SFI SYSTEM (2UZ–FE)(From August, 2003)

05G1G-01

PRECAUTION

NOTICE:

Perform the RESET MEMORY (AT initialization) when replacing the automatic transaxle assembly, engine assembly or ECM.

HINT:

Initialization can not be completed by only removing the battery.

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DEFINITION OF TERMS

Term	Definition
Monitor description	Description of what the ECM monitors and how it detects malfunctions (monitoring purpose and its details).
Related DTCs	Diagnostic codes
Typical enabling condition	Preconditions that allow the ECM to detect malfunctions. With all preconditions satisfied, the ECM sets the DTC when the monitored value(s) exceeds the malfunction threshold(s).
Sequence of operation	The priority order that is applied to monitoring, if multiple sensors and components are used to detect the malfunction. While another sensor is being monitored, the next sensor or component will not be monitored until the current sensor monitoring is finished.
Required sensor/components	The sensors and components that are used by the ECM to detect malfunctions.
Frequency of operation	The number of times that the ECM checks for malfunctions per driving cycle. "Once per driving cycle" means that the ECM detects malfunction only one time during a single driving cycle. "Continuous" means that the ECM detects the malfunction every time an enabling condition is met.
Duration	The minimum time that the ECM must sense a continuous deviation in the monitored value(s) before setting a DTC. This timing begins after the "typical enabling conditions" are met.
Malfunction thresholds	Beyond this value, the ECM will conclude that there is a malfunction and set a DTC.
MIL operation	MIL illumination timing after a defect is detected. "Immediately" means that the ECM illuminates the MIL the instant the ECM determines that there is a malfunction. "2 driving cycle" means that the ECM illuminates the MIL if the same malfunction is detected again in the 2nd driving cycle.

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PART AND SYSTEM NAME LIST

This reference list indicates the part names used in this manual along with their definitions.

TOYOTA/LEXUS name	Definition
Toyota HCAC system, Hydro–carbon adsorptive catalyst (HCAC) system, HC adsorptive three–way catalyst	HC adsorptive three–way catalytic converter
Variable valve timing sensor, VVT sensor	Camshaft position sensor
Variable valve timing system, VVT system	Camshaft timing control system
Camshaft timing oil control valve, Oil control valve, OCV, VVT, VSV	Camshaft timing oil control valve
Variable timing and lift, VVTL	Camshaft timing and lift control
Crankshaft position sensor "A"	Crankshaft position sensor
Engine speed sensor	Crankshaft position sensor
THA	Intake air temperature
Knock control module	Engine knock control module
Knock sensor	Engine knock sensor
Mass or volume air flow circuit	Mass air flow meter circuit
Vacuum sensor	Manifold air pressure sensor
Internal control module, Control module, Engine control ECU, PCM, ECM	Power train control module
FC idle	Deceleration fuel cut
Idle air control valve	Idle speed control
VSV for CCV, Canister close valve VSV for canister control	Evaporative emissions canister vent valve
VSV for EVAP, Vacuum switching valve assembly No. 1, EVAP VSV, Purge VSV	Evaporative emissions canister purge valve
VSV for pressure switching valve, Bypass VSV	Evaporative emission pressure switching valve
Vapor pressure sensor, EVAP pressure sensor, Evaporative emission control system pressure sensor	Fuel tank pressure sensor
Charcoal canister	Evaporative emissions canister
ORVR system	On–boad refueling vapor recovery system
Intake manifold runner control	Intake manifold tuning system
Intake manifold runner valve, IMRV, IACV (runner valve)	Intake manifold tuning valve
Intake control VSV	Intake manifold tuning solenoid valve
AFS	Air–fuel ratio sensor
O2 sensor	Heater oxygen sensor
Oxygen sensor pumping current circuit	Oxygen sensor output signal
Oxygen sensor reference ground circuit	Oxygen sensor signal ground
Accel position sensor	Accelerator pedal position sensor
Throttle actuator control motor, Actuator control motor, Electronic throttle motor, Throttle control motor	Electronic throttle actuator
Electronic throttle control system, Throttle actuator control system	Electronic throttle control system
Throttle/pedal position sensor, Throttle/pedal position switch, Throttle position sensor/switch	Throttle position sensor
Turbo press sensor	Turbocharger pressure sensor
Turbo VSV	Turbocharger pressure control solenoid valve
P/S pressure switch	Power–steering pressure switch
VSV for ACM	Active control engine mount
Speed sensor, Vehicle speed sensor "A", Speed sensor for skid control ECU	Vehicle speed sensor
ATF temperature sensor, Transmission fluid temperature sensor, ATF temperature sensor "A"	Transmission fluid temperature sensor
Electronic controlled automatic transmission, ECT	Electronically controlled automatic
Intermediate shaft speed sensor "A"	Counter gear speed sensor

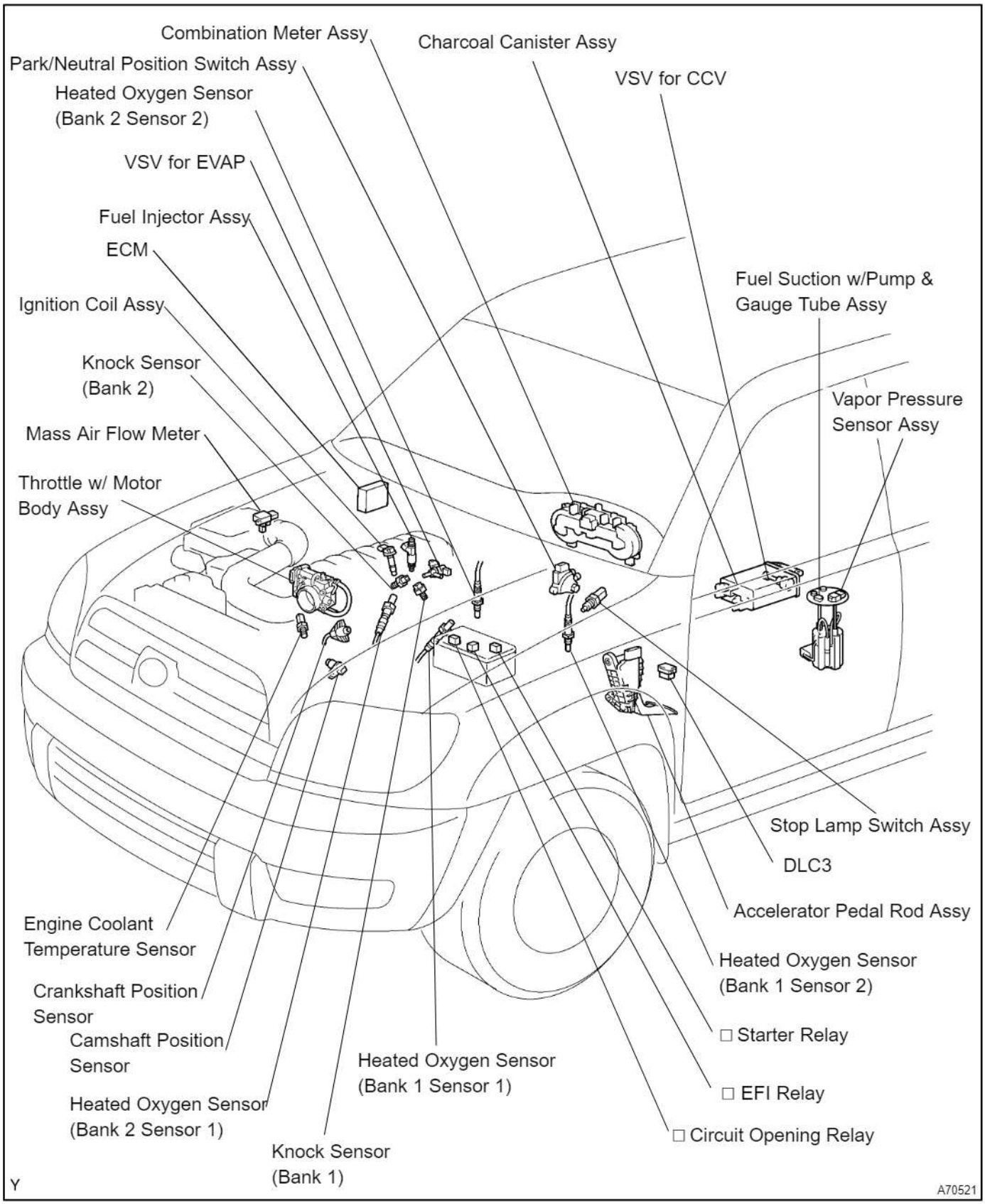
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TOYOTA/LEXUS name	Definition
Output speed sensor	Output shaft speed sensor
Input speed sensor, Input turbine speed sensor "A", Speed sensor (NT), Turbine speed sensor	Input turbine speed sensor
PNP switch, NSW	Park/Neutral position switch
Pressure control solenoid	Transmission pressure control solenoid
Shift solenoid	Transmission shift solenoid valve
Transmission control switch, Shift lock control unit	Shift lock control module
Engine immobilizer system, Immobilizer system	Vehicle anti–theft system

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LOCATION



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HOW TO PROCEED WITH TROUBLESHOOTING

HINT:
The hand–held tester can be used at step 3, 4, 5, 7 and 10.

1	VEHICLE BROUGHT TO WORKSHOP

2	CUSTOMER PROBLEM ANALYSIS (See page 05–9)

3	CONNECT HAND–HELD TESTER TO DLC3

HINT:
If the display indicates a communication fault in the tool, inspect the DLC3.

4	CHECK DTC AND FREEZE FRAME DATA (See page 05–36)

HINT:
Record or print DTC and freeze frame data, if needed.

5	CLEAR DTC AND FREEZE FRAME DATA (See page 05–36)

6	VISUAL INSPECTION

7	SETTING CHECK (TEST) MODE DIAGNOSIS (See page 05–38)

8	PROBLEM SYMPTOM CONFIRMATION

HINT:
If the engine does not start, perform steps 10 and 12 first.

A	Malfunction does not occur
B	Malfunction occurs

B → GO TO STEP 10

A

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9	SYMPTOM SIMULATION

10	DTC CHECK (See page 05–36)

A	Malfunction code
B	No code

B → GO TO STEP 12

A

11	DTC CHART (See page 05–47)

GO TO STEP 14

12	BASIC INSPECTION (See page 05–11)

A	Wrong parts not confirmed
B	Wrong parts confirmed

B → GO TO STEP 17

A

13	PROBLEM SYMPTOMS TABLE (See page 05–29)

A	Wrong circuit confirmed
B	Wrong parts confirmed

B → GO TO STEP 17

A

14	CHECK ECM POWER SOURCE CIRCUIT (See page 05–293)

15	CIRCUIT INSPECTION

A	Malfunction not confirmed
B	Malfunction confirmed

B → GO TO STEP 18

A

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16	CHECK FOR INTERMITTENT PROBLEMS (See page 05–10)

GO TO STEP 18

17	PARTS INSPECTION

18	IDENTIFICATION OF PROBLEM

19	ADJUSTMENT AND/OR REPAIR

20	CONFIRMATION TEST

END

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CUSTOMER PROBLEM ANALYSIS CHECK

ENGINE CONTROL SYSTEM Check Sheet

Inspector's Name _____

Customer's Name		VIN	
Date Vehicle Brought in		Production Data	
License Plate No.		Odometer Reading	km / miles

Problem Symptoms	☐ Engine does not Start	☐ Engine does not crank ☐ No initial combustion ☐ No complete combustion
	☐ Difficult to Start	☐ Engine cranks slowly ☐ Other _____
	☐ Poor Idling	☐ Incorrect first idle ☐ Idling rpm is abnormal ☐ High (rpm) ☐ Low (rpm) ☐ Rough idling ☐ Other _____
	☐ Poor Driveability	☐ Hesitation ☐ Back fire ☐ Muffler explosion (after–fire) ☐ Surging ☐ Knocking ☐ Other _____
	☐ Engine Stall	☐ Soon after starting ☐ After accelerator pedal depressed ☐ After accelerator pedal released ☐ During A/C operation ☐ Shifting from N to D ☐ Other _____
	☐ Others	

Data Problem Occurred		
Problem Frequency		☐ Constant ☐ Sometimes (times per day/month) ☐ Once only ☐ Other _____
Condition When Problem Occurs	Weather	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Various/Other _____
	Outdoor Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold (approx. ____ °C/____ °F)
	Place	☐ Highway ☐ Suburbs ☐ Inner City ☐ Uphill ☐ Downhill ☐ Rough road ☐ Other _____
	Engine Temp.	☐ Cold ☐ Warming up ☐ After Warming up ☐ Any temp. ☐ Other _____
	Engine Operation	☐ Starting ☐ Just after starting (min.) ☐ Idling ☐ Racing ☐ Driving ☐ Constant speed ☐ Acceleration ☐ Deceleration ☐ A/C switch ON/OFF ☐ Other _____

Condition of malfunction indicator lamp (MIL)		☐ Remains on ☐ Sometimes lights up ☐ Does not light up
DTC Inspection	Normal mode (Pre–check)	☐ Normal ☐ Malfunction code(s) (code) ☐ Freeze frame data ( )
	Check Mode	☐ Normal ☐ Malfunction code(s) (code) ☐ Freeze frame data ( )

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CHECK FOR INTERMITTENT PROBLEMS

HINT:

Hand–held tester only:

Inspect the vehicle's ECM using check mode. Intermittent problems are easier to detect when the ECM is in check mode with a hand–held tester. In check mode, the ECM uses 1 trip detection logic, which has a higher sensitivity to malfunctions than normal mode (default) using 2 trip detection logic.

(a) Clear the DTCs (see page 05–36).
(b) Switch the hand–held tester from normal mode to check mode (see page 05–38).
(c) Perform a simulation test (see page 01–25).
(d) Check the connector(s) and terminal(s) (see page 01–35).
(e) Wiggle the harness(s) and connector(s) (see page 01–35).

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BASIC INSPECTION

When the malfunction is not confirmed in the DTC check, troubleshooting should be carried out in all the possible circuits considered as causes of the problem. In many cases, by carrying out the basic engine check shown in the following flowchart, the location causing the problem can be found quickly and efficiently. Therefore, using this check is essential in the engine troubleshooting.

1 CHECK BATTERY POSITIVE VOLTAGE

NOTICE:
Carry out this check with the engine stopped and ignition switch OFF.

	OK	NG
Voltage	11 V or more	Less than 11 V

NG → **CHARGE OR REPLACE BATTERY**

OK

2 CHECK IF ENGINE IS CRANKED

NG → **PROCEED TO PROBLEM SYMPTOMS TABLE ON PAGE 05–29**

OK

3 CHECK IF ENGINE STARTS

NG → **GO TO STEP 7**

OK

4 CHECK AIR FILER

(a) Visually check if the air filter is not contaminated with dirt or oil.

→ **REPLACE AIR FILTER**

OK

5 CHECK IDLE SPEED (See page 14–190)

NG → **PROCEED TO PROBLEM SYMPTOMS TABLE ON PAGE 05–29**

OK

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6	CHECK IGNITION TIMING (See page 14–190)

NG → PROCEED TO PAGE 18–8 AND CONTINUE TO TROUBLESHOOT

OK

PROCEED TO PROBLEM SYMPTOMS TABLE ON PAGE 05–29

7	CHECK FUEL PRESSURE (See page 11–35)

NG → PROCEED TO PAGE 11–31 AND CONTINUE TO TROUBLESHOOT

OK

8	CHECK FOR SPARK (See page 18–8)

NG → PROCEED TO PAGE 18–8 AND CONTINUE TO TROUBLESHOOT

OK

PROCEED TO PROBLEM SYMPTOMS TABLE ON PAGE 05–29

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LIST OF DISABLE A MONITOR

HINT:

The table below shows the ECM monitoring status for the components listed in the top of the table when the DTCs on the left of the table are set.

As for the "·" mark, when the DTC on the left is stored, detection of the DTC in the upper column is not perfomed.

Monitor detected malfunction: Fault code	Fault code	Component/system	Monitor disablement (X - disabled): P0010,P0020	P0011	P0012	P0016,P0018	P0021	P0022	P0030,50	P0135,P0155	P0036,56	P0043,44,63,64	P0100	P0101	P0105	P0106	P0110	P0115	P0116	P0120,P0121	P0125	P0128	P0130-P0153	P0134,P0154	P0136,P0156	P0142,P0162	P0171,P0172	P0300-P0308
			P0010,P0020	P0011	P0012	P0016,P0018	P0021	P0022	P0031,32,51,52	P0031,32,51,52	P0037,38,57,58	P0043,44,63,64	P0100-P0103	P0101	P0105-P0108	P0106	P0110-P0113	P0115-P0118	P0116	P0120-P0223,P2135	P0125	P0128	P0130-P0153	P0134,P0154	P0136,P0156	P0142,P0162	P0171,P0172	P0300-P0308
			VVT VSV1,2	VVT System1 -Advance	VVT System1 - Retard	VVT System - Misalignment	VVT System2 - Advance	VVT System2 - Retard	O2 Sensor Heater - Sensor1	A/F Sensor Heater - Sensor1	O2 Sensor Heater - Sensor2	O2 Snesor Heater - Sensor3	MAF sensor	MAF sensor	MAP sensor	MAP sensor	IAT sensor	ECT sensor	ECT sensor	TP sensor	Insufficient ECT for Closed Loop	Thermostat	O2 Sensor -Sensor1	O2 Sensor, A/F Sensor(No Activity) - Sensor1	O2 Sensor - Sensor2	O2 Snesor - Sensor3	Fuel system	Misfire
P0010,P0020	P0010,P0020	VVT VSV1,2																				X					X	
P0011	P0011	VVT System1 - Advance				X		X														X					X	
P0012	P0012	VVT System1 - Retard				X		X														X					X	
P0016,P0018	P0016,P0018	VVT System - Misalignment																										
P0021	P0021	VVT System2 - Advance			X	X																X					X	
P0022	P0022	VVT System2 - Retard			X																	X					X	
P0030,50	P0031,32,51,52	O2 Sensor Heater - Sensor1																				X	X	X	X	X	X	
P0135,P0155	P0031,32,51,52	A/F Sensor Heater - Sensor1																				X			X	X	X	
P0036,56	P0037,38,57,58	O2 Sensor Heater - Sensor2																							X	X		
P0043,44,63,64	P0043,44,63,64	O2 Sensor Heater - Sensor3																									X	
P0100,P0101	P0100-P0103	MAF sensor		X	X		X	X											X		X	X	X	X	X	X	X	X
P0105,P0106	P0105-P0108	MAP sensor		X	X		X	X											X		X	X	X	X	X	X	X	X
P0110	P0110-P0113	IAT sensor																			X	X	X	X	X	X		X
P0115,P0116	P0115-P0118	ECT sensor		X	X	X	X	X						X		X					X	X	X	X	X	X	X	X
P0120,P0121	P0120-P0223,P2135	TP sensor												X		X							X	X	X	X	X	X
P0125	P0125	Insufficient ECT for Closed Loop		X	X		X	X						X		X						X	X	X	X	X	X	X
P0128	P0128	Thermostat																					X					
P0130-P0153	P0130-P0153	O2 Sensor - Sensor1																				X		X	X	X		
P0134,P0154	P0134,P0154	O2 Sensor, A/F Sensor(No Activity) - Sensor1								X												X	X		X	X	X	
P0136,P0156	P0136,P0156	O2 Sensor - Sensor2																										
P0142,P0162	P0142,P0162	O2 Sensor - Sensor3																										
P0171,P0172	P0171,P0172	Fuel system																				X	X	X	X	X		
P0300-P0308	P0300-P0308	Misfire							X													X	X	X	X	X		
P0325,P0330	P0325-P0333	Knock sensor																										X
P0335	P0335	CKP sensor		X	X		X	X						X		X						X	X	X	X	X	X	X
P0340, P0341	P0340, P0341	CMP sensor		X	X		X	X						X		X						X	X	X	X	X	X	X
P0340-P0346	P0340-P0346	VVT sensor1,2																				X						
P0351-P0358	P0351-P0358	Ignitor		X	X		X	X														X						
P0385	P0385	CKP sensor 2												X		X						X	X	X	X	X	X	X
P0401	P0401	EGR system (closed)																				X					X	
P0402	P0402	EGR system (open)																				X	X	X	X	X	X	
P0405,P0409	P0405-P0409	Lift sensor																									X	
P0420,P0430	P0420,P0430	Catalyst																										
P0442-P0456	P0442-P0456	EVAP system																					X	X	X	X		
P0450,P0451	P0450-P0453	EVAP press sensor																										

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Monitor detected malfunction				Monitor disablement (X - disabled)																											
	Fault code			P0010,P0020	P0011	P0012	P0016,P0018	P0021	P0022	P0030,50	P0135,P0155	P0036,56	P0043,44,63,64	P0100	P0101	P0105	P0106	P0110	P0115	P0116	P0120,P0121	P0125	P0128	P0130-P0153	P0134,P0154	P0136,P0156	P0142,P0162	P0171,P0172	P0300-P0308		
	Fault code			P0010,P0020	P0011	P0012	P0016,P0018	P0021	P0022	P0031,32,51,52	P0031,32,51,52	P0037,38,57,58	P0043,44,63,64	P0100-P0103	P0101	P0105-P0108	P0106	P0110-P0113	P0115-P0118	P0116	P0120-P0223,P2135	P0125	P0128	P0130-P0153	P0134,P0154	P0136,P0156	P0142,P0162	P0171,P0172	P0300-P0308		
		Component/ system		VVT VSV1,2	VVT System1 -Advance	VVT System1 - Retard	VVT System - Misalignment	VVT System2 - Advance	VVT System2 - Retard	O2 Sensor Heater - Sensor1	A/F Sensor Heater - Sensor1	O2 Sensor Heater - Sensor2	O2 Snesor Heater - Sensor3	MAF sensor	MAF sensor	MAP sensor	MAP sensor	IAT sensor	ECT sensor	ECT sensor	TP sensor	Insufficient ECT for Closed Loop	Thermostat	O2 Sensor -Sensor1	O2 Sensor, A/F Sensor(No Activity) - Sensor1	O2 Sensor - Sensor2	O2 Snesor - Sensor3	Fuel system	Misfire		
	P0500	P0500	VSS																				X	X	X	X	X	X	X		
	P0511	P0511	IAC valve																					X							
	P0510	P0510	Idle switch												X		X						X	X		X	X	X	X		
	P0560	P0560	System Voltage																												
	P0617	P0617	Starter signal																												
	P0705	P0705	Shift lever position switch																												
	P0710	P0710-P0713	Trans fluid temp sensor																												
	P0720-P0793	P0720-P0793	Output speed sensor																												
	P0715-P0717	P0715-P0717	Input speed sensor																												
	P0724	P0724	Stop lamp switch																												
	P0741-P0796	P0741-P0796	Trans solenoid (function)																												
	P0748-P0798	P0748-P0799	Trans solenoid (range)																												
	P0850	P0850	PNP switch																												X
	P1010,P1020	P1010,P1020	VVTL																				X						X		
	P1011,12(,21,22)	P1011,12(,21,22)	VVTL system1(,2)																				X						X		
	P1126	P1126	Electronic magnet clutch																												
	P1129	P1129	Electronic throttle system																												
	P1430	P1430	HC adsorber ACT press sensor																												
	P2004,6	P2004,6	Intake Manifold Runner Control																												
	P2009,10	P2009,10	Intake Manifold Runner Control Circuit																												
	P2014,16,17	P2014,16,17	Intake Manifold Runner Position Sensor																												
	P2102,P2103	P2102,P2103	Throttle motor																												
	P2120-P2138	P2120-P2138	Accel position sensor																												
	P2196,P2198	P2196,P2198	A/F sensor (rationality)																				X			X	X				
	P2226	P2226	BARO sensor																					X		X	X				
	P2237,P2240	P2237,P2240	A/F sensor (open)																				X			X	X				
	P2423,24	P2423,24	HC Absorption Catalyst																												
	P2430,2,3	P2430,2,3	AIR Pressure Sensor(Low/High)																												
	P2431	P2431	AIR Pressure Sensor(Rationality)																												
	P2440	P2440	AIR control valve stuck open																					X	X	X	X	X			
	P2441	P2441	AIR control valve stuck close																					X	X	X	X	X			
	P2444	P2444	AIP stuck On																					X	X	X	X	X			
	P2445	P2445	AIP stuck Off																					X	X	X	X	X			
	P2714-P2759	P2714-P2759	Trans solenoid(SLU-SLD)																												
	P2A00,P2A03	P2A00,P2A03	A/F sensor (slow response)																				X			X	X				

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Monitor detected malfunction

Fault code	Fault code	Component/ system	Monitor disablement (X - disabled)																														
			P0325,P0330	P0335	P0340,P0341	P0340-P0346	P0351-P0358	P0385	P0401	P0402	P0405	P0409	P0420,P0430	P0440-P0446	P0450,P0451	P0500	P0500	P0500	P0511	P0510	P0560	P0617	P0705	P0710	P0720-P0793	P0715-P0717	P0724	P0741-P0796						
			P0325-P0333	P0335	P0340,P0341	P0340-P0346	P0351-P0358	P0385	P0401	P0402	P0405,P0406	P0409	P0420,P0430	P0440-P0446	P0450-P0453	P0500	P0500	P0500	P0511	P0510	P0560	P0617	P0705	P0710-P0713	P0720-P0793	P0715-P0717	P0724	P0741-P0796						
			Knock sensor	CKP sensor	CMP sensor	VVT sensor1,2	Ignitor	CKP sensor 2	EGR system (closed)	EGR system (open)	EGR Lift sensor	EGR Lift sensor	Catalyst	EVAP system	EVAP press sensor	VSS(ECT2sensor)	VSS(ECT1sensor, non-ECT)	VSS(M/T)	IAC valve	Idle switch	System Voltage	Starter signal	Shift lever position switch	Trans fluid temp sensor	Output speed sensor	Input speed sensor	Stop lamp switch	Trans solenoid (function)*1						
P0010,P0020	P0010,P0020	VVT VSV1,2																										X					
P0011	P0011	VVT System1 - Advance							X	X			X	X					X														
P0012	P0012	VVT System1 - Retard							X	X			X	X					X														
P0016,P0018	P0016,P0018	VVT System - Misalignment																															
P0021	P0021	VVT System2 - Advance							X	X			X	X					X														
P0022	P0022	VVT System2 - Retard							X	X			X	X					X														
P0030,50	P0031,32,51,52	O2 Sensor Heater - Sensor1							X	X			X						X									X					
P0135,P0155	P0031,32,51,52	A/F Sensor Heater - Sensor1							X	X			X						X														
P0036,56	P0037,38,57,58	O2 Sensor Heater - Sensor2											X																				
P0043,44,63,64	P0043,44,63,64	O2 Sensor Heater - Sensor3																															
P0100,P0101	P0100-P0103	MAF sensor							X	X			X	X				X	X									X					
P0105,P0106	P0105-P0108	MAP sensor							X	X			X	X				X	X									X					
P0110	P0110-P0113	IAT sensor							X	X				X														X					
P0115,P0116	P0115-P0118	ECT sensor							X	X		X	X	X				X	X									X					
P0120,P0121	P0120-P0223,P2135	TP sensor							X	X			X	X			X		X									X					
P0125	P0125	Insufficient ECT for Closed Loop							X	X		X	X	X				X	X									X					
P0128	P0128	Thermostat																															
P0130-P0153	P0130-P0153	O2 Sensor - Sensor1							X	X			X	X					X									X					
P0134,P0154	P0134,P0154	O2 Sensor, A/F Sensor(No Activity) - Sensor1							X	X			X						X									X					
P0136,P0156	P0136,P0156	O2 Sensor - Sensor2											X																				
P0142,P0162	P0142,P0162	O2 Sensor - Sensor3																															
P0171,P0172	P0171,P0172	Fuel system							X	X			X	X					X									X					
P0300-P0308	P0300-P0308	Misfire											X	X					X									X					
P0325,P0330	P0325-P0333	Knock sensor							X	X																		X					
P0335	P0335	CKP sensor							X	X			X	X					X									X					
P0340, P0341	P0340, P0341	CMP sensor							X	X			X	X					X									X					
P0340-P0346	P0340-P0346	VVT sensor1,2																															
P0351-P0358	P0351-P0358	Ignitor							X	X			X	X					X									X					
P0385	P0385	CKP sensor 2							X	X			X	X					X														
P0401	P0401	EGR system (closed)											X															X					
P0402	P0402	EGR system (open)											X	X					X									X					
P0405,P0409	P0405-P0409	Lift sensor																															
P0420,P0430	P0420,P0430	Catalyst																															
P0442-P0456	P0442-P0456	EVAP system																	X														
P0450,P0451	P0450-P0453	EVAP press sensor												X																			

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Monitor detected malfunction

Fault code	Fault code	Component/ system	Monitor disablement (X - disabled)																												
			P0325,P0330	P0335	P0340,P0341	P0340-P0346	P0351-P0358	P0385	P0401	P0402	P0405,P0406	P0409	P0420,P0430	P0440-P0446	P0450,P0451	P0500	P0500	P0500	P0500	P0511	P0510	P0560	P0617	P0705	P0710	P0720-P0793	P0715-P0717	P0724	P0741-P0796	
			P0325-P0333	P0335	P0340,P0341	P0340-P0346	P0351-P0358	P0385	P0401	P0402	P0405,P0406	P0409	P0420,P0430	P0440-P0446	P0450-P0453	P0500	P0500	P0500	P0500	P0511	P0510	P0560	P0617	P0705	P0710-P0713	P0720-P0793	P0715-P0717	P0724	P0741-P0796	
			Knock sensor	CKP sensor	CMP sensor	VVT sensor1,2	Ignitor	CKP sensor 2	EGR system (closed)	EGR system (open)	EGR Lift sensor	EGR Lift sensor	Catalyst	EVAP system	EVAP press sensor	VSS(ECT2sensor)	VSS(ECT1sensor, non-ECT)	VSS(M/T)	IAC valve	Idle switch	System Voltage	Starter signal	Shift lever position switch	Trans fluid temp sensor	Output speed sensor	Input speed sensor	Stop lamp switch	Trans solenoid (function)*1	
P0500	P0500	VSS							X	X			X	X					X						X	X		X	
P0511	P0511	IAC valve																											
P0510	P0510	Idle switch								X			X	X					X									X	
P0560	P0560	System Voltage																											
P0617	P0617	Starter signal																											
P0705	P0705	Shift lever position switch																											
P0710	P0710-P0713	Trans fluid temp sensor																											
P0720-P0793	P0720-P0793	Output speed sensor																										X	
P0715-P0717	P0715-P0717	Input speed sensor																											
P0724	P0724	Stop lamp switch																											
P0741-P0796	P0741-P0796	Trans solenoid (function)																											
P0748-P0798	P0748-P0799	Trans solenoid (range)																							X	X		X	
P0850	P0850	PNP switch																	X									X	
P1010,P1020	P1010,P1020	VVTL																											
P1011,12(,21,22)	P1011,12(,21,22)	VVTL system1(,2)							X	X			X	X					X										
P1126	P1126	Electronic magnet clutch																											
P1129	P1129	Electronic throttle system																											
P1430	P1430	HC adsorber ACT press sensor												X	X														
P2004,6	P2004,6	Intake Manifold Runner Control																											
P2009,10	P2009,10	Intake Manifold Runner Control Circuit																											
P2014,16,17	P2014,16,17	Intake Manifold Runner Position Sensor																											
P2102,P2103	P2102,P2103	Throttle motor																											
P2120-P2138	P2120-P2138	Accel position sensor																											
P2196,P2198	P2196,P2198	A/F sensor (rationality)							X	X			X						X									X	
P2226	P2226	BARO sensor																										X	
P2237,P2240	P2237,P2240	A/F sensor (open)							X	X			X						X									X	
P2423,24	P2423,24	HC Absorption Catalyst																											
P2430,2,3	P2430,2,3	AIR Pressure Sensor(Low/High)																											
P2431	P2431	AIR Pressure Sensor(Rationality)																											
P2440	P2440	AIR control valve stuck open							X	X			X																
P2441	P2441	AIR control valve stuck close							X	X			X																
P2444	P2444	AIP stuck On							X	X			X																
P2445	P2445	AIP stuck Off							X	X			X																
P2714-P2759	P2714-P2759	Trans solenoid(SLU-SLD)																										X	
P2A00,P2A03	P2A00,P2A03	A/F sensor (slow response)							X	X			X						X									X	

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Monitor detected malfunction				Monitor disablement (X - disabled)																												
	Fault code			P0741-P0796	P0748-P0798	P0850	P1010,P1020	P1011,12(,21,22)	P1126	P1129	P1430	P2004,P2006	P2009,P2010	P2014,16,17	P2102,P2103	P2120-P2138	P2196,P2198	P2226	P2237,P2240	P2423,24	P2430,2,3	P2431	P2440	P2441	P2444	P2445	P2714-P2759	P2A00,P2A03
	Fault code			P0741-P0796	P0748-P0999	P0850	P1010,P1020	P1011,12(,21,22)	P1126	P1129	P1430	P2004,6	P2009,10	P2014,16,17	P2102,P2103	P2120-P2138	P2196,P2198	P2226	P2237,P2240	P2423,24	P2430,2,3	P2431	P2440	P2441	P2444	P2445	P2714-P2759	P2A00,P2A03
		Component/ system		Trans solenoid (function)*2	Trans solenoid (range)	PNP switch	VVTL	VVTL system1(,2)	Electronic magnet clutch	Electronic throttle system	HC adsorber ACT press sensor	Intake Manifold Runner Control	Intake Manifold Runner Control Circuit	Intake Manifold Runner Position Sensor	Throttle motor	Accel position sensor	A/F Sensor(Rationality) - Sensor1	BARO sensor	A/F Sensor(Open) - Sensor1	HC Absorption Catalyst	AIR Pressure Sensor(Low/High)	AIR Pressure Sensor(Rationality)	AIR control valve stuck open	AIR control valve stuck close	AIP stuck On	AIP stuck Off	Trans solenoid(SLU-SLD)	A/F Sensor (Slow response) - Sensor1
	P0010,P0020	P0010,P0020	VVT VSV1,2																				X	X	X	X		
	P0011	P0011	VVT System1 - Advance																				X	X	X	X		
	P0012	P0012	VVT System1 - Retard																				X	X	X	X		
	P0016,P0018	P0016,P0018	VVT System - Misalignment																				X	X	X	X		
	P0021	P0021	VVT System2 - Advance																				X	X	X	X		
	P0022	P0022	VVT System2 - Retard																				X	X	X	X		
	P0030,50	P0031,32,51,52	O2 Sensor Heater - Sensor1																	X			X	X	X	X		
	P0135,P0155	P0031,32,51,52	A/F Sensor Heater - Sensor1														X		X	X			X	X	X	X		X
	P0036,56	P0037,38,57,58	O2 Sensor Heater - Sensor2														X			X								
	P0043,44,63,64	P0043,44,63,64	O2 Sensor Heater - Sensor3																	X								
	P0100,P0101	P0100-P0103	MAF sensor				X	X									X		X	X			X	X	X	X		X
	P0105,P0106	P0105-P0108	MAP sensor				X	X									X		X	X			X	X	X	X		X
	P0110	P0110-P0113	IAT sensor									X					X		X				X	X	X	X		X
	P0115,P0116	P0115-P0118	ECT sensor	X			X	X				X					X		X	X			X	X	X	X		X
	P0120,P0121	P0120-P0223,P2135	TP sensor														X		X	X			X	X	X	X		X
	P0125	P0125	Insufficient ECT for Closed Loop	X			X										X		X	X			X	X	X	X		X
	P0128	P0128	Thermostat																									
	P0130-P0153	P0130-P0153	O2 Sensor - Sensor1																	X			X	X	X	X		
	P0134,P0154	P0134,P0154	O2 Sensor, A/F Sensor(No Activity) - Sensor1														X		X	X			X	X	X	X		X
	P0136,P0156	P0136,P0156	O2 Sensor - Sensor2														X			X								
	P0142,P0162	P0142,P0162	O2 Sensor - Sensor3																	X								
	P0171,P0172	P0171,P0172	Fuel system														X		X	X			X	X	X	X		X
	P0300-P0308	P0300-P0308	Misfire														X		X	X			X	X	X	X		X
	P0325,P0330	P0325-P0333	Knock sensor																				X	X	X	X		
	P0335	P0335	CKP sensor				X	X									X		X	X			X	X	X	X		X
	P0340, P0341	P0340, P0341	CMP sensor				X	X									X		X	X			X	X	X	X		X
	P0340-P0346	P0340-P0346	VVT sensor1,2																				X	X	X	X		
	P0351-P0358	P0351-P0358	Ignitor																	X			X	X	X	X		
	P0385	P0385	CKP sensor 2				X	X									X		X	X			X	X	X	X		X
	P0401	P0401	EGR system (closed)																	X								
	P0402	P0402	EGR system (open)														X		X	X			X	X	X	X		X
	P0405,P0409	P0405-P0409	Lift sensor																									
	P0420,P0430	P0420,P0430	Catalyst																									
	P0442-P0456	P0442-P0456	EVAP system														X		X				X	X	X	X		X
	P0450,P0451	P0450-P0453	EVAP press sensor																				X	X	X	X		

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Monitor detected malfunction

Fault code	Fault code	Component/system	Monitor disablement (X - disabled)																										
			P0741-P0796	P0748-P0798	P0850	P1010,P1020	P1011,12(,21,22)	P1126	P1129	P1430	P2004,P2006	P2009,P2010	P2014,16,17	P2102,P2103	P2120-P2138	P2196,P2198	P2226	P2237,P2240	P2423,24	P2430,2,3	P2431	P2440	P2441	P2444	P2445	P2714-P2759	P2A00,P2A03
	P0741-P0796	Trans solenoid (function)*2																											
	P0748-P0799	Trans solenoid (range)																											
	P0850	PNP switch																											
	P1010,P1020	VVTL																											
	P1011,12(,21,22)	VVTL system1(,2)																											
	P1126	Electronic magnet clutch																											
	P1129	Electronic throttle system																											
	P1430	HC adsorber ACT press sensor																											
	P2004,6	Intake Manifold Runner Control																											
	P2009,10	Intake Manifold Runner Control Circuit																											
	P2014,16,17	Intake Manifold Runner Position Sensor																											
	P2102,P2103	Throttle motor																											
	P2120-P2138	Accel position sensor																											
	P2196,P2198	A/F Sensor(Rationality) - Sensor1																											
	P2226	BARO sensor																											
	P2237,P2240	A/F Sensor(Open) - Sensor1																											
	P2423,24	HC Absorption Catalyst																											
	P2430,2,3	AIR Pressure Sensor(Low/High)																											
	P2431	AIR Pressure Sensor(Rationality)																											
	P2440	AIR control valve stuck open																											
	P2441	AIR control valve stuck close																											
	P2444	AIP stuck On																											
	P2445	AIP stuck Off																											
	P2714-P2759	Trans solenoid(SLU-SLD)																											
	P2A00,P2A03	A/F Sensor (Slow response) - Sensor1																											

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05FDQ-02

O2S TEST RESULT

1. INTRODUCTION

The O2S TEST RESULT refers to the results of the engine control module (ECM) when it monitors the oxygen sensor (O2S), and it can be read using the hand–held tester or the generic OBDII scantool. Based on this, you can find the O2S's conditions. The ECM monitors the O2S in the various items. You can read the monitor result (TEST DATA) of each monitor item using the O2S TEST RESULT. However, the output value of the TEST DATA is the latest "snapshot" value that is it taken after monitoring and therefore it is not dynamic.

In this repair manual, the description of the O2S TEST RESULT (for O2S related DTCs) are written in a table.

This table consists of 5 items:

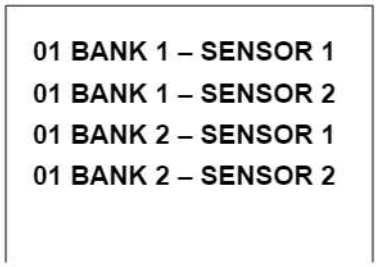
(1) TEST ID (a code applied to each TEST DATA)
(2) Description of TEST DATA
(3) Conversion Factor (When Conversion Factor has a value written in the table, multiply the TEST DATA value appearing on the scantool by the Conversion Factor value. The result will be the required value.)
(4) Unit
(5) Standard Value

If the TEST DATA value appearing on the scantool is out of the standard value, the O2S is malfunctioning. If it is within the standard value, the O2S is functioning normally. However, if the value is on the borderline of the standard value, the O2S may malfunction very soon.

2. HOW TO READ O2S TEST RESULT USING HAND–HELD TESTER

(a) Connect the hand–held tester to the DLC3.

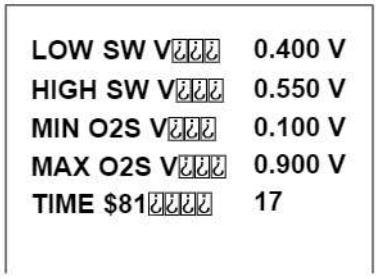
O2S TEST RESULT Screen



(b) On the tester screen, select the following menus: DIAGNOSIS/CARB OBDII/O2S TEST RESULT. A list of the O2S equipped on the vehicle will be displayed.

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TEST DATA Screen



(c) Select the desired O2S and press ENTER. The following screen will appear.

(d) Press HELP and simultaneously. More information will appear.

(e) Example:

(1) The hand–held tester displays ”17” as a value of the ”TIME $81” (see the illustration on the left).

(2) Find the Conversion Factor value of ”TIME $81” in the O2S TEST RESULT chart below. 0.3906 is specified for $81 in this chart.

(3) Multiply ”17” in step (1) by 0.3906 (Conversion Factor) in the step (2).

17 x 0.3906 = 6.6 %

(4) If the answer is within the standard value, the ”TIME $81” can be confirmed to be normal.

O2S TEST RESULT Chart

TEST ID	Description of TEST DATA	Conversion Factor	Unit
$81	Percentage of monitoring time when the O2S voltage is less than 0.05V	Multiply 0.3906	%

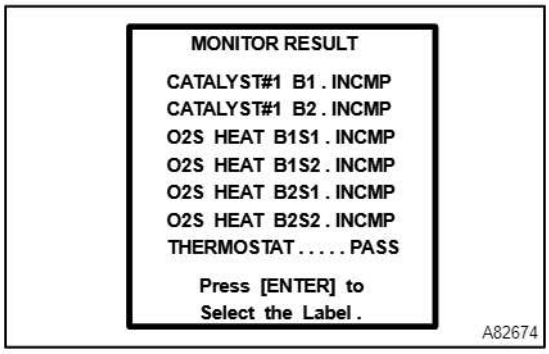
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CHECKING MONITOR STATUS

HINT:

"MONITOR RESULT" indicates normal or malfunction of each component and system when judgment has done.



1. HOW TO READ DATA

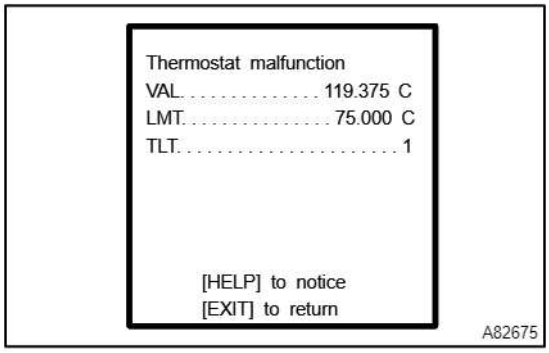
(a) Connect the hand–held tester to the DLC 3.

(b) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / MONITOR INFO / MONITOR RESULT

The Test ID will appear at the beginning of each line, followed by INCMP, PASS, or FAIL.

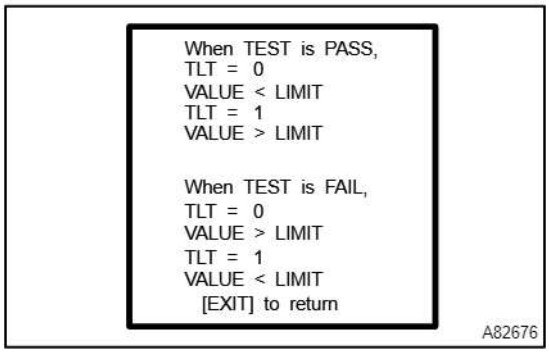
HINT:

- □ INCMP: The judgement has not been done yet.
- □ PASS: Normal is detected.
- □ FAIL: Malfunction is detected.



(c) Select a Test ID that you want from the list and press the "ENTER" button. You will see the following screen:

(1) VAL (TEST VALUE) [Test Data] [Unit]
(2) LMT (TEST LIMIT) [Test Limit] [Unit]
(3) TLT [Test Limit Type]



(d) By pressing the "HELP" button, you can see more information.

HINT:

- □ Monitor test results can be viewed in the MONITOR RESULT screen.
- □ Monitor test results indicates the latest malfunction judgement result of this diagnostic.
- □ TEST VALUE indicates the detection parameter value (Example: P0128 Thermostat Malfunction = Engine coolant temperature) at the time of malfunction (or normal) judgement is done.
- □ TEST LIMIT indicates a threshold of malfunction judgement (Example: P0128 Thermostat Malfunction = 75 C).
- □ When the monitor runs, the monitored Parameter's VALUE is recorded. The value is then compared to the TEST LIMIT to determine if the result is PASS or FAIL.
- □ By comparing the Parameter VALUE to the TEST LIMIT, it is possible to determine the degree of failure.

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□ In rare cases, the monitor may have passed even with a DTC set and MIL illuminated. The monitor might detect malfunction on a previous trip, and then passed on the most recent trip. This would indicate an intermittent problem may be the cause of the DTC.

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05FDS-02

READINESS MONITOR DRIVE PATTERN

1. PURPOSE OF THE READINESS TESTS

- The On–Board Diagnostic (OBD II) system is designed to monitor the performance of emission–related components, and report any detected abnormalities with Diagnostic Trouble Codes (DTCs). Since various components need to be monitored during different driving conditions, the OBD II system is designed to run separate monitoring programs called readiness monitors.
- The hand–held tester's software must be version 9.0 or newer to view the readiness monitor status. From the "Enhanced OBD II Menu", select "Monitor Status" to view the readiness monitor status.
- A generic OBD II scan tool can also be used to view the readiness monitor status.
- When the readiness monitor status reads "complete", the necessary conditions have been met for running performance tests for that readiness monitor.

HINT:

Many state Inspection and Maintenance (I/M) programs require a vehicle's readiness monitor status to show "complete".

- The Readiness Monitor will be reset to "incomplete" if:
  - The ECM has lost battery power or blown a fuse.
  - DTCs have been cleared.
  - The conditions for running the Readiness Monitor have not been met.
- If the readiness monitor status shows "incomplete", follow the appropriate readiness monitor drive pattern to change the status to "complete".

CAUTION:

Strictly observe posted speed limits, traffic laws, and road conditions when performing these drive patterns.

NOTICE:

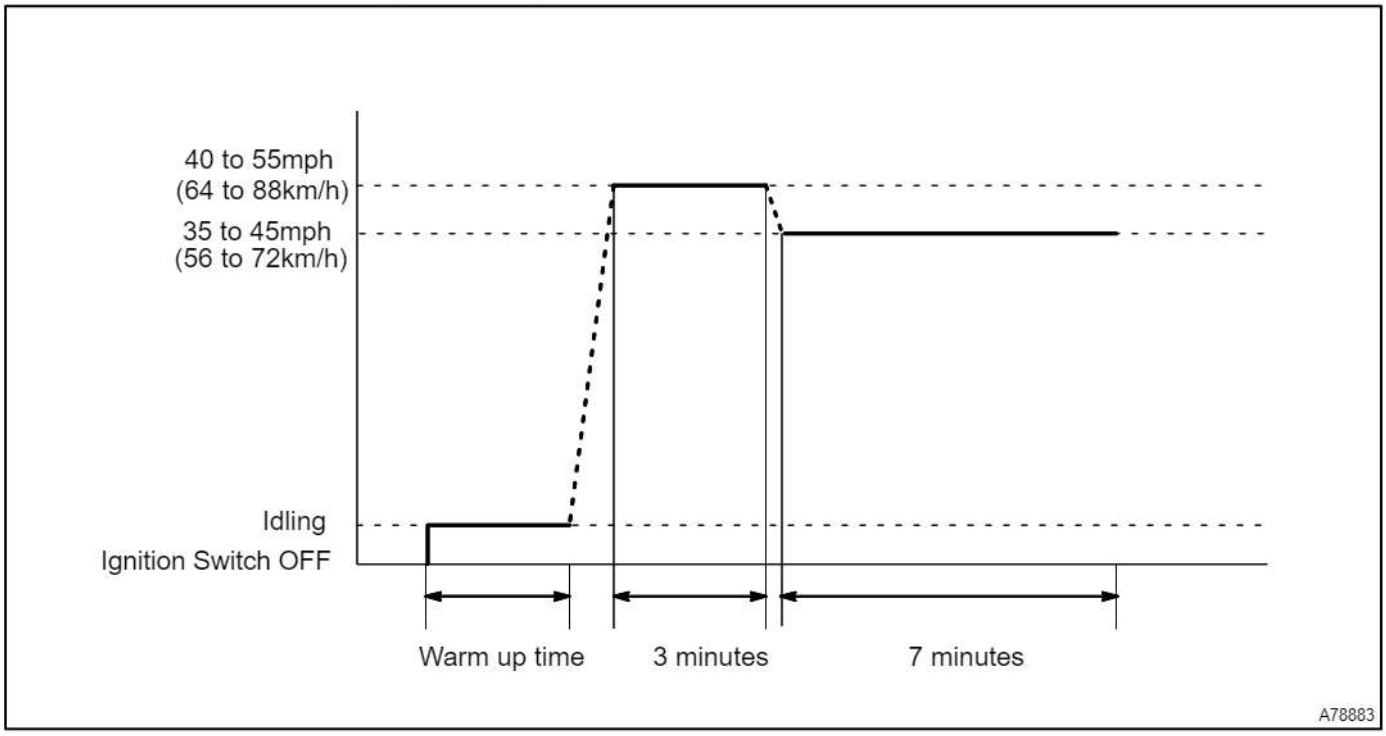
The following drive patterns are the fastest method of completing all the requirements necessary for making the readiness monitor status read "complete".

If forced to momentarily stop a drive pattern due to traffic or other factors, the drive pattern can be resumed. Upon completion of the drive pattern, in most cases, the readiness monitor status will change to "complete".

Sudden changes in vehicle load and speed, such as driving up and down hills and / or sudden acceleration, hinder readiness monitor completion.

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2. CATALYST MONITOR (O2S TYPE)



(a) Preconditions

The monitor will not run unless:

- □ MIL is OFF.
- □ Engine Coolant Temperature (ECT) is 76°C (167°F) or higher.
- □ Intake Air Temperature (IAT) is –10°C (14°F) or higher.

NOTICE:

To completed the readiness test in cold ambient conditions (less than –10°C / 14°F), turn the ignition switch to the OFF position and then back to the ON position. Perform the drive pattern a second time.

(b) Drive Pattern

(1) Connect the hand–held tester or OBD II scan tool to DLC3 to check readiness monitor status and preconditions (refer to step "a").

(2) Drive the vehicle at 40 to 55mph (64 to 88km/h) for approximately 3 minutes.

NOTICE:

Drive with smooth throttle operation and avoid sudden acceleration.

If IAT is less than 10°C (50°F) when starting engine, continue to drive vehicle at 40 to 55mph (64 to 88km/h) for additional 4 minutes.

(3) Drive vehicle allowing speed to fluctuate between 35 to 45 mph (56 to 72 km/h) for approximately 7 minutes.

NOTICE:

Drive with smooth throttle operation and avoid sudden closure of the throttle.

(4) Check the status of the readiness monitor on the hand–held tester or OBD II scan tool display. If the readiness monitor status did not switch to complete, ensure the preconditions are met, turn the ignition switch to OFF, and then repeat steps (2) and (3).

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3. EVAP MONITOR (VACUUM PRESSURE MONITOR)

NOTICE:

A cold soak must be performed prior to conducting the drive pattern to complete the Internal Pressure Readiness Monitor.

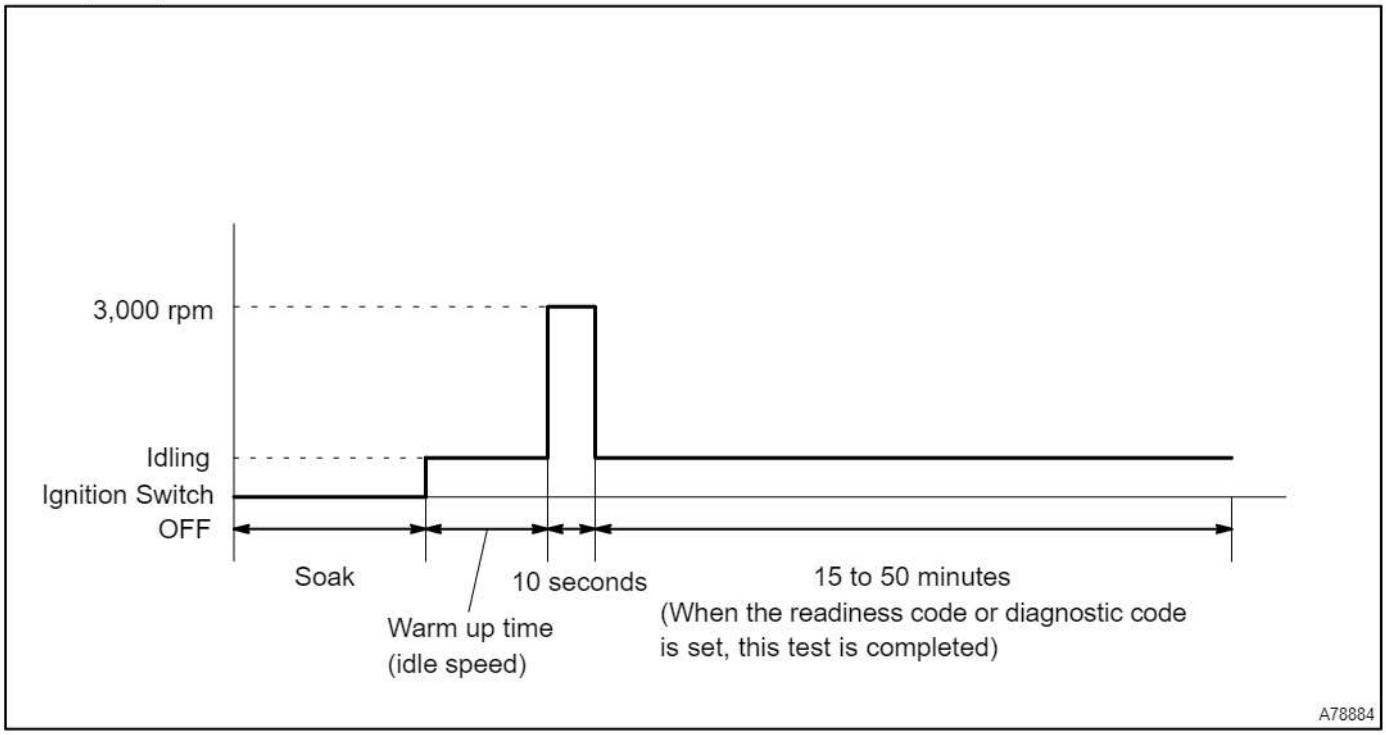
(a) Cold Soak Preconditions

The monitor will not run unless:

- □ MIL is OFF.
- □ Fuel level is approximately 1/2 to 3/4 full.
- □ Altitude is 8,000 feet (2,438 m) or less.

(b) Cold Soak Procedure

Let vehicle cold soak for 8 hours or until the difference between IAT and ECT leaches less than 7°C (13°F).



(c) Preconditions

The monitor will not run unless:

- □ MIL is OFF.
- □ Fuel level is approximately 1/2 to 3/4 full.
- □ Altitude is 8,000 feet (2,438 m) or less.
- □ Engine Coolant Temperature (ECT) is between 4.4°C and 35°C (40°F and 95°F).
- □ Intake Air Temperature (IAT) is between 4.4°C and 35°C (40°F and 95 °F).
- □ The cold soak procedure has been completed.
- □ Before starting the engine, the difference between ECT and IAT must be less than 7°C (13°F).

HINT:

- □ Example 1

  ECT = 24°C (75°F)

  IAT = 16°C (60°F)

  Difference between ECT and IAT is 8°C (15°F).

  → The monitor will not run because the difference between ECT and IAT is greater than 7°C (13°F).

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□ Example 2
ECT = 21°C (70°F)
IAT = 20°C (68°F)
Difference between ECT and IAT is 1°C (2°F).
→ The monitor will run because the difference between ECT and IAT is less than 7°C (13°F).

NOTICE:

The readiness test can be completed in cold ambient conditions (less than 4.4°C / 40°F) and/or at high altitudes (more than 8,000 feet / 2,438 m). Finish the drive pattern, turn the ignition switch OFF and then ON again, and repeat the drive pattern a second time.

(d) Drive Pattern
(1) Connect the hand–held tester or hand–held tester or OBD II scan tool to DLC3 to check monitor status and preconditions (refer to step "a").
(2) Release pressure in fuel tank by removing the fuel tank cap and then reinstalling it.
(3) Start the engine and allow it to idle until ECT reaches 75°C (167°F) or higher.
(4) Run the engine at 3,000 rpm for approximately 10 seconds.
(5) With the engine idling, turn the A/C ON to create a slight electrical load. Wait for 15 to 50 minutes.

NOTICE:

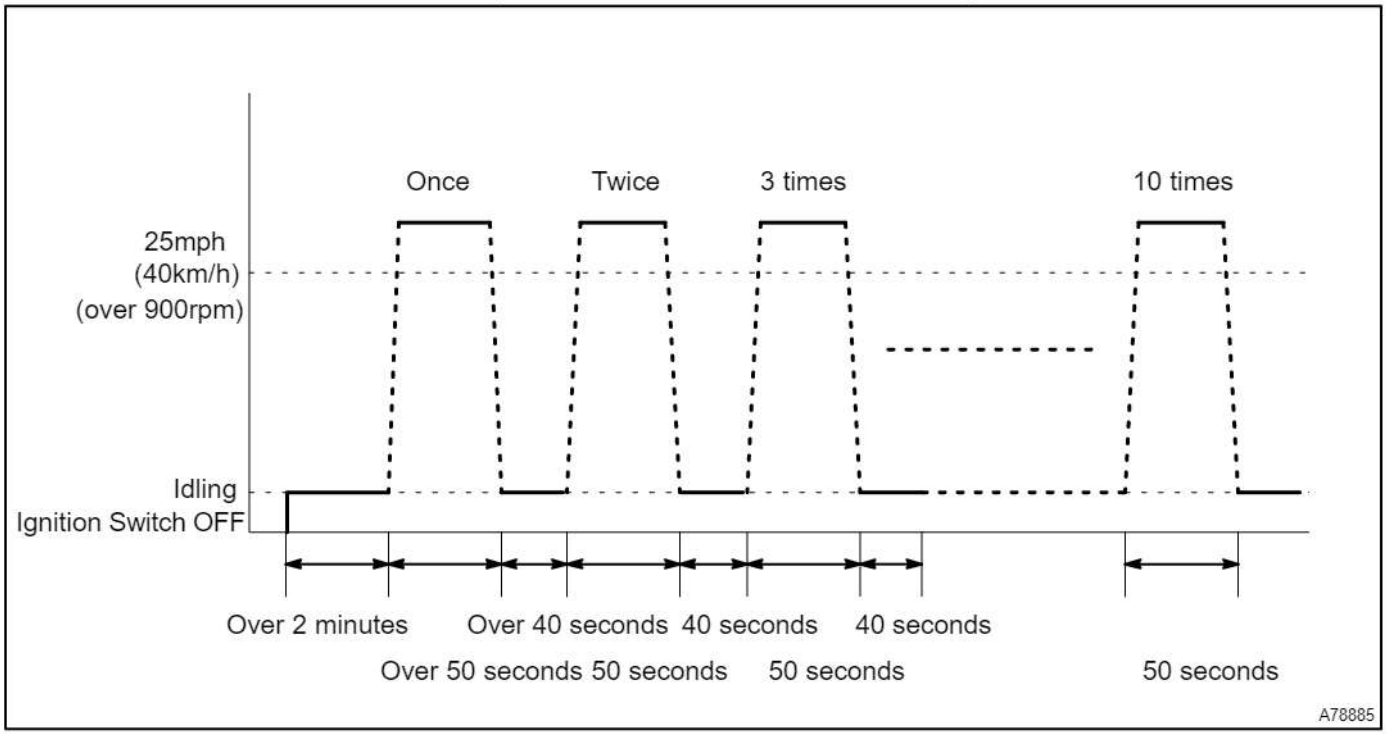
If the vehicle does not have A/C, put a slight electrical load on the engine by following the steps below:

□ **Apply the parking brake securely.**
□ **Use wheel chocks to secure the tires.**
□ **Move the shift lever to the D position and allow the engine to idle for 15 to 50 minutes.**

Check the readiness monitor status.

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4. OXYGEN SENSOR MONITOR (FRONT AND REAR O2S SYSTEM)



(a) Preconditions

The monitor will not run unless:

- □ MIL is OFF

(b) Drive Pattern

(1) Connect the hand–held tester or OBD II scan tool to DLC3 to check monitor status and preconditions (refer to step "a").

(2) Start the engine and allow it to idle for 2 minutes or more.

(3) Drive the vehicle at 25mph (40km/h) or more at least for 50 seconds.

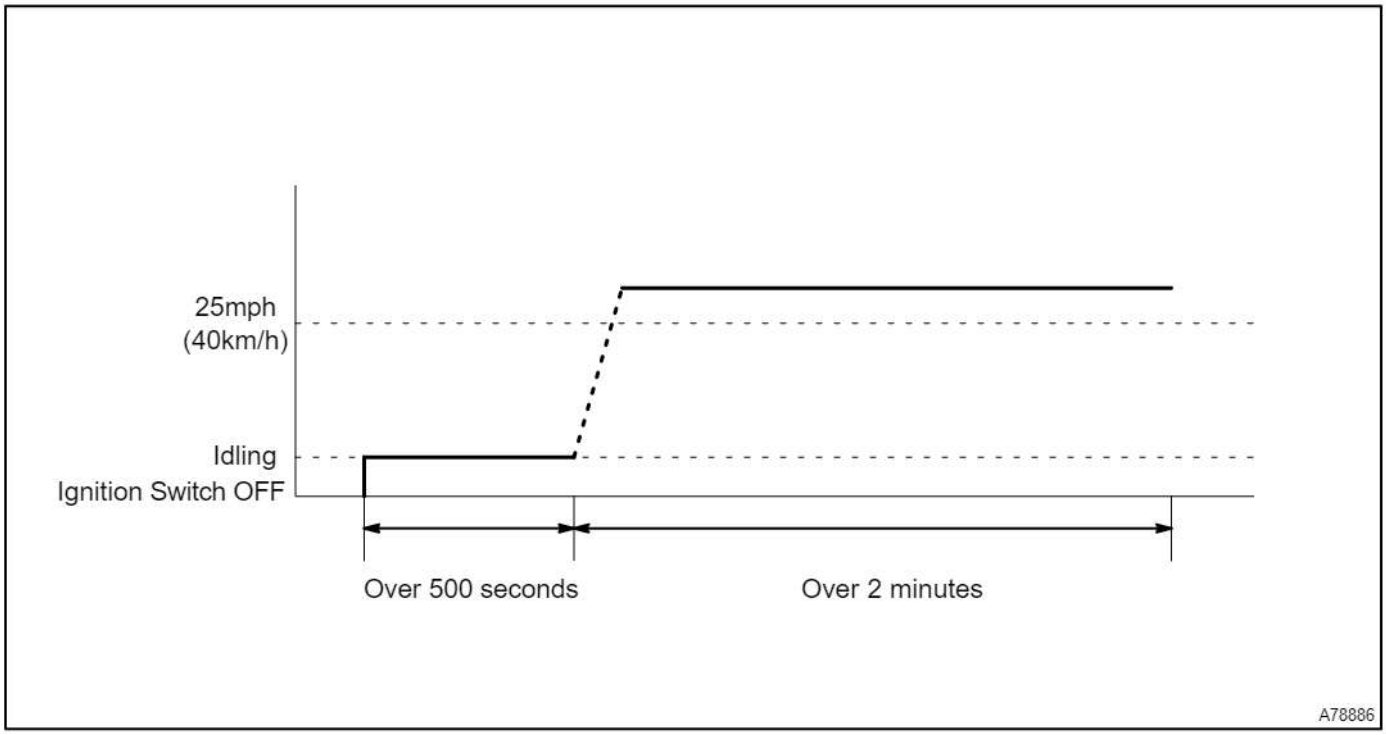
(4) Stop the vehicle and allow the engine to idle for 40 seconds or more.

(5) Perform steps (3) and (4) ten times.

(6) If readiness status dose not switch to complete, ensure the preconditions are met, turn the ignition switch to OFF and then repeat steps (1) through (5).

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5. OXYGEN SENSOR HEATER MONITOR



(a) Preconditions
The monitor will not run unless:
- □ MIL is OFF

(b) Drive Pattern
(1) Connect the hand–held tester or OBD II scan tool to DLC3 to check monitor status and preconditions (refer to step "a").
(2) Start the engine and allow it to idle for 500 seconds or more.
(3) Drive the vehicle at 25mph (40km/h) or more at least for 2 minutes.
(4) Check the readiness monitor status. If the readiness monitor status did not change to "complete", check the preconditions, turn the ignition switch to OFF, and repeat steps (2) and (3).

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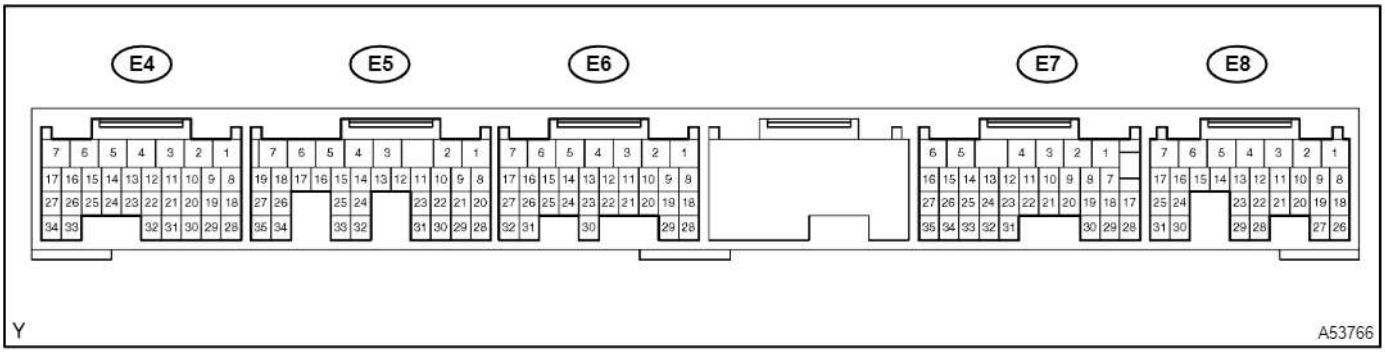
PROBLEM SYMPTOMS TABLE

Symptom	Suspected Area	See page
Engine does not crank (Does not start)	26.Cranking holding function circuit 27.Starter 28.Starter relay	05–298 19–34 19–34
No initial combustion (Does not start)	1. ECM power source circuit 2. Fuel pump control circuit 3. ECM	05–293 05–308 05–30
No complete combustion (Does not start)	1. Fuel pump control circuit	05–308
Difficult to start (Engine cranks normally)	1. Starter signal circuit 2. Fuel pump control circuit 3. Compression	05–257 05–308 14–190
Difficult to start (With cold engine)	1. Starter signal circuit 2. Fuel pump control circuit	05–257 05–308
Difficult to start (With hot engine)	1. Starter signal circuit 2. Fuel pump control circuit	05–257 05–308
High engine idle speed (Poor idling)	1. A/C signal circuit (Compressor circuit) 2. ECM power source circuit	05–1153 05–293
Low engine idle speed (Poor idling)	1. A/C signal circuit (Compressor circuit) 2. Fuel pump control circuit	05–1153 05–308
Rough idling (Poor idling)	1. Compression 2. Fuel pump control circuit	14–190 05–308
Hunting (Poor idling)	1. ECM power source circuit 2. Fuel pump control circuit	05–293 05–308
Hesitation/Poor acceleration (Poor driveability)	1. Fuel pump control circuit 2. A/T faulty	05–308 05–1078
Surging (Poor driveability)	1. Fuel pump control circuit	05–308
Engine stalls soon after starting	1. Fuel pump control circuit	05–308
Engine stalls during A/C operation	1. A/C signal circuit (Compressor circuit) 2. ECM	05–1153 05–30
Unable to refuel/Difficult to refuel	1. ORVR system	☑

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TERMINALS OF ECM



Each ECM terminal's standard voltage is shown in the table below.
In the table, first follow the information under "Condition". Next look under "Symbol (Terminal No.)" for the terminals to be inspected. The standard voltage between the terminals is shown under "Specific Condition". Use the illustration above as a reference for the ECM terminals.

Symbols (Terminals No.)	Wiring Color	Terminal Description	Condition	Specified Condition
BATT (E8–3) – E1 (E6–1)	L – BR	Battery (for measuring the battery voltage and for the ECM memory)	Always	9 to 14 V
+BM (E7–6) – E1 (E6–1)	GR – BR	Power source of throttle motor	Always	9 to 14 V
IGSW (E8–9) – E1 (E6–1)	B–O – BR	Ignition switch	Ignition switch ON	9 to 14 V
+B (E8–1) – E1 (E6–1)	B – BR	Power source of ECM	Ignition switch ON	9 to 14 V
+B2 (E8–2) – E1 (E6–1)	B – BR	Power source of ECM	Ignition switch ON	9 to 14 V
MREL (E8–8) – E1 (E6–1)	W–G – BR	EFI relay	Ignition switch ON	9 to 14 V
VC (E4–18) – E2 (E4–28)	L–R – BR	Power source for sensors (specific voltage)	Ignition switch ON	4.5 to 5.5 V
VG (E4–30) – E2G (E4–29)	W–R – B–W	Mass air flow meter	Idling, shift lever position P or N, A/C switch OFF	0.5 to 3.0 V
THA (E4–20) – E2 (E4–28)	Y–B – BR	Intake air temperature sensor	Idling, Intake air temperature 20°C (68°F)	0.5 to 3.4 V
THW (E4–19) – E2 (E4–28)	R–L – BR	Engine coolant temperature sensor	Idling, Engine coolant temperature 80°C (176°F)	0.2 to 1.0 V
VTA1 (E4–21) – E2 (E4–28)	Y – BR	Throttle position sensor (for engine control)	Ignition switch ON, throttle valve fully closed	0.5 to 1.2 V
VTA1 (E4–21) – E2 (E4–28)	Y – BR	Throttle position sensor (for engine control)	Ignition switch ON, throttle valve fully open	3.2 to 4.8 V
VTA2 (E4–31) – E2 (E4–28)	R–B – BR	Throttle position sensor (for sensor malfunction detection)	Ignition switch ON, throttle valve fully closed	2.1 to 3.1 V
VTA2 (E4–31) – E2 (E4–28)	R–B – BR	Throttle position sensor (for sensor malfunction detection)	Ignition switch ON, throttle valve fully open	4.5 to 5.5 V
VPA (E8–22) – EPA (E8–28)	W–R – LG–B	Accelerator pedal position sensor (for engine control)	Ignition switch ON, throttle valve fully closed	0.5 to 1.1 V
VPA (E8–22) – EPA (E8–28)	W–R – LG–B	Accelerator pedal position sensor (for engine control)	Ignition switch ON, throttle valve fully open	2.6 to 4.5 V
VPA2 (E8–23) – EPA2 (E8–29)	R–B – V–W	Accelerator pedal position sensor (for sensor malfunction detection)	Ignition switch ON, throttle valve fully closed	1.2 to 2.0 V
VPA2 (E8–23) – EPA2 (E8–29)	R–B – V–W	Accelerator pedal position sensor (for sensor malfunction detection)	Ignition switch ON, throttle valve fully open	3.4 to 5.3 V

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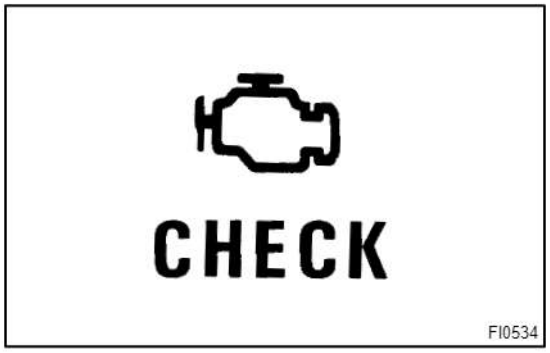
Symbols (Terminals No.)	Wiring Color	Terminal Description	Condition	Specified Condition
VCPA (E8–26) – EPA (E8–28)	B–Y – LG–B	Power source of accelerator pedal position sensor (for VPA)	Ignition switch ON	4.5 to 5.5 V
VCP2 (E8–27) – EPA2 (E8–29)	W–L – V–W	Power source of accelerator pedal position sensor (for VPA2)	Ignition switch ON	4.5 to 5.5 V
OX1A (E5–23) – E1 (E6–1) OX1B (E5–29) – E1 (E6–1) OX2A (E5–22) – E1 (E6–1) OX2B (E5–21) – E1 (E6–1)	R – BR B – BR G – BR W – BR	Heated oxygen sensor	Maintain engine speed at 2,500 rpm for 2 minutes after warming up	Pulse generation (See page 05–196)
HT1A (E5–4) – E1 (E6–1) HT1B (E5–5) – E1 (E6–1) HT2A (E5–33) – E1 (E6–1) HT2B (E5–25) – E1 (E6–1)	LG – BR G–Y – BR B–L – BR P – BR	Heated oxygen sensor heater	Idling	Below 3.0 V
HT1A (E5–4) – E1 (E6–1) HT1B (E5–5) – E1 (E6–1) HT2A (E5–33) – E1 (E6–1) HT2B (E5–25) – E1 (E6–1)	LG – BR G–Y – BR B–L – BR P – BR	Heated oxygen sensor heater	Ignition switch ON	9 to 14 V
#1 (E4–1) – E01 (E4–7) #2 (E4–2) – E01 (E4–7) #3 (E4–3) – E01 (E4–7) #4 (E4–4) – E01 (E4–7) #5 (E4–5) – E01 (E4–7) #6 (E5–3) – E01 (E4–7) #7 (E6–6) – E01 (E4–7) #8 (E6–5) – E01 (E4–7)	R–L – W–B L – W–B W – W–B Y – W–B G – W–B R – W–B W – W–B BR – W–B	Injector	Ignition switch ON	9 to 14 V
#1 (E4–1) – E01 (E4–7) #2 (E4–2) – E01 (E4–7) #3 (E4–3) – E01 (E4–7) #4 (E4–4) – E01 (E4–7) #5 (E4–5) – E01 (E4–7) #6 (E5–3) – E01 (E4–7) #7 (E6–6) – E01 (E4–7) #8 (E6–5) – E01 (E4–7)	R–L – W–B L – W–B W – W–B Y – W–B G – W–B R – W–B W – W–B BR – W–B	Injector	Idling	Pulse generation (See page 05–156)
KNK1 (E5–1) – E1 (E6–1)	B – BR	Knock sensor	Maintain engine speed at 4,000 rpm after warming up	Pulse generation (See page 05–171)
KNK2 (E5–2) – E1 (E6–1)	W – BR	Knock sensor	Maintain engine speed at 4,000 rpm after warming up	Pulse generation (See page 05–171)
G2+ (E6–27) – G2– (E6–32)	B – W	Camshaft position sensor	Idling	Pulse generation (See page 05–181)
NE+ (E6–25) – NE– (E6–24)	L – Y	Crankshaft position sensor	Idling	Pulse generation (See page 05–176)
PRG (E4–34) – E1 (E6–1)	Y–R – BR	VSV for EVAP	Ignition switch ON	9 to 14 V
PTNK (E8–21) – E2 (E4–28)	O – BR	Vapor pressure sensor	Ignition switch ON	2.9 to 3.7 V
PTNK (E8–21) – E2 (E4–28)	O – BR	Vapor pressure sensor	Ignition switch ON, Apply vacuum of 4.0 kPa (30 mmHg, 1.18 in.Hg)	Below 0.5 V
SPD (E7–17) – E1 (E6–1)	V–R – BR	Speed signal from combination meter	Ignition switch ON, Rotate driving wheel slowly	Pulse generation (See page 05–239)
M+ (E6–3) – E1 (E6–1) M– (E6–2) – E1 (E6–1)	R – BR G – BR	Throttle motor	Idling	Pulse generation
FPR (E4–33) – E1 (E6–1)	G–R – BR	Fuel pump relay	Ignition switch ON	0 to 3.0 V
FC (E8–10) – E1 (E6–1)	GR–B – BR	Fuel pump control	Ignition switch ON	9 to 14 V

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Symbols (Terminals No.)	Wiring Color	Terminal Description	Condition	Specified Condition
IGT1 (E4–9) – E1 (E6–1) IGT2 (E4–8) – E1 (E6–1) IGT3 (E4–25) – E1 (E6–1) IGT4 (E4–11) – E1 (E6–1) IGT5 (E4–12) – E1 (E6–1) IGT6 (E4–26) – E1 (E6–1) IGT7 (E4–13) – E1 (E6–1) IGT8 (E4–10) – E1 (E6–1)	LG – BR LG–B – BR L–W – BR L–Y – BR B–L – BR G – BR G–W – BR G–B – BR	Ignition coil with igniter (ignition signal)	Idling	Pulse generation (See page 05–186)
IGF1 (E4–24) – E1 (E6–1) IGF2 (E4–23) – E1 (E6–1)	R–Y – BR R–W – BR	Ignition coil with igniter (ignition confirmation signal)	Ignition switch ON	4.5 to 5.5 V
IGF1 (E4–24) – E1 (E6–1) IGF2 (E4–23) – E1 (E6–1)	R–Y – BR R–W – BR	Ignition coil with igniter (ignition confirmation signal)	Idling	Pulse generation (See page 05–186)
STP (E7–19) – E1 (E6–1)	G–Y – BR	Stop light switch	Brake pedal depressed	7.5 to 14 V
STP (E7–19) – E1 (E6–1)	G–Y – BR	Stop light switch	Brake pedal released	Below 1.5 V
NSW (E4–16) – E1 (E6–1)	P – BR	Park/Neutral position switch	Ignition switch ON, Shift lever position other than P and N	9 to 14 V
NSW (E4–16) – E1 (E6–1)	P – BR	Park/Neutral position switch	Ignition switch ON, Shift lever position in P, N	Below 3.0 V
W (E8–11) – E1 (E6–1)	R–B – BR	MIL	Idling	9 to 14 V
W (E8–11) – E1 (E6–1)	R–B – BR	MIL	Ignition switch ON	Below 3.0 V
ST1– (E7–12) – E1 (E6–1)	R–L – BR	Stop lamp switch	Ignition switch ON, Brake pedal depressed	Below 1.5 V
ST1– (E7–12) – E1 (E6–1)	R–L – BR	Stop lamp switch (opposite to STP terminal)	Ignition switch ON, Brake pedal released	7.5 to 14 V
SIL (E8–18) – E1 (E6–1)	R–Y – BR	Terminal SIL of DLC3	Connect the hand–held tester to DLC 3	Pulse generation
ELS (E8–12) – E1 (E6–1)	L–R – BR	Electric load	Taillight switch ON, Defogger switch ON	7.5 to 14 V
ELS (E8–12) – E1 (E6–1)	L–R – BR	Electric load	Taillight switch OFF, Defogger switch OFF	0 to 1.5 V
TACH (E8–5) – E1 (E6–1)	B–W – BR	Engine speed	Idling	Pulse generation
TC (E8–20) – E1 (E6–1)	P–L – BR	Terminal TC of DLC 3	Ignition switch ON	9 to 14 V
STA (E4–17) – E1 (E6–1)	B–Y – BR	Starter signal	Cranking	6 V or higher
STAR (E5–9) – E1 (E6–1)	P – BR	Park/neutral position switch	Shift lever position P or N, Ignition switch START	9 to 14 V
STSW (E6–12) – E1 (E6–1)	L–Y – BR	STA No.2 fuse	Shift lever position P or N, Ignition switch START	9 to 14 V

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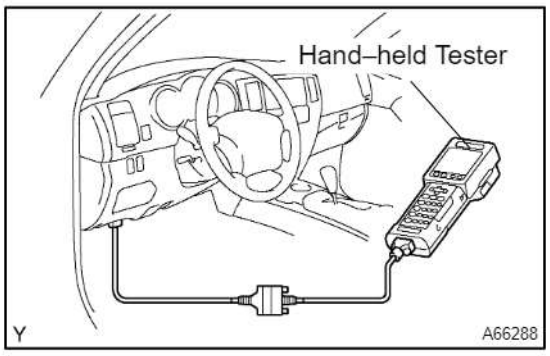
DIAGNOSIS SYSTEM

1. DESCRIPTION

□ When troubleshooting On–Board Diagnostic (OBD II) vehicles, the vehicle must be connected to the OBD II scan tool (in compliance with SAE J1978) or the hand held tester. Various data output from the vehicle's ECM can then be read.

□ OBD II regulations require that the vehicle's on–board computer illuminates the Malfunction Indicator Light (MIL) on the instrument panel when the computer detects a malfunction in: 1) the emission control system / components, or 2) the powertrain control components (which affect vehicle emissions), or 3) the computer. In addition, the applicable Diagnostic Trouble Codes (DTCs) prescribed by SAE J2012 are recorded in the ECM memory (see page 05–47).

If the malfunction does not reoccur in 3 consecutive trips, the MIL goes off automatically but the DTCs remain recorded in the ECM memory.



□ To check DTCs, connect the hand–held tester or OBD II scan tool to the Data Link Connector 3 (DLC3) of the vehicle. The hand–held tester or OBD II scan tool also enables you to erase the DTC and check the freeze frame data and various forms of engine data (See the instruction manual for the OBD II scan tool or the hand–held tester). The DTC includes SAE controlled codes and manufacturer controlled codes. SAE controlled codes must be set according to the SAE, while manufacturer controlled codes can be set by a manufacturer with certain restrictions (see the DTC chart on page 05–47).

□ The diagnosis system operates in normal mode during normal vehicle use. In "normal mode", 2 trip detection logic* is used to ensure accurate detection of malfunctions. A "check mode", is also available to technicians as an option. In "check mode", 1 trip detection logic is used for simulating malfunction symptoms and increasing the system's ability to detect malfunctions, including intermittent malfunctions (hand–held tester only) (see page 05–36).

□ *2 trip detection logic:
When a malfunction is first detected, the malfunction is temporarily stored in the ECM memory (1st trip). If the ignition switch is turned OFF and then ON again, and the same malfunction is detected again, the MIL will illuminate (2nd trip).

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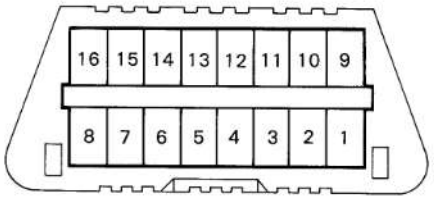
□ Freeze frame data:
The freeze frame data records the engine conditions (fuel system, calculated load, engine coolant temperature, fuel trim, engine speed, vehicle speed, etc.) when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

Priorities for troubleshooting:
When multiple DTCs occur, find out the order in which the DTCs should be inspected by checking the component's DTC chart. If no instructions are written in the DTC chart, check DTCs in the following order of priority:

(a) DTCs other than fuel trim malfunction DTCs (P0171, P0172, P0174 and P0175) and misfire DTCs (P0300 to P0308).
(b) Fuel trim malfunction DTCs (P0171, P0172, P0174 and P0175).
(c) Misfire DTCs (P0300 to P0308).

2. CHECK DLC3

The vehicle's ECM uses the ISO 9141–2 for communication protocol. The terminal arrangement of the DLC3 complies with SAE J1962 and matches the ISO 9141–2 format.



DLC3
C52361

Symbol	Terminal No.	Name	Reference Terminal	Result	Condition
SIL	7	Bus "+" line	5 – Signal ground	Pulse generation	During transmission
CG	4	Chassis ground	Body ground	1 Ω or less	Always
SG	5	Signal ground	Body ground	1 Ω or less	Always
BAT	16	Battery positive	Body ground	9 to 14 V	Always

HINT:
Connect the cable of the OBD II scan tool or the hand–held tester to the DLC3, turn the ignition switch ON and attempt to use the hand–held tester. If the screen displays UNABLE TO CONNECT TO VEHICLE, a problem exists in the vehicle side or the tester side.

□ If the communication is normal when the tool is connected to another vehicle, inspect the DLC3 on the original vehicle.
□ If the communication is still impossible when the tool is connected to another vehicle, the problem is probably in the tool itself, so consult the Service Department listed in the tool's instruction manual.

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3. INSPECT BATTERY VOLTAGE

Battery Voltage: 11 to 14 V

If voltage is below 11 V, recharge the battery before proceeding.

4. CHECK MIL

(a) The MIL comes on when the ignition switch is turned ON and the engine is not running.

HINT:

If the MIL is not illuminated, troubleshoot the MIL circuit (see page 05–320).

(b) When the engine is started, the MIL should not illuminate. If the lamp remains on, the diagnosis system has detected a malfunction or abnormality in the system.

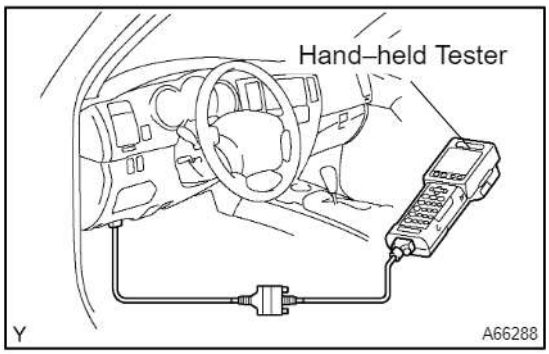
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DTC CHECK/CLEAR

NOTICE:

- **If no DTC appears in normal mode:**
  On the OBD II scan tool or the hand–held tester, check the pending fault code using the Continuous Test Results function (Mode 7 for SAE J1979).
- **When the diagnosis system is changed from normal mode to check mode or vice–versa, all DTCs and freeze frame data recorded in normal mode will be erased. Before changing modes, always check and make a note of DTCs and freeze frame data.**



1. CHECK DTC (Using the OBD II scan tool or hand–held tester)

(a) Connect the OBD II scan tool or hand–held tester to the DLC3.

(b) Turn the ignition switch ON.

(c) Use the OBD II scan tool or the hand–held tester to check the DTCs and freeze frame data and then write them down. For the hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODEDS. For the OBD II scan tool, see its instruction manual.

(d) See page 05–47 to confirm the details of the DTCs.

NOTICE:

- **When simulating a symptom with the OBD II scan tool (excluding hand–held tester) to check the DTCs, use the normal mode. For DTCs subject to "2 trip detection logic", perform either of the following actions.**
- **Turn the ignition switch OFF after the symptom is simulated once. Then repeat the simulation process again. When the problem has been simulated again, the MIL illuminates and the DTCs are recorded in the ECM.**
- **Check the pending fault code using the Continuous Test Results function (Mode 7 for SAE J1979) on the OBD II scan tool.**

2. FREEZE FRAME DATA (Using the OBD II scan tool or hand–held tester)

(a) Connect the OBD II scan tool or hand–held tester to the DLC3.

(b) Turn the ignition switch to ON.

(c) Use the OBD II scan tool or hand–held tester to check the DTCs and freeze frame data and then write them down. For the hand–held tester, enter the following menus: DIAGNOSIS / OBD/MOBD / FREEZE FRAME DATA. For the OBD II scan tool, see its instruction manual.

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3. CLEAR DTC (Using the OBD II scan tool or hand–held tester)

(a) Connect the OBD II scan tool or the hand–held tester to the DLC3.

(b) Turn the ignition switch ON.

(c) Erase DTCs and freeze frame data with the OBD II scan tool (complying with SAE J1978) or the hand–held tester For the hand–held tester: 1) enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CLEAR CODEDS; and 2) press YES. For the OBD II scan tool, see its instruction manual.

4. CLEAR DTC (Not using the OBD II scan tool or hand–held tester)

(a) Remove the EFI and ETCS fuse from the engine room R/B for more than 60 seconds, or disconnect the battery terminal for more than 60 seconds. When disconnecting the battery terminal, perform the ”INITIALIZE” procedure.

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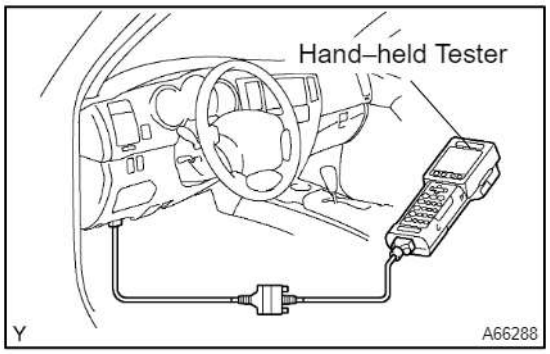
CHECK MODE PROCEDURE

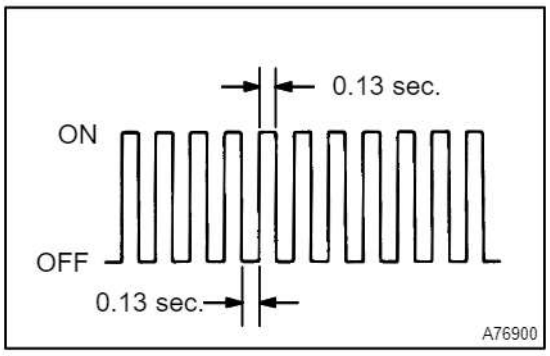
HINT:

Hand–held tester only:

Check mode has a higher sensitivity to detect malfunctions and can detect malfunctions that normal mode cannot detect.

Check mode can also detect all the malfunctions that normal mode can detect.





1. CHECK MODE PROCEDURE(Using the hand–held tester)

(a) Make sure that the items below are true.
  (1) Battery positive voltage 11 V or more
  (2) Throttle valve fully closed
  (3) Transmission in the P or N position
  (4) A/C switched OFF

(b) Turn the ignition switch OFF.

(c) Connect the hand–held tester to the DLC3.

(d) Turn the ignition switch ON.

(e) Change the ECM to check mode with hand–held tester. Make sure the MIL flashes as shown in the illustration.

NOTICE:

All DTCs and freeze frame data recorded will be erased if: 1) the hand–held tester is used to change the ECM from normal mode to check mode or vice–versa; or 2) during check mode, the ignition switch is turned from ON to ACC or OFF.

(f) Start the engine. The MIL should turn off after the engine starts.

(g) Simulate the conditions of the malfunction described by the customer.

(h) After simulating the malfunction conditions, use the hand–held tester diagnosis selector to check the DTC, freeze frame data and other data.

(i) After checking the DTC, inspect the applicable circuit.

2. CLEAR DTC (Using the OBD II scan tool or hand–held tester)

(a) Connect the OBD II scan tool or hand–held tester to the DLC3.

(b) Turn the ignition switch ON.

(c) Erase DTCs and freeze frame data with the OBD II scan tool (complying with SAE J1978) or the hand–held tester. For the hand–held tester: 1) enter the following menus: DIAGNOSIS ENHANCED OBD II / DTC INFO / CLEAR CODES; and 2) press YES. For the OBD II scan tool, see its instruction manual.

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3. CLEAR DTC (Not using the OBD II scan tool or hand–held tester)

(a) Remove the EFI and ETCS fuse from the engine room R/B for more than 60 seconds, or disconnect the battery terminal for more than 60 seconds. When disconnecting the battery terminal, perform the ”INITIALIZE” procedure.

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FAIL–SAFE CHART

If any of the following codes are recorded, the ECM enters the fail–safe mode.

DTC No.	Fail–Safe Operation	Fail–Safe Deactivation Conditions
P0031 P0032 P0037 P0038 P0051 P0052 P0057 P0058	Turn off sensor heater	Ignition switch OFF
P0100 P0102 P0103	Ignition timing is calculated from engine RPM and TP (Throttle Position)	"Pass" condition detected
P0110 P0112 P0113	IAT (Intake Air Temperature) is fixed at 20°C (68°F)	"Pass" condition detected
P0115 P0117 P0118	ECT (Engine Coolant Temperature) is fixed at 80°C (176°F)	"Pass" condition detected
P0120 P0121 P0122 P0123 P0220 P0222 P0223 P2102 P2103 P2111 P2112 P2118 P2119 P2135	If the Electronic Throttle Control System (ETCS) has a malfunction, the ECM cuts off current to the throttle control motor. The throttle control valve returns to a predetermined opening angle (approximately 16□) by the force of the return spring. The ECM then adjusts the engine output by controlling the fuel injection (intermittent fuel–cut) and ignition timing in accordance with the accelerator pedal opening angle to enable the vehicle to continue at a minimal speed. If the accelerator pedal is depressed firmly and slowly, the vehicle can be driven slowly. If the accelerator pedal is depressed quickly, the vehicle may speed up and slow down erratically.	"Pass" condition detected and then the ignition switch OFF
P0325 P0330	Maximum ignition timing retardation	Ignition switch OFF
P0351 P0352 P0353 P0354 P0355 P0356 P0357 P0358	Fuel is cut	"Pass" condition detected
P2120 P2121 P2122 P2123 P2125 P2127 P2128 P2138	The accelerator pedal position sensor has two (main and sub) sensor circuits. If a malfunction occurs in either of the sensor circuits, the ECM detects the abnormal signal voltage difference between the two sensor circuits and switches to limp mode. In limp mode, the functioning circuit is used to calculate the accelerator pedal opening angle to allow the vehicle to continue driving. If both circuits malfunction, the ECM regards the opening angle of the accelerator pedal to be fully closed. In this case, the throttle valve will remain closed as if the engine is idling.	"Pass" condition detected and then the ignition switch OFF

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05FDX-02

DATA LIST/ACTIVE TEST

1. DATA LIST

HINT:

Using the hand–held tester DATA LIST allows switch, sensor, actuator and other item values to be read without removing any parts. Reading DATA LIST early in troubleshooting is one way to shorten labor time.

NOTICE:

In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

(a) Warm up the engine.
(b) Turn the ignition switch to OFF.
(c) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(d) Turn the ignition switch to ON.
(e) Turn the hand–held tester ON.
(f) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST.
(g) According to the display on the tester, perform DATA LIST.

Hand–held Tester Display	Measurement Item/Range (Display)	Normal Condition *	Diagnostic Note
INJECTOR	Injection period of the No. 1 cylinder/ Min.: 0 ms, Max.: 32.64 ms	Idling: 2.1 to 3.9 ms	□
IGN ADVANCE	Ignition timing advance for No. 1 cylinder/ Min.: –64 deg., Max.: 63.5 deg.	Idling: BTDC 5 to 15°	□
CALC LOAD	Calculated load by engine ECM/ Min.: 0 %, Max.: 100 %	□Idling: 12.0 to 18.0 % □Running without load (2,500 rpm): 11.0 to 17.0 %	□
MAF	Air flow rate from MAF meter/ Min.: 0 gm/s, Max.: 655 gm/s	□Idling: 4 to 6 gm/s □Running without load (2,500 rpm): 13 to 20 gm/s	If value is approximately 0.0 gm/s: □Open in mass air flow meter power source circuit □Open or short VG circuit If value is 271.0 gm/s or more: □Open in E2G circuit
ENGINE SPD	Engine speed/ Min.: 0 rpm, Max.: 16,383 rpm	Idling: 650 to 750 rpm	□
COOLANT TEMP	Coolant temperature/ Min.: –40 C, Max.: 140 C	After warming up: 80 to 95°C (176 to 203°F)	If value is –40 C or 140 C, sensor circuit is open or shorted
INTAKE AIR	Intake air temperature/ Min.: –40 C, Max.: 140 C	Equivalent to ambient air temperature (after cold soak)	If value is –40 C or 140 C, sensor circuit is open or shorted
THROTTLE POS	Absolute throttle position sensor/ Min.: 0 %, Max.: 100 %	□Throttle fully closed: 10 to 24 % □Throttle fully open: 64 to 96 %	Read value when ignition switch ON (Do not start engine)
CTP SW	Closed throttle position switch/ ON or OFF	□Throttle fully closed: ON □Throttle open: OFF	□
VEHICLE SPD	Vehicle speed/ Min.: 0 km/h, Max.: 255 km/h	Vehicle stopped: 0 km/h (0 mph)	□
ACCEL POS #1	Accelerator pedal position sensor No.1 output voltage/ Min.: 0 V, Max.: 5 V	□Accelerator pedal released: 0.5 to 1.1 V □Accelerator pedal depressed: 2.6 to 4.5 V	Read value when ignition switch ON (Do not start engine)
ACCEL POS #2	Accelerator pedal position sensor No.2 output voltage/ Min.: 0 V, Max.: 5 V	□Accelerator pedal released: 1.2 to 2.0 V □Accelerator pedal depressed: 3.4 to 5.3 V	Read value when ignition switch ON (Do not start engine)

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Hand–held Tester Display	Measurement Item/Range (Display)	Normal Condition *	Diagnostic Note
THROTTLE POS #2	Throttle position sensor No.2 output voltage/ Min.: 0 V, Max.: 5 V	□Throttle fully closed: 2.1 to 3.1 V □Throttle fully open: 4.5 to 5.5 V	Read value when ignition switch ON (Do not start engine)
THROTTLE TARGT	Target position of throttle valve/ Min.: 0 V, Max.: 5 V	Idling: 0.4 to 1.1 V	□
THROTTLE OPN DUTY	Throttle motor opening duty ratio/ Min.: 0 %, Max.: 100 %	Throttle fully closed: 0 %	□When accelerator pedal is depressed, duty ratio is increased □Read value when ignition switch ON (Do not start engine)
THROTTLE CLS DUTY	Throttle motor closed duty ratio/ Min.: 0 %, Max.: 100 %	Throttle fully closed: 0 %	□When accelerator pedal is quick released, duty ratio is increased □Read value when ignition switch ON (Do not start engine)
THROTTLE MOT	Whether or not throttle motor control is permitted/ ON or OFF	Idling: ON	Read value when ignition switch ON (Do not start engine)
+BM	Whether or not electric throttle control system power is inputted/ ON or OFF	Idling: ON	□
ACCEL IDL POS	Whether or not accelerator pedal position sensor is detecting idle/ ON or OFF	Idling: ON	□
THROTTLE IDL POS	Whether or not throttle position sensor is detecting idle/ ON or OFF	Idling: ON	□
FAIL #1	Whether or not fail safe function is executed/ ON or OFF	ETCS has failed: ON	□
FAIL #2	Whether or not fail safe function is executed/ ON or OFF	ETCS has failed: ON	□
THROTTLE INITIAL	Throttle fully closed learning value Min.: 0 V, Max.: 5 V	0.5 to 0.9 V	□
ACCEL LEARN VAL	Accelerator fully closed learning value Min.: 0 V, Max.: 5 V	0.4 to 0.8 V	□
THROTTLE MOT	Throttle motor current Min.: 0 A, Max.: 20 A	Idling: 0 to 3.0 A	□
O2S B1 S1	Heated oxygen sensor output voltage of the bank 1 sensor 1/ Min.: 0 V, Max.: 1.275 V	Idling: 0.1 to 0.9 V	□
O2S B1 S2	Heated oxygen sensor output voltage of the bank 1 sensor 2/ Min.: 0 V, Max.: 1.275 V	Driving (50 km/h, 31 mph): 0.1 to 0.9 V	□
O2S B2 S1	Heated oxygen sensor output voltage of the bank 2 sensor 1/ Min.: 0 V, Max.: 1.275 V	Idling: 0.1 to 0.9 V	□
O2S B2 S2	Heated oxygen sensor output voltage of the bank 2 sensor 2/ Min.: 0 V, Max.: 1.275 V	Driving (50 km/h, 31 mph): 0.1 to 0.9 V	□
VAPOR PRESS	Vapor Pressure/ Min.: –4.125 kPa, Max.: 2.125 kPa	Fuel tank cap removed: 0 kPa	Pressure inside fuel tank is monitored by the vapor pressure sensor
SHORT FT #1	Short term fuel trim of bank 1/ Min.: –100 %, Max.: 100%	0 ± 20 %	This item is short–term fuel compensation used to maintain air–fuel ratio at stoichiometric air–fuel ratio

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Hand–held Tester Display	Measurement Item/Range (Display)	Normal Condition *	Diagnostic Note
LONG FT #1	Long term fuel trim of bank 1/ Min.: –100 %, Max.: 100 %	0 ± 20 %	This item is overall long–term fuel compensation that helps to maintain air–fuel ratio at stoichiometric air–fuel ratio (steadies long term deviations of short–term fuel trim from central value)
TOTAL FT #1	Total fuel trim of bank 1/ Min.: 0.5, Max.: 1.496	Idling: 0.5 to 1.4	□
SHORT FT #2	Short term fuel trim of bank 2/ Min.: –100 %, Max.: 100 %	0 ± 20 %	This item is short–term fuel compensation used to maintain air–fuel ratio at stoichiometric air–fuel ratio
LONG FT #2	Long term fuel trim of bank 2/ Min.: –100 %, Max.: 100 %	0 ± 20 %	This item is overall long–term fuel compensation that helps to maintain air–fuel ratio at stoichiometric air–fuel ratio (steadies long term deviation of short–term fuel trim from central value)
TOTAL FT #2	Total fuel trim of bank 2/ Min.: 0.5, Max.: 1.496	Idling: 0.5 to 1.4	□
O2FT B1 S1	Short term fuel trim associated with the bank 1, sensor 1/ Min.: –100 %, Max.: 100 %	0 ± 20 %	Same as SHORT FT #1
O2FT B1 S2	Short term fuel trim associated with the bank 1, sensor 2/ Min.: –100 %, Max.: 100 %	0 ± 20 %	Same as SHORT FT #1
O2FT B2 S1	Short term fuel trim associated with the bank 2, sensor 1/ Min.: –100 %, Max.: 100 %	0 ± 20 %	Same as SHORT FT #2
O2FT B2 S2	Short term fuel trim associated with the bank 2, sensor 2/ Min.: –100 %, Max.: 100 %	0 ± 20 %	Same as SHORT FT #2
FUEL SYS #1	Fuel system status (Bank1) / OL or CL or OL DRIVE or OL FAULT or CL FAULT	Idling after warming up: CL	□OL (Open Loop): Has not yet satisfied conditions to go closed loop □CL (Closed Loop): Using heated oxygen sensor(s) as feed back for fuel control □OL DRIVE: Open loop due to driving conditions (fuel enrichment) □OL FAULT: Open loop due to detected system fault □CL FAULT: Closed loop but one of heated oxygen sensors, which is used for fuel control, is malfunctioning

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Hand–held Tester Display	Measurement Item/Range (Display)	Normal Condition *	Diagnostic Note
FUEL SYS #2	Fuel system status (Bank2) / OL or CL or OL DRIVE or OL FAULT or CL FAULT	Idling after warming up: CL	□OL (Open Loop): Has not yet satisfied conditions to go closed loop □CL (Closed Loop): Using heated oxygen sensor(s) as feed back for fuel control □OL DRIVE: Open loop due to driving conditions (fuel enrichment) □OL FAULT: Open loop due to detected system fault □CL FAULT: Closed loop but one of heated oxygen sensors, which is used for fuel control, is malfunctioning
FC IDL	Idle fuel cut/ ON or OFF	Fuel cut operation: ON	FC IDL = "ON" when throttle valve is fully closed and engine speed is over 1,500 rpm
MIL	MIL status/ ON or OFF	MIL ON: ON	□
O2 LR B1 S1	Response time of the heated oxygen sensor, lean to rich (bank 1 sensor 1)/ Min.: 0 ms, Max.: 16,711 ms	Idling after warming up: 0 to 1,000 msec.	□
O2 LR B2 S1	Response time of the heated oxygen sensor, lean to rich (bank 2 sensor 1)/ Min.: 0 ms, Max.: 16,711 ms	Idling after warming up: 0 to 1,000 msec.	□
O2 RL B1 S1	Response time of the heated oxygen sensor, rich to lean (bank 1 sensor 1)/ Min.: 0 ms, Max.: 16,711 ms	Idling after warming up: 0 to 1,000 msec.	□
O2 RL B2 S1	Response time of the heated oxygen sensor, rich to lean (bank 2 sensor 1)/ Min.: 0 ms, Max.: 16,711 ms	Idling after warming up: 0 to 1,000 msec.	□
STARTER SIG	Starter signal/ ON or OFF	Cranking: ON	□
A/C SIG	A/C signal/ ON or OFF	A/C ON: ON	□
PNP SW [NSW]	Park/neutral position switch signal/ ON or OFF	P or N position: ON	□
ELECT LOAD SIG	Electrical load signal/ ON or OFF	Defogger switch ON: ON	□
STOP LIGHT SW	Stop lamp switch/ ON or OFF	□Brake pedal depressed: ON □Brake pedal released: OFF	□
FUEL PUMP SP CTL	Fuel pump speed control status/ ON or OFF	Idling: ON Cranking: OFF	□
FUEL PUMP / SPD	Fuel pump/speed status/ ON/H or OFF/M,L	Idling: ON	□
A/C MAG CLUTCH	A/C magnet clutch status/ ON or OFF	A/C magnet clutch ON: ON	□
EVAP VSV	VSV status for EVAP control/ ON or OFF	VSV operating: ON	VSV for EVAP is controlled by the ECM (ground side duty control)
IGNITION	Ignition counter/ Min.: 0, Max.: 800	0 to 800	□
CYL #1, #2, #3, #4, #5, #6, #7, #8	Misfire ratio of the cylinder 1 to 8/ Min.: 0 %, Max.: 50 %	0 %	This item is displayed in only idling

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Hand–held Tester Display	Measurement Item/Range (Display)	Normal Condition *	Diagnostic Note
FC TAU	Fuel Cut TAU: Fuel cut during very light load/ ON or OFF	Fuel cut operating: ON	Fuel cut is being performed under very light load to prevent engine combustion from becoming incomplete
CHECK MODE	Check mode/ ON or OFF	Check mode ON: ON	See page 05–38

*: If no conditions are specifically stated for "Idling", the shift lever is in the N or P position, the A/C switch is OFF and all accessory switches are OFF.

2. ACTIVE TEST

HINT:

Performing ACTIVE TEST using the hand–held tester allows the relay, VSV, actuator and so on to operate without parts removal. Performing ACTIVE TEST as a first step of troubleshooting is one of the method to shorten the labor time.

It is possible to display DATA LIST during ACTIVE TEST.

(a) Warm up the engine.
(b) Turn the ignition switch to OFF.
(c) Connect the hand–held tester or the to the DLC3.
(d) Turn the ignition switch to ON.
(e) Turn the hand–held tester ON.
(f) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST.
(g) According to the display on the tester, perform ACTIVE TEST.

Hand–held Tester Display	Test Details	Diagnostic Note
INJ VOL	[Test Details] Control the injection volume Min.: –12.5 %, Max.: 24.8 % [Vehicle Condition] Engine speed: 3,000 rpm or less	□All injectors are tested at once □Injection volume is gradually changed between –12.5 and 25 %
A/F CONTROL	[Test Details] Control the injection volume –12.5 or 25 % (Change the injection volume to –12.5 % or 25 %) [Vehicle Condition] Engine speed: 3,000 rpm or less	Following A/F CONTROL procedure enables the technician to check and graph voltage outputs of both the heated oxygen sensor To display the enter ACTIVE TEST / A/F CONTROL / USER DATA, select "O2S B1S1 and B1S2" or "O2S B2S1 and B2S2" by pressing "YES" followed by "ENTER" and then "F4"
CAN CTRL VSV	[Test Details] Activate the VSV for canister control ON or OFF	□
EVAP VSV (ALONE)	[Test Details] Activate the VSV for EVAP control ON or OFF	□
A/C MAG CLUTCH	[Test Details] Control the A/C magnet clutch ON or OFF	□
FUEL PUMP / SPD	[Test Details] Control the fuel pump ON or OFF	□
FUEL PMP SP CTL	[Test Details] Control the fuel pump speed ON or OFF	□

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TC/TE1	[Test Details] Connect the TC and TE1 ON or OFF	□
FC IDL PROHBT	[Test Details] Control the idle fuel cut prohibit ON or OFF	□

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DIAGNOSTIC TROUBLE CODE CHART

HINT:

Parameters listed in the chart may be different than your readings depending on the type of instrument used and other factors.

During the DTC check, refer to the table below if a malfunction code is displayed. For details about each code, refer to the page number in the DTC Chart's left column.

DTC No. (See Page)	Detection Item	Trouble Area	MIL*1	Memory
P0031 (05–58)	Oxygen Sensor Heater Control Circuit Low (Bank 1 Sensor 1)	Open or short in heater circuit of heated oxygen sensor Heated oxygen sensor heater (Bank 1 Sensor 1) EFI relay EFI No. 2 fuse ECM	○	○
P0032 (05–58)	Oxygen Sensor Heater Control Circuit High (Bank 1 Sensor 1)	Short in heater circuit of heated oxygen sensor Heated oxygen sensor heater (Bank 1 Sensor 1) EFI relay ECM	○	○
P0037 (05–58)	Oxygen Sensor Heater Control Circuit Low (Bank 1 Sensor 2)	Open or short in heater circuit of heated oxygen sensor Heated oxygen sensor heater (Bank 1 Sensor 2) EFI relay ECM	○	○
P0038 (05–58)	Oxygen Sensor Heater Control Circuit High (Bank 1 Sensor 2)	Short in heater circuit of heated oxygen sensor Heated oxygen sensor heater (Bank 1 Sensor 2) EFI relay ECM	○	○
P0051 (05–58)	Oxygen Sensor Heater Control Circuit Low (Bank 2 Sensor 1)	Open or short in heater circuit of heated oxygen sensor Heated oxygen sensor heater (Bank 2 Sensor 1) EFI relay ECM	○	○
P0052 (05–58)	Oxygen Sensor Heater Control Circuit High (Bank 2 Sensor 1)	Short in heater circuit of heated oxygen sensor Heated oxygen sensor heater (Bank 2 Sensor 1) EFI relay ECM	○	○
P0057 (05–58)	Oxygen Sensor Heater Control Circuit Low (Bank 2 Sensor 2)	Open or short in heater circuit of heated oxygen sensor Heated oxygen sensor heater (Bank 2 Sensor 2) EFI relay ECM	○	○
P0058 (05–58)	Oxygen Sensor Heater Control Circuit High (Bank 2 Sensor 2)	Short in heater circuit of heated oxygen sensor Heated oxygen sensor heater (Bank 2 Sensor 2) EFI relay ECM	○	○
P0100 (05–65)	Mass or Volume Air Flow Circuit	Open or short in mass air flow meter circuit Mass air flow meter ECM	○	○
P0101 (05–71)	Mass or Volume Air Flow Circuit Range/Performance Problem	Mass air flow meter	○	○
P0102 (05–65)	Mass or Volume Air Flow Circuit Low Input	Open in mass air flow meter circuit Short in ground circuit Mass air flow meter ECM	○	○
P0103 (05–65)	Mass or Volume Air Flow Circuit High Input	Open in mass air flow meter circuit (E2G circuit) Short in mass air flow meter circuit (+B circuit) Mass air flow meter ECM	○	○
P0110 (05–73)	Intake Air Temperature Circuit	Open or short in intake air temperature sensor circuit Intake air temperature sensor (built in mass air flow meter) ECM	○	○

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DTC No. (See Page)	Detection Item	Trouble Area	MIL*1	Memory
P0112 (05–73)	Intake Air Temperature Circuit Low Input	Short in intake air temperature sensor circuit Intake air temperature sensor (built in mass air flow meter) ECM	○	○
P0113 (05–73)	Intake Air Temperature Circuit High Input	Open in intake air temperature sensor circuit Intake air temperature sensor (built in mass air flow meter) ECM	○	○
P0115 (05–78)	Engine Coolant Temperature Circuit	Open or short in engine coolant temperature sensor circuit Engine coolant temperature sensor ECM	○	○
P0116 (05–83)	Engine Coolant Temperature Circuit Range/Performance Problem	Engine coolant temperature sensor	○	○
P0117 (05–78)	Engine Coolant Temperature Circuit Low Input	Open or short in engine coolant temperature sensor circuit Engine coolant temperature sensor ECM	○	○
P0118 (05–78)	Engine Coolant Temperature Circuit High Input	Open or short in engine coolant temperature sensor circuit Engine coolant temperature sensor ECM	○	○
P0120 (05–85)	Throttle/Pedal Position Sensor/ Switch "A" Circuit	Throttle position sensor (built in throttle body) ECM	○	○
P0121 (05–95)	Throttle/Pedal Position Sensor/ Switch "A" Circuit Range/Performance Problem	Throttle position sensor (built in throttle body)	○	○
P0122 (05–85)	Throttle/Pedal Position Sensor/ Switch "A" Circuit Low Input	Throttle position sensor (built in throttle body) Short in VTA1 circuit Open in VC circuit ECM	○	○
P0123 (05–85)	Throttle/Pedal Position Sensor/ Switch "A" Circuit High Input	Throttle position sensor (built in throttle body) Open in VTA1 circuit Open in E2 circuit VC and VTA1 circuits are short–circuited ECM	○	○
P0125 (05–97)	Insufficient Coolant Temperature for Closed Loop Fuel Control	Cooling system Engine coolant temperature sensor Thermostat	○	○
P0128 (05–99)	Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature)	Thermostat Cooling system Engine coolant temperature sensor ECM	○	○
P0130*3 (05–102)	Oxygen Sensor Circuit (Bank 1 Sensor 1)	Open or short in heated oxygen sensor circuit Heated oxygen sensor (Bank 1 Sensor 1) Heated oxygen sensor heater (Bank 1 Sensor 1) EFI relay Air induction system Fuel pressure Injector ECM	○	○
P0133*3 (05–114)	Oxygen Sensor Circuit Slow Response (Bank 1 Sensor 1)	Open or short in heated oxygen sensor circuit Heated oxygen sensor (Bank 1 Sensor 1) Heated oxygen sensor heater (Bank1 Sensor 1) EFI relay Air induction system Fuel pressure Injector ECM	○	○

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DTC No. (See Page)	Detection Item	Trouble Area	MIL*1	Memory
P0134 (05–124)	Oxygen Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	Open or short in heated oxygen sensor circuit Heated oxygen sensor (Bank 1 Sensor 1) Heated oxygen sensor heater (Bank 1 Sensor 1) EFI relay Air induction system Fuel pressure PCV valve and hose PCV hose connection Injector Gas leakage in exhaust system ECM	○	○
P0136 (05–132)	Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 2)	Open or short in heated oxygen sensor circuit Heated oxygen sensor (Bank 1 Sensor 2) Heated oxygen sensor heater (Bank 1 Sensor 2) EFI relay	○	○
P0150*3 (05–102)	Oxygen Sensor Circuit (Bank 2 Sensor 1)	Open or short in heated oxygen sensor circuit Heated oxygen sensor (Bank 2 Sensor 1) Heated oxygen sensor heater (Bank 2 Sensor 1) EFI relay Air induction system Fuel pressure Injector ECM	○	○
P0153*3 (05–114)	Oxygen Sensor Circuit Slow Response (Bank 2 Sensor 1)	Open or short in heated oxygen sensor circuit Heated oxygen sensor (Bank 2 Sensor 1) Heated oxygen sensor heater (Bank 2 Sensor 1) EFI relay Air induction system Fuel pressure Injector ECM	○	○
P0154 (05–124)	Oxygen Sensor Circuit No Activity Detected (Bank 2 Sensor 1)	Open or short in heated oxygen sensor circuit Heated oxygen sensor (Bank 2 Sensor 1) Heated oxygen sensor heater (Bank 2 Sensor 1) EFI relay Air induction system Fuel pressure PCV valve and hose PCV hose connection Injector Gas leakage in exhaust system ECM	○	○
P0156 (05–132)	Oxygen Sensor Circuit Malfunction (Bank 2 Sensor 2)	Open or short in heated oxygen sensor circuit Heated oxygen sensor (Bank 2 Sensor 2) Heated oxygen sensor heater (Bank 2 Sensor 2) EFI relay	○	○
P0171 (05–140)	System too Lean (Bank 1)	Air induction system Injector blockage Mass air flow meter Engine coolant temperature sensor Fuel pressure Gas leakage in exhaust system Open or short in heated oxygen sensor circuit Heated oxygen sensor (Bank 1 Sensor 1) Heated oxygen sensor heater (Bank 1 Sensor 1) EFI relay PCV valve and hose PCV hose connection ECM	○	○

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DTC No. (See Page)	Detection Item	Trouble Area	MIL*1	Memory
P0172 (05–140)	System too Rich (Bank 1)	Injector leakage or blockage Mass air flow meter Engine coolant temperature sensor Ignition system Fuel pressure Gas leakage in exhaust system Open or short in heated oxygen sensor circuit Heated oxygen sensor (Bank 1 Sensor 1) ECM	○	○
P0174 (05–140)	System too Lean (Bank2)	Air induction system Injector blockage Mass air flow meter Engine coolant temperature sensor Fuel pressure Gas leakage in exhaust system Open or short in heated oxygen sensor circuit Heated oxygen sensor (Bank 2 Sensor 1) Heated oxygen sensor heater (Bank 2 Sensor 1) EFI relay PCV valve and hose PCV hose connection ECM	○	○
P0175 (05–140)	System too Rich (Bank2)	Injector leakage or blockage Mass air flow meter Engine coolant temperature sensor Ignition system Fuel pressure Gas leakage in exhaust system Open or short in heated oxygen sensor circuit Heated oxygen sensor (Bank 2 Sensor 1) ECM	○	○
P0220 (05–85)	Throttle/Pedal Position Sensor/ Switch "B" Circuit	Throttle position sensor (built in throttle body) ECM	○	○
P0222 (05–85)	Throttle/Pedal Position Sensor/ Switch "B" Circuit Low Input	Throttle position sensor (built in throttle body) Short in VTA2 circuit Open in VC circuit ECM	○	○
P0223 (05–85)	Throttle/Pedal Position Sensor/ Switch "B" Circuit High Input	Throttle position sensor (built in throttle body) Open in VTA2 circuit Open in E2 circuit VC and VTA2 circuits are short–circuited ECM	○	○
P0230 (05–152)	Fuel Pump Primary Circuit	Open or short in fuel pump relay circuit Fuel pump relay ECM	□	○
P0300*3 (05–156)	Random/Multiple Cylinder Misfire Detected	Open or short in engine wire hatness Connector connection Vacuum hose connection Ignition system Injector Fuel pressure Mass air flow meter Engine coolant temperature sensor Compression pressure Valve clearance Valve timing PCV hose connection PCV hose ECM	○*2	○

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DTC No. (See Page)	Detection Item	Trouble Area	MIL*1	Memory
P0301*3 (05–156)	Cylinder 1 Misfire Detected	Same as DTC P0300	○*2	○
P0302*3 (05–156)	Cylinder 2 Misfire Detected	Same as DTC P0300	○*2	○
P0303*3 (05–156)	Cylinder 3 Misfire Detected	Same as DTC P0300	○*2	○
P0304*3 (05–156)	Cylinder 4 Misfire Detected	Same as DTC P0300	○*2	○
P0305*3 (05–156)	Cylinder 5 Misfire Detected	Same as DTC P0300	○*2	○
P0306*3 (05–156)	Cylinder 6 Misfire Detected	Same as DTC P0300	○*2	○
P0307*3 (05–156)	Cylinder 7 Misfire Detected	Same as DTC P0300	○*2	○
P0308*3 (05–156)	Cylinder 8 Misfire Detected	Same as DTC P0300	○*2	○
P0325 (05–171)	Knock Sensor 1 Circuit (Bank 1 or Single Sensor)	Open or short in knock sensor 1 circuit Knock sensor 1 (looseness) ECM	○	○
P0330 (05–171)	Knock Sensor 2 Circuit (Bank 2)	Open or short in knock sensor 2 circuit Knock sensor 2 (looseness) ECM	○	○
P0335 (05–176)	Crankshaft Position Sensor "A" Circuit	Open or short in crankshaft position sensor circuit Crankshaft position sensor Signal plate (crankshaft position sensor plate No. 1) ECM	○	○
P0339 (05–176)	Crankshaft Position Sensor "A" Circuit Intermittent	Open or short in crankshaft position sensor circuit Crankshaft position sensor Signal plate (crankshaft position sensor plate No. 1) ECM	□	○
P0340 (05–181)	Camshaft Position Sensor "A" Circuit (Bank 1 or Single Sensor)	Open or short in camshaft position sensor circuit Camshaft position sensor Bank1 camshaft timing pulley Jumping teeth of timing belt ECM	○	○
P0341 (05–181)	Camshaft Position Sensor "A" Circuit Range/Performance (Bank 1 or Single Sensor)	Open or short in camshaft position sensor circuit Camshaft position sensor Bank1 camshaft timing pulley Jumped tooth of timing belt ECM	○	○
P0351 (05–186)	Ignition Coil "A" Primary/Secondary Circuit	Ignition system Open or short in IGF or IGT1 circuit between ignition coil with igniter and ECM No. 1 ignition coil with igniter ECM	○	○
P0352 (05–186)	Ignition Coil "B" Primary/Secondary Circuit	Ignition system Open or short in IGF or IGT2 circuit between ignition coil with igniter and ECM No. 2 ignition coil with igniter ECM	○	○
P0353 (05–186)	Ignition Coil "C" Primary/Secondary Circuit	Ignition system Open or short in IGF or IGT3 circuit between ignition coil with igniter and ECM No. 3 ignition coil with igniter ECM	○	○

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DTC No. (See Page)	Detection Item	Trouble Area	MIL*1	Memory
P0354 (05–186)	Ignition Coil "D" Primary/Secondary Circuit	Ignition system Open or short in IGF or IGT4 circuit between ignition coil with igniter and ECM No. 4 ignition coil with igniter ECM	○	○
P0355 (05–186)	Ignition Coil "E" Primary/Secondary Circuit	Ignition system Open or short in IGF or IGT5 circuit between ignition coil with igniter and ECM No. 5 ignition coil with igniter ECM	○	○
P0356 (05–186)	Ignition Coil "F" Primary/Secondary Circuit	Ignition system Open or short in IGF or IGT6 circuit between ignition coil with igniter and ECM No. 6 ignition coil with igniter ECM	○	○
P0357 (05–186)	Ignition Coil "G" Primary/Secondary Circuit	Ignition system Open or short in IGF or IGT7 circuit between ignition coil with igniter and ECM No. 7 ignition coil with igniter ECM	○	○
P0358 (05–186)	Ignition Coil "H" Primary/Secondary Circuit	Ignition system Open or short in IGF or IGT8 circuit between ignition coil with igniter and ECM No. 8 ignition coil with igniter ECM	○	○
P0420*3 (05–196)	Catalyst System Efficiency Below Threshold (Bank 1)	Gas leakage in exhaust system Heated oxygen sensor (Bank 1 Sensor 1, 2) Three–way catalytic converter (inside exhaust manifold)	○	○
P0430*3 (05–196)	Catalyst System Efficiency Below Threshold (Bank 2)	Gas leakage in exhaust system Heated oxygen sensor (Bank 2 Sensor 1, 2) Three–way catalytic converter (inside exhaust manifold)	○	○
P0441*3 (05–203)	Evaporative Emission Control System Incorrect Purge Flow	Vacuum hose has cracks, holes, or is blocked, damaged or disconnected Fuel tank cap is incorrectly installed Fuel tank cap has cracks or is damaged Open or short in vapor pressure sensor circuit Vapor pressure sensor Open or short in VSV circuit for EVAP VSV for EVAP Open or short in VSV circuit for CCV VSV for CCV Fuel tank has cracks, holes, or is damaged Charcoal canister has cracks, holes, or is damaged Fuel tank over fill check valve has cracks, or is damaged ECM	○	○
P0442*3 (05–203)	Evaporative Emission Control System Leak detected (small leak)	Vacuum hose has cracks, holes, or is blocked, damaged or disconnected Fuel tank cap is incorrectly installed Fuel tank cap has cracks or is damaged Open or short in vapor pressure sensor circuit Vapor pressure sensor Open or short in VSV circuit for EVAP VSV for EVAP Open or short in VSV circuit for CCV VSV for CCV Fuel tank has cracks, holes, or is damaged Charcoal canister has cracks, holes, or is damaged Fuel tank over fill check valve has cracks, or is damaged ECM	○	○

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DTC No. (See Page)	Detection Item	Trouble Area	MIL*1	Memory
P0446*3 (05–203)	Evaporative Emission Control System Vent Control Circuit	Vacuum hose has cracks, holes, or is blocked, damaged or disconnected Fuel tank cap is incorrectly installed Fuel tank cap has cracks or is damaged Open or short in vapor pressure sensor circuit Vapor pressure sensor Open or short in VSV circuit for EVAP VSV for EVAP Open or short in VSV circuit for CCV VSV for CCV Fuel tank has cracks, holes, or is damaged Charcoal canister has cracks, holes, or is damaged Fuel tank over fill check valve has cracks, or is damaged ECM	○	○
P0451*3 (05–232)	Evaporative Emission Control System Pressure Sensor Range/ Performance	Open or short in vapor pressure sensor circuit Vapor pressure sensor ECM	○	○
P0452 (05–232)	Evaporative Emission Control System Pressure Sensor/Switch Low Input	Open in vapor pressure sensor circuit Vapor pressure sensor ECM	○	○
P0453 (05–232)	Evaporative Emission Control System Pressure Sensor/Switch High Input	Short in vapor pressure sensor circuit Vapor pressure sensor ECM	○	○
P0455*3 (05–203)	Evaporative Emission Control System Leak Detected (Gross Leak)	Vacuum hose has cracks, holes, or is blocked, damaged or disconnected Fuel tank cap is incorrectly installed Fuel tank cap has cracks or is damaged Open or short in vapor pressure sensor circuit Vapor pressure sensor Open or short in VSV circuit for EVAP VSV for EVAP Open or short in VSV circuit for CCV VSV for CCV Fuel tank has cracks, holes, or is damaged Charcoal canister has cracks, holes, or is damaged Fuel tank over fill check valve has cracks, or is damaged ECM	○	○
P0456*3 (05–203)	Evaporative Emission Control System Leak Detected (very small leak)	Vacuum hose has cracks, holes, or is blocked, damaged or disconnected Fuel tank cap is incorrectly installed Fuel tank cap has cracks or is damaged Open or short in vapor pressure sensor circuit Vapor pressure sensor Open or short in VSV circuit for EVAP VSV for EVAP Open or short in VSV circuit for CCV VSV for CCV Fuel tank has cracks, holes, or is damaged Charcoal canister has cracks, holes, or is damaged Fuel tank over fill check valve has cracks, or is damaged ECM	○	○
P0500 (05–239)	Vehicle Speed Sensor "A"	Open or short in speed sensor circuit Speed sensor Combination meter ECM Skid control ECU	○	○

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DTC No. (See Page)	Detection Item	Trouble Area	MIL*1	Memory
P0503 (05–239)	Vehicle Speed Sensor "A" Intermittent/Erratic/High	Open or short in vehicle speed sensor circuit Vehicle speed sensor Combination meter ECM Skid control ECU	□	○
P0504 (05–242)	Brake Switch "A"/"B" Correlation	Short in stop lamp switch signal circuit Stop lamp switch ECM	□	○
P0505 (05–248)	Idle Air Control System	Electric throttle control system Air induction system PCV hose connection	○	○
P0560 (05–251)	System Voltage	Open in back–up power source circuit ECM	○	○
P0571 (05–1943)	Brake Switch "A" Circuit	Cruise control system	□	○
P0604 (05–255)	Internal Control Module Random Access Memory (RAM) Error	ECM	○	○
P0606 (05–255)	ECM/PCM Processor	ECM	○	○
P0607 (05–255)	Control Module Performance	ECM	○	○
P0617 (05–257)	Starter Relay Circuit High	Short in Park/Neutral position switch circuit Park/Neutral position switch Ignition switch ECM	○	○
P0657 (05–255)	Actuator Supply Voltage Circuit / Open	ECM	○	○
P0705 (05–978)	Transmission Range Sensor Circuit Malfunction (PRNDL Input)	Electronic controlled automatic transmission (ECT)	○	○
P0710 (05–983)	Transmission Fluid Temperature Sensor "A" Circuit	Electronic controlled automatic transmission (ECT)	○	○
P0711 (05–986)	Transmission Fluid Temperature Sensor "A" Circuit Range/Performance	Electronic controlled automatic transmission (ECT)	○	○
P0712 (05–983)	Transmission Fluid Temperature Sensor "A" Circuit Low Input	Electronic controlled automatic transmission (ECT)	○	○
P0713 (05–983)	Transmission Fluid Temperature Sensor "A" Circuit High Input	Electronic controlled automatic transmission (ECT)	○	○
P0717 (05–988)	Input/Turbine Speed Sensor "A" Circuit No Signal	Electronic controlled automatic transmission (ECT)	○	○
P0722 (05–991)	Output Speed Sensor Circuit No Signal	Electronic controlled automatic transmission (ECT)	○	○
P0724 (05–994)	Brake Switch "B" Circuit High	Electronic controlled automatic transmission (ECT)	○	○
P0748 (05–996)	Pressure Control Solenoid "A" Electrical	Electronic controlled automatic transmission (ECT)	○	○
P0751 (05–1002)	Shift Solenoid "A" Performance or Stuck Off	Electronic controlled automatic transmission (ECT)	○	○
P0756 (05–1006)	Shift Solenoid "B" Performance or Stuck Off	Electronic controlled automatic transmission (ECT)	○	○
P0771 (05–1010)	Shift Solenoid "E" Performance or Stuck Off	Electronic controlled automatic transmission (ECT)	○	○
P0776 (05–1014)	Pressure Control Solenoid "B" Performance or Stuck Off	Electronic controlled automatic transmission (ECT)	○	○

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DTC No. (See Page)	Detection Item	Trouble Area	MIL*1	Memory
P0778 (05–1018)	Pressure Control Solenoid "B" Electrical	Electronic controlled automatic transmission (ECT)	○	○
P0781 (05–1022)	1 – 2 Shift	Electronic controlled automatic transmission (ECT)	○	○
P0973 (05–1025)	Shift Solenoid "A" Control Circuit Low	Electronic controlled automatic transmission (ECT)	○	○
P0974 (05–1025)	Shift Solenoid "A" Control Circuit High	Electronic controlled automatic transmission (ECT)	○	○
P0976 (05–1028)	Shift Solenoid "B" Control Circuit Low	Electronic controlled automatic transmission (ECT)	○	○
P0977 (05–1028)	Shift Solenoid "B" Control Circuit High	Electronic controlled automatic transmission (ECT)	○	○
P0985 (05–1031)	Shift Solenoid "E" Control Circuit Low	Electronic controlled automatic transmission (ECT)	○	○
P0986 (05–1031)	Shift Solenoid "E" Control Circuit High	Electronic controlled automatic transmission (ECT)	○	○
P1782 (05–1034)	Transfer L4 SW Circuit	Electronic controlled automatic transmission (ECT)	○	○
P2102 (05–265)	Throttle Actuator Control Motor Circuit Low	Open in throttle control motor circuit Throttle control motor ECM	○	○
P2103 (05–265)	Throttle Actuator Control Motor Circuit High	Short in throttle control motor circuit Throttle control motor Throttle valve Throttle body assembly ECM	○	○
P2111 (05–269)	Throttle Actuator Control System – Stuck Open	Throttle control motor circuit Throttle control motor Throttle body Throttle valve	○	○
P2112 (05–269)	Throttle Actuator Control System – Stuck Closed	Throttle control motor circuit Throttle control motor Throttle body Throttle valve	○	○
P2118 (05–272)	Throttle Actuator Control Motor Current Range/Performance	Open in ETCS power source circuit ETCS fuse ECM	○	○
P2119 (05–276)	Throttle Actuator Control Throttle Body Range/Performance	Electric throttle control system ECM	○	○
P2120 (05–278)	Throttle/Pedal Position Sensor/ Switch "D" Circuit	Accelerator pedal position sensor ECM	○	○
P2121 (05–287)	Throttle/Pedal Position Sensor/ Switch "D" Circuit Range/Performance	Accelerator pedal position sensor circuit Accelerator pedal position sensor ECM	○	○
P2122 (05–278)	Throttle/Pedal Position Sensor/ Switch "D" Circuit Low Input	Accelerator pedal position sensor Open in VCP1 circuit Open or ground short in VPA circuit ECM	○	○
P2123 (05–278)	Throttle/Pedal Position Sensor/ Switch "D" Circuit High Input	Accelerator pedal position sensor Open in EPA circuit ECM	○	○
P2125 (05–278)	Throttle/Pedal Position Sensor/ Switch "E" Circuit	Accelerator pedal position sensor ECM	○	○

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DTC No. (See Page)	Detection Item	Trouble Area	MIL*1	Memory
P2127 (05–278)	Throttle/Pedal Position Sensor/ Switch "E" Circuit Low Input	Accelerator pedal position sensor Open in VCP2 circuit Open or ground short in VPA2 circuit ECM	○	○
P2128 (05–278)	Throttle/Pedal Position Sensor/ Switch "E" Circuit High Input	Accelerator pedal position sensor Open in EPA2 circuit ECM	○	○
P2135 (05–278)	Throttle Pedal Position Sensor/ Switch "A"/"B" Voltage Correlation	VTA1 and VTA2 circuit are short–circuited Throttle position sensor (built in throttle body) ECM	○	○
P2138 (05–278)	Throttle Pedal Position Sensor/ Switch "D"/"E" Voltage Correlation	VPA and VPA2 circuit are short–circuited Accelerator pedal position sensor ECM	○	○
P2195*3 (05–102)	Oxygen Sensor Signal Stuck Lean (Bank 1 Sensor 1)	Open or short in heated oxygen sensor circuit Heated oxygen sensor (Bank 1 Sensor 1) Heated oxygen sensor heater (Bank 1 Sensor 1) EFI relay Air induction system Fuel pressure Injector ECM	○	○
P2196*3 (05–102)	Oxygen Sensor Signal Stuck Rich (Bank 1 Sensor 1)	Open or short in heated oxygen sensor circuit Heated oxygen sensor (Bank 1 Sensor 1) Heated oxygen sensor heater (Bank 1 Sensor 1) EFI relay Air induction system Fuel pressure Injector ECM	○	○
P2197*3 (05–102)	Oxygen Sensor Signal Stuck Lean (Bank 2 Sensor 1)	Open or short in heated oxygen sensor circuit Heated oxygen sensor (Bank 2 Sensor 1) Heated oxygen sensor heater (Bank 2 Sensor 1) EFI relay Air induction system Fuel pressure Injector ECM	○	○
P2198*3 (05–102)	Oxygen Sensor Signal Stuck Rich (Bank 2 Sensor 1)	Open or short in heated oxygen sensor circuit Heated oxygen sensor (Bank 2 Sensor 1) Heated oxygen sensor heater (Bank 2 Sensor 1) EFI relay Air induction system Fuel pressure Injector ECM	○	○
P2714 (05–1037)	Pressure Control Solenoid "D" Performance or Stuck Off	Electronic controlled automatic transmission (ECT)	○	○
P2716 (05–1040)	Pressure Control Solenoid "D" Electrical	Electronic controlled automatic transmission (ECT)	○	○
P2740 (05–1043)	Transmission Fluid Temperature Sensor "B" Circuit	Electronic controlled automatic transmission (ECT)	○	○
P2742 (05–1043)	Transmission Fluid Temperature Sensor "B" Circuit Low Input	Electronic controlled automatic transmission (ECT)	○	○
P2743 (05–1043)	Transmission Fluid Temperature Sensor "B" Circuit High Input	Electronic controlled automatic transmission (ECT)	○	○
P2757 (05–1047)	Torque Converter Clutch Pressure Control Solenoid Control Circuit Performance or Stuck Off	Electronic controlled automatic transmission (ECT)	○	○

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DTC No. (See Page)	Detection Item	Trouble Area	MIL*1	Memory
P2759 (05–1050)	Torque Converter Clutch Pressure Control Solenoid Control Circuit Electrical	Electronic controlled automatic transmission (ECT)	○	○
B2799 (05–1886)	Engine Immobilizer System Malfunction	Immobilizer system	□	○

*1: □ MIL dese not illuminates, ○ MIL illuminates.
*2: MIL illuminates up or blinks.
*3: For USA only.

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DTC	P0031	OXYGEN SENSOR HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1)

DTC	P0032	OXYGEN SENSOR HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1)

DTC	P0037	OXYGEN SENSOR HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2)

DTC	P0038	OXYGEN SENSOR HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2)

DTC	P0051	OXYGEN SENSOR HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 1)

DTC	P0052	OXYGEN SENSOR HEATER CONTROL CIRCUIT HIGH (BANK 2 SENSOR 1)

DTC	P0057	OXYGEN SENSOR HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 2)

DTC	P0058	OXYGEN SENSOR HEATER CONTROL CIRCUIT HIGH (BANK 2 SENSOR 2)

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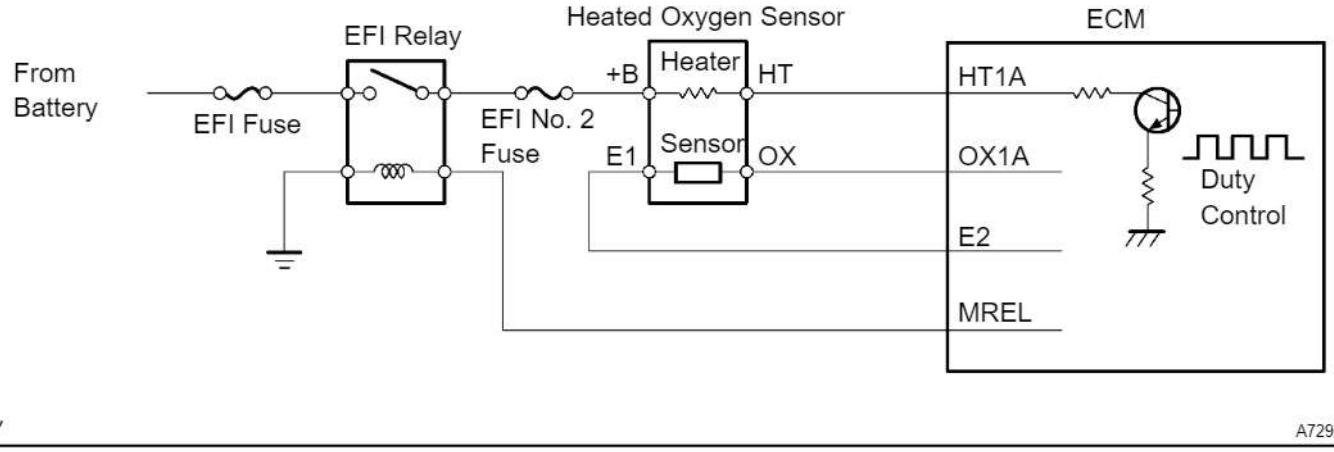
CIRCUIT DESCRIPTION

Refer to DTC P0130 on page 05–102.

HINT:

The ECM provides a pulse width modulated control circuit to adjust current through the heater. The heated oxygen sensor heater circuit uses a relay on the B+ side of the circuit.

Reference (Bank 1 Sensor 1 System Drawing)



DTC No.	DTC Detection Condition	Trouble Area
P0031 P0037 P0051 P0057	(1) Heated current is 0.2 A or less when heater operates with +B voltage between 10.5 V and 11.5 V (1 trip detection logic) (2) Heated current is 0.25 A or less when heater operates with +B greater than 11.5 V (1 trip detection logic)	□Open or short in heater circuit of heated oxygen sensor □Heated oxygen sensor heater □EFI relay □EFI No. 2 fuse □ECM
P0032 P0038 P0052 P0058	When heater operates, heater current exceeds 2 A (1 trip detection logic)	□Open or short in heater circuit of heated oxygen sensor □Heated oxygen sensor heater □EFI relay □ECM

HINT:

- □ Bank 1 refers to the bank that includes cylinder No.1.
- □ Bank 2 refers to the bank that does not include cylinder No.1.
- □ Sensor 1 refers to the sensor closest to the engine body.
- □ Sensor 2 refers to the sensor farthest away from the engine body.

MONITOR DESCRIPTION

The ECM uses the heated oxygen sensor information to regulate the air–fuel ratio close to a stoichiometric ratio. This maximizes the catalytic converter's ability to purify the exhaust gases. The sensor detects oxygen levels in the exhaust gas and sends this signal to the ECM.

The inner surface of the sensor element is exposed to outside air. The outer surface of the sensor element is exposed to exhaust gas. The sensor element is made of platinum coated zirconia and includes an integrated heating element. The oxygen sensor has the characteristic whereby its output voltage change suddenly in the vicinity of the stoichiometric air–fuel ratio. When heated, the sensor becomes very efficient. If the temperature of the exhaust is low, the sensor will not generate useful voltage signals without supplemental heating. The ECM regulates the supplemental heating using a duty–cycle approach to regulate the average current in the heater element. If the heater current is out of the normal range, the sensor's output signals will be inaccurate and the ECM cannot regulate the air–fuel ratio properly. When the heater current is out of the normal operating range, the ECM interprets this as a malfunction and sets a DTC.

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Example:
The ECM will set a high current DTC if the current in the sensor is more than 2 A when the heater is OFF. Similarly, the ECM will set a low current DTC if the current is less than 0.25 A when the heater is ON.

MONITOR STRATEGY

Related DTCs	P0031: Heated oxygen sensor heater current bank 1 sensor 1 (Low current) P0032: Heated oxygen sensor heater current bank 1 sensor 1 (High current) P0037: Heated oxygen sensor heater current bank 1 sensor 2 (Low current) P0038: Heated oxygen sensor heater current bank 1 sensor 2 (High current) P0051: Heated oxygen sensor heater current bank 2 sensor 1 (Low current) P0052: Heated oxygen sensor heater current bank 2 sensor 1 (High current) P0057: Heated oxygen sensor heater current bank 2 sensor 2 (Low current) P0058: Heated oxygen sensor heater current bank 2 sensor 2 (High current)
Required sensors/ components (Main)	Heated oxygen sensor
Required sensors/ components (Related)	Vehicle speed sensor
Frequency of operation	Continuous
Duration	0.3 second
MIL operation	1 driving cycle
Sequence operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05–13

P0031, P0037, P0051 and P0057 (Low current):

Either of the following conditions A and B is met	
Condition A	
Time after engine start	250 to 500 seconds
Battery voltage	10.5 V or more
Vehicle speed	Within 56 mph (90 km/h)
Misfire	None
Pass or Fail detection in this driving cycle	None
Condition B	
Time after engine start	500 seconds or more
Battery voltage	10.5 V or more
Vehicle speed	25 mph (40 km/h) or more
Misfire	None
Pass or Fail detection in this driving cycle	None

P0032, P0038, P0052 and P0058 (High current):

Intrusive heating	OFF

TYPICAL MALFUNCTION THRESHOLDS

P0031, P0037, P0051 and P0057 (Low current):

Heated oxygen sensor heater current	Less than 0.25 A (at 0.3 sec. after heater "ON")

P0032, P0038, P0052 and P0058 (High current):

Heated oxygen sensor heater current	More than 2A (while intrusive heating is OFF)

COMPONENT OPERATING RANGE

Heated oxygen sensor heater current	0.4 to 1 A (at idle, warmed–up engine and +B: 11 to 14 V)

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MONITOR RESULT (MODE 06 DATA)

Heated oxygen sensor heater:

Test ID/Comp ID	Description of Test Data	Description of Test Limit	Conversion Factor (Unit)
$04/$81, $82, $90, $A0	Maximum heated oxygen sensor heater current	Maximum threshold heater current to detect heated oxygen sensor malfunction	Multiply by 0.000076 (A)

Refer to page 05–21 for detailed information on CHECKING MONITOR STATUS.

WIRING DIAGRAM

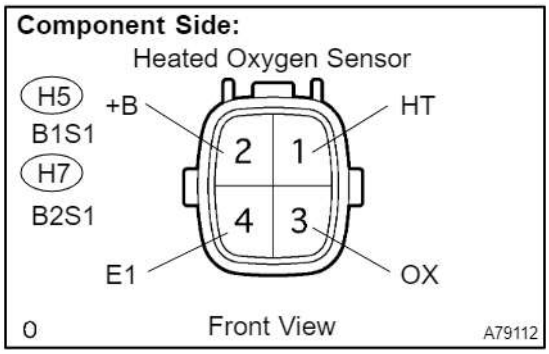
Refer to DTC P0130 on page 05–102.

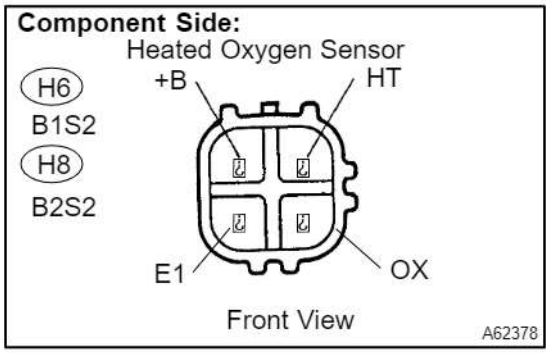
INSPECTION PROCEDURE

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1 INSPECT HEATED OXYGEN SENSOR(HEATER RESISTANCE)





(a) Disconnect the H5, H6, H7 or H8 heated oxygen sensor connector.

(b) Measure the resistance between the terminals of the heated oxygen sensor connector.

Standard (Bank 1, 2 sensor 1):

Tester Connection	Specified Condition
1 (HT) – 2 (+B)	11 to 16 Ω at 20 C (68 F)
1 (HT) – 4 (E1)	10 kΩ or higher

Standard (Bank 1, 2 sensor 2):

Tester Connection	Specified Condition
1 (HT) – 2 (+B)	11 to 16 Ω at 20 C (68 F)
1 (HT) – 4 (E1)	10 kΩ or higher

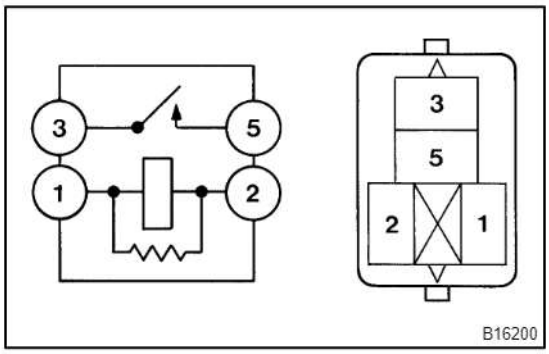
(c) Reconnect the heated oxygen sensor connector.

NG → **REPLACE HEATED OXYGEN SENSOR**

OK

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2 INSPECT EFI RELAY



(a) Remove the EFI relay from the engine room R/B.
(b) Check for continuity in the EFI relay.
Standard:

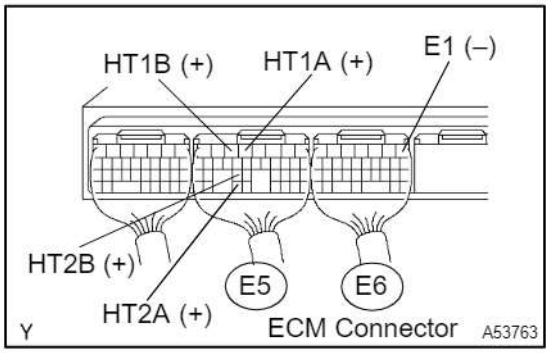
Tester Connection	Specified Condition
1 – 2	Continuity
3 – 5	No continuity
3 – 5	Continuity (Apply battery voltage to terminals 1 and 2)

(c) Reinstall the EFI relay.

NG → **REPLACE EFI RELAY**

OK

3 INSPECT ECM(HT1A, HT1B, HT2A OR HT2B VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between the applicable terminals of the E5 and E6 ECM connectors.
Standard:

Tester Connection	Specified Condition
HT1A (E5–4) – E1 (E6–1)	9 to 14 V
HT1B (E5–5) – E1 (E6–1)	9 to 14 V
HT2A (E5–33) – E1 (E6–1)	9 to 14 V
HT2B (E5–25) – E1 (E6–1)	9 to 14 V

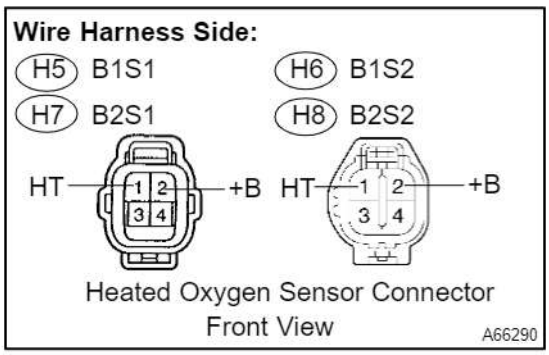
HINT:
- The HT1A means the heated oxygen sensor bank 1 sensor 1.
- The HT1B means the heated oxygen sensor bank 1 sensor 2.
- The HT2A means the heated oxygen sensor bank 2 sensor 1.
- The HT2B means the heated oxygen sensor bank 2 sensor 2.

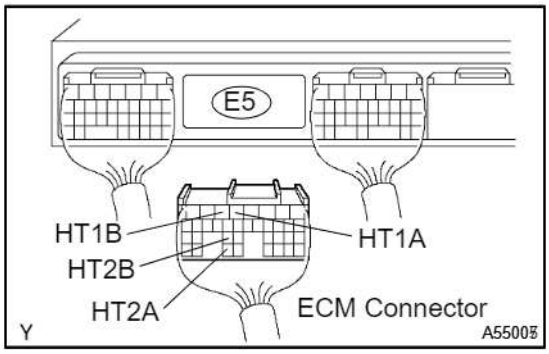
OK → **REPLACE ECM (See page 10–24)**

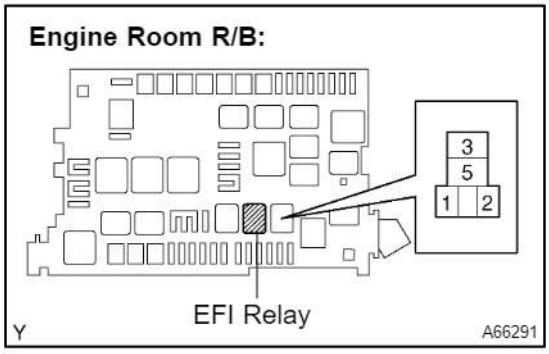
NG

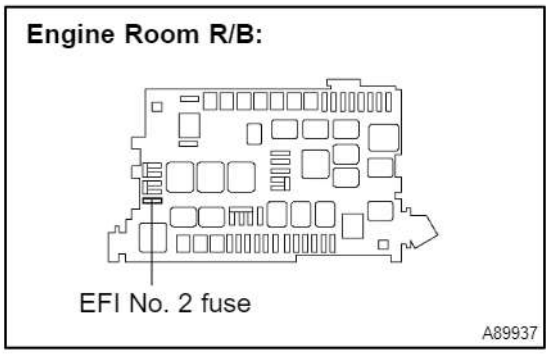
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4 CHECK HARNESS AND CONNECTOR(HEATED OXYGEN SENSOR – ECM, HEATED OXYGEN SENSOR – EFI RELAY)









(a) Check the harness and connector between the ECM and heated oxygen sensor connectors.

(1) Disconnect the H5, H6, H7 or H8 heated oxygen sensor connector.

(2) Disconnect the E5 ECM connector.

(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
HT (H5–1) – HT1A (E5–4)	Below 1 Ω
HT (H6–1) – HT1B (E5–5)	Below 1 Ω
HT (H7–1) – HT2A (E5–33)	Below 1 Ω
HT (H8–1) – HT2B (E5–25)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
HT (H5–1) or HT1A (E5–4) – Body ground	10 kΩ or higher
HT (H6–1) or HT1B (E5–5) – Body ground	10 kΩ or higher
HT (H7–1) or HT2A (E5–33) – Body ground	10 kΩ or higher
HT (H8–1) or HT2B (E5–25) – Body ground	10 kΩ or higher

(4) Reconnect the heated oxygen sensor connector.

(5) Reconnect the ECM connector.

(b) Check the harness and connector between the heated oxygen sensor and EFI relay.

(1) Inspect the EFI No.2 fuse.

□ Remove the EFI No.2 fuse from the engine room R/B.

□ Check for continuity in the EFI No.2 fuse.

Standard: Continuity

□ Reinstall the EFI No. 2 fuse.

(2) Disconnect the H5, H6, H7 or H8 heated oxygen sensor connector.

(3) Remove the EFI relay from the engine room R/B.

(4) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
+B (H5–2) – Engine room R/B (EFI relay terminal 3)	Below 1 Ω
+B (H6–2) – Engine room R/B (EFI relay terminal 3)	Below 1 Ω
+B (H7–2) – Engine room R/B (EFI relay terminal 3)	Below 1 Ω
+B (H8–2) – Engine room R/B (EFI relay terminal 3)	Below 1 Ω

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Standard (Check for short):

Tester Connection	Specified Condition
+B (H5–2) or Engine room R/B (EFI relay terminal 3) – Body ground	10 kΩ or higher
+B (H6–2) or Engine room R/B (EFI relay terminal 3) – Body ground	10 kΩ or higher
+B (H7–2) or Engine room R/B (EFI relay terminal 3) – Body ground	10 kΩ or higher
+B (H8–2) or Engine room R/B (EFI relay terminal 3) – Body ground	10 kΩ or higher

(5) Reconnect the heated oxygen sensor connector.
(6) Reinstall the EFI relay.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM (See page 10–24)

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DTC	P0100	MASS OR VOLUME AIR FLOW CIRCUIT

DTC	P0102	MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT

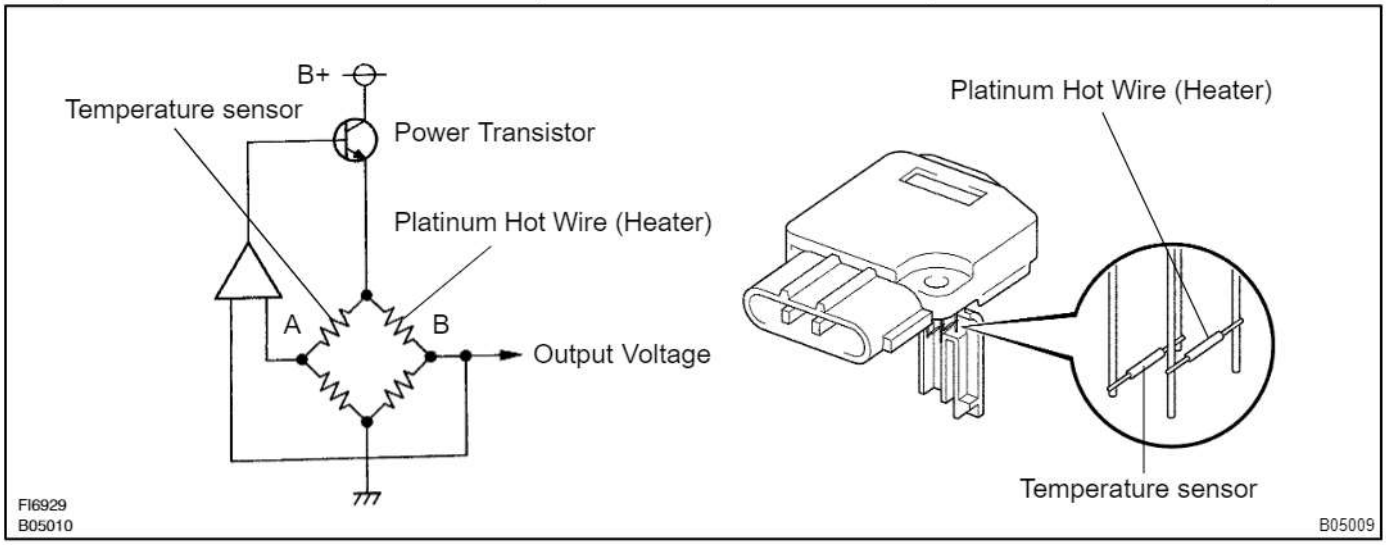
DTC	P0103	MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT

CIRCUIT DESCRIPTION

The MAF (Mass Air Flow) meter is a sensor measures the amount of air flowing through the throttle valve. The ECM uses this information to determine the fuel injection time and provide a proper air–fuel ratio. Inside the MAF meter, there is a heated platinum wire exposed to the flow of intake air.

By applying a specific current to the wire, the ECM heats this wire to a given temperature. The flow of incoming air cools the wire and an internal thermistor, affecting their resistance. To maintain a constant current value, the ECM varies the voltage applied to these components in the MAF meter. The voltage level is proportional to the flow of the air passing through the sensor. The ECM interprets this voltage as the intake air amount.

The circuit is constructed so that the platinum hot wire and temperature sensor provide a bridge circuit, with the power transistor controlled so that the potential of A and B remains equal to maintain the set temperature.



DTC No.	DTC Detection Condition	Trouble Area
P0100	Open or short in mass air flow meter circuit with more than 3 seconds engine speed 4,000 rpm or less	□Open or short in mass air flow meter circuit □Mass air flow meter □ECM
P0102	Open or short in mass air flow meter circuit with more than 3 seconds engine speed 4,000 rpm or less	□Open in mass air flow meter circuit □Short in ground circuit □Mass air flow meter □ECM
P0103	Open in mass air flow meter circuit with more than 3 seconds (E2G circuit) engine speed 4,000 rpm or less Short in mass air flow meter circuit with more than 3 seconds (+B circuit) engine speed 4,000 rpm or less	□Open in mass air flow meter circuit (E2G circuit) □Short in mass air flow meter circuit (+B circuit) □Mass air flow meter □ECM

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HINT:
After confirming DTC P0100, P0102 or P0103, use the hand–held tester or the OBD II scan tool to confirm the mass air flow ratio from the DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL.

Air Flow Value (gm/s)	Malfunction
Approximately 0.0	□Mass air flow meter power source circuit open □VG circuit open or short
271.0 or more	□E2G circuit open

MONITOR DESCRIPTION

If there is a defect in the sensor or an open or short circuit, the voltage level will deviate outside the normal operating range. The ECM interprets this deviation as a defect in the MAF meter and sets a DTC.
Example:
When the sensor voltage output is less than 0.2 V or more than 4.9 V and if either condition continues for more than 3 seconds.

MONITOR STRATEGY

Related DTCs	P0100: Mass air flow meter circuit range check (Fluttering) P0102: Mass air flow meter circuit range check (Low voltage) P0103: Mass air flow meter circuit range check (High voltage)
Required sensors/ components (Main)	Mass air flow meter
Required sensors/ components (Related)	–
Frequency of operation	Continuous
Duration	3 seconds
Mil operation	Immediate: Engine RPM is less than 4,000 rpm 2 driving cycles: Engine RPM is 4,000 rpm or more
Sequence operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05–13

TYPICAL MALFUNCTION THRESHOLDS

P0100:

Mass air flow meter voltage	Less than 0.2 V or more than 4.9 V

P0102:

Mass air flow meter voltage	Less than 0.2 V

P0103:

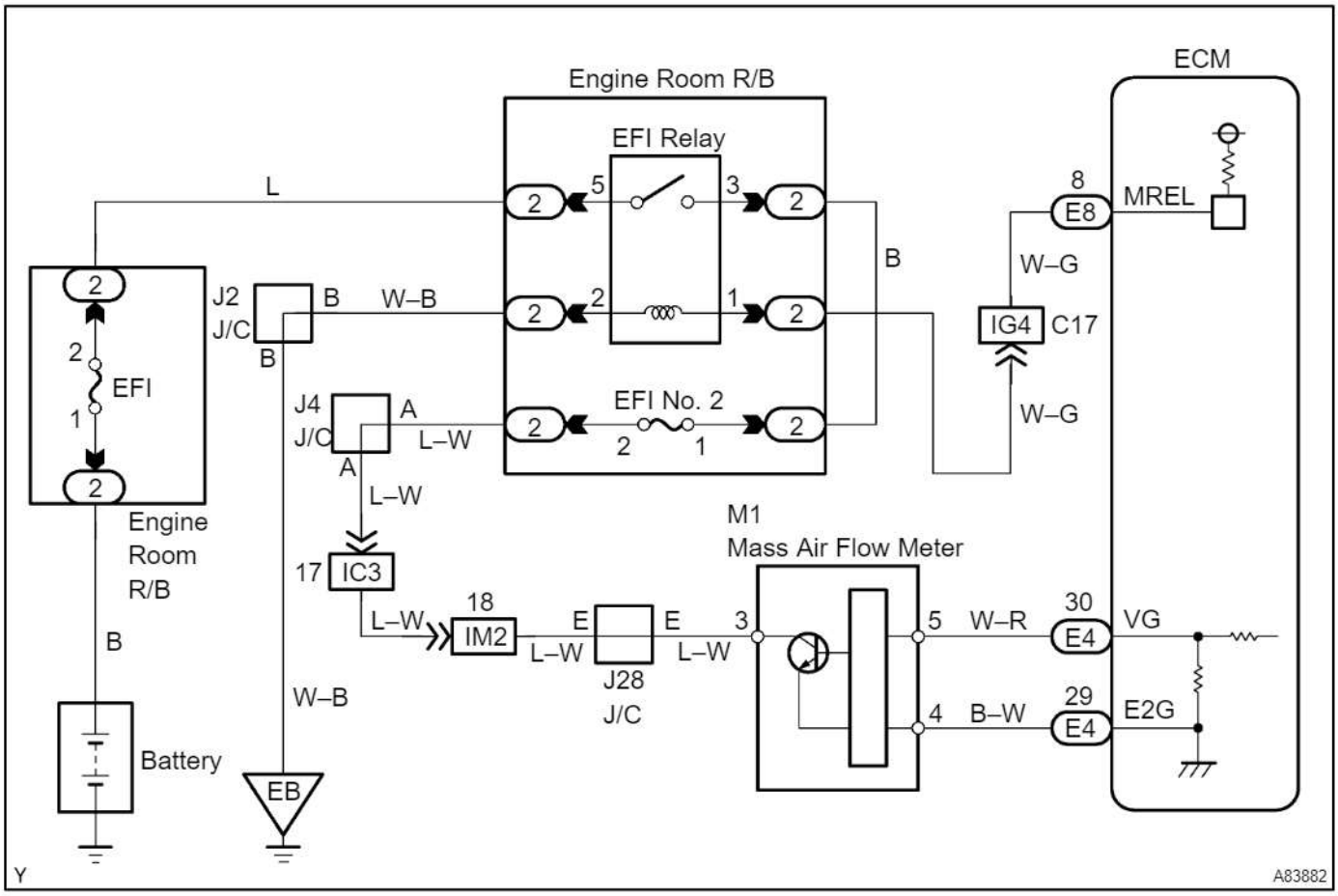
Mass air flow meter voltage	More than 4.9 V

COMPONENT OPERATING RANGE

Mass air flow meter voltage	Between 0.4 and 2.2 V

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WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1	**READ VALUE OF HAND–HELD TESTER OR OBD II SCAN TOOL(MASS AIR FLOW RATE)**

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Start the engine.
(c) Turn the hand–held tester or the OBD II scan tool ON.
(d) On the hand–held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / MAF.
(e) Read the values.

Result:

Air Flow Rate (gm/s)	Proceed to
0.0	A
271.0 or more	B
Between 1.0 and 270.0 (*1)	C

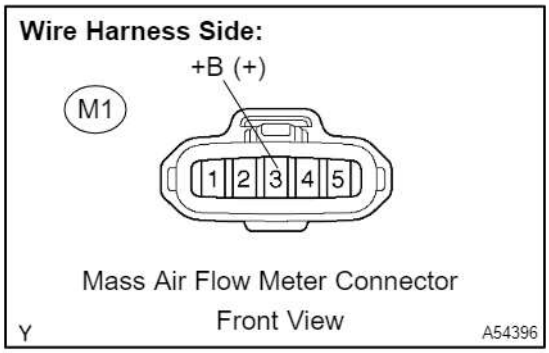
*1: The value must be changed when the throttle valve is opened or closed.

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B	Go to step 6
C	CHECK FOR INTERMITTENT PROBLEMS (See page 05–10)

A

2 INSPECT MASS AIR FLOW METER(POWER SOURCE)



(a) Turn the ignition switch to ON.
(b) Disconnect the mass air flow meter connector.
(c) Measure the voltage between the terminal of the wire harness side connector and body ground.

Standard:

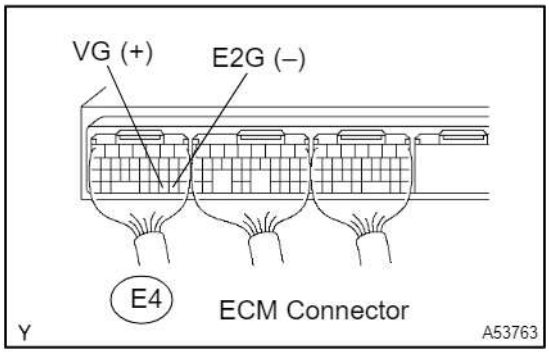
Tester Connection	Specified Condition
+B (3) – Body ground	9 to 14 V

(d) Reconnect the mass air flow meter connector.

NG	Go to step 5

OK

3 INSPECT ECM(VG VOLTAGE)



(a) Start the engine.
(b) Measure the voltage between the specified terminals of the E4 ECM connector.

HINT:
The shift position should be P or N and the A/C switch should be turned OFF.

Standard:

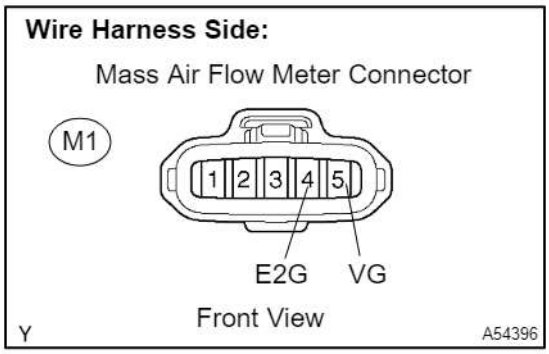
Tester Connection	Condition	Specified Condition
VG (E4–30) – E2G (E4–29)	Engine is idling	0.5 to 3.0 V

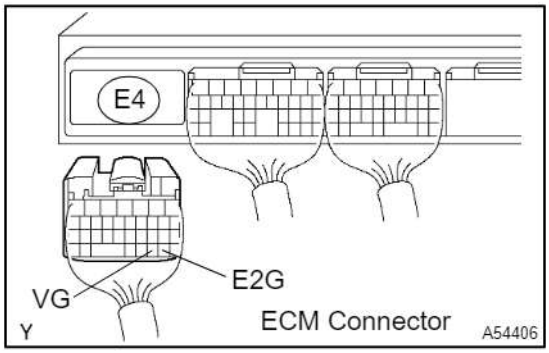
OK	REPLACE ECM (See page 10–24)

NG

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4 CHECK HARNESS AND CONNECTOR(MASS AIR FLOW METER – ECM)





(a) Disconnect the M1 mass air flow meter connector.
(b) Disconnect the E4 ECM connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
VG (5) – VG (E4–30)	Below 1 Ω
E2G (4) – E2G (E4–29)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
VG (5) or VG (E4–30) – Body ground	10 kΩ or higher

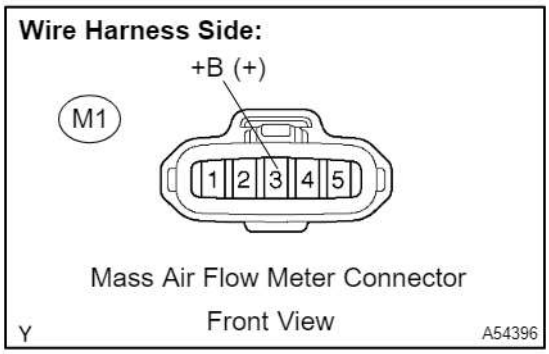
(d) Reconnect the mass air flow meter connector.
(e) Reconnect the ECM connector.

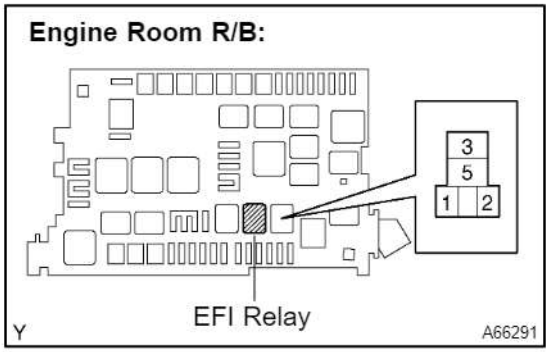
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE MASS AIR FLOW METER

5 CHECK HARNESS AND CONNECTOR(MASS AIR FLOW METER – EFI RELAY)





(a) Inspect the EFI No.2 fuse.
  (1) Remove the EFI No.2 fuse from the engine room R/B.
  (2) Check for continuity in the EFI No.2 fuse.

Standard: Continuity

  (3) Reinstall the EFI No. 2 fuse.
(b) Disconnect the M1 mass air flow meter connector.
(c) Remove the EFI relay from the engine room R/B.
(d) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
+B (3) – Engine room R/B (EFI relay terminal 3)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
+B (3) or Engine room R/B (EFI relay terminal 3) – Body ground	10 kΩ or higher

(e) Reconnect the mass air flow meter connector.
(f) Reinstall the EFI relay.

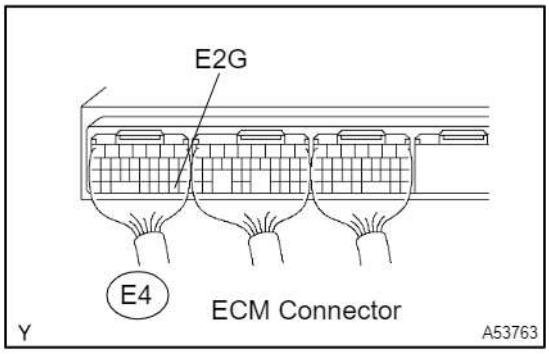
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NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

CHECK FOR ECM POWER SOURCE CIRCUIT (See page 05–293)

6 INSPECT ECM(SENSOR GROUND)



(a) Check the resistance between the specified terminal of the E4 ECM connector and body ground.

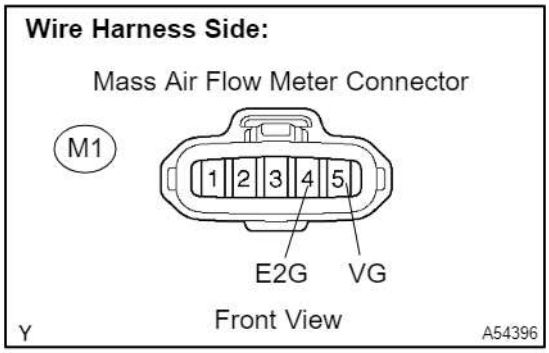
Standard:

Tester Connection	Specified Condition
E2G (E4–29) – Body ground	Below 1 Ω

NG → REPLACE ECM (See page 10–24)

OK

7 CHECK HARNESS AND CONNECTOR(MASS AIR FLOW METER – ECM)



(a) Disconnect the M1 mass air flow meter connector.
(b) Disconnect the E4 ECM connector.
(c) Check the resistance between the wire harness side connectors.

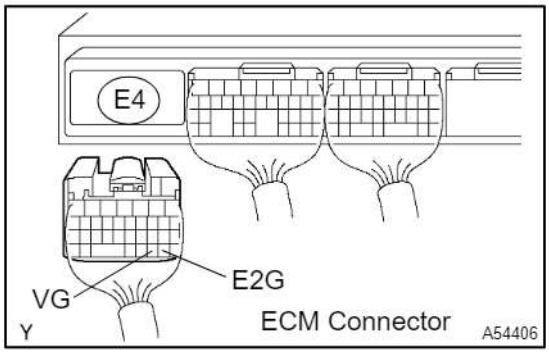
Standard (Check for open):

Tester Connection	Specified Condition
VG (5) – VG (E4–30)	Below 1 Ω
E2G (4) – E2G (E4–29)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
VG (5) or VG (E4–30) – Body ground	10 kΩ or higher

(d) Reconnect the mass air flow meter connector.
(e) Reconnect the ECM connector.



NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE MASS AIR FLOW METER

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DTC	P0101	MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE PROBLEM

CIRCUIT DESCRIPTION

Refer to DTCs P0100 on page 05–65.

DTC No.	DTC Detection Condition	Trouble Area
P0101	(1) After the engine is warmed up, conditions (a), (b), (c) and (d) continue for more than 10 seconds (2 trip detection logic): (a) Throttle valve is fully closed (b) Voltage output of the mass air flow meter is more than 2.2 V (c) Engine coolant temperature is more than 70 C (d) Engine speed is less than 900 rpm (2) Conditions (a), (b) and (c) continue for more than 6 seconds (2 trip detection logic): (a) Engine speed is more than 0 rpm (b) VTA is more than 0.1 V (c) Voltage output of the mass air flow sensor is less than 0.25 V	□Mass air flow meter

MONITOR DESCRIPTION

The MAF (Mass Air Flow) meter is a sensor that helps the ECM calculates the amount of air flowing through the throttle valve. The ECM uses this information to determine the fuel injection time and provide a proper air–fuel ratio. Inside the MAF meter, there is a heated platinum wire exposed to the flow of intake air. By applying a specific current to the wire, the ECM heats this wire to a given temperature. The flow of incoming air cools the wire and an internal thermistor, changing their resistance. To maintain a constant current value, the ECM varies the voltage applied to these components in the MAF meter. The voltage level is proportional to the flow of the air passing through the sensor. The ECM interprets this voltage as the intake air amount. If there is a defect in the sensor or an open or short circuit, the voltage level will deviate outside the normal operating range. The ECM interprets this deviation as a defect in the MAF meter and sets a DTC.
Example:
If the voltage is more than 2.2 V at idle or less than 0.25 V at idle off, the ECM interprets this as a defect in the MAF sensor and sets a DTC.

MONITOR STRATEGY

Related DTCs	P0101: Mass air flow meter malfunction (High voltage) P0101: Mass air flow meter malfunction (Low voltage)
Required sensors/ components (Main)	Mass air flow meter
Required sensors/ components (Related)	Crankshaft position sensor, Engine coolant temperature sensor, Throttle position sensor
Frequency of operation	Continuous
Duration	10 seconds (High voltage) 6 seconds (Low voltage)
MIL operation	2 driving cycles
Sequence operation	None

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TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05–13

Mass air flow meter malfunction (High voltage):

Engine speed	Less than 900 rpm
Idle	ON
Engine coolant temperature	70 C (158 F) or more

Mass air flow meter malfunction (Low voltage):

Engine speed	0 rpm or more
Throttle position	0.1 V or more

TYPICAL MALFUNCTION THRESHOLDS

Mass air flow meter malfunction (High voltage):

Mass air flow meter voltage	More than 2.2 V

Mass air flow meter malfunction (Low voltage):

Mass air flow meter voltage	Less than 0.25 V

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1 CHECK OTHER DTC OUTPUT(IN ADDITION TO DTC P0101)

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool main switch ON.
(c) On the hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(d) Read the DTCs using the hand–held tester or the OBD II scan tool.

Result:

Display (DTC output)	Proceed to
P0101 and other DTCs	A
P0101	B

HINT:

If any other codes besides P0101 are output, perform troubleshooting for those DTCs first.

B → **REPLACE MASS AIR FLOW METER**

A

GO TO RELEVANT DTC CHART (See page 05–47)

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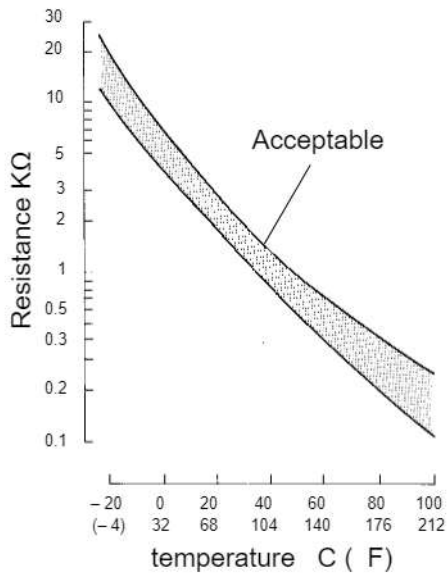
DTC	P0110	INTAKE AIR TEMPERATURE CIRCUIT

DTC	P0112	INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT

DTC	P0113	INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT

CIRCUIT DESCRIPTION

(Fig.1)



The intake air temperature (IAT) sensor, mounted on the mass air flow (MAF) meter, monitors the intake air temperature. The IAT sensor has a thermistor that varies its resistance depending on the temperature of the intake air. When the air temperature is low, the resistance in the thermistor increases. When the temperature is high, the resistance drops. The variations in resistance are reflected as voltage changes to the ECM terminal. (see Fig. 1).

The intake air temperature sensor is connected to the ECM. The 5 V power source voltage in the ECM is applied to the intake air temperature sensor from terminal THA (THAR) via resistor R.

That is, the resistor R and the intake air temperature sensor are connected in series. When the resistance value of the intake air temperature sensor changes in accordance with changes in the intake air temperature, the potential at terminal THA (THAR) also changes. Based on this signal, the ECM increases the fuel injection volume to improve the driveability during cold engine operation.

DTC No.	Proceed to	DTC Detection Condition	Trouble Area
P0110	Step 1	Open or short in intake air temperature sensor circuit for 0.5 second	□Open or short in intake air temperature sensor circuit □Intake air temperature sensor (built in mass air flow meter) □ECM
P0112	Step 4	Short in intake air temperature sensor circuit for 0.5 second	□Open or short in intake air temperature sensor circuit □Intake air temperature sensor (built in mass air flow meter) □ECM
P0113	Step 2	Open in intake air temperature sensor circuit for 0.5 second	□Open or short in intake air temperature sensor circuit □Intake air temperature sensor (built in mass air flow meter) □ECM

HINT:

After confirming DTC P0110, P0112 or P0113, use the hand–held tester or the OBD II scan tool to confirm the intake air temperature from the "DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL".

Temperature Displayed	Malfunction
–40°C (–40°F)	Open circuit
140°C (284°F) or more	Short circuit

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MONITOR DESCRIPTION

The ECM monitors the sensor voltage and uses this value to calculate the intake air temperature. When the sensor output voltage deviates from the normal operating range, the ECM interprets this as a fault in the IAT sensor and sets a DTC.
Example:
When the sensor voltage output equal to –40 C (–40 F), or more than 140 C (284 F).

MONITOR STRATEGY

Related DTCs	P0110: Intake air temperature sensor range check (Fluttering) P0112: Intake air temperature sensor range check (Low resistance) P0113: Intake air temperature sensor range check (High resistance)
Required sensors/components (Main)	Intake air temperature sensor
Required sensors/components (Related)	–
Frequency of operation	Continuous
Duration	0.5 second
MIL operation	Immediate
Sequence operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05–13

TYPICAL MALFUNCTION THRESHOLDS

P0110:

Intake air temperature sensor resistance	Less than 98.5 Ω or more than 156 KΩ [more than 140 C (284 F) or less than –40 C (–40 F)]

P0112

Intake air temperature sensor resistance	Less than 98.5 Ω [More than 140 C (284 F)]

P0113

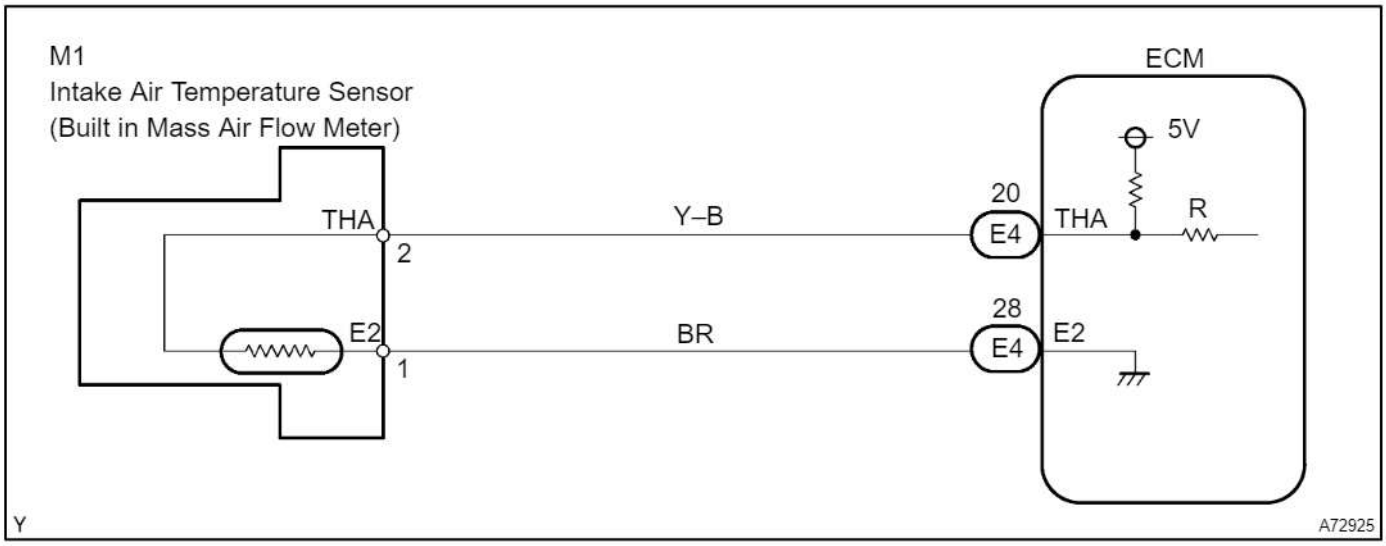
Intake air temperature sensor resistance	More than 156 kΩ [Less than –140 C (–40 F)]

COMPONENT OPERATING RANGE

Parameter	Standard Value
Intake air temperature sensor resistance	98.5 Ω to 156 kΩ [–40 to 140 C (–40 to 284 F)]

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WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1	READ VALUE OF HAND–HELD TESTER OR OBD II SCAN TOOL(INTAKE AIR TEMPERATURE)

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(c) On the hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / INTAKE AIR.
(d) Read the values.
Temperature: Same value as the actual intake air temperature.
Result:

Temperature Displayed	Proceed to
–40°C (–40°F)	A
140°C (284°F) or more	B
OK (Same as present temperature)	C

HINT:

- If there is an open circuit, the hand–held tester or the OBD II scan tool indicates –40°C (–40°F).
- If there is a short circuit, the hand–held tester or the OBD II scan tool indicates 140°C (284°F) or more.

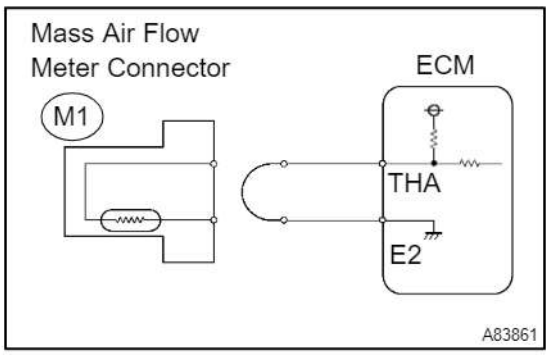
B → **Go to step 4**

C → **CHECK FOR INTERMITTENT PROBLEMS (See page 05–10)**

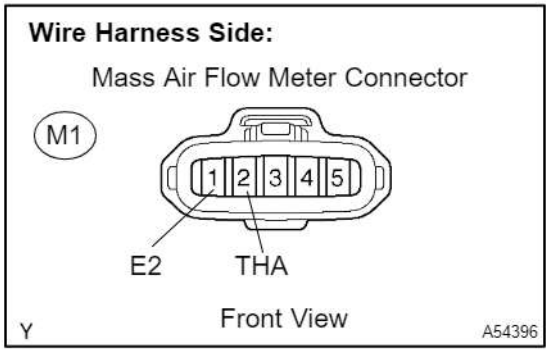
A

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2	READ VALUE OF HAND–HELD TESTER OR OBD II SCAN TOOL(CHECK FOR OPEN IN WIRE HARNESS)



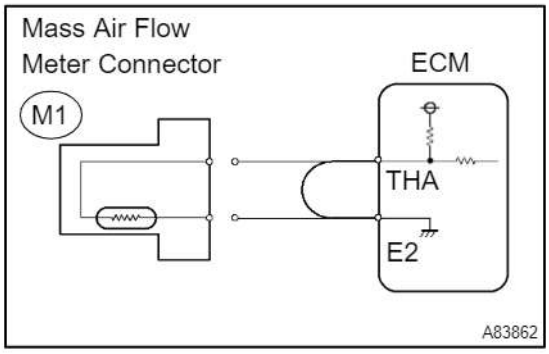
(a) Disconnect the M1 mass air flow meter connector.
(b) Connect terminals THA and E2 of the mass air flow meter wire harness side connector.
(c) Turn the ignition switch to ON.
(d) On the hand–held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / INTAKE AIR.
(e) Read the values.
Temperature value: 140°C (284°F) or more
(f) Reconnect the mass air flow meter connector.



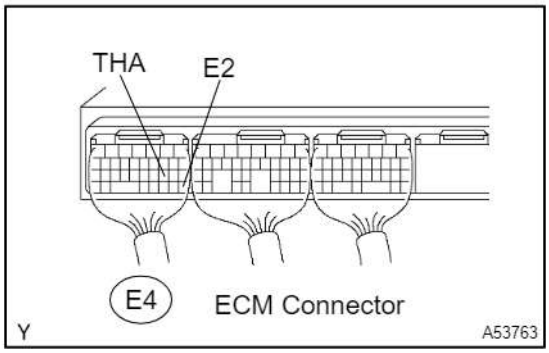
OK → **CONFIRM GOOD CONNECTION AT SENSOR. IF OK, REPLACE MASS AIR FLOW SENSOR**

NG

3	READ VALUE OF HAND–HELD TESTER OR OBD II SCAN TOOL(CHECK FOR OPEN IN ECM)



(a) Disconnect the M1 mass air flow meter connector.
(b) Connect terminals THA and E2 of the E4 ECM connector.
HINT:
Before checking, do a visual and contact pressure check for the ECM connector.
(c) Turn the ignition switch to ON.
(d) On the hand–held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / INTAKE AIR.
(e) Read the values.
Temperature value: 140°C (284°F) or more
(f) Reconnect the mass air flow meter connector.



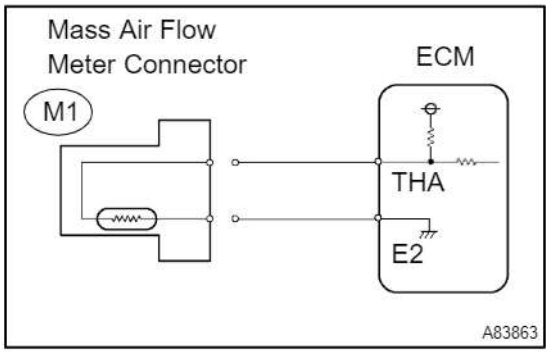
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OK	REPAIR OR REPLACE HARNESS OR CONNECTOR

NG

CONFIRM GOOD CONNECTION AT ECM. IF OK, REPLACE ECM (See page 10–24)

4	READ VALUE OF HAND–HELD TESTER OR OBD II SCAN TOOL(CHECK FOR SHORT IN WIRE HARNESS)

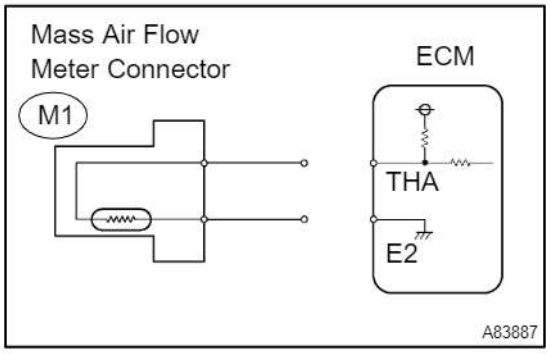


(a) Disconnect the M1 mass air flow meter connector.
(b) Turn the ignition switch to ON.
(c) On the hand–held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / INTAKE AIR.
(d) Read the values.
Temperature value: –40°C (–40°F)
(e) Reconnect the mass air flow meter connector.

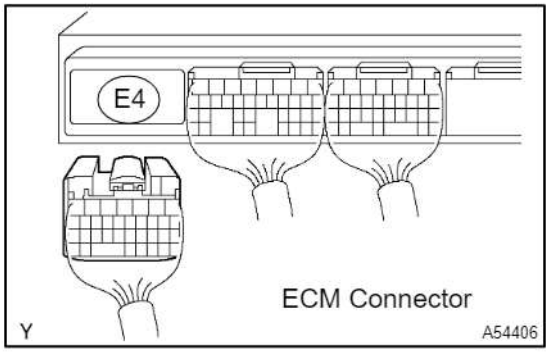
OK	REPLACE MASS AIR FLOW SENSOR

NG

5	READ VALUE OF HAND–HELD TESTER OR OBD II SCAN TOOL(CHECK FOR SHORT IN ECM)



(a) Disconnect the E4 ECM connector.
(b) Turn the ignition switch to ON.
(c) On the hand–held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / INTAKE AIR.
(d) Read the values.
Temperature value: –40°C (–40°F)
(e) Reconnect the ECM connector.



OK	REPAIR OR REPLACE HARNESS OR CONNECTOR

NG

REPLACE ECM (See page 10–24)

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DTC	P0115	ENGINE COOLANT TEMPERATURE CIRCUIT

DTC	P0117	ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT

DTC	P0118	ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT

CIRCUIT DESCRIPTION

A thermistor is built in the engine coolant temperature sensor changes the resistance value according to the engine coolant temperature.
The structure of the sensor and connection to the ECM is the same as those of the intake air temperature sensor.
HINT:
If the ECM detects the DTC P0115, P0117 or P0118, the ECM enter fail–safe function in which the engine coolant temperature is assumed to be 80 C (176 F).

DTC No.	Proceed to	DTC Detection Condition	Trouble Area
P0115	Step 1	Open or short in engine coolant temperature sensor circuit for 0.5 second	□Open or short in engine coolant temperature sensor circuit □Engine coolant temperature sensor □ECM
P0117	Step 4	Short in engine coolant temperature sensor circuit for 0.5 second	□Open or short in engine coolant temperature sensor circuit □Engine coolant temperature sensor □ECM
P0118	Step 2	Open in engine coolant temperature sensor circuit for 0.5 second	□Open or short in engine coolant temperature sensor circuit □Engine coolant temperature sensor □ECM

HINT:
After confirming DTC P0115, P0117 or P0118, use the hand–held tester or the OBD II scan tool to confirm the engine coolant temperature from the DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL.

Temperature Displayed	Malfunction
–40°C (–40°F)	Open circuit
140°C (284°F) or more	Short circuit

MONITOR DESCRIPTION

The engine coolant temperature (ECT) sensor is used to monitor the engine coolant temperature. The ECT sensor has a thermistor that varies its resistance depending on the temperature of the engine coolant. When the coolant temperature is low, the resistance in the thermistor increases. When the temperature is high, the resistance drops. The variations in resistance are reflected in the voltage output from the sensor. The ECM monitors the sensor voltage and uses this value to calculate the engine coolant temperature. When the sensor output voltage deviates from the normal operating range, the ECM interprets this as a fault in the ECT sensor and sets a DTC.
Example:
When the ECM calculates that the ECT is –40 C (–40 F), or more than 140 C (284 F), and if either condition continues for 0.5 second or more, the ETC will set a DTC.

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MONITOR STRATEGY

Related DTCs	P0115: Engine coolant temperature sensor range check (Fluttering) P0117: Engine coolant temperature sensor range check (Low resistance) P0118: Engine coolant temperature sensor range check (High resistance)
Required sensors/components (Main)	Engine coolant temperature sensor
Required sensors/components (Related)	–
Frequency of operation	Continuous
Duration	0.5 second
MIL operation	Immediate
Sequence operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05–13

TYPICAL MALFUNCTION THRESHOLDS

P0115:

Engine coolant temperature sensor resistance	Less than 79 Ω or more than 156 kΩ [more than 140 C (284 F) or less than –40 C (–40 F)]

P0117:

Engine coolant temperature sensor resistance	Less than 79 Ω [More than 140 C (284 F)]

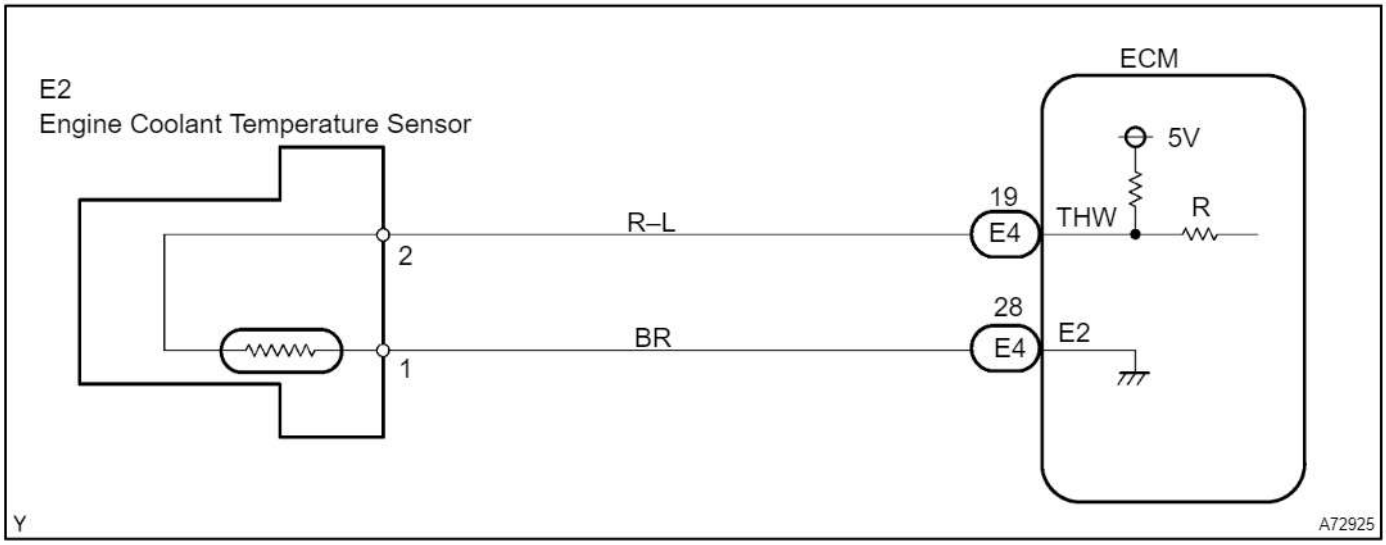
P0118:

Engine coolant temperature sensor resistance	More than 156 kΩ [Less than –40 C (–40 F)]

COMPONENT OPERATING RANGE

Engine coolant temperature sensor resistance	79 Ω to 156 kΩ [–40 to 140 C (–40 to 284 F)]

WIRING DIAGRAM



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INSPECTION PROCEDURE

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1	READ VALUE OF HAND–HELD TESTER OR OBD II SCAN TOOL(ENGINE COOLANT TEMPERATURE)

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(c) On the hand–held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / COOLANT TEMP.
(d) Read the values.
Temperature: Same value as the actual intake air temperature.
Result:

Temperature Displayed	Proceed to
–40°C (–40°F)	A
140°C (284°F) or more	B
OK (Same as present temperature)	C

HINT:

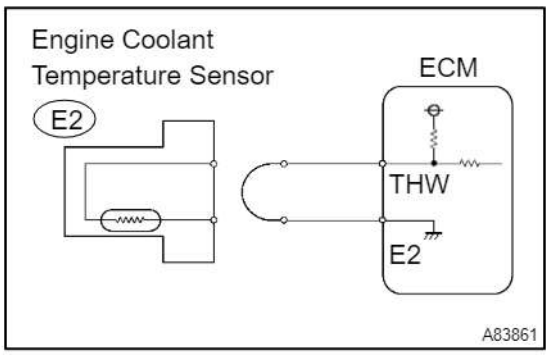
- If there is an open circuit, the hand–held tester or the OBD II scan tool indicates –40°C (–40°F).
- If there is a short circuit, the hand–held tester or the OBD II scan tool indicates 140°C (284°F) or more.

B	Go to step 4
C	CHECK FOR INTERMITTENT PROBLEMS (See page 05–10)

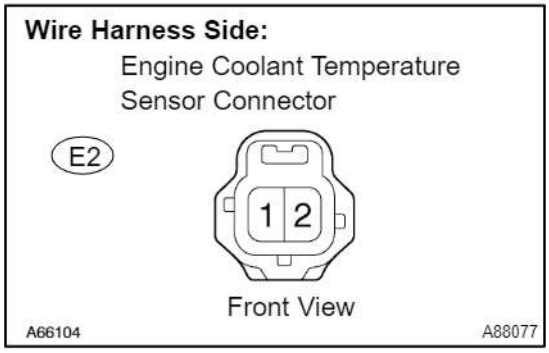
A

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2	READ VALUE OF HAND–HELD TESTER OR OBD II SCAN TOOL(CHECK FOR OPEN IN WIRE HARNESS)



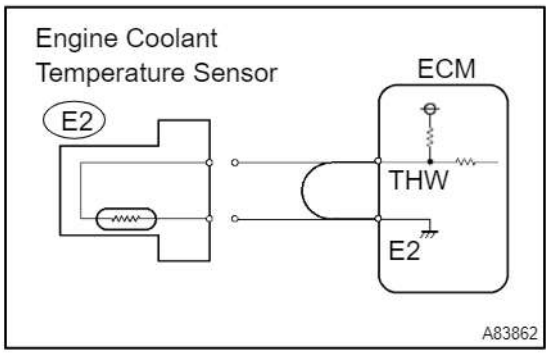
(a) Disconnect the E2 engine coolant temperature sensor connector.
(b) Connect terminals 1 and 2 of the engine coolant temperature sensor wire harness side connector.
(c) Turn the ignition switch to ON.
(d) On the hand–held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / COOLANT TEMP.
(e) Read the values.
Temperature value: 140°C (284°F) or more
(f) Reconnect the engine coolant temperature sensor connector.



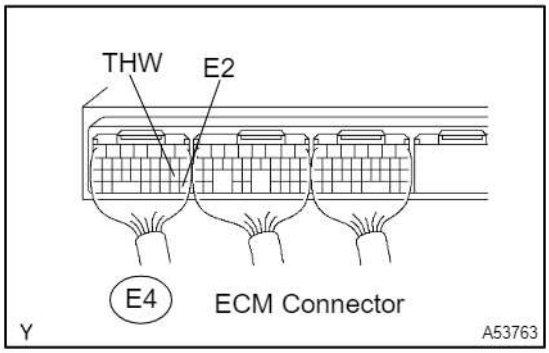
OK	CONFIRM GOOD CONNECTION AT SENSOR. IF OK, REPLACE ENGINE COOLANT TEMPERATURE SENSOR

NG

3	READ VALUE OF HAND–HELD TESTER OR OBD II SCAN TOOL(CHECK FOR OPEN IN ECM)



(a) Disconnect the E2 engine coolant temperature sensor connector.
(b) Connect terminals THW and E2 of the E4 ECM connector.
HINT:
Before checking, do a visual and contact pressure check for the ECM connector.
(c) Turn the ignition switch to ON.
(d) On the hand–held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / COOLANT TEMP.
(e) Read the values.
Temperature value: 140°C (284°F) or more
(f) Reconnect the engine coolant temperature sensor connector.



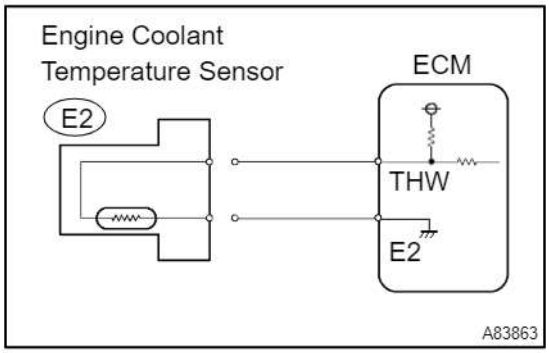
OK	REPAIR OR REPLACE HARNESS OR CONNECTOR

NG

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CONFIRM GOOD CONNECTION AT ECM. IF OK, CHECK AND REPLACE ECM (See page 01–35)

4	READ VALUE OF HAND–HELD TESTER OR OBD II SCAN TOOL(CHECK FOR SHORT IN WIRE HARNESS)

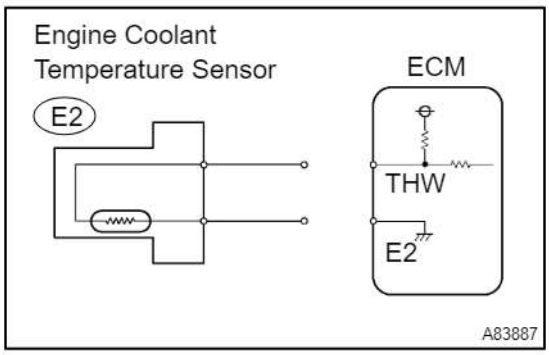


(a) Disconnect the E2 engine coolant temperature sensor connector.
(b) Turn the ignition switch to ON.
(c) On the hand–held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / COOLANT TEMP.
(d) Read the values.
Temperature value: –40°C (–40°F)
(e) Reconnect the engine coolant temperature sensor connector.

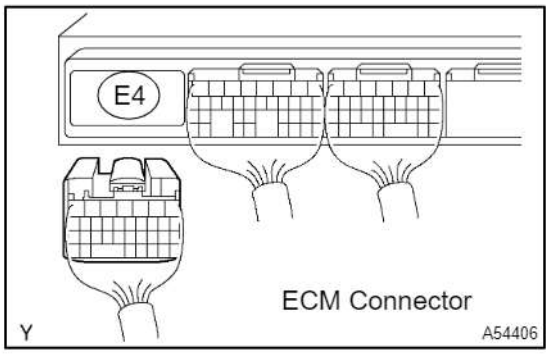
OK	REPLACE ENGINE COOLANT TEMPERATURE SENSOR

NG

5	READ VALUE OF HAND–HELD TESTER OR OBD II SCAN TOOL(CHECK FOR SHORT IN ECM)



(a) Disconnect the E4 ECM connector.
(b) Turn the ignition switch to ON.
(c) On the hand–held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / COOLANT TEMP.
(d) Read the values.
Temperature: –40°C (–40°F)
(e) Reconnect the ECM connector.



OK	REPAIR OR REPLACE HARNESS OR CONNECTOR

NG

REPLACE ECM (See page 10–24)

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DTC	P0116	ENGINE COOLANT TEMPERATURE CIRCUIT RANGE/PERFORMANCE PROBLEM

CIRCUIT DESCRIPTION

Refer to DTC P0115 on page 05–78.

DTC No.	DTC Detection Condition	Trouble Area
P0116	(1) With the engine coolant temperature was 35°C (95°F) or more but less than 60°C (140°F) when the engine was started, and if conditions (a) and (b) are met: (a) Vehicle has accelerated and decelerated. (b) Engine coolant temperature remains within 3°C (5.4°F) of the initial engine coolant temperature (2 trip detection logic) (2) If the engine coolant temperature is more than 60°C (140°F) when the engine is started and the vehicle has accelerated and decelerated (3) If the engine coolant temperature sensor records a temperature variation below 1°C (1.8°F) successively 6 times (6 trip detection logic)	□Engine coolant temperature sensor

MONITOR DESCRIPTION

The engine coolant temperature (ECT) sensor is used to monitor the engine coolant temperature. The ECT sensor has a thermistor that varies its resistance depending on the temperature of the engine coolant. When the coolant temperature is low, the resistance in the thermistor increases. When the temperature is high, the resistance drops. The variations in resistance are reflected in the voltage output from the sensor. The ECM monitors the sensor voltage and uses this value to calculate the engine coolant temperature. When the sensor output voltage deviates from the normal operating range, the ECM interprets this as a fault in the ECT sensor and sets a DTC.

Examples:

1) Upon starting the engine, the coolant temperature (ECT) was between 35 C (95 F) and 60 C (140 F). If after driving for 250 seconds, the ECT still remains within 3 C (5.4 F) of the staring temperature, a DTC will be set. (2 trip detection logic)

2) Upon starting the engine, the coolant temperature (ECT) was over 60 C (140 F). If after driving for 250 seconds, the ECT still remains within 1 C (1.8 F) of the starting temperature, a DTC will be set. (6 trip detection logic)

MONITOR STRATEGY

Related DTCs	P0116: Engine coolant temperature sensor stuck (Low engine coolant temperature) P0116: Engine coolant temperature sensor stuck (High engine coolant temperature)
Required sensors/ components (Main)	Engine coolant temperature sensor
Required sensors/ components (Related)	Crankshaft position sensor, Intake air temperature sensor, Mass air flow meter
Frequency of operation	Continuous
Duration	250 seconds or more
MIL operation	2 driving cycles: Engine coolant temperature sensor stuck (Low engine coolant temperature) 6 driving cycles: Engine coolant temperature sensor stuck (High engine coolant temperature)
Sequence operation	None

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TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05–13

Engine coolant temperature sensor stuck (Low engine coolant temperature):

Cumulative idle off period	250 seconds or more
Speed increase by 19 mph (30 km/h) or more	10 times or more
Engine coolant temperature	35 to 60 C (95 to 140 F)
Intake air temperature	–6.7 C (20 F) or more

Engine coolant temperature sensor stuck (High engine coolant temperature):

Engine coolant temperature	60 C or more
Intake air temperature	–6.7 C (20 F) or more
Engine running and time after engine start	0.3 second or more
"Stop and go"*1	Once or more
"Steady driving and stop*2	Once or more

*1 Vehicle is stopped for 20 seconds or more and accelerated from 2 mph (3 km/h) to 44 mph (70 km/h) within 40 seconds.

*2 Vehicle is driven by 40 mph (65 km/h) or more for 30 seconds or more and the vehicle speed reaches 44 mph (70 km/h). The vehicle is decelerated from 40 mph (65 km/h) to 2 mph (3 km/h) or less within 35 seconds and stopped for 10 seconds.

TYPICAL MALFUNCTION THRESHOLDS

Engine coolant temperature sensor stuck (Low engine coolant temperature):

Engine coolant temperature change	Less than 3 C (5.4 F)

Engine coolant temperature sensor stuck (High engine coolant temperature):

Engine coolant temperature change	1 C (1.8 F) or less

COMPONENT OPERATING RANGE

Engine coolant temperature	Varies with actual engine coolant temperature

WIRING DIAGRAM

Refer to DTC P0115 on page 05–78.

INSPECTION PROCEDURE

HINT:

- If DTCs P0115, P0116, P0117, P0118 and P0125 are output simultaneously, engine coolant temperature sensor circuit may be open or short. Perform the troubleshooting of DTC P0115, P0117 or P0118 first.
- Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1	**REPLACE ENGINE COOLANT TEMPERATURE SENSOR**

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DTC	P0120	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”A” CIRCUIT

DTC	P0122	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”A” CIRCUIT LOW INPUT

DTC	P0123	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”A” CIRCUIT HIGH INPUT

DTC	P0220	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”B” CIRCUIT

DTC	P0222	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”B” CIRCUIT LOW INPUT

DTC	P0223	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”B” CIRCUIT HIGH INPUT

DTC	P2135	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”A”/”B” VOLTAGE CORRELATION

HINT:
This is the repair purpose for the throttle position sensor.

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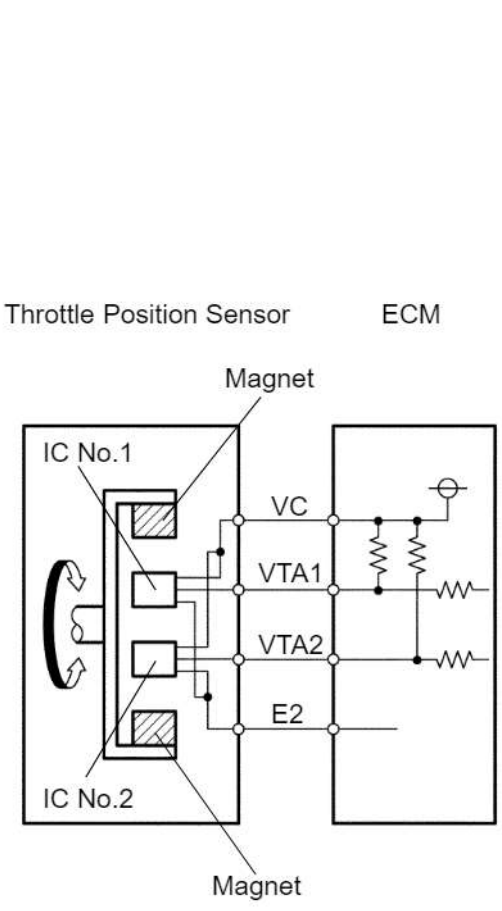
CIRCUIT DESCRIPTION

HINT:

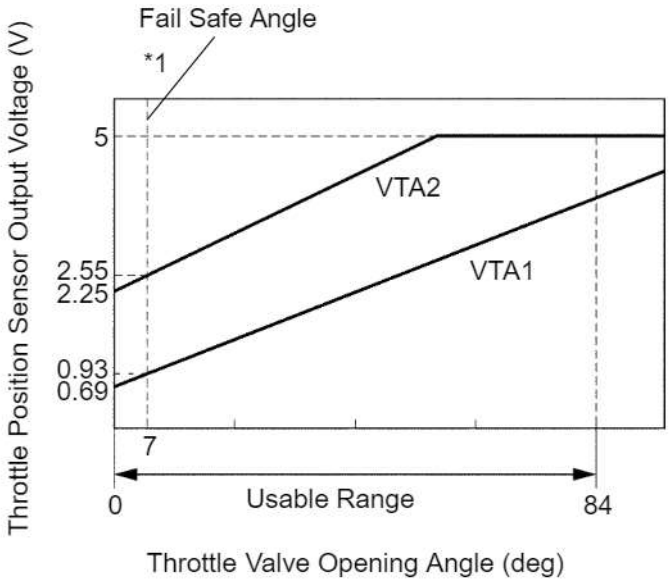
- This Electrical Throttle Control System (ETCS) does not use a throttle cable.
- This throttle position sensor is a non–contact type.

The throttle position sensor is mounted on the throttle body and it detects the opening angle of the throttle valve. This sensor is electronically controlled and uses Hall–effect elements, so that accurate control and reliability can be obtained. The throttle position sensor has 2 sensor elements / signal outputs: VTA1 and VTA2. VTA1 used to detect the throttle opening angle and VTA2 is used to detect malfunctions in VTA1. Voltage applied to VTA1 and VTA2 change between 0V and 5V in proportion to the opening angle of the throttle valve. There are several checks that the ECM performs to confirm proper operation of the throttle position sensor and VTA1.

The ECM judges the current opening angle of the throttle valve from these signals input from terminals VTA1 and VTA2, and the ECM controls the throttle motor to make the throttle valve angle properly in response to driver inputs.



A19755



A19802

Throttle Valve Fully Closed
(Throttle Position expressed as percentage
(VTA1) 10 to 24 %)

Throttle Valve Fully Opened
(Throttle Position expressed as percentage
(VTA1) 64 to 96 %)

*1: Fail Safe Angle 7°
(Throttle Position expressed as percentage
(VTA1) about10 to 16 %)

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DTC No.	DTC Detection Condition	Trouble Area
Condition (a) of DTC P0120, P0122, P0123, P0220, P0222 or P0223 continues for 2 seconds (Open or short in the throttle position sensor circuit)		
P0120	Detection conditions for DTCs P0122 and P0123 are not satisfied but condition (a) is satisfied: (a) VTA1 is "0.2 V or less" or VTA1 is "4.8 V or more"	□Throttle position sensor (built in throttle body) □ECM
P0122	(a) VTA1 is 0.2 V or less	□Throttle position sensor (built in throttle body) □Short in VTA1 circuit □Open in VC circuit □ECM
P0123	(a) VTA1 is 4.8 V or more	□Throttle position sensor (built in throttle body) □Open in VTA1 circuit □Open in E2 circuit □VC and VTA1 circuit are short–circuited □ECM
P0220	Detection conditions for DTCs P0222 and P0223 are not satisfied but condition (a) is satisfied (a) VTA2 is "0.5 V or less" or VTA2 is "4.8 V or more" and VTA1 is "0.2 V or more" and VTA1 is "1.8 V or less"	□Throttle position sensor (built in throttle body) □ECM
P0222	(a) VTA2 is 0.5 V or less	□Throttle position sensor (built in throttle body) □Short in VTA2 circuit □Open in VC circuit □ECM
P0223	(a) VTA2 is "4.8 V or more" and VTA1 is "0.2 V or more" and VTA1 is "1.8 V or less"	□Throttle position sensor (built in throttle body) □Open in VTA2 circuit □Open in E2 circuit □VC and VTA2 circuits are short–circuited □ECM
P2135	Condition (a) continues for 0.5 second or more, or condition (b) continues for 0.4 second or more: (a) Difference between VTA1 and VTA2 is 0.02 V or less (b) VTA1 is "0.2 V or less" and VTA2 is "0.5 V or less"	□VTA1 and VTA2 circuits are short–circuited □Throttle position sensor (built in throttle body) □ECM

NOTICE:

When a malfunction is detected, the throttle valve is locked at a certain opening angle. Also, the whole electronically controlled throttle operation is cancelled until the system returns to normal and the ignition switch is turned OFF.

HINT:

- □ After confirming DTCs, use the hand–held tester or the OBD II scan tool to confirm the throttle valve opening percentage and closed throttle position switch condition.
- □ The THROTTLE POS means VTA1 signal as well as the THROTTLE POS #2 for the VTA2 signal.

Reference (Normal condition):

Tester display	Accelerator pedal fully released	Accelerator pedal fully depressed
THROTTLE POS	10 to 24 %	64 to 96 %
THROTTLE POS #2	2.1 to 3.1 V	4.5 to 5.5 V

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MONITOR DESCRIPTION

The ECM uses the throttle position sensor to monitor the throttle valve opening angle.

(a) There is a specify voltage difference expected between VTA1 and VTA2 for each throttle opening angle.

□ If the difference between VTA1 and VTA2 is incorrect, the ECM interprets this as a default and will set a DTC.

(b) VTA1 and VTA2 each have a specific voltage operating range.

□ If VTA1 or VTA2 is out of the normal operating range, the ECM interprets this as a fault and will set a DTC.

(c) VTA1 and VTA2 should never be close to the same voltage levels.

□ If VTA1 is within 0.02V of VTA2, the ECM interprets this as a short circuit in the throttle position sensor system and will set a DTC.

FAIL SAFE

If the Electronic Throttle Control System (ETCS) has a malfunction, the ECM cuts off current to the throttle control motor. The throttle control valve returns to a predetermined opening angle (approximately 16) by the force of the return spring. The ECM then adjusts the engine output by controlling the fuel injection (intermittent fuel–cut) and ignition timing in accordance with the accelerator pedal opening angle to enable the vehicle to continue at a minimal speed.

If the accelerator pedal is depressed firmly and slowly, the vehicle can be driven slowly.

If a ”pass” condition is detected and then the ignition switch is turned OFF, the fail–safe operation will stop and the system will return to normal condition.

MONITOR STRATEGY

Related DTCs	P0120: Throttle position sensor (VTA1) open/short (Chattering) P0122: Throttle position sensor (VTA1) open/short (Low voltage) P0123: Throttle position sensor (VTA1) open/short (High voltage) P0220: Throttle position sensor (VTA2) open/short (Fluttering) P0222: Throttle position sensor (VTA2) open/short (Low voltage) P0223: Throttle position sensor (VTA2) open/short (High voltage) P2135: Throttle position sensor (Between VA1 and VTA2) open P2135: Throttle position sensor (Between VA1 and VTA2) short
Required sensors/components (Main)	Throttle position sensor
Required sensors/components (Related)	–
Frequency of operation	Continuous
Duration	2 seconds
MIL operation	Immediate
Sequence operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05–13
Throttle control motor power	ON

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TYPICAL MALFUNCTION THRESHOLDS

P0120:

VTA1 voltage	0.2 V or less or 4.8 V or more (2 seconds or more)

P0122:

VTA1 voltage	0.2 V or less (2 seconds or more)

P0123:

VTA1 voltage	4.8 V or more (2 seconds or more)

P0220:

VTA2 voltage	0.5 V or less or 4.8 V or more (2 seconds or more)

P0222:

VTA2 voltage	0.5 V or less (2 seconds or more)

P0223:

VTA2 voltage when the VTA1 is 0.2 to 1.8 V	4.8 V or more

P2135 Throttle position sensor (Between VTA1 and VTA2) open:

Difference between VTA1 and VTA2 voltage	0.02 V or less

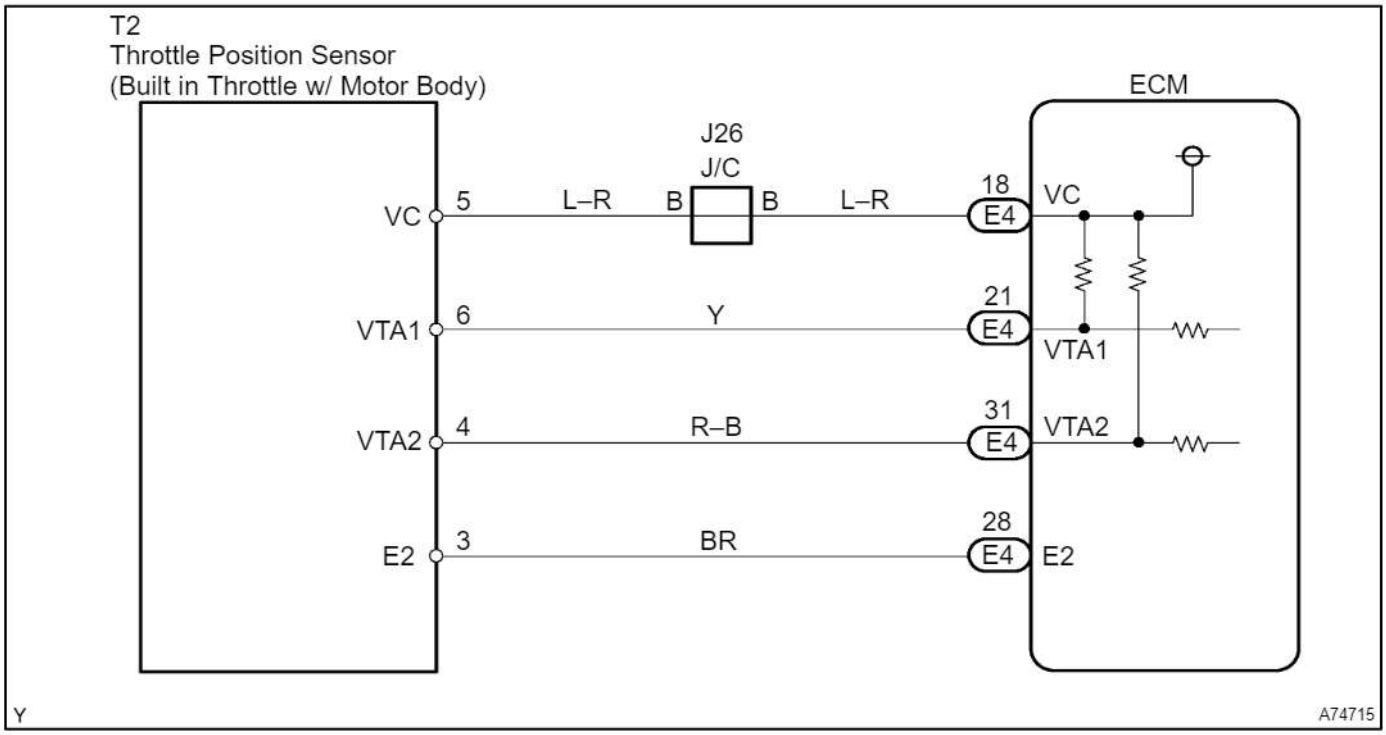
P2135 Throttle position sensor (Between VTA1 and VTA2) short:

Both of the following conditions are met:	
VTA1 voltage	0.2 V or less
VTA2 voltage	0.5 V or less

COMPONENT OPERATING RANGE

VTA1 voltage	0.6 to 3.96 V
VTA2 voltage	2.25 to 4.8 V

WIRING DIAGRAM



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INSPECTION PROCEDURE

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

Hand–held tester:

1	READ VALUE OF HAND–HELD TESTER(THROTTLE POS AND THROTTLE POS #2)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch to ON and turn the hand–held tester ON.
(c) On the hand–held tester, select the items: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ETCS / THROTTLE POS and THROTTLE POS #2.
(d) Read the values.

Result:

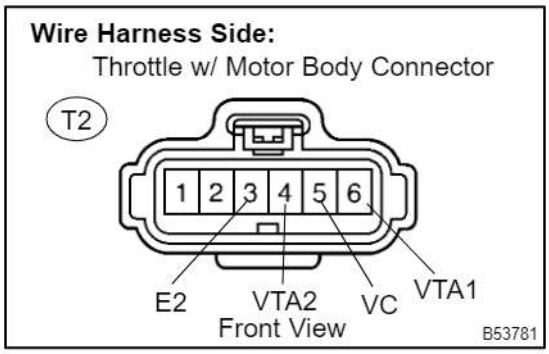
Throttle position expressed as percentage and voltage				Trouble Area	Proceed to
Accelerator pedal released		Accelerator pedal depressed			
THROTTLE POS (VTA1)	THROTTLE POS #2 (VTA2)	THROTTLE POS (VTA1)	THROTTLE POS #2 (VTA2)		
0 %	0 to 0.2 V	0 %	0 to 0.2 V	VC circuit open	A
100 %	4.5 to 5.5 V	100 %	4.5 to 5.5 V	E2 circuit open	
0 % or 100 %	2.1 to 3.1 V (Fail safe)	0 % or 100 %	2.1 to 3.1 V (Fail safe)	VTA1 circuit open or ground short	
10 to 24 % (Fail safe)	0 to 0.2 or 4.5 to 5.5 V	10 to 24 % (Fail safe)	0 to 0.2 or 4.5 to 5.5 V	VTA2 circuit open or ground short	
10 to 24 %	2.1 to 3.1 V	64 to 96 % (Does not fail safe)	4.5 to 5.5 V (Does not fail safe)	Throttle position sensor circuit is normal	B

B → **Go to step 5**

A

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2 CHECK HARNESS AND CONNECTOR(THROTTLE POSITION SENSOR – ECM)



(a) Disconnect the T2 throttle w/ motor body connector.
(b) Disconnect the E4 ECM connector.
(c) Check the resistance between the wire harness side connectors.

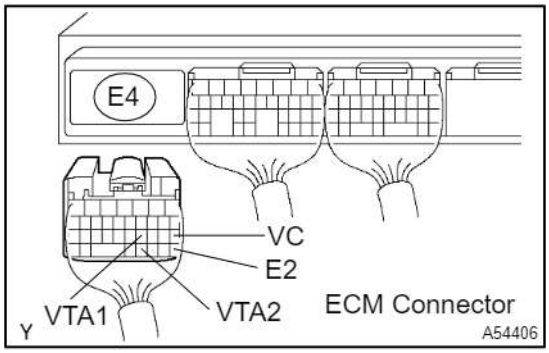
Standard (Check for open):

Tester Connection	Specified Condition
VC (T2–5) – VC (E4–18)	Below 1 Ω
VTA1 (T2–6) – VTA1 (E4–21)	Below 1 Ω
VTA2 (T2–4) – VTA2 (E4–31)	Below 1 Ω
E2 (T2–3) – E2 (E4–28)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
VC (T2–5) or VC (E4–18) – Body ground	10 kΩ or higher
VTA1 (T2–6) or VTA1 (E4–21) – Body ground	10 kΩ or higher
VTA2 (T2–4) or VTA2 (E4–31) – Body ground	10 kΩ or higher

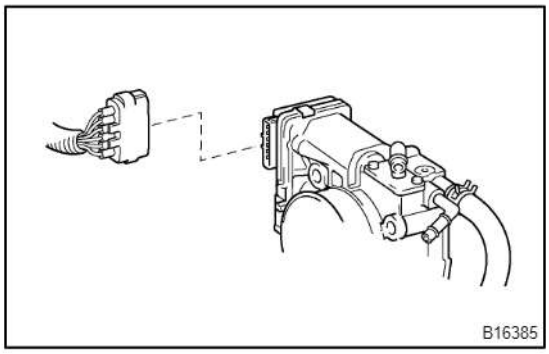
(d) Reconnect the throttle w/ motor body connector.
(e) Reconnect the ECM connector.



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3 INSPECT ECM(VC VOLTAGE)

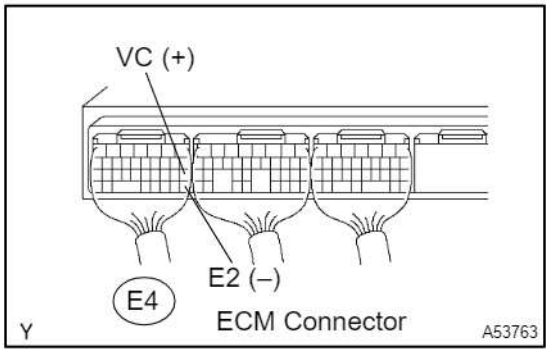


(a) Disconnect the T2 throttle w/ motor body connector.
(b) Turn the ignition switch to ON.
(c) Measure the voltage between the terminals of the E4 ECM connector.

Standard:

Tester Connection	Specified Condition
VC (E4–18) – E2 (E4–28)	4.5 to 5.5 V

(d) Reconnect the throttle w/ motor body connector.



NG → **REPLACE ECM (See page 10–24)**

OK

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4	REPLACE THROTTLE W/MOTOR BODY ASSY (See page 10–18)

GO

5	READ OUTPUT DTC(THROTTLE POSTION SENSOR DTCS ARE OUTPUT AGAIN)

(a) Clear the DTC (see page 05–36).
(b) Start the engine.
(c) Drive the engine at idle for 15 seconds or more.
(d) Read the DTC (see page 05–36).

Result:

Display (DTC output)	Proceed to
P0120, P0122, P0123, P0220, P0222, P0223 and/or P2135	A
No output	B

B → SYSTEM OK

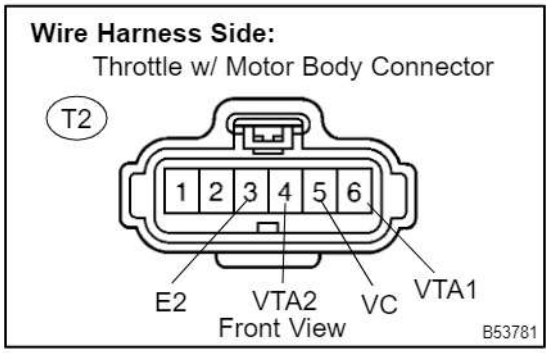
A

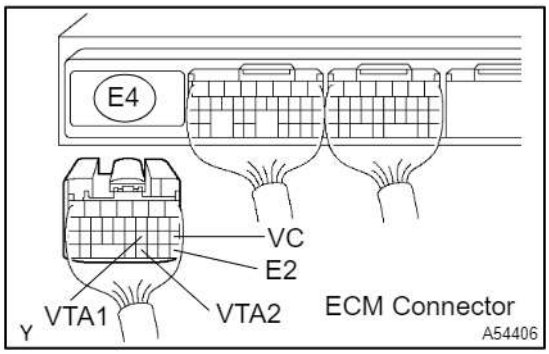
REPLACE ECM (See page 10–24)

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OBD II scan tool (excluding hand–held tester):

1 CHECK HARNESS AND CONNECTOR(THROTTLE POSITION SENSOR – ECM)





(a) Disconnect the T2 throttle w/ motor body connector.
(b) Disconnect the E4 ECM connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
VC (T2–5) – VC (E4–18)	Below 1 Ω
VTA1 (T2–6) – VTA1 (E4–21)	Below 1 Ω
VTA2 (T2–4) – VTA2 (E4–31)	Below 1 Ω
E2 (T2–3) – E2 (E4–28)	Below 1 Ω

Standard (Check for short):

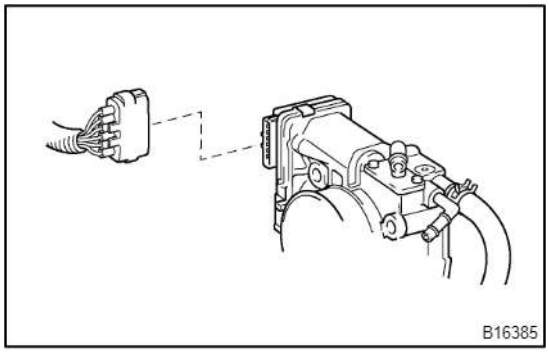
Tester Connection	Specified Condition
VC (T2–5) or VC (E4–18) – Body ground	10 kΩ or higher
VTA1 (T2–6) or VTA1 (E4–21) – Body ground	10 kΩ or higher
VTA2 (T2–4) or VTA2 (E4–31) – Body ground	10 kΩ or higher

(d) Reconnect the throttle w/ motor body connector.
(e) Reconnect the ECM connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

2 INSPECT ECM(VC VOLTAGE)

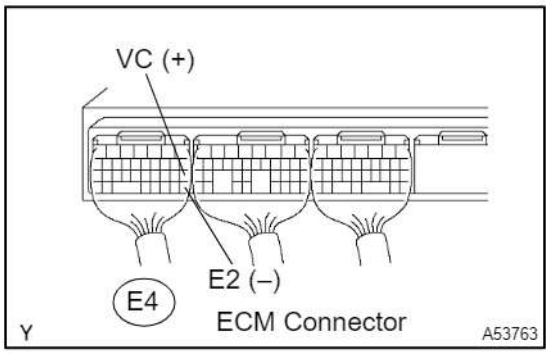


(a) Disconnect the T2 throttle w/ motor body connector.
(b) Turn the ignition switch to ON.
(c) Measure the voltage between the terminals of the E4 ECM connector.

Standard:

Tester Connection	Specified Condition
VC (E4–18) – E2 (E4–28)	4.5 to 5.5 V

(d) Reconnect the throttle w/ motor body connector.



NG → **REPLACE ECM (See page 10–24)**

OK

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3	REPLACE THROTTLE W/MOTOR BODY ASSY (See page 10–18)

GO

4	READ OUTPUT DTC(THROTTLE POSITION SENSOR DTCS ARE OUTPUT AGAIN)

(a) Clear the DTC (see page 05–36).
(b) Start the engine.
(c) Drive the engine at idle for 15 seconds or more.
(d) Read the DTC (see page 05–36).

Result:

Display (DTC output)	Proceed to
P0120, P0122, P0123, P0220, P0222, P0223 and/or P2135	A
No output	B

B → SYSTEM OK

A

REPLACE ECM (See page 10–24)

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DTC	P0121	THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT RANGE/PERFORMANCE PROBLEM

HINT:
This is the procedure of the throttle position sensor.

CIRCUIT DESCRIPTION

Refer to DTC P0120 on page 05–85.

DTC No.	DTC Detection Condition	Trouble Area
P0121	Condition (a) continues for 2.0 seconds: (a) Difference between VTA1 and VTA2 deviates from the threshold	□Throttle position sensor (built in throttle body)

MONITOR DESCRIPTION

The ECM uses the throttle position sensor to monitor the throttle valve opening angle.
This sensor includes two signals: VTA1 and VTA2. VTA1 is used to detect the throttle opening angle and VTA2 is used to detect malfunctions in VTA1. There are several checks that the ECM performs to confirm proper operation of the throttle position sensor and VTA1.
The output voltage difference between VTA1 and VTA2 multiplied by 0.8 (corrected by learning value) should be more than 0.7V and less than 1.7 V. If the voltage output difference deviates from this range, the ECM concludes the throttle position sensor has a malfunction. The ECM will turn on the MIL and a DTC is set.

FAIL SAFE

If the Electronic Throttle Control System (ETCS) has a malfunction, the ECM cuts off current to the throttle control motor. The throttle control valve returns to a predetermined opening angle (approximately 16) by the force of the return spring. The ECM then adjusts the engine output by controlling the fuel injection (intermittent fuel–cut) and ignition timing in accordance with the accelerator pedal opening angle to enable the vehicle to continue at a minimal speed.
If the accelerator pedal is depressed firmly and slowly, the vehicle can be driven slowly.
If a "pass" condition is detected and then the ignition switch is turned OFF, the fail–safe operation will stop and the system will return to normal condition.

MONITOR STRATEGY

Related DTCs	P0121: Throttle position sensor malfunction
Required sensors/components (Main)	Throttle position sensor
Required sensors/components (Related)	–
Frequency of operation	Continuous
Duration	2 seconds
MIL operation	Immediate
Sequence operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05–13
VTA2 voltage	4.6 V or less

TYPICAL MALFUNCTION THRESHOLDS

Either of the following condition is met:	
Difference in voltage between VTA1 (opening angle, sensor 1) and VTA2 x 0.8 (opening angle, sensor 2)	Less than 0.7 V or more than 1.7 V

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INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1	**REPLACE THROTTLE W/MOTOR BODY ASSY (See page 10–18)**

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DTC	P0125	INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL

CIRCUIT DESCRIPTION

Refer to DTC P0115 on page 05–78.

DTC No.	DTC Detection Condition	Trouble Area
P0125	(1) If THW or THA is less than –6.6°C (20°F) at engine start and 20 minutes or more after starting engine, engine coolant temperature sensor value is 20°C (68°F) or less (2 trip detection logic) (2) If THW and THA is between –6.6°C (20°F) and 10°C (50°F) at engine start, 5 minutes or more after starting engine and engine coolant temperature sensor value is 20°C (68°F) or less (2 trip detection logic) (3) If THW and THA greater than 10°C (50°F) at engine start and 2 minutes or more after starting engine, engine coolant temperature sensor value is 20°C (68°F) or less (2 trip detection logic)	□Cooling system □Engine coolant temperature sensor □Thermostat

MONITOR DESCRIPTION

The engine coolant temperature (ECT) sensor is used to monitor the temperature of the engine coolant. The resistance of the sensor varies with the actual coolant temperature. The ECM applies a voltage to the sensor and the varying resistance of the sensor causes the signal voltage to vary. The ECM monitors the ECT signal voltage after engine start–up. If, after sufficient time has passed, the sensor still reports that the engine is not warm enough for closed–loop fuel control, the ECM interprets this as a fault in the sensor or cooling system and sets a DTC.

Example:

The engine coolant temperature was 0 C (32 F) at engine start. After 5 minutes running time, the coolant temperature sensor still indicates that the engine is not warm enough to begin the air–fuel ratio feedback control. The ECM interprets this as a fault in the sensor or cooling system and will set a DTC.

MONITOR STRATEGY

Related DTCs	P0125: Insufficient engine coolant temperature for Closed Loop
Required sensors/components (Main)	Engine coolant temperature sensor, Thermostat, Cooling system
Required sensors/components (Related)	Mass air flow meter
Frequency of operation	Continuous
Duration	2 minutes: Engine start engine coolant temperature is 10 C (50 F) or more 5 minutes: Engine start engine coolant temperature is –6.6 to 10 C (20 to 50 F) 20 minutes: Engine start engine coolant temperature is less than –6.6 C (20 F)
MIL operation	2 driving cycles
Sequence operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05–13
Engine	Running
Fuel cut	OFF

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TYPICAL MALFUNCTION THRESHOLDS

Time until "actual engine coolant temperature" reaches "Closed Loop engine coolant temperature"	2 minutes: Engine start engine coolant temperature is 10 C (50 F) or more 5 minutes: Engine start engine coolant temperature is –6.6 to 10 C (20 to 50 F) 20 minutes: Engine start engine coolant temperature is less than –6.6 C (20 F)

WIRING DIAGRAM

Refer to DTC P0115 on page 05–78.

INSPECTION PROCEDURE

HINT:

- If DTCs P0115, P0116, P0117, P0118 and P0125 are output simultaneously, the engine coolant temperature sensor circuit may be open or short. Perform the troubleshooting of DTC P0115, P0117 or P0118 first.
- Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1 CHECK OTHER DTCS OUTPUT(IN ADDITION TO DTC P0125)

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(c) Select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(d) Read the DTCs using the hand–held tester or the OBD II scan tool.

Result:

Display (DTC output)	Proceed to
P0125	A
P0125 and other DTCs	B

HINT:

If any other codes besides P0125 is output, perform the troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05–47)**

A

2 INSPECT THERMOSTAT (See page 16–15)

NG → **REPLACE THERMOSTAT**

OK

3 CHECK COOLING SYSTEM

(a) Check that there is a defect in the cooling system which causes overcool, such as abnormal radiator fan operation, modified cooling system and so on.

NG → **REPAIR OR REPLACE COOLING SYSTEM**

OK

REPLACE ENGINE COOLANT TEMPERATURE SENSOR

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DTC	P0128	COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE)

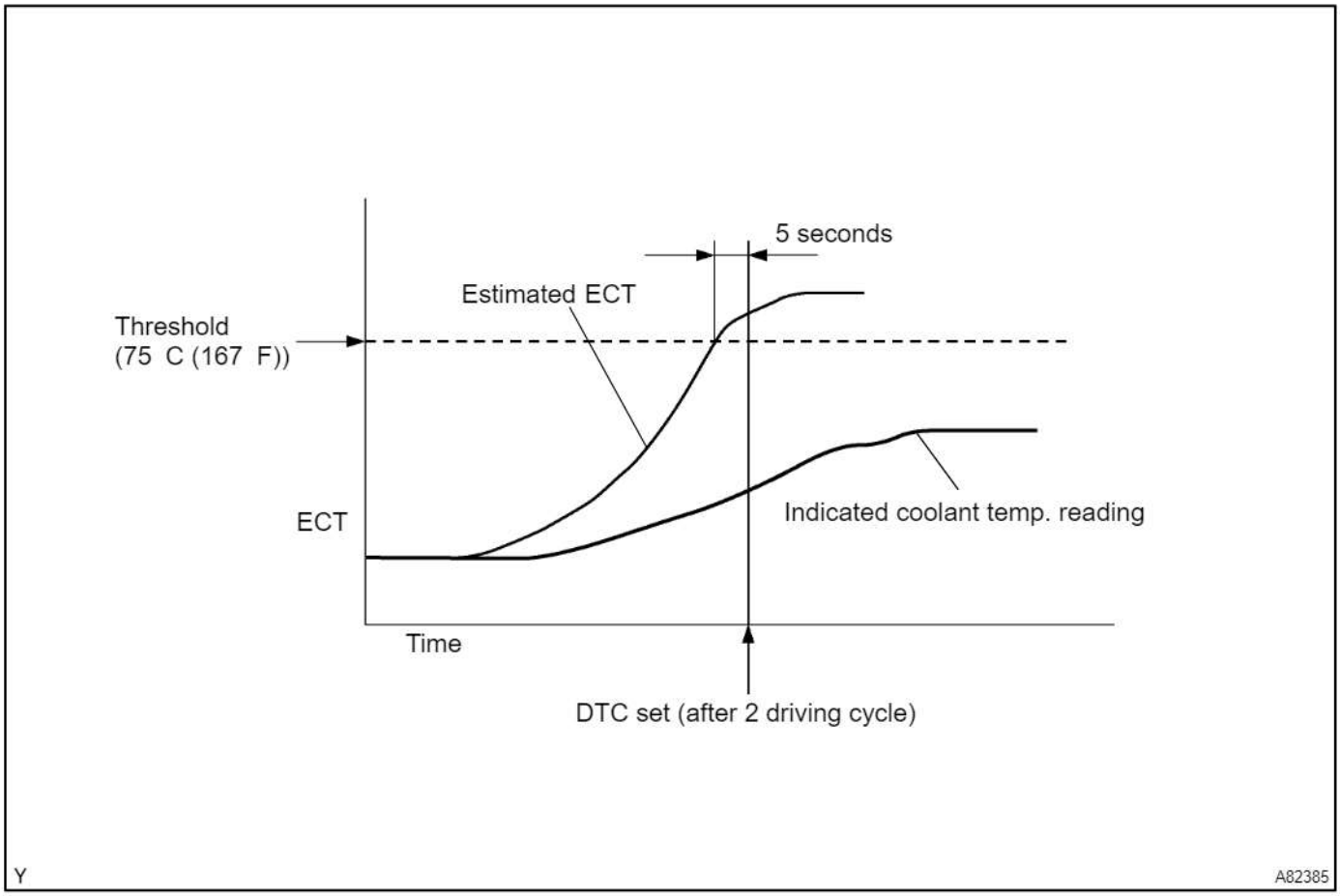
HINT:
This is the procedure of the "thermostat" malfunction detection.

CIRCUIT DESCRIPTION

If the engine coolant temperature does not reach 75°C (167°F) despite sufficient warm–up time has elapsed.

DTC No.	DTC Detection Condition	Trouble Area
P0128	Conditions (a), (b) and (c) are met: (a) Cold start (b) After sufficient warm–up time has elapsed (c) Engine coolant temperature less than 75°C (167°F)	□Thermostat □Cooling system □Engine coolant temperature sensor □ECM

MONITOR DESCRIPTION



The ECM estimates the coolant temperature based on starting temperature, engine loads, and engine speeds. The ECM then compares the estimated temperature with the actual engine coolant temperature (ECT). When the estimated coolant temperature reaches 75 C (167 F) the ECM checks the actual ECT. If the actual ECT is less than 75 C (167 F) the ECM will interpret this as a fault in the engine cooling system or thermostat and set a DTC.

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MONITOR STRATEGY

Related DTCs	P0128: Coolant thermostat
Required sensors/components (Main)	Engine coolant temperature sensor, Engine cooling system thermostat
Required sensors/components (Related)	Intake air temperature sensor, Vehicle speed sensor
Frequency of operation	Once per drive cycle
Duration	15 minutes
MIL operation	2 driving cycles
Sequence operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05–13
Battery voltage	11 V or more
Engine start intake air temperature	–10 to 35 C (14 to 95 F)
Engine start engine coolant temperature	–10 to 35 C (14 to 95 F)
Difference between engine start engine coolant temperature and engine start intake air temperature	–15 to 7 C (–27 to 12.6 F)

TYPICAL MALFUNCTION THRESHOLDS

Time that both of the following conditions are met:	5 seconds or more
Estimated engine coolant temperature	75 C (167 F) or more
Actual engine coolant temperature	Less than 75 C (167 F)

COMPONENT OPERATING RANGE

Engine coolant temperature sensor output value after warm–up	75 C (167 F) or more

MONITOR RESULT (MODE 06 DATA)

Test ID/Comp ID	Description of Test Data	Description of Test Limit	Conversion Factor (Unit)
$08/$81	Actual engine coolant temperature	Estimated engine coolant temperature (75 C/167 F)	Multiply by 0.625 and minus 40 (C)

If the Test Data is less than Test Limit when the engine is warmed up, the ECM interprets this as a malfunction.

Refer to page 05–21 for detailed information on CHECKING MONITOR STATUS.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1	CHECK COOLING SYSTEM

(a) Check that there is no defect in the cooling system which causes overcool, such as abnormal radiator fan operation, modified cooling system and so on.

NG → REPAIR OR REPLACE COOLING SYSTEM

OK

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2	INSPECT THERMOSTAT (See page 16–15)

NG → REPLACE THERMOSTAT

OK

REPLACE ECM (See page 10–24)

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DTC	P0130	OXYGEN SENSOR CIRCUIT (BANK 1 SENSOR 1)

DTC	P0150	OXYGEN SENSOR CIRCUIT (BANK 2 SENSOR 1)

DTC	P2195	OXYGEN SENSOR SIGNAL STUCK LEAN (BANK 1 SENSOR 1)

DTC	P2196	OXYGEN SENSOR SIGNAL STUCK RICH (BANK 1 SENSOR 1)

DTC	P2197	OXYGEN SENSOR SIGNAL STUCK LEAN (BANK 2 SENSOR 1)

DTC	P2198	OXYGEN SENSOR SIGNAL STUCK RICH (BANK 2 SENSOR 1)

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CIRCUIT DESCRIPTION

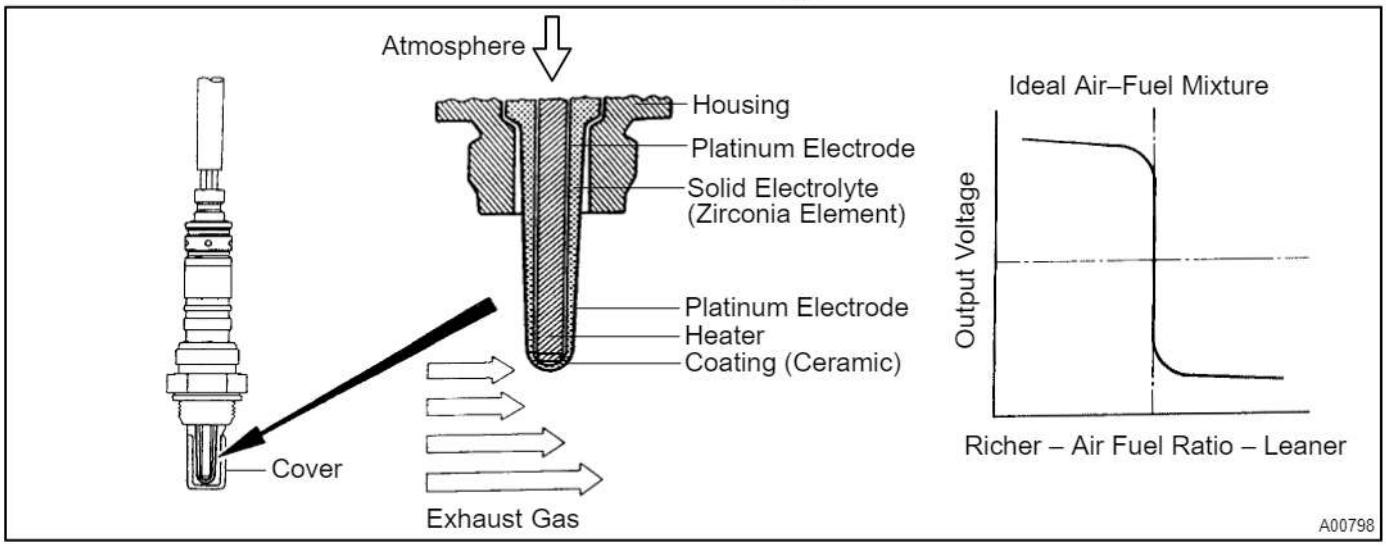
To obtain a high purification rate for the CO, HC and NOx components of the exhaust gas, a three–way catalytic converter is used. For the most efficient use of the three–way catalytic converter, the air–fuel ratio must be precisely controlled so that it is always close to the stoichiometric air–fuel ratio.

The heated oxygen sensor has the characteristic whereby its output voltage changes suddenly in the vicinity of the stoichiometric air–fuel ratio. This is used to detect the oxygen concentration in the exhaust gas and to provide the ECM with feedback control the air–fuel ratio.

When the air–fuel ratio becomes LEAN, the oxygen concentration in the exhaust gas increases. And the heated oxygen sensor informs the ECM of the LEAN condition (low voltage, i. e. less than 0.45 V).

When the air–fuel ratio is RICHER than the stoichiometric air–fuel ratio, the oxygen concentration in the exhaust gas is reduced. And the heated oxygen sensor informs the ECM of the RICH condition (high voltage, i. e. more than 0.45 V). The ECM judges whether the air–fuel ratio is RICH or LEAN by voltage from the heated oxygen sensor, and controls the injection timing accordingly. However, if the malfunction of the heated oxygen sensor causes abnormal voltage output, the ECM becomes unable to perform the accurate air–fuel ratio control.

The heated oxygen sensors include a heater which heats the zirconia element. The heater is controlled by the ECM. When the intake air volume is low (the temperature of the exhaust gas is low), the current flows to the heater in order to heat the sensor for the accurate oxygen concentration detection.



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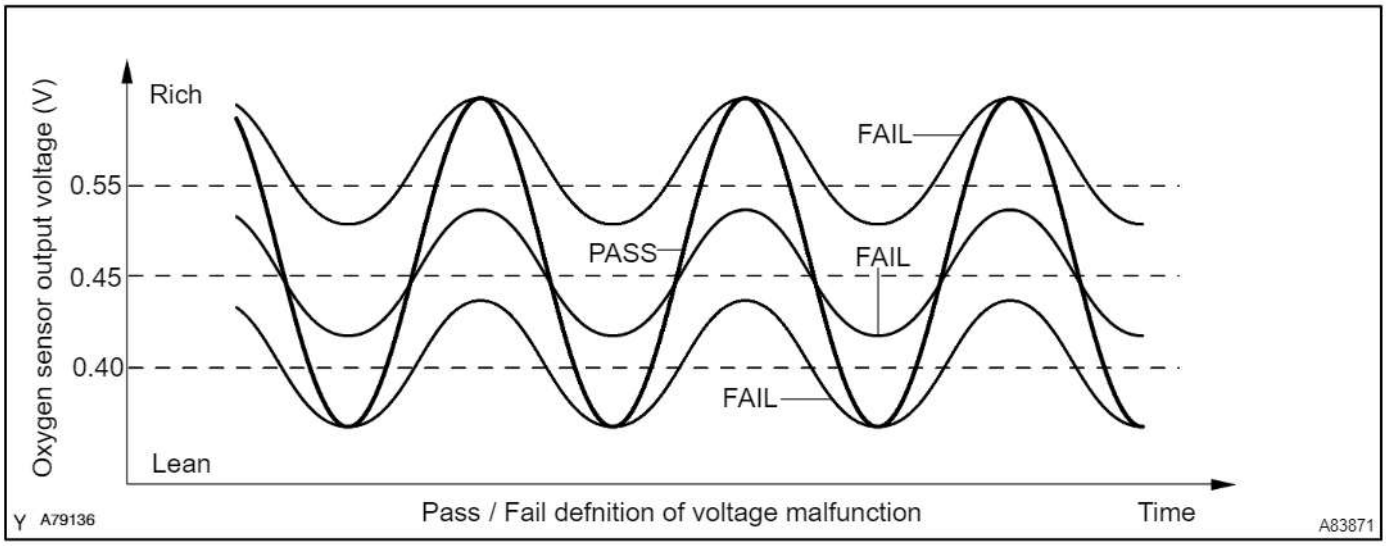
DTC No.	DTC Detection Condition	Trouble Area
P0130 P0150	After engine is warmed up, output voltage of heated oxygen sensor remains at 0.4 V or more, or 0.55 V or less, during idling (2 trip detection logic)	□Open or short in heated oxygen sensor circuit □Heated oxygen sensor (Bank 1, 2 Sensor 1) □Heated oxygen sensor heater (Bank 1, 2 Sensor 1) □EFI relay □Air induction system □Fuel pressure □Injector □ECM
P2195 P2197	After engine is warmed up, output voltage of heated oxygen sensor remains at 0.55 V or less, during idling (2 trip detection logic)	□Open or short in heated oxygen sensor circuit □Heated oxygen sensor (Bank 1, 2 Sensor 1) □Heated oxygen sensor heater (Bank 1, 2 Sensor 1) □EFI relay □Air induction system □Fuel pressure □Injector □ECM
P2196 P2198	After engine is warmed up, output voltage of heated oxygen sensor remains at 0.4 V or more, during idling (2 trip detection logic)	□Open or short in heated oxygen sensor circuit □Heated oxygen sensor (Bank 1, 2 Sensor 1) □Heated oxygen sensor heater (Bank 1, 2 Sensor 1) □EFI relay □Air induction system □Fuel pressure □Injector □ECM

HINT:

- □ Bank 1 refers to the bank that includes cylinder No.1.
- □ Bank 2 refers to the bank that does not include cylinder No.1.
- □ Sensor 1 refers to the sensor closest to the engine body.
- □ The output voltage of the heated oxygen sensor and the short–term fuel trim value can be read using the hand–held tester or the OBD II scan tool.

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MONITOR DESCRIPTION



The ECM uses the heated oxygen sensor information to regulate the air–fuel ratio close to a stoichiometric ratio. This maximizes the catalytic converter's ability to purify the exhaust gases. The sensor detects oxygen levels in the exhaust gas and sends this signal to the ECM.

The inner surface of the sensor element is exposed to outside air. The outer surface of the sensor element is exposed to the exhaust gases. The sensor element is made of platinum coated zirconia and includes an integrated heating element. The heated oxygen sensor has the characteristic whereby its output voltage change suddenly in the vicinity of the stoichiometric air–fuel ratio. The heated oxygen sensor generates output voltage between 0 V and 1.0 V in response to the oxygen concentration in the exhaust gas. When the output voltage of the sensor is 0.55 V or more, the ECM judges that the air–fuel ratio is RICH. When it is 0.40 V or less, the ECM judges that the air–fuel ratio is LEAN.

In normal condition, the heated oxygen sensor indicates RICH and LEAN alternately with a regular cycle under the air–fuel ratio feedback control. If the sensor voltage output remains at RICH, or at LEAN, the ECM interprets this as malfunction of the sensor and sets a DTC.

MONITOR STRATEGY

Related DTCs	P0130: Heated oxygen sensor (Bank 1 Sensor 1) voltage is constant at Lean side or Rich side P0150: Heated oxygen sensor (Bank 2 Sensor 1) voltage is constant at Lean side or Rich side P2195: Heated oxygen sensor (Bank 1 Sensor 1) voltage is constant at Lean side P2196: Heated oxygen sensor (Bank 1 Sensor 1) voltage is constant at Rich side P2197: Heated oxygen sensor (Bank 2 Sensor 1) voltage is constant at Lean side P2198: Heated oxygen sensor (Bank 2 Sensor 1) voltage is constant at Rich side
Required sensors/ components (Main)	Heated oxygen sensor (Sensor 1)
Required sensors/ components (Related)	Crank position sensor, vehicle speed sensor
Frequency of operation	Once per drive cycle
Duration	25 to 36 seconds (2 times)
MIL operation	2 driving cycle
Sequence operation	None

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TYPICAL ENABLING CONDITION

The monitor will run whenever the following DTCs are not present	See page 05–13
There is history that the following conditions were met for 20 seconds	(a) and (b)
(a) Vehicle speed	25 mph (40 km/h) or more
(b) Engine RPM	900 rpm or more
Time after engine start	120 seconds or more
Idle	ON
Fuel system status	Closed loop

TYPICAL MALFUNCTION THRESHOLDS

P0130 and P0150:

Either the following conditions (a) or (b) is met:	More than 3 times
(a) Front heated oxygen sensor voltage is 0.55 V or less	For more than 18 seconds
(b) Front heated oxygen sensor voltage is 0.40 V or more	For more than 18 seconds

P2195 and P2197:

Front heated oxygen sensor voltage	Constant 0.55 V or less

P2196 and P2198:

Front heated oxygen sensor voltage	Constant 0.4 V or more

COMPONENT OPERATING RANGE

Sensor voltage	0 to 1 V

O2S TEST RESULT

Refer to page 05–19 for detailed information.

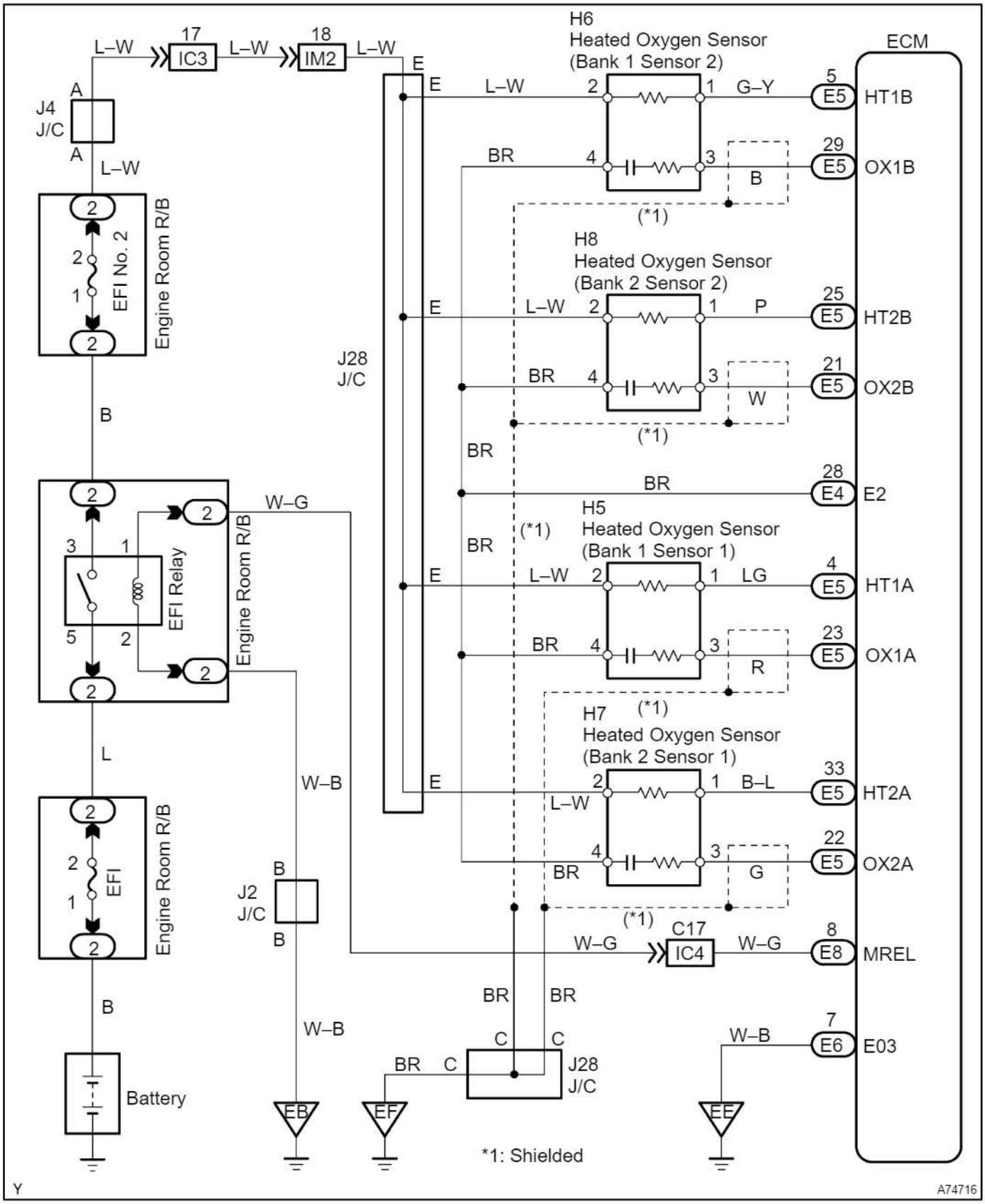
Front O2S voltage monitor

If the O2S voltage is out of the standard value, the ECM interprets this as a malfunction.

TEST ID	Description of TEST Data	Conversion Factor	Unit
$07	The minimum voltage	N/A	V
$08	The maximum voltage	N/A	V

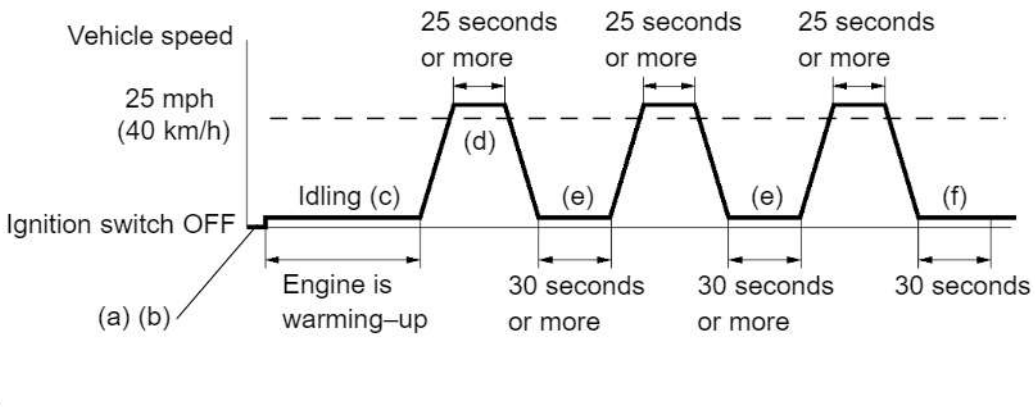
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WIRING DIAGRAM



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CONFIRMATION DRIVING PATTERN



(a) Connect the hand–held tester to the DLC3.
(b) Switch the hand–held tester from normal mode to check mode (see page 05–38).
(c) Start the engine and let the engine idle.
(d) Drive the vehicle at 25 mph (40 km/h) or more for 25 seconds or more.
(e) Let the engine idle for 30 seconds or more. Perform steps (d) and (e) at least 3 times.
(f) Let the engine idle for 30 seconds.

HINT:
If malfunction exists, the MIL will be illuminated during step (f).

NOTICE:
If the conditions in this test are not strictly followed, no malfunction will be detected.
If you do not have the hand–held tester, turn the ignition switch to OFF after performing steps from (c) to (f), then perform steps (c) to (f) again.

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INSPECTION PROCEDURE

HINT:

Hand–held tester only:

It is possible the malfunctioning area can be found using the ACTIVE TEST A/F CONTROL operation. The A/F CONTROL operation can determine if the A/F sensor, heated oxygen sensor or other potential trouble areas are malfunctioning or not.

(a) Perform the ACTIVE TEST A/F CONTROL operation.

HINT:

The A/F CONTROL operation lowers the injection volume 12.5% or increases the injection volume 25%.

(1) Connect the hand–held tester to the DLC3 on the vehicle.
(2) Turn the ignition switch to ON.
(3) Warm up the engine by running the engine at 2,500 rpm for approximately 90 seconds.
(4) Select the item: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL.
(5) Perform the A/F CONTROL operation with the engine in an idle condition (press the right or left button).

Result:

Heated oxygen sensor reacts in accordance with increase and decrease of injection volume:
+25 % → rich output: More than 0.5 V
–12.5 % → lean output: Less than 0.4 V

NOTICE:

There is a delay of few seconds in the sensor 1 (front sensor) output, and there is about 20 seconds delay at maximum in the sensor 2 (rear sensor).

	Output voltage of heated oxygen sensor (sensor 1: front sensor)	Output voltage of heated oxygen sensor (sensor 2: rear sensor)	Main suspect trouble area
Case 1	Injection volume +25 % –12.5 % Output voltage More than 0.5 V Less than 0.4V **OK**	Injection volume +25 % –12.5 % Output voltage More than 0.5 V Less than 0.4V **OK**	□
Case 2	Injection volume +25 % –12.5 % Output voltage Almost no reaction **NG**	Injection volume +25 % –12.5 % Output voltage More than 0.5 V Less than 0.4V **OK**	Sensor 1: front sensor (sensor 1, heater, sensor 1 circuit)
Case 3	Injection volume +25 % –12.5 % Output voltage More than 0.5 V Less than 0.4V **OK**	Injection volume +25 % –12.5 % Output voltage Almost no reaction **NG**	Sensor 2: rear sensor (sensor 2, heater, sensor 2 circuit)
Case 4	Injection volume +25 % –12.5 % Output voltage Almost no reaction **NG**	Injection volume +25 % –12.5 % Output voltage Almost no reaction **NG**	Extremely rich or lean actual air–fuel ratio (Injector, fuel pressure, gas leakage in exhaust system, etc.)

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The following A/F CONTROL procedure enables the technician to check and graph the voltage outputs of both the heated oxygen sensor.
To display the graph, enter ACTIVE TEST/ A/F CONTROL/USER DATA, then select "O2S B1S1 and O2S B1S2" or "O2S B2S1 and O2S B2S2" by pressing the "YES" button followed by the "ENTER" button and then the "F4" button.

NOTICE:

If the vehicle is short of fuel, the air–fuel ratio becomes LEAN and heated oxygen sensor DTCs will be recorded, and the MIL then illuminates.

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may have an open circuit.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.
- A high heated oxygen sensor (sensor 1) voltage (0.5 V or more) could be caused by a rich air–fuel mixture. Check for conditions that would cause the engine to run rich.
- A low heated oxygen sensor (sensor 1) voltage (0.4 V or less) could be caused by a lean air–fuel mixture. Check for conditions that would cause the engine to run lean.

1	CHECK OTHER DTC OUTPUT(IN ADDITION TO HEATED OXYGEN SENSOR DTCS)

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(c) Select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(d) Read the DTC using the hand–held tester or the OBD II scan tool.

Result:

Display (DTC output)	Proceed to
P0130, P0150, P2195, P2196, P2197 and/or P2198	A
P0130, P0150, P2195, P2196, P2197 or P2198 and other DTCs	B

HINT:
If any other codes besides P0130, P0150, P2195, P2196, P2197 and/or P2198 are output, perform troubleshooting for those DTCs first.

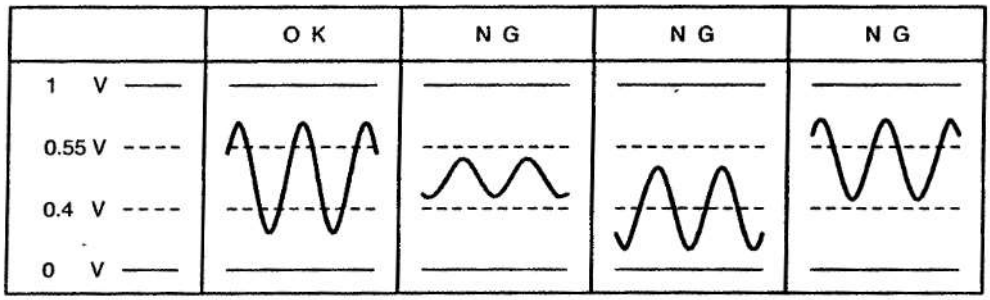
B → **GO TO RELEVANT DTC CHART (See page 05–47)**

A

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2	READ VALUE OF HAND–HELD TESTER OR OBD II SCAN TOOL(OUTPUT VOLTAGE OF HEATED OXYGEN SENSOR)

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Start the engine and turn the hand–held tester or the OBD II scan tool ON.
(c) Select the item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / O2S B1S1.
(d) Warm up the heated oxygen sensor with the engine speed at 2,500 rpm for approximately 90 seconds.
(e) Read the output voltage of the heated oxygen sensor during idling.
Heated oxygen sensor output voltage:
Alternates repeatedly between less than 0.4 V and more than 0.55 V (see the following table).

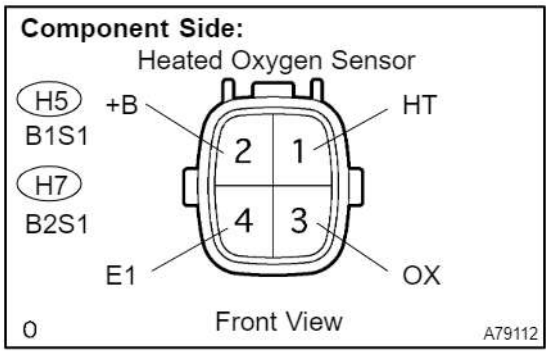


P18349

OK → **Go to step 9**

NG

3	INSPECT HEATED OXYGEN SENSOR(HEATER RESISTANCE)



(a) Disconnect the H5 or H7 heated oxygen sensor connector.
(b) Measure the resistance between the terminals of the heated oxygen sensor connector.
Standard (Bank 1, 2 sensor 1):

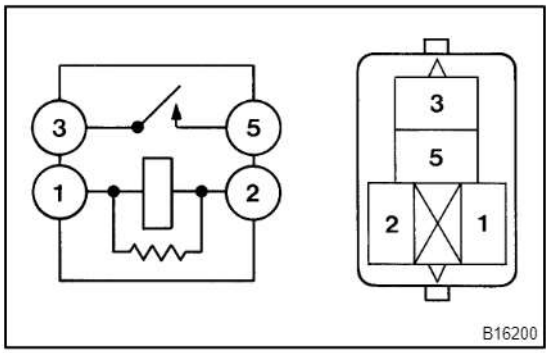
Tester Connection	Specified Condition
1 (HT) – 2 (+B)	11 to 16 Ω at 20 C (68 F)
1 (HT) – 4 (E1)	10 kΩ or higher

(c) Reconnect the heated oxygen sensor connector.

NG → **REPLACE HEATED OXYGEN SENSOR**

OK

4	INSPECT EFI RELAY



(a) Remove the EFI relay from the engine room R/B.
(b) Check for continuity in the EFI relay.
Standard:

Tester Connection	Specified Condition
1 – 2	Continuity
3 – 5	No continuity
3 – 5	Continuity (Apply battery voltage to terminals 1 and 2)

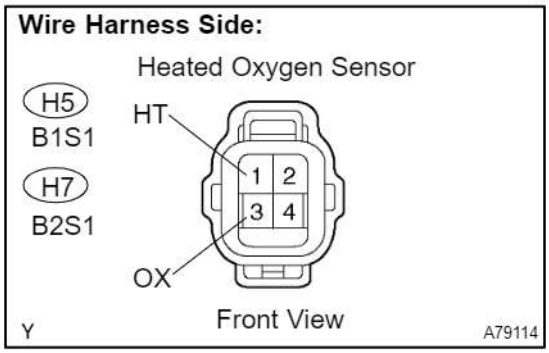
(c) Reinstall the EFI relay.

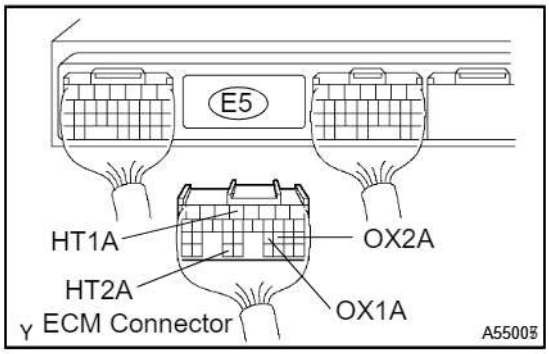
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NG → REPLACE EFI RELAY

OK

5 CHECK HARNESS AND CONNECTOR(HEATED OXYGEN SENSOR – ECM)





(a) Disconnect the H5 or H7 heated oxygen sensor connector.
(b) Disconnect the E5 ECM connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

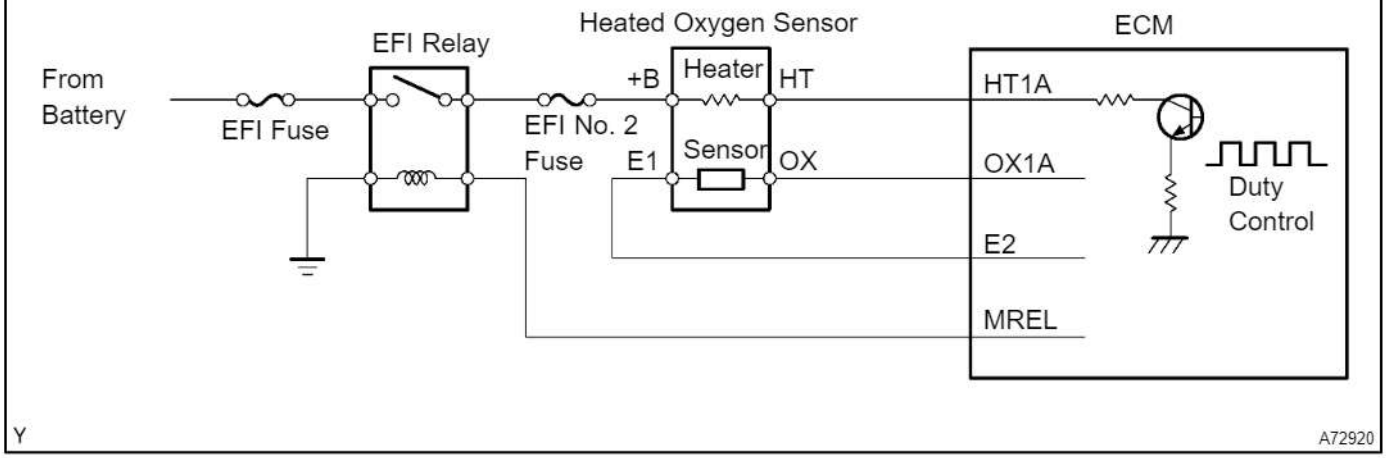
Tester Connection	Specified Condition
OX (H5–3) – OX1A (E5–23)	Below 1 Ω
HT (H5–1) – HT1A (E5–4)	Below 1 Ω
OX (H7–3) – OX2A (E5–22)	Below 1 Ω
HT (H7–1) – HT2A (E5–33)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
OX (H5–3) or OX1A (E5–23) – Body ground	10 kΩ or higher
HT (H5–1) or HT1A (E5–4) – Body ground	10 kΩ or higher
OX (H7–3) or OX2A (E5–22) – Body ground	10 kΩ or higher
HT (H7–1) or HT2A (E5–33) – Body ground	10 kΩ or higher

(d) Reconnect the heated oxygen sensor connector.
(e) Reconnect the ECM connector.

Reference (Bank 1 Sensor 1 System Drawing)



NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

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6	CHECK AIR INDUCTION SYSTEM

(a) Check for vacuum leaks in the air induction system.

NG → REPAIR OR REPLACE AIR INDUCTION SYSTEM

OK

7	CHECK FUEL PRESSURE (See page 11–35)

(a) Check the fuel pressure (high or low pressure).

NG → REPAIR OR REPLACE FUEL SYSTEM

OK

8	INSPECT FUEL INJECTOR ASSY(INJECTION AND VOLUME) (See page 11–37)

NG → REPLACE FUEL INJECTOR ASSY (See page 11–41)

OK

REPLACE HEATED OXYGEN SENSOR

9	PERFORM CONFIRMATION DRIVING PATTERN

HINT:
Clear all DTCs prior to performing the confirmation driving pattern.

GO

10	READ OUTPUT DTC(SEE IF HEATED OXYGEN SENSOR DTCS ARE OUTPUT AGAIN)

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(c) Select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(d) Read the DTC using the hand–held tester or the OBD II scan tool.
Result:

Display (DTC output)	Proceed to
P0130, P0150, P2195, P2196, P2197 and/or P2198	A
No output	B

B → CHECK FOR INTERMITTENT PROBLEMS (See page 05–10)

A

REPLACE HEATED OXYGEN SENSOR

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DTC	P0133	OXYGEN SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1)

DTC	P0153	OXYGEN SENSOR CIRCUIT SLOW RESPONSE (BANK 2 SENSOR 1)

CIRCUIT DESCRIPTION

Refer to DTC P0130 on page 05–102.

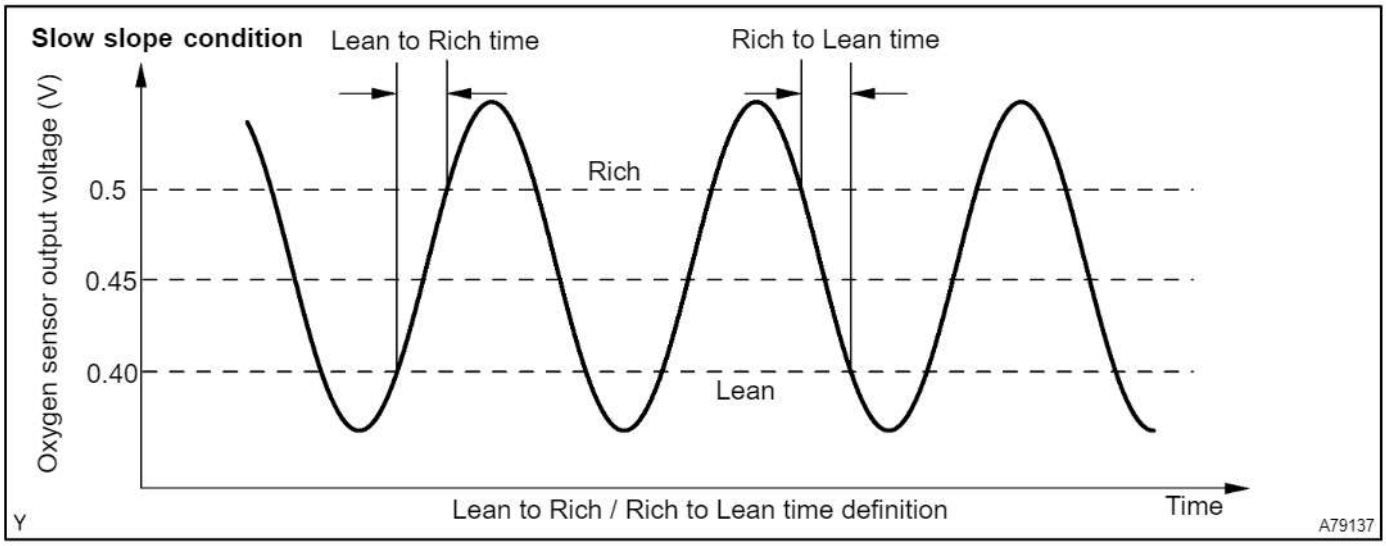
DTC No.	DTC Detection Condition	Trouble Area
P0133 P0153	(1) After engine has been warmed up, if response time that heated oxygen sensor's output voltage reaches from RICH to LEAN, or from LEAN to RICH, is 0.6 second or more during idling (2 trip detection logic) (2) If response time of heated oxygen sensor's output voltage in one RICH–LEAN cycle is 9 seconds or more (M/T vehicle: 5.5 seconds or more) during idling (2 trip detection logic)	□Open or short in heated oxygen sensor circuit □Heated oxygen sensor (Bank 1, 2 Sensor 1) □Heated oxygen sensor heater (Bank 1, 2 Sensor 1) □EFI relay □Air induction system □Fuel pressure □Injector □ECM

HINT:

- □ Bank 1 refers to the bank that includes cylinder No.1.
- □ Bank 2 refers to the bank that does not include cylinder No.1.
- □ Sensor 1 refers to the sensor closest to the engine body.

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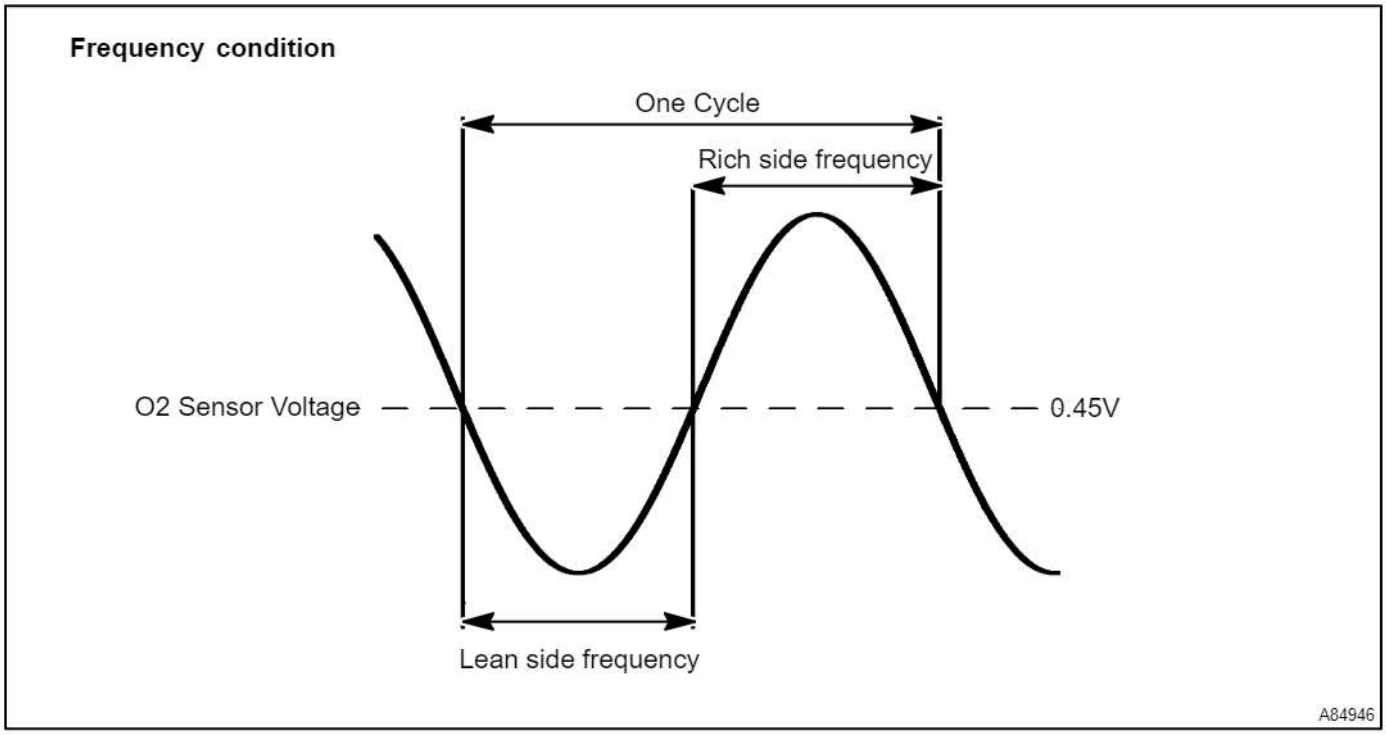
MONITOR DESCRIPTION



The ECM uses the oxygen sensor information to regulate the air–fuel ratio close to a stoichiometric ratio. This maximizes the catalytic converter's ability to purify the exhaust gases. The sensor detects oxygen levels in the exhaust gas and sends this signal to the ECM.

The inner surface of the sensor element is exposed to outside air. The outer surface of the sensor element is exposed to the exhaust gases. The sensor element is made of platinum coated zirconia and includes an integrated heating element. The heated oxygen sensor has the characteristic whereby its output voltage change suddenly in the vicinity of the stoichiometric air–fuel ratio. The heated oxygen sensor generates waveforms of a voltage between 0 V and 1 V in response to the oxygen concentration in the exhaust gas. When the output voltage of the sensor is 0.55 V or more, the ECM judges that the air–fuel ratio is RICH. When it is 0.40 V or less, the ECM judges that the air–fuel ratio is LEAN.

The ECM monitors the response feature of the heated oxygen sensor. If the response time of the sensor output status change from RICH to LEAN or vice versa becomes longer, the ECM interprets this as malfunction in the heated oxygen sensor and sets a DTC.



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MONITOR STRATEGY

Related DTCs	P0133: Heated oxygen sensor (Bank 1 Sensor 1) response monitor P0153: Heated oxygen sensor (Bank 2 Sensor 1) response monitor
Required sensors/ components (Main)	Heated oxygen sensor (Sensor 1)
Required sensors/ components (Related)	Crank position sensor, vehicle speed sensor, mass air flow meter
Frequency of operation	Once par drive cycles
Duration	Within 60 seconds
MIL operation	2 driving cycle
Sequence operation	None

TYPICAL ENABLING CONDITION

The monitor will run whenever the following DTCs are not present	See page 05–13

Frequency idle condition:

There is history that the following conditions were met for 20 seconds	(a) and (b)
(a) Vehicle speed	25 mph (40 km/h) or more
(b) Engine RPM	900 rpm or more
Idle	ON
Vehicle speed	3 mph (5 km/h) or less
Fuel system status	Closed loop
Time after engine start	120 seconds or more
Engine coolant temperature	40 C (104 F) or more

Frequency cruise condition:

There is history that the following conditions were met for 20 seconds	(a) and (b)
(a) Vehicle speed	25 mph (40 km/h) or more
(b) Engine RPM	900 rpm or more
Intake air amount	3 to 13 g/s
Time after engine start	120 seconds or more
Idle	OFF
Fuel system status	Closed loop
Engine RPM	1000 to 3500 rpm
Engine coolant temperature	70 C (158 F) or more

Slow slope condition:

There is history that the following conditions were met for 20 seconds	(a) and (b)
(a) Vehicle speed	25 mph (40 km/h) or more
(b) Engine RPM	900 rpm or more
Time after engine start	120 seconds or more
Idle	ON
Vehicle speed	3 mph (5 km/h) or less
Fuel system status	Closed loop
Engine coolant temperature	40 C (104 F) or more

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TYPICAL MALFUNCTION THRESHOLDS

Frequency idle condition:

Time required by the sensor's output voltage to change in one RICH–LEAN cycle	5.6 seconds or more

Frequency cruise condition:

Time required by the sensor's output voltage to change in one RICH–LEAN cycle	a specific time or more

Slow slope condition:

Time that sensor's output voltage changes from 0.4 to 0.55 V, or from 0.55 to 0.4 V	0.9 second or more
Both of the following conditions were met	A and B
A. Number of judgment made	3 times
B. Following conditions were met	(a) or (b)
(a) Average lean to rich response time	0.9 second or more
(b) Average rich to lean response time	0.9 second or more

COMPONENT OPERATING RANGE

Voltage output from heated oxygen sensor	Quickly fluctuates between 0.4 and 0.55 V

O2S TEST RESULT

Refer to page 05–19 for detailed information.

Front O2S voltage monitor

If the time required to change is out of the standard value, the ECM interprets this as a malfunction.

TEST ID	Description of TEST DATA	Conversion Factor	Unit
$31	Time to change from Lean (| 0.35 V) to Rich (⊖0.45 V)	N/A	second
$32	Time to change from Rich (⊖0.45 V) to Lean (| 0.35 V)	N/A	second

Front O2S frequency monitor during engine idling

If the sum of $33 and $34 is out of the standard value, the ECM interprets this as a malfunction.

TEST ID	Description of TEST DATA	Conversion Factor	Unit
$33	Average (| 0.35 V) Lean time of one waveform cycle	N/A	second
$34	Average (⊖0.45 V) Rich time of one waveform cycle	N/A	second

Front O2S frequency monitor during vehicle running

If the sum of $35 and $36 is out of the standard value, the ECM interprets this as a malfunction.

TEST ID	Description of TEST DATA	Conversion Factor	Unit
$35	Average Lean (| 0.35 V) time of one waveform cycle	N/A	second
$36	Average Rich (⊖0.45 V) time of one waveform cycle	N/A	second

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WIRING DIAGRAM

Refer to DTC P0130 on page 05–102.

INSPECTION PROCEDURE

HINT:

Hand–held tester only:

It is possible the malfunctioning area can be found using the ACTIVE TEST A/F CONTROL operation. The A/F CONTROL operation can determine if the A/F sensor, heated oxygen sensor or other potential trouble areas are malfunctioning or not.

(a) Perform the ACTIVE TEST A/F CONTROL operation.

HINT:

The A/F CONTROL operation lowers the injection volume 12.5% or increases the injection volume 25%.

(1) Connect the hand–held tester to the DLC3 on the vehicle.
(2) Turn the ignition switch to ON.
(3) Warm up the engine by running the engine at 2,500 rpm for approximately 90 seconds.
(4) Select the item: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL.
(5) Perform the A/F CONTROL operation with the engine in an idle condition (press the right or left button).

Result:

Heated oxygen sensor reacts in accordance with increase and decrease of injection volume:
+25 % → rich output: More than 0.5 V
–12.5 % → lean output: Less than 0.4 V

NOTICE:

There is a delay of few seconds in the sensor 1 (front sensor) output, and there is about 20 seconds delay at maximum in the sensor 2 (rear sensor).

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	Output voltage of heated oxygen sensor (sensor 1: front sensor)	Output voltage of heated oxygen sensor (sensor 2: rear sensor)	Main suspect trouble area
Case 1	Injection volume +25 % –12.5 % Output voltage More than 0.5 V Less than 0.4V OK	Injection volume +25 % –12.5 % Output voltage More than 0.5 V Less than 0.4V OK	□
Case 2	Injection volume +25 % –12.5 % Output voltage Almost no reaction NG	Injection volume +25 % –12.5 % Output voltage More than 0.5 V Less than 0.4V OK	Sensor 1: front sensor (sensor 1, heater, sensor 1 circuit)
Case 3	Injection volume +25 % –12.5 % Output voltage More than 0.5 V Less than 0.4V OK	Injection volume +25 % –12.5 % Output voltage Almost no reaction NG	Sensor 2: rear sensor (sensor 2, heater, sensor 2 circuit)
Case 4	Injection volume +25 % –12.5 % Output voltage Almost no reaction NG	Injection volume +25 % –12.5 % Output voltage Almost no reaction NG	Extremely rich or lean actual air–fuel ratio (Injector, fuel pressure, gas leakage in exhaust system, etc.)

The following A/F CONTROL procedure enables the technician to check and graph the voltage outputs of both the heated oxygen sensor.

To display the graph, enter ACTIVE TEST/ A/F CONTROL/USER DATA, then select ”O2S B1S1 and O2S B1S2” or ”O2S B2S1 and O2S B2S2” by pressing the ”YES” button followed by the ”ENTER” button and then the ”F4” button.

NOTICE:

If the vehicle is short of fuel, the air–fuel ratio becomes LEAN and heated oxygen sensor DTCs will be recorded, and the MIL then illuminates.

HINT:

- □ If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may have an open circuit.
- □ Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.
- □ A high heated oxygen sensor (sensor 1) voltage (0.5 V or more) could be caused by a rich air–fuel mixture. Check for conditions that would cause the engine to run rich.
- □ A low heated oxygen sensor (sensor 1) voltage (0.4 V or less) could be caused by a lean air–fuel mixture. Check for conditions that would cause the engine to run lean.

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1	CHECK OTHER DTC OUTPUT(IN ADDITION TO DTC P0133 AND/OR P0153)

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(c) Select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(d) Read the DTC using the hand–held tester or the OBD II scan tool.
Result:

Display (DTC output)	Proceed to
P0133 and/or P0153	A
P0133 or P0153 and other DTCs	B

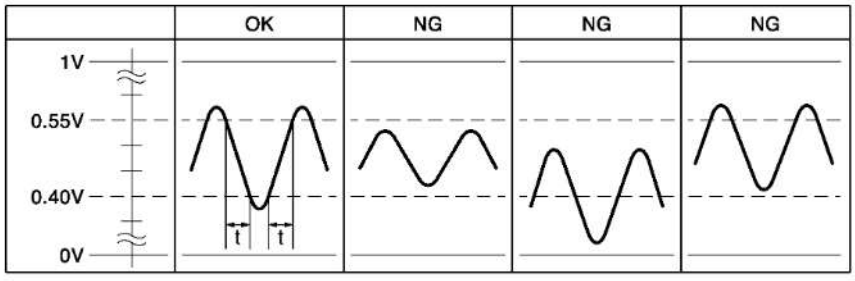
HINT:
If any other codes besides P0133 and/or P0153 are output, perform troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05–47)**

A

2	READ VALUE OF HAND–HELD TESTER OR OBD II SCAN TOOL(HEATED OXYGEN SENSOR DURING IDLING)

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Start the engine and turn the hand–held tester or the OBD II scan tool ON.
(c) Select the item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / O2S B1S1.
(d) Warm up the heated oxygen sensor with the engine speed at 2,500 rpm for approximately 90 seconds.
(e) Read the output voltage of the heated oxygen sensor during idling.
Heated oxygen sensor output voltage:
Alternates repeatedly between less than 0.4 V and more than 0.55 V, and period of "t" must exist more than 0.9 second (see the following table).



N

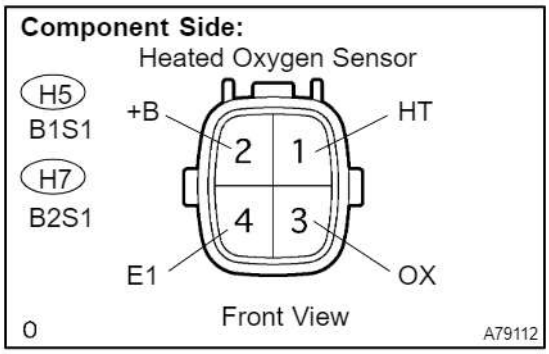
A73686

OK → **Go to step 9**

NG

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3 INSPECT HEATED OXYGEN SENSOR(HEATER RESISTANCE)



(a) Disconnect the H5 or H7 heated oxygen sensor connector.

(b) Measure the resistance between the terminals of the heated oxygen sensor connector.

Standard (Bank 1, 2 sensor 1):

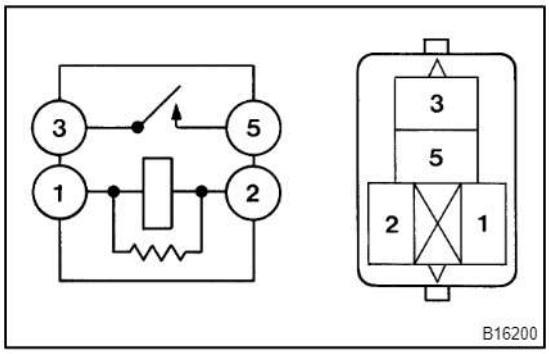
Tester Connection	Specified Condition
1 (HT) – 2 (+B)	11 to 16 Ω at 20 C (68 F)
1 (HT) – 4 (E1)	10 kΩ or higher

(c) Reconnect the heated oxygen sensor connector.

NG → **REPLACE HEATED OXYGEN SENSOR**

OK

4 INSPECT EFI RELAY



(a) Remove the EFI relay from the engine room R/B.

(b) Check for continuity in the EFI relay.

Standard:

Tester Connection	Specified Condition
1 – 2	Continuity
3 – 5	No continuity
3 – 5	Continuity (Apply battery voltage to terminals 1 and 2)

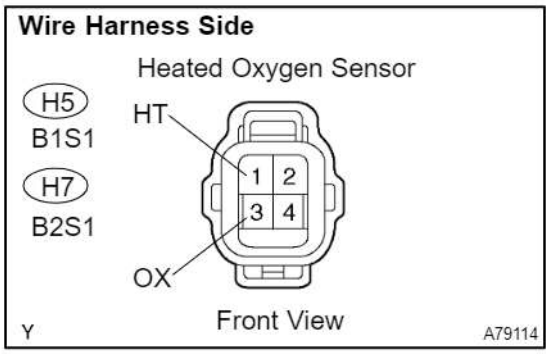
(c) Reinstall the EFI relay.

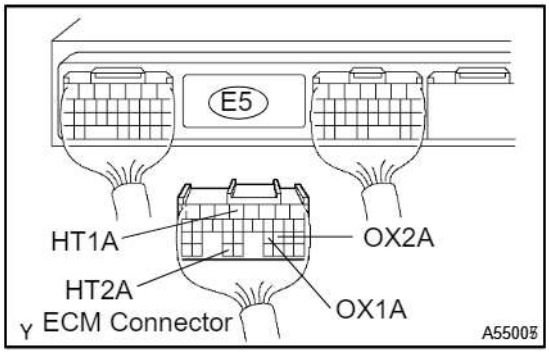
NG → **REPLACE EFI RELAY**

OK

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5 CHECK HARNESS AND CONNECTOR(HEATED OXYGEN SENSOR – ECM)





(a) Disconnect the H5 or H7 heated oxygen sensor connector.
(b) Disconnect the E5 ECM connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

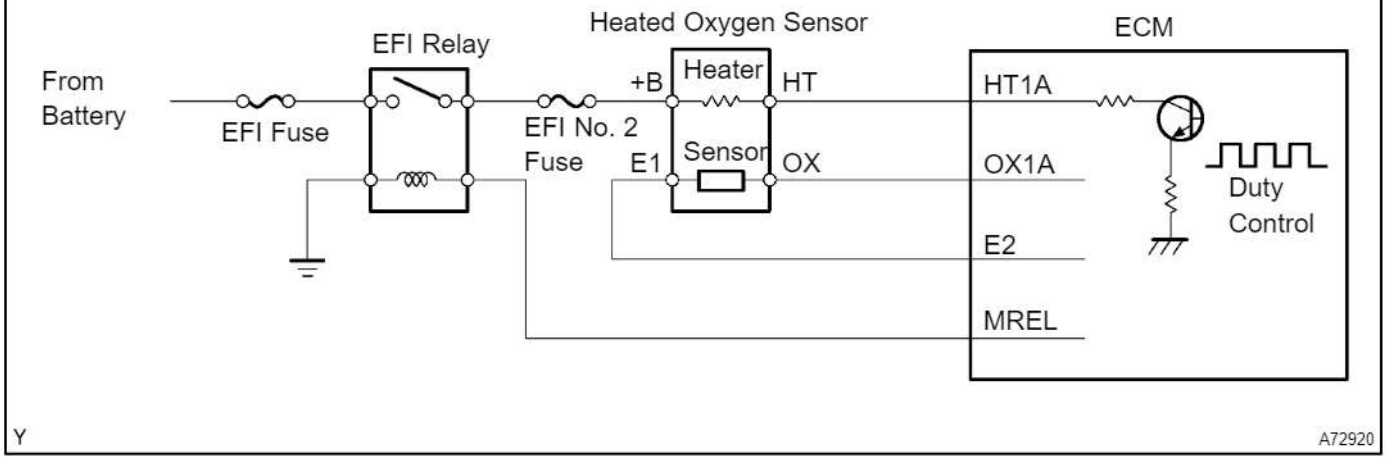
Tester Connection	Specified Condition
OX (H5–3) – OX1A (E5–23)	Below 1 Ω
HT (H5–1) – HT1A (E5–4)	Below 1 Ω
OX (H7–3) – OX2A (E5–22)	Below 1 Ω
HT (H7–1) – HT2A (E5–33)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
OX (H5–3) or OX1A (E5–23) – Body ground	10 kΩ or higher
HT (H5–1) or HT1A (E5–4) – Body ground	10 kΩ or higher
OX (H7–3) or OX2A (E5–22) – Body ground	10 kΩ or higher
HT (H7–1) or HT2A (E5–33) – Body ground	10 kΩ or higher

(d) Reconnect the heated oxygen sensor connector.
(e) Reconnect the ECM connector.

Reference (Bank 1 Sensor 1 System Drawing)



NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

6 CHECK AIR INDUCTION SYSTEM

(a) Check for vacuum leaks in the air induction system.

NG → REPAIR OR REPLACE AIR INDUCTION SYSTEM

OK

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7	CHECK FUEL PRESSURE (See page 11–35)

(a) Check the fuel pressure (high or low pressure).

NG → REPAIR OR REPLACE FUEL SYSTEM

OK

8	INSPECT FUEL INJECTOR ASSY(INJECTION AND VOLUME) (See page 11–37)

NG → REPLACE FUEL INJECTOR ASSY (See page 11–41)

OK

REPLACE HEATED OXYGEN SENSOR

9	PERFORM CONFIRMATION DRIVING PATTERN (See page 05–102)

HINT:
Clear all DTCs prior to performing the confirmation driving pattern.

GO

10	READ OUTPUT DTC(SEE IF DTC P0133 AND/OR P0153 ARE OUTPUT AGAIN)

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(c) Select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(d) Read the DTC using the hand–held tester or the OBD II scan tool.
Result:

Display (DTC output)	Proceed to
P0133 and/or P0153	A
No output	B

B → CHECK FOR INTERMITTENT PROBLEMS (See page 05–10)

A

REPLACE HEATED OXYGEN SENSOR

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DTC	P0134	OXYGEN SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1)

DTC	P0154	OXYGEN SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 2 SENSOR 1)

CIRCUIT DESCRIPTION

Refer to DTC P0130 on page 05–102.

DTC No.	DTC Detecting Condition	Trouble Area
P0134 P0154	After engine is warmed up, if heated oxygen sensor (bank 1, sensor 1) output does not indicate RICH (greater than 0.45 V) when conditions (a), (b), (c), (d) and (e) continue at least 65 seconds: (a) Engine speed: 1,400 rpm or more (b) Vehicle speed: 24.8 mph (40 km/h) or more (c) Throttle valve is not fully closed (d) 180 seconds or more after starting engine (e) Engine coolant temperature is more than 40 C (104 F) (1 trip detection logic)	□Open or short in heated oxygen sensor circuit □Heated oxygen sensor (Bank 1, 2 Sensor 1) □Heated oxygen sensor heater (Bank 1, 2 Sensor 1) □EFI relay □Air induction system □Fuel pressure □PCV hose connection □PCV valve and hose □Injector □Gas leakage in exhaust system □ECM

HINT:

- □ Bank 1 refers to bank that includes cylinder No. 1.
- □ Bank 2 refers to bank that dose not includes cylinder No. 1.
- □ Sensor 1 refers to the sensor farthest away from the engine body.
- □ After confirming DTCs P0134 and P0154, use the hand–held tester or the OBD II scan tool to confirm the output voltage of the heated oxygen sensor (bank 1, 2 sensor 1) from the DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL. If the output voltage of the heated oxygen sensor is less than 0.1 V, the heated oxygen sensor circuit may be open or short.

MONITOR DESCRIPTION

The ECM uses the heated oxygen sensor to optimize the air–fuel mixture in closed–loop fuel control. This control helps decrease exhaust emissions by providing the catalyst with a nearly stoichiometric mixture. The sensor detects the oxygen level in the exhaust gas and the ECM uses this data to control the air–fuel ratio. The sensor output voltage ranges from 0 V to 1 V. If the signal voltage is less than 0.4 V, the air–fuel ratio is LEAN. If the signal voltage is more than 0.5 V, the air–fuel ratio is RICH. If the conditions for closed–loop fuel control are met and after a specified time period, the sensor's output signal never indicates RICH, the ECM will conclude that closed–loop fuel control is malfunctioning. The ECM will illuminate the MIL and a DTC is set.

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MONITOR STRATEGY

Related DTCs	P0134: Heated oxygen sensor (Bank 1 Sensor 1) excessive time to enter closed loop P0154: Heated oxygen sensor (Bank 2 Sensor 1) excessive time to enter closed loop
Required sensors/ components (Main)	Heated oxygen sensor (Sensor 1)
Required sensors/ components (Related)	Crankshaft position sensor, engine coolant temperature sensor, vehicle speed sensor
Frequency of operation	Once per drive cycles
Duration	65 seconds
MIL operation	1 driving cycle
Sequence operation	None

TYPICAL ENABLING CONDITION

The monitor will run whenever the following DTCs are not present	See page 05–13
Both of the following conditions were met	A and B
A. Time after following conditions met for 50 seconds	(a), (b), (c), (d), (e) and (f)
(a) Engine coolant temperature	40 C (104°F) or more
(b) Engine speed	1,400 rpm or more
(c) Vehicle speed	25 mph (40 km/h) or less
(d) Idle	OFF
(e) Time after engine start	180 seconds or less
(f) Fuel enrichment correction factor	1 to 63.998
B. Neither fail nor pass is determined yet in the present drive cycle	–

TYPICAL MALFUNCTION THRESHOLDS

Front heated oxygen sensor voltage	less than 0.45 V

COMPONENT OPERATING RANGE

In normal condition, the font heated oxygen sensor voltage	0 to 1 V

WIRING DIAGRAM

Refer to DTC P0130 on page 05–102.

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INSPECTION PROCEDURE

HINT:

Hand–held tester only:

It is possible the malfunctioning area can be found using the ACTIVE TEST A/F CONTROL operation. The A/F CONTROL operation can determine if the A/F sensor, heated oxygen sensor or other potential trouble areas are malfunctioning or not.

(a) Perform the ACTIVE TEST A/F CONTROL operation.

HINT:

The A/F CONTROL operation lowers the injection volume 12.5% or increases the injection volume 25%.

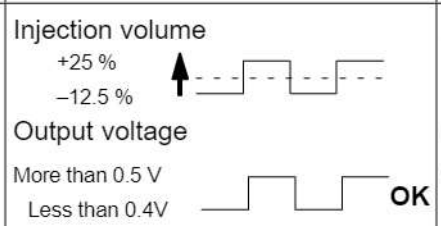
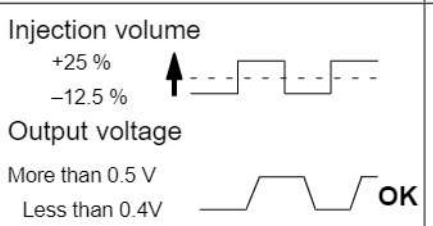
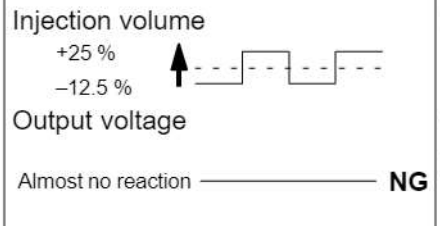
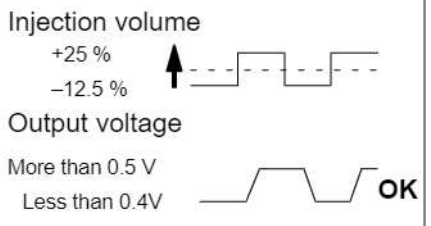
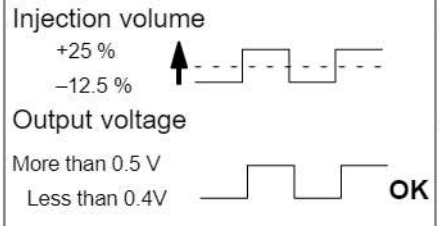
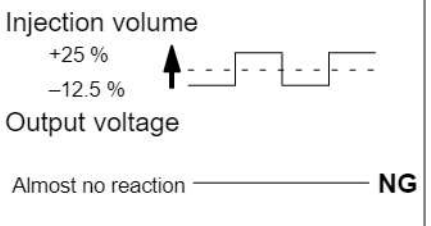
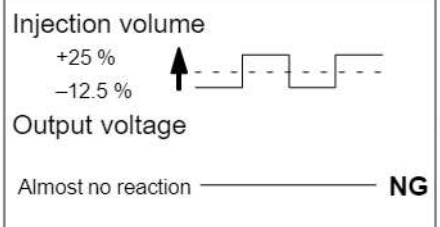
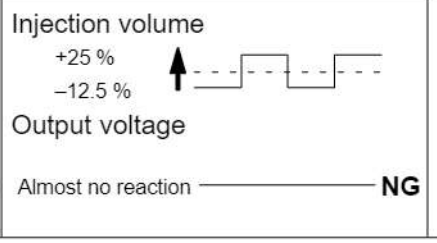
(1) Connect the hand–held tester to the DLC3 on the vehicle.
(2) Turn the ignition switch to ON.
(3) Warm up the engine by running the engine at 2,500 rpm for approximately 90 seconds.
(4) Select the item: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL.
(5) Perform the A/F CONTROL operation with the engine in an idle condition (press the right or left button).

Result:

Heated oxygen sensor reacts in accordance with increase and decrease of injection volume:
+25 % → rich output: More than 0.5 V
–12.5 % → lean output: Less than 0.4 V

NOTICE:

There is a delay of few seconds in the sensor 1 (front sensor) output, and there is about 20 seconds delay at maximum in the sensor 2 (rear sensor).

	Output voltage of heated oxygen sensor (sensor 1: front sensor)	Output voltage of heated oxygen sensor (sensor 2: rear sensor)	Main suspect trouble area
Case 1			□
Case 2			Sensor 1: front sensor (sensor 1, heater, sensor 1 circuit)
Case 3			Sensor 2: rear sensor (sensor 2, heater, sensor 2 circuit)
Case 4			Extremely rich or lean actual air–fuel ratio (Injector, fuel pressure, gas leakage in exhaust system, etc.)

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The following A/F CONTROL procedure enables the technician to check and graph the voltage outputs of both the heated oxygen sensor.
To display the graph, enter ACTIVE TEST/ A/F CONTROL/USER DATA, then select "O2S B1S1 and O2S B1S2" or "O2S B2S1 and O2S B2S2" by pressing the "YES" button followed by the "ENTER" button and then the "F4" button.

NOTICE:

If the vehicle is short of fuel, the air–fuel ratio becomes LEAN and heated oxygen sensor DTCs will be recorded, and the MIL then illuminates.

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may have an open circuit.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.
- A high heated oxygen sensor (sensor 1) voltage (0.5 V or more) could be caused by a rich air–fuel mixture. Check for conditions that would cause the engine to run rich.
- A low heated oxygen sensor (sensor 1) voltage (0.4 V or less) could be caused by a lean air–fuel mixture. Check for conditions that would cause the engine to run lean.

1	CHECK OTHER DTC OUTPUT(IN ADDITION TO DTC P0134 AND/OR P0154)

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(c) Select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(d) Read the DTC using the hand–held tester or the OBD II scan tool.

Result:

Display (DTC output)	Proceed to
P0134 and/or P0154	A
P0134 or P0154 and other DTCs	B

HINT:
If any other codes besides P0134 and/or P0154 are output, perform troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05–47)**

A

2	READ VALUE OF HAND–HELD TESTER OR OBD II SCAN TOOL(OUTPUT VOLTAGE OF HEATED OXYGEN SENSOR)

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(c) Select the item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / O2S B1S1.
(d) Warm up the engine above 75 C (169 F).
(e) Read the output voltage of the heated oxygen sensor when the engine speed is suddenly increased.

HINT:
Quickly accelerate the engine to 4,000 rpm 3 times by using the accelerator pedal.

Standard:

Heated oxygen sensor outputs a RICH signal (0.45 V or more) at least once.

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OK → Go to step 12

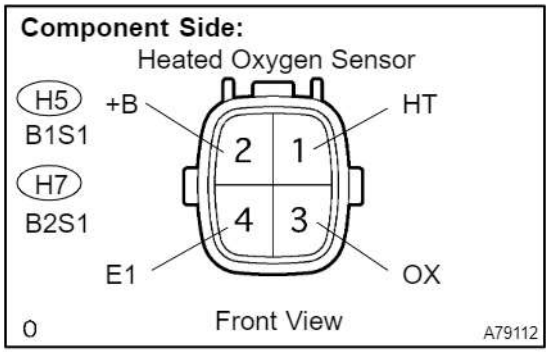
NG

3	CHECK CONNECTION OF PCV HOSE (See page 12–17)

NG → REPAIR OR REPLACE PCV HOSE

OK

4	INSPECT HEATED OXYGEN SENSOR(HEATER RESISTANCE)



(a) Disconnect the H5 or H7 heated oxygen sensor connector.

(b) Measure the resistance between the terminals of the heated oxygen sensor connector.

Standard (Bank 1, 2 sensor 1):

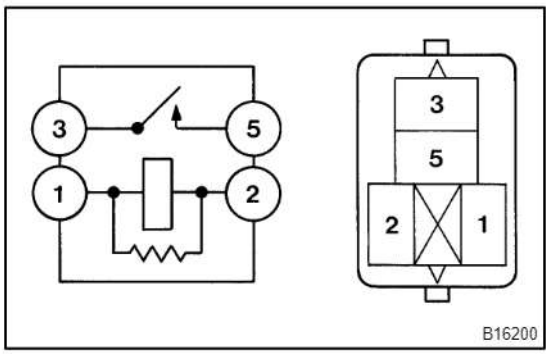
Tester Connection	Specified Condition
1 (HT) – 2 (+B)	11 to 16 Ω at 20 C (68 F)
1 (HT) – 4 (E1)	10 kΩ or higher

(c) Reconnect the heated oxygen sensor connector.

NG → REPLACE HEATED OXYGEN SENSOR

OK

5	INSPECT EFI RELAY



(a) Remove the EFI relay from the engine room R/B.

(b) Check for continuity in the EFI relay.

Standard:

Tester Connection	Specified Condition
1 – 2	Continuity
3 – 5	No continuity
3 – 5	Continuity (Apply battery voltage to terminals 1 and 2)

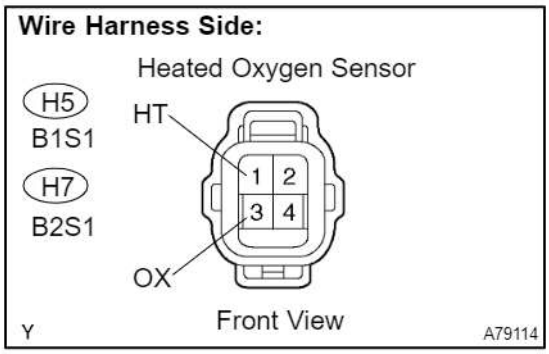
(c) Reinstall the EFI relay.

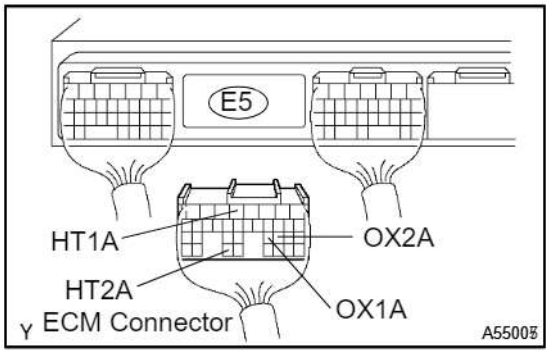
NG → REPLACE EFI RELAY

OK

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6 CHECK HARNESS AND CONNECTOR(HEATED OXYGEN SENSOR – ECM)





(a) Disconnect the H5 or H7 heated oxygen sensor connector.
(b) Disconnect the E5 ECM connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

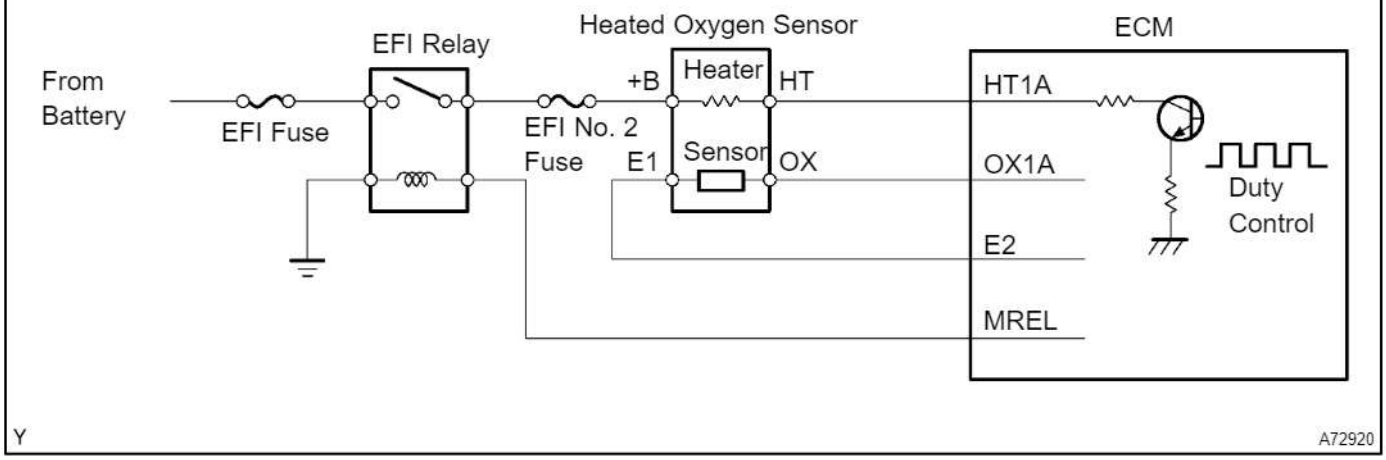
Tester Connection	Specified Condition
OX (H5–3) – OX1A (E5–23)	Below 1 Ω
HT (H5–1) – HT1A (E5–4)	Below 1 Ω
OX (H7–3) – OX2A (E5–22)	Below 1 Ω
HT (H7–1) – HT2A (E5–33)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
OX (H5–3) or OX1A (E5–23) – Body ground	10 kΩ or higher
HT (H5–1) or HT1A (E5–4) – Body ground	10 kΩ or higher
OX (H7–3) or OX2A (E5–22) – Body ground	10 kΩ or higher
HT (H7–1) or HT2A (E5–33) – Body ground	10 kΩ or higher

(d) Reconnect the heated oxygen sensor connector.
(e) Reconnect the ECM connector.

Reference (Bank 1 Sensor 1 System Drawing)



NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

7 CHECK WHETHER MISFIRE IS OCCURRED OR NOT BY MONITORING DTC AND DATA LIST

NG → PERFORM TROUBLESHOOTING FOR MISFIRE (See page 05–156)

OK

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8	CHECK AIR INDUCTION SYSTEM

(a) Check for vacuum leaks in the air induction system.

NG → REPAIR OR REPLACE AIR INDUCTION SYSTEM

OK

9	CHECK FUEL PRESSURE (See page 11–35)

(a) Check the fuel pressure (high or low pressure).

NG → REPAIR OR REPLACE FUEL SYSTEM

OK

10	INSPECT FUEL INJECTOR ASSY(INJECTION AND VOLUME) (See page 11–37)

NG → REPLACE FUEL INJECTOR ASSY (See page 11–41)

OK

11	CHECK FOR EXHAUST GAS LEAKS

NG → REPAIR OR REPLACE EXHAUST GAS LEAKAGE POINT

OK

REPLACE HEATED OXYGEN SENSOR

12	PERFORM CONFIRMATION DRIVING PATTERN (See page 05–102)

HINT:
Clear all DTCs prior to performing the confirmation driving pattern.

GO

13	READ OUTPUT DTC(SEE IF DTC P0134 AND/OR P0154 ARE OUTPUT AGAIN)

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(c) Select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(d) Read the DTC using the hand–held tester or the OBD II scan tool.
Result:

Display (DTC output)	Proceed to
No output	A
P0134 and/or P0154	B

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B → REPLACE ECM (See page 10–24)

A

14	CONFIRM IF VEHICLE HAS RUN OUT OF FUEL IN PAST

NO → CHECK FOR INTERMITTENT PROBLEMS (See page 05–10)

YES

DTC IS CAUSED BY RUNNING OUT OF FUEL (DTC P0134 AND/OR P0154)

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DTC	P0136	OXYGEN SENSOR CIRCUIT MALFUNCTION (BANK 1 SENSOR 2)

DTC	P0156	OXYGEN SENSOR CIRCUIT MALFUNCTION (BANK 2 SENSOR 2)

CIRCUIT DESCRIPTION

Refer to DTC P0130 on page 05–102.

DTC No.	DTC Detection Condition	Trouble Area
P0136 P0156	The following condition (a) or (b) continues for 500 seconds or more: (a) During driving with the engine warmed up, heated oxygen sensor output does not change (b) Heated oxygen sensor output is very low most of the time	□Open or short in heated oxygen sensor circuit □Heated oxygen sensor (Bank 1, 2 Sensor 2) □Heated oxygen sensor heater (Bank 1, 2 Sensor 2) □EFI relay

HINT:

- □ Bank 1 refers to the bank that includes cylinder No.1.
- □ Bank 2 refers to the bank that does not include cylinder No.1.
- □ Sensor 2 refers to the sensor farthest away from the engine body.

MONITOR DESCRIPTION

The heated oxygen sensor generates waveform of the voltage between 0 V and 1 V in response to the oxygen concentration in the exhaust gases . When the output voltage of the heated oxygen sensor is 0.55 V or more, the ECM judges that the air–fuel ratio is RICH. When it is 0.40 V or less, the ECM judges that the air–fuel ratio is LEAN.

If the rear heated oxygen sensor output dose not change between RICH and LEAN during ”Stop and GO” driving, the ECM interprets this as malfunction in the sensor and sets a DTC. Also, if the sensor output remains at less than 0.05 V for more than 126 seconds (when ECM monitored the sensor for 210 seconds while the air–fuel feedback is being performed), the ECM will interpret this as a fault. In either case, the ECM will turn on the MIL and set a DTC.

MONITOR STRATEGY

Related DTCs	P0136: Heated oxygen sensor (Bank 1 Sensor 2) output voltage (Crack) P0136: Heated oxygen sensor (Bank 1 Sensor 2) output voltage P0156: Heated oxygen sensor (Bank 2 Sensor 2) output voltage (Crack) P0156: Heated oxygen sensor (Bank 2 Sensor 2) output voltage
Required sensors/ components (Main)	Heated oxygen sensor (Sensor 2)
Required sensors/ components (Related)	Mass air flow meter, vehicle speed sensor
Frequency of operation	Once per drive cycles
Duration	300 seconds
MIL operation	2 driving cycles
Sequence operation	None

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TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05–13

Case 1 (Output voltage (crack)):

Vehicle speed	2 mph (3 km/h) or more
Idle	OFF
Fuel cut	OFF
Time after fuel cut from ON to OFF	40 seconds
Intake air amount per revolution	0.7 g/rev or more

Case 2 (Output voltage):

All of the following conditions are met:	A, B, C and D
A. Pass/fail detection in this driving cycle	Not detected
B. Engine	Running
C. Time after engine start	0 second or more
D. Either of the following conditions is met:	(a) or (b)
(a) Cumulative time while heated oxygen sensor hearter is ON	22 seconds or more
(b) At once more heated oxygen sensor voltage	0.2 V or more

TYPICAL MALFUNCTION THRESHOLDS

Case 1 (Output voltage (crack)):

Following conditions are met:	A, B and C
A. Cumulative heated oxygen sensor monitor time	300 seconds or more
B. Time while heated oxygen sensor voltage is less than 0.05V	180 seconds or more
C. Maximum heated oxygen sensor rich time (0.45V or more)	Less than 20 seconds

Case 2 (Output voltage):

Number of heated oxygen sensor voltage "switching"	0 times or less
"Switching" is counted when the sensor signal alternates the minimum or maximum voltage	–
Minimum voltage	Less than 0.4 V
Maximum voltage	0.5 V or more

COMPONENT OPERATING RANGE

Heated oxygen sensor voltage	0 to 1 V

O2S TEST RESULT

Refer to page 05–19 for detailed information.

Rear O2S voltage monitor

If the O2S sensor voltage is out of the standard value, the ECM interprets this as a malfunction.

TEST ID	Description of TEST DATA	Conversion Factor	Unit
$07	The minimum voltage	N/A	V
$08	The maximum voltage	N/A	V
$31	Time to change from Lean (less than 0.4 V) to Rich (0.5 V or more)	N/A	second
$32	Time to change from Rich (0.5 V or more) to Lean (less than 0.4 V)	N/A	second

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Rear O2S element monitor

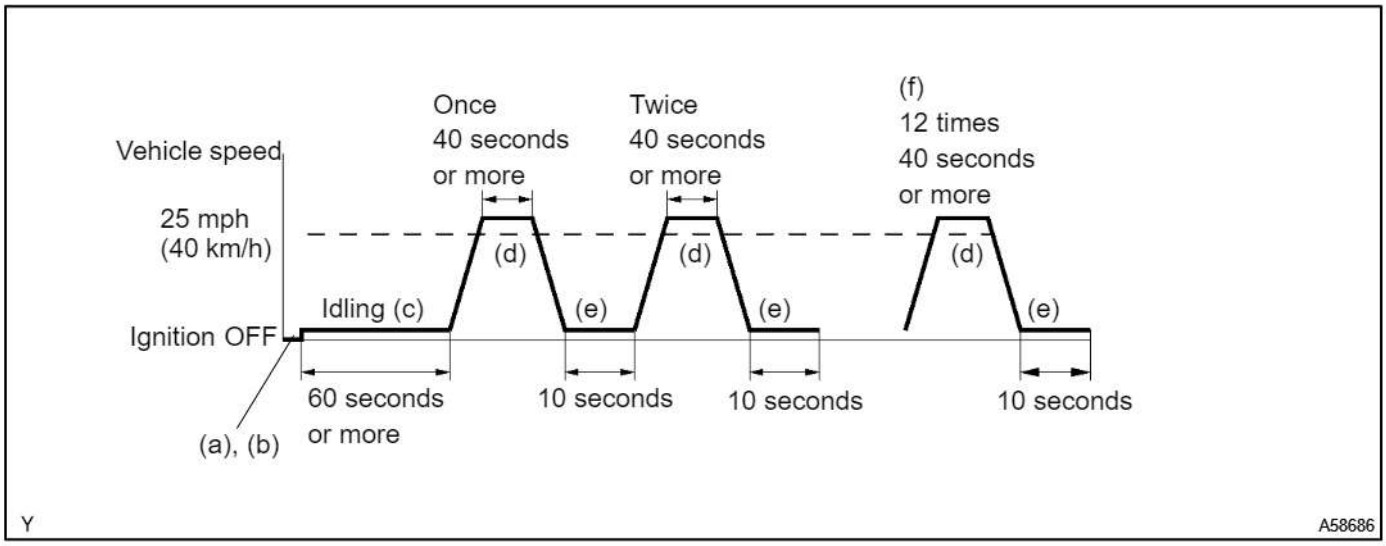
If all the values ($81, $84 $85 and $87) are out of the standard values, the ECM interprets this as a malfunction.

TEST ID	Description of TEST DATA	Conversion Factor	Unit
$81	Percentage of monitoring time when the HO2S voltage is less than 0.05V	Multiply 0.3906	%
$84	Percentage of monitoring time when the HO2S voltage is more than 0.7V	Multiply 0.3906	%
$85	Time when the HO2S voltage is 0.45V or more	Multiply 0.2621	second
$87	Percentage of monitoring time when the HO2S voltage is more than 0.45V	Multiply 0.3906	%

WIRING DIAGRAM

Refer to DTC P0130 on page 05–102.

CONFIRMATION DRIVING PATTERN



(a) Connect the hand–held tester to the DLC3.
(b) Switch the hand–held tester from normal mode to the check mode (see page 05–38).
(c) Start the engine and let it idle for 60 seconds or more.
(d) Drive the vehicle at 25 mph (40 km/h) or more for 40 seconds or more.
(e) Let the engine idle for 10 seconds or more.
(f) Perform steps (d) and (e) 12 times.

HINT:

If a malfunction exists, the MIL will be illuminated during step (f).

NOTICE:

If the conditions in this test are not strictly followed, no malfunction will be detected. If you do not have a hand–held tester, turn the ignition switch to OFF after performing steps from (c) to (f), then perform steps (c) to (f) again.

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INSPECTION PROCEDURE

HINT:

Hand–held tester only:

It is possible the malfunctioning area can be found using the ACTIVE TEST A/F CONTROL operation. The A/F CONTROL operation can determine if the A/F sensor, heated oxygen sensor or other potential trouble areas are malfunctioning or not.

(a) Perform the ACTIVE TEST A/F CONTROL operation.

HINT:

The A/F CONTROL operation lowers the injection volume 12.5% or increases the injection volume 25%.

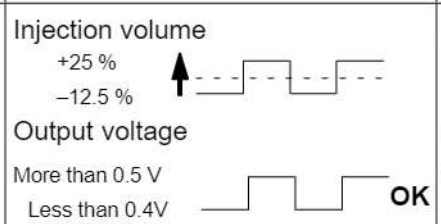
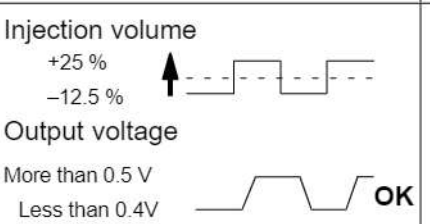
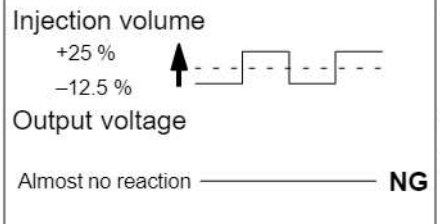
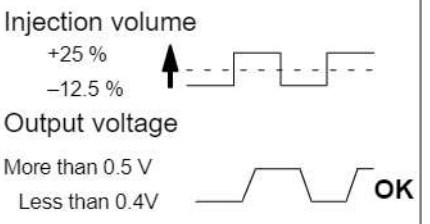
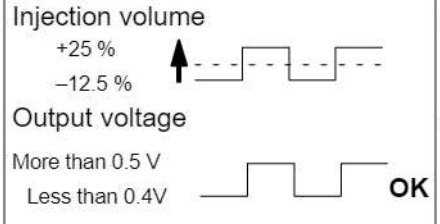
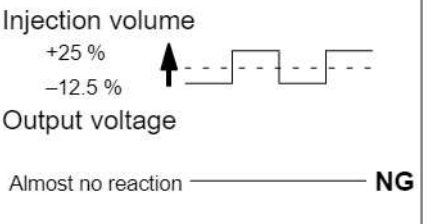
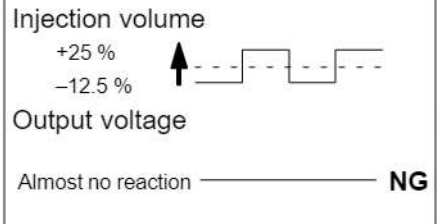
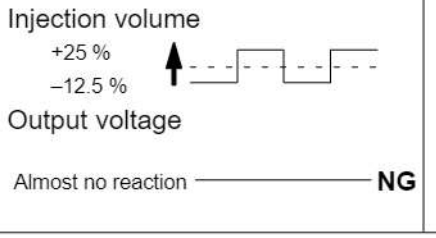
(1) Connect the hand–held tester to the DLC3 on the vehicle.
(2) Turn the ignition switch to ON.
(3) Warm up the engine by running the engine at 2,500 rpm for approximately 90 seconds.
(4) Select the item: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL.
(5) Perform the A/F CONTROL operation with the engine in an idle condition (press the right or left button).

Result:

Heated oxygen sensor reacts in accordance with increase and decrease of injection volume:
+25 % → rich output: More than 0.5 V
–12.5 % → lean output: Less than 0.4 V

NOTICE:

There is a delay of few seconds in the sensor 1 (front sensor) output, and there is about 20 seconds delay at maximum in the sensor 2 (rear sensor).

	Output voltage of heated oxygen sensor (sensor 1: front sensor)	Output voltage of heated oxygen sensor (sensor 2: rear sensor)	Main suspect trouble area
Case 1			□
Case 2			Sensor 1: front sensor (sensor 1, heater, sensor 1 circuit)
Case 3			Sensor 2: rear sensor (sensor 2, heater, sensor 2 circuit)
Case 4			Extremely rich or lean actual air–fuel ratio (Injector, fuel pressure, gas leakage in exhaust system, etc.)

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The following A/F CONTROL procedure enables the technician to check and graph the voltage outputs of both the heated oxygen sensor.
To display the graph, enter ACTIVE TEST/ A/F CONTROL/USER DATA, then select "O2S B1S1 and O2S B1S2" or "O2S B2S1 and O2S B2S2" by pressing the "YES" button followed by the "ENTER" button and then the "F4" button.

NOTICE:

If the vehicle is short of fuel, the air–fuel ratio becomes LEAN and heated oxygen sensor DTCs will be recorded, and the MIL then illuminates.

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may have an open circuit.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.
- A high heated oxygen sensor (sensor 1) voltage (0.5 V or more) could be caused by a rich air–fuel mixture. Check for conditions that would cause the engine to run rich.
- A low heated oxygen sensor (sensor 1) voltage (0.4 V or less) could be caused by a lean air–fuel mixture. Check for conditions that would cause the engine to run lean.

1	CHECK OTHER DTC OUTPUT(IN ADDITION TO DTC P0136 AND/OR P0156)

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(c) Select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(d) Read the DTC using the hand–held tester or the OBD II scan tool.

Result:

Display (DTC output)	Proceed to
P0136 and/or P0156	A
P0136 or P0156 and other DTCs	B

HINT:
If any other codes besides P0136 and/or P0156 are output, perform troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05–47)**

A

2	READ VALUE OF HAND–HELD TESTER OR OBD II SCAN TOOL(OUTPUT VOLTAGE OF HEATED OXYGEN SENSOR)

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Start the engine and turn the hand–held tester or the OBD II scan tool ON.
(c) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(d) After warming up the engine, run the engine at 2,500 rpm for 3 minutes.
(e) Read the output voltage of the heated oxygen sensor when the engine speed is suddenly increased.

HINT:
Quickly accelerate the engine to 4,000 rpm 3 times by using the accelerator pedal.

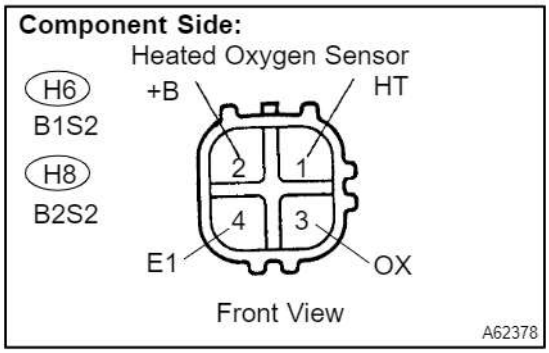
Heated oxygen sensor output voltage: Alternates from 0.4 V or less to 0.5 V or more.

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OK → Go to step 6

NG

3 INSPECT HEATED OXYGEN SENSOR(HEATER RESISTANCE)



(a) Disconnect the H6 or H8 heated oxygen sensor connector.

(b) Measure the resistance between the terminals of the heated oxygen sensor connector.

Standard (Bank 1, 2 sensor 2):

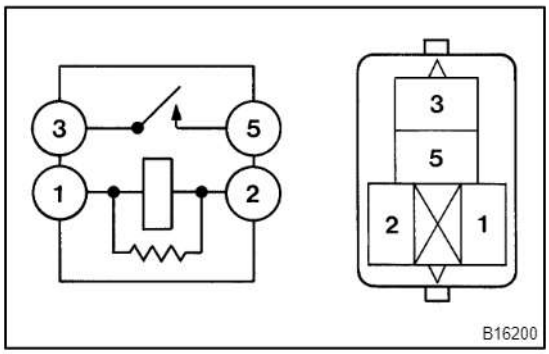
Tester Connection	Specified Condition
1 (HT) – 2 (+B)	11 to 16 Ω at 20 C (68 F)
1 (HT) – 4 (E1)	10 kΩ or higher

(c) Reconnect the heated oxygen sensor connector.

NG → REPLACE HEATED OXYGEN SENSOR

OK

4 INSPECT EFI RELAY



(a) Remove the EFI relay from the engine room R/B.

(b) Check for continuity in the EFI relay.

Standard:

Tester Connection	Specified Condition
1 – 2	Continuity
3 – 5	No continuity
3 – 5	Continuity (Apply battery voltage to terminals 1 and 2)

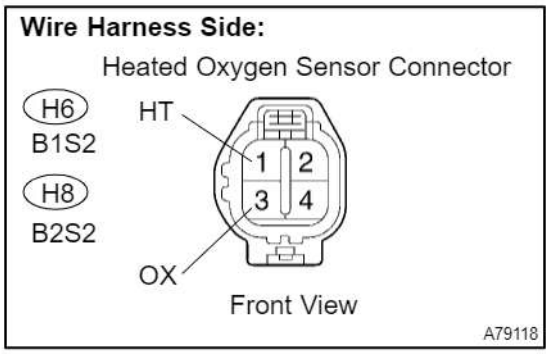
(c) Reinstall the EFI relay.

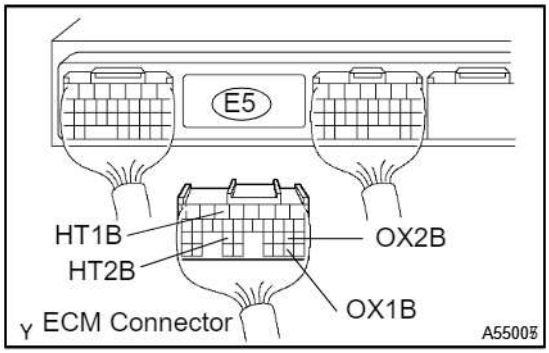
NG → REPLACE EFI RELAY

OK

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5 CHECK HARNESS AND CONNECTOR(HEATED OXYGEN SENSOR – ECM)





(a) Disconnect the H6 or H8 heated oxygen sensor connector.
(b) Disconnect the E5 ECM connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

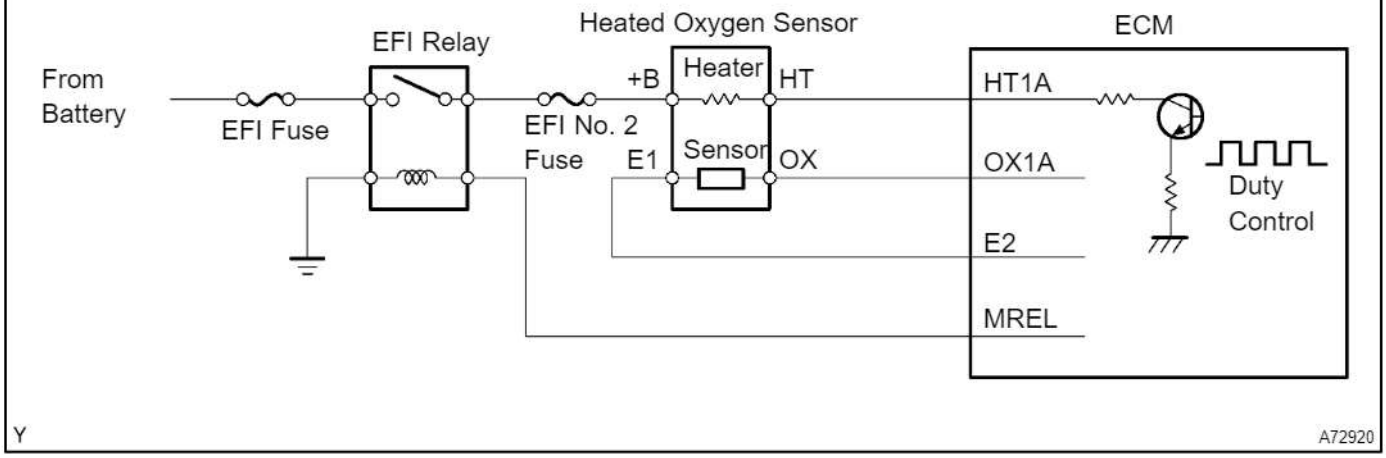
Tester Connection	Specified Condition
OX (H6–3) – OX1B (E5–29)	Below 1 Ω
HT (H6–1) – HT1B (E5–5)	
OX (H8–3) – OX2B (E5–21)	
HT (H8–1) – HT2B (E5–25)	

Standard (Check for short):

Tester Connection	Specified Condition
OX (H6–3) or OX1B (E5–29) – Body ground	10 kΩ or higher
HT (H6–1) or HT1B (E5–5) – Body ground	
OX (H8–3) or OX2B (E5–21) – Body ground	
HT (H8–1) or HT2B (E5–25) – Body ground	

(d) Reconnect the heated oxygen sensor connector.
(e) Reconnect the ECM connector.

Reference (Bank 1 Sensor 1 System Drawing)



NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE HEATED OXYGEN SENSOR

6 PERFORM CONFIRMATION DRIVING PATTERN

HINT:
Clear all DTCs prior to performing the confirmation driving pattern.

GO

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7	READ OUTPUT DTC(SEE IF DTC P0136 AND/OR P0156 ARE OUTPUT AGAIN)

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(c) Select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(d) Read the DTC using the hand–held tester or the OBD II scan tool.

Result:

Display (DTC output)	Proceed to
No output	A
P0136 and/or P0156	B

B → **REPLACE HEATED OXYGEN SENSOR**

A

CHECK FOR INTERMITTENT PROBLEMS (See page 05–10)

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DTC	P0171	SYSTEM TOO LEAN (BANK 1)

DTC	P0172	SYSTEM TOO RICH (BANK 1)

DTC	P0174	SYSTEM TOO LEAN (BANK 2)

DTC	P0175	SYSTEM TOO RICH (BANK 2)

CIRCUIT DESCRIPTION

The fuel trim is related to the feedback compensation value, not to the basic injection time. The fuel trim includes the short–term fuel trim and the long–term fuel trim.
The short–term fuel trim is the short–term fuel compensation used to maintain the air–fuel ratio at stoichiometric air–fuel ratio. The signal from the heated oxygen sensor indicates whether the air–fuel ratio is RICH or LEAN compared to the stoichiometric air–fuel ratio. This variance triggers a reduction in the fuel volume if the air–fuel ratio is RICH, and an increase in the fuel volume if it is LEAN.
The short–term fuel trim varies from the central value due to individual engine differences, wear over time and changes in operating environment. The long–term fuel trim, which controls overall fuel compensation, steadies long–term deviations of the short–term fuel trim from the central value.
If both the short–term fuel trim and the long–term fuel trim are LEAN or RICH beyond a certain value, it is detected as a malfunction and the MIL is illuminated and a DTC is set.

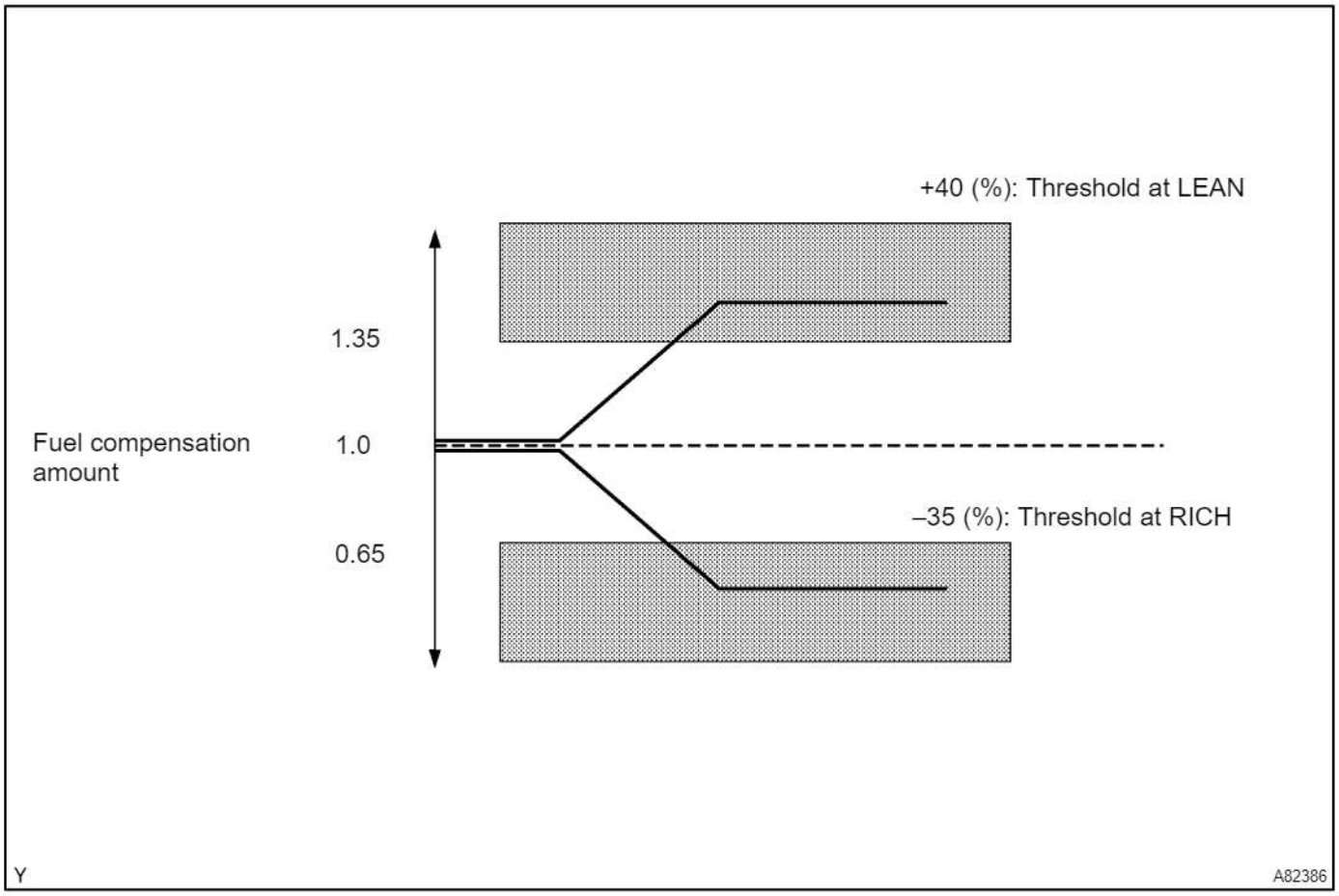
DTC No.	DTC Detection Condition	Trouble Area
P0171 P0174	When air–fuel ratio feedback is stable after warming up engine, fuel trim is considerably in error on LEAN side (2 trip detection logic)	Air induction system Injector blockage Mass air flow meter Engine coolant temperature sensor Fuel pressure Gas leakage in exhaust system Open or short in heated oxygen sensor circuit Heated oxygen sensor (Bank 1, 2 Sensor 1) Heated oxygen sensor heater (Bank 1, 2 Sensor 1) EFI relay PCV valve and hose PCV hose connection ECM
P0172 P0175	When air–fuel ratio feedback is stable after warming up engine, fuel trim is considerably in error on RICH side (2 trip detection logic)	Injector leakage or blockage Mass air flow meter Engine coolant temperature sensor Ignition system Fuel pressure Gas leakage in exhaust system Open or short in heated oxygen sensor circuit Heated oxygen sensor (Bank 1, 2 Sensor 1) ECM

HINT:

When DTC P0171 or P0174 is recorded, the actual air–fuel ratio is on the LEAN side. When DTC ”P0172 or P0175” is recorded, the actual air–fuel ratio is on the RICH side.
If the vehicle runs out of fuel, the air–fuel ratio is LEAN and DTC P0171 or P0174 may be recorded. The MIL then illuminates.
If the total of the short–term fuel trim value and long–term fuel trim value is within | 35 % (engine coolant temperature is more than 75℃ (167℉)), the system is functioning normally.

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MONITOR DESCRIPTION



Under closed–loop fuel control, fuel injection amounts that deviate from the ECM's estimated fuel amount will cause a change in the long–term fuel trim compensation value. This long–term fuel trim is adjusted when there are persistent deviations in the short–term fuel trim values. And the deviation from the simulated fuel injection amount by the ECM affects a smoothed fuel trim learning value. The smoothed fuel trim learning value is the combination of smoothed short–term fuel trim (fuel feedback compensation value) and smoothed long–term fuel trim (learning value of the air–fuel ratio). When the smoothed fuel trim learning value exceeds the DTC threshold, the ECM interprets this as a fault in the fuel system and sets a DTC.
Example:
The smoothed fuel trim leaning value is more than +40% or less than –35%. The ECM interprets this as a failure in the fuel system.

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MONITOR STRATEGY

Related DTCs	P0171: Fuel trim Lean (Bank 1) P0172: Fuel trim Rich (Bank 1) P0174: Fuel trim Lean (Bank 2) P0175: Fuel trim Rich (Bank 2)
Required sensors/ components (Main)	Heated oxygen sensor (Sensor 1)
Required sensors / components (Related)	Engine coolant temperature sensor, mass air flow meter, crankshaft position sensor
Frequency of operation	Continuous
Duration	10 seconds
MIL operation	2 driving cycles
Sequence operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05–13
Battery voltage	11 V or more
Fuel system: Closed loop	Closed Loop (for 13 seconds or more)
One of the following condition is met:	(a) or (b)
(a) Engine RPM	Less than 1,000 rpm
(b) Intake air amount per revolution	0.26 g/sec or more

TYPICAL MALFUNCTION THRESHOLDS

Fuel trim Lean:

Smoothed fuel trim learning value	40 % or more

Fuel trim Rich:

Smoothed fuel trim learning value	–35 % or less

WIRING DIAGRAM

Refer to DTC P0130 on page 05–102.

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INSPECTION PROCEDURE

HINT:

Hand–held tester only:

It is possible the malfunctioning area can be found using the ACTIVE TEST A/F CONTROL operation. The A/F CONTROL operation can determine if the A/F sensor, heated oxygen sensor or other potential trouble areas are malfunctioning or not.

(a) Perform the ACTIVE TEST A/F CONTROL operation.

HINT:

The A/F CONTROL operation lowers the injection volume 12.5% or increases the injection volume 25%.

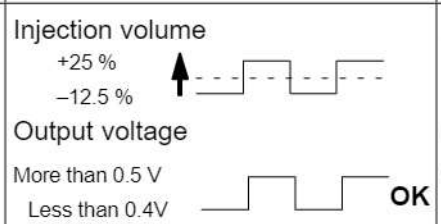
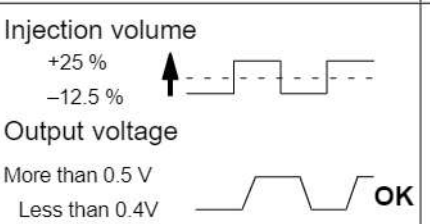
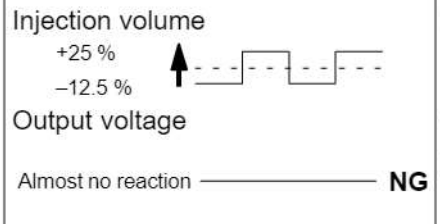
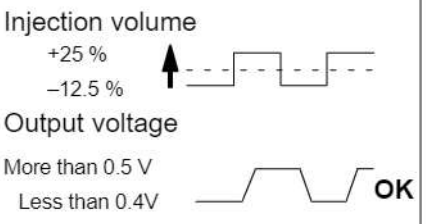
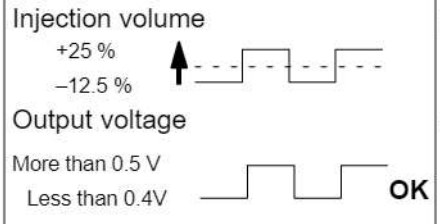
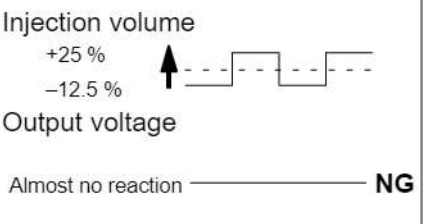
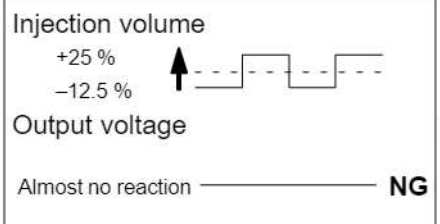
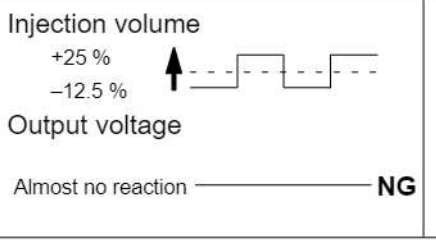
(1) Connect the hand–held tester to the DLC3 on the vehicle.
(2) Turn the ignition switch to ON.
(3) Warm up the engine by running the engine at 2,500 rpm for approximately 90 seconds.
(4) Select the item: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL.
(5) Perform the A/F CONTROL operation with the engine in an idle condition (press the right or left button).

Result:

Heated oxygen sensor reacts in accordance with increase and decrease of injection volume:
+25 % → rich output: More than 0.5 V
–12.5 % → lean output: Less than 0.4 V

NOTICE:

There is a delay of few seconds in the sensor 1 (front sensor) output, and there is about 20 seconds delay at maximum in the sensor 2 (rear sensor).

	Output voltage of heated oxygen sensor (sensor 1: front sensor)	Output voltage of heated oxygen sensor (sensor 2: rear sensor)	Main suspect trouble area
Case 1			□
Case 2			Sensor 1: front sensor (sensor 1, heater, sensor 1 circuit)
Case 3			Sensor 2: rear sensor (sensor 2, heater, sensor 2 circuit)
Case 4			Extremely rich or lean actual air–fuel ratio (Injector, fuel pressure, gas leakage in exhaust system, etc.)

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The following A/F CONTROL procedure enables the technician to check and graph the voltage outputs of both the heated oxygen sensor.
To display the graph, enter ACTIVE TEST/ A/F CONTROL/USER DATA, then select "O2S B1S1 and O2S B1S2" or "O2S B2S1 and O2S B2S2" by pressing the "YES" button followed by the "ENTER" button and then the "F4" button.

NOTICE:

If the vehicle is short of fuel, the air–fuel ratio becomes LEAN and heated oxygen sensor DTCs will be recorded, and the MIL then illuminates.

HINT:

If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may have an open circuit.

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

A high heated oxygen sensor (sensor 1) voltage (0.5 V or more) could be caused by a rich air–fuel mixture. Check for conditions that would cause the engine to run rich.

A low heated oxygen sensor (sensor 1) voltage (0.4 V or less) could be caused by a lean air–fuel mixture. Check for conditions that would cause the engine to run lean.

1	CHECK AIR INDUCTION SYSTEM

(a) Check for vacuum leaks in the air induction system.

NG → REPAIR OR REPLACE AIR INDUCTION SYSTEM

OK

2	CHECK CONNECTION OF PCV HOSE

NG → REPAIR OR REPLACE PCV HOSE

OK

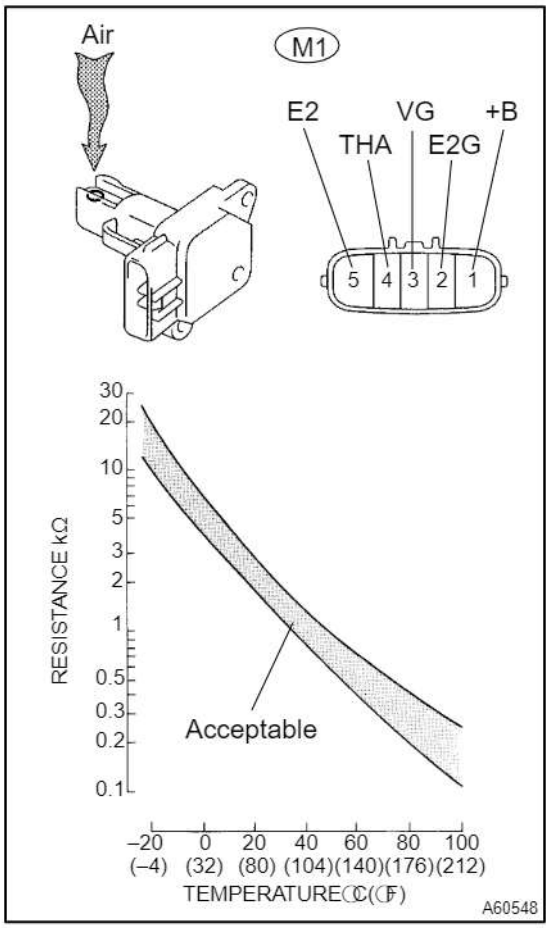
3	INSPECT FUEL INJECTOR ASSY(INJECTION AND VOLUME) (See page 11–37)

NG → REPLACE FUEL INJECTOR ASSY

OK

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4 INSPECT MASS AIR FLOW METER



(a) Remove the mass air flow meter.
(b) Output voltage inspection.
  (1) Apply battery voltage across terminals +B and E2G.
  (2) Connect the positive (+) tester prove to terminal VG, and negative (–) tester prove to terminal E2G.
  (3) Blow air into the mass air flow meter, and check that the voltage fluctuates.
(c) Resistance inspection.
  (1) Measure the resistance between the terminals of the intake air temperature sensor.

Standard:

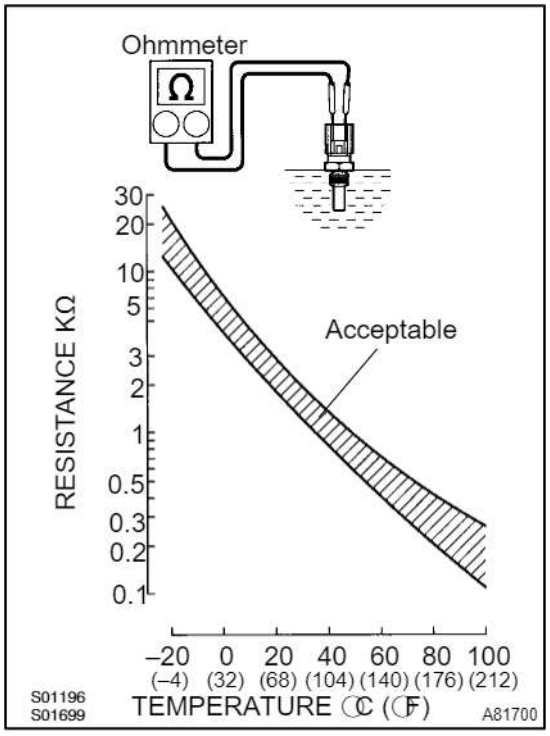
Tester Connection	Temperature	Specified Condition
THA (M1–4) – E2 (M1–1)	–20 ℃ (–4 ℉)	12.5 to 16.9 kΩ
THA (M1–4) – E2 (M1–1)	20 ℃ (68 ℉)	2.19 to 2.67 kΩ
THA (M1–4) – E2 (M1–1)	60 ℃ (140 ℉)	0.50 to 0.68 kΩ

(d) Reinstall the mass air flow meter.

NG → **REPLACE MASS AIR FLOW METER**

OK

5 INSPECT ENGINE COOLANT TEMPERATURE SENSOR(RESISTANCE)



(a) Remove the engine coolant temperature sensor.
(b) Measure the resistance between the terminals of the engine coolant temperature sensor.

Resistance:

Tester Connection	Temperature	Specified Condition
1 – 2	20℃ (68℉)	2.32 to 2.59 kΩ
1 – 2	80℃ (176℉)	0.310 to 0.326 kΩ

NOTICE:

When checking the engine coolant temperature sensor in water, be careful not to allow water to contact the terminals. After checking, dry the sensor.

HINT:

Alternate procedure: Connect an ohmmeter to the installed engine coolant temperature sensor and read the resistance. Use an infrared thermometer to measure the engine temperature in the immediate vicinity of the sensor. Compare these values to the resistance/temperature graph. Change the engine temperature (warm up or allow to cool down) and repeat the test.

(c) Reinstall the engine coolant temperature sensor.

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NG → REPLACE ENGINE COOLANT TEMPERATURE SENSOR

OK

6	CHECK FOR SPARK AND IGNITION (See page 11–35)

NG → REPAIR OR REPLACE

OK

7	CHECK FUEL PRESSURE (See page 11–35)

(a) Check the fuel pressure (high or low pressure).

NG → CHECK AND REPLACE FUEL SYSTEM

OK

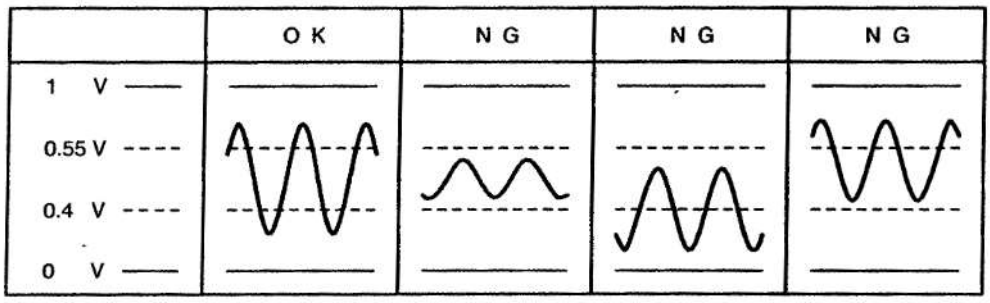
8	CHECK FOR EXHAUST GAS LEAKAGE

NG → REPAIR OR REPLACE EXHAUST GAS LEAKAGE POINT

OK

9	READ VALUE OF HAND–HELD TESTER OR OBD II SCAN TOOL(OUTPUT VOLTAGE OF HEATED OXYGEN SENSOR (BANK 1, 2 SENSOR 1))

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Start the engine and turn the hand–held tester or the OBD II scan tool ON.
(c) Select the item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / O2S B1S1.
(d) Warm up the heated oxygen sensor with the engine speed at 2,500 rpm for approximately 90 seconds.
(e) Read the output voltage of the heated oxygen sensor during idling.
Heated oxygen sensor output voltage:
Alternates between less than 0.4 V and more than 0.55 V (See the following table).



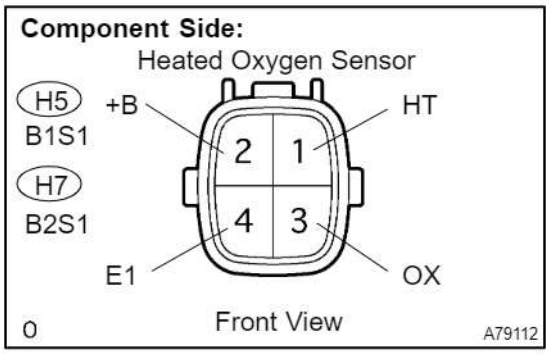
P18349

OK → Go to step 17

NG

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10 INSPECT HEATED OXYGEN SENSOR(HEATER RESISTANCE)



(a) Disconnect the H5 or H7 heated oxygen sensor connector.

(b) Measure the resistance between the terminals of the heated oxygen sensor connector.

Standard (Bank 1, 2 sensor 1):

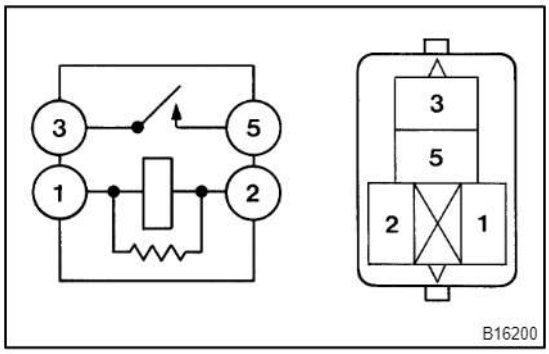
Tester Connection	Specified Condition
1 (HT) – 2 (+B)	11 to 16 Ω at 20 ℃ (68 ℉)
1 (HT) – 4 (E1)	10 kΩ or higher

(c) Reconnect the heated oxygen sensor connector.

NG → **REPLACE HEATED OXYGEN SENSOR**

OK

11 INSPECT EFI RELAY



(a) Remove the EFI relay from the engine room R/B.

(b) Check for continuity in the EFI relay.

Standard:

Tester Connection	Specified Condition
1 – 2	Continuity
3 – 5	No continuity
3 – 5	Continuity (Apply battery voltage to terminals 1 and 2)

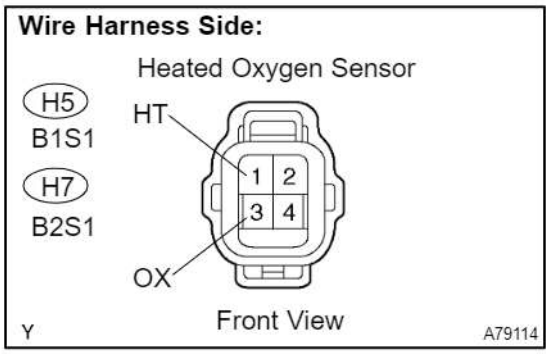
(c) Reinstall the EFI relay.

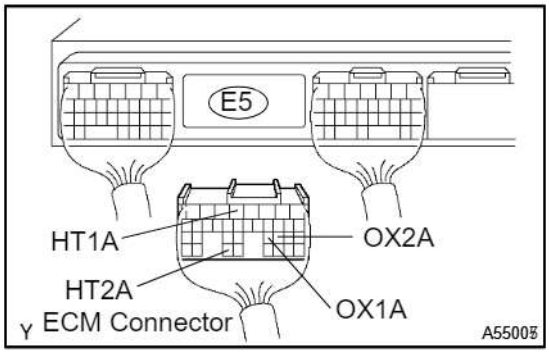
NG → **REPLACE EFI RELAY**

OK

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12 CHECK HARNESS AND CONNECTOR(HEATED OXYGEN SENSOR – ECM)





(a) Disconnect the H5 or H7 heated oxygen sensor connector.

(b) Disconnect the E5 ECM connector.

(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
OX (H5–3) – OX1A (E5–23)	Below 1 Ω
HT (H5–1) – HT1A (E5–4)	Below 1 Ω
OX (H7–3) – OX2A (E5–22)	Below 1 Ω
HT (H7–1) – HT2A (E5–33)	Below 1 Ω

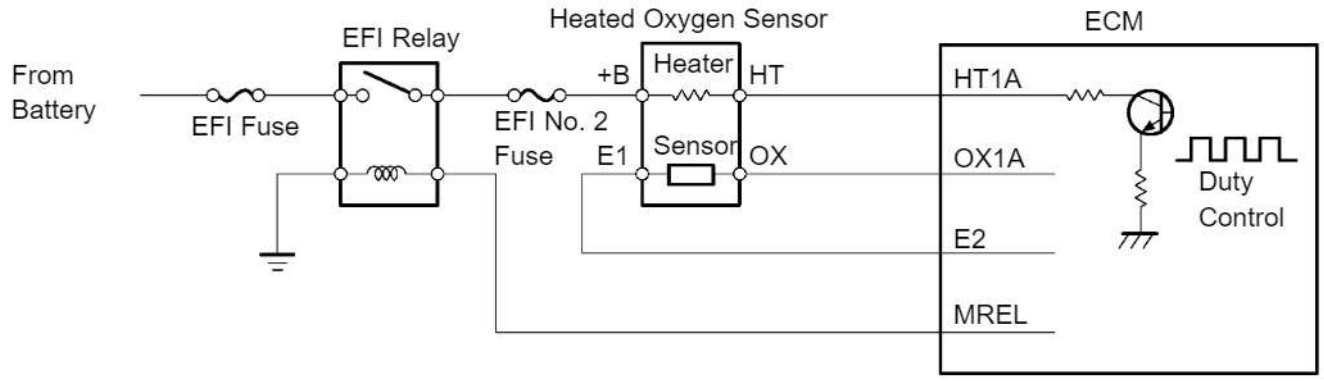
Standard (Check for short):

Tester Connection	Specified Condition
OX (H5–3) or OX1A (E5–23) – Body ground	10 kΩ or higher
HT (H5–1) or HT1A (E5–4) – Body ground	10 kΩ or higher
OX (H7–3) or OX2A (E5–22) – Body ground	10 kΩ or higher
HT (H7–1) or HT2A (E5–33) – Body ground	10 kΩ or higher

(d) Reconnect the heated oxygen sensor connector.

(e) Reconnect the ECM connector.

Reference (Bank 1 Sensor 1 System Drawing)



NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

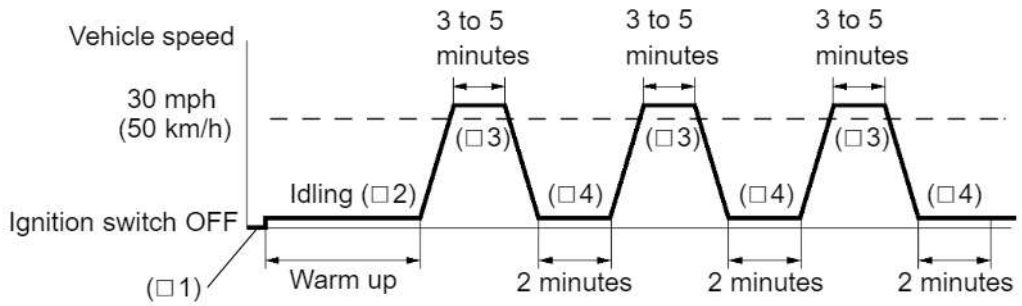
OK

13 REPLACE HEATED OXYGEN SENSOR

GO

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14	PERFORM CONFIRMATION DRIVING PATTERN



(a) Disconnect the battery cable for more than 1 minute (clear learning value of the air fuel ratio). (□1)
(b) Connect the hand–held tester to the DLC3. (□1)
(c) Switch the hand–held tester from normal mode to check mode (see page 05–38). (□1)
(d) Start the engine and let it idle until engine coolant temperature reaches 75 °C (167 °F) or higher. (□2)
(e) Drive the vehicle at 30 mph (50 km/h) or more for 3 minutes or more. (□3)
(f) Let the engine idle for approximately 2minutes. (□4)
(g) Perform step (e) and (f) at least 3 times.

HINT:

If a malfunction exists, the MIL will be illuminated during step (g).

NOTICE:

If the conditions in this test are not strictly followed, no malfunction will be detected.

If you do not have the hand–held tester, turn the ignition switch to OFF after performing steps from (d) to (g), then perform steps (d) to (g) again.

GO

15	READ OUTPUT DTC(SEE IF DTC P0171, P0172, P0174 AND/OR P0175 ARE OUTPUT AGAIN)

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(c) Select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(d) Read the DTC using the hand–held tester or the OBD II scan tool.

Result:

Display (DTC output)	Proceed to
No output	A
P0171, P0172, P0174 and/or P0175	B

B → **REPLACE ECM (See page 10–24) AND PERFORM CONFIRMATION DRIVING PATTERN (See step 14)**

A

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16	CONFIRM IF VEHICLE HAS RUN OUT OF FUEL IN PAST

NO → CHECK FOR INTERMITTENT PROBLEMS (See page 05–10)

YES

DTC IS CAUSED BY RUNNING OUT OF FUEL (DTCS P0171, P0172, P0174 AND/OR P0175)

17	PERFORM CONFIRMATION DRIVING PATTERN (See step 14)

HINT:
Clear all DTCs prior to performing the confirmation driving pattern.

GO

18	READ OUTPUT DTC(SEE IF DTC P0171, P0172, P0174 AND/OR P0175 ARE OUTPUT AGAIN)

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(c) Select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(d) Read the DTC using the hand–held tester or the OBD II scan tool.
Result:

Display (DTC output)	Proceed to
P0171, P0172, P0174 and/or P0175	A
No output	B

B → Go to step 22

A

19	REPLACE HEATED OXYGEN SENSOR

GO

20	PERFORM CONFIRMATION DRIVING PATTERN (See step 14)

HINT:
Clear all DTCs prior to performing the confirmation driving pattern.

GO

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21	READ OUTPUT DTC(SEE IF DTC P0171, P0172, P0174 AND/OR P0175 ARE OUTPUT AGAIN)

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(c) Select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(d) Read the DTC using the hand–held tester or the OBD II scan tool.

Result:

Display (DTC output)	Proceed to
No output	A
P0171, P0172, P0174 and/or P0175	B

B → **REPLACE ECM (See page 10–24) AND PERFORM CONFIRMATION DRIVING PATTERN (See step 14)**

A

22	CONFIRM IF VEHICLE HAS RUN OUT OF FUEL IN PAST

NO → **CHECK FOR INTERMITTENT PROBLEMS (See page 05–10)**

YES

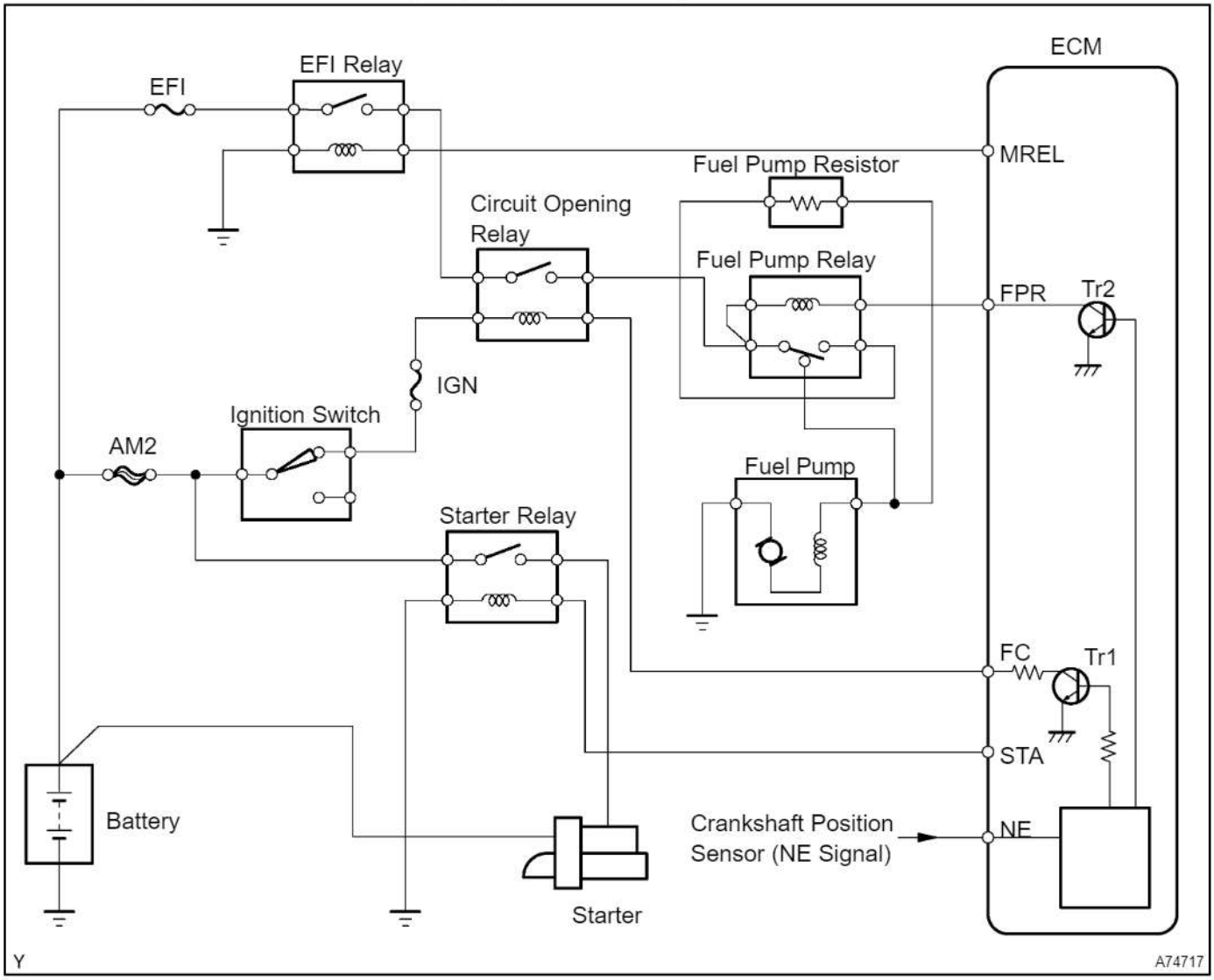
DTC IS CAUSED BY RUNNING OUT OF FUEL (DTCS P0171, P0172, P0174 AND/OR P0175)

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DTC P0230 FUEL PUMP PRIMARY CIRCUIT

CIRCUIT DESCRIPTION

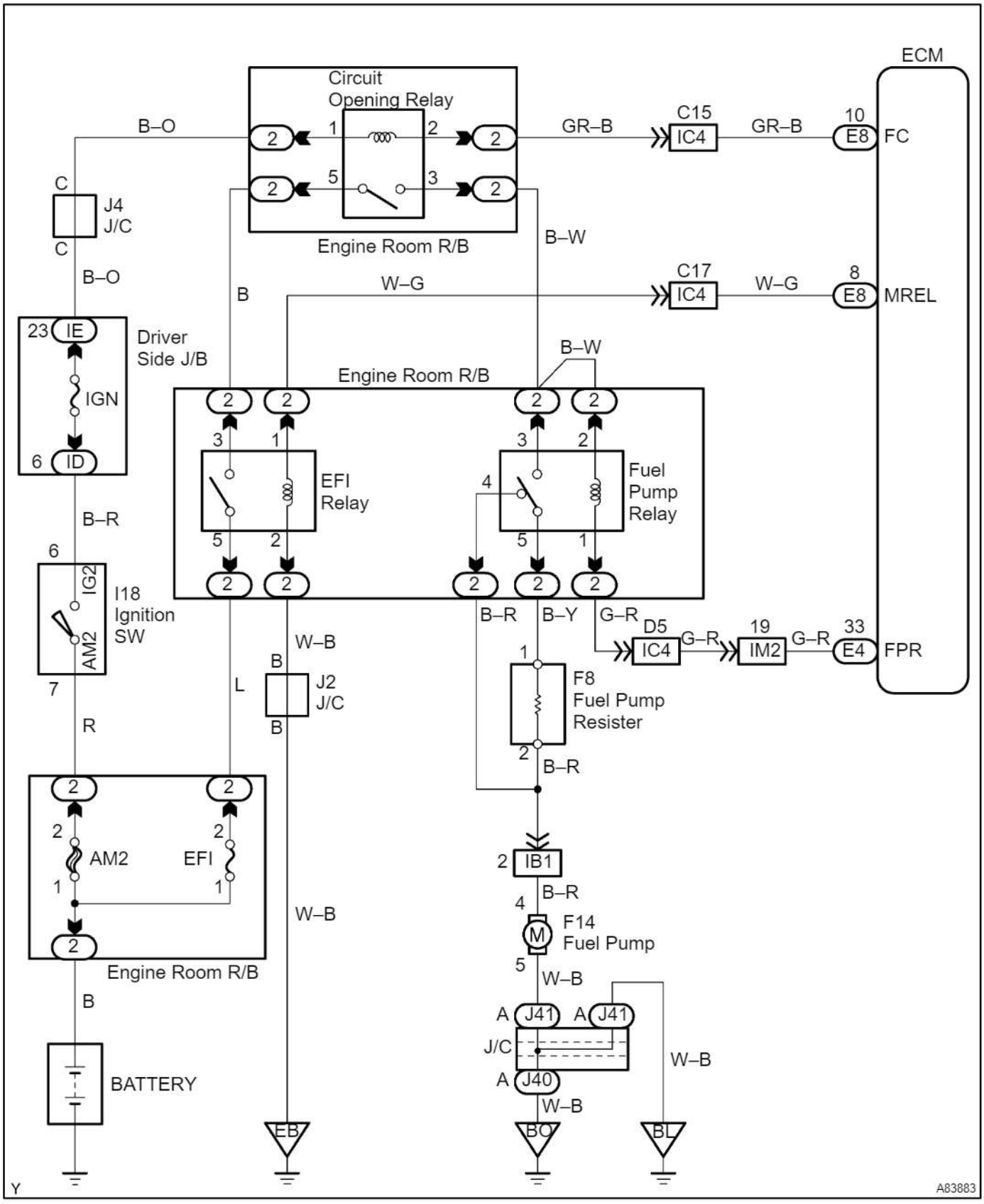
In the diagram below, when the engine is cranked, current flows from terminal STAR of the ECM to the starter relay coil and also current flows to terminal STA of the ECM (STA signal).
When the STA signal and NE signal are input to the ECM, the Tr1 is turned ON, current flows to the coil of the circuit opening relay, the relay switches on, power is supplied to the fuel pump, and the fuel pump operates.
While the NE signal is generated (engine running), the ECM keeps the Tr1 ON (circuit opening relay ON) and the fuel pump also keeps operating.
The fuel pump speed is controlled at two levels (high speed or low speed) by the engine condition (starting, light load, heavy load). When the engine starts (STA ON), the Tr2 in the ECM is OFF, so the fuel pump relay closes and battery positive voltage is applied directly to the fuel pump. The fuel pump operates at high speed. After the engine starts during idling or light loads, since the Tr2 goes ON, power is supplied to the fuel pump via the fuel pump resistor. The fuel pump operates at low speed.



DTC No.	DTC Detection Condition	Trouble Area
P0230	Open or short in fuel pump relay circuit	□Open or short in fuel pump relay circuit □Fuel pump relay □ECM

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WIRING DIAGRAM



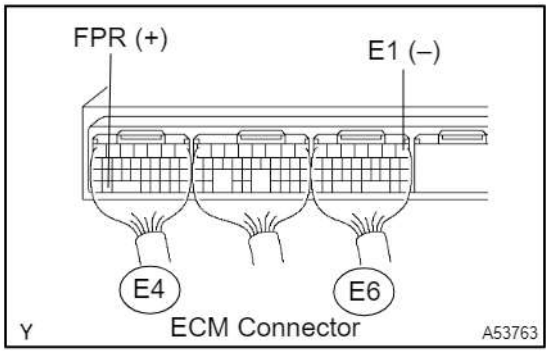
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HINT:
This DTC chart is on the premise that the engine is started. If the engine is not started, proceed to the problem symptoms table on 05–29.

INSPECTION PROCEDURE

HINT:
Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1 INSPECT ECM(FPR VOLTAGE)



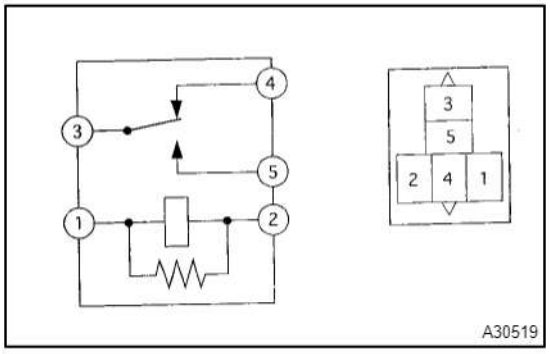
(a) Measure the voltage between the terminals of the E4 and E6 ECM connectors.
Standard:

Tester Connection	Condition	Specified Condition
FPR (E4–33) – E1 (E6–1)	STA signal ON	9 to 14 V
FPR (E4–33) – E1 (E6–1)	STA signal OFF	0 to 3 V

OK → **REPLACE ECM (See page 10–24)**

NG

2 INSPECT FUEL PUMP RELAY ASSY



(a) Remove the fuel pump relay from the engine room R/B.
(b) Check for continuity in the fuel pump relay.
Standard:

Tester Connection	Specified Condition
1 – 2 3 – 4	Continuity
3 – 5	No continuity
3 – 5	Continuity (Apply battery voltage to terminals 1 and 2)

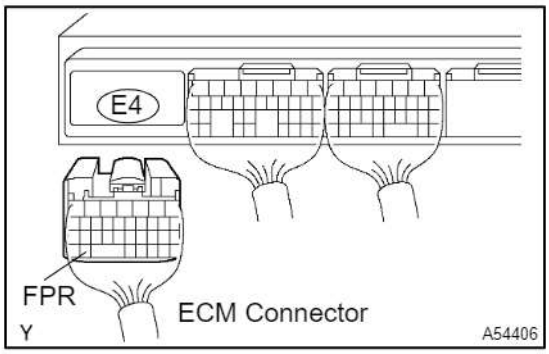
(c) Reinstall the fuel pump relay.

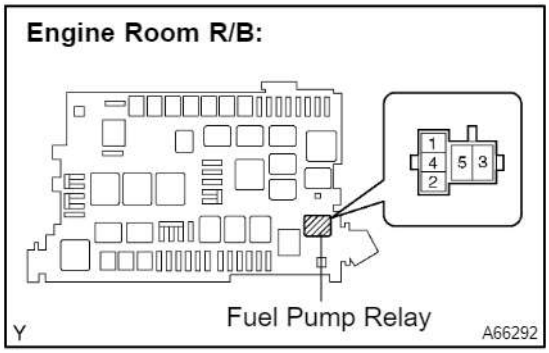
NG → **REPLACE FUEL PUMP RELAY ASSY**

OK

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3 CHECK HARNESS AND CONNECTOR(FUEL PUMP RELAY – ECM)





(a) Remove the fuel pump relay from the engine room R/B.
(b) Disconnect the E4 ECM connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Engine room R/B (Fuel pump relay terminal 1) – FPR (E4–33)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
Engine room R/B (Fuel pump relay terminal 1) or FPR (E4–33) – Body ground	10 kΩ or higher

(d) Reinstall the fuel pump relay.
(e) Reconnect the ECM connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM (See page 10–24)

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DTC	P0300	RANDOM/MULTIPLE CYLINDER MISFIRE DETECTED

DTC	P0301	CYLINDER 1 MISFIRE DETECTED

DTC	P0302	CYLINDER 2 MISFIRE DETECTED

DTC	P0303	CYLINDER 3 MISFIRE DETECTED

DTC	P0304	CYLINDER 4 MISFIRE DETECTED

DTC	P0305	CYLINDER 5 MISFIRE DETECTED

DTC	P0306	CYLINDER 6 MISFIRE DETECTED

DTC	P0307	CYLINDER 7 MISFIRE DETECTED

DTC	P0308	CYLINDER 8 MISFIRE DETECTED

CIRCUIT DESCRIPTION

When a misfire occurs in the engine, hydrocarbons (HC) enter the exhaust in high concentrations. If this HC concentration is high enough, there could be an increase in exhaust emissions levels. High concentrations of HC can also cause to temperature of the catalyst to increase, possibly damaging the catalyst. To prevent this increase in emissions and limit the possibility of thermal damage, the ECM monitors the misfire rate. When the temperature of the catalyst reaches a point of thermal degradation, the ECM will blink the MIL. For monitoring misfire, the ECM uses both the camshaft position sensor and the crankshaft position sensor. The camshaft position sensor is used to identify misfiring cylinders and the crankshaft position sensor is used to measure variations in the crankshaft rotation speed. The misfire counter increments when crankshaft rotation speed variations exceed threshold values.

If the misfiring rate exceeds the threshold value and could cause emissions deterioration, the ECM illuminates the MIL.

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DTC No.	DTC Detection Condition	Trouble Area
P0300	Misfiring of random cylinders is detected	□Open or short in engine wire haness □Connector connection □Vacuum hose connection □Ignition system □Injector □Fuel pressure □Mass air flow meter □Engine coolant temperature sensor □Compression pressure □Valve clearance □Valve timing □PCV hose connection □PCV hose □ECM
P0301 P0302 P0303 P0304 P0305 P0306 P0307 P0308	Misfiring of each cylinder is detected	□Open or short in engine wire haness □Connector connection □Vacuum hose connection □Ignition system □Injector □Fuel pressure □Mass air flow meter □Engine coolant temperature sensor □Compression pressure □Valve clearance □Valve timing □PCV hose connection □PCV hose □ECM

HINT:

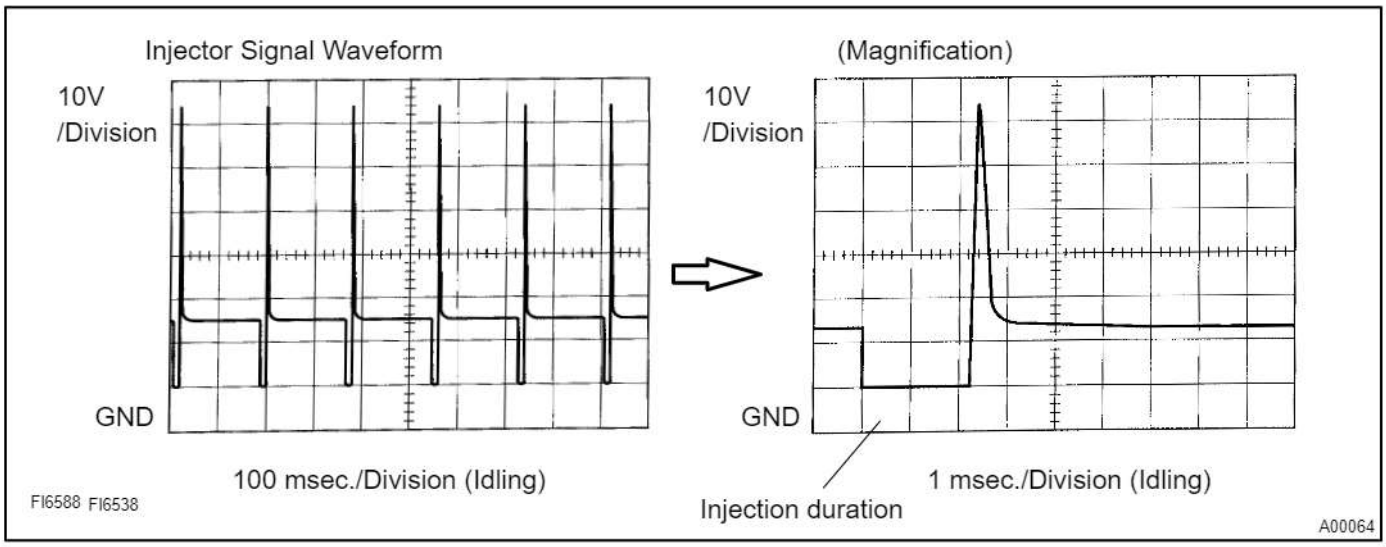
When several DTCs for a misfiring cylinder are recorded repeatedly but no random misfire code is recorded, it indicates that the misfires have been detected and recorded at different times.

Reference: Inspection using oscilloscope

With the engine idling, check the waveform between terminals #1 to #8 and E01 of the ECM connectors.

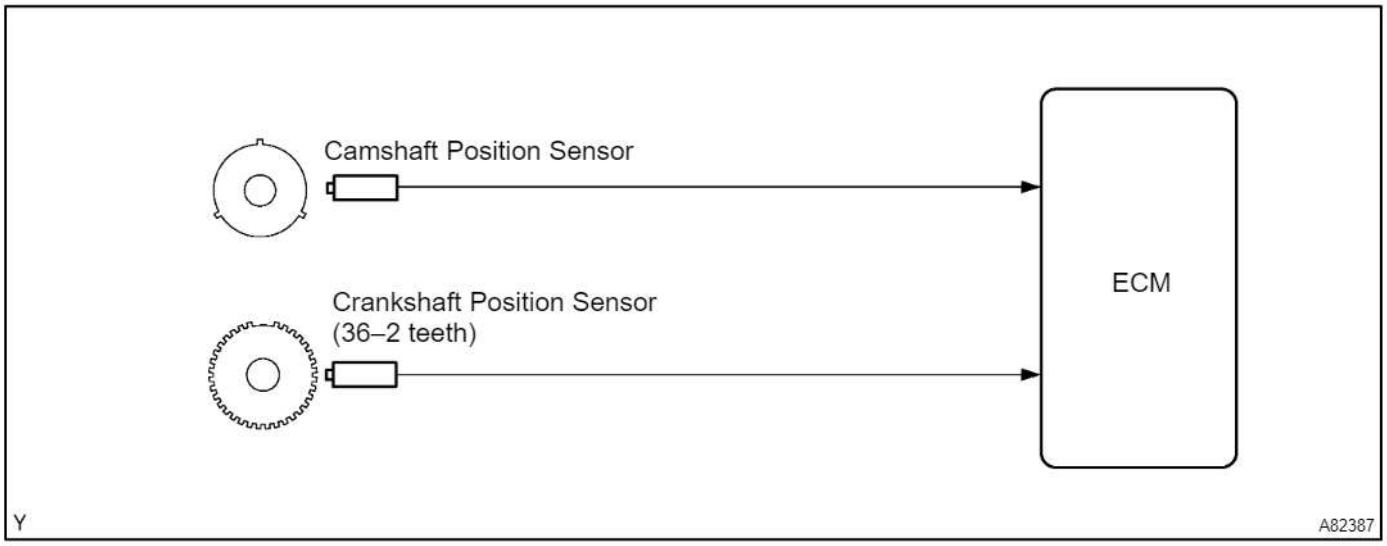
HINT:

The correct waveform is as shown.



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MONITOR DESCRIPTION



The ECM illuminates the MIL (2 trip detection logic) if:

- The ECM will illuminate the MIL when the percent misfire exceeds the specified limit per 1,000 engine revolutions. One occurrence of excessive misfire during engine start will set the MIL. Four occurrences are required to set the MIL 1,000 revolutions after engine start.

The ECM blinks the MIL (MIL blinks immediately) if:

- Within 200 engine revolutions at a high rpm, the threshold for "percent of misfire causing catalyst damage" is reached 1 time.
- Within 200 engine revolutions at a normal rpm, the threshold for "percent of misfire causing catalyst damage" is reached 3 times.

MONITOR STRATEGY

Related DTCs	P0300: Random/Multiple cylinder misfire detected P0301: Cylinder 1 misfire detected P0302: Cylinder 2 misfire detected P0303: Cylinder 3 misfire detected P0304: Cylinder 4 misfire detected P0305: Cylinder 5 misfire detected P0306: Cylinder 6 misfire detected P0307: Cylinder 7 misfire detected P0308: Cylinder 8 misfire detected
Required sensors/ components (Main)	Camshaft position sensor, Crankshaft position sensor
Required sensors / components (Related)	Engine coolant temperature sensor, Intake air temperature sensor, Throttle position sensor
Frequency of operation	Continuous
Duration	Every 1,000 revolutions (soon after engine is started: 1 time, other 4 times) (emission related misfire) Every 200 revolutions (1 or 3 times) (catalyst deteriorating misfire)
MIL operation	2 driving cycles MIL ON Immediate MIL blinking (Catalyst deteriorating misfire)
Sequence operation	None

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TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05–13
Battery voltage	8 V or more
VVT system	Normal operation (i. e. not under scan–tool control)
Engine speed fluctuation	Engine speed should not have changed rapidly
Engine RPM (Two full revolutions (2 revolutions) after engine has started)	400 to 5,300 rpm
All of the following conditions are met:	A, B and C
A. Engine coolant temperature	–10 C (14 F) or more
B. Either of the following conditions is met:	(a) or (b)
(a) Intake air temperature	–10 C (14 F) or more
(b) Engine coolant temperature	Less than 75 C (167 F)
C. Either of the following conditions is met:	(a) or (b)
(a) Engine coolant temperature at engine start	More than–7 C (19 F)
(b) Engine coolant temperature	More than20 C (68 F)
Intake air amount per revolution (varies with engine speed)	0.4 g/rev or more
Throttle position learning	Completed
Throttle position	Rapid throttle opening or closing operation has not occurred
Throttle position	Changing value of throttle position Less than 0.5 per 0.008 second
Rough road counter	14 times/1,000 revolutions (Not running on rough road)

TYPICAL MALFUNCTION THRESHOLDS

Emission related misfire rate:

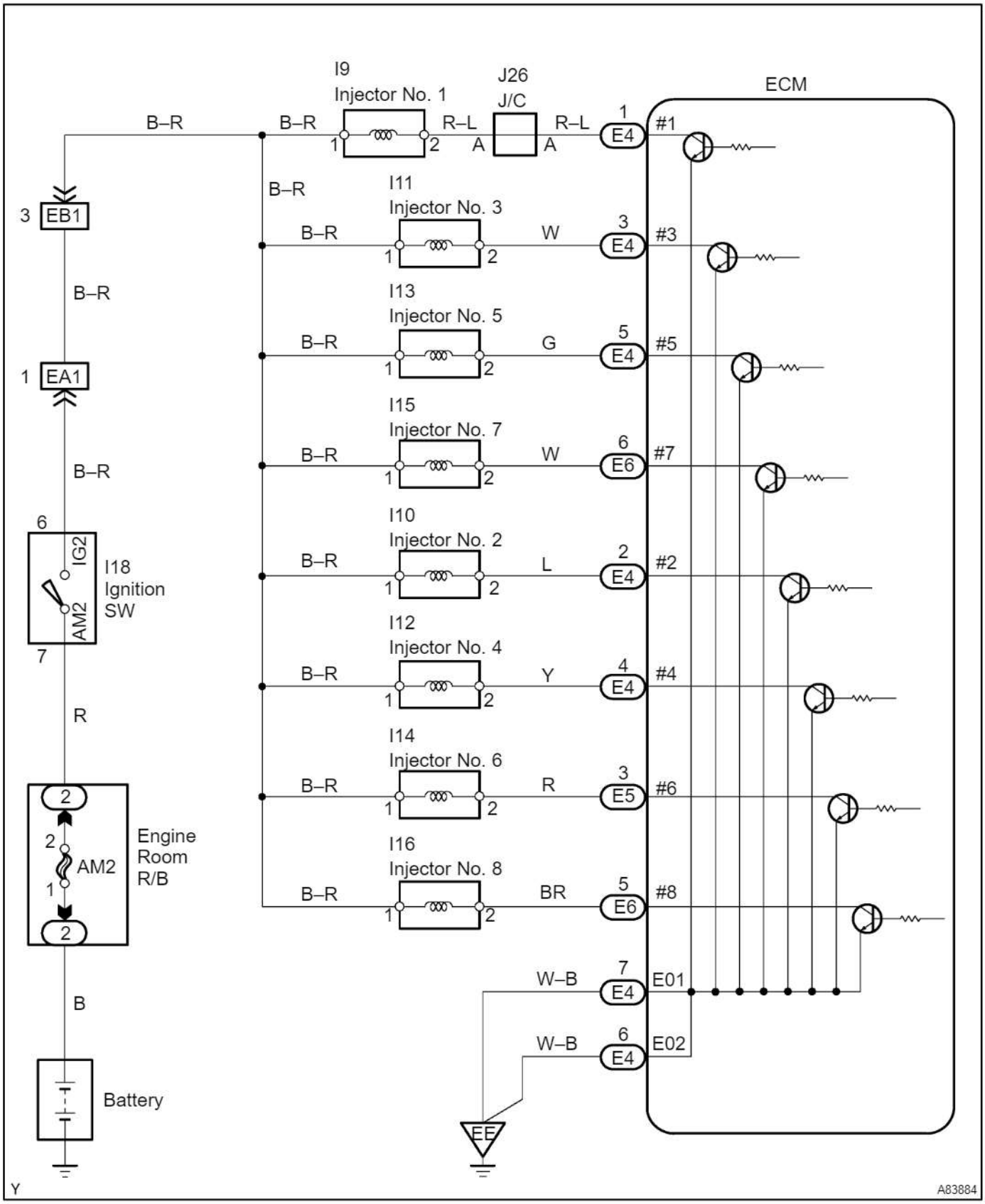
Emission related misfire rate: 1. During the first 1,000 revolutions after engine start (MIL is set when misfire is detected 1 time) 2. After the first 1,000 revolutions have occurred (MIL is set when misfire is detected 4 times)	2 %/1,000 revolutions

Catalyst damage misfire rate:

Catalyst damage misfire count: 1. Low engine rpm area (ex. less than 3,000 rpm): 200 revolutions (MIL is set when misfire is detected 3 times) 2. High engine rpm area: Every 200 revolutions	85 count/200 revolutions (Threshold varies with engine speed and intake air amount per revolution)

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WIRING DIAGRAM



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CONFIRMATION DRIVING PATTERN

(a) Connect the hand–held tester to the DLC3.
(b) Record DTC and the freeze frame data.
(c) Swtitch the hand–held tester from normal mode to check mode (see page 05–38).
(d) Read the value on the misfire counter for each cylinder when idling. If the value is displayed on the misfire counter, skip the following procedure of confirmation driving.
(e) Drive the vehicle several times with the engine speed, load and its surrounding range shown with ENGINE SPD, CALC LOAD in the freeze frame data or MISFIRE RPM, MISFIRE LOAD in the data list.

If you have no hand–held tester, turn the ignition switch OFF after the symptom is simulated once. Then repeat the simulation process again.

HINT:

In order to memorize the misfire DTC, it is necessary to drive with MISFIRE RPM, MISFIRE LOAD in the DATA LIST for the period of time in the chart below. Take care not to turn the ignition switch to OFF. Turning the ignition switch OFF switches the diagnosis system from check mode to normal mode and all DTCs, freeze frame data and other data are erased.

Engine Speed	Time
Idling	3 minutes 30 seconds or more
1,000 rpm	3 minutes or more
2,000 rpm	1 minute 30 seconds or more
3,000 rpm	1 minute or more

(f) Check if there is misfire and DTC and the freeze frame data. Record the DTC's, freeze frame data and misfire counter data.
(g) Turn the ignition switch OFF and wait for at least 5 seconds.

INSPECTION PROCEDURE

HINT:

- If DTCs besides misfire DTCs are memorized simultaneously, troubleshoot the non–misfire DTCs first.
- Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.
- If the misfire does not occur when the vehicle is brought to the workshop, the misfire can be confirmed by reproducing the condition of the freeze frame data. Also, after finishing the repair, confirm that there is no misfire (See confirmation driving pattern).
- On 6 and 8 cylinder engines, misfiring cylinder identification is disabled at high engine speed and only a general misfire fault code P0300 is stored instead of a cylinder specific misfire fault code (P0301 to P0308).

  If the misfire starts in a high engine speed area or the misfire occurs only in a high engine speed area, only DTC P0300 may be stored.

When only a general misfire fault code like P0300 is stored:

- Erase the general misfire fault code from the hand–held tester or OBD II scan tool.
- Start the engine and drive the confirmation patten.
- Read the value of the misfire ratio for each cylinder. Or read the DTC.
- Perform repairs on the cylinder that has a high misfire ratio. Or repair the cylinder indicated by the DTC.
- After finishing the repair, drive the confirmation pattern again and confirm that no misfire occurs.
- When either of SHORT FT #1, LONG FT #1, SHORT FT #2 or LONG FT #2 in the freeze frame data is over the range of ±20 %, there is a possibility that the air–fuel ratio is becoming RICH (–20 % or less) or LEAN (+20 % or more).

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- When COOLANT TEMP in the freeze frame data is less than 80°C (176°F), there is a possibility of misfire only during engine warm–up.
- If the misfire cannot be reproduced, the following reasons may apply: 1) the vehicle has low fuel, 2) improper fuel is being used, and 3) the ignition plug is contaminated.
- Be sure to check the value on the misfire counter after the repair.

1 CHECK OTHER DTC OUTPUT(BESIDES MISFIRE DTCS)

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(c) Select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(d) Read the DTCs using the hand–held tester or the OBD II scan tool.

Result:

Display (DTC output)	Proceed to
P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307 and/or P0308	A
P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307 or P0308 and other DTCs	B

HINT:
If any other codes besides P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307 and/or P0308 are output, perform the troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05–10)**

A

2 CHECK WIRE HARNESS, CONNECTOR AND VACUUM HOSE IN ENGINE ROOM

(a) Check the connection conditions of the wire harness and connector.
(b) Check the vacuum hose piping for disconnection or breaks.

NG → **REPAIR OR REPLACE, THEN CONFIRM THAT THERE IS NO MISFIRE**

OK

3 CHECK CONNECTION OF PCV HOSE

NG → **REPAIR OR REPLACE PCV HOSE**

OK

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4	READ VALUE OF HAND–HELD TESTER OR OBD II SCAN TOOL(NUMBER OF MISFIRE)

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(c) Start the engine.
(d) Select the item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / CYL#1 to CYL#8.
(e) Read the number of misfire on the hand–held tester or the OBD II scan tool.

HINT:
When a misfire is not reproduced, be sure to branch below based on the stored DTC.

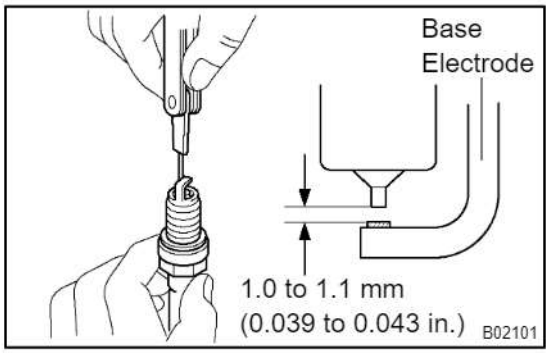
Result:

High Misfire Rate Cylinder	Proceed to
1 or 2 cylinders	A
More than 3 cylinders	B

B → **Go to step 15**

A

5	CHECK SPARK PLUG AND SPARK OF MISFIRING CYLINDER



(a) Remove the ignition coil assembly.
(b) Remove the spark plug.
(c) Check the spark plug type.

Recommended spark plug:

DENSO made	SK20R11
NGK made	IFR6A11

(d) Check the spark plug electrode gap.

Electrode gap: 1.0 to 1.1 mm (0.039 to 0.043 in.)
Maximum electrode gap: 1.3 mm (0.051 in.)

NOTICE:

If adjusting the gap of a new spark plug, bend only "the base/ground" electrode. Do not touch the tip. Never attempt to adjust the gap on a used plug.

(e) Check the electrode for carbon deposits.
(f) Perform a spark test.

CAUTION:

Absolutely disconnect each injector connector.

NOTICE:

Do not crank the engine for more than 2 seconds.

(1) Install the spark plug to the ignition coil, and connect the ignition coil connector.
(2) Disconnect the injector connector.
(3) Ground the spark plug.
(4) Check if spark occurs while the engine is being cranked.

Standard: Spark jumps across electrode gap.

(g) Reinstall the spark plug.
(h) Reinstall the ignition coil assy.

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OK	Go to step 8

NG

6	CHANGE NORMAL SPARK PLUG AND CHECK SPARK OF MISFIRING CYLINDER

(a) Change to the normal spark plug.
(b) Perform a spark test.

CAUTION:
Absolutely disconnect the each injector connector.
NOTICE:
Do not crank the engine for more than 5 to 10 seconds at a time.

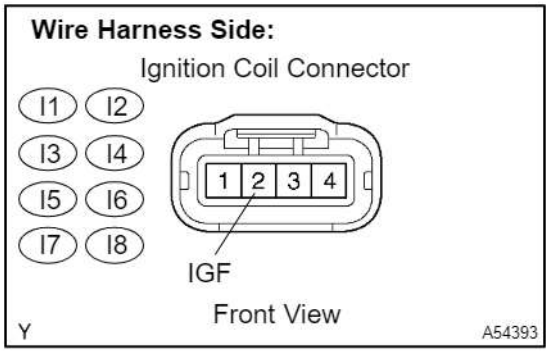
(1) Install the spark plug to the ignition coil, and connect the ignition coil connector.
(2) Disconnect the injector connector.
(3) Ground the spark plug.
(4) Check if spark occurs while the engine is being cranked.

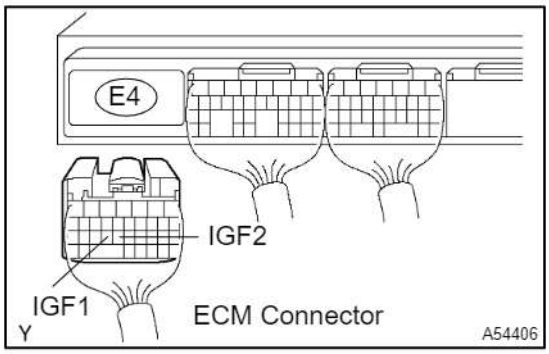
Standard: Spark jumps across electrode gap.

OK	REPLACE SPARK PLUG

NG

7	CHECK HARNESS AND CONNECTOR OF MISFIRING CYLINDER(IGNITION COIL – ECM)





(a) Check the harness and connector between the ignition coil and ECM (IGF terminal).
(1) Disconnect the I1, I2, I3, I4, I5, I6, I7 or I8 ignition coil connector.
(2) Disconnect the ECM E4 connector.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

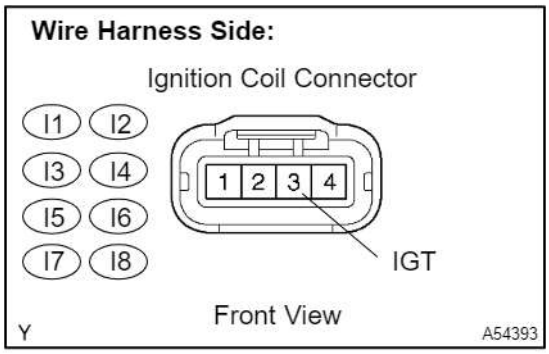
Tester Connection	Specified Condition
IGF (I1–2) – IGF1 (E4–24)	Below 1 Ω
IGF (I2–2) – IGF2 (E4–23)	Below 1 Ω
IGF (I3–2) – IGF2 (E4–23)	Below 1 Ω
IGF (I4–2) – IGF1 (E4–24)	Below 1 Ω
IGF (I5–2) – IGF2 (E4–23)	Below 1 Ω
IGF (I6–2) – IGF1 (E4–24)	Below 1 Ω
IGF (I7–2) – IGF1 (E4–24)	Below 1 Ω
IGF (I8–2) – IGF2 (E4–23)	Below 1 Ω

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Standard (Check for short):

Tester Connection	Specified Condition
IGF (I1–2) or IGF1 (E4–24) – Body ground	10 kΩ or higher
IGF (I2–2) or IGF2 (E4–23) – Body ground	10 kΩ or higher
IGF (I3–2) or IGF2 (E4–23) – Body ground	10 kΩ or higher
IGF (I4–2) or IGF1 (E4–24) – Body ground	10 kΩ or higher
IGF (I5–2) or IGF2 (E4–23) – Body ground	10 kΩ or higher
IGF (I6–2) or IGF1 (E4–24) – Body ground	10 kΩ or higher
IGF (I7–2) or IGF1 (E4–24) – Body ground	10 kΩ or higher
IGF (I8–2) or IGF2 (E4–23) – Body ground	10 kΩ or higher

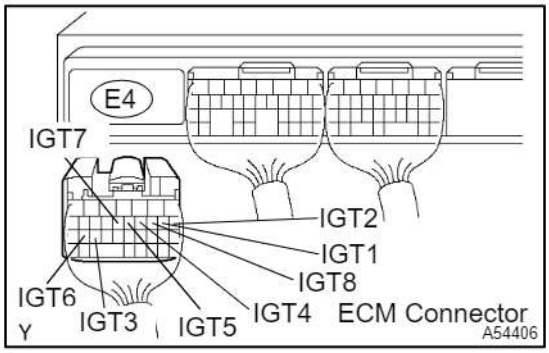
(4) Reconnect the ignition coil connector.
(5) Reconnect the ECM connector.



(b) Check the harness and connector between the ignition coil and ECM (IGT terminal).
(1) Disconnect the I1, I2, I3, I4, I5, I6, I7 or I8 ignition coil connector.
(2) Disconnect the ECM E4 connector.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
IGT (I1–3) – IGT1 (E4–9)	Below 1 Ω
IGT (I2–3) – IGT2 (E4–8)	Below 1 Ω
IGT (I3–3) – IGT3 (E4–25)	Below 1 Ω
IGT (I4–3) – IGT4 (E4–11)	Below 1 Ω
IGT (I5–3) – IGT5 (E4–12)	Below 1 Ω
IGT (I6–3) – IGT6 (E4–26)	Below 1 Ω
IGT (I7–3) – IGT7 (E4–13)	Below 1 Ω
IGT (I8–3) – IGT8 (E4–10)	Below 1 Ω



Standard (Check for short):

Tester Connection	Specified Condition
IGT (I1–3) or IGT1 (E4–9) – Body ground	10 kΩ or higher
IGT (I2–3) or IGT2 (E4–8) – Body ground	10 kΩ or higher
IGT (I3–3) or IGT3 (E4–25) – Body ground	10 kΩ or higher
IGT (I4–3) or IGT4 (E4–11) – Body ground	10 kΩ or higher
IGT (I5–3) or IGT5 (E4–12) – Body ground	10 kΩ or higher
IGT (I6–3) or IGT6 (E4–26) – Body ground	10 kΩ or higher
IGT (I7–3) or IGT7 (E4–13) – Body ground	10 kΩ or higher
IGT (I8–3) or IGT8 (E4–10) – Body ground	10 kΩ or higher

(4) Reconnect the ignition coil connector.
(5) Reconnect the ECM connector.

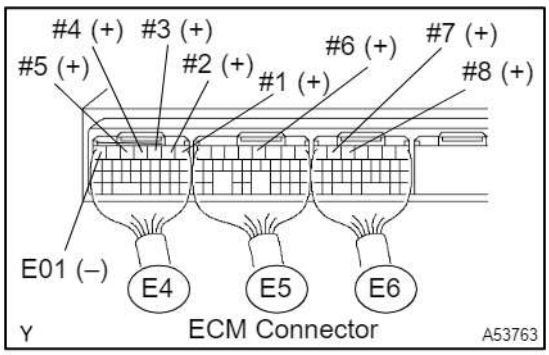
OK → **REPLACE IGNITION COIL ASSY (THEN CONFIRM THAT THERE IS NO MISFIRE)**

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

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8	INSPECT ECM TERMINAL OF MISFIRING CYLINDER(#1, #2, #3, #4, #5, #6, #7 OR #8 VOLTAGE)



(a) Turn the ignition switch to ON.
(b) Measure the voltage between the applicable terminals of the E4, E5 and E6 ECM connectors.

Standard:

Tester Connection	Specified Condition
#1 (E4–1) – E01 (E4–7)	9 to 14 V
#2 (E4–2) – E01 (E4–7)	9 to 14 V
#3 (E4–3) – E01 (E4–7)	9 to 14 V
#4 (E4–4) – E01 (E4–7)	9 to 14 V
#5 (E4–5) – E01 (E4–7)	9 to 14 V
#6 (E5–3) – E01 (E4–7)	9 to 14 V
#7 (E6–6) – E01 (E4–7)	9 to 14 V
#8 (E6–5) – E01 (E4–7)	9 to 14 V

OK → **Go to step 11**

NG

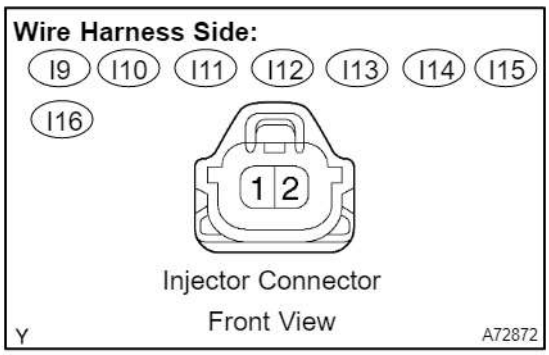
9	INSPECT FUEL INJECTOR RESISTANCE OF MISFIRING CYLINDER (See page 11–37)

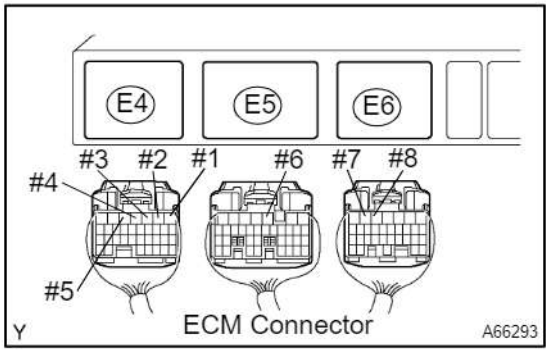
NG → **REPLACE FUEL INJECTOR ASSY (See page 11–41)**

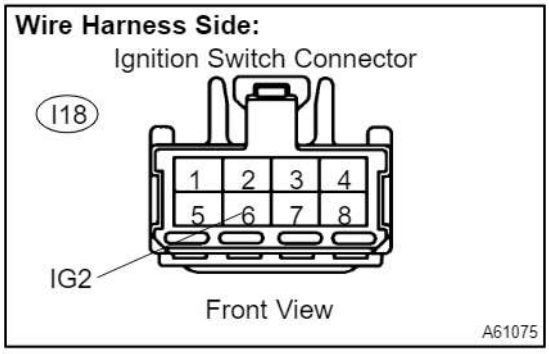
OK

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10	CHECK HARNESS AND CONNECTOR OF MISFIRING CYLINDER(INJECTOR – ECM, INJECTOR – IGNITION SWITCH)







(a) Check the harness and connector between the injector and ECM.
  (1) Disconnect the I9, I10, I11, I12, I13, I14, I15 or I16 injector connector.
  (2) Disconnect the E4, E5 or E6 ECM connector.
  (3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Injector (I9–2) – #1 (E4–1)	Below 1 Ω
Injector (I10–2) – #2 (E4–2)	Below 1 Ω
Injector (I11–2) – #3 (E4–3)	Below 1 Ω
Injector (I12–2) – #4 (E4–4)	Below 1 Ω
Injector (I13–2) – #5 (E4–5)	Below 1 Ω
Injector (I14–2) – #6 (E5–3)	Below 1 Ω
Injector (I15–2) – #7 (E6–6)	Below 1 Ω
Injector (I16–2) – #8 (E6–5)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
Injector (I9–2) or #1 (E4–1) – Body ground	10 kΩ or higher
Injector (I10–2) or #2 (E4–2) – Body ground	10 kΩ or higher
Injector (I11–2) or #3 (E4–3) – Body ground	10 kΩ or higher
Injector (I12–2) or #4 (E4–4) – Body ground	10 kΩ or higher
Injector (I13–2) or #5 (E4–5) – Body ground	10 kΩ or higher
Injector (I14–2) or #6 (E5–3) – Body ground	10 kΩ or higher
Injector (I15–2) or #7 (E6–6) – Body ground	10 kΩ or higher
Injector (I16–2) or #8 (E6–5) – Body ground	10 kΩ or higher

  (4) Reconnect the injector connector.
  (5) Reconnect the ECM connector.

(b) Check the harness and connector between the injector and ignition switch.
  (1) Disconnect the I9, I10, I11, I12, I13, I14, I15 or I16 injector connector.
  (2) Disconnect the I18 ignition switch connector.
  (3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Injector (I9–1) – IG2 (I18–6)	Below 1 Ω
Injector (I10–1) – IG2 (I18–6)	Below 1 Ω
Injector (I11–1) – IG2 (I18–6)	Below 1 Ω
Injector (I12–1) – IG2 (I18–6)	Below 1 Ω
Injector (I13–1) – IG2 (I18–6)	Below 1 Ω
Injector (I14–1) – IG2 (I18–6)	Below 1 Ω
Injector (I15–1) – IG2 (I18–6)	Below 1 Ω
Injector (I16–1) – IG2 (I18–6)	Below 1 Ω

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Standard (Check for short):

Tester Connection	Specified Condition
Injector (I9–1) or IG2 (I18–6) Body ground	10 kΩ or higher
Injector (I10–1) or IG2 (I18–6) – Body ground	10 kΩ or higher
Injector (I11–1) or IG2 (I18–6) – Body ground	10 kΩ or higher
Injector (I12–1) or IG2 (I18–6) – Body ground	10 kΩ or higher
Injector (I13–1) or IG2 (I18–6) – Body ground	10 kΩ or higher
Injector (I14–1) or IG2 (I18–6) – Body ground	10 kΩ or higher
Injector (I15–1) or IG2 (I18–6) – Body ground	10 kΩ or higher
Injector (I16–1) or IG2 (I18–6) – Body ground	10 kΩ or higher

(4) Reconnect the injector connector.
(5) Reconnect the ECM connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

11	**INSPECT FUEL INJECTOR INJECTION AND VOLUME OF MISFIRING CYLINDER (See page 11–37)**

NG → **REPLACE FUEL INJECTOR ASSY (See page 11–41)**

OK

12	**CHECK CYLINDER COMPRESSION PRESSURE OF MISFIRING CYLINDER (See page 14–190)**

NG → **REPAIR OR REPLACE**

OK

13	**CHECK VALVE CLEARANCE OF MISFIRING CYLINDER (See page 14–195)**

NG → **ADJUST VALVE CLEARANCE (See page 14–195)**

OK

14	**SWITCH STEP BY NUMBER OF MISFIRE CYLINDER(REFER RESULT OF STEP 4)**

HINT:
- If the result of step 4 is ”1 or 2 cylinders”, proceed to A.
- If the result of step 4 is ”more than 3 cylinders”, proceed to B.

B → **CHECK FOR INTERMITTENT PROBLEMS (See page 05–10)**

A

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15	CHECK VALVE TIMING(CHECK FOR LOOSE AND A JUMPED TOOTH OF TIMING BELT) (See page 14–296)

NG → ADJUST VALVE TIMING (REPAIR OR REPLACE TIMING BELT)

OK

16	CHECK FUEL PRESSURE (See page 11–35)

NG → CHECK AND REPLACE FUEL PUMP, PRESSURE REGULATOR, FUEL PIPE LINE AND FILTER

OK

17	READ VALUE OF HAND–HELD TESTER OR OBD II SCAN TOOL(INTAKE AIR TEMPERATURE AND MASS AIR FLOW RATE)

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch to ON.
(c) Check the intake air temperature.
  (1) On the hand–held tester or the OBD II scan tool, select the item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / INTAKE AIR. Read the values.

  Temperature: Equivalent to ambient air temperature
(d) Check the air flow rate.
  (1) On the hand–held tester or the OBD II scan tool, select the item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / MAF. Read the values.

  Standard:

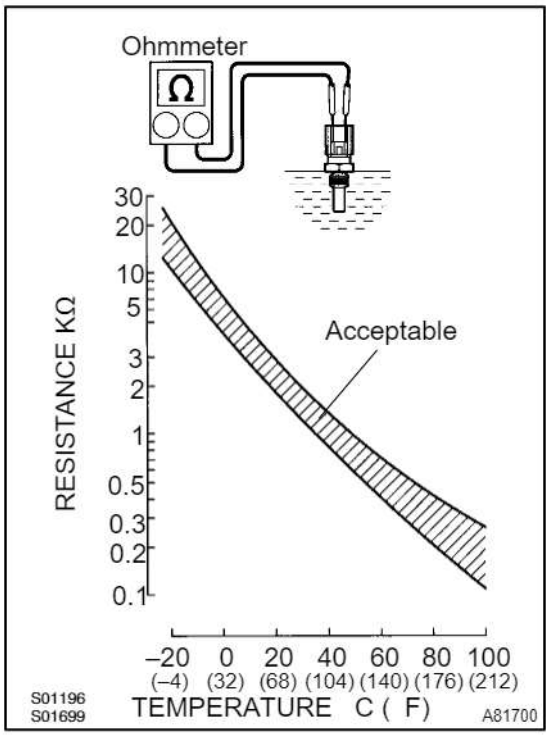
Condition	Air flow rate (gm/s)
Ignition switch On (do not start engine)	0
Idling	4 to 6
Running without load (2,500 rpm)	13 to 20
Idling to quickly accelerating	Air flow rate fluctuates

NG → REPLACE MASS AIR FLOW METER

OK

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18	INSPECT ENGINE COOLANT TEMPERATURE SENSOR(RESISTANCE)



(a) Remove the engine coolant temperature sensor.
(b) Measure the resistance between the terminals of the engine coolant temperature sensor.

Resistance:

Tester Connection	Temperature	Specified Condition
1 – 2	20 C (68 F)	2.32 to 2.59 kΩ
1 – 2	80 C (176 F)	0.310 to 0.326 kΩ

NOTICE:

When checking the engine coolant temperature sensor in water, be careful not to allow water to contact the terminals. After checking, dry the sensor.

HINT:

Alternate procedure: Connect an ohmmeter to the installed engine coolant temperature sensor and read the resistance. Use an infrared thermometer to measure the engine temperature in the immediate vicinity of the sensor. Compare these values to the resistance/temperature graph. Change the engine temperature (warm up or allow to cool down) and repeat the test.

(c) Reinstall the engine coolant temperature sensor.

NG → **REPLACE ENGINE COOLANT TEMPERATURE SENSOR**

OK

19	SWITCH STEP BY NUMBER OF MISFIRE CYLINDER(REFER RESULT OF STEP 4)

HINT:

- If the result of step 4 is "1 or 2 cylinders", proceed to A.
- If the result of step 4 is "more than 3 cylinders", proceed to B.

B → **Go to step 5**

A

CHECK FOR INTERMITTENT PROBLEMS (See page 05–10)

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DTC	P0325	KNOCK SENSOR 1 CIRCUIT (BANK 1 OR SINGLE SENSOR)

DTC	P0330	KNOCK SENSOR 2 CIRCUIT (BANK 2)

CIRCUIT DESCRIPTION

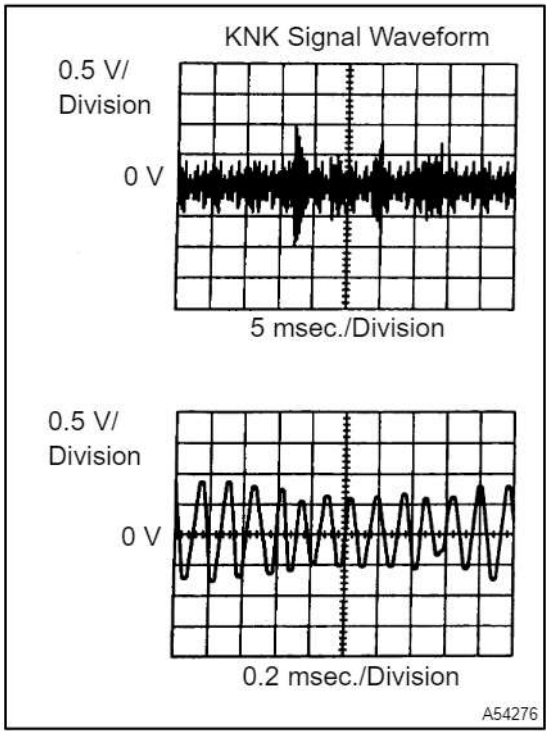
The each knock sensor fitted on the right bank and left bank of the cylinder block is used to detect the engine knocking.

Each knock sensor contains a piezoelectric element which generates voltage when it becomes deformed. Generation of the voltage occurs when the cylinder block vibrates due to knocking. If engine knocking occurs, the ignition timing is retarded in order to suppress the knocking.

DTC No.	DTC Detection Condition	Trouble Area
P0325	No knock sensor 1 signal to ECM at engine speed of 1,500 rpm to 5,500 rpm	□Open or short in knock sensor 1 circuit □Knock sensor 1 (looseness) □ECM
P0330	No knock sensor 2 signal to ECM at engine speed of 1,500 rpm to 5,500 rpm	□Open or short in knock sensor 2 circuit □Knock sensor 2 (looseness) □ECM

HINT:

- □ Bank 1 refers to the bank that includes cylinder No.1.
- □ Bank 2 refers to the bank that does not include cylinder No.1.



Reference: Inspection using the oscilloscope.

(a) Check the waveform between terminals KNK1 and KNK2 of the ECM connector and body ground at 4,000 rpm.
Standard: Refer to the illustration.

(b) Spread the time on the horizontal axis and confirm that period of the wave is 0.123 msec (normal mode vibration frequency of knock sensor: 8.1 kHz).

If the normal mode vibration frequency is not 8.1 kHz, the sensor is malfunctioning.

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MONITOR DESCRIPTION

The knock sensor detects spark knock. When spark knock occurs, the sensor picks–up vibrates in a specific frequency range. When the ECM detects voltage in this frequency range, it retards the ignition timing to suppress the spark knock.

The ECM also senses background engine noise with the knock sensor and uses this noise to check for faults in the sensor. If the knock sensor signal level is too low for more than 10 seconds, and if the knock sensor output voltage is out of the normal range, the ECM interprets this as a fault in the knock sensor and sets a DTC.

MONITOR STRATEGY

Related DTCs	P0325: Knock sensor (Bank 1) range check / rationality P0330: Knock sensor (Bank 2) range check / rationality
Required sensors/ components (Main)	Knock sensor (Bank 1 and 2)
Required sensors / components (Related)	Crankshaft position sensor, camshaft position sensor, engine coolant temperature sensor, mass air flow sensor
Frequency of operation	Continuous
Duration	10 seconds
MIL operation	Immediate
Sequence operation	None

TYPICAL ENABLING CONDITIONS

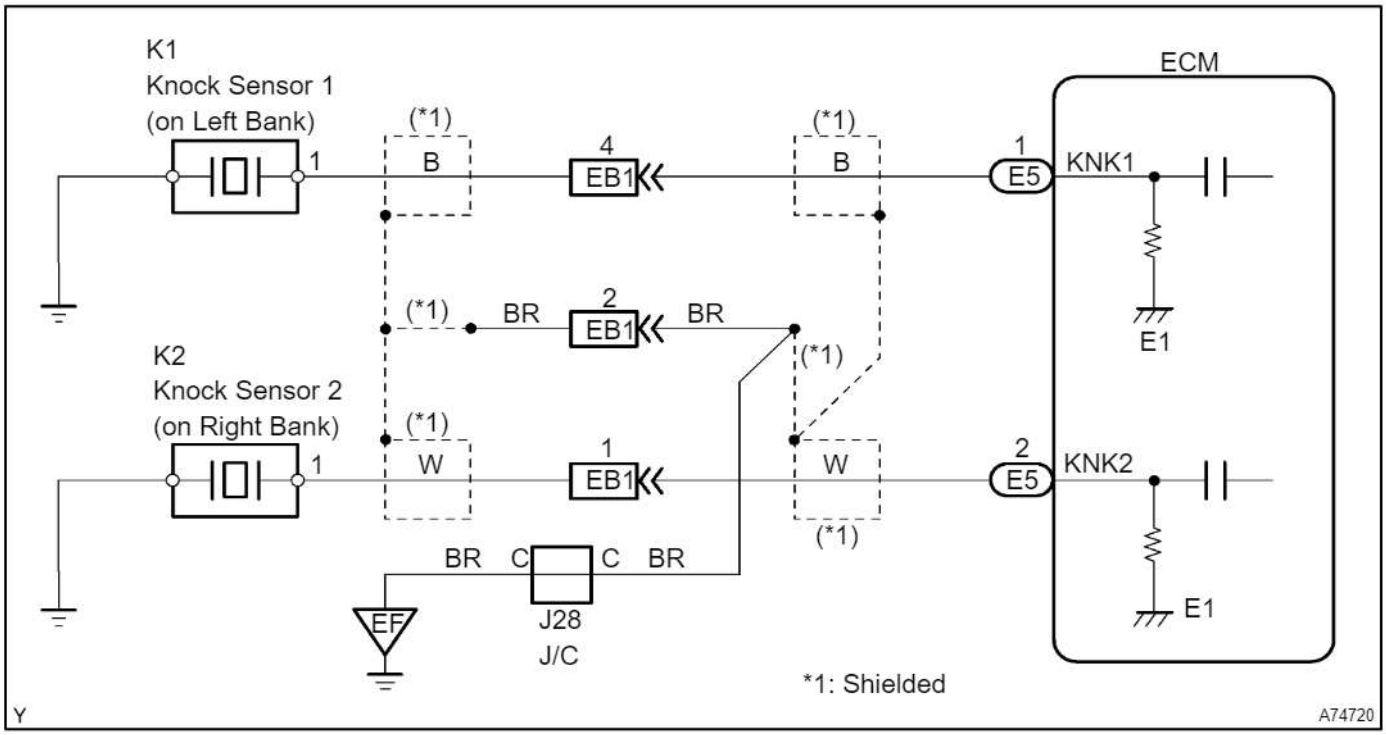
The monitor will run whenever the following DTCs are not present	See page 05–13
Battery voltage	10 V or more
Idle	OFF
Time after engine start	5 seconds or more
Engine coolant temperature	60 C (140 F) or more
Intake air amount per revolution	0.45 g/rev
RPM	1,500 to 5,500 rpm

TYPICAL MALFUNCTION THRESHOLDS

Knock sensor's voltage output remains at a low level for a specific period of time	10 seconds or more

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WIRING DIAGRAM

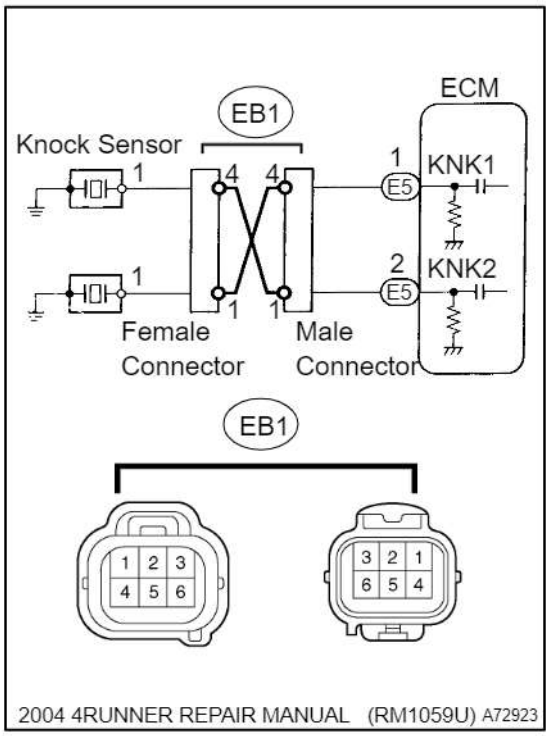


INSPECTION PROCEDURE

HINT:

- DTC P0325 is for the left bank knock sensor circuit.
- DTC P0330 is for the right bank knock sensor circuit.
- Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1	READ OUTPUT DTC(CHECK KNOCK SENSOR CIRCUIT)



(a) Disconnect the EB1 connector.

(b) Using lead wires, connect the EB1 connectors as follows.

Male connector – Female connector
Terminal 4 – Terminal 1
Terminal 1 – Terminal 4

(c) Warm up the engine.

(d) Perform a quick engine RPM acceleration to 4,000 rpm 3 times.

(e) Check the DTC.

Standard:

Display	Proceed to
DTC same as when vehicle brought in P0325 → P0325 or P0330 → P0330	A
DTC different from when vehicle brought in P0325 → P0330 → P0325	B

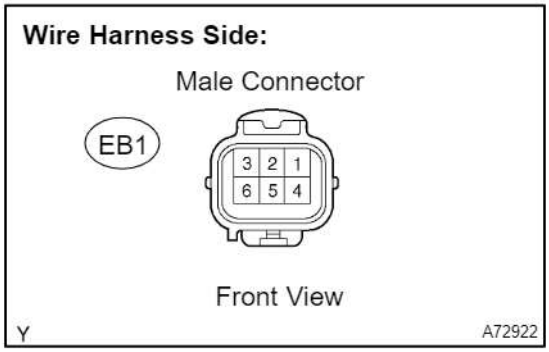
(f) Reconnect the EB1 connector.

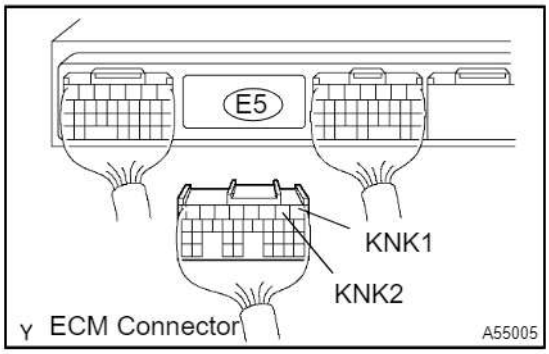
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B → Go to step 3

A

2 CHECK HARNESS AND CONNECTOR(EB1 CONNECTOR – ECM)





(a) Disconnect the EB1 connector.
(b) Disconnect the E5 ECM connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
EB1 male connector 4 – KNK1 (E5–1)	Below 1 Ω
EB1 male connector 1 – KNK1 (E5–2)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
EB1 male connector 4 or KNK1 (E5–1) – Body ground	10 kΩ or higher
EB1 male connector 1 or KNK2 (E5–2) – Body ground	10 kΩ or higher

(d) Reconnect the EB1 connector.
(e) Reconnect the ECM connector.

OK → REPLACE ECM (See page 10–24)

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

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3	CHECK HARNESS AND CONNECTOR(EB1 CONNECTOR – KNOCK SENSOR)

HINT:

- □ If DTC P0325 has changed to P0330, check the knock sensor circuit on the left bank side.
- □ If DTC P0330 has changed to P0325, check the knock sensor circuit on the right bank side.

(a) Disconnect the EB1 connector.
(b) Disconnect the K1 and K2 knock sensor connectors.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
EB1 female connector 4 – K1–1	Below 1 Ω
EB1 female connector 1 – K2–1	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
EB1 female connector 4 or K1–1 – Body ground	10 kΩ or higher
EB1 female connector 1 or K2–1 – Body ground	10 kΩ or higher

(d) Reconnect the EB1 connector.
(e) Reconnect the knock sensor connector.

Wire Harness Side:

Female Connector



Front View

A75544

Wire Harness Side:

Knock Sensor Connector



Front View

B59896

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE KNOCK SENSOR

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DTC	P0335	CRANKSHAFT POSITION SENSOR ”A” CIRCUIT

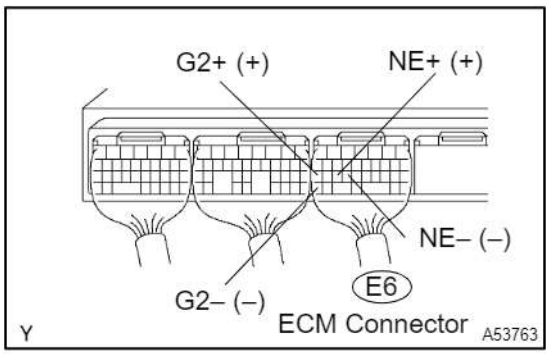
DTC	P0339	CRANKSHAFT POSITION SENSOR ”A” CIRCUIT INTERMITTENT

CIRCUIT DESCRIPTION

The crankshaft position sensor system consists of a crankshaft position sensor plate and a pick–up coil. The sensor plate has 34 teeth and is installed on the crankshaft. The pick–up coil is made of an iron core and magnet. The sensor plate rotates and as each tooth passes through the pick–up coil, a pulse signal is created. The pick–up coil generates 34 signals for each engine revolution. Based on these signals, the ECM calculates the crankshaft position and engine RPM. Using these calculations, the fuel injection time and ignition timing are controlled.

DTC No.	DTC Detection Condition	Trouble Area
P0335	(1) No crankshaft position sensor signal to ECM during cranking (1 trip detection logic) (2) No crankshaft position sensor signal to ECM at engine speed of 600 rpm or more (1 trip detection logic)	□Open or short in crankshaft position sensor circuit □Crankshaft position sensor □Signal plate (crankshaft position sensor plate No. 1) □ECM
P0339	No crankshaft position sensor signal to ECM for 0.05 second or more, and conditions (a), (b) and (c) are met: (a) Engine speed is at 1,000 rpm or more (b) STA signal is OFF (c) 3 seconds or more have elapsed after STA signal is switched from ON to OFF	□Open or short in crankshaft position sensor circuit □Crankshaft position sensor □Signal plate (crankshaft position sensor plate No. 1) □ECM

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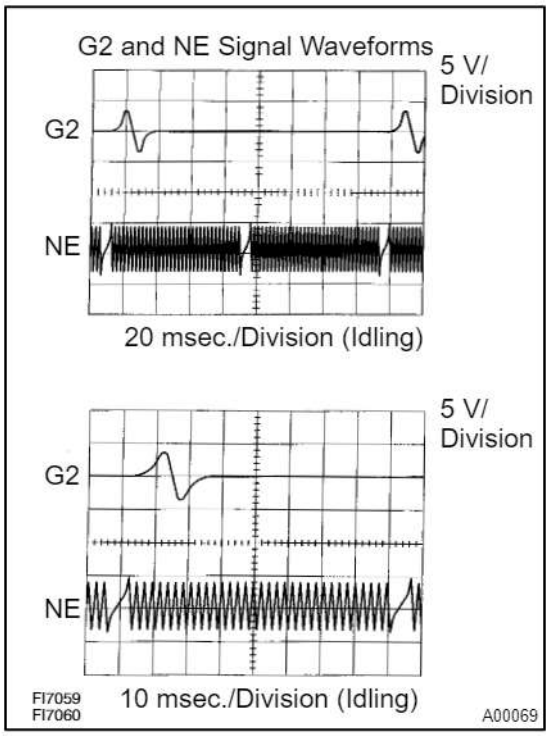


Reference: Inspection using the oscilloscope.

(a) During cranking or idling, check the waveform between the terminals of the E6 ECM connector.

Standard: .

Tester Connection	Specified Condition
NE+ (E6–25) – NE– (E6–24)	Correct waveform is as shown
G2+ (E6–27) – G2– (E6–32)	Correct waveform is as shown



MONITOR DESCRIPTION

If there is no signal from the crankshaft sensor even though the engine is revolving, the ECM interprets this as a malfunction of the sensor.

MONITOR STRATEGY

Related DTCs	P0335: Crankshaft position sensor range check or rationality
Required sensors/ components (Main)	Crankshaft position sensor
Required sensors / components (Related)	Engine speed sensor
Frequency of operation	Continuous
Duration	Case 1: 4.7 seconds Case 2: 0.016 second Case 3: 2 rev x 5 times
MIL operation	Case 1: 2 driving cycles Case 2, 3: 1 driving cycle
Sequence operation	None

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TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05–13

Case 1:

Starter	ON
Minimal battery voltage while starter ON	Less than 11 V

Case 2:

Engine RPM	600 rpm or more
Starter	OFF
Time after starter ON to OFF	3 seconds or more

Case 3:

Time after starter ON to OFF	0.3 second or more
Number of camshaft position sensor signal pulse	1
Battery voltage	7 V or more

TYPICAL MALFUNCTION THRESHOLDS

Case 1:

Engine speed signal	No signal for 4.7 seconds

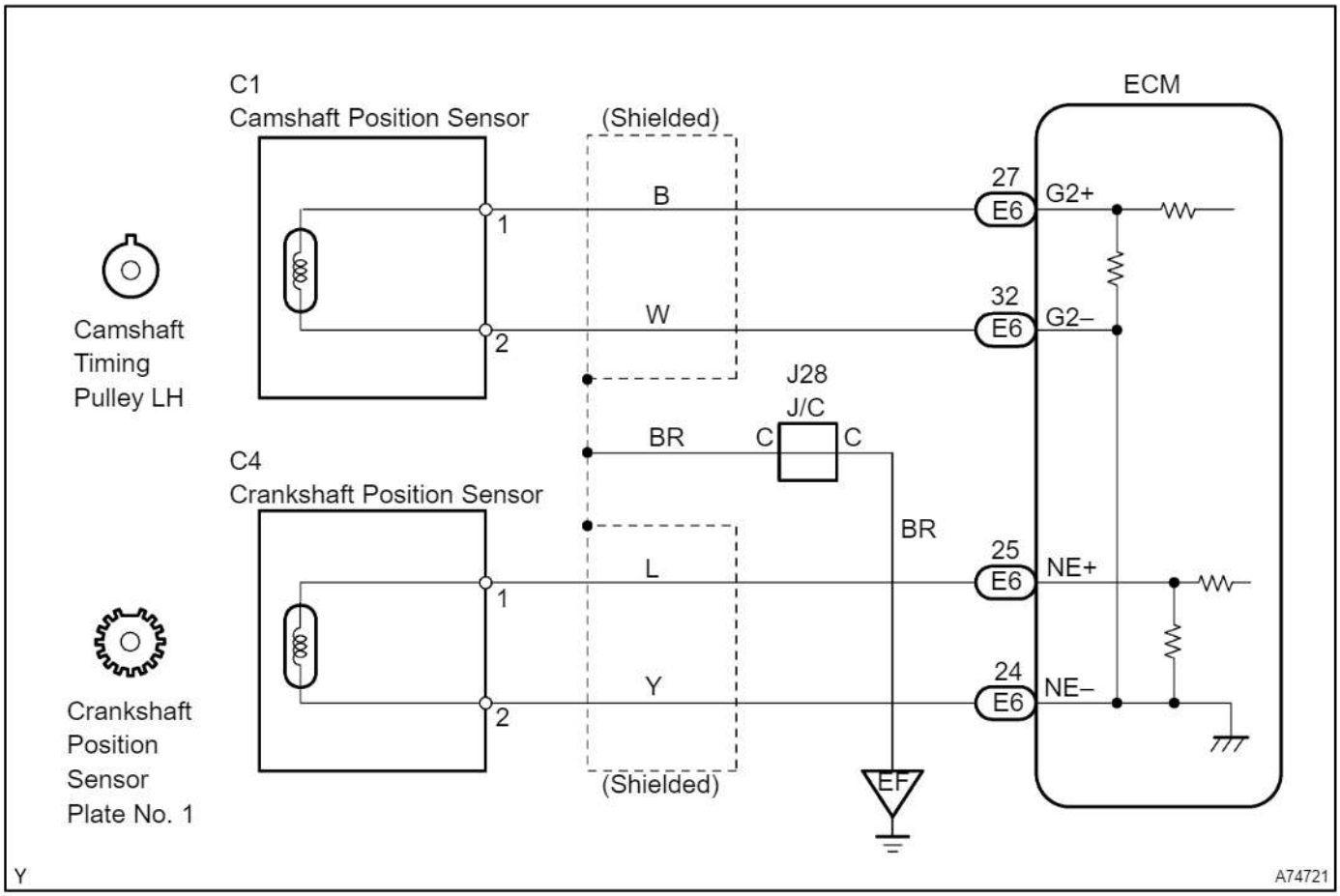
Case 2:

Engine speed signal	No signal for 0.016 second

Case 3:

Number of crankshaft position sensor signal pulse	17 or more and 29 or less

WIRING DIAGRAM



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INSPECTION PROCEDURE

HINT:

- □ Perform troubleshooting of DTC P0335 first. If no trouble is found, troubleshoot the engine mechanical systems.
- □ Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.
- □ Read value of hand–held tester or OBD II scan tool
  (a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
  (b) Start the engine and turn the hand–held tester or the OBD II scan tool ON.
  (c) Select the item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / ENGINE SPD.

The engine speed can be observed in DATA LIST using the hand–held tester or OBD II scan tool. If there is no NE signals from the crankshaft position sensor despite the engine revolving, the engine speed will be indicated as zero. If voltage output from the crankshaft position sensor is insufficient, the engine speed will be indicated as lower PRM (than the actual RPM).

1	INSPECT CRANKSHAFT POSITION SENSOR(RESISTANCE)

(a) Disconnect the C4 crankshaft position sensor connector.
(b) Measure the resistance between the terminals of the crankshaft position sensor connector.
Standard:
1.630 to 2,740 Ω at cold
2,065 to 3,225 Ω at hot

HINT:

The terms "cold" and "hot" refer to the temperature of the coils. "Cold" means approximately –10 C to 50 C (14 F to 122 F). "Hot" means approximately 50 C to 100 C (122 F to 212 F).

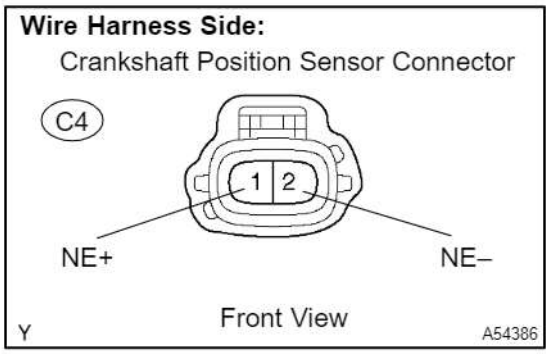
(c) Reconnect the crankshaft position sensor connector.

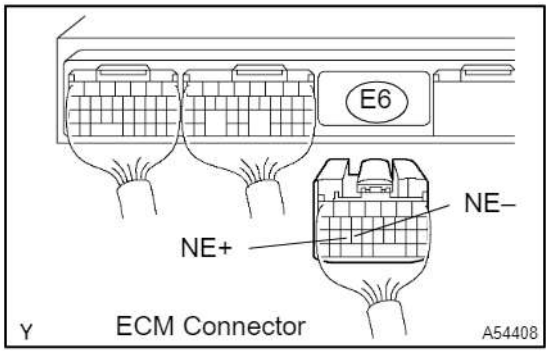
NG → **REPLACE CRANKSHAFT POSITION SENSOR (See page 18–12)**

OK

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2 CHECK HARNESS AND CONNECTOR(CRANKSHAFT POSITION SENSOR – ECM)





(a) Disconnect the C4 crankshaft position sensor connector.
(b) Disconnect the E6 ECM connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
NE+ (C4–1) – NE+ (E6–25)	Below 1 Ω
NE– (C4–2) – NE– (E6–24)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
NE+ (C4–1) or NE+ (E6–25) – Body ground	10 kΩ or higher
NE– (C4–2) or NE– (E6–24) – Body ground	10 kΩ or higher

(d) Reconnect the crankshaft position sensor connector.
(e) Reconnect the ECM connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3 CHECK SENSOR INSTALLATION(CRANKSHAFT POSITION SENSOR)

NG → **TIGHTEN SENSOR**

OK

4 CHECK CRANKSHAFT POSITION SENSOR PLATE NO.1(TOOTH OF PLATE)

(a) Remove the crankshaft position sensor plate No. 1 (see page 14–296).
(b) Check the tooth of the signal plate.

NG → **REPLACE CRANKSHAFT POSITION SENSOR PLATE NO.1**

OK

REPLACE ECM (See page 10–24)

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DTC	P0340	CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 1 OR SINGLE SENSOR)

DTC	P0341	CAMSHAFT POSITION SENSOR "A" CIRCUIT RANGE/PERFORMANCE (BANK 1 OR SINGLE SENSOR)

CIRCUIT DESCRIPTION

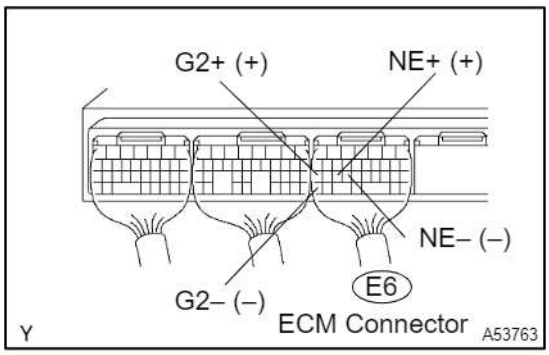
The camshaft position sensor (G2 signal) consists of a magnet, iron core and pickup coil.
The G2 signal plate has 1 tooth on its outer circumference and is installed on the camshaft timing pulley left hand.
When the camshafts rotate, the protrusion on the signal plate and the air gap on the pickup coil change, causing fluctuations in the magnetic field and generating voltage in the pickup coil.
The NE signal plate (crankshaft position sensor plate No. 1) has 34 teeth and is installed on the crankshaft.
The NE signal sensor generates 34 signals at every engine revolution. Using the NE signal, the ECM detects both crankshaft angle and engine speed. In order to locate the top dead center position of the No. 1 cylinder, the ECM uses the G2 and NE signals.

DTC No.	DTC Detection Condition	Trouble Area
P0340	□No camshaft position sensor signal to ECM during cranking (2 trip detection logic) □No camshaft position sensor signal to ECM at engine speed of 600 rpm or more (1 trip detection logic)	□Open or short in camshaft position sensor circuit □Camshaft position sensor □Bank1 camshaft timing pulley □Jumped tooth of timing belt □ECM
P0341	While crankshaft rotates twice, camshaft position sensor signal is input to ECM 12 times or more (1 trip detection logic)	□Open or short in camshaft position sensor circuit □Camshaft position sensor □Bank1 camshaft timing pulley □Jumped tooth of timing belt □ECM

HINT:

- □ DTC P0340 indicate a malfunction related to the camshaft position sensor (+) circuit. (Wire harness [ECM – camshaft position sensor] and camshaft position sensor.)
- □ DTC P0341 indicate a malfunction related to the camshaft position sensor (–) circuit (Wire harness [ECM – camshaft position sensor] and camshaft position sensor.)

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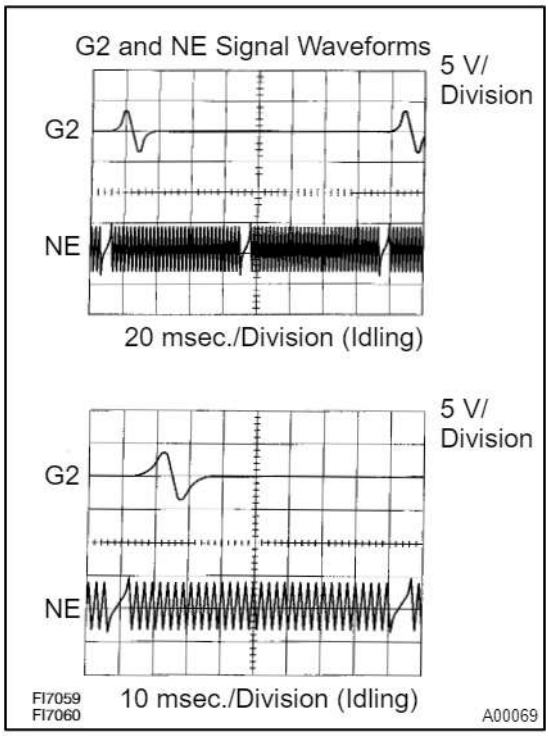


Reference: Inspection using the oscilloscope.

(a) During cranking or idling, check the waveform between the terminals of the E6 ECM connector.

Standard:

Tester Connection	Specified Condition
NE+ (E6–25) – NE– (E6–24)	Correct waveform is as shown
G2+ (E6–27) – G2– (E6–32)	Correct waveform is as shown



MONITOR DESCRIPTION

If there is no signal from the camshaft position sensor despie the engine revolvong, or if the rotation of the camshaft and the crankshaft is not synchronized, the ECM interprets this as a malfunction of the sensor.

MONITOR STRATEGY

Related DTCs	P0340: Camshaft position sensor (Bank 1) range check or rationality P0341: Camshaft position sensor (Bank 1) range check or rationality
Required sensors/ components (Main)	Camshaft position sensor
Required sensors / components (Related)	Crankshaft position sensor, engine speed sensor
Frequency of operation	Continuous
Duration	5 seconds
MIL operation	P0340 case 1 (no signal): 2 driving cycles P0340 case 2 (mis–aligned), P0341: Immediate
Sequence operation	None

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TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05–13

P0340 Case 1 (No signal):

Starter	ON
Minimal battery voltage while starter ON	Less than 11 V

P0340 Case 1 (Mis–aligned):

Engine RPM	600 rpm or more
Starter	OFF

P0341:

Starter	After OFF to ON timing
Engine revolution	720 CA

TYPICAL MALFUNCTION THRESHOLDS

P0340 Case 1 (No signal):

Camshaft position sensor signal	No signal

P0340 Case 1 (Mis–aligned):

Crankshaft/camshaft alignment is mis–aligned (judged by comparing the crankshaft position to the camshaft position)	–
Camshaft position sensor signal: No input in appropriate timing.	–

P0341:

Crankshaft/Camshaft alignment	Mis–aligned
Camshaft position sensor count	12 or more / 720 CA (= Engine 2 revolutions)

COMPONENT OPERATING RANGE

Camshaft position sensor signal input during every 720 CA	3

WIRING DIAGRAM

Refer to DTC P0335 on page 05–176.

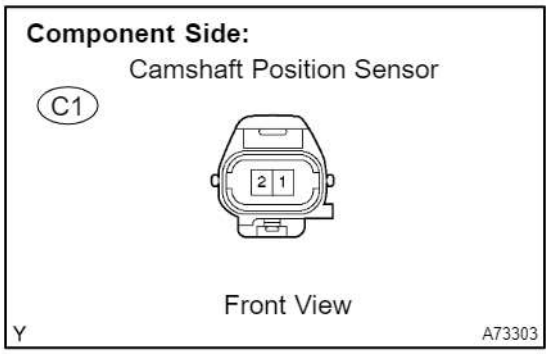
INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

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1 INSPECT CAMSHAFT POSITION SENSOR(RESISTANCE)



(a) Disconnect the C1 camshaft position sensor connector.
(b) Measure the resistance between the terminals of camshaft posision sensor connector.

Standard:

Tester Connection	Specified Condition
1 – 2	835 to 1,400 Ω at cold
1 – 2	1,060 to 1,645 Ω at hot

NOTICE:

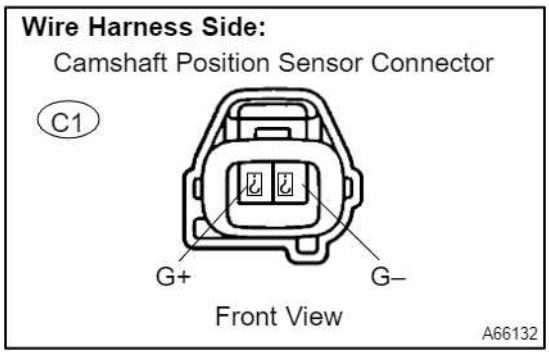
The terms "cold" and "hot" refer to the temperature of the coils. "Cold" means approximately –10 C to 50 C (14 F to 122 F). "Hot" means approximately 50 C to 100 C (122 F to 212 F).

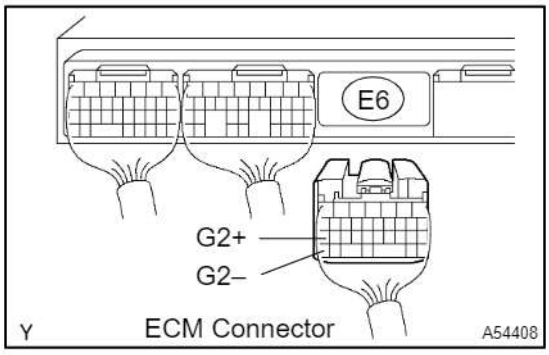
(c) Reconnect the camshaft position sensor connector.

NG → **REPLACE CAMSHAFT POSITION SENSOR (See page 18–13)**

OK

2 CHECK HARNESS AND CONNECTOR(CAMSHAFT POSITION SENSOR – ECM)





(a) Disconnect the C1 camshaft position sensor connector.
(b) Disconnect the E6 ECM connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
G+ (C1–1) – G2+ (E6–27)	Below 1 Ω
G– (C1–2) – G2– (E6–32)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
G+ (C1–1) or G2+ (E6–27) – Body ground	10 kΩ or higher
G– (C1–2) or G2– (E6–32) – Body ground	10 kΩ or higher

(d) Reconnect the camshaft position sensor connector.
(e) Reconnect the ECM connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3 CHECK SENSOR INSTALLATION(CAMSHAFT POSITION SENSOR)

NG → **TIGHTEN SENSOR**

OK

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4	CHECK CAMSHAFT TIMING PULLEY SUB–ASSY LH(TOOTH OF PLATE)

(a) Remove the camshaft timing pulley sub–assy left–bank (see page 14–330).
(b) Check the tooth of the signal plate.

NG → REPLACE CAMSHAFT TIMING PULLEY SUB–ASSY LH

OK

REPLACE ECM (See page 10–24)

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DTC	P0351	IGNITION COIL "A" PRIMARY/SECONDARY CIRCUIT

DTC	P0352	IGNITION COIL "B" PRIMARY/SECONDARY CIRCUIT

DTC	P0353	IGNITION COIL "C" PRIMARY/SECONDARY CIRCUIT

DTC	P0354	IGNITION COIL "D" PRIMARY/SECONDARY CIRCUIT

DTC	P0355	IGNITION COIL "E" PRIMARY/SECONDARY CIRCUIT

DTC	P0356	IGNITION COIL "F" PRIMARY/SECONDARY CIRCUIT

DTC	P0357	IGNITION COIL "G" PRIMARY/SECONDARY CIRCUIT

DTC	P0358	IGNITION COIL "H" PRIMARY/SECONDARY CIRCUIT

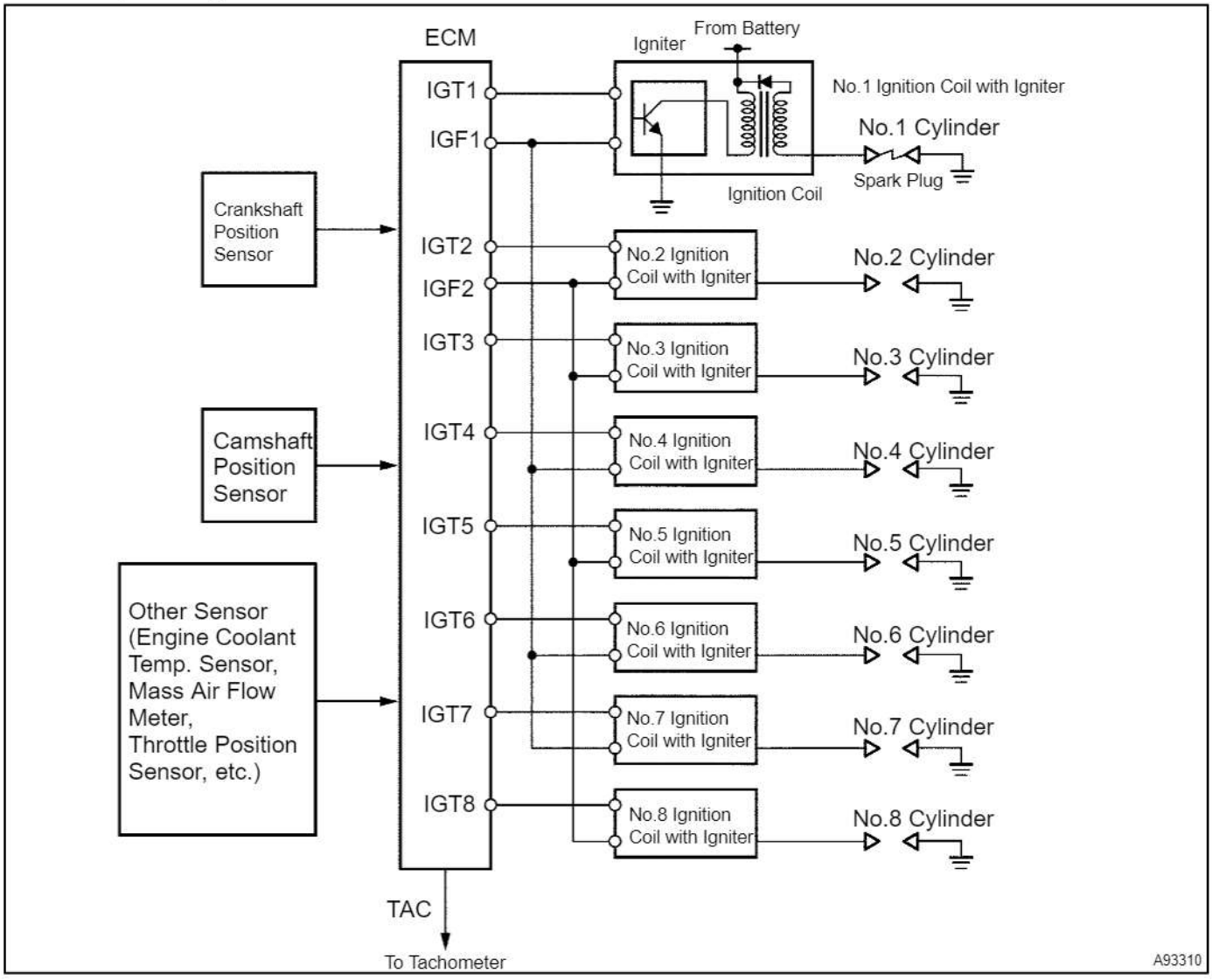
CIRCUIT DESCRIPTION

HINT:

- □ These DTCs indicate a malfunction related to the primary circuit.
- □ If DTC P0351 is displayed, check No.1 ignition coil with igniter circuit.
- □ If DTC P0352 is displayed, check No.2 ignition coil with igniter circuit.
- □ If DTC P0353 is displayed, check No.3 ignition coil with igniter circuit.
- □ If DTC P0354 is displayed, check No.4 ignition coil with igniter circuit.
- □ If DTC P0355 is displayed, check No.5 ignition coil with igniter circuit.
- □ If DTC P0356 is displayed, check No.6 ignition coil with igniter circuit.
- □ If DTC P0357 is displayed, check No.7 ignition coil with igniter circuit.
- □ If DTC P0358 is displayed, check No.8 ignition coil with igniter circuit.

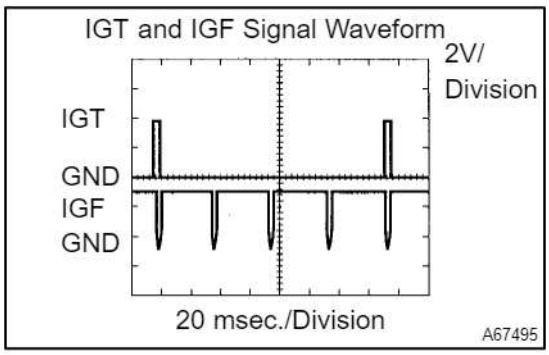
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A Direct Ignition System (DIS) has been adopted.
The DIS is a 1–cylinder ignition system which ignites one cylinder with one ignition coil. In the 1–cylinder ignition system, the one spark plug is connected to the end of the secondary winding. High voltage generated in the secondary winding is applied directly to the spark plug. The spark of the spark plug passes from the center electrode to the ground electrode.
The ECM determines the ignition timing and outputs the ignition (IGT) signals for each cylinder. Using the ignition (IGT) signal, the ECM turns on and off the power transistor inside the igniter and this switches on and off the current to the primary coil. When the current flow to the primary coil is cut off, high–voltage is generated in the secondary coil and this voltage is applied to the spark plugs to spark inside the cylinders. As the ECM cuts the current to the primary coil, the igniter sends back the ignition confirmation (IGF) signal for each cylinder ignition to the ECM.



DTC No.	DTC Detection Condition	Trouble Area
P0351 P0352 P0353 P0354 P0355 P0356 P0357 P0358	No IGF signal to ECM while engine is running	□Ignition system □Open or short in IGF or IGT1 to 8 circuit between ignition coil with igniter and ECM □No.1 to No.8 ignition coil with igniter (primary ignition) □ECM

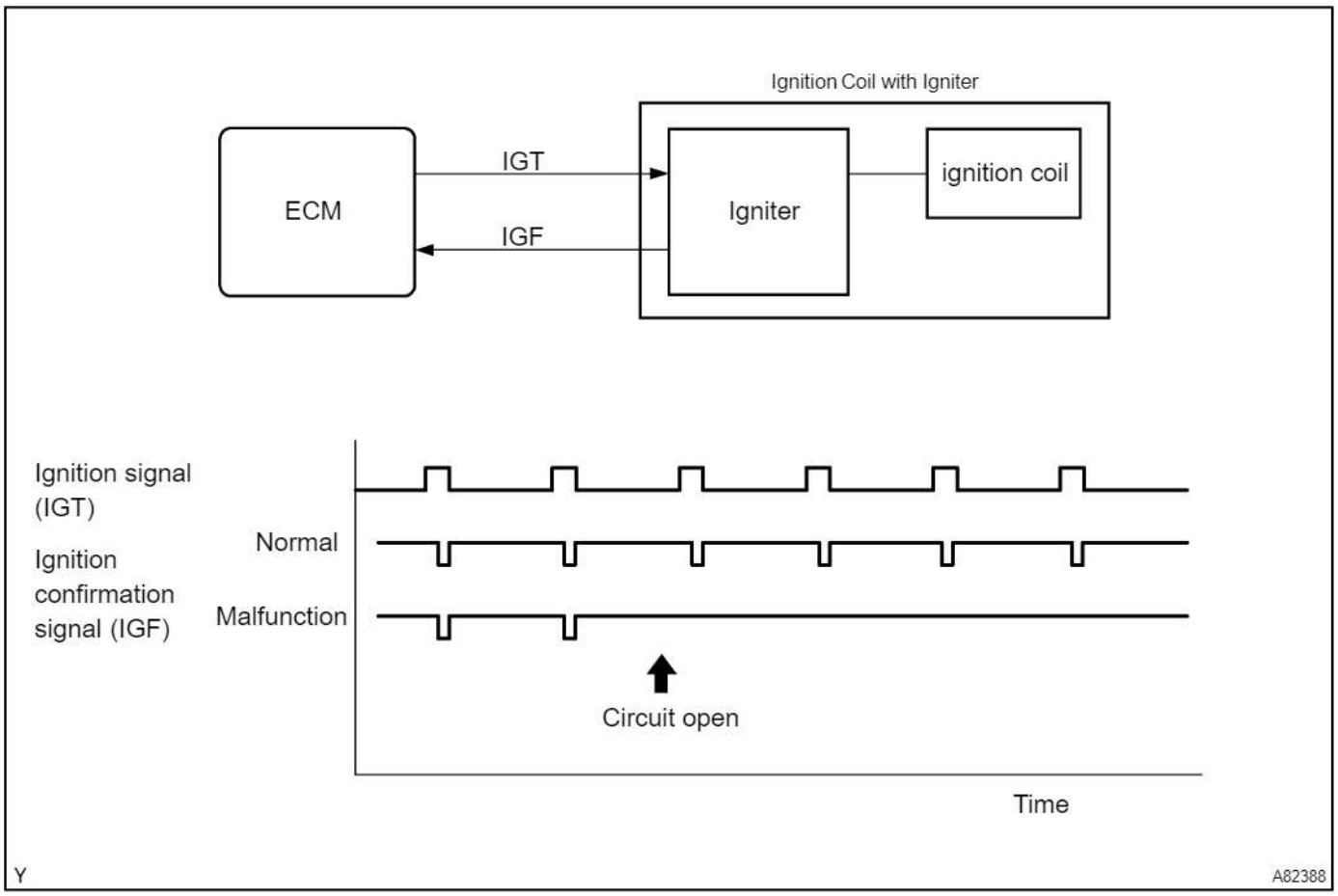
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Reference: Inspection using the oscilloscope.
HINT:
The correct waveform is as shown on the left.

Item	Contents
Terminal	CH1: IGT1 to IGT8 – E1 CH2: IGF – E1
Equipment Setting	2V/Division, 20ms/Division
Condition	While the engine is cranking or idling

MONITOR DESCRIPTION



If the ECM does not receive the ignition confirmation (IGF) signal after sending the ignition (IGT) signal, it interprets this as a fault in the igniter and sets a DTC.

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MONITOR STRATEGY

Related DTCs	P0351: No. 1 ignition coil with igniter circuit malfunction P0352: No. 2 ignition coil with igniter circuit malfunction P0353: No. 3 ignition coil with igniter circuit malfunction P0354: No. 4 ignition coil with igniter circuit malfunction P0355: No. 5 ignition coil with igniter circuit malfunction P0356: No. 6 ignition coil with igniter circuit malfunction P0357: No. 7 ignition coil with igniter circuit malfunction P0358: No. 8 ignition coil with igniter circuit malfunction
Required sensors/ components (Main)	Igniter (Cylinder 1 to 8)
Required sensors / components (Related)	–
Frequency of operation	Continuous
Duration	0.256 second
MIL operation	Immediate
Sequence operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05–13
Engine RPM	1,500 rpm or less
Either following condition is met:	(a) or (b)
(a) Following conditions are met:	1 & 2
1. Engine RPM	500 rpm or less
2. Battery voltage	6 V or more
(b) Following conditions are met:	1 & 2
1. Engine RPM	More than 500 rpm
2. Battery voltage	10 V or more

TYPICAL MALFUNCTION THRESHOLDS

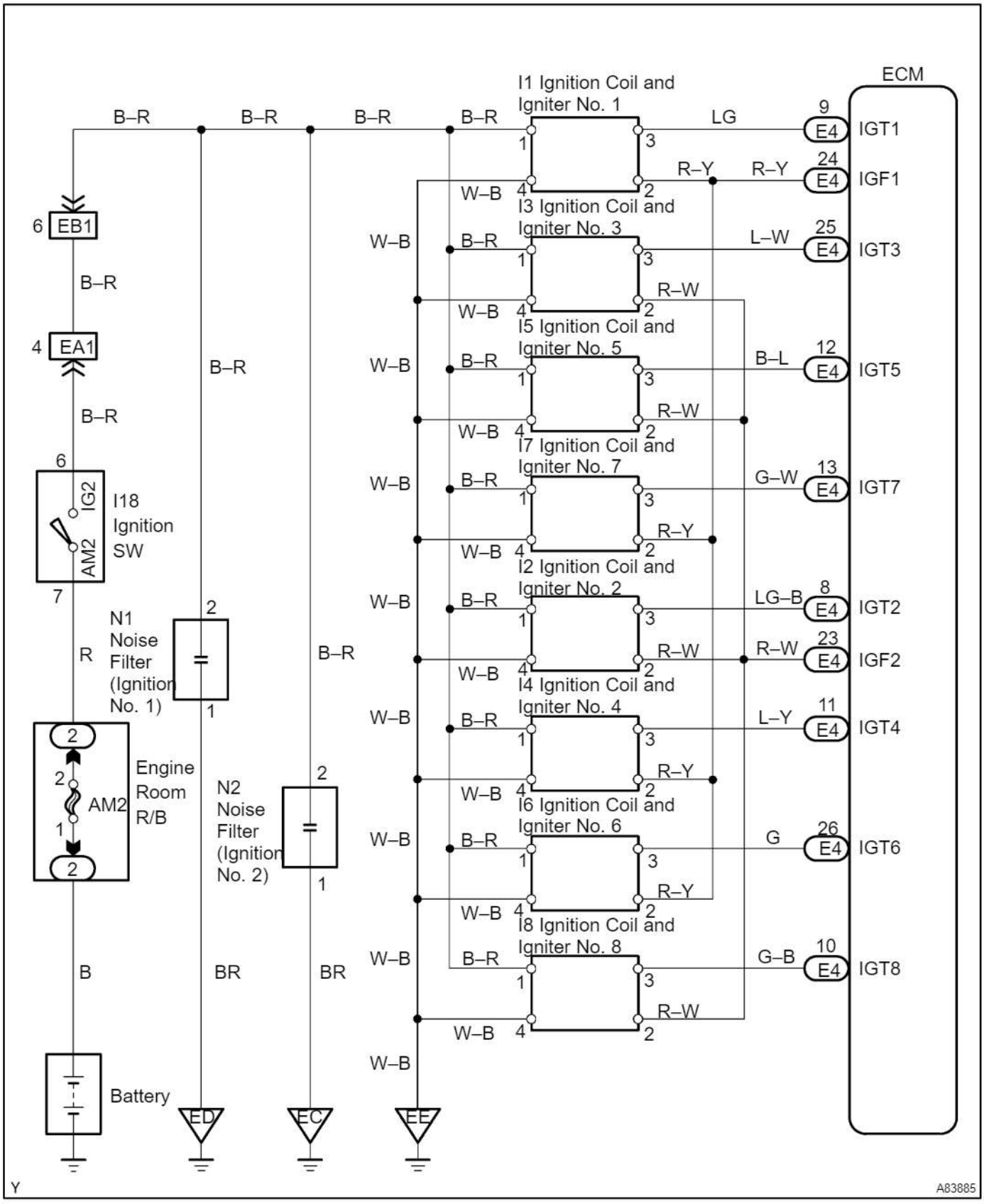
Ignition signal fail count	More than 2
Ignition signal fail count is as follows:	When IGF should have returned despite sending IGT.

COMPONENT OPERATING RANGE

Confirmed signal number = ignition signal number	–

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WIRING DIAGRAM



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INSPECTION PROCEDURE

HINT:

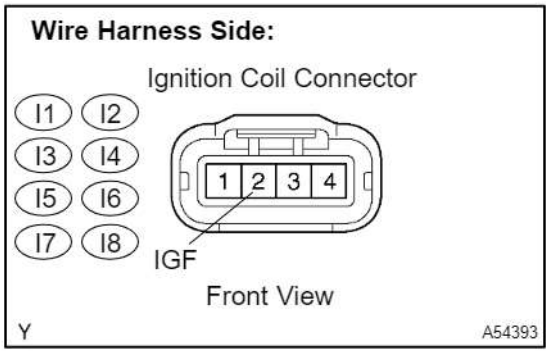
- If DTCs P0351, P0354, P0356 and P0357 are output simultaneously, IGF1 circuit may be open or short.
- If DTCs P0352, P0353, P0355 and P0358 are output simultaneously, IGF2 circuit may be open or short.
- Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

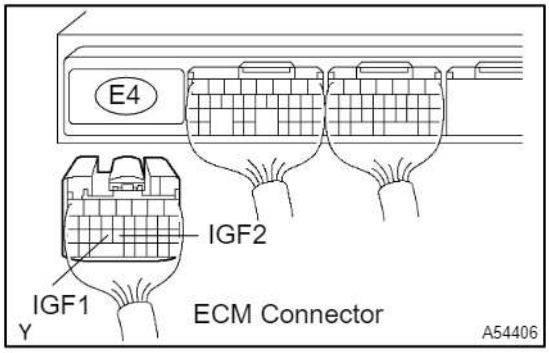
1	CHECK SPARK PLUG AND SPARK OF MISFIRING CYLINDER (See page 05–156)

NG → Go to step 4

OK

2	CHECK HARNESS AND CONNECTOR(IGNITION COIL – ECM (IGF SIGNAL TERMINAL))





(a) Disconnect the I1, I2, I3, I4, I5, I6, I7 or I8 ignition coil connector.

(b) Disconnect the E4 ECM connector.

(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
IGF (I1–2) – IGF1 (E4–24)	Below 1 Ω
IGF (I2–2) – IGF2 (E4–23)	Below 1 Ω
IGF (I3–2) – IGF2 (E4–23)	Below 1 Ω
IGF (I4–2) – IGF1 (E4–24)	Below 1 Ω
IGF (I5–2) – IGF2 (E4–23)	Below 1 Ω
IGF (I6–2) – IGF1 (E4–24)	Below 1 Ω
IGF (I7–2) – IGF1 (E4–24)	Below 1 Ω
IGF (I8–2) – IGF2 (E4–23)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
IGF (I1–2) or IGF1 (E4–24) – Body ground	10 kΩ or higher
IGF (I2–2) or IGF2 (E4–23) – Body ground	10 kΩ or higher
IGF (I3–2) or IGF2 (E4–23) – Body ground	10 kΩ or higher
IGF (I4–2) or IGF1 (E4–24) – Body ground	10 kΩ or higher
IGF (I5–2) or IGF2 (E4–23) – Body ground	10 kΩ or higher
IGF (I6–2) or IGF1 (E4–24) – Body ground	10 kΩ or higher
IGF (I7–2) or IGF1 (E4–24) – Body ground	10 kΩ or higher
IGF (I8–2) or IGF2 (E4–23) – Body ground	10 kΩ or higher

(d) Reconnect the ignition coil connector.

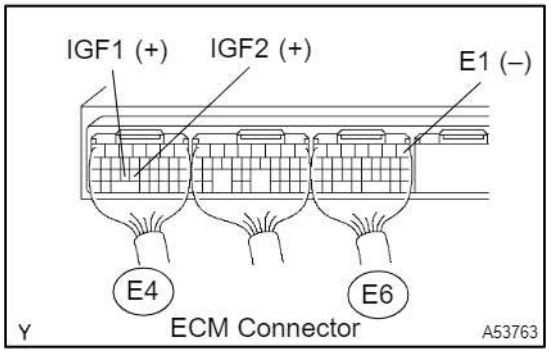
(e) Reconnect the ECM connector.

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NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

3	INSPECT ECM(IGF1 AND IGF2 VOLTAGE)



(a) Disconnect the ignition coil connector.
(b) Turn the ignition switch to ON.
(c) Measure the voltage between the terminals of the E4 ECM connector.

Standard:

Tester Connection	Specified Condition
IGF1 (E4–24) – E1 (E6–1)	4.5 to 5.5 V
IGF2 (E4–23) – E1 (E6–1)	4.5 to 5.5 V

(d) Reconnect the ignition coil connector.

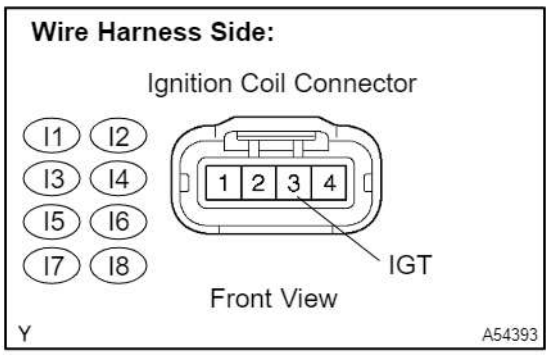
NG → REPLACE ECM (See page 10–24)

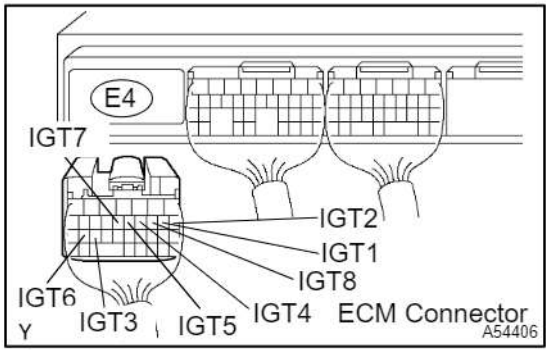
OK

REPLACE IGNITION COIL ASSY

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4 CHECK HARNESS AND CONNECTOR(IGNITION COIL – ECM (IGT SIGNAL TERMINAL))





(a) Disconnect the I1, I2, I3, I4, I5, I6, I7 or I8 ignition coil connector.
(b) Disconnect the E4 ECM connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
IGT (I1–3) – IGT1 (E4–9)	Below 1 Ω
IGT (I2–3) – IGT2 (E4–8)	Below 1 Ω
IGT (I3–3) – IGT3 (E4–25)	Below 1 Ω
IGT (I4–3) – IGT4 (E4–11)	Below 1 Ω
IGT (I5–3) – IGT5 (E4–12)	Below 1 Ω
IGT (I6–3) – IGT6 (E4–26)	Below 1 Ω
IGT (I7–3) – IGT7 (E4–13)	Below 1 Ω
IGT (I8–3) – IGT8 (E4–10)	Below 1 Ω

Standard (Check for short):

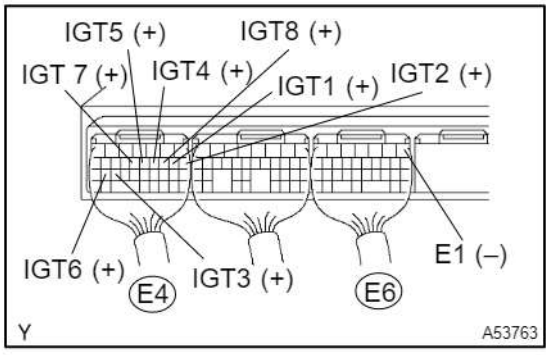
Tester Connection	Specified Condition
IGT (I1–3) or IGT1 (E4–9) – Body ground	10 kΩ or higher
IGT (I2–3) or IGT2 (E4–8) – Body ground	10 kΩ or higher
IGT (I3–3) or IGT3 (E4–25) – Body ground	10 kΩ or higher
IGT (I4–3) or IGT4 (E4–11) – Body ground	10 kΩ or higher
IGT (I5–3) or IGT5 (E4–12) – Body ground	10 kΩ or higher
IGT (I6–3) or IGT6 (E4–26) – Body ground	10 kΩ or higher
IGT (I7–3) or IGT7 (E4–13) – Body ground	10 kΩ or higher
IGT (I8–3) or IGT8 (E4–10) – Body ground	10 kΩ or higher

(d) Reconnect the ignition coil connector.
(e) Reconnect the ECM connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

5 INSPECT ECM(IGT1, IGT2, IGT3, IGT4, IGT5, IGT6, IGT7 OR IGT8 VOLTAGE)



(a) Measure the voltage between the terminals of the E4 and E6 ECM connectors when the engine is cranked.

Standard:

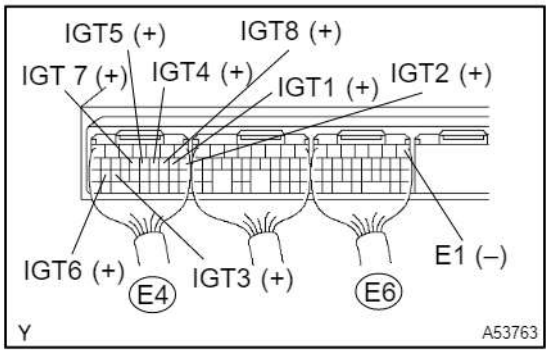
Tester Connection	Specified Condition
IGT1 (E4–9) – E1 (E6–1)	Between 0.1 V and 4.5 V
IGT2 (E4–8) – E1 (E6–1)	Between 0.1 V and 4.5 V
IGT3 (E4–25) – E1 (E6–1)	Between 0.1 V and 4.5 V
IGT4 (E4–11) – E1 (E6–1)	Between 0.1 V and 4.5 V
IGT5 (E4–12) – E1 (E6–1)	Between 0.1 V and 4.5 V
IGT6 (E4–26) – E1 (E6–1)	Between 0.1 V and 4.5 V
IGT7 (E4–13) – E1 (E6–1)	Between 0.1 V and 4.5 V
IGT8 (E4–10) – E1 (E6–1)	Between 0.1 V and 4.5 V

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NG → REPLACE ECM (See page 10–24)

OK

6 INSPECT ECM(IGT1, IGT2, IGT3, IGT4, IGT5, IGT6, IGT7 OR IGT8 VOLTAGE)



(a) Disconnect the I1, I2, I3, I4, I5, I6, I7 or I8 ignition coil connector.

(b) Measure the voltage between the terminals of the E4 and E6 ECM connectors when the engine is cranked.

Standard:

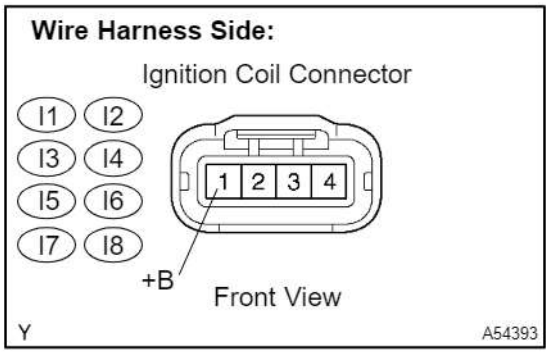
Tester Connection	Specified Condition
IGT1 (E4–9) – E1 (E6–1)	4.5 V or more
IGT2 (E4–8) – E1 (E6–1)	4.5 V or more
IGT3 (E4–25) – E1 (E6–1)	4.5 V or more
IGT4 (E4–11) – E1 (E6–1)	4.5 V or more
IGT5 (E4–12) – E1 (E6–1)	4.5 V or more
IGT6 (E4–26) – E1 (E6–1)	4.5 V or more
IGT7 (E4–13) – E1 (E6–1)	4.5 V or more
IGT8 (E4–10) – E1 (E6–1)	4.5 V or more

(c) Reconnect the ignition coil connector.

NG → REPLACE ECM (See page 10–24)

OK

7 INSPECT IGNITION COIL ASSY(POWER SOURCE)



(a) Disconnect the I1, I2, I3, I4, I5, I6, I7 or I8 ignition coil connector.

(b) Turn the ignition switch to ON or START position.

(c) Measure the voltage between the terminal of the wire harness side connector and body ground.

Standard:

Tester Connection	Specified Condition
+B (I1–1) – Body ground	9 to 14 V
+B (I2–1) – Body ground	9 to 14 V
+B (I3–1) – Body ground	9 to 14 V
+B (I4–1) – Body ground	9 to 14 V
+B (I5–1) – Body ground	9 to 14 V
+B (I6–1) – Body ground	9 to 14 V
+B (I7–1) – Body ground	9 to 14 V
+B (I8–1) – Body ground	9 to 14 V

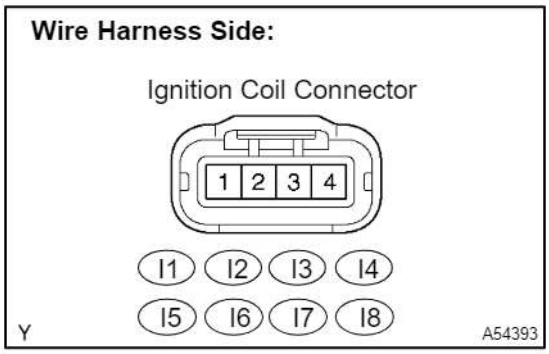
(d) Reconnect the ignition coil connector.

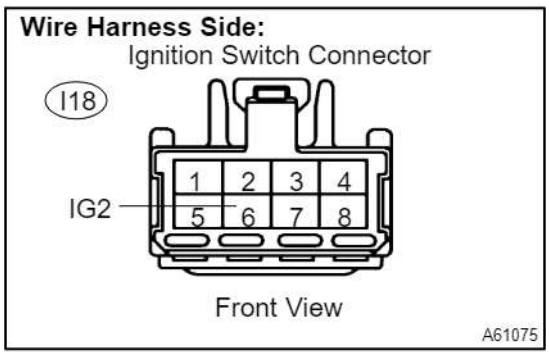
OK → REPLACE IGNITION COIL ASSY

NG

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8 CHECK HARNESS AND CONNECTOR(IGNITION COIL – IGNITION SWITCH)





(a) Disconnect the I1, I2, I3, I4, I5, I6, I7 or I8 ignition coil connector.

(b) Disconnect the I18 ignition switch connector.

(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
+B (I1–1) – IG2 (I18–6)	Below 1 Ω
+B (I2–1) – IG2 (I18–6)	Below 1 Ω
+B (I3–1) – IG2 (I18–6)	Below 1 Ω
+B (I4–1) – IG2 (I18–6)	Below 1 Ω
+B (I5–1) – IG2 (I18–6)	Below 1 Ω
+B (I6–1) – IG2 (I18–6)	Below 1 Ω
+B (I7–1) – IG2 (I18–6)	Below 1 Ω
+B (I8–1) – IG2 (I18–6)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
+B (I1–1) or IG2 (I18–6) – Body ground	10 kΩ or higher
+B (I2–1) or IG2 (I18–6) – Body ground	10 kΩ or higher
+B (I3–1) or IG2 (I18–6) – Body ground	10 kΩ or higher
+B (I4–1) or IG2 (I18–6) – Body ground	10 kΩ or higher
+B (I5–1) or IG2 (I18–6) – Body ground	10 kΩ or higher
+B (I6–1) or IG2 (I18–6) – Body ground	10 kΩ or higher
+B (I7–1) or IG2 (I18–6) – Body ground	10 kΩ or higher
+B (I8–1) or IG2 (I18–6) – Body ground	10 kΩ or higher

(d) Reconnect the ignition coil connector.

(e) Reconnect the ignition switch connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE IGNITION COIL ASSY

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DTC	P0420	CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1)

DTC	P0430	CATALYST SYSTEM EFFICIENCY BELOW REPLACE TWCTHRESHOLD (BANK 2)

CIRCUIT DESCRIPTION

The ECM compares the 2 waveforms of the heated oxygen sensors located before and after the catalyst to determine whether or not the catalyst performance has deteriorated.
Air–fuel ratio feedback compensation keeps the waveform of the heated oxygen sensor in front of the catalyst alternates between back and forth, from RICH to LEAN.
If the catalyst is functioning normally, the waveform of the heated oxygen sensor behind the catalyst switches back and forth between RICH and LEAN much more slowly than the waveform of the heated oxygen sensor in front of the catalyst.
When both waveforms change at a similar rate, it indicates that the catalyst performance has deteriorated.

DTC No.	DTC Detection Condition	Trouble Area
P0420 P0430	After engine and catalyst are warmed up, and while vehicle is driven within set vehicle speed and engine speed ranges, waveforms of heated oxygen sensors have the same amplitude (2 trip detection logic)	□Gas leakage in exhaust system □Heated oxygen sensor □Three–way catalytic converter (inside exhaust manifold)

HINT:

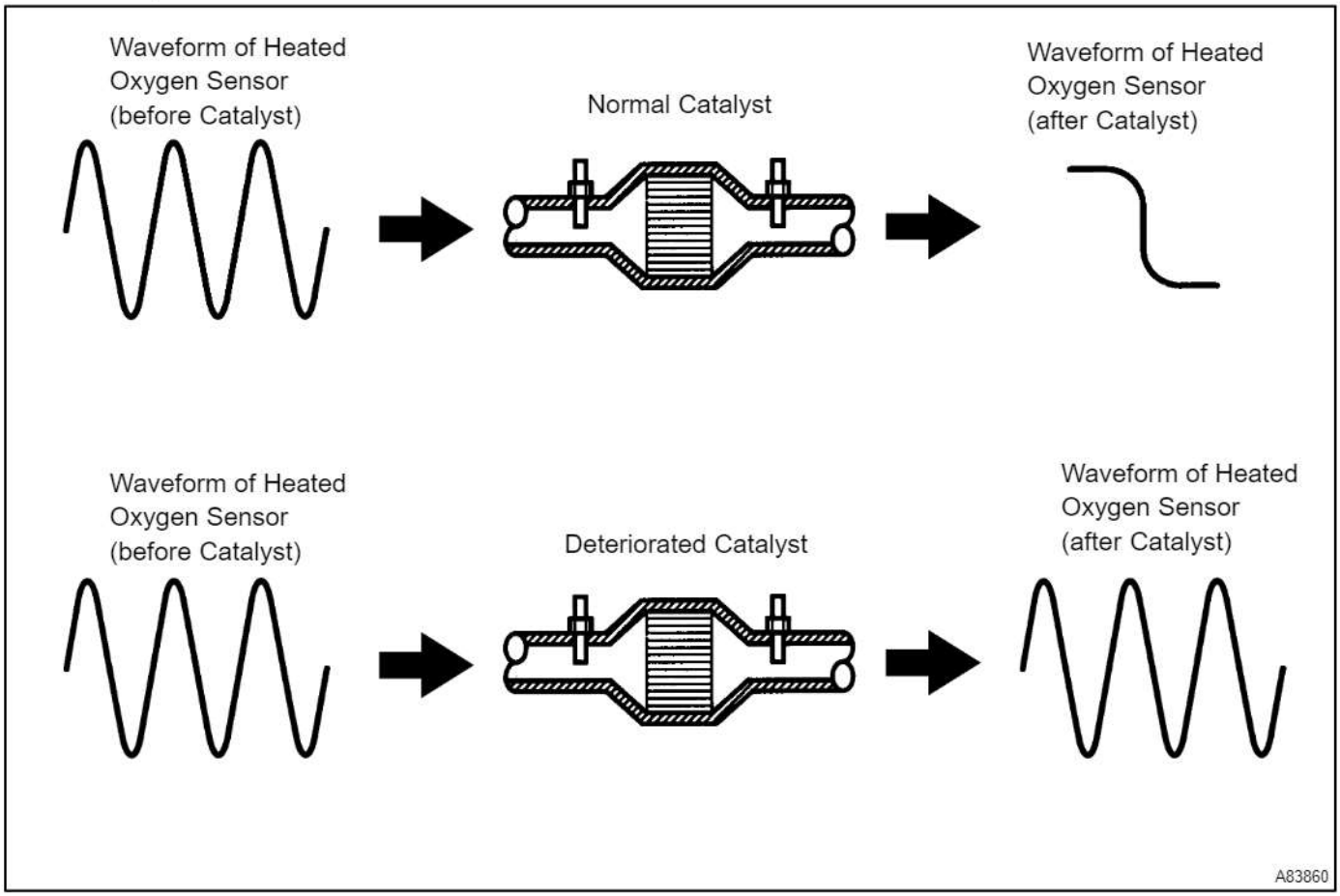
- □ Bank 1 refers to the bank that includes cylinder No.1.
- □ Bank 2 refers to the bank that does not include cylinder No.1.
- □ Sensor 1 refers to the sensor closest to the engine body.
- □ Sensor 2 refers to the sensor farthest away from the engine body.

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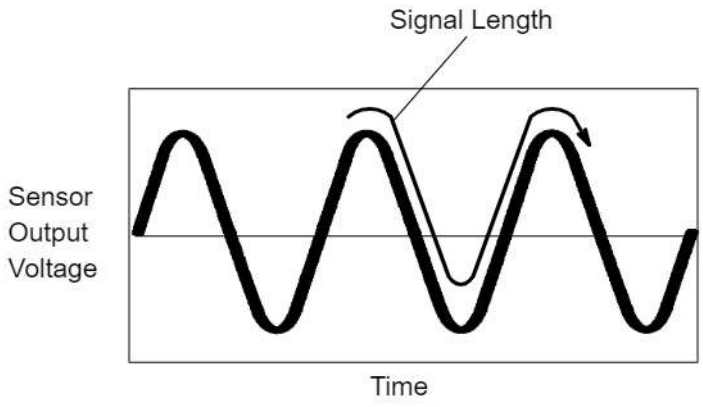
MONITOR DESCRIPTION

The vehicle is equipped with the four heated oxygen sensors (O2S). Two of them are mounted upstream from the three–way catalytic (TWC) converter (front heated oxygen sensor "sensor 1"), the rest are mounted downstream (rear heated oxygen sensor "sensor 2"). The catalyst efficiency monitor compares the sensor 1 and 2 signals in order to calculate TWC ability to store oxygen.

During normal operation, the TWC stores and releases oxygen as needed. This results in low oxygen variations in the post TWC exhaust stream as shown.



Heated Oxygen Sensor Signal Length



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MONITOR STRATEGY

Related DTCs	P0420: Catalyst (Bank 1) is deterioration P0430: Catalyst (Bank 2) is deterioration
Required sensors/ components (Main)	Heated oxygen sensor (Sensor 1 and 2)
Required sensors / components (Related)	Mass air flow meter, engine coolant temperature sensor, engine speed sensor, intake air temperature sensor
Frequency of operation	Once per driving cycle
Duration	90 seconds (30 seconds x 3)
MIL operation	2 driving cycles
Sequence operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05–13
Battery voltage	11 V or more
Intake air temperature	–10 C (14 F) or more
Idle	OFF
Intake air amount	8 to 50 g/sec
Engine RPM	Less than 4,000 rpm
Engine coolant temperature	75 C (167 F) or more
Estimated catalyst temperature conditions are met:	A and B
A. Estimated temperature of up stream catalyst	450 to 830 C (842 to 1,526 F)
B. Estimated temperature of down stream catalyst	450 to 830 C (842 to 1,526 F)
Fuel system status	Closed Loop

TYPICAL MALFUNCTION THRESHOLDS

Catalyst deterioration level (heated oxygen sensor locus length ratio)	0.6 or more
Number of times detection	8 times

COMPONENT OPERATING RANGE

Catalyst deterioration level (heated oxygen sensor locus length ratio)	0 to 1

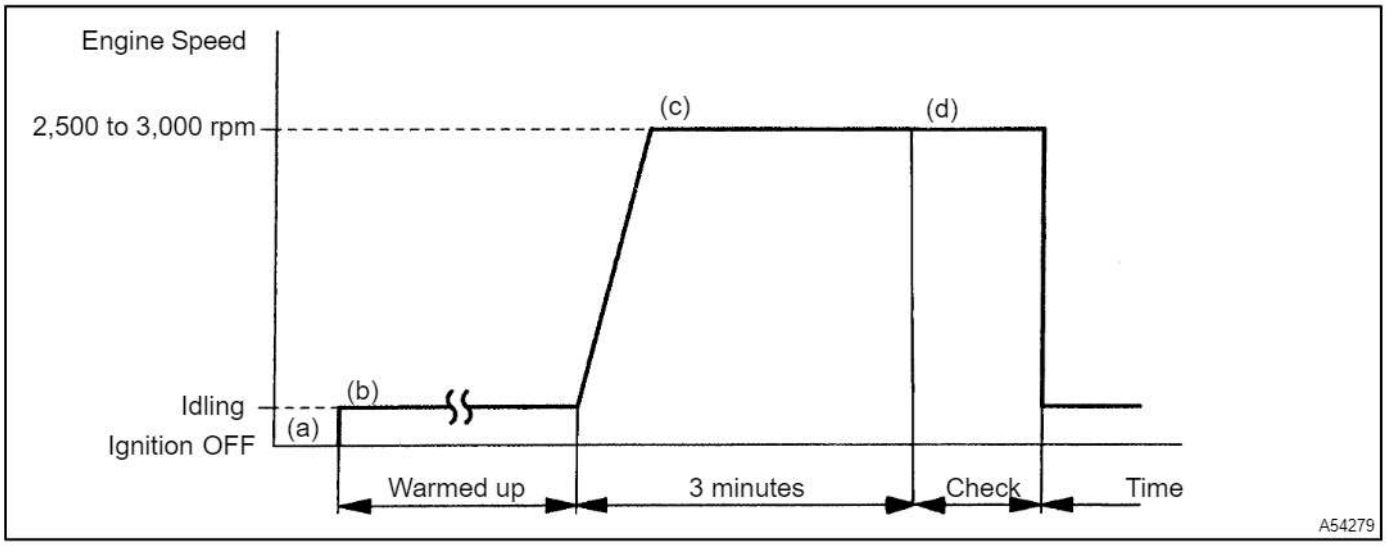
MONITOR RESULT (MODE 06 DATA)

Test ID/Comp ID	Description of Test Data	Description of Test Limit	Conversion Factor (Unit)
$01/$01 to $02	Catalyst deterioration level determined by waveforms of the heated oxygen sensor	Malfunction criteria for catalyst deterioration	Multiply by 0.007812 (No dimension)

Refer to page 05–21 for detailed information on CHECKING MONITOR STATUS.

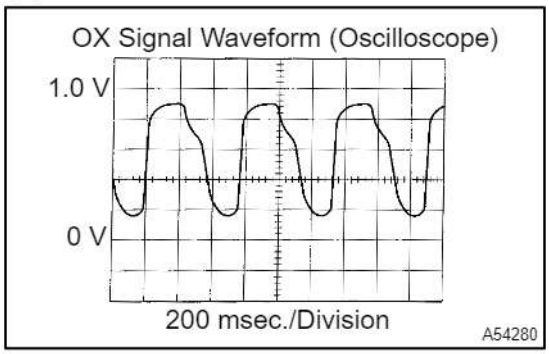
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CONFIRMATION ENGINE RACING PATTERN



HINT:
Follow this procedure to active and condition the heated oxygen sensors prior to observation of their respective waveform output.

(a) Connect the hand–held tester to the DLC3, or connect the oscilloscope probe between terminals OX1A (bank 1, sensor 1), OX2A (bank 1, sensor 2), OX1B (bank 2, sensor 1), OX2B (bank 2, sensor 2) and E2 of the ECM connectors.
(b) Start the engine and warm it up with all accessories switched OFF until the engine coolant temperature become stable.
(c) Run the engine at 2,500 to 3,000 rpm for approximately 3 minutes.
(d) First, check the waveforms of each front heated oxygen sensor (OX1A and OX2A) at the engine speed of 2,500 to 3,000 rpm. The voltage output should alternate between 0 V and 1 V as shown.
(e) Then, check the waveform of each rear heated oxygen sensor (OX1B and OX2B) likewise.



HINT:
If the voltage fluctuation of either of the rear heated oxygen sensors is similar to the respective front sensors' waveform output, it may be that the three–way catalytic converter has deteriorated.

INSPECTION PROCEDURE

HINT:
Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

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1	CHECK OTHER DTC OUTPUT(IN ADDITION TO DTC P0420 AND/OR P0430)

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(c) Select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(d) Read the DTCs using the hand–held tester or the OBD II scan tool.

Result:

Display (DTC output)	Proceed to
P0420 and/or P0430	A
P0420 or P0430 and other DTCs	B

HINT:
If any other codes besides P0420 and/or P0430 are output, perform troubleshoot on that DTC before.

B → GO TO RELEVANT DTC CHART (See page 05–47)

A

2	CHECK FOR EXHAUST GAS LEAKAGE

NG → REPAIR OR REPLACE EXHAUST GAS LEAKAGE POINT

OK

3	INSPECT HEATED OXYGEN SENSOR(BANK 1, 2 SENSOR 1) (See page 05–58)

Refer to the hint below.

NG → REPLACE HEATED OXYGEN SENSOR

OK

4	INSPECT HEATED OXYGEN SENSOR(BANK 1, 2 SENSOR 2) (See page 05–58)

Refer to the hint below.

NG → REPLACE HEATED OXYGEN SENSOR

OK

REPLACE THREE–WAY CATALYTIC CONVERTER (REPLACE FRONT AND REAR THREE–WAY CATALYTIC CONVERTER IN THE BANK A MALFUNCTION IS DETECTED)

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HINT:
Hand–held tester only:
It is possible the malfunctioning area can be found using the ACTIVE TEST A/F CONTROL operation. The A/F CONTROL operation can determine if the A/F sensor, heated oxygen sensor or other potential trouble areas are malfunctioning or not.
(a) Perform the ACTIVE TEST A/F CONTROL operation.
HINT:
The A/F CONTROL operation lowers the injection volume 12.5% or increases the injection volume 25%.
(1) Connect the hand–held tester to the DLC3 on the vehicle.
(2) Turn the ignition switch to ON.
(3) Warm up the engine by running the engine at 2,500 rpm for approximately 90 seconds.
(4) Select the item: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL.
(5) Perform the A/F CONTROL operation with the engine in an idle condition (press the right or left button).

Result:

Heated oxygen sensor reacts in accordance with increase and decrease of injection volume:
+25 % → rich output: More than 0.5 V
–12.5 % → lean output: Less than 0.4 V

NOTICE:
There is a delay of few seconds in the sensor 1 (front sensor) output, and there is about 20 seconds delay at maximum in the sensor 2 (rear sensor).

	Output voltage of heated oxygen sensor (sensor 1: front sensor)	Output voltage of heated oxygen sensor (sensor 2: rear sensor)	Main suspect trouble area
Case 1	Injection volume +25 % –12.5 % Output voltage More than 0.5 V Less than 0.4V OK	Injection volume +25 % –12.5 % Output voltage More than 0.5 V Less than 0.4V OK	□
Case 2	Injection volume +25 % –12.5 % Output voltage Almost no reaction NG	Injection volume +25 % –12.5 % Output voltage More than 0.5 V Less than 0.4V OK	Sensor 1: front sensor (sensor 1, heater, sensor 1 circuit)
Case 3	Injection volume +25 % –12.5 % Output voltage More than 0.5 V Less than 0.4V OK	Injection volume +25 % –12.5 % Output voltage Almost no reaction NG	Sensor 2: rear sensor (sensor 2, heater, sensor 2 circuit)
Case 4	Injection volume +25 % –12.5 % Output voltage Almost no reaction NG	Injection volume +25 % –12.5 % Output voltage Almost no reaction NG	Extremely rich or lean actual air–fuel ratio (Injector, fuel pressure, gas leakage in exhaust system, etc.)

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The following A/F CONTROL procedure enables the technician to check and graph the voltage outputs of both the heated oxygen sensor.
To display the graph, enter ACTIVE TEST/ A/F CONTROL/USER DATA, then select ”O2S B1S1 and O2S B1S2” or ”O2S B2S1 and O2S B2S2” by pressing the ”YES” button followed by the ”ENTER” button and then the ”F4” button.

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DTC	P0441	EVAPORATIVE EMISSION CONTROL SYSTEM INCORRECT PURGE FLOW

DTC	P0442	EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK)

DTC	P0446	EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT

DTC	P0455	EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (GROSS LEAK)

DTC	P0456	EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK)

MONITOR DESCRIPTION

The ECM tests the Evaporative Emissions (EVAP) system using the fuel tank pressure sensor, the Canister Close Valve (CCV), and the VSV for EVAP. The ECM closes the EVAP system and introduces a negative pressure (vacuum) into it. The ECM then monitors the internal pressure using the fuel tank pressure sensor (refer to the diagram leak check).

P0441

The VSV for EVAP:

(a) Is used to purge the evaporative emissions from the fuel tank into the intake manifold.
(b) Works with the VSV for CCV to create a vacuum (negative pressure) inside the fuel tank, and perform leak tests.

Opening or closing malfunctions in the VSV for EVAP prompt the ECM to set DTC P0441.

The ECM checks for a VSV for EVAP "stuck closed" fault by commanding the VSV for EVAP open with the VSV for CCV (vent) closed. The fuel tank should develop a high negative pressure (vacuum). If it does not, the ECM determines that despite an OPEN command, the VSV for EVAP remained closed. The ECM turns on the MIL and a DTC is set.

The ECM checks for a VSV for EVAP "stuck open" fault by commanding both the VSV for EVAP and VSV for CCV closed at a time when the fuel tank is at atmospheric pressure. If the fuel tank develops a high negative pressure (vacuum) during this early stage of the test, the ECM determines that the VSV for EVAP is stuck open. The ECM will turn on the MIL and DTC is set.

P0446

The VSV for CCV opens under normal conditions. The VSV for CCV is used to:

(a) After the VSV for EVAP purges the evaporative emissions from the fuel tank into the intake manifold, the VSV for CCV draws fumes from the fuel tank into the charcoal canister.
(b) Pressure inside the fuel tank when the pressure has suddenly risen.
(c) Along with the VSV for EVAP, it creates a vacuum (negative pressure) inside the fuel tank and performs leak tests.

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The ECM checks for a VSV for CCV "stuck closed" malfunction by commanding both valves (VSV for EVAP and VSV for CCV) open at a time when the fuel tank is at atmospheric pressure. If the fuel tank develops a high negative pressure (vacuum) and it remains in that state for more than 4 seconds, the ECM determines that the VSV for CCV (vent) is stuck closed. The ECM will turn on the MIL and a DTC is set. This malfunction is detected regardless of the engine coolant temperature.
The ECM checks for a VSV for CCV "stuck open" malfunction by commanding the VSV for EVAP open with the VSV for CCV closed when the fuel tank should have developed a high negative pressure (vacuum). If the fuel tank did not develop the proper high negative pressure (vacuum), the ECM concludes that the VSV for CCV must have been "stuck open". The ECM will turn on the MIL and a DTC is set.

P0442, P0455 and P0456

A leak in the evaporative emission system prompts the ECM to set DTC P0442, P0455 or P0456.
The ECM checks for leaks in the system by introducing a high negative pressure (vacuum) from the intake manifold by commanding the VSV for EVAP open while the VSV for CCV (vent) is closed. After sufficient time has elapsed the fuel tank should develop a high negative pressure (vacuum) and the VSV for EVAP is closed. The ECM then monitors the pressure–rise (loss of vacuum) in the fuel tank. If the pressure rises too rapidly, the ECM concludes that there is a leak in the system.
The ECM will turn on the MIL and a DTC is set.
The ECM has separate DTCs for small and large leaks:

(a) DTC P0442 is set when the internal fuel tank pressure has a large increase and the EVAP system has a small leak.
(b) DTC P0455 is set when EVAP system has a very large leak. Even though the ECM sends a signal to the VSV for EVAP when CCV is closed to create a vacuum when CCV is closed, the internal fuel tank pressure does not decrease beyond a specified level.
(c) DTC P0456 is set when the internal fuel tank pressure increase slightly and the EVAP system has a very small leak.

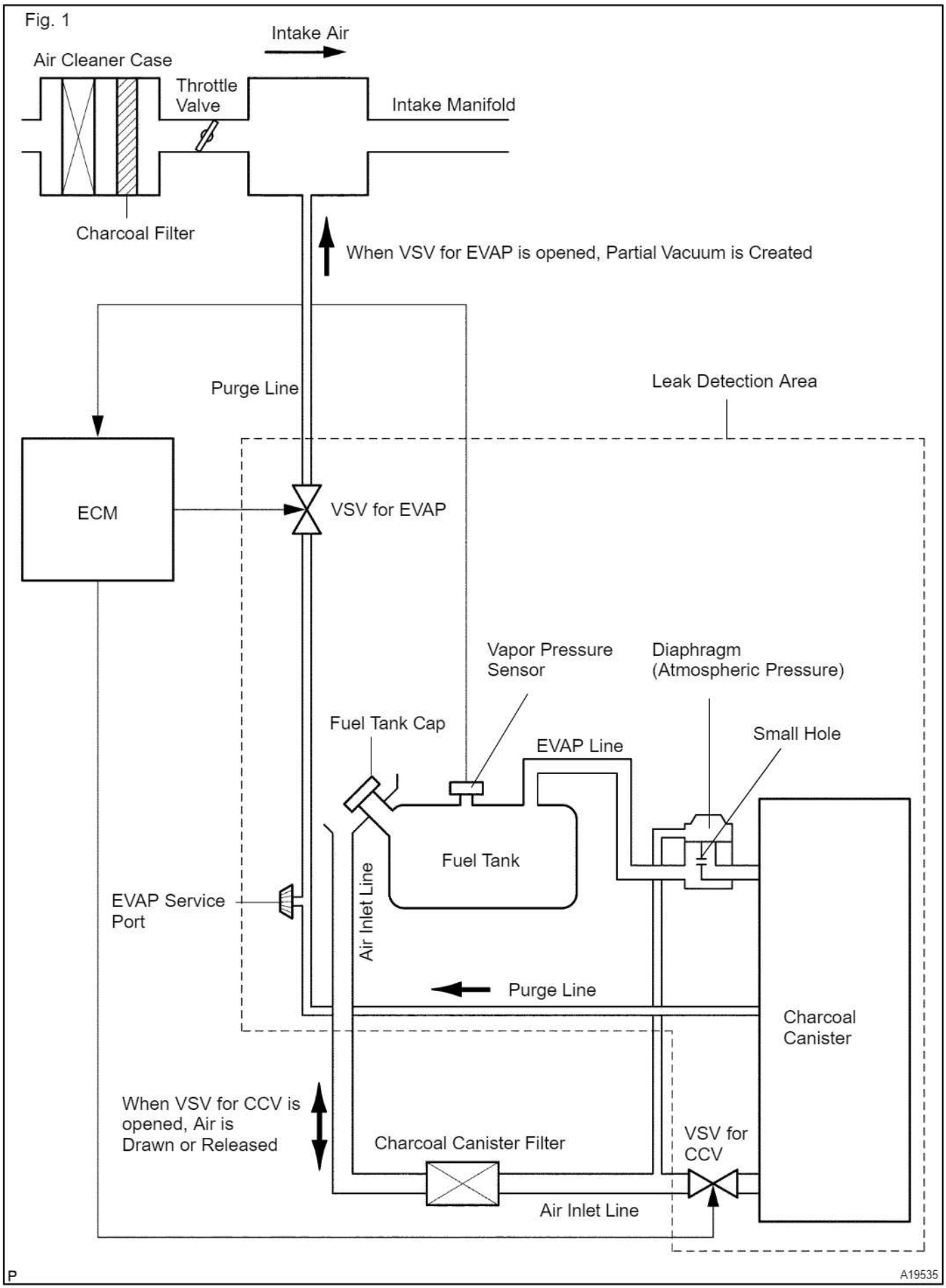
DTC No.	DTC Detection Condition	Trouble Area
P0441	Pressure in charcoal canister and fuel tank does not drop during purge control (2 trip detection logic) During purge cut–off, negative pressure entering the charcoal canister and fuel tank. (2 trip detection logic)	Vacuum hose has cracks, holes, or is blocked, damaged or disconnected Fuel tank cap incorrectly installed Fuel tank cap has cracks or is damaged Open or short in vapor pressure sensor circuit Vapor pressure sensor Open or short in VSV circuit for EVAP VSV for EVAP Open or short in VSV circuit for CCV VSV for CCV Fuel tank has cracks, holes, or is damaged Charcoal canister has cracks, holes, or is damaged Fuel tank over fill check valve cracks, or is damaged ECM

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P0446	Open or close malfunction in the canister close valve (CCV). (2 trip detection logic)	Vacuum hose has cracks, holes, or is blocked, damaged or disconnected Fuel tank cap incorrectly installed Fuel tank cap has cracks or is damaged Open or short in vapor pressure sensor circuit Vapor pressure sensor Open or short in VSV circuit for EVAP VSV for EVAP Open or short in VSV circuit for CCV VSV for CCV Fuel tank has cracks, holes, or is damaged Charcoal canister has cracks, holes, or is damaged Fuel tank over fill check valve cracks, or is damaged ECM
P0442 P0455 P0456	After a cold engine start. After VSV for EVAP operation, the VSV for EVAP is turned off, Sealing the vacuum in the system and the ECM begins to monitor the pressure increase. Some increase is expected and will not set a DTC. (2 trip detection logic) A rapid, sharp increase in pressure indicates a leak in the EVAP system and DTC P0442 sets. An increase in pressure (above the expected amount) indicates a very small leak in the EVAP system and DTC P0456 sets. If the vacuum is not strong enough, the ECM assumes the EVAP system has a large hole and DTC P0455 sets.	Vacuum hose has cracks, holes, or is blocked, damaged or disconnected Fuel tank cap incorrectly installed Fuel tank cap has cracks or is damaged Open or short in vapor pressure sensor circuit Vapor pressure sensor Open or short in VSV circuit for EVAP VSV for EVAP Open or short in VSV circuit for CCV VSV for CCV Fuel tank has cracks, holes, or is damaged Charcoal canister has cracks, holes, or is damaged Fuel tank over fill check valve cracks, or is damaged ECM

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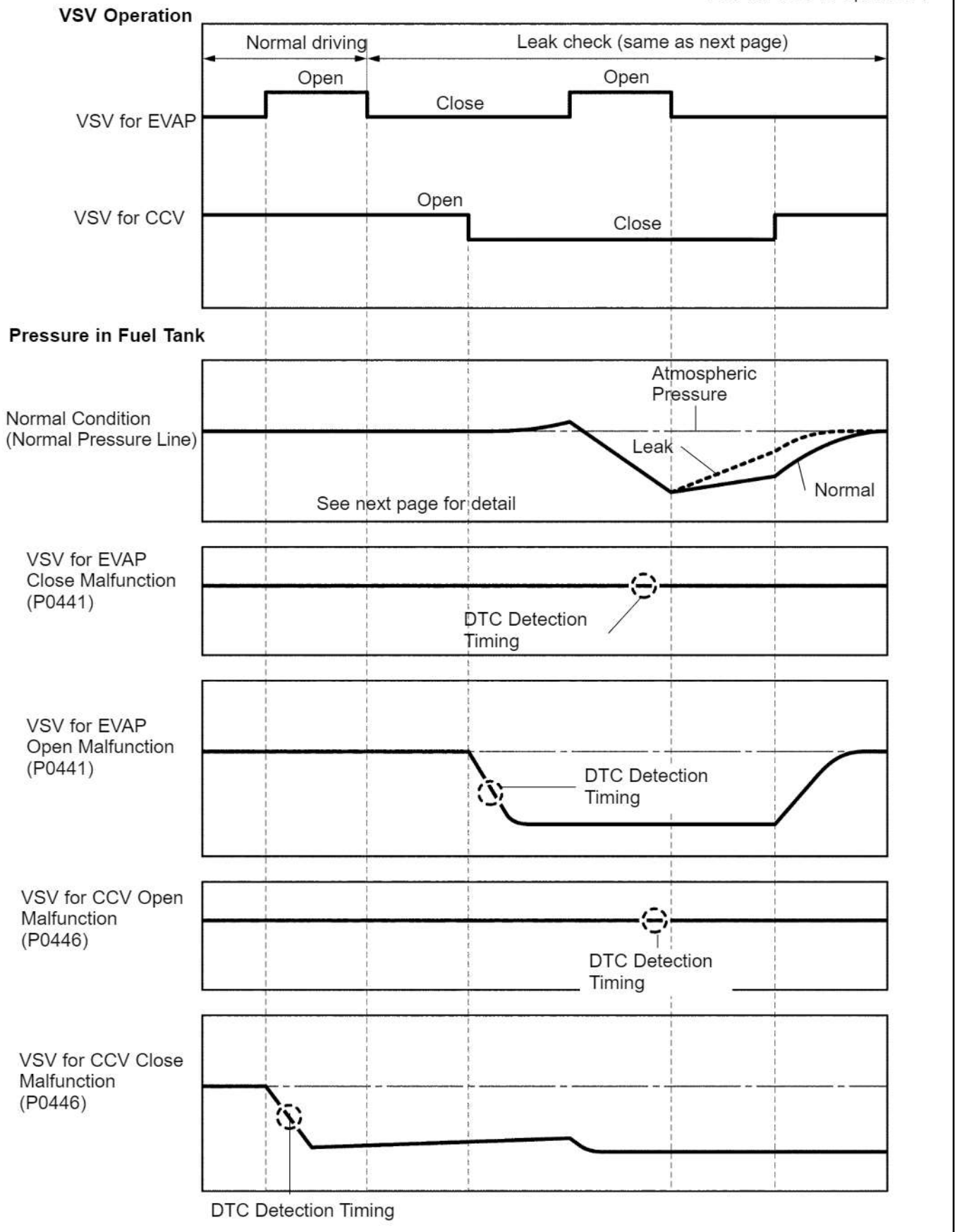
Fig. 1



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VSV Malfunction Condition and DTC Detection Timing

VSV for EVAP is Open: ON
VSV for CCV is Open: OFF

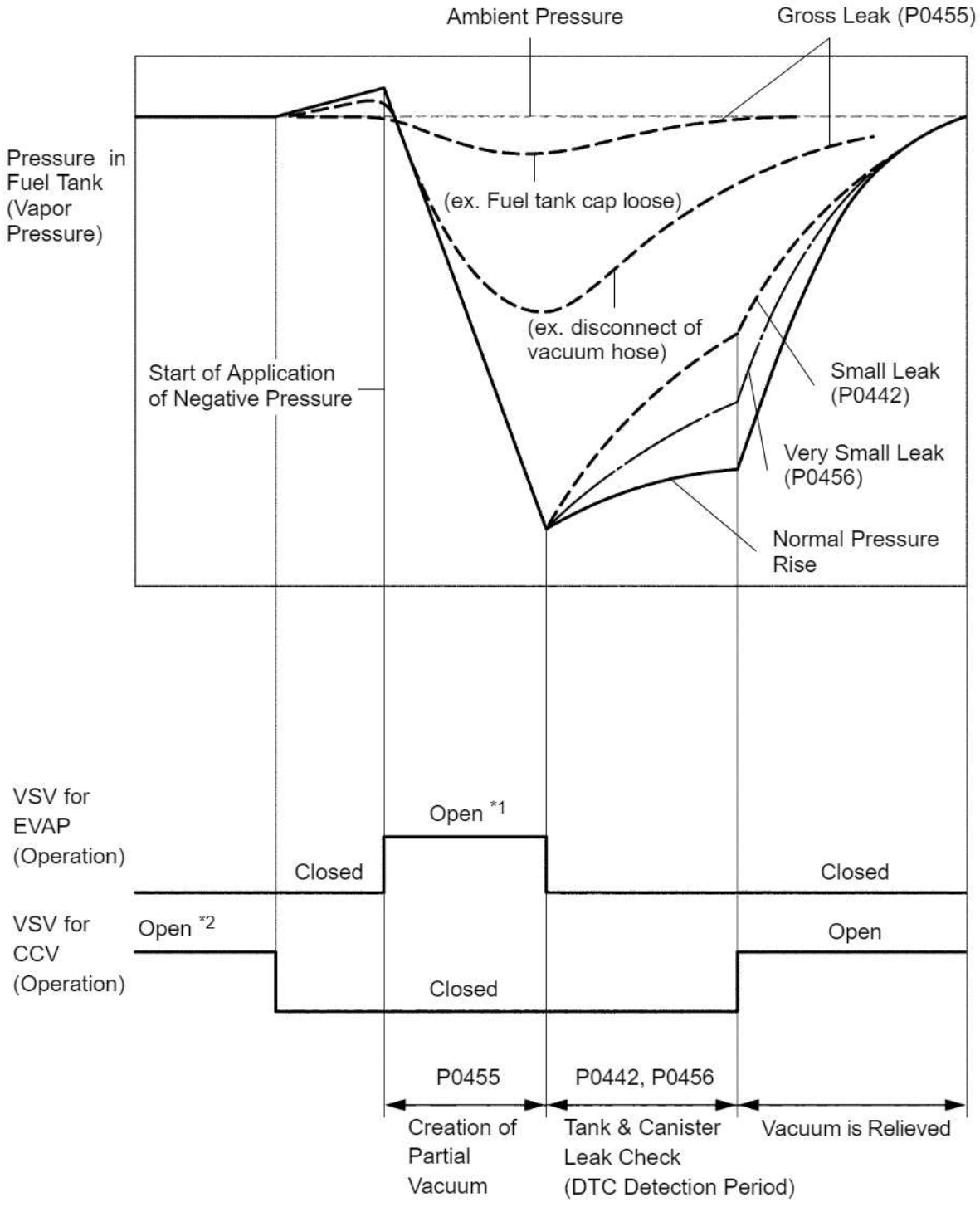


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Leak Check

Initial Condition
☐ Cold Start
☐ Temperature: Engine Coolant / Intake Air / Nearly Same



*1: VSV for EVAP is Open: ON
*2: VSV for CCV is Open: OFF

P A85439

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MONITOR STRATEGY

Related DTCs	P0441: Purge VSV stuck open P0441: Purge VSV stuck close P0442: EVAP small leak (0.04 inch leak) P0446: CCV stuck open P0446: CCV stuck close P0455: EVAP gross leak P0456: EVAP very small leak (0.02 inch leak)
Required sensors/ components (Main)	Fuel cap, Fuel tank, EVAP canister, EVAP hose, Purge VSV, CCV
Required sensors / components (Related)	Vapor pressure sensor, Engine coolant temperature sensor, Intake air temperature sensor, Vehicle speed sensor, Mass air flow meter
Frequency of operation	Once per driving cycle
Duration	90 seconds (30 seconds x 3)
MIL operation	2 driving cycles
Sequence operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05–13
Battery voltage	11 V or more
Altitude	7,870 ft. (2,400 m) or less
Intake air temperature	4.4°C (39.92°F) or more
Engine start intake air temperature	4.4 to 35°C (39.92 to 95°F) (P0441, P0442, P0446 and P0455) 4.4 to 32°C (39.92 to 89.6°F) (P0456)
Engine start engine coolant temperature	4.4 to 35°C (39.92 to 95°F) (P0441, P0442, P0446 and P0455) 4.4 to 32°C (39.92 to 89.6°F) (P0456)
Difference between intake air temperature and engine coolant temperature at engine start	–7 to 11.1°C (–12.6 to 20°F)
Purge VSV and CCV	No active test by scan tool
Time after engine start	5 seconds or more, less than 50 minutes
Vehicle speed	Within 80 mph (130 km/h)
Vehicle condition is either (a) or (b)	(a) 90 seconds or more pass since vehicle stop (b) 20 seconds or more pass since vehicle starting to run and vehicle is driven by steady speed.
Fuel slosh	No sloshing, i.e. fairly smooth road
Mass air flow	No great change
Fuel tank pressure change	Minimal change
Fuel tank pressure	Less than –19.5 mmHg (–2.6 kPa) [Less than 740.5mmHg]
Fuel tank level	Less than 90 %
Number of "negative pressure introduction" in this driving cycles	Within 8 times

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TYPICAL MALFUNCTION THRESHOLDS

P0441 (Purge VSV stuck close):

Change fuel tank pressure during "negative Pressure introduction"	Less than 5.25 mmHg (0.7 kPa)

P0441 (Purge VSV stuck open):

Fuel tank pressure before "negative pressure introduction"	Less than –10 mm Hg (–1.333 kPa) [Less than 750 mmHg]

P0446 (CCV stuck close):

Both of the following conditions are met:	
Accumulated EVAP purge volume	0.5 gram or more
Fuel tank pressure	Less than –12.75 mmHg (–1.7 kPa) [Less than 747.25 mmHg]

P0446 (CCV stuck open):

Purge VSV stuck close	Detected

P0442 (EVAP small leak (0.04 inch leak)):

Fuel tank pressure increase for 5 seconds from –20 mmHg (–2.67 kPa) [740 mmHg]	More than 1.2mmHg (0.16 kPa)
Both of the following conditions are met:	
Fuel tank pressure increase for 5 seconds from –17 mmHg (–2.27 kPa) [743 mmHg]	More than 1.2mmHg (0.16 kPa)
Fuel tank pressure after "negative pressure introduction"	Less than –18 mmHg (–2.4 kPa) [More than 742 mmHg]

P0442 (EVAP very small leak (0.02 inch leak)):

Fuel tank pressure increase for 5 seconds from –20 mmHg (–2.67 kPa) [740 mmHg]	More than 0.525 mmHg (0.07 kPa)
Fuel tank pressure increase for 5 seconds from –17 mmHg (–2.27 kPa) [743 mmHg]	More than 0.525 mmHg (0.07 kPa)

P0455 (EVAP gross leak):

Fuel tank pressure after "negative pressure introduction"	More than –7 mm Hg kPa (–0.933 kPa) [More than 753 mmHg]

MONITOR RESULT (MODE 06 DATA)

EVAP system:

Test ID/Comp ID	Description of Test Data	Description of Test Limit	Conversion Factor (Unit)
$02/$81	**Purge VSV stuck close** is monitored by FTP change during "negative pressure introduction"*	Malfunction criteria for purge VSV	Multiply by 0.183 (mmHg)
$02/$82	**Purge VSV stuck open** is monitored by FTP before "negative pressure introduction"*	Malfunction criteria for purge VSV	Multiply by 65.536 (ms)
$02/$03	FTP during EVAP purge control	Malfunction criteria for CCV	Multiply by 65.536 (ms)
$02/$04	FTP increase for 5 seconds after "negative pressure introduction"*	Malfunction criteria for 0.04 inch leak	Multiply by 0.0458 (mmHg)
$02/$05	FTP increase for 5 seconds after "negative pressure introduction"*	Malfunction criteria for 0.02 inch leak	Multiply by 0.0458 (mmHg)

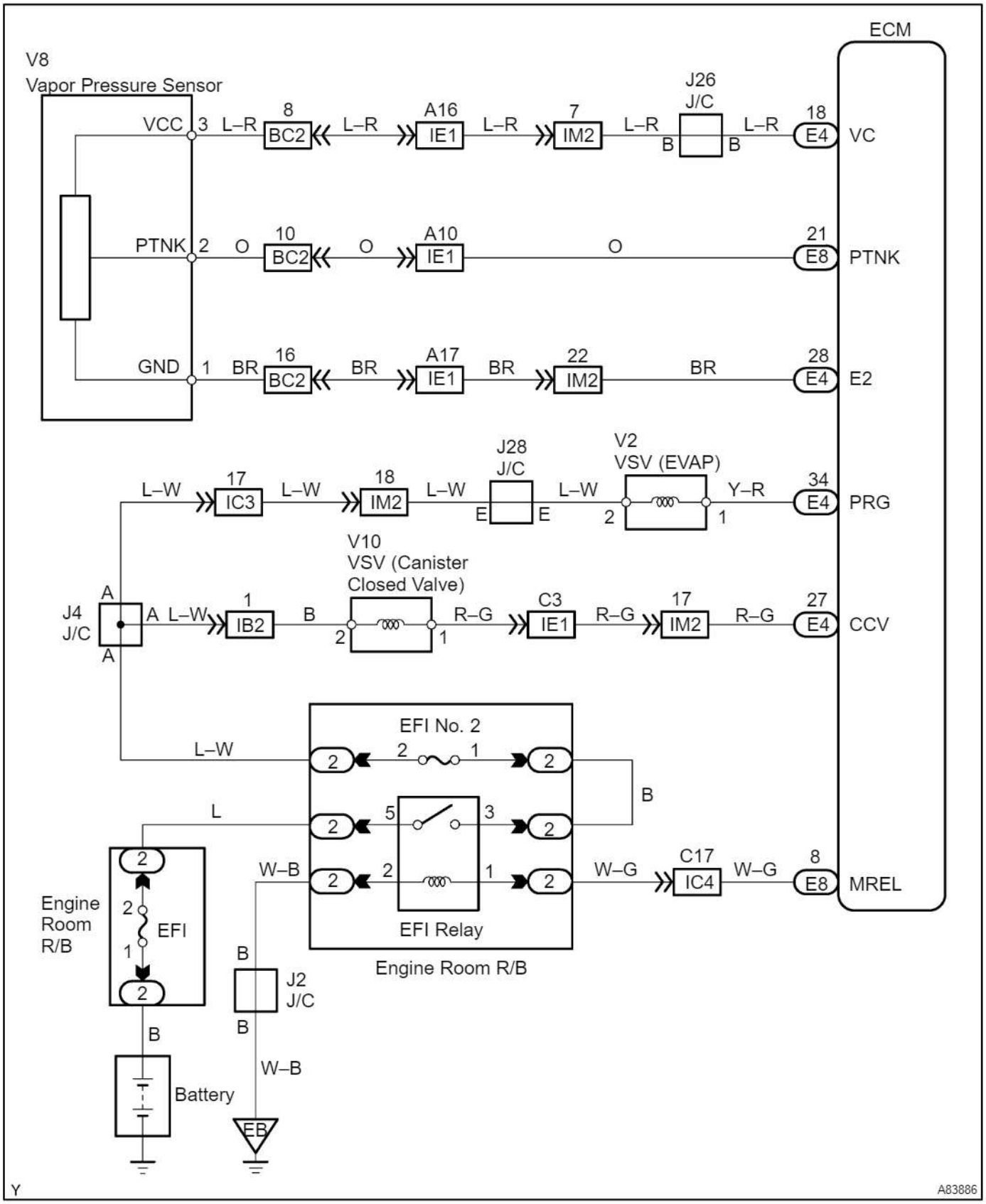
Refer to page 05–21 for detailed information on CHECKING MONITOR STATUS.

*The ECM operates the purge VSV and the CCV as the following chart when the EVAP system is being monitored.

EVAP system condition	Purge VSV	CCV	EVAP (FTP) pressure
Before "Negative pressure introduction"	Closed (OFF)	Open (OFF)	Positive
During "Negative pressure introduction"	Open (ON)	Closed (OFF)	Intake manifold pressure is applied to EVAP system
After "Negative pressure introduction"	Closed (OFF)	Open (OFF)	Negative

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WIRING DIAGRAM



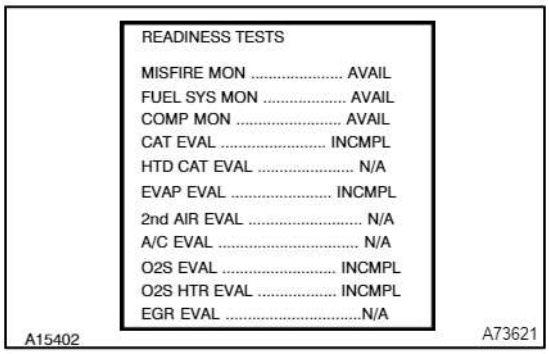
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CONFIRMATION READINESS TEST

First Trip Procedure

(a) The vehicle must be cold and the ambient temperature must be approximately between 10 to 35°C (50 to 95 °F).

(b) The Intake Air Temperature (IAT) and the Engine Coolant Temperature (ECT) sensors indicate almost the same value.



(c) Clear the DTCs.

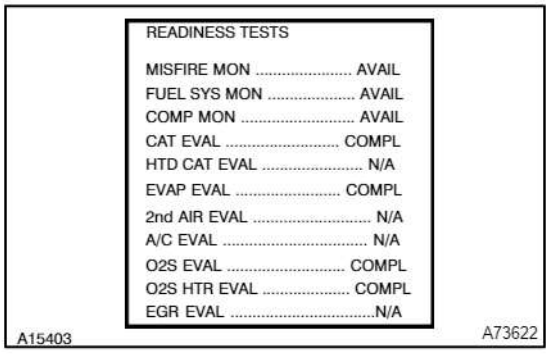
Disconnect the battery terminal or remove the EFI and ETCS fuses for more than 60 seconds.

READINESS TESTS will show INCMPL (incomplete).

(d) Drive the vehicle on a freeway. Write down the initial status of the READINESS TESTS. As each Readiness Test passes EVAP evaluation monitors, its status will change to COMPL (complete). This procedure may take approximately 20 minutes or more.

NOTICE:

Do not shut off the engine – the results will be invalid.



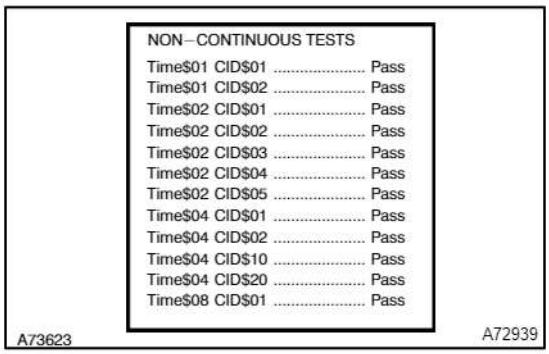
Pass Condition – No problem Found by the ECM

If the EVAP evaluation monitor shows COMPL, go to the NON–CONTINUOUS TESTS screen.

Enter the following menus: ADVANCED OBD II / ONBOARD TESTS / NON–CONTINUOUS.

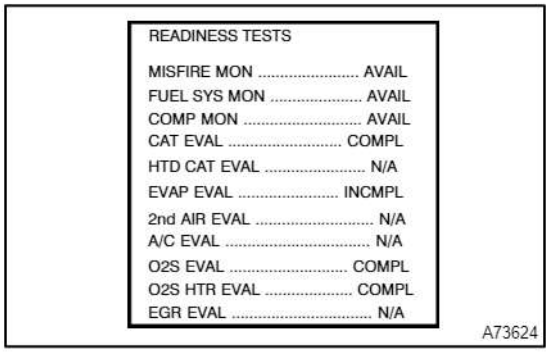
NOTICE:

Do not shut off the engine – the results will be invalid.



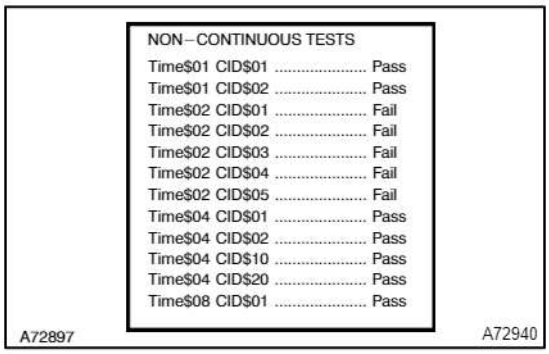
If all of the tests in the "Time $02" category show "Pass", the EVAP evaluation monitor detected no problem.

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Fail Condition – Problem Detected by the ECM

If the EVAP evaluation monitor shows COMPL, go to the NON–CONTINUOUS TESTS screen.



(1) If all tests show "Pass", one of the following may have occurred:

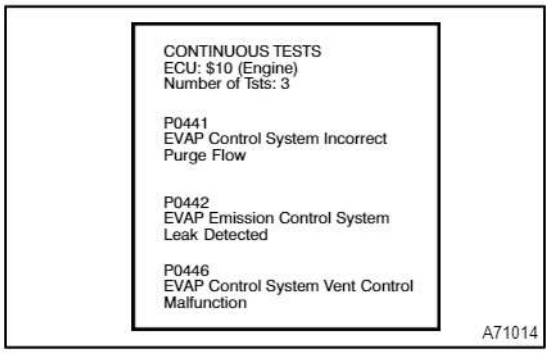
The EVAP evaluation monitor did not operate.

The EVAP evaluation monitor did not finish its tests.

The ECM has withheld judgement.

(2) If one or more of the tests in the time $02 category show "Fail", the EVAP evaluation monitor did operate and the ECM detected a problem.

(3) Go to the CONTINUOUS TESTS screen. This is the only place DTCs are listed for the first trip.



NOTICE:

The DTCs listed may not be valid. A second trip is needed to confirm listed DTCs.

Second Trip Procedure

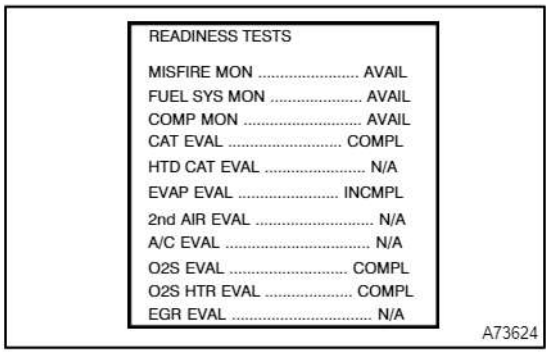
(e) The vehicle must be cold, and the ambient temperature must be approximately between 50 to 95 °F.

(f) Go to the READINESS TESTS screen.

(g) Drive the vehicle on a freeway. Write down the initial status of the READINESS TESTS. This procedure may take approximately 20 minutes or more.

NOTICE:

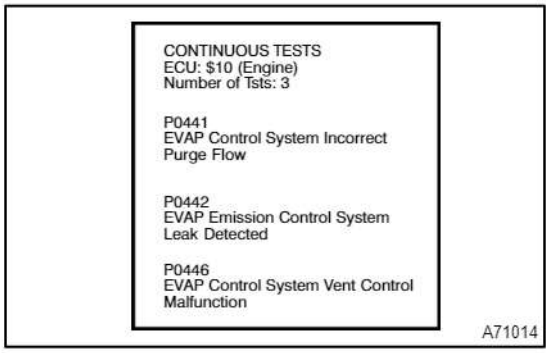
Do not shut off the engine – the results will be invalid.



(h) If the READINESS TESTS change to COMPL, the EVAP evaluation monitor has operated. Check for any stored DTCs.

If a DTC was stored, the problem has been detected and confirmed by the ECM.

If no DTC was found, the EVAP monitor operated but no problem was detected.



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INSPECTION PROCEDURE

HINT:

When using the hand–held tester, follow the procedures under the title "Hand–held tester " (See next page).

When using the OBD II scan tool, follow the procedures under the title "OBD II scan tool (excluding hand–held tester)" (See the procedures after the "Hand–held tester" procedures).

Always troubleshoot DTCs P0441 (purge flow), P0446 (VSV for CCV), P0451, P0452 and P0453 (evaporative pressure sensor) before troubleshooting DTCs P0442 or P0456.

As the customer the following questions:

1) When the MIL came on, if the fuel tank cap was loose and if it was then tightened.

2) When refueling, if the fuel tank cap was loose.

If the fuel tank cap was loose, that is the why the DTC was stored.

If the fuel cap was not loose or if the customer cannot remember, troubleshoot according to the procedures on the following page.

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

If the ENGINE RUN TIME in the freeze frame data is less than 200 seconds, carefully check the vapor pressure sensor.

DTC Output	Malfunction Indicated	Trouble Chart	
P0441 only	Open Malfunction of VSV for EVAP	Execute step from 6 to 9	Check and replace of VSV for EVAP
P0446 only	Close Malfunction of VSV for CCV	Execute step from 10 to 14	Check and replace of VSV for CCV
P0442 and/or P0456	Very small, small or medium leak	Execute step from 2	
P0455 only	Medium leak (for example, vacuum hose is disconnected or has about φ 2.0 hole)	Execute step from 2	
P0441 and P0455 and P0446	Large leak (for example, fuel tank cap loose) or VSV malfunction (open malfunction of VSV for CCV or close malfunction of VSV for EVAP)	Execute step from 2*	

*: In most cases, troubleshooting can be completed by checking if the fuel tank cap was loose, or repairing the VSV for CCV or the VSV for EVAP.

HINT:

Use the chart above to check the malfunction for each DTC output. The perform the necessary repairs listed under trouble chart.

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Hand–held tester:

1	READ OUTPUT DTC

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch to ON and turn the hand–held tester ON.
(c) Select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(d) Read the DTCs using the hand–held tester.
(e) Troubleshoot the problems, according to the DTC output.

HINT:
Based on the output DTC, proceed to A, B or C.

DTC output	Troubleshoot	Proceed to
P0442 (small leak) P0455 (gross leak) P0456 (very small leak) P0442 and P0456 Other DTC combination P0441 and P0442 and P0446	Go to step 2	A
P0441 only (VSV for EVAP malfunction)	Execute step from 6 to 9	B
P0446 only (VSV for CCV malfunction)	Execute step from 10 to 14	C

B → Go to step 6

C → Go to step 10

A

2	CHECK THAT FUEL TANK CAP MEETS OEM SPECIFICATIONS

NG → REPLACE WITH A CAP THAT MEETS OEM SPECIFICATIONS

OK

3	CHECK THAT FUEL TANK CAP IS CORRECTLY INSTALLED

NG → CORRECTLY INSTALL FUEL TANK CAP

OK

4	INSPECT FUEL TANK CAP ASSY (See page 12–22)

NG → REPLACE FUEL TANK CAP ASSY

OK

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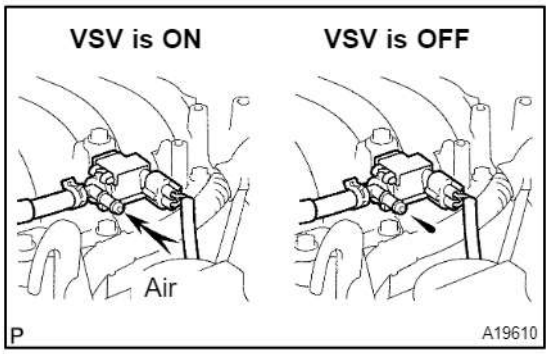
5	CHECK FILLER NECK FOR DAMAGE

(a) Remove the fuel tank cap.
(b) Visually inspect the filler neck for damage.
(c) Reinstall the fuel tank cap.

NG → REPLACE FUEL TANK INLET PIPE SUB–ASSY

OK

6	PERFORM ACTIVE TEST BY HAND–HELD TESTER(VSV FOR EVAP)



(a) Disconnect the vacuum hose for the VSV for EVAP from the charcoal canister.
(b) Start the engine.
(c) Select the item: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / EVAP VSV (press the right or left button).
(d) When the VSV for EVAP is operated by the hand–held tester, check whether the disconnected hose applies suction to your finger.

Standard:

Tester Operation	Specified Condition
VSV is ON	Disconnected hose applies suction to your finger
VSV is OFF	Disconnected hose applies no suction to your finger

(e) Reconnect the vacuum hose.

OK → Go to step 10

NG

7	CHECK HOSE AND TUBE(INTAKE MANIFOLD – VSV FOR EVAP, VSV FOR EVAP – CHARCOAL CANISTER)

(a) Check that the vacuum hose is connected correctly.
(b) Check the vacuum hose for looseness and disconnection.
(c) Check the vacuum hose and tube for cracks, hole, damage and blockage.

NG → REPAIR OR REPLACE DEFECTIVE OR DAMAGED HOSE OR TUBE

OK

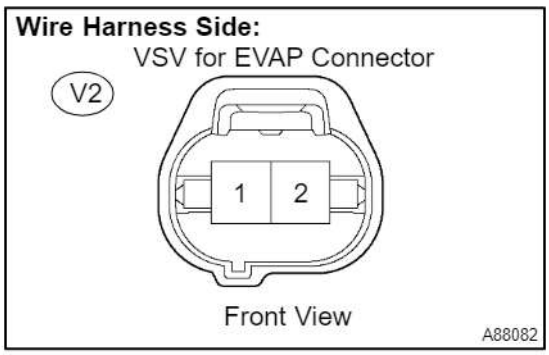
8	INSPECT VACUUM SWITCHING VALVE ASSY NO.1(CHECK OPERATION OF VSV FOR EVAP) (See page 12–22)

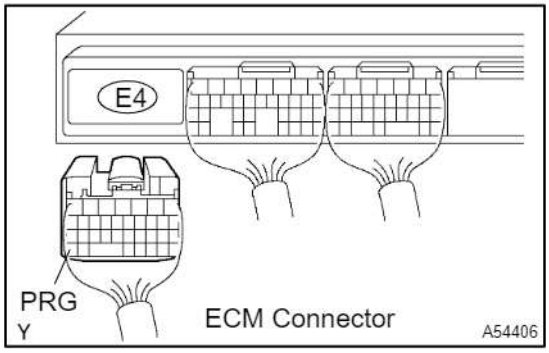
NG → REPLACE VACUUM SWITCHING VALVE ASSY NO.1

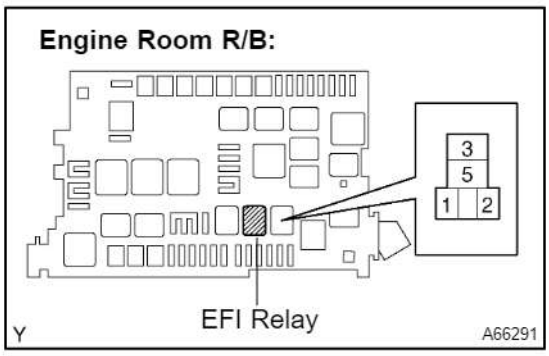
OK

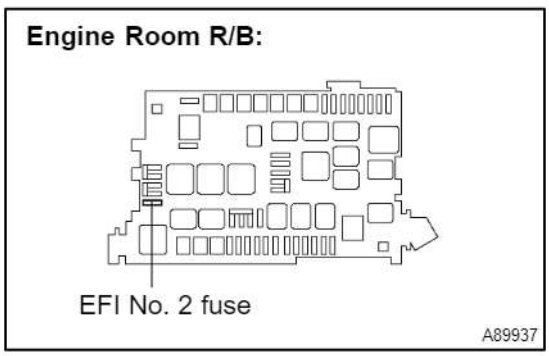
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9	CHECK HARNESS AND CONNECTOR(VSV FOR EVAP – ECM, VSV FOR EVAP – EFI RELAY)









(a) Check the harness and connector between the VSV for EVAP connector and ECM connector.

(1) Disconnect the V2 VSV for EVAP connector.

(2) Disconnect the E4 ECM connector.

(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
VSV for EVAP (V2–1) – PRG (E4–34)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
VSV for EVAP (V2–1) or PRG (E4–34) – Body ground	10 kΩ or higher

(4) Reconnect the VSV for EVAP connector.

(5) Reconnect the ECM connector.

(c) Check the harness and connector between the VSV for EVAP connector and EFI relay.

(1) Inspect the EFI No.2 fuse.

Remove the EFI No.2 fuse from the engine room R/B.

Check for continuity in the EFI No.2 fuse.

Standard: Continuity

Reinstall the EFI No 2 fuse.

(2) Disconnect the V2 VSV for EVAP connector.

(3) Remove the EFI relay from the engine room R/B.

(4) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
VSV for EVAP (V2–2) – Engine room R/B (EFI relay terminal 3)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
VSV for EVAP (V2–2) or Engine room R/B (EFI relay terminal 3) – Body ground	10 kΩ or higher

(5) Reconnect the VSV for EVAP connector.

(6) Reinstall the EFI relay.

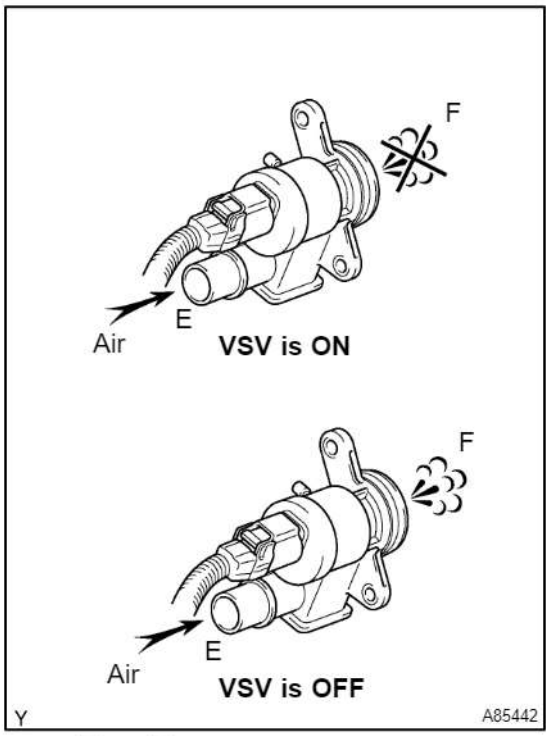
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM (See page 10–24)

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10 PERFORM ACTIVE TEST BY HAND–HELD TESTER(VSV FOR CCV)



(a) Disconnect the vacuum hose for the VSV for CCV from the charcoal canister.
(b) Start the engine.
(c) Select the item: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / CAN CTRL VSV (press the right or left button).
(d) Check the VSV for CCV operation when it is operated by the hand–held tester.

Standard:

Tester operation	Specified condition
VSV is ON	Air does not flow from ports E to F
VSV is OFF	Air from port E flows out through port F

Result:

VSV operation	Output DTC	Proceed to
NG	□	A
OK	P0446 output when vehicle was brought in	B
OK	P0446 does not output when vehicle was brought in	C

B → **Go to step 13**

C → **Go to step 15**

A

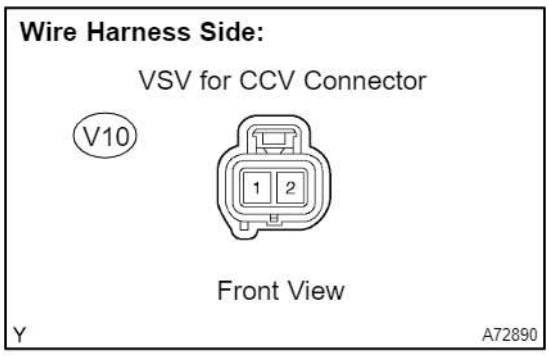
11 CHECK OPERATION OF VSV FOR CCV

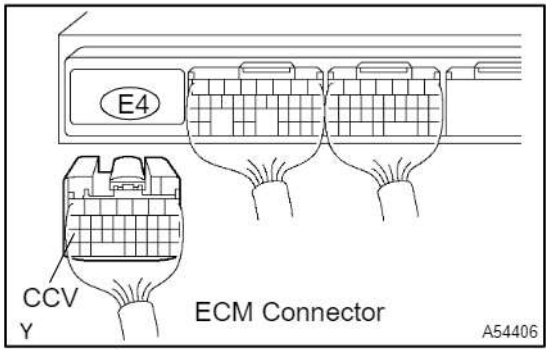
NG → **REPLACE VSV FOR CCV**

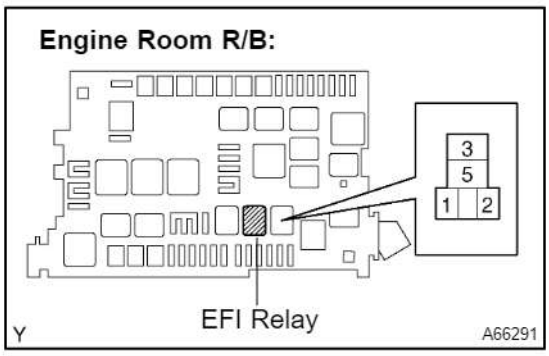
OK

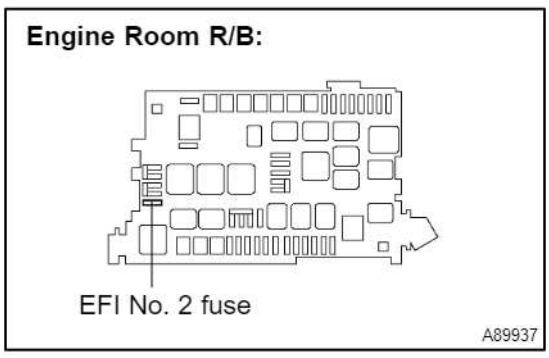
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12	CHECK HARNESS AND CONNECTOR(VSV FOR CCV – ECM, VSV FOR CCV – EFI RELAY)









OK

(a) Check the harness and connector between the VSV for CCV connector and ECM connector.
  (1) Disconnect the V10 VSV for CCV connector.
  (2) Disconnect the E4 ECM connector.
  (3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
VSV for CCV (V10–1) – CCV (E4–27)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
VSV for CCV (V10–1) or CCV (E4–27) – Body ground	10 kΩ or higher

  (4) Reconnect the VSV for CCV connector.
  (5) Reconnect the ECM connector.

(b) Check the harness and connector between the VSV for CCV connector and EFI relay.
  (1) Inspect the EFI No.2 fuse.
    Remove the EFI No.2 fuse from the engine room R/B.
    Check for continuity in the EFI No.2 fuse.

Standard: Continuity

    Reinstall the EFI No 2 fuse.
  (2) Disconnect the V10 VSV for CCV connector.
  (3) Remove the EFI relay from the engine room R/B.
  (4) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
VSV for CCV (V10–2) – Engine room R/B (EFI relay terminal 3)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
VSV for CCV (V10–2) or Engine room R/B (EFI relay terminal 3) – Body ground	10 kΩ or higher

  (5) Reconnect the VSV for CCV connector.
  (6) Reinstall the EFI relay.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

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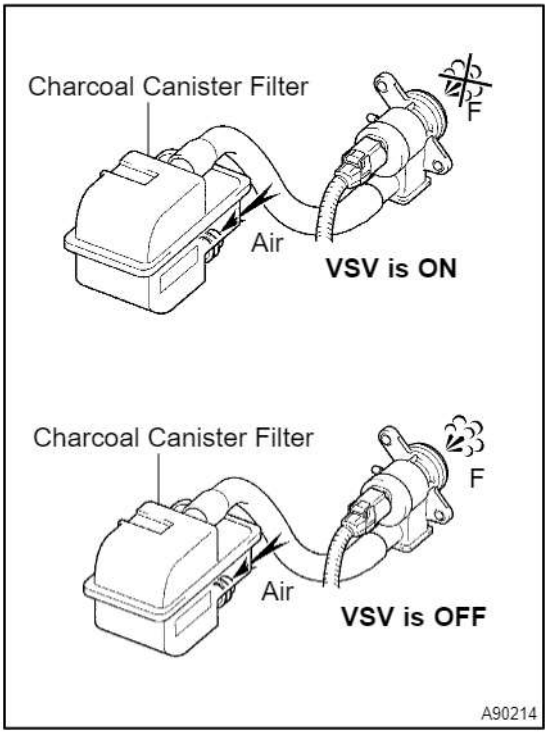
13	CHECK VSV FOR CCV(CHECK FOR LEAKAGE BETWEEN VSV FOR CCV AND CHARCOAL CANISTER)

(a) Check that the VSV for CCV is correctly installed.
(b) Check the O–ring.

NG → REPAIR OR REPLACE

OK

14	PERFORM ACTIVE TEST BY HAND–HELD TESTER(VSV FOR CCV)



(a) Disconnect the vacuum hose for the VSV for CCV from the charcoal canister.
(b) Turn the ignition switch to ON.
(c) Select the item: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / CAN CTRL VSV (press the right or left button).
(d) Check the VSV for CCV operation when it is operated by the hand–held tester.

Standard:

Tester Operation	Specified Condition
VSV is ON	Air does not flow from charcoal canister filter port to port F
VSV is OFF	Air from charcoal canister filter port flows out through port F

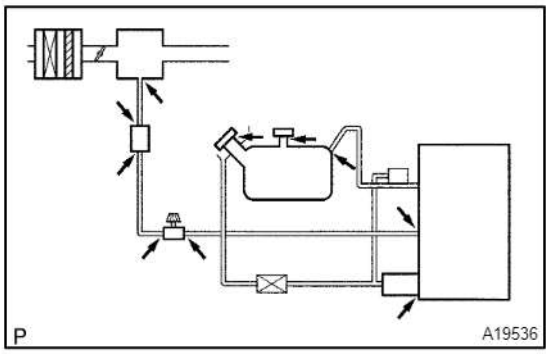
NG → REPLACE CHARCOAL CANISTER FILTER NO.2

OK

REPLACE ECM (See page 10–24)

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15	CHECK FOR EVAPORATIVE EMISSIONS LEAK



(a) Check if any hoses close to the fuel tank have been modified, and check if there are signs of any accident near fuel tank or charcoal canister.
  (1) Check for cracks, deformation and loose connection of the following parts:
  Fuel tank
  Charcoal canister
  Fuel tank filler pipe
  Hoses and tubes around fuel tank and charcoal canister

NG → REPAIR OR REPLACE DEFECTIVE OR DAMAGED COMPONENT

OK

16	CHECK HOSES AND TUBES(INTAKE MANIFOLD – VSV FOR EVAP, VSV FOR EVAP – CHACOAL CANISTER)

(a) Check that the vacuum hose is connected correctly.
(b) Check the vacuum hose for looseness and disconnection.
(c) Check the vacuum hose and tube for cracks, hole, damage and blockage.

NG → REPAIR OR REPLACE DEFECTIVE OR DAMAGED HOSE OR TUBE

OK

17	CHECK HOSE AND TUBE(FUEL TANK – CHARCOAL CANISTER)

(a) Check the following for proper connection:
  The fuel tank and the fuel EVAP pipe (see page 12–17)
  The fuel EVAP pipe and the fuel tube under the floor
  The fuel tube and the charcoal canister
(b) Check the hose and the tube for cracks, hole and damage.

NG → REPAIR OR REPLACE DEFECTIVE OR DAMAGED HOSE OR TUBE

OK

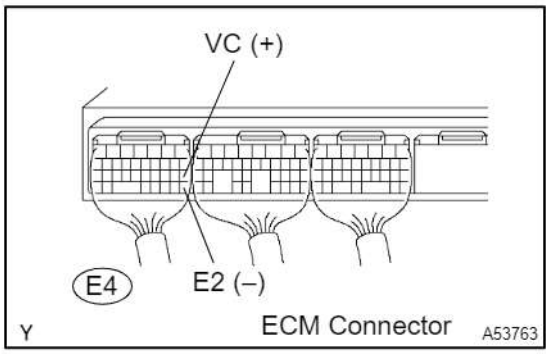
18	INSPECT CHARCOAL CANISTER ASSY(CRACKS, HOLE AND DAMAGE) (See page 12–22)

NG → REPLACE CHARCOAL CANISTER ASSY

OK

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19 INSPECT ECM(VC VOLTAGE)



(a) Turn the ignition switch to ON.
(b) Measure the voltage between the terminals of the E4 ECM connector.

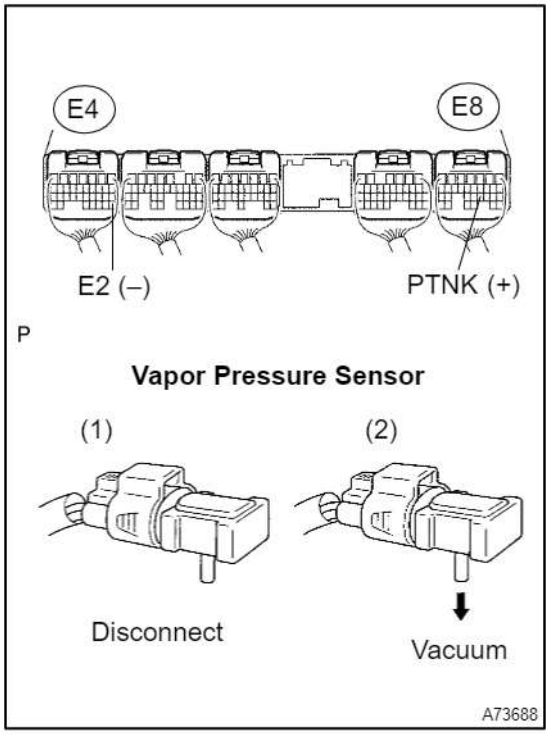
Standard:

Tester Connection	Specified Condition
VC (E4–18) – E2 (E4–28)	4.5 to 5.5 V

NG → **REPLACE ECM (See page 10–24)**

OK

20 INSPECT ECM(PTNK VOLTAGE)



(a) Turn the ignition switch to ON.
(b) Measure the voltage between the terminals of the E4 and E8 ECM connectors.
(1) Disconnect the vacuum hose from the vapor pressure sensor.

Standard (1):

Tester Connection	Specified Condition
PTNK (E8–21) – E2 (E4–28)	2.9 to 3.7 V

(2) Using the MITYVAC (Hand–Held Vacuum Pump), apply a vacuum of 4.0 kPa (30 mmHg, 1.18 in.Hg) to the vapor pressure sensor.

NOTICE:
The vacuum applied to the vapor pressure sensor must be less than 66.7 kPa (500 mmHg, 19.7 in.Hg).

Standard (2):

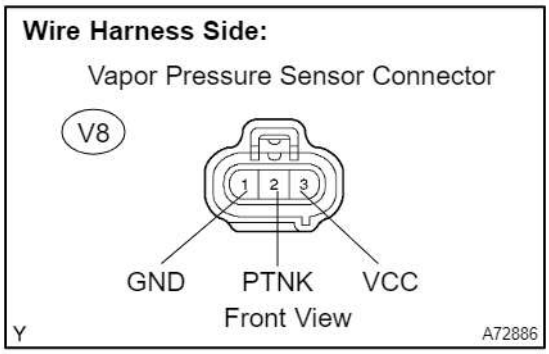
Tester Connection	Specified Condition
PTNK (E8–21) – E2 (E4–28)	0.5 V or less

OK → **Go to step 22**

NG

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21	CHECK HARNESS AND CONNECTOR(VAPOR PRESSURE SENSOR – ECM)



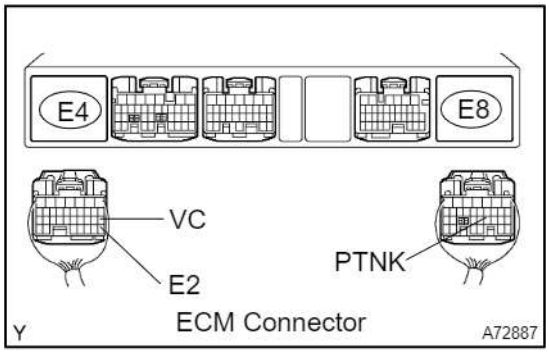
(a) Disconnect the V8 vapor pressure sensor connector.
(b) Disconnect the E4 and E8 ECM connectors.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
PTNK (V8–2) – PTNK (E8–21)	Below 1 Ω
GND (V8–1) – E2 (E4–28)	Below 1 Ω
VCC (V8–3) – VC (E4–18)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
PTNK (V8–2) or PTNK (E8–21) – Body ground	10 kΩ or higher
VCC (V8–3) or VC (E4–18) – Body ground	10 kΩ or higher



(1) Reconnect the vapor pressure sensor connector.
(2) Reconnect the ECM connector.

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE VAPOR PRESSURE SENSOR ASSY

22	INSPECT FUEL TANK ASSY(CRACKS AND DAMAGE)

NG → REPLACE FUEL TANK ASSY

OK

IT IS LIKELY THAT VEHICLE USER DID NOT PROPERLY CLOSE FUEL TANK CAP

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OBD II scan tool (excluding hand–held tester):

1	INSPECT CHECK THAT FUEL TANK CAP MEETS OEM SPECIFICATIONS

NG → REPLACE WITH A CAP THAT MEETS OEM SPECIFICATIONS

OK

2	CHECK THAT FUEL TANK CAP IS CORRECTLY INSTALLED

NG → CORRECTLY INSTALL FUEL TANK CAP

OK

3	INSPECT FUEL TANK CAP ASSY (See page 12–22)

NG → REPLACE FUEL TANK CAP ASSY

OK

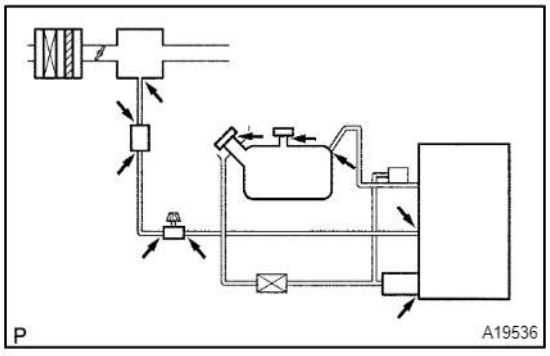
4	CHECK FILLER NECK FOR DAMAGE

(a) Remove the fuel tank cap.
(b) Visually inspect the filler neck for damage.
(c) Reinstall the fuel tank cap.

NG → REPLACE FUEL TANK INLET PIPE SUB–ASSY

OK

5	CHECK FOR EVAPORATIVE EMISSIONS LEAK



(a) Check whether hose close to the fuel tank have been modified, and check whether there are signs of any accident near fuel tank or charcoal canister.
  (1) Check for cracks, deformation and loose connection of the following parts:
  Fuel tank
  Charcoal canister
  Fuel tank filler pipe
  Hoses and tubes around fuel tank and charcoal canister

NG → REPAIR OR REPLACE DEFECTIVE OR DAMAGED COMPONENT

OK

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6	CHECK HOSE AND TUBE(FUEL TANK – CHARCOAL CANISTER)

(a) Check the following for proper connection:
The fuel tank and the fuel EVAP pipe (see page 12–17)
The fuel EVAP pipe and the fuel tube under the floor
The fuel tube and the charcoal canister
(b) Check the hose and the tube for cracks, hole and damage.

NG → REPAIR OR REPLACE DEFECTIVE OR DAMAGED HOSE OR TUBE

OK

7	CHECK EACH VSV CONNECTOR FOR LOOSENESS AND DISCONNECTION(VSV FOR EVAP, VSV FOR CCV AND VAPOR PRESSURE SENSOR)

NG → REPAIR OR CONNECT VSV AND SENSOR CONNECTORS

OK

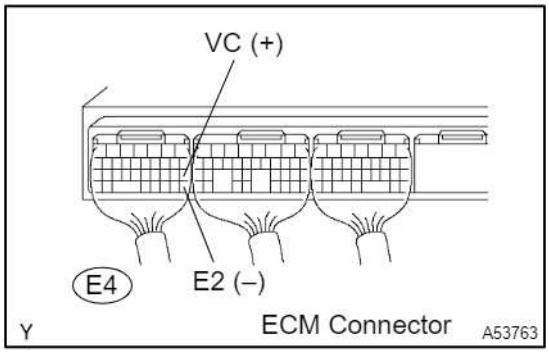
8	CHECK HOSES AND TUBES(INTAKE MANIFOLD – VSV FOR EVAP, VSV FOR EVAP – CHARCOAL CANISTER)

(a) Check that the vacuum hose is connected correctly.
(b) Check the vacuum hose for looseness and disconnection.
(c) Check the vacuum hose and tube for cracks, hole, damage and blockage.

NG → REPAIR OR REPLACE DEFECTIVE OR DAMAGED HOSE OR TUBE

OK

9	INSPECT ECM(VC VOLTAGE)



(a) Turn the ignition switch to ON.
(b) Measure the voltage between the terminals of the E4 ECM connector.

Standard:

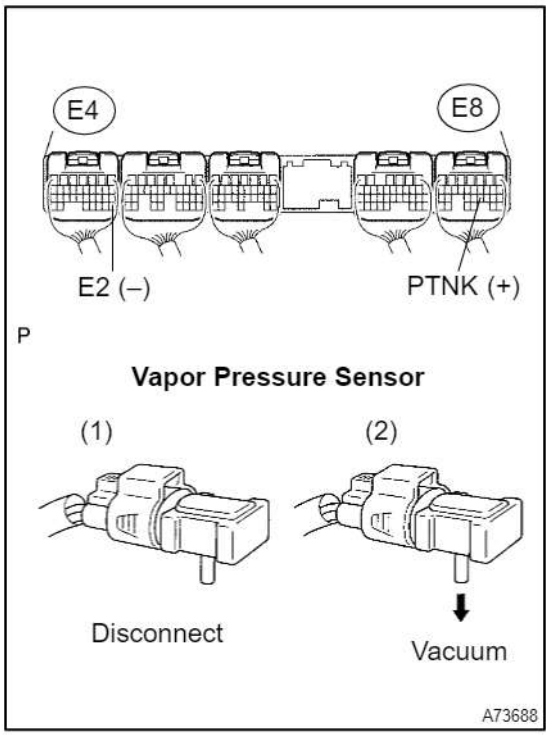
Tester Connection	Specified Condition
VC (E4–18) – E2 (E4–28)	4.5 to 5.5 V

NG → REPLACE ECM (See page 10–24)

OK

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10 INSPECT ECM(PTNK VOLTAGE)



(a) Turn the ignition switch to ON.
(b) Measure the voltage between the terminals of the E4 and E8 ECM connectors.
(1) Disconnect the vacuum hose from the vapor pressure sensor.

Standard (1):

Tester Connection	Specified Condition
PTNK (E8–21) – E2 (E4–28)	2.9 to 3.7 V

(2) Using the MITYVAC (Hand–Held Vacuum Pump), apply a vacuum of 4.0 kPa (30 mmHg, 1.18 in.Hg) to the vapor pressure sensor.

NOTICE:
The vacuum applied to the vapor pressure sensor must be less than 66.7 kPa (500 mmHg, 19.7 in.Hg).

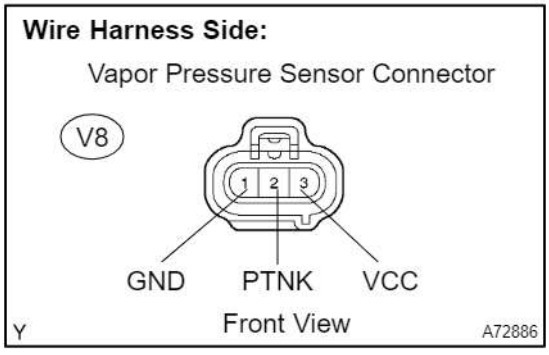
Standard (2):

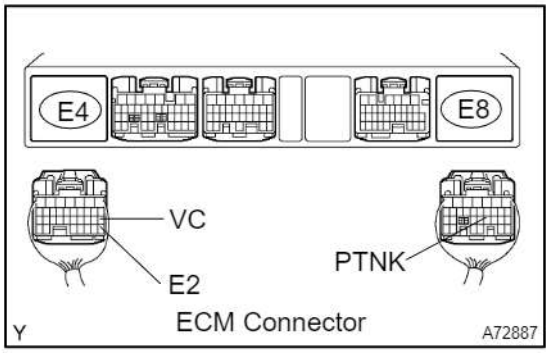
Tester Connection	Specified Condition
PTNK (E8–21) – E2 (E4–28)	0.5 V or less

OK → **Go to step 12**

NG

11 CHECK HARNESS AND CONNECTOR(VAPOR PRESSURE SENSOR – ECM)





(a) Disconnect the V8 vapor pressure sensor connector.
(b) Disconnect the E4 and E8 ECM connectors.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
PTNK (V8–2) – PTNK (E8–21)	Below 1 Ω
GND (V8–1) – E2 (E4–28)	Below 1 Ω
VCC (V8–3) – VC (E4–18)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
PTNK (V8–2) or PTNK (E8–21) – Body ground	10 kΩ or higher
VCC (V8–3) or VC (E4–18) – Body ground	10 kΩ or higher

(1) Reconnect the vapor pressure sensor connector.
(2) Reconnect the ECM connector.

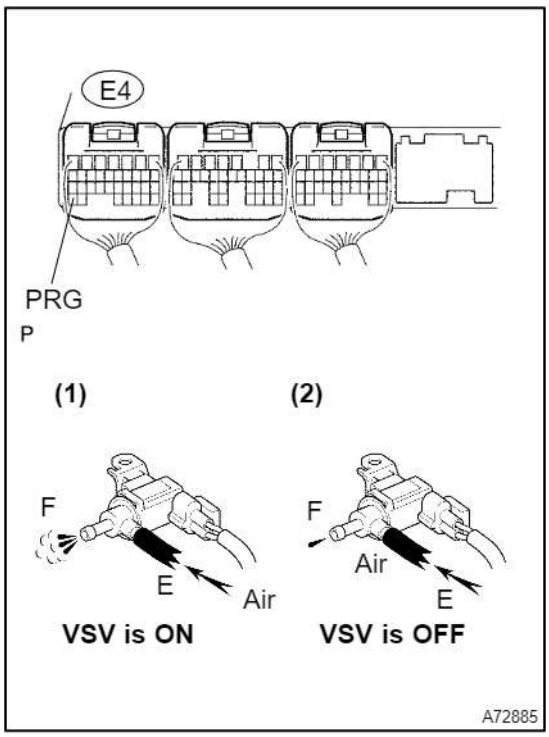
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE VAPOR PRESSURE SENSOR ASSY

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12	INSPECT VACUUM SWITCHING VALVE ASSY NO.1(FUNCTION OF VSV FOR EVAP)



(a) Turn the ignition switch to ON.
(b) Check the VSV function.
(1) Connect terminal PRG of the ECM connector and the body ground (VSV for EVAP should OPEN, i. e. ON).

Standard (1):
Air from port E flows out through port F.

(2) Disconnect terminal PRG of the ECM connector from the body ground (VSV for EVAP should CLOSED, i. e. OFF).

Standard (2):
Air does not flow from port E to port F.

OK	Go to step 15

NG

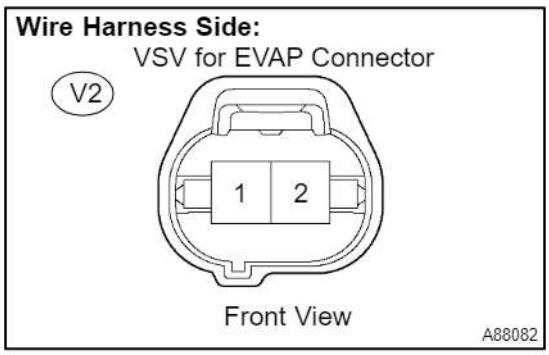
13	INSPECT VACUUM SWITCHING VALVE ASSY NO.1(OPERATION OF VSV FOR EVAP) (See page 12–22)

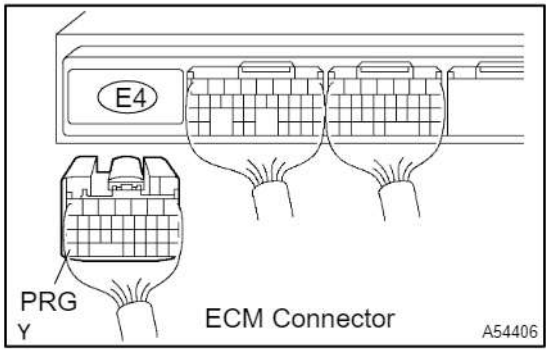
NG	REPLACE REPLACE VSV AND CLEAN VACUUM HOSES, AND THEN CHECK CHARCOAL CANISTER

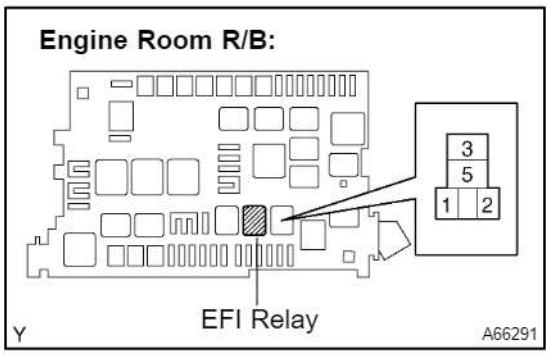
OK

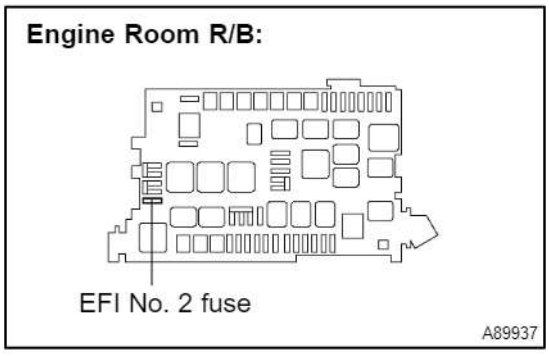
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14	CHECK HARNESS AND CONNECTOR(VSV FOR EVAP – ECM, VSV FOR EVAP – EFI RELAY)









(a) Check the harness and connector between the VSV for EVAP connector and ECM connector.
  (1) Disconnect the V2 VSV for EVAP connector.
  (2) Disconnect the E4 ECM connector.
  (3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
VSV for EVAP (V2–1) – PRG (E4–34)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
VSV for EVAP (V2–1) or PRG (E4–34) – Body ground	10 kΩ or higher

  (4) Reconnect the VSV for EVAP connector.
  (5) Reconnect the ECM connector.

(b) Check the harness and connector between the VSV for EVAP connector and EFI relay.
  (1) Inspect the EFI No.2 fuse.
    Remove the EFI No.2 fuse from the engine room R/B.
    Check for continuity in the EFI No.2 fuse.

Standard: Continuity

    Reinstall the EFI No 2 fuse.
  (2) Disconnect the V2 VSV for EVAP connector.
  (3) Remove the EFI relay from the engine room R/B.
  (4) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
VSV for EVAP (V2–2) – Engine room R/B (EFI relay terminal 3)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
VSV for EVAP (V2–2) or Engine room R/B (EFI relay terminal 3) – Body ground	10 kΩ or higher

  (5) Reconnect the VSV for EVAP connector.
  (6) Reinstall the EFI relay.

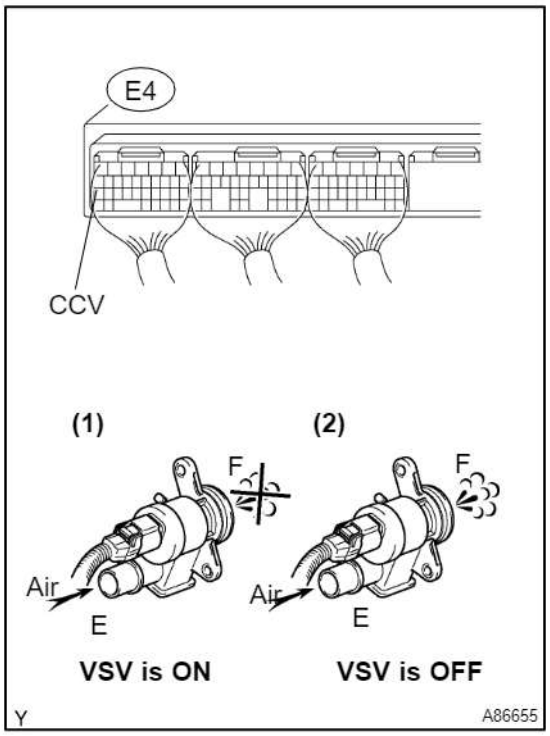
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM (See page 10–24)

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15	CHECK VSV FOR CCV(FUNCTION OF VSV FOR CCV)



(a) Turn the ignition switch to ON.
(b) Check the VSV function.
(1) Connect terminal CCV of the ECM connector and the body ground (VSV for CCV should OPEN, i. e. ON).

Standard (1):
Air does not flow from port E to port F.

(2) Disconnect terminal CCV of the ECM connector from the body ground (VSV for CCV should CLOSED, i. e. OFF).

Standard (2):
Air from port E flows out through port F.

OK	Go to step 18

NG

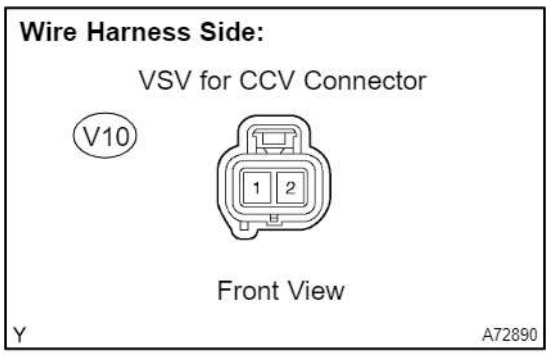
16	CHECK OPERATION OF VSV FOR CCV (See page 12–22)

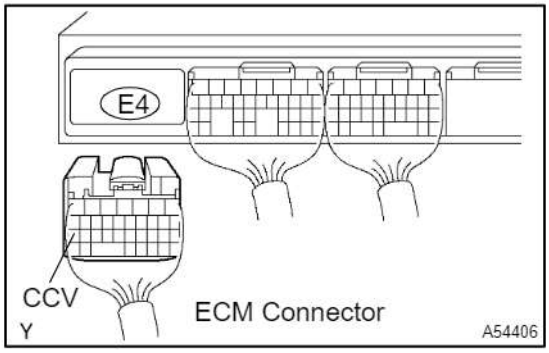
NG	REPLACE VSV FOR CCV, AND THEN CHECK LEAKAGE

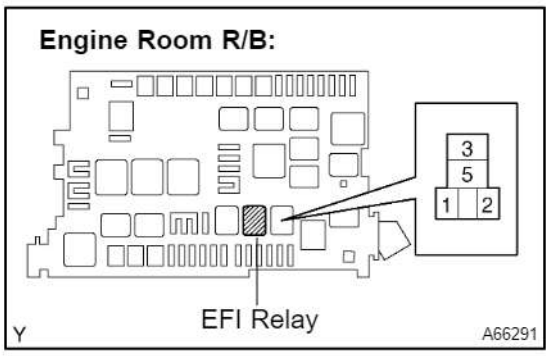
OK

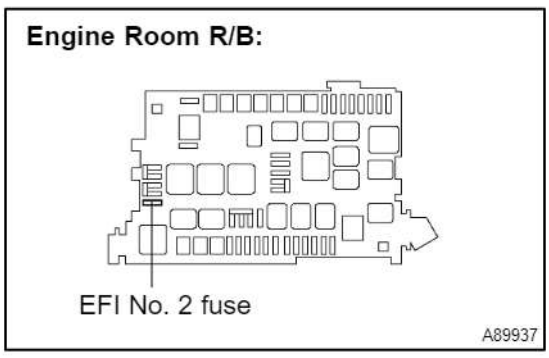
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17	CHECK HARNESS AND CONNECTOR(VSV FOR CCV – ECM, VSV FOR CCV – EFI RELAY)









(a) Check the harness and connector between the VSV for CCV connector and ECM connector.
(1) Disconnect the V10 VSV for CCV connector.
(2) Disconnect the E4 ECM connector.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
VSV for CCV (V10–1) – CCV (E4–27)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
VSV for CCV (V10–1) or CCV (E4–27) – Body ground	10 kΩ or higher

(4) Reconnect the VSV for CCV connector.
(5) Reconnect the ECM connector.

(b) Check the harness and connector between the VSV for CCV and EFI relay.
(1) Inspect the EFI No.2 fuse.
Remove the EFI No.2 fuse from the engine room R/B.
Check for continuity in the EFI No.2 fuse.

Standard: Continuity

Reinstall the EFI No 2 fuse.
(2) Disconnect the V10 VSV for CCV connector.
(3) Remove the EFI relay from the engine room R/B.
(4) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
VSV for CCV (V10–2) – Engine room R/B (EFI relay terminal 3)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
VSV for CCV (V10–2) or Engine room R/B (EFI relay terminal 3) – Body ground	10 kΩ or higher

(5) Reconnect the VSV for CCV connector.
(6) Reinstall the EFI relay.

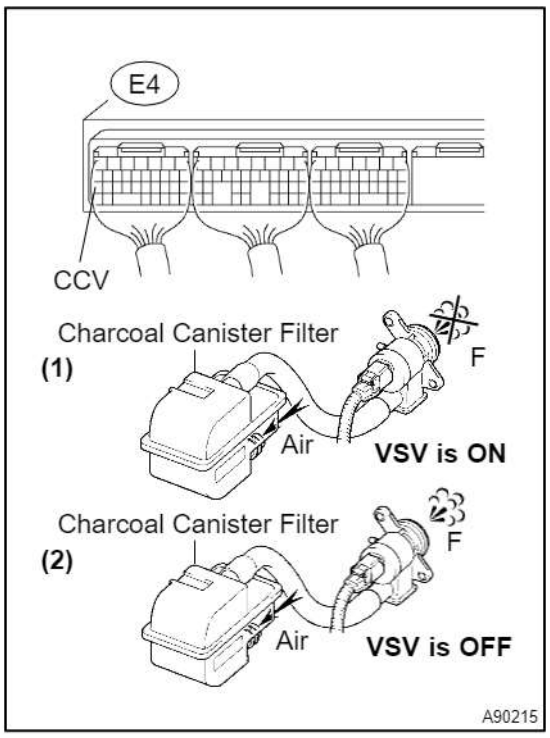
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM (See page 10–24)

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18	INSPECT CHARCOAL CANISTER FILTER NO.2(CHECK THAT CHARCOAL CANISTER FILTER IS NOT CLOGGED)



(a) Turn the ignition switch to ON.
(b) Check the VSV function.
(1) Connect terminal CCV of the ECM connector and the body ground (VSV for CCV should OPEN, i. e. ON).

Standard (1):
Air does not flow from charcoal canister filter port to port F.

(2) Disconnect terminal CCV of the ECM connector from the body ground (VSV for CCV should CLOSED, i. e. OFF).

Standard (2):
Air from the charcoal canister filter's port flows out through port F.

NG → **REPLACE CHARCOAL CANISTER FILTER NO.2**

OK

19	CHECK FUEL TANK OVER FILL CHECK VALVE

NG → **REPLACE FUEL TANK ASSY**

OK

CHECK AND REPLACE CHARCOAL CANISTER ASSY

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DTC	P0451	EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE

DTC	P0452	EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR/SWITCH LOW INPUT

DTC	P0453	EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR/SWITCH HIGH INPUT

CIRCUIT DESCRIPTION

DTC P0451, P0452 or P0453 is recorded by the ECM when the vapor pressure sensor malfunctions.

P0451

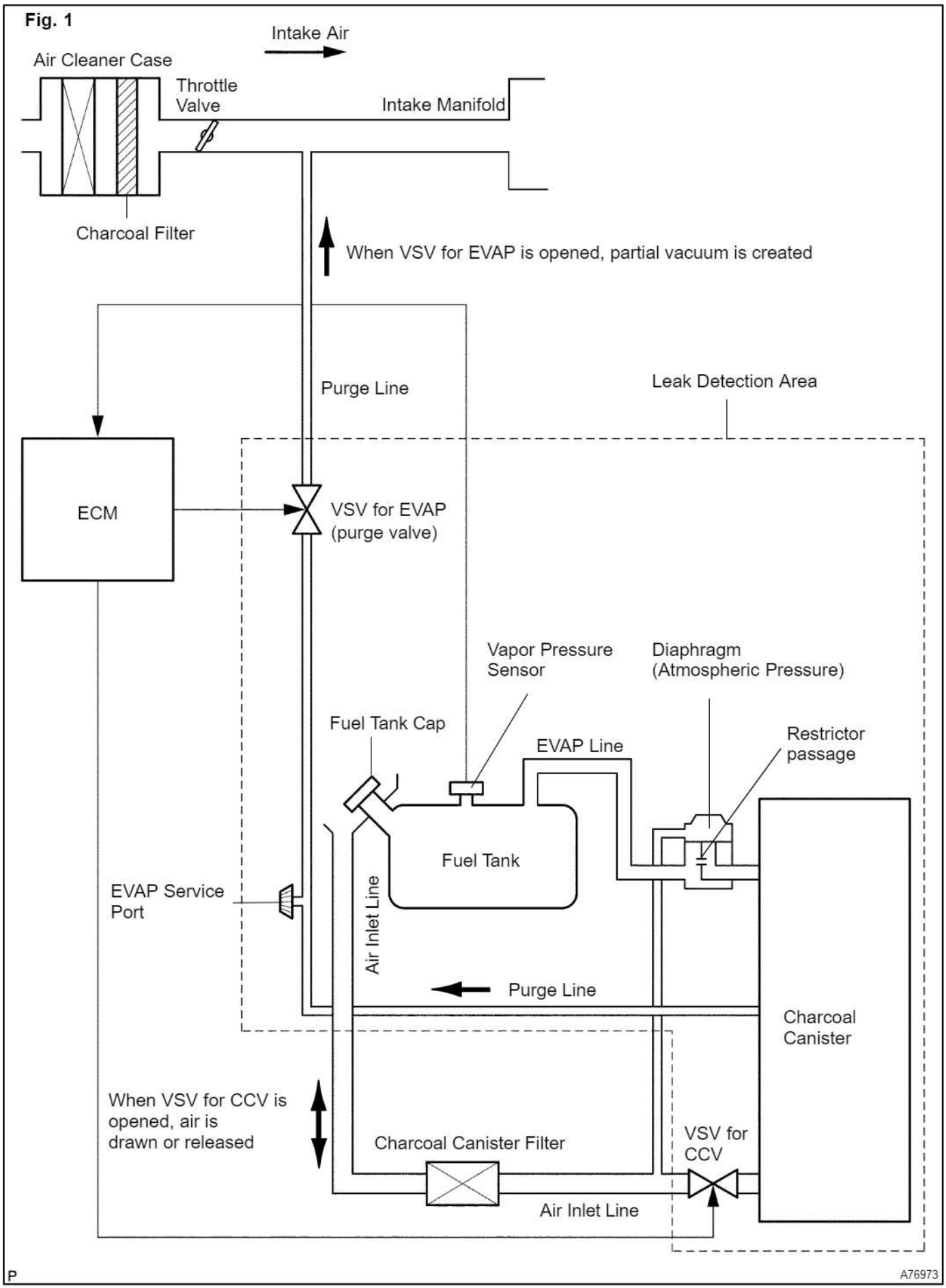
The ECM monitors the vapor pressure sensor in two ways. One method examines the fluctuation of the electrical signal while the engine is idling. If the pressure signal varies beyond the specified range more than 7 times, the ECM interprets this as a fault in the vapor pressure sensor. The ECM also verifies that the pressure signal changes within the specified range. If the output of the sensor does not vary for 5 minutes while the intake air amount is changing, the ECM interprets this as a fault in the vapor pressure sensor. Either fault will set DTC P0451 and the ECM will turn on the MIL.

P0452 and P0453

When pressure indicated by the vapor pressure sensor is below –3.999 kpa (–30 mmHg) or above 1.999 kpa (15 mmHg), the ECM interprets this as a malfunction in the vapor pressure sensor. The ECM will turn on the MIL and a DTC will be set.

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Fig. 1



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DTC No.	DTC Detection Condition	Trouble Area
P0451	Either of conditions, (a) or (b), is met (2 trip detection logic): (a) Vapor pressure sensor output changes frequently when vehicle speed is 0 mph (0 km/h) and engine speed is Idling (b) Vapor pressure sensor output remains at a constant value for 5minutes or more	□Open or short in vapor pressure sensor circuit □Vapor pressure sensor □ECM
P0452	After engine start, vapor pressure sensor output remains outside lower threshold (2 trip detection logic)	□Open or short in vapor pressure sensor circuit □Vapor pressure sensor □ECM
P0453	After engine start, vapor pressure sensor output continues to exceed upper threshold (2 trip detection logic)	□Open or short in vapor pressure sensor circuit □Vapor pressure sensor □ECM

MONITOR STRATEGY

P0451

Related DTCs	P0451: Evaporative emission control system pressure sensor range/performance
Required sensors/ components (Main)	Vapor pressure sensor
Required sensors / components (Related)	Engine coolant temperature sensor, Intake air temperature sensor, Mass air flow meter
Frequency of operation	Once per driving cycle
Duration	Signal fluctuation (noise) monitoring: 10 seconds No signal change (stuck) monitoring: 20 minutes
MIL operation	2 driving cycles
Sequence operation	None

P0452 and P0453

Related DTCs	P0452: Evaporative emission control system pressure sensor/switch low input P0453: Evaporative emission control system pressure sensor/switch high input
Required sensors/ components (Main)	Vapor pressure sensor
Required sensors / components (Related)	Engine coolant temperature sensor, Mass air flow sensor
Frequency of operation	Once per driving cycle
Duration	17 seconds
MIL operation	2 driving cycles
Sequence operation	None

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TYPICAL ENABLING CONDITIONS

P0451

The monitor will run whenever the following DTCs are not present	See page 05–13
Signal fluctuation (noise) monitoring:	
Altitude	7,870 ft. (2,400 m) or less
Battery voltage	11 V or more
Difference between intake air temperature and engine coolant temperature at engine start	–7 to 11.1 C (–12.6 to 20 F)
Engine start intake air temperature	4.4 to 35 C (40 to 95 F)
Engine start engine coolant temperature	4.4 to 35 C (40 to 95 F)
Purge VSV and CCV	No active test by scan tool
Vehicle stop and idling	5 to 15 seconds
Stuck monitoring:	
Altitude	7,870 ft. (2,400 m) or less
Battery voltage	11 Vor more
Vapor pressure sensor	No malfunction
Difference between intake air temperature and engine coolant temperature at engine start	–7 to 11.1 C (–12.6 to 20 F)
Engine start intake air temperature	4.4 to 35 C (40 to 95 F)
Engine start engine coolant temperature	4.4 to 35 C (40 to 95 F)
Time after vehicle stop	5 seconds

P0452 and P0453

The monitor will run whenever the following DTCs are not present	See page 05–13
Difference between intake air temperature and engine coolant temperature at engine start	Less than 12 C (22 F)
Engine start intake air temperature	10 to 35 C (50 to 95 F)
Engine start engine coolant temperature	10 to 35 C (50 to 95 F)
Engine	Running

TYPICAL MALFUNCTION THRESHOLDS

P0451

Signal fluctuation (noise) monitoring:	
The number of times the output changes | 0.667 kPa (5 mmHg) or more for 5 to 15 seconds during idling and vehicle stop	5 times or more
Stuck monitoring:	
Fuel tank pressure ”no change” time (less than 0.018 kPa (0.135 mmHg) change since engine start)	5 min or more

P0452 and P0453

P0452:	
Fuel tank pressure	Less than –3.999 kPa (–30 mmHg) / when engine running
P0453:	
Fuel tank pressure	1.999 kPa (15 mmHg) or more / when engine running

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WIRING DIAGRAM

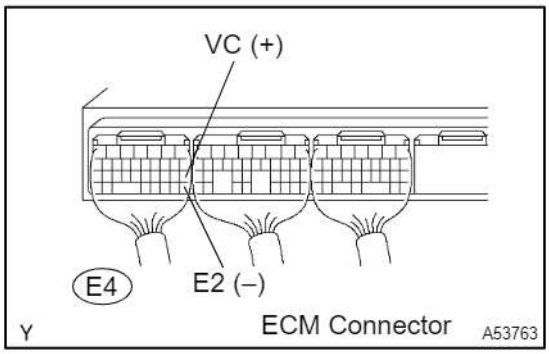
Refer to DTC No. P0441 on page 05–203.

INSPECTION PROCEDURE

HINT:

- If DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may have an open circuit.
- If DTC P0441 (Purge Flow), P0446 (VSV for CCV), P0451, P0452 or P0453 (Evaporative Pressure Sensor) is output with DTC P0442 or P0456, first troubleshoot DTC P0441, P0446, P0451, P0452 or P0453. If no malfunction is detected, troubleshoot DTC P0442 or P0456 next.
- Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.
- When the ENGINE RUN TIME in the freeze frame data is less than 200 seconds, carefully check the vapor pressure sensor.

1	INSPECT ECM(VC VOLTAGE)



(a) Turn the ignition switch to ON.
(b) Measure the voltage between the terminals of the E4 ECM connector.

Standard:

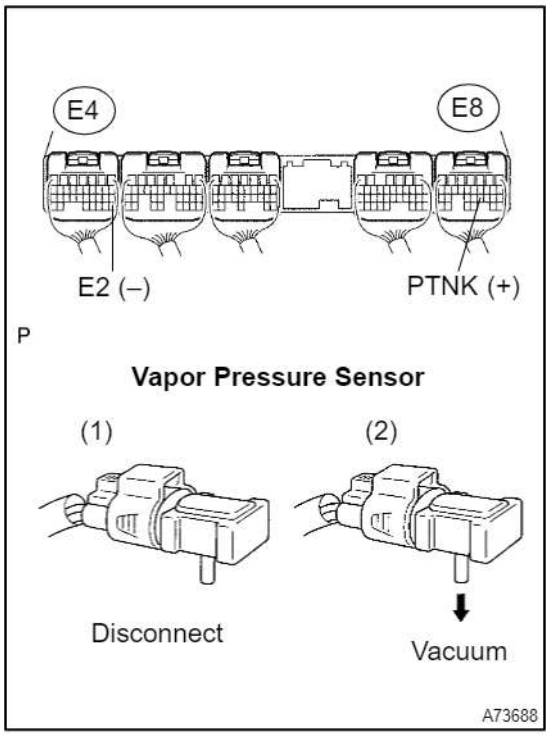
Tester Connection	Specified Condition
VC (E4–18) – E2 (E4–28)	4.5 to 5.5 V

NG → **REPLACE ECM (See page 10–24)**

OK

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2 INSPECT ECM(PTNK VOLTAGE)



(a) Turn the ignition switch to ON.
(b) Measure the voltage between the terminals of the E4 and E8 ECM connectors.
(1) Disconnect the vacuum hose from the vapor pressure sensor.

Standard (1):

Tester Connection	Specified Condition
PTNK (E8–21) – E2 (E4–28)	2.9 to 3.7 V

(2) Using the MITYVAC (Hand–Held Vacuum Pump), apply a vacuum of 4.0 kPa (30 mmHg, 1.18 in.Hg) to the vapor pressure sensor.

NOTICE:
The vacuum applied to the vapor pressure sensor must be less than 66.7 kPa (500 mmHg, 19.7 in.Hg).

Standard (2):

Tester Connection	Specified Condition
PTNK (E8–21) – E2 (E4–28)	0.5 V or less

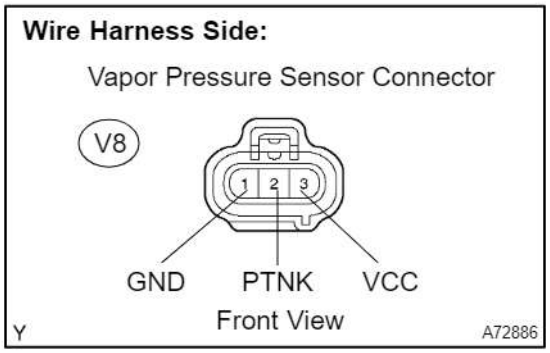
(3) Check the vapor pressure sensor output waveform using a hand–held tester.

Standard: A consecutive waveform presents.

OK	CHECK FOR INTERMITTENT PROBLEMS (See page 05–10)

NG

3 CHECK HARNESS AND CONNECTOR(VAPOR PRESSURE SENSOR – ECM)



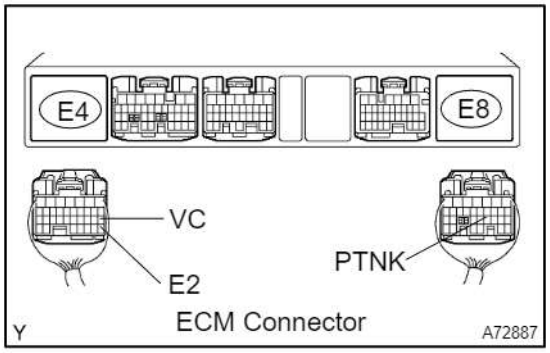
(a) Disconnect the V8 vapor pressure sensor connector.
(b) Disconnect the E4 and E8 ECM connectors.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
PTNK (V8–2) – PTNK (E8–21)	Below 1 Ω
GND (V8–1) – E2 (E4–28)	Below 1 Ω
VCC (V8–3) – VC (E4–18)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
PTNK (V8–2) or PTNK (E8–21) – Body ground	10 kΩ or higher
VCC (V8–3) or VC (E4–18) – Body ground	10 kΩ or higher



(d) Reconnect the vapor pressure sensor connector.
(e) Reconnect the ECM connectors.

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NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE VAPOR PRESSURE SENSOR ASSY

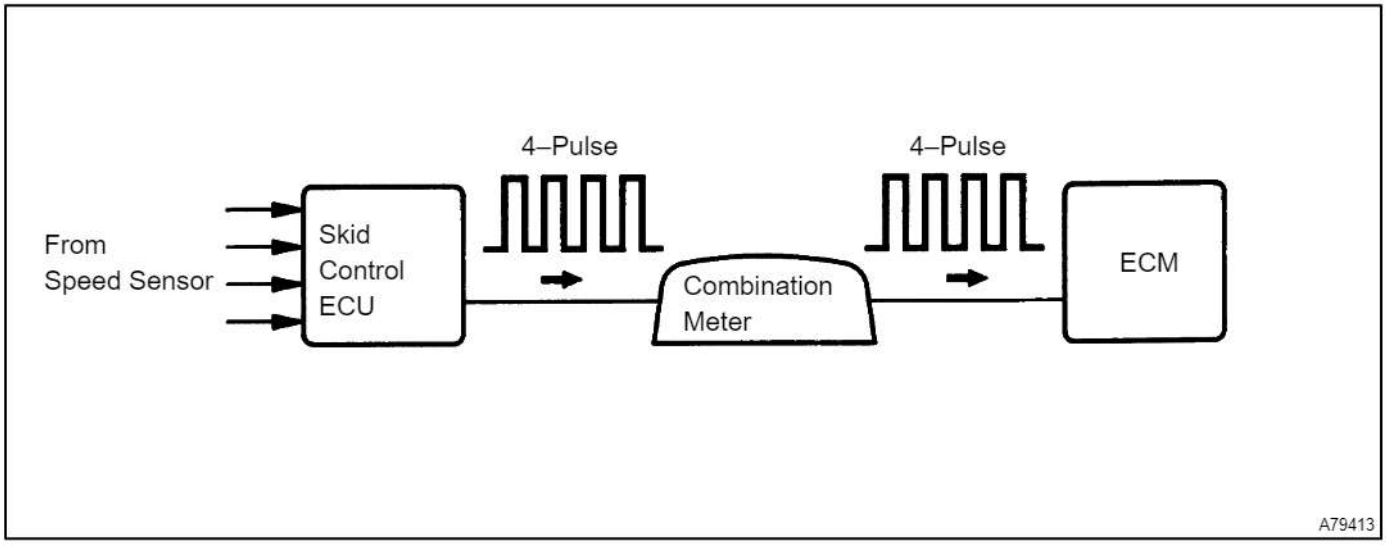
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DTC	P0500	VEHICLE SPEED SENSOR "A"

DTC	P0503	VEHICLE SPEED SENSOR "A" INTERMITTENT/ERRATIC/HIGH

CIRCUIT DESCRIPTION

The speed sensor detects the wheel speed and sends the appropriate signals to the skid control ECU. The skid control ECU converts these wheel speed signals into a 4–pulse signal and outputs it to the ECM via the combination meter. The ECM determines the vehicle speed based on the frequency of these pulse signals.



DTC No.	DTC Detection Condition	Trouble Area
P0500 P0503	The ECM detects following conditions simultaneously for 1 second (1 trip detection logic): □No SPD (speed sensor) signal while ECM detects NC (transmission counter gear) signal □Park/Neutral position switch is OFF (When shift lever is in other than P and N positions) □Transfer lever is in other than N position (4WD)	□Open or short in vehicle speed sensor circuit □Vehicle speed sensor □Combination meter □ECM □Skid control ECU

MONITOR DESCRIPTION

The ECM assumes that the vehicle is being driven when the transmission counter gear indicates more than 300 rpm and over 30 seconds have passed since the park/neutral position switch was turned OFF. If there is no signal from the vehicle speed sensor with these conditions satisfied, the ECM concludes that the vehicle speed sensor is malfunctioning. The ECM will turn on the MIL and a DTC is set.

MONITOR STRATEGY

Related DTCs	P0500: Vehicle speed sensor open/short
Required sensors/ components (Main)	Vehicle speed sensor, Combination meter, Skid control ECU
Required sensors / components (Related)	Countergear speed sensor, Park/Neutral position switch, Engine coolant temperature sensor
Frequency of operation	Continuous
Duration	500 output X 4 times
MIL operation	Immediate
Sequence operation	None

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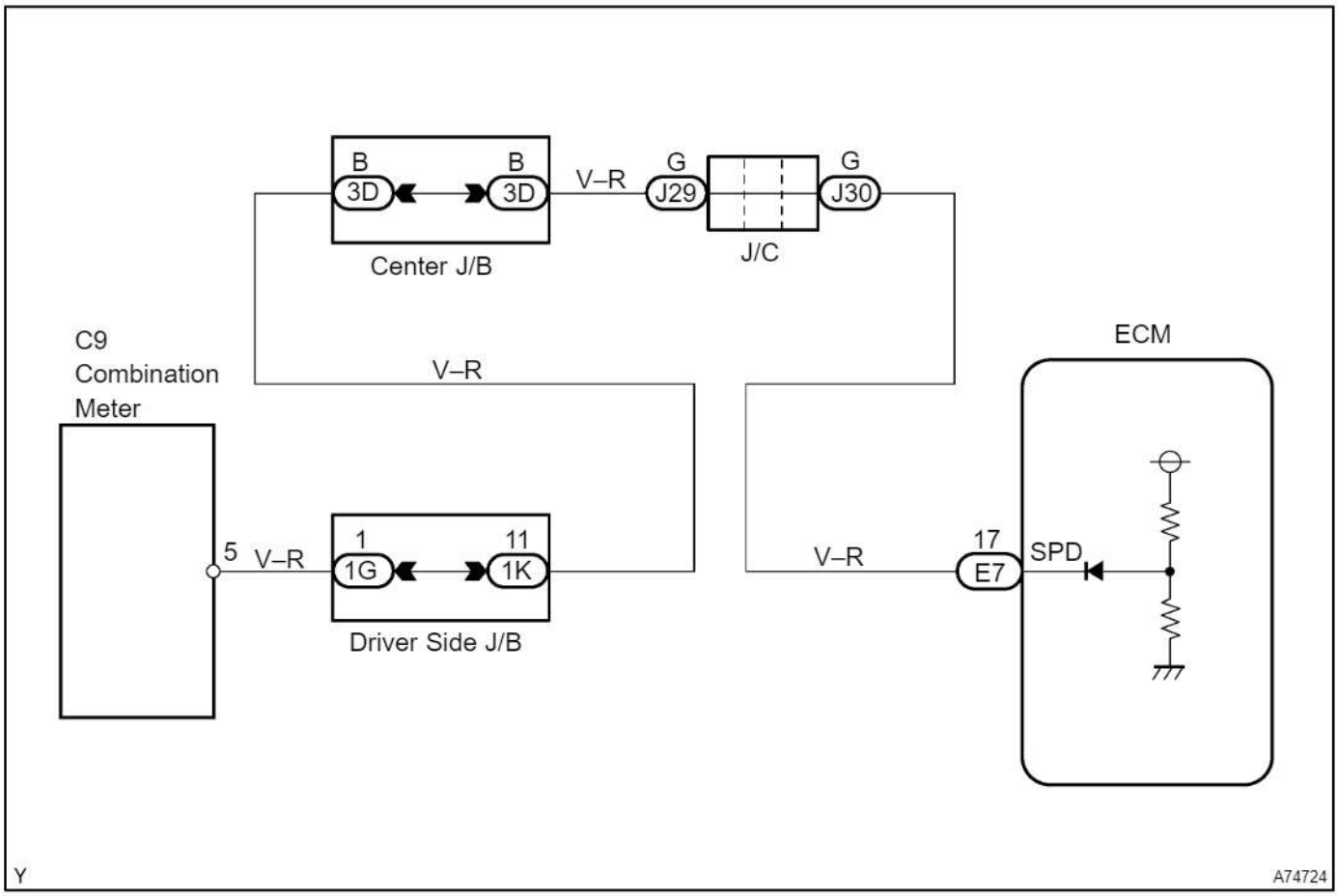
TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05–13
Vehicle speed is 6mph (9 km/h) or more	4 seconds or more
Park/Neutral position switch	OFF
Time after ignition switch ON	0.5 second or more

TYPICAL MALFUNCTION THRESHOLDS

Vehicle speed sensor signal	No pulse input

WIRING DIAGRAM



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INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1	CHECK OPERATION OF SPEEDOMETER

(a) Drive the vehicle and check if the operation of the speedometer in the combination meter is normal.

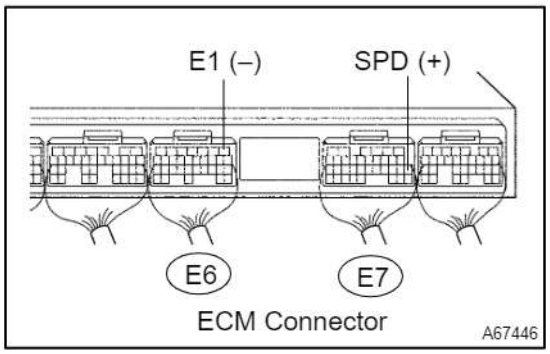
HINT:

The vehicle speed sensor is operating normally if the speedometer display is normal.

NG → **CHECK SPEEDOMETER CIRCUIT (See page 05–1702)**

OK

2	INSPECT ECM(SPD VOLTAGE)



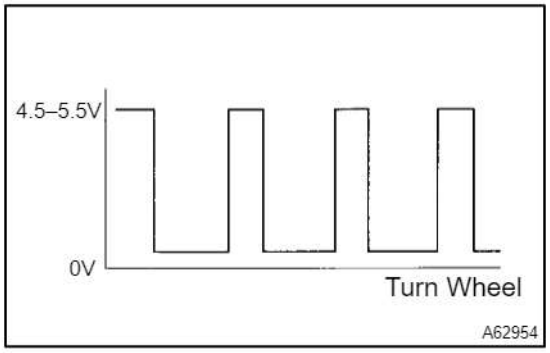
(a) Shift the lever to the neutral position.
(b) Jack up the vehicle.
(c) Turn the ignition switch to ON.
(d) Check the voltage between the specified terminals of the E6 and E7 ECM connectors as the wheel is turned slowly.

Standard:

Tester Connection	Specified Condition
SPD (E7–17) – E1 (E6–1)	Generated intermittently

HINT:

The output voltage should fluctuate up and down similarly to the diagram on the left when the wheel is turned slowly.



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM (See page 10–24)

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DTC P0504 BRAKE SWITCH "A"/"B" CORRELATION

CIRCUIT DESCRIPTION

In addition to turning on the stop lamps, the stop lamp switch signals are used for a variety of engine, transmission, and suspension functions as well as being an input for diagnostic checks. It is important that the switch operates properly, therefore this switch is designed with two complementary signal output: STP and ST1–. The ECM analyzes these signal output to detect malfunctions in the stop lamp switch.

HINT:

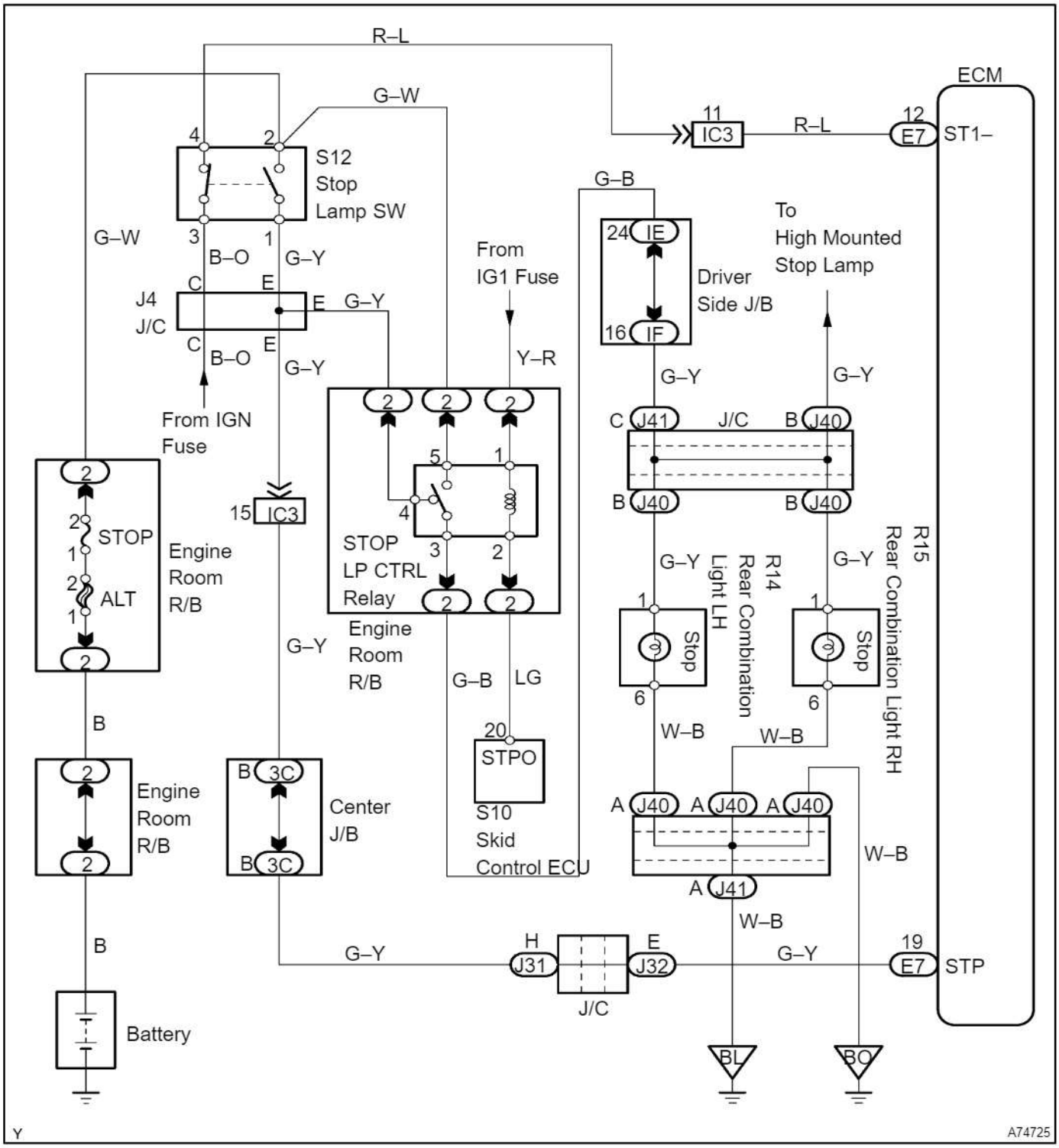
Normal condition is as shown in the table.

Signal	Brake pedal released	In transition	Brake pedal depressed
STP	OFF	ON	ON
ST1–	ON	ON	OFF

DTC No.	DTC Detection Condition	Trouble Area
P0504	Conditions (a), (b) and (c) continue for 0.5 second or more (a) Ignition switch ON (b) Brake pedal released (c) STP signal is OFF when the ST1– signal is OFF	□Short in stop lamp switch signal circuit □Stop lamp switch □ECM

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WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

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Hand–held tester:

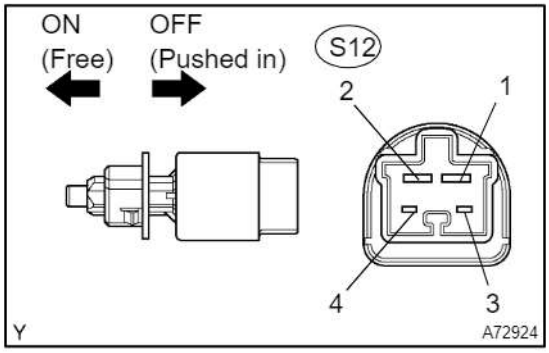
1	CHECK OPERATION OF STOP LAMP

(a) Check if the stop lamps go on and off normally when the brake pedal is depressed and released.

NG → REPAIR OR REPLACE STOP LAMP SWITCH CIRCUIT

OK

2	INSPECT STOP LAMP SWITCH ASSY



(a) Check for continuity between each pair of the terminals when the switch is ON and OFF.

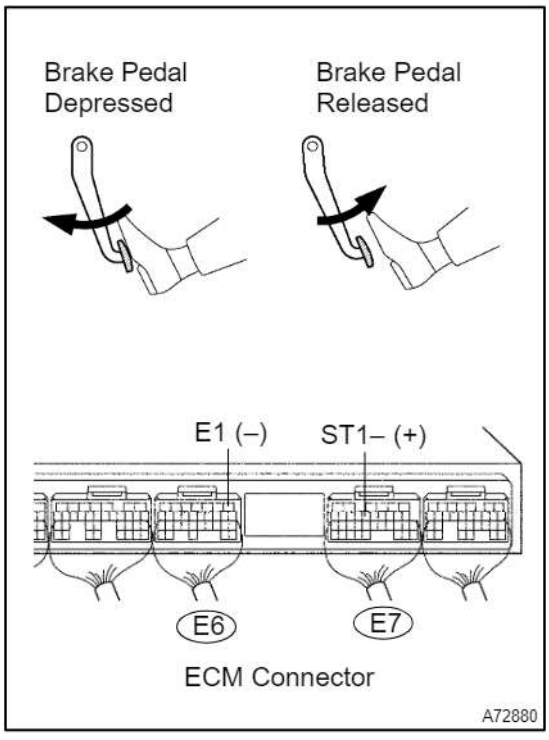
Standard:

Switch Position	Tester Connection	Specified Condition
Switch pin free	1 – 2	Continuity
Switch pin free	3 – 4	No continuity
Switch pin pushed in	1 – 2	No Continuity
Switch pin pushed in	3 – 4	Continuity

NG → REPLACE STOP LAMP SWITCH ASSY

OK

3	READ VALUE OF HAND–HELD TESTER(STP SIGNAL AND ST1– VOLTAGE)



(a) Turn the ignition switch to ON.

(b) On the hand–held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / STOP LIGHT SW. Read the values.

Standard:

Brake Pedal	Specified Condition
Depressed	STP Signal ON
Released	STP Signal OFF

(c) Measure the voltage between the terminals of the E6 and E7 ECM connectors.

Standard:

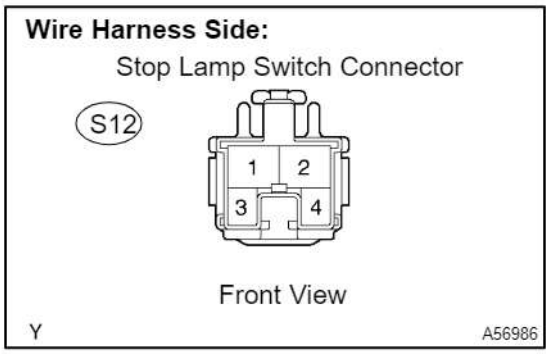
Tester Connection	Brake Pedal	Specified Condition
ST1– (E7–12) – E1 (E6–1)	Depressed	Below 1.5 V
ST1– (E7–12) – E1 (E6–1)	Released	7.5 to 14 V

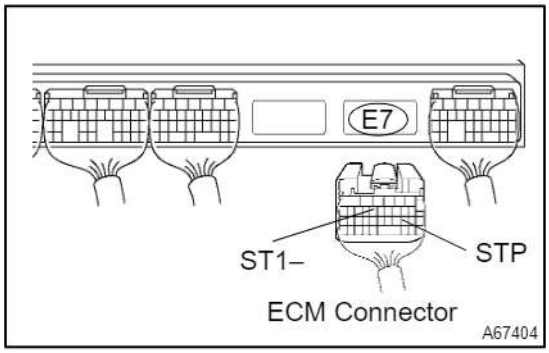
OK → CHECK FOR INTERMITTENT PROBLEMS (See page 05–10)

NG

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4 CHECK HARNESS AND CONNECTOR(STOP LAMP SWITCH – ECM)





(a) Disconnect the S12 stop lamp switch connector.
(b) Disconnect the E7 ECM connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Stop lamp switch (S12–1) – STP (E7–19)	Below 1 Ω
Stop lamp switch (S12–4) – ST1– (E7–12)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
Stop lamp switch (S12–1) or STP (E7–19) – Body ground	10 kΩ or higher
Stop lamp switch (S12–4) or ST1– (E7–12) – Body ground	10 kΩ or higher

(d) Reconnect the stop lamp switch connector.
(e) Reconnect the ECM connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM (See page 10–24)

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OBD II scan tool (excluding hand–held tester):

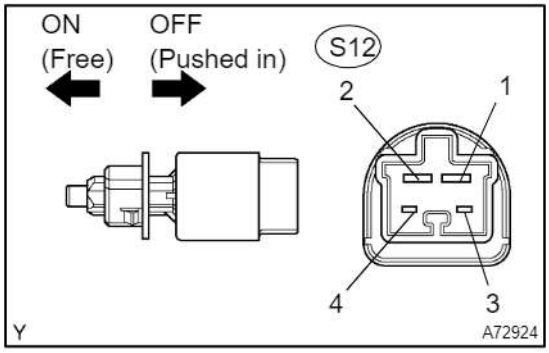
1	CHECK OPERATION OF STOP LAMP

(a) Check if the stop lamps go on and off normally when the brake pedal is depressed and released.

NG → REPAIR OR REPLACE STOP LAMP SWITCH CIRCUIT

OK

2	INSPECT STOP LAMP SWITCH ASSY



(a) Check for continuity between each pair of the terminals when the switch is ON and OFF.

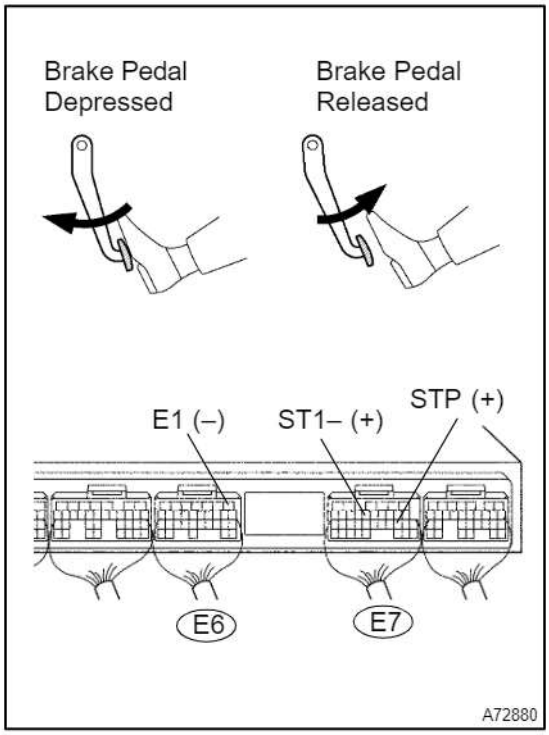
Standard:

Switch Position	Tester Connection	Specified Condition
Switch pin free	1 – 2	Continuity
Switch pin free	3 – 4	No continuity
Switch pin pushed in	1 – 2	No Continuity
Switch pin pushed in	3 – 4	Continuity

NG → REPLACE STOP LAMP SWITCH ASSY

OK

3	INSPECT ECM(STP AND ST1– VOLTAGE)



(a) Turn the ignition switch to ON.

(b) Measure the voltage between the terminals of the E6 and E7 ECM connectors.

Standard:

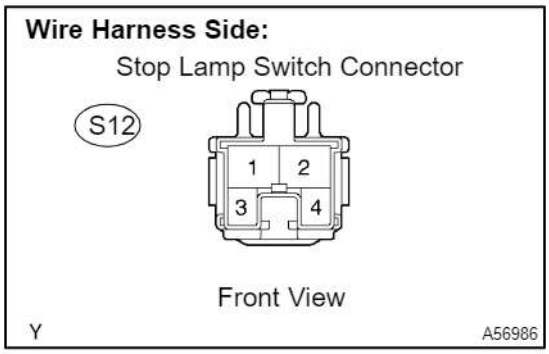
Tester Connection	Brake Pedal Position	Specified Condition
STP (E7–19) – E1 (E6–1)	Depressed	7.5 to 14 V
STP (E7–19) – E1 (E6–1)	Released	Below 1.5 V
ST1– (E7–12) – E1 (E6–1)	Depressed	Below 1.5 V
ST1– (E7–12) – E1 (E6–1)	Released	7.5 to 14 V

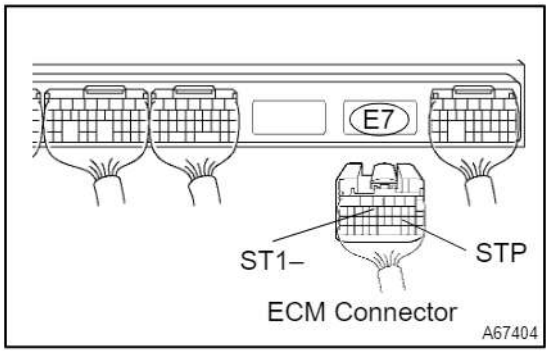
OK → CHECK FOR INTERMITTENT PROBLEMS (See page 05–10)

NG

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4 CHECK HARNESS AND CONNECTOR(STOP LAMP SWITCH – ECM)





(a) Disconnect the S12 stop lamp switch connector.
(b) Disconnect the E7 ECM connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Stop lamp switch (S12–1) – STP (E7–19)	Below 1 Ω
Stop lamp switch (S12–4) – ST1– (E7–12)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
Stop lamp switch (S12–1) or STP (E7–19) – Body ground	10 kΩ or higher
Stop lamp switch (S12–4) or ST1– (E7–12) – Body ground	10 kΩ or higher

(d) Reconnect the stop lamp switch connector.
(e) Reconnect the ECM connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

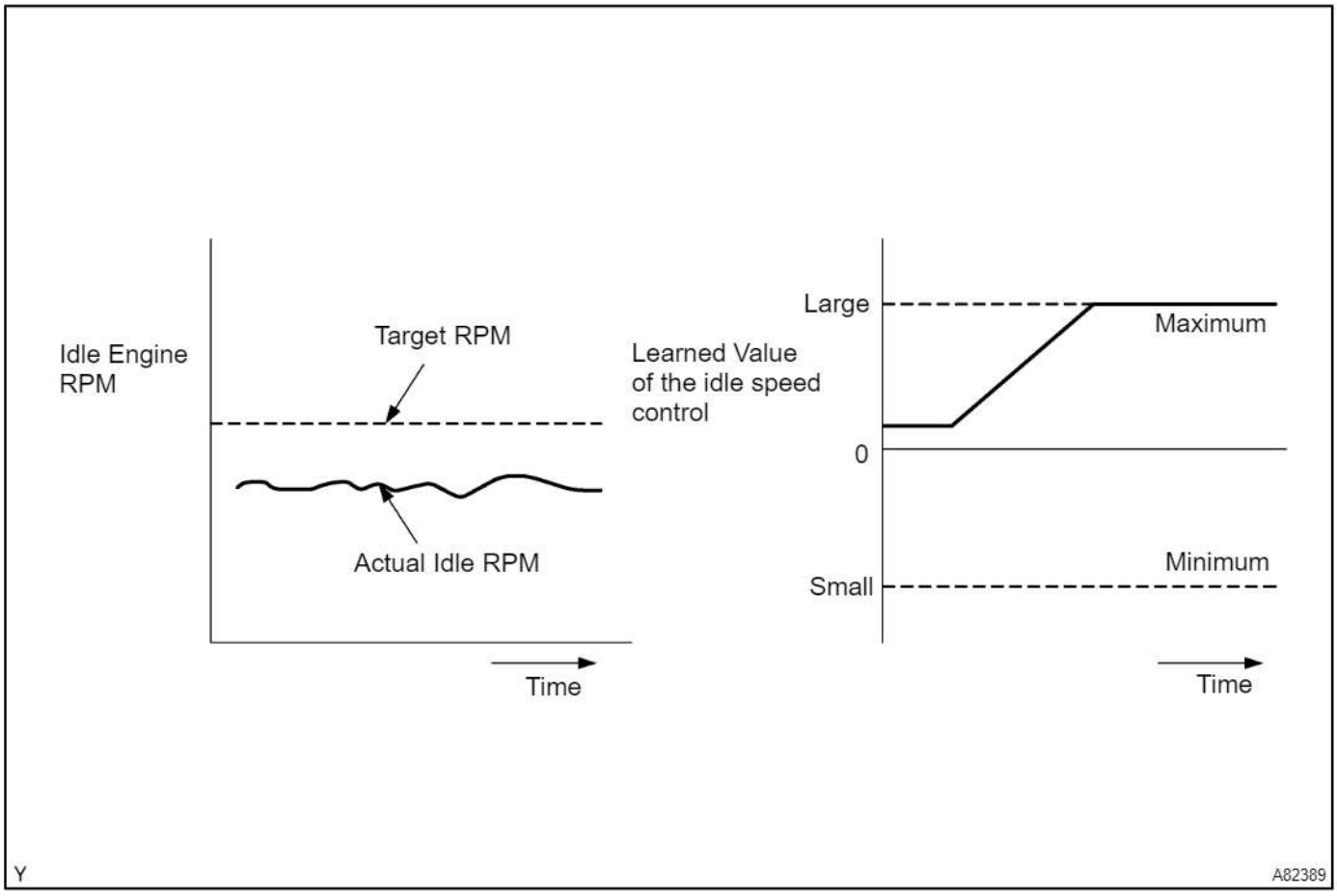
REPLACE ECM (See page 10–24)

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DTC P0505 IDLE AIR CONTROL SYSTEM

MONITOR DESCRIPTION

The idle speed is controlled by the Electronic Throttle Control System (ETCS).
ETCS is composed of the throttle motor which operates the throttle valve, and the throttle position sensor which detects the opening angle of the throttle valve.
The ECM controls the throttle motor to provide the proper throttle valve opening angle to obtain the target idle speed.
The ECM regulates the idle speed by opening and closing the throttle valve using the ETCS. The ECM concludes that the idle speed control ECM function is malfunctioning if: 1) the actual idle RPM varies more than the specified amount five times or more during a drive cycle, or 2) a learned value of the idle speed control remains at the maximum or minimum five times or more during a drive cycle. The ECM will turn on the MIL and set a DTC.
Example:
If the actual idle RPM varies from the target idle RPM by more than 200 (*1) rpm five times during a drive cycle, the ECM will turn on the MIL and a DTC is set.
HINT:
*1: RPM threshold varies with engine load.



DTC No.	DTC Detection Condition	Trouble Area
P0505	Idle speed continues to vary greatly from target speed (1 trip detection logic)	□Electric throttle control system □Air induction system □PCV hose connection

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MONITOR STRATEGY

Related DTCs	P0505: Idle air control (IAC) malfunction
Required sensors/ components (Main)	Crankshaft position sensor
Required sensors/ components (Related)	Vehicle speed sensor, Engine coolant temperature sensor
Frequency of operation	Functional check: Once per trip Range check: Continuous
Duration	Functional check: 10 minutes Range check: 10 seconds
MIL operation	Functional check: 2 driving cycles Range check: Immediate
Sequence operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05–13

Functional check:

Precondition is met when both of the following are met	A and B
A. Intake air flow rate learnings is enabled	3 seconds or more
B. Engine	Running

Range check:

Output signal duty	10 to 90 %
Battery voltage	10 V

TYPICAL MALFUNCTION THRESHOLDS

Functional check:

Case 1:	
All of the following conditions are met:	A, B and C
A. Engine RPM – target engine RPM (History that vehicle had run for 6.2 mph (10 km/h) or more)	"Less than –100 rpm or more than 200 rpm (A/C ON or park/neutral position switch ON)" or "Less than –100 rpm or more than 150 rpm (A/C OFF or park/neutral position switch OFF)"
B. Number of fall judgment	5 times or more
C. Intake air control flow rate learning value	Value when fail is judged first + 3.31 L/sec. or more Value when fail is judged first – 3.31 L/sec. or less
Case 2:	
Both or the following condition are met:	A and B
A Engine RPM – target engine RPM (History that vehicle had run for 6.2 mph (10 km/h) or more)	"Less than –100 rpm or more than 200 rpm (A/C ON or park/neutral position switch ON)" or "Less than –100 rpm or more than 150 rpm (A/C OFF or park/neutral position switch OFF)"
B. Intake air control flow rate learning value is for 5 seconds	2.48 L/sec. or more or 11 L/sec. or less

Range check:

Missing output duty change	–

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INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1	CHECK OTHER DTC OUTPUT(IN ADDITION TO DTC P0505)

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(c) Select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(d) Read the DTC using the hand–held tester or the OBD II scan tool.

Result:

Display (DTC output)	Proceed to
P0505	A
P0505 and other DTCs	B

HINT:

If any other codes besides P0505 are output, perform troubleshooting for those DTCs first.

B → GO TO RELEVANT DTC CHART (See page 05–47)

A

2	CHECK CONNECTION OF PCV HOSE (See page 12–17)

NG → REPAIR OR REPLACE PCV HOSE

OK

3	CHECK AIR INDUCTION SYSTEM

(a) Check for vacuum leaks in the air induction system.

NG → REPAIR OR REPLACE AIR INDUCTION SYSTEM

OK

CHECK ELECTRIC THROTTLE CONTROL SYSTEM (See page 10–13)

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DTC P0560 SYSTEM VOLTAGE

CIRCUIT DESCRIPTION

The battery supplies electricity to the ECM even when the ignition switch is OFF. This electricity allows the ECM to store data such as DTC history, freeze frame data, fuel trim values, and other data. If the battery voltage falls below a minimum level, the ECM will conclude that there is a fault in the power supply circuit. The next time the engine start, the ECM will turn on the MIL and a DTC will be set.

DTC No.	DTC Detection Condition	Trouble Area
P0560	Open in back–up power source circuit	□Open in back–up power source circuit □ECM

HINT:
If DTC P0560 appears, the ECM does not store another DTC.

MONITOR STRATEGY

Related DTCs	P0560: System voltage malfunction
Required sensors/components	ECM
Frequency of operation	Continuous
Duration	3 seconds
MIL operation	Immediately (*1)
Sequence of operation	None

*1: The DTC is set immediately. The MIL will be illuminated after the next engine start.

TYPICAL ENABLING CONDITIONS

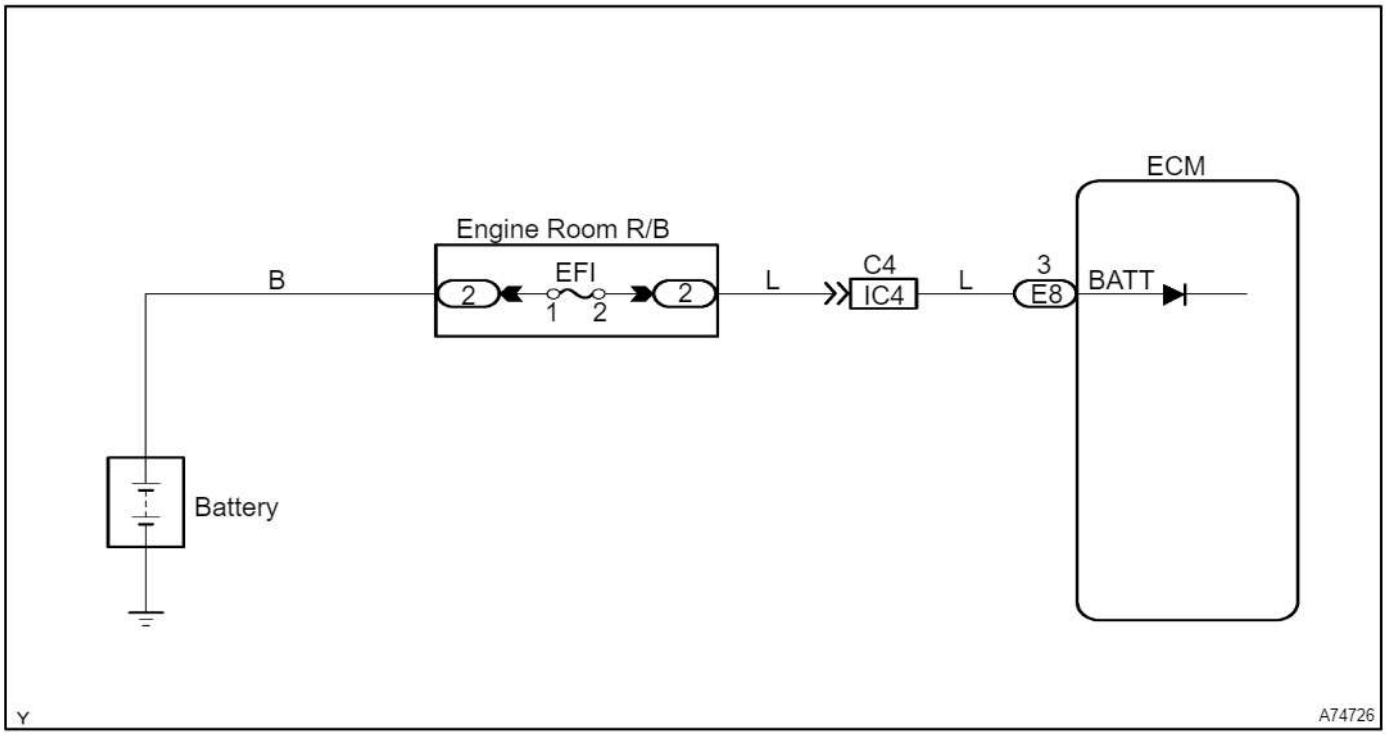
The monitor will run whenever the following DTCs are not present	See page 05–13
Stand–by RAM	Initialized

TYPICAL MALFUNCTION THRESHOLDS

Battery voltage	Less than 3.5 V

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WIRING DIAGRAM



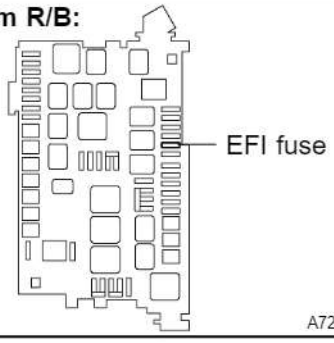
INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1	CHECK FUSE(EFI FUSE)

Engine Room R/B:



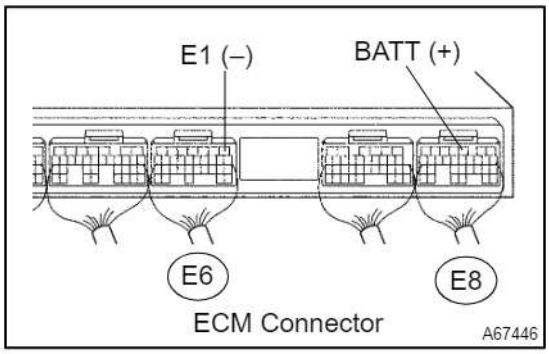
(a) Remove the EFI fuse from the engine room R/B.
(b) Check for continuity in the EFI fuse.
Standard: Continuity
(c) Reinstall the EFI fuse.

NG → **CHECK FOR SHORT IN ALL HARNESS AND COMPONENTS CONNECTED EFI FUSE**

OK

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2 INSPECT ECM(BATT VOLTAGE)



(a) Measure the voltage between the terminals of the E6 and E8 ECM connectors.

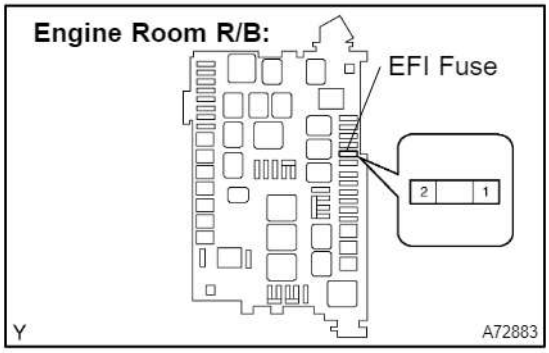
Standard:

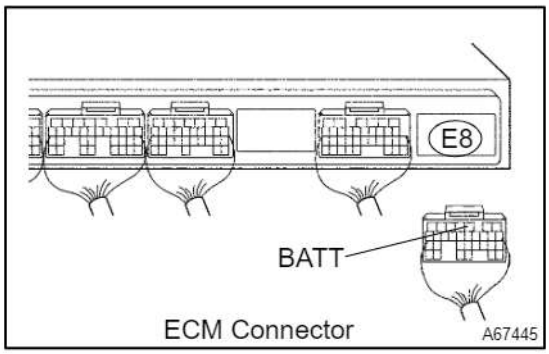
Tester Connection	Specified Condition
BATT (E8–3) – E1 (E6–1)	9 to 14 V

OK → **REPLACE ECM (See page 10–24)**

NG

3 CHECK HARNESS AND CONNECTOR(ECM – EFI FUSE, EFI FUSE – BATTERY)





(a) Check the harness and the connector between the EFI fuse and ECM.
(1) Remove the EFI fuse from the engine room R/B.
(2) Disconnect the E8 ECM connector.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Engine room R/B (EFI fuse terminal 2) – BATT (E8–3)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
Engine room R/B (EFI fuse terminal 2) or BATT (E8–3) – Body ground	10 kΩ or higher

(4) Reinstall the EFI fuse.
(5) Reconnect the ECM connector.

(b) Check the harness and the connector between the EFI fuse and battery.
(1) Remove the EFI fuse from the engine room R/B.
(2) Disconnect the positive battery terminal.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Battery positive terminal – Engine room R/B (EFI fuse terminal 1)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
Battery positive terminal or Engine room R/B (EFI fuse terminal 1) – Body ground	10 kΩ or higher

(4) Reinstall the EFI fuse.
(5) Reconnect the positive battery terminal.

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NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ENGINE ROOM RELAY BLOCK

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DTC	P0604	INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR

DTC	P0606	ECM/PCM PROCESSOR

DTC	P0607	CONTROL MODULE PERFORMANCE

DTC	P0657	ACTUATOR SUPPLY VOLTAGE CIRCUIT/OPEN

MONITOR DESCRIPTION

The ECM continuously monitors its internal memory status, internal circuits, and output signals to the throttle actuator. This self–check ensures that the ECM is functioning properly. If any malfunction is detected, the ECM will set the appropriate DTC and illuminate the MIL.
The ECM memory status is diagnosed by internal ”mirroring” of the main CPU and the sub CPU to detect random access memory (RAM) errors. The two CPUs also perform continuous mutual monitoring.

The ECM sets a DTC if: 1) output from the 2 CPUs is different and deviates from the standards, 2) the signals to the throttle actuator deviate from the standards, 3) a malfunction is found in the throttle actuator supply voltage, and 4) any other ECM malfunction is found.

DTC No.	DTC Detection Condition	Trouble Area
P0604 P0606 P0607 P0657	ECM internal error	□ECM

MONITOR STRATEGY

Related DTCs	P0604: Random access memory (RAM) error range check P0606: ECM range check/description P0657: Actuator supply voltage circuit range check
Required sensors/ components (Main)	ECM
Required sensors/ components (Related)	–
Frequency of operation	Continuous
Duration	Within 1 second
MIL operation	Immediate
Sequence operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05–13

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TYPICAL MALFUNCTION THRESHOLDS

P0604:

RAM mirror check failure	–

P0606:

ECM error	–

P0657:

ECM error	–

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1	**REPLACE ECM (See page 10–24)**

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DTC	P0617	STARTER RELAY CIRCUIT HIGH

CIRCUIT DESCRIPTION

HINT:

Refer to cranking holding function circuit on page 05–298.

If the vehicle is being driven and the ECM detects the starter control signal (STA), the ECM concludes that the starter control circuit is malfunctioning. The ECM will turn on the MIL and a DTC is set.

DTC No.	DTC Detection Condition	Trouble Area
P0617	When conditions (a), (b) and (c) are met when the battery (+B) voltage 10.5 V or more is applied for 20 seconds: (a) Vehicle speed greater than 12 mph (20 km/h) (b) Engine speed greater than 1,000 rpm (c) STA signal ON	□Short in Park/Neutral position switch circuit □Park/Neutral position switch □Ignition switch □ECM

MONITOR STRATEGY

Related DTCs	P0617: Starter signal error
Required sensors/ components (Main)	Starter signal
Required sensors/ components (Related)	Vehicle speed sensor, Engine speed sensor
Frequency of operation	Continuous
Duration	20 seconds
MIL operation	Immediate
Sequence operation	None

TYPICAL ENABLING CONDITIONS

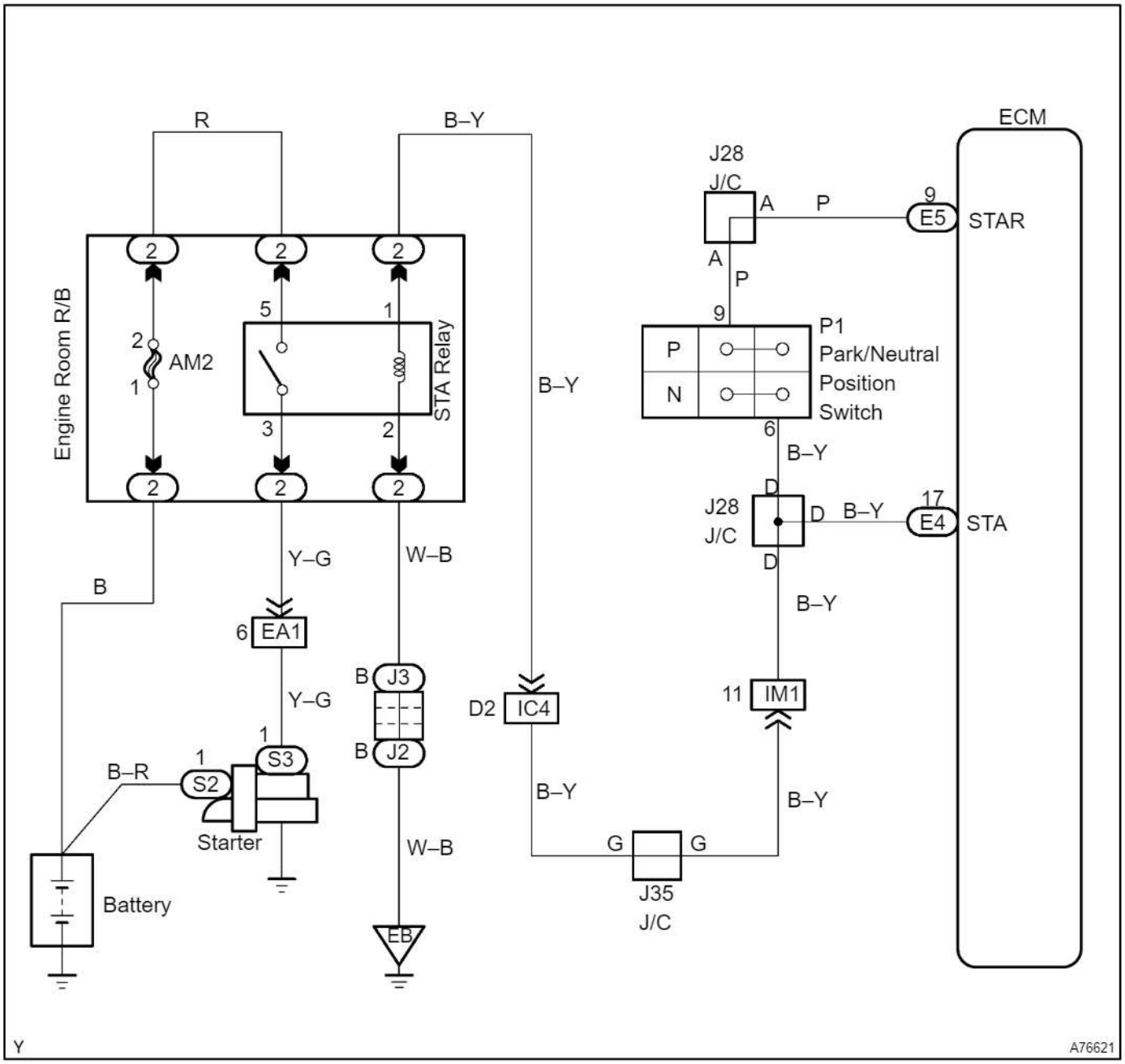
The monitor will run whenever the following DTCs are not present	See page 05–13
Battery voltage	10.5 V or more
Vehicle speed	12.4 mph (20 km/h) or more
Engine RPM	1,000 rpm or more

TYPICAL MALFUNCTION THRESHOLDS

Starter signal	ON (at "more than 12.4 mph (20 km/h) and more than 1,000 rpm")

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WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- This DTC chart is on the premise that the engine is cranked normally. If the engine is not cranked, proceed to the problem symptoms table on page 05–29.
- Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

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Hand–held tester:

1	READ VALUE OF HAND–HELD TESTER(STARTER SIGNAL)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch to ON and turn the hand–held tester ON.
(c) On the hand–held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / STARTER SIG. Read the values.

Result:

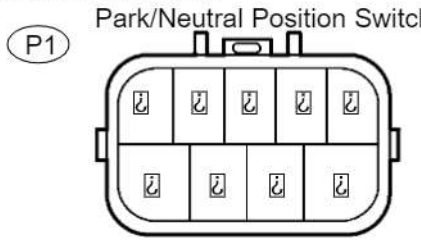
Ignition Switch Position	ON	START
STARTER SIG	OFF	ON

OK → **Go to step 6**

NG

2	INSPECT PARK/NEUTRAL POSITION SWITCH ASSY

Component Side:



(a) Disconnect the P1 park/neutral position switch connector.
(b) check the resistance between each terminal shown below when the shift lever is moved to each position.

Standard:

Shift Position	Tester Connection	Specified Condition
P	1 – 3, 6 – 9	Below 1 Ω
R	2 – 3	Below 1 Ω
N	3 – 5, 6 – 9	Below 1 Ω
D,4	3 – 7	Below 1 Ω
3	3 – 4	Below 1 Ω
2,L	3 – 8	Below 1 Ω

(c) Reconnect the park/neutral position switch connector.

NG → **REPLACE PARK/NEUTRAL POSITION SWITCH ASSY (See page 40–12) (GO TO STEP 3 AFTER THE REPLACEMENT)**

OK

3	READ VALUE OF HAND–HELD TESTER(STARTER SIGNAL)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch to ON and turn the hand–held tester ON.
(c) On the hand–held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / STARTER SIG. Read the values.

Result:

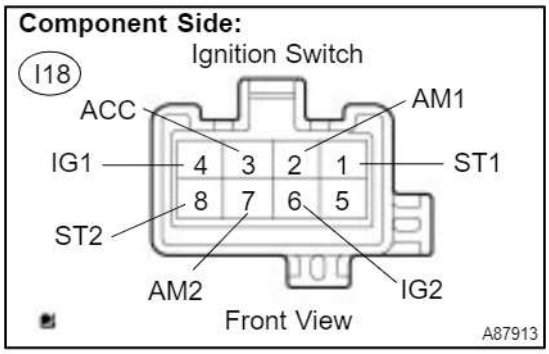
Ignition Switch Position	ON	START
STARTER SIG	OFF	ON

OK → **SYSTEM OK**

NG

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4 INSPECT IGNITION OR STARTER SWITCH ASSY



(a) Disconnect the I18 ignition switch connector.
(b) Measure the resistance between the connector terminals shown in the chart below.

Standard:

Switch Position	Tester Connection	Specified Condition
LOCK	All Terminals	10 kΩ or higher
ACC	2–3	Below 1 Ω
ON	2–3, 2–4, 6–7	Below 1 Ω
START	1–2, 2–4, 6–7, 6–8	Below 1 Ω

(c) Reconnect the I18 ignition switch connector.

NG → **REPLACE IGNITION OR STARTER SWITCH ASSY (GO TO STEP 5 AFTER THE REPLACEMENT)**

OK

5 READ VALUE OF HAND–HELD TESTER(STARTER SIGNAL)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch to ON and turn the hand–held tester ON.
(c) On the hand–held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / STARTER SIG.
(d) Read the values.

Result:

Ignition Switch Position	ON	START
STARTER SIG	OFF	ON

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

6 CHECK IF DTC OUTPUT REOCCURS

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch to ON and turn the hand–held tester ON.
(c) Erease DTC, select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CLEAR CODE; and press YES.
(d) Drive the vehicle more than 25 mph (40 km/h) for 20 seconds or more.
(e) Check DTC reoccur.

Result:

Display (DTC output)	Proceed to
P0617	A
No output	B

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B → CHECK FOR INTERMITTENT PROBLEMS

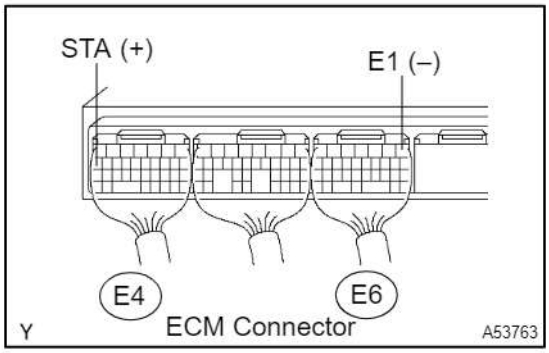
A

REPLACE ECM (See page 10–24)

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OBD II scan tool (excluding hand–held tester):

1 INSPECT ECM(STA VOLTAGE)



(a) Turn the ignition switch to ON.
(b) Measure the voltage between the specified terminals of the E4 and E6 ECM connectors.

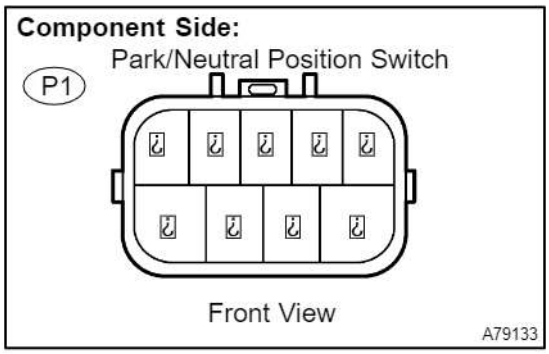
Standard:

Tester Connection	Condition	Specified Condition
STA (E4–17) – E1 (E6–1)	Ignition switch ON	Below 0.5 V
STA (E4–17) – E1 (E6–1)	Cranking	9 to 14 V

OK → **Go to step 6**

NG

2 INSPECT PARK/NEUTRAL POSITION SWITCH ASSY



(a) Disconnect the P1 park/neutral position switch connector.
(b) Measure the resistance between each terminal shown below when the shift lever is moved to each position.

Standard:

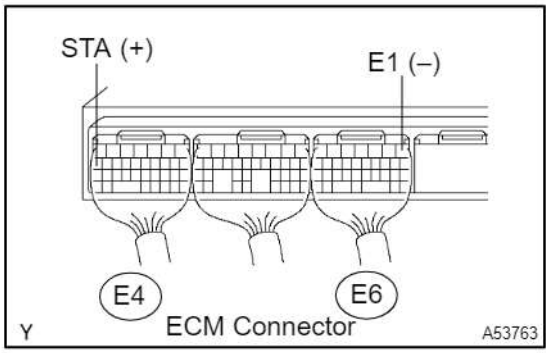
Shift Position	Tester Connection	Specified Condition
P	1 – 3, 6 – 9	Below 1 Ω
R	2 – 3	Below 1 Ω
N	3 – 5, 6 – 9	Below 1 Ω
D,4	3 – 7	Below 1 Ω
3	3 – 4	Below 1 Ω
2,L	3 – 8	Below 1 Ω

(c) Reconnect the park/neutral position switch connector.

NG → **REPLACE PARK/NEUTRAL POSITION SWITCH ASSY (See page 40–12) (GO TO STEP 3 AFTER THE REPLACEMENT)**

OK

3 INSPECT ECM



(a) Turn the ignition switch to ON.
(b) Measure the voltage between the specified terminals of the E4 and E6 ECM connectors.

Standard:

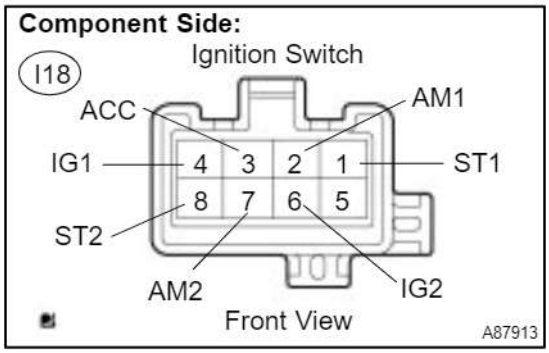
Tester Connection	Condition	Specified Condition
STA (E4–17) – E1 (E6–1)	Ignition switch ON	Below 0.5 V
STA (E4–17) – E1 (E6–1)	Cranking	9 to 14 V

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OK → SYSTEM OK

NG

4 INSPECT IGNITION OR STARTER SWITCH ASSY



(a) Disconnect the I18 ignition switch connector.
(b) Measure the resistance between the connector terminals shown in the chart below.

Standard:

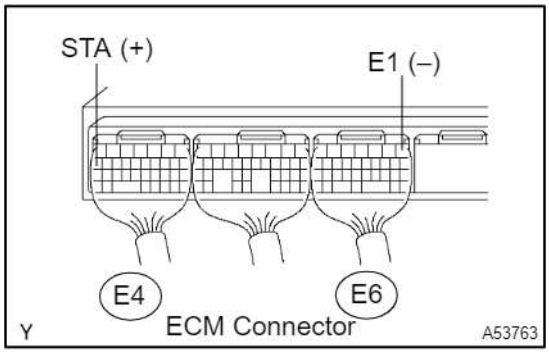
Switch Position	Tester Connection	Specified Condition
LOCK	All Terminals	10 kΩ or higher
ACC	2–3	Below 1 Ω
ON	2–3, 2–4, 6–7	Below 1 Ω
START	1–2, 2–4, 6–7, 6–8	Below 1 Ω

(c) Reconnect the I18 ignition switch connector.

NG → REPLACE IGNITION OR STARTER SWITCH ASSY (GO TO STEP 5 AFTER THE REPLACEMENT)

OK

5 INSPECT ECM



(a) Turn the ignition switch to ON.
(b) Measure the voltage between the specified terminals of the E4 and E6 ECM connectors.

Standard:

Tester Connection	Condition	Specified Condition
STA (E4–17) – E1 (E6–1)	Ignition switch ON	Below 0.5 V
STA (E4–17) – E1 (E6–1)	Cranking	9 to 14 V

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

6 CHECK IF DTC OUTPUT REOCCURS

(a) Clear the DTC (see page 05–36).
(b) Drive the vehicle more than 25 mph (40 km/h) for 20 seconds or more.
(c) Check DTC reoccur.

Result:

Display (DTC output)	Proceed to
P0617	A
No output	B

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B → CHECK FOR INTERMITTENT PROBLEMS

A

REPLACE ECM (See page 10–24)

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DTC	P2102	THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW

DTC	P2103	THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH

CIRCUIT DESCRIPTION

The throttle motor is operated by the ECM and it opens and closes the throttle valve.
The opening angle of the throttle valve is detected by the throttle position sensor which is mounted on the throttle body. The throttle position sensor provides feedback to the ECM. This feedback allows the ECM to control the throttle motor and monitor the throttle opening angle as the ECM responds to driver input.
HINT:
This Electrical Throttle Control System (ETCS) does not use a throttle cable.

DTC No.	DTC Detection Condition	Trouble Area
P2102	Conditions (a) and (b) continue for 2.0 seconds: (1 trip detection logic) (a) Throttle control motor output duty ratio 80 % or more (b) Throttle control motor current 0.5 A or less	□Open in throttle control motor circuit □Throttle control motor □ECM
P2103	Either of following conditions is met. (1 trip detection logic) □Throttle control motor current 10 A or more (0.1 second) □Throttle control motor current 7A or more (0.6 second)	□Short in throttle control motor circuit □Throttle control motor □Throttle valve □Throttle body assembly □ECM

MONITOR DESCRIPTION

The ECM monitors the flow of electrical current through the electronic throttle motor, and detects malfunctions or open circuits in the throttle motor based on the value of the electrical current. When the current deviates from the standard values, the ECM concludes that there is a fault in the throttle motor. Or, if the throttle valve is not functioning properly (for example, stuck ON) the ECM concludes that there is a fault and turns on the MIL and a DTC is set.
Example:
When the current is more than 10A. Or, the current is less than 0.5A when the motor driving duty ratio is more than 80%. The ECM concludes that the current is deviated from the standard values, turns on the MIL and a DTC is set.

FAIL SAFE

If the Electronic Throttle Control System (ETCS) has a malfunction, the ECM cuts off current to the throttle control motor. The throttle control valve returns to a predetermined opening angle (approximately 16) by the force of the return spring. The ECM then adjusts the engine output by controlling the fuel injection (intermittent fuel–cut) and ignition timing in accordance with the accelerator pedal opening angle to enable the vehicle to continue at a minimal speed.
If the accelerator pedal is depressed firmly and slowly, the vehicle can be driven slowly.
If a ”pass” condition is detected and then the ignition switch is turned to OFF, the fail–safe operation will stop and the system will return to normal condition.

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MONITOR STRATEGY

Related DTCs	P2102: Throttle actuator motor current (Low electrical current) P2103: Throttle actuator motor current (High electrical current)
Required sensors/ components (Main)	Throttle actuator motor (Throttle body)
Required sensors/ components (Related)	–
Frequency of operation	Continuous
Duration	2 seconds
MIL operation	P2102: Immediate P2103: 1 driving cycle
Sequence operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05–13

P2102:

Throttle motor	ON
Duty–cycle ratio to open throttle actuator	80 % or more
Throttle actuator power supply	8 V or more
Current motor current – Motor current at 0.016 sec. before	Less than 0.2 A

P2103:

Throttle motor	ON
Either of the following conditions is met:	A or B
A. Throttle actuator power supply	8 V or more
B. Throttle actuator power	ON

TYPICAL MALFUNCTION THRESHOLDS

P2102:

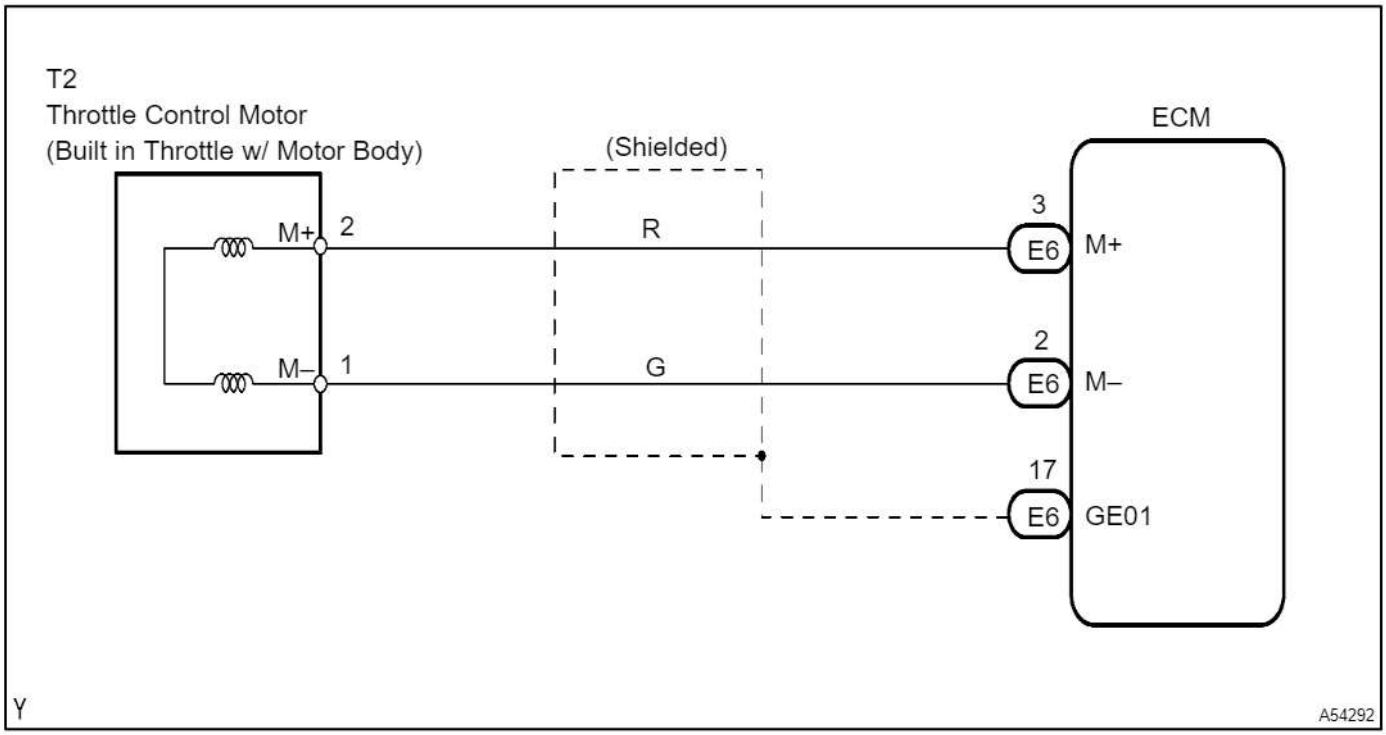
Throttle motor current	Less than 0.5 A (when motor drive duty 80% or more)

P2103:

Throttle motor current	More than 10 A (0.1 second) More than 7 A (0.6 second)

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WIRING DIAGRAM

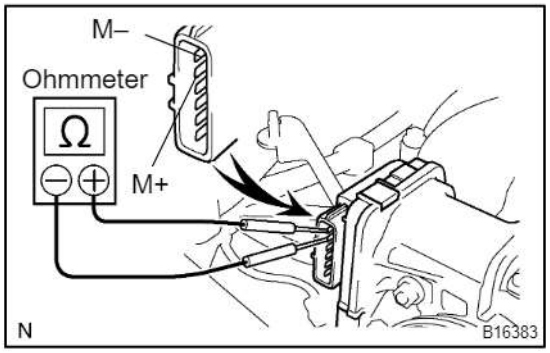


INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1	INSPECT THROTTLE W/MOTOR BODY ASSY(RESISTANCE OF THROTTLE CONTROL MOTOR)



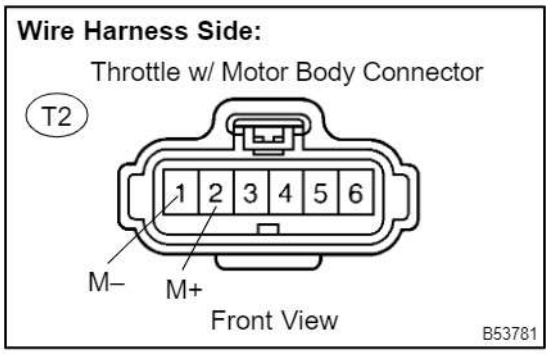
(a) Disconnect the T2 throttle w/ motor body connector.
(b) Measure the motor resistance between terminal M+ and M–.
Motor resistance: 0.3 to 100 Ω at 20 C (68 F)
(c) Reconnect the throttle w/ motor body connector.

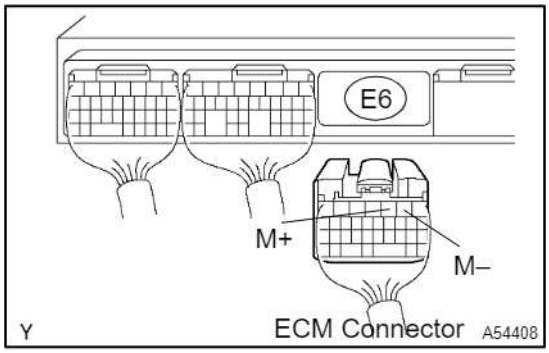
NG → **REPLACE THROTTLE W/MOTOR BODY ASSY**

OK

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2	CHECK HARNESS AND CONNECTOR(THROTTLE CONTROL MOTOR – ECM)





(a) Disconnect the T2 throttle w/ motor body connector.
(b) Disconnect the E6 ECM connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
M+ (T2–2) – M+ (E6–3)	Below 1 Ω
M– (T2–1) – M– (E6–2)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
M+ (T2–2) or M+ (E6–3) – Body ground	10 kΩ or higher
M– (T2–1) or M– (E6–2) – Body ground	10 kΩ or higher

(d) Reconnect the throttle w/ motor body connector.
(e) Reconnect the ECM connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3	INSPECT BODY ASSY, THROTTLE W/MOTOR(VISUALLY CHECK THROTTLE VALVE)

(a) Check between the throttle valve and the housing for foreign objects.
Also, check if the valve can open and close smoothly.

NG → **REMOVE FOREIGN OBJECT AND CLEAN THROTTLE BODY**

OK

REPLACE ECM (See page 10–24)

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DTC	P2111	THROTTLE ACTUATOR CONTROL SYSTEM – STUCK OPEN

DTC	P2112	THROTTLE ACTUATOR CONTROL SYSTEM – STUCK CLOSED

CIRCUIT DESCRIPTION

The throttle motor is operated by the ECM and it opens and closes the throttle valve using gears. The opening angle of the throttle valve is detected by the throttle position sensor, which is mounted on the throttle body. The throttle position sensor provides feedback to the ECM to control the throttle motor and set the throttle valve angle in response to driver input.

HINT:

This Electrical Throttle Control System (ETCS) does not use a throttle cable.

DTC No.	DTC Detection Condition	Trouble Area
P2111	Throttle valve opening angle is stuck during ECM orders to close (1 trip detection logic)	□Throttle control motor circuit □Throttle control motor □Throttle body □Throttle valve
P2112	Throttle valve opening angle is stuck during ECM orders to open (1 trip detection logic)	□Throttle control motor circuit □Throttle control motor □Throttle body □Throttle valve

MONITOR DESCRIPTION

The ECM concludes that there is a malfunction of the ETCS when the throttle valve remains at a fixed angle despite high drive current from the ECM. The ECM will turn on the MIL and a DTC is set.

FAIL SAFE

If the Electronic Throttle Control System (ETCS) has a malfunction, the ECM cuts off current to the throttle control motor. The throttle control valve returns to a predetermined opening angle (approximately 16) by the force of the return spring. The ECM then adjusts the engine output by controlling the fuel injection (intermittent fuel–cut) and ignition timing in accordance with the accelerator pedal opening angle to enable the vehicle to continue at a minimal speed.

If the accelerator pedal is depressed firmly and slowly, the vehicle can be driven slowly.

If a ”pass” condition is detected and then the ignition switch is turned to OFF, the fail–safe operation will stop and the system will return to normal condition.

MONITOR STRATEGY

Related DTCs	P2111: Throttle motor actuator lock (Closed) P2112: Throttle motor actuator lock (Open)
Required sensors/ components (Main)	Throttle actuator motor
Required sensors/ components (Related)	Throttle position sensor
Frequency of operation	Continuous
Duration	0.5 second
MIL operation	Immediate
Sequence operation	None

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TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05–13

P2111:

Throttle motor electrical current	2 A or more
Duty–cycle ratio to close throttle valve	80 % or more

P2112:

Throttle motor electrical current	2 A or more
Duty–cycle ratio to open throttle valve	80 % or more

TYPICAL MALFUNCTION THRESHOLDS

Current throttle position sensor voltage at this time – throttle position sensor voltage 0.016 second earlier	Less than 0.1 V when throttle motor open (or close) duty 80% or more

WIRING DIAGRAM

Refer to DTC P2102 on page 05–265.

INSPECTION PROCEDURE

HINT:

- Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.
- If any other codes besides P2111 and P2112 are output, perform troubleshooting for those DTCs first.

1	CHECK OTHER DTCS OUTPUT

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(c) Select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(d) Read DTCs.

Result:

Display (DTC output)	Proceed to
P2111 or P2112	A
P2111 or P2112 and other DTCs	B

HINT:

If any other codes besides P2111 or P2112 are output, perform troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05–47)**

A

2	INSPECT THROTTLE W/MOTOR BODY ASSY(VISUALLY CHECK THROTTLE VALVE)

(a) Check if or not a foreign object has been caught between the throttle valve and housing. Also, check if the valve can open and close smoothly.

NG → **REPLACE THROTTLE W/MOTOR BODY ASSY (See page 10–17)**

OK

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3	CHECK DTC OUTPUT

(a) Clear the DTC (See page 05–36).
(b) Start the engine, and depress and release the accelerator pedal quickly (fully open and fully close).
(c) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(d) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(e) Select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(f) Read DTC.

Result:

Display (DTC output)	Proceed to
No DTC	A
P2111 and/or P2112	B

B → **REPLACE ECM (See page 10–24)**

A

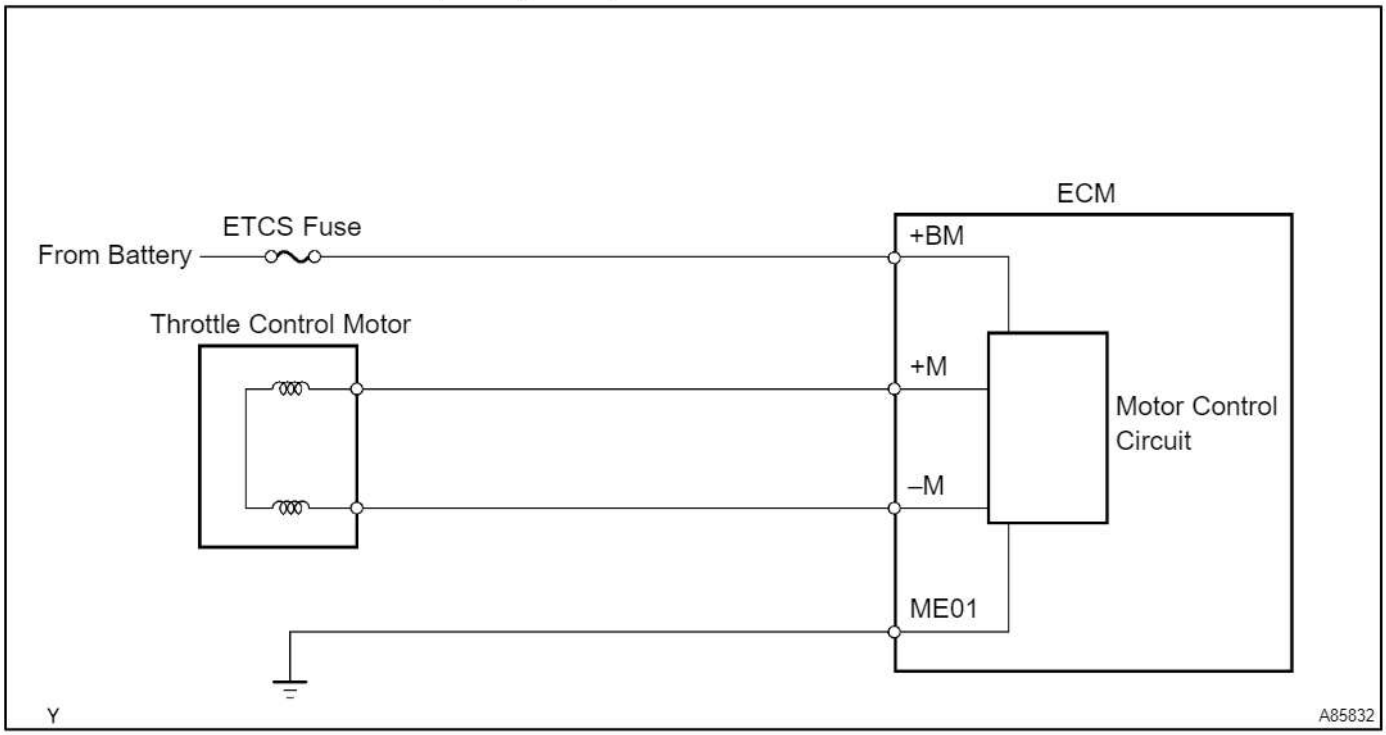
CHECK FOR INTERMITTENT PROBLEMS (See page 05–10)

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DTC	P2118	THROTTLE ACTUATOR CONTROL MOTOR CURRENT RANGE/PERFORMANCE

CIRCUIT DESCRIPTION

The Electronic Throttle Control System (ETCS) has a dedicated power supply circuit. The voltage (+BM) is monitored and when the voltage is low (less than 4V), the ECM concludes that the ETCS has a fault and current to the throttle control motor is cut.
When the voltage becomes unstable, the ETCS itself becomes unstable. For this reason, when the voltage is low, the current to the motor is cut. If repairs are made and the system has returned to normal, turn the ignition switch to OFF. The ECM then allows current to flow to the motor and the motor can be restarted.
HINT:
This Electrical Throttle Control System (ETCS) does not use a throttle cable.



DTC No.	DTC Detection Condition	Trouble Area
P2118	Open in ETCS power source circuit (+BM) (1 trip detection logic)	□Open in ETCS power source circuit □ETCS fuse □ECM

MONITOR DESCRIPTION

The ECM monitors the battery supply voltage applied to the electronic throttle motor (+BM). When the power supply voltage drops below the threshold, the ECM concludes that there is an open in the power supply circuit. A DTC is set and the MIL is turned on.

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FAIL SAFE

If the Electronic Throttle Control System (ETCS) has a malfunction, the ECM cuts off current to the throttle control motor. The throttle control valve returns to a predetermined opening angle (approximately 16) by the force of the return spring. The ECM then adjusts the engine output by controlling the fuel injection (intermittent fuel–cut) and ignition timing in accordance with the accelerator pedal opening angle to enable the vehicle to continue at a minimal speed.
If the accelerator pedal is depressed firmly and slowly, the vehicle can be driven slowly.
If a "pass" condition is detected and then the ignition switch is turned OFF, the fail–safe operation will stop and the system will return to normal.

MONITOR STRATEGY

Related DTCs	P2118: Throttle actuator motor power supply line range check (Low voltage)
Required sensors/ components (Main)	Throttle actuator motor
Required sensors/ components (Related)	–
Frequency of operation	Continuous
Duration	0.8 second
MIL operation	Immediate
Sequence operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05–13
Actuator power	ON
Battery voltage (+BM)	More than 8 V

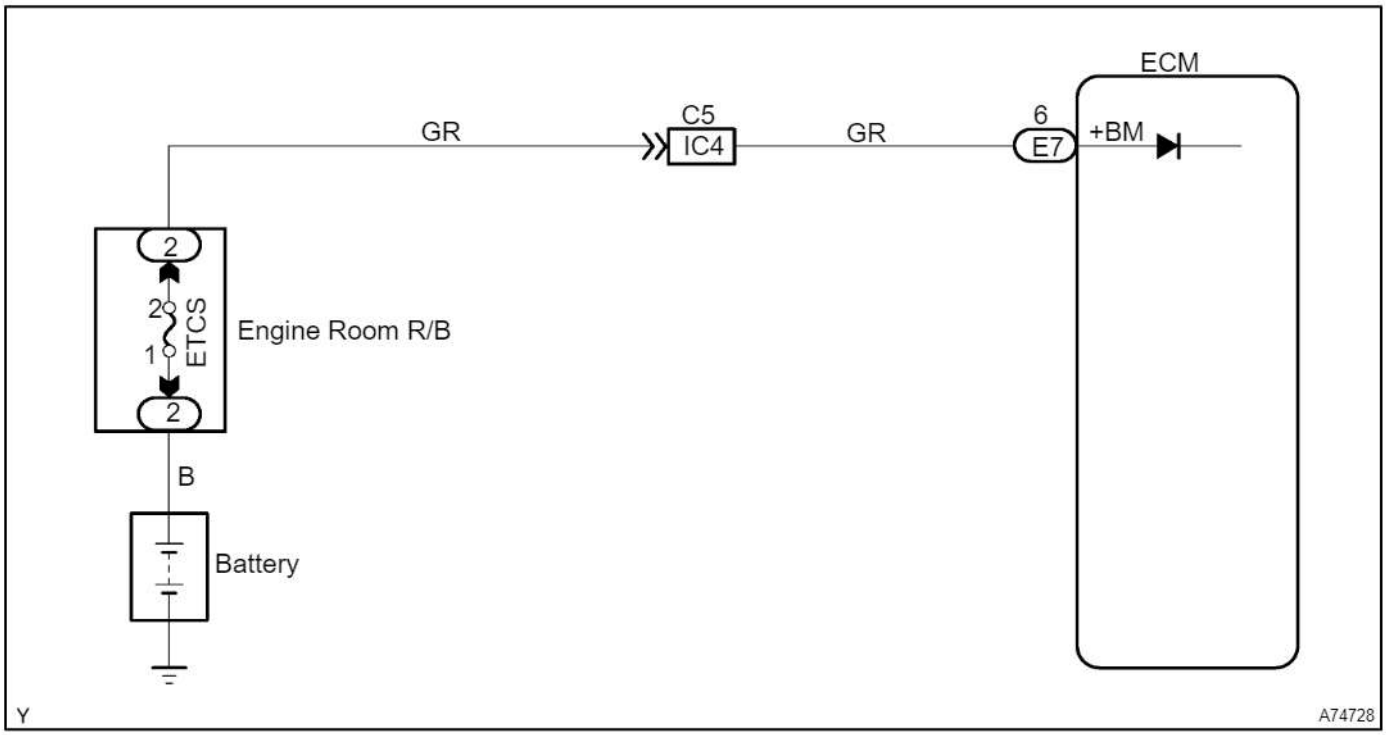
TYPICAL MALFUNCTION THRESHOLDS

Throttle actuator power supply voltage	Less than 4 V

COMPONENT OPERATING RANGE

Throttle actuator power supply voltage	9 to 14 V

WIRING DIAGRAM



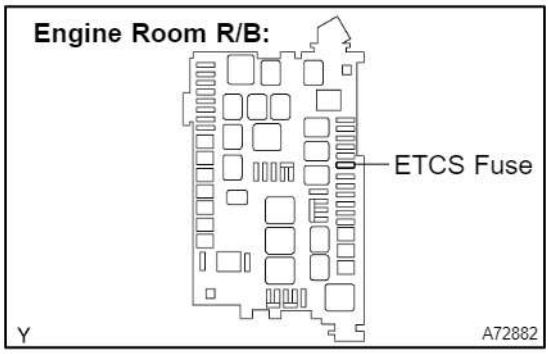
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INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1 CHECK FUSE(ETCS FUSE)

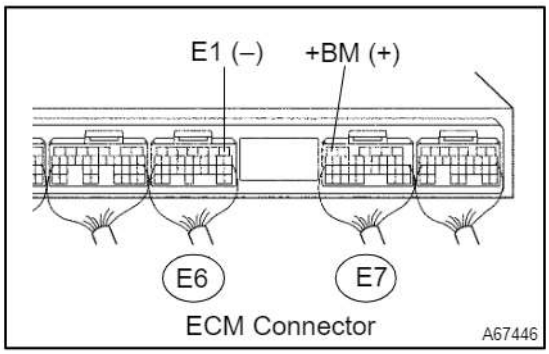


(a) Remove the ETCS fuse from the engine room R/B.
(b) Check for continuity in the ETCS fuse.
Standard: Continuity
(c) Reinstall the ETCS fuse.

NG → **REPLACE CHECK FOR SHORT IN ALL HARNESSES AND COMPONENTS CONNECTED TO FUSE**

OK

2 INSPECT ECM(+BM VOLTAGE)



(a) Check the voltage between the terminals of the E6 and E7 ECM connectors.
Standard:

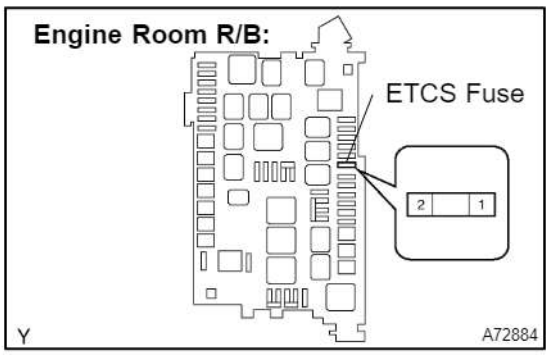
Tester Connection	Specified Condition
+BM (E7–6) – E1 (E6–1)	9 to 14 V

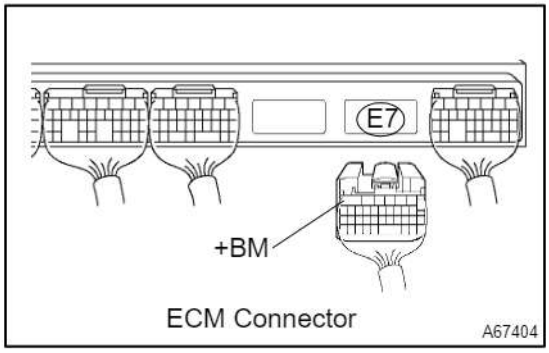
OK → **REPLACE ECM (See page 10–24)**

NG

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3	CHECK HARNESS AND CONNECTOR(ECM – ETCS FUSE, ETCS FUSE – BATTERY)





(a) Check the harness and connector between the ETCS fuse and ECM.
(1) Remove the ETCS fuse from the engine room R/B.
(2) Disconnect the E7 ECM connector.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Engine room R/B (ETCS fuse terminal 2) – +BM (E7–6)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
Engine room R/B (ETCS fuse terminal 2) or +BM (E7–6) – Body ground	10 kΩ or higher

(4) Reinstall the ETCS fuse.
(5) Reconnect the ECM.

(b) Check the harness and connector between the ETCS fuse and battery.
(1) Remove the ETCS fuse from the engine room R/B.
(2) Disconnect the positive battery cable.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Positive battery cable – Engine room R/B (ETCS fuse terminal 1)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
Positive battery cable or Engine room R/B (ETCS fuse terminal 1) – Body ground	10 kΩ or higher

(4) Reinstall the ETCS fuse.
(5) Reconnect the positive battery cable.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK ENGINE ROOM RELAY BLOCK

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DTC	P2119	THROTTLE ACTUATOR CONTROL THROTTLE BODY RANGE/PERFORMANCE

CIRCUIT DESCRIPTION

The Electric Throttle Control System (ETCS) is composed of a throttle motor that operates the throttle valve, a throttle position sensor that detects the opening angle of the throttle valve, an accelerator pedal position sensor that detects the accelerator pedal position, and the ECM that controls the ETCS system.
The ECM operates the throttle motor to position the throttle valve for proper response to driver input. The throttle position sensor, mounted on the throttle body, detects the opening angle of the throttle valve and provides this signal to the ECM so that the ECM can regulate the throttle motor.

DTC No.	DTC Detection Condition	Trouble Area
P2119	Throttle opening angle continues to vary greatly from target throttle opening angle (1 trip detection logic)	□Electric throttle control system □ECM

MONITOR DESCRIPTION

The ECM determines the "actual" throttle angle based on the throttle position sensor signal. The "actual" throttle position is compared to the "target" throttle position commanded by the ECM. If the difference of these two values exceeds a specified limit, the ECM interprets this as a fault in the ETCS (Electric Throttle Control System). The ECM turns on the MIL and a DTC is set.

FAIL SAFE

If the Electronic Throttle Control System (ETCS) has a malfunction, the ECM cuts off current to the throttle control motor. The throttle control valve returns to a predetermined opening angle (approximately 16) by the force of the return spring. The ECM then adjusts the engine output by controlling the fuel injection (intermittent fuel–cut) and ignition timing in accordance with the accelerator pedal opening angle to enable the vehicle to continue at a minimal speed.
If the accelerator pedal is depressed firmly and slowly, the vehicle can be driven slowly.
If a "pass" condition is detected and then the ignition switch is turned to OFF, the fail–safe operation will stop and the system will return to normal condition.

MONITOR STRATEGY

Related DTCs	P2119: Electronic throttle control system failure
Required sensors/ components (Main)	Throttle actuator motor
Required sensors/ components (Related)	Throttle position sensor
Frequency of operation	Continuous
Duration	1 second
MIL operation	Immediate
Sequence operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05–13

TYPICAL MALFUNCTION THRESHOLDS

Difference between "target throttle position" and "actual throttle position"	0.3 V or more

COMPONENT OPERATING RANGE

Commanded throttle position and current throttle position are nearly same	–

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WIRING DIAGRAM

Refer to DTC P2102 on page 05–265.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1	CHECK OTHER DTC OUTPUT(IN ADDITION TO DTC P2119)

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(c) Select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(d) Read the DTC using the hand–held tester or the OBD II scan tool.
Result:

Display (DTC output)	Proceed to
P2119	A
P2119 and other DTCs	B

HINT:

If any other codes besides P2119 are output, perform troubleshoot on those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05–47)**

A

2	REPLACE ECM AND CLEAR DTC(CHECK IF DTC OUTPUT RECURS)

(a) Replace the ECM.
(b) Clear the DTC (see page 05–36).
(c) Start and warm up the engine.
(d) Run the engine at idle for 15 seconds or more.
(e) Read the DTC using the hand–held tester or the OBD II scan tool (see page 05–36).
Standard: No DTC output.

NG → **REPLACE THROTTLE W/MOTOR BODY ASSY (See page 10–18)**

OK

NORMAL

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DTC	P2120	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”D” CIRCUIT

DTC	P2122	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”D” CIRCUIT LOW INPUT

DTC	P2123	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”D” CIRCUIT HIGH INPUT

DTC	P2125	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”E” CIRCUIT

DTC	P2127	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”E” CIRCUIT LOW INPUT

DTC	P2128	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”E” CIRCUIT HIGH INPUT

DTC	P2138	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”D”/”E” VOLTAGE CORRELATION

HINT:
This is the repair procedure for the accelerator pedal position sensor.

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CIRCUIT DESCRIPTION

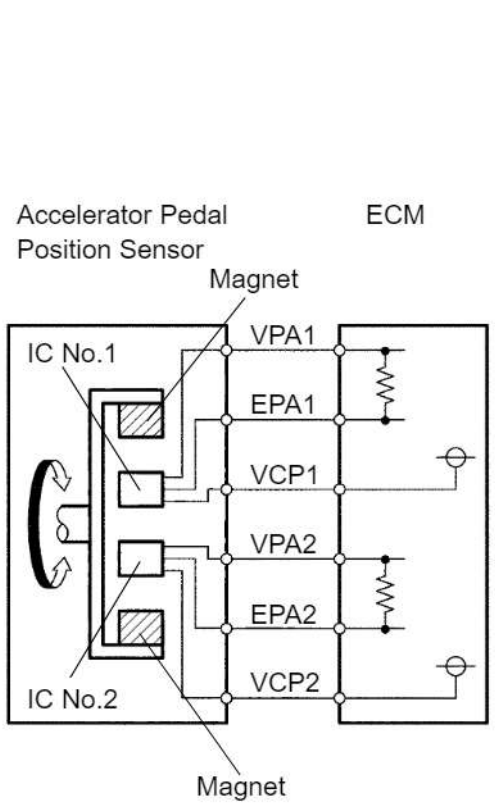
HINT:

- This electrical throttle system is no used throttle cable.
- This accelerator pedal position sensor is non–contact type.

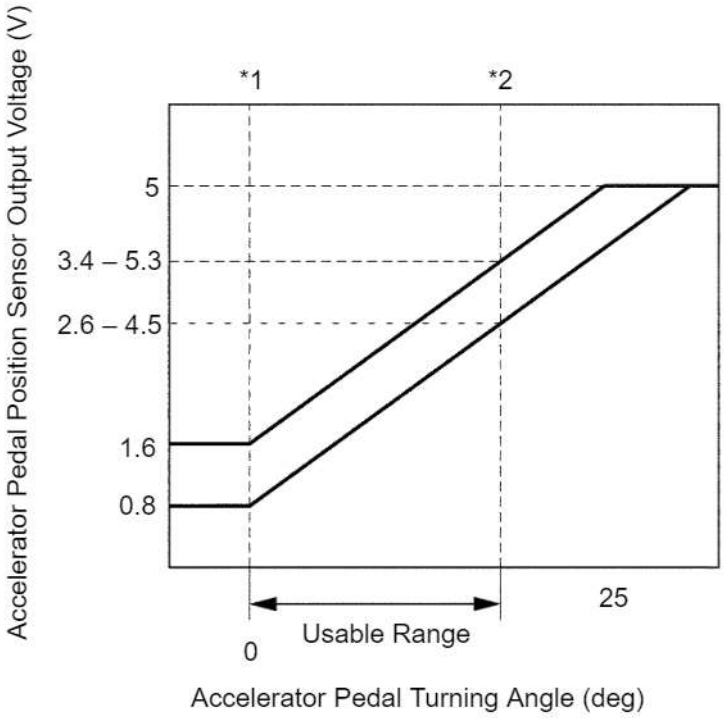
The accelerator pedal position sensor is mounted on the accelerator pedal to detect the opening angle of the accelerator pedal. Since this sensor is electronically controlled with hall elements, accurate control and reliability can be obtained. It have the 2 sensors to detect the accelerator position and a malfunction of the accelerator position sensor.

In the accelerator pedal position sensor, the voltage applied to pedal terminals VPA and VPA2 of the ECM changes between 0 V and 5 V, in proportion to the opening angle of the accelerator pedal. The VPA is a signal to indicate the actual accelerator pedal opening angle which is used for the engine control, and the VPA2 is a signal to indicate the information about the opening angle which is used for detecting a malfunction.

The ECM judges the current opening angle of the accelerator pedal from these signals input from terminals VPA and VPA2 and, the ECM controls the throttle motor based on these signals.



A19694



*1: Accelerator Pedal Fully Released
*2: Accelerator Pedal Fully Depressed

A19803

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DTC No.	DTC Detection Condition	Trouble Area
P2120	Condition (a) continues for 0.5 second or more: (a) VPA is 0.2 V or less when accelerator pedal is fully released, or VPA is 4.8 V or more	□Accelerator pedal position sensor □ECM
P2122	Condition (a) continues for 0.5 second or more when accelerator pedal is fully released: (a) VPA is 0.2 V or less	□Accelerator pedal position sensor □Open in VCP1 circuit □VPA1 circuit open or ground short □ECM
P2123	Condition (a) continues for 2.0 seconds or more: (a) VPA is 4.8 V or more	□Accelerator pedal position sensor □Open in EPA1 circuit □ECM
P2125	Condition (a) continues for 0.5 second or more: (a) (VPA2 is 0.5 V or less when accelerator pedal is fully released) or (VPA2 is 4.8 V or more and VPA is between 0.2 V and 3.45 V)	□Accelerator pedal position sensor □ECM
P2127	Condition (a) continues for 0.5 second or more when accelerator pedal is fully released: (a) VPA2 is 0.5 V or less	□Accelerator pedal position sensor □Open in VCP2 circuit □VPA2 circuit open or ground short □ECM
P2128	Conditions (a) and (b) continue for 2.0 seconds or more: (a) VPA2 is 4.8 V or more (b) VPA is 0.2 V or more and VPA is 3.45 V or less	□Accelerator pedal position sensor □Open in EPA2 circuit □ECM
P2138	Condition (a) or (b) continues for 2.0 seconds or more: (a) Difference between VPA and VPA2 is 0.02 V or less (b) VPA is 0.2 V or less and VPA2 is 0.5 V or less	□VPA1 and VPA2 circuits are short circuited □Accelerator pedal position sensor □ECM

HINT:
After confirming DTC P2120, P2122, P2123, P2125, P2127, P2128 and P2138, use the hand–held tester or the OBD II scan tool to confirm the throttle valve opening percentage.

Trouble area	Accelerator pedal position expressed as voltage			
	Accelerator pedal released		Accelerator pedal depressed	
	ACCEL POS #1	ACCEL POS #2	ACCEL POS #1	ACCEL POS #2
VC circuit open	0 to 0.2 V	0 to 0.2 V	0 to 0.2 V	0 to 0.2 V
VPA circuit open or ground short	0 to 0.2 V	1.2 to 2.0 V	0 to 0.2 V	3.4 to 5.3 V
VPA2 circuit open or ground short	0.5 to 1.1 V	0 to 0.2 V	2.6 to 4.5 V	0 to 0.2 V
E2 circuit open	4.5 to 5.5 V	4.5 to 5.5 V	4.5 to 5.5 V	4.5 to 5.5 V

MONITOR DESCRIPTION

When VPA or VPA2 deviates from the standard, or the difference between the voltage output of the two sensors is less than the threshold, the ECM concludes that there is a defect in the accelerator pedal position sensor. The ECM turns on the MIL and a DTC is set.
Example:
When the voltage output of the VPA is below 0.2 V or exceeds 4.8 V.

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FAIL SAFE

The accelerator pedal position sensor has two (main and sub) sensor circuits. If a malfunction occurs in either of the sensor circuits, the ECM detects the abnormal signal voltage difference between the two sensor circuits and switches to limp mode. In limp mode, the functioning circuit is used to calculate the accelerator pedal opening angle to allow the vehicle to continue driving. If both circuits malfunction, the ECM regards the opening angle of the accelerator pedal to be fully closed. In this case, the throttle valve will remain closed as if the engine was idling.
If a ”pass” condition is detected and then the ignition switch is turned to OFF, the fail–safe operation will stop and the system will return to normal condition.

MONITOR STRATEGY

Related DTCs	P2120: Accelerator pedal position sensor (VPA1) open/short (Fluttering) P2122: Accelerator pedal position sensor (VPA1) open/short (Low voltage) P2123: Accelerator pedal position sensor (VPA1) open/short (High voltage) P2125: Accelerator pedal position sensor (VPA2) open/short (Fluttering) P2127: Accelerator pedal position sensor (VPA2) open/short (Low voltage) P2128: Accelerator pedal position sensor (VPA2) open/short (High voltage) P2138: Accelerator pedal position sensor (Between VPA1 and VPA2) open P2138: Accelerator pedal position sensor (Between VPA1 and VPA2) short
Required sensors/ components (Main)	Throttle position sensor
Required sensors/ components (Related)	–
Frequency of operation	Continuous
Duration	2 seconds
MIL operation	Immediate
Sequence operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05–13
Ignition switch	ON
Throttle control motor power	ON

TYPICAL MALFUNCTION THRESHOLDS

P2120:

VPA1 voltage	0.2 V or less or 4.8 V or more fluttering

P2122:

VPA1 voltage when VPA2 is 0.97 degree or more	0.2 V or less

P2123:

VPA1 voltage	4.8 V or more

P2125:

VPA2 voltage	0.5 V or less or 4.8 V or more fluttering

P2127:

VPA2 voltage when VPA1 is 0.97 degree or more	0.5 V or less

P2128:

VPA2 voltage when VPA1 is 0.2 to 3.45 V	4.8 V or more

P2138 Accelerator pedal position sensor (Between VPA1 and VPA2) open:

Difference between VPA1 and VPA2 voltage	0.02 V or less

P2138 Accelerator pedal position sensor (Between VPA1 and VPA2) short:

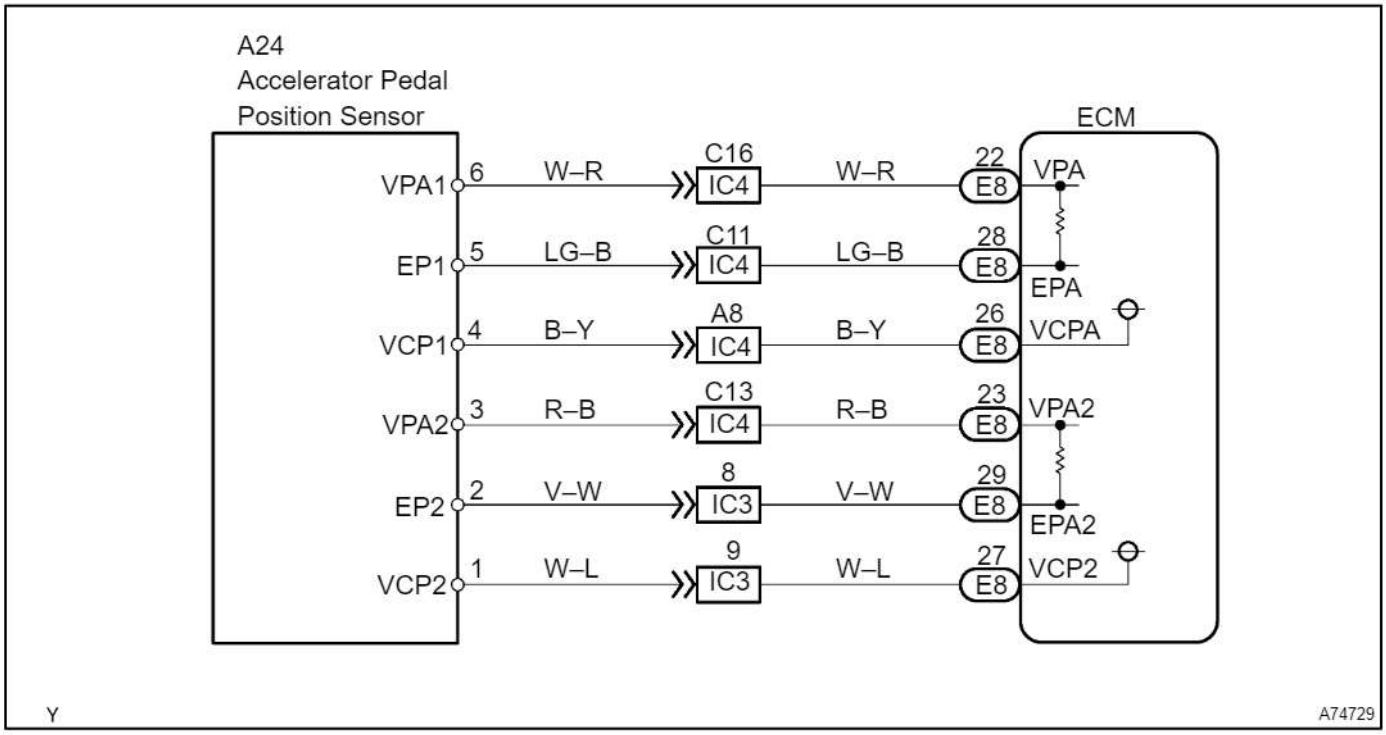
Both of the following conditions are met:	
VPA1 voltage	0.2 V or less
VPA2 voltage	0.5 V or less

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COMPONENT OPERATING RANGE

VPA1 voltage	More than 0.2 V and less than 4.8 V
VPA2 voltage	More than 0.5 V and Less than 4.8 V
Difference between VPA and VPA2 voltages	More than 0.02 V

WIRING DIAGRAM



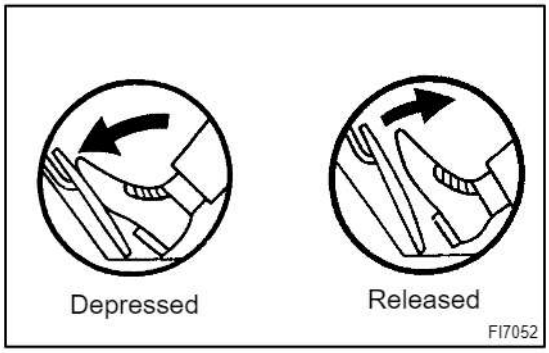
INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

Hand–held tester:

1	READ VALUE OF HAND–HELD TESTER(ACCEL POS #1 AND ACCEL POS #2)



(a) Turn the ignition switch to ON.

(b) On the hand–held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ETCS / ACCEL POS #1 and ACCEL POS #2. Read the values.

Standard:

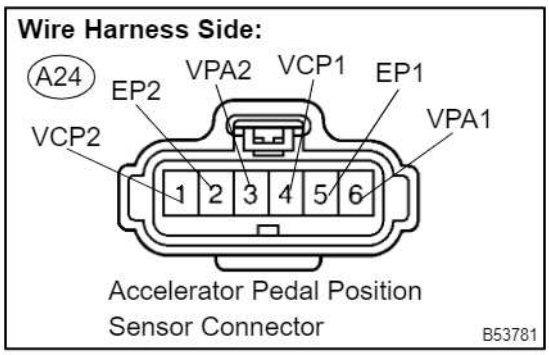
Accelerator Pedal	ACCEL POS #1	ACCEL POS #2
Released	0.5 to 1.1 V	1.5 to 2.9 V
Depressed	2.5 to 4.6 V	3.5 to 5.5 V

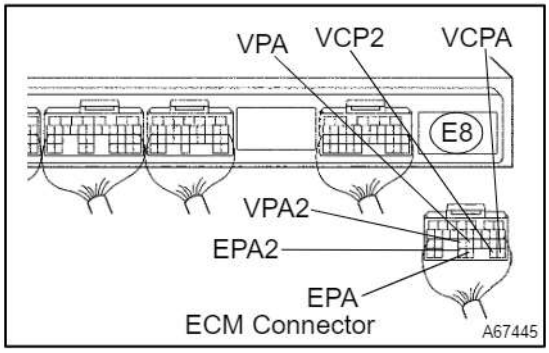
OK	Go to step 5

NG

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2	CHECK HARNESS AND CONNECTOR(ACCELERATOR PEDAL POSITION SENSOR – ECM)





(a) Disconnect the A24 accelerator pedal position sensor connector.

(b) Disconnect the E8 ECM connector.

(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
VPA1 (A24–6) – VPA (E8–22)	Below 1 Ω
EP1 (A24–5) – EPA (E8–28)	Below 1 Ω
VCP1 (A24–4) – VCPA (E8–26)	Below 1 Ω
VPA2 (A24–3) – VPA2 (E8–23)	Below 1 Ω
EP2 (A24–2) – EPA2 (E8–29)	Below 1 Ω
VCP2 (A24–1) – VCP2 (E8–27)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
VPA1 (A24–6) or VPA (E8–22) – Body ground	10 kΩ or higher
EP1 (A24–5) or EPA (E8–28) – Body ground	10 kΩ or higher
VCP1 (A24–4) or VCPA (E8–26) – Body ground	10 kΩ or higher
VPA2 (A24–3) or VPA2 (E8–23) – Body ground	10 kΩ or higher
EP2 (A24–2) or EPA2 (E8–29) – Body ground	10 kΩ or higher
VCP2 (A24–1) or VCP2 (E8–27) – Body ground	10 kΩ or higher

(d) Reconnect the accelerator pedal position sensor connector.

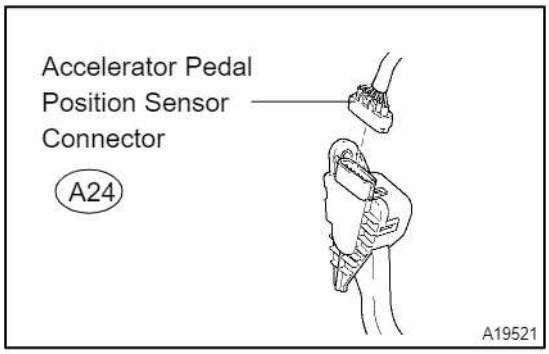
(e) Reconnect the ECM connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK →

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3	INSPECT ECM(VCPA AND VCP2 VOLTAGE)

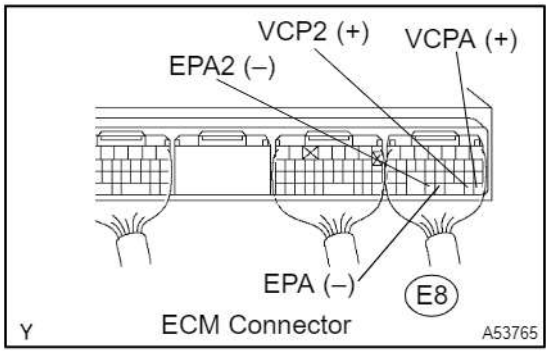


(a) Disconnect the A24 accelerator pedal position sensor connector.
(b) Turn the ignition switch to ON.
(c) Measure the voltage between the terminals of the E8 ECM connector.

Standard:

Tester Connection	Specified Condition
VCPA (E8–26) – EPA (E8–28)	4.5 to 5.5 V
VCP2 (E8–27) – EPA2 (E8–29)	4.5 to 5.5 V

(d) Reconnect the accelerator pedal position sensor connector.



NG → **REPLACE ECM (See page 10–24)**

OK

4	REPLACE ACCELERATOR PEDAL ROD ASSY (See page 10–25)

GO

5	READ OUTPUT DTC(SEE IF ACCELERATOR PEDAL POSITION SENSOR DTCS ARE OUTPUT AGAIN)

(a) Clear the DTC (see page 05–36).
(b) Start the engine.
(c) Drive the engine at idle for 15 seconds or more.
(d) Read the DTC (see page 05–36).

Result:

Display (DTC output)	Proceed to
P2120, P2122, P2123, P2125, P2127, P2128 and/or P2138	A
No output	B

B → **SYSTEM OK**

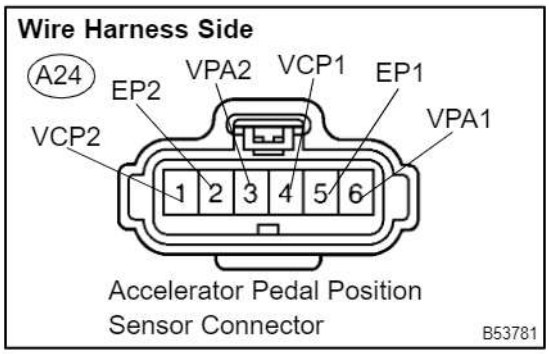
A

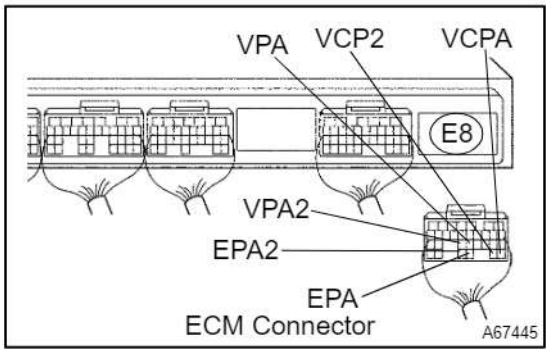
REPLACE ECM (See page 10–24)

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OBD II scan tool (excluding hand–held tester):

1	**CHECK HARNESS AND CONNECTOR(ACCELERATOR PEDAL POSITION SENSOR – ECM)**





(a) Disconnect the A24 accelerator pedal position sensor connector.

(b) Disconnect the E8 ECM connector.

(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
VPA1 (A24–6) – VPA (E8–22)	Below 1 Ω
EP1 (A24–5) – EPA (E8–28)	Below 1 Ω
VCP1 (A24–4) – VCPA (E8–26)	Below 1 Ω
VPA2 (A24–3) – VPA2 (E8–23)	Below 1 Ω
EP2 (A24–2) – EPA2 (E8–29)	Below 1 Ω
VCP2 (A24–1) – VCP2 (E8–27)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
VPA1 (A24–6) or VPA (E8–22) – Body ground	10 kΩ or higher
EP1 (A24–5) or EPA (E8–28) – Body ground	10 kΩ or higher
VCP1 (A24–4) or VCPA (E8–26) – Body ground	10 kΩ or higher
VPA2 (A24–3) or VPA2 (E8–23) – Body ground	10 kΩ or higher
EP2 (A24–2) or EPA2 (E8–29) – Body ground	10 kΩ or higher
VCP2 (A24–1) or VCP2 (E8–27) – Body ground	10 kΩ or higher

(d) Reconnect the accelerator pedal position sensor connector.

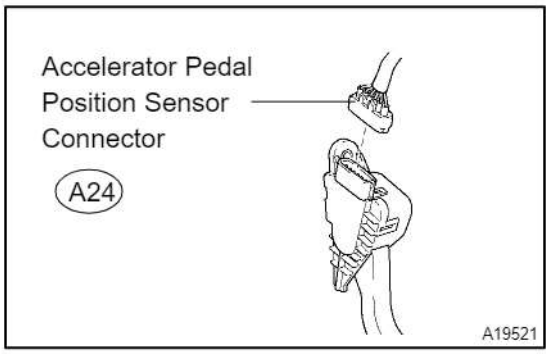
(e) Reconnect the ECM connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

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2	INSPECT ECM(VCPA AND VCP2 VOLTAGE)

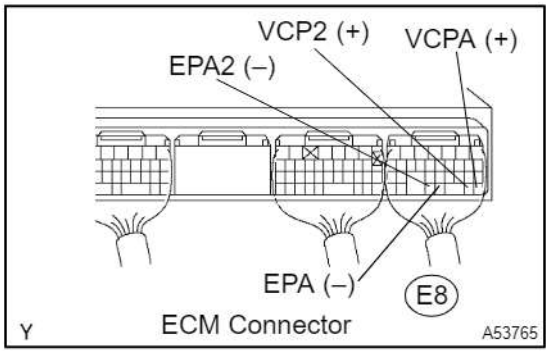


(a) Disconnect the A24 accelerator pedal position sensor connector.
(b) Turn the ignition switch to ON.
(c) Measure the voltage between the terminals of the E8 ECM connector.

Standard:

Tester Connection	Specified Condition
VCPA (E8–26) – EPA (E8–28)	4.5 to 5.5 V
VCP2 (E8–27) – EPA2 (E8–29)	4.5 to 5.5 V

(d) Reconnect the accelerator pedal position sensor connector.



NG → **REPLACE ECM (See page 10–24)**

OK

3	REPLACE ROD ASSY, ACCELERATOR PEDAL (See page 10–25)

GO

4	READ OUTPUT DTC(SEE IF ACCELERATOR PEDAL POSITION SENSOR DTCS ARE OUTPUT AGAIN)

(a) Clear the DTC (see page 05–36).
(b) Start the engine.
(c) Run the engine at idle for 15 seconds or more.
(d) Read DTCs (see page 05–36).

Result:

Display (DTC output)	Proceed to
P2120, P2122, P2123, P2125, P2127, P2128 and/or P2138	A
No output	B

B → **SYSTEM OK**

A

REPLACE ECM (See page 10–24)

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DTC	P2121	THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT RANGE/PERFORMANCE

HINT:
This is the repair procedure of accelerator pedal position sensor.

CIRCUIT DESCRIPTION

Refer to DTC P2120 on page 05–278.

DTC No.	DTC Detection Condition	Trouble Area
P2121	Conditions (a) and (b) continue for 0.5 second: (a) Difference between VPA1 and VPA2 deviates from the standard (b) IDL is OFF	□Accelerator pedal position sensor circuit □Accelerator pedal position sensor □ECM

MONITOR DESCRIPTION

The accelerator pedal position sensor is mounted on the accelerator pedal bracket. The accelerator pedal position sensor has 2 sensor elements / signal output: VPA1 and VPA2. VPA1 is used to detect the actual accelerator pedal angle (used for engine control) and VPA2 is used to detect malfunctions in VPA1. When the difference between the voltage output of VPA1 and VPA2 deviates from the standard, the ECM concludes the accelerator pedal position sensor has a malfunction. The ECM turns on the MIL and a DTC is set.

FAIL SAFE

The accelerator pedal position sensor has two (main and sub) sensor circuits. If a malfunction occurs in either of the sensor circuits, the ECM detects the abnormal signal voltage difference between the two sensor circuits and switches to limp mode. In limp mode, the functionig circuit is used to calculate the accelerator pedal opening angle to allow the vehicle to continue driving. If both circuits malfunction, the ECM regards the opening angle of the accelerator pedal to be fully closed. In this case, the throttle valve will remain closed as if the engine was idling.
If a "pass" condition is detected and then the ignition switch is turned to OFF, the fail–safe operation will stop and the system will return to normal condition.

MONITOR STRATEGY

Related DTCs	P2121: Accelerator position sensor (rationality)
Required sensors/ components (Main)	Accelerator position sensor
Required sensors/ components (Related)	–
Frequency of operation	Continuous
Duration	0.5 second
MIL operation	Immediate
Sequence operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05–13
Either of the following conditions is met	A or B
A. Ignition switch	ON
B. Throttle control motor power	ON
System is not under limp home mode due to accelerator pedal position sensor malfunction	–

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TYPICAL MALFUNCTION THRESHOLDS

|VPA – (VPA2 – 0.8)|* *Corrected by learning value	More than 0.4 V

WIRING DIAGRAM

Refer to DTC P2120 on page 05–278.

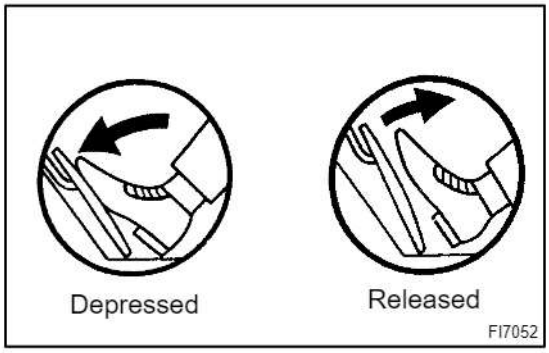
INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

Hand–held tester:

1	READ VALUE OF HAND–HELD TESTER(ACCEL POS #1 AND ACCEL POS #2)



(a) Turn the ignition switch to ON.

(b) On the hand–held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ETCS / ACCEL POS #1 and ACCEL POS #2. Read the values.

Standard:

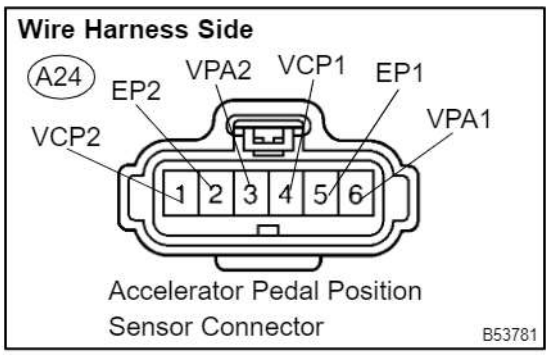
Accelerator Pedal	ACCEL POS #1	ACCEL POS #2
Released	0.5 to 1.1 V	1.5 to 2.9 V
Depressed	2.5 to 4.6 V	3.5 to 5.5 V

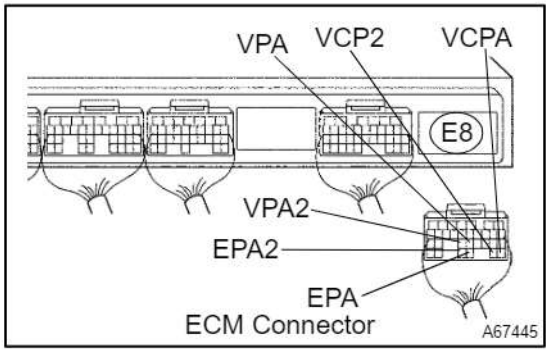
OK → **Go to step 3**

NG

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2	CHECK HARNESS AND CONNECTOR(ACCELERATOR PEDAL POSITION SENSOR – ECM)





(a) Disconnect the A24 accelerator pedal position sensor connector.
(b) Disconnect the E8 ECM connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
VPA1 (A24–6) – VPA (E8–22)	Below 1 Ω
EP1 (A24–5) – EPA (E8–28)	Below 1 Ω
VCP1 (A24–4) – VCPA (E8–26)	Below 1 Ω
VPA2 (A24–3) – VPA2 (E8–23)	Below 1 Ω
EP2 (A24–2) – EPA2 (E8–29)	Below 1 Ω
VCP2 (A24–1) – VCP2 (E8–27)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
VPA1 (A24–6) or VPA (E8–22) – Body ground	10 kΩ or higher
EP1 (A24–5) or EPA (E8–28) – Body ground	10 kΩ or higher
VCP1 (A24–4) or VCPA (E8–26) – Body ground	10 kΩ or higher
VPA2 (A24–3) or VPA2 (E8–23) – Body ground	10 kΩ or higher
EP2 (A24–2) or EPA2 (E8–29) – Body ground	10 kΩ or higher
VCP2 (A24–1) or VCP2 (E8–27) – Body ground	10 kΩ or higher

(d) Reconnect the accelerator pedal position sensor connector.
(e) Reconnect the ECM connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3	REPLACE ACCELERATOR PEDAL ROD ASSY (See page 10–25)

GO

4	READ OUTPUT DTC(SEE IF ACCELERATOR PEDAL POSITION SENSOR DTCS ARE OUTPUT AGAIN)

(a) Clear the DTC (see page 05–36).
(b) Start the engine.
(c) Run the engine at idle for 15 sec. or more.
(d) Connect the hand–held tester to the DLC3.
(e) Turn the ignition switch to ON and turn the hand–held tester ON.
(f) Select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(g) Read DTCs.

Result:

Display (DTC Output)	Proceed to
P2121	A
No output	B

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B → SYSTEM OK

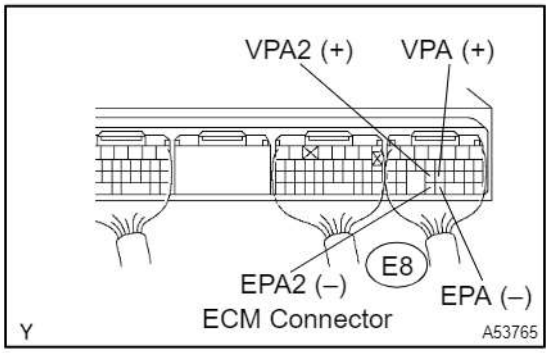
A

REPLACE ECM (See page 10–24)

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OBD II scan tool (excluding hand–held tester):

1	INSPECT ECM(VPA AND VPA2 VOLTAGE)



(a) Turn the ignition switch to ON.
(b) Measure the voltage between the terminals of the E8 ECM connector.

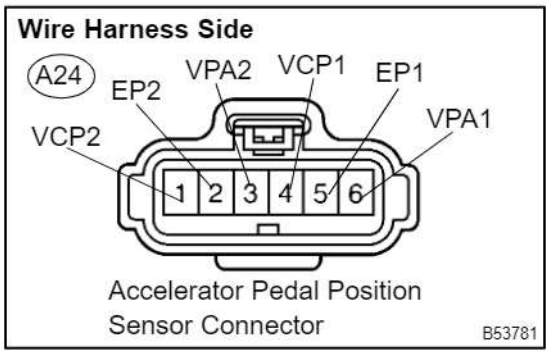
Standard:

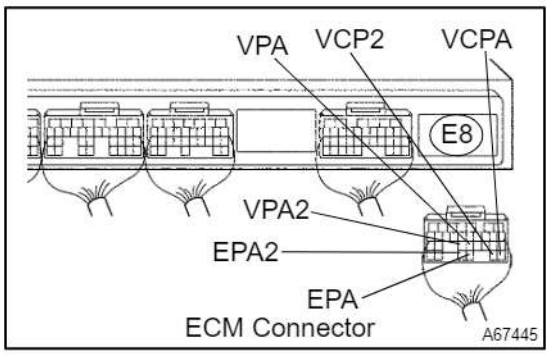
Accelerator Pedal Position	Tester Connection	Specified Condition
Released	VPA (E8–22) – EPA (E8–28)	0.5 to 1.1 V
Depressed	VPA (E8–22) – EPA (E8–28)	2.5 to 4.6 V
Released	VPA2 (E8–23) – EPA2 (E8–29)	1.5 to 2.9 V
Depressed	VPA2 (E8–23) – EPA2 (E8–29)	3.5 to 5.5 V

OK → **Go to step 3**

NG

2	CHECK HARNESS AND CONNECTOR(ACCELERATOR PEDAL POSITION SENSOR – ECM)





(a) Disconnect the A24 accelerator pedal position sensor connector.
(b) Disconnect the E8 ECM connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
VPA1 (A24–6) – VPA (E8–22)	Below 1 Ω
EP1 (A24–5) – EPA (E8–28)	Below 1 Ω
VCP1 (A24–4) – VCPA (E8–26)	Below 1 Ω
VPA2 (A24–3) – VPA2 (E8–23)	Below 1 Ω
EP2 (A24–2) – EPA2 (E8–29)	Below 1 Ω
VCP2 (A24–1) – VCP2 (E8–27)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
VPA1 (A24–6) or VPA (E8–22) – Body ground	10 kΩ or higher
EP1 (A24–5) or EPA (E8–28) – Body ground	10 kΩ or higher
VCP1 (A24–4) or VCPA (E8–26) – Body ground	10 kΩ or higher
VPA2 (A24–3) or VPA2 (E8–23) – Body ground	10 kΩ or higher
EP2 (A24–2) or EPA2 (E8–29) – Body ground	10 kΩ or higher
VCP2 (A24–1) or VCP2 (E8–27) – Body ground	10 kΩ or higher

(d) Reconnect the accelerator pedal position sensor connector.
(e) Reconnect the ECM connector.

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NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

3	REPLACE ACCELERATOR PEDAL ROD ASSY (See page 10–25)

GO

4	READ OUTPUT DTC(SEE IF ACCELERATOR PEDAL POSITION SENSOR DTCS ARE OUTPUT AGAIN)

(a) Clear the DTC (see page 05–36).
(b) Start the engine.
(c) Run the engine at idle for 15 seconds or more.
(d) Read a DTC (see page 05–36).

Result:

Display (DTC Output)	Proceed to
P2121	A
No output	B

B → SYSTEM OK

A

REPLACE ECM (See page 10–24)

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ECM POWER SOURCE CIRCUIT

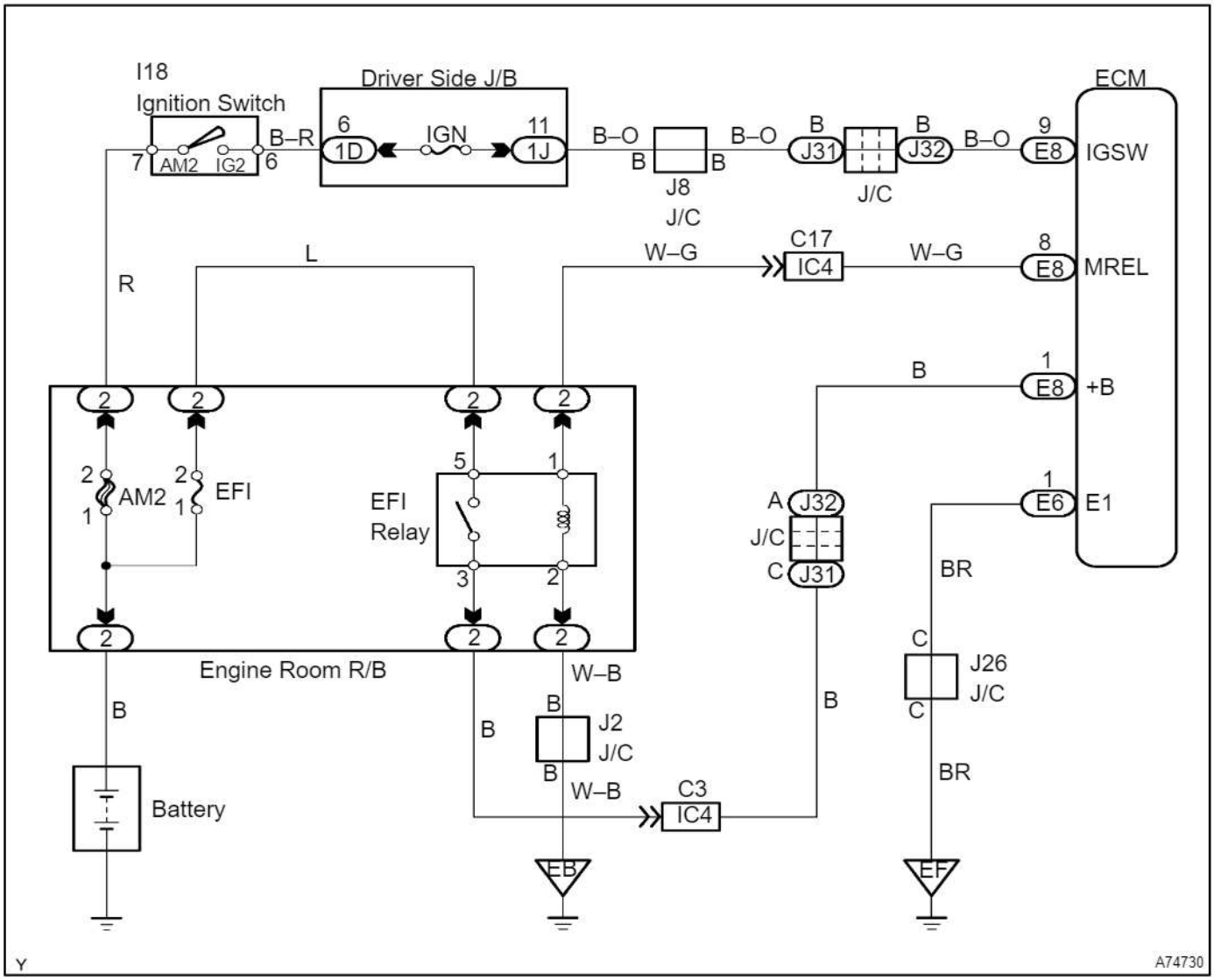
CIRCUIT DESCRIPTION

When the ignition switch is turned ON, the positive battery voltage is applied to terminal IGSW of the ECM and the EFI relay (Marked: EFI) control circuit in the ECM sends a signal to terminal MREL of the ECM switching on the EFI relay.

This signal causes current to flow to the coil, closing the contacts of the EFI relay and supplying power to terminal +B of the ECM.

If the ignition switch is turned OFF, the ECM holds the EFI relay for a maximum of 2 seconds to allow for the initial setting of the throttle valve.

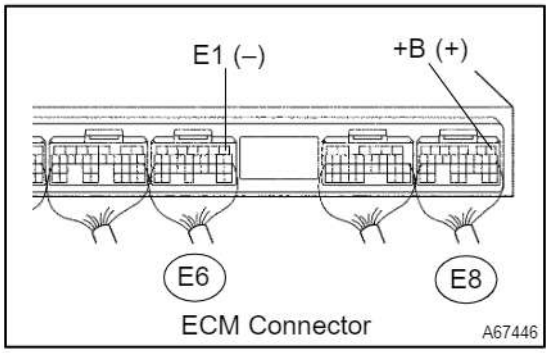
WIRING DIAGRAM



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INSPECTION PROCEDURE

1 INSPECT ECM(+B VOLTAGE)



(a) Turn the ignition switch to ON.
(b) Measure the voltage between the terminals of the E6 and E8 ECM connectors.

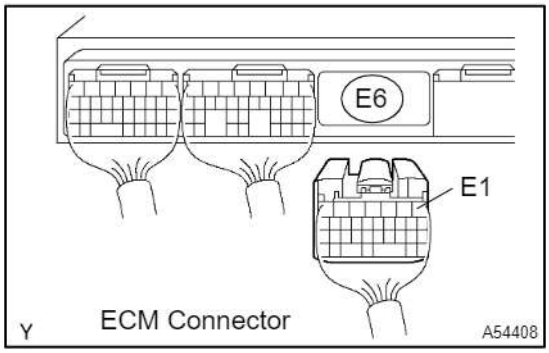
Standard:

Tester Connection	Specified Condition
+B (E8–1) – E1 (E6–1)	9 to 14 V

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (See page 05–29)**

NG

2 CHECK HARNESS AND CONNECTOR(ECM – BODY GROUND)



(a) Disconnect the E6 ECM connector.
(b) Check the resistance between the wire harness side connectors.

Standard (Check for open):

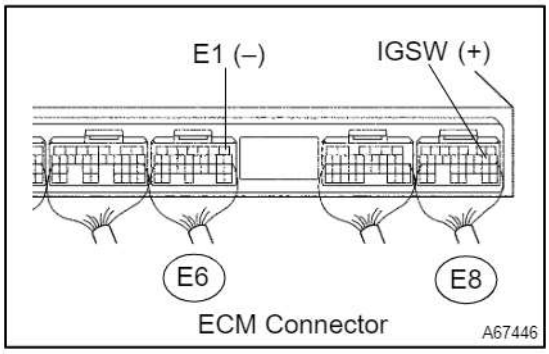
Tester Connection	Specified Condition
E1 (E6–1) – Body ground	Below 1 Ω

(c) Reconnect the ECM connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3 INSPECT ECM(IGSW VOLTAGE)



(a) Turn the ignition switch to ON.
(b) Measure the voltage between the terminals of the E6 and E8 ECM connectors.

Standard:

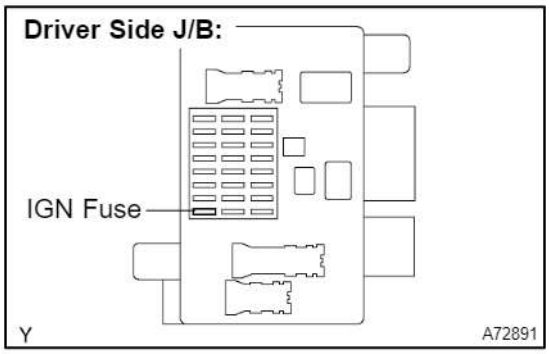
Tester Connection	Specified Condition
IGSW (E8–9) – E1 (E6–1)	9 to 14 V

OK → **Go to step 6**

NG

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4 CHECK FUSE(IGN FUSE)

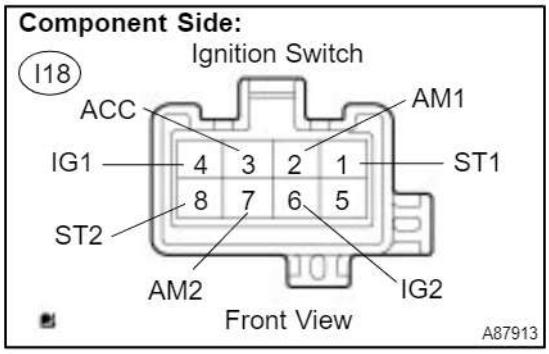


(a) Remove the IGN fuse from the driver side J/B.
(b) Check for continuity in the IGN fuse.
Standard: Continuity
(c) Reinstall the IGN fuse.

NG → **CHECK FOR SHORT IN ALL HARNESSES AND COMPONENTS CONNECTED TO FUSE**

OK

5 INSPECT IGNITION OR STARTER SWITCH ASSY



(a) Disconnect the I18 ignition switch connector.
(b) Measure the resistance between the connector terminals shown in the chart below.
Standard:

Switch Position	Tester Connection	Specified Condition
LOCK	All Terminals	10 kΩ or higher
ACC	2–3	Below 1 Ω
ON	2–3, 2–4, 6–7	Below 1 Ω
START	1–2, 2–4, 6–7, 6–8	Below 1 Ω

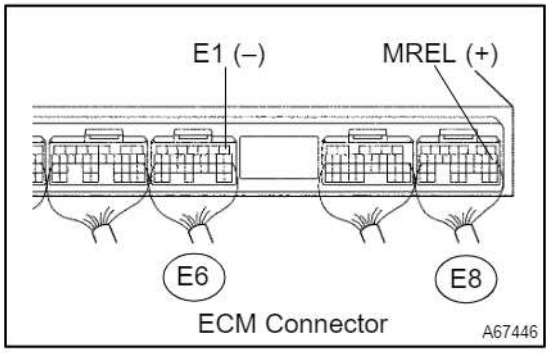
(c) Reconnect the ignition switch connector.

NG → **REPLACE IGNITION OR STARTER SWITCH ASSY**

OK

CHECK AND REPAIR HARNESS AND CONNECTOR (BATTERY – IGNITION SWITCH, IGNITION SWITCH – ECM)

6 INSPECT ECM(MREL VOLTAGE)



(a) Turn the ignition switch to ON.
(b) Measure the voltage between the terminals of the E6 and E8 ECM connectors.
Standard:

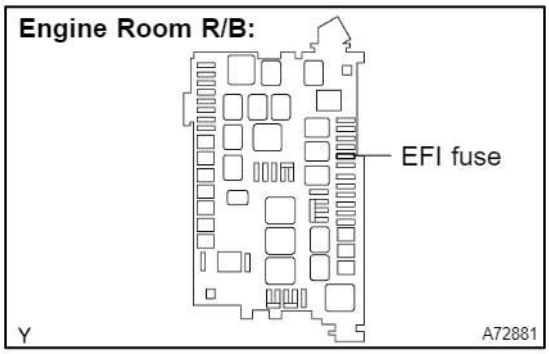
Tester Connection	Specified Condition
MREL (E8–8) – E1 (E6–1)	9 to 14 V

NG → **REPLACE ECM (See page 10–24)**

OK

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7 CHECK FUSE(EFI FUSE)

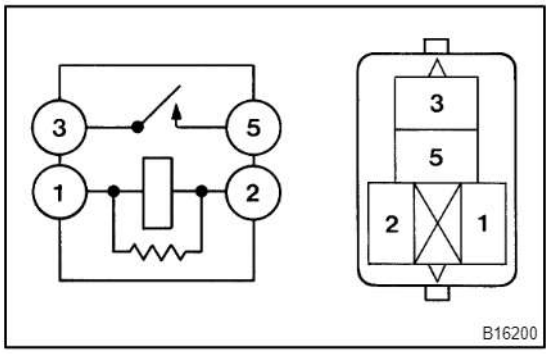


(a) Remove the EFI fuse from the engine room R/B.
(b) Check for continuity in the EFI fuse.
Standard: Continuity
(c) Reinstall the EFI fuse.

NG → **CHECK FOR SHORT IN ALL HARNESSES AND COMPONENTS CONNECTED TO FUSE**

OK

8 INSPECT EFI RELAY



(a) Remove the EFI relay from the engine room R/B.
(b) Check for continuity in the EFI relay.
Standard:

Tester Connection	Specified Condition
1 – 2	Continuity
3 – 5	No continuity
3 – 5	Continuity (Apply battery voltage to terminals 1 and 2)

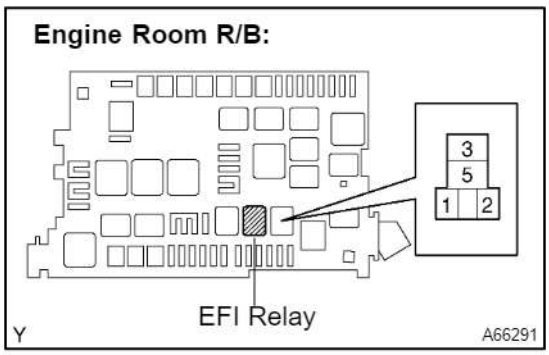
(c) Reinstall the EFI relay.

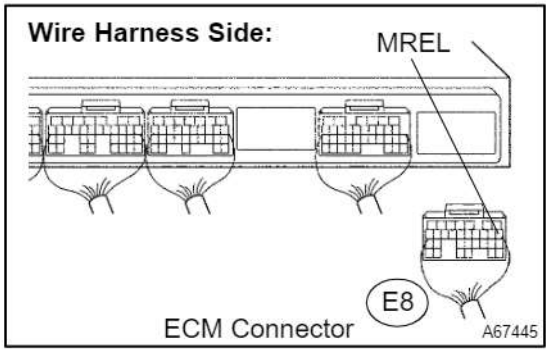
NG → **REPLACE EFI RELAY**

OK

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9	CHECK HARNESS AND CONNECTOR(EFI RELAY – ECM, EFI RELAY – BODY GROUND)





(a) Check the harness and connector between the EFI relay and ECM.
  (1) Remove the EFI relay from the engine room R/B.
  (2) Disconnect the E8 ECM connector.
  (3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Engine room R/B (EFI relay terminal 1) – MREL (E8–8)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
Engine room R/B (EFI relay terminal 1) or MREL (E8–8) – Body ground	10 kΩ or higher

  (4) Reinstall the EFI relay.
  (5) Reconnect the ECM connector.

(b) Check the harness and connector between the EFI relay and body ground.
  (1) Remove the EFI relay from the engine room R/B.
  (2) Check the resistance between the wire harness side connector and body ground.

Standard (Check for open):

Tester Connection	Specified Condition
Engine room R/B (EFI relay terminal 2) – Body ground	Below 1 Ω

  (3) Reinstall the EFI relay.

OK → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

NG

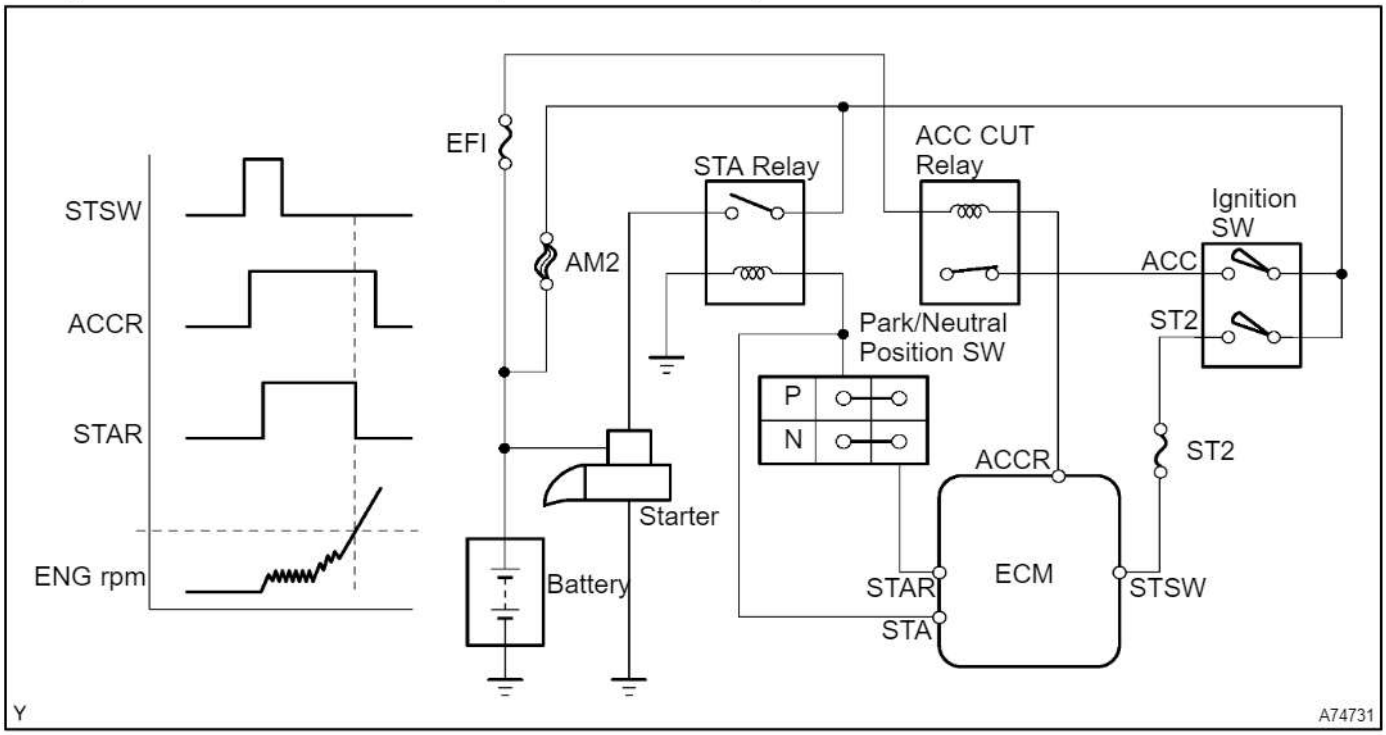
CHECK AND REPAIR HARNESS AND CONNECTOR (TERMINAL +B OF ECM – BATTERY POSITIVE TERMINAL)

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CRANKING HOLDING FUNCTION CIRCUIT

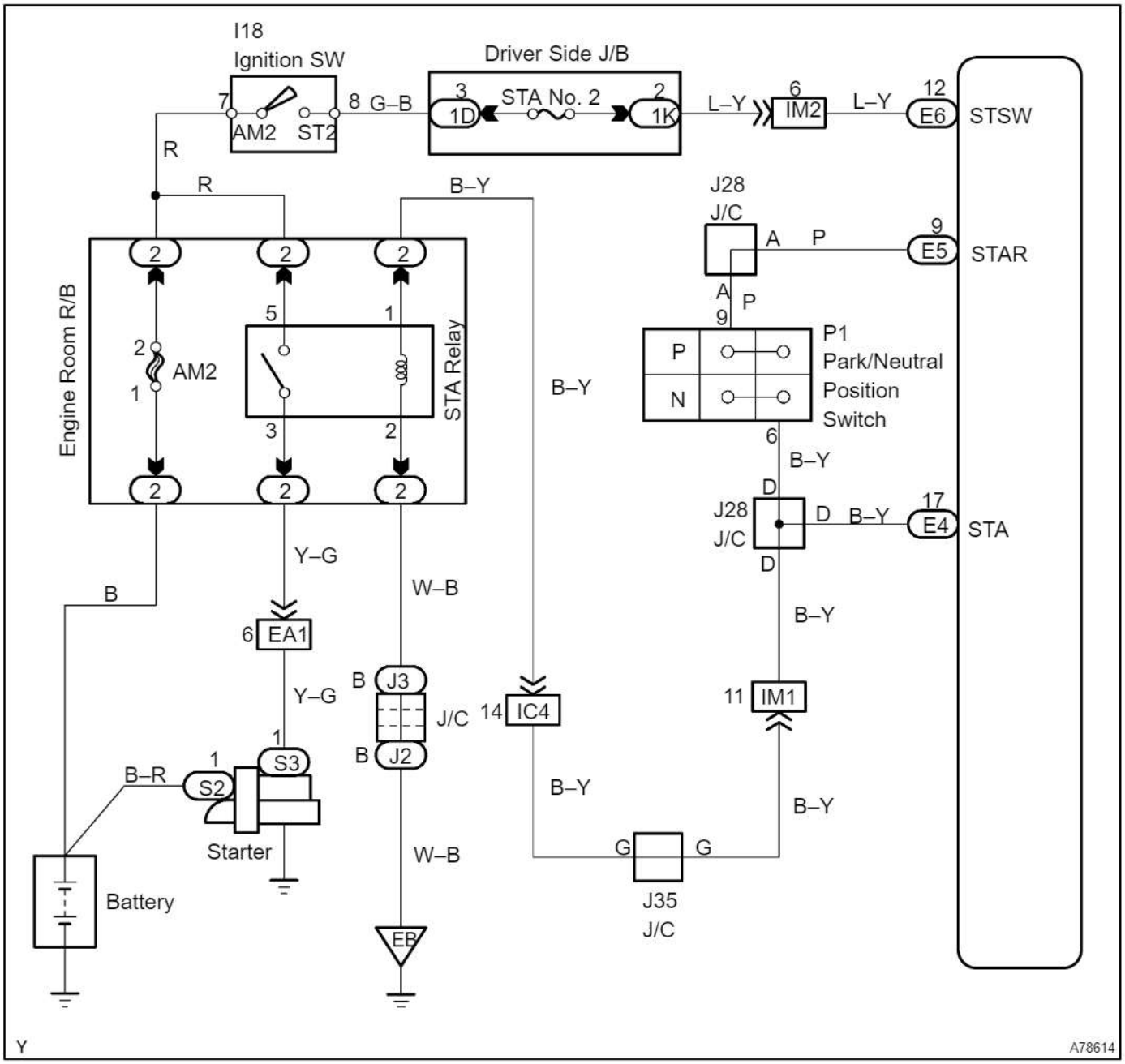
CIRCUIT DESCRIPTION

The starter is controlled by the ECM, when the ECM detects a start signal (STSW) from the ignition switch, this system monitors the engine speed (NE) and continues to operate the starter until it has determined that the engine has started (engine speed reaches approximately 500 rpm). If the engine is already running and the ignition switch is turned to START, the ECM will not operate the starter.



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WIRING DIAGRAM



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INSPECTION PROCEDURE

Hand–held tester:

1	CHECK OPERATION OF ENGINE CRANKING

(a) When turning the ignition switch to the ST position, check if the starter motor starts.

OK → CHECK FOR INTERMITTENT PROBLEMS (See page 05–10)

NG

2	READ VALUE OF HAND–HELD TESTER(STA SIGNAL)

(a) On the hand–held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / STARTER SIG. Read the values.

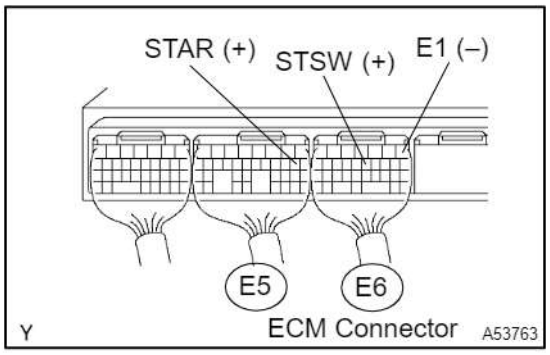
Standard:

Ignition Switch Position	ON	START
STARTER SIG	OFF	ON

OK → Go to step 5

NG

3	INSPECT ECM(STAR AND STSW VOLTAGE)



(a) Measure the voltage between the terminals of the E5 and E6 ECM connectors, while cranking the engine (ignition switch is in the START position).

Standard:

Tester Connection	Specified Condition
STAR (E5–9) – E1 (E6–1)	9 to 14 V
STSW (E6–12) – E1 (E6–1)	9 to 14 V

Result:

Terminal STAR	Terminal STSW	Proceed to
9 to 14 V	9 to 14 V	A
0 V	9 to 14 V	B
0 V	0 V	C

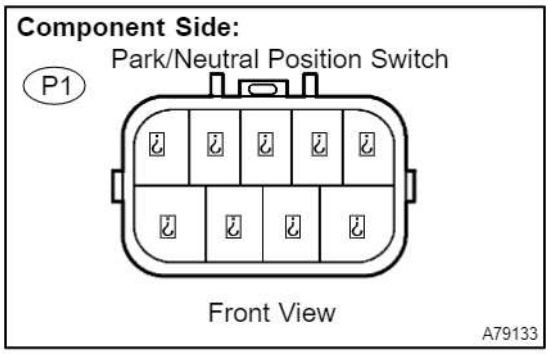
B → REPLACE ECM (See page 10–24)

C → Go to step 9

A

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4 INSPECT PARK/NEUTRAL POSITION SWITCH ASSY



(a) Disconnect the P1 park/neutral position switch connector.
(b) Measure the resistance between each terminal shown below when the shift lever is moved to each range.

Standard:

Shift Range	Tester Connection	Specified Condition
P	1 – 3, 6 – 9	Below 1 Ω
R	2 – 3	Below 1 Ω
N	3 – 5, 6 – 9	Below 1 Ω
D,4	3 – 7	Below 1 Ω
3	3 – 4	Below 1 Ω
2,L	3 – 8	Below 1 Ω

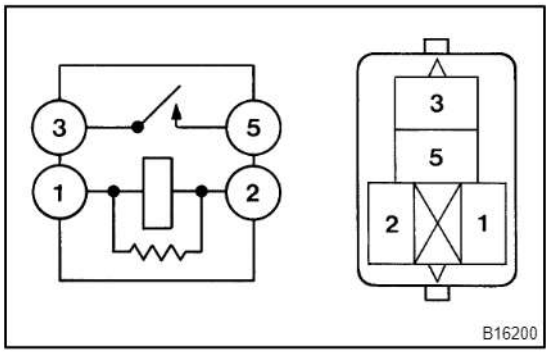
(1) Reconnect the park/neutral position switch connector.

NG → **REPLACE PARK/NEUTRAL POSITION SWITCH ASSY**

OK

CHECK AND REPAIR HARNESS AND CONNECTOR (PARK/NEUTRAL POSITION SWITCH – ECM)

5 INSPECT STARTER RELAY ASSY



(a) Remove the starter relay from the engine room R/B.
(b) Check for continuity in the starter relay.

Standard:

Tester Connection	Specified Condition
1 – 2	Continuity
3 – 5	No continuity
3 – 5	Continuity (Apply battery voltage to terminals 1 and 2)

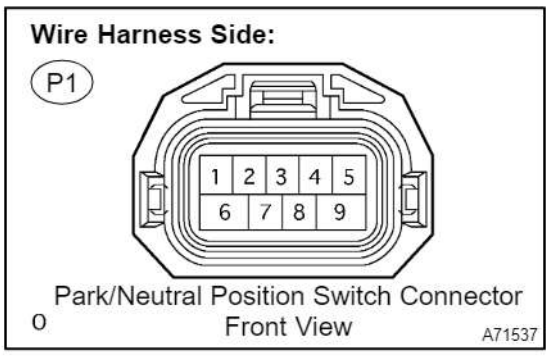
(c) Reinstall the starter relay.

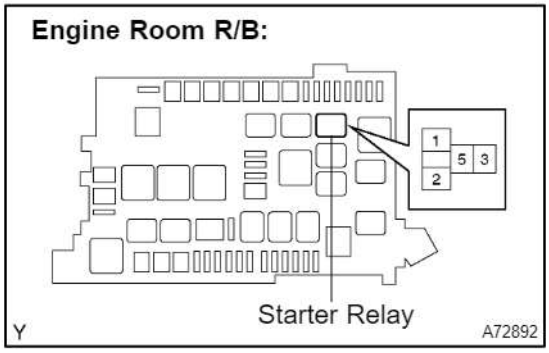
NG → **REPLACE STARTER RELAY ASSY**

OK

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6 CHECK HARNESS AND CONNECTOR(PARK/NEUTRAL POSITION SWITCH – STARTER RELAY, STARTER RELAY – BODY GROUND)





(a) Check the harness and connector between the park/neutral position switch and starter relay.
  (1) Disconnect the P1 park/neutral position switch connector.
  (2) Remove the starter relay from the engine room R/B.
  (3) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Park/neutral position switch (P1–6) – Engine room R/B (Starter relay terminal 1)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
Park/neutral position switch (P1–6) or Engine room R/B (Starter relay terminal 1) – Body ground	10 kΩ or higher

  (4) Reconnect the park/neutral position switch connector.
  (5) Reinstall the starter relay.

(b) Check the harness and connector between the starter relay and body ground.
  (1) Remove the starter relay from the engine room R/B.
  (2) Check for continuity between the starter relay and body ground.

Standard (Check for open):

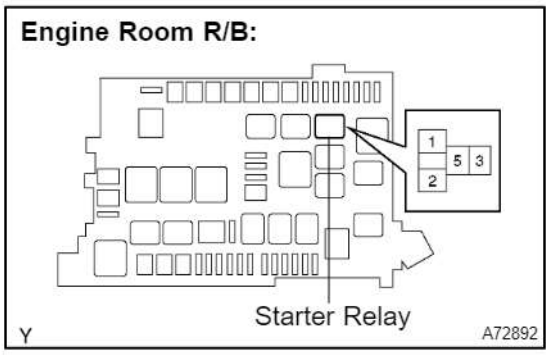
Tester Connection	Specified Condition
Engine room R/B (Starter relay terminal 2) – Body ground	Below 1 Ω

  (3) Reinstall the starter relay.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

7 INSPECT ENGINE ROOM RELAY BLOCK(STARTER RELAY VOLTAGE)



(a) Remove the starter relay from the engine room R/B.
(b) Measure the voltage between the terminal of the engine room R/B and body ground.

Standard:

Tester Connection	Specified Condition
Engine room R/B (Starter relay terminal 5) – Body ground	9 to 14 V

  (1) Reinstall the starter relay.

NG → **CHECK AND REPAIR HARNESS AND CONNECTOR (STARTER RELAY – BATTERY)**

OK

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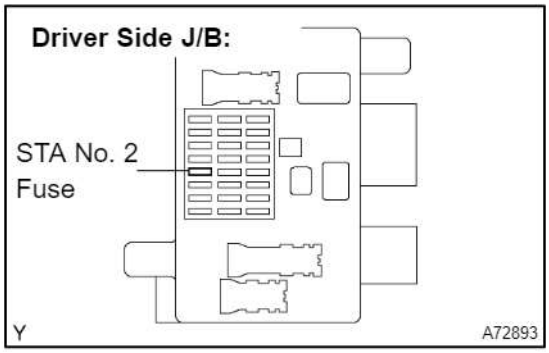
8	INSPECT STARTER ASSY (See page 19–34)

NG → REPAIR OR REPLACE STARTER ASSY

OK

CHECK AND REPAIR HARNESS AND CONNECTOR (STARTER RELAY – STARTER, STARTER – BATTERY)

9	CHECK FUSE(STA No. 2)

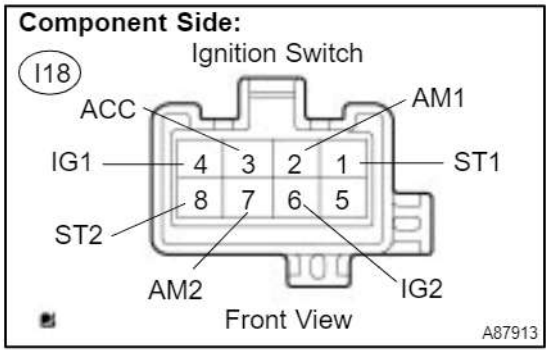


(a) Remove the STA No. 2 fuse from the driver side J/B.
(b) Check for continuity in the STA No. 2 fuse.
Standard: Continuity
(c) Reinstall the STA No. 2 fuse.

NG → CHECK FOR SHORT IN ALL HARNESSES AND COMPONENTS CONNECTED TO FUSE

OK

10	INSPECT IGNITION OR STARTER SWITCH ASSY



(a) Disconnect the I18 ignition switch connector.
(b) Measure the resistance between the connector terminals shown in the chart below.
Standard:

Switch Position	Tester Connection	Specified Condition
LOCK	All Terminals	10 kΩ or higher
ACC	2–3	Below 1 Ω
ON	2–3, 2–4, 6–7	Below 1 Ω
START	1–2, 2–4, 6–7, 6–8	Below 1 Ω

(c) Reconnect the I18 ignition switch connector.

NG → REPLACE IGNITION OR STARTER SWITCH ASSY

OK

CHECK AND REPAIR HARNESS AND CONNECTOR (ECM – IGNITION SWITCH, IGNITION SWITCH – BATTERY)

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OBD II scan tool (excluding hand–held tester):

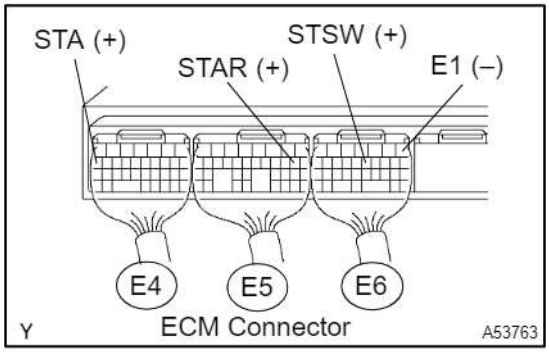
1	CHECK OPERATION OF ENGINE CRANKING

(a) When turning the ignition switch to the ST position, check if the starter motor starts.

OK → CHECK FOR INTERMITTENT PROBLEMS (See page 05–10)

NG

2	INSPECT ECM(STA, STAR AND STSW VOLTAGE)



(a) Measure the voltage between the terminals of the E4, E5 and E6 ECM connectors, while cranking the engine (ignition switch is in the START position).

Standard:

Tester Connection	Specified Condition
STA (E4–17) – E1 (E6–1)	9 to 14 V
STAR (E5–9) – E1 (E6–1)	9 to 14 V
STSW (E6–12) – E1 (E6–1)	9 to 14 V

Result:

Terminal STA	Terminal STAR	Terminal STSW	Proceed to
9 to 14 V	9 to 14 V	9 to 14 V	A
0 V	9 to 14 V	9 to 14 V	B
0 V	0 V	9 to 14 V	C
0 V	0 V	0 V	D

B → Go to step 7

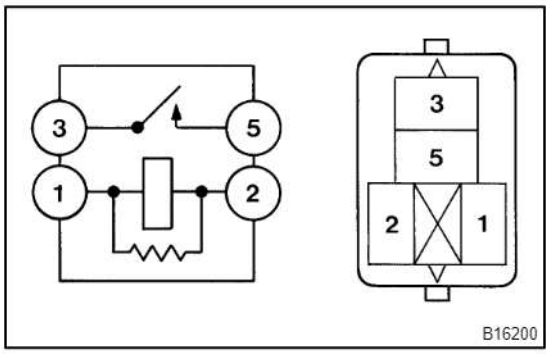
C → REPLACE ECM (See page 10–24)

D → Go to step 8

A

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3 INSPECT STARTER RELAY ASSY



(a) Remove the starter relay from the engine room R/B.
(b) Check for continuity in the starter relay.

Standard:

Tester Connection	Specified Condition
1 – 2	Continuity
3 – 5	No continuity
3 – 5	Continuity (Apply battery voltage to terminals 1 and 2)

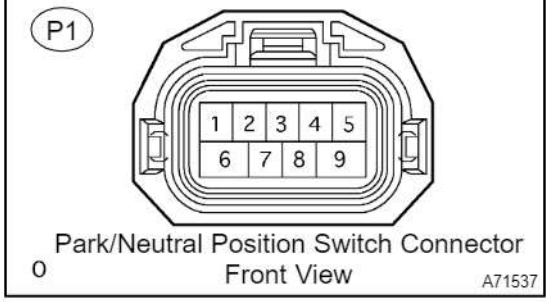
(c) Reinstall the starter relay.

NG → **REPLACE STARTER RELAY ASSY**

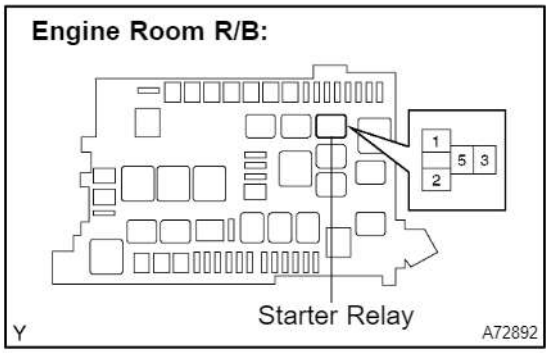
OK

4 CHECK HARNESS AND CONNECTOR(PARK/NEUTRAL POSITION SWITCH – STARTER RELAY, STARTER RELAY – BODY GROUND)

Wire Harness Side:



Engine Room R/B:



(a) Check the harness and connector between the park/neutral position switch and starter relay.
  (1) Disconnect the P1 park/neutral position switch connector.
  (2) Remove the starter relay from the engine room R/B.
  (3) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Park/neutral position switch (P1–6) – Engine room R/B (Starter relay terminal 1)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
Park/neutral position switch (P1–6) or Engine room R/B (Starter relay terminal 1) – Body ground	10 kΩ or higher

  (4) Reconnect the park/neutral position switch connector.
  (5) Reinstall the starter relay.

(b) Check the harness and connector between the starter relay and body ground.
  (1) Remove the starter relay from the engine room R/B.
  (2) Check for continuity between the starter relay and body ground.

Standard (Check for open):

Tester Connection	Specified Condition
Engine room R/B (Starter relay terminal 2) – Body ground	Below 1 Ω

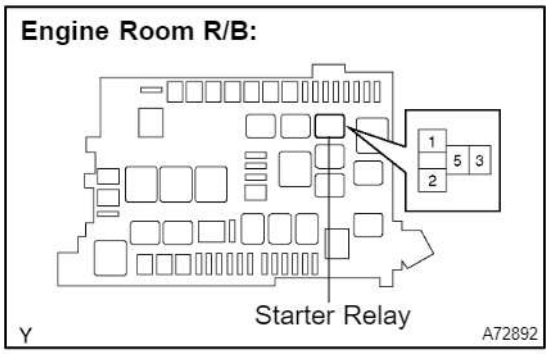
  (3) Reinstall the starter relay.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

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5 INSPECT ENGINE ROOM RELAY BLOCK(STARTER RELAY VOLTAGE)



(a) Remove the starter relay from the engine room R/B.

(b) Measure the voltage between the terminal of the engine room R/B and body ground.

Standard:

Tester Connection	Specified Condition
Engine room R/B (Starter relay terminal 5) – Body ground	9 to 14 V

(c) Reinstall the starter relay.

NG → **CHECK AND REPAIR HARNESS AND CONNECTOR (STARTER RELAY – BATTERY)**

OK

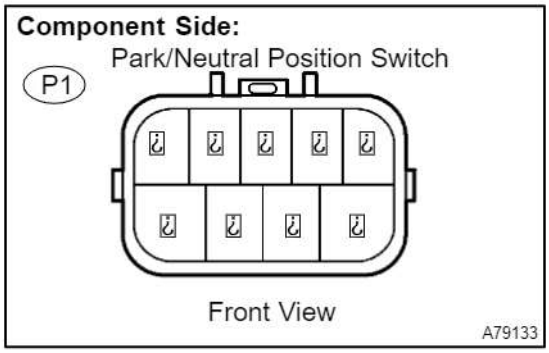
6 INSPECT STARTER ASSY (See page 19–34)

NG → **REPAIR OR REPLACE STARTER ASSY**

OK

CHECK AND REPAIR HARNESS AND CONNECTOR (STARTER RELAY – STARTER, STARTER – BATTERY)

7 INSPECT PARK/NEUTRAL POSITION SWITCH ASSY



(a) Disconnect the P1 park/neutral position switch connector.

(b) Measure the resistance between each terminal shown below when the shift lever is moved to each range.

Standard:

Shift Range	Tester Connection	Specified Condition
P	1 – 3, 6 – 9	Below 1 Ω
R	2 – 3	Below 1 Ω
N	3 – 5, 6 – 9	Below 1 Ω
D,4	3 – 7	Below 1 Ω
3	3 – 4	Below 1 Ω
2,L	3 – 8	Below 1 Ω

(1) Reconnect the park/neutral position switch connector.

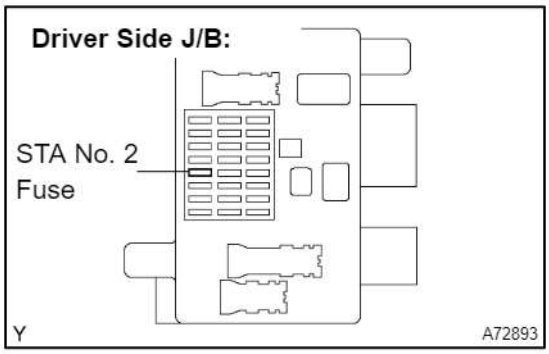
NG → **REPLACE PARK/NEUTRAL POSITION SWITCH ASSY**

OK

CHECK AND REPAIR HARNESS AND CONNECTOR (PARK/NEUTRAL POSITION SWITCH – ECM)

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8 CHECK FUSE(STA No. 2)

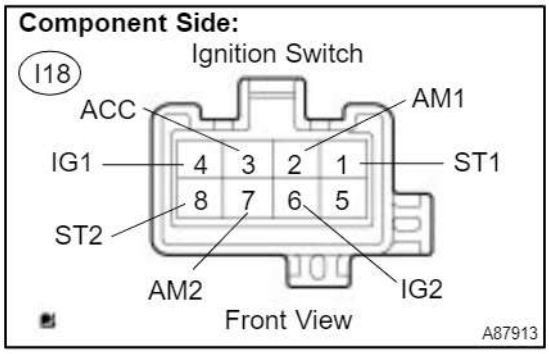


(a) Remove the STA No. 2 fuse from the driver side J/B.
(b) Check for continuity in the STA No. 2 fuse.
Standard: Continuity
(c) Reinstall the STA No. 2 fuse.

NG → **CHECK FOR SHORT IN ALL HARNESSES AND COMPONENTS CONNECTED TO FUSE**

OK

9 INSPECT IGNITION OR STARTER SWITCH ASSY



(a) Disconnect the I18 ignition switch connector.
(b) Measure the resistance between the connector terminals shown in the chart below.
Standard:

Switch Position	Tester Connection	Specified Condition
LOCK	All Terminals	10 kΩ or higher
ACC	2–3	Below 1 Ω
ON	2–3, 2–4, 6–7	Below 1 Ω
START	1–2, 2–4, 6–7, 6–8	Below 1 Ω

(c) Reconnect the I18 ignition switch connector.

NG → **REPLACE IGNITION OR STARTER SWITCH ASSY**

OK

CHECK AND REPAIR HARNESS AND CONNECTOR (ECM – IGNITION SWITCH, IGNITION SWITCH – BATTERY)

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FUEL PUMP CONTROL CIRCUIT

CIRCUIT DESCRIPTION

Refer to DTC P0230 on page 05–152.

WIRING DIAGRAM

Refer to DTC P0230 on page 05–152.

INSPECTION PROCEDURE

Hand–held tester:

1	CHECK FUEL PUMP OPERATION (See page 11–35)

(a) Check if there is pressure in the fuel inlet hose.

HINT:

If there is fuel pressure, you will hear the fuel flowing sound.

OK → Go to step 10

NG

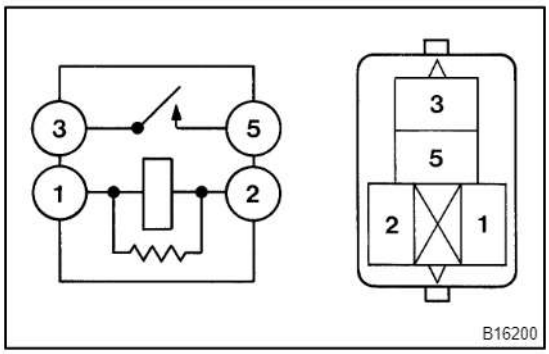
2	PERFORM ACTIVE TEST BY HAND–HELD TESTER(OPERATE CIRCUIT OPENING RELAY)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch to ON and turn the hand–held tester ON.
(c) Select the item: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / FUEL PUMP / SPD.
(d) Check the relay operation while operating it using the hand–held tester.
Standard: Operating sound can be heard from the relay.

OK → Go to step 5

NG

3	INSPECT CIRCUIT OPENING RELAY



(a) Remove the circuit opening relay from the engine room R/B.
(b) Check for continuity in the circuit opening relay.
Standard:

Tester Connection	Specified Condition
1 – 2	Continuity
3 – 5	No continuity
3 – 5	Continuity (Apply battery voltage to terminals 1 and 2)

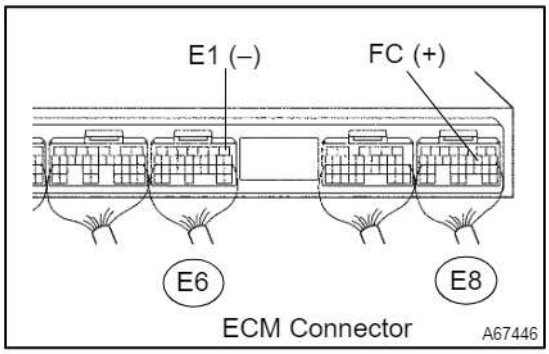
(c) Reinstall the circuit opening relay.

NG → REPLACE CIRCUIT OPENING RELAY

OK

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4	INSPECT ECM(FC VOLTAGE)



(a) Turn the ignition switch to ON.
(b) Measure the voltage between the terminals of the E6 and E8 ECM connectors.

Standard:

Tester Connection	Specified Condition
FC (E8–10) – E1 (E6–1)	9 to 14 V

OK → **REPLACE ECM (See page 10–24)**

NG

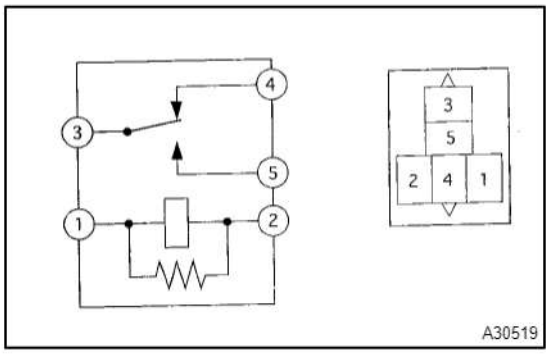
CHECK AND REPAIR HARNESS AND CONNECTOR (ECM – CIRCUIT OPENING RELAY, CIRCUIT OPENING RELAY – IGNITION SWITCH)

5	CHECK FOR ECM POWER SOURCE CIRCUIT (See page 05–293)

NG → **REPAIR OR REPLACE**

OK

6	INSPECT FUEL PUMP RELAY ASSY



(a) Remove the fuel pump relay from the engine room R/B.
(b) Check for continuity in the fuel pump relay.

Standard:

Tester Connection	Specified Condition
1 – 2 3 – 4	Continuity
3 – 5	No continuity
3 – 5	Continuity (Apply battery voltage to terminals 1 and 2)

(c) Reinstall the fuel pump relay.

NG → **REPLACE FUEL PUMP RELAY ASSY**

OK

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7 INSPECT FUEL PUMP

Component Side:

Fuel Pump Connector

F14



Front View

A74356

(a) Inspect fuel pump resistance.
  (1) Disconnect the F14 fuel pump connector.
  (2) Measure the resistance between the terminals of the fuel pump connector.

Standard:

Tester Connection	Specified Condition
4 – 5	0.2 to 3.0 Ω at 20 C (68 F)

  (3) Reconnect the fuel pump connector.

(b) Inspect fuel pump operation
  (1) Apply battery voltage to both terminals. Check that the pump operates.

NOTICE:

- **These tests must be done quickly (within 10 seconds) to prevent the coil from burning out.**
- **Keep fuel pump as far away from the battery as possible.**
- **Always do the switching at the battery side.**

NG → **REPLACE FUEL PUMP**

OK

8 CHECK HARNESS AND CONNECTOR(FUEL PUMP – FUEL PUMP RELAY, FUEL PUMP – BODY GROUND)

Wire Harness Side:

Fuel Pump Connector

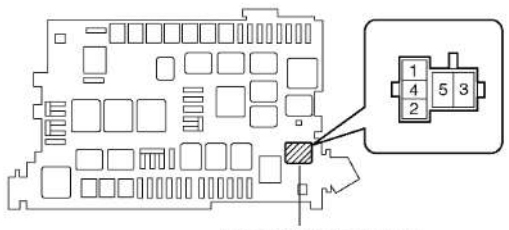
F14



Front View

A66276

Engine Room R/B:



Fuel Pump Relay

Y

A66292

(a) Check the harness and connector between the fuel pump and fuel pump relay.
  (1) Disconnect the F14 fuel pump connector.
  (2) Remove the fuel pump relay from the engine room R/B.
  (3) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Fuel pump (F14–4) – Engine room R/B (Fuel pump relay terminal 4)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
Fuel pump (F14–4) or Engine room R/B (Fuel pump relay terminal 4) – Body ground	10 kΩ or higher

(b) Check the harness and connector between the fuel pump and body ground.
  (1) Disconnect the F14 fuel pump connector.
  (2) Check for continuity between the wire harness side connector and body ground.

Standard (Check for open):

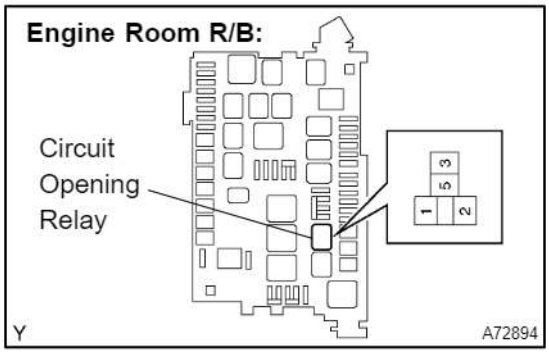
Tester Connection	Specified Condition
Engine room R/B (Fuel pump relay terminal 5) – Body ground	Below 1 Ω

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NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

9 CHECK HARNESS AND CONNECTOR(CIRCUIT OPENING RELAY – FUEL PUMP RELAY)



(a) Remove the circuit opening relay from the engine room R/B.
(b) Remove the fuel pump relay from the engine room R/B.
(c) Check for continuity between the wire harness side connectors.

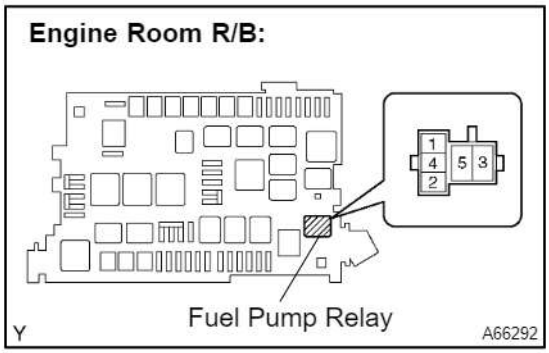
Standard (Check for open):

Tester Connection	Specified Condition
Circuit opening relay (3) – Engine room R/B (Fuel pump relay terminal 3)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
Circuit opening relay (3) or Engine room R/B (Fuel pump relay terminal 3) – Body ground	10 kΩ or higher

(d) Reinstall the circuit opening relay.
(e) Reinstall the fuel pump relay.

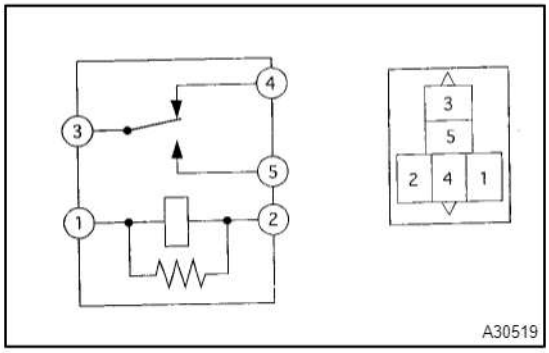


NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

CHECK AND REPAIR HARNESS AND CONNECTOR (EFI RELAY – CIRCUIT OPENING RELAY)

10 INSPECT FUEL PUMP RELAY ASSY



(a) Remove the fuel pump relay from the engine room R/B.
(b) Check for continuity in the fuel pump relay.

Standard:

Tester Connection	Specified Condition
1 – 2 3 – 4	Continuity
3 – 5	No continuity
3 – 5	Continuity (Apply battery voltage to terminals 1 and 2)

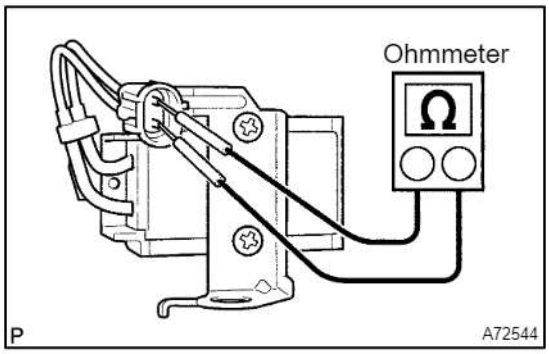
(c) Reinstall the fuel pump relay.

NG → REPLACE FUEL PUMP RELAY ASSY

OK

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11 INSPECT FUEL PUMP RESISTER(RESISTANCE)



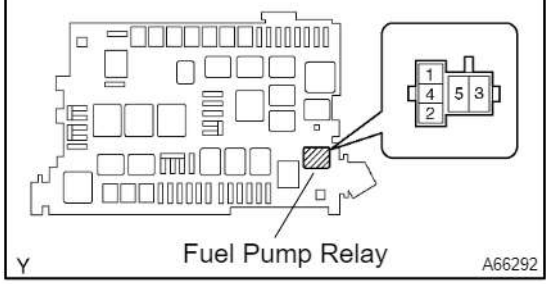
(a) Inspect the fuel pump resistor resistance.
(1) Measure the resistance between the terminals.
Resistance: 0.70 to 0.76 Ω at 20 C (68 F)

NG → **REPLACE FUEL PUMP RESISTER**

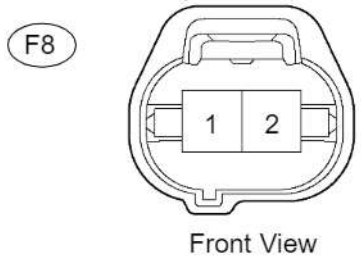
OK

12 CHECK HARNESS AND CONNECTOR(FUEL PUMP RELAY – FUEL PUMP RESISTOR, FUEL PUMP RESISTOR – FUEL PUMP)

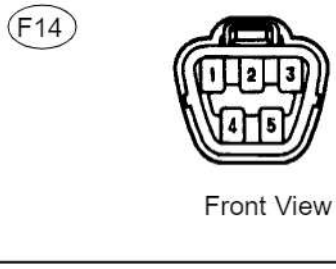
Engine Room R/B:



Wire Harness Side:
Fuel Pump Resistor Connector



Wire Harness Side:
Fuel Pump Connector



(a) Check the harness and connector between the fuel pump relay and fuel pump resistor.
(1) Remove the fuel pump relay from the engine room R/B.
(2) Disconnect the F8 fuel pump resistor connector.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Engine room R/B (Fuel pump relay terminal 5) – Fuel pump resistor (F8–1)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
Engine room R/B (Fuel pump relay terminal 5) or Fuel pump resistor (F8–1) – Body ground	10 kΩ or higher

(4) Reinstall the fuel pump relay.
(5) Reconnect the fuel pump resistor connector.

(b) Check the harness and connector between the fuel pump resistor and fuel pump.
(1) Disconnect the F8 fuel pump resistor connector.
(2) Disconnect the F14 fuel pump connector.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Fuel pump resistor (F8–2) – Fuel pump (F14–4)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
Fuel pump resistor (F8–2) or Fuel pump (F14–4) – Body ground	10 kΩ or higher

(c) Reconnect the fuel pump resistor connector.
(d) Reconnect the fuel pump connector.

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OK → PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (See page 05–10)

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

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OBD II scan tool (excluding hand–held tester):

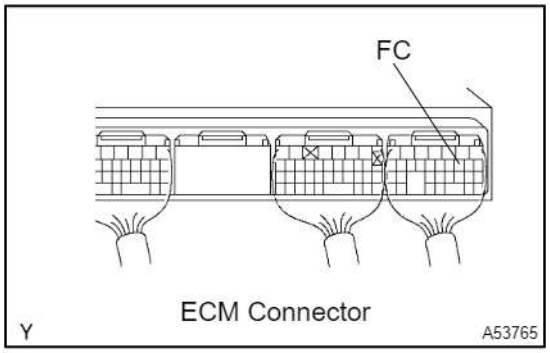
1	CHECK FUEL PUMP OPERATION (See page 11–35)

(a) Check if there is pressure in the fuel inlet hose.
HINT:
If there is fuel pressure, you will hear the fuel flowing sound.

OK	Go to step 10

NG

2	CHECK RELAY OPERATION(CIRCUIT OPENING RELAY)

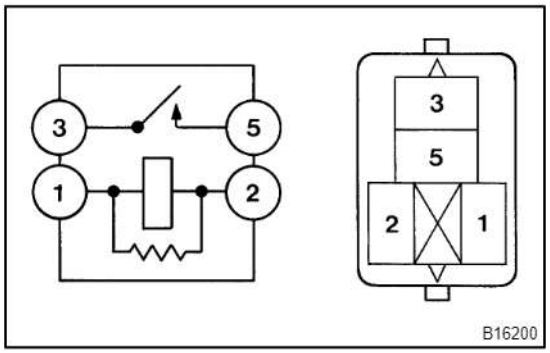


(a) Connect the between terminal FC of the ECM connector and body ground,
(b) Check the relay operation.
Standard:
Operating sound can be heard from the circuit opening relay.

OK	Go to step 5

NG

3	INSPECT CIRCUIT OPENING RELAY



(a) Remove the circuit opening relay from the engine room R/B.
(b) Check for continuity in the circuit opening relay.
Standard:

Tester Connection	Specified Condition
1 – 2	Continuity
3 – 5	No continuity
3 – 5	Continuity (Apply battery voltage to terminals 1 and 2)

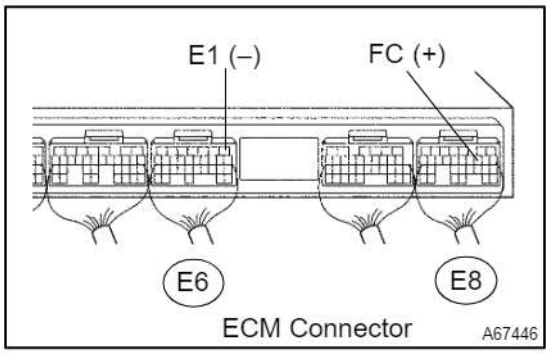
(c) Reinstall the circuit opening relay.

NG	REPLACE CIRCUIT OPENING RELAY

OK

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4 INSPECT ECM(FC VOLTAGE)



(a) Turn the ignition switch to ON.
(b) Measure the voltage between the terminals of the E6 and E8 ECM connectors.

Standard:

Tester Connection	Specified Condition
FC (E8–10) – E1 (E6–1)	9 to 14 V

OK → **REPLACE ECM (See page 10–24)**

NG

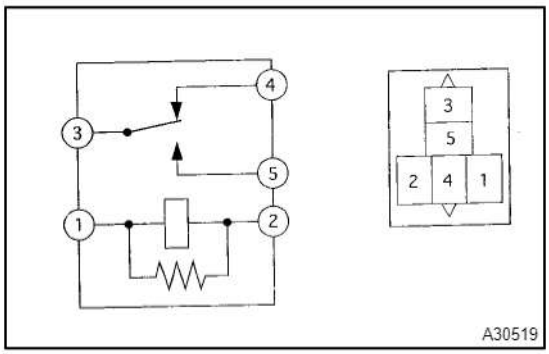
CHECK AND REPAIR HARNESS AND CONNECTOR (ECM – CIRCUIT OPENING RELAY, CIRCUIT OPENING RELAY – IGNITION SWITCH)

5 CHECK FOR ECM POWER SOURCE CIRCUIT (See page 05–293)

NG → **REPAIR OR REPLACE**

OK

6 INSPECT FUEL PUMP RELAY ASSY



(a) Remove the fuel pump relay from the engine room R/B.
(b) Check for continuity in the fuel pump relay.

Standard:

Tester Connection	Specified Condition
1 – 2 3 – 4	Continuity
3 – 5	No continuity
3 – 5	Continuity (Apply battery voltage to terminals 1 and 2)

(c) Reinstall the fuel pump relay.

NG → **REPLACE FUEL PUMP RELAY ASSY**

OK

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7 INSPECT FUEL PUMP

Component Side:

Fuel Pump Connector

F14



Front View

A74356

(a) Inspect the fuel pump resistance.
  (1) Disconnect the F14 fuel pump connector.
  (2) Measure the resistance between the terminals of the fuel pump connector.

Standard:

Tester Connection	Specified Condition
4 – 5	0.2 to 3.0 Ω at 20 C (68 F)

  (3) Reconnect the fuel pump connector.

(b) Inspect fuel pump operation
  (1) Apply battery voltage to both terminals. Check that the pump operates.

NOTICE:

- **These tests must be done quickly (within 10 seconds) to prevent the coil from burning out.**
- **Keep fuel pump as far away from the battery as possible.**
- **Always do the switching at the battery side.**

NG → **REPLACE FUEL PUMP**

OK

8 CHECK HARNESS AND CONNECTOR(FUEL PUMP – FUEL PUMP RELAY, FUEL PUMP – BODY GROUND)

Wire Harness Side:

Fuel Pump Connector

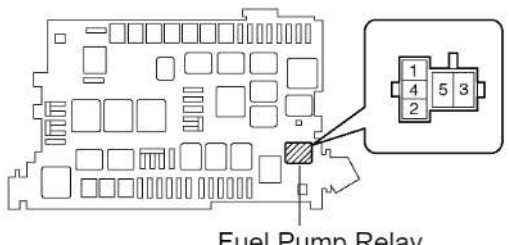
F14



Front View

A66276

Engine Room R/B:



Fuel Pump Relay

Y

A66292

(a) Check the harness and connector between the fuel pump and fuel pump relay.
  (1) Disconnect the F14 fuel pump connector.
  (2) Remove the fuel pump relay from the engine room R/B.
  (3) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Fuel pump (F14–4) – Engine room R/B (Fuel pump relay terminal 4)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
Fuel pump (F14–4) or Engine room R/B (Fuel pump relay terminal 4) – Body ground	10 kΩ or higher

(b) Check the harness and connector between the fuel pump and body ground.
  (1) Disconnect the F14 fuel pump connector.
  (2) Check for continuity between the wire harness side connector and body ground.

Standard (Check for open):

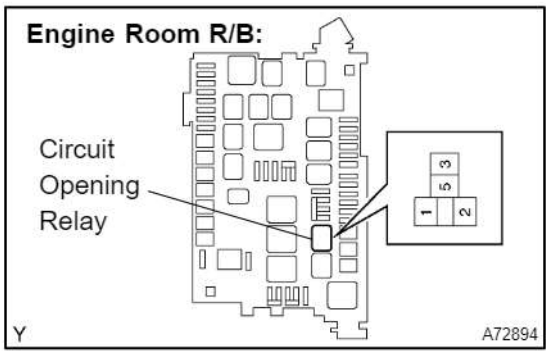
Tester Connection	Specified Condition
Engine room R/B (Fuel pump relay terminal 5) – Body ground	Below 1 Ω

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NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

9 CHECK HARNESS AND CONNECTOR(CIRCUIT OPENING RELAY – FUEL PUMP RELAY)



(a) Remove the circuit opening relay from the engine room R/B.
(b) Remove the fuel pump relay from the engine room R/B.
(c) Check for continuity between the wire harness side connectors.

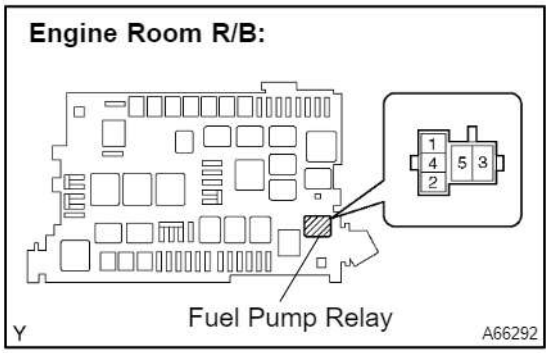
Standard (Check for open):

Tester Connection	Specified Condition
Circuit opening relay (3) – Engine room R/B (Fuel pump relay terminal 3)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
Circuit opening relay (3) or Engine room R/B (Fuel pump relay terminal 3) – Body ground	10 kΩ or higher

(d) Reinstall the circuit opening relay.
(e) Reinstall the fuel pump relay.

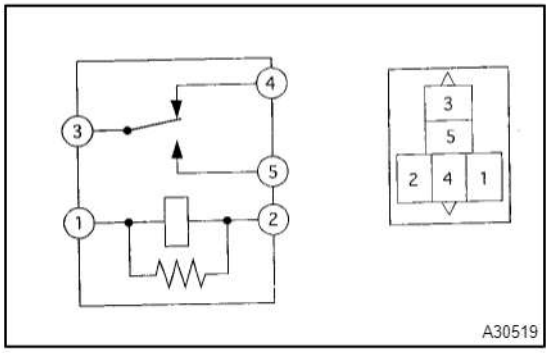


NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

CHECK AND REPAIR HARNESS AND CONNECTOR (EFI RELAY – CIRCUIT OPENING RELAY)

10 INSPECT FUEL PUMP RELAY ASSY



(a) Remove the fuel pump relay from the engine room R/B.
(b) Check for continuity in the fuel pump relay.

Standard:

Tester Connection	Specified Condition
3 – 5	No continuity
3 – 5	Continuity (Apply battery voltage to terminals 1 and 2)
1 – 2 3 – 4	Continuity

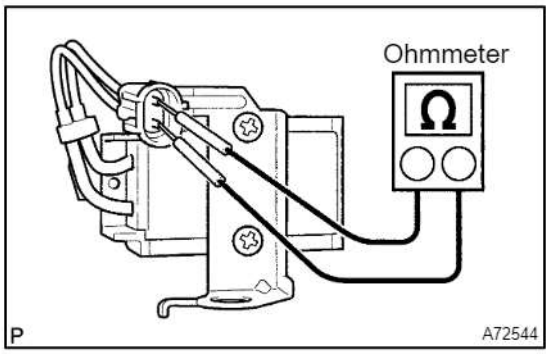
(c) Reinstall the fuel pump relay.

NG → REPLACE FUEL PUMP RELAY ASSY

OK

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11 INSPECT FUEL PUMP RESISTER(RESISTANCE)



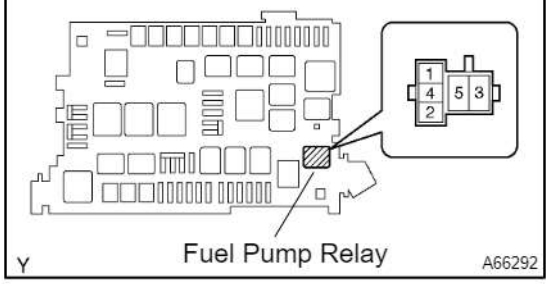
(a) Inspect the fuel pump resistor resistance.
(1) Measure the resistance between the terminals.
Resistance: 0.70 to 0.76 Ω at 20 C (68 F)

NG → **REPLACE FUEL PUMP RESISTER**

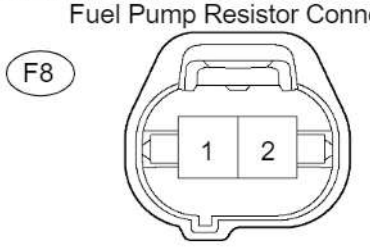
OK

12 CHECK HARNESS AND CONNECTOR(FUEL PUMP RELAY – FUEL PUMP RESISTOR, FUEL PUMP RESISTOR – FUEL PUMP)

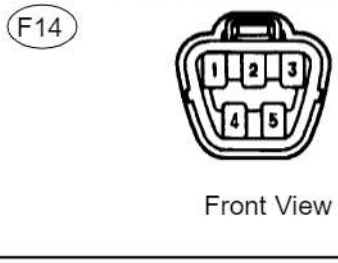
Engine Room R/B:



Wire Harness Side:
Fuel Pump Resistor Connector



Wire Harness Side:
Fuel Pump Connector



(a) Check the harness and connector between the fuel pump relay and fuel pump resistor.
(1) Remove the fuel pump relay from the engine room R/B.
(2) Disconnect the F8 Fuel pump resistor connector.
(3) Check for resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Engine room R/B (Fuel pump relay terminal 5) – Fuel pump resistor (F8–1)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
Engine room R/B (Fuel pump relay terminal 5) or Fuel pump resistor (F8–1) – Body ground	10 kΩ or higher

(4) Reinstall the fuel pump relay.
(5) Reconnect the fuel pump resistor connector.

(b) Check the harness and connector between the fuel pump resistor and fuel pump.
(1) Disconnect the F8 fuel pump resistor connector.
(2) Disconnect the F14 fuel pump connector.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Fuel pump resistor (F8–2) – Fuel pump (F14–4)	Below1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
Fuel pump resistor (F8–2) or Fuel pump (F14–4) – Body ground	10 kΩ or higher

(c) Reconnect the fuel pump resistor connector.
(d) Reconnect the fuel pump connector.

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OK → PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (See page 05–10)

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

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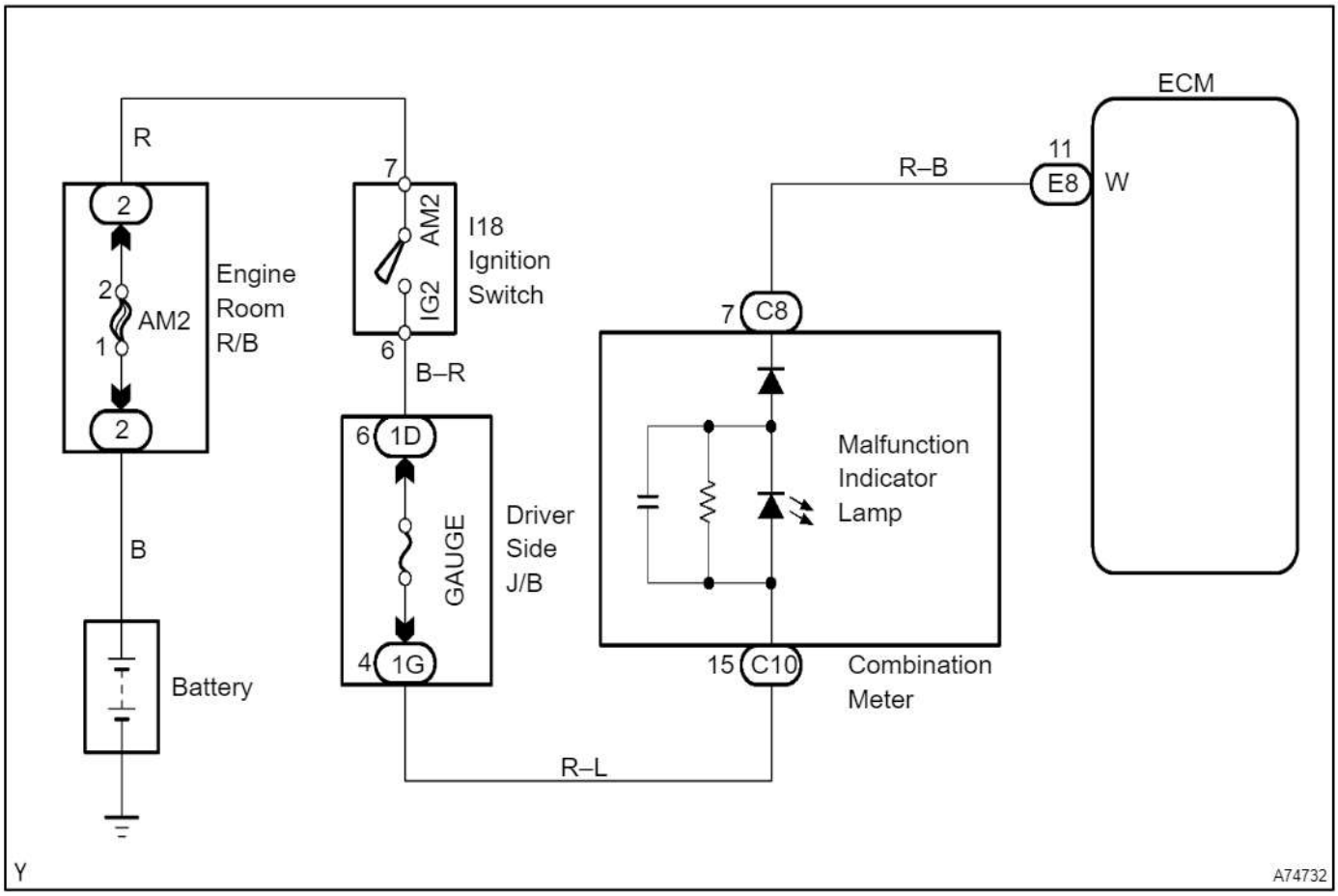
MIL CIRCUIT

CIRCUIT DESCRIPTION

The MIL is used to indicate the ECM's detection of a vehicle malfunction.
The instrument panel GAUGE fuse provides the circuit power and the ECM provides the circuit ground that illuminates the MIL.

Operation of MIL should be checked visually:
When the ignition switch is first turned to ON, the MIL should be illuminated. If the MIL is always OFF or ON, use the hand–held tester or OBD II scan tool and follow the procedure below to determine cause of the problem.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:
Troubleshoot each trouble symptom in accordance with the chart below .

MIL remains on	Start inspection from step 1
MIL is not illuminated	Start inspection from step 3

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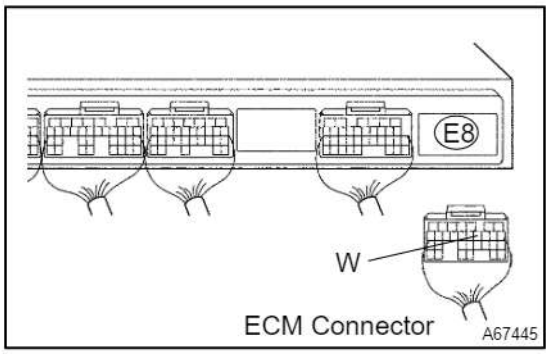
1	CLEAR DTC

(a) Connect the hand–held tester or the OBD II scan tool to the DLC 3.
(b) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(c) Read the DTC (see page 05–36).
(d) Clear the DTC (see page 05–36).
(e) Check that MIL is not illuminated.
Standard: MIL is not illuminated

OK → **REPAIR CIRCUIT INDICATED BY OUTPUT DTC (See page 05–47)**

NG

2	CHECK HARNESS AND CONNECTOR(CHECK FOR SHORT IN WIRE HARNESS)



(a) Disconnect the E8 ECM connector.
(b) Turn the ignition switch to ON.
(c) Check that MIL is not illuminated.
Standard: MIL is not illuminated
(d) Reconnect the ECM connector.

OK → **REPLACE ECM (See page 10–24)**

NG

CHECK AND REPAIR HARNESS AND CONNECTOR (COMBINATION METER – ECM)

3	CHECK THAT MIL IS ILLUMINATED

(a) Check that MIL is illuminated when turning the ignition switch to ON.
Standard: MIL is illuminated

OK → **SYSTEM OK**

NG

4	INSPECT COMBINATION METER ASSY (MIL CIRCUIT)

(a) See the combination meter troubleshooting procedure on page 05–1701.

NG → **REPAIR OR REPLACE BULB OR COMBINATION METER ASSEMBLY**

OK

CHECK AND REPAIR HARNESS AND CONNECTOR (COMBINATION METER – ECM)

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SFI SYSTEM (1GR–FE)(From August, 2003)

05G1K-01

PRECAUTION

NOTICE:

Perform the RESET MEMORY (AT initialization) when replacing the automatic transaxle assembly, engine assembly or ECM.

HINT:

Initialization can not be completed by only removing the battery.

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DEFINITION OF TERMS

Term	Definition
Monitor description	Description of what the ECM monitors and how it detects malfunctions (monitoring purpose and its details).
Related DTCs	Diagnostic codes
Typical enabling condition	Preconditions that allow the ECM to detect malfunctions. With all preconditions satisfied, the ECM sets the DTC when the monitored value(s) exceeds the malfunction threshold(s).
Sequence of operation	The priority order that is applied to monitoring, if multiple sensors and components are used to detect the malfunction. While another sensor is being monitored, the next sensor or component will not be monitored until the current sensor monitoring is finished.
Required sensor/components	The sensors and components that are used by the ECM to detect malfunctions.
Frequency of operation	The number of times that the ECM checks for malfunctions per driving cycle. "Once per driving cycle" means that the ECM detects malfunction only one time during a single driving cycle. "Continuous" means that the ECM detects the malfunction every time an enabling condition is met .
Duration	The minimum time that the ECM must sense a continuous deviation in the monitored value(s) before setting a DTC. This timing begins after the "typical enabling conditions" are met.
Malfunction thresholds	Beyond this value, the ECM will conclude that there is a malfunction and set a DTC.
MIL operation	MIL illumination timing after a defect is detected. "Immediately" means that the ECM illuminates the MIL the instant the ECM determines that there is a malfunction. "2 driving cycle" means that the ECM illuminates the MIL if the same malfunction is detected again in the 2nd driving cycle.

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PART AND SYSTEM NAME LIST

This reference list indicates the part names used in this manual along with their definitions.

Part and system name	Definition
Toyota HCAC system, Hydro–carbon adsorptive catalyst (HCAC) system, HC adsorptive three–way catalyst	HC adsorptive three–way catalytic converter
Variable valve timing sensor, VVT sensor	Camshaft position sensor
Variable valve timing system, VVT system	Camshaft timing control system
Camshaft timing oil control valve, Oil control valve, OCV, VVT, VSV	Camshaft timing oil control valve
Variable timing and lift, VVTL	Camshaft timing and lift control
Crankshaft position sensor "A"	Crankshaft position sensor
Engine speed sensor	Crankshaft position sensor
THA	Intake air temperature
Knock control module	Engine knock control module
Knock sensor	Engine knock sensor
Mass or volume air flow circuit	Mass air flow meter circuit
Vacuum sensor	Manifold air pressure sensor
Internal control module, Control module, Engine control ECU, PCM	Power train control module
FC idle	Deceleration fuel cut
Idle air control valve	Idle speed control
VSV for CCV, Canister close valve VSV for canister control	Evaporative emissions canister vent valve
VSV for EVAP, Vacuum switching valve assembly No. 1, EVAP VSV, Purge VSV	Evaporative emissions canister purge valve
VSV for pressure switching valve, Bypass VSV	Evaporative emission pressure switching valve
Vapor pressure sensor, EVAP pressure sensor, Evaporative emission control system pressure sensor	Fuel tank pressure sensor
Charcoal canister	Evaporative emissions canister
ORVR system	On–board refueling vapor recovery system
Intake manifold runner control	Intake manifold tuning system
Intake manifold runner valve, IMRV, IACV (runner valve)	Intake manifold tuning valve
Intake control VSV	Intake manifold tuning solenoid valve
AFS	Air fuel ratio sensor
O2 sensor	Heater oxygen sensor
Oxygen sensor pumping current circuit	Oxygen sensor output signal
Oxygen sensor reference ground circuit	Oxygen sensor signal ground
Accel position sensor	Accelerator pedal position sensor
Throttle actuator control motor, Actuator control motor, Electronic throttle motor, Throttle control motor	Electronic throttle actuator
Electronic throttle control system, Throttle actuator control system	Electronic throttle control system
Throttle/pedal position sensor, Throttle/pedal position switch, Throttle position sensor/switch	Throttle position sensor
Turbo press sensor	Turbocharger pressure sensor
Turbo VSV	Turbocharger pressure control solenoid valve
P/S pressure switch	Power–steering pressure switch
VSV for ACM	Active control engine mount
Speed sensor, Vehicle speed sensor "A", Speed sensor for skid control ECU	Vehicle speed sensor
ATF temperature sensor, Trans. fluid temp. sensor, ATF temperature sensor "A"	Transmission fluid temperature sensor
Electronic controlled automatic transmission, ECT	Electronically controlled automatic
Intermediate shaft speed sensor "A"	Counter gear speed sensor

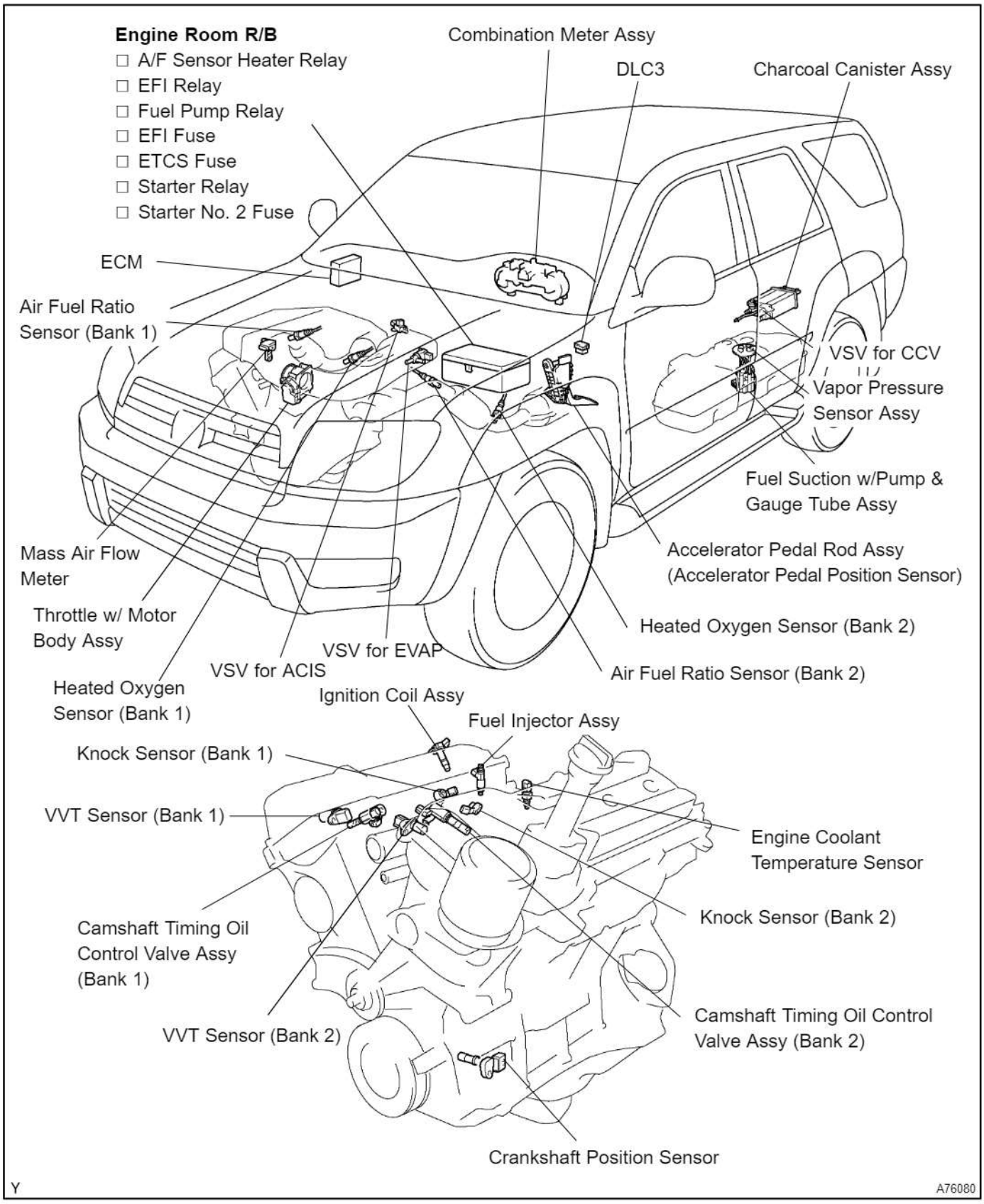
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Part and system name	Definition
Output speed sensor	Output shaft speed sensor
Input speed sensor, Input turbine speed sensor "A", Speed sensor (NT), Turbine speed sensor	Input turbine speed sensor
PNP switch, NSW	Park/Neutral position switch
Pressure control solenoid	Transmission pressure control solenoid
Shift solenoid	Transmission shift solenoid valve
Transmission control switch, Shift lock control unit	Shift lock control module
Engine immobilizer system, Immobilizer system	Vehicle anti–theft system

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LOCATION



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05288–21

HOW TO PROCEED WITH TROUBLESHOOTING

HINT:

The hand–held tester can be used at step 3, 4, 5, 7 and 10.

1	VEHICLE BROUGHT TO WORKSHOP

2	CUSTOMER PROBLEM ANALYSIS (See page 05–330)

3	CONNECT HAND–HELD TESTER TO DLC3

HINT:

If the display indicates a communication fault in the tool, inspect DLC3.

4	CHECK DTC AND FREEZE FRAME DATA (See page 05–355)

HINT:

Record or print DTC and freeze frame data, if needed.

5	CLEAR DTC AND FREEZE FRAME DATA (See page 05–355)

6	VISUAL INSPECTION

7	SETTING CHECK (TEST) MODE DIAGNOSIS (See page 05–357)

8	PROBLEM SYMPTOM CONFIRMATION

HINT:

If the engine does not start, perform steps 10 and 12 first.

A	Malfunction does not occur
B	Malfunction occurs

B	GO TO STEP 10

A

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9	SYMPTOM SIMULATION

10	DTC CHECK (See page 05–355)

A	Malfunction code
B	No code

B → GO TO STEP 12

A

11	DTC CHART (See page 05–366)

GO TO STEP 14

12	BASIC INSPECTION (See page 05–332)

A	Wrong parts not confirmed
B	Wrong parts confirmed

B → GO TO STEP 17

A

13	PROBLEM SYMPTOMS TABLE (See page 05–348)

A	Wrong circuit confirmed
B	Wrong parts confirmed

B → GO TO STEP 17

A

14	CHECK ECM POWER SOURCE CIRCUIT (See page 05–644)

15	CIRCUIT INSPECTION

A	Malfunction not confirmed
B	Malfunction confirmed

B → GO TO STEP 18

A

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16	CHECK FOR INTERMITTENT PROBLEMS (See page 05–331)

GO TO STEP 18

17	PARTS INSPECTION

18	IDENTIFICATION OF PROBLEM

19	ADJUSTMENT AND/OR REPAIR

20	CONFIRMATION TEST

END

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CUSTOMER PROBLEM ANALYSIS CHECK

ENGINE CONTROL SYSTEM Check Sheet

Inspector's Name

Customer's Name		VIN	
Date Vehicle Brought in		Production Date	
License Plate No.		Odometer Reading	km miles

Problem Symptoms	☐ Engine does not Start	☐ Engine does not crank ☐ No initial combustion ☐ No complete combustion
	☐ Difficult to Start	☐ Engine cranks slowly ☐ Other _____
	☐ Poor Idling	☐ Incorrect first idle ☐ Idling rpm is abnormal ☐ High (rpm) ☐ Low (rpm) ☐ Rough idling ☐ Other _____
	☐ Poor Driveability	☐ Hesitation ☐ Back fire ☐ Muffler explosion (after–fire) ☐ Surging ☐ Knocking ☐ Other _____
	☐ Engine Stall	☐ Soon after starting ☐ After accelerator pedal depressed ☐ After accelerator pedal released ☐ During A/C operation ☐ Shifting from N to D ☐ Other _____
	☐ Others	

Data Problem Occurred		
Problem Frequency		☐ Constant ☐ Sometimes (times per day/month) ☐ Once only ☐ Other _____
Condition When Problem Occurs	Weather	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Various/Other _____
	Outdoor Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold (approx. ____ °C/____ °F)
	Place	☐ Highway ☐ Suburbs ☐ Inner City ☐ Uphill ☐ Downhill ☐ Rough road ☐ Other _____
	Engine Temp.	☐ Cold ☐ Warming up ☐ After Warming up ☐ Any temp. ☐ Other _____
	Engine Operation	☐ Starting ☐ Just after starting (min.) ☐ Idling ☐ Racing ☐ Driving ☐ Constant speed ☐ Acceleration ☐ Deceleration ☐ A/C switch ON/OFF ☐ Other _____

Condition of malfunction indicator lamp (MIL)		☐ Remains on ☐ Sometimes lights up ☐ Does not light up
DTC Inspection	Normal mode (Pre–check)	☐ Normal ☐ Malfunction code(s) (code) ☐ Freeze frame data ( )
	Check Mode	☐ Normal ☐ Malfunction code(s) (code) ☐ Freeze frame data ( )

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CHECK FOR INTERMITTENT PROBLEMS

HINT:

Hand–held tester only:

Inspect the vehicle's ECM using check mode. Intermittent problems are easier to detect when the ECM is in check mode with a hand–held tester. In check mode, the ECM uses 1 trip detection logic, which has a higher sensitivity to malfunctions than normal mode (default) using 2 trip detection logic.

(a) Clear the DTCs (see page 05–355).
(b) Switch the hand–held tester from normal mode to check mode (see page 05–357).
(c) Perform a simulation test (see page 01–25).
(d) Check the connector(s) and terminal(s) (see page 01–35).
(e) Wiggle the harness(s) and connector(s) (see page 01–35).

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BASIC INSPECTION

When the malfunction is not confirmed in the DTC check, troubleshooting should be carried out in all the possible circuits considered as causes of the problem. In many cases, by carrying out the basic engine check shown in the following flowchart, the location causing the problem can be found quickly and efficiently. Therefore, using this check is essential in the engine troubleshooting.

1	CHECK BATTERY VOLTAGE

NOTICE:
Carry out this check with the engine stopped and ignition switch OFF.

	OK	NG
Voltage	11 V or more	Less than 11 V

NG → CHARGE OR REPLACE BATTERY

OK

2	CHECK IF ENGINE WILL CRANK

NG → PROCEED TO PROBLEM SYMPTOMS TABLE ON PAGE 05–348

OK

3	CHECK IF ENGINE STARTS

NG → GO TO STEP 7

OK

4	CHECK AIR FILTER

(a) Visually check if the air filter is not contaminated with dirt or oil.

NG → REPLACE AIR FILTER

OK

5	CHECK IDLE SPEED (See page 14–1)

NG → PROCEED TO PROBLEM SYMPTOMS TABLE ON PAGE 05–348

OK

PROCEED TO PROBLEM SYMPTOMS TABLE ON PAGE 05–348

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6	CHECK FUEL PRESSURE (See page 11–5)

NG → PROCEED TO PAGE 18–1 AND CONTINUE TO TROUBLESHOOT

OK

7	CHECK FOR SPARK (See page 18–3)

NG → PROCEED TO PAGE 18–1 AND CONTINUE TO TROUBLESHOOT

OK

PROCEED TO PROBLEM SYMPTOMS TABLE ON PAGE 05–348

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LIST OF DISABLE A MONITOR

HINT:

The table below shows the ECM monitoring status for the components listed in the top of the table when the DTCs on the left of the table are set.

As for the ”X” mark, when the DTC on the left is stored, detection of the DTC in the upper column is not performed.

Monitor detected malfunction		Monitor disablement (X : disabled)																														
DTC	Component/System	VVT VVS1,2	FrO2S heater sensor 1	A/F sensor heater sensor 1	FrO2S heater sensor 2	FrO2S heater sensor 3	MAF meter	MAF meter	IAT sensor	ECT sensor	ECT sensor	TP sensor	Insufficient ECT for CL	Thermostat	O2S Sensor 1	FrO2S,A/F sensor (No Activity)	O2S Sensor 2	O2S Sensor 3	Fuel system	Misfire	Knock sensor	CKP sensor	CMP sensor	VVT sensor 1,2	Ignitor	EGR system (closed)	EGR system (open)	EGR Lift sensor	EGR Lift sensor	Catalyst	EVAP system	EVAP press sensor
		P0010,P0020	P0031-0052	P0031-0052	P0037-0058	P0043-P0064	P0100-P0103	P0101	P0110-P0113	P0115-P0118	P0116	P0120-P2135	P0125	P0128	P0130-P0153	P0134-P0154	P0136,P0156	P0142,P0162	P0171-P0175	P0300,P0308	P0325-P0333	P0335	P0340,P0341	P0340-P0346	P0351-P0358	P0401	P0402	P0405	P0409	P0420,P0430	P0440-P0446	P0450,P0453
P0010,P0020	VVT VVS1,2													X					X													
P0031-0052	FrO2S heater sensor 1													X	X	X	X	X	X							X	X			X		
P0031-0052	A/F sensor heater sensor 1													X			X	X	X							X	X			X		
P0037-0058	FrO2S heater sensor 2																X	X												X		
P0043-0064	FrO2S heater sensor 3																	X														
P0100-P0103	MAF meter										X		X	X	X	X	X	X	X	X						X	X			X	X	
P0110-P0113	IAT sensor												X	X	X	X	X	X		X						X	X				X	
P0115-P0118	ECT sensor							X					X	X	X	X	X	X	X	X						X	X		X	X	X	
P0120-P2135	TP sensor							X							X	X	X	X	X	X						X	X			X	X	
P0125	ECT sensor							X						X	X	X	X	X	X	X						X	X		X	X	X	
P0128	Thermostat																															
P0130-P0153	O2S Sensor 1													X		X	X	X								X	X			X		
P0134,P0154	Closed Loop			X										X	X		X	X	X							X	X			X	X	
P0136,P0156	O2S Sensor 2																													X		
P0142,P0162	O2S Sensor 3																															
P0171-P0172	Fuel system													X	X	X	X	X								X	X			X	X	
P0300-P0308	Misfire		X											X	X	X	X	X												X	X	
P0325-P0333	Knock sensor																		X							X	X					
P0335	CKP sensor							X						X	X	X	X	X	X	X						X	X			X	X	
P0340,P0341	CMP sensor							X						X	X	X	X	X	X	X						X	X			X	X	
P0340-P0346	VVT sensor 1,2													X																			
P0351-P0358	Ignitor													X					X							X	X			X	X	
P0401	EGR system (closed)													X					X											X		
P0402	EGR system (open)													X	X	X	X	X	X											X	X	
P0405,P0409	Lift sensor																															
P0420,P0430	Catalyst																															
P0442-P0456	EVAP system														X	X	X	X														
P0450,P0451	EVAP press sensor																														X	

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	DTC		Monitor disablement (X : disabled)																												
		Component/System	VVT VVS1,2	FrO2S heater sensor 1	A/F sensor heater sensor 1	FrO2S heater sensor 2	FrO2S heater sensor 3	MAF meter	MAF meter	IAT sensor	ECT sensor	ECT sensor	TP sensor	Insufficient ECT for CL	Thermostat	O2S Sensor 1	FrO2S,A/F sensor (No Activity)	O2S Sensor 2	O2S Sensor 3	Fuel system	Misfire	Knock sensor	CKP sensor	CMP sensor	VVT sensor 1,2	Ignitor	EGR system (closed)	EGR system (open)	EGR Lift sensor	EGR Lift sensor	Catalyst	EVAP system	EVAP press sensor
			P0010,P0020	P0031-0052	P0031-0052	P0037-0058	P0043-P0064	P0100-P0103	P0101	P0110-P0113	P0115-P0118	P0116	P0120-P2135	P0125	P0128	P0130-P0153	P0134-P0154	P0136,P0156	P0142,P0162	P0171-P0175	P0300,P0308	P0325-P0333	P0335	P0340,P0341	P0340-P0346	P0351-P0358	P0401	P0402	P0405	P0409	P0420,P0430	P0440-P0446	P0450-P0453
Monitor detected malfunction	P0500	VVS													X	X	X	X	X	X	X						X	X			X	X	
	P0505,P0511	ISC valve														X																	
	P0560	Battery																															
	P0617	Starter signal																															
	P0705	Shift lever position switch																															
	P0710	Trans fluid temp sensor																															
	P0715-P0717	Output speed sensor																															
	P0715-P0717	Input speed sensor																															
	P0724	Stop lamp switch																															
	P0741-P0796	Trans solenoid (function)																															
	P0748-P0798	Trans solenoid (range)																															
	P0850	PNP switch																			X												
	P1010	OCV for VVTL													X					X													
	P2120-P2138	Accel position sensor																															
	P2120,P2103	Throttle motor																															
	P1126	Electronic magenet clutch																															
	P1129	Electronic throttle system																															
	P0011,P0012	VVT system 1,2													X					X							X	X			X	X	
	P1011,P1012	VVTL System													X					X							X	X			X	X	
	P1430	Pressure sensor (HC adsorber)																														X	X
	P2004,P2006	Intake manifold runner conrtol																															
	P2009,P2010	Intake manifold runner circuit																															
	P2014,16,17	Intake manifold runner sensor																															
	P2196,P2198	A/F sensor (rationality)													X			X	X								X	X			X		
	P2237,P2240	A/F sensor (open)													X			X	X								X	X			X		
	P2423,P2424	HC adsorption catalyst																															
	P2714-P2759	Trans solenoid (SLU-SLD)																															
	P2A00,P2A03	A/F sensor (slow response)													X			X	X								X	X			X		

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Note *1: Without input speed sensor

Note *2: With input speed sensor

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Monitor disablement (X : disabled)

Monitor detected malfunction	DTC	Component/System	VVS (ECT2sensor)	VVS (ECT1sensor,non-ECT)	VVS (M/T)	ISC valve	Battery	Starter signal	Shift lever position switch	Trans fluid temp sensor	Output speed sensor	Input speed sensor	Stop lamp switch	Trans solenoid (function) *1	Trans solenoid (function) *2	Trans solenoid (range)	PNP switch	VVTL	Accel position sensor	Throttle motor	Electronic magenet clutch	Electronic throttle system	VVT system 1,2	VVTL System	Pressure sensor (HC adsorber)	Intake manifold runner conrtol	Intake manifold runner circuit	Intake manifold runner sensor	A/F sensor (rationality)	A/F sensor (open)	HC adsorption catalyst	Yrans solenoid (SLU-SLD)	A/F sensor (slow response)
			P0500	P0500	P0500	P0505,P0511	P0560	P0617	P0705	P0710	P0715-P0717	P0715-P0717	P0724	P0741-P0796	P0741-P0796	P0748-P0798	P0850	P1010,P1020	P1120-P2138	P2120,P2103	P1126	P1129	P0011-P0012	P1011,P1012	P1430	P2004,P2006	P2009,P2010	P2014,16,17	P2196,P2198	P2237,P2240	P2423,P2424	P2714-P2759	P2A00,P2A03
	P0010,P0020	VVT VVS1,2												X																			
	P0031-0052	FrO2S heater sensor 1				X								X																	X		
	P0031-0052	A/F sensor heater sensor 1				X																							X	X	X		X
	P0037-0058	FrO2S heater sensor 2																											X		X		
	P0043-0064	FrO2S heater sensor 3																													X		
	P0100-P0103	MAF meter			X	X								X				X					X	X					X	X	X		X
	P0110-P0113	IAT sensor												X												X			X	X			X
	P0115-P0118	ECT sensor			X	X								X	X			X					X	X		X			X	X	X		X
	P0120-P2135	TP sensor		X		X								X															X	X	X		X
	P0125	ECT sensor			X	X								X	X			X					X						X	X	X		X
	P0128	Thermostat																																
	P0130-P0153	O2S Sensor 1				X								X																	X		
	P0134,P0154	Closed Loop				X								X															X	X	X		X
	P0136,P0156	O2S Sensor 2																											X		X		
	P0142,P0162	O2S Sensor 3																													X		
	P0171-P0172	Fuel system				X								X															X	X	X		X
	P0300-P0308	Misfire				X								X															X	X	X		X
	P0325-P0333	Knock sensor												X																			
	P0335	CKP sensor				X								X				X					X	X					X	X	X		X
	P0340,P0341	CMP sensor				X								X				X					X	X					X	X	X		X
	P0340-P0346	VVT sensor 1,2																																
	P0351-P0358	Ignitor				X								X																	X		
	P0401	EGR system (closed)												X																	X		
	P0402	EGR system (open)				X								X															X	X	X		X
	P0405,P0409	Lift sensor																																
	P0420,P0430	Catalyst																																
	P0442-P0456	EVAP system				X																							X	X			X
	P0450,P0451	EVAP press sensor																																

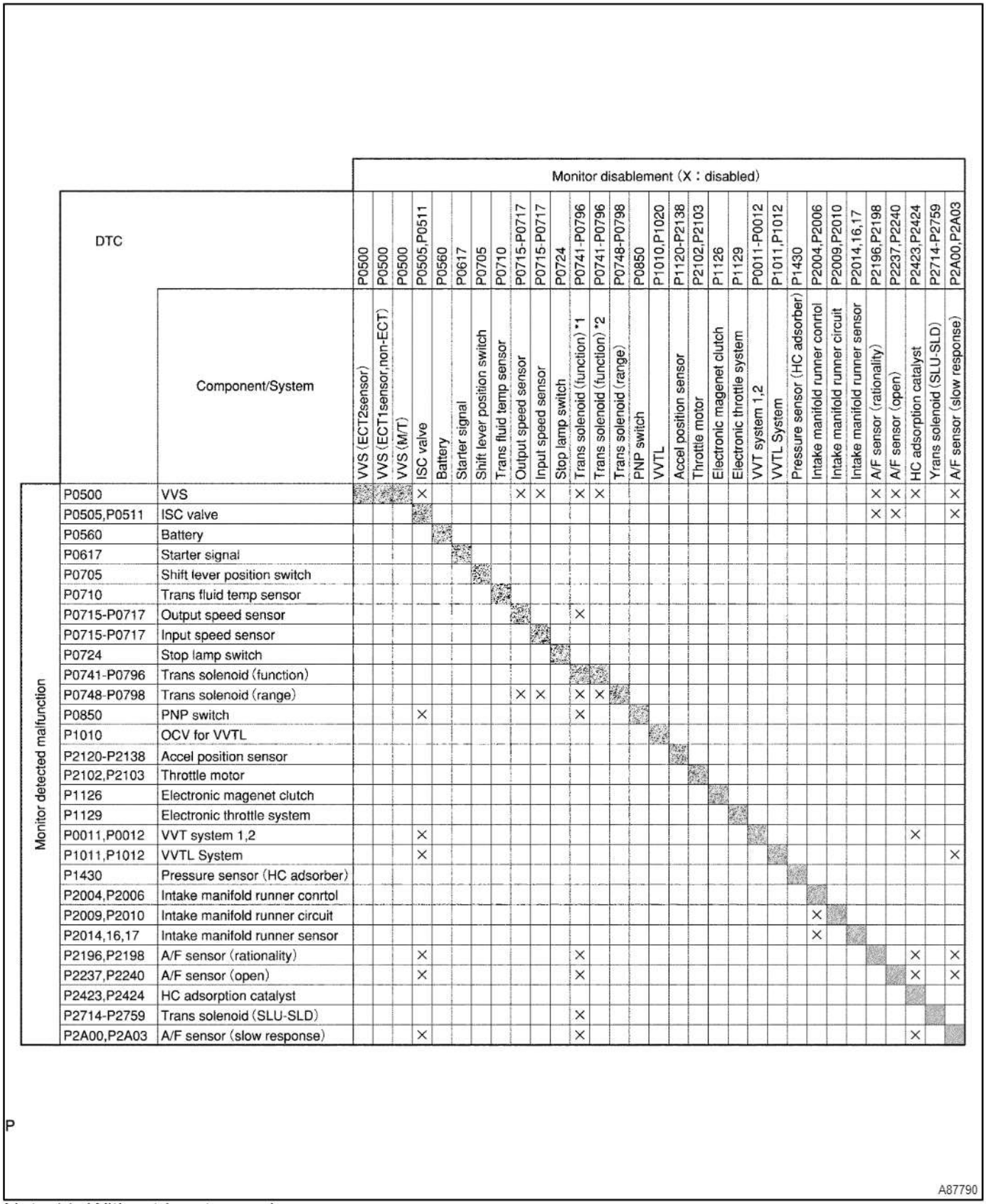
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Note *1: Without input speed sensor

Note *2: With input speed sensor

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Note *1: Without input speed sensor
Note *2: With input speed sensor

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05G1Q–01

O2S TEST RESULT

1. INTRODUCTION

The O2S TEST RESULT refers to the results of the engine control module (ECM) when it monitors the oxygen sensor (O2S), and it can be read using the hand–held tester or the generic OBD II scan tool. Based on this, you can find the O2S's conditions.

The ECM monitors the O2S in the various items. You can read the monitor result (TEST DATA) of each monitor item using the O2S TEST RESULT. However, the output value of the TEST DATA is the latest "snapshot" value that is it taken after monitoring and therefore it is not dynamic.

In this repair manual, the description of the O2S TEST RESULT (for O2S related DTCs) are written in a table.

This table consists of 5 items:

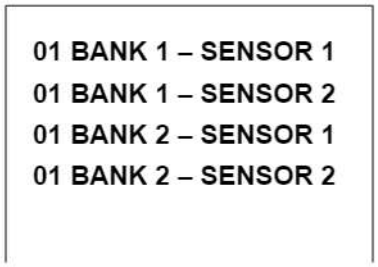
(1) TEST ID (a code applied to each TEST DATA)
(2) Description of TEST DATA
(3) Conversion Factor (When Conversion Factor has a value written in the table, multiply the TEST DATA value appearing on the scan tool by the Conversion Factor value. The result will be the required value.)
(4) Unit
(5) Standard Value

If the TEST DATA value appearing on the scan tool is out of the standard value, the O2S is malfunctioning. If it is within the standard value, the O2S is functioning normally. However, if the value is on the borderline of the standard value, the O2S may malfunction very soon.

2. HOW TO READ O2S TEST RESULT USING HAND–HELD TESTER

(a) Connect the hand–held tester to the DLC3.

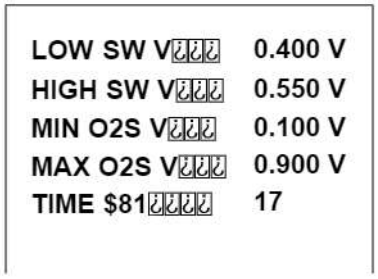
O2S TEST RESULT Screen



(b) On the tester screen, enter the following menus: DIAGNOSIS/CARB OBDII/O2S TEST RESULT. A list of the O2S equipped on the vehicle will be displayed.

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TEST DATA Screen



(c) Select the desired O2S and press ENTER. The screen shown on the left will appear.

(d) Press HELP and simultaneously. More information will appear.

(e) Example:

(1) The hand–held tester displays ”17” as a value of the ”TIME $81” (see the illustration on the left).

(2) Find the Conversion Factor value of ”TIME $81” in the O2S TEST RESULT chart below. 0.3906 is specified for $81 in this chart.

(3) Multiply ”17” in step (1) by 0.3906 (Conversion Factor) in the step (2).

17 x 0.3906 = 6.6 %

(4) If the answer is within the standard value, the ”TIME $81” can be confirmed to be normal.

O2S TEST RESULT Chart

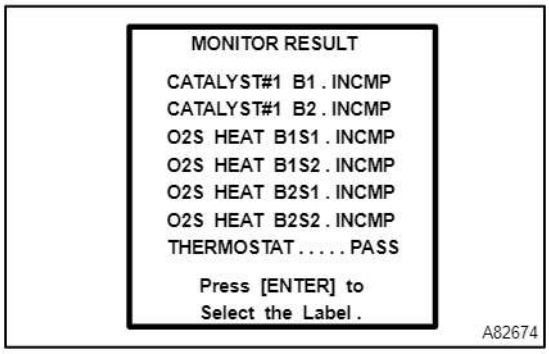
TEST ID	Description of TEST DATA	Conversion Factor	Unit	Standard Value
$81	Percentage of monitoring time when the O2S voltage is less than 0.05V	Multiply 0.3906	%	Within 60 %

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05G1R-01

CHECKING MONITOR STATUS

HINT:
"MONITOR RESULT" indicates normal or malfunction of each component and system when judgment has done.



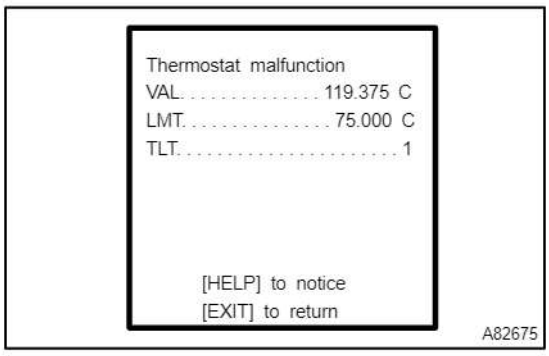
1. HOW TO READ DATA

(a) Connect the hand–held tester to the DLC 3.

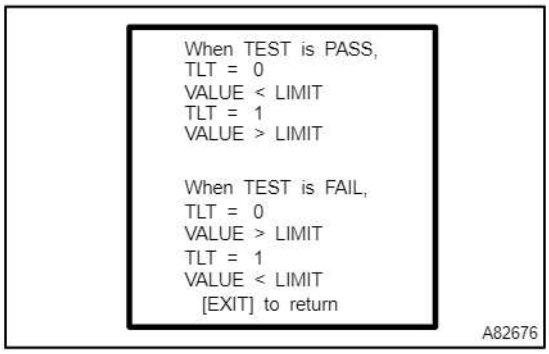
(b) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / MONITOR INFO / MONITOR RESULT
The Test ID will appear at the beginning of each line, followed by INCMP, PASS, or FAIL.

HINT:

- □ INCMP: Stands for "incomplete".The judgement has not been done yet.
- □ PASS: Normal is detected.
- □ FAIL: A malfunction has been detected.



(c) Select a Test ID that you want from the list and press the "ENTER" button. You will see the following screen:
(1) VAL (TEST VALUE) [Test Data] [Unit]
(2) LMT (TEST LIMIT) [Test Limit] [Unit]
(3) TLT [Test Limit Type]



(d) By pressing the "HELP" button, you can see more information.

HINT:

- □ Monitor test results can be viewed in the MONITOR RESULT screen.
- □ Monitor test results indicate the latest malfunction judgement result of this diagnostic.
- □ TEST VALUE indicates the detection parameter value (Example: P0128 Thermostat Malfunction = Engine coolant temperature) at the time of malfunction (or normal) judgement is done.
- □ TEST LIMIT indicates a threshold of malfunction judgement (Example: P0128 Thermostat Malfunction = 75 C).
- □ When the monitor runs, the monitored Parameter's VALUE is recorded. The value is then compared to the TEST LIMIT to determine if the result is PASS or FAIL.
- □ By comparing the Parameter VALUE to the TEST LIMIT, it is possible to determine the degree of failure.

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□ In rare cases, the monitor may have passed even with a DTC set and MIL illuminated. The monitor might detect malfunction on a previous trip, and then passed on the most recent trip. This would indicate an intermittent problem may be the cause of the DTC.

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05G1S–01

READINESS MONITOR DRIVE PATTERN

1. PURPOSE OF THE READINESS TESTS

- The On–Board Diagnostic (OBD II) system is designed to monitor the performance of emission–related components, and report any detected abnormalities with Diagnostic Trouble Codes (DTCs). Since various components need to be monitored during different driving conditions, the OBD II system is designed to run separate monitoring programs called readiness monitors.
- The hand–held tester's software must be version 9.0 or newer to view the readiness monitor status. From the "Enhanced OBD II Menu", select "Monitor Status" to view the readiness monitor status.
- A generic OBD II scan tool can also be used to view the readiness monitor status.
- When the readiness monitor status reads "complete", the necessary conditions have been met for running performance tests for that readiness monitor.

HINT:

Many state Inspection and Maintenance (I/M) programs require a vehicle's readiness monitor status to show "complete".

- The Readiness Monitor will be reset to "incomplete" if:
  - The ECM has lost battery power or blown a fuse.
  - DTCs have been cleared.
  - The conditions for running the Readiness Monitor have not been met.
- If the readiness monitor status shows "incomplete", follow the appropriate readiness monitor drive pattern to change the status to "complete".

CAUTION:

Strictly observe posted speed limits, traffic laws, and road conditions when performing these drive patterns.

NOTICE:

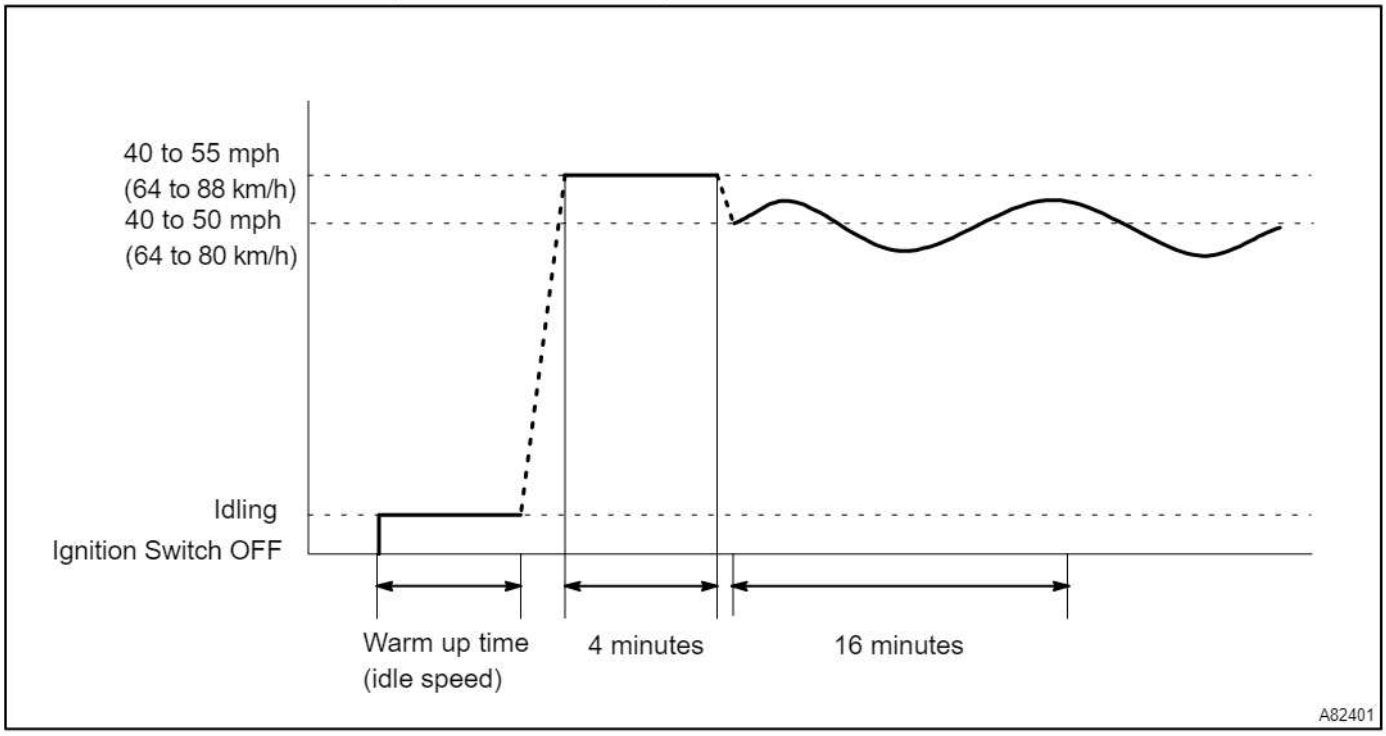
The following drive patterns are the fastest method of completing all the requirements necessary for making the readiness monitor status read "complete".

If forced to momentarily stop a drive pattern due to traffic or other factors, the drive pattern can be resumed. Upon completion of the drive pattern, in most cases, the readiness monitor status will change to "complete".

Sudden changes in vehicle load and speed, such as driving up and down hills and / or sudden acceleration, hinder readiness monitor completion.

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2. CATALYST MONITOR (A/F SENSOR TYPE)



(a) Preconditions

The monitor will not run unless:

- □ MIL is OFF.
- □ Engine Coolant Temperature (ECT) is 75°C (167°F) or higher.
- □ Intake Air Temperature (IAT) is –10°C (14°F) or higher.

NOTICE:

To completed the readiness test in cold ambient conditions (less than –10°C / 14°F), turn the ignition switch to the OFF position and then back to the ON position. Perform the drive pattern a second time.

(b) Drive Pattern

(1) Connect the hand–held tester or OBD II scan tool to DLC3 to check readiness monitor status and preconditions (refer to step "a").

(2) Drive the vehicle at 40 to 55 mph (64 to 88 km/h) for approximately 4 minutes.

NOTICE:

Drive with smooth throttle operation and avoid sudden acceleration.

If IAT was less than 10°C (50°F) when the engine was started, drive the vehicle at 40 to 55 mph (64 to 88 km/h) for additional 4 minutes.

(3) Drive the vehicle allowing speed to fluctuate between 40 to 50 mph (64 to 80 km/h) for approximately 16 minutes.

NOTICE:

Drive with smooth throttle operation and avoid sudden closure of the throttle.

(4) Check the status of the readiness monitor on the scan tool display. If the readiness monitor status did not switch to complete, ensure preconditions are met, turn the ignition switch to OFF, and then repeat steps (2) and (3).

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3. EVAP MONITOR (VACUUM PRESSURE MONITOR)

NOTICE:

A cold soak must be performed prior to conducting the drive pattern to complete the Internal Pressure Readiness Monitor.

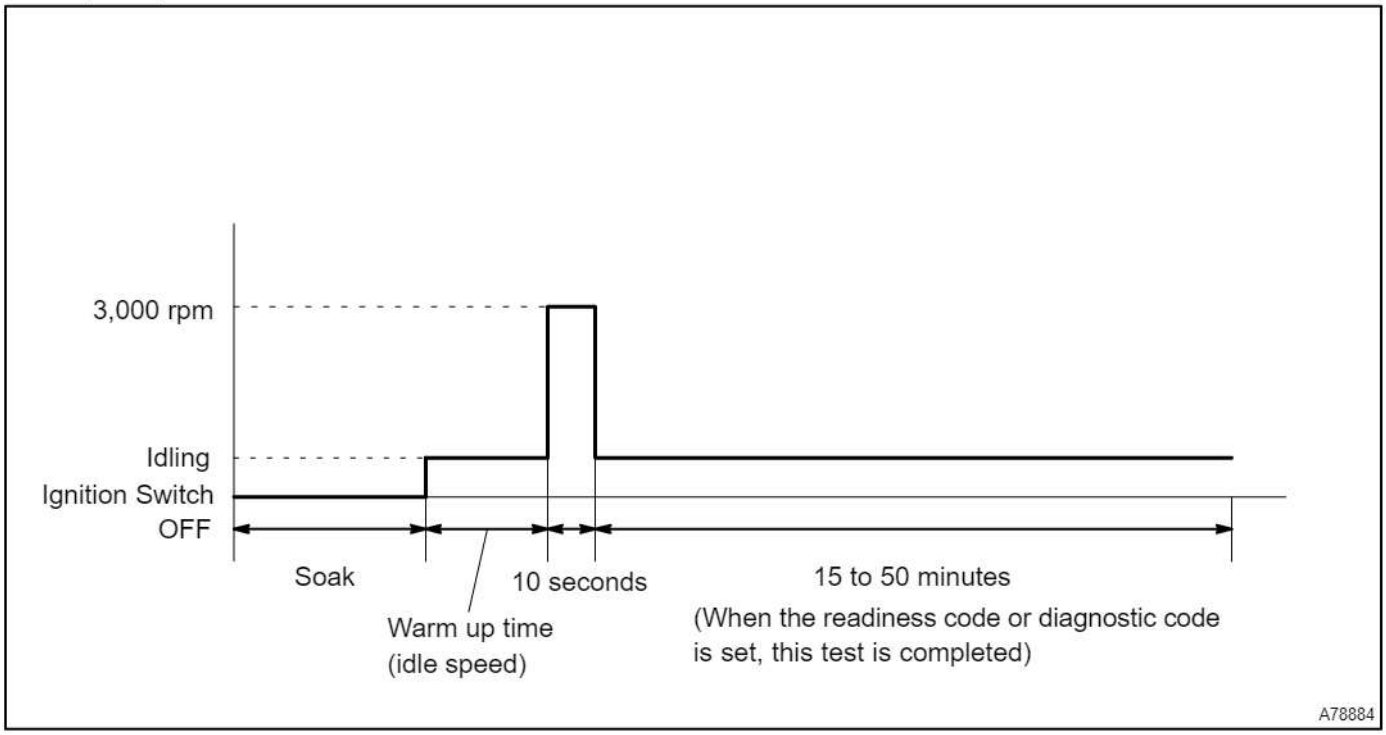
(a) Cold Soak Preconditions

The monitor will not run unless:

- □ MIL is OFF.
- □ Fuel level is approximately 1/2 to 3/4 full.
- □ Altitude is 8,000 feet (2,438 m) or less.

(b) Cold Soak Procedure

Let vehicle cold soak for 8 hours or until the difference between IAT and ECT leaches less than 7°C (13°F).



(c) Preconditions

The monitor will not run unless:

- □ MIL is OFF.
- □ Fuel level is approximately 1/2 to 3/4 full.
- □ Altitude is 8,000 feet (2,438 m) or less.
- □ Engine Coolant Temperature (ECT) is between 4.4°C and 35°C (40°F and 95°F).
- □ Intake Air Temperature (IAT) is between 4.4°C and 35°C (40°F and 95 °F).
- □ The cold soak procedure has been completed.
- □ Before starting the engine, the difference between ECT and IAT must be less than 7°C (13°F).

HINT:

□ Example 1

ECT = 24°C (75°F)

IAT = 16°C (60°F)

Difference between ECT and IAT is 8°C (15°F).

→ The monitor will not run because the difference between ECT and IAT is greater than 7°C (13°F).

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□ Example 2
ECT = 21°C (70°F)
IAT = 20°C (68°F)
Difference between ECT and IAT is 1°C (2°F).
→ The monitor will run because the difference between ECT and IAT is less than 7°C (13°F).

NOTICE:

The readiness test can be completed in cold ambient conditions (less than 4.4°C / 40°F) and/or at high altitudes (more than 8,000 feet / 2,438 m). Finish the drive pattern, turn the ignition switch OFF and then ON again, and repeat the drive pattern a second time.

(d) Drive Pattern
(1) Connect the hand–held tester or OBD II scan tool to DLC3 to check monitor status and preconditions (refer to step "a").
(2) Release pressure in fuel tank by removing the fuel tank cap and then reinstalling it.
(3) Start the engine and allow it to idle until ECT reaches 75°C (167°F) or higher.
(4) Run the engine at 3,000 rpm for approximately 10 seconds.
(5) With the engine idling, turn the A/C ON to create a slight electrical load. Wait for 15 to 50 minutes.

NOTICE:

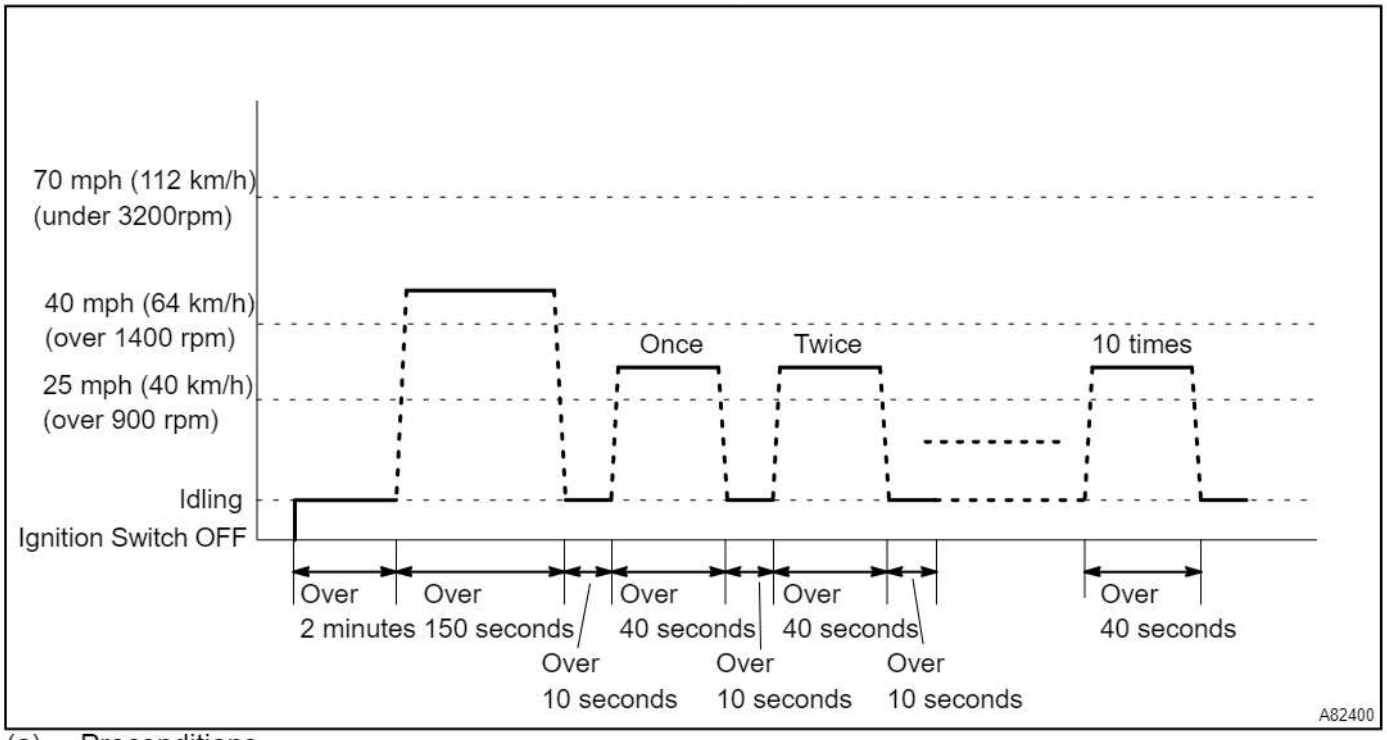
If the vehicle does not have A/C, put a slight electrical load on the engine by following the steps below:

□ **Apply the parking brake securely.**
□ **Use wheel chocks to secure the tires.**
□ **Move the shift lever to the D position and allow the engine to idle for 15 to 50 minutes.**

Check the readiness monitor status.

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4. OXYGEN / AIR FUEL RATIO SENSOR MONITOR (FRONT A/F SENSOR AND REAR O2S SYSTEM)



(a) Preconditions

The monitor will not run unless:

MIL is OFF

(b) Drive Pattern

(1) Connect the hand–held tester or OBD II scan tool to DLC3 to check monitor status and preconditions (refer to step "a").

(2) Start the engine and allow it to idle for 2 minutes or more.

(3) Drive the vehicle at 40 to 70 mph (64 to 112 km/h) at least for 150 seconds.

(4) Stop the vehicle and allow the engine to idle for 10 seconds or more.

(5) Drive the vehicle at 25 to 40 mph (40 to 64 km/h) at least for 40 seconds.

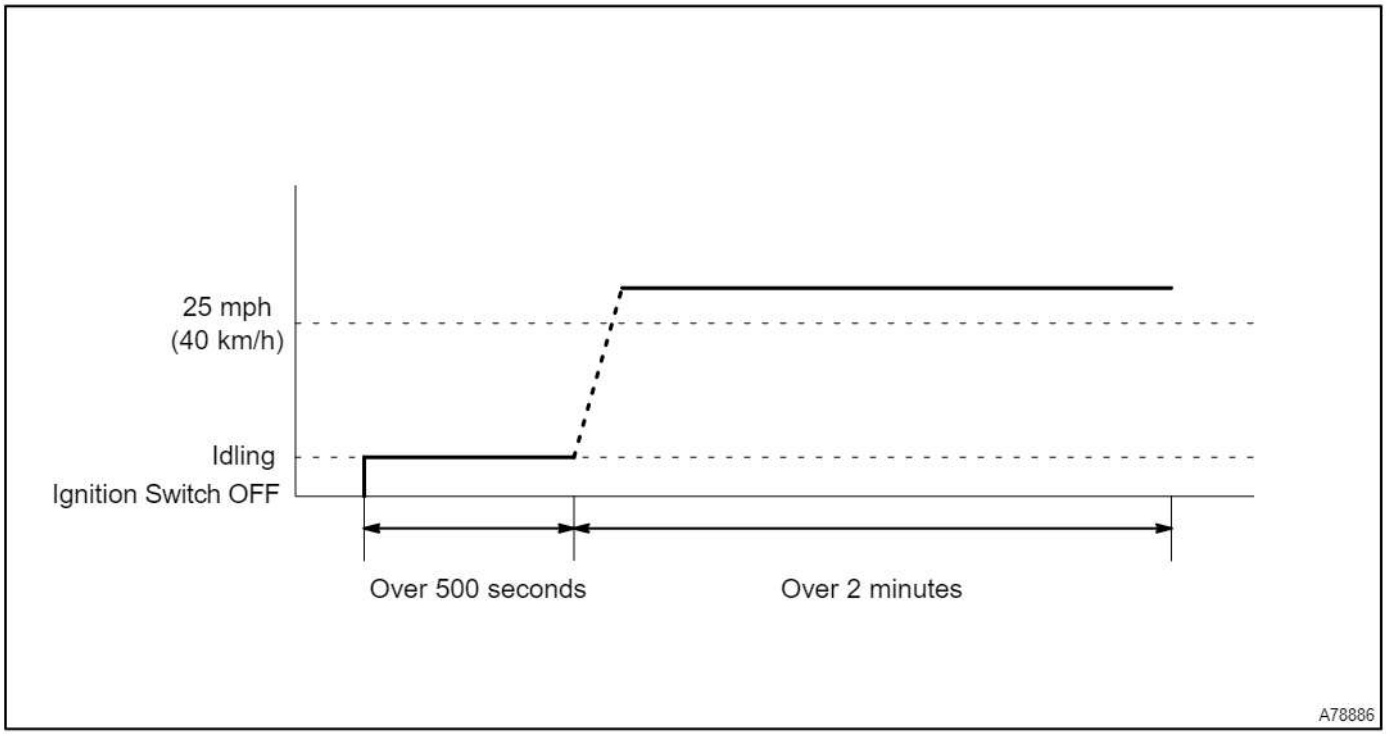
(6) Stop the vehicle and allow the engine to idle for 10 seconds or more.

(7) Perform steps (5) and (6) 10 times.

(8) Check the readiness monitor status. If the readiness monitor status did not change to "complete", check the preconditions, turn the ignition switch to OFF, and repeat steps (1) to (6).

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5. OXYGEN / A/F SENSOR HEATER MONITOR



(a) Preconditions
The monitor will not run unless:
MIL is OFF

(b) Drive Pattern
(1) Connect the hand–held tester or OBD II scan tool to DLC3 to check monitor status and preconditions (refer to step "a").
(2) Start the engine and allow it to idle for 500 seconds or more.
(3) Drive the vehicle at 25 mph (40 km/h) or more at least for 2 minutes.
(4) Check the readiness monitor status. If the readiness monitor status did not change to "complete", check the preconditions, turn the ignition switch to OFF, and repeat steps (2) and (3).

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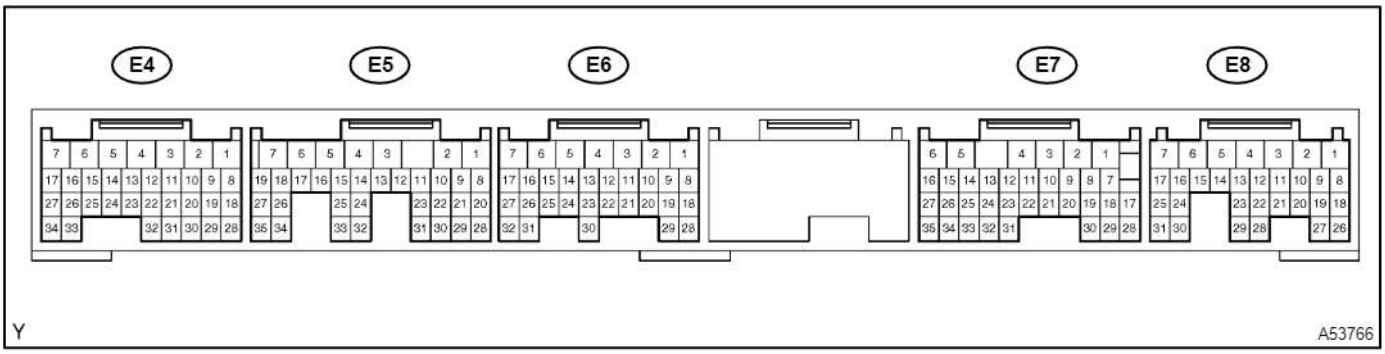
PROBLEM SYMPTOMS TABLE

Symptom	Suspected Area	See page
Engine does not crank (Does not start)	3. Cranking holding function circuit 4. Starter 5. Starter relay	05–635 19–1 19–1
No initial combustion (Does not start)	1. ECM power source circuit 2. Fuel pump control circuit 3. ECM	05–644 05–649 10–11
No complete combustion (Does not start)	1. Fuel pump control circuit	05–649
Difficult to start (Engine cranks normally)	1. Starter signal circuit 2. Fuel pump control circuit 3. Compression	05–565 05–649 14–1
Difficult to start with cold engine	1. Starter signal circuit 2. Fuel pump control circuit	05–565 05–649
Difficult to start with hot engine	1. Starter signal circuit 2. Fuel pump control circuit	05–565 05–649
High engine idle speed (Poor idling)	1. A/C signal circuit (Compressor circuit) 2. ECM power source circuit	05–1223 05–644
Low engine idle speed (Poor idling)	1. A/C signal circuit (Compressor circuit) 2. Fuel pump control circuit	05–1223 05–649
Rough idling (Poor idling)	1. Compression 2. Fuel pump control circuit	14–1 05–649
Hunting (Poor idling)	1. ECM power source circuit 2. Fuel pump control circuit	05–644 05–649
Hesitation/Poor acceleration (Poor driveability)	1. Fuel pump control circuit 2. A/T faulty	05–649 05–1078
Surging (Poor driveability)	1. Fuel pump control circuit	05–649
Engine stalls soon after starting	1. Fuel pump control circuit	05–649
Engine stalls during A/C operation	1. A/C signal circuit (Compressor circuit) 2. ECM	05–1223 10–11
Unable to refuel/Difficult to refuel	1. ORVR system	☑

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05286–23

TERMINALS OF ECM



HINT:

Each ECM terminal's standard voltage is shown in the table below.

In the table, first follow the information under "Condition". Next look under "Symbol (Terminal No.)" for the terminals to be inspected. The standard voltage between the terminals is shown under "Specific Condition". Use the illustration above as a reference for the ECM terminals.

Symbols (Terminal No.)	Wiring Color	Terminal Description	Condition	Specified Condition
BATT (E8–3) – E1 (E6–1)	L – BR	Battery (for measuring the battery voltage and for the ECM memory)	Always	9 to 14 V
+BM (E7–6) – E1 (E6–1)	GR – BR	Power source of throttle motor		
IGSW (E8–9) – E1 (E6–1)	B–O – BR	Ignition switch	Ignition switch ON	9 to 14 V
+B (E8–1) – E1 (E6–1)	B – BR	Power source of ECM		
+B2 (E8–2) – E1 (E6–1)	B – BR	Power source of ECM		
OC1+ (E6–16) – OC1– (E6–15)	G–Y – L–B	Camshaft timing oil control valve (OCV)	Ignition switch ON	Pulse generation (See page 05–376)
OC2+ (E6–14) – OC2– (E6–13)	L–W – L–R			
MREL (E8–8) – E1 (E6–1)	W–G – BR	EFI relay	Ignition switch ON	9 to 14 V
VC (E4–18) – E2 (E4–28)	L–R – BR	Power source for sensors (specific voltage)	Ignition switch ON	4.5 to 5.5 V
VG (E4–30) – E2G (E4–29)	R–Y – R–W	Mass air flow meter	Idling, Shift lever position P or N, A/C switch OFF	0.5 to 3.0 V
THA (E4–20) – E2 (E4–28)	R–B – BR	Intake air temperature sensor	Idling, Intake air temperature 20°C (68°F)	0.5 to 3.4 V
THW (E4–19) – E2 (E4–28)	B–L – BR	Engine coolant temperature sensor	Idling, Engine coolant temperature 80°C (176°F)	0.2 to 1.0 V
VTA1 (E4–21) – E2 (E4–28)	G–B – BR	Throttle position sensor (for engine control)	Ignition switch ON, Throttle valve fully closed	0.5 to 1.2 V
			Ignition switch ON, Throttle valve fully open	3.2 to 4.8 V
VTA2 (E4–31) – E2 (E4–28)	G–W – BR	Throttle position sensor (for sensor malfunction detection)	Ignition switch ON, Accelerator pedal released	2.1 to 3.1 V
			Ignition switch ON, Accelerator pedal depressed	4.5 to 5.5 V
VPA (E8–22) – EPA (E8–28)	W–R – LG–B	Accelerator pedal position sensor (for engine control)	Ignition switch ON, Accelerator pedal released	0.5 to 1.1 V
			Ignition switch ON, Accelerator pedal depressed	2.6 to 4.5 V
VPA2 (E8–23) – EPA2 (E8–29)	R–B – V–W	Accelerator pedal position sensor (for sensor malfunction detection)	Ignition switch ON, Accelerator pedal released	1.2 to 2.0 V
			Ignition switch ON, Accelerator pedal depressed	3.4 to 5.3 V

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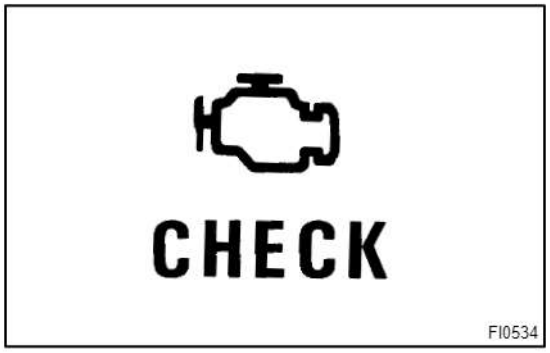
Symbols (Terminal No.)	Wiring Color	Terminal Description	Condition	Specified Condition
VCPA (E8–26) – EPA (E8–28)	B–Y – LG–B	Power source of accelerator pedal position sensor (for VPA)	Ignition switch ON	4.5 to 5.5 V
VCP2 (E8–27) – EPA2 (E8–29)	W–L – V–W	Power source of accelerator pedal position sensor (for VPA2)	Ignition switch ON	4.5 to 5.5 V
HA1A (E5–5) – E04 (E5–7)	R–L – W–B	A/F sensor heater	Idling	Below 3.0 V
HA2A (E5–4) – E05 (E5–6)	B–W – W–B		Ignition switch ON	9 to 14 V
A1A+ (E5–22) – E1 (E6–1)	P – BR	A/F sensor	Ignition switch ON	3.0 to 3.6 V
A2A+ (E5–23) – E1 (E6–1)	Y – BR			
A1A– (E5–30) – E1 (E6–1)	L – BR		Ignition switch ON	2.7 to 3.3 V
A2A– (E5–31) – E1 (E6–1)	BR – BR			
HT1B (E5–25) – E1 (E6–1)	G – BR	Heated oxygen sensor heater	Idling	Below 3.0 V
HT2B (E5–33) – E1 (E6–1)	L – BR		Ignition switch ON	9 to 14 V
OX1B (E5–21) – E2 (E4–28)	W – BR	Heated oxygen sensor	Maintain engine speed at 2,500 rpm for 2 minutes after warming up	Pulse generation
OX2B (E5–29) – E2 (E4–28)	B – BR			
#10 (E4–1) – E01 (E4–7)	R–L – W–B	Injector	Ignition switch ON	9 to 14 V
#20 (E4–2) – E01 (E4–7)	B – W–B			
#30 (E4–3) – E01 (E4–7)	R – W–B			
#40 (E4–4) – E01 (E4–7)	G – W–B		Idling	Pulse generation (See page 05–469)
#50 (E4–5) – E01 (E4–7)	Y – W–B			
#60 (E5–3) – E01 (E4–7)	L – W–B			
KNK1 (E5–1) – EKNK (E5–28)	B – W	Knock sensor	Maintain engine speed at 4,000 rpm after warming up	Pulse generation (See page 05–482)
KNK2 (E5–2) – EKN2 (E5–20)	G – R			
VV1+ (E6–27) – NE– (E6–24)	R – W	Variable valve timing (VVT) sensor	Idling	Pulse generation (See page 05–489)
VV2+ (E6–26) – NE– (E6–24)	Y – W			
NE+ (E6–25) – NE– (E6–24)	B – W	Crankshaft position sensor		
IGT1 (E4–8) – E1 (E6–1)	Y–R – BR	Ignition coil with igniter (ignition signal)	Idling	Pulse generation (See page 05–498)
IGT2 (E4–9) – E1 (E6–1)	P–L – BR			
IGT3 (E4–10) – E1 (E6–1)	LG – BR			
IGT4 (E4–11) – E1 (E6–1)	LG–B – BR			
IGT5 (E4–12) – E1 (E6–1)	GR – BR			
IGT6 (E4–13) – E1 (E6–1)	L – BR			
IGF1 (E4–24) – E1 (E6–1)	W–R – BR	Ignition coil with igniter (ignition confirmation signal)	Ignition switch ON	4.5 to 5.5 V
			Idling	Pulse generation (See page 05–498)
PRG (E4–34) – E1 (E6–1)	G–Y – BR	VSV for EVAP	Ignition switch ON	9 to 14 V
CCV (E4–27) – E1 (E6–1)	R–G – BR	VSV for CCV	Ignition switch ON	9 to 14 V
PTNK (E8–21) – E2 (E4–28)	O – BR	Vapor pressure sensor	Ignition switch ON	2.9 to 3.7 V
			Ignition switch ON, Apply vacuum of 4.0 kPa (30 mmHg, 1.18 in.Hg)	Below 0.5 V
SPD (E7–17) – E1 (E6–1)	V–R – BR	Speed signal from combination meter	Ignition switch ON, Rotate driving wheel slowly	Pulse generation (See page 05–547)
STA (E4–17) – E1 (E6–1)	B–Y – BR	Starter signal	Cranking	9 to 14 V
STAR (E5–9) – E1 (E6–1)	P – BR	Starter signal	Cranking	9 to 14 V
STSW (E6–12) – E1 (E6–1)	L–Y – BR	Starter signal	Cranking	9 to 14 V
STP (E7–19) – E1 (E6–1)	G–Y – BR	Stop lamp switch	Brake pedal depressed	7.5 to 14 V
			Brake pedal released	Below 1.5 V
ST1– (E7–12) – E1 (E6–1)	R–L – BR	Stop lamp switch (opposite to STP terminal)	Ignition switch ON, Brake pedal depressed	Below 1.5 V
			Ignition switch ON, Brake pedal released	7.5 to 14 V

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Symbols (Terminal No.)	Wiring Color	Terminal Description	Condition	Specified Condition
NSW (E4–16) – E1 (E6–1)	P – BR	Park/Neutral position switch	Ignition switch ON, Shift lever position in P or N	Below 3.0 V
			Ignition switch ON, Shift lever position in other than P and N	9 to 14 V
M+ (E6–3) – E1 (E6–1) M– (E6–2) – E1 (E6–1)	P – BR L – BR	Throttle motor	Idling	Pulse generation
FC (E8–10) – E1 (E6–1)	GR–B – BR	Fuel pump control	Ignition switch ON	9 to 14 V
FPR (E4–33) – E1 (E6–1)	Y–B – BR	Fuel pump control	Ignition switch ON	9 to 14 V
W (E8–11) – E1 (E6–1)	R–B – BR	MIL	Ignition switch ON	Below 3.0 V
			Idling	9 to 14 V
ELS (E8–12) – E1 (E6–1)	Y–G – BR	Electric load	Defogger switch OFF	0 to 1.5 V
			Defogger switch ON	7.5 to 14 V
ELS2 (E8–13) – E1 (E6–1)	G – BR	Electric load	Taillight switch OFF	0 to 1.5 V
			Taillight switch ON	7.5 to 14 V
TC (E8–20) – E1 (E6–1)	P–L – BR	Terminal TC of DLC 3	Ignition switch ON	9 to 14 V
SIL (E8–18) – E1 (E6–1)	R–Y – BR	Terminal SIL of DLC3	Connect the hand–held tester to DLC3	Pulse generation
TACH (E8–5) – E1 (E6–1)	B–W – BR	Engine speed	Idling	Pulse generation
ACIS (E4–15) – E1 (E6–1)	W–L – BR	VSV for ACIS	Ignition switch ON	9 to 14 V
ENG+ (E8–24) – ENG– (E8–30)	R – W	Electric load (from skid control ECU)	Idling	Pulse generation
TRC+ (E8–25) – TRC– (E8–31)	B – Y		Idling	Pulse generation
PSW (E6–10) – E1 (E6–1)	G–W – BR	P/S pressure switch	Ignition switch ON	9 to 14 V

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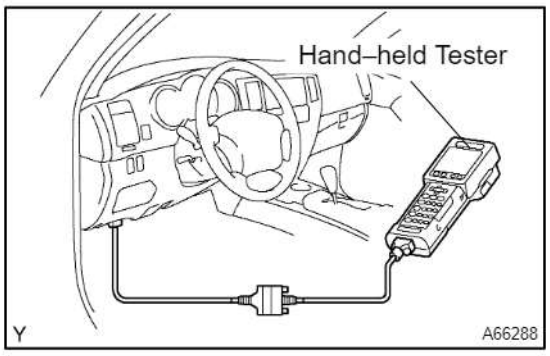
DIAGNOSIS SYSTEM

1. DESCRIPTION

□ When troubleshooting On–Board Diagnostic (OBD II) vehicles, the vehicle must be connected to the OBD II scan tool (in compliance with SAE J1978) or the hand held tester. Various data output from the vehicle's ECM can then be read.

□ OBD II regulations require that the vehicle's on–board computer illuminates the Malfunction Indicator Lamp (MIL) on the instrument panel when the computer detects a malfunction in: 1) the emission control system / components, or 2) the powertrain control components (which affect vehicle emissions), or 3) the computer. In addition, the applicable Diagnostic Trouble Codes (DTCs) prescribed by SAE J2012 are recorded in the ECM memory (see page 05–366).

If the malfunction does not reoccur in 3 consecutive trips, the MIL goes off automatically but the DTCs remain recorded in the ECM memory.



□ To check DTCs, connect the hand–held tester or OBD II scan tool to the Data Link Connector 3 (DLC3) of the vehicle. The hand–held tester or OBD II scan tool also enables you to erase the DTC and check the freeze frame data and various forms of engine data (see the instruction manual for the OBD II scan tool or the hand–held tester). The DTC includes SAE controlled codes and manufacturer controlled codes. SAE controlled codes must be set according to the SAE, while manufacturer controlled codes can be set by a manufacturer with certain restrictions (see the DTC chart on page 05–366).

□ The diagnosis system operates in normal mode during normal vehicle use. In "normal mode", 2 trip detection logic* is used to ensure accurate detection of malfunctions. A "check mode", is also available to technicians as an option. In "check mode", 1 trip detection logic is used for simulating malfunction symptoms and increasing the system's ability to detect malfunctions, including intermittent malfunctions (hand–held tester only) (see page 05–366).

□ *2 trip detection logic:
When a malfunction is first detected, the malfunction is temporarily stored in the ECM memory (1st trip). If the ignition switch is turned to OFF and then ON again, and the same malfunction is detected again, the MIL will illuminate (2nd trip).

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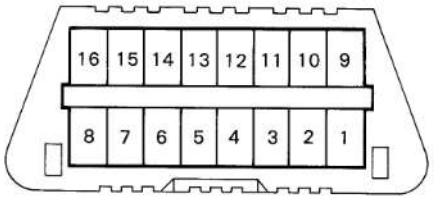
□ Freeze frame data:
The freeze frame data records the engine conditions (fuel system, calculated load, engine coolant temperature, fuel trim, engine speed, vehicle speed, etc.) when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

Priorities for troubleshooting:
When multiple DTCs occur, find out the order in which the DTCs should be inspected by checking the component's DTC chart. If no instructions are written in the DTC chart, check DTCs in the following order of priority:

(a) DTCs other than fuel trim malfunction DTCs (P0171, P0172, P0174 and P0175) and misfire DTCs (P0300 to P0306).
(b) Fuel trim malfunction DTCs (P0171, P0172, P0174 and P0175).
(c) Misfire DTCs (P0300 to P0306).

2. CHECK DLC3

The vehicle's ECM uses the ISO 9141–2 for communication protocol. The terminal arrangement of the DLC3 complies with SAE J1962 and matches the ISO 9141–2 format.



DLC3

Symbol	Terminal No.	Name	Reference Terminal	Result	Condition
SIL	7	Bus "+" line	5 – Signal ground	Pulse generation	During transmission
CG	4	Chassis ground	Body ground	1 Ω or less	Always
SG	5	Signal ground	Body ground	1 Ω or less	Always
BAT	16	Battery positive	Body ground	9 to 14 V	Always

HINT:
Connect the cable of the OBD II scan tool or the hand–held tester to the DLC3, turn the ignition switch to ON and attempt to use the hand–held tester. If the screen displays UNABLE TO CONNECT TO VEHICLE, a problem exists in the vehicle side or the tester side.

□ If the communication is normal when the tool is connected to another vehicle, inspect the DLC3 on the original vehicle.
□ If the communication is still impossible when the tool is connected to another vehicle, the problem is probably in the tool itself, so consult the Service Department listed in the tool's instruction manual.

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3. INSPECT BATTERY VOLTAGE

Battery Voltage: 11 to 14 V

If voltage is below 11 V, recharge the battery before proceeding.

4. CHECK MIL

(a) The MIL comes on when the ignition switch is turned to ON and the engine is not running.

HINT:

If the MIL is not illuminated, troubleshoot the MIL circuit (see page 05–661).

(b) When the engine is started, the MIL should turn off. If the MIL illuminates again, the diagnosis system has detected a malfunction or abnormality in the system.

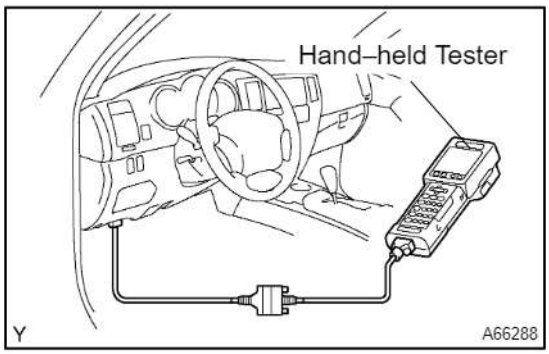
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DTC CHECK/CLEAR

NOTICE:

- **If no DTC appears in normal mode:**
  On the OBD II scan tool or the hand–held tester, check the pending fault code using the Continuous Test Results function (Mode 7 for SAE J1979).
- **When the diagnosis system is changed from normal mode to check mode or vice–versa, all DTCs and freeze frame data recorded in normal mode will be erased. Before changing modes, always check and make a note of DTCs and freeze frame data.**



1. CHECK DTC (Using the OBD II scan tool or hand–held tester)

(a) Connect the OBD II scan tool or hand–held tester to the DLC3.

(b) Turn the ignition switch to ON.

(c) Use the OBD II scan tool or the hand–held tester to check the DTCs and freeze frame data and then write them down. For the hand–held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODEDS. For the OBD II scan tool, see its instruction manual.

(d) See page 05–366 to confirm the details of the DTCs.

NOTICE:

- **When simulating a symptom with the OBD II scan tool (excluding hand–held tester) to check DTCs, use normal mode. For DTCs subject to "2 trip detection logic", perform either of the following actions.**
- **Turn the ignition switch to OFF after the symptom is simulated once. Then repeat the simulation process again. When the problem has been simulated again, the MIL illuminates and the DTCs are recorded in the ECM.**
- **Check the pending fault code using the Continuous Test Results function (Mode 7 for SAE J1979) on the OBD II scan tool.**

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2. CLEAR DTC (Using the OBD II scan tool or hand–held tester)

(a) Connect the OBD II scan tool or the hand–held tester to the DLC3.

(b) Turn the ignition switch to ON.

(c) Erase DTCs and freeze frame data with the OBD II scan tool (complying with SAE J1978) or the hand–held tester. For the hand–held tester: 1) enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CLEAR CODEDS; and 2) press YES. For the OBD II scan tool, see its instruction manual.

3. CLEAR DTC (Not using the OBD II scan tool or hand–held tester)

(a) Remove the EFI and ETCS fuse from the engine room J/B for more than 60 seconds, or disconnect the battery cable for more than 60 seconds. When disconnecting the battery cable, perform the ”INITIALIZE” procedure.

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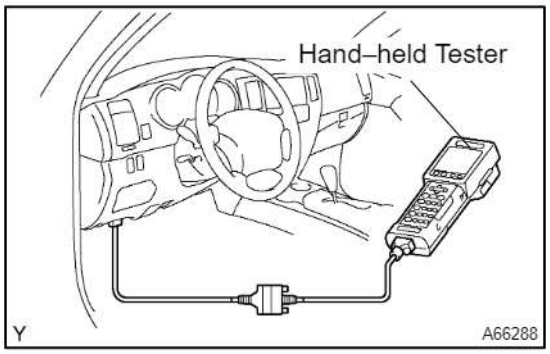
CHECK MODE PROCEDURE

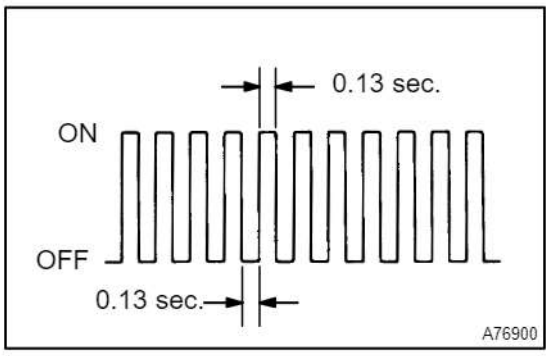
HINT:

Hand–held tester only:

Check mode has a higher sensitivity to detect malfunctions and can detect malfunctions that normal mode cannot detect.

Check mode can also detect all the malfunctions that normal mode can detect.





1. CHECK MODE PROCEDURE(Using the hand–held tester)

(a) Make sure that the items below are true.
  (1) Battery positive voltage 11 V or more
  (2) Throttle valve fully closed
  (3) Transmission in the P or N position
  (4) A/C switched OFF

(b) Turn the ignition switch to OFF.

(c) Connect the hand–held tester to the DLC3.

(d) Turn the ignition switch to ON.

(e) Change the ECM to check mode with the hand–held tester. Make sure the MIL flashes as shown in the illustration.

NOTICE:

All DTCs and freeze frame data recorded will be erased if: 1) the hand–held tester is used to change the ECM from normal mode to check mode or vice–versa; or 2) during check mode, the ignition switch is turned from ON to ACC or OFF.

(f) Start the engine. The MIL should turn off after the engine starts.

(g) Simulate the conditions of the malfunction described by the customer.

(h) After simulating the malfunction conditions, use the hand–held tester diagnosis selector to check the DTC, freeze frame data and other data.

(i) After checking the DTC, inspect the applicable circuit.

2. CLEAR DTC (Using the OBD II scan tool or hand–held tester)

(a) Connect the OBD II scan tool or hand–held tester to the DLC3.

(b) Turn the ignition switch to ON.

(c) Erase DTCs and freeze frame data with the OBD II scan tool (complying with SAE J1978) or the hand–held tester. For the hand–held tester: 1) enter the following menus: DIAGNOSIS ENHANCED OBD II / DTC INFO / CLEAR CODES; and 2) press YES. For the OBD II scan tool, see its instruction manual.

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3. CLEAR DTC (Not using the OBD II scan tool or hand–held tester)

(a) Remove the EFI and ETCS fuse from the engine room J/B for more than 60 seconds, or disconnect the battery cable for more than 60 seconds. When disconnecting the battery cable, perform the "INITIALIZE" procedure.

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05G1W–01

FAIL–SAFE CHART

If any of the following codes are recorded, the ECM enters the fail–safe mode.

DTC No.	Fail–Safe Operation	Fail–Safe Deactivation Condition
P0031 P0032 P0037 P0038 P0051 P0052 P0057 P0058	Turn off sensor heater	Ignition switch OFF
P0100 P0102 P0103	Ignition timing is calculated from engine RPM and TP (Throttle Position)	"Pass" condition detected
P0110 P0112 P0113	IAT (Intake Air Temperature) is fixed at 20°C (68°F)	"Pass" condition detected
P0115 P0117 P0118	ECT (Engine Coolant Temperature) is fixed at 80°C (176°F)	"Pass" condition detected
P0120 P0121 P0122 P0123 P0220 P0222 P0223 P2102 P2103 P2111 P2112 P2118 P2119 P2135	If the Electronic Throttle Control System (ETCS) has a malfunction, the ECM cuts off current to the throttle control motor. The throttle control valve returns to a predetermined opening angle (approximately 16□) by the force of the return spring. The ECM then adjusts the engine output by controlling the fuel injection (intermittent fuel–cut) and ignition timing in accordance with the accelerator pedal opening angle to enable the vehicle to continue at a minimal speed. If the accelerator pedal is depressed firmly and slowly, the vehicle can be driven slowly. If the accelerator pedal is depressed quickly, the vehicle may speed up and slow down erratically.	"Pass" condition detected and then the ignition switch OFF
P0325 P0327 P0328 P0330 P0332 P0333	Maximum ignition timing retardation	Ignition switch OFF
P0351 P0352 P0353 P0354 P0355 P0356	Fuel is cut	"Pass" condition detected
P2120 P2121 P2122 P2123 P2125 P2127 P2128 P2138	The accelerator pedal position sensor has two (main and sub) sensor circuits. If a malfunction occurs in either of the sensor circuits, the ECM detects the abnormal signal voltage difference between the two sensor circuits and switches to limp mode. In limp mode, the functioning circuit is used to calculate the accelerator pedal opening angle to allow the vehicle to continue driving. If both circuits malfunction, the ECM regards the opening angle of the accelerator pedal to be fully closed. In this case, the throttle valve will remain closed as if the engine was idling.	"Pass" condition detected and then the ignition switch OFF

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DATA LIST/ACTIVE TEST

1. DATA LIST

HINT:

Using the hand–held tester DATA LIST allows switch, sensor, actuator and other item values to be read without removing any parts. Reading DATA LIST early in troubleshooting is one way to shorten labor time.

NOTICE:

In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

(a) Warm up the engine.
(b) Turn the ignition switch to OFF.
(c) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(d) Turn the ignition switch to ON.
(e) Turn ON the hand–held tester.
(f) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST.
(g) According to the display on the tester, read DATA LIST.

Hand–held Tester Display	Measurement Item/Range (Display)	Normal Condition *	Diagnostic Note
INJECTOR	Injection period of the No. 1 cylinder/ Min.: 0 ms, Max.: 32.64 ms	Idling: 1.6 to 2.4 ms	□
IGN ADVANCE	Ignition timing advance for No. 1 cylinder/ Min.: –64 deg., Max.: 63.5 deg.	Idling: BTDC 7 to 24°	□
CALC LOAD	Calculated load by ECM/ Min.: 0 %, Max.: 100 %	□Idling: 11.4 to 16.4 % □Running without load (2,500 rpm): 13.1 to 18.9 %	□
MAF	Air flow rate from MAF sensor/ Min.: 0 gm/s, Max.: 655 gm/s	□Idling: 3.2 to 4.7 gm/s □Running without load (2,500 rpm): 13.1 to 18.9 gm/s	If value is approximately 0.0 gm/s: □Open in mass air flow meter power source circuit □Open or short VG circuit If value is 271.0 gm/s or more: □Open in E2G circuit
ENGINE SPD	Engine speed/ Min.: 0 rpm, Max.: 16,383 rpm	Idling: 650 to **750** rpm	□
COOLANT TEMP	Coolant temperature/ Min.: –40 C, Max.: 140 C	After warming up: 80 to 95°C (176 to 203°F)	If value is –40 C or 140 C, sensor circuit is open or shorted
INTAKE AIR	Intake air temperature/ Min.: –40 C, Max.: 140 C	Equivalent to ambient intake temperature (after cold soak)	If value is –40 C or 140 C, sensor circuit is open or shorted
THROTTLE POS	Absolute throttle position sensor/ Min.: 0 %, Max.: 100 %	□Throttle fully closed: 10 to 24 % □Throttle fully open: 64 to 96 %	Read value with ignition switch ON (Do not start engine)
CTP SW	Closed throttle position switch/ ON or OFF	□Throttle fully closed: ON □Throttle open: OFF	□
VEHICLE SPD	Vehicle speed/ Min.: 0 km/h, Max.: 255 km/h	Actual vehicle speed	Speed indicated on speedometer
ACCEL POS #1	Accelerator pedal position sensor No.1 output voltage/ Min.: 0 V, Max.: 5 V	□Accelerator pedal released: 0.5 to 1.1 V □Accelerator pedal depressed: 2.6 to 4.5 V	Read value with ignition switch ON (Do not start engine)
ACCEL POS #2	Accelerator pedal position sensor No.2 output voltage/ Min.: 0 V, Max.: 5 V	□Accelerator pedal released: 1.2 to 2.0 V □Accelerator pedal depressed: 3.4 to 5.3 V	Read value with ignition switch ON (Do not start engine)

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Hand–held Tester Display	Measurement Item/Range (Display)	Normal Condition *	Diagnostic Note
THROTTLE POS #2	Throttle position sensor No.2 output voltage/ Min.: 0 V, Max.: 5 V	□Throttle fully closed: 2.1 to 3.1 V □Throttle fully open: 4.5 to 5.5 V	Read value with ignition switch ON (Do not start engine)
THROTTLE TARGT	Target position of throttle valve/ Min.: 0 V, Max.: 5 V	Idling: 0.4 to 1.1 V	Read value with ignition switch ON (Do not start engine)
THROTTLE OPN DUTY	Throttle motor opening duty ratio/ Min.: 0 %, Max.: 100 %	Throttle fully closed: 0 %	□When accelerator pedal is depressed, duty ratio is increased □Read value with ignition switch ON (Do not start engine)
THROTTLE CLS DUTY	Throttle motor closed duty ratio/ Min.: 0 %, Max.: 100 %	Throttle fully closed: 0 %	□When accelerator pedal is released quickly, duty ratio is increased □Read value with ignition switch ON (Do not start engine)
THROTTLE MOT	Whether or not throttle motor control is permitted/ ON or OFF	Idling: ON	Read value with ignition switch ON (Do not start engine)
+BM	Whether or not electric throttle control system power is inputted/ ON or OFF	Idling: ON	□
ACCEL IDL POS	Whether or not accelerator pedal position sensor is detecting idle/ ON or OFF	Idling: ON	□
THROTTLE IDL POS	Whether or not throttle position sensor is detecting idle/ ON or OFF	Idling: ON	□
FAIL #1	Whether or not fail safe function is executed/ ON or OFF	ETCS has failed: ON	□
FAIL #2	Whether or not fail safe function is executed/ ON or OFF	ETCS has failed: ON	□
THROTTLE INITIAL	Throttle fully closed (learned value) Min.: 0 V, Max.: 5 V	0.5 to 0.9 V	□
ACCEL LEARN VAL	Accelerator fully closed (learned value) Min.: 0 V, Max.: 5 V	0.4 to 0.8 V	□
THROTTLE MOT	Throttle motor current Min.: 0 A, Max.: 20 A	Idling: 0 to 3.0 A	□
O2S B1 S2	Heated oxygen sensor output voltage for bank 1 sensor 2/ Min.: 0 V, Max.: 1.275 V	Driving (31 mph, 50 km/h): 0.1 to 0.9 V	Performing the INJ VOL or A/F CONTROL function of the ACTIVE TEST enables the technician to check the voltage output of each sensor
O2S B2 S2	Heated oxygen sensor output voltage for bank 2 sensor 2/ Min.: 0 V, Max.: 1.275 V	Driving (31 mph, 50 km/h): 0.1 to 0.9 V	
AFS B1 S1	A/F sensor output voltage for bank 1 sensor 1/ Min.: 0 V, Max.: 7.999 V	Idling 2.8 to 3.8 V	
AFS B2 S1	A/F sensor output voltage for bank 2 sensor 1/ Min.: 0 V, Max.: 7.999 V	Idling 2.8 to 3.8 V	
VAPOR PRESS	Vapor Pressure/ Min.: –4.125 kPa, Max.: 2.125 kPa	Fuel tank cap removed: 0 kPa	Pressure inside fuel tank is monitored by the vapor pressure sensor
SHORT FT #1	Short–term fuel trim of bank 1/ Min.: –100 %, Max.: 100%	0 ± 20 %	This item is short–term fuel compensation used to maintain air–fuel ratio at stoichiometric air–fuel ratio

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Hand–held Tester Display	Measurement Item/Range (Display)	Normal Condition *	Diagnostic Note
LONG FT #1	Long–term fuel trim of bank 1/ Min.: –100 %, Max.: 100 %	0 ± 20 %	This item is overall long–term fuel compensation that helps to maintain air–fuel ratio at stoichiometric air–fuel ratio (steadies long term deviations of short–term fuel trim from central value)
SHORT FT #2	Short–term fuel trim of bank 2/ Min.: –100 %, Max.: 100 %	0 ± 20 %	This item is short–term fuel compensation used to maintain air–fuel ratio at stoichiometric air–fuel ratio
LONG FT #2	Long–term fuel trim of bank 2/ Min.: –100 %, Max.: 100 %	0 ± 20 %	This item is overall long–term fuel compensation that helps to maintain air–fuel ratio at stoichiometric air–fuel ratio (steadies long term deviation of short–term fuel trim from central value)
O2FT B1 S2	Short–term fuel trim associated with the bank 1 sensor 2/ Min.: –100 %, Max.: 100 %	0 ± 20 %	Same as SHORT FT #1
O2FT B2 S2	Short–term fuel trim associated with the bank 2 sensor 2/ Min.: –100 %, Max.: 100 %	0 ± 20 %	Same as SHORT FT #2
AF FT B1 S1	Short–term fuel trim associated with the bank 1 sensor 1/ Min.: 0, Max.: 1.999	□Value less than 1 (0.000 to 0.999) = Lean □Stoichiometric air–fuel ratio=1 □Value greater than 1 (1.001 to 1.999) = RICH	□
AF FT B2 S1	Short–term fuel trim associated with the bank 2 sensor 1/ Min.: 0, Max.: 1.999	□Lean: 0 ⎪ AF FT B2 S1 < 1 □Stoichiometric air–fuel ratio=1 □Rich: 1 ⎪ AF FT B2 S1< 1.999	□
FUEL SYS #1	Fuel system status (Bank1) / OL or CL or OL DRIVE or OL FAULT or CL FAULT	Idling after warming up: CL	□OL (Open Loop): Has not yet satisfied conditions to go closed loop □CL (Closed Loop): Using heated oxygen sensor(s) as feed back for fuel control. □OL DRIVE: Open loop due to driving conditions (fuel enrichment) □OL FAULT: Open loop due to detected system fault □CL FAULT: Closed loop but one of heated oxygen sensors, which is used for fuel control, is malfunctioning
FUEL SYS #2	Fuel system status (Bank2) / OL or CL or OL DRIVE or OL FAULT or CL FAULT		
FC IDL	Fuel cut idle/ ON or OFF	Fuel cut operation: ON	FC IDL = "ON" when throttle valve is fully closed and engine speed is over 1,500 rpm
MIL	MIL status/ ON or OFF	MIL ON: ON	□
STARTER SIG	Starter signal/ ON or OFF	Cranking: ON	□
A/C SIG	A/C signal/ ON or OFF	A/C ON: ON	□
PNP SW [NSW]	Park/Neutral position switch signal/ ON or OFF	P or N position: ON	□
ELECT LOAD SIG	Electrical load signal/ ON or OFF	□Taillight switch ON: ON □Defogger switch ON: ON	□
STOP LIGHT SW	Stop lamp switch/ ON or OFF	□Brake pedal depressed: ON □Brake pedal released: OFF	□

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Hand–held Tester Display	Measurement Item/Range (Display)	Normal Condition *	Diagnostic Note
PS OIL PRESS SW	Power steering oil pressure switch signal/ ON or OFF	□While turning the steering wheel: ON □While not turning the steering wheel: OFF	Idle–up control is performed when PS is ON
PS SIGNAL	Power steering signal/ ON or OFF	When the steering wheel is turned	This signal is usually ON until the ignition switch is turned to OFF
INTAKE CTL VSV1	VSV status for intake control (bank1)/ ON or OFF	VSV operation: ON	□
INTAKE CTL VSV 2	VSV status for intake control (bank1)/ ON or OFF	VSV operation: ON	□
FUEL PUMP SP CTL	Fuel pump speed control status/ ON or OFF	□Idling: ON □Cranking: OFF	□
FUEL PUMP / SPD	Fuel pump/speed status/ ON/H or OFF/M,L	Idling: ON	□
A/C MAG CLUTCH	A/C magnet clutch status/ ON or OFF	A/C magnet clutch ON: ON	□
EVAP VSV	VSV status for EVAP control/ ON or OFF	VSV operating: ON	VSV for EVAP is controlled by the ECM (ground side duty control)
VVT CTRL B2	VVT control status (bank 2)/ ON or OFF	VVT system operation: ON	□
VVT CTRL B1	VVT control status (bank 1)/ ON or OFF	VVT system operation: ON	□
IGNITION	Ignition counter/ Min.: 0, Max.: 600	0 to 600	□
CYL #1, #2, #3, #4, #5, #6	Misfire ratio of the cylinder 1 to 6/ Min.: 0 %, Max.: 50 %	0 %	This item is displayed in only idling
MISFIRE LOAD	Engine load for first misfire range/ Min.: 0 g/rev, Max.: 3.98 g/rev	Misfire 0: 0 g/rev	□
MISFIRE RPM	Engine RPM for first misfire range/ Min.: 0 rpm, Max.: 6,375 rpm	Misfire 0: 0 rpm	□
FC TAU	Fuel cut TAU: Fuel cut during very light load/ ON or OFF	Fuel cut operating: ON	Fuel cut is being performed under very light load to prevent engine combustion from becoming incomplete
CHECK MODE	Check mode/ ON or OFF	Check mode ON: ON	See page 05–357

*: If no conditions are specifically stated for "Idling", the shift lever is in the N or P position, the A/C switch is OFF and all accessory switches are OFF.

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2. ACTIVE TEST

HINT:

Performing ACTIVE TEST using the hand–held tester allows the relay, VSV, actuator and so on to operate without parts removal. Performing ACTIVE TEST as a first step of troubleshooting is one method to shorten diagnostic time.

It is possible to display DATA LIST during ACTIVE TEST.

(a) Warm up the engine.
(b) Turn the ignition switch to OFF.
(c) Connect the hand–held tester to the DLC3.
(d) Turn the ignition switch to ON.
(e) Turn the hand–held tester ON.
(f) Enter the following menus: DIAGNOSIS/ENHANCED OBD II/ACTIVE TEST.
(g) According to the display on the tester, perform the ACTIVE TEST.

Hand–held Tester Display	Test Details	Diagnostic Note
INJ VOL	[Test Details] Control the injection volume Min.: –12.5 %, Max.: 25 % [Vehicle Condition] Engine speed: 3,000 rpm or less	□All injectors are tested at once □Injection volume is gradually changed between –12.5 and 25 %
A/F CONTROL	[Test Details] Control the injection volume –12.5 or 25 % (Change the injection volume –12.5 % or 25 %) [Vehicle Condition] Engine speed: 3,000 rpm or less	Following A/F CONTROL procedure enables the technician to check and graph voltage output of both the A/F sensor and heated oxygen sensor To display a graph, enter ACTIVE TEST / A/F CONTROL / USER DATA, select "AFS B1S1 and O2S B1S2" or "AFS B2S1 and O2S B2S2" by pressing "YES" followed by "ENTER" and then "F4"
FUEL PMP SP CTL	[Test Details] Control the fuel pump speed ON or OFF	□
INTAKE CTL VSV1	[Test Details] Activate the VSV for intake control ON or OFF	□
CAN CTRL VSV	[Test Details] Activate the VSV for canister control ON or OFF	□
EVAP VSV (ALONE)	[Test Details] Activate the VSV for EVAP control ON or OFF	□
A/C MAG CLUTCH	[Test Details] Control the A/C magnet clutch ON or OFF	□
FUEL PUMP / SPD	[Test Details] Control the fuel pump ON or OFF	□
VVT CTRL B1	[Test Details] Activate the VVT system (Bank 1) ON or OFF	□ON: Rough idle or engine stall □OFF: Normal engine speed
VVT CTRL B2	[Test Details] Activate the VVT system (Bank 2) ON or OFF	□ON: Rough idle or engine stall □OFF: Normal engine speed

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Hand–held Tester Display	Test Details	Diagnostic Note
ACM INHIBIT	[Test Details] Control the ACM inhibit ON or OFF	□
TC/TE1	[Test Details] Connect the TC and TE1 ON or OFF	□
FC IDL PROHBT	[Test Details] Control the idle fuel cut prohibit ON or OFF	□

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05284–24

DIAGNOSTIC TROUBLE CODE CHART

HINT:

Parameters listed in the chart may be different than your readings depending on the type of instrument used and other factors.

During the DTC check, refer to the table below if a malfunction code is displayed. For details about each code, refer to the page number in the DTC chart in the left column.

DTC No. (See Page)	Detection Item	Trouble Area	MIL*1	Memory
P0010 (05–376)	Camshaft Position "A" Actuator Circuit (Bank 1)	□Open or short in OCV circuit □OCV (bank 1) □ECM		
P0011 (05–383)	Camshaft Position "A" –Timing Over–Advanced or System Performance (Bank 1)	□Valve timing □OCV □Camshaft timing gear assembly □ECM		
P0012 (05–383)	Camshaft Position "A" –Timing Over– Retarded (Bank 1)	□Same as DTC P0011		
P0016 (05–391)	Camshaft Position – Camshaft Position Correlation (Bank 1 Sensor A)	□Mechanical system (Jumped tooth of timing chain, chain stretched) □ECM		
P0018 (05–391)	Camshaft Position – Camshaft Position Correlation (Bank 2 Sensor A)	□Same as DTC P0016		
P0020 (05–376)	Camshaft Position "A" Actuator Circuit (Bank 2)	□Open or short in OCV circuit □OCV (bank 2) □ECM		
P0021 (05–383)	Camshaft Position "A" –Timing Over–Advanced or System Performance (Bank 2)	□Same as DTC P0011		
P0022 (05–383)	Camshaft Position "A" –Timing Over– Retarded (Bank 2)	□Same as DTC P0012		
P0031 *3 (05–393)	Oxygen (A/F) Sensor Heater Control Circuit Low (Bank 1 Sensor 1)	□Open or short in heater circuit of A/F sensor □A/F sensor heater (bank1 sensor1) □A/F sensor heater relay □ECM		
P0032 *3 (05–393)	Oxygen (A/F) Sensor Heater Control Circuit High (Bank 1 Sensor 1)	□Short in heater circuit of A/F sensor □A/F sensor heater (bank1 sensor1) □A/F sensor heater relay □ECM		
P0037 (05–398)	Oxygen Sensor Heater Control Circuit Low (Bank 1 Sensor 2)	□Open or short in heater circuit of heated oxygen sensor □Heated oxygen sensor heater (bank1 sensor2) □EFI relay □ECM		
P0038 (05–398)	Oxygen Sensor Heater Control Circuit High (Bank 1 Sensor 2)	□Short in heater circuit of heated oxygen sensor □Heated oxygen sensor heater (bank1 sensor2) □EFI relay □ECM		
P0051 *3 (05–393)	Oxygen (A/F) Sensor Heater Control Circuit Low (Bank 2 Sensor 1)	□Open or short in heater circuit of A/F sensor □A/F sensor heater (bank2 sensor1) □A/F sensor heater relay □ECM		
P0052 *3 (05–393)	Oxygen (A/F) Sensor Heater Control Circuit High (Bank 2 Sensor 1)	□Short in heater circuit of A/F sensor □A/F sensor heater (bank2 sensor1) □A/F sensor heater relay □ECM		

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DTC No. (See Page)	Detection Item	Trouble Area	MIL*1	Memory
P0057 (05–398)	Oxygen Sensor Heater Control Circuit Low (Bank 2 Sensor 2)	□Open or short in heater circuit of heated oxygen sensor □Heated oxygen sensor heater (bank2 sensor2) □EFI relay □ECM		
P0058 (05–398)	Oxygen Sensor Heater Control Circuit High (Bank 2 Sensor 2)	□Short in heater circuit of heated oxygen sensor □Heated oxygen sensor heater (bank2 sensor2) □EFI relay □ECM		
P0100 (05–403)	Mass or Volume Air Flow Circuit	□Open or short in mass air flow meter circuit □mass air flow meter □ECM		
P0101 (05–410)	Mass or Volume Air Flow Circuit Range/Performance Problem	□Mass air flow meter		
P0102 (05–403)	Mass or Volume Air Flow Circuit Low Input	□Open in mass air flow meter circuit □Short in ground circuit □Mass air flow meter □ECM		
P0103 (05–403)	Mass or Volume Air Flow Circuit High Input	□Short in mass air flow meter circuit (+B circuit) □Mass air flow meter □ECM		
P0110 (05–412)	Intake Air Temperature Circuit	□Open or short in intake air temperature sensor circuit □Intake air temperature sensor (built in mass air flow meter) □ECM		
P0112 (05–412)	Intake Air Temperature Circuit Low Input	□Short in intake air temperature sensor circuit □Intake air temperature sensor (built in mass air flow meter) □ECM		
P0113 (05–412)	Intake Air Temperature Circuit High Input	□Open in intake air temperature sensor circuit □Intake air temperature sensor (built in mass air flow meter) □ECM		
P0115 (05–417)	Engine Coolant Temperature Circuit	□Open or short in engine coolant temperature sensor circuit □Engine coolant temperature sensor □ECM		
P0116 (05–423)	Engine Coolant Temperature Circuit Range/Performance Problem	□Engine coolant temperature sensor		
P0117 (05–417)	Engine Coolant Temperature Circuit Low Input	□Short in engine coolant temperature sensor circuit □Engine coolant temperature sensor □ECM		
P0118 (05–417)	Engine Coolant Temperature Circuit High Input	□Open or short in engine coolant temperature sensor circuit □Engine coolant temperature sensor □ECM		
P0120 (05–425)	Throttle/Pedal Position Sensor/ Switch "A" Circuit	□Throttle position sensor (built in throttle body) □ECM		
P0121 (05–435)	Throttle/Pedal Position Sensor/ Switch "A" Circuit Range/Performance Problem	□Throttle position sensor (built in throttle body)		
P0122 (05–425)	Throttle/Pedal Position Sensor/ Switch "A" Circuit Low Input	□Throttle position sensor (built in throttle body) □Short in VTA1 circuit □Open in VC circuit □ECM		
P0123 (05–425)	Throttle/Pedal Position Sensor/ Switch "A" Circuit High Input	□Throttle position sensor (built in throttle body) □Open in VTA1 circuit □Open in E2 circuit □VC and VTA1 circuits are short–circuited □ECM		

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DTC No. (See Page)	Detection Item	Trouble Area	MIL*1	Memory
P0125 (05–437)	Insufficient Coolant Temperature for Closed Loop Fuel Control	□Cooling system □Engine coolant temperature sensor □Thermostat (water inlet)		
P0128 (05–439)	Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature)	□Thermostat (water inlet) □Cooling system □Engine coolant temperature sensor □ECM		
P0136 (05–442)	Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 2)	□Open or short in heated oxygen sensor circuit □Heated oxygen sensor □Heated oxygen sensor heater □EFI relay		
P0156 (05–442)	Oxygen Sensor Circuit Malfunction (Bank 2 Sensor 2)	□Same as DTC P0136		
P0171 (05–452)	System Too Lean (Bank 1)	□Air induction system □Injector blockage □Mass air flow meter □Engine coolant temperature sensor □Fuel pressure □Gas leakage in exhaust system □Open or short in A/F sensor (bank 1 sensor 1) circuit □A/F sensor (bank 1 sensor 1) □A/F sensor heater (bank 1 sensor 1) □A/F sensor heater relay □PCV valve and hose □PCV hose connection		
P0172 (05–452)	System Too Rich (Bank 1)	□Injector leakage, blockage □Mass air flow meter □Engine coolant temperature sensor □Ignition system □Fuel pressure □Gas leakage in exhaust system □Open or short in A/F sensor (bank 1 sensor 1) circuit □A/F sensor (bank 1 sensor 1) □A/F sensor heater □A/F sensor heater relay		
P0174 (05–452)	System Too Lean (Bank2)	□Air induction system □Injector blockage □Mass air flow meter □Engine coolant temperature sensor □Fuel pressure □Gas leakage in exhaust system □Open or short in A/F sensor (bank 2 sensor 1) circuit □A/F sensor (bank 2 sensor 1) □A/F sensor heater (bank 2 sensor 1) □A/F sensor heater relay □PCV valve and hose □PCV hose connection		
P0175 (05–452)	System Too Rich (Bank2)	□Injector leakage, blockage □Mass air flow meter □Engine coolant temperature sensor □Ignition system □Fuel pressure □Gas leakage in exhaust system □Open or short in A/F sensor (bank 2 sensor 1) circuit □A/F sensor (bank 2 sensor 1) □A/F sensor heater □A/F sensor heater relay		
P0220 (05–425)	Throttle/Pedal Position Sensor/ Switch "B" Circuit	□Throttle position sensor (built in throttle body) □ECM		

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DTC No. (See Page)	Detection Item	Trouble Area	MIL*1	Memory
P0222 (05–425)	Throttle/Pedal Position Sensor/ Switch "B" Circuit Low Input	□Throttle position sensor (built in throttle body) □Short in VTA2 circuit □Open in VC circuit □ECM		
P0223 (05–425)	Throttle/Pedal Position Sensor/ Switch "B" Circuit High Input	□Throttle position sensor (built in throttle body) □Open in VTA2 circuit □Open in E2 circuit □VC and VTA2 circuits are short–circuited □ECM		
P0230 (05–465)	Fuel Pump Primary Circuit	□Open or short in fuel pump relay circuit □Fuel pump relay □ECM	□	
P0300 (05–469)	Random/Multiple Cylinder Misfire Detected	□Open or short in engine wire harness □Connector connection □Vacuum hose connection □Ignition system □Injector □Fuel pressure □Mass air flow meter □Engine coolant temperature sensor □Compression pressure □Valve clearance □Valve timing □PCV hose connection □PCV hose □ECM	*2	
P0301 (05–469)	Cylinder 1 Misfire Detected	□Same as DTC P0300	*2	
P0302 (05–469)	Cylinder 2 Misfire Detected	□Same as DTC P0300	*2	
P0303 (05–469)	Cylinder 3 Misfire Detected	□Same as DTC P0300	*2	
P0304 (05–469)	Cylinder 4 Misfire Detected	□Same as DTC P0300	*2	
P0305 (05–469)	Cylinder 5 Misfire Detected	□Same as DTC P0300	*2	
P0306 (05–469)	Cylinder 6 Misfire Detected	□Same as DTC P0300	*2	
P0325 (05–482)	Knock Sensor 1 Circuit (Bank 1 or Single Sensor)	□Knock sensor 1 □Knock sensor 1 (loose) □ECM		
P0327 (05–482)	Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)	□Short in knock sensor 1 circuit □Knock sensor 1 □ECM		
P0328 (05–482)	Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)	□Open in knock sensor 1 circuit □Knock sensor 1 □ECM		
P0330 (05–482)	Knock Sensor 2 Circuit (Bank 2)	□Knock sensor 2 □Knock sensor 2 (loose) □ECM		
P0332 (05–482)	Knock Sensor 2 Circuit Low Input (Bank 2)	□Short in knock sensor 2 circuit □Knock sensor 2 □ECM		
P0333 (05–482)	Knock Sensor 2 Circuit High Input (Bank 2)	□Open in knock sensor 2 circuit □Knock sensor 2 □ECM		

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DTC No. (See Page)	Detection Item	Trouble Area	MIL*1	Memory
P0335 (05–489)	Crankshaft Position Sensor "A" Circuit	□Open or short in crankshaft position sensor circuit □Crankshaft position sensor □Signal plate (crankshaft) □ECM		
P0339 (05–489)	Crankshaft Position Sensor "A" Circuit Intermittent	□Same as DTC P0335	□	
P0340 (05–494)	Camshaft Position Sensor "A" Circuit (Bank 1 or Single Sensor)	□Open or short in VVT sensor circuit □VVT sensor □Camshaft timing pulley □Jumped tooth of timing chain □ECM		
P0341 (05–494)	Camshaft Position Sensor "A" Circuit Range/Performance (Bank 1 or Single Sensor)	□Same as DTC P0340		
P0345 (05–494)	Camshaft Position Sensor "A" Circuit (Bank 2)	□Same as DTC P0340		
P0346 (05–494)	Camshaft Position Sensor "A" Circuit Range/Performance (Bank 2)	□Same as DTC P0340		
P0351 *4 (05–498)	Ignition Coil "A" Primary/Secondary Circuit	□Ignition system □Open or short in IGF1 or IGT1 circuit between ignition coil with igniter and ECM □No. 1 ignition coil with igniter □ECM		
P0352 *4 (05–498)	Ignition Coil "B" Primary/Secondary Circuit	□Ignition system □Open or short in IGF1 or IGT2 circuit between ignition coil with igniter and ECM □No. 2 ignition coil with igniter □ECM		
P0353 *4 (05–498)	Ignition Coil "C" Primary/Secondary Circuit	□Ignition system □Open or short in IGF1 or IGT3 circuit between ignition coil with igniter and ECM □No. 3 ignition coil with igniter □ECM		
P0354 *4 (05–498)	Ignition Coil "D" Primary/Secondary Circuit	□Ignition system □Open or short in IGF1 or IGT4 circuit between ignition coil with igniter and ECM □No. 4 ignition coil with igniter □ECM		
P0355 *4 (05–498)	Ignition Coil "E" Primary/Secondary Circuit	□Ignition system □Open or short in IGF1 or IGT5 circuit between ignition coil with igniter and ECM □No. 5 ignition coil with igniter □ECM		
P0356 *4 (05–498)	Ignition Coil "F" Primary/Secondary Circuit	□Ignition system □Open or short in IGF1 or IGT6 circuit between ignition coil with igniter and ECM □No. 6 ignition coil with igniter □ECM		
P0420 (05–506)	Catalyst System Efficiency Below Threshold (Bank 1)	□Gas leakage in exhaust system □A/F sensor (bank 1 sensor 1) □Heated oxygen sensor (bank 1 sensor 2) □Three–way catalytic converter (inside exhaust manifold)		
P0430 (05–506)	Catalyst System Efficiency Below Threshold (Bank 2)	□Gas leakage in exhaust system □A/F sensor (bank 2 sensor 1) □Heated oxygen sensor (bank 2 sensor 2) □Three–way catalytic converter (inside exhaust manifold)		

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DTC No. (See Page)	Detection Item	Trouble Area	MIL*1	Memory
P0441 (05–512)	Evaporative Emission Control System Incorrect Purge Flow	□Vacuum hose has cracks, holes, or is blocked, damaged or disconnected □Fuel tank cap is incorrectly installed □Fuel tank cap has cracks or is damaged □Open or short in vapor pressure sensor circuit □Vapor pressure sensor □Open or short in VSV circuit for EVAP □VSV for EVAP □Open or short in VSV circuit for CCV □VSV for CCV □Fuel tank has cracks, holes, or is damaged □Charcoal canister has cracks, holes, or is damaged □Fuel tank over fill check valve cracks, or is damaged □ECM		
P0442 (05–512)	Evaporative Emission Control System Leak detected (small leak)	□Same as DTC P0441		
P0446 (05–512)	Evaporative Emission Control System Vent Control Circuit	□Same as DTC P0441		
P0451 (05–541)	Evaporative Emission Control System Pressure Sensor/Switch Range/Performance	□Open or short in vapor pressure sensor circuit □Vapor pressure sensor □ECM		
P0452 (05–541)	Evaporative Emission Control System Pressure Sensor/Switch Low Input	□Open in vapor pressure sensor circuit □Vapor pressure sensor □ECM		
P0453 (05–541)	Evaporative Emission Control System Pressure Sensor/Switch High Input	□Short in vapor pressure sensor circuit □Vapor pressure sensor □ECM		
P0455 (05–512)	Evaporative Emission Control System Leak Detected (gross leak)	□Same as DTC P0441		
P0456 (05–512)	Evaporative Emission Control System Leak Detected (very small leak)	□Same as DTC P0441		
P0500 (05–547)	Vehicle Speed Sensor "A"	□Open or short in speed sensor circuit □Speed sensor □Combination meter □ECM □Skid control ECU		
P0503 (05–547)	Vehicle Speed Sensor "A" Intermittent/Erratic/High	□Same as DTC P0500	□	
P0504 (05–550)	Brake Switch Correlation	□Short in stop lamp switch signal circuit □Stop lamp switch □ECM	□	
P0505 (05–556)	Idle Air Control System	□Electric throttle control system □Air induction system □PCV hose connection		
P0560 (05–559)	System Voltage	□Open in back up power source circuit □ECM		
P0571 (05–1943)	Brake Switch "A" Circuit	□Cruise control system	□	
P0604 (05–563)	Internal Control Module Random Access Memory (RAM) Error	□ECM		
P0606 (05–563)	ECM/PCM Processor	□ECM		
P0607 (05–563)	Control Module Performance	□ECM		

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DTC No. (See Page)	Detection Item	Trouble Area	MIL*1	Memory
P0617 (05–565)	Starter Relay Circuit High	□Short in Park/Neutral position switch circuit □Park/Neutral position switch □Cranking holding function circuit □ECM		
P0657 (05–563)	Actuator Supply Voltage Circuit / Open	□ECM		
P0705 (05–1095)	Transmission Range Sensor Circuit Malfunction (PRNDL Input)	□Short in Park/Neutral position switch circuit □Park/Neutral position switch □ECM		
P0710 (05–1100)	Transmission Fluid Temperature Sensor "A" Circuit	□Electronic controlled automatic transmission (ECT)		
P0712 (05–1100)	Transmission Fluid Temperature Sensor "A" Circuit Low Input	□Electronic controlled automatic transmission (ECT)		
P0713 (05–1100)	Transmission Fluid Temperature Sensor "A" Circuit High Input	□Electronic controlled automatic transmission (ECT)		
P0717 (05–1103)	Input Speed Sensor Circuit No Signal	□Electronic controlled automatic transmission (ECT)		
P0722 (05–1106)	Output Speed Sensor	□Electronic controlled automatic transmission (ECT)		
P0724 (05–1109)	Brake Switch "B" Circuit High	□Electronic controlled automatic transmission (ECT)		
P0741 (05–1111)	Torque Converter Clutch Solenoid Performance (Shift Solenoid Valve SL)	□Electronic controlled automatic transmission (ECT)		
P0751 (05–1118)	Shift Solenoid "A" Performance (Shift Solenoid Valve S1)	□Electronic controlled automatic transmission (ECT)		
P0756 (05–1118)	Shift Solenoid "B" Performance (Shift Solenoid Valve S2)	□Electronic controlled automatic transmission (ECT)		
P0850 (05–1095)	Park/Neutral Switch Input Circuit	□Electronic controlled automatic transmission (ECT)		
P0973 (05–1122)	Shift Solenoid "A" Control Circuit Low (Shift Solenoid Valve S1)	□Electronic controlled automatic transmission (ECT)		
P0974 (05–1122)	Shift Solenoid "A" Control Circuit High (Shift Solenoid Valve S1)	□Electronic controlled automatic transmission (ECT)		
P0976 (05–1122)	Shift Solenoid "B" Control Circuit Low (Shift Solenoid Valve S2)	□Electronic controlled automatic transmission (ECT)		
P0977 (05–1122)	Shift Solenoid "B" Control Circuit High (Shift Solenoid Valve S2)	□Electronic controlled automatic transmission (ECT)		
P1782 (05–1034)	T/F L4 Range Position Switch Performance	□Electronic controlled automatic transmission (ECT)		
P2102 (05–569)	Throttle Actuator Control Motor Circuit Low	□Open in throttle control motor circuit □Throttle control motor □ECM		
P2103 (05–569)	Throttle Actuator Control Motor Circuit High	□Short in throttle control motor circuit □Throttle control motor □ECM		
P2111 (05–573)	Throttle Actuator Control System – Stuck Open	□Throttle control motor circuit □Throttle control motor □Throttle body □Throttle valve		
P2112 (05–573)	Throttle Actuator Control System – Stuck Closed	□Same as DTC P2111		
P2118 (05–576)	Throttle Actuator Control Motor Current Range/Performance	□Open in ETCS power source circuit □ETCS fuse □ECM		

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DTC No. (See Page)	Detection Item	Trouble Area	MIL*1	Memory
P2119 (05–580)	Throttle Actuator Control Throttle Body Range/Performance	□Electric throttle control system □ECM		
P2120 (05–582)	Throttle/Pedal Position Sensor/ Switch "D" Circuit	□Accelerator pedal position sensor □ECM		
P2121 (05–591)	Throttle/Pedal Position Sensor/ Switch "D" Circuit Range/Performance	□Accelerator pedal position sensor circuit □Accelerator pedal position sensor □ECM		
P2122 (05–582)	Throttle/Pedal Position Sensor/ Switch "D" Circuit Low Input	□Accelerator pedal position sensor □VCP1 circuit open □Open or ground short in VPA1 circuit □ECM		
P2123 (05–582)	Throttle/Pedal Position Sensor/ Switch "D" Circuit High Input	□Accelerator pedal position sensor □Open in EPA1 circuit □ECM		
P2125 (05–582)	Throttle/Pedal Position Sensor/ Switch "E" Circuit	□Accelerator pedal position sensor □ECM		
P2127 (05–582)	Throttle/Pedal Position Sensor/ Switch "E" Circuit Low Input	□Accelerator pedal position sensor □Open in VCP2 circuit □Open or ground short in VPA2 circuit □ECM		
P2128 (05–582)	Throttle/Pedal Position Sensor/ Switch "E" Circuit High Input	□Accelerator pedal position sensor □Open in EPA2 circuit □ECM		
P2135 (05–425)	Throttle Pedal Position Sensor/ Switch "A"/"B" Voltage Correlation	□VTA1 and VTA2 circuits are short circuited □Throttle position sensor (built in throttle body) □ECM		
P2138 (05–582)	Throttle Pedal Position Sensor/ Switch "D"/"E" Voltage Correlation	□VPA1 and VPA2 circuits are short circuited □Accelerator pedal position sensor □ECM		
P2195 *3 (05–597)	Oxygen (A/F) Sensor Signal Stuck Lean (Bank 1 Sensor 1)	□Open or short in A/F sensor (bank 1 sensor 1) circuit □A/F sensor (bank 1 sensor 1) □A/F sensor (bank 1 sensor 1) heater □A/F sensor heater relay □A/F sensor heater and relay circuit □Air induction system □Fuel pressure □Injector □ECM		
P2196 *3 (05–597)	Oxygen (A/F) Sensor Signal Stuck Rich (Bank 1 Sensor 1)	□Same as DTC P2195		
P2197 *3 (05–597)	Oxygen (A/F) Sensor Signal Stuck Lean (Bank 2 Sensor 1)	□Open or short in A/F sensor (bank 2 sensor 1) circuit □A/F sensor (bank 2 sensor 1) □A/F sensor (bank 2 sensor 1) heater □A/F sensor heater relay □A/F sensor heater and relay circuit □Air induction system □Fuel pressure □Injector □ECM		
P2198 *3 (05–597)	Oxygen (A/F) Sensor Signal Stuck Rich (Bank 2 Sensor 1)	□Same as DTC P2197		
P2238 *3 (05–610)	Oxygen Sensor Pumping Current Circuit Low (for A/F sensor) (Bank 1 Sensor 1)	□Open or short in A/F sensor (bank 1 sensor 1) circuit □A/F sensor (bank1 sensor 1) □A/F sensor heater □A/F sensor heater relay □A/F sensor heater and relay circuit □ECM		

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DTC No. (See Page)	Detection Item	Trouble Area	MIL*1	Memory
P2239 *3 (05–610)	Oxygen Sensor Pumping Current Circuit High (for A/F sensor) (Bank 1 Sensor 1)	□Same as DTC P2238		
P2241 *3 (05–610)	Oxygen Sensor Pumping Current Circuit Low (for A/F sensor) (Bank 2 Sensor 1)	□Open or short in A/F sensor (bank 2 sensor 1) circuit □A/F sensor (bank 2 sensor 1) □A/F sensor heater □A/F sensor heater relay □A/F sensor heater and relay circuit □ECM		
P2242 *3 (05–610)	Oxygen Sensor Pumping Current Circuit High (for A/F sensor) (Bank 2 Sensor 1)	□Same as DTC P2241		
P2252 *3 (05–610)	Oxygen Sensor Reference Ground Circuit Low (for A/F senor) (Bank 1 Sensor 1)	□Same as DTC P2238		
P2253 *3 (05–610)	Oxygen Sensor Reference Ground Circuit High (for A/F senor) (Bank 1 Sensor 1)	□Same as DTC P2238		
P2255 *3 (05–610)	Oxygen Sensor Reference Ground Circuit Low (for A/F senor) (Bank 2 Sensor 1)	□Same as DTC P2241		
P2256 *3 (05–610)	Oxygen Sensor Reference Ground Circuit High (for A/F senor) (Bank 2 Sensor 1)	□Same as DTC P2241		
P2716 (05–1130)	Pressure Control Solenoid "D" Electrical (Shift Solenoid Valve SLT)	□Electronic controlled automatic transmission (ECT)		
P2769 (05–1134)	Torque Converter Clutch Solenoid Circuit Low (Shift Solenoid Valve SL)	□Electronic controlled automatic transmission (ECT)		
P2770 (05–1134)	Torque Converter Clutch Solenoid Circuit High (Shift Solenoid Valve SL)	□Electronic controlled automatic transmission (ECT)		
P2A00 (05–617)	A/F Sensor Circuit Slow Response (Bank 1 Sensor 1)	□Open or short in A/F sensor (bank 1 sensor 1) circuit □A/F sensor (bank1 sensor 1) □A/F sensor heater □A/F sensor heater relay □A/F sensor heater and relay circuit □Air induction system □Fuel pressure □Injector □ECM		
P2A03 (05–617)	A/F Sensor Circuit Slow Response (Bank 2 Sensor 1)	□Open or short in A/F sensor (bank 2 sensor 1) circuit □A/F sensor (bank 2 sensor 1) □A/F sensor heater □A/F sensor heater relay □A/F sensor heater and relay circuit □Air induction system □Fuel pressure □Injector □ECM		
B2799 (05–1886)	Engine Immobilizer System Malfunction	□Immobilizer system	□	

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*1: MIL illuminates
*2: MIL illuminates or blinks
*3: This DTC is related to A/F sensor, although the caption is the heated oxygen sensor.
*4: This DTC indicates a malfunction related to the primary circuit.

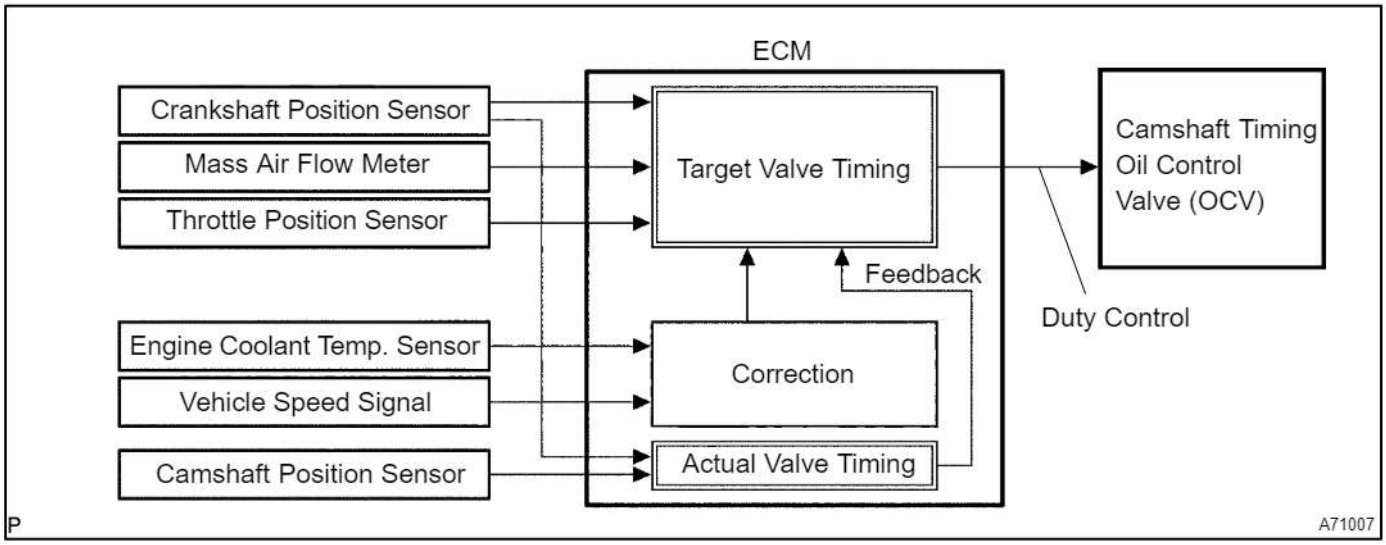
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DTC	P0010	CAMSHAFT POSITION "A" ACTUATOR CIRCUIT (BANK 1)

DTC	P0020	CAMSHAFT POSITION "A" ACTUATOR CIRCUIT (BANK 2)

CIRCUIT DESCRIPTION

The Variable Valve Timing (VVT) system includes the ECM, the Oil Control Valve (OCV) and the VVT controller. The ECM sends a target "duty–cycle" control signal to the OCV. This control signal, applied to the OCV, regulates the oil pressure supplied to the VVT controller. Camshaft timing control is performed based on engine operation conditions such as intake air volume, throttle position and engine coolant temperature.
The ECM controls the OCV based on the signals output from several sensors. The VVT controller regulates the intake camshaft angle using oil pressure through the OCV. As result, the relative position between the camshaft and the crankshaft is optimized, and the engine torque improves, fuel economy improves, and exhaust emissions decrease. The ECM detects the actual valve timing using signals from the camshaft position sensor and the crankshaft position sensor. The ECM performs feedback control and verifies target valve timing.



DTC No.	DTC Detection Condition	Trouble Area
P0010 P0020	Open or short in oil control valve circuit (1 trip detection logic)	□Open or short in oil control valve circuit □Oil control valve □ECM

MONITOR DESCRIPTION

After the ECM sends the "target" duty–cycle signal to the OCV, the ECM monitors the OCV current to establish an "actual" duty–cycle. When the actual duty–cycle ratio varies from the target duty–cycle ratio, the ECM sets a DTC.

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MONITOR STRATEGY

Related DTCs	P0010: VVT OCV (bank 1) open/short P0020: VVT OCV (bank 2) open/short
Required sensors/ components (Main)	VVT OCV (Bank 1 or 2)
Required sensors / components (Related)	–
Frequency of operation	Continuous
Duration	1 second
MIL operation	Immediate
Sequence operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	None
Starter	OFF

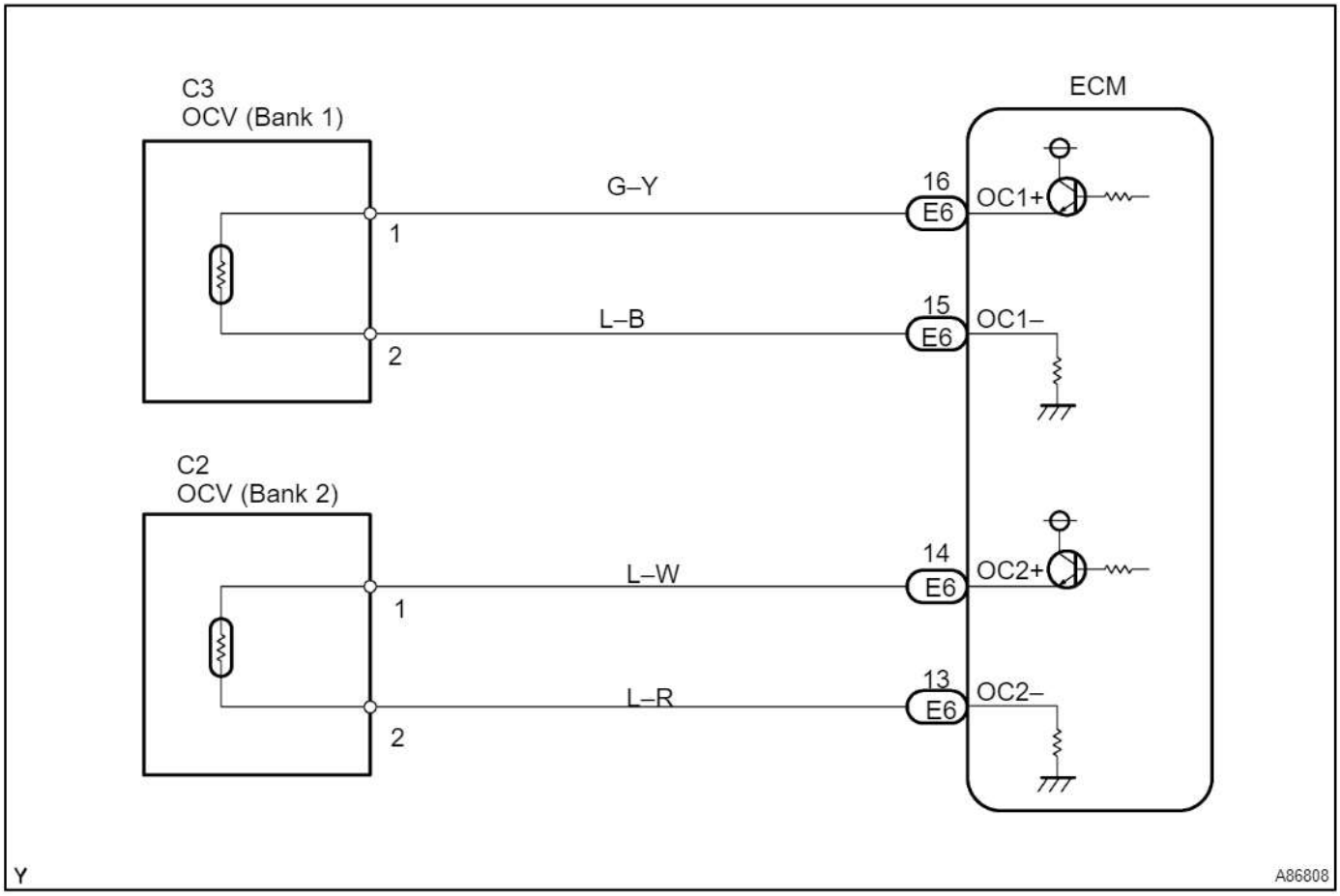
TYPICAL MALFUNCTION THRESHOLDS

One of the following conditions is met:	
OCV duty–cycle ratio when "target" duty–cycle ratio is less than 70 %	100 % (OCV always ON)
OCV duty–cycle ratio when ECM supplies current to OCV	3 % or less

COMPONENT OPERATING RANGE

VVT OCV duty ratio	3 to 100 %

WIRING DIAGRAM



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INSPECTION PROCEDURE

HINT:

- If DTC P0010 is displayed, check the bank 1 VVT system circuit.
- Bank 1 refers to the bank that includes cylinder No. 1.
- If DTC P0020 is displayed, check the bank 2 VVT system circuit.
- Bank 2 refers to the bank that does not includes cylinder No. 1.
- Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

Hand–held tester:

1	PERFORM ACTIVE TEST BY HAND–HELD TESTER(OPERATE OCV)

(a) Connect the hand–held tester to the DLC3.
(b) Start the engine and warm it up.
(c) Turn the ignition switch to ON and turn the hand–held tester ON.
(d) Select the item: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / VVT CTRL B1 or VVT CTRL B2.
(e) Using the hand–held tester, operate the OCV and check the engine speed.

Standard:

Tester Operation	Specified Condition
OCV is OFF	Normal engine speed
OCV is ON	Rough idle or engine stall

OK → CHECK FOR INTERMITTENT PROBLEMS (See page 05–331)

NG

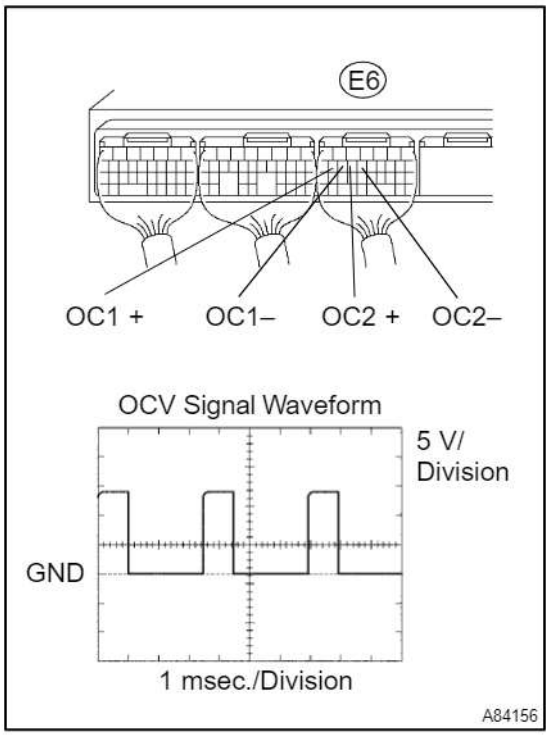
2	INSPECT CAMSHAFT TIMING OIL CONTROL VALVE ASSY(OCV) (See page 10–3)

NG → REPLACE CAMSHAFT TIMING OIL CONTROL VALVE ASSY

OK

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3	INSPECT ECM(OCV SIGNAL)



(a) Inspection using the oscilloscope.
(b) During idling, check the waveform between the specified terminals of the E6 ECM connector.

Standard:

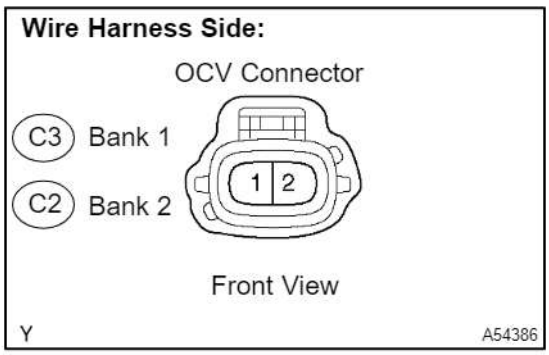
Tester Connection	Specified Condition
OC1+ (E6–16) – OC1– (E6–15)	Correct waveform is as shown
OC2+ (E6–14) – OC2– (E6–13)	

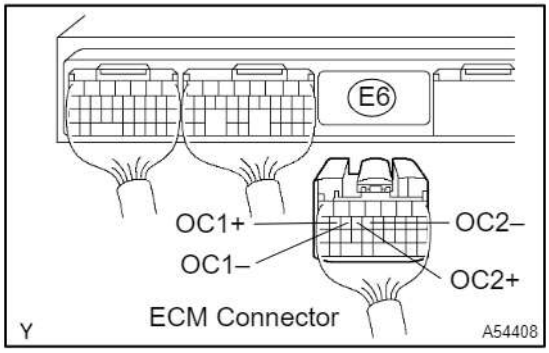
NG → **REPLACE ECM (See page 10–11)**

OK

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4	CHECK HARNESS AND CONNECTOR(CAMSHAFT TIMING OIL CONTROL VALVE (OCV) – ECM)





(a) Disconnect the C2 or C3 OCV connector.
(b) Disconnect the E6 ECM connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
OCV (C3–1) – OC1+ (E6–16)	Below 1 Ω
OCV (C3–2) – OC1– (E6–15)	
OCV (C2–1) – OC2+ (E6–14)	
OCV (C2–2) – OC2– (E6–13)	

Standard (Check for short):

Tester Connection	Specified Condition
OCV (C3–1) or OC1+ (E6–16) – Body ground	10 kΩ or higher
OCV (C3–1) or OC1– (E6–15) – Body ground	
OCV (C2–1) or OC2+ (E6–14) – Body ground	
OCV (C2–1) or OC2– (E6–13) – Body ground	

(d) Reconnect the OCV connector.
(e) Reconnect the ECM connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

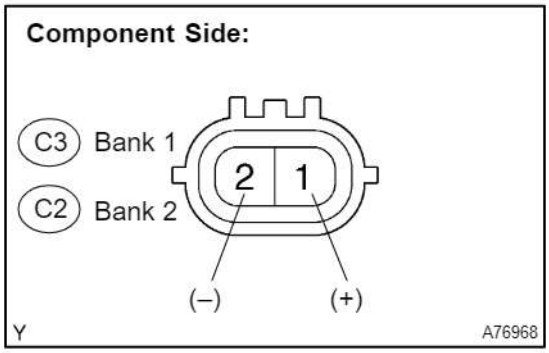
OK

CHECK FOR INTERMITTENT PROBLEMS (See page 05–331)

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OBDII scan tool (excluding hand–held tester):

1	INSPECT CAMSHAFT TIMING OIL CONTROL VALVE ASSY(OPERATE OCV)

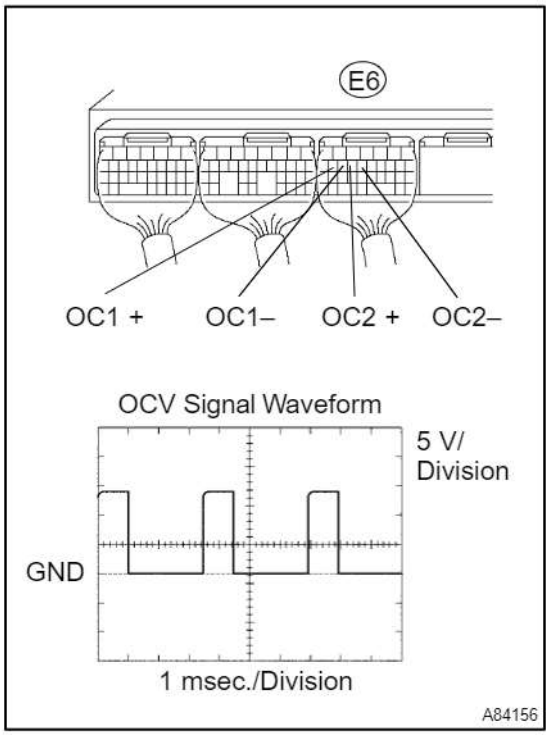


(a) Disconnect the C2 or C3 OCV connector.
(b) Apply positive battery voltage between the terminals of the OCV.
(c) Check the engine speed.
Standard:
Engine speed is rough idle or engine is stalled.
(d) Reconnect the OCV connector.

NG → **REPLACE CAMSHAFT TIMING OIL CONTROL VALVE ASSY**

OK

2	INSPECT ECM(OCV SIGNAL)



(a) Inspection using the oscilloscope.
(b) During idling, check the waveform between the specified terminals of the E6 ECM connector.
Standard:

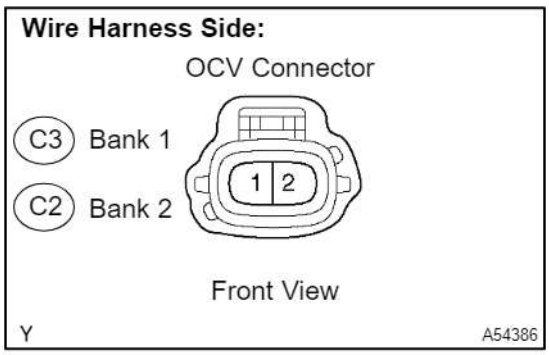
Tester Connection	Specified Condition
OC1+ (E6–16) – OC1– (E6–15)	Correct waveform is as shown
OC2+ (E6–14) – OC2– (E6–13)	

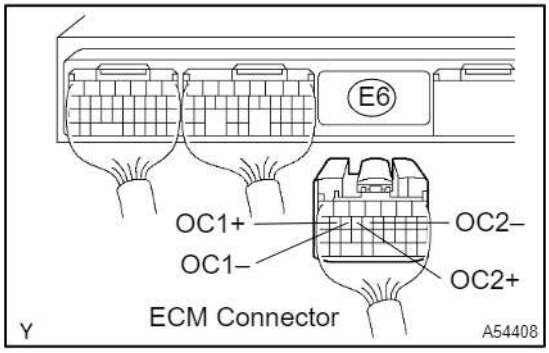
NG → **REPLACE ECM (See page 10–11)**

OK

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3	CHECK HARNESS AND CONNECTOR(CAMSHAFT TIMING OIL CONTROL VALVE (OCV) – ECM)





(a) Disconnect the C2 or C3 OCV connector.
(b) Disconnect the E6 ECM connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
OCV (C3–1) – OC1+ (E6–16)	Below 1 Ω
OCV (C3–2) – OC1– (E6–15)	
OCV (C2–1) – OC2+ (E6–14)	
OCV (C2–2) – OC2– (E6–13)	

Standard (Check for short):

Tester Connection	Specified Condition
OCV (C3–1) or OC1+ (E6–16) – Body ground	10 kΩ or higher
OCV (C3–1) or OC1– (E6–15) – Body ground	
OCV (C2–1) or OC2+ (E6–14) – Body ground	
OCV (C2–1) or OC2– (E6–13) – Body ground	

(d) Reconnect the OCV connector.
(e) Reconnect the ECM connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK FOR INTERMITTENT PROBLEMS (See page 05–331)

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DTC	P0011	CAMSHAFT POSITION ”A” –TIMING OVER–ADVANCED OR SYSTEM PERFORMANCE (BANK 1)

DTC	P0012	CAMSHAFT POSITION ”A” –TIMING OVER–RETARDED (BANK 1)

DTC	P0021	CAMSHAFT POSITION ”A” – TIMING OVER–ADVANCED OR SYSTEM PERFORMANCE (BANK 2)

DTC	P0022	CAMSHAFT POSITION ”A” – TIMING OVER–RETARDED (BANK2)

CIRCUIT DESCRIPTION

Refer to DTC P0010 on page 05–376.

DTC No.	DTC Detection Condition	Trouble Area
P0011 P0021	Advanced cam timing: After engine is warmed up, valve timing does not change from current valve timing while driving at engine speed of 500 to 4,000 rpm (1 trip detection logic)	□Valve timing □OCV □Camshaft timing gear assembly □ECM
P0012 P0022	Retarded cam timing: After engine is warmed up, valve timing does not change from current valve timing while driving at engine speed of 500 to 4,000 rpm (2 trip detection logic)	

MONITOR DESCRIPTION

The ECM optimizes the valve timing using the Variable Valve Timing (VVT) system to control the intake valve camshaft. The VVT system includes the ECM, the Oil Control Valve (OCV) and the VVT controller. The ECM sends a target ”duty–cycle” control signal to the OCV. This control signal, applied to the OCV, regulates the oil pressure supplied to the VVT controller. The VVT controller can advance or retard the intake valve camshaft.

Example:

A DTC will set if: 1) the difference between the target and actual valve timing is more than 5 degrees of the camshaft angle (CA) and this condition continues for more than 4.5 seconds; or 2) the OCV is forcibly activated 63 times or more.

Advanced cam DTCs are subject to ”1 trip” detection logic.

Retarded cam DTCs are subject to ”2 trip” detection logic.

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MONITOR STRATEGY

Related DTCs	P0011: Advance camshaft timing (bank 1) P0012: Retard camshaft timing (bank 1) P0021: Advance camshaft timing (bank 2) P0022: Retard camshaft timing (bank 2)
Required sensors/ components (Main)	VVT OCV (Bank 1 or 2), VVT actuator (Bank 1 or 2)
Required sensors/ components (Related)	Engine coolant temperature sensor, Camshaft position sensor, Crankshaft position sensor
Frequency of operation	Once per driving cycles
Duration	Within 10 seconds
Mil operation	P0011 and P0021: Immediate P0012 and P0022: 2 driving cycles
Sequence operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05–334
Battery voltage	11 V or more
Engine RPM	500 to 4,000 rpm
Engine coolant temperature	75 to 100 C (167 to 212 F)

TYPICAL MALFUNCTION THRESHOLDS

Difference between "target" and "actual" camshaft timing	More than 5 CA (Crankshaft Angle)
Response of valve timing	1 sec/ CA or more

If the difference between "target" and "actual" camshaft timing is larger than the specified value, the ECM operates the VVT actuator.
Then, the ECM monitors the camshaft timing change for 5 seconds.

WIRING DIAGRAM

Refer to DTC P0010 on page 05–376.

INSPECTION PROCEDURE

HINT:

Abnormal bank	Advanced timing over (Valve timing is out of specified range)	Retarded timing over (Valve timing is out of specified range)
Bank 1	P0011	P0012
Bank 2	P0021	P0022

- □ If DTC P0011 or P0012 is displayed, check the bank 1 VVT system circuit.
- □ Bank 1 refers to the bank that includes cylinder No. 1.
- □ If DTC P0021 or P0022 is displayed, check the bank 2 VVT system circuit.
- □ Bank 2 refers to the bank that does not includes cylinder No. 1.
- □ Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

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Hand–held tester:

1	CHECK VALVE TIMING(CHECK FOR LOOSE AND A JUMPED TOOTH OF TIMING CHAIN) (See page 14–7)

NG → ADJUST VALVE TIMING (See page 14–7)

OK

2	PERFORM ACTIVE TEST BY HAND–HELD TESTER(OPERATE OCV)

(a) Connect the hand–held tester to the DLC3.
(b) Start the engine and warm it up.
(c) Turn the ignition switch to ON and turn the hand–held tester ON.
(d) Select the item: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / VVT CTRL B1 or VVT CTRL B2.
(e) Using the hand–held tester, operate the OCV and check the engine speed.
Standard:

Tester operation	Specified condition
OCV is OFF	Normal engine speed
OCV is ON	Rough idle or engine stall

NG → Go to step 4

OK

3	CHECK IF DTC OUTPUT REOCCURS

(a) Clear the DTCs.
(1) Erase the codes using one of the following methods: 1) use the hand held tester, 2) disconnect the battery cable or 3) remove the EFI and ETCS fuses for more than 60 seconds.

NOTICE:
When disconnecting the battery cable, perform the "INITIALIZE" procedure.

(b) Start and warm up the engine.
(c) Drive the vehicle around for 10 minutes or more.
(d) Read output DTC using the hand–held tester.
Standard: No DTC output.

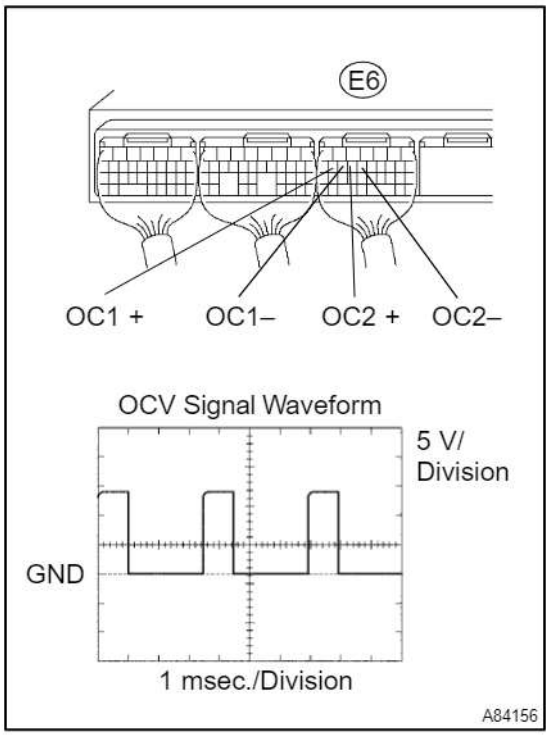
OK → VVT SYSTEM OK *

HINT:
*: DTC P0011, P0012, P0021 or P0022 is output when a foreign object in engine oil is caught in some part of the system. These codes will stay registered even if the system returns to normal after a short time. Foreign objects are filtered out by the oil filter.

NG

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4	INSPECT ECM(OCV SIGNAL)



(a) Inspection using the oscilloscope.
(b) During idling, check the waveform between the specified terminals of the E6 ECM connector.

Standard:

Tester Connection	Specified Condition
OC1+ (E6–16) – OC1– (E6–15)	Correct waveform is as shown
OC2+ (E6–14) – OC2– (E6–13)	

NG → REPLACE ECM (See page 10–11)

OK

5	CHECK OIL CONTROL VALVE FILTER

NG → REPLACE OIL CONTROL VALVE FILTER

OK

6	INSPECT CAMSHAFT TIMING OIL CONTROL VALVE ASSY(OCV) (See page 10–3)

OK → Go to step 8

NG

7	REPLACE CAMSHAFT TIMING OIL CONTROL VALVE ASSY(OCV)

GO

8	CHECK CAMSHAFT TIMING GEAR ASSY (See page 14–132 or 14–148)

OK → Go to step 10

NG

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9	REPLACE CAMSHAFT TIMING GEAR ASSY

GO

10	CHECK FOR BLOCKAGE(OCV, OIL CHECK VALVE AND OIL HOLE)

NG > REPAIR OR REPLACE

OK

11	CHECK IF DTC OUTPUT REOCCURS

(a) Clear the DTCs.
  (1) Erase the codes using one of the following methods: 1) use the hand held tester, 2) disconnect the battery cable or 3) remove the EFI and ETCS fuses for more than 60 seconds.

NOTICE:

When disconnecting the battery cable, perform the "INITIALIZE" procedure.

(b) Start and warm up the engine.
(c) Drive the vehicle around for 10 minutes or more.
(d) Read output DTC using the hand–held tester.

Standard: No DTC output.

OK > VVT SYSTEM OK *

HINT:
*: DTC P0011, P0012, P0021 or P0022 is output when a foreign object in engine oil is caught in some part of the system. These codes will stay registered even if the system returns to normal after a short time. Foreign objects are filtered out by the oil filter.

NG

REPLACE ECM (See page 10–11)

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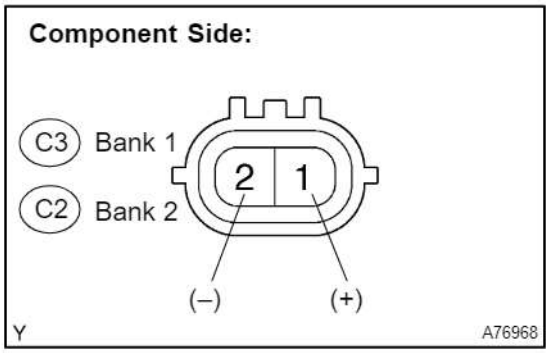
OBDII scan tool (excluding hand–held tester):

1	CHECK VALVE TIMING(CHECK FOR LOOSE AND A JUMPED TOOTH OF TIMING CHAIN) (See page 14–7)

OK → ADJUST VALVE TIMING (See page 14–7)

NG

2	CHECK OPERATION OF OCV



(a) Start the engine.
(b) Check the engine speed at (1) and (2).
(1) Disconnect the C2 or C3 OCV connector.
(2) Apply the positive battery voltage between the terminals of the OCV.

Result:

Proceed to	Check (1)	Check (2)
A	Normal engine speed	Rough idle or engine stall
B	Condition other than A	

(3) Reconnect the OCV connector.

B → Go to step 4

A

3	CHECK IF DTC OUTPUT REOCCURS

(a) Clear the DTCs.
(1) Disconnecting the battery cable or removing the EFI and ECTS fuses for more than 60 seconds.

NOTICE:

When disconnecting the battery cable, perform the "INITIALIZE" procedure (see page 05–322).

(b) Start and warm up the engine.
(c) Drive the vehicle around for 10 minutes or more.
(d) Read output DTC using the OBD II scan tool.

Standard: No DTC output.

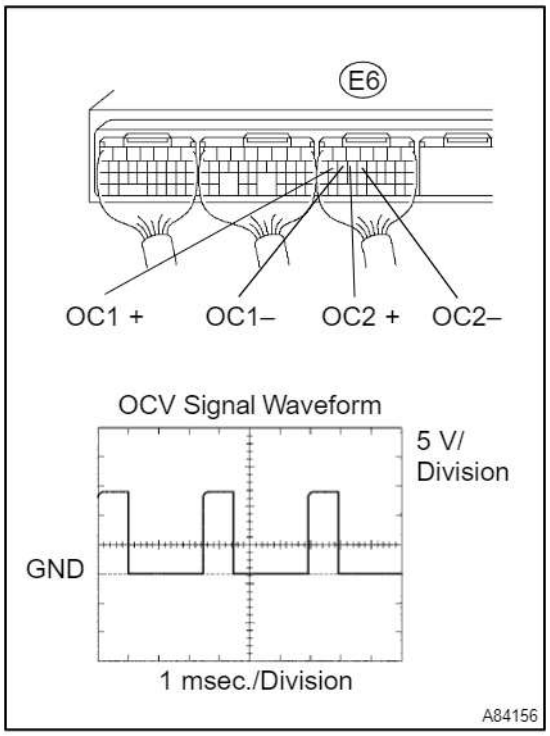
OK → VVT SYSTEM OK *

HINT:
*: DTC P0011, P0012, P0021 or P0022 is output when a foreign object in engine oil is caught in some part of the system. These codes will stay registered even if the system returns to normal after a short time. Foreign objects are filtered out by the oil filter.

NG

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4	INSPECT ECM(OCV SIGNAL)



(a) Inspection using the oscilloscope.
(b) During idling, check the waveform between the specified terminals of the E6 ECM connector.

Standard:

Tester Connection	Specified Condition
OC1+ (E6–16) – OC1– (E6–15)	Correct waveform is as shown
OC2+ (E6–14) – OC2– (E6–13)	

NG → REPLACE ECM (See page 10–11)

OK

5	CHECK OIL CONTROL VALVE FILTER

NG → REPLACE OIL CONTROL VALVE FILTER

OK

6	CHECK CAMSHAFT TIMING OIL CONTROL VALVE ASSY(OCV) (See page 10–3)

OK → Go to step 8

NG

7	REPLACE CAMSHAFT TIMING OIL CONTROL VALVE ASSY(OCV)

GO

8	CHECK CAMSHAFT TIMING GEAR ASSY (See page 14–132 or 14–148)

OK → Go to step 10

NG

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9	REPLACE CAMSHAFT TIMING GEAR ASSY

GO

10	CHECK FOR BLOCKAGE(OCV, OIL CHECK VALVE AND OIL HOLE)

NG > REPAIR OR REPLACE

OK

11	CHECK IF DTC OUTPUT REOCCURS

(a) Clear the DTCs.
(1) Disconnecting the battery cable or removing the EFI and ECTS fuses for more than 60 seconds.

NOTICE:
When disconnecting the battery cable, perform the "INITIALIZE" procedure (see page 05–322).

(b) Start and warm up the engine.
(c) Drive the vehicle around for 10 minutes or more.
(d) Read output DTC using the OBD II scan tool.

Standard: No DTC output.

OK > VVT SYSTEM OK *

HINT:
*: DTC P0011, P0012, P0021 or P0022 is output when a foreign object in engine oil is caught in some part of the system. These codes will stay registered even if the system returns to normal after a short time. Foreign objects are filtered out by the oil filter.

NG

REPLACE ECM (See page 10–11)

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DTC	P0016	CRANKSHAFT POSITION – CAMSHAFT POSITION CORRELATION (BANK 1 SENSOR A)

DTC	P0018	CRANKSHAFT POSITION – CAMSHAFT POSITION CORRELATION (BANK 2 SENSOR A)

CIRCUIT DESCRIPTION

Refer to DTC P0335 and P0339 on page 05–489.

DTC No.	DTC Detection Condition	Trouble Area
P0016	Deviation in crankshaft position sensor signal and VVT sensor 1 signal (2 trip detection logic)	□Mechanical system (Jumped tooth of timing chain, chain stretched) □ECM
P0018	Deviation in crankshaft position sensor signal and VVT sensor 2 signal (2 trip detection logic)	

MONITOR DESCRIPTION

The ECM optimizes the valve timing using the Variable Valve Timing (VVT) system to control the intake valve camshaft. The VVT system includes the ECM, the Oil Control Valve (OCV) and the VVT controller. The ECM sends a target "duty–cycle" control signal to the OCV. This control signal, applied to the OCV, regulates the oil pressure supplied to the VVT controller. The VVT controller can advance or retard the intake valve camshaft. The ECM calibrates the valve timing of the VVT system by setting the camshaft to the maximum retard angle when the engine speed is idling. The ECM closes the OCV to retard the cam. The ECM stores this valve as "VVT learned value." (When the difference between the target valve timing and the actual valve timing is 5 degrees or less, the ECM stores this in its memory.)

If the learned value meets both of the following conditions ("a" and "b"), the ECM interprets this as a defect in the VVT system and sets a DTC.

(a) "VVT learning" value is less than 22 CA or more than 47 CA.

(b) Above condition continues for more than 18 seconds.

MONITOR STRATEGY

Related DTCs	P0016: Camshaft timing (bank 1) misalignment P0018: Camshaft timing (bank 2) misalignment
Required sensors/ components (Main)	VVT actuator (Bank 1 or 2)
Required sensors/ components (Related)	Camshaft position sensor, Crankshaft position sensor,
Frequency of operation	Once per driving cycle
Duration	60 seconds
Mil operation	2 driving cycles
Sequence operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05–334
VVT system status	"Feedback mode" for 8 seconds or more
Camshaft timing	Maximum retarded
Difference between "target" and "actual" camshaft timing	5 or more within 5 seconds
"Actual" camshaft timing change per 240 CA	1.875 CA or less
Engine RPM	500 to 1,400 rpm

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TYPICAL MALFUNCTION THRESHOLDS

Either of the following conditions is met:	
"VVT learning value"	Less than 22 CA
"VVT learning value"	More than 47 CA

WIRING DIAGRAM

Refer to DTC P0335 and P0339 on page 05–489.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1	**CHECK VALVE TIMING(CHECK FOR LOOSE AND A JUMPED TOOTH OF TIMING CHAIN) (See page 14–7)**

NG → **ADJUST VALVE TIMING (See page 14–7) (REPAIR OR REPLACE TIMING CHAIN)**

OK

REPLACE ECM (See page 10–11)

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DTC	P0031	OXYGEN (A/F) SENSOR HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1)

DTC	P0032	OXYGEN (A/F) SENSOR HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1)

DTC	P0051	OXYGEN (A/F) SENSOR HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 1)

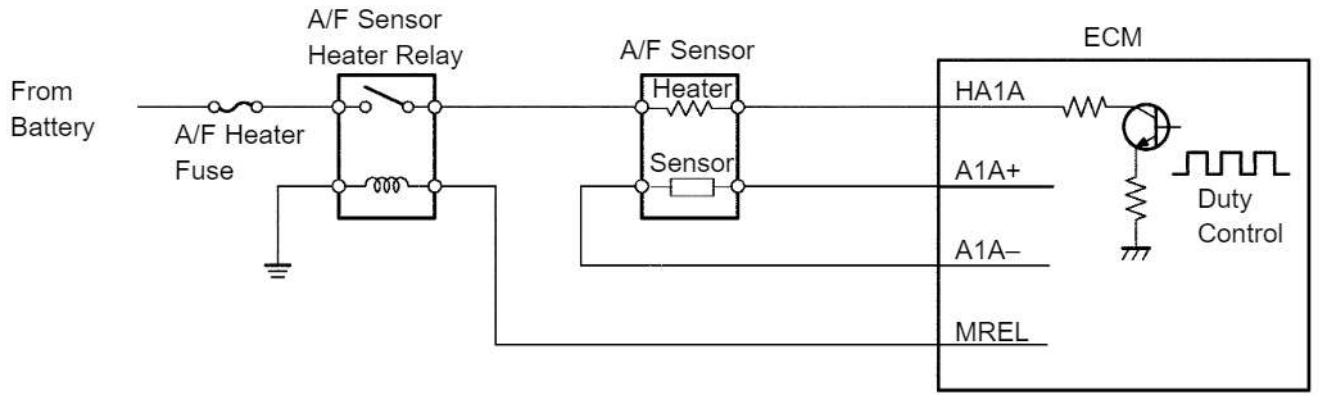
DTC	P0052	OXYGEN (A/F) SENSOR HEATER CONTROL CIRCUIT HIGH (BANK 2 SENSOR 1)

HINT:
Although each DTC title says "oxygen sensor", these DTCs are related to the air–fuel ratio (A/F) sensor.

CIRCUIT DESCRIPTION

Refer to DTC P2195 on page 05–597.
HINT:
The ECM provides a pulse width modulated control circuit to adjust current through the heater. The A/F sensor heater circuit uses a relay on the B+ side of the circuit.

Reference (Bank 1 Sensor 1 System Drawing):



DTC No.	DTC Detection Condition	Trouble Area
P0031 P0051	Heated current is 0.8 A or less when heater operates (1 trip detection logic)	□Open or short in heater circuit of A/F sensor □A/F sensor heater □A/F sensor heater relay □ECM
P0032 P0052	When the heater operates, heated current exceeds 19.7 A (1 trip detection logic)	

HINT:
- □ Bank 1 refers to the bank that includes cylinder No.1.
- □ Bank 2 refers to the bank that does not include cylinder No.1.
- □ Sensor 1 refers to the sensor closest to the engine assembly.
- □ Sensor 2 refers to the sensor farthest away from the engine assembly.

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MONITOR DESCRIPTION

The ECM uses the Air–Fuel Ratio sensor (A/F sensor) information to regulate the air–fuel ratio close to the stoichiometric ratio. This maximizes the catalytic converter's ability to purify exhaust gases. The sensor detects oxygen levels in the exhaust gas and sends this signal to the ECM.

The inner surface of the sensor element is exposed to outside air. The outer surface of the sensor element is exposed to exhaust gas. The sensor element is made of platinum coated zirconia and includes an integrated heating element. The zirconia element generates a small voltage when there is a large difference in the oxygen concentrations of the exhaust and the outside air. The platinum coating amplifies the voltage generation. When heated, the sensor becomes very efficient. If the temperature of the exhaust is low, the sensor will not generate useful voltage signals without supplemental heating. The ECM regulates the supplemental heating using a duty–cycle approach to regulate the average current in the heater element. If the heater current is out of the normal range, the sensor's output signals will be inaccurate and the ECM can not regulate the air–fuel ratio properly.

When the heater current is out of the normal operating range, the ECM interprets this as a malfunction and sets a DTC.

MONITOR STRATEGY

Related DTCs	P0031: A/F sensor heater (bank 1) open/short (Low electrical current) P0032: A/F sensor heater (bank 1) open/short (High electrical current) P0051: A/F sensor heater (bank 2) open/short (Low electrical current) P0052: A/F sensor heater (bank 2) open/short (High electrical current)
Required sensors/ components (Main)	A/F sensor heater (bank 1 and 2)
Required sensors/ components (Related)	–
Frequency of operation	Continuous
Duration	10 seconds
MIL operation	Immediate
Sequence operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	None
Battery voltage	10.5 V or more
A/F sensor heater duty–cycle ratio	50% or more
Time after engine start	10 seconds

TYPICAL MALFUNCTION THRESHOLDS

P0031 and P0051:

A/F sensor heater current	Less than 0.8 A

P0032 and P0052

A/F sensor heater current	More than 19.7 A

COMPONENT OPERATING RANGE

A/F sensor heater current	1.8 to 3.4 A at 20°C (68°F)

MONITOR RESULT (MODE 06 DATA)

A/F sensor heater:

Test ID/Comp ID	Description of Test Data	Description of Test Limit	Conversion Factor (Unit)
$07/$81 $07/$90	Maximum A/F sensor heater current	Maximum threshold heater current to detect A/F sensor circuit malfunction	Multiply by 0.173 (A)

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Refer to page 05–340 for detailed information on CHECKING MONITOR STATUS (MODE 06 DATA).

WIRING DIAGRAM

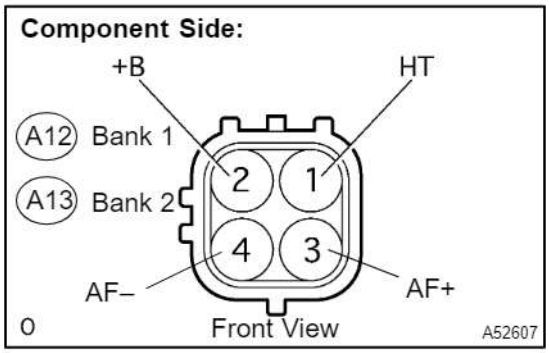
Refer to DTC P2195 on page 05–597.

INSPECTION PROCEDURE

HINT:

- If DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may have an open circuit.
- Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1 INSPECT AIR FUEL RATIO SENSOR(HEATER RESISTANCE)



(a) Disconnect the A12 or A13 A/F sensor connector.

(b) Measure the resistance between the terminals of the A/F sensor.

Standard:

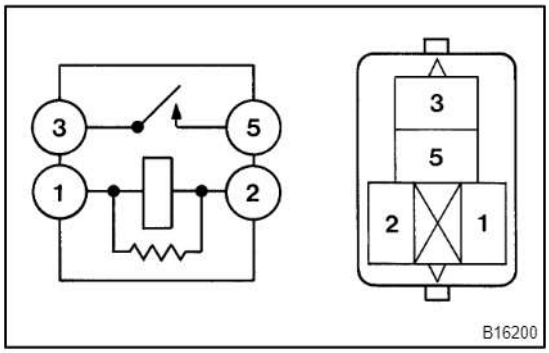
Tester Connection	Specified Condition
HT (1) – +B (2)	1.8 to 3.4 Ω at 20 C (68 F)

(c) Reconnect the A/F sensor connector.

NG → **REPLACE AIR FUEL RATIO SENSOR**

OK

2 INSPECT AIR FUEL RATIO SENSOR HEATER RELAY



(a) Remove the A/F sensor heater relay from the engine room R/B.

(b) Check for continuity in the A/F sensor heater relay.

Standard:

Tester Connection	Specified Condition
1 – 2	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage to terminals 1 and 2)

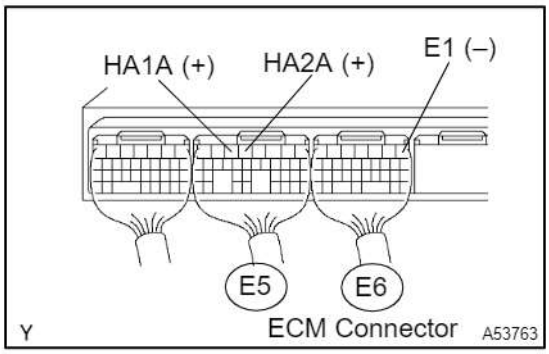
(c) Reinstall the A/F sensor heater relay.

NG → **REPLACE AIR FUEL RATIO SENSOR HEATER RELAY**

OK

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3	INSPECT ECM(HA1A OR HA2A VOLTAGE)



(a) Turn the ignition switch to ON.
(b) Measure the voltage between the applicable terminals of the E5 and E6 ECM connectors.

Standard:

Tester Connection	Specified Condition
HA1A (E5–5) – E1 (E6–1)	9 to 14 V
HA2A (E5–4) – E1 (E6–1)	

HINT:

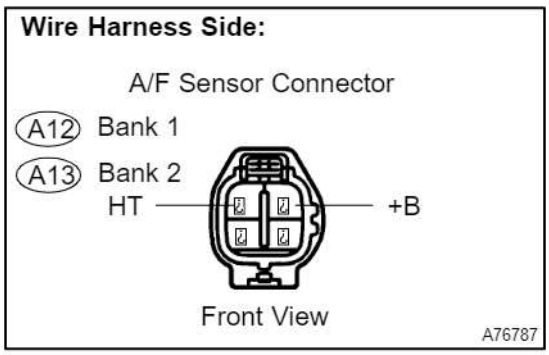
- The HA1A means the A/F sensor bank 1 sensor 1.
- The HA2A means the A/F sensor bank 2 sensor 1.

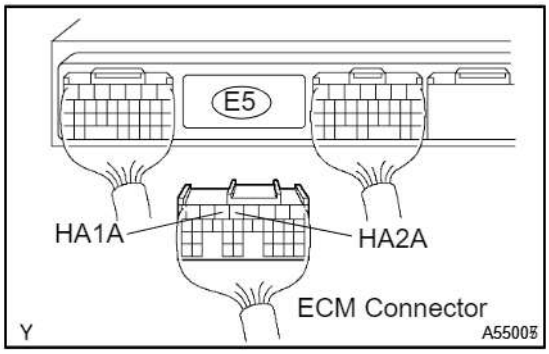
OK → **REPLACE ECM (See page 10–11)**

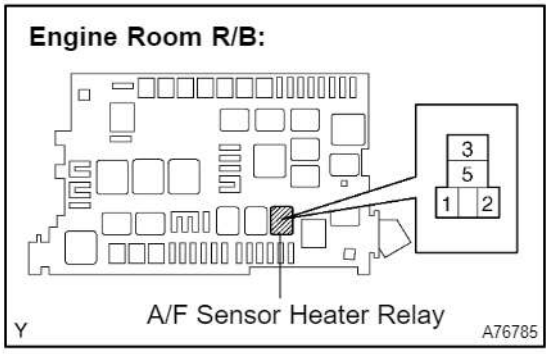
NG

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4	CHECK HARNESS AND CONNECTOR(A/F SENSOR – ECM, A/F SENSOR – A/F SENSOR HEATER RELAY)







(a) Check the harness and the connector between the ECM and the A/F sensor.
(1) Disconnect the A12 or A13 A/F sensor connector.
(2) Disconnect the E5 ECM connector.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
HT (A12–1) – HA1A (E5–5)	Below 1 Ω
HT (A13–1) – HA2A (E5–4)	

Standard (Check for short):

Tester Connection	Specified Condition
HT (A12–1) or HA1A (E5–5) – Body ground	10 kΩ or higher
HT (A13–1) or HA2A (E5–4) – Body ground	

(4) Reconnect the A/F sensor connector.
(5) Reconnect the ECM connector.

(b) Check the harness and the connector between the A/F sensor and A/F sensor heater relay.
(1) Disconnect the A12 or A13 A/F sensor connector.
(2) Remove the A/F sensor heater relay from the engine room R/B.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
+B (A12–2) – A/F sensor heater relay (3)	Below 1 Ω
+B (A13–2) – A/F sensor heater relay (3)	

Standard (Check for short):

Tester Connection	Specified Condition
+B (A12–2) or A/F sensor heater relay (3) – Body ground	10 kΩ or higher
+B (A13–2) or A/F sensor heater relay (3) – Body ground	

(4) Reconnect the A/F sensor connector.
(5) Reinstall the A/F sensor heater relay.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM (See page 10–11)

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DTC	P0037	OXYGEN SENSOR HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2)

DTC	P0038	OXYGEN SENSOR HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2)

DTC	P0057	OXYGEN SENSOR HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 2)

DTC	P0058	OXYGEN SENSOR HEATER CONTROL CIRCUIT HIGH (BANK 2 SENSOR 2)

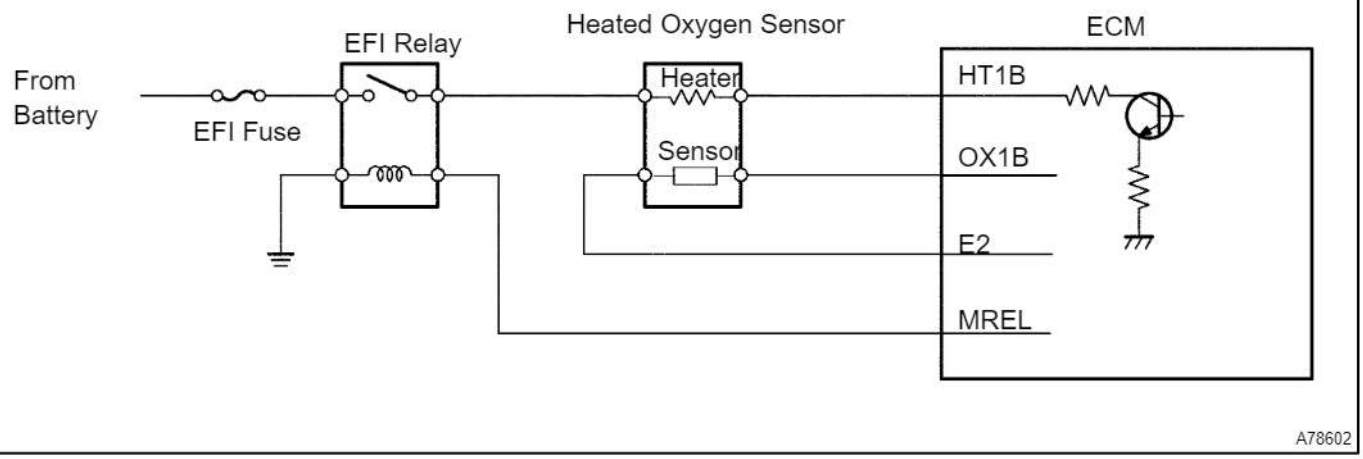
CIRCUIT DESCRIPTION

Refer to DTC P0136 on page 05–442.

HINT:

The ECM provides a pulse width modulated control circuit to adjust current through the heater. The heated oxygen sensor heater circuit uses a relay on the B+ side of the circuit.

Reference (Bank 1 Sensor 2 System Drawing):



DTC No.	DTC Detection Condition	Trouble Area
P0037 P0057	Heated current is 0.25 A or less when the heater operates with +B greater than 11.5 V (1 trip detection logic)	□Open or short in heater circuit of heated oxygen sensor □Heated oxygen sensor heater □EFI relay □ECM
P0038 P0058	When heater operates, heated current exceeds 2 A (1 trip detection logic)	

HINT:

- □ Bank 1 refers to the bank that includes cylinder No.1.
- □ Bank 2 refers to the bank that does not include cylinder No.1.
- □ Sensor 1 refers to the sensor closest to the engine assembly.
- □ Sensor 2 refers to the sensor farthest away from the engine assembly.

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MONITOR DESCRIPTION

The sensing portion of the heated oxygen sensor has a zirconia element which is used to detect oxygen concentration in the exhaust. If the zirconia element is at the proper temperature and difference of the oxygen concentration between the inside and outside surface of sensor is large, the zirconia element will generate voltage signals. In order to increase the oxygen concentration detecting capacity in the zirconia element, the ECM supplements the heat from the exhaust with heat from a heating element inside the sensor. When current in the sensor is out of the standard operating range, the ECM interprets this as a fault in the heated oxygen sensor and sets a DTC.

Example:

The ECM will set a high current DTC if the current in the sensor is more than 2 A when the heater is OFF. Similarly, the ECM will set a low current DTC if the current is less than 0.25 A when the heater is ON.

MONITOR STRATEGY

Related DTCs	P0037: Heated oxygen sensor heater (bank 1) open/short (Low electrical current) P0038: Heated oxygen sensor heater (bank 1) open/short (High electrical current) P0057: Heated oxygen sensor heater (bank 2) open/short (Low electrical current) P0058: Heated oxygen sensor heater (bank 2) open/short (High electrical current)
Required sensors/ components (Main)	Heated oxygen sensor heater (bank 1 and 2)
Required sensors/ components (Related)	Vehicle speed sensor
Frequency of operation	Continuous
Duration	0.3 second
MIL operation	Immediate
Sequence operation	None

TYPICAL ENABLING CONDITIONS

P0037 and P0057:

The monitor will run whenever the following DTCs are not present	None
Either of the following conditions A and B is met	
Condition A	
Time after engine start	250 to 500 seconds
Vehicle speed	Within 56 mph (90 km/h)
Battery voltage	10.5 V or more
Pass or Fail detection in this driving cycle	None
Condition B	
Time after engine start	500 seconds or more
Vehicle speed	25 mph (40 km/h) or more
Battery voltage	10.5 V or more
Pass or Fail detection in this driving cycle	None

P0038 and P0058:

The monitor will run whenever the following DTCs are not present	None

TYPICAL MALFUNCTION THRESHOLDS

P0037 and P0057:

Heated oxygen sensor heater current when heated oxygen sensor heater OFF	Less than 0.25 A

P0038 and P0058:

Heated oxygen sensor heater current when heated oxygen sensor heater ON	More than 2A

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COMPONENT OPERATING RANGE

Heated oxygen sensor heater current	0.4 to 1 A (at idle, warmed–up engine and +B: 11 to 14 V)

MONITOR RESULT (MODE 06 DATA)

Heated oxygen sensor heater:

Test ID/Comp ID	Description of Test Data	Description of Test Limit	Conversion Factor (Unit)
$04/$81 $04/$82	Maximum heated oxygen sensor heater current	Maximum threshold heater current to detect heated oxygen sensor malfunction	Multiply by 0.000076 (A)

Refer to page 05–340 for detailed information on CHECKING MONITOR STATUS (MODE 06 DATA).

WIRING DIAGRAM

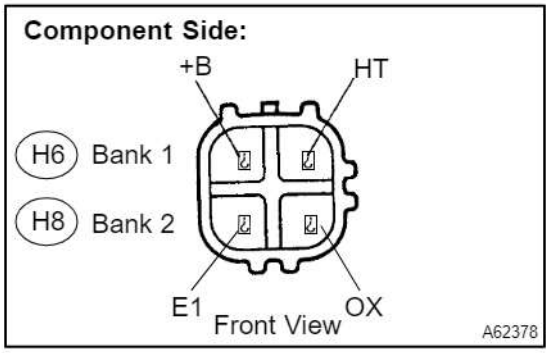
Refer to DTC P0136 on page 05–442.

INSPECTION PROCEDURE

HINT:

- If different DTCs that are related to a different system are output simultaneously while terminal E2 is used as a ground terminal, terminal E2 may be open.
- Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1 INSPECT HEATED OXYGEN SENSOR(HEATER RESISTANCE)



(a) Disconnect the H6 or H8 heated oxygen sensor connector.

(b) Measure the resistance between the terminals of the heated oxygen sensor connector.

Standard (Bank 1, 2 sensor 2):

Tester Connection	Specified Condition
1 (HT) – 2 (+B)	5 to 10 Ω at 20 C (68 F)
1 (HT) – 4 (E1)	No Continuity

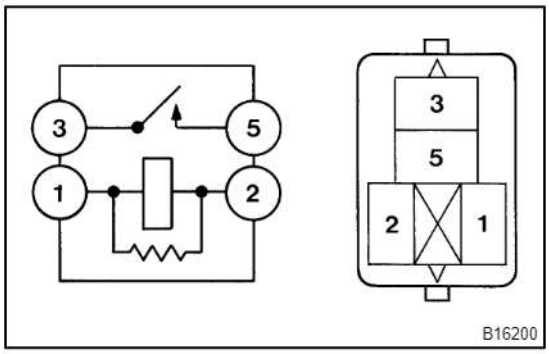
(c) Reconnect the heated oxygen sensor connector.

NG → **REPLACE HEATED OXYGEN SENSOR**

OK

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2 INSPECT EFI RELAY



(a) Remove the EFI relay from the engine room R/B.
(b) Check for continuity in the EFI relay.
Standard:

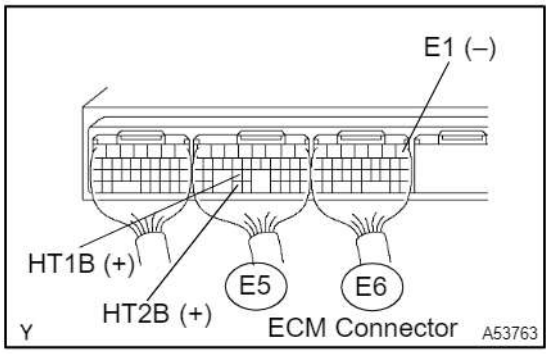
Tester Connection	Specified Condition
1 – 2	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage to terminals 1 and 2)

(c) Reinstall the EFI relay.

NG → **REPLACE EFI RELAY**

OK

3 INSPECT ECM(HT1B OR HT2B VOLTAGE)



(a) Turn the ignition switch to ON.
(b) Measure the voltage between the applicable terminals of the E5 and E6 ECM connectors.
Standard:

Tester Connection	Specified Condition
HT1B (E5–25) – E1 (E6–1)	9 to 14 V
HT2B (E5–33) – E1 (E6–1)	

HINT:
- The HT1B means the heated oxygen sensor bank 1 sensor 2.
- The HT2B means the heated oxygen sensor bank 2 sensor 2.

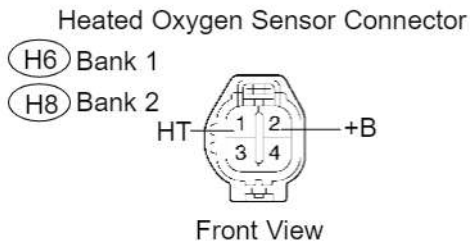
OK → **REPLACE ECM (See page 10–11)**

NG

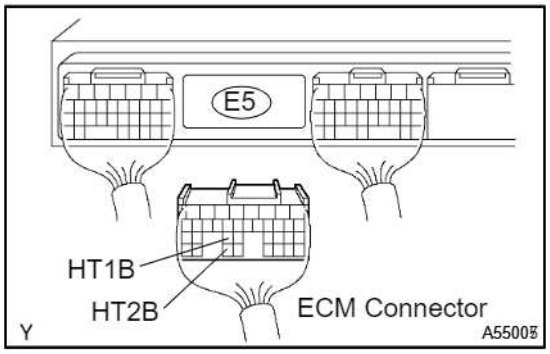
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4	CHECK HARNESS AND CONNECTOR(HEATED OXYGEN SENSOR – ECM, HEATED OXYGEN SENSOR – EFI RELAY)

Wire Harness Side:

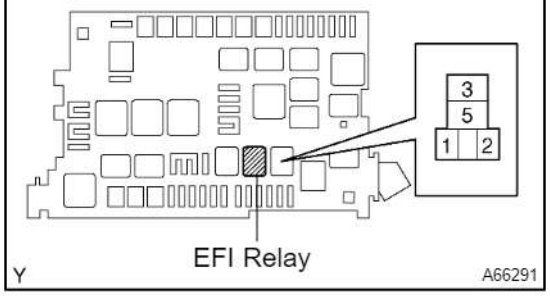


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A55005

Engine Room R/B:



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(a) Check the harness and the connector between the ECM and heated oxygen sensor.

(1) Disconnect the H6 or H8 heated oxygen sensor connector.

(2) Disconnect the E5 ECM connector.

(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
HT (H6–1) – HT1B (E5–25)	Below 1 Ω
HT (H8–1) – HT2B (E5–33)	

Standard (Check for short):

Tester Connection	Specified Condition
HT (H6–1) or HT1B (E5–25) – Body ground	10 kΩ or higher
HT (H8–1) or HT2B (E5–33) – Body ground	

(4) Reconnect the heated oxygen sensor connector.

(5) Reconnect the ECM connector.

(b) Check the harness and the connector between the heated oxygen sensor and EFI relay.

(1) Disconnect the H6 or H8 heated oxygen sensor connector.

(2) Remove the EFI relay from the engine room R/B.

(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
+B (H6–2) – EFI relay (3)	Below 1 Ω
+B (H8–2) – EFI relay (3)	

Standard (Check for short):

Tester Connection	Specified Condition
+B (H6–2) or EFI relay (3) – Body ground	10 kΩ or higher
+B (H8–2) or EFI relay (3) – Body ground	

(4) Reconnect the heated oxygen sensor connector.

(5) Reinstall the EFI relay.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM (See page 10–11)

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DTC	P0100	MASS OR VOLUME AIR FLOW CIRCUIT

DTC	P0102	MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT

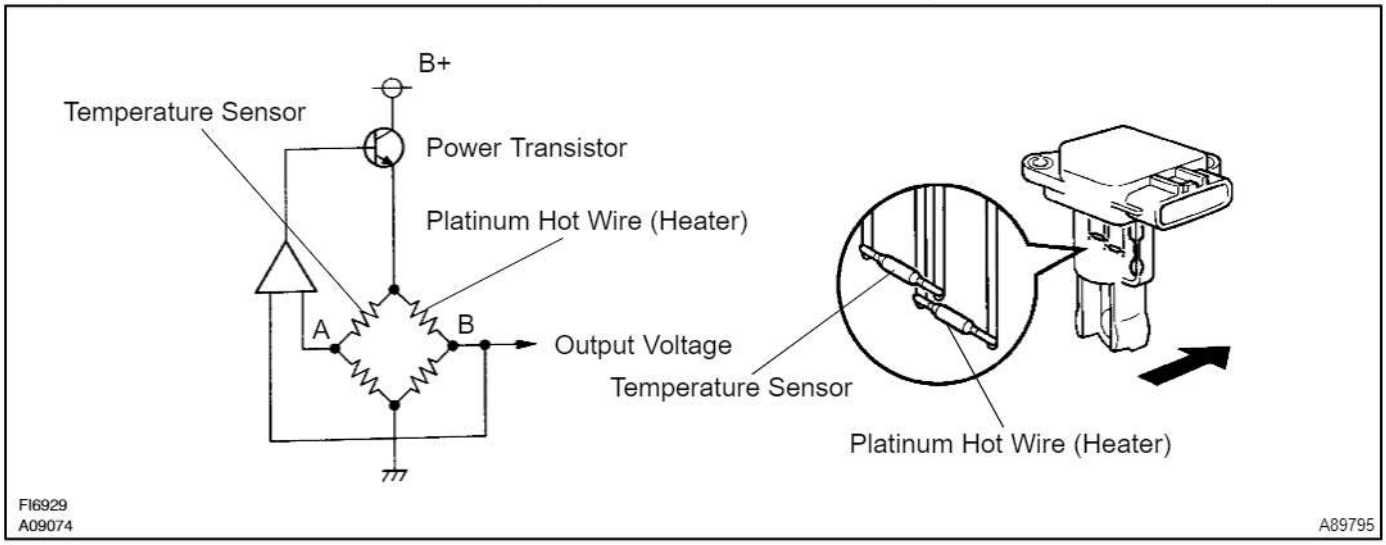
DTC	P0103	MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT

CIRCUIT DESCRIPTION

The MAF (Mass Air Flow) meter is a sensor measures the amount of air flowing through the throttle valve. The ECM uses this information to determine the fuel injection time and provides a proper air–fuel ratio. Inside the MAF meter, there is a heated platinum wire exposed to the flow of intake air.

By applying a specific current to the wire, the ECM heats this wire to a given temperature. The flow of incoming air cools the wire and an internal thermistor, affecting their resistance. To maintain a constant current value, the ECM varies the voltage applied to these components in the MAF meter. The voltage level is proportional to the flow of the air passing through the sensor. The ECM interprets this voltage as the intake air amount.

The circuit is constructed so that the platinum hot wire and temperature sensor provide a bridge circuit, with the power transistor controlled so that the potential of A and B remains equal to maintain the set temperature.



DTC No.	DTC Detection Condition	Trouble Area
P0100	When the mass air flow meter circuit has an open or a short for more than 3 seconds under the 4,000 rpm engine speed.	□Open or short in mass air flow meter circuit □mass air flow meter □ECM
P0102	When the mass air flow meter circuit has an open for more than 3 seconds under the 4,000 rpm engine speed.	□Open in mass air flow meter circuit □Short in ground circuit □Mass air flow meter □ECM
P0103	When the mass air flow meter circuit has a short for more than 3 seconds under the 4,000 rpm engine speed.	□Short in mass air flow meter circuit (+B circuit) □Mass air flow meter □ECM

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HINT:
After confirming DTC P0100, P0102 or P0103, use the hand–held tester or the OBD II scan tool to confirm the air flow ratio in the DIAGNOSIS/ENHANCED OBD II/DATA LIST/ALL.

Air Flow Rate (gm/s)	Malfunction
Approximately 0.0	□Mass air flow meter power source circuit open □VG circuit open or short
271.0 or more	□E2G circuit open

MONITOR DESCRIPTION

If there is a defect in the sensor or an open or short circuit, the voltage level will deviate from the normal operating range. The ECM interprets this deviation as a defect in the MAF meter and sets a DTC.
Example:
When the sensor voltage output is less than 0.2 V or more than 4.9 V and if either of the conditions continues for more than 3 seconds.

MONITOR STRATEGY

Related DTCs	P0100: Mass air flow meter open/short (Chattering) P0102: Mass air flow meter open/short (Low voltage) P0103: Mass air flow meter open/short (High voltage)
Required sensors/ components (Main)	Mass air flow meter
Required sensors/ components (Related)	Crankshaft position sensor
Frequency of operation	Continuous
Duration	3 seconds
Mil operation	Immediate: Engine RPM is less than 4,000 rpm 2 driving cycles: Engine RPM is 4,000 rpm or more
Sequence operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	None

TYPICAL MALFUNCTION THRESHOLDS

P0100:

Mass air flow meter voltage	Less than 0.2 V or more than 4.9 V

P0102:

Mass air flow meter voltage	Less than 0.2 V

P0103:

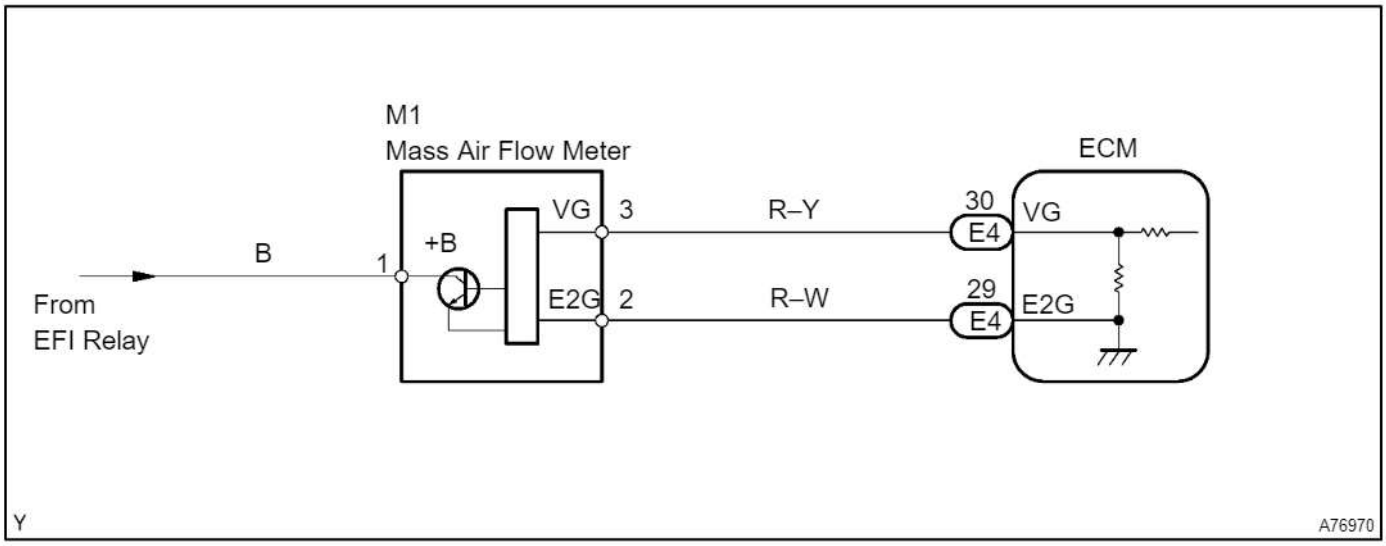
Mass air flow meter voltage	More than 4.9 V

COMPONENT OPERATING RANGE

Mass air flow meter voltage	Between 0.4 and 2.2 V

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WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1	**READ VALUE OF HAND–HELD TESTER OR OBD II SCAN TOOL(MASS AIR FLOW RATE)**

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Start the engine.
(c) Turn the hand–held tester or the OBD II scan tool ON.
(d) On the hand–held tester or the OBD II scan tool, select the item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / MAF.
(e) Read the values.

Result:

Air Flow Rate (gm/s)	Proceed to
0.0	A
271.0 or more	B
Between 1.0 and 270.0 (*1)	C

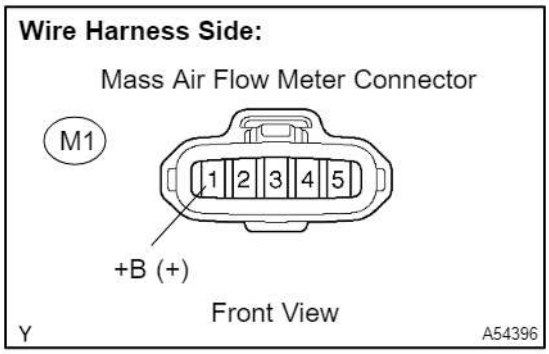
*1: The value must be changed when the throttle valve is opened or closed.

B	**Go to step 6**
C	**CHECK FOR INTERMITTENT PROBLEMS (See page 05–331)**

A

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2 INSPECT MASS AIR FLOW METER(POWER SOURCE)



(a) Turn the ignition switch to ON.
(b) Disconnect the mass air flow meter connector.
(c) Measure the voltage between the terminal of the wire harness side connector and body ground.

Standard:

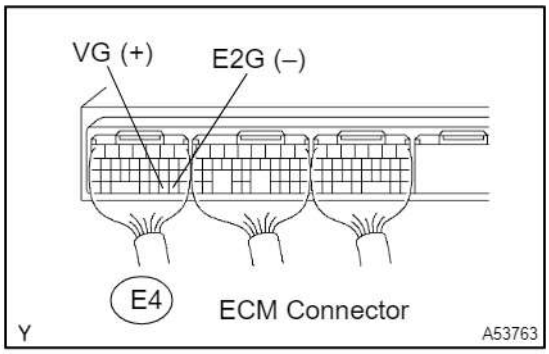
Tester Connection	Specified Condition
+B (M1–1) – Body ground	9 to 14 V

(d) Reconnect the mass air flow meter connector.

NG → **Go to step 5**

OK

3 INSPECT ECM(VG VOLTAGE)



(a) Start the engine.
(b) Measure the voltage between the specified terminals of the E4 ECM connector.

HINT:
The shift position should be P or N and the A/C switch should be turned OFF.

Standard:

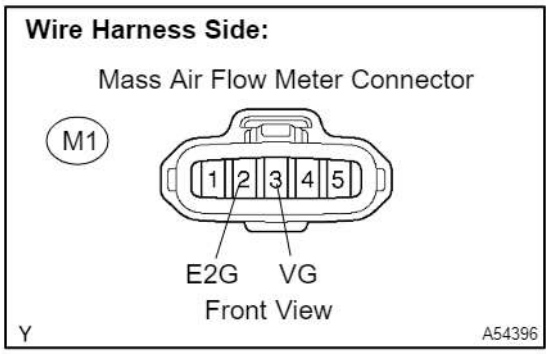
Tester Connection	Condition	Specified Condition
VG (E4–30) – E2G (E4–29)	Engine is idling	0.5 to 3.0 V

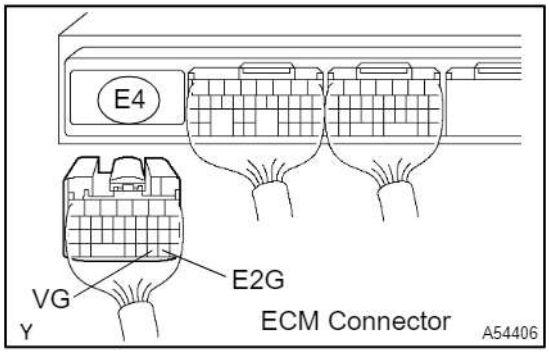
OK → **REPLACE ECM (See page 10–11)**

NG

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4 CHECK HARNESS AND CONNECTOR(MASS AIR FLOW METER – ECM)





(a) Disconnect the mass air flow meter connector.
(b) Disconnect the E4 ECM connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
VG (M1–3) – VG (E4–30)	Below 1 Ω
E2G (M1–2) – E2G (E4–29)	

Standard (Check for short):

Tester Connection	Specified Condition
VG (M1–3) or VG (E4–30) – Body ground	10 kΩ or higher

(d) Reconnect the mass air flow meter connector.
(e) Reconnect the ECM connector.

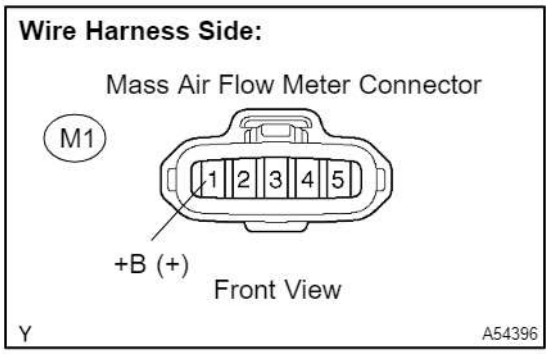
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE MASS AIR FLOW METER

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5 CHECK HARNESS AND CONNECTOR(MASS AIR FLOW METER – EFI RELAY)



(a) Disconnect the mass air flow meter connector.
(b) Remove the EFI relay from the engine room R/B.
(c) Check the resistance between the wire harness side connectors.

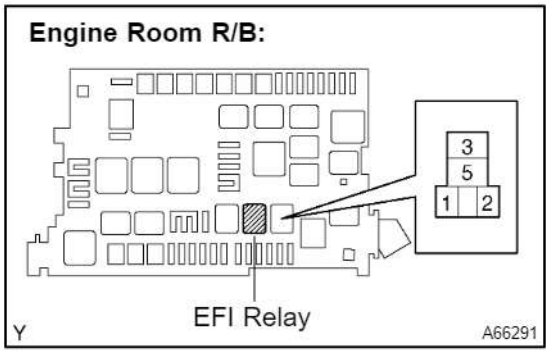
Standard (Check for open):

Tester Connection	Specified Condition
+B (M1–1) – EFI relay (3)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
+B (M1–1) or EFI relay (3) – Body ground	10 kΩ or higher

(d) Reconnect the mass air flow meter connector.
(e) Reinstall the EFI relay.

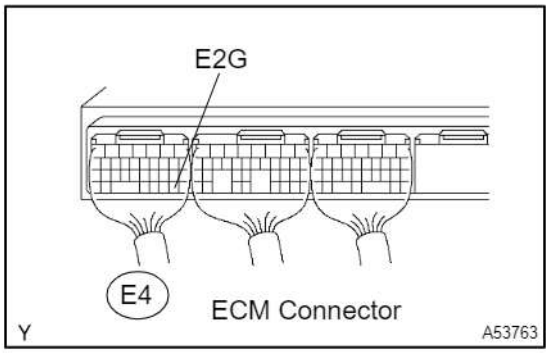


NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK ECM POWER SOURCE CIRCUIT (See page 05–644)

6 INSPECT ECM(SENSOR GROUND)



(a) Check the resistance between the specified terminal of the E4 ECM connector and body ground.

Standard:

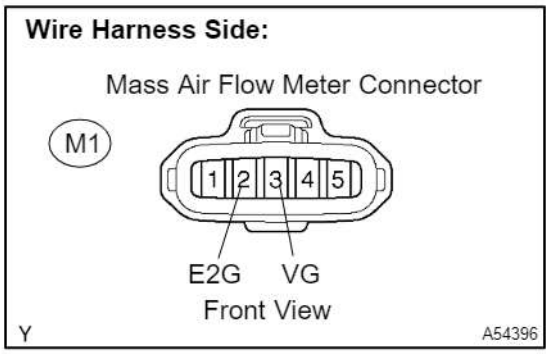
Tester Connection	Specified Condition
E2G (E4–29) – Body ground	Below 1 Ω

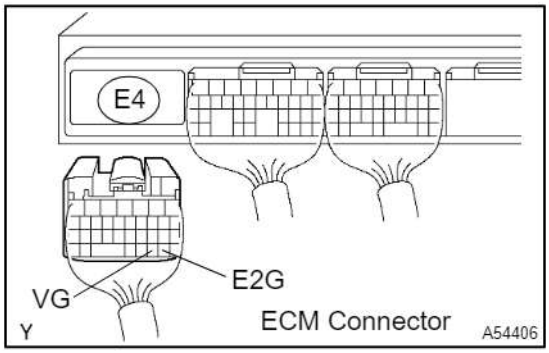
NG → **REPLACE ECM (See page 10–11)**

OK

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7 CHECK HARNESS AND CONNECTOR(MASS AIR FLOW METER – ECM)





(a) Disconnect the mass air flow meter connector.
(b) Disconnect the E4 ECM connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
VG (M1–3) – VG (E4–30)	Below 1 Ω
E2G (M1–2) – E2G (E4–29)	

Standard (Check for short):

Tester Connection	Specified Condition
VG (M1–3) or VG (E4–30) – Body ground	10 kΩ or higher

(d) Reconnect the mass air flow meter connector.
(e) Reconnect the ECM connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE MASS AIR FLOW METER

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DTC	P0101	MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE PROBLEM

CIRCUIT DESCRIPTION

Refer to DTC P0100 on page 05–403.

DTC No.	DTC Detection Condition	Trouble Area
P0101	After the engine is warmed up, conditions (a), (b), (c) and (d) continue for more than 10 seconds (2 trip detection logic): (a) Throttle valve is fully closed (b) Voltage output of the mass air flow meter is more than 2.2 V (c) Engine coolant temperature is more than 70 C (d) Engine speed is less than 900 rpm	□Mass air flow meter
	Conditions (a), (b) and (c) continue for more than 6 seconds (2 trip detection logic): (a) Engine speed is more than 0 rpm (b) Voltage output of the throttle position sensor (VTA) is more than 0.1 V (c) Voltage output of the mass air flow meter is less than 0.4 V	

MONITOR DESCRIPTION

The MAF (Mass Air Flow) meter is a sensor that helps the ECM calculate the amount of air flowing through the throttle valve. The ECM uses this information to determine the fuel injection time and provide a proper air–fuel ratio. Inside the MAF meter, there is a heated platinum wire exposed to the flow of intake air. By applying a specific current to the wire, the ECM heats this wire to a given temperature. The flow of incoming air cools the wire and an internal thermistor, changing their resistance. To maintain a constant current value, the ECM varies the voltage applied to these components in the MAF meter. The voltage level is proportional to the flow of the air passing through the sensor. The ECM interprets this voltage as the intake air amount. If there is a defect in the sensor or an open or short circuit, the voltage level will deviate from the normal operating range. The ECM interprets this deviation as a defect in the MAF meter and sets a DTC.
Example: If the voltage is more than 2.2 V at idle or less than 0.4 V at idle off, the ECM interprets this as a defect in the MAF meter and sets a DTC.

MONITOR STRATEGY

Related DTCs	P0101: Mass air flow meter malfunction (Low voltage) P0101: Mass air flow meter malfunction (High voltage)
Required sensors/ components (Main)	Mass air flow meter
Required sensors/ components (Related)	Crankshaft position sensor, Engine coolant temperature sensor, Throttle position sensor
Frequency of operation	Continuous
Duration	10 seconds
MIL operation	2 driving cycles
Sequence operation	None

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TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05–334

Mass air flow meter malfunction (High voltage):

Engine RPM	Less than 900 rpm
Idle	ON
Engine coolant temperature	70°C (158°F) or more

Mass air flow meter malfunction (Low voltage):

Engine RPM	0 rpm or more
Throttle position sensor voltage	0.1 V or more

TYPICAL MALFUNCTION THRESHOLDS

Mass air flow meter malfunction (High voltage):

Mass air flow meter voltage	More than 2.2 V

Mass air flow meter malfunction (Low voltage):

Mass air flow meter voltage	Less than 0.4 V

WIRING DIAGRAM

Refer to DTC P0100 on page 05–403.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1 CHECK OTHER DTC OUTPUT(BESIDES DTC P0101)

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(c) Select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(d) Read DTCs.

Result:

Display (DTC output)	Proceed to
P0101 and other DTCs	A
P0101	B

HINT:

If any other codes besides P0101 are output, perform troubleshooting for those DTCs first.

B → **REPLACE MASS AIR FLOW METER**

A

GO TO RELEVANT DTC CHART (See page 05–366)

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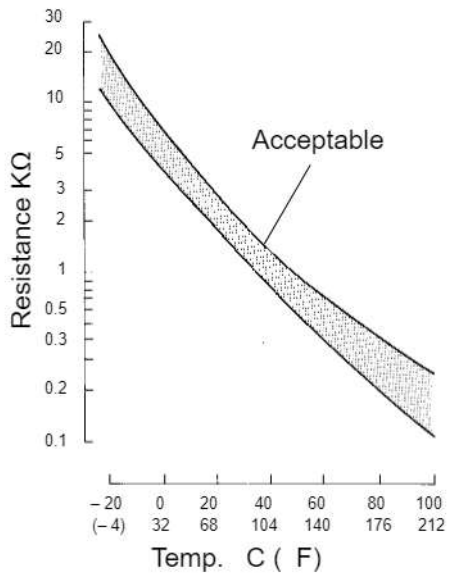
DTC	P0110	INTAKE AIR TEMPERATURE CIRCUIT

DTC	P0112	INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT

DTC	P0113	INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT

CIRCUIT DESCRIPTION

(Figure 1)



The intake air temperature (IAT) sensor, mounted on the mass air flow (MAF) meter, monitors the intake air temperature. The IAT sensor has a thermistor that varies its resistance depending on the temperature of the intake air. When the air temperature is low, the resistance in the thermistor increases. When the temperature is high, the resistance drops. The variations in resistance are reflected as voltage changes to the ECM terminal (see Figure 1).

The intake air temperature sensor is connected to the ECM. The 5 V power source voltage in the ECM is applied to the intake air temperature sensor from terminal THA (THAR) via resistor R.

That is, the resistor R and the intake air temperature sensor are connected in series. When the resistance value of the intake air temperature sensor changes in accordance with changes in the intake air temperature, the voltage at terminal THA (THAR) also changes. Based on this signal, the ECM increases the fuel injection volume to improve the driveability during cold engine operation.

DTC No.	Proceed to	DTC Detection Condition	Trouble Area
P0110	Step 1	Open or short in intake air temperature sensor circuit for 0.5 second	□Open or short in intake air temperature sensor circuit □Intake air temperature sensor (built in mass air flow meter) □ECM
P0112	Step 4	Short in intake air temperature sensor circuit for 0.5 second	
P0113	Step 2	Open in intake air temperature sensor circuit for 0.5 second	

HINT:

After confirming DTC P0110, P0112 or P0113, use the hand–held tester or the OBD II scan tool to confirm the intake air temperature in the DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL.

Temperature Displayed	Malfunction
–40°C (–40°F)	Open circuit
140°C (284°F) or more	Short circuit

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MONITOR DESCRIPTION

The ECM monitors the sensor voltage and uses this value to calculate the intake air temperature. When the sensor output voltage deviates from the normal operating range, the ECM interprets this as a fault in the IAT sensor and sets a DTC.
Example:
When the sensor voltage output is less than –40 C (–40 F), or more than 140 C (284 F).

MONITOR STRATEGY

Related DTCs	P0110:Intake air temperature sensor open/short (Fluttering) P0112: Intake air temperature sensor short (Low electrical resistance) P0113: Intake air temperature sensor open (High electrical resistance)
Required sensors/components (Main)	Intake air temperature sensor
Required sensors/components (Related)	–
Frequency of operation	Continuous
Duration	0.5 second
MIL operation	Immediate
Sequence operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	None

TYPICAL MALFUNCTION THRESHOLDS

P0110:

Intake air temperature sensor resistance	Less than 98.5 Ω or more than 156 KΩ

P0112

Intake air temperature sensor resistance	Less than 98.5 Ω [More than 140 C (284 F)]

P0113

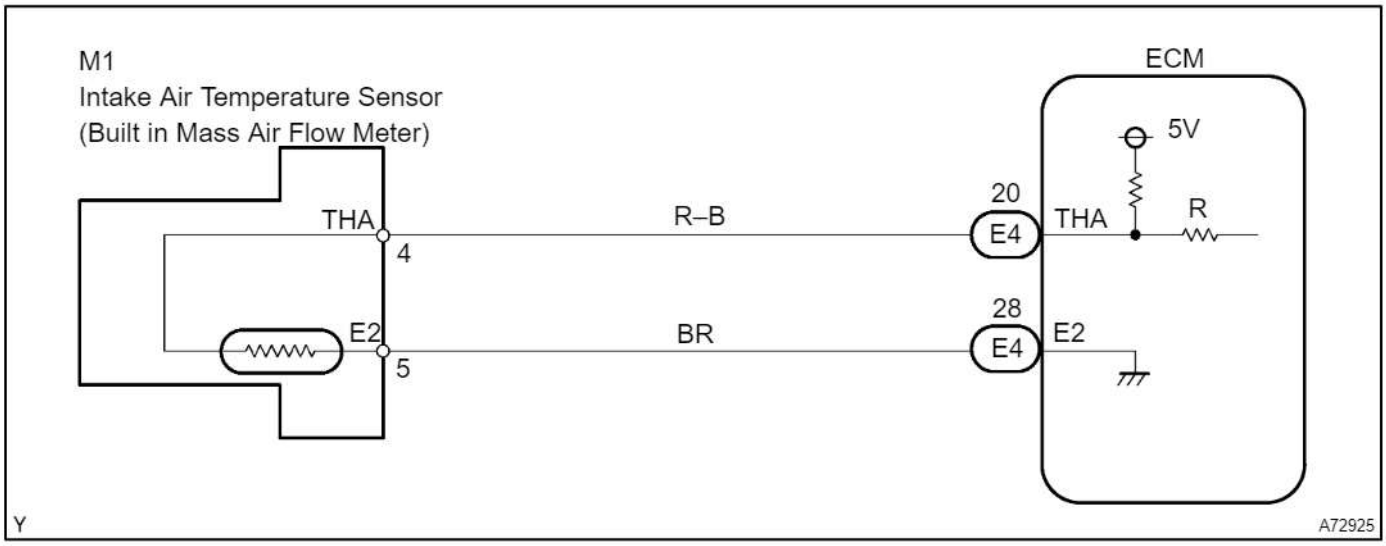
Intake air temperature sensor resistance	More than 156 kΩ [Less than –40 C (–40 F)]

COMPONENT OPERATING RANGE

Intake air temperature sensor resistance	98.5 Ω to 156 kΩ [–40 to 140 C (–40 to 284 F)]

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WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may have an open circuit.
- Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1	READ VALUE OF HAND–HELD TESTER OR OBD II SCAN TOOL(INTAKE AIR TEMPERATURE)

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(c) On the hand–held tester or the OBD II scan tool, select the item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / INTAKE AIR.
(d) Read the values.
Temperature: Same value as the ambient air temperature.
Result:

Temperature Displayed	Proceed to
–40°C (–40°F)	A
140°C (284°F) or more	B
OK (Same as the ambient air temperature)	C

HINT:

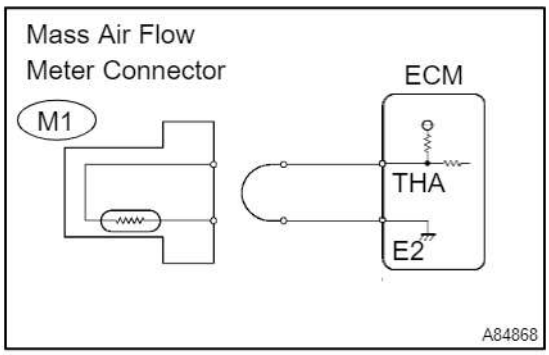
- If there is an open circuit, the hand–held tester or the OBD II scan tool indicates –40°C (–40°F).
- If there is a short circuit, the hand–held tester or the OBD II scan tool indicates 140°C (284°F) or more.

B	Go to step 4
C	CHECK FOR INTERMITTENT PROBLEMS (See page 05–331)

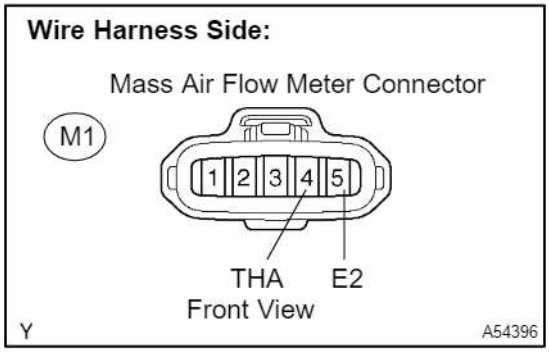
A

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2	READ VALUE OF HAND–HELD TESTER OR OBD II SCAN TOOL(CHECK FOR OPEN IN WIRE HARNESS)



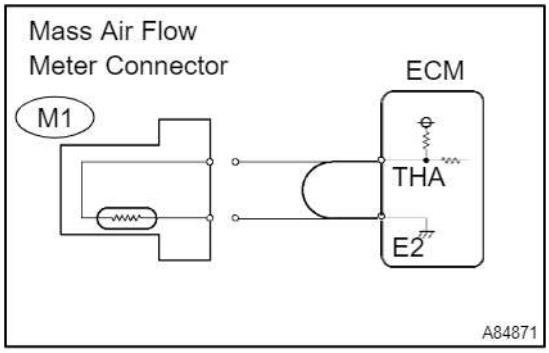
(a) Disconnect the mass air flow meter connector.
(b) Connect terminals THA and E2 of the mass air flow meter wire harness side connector.
(c) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(d) On the hand–held tester or the OBD II scan tool, select the item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / INTAKE AIR.
(e) Read the values.
Temperature: 140°C (284°F) or more
(f) Reconnect the mass air flow meter connector.



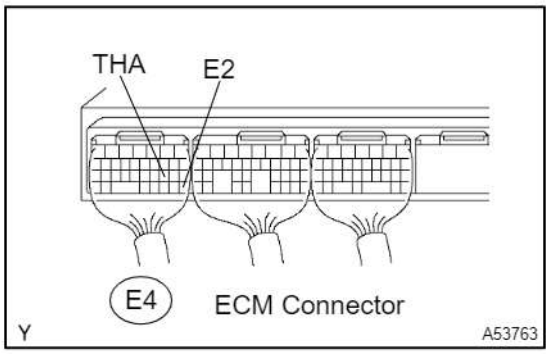
OK	CONFIRM GOOD CONNECTION AT SENSOR. IF OK, REPLACE MASS AIR FLOW METER

NG

3	READ VALUE OF HAND–HELD TESTER OR OBD II SCAN TOOL(CHECK FOR OPEN IN ECM)



(a) Disconnect the mass air flow meter connector.
(b) Connect terminals THA and E2 of the E4 ECM connector.
HINT:
Before checking, do a visual and contact pressure check on the ECM connector.
(c) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(d) On the hand–held tester or the OBD II scan tool, select the item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / INTAKE AIR.
(e) Read the values.
Temperature: 140°C (284°F) or more
(f) Reconnect the mass air flow meter connector.



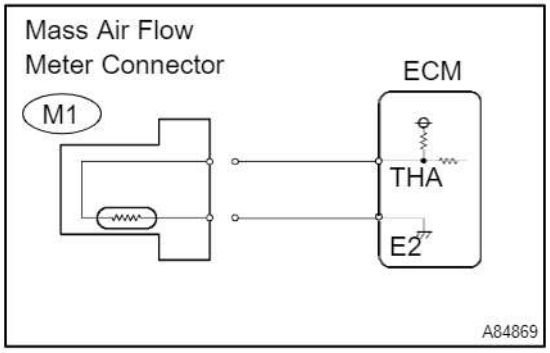
OK	REPAIR OR REPLACE HARNESS OR CONNECTOR

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NG

CONFIRM GOOD CONNECTION AT ECM. IF OK, REPLACE ECM (See page 10–11)

4	READ VALUE OF HAND–HELD TESTER OR OBD II SCAN TOOL(CHECK FOR SHORT IN WIRE HARNESS)

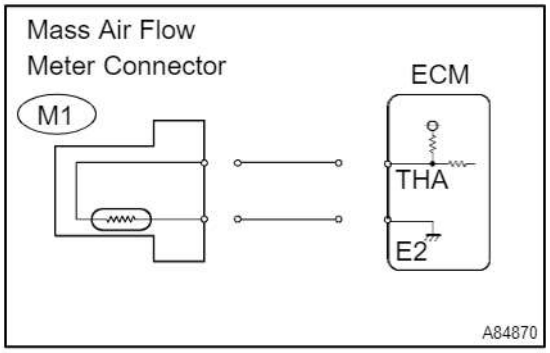


(a) Disconnect the mass air flow meter connector.
(b) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(c) On the hand–held tester or the OBD II scan tool, select the item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / INTAKE AIR.
(d) Read the values.
Temperature: –40°C (–40°F)
(e) Reconnect the mass air flow meter connector.

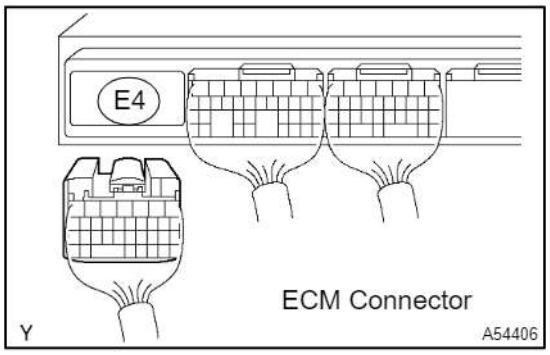
OK → **REPLACE MASS AIR FLOW METER**

NG

5	READ VALUE OF HAND–HELD TESTER OR OBD II SCAN TOOL(CHECK FOR SHORT IN ECM)



(a) Disconnect the E4 ECM connector.
(b) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(c) On the hand–held tester or the OBD II scan tool, select the item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / INTAKE AIR.
(d) Read the values.
Temperature: –40°C (–40°F)
(e) Reconnect the ECM connector.



OK → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

NG

REPLACE ECM (See page 10–11)

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DTC	P0115	ENGINE COOLANT TEMPERATURE CIRCUIT

DTC	P0117	ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT

DTC	P0118	ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT

CIRCUIT DESCRIPTION

A thermistor is built in the engine coolant temperature (ECT) sensor and changes the resistance value according to the engine coolant temperature.
The structure of the sensor and connection to the ECM is the same as those of the intake air temperature sensor.
HINT:
If the ECM detects the DTC P0115, P0117 or P0118, the ECM enter fail–safe function in which the engine coolant temperature is assumed to be 80 C (176 F).

DTC No.	Proceed to	DTC Detection Condition	Trouble Area
P0115	Step 1	Open or short in engine coolant temperature sensor circuit for 0.5 second	□Open or short in engine coolant temperature sensor circuit □Engine coolant temperature sensor □ECM
P0117	Step 4	Short in engine coolant temperature sensor circuit for 0.5 second	
P0118	Step 2	Open in engine coolant temperature sensor circuit for 0.5 second	

HINT:
After confirming DTC P0115, P0117 or P0118, use the hand–held tester or the OBD II scan tool to confirm the engine coolant temperature in the DIAGNOSIS/ENHANCED OBD II/DATA LIST/ALL.

Temperature Displayed	Malfunction
–40°C (–40°F)	Open circuit
140°C (284°F) or more	Short circuit

MONITOR DESCRIPTION

The engine coolant temperature (ECT) sensor is used to monitor the engine coolant temperature. The ECT sensor has a thermistor that varies its resistance depending on the temperature of the engine coolant. When the coolant temperature is low, the resistance in the thermistor increases. When the temperature is high, the resistance drops. The variations in resistance are reflected in the voltage output from the sensor. The ECM monitors the sensor voltage and uses this value to calculate the engine coolant temperature. When the sensor output voltage deviates from the normal operating range, the ECM interprets this as a fault in the ECT sensor and sets a DTC.
Example:
When the ECM calculates that the ECT is –40 C (–40 F), or more than 140 C (284 F) and if either of the conditions continues for 0.5 second or more, the ECM will set a DTC.

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MONITOR STRATEGY

Related DTCs	P0115: Engine coolant temperature sensor open/short (Fluttering) P0117: Engine coolant temperature sensor short (Low electrical resistance) P0118: Engine coolant temperature sensor open (High electrical resistance)
Required sensors/components (Main)	Engine coolant temperature sensor
Required sensors/components (Related)	–
Frequency of operation	Continuous
Duration	0.5 second
MIL operation	Immediate
Sequence operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	None

TYPICAL MALFUNCTION THRESHOLDS

P0115:

Engine coolant temperature sensor resistance	Less than 79 Ω or more than 156 kΩ

P0117:

Engine coolant temperature sensor resistance	Less than 79 Ω [More than 140 C (284 F)]

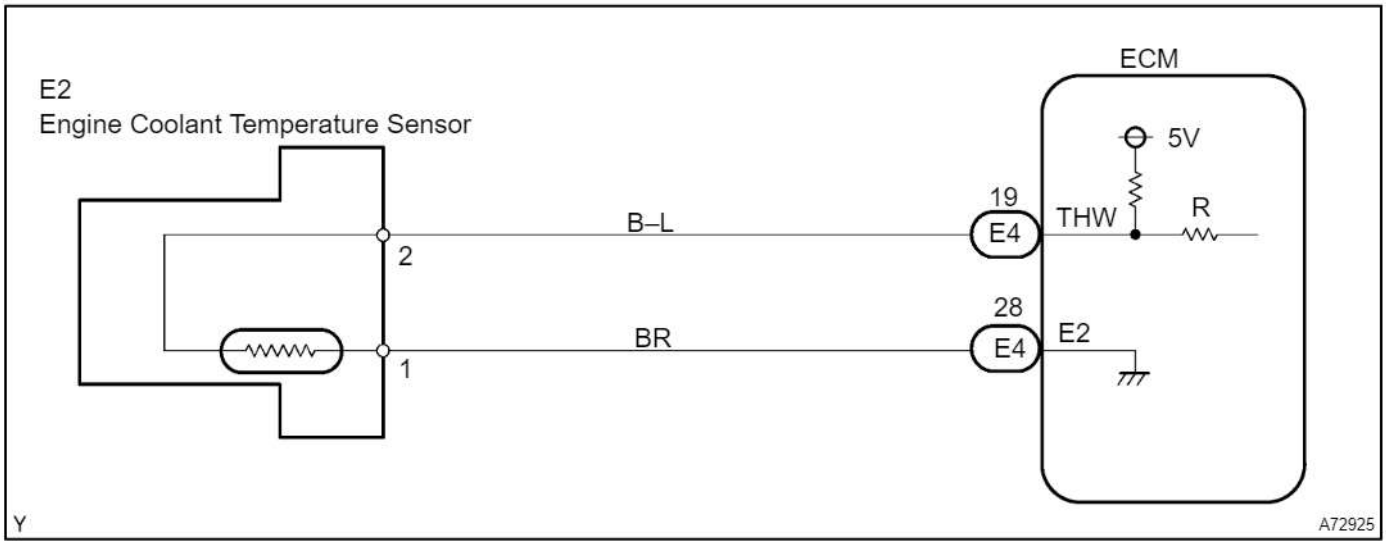
P0118:

Engine coolant temperature sensor resistance	More than 156 kΩ [Less than –40 C (–40 F)]

COMPONENT OPERATING RANGE

Engine coolant temperature sensor resistance	79 Ω to 156 kΩ [–40 to 140 C (–40 to 284 F)]

WIRING DIAGRAM



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INSPECTION PROCEDURE

HINT:

- If DTCs related to different system that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may have an open circuit.
- Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1	READ VALUE OF HAND–HELD TESTER OR OBD II SCAN TOOL(ENGINE COOLANT TEMPERATURE)

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(c) On the hand–held tester or the OBD II scan tool, select the item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / COOLANT TEMP.
(d) Read the values.

Temperature: 80 C to 97 C (176 to 207 F) after warming up.

Result:

Temperature Displayed	Proceed to
–40°C (–40°F)	A
140°C (284°F) or more	B
OK (Same as the actual engine coolant temperature)	C

HINT:

- If there is an open circuit, the hand–held tester or the OBD II scan tool indicates –40°C (–40°F).
- If there is a short circuit, the hand–held tester or the OBD II scan tool indicates 140°C (284°F) or more.

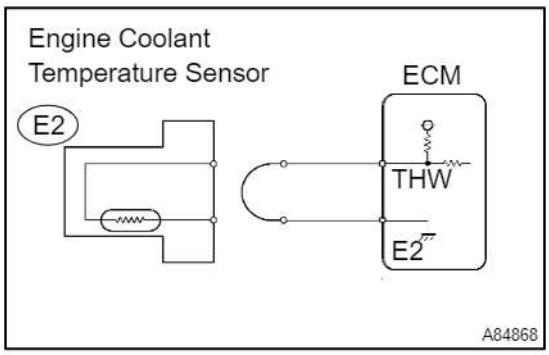
B → **Go to step 4**

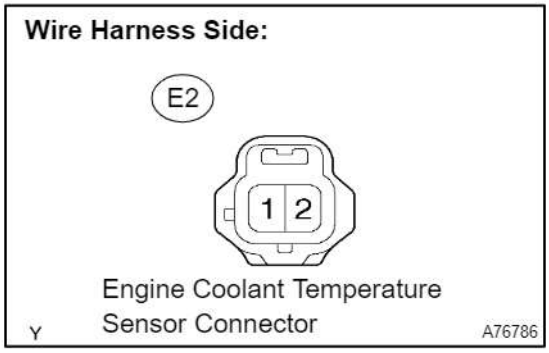
C → **CHECK FOR INTERMITTENT PROBLEMS (See page 05–331)**

A

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2	READ VALUE OF HAND–HELD TESTER OR OBD II SCAN TOOL(CHECK FOR OPEN IN WIRE HARNESS)



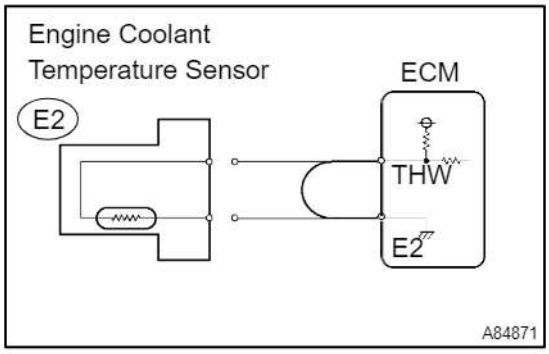


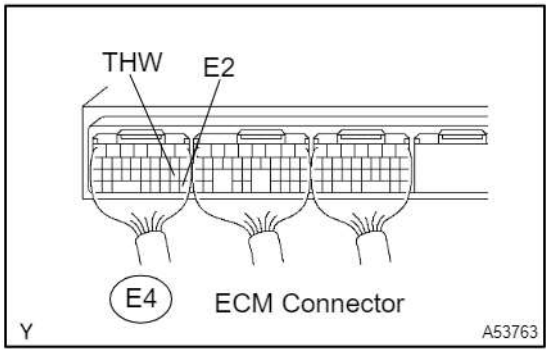
(a) Disconnect the engine coolant temperature sensor connector.
(b) Connect terminals 1 and 2 of the engine coolant temperature sensor wire harness side connector.
(c) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(d) On the hand–held tester or the OBD II scan tool, select the item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / COOLANT TEMP.
(e) Read the values.
Temperature: 140°C (284°F) or more
(f) Reconnect the engine coolant temperature sensor connector.

OK	CONFIRM GOOD CONNECTION AT SENSOR. IF OK, REPLACE ENGINE COOLANT TEMPERATURE SENSOR

NG

3	READ VALUE OF HAND–HELD TESTER OR OBD II SCAN TOOL(CHECK FOR OPEN IN ECM)





(a) Disconnect the engine coolant temperature sensor connector.
(b) Connect terminals THW and E2 of the E4 ECM connector.
HINT:
Before checking, do a visual and contact pressure check on the ECM connector.
(c) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(d) On the hand–held tester or the OBD II scan tool, select the item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / COOLANT TEMP.
(e) Read the values.
Temperature: 140°C (284°F) or more
(f) Reconnect the engine coolant temperature sensor connector.

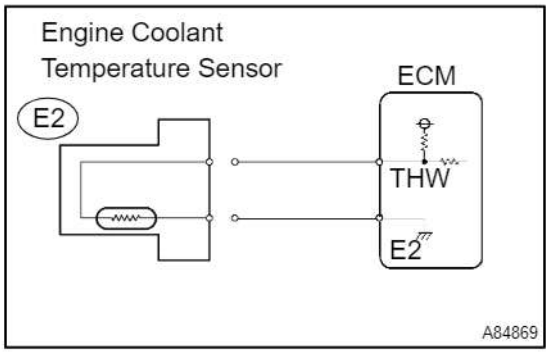
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OK	REPAIR OR REPLACE HARNESS OR CONNECTOR

NG

CONFIRM GOOD CONNECTION AT ECM. IF OK, REPLACE ECM (See page 10–11)

4	READ VALUE OF HAND–HELD TESTER OR OBD II SCAN TOOL(CHECK FOR SHORT IN WIRE HARNESS)

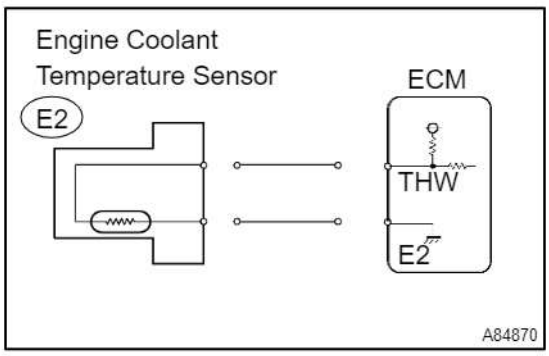


(a) Disconnect the engine coolant temperature sensor connector.
(b) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(c) On the hand–held tester or the OBD II scan tool, select the item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / COOLANT TEMP.
(d) Read the values.
Temperature: –40°C (–40°F)
(e) Reconnect the engine coolant temperature sensor connector.

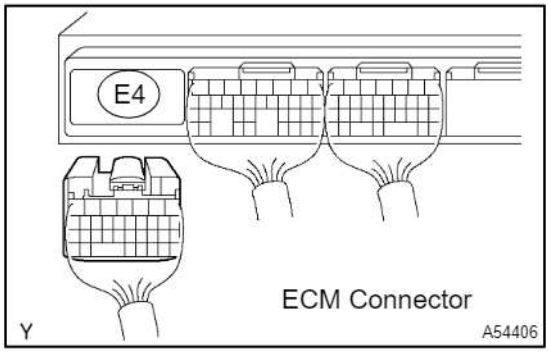
OK	REPLACE ENGINE COOLANT TEMPERATURE SENSOR

NG

5	READ VALUE OF HAND–HELD TESTER OR OBD II SCAN TOOL(CHECK FOR SHORT IN ECM)



(a) Disconnect the E4 ECM connector.
(b) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(c) On the hand–held tester or the OBD II scan tool, select the item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / COOLANT TEMP.
(d) Read the values.
Temperature: –40°C (–40°F)
(e) Reconnect the ECM connector.



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OK → REPAIR OR REPLACE HARNESS OR CONNECTOR

NG

REPLACE ECM (See page 10–11)

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DTC	P0116	ENGINE COOLANT TEMP. CIRCUIT RANGE/PERFORMANCE PROBLEM

CIRCUIT DESCRIPTION

Refer to DTC P0115 on page 05–417.

DTC No.	DTC Detection Condition	Trouble Area
P0116	If the engine coolant temperature was 35°C (95°F) and 60°C (140°F) at engine start, and condition (a) and (b) are met (2 trip detection logic): (a) Vehicle is driven at varying speeds (under acceleration and deceleration) (b) Engine coolant temperature remains within 3°C (5.4°F) of the engine starting temperature	□Engine coolant temperature sensor
	If the engine coolant temperature was more than 60°C (140°F) at engine start, and conditions (a) and (b) are met (6 trip detection logic): (a) Vehicle is driven at varying speeds (under acceleration and deceleration) (b) Engine coolant temperature remains within 1°C (1.8°F) of the engine starting temperature, and this is successively recorded 6 times	

MONITOR DESCRIPTION

The engine coolant temperature (ECT) sensor is used to monitor the engine coolant temperature. The ECT sensor has a thermistor that varies its resistance depending on the temperature of the engine coolant. When the coolant temperature is low, the resistance in the thermistor increases. When the temperature is high, the resistance drops. The variations in resistance are reflected in the voltage output from the sensor. The ECM monitors the sensor voltage and uses this value to calculate the engine coolant temperature. When the sensor output voltage deviates from the normal operating range, the ECM interprets this as a fault in the ECT sensor and sets a DTC.

Examples:

1) Upon starting the engine, the coolant temperature (ECT) was between 35 C (95 F) and 60 C (140 F). If after driving for 250 seconds, the ECT still remains within 3 C (5.4 F) of the staring temperature, a DTC will be set (2 trip detection logic).

2) Upon starting the engine, the coolant temperature (ECT) was over 60 C (140 F). If, after driving for 250 seconds, the ECT still remains within 1 C (1.8 F) of the starting temperature, a DTC will be set (6 trip detection logic).

MONITOR STRATEGY

Related DTCs	P0116: Engine coolant temperature sensor output stuck at low engine coolant temperature P0116: Engine coolant temperature sensor output stuck at high engine coolant temperature
Required sensors/ components (Main)	Engine coolant temperature sensor
Required sensors/ components (Related)	Crankshaft position sensor, Intake air temperature sensor, Mass air flow meter
Frequency of operation	Continuous
Duration	250 seconds or more
MIL operation	2 driving cycles: Engine coolant temperature sensor output stuck at low engine coolant temperature 6 driving cycles: Engine coolant temperature sensor output stuck at high engine coolant temperature
Sequence operation	None

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TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05–334

Engine coolant temperature sensor output stuck at low engine coolant temperature:

Cumulative idle off period	250 seconds or more
Speed increase by 30 km/h (19 mph) or more	10 times or more
Engine coolant temperature	35 to 60 C (95 to 140 F)
Intake air temperature	–6.7 C (20 F) or more

Engine coolant temperature sensor output stuck at high engine coolant temperature:

Engine coolant temperature	60 C or more
Intake air temperature	–6.7 C (20 F) or more
"Stop and go" *1	Once or more
"Steady driving and stop" *2	Once or more

*1 Vehicle is stopped for 20 seconds or more and accelerated from 2 mph (3 km/h) to 44 mph (70 km/h) within 40 seconds.

*2 Vehicle is driven by 40 mph (65 km/h) or more for 30 seconds or more and the vehicle speed reaches 44 mph (70 km/h). The vehicle is decelerated from 40 mph (65 km/h) to 2 mph (3 km/h) or less within 35 seconds and stopped for 10 seconds.

TYPICAL MALFUNCTION THRESHOLDS

Engine coolant temperature sensor output stuck at low engine coolant temperature):

Varition of engine coolant temperature	Less than 3 C (5.4 F)

Engine coolant temperature sensor output stuck at high engine coolant temperature):

Varition of engine coolant temperature	1 C (1.8 F) or less

COMPONENT OPERATING RANGE

Engine coolant temperature	Varies with actual engine coolant temperature

INSPECTION PROCEDURE

HINT:

- If DTCs P0115, P0116, P0117, P0118 and P0125 are output simultaneously, the engine coolant temperature sensor circuit may be open or short. Perform troubleshooting on DTC P0115, P0117 or P0118 first.
- Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

REPLACE ENGINE COOLANT TEMPERATURE SENSOR

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DTC	P0120	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”A” CIRCUIT

DTC	P0122	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”A” CIRCUIT LOW INPUT

DTC	P0123	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”A” CIRCUIT HIGH INPUT

DTC	P0220	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”B” CIRCUIT

DTC	P0222	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”B” CIRCUIT LOW INPUT

DTC	P0223	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”B” CIRCUIT HIGH INPUT

DTC	P2135	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”A”/”B” VOLTAGE CORRELATION

HINT:
This is the purpose of troubleshooting on the throttle position sensor.

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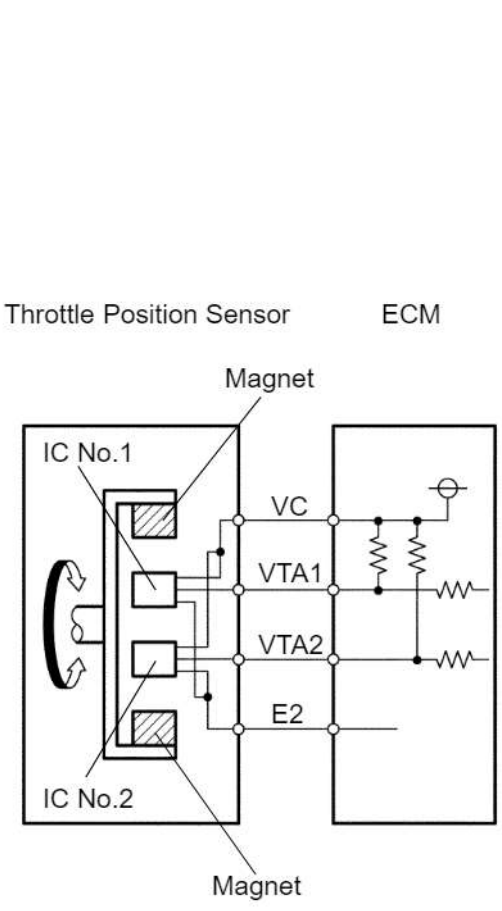
CIRCUIT DESCRIPTION

HINT:

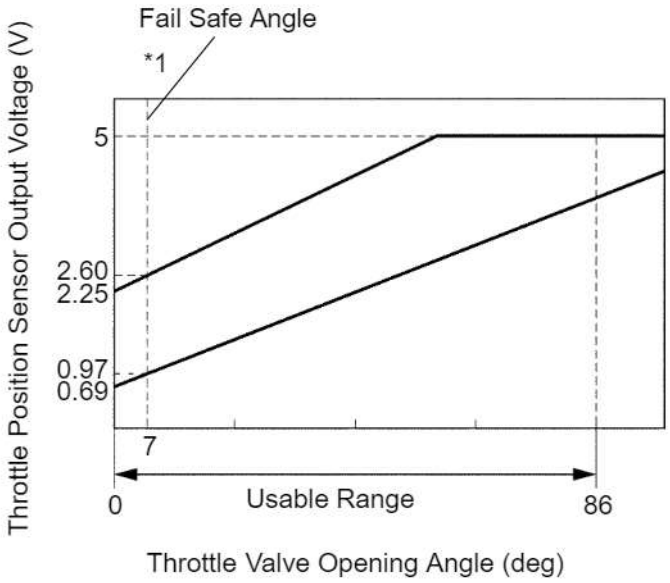
- This Electrical Throttle Control System (ECTS) does not use a throttle cable.
- This throttle position sensor is a non–contact type.

The throttle position sensor is mounted on the throttle body and it detects the opening angle of the throttle valve. This sensor is electronically controlled and uses Hall–effect elements, so that accurate control and reliability can be obtained. The throttle position sensor has 2 sensor elements / signal output: VTA1 and VTA2. VTA1 is used to detect the throttle opening angle and VTA2 is used to detect malfunction in VTA1. Voltage applied to VTA1 and VTA2 changes between 0V and 5V in proportion to the opening angle of the throttle valve. There are several checks that the ECM performs to confirm proper operation of the throttle position sensor and VTA1.

The ECM judges the current opening angle of the throttle valve from these signals input from terminals VTA1 and VTA2, and the ECM controls the throttle motor to make the throttle valve angle properly in response to driver inputs.



A19755



A19802

Throttle Valve Fully Closed
(Throttle Position expressed as percentage
(VTA1) 10 to 20 %)

Throttle Valve Fully Opened
(Throttle Position expressed as percentage
(VTA1) 64 to 96 %)

*1: Fail Safe Angle 7°
(Throttle Position expressed as percentage
(VTA1) 10 to 24 %)

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DTC No.	DTC Detection Condition	Trouble Area
Condition (a) of DTC P0120, P0122, P0123, P0220, P0222 or P0223 continues for 2 seconds (Open or short in throttle position sensor circuit)		
P0120	Detection conditions for DTCs P0122 and P0123 are not satisfied but condition (a) is satisfied: (a) VTA1 is 0.2 V or less or 4.8 V or more	□Throttle position sensor (built in throttle body) □ECM
P0122	(a) VTA1 is 0.2 V or less	□Throttle position sensor (built in throttle body) □Short in VTA1 circuit □Open in VC circuit □ECM
P0123	(a) VTA1 is 4.8 V or more	□Throttle position sensor (built in throttle body) □Open in VTA1 circuit □Open in E2 circuit □VC and VTA1 circuit are short–circuited □ECM
P0220	Detection conditions for DTCs P0222 and P0223 are not satisfied but condition (a) is satisfied (a) VTA2 is 0.5 V or less or 4.8 V or more, and VTA1 is between 0.2 V and 1.8 V	□Throttle position sensor (built in throttle body) □ECM
P0222	(a) VTA2 is 0.5 V or less	□Throttle position sensor (built in throttle body) □Short in VTA2 circuit □Open in VC circuit □ECM
P0223	(a) VTA2 is 4.8 V or more, and VTA1 is between 0.2 V and 1.8 V	□Throttle position sensor (built in throttle body) □Open in VTA2 circuit □Open in E2 circuit □VC and VTA2 circuits are short–circuited □ECM
P2135	Condition (a) continues for 0.5 second or more, or condition (b) continues for 0.4 second or more: (a) Difference between VTA1 and VTA2 is 0.02 V or less (b) VTA1 is 0.2 V or less and VTA2 is 0.5 V or less	□VTA1 and VTA2 circuits are short–circuited □Throttle position sensor (built in throttle body) □ECM

NOTICE:

When a malfunction is detected, the throttle valve is locked at a certain opening angle. Also, the whole electronically controlled throttle operation is cancelled until the system returns to normal and the ignition switch is turned to OFF.

HINT:

- □ After confirming DTCs, use the hand–held tester or the OBD II scan tool to confirm the throttle valve opening percentage and closed throttle position switch condition.
- □ The THROTTLE POS means the VTA1 signal, and the THROTTLE POS #2 stands for the VTA2 signal.

Reference (Normal condition):

Tester display	Accelerator pedal fully released	Accelerator pedal fully depressed
THROTTLE POS	10 to 24 %	64 to 96 %
THROTTLE POS #2	2.1 to 3.1 V	4.5 to 5.5 V

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MONITOR DESCRIPTION

The ECM uses the throttle position sensor to monitor the throttle valve opening angle.

(a) There is a specific voltage difference expected between VTA1 and VTA2 for each throttle opening angle.

□ If the difference between VTA1 and VTA2 is incorrect, the ECM interprets this as a default and will set a DTC.

(b) VTA1 and VTA2 each have a specific voltage operating range.

□ If VTA1 or VTA2 is out of the normal operating range, the ECM interprets this as a fault and will set a DTC.

(c) VTA1 and VTA2 should never be close to the same voltage levels.

□ If VTA1 is within 0.02V of VTA2, the ECM interprets this as a short circuit in the throttle position sensor system and will set a DTC.

FAIL SAFE

If the Electronic Throttle Control System (ETCS) has a malfunction, the ECM cuts off current to the throttle control motor. The throttle control valve returns to a predetermined opening angle (approximately 16) by the force of the return spring. The ECM then adjusts the engine output by controlling the fuel injection (intermittent fuel–cut) and ignition timing in accordance with the accelerator pedal opening angle to enable the vehicle to continue at a minimal speed.

If the accelerator pedal is depressed firmly and slowly, the vehicle can be driven slowly.

If a ”pass” condition is detected and then the ignition switch is turned to OFF, the fail–safe operation will stop and the system will return to normal condition.

MONITOR STRATEGY

Related DTCs	P0120: Throttle position sensor (VTA1) open/short (Fluttering) P0122: Throttle position sensor (VTA1) open/short (Low voltage) P0123: Throttle position sensor (VTA1) open/short (High voltage) P0220: Throttle position sensor VTA2) open/short (Fluttering) P0222: Throttle position sensor (VTA2) open/short (Low voltage) P0223: Throttle position sensor (VTA2) open/short (High voltage) P2135: Throttle position sensor (Between VA1 and VTA2) open P2135: Throttle position sensor (Between VA1 and VTA2) short
Required sensors/components (Main)	Throttle position sensor
Required sensors/components (Related)	–
Frequency of operation	Continuous
Duration	2 seconds
MIL operation	Immediate
Sequence operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	None

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TYPICAL MALFUNCTION THRESHOLDS

P0120:

VTA1 voltage	0.2 V or less or 4.8 V or more

P0122:

VTA1 voltage	0.2 V or less

P0123:

VTA1 voltage	4.8 V or more

P0220:

VTA1 voltage	0.5 V or less or 4.8 V or more

P0222:

VTA2 voltage	0.5 V or less

P0223:

VTA2 voltage when the VTA1 is 0.2 to 1.8 V	4.8 V or more

P2135 Throttle position sensor (Between VTA1 and VTA2) open:

Difference between VTA1 and VTA2 voltage	0.02 V or less

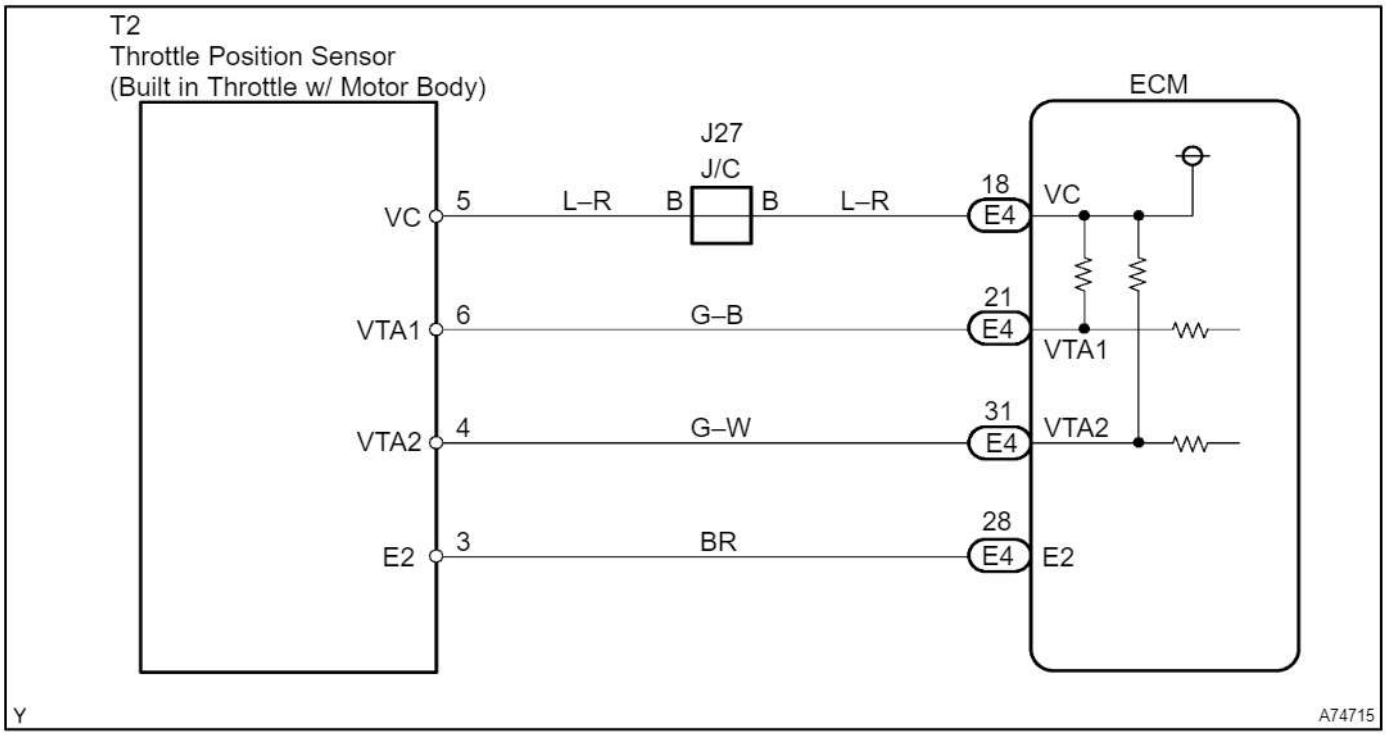
P2135 Throttle position sensor (Between VTA1 and VTA2) short:

Both of the following conditions are met:	
VTA1 voltage	0.2 V or less
VTA2 voltage	0.5 V or less

COMPONENT OPERATING RANGE

VTA1 voltage	0.6 to 3.96 V
VTA2 voltage	2.25 to 4.8 V

WIRING DIAGRAM



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INSPECTION PROCEDURE

HINT:

- If DTCs related to different system that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may have an open circuit.
- Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

Hand–held tester:

1	**READ VALUE OF HAND–HELD TESTER(THROTTLE POS AND THROTTLE POS #2)**

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch to ON and turn the hand–held tester ON.
(c) On the hand–held tester, select the items: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ETCS / THROTTLE POS and THROTTLE POS #2.
(d) Read the values.

Result:

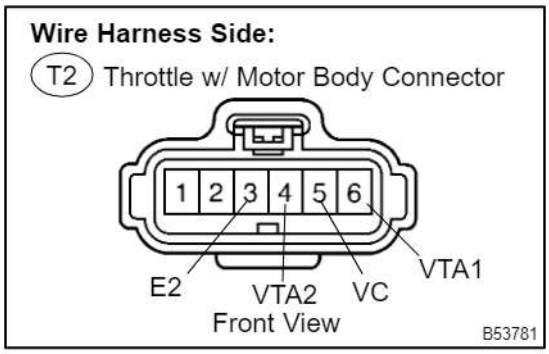
Throttle position expressed as percentage and voltage				Trouble Area	Proceed to
Accelerator pedal released		Accelerator pedal depressed			
THROTTLE POS (VTA1)	THROTTLE POS #2 (VTA2)	THROTTLE POS (VTA1)	THROTTLE POS #2 (VTA2)		
0 %	0 to 0.2 V	0 %	0 to 0.2 V	VC circuit open	A
100 %	4.5 to 5.5 V	100 %	4.5 to 5.5 V	E2 circuit open	
0 % or 100 %	2.1 to 3.1 V (Fail–safe)	0 % or 100 %	2.1 to 3.1 V (Fail–safe)	VTA1 circuit open or ground short	
10 to 24 % (Fail–safe)	0 to 0.2 or 4.5 to 5.5 V	10 to 24 % (Fail–safe)	0 to 0.2 or 4.5 to 5.5 V	VTA2 circuit open or ground short	
10 to 24 %	2.1 to 3.1 V	64 to 96 % (Not fail–safe)	4.5 to 5.5 V (Not fail–safe)	Throttle position sensor circuit is normal	B

B → **Go to step 5**

A

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2 CHECK HARNESS AND CONNECTOR(THROTTLE POSITION SENSOR – ECM)



(a) Disconnect the T2 throttle w/ motor body connector.
(b) Disconnect the E4 ECM connector.
(c) Check the resistance between the wire harness side connectors.

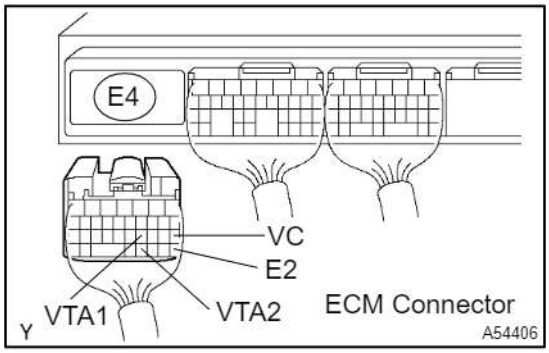
Standard (Check for open):

Tester Connection	Specified Condition
VC (T2–5) – VC (E4–18)	Below 1 Ω
VTA1 (T2–6) – VTA1 (E4–21)	
VTA2 (T2–4) – VTA2 (E4–31)	
E2 (T2–3) – E2 (E4–28)	

Standard (Check for short):

Tester Connection	Specified Condition
VC (T2–5) or VC (E4–18) – Body ground	10 kΩ or higher
VTA1 (T2–6) or VTA1 (E4–21) – Body ground	
VTA2 (T2–4) or VTA2 (E4–31) – Body ground	

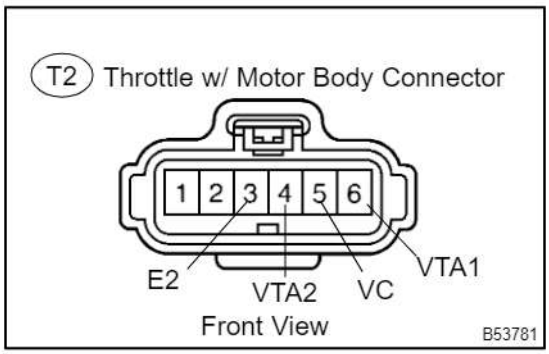
(d) Reconnect the throttle body connector.
(e) Reconnect the ECM connector.



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3 INSPECT ECM(VC VOLTAGE)

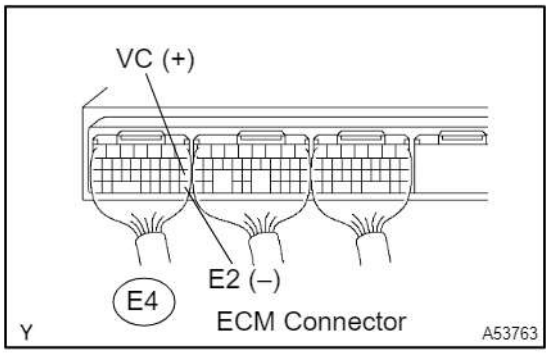


(a) Disconnect the T2 throttle w/ motor body connector.
(b) Turn the ignition switch to ON and turn the hand–held tester ON.
(c) Measure the voltage between the specified terminals of the E4 ECM connector.

Standard:

Tester Connection	Specified Condition
VC (E4–18) – E2 (E4–28)	4.5 to 5.5 V

(d) Reconnect the throttle body connector.



NG → **REPLACE ECM (See page 10–11)**

OK

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4	REPLACE THROTTLE W/MOTOR BODY ASSY (See page 10–6)

GO

5	READ OUTPUT DTC(SEE IF THROTTLE POSTION SENSOR DTCS ARE OUTPUT AGAIN)

(a) Clear the DTCs (See page 05–355).
(b) Start the engine.
(c) Run the engine at idle for 15 seconds or more.
(d) Connect the hand–held tester to the DLC3.
(e) Turn the ignition switch to ON and turn the hand–held tester ON.
(f) Select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(g) Read DTCs.

Result:

Display (DTC output)	Proceed to
P0120, P0122, P0123, P0220, P0222, P0223 and/or P2135	A
No output	B

B → SYSTEM OK

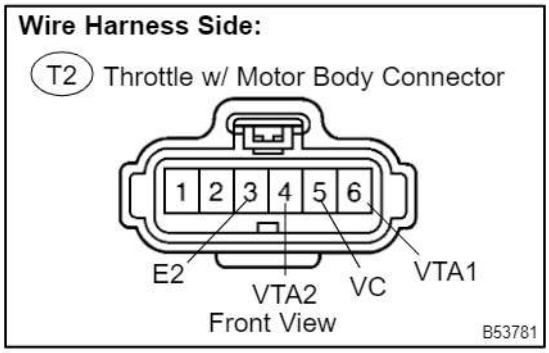
A

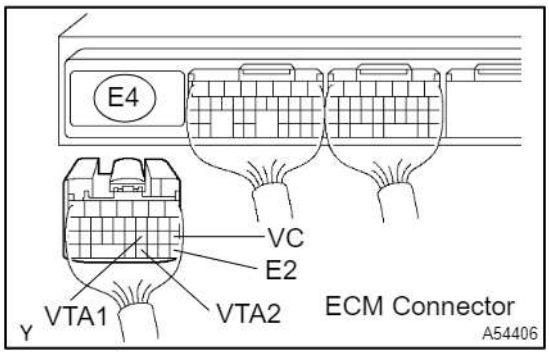
REPLACE ECM (See page 10–11)

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OBD II scan tool (excluding hand–held tester):

1 CHECK HARNESS AND CONNECTOR(THROTTLE POSITION SENSOR – ECM)





(a) Disconnect the T2 throttle w/ motor body connector.
(b) Disconnect the E4 ECM connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
VC (T2–5) – VC (E4–18)	Below 1 Ω
VTA1 (T2–6) – VTA1 (E4–21)	
VTA2 (T2–4) – VTA2 (E4–31)	
E2 (T2–3) – E2 (E4–28)	

Standard (Check for short):

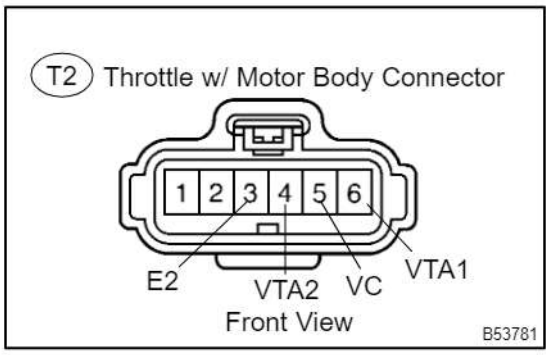
Tester Connection	Specified Condition
VC (T2–5) or VC (E4–18) – Body ground	10 kΩ or higher
VTA1 (T2–6) or VTA1 (E4–21) – Body ground	
VTA2 (T2–4) or VTA2 (E4–31) – Body ground	

(d) Reconnect the throttle body connector.
(e) Reconnect the ECM connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

2 INSPECT ECM(VC VOLTAGE)

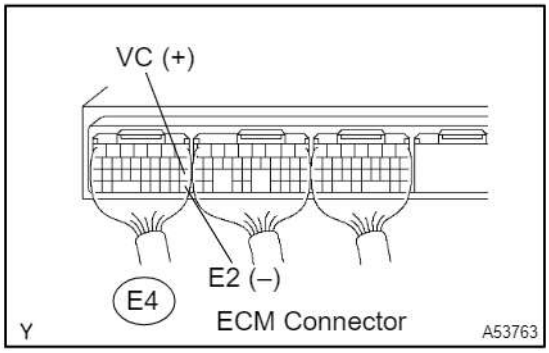


(a) Disconnect the throttle w/ motor body connector.
(b) Turn the ignition switch to ON.
(c) Measure the voltage between the specified terminals of the E4 ECM connector.

Standard:

Tester Connection	Specified Condition
VC (E4–18) – E2 (E4–28)	4.5 to 5.5 V

(d) Reconnect the throttle body connector.



NG → **REPLACE ECM (See page 10–11)**

OK

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3	REPLACE THROTTLE W/MOTOR BODY ASSY (See page 10–6)

GO

4	READ OUTPUT DTC(SEE IF THROTTLE POSITION SENSOR DTCS ARE OUTPUT AGAIN)

(a) Clear the DTCs (See page 05–355).
(b) Start the engine.
(c) Run the engine at idle for 15 seconds or more.
(d) Read DTCs (See page 05–355).

Result:

Display (DTC output)	Proceed to
P0120, P0122, P0123, P0220, P0222, P0223 and/or P2135	A
No output	B

B → SYSTEM OK

A

REPLACE ECM (See page 10–11)

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DTC	P0121	THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT RANGE/PERFORMANCE PROBLEM

HINT:
This is the purpose of troubleshooting on the throttle position sensor.

CIRCUIT DESCRIPTION

Refer to DTC P0120 on page 05–425.

DTC No.	DTC Detection Condition	Trouble Area
P0121	Difference between voltage output of VTA1 and VTA2 deviates from the threshold for 2.0 seconds.	☐Throttle position sensor (built in throttle body)

MONITOR DESCRIPTION

The ECM uses the throttle position sensor to monitor the throttle valve opening angle.
This sensor includes 2 signals: VTA1 and VTA2. VTA1 is used to detect the throttle opening angle and VTA2 is used to detect malfunction in VTA1. There are several checks that the ECM performs to confirm proper operation of the throttle position sensor and VTA1.
The output voltage difference between VTA1 and VTA2 multiplied by 0.8 (corrected by learning value) should be more than 0.7V and less than 1.7 V. If the voltage output difference deviates from this range, the ECM concludes the throttle position sensor has a malfunction. The ECM will turn on the MIL and a DTC is set.

FAIL SAFE

If the Electronic Throttle Control System (ETCS) has a malfunction, the ECM cuts off current to the throttle control motor. The throttle control valve returns to a predetermined opening angle (approximately 16) by the force of the return spring. The ECM then adjusts the engine output by controlling the fuel injection (intermittent fuel–cut) and ignition timing in accordance with the accelerator pedal opening angle to enable the vehicle to continue at a minimal speed.
If the accelerator pedal is depressed firmly and slowly, the vehicle can be driven slowly.
If a "pass" condition is detected and then the ignition switch is turned to OFF, the fail–safe operation will stop and the system will return to normal condition.

MONITOR STRATEGY

Related DTCs	P0121: Throttle position sensor malfunction
Required sensors/components (Main)	Throttle position sensor
Required sensors/components (Related)	–
Frequency of operation	Continuous
Duration	2 seconds
MIL operation	Immediate
Sequence operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	None
VTA2 voltage	4.9 V or less

TYPICAL MALFUNCTION THRESHOLDS

Either of the following condition is met:	
Difference in voltage between VTA1 (opening angle, sensor 1) and VTA2 x 0.8 (opening angle, sensor 2)	Less than 0.7 V or more than 1.7 V

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INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

REPLACE THROTTLE W/MOTOR BODY ASSY (See page 10–6)

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DTC	P0125	INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL

CIRCUIT DESCRIPTION

Refer to DTC P0115 on page 05–417.

DTC No.	DTC Detection Condition	Trouble Area
P0125	If engine coolant temperature and intake air temperature were –6.6°C (20°F) at engine start, and 20 minutes after the engine start, the coolant temperature remains at 20°C (68°F) or less (2 trip detection logic)	□Cooling system □Engine coolant temperature sensor □Thermostat
	If engine coolant temperature and intake air temperature were between –6.6°C (20°F) and 10°C (50°F) at engine start, and more than 5 minutes after the engine start, the coolant temperature remains at 20°C (68°F) or less (2 trip detection logic)	
	If engine coolant temperature and intake air temperature were more than 10°C (50°F) at engine start, and more than 2 minutes after the engine start, the coolant temperature remains at 20°C (68°F) or less (2 trip detection logic)	

MONITOR DESCRIPTION

The engine coolant temperature (ECT) sensor is used to monitor the temperature of the engine coolant. The resistance of the sensor varies with the actual coolant temperature. The ECM applies a voltage to the sensor and the varying resistance of the sensor causes the signal voltage to vary. The ECM monitors the ECT signal voltage after engine start–up. If, after sufficient time has passed, the sensor still reports that the engine is not warm enough for closed–loop fuel control, the ECM interprets this as a fault in the sensor or cooling system and sets a DTC.

Example:

The engine coolant temperature was 0 C (32 F) at engine start. After 5 minutes running time, the engine coolant temperature sensor still indicates that the engine is not warm enough to begin active feedback control of the air fuel–ratio. The ECM interprets this as a fault in the sensor or cooling system and will set a DTC.

MONITOR STRATEGY

Related DTCs	P0125: Insufficient engine coolant temperature for closed loop
Required sensors/components (Main)	Thermostat, Cooling system
Required sensors/components (Related)	Engine coolant temperature sensor, Mass air flow meter
Frequency of operation	Continuous
Duration	2 minutes: Engine coolant temperature at engine start is 10 C (50 F) or more 5 minutes: Engine coolant temperature at engine start is –6.6 to 10 C (20 to 50 F) 20 minutes: Engine coolant temperature at engine start is less than –6.6 C (20 F)
MIL operation	2 driving cycles
Sequence operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05–334
Engine	Running
Fuel cut	OFF

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TYPICAL MALFUNCTION THRESHOLDS

Time until actual engine coolant temperature reaches "Closed–Loop" engine coolant temperature	2 minutes: Engine coolant temperature at engine start is 10 C (50 F) or more 5 minutes: Engine coolant temperature at engine start is –6.6 to 10 C (20 to 50 F) 20 minutes: Engine coolant temperature at engine start is less than –6.6 C (20 F)

INSPECTION PROCEDURE

HINT:

- If DTCs P0115, P0116, P0117, P0118 and P0125 are output simultaneously, the engine coolant temperature sensor circuit may be open or short. Perform troubleshooting on DTC P0115, P0117 or P0118 first.
- Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1 CHECK OTHER DTC OUTPUT(IN ADDITION TO DTC P0125)

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(c) Select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(d) Read DTCs.

Result:

Display (DTC Output)	Proceed to
P0125	A
P0125 and other DTCs	B

HINT:

If any other codes besides P0125 are output, perform troubleshooting for those DTCs first.

B → GO TO RELEVANT DTC CHART

A

2 INSPECT W/THERMOSTAT WATER INLET SUB–ASSY(THERMOSTAT) (See page 16–3)

NG → REPLACE W/THERMOSTAT WATER INLET SUB–ASSY THERMOSTAT

OK

3 CHECK COOLING SYSTEM

(a) Check that there is no defect in the cooling system which causes overcool, such as abnormal radiator fan operation and modified cooling system.

NG → REPAIR OR REPLACE COOLING SYSTEM

OK

REPLACE ENGINE COOLANT TEMPERATURE SENSOR

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DTC	P0128	COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE)

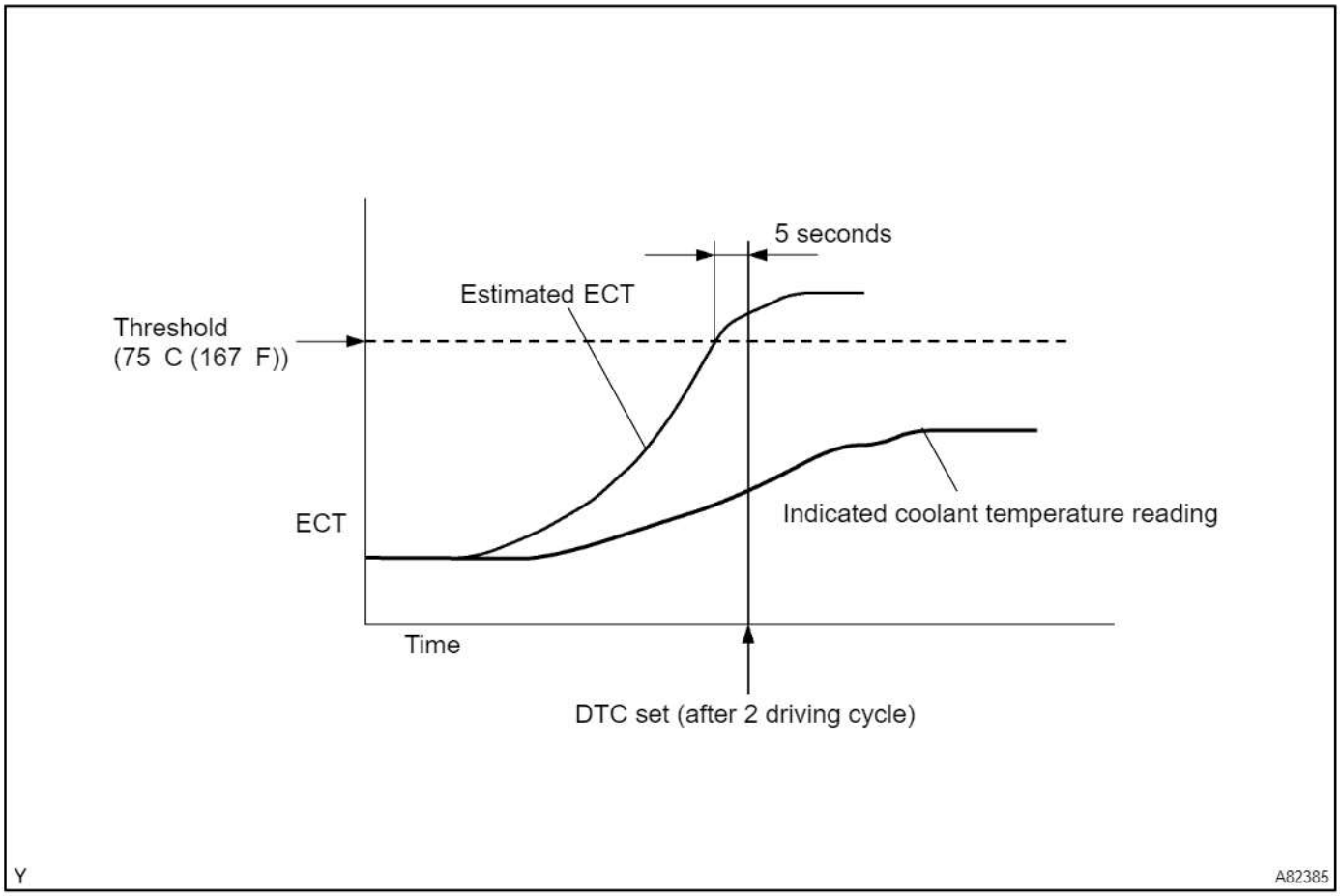
HINT:
This is the purpose of the "thermostat".

CIRCUIT DESCRIPTION

If the engine coolant temperature does not reach 75°C (167°F) despite sufficient warm – up time has elapsed.

DTC No.	DTC Detection Condition	Trouble Area
P0128	Condition (a), (b) and (c): (a) Cold start (b) After engine is warmed up (c) Engine coolant temperature is less than 75°C (167°F)	□Thermostat (water inlet) □Cooling system □Engine coolant temperature sensor □ECM

MONITOR DESCRIPTION



The ECM estimates the coolant temperature based on starting temperature, engine loads, and engine speeds. The ECM then compares the estimated temperature with the actual engine coolant temperature (ECT). When the estimated coolant temperature reaches 75 C (167 F) the ECM checks the actual ECT. If the actual ECT is less than 75 C (167 F) the ECM will interpret this as a fault in the engine cooling system or thermostat and set a DTC.

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MONITOR STRATEGY

Related DTCs	P0128: Coolant thermostat
Required sensors/components (Main)	Thermostat
Required sensors/components (Related)	Engine coolant temperature sensor, Intake air temperature sensor, Vehicle speed sensor
Frequency of operation	Once per drive cycle
Duration	15 minutes
MIL operation	2 driving cycles
Sequence operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05–334
Battery voltage	11 V or more
Engine start intake air temperature	–10 to 35 C (14 to 95 F)
Engine start engine coolant temperature	–10 to 35 C (14 to 95 F)
Difference between engine start engine coolant temperature and engine start intake air temperature	–15 to 7 C (–27 to 12.6 F)
Vehicle speed	Less than 80 mph (128 km/h)

TYPICAL MALFUNCTION THRESHOLDS

Time that both of the following conditions are met:	5 seconds or more
Estimated engine coolant temperature	75 C (167 F) or more
Actual engine coolant temperature	Less than 75 C (167 F)

MONITOR RESULT (MODE 06 DATA)

Coolant thermostat:

Test ID/Comp ID	Description of Test Data	Description of Test Limit	Conversion Factor (Unit)
$08/$81	Actual engine coolant temperature	Estimated engine coolant temperature (75 C/167 F)	Multiply by 0.625 and minus 40 (C)

If the Test Data is less than Test Limit when the engine is warmed up, the ECM interprets this as a malfunction.

Refer to page 05–340 for detailed information on CHECKING MONITOR STATUS (MODE 06 DATA).

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1	CHECK COOLING SYSTEM

(a) Check that there is no defect in the cooling system which causes overcool, such as abnormal radiator fan operation, modified cooling system and so on.

NG → REPAIR OR REPLACE COOLING SYSTEM

OK

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2	INSPECT W/THERMOSTAT WATER INLET SUB–ASSY(THERMOSTAT) (See page 16–3)

NG → REPLACE W/THERMOSTAT WATER INLET SUB–ASSY (See page 16–10)

OK

REPLACE ECM (See page 10–11)

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DTC	P0136	OXYGEN SENSOR CIRCUIT MALFUNCTION (BANK 1 SENSOR 2)

DTC	P0156	OXYGEN SENSOR CIRCUIT MALFUNCTION (BANK 2 SENSOR 2)

CIRCUIT DESCRIPTION

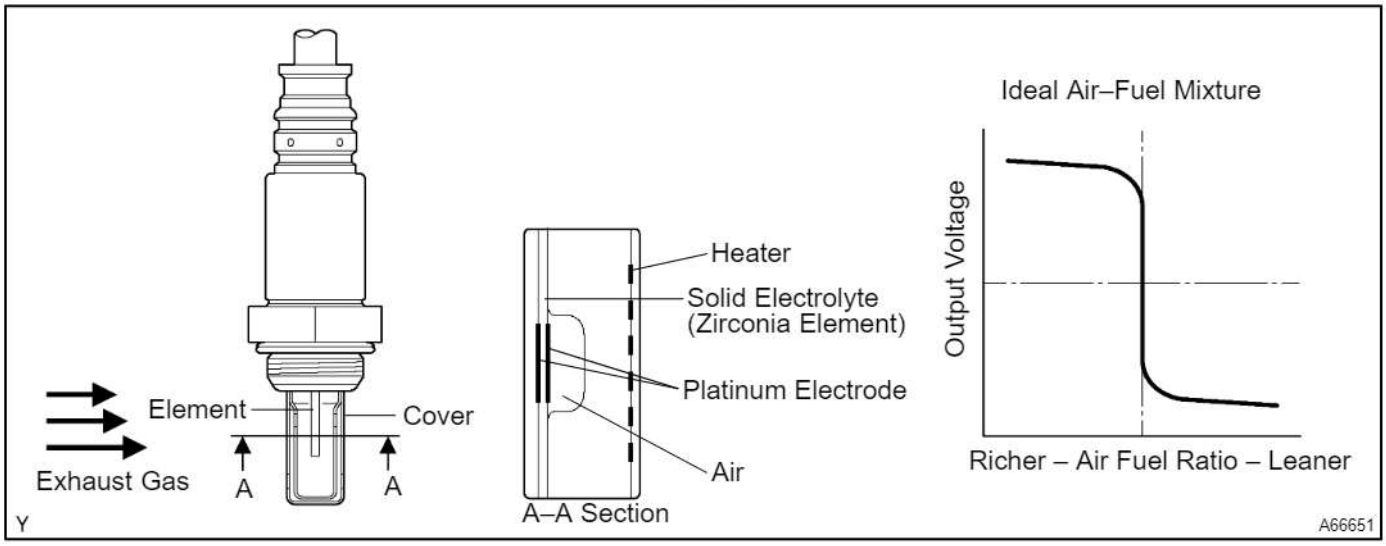
The heated oxygen sensor (HO2S) is the lamination type. Compared to the conventional type, the sensor and heater portions of the lamination type are narrower overall. Because the heat of the heater acts directly on the alumina and zirconia (of the sensor portion) it accelerates the activation of the sensor.

The heated oxygen sensor is used to monitor oxygen concentration in the exhaust. For optimum catalytic converter operation, the air–fuel mixture must be maintained near the ideal stoichiometric air–fuel ratio. The oxygen sensor output voltage changes at the stoichiometric ratio. The ECM adjusts the fuel injection time so that the air–fuel ratio is nearly stoichiometric.

If the oxygen concentration in the exhaust gas increases, the air–fuel ratio is called LEAN. The heated oxygen sensor voltage drops below 0.45V, which informs the ECM of the LEAN condition.

If oxygen is not in the exhaust gas, the air–fuel ratio is called RICH. The heated oxygen sensor voltage increases above 0.45V, which informs the ECM of the RICH condition.

The heated oxygen sensors include a heater which heats the zirconia element. The heater is controlled by the ECM. When the intake air volume is low (the temperature of the exhaust gas is low), current flows to the heater in order to heat the sensor for the accurate oxygen concentration detection.



DTC No	DTC Detection Condition	Trouble Area
P0136 P0156	The following condition (a) or (b) continues for 480 seconds or more: (a) During driving with the engine warmed up, heated oxygen sensor output does not change (b) Heated oxygen sensor output is very low most of the time.	□Open or short in heated oxygen sensor (bank 1, 2 sensor 2) circuit □Heated oxygen sensor (bank 1, 2 sensor 2) □Heated oxygen sensor heater (bank 1, 2 sensor 2) □EFI relay

HINT:

- □ Bank 1 refers to the bank that includes cylinder No.1.
- □ Bank 2 refers to the bank that does not include cylinder No.1.
- □ Sensor 2 refers to the sensor farthest away from the engine assembly.

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MONITOR DESCRIPTION

The ECM will turn on the MIL and set a DTC if one of the following events occurs:

- 1. The heated oxygen sensor voltage changes between Rich (more than 0.45 volts) and Lean (less than 0.45 volts) while the vehicle is running (repeating acceleration and deceleration) for 8 minutes. If not, the ECM interprets this as a malfunction, illuminates the MIL, and then sets a DTC.
- 2. The heated oxygen sensor voltage does not remain at less than 0.05 volts for a long time while the vehicle is running (60% of the time in the 220 seconds monitor, the sensor output is less than 0.05 V). If it does, the ECM interprets this as a malfunction, illuminates the MIL, and then sets a DTC.
- 3. The sensor's voltage drops to below 0.2 volts (extremely Lean status) immediately when the vehicle decelerates and the fuel cut is working for 7 seconds. If not, the ECM interprets this to mean the sensor's response feature has deteriorated, illuminates the MIL, and then sets a DTC.

MONITOR STRATEGY

Related DTCs	P0136: Heated oxygen sensor (Bank 1 sensor 2) P0136: Heated oxygen sensor (Bank 1 sensor 2) output voltage P0156: Heated oxygen sensor (Bank 2 sensor 2) P0156: Heated oxygen sensor (Bank 2 sensor 2) output voltage
Required sensors/components (Main)	Heated oxygen sensor (Bank 1 sensor 2) Heated oxygen sensor (Bank 2 sensor 2)
Required sensors/components (Related)	Engine coolant temperature sensor, Mass air flow meter, Vehicle speed sensor
Frequency of operation	Once per drive cycle
Duration	300 seconds
MIL operation	2 driving cycles
Sequence operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05–334

Heated oxygen sensor output voltage:

Time while both of the following conditions (a) and (b) are met:	480 seconds: Engine coolant temperature is less than 75 C (167 F) 320 seconds: Engine coolant temperature is 75 C (167 F) or more
(a) Fuel system status	Closed Loop
(b) Idle	OFF
Deceleration*	30 times or more

*Deceleration is counted up when the vehicle decelerates 3 mph (5 km/h) or more for 2 seconds.

Heated oxygen sensor output voltage (crack):

Vehicle speed	2 mph (3 km/h) or more
Idle	OFF
Fuel cut	OFF (for 10 seconds or more)
Intake air amount per revolution	0.65 g per revolution

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TYPICAL MALFUNCTION THRESHOLDS

Heated oxygen sensor output voltage:

Number of Lean/Rich switching	None
Lean	Rear heated oxygen sensor voltage is less than 0.45 V
Rich	Rear heated oxygen sensor voltage is 0.55 V or more

Heated oxygen sensor output voltage (crack):

Percentage of monitoring time when rear heated oxygen sensor voltage is less than 0.05 V	60 % or more
Percentage of monitoring time when rear heated oxygen sensor voltage is 0.70 V or more	Less than 20 %
Maximum time when rear heated oxygen sensor voltage is 0.45 V or more	Less than 20 seconds

COMPONENT OPERATING RANGE

Rear heated oxygen sensor voltage	Fluctuate between 0 and 1 V

O2S TEST RESULT (MODE 05)

Refer to page 05–338 for detailed information on O2S TEST RESULT (MODE 05 DATA).

Heated oxygen sensor output voltage:

Test ID/Comp ID	Description of Test Date	Conversion Factor	Unit
$07	The minimum sensor voltage while the malfunction is being monitored	N/A	V
$08	The maximum sensor voltage while the malfunction is being monitored	N/A	V

If the sensor voltage is out of the standard value, the ECM interprets this as a malfunction and sets a DTC.

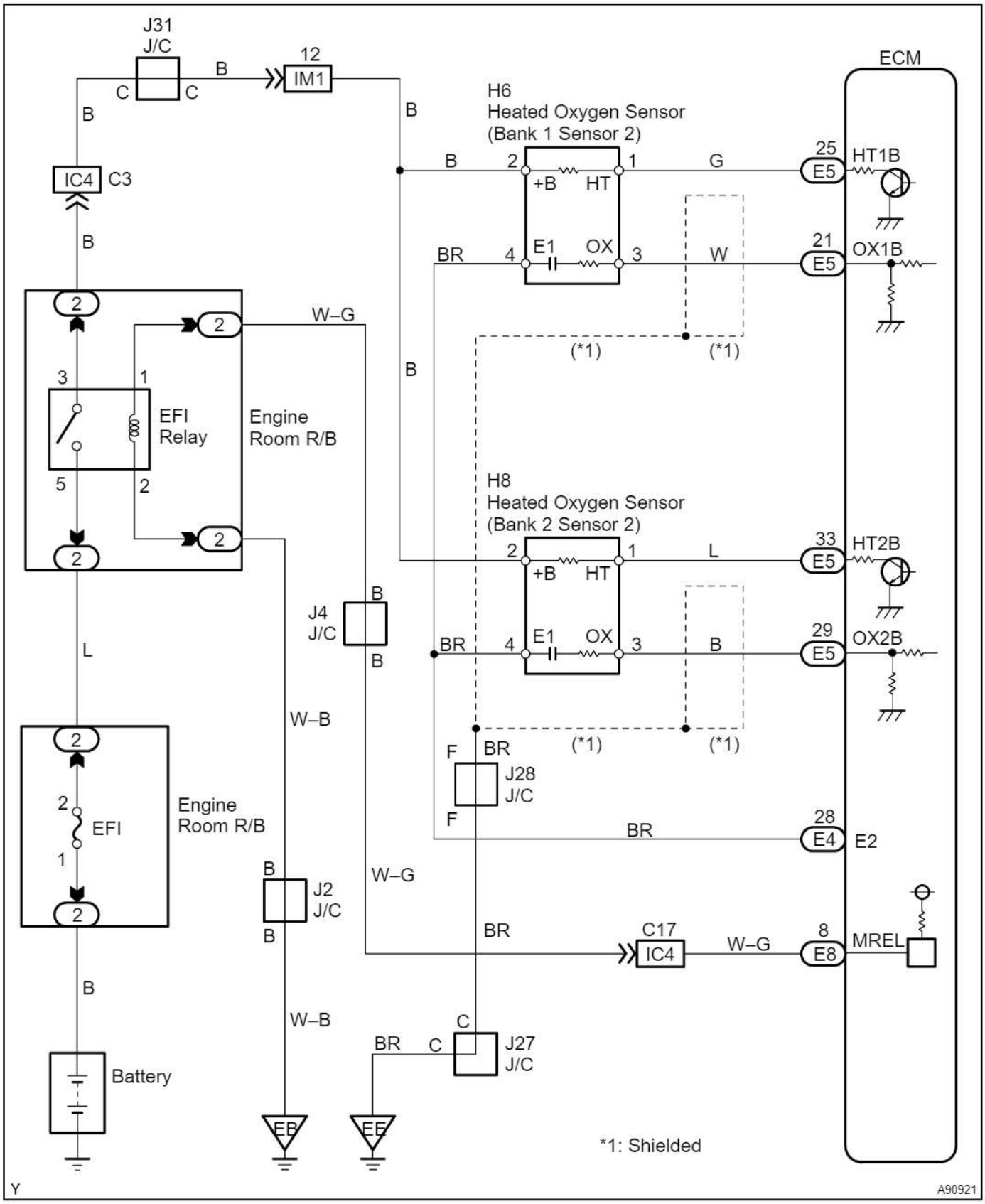
Heated oxygen sensor:

Test ID/Comp ID	Description of Test Data	Conversion Factor	Unit
$81	Percentage of monitoring time where heated oxygen sensor voltage is less than 0.05 V	Multiply 0.3906	%
$84	Percentage of monitoring time where heated oxygen sensor voltage is 0.70 V or more	Multiply 0.3906	%
$85	Maximum Rich (0.45 V or more) time	Multiply 0.2621	second

If all the values ($81, $84 and $85) are out of the standard values, the ECM interprets this as a malfunction and sets a DTC.

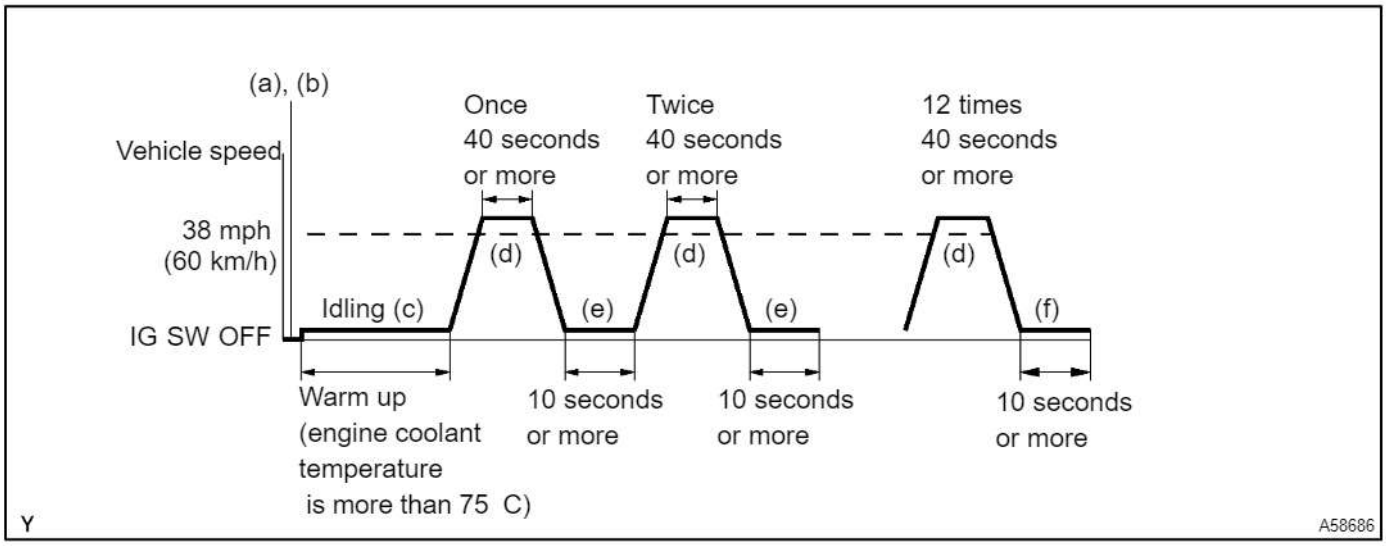
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WIRING DIAGRAM



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CONFIRMATION DRIVING PATTERN



(a) Connect the hand–held tester to the DLC3.
(b) Switch the hand–held tester from normal mode to check mode (see page 05–357).
(c) Start the engine and warm up the engine untill engine coolant temperature is more than 75 C.
(d) Drive the vehicle at 38 mph (60 km/h) or more for 40 seconds or more.
(e) Let the engine idle for 10 seconds or more.
(f) Perform steps (d) and (e) 12 times.

HINT:

If a malfunction exists, the MIL will be illuminated during step (f).

NOTICE:

If the conditions in this test are not strictly followed, no malfunction will be detected. If you do not have the hand–held tester, turn the ignition switch to OFF after performing steps from (c) to (f), then perform steps (c) to (f) again.

INSPECTION PROCEDURE

HINT:

Hand–held tester only:

It is possible the malfunctioning area can be found using the ACTIVE TEST A/F CONTROL operation. The A/F CONTROL operation can determine if the A/F sensor, heated oxygen sensor or other potential trouble areas are malfunctioning or not.

(a) Perform the ACTIVE TEST A/F CONTROL operation.

HINT:

The A/F CONTROL operation lowers the injection volume 12.5% or increases the injection volume 25%.

(1) Connect the hand–held tester to the DLC3 on the vehicle.
(2) Turn the ignition switch to ON.
(3) Warm up the engine by running the engine at 2,500 rpm for approximately 90 seconds.
(4) Select the item: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL.
(5) Perform the A/F CONTROL operation with the engine in an idle condition (press the right or left button).

Result:

A/F sensor reacts in accordance with increase and decrease of injection volume:
+25 % → rich output: Less than 3.0 V
–12.5 % → lean output: More than 3.35 V

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Heated oxygen sensor reacts in accordance with increase and decrease of injection volume:
+25 % → rich output: More than 0.55 V
–12.5 % → lean output: Less than 0.4 V

NOTICE:

The A/F sensor output has a few seconds of delay and the heated oxygen sensor output has about 20 seconds of delay at maximum.

	Output voltage of A/F sensor (sensor 1)	Output voltage of heated oxygen sensor (sensor 2)	Main Suspect Trouble Area
Case 1	Injection volume +25 % –12.5 % Output voltage More than 3.35 V Less than 3.0 V **OK**	Injection volume +25 % –12.5 % Output voltage More than 0.55 V Less than 0.4V **OK**	□
Case 2	Injection volume +25 % –12.5 % Output voltage Almost no reaction **NG**	Injection volume +25 % –12.5 % Output voltage More than 0.55 V Less than 0.4V **OK**	A/F sensor (A/F sensor, heater, A/F sensor circuit)
Case 3	Injection volume +25 % –12.5 % Output voltage More than 3.35 V Less than 3.0V **OK**	Injection volume +25 % –12.5 % Output voltage Almost no reaction **NG**	Heated oxygen sensor (heated oxygen sensor, heater, heated oxygen sensor circuit)
Case 4	Injection volume +25 % –12.5 % Output voltage Almost no reaction **NG**	Injection volume +25 % –12.5 % Output voltage Almost no reaction **NG**	Extremely rich or lean actual air–fuel ratio (Injector, fuel pressure, gas leakage in exhaust system, etc.)

The following A/F CONTROL procedure enables the technician to check and graph the voltage outputs of both the A/F sensor and the heated oxygen sensor.

To display the graph, enter ACTIVE TEST/ A/F CONTROL/USER DATA, then select ”AFS B1S1 and O2S B1S2” or ”AFS B2S1 and O2S B2S2” by pressing the ”YES” button followed by the ”ENTER” button and then the ”F4” button.

HINT:

- □ If DTCs related to different system that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may have an open circuit.
- □ Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

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1	CHECK OTHER DTC OUTPUT(IN ADDITION TO DTC P0136 AND/OR P0156)

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(c) Select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(d) Read DTCs.

Result:

Display (DTC output)	Proceed to
P0136 and/or P0156	A
P0136 or P0156 and other DTCs	B

HINT:
If any other codes besides P0136 and/or P0156 are output, perform troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05–366)**

A

2	READ VALUE OF HAND–HELD TESTER OR OBD II SCAN TOOL(OUTPUT VOLTAGE OF HEATED OXYGEN SENSOR)

(a) After warming up the engine, run the engine at 2,500 rpm for 3 minutes.
(b) Read the output voltage of the heated oxygen sensor when the engine rpm is suddenly increased.

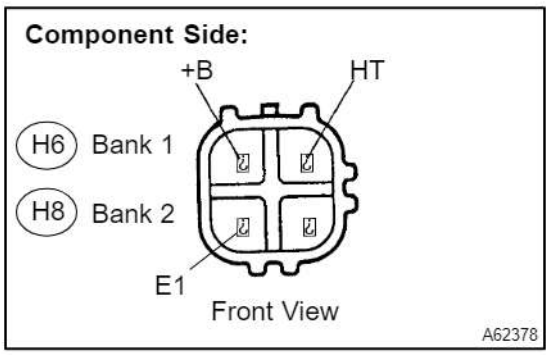
HINT:
Quickly accelerate the engine to 4,000 rpm 3 times by using the accelerator pedal.

Heated oxygen sensor output voltage: Alternates 0.4 V or less and 0.5 V or more.

OK → **Go to step 6**

NG

3	INSPECT HEATED OXYGEN SENSOR(HEATER RESISTANCE)



(a) Disconnect the H6 or H8 heated oxygen sensor connector.
(b) Measure the resistance between the terminals of the heated oxygen sensor connector.

Standard (Bank 1, 2 sensor 2):

Tester Connection	Specified Condition
1 (HT) – 2 (+B)	5 to 10 Ω at 20 C (68 F)
1 (HT) – 4 (E1)	No Continuity

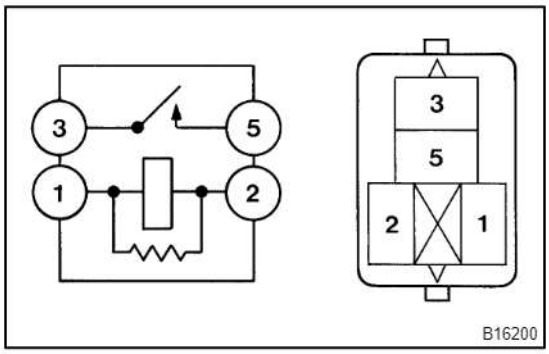
(c) Reconnect the heated oxygen sensor connector.

NG → **REPLACE HEATED OXYGEN SENSOR**

OK

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4	INSPECT EFI RELAY



(a) Remove the EFI relay from the engine room R/B.
(b) Inspect the EFI relay.

Standard:

Tester Connection	Specified Condition
1 – 2	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage to terminals 1 and 2)

(c) Reinstall the EFI relay.

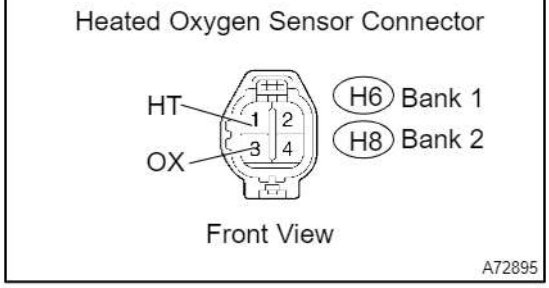
NG → **REPLACE EFI RELAY**

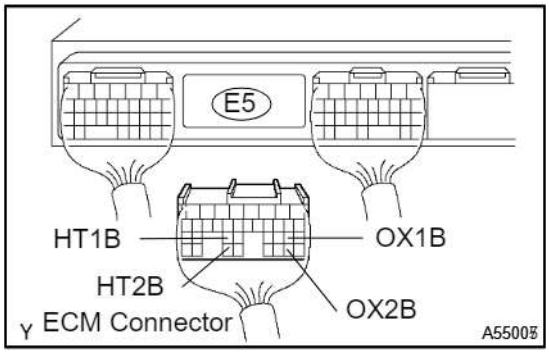
OK

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5 CHECK HARNESS AND CONNECTOR(HEATED OXYGEN SENSOR – ECM)

Wire Harness Side:





(a) Disconnect the H6 or H8 heated oxygen sensor connector.
(b) Disconnect the E5 ECM connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

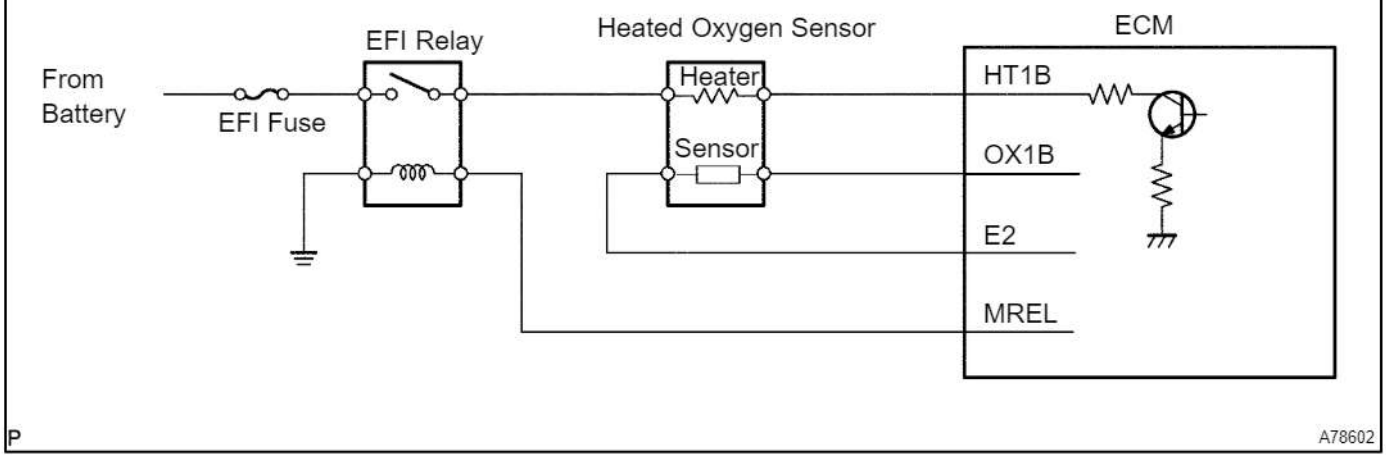
Tester Connection	Specified Condition
OX (H6–3) – OX1B (E5–21)	Below 1 Ω
HT (H6–1) – HT1B (E5–25)	
OX (H8–3) – OX2B (E5–29)	
HT (H8–1) – HT2B (E5–33)	

Standard (Check for short):

Tester Connection	Specified Condition
OX (H6–3) or OX1B (E5–21) – Body ground	10 kΩ or higher
HT (H6–1) or HT1B (E5–25) – Body ground	
OX (H8–3) or OX2B (E5–29) – Body ground	
HT (H8–1) or HT2B (E5–33) – Body ground	

(d) Reconnect the heated oxygen sensor connector.
(e) Reconnect the ECM connector.

Reference (Bank 1 Sensor 2 System Diagram):



NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK →

REPLACE HEATED OXYGEN SENSOR

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6	PERFORM CONFIRMATION DRIVING PATTERN

HINT:
Clear all DTCs prior to perform the confirmation driving pattern.

GO

7	READ OUTPUT DTC(SEE IF DTC P0136 AND/OR P0156 ARE OUTPUT AGAIN)

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(c) Select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(d) Read DTCs.

Result:

Display (DTC output)	Proceed to
No output	A
P0136 and/or P0156	B

B → REPLACE HEATED OXYGEN SENSOR

A

CHECK FOR INTERMITTENT PROBLEMS (See page 05–331)

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DTC	P0171	SYSTEM TOO LEAN (BANK 1)

DTC	P0172	SYSTEM TOO RICH (BANK 1)

DTC	P0174	SYSTEM TOO LEAN (BANK 2)

DTC	P0175	SYSTEM TOO RICH (BANK 2)

CIRCUIT DESCRIPTION

The fuel trim is related to the feedback compensation value, not to the basic injection time. The fuel trim includes the short–term fuel trim and the long–term fuel trim.

The short–term fuel trim is the short–term fuel compensation used to maintain the air–fuel ratio at stoichiometric air–fuel ratio. The signal from the A/F sensor indicates whether the air–fuel ratio is RICH or LEAN compared to the stoichiometric air–fuel ratio. This variance triggers a reduction in the fuel volume if the air–fuel ratio is RICH, and an increase in the fuel volume if it is LEAN.

The short–term fuel trim varies from the central value due to individual engine differences, wear over time and changes in operating environment. The long–term fuel trim, which controls overall fuel compensation, steadies long–term deviations of the short–term fuel trim from the central value.

If both the short–term fuel trim and the long–term fuel trim are LEAN or RICH beyond a certain value, it is detected as a malfunction and the MIL is illuminated and a DTC is set.

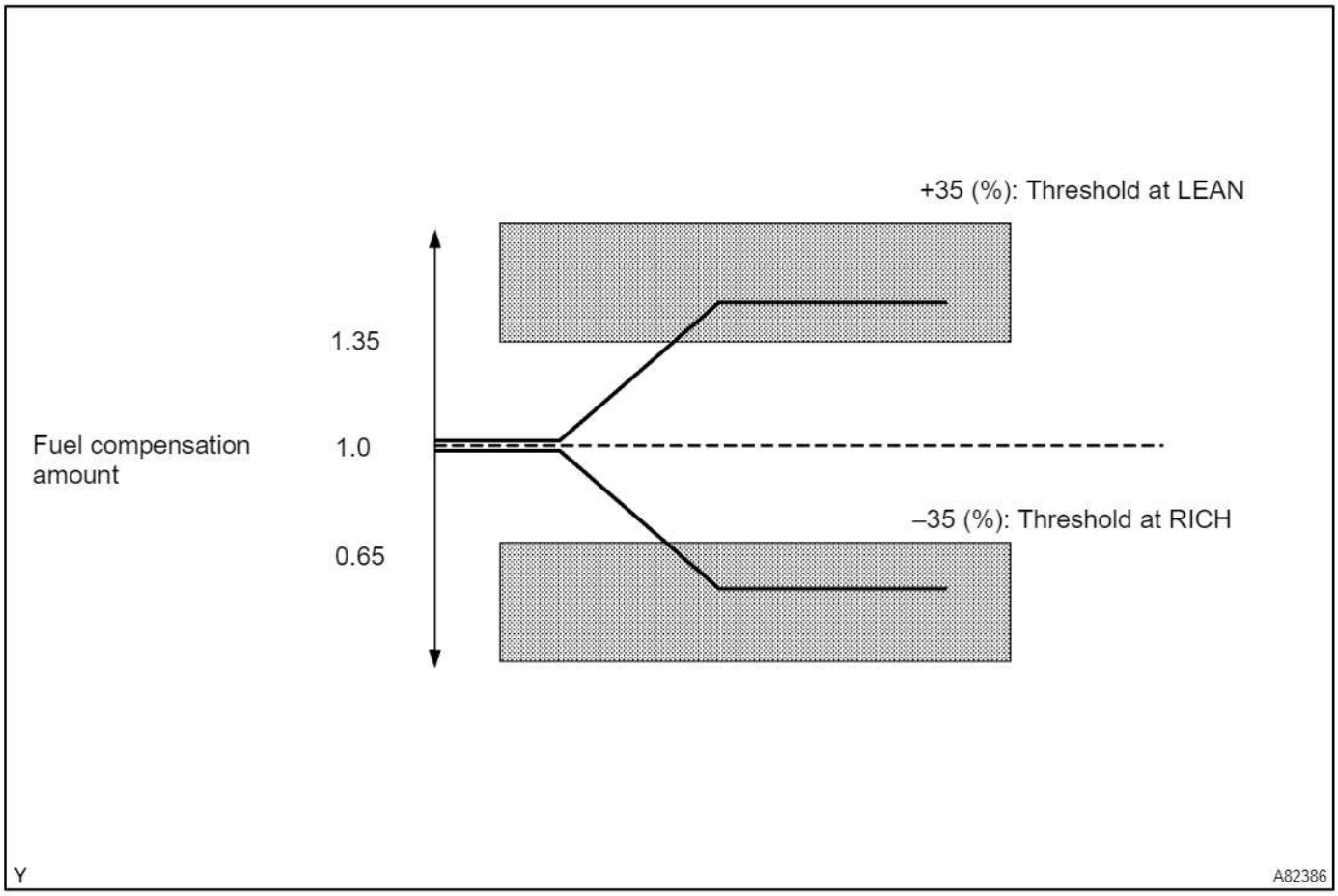
DTC No.	DTC Detection Condition	Trouble Area
P0171 P0174	When air–fuel ratio feedback is stable after warming up engine, fuel trim is considerably in error on LEAN side (2 trip detection logic)	□Air induction system □Injector blockage □Mass air flow meter □Engine coolant temperature sensor □Fuel pressure □Gas leakage in exhaust system □Open or short in A/F sensor (bank 1, 2 sensor 1) circuit □A/F sensor (bank 1, 2 sensor 1) □A/F sensor heater (bank 1, 2 sensor 1) □A/F sensor heater relay □PCV valve and hose □PCV hose connection
P0172 P0175	When air–fuel ratio feedback is stable after warming up engine, fuel trim is considerably in error on RICH side (2 trip detection logic)	□Injector leak, blockage □Mass air flow meter □Engine coolant temperature sensor □Ignition system □Fuel pressure □Gas leakage in exhaust system □Open or short in A/F sensor (bank 1, 2 sensor 1) circuit □A/F sensor (bank 1, 2 sensor 1) □A/F sensor heater □A/F sensor heater relay

HINT:

- □ When DTC P0171 or P0174 is recorded, the actual air–fuel ratio is on the LEAN side. When DTC P0172 or P0175 is recorded, the actual air–fuel ratio is on the RICH side.
- □ If the vehicle runs out of fuel, the air–fuel ratio is LEAN and DTC P0171 or P0174 may be recorded. The MIL then illuminates.
- □ If the total of the short–term fuel trim value and long–term fuel trim value is within | 35 % (engine coolant temperature is more than 75 C (167 F)), the system is functioning normally.

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MONITOR DESCRIPTION



Under closed–loop fuel control, fuel injection amount that deviates from the ECM's estimated fuel amount will cause a change in the long–term fuel trim compensation value. This long–term fuel trim is adjusted when there are persistent deviations in the short–term fuel trim values. And the deviation from the simulated fuel injection amount by the ECM affects a smoothed fuel trim learning value. The smoothed fuel trim learning value is the combination of smoothed short–term fuel trim (fuel feedback compensation value) and smoothed long–term fuel trim (learning value of the air–fuel ratio). When the smoothed fuel trim learning value exceeds the DTC threshold, the ECM interprets this as a fault in the fuel system and sets a DTC.
Example:
The smoothed fuel trim leaning value is more than +35% or less than –35%. The ECM interprets this as a failure in the fuel system.

MONITOR STRATEGY

Related DTCs	P0171: Fuel trim Lean (Bank 1) P0172: Fuel trim Rich (Bank 1) P0174: Fuel trim Lean (Bank 2) P0175: Fuel trim Rich (Bank 2)
Required sensors/ components (Main)	Fuel system
Required sensors / components (Related)	A/F sensor, Mass air flow meter, Crankshaft position sensor
Frequency of operation	Continuous
Duration	10 seconds
MIL operation	2 driving cycles
Sequence operation	None

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TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05–334
Battery voltage	11 V or more
Fuel system	Closed Loop (for 13 sec or more)
Warm–up condition to enable air–fuel ratio learning control	The conditions are met
Either of the following conditions is met:	
Engine RPM	Less than 1,000 rpm
Mass air flow	0.22 g per revolution

TYPICAL MALFUNCTION THRESHOLDS

Fuel trim Lean:

Smoothed fuel trim learning value	35 % or more

Fuel trim Rich:

Smoothed fuel trim learning value	–35 % or less

WIRING DIAGRAM

Refer to DTC P2195 on page 05–597.

INSPECTION PROCEDURE

HINT:

Hand–held tester only:

It is possible the malfunctioning area can be found using the ACTIVE TEST A/F CONTROL operation. The A/F CONTROL operation can determine if the A/F sensor, heated oxygen sensor or other potential trouble areas are malfunctioning or not.

(a) Perform the ACTIVE TEST A/F CONTROL operation.

HINT:

The A/F CONTROL operation lowers the injection volume 12.5% or increases the injection volume 25%.

(1) Connect the hand–held tester to the DLC3 on the vehicle.
(2) Turn the ignition switch to ON.
(3) Warm up the engine by running the engine at 2,500 rpm for approximately 90 seconds.
(4) Select the item: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL.
(5) Perform the A/F CONTROL operation with the engine in an idle condition (press the right or left button).

Result:

A/F sensor reacts in accordance with increase and decrease of injection volume:
+25 % → rich output: Less than 3.0 V
–12.5 % → lean output: More than 3.35 V
Heated oxygen sensor reacts in accordance with increase and decrease of injection volume:
+25 % → rich output: More than 0.55 V
–12.5 % → lean output: Less than 0.4 V

NOTICE:

The A/F sensor output has a few seconds of delay and the heated oxygen sensor output has about 20 seconds of delay at maximum.

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	Output voltage of A/F sensor (sensor 1)	Output voltage of heated oxygen sensor (sensor 2)	Main Suspect Trouble Area
Case 1	Injection volume +25 % –12.5 % Output voltage More than 3.35 V Less than 3.0 V OK	Injection volume +25 % –12.5 % Output voltage More than 0.55 V Less than 0.4V OK	□
Case 2	Injection volume +25 % –12.5 % Output voltage Almost no reaction NG	Injection volume +25 % –12.5 % Output voltage More than 0.55 V Less than 0.4V OK	A/F sensor (A/F sensor, heater, A/F sensor circuit)
Case 3	Injection volume +25 % –12.5 % Output voltage More than 3.35 V Less than 3.0V OK	Injection volume +25 % –12.5 % Output voltage Almost no reaction NG	Heated oxygen sensor (heated oxygen sensor, heater, heated oxygen sensor circuit)
Case 4	Injection volume +25 % –12.5 % Output voltage Almost no reaction NG	Injection volume +25 % –12.5 % Output voltage Almost no reaction NG	Extremely rich or lean actual air–fuel ratio (Injector, fuel pressure, gas leakage in exhaust system, etc.)

The following A/F CONTROL procedure enables the technician to check and graph the voltage outputs of both the A/F sensor and the heated oxygen sensor.
To display the graph, enter ACTIVE TEST/ A/F CONTROL/USER DATA, then select ”AFS B1S1 and O2S B1S2” or ”AFS B2S1 and O2S B2S2” by pressing the ”YES” button followed by the ”ENTER” button and then the ”F4” button.
HINT:

- □ Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.
- □ A low A/F sensor voltage could be caused by a rich air–fuel mixture. Check for conditions that would cause the engine to run rich.
- □ A high A/F sensor voltage could be caused by a lean air–fuel mixture. Check for conditions that would cause the engine to run lean.

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1	CHECK AIR INDUCTION SYSTEM

(a) Check for vacuum leaks in the air induction system.

NG → REPAIR OR REPLACE AIR INDUCTION SYSTEM

OK

2	CHECK CONNECTION OF PCV HOSE

NG → REPAIR OR REPLACE PCV HOSE

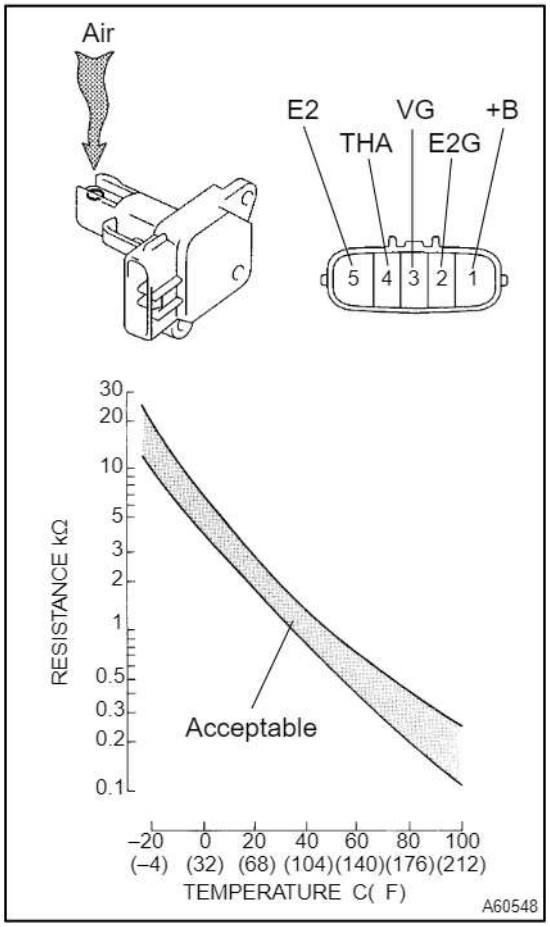
OK

3	INSPECT FUEL INJECTOR ASSY(INJECTION AND VOLUME) (See page 11–7)

NG → REPLACE FUEL INJECTOR ASSY (See page 11–10)

OK

4	INSPECT MASS AIR FLOW METER



(a) Remove the mass air flow meter.

(b) Inspect output voltage.

(1) Apply battery voltage across terminals +B and E2G.

(2) Connect the positive (+) tester prove to terminal VG, and negative (–) tester prove to terminal E2G.

(3) Blow air into the mass air flow meter, and check that the voltage fluctuates.

(c) Inspect resistance.

(1) Measure the resistance between the terminals of the intake air temperature sensor.

Standard:

Tester Connection	Temperature	Specified Condition
THA (4) – E2 (5)	–20 C (–4 F)	13.6 to 18.4 kΩ
	20 C (68 F)	2.21 to 2.69 kΩ
	60 C (140 F)	0.49 to 0.67 kΩ

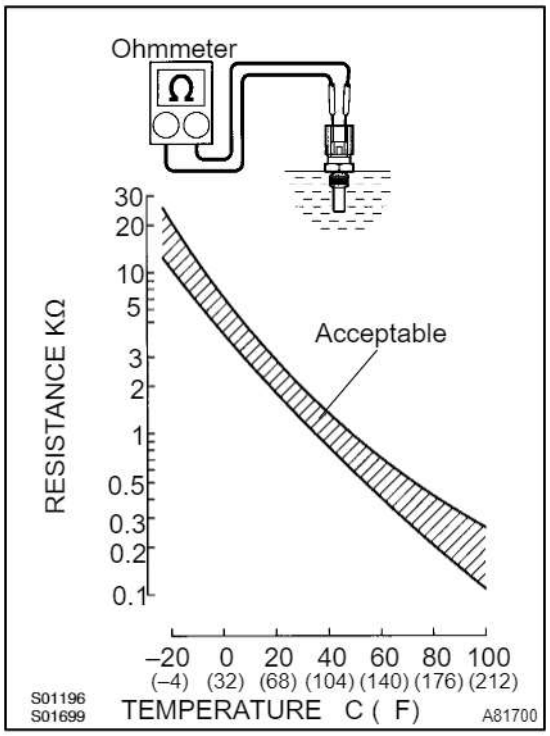
(d) Reinstall the mass air flow meter.

NG → REPLACE MASS AIR FLOW METER

OK

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5	INSPECT ENGINE COOLANT TEMPERATURE SENSOR(RESISTANCE)



(a) Remove the engine coolant temperature sensor.
(b) Measure the resistance between the terminals of the engine coolant temperature sensor.

Standard:

Tester Connection	Specified Condition
1 – 2	2.32 to 2.59 kΩ (20 C (68 F))
	0.310 to 0.326 kΩ (80 C (176 F))

NOTICE:

When checking the engine coolant temperature sensor in water, be careful not to allow water to contact the terminals. After checking, dry the sensor.

HINT:

Alternate procedure: Connect an ohmmeter to the installed engine coolant temperature sensor and read the resistance. Use an infrared thermometer to measure the engine temperature in the immediate vicinity of the sensor. Compare these values to the resistance/temperature graph. Change the engine temperature (warm up or allow to cool down) and repeat the test.

NG → **REPLACE ENGINE COOLANT TEMPERATURE SENSOR**

OK

6	CHECK FOR SPARK AND IGNITION (See page 18–1)

NG → **REPAIR OR REPLACE**

OK

7	CHECK FUEL PRESSURE (See page 11–5)

(a) Check the fuel pressure (high or low pressure).

NG → **CHECK AND REPLACE FUEL SYSTEM**

OK

8	CHECK FOR EXHAUST GAS LEAKAGE

NG → **REPAIR OR REPLACE EXHAUST GAS LEAKAGE POINT (See page 15–2)**

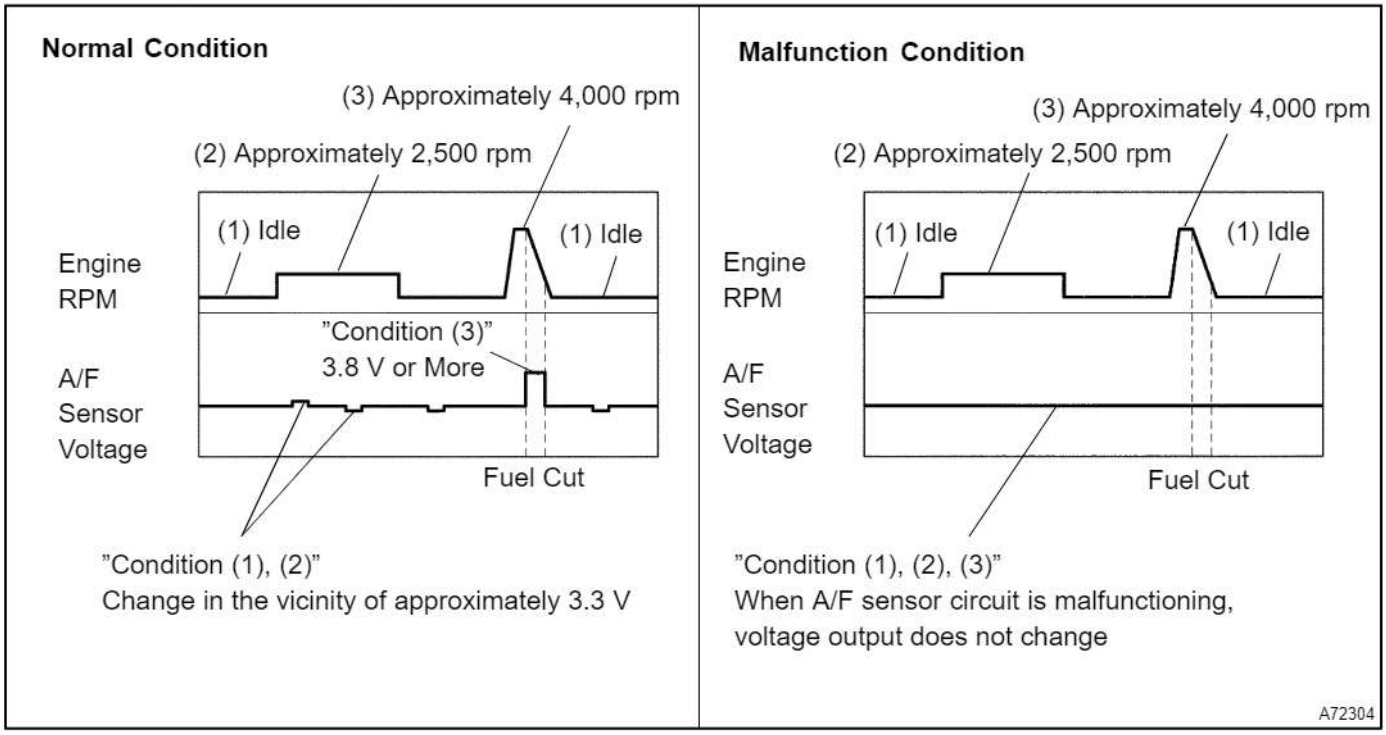
OK

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9	READ VALUE OF HAND–HELD TESTER OR OBD II SCAN TOOL(OUTPUT VOLTAGE OF AIR FUEL RATIO SENSOR (BANK 1, 2 SENSOR 1))

(a) Connect the hand–held tester or the OBD II scan tool to the DLC 3.
(b) Warm up the A/F sensors (bank 1, 2 sensor 1) by running the engine at 2,500 rpm for approximately 90 seconds.
(c) Read A/F sensor voltage output on the OBD II scan tool or the hand–held tester.
(d) Hand–held tester only:
On the hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / SNAPSHOT / MANUAL SNAPSHOT / USER DATA. Read the values.
(e) Select the item "AFS B1 S1 or AFS B2 S1/ENGINE SPD" and press YES.
(f) Monitor the A/F sensor voltage carefully.
(g) Check the A/F sensor voltage output under the following conditions:
(1) Allow the engine to idle for 30 seconds.
(2) Running the engine at approximately 2,500 rpm. Do not suddenly change the rpm.
(3) Raise the engine to 4,000 rpm and quickly release the accelerator pedal so that the throttle is fully closed.

Standard:
Condition (1) and (2)
Voltage change of 3.3 V (0.66 V)* (between approximately 3.1 to 3.5 V) as shown in the illustration.
Condition (3)
A/F sensor voltage increases to 3.8 V (0.76 V)* or more during engine deceleration when fuel is cut as shown in the illustration.
***: Voltage when using the OBD II scan tool.**



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HINT:

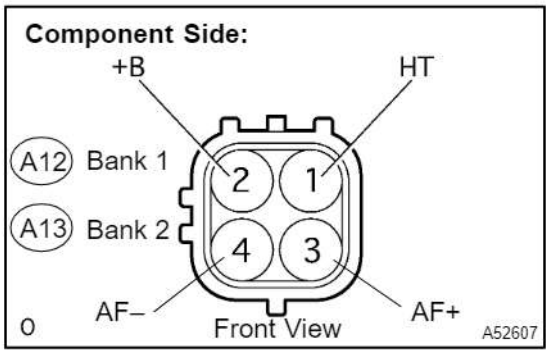
- Whenever the A/F sensor output voltage remains at approximately 3.3 V (0.660 V)* (see "Malfunction Condition" graphic) under any condition as well as the above conditions, the A/F sensor may have an open–circuit. This will happen also when the A/F sensor heater has an open–circuit.
- Whenever the A/F sensor output voltage remains at a certain value of approximately 3.8 V (0.76 V)* or more, or 2.8 V (0.56 V)* or less (see "Malfunction Condition" graphic) under any condition as well as the above conditions, the A/F sensor may have a short–circuit.
- The ECM will stop fuel injection (fuel is cut) during engine deceleration. This will cause a LEAN condition and should result in a momentary increase in A/F sensor output voltage.
- The ECM must establish a closed throttle position learned value to perform fuel cut. If the battery cable was reconnected, the vehicle must be driven over 10 mph to allow the ECM to learn the closed throttle position.
- When the vehicle is driven:
  The output voltage of the A/F sensor may be below 2.8 V (0.76 V)* during fuel enrichment. For the vehicle, this translates to a sudden increase in speed with the accelerator pedal fully depressed when trying to overtake another vehicle. The A/F sensor is functioning normally.
- The A/F sensor is a current output element, and therefore the current is converted into voltage inside the ECM. If measuring voltage at connectors of A/F sensor or ECM, you will observe a constant voltage.

*: Voltage when using the OBD II scan tool.

OK → **Go to step 17**

NG

10 INSPECT AIR FUEL RATIO SENSOR(HEATER RESISTANCE)



(a) Disconnect the A12 or A13 A/F sensor connector.
(b) Measure the resistance between the terminals of the air fuel ratio sensor.

Resistance:

Tester Connection	Specified Condition
HT (1) – +B (2)	1.8 to 3.4 Ω at 20 C (68 F)

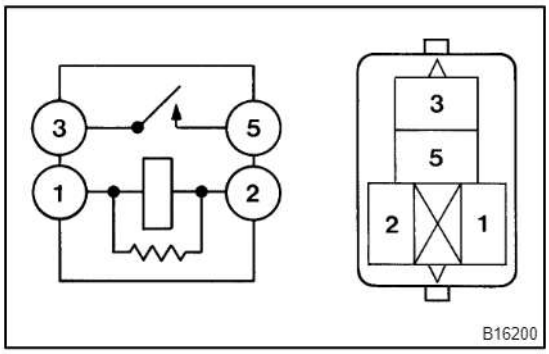
(c) Reconnect the A/F sensor connector.

NG → **REPLACE AIR FUEL RATIO SENSOR**

OK

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11	INSPECT AIR FUEL RATIO SENSOR HEATER RELAY



(a) Remove the A/F sensor heater relay from the engine room R/B.

(b) Check for continuity in the A/F sensor heater relay.

Standard:

Tester Connection	Specified Condition
1 – 2	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage to terminals 1 and 2)

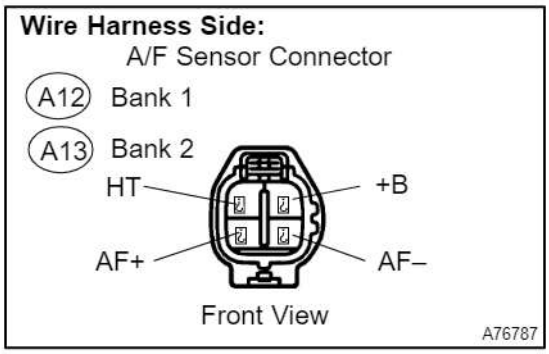
(c) Reinstall the A/F sensor heater relay.

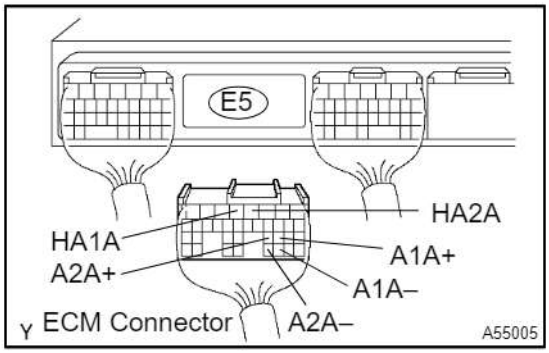
NG → **REPLACE AIR FUEL RATIO SENSOR HEATER RELAY**

OK

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12 CHECK HARNESS AND CONNECTOR(A/F SENSOR – ECM)





(a) Disconnect the A12 or A13 A/F sensor connector.
(b) Disconnect the E5 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

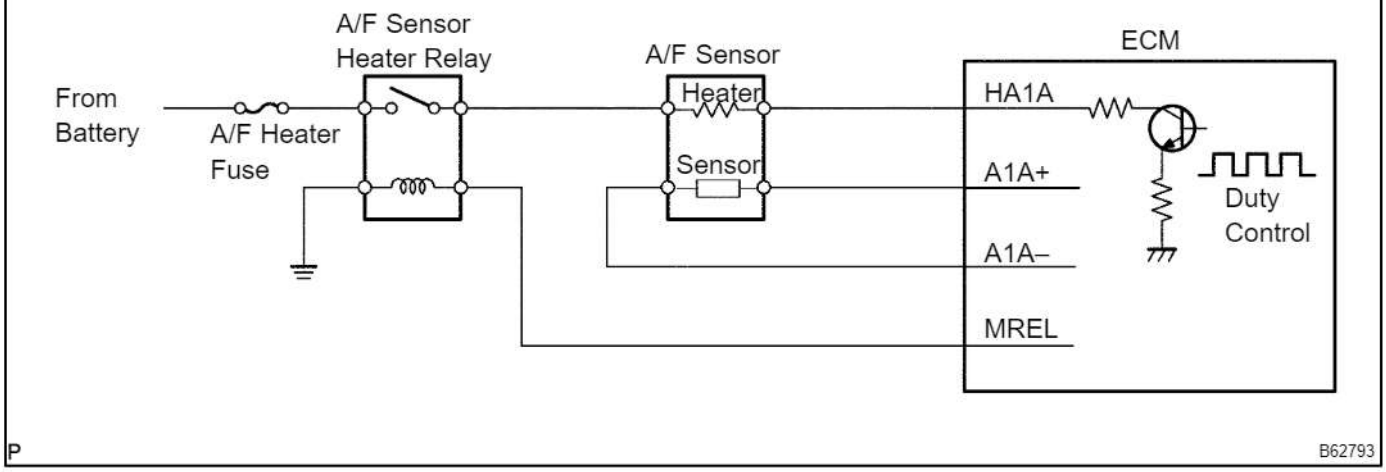
Tester Connection	Specified Condition
AF+ (A12–3) – A1A+ (E5–22)	Below 1 Ω
AF– (A12–4) – A1A– (E5–30)	
HT (A12–1) – HA1A (E5–5)	
AF+ (A13–3) – A2A+ (E5–23)	
AF– (A13–4) – A2A– (E5–31)	
HT (A13–1) – HA2A (E5–4)	

Standard (Check for short):

Tester Connection	Specified Condition
AF+ (A12–3) or A1A+ (E5–22) – Body ground	10 kΩ or higher
AF– (A12–4) or A1A– (E5–30) – Body ground	
HT (A12–1) or HA1A (E5–5) – Body ground	
AF+ (A13–3) or A2A+ (E5–23) – Body ground	
AF– (A13–4) or A2A– (E5–31) – Body ground	
HT (A13–1) or HA2A (E5–4) – Body ground	

(d) Reconnect the A/F sensor connector.
(e) Reconnect the ECM connector.

Reference (Bank 1 Sensor 1 System Diagram):



NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

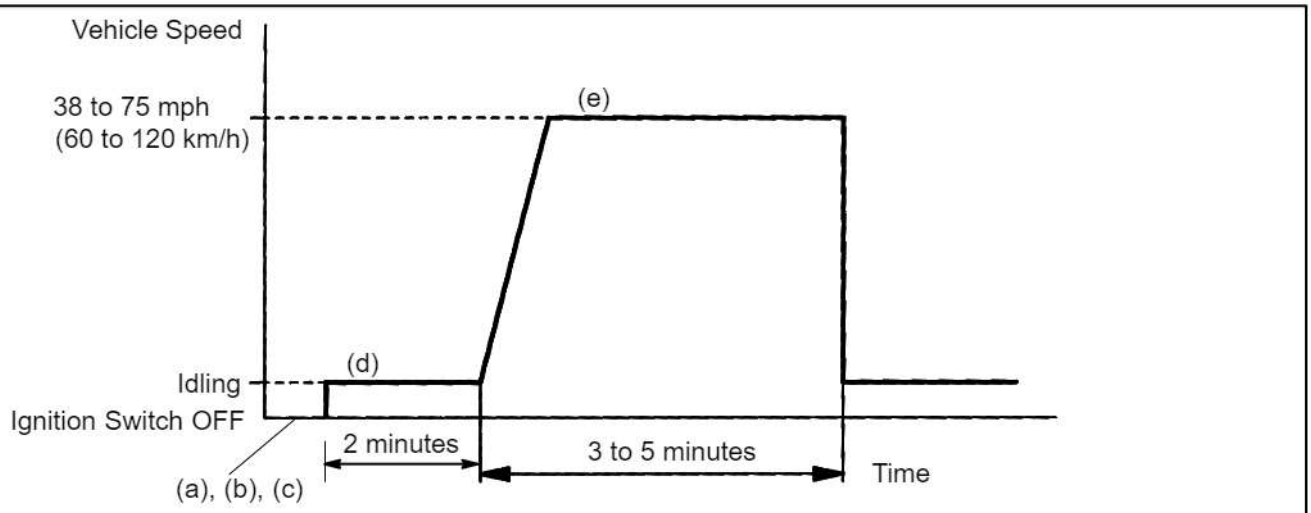
OK

13 REPLACE AIR FUEL RATIO SENSOR

GO

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14	PERFORM CONFIRMATION DRIVING PATTERN



(a) Clear the DTCs.
  (1) Disconnect the battery terminal or remove the EFI and ETCS fuses for 60 seconds or more.
(b) Connect the hand–held tester to the DLC3.
(c) Switch the hand–held tester from normal mode to check mode (see page 05–357).
(d) Start the engine and warm it up with all the accessory switched OFF.
(e) Drive the vehicle at 38 to 75 mph (60 to 120 km/h) and at engine speed of 1,400 to 3,200 rpm for 3 to 5 minutes.

HINT:
If a malfunction exists, the MIL will be illuminated during step (e).

NOTICE:
If the conditions in this test are not strictly followed, no malfunction will be detected. If you do not have the hand–held tester, turn the ignition switch to OFF after performing steps (d) and (e), then perform step (e) again.

GO

15	READ OUTPUT DTC(SEE IF DTC P0171, P0172, P0174 AND/OR P0175 ARE OUTPUT AGAIN)

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(c) Select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(d) Read the DTCs.
  Result:

Display (DTC output)	Proceed to
No output	A
P0171, P0172, P0174 and/or P0175	B

B → **REPLACE ECM (See page 10–11) AND PERFORM CONFIRMATION DRIVING PATTERN (Refer to step 14)**

A

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16	CONFIRM IF VEHICLE HAS RUN OUT OF FUEL IN PAST

NO → CHECK FOR INTERMITTENT PROBLEMS (See page 05–331)

YES

DTC IS CAUSED BY RUNNING OUT OF FUEL (DTCS P0171, P0172, P0174 AND/OR P0175)

17	PERFORM CONFIRMATION DRIVING PATTERN

HINT:
Clear all DTCs prior to perform the confirmation driving pattern (Refer to step 14).

GO

18	READ OUTPUT DTC(SEE IF DTC P0171, P0172, P0174 AND/OR P0175 ARE OUTPUT AGAIN)

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(c) Select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(d) Read the DTCs.

Result:

Display (DTC output)	Proceed to
P0171, P0172, P0174 and/or P0175	A
No output	B

B → Go to step 22

A

19	REPLACE AIR FUEL RATIO SENSOR

GO

20	PERFORM CONFIRMATION DRIVING PATTERN

HINT:
Clear all DTCs prior to perform the confirmation driving pattern (Refer to step 14).

GO

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21	READ OUTPUT DTC(SEE IF DTC P0171, P0172, P0174 AND/OR P0175 ARE OUTPUT AGAIN)

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(c) Select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(d) Read the DTCs.

Result:

Display (DTC output)	Proceed to
No output	A
P0171, P0172, P0174 and/or P0175	B

B → **REPLACE ECM (See page 10–11) AND PERFORM CONFIRMATION DRIVING PATTERN (Refer to step 14)**

A

22	CONFIRM IF VEHICLE HAS RUN OUT OF FUEL IN PAST

NO → **CHECK FOR INTERMITTENT PROBLEMS (See page 05–331)**

YES

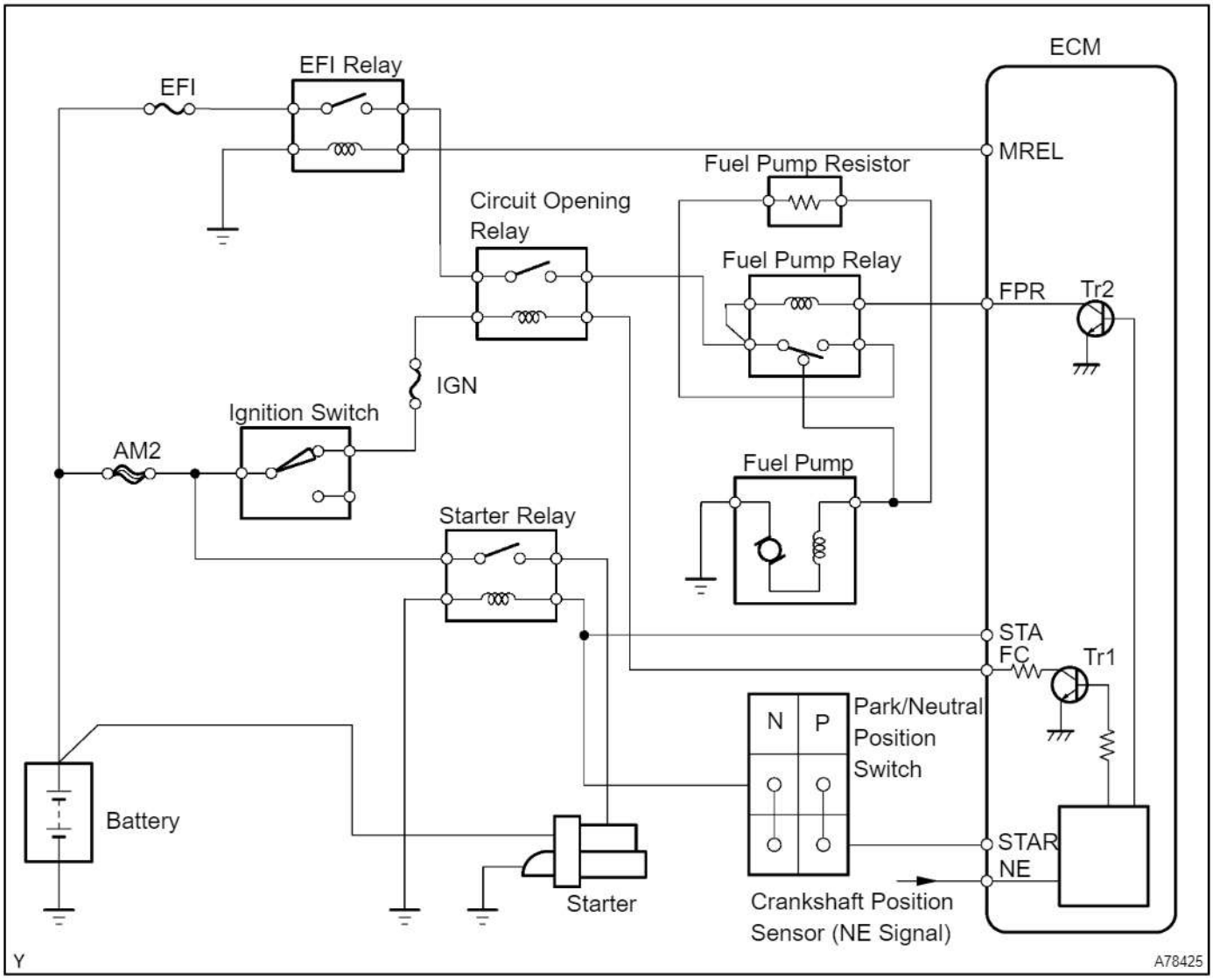
DTC IS CAUSED BY RUNNING OUT OF FUEL (DTCS P0171, P0172, P0174 AND/OR P0175)

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DTC P0230 FUEL PUMP PRIMARY CIRCUIT

CIRCUIT DESCRIPTION

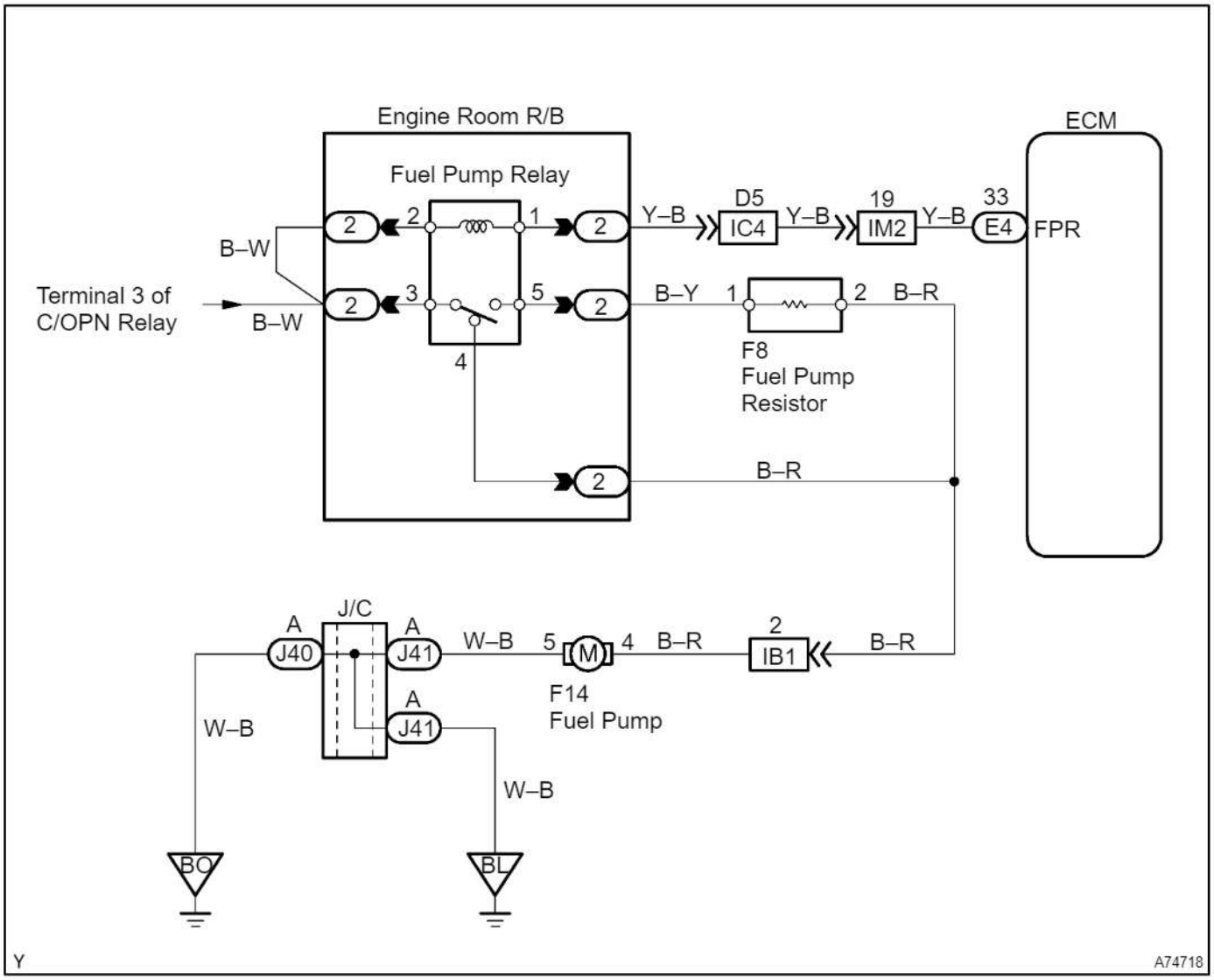
In the diagram below, when the engine is cranked, current flows from terminal STAR of the ECM to the starter relay coil and also current flows to terminal STA of the ECM (STA signal).
When the STA signal and NE signal are input to the ECM, Tr1 is turned ON, current flows to the coil of the circuit opening relay, the relay switches on, power is supplied to the fuel pump, and the fuel pump operates. While the NE signal is generated (engine running), the ECM keeps the Tr1 ON (circuit opening relay ON) and the fuel pump also keeps operating.
The fuel pump speed is controlled at two levels (high speed or low speed) by engine condition (starting, light load, heavy load). When the engine starts (STA ON), Tr2 in the ECM is OFF, so the fuel pump relay closes and positive battery voltage is applied directly to the fuel pump. The fuel pump operates at high speed.
During idling or under light loads, Tr2 goes ON, and then power is supplied to the fuel pump via the fuel pump resistor. The fuel pump operates at low speed.



DTC No	DTC Detection Condition	Trouble Area
P0230	Open or short in fuel pump relay circuit	□Open or short in fuel pump relay circuit □Fuel pump relay □ECM

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WIRING DIAGRAM



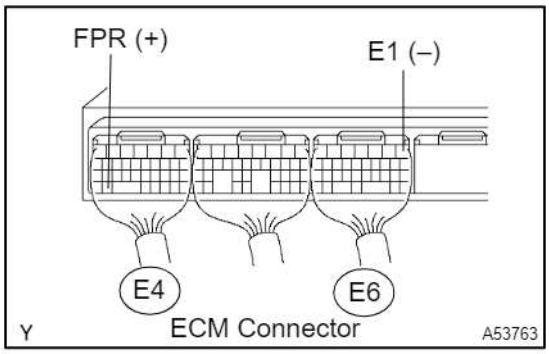
HINT:
This DTC chart is on the premise that the engine is started normally. If the engine is difficult to start, proceed to the problem symptoms table on page 05–348.

INSPECTION PROCEDURE

HINT:
Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

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1 INSPECT ECM(FPR VOLTAGE)



(a) Measure the voltage between the terminals of the E4 and E6 ECM connectors.

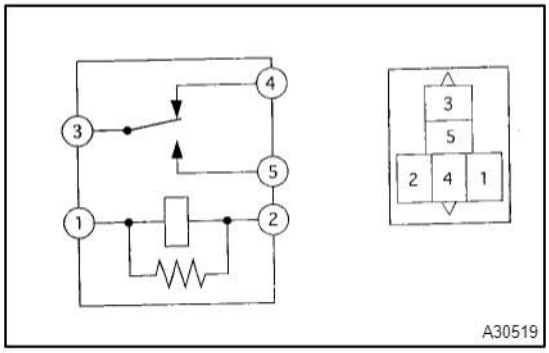
Standard:

Tester Connection	Condition	Specified Condition
FPR (E4–33) – E1 (E6–1)	STA signal ON	9 to 14 V
	STA signal OFF	0 to 3 V

OK → **REPLACE ECM (See page 10–11)**

NG

2 INSPECT FUEL PUMP RELAY ASSY



(a) Remove the fuel pump relay from the engine room R/B.

(b) Check for continuity in the fuel pump relay.

Standard:

Tester Connection	Specified Condition
1 – 2 3 – 4	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage to terminals 1 and 2)

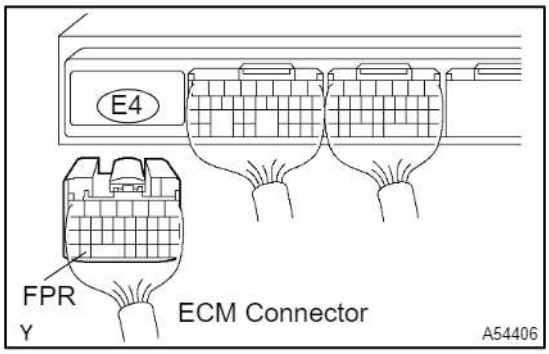
(c) Reinstall the fuel pump relay.

NG → **REPLACE FUEL PUMP RELAY ASSY**

OK

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3	CHECK HARNESS AND CONNECTOR(FUEL PUMP RELAY – ECM)



(a) Remove the fuel pump relay from the engine room R/B.
(b) Disconnect the E4 ECM connector.
(c) Check for resistance between the wire harness side connectors.

Standard (Check for open):

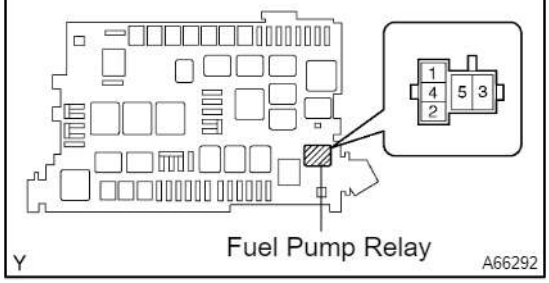
Tester Connection	Specified Condition
Fuel pump relay (1) – FPR (E4–33)	Βελοω 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
Fuel pump relay (1) or FPR (E4–33) – Body ground	10 kΩ or higher

(d) Reinstall the fuel pump relay.
(e) Reconnect the ECM connector.

Engine Room R/B:



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK →

REPLACE ECM (See page 10–11)

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DTC	P0300	RANDOM/MULTIPLE CYLINDER MISFIRE DETECTED

DTC	P0301	CYLINDER 1 MISFIRE DETECTED

DTC	P0302	CYLINDER 2 MISFIRE DETECTED

DTC	P0303	CYLINDER 3 MISFIRE DETECTED

DTC	P0304	CYLINDER 4 MISFIRE DETECTED

DTC	P0305	CYLINDER 5 MISFIRE DETECTED

DTC	P0306	CYLINDER 6 MISFIRE DETECTED

CIRCUIT DESCRIPTION

When a misfire occurs in the engine, hydrocarbons (HC) enter the exhaust in high concentrations. If this HC concentration is high enough, there could be an increase in exhaust emissions levels. High concentrations of HC can also cause to temperature of the catalyst to increase, possibly damaging the catalyst. To prevent this increase in emissions and limit the possibility of thermal damage, the ECM monitors the misfire rate. When the temperature of the catalyst reaches a point of thermal degradation, the ECM will blink the MIL. For monitoring misfire, the ECM uses both the camshaft position sensor and the crankshaft position sensor. The camshaft position sensor is used to identify misfiring cylinders and the crankshaft position sensor is used to measure variations in the crankshaft rotation speed. The misfire counter increments when crankshaft rotation speed variations exceed threshold values.

If the misfiring rate exceeds the threshold value and could cause emissions deterioration, the ECM illuminates the MIL.

DTC No.	DTC Detection Condition	Trouble Area
P0300	Misfiring of random cylinders is detected	□Open or short in engine wire harness □Connector connection □Vacuum hose connection □Ignition system □Injector □Fuel pressure □Mass air flow meter □Engine coolant temperature sensor □Compression pressure □Valve clearance □Valve timing □PCV hose connection □PCV hose □ECM
P0301 P0302 P0303 P0304 P0305 P0306	Misfiring of each cylinder is detected	

HINT:

When codes for a misfiring cylinder are recorded repeatedly but no random misfire code is recorded, it indicates that the misfires have been detected and recorded at different times.

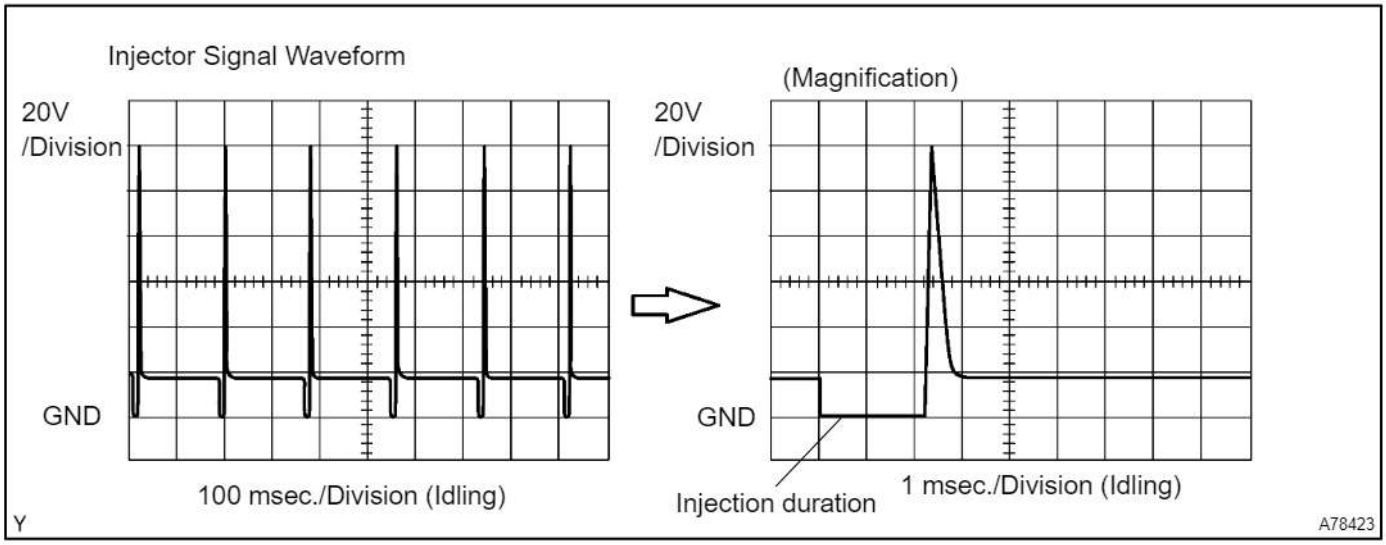
Reference: Inspection using oscilloscope

With the engine idling, check the waveform between terminals #10 to #60 and E01 of the ECM connectors.

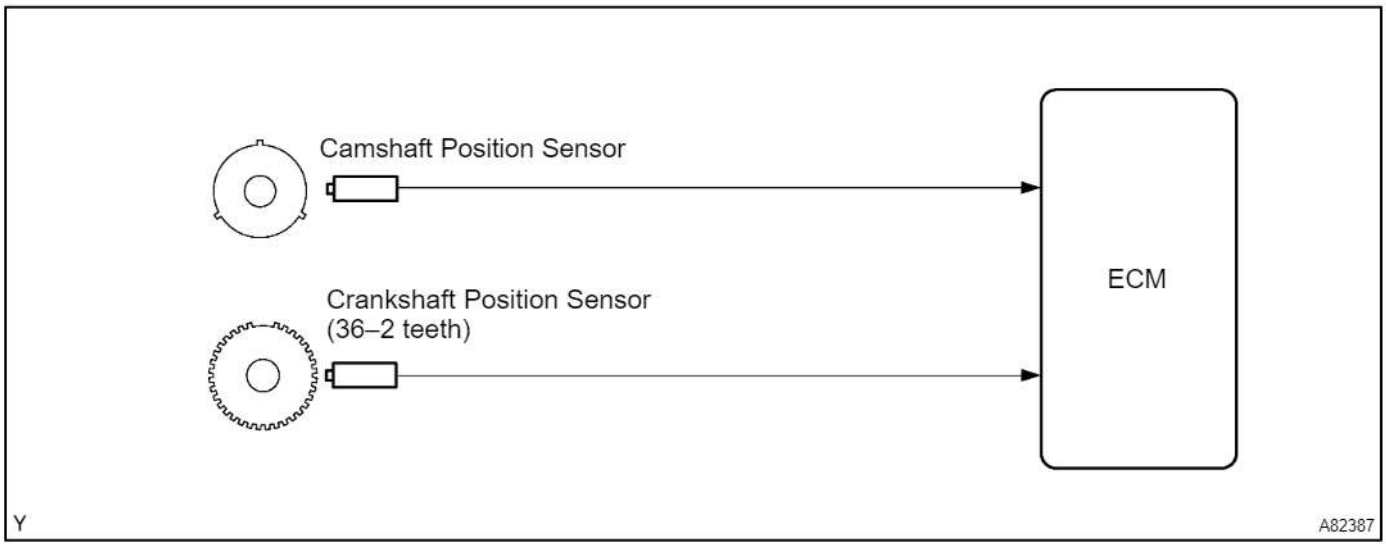
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HINT:

The correct waveform is as shown.



MONITOR DESCRIPTION



The ECM illuminates the MIL (2 trip detection logic) if:

- The percent misfire exceeds the specified limit per 1,000 engine revolutions. One occurrence of excessive misfire during engine start will set the MIL. Four occurrences are required to set the MIL 1,000 revolutions after engine start.

The ECM blinks the MIL (MIL blinks immediately) if:

- The threshold for percent of misfire causing catalyst damage is reached 1 time within 200 engine revolutions at a high engine rpm.
- The threshold for percent of misfire causing catalyst damage is reached 3 times within 200 engine revolutions at a normal engine rpm.

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MONITOR STRATEGY

Related DTCs	P0300: Multiple cylinder misfire P0301: Cylinder 1 misfire P0302: Cylinder 2 misfire P0303: Cylinder 3 misfire P0304: Cylinder 4 misfire P0305: Cylinder 5misfire P0306: Cylinder 6 misfire
Required sensors/ components (Main)	Injector, Igniter, spark plug
Required sensors / components (Related)	Mass air flow meter, Crankshaft position sensor, Camshaft position sensor, Engine coolant temperature sensor, Intake air temperature sensor
Frequency of operation	Continuous
Duration	1,000 revolutions: Emission–related misfire 200 revolutions: Catalyst–damaged misfire and paired cylinders misfire
MIL operation	2 driving cycles: Except the following conditions Flashing immediately: Paired cylinders misfire at idle
Sequence operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05–334
Battery voltage	8 V or more
VVT system	No active test by scan tool
RPM fluctuation	Not changing rapidly
Engine RPM	400 rpm to allowable RPM limit
All of the following conditions are met:	A, B and C
A. Engine coolant temperature	–10 C (14 F) or more
B. Either of the following conditions is met:	(a) or (b)
(a) Intake air temperature	–10 C (14 F) or more
(b) Engine coolant temperature	75 C (167 F) or more
C. Either of the following conditions is met:	(a) or (b)
(a) Engine coolant temperature at engine start	More than –7 C (19 F) or more
(b) Engine coolant temperature	More than 20 C (68 F)
Mass air flow	Varies with engine coolant temperature and RPM
Throttle position	Not changing rapidly
Rough load counter	20 times or less per 1,000 revolutions (Not running on rough load)

TYPICAL MALFUNCTION THRESHOLDS

Emission–related–misfire:

Misfire rate	3.5 % (During the first 1,000 revolution after engine start)

Emission–related–misfire after hot start:

Misfire rate	14 % per 1,000 revolutions

Emission–related–misfire due to ignition fail:

Ignition fail count during 1000 revolutions	84 counts

Catalyst–damage–misfire:

Misfire count	77 or more*1 per 200 revolutions (at intake air amount: 0.5 g/rev and engine RPM: 1,600 rpm)

Catalyst–damage–misfire due to ignition fail:

Misfire count	81.4 or more*1 per 200 revolutions (at intake air amount: 0.5 g/rev and engine RPM: 1,600 rpm)

Paired cylinders misfire at idle (MIL flashing) *2:

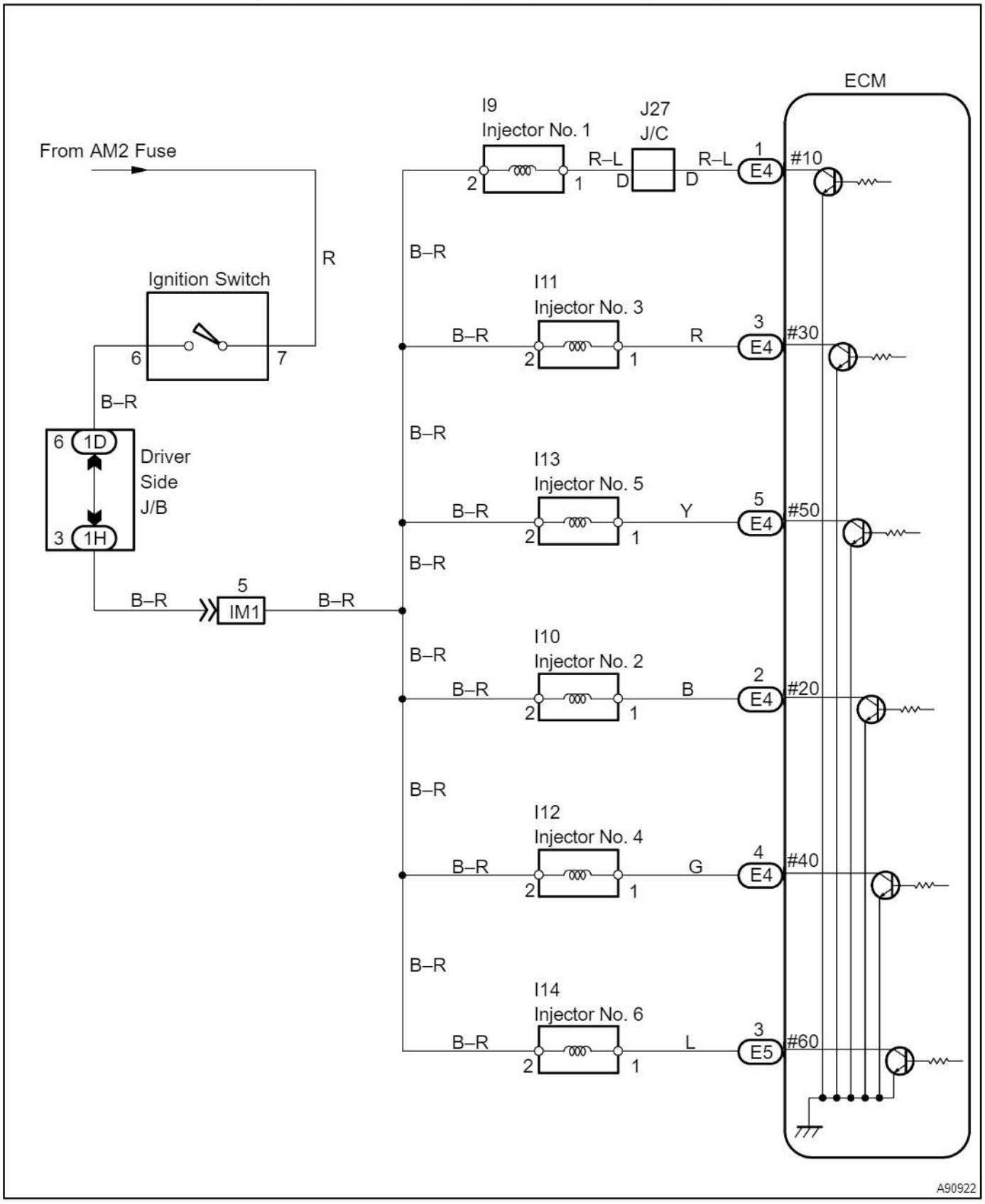
Paired cylinder misfire	72 times per 170 revolutions

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*1: The threshold value varies with the intake air amount and the engine RPM.
*2: MIL flashing is stopped when the misfire counts are less than 72 per 170 revolutions.

WIRING DIAGRAM

Refer to DTC P0351 on page 05–498 for the wiring diagram of the ignition system.



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CONFIRMATION DRIVING PATTERN

(a) Connect the hand–held tester to the DLC3.
(b) Record DTC and the freeze frame data.
(c) Switch the hand–held tester from normal mode to check mode (see page 05–357).
(d) Read the value on the misfire counter for each cylinder when idling. If the value is displayed on the misfire counter, skip the following procedure of confirmation driving.
(e) Drive the vehicle several times with the engine speed, load and its surrounding range shown with ENGINE SPD, CALC LOAD in the freeze frame data or MISFIRE RPM, MISFIRE LOAD in the data list.

If you have no hand–held tester, turn the ignition switch to OFF after the symptom is simulated once. Then repeat the simulation process again.

HINT:

In order to memorize the DTC of misfire, it is necessary to drive around MISFIRE RPM, MISFIRE LOAD in the DATA LIST for the following period of time. Take care not to turn the ignition switch to OFF. Turning the ignition switch OFF switches the diagnosis system from check mode to normal mode. So all DTCs and other data will be erased.

Engine Speed	Time
Idling	3 minutes 30 seconds or more
1,000 rpm	3 minutes or more
2,000 rpm	1 minute 30 seconds or more
3,000 rpm	1 minute or more

(f) Check whether there is misfire or not by monitoring DTC and the freeze frame data. After that, record them.
(g) Turn the ignition switch to OFF and wait for at least 5 seconds.

INSPECTION PROCEDURE

HINT:

- If DTCs besides misfire DTCs are memorized simultaneously, troubleshoot the non–misfire DTCs first.
- If the misfire does not occur when the vehicle is brought to the workshop, the misfire can be confirmed by reproducing the condition of the freeze frame data. Also, after finishing the repair, confirm that there is no misfire (see confirmation driving pattern).
- Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.
- On 6 and 8 cylinder engines, misfiring cylinder identification is disabled at high engine speed and only a general misfire fault code P0300 is stored instead of a cylinder specific misfire fault code (P0301 to P0308).

  If the misfire starts in a high engine speed area or the misfire occurs only in a high engine speed area, only DTC P0300 may be stored.

  When only a general misfire fault code like P0300 is stored:

- Erase the general misfire fault code from the hand–held tester or OBD II scan tool.
- Start the engine and drive the confirmation patten.
- Read the value of the misfire ratio for each cylinder. Or read the DTC.
- Perform repairs on the cylinder that has a high misfire ratio. Or repair the cylinder indicated by the DTC.
- After finishing the repair, drive the confirmation pattern again and confirm that no misfire occurs.
- When one of SHORT FT #1, LONG FT #1, SHORT FT #2 and LONG FT #2 in the freeze frame data is over the range of ±20 %, there is a possibility that the air–fuel ratio is becoming RICH (–20 % or less) or LEAN (+20 % or more).

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- When COOLANT TEMP in the freeze frame data is less than 80°C (176°F), there is a possibility of misfire only during engine warm–up.
- If the misfire cannot be reproduced, the following reasons may apply: 1) the vehicle has low fuel, 2) improper fuel is being used, and 3) the ignition plug is contaminated.
- Be sure to check the value on the misfire counter after the repair.

1 CHECK OTHER DTC OUTPUT(BESIDES MISFIRE DTCS)

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(c) Select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(d) Read DTCs.

Result:

Display (DTC output)	Proceed to
P0300, P0301, P0302, P0303, P0304, P0305 and/or P0306	A
P0300, P0301, P0302, P0303, P0304, P0305 or P0306 and other DTCs	B

HINT:
If any other codes besides P0300, P0301, P0302, P0303, P0304, P0305 or P0306 are output, perform troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05–366)**

A

2 CHECK WIRE HARNESS, CONNECTOR AND VACUUM HOSE IN ENGINE ROOM

(a) Check the connection conditions of the wire harness and connector.
(b) Check the piping of the vacuum hose.
(c) Check the vacuum hose for disconnection or breakage.

NG → **REPAIR OR REPLACE, THEN CONFIRM THAT THERE IS NO MISFIRE**

OK

3 CHECK CONNECTION OF PCV HOSE

NG → **REPAIR OR REPLACE PCV HOSE**

OK

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4	READ VALUE OF HAND–HELD TESTER OR OBD II SCAN TOOL(NUMBER OF MISFIRE)

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(c) Start the engine.
(d) Select the item: DIAGNOSIS/ENHANCED OBD II/DATA LIST/ALL/CYL#1 – CYL#6.
(e) Read the number of misfire on the hand–held tester or the OBD II scan tool.

HINT:
When a misfire is not reproduced, be sure to branch below based on the stored DTC.

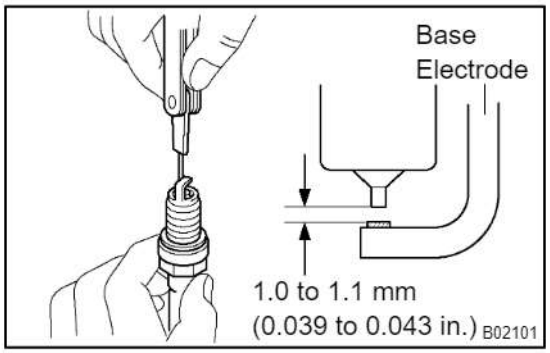
Result:

High Misfire Rate Cylinder	Proceed to
1 or 2 cylinders	A
More than 3 cylinders	B

B → **Go to step 15**

A

5	CHECK SPARK PLUG AND SPARK OF MISFIRING CYLINDER



(a) Remove the ignition coil assembly.
(b) Remove the spark plug.
(c) Check the spark plug type.

Recommended spark plug:

DENSO made	K20HR–U11
NGK made	LFR6C–11

(d) Check the spark plug electrode gap.

Electrode gap: 1.0 to 1.1 mm (0.039 to 0.043 in.)
Maximum electrode gap: 1.46 mm (0.057 in.)

NOTICE:
If adjusting the gap of a new spark plug, bend only the base the ground electrode. Do not touch the tip. Never attempt to adjust the gap on a used plug.

(e) Check the electrode for carbon deposits.
(f) Perform a spark test.

CAUTION:
Absolutely disconnect each injector connector.
NOTICE:
Do not crank the engine for more than 5 to 10 seconds.

(1) Install the spark plug to the ignition coil, and connect the ignition coil connector.
(2) Disconnect the injector connector.
(3) Ground the spark plug.
(4) Check if spark occurs while the engine is being cranked.

Standard: Spark jumps across electrode gap.

(g) Reinstall the spark plug.
(h) Reinstall the ignition coil assembly.

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OK → Go to step 8

NG

6 CHANGE NORMAL SPARK PLUG AND CHECK SPARK OF MISFIRING CYLINDER

(a) Change to the normal spark plug.
(b) Perform a spark test.

CAUTION:
Absolutely disconnect each injector connector.
NOTICE:
Do not crank the engine for more than 5 to 10 seconds.

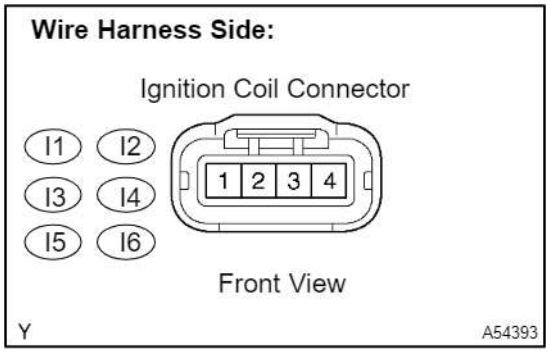
(1) Install the spark plug to the ignition coil, and connect the ignition coil connector.
(2) Disconnect the injector connector.
(3) Ground the spark plug.
(4) Check if spark occurs while the engine is being cranked.

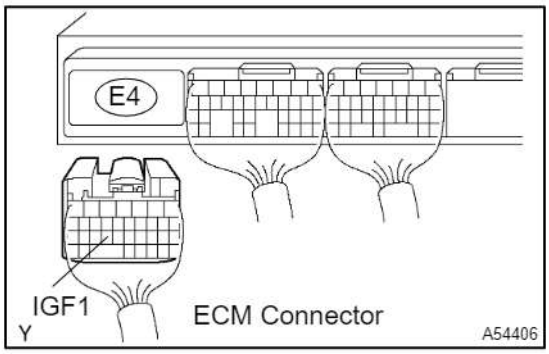
Standard: Spark jumps across electrode gap.

OK → REPLACE SPARK PLUG

NG

7 CHECK HARNESS AND CONNECTOR OF MISFIRING CYLINDER(IGNITION COIL – ECM)





(a) Check the harness and the connector between the ignition coil and ECM (IGF1 terminal).
(1) Disconnect the I1, I2, I3, I4, I5 or I6 ignition coil connector.
(2) Disconnect the ECM E4 connector.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

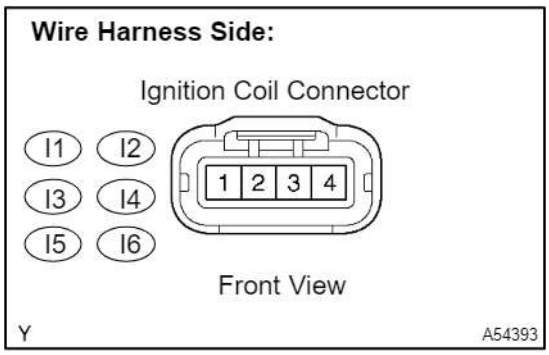
Tester Connection	Specified Condition
Ignition coil (I1–2) – IGF1 (E4–24)	Below 1 Ω
Ignition coil (I2–2) – IGF1 (E4–24)	
Ignition coil (I3–2) – IGF1 (E4–24)	
Ignition coil (I4–2) – IGF1 (E4–24)	
Ignition coil (I5–2) – IGF1 (E4–24)	
Ignition coil (I6–2) – IGF1 (E4–24)	

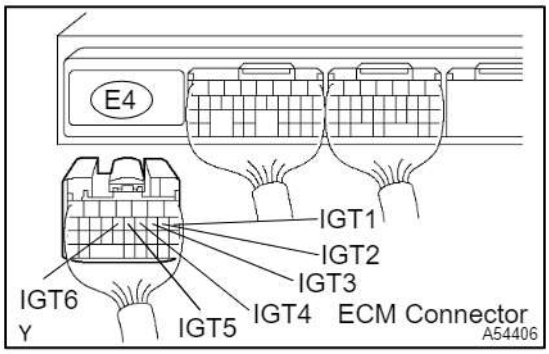
Standard (Check for short):

Tester Connection	Specified Condition
Ignition coil (I1–2) or IGF1 (E4–24) – Body ground	10 kΩ or higher
Ignition coil (I2–2) or IGF1 (E4–24) – Body ground	
Ignition coil (I3–2) or IGF1 (E4–24) – Body ground	
Ignition coil (I4–2) or IGF1 (E4–24) – Body ground	
Ignition coil (I5–2) or IGF1 (E4–24) – Body ground	
Ignition coil (I6–2) or IGF1 (E4–24) – Body ground	

(4) Reconnect the ignition coil connector.
(5) Reconnect the ECM connector.

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(b) Check the harness and the connector between the ignition coil and ECM (IGT terminal).
(1) Disconnect the I1, I2, I3, I4, I5 or I6 ignition coil connector.
(2) Disconnect the ECM E4 connector.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Ignition coil (I1–3) – IGT1 (E4–8)	Below 1 Ω
Ignition coil (I2–3) – IGT2 (E4–9)	
Ignition coil (I3–3) – IGT3 (E4–10)	
Ignition coil (I4–3) – IGT4 (E4–11)	
Ignition coil (I5–3) – IGT5 (E4–12)	
Ignition coil (I6–3) – IGT6 (E4–13)	

Standard (Check for short):

Tester Connection	Specified Condition
Ignition coil (I1–3) or IGT1 (E4–8) – Body ground	10 kΩ or higher
Ignition coil (I2–3) or IGT2 (E4–9) – Body ground	
Ignition coil (I3–3) or IGT3 (E4–10) – Body ground	
Ignition coil (I4–3) or IGT4 (E4–11) – Body ground	
Ignition coil (I5–3) or IGT5 (E4–12) – Body ground	
Ignition coil (I6–3) or IGT6 (E4–13) – Body ground	

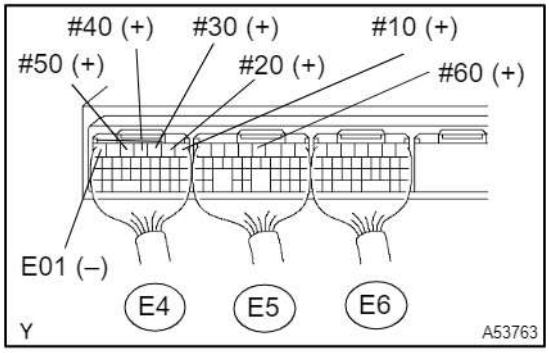
(4) Reconnect the ignition coil connector.
(5) Reconnect the ECM connector.

OK → **REPLACE IGNITION COIL ASSY (THEN CONFIRM THAT THERE IS NO MISFIRE)**

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

8 INSPECT ECM TERMINAL OF MISFIRING CYLINDER(#10, #20, #30, #40, #50 OR #60 VOLTAGE)



(a) Turn the ignition switch to ON.
(b) Measure the voltage between the applicable terminals of the E4, E5 and E6 ECM connectors.

Standard:

Tester Connection	Specified Condition
#10 (E4–1) – E01 (E4–7)	9 to 14 V
#20 (E4–2) – E01 (E4–7)	
#30 (E4–3) – E01 (E4–7)	
#40 (E4–4) – E01 (E4–7)	
#50 (E4–5) – E01 (E4–7)	
#60 (E5–3) – E01 (E4–7)	

OK → **Go to step 11**

NG

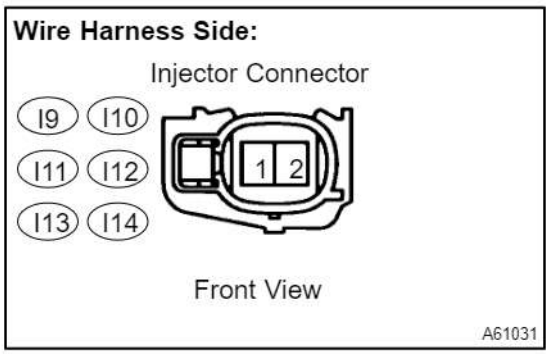
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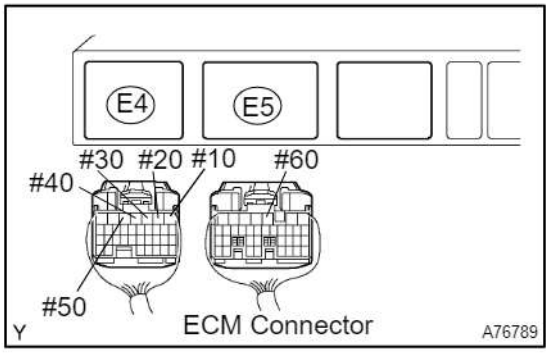
9	INSPECT FUEL INJECTOR RESISTANCE OF MISFIRING CYLINDER (See page 11–7)

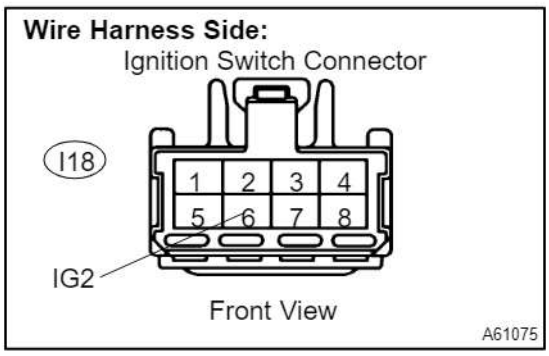
NG → REPLACE FUEL INJECTOR ASSY

OK

10	CHECK HARNESS AND CONNECTOR OF MISFIRING CYLINDER(INJECTOR – ECM, INJECTOR – IGNITION SWITCH)







(a) Check the harness and the connector between the injector and ECM.
  (1) Disconnect the I9, I10, I11, I12, I13 or I14 injector connector.
  (2) Disconnect the E4 or E5 ECM connector.
  (3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Injector (I9–1) – #10 (E4–1)	Below 1 Ω
Injector (I10–1) – #20 (E4–2)	
Injector (I11–1) – #30 (E4–3)	
Injector (I12–1) – #40 (E4–4)	
Injector (I13–1) – #50 (E4–5)	
Injector (I14–1) – #60 (E5–3)	

Standard (Check for short):

Tester Connection	Specified Condition
Injector (I9–1) or #10 (E4–1) – Body ground	10 kΩ or higher
Injector (I10–1) or #20 (E4–2) – Body ground	
Injector (I11–1) or #30 (E4–3) – Body ground	
Injector (I12–1) or #40 (E4–4) – Body ground	
Injector (I13–1) or #50 (E4–5) – Body ground	
Injector (I14–1) or #60 (E5–3) – Body ground	

  (4) Reconnect the injector connector.
  (5) Reconnect the ECM connector.

(b) Check the harness and connector between the injector and ignition switch.
  (1) Disconnect the I9, I10, I11, I12, I13 or I14 injector connector.
  (2) Disconnect the I18 ignition switch connector.
  (3) Check the resistance between the wire harness side connectors.

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Standard (Check for open):

Tester Connection	Specified Condition
Injector (I9–2) – IG2 (6)	Below 1 Ω
Injector (I10–2) – IG2 (6)	
Injector (I11–2) – IG2 (6)	
Injector (I12–2) – IG2 (6)	
Injector (I13–2) – IG2 (6)	
Injector (I14–2) – IG2 (6)	
Injector (I15–2) – IG2 (6)	
Injector (I16–2) – IG2 (6)	

Standard (Check for short):

Tester Connection	Specified Condition
Injector (I9–2) or IG2 (6) – Body ground	10 kΩ or higher
Injector (I10–2) or IG2 (6) – Body ground	
Injector (I11–2) or IG2 (6) – Body ground	
Injector (I12–2) or IG2 (6) – Body ground	
Injector (I13–2) or IG2 (6) – Body ground	
Injector (I14–2) or IG2 (6) – Body ground	
Injector (I15–2) or IG2 (6) – Body ground	
Injector (I16–2) or IG2 (6) – Body ground	

(4) Reconnect the injector connector.
(5) Reconnect the ignition switch connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

11	**INSPECT FUEL INJECTOR INJECTION AND VOLUME OF MISFIRING CYLINDER (See page 11–7)**

NG → **REPLACE FUEL INJECTOR ASSY (See page 11–10)**

OK

12	**CHECK CYLINDER COMPRESSION PRESSURE OF MISFIRING CYLINDER (See page 14–1)**

NG → **REPAIR OR REPLACE**

OK

13	**CHECK VALVE CLEARANCE OF MISFIRING CYLINDER (See page 14–7)**

NG → **ADJUST VALVE CLEARANCE (See page 14–7)**

OK

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14	SWITCH STEP BY NUMBER OF MISFIRE CYLINDER(REFER RESULT OF STEP 4)

HINT:
- □ If the result of step 4 is "1 or 2 cylinders", proceed to A.
- □ If the result of step 4 is "more than 3 cylinders", proceed to B.

B → CHECK FOR INTERMITTENT PROBLEMS (See page 05–331)

A

15	CHECK VALVE TIMING(CHECK FOR LOOSE AND JUMPED TOOTH OF TIMING CHAIN) (See page 14–7)

NG → ADJUST VALVE TIMING (REPAIR OR REPLACE TIMING CHAIN) (See page 14–7)

OK

16	CHECK FUEL PRESSURE (See page 11–5)

NG → CHECK AND REPLACE FUEL PUMP, PRESSURE REGULATOR, FUEL PIPE LINE AND FILTER

OK

17	READ VALUE OF HAND–HELD TESTER OR OBD II SCAN TOOL(INTAKE AIR TEMPERATURE AND MASS AIR FLOW RATE)

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(c) Check the intake air temperature.
  (1) On the hand–held tester or the OBD II scan tool, select the item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / INTAKE AIR. Read the values.

  Temperature: Equivalent to ambient air temperature
(d) Check the air flow rate.
  (1) On the hand–held tester or the OBD II scan tool, select the item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / MAF.
  (2) Read the values.

  Standard:

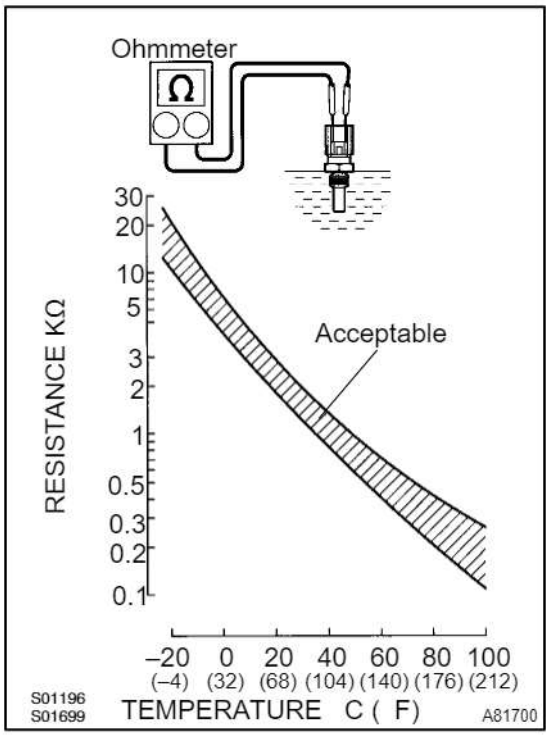
Condition	Air Flow Rate (gm/s)
Ignition switch On (do not start engine)	0
Idling	3.2 to 4.7
Racing without load (2,500 rpm)	13.1 to 18.9
Idling – Racing	Air flow rate fluctuates

NG → REPLACE MASS AIR FLOW METER

OK

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18	INSPECT ENGINE COOLANT TEMPERATURE SENSOR(RESISTANCE)



(a) Remove the engine coolant temperature sensor.
(b) Measure the resistance between the terminals.

Standard:

Tester Connection	Specified Condition
1 – 2	2.32 to 2.59 kΩ (20 C (68 F))
	0.310 to 0.326 kΩ (80 C (176 F))

NOTICE:

When checking the engine coolant temperature sensor in water, be careful not to allow water to contact the terminals. After the check, dry the sensor.

HINT:

Alternate procedure: Connect an ohmmeter to the installed engine coolant temperature sensor and read the resistance. Use an infrared thermometer to measure the engine temperature in the immediate vicinity of the sensor. Compare these values to the resistance/temperature graph. Change the engine temperature (warm up or allow to cool down) and repeat the test.

NG → **REPLACE ENGINE COOLANT TEMPERATURE SENSOR**

OK

19	SWITCH STEP BY NUMBER OF MISFIRE CYLINDER(REFER RESULT OF STEP 4)

HINT:

- If the result of step 4 is "1 or 2 cylinders", proceed to A.
- If the result of step 4 is "more than 3 cylinders", proceed to B.

B → **AGAIN GO TO STEP 5**

A

CHECK FOR INTERMITTENT PROBLEMS (See page 05–331)

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DTC	P0325	KNOCK SENSOR 1 CIRCUIT (BANK 1 OR SINGLE SENSOR)

DTC	P0327	KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR)

DTC	P0328	KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR)

DTC	P0330	KNOCK SENSOR 2 CIRCUIT (BANK 2)

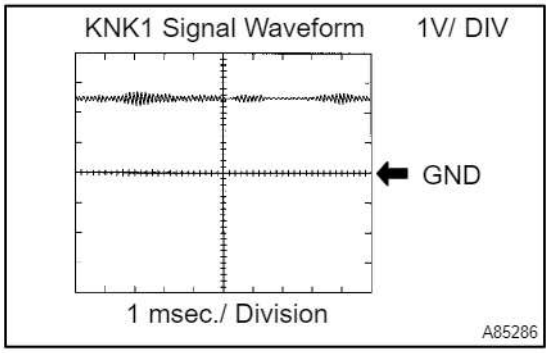
DTC	P0332	KNOCK SENSOR 2 CIRCUIT LOW INPUT (BANK 2)

DTC	P0333	KNOCK SENSOR 2 CIRCUIT HIGH INPUT (BANK 2)

CIRCUIT DESCRIPTION

A flat type knock sensor (non–resonant type) has the structure that can detect the vibration in a wider band of frequency from about 6 kHz to 15 kHz and has the following features.
Knock sensors are fitted on the right bank and left bank of the cylinder block to detect engine knocking. Each knock sensor contains a piezoelectric element which generates voltage when it becomes deformed. Generation of the voltage occurs when the cylinder block vibrates due to knocking. If engine knocking occurs, the ignition timing is retarded in order to suppress the knocking.

DTC No.	DTC Detection Condition	Trouble Area
P0325 P0330	Knock sensor signal level remains at low for more than 10 seconds	□Knock sensor 1 or 2 □Knock sensor 1 or 2 (looseness) □ECM
P0327 P0332	Output voltage of the knock sensor 1 or 2 is 0.5 V or less	□Short in knock sensor 1 or 2 circuit □Knock sensor 1 or 2 □ECM
P0328 P0333	Output voltage of the knock sensor 1 or 2 is 4.5 V or more	□Open in knock sensor 1 or 2 circuit □Knock sensor 1 or 2 □ECM



Reference: Inspection using the oscilloscope.
The correct waveform is as shown.

Item	Details
Terminal	KNK1 – EKNK or KNK2 – EKN2
Equipment Settings	0.01 to 10 V/Division, 0.01 to 10 msec./Division
Condition	After warming up the engine, keep the engine speed at 4,000 rpm.

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MONITOR DESCRIPTION

The knock sensor, located on the cylinder block, detects spark knock. When spark knock occurs, the piezoelectric element of the sensor vibrates. When the ECM detects the voltage in this frequency range, it retards the ignition timing to suppress the spark knock.
The ECM also senses background engine noise with the knock sensor and uses this noise to check for faults in the sensor. If the knock sensor signal level is too low for more than 10 seconds, and if the knock sensor output voltage is out of normal range, the ECM interprets this as a fault in the knock sensor and sets a DTC.

MONITOR STRATEGY

Related DTCs	P0325: Knock sensor (Bank 1) malfunction P0325: Knock sensor (Bank 1) open/short (Fluttering) P0327: Knock sensor (Bank 1) open/short (Low voltage) P0328: Knock sensor (Bank 1) open/short (High voltage) P0330: Knock sensor (Bank 2) malfunction P0330: Knock sensor (Bank 2) open/short (Fluttering) P0332: Knock sensor (Bank 2) open/short (Low voltage) P0333: Knock sensor (Bank 2) open/short (High voltage)
Required sensors/ components (Main)	Knock sensor (Bank 1 and 2)
Required sensors / components (Related)	Mass air flow meter, Crankshaft position sensor, Engine coolant temperature sensor
Frequency of operation	Continuous
Duration	10 seconds: Knock sensor malfunction 1 second: Knock sensor open/short
MIL operation	Immediate
Sequence operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	None

Knock sensor malfunction:

Battery voltage	10 V or more
Idle	OFF
Time after engine start	5 seconds or more
Engine coolant temperature	60 C (140 F) or more
Spark cut	OFF
Mass air flow	0.3 g per revolution
Engine RPM	2,500 to 5,000 rpm

Knock sensor open/short:

Battery voltage	10.5 V or more
Time after engine start	5 seconds or more

TYPICAL MALFUNCTION THRESHOLDS

P0325 and P0330 (Knock sensor malfunction):

Knock sensor signal	Signal level is low

P0325 and P0330 (Knock sensor open/short (Fluttering)):

Knock sensor voltage	Less than 0.5 V or more than 4.5 V

P0327 and P0332 (Knock sensor open/short (Low voltage)):

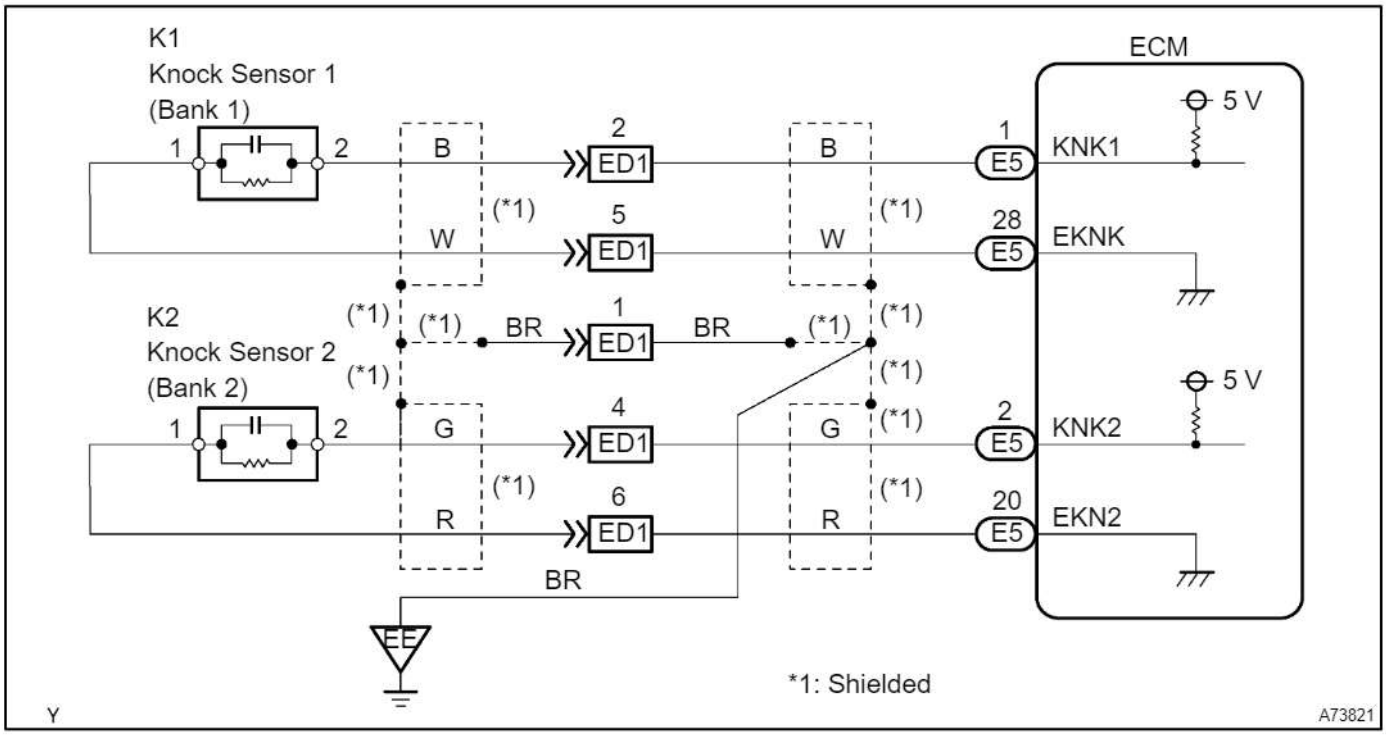
Knock sensor Voltage	Less than 0.5 V

P0328 and P0333 (Knock sensor open/short (High voltage)):

Knock sensor voltage	More than 4.5 V

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WIRING DIAGRAM



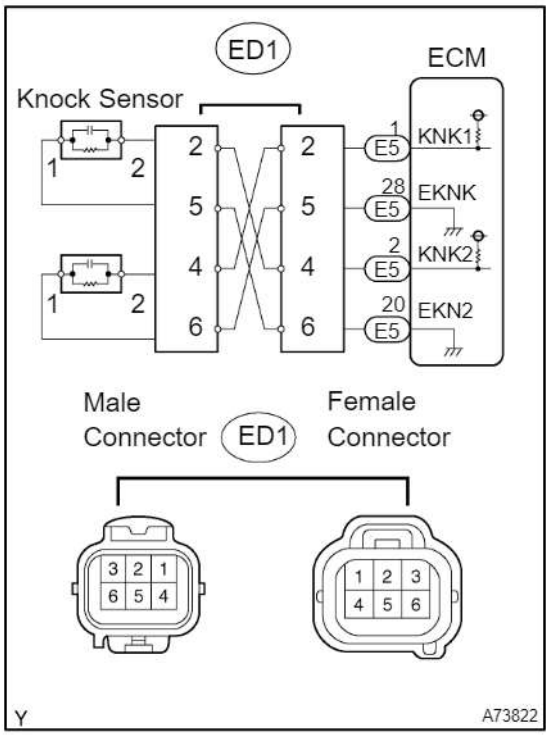
INSPECTION PROCEDURE

HINT:

- DTC P0325, P0327 and P0328 are for the bank 1 knock sensor circuit.
- DTC P0330, P0332 and P0333 are for the bank 2 knock sensor circuit.
- Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

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1 READ OUTPUT DTC(CHECK KNOCK SENSOR CIRCUIT)



(a) Disconnect the ED1 connector.
(b) Using lead wires, connect the ED1 connectors as follows.

Male Connector – Female Connector
Terminal 2 – Terminal 4
Terminal 5 – Terminal 6
Terminal 4 – Terminal 2
Terminal 6 – Terminal 5

(c) Warm up the engine.
(d) Run the engine at 3,000 rpm for 10 seconds or more.
(e) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(f) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(g) Select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(h) Read DTCs.

Result :

Display	Proceed to
DTCs same as when vehicle brought in P0325, P0327, P0328 → P0325, P0327, P0328 or P0330, P0332, P0333 → P0330, P0332, P0333	A
DTC different from when vehicle brought in P0325 → P0330 or P0330 → P0325	B
DTCs different from when vehicle brought in P0327, P0328 → P0332, P0333 or P0332, P0333 → P0327, P0328	C

(i) Reconnect the ED1 connector.

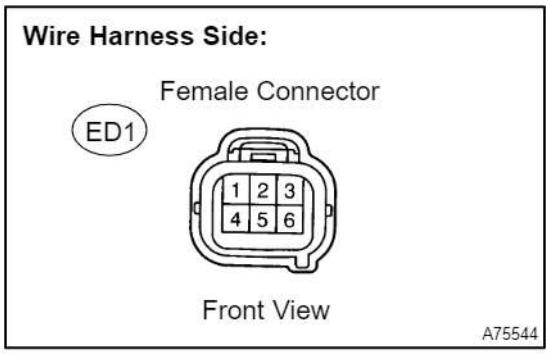
B → **Go to step 4**

C → **Go to step 5**

A

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2 CHECK HARNESS AND CONNECTOR(ED1 CONNECTOR – ECM)



(a) Disconnect the ED1 connector.
(b) Disconnect the E5 ECM connector.
(c) Check the resistance between the wire harness side connectors.

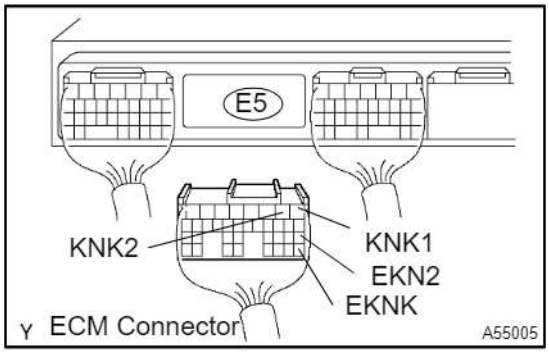
Standard (Check for open):

Tester Connection	Specified Condition
ED1 female connector 2 – KNK1 (E5–1)	Below 1 Ω
ED1 female connector 5 – EKNK (E5–28)	
ED1 female connector 4 – KNK2 (E5–2)	
ED1 female connector 6 – EKN2 (E5–20)	

Standard (Check for short):

Tester Connection	Specified Condition
ED1 female connector 2 or KNK1 (E5–1) – Body ground	10 kΩ or higher
ED1 female connector 5 or EKNK (E5–28) – Body ground	
ED1 female connector 4 or KNK2 (E5–2) – Body ground	
ED1 female connector 6 or EKN2 (E5–20) – Body ground	

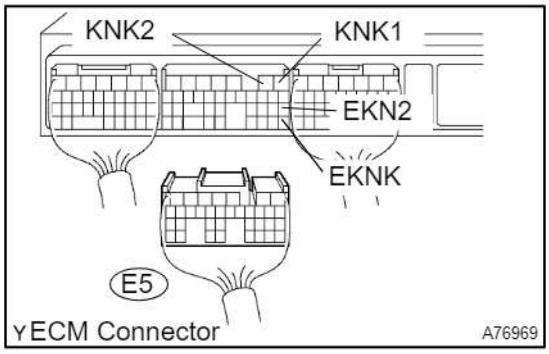
(d) Reconnect the ED1 connector.
(e) Reconnect the ECM connector.



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3 INSPECT ECM



(a) Disconnect the E5 ECM connector.
(b) Turn the ignition switch to ON.
(c) Measure the voltage between the specified ECM terminals.

Standard:

Tester Connection	Specified Condition
KNK1 (E5–1) – EKNK (E5–28)	4.5 to 5.5 V
KNK2 (E5–2) – EKN2 (E5–20)	

(d) Reconnect the ECM connector.

NG → **REPLACE ECM (See page 10–11)**

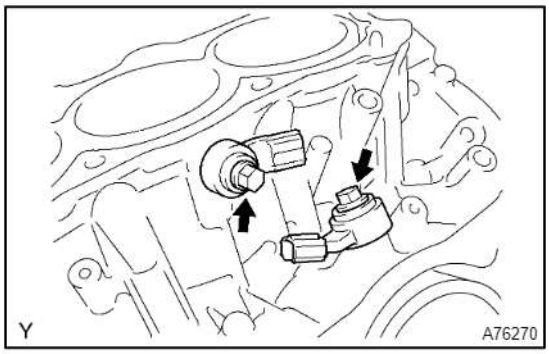
OK

CHECK FOR INTERMITTENT PROBLEMS (See page 05–331)

NOTICE:
Fault may be intermittent. Check the harness and connectors carefully and retest.

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4 CHECK KNOCK SENSOR



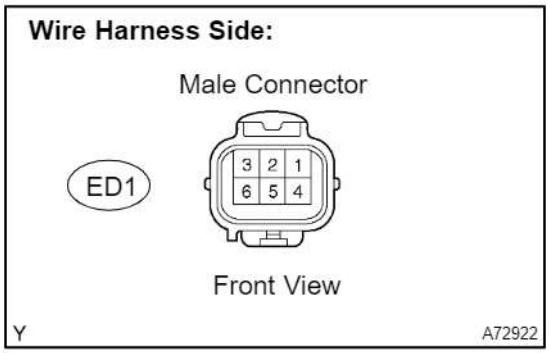
(a) Check the knock sensor installation.
Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)

NG → **TIGHTEN SENSOR**

OK

REPLACE KNOCK SENSOR (See page 10–9)

5 INSPECT KNOCK SENSOR



(a) Disconnect the ED1 connector.
(b) Check the resistance between the terminals of the ED1 male connector.
Standard:

Tester Connection	Specified Condition
ED1 male connector 2 – 5	120 to 280 kΩ
ED1 male connector 4 – 6	

(c) Reconnect the ED1 connector.

OK → **CHECK FOR INTERMITTENT PROBLEMS (See page 05–331)**

NG

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6	CHECK HARNESS AND CONNECTOR(ED1 CONNECTOR – KNOCK SENSOR)

HINT:

- □ If DTC P0327 or P0328 has changed to P0332 or P0333, check the knock sensor circuit on the right bank side.
- □ If DTC P0332 or P0333 has changed to P0327 or P0328, check the knock sensor circuit on the left bank side.

(a) Disconnect the ED1 connector.

(b) Disconnect the K1 and K2 knock sensor connectors.

(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
ED1 male connector 2 – K1–2	Below 1 Ω
ED1 male connector 5 – K1–1	
ED1 male connector 4 – K2–2	
ED1 male connector 6 – K2–1	

Standard (Check for short):

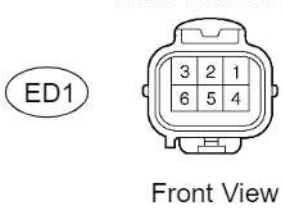
Tester Connection	Specified Condition
ED1 male connector 2 or K1–2 – Body ground	10 kΩ or higher
ED1 male connector 5 or K1–1 – Body ground	
ED1 male connector 4 or K2–2 – Body ground	
ED1 male connector 6 or K2–1 – Body ground	

(d) Reconnect the ED1 connector.

(e) Reconnect the knock sensor connector.

Wire Harness Side:

Male Connector

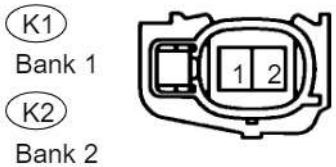


Front View

Y A72922

Wire Harness Side:

Knock Sensor Connector



Front View

A61031

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE KNOCK SENSOR (See page 10–9)

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DTC	P0335	CRANKSHAFT POSITION SENSOR "A" CIRCUIT

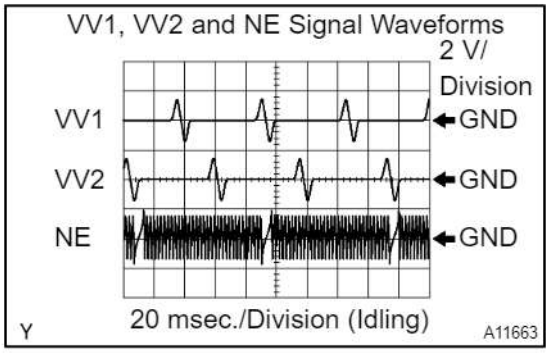
DTC	P0339	CRANKSHAFT POSITION SENSOR "A" CIRCUIT INTERMITTENT

CIRCUIT DESCRIPTION

The crankshaft position sensor (CKP) system consists of a crankshaft position sensor plate and a pick–up coil.

The sensor plate has 34 teeth and is installed on the crankshaft. The pick–up coil is made of an iron core and magnet. The sensor plate rotates and as each tooth passes through the pick–up coil, a pulse signal is created. The pick–up coil generates 34 signals for each engine revolution. Based on these signals, the ECM calculates the crankshaft position and engine RPM. Using these calculations, the fuel injection time and ignition timing are controlled.

DTC No.	DTC Detection Condition	Trouble Area
P0335	No crankshaft position sensor signal to ECM during cranking (2 trip detection logic)	□Open or short in crankshaft position sensor circuit □Crankshaft position sensor □Signal plate (crankshaft) □ECM
	No crankshaft position sensor signal to ECM at engine speed of 600 rpm or more (2 trip detection logic)	
P0339	No crankshaft position sensor signal to ECM is input for 0.05 second or more, and conditions (a), (b) and (c) are met: (a) Engine speed is 1,000 rpm or more (b) STA signal is OFF (c) 3 seconds or more lapsed after STA signal is switched from ON to OFF	



Reference: Inspection using the oscilloscope.
The correct waveform is as shown.

Tester Connection	Specified Condition
VV1+ (E6–27) – NE– (E6–24)	Correct waveform is as shown
VV2+ (E6–26) – NE– (E6–24)	
NE+ (E6–25) – NE– (E6–24)	

MONITOR DESCRIPTION

If there is no signal from the crankshaft sensor even though the engine is revolving, the ECM interprets this as a malfunction of the sensor.

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MONITOR STRATEGY

Related DTCs	P0335: Crankshaft position sensor open/short during cranking P0339: Crankshaft position sensor open/short during engine running
Required sensors/ components (Main)	Crankshaft position sensor
Required sensors / components (Related)	–
Frequency of operation	Continuous
Duration	4.7 seconds: Crankshaft position sensor open/short during cranking 0.5 second: Crankshaft position sensor open/short during engine running
MIL operation	2 driving cycles
Sequence operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	None

Knock sensor open/short during cranking:

Starter	ON
Minimal battery voltage while starter ON	11 V

Knock sensor open/short during engine running:

Engine RPM	600 rpm or more
Starter	OFF
Time after starter ON to OFF	3 seconds or more

TYPICAL MALFUNCTION THRESHOLDS

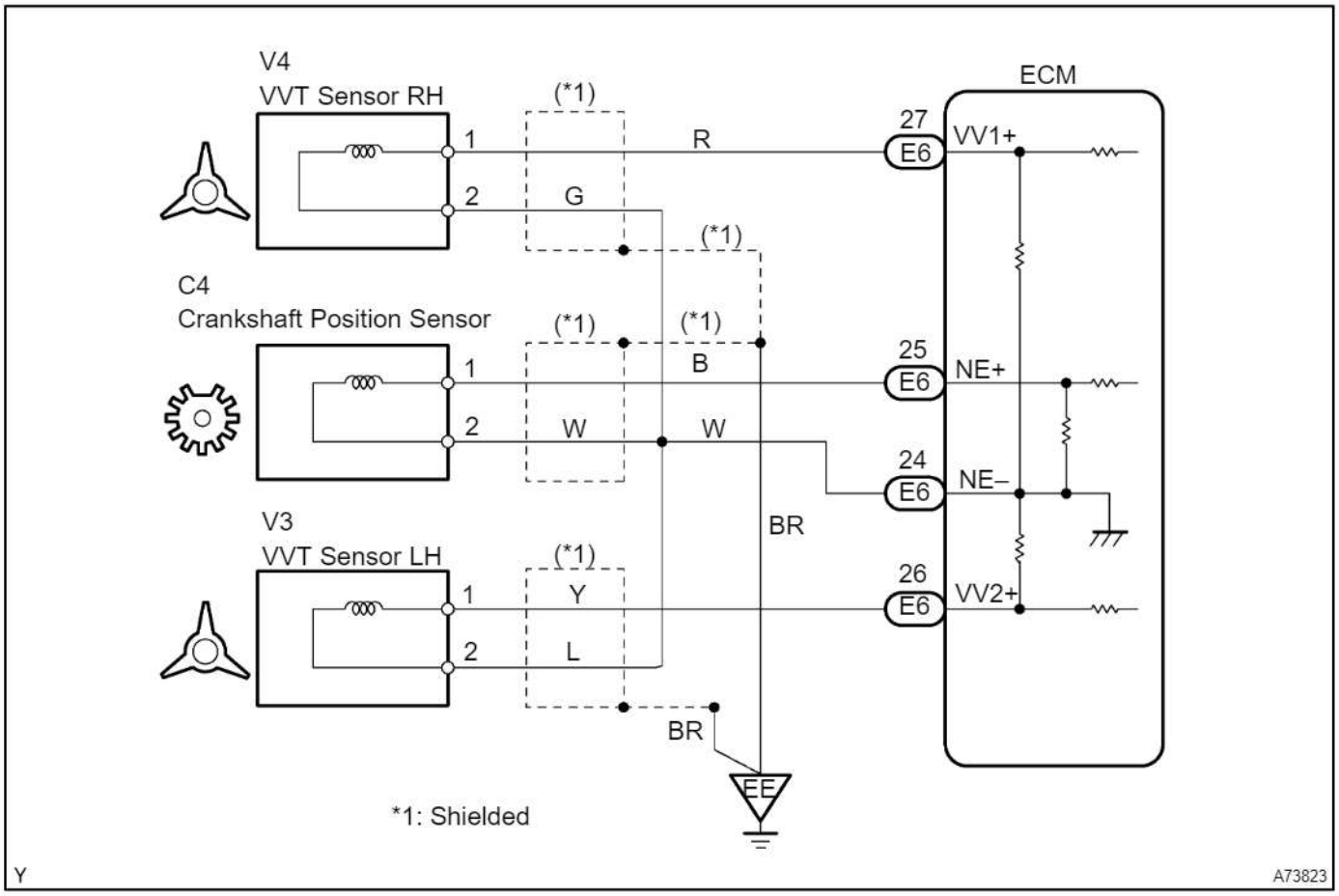
Crankshaft position signal	No signal

COMPONENT OPERATING RANGE

Crankshaft position signal	Crankshaft position sensor voltage fluctuates when the crankshaft rotates (34 crankshaft position signals per crankshaft revolution)

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WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.
- Read value of hand–held tester or OBD II scan tool
  (a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
  (b) Start the engine and turn the hand–held tester or the OBD II scan tool ON.
  (c) Select the item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / ENGINE SPD.
- The engine speed can be confirmed in DATA LIST using the hand–held tester or OBD II scan tool. If there is no NE signals from the crankshaft position sensor despite the engine revolving, the engine speed will be indicated as zero. If voltage output of the crankshaft position sensor is insufficient, the engine speed will be indicated as lower PRM (than the actual RPM).

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1 INSPECT CRANKSHAFT POSITION SENSOR(RESISTANCE)

Component Side:



Crankshaft Position Sensor

A78431

(a) Disconnect the C4 crankshaft position sensor connector.
(b) Measure the resistance between terminals 1and 2.

Standard:

Tester Connection	Specified Condition
1 – 2	1,630 to 2,740 Ω at cold
	2,065 to 3,225 Ω at hot

NOTICE:

"Cold" and "Hot" shown above mean the temperature of the coils themselves. "Cold" is from –10 C (14 F) to 50 C (122 F) and "Hot" is from 50 C (122 F) to 100 C (212 F).

(c) Reconnect the crankshaft position sensor connector.

NG → **REPLACE CRANKSHAFT POSITION SENSOR (See page 18–7)**

OK

2 CHECK HARNESS AND CONNECTOR(CRANKSHAFT POSITION SENSOR – ECM)

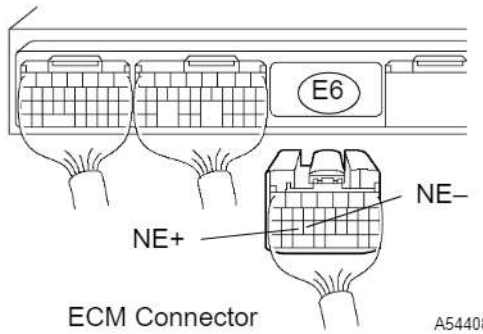
Wire Harness Side:

Crankshaft Position Sensor Connector



Front View

A76790



ECM Connector

A54408

(a) Disconnect the C4 crankshaft position sensor connector.
(b) Disconnect the E6 ECM connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Crankshaft position sensor (C4–1) – NE+ (E6–25)	Below 1 Ω
Crankshaft position sensor (C4–2) – NE– (E6–24)	

Standard (Check for short):

Tester Connection	Specified Condition
Crankshaft position sensor (C4–1) or NE+ (E6–25) – Body ground	10 kΩ or higher
Crankshaft position sensor (C4–2) or NE– (E6–24) – Body ground	

(d) Reconnect the crankshaft position sensor connector.
(e) Reconnect the ECM connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3 CHECK SENSOR INSTALLATION(CRANKSHAFT POSITION SENSOR)

NG → **TIGHTEN SENSOR**

OK

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4	CHECK CRANKSHAFT POSITION SENSOR PLATE(TEETH OF SENSOR PLATE(CRANKSHAFT))

(a) Check the teeth of the sensor plate.

NG → REPLACE CRANKSHAFT POSITION SENSOR PLATE (CRANKSHAFT)

OK

REPLACE ECM (See page 10–11)

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DTC	P0340	CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 1 OR SINGLE SENSOR)

DTC	P0341	CAMSHAFT POSITION SENSOR "A" CIRCUIT RANGE/PERFORMANCE (BANK 1 OR SINGLE SENSOR)

DTC	P0345	CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 2)

DTC	P0346	CAMSHAFT POSITION SENSOR "A" CIRCUIT RANGE/PERFORMANCE (BANK 2)

CIRCUIT DESCRIPTION

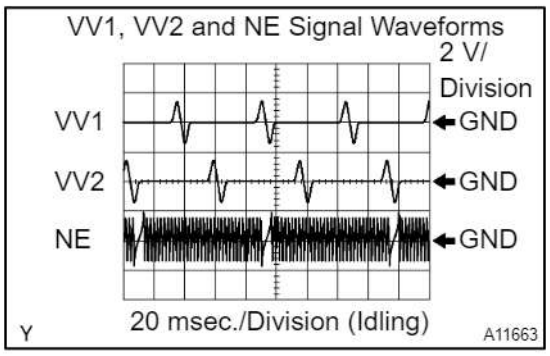
The variable valve timing (VVT) sensor (VV signal) consists of a magnet, iron core and pickup coil.
The VV signal plate has 3 teeth on its outer circumference and is installed on the camshaft timing pulley.
When the camshafts rotate, the protrusion on the signal plate and the air gap on the pickup coil change, causing fluctuations in the magnetic field and generating a voltage in the pickup coil.
This sensor monitors a timing rotor located on the camshaft and is used to detect a camshaft angle by the ECM. The camshaft rotation synchronizes with the crankshaft rotation, and this sensor communicates the rotation of the camshaft timing rotor as a pulse signal to the ECM. Based on the signal, the ECM controls fuel injection time and ignition timing.

DTC No.	DTC Detection Condition	Trouble Area
P0340 P0345	□No VVT sensor signal to ECM during cranking (2 trip detection logic) □No VVT sensor signal to ECM at engine speed of 600 rpm or more (1 trip detection logic)	□Open or short in VVT sensor circuit □VVT sensor □Camshaft timing pulley □Jumped tooth of timing chain □ECM
P0341	While crankshaft rotates twice, VVT sensor signal is input to ECM 12 times or more (1 trip detection logic) HINT: Under normal condition, VVT sensor output is input to ECM 3 times per 2 engine revolutions	
P0346	While crankshaft rotates twice, VVT sensor signal is input to ECM 5 times or more (1 trip detection logic) HINT: Under normal condition, VVT sensor output is input to ECM 3 times per 2 engine revolutions	

HINT:

- □ DTC P0340 and P0345 indicate a malfunction related to the VVT sensor (+) circuit. (Wire harness (ECM – VVT sensor) and VVT sensor.)
- □ DTC P0341 and P0346 indicate a malfunction related to the VVT sensor (–) circuit. (Wire harness (ECM – VVT sensor) and VVT sensor.)

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Reference: Inspection using the oscilloscope.
During cranking or idling, check the waveform between the terminals of the ECM connector.

Tester Connection	Specified Condition
VV1+ (E6–27) – NE– (E6–24)	Correct waveform is as shown
VV2+ (E6–26) – NE– (E6–24)	
NE+ (E6–25) – NE– (E6–24)	

MONITOR DESCRIPTION

If there is no signal from the VVT sensor even though the engine is turning, or if the rotation of the camshaft and crankshaft is not synchronized, the ECM interprets this as a malfunction of the sensor.

MONITOR STRATEGY

Related DTCs	P0340: Camshaft position sensor (Bank 1) open/short P0340: Camshaft position/Crankshaft position misalignment (Bank 1) P0341: Camshaft position sensor (Bank 1) malfunction P0345: Camshaft position sensor (Bank 2) open/short P0346: Camshaft position sensor (Bank 2) malfunction
Required sensors/ components (Main)	Camshaft position sensor (Bank 1 and 2)
Required sensors / components (Related)	Crankshaft position sensor
Frequency of operation	Continuous
Duration	5 seconds
MIL operation	2 driving cycles: Camshaft position sensor open/short Immediate: Camshaft position/crankshaft position misalignment and camshaft position malfunction
Sequence operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	None

Camshaft position sensor open/short:

Starter	ON
Minimal battery voltage while starter ON	Less than 11 V

Camshaft position/crankshaft position misalignment and camshaft position sensor malfunction:

Engine RPM	600 rpm or more
Starter	OFF

TYPICAL MALFUNCTION THRESHOLDS

P0340 and P0341 (Camshaft position sensor open/short):

Crankshaft position signal	No signal

P0340 and P0341 (Camshaft position/crankshaft position misalignment):

Camshaft position and crankshaft position signal	Misaligned

P0341 (Camshaft position sensor (Bank 1) malfunction):

Camshaft position and crankshaft position phase	Misaligned
Camshaft position signal per 2 crankshaft revolutions	12 camshaft position signals or more

P0346 (Camshaft position sensor (Bank 2) malfunction):

Camshaft position signal per 2 crankshaft revolutions	5 camshaft position signals or more

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COMPONENT OPERATING RANGE

Camshaft position sensor signal	Camshaft position sensor voltage fluctuates when the camshaft rotates 3 camshaft position signals per camshaft revolution 3 camshaft position signals per 2 crankshaft revolutions

WIRING DIAGRAM

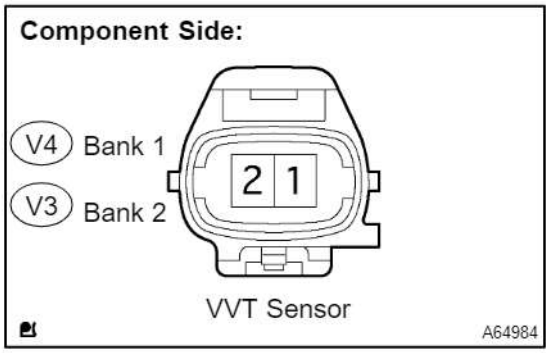
Refer to DTC P0335 on page 05–489.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1 INSPECT VVT SENSOR(RESISTANCE)



(a) Disconnect the V3 or V4 VVT sensor connector.

(b) Measure the resistance between the terminals of the VVT sensor.

Standard:

Tester Connection	Specified Condition
1 – 2	835 to 1,400 Ω at cold
	1,060 to 1,645 Ω at hot

NOTICE:

The terms "cold" and "hot" refer to the temperature of the coils. "Cold" means approximately –10 C to 50 C (14 F to 122 F). "Hot" means approximately 50 C to 100 C (122 F to 212 F).

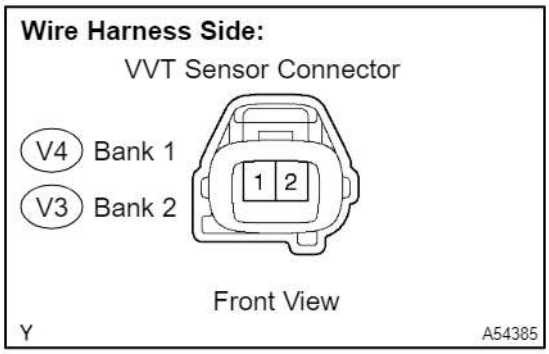
(c) Reconnect the VVT sensor connector.

NG → **REPLACE VVT SENSOR (See page 18–5)**

OK

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2 CHECK HARNESS AND CONNECTOR(VVT SENSOR – ECM)



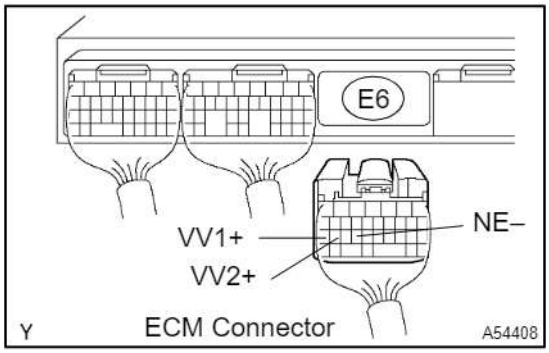
(a) Disconnect the V3 or V4 VVT sensor connector.
(b) Disconnect the E6 ECM connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
VVT sensor (V4–1) – VV1+ (E6–27)	Below 1 Ω
VVT sensor (V3–1) – VV2+ (E6–26)	
VVT sensor (V3 or V4–2) – NE– (E6–24)	

Standard (Check for short):

Tester Connection	Specified Condition
VVT sensor (V4–1) or VV1+ (E6–27) – Body ground	10 kΩ or higher
VVT sensor (V3 –1) or VV2+ (E6–26) – Body ground	
VVT sensor (V3 or V4–2) or NE– (E6–24) – Body ground	



(d) Reconnect the VVT sensor connector.
(e) Reconnect the ECM connector.

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

3 CHECK SENSOR INSTALLATION(VVT SENSOR)

NG → TIGHTEN SENSOR

OK

4 CHECK CAMSHAFT TIMING GEAR ASSY(TEETH OF PLATE)

(a) Check the teeth of the signal plate.

NG → REPLACE CAMSHAFT TIMING GEAR ASSY

OK

REPLACE ECM (See page 10–11)

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DTC	P0351	IGNITION COIL "A" PRIMARY/SECONDARY CIRCUIT

DTC	P0352	IGNITION COIL "B" PRIMARY/SECONDARY CIRCUIT

DTC	P0353	IGNITION COIL "C" PRIMARY/SECONDARY CIRCUIT

DTC	P0354	IGNITION COIL "D" PRIMARY/SECONDARY CIRCUIT

DTC	P0355	IGNITION COIL "E" PRIMARY/SECONDARY CIRCUIT

DTC	P0356	IGNITION COIL "F" PRIMARY/SECONDARY CIRCUIT

CIRCUIT DESCRIPTION

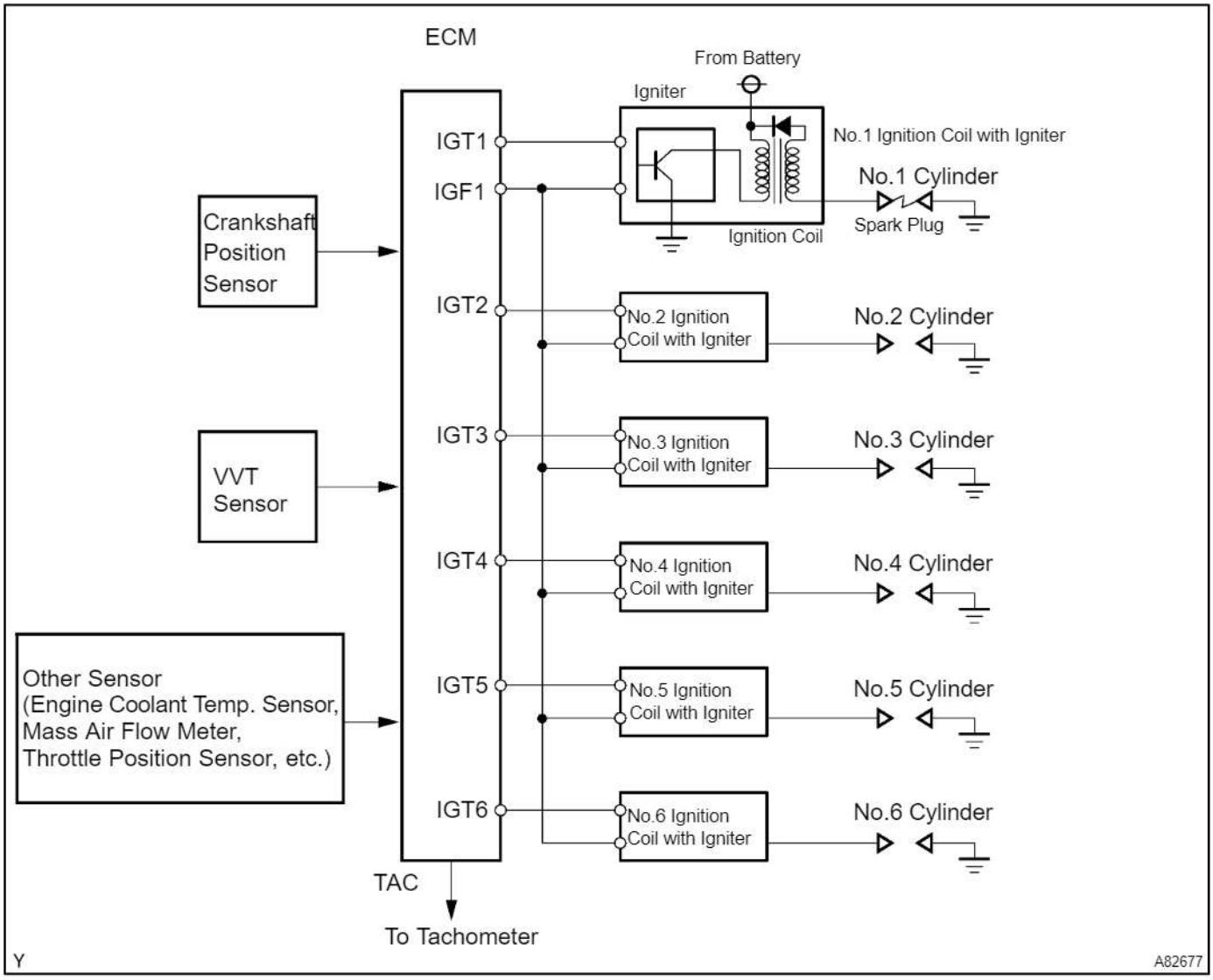
HINT:

- □ These DTCs indicate a malfunction related to the primary circuit.
- □ If DTC P0351 is displayed, check No.1 ignition coil with igniter circuit.
- □ If DTC P0352 is displayed, check No.2 ignition coil with igniter circuit.
- □ If DTC P0353 is displayed, check No.3 ignition coil with igniter circuit.
- □ If DTC P0354 is displayed, check No.4 ignition coil with igniter circuit.
- □ If DTC P0355 is displayed, check No.5 ignition coil with igniter circuit.
- □ If DTC P0356 is displayed, check No.6 ignition coil with igniter circuit.

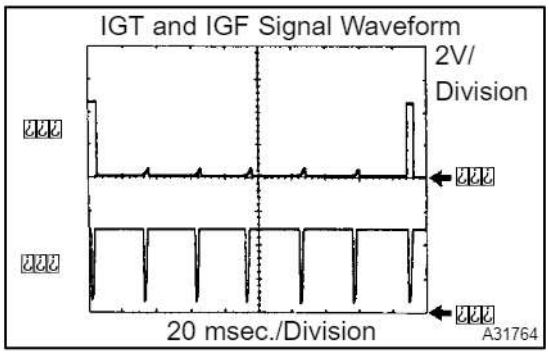
A Direct Ignition System (DIS) has been adopted. The DIS improves the ignition timing accuracy, reduces high–voltage loss, and enhances the overall reliability of the ignition system by eliminating the distributor. The DIS is a 1–cylinder ignition system which ignites one cylinder with one ignition coil. In the 1–cylinder ignition system, the one spark plug is connected to the end of the secondary winding. High voltage generated in the secondary winding is applied directly to the spark plug. The spark of the spark plug passes from the center electrode to the ground electrode.

The ECM determines the ignition timing and outputs the ignition (IGT) signals for each cylinder. Based on the IGT signals, the power transistors in the igniter cut off the current to the primary coil in the ignition coil is supplied to the spark plug that is connected to the end of the secondary coil. At the same time, the igniter also sends an ignition confirmation (IGF1) signal as a fail–safe measure to the ECM.

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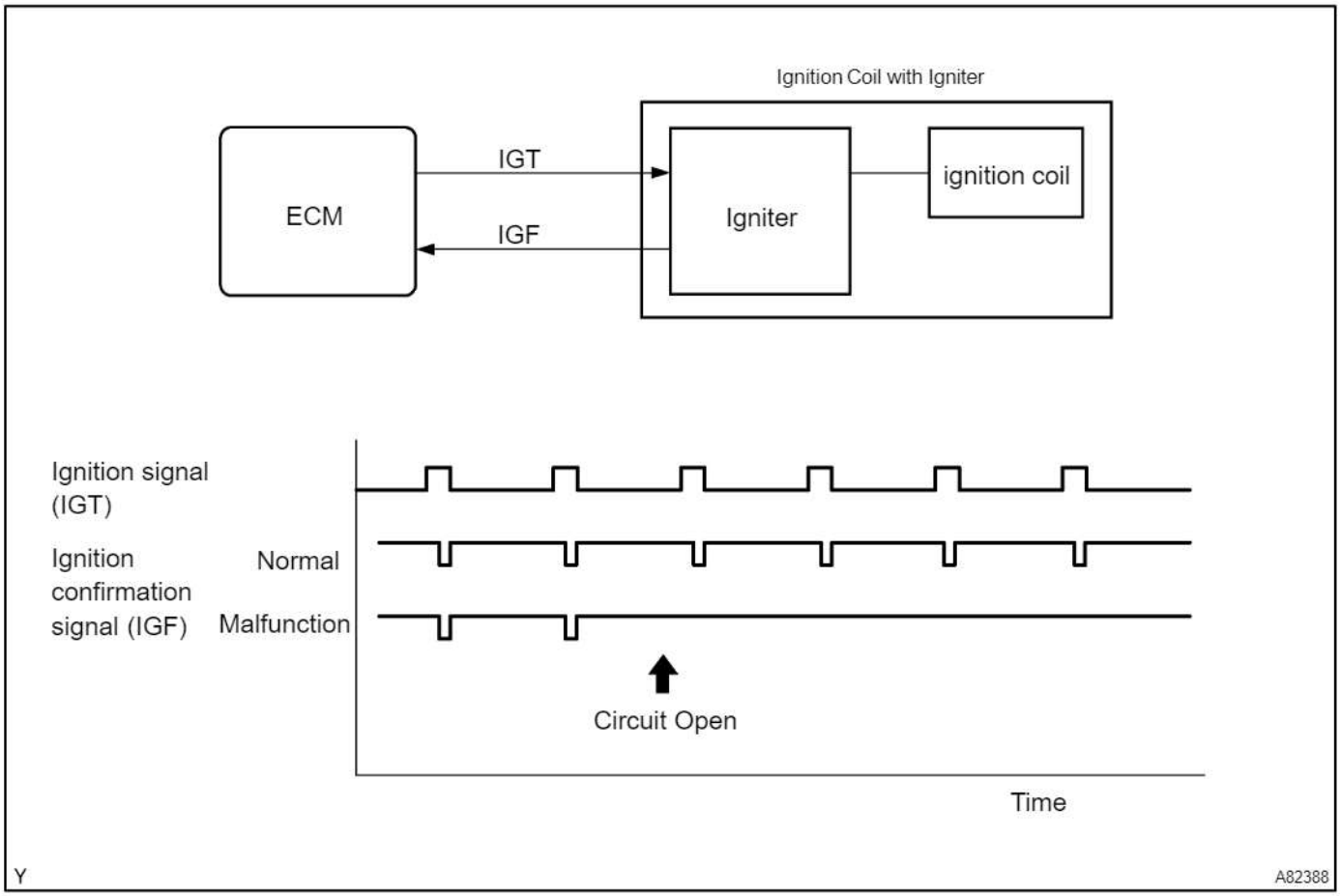
DTC No.	DTC Detection Condition	Trouble Area
P0351 P0352 P0353 P0354 P0355 P0356	No IGF1 signal to ECM while engine is running	□Ignition system □Open or short in IGF or IGT circuit between ignition coil with igniter and ECM (ignition coil circuit 1 through 6) □Ignition coil with igniter (ignition coil 1 through 6) □ECM



Reference: Inspection using the oscilloscope.
During cranking or idling, check the waveform between terminals IGT1 to IGT6 and E1, and IGF1 and E1 of the E4 and ECM connectors.

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MONITOR DESCRIPTION



If the ECM does not receive the ignition confirmation (IGF) signal after sending the ignition (IGT) signal, it interprets this as a fault in the igniter and sets a DTC.

MONITOR STRATEGY

Related DTCs	P0351: Igniter (Cylinder 1) malfunction P0352: Igniter (Cylinder 2) malfunction P0353: Igniter (Cylinder 3) malfunction P0354: Igniter (Cylinder 4) malfunction P0355: Igniter (Cylinder 5) malfunction P0356: Igniter (Cylinder 6) malfunction
Required sensors/ components (Main)	Igniter (Cylinder 1 to 6)
Required sensors / components (Related)	Crankshaft position sensor
Frequency of operation	Continuous
Duration	0.256 second
MIL operation	Immediate
Sequence operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	None

TYPICAL MALFUNCTION THRESHOLDS

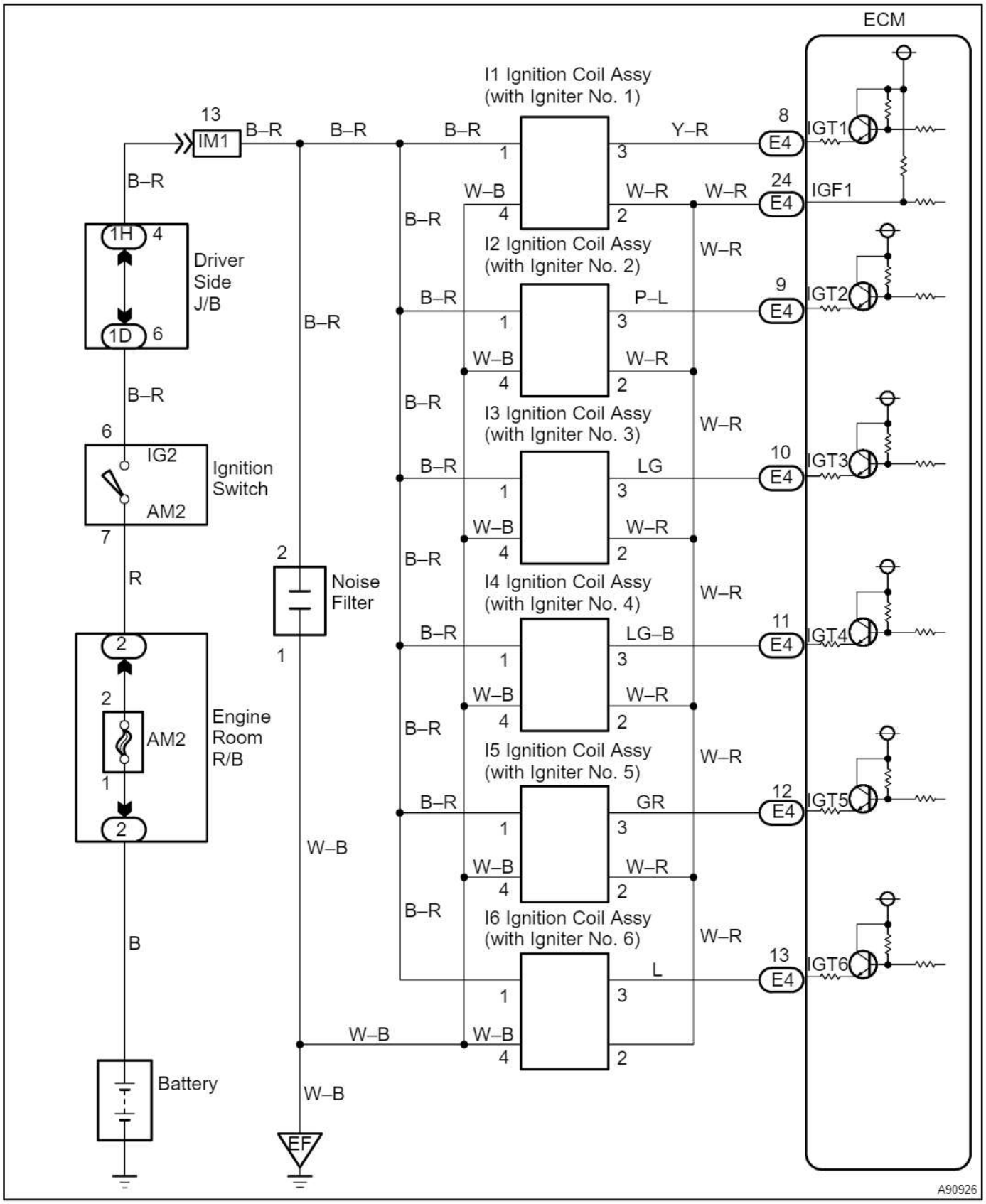
IGF signal	No signal

COMPONENT OPERATING RANGE

IGF signal	Igniter outputs IGF signal when it receives IGT signal from ECM

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WIRING DIAGRAM



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INSPECTION PROCEDURE

HINT:

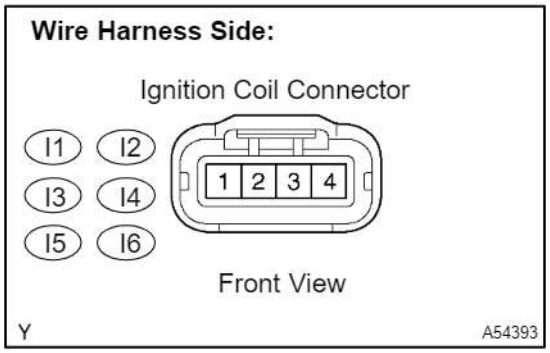
Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

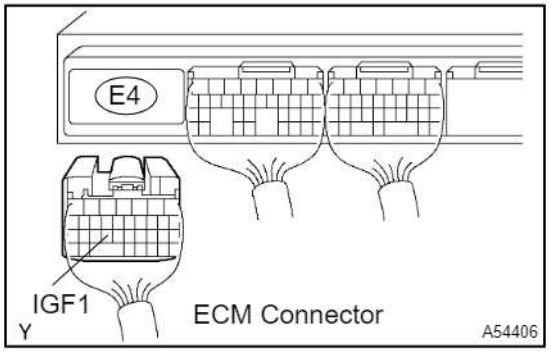
1	CHECK SPARK PLUG AND SPARK OF MISFIRING CYLINDER (See page 18–1)

NG → Go to step 4

OK

2	CHECK HARNESS AND CONNECTOR(IGNITION COIL ASSY – ECM (IGF SIGNAL TERMINAL))





(a) Disconnect the I1, I2, I3, I4, I5 or I6 ignition coil connector.
(b) Disconnect the E4 ECM connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Ignition coil (I1–2) – IGF1 (E4–24)	Below 1 Ω
Ignition coil (I2–2) – IGF1 (E4–24)	
Ignition coil (I3–2) – IGF1 (E4–24)	
Ignition coil (I4–2) – IGF1 (E4–24)	
Ignition coil (I5–2) – IGF1 (E4–24)	
Ignition coil (I6–2) – IGF1 (E4–24)	

Standard (Check for short):

Tester Connection	Specified Condition
Ignition coil (I1–2) or IGF1 (E4–24) – Body ground	10 kΩ or higher
Ignition coil (I2–2) or IGF1 (E4–24) – Body ground	
Ignition coil (I3–2) or IGF1 (E4–24) – Body ground	
Ignition coil (I4–2) or IGF1 (E4–24) – Body ground	
Ignition coil (I5–2) or IGF1 (E4–24) – Body ground	
Ignition coil (I6–2) or IGF1 (E4–24) – Body ground	

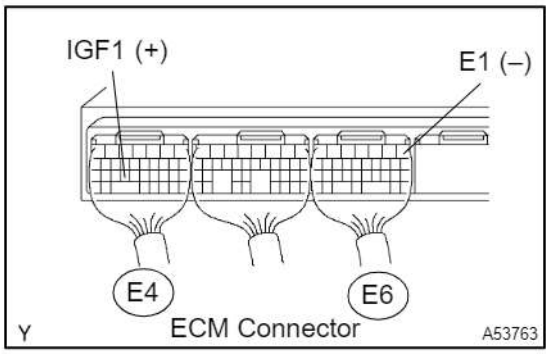
(d) Reconnect the ignition coil connector.
(e) Reconnect the ECM connector.

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

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3 INSPECT ECM(IGF1 VOLTAGE)



(a) Disconnect the ignition coil connector.
(b) Turn the ignition switch to ON.
(c) Measure the voltage between the terminals of the E4 and E6 ECM connector.

Standard:

Tester Connection	Specified Condition
IGF1 (E4–24) – E1 (E6–1)	4.5 to 5.5 V

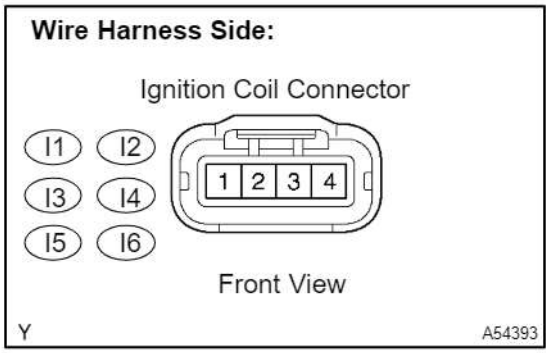
(d) Reconnect the ignition coil connector.

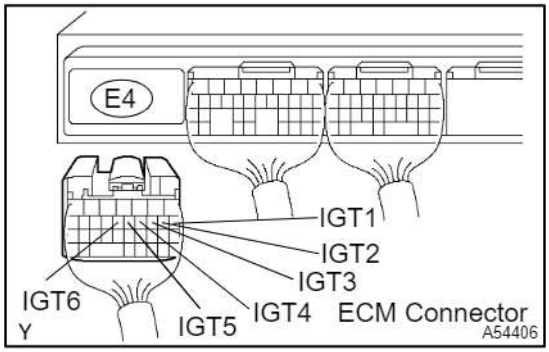
NG → **REPLACE ECM (See page 10–11)**

OK

REPLACE IGNITION COIL ASSY

4 CHECK HARNESS AND CONNECTOR(IGNITION COIL ASSY – ECM (IGT SIGNAL TERMINAL))





(a) Disconnect the I1, I2, I3, I4, I5 or I6 ignition coil connector.
(b) Disconnect the E4 ECM connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Ignition coil (I1–3) – IGT1 (E4–8)	Below 1 Ω
Ignition coil (I2–3) – IGT2 (E4–9)	
Ignition coil (I3–3) – IGT3 (E4–10)	
Ignition coil (I4–3) – IGT4 (E4–11)	
Ignition coil (I5–3) – IGT5 (E4–12)	
Ignition coil (I6–3) – IGT6 (E4–13)	

Standard (Check for short):

Tester Connection	Specified Condition
Ignition coil (I1–3) or IGT1 (E4–8) – Body ground	10 kΩ or higher
Ignition coil (I2–3) or IGT2 (E4–9) – Body ground	
Ignition coil (I3–3) or IGT3 (E4–10) – Body ground	
Ignition coil (I4–3) or IGT4 (E4–11) – Body ground	
Ignition coil (I5–3) or IGT5 (E4–12) – Body ground	
Ignition coil (I6–3) or IGT6 (E4–13) – Body ground	

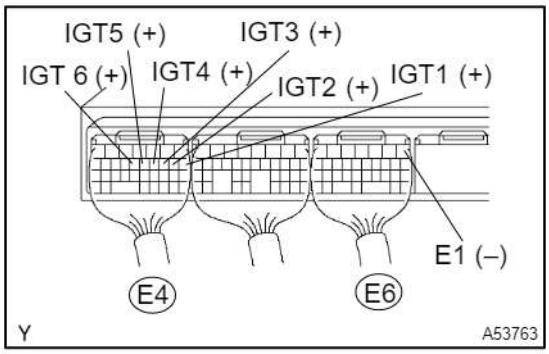
(d) Reconnect the ignition coil connector.
(e) Reconnect the ECM connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

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5 INSPECT ECM(IGT1, IGT2, IGT3, IGT4, IGT5 OR IGT6 VOLTAGE)



(a) Measure the voltage between the applicable terminals of the E4 and E6 ECM connectors when the engine is cranked.

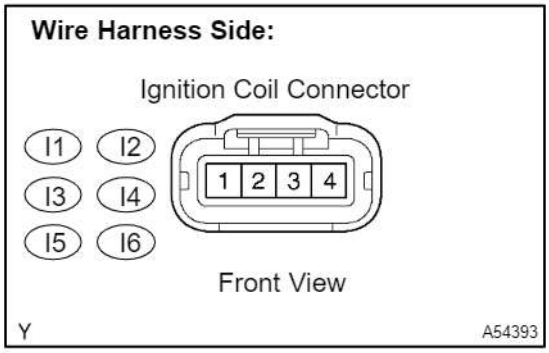
Standard:

Tester Connection	Specified Condition
IGT1 (E4–8) – E1 (E6–1)	Between 0.1 V and 4.5 V
IGT2 (E4–9) – E1 (E6–1)	
IGT3 (E4–10) – E1 (E6–1)	
IGT4 (E4–11) – E1 (E6–1)	
IGT5 (E4–12) – E1 (E6–1)	
IGT6 (E4–13) – E1 (E6–1)	

NG → **REPLACE ECM (See page 10–11)**

OK

6 INSPECT ECM(IGT1, IGT2, IGT3, IGT4, IGT5 OR IGT6 VOLTAGE)



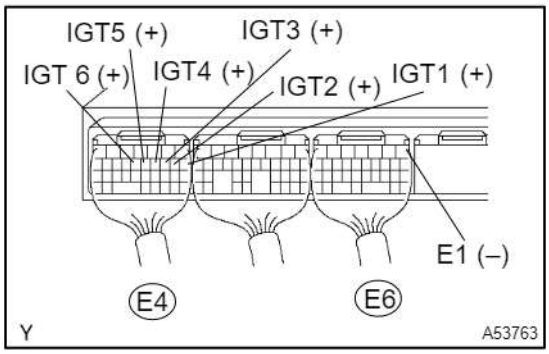
(a) Disconnect the I1, I2, I3, I4, I5 or I6 ignition coil connector.

(b) Measure the voltage between the applicable terminals of the E4 and E6 ECM connectors when the engine is cranked.

Standard:

Tester Connection	Specified Condition
IGT1 (E4–8) – E1 (E6–1)	4.5 V or more
IGT2 (E4–9) – E1 (E6–1)	
IGT3 (E4–10) – E1 (E6–1)	
IGT4 (E4–11) – E1 (E6–1)	
IGT5 (E4–12) – E1 (E6–1)	
IGT6 (E4–13) – E1 (E6–1)	

(c) Reconnect the ignition coil connector.

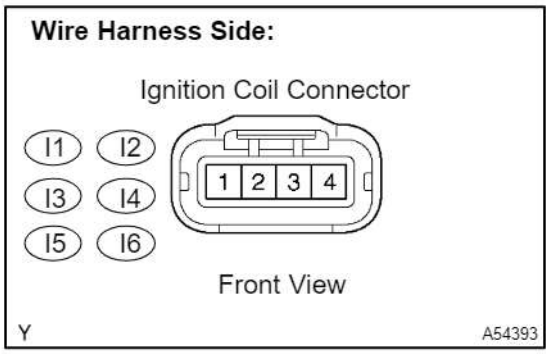


NG → **REPLACE ECM (See page 10–11)**

OK

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7 INSPECT IGNITION COIL ASSY(POWER SOURCE)



(a) Disconnect the I1, I2, I3, I4, I5 or I6 ignition coil connector.
(b) Turn the ignition switch to ON position.
(c) Measure the voltage between the terminal of the wire harness side connector and body ground.

Standard:

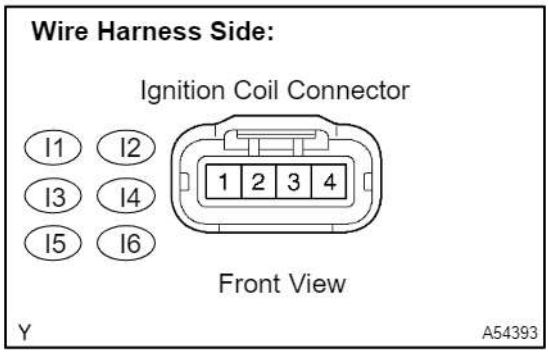
Tester Connection	Specified Condition
I1–1 – Body ground	9 to 14 V
I2–1 – Body ground	
I3–1 – Body ground	
I4–1 – Body ground	
I5–1 – Body ground	
I6–1 – Body ground	

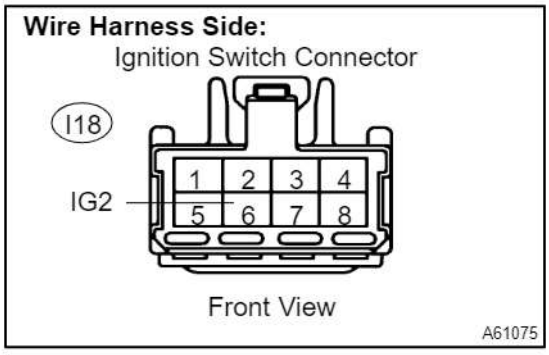
(d) Reconnect the ignition coil connector.

OK → REPLACE IGNITION COIL ASSY

NG

8 CHECK HARNESS AND CONNECTOR(IGNITION COIL ASSY – IGNITION SWITCH)





(a) Disconnect the I1, I2, I3, I4, I5 or I6 ignition coil connector.
(b) Disconnect the I18 ignition switch connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Ignition coil (I1–1) – IG2 (6)	Below 1 Ω
Ignition coil (I2–1) – IG2 (6)	
Ignition coil (I3–1) – IG2 (6)	
Ignition coil (I4–1) – IG2 (6)	
Ignition coil (I5–1) – IG2 (6)	
Ignition coil (I6–1) – IG2 (6)	

Standard (Check for short):

Tester Connection	Specified Condition
Ignition coil (I1–1) or IG2 (6) – Body ground	10 kΩ or higher
Ignition coil (I2–1) or IG2 (6) – Body ground	
Ignition coil (I3–1) or IG2 (6) – Body ground	
Ignition coil (I4–1) or IG2 (6) – Body ground	
Ignition coil (I5–1) or IG2 (6) – Body ground	
Ignition coil (I6–1) or IG2 (6) – Body ground	

(d) Reconnect the ignition coil connector.
(e) Reconnect the ignition switch connector.

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE IGNITION COIL ASSY

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DTC	P0420	CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1)

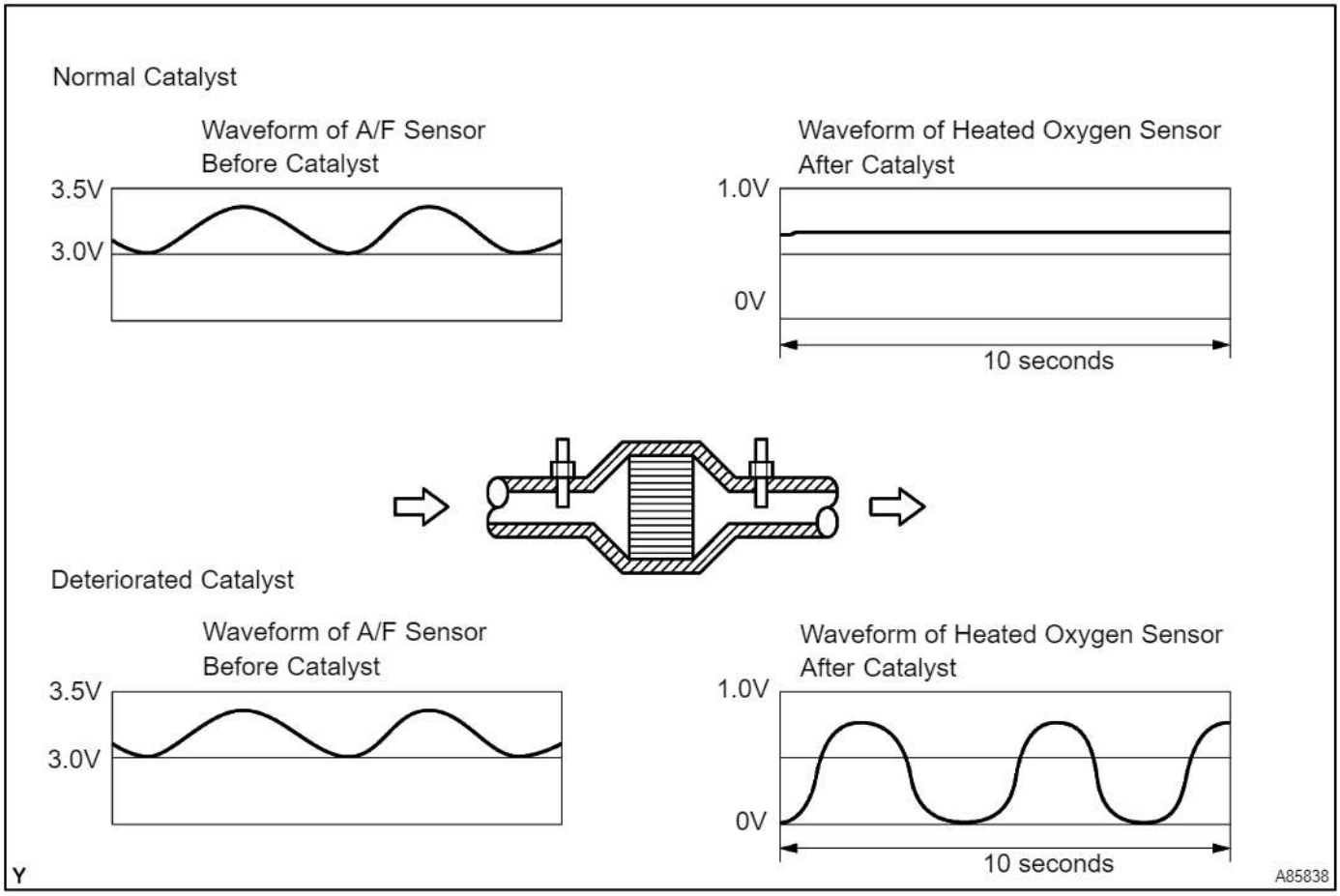
DTC	P0430	CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 2)

CIRCUIT DESCRIPTION

The ECM uses sensors mounted before and after the three–way catalytic converter (TWC) to monitor its efficiency. The first sensor, an Air Fuel ratio (A/F) sensor, sends pre–catalyst A/F ratio information to the ECM. The second sensor, a heated oxygen sensor sends post–catalyst information to the ECM. The ECM compares these two signals to judge the efficiency of the catalyst and the catalyst's ability to store oxygen. During normal operation, the TWC stores and releases oxygen as needed. The capacity to store oxygen results in a low variation in the post–TWC exhaust stream as shown below.

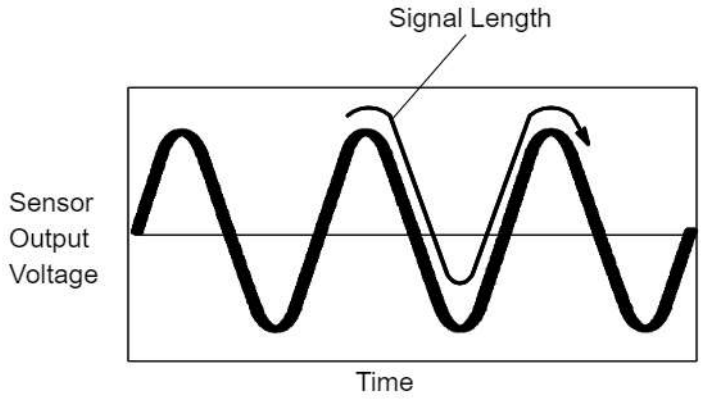
If the catalyst is functioning normally, the waveform of the heated oxygen sensor slowly switches between RICH and LEAN. If the catalyst is deteriorated, the waveform will alternate frequently between RICH and LEAN. As the catalyst efficiency degrades, its ability to store oxygen is reduced and the catalyst output becomes more variable.

When running the monitor, the ECM compares sensor signals before and after the catalyst over a specific amount of time to determine catalyst efficiency. The ECM begins the comparison by calculating the signal length for both sensors (using each output voltage from the sensors). If the oxygen sensor signal length is greater than the threshold (threshold is calculated based on the A/F sensor signal length), the ECM concludes that the catalyst is malfunctioning. The ECM will turn on the MIL and a DTC will be set.



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Heated Oxygen Sensor Signal Length



DTC No.	DTC Detection Condition	Trouble Area
P0420	After engine and catalyst are warmed up, and while vehicle is driven within set vehicle speed and engine speed ranges: Waveform of heated oxygen sensor (bank 1 sensor 2) alternates frequently between RICH and LEAN (2 trip detection logic)	□Gas leakage in exhaust system □A/F sensor (bank 1 sensor 1) □Heated oxygen sensor (bank 1 sensor 2) □Three–way catalytic converter (Exhaust manifold)
P0430	After engine and catalyst are warmed up, and while vehicle is driven within set vehicle and engine speed ranges: Waveform of heated oxygen sensor (bank 2 sensor 2) alternates frequently between RICH and LEAN (2 trip detection logic)	□Gas leakage in exhaust system □A/F sensor (bank 2 sensor 1) □Heated oxygen sensor (bank 2 sensor 2) □Three–way catalytic converter (Exhaust manifold)

HINT:

- □ Bank 1 refers to the bank that includes cylinder No.1.
- □ Bank 2 refers to the bank that does not include cylinder No.1.
- □ Sensor 1 refers to the sensor closest to the engine assembly.
- □ Sensor 2 refers to the sensor farthest away from the engine assembly.

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MONITOR STRATEGY

Related DTCs	P0420: Catalyst (Bank 1) efficiency P0430: Catalyst (Bank 2) efficiency
Required sensors/ components (Main)	Catalyst (Bank 1 and 2)
Required sensors / components (Related)	A/F sensor, Heated oxygen sensor, Mass air flow meter, Crankshaft position sensor, Engine coolant temperature sensor, Intake air temperature sensor
Frequency of operation	Once per driving cycle
Duration	90 seconds (30 seconds x 3)
MIL operation	2 driving cycles
Sequence operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05–334
Accumulated time that the following conditions are met	30 seconds
Battery voltage	11 V or more
Intake air temperature	–10 C (14 F) or more
Idle	OFF
Mass air flow	5 to 45 gram per second
Engine RPM	Less than 4,500 rpm
Engine coolant temperature	75 C (167 F) or more
Estimated catalyst temperature	Up stream catalyst: 500 to 800 C (932 to 1,472 F) Down stream catalyst: 500 to 800 C (932 to 1,472 F)
Fuel system status	Closed Loop
A/F sensor voltage	3 to 3.5 V

TYPICAL MALFUNCTION THRESHOLDS

Number that the following conditions is set:	3 of 5 times
Catalyst deterioration level (Heated oxygen sensor locus length)	4 V or more (Varies with A/F sensor locus length)

MONITOR RESULT (MODE 06 DATA)

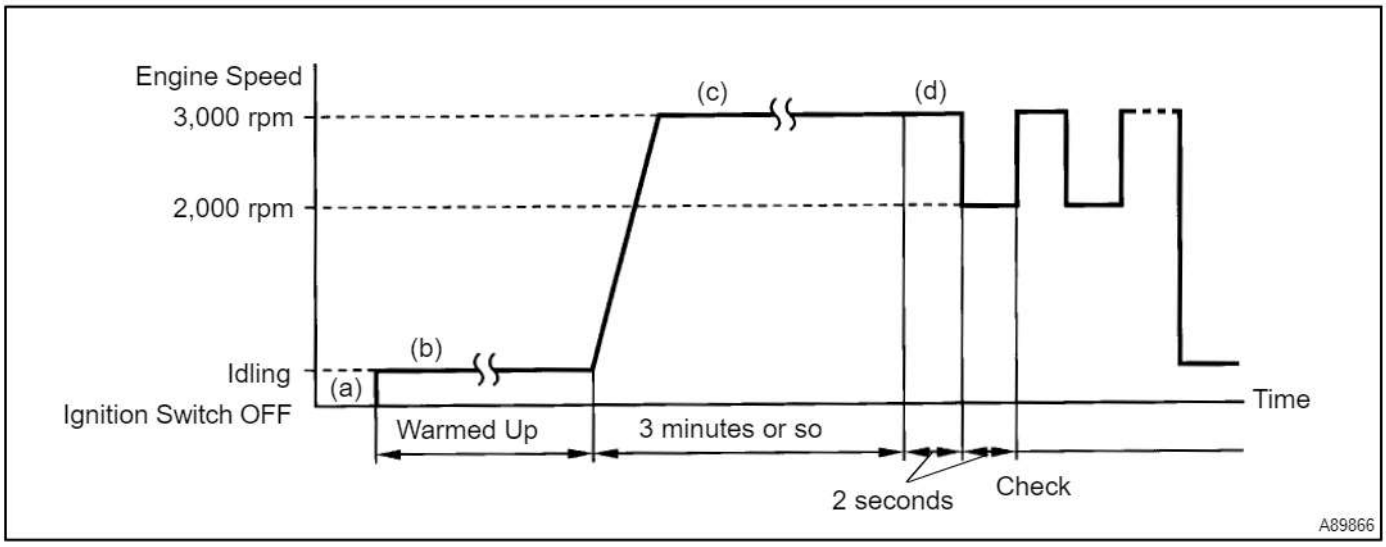
Catalyst:

Test ID/Comp ID	Description of Test Data	Description of Test Limit	Conversion Factor (Unit)
$01/$01	Catalyst deterioration level is determined by waveforms of A/F sensor and heated oxygen sensor	Malfunction criteria for catalyst deterioration	Multiply by 0.07812 (No dimension)

Refer to page 05–340 for detailed information on CHECKING MONITOR STATUS (MODE 06 DATA).

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CONDITIONING THE A/F SENSOR AND HEATED OXYGEN SENSOR FOR TESTING



(a) Connect the OBD II scan tool or the hand–held tester to the DLC3.
(b) Start the engine and warm it up with all the accessories switched OFF until the engine coolant temperature is stable.
(c) Run the engine at 2,500 to 3,000 rpm for approximately 3 minutes.
(d) When alternating the engine between 3,000 rpm for 2 seconds and 2,000 rpm for 2 seconds, check the waveform of the oxygen sensor (bank 1 sensor 2).

INSPECTION PROCEDURE

HINT:
Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1	CHECK OTHER DTC OUTPUT(BESIDES DTC P0420 AND/OR P0430)

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch to ON and the hand–held tester or the OBD II scan tool ON.
(c) Select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(d) Read DTCs.

Result:

Display (DTC output)	Proceed to
P0420 and/or P0430	A
P0420 or P0430 and other DTCs	B

HINT:
If any other codes besides "P0420 and/or P0430" are output, perform troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05–366)**

A

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2	CHECK FOR EXHAUST GAS LEAKAGE

NG → REPAIR OR REPLACE EXHAUST GAS LEAKAGE POINT

OK

3	INSPECT AIR FUEL RATIO SENSOR(BANK 1, 2 SENSOR 1) (See page 05–597)

NG → REPLACE AIR FUEL RATIO SENSOR

OK

4	INSPECT HEATED OXYGEN SENSOR(BANK 1, 2 SENSOR 2) (See page 05–442)

NG → REPLACE HEATED OXYGEN SENSOR

OK

REPLACE THREE–WAY CATALYTIC CONVERTER (EXHAUST MANIFOLD AND FRONT EXHAUST PIPE)

NOTICE:

On the damaged bank, replace both the front catalyst and rear catalyst.

HINT:

Hand–held tester only:

- The ACTIVE TEST A/F CONTROL procedure enables the technician to identify a trouble area if malfunction in A/F sensors or heated oxygen sensors other than the catalyst converter, or the malfunction that indicates the actual air–fuel ratio extremely RICH or LEAN.
- It is possible to locate the problem area by performing "A/F CONTROL" ACTIVE TEST (heated oxygen sensor or other trouble areas can be distinguished).

(a) Perform the ACTIVE TEST A/F CONTROL operation.

HINT:

The A/F CONTROL operation lowers the injection volume 12.5% or increases the injection volume 25%.

(1) Connect the hand–held tester to the DLC3 on the vehicle.
(2) Turn the ignition switch to ON.
(3) Warm up the engine by running the engine at 2,500 rpm for approximately 90 seconds.
(4) Select the item: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL.
(5) Perform the A/F CONTROL operation with the engine in an idle condition (press the right or left button).

Result:

A/F sensor reacts in accordance with increase and decrease of injection volume:

+25 % → rich output: Less than 3.0 V

–12.5 % → lean output: More than 3.35 V

Heated oxygen sensor reacts in accordance with increase and decrease of injection volume:

+25 % → rich output: More than 0.55 V

–12.5 % → lean output: Less than 0.4 V

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NOTICE:

The A/F sensor output has a few seconds of delay and the heated oxygen sensor output has about 20 seconds of delay at maximum.

	Output voltage of A/F sensor (sensor 1)	Output voltage of heated oxygen sensor (sensor 2)	Main Suspect Trouble Area
Case 1	Injection volume +25 % –12.5 % Output voltage More than 3.35 V Less than 3.0 V **OK**	Injection volume +25 % –12.5 % Output voltage More than 0.55 V Less than 0.4V **OK**	□
Case 2	Injection volume +25 % –12.5 % Output voltage Almost no reaction **NG**	Injection volume +25 % –12.5 % Output voltage More than 0.55 V Less than 0.4V **OK**	A/F sensor (A/F sensor, heater, A/F sensor circuit)
Case 3	Injection volume +25 % –12.5 % Output voltage More than 3.35 V Less than 3.0V **OK**	Injection volume +25 % –12.5 % Output voltage Almost no reaction **NG**	Heated oxygen sensor (heated oxygen sensor, heater, heated oxygen sensor circuit)
Case 4	Injection volume +25 % –12.5 % Output voltage Almost no reaction **NG**	Injection volume +25 % –12.5 % Output voltage Almost no reaction **NG**	Extremely rich or lean actual air–fuel ratio (Injector, fuel pressure, gas leakage in exhaust system, etc.)

The following A/F CONTROL procedure enables the technician to check and graph the voltage outputs of both the A/F sensor and the heated oxygen sensor.

To display the graph, enter ACTIVE TEST/ A/F CONTROL/USER DATA, then select ”AFS B1S1 and O2S B1S2” or ”AFS B2S1 and O2S B2S2” by pressing the ”YES” button followed by the ”ENTER” button and then the ”F4” button.

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DTC	P0441	EVAPORATIVE EMISSION CONTROL SYSTEM INCORRECT PURGE FLOW

DTC	P0442	EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK)

DTC	P0446	EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT

DTC	P0455	EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (GROSS LEAK)

DTC	P0456	EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK)

MONITOR DESCRIPTION

The ECM tests the Evaporative Emissions (EVAP) system using the fuel tank pressure sensor, the Canister Close Valve (CCV), and the VSV for EVAP. The ECM closes the EVAP system and introduces a negative pressure (vacuum) into it. The ECM then monitors the internal pressure using the fuel tank pressure sensor (refer to diagram Leak Check).

P0441

The VSV for EVAP:

(a) Is used to purge the evaporative emissions from the fuel tank into the intake manifold.
(b) Works with the VSV for CCV to create a vacuum (negative pressure) inside the fuel tank, and perform leak tests.

Opening or closing malfunctions in the VSV for EVAP prompt the ECM to set DTC P0441.

The ECM checks for a VSV for EVAP "stuck closed" fault by commanding the VSV for EVAP open with the VSV for CCV (vent) closed. The fuel tank should develop a high negative pressure (vacuum). If it does not, the ECM determines that despite an OPEN command, the VSV for EVAP remained closed. The ECM turns on the MIL and a DTC is set.

The ECM checks for a VSV for EVAP "stuck open" fault by commanding both the VSV for EVAP and VSV for CCV closed at a time when the fuel tank is at atmospheric pressure. If the fuel tank develops a high negative pressure (vacuum) during this early stage of the test, the ECM determines that the VSV for EVAP is stuck open. The ECM will turn on the MIL and DTC is set.

P0446

The VSV for CCV opens under normal conditions. The VSV for CCV is used to:

(a) After the VSV for EVAP purges the evaporative emissions from the fuel tank into the intake manifold, the VSV for CCV draws fumes from the fuel tank into the charcoal canister.
(b) Discharge pressure inside the fuel tank when the pressure has suddenly risen.
(c) Along with the VSV for EVAP, it creates a vacuum (negative pressure) inside the fuel tank and performs leak tests.

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The ECM checks for a VSV for CCV "stuck closed" malfunction by commanding both valves (VSV for EVAP and VSV for CCV) open at a time when the fuel tank is at atmospheric pressure. If the fuel tank develops a high negative pressure (vacuum) and it remains in that state for more than 4 seconds, the ECM determines that the VSV for CCV (vent) is stuck closed. The ECM will turn on the MIL and a DTC is set. This malfunction is detected regardless of the engine coolant temperature.
The ECM checks for a VSV for CCV "stuck open" malfunction by commanding the VSV for EVAP open with the VSV for CCV closed when the fuel tank should have developed a high negative pressure (vacuum). If the fuel tank did not develop the proper high negative pressure (vacuum), the ECM concludes that the VSV for CCV must have been "stuck open". The ECM will turn on the MIL and a DTC is set.

P0442, P0455 and P0456

A leak in the evaporative emission system prompts the ECM to set DTC P0442, P0455 or P0456.
The ECM checks for leaks in the system by introducing a high negative pressure (vacuum) from the intake manifold by commanding the VSV for EVAP open while the VSV for CCV (vent) is closed. After sufficient time has elapsed the fuel tank should develop a high negative pressure (vacuum) and the VSV for EVAP is closed. The ECM then monitors the pressure–rise (loss of vacuum) in the fuel tank. If the pressure rises too rapidly, the ECM concludes that there is a leak in the system.
The ECM will turn on the MIL and a DTC is set.
The ECM has separate DTCs for small and large leaks:

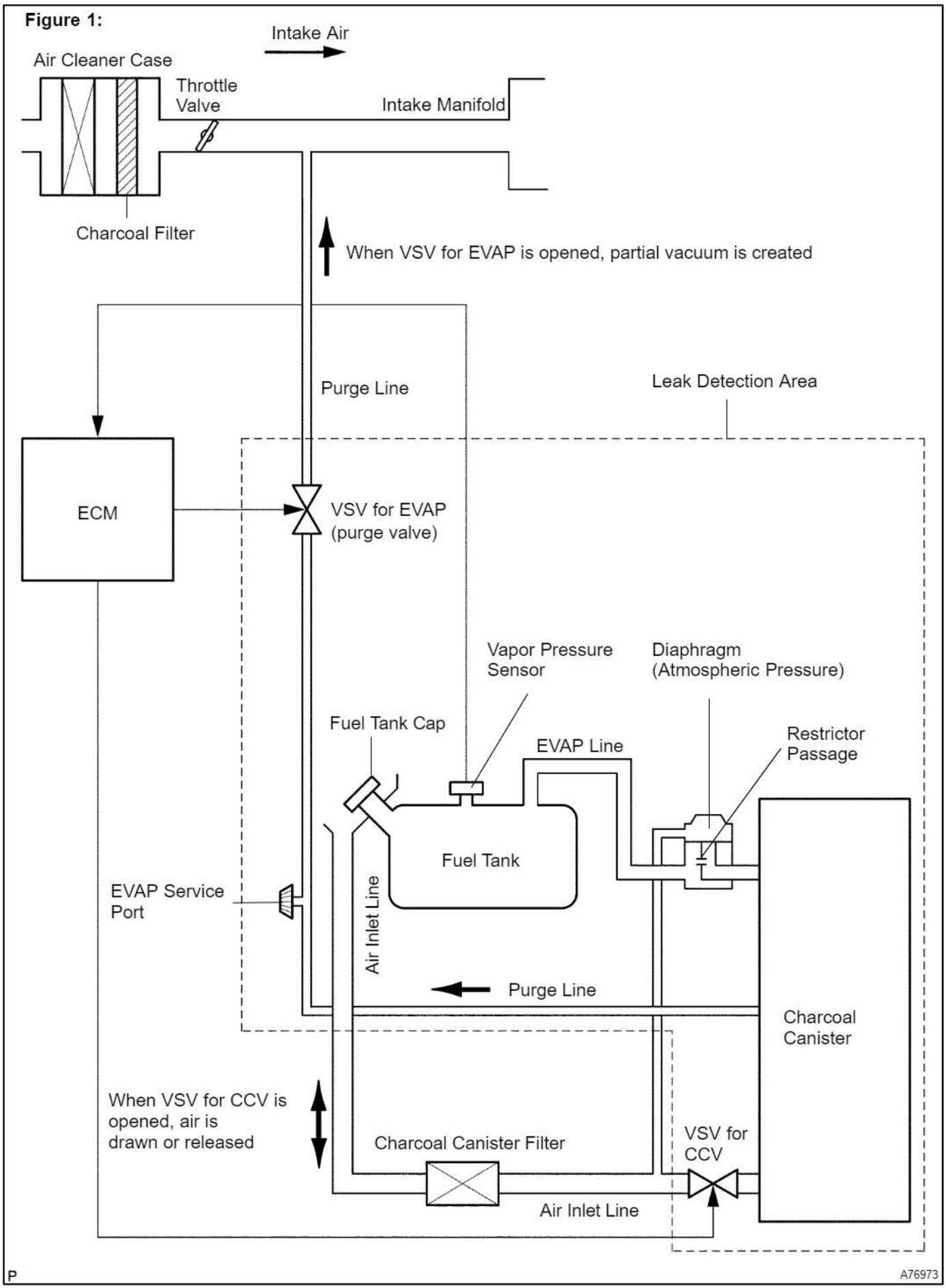
(a) DTC P0442 is set when the internal fuel tank pressure has a large increase and the EVAP system has a small leak.
(b) DTC P0455 is set when EVAP system has a very large leak. Even though the ECM sends a signal to the VSV for EVAP when CCV is closed to create a vacuum when CCV is closed, the internal fuel tank pressure does not decrease beyond a specified level.
(c) DTC P0456 is set when the internal fuel tank pressure increase slightly and the EVAP system has a very small leak.

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DTC No.	DTC Detection Condition	Trouble Area
P0441	Pressure in charcoal canister and fuel tank does not drop during purge control (2 trip detection logic) During purge cut–off, negative pressure entering the charcoal canister and fuel tank (2 trip detection logic)	Vacuum hose has cracks, holes, or is blocked, damaged or disconnected Fuel tank cap is incorrectly installed Fuel tank cap has cracks or is damaged Open or short in vapor pressure sensor circuit Vapor pressure sensor Open or short in VSV circuit for EVAP VSV for EVAP Open or short in VSV circuit for CCV VSV for CCV Fuel tank has cracks, holes, or is damaged Charcoal canister has cracks, holes, or is damaged Fuel tank over fill check valve cracks, or is damaged ECM
P0446	Open or close malfunction in the canister close valve (CCV) (2 trip detection logic)	Vacuum hose has cracks, holes, or is blocked, damaged or disconnected Fuel tank cap is incorrectly installed Fuel tank cap has cracks or is damaged Open or short in vapor pressure sensor circuit Vapor pressure sensor Open or short in VSV circuit for EVAP VSV for EVAP Open or short in VSV circuit for CCV VSV for CCV Fuel tank has cracks, holes, or is damaged Charcoal canister has cracks, holes, or is damaged Fuel tank over fill check valve cracks, or is damaged ECM
P0442 P0455 P0456	After a cold engine start. After VSV for EVAP operation, the VSV for EVAP is turned off. The VSV for EVAP seals the vacuum in the system and the ECM begins to monitor the pressure increase. Some increase is expected and will not set a DTC (2 trip detection logic) A rapid, sharp increase in pressure indicates a leak in the EVAP system and DTC P0442 is set An increase in pressure (above the expected amount) indicates a very small leak in the EVAP system and DTC P0456 is set If the vacuum is not strong enough, the ECM assumes the EVAP system has a large hole and DTC P0455 is set	Vacuum hose has cracks, holes, or is blocked, damaged or disconnected Fuel tank cap is incorrectly installed Fuel tank cap has cracks or is damaged Open or short in vapor pressure sensor circuit Vapor pressure sensor Open or short in VSV circuit for EVAP VSV for EVAP Open or short in VSV circuit for CCV VSV for CCV Fuel tank has cracks, holes, or is damaged Charcoal canister has cracks, holes, or is damaged Fuel tank over fill check valve cracks, or is damaged ECM

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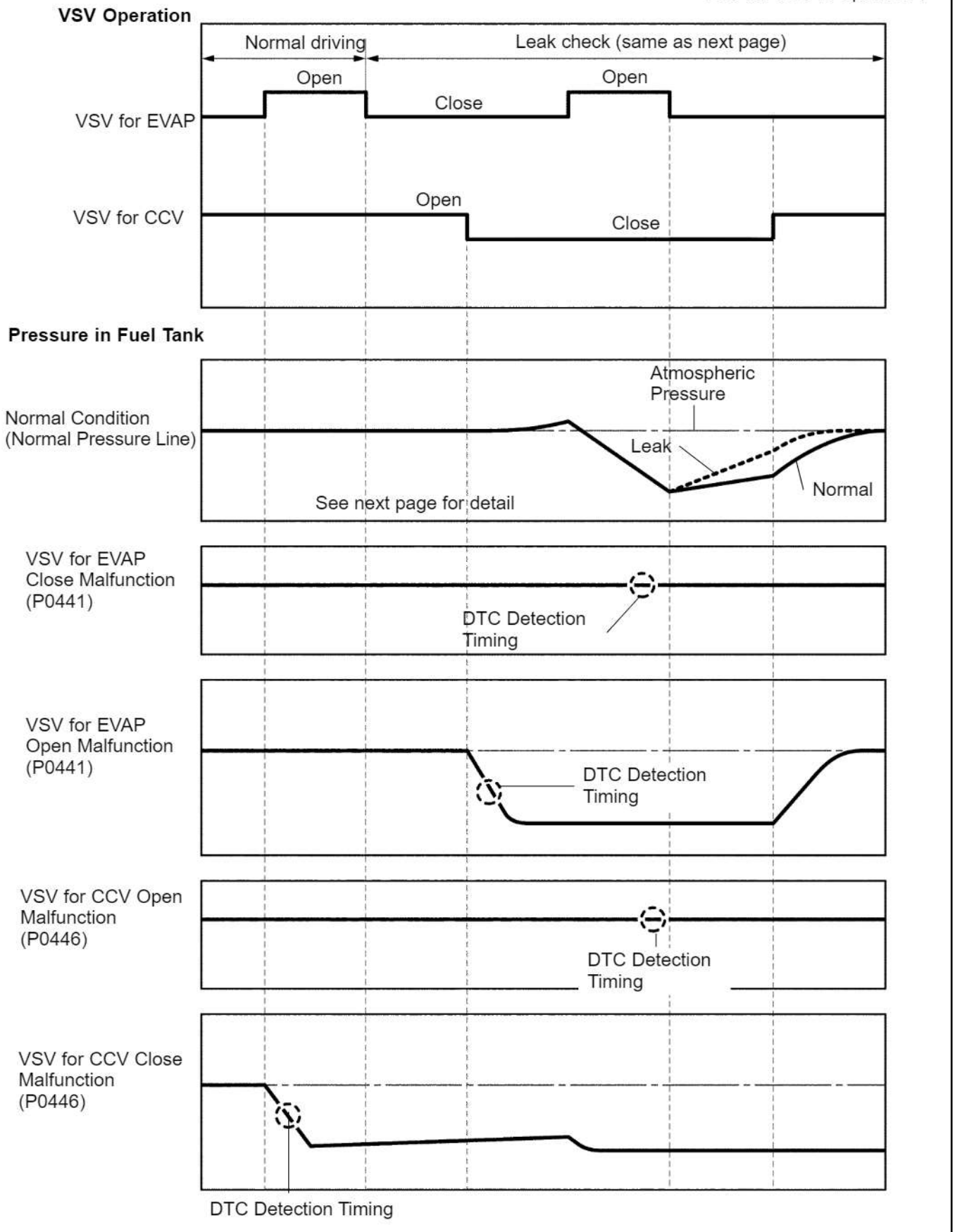
Figure 1:



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VSV Malfunction Condition and DTC Detection Timing:

VSV for EVAP is Open: ON
VSV for CCV is Open: OFF

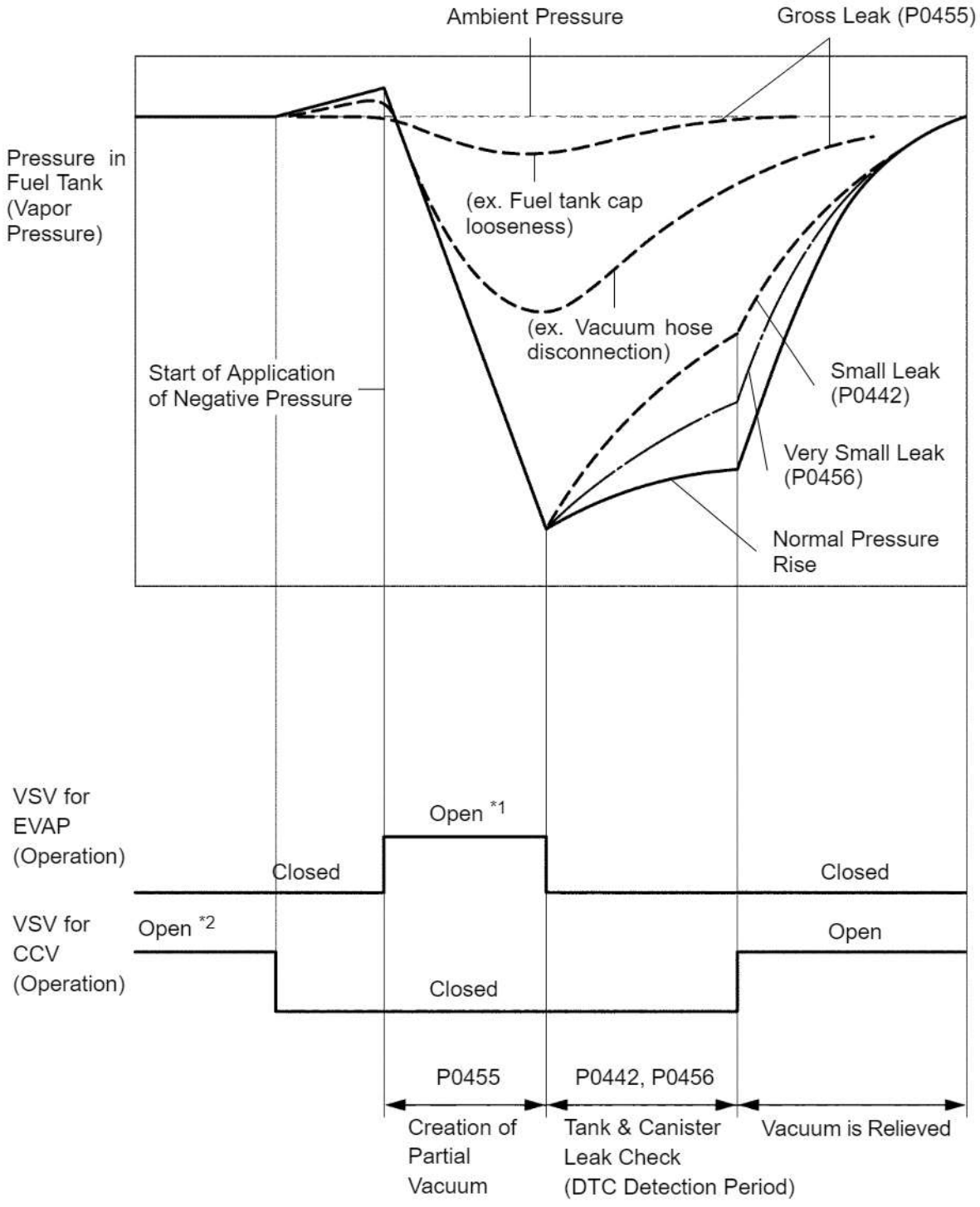


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Leak Check:

Initial Condition
☐ Cold start
☐ Temperatures of engine coolant and Intake air are nearly same



*1: VSV for EVAP is open: ON
*2: VSV for CCV is open: OFF

P A85439

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MONITOR STRATEGY

Related DTCs	P0441: Purge VSV stuck open P0441: Purge VSV stuck close P0442: EVAP small leak (0.04 inch leak) P0446: CCV stuck open P0446: CCV stuck close P0455: EVAP gross leak P0456: EVAP very small leak (0.02 inch leak)
Required sensors/ components (Main)	Fuel cap, Fuel tank, EVAP canister, EVAP hose, Purge VSV, CCV
Required sensors / components (Related)	Vapor pressure sensor, Engine coolant temperature sensor, Intake air temperature sensor, Vehicle speed sensor, Mass air flow meter
Frequency of operation	Once per driving cycle
Duration	90 seconds (30 seconds x 3)
MIL operation	2 driving cycles
Sequence operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05–334
Battery voltage	11 V
Altitude	7,870 ft. (2,400 m) or less
Intake air temperature	4.4°C (39.92°F) or more
Engine start intake air temperature	4.4 to 35°C (39.9 to 95°F) 4.4 to 32°C (39.9 to 89.6°F) (only EVAP 0.02 inch leak)
Engine start engine coolant temperature	4.4 to 35°C (39.9 to 95°F) 4.4 to 32°C (39.9 to 89.6°F) (only EVAP 0.02 inch leak)
Difference between intake air temperature and engine coolant temperature at engine start	–7 to 11.1°C (–12.6 to 20°F)
Purge VSV and CCV	No active test by scan tool
Time after engine start	5 seconds or more, less than 50 minutes
Vehicle speed	Within 80 mph (130 km/h)
Vehicle condition is either (a) or (b)	(a) 90 seconds or more passed after vehicle stop (b) 20 seconds or more passed after vehicle started to run and is driven by constant speed.
Fuel slosh	No sloshing, i.e. fairly smooth road
Mass air flow	No great change
Fuel tank pressure change	Minimal change
Fuel tank pressure	Less than –19.5 mmHg (–2.6 kPa) [Less than 740.5 mmHg]
Fuel tank level	Less than 90 %
Number of "negative pressure introduction" in this driving cycles	Within 8 times

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TYPICAL MALFUNCTION THRESHOLDS

P0441 (Purge VSV stuck close):

Change fuel tank pressure during "negative Pressure introduction"	Less than 5.25 mmHg (0.7 kPa)

P0441 (Purge VSV stuck open):

Fuel tank pressure before "negative pressure introduction"	Less than –10 mm Hg (–1.333 kPa) [Less than 750 mmHg]

P0446 (CCV stuck close):

Both of the following conditions are met:	
Accumulated EVAP purge volume	0.5 g or more
Fuel tank pressure	Less than –12.75 mmHg (–1.7 kPa) [Less than 747.25 mmHg]

P0446 (CCV stuck open):

Purge VSV stuck close	Detected

P0442 (EVAP small leak (0.04 inch leak)):

Fuel tank pressure increase for 5 seconds from –20 mmHg (–2.67 kPa) [740 mmHg]	More than 1.2mmHg (0.16 kPa)
Both of the following conditions are met:	
Fuel tank pressure increase for 5 seconds from –17 mmHg (–2.27 kPa) [743 mmHg]	More than 1.2mmHg (0.16 kPa)
Fuel tank pressure after "negative pressure introduction"	Less than –18 mmHg (–2.4 kPa) [More than 742 mmHg]

P0455 (EVAP gross leak):

Fuel tank pressure after "negative pressure introduction"	More than –7 mm Hg kPa (–0.933 kPa) [More than 753 mmHg]

P0456 (EVAP very small leak (0.02 inch leak)):

Fuel tank pressure increase for 5 seconds from –20 mmHg (–2.67 kPa) [740 mmHg]	More than 0.525 mmHg (0.07 kPa)
Fuel tank pressure increase for 5 seconds from –17 mmHg (–2.27 kPa) [743 mmHg]	More than 0.525 mmHg (0.07 kPa)

MONITOR RESULT (MODE 06 DATA)

EVAP system:

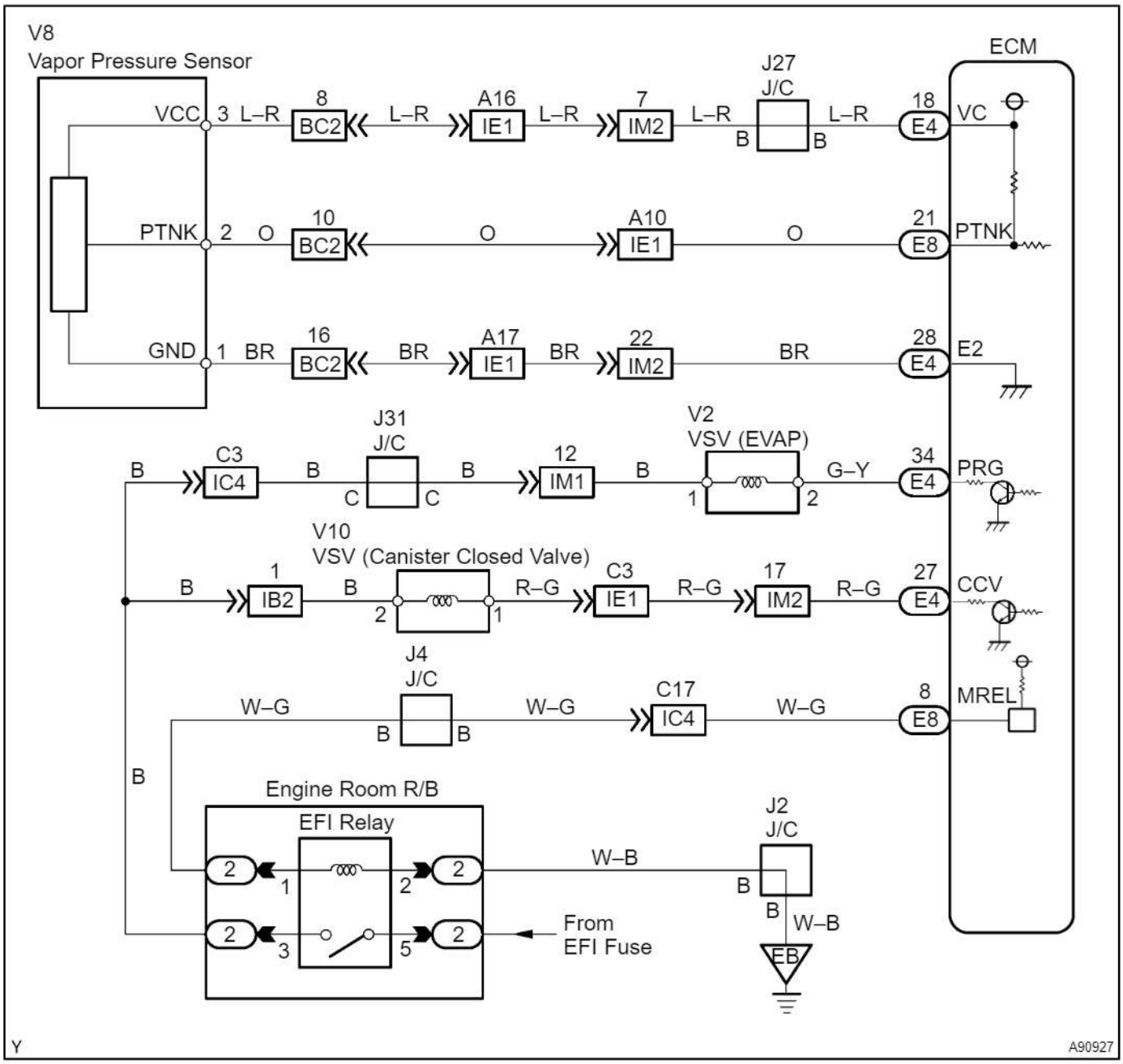
Test ID/Comp ID	Description of Test Data	Description of Test Limit	Conversion Factor (Unit)
$02/$81	**Purge VSV stuck close** is monitored by fuel tank pressure change during "negative pressure introduction"* **Purge VSV stuck open** is monitored by fuel tank pressure before "negative pressure introduction"*	Malfunction criteria for purge VSV	Multiply by 0.0916 (mmHg)
$02/$82	Fuel tank pressure during EVAP purge control	Malfunction criteria for CCV	Multiply by 0.0458 minus 2.93 (mmHg)
$02/$03	Fuel tank pressure increases for 5 seconds after "negative pressure introduction"*	Malfunction criteria for 0.04 inch leak	Multiply by 0.0458 (mmHg)
$02/$04	Fuel tank pressure increases for 5 seconds after "negative pressure introduction"*	Malfunction criteria for 0.02 inch leak	Multiply by 0.0458 (mmHg)

Refer to page 05–340 for detailed information on CHECKING MONITOR STATUS (MODE 06 DATA).
*The ECM operates the purge VSV and the CCV as the following chart when the EVAP system is being monitored.

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EVAP system condition	Purge VSV	CCV	EVAP (FTP) pressure
Before "Negative pressure introduction"	Closed (OFF)	Open (OFF)	Positive
During "Negative pressure introduction"	Open (ON)	Closed (OFF)	Intake manifold pressure is applied to EVAP system
After "Negative pressure introduction"	Closed (OFF)	Open (OFF)	Negative

WIRING DIAGRAM



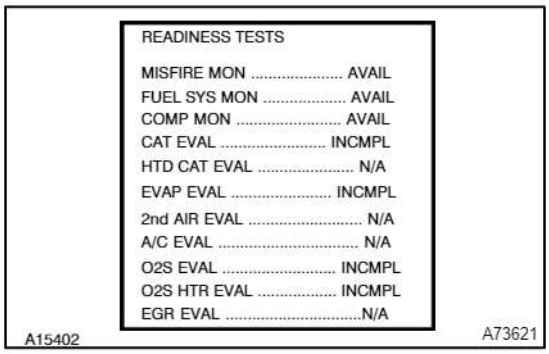
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CONFIRMATION READINESS TEST

First Trip Procedure

(a) The vehicle must be cold and the ambient temperature must be approximately between 50 to 95°F.

(b) The Intake Air Temperature (IAT) and the Engine Coolant Temperature (ECT) sensors indicate almost the same value.



(c) Clear the DTCs.

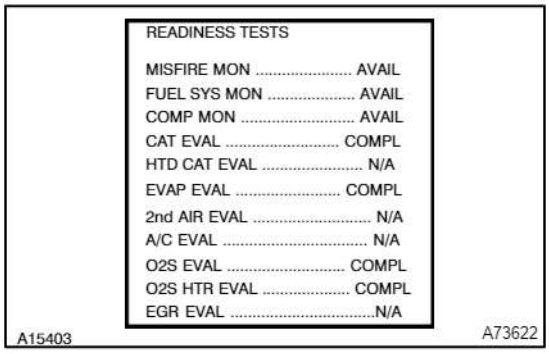
Disconnect the battery terminal or remove the EFI and ETCS fuses for more than 60 seconds.

READINESS TESTS will show INCMPL (incomplete).

(d) Drive the vehicle on a freeway. Write down the initial status of the READINESS TESTS. As each Readiness Test passes EVAP evaluation monitors, its status will change to COMPL (complete). This procedure may take approximately 20 minutes or more.

NOTICE:

Do not shut off the engine – the results will be invalid.



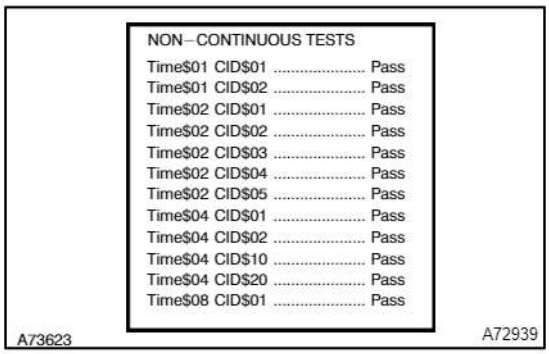
Pass Condition – No problem Found by the ECM

If the EVAP evaluation monitor shows COMPL, go to the NON–CONTINUOUS TESTS screen.

Enter the following menus: ADVANCED OBD II / ONBOARD TESTS / NON–CONTINUOUS.

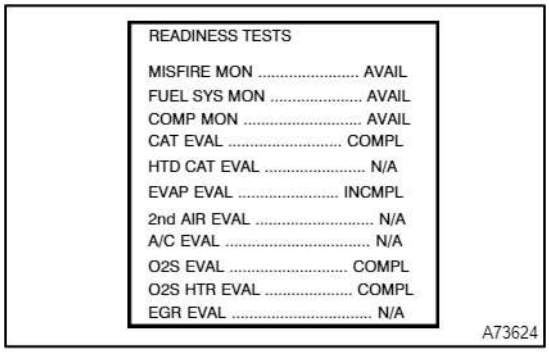
NOTICE:

Do not shut off the engine – the results will be invalid.



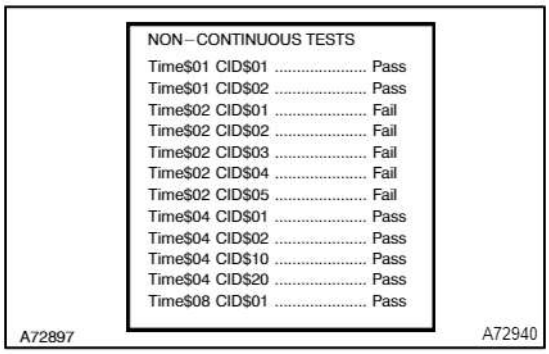
If all of the tests in the "Time $02" category show "Pass", the EVAP evaluation monitor detected no problem.

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Fail Condition – Problem Detected by the ECM

If the EVAP evaluation monitor shows COMPL, go to the NON–CONTINUOUS TESTS screen.



(1) If all tests show "Pass", one of the following may have occurred:

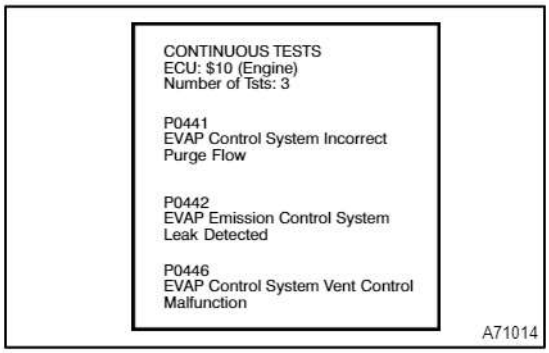
The EVAP evaluation monitor did not operate.

The EVAP evaluation monitor did not finish its tests.

The ECM has withheld judgement.

(2) If one or more of the tests in the time $02 category show "Fail", the EVAP evaluation monitor did operate and the ECM detected a problem.

(3) Go to the CONTINUOUS TESTS screen. This is the only place DTCs are listed for the first trip.



NOTICE:

The DTCs listed may not be valid. A second trip is needed to confirm listed DTCs.

Second Trip Procedure

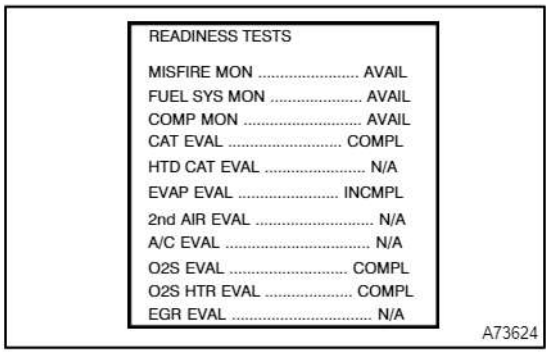
(e) The vehicle must be cold, and the ambient temperature must be approximately between 50 to 95°F.

(f) Go to the READINESS TESTS screen.

(g) Drive the vehicle on a freeway. Write down the initial status of the READINESS TESTS. This procedure may take approximately 20 minutes or more.

NOTICE:

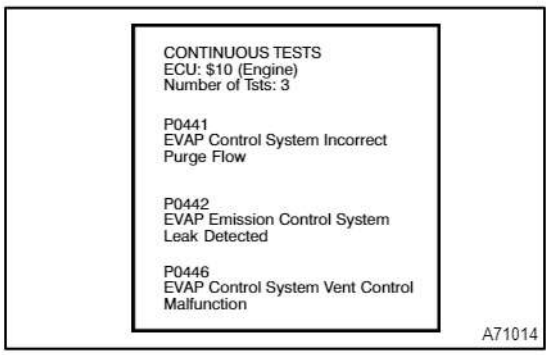
Do not shut off the engine – the results will be invalid.



(h) If the READINESS TESTS change to COMPL, the EVAP evaluation monitor has operated. Check for any stored DTCs.

If a DTC was stored, the problem has been detected and confirmed by the ECM.

If no DTC was found, the EVAP monitor operated but no problem was detected.



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INSPECTION PROCEDURE

HINT:

When using the hand–held tester, follow the procedures under the title "Hand–held tester " (see next page).

When using the OBD II scan tool, follow the procedures under the title "OBD II scan tool (excluding hand–held tester)" (see the procedures after the "Hand–held tester" procedures).

Always troubleshoot DTCs P0441 (purge flow), P0446 (VSV for CCV), P0451, P0452 and P0453 (evaporative pressure sensor) before troubleshooting DTCs P0442 or P0456.

As the customer the following questions:

1) When the MIL came on, if the fuel tank cap was loose and if it was then tightened.

2) When refueling, if the fuel tank cap was loose.

If the fuel tank cap was loose, that is the why the DTC was stored.

If the fuel cap was not loose or if the customer cannot remember, troubleshoot according to the procedures on the following page.

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

If the ENGINE RUN TIME in the freeze frame data is less than 200 seconds, carefully check the vapor pressure sensor.

DTC Output	Malfunction Indicated	Trouble Chart	
P0441 only	Open Malfunction of VSV for EVAP	Execute step from 6 to 9	Check and replace of VSV for EVAP
P0446 only	Close Malfunction of VSV for CCV	Execute step from 10 to 14	Check and replace of VSV for CCV
P0442 and/or P0456	Very small, small or medium leak	Execute step from 2	
P0455 only	Medium leak (for example, vacuum hose is disconnected or has about φ 2.0 hole)	Execute step from 2	
P0441 and P0455 and P0446	Large leak (for example, fuel tank cap loose) or VSV malfunction (open malfunction of VSV for CCV or close malfunction of VSV for EVAP)	Execute step from 2*	

*: In most cases, troubleshooting can be completed by checking if the fuel tank cap was loose, or repairing the VSV for CCV or the VSV for EVAP.

HINT:

Use the chart above to check the malfunction for each DTC output. The perform the necessary repairs listed under trouble chart.

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Hand–held tester:

1	READ OUTPUT DTC

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(c) Select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(d) Read the DTCs.
(e) Troubleshoot each of the problems according to the procedure for each DTC.

HINT:
Based on the output DTC, proceed to A, B or C.

DTC output	Troubleshoot	Proceed to
P0442 (small leak) P0455 (gross leak) P0456 (very small leak) P0442 and P0456 Other DTC combination	Go to step 2	A
P0441 only (VSV for EVAP malfunction)	Execute step from 6 to 9	B
P0446 only (VSV for CCV malfunction)	Execute step from 10 to 14	C

B → Go to step 6

C → Go to step 10

A

2	CHECK THAT FUEL TANK CAP MEETS OEM SPECIFICATIONS

NG → REPLACE WITH A CAP THAT MEETS OEM SPECIFICATIONS

OK

3	CHECK THAT FUEL TANK CAP IS CORRECTLY INSTALLED

NG → CORRECTLY INSTALL FUEL TANK CAP

OK

4	INSPECT FUEL TANK CAP ASSY (See page 12–8)

NG → REPLACE FUEL TANK CAP ASSY

OK

5	CHECK FILLER NECK FOR DAMAGE

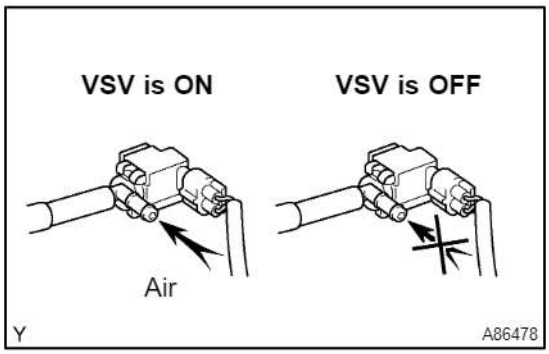
(a) Remove the fuel tank cap.
(b) Visually inspect the filler neck for damage.
(c) Reinstall the fuel tank cap.

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NG → REPLACE FUEL TANK INLET PIPE SUB–ASSY (FILLER NECK)

OK

6	PERFORM ACTIVE TEST BY HAND–HELD TESTER(VSV FOR EVAP PURGE FLOW)



(a) Disconnect the vacuum hose of the VSV for EVAP from the charcoal canister.
(b) Start the engine.
(c) Select the item: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / EVAP VSV. Press the right or left button.
(d) When the VSV for EVAP is operated by the hand–held tester, check if the disconnected hose applies suction to your finger.

Standard:

Tester Operation	Specified Condition
VSV is ON	Disconnected hose applies suction to your finger
VSV is OFF	Disconnected hose applies no suction to your finger

(e) Reconnect the vacuum hose.

OK → Go to step 10

NG

7	CHECK HOSES AND TUBES(INTAKE MANIFOLD – VSV FOR EVAP, VSV FOR EVAP – CHARCOAL CANISTER)

(a) Check that the vacuum hoses are connected correctly.
(b) Check that the vacuum hoses are not loose or disconnected.
(c) Check the vacuum hoses and tubes for cracks, holes, damage or blockage.

NG → REPAIR OR REPLACE DEFECTIVE OR DAMAGED HOSE OR TUBE

OK

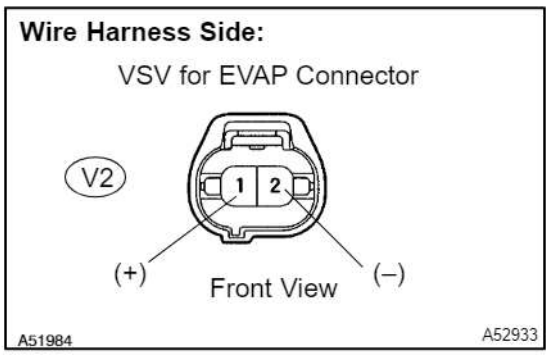
8	CHECK OPERATION OF VSV FOR EVAP (See page 12–8)

NG → REPLACE VSV FOR EVAP (VACUUM SWITCHING VALVE ASSY NO. 1)

OK

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9	CHECK HARNESS AND CONNECTOR(VSV FOR EVAP – ECM, VSV FOR EVAP – EFI RELAY)



(a) Disconnect the V2 VSV for EVAP connector.
(b) Turn the ignition switch to ON.
(c) Measure the voltage between the specified terminal of the V2 VSV for EVAP connector and body ground.

Standard :

Tester Connection	Specified Condition
VSV for EVAP (V2–1) – Body ground	9 to 14 V

(d) Select the item: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / EVAP VSV. Press the right or left button.
(e) When the VSV for EVAP is operated by the hand–held tester, measure the voltage between the specified terminals of the V2 VSV for EVAP connector.

Standard :

Tester Operation	Tester Connection	Specified Condition
VSV is ON	VSV for EVAP: (V2–1) – (V2–2)	10 to 16 V
VSV is OFF	VSV for EVAP: (V2–1) – (V2–2)	0 V

(f) Turn the ignition switch to OFF.
(g) Check the resistance in VSV for EVAP wire harness.

Standard :

Tester Connection	Specified Condition
VSV for EVAP (V2–1) – Body ground	10 Ω or higher
VSV for EVAP (V2–2) – Body ground	

(h) Reconnect the VSV for EVAP connector.

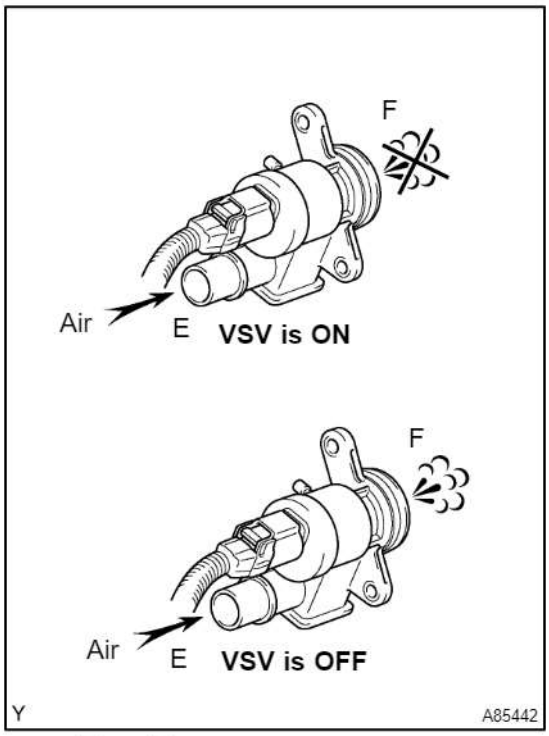
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM (See page 10–11)

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10	PERFORM ACTIVE TEST BY HAND–HELD TESTER(VSV FOR CCV)



(a) Remove the VSV for CCV.
(b) Turn the ignition switch to ON.
(c) Select the item: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / CAN CTRL VSV. Press the right or left button.
(d) Check the VSV for CCV operation while operating it with the hand–held tester.

Standard:

Tester Operation	Specified Condition
VSV is ON	Air does not flow from ports E to F
VSV is OFF	Air from port E flows out through port F

Result:

VSV Operation	DTC output (when vehicle was brought in)	Proceed to
NG	□	A
OK	P0446	B
	Other than P0446	C

B → **Go to step 13**

C → **Go to step 15**

A

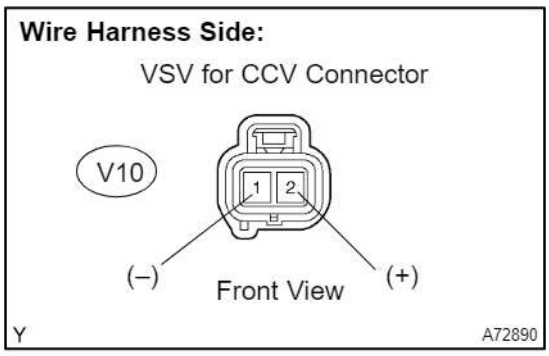
11	CHECK OPERATION OF VSV FOR CCV (See page 12–8)

NG → **REPLACE VSV FOR CCV**

OK

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12	CHECK HARNESS AND CONNECTOR(VSV FOR CCV – ECM, VSV FOR CCV – EFI RELAY)



(a) Disconnect the V10 VSV for CCV connector.
(b) Turn the ignition switch to ON.
(c) Measure the voltage between the specified terminal of the V10 VSV for CCV connector and body ground.

Standard :

Tester Connection	Specified Condition
VSV for CCV (V10–2) – Body ground	9 to 14 V

(d) Select the item: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / CAN CTRL VSV. Press the right or left button.
(e) When the VSV for CCV is operated by the hand–held tester, measure the voltage between the specified terminals of the V10 VSV for CCV connector.

Standard :

Tester Operation	Tester Connection	Specified Condition
VSV is ON	VSV for CCV: (V10–1) – (V10–2)	9 to 14 V
VSV is OFF	VSV for CCV: (V10–1) – (V10–2)	0 V

(f) Turn the ignition switch to OFF.
(g) Check the resistance in VSV for CCV wire harness.

Standard :

Tester Connection	Specified Condition
VSV for CCV (V10–1) – Body ground	10 Ω or higher
VSV for CCV (V10–2) – Body ground	

(h) Reconnect the VSV for CCV connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

13	CHECK VSV FOR CCV(CHECK FOR LEAKAGE BETWEEN VSV FOR CCV AND CHARCOAL CANISTER)

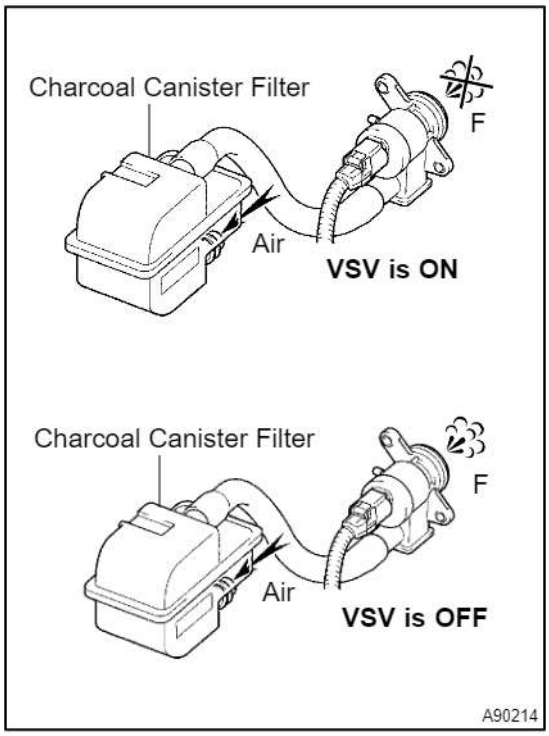
(a) Check that the VSV for CCV is correctly installed.
(b) Check the O–ring.

NG → **REPAIR OR REPLACE**

OK

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14 PERFORM ACTIVE TEST BY HAND–HELD TESTER(VSV FOR CCV)



(a) Remove the VSV for CCV from the charcoal canister.
(b) Turn the ignition switch to ON.
(c) Select the item: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / CAN CTRL VSV. Press the right or left button.
(d) Check the VSV for CCV operation while operating it with the hand–held tester.

Standard:

Tester Operation	Specified Condition
VSV is ON	Air does not flow from charcoal canister filter port to port F
VSV is OFF	Air from charcoal canister filter port flows out through port F

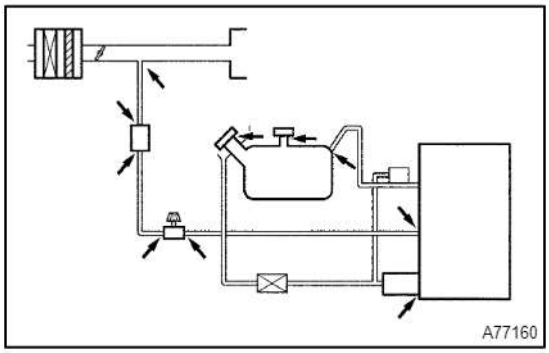
(e) Reinstall the VSV for CCV.

NG → **REPLACE CHARCOAL CANISTER FILTER NO.2**

OK

REPLACE ECM (See page 10–11)

15 CHECK FOR EVAPORATIVE EMISSIONS LEAK



(a) Check if the hoses close to the fuel tank have been modified, and check if there are signs of any accident damage near the fuel tank or the charcoal canister.
(1) Check for cracks, deformation or loose connections of the following parts:
Fuel tank
Charcoal canister
Fuel tank filler pipe
Hoses and tubes around fuel tank and charcoal canister

NG → **REPAIR OR REPLACE DEFECTIVE OR DAMAGED COMPONENT**

OK

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16	CHECK HOSES AND TUBES(INTAKE MANIFOLD – VSV FOR EVAP, VSV FOR EVAP – CHACOAL CANISTER)

(a) Check that the vacuum hose is connected correctly.
(b) Check the vacuum hose for looseness and disconnection.
(c) Check the vacuum hose and tube for cracks, hole, damage and blockage.

NG → REPAIR OR REPLACE DEFECTIVE OR DAMAGED HOSE OR TUBE

OK

17	CHECK HOSES AND TUBES(FUEL TANK – CHARCOAL CANISTER)

(a) Check the following for proper connection:
The fuel tank and the fuel EVAP pipe (see page 12–3)
The fuel EVAP pipe and the fuel tube under the floor
The fuel tube and the charcoal canister
(b) Check the hose and tube for cracks, hole and damage.

NG → REPAIR OR REPLACE DEFECTIVE OR DAMAGED HOSE OR TUBE

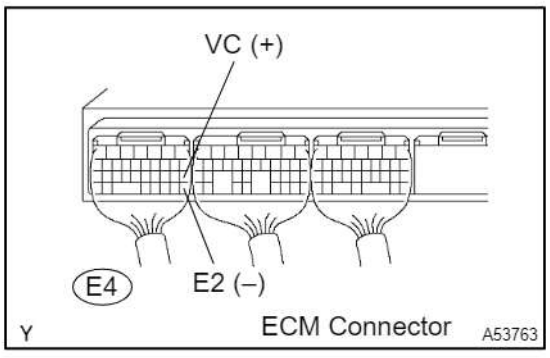
OK

18	INSPECT CHARCOAL CANISTER ASSY(CRACKS, HOLE AND DAMAGE) (See page 12–8)

NG → REPLACE CHARCOAL CANISTER ASSY

OK

19	INSPECT ECM(VC VOLTAGE)



(a) Turn the ignition switch to ON.
(b) Measure the voltage between the specified terminals of the E4 ECM connector.
Standard:

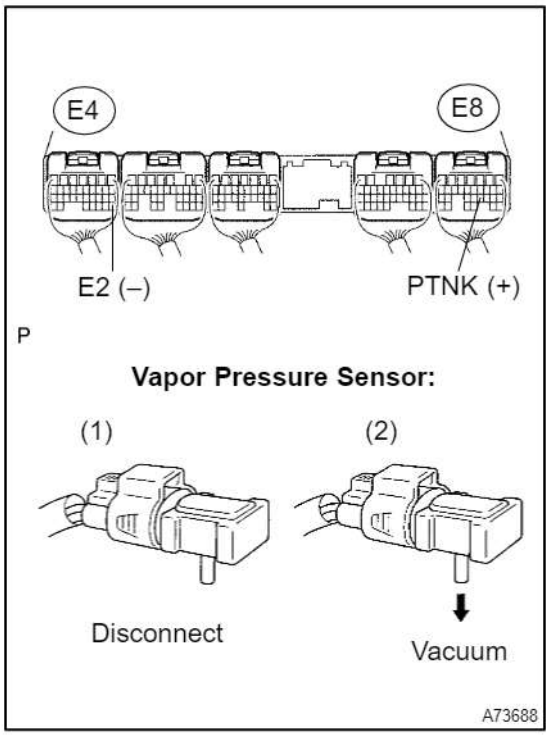
Tester Connection	Specified Condition
VC (E4–18) – E2 (E4–28)	4.5 to 5.5 V

NG → REPLACE ECM (See page 10–11)

OK

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20 INSPECT ECM(PTNK VOLTAGE)



(a) Turn the ignition switch to ON.
(b) Measure the voltage between the specified terminals of the E4 and E8 ECM connectors.
(1) Disconnect the vacuum hose from the vapor pressure sensor.

Standard (1):

Tester Connection	Specified Condition
PTNK (E8–21) – E2 (E4–28)	2.9 to 3.7 V

(2) Using a MITYVAC (Hand–Held Vacuum Pump), apply a vacuum of 4.0 kPa (30 mmHg, 1.18 in.Hg) to the vapor pressure sensor.

NOTICE:
The vacuum applied to the vapor pressure sensor must be less than 66.7 kPa (500 mmHg, 19.7 in.Hg).

Standard (2):

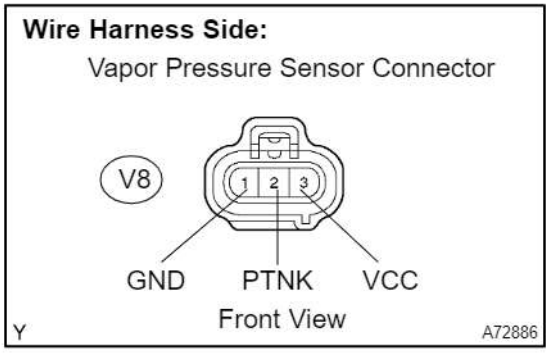
Tester Connection	Specified Condition
PTNK (E8–21) – E2 (E4–28)	0.5 V or less

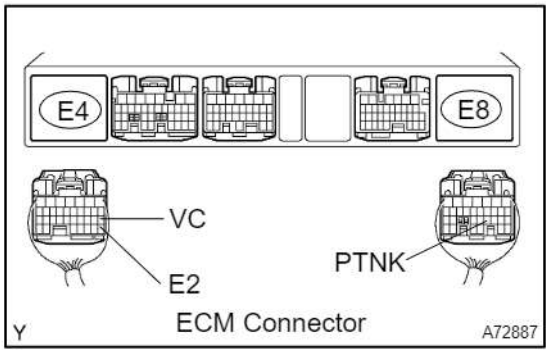
(3) Reconnect the vacuum hose.

OK → **Go to step 22**

NG

21 CHECK HARNESS AND CONNECTOR(VAPOR PRESSURE SENSOR – ECM)





(a) Disconnect the vapor pressure sensor connector.
(b) Disconnect the E4 and E8 ECM connectors.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
PTNK (V8–2) – PTNK (E8–21)	Below 1 Ω
GND (V8–1) – E2 (E4–28)	
VCC (V8–3) – VC (E4–18)	

Standard (Check for short):

Tester Connection	Specified Condition
PTNK (V8–2) or PTNK (E8–21) – Body ground	10 kΩ or higher
VCC (V8–3) or VC (E4–18) – Body ground	

(d) Reconnect the vapor pressure sensor connector.
(e) Reconnect the ECM connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE VAPOR PRESSURE SENSOR ASSY

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22	INSPECT FUEL TANK ASSY(CRACKS AND DAMAGE)

NG → REPLACE FUEL TANK ASSY

OK

IT IS LIKELY THAT VEHICLE USER DID NOT PROPERLY CLOSE FUEL TANK CAP

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OBD II scan tool (excluding hand–held tester):

1	CHECK THAT FUEL TANK CAP MEETS OEM SPECIFICATIONS

NG → REPLACE WITH A CAP THAT MEETS OEM SPECIFICATIONS

OK

2	CHECK THAT FUEL TANK CAP IS CORRECTLY INSTALLED

NG → CORRECTLY INSTALL FUEL TANK CAP

OK

3	INSPECT FUEL TANK CAP ASSY (See page 12–8)

NG → REPLACE FUEL TANK CAP ASSY

OK

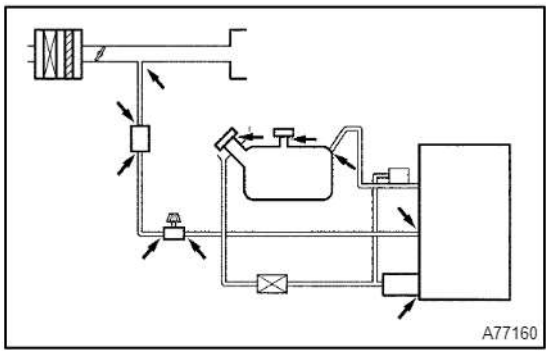
4	CHECK FILLER NECK FOR DAMAGE

(a) Remove the fuel tank cap.
(b) Visually inspect the filler neck for damage.
(c) Reinstall the fuel tank cap.

NG → REPLACE FUEL TANK INLET PIPE SUB–ASSY (FILLER NECK)

OK

5	CHECK FOR EVAPORATIVE EMISSIONS LEAK



(a) Check if the hoses close to the fuel tank have been modified, and check if there are signs of any accident damage near the fuel tank or the charcoal canister.
  (1) Check for cracks, deformation or loose connections of the following parts:
  Fuel tank
  Charcoal canister
  Fuel tank filler pipe
  Hoses and tubes around fuel tank and charcoal canister

NG → REPAIR OR REPLACE DEFECTIVE OR DAMAGED COMPONENT

OK

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6	CHECK HOSES AND TUBES(FUEL TANK – CHARCOAL CANISTER)

(a) Check the following for proper connection:
The fuel tank and the fuel EVAP pipe (see page 12–3)
The fuel EVAP pipe and the fuel tube under the floor
The fuel tube and the charcoal canister
(b) Check the hoses and the tubes for cracks, holes or damage.

NG → REPAIR OR REPLACE DEFECTIVE OR DAMAGED HOSE OR TUBE

OK

7	CHECK EACH VSV CONNECTOR FOR LOOSENESS OR DISCONNECTION(VSV FOR EVAP, VSV FOR CCV AND VAPOR PRESSURE SENSOR)

NG → REPAIR OR CONNECT VSV AND SENSOR CONNECTORS

OK

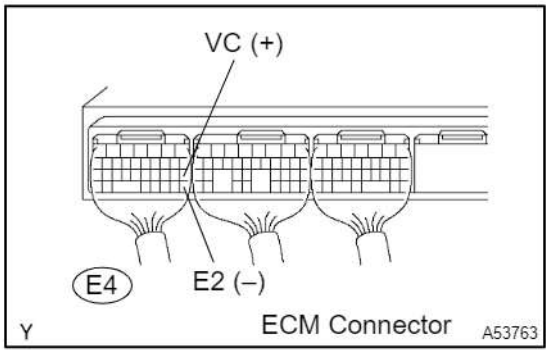
8	CHECK HOSES AND TUBES(INTAKE MANIFOLD – VSV FOR EVAP, VSV FOR EVAP – CHARCOAL CANISTER)

(a) Check that the vacuum hoses are connected correctly.
(b) Check that the vacuum hoses are not loose or disconnected.
(c) Check the vacuum hoses and tubes for cracks, holes, damage or blockage.

NG → REPAIR OR REPLACE DEFECTIVE OR DAMAGED HOSE OR TUBE

OK

9	INSPECT ECM(VC VOLTAGE)



(a) Turn the ignition switch to ON.
(b) Measure the voltage between the specified terminals of the E4 ECM connector.
Standard:

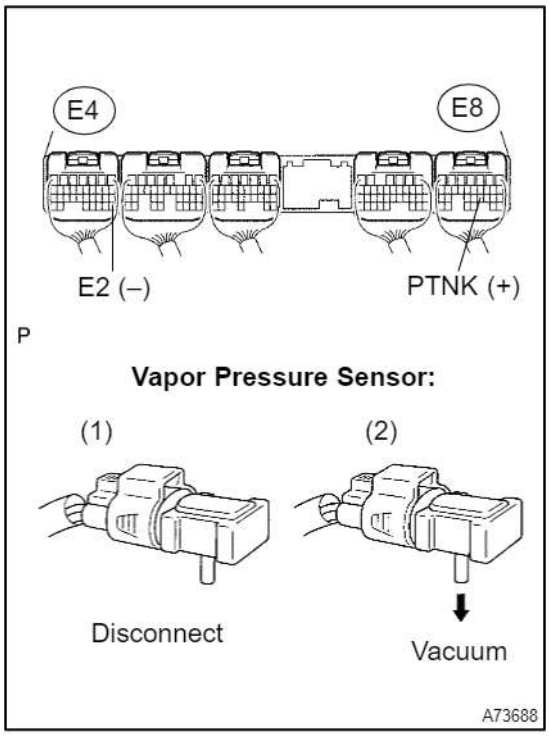
Tester Connection	Specified Condition
VC (E4–18) – E2 (E4–28)	4.5 to 5.5 V

NG → REPLACE ECM (See page 10–11)

OK

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10 INSPECT ECM(PTNK VOLTAGE)



(a) Turn the ignition switch to ON.
(b) Measure the voltage between the specified terminals of the E4 and E8 ECM connectors.
(1) Disconnect the vacuum hose from the vapor pressure sensor.

Standard (1):

Tester Connection	Specified Condition
PTNK (E8–21) – E2 (E4–28)	2.9 to 3.7 V

(2) Using a MITYVAC (Hand–Held Vacuum Pump), apply a vacuum of 4.0 kPa (30 mmHg, 1.18 in.Hg) to the vapor pressure sensor.

NOTICE:
The vacuum applied to the vapor pressure sensor must be less than 66.7 kPa (500 mmHg, 19.7 in.Hg).

Standard (2):

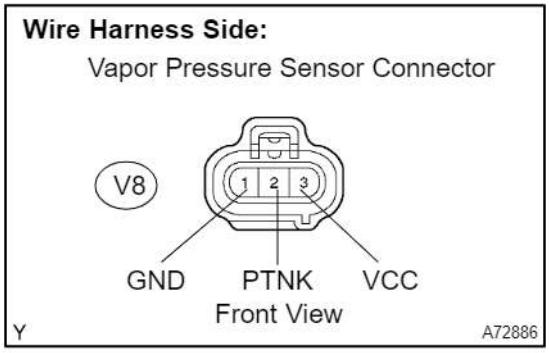
Tester Connection	Specified Condition
PTNK (E8–21) – E2 (E4–28)	0.5 V or less

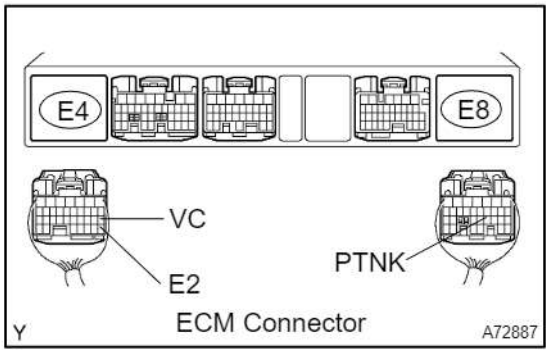
(3) Reconnect the vacuum hose.

OK → **Go to step 12**

NG

11 CHECK HARNESS AND CONNECTOR(VAPOR PRESSURE SENSOR – ECM)





(a) Disconnect the vapor pressure sensor connector.
(b) Disconnect the E4 and E8 ECM connectors.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
PTNK (V8–2) – PTNK (E8–21)	Below 1 Ω
GND (V8–1) – E2 (E4–28)	
VCC (V8–3) – VC (E4–18)	

Standard (Check for short):

Tester Connection	Specified Condition
PTNK (V8–2) or PTNK (E8–21) – Body ground	10 kΩ or higher
VCC (V8–3) or VC (E4–18) – Body ground	

(d) Reconnect the vapor pressure sensor connector.
(e) Reconnect the ECM connector.

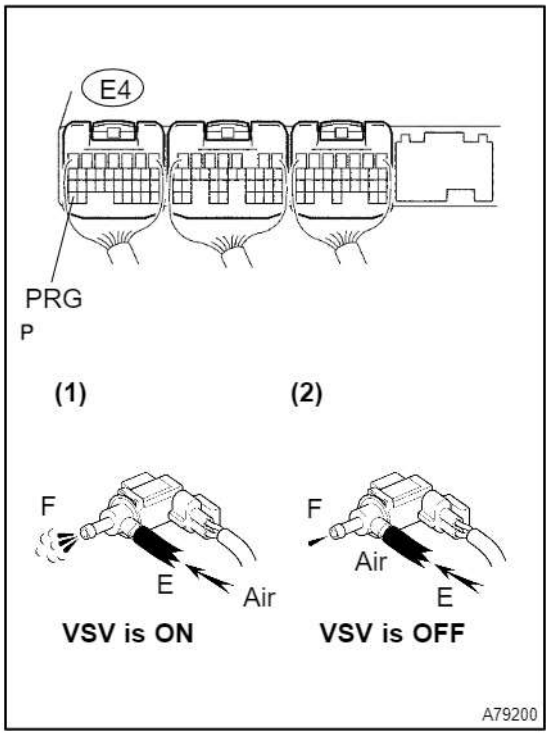
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NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE VAPOR PRESSURE SENSOR ASSY

12 CHECK FUNCTION OF VSV FOR EVAP



(a) Turn the ignition switch to ON.
(b) Check the VSV function.
(1) Connect terminal PRG (E4–34 of the ECM connector and body ground (VSV for EVAP should OPEN, i.e. ON).

Standard (1):
Air from port E flows out through port F.

(2) Disconnect terminal PRG of the ECM connector from body ground (VSV for EVAP should CLOSED, i.e. OFF).

Standard (2):
Air does not flow from port E to port F.

OK	Go to step 15

NG

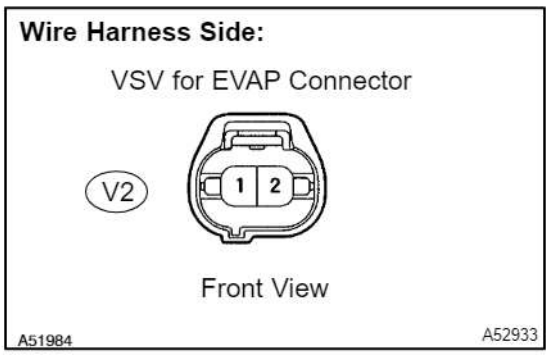
13 CHECK OPERATION OF VSV FOR EVAP (See page 12–8)

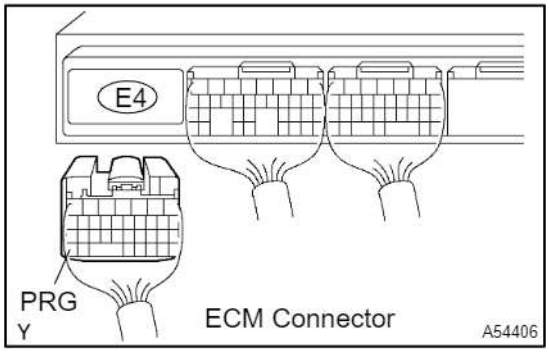
NG	REPLACE VSV FOR EVAP AND CLEAN VACUUM HOSES, AND THEN CHECK CHARCOAL CANISTER

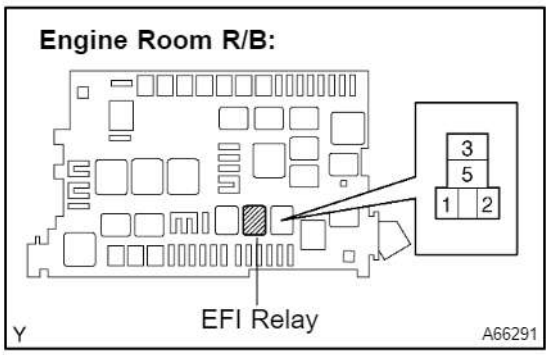
OK

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14	CHECK HARNESS AND CONNECTOR(VSV FOR EVAP – ECM, VSV FOR EVAP – EFI RELAY)







(a) Check the harness and the connector between the VSV for EVAP connector and ECM connector.
(1) Disconnect the VSV for EVAP connector.
(2) Disconnect the E4 ECM connector.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
VSV for EVAP (V2–1) – PRG (E4–34)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
VSV for EVAP (V2–1) or PRG (E4–34) – Body ground	10 kΩ or higher

(4) Reconnect the VSV for EVAP connector.
(5) Reconnect the ECM connector.

(b) Check the harness and the connector between the VSV for EVAP connector and the EFI relay.
(1) Disconnect the VSV for EVAP connector.
(2) Remove the EFI relay from the engine room R/B.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
VSV for EVAP (V2–2) – EFI relay (3)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
VSV for EVAP (V2–2) or EFI relay (3) – Body ground	10 kΩ or higher

(4) Reconnect the VSV for EVAP connector.
(5) Reinstall the EFI relay.

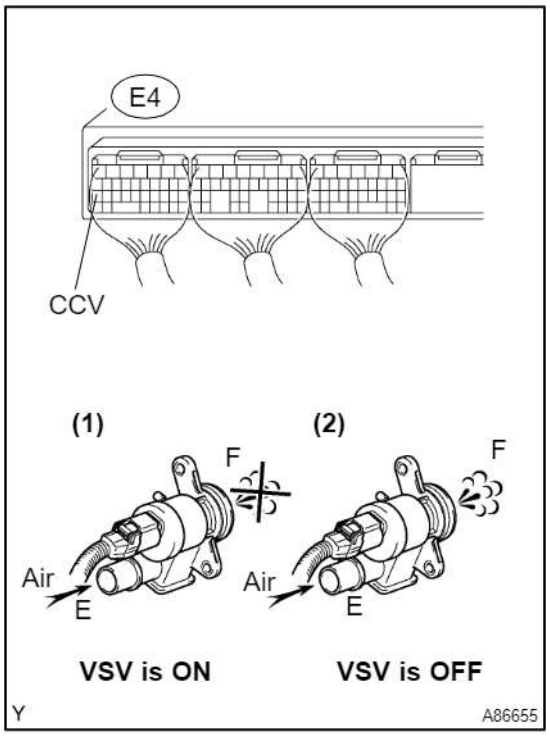
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM (See page 10–11)

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15	CHECK FUNCTION OF VSV FOR CCV



(a) Remove the VSV for CCV.
(b) Turn the ignition switch to ON.
(c) Check the VSV function.
(1) Connect terminal CCV (E4–27) of the ECM connector and body ground (VSV for CCV should be CLOSED, i.e. ON).

Standard (1):
Air does not flow from port E to port F.

(2) Disconnect terminal CCV of the ECM connector from body ground (VSV for CCV should be OPEN, i.e. OFF).

Standard (2):
Air from port E flows out through port F.

OK	Go to step 18

NG

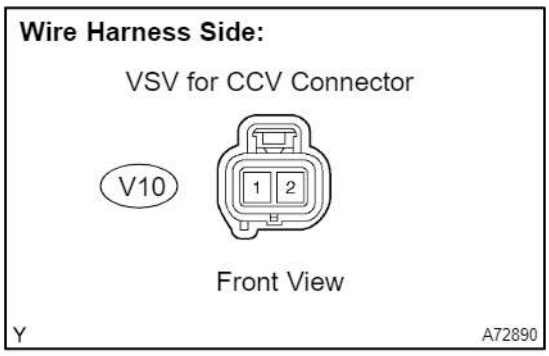
16	CHECK OPERATION OF VSV FOR CCV (See page 12–8)

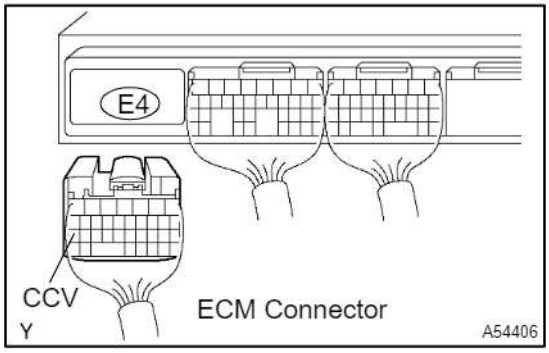
NG	REPLACE VSV FOR CCV, AND THEN CHECK LEAKAGE

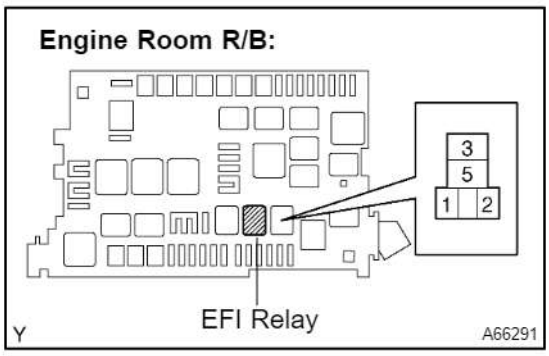
OK

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17	CHECK HARNESS AND CONNECTOR(VSV FOR CCV – ECM, VSV FOR CCV – EFI RELAY)







(a) Check the harness and the connector between the VSV for CCV connector and ECM connector.
(1) Disconnect the VSV for CCV connector.
(2) Disconnect the E4 ECM connector.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
VSV for CCV (V10–1) – CCV (E4–27)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
VSV for CCV (V10–1) or CCV (E4–27) – Body ground	10 kΩ or higher

(4) Reconnect the VSV for CCV connector.
(5) Reconnect the ECM connector.

(b) Check the harness and the connector between the VSV for CCV and EFI relay.
(1) Disconnect the VSV for CCV connector.
(2) Remove the EFI relay from the engine room R/B.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
VSV for CCV (V10–2) – EFI relay (3)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
VSV for CCV (V10–2) or EFI relay (3) – Body ground	10 kΩ or higher

(4) Reconnect the VSV for CCV connector.
(5) Reinstall the EFI relay.

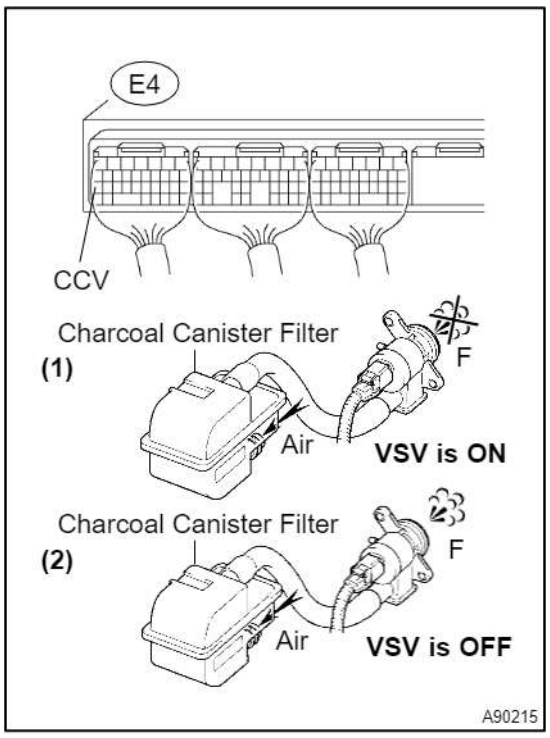
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM (See page 10–11)

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18	INSPECT CHARCOAL CANISTER FILTER NO.2(CHECK THAT CHARCOAL CANISTER FILTER IS NOT CLOGGED)



(a) Turn the ignition switch to ON.
(b) Check the VSV function.
(1) Connect terminal CCV (E4–27) of the ECM connector and the body ground (VSV for CCV should be CLOSED, i.e. ON).

Standard (1):
Air does not flow from the charcoal canister filter's port to port F.

(2) Disconnect terminal CCV of the ECM connector from body ground (VSV for CCV should be OPEN, i.e. OFF).

Standard (2):
Air from the charcoal canister filter's port flows out through port F.

NG → **REPLACE CHARCOAL CANISTER FILTER NO.2**

OK

19	CHECK FUEL TANK OVER FILL CHECK VALVE

NG → **REPLACE FUEL TANK ASSY**

OK

CHECK AND REPLACE CHARCOAL CANISTER ASSY

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DTC	P0451	EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE

DTC	P0452	EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR/SWITCH LOW INPUT

DTC	P0453	EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR/SWITCH HIGH INPUT

MONITOR DESCRIPTION

DTC "P0451, P0452 or P0453" is recorded by the ECM when the vapor pressure sensor malfunctions.

P0451

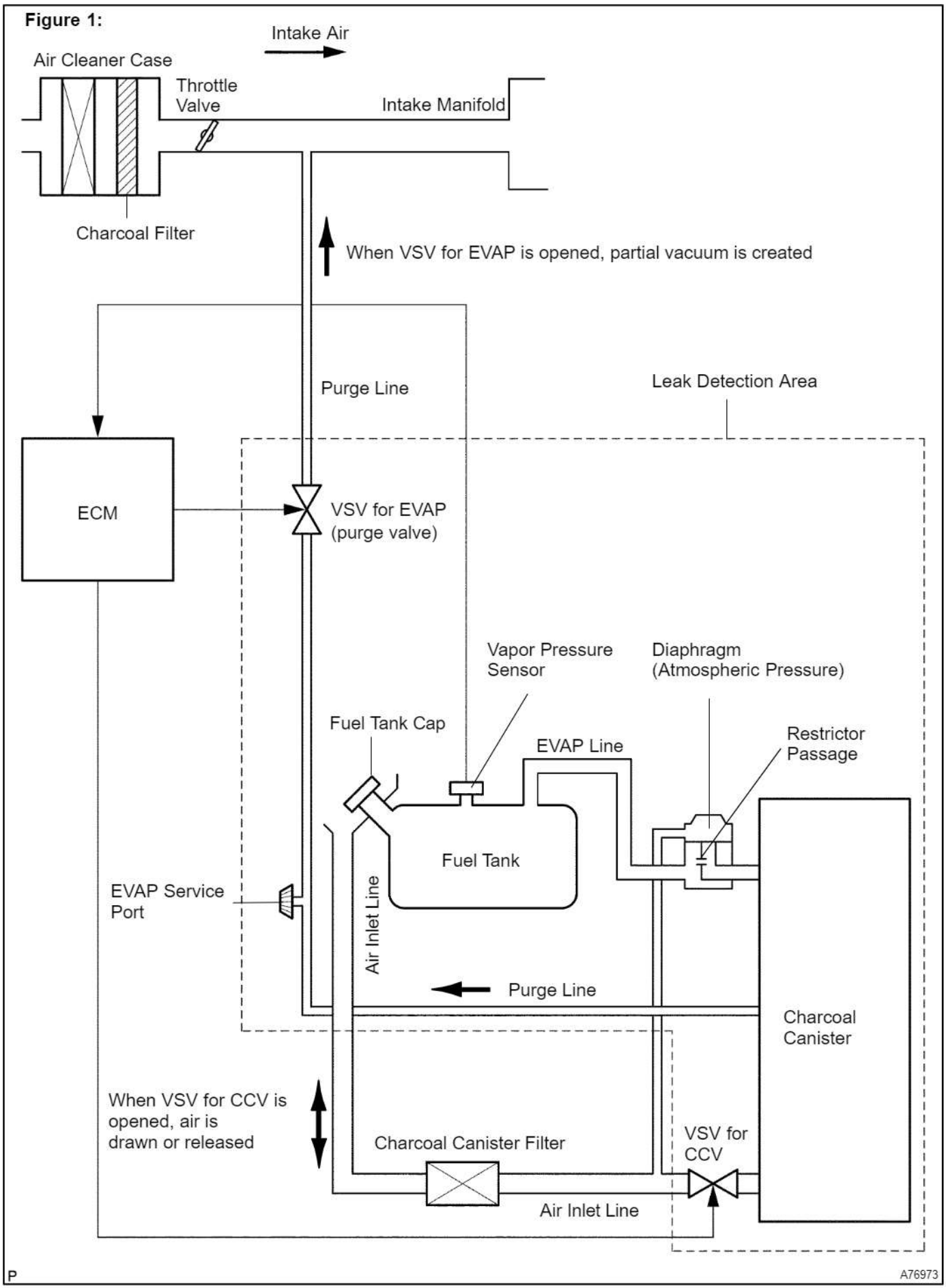
The ECM monitors the vapor pressure sensor in two ways. One method examines the fluctuation of the electrical signal while the engine is idling. If the pressure signal varies beyond the specified range more than 7 times, the ECM interprets this as a fault in the vapor pressure sensor. The ECM also verifies that the pressure signal changes within the specified range. If the output of the sensor does not vary for 5 minutes while the intake air amount is changing, the ECM interprets this as a fault in the vapor pressure sensor. Either fault will set DTC P0451 and the ECM will turn on the MIL.

P0452 and P0453

When pressure indicated by the vapor pressure sensor is below –3.999 kPa (–30 mmHg) or above 1.999 kPa (15 mmHg), the ECM interprets this as a malfunction in the vapor pressure sensor. The ECM will turn on the MIL and a DTC will be set.

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Figure 1:



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DTC No.	DTC Detection Condition	Trouble Area
P0451	Either of conditions, (a) or (b), is met (2 trip detection logic): (a) Vapor pressure sensor output changes frequently when vehicle speed is 0 mph (0 km/h) and engine speed is Idling (b) Vapor pressure sensor output remains at a constant value for 5minutes or more	□Open or short in vapor pressure sensor circuit □Vapor pressure sensor □ECM
P0452	After engine start, vapor pressure sensor output remains outside lower threshold (2 trip detection logic)	
P0453	After engine start, vapor pressure sensor output continues to exceed upper threshold (2 trip detection logic)	

MONITOR STRATEGY

P0451

Related DTCs	P0451: Evaporative emission control system pressure sensor range/performance
Required sensors/ components (Main)	Vapor pressure sensor
Required sensors / components (Related)	Engine coolant temperature sensor, Intake air temperature sensor, Mass air flow meter
Frequency of operation	Once per driving cycle
Duration	Signal fluctuation (noise) monitoring: 10 seconds No signal change (stuck) monitoring: 20 minutes
MIL operation	2 driving cycles
Sequence operation	None

P0452 and P0453

Related DTCs	P0452: Evaporative emission control system pressure sensor/switch low input P0453: Evaporative emission control system pressure sensor/switch high input
Required sensors/ components (Main)	Vapor pressure sensor
Required sensors / components (Related)	Engine coolant temperature sensor, Mass air flow sensor
Frequency of operation	Once per driving cycle
Duration	17 seconds
MIL operation	2 driving cycles
Sequence operation	None

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TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05–334
Signal fluctuation (noise) monitoring:	
Altitude	7,870 ft. (2,400 m) or less
Battery voltage	11 V or more
Difference between intake air temperature and engine coolant temperature at engine start	–7 to 11.1 C (–12.6 to 20 F)
Engine start intake air temperature	4.4 to 35 C (40 to 95 F)
Engine start engine coolant temperature	4.4 to 35 C (40 to 95 F)
Purge VSV and CCV	No active test by scan tool
Vehicle stop and idling	5 to 15 seconds
Stuck monitoring:	
Altitude	7,870 ft. (2,400 m) or less
Battery voltage	11 V or more
Vapor pressure sensor	No malfunction
Difference between intake air temperature and engine coolant temperature at engine start	–7 to 11.1 C (–12.6 to 20 F)
Engine start intake air temperature	4.4 to 35 C (40 to 95 F)
Engine start engine coolant temperature	4.4 to 35 C (40 to 95 F)
Time after vehicle stop	5 seconds

P0452 and P0453

The monitor will run whenever the following DTCs are not present	See page 05–334
Difference between intake air temperature and engine coolant temperature at engine start	Less than 12 C (22 F)
Engine start intake air temperature	10 to 35 C (50 to 95 F)
Engine start engine coolant temperature	10 to 35 C (50 to 95 F)
Engine	Running

TYPICAL MALFUNCTION THRESHOLDS

P0451

Signal fluctuation (noise) monitoring:	
The number of times the output changed	0.267 kPa (5 mmHg) or more for 5 to 15 seconds during idling and vehicle stop	5 times or more
Stuck monitoring:	
Fuel tank pressure "no change" time (less than 0.018 kPa (0.135 mmHg) change since engine start)	5 minutes or more

P0452 and P0453

P0452:	
Fuel tank pressure	Less than –3.999 kPa (–30 mmHg) / when engine running
P0453:	
Fuel tank pressure	1.999 kPa (15 mmHg) or more / when engine running

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WIRING DIAGRAM

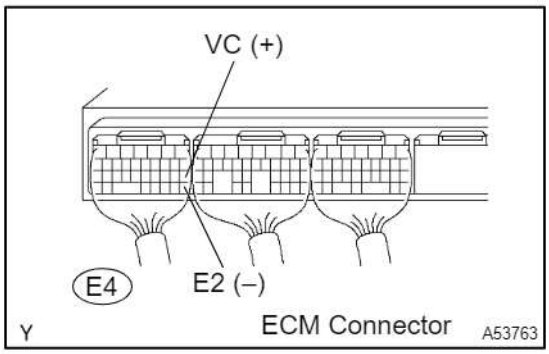
Refer to DTC No. P0441 on page 05–512.

INSPECTION PROCEDURE

HINT:

- If DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may have an open circuit.
- If DTC P0441 (Purge Flow), P0446 (VSV for CCV), P0451, P0452 or P0453 (Evaporative Pressure Sensor) is output with DTC P0442 or P0456, troubleshoot DTC P0441, P0446, P0451, P0452 or P0453 first. If no malfunction is detected, troubleshoot DTC P0442 or P0456 next.
- Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.
- When the ENGINE RUN TIME in the freeze frame data is less than 200 seconds, carefully check the vapor pressure sensor.

1	INSPECT ECM(VC VOLTAGE)



(a) Turn the ignition switch to ON.

(b) Measure the voltage between the specified terminals of the E4 ECM connector.

Standard:

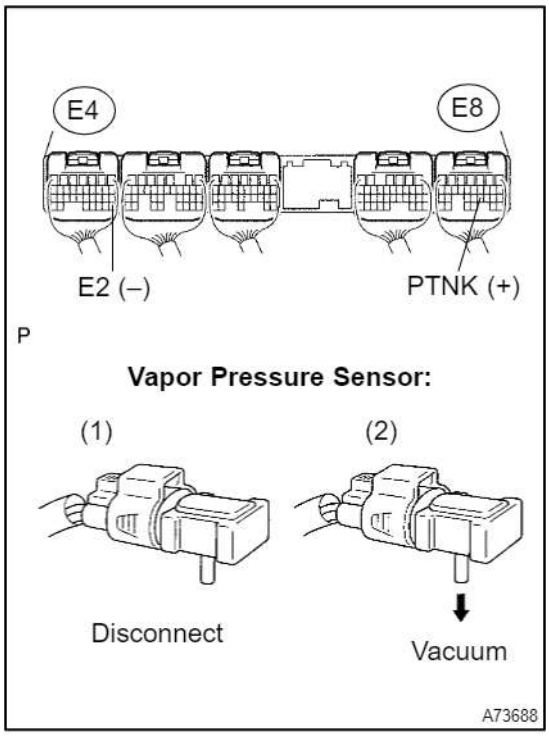
Tester Connection	Specified Condition
VC (E4–18) – E2 (E4–28)	4.5 to 5.5 V

NG → **REPLACE ECM (See page 10–11)**

OK

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2 INSPECT ECM(PTNK VOLTAGE)



(a) Turn the ignition switch to ON.
(b) Measure the voltage between the specified terminals of the E4 and E8 ECM connectors.
(1) Disconnect the vacuum hose from the vapor pressure sensor.

Standard (1):

Tester Connection	Specified Condition
PTNK (E8–21) – E2 (E4–28)	2.9 to 3.7 V

(2) Using the MITYVAC (Hand–Held Vacuum Pump), apply a vacuum of 4.0 kPa (30 mmHg, 1.18 in.Hg) to the vapor pressure sensor.

NOTICE:
The vacuum applied to the vapor pressure sensor must be less than 66.7 kPa (500 mmHg, 19.7 in.Hg).

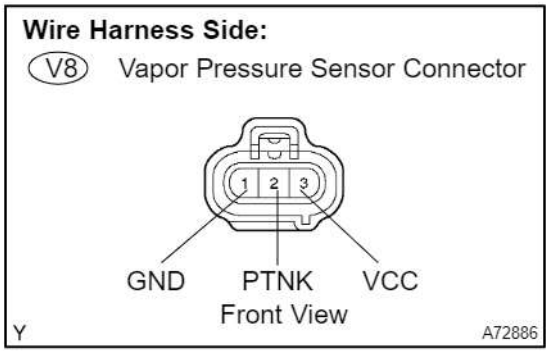
Standard (2):

Tester Connection	Specified Condition
PTNK (E8–21) – E2 (E4–28)	0.5 V or less

OK → **REPLACE ECM (See page 10–11)**

NG

3 CHECK HARNESS AND CONNECTOR(VAPOR PRESSURE SENSOR – ECM)



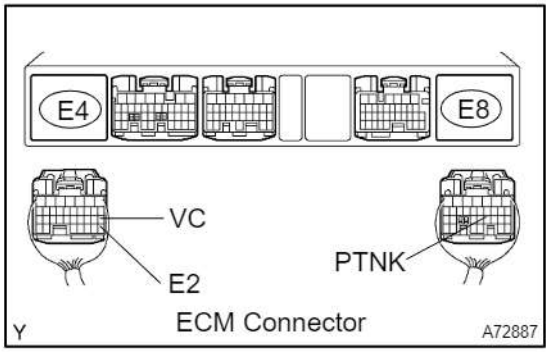
(a) Disconnect the vapor pressure sensor connector.
(b) Disconnect the E4 and E8 ECM connectors.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
PTNK (V8–2) – PTNK (E8–21)	Below 1 Ω
GND (V8–1) – E2 (E4–28)	
VCC (V8–3) – VC (E4–18)	

Standard (Check for short):

Tester Connection	Specified Condition
PTNK (V8–2) or PTNK (E8–21) – Body ground	10 kΩ or higher
VCC (V8–3) or VC (E4–18) – Body ground	



(d) Reconnect the vapor pressure sensor connector.
(e) Reconnect the ECM connectors.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE VAPOR PRESSURE SENSOR ASSY

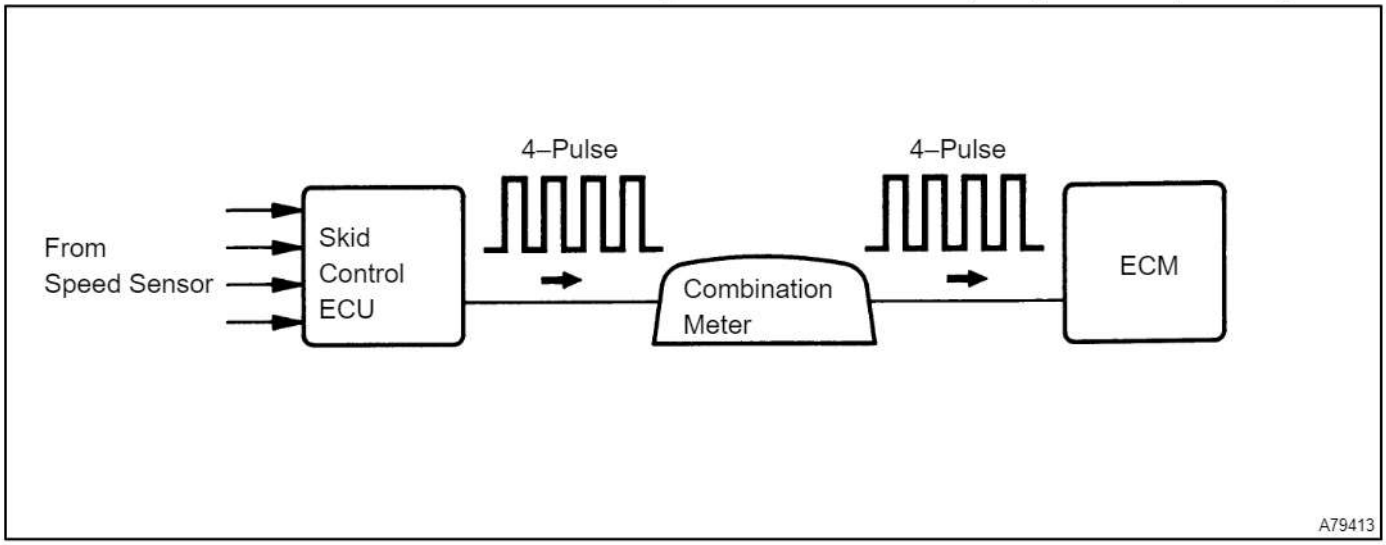
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DTC	P0500	VEHICLE SPEED SENSOR ”A”

DTC	P0503	VEHICLE SPEED SENSOR ”A” INTERMITTENT/ERRATIC/HIGH

CIRCUIT DESCRIPTION

The speed sensor detects the wheel speed and sends appropriate signals to the skid control ECU. The skid control ECU converts these wheel speed signals into a 4–pulse signal and outputs it to the ECM via the combination meter. The ECM determines the vehicle speed based on the frequency of these pulse signals.



DTC No.	DTC Detection Condition	Trouble Area
P0500 P0503	The ECM detects following conditions simultaneously 500 times (2 trip detection logic) □No SP1 (speed sensor) signal while ECM detects SP2 (No. 2 speed sensor) signal □Vehicle speed is 6 mph (9 km/h) or more for 4 seconds □Park/Neutral position switch is OFF (shift lever other than P and N positions) □Transfer lever is in other than N position (4WD)	□Open or short in vehicle speed sensor circuit □Vehicle speed sensor □Combination meter □ECM □Skid control ECU

MONITOR DESCRIPTION

The ECM assumes that the vehicle is being driven when the transmission counter gear indicates more than 300 rpm and over 30 seconds have passed since the park/neutral position switch was turned OFF. If there is no signal from the vehicle speed sensor with these conditions satisfied, the ECM concludes that the vehicle speed sensor is malfunctioning. The ECM will turn on the MIL and a DTC is set.

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MONITOR STRATEGY

Related DTCs	P0500: Vehicle speed sensor open/short
Required sensors/ components (Main)	Vehicle speed sensor, Combination meter, Skid control ECU
Required sensors / components (Related)	Countergear speed sensor, Park/Neutral position switch, Engine coolant temperature sensor
Frequency of operation	Continuous
Duration	2 seconds
MIL operation	2 driving cycles
Sequence operation	None

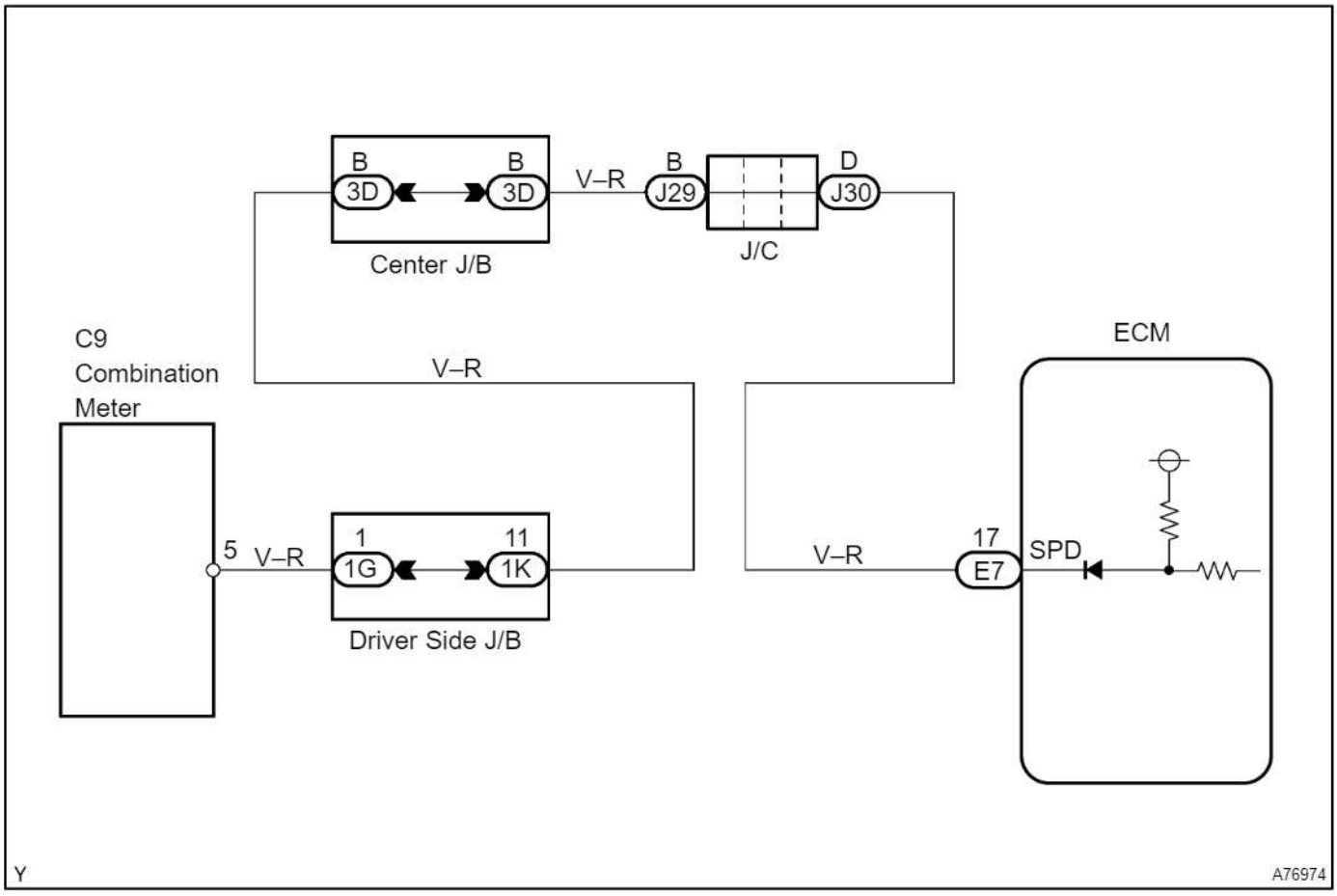
TYPICAL ENABLING CONDITIONS

Vehicle speed is 6 mph (9 km/h) or more	4 seconds or more
park/Neutral position switch	OFF
Time after ignition switch to ON	0.5 second or more

TYPICAL MALFUNCTION THRESHOLDS

Number of no pulse input during 16 pulse input of output speed sensor (2WD)	500 times or more
Number of no pulse input during 16 pulse input of output speed sensor with transfer switch OFF (4WD)	500 times or more
Number of no pulse input during 41 pulse input of output speed sensor with transfer switch ON (4WD)	500 times or more

WIRING DIAGRAM



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INSPECTION PROCEDURE

HINT:
Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

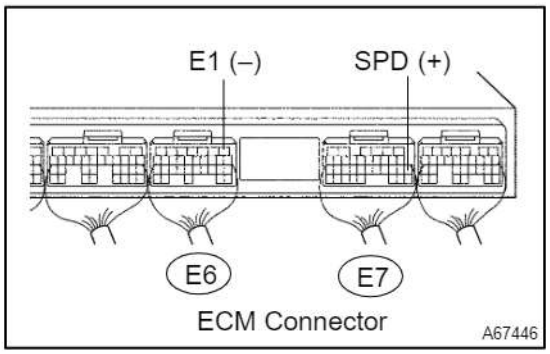
1	CHECK OPERATION OF SPEEDOMETER

(a) Drive the vehicle and check if the operation of the speedometer in the combination meter is normal.
HINT:
The vehicle speed sensor is operating normally if the speedometer display is normal.

NG → **CHECK SPEEDOMETER CIRCUIT (See page 05–1702)**

OK

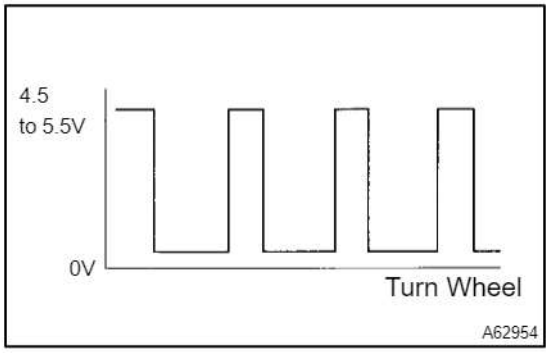
2	INSPECT ECM(SPD VOLTAGE)



(a) Shift the lever to the neutral position.
(b) Jack up the vehicle.
(c) Turn the ignition switch to ON.
(d) Measure the voltage between the specified terminals of the E6 and E7 ECM connectors as the wheel is turned slowly.

Standard:

Tester Connection	Specified Condition
SPD (E7–17) – E1 (E6–1)	Generated intermittently



HINT:
The output voltage should fluctuate up and down similarly to the diagram on the left when the wheel is turned slowly.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM (See page 10–11)

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DTC P0504 BRAKE SWITCH "A"/"B" CORRELATION

CIRCUIT DESCRIPTION

In addition to turning on the stop lamps, the stop lamp switch signals are used for a variety of engine, transmission, and suspension functions as well as being an input for diagnostic checks. It is important that the switch operates properly, therefore this switch is designed with two complementary signal output: STP and ST1–. The ECM analyzes these signal output to detect malfunctions in the stop lamp switch.

HINT:

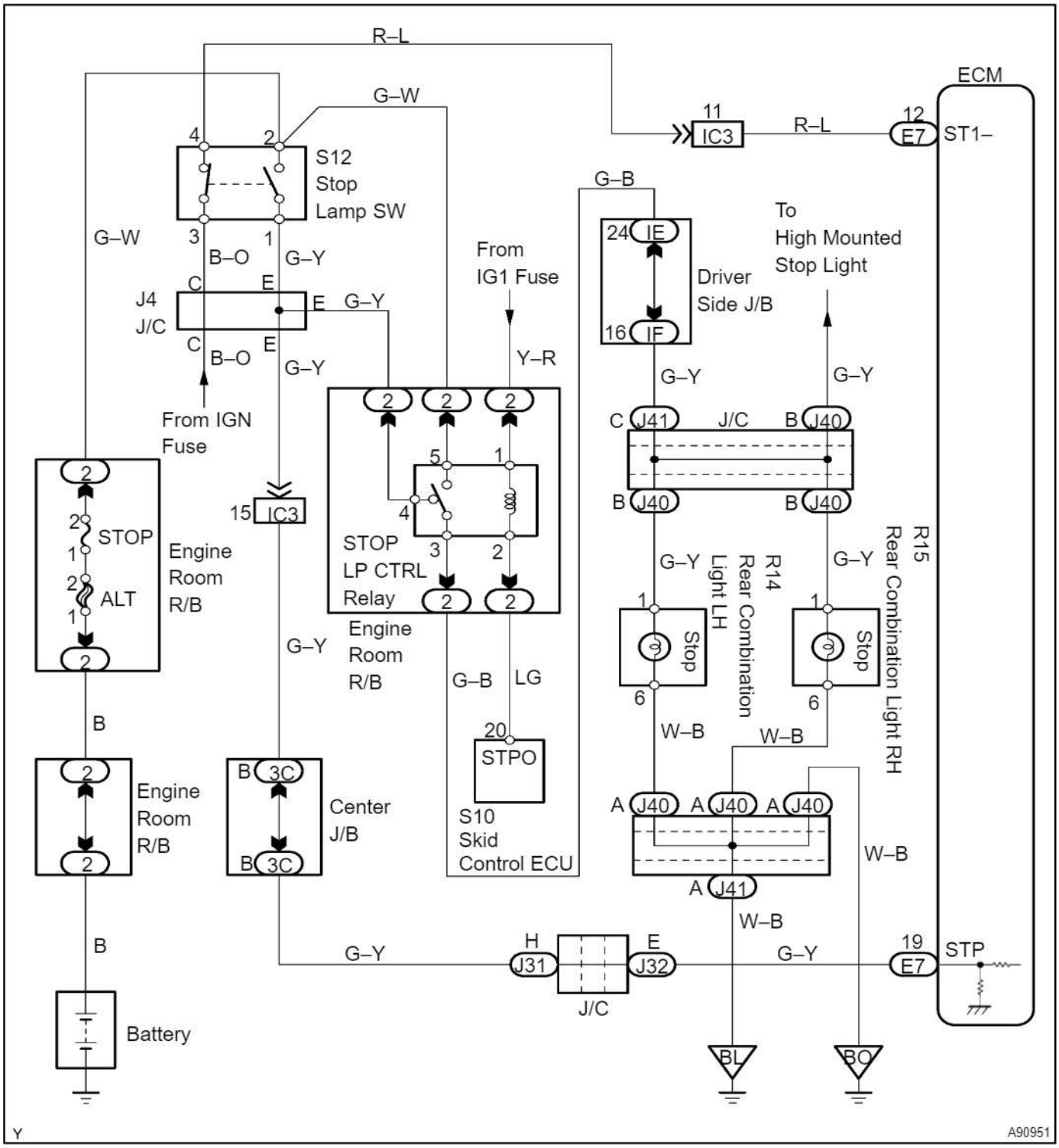
Normal condition is as shown in the table.

Signal	Brake Pedal Released	In Transition	Brake Pedal Depressed
STP	OFF	ON	ON
ST1–	ON	ON	OFF

DTC No.	DTC Detection Condition	Trouble Area
P0504	Conditions (a), (b) and (c) continue for 0.5 second or more: (a) Ignition switch ON (b) Brake pedal released (c) STP signal is OFF when the ST1– signal is OFF	□Short in stop lamp switch signal circuit □Stop lamp fuse □Stop lamp switch □ECM

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WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

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Hand–held tester:

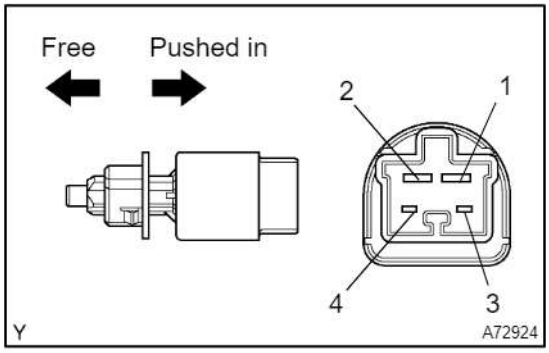
1	CHECK OPERATION OF STOP LAMP

(a) Check if the stop lamps go on and off normally when the brake pedal is depressed and released.

NG → REPAIR OR REPLACE STOP LAMP SWITCH CIRCUIT

OK

2	INSPECT STOP LAMP SWITCH ASSY



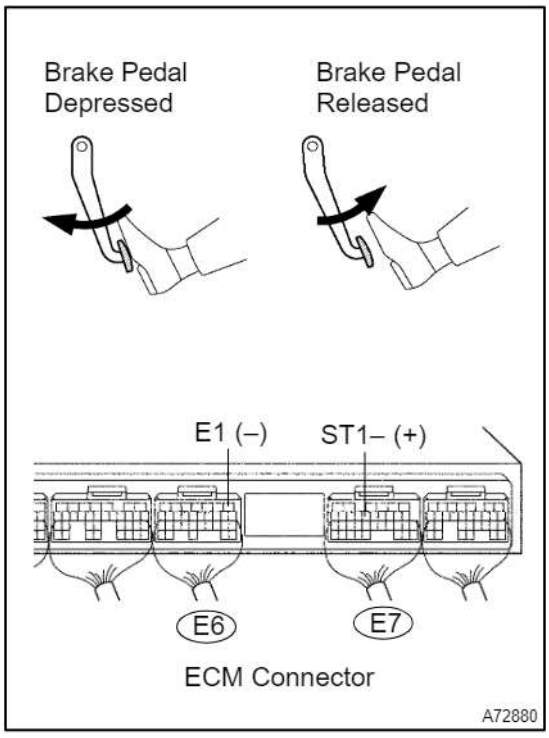
(a) Check for continuity between each pair of the terminals.
Standard:

Switch Position	Tester Connection	Specified Condition
Switch pin free	1 – 2	Continuity
	3 – 4	No continuity
Switch pin pushed in	1 – 2	No continuity
	3 – 4	Continuity

NG → REPLACE STOP LAMP SWITCH ASSY

OK

3	READ VALUE OF HAND–HELD TESTER(STP SIGNAL AND ST1– VOLTAGE)



(a) Turn the ignition switch to ON.
(b) On the hand–held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / STOP LIGHT SW.
(c) Read the values.
Standard:

Brake Pedal	Specified Condition
Depressed	STP Signal ON
Released	STP Signal OFF

(d) Measure the voltage between the specified terminals of the E6 and E7 ECM connectors.
Standard:

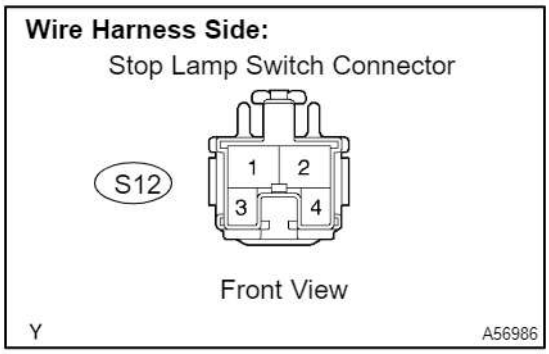
Tester Connection	Brake Pedal	Specified Condition
ST1– (E7–12) – E1 (E6–1)	Depressed	Below 1.5 V
	Released	7.5 to 14 V

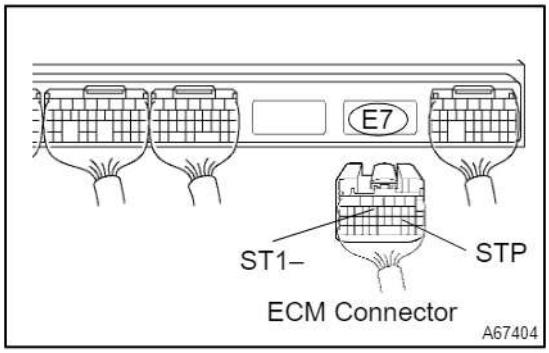
OK → CHECK FOR INTERMITTENT PROBLEMS (See page 05–331)

NG

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4 CHECK HARNESS AND CONNECTOR(STOP LAMP SWITCH – ECM)





(a) Disconnect the S12 stop lamp switch connector.
(b) Disconnect the E7 ECM connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Stop lamp switch (S12–1) – STP (E7–19)	Below 1 Ω
Stop lamp switch (S12–4) – ST1– (E7–12)	

Standard (Check for short):

Tester Connection	Specified Condition
Stop lamp switch (S12–1) or STP (E7–19) – Body ground	10 kΩ or higher
Stop lamp switch (S12–4) or ST1– (E7–12) – Body ground	

(d) Reconnect the stop lamp switch connector.
(e) Reconnect the ECM connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM (See page 10–11)

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OBD II scan tool (excluding hand–held tester):

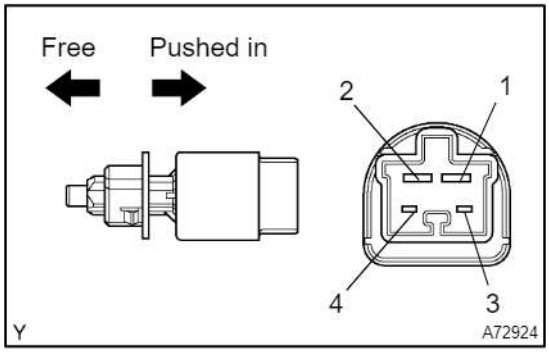
1	CHECK OPERATION OF STOP LAMP

(a) Check if the stop lamps go on and off normally when the brake pedal is depressed and released.

NG → REPAIR OR REPLACE STOP LAMP SWITCH CIRCUIT

OK

2	INSPECT STOP LAMP SWITCH ASSY



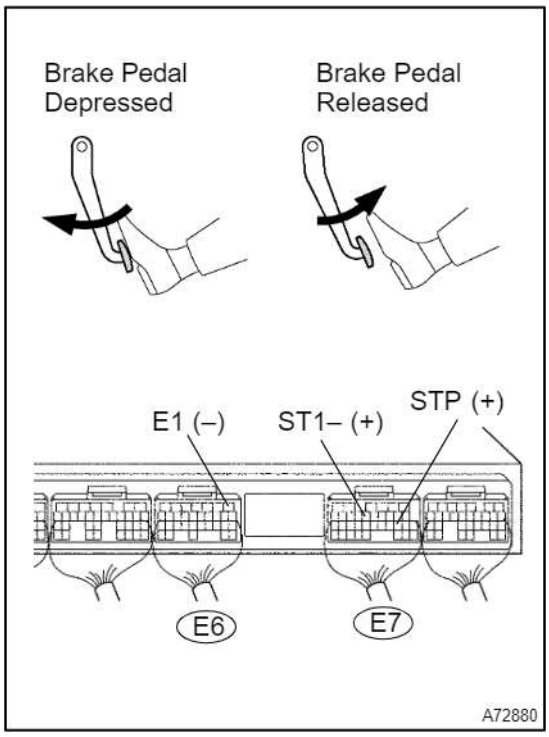
(a) Check for continuity between each pair of the terminals.
Standard:

Switch Position	Tester Connection	Specified Condition
Switch pin free	1 – 2	Continuity
	3 – 4	No continuity
Switch pin pushed in	1 – 2	No continuity
	3 – 4	Continuity

NG → REPLACE STOP LAMP SWITCH ASSY

OK

3	INSPECT ECM(STP AND ST1– VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between the terminals of the E6 and E7 ECM connectors.
Standard:

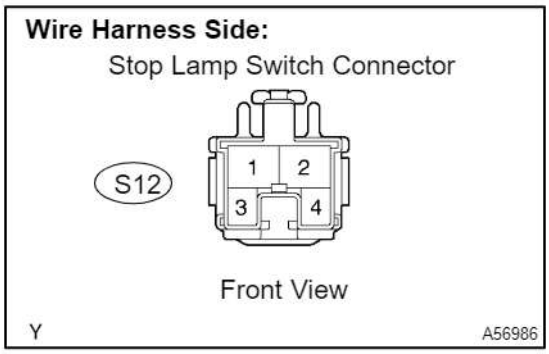
Tester Connection	Brake Pedal Position	Specified Condition
STP (E7–19) – E1 (E6–1)	Depressed	7.5 to 14 V
	Released	Below 1.5 V
ST1– (E7–12) – E1 (E6–1)	Depressed	Below 1.5 V
	Released	7.5 to 14 V

OK → CHECK FOR INTERMITTENT PROBLEMS (See page 05–331)

NG

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4 CHECK HARNESS AND CONNECTOR(STOP LAMP SWITCH – ECM)



(a) Disconnect the S12 stop lamp switch connector.
(b) Disconnect the E7 ECM connector.
(c) Check the resistance between the wire harness side connectors.

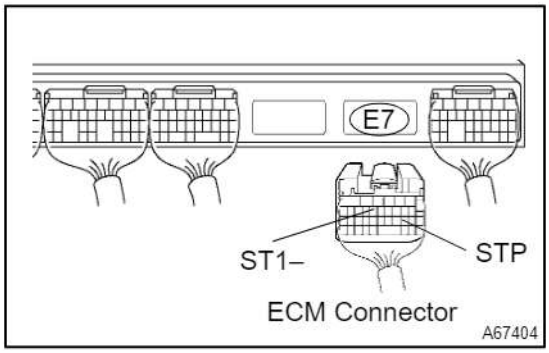
Standard (Check for open):

Tester Connection	Specified Condition
Stop lamp switch (S12–1) – STP (E7–19)	Below 1 Ω
Stop lamp switch (S12–4) – ST1– (E7–12)	

Standard (Check for short):

Tester Connection	Specified Condition
Stop lamp switch (S12–1) or STP (E7–19) – Body ground	10 kΩ or higher
Stop lamp switch (S12–4) or ST1– (E7–12) – Body ground	

(d) Reconnect the stop lamp switch connector.
(e) Reconnect the ECM connector.



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK →

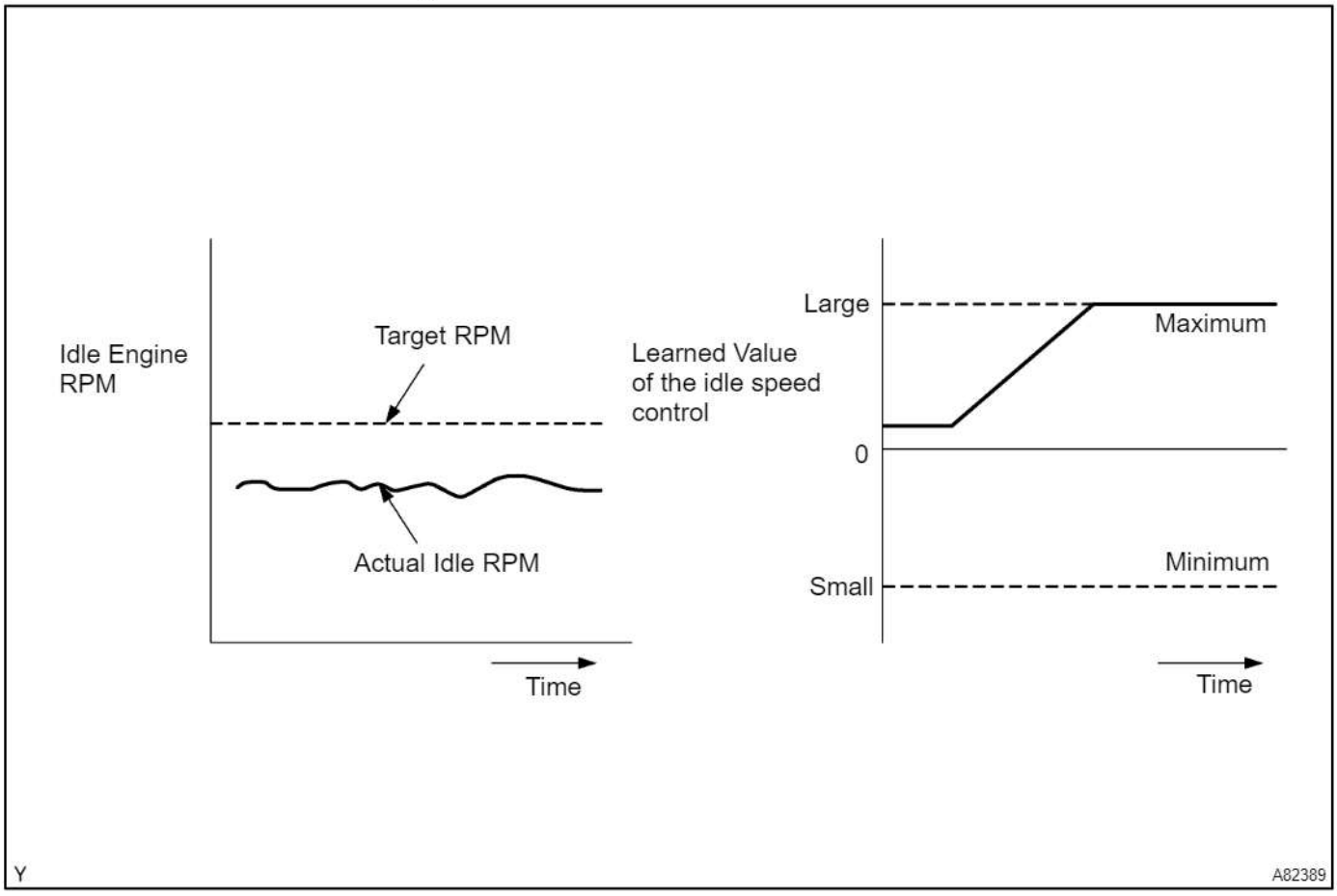
REPLACE ECM (See page 10–11)

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DTC P0505 IDLE AIR CONTROL SYSTEM

MONITOR DESCRIPTION

The idle speed is controlled by the Electronic Throttle Control System (ETCS).
The ETCS is composed of the throttle motor which operates the throttle valve, and the throttle position sensor which detects an opening angle of the throttle valve.
The ECM controls the throttle motor to provide the proper throttle valve opening angle to obtain the target idle speed.
The ECM regulates the idle speed by opening and closing the throttle valve using the ETCS. The ECM concludes that the idle speed control ECM function is malfunctioning if: 1) the actual idle RPM varies more than the specified amount five times or more during a drive cycle, or 2) a learned value of the idle speed control remains at the maximum or minimum five times or more during a drive cycle. The ECM will turn on the MIL and set a DTC.
Example:
If the actual idle RPM varies from the target idle RPM by more than 200 (*1) rpm five times during a drive cycle, the ECM will turn on the MIL and a DTC is set.
HINT:
*1: RPM threshold varies with engine load.



DTC No.	DTC Detection Condition	Trouble Area
P0505	Idle speed continues to vary greatly from target speed (2 trip detection logic)	□Electric throttle control system □Air induction system □PCV hose connection

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MONITOR STRATEGY

Related DTCs	P0505: Idle air control (IAC) function malfunction P0505: Idle air control (IAC) output malfunction
Required sensors/ components (Main)	Electronic throttle control system
Required sensors/ components (Related)	Engine coolant temperature sensor, Vehicle speed sensor, Crankshaft position sensor
Frequency of operation	Continuous
Duration	10 minutes: IAC function malfunction 10 seconds: IAC output malfunction
MIL operation	2 driving cycles: IAC function malfunction Immediate: IAC output malfunction
Sequence operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05–334

IAC function malfunction:

Both of following condition are met:	
IAC flow rate learning is enabled	3 seconds
Engine	Running
Engine speed in which engine is judged running	400 rpm or more
Engine speed in which engine is judged not running	less than 400 rpm

IAC output malfunction:

IAC duty–cycle ratio	10 to 90 %
Battery voltage	10 V

TYPICAL MALFUNCTION THRESHOLDS

IAC function malfunction:

Either of the following conditions, A or B, is met:	
Condition A	
IAC flow rate (Learned value)	–0.75 liters or less, or 2.08 liters or more, per second (A/C is turned ON) –0.17 liters or less, or 2.08 liters or more, per second (A/C is turned OFF)
Condition B	
The number of times that the following condition is met:	5 times
Deviation of idle speed after running by 6 mph (10 km/h) or more	Less than –100 rpm, or more than 200 rpm (Shift position is N or A/C is turned ON) Less than –100 rpm, or more than 150 rpm (Shift position is D or A/C is turned OFF)

IAC output malfunction:

IAC duty–cycle ratio	None

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INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1	CHECK OTHER DTC OUTPUT(IN ADDITION TO DTC P0505)

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(c) Select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(d) Read DTCs.

Result:

Display (DTC output)	Proceed to
P0505	A
P0505 and other DTCs	B

HINT:

If any other codes besides P0505 are output, perform troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05–366)**

A

2	CHECK CONNECTION OF PCV HOSE

NG → **REPAIR OR REPLACE PCV HOSE**

OK

3	CHECK AIR INDUCTION SYSTEM

(a) Check for vacuum leaks in the air induction system.

NG → **REPAIR OR REPLACE AIR INDUCTION SYSTEM**

OK

CHECK ELECTRIC THROTTLE CONTROL SYSTEM (See page 10–1)

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DTC P0560 SYSTEM VOLTAGE

MONITOR DESCRIPTION

The battery supplies electricity to the ECM even when the ignition switch is OFF. This electricity allows the ECM to store data such as DTC history, freeze frame data, fuel trim values, and other data. If the battery voltage falls below a minimum level, the ECM will conclude that there is a fault in the power supply circuit. The next time the engine start, the ECM will turn on the MIL and a DTC will be set.

DTC No.	DTC Detection Condition	Trouble Area
P0560	Open in back–up power source circuit	□Open in back–up power source circuit □ECM

HINT:
If DTC P0560 is present, the ECM will not store other DTCs.

MONITOR STRATEGY

Related DTCs	P0560: System voltage malfunction
Required sensors/components	ECM
Frequency of operation	Continuous
Duration	3 seconds
MIL operation	Immediately (*1)
Sequence of operation	None

*1: The DTC is set immediately. The MIL will be illuminated after the next engine start.

TYPICAL ENABLING CONDITIONS

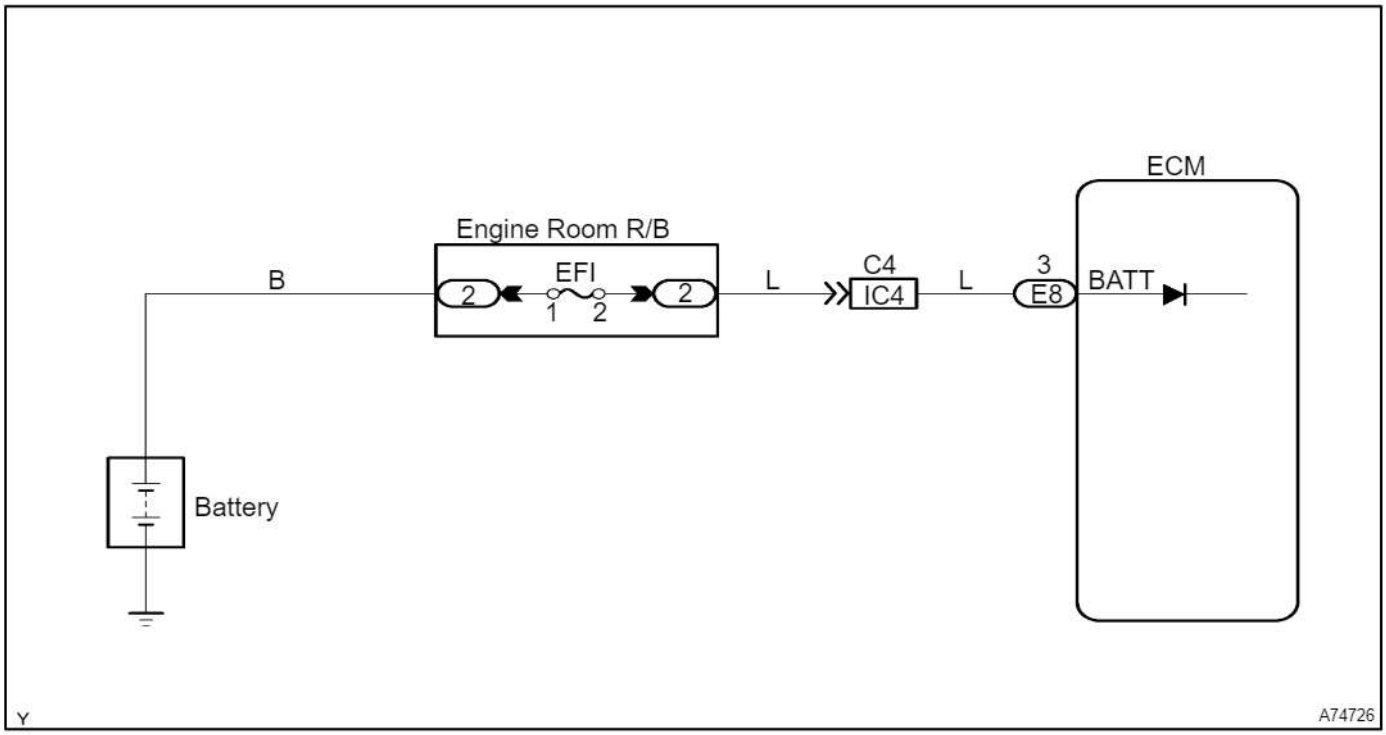
The monitor will run whenever the following DTCs are not present	See page 05–334
Stand–by RAM	Initialized

TYPICAL MALFUNCTION THRESHOLDS

Battery voltage	Less than 3.5 V

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WIRING DIAGRAM

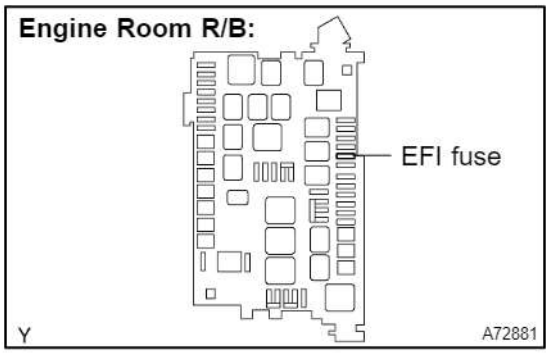


INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1	CHECK FUSE(EFI FUSE)



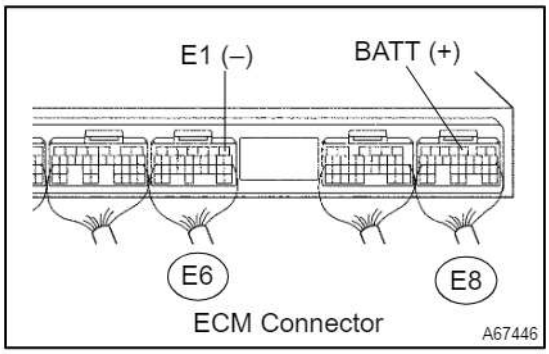
(a) Remove the EFI fuse from the engine room R/B.
(b) Check for continuity in the EFI fuse.
Standard: Continuity
(c) Reinstall the EFI fuse.

NG → **CHECK FOR SHORT IN ALL HARNESSES AND COMPONENTS CONNECTED FUSE**

OK

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2 INSPECT ECM(BATT VOLTAGE)



(a) Measure the voltage between the terminals of the E6 and E8 ECM connectors.

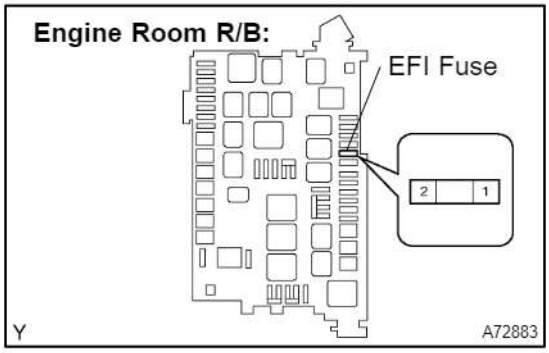
Standard:

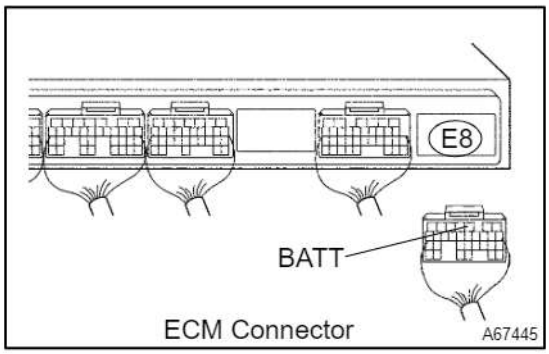
Tester Connection	Specified Condition
BATT (E8–3) – E1 (E6–1)	9 to 14 V

OK → **REPLACE ECM (See page 10–11)**

NG

3 CHECK HARNESS AND CONNECTOR(ECM – EFI FUSE, EFI FUSE – BATTERY)





(a) Check the harness and the connector between the EFI fuse and ECM.
(1) Remove the EFI fuse from the engine room R/B.
(2) Disconnect the E8 ECM connector.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
EFI fuse (2) – BATT (E8–3)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
EFI fuse (2) or BATT (E8–3) – Body ground	10 kΩ or higher

(4) Reinstall the EFI fuse.
(5) Reconnect the ECM connector.

(b) Check the harness and the connector between the EFI fuse and battery.
(1) Remove the EFI fuse from the engine room R/B.
(2) Disconnect the positive battery terminal.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Battery positive terminal – EFI fuse (1)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
Battery positive terminal or EFI fuse (1) – Body ground	10 kΩ or higher

(4) Reinstall the EFI fuse.
(5) Reconnect the positive battery positive terminal.

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NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

CHECK AND REPLACE ENGINE ROOM RELAY BLOCK

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DTC	P0604	INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR

DTC	P0606	ECM/PCM PROCESSOR

DTC	P0607	CONTROL MODULE PERFORMANCE

DTC	P0657	ACTUATOR SUPPLY VOLTAGE CIRCUIT/OPEN

MONITOR DESCRIPTION

The ECM continuously monitors its internal memory status, internal circuits, and output signals to the throttle actuator. This self–check ensures that the ECM is functioning properly. If any malfunction is detected, the ECM will set the appropriate DTC and illuminate the MIL.
The ECM memory status is diagnosed by internal ”mirroring” of the main CPU and the sub CPU to detect random access memory (RAM) errors. The two CPUs also perform continuous mutual monitoring.

The ECM sets a DTC if: 1) output from the 2 CPUs is different and deviates from the standards, 2) the signals to the throttle actuator deviate from the standards, 3) a malfunction is found in the throttle actuator supply voltage, and 4) any other ECM malfunction is found.

DTC No.	DTC Detection Condition	Trouble Area
P0604 P0606 P0607 P0657	ECM internal error	ECM

MONITOR STRATEGY

Related DTCs	P0604: ECM RAM errors P0606: ECM CPU malfunctions P0657: ETCS power supply function of ECM malfunctions
Required sensors/ components (Main)	ECM
Required sensors/ components (Related)	–
Frequency of operation	Continuous
Duration	Within 1 second
MIL operation	Immediate
Sequence operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	None

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TYPICAL MALFUNCTION THRESHOLDS

ECM RAM errors:

Difference between main and sub CPU output	Larger than the specified range

ECM CPU malfunctions:

Either of the following conditions is met:	
Difference between throttle position of main CPU and throttle position of sub CPU	0.3 V or more
Difference between accelerator pedal position of main CPU and accelerator pedal position of sub CPU	0.3 V or more

Electronic throttle control system power supply function of ECM malfunctions:

Electronic throttle control system power supply when ignition switch is turned from OFF to ON	7 V or more

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

REPLACE ECM (See page 10–11)

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DTC P0617 STARTER RELAY CIRCUIT HIGH

MONITOR DESCRIPTION

HINT:

Refer to cranking holding function circuit on page 05–635.

While the engine is being cranked, the battery positive voltage is applied to terminal STA of the ECM. If the vehicle is being driven and the ECM detects the starter control signal (STA), the ECM concludes that the starter control circuit is malfunctioning. The ECM will turn on the MIL and a DTC is set.

DTC No.	DTC Detection Condition	Trouble Area
P0617	When conditions (a), (b) and (c) are met when the battery (+B) voltage 10.5 V or more is applied for 20 seconds: (a) Vehicle speed greater than 12 mph (20 km/h) (b) Engine speed greater than 1,000 rpm (c) STA signal ON	□Short in Park/Neutral position switch circuit □Park/Neutral position switch □Cranking holding function circuit □ECM

MONITOR STRATEGY

Related DTCs	P0617: Starter signal error
Required sensors/ components (Main)	Starter relay, Park/Neutral position switch, Ignition switch
Required sensors/ components (Related)	Vehicle speed sensor, Crankshaft position sensor
Frequency of operation	Continuous
Duration	20 seconds
MIL operation	Immediate
Sequence operation	None

TYPICAL ENABLING CONDITIONS

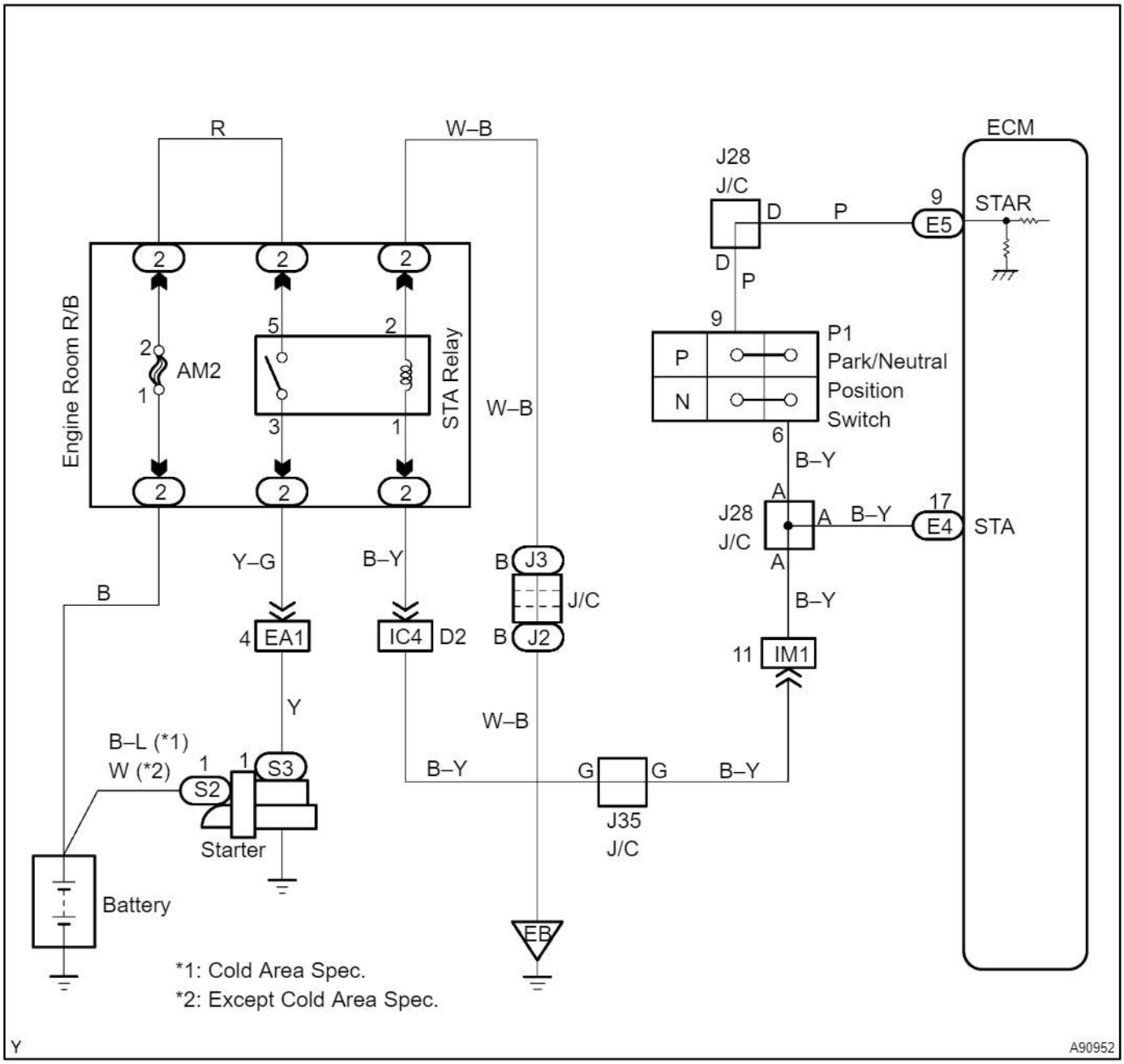
The monitor will run whenever the following DTCs are not present	None
Battery voltage	10.5 V or more
Vehicle speed	12 mph (20 km/h) or more
Engine RPM	1,000 rpm or more

TYPICAL MALFUNCTION THRESHOLDS

Starter signal	ON

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WIRING DIAGRAM



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INSPECTION PROCEDURE

HINT:

- This DTC chart is on the premise that the engine is cranked normally. If the engine is not cranked, proceed to the problem symptoms table on page 05–348.
- Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

Hand–held tester:

1 READ VALUE OF HAND–HELD TESTER(STA SIGNAL)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch to ON and turn the hand–held tester ON.
(c) On the hand–held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / STARTER SIG. Read the values.

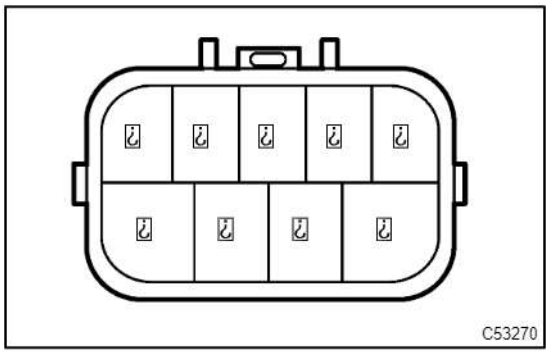
Standard:

Ignition Switch Position	ON	START
STARTER SIG	OFF	ON

OK → **REPLACE ECM(See page 10–11)**

NG

2 INSPECT PARK/NEUTRAL POSITION SWITCH ASSY



(a) Disconnect the park/neutral position switch connector.
(b) Check for continuity between each terminal shown below when the shift lever is moved to each position.

Standard:

Shift Position	Tester Connection	Specified Condition
P	1 – except 3 6 – except 9	No continuity
R	2 – except 3	
N	3 – except 5 6 – except 9	
D	3 – except 7	
3	3 – except 4	
2, L	3 – except 8	

(c) Reconnect the park/neutral position switch connector.

NG → **REPLACE PARK/NEUTRAL POSITION SWITCH ASSY (THEN CHECK CRANKING HOLDING FUNCTION CIRCUIT) (See page 05–635)**

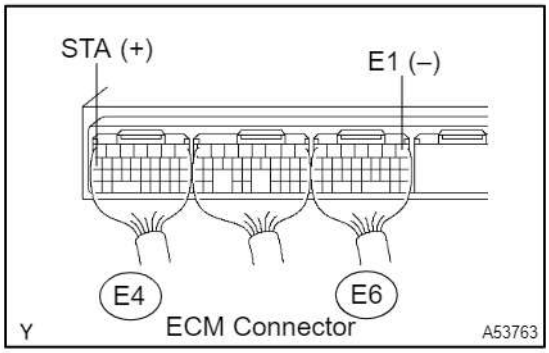
OK

CHECK CRANKING HOLDING FUNCTION CIRCUIT (See page 05–635)

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OBD II scan tool (excluding hand–held tester):

1 INSPECT ECM(STA VOLTAGE)



(a) Measure the voltage between the terminals of the E4 and E6 ECM connectors.

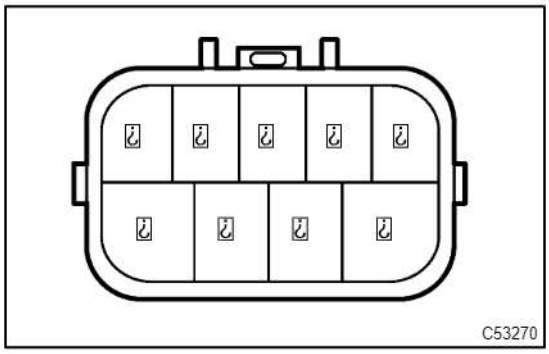
Standard:

Tester Connection	Condition	Specified Condition
STA (E4–17) – E1 (E6–1)	Ignition switch ON	Below 0.5 V
	Engine cranking	9 to 14 V

OK → **REPLACE ECM (See page 10–11)**

NG

2 INSPECT PARK/NEUTRAL POSITION SWITCH ASSY



(a) Disconnect the park/neutral position switch connector.

(b) Check for continuity between each terminal shown below when the shift lever is moved to each position.

Standard:

Shift Position	Tester Connection	Specified Condition
P	1 – except 3 6 – except 9	No continuity
R	2 – except 3	
N	3 – except 5 6 – except 9	
D	3 – except 7	
3	3 – except 4	
2, L	3 – except 8	

(c) Reconnect the park/neutral position switch connector.

NG → **REPLACE PARK/NEUTRAL POSITION SWITCH ASSY (THEN CHECK CRANKING HOLDING FUNCTION CIRCUIT) (See page 05–635)**

OK

CHECK CRANKING HOLDING FUNCTION CIRCUIT (See page 05–635)

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DTC	P2102	THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW

DTC	P2103	THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH

CIRCUIT DESCRIPTION

The throttle motor is operated by the ECM and it opens and closes the throttle valve.
The opening angle of the throttle valve is detected by the throttle position sensor which is mounted on the throttle body. The throttle position sensor provides feedback to the ECM. This feedback allows the ECM to control the throttle motor and monitor the throttle opening angle as the ECM responds to driver input.
HINT:
This Electrical Throttle Control System (ETCS) does not use a throttle cable.

DTC No.	DTC Detection Condition	Trouble Area
P2102	Conditions (a) and (b) continue for 2.0 seconds: (a) Throttle control motor output duty 80 % or more (b) Throttle control motor current 0.5 A or less	□Open in throttle control motor circuit □Throttle control motor □ECM
P2103	Either of following conditions is met □Throttle control motor current 10 A or more (0.1 second) □Throttle control motor current 7A or more (0.6 second)	□ECM □Short in throttle control motor circuit □Throttle control motor □Throttle valve □Throttle body assembly □ECM

MONITOR DESCRIPTION

The ECM monitors the flow of electrical current through the electronic throttle motor, and detects malfunctions or open circuits in the throttle motor based on the value of the electrical current. When the current deviates from the standard values, the ECM concludes that there is a fault in the throttle motor. Or, if the throttle valve is not functioning properly (for example, stuck ON) the ECM concludes that there is a fault and turns on the MIL and a DTC is set.
Example:
When the current is more than 10A. Or, the current is less than 0.5 A when the motor driving duty ratio is more than 80 %. The ECM concludes that the current is deviated from the standard values, turns on the MIL and a DTC is set.

FAIL SAFE

If the Electronic Throttle Control System (ETCS) has a malfunction, the ECM cuts off current to the throttle control motor. The throttle control valve returns to a predetermined opening angle (approximately 16) by the force of the return spring. The ECM then adjusts the engine output by controlling the fuel injection (intermittent fuel–cut) and ignition timing in accordance with the accelerator pedal opening angle to enable the vehicle to continue at a minimal speed.
If the accelerator pedal is depressed firmly and slowly, the vehicle can be driven slowly.
If a ”pass” condition is detected and then the ignition switch is turned to OFF, the fail–safe operation will stop and the system will return to normal condition.

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MONITOR STRATEGY

Related DTCs	P2102: Throttle actuator open/short (Low electrical current) P2103: Throttle actuator open/short (High electrical current)
Required sensors/ components (Main)	Throttle actuator (Throttle body)
Required sensors/ components (Related)	–
Frequency of operation	Continuous
Duration	2 seconds
MIL operation	P2102: Immediate P2103: 1 driving cycle
Sequence operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	None

P2102:

Duty–cycle ratio to open throttle actuator	80 % or more
Throttle actuator power supply	8 V or more

P2103:

Throttle actuator power supply	8 V or more

TYPICAL MALFUNCTION THRESHOLDS

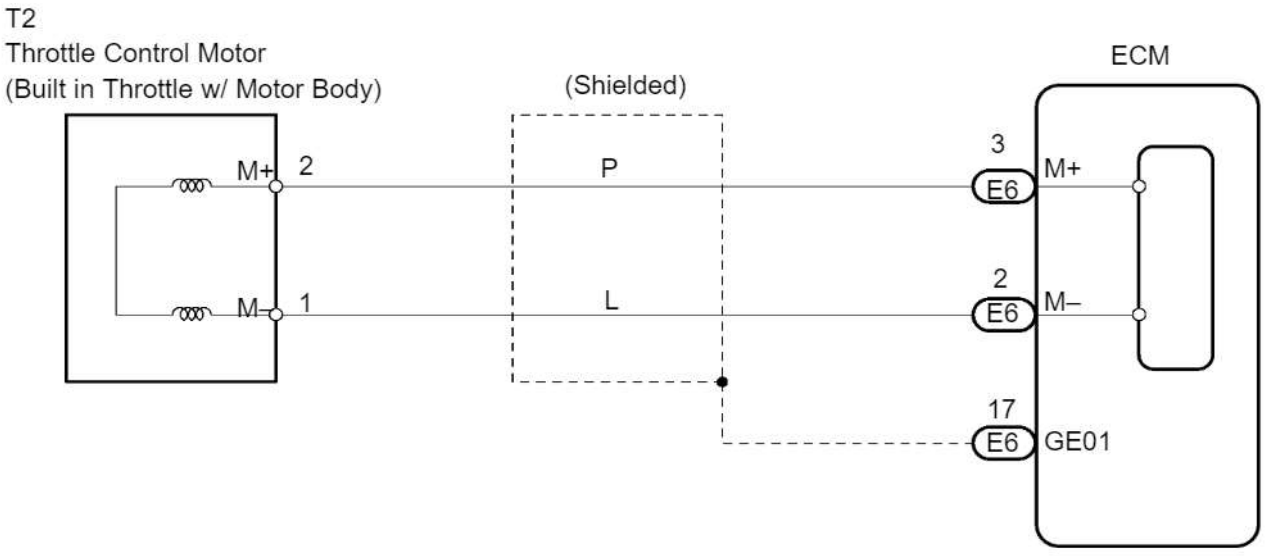
P2102:

Throttle motor electrical current	Less than 0.5 A

P2103:

Either of the following conditions is set:	
Hybrid IC diagnosis signal	Fail (for 0.1 seconds)
Hybrid IC current limiter port	Fail (for 0.6 seconds)

WIRING DIAGRAM



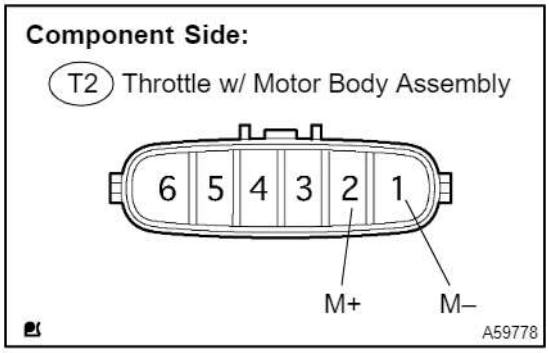
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INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1	INSPECT THROTTLE W/MOTOR BODY ASSY(RESISTANCE OF THROTTLE CONTROL MOTOR)



(a) Disconnect the T2 throttle w/ motor body connector.
(b) Measure the motor resistance between the terminals of the throttle control motor.

Standard:

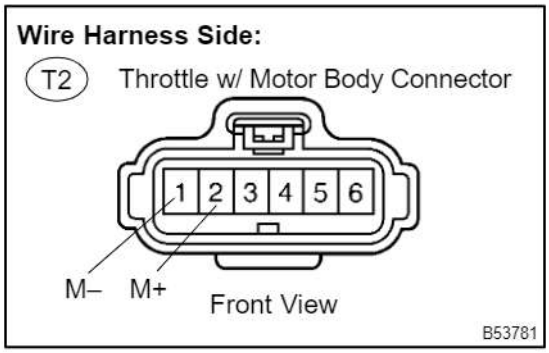
Tester Connection	Specified Condition
M+ (T2–2) – M– (T2–1)	0.3 to 100 Ω (20 C (68 F))

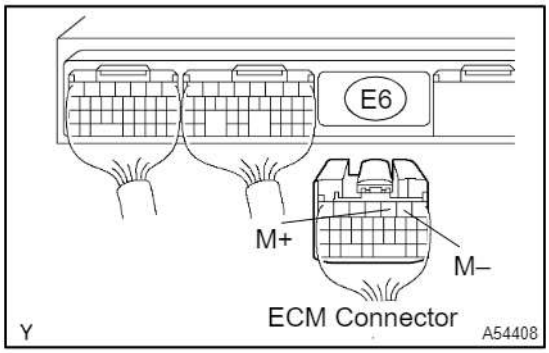
(c) Reconnect the throttle body connector.

NG → **REPLACE THROTTLE W/MOTOR BODY ASSY**

OK

2	CHECK HARNESS AND CONNECTOR(THROTTLE CONTROL MOTOR – ECM)





(a) Disconnect the T2 throttle w/ motor body connector.
(b) Disconnect the E6 ECM connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
M+ (T2–2) – M+ (E6–3)	Below 1 Ω
M– (T2–1) – M– (E6–2)	

Standard (Check for short):

Tester Connection	Specified Condition
M+ (T2–2) or M+ (E6–3) – Body ground	10 kΩ or higher
M– (T2–1) or M– (E6–2) – Body ground	

(d) Reconnect the throttle body connector.
(e) Reconnect the ECM connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

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3	INSPECT THROTTLE W/MOTOR BODY ASSY

(a) Check if a foreign object has been caught between the throttle valve and housing. Also, check if the valve can open and close smoothly.

NG → REMOVE FOREIGN OBJECT AND CLEAN THROTTLE BODY

OK

REPLACE ECM (See page 10–11)

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DTC	P2111	THROTTLE ACTUATOR CONTROL SYSTEM – STUCK OPEN

DTC	P2112	THROTTLE ACTUATOR CONTROL SYSTEM – STUCK CLOSED

CIRCUIT DESCRIPTION

The throttle motor is operated by the ECM and it opens and closes the throttle valve using gears. The opening angle of the throttle valve is detected by the throttle position sensor, which is mounted on the throttle body. The throttle position sensor provides feedback to the ECM to control the throttle motor and set the throttle valve angle in response to driver input.

HINT:

This Electrical Throttle Control System (ETCS) does not use a throttle cable.

DTC No.	DTC Detection Condition	Trouble Area
P2111	Throttle valve opening angle is stuck during ECM orders to close (1 trip detection logic)	□Throttle control motor circuit □Throttle control motor □Throttle body assembly □Throttle valve
P2112	Throttle valve opening angle is stuck during ECM orders to open (1 trip detection logic)	

MONITOR DESCRIPTION

The ECM concludes that there is a malfunction of the ETCS when the throttle valve remains at a fixed angle despite high drive current from the ECM. The ECM will turn on the MIL and a DTC is set.

FAIL SAFE

If the Electronic Throttle Control System (ETCS) has a malfunction, the ECM cuts off current to the throttle control motor. The throttle control valve returns to a predetermined opening angle (approximately 16) by the force of the return spring. The ECM then adjusts the engine output by controlling the fuel injection (intermittent fuel–cut) and ignition timing in accordance with the accelerator pedal opening angle to enable the vehicle to continue at a minimal speed.

If the accelerator pedal is depressed firmly and slowly, the vehicle can be driven slowly.

If a ”pass” condition is detected and then the ignition switch is turned to OFF, the fail–safe operation will stop and the system will return to normal condition.

MONITOR STRATEGY

Related DTCs	P2111: Throttle actuator stuck open P2112: Throttle actuator stuck close
Required sensors/ components (Main)	Throttle actuator, Throttle valve
Required sensors/ components (Related)	–
Frequency of operation	Continuous
Duration	0.5 second
MIL operation	Immediate
Sequence operation	None

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TYPICAL ENABLING CONDITIONS

All:

The monitor will run whenever the following DTCs are not present	None

P2111:

Throttle motor electrical current	2 A or more
Duty–cycle ratio to close throttle valve	80 % or more

P2112:

Throttle motor electrical current	2 A or more
Duty–cycle ratio to open throttle valve	80 % or more

TYPICAL MALFUNCTION THRESHOLDS

TP sensor voltage change	Less than 0.1 A

WIRING DIAGRAM

Refer to DTC P2102 on page 05–569.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1	**CHECK OTHER DTCS OUTPUT**

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(c) Select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(d) Read DTCs.

Result:

Display (DTC output)	Proceed to
P2111 or P2112	A
P2111 or P2112 and other DTCs	B

HINT:

If any other codes besides P2111 or P2112 are output, perform troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05–366)**

A

2	**INSPECT THROTTLE W/MOTOR BODY ASSY(VISUALLY CHECK THROTTLE VALVE)**

(a) Check for contamination between the throttle valve and the housing. If necessary, clean the throttle body.And check that the throttle valve moves smoothly.

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NG → **REPLACE THROTTLE W/MOTOR BODY ASSY (See page 10–6)**

OK

3	CHECK DTC OUTPUT

(a) Clear the DTC (See page 05–355).
(b) Start the engine, and depress and release the accelerator pedal quickly (fully open and fully close).
(c) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(d) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(e) Select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(f) Read DTC.

Result:

Display (DTC output)	Proceed to
No DTC	A
P2111 and/or P2112	B

B → **REPLACE ECM (See page 10–11)**

A

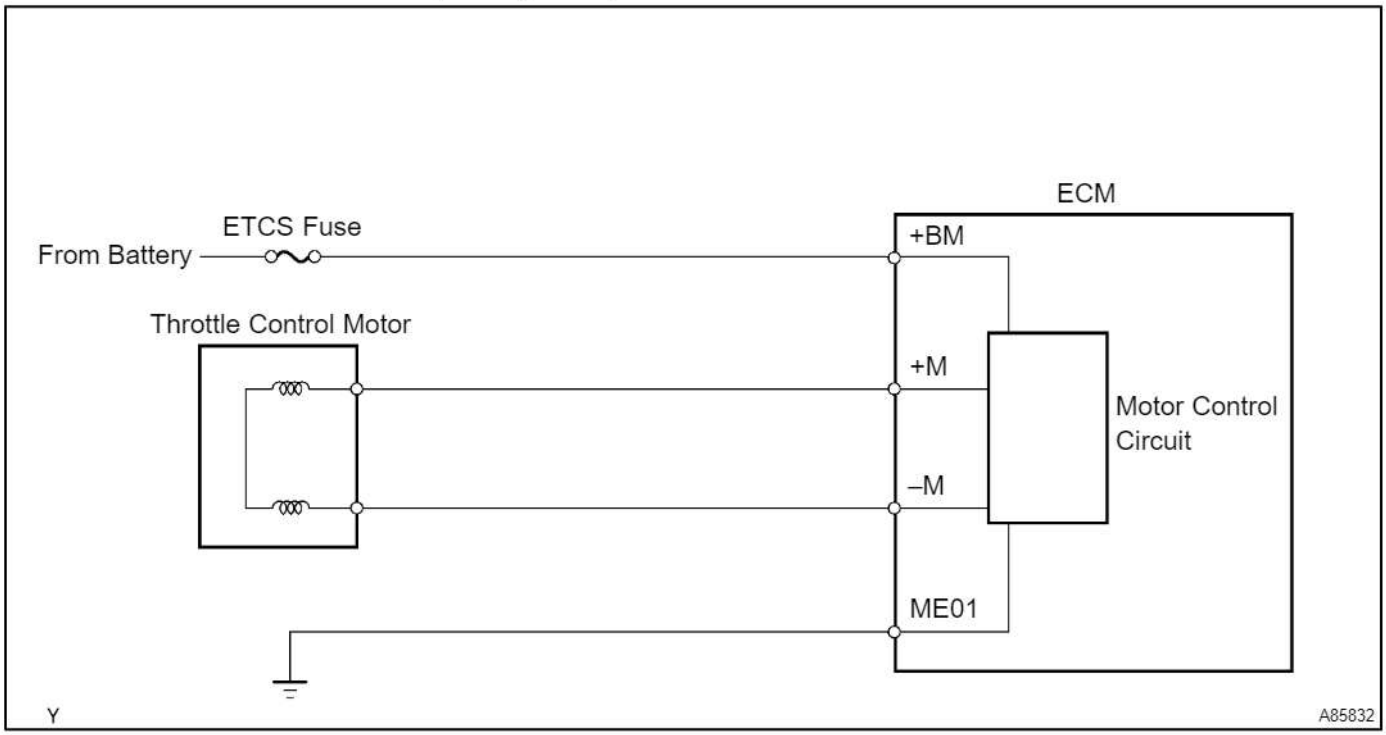
CHECK FOR INTERMITTENT PROBLEMS (See page 05–331)

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DTC	P2118	THROTTLE ACTUATOR CONTROL MOTOR CURRENT RANGE/PERFORMANCE

CIRCUIT DESCRIPTION

The Electronic Throttle Control System (ETCS) has a dedicated power supply circuit. The voltage (+BM) is monitored and when the voltage is low (less than 4V), the ECM concludes that the ETCS has a fault and current to the throttle control motor is cut.
When the voltage becomes unstable, the ETCS itself becomes unstable. For this reason, when the voltage is low, the current to the motor is cut. If repairs are made and the system has returned to normal, turn the ignition switch to OFF. The ECM then allows current to flow to the motor and the motor can be restarted.
HINT:
This Electrical Throttle Control System (ETCS) does not use a throttle cable.



DTC No.	DTC Detection Condition	Trouble Area
P2118	Open in ETCS power source circuit	□Open in ETCS power source circuit □ETCS fuse □ECM

MONITOR DESCRIPTION

The ECM monitors the battery supply voltage applied to the electronic throttle motor. When the power supply voltage drops below the threshold, the ECM concludes that the power supply circuit has an open circuit. A DTC is set and the MIL is turned on.

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FAIL SAFE

If the Electronic Throttle Control System (ETCS) has a malfunction, the ECM cuts off current to the throttle control motor. The throttle control valve returns to a predetermined opening angle (approximately 16) by the force of the return spring. The ECM then adjusts the engine output by controlling the fuel injection (intermittent fuel–cut) and ignition timing in accordance with the accelerator pedal opening angle to enable the vehicle to continue at a minimal speed.
If the accelerator pedal is depressed firmly and slowly, the vehicle can be driven slowly.
If a "pass" condition is detected and then the ignition switch is turned OFF, the fail–safe operation will stop and the system will return to normal.

MONITOR STRATEGY

Related DTCs	P2118: Throttle actuator stuck open
Required sensors/ components (Main)	Throttle actuator, Throttle valve
Required sensors/ components (Related)	–
Frequency of operation	Continuous
Duration	0.8 second
MIL operation	Immediate
Sequence operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	None
Battery voltage	More than 8 V

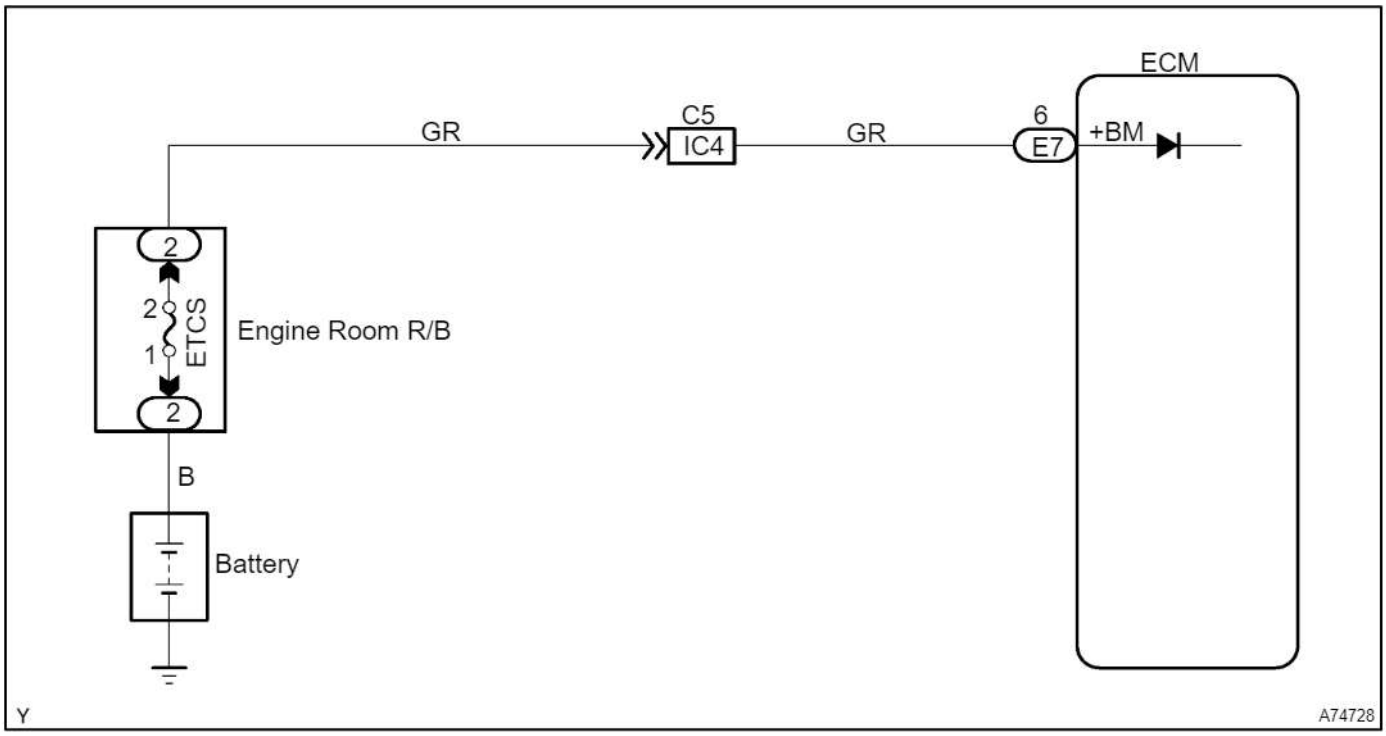
TYPICAL MALFUNCTION THRESHOLDS

Throttle actuator power supply voltage	Less than 4 V

COMPONENT OPERATING RANGE

Throttle actuator power supply voltage	9 to 14 V

WIRING DIAGRAM



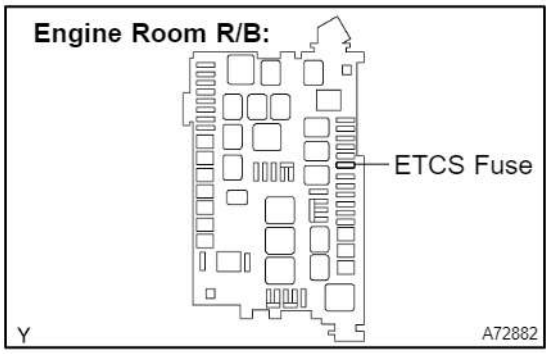
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INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1	CHECK FUSE(ETCS FUSE)

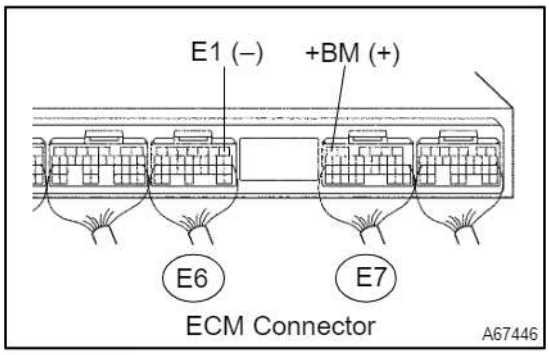


(a) Remove the ETCS fuse from the engine room R/B.
(b) Check for continuity in the ETCS fuse.
Standard: Continuity
(c) Reinstall the ETCS fuse.

NG → **CHECK FOR SHORT IN ALL HARNESSES AND COMPONENTS CONNECTED FUSE**

OK

2	INSPECT ECM(+BM VOLTAGE)



(a) Measure the voltage between the specified terminals of the E6 and E7 ECM connectors.
Standard:

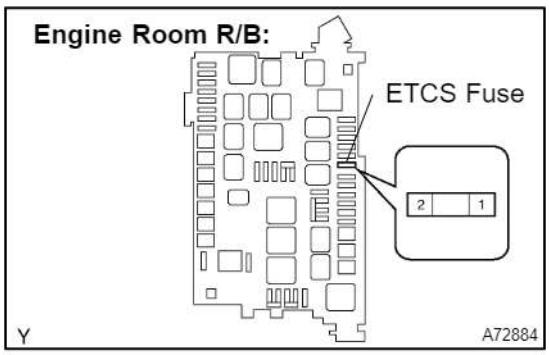
Tester Connection	Specified Condition
+BM (E7–6) – E1 (E6–1)	9 to 14 V

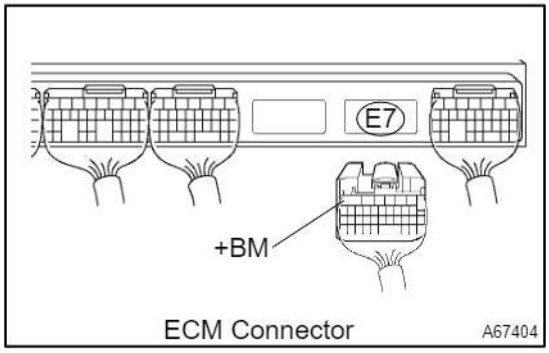
OK → **REPLACE ECM (See page 10–11)**

NG

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3	CHECK HARNESS AND CONNECTOR(ECM – ETCS FUSE, ETCS FUSE – BATTERY)





(a) Check the harness and connector between the ETCS fuse and ECM.
(1) Remove the ETCS fuse from the engine room R/B.
(2) Disconnect the E7 ECM connector.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
ETCS fuse (2) – +BM (E7–6)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
ETCS fuse (2) or +BM (E7–6) – Body ground	10 kΩ or higher

(4) Reinstall the ETCS fuse.
(5) Reconnect the ECM connector.

(b) Check the harness and connector between the ETCS fuse and positive battery cable.
(1) Remove the ETCS fuse from the engine room R/B.
(2) Disconnect the positive battery cable.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Battery positive cable – ETCS fuse (1)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
Battery positive cable or ETCS fuse (1) – Body ground	10 kΩ or higher

(4) Reinstall the ETCS fuse.
(5) Reconnect the positive battery cable.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ENGINE ROOM RELAY BLOCK

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DTC	P2119	THROTTLE ACTUATOR CONTROL THROTTLE BODY RANGE/PERFORMANCE

CIRCUIT DESCRIPTION

The Electric Throttle Control System (ETCS) is composed of a throttle motor that operates the throttle valve, a throttle position sensor that detects the opening angle of the throttle valve, an accelerator pedal position sensor that detects the accelerator pedal position, and the ECM that controls the ETCS system.
The ECM operates the throttle motor to position the throttle valve for proper response to driver input. The throttle position sensor, mounted on the throttle body, detects the opening angle of the throttle valve and provides this signal to the ECM so that the ECM can regulate the throttle motor.

DTC No.	DTC Detection Condition	Trouble Area
P2119	Throttle opening angle continues to vary greatly from target throttle opening angle	□Electric throttle control system □ECM

MONITOR DESCRIPTION

The ECM determines the "actual" throttle angle based on the throttle position sensor signal. The "actual" throttle position is compared to the "target" throttle position commanded by the ECM. If the difference of these two values exceeds a specified limit, the ECM interprets this as a fault in the ETCS system. The ECM turns on the MIL and a DTC is set.

FAIL SAFE

If the Electronic Throttle Control System (ETCS) has a malfunction, the ECM cuts off current to the throttle control motor. The throttle control valve returns to a predetermined opening angle (approximately 16) by the force of the return spring. The ECM then adjusts the engine output by controlling the fuel injection (intermittent fuel–cut) and ignition timing in accordance with the accelerator pedal opening angle to enable the vehicle to continue at a minimal speed.
If the accelerator pedal is depressed firmly and slowly, the vehicle can be driven slowly.
If a "pass" condition is detected and then the ignition switch is turned to OFF, the fail–safe operation will stop and the system will return to normal condition.

MONITOR STRATEGY

Related DTCs	P2119: Electronic throttle control system malfunction
Required sensors/ components (Main)	Throttle actuator
Required sensors/ components (Related)	–
Frequency of operation	Continuous
Duration	1 second
MIL operation	Immediate
Sequence operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	None

TYPICAL MALFUNCTION THRESHOLDS

Difference between "target throttle position" and "actual throttle position"	0.3 V or more

WIRING DIAGRAM

Refer to DTC P2102 on page 05–569.

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INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1	CHECK OTHER DTC OUTPUT(IN ADDITION TO DTC P2119)

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(c) Select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(d) Read DTCs.

Result:

Display (DTC output)	Proceed to
P2119	A
P2119 and other DTCs	B

HINT:

If any other codes besides P2119 are output, perform troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05–366)**

A

2	CHECK IF DTC OUTPUT REOCCURS

(a) Clear the DTC (See page 05–355).
(b) Allow the engine to idle for 15 seconds.
(c) Pull the hand brake and shift the gear to D.
(d) Depress the brake pedal securely and the accelerator pedal fully for 5 seconds.
(e) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(f) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(g) Select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(h) Read DTCs.

HINT:

Actual throttle position (TP) sensor voltage can be confirmed using the hand–held tester [DATA LIST/ALL/THROTTLE POS #1].

Standard: No DTC output.

NG → **REPLACE THROTTLE W/MOTOR BODY ASSY (See page 10–6)**

OK

NORMAL

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DTC	P2120	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”D” CIRCUIT

DTC	P2122	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”D” CIRCUIT LOW INPUT

DTC	P2123	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”D” CIRCUIT HIGH INPUT

DTC	P2125	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”E” CIRCUIT

DTC	P2127	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”E” CIRCUIT LOW INPUT

DTC	P2128	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”E” CIRCUIT HIGH INPUT

DTC	P2138	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”D”/”E” VOLTAGE CORRELATION

HINT:
This is the repair procedure of th accelerator pedal position sensor.

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CIRCUIT DESCRIPTION

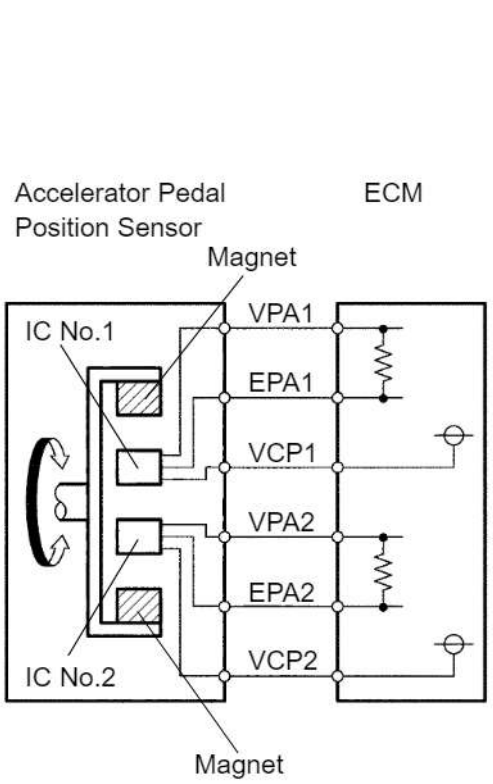
HINT:

- □ This electrical throttle system does not use a throttle cable.
- □ This accelerator pedal position sensor is non–contact type.

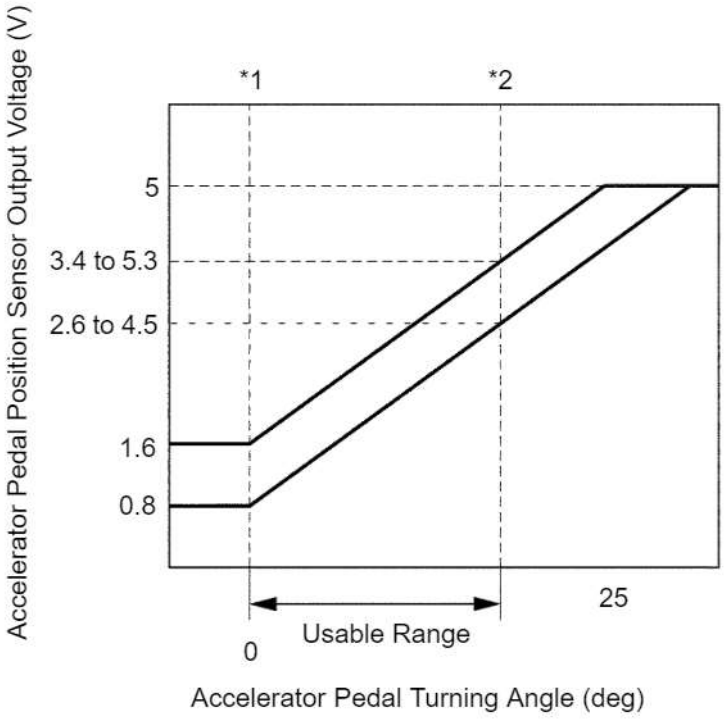
The accelerator pedal position sensor is mounted on the accelerator pedal to detect the opening angle of the accelerator pedal. Since this sensor is electronically controlled with hall elements, accurate control and reliability can be obtained. It has 2 sensors to detect the accelerator position and a malfunction of the accelerator position sensor.

In the accelerator pedal position sensor, the voltage applied to pedal terminals VPA and VPA2 of the ECM changes between 0 V and 5 V, in proportion to the opening angle of the accelerator pedal. The VPA is a signal to indicate the actual accelerator pedal opening angle which is used for the engine control, and the VPA2 is a signal to indicate the information about the opening angle which is used for detecting a malfunction.

The ECM judges the current opening angle of the accelerator pedal from these signals input from terminals VPA and VPA2, and the ECM controls the throttle motor based on these signals.



A19694



*1: Accelerator Pedal Fully Released
*2: Accelerator Pedal Fully Depressed

A19803

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DTC No.	DTC Detection Condition	Trouble Area
P2120	Condition (a) continues for 0.5 second or more: (a) VPA is 0.2 V or less when accelerator pedal is fully released, or VPA is 4.8 V or more	□Accelerator pedal position sensor □ECM
P2122	Condition (a) continues for 0.5 second or more when accelerator pedal is fully released: (a) VPA is 0.2 V or less	□Accelerator pedal position sensor □Open in VCP1 circuit □VPA1 circuit open or ground short □ECM
P2123	Condition (a) continues for 2.0 seconds or more: (a) VPA is 4.8 V or more	□Accelerator pedal position sensor □Open in EPA1 circuit □ECM
P2125	Condition (a) continues for 0.5 second or more: (a) (VPA2 is 0.5 V or less when accelerator pedal is fully released) or (VPA2 is 4.8 V or more and VPA is between 0.2 V and 3.45 V)	□Accelerator pedal position sensor □ECM
P2127	Condition (a) continues for 0.5 second or more when accelerator pedal is fully released: (a) VPA2 is 0.5 V or less	□Accelerator pedal position sensor □Open in VCP2 circuit □VPA2 circuit open or ground short □ECM
P2128	Conditions (a) and (b) continue for 2.0 seconds or more: (a) VPA2 is 4.8 V or more (b) VPA is 0.2 V or more and VPA is 3.45 V or less	□Accelerator pedal position sensor □Open in EPA2 circuit □ECM
P2138	Condition (a) or (b) continues for 2.0 seconds or more: (a) Difference between VPA and VPA2 is 0.02 V or less (b) VPA is 0.2 V or less and VPA2 is 0.5 V or less	□VPA1 and VPA2 circuits are short circuited □Accelerator pedal position sensor □ECM

HINT:

After confirming DTC "P2120, P2122, P2123, P2125, P2127, P2128 and P2138", use the hand–held tester or the OBD II scan tool to confirm the accelerator pedal position sensor output voltage.

Trouble area	Accelerator pedal position expressed as voltage			
	Accelerator pedal released		Accelerator pedal depressed	
	ACCEL POS #1	ACCEL POS #2	ACCEL POS #1	ACCEL POS #2
VC circuit open	0 to 0.2 V	0 to 0.2 V	0 to 0.2 V	0 to 0.2 V
VPA circuit open or ground short	0 to 0.2 V	1.2 to 2.0 V	0 to 0.2 V	3.4 to 5.3 V
VPA2 circuit open or ground short	0.5 to 1.1 V	0 to 0.2 V	2.6 to 4.5 V	0 to 0.2 V
E2 circuit open	4.5 to 5.5 V	4.5 to 5.5 V	4.5 to 5.5 V	4.5 to 5.5 V

MONITOR DESCRIPTION

When VPA or VPA2 deviates from the standard, or the difference between the voltage output of the two sensors is less than threshold, the ECM concludes that there is a defect in the accelerator pedal position sensor. The ECM turns on the MIL and a DTC is set.

Example:

When the voltage output of the VPA is below 0.2 V or exceeds 4.8 V.

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FAIL SAFE

The accelerator pedal position sensor has two (main and sub) sensor circuits. If a malfunction occurs in either of the sensor circuits, the ECM detects the abnormal signal voltage difference between the two sensor circuits and switches to limp mode. In limp mode, the functioning circuit is used to calculate the accelerator pedal opening angle to allow the vehicle to continue driving. If both circuits malfunction, the ECM regards the opening angle of the accelerator pedal to be fully closed. In this case, the throttle valve will remain closed as if the engine was idling.

If a "pass" condition is detected and then the ignition switch is turned to OFF, the fail–safe operation will stop and the system will return to normal condition.

MONITOR STRATEGY

Related DTCs	P2120: Accelerator position sensor 1 (VPA) range check (fluttering) P2122: Accelerator position sensor 1 (VPA) range check (low voltage) P2123: Accelerator position sensor 1 (VPA) range check (high voltage) P2125: Accelerator position sensor 2 (VPA2) range check (fluttering) P2127: Accelerator position sensor 2 (VPA2) range check (low voltage) P2128: Accelerator position sensor 2 (VPA2) range check (high voltage) P2138: Accelerator position sensor correlation range check
Required sensors/ components (Main)	Accelerator position sensor
Required sensors/ components (Related)	
Frequency of operation	Continuous
Duration	2 seconds
Mil operation	Immediate
Sequence operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05–334
Ignition switch	ON

TYPICAL MALFUNCTION THRESHOLDS

P2120:

VPA voltage	0.2 V or less or 4.8 V or more fluttering

P2122:

VPA voltage	0.2 V or less (When accelerator pedal is fully released)

P2123:

VPA voltage	4.8 V or more

P2125:

VPA2 voltage	0.5 V or less or 4.8 V or more fluttering

P2127:

VPA2 voltage	0.5 V or less (When accelerator pedal is fully released)

P2128:

Following conditions are met:	A & B
A. VPA voltage	0.2 V or more and 3.45 V or less
B. VPA2 voltage	4.8 V or more

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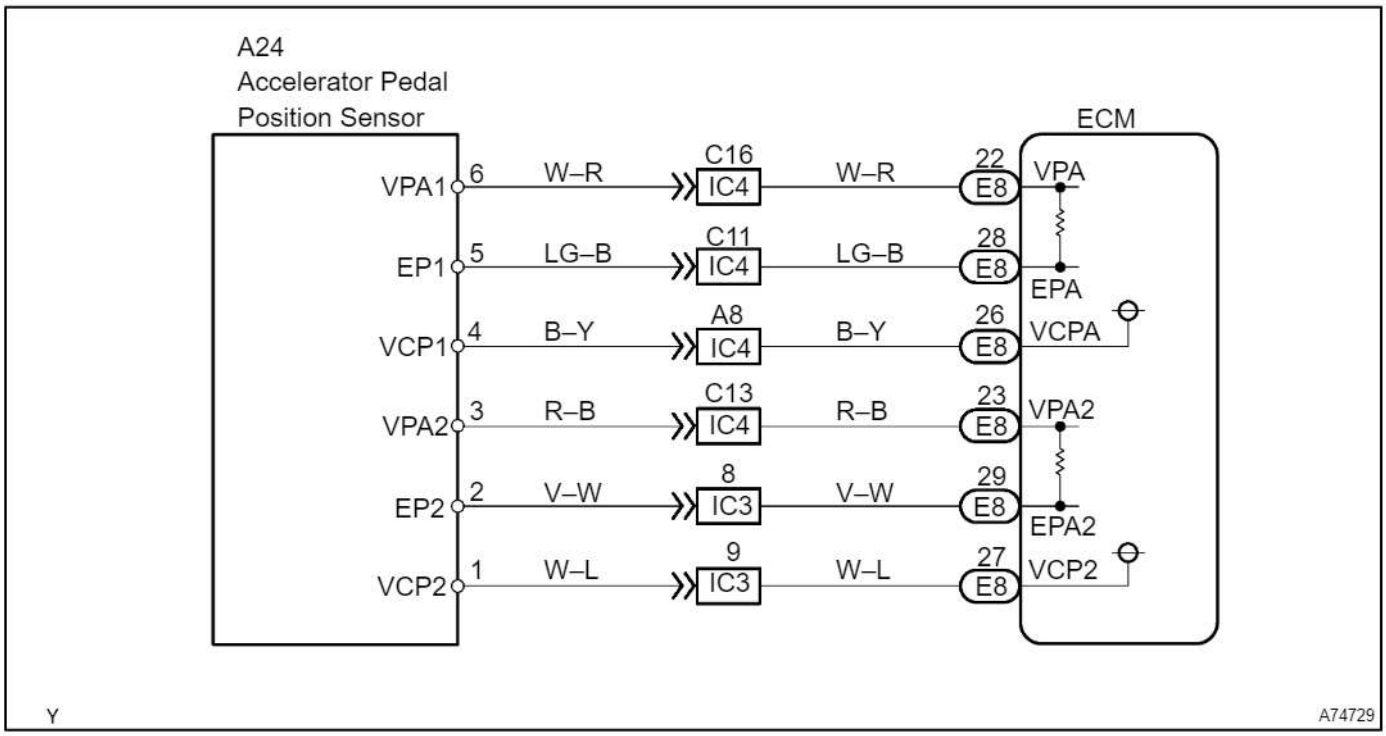
P2138:

Following condition is met for	A or B
A. Difference between VPA and VPA2 voltages	0.02 V or less
B. Both following conditions are met:	(1) & (2)
(1) VPA voltage	0.2 V or less
(2) VPA2 voltage	0.5 V or less

COMPONENT OPERATING RANGE

Parameter	Standard Value
VPA voltage	More than 0.2 V and less than 4.8 V
VPA2 voltage	More than 0.5 V and Less than 4.8 V
Difference between VPA and VPA2 voltages	More than 0.02 V

WIRING DIAGRAM



INSPECTION PROCEDURE

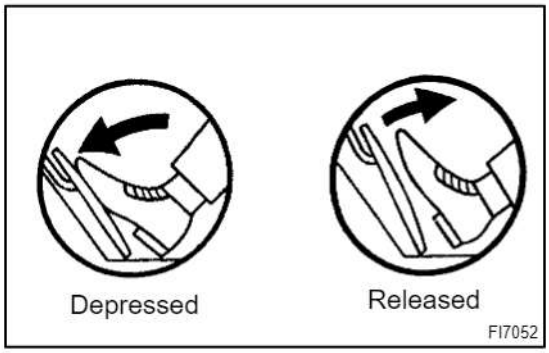
HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

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Hand–held tester:

1	READ VALUE OF HAND–HELD TESTER(ACCEL POS #1 AND ACCEL POS #2)



(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch to ON.
(c) On the hand–held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ETCS /ACCEL POS #1 and ACCEL POS #2. Read the values.

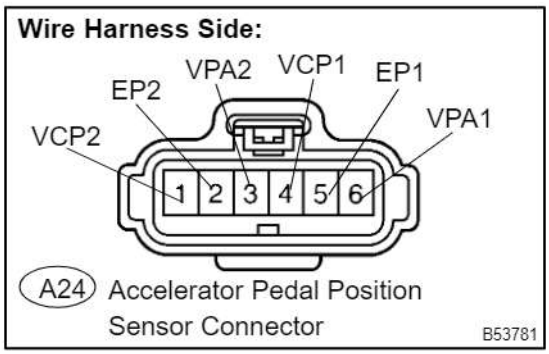
Standard:

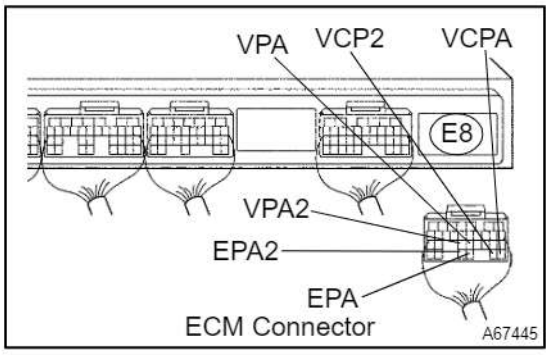
Accelerator Pedal	ACCEL POS #1	ACCEL POS #2
Released	0.5 to 1.1 V	1.2 to 2.0 V
Depressed	2.6 to 4.5 V	3.4 to 5.3 V

OK	Go to step 5

NG

2	CHECK HARNESS AND CONNECTOR(ACCELERATOR PEDAL POSITION SENSOR – ECM)





(a) Disconnect the A24 accelerator pedal position sensor connector.
(b) Disconnect the E8 ECM connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
VPA1 (A24–6) – VPA (E8–22)	Below 1 Ω
EP1 (A24–5) – EPA (E8–28)	
VCP1 (A24–4) – VCPA (E8–26)	
VPA2 (A24–3) – VPA2 (E8–23)	
EP2 (A24–2) – EPA2 (E8–29)	
VCP2 (A24–1) – VCP2 (E8–27)	

Standard (Check for short):

Tester Connection	Specified Condition
VPA1 (A24–6) or VPA (E8–22) – Body ground	10 kΩ or higher
EP1 (A24–5) or EPA (E8–28) – Body ground	
VCP1 (A24–4) or VCPA (E8–26) – Body ground	
VPA2 (A24–3) or VPA2 (E8–23) – Body ground	
EP2 (A24–2) or EPA2 (E8–29) – Body ground	
VCP2 (A24–1) or VCP2 (E8–27) – Body ground	

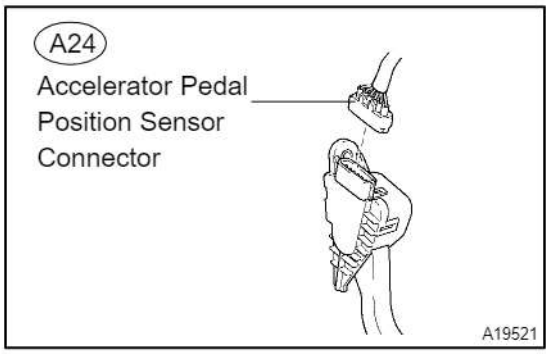
(d) Reconnect the accelerator pedal position sensor connector.
(e) Reconnect the ECM connector.

NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

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3	INSPECT ECM(VCPA AND VCP2 VOLTAGE)

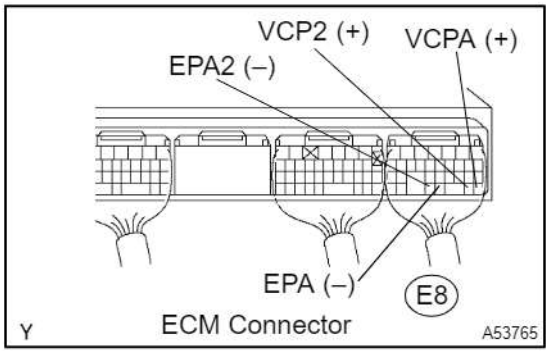


(a) Disconnect the A24 accelerator pedal position sensor connector.
(b) Turn the ignition switch to ON.
(c) Measure the voltage between the terminals of the E8 ECM connector.

Standard:

Tester Connection	Specified Condition
VCPA (E8–26) – EPA (E8–28)	4.5 to 5.5 V
VCP2 (E8–27) – EPA2 (E8–29)	

(d) Reconnect the accelerator pedal position sensor connector.



NG → **REPLACE ECM (See page 10–11)**

OK

4	REPLACE ACCELERATOR PEDAL ROD ASSY (See page 10–12)

GO

5	READ OUTPUT DTC(SEE IF ACCELERATOR PEDAL POSITION SENSOR DTCS ARE OUTPUT AGAIN)

(a) Clear the DTC.
(b) Start the engine.
(c) Run the engine at idle for 15 seconds or more.
(d) Connect the hand–held tester to the DLC3.
(e) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(f) Select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(g) Read DTCs.

Result:

Display (DTC Output)	Proceed to
P2120, P2122, P2123, P2125, P2127, P2128 and/or P2138	A
No output	B

B → **SYSTEM OK**

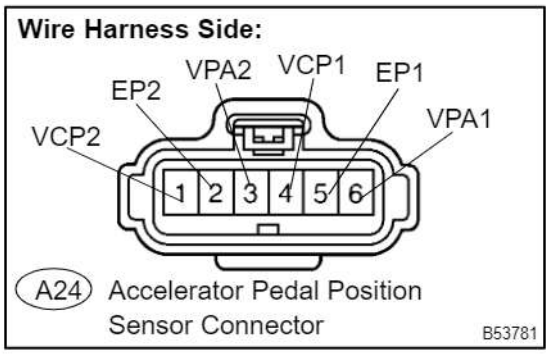
A

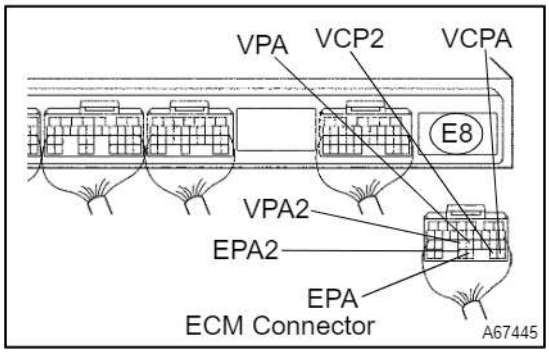
REPLACE ECM (See page 10–11)

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OBD II scan tool (excluding hand–held tester):

1	**CHECK HARNESS AND CONNECTOR(ACCELERATOR PEDAL POSITION SENSOR – ECM)**





(a) Disconnect the A24 accelerator pedal position sensor connector.

(b) Disconnect the E8 ECM connector.

(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
VPA1 (A24–6) – VPA (E8–22)	Below 1 Ω
EP1 (A24–5) – EPA (E8–28)	
VCP1 (A24–4) – VCPA (E8–26)	
VPA2 (A24–3) – VPA2 (E8–23)	
EP2 (A24–2) – EPA2 (E8–29)	
VCP2 (A24–1) – VCP2 (E8–27)	

Standard (Check for short):

Tester Connection	Specified Condition
VPA1 (A24–6) or VPA (E8–22) – Body ground	10 kΩ or higher
EP1 (A24–5) or EPA (E8–28) – Body ground	
VCP1 (A24–4) or VCPA (E8–26) – Body ground	
VPA2 (A24–3) or VPA2 (E8–23) – Body ground	
EP2 (A24–2) or EPA2 (E8–29) – Body ground	
VCP2 (A24–1) or VCP2 (E8–27) – Body ground	

(d) Reconnect the accelerator pedal position sensor connector.

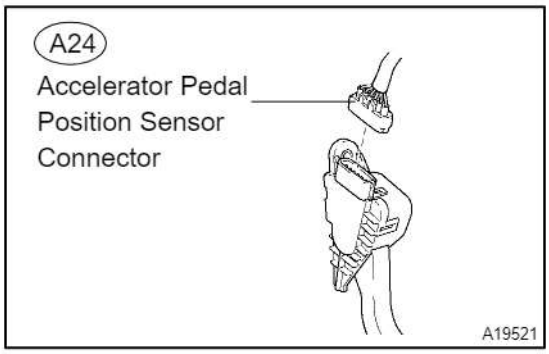
(e) Reconnect the ECM connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

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2	INSPECT ECM(VCPA AND VCP2 VOLTAGE)

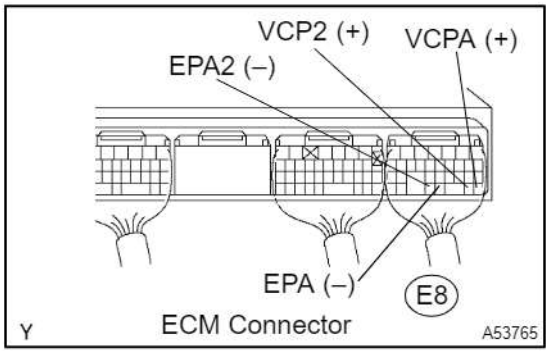


(a) Disconnect the A24 accelerator pedal position sensor connector.
(b) Turn the ignition switch to ON.
(c) Measure the voltage between the terminals of the E8 ECM connector.

Standard:

Tester Connection	Specified Condition
VCPA (E8–26) – EPA (E8–28)	4.5 to 5.5 V
VCP2 (E8–27) – EPA2 (E8–29)	

(d) Reconnect the accelerator pedal position sensor connector.



NG → **REPLACE ECM (See page 10–11)**

OK

3	REPLACE ACCELERATOR PEDAL ROD ASSY (See page 10–12)

GO

4	READ OUTPUT DTC(SEE IF ACCELERATOR PEDAL POSITION SENSOR DTCS ARE OUTPUT AGAIN)

(a) Clear the DTC (see page 05–355).
(b) Start the engine.
(c) Run the engine at idle for 15 seconds or more.
(d) Read DTCs (see page 05–355).

Result:

Display (DTC Output)	Proceed to
P2120, P2122, P2123, P2125, P2127, P2128 and/or P2138	A
No DTC output	B

B → **SYSTEM OK**

A

REPLACE ECM (See page 10–11)

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DTC	P2121	THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT RANGE/PERFORMANCE

HINT:
This is repair procedure for the accelerator pedal position sensor.

CIRCUIT DESCRIPTION

Refer to DTC P2120 on page 05–582.

DTC No.	DTC Detection Condition	Trouble Area
P2121	Conditions (a) and (b) continue for 0.5 second: (a) Difference between VPA1 and VPA2 exceeds the threshold (b) IDL is OFF	□Accelerator pedal position sensor circuit □Accelerator pedal position sensor □ECM

MONITOR DESCRIPTION

The accelerator pedal position sensor is mounted on the accelerator pedal bracket. The accelerator pedal position sensor has 2 sensor elements / signal output: VPA1 and VPA2. VPA1 is used to detect the actual accelerator pedal angle (used for engine control) and VPA2 is used to detect malfunctions in VPA1. When the difference between the voltage output of VPA1 and VPA2 deviates from the standard, the ECM concludes the accelerator pedal position sensor has a malfunction. The ECM turns on the MIL and a DTC is set.

FAIL SAFE

The accelerator pedal position sensor has two (main and sub) sensor circuits. If a malfunction occurs in either of the sensor circuits, the ECM detects the abnormal signal voltage difference between the two sensor circuits and switches to limp mode. In limp mode, the functioning circuit is used to calculate the accelerator pedal opening angle to allow the vehicle to continue driving. If both circuits malfunction, the ECM regards the opening angle of the accelerator pedal to be fully closed. In this case, the throttle valve will remain closed as if the engine was idling.
If a "pass" condition is detected and then the ignition switch is turned to OFF, the fail–safe operation will stop and the system will return to normal condition.

MONITOR STRATEGY

Related DTCs	P2121: Throttle position sensor malfunction
Required sensors/ components (Main)	Throttle position sensor
Required sensors/ components (Related)	–
Frequency of operation	Continuous
Duration	0.5 second
MIL operation	Immediately
Sequence operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	None

TYPICAL MALFUNCTION THRESHOLDS

Either of the following conditions is met:	
VTA1 sensor 1 voltage (learned value) and VTA2 sensor 2 voltage (learned value)	More than 0.4 V, or more than 1.2 V

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WIRING DIAGRAM

Refer to DTC P2120 on page 05–582.

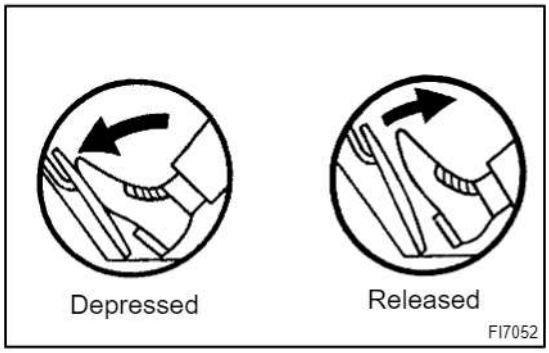
INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

Hand–held tester:

1	READ VALUE OF HAND–HELD TESTER(ACCEL POS #1 AND ACCEL POS #2)



(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch to ON.
(c) On the hand–held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ETCS / ACCEL POS #1 and ACCEL POS #2. Read the values.

Standard:

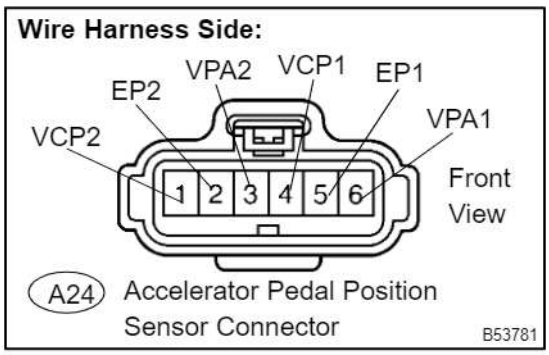
Accelerator Pedal	ACCEL POS #1	ACCEL POS #2
Released	0.5 to 1.1 V	1.2 to 2.0 V
Depressed	2.6 to 4.5 V	3.4 to 5.3 V

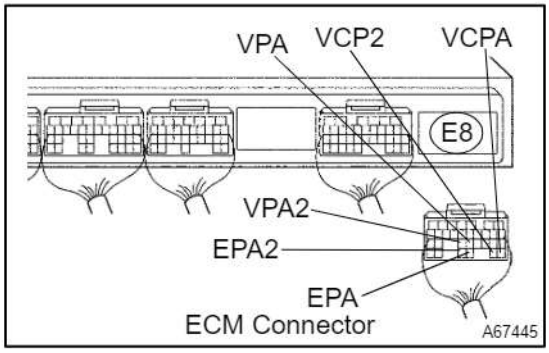
OK	Go to step 3

NG

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2	CHECK HARNESS AND CONNECTOR(ACCELERATOR PEDAL POSITION SENSOR – ECM)





(a) Disconnect the A24 accelerator pedal position sensor connector.
(b) Disconnect the E8 ECM connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
VPA1 (A24–6) – VPA (E8–22)	Below 1 Ω
EP1 (A24–5) – EPA (E8–28)	
VCP1 (A24–4) – VCPA (E8–26)	
VPA2 (A24–3) – VPA2 (E8–23)	
EP2 (A24–2) – EPA2 (E8–29)	
VCP2 (A24–1) – VCP2 (E8–27)	

Standard (Check for short):

Tester Connection	Specified Condition
VPA1 (A24–6) or VPA (E8–22) – Body ground	10 kΩ or higher
EP1 (A24–5) or EPA (E8–28) – Body ground	
VCP1 (A24–4) or VCPA (E8–26) – Body ground	
VPA2 (A24–3) or VPA2 (E8–23) – Body ground	
EP2 (A24–2) or EPA2 (E8–29) – Body ground	
VCP2 (A24–1) or VCP2 (E8–27) – Body ground	

(d) Reconnect the accelerator pedal position sensor connector.
(e) Reconnect the ECM connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3	REPLACE ACCELERATOR PEDAL ROD ASSY (See page 10–12)

GO

4	READ OUTPUT DTC(SEE IF ACCELERATOR PEDAL POSITION SENSOR DTCS ARE OUTPUT AGAIN)

(a) Clear the DTC (see page 05–355).
(b) Start the engine.
(c) Run the engine at idle for 15 sec. or more.
(d) Connect the hand–held tester to the DLC3.
(e) Turn the ignition switch to ON and turn the hand–held tester ON.
(f) Select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(g) Read DTCs.

Result:

Display (DTC Output)	Proceed to
P2121	A
No output	B

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B → SYSTEM OK

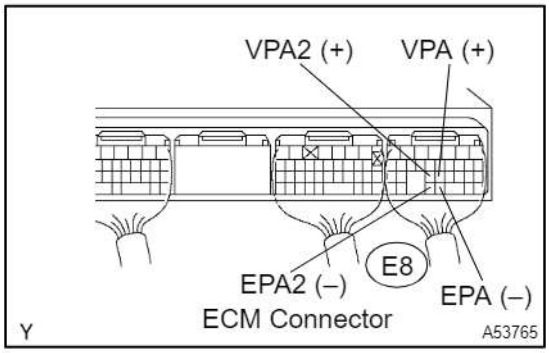
A

REPLACE ECM (See page 10–11)

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OBD II scan tool (excluding hand–held tester):

1	INSPECT ECM(VPA AND VPA2 VOLTAGE)



(a) Turn the ignition switch to ON.
(b) Measure the voltage between the terminals of the E8 ECM connector.

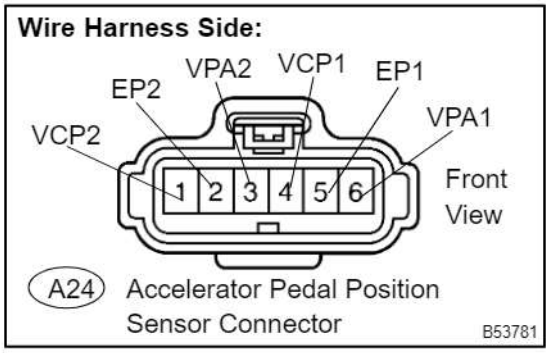
Standard:

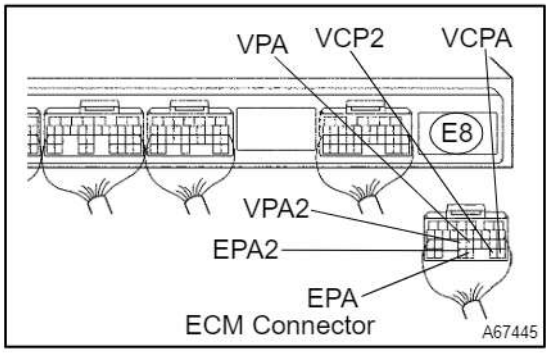
Accelerator pedal position	Symbols (Terminal No.)	Symbols (Terminal No.)
	VPA (E8–22) – EPA (E8–28)	VPA2 (E8–23) – EPA2 (E8–29)
Released	0.5 to 1.1 V	1.2 to 2.0 V
Depressed	2.6 to 4.5 V	3.4 to 5.3 V

OK → **Go to step 3**

NG

2	CHECK HARNESS AND CONNECTOR(ACCELERATOR PEDAL POSITION SENSOR – ECM)





(a) Disconnect the A24 accelerator pedal position sensor connector.
(b) Disconnect the ECM E8 connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
VPA1 (A24–6) – VPA (E8–22)	Below 1 Ω
EP1 (A24–5) – EPA (E8–28)	
VCP1 (A24–4) – VCPA (E8–26)	
VPA2 (A24–3) – VPA2 (E8–23)	
EP2 (A24–2) – EPA2 (E8–29)	
VCP2 (A24–1) – VCP2 (E8–27)	

Standard (Check for short):

Tester Connection	Specified Condition
VPA1 (A24–6) or VPA (E8–22) – Body ground	10 kΩ or higher
EP1 (A24–5) or EPA (E8–28) – Body ground	
VCP1 (A24–4) or VCPA (E8–26) – Body ground	
VPA2 (A24–3) or VPA2 (E8–23) – Body ground	
EP2 (A24–2) or EPA2 (E8–29) – Body ground	
VCP2 (A24–1) or VCP2 (E8–27) – Body ground	

(d) Reconnect the accelerator pedal position sensor connector.
(e) Reconnect the ECM connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

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3	REPLACE ACCELERATOR PEDAL ROD ASSY (See page 10–12)

GO

4	READ OUTPUT DTC(SEE IF ACCELERATOR PEDAL POSITION SENSOR DTCS ARE OUTPUT AGAIN)

(a) Clear the DTC (see page 05–355).
(b) Start the engine.
(c) Run the engine at idle for 15 seconds or more.
(d) Read a DTC (see page 05–355).

Result:

Display (DTC Output)	Proceed to
P2121	A
No output	B

B → SYSTEM OK

A

REPLACE ECM (See pagr 10–11)

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DTC	P2195	OXYGEN (A/F) SENSOR SIGNAL STUCK LEAN (BANK 1 SENSOR 1)

DTC	P2196	OXYGEN (A/F) SENSOR SIGNAL STUCK RICH (BANK 1 SENSOR 1)

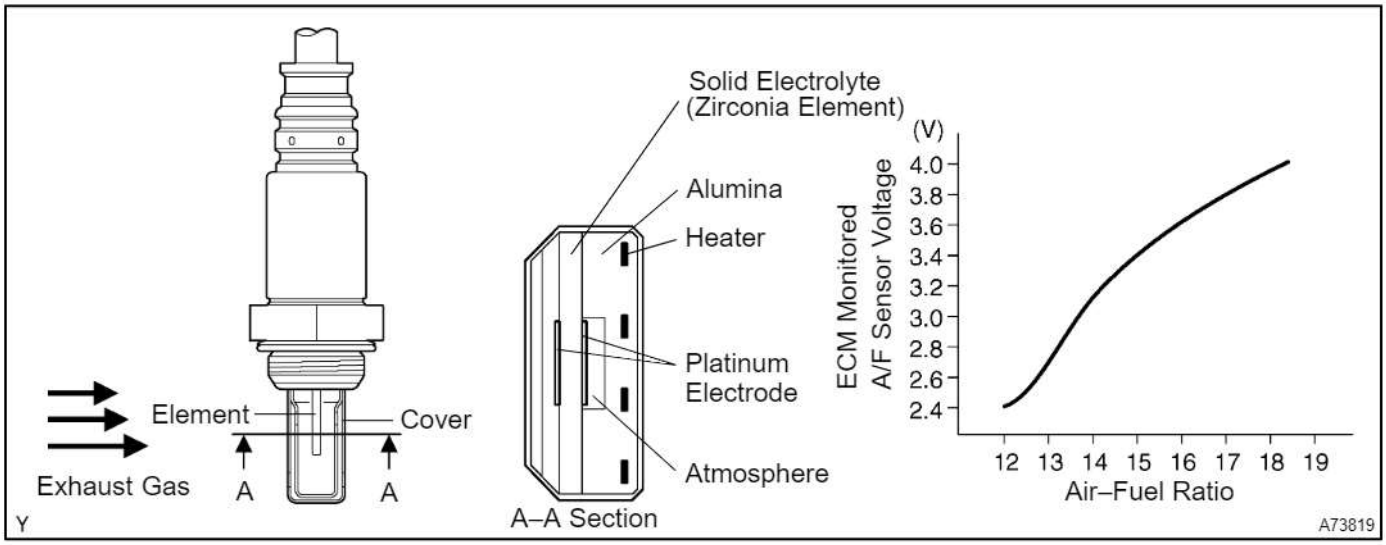
DTC	P2197	OXYGEN (A/F) SENSOR SIGNAL STUCK LEAN (BANK 2 SENSOR 1)

DTC	P2198	OXYGEN (A/F) SENSOR SIGNAL STUCK RICH (BANK 2 SENSOR 1)

HINT:
Although each DTC title (DTC description) says "oxygen sensor", these DTCs are related to the "A/F sensor".

CIRCUIT DESCRIPTION

The A/F sensor provides output voltage* is approximately equal to the existing air–fuel ratio. The A/F sensor output voltage is used to provide the ECM feedback with to control the air–fuel ratio.
With the A/F sensor output, the ECM can determine deviation from the stoichiometric air–fuel ratio and control proper injection time. If the A/F sensor is malfunctioning, the ECM is unable to accurately control air–fuel ratio.
The A/F sensor is equipped with a heater which heats the zirconia element. The heater is also controlled by the ECM. When the intake air volume is low (the temperature of the exhaust gas is low), current flows to the heater to heat the sensor to facilitate detection of accurate oxygen concentration.
The A/F sensor is a planar type. Compared to a conventional type, the sensor and heater portions are narrower. Because the heat of the heater is conducted through the alumina to zirconia (of the sensor portion), sensor activation is accelerated.
To obtain a high purification rate of the CO, HC and NOx components of the exhaust gas, a three–way catalytic converter is used. The converter is most efficient when the air–fuel ratio is maintained near the stoichiometric air–fuel ratio.
*: The voltage value changes on the inside of the ECM only.



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DTC No.	DTC Detecting Condition	Trouble Area
P2195 P2197	Conditions (a) and (b) continue for 2 seconds or more : (a) A/F sensor voltage is more than 3.8 V (b) Heated oxygen sensor voltage is 0.15 V or more	□Open or short in A/F sensor (bank 1, 2 sensor 1) circuit □A/F sensor (bank 1, 2 sensor 1) □A/F sensor heater □A/F sensor heater relay □A/F sensor heater and relay circuit □Air induction system □Fuel pressure □Injector □ECM
P2196 P2198	Conditions (a) and (b) continue for 2 seconds or more : (a) A/F sensor voltage is less than 2.8 V (b) Heated oxygen sensor voltage is less than 0.85 V	

HINT:

- □ DTCs P2195 and P2196 means malfunction related to bank 1 A/F sensor circuit.
- □ DTCs P2197 and P2198 means malfunction related to bank 2 A/F sensor circuit.
- □ Bank 1 refers to the bank that includes cylinder No. 1.
- □ Bank 2 refers to the bank that includes cylinder No. 2.
- □ Sensor 1 refers to the sensor closest to the engine assembly.
- □ After confirming DTC P2195, P2196, P2197 and P2198, use the OBD II scan tool or the hand−held tester to confirm voltage output of A/F sensor (AFS B1 S1/AFS B2 S1) from the ALL menu (to reach the ALL menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL).
- □ The A/F sensor output voltage and the short−term fuel trim value can be read using the OBD II scan tool or the hand−held tester.
- □ The ECM controls the voltage of the A1A+, A2A+, A1A− and A2A− terminals of the ECM to the fixed voltage. Therefore, it is impossible to confirm the A/F sensor output voltage without the OBD II scan tool or the hand–held tester.
- □ The OBD II scan tool (excluding hand−held tester) displays the one fifth of the A/F sensor output voltage which is displayed on the hand−held tester.

MONITOR DESCRIPTION

Under the air–fuel ratio feedback control, if the voltage output of the A/F sensor indicates RICH or LEAN for a certain period of time or more, the ECM concludes that there is a fault in the A/F sensor system. The ECM will turn on the MIL and a DTC is set.

If the A/F sensor voltage output is less than 2.8 V (very RICH) for 10 seconds even though voltage output of the heated oxygen sensor output voltage is less than 0.85 V, the ECM sets DTC P2196 or DTC P2198.

If the heated oxygen sensor output voltage is 0.15 V or more but the A/F sensor voltage output is more than 3.8 V (very LEAN) for 10 seconds, DTC P2195 or DTC P2197 is set.

MONITOR STRATEGY

Related DTCs	P2195: A/F sensor (Bank 1) stuck Lean P2196: A/F sensor (Bank 1) stuck Rich P2197: A/F sensor (Bank 2) stuck Lean P2198: A/F sensor (Bank 2) stuck Rich
Required sensors/ components (Main)	A/F sensor
Required sensors/ components (Related)	–
Frequency of operation	Continuous
Duration	10 seconds
MIL operation	2 driving cycles
Sequence operation	None

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TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05–334
Time after engine start	30 seconds or more
A/F sensor status	Activated
A/F admittance	0.014 1/Ω
Fuel system status	Closed Loop
Engine condition	Running
Sub–feedback status	Executing

TYPICAL MALFUNCTION THRESHOLDS

P2195 and P2197:

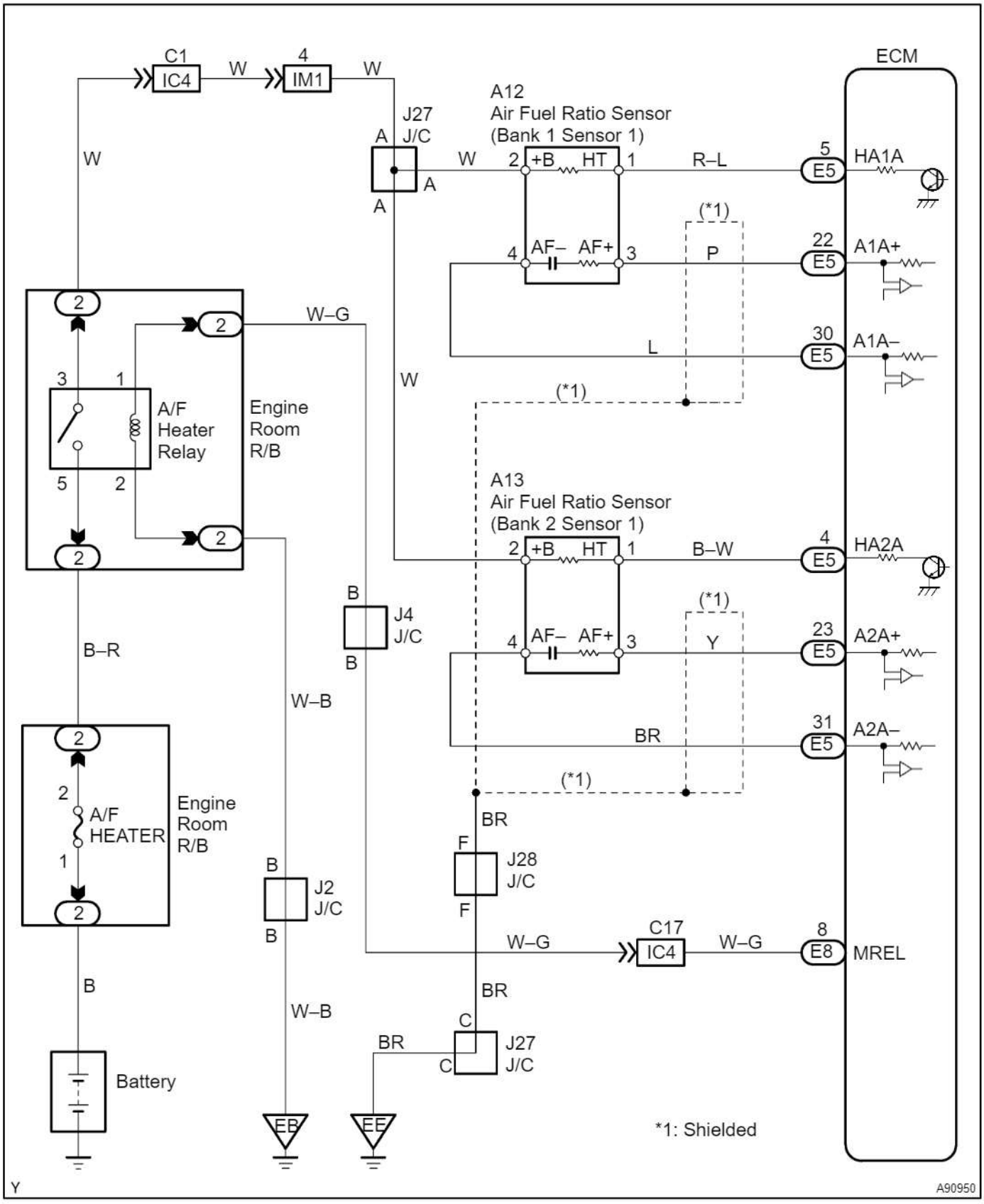
Both of the following conditions are met:	
A/F sensor voltage	More than 3.8 V
Heated heated oxygen sensor voltage	0.15 V or more

P2196 and P2198:

Both of the following conditions are met:	
A/F sensor voltage	Less than 2.8 V
Heated heated oxygen sensor voltage	Less than 0.85 V

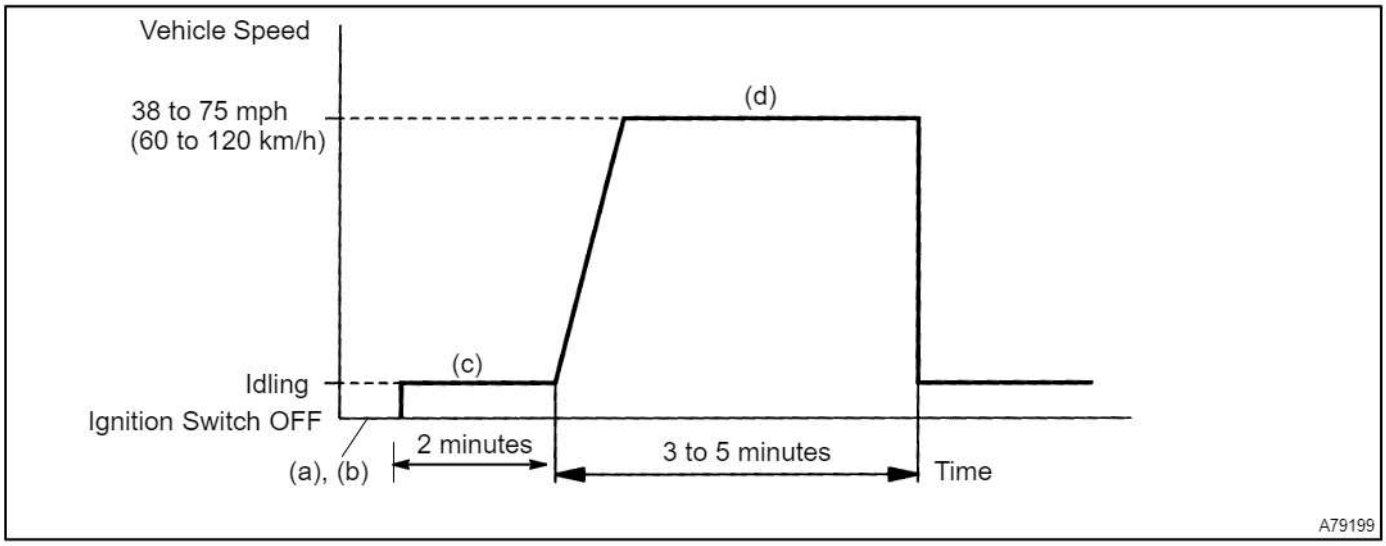
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WIRING DIAGRAM



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CONFIRMATION DRIVING PATTERN



(a) Connect the hand–held tester to the DLC3.
(b) Switch the hand–held tester from normal mode to check mode (see page 05–357).
(c) Start the engine and warm it up with all the accessory switched OFF.
(d) Drive the vehicle at 38 to 75 mph (60 to 120 km/h) and at engine speed of 1,400 to 3,200 rpm for 3 to 5 minutes.

HINT:
If a malfunction exists, the MIL will be illuminated during step (d).

NOTICE:
If the conditions in this test are not strictly followed, no malfunction will be detected. If you do not have the hand–held tester, turn the ignition switch to OFF after performing steps (c) and (d), then perform steps (c) and (d) again.

INSPECTION PROCEDURE

HINT:
Hand–held tester only:
It is possible the malfunctioning area can be found using the ACTIVE TEST A/F CONTROL operation. The A/F CONTROL operation can determine if the A/F sensor, heated oxygen sensor or other potential trouble areas are malfunctioning or not.

(a) Perform the ACTIVE TEST A/F CONTROL operation.

HINT:
The A/F CONTROL operation lowers the injection volume 12.5% or increases the injection volume 25%.

(1) Connect the hand–held tester to the DLC3 on the vehicle.
(2) Turn the ignition switch to ON.
(3) Warm up the engine by running the engine at 2,500 rpm for approximately 90 seconds.
(4) Select the item: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL.
(5) Perform the A/F CONTROL operation with the engine in an idle condition (press the right or left button).

Result:
A/F sensor reacts in accordance with increase and decrease of injection volume:
+25 % → rich output: Less than 3.0 V
–12.5 % → lean output: More than 3.35 V

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Heated oxygen sensor reacts in accordance with increase and decrease of injection volume:
+25 % → rich output: More than 0.55 V
–12.5 % → lean output: Less than 0.4 V

NOTICE:

The A/F sensor output has a few seconds of delay and the heated oxygen sensor output has about 20 seconds of delay at maximum.

	Output voltage of A/F sensor (sensor 1)	Output voltage of heated oxygen sensor (sensor 2)	Main Suspect Trouble Area
Case 1	Injection volume +25 % –12.5 % Output voltage More than 3.35 V Less than 3.0 V **OK**	Injection volume +25 % –12.5 % Output voltage More than 0.55 V Less than 0.4V **OK**	□
Case 2	Injection volume +25 % –12.5 % Output voltage Almost no reaction **NG**	Injection volume +25 % –12.5 % Output voltage More than 0.55 V Less than 0.4V **OK**	A/F sensor (A/F sensor, heater, A/F sensor circuit)
Case 3	Injection volume +25 % –12.5 % Output voltage More than 3.35 V Less than 3.0V **OK**	Injection volume +25 % –12.5 % Output voltage Almost no reaction **NG**	Heated oxygen sensor (heated oxygen sensor, heater, heated oxygen sensor circuit)
Case 4	Injection volume +25 % –12.5 % Output voltage Almost no reaction **NG**	Injection volume +25 % –12.5 % Output voltage Almost no reaction **NG**	Extremely rich or lean actual air–fuel ratio (Injector, fuel pressure, gas leakage in exhaust system, etc.)

The following A/F CONTROL procedure enables the technician to check and graph the voltage outputs of both the A/F sensor and the heated oxygen sensor.

To display the graph, enter ACTIVE TEST/ A/F CONTROL/USER DATA, then select ”AFS B1S1 and O2S B1S2” or ”AFS B2S1 and O2S B2S2” by pressing the ”YES” button followed by the ”ENTER” button and then the ”F4” button.

HINT:

- □ If DTC P2195 or P2196 is displayed, check the bank 1 sensor 1 circuit.
- □ If DTC P2197 or P2198 is displayed, check the bank 2 sensor 1 circuit.
- □ A low A/F sensor voltage could be caused by a rich air–fuel mixture. Check for conditions that would cause the engine to run rich.
- □ A high A/F sensor voltage could be caused by a lean air–fuel mixture. Check for conditions that would cause the engine to run lean.
- □ Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

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1	CHECK OTHER DTC OUTPUT(BESIDES A/F SENSOR DTCS)

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(c) Select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(d) Read DTCs.

Result :

Display (DTC Output)	Proceed to
A/F sensor circuit DTCs	A
A/F sensor circuit DTCs and other DTCs	B

HINT:
If any other codes besides A/F sensor DTCs are output, perform troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05–366)**

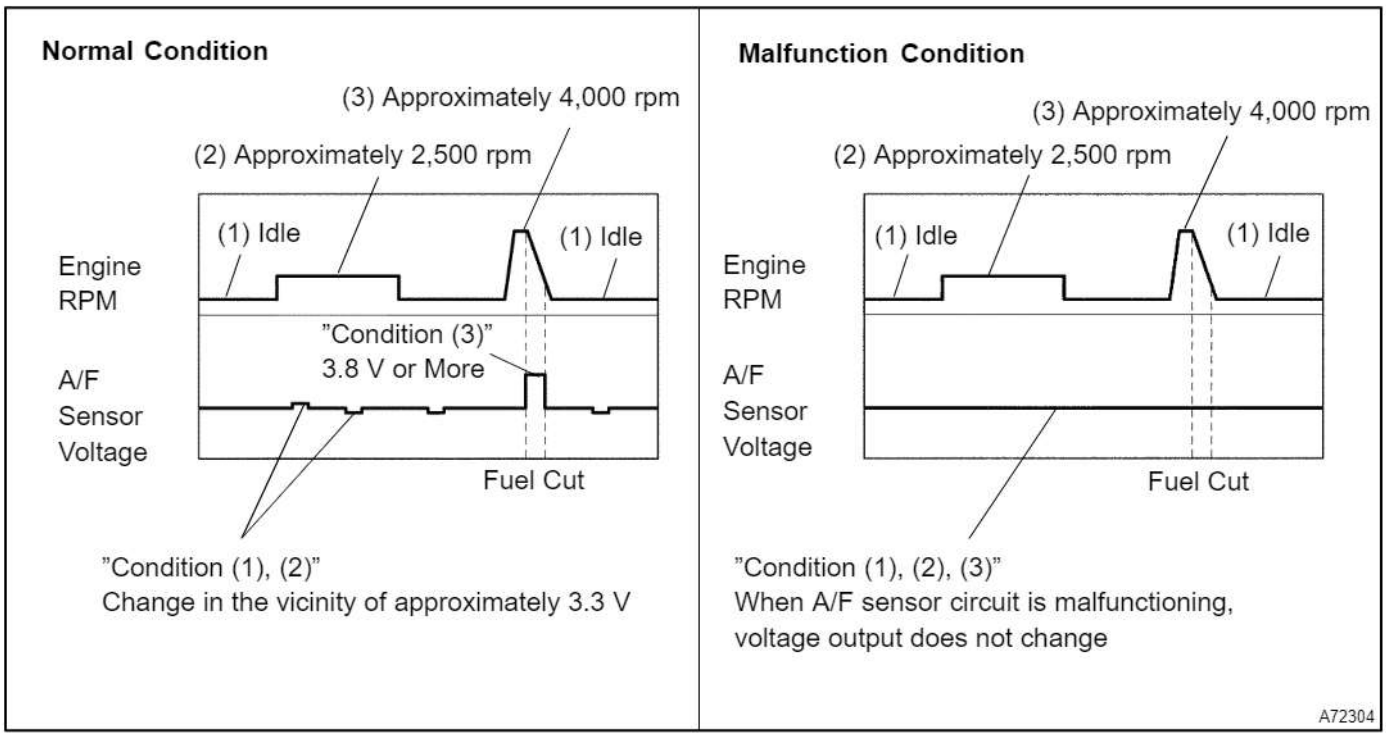
A

2	READ VALUE OF OBD II SCAN TOOL OR HAND–HELD TESTER(OUTPUT VOLTAGE OF A/F SENSOR)

(a) Connect the hand–held tester or the OBD II scan tool to the DLC 3.
(b) Warm up the A/F sensors (bank 1, 2 sensor 1) by running the engine at 2,500 rpm for approximately 90 seconds.
(c) Read A/F sensor voltage output on the OBD II scan tool or the hand–held tester.
(d) Hand–held tester only:
On the hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / SNAPSHOT / MANUAL SNAPSHOT / USER DATA. Read the values.
(e) Select ”AFS B1 S1 or AFS B2 S1/ENGINE SPD” and press YES.
(f) Monitor the A/F sensor voltage carefully.
(g) Check the A/F sensor voltage output under the following conditions:
(1) Allow the engine to idle for 30 seconds.
(2) Running the engine at approximately 2,500 rpm. Do not suddenly change the rpm.
(3) Raise the engine to 4,000 rpm and quickly release the accelerator pedal so that the throttle is fully closed.

Standard:
Condition (1) and (2)
Voltage change of 3.3 V (0.66 V)* (between approximately 3.1 to 3.5 V) as shown in the illustration.
Condition (3)
A/F sensor voltage increases to 3.8 V (0.76 V)* or more during engine deceleration when fuel is cut as shown in the illustration.
***: Voltage when using the OBD II scan tool.**

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HINT:

- Whenever the A/F sensor output voltage remains at approximately 3.3 V (0.660 V)* (see "Malfunction Condition" graphic) under any condition as well as the above conditions, the A/F sensor may have an open–circuit. This will happen also when the A/F sensor heater has an open–circuit.
- Whenever the A/F sensor output voltage remains at a certain value of approximately 3.8 V (0.76 V)* or more, or 2.8 V (0.56 V)* or less (see "Malfunction Condition" graphic) under any condition as well as the above conditions, the A/F sensor may have a short–circuit.
- The ECM will stop fuel injection (fuel is cut) during engine deceleration. This will cause a LEAN condition and should result in a momentary increase in A/F sensor output voltage.
- The ECM must establish a closed throttle position learned value to perform fuel cut. If the battery cable was reconnected, the vehicle must be driven over 10 mph to allow the ECM to learn the closed throttle position.
- When the vehicle is driven:
  The output voltage of the A/F sensor may be below 2.8 V (0.76 V)* during fuel enrichment. For the vehicle, this translates to a sudden increase in speed with the accelerator pedal fully depressed when trying to overtake another vehicle. The A/F sensor is functioning normally.
- The A/F sensor is a current output element, and therefore the current is converted into voltage inside the ECM. If measuring voltage at connectors of A/F sensor or ECM, you will observe a constant voltage.

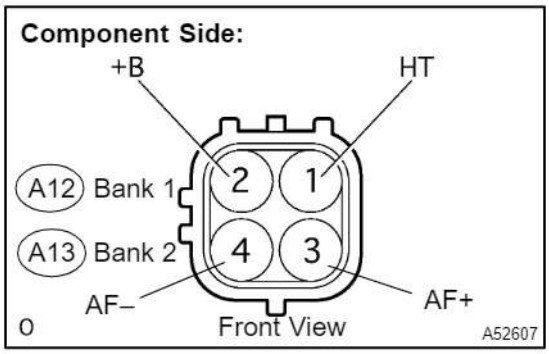
*: Voltage when using the OBD II scan tool.

OK	**Go to step 13**

NG

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3 INSPECT AIR FUEL RATIO SENSOR(RESISTANCE OF A/F SENSOR HEATER)



(a) Disconnect the A12 or A13 A/F sensor connector.
(b) Measure the resistance between the terminals of the A/F sensor.
Standard:

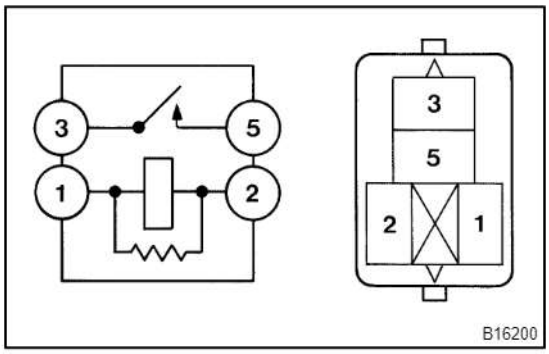
Tester Connection	Specified Condition
HT (1) – +B (2)	1.8 to 3.4 Ω at 20 C (68 F)

(c) Reconnect the A/F sensor connector.

NG → **REPLACE AIR FUEL RATIO SENSOR**

OK

4 INSPECT AIR FUEL RATIO SENSOR HEATER RELAY



(a) Remove the A/F sensor heater relay from the engine room R/B.
(b) Check for continuity in the A/F sensor heater relay.
Standard:

Tester Connection	Specified condition
1 – 2	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage to terminals 1 and 2)

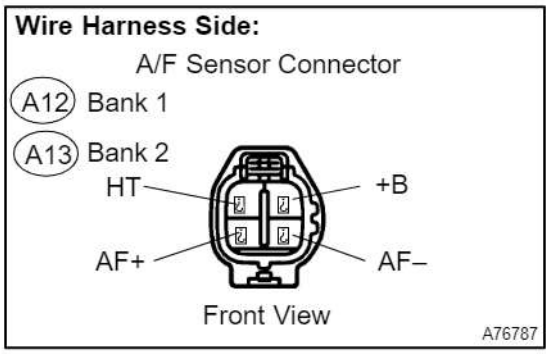
(c) Reinstall the A/F sensor heater relay.

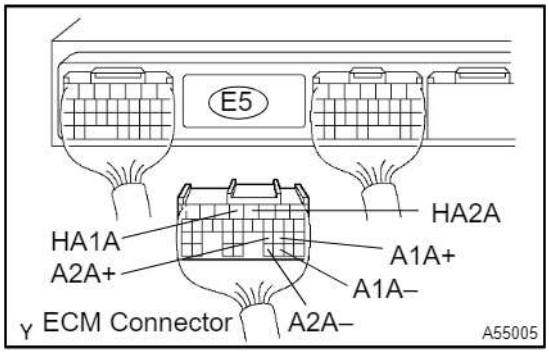
NG → **REPAIR OR REPLACE AIR FUEL RATIO SENSOR HEATER RELAY**

OK

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5 CHECK HARNESS AND CONNECTOR(A/F SENSOR – ECM)





(a) Disconnect the A12 or A13 A/F sensor connector.
(b) Disconnect the E5 ECM connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

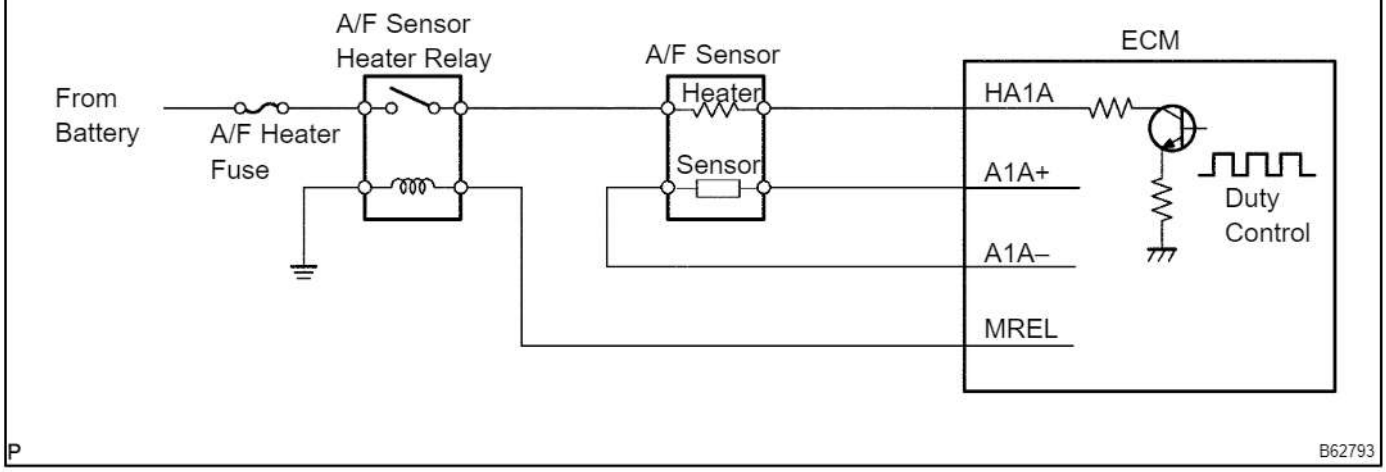
Tester Connection	Specified Condition
AF+ (A12–3) – A1A++ (E5–22)	Below 1 Ω
AF– (A12–4) – A1A– (E5–30)	
HT (A12–1) – HA1A (E5–5)	
AF+ (A13–3) – A2A+ (E5–23)	
AF– (A13–4) – A2A– (E5–31)	
HT (A13–1) – HA2A (E5–4)	

Standard (Check for short):

Tester Connection	Specified Condition
AF+ (A12–3) or A1A+ (E5–22) – Body ground	10 kΩ or higher
AF– (A12–4) or A1A– (E5–30) – Body ground	
HT (A12–1) or HA1A (E5–5) – Body ground	
AF+ (A13–3) or A2A+ (E5–23) – Body ground	
AF– (A13–4) or A2A– (E5–31) – Body ground	
HT (A13–1) or HA2A (E5–4) – Body ground	

(d) Reconnect the A/F sensor connector.
(e) Reconnect the ECM connector.

Reference (Bank 1 Sensor 1 System Diagram):



NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

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6	CHECK AIR INDUCTION SYSTEM

(a) Check for vacuum leaks in air induction system.

NG → REPAIR OR REPLACE AIR INDUCTION SYSTEM

OK

7	CHECK FUEL PRESSURE (See page 11–5)

(a) Check fuel pressure (High or low fuel pressure).

NG → REPAIR OR REPLACE FUEL SYSTEM

OK

8	INSPECT FUEL INJECTOR ASSY (See page 11–7)

(a) Check injector injection (High or low fuel pressure).

NG → REPLACE FUEL INJECTOR ASSY (See page 11–10)

OK

9	REPLACE AIR FUEL RATIO SENSOR

GO

10	PERFORM CONFIRMATION DRIVING PATTERN

HINT:
Clear all DTCs prior to perform the confirmation driving pattern.

GO

11	READ OUTPUT DTC(SEE IF A/F SENSOR DTCS OUTPUT AGAIN)

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(c) Select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(d) Read DTCs.

Result :

Display (DTC Output)	Proceed to
No output	A
A/F sensor circuit DTCs	B

B → REPLACE ECM (See page 10–11) AND PERFORM CONFIRMATION DRIVING PATTERN

A

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12	CONFIRM IF VEHICLE HAS RUN OUT OF FUEL IN PAST

NO → CHECK FOR INTERMITTENT PROBLEMS (See page 05–331)

YES

DTC IS CAUSED BY RUNNING OUT OF FUEL

13	PERFORM CONFIRMATION DRIVING PATTERN

HINT:
Clear all DTCs prior to perform the confirmation driving pattern.

GO

14	READ OUTPUT DTC(SEE IF A/F SENSOR DTCS OUTPUT AGAIN)

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(c) Select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(d) Read DTCs.

Result :

Display (DTC Output)	Proceed to
A/F sensor circuit DTCs	A
No output	B

B → Go to step 18

A

15	REPLACE AIR FUEL RATIO SENSOR

GO

16	PERFORM CONFIRMATION DRIVING PATTERN

HINT:
Clear all DTCs prior to perform the confirmation driving pattern.

GO

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17	READ OUTPUT DTC(SEE IF A/F SENSOR DTCS OUTPUT AGAIN)

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(c) Select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(d) Read DTCs.

Result :

Display (DTC Output)	Proceed to
No output	A
A/F sensor circuit DTCs	B

B → **REPLACE ECM (See page 10–11) AND PERFORM CONFIRMATION DRIVING PATTERN**

A

18	CONFIRM IF VEHICLE HAS RUN OUT OF FUEL IN PAST

NO → **CHECK FOR INTERMITTENT PROBLEMS (See page 05–331)**

YES

DTC IS CAUSED BY RUNNING OUT OF FUEL

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DTC	P2238	OXYGEN SENSOR PUMPING CURRENT CIRCUIT LOW (FOR A/F SENSOR)(BANK 1 SENSOR 1)

DTC	P2239	OXYGEN SENSOR PUMPING CURRENT CIRCUIT HIGH (FOR A/F SENSOR)(BANK 1 SENSOR 1)

DTC	P2241	OXYGEN SENSOR PUMPING CURRENT CIRCUIT LOW (FOR A/F SENSOR)(BANK 2 SENSOR 1)

DTC	P2242	OXYGEN SENSOR PUMPING CURRENT CIRCUIT HIGH (FOR A/F SENSOR)(BANK 2 SENSOR 1)

DTC	P2252	OXYGEN SENSOR REFERENCE GROUND CIRCUIT LOW (FOR A/F SENSOR)(BANK 1 SENSOR 1)

DTC	P2253	OXYGEN SENSOR REFERENCE GROUND CIRCUIT HIGH (FOR A/F SENSOR)(BANK 1 SENSOR 1)

DTC	P2255	OXYGEN SENSOR REFERENCE GROUND CIRCUIT LOW (FOR A/F SENSOR)(BANK 2 SENSOR 1)

DTC	P2256	OXYGEN SENSOR REFERENCE GROUND CIRCUIT HIGH (FOR A/F SENSOR)(BANK 2 SENSOR 1)

HINT:

- □ Although each DTC title says ”oxygen sensor”, these DTCs are related to the ”A/F sensor”.
- □ DTC P2238, P2239, P2252 and P2253 refer to the malfunction related to the bank 1 A/F sensor circuit.
- □ DTC P2241, P2242, P2255 and P2256 refer to the malfunction related to the bank 2 A/F sensor circuit.

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CIRCUIT DESCRIPTION

Refer to DTC P2195 on page 05–597.

DTC No.	DTC Detecting Condition	Trouble Area
P2238 P2241	A/F sensor circuit low (bank 1 sensor 1)	HINT : Main trouble area □Open in A/F sensor circuit
	Condition (a) continues for 5.0 seconds or more : (a) AF+ is 0.5 V or less	□Open or short in A/F sensor circuit □A/F sensor □A/F sensor heater □A/F sensor heater relay □A/F sensor heater and relay circuit □ECM
	Condition (a) continues for 5.0 seconds or more : (a) (AF+) – (AF–) is 0.1 V or less	
P2239 P2242	A/F sensor circuit high (bank 1 sensor 1)	HINT : Main trouble area □Short in A/F sensor circuit
	Condition (a) continues for 5.0 seconds or more : (a) AF+ is more than 4.5 V	□Open or short in A/F sensor circuit □A/F sensor □A/F sensor heater □A/F sensor heater relay □A/F sensor heater and relay circuit □ECM
	Condition (a) continues for 5.0 seconds or more : (a) (AF+) – (AF–) is more than 0.8 V	
P2252 P2255	Condition (a) continues for 5.0 seconds or more : (a) AF– is 0.5 V or less	□Open or short in A/F sensor circuit □A/F sensor □A/F sensor heater □A/F sensor heater relay □A/F sensor heater and relay circuit □ECM
P2253 P2256	Condition (a) continues for 5.0 seconds or more : (a) AF– is more than 4.5 V	

HINT:

- □ Bank 1 refers to the bank that includes cylinder No. 1.
- □ Bank 2 refers to the bank that includes cylinder No. 2.

MONITOR DESCRIPTION

The air fuel ratio (A/F) sensor has a characteristic that it varies its voltage output in proportion to the air–fuel ratio. If impedance (alternating current resistance) or voltage output of the sensor extraordinarily deviates from the standard range, the ECM interprets this as open or short malfunction in the A/F sensor circuit.

MONITOR STRATEGY

Related DTCs	P2238: A/F sensor pumping current circuit low (bank 1 sensor1) P2239: A/F sensor pumping current circuit high (bank 1 sensor1) P2241: A/F sensor pumping current circuit low (bank 2 sensor1) P2242: A/F sensor pumping current circuit high (bank 2 sensor1) P2252: A/F sensor reference ground circuit low (bank 1 sensor1) P2253: A/F sensor reference ground circuit high (bank 1 sensor1) P2255: A/F sensor reference ground circuit low (bank 2 sensor1) P2256: A/F sensor reference ground circuit high (bank 2 sensor1)
Required sensors/ components (Main)	A/F sensor
Required sensors/ components (Related)	Engine speed sensor, Vehicle speed sensor, Engine coolant temperature sensor
Frequency of operation	Once per driving cycle
Duration	20 seconds
MIL operation	Immediately
Sequence operation	None

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TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05–334
"General precondition" is defined as follows:	
Battery	10.5 V
Ignition switch	ON
Time after ignition switch from OFF to ON	5 seconds
"A/F sensor admittance precondition" is defined as follows:	
Engine coolant temperature	20 C (68 F) or more
Engine	Running
Time after engine start	20 seconds or more
Time after A/F sensor heating	20 seconds or more

P2238, P2241 (AF+, AF– open):

Time while "A/F sensor admittance precondition" is met	20 seconds

P2238, P2241 ("AF+, GND short" and "AF+, AF– short"):

"General precondition"	Met

P2239, P2242, P2252, P2253, P2255, P2256:

"General precondition"	Met

TYPICAL MALFUNCTION THRESHOLDS

P2238, P2241:

A/F sensor admittance (AF+, AF– open)	Less than 0.022 1/Ω
AF+ terminal voltage (AF+ – GND short)	Less than 0.5 V
AF+ terminal – AF– terminal voltage (AF+ – AF– short)	0.1 V or less

P2239, P2242:

AF+ terminal voltage (AF+ – +B, VCC short)	More than 4.5 V

P2252, P2255:

AF– terminal voltage (AF– – GND short)	Less than 0.5 V

P2253, P2256:

AF– terminal voltage (AF– – +B, VCC short)	More than 4.5 V

COMPONENT OPERATING RANGE

P2238, P2241:

A/F sensor admittance (AF+, AF– open)	0.022 1/Ω or more and less than 0.079 1/Ω
AF+ terminal voltage (AF+ – GND short)	0.5 V or more and less than 4.5 V
AF+ terminal – AF– terminal voltage (AF+ – AF– short)	0.1 V or more and less than 0.8 V

P2239, P2242:

AF+ terminal voltage (AF+ – +B, VCC short)	0.5 V or more and less than 4.5 V

P2252, P2255:

AF– terminal voltage (AF– – GND short)	0.5 V or more and less than 4.5 V

P2253, P2256:

AF– terminal voltage (AF– – +B, VCC short)	0.5 V or more and less than 4.5 V

WIRING DIAGRAM

Refer to DTC P2195 on page 05–597.

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INSPECTION PROCEDURE

HINT:

Hand–held tester only:

It is possible the malfunctioning area can be found using the ACTIVE TEST A/F CONTROL operation. The A/F CONTROL operation can determine if the A/F sensor, heated oxygen sensor or other potential trouble areas are malfunctioning or not.

(a) Perform the ACTIVE TEST A/F CONTROL operation.

HINT:

The A/F CONTROL operation lowers the injection volume 12.5% or increases the injection volume 25%.

(1) Connect the hand–held tester to the DLC3 on the vehicle.
(2) Turn the ignition switch to ON.
(3) Warm up the engine by running the engine at 2,500 rpm for approximately 90 seconds.
(4) Select the item: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL.
(5) Perform the A/F CONTROL operation with the engine in an idle condition (press the right or left button).

Result:

A/F sensor reacts in accordance with increase and decrease of injection volume:
+25 % → rich output: Less than 3.0 V
–12.5 % → lean output: More than 3.35 V
Heated oxygen sensor reacts in accordance with increase and decrease of injection volume:
+25 % → rich output: More than 0.55 V
–12.5 % → lean output: Less than 0.4 V

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NOTICE:

The A/F sensor output has a few seconds of delay and the heated oxygen sensor output has about 20 seconds of delay at maximum.

	Output voltage of A/F sensor (sensor 1)	Output voltage of heated oxygen sensor (sensor 2)	Main Suspect Trouble Area
Case 1	Injection volume +25 % –12.5 % Output voltage More than 3.35 V Less than 3.0 V OK	Injection volume +25 % –12.5 % Output voltage More than 0.55 V Less than 0.4V OK	□
Case 2	Injection volume +25 % –12.5 % Output voltage Almost no reaction NG	Injection volume +25 % –12.5 % Output voltage More than 0.55 V Less than 0.4V OK	A/F sensor (A/F sensor, heater, A/F sensor circuit)
Case 3	Injection volume +25 % –12.5 % Output voltage More than 3.35 V Less than 3.0V OK	Injection volume +25 % –12.5 % Output voltage Almost no reaction NG	Heated oxygen sensor (heated oxygen sensor, heater, heated oxygen sensor circuit)
Case 4	Injection volume +25 % –12.5 % Output voltage Almost no reaction NG	Injection volume +25 % –12.5 % Output voltage Almost no reaction NG	Extremely rich or lean actual air–fuel ratio (Injector, fuel pressure, gas leakage in exhaust system, etc.)

The following A/F CONTROL procedure enables the technician to check and graph the voltage outputs of both the A/F sensor and the heated oxygen sensor.

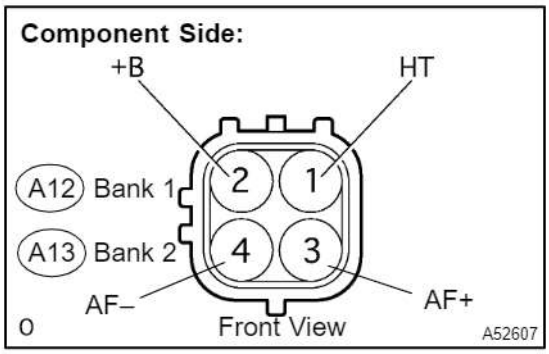
To display the graph, enter ACTIVE TEST/ A/F CONTROL/USER DATA, then select ”AFS B1S1 and O2S B1S2” or ”AFS B2S1 and O2S B2S2” by pressing the ”YES” button followed by the ”ENTER” button and then the ”F4” button.

HINT:

- □ If DTC P2238, P2239, P2252 or P2253 is displayed, check the bank 1 sensor 1 circuit.
- □ If DTC P2241, P2242, P2255 or P2256 is displayed, check the bank 2 sensor 1 circuit.
- □ Read freeze frame data using the hand–held tester or the OBD II scan tool, as freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

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1 INSPECT AIR FUEL RATIO SENSOR(RESISTANCE OF A/F SENSOR HEATER)



(a) Disconnect the A12 or A13 A/F sensor connector.
(b) Measure the resistance between the terminals of the A/F sensor.
Standard:

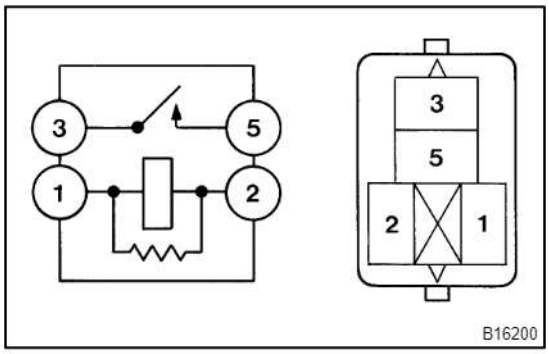
Tester Connection	Specified Condition
HT (1) – +B (2)	1.8 to 3.4 Ω at 20 C (68 F)

(c) Reconnect the A/F sensor connector.

NG → **REPLACE AIR FUEL RATIO SENSOR**

OK

2 INSPECT AIR FUEL RATIO SENSOR HEATER RELAY



(a) Remove the A/F sensor heater relay from the engine room R/B.
(b) Check for continuity in the A/F sensor heater relay.
Standard:

Tester Connection	Specified Condition
1 – 2	Continuity
3 – 5	No continuity
	Continuity (Apply battery voltage to terminals 1 and 2)

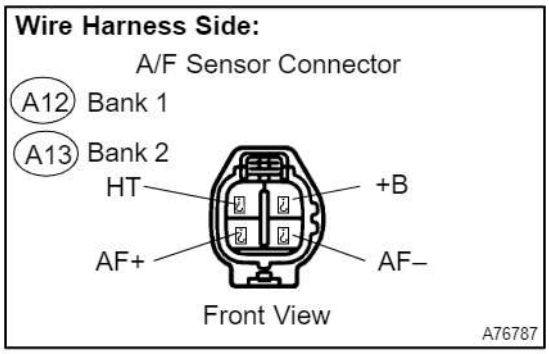
(c) Reinstall the A/F sensor heater relay.

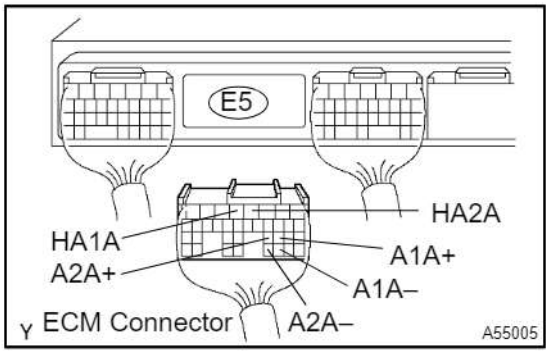
NG → **REPAIR OR REPLACE AIR FUEL RATIO SENSOR HEATER RELAY**

OK

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3 CHECK HARNESS AND CONNECTOR(A/F SENSOR – ECM)





(a) Disconnect the A12 or A13 heated oxygen sensor connector.

(b) Disconnect the E5 ECM connector.

(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
AF+ (A12–3) – A1A+ (E5–22)	Below 1 Ω
AF– (A12–4) – A1A– (E5–30)	
HT (A12–1) – HA1A (E5–5)	
AF+ (A13–3) – A2A+ (E5–23)	
AF– (A13–4) – A2A– (E5–31)	
HT (A13–1) – HA2A (E5–4)	

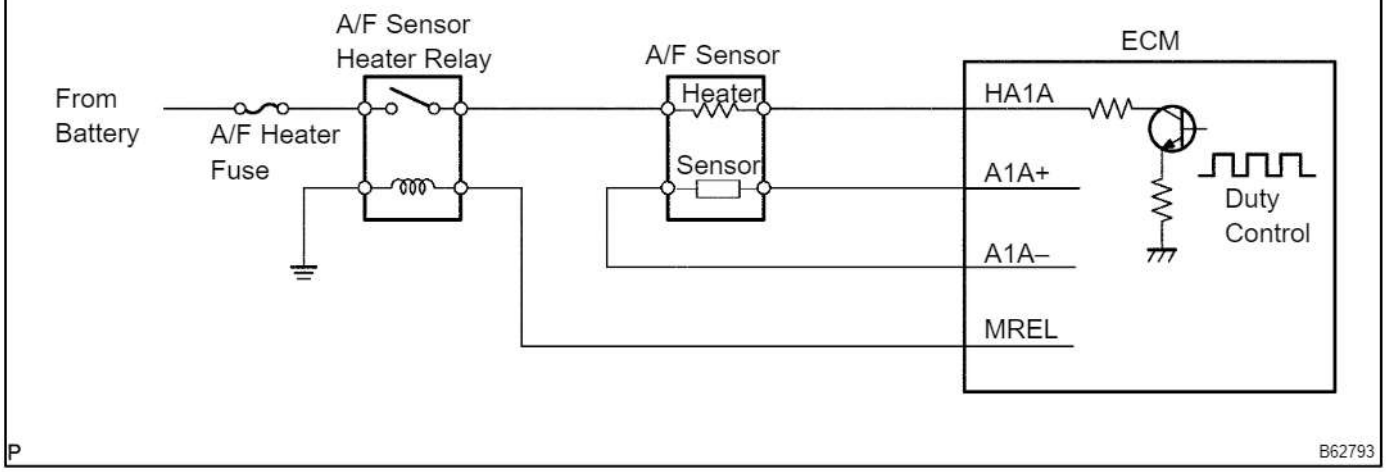
Standard (Check for short):

Tester Connection	Specified Condition
AF+ (A12–3) or A1A+ (E5–22) – Body ground	10 kΩ or higher
AF– (A12–4) or A1A– (E5–30) – Body ground	
HT (A12–1) or HA1A (E5–5) – Body ground	
AF+ (A13–3) or A2A+ (E5–23) – Body ground	
AF– (A13–4) or A2A– (E5–31) – Body ground	
HT (A13–1) or HA2A (E5–4) – Body ground	

(d) Reconnect the A/F sensor connector.

(e) Reconnect the ECM connector.

Reference (Bank 1 Sensor 1 System Diagram):



NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK →

REPLACE ECM (See page 10–11)

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DTC	P2A00	A/F SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1)

DTC	P2A03	A/F SENSOR CIRCUIT SLOW RESPONSE (BANK 2 SENSOR 1)

HINT:

- DTC P2A00 means malfunction related to the bank 1 A/F sensor.
- DTC P2A03 means malfunction related to the bank 2 A/F sensor.

CIRCUIT DESCRIPTION

Refer to DTC P2195 on page 05–597.

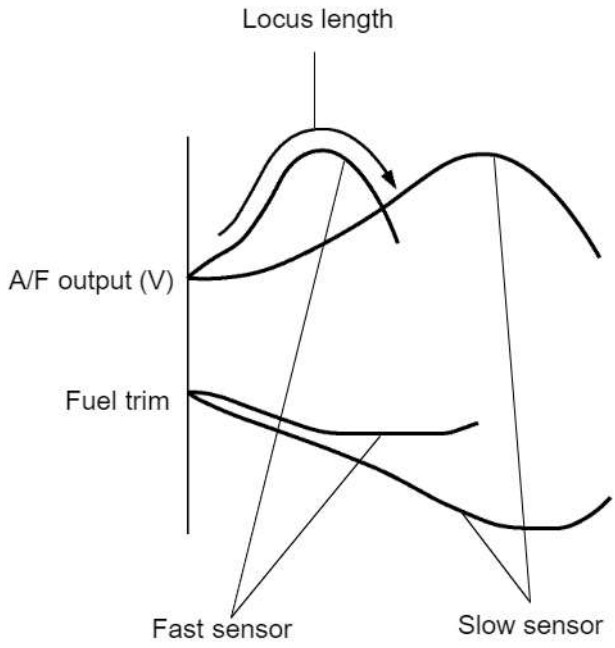
DTC No.	DTC Detecting Condition	Trouble Area
P2A00 P2A03	When A/F sensor output voltage change is below expected variation compared to fuel trim change, ECM judges that A/F sensor circuit has slow response if conditions (a), (b) and (c) are met (2 trip detection logic): (a) After engine is warmed up (b) During vehicle driving at engine speed of 1,400 rpm or more (c) Vehicle speed is 38 mph (60 km/h) or more	□Open or short in A/F sensor (bank 1, 2 sensor 1) circuit □A/F sensor (bank 1, 2 sensor 1) □A/F sensor heater □A/F sensor heater relay □A/F sensor heater and relay circuit □Air induction system □Fuel pressure □Injector □ECM

HINT:

- Bank 1 refers to the bank that includes cylinder No. 1.
- Bank 2 refers to the bank that includes cylinder No. 2.
- Sensor 1 refers to the sensor closest to the engine assembly.

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MONITOR DESCRIPTION



The air fuel ratio (A/F) sensor varies its output voltage in proportion to the air–fuel ratio. Based on the output voltage, the ECM determines if the air–fuel ratio is RICH or LEAN and adjusts the stoichiometric air–fuel ratio. The ECM also checks the fuel injection volume compensation value to check if the A/F sensor has deteriorated or not. The output voltage variation, known as locus length, should be high when the air–fuel ratio fluctuates. When the A/F sensor response rate has deteriorated, the locus length should be short.
The ECM concludes that there is a malfunction in the ratio of the A/F sensor when the locus length is short and the response rate has deteriorated.

MONITOR STRATEGY

Related DTCs	P2A00: A/F sensor (Bank 1) slow response P2A03: A/F sensor (Bank 2) slow response
Required sensors/ components (Main)	A/F sensor
Required sensors/ components (Related)	Vehicle speed sensor, Crankshaft position sensor
Frequency of operation	Once per driving cycle
Duration	60 seconds
MIL operation	2 driving cycles
Sequence operation	None

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TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05–334
Engine condition	Running
Time after engine start	120 seconds or more
Driving record for 20 seconds or more	25 mph (40 km/h) or more and 900 rpm or more
Fuel system status	Closed Loop
A/F sensor status	Activated
Idle	OFF
Time after idle OFF	2 seconds or more
Engine PRM	1,400 to 3,200 rpm
Vehicle speed	37.5 to 75 mph (60 to 121 km/h)
Fuel cut	OFF
Time after fuel cut is OFF	2 seconds or more

TYPICAL MALFUNCTION THRESHOLDS

Response rate deterioration level	7.5 or more

MONITOR RESULT (MODE 06 DATA)

A/F sensor deterioration:

Test ID/Comp ID	Description of Test Data	Description of Test Limit	Conversion Factor (Unit)
$06/$81	Response rate deterioration level	Maximum test limit	Multiply by 0.000244 (No dimension)

Refer to page 05–340 for detailed information on CHECKING MONITOR STATUS (MODE 06 DATA).

WIRING DIAGRAM

Refer to DTC P2195 on page 05–597.

INSPECTION PROCEDURE

HINT:

Hand–held tester only:

It is possible the malfunctioning area can be found using the ACTIVE TEST A/F CONTROL operation. The A/F CONTROL operation can determine if the A/F sensor, heated oxygen sensor or other potential trouble areas are malfunctioning or not.

(a) Perform the ACTIVE TEST A/F CONTROL operation.

HINT:

The A/F CONTROL operation lowers the injection volume 12.5% or increases the injection volume 25%.

(1) Connect the hand–held tester to the DLC3 on the vehicle.
(2) Turn the ignition switch to ON.
(3) Warm up the engine by running the engine at 2,500 rpm for approximately 90 seconds.
(4) Select the item: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL.
(5) Perform the A/F CONTROL operation with the engine in an idle condition (press the right or left button).

Result:

A/F sensor reacts in accordance with increase and decrease of injection volume:
+25 % → rich output: Less than 3.0 V
–12.5 % → lean output: More than 3.35 V
Heated oxygen sensor reacts in accordance with increase and decrease of injection volume:
+25 % → rich output: More than 0.55 V
–12.5 % → lean output: Less than 0.4 V

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NOTICE:

The A/F sensor output has a few seconds of delay and the heated oxygen sensor output has about 20 seconds of delay at maximum.

	Output voltage of A/F sensor (sensor 1)	Output voltage of heated oxygen sensor (sensor 2)	Main Suspect Trouble Area
Case 1	Injection volume +25 % –12.5 % Output voltage More than 3.35 V Less than 3.0 V OK	Injection volume +25 % –12.5 % Output voltage More than 0.55 V Less than 0.4V OK	□
Case 2	Injection volume +25 % –12.5 % Output voltage Almost no reaction NG	Injection volume +25 % –12.5 % Output voltage More than 0.55 V Less than 0.4V OK	A/F sensor (A/F sensor, heater, A/F sensor circuit)
Case 3	Injection volume +25 % –12.5 % Output voltage More than 3.35 V Less than 3.0V OK	Injection volume +25 % –12.5 % Output voltage Almost no reaction NG	Heated oxygen sensor (heated oxygen sensor, heater, heated oxygen sensor circuit)
Case 4	Injection volume +25 % –12.5 % Output voltage Almost no reaction NG	Injection volume +25 % –12.5 % Output voltage Almost no reaction NG	Extremely rich or lean actual air–fuel ratio (Injector, fuel pressure, gas leakage in exhaust system, etc.)

The following A/F CONTROL procedure enables the technician to check and graph the voltage outputs of both the A/F sensor and the heated oxygen sensor.

To display the graph, enter ACTIVE TEST/ A/F CONTROL/USER DATA, then select ”AFS B1S1 and O2S B1S2” or ”AFS B2S1 and O2S B2S2” by pressing the ”YES” button followed by the ”ENTER” button and then the ”F4” button.

HINT:

- □ DTC P2A00 or P2A03 may be also detected, when the air–fuel ratio is stuck rich or lean.
- □ A low A/F sensor voltage could be caused by a rich air–fuel mixture. Check for conditions that would cause the engine to run rich.
- □ A high A/F sensor voltage could be caused by a lean air–fuel mixture. Check for conditions that would cause the engine to run lean.
- □ Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

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1	CHECK OTHER DTC OUTPUT(IN ADDITION TO A/F SENSOR DTCS)

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(c) Select th item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(d) Read DTCs.

Result :

Display (DTC Output)	Proceed to
P2A00 and/or P2A03	A
P2A00 and/or P2A03 and other DTCs	B

HINT:
If any other code besides P2A00 are/or P2A03 are output, perform troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05–366)**

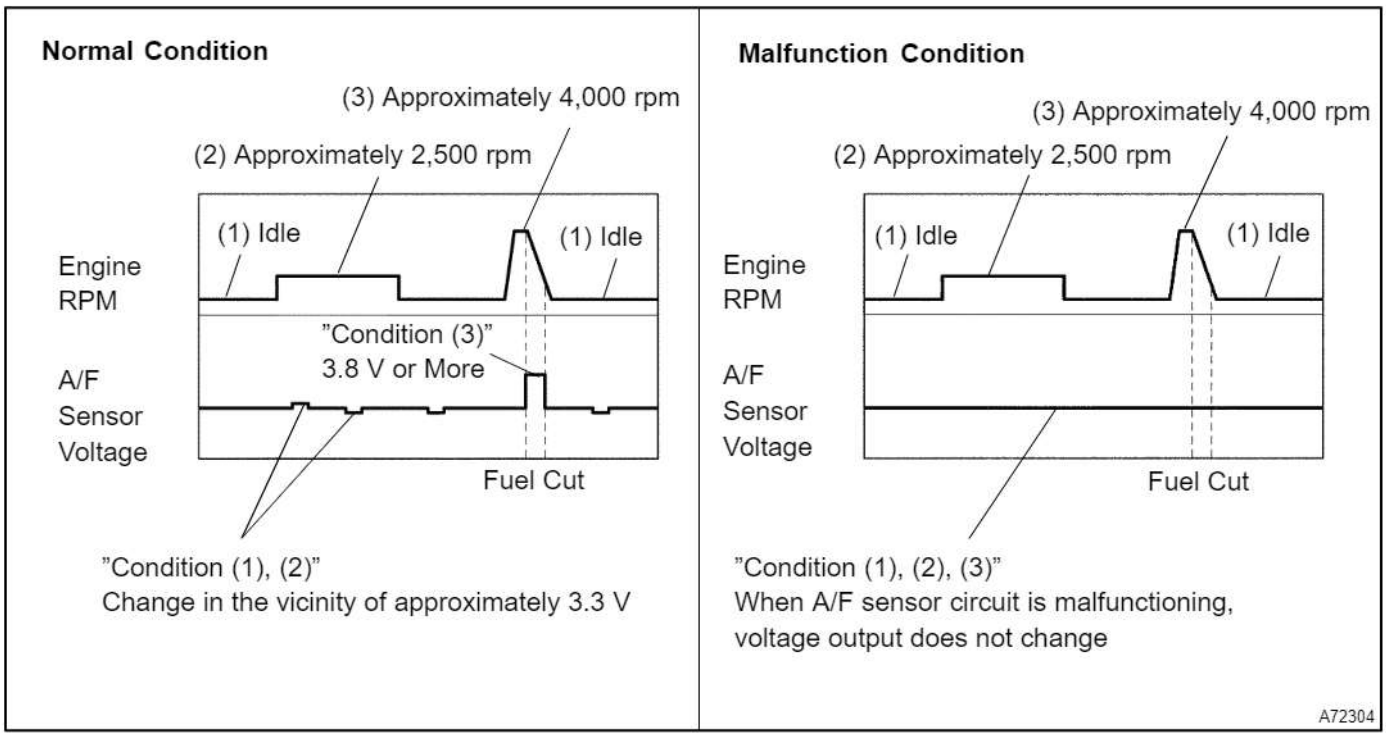
A

2	READ VALUE OF OBD II SCAN TOOL OR HAND–HELD TESTER(OUTPUT VOLTAGE OF A/F SENSOR)

(a) Connect the hand–held tester or the OBD II scan tool to the DLC 3.
(b) Warm up the A/F sensors (bank 1, 2 sensor 1) by running the engine at 2,500 rpm for approximately 90 seconds.
(c) Read A/F sensor voltage output on the OBD II scan tool or the hand–held tester.
(d) Hand–held tester only:
On the hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / SNAPSHOT / MANUAL SNAPSHOT / USER DATA. Read the values.
(e) Select ”AFS B1 S1 or AFS B2 S1/ENGINE SPD” and press YES.
(f) Monitor the A/F sensor voltage carefully.
(g) Check the A/F sensor voltage output under the following conditions:
(1) Allow the engine to idle for 30 seconds.
(2) Running the engine at approximately 2,500 rpm. Do not suddenly change the rpm.
(3) Raise the engine to 4,000 rpm and quickly release the accelerator pedal so that the throttle is fully closed.

Standard:
Condition (1) and (2)
Voltage change of 3.3 V (0.66 V)* (between approximately 3.1 to 3.5 V) as shown in the illustration.
Condition (3)
A/F sensor voltage increases to 3.8 V (0.76 V)* or more during engine deceleration when fuel is cut as shown in the illustration.
***: Voltage when using the OBD II scan tool.**

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HINT:

- Whenever the A/F sensor output voltage remains at approximately 3.3 V (0.660 V)* (see "Malfunction Condition" graphic) under any condition as well as the above conditions, the A/F sensor may have an open–circuit. This will happen also when the A/F sensor heater has an open–circuit.
- Whenever the A/F sensor output voltage remains at a certain value of approximately 3.8 V (0.76 V)* or more, or 2.8 V (0.56 V)* or less (see "Malfunction Condition" graphic) under any condition as well as the above conditions, the A/F sensor may have a short–circuit.
- The ECM will stop fuel injection (fuel is cut) during engine deceleration. This will cause a LEAN condition and should result in a momentary increase in A/F sensor output voltage.
- The ECM must establish a closed throttle position learned value to perform fuel cut. If the battery cable was reconnected, the vehicle must be driven over 10 mph to allow the ECM to learn the closed throttle position.
- When the vehicle is driven:
  The output voltage of the A/F sensor may be below 2.8 V (0.76 V)* during fuel enrichment. For the vehicle, this translates to a sudden increase in speed with the accelerator pedal fully depressed when trying to overtake another vehicle. The A/F sensor is functioning normally.
- The A/F sensor is a current output element, and therefore the current is converted into voltage inside the ECM. If measuring voltage at connectors of A/F sensor or ECM, you will observe a constant voltage.

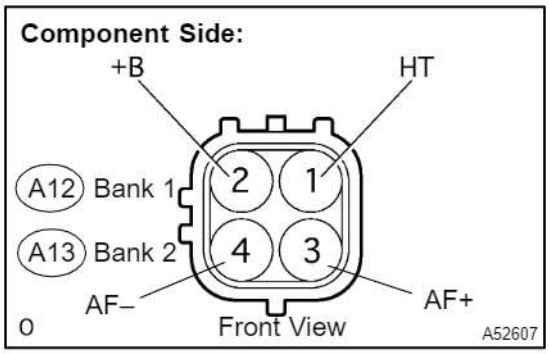
*: Voltage when using the OBD II scan tool.

OK	**Go to step 14**

NG

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3 INSPECT AIR FUEL RATIO SENSOR(RESISTANCE OF A/F SENSOR HEATER)



(a) Disconnect the A12 or A13 A/F sensor connector.
(b) Measure the resistance between the terminals of the A/F sensor.

Standard:

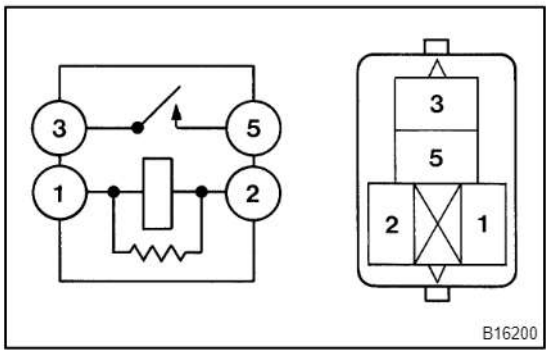
Tester Connection	Specified Condition
HT (1) – +B (2)	1.8 to 3.4 Ω at 20 C (68 F)

(c) Reconnect the A/F sensor connector.

NG → **REPLACE AIR FUEL RATIO SENSOR**

OK

4 INSPECT AIR FUEL RATIO SENSOR HEATER RELAY



(a) Remove the A/F sensor heater relay from the engine room R/B.
(b) Check for continuity in the A/F sensor heater relay.

Standard:

Tester Connection	Specified Condition
1 – 2	Continuity
3 – 5	No continuity
	Continuity (Apply battery voltage to terminals 1 and 2)

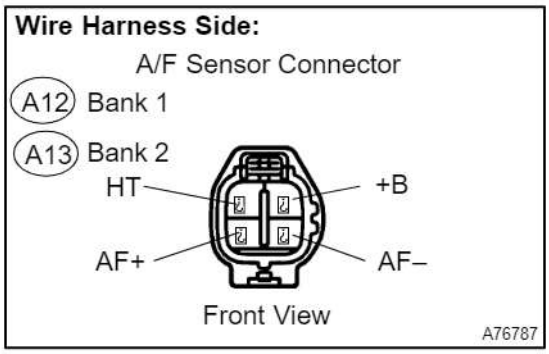
(c) Reinstall the A/F sensor heater relay.

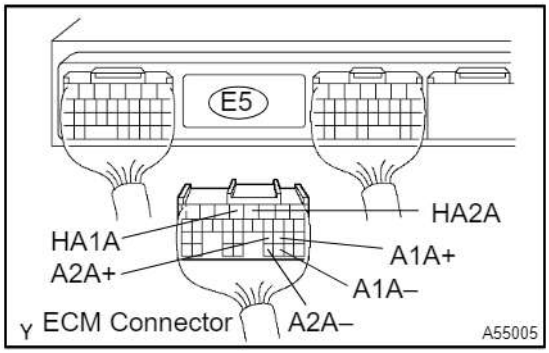
NG → **REPAIR OR REPLACE AIR FUEL RATIO SENSOR HEATER RELAY**

OK

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5 CHECK HARNESS AND CONNECTOR(A/F SENSOR – ECM)





(a) Disconnect the A12 or A13 heated oxygen sensor connector.

(b) Disconnect the E5 ECM connector.

(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
AF+ (A12–3) – A1A+ (E5–22)	Below 1 Ω
AF– (A12–4) – A1A– (E5–30)	
HT (A12–1) – HA1A (E5–5)	
AF+ (A13–3) – A2A+ (E5–23)	
AF– (A13–4) – A2A– (E5–31)	
HT (A13–1) – HA2A (E5–4)	

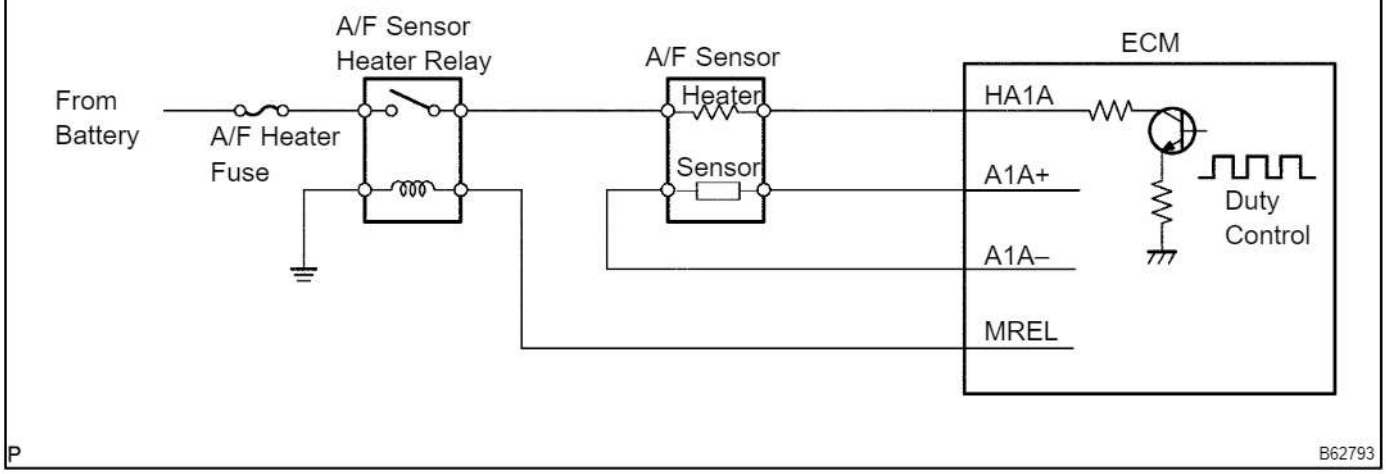
Standard (Check for short):

Tester Connection	Specified Condition
AF+ (A12–3) or A1A+ (E5–22) – Body ground	10 kΩ or higher
AF– (A12–4) or A1A– (E5–30) – Body ground	
HT (A12–1) or HA1A (E5–5) – Body ground	
AF+ (A13–3) or A2A+ (E5–23) – Body ground	
AF– (A13–4) or A2A– (E5–31) – Body ground	
HT (A13–1) or HA2A (E5–4) – Body ground	

(d) Reconnect the A/F sensor connector.

(e) Reconnect the ECM connector.

Reference (Bank 1 Sensor 1 System Diagram):



NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

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6	CHECK AIR INDUCTION SYSTEM

(a) Check for vacuum leaks in the air induction system.

NG → REPAIR OR REPLACE AIR INDUCTION SYSTEM

OK

7	CHECK CONNECTION OF PCV HOSE

NG → REPAIR OR REPLACE PCV HOSE

OK

8	CHECK FUEL PRESSURE (See page 11–5)

(a) Check fuel pressure (High or low fuel pressure).

NG → REPAIR OR REPLACE FUEL SYSTEM

OK

9	INSPECT FUEL INJECTOR ASSY (See page 11–10)

(a) Check injector injection (High or low fuel pressure).

NG → REPLACE FUEL INJECTOR ASSY (See page 11–10)

OK

10	REPLACE AIR FUEL RATIO SENSOR

GO

11	PERFORM CONFIRMATION DRIVING PATTERN (See page 05–597)

HINT:
Clear all DTCs prior to perform the confirmation driving pattern (See page 05–597).

GO

12	READ OUTPUT DTC(SEE IF A/F SENSOR DTCS OUTPUT AGAIN)

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(c) Select th item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(d) Read DTCs.

Result :

Display (DTC Output)	Proceed to
No output	A
P2A00 and/or P2A03	B

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B → REPLACE ECM (See page 10–11) AND PERFORM CONFIRMATION DRIVING PATTERN (See page 05–597)

A

13	CONFIRM IF VEHICLE HAS RUN OUT OF FUEL IN PAST

NO → CHECK FOR INTERMITTENT PROBLEMS (See page 05–331)

YES

DTC IS CAUSED BY RUNNING OUT OF FUEL

14	PERFORM CONFIRMATION DRIVING PATTERN (See page 05–597)

HINT:
Clear all DTCs prior to perform the confirmation driving pattern (See page 05–597).

GO

15	READ OUTPUT DTC(SEE IF A/F SENSOR DTCS OUTPUT AGAIN)

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(c) Select th item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(d) Read DTCs.

Result :

Display (DTC Output)	Proceed to
P2A00 and/or P2A03	A
No output	B

B → Go to step 19 AND PERFORM CONFIRMATION DRIVING PATTERN (See Page 05–597)

A

16	REPLACE AIR FUEL RATIO SENSOR

GO

17	PERFORM CONFIRMATION DRIVING PATTERN (See page 05–597)

HINT:
Clear all DTCs prior to perform the confirmation driving pattern (See page 05–597).

GO

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18	READ OUTPUT DTC(SEE IF A/F SENSOR DTCS OUTPUT AGAIN)

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(c) Select th item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(d) Read DTCs.

Result :

Display (DTC Output)	Proceed to
No output	A
P2A00 and/or P2A03	B

B → **REPLACE ECM (See page 10–11) AND PERFORM CONFIRMATION DRIVING PATTERN (See page 05–597)**

A

19	CONFIRM IF VEHICLE HAS RUN OUT OF FUEL IN PAST

NO → **CHECK FOR INTERMITTENT PROBLEMS (See page 05–331)**

YES

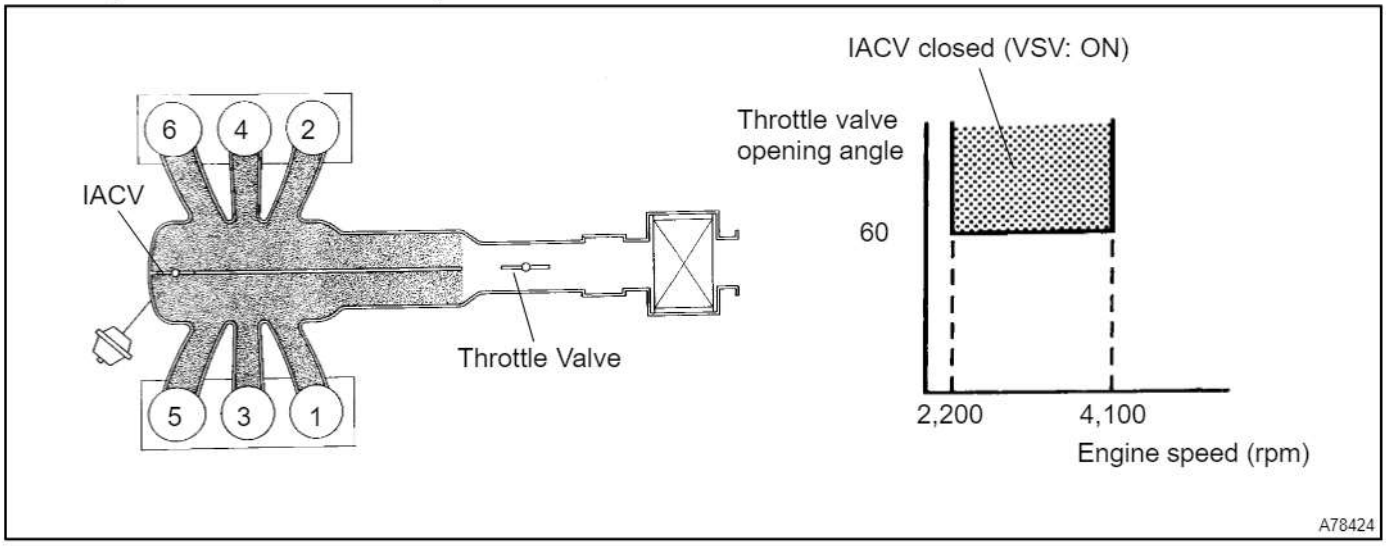
DTC IS CAUSED BY RUNNING OUT OF FUEL

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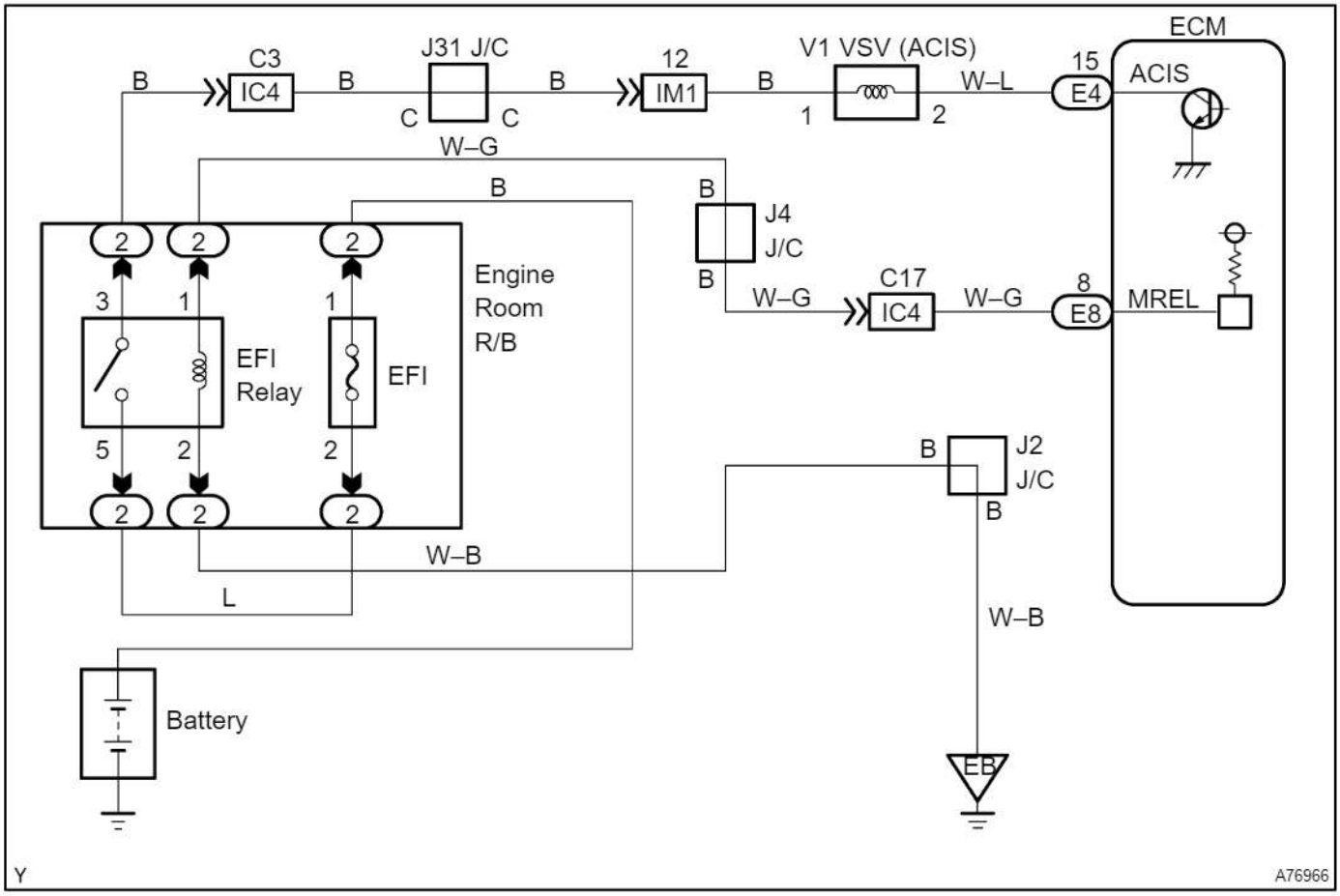
ACIS CONTROL CIRCUIT

CIRCUIT DESCRIPTION

This circuit opens and closes the Intake Air Control Valve (IACV) in response to the engine load in order to increase the intake efficiency (ACIS: Acoustic Control Induction System).
When the engine speed is between 2,200 and 4,100 rpm and the throttle valve opening angle is 60° or more, the ECM supplies current to the VSV (ON status), so the IACV will close. Besides that condition, the VSV is usually OFF and the IACV is open.



WIRING DIAGRAM

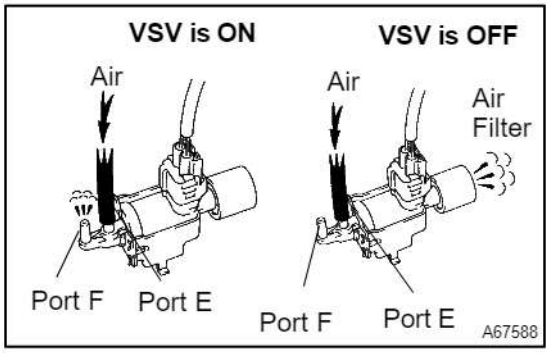


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INSPECTION PROCEDURE

Hand–held tester:

1	PERFORM ACTIVE TEST BY HAND–HELD TESTER(OPERATE VSV FOR ACIS)



(a) Disconnect the vacuum hose.
(b) Connect the hand–held tester to the DLC3.
(c) Turn the ignition switch to ON and turn the hand–held tester ON.
(d) Select the item: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / INTAKE CTL VSV1. Operate the VSV for AICS.
(e) Check the VSV operation when it is operated using the hand–held tester.

Standard:

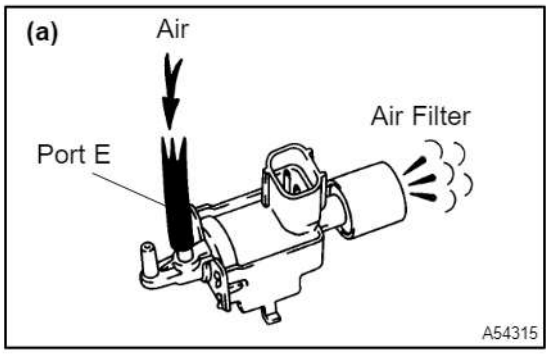
Tester Operation	Specified Condition
VSV is ON	Air from port E flows out through port F
VSV is OFF	Air from port E flows out through the air filter

(f) Reconnect the vacuum hose.

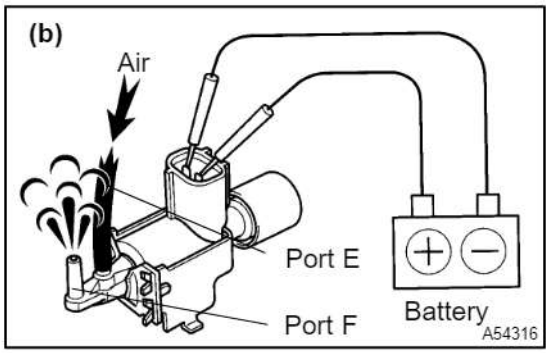
OK → **Go to step 4**

NG

2	CHECK VSV FOR ACIS(OPERATION)



(a) Check that air flows from port E to the air filter.



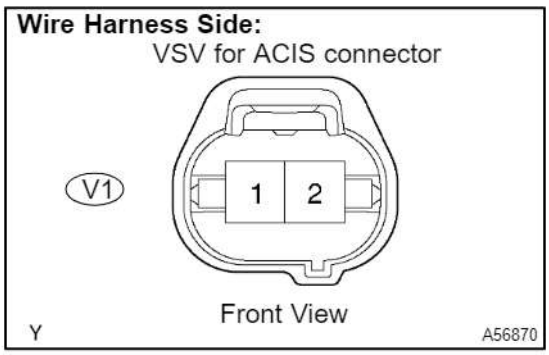
(b) Apply positive battery voltage across the terminals.
(c) Check that air flows from port E to port F.

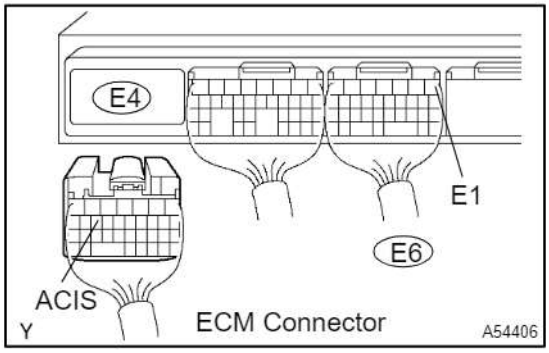
NG → **REPLACE VSV FOR ACIS**

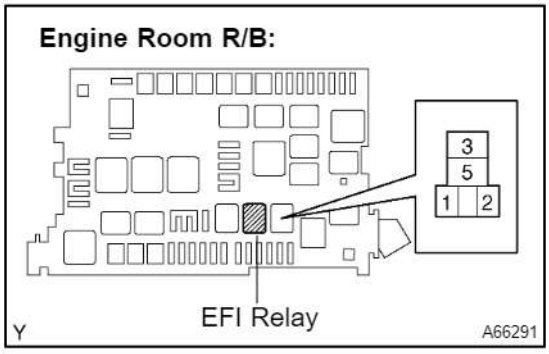
OK

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3	CHECK HARNESS AND CONNECTOR(VSV FOR ACIS – ECM, VSV FOR ACIS – EFI RELAY)







(a) Check the wire harness and connectors between the VSV for ACIS and ECM.
  (1) Disconnect the V1 VSV for ACIS connector.
  (2) Disconnect the E4 ECM connector.
  (3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
VSV for ACIS (V1–2) – ACIS (E4–15)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
VSV for ACIS (V1–2) or ACIS (E4–15) – E1 (E6–1)	10 kΩ or higher

  (4) Reconnect the VSV for ACIS connector.
  (5) Reconnect the ECM connector.

(b) Check the wire harness between the VSV for ACIS and EFI relay.
  (1) Disconnect the V1 VSV for ACIS connector.
  (2) Remove the EFI relay from the engine room R/B.
  (3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
VSV for ACIS (V1–1) – EFI relay terminal 3 of R/B	Below 1 Ω

  (4) Reconnect the VSV for ACIS connector.
  (5) Reinstall the EFI relay.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4	CHECK VACUUM HOSES(INTAKE MANIFOLD – INTAKE AIR CONTROL VALVE, INTAKE AIR CONTROL VALVE – VSV FOR ACIS)

(a) Check that the vacuum hose is connected correctly.
(b) Check the vacuum hose for looseness and disconnection.
(c) Check the vacuum hose for cracks, holes and damage.

NG → **REPAIR OR REPLACE VACUUM HOSES**

OK

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5	INSPECT INTAKE AIR CONTROL VALVE(INTAKE AIR SURGE TANK) (See page 13–2)

NG → REPLACE INTAKE AIR CONTROL VALVE (INTAKE AIR SURGE TANK) (See page 14–163)

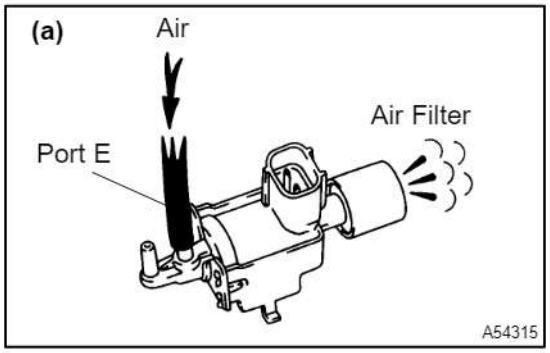
OK

REPLACE ECM (See page 10–11)

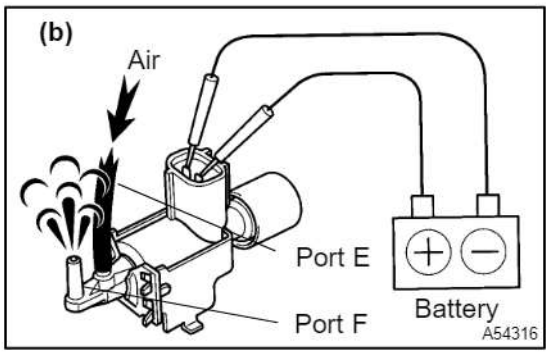
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OBD II scan tool (excluding hand–held tester):

1	INSPECT VSV FOR ACIS(OPRATION)



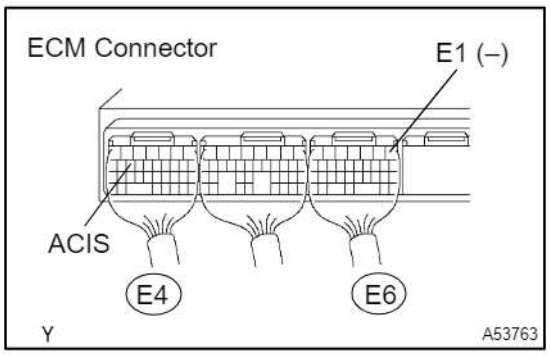
(a) Disconnect the VSV for ACIS connector.
(b) Check the operation of the VSV for ACIS when positive battery voltage is applied to the terminals of the VSV for ACIS connector.
Standard:
Positive battery voltage is not applied:
Air from port E flows out through the air filter.
Positive battery voltage is applied:
Air from port E flows out through port F.



NG → **REPLACE VSV FOR ACIS**

OK

2	CHECK ECM(ACIS VOLTAGE)



(a) Start the engine.
(b) Measure the voltage between the specified terminals of the E4 and E6 ECM connectors.
Standard:

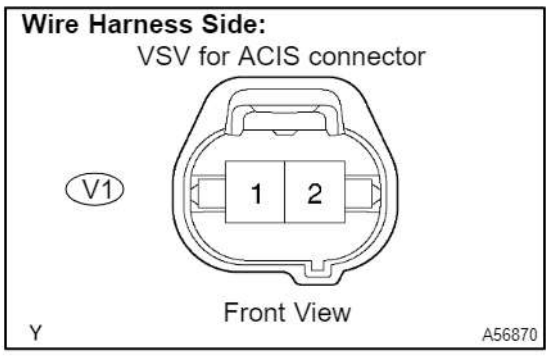
Tester Connection	Condition	Specified Condition
ACIS (E4–15) – E1 (E6–1)	□Engine speed is between 2,200 rpm and 4,100 rpm □Throttle valve opening angle is 60 or more	9 to 14 V

OK → **Go to step 4**

NG

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3	CHECK HARNESS AND CONNECTOR(VSV FOR ACIS – ECM, VAV FOR ACIS – EFI RELAY)



(a) Check the wire harness and connectors between the VSV for ACIS and ECM.
(1) Disconnect the V1 VSV for ACIS connector.
(2) Disconnect the E4 ECM connector.
(3) Check the resistance between the wire harness side connectors.

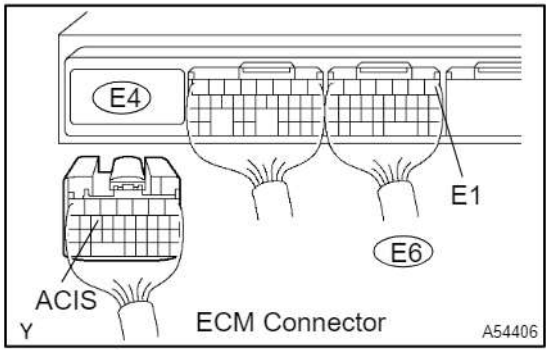
Standard (Check for open):

Tester Connection	Specified Condition
VSV for ACIS (V1–2) – ACIS (E4–15)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
VSV for ACIS (V1–2) or ACIS (E4–15) – E1 (E6–1)	10 kΩ or higher

(4) Reconnect the VSV for ACIS connector.
(5) Reconnect the ECM connector.

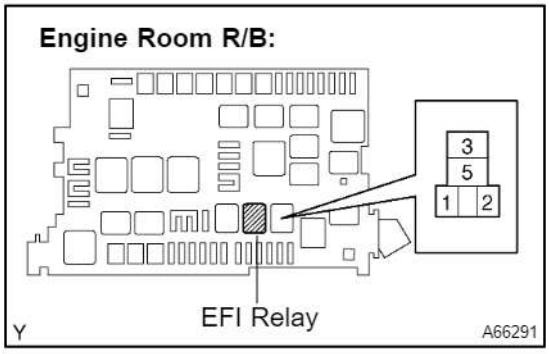


(b) Check the wire harness between the VSV for ACIS and EFI relay.
(1) Disconnect the V1 VSV for ACIS connector.
(2) Remove the EFI relay from the engine room R/B.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
VSV for ACIS (V1–1) – EFI relay terminal 3 of R/B	Below 1 Ω

(4) Reconnect the VSV for ACIS connector.
(5) Reinstall the EFI relay.



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4	CHECK VACUUM HOSES(INTAKE MANIFOLD – INTAKE AIR CONTROL VALVE, INTAKE AIR CONTROL VALVE – VSV FOR ACIS)

(a) Check if the vacuum hose is connected correctly.
(b) Check the vacuum hose for looseness and disconnection.
(c) Check the vacuum hose for cracks, holes and damage.

NG → **REPAIR OR REPLACE VACUUM HOSE**

OK

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5	INSPECT INTAKE AIR CONTROL VALVE(INTAKE AIR SURGE TANK) (See page 13–2)

NG → REPLACE INTAKE AIR CONTROL VALVE (INTAKE AIR SURGE TANK) (See page 14–163)

OK

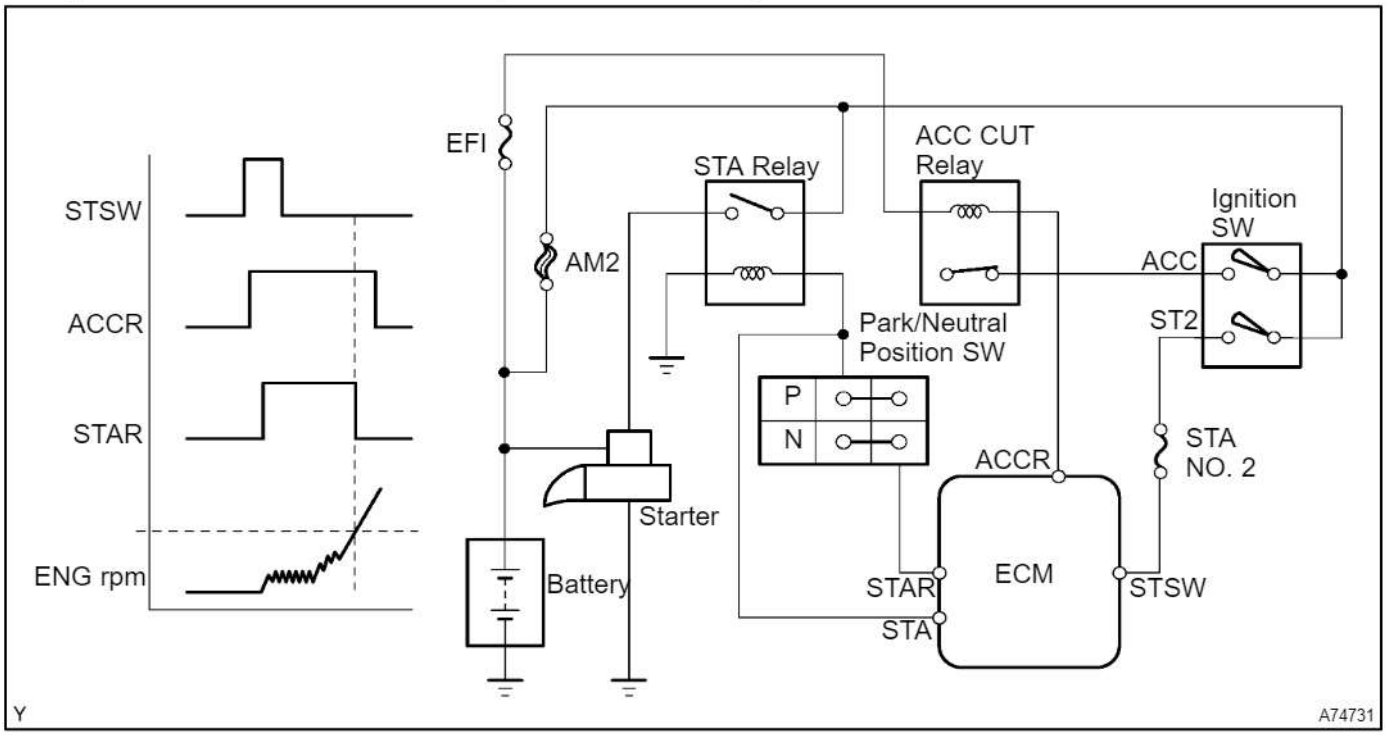
REPLACE ECM (See page 01–35)

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CRANKING HOLDING FUNCTION CIRCUIT

CIRCUIT DESCRIPTION

The starter is controlled by the ECM, when the ECM detects a start signal (STSW) from the ignition switch, this system monitors the engine speed (NE) and continues to operate the starter until it has determined that the engine has started (engine speed reaches approximately 500 rpm). If the engine is already running and the ignition switch is turned to START, the ECM will not operate the starter.



WIRING DIAGRAM

Refer to DTC P0617 on page 05–565.

INSPECTION PROCEDURE

Hand–held tester:

1	CHECK OPERATION OF ENGINE CRANKING

(a) When turning the ignition switch to the ST position, check whether the starter motor starts.

OK → CHECK FOR INTERMITTENT PROBLEMS (See page 05–331)

NG

2	READ VALUE OF HAND–HELD TESTER(STA SIGNAL)

(a) Connect the hand–held tester to the DLC3.
(b) Select the item "DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL/STARTER SIG" and read its value displayed on the hand–held tester.

Standard:

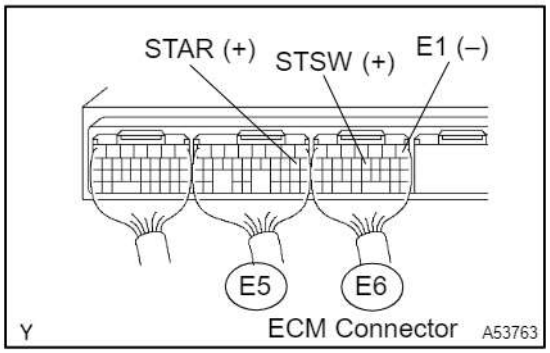
Ignition Switch Position	ON	START
STARTER SIG	OFF	ON

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OK	Go to step 5

NG

3 INSPECT ECM(STAR AND STSW VOLTAGE)



(a) Measure the voltage between the terminals of the E5 and E6 ECM connectors, while cranking the engine (ignition switch is in START position).

Standard:

Tester Connection	Specified Condition
STAR (E5–9) – E1 (E6–1)	9 to 14 V
STSW (E6–12) – E1 (E6–1)	9 to 14 V

Result:

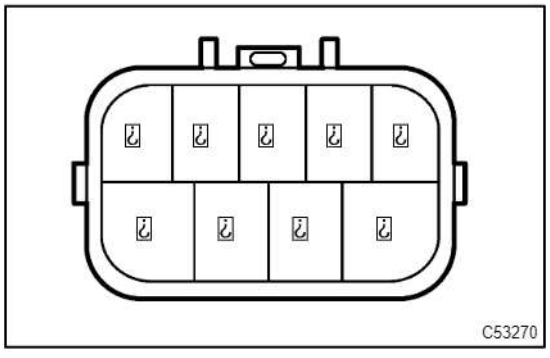
Terminal STAR	Terminal STSW	Proceed to
9 to 14 V	9 to 14 V	A
0 V	9 to 14 V	B
0 V	0 V	C

B	REPLACE ECM (See page 10–11)

C	Go to step 9

A

4 INSPECT PARK/NEUTRAL POSITION SWITCH ASSY



(a) Disconnect the park/neutral position switch connector.
(b) Check for continuity between each terminal shown below when the shift lever is moved to each position.

Standard:

Shift Position	Tester Connection	Specified Condition
P	1 – 3 6 – 9	Continuity
R	2 – 3	
N	3 – 5 6 – 9	
D	3 – 7	
3	3 – 4	
2, L	3 – 8	

(c) Reconnect the park/neutral position switch connector.

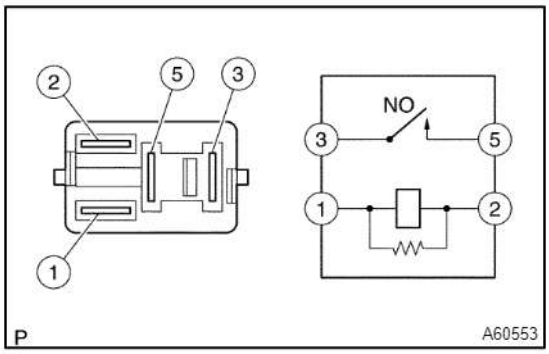
NG	REPLACE PARK/NEUTRAL POSITION SWITCH ASSY

OK

CHECK AND REPAIR HARNESS AND CONNECTOR (PARK/NEUTRAL POSITION SWITCH – ECM)

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5 INSPECT STARTER RELAY ASSY



(a) Remove the starter relay from the engine room R/B.
(b) Inspect the starter relay.

Standard:

Tester Connection	Specified Condition
1 – 2	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage to terminals 1 and 2)

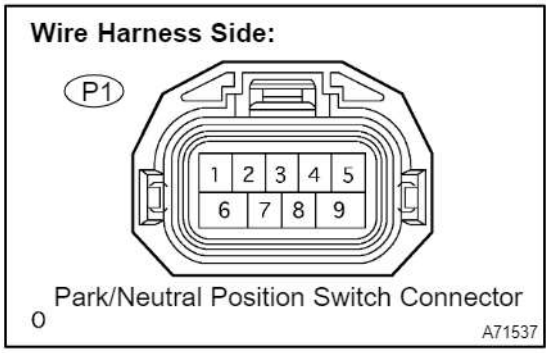
(c) Reinstall the starter relay.

NG → **REPLACE STARTER RELAY ASSY**

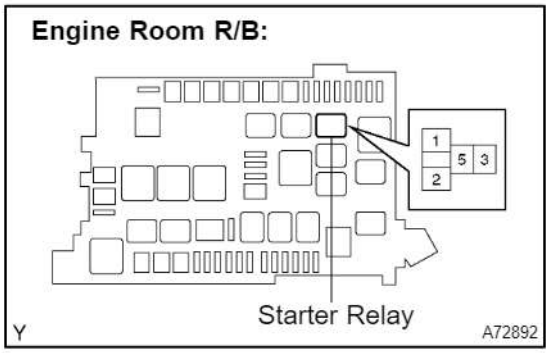
OK

6 CHECK HARNESS AND CONNECTOR(PARK/NEUTRAL POSITION SWITCH – STARTER RELAY, STARTER RELAY – BODY GROUND)

Wire Harness Side:



Engine Room R/B:



(a) Check the harness and connector between the park/neutral position switch and starter relay.
  (1) Disconnect the park/neutral position switch connector.
  (2) Remove the starter relay from the engine room R/B.
  (3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Park/neutral position switch (P1–6) – Starter relay (1)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
Park/neutral position switch (P1–6) or Starter relay (1) – Body ground	10 kΩ or higher

  (4) Reconnect the park/neutral position switch connector.
  (5) Reinstall the starter relay.

(b) Check the harness and connector between the starter relay and body ground.
  (1) Remove the starter relay from the engine room R/B.
  (2) Check the resistance between the starter relay and body ground.

Standard (Check for open):

Tester Connection	Specified Condition
Starter relay (2) – Body ground	Below 1 Ω

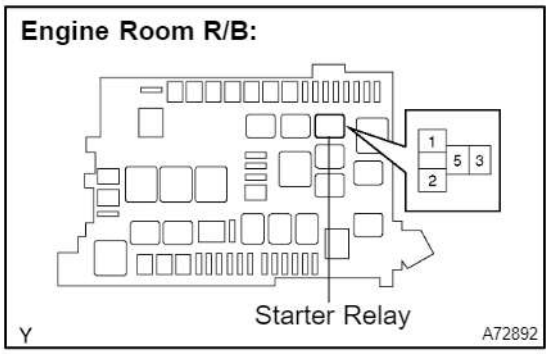
  (3) Reinstall the starter relay.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

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7	INSPECT ENGINE ROOM RELAY BLOCK(STARTER RELAY VOLTAGE)



(a) Remove the starter relay from the engine room R/B.
(b) Measure the voltage between the terminal of the engine room R/B and body ground.
Standard:

Tester Connection	Specified Condition
Starter relay (5) – Body ground	9 to 14 V

(c) Reinstall the starter relay.

NG → **CHECK AND REPAIR HARNESS AND CONNECTOR (STARTER RELAY – BATTERY)**

OK

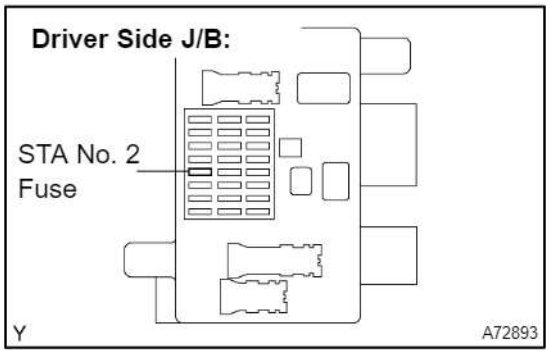
8	INSPECT STARTER ASSY (See page 19–1)

NG → **REPAIR OR REPLACE STARTER ASSY**

OK

CHECK AND REPAIR HARNESS AND CONNECTOR (STARTER RELAY – STARTER, STARTER – BATTERY)

9	CHECK FUSE(STA NO.2)



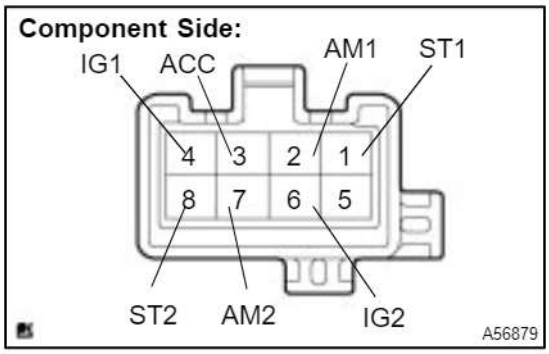
(a) Remove the STA No. 2 fuse from the driver side J/B.
(b) Check for continuity in the STA No. 2 fuse.
Standard: Continuity
(c) Reinstall the STA No. 2 fuse.

NG → **CHECK FOR SHORT IN ALL HARNESSES AND COMPONENTS CONNECTED TO FUSE**

OK

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10	INSPECT IGNITION OR STARTER SWITCH ASSY



(a) Disconnect the ignition switch connector.
(b) Check for continuity between the connector terminals shown in the chart below.

Standard:

Switch Position	Tester Connection	Specified Condition
LOCK	All terminal to terminal	No continuity
ACC	2 – 3	Continuity
ON	2 – 3, 2 – 4, 3 – 4, 6 – 7	Continuity
START	1 – 2, 1 – 4, 2 – 4, 6 – 7, 6 – 8, 7 – 8	Continuity

(c) Reconnect the ignition switch connector.

NG → **REPLACE IGNITION OR STARTER SWITCH ASSY**

OK

CHECK AND REPAIR HARNESS AND CONNECTOR (ECM – IGNITION SWITCH, IGNITION SWITCH – BATTERY)

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OBD II scan tool (excluding hand–held tester):

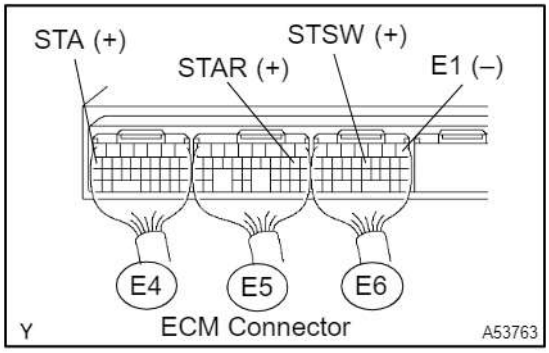
1 CHECK OPERATION OF ENGINE CRANKING

(a) When turning the ignition switch to the ST position, check whether the starter motor starts.

OK → **CHECK FOR INTERMITTENT PROBLEMS (See page 05–331)**

NG

2 INSPECT ECM(STA, STAR AND STSW VOLTAGE)



(a) Measure the voltage between the terminals of the E4, E5 and E6 ECM connectors, while cranking the engine (ignition switch START position).

Standard:

Tester Connection	Specified Condition
STA (E4–17) – E1 (E6–1)	9 to 14 V
STAR (E5–9) – E1 (E6–1)	9 to14 V
STSW (E6–12) – E1 (E6–1)	9 to 14 V

Result:

Terminal STA	Terminal STAR	Terminal STSW	Proceed to
9 to 14 V	9 to 14 V	9 to 14 V	A
0 V	9 to 14 V	9 to 14 V	B
0 V	0 V	9 to 14 V	C
0 V	0 V	0 V	D

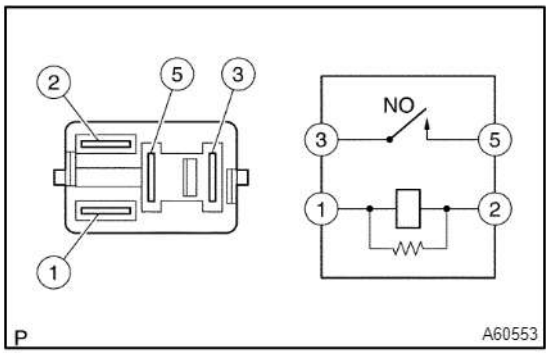
B → **Go to step 7**

C → **REPLACE ECM (See page 10–11)**

D → **Go to step 8**

A

3 INSPECT STARTER RELAY ASSY



(a) Remove the starter relay from the engine room R/B.

(b) Inspect the starter relay.

Standard:

Tester Connection	Specified Condition
1 – 2	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage to terminals 1 and 2)

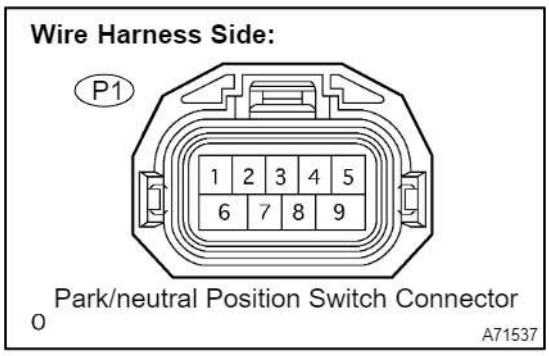
(c) Reinstall the starter relay.

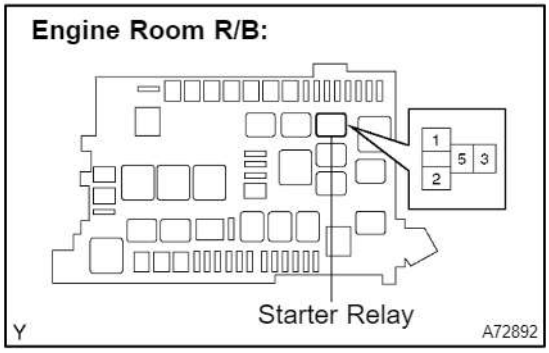
NG → **REPLACE STARTER RELAY ASSY**

OK

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4 CHECK HARNESS AND CONNECTOR(PARK/NEUTRAL POSITION SWITCH – STARTER RELAY, STARTER RELAY – BODY GROUND)





(a) Check the harness and connector between the park/neutral position switch connector and starter relay.
  (1) Disconnect the park/neutral position switch connector.
  (2) Remove the starter relay from the engine room R/B.
  (3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Park/neutral position switch (P1–6) – Starter relay (1)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
Park/neutral position switch (P1–6) or Starter relay (1) – Body ground	10 kΩ or higher

  (4) Reconnect the park/neutral position switch connector.
  (5) Reinstall the starter relay.

(b) Check the harness and connector between the starter relay and body ground.
  (1) Remove the starter relay from the engine room R/B.
  (2) Check the resistance between the starter relay and body ground.

Standard (Check for open):

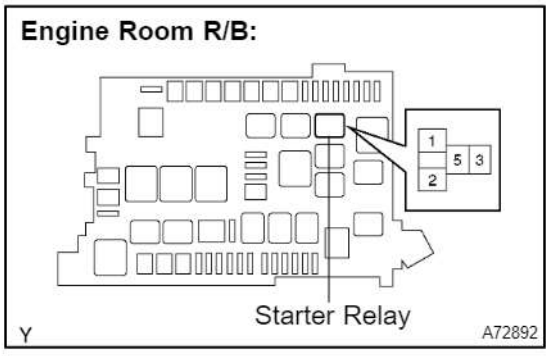
Tester Connection	Specified Condition
Starter relay (2) – Body ground	Below 1 Ω

  (3) Reinstall the starter relay.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

5 INSPECT ENGINE ROOM RELAY BLOCK(STARTER RELAY VOLTAGE)



(a) Remove the starter relay from the engine room R/B.
(b) Measure the voltage between the terminal of the engine room R/B and body ground.

Standard:

Tester Connection	Specified Condition
Starter relay (5) – Body ground	9 to 14 V

(c) Reinstall the starter relay.

NG → **CHECK AND REPAIR HARNESS AND CONNECTOR (STARTER RELAY – BATTERY)**

OK

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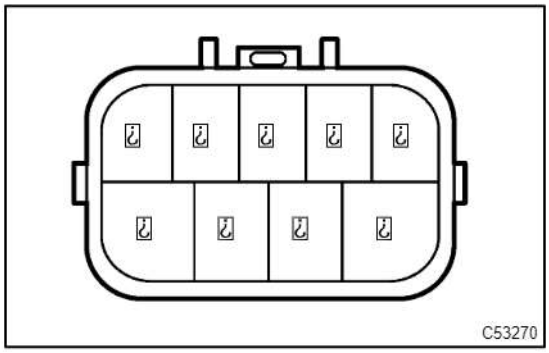
6	INSPECT STARTER ASSY (See page 19–1)

NG → REPAIR OR REPLACE STARTER ASSY

OK

CHECK AND REPAIR HARNESS AND CONNECTOR (STARTER RELAY – STARTER, STARTER – BATTERY)

7	INSPECT PARK/NEUTRAL POSITION SWITCH ASSY



(a) Disconnect the park/neutral position switch connector.
(b) Check for continuity between each terminal shown below when the shift lever is moved to each position.

Standard:

Shift Position	Tester Connection	Specified Condition
P	1 – 3 6 – 9	Continuity
R	2 – 3	
N	3 – 5 6 – 9	
D	3 – 7	
3	3 – 4	
2, L	3 – 8	

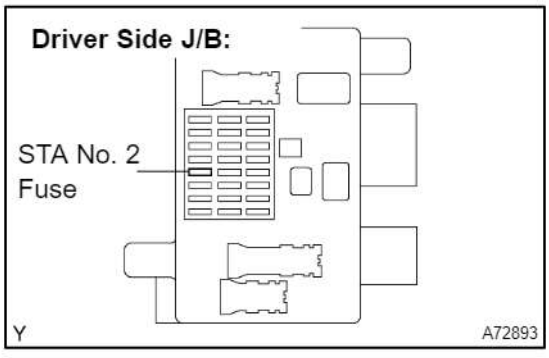
(c) Reconnect the park/neutral position switch connector.

NG → REPLACE PARK/NEUTRAL POSITION SWITCH ASSY

OK

CHECK AND REPAIR HARNESS AND CONNECTOR (PARK/NEUTRAL POSITION SWITCH – ECM)

8	CHECK FUSE(STA NO.2)



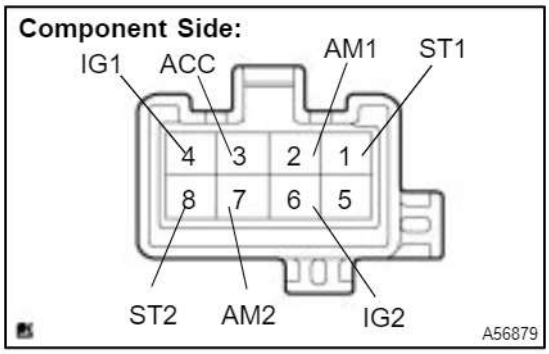
(a) Remove the STA No. 2 fuse from the driver side J/B.
(b) Check for continuity in the STA No. 2 fuse.
Standard: Continuity
(c) Reinstall the STA No. 2 fuse.

NG → CHECK FOR SHORT IN ALL HARNESSES AND COMPONENTS CONNECTED TO FUSE

OK

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9	INSPECT IGNITION OR STARTER SWITCH ASSY



(a) Disconnect the ignition switch connector.
(b) Check for continuity between the connector terminals shown in the chart below.

Standard:

Switch Position	Tester Connection	Specified Condition
LOCK	All terminal to terminal	No continuity
ACC	2 – 3	Continuity
ON	2 – 3, 2 – 4, 3 – 4, 6 – 7	Continuity
START	1 – 2, 1 – 4, 2 – 4, 6 – 7, 6 – 8, 7 – 8	Continuity

(c) Reconnect the ignition switch connector.

NG → **REPLACE IGNITION OR STARTER SWITCH ASSY**

OK

CHECK AND REPAIR HARNESS AND CONNECTOR (ECM – IGNITION SWITCH, IGNITION SWITCH – BATTERY)

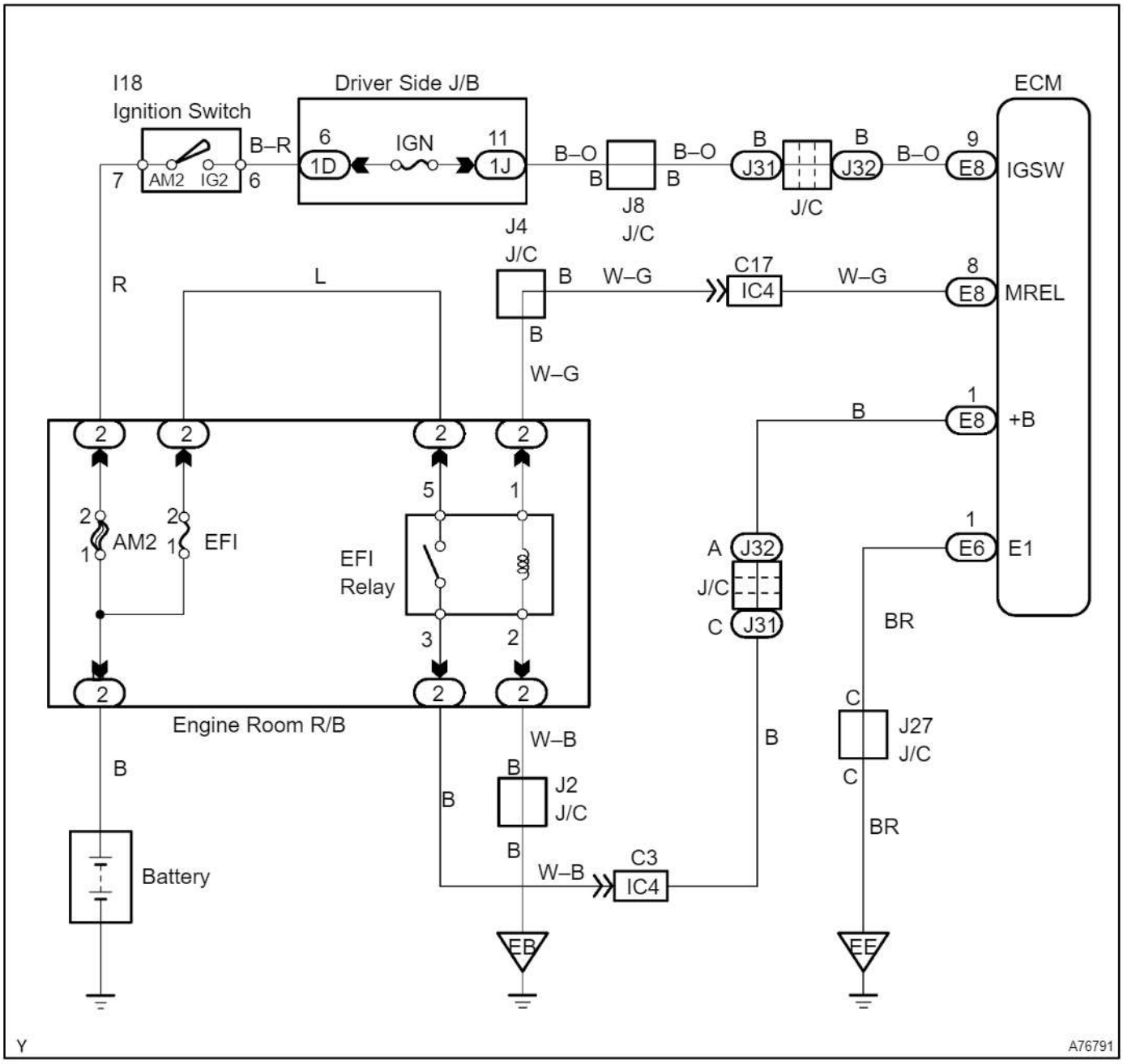
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ECM POWER SOURCE CIRCUIT

CIRCUIT DESCRIPTION

When the ignition switch is turned to ON, battery voltage is applied to terminal IGSW of the ECM. The ECM "MREL" output signal causes current to flow to the coil, closing the contacts of the EFI relay and supplying power to terminal +B of the ECM.
If the ignition switch is turned to OFF, the ECM holds the EFI relay ON for a maximum of 2 seconds to allow for the initial setting of the throttle valve.

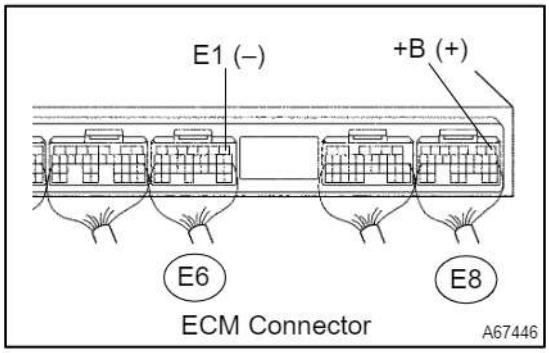
WIRING DIAGRAM



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INSPECTION PROCEDURE

1 INSPECT ECM(+B VOLTAGE)



(a) Turn the ignition switch to ON.
(b) Measure the voltage between the specified terminals of the E6 and E8 ECM connectors.

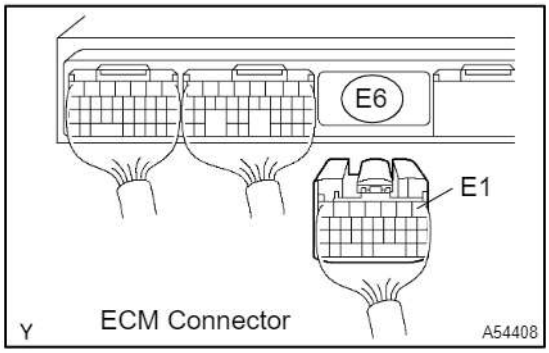
Standard:

Tester Connection	Specified Condition
+B (E8–1) – E1 (E6–1)	9 to 14 V

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (See page 05–348)**

NG

2 CHECK HARNESS AND CONNECTOR(ECM – BODY GROUND)



(a) Disconnect the E6 ECM connector.
(b) Check the resistance between the wire harness side connectors.

Standard (Check for open):

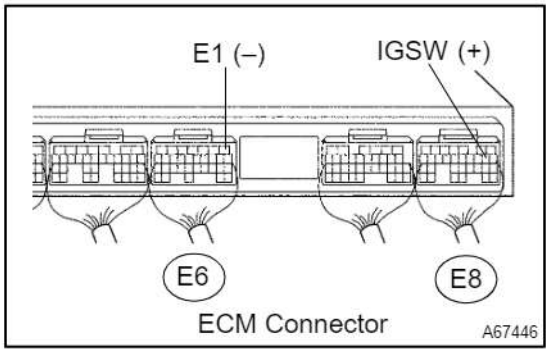
Tester Connection	Specified Condition
E1 (E6–1) – Body ground	Below 1 Ω

(c) Reconnect the ECM connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3 INSPECT ECM(IGSW VOLTAGE)



(a) Turn the ignition switch to ON.
(b) Measure the voltage between the specified terminals of the E6 and E8 ECM connectors.

Standard:

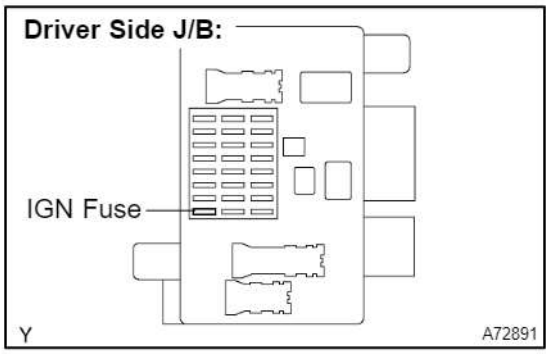
Tester Connection	Specified Condition
IGSW (E8–9) – E1 (E6–1)	9 to 14 V

OK → **Go to step 6**

NG

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4 CHECK FUSE(IGN FUSE)

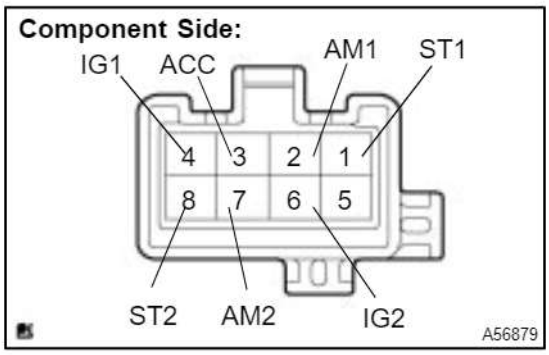


(a) Remove the IGN fuse from the driver side J/B.
(b) Check for continuity in the IGN fuse.
Standard: Continuity
(c) Reinstall the IGN fuse

NG → **CHECK FOR SHORT IN ALL HARNESSES AND COMPONENTS CONNECTED TO FUSE**

OK

5 INSPECT IGNITION OR STARTER SWITCH ASSY



(a) Disconnect the ignition switch connector.
(b) Check for continuity between the connector terminals shown in the table below.
Standard:

Switch Position	Tester Connection	Specified Condition
LOCK	All terminal to terminal	No continuity
ACC	2 – 3	Continuity
ON	2 – 3, 2 – 4, 3 – 4, 6 – 7	Continuity
START	1 – 2, 1 – 4, 2 – 4, 6 – 7, 6 – 8, 7 – 8	Continuity

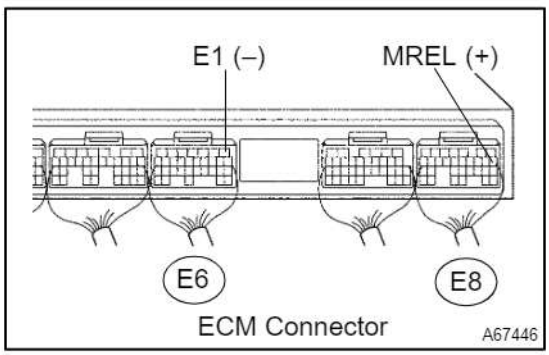
(c) Reconnect the ignition switch connector.

NG → **REPLACE IGNITION OR STARTER SWITCH ASSY**

OK

CHECK AND REPAIR HARNESS AND CONNECTOR (BATTERY – IGNITION SWITCH, IGNITION SWITCH – ECM)

6 INSPECT ECM(MREL VOLTAGE)



(a) Turn the ignition switch to ON.
(b) Measure the voltage between the specified terminals of the E6 and E8 ECM connectors.
Standard:

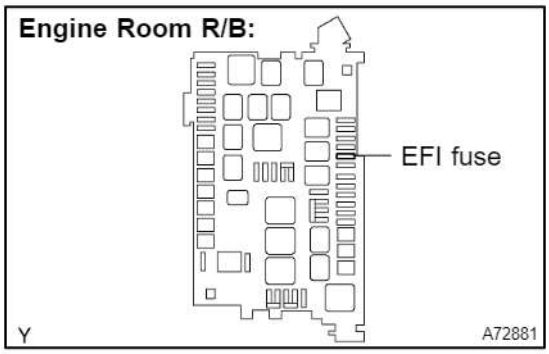
Tester Connection	Specified Condition
MREL (E8–8) – E1 (E6–1)	9 to 14 V

NG → **REPLACE ECM (See page 10–11)**

OK

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7 CHECK FUSE(EFI FUSE)

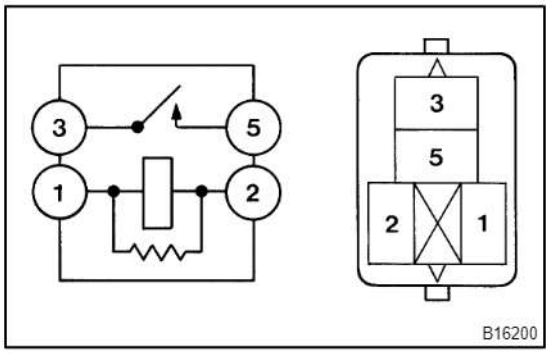


(a) Remove the EFI fuse from the engine room R/B.
(b) Check for continuity in the EFI fuse.
Standard: Continuity
(c) Reinstall the EFI fuse.

NG → **CHECK FOR SHORT IN ALL HARNESSES AND COMPONENTS CONNECTED TO FUSE**

OK

8 INSPECT EFI RELAY



(a) Remove the EFI relay from the engine room R/B.
(b) Check for continuity in the EFI relay.
Standard:

Tester Connection	Specified Condition
1 – 2	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage to terminals 1 and 2)

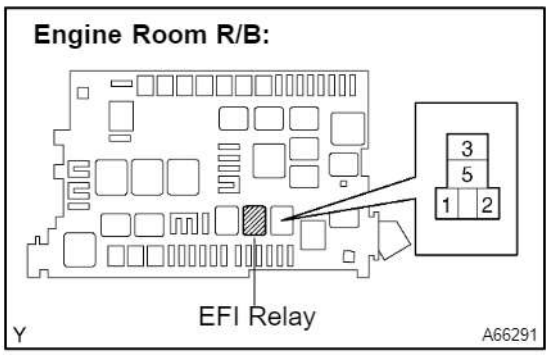
(c) Reinstall the EFI relay

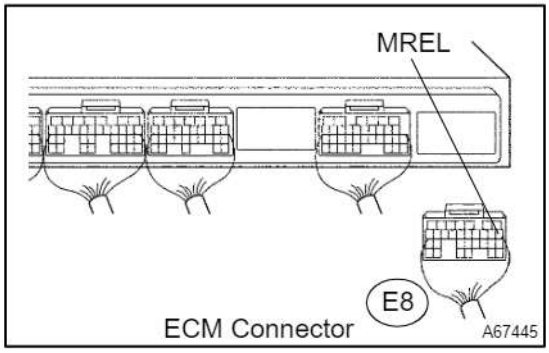
NG → **REPLACE EFI RELAY**

OK

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9	CHECK HARNESS AND CONNECTOR(EFI RELAY – ECM, EFI RELAY – BODY GROUND)





(a) Check the harness and connector between the EFI relay and ECM.
(1) Remove the EFI relay from the engine room R/B.
(2) Disconnect the E8 ECM connector.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
EFI relay (1) – MREL (E8–8)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
EFI relay (1) or MREL (E8–8) – Body ground	10 kΩ or higher

(4) Reinstall the EFI relay
(5) Reconnect the ECM connector.

(b) Check the harness and connector between the EFI relay and body ground.
(1) Remove the EFI relay from the engine room R/B.
(2) Check the resistance between the wire harness side connector and body ground.

Standard (Check for open):

Tester Connection	Specified Condition
EFI relay (2) – Body ground	Below 1 Ω

(3) Reinstall the EFI relay

OK	REPAIR OR REPLACE HARNESS OR CONNECTOR

NG

CHECK AND REPAIR HARNESS AND CONNECTOR (TERMINAL +B OF ECM – BATTERY POSITIVE TERMINAL)

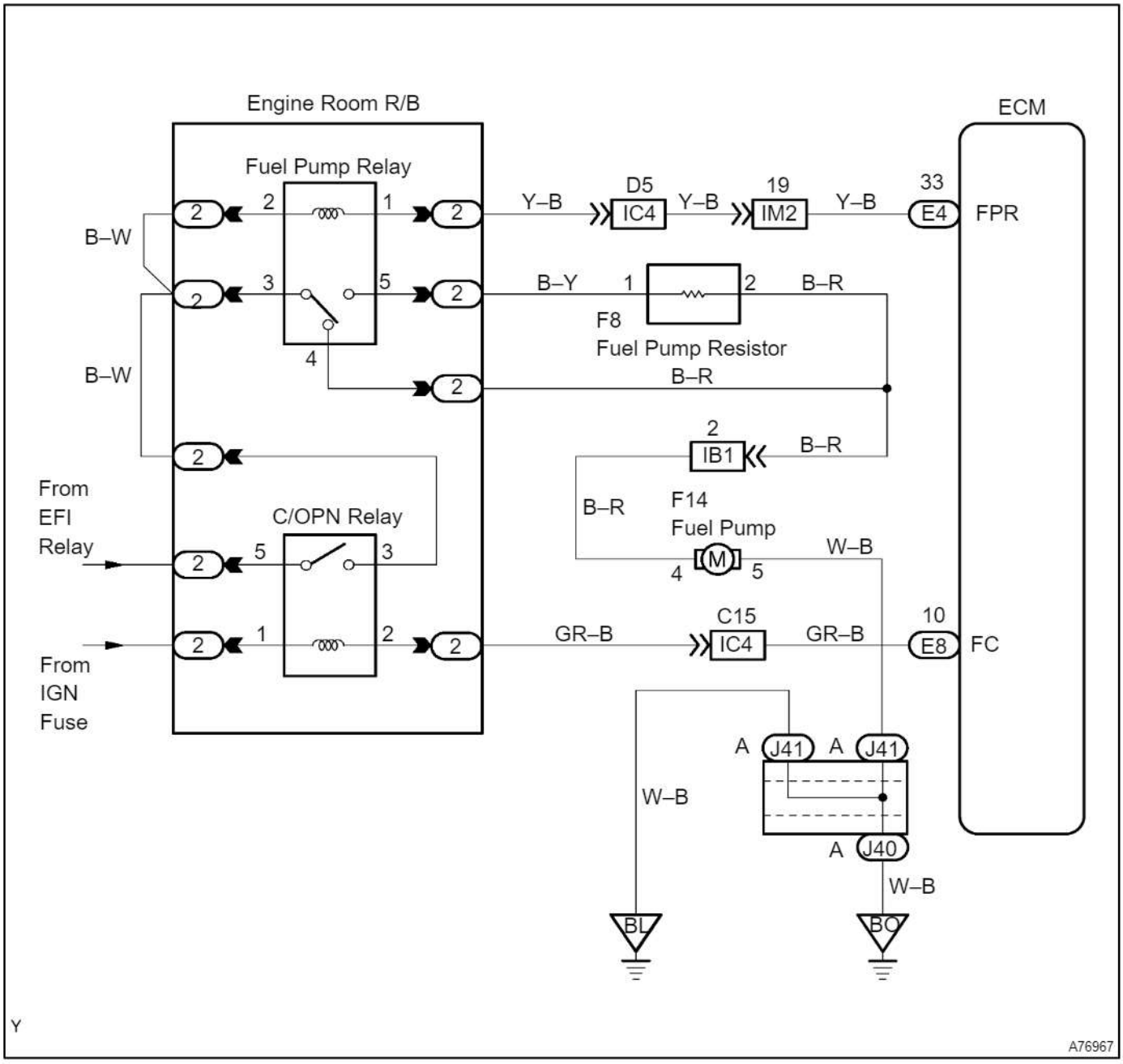
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FUEL PUMP CONTROL CIRCUIT

CIRCUIT DESCRIPTION

Refer to DTC P0230 on page 05–465.

WIRING DIAGRAM



INSPECTION PROCEDURE

Hand–held tester:

1	CHECK FUEL PUMP OPERATION (See page 11–5)

(a) Check if there is pressure in the fuel inlet hose.

HINT:

If there is fuel pressure, you will hear fuel flowing sound.

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OK → Go to step 10

NG

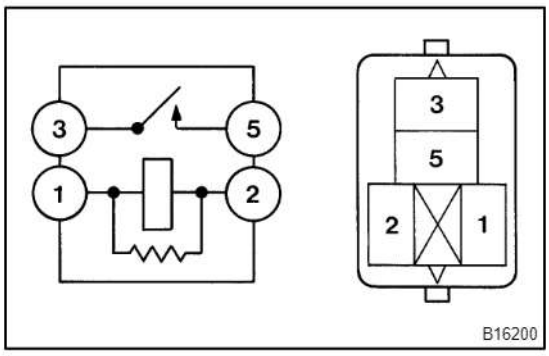
2	PERFORM ACTIVE TEST BY HAND–HELD TESTER(OPERATE CIRCUIT OPENING RELAY)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch to ON and turn the hand–held tester ON.
(c) Slect the item: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / FUEL PUMP / SPD.
(d) Check the relay operation while operating it using the hand–held tester.
Standard: Operating sound can be heard from the relay.

OK → Go to step 5

NG

3	INSPECT CIRCUIT OPENING RELAY



(a) Remove the circuit opening relay from the engine room R/B.
(b) Check for continuity in the circuit opening relay.
Standard:

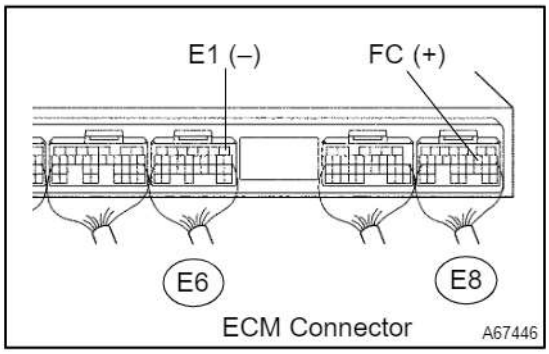
Tester Connection	Specified Condition
1 – 2	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage to terminals 1 and 2)

(c) Reinstall the circuit opening relay.

NG → REPLACE CIRCUIT OPENING RELAY

OK

4	INSPECT ECM(FC VOLTAGE)



(a) Turn the ignition switch to ON.
(b) Measure the voltage between the terminals of the E6 and E8 ECM connectors.
Standard:

Tester Connection	Specified Condition
FC (E8–10) – E1 (E6–1)	9 to 14 V

OK → REPLACE ECM (See page 10–11)

NG

CHECK AND REPAIR HARNESS AND CONNECTOR (ECM – CIRCUIT OPENING RELAY, CIRCUIT OPENING RELAY – IGNITION SWITCH)

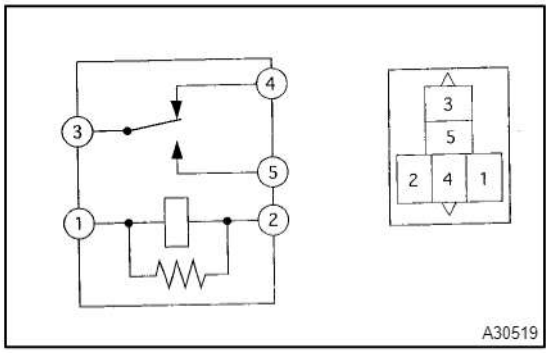
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5	INSPECT ECM POWER SOURCE CIRCUIT (See page 05–644)

NG → REPAIR OR REPLACE

OK

6	INSPECT FUEL PUMP RELAY ASSY



(a) Remove the fuel pump relay from the engine room R/B.
(b) Check for continuity in the fuel pump relay.
Standard:

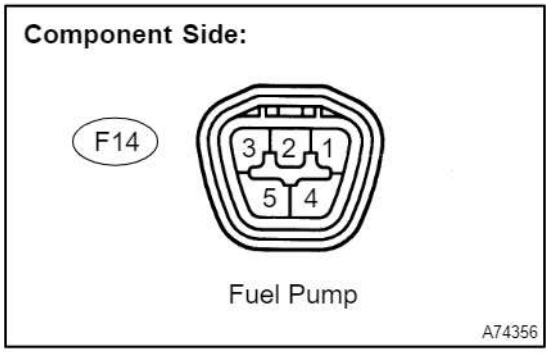
Tester Connection	Specified Condition
1 – 2 3 – 4	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage to terminals 1 and 2)

(c) Reinstall the fuel pump relay.

NG → REPLACE FUEL PUMP RELAY ASSY

OK

7	INSPECT FUEL PUMP



(a) Inspect fuel pump resistance.
(1) Measure the resistance between terminals 4 and 5.
Resistance: 0.2 to 3.0 Ω at 20 C (68 F)
(b) Inspect fuel pump operation
(1) Apply battery voltage to both terminals. Check that the pump operates.

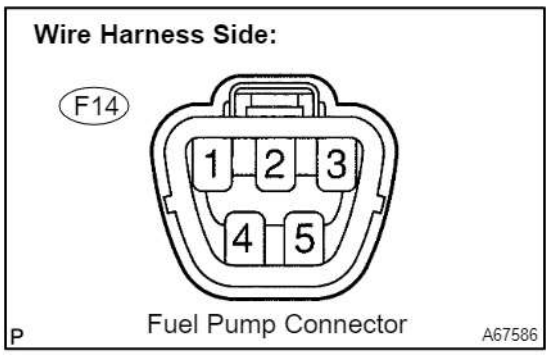
NOTICE:
- **These tests must be done quickly (within 10 seconds) to prevent the coil from burning out.**
- **Keep fuel pump as far away from the battery as possible.**
- **Always do the switching at the battery side.**

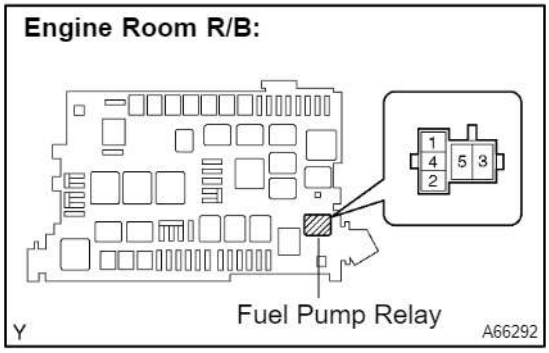
NG → REPLACE FUEL PUMP (See page 11–27)

OK

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8 CHECK HARNESS AND CONNECTOR(FUEL PUMP – FUEL PUMP RELAY, FUEL PUMP – BODY GROUND)





(a) Check the harness and connector between the fuel pump and fuel pump relay.
  (1) Disconnect the fuel pump connector.
  (2) Remove the fuel pump relay from the engine room R/B.
  (3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Fuel pump (F14–4) – Fuel pump relay (4)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
Fuel pump (F14–4) or Fuel pump relay (4) – Body ground	10 kΩ or higher

  (4) Reconnect the fuel pump connector.
  (5) Reinstall the fuel pump relay.

(b) Check the harness and connector between the fuel pump and body ground.
  (1) Disconnect the fuel pump connector.
  (2) Check the resistance between the wire harness side connector and body ground.

Standard (Check for open):

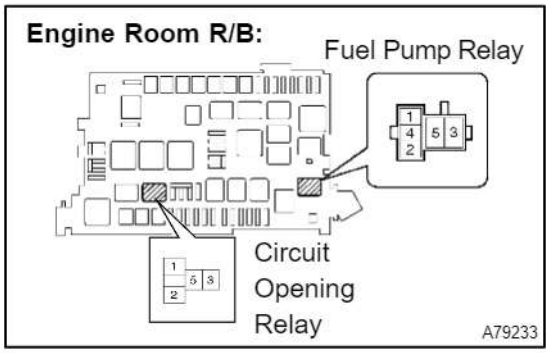
Tester Connection	Specified Condition
Fuel pump (F14–5) – Body ground	Below 1 Ω

  (3) Reconnect the fuel pump connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

9 CHECK HARNESS AND CONNECTOR(CIRCUIT OPENING RELAY – FUEL PUMP RELAY)



(a) Remove the circuit opening relay from the engine room R/B.
(b) Remove the fuel pump relay from the engine room R/B.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Circuit opening relay (3) – Fuel pump relay (3)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
Circuit opening relay (3) or Fuel pump relay (3) – Body ground	10 kΩ or higher

(d) Reinstall the circuit opening relay.
(e) Reinstall the fuel pump relay.

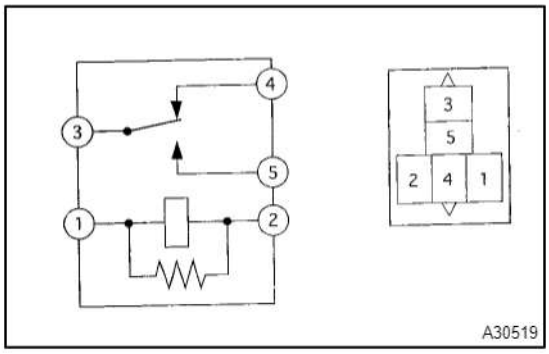
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NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

CHECK AND REPAIR HARNESS AND CONNECTOR (EFI RELAY – CIRCUIT OPENING RELAY)

10 INSPECT FUEL PUMP RELAY ASSY



(a) Remove the fuel pump relay from the engine room R/B.
(b) Check for continuity in the fuel pump relay.
Standard:

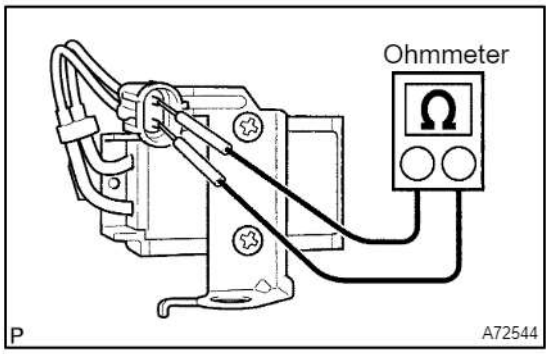
Tester Connection	Specified Condition
1 – 2 3 – 4	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage to terminal 1 and 2)

(c) Reinstall the fuel pump relay.

NG → REPLACE FUEL PUMP RELAY ASSY

OK

11 INSPECT FUEL PUMP RESISTOR(RESISTANCE)



(a) Inspect the fuel pump resistor resistance.
(1) Measure the resistance between the terminals.
Resistance: 0.70 to 0.76 Ω at 20 C (68 F)

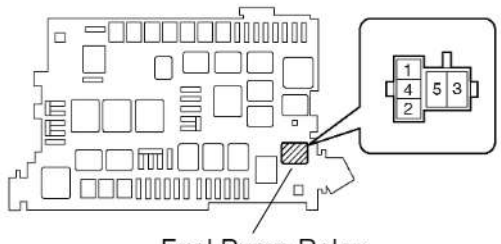
NG → REPLACE FUEL PUMP RESISTOR

OK

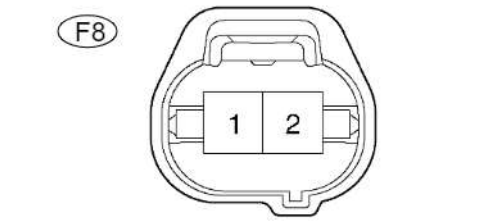
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12	CHECK HARNESS AND CONNECTOR(FUEL PUMP RELAY – FUEL PUMP RESISTOR, FUEL PUMP RESISTOR – FUEL PUMP)

Engine Room R/B:



Wire Harness Side:



Wire Harness Side:



(a) Check the harness and connector between the fuel pump relay and fuel pump resistor.

(1) Remove the fuel pump relay from the engine room R/B.

(2) Disconnect the fuel pump resistor connector.

(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Fuel pump relay (5) – Fuel pump resistor (F8–1)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
Fuel pump relay (5) or Fuel pump resistor (F8–1) – Body ground	10 kΩ or higher

(4) Reinstall the fuel pump relay

(5) Reconnect the fuel pump resistor connector.

(b) Check the harness and connector between the fuel pump resistor and fuel pump.

(1) Disconnect the fuel pump resistor connector.

(2) Disconnect the fuel pump connector.

(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Fuel pump resistor (F8–2) – Fuel pump (F14–4)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
Fuel pump resistor (F8–2) or Fuel pump (F14–4) – Body ground	10 kΩ or higher

(4) Reconnect the fuel pump resistor connector.

(5) Reconnect the fuel pump connector.

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE** **(See page 05–348)**

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

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OBD II scan tool (excluding hand–held tester):

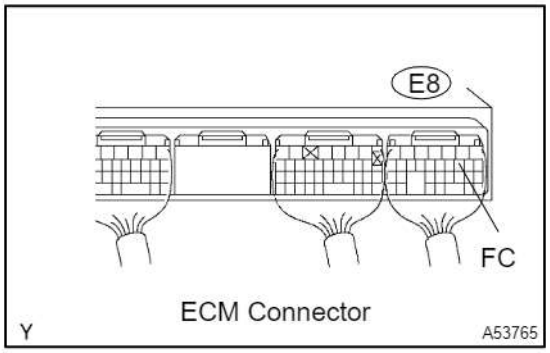
1	CHECK FUEL PUMP OPERATION (See page 11–5)

(a) Check if there is pressure in the fuel inlet hose.
HINT:
If there is fuel pressure, you will hear the sound of fuel flowing.

OK	Go to step 10

NG

2	CHECK RELAY OPERATION(CIRCUIT OPENING RELAY)

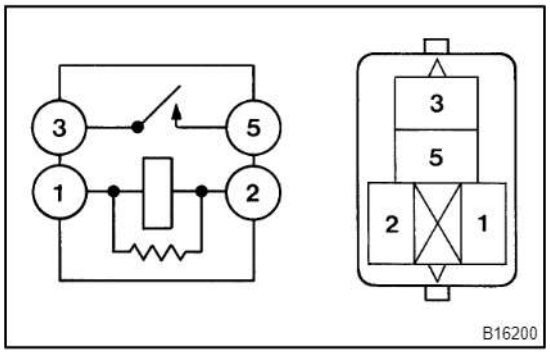


(a) Turn the ignition switch to ON.
(b) Connect terminal FC of the ECM connector and the body ground, check the relay operation.
Standard:
Operating sound can be heard from the circuit opening relay.

OK	Go to step 5

NG

3	INSPECT CIRCUIT OPENING RELAY



(a) Remove the circuit opening relay from the engine room R/B.
(b) Check for continuity in the circuit opening relay.
Standard:

Tester Connection	Specified Condition
1 – 2	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage to terminals 1 and 2)

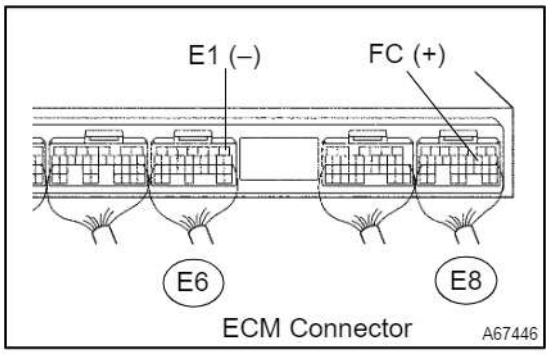
(c) Reinstall the circuit opening relay.

NG	REPLACE CIRCUIT OPENING RELAY

OK

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4	INSPECT ECM(FC VOLTAGE)



(a) Turn the ignition switch to ON.
(b) Measure the voltage between the terminals of the E6 and E8 ECM connectors.

Standard:

Tester Connection	Specified Condition
FC (E8–10) – E1 (E6–1)	9 to 14 V

OK → **REPLACE ECM (See page 10–11)**

NG

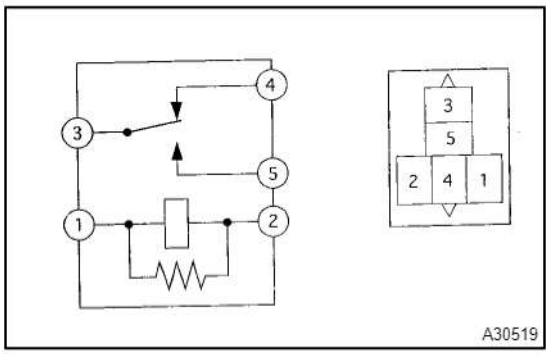
CHECK AND REPAIR HARNESS AND CONNECTOR (ECM – CIRCUIT OPENING RELAY, CIRCUIT OPENING RELAY – IGNITION SWITCH)

5	INSPECT ECM POWER SOURCE CIRCUIT (See page 05–644)

NG → **REPAIR OR REPLACE**

OK

6	INSPECT FUEL PUMP RELAY ASSY



(a) Remove the fuel pump relay from the engine room R/B.
(b) Check for continuity in the fuel pump relay.

Standard:

Tester Connection	Specified Condition
1 – 2 3 – 4	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage to terminals 1 and 2)

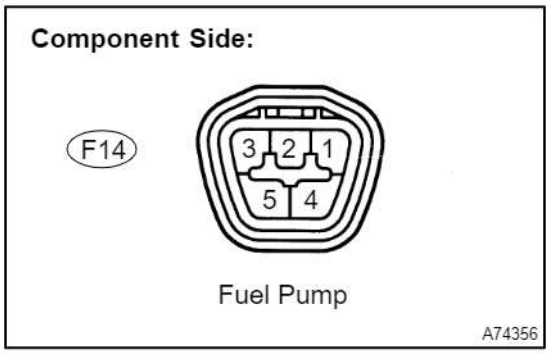
(c) Reinstall the fuel pump relay.

NG → **REPLACE FUEL PUMP RELAY ASSY**

OK

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7 INSPECT FUEL PUMP



(a) Inspect fuel pump resistance.
(1) Measure the resistance between terminals 4 and 5.
Resistance: 0.2 to 3.0 Ω at 20 C (68 F)

(b) Inspect fuel pump operation
(1) Apply battery voltage to both terminals. Check that the pump operates.

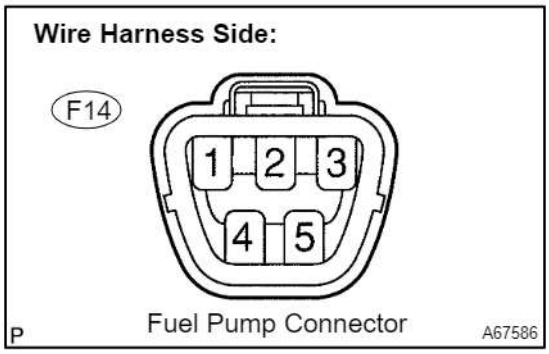
NOTICE:

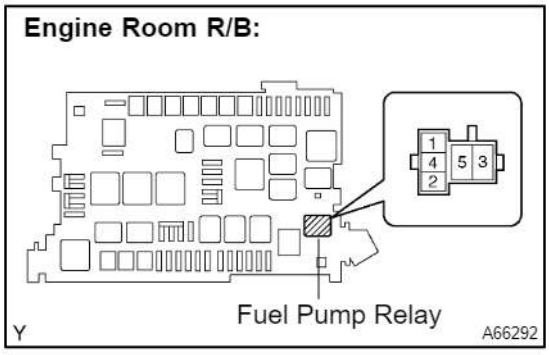
- **These tests must be done quickly (within 10 seconds) to prevent the coil from burning out.**
- **Keep fuel pump as far away from the battery as possible.**
- **Always do the switching at the battery side.**

NG → **REPLACE FUEL PUMP (See page 11–27)**

OK

8 CHECK HARNESS AND CONNECTOR(FUEL PUMP – FUEL PUMP RELAY, FUEL PUMP – BODY GROUND)





(a) Check the harness and connector between the fuel pump and fuel pump relay.
(1) Disconnect the fuel pump connector.
(2) Remove the fuel pump relay from the engine room R/B.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Fuel pump (F14–4) – Fuel pump relay (4)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
Fuel pump (F14–4) or Fuel pump relay (4) – Body ground	10 kΩ or higher

(4) Reconnect the fuel pump connector.
(5) Reinstall the fuel pump relay.

(b) Check the harness and connector between the fuel pump and body ground.
(1) Disconnect the fuel pump connector.
(2) Check the resistance between the wire harness side connector and body ground.

Standard (Check for open):

Tester Connection	Specified Condition
Fuel pump (F14–5) – Body ground	Below 1 Ω

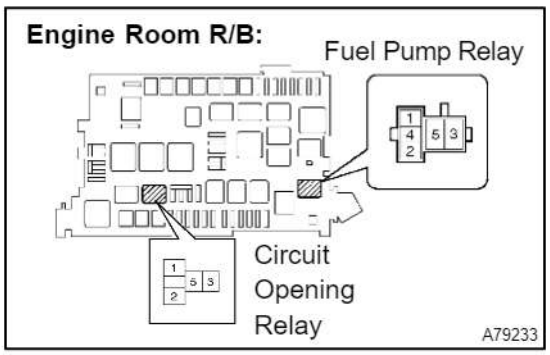
(3) Reconnect the fuel pump connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

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9	CHECK HARNESS AND CONNECTOR(CIRCUIT OPENING RELAY – FUEL PUMP RELAY)



(a) Remove the circuit opening relay from the engine room R/B.
(b) Remove the fuel pump relay from the engine room R/B.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Circuit opening relay (3) – Fuel pump relay (3)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
Circuit opening relay (3) or Fuel pump relay (3) – Body ground	10 kΩ or higher

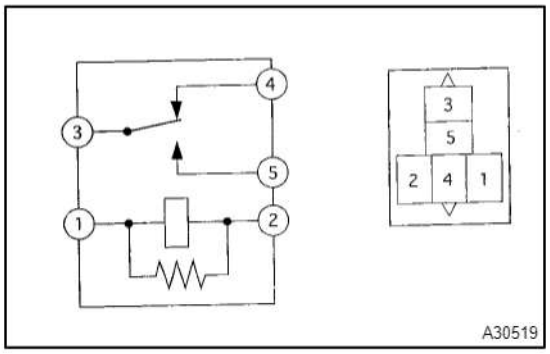
(d) Reinstall the circuit opening relay.
(e) Reinstall the fuel pump relay.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPAIR HARNESS AND CONNECTOR (EFI RELAY – CIRCUIT OPENING RELAY)

10	INSPECT FUEL PUMP RELAY ASSY



(a) Remove the fuel pump relay from the engine room R/B.
(b) Check for continuity in the fuel pump relay.

Standard:

Tester Connection	Specified Condition
1 – 2 3 – 4	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage to terminals 1 and 2)

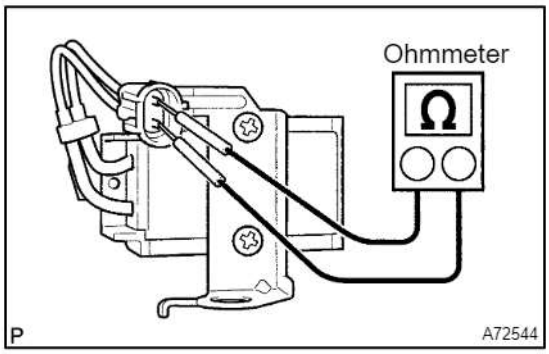
(c) Reinstall the fuel pump relay.

NG → **REPLACE FUEL PUMP RELAY ASSY**

OK

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11 INSPECT FUEL PUMP RESISTOR(RESISTANCE)



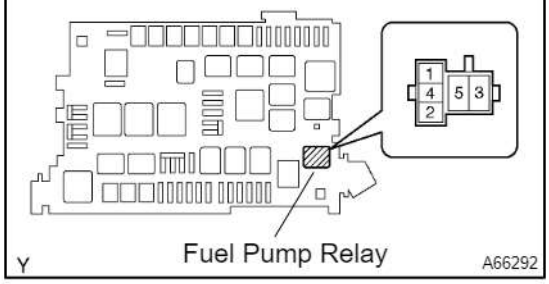
(a) Inspect the fuel pump resistor resistance.
(1) Measure the resistance between the terminals.
Resistance: 0.70 to 0.76 Ω at 20 C (68 F)

NG → **REPLACE FUEL PUMP RESISTOR**

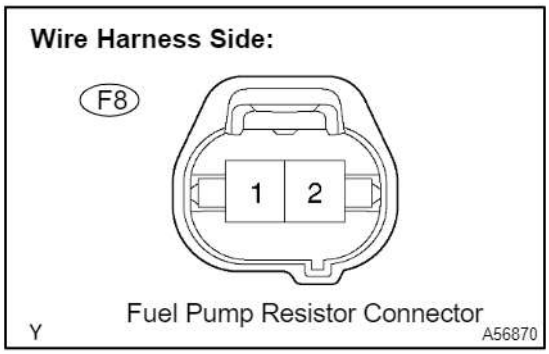
OK

12 CHECK HARNESS AND CONNECTOR(FUEL PUMP RELAY – FUEL PUMP RESISTOR, FUEL PUMP RESISTOR – FUEL PUMP)

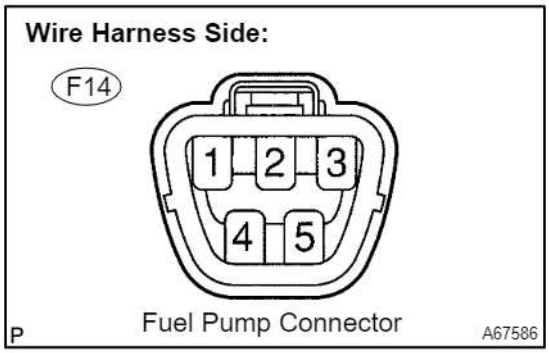
Engine Room R/B:



Wire Harness Side:



Wire Harness Side:



(a) Check the harness and connector between the fuel pump relay and fuel pump resistor.
(1) Remove the fuel pump relay from the engine room R/B.
(2) Disconnect the fuel pump resistor connector.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Fuel pump relay (5) – Fuel pump resistor (F8–1)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
Fuel pump relay (5) or Fuel pump resistor (F8–1) – Body ground	10 kΩ or higher

(4) Reinstall the fuel pump relay
(5) Reconnect the fuel pump resistor connector.

(b) Check the harness and connector between the fuel pump resistor and fuel pump.
(1) Disconnect the fuel pump resistor connector.
(2) Disconnect the fuel pump connector.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Fuel pump resistor (F8–2) – Fuel pump (F14–4)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
Fuel pump resistor (F8–2) or Fuel pump (F14–4) – Body ground	10 kΩ or higher

(4) Reconnect the fuel pump resistor connector.
(5) Reconnect the fuel pump connector.

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OK → PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (See page 05–348)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

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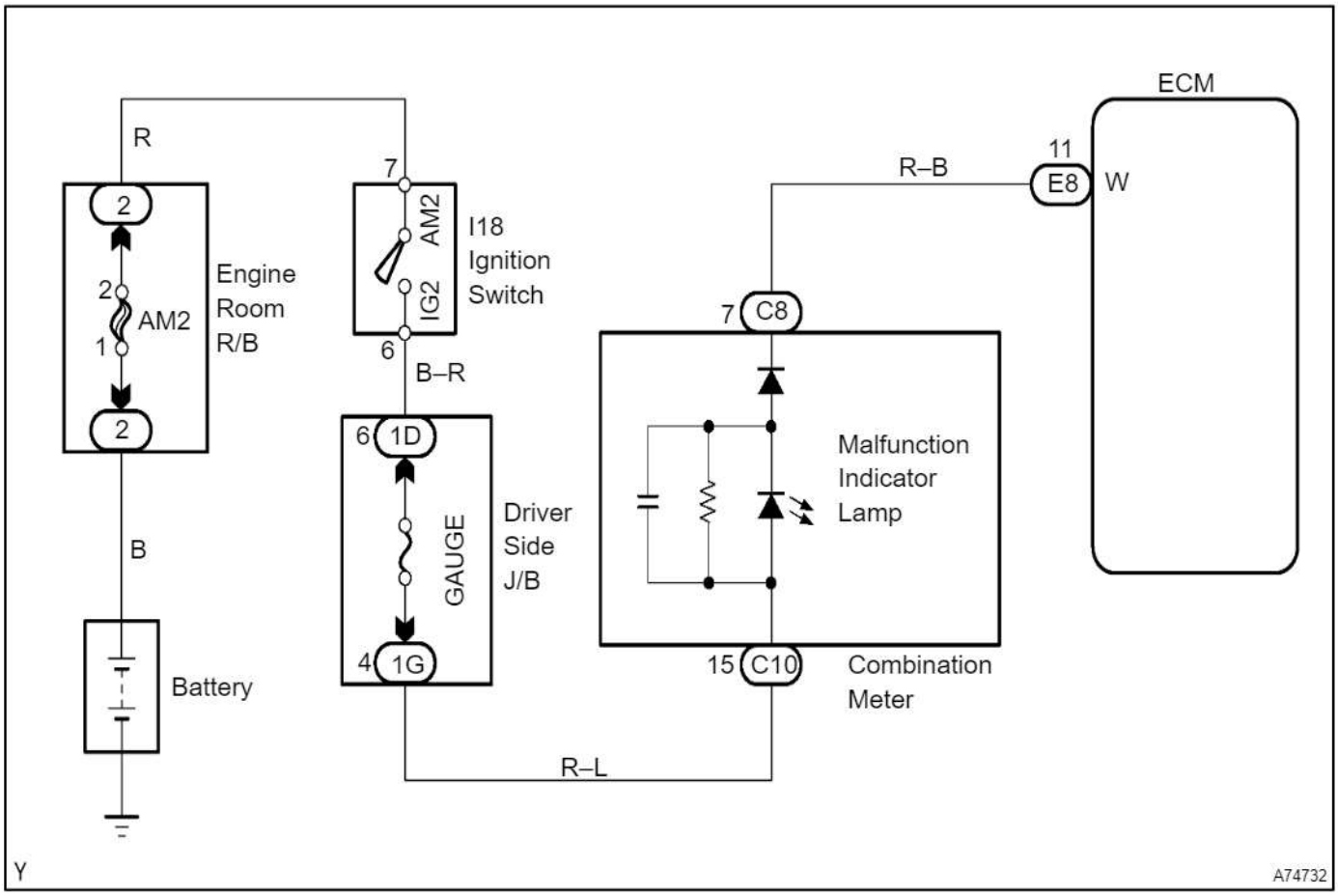
MIL CIRCUIT

CIRCUIT DESCRIPTION

The MIL is used to indicate the ECM's detection of a vehicle malfunction.
The instrument panel GAUGE fuse provides the circuit power and the ECM provides the circuit ground that illuminates the MIL.

Operation of MIL should be checked visually:
When the ignition switch is first turned to ON, the MIL should be illuminated. If the MIL is always OFF or ON, use the hand–held tester or OBD II scan tool and follow the procedure below to determine cause of the problem.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:
Troubleshoot each symptom in accordance with the table below .

MIL remains on	Start inspection from step 1
MIL does not illuminate	Start inspection from step 3

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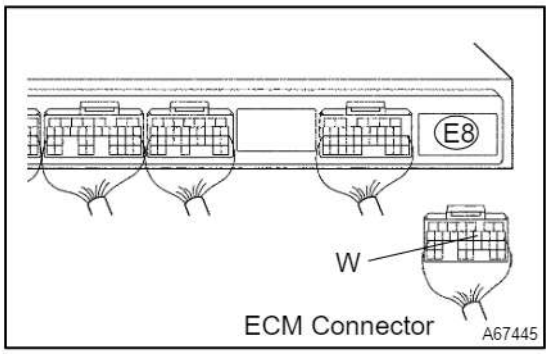
1	CLEAR DTC

(a) Connect the hand–held tester or the OBD II scan tool to the DLC 3.
(b) Turn the ignition switch to ON and turn the hand–held tester or the OBD II scan tool ON.
(c) Read the DTC (see page 05–355).
(d) Clear the DTC (see page 05–355).
(e) Check that MIL is not illuminated.
Standard: MIL is not illuminated

OK → **REPAIR CIRCUIT INDICATED BY OUTPUT DTC (See page 05–366)**

NG

2	CHECK HARNESS AND CONNECTOR(CHECK FOR SHORT IN WIRE HARNESS)



(a) Disconnect the E8 ECM connector.
(b) Turn the ignition switch to ON.
(c) Check that MIL is not illuminated.
Standard: MIL is not illuminated
(d) Reconnect the ECM connector.

OK → **REPLACE ECM (See page 10–11)**

NG

CHECK AND REPAIR HARNESS AND CONNECTOR (COMBINATION METER – ECM)

3	CHECK THAT MIL IS ILLUMINATED

(a) Check that the MIL is illuminated when turning the ignition switch to ON.
Standard: MIL is illuminated

OK → **SYSTEM OK**

NG

4	INSPECT COMBINATION METER ASSY (MIL CIRCUIT)

(a) See the combination meter troubleshooting procedure on page 05–1701.

NG → **REPAIR OR REPLACE BULB OR COMBINATION METER ASSEMBLY**

OK

CHECK AND REPAIR HARNESS AND CONNECTOR (COMBINATION METER – ECM)

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TIRE PRESSURE WARNING SYSTEM

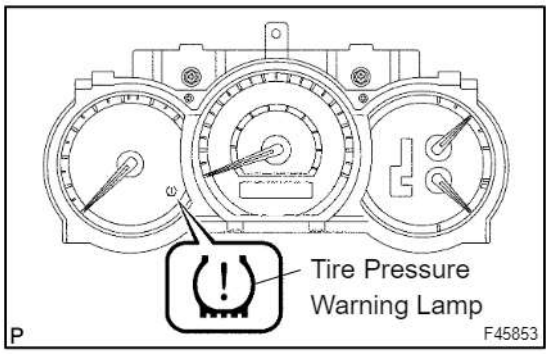
05GC9-01

PRECAUTION

NOTICE:

When disconnecting the negative (–) battery terminal, initialize the following systems after the terminal is reconnected.

System Name	See Page
Sliding Roof System	74–3



1. TIRE PRESSURE WARNING SYSTEM PRECAUTION

(a) When the tire pressure warning lamp comes on, immediately check the tire pressure of the tire and adjust it to the specified pressure.(The tire pressure warning lamp comes on if there is an open in the tire pressure warning lamp circuit.)

NOTICE:

Check the spare tire as well since this system monitors pressure of all tires, including the spare.

Front	Rear	Spare
220 kPa (2.2 kgf/cm^2, 32 psi)	220 kPa (2.2 kgf/cm^2, 32 psi)	220 kPa (2.2 kgf/cm^2, 32 psi)

(b) When the tire pressure warning lamp blinks, there is a malfunction in the system. Check for DTCs.

(c) It is necessary to register the transmitter ID in the tire pressure monitor ECU when replacing the tire pressure monitor valve sub–assy and/or tire pressure monitor ECU (see page 05–670).

(d) When replacing the tire pressure monitor ECU.

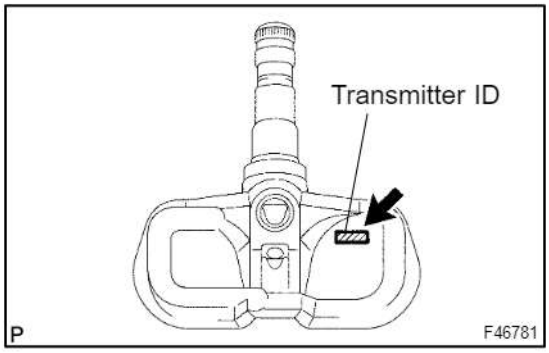
(1) Using the DATA LIST, read the transmitter IDs registered in the ECU and make a note of them before removing the tire pressure monitor ECU.

(2) Register the transmitter IDs after installing a new tire pressure monitor ECU.

(e) When replacing the tire pressure monitor valve sub–assy.

(1) Make a note of the 7 digit number (transmitter ID) written on the tire pressure monitor valve sub–assy when replacing the tire pressure monitor valve sub–assy. Register the transmitter IDs in the tire pressure monitor ECU after replacing the tire pressure monitor valve sub–assy and installing the tires and wheels on the vehicle.

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NOTICE:
The transmitter ID is written on the tire pressure monitor valve sub–assy and ID can not be seen after installing the tire pressure monitor valve sub–assy on the tire and wheel. Therefore, make a note of the transmitter ID before installing the tire pressure monitor valve sub–assy.

2. IN CASE OF TIRE AND WHEEL REPLACEMENT

(a) When tires and wheels are replaced, register the transmitter ID without fail.

3. FAIL–SAFE FUNCTION

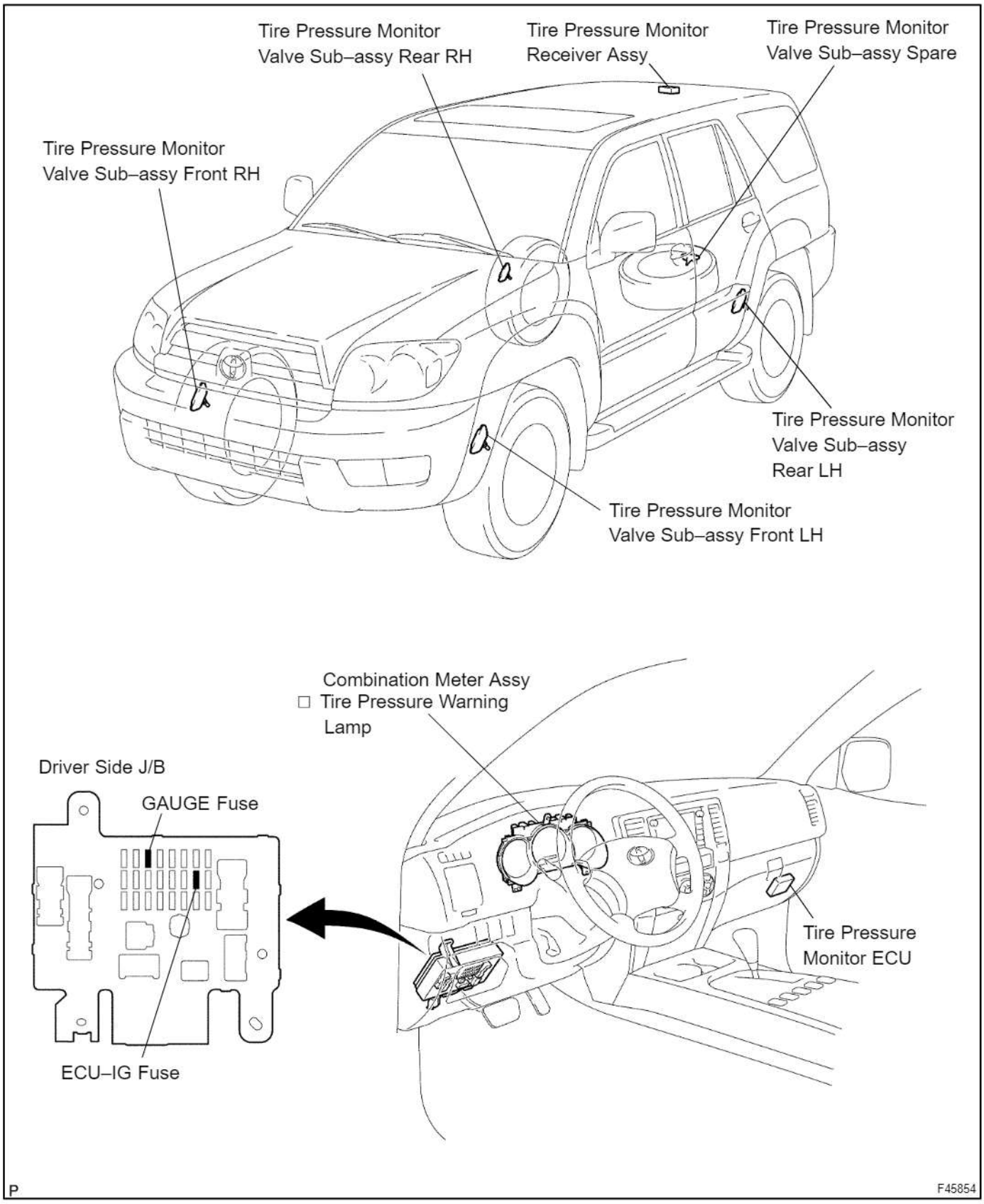
(a) When a system malfunction occurs in the tire pressure warning system, the tire pressure warning lamp blinks.

(b) The result of this diagnosis is stored in the tire pressure monitor ECU.

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052LT-02

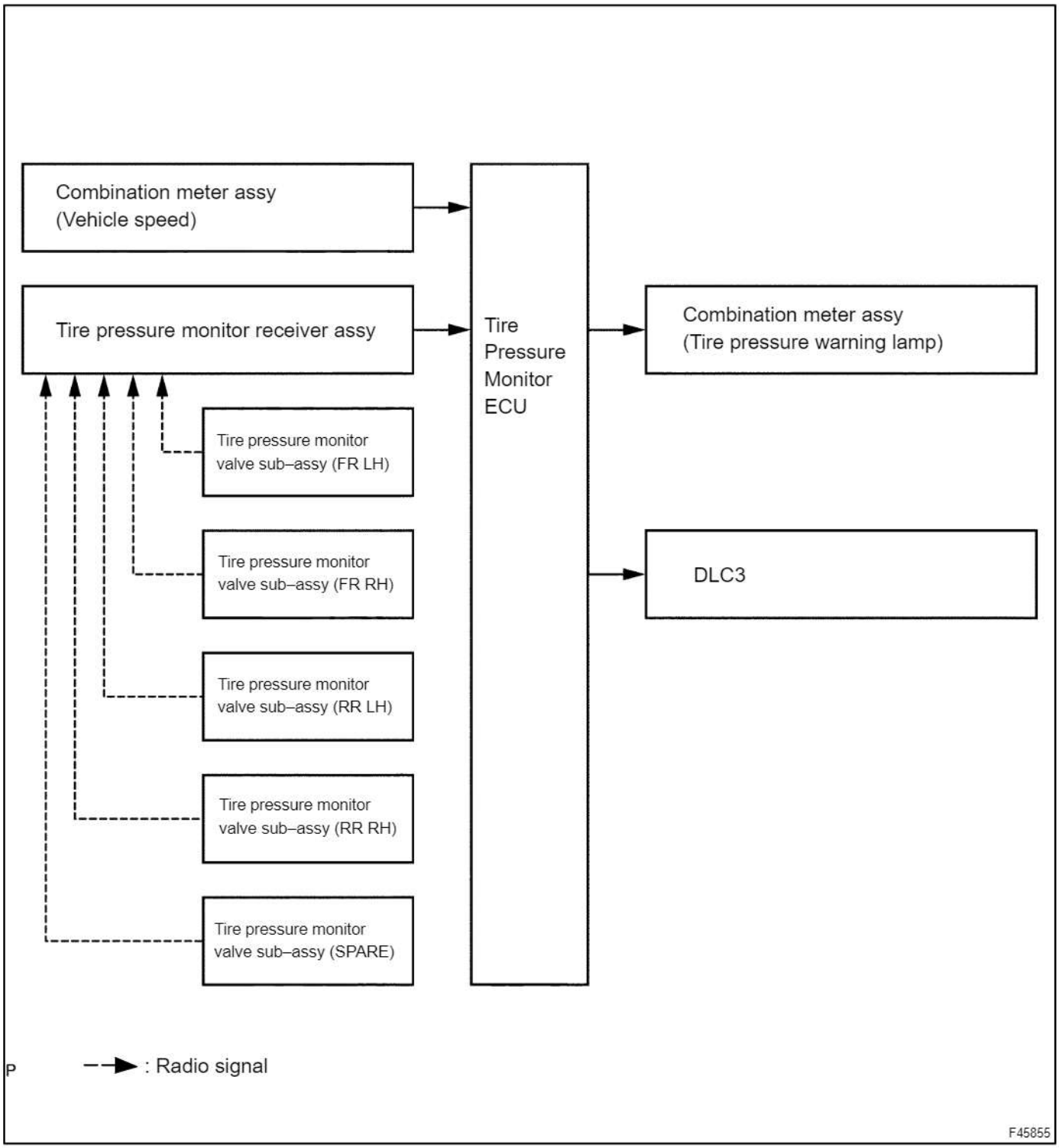
LOCATION



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05GAV-01

SYSTEM DIAGRAM



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052LP-02

DESCRIPTION

1. DESCRIPTION OF SYSTEM

(a) A tire pressure monitor valve sub–assy equipped with tire pressure sensor, transmitter and is installed in a tire wheel assy. The sensor measures the tire pressure and the measured value and transmitter ID are transmitted to the tire pressure monitor receiver assy on the body as radio waves and then sent to the tire pressure monitor ECU from the tire pressure monitor receiver. If the transmitter ID has already been registered, the ECU compares the measured air pressure value and the standard value. When the value is less than the standard value registered in the tire pressure monitor ECU, the warning lamp on the combination meter comes on.

2. WHEN TIRE PRESSURE WARNING LAMP IS LIT

(a) When the warning lamp does not go off, or when it comes on during driving, check tire pressure. If the warning lamp is lit even though the tire pressure is correctly adjusted, the tire could be punctured.

(b) Under the following conditions, the system may not function properly.

- □ The areas, facilities or devices that use similar radio frequencies are located in the vicinity of the vehicle.
- □ A radio device of similar frequency is used in the vehicle.
- □ A lot of snow or ice is stuck to the vehicle, especially onto the wheels and around the wheel houses.
- □ The battery of the sensor has been depleted.
- □ The tires without tire pressure monitor valve sub–assy are used.
- □ Tire chains are used.
- □ Wheels other than manufacturer spec 4RUNNER wheels are used.

HINT:

- □ If any other wheels than the specified ones are used, the system may not function properly because the radio waves are differently transmitted from the tire pressure sensor.
- □ Depending on the tire type, the system may not function properly even though the specified wheels are used.

(c) The average use life of the grommet of the tire pressure monitor valve sub–assy is approximately 5 years, at which time it must be replaced.

(d) After removing and installing the ECU or a sensor, output a diagnosis code and check that it is a normal code.

3. FUNCTION OF COMPONENTS

Components	Function
Tire pressure monitor valve sub–assy	Combined as a single unit with a disc wheel air valve, it measures tire pressure and temperature and transmits an ID number for measurement value and identification. Built–in the battery.
Tire pressure monitor receiver assy	Receives and transmits a necessary signal from the transmitter to the tire pressure monitor ECU.
Tire pressure monitor ECU	Receives the signal from the receiver and identifies it as vehicle's own signal. If the measurement value is equal to or lower than the specified value, it transmits a signal so that the air pressure warning lamp on the combination meter comes on.
Tire warning lamp	Located in the instrumental panel, it informs the driver of lowered tire air pressure and system failure.

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052LO–03

HOW TO PROCEED WITH TROUBLESHOOTING

The hand–held tester can be used at steps 3, 7 and 9.

1	VEHICLE BROUGHT TO WORK SHOP

2	CUSTOMER PROBLEM ANALYSIS (SEE PAGE 05–669)

3	DTC CHECK AND CLEAR (SEE PAGE 05–681)

- DTC IS OUTPUT: Go to step 4
- DTC IS NOT OUTPUT: Go to step 5

4	DTC CHART (SEE PAGE 05–685)

- Go to step 7

5	PROBLEM SYMPTOM CONFIRMATION

- SYMPTOM DOES NOT OCCUR: SYMPTOM SIMULATION (SEE PAGE 01–25)
- SYMPTOM OCCURS: Go to step 6

6	PROBLEM SYMPTOMS TABLE (SEE PAGE 05–675)

7	CIRCUIT INSPECTION (SEE PAGE 05–687 TO 05–717)

8	REPAIR

9	CONFIRMATION TEST

END

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052LQ-02

CUSTOMER PROBLEM ANALYSIS CHECK

Tire Pressure Warning System Check Sheet

Inspector's Name :

Customer's Name		**VIN**	
		Production Date	/ /
		Licence Plate No.	
Date Vehicle Brought In	/ /	**Odometer Reading**	km miles

Date of First Occurrence	/ /
Frequency of Problem Occurrence	☐ Continuous ☐ Intermittent (times a day)

Symptoms	☐ **In spite of abnormal low tire pressure, the warning lamp does not come on.**	
	☐ **The warning lamp was lighted and the tire was filled up with air, but the warning lamp does not go off.**	
	Tire Pressure Warning Lamp Abnormal	☐ Remains ON ☐ Does not come on

Check Item	**Tire Pressure Warning Lamp**	☐ Normal ☐ Malfunction Code (Code)
	Tire	☐ Tire Pressure FR ( ) FL ( ) RR ( ) RL ( ) ☐ Tire Size FR ( ) FL ( ) RR ( ) RL ( ) ☐ Tire Type FR ( ) FL ( ) RR ( ) RL ( ) ☐ Tire Wear Condition FR ( ) FL ( ) RR ( ) RL ( ) ☐ History of changing tires or wheels When ( ) ☐ History of rotating tires When ( )

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05GAW–01

REGISTRATION

1. REGISTER TRANSMITTER ID

NOTICE:

It is necessary to register the transmitter ID in the tire pressure monitor ECU when replacing the tire pressure monitor valve sub–assy and/or tire pressure monitor ECU.

(a) Set the tire pressure of all wheels to the specified value.

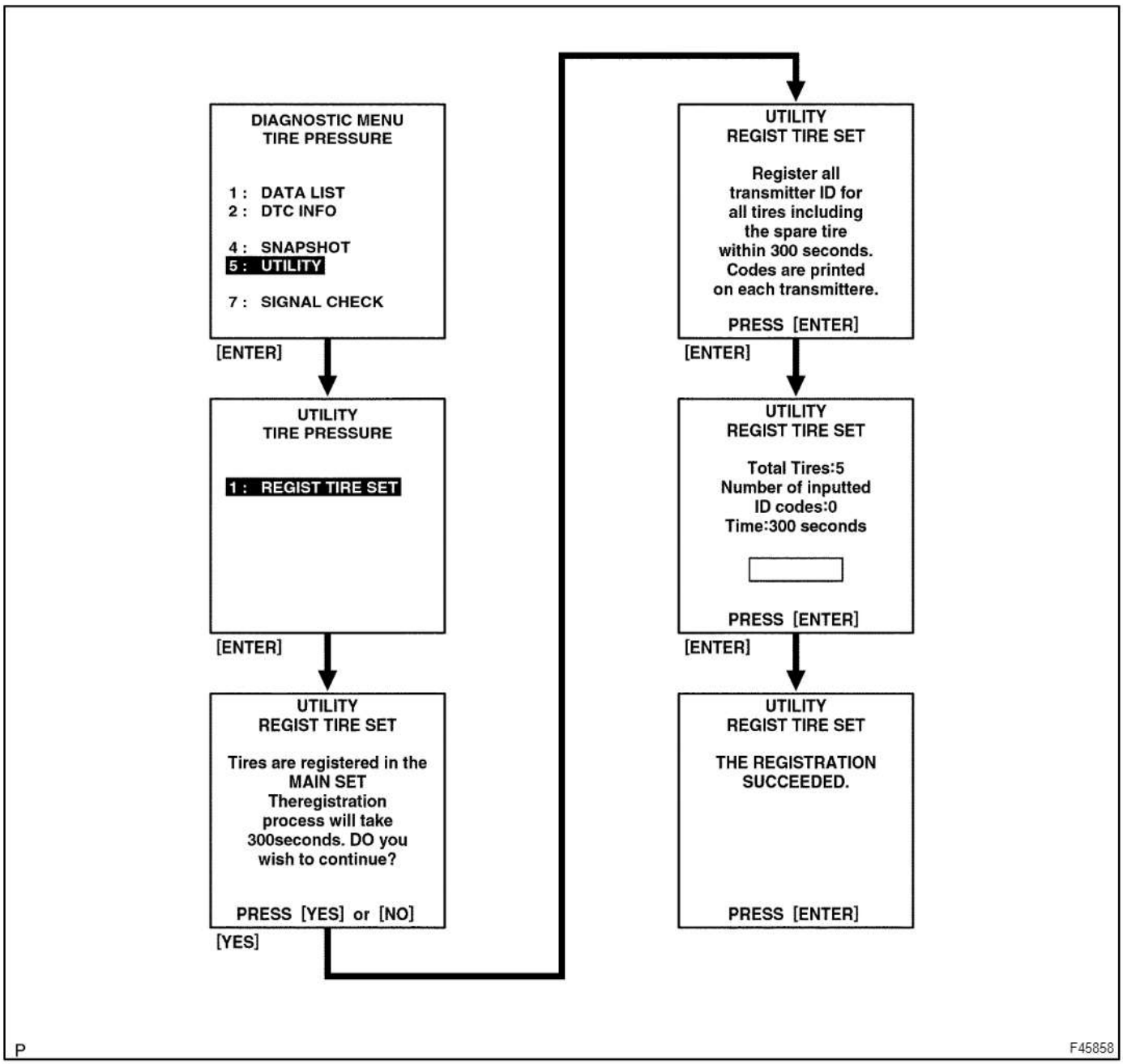
Front	Rear	Spare
220 kPa (2.2 kgf/cm^2, 32 psi)	220 kPa (2.2 kgf/cm^2, 32 psi)	220 kPa (2.2 kgf/cm^2, 32 psi)

(b) Connect the hand–held tester to DLC3.
(c) Turn the ignition switch to the ON position.
(d) Read and write down the ID by using the DATA LIST.
(e) Select the registration mode ”MAIN”.
(f) Input the ID using the hand–held tester and transmit it to the tire pressure monitor ECU.
(g) Set the ID transmission condition to ”COMPLETE”.

HINT:

If the operation of step (d) to (f) does not complete within 5 min., the mode will return to the normal operation mode.

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2. CONFIRMATION OF TRANSMITTER ID REGISTRATION

(a) Set the tire pressure of all wheels to the specified value.

Front	Rear	Spare
220 kPa (2.2 kgf/cm^2, 32 psi)	220 kPa (2.2 kgf/cm^2, 32 psi)	220 kPa (2.2 kgf/cm^2, 32 psi)

(b) Connect the hand–held tester to DLC3.

(c) Turn the ignition switch to the ON position.

(d) Select the "SIGNAL CHECK" mode on the hand–held tester (see page 05–673).

(e) Forcibly transmit the transmitter IDs for all wheels.

HINT:

- The transmitter ID can be transmitted by rapidly reducing the tire air pressure.
- When rapidly reducing the pressure, loosen the valve core.

(f) Check that test mode DTCs C2181/81, C2182/82, C2183/83, C2184/84 and C2185/85 are all erased.

HINT:

If they haven't been erased, reset the tire pressure to the specified value and rotate the tire 90 to 270 degrees. Then forcibly transmit the transmitter IDs of all wheels. If they are still output, register the transmitter IDs.

(g) Set the tire pressure of all wheels to the specified value.

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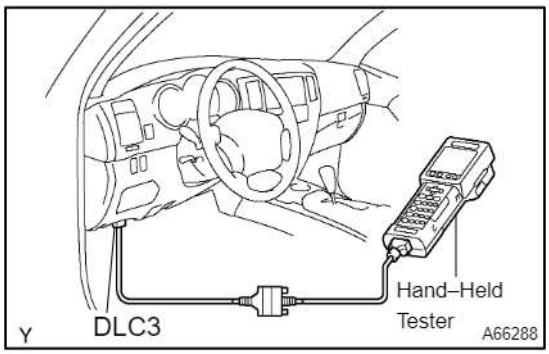
05GBB-01

OPERATION CHECK

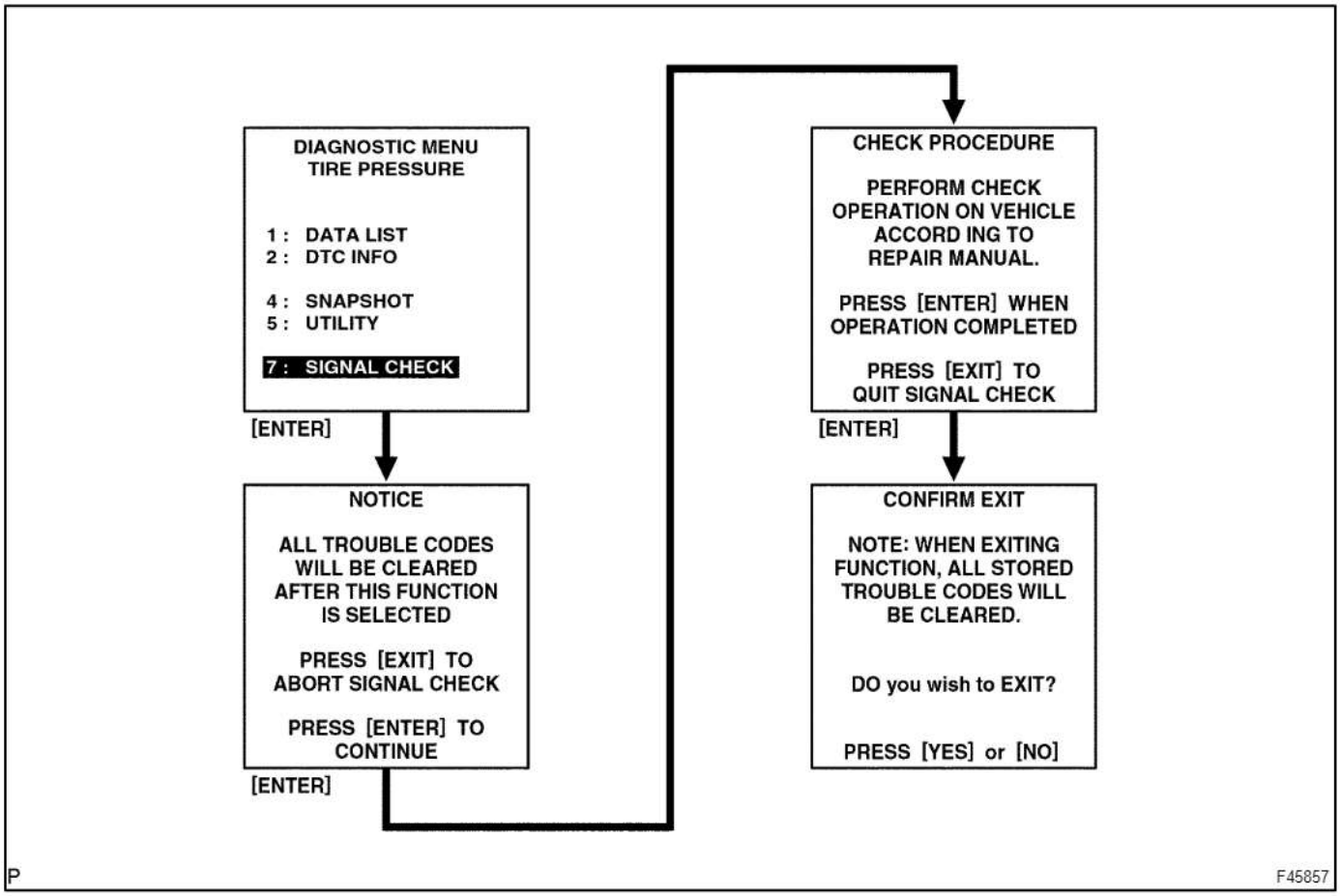
1. TEST MODE CHECK

HINT:

- When entering the test mode, the tire pressure monitor ECU sets all the test DTCs first.
  After completing the test mode for each inspection item, the DTCs that are determined normal by the tire pressure monitor ECU will be erased.
  The DTCs for other inspection items may not be erased when only a certain signal is inspected.
- When the test mode returns back to the normal mode, all the test DTCs will be erased.



(a) Procedure for Test Mode.
  (1) Make sure that the ignition switch is off.
  (2) Connect the hand–held tester to DLC3.
  (3) Turn the ignition switch to the ON position.
  (4) Perform the test mode (SIGNAL CHECK) procedure.



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(1) After completing the input signal check, disconnect the tester and turn the ignition switch off.

DTC of Tire Pressure Warning System test mode function:

If a malfunction code is displayed during the test mode DTC check, check the circuit listed for that code. For details of each code, refer to the "See Page" under respective "DTC No." in the chart.

DTC No. (See Page)	Detection Item	Trouble Area
C2181/81 (05–692)	Transmitter ID1 not received	□Tire pressure monitor receiver assy □Each tire pressure monitor valve sub–assy □Tire pressure monitor ECU □Wire harness
C2182/82 (05–692)	Transmitter ID2 not received	□Tire pressure monitor receiver assy □Each tire pressure monitor valve sub–assy □Tire pressure monitor ECU □Wire harness
C2183/83 (05–692)	Transmitter ID3 not received	□Tire pressure monitor receiver assy □Each tire pressure monitor valve sub–assy □Tire pressure monitor ECU □Wire harness
C2184/84 (05–692)	Transmitter ID4 not received	□Tire pressure monitor receiver assy □Each tire pressure monitor valve sub–assy □Tire pressure monitor ECU □Wire harness
C2185/85 (05–692)	Transmitter ID5 not received	□Tire pressure monitor receiver assy □Each tire pressure monitor valve sub–assy □Tire pressure monitor ECU □Wire harness
C2191/91 (05–708)	Vehicle speed signal error	□Combination meter assy □Vehicle speed sensor □Tire pressure monitor ECU □Wire harness

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052LV–04

PROBLEM SYMPTOMS TABLE

If a normal code is displayed during DTC check but the problem still occurs, check the circuits for each problem symptom in the order given in the table below and proceed to the relevant troubleshooting page.

Symptom	Suspected Area	See page
Tire pressure warning system does not operate.	1. Tire pressure monitor valve sub–assy 2. Tire pressure monitor receiver assy 3. Power source circuit 4. Tc terminal circuit 5. Combination meter assy 6. Tire pressure monitor ECU	– – 05–714 05–717 05–1687 –
DTC check cannot be done.	1. Power source circuit 2. Tc terminal circuit 3. Tire pressure monitor ECU	05–714 05–717 –
Tire pressure warning lamp malfunctions.	1. Power source circuit 2. Tire pressure warning lamp circuit 3. Combination meter assy 4. Tire pressure monitor ECU	05–714 05–711 05–1687 –

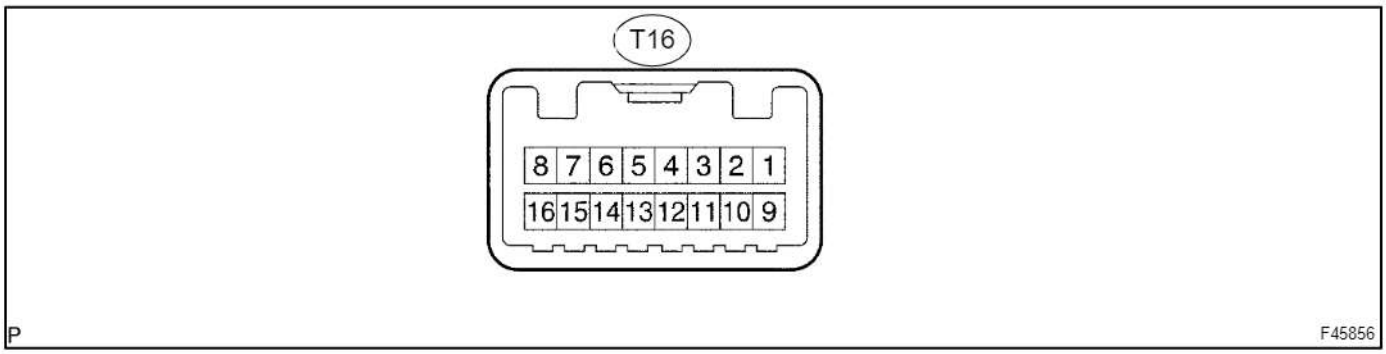
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052LU-03

TERMINALS OF ECU

HINT:

Inspect the connectors from the back side while the connectors are connected.

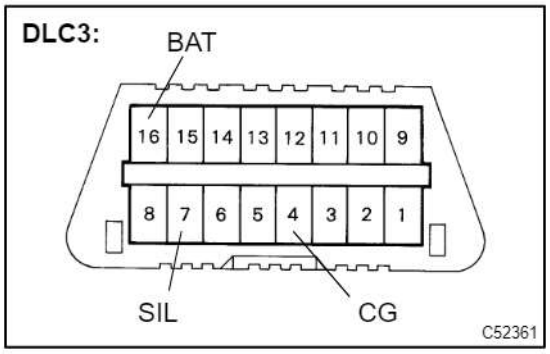


Symbols (Terminals No.)	Wiring Color	Terminal Description	Condition	Specified Condition
IG (T16–2) – GND (T16–11)	B–R – W–B	IG power source	IG switch ON	10 to 14 V
SPD (T16–3) – GND (T16–11)	V–R – W–B	Vehicle speed signal	Vehicle is running	Pulse generation
SIL (T16–4) – GND (T16–11)	R–Y – W–B	Diagnosis tester communication line	IG switch ON, when communication is not performed with a tester	8 V or more
IND (T16–6) – GND (T16–11)	P–B – W–B	Tire pressure warning lamp output signal	IG switch ON, tire pressure warning lamp ON	8 V or more
IND (T16–6) – GND (T16–11)	P–B – W–B	Tire pressure warning lamp output signal	IG switch ON, tire pressure warning lamp OFF	Below 1.5 V
RDA (T16–7) – GND (T16–11)	GR – W–B	Tire pressure monitor receiver input signal	IG switch ON, when the tire pressure monitor receiver is not connected	10 to 14 V
RF5V (T16–8) – GND (T16–11)	L – W–B	Tire pressure monitor receiver power source	IG switch ON	4.5 to 5.5 V
GND (T16–11) – Body ground	W–B – Body ground	Ground	Always	Below 1 Ω
TC (T16–12) – GND (T16–11)	P–L – W–B	Tc terminal	When terminal TC is not connected.	8 V or more
GND2 (T16–16) – GND (T16–11)	LG–B – W–B	Tire pressure monitor receiver ground	Always	Below 1 Ω

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05GAX-01

DIAGNOSIS SYSTEM



1. DIAGNOSIS SYSTEM

(a) Inspect the battery voltage.

Battery voltage: 11 to 14 V

If the voltage is below 11 V, recharge the battery before proceeding.

(b) Check DLC3.

The vehicle's tire pressure monitor ECU uses ISO 9141–2 for communication. The terminal arrangement of DLC3 complies with SAE J1962 and matches the ISO 9141–2 format.

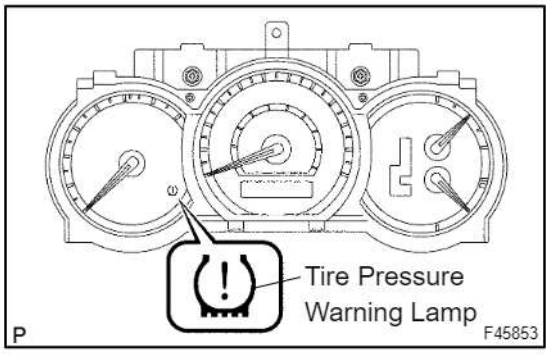
Verify the conditions listed in the table below:

Terminal No.	Disc.	Connection / Voltage or Resistance	Condition
7	SIL	Bus + Line / Pulse generation	During transmission
4	CG	Chassis Ground to Body Ground / 1 Ω or less	Always
16	BAT	Battery Positive to Body Ground / 10 to 14 V	Always

HINT:

If the hand–held tester display shows UNABLE TO CONNECT TO VEHICLE when the cable of the hand–held tester is connected to DLC3, the ignition switch is turned to the ON position and the tester is operated, there is a problem on the vehicle side or tester side.

- If communication is normal when the tester is connected to another vehicle, inspect DLC3 on the original vehicle.
- If communication is still not possible when the tool is connected to another vehicle, the problem is probably in the tester itself, so consult the Service Department listed in the tester's instruction manual.



(c) Warning lamp

(1) The tire pressure warning lamp blinks when there is any malfunction in the tire pressure warning system.

NOTICE:

When the malfunction has been corrected, the tire pressure warning lamp does not come on.

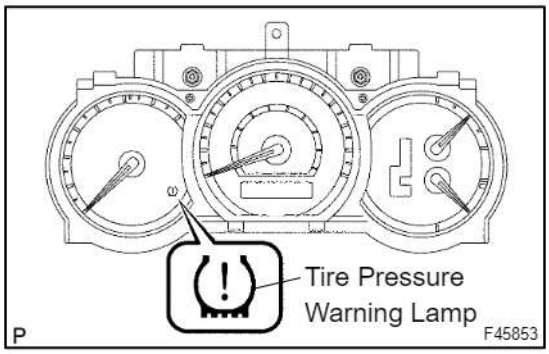
(d) DTCs (Normal mode)

(1) DTCs are memorized in the tire pressure monitor ECU and read by the blinks of the tire pressure warning lamp or using the hand–held tester (see page 05–681 for the procedure of DTCs check).

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(e) Test mode

(1) By switching from normal mode into test mode (input signal check), you can inspect the tire pressure monitor receiver assy, each tire pressure monitor valve sub–assy and vehicle speed sensor (see page 05–673).



2. CHECK WARNING LAMP

(a) Turn the ignition switch to the ON position.

(b) Check that the tire pressure warning lamp comes on for 3 sec.

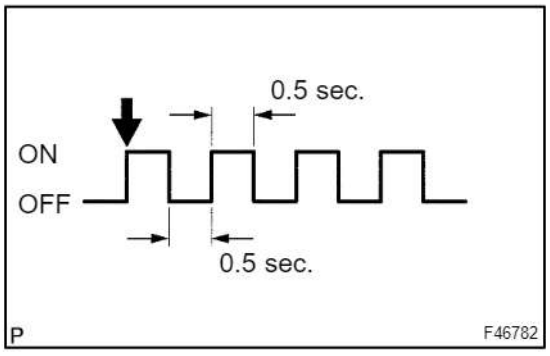
If the warning check result is not normal, proceed to the trouble-shooting for the tire pressure warning lamp circuit.

Trouble Area	See page
Tire pressure warning lamp circuit	05–711

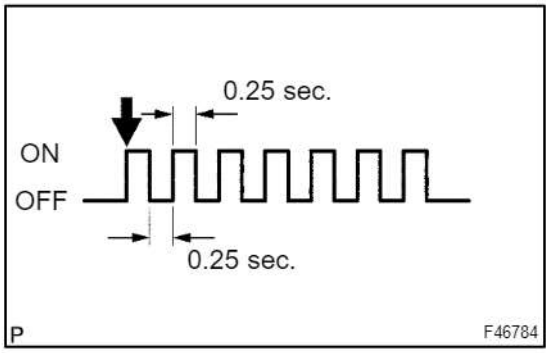
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3. TIRE PRESSURE WARNING LAMP CHART

	Immediately after turning the IG ON	Always					
	Comes on for 3 sec.	Goes off	Comes on	Blinks (*1)	Blinks (*2)	Blinks (*3)	Output DTC
Normal							
Low tire pressure							
System fail							
ECU Connector poorly connected							
TC ground (There is no DTC)							
TC ground (There is DTC)							
Test mode							

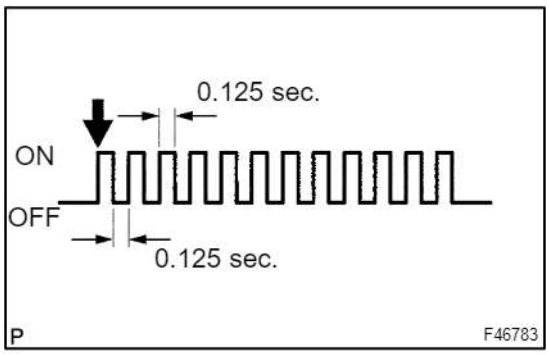


*1: Comes on and goes off repeatedly at 0.5 second intervals.



*2: Comes on and goes off repeatedly at 0.25 second intervals.

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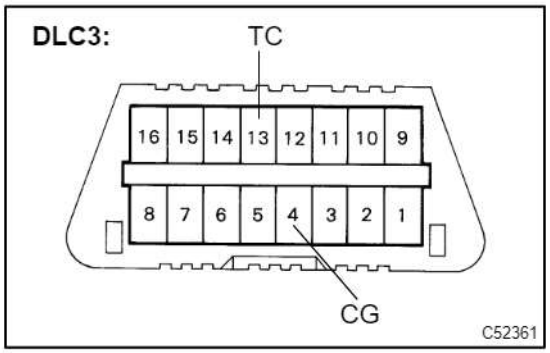


*3: Comes on and goes off repeatedly at 0.125 second intervals.

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DTC CHECK/CLEAR



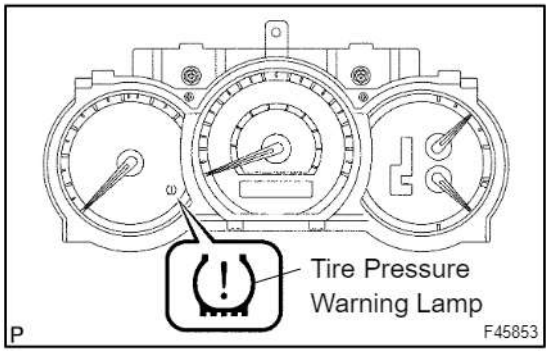
1. DTC CHECK (USING SST CHECK WIRE)

(a) Check DTCs.

(1) Using the SST, connect terminals TC and CG of DLC3.

SST 09843–18040

(2) Turn the ignition switch to the ON position.



(3) Read and record any DTCs from the tire pressure warning lamp on the combination meter. Refer to the illustration on the left for examples of a normal system code and codes 13 and 33.

HINT:

- If the tire pressure warning lamp does not blink any DTCs or the normal system code, inspect the tire pressure warnning lamp circuit or TC terminal circuit.

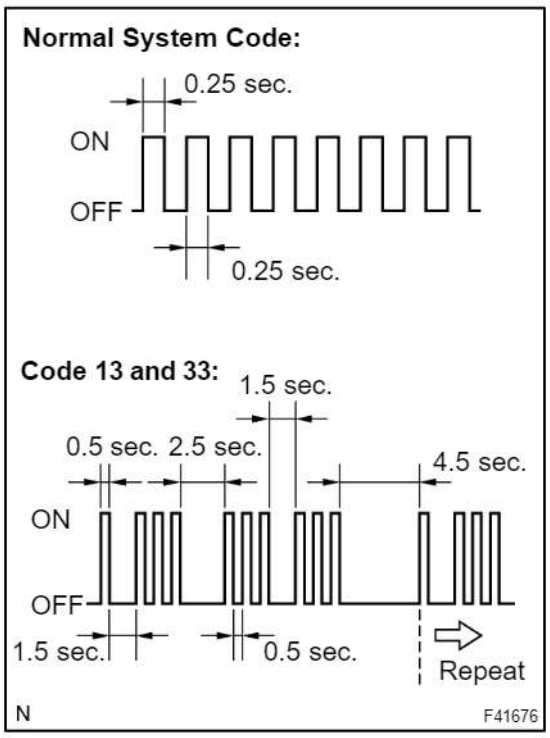
Trouble Area	See page
Tire pressure warning lamp circuit	05–711
TC terminal circuit	05–717

- If 2 or more malfunctions are indicated at the same time, the lowest numbered DTC is displayed first.

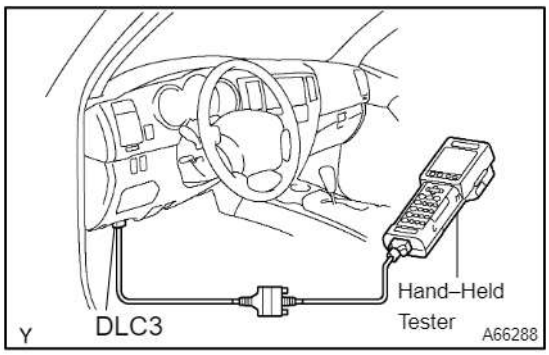
(4) Refer to the Diagnostic Trouble Code Chart (see page 05–685) for DTC information.

(5) After completing the check, turn the ignition switch off and remove the SST from DLC3.

SST 09843–18040



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2. DTC CHECK (USING HAND–HELD TESTER)

(a) Check DTCs.

(1) Connect the hand–held tester to DLC3.

(2) Turn the ignition switch to the ON position.

(3) Read the DTCs following the prompts on the tester screen.

HINT:

Refer to the hand–held tester operator's manual for further details.

(b) Clear the DTCs.

HINT:

After repairing the malfunctions, clear the DTC.

(1) Connect the hand–held tester to DLC3.

(2) Turn the ignition switch to the ON position.

(3) Erase the DTCs following the prompts on the tester screen.

HINT:

Refer to the hand–held tester operator's manual for further details.

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05GAZ–01

DATA LIST/ACTIVE TEST

1. DATA LIST

(a) Connect the hand–held tester to DLC3.

(b) Turn the ignition switch to the ON position.

(c) Following the display on the hand–held tester, read the "DATA LIST".

Item	Measurement item/ Range (Display)	Normal Condition	Diagnostic Note
MODE STATUS	Tire pressure warning system mode/NORMAL or REG 2nd or REG M or TEST	NORMAL: Normal mode REG 2nd: 2nd registration REG M: Main registration TEST: Test mode	–
MAIN TIRE	Number of main tire ID to be registered/0 or 1 or 2 or 3 or 4 or 5	0 to 5 should be displayed	–
VEHICLE SPEED	Vehicle speed reading/ min.: 0 km/h (0 mph), max.: 255 km/h (158 mph)	Actual vehicle speed	Speed indicated on the combination meter
REGIT ID1 CODE	Registered ID1 code/min.: 0, max.: FFFFFFF	The ID No. registered in the transmitter ID1 is displayed	–
REGIT ID2 CODE	Registered ID2 code/min.: 0, max.: FFFFFFF	The ID No. registered in the transmitter ID2 is displayed	–
REGIT ID3 CODE	Registered ID3 code/min.: 0, max.: FFFFFFF	The ID No. registered in the transmitter ID3 is displayed	–
REGIT ID4 CODE	Registered ID4 code/min.: 0, max.: FFFFFFF	The ID No. registered in the transmitter ID4 is displayed	–
REGIT ID5 CODE	Registered ID5 code/min.: 0, max.: FFFFFFF	The ID No. registered in the transmitter ID5 is displayed	–
TRANS STATUS	ID code transmission status/ FINISH or NOW	FINISH or NOW	–
INITIAL SW	Initialization switch condition/ ON or OFF	ON or OFF	–
TIREPRESS1	ID1 tire inflation pressure/ min.: 0 kPa (0 kgf·cm^2, 0 psi), max.: 637.5 kPa (6.48 kgf·cm^2, 92.2 psi)	Actual tire inflation pressure	–
TIREPRESS2	ID2 tire inflation pressure/ min.: 0 kPa (0 kgf·cm^2, 0 psi), max.: 637.5 kPa (6.48 kgf·cm^2, 92.2 psi)	Actual tire inflation pressure	–
TIREPRESS3	ID3 tire inflation pressure/ min.: 0 kPa (0 kgf·cm^2, 0 psi), max.: 637.5 kPa (6.48 kgf·cm^2, 92.2 psi)	Actual tire inflation pressure	–
TIREPRESS4	ID4 tire inflation pressure/ min.: 0 kPa (0 kgf·cm^2, 0 psi), max.: 637.5 kPa (6.48 kgf·cm^2, 92.2 psi)	Actual tire inflation pressure	–
TIREPRESS5	ID5 tire inflation pressure/ min.: 0 kPa (0 kgf·cm^2, 0 psi), max.: 637.5 kPa (6.48 kgf·cm^2, 92.2 psi)	Actual tire inflation pressure	–
TIRE TEMP1	ID1 temperature in tire/ min.: –40□C (–40□F), max.: 215□C (419□F)	Actual tire temperature	–
TIRE TEMP2	ID2 temperature in tire/ min.: –40□C (–40□F), max.: 215□C (419□F)	Actual tire temperature	–

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Item	Measurement item/ Range (Display)	Normal Condition	Diagnostic Note
TIRE TEMP3	ID3 temperature in tire/ min.: –40□C (–40□F), max.: 215□C (419□F)	Actual tire temperature	–
TIRE TEMP4	ID4 temperature in tire/ min.: –40□C (–40□F), max.: 215□C (419□F)	Actual tire temperature	–
TIRE TEMP5	ID5 temperature in tire/ min.: –40□C (–40□F), max.: 215□C (419□F)	Actual tire temperature	–
BATT VOLT1	ID1 battery voltage/ OVER or LESS	OVER	–
BATT VOLT2	ID2 battery voltage/ OVER or LESS	OVER	–
BATT VOLT3	ID3 battery voltage/ OVER or LESS	OVER	–
BATT VOLT4	ID4 battery voltage/ OVER or LESS	OVER	–
BATT VOLT5	ID5 battery voltage/ OVER or LESS	OVER	–
SELECT SW INFO	Select switch setting information/ WITH or WITHOUT	WITH or WITHOUT	–
INITIAL SW INFO	Initialization switch setting information/WITH or WITHOUT	WITH or WITHOUT	–
# CODES	Number of DTC recorded/ min.: 0, max.: 255	Min.: 0, Max.: –	–

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052LS–02

DIAGNOSTIC TROUBLE CODE CHART

HINT:

- □ If any abnormality is not found when the parts are inspected, inspect the tire pressure monitor ECU.
- □ If a malfunction code is displayed during the DTC check, inspect the circuit listed for that code. For details of each code, refer to the "See page" under respective "DTC No." in the DTC chart.

DTC chart of Tire Pressure Warning:

DTC No. (See Page)	Detection Item	Trouble Area
C2111/11 (05–687)	Transmitter ID1 operate stop	□Tire pressure monitor valve sub–assy □Tire pressure monitor receiver assy □Tire pressure monitor ECU
C2112/12 (05–687)	Transmitter ID2 operate stop	□Tire pressure monitor valve sub–assy □Tire pressure monitor receiver assy □Tire pressure monitor ECU
C2113/13 (05–687)	Transmitter ID3 operate stop	□Tire pressure monitor valve sub–assy □Tire pressure monitor receiver assy □Tire pressure monitor ECU
C2114/14 (05–687)	Transmitter ID4 operate stop	□Tire pressure monitor valve sub–assy □Tire pressure monitor receiver assy □Tire pressure monitor ECU
C2115/15 (05–687)	Transmitter ID5 operate stop	□Tire pressure monitor valve sub–assy □Tire pressure monitor receiver assy □Tire pressure monitor ECU
C2121/21 (05–692)	Transmitter ID1 not received	□Tire pressure monitor valve sub–assy □Tire pressure monitor receiver assy □Tire pressure monitor ECU
C2122/22 (05–692)	Transmitter ID2 not received	□Tire pressure monitor valve sub–assy □Tire pressure monitor receiver assy □Tire pressure monitor ECU
C2123/23 (05–692)	Transmitter ID3 not received	□Tire pressure monitor valve sub–assy □Tire pressure monitor receiver assy □Tire pressure monitor ECU
C2124/24 (05–692)	Transmitter ID4 not received	□Tire pressure monitor valve sub–assy □Tire pressure monitor receiver assy □Tire pressure monitor ECU
C2125/25 (05–692)	Transmitter ID5 not received	□Tire pressure monitor valve sub–assy □Tire pressure monitor receiver assy □Tire pressure monitor ECU
C2141/41 (05–698)	Transmitter ID1 error	□Tire pressure monitor valve sub–assy □Tire pressure monitor ECU □Tire pressure monitor receiver assy
C2142/42 (05–698)	Transmitter ID2 error	□Tire pressure monitor valve sub–assy □Tire pressure monitor ECU □Tire pressure monitor receiver assy
C2143/43 (05–698)	Transmitter ID3 error	□Tire pressure monitor valve sub–assy □Tire pressure monitor ECU □Tire pressure monitor receiver assy
C2144/44 (05–698)	Transmitter ID4 error	□Tire pressure monitor valve sub–assy □Tire pressure monitor ECU □Tire pressure monitor receiver assy
C2145/45 (05–698)	Transmitter ID5 error	□Tire pressure monitor valve sub–assy □Tire pressure monitor ECU □Tire pressure monitor receiver assy
C2165/65 (05–701)	Abnormal temperature inside ID1 tire	□Tire pressure monitor valve sub–assy □Tire pressure monitor ECU □Tire pressure monitor receiver assy

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C2166/66 (05–701)	Abnormal temperature inside ID2 tire	□Tire pressure monitor valve sub–assy □Tire pressure monitor ECU □Tire pressure monitor receiver assy
C2167/67 (05–701)	Abnormal temperature inside ID3 tire	□Tire pressure monitor valve sub–assy □Tire pressure monitor ECU □Tire pressure monitor receiver assy
C2168/68 (05–701)	Abnormal temperature inside ID4 tire	□Tire pressure monitor valve sub–assy □Tire pressure monitor ECU □Tire pressure monitor receiver assy
C2169/69 (05–701)	Abnormal temperature inside ID5 tire	□Tire pressure monitor valve sub–assy □Tire pressure monitor ECU □Tire pressure monitor receiver assy
C2171/71 (05–704)	Transmitter ID not registered	Tire pressure monitor ECU
C2176/76 (05–705)	Receiver error	□Tire pressure monitor receiver assy □Tire pressure monitor ECU

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DTC	C2111/11	TRANSMITTER ID1 OPERATION STOP

DTC	C2112/12	TRANSMITTER ID2 OPERATION STOP

DTC	C2113/13	TRANSMITTER ID3 OPERATION STOP

DTC	C2114/14	TRANSMITTER ID4 OPERATION STOP

DTC	C2115/15	TRANSMITTER ID5 OPERATION STOP

CIRCUIT DESCRIPTION

The tire pressure monitor valve sub–assy stops transmitting signals when receiving specific signals. The ECU stores the DTC when the tire pressure monitor valve sub–assy receives the signals, for some reason, and stops transmitting signals. As this is not a system malfunction, the DTC is erased when signal transmission is resumed.

HINT:

The electric wave is stopped at assembly plant, because the strength of the electric wave emitting from the tire pressure sensing transmitter does not comply with the Japan Wireless Telegraphy Act.

DTC No.	DTC Detecting Condition	Trouble Area
C2111/11 C2112/12 C2113/13 C2114/14 C2115/15	When any signal similar to the stop signal is received for some reason, this DTC will be output.	□Tire pressure monitor valve sub–assy □Tire pressure monitor receiver assy □Tire pressure monitor ECU

HINT:

It is necessary to perform the procedure to identify the tire pressure monitor valve sub–assy that is malfunctioning because it cannot be identified by the output DTC.

INSPECTION PROCEDURE

HINT:

Set the tire pressure to the specified value.

1	FORCIBLY TRANSMIT TRANSMITTER ID OF ALL WHEELS

(a) Remove the valve cores of the wheels to rapidly reduce the pressure of all tires to 120 kPa (1.2 kgf/cm^2, 17 psi respectively).

HINT:

The transmitter ID can be transmitted forcibly by rapidly reducing tire air pressure.

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2	CHECK DTC

(a) Check for DTC.
OK: DTC is not output.

OK → **SET TIRE PRESSURE TO NORMAL VALUE (TRANSMITTER STOP CONDITON IS COMPLETELY RESET)**

NG

3	SET TIRE PRESSURE TO NORMAL VALUE

(a) Set the tire pressure back to the specified normal value.

Front	Rear	Spare
220 kPa (2.2 kgf/cm^2, 32 psi)	220 kPa (2.2 kgf/cm^2, 32 psi)	220 kPa (2.2 kgf/cm^2, 32 psi)

4	FORCIBLY TRANSMIT TRANSMITTER ID

(a) Forcibly transmit the transmitter ID by performing the following: Set the tire pressure to the specified value and rotate the tire 90 to 270 degrees. Rapidly reduce the tire pressure of all wheels.

NOTICE:
Rapidly reduce the pressure of all tires respectively.

5	CHECK DTC

(a) Check for DTC.
OK: DTC is not output.

HINT:
In the case of NG, system error is probable. Perform troubleshooting according to other DTC.

OK → **SET TIRE PRESSURE TO NORMAL VALUE (TRANSMITTER STOP CONDITON IS COMPLETELY RESET)**

NG

6	CHECK DTC

(a) Check if DTCs C2121/21, C2122/22, C2123/23, C2124/24 and C2125/25 are all output.

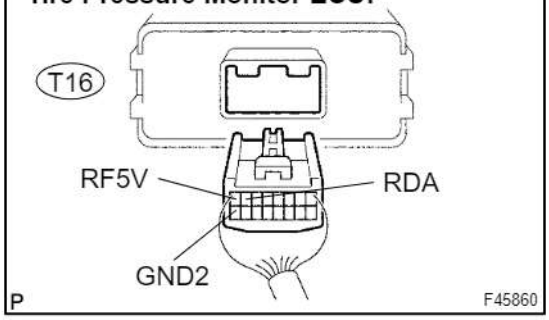
NO → **Go to step 9**

YES

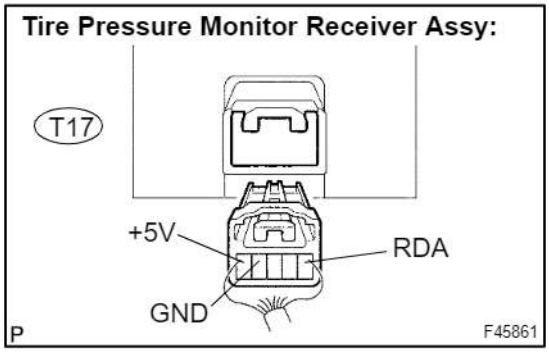
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7	CHECK HARNESS AND CONNECTOR(TIRE PRESSURE MONITOR RECEIVER ASSY – TIRE PRESSURE MONITOR ECU) (SEE PAGE 01–35)

Tire Pressure Monitor ECU:



Tire Pressure Monitor Receiver Assy:



(a) Disconnect the tire pressure monitor receiver assy T17 connector and tire pressure monitor ECU T16 connector.

(b) Measure the resistance according to the value(s) in the table below.

Standard:

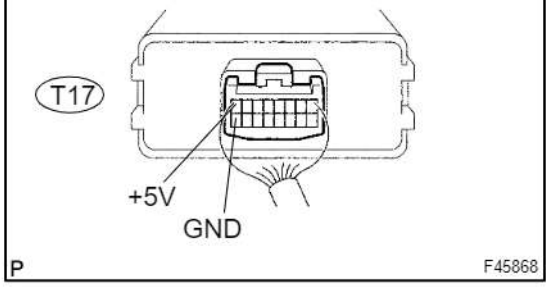
Tester Connection	Specified Condition
T16–7 (RDA) – T17–1 (RDA)	Below 1 Ω
T16–8 (RF5V) – T17–5 (+5V)	Below 1 Ω
T16–16 (GND2) – T17–4 (GND)	Below 1 Ω
T16–7 (RDA) – Body ground	10 kΩ or higher
T16–8 (RF5V) – Body ground	10 kΩ or higher
T16–16 (GND2) – Body ground	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

8	INSPECT TIRE PRESSURE MONITOR ECU

Tire Pressure Monitor Receiver Assy:



(a) Connect the tire pressure monitor ECU T16 connector.

(b) Measure the resistance according to the value(s) in the table below.

Standard:

Tester Connection	Specified Condition
T16–8 (RF5V) – T16–16 (GND2)	4.5 to 5.5 V

NG → **CHECK POWER SOURCE CIRCUIT(SEE PAGE 05–714)**

OK

REPLACE TIRE PRESSURE MONITOR RECEIVER ASSY

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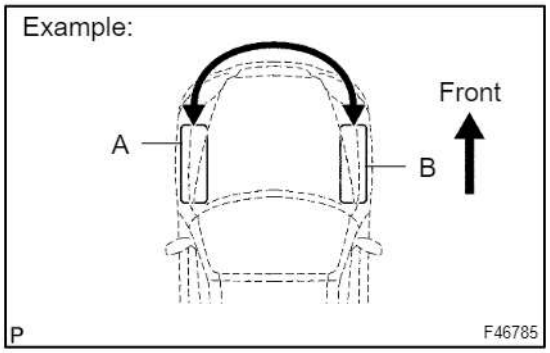
9	SET TIRE PRESSURE TO NORMAL VALUE

(a) Set the tire pressure of all wheels to the specified value.

Front	Rear	Spare
220 kPa (2.2 kgf/cm^2, 32 psi)	220 kPa (2.2 kgf/cm^2, 32 psi)	220 kPa (2.2 kgf/cm^2, 32 psi)

10	IDENTIFY TRANSMITTER CORRESPONDING TO DTC (SEE PAGE 05–720)

11	INTERCHANGE TIRES



HINT:
In the case where ”A” (left front) is identified at step 10.

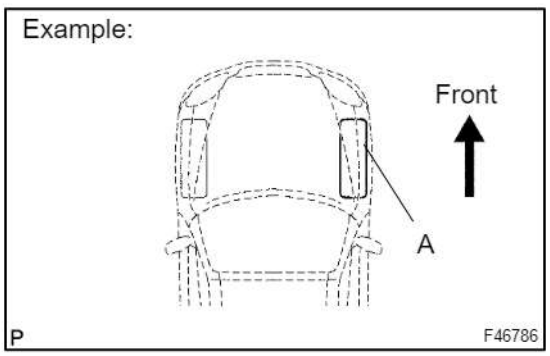
(a) Interchange tire ”A” for the identified tire pressure monitor valve sub–assy with tire ”B” for a normal one.

12	SET TIRE PRESSURE TO NORMAL VALUE

(a) Set the tire pressure of all wheels to the specified value.

Front	Rear	Spare
220 kPa (2.2 kgf/cm^2, 32 psi)	220 kPa (2.2 kgf/cm^2, 32 psi)	220 kPa (2.2 kgf/cm^2, 32 psi)

13	FORCIBLY TRANSMIT TRANSMITTER ID



(a) Remove the valve core of the tire ”A”, rapidly reduce the tire pressure and forcibly transmit the transmitter ID of the tire pressure monitor valve sub–assy.

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14	CHECK DTC AGAIN

(a) Check DTC.
OK: DTC is not output

HINT:
- □ If a DTC is output, replace the identified tire pressure monitor valve sub–assy.
- □ Register the transmitter ID after replacing and then set the tire pressure to the specified value.

NG → **REPLACE TIRE PRESSURE MONITOR VALVE SUB–ASSY**

OK

REPLACE TIRE PRESSURE MONITOR RECEIVER ASSY

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DTC	C2121/21	TRANSMITTER ID1 NOT RECEIVED
DTC	C2122/22	TRANSMITTER ID2 NOT RECEIVED
DTC	C2123/23	TRANSMITTER ID3 NOT RECEIVED
DTC	C2124/24	TRANSMITTER ID4 NOT RECEIVED
DTC	C2125/25	TRANSMITTER ID5 NOT RECEIVED
DTC	C2181/81	TRANSMITTER ID1 NOT RECEIVED(TEST DIAGNOSIS)
DTC	C2182/82	TRANSMITTER ID2 NOT RECEIVED(TEST DIAGNOSIS)
DTC	C2183/83	TRANSMITTER ID3 NOT RECEIVED(TEST DIAGNOSIS)
DTC	C2184/84	TRANSMITTER ID4 NOT RECEIVED(TEST DIAGNOSIS)
DTC	C2185/85	TRANSMITTER ID5 NOT RECEIVED(TEST DIAGNOSIS)

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CIRCUIT DESCRIPTION

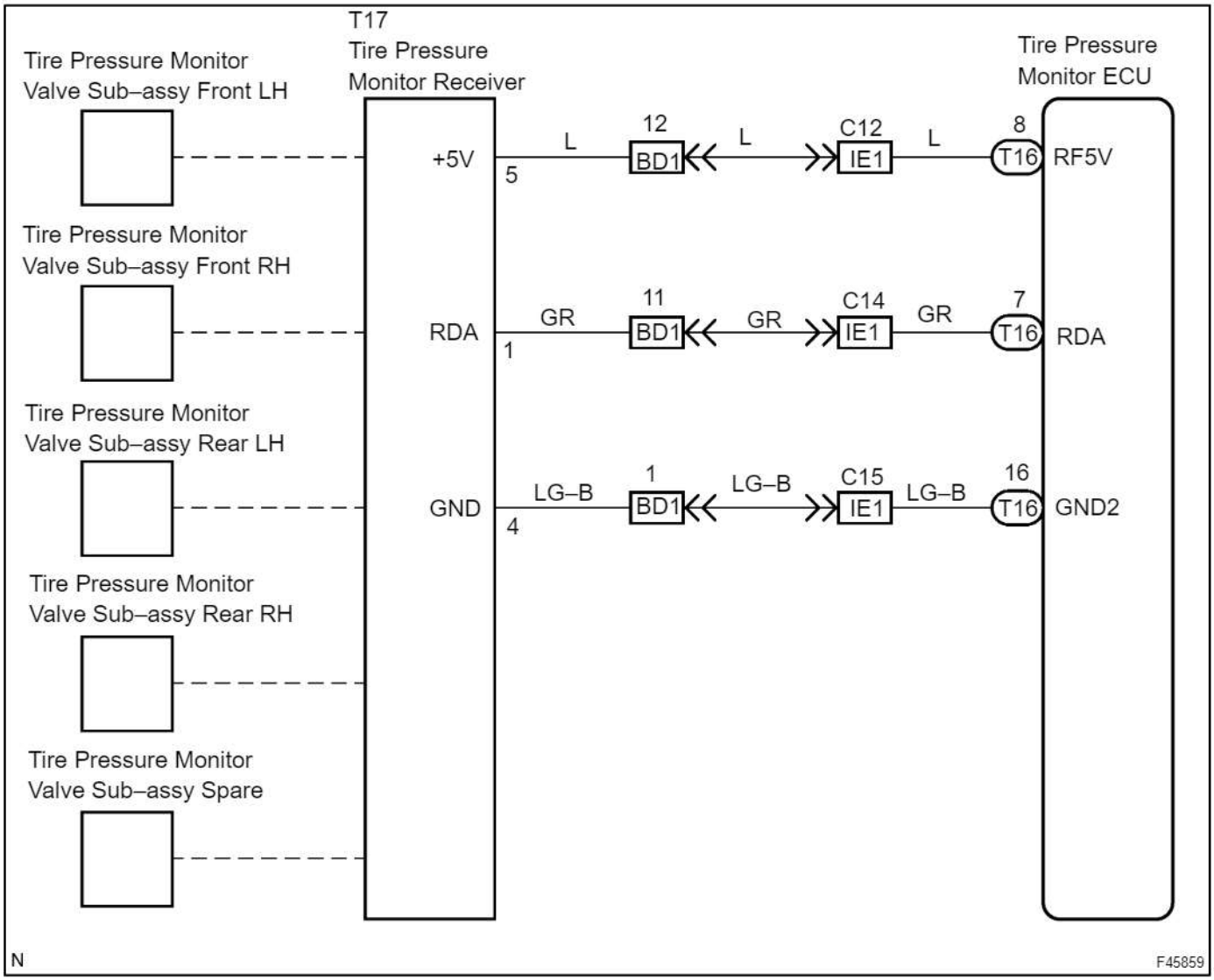
The tire pressure monitor valve sub–assy constantly sends radio waves to the tire pressure monitor receiver assy. If the battery for the tire pressure monitor valve sub–assy is depleted, or if the tire pressure monitor receiver assy is defective or comes off, the DTC will be output. DTCs C2121/21 to C2125/25 can only be deleted by the tester. DTCs C2181/81 to C2185/85 can be deleted when the transmitter sends a force transmission signal or the test mode ends. DTCs C2181/81 to C2185/85 are output only in the test mode.

DTC No.	DTC Detecting Condition	Trouble Area
C2121/21 C2122/22 C2123/23 C2124/24 C2125/25 C2181/81 C2182/82 C2183/83 C2184/84 C2185/85	A DTC is detected when the ECU receives no signals for 51 minutes or more, the vehicle speed is 8 km/h or higher, and the ECU receives no signals for 12 minutes or more.	□Tire pressure monitor receiver assy □Each tire pressure monitor valve sub–assy □Tire pressure monitor ECU

HINT:

It is necessary to perform the procedure to identify the tire pressure monitor valve sub–assy that is malfunctioning because it cannot be identified by the output DTC.

WIRING DIAGRAM



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INSPECTION PROCEDURE

HINT:
Set the tire pressure to the specified value.

1	CHECK TIRE PRESSURE WARNING LAMP

(a) Turn the ignition switch to the ON position.
(b) Check the tire pressure warning lamp.
Result:

A	Does not blink
B	Comes on and goes off repeatedly at 0.5 second intervals

B → **Go to step 4**

A

2	CLEAR DTC

3	CHECK DTC

(a) Check for DTC.
OK: DTC is not output.

NG → **Go to step 4**

OK

CHECK PROBLEM SYMPTOMS TABLE

4	CHECK DTC

(a) Check if DTCs C2121/21, C2122/22, C2123/23, C2124/24 and C2125/25 are all output.

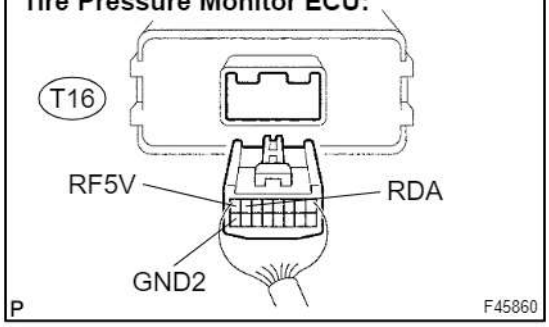
NO → **Go to step 7**

YES

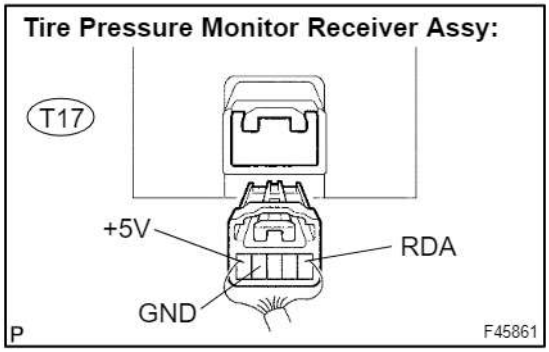
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5	CHECK HARNESS AND CONNECTOR(TIRE PRESSURE MONITOR RECEIVER ASSY – TIRE PRESSURE MONITOR ECU) (SEE PAGE 01–35)

Tire Pressure Monitor ECU:



Tire Pressure Monitor Receiver Assy:



(a) Disconnect the tire pressure monitor receiver assy T17 connector and tire pressure monitor ECU T16 connector.

(b) Measure the resistance according to the value(s) in the table below.

Standard:

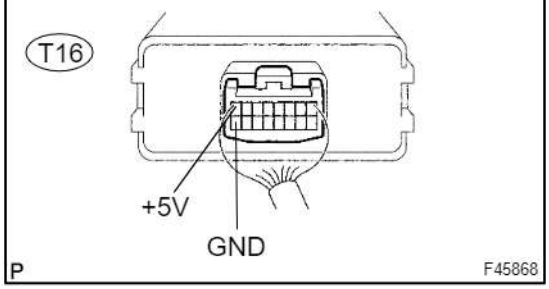
Tester Connection	Specified Condition
T16–7 (RDA) – T17–1 (RDA)	Below 1 Ω
T16–8 (RF5V) – T17–5 (+5V)	Below 1 Ω
T16–16 (GND2) – T17–4 (GND)	Below 1 Ω
T16–7 (RDA) – Body ground	10 kΩ or higher
T16–8 (RF5V) – Body ground	10 kΩ or higher
T16–16 (GND2) – Body ground	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

6	INSPECT TIRE PRESSURE MONITOR ECU

Tire Pressure Monitor ECU:



(a) Connect the tire pressure monitor ECU T16 connector.

(b) Measure the resistance according to the value(s) in the table below.

Standard:

Tester Connection	Specified Condition
T16–8 (RF5V) – T16–10 (GND2)	4.5 to 5.5 V

NG → **CHECK POWER SOURCE CIRCUIT(SEE PAGE 05–714)**

OK

REPLACE TIRE PRESSURE MONITOR RECEIVER ASSY

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7	SET TIRE PRESSURE TO NORMAL VALUE

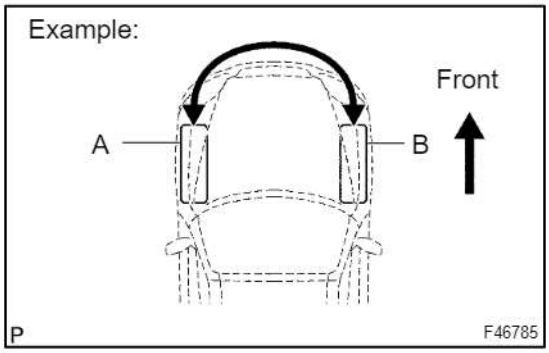
(a) Set the tire pressure of all wheels to the specified value.

Front	Rear	Spare
220 kPa (2.2 kgf/cm^2, 32 psi)	220 kPa (2.2 kgf/cm^2, 32 psi)	220 kPa (2.2 kgf/cm^2, 32 psi)

8	IDENTIFY TRANSMITTER CORRESPONDING TO DTC (SEE PAGE 05–720)

9	INTERCHANGE TIRES

HINT:
When "A" (left front) is identified at step 8.



(a) Interchange tire "A" for the identified tire pressure monitor valve sub–assy with tire "B" for a normal one.

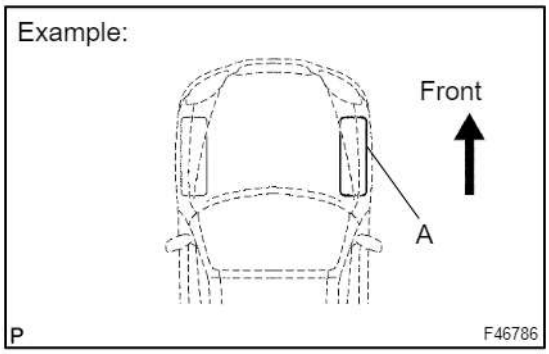
10	SET TIRE PRESSURE TO NORMAL VALUE

(a) Set the tire pressure of all wheels to the specified value.

Front	Rear	Spare
220 kPa (2.2 kgf/cm^2, 32 psi)	220 kPa (2.2 kgf/cm^2, 32 psi)	220 kPa (2.2 kgf/cm^2, 32 psi)

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11	FORCIBLY TRANSMIT TRANSMITTER ID



(a) Remove the valve core of the tire "A", rapidly reduce the tire pressure and forcibly transmit the transmitter ID of the tire pressure monitor valve sub–assy.

12	CHECK DTC AGAIN

(a) Check for DTC.
OK: DTC is not output

HINT:
- If a DTC is output, replace the identified tire pressure monitor valve sub–assy.
- Register the transmitter ID after replacing and then set the tire pressure to the specified value.

NG → **REPLACE TIRE PRESSURE MONITOR VALVE SUB–ASSY**

OK

REPLACE TIRE PRESSURE MONITOR RECEIVER ASSY

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DTC	C2141/41	TRANSMITTER ID1 ERROR

DTC	C2142/42	TRANSMITTER ID2 ERROR

DTC	C2143/43	TRANSMITTER ID3 ERROR

DTC	C2144/44	TRANSMITTER ID4 ERROR

DTC	C2145/45	TRANSMITTER ID5 ERROR

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
C2141/41 C2142/42 C2143/43 C2144/44 C2145/45	If an "ERROR" signal is received 3 times consecutively, the tire pressure monitor valve sub–assy will be judged as defective and this DTC will be output. This will happen under the situations where the inflation pressure is out of the specified range 0 to 637.5 kPa (0 to 6.48 kgf/cm^2, 0 psi to 92.2 psi), the temperature inside the tire is out of the specified range –40 to 215 C (–40 to 419 F), or an error occurs in the tire pressure monitor valve sub–assy, etc.	□Tire pressure monitor valve sub–assy □Tire pressure monitor ECU □Tire pressure monitor receiver assy

HINT:
It is necessary to perform the procedure to identify the tire pressure monitor valve sub–assy that is malfunctioning because it cannot be identified by the output DTC.

INSPECTION PROCEDURE

HINT:
Set the tire pressure to the specified value.

1	CHECK TIRE PRESSURE WARNING LAMP

(a) Check the tire pressure warning lamp.
Result:

A	Does not blink
B	Comes on and goes off repeatedly at 0.5 second intervals

B → Go to step 5

A

2	IDENTIFY TRANSMITTER CORRESPONDING TO DTC (SEE PAGE 05–720)

3	CLEAR DTC (SEE PAGE 05–681)

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4	CHECK DTC

(a) Check for DTC.
OK: DTC is not output

HINT:
- If the result is OK, replace the tire pressure monitor valve sub–assy specified in STEP 2.
- Register the transmitter ID after replacing and then set the tire pressure to the specified value.

NG → **Go to step 9**

OK

REPLACE TIRE PRESSURE MONITOR VALVE SUB–ASSY

5	IDENTIFY TRANSMITTER CORRESPONDING TO RECORDED DTC (SEE PAGE 05–720)

6	REPLACE TIRE PRESSURE MONITOR VALVE SUB–ASSY

(a) Replace the identified tire pressure monitor valve sub–assy with a new one.

7	REGISTRATION OF TRANSMITTER ID (SEE PAGE 05–670)

(a) Register the transmitter ID for all wheels.
(b) Set tire air pressure to the specified value.

8	CHECK DTC

(a) Check for DTC.
OK: DTC is not output.

NG → **Go to step 9**

OK

END

9	REPLACE TIRE PRESSURE MONITOR RECEIVER ASSY

HINT:
Perform the inspection using parts from a normal vehicle when possible.

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10	CHECK DTC

(a) Check DTC.
OK: DTC is not output.

NG → **REPLACE TIRE PRESSURE MONITOR ECU**

OK

END

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DTC	C2165/65	ABNORMAL TEMPERATURE INSIDE ID1 TIRE

DTC	C2166/66	ABNORMAL TEMPERATURE INSIDE ID2 TIRE

DTC	C2167/67	ABNORMAL TEMPERATURE INSIDE ID3 TIRE

DTC	C2168/68	ABNORMAL TEMPERATURE INSIDE ID4 TIRE

DTC	C2169/69	ABNORMAL TEMPERATURE INSIDE ID5 TIRE

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
C2165/65 C2166/66 C2167/67 C2168/68 C2169/69	The temperature inside the tire is out of the specified range –40 to 215 C (–40 to 419 F).	□Tire pressure monitor valve sub–assy □Tire pressure monitor ECU □Tire pressure monitor receiver assy

HINT:
It is necessary to perform the procedure to identify the tire pressure monitor valve sub–assy that is malfunctioning because it cannot be identified by the output DTC.

INSPECTION PROCEDURE

HINT:
Set the tire pressure to the specified value.

1	CHECK TIRE PRESSURE WARNING LAMP

(a) Check the tire pressure warning lamp.
Result:

A	Does not blink
B	Comes on and goes off repeatedly at 0.5 second intervals

B → **Go to step 6**

A

2	IDENTIFY TRANSMITTER CORRESPONDING TO DTC (SEE PAGE 05–720)

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3	CHECK TIRES

4	CLEAR DTC (SEE PAGE 05–681)

5	CHECK DTC

(a) Check for DTC.
OK: DTC is not output

HINT:
- If the result is OK, replace the tire pressure monitor valve sub–assy specified in STEP 2.
- Register the transmitter ID after replacing and then set the tire pressure to the specified value.

NG → Go to step 11

OK

REPLACE TIRE PRESSURE MONITOR VALVE SUB–ASSY

6	CHECK TIRES

7	IDENTIFY TRANSMITTER CORRESPONDING TO DTC (SEE PAGE 05–720)

8	REPLACE TIRE PRESSURE MONITOR VALVE SUB–ASSY

(a) Replace the identified tire pressure monitor valve sub–assy with a new one.

9	REGISTRATION OF TRANSMITTER ID (SEE PAGE 05–670)

(a) Register the transmitter ID for all wheels.
(b) Set the tire pressure to the specified value.

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10	CHECK DTC

(a) Check for DTC.
OK: DTC is not output.

NG → **Go to step 11**

OK

END

11	REPLACE TIRE PRESSURE MONITOR RECEIVER ASSY

HINT:
Perform the inspection using parts from a normal vehicle when possible.

12	CHECK DTC

(a) Check DTC.
OK: DTC is not output.

NG → **REPLACE TIRE PRESSURE MONITOR ECU**

OK

END

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DTC C2171/71 TRANSMITTER ID NOT REGISTERED

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
C2171/71	Transmitter ID code is not registrated. (When an ID code is unregistered for 51 minutes or more.)	□Tire pressure monitor ECU

INSPECTION PROCEDURE

HINT:
Set the tire pressure to the specified value.

1	CHECK TIRE PRESSURE WARNING LAMP

(a) Check the tire pressure warning lamp.
Result:

A	Does not blink
B	Comes on and goes off repeatedly at 0.5 second intervals

B → **REGISTRATION OF TRANSMITTER ID (SEE PAGE 05–670)**

A

2	CLEAR DTC (SEE PAGE 05–681)

3	CHECK DTC

(a) Check for DTC.
OK: DTC is not output.

NG → **REPLACE TIRE PRESSURE MONITOR ECU**

OK

END (Perform procedures to check if the transmitter ID is registered and confirm registration (see page 05–670).)

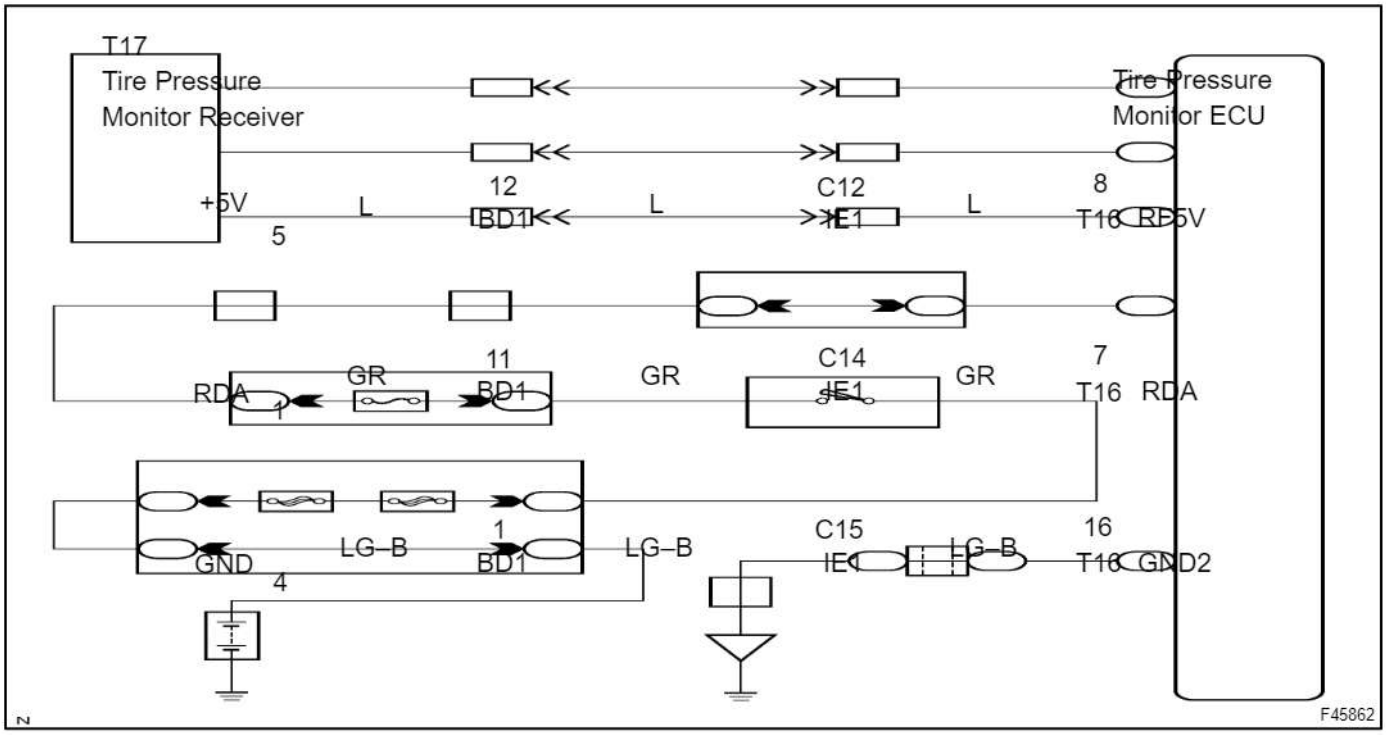
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DTC C2176/76 RECEIVER ERROR

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
C2176/76	DTC is stored when either of the following is detected: □EEPROM data is invalid to use. □Terminal RF5V is short to ground.	□Tire pressure monitor receiver assy □Tire pressure monitor ECU

WIRING DIAGRAM

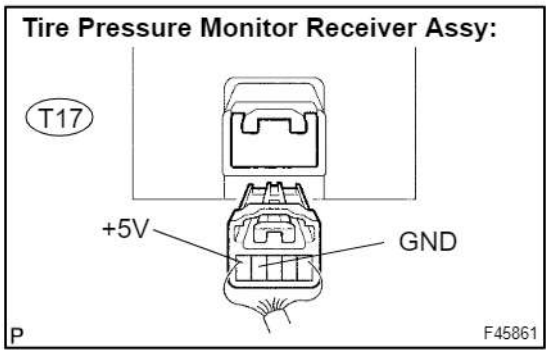


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INSPECTION PROCEDURE

HINT:
Set the tire pressure to the specified value.

1	INSPECT TIRE PRESSURE MONITOR RECEIVER ASSY



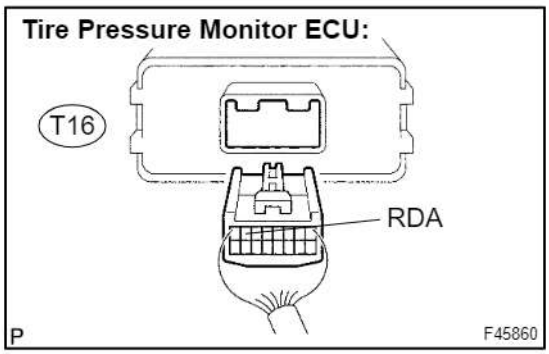
(a) Disconnect the tire pressure monitor receiver assy T17 connector.
(b) Measure the resistance according to the value(s) in the table below.
Standard:

Tester Connection	Specified Condition
T17–4 (GND) – T17–5 (+5V)	4.5 to 5.5 V

NG → **Go to step 3**

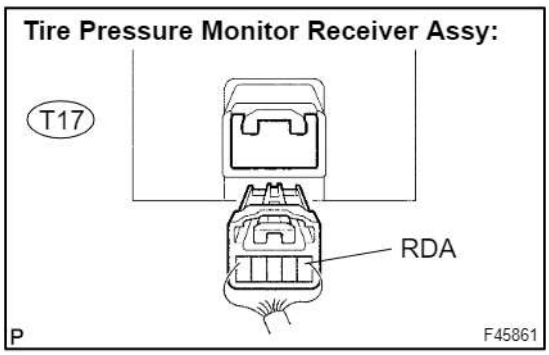
OK

2	CHECK HARNESS AND CONNECTOR(TIRE PRESSURE MONITOR RECEIVER ASSY – TIRE PRESSURE MONITOR ECU) (SEE PAGE 01–35)



(a) Disconnect the tire pressure monitor receiver assy T17 connector and tire pressure monitor ECU T16 connector.
(b) Measure the resistance according to the value(s) in the table below.
Standard:

Tester Connection	Specified Condition
T16–7 (RDA) – T17–1 (RDA)	Below 1 Ω



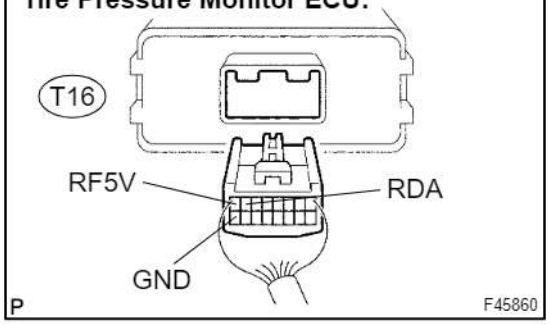
OK → **Go to step 5**

NG

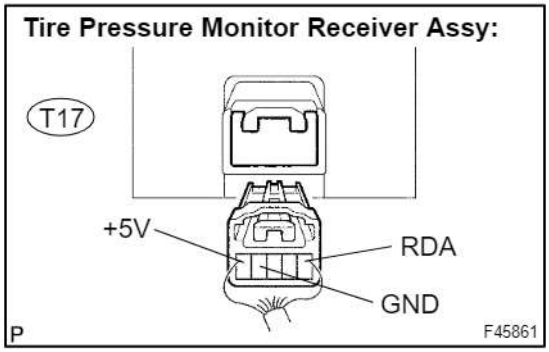
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3	CHECK HARNESS AND CONNECTOR(TIRE PRESSURE MONITER RECEIVER ASSY – TIRE PRESSURE MONITOR ECU)(SEE PAGE 01–35)

Tire Pressure Monitor ECU:



Tire Pressure Monitor Receiver Assy:



(a) Disconnect the tire pressure monitor receiver assy T17 connector and tire pressure monitor ECU T16 connector.

(b) Measure the resistance according to the value(s) in the table below.

Standard:

Tester Connection	Specified Condition
T16–7 (RDA) – T17–1 (RDA)	Below 1 Ω
T16–8 (RF5V) – T17–5 (+5V)	Below 1 Ω
T16–16 (GND2) – T17–4 (GND)	Below 1 Ω
T16–7 (RDA) – Body ground	10 kΩ or higher
T16–8 (RF5V) – Body ground	10 kΩ or higher
T16–16 (GND2) – Body ground	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4	CHECK POWER SOURCE CIRCUIT(SEE PAGE 05–714)

NG → **REPAIR OR REPLACE POWER SOURCE CIRCUIT**

OK

5	REPLACE TIRE PRESSURE MONITOR RECEIVER ASSY

HINT:
Perform the inspection using parts from a normal vehicle when possible.

6	CHECK DTC

(a) Check DTC.
OK: DTC is not output.

NG → **REPLACE TIRE PRESSURE MONITOR ECU**

OK

END

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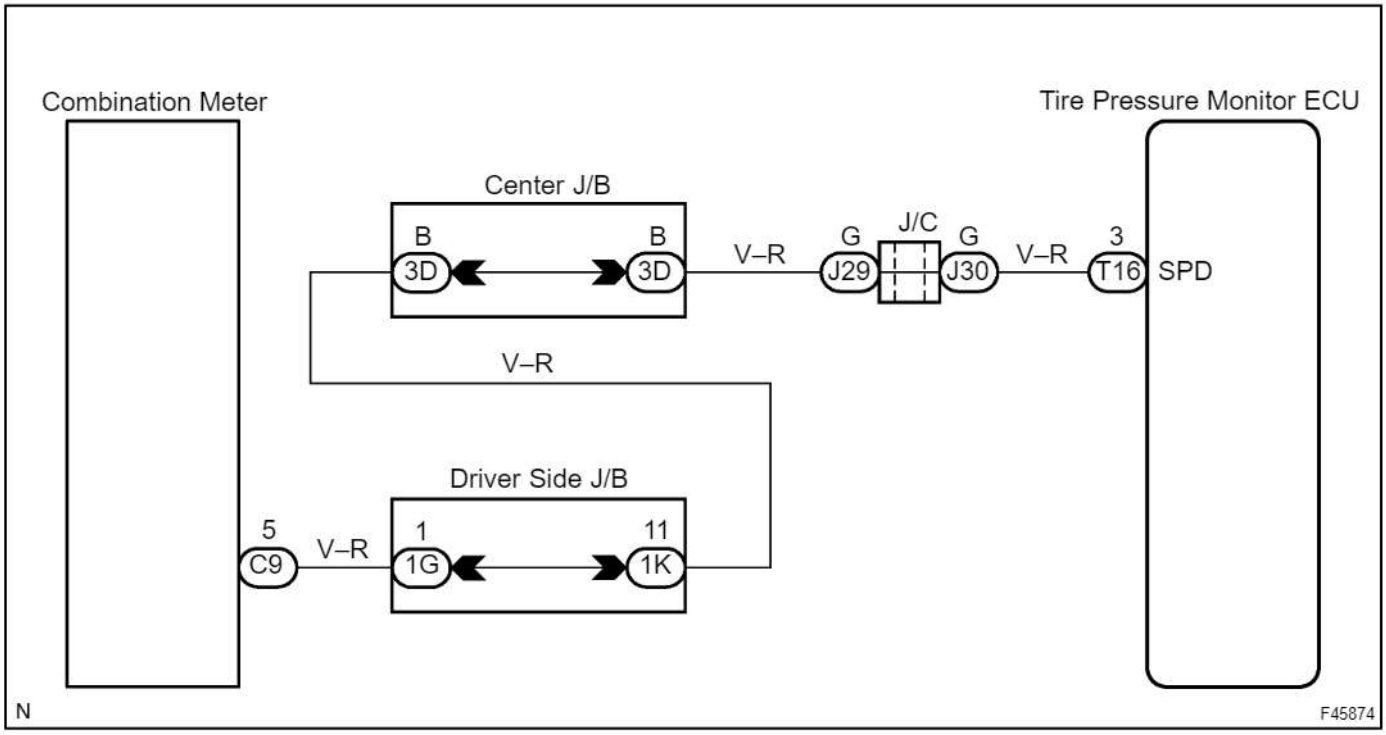
DTC	C2191/91	VEHICLE SPEED SIGNAL ERROR

CIRCUIT DESCRIPTION

The tire pressure monitor ECU receives a speed signal from the combination meter. This DTC is stored upon entering the test mode but erased when a vehicle speed signal of 12 mph (20 km/h) is detected for 3 seconds or more. The DTC is output only in the test mode.

DTC No.	DTC Detecting Condition	Trouble Area
C2191/91	Speed sensor circuit malfunction.	□Vehicle speed sensor □Combination meter assy □Tire pressure monitor ECU

WIRING DIAGRAM



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INSPECTION PROCEDURE

1	READ VALUE ON HAND–HELD TESTER

HINT:
When not using the hand–held tester, go to step 2.
(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch to the ON position, and push the hand–held tester main switch ON.
(c) Select the item below in the DATA LIST, and read its value displayed on the hand–held tester.

TIRE PRESSURE:

Item	Normal Condition
VEHICLE SPEED	Actual vehicle speed

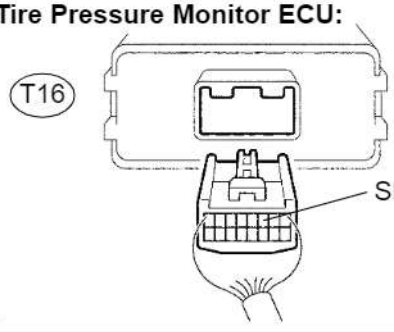
(d) Check that the values indicated on the tester and the combination meter are the same.
OK: Indicate actual speed

OK → REPLACE TIRE PRESSURE MONITOR ECU

NG

2	CHECK HARNESS AND CONNECTOR(TIRE PRESSURE MONITOR ECU – COMBINATION METER ASSY)(SEE PAGE 01–35)

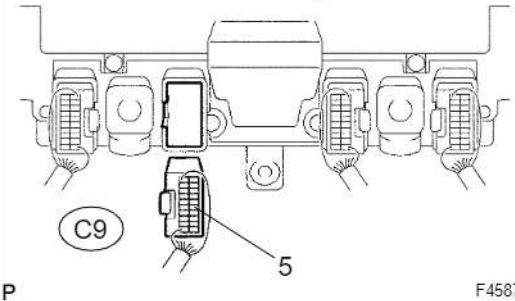
Tire Pressure Monitor ECU:



(a) Disconnect the combination meter assy C9 connector and tire pressure monitor ECU T16 connector.
(b) Measure the resistance according to the value(s) in the table below.
Standard:

Tester Connection	Specified Condition
T16–3 (SPD) – C9–5	Below 1 Ω
T16–3 (SPD) – Body ground	10 kΩ or higher

Combination Meter Assy:



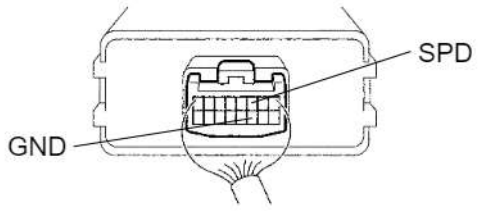
NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

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3	INSPECT TIRE PRESSURE MONITOR ECU

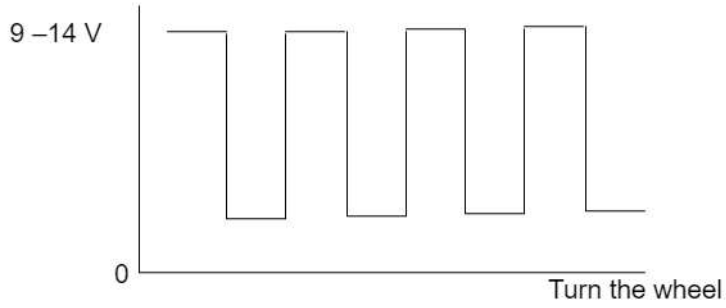
Tire Pressure Monitor ECU:



(a) Remove the tire pressure monitor ECU with connectors still connected.

(b) Check voltage.
  (1) Shift the shift lever to neutral.
  (2) Jack up one of the front wheels.
  (3) Turn the ignition switch to the ON position.
  (4) Measure voltage between terminals SPD and GND of the tire pressure monitor ECU when the front wheel is turned slowly.

OK:
Voltage is generated intermittently.



NG → **REPLACE COMBINATION METER ASSY**

OK

REPLACE TIRE PRESSURE MONITOR ECU

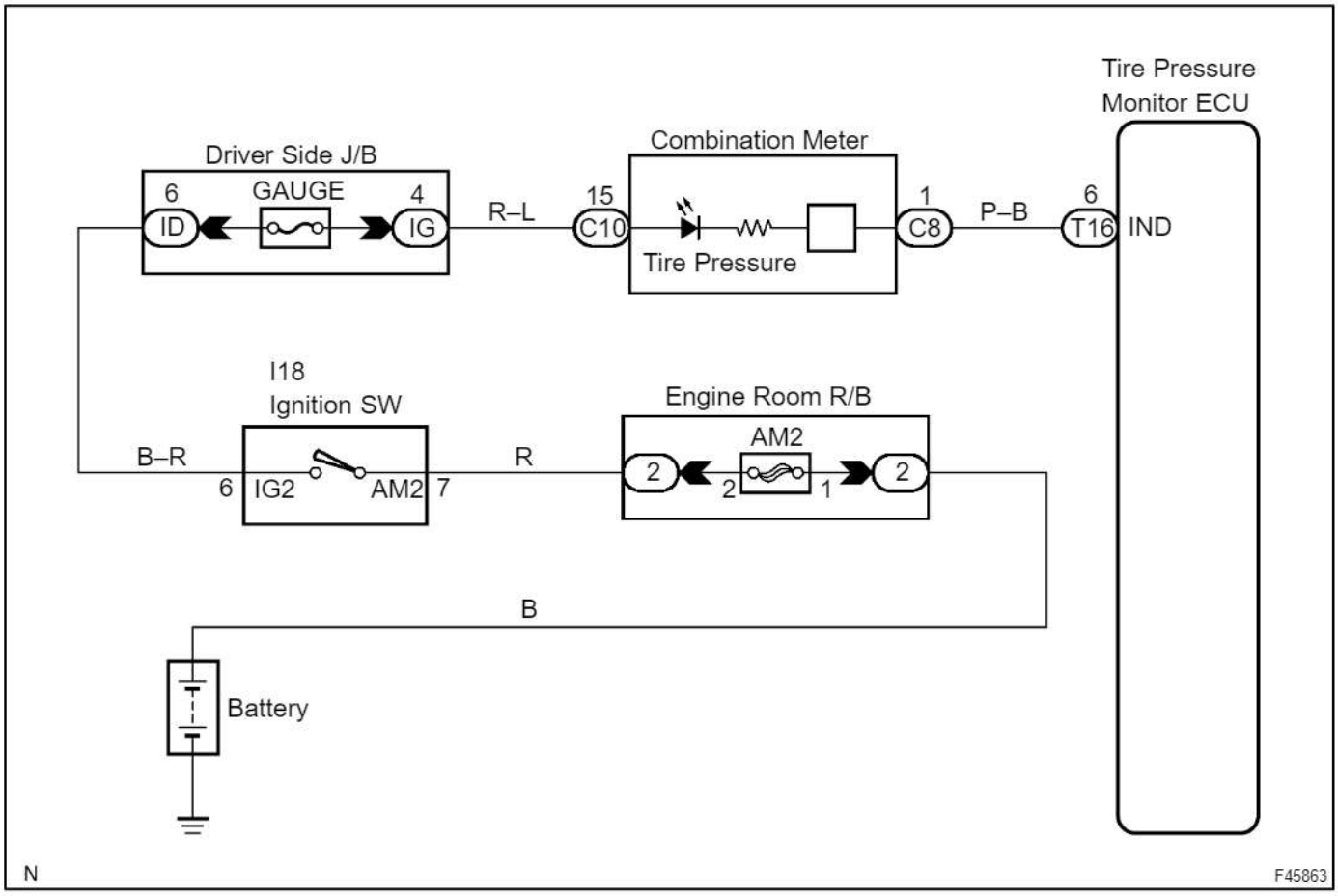
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TIRE PRESSURE WARNING LAMP CIRCUIT

CIRCUIT DESCRIPTION

If the ECU detects trouble, it lights the tire pressure warning lamp while at the same time prohibiting tire pressure monitor. At this time, the ECU records a DTC in memory.
Connect terminals Tc and CG of the DLC3 to make the tire pressure warning light blink and output the DTC.

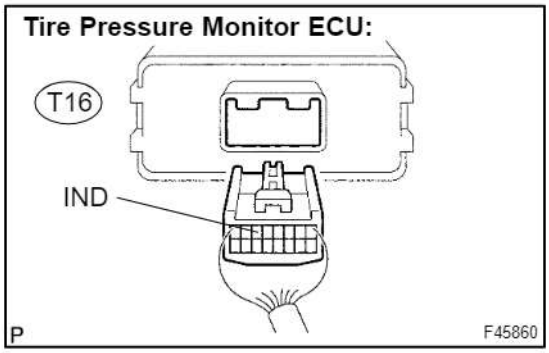
WIRING DIAGRAM



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INSPECTION PROCEDURE

1	INSPECT TIRE PRESSURE WARNING LAMP CIRCUIT



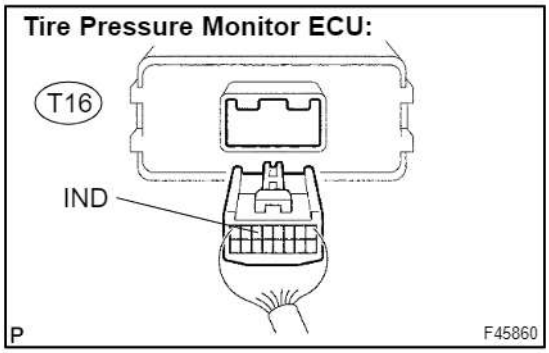
(a) Disconnect the tire pressure monitor ECU T16 connector.
(b) Connect terminal IND of the tire pressure monitor ECU and body ground.
(c) Turn the ignition switch to the ON position.
(d) Check that the tire pressure warning lamp goes off.
OK:
Tire pressure warning lamp goes off

NG → **Go to step 2**

OK

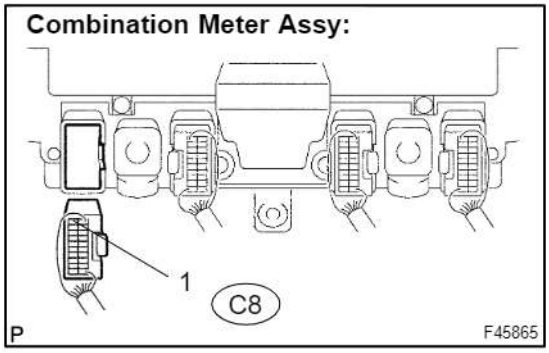
REPLACE TIRE PRESSURE MONITOR ECU

2	CHECK HARNESS AND CONNECTOR(TIRE PRESSURE MONITOR ECU – COMBINATION METER ASSY) (SEE PAGE 01–35)



(a) Disconnect the tire pressure monitor ECU T16 connector.
(b) Measure the resistance according to the value(s) in the table below.
Standard:

Tester Connection	Specified Condition
T16–6 (IND) – C8–1	Below 1 Ω
T16–6 (IND) – Body ground	10 kΩ or higher

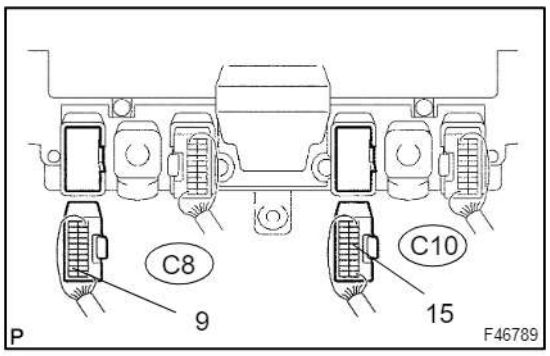


NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

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3	CHECK HARNESS AND CONNECTOR(COMBINATION METER ASSY POWER SOURCE CIRCUIT) (SEE PAGE 01–35)



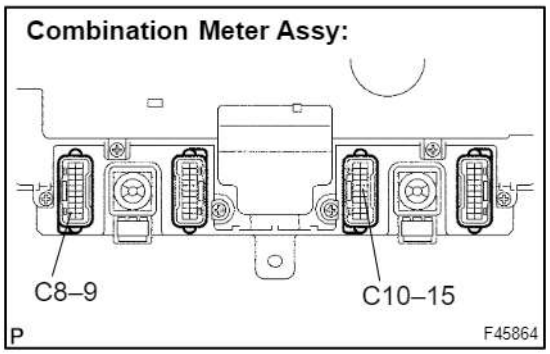
(a) Remove the combination meter assy.
(b) Disconnect the combination meter assy C10 and C8 connector.
(c) Measure the voltage according to the value(s) in the table below.

Tester Connection	Specified Condition
C10–15 – C8–9	10 to 14 V

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

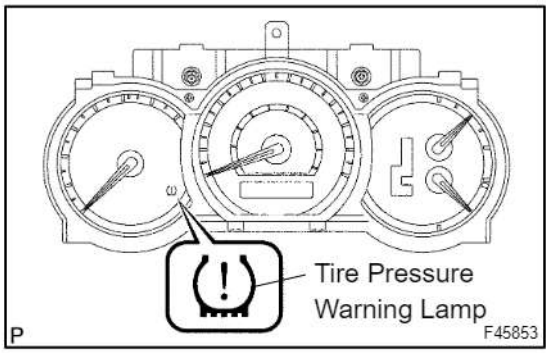
4	INSPECT METER ASSY, COMBINATION(TIRE PRESSURE WARNING LAMP)



(a) Remove the combination meter assy.
(b) Check warning lamp on the combination meter assy.
(1) Check that the tire pressure warning lamp comes on when battery voltage is applied to the terminals as shown in the table below.

Warning Lamp	Battery Positive	Battery Negative
Tire pressure	C10 – 15	C8 – 1

OK:
Tire pressure warning lamp comes on.



NG → REPLACE COMBINATION METER ASSY

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE (SEE PAGE 05–675)

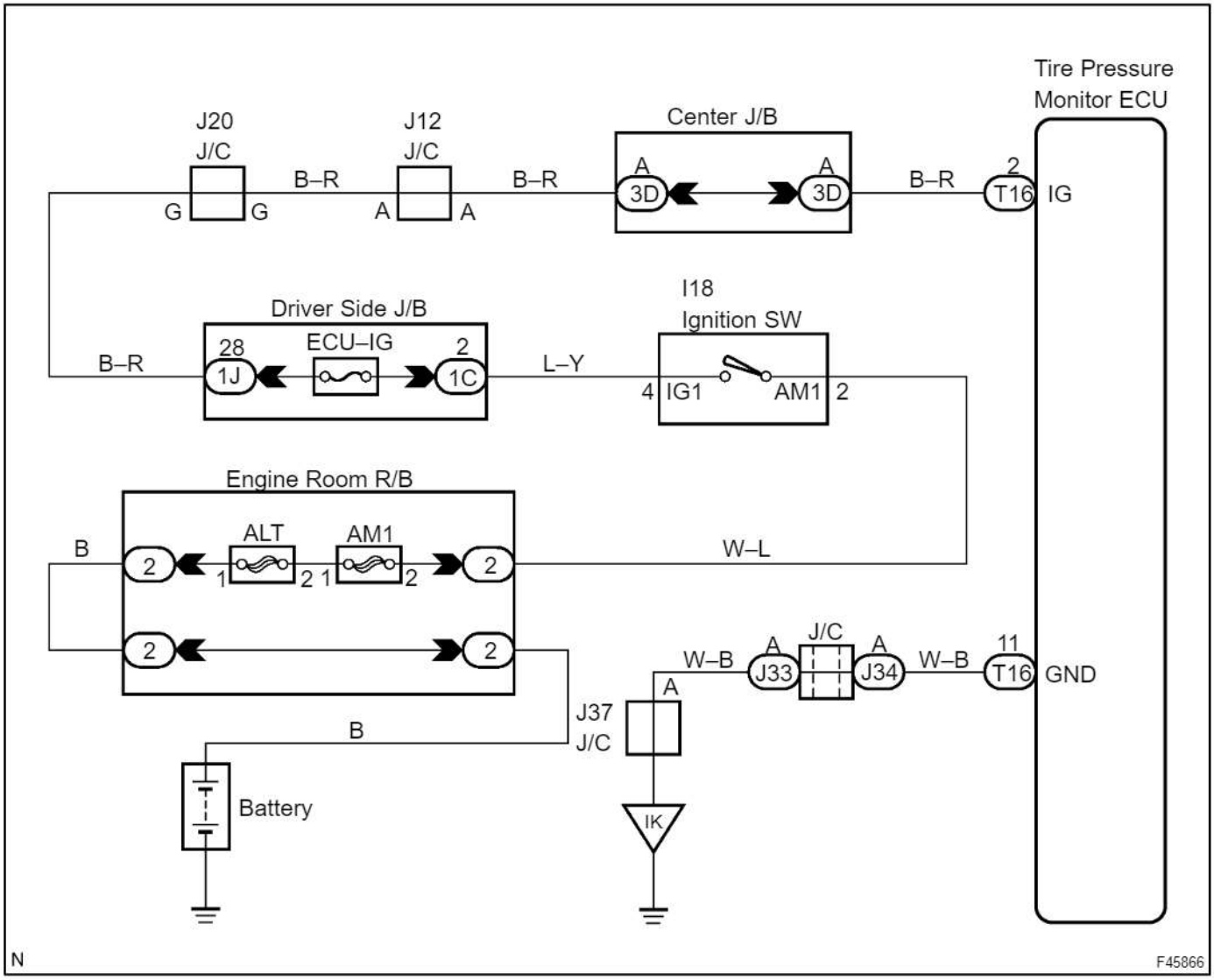
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ECU POWER SOURCE CIRCUIT

CIRCUIT DESCRIPTION

This is the power source for the tire pressure monitor ECU. It also supplies the power to the tire pressure monitor receiver via the ECU.

WIRING DIAGRAM



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INSPECTION PROCEDURE

1	INSPECT BATTERY

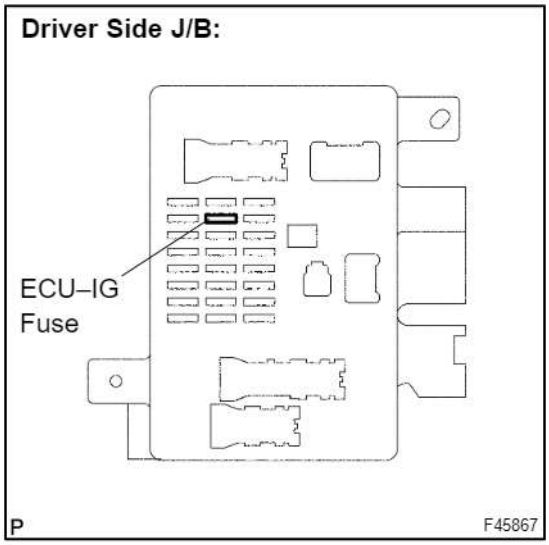
(a) Check the battery voltage.
Standard:
Voltage: 11 to 14 V

NG → REPLACE BATTERY

OK

2	INSPECT FUSE(ECU–IG)

Driver Side J/B:



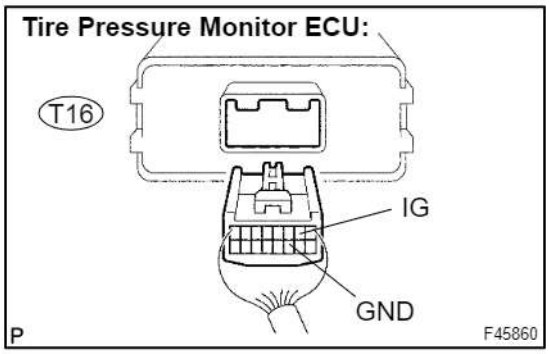
(a) Remove the ECU–IG fuse from driver side J/B.
(b) Check continuity of the ECU–IG fuse.
Standard:
Continuity

NG → CHECK FOR SHORT IN ALL HARNESS AND CONNECTOR CONNECTED TO FUSE AND REPLACE FUSE

OK

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3	INSPECT TIRE PRESSURE MONITOR ECU



(a) Remove the tire pressure monitor ECU with connectors being connected.
(b) Turn the ignition switch to the ON position.
(c) Measure the voltage according to the value(s) in the table below.

Standard:

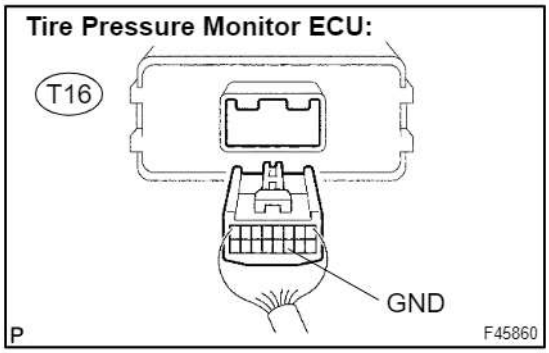
Tester Connection	Specified Condition
T16–2 (IG) – T16–11 (GND)	10 to 14 V

NG → **Go to step 4**

OK

REPLACE TIRE PRESSURE MONITOR ECU

4	CHECK HARNESS AND CONNECTOR(TIRE PRESSURE MONITOR ECU – BODY GROUND) (SEE PAGE 01–35)



(a) Disconnect the tire pressure monitor ECU T16 connector.
(b) Measure the resistance according to the value(s) in the table below.

Standard:

Tester Connection	Specified Condition
T16–11 (GND) – Body ground	Below 1 Ω

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE TIRE PRESSURE MONITOR ECU

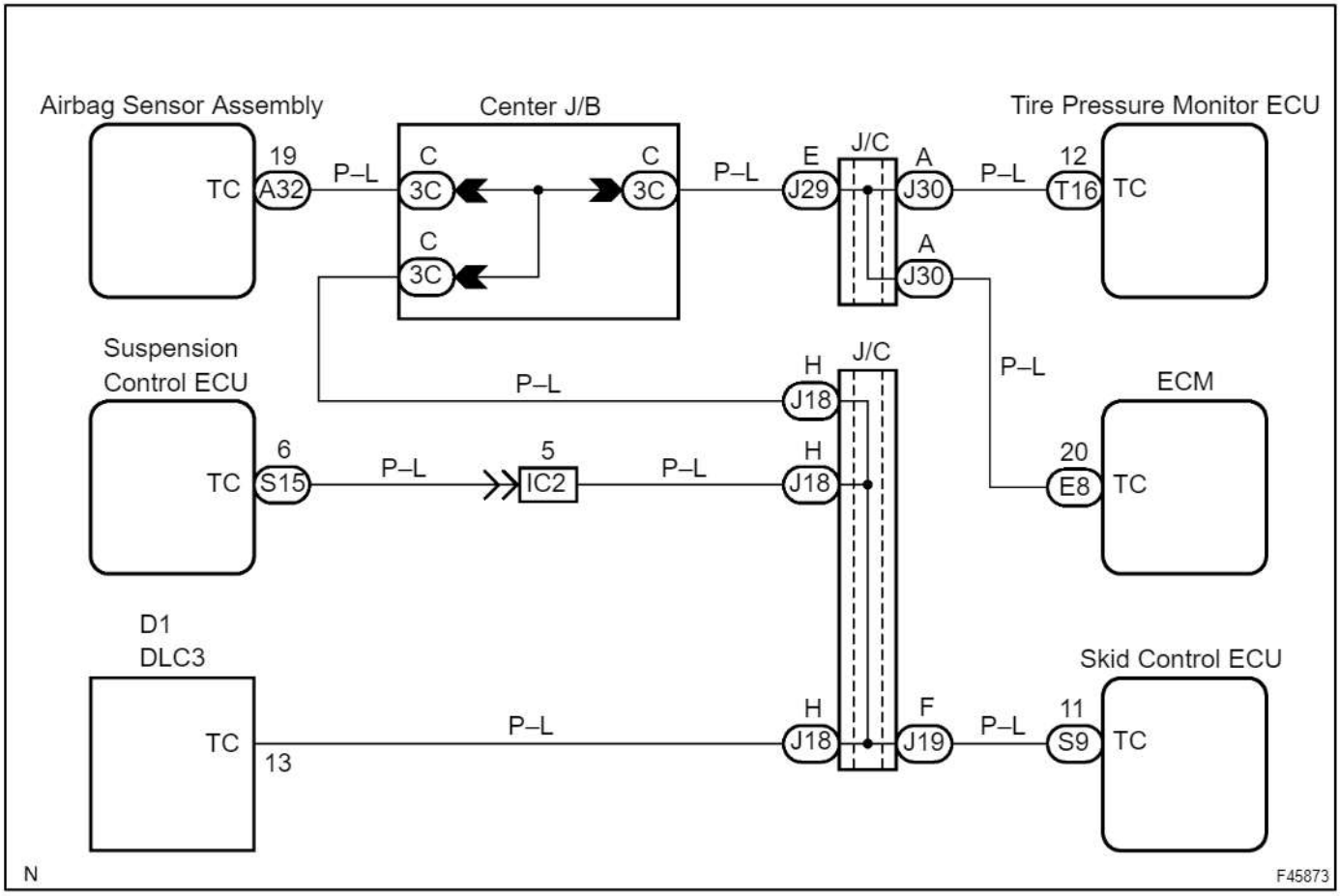
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TC TERMINAL CIRCUIT

CIRCUIT DESCRIPTION

DTC output mode is set by connecting terminals TC and CG of the DLC3.
The DTCs are displayed by blinking the tire pressure warning lamp.

WIRING DIAGRAM

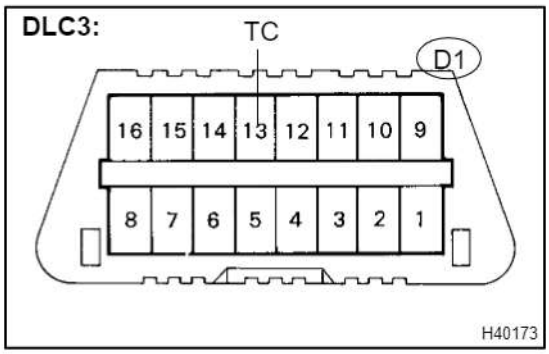


HINT:
When each warning lamp stays blinking, a ground short in the wiring of terminal TC of the DLC3 or an internal ground short in each ECU is suspected.

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INSPECTION PROCEDURE

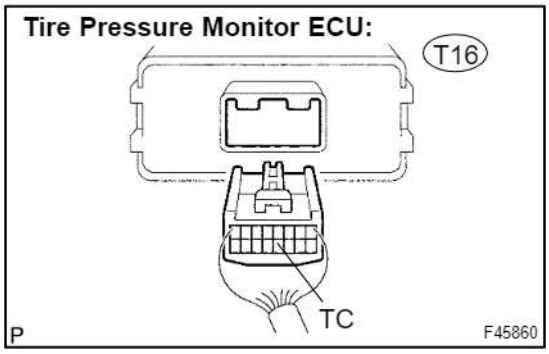
1	CHECK HARNESS AND CONNECTOR(DLC3 – TIRE PRESSURE MONITOR ECU) (SEE PAGE 01–35)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the tire pressure monitor ECU T16 connector.
(c) Measure the resistance according to the value(s) in the table below.

Standard:

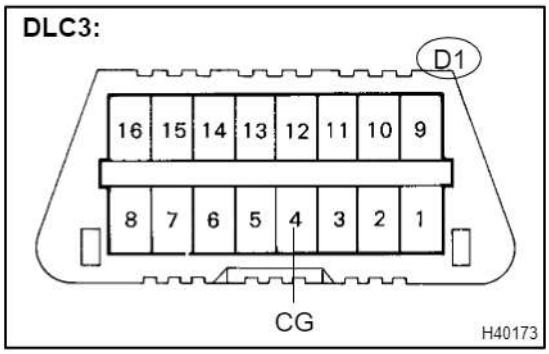
Tester connection	Condition	Specified condition
D1–13 (TC) – T16–12 (TC)	Always	Below 1 Ω



NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

2	CHECK HARNESS AND CONNECTOR(DLC3 – BODY GROUND) (SEE PAGE 01–35)



(a) Measure the resistance according to the value(s) in the table below.

Standard:

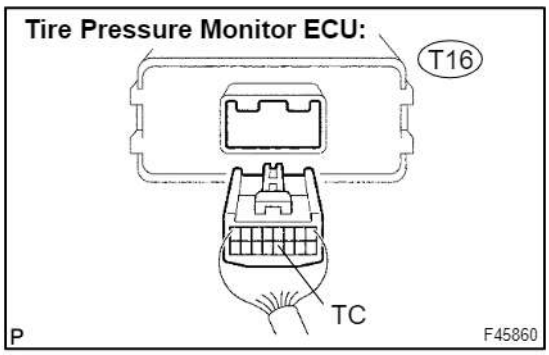
Tester connection	Condition	Specified condition
D1–4 (CG) – Body ground	Always	Below 1 Ω

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

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3	CHECK HARNESS AND CONNECTOR(TIRE PRESSURE MONITOR ECU – BODY GROUND) (SEE PAGE 01–35)



(a) Measure the resistance according to the value(s) in the table below.

Standard:

Tester connection	Condition	Specified condition
T16–12 (TC) – Body ground	Always	10 kΩ or Higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR AND EACH ECU**

OK

REPLACE TIRE PRESSURE MONITOR ECU

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IDENTIFY TRANSMITTER (ERROR IN PRESENT)

HINT:

- Refer to IDENTIFY TRANSMITTER (ERROR IN PRESENT) if the DTC is output currently. Refer to IDENTIFY TRANSMITTER (ERROR IN PAST) if a previously output DTC is not output now. Even when DTCs C2165/65 to C2169/69 output both present and past codes, refer to IDENTIFY TRANSMITTER (ERROR IN PAST).
- DTCs relevant to the transmitters are corresponding to each transmitter ID. It is impossible to identify which tire is malfunctioning according to each transmitter ID. Therefore the following procedure must be done to confirm the ID No. and tire location.

IDENTIFY PROCEDURE

1	**Set the pressure of all tires to the specified value.**

Front	Rear	Spare
220 kPa (2.2 kgf/cm^2, 32 psi)	220 kPa (2.2 kgf/cm^2, 32 psi)	220 kPa (2.2 kgf/cm^2, 32 psi)

2	**Rapidly reduce the pressure of front right wheel to 120 kPa (1.2 kgf/cm^2, 17 psi).**

3	**Using hand–held tester, check the tire pressure data of each wheel.**

4	**Is any of the tire pressure data 120 kPa (1.2 kgf/cm^2, 17 psi)?**

NO → **The detected DTC is for the front right wheel transmitter.**

YES

5	**Rapidly reduce the pressure of front left wheel to 120 kPa (1.2 kgf/cm^2, 17 psi).**

6	**Using hand–held tester, check the tire pressure data of each wheel.**

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7	Is there a wheel whose tire pressure newly becomes 120 kPa (1.2 kgf/cm^2, 17 psi)?

NO → The detected DTC is for the front left wheel transmitter.

YES

8	Rapidly reduce the pressure of rear right wheel to 120 kPa (1.2 kgf/cm^2, 17 psi).

9	Using hand–held tester, check the tire pressure data of each wheel.

10	Is there a wheel whose tire pressure newly becomes 120 kPa (1.2 kgf/cm^2, 17 psi)?

NO → The detected DTC is for the rear right wheel transmitter.

YES

11	Rapidly reduce the pressure of rear left wheel to 120 kPa (1.2 kgf/cm^2, 17 psi).

12	Using hand–held tester, check the tire pressure data of each wheel.

13	Is there a wheel whose tire pressure newly becomes 120 kPa (1.2 kgf/cm^2, 17 psi)?

NO → The detected DTC is for the rear left wheel transmitter.

YES

The detected DTC is for the spare tire transmitter.

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IDENTIFY TRANSMITTER (ERROR IN PAST)

HINT:

- Refer to IDENTIFY TRANSMITTER (ERROR IN PRESENT) if the DTC is output currently. Refer to IDENTIFY TRANSMITTER (ERROR IN PAST) if a previously output DTC is not output now. Even when DTCs C2165/65 to C2169/69 output both present and past codes, refer to IDENTIFY TRANSMITTER (ERROR IN PAST).
- DTCs relevant to the transmitters are corresponding to each transmitter ID. It is impossible to identify which tire is malfunctioning according to each transmitter ID. Therefore the following procedure must be done to confirm the ID No. and tire location.
- The following is the procedure to identify which wheel's transmitter the ID1 is resulting from when assuming that either of the DTCs C2141/41 (Transmitter ID1 error) or C2165/65 (Abnormal temperature inside ID1 tire) is detected. Identify the corresponding transmitter using the same procedure when DTCs C2142/42 to C2145/45, C2166/66 to C2169/69 are detected.

IDENTIFY PROCEDURE

1	**Set the pressure of all tires to the specified value.**

Front	Rear	Spare
220 kPa (2.2 kgf/cm^2, 32 psi)	220 kPa (2.2 kgf/cm^2, 32 psi)	220 kPa (2.2 kgf/cm^2, 32 psi)

2	**Rapidly reduce the pressure of front right wheel to 120 kPa (1.2 kgf/cm^2, 17 psi).**

3	**Using hand–held tester, check the ID1 tire pressure data.**

4	**Is ID1 tire pressure 120 kPa (1.2 kgf/cm^2, 17 psi)?**

YES → **The ID1 is for the front right wheel transmitter.**

NO

5	**Rapidly reduce the pressure of front left wheel to 120 kPa (1.2 kgf/cm^2, 17 psi).**

6	**Using hand–held tester, check the ID1 tire pressure data.**

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7	Is ID1 tire pressure 120 kPa (1.2 kgf/cm^2, 17 psi)?

YES → The ID1 is for the front left wheel transmitter.

NO

8	Rapidly reduce the pressure of rear right wheel to 120 kPa (1.2 kgf/cm^2, 17 psi).

9	Using hand–held tester, check the ID1 tire pressure data.

10	Is ID1 tire pressure 120 kPa (1.2 kgf/cm^2, 17 psi)?

YES → The ID1 is for the rear right wheel transmitter.

NO

11	Rapidly reduce the pressure of rear left wheel to 120 kPa (1.2 kgf/cm^2, 17 psi).

12	Using hand–held tester, check the ID1 tire pressure data.

13	Is ID1 tire pressure 120 kPa (1.2 kgf/cm^2, 17 psi)?

YES → The ID1 is for the rear left wheel transmitter.

NO

The ID1 is for the spare tire transmitter.

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REAR AIR SUSPENSION SYSTEM

HOW TO PROCEED WITH TROUBLESHOOTING

056A4-02

1	VEHICLE BROUGHT TO WORKSHOP

2	CUSTOMER PROBLEM ANALYSIS (See page 05–726)

3	CHECK AND CLEAR DTCs (See page 05–727)

4	PROBLEM SYMPTOM CONFIRMATION

- SYMPTOM DOES NOT OCCUR (Go to step 5)
- SYMPTOM OCCURS (Go to step 6)

5	SYMPTOM SIMULATION (See page 01–25)

6	DTC CHECK (See page 05–727)

- NORMAL CODE (Go to step 7)
- MALFUNCTION CODE (Go to step 8)

7	PROBLEM SYMPTOMS TABLE (See page 05–741)

8	DTC CHART (See page 05–735)

9	CIRCUIT INSPECTION (See page 05–743 to 05–797)

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10	IDENTIFICATION OF PROBLEM

11	REPAIR

12	CONFIRMATION TEST

END

HINT:
Step 3, 6, 9, 12:
Diagnostic steps permitting the use of the hand–held tester.

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056A5–02

CUSTOMER PROBLEM ANALYSIS CHECK

Rear Air Suspension System Check Sheet

Inspector's Name :

Customer's Name		**VIN**	
		Production Date	
		Licence No.	/ /
Date Vehicle Brought In	/ /	**Odometer Reading**	

Date Problem First Occurred		
How often Problem Occurs		☐ Always ☐ Sometimes (times per day, month) ☐ Once only
Conditions at Time of Problem Occurrence	**Weather**	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Various/Others
	Outdoor Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold (Approx. °F (°C))
	Place	☐ Highway ☐ Suburbs ☐ Inner City ☐ Hill (Up, Down) ☐ Rough Road ☐ Others

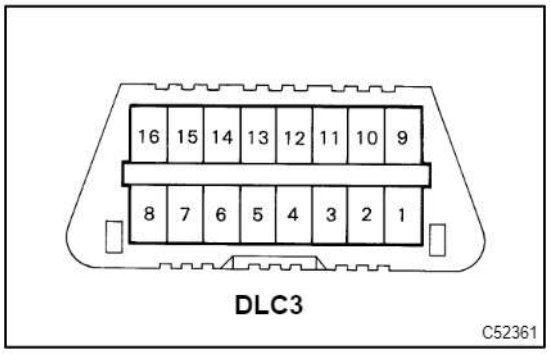
Symptoms	☐ Malfunction in vehicle height control	☐ Vehicle height cannot be changed by operating the height control switch ☐ High speed control does not operate ☐ Others ( )
	☐ Indicator lamp does not comes on	☐ Height control OFF indicator lamp does not come on ☐ Height control indicator lamp does not come on
	☐ Others	

DTC Check	**1st Time**	☐ Normal Code ☐ Malfunction Code (Code)
	2nd Time	☐ Normal Code ☐ Malfunction Code (Code)

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059UZ-02

PRE–CHECK



1. DIAGNOSIS SYSTEM

(a) Inspect the battery voltage.

Battery voltage: 11 to 14 V

If voltage is below 11 V, recharge the battery before proceeding.

(b) Check DLC3.

The vehicle's suspension control ECU uses ISO 9141–2 for communication. The terminal arrangement of DLC3 complies with SAE J1962 and matches the ISO 9141–2 format.

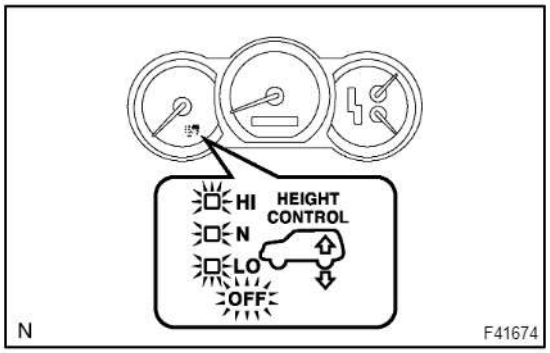
Verify conditions listed in table below:

Terminal No.	Connection / Voltage or Resistance	Condition
7	Bus + Line / Pulse generation	During transmission
4	Chassis Ground to Body Ground / 1 Ω or less	Always
16	Battery Positive to Body Ground / 9 to 14 V	Always

HINT:

If the hand–held tester display shows UNABLE TO CONNECT TO VEHICLE when the cable of the hand–held tester is connected to DLC3, the ignition switch is turned to ON and the tester is operated, there is a problem on the vehicle side or tester side.

- If communication is normal when the tester is connected to another vehicle, inspect DLC3 on the original vehicle.
- If communication is still not possible when the tool is connected to another vehicle, the problem is probably in the tester itself, so consult the Service Department listed in the tester's instruction manual.



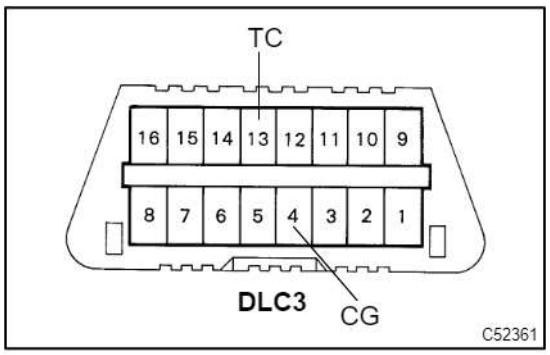
(c) Check the indicator lamp.

(1) Turn the ignition switch ON.

(2) Check that the height control OFF indicator lamp and the height control indicator lamp come on for 2 sec.

If the indicator check result is not normal, proceed to troubleshooting for the height control indicator lamp circuit (See page 05–788) and the height control OFF indicator lamp circuit (See page 05–791).

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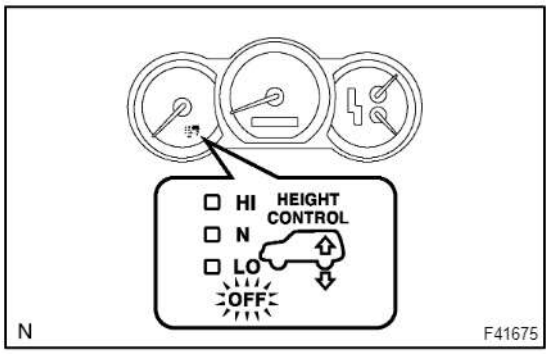


2. DTC CHECK (USING SST CHECK WIRE)

(a) Checking DTCs using a SST check wire.
SST 09843–18040

(1) Using the SST, connect terminals TC and CG of DLC3.

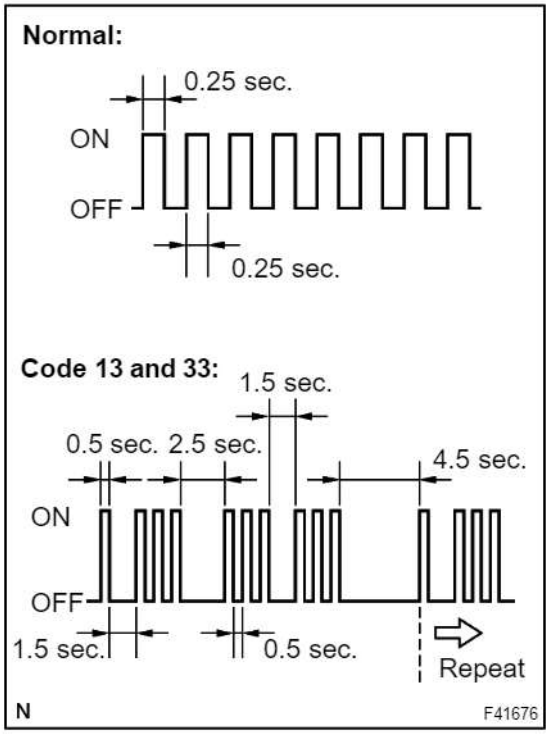
(2) Turn the ignition switch ON.



(3) Read and record any DTCs from the height control OFF indicator lamp on the combination meter. Refer to the chart on the left for examples of a normal code and codes 13 and 33.

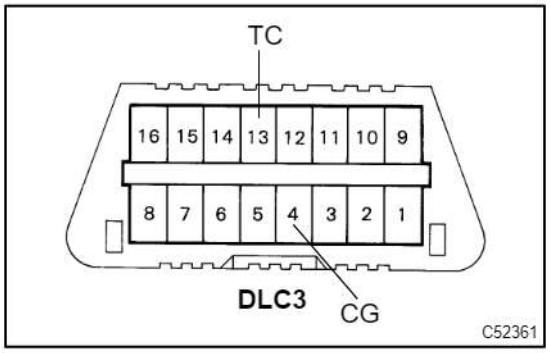
HINT:

- If the height control OFF indicator lamp does not blink any DTC codes or the normal code, inspect the height control OFF indicator lamp circuit (See page 05–791) and the TC terminal circuit (See page 05–795).
- If 2 or more malfunctions are indicated at the same time, the lowest numbered DTC is displayed first.



(4) Refer to the Diagnostic Trouble Code Chart (See page 05–735) for DTC information.

(5) After completing the check, remove SST check wire from DLC3.
SST 09843–18040

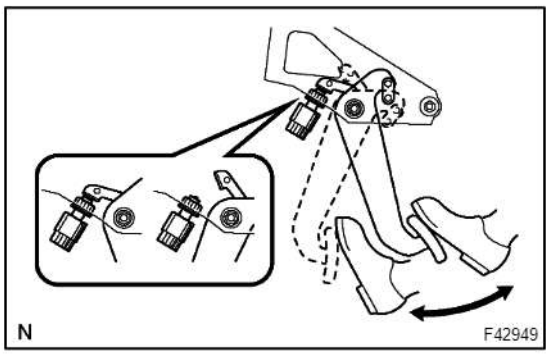


(b) Clearing the DTCs using the SST check wire.
SST 09843–18040

(1) Using SST, connect terminals TC and CG of DLC3.

(2) Turn the ignition switch ON.

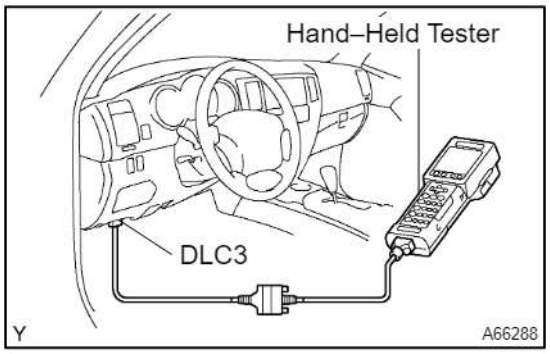
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(3) Clear DTC stored in ECU by depressing the brake pedal 8 times or more within 5 sec.
(4) Check that the height control OFF indicator lamp shows the normal code.
(5) Remove SST check wire from DLC3.

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HINT:
Disconnect the battery cable during the operation will not erase DTC in ECU.



3. DTC CHECK (USING HAND–HELD TESTER)

(a) Checking DTCs using the Hand–held tester.
(1) Connect the hand–held tester to DLC3.
(2) Turn the ignition switch ON.
(3) Read DTCs by following the prompts on the tester screen.

HINT:
Refer to the hand–held tester operator's manual for further details.

(b) Clearing the DTCs using the Hand–held tester.
(1) Connect the hand–held tester to DLC3
(2) Turn the ignition switch ON.
(3) Erease the DTCs following the prompts on the tester screen.

HINT:
Refer to the hand–held tester operator's manual for further details.

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4. DATA LIST

HINT:

By accessing the DATA LIST displayed by the hand–held tester, you can read the value of the switches and sensors and so on without removing any parts. Reading the DATA LIST is the first step of troubleshooting and is one method to shorten labor time.

(a) Connect the hand–held tester to DLC3.

(b) Turn the ignition switch ON.

(c) Following the display on the tester, read the "DATA LIST".

Item	Measurement Item / Range (Display)	Normal Condition	Diagnostic Note
VEHICLE SPD	Vehicle speed reading / min.: 0 km/h (0 mph), max.: 255 km/h (158 mph)	Vehicle speed: 0 km/h (0 mph)	–
IG VOLTAGE	ECU power supply voltage / min.: 0 V, max.: 25.5 V	Actual ECU power supply voltage: 10 to 14 V	–
ENGINE SPD	Cam position sensor reading / min.: 0 rpm, max.: 25,500 rpm	Actual engine speed	Speed indicated on the combination meter
HEIGHT SW DOWN	Height control switch (DOWN) / ON or OFF	ON: Height control switch while pressing "DOWN" button OFF: –	–
HEIGHT SW UP	Height control switch (UP) / ON or OFF	ON: Height control switch while pressing "UP" button OFF: –	–
HEIGHT SW HOLD	Height control OFF switch / ON or OFF	ON: Height control OFF switch pressing OFF: –	–
STOP LIGHT SW	Stop light switch / ON or OFF	ON: Brake pedal depressed OFF: Brake pedal released	–
DOOR SW	Door switch / ON or OFF	ON: Open each door OFF: Close all doors	–
DAMPER SW1	Damping force switch 1 / ON or OFF	The same as height control switch position	Operate the height control switch
TS	TS terminal / ON or OFF	ON: During test mode OFF: Normal mode	–
TC	TC terminal / ON or OFF	ON: DTC recorded OFF: No DTC recorded	–
SOL SLRL	Height control valve solenoid (SLRL) / ON or OFF	ON or OFF	–
SOL SLRG	Height control valve solenoid (SLRG) / ON or OFF	ON or OFF	–
LOW PRS TNK SOL	Tank solenoid valve (SLLO) / ON or OFF	ON or OFF	–
MOTOR RELAY	AIR SUS relay / ON or OFF	ON: Compressor operated OFF: Compressor not operated	–
RR HEIGHT	Right rear height control sensor reading / min.: –3276.7 mm (–129.004 in.), max.: 3276 mm (129.008 in.)	Min.: –20 mm (–0.79 in.) Max.: 40 mm (1.57 in.)	–
RL HEIGHT	Left rear height control sensor reading / min.: –32776.7 mm (–129.004 in.), max.: 3276 mm (129.008 in.)	Min.: –20 mm (–0.79 in.) Max.: 40 mm (1.57 in.)	–
#CODES	Number of DTC recorded / min.: 0, max.: 255	Min.: 0, Max.: XX	–

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5. ACTIVE TEST LIST

HINT:

Perform the ACTIVE TEST using the hand–held tester to operate the sensors, relays and solenoids without removing any parts. Performing the ACTIVE TEST is the first step of troubleshooting is one of the methods to shorten labor time. It is possible to display the DATA LIST during the ACTIVE TEST.

(a) Connect the hand–held tester to DLC3.

(b) Turn the ignition switch ON.

(c) Following the display on tester, perform the "ACTIVE TEST".

Item	Vehicle Condition / Test Details	Diagnostic Note
RR HEIGHT	Turn height control switch / UP or DOWN	–
MOTOR RELAY	Turn AIR SUS relay / ON or OFF	Operation of motor can be heard
LEVEL SOL REAR	Turn leveling solenoid valve / ON or OFF	Operation of solenoid (clicking sound) can be heard
GATE SOL REAR	Turn gate solenoid valve / ON or OFF	Operation of solenoid (clicking sound) can be heard
LOW PRS TNK SOL	Turn tank solenoid valve / ON or OFF	Operation of solenoid (clicking sound) can be heard

6. INPUT SIGNAL CHECK (TEST MODE CHECK)

HINT:

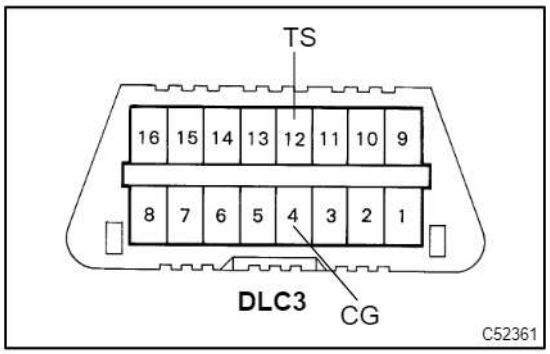
This function checks that whether signals from the stop lamp switch assy and the door courtesy switch, etc. are being input normally to the ECU.

(a) Procedure for Input Signal Check Mode (Test Mode) using SST check wire.

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(1) Make sure the ignition switch is OFF.

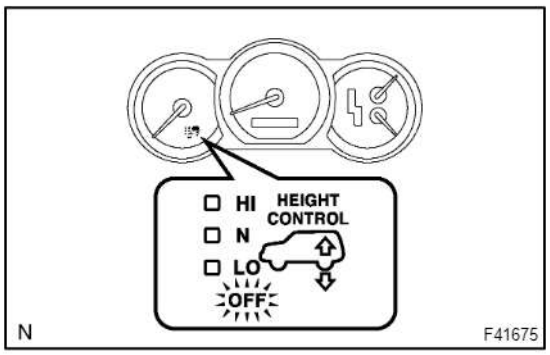
(2) Set each of the check items in the table below to the condition in Operation (A).



(3) Using SST, connect the terminals TS and CG of DLC3.

(4) Turn the ignition switch ON.

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(5) Check that the height control OFF indicator lamp is blinking.

HINT:

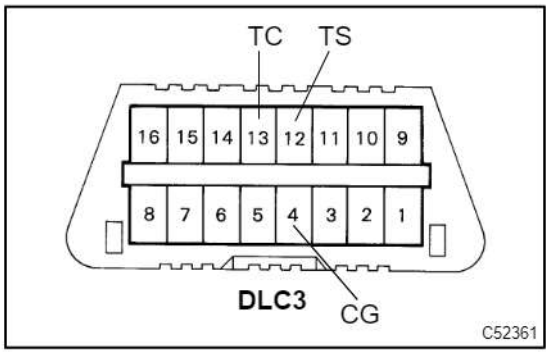
- At this time, the height control OFF indicator lamp should come on for 2 sec. After that, this lamp blinks at 0.25 sec. intervals.
- If the height control OFF indicator light does not blink, inspect the height control OFF indicator lamp circuit (See page 05–791) and the TS terminal circuit (See page 05–797).

(6) Set each of the check items to the condition in Operation (B).

HINT:

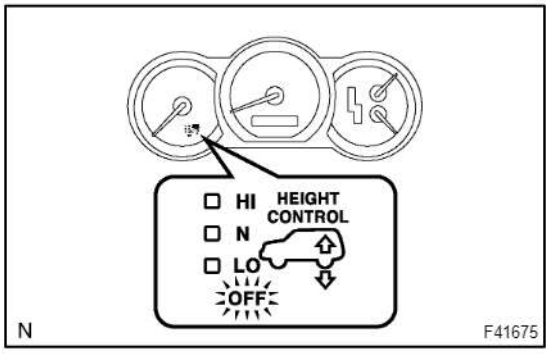
When checking each item, the height control OFF indicator lamp should come on for 1 sec.

Check Item	Operation (A)	Operation (B)
Stop lamp switch signal	OFF (Brake pedal not depressed)	ON (Brake pedal depressed)
Door courtesy switch signal	ON (Each door opened)	OFF (All doors closed)
Height control switch signal	–	Press the height control switch "UP" first and then press "DOWN"
Height control OFF switch signal	OFF (Height control OFF switch not pushed in)	ON to OFF (Height control OFF switch pushed in and released)
Right front speed sensor signal	Vehicle speed below 20 km/h (12 mph)	Vehicle speed 20 km/h (12 mph) or higher
Left front speed sensor signal	Vehicle speed below 20 km/h (12 mph)	Vehicle speed 20 km/h (12 mph) or higher
Crankshaft position sensor signal	Engine speed below 2,000 rpm	Engine speed 2,000 rpm or higher



(7) Using SST, connect the 3rd terminal of the SST check wire to terminal TC in DLC3.

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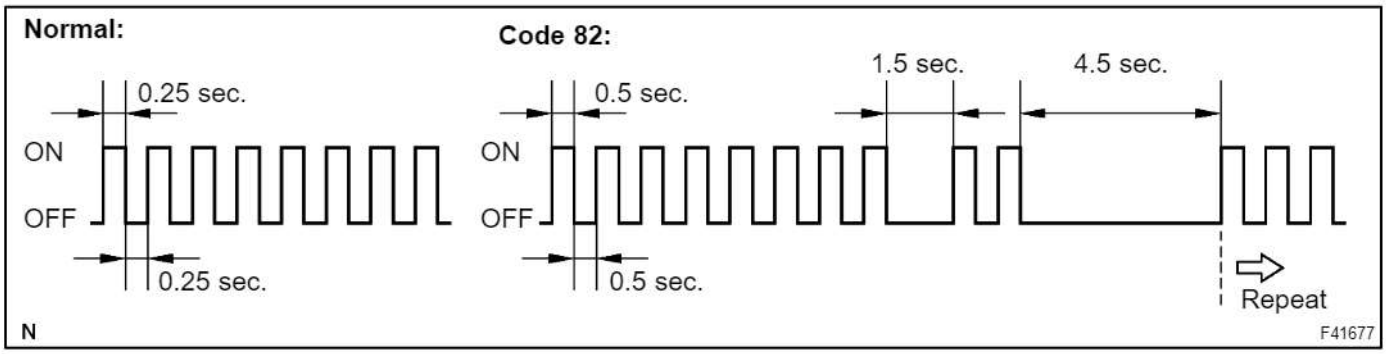
(8) Read the number of blinks of the height control OFF indicator lamp.

HINT:

- As an example, the blinking patterns of normal code and code 82 are shown in the illustration.
- If 2 or more malfunctions are indicated at the same time, the lowest numbered code is displayed first.
- When DTC is not output, check the TC terminal circuit on page 05–795.

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(9) Check the malfunction using the code table on the this page.



(b) Ending the Input Signal Check Mode (Test Mode) using SST check wire.

SST 09843–18040

(1) With the ignition switch to OFF, disconnect the SST check wire from the terminals of DLC3 and then turn the ignition switch ON.

(c) Procedure for Sensor Test Mode (Test Mode) using the hand–held tester.

(1) Make sure the ignition switch OFF.
(2) Set each of the check items to the condition in Operation (A) on the previous page.
(3) Connect the hand–held tester to DLC3.
(4) Turn the ignition switch ON.
(5) Select the SIGNAL CHECK mode on the hand–held tester.
(6) Set each of the check items to the condition in Operation (B) on the previous page.

HINT:
In step (6), all signals can be checked together.

(7) Read the DTCs by following the prompts on the tester screen.

HINT:
Refer to the hand–held tester operator's manual for further details.

DTC from input signal check

If a malfunction code is displayed during the test mode DTC check, check the circuit listed for that code. For details of each code, refer to the "See page" under respective "DTC No." in the chart.

DTC No. (See Page)	Detection Item	Trouble Area
C1782/82 (05–777)	Stop light switch circuit malfunction	□Stop lamp switch assy □Stop light switch circuit □Suspension control ECU
C1783/83 (05–780)	Door courtesy switch circuit malfunction	□Door courtesy switch assy □w/ Motor back door assy □Door courtesy switch circuit □Body ECU □Back door ECU □Suspension control ECU

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C1786/86 (05–782)	Height control switch circuit malfunction	□Height control switch (Suspension control switch) □Height control switch circuit □Suspension control ECU
C1788/88 (05–785)	Height control OFF switch circuit malfunction	□Height control OFF switch (Suspension control switch) □Height control OFF switch circuit □Suspension control ECU
C1794/94 (05–772)	Right front speed sensor circuit malfunction	□Right front speed sensor □Right front speed sensor circuit □Skid control ECU assy □Suspension control ECU
C1795/95 (05–772)	Left front speed sensor circuit malfunction	□Left front speed sensor □Left front speed sensor circuit □Skid control ECU assy □Suspension control ECU
C1797/97 (05–775)	Crankshaft position sensor circuit malfunction	□Crankshaft position sensor □Crankshaft position sensor circuit □ECM □Suspension control ECU

7. FAIL–SAFE FUNCTION

(a) In the normal control operation, if there is short or open in the sensors etc., the suspension control ECU suspend the vehicle height control operation.

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DIAGNOSTIC TROUBLE CODE CHART

HINT:

- Using SST 09843–18040, connect terminal TC and CG of DLC3.
- If no abnormality is found when the parts are inspected, inspect the suspension control ECU.
- If a malfunction code is displayed during the DTC check, check the circuit listed for that code. For details of each code, refer to the "See page" under respective "DTC No." in the DTC chart.

DTC No. (See Page)	Detection Item	Trouble Area	OFF Indicator Lamp*1	Memory*2
C1713/13 (05–743)	Open or short circuit in right rear height control sensor circuit	□Height control sensor sub–assy rear RH □Right rear height control sensor circuit	*3	
C1714/14 (05–743)	Open or short circuit in left rear height control sensor circuit	□Height control sensor sub–assy rear LH □Left rear height control sensor circuit	*3	
C1733/33 (05–748)	Open or short circuit in gate solenoid valve circuit	□Gate solenoid valve □Gate solenoid valve circuit		
C1734/34 (05–748)	Open or short circuit in leveling solenoid valve circuit	□Leveling solenoid valve □Leveling solenoid valve circuit		
C1735/35 (05–748)	Open or short circuit in exhaust solenoid valve circuit	□Exhaust solenoid valve □Exhaust solenoid valve circuit		
C1741/41 (05–753)	Open or short circuit in AIR SUS relay circuit	□AIR SUS relay □AIR SUS relay circuit		
C1742/42 (05–757)	Lock, open or short circuit in height control compressor circuit	□Height control compressor assy □Height control compressor circuit		
C1744/44 (05–748)	Open or short circuit in tank solenoid valve circuit	□Tank solenoid valve □Tank solenoid valve circuit	X	
C1751/51*4 (05–762)	Continuous electric current to height control compressor circuit	□Height control compressor assy □Height control compressor circuit □Height control sensor link sub–assy rear □Height control sensor sub–assy rear □Relief valve □AIR SUS relay comes off □Air leakage from the air tube or each valve □Clogging in the air tube or each valve		
C1761/61 (05–765)	ECU malfunction	□Suspension control ECU		
C1774/74 (05–767)	Power voltage drop	□Battery □Power source circuit	X	
C1776/76 (05–772)	Speed sensor circuit malfunction	□Speed sensor □Speed sensor circuit □Skid control ECU assy	X	
C1779/79 (05–775)	Crankshaft position sensor circuit	□Crankshaft position sensor □Crankshaft position sensor circuit □ECM	X	

HINT:

- *1: For codes with a " " mark in the "OFF Indicator Light" column, the height control OFF indicator lamp blinks at 1 second intervals.
- *2: The codes with " " mark in the "Memory" column are stored in memory even when the ignition switch is OFF, but the codes with "X" mark are not.
- *3: Height control OFF indicator lamp blinks when the vehicle speed is at 3 km/h (1.9 mph) or higher.

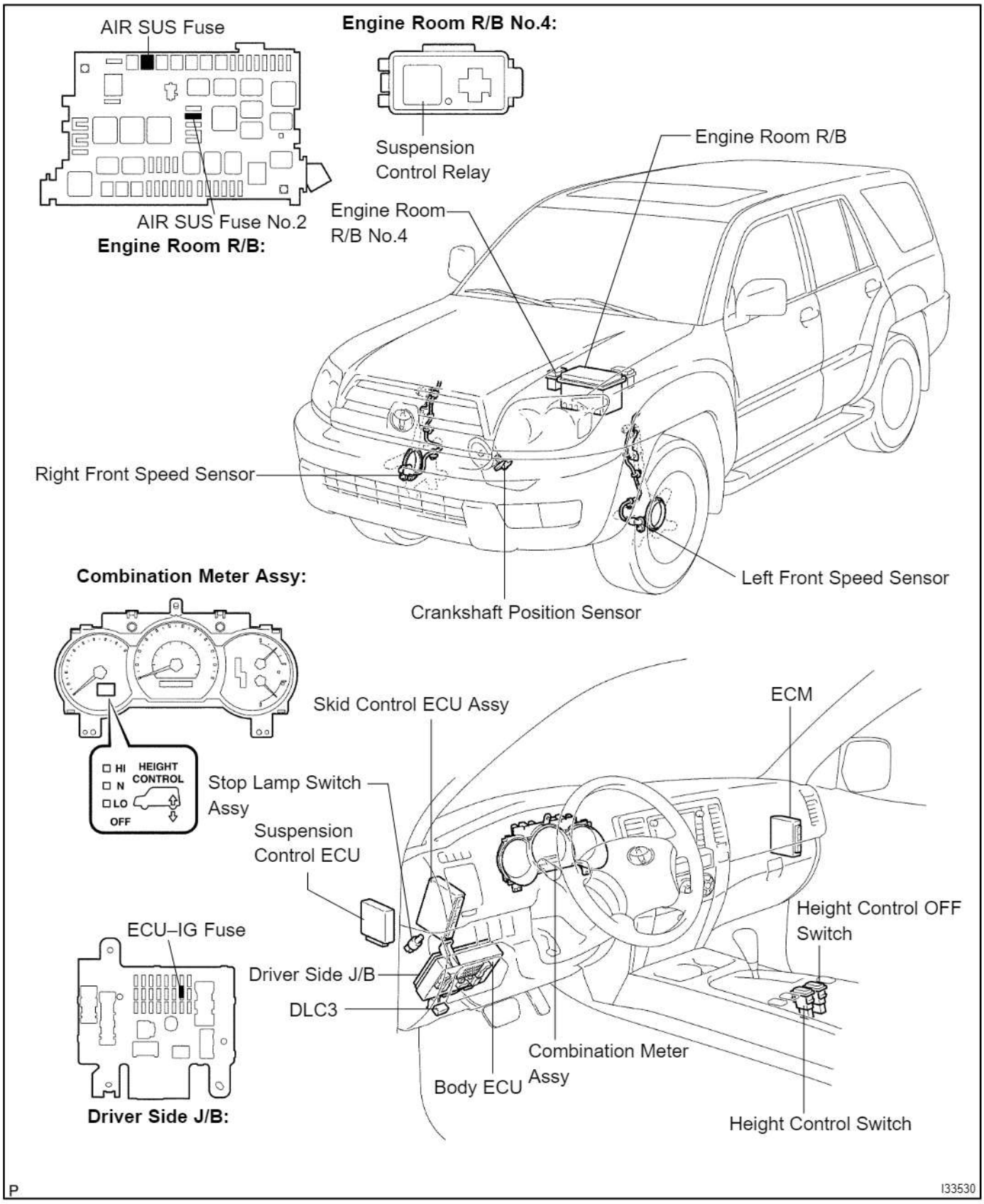
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□ *4: Since the relief pressure of the compressed air is 980 kPa (10 kgf/cm^2, 142 psi), if the vehicle height control is attempted on a steeply sloping road, when the vehicle is overloaded, or when the vehicle is jacked up with the engine running, code "C1751/51" may be output and the vehicle height control may be suspended (This is not abnormal.). In this case, however, the vehicle height operation is resumed approx. 10 min. after the ignition switch is turned ON after the ECU detects the first error. If ECU detects another error, it takes 70 minutes until the vehicle height control is resumed.

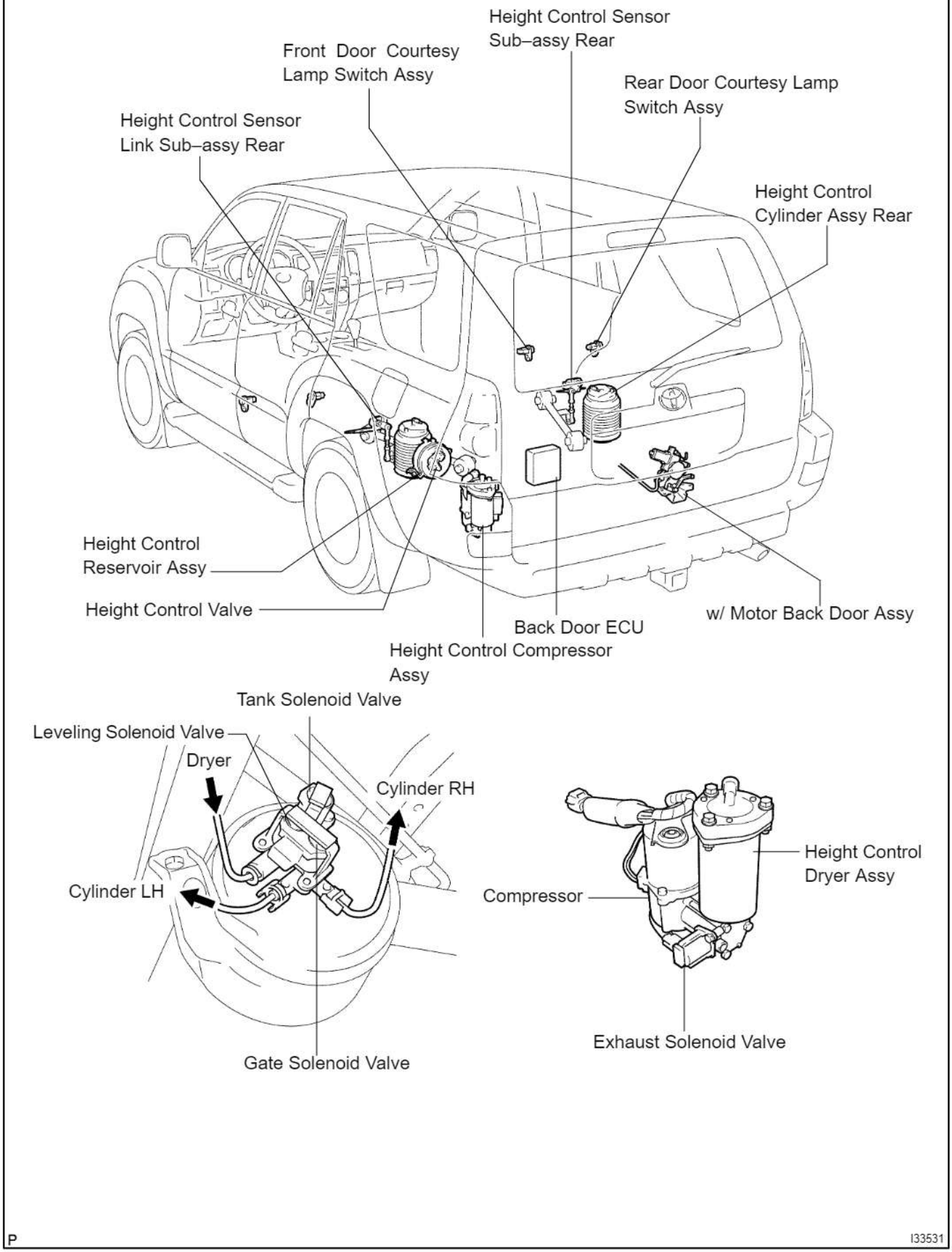
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LOCATION



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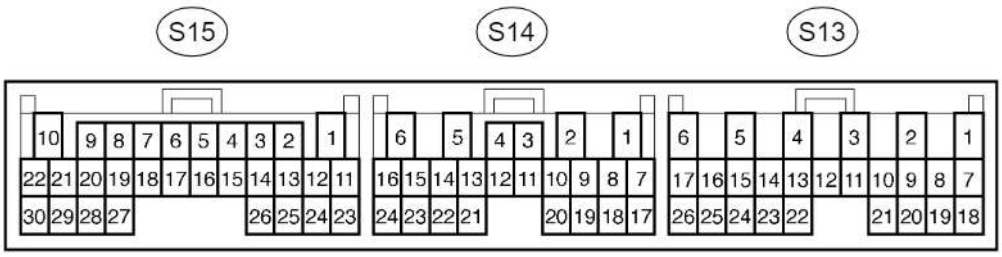


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TERMINALS OF ECU



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Symbols (Terminals No.)	Wiring Color	Condition	Specified Condition
SLRL (S13–1) – GND (S15–1)	V–W – W–B	IG switch ON	Below 1.0 V
		Engine idling, button of height control switch is pushed from "N" to "UP" or "DOWN"	8 V or more
SLRR (S13–2) – GND (S15–1)	V – W–B	IG switch ON	Below 1.0 V
		Engine idling, button of height control switch is pushed from "N" to "UP" or "DOWN"	8 V or more
SLLO (S13–7) – GND (S15–1)	P–G – W–B	IG switch ON	Below 1.0 V
		Engine idling, button of height control switch from "UP" to "DOWN"	8 V or more
SLEX (S13–8) – GND (S15–1)	LG – W–B	IG switch ON	Below 1.0 V
		Engine idling, button of height control switch from "UP" to "DOWN"	8 V or more
RC (S13–18) – GND (S15–1)	BR–Y – W–B	IG switch ON	Below 1.0 V
		Engine idling, button of height control switch is pushed from "N" to "UP" or "DOWN"	8 V or more
SGR2 (S13–19) – GND (S15–1)	GR – W–B	Always	Continuity (Ω)
SBR2 (S13–20) – GND (S15–1)	G–R – W–B	IG switch ON	4.5 to 5.5 V
SGL2 (S13–21) – GND (S15–1)	R–W – W–B	Always	Continuity (Ω)
SBL2 (S13–22) – GND (S15–1)	BR–W – W–B	IG switch ON	4.5 to 5.5 V
SHRL (S13–23) – GND (S15–1)	GR–G – W–B	IG switch ON	0.5 to 4.5 V
		Engine idling, vehicle height is changed from "HIGH" to "NORMAL" by pressing the height control switch	Approx. 2.5 V
SHRR (S13–24) – GND (S15–1)	W – W–B	IG switch ON	0.5 to 4.5 V
		Engine idling, vehicle height is changed from "HIGH" to "NORMAL" by pressing the height control switch	Approx. 2.5 V
RM+ (S13–25) – GND (S15–1)	O – W–B	Engine idling, vehicle height is changing from "NORMAL" to "HIGH" by pressing the height control switch (While height control compressor assy is working).	Below 1.0 V
RM– (S13–26) – GND (S15–1)	P – W–B	Always	Continuity (Ω)
GND2 (S14–5) – Body ground	W–B – Body ground	Always	Continuity (Ω)
B (S14–6) – GND (S15–1)	GR – W–B	IG switch ON	10 to 14 V
STP (S14–12) – GND (S15–1)	G–Y – W–B	Brake pedal depressed	10 to 14 V
		Brake pedal released	Below 1.5 V

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TACH (S14–13) – GND (S15–1)	B–W – W–B	Engine idling	Pulse generation
DNSW (S14–15) – GND (S15–1)	L–W – W–B	IG switch ON, "DOWN" button of height control switch pushed in	Below 1.5 V
		IG switch ON, "DOWN" button of height control switch free	10 to 14 V
UPSW (S14–16) – GND (S15–1)	L – W–B	IG switch ON, "UP" button of height control switch pushed in	Below 1.5 V
		IG switch ON, "DOWN" button of height control switch free	10 to 14 V
TD (S14–24) – GND (S15–1)	G – W–B	IG switch ON, height control OFF switch push in	Below 1.5 V
		IG switch ON, height control OFF switch released	10 to 14 V
GND (S15–1) – Body ground	W–B – Body ground	Always	Continuity (Ω)
DOOR (S15–4) – GND (S15–1)	R–G – W–B	IG switch ON, each door opened	Below 1.5 V
		IG switch ON, all door closed	10 to 14 V
TS (S15–5) – GND (S15–1)	R–B – W–B	IG switch ON and terminals TS – CG connected	Below 1.0 V
		IG switch ON and terminals TS – CG not connected	10 to 14 V
TC (S15–6) – GND (S15–1)	P–L – W–B	IG switch ON and terminals TC – CG connected	Below 1.0 V
		IG switch ON and terminals TC – CG not connected	10 to 14 V
FLO (S15–8) – GND (S15–1)	L–O – W–B	Vehicle speed 20 km/h (12 mph) or higher	Pulse generation
FRO (S15–9) – GND (S15–1)	L–R – W–B	Vehicle speed 20 km/h (12 mph) or higher	Pulse generation
IG (S15–10) – GND (S15–1)	B–R – W–B	IG switch ON	10 to 14 V
MOD2 (S15–11) – GND (S15–1)	W–B – W–B	Always	Continuity (Ω)
MOD1 (S15–12) – GND (S15–1)	W–B – W–B	Always	Continuity (Ω)
VN (S15–15) – GND (S15–1)	Y–G – W–B	IG switch ON, height control OFF indicator lamp ON	8 V or more
		IG switch ON, height control OFF indicator lamp OFF	Below 1.5 V
HI (S15–16) – GND (S15–1)	Y – W–B	IG switch ON, height control "HI" indicator lamp ON	8 V or more
		IG switch ON, height control "N" or "LO" indicator lamp ON	Below 1.5 V
NR (S15–17) – GND (S15–1)	Y–B – W–B	IG switch ON, height control "N" indicator lamp ON	8 V or more
		IG switch ON, height control "LO" or "HI" indicator lamp ON	Below 1.5 V
LO (S15–18) – GND (S15–1)	BR–B – W–B	IG switch ON, height control "LO" indicator lamp ON	8 V or more
		IG switch ON, height control "HI" or "N" indicator lamp ON	Below 1.5 V
SIL (S15–20) – GND (S15–1)	R–Y – W–B	IG switch ON	8 V or more

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PROBLEM SYMPTOMS TABLE

If a normal code is displayed during the DTC check but the problem still occurs, check the circuits for each problem symptom in the order given in the table below and proceed to the relevant troubleshooting page.
HINT:
Inspect each malfunction circuit in numerical order for the corresponding symptom.
If the malfunction still exist even after checking and confirming that all the circuit are normal, replace the suspension control ECU.

Symptom	Suspect Area	See page
Vehicle height control function does not operate	1. Freezing of the air tube	–
	2. Power source circuit	05–767
	3. Crankshaft position sensor circuit	05–775
	4. Height control OFF switch circuit	05–785
	5. Height control switch circuit	05–782
	6. Height control sensor circuit	05–743
	7. Height control solenoid valve circuit	05–748
	8. Gate solenoid valve circuit	05–748
	9. Exhaust solenoid valve circuit	05–748
	10.AIR SUS relay circuit	05–753
	11.Height control compressor circuit	05–762
	12.Suspension control ECU	01–35
Illuminated up position of height control indicator lamp does not change by the height control switch operation	1. Power source circuit	05–767
	2. Crankshaft position sensor circuit	05–775
	3. Height control OFF switch circuit	05–785
	4. Height control switch circuit	05–782
	5. Height control sensor circuit	05–743
	6. Height control sensor valve circuit	05–748
	7. Gate solenoid valve circuit	05–748
	8. Exhaust solenoid valve circuit	05–748
	9. AIR SUS relay circuit	05–753
	10.Height control compressor circuit	05–762
	11.Speed sensor circuit	05–772
	12.Suspension control ECU	01–35
Hunting of vehicle height occurs	1. Air leakage (Height control cylinder assy rear)	25–3
	2. Height control sensor circuit	05–743
	3. Suspension control ECU	01–35
Vehicle height control operates, but vehicle height is uneven	1. Air leakage	25–3
	2. Clogging of the Air tube	–
	3. Height control sensor link sub–assy	25–3
	4. Height control sensor circuit	05–743
	5. Gate solenoid valve circuit	05–748
	6. Suspension control ECU	01–35
Vehicle height control operates, but vehicle height is high or low. (Vehicle height in NORMAL mode differs from the standard value)	1. Height control sensor link sub–assy	25–3
	2. Height control sensor circuit	05–743
	3. Suspension control ECU	01–35
When vehicle height control is adjusted, it stops at extremely high or extremely low position	1. Height control sensor circuit	05–743
	2. Height control sensor link sub–assy	25–3
	3. Suspension control ECU	01–35
Height control OFF indicator lamp condition is abnormal	1. Power source circuit	05–767
	2. Height control OFF switch circuit	05–785
	3. Height control OFF indicator lamp circuit	05–791
	4. Suspension control ECU	01–35
Height control indicator lamp condition is abnormal	1. Power source circuit	05–767
	2. Height control indicator lamp circuit	05–788
	3. Suspension control ECU	01–35

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DTC check cannot be completed	1. Power source circuit 2. TC terminal circuit 3. Height control OFF indicator lamp circuit 4. Suspension control ECU	05–767 05–795 05–791 01–35
Input signal check (Test mode) cannot be completed	1. Power source circuit 2. TS terminal circuit 3. Suspension control ECU	05–767 05–797 01–35
Vehicle height is extremely low when vehicle is parked	Although, especially in a cold district, the vehicle height may become lower due to the air temperature drop in the height control cylinder assy, that is not abnormal. 1. Air leakage 2. Height control cylinder assy rear 3. Height control sensor link sub–assy 4. Height control solenoid valve circuit 5. Exhaust valve circuit	 25–3 – 25–3 05–748 05–748
Compressor motor continues to operate	Due to the air tube freezing, vehicle height may not rise all the time. 1. Air leakage 2. Air tube clogged 3. Height control cylinder assy rear 4. Height control sensor link sub–assy 5. Height control solenoid valve circuit 6. Exhaust valve circuit 7. Tank solenoid valve circuit 8. AIR SUS relay circuit 9. Height control compressor circuit 10.Suspension control ECU	 25–3 – – 25–3 05–748 05–748 05–748 05–753 05–762 01–35

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DTC	C1713/13	RIGHT REAR HEIGHT CONTROL SENSOR CIRCUIT

DTC	C1714/14	LEFT REAR HEIGHT CONTROL SENSOR CIRCUIT

CIRCUIT DESCRIPTION

Inside the sensor, a brush integrated with the control sensor rotor shaft moves above the resister, providing linear output. Since the resistance value between the brush and resistor terminal changes in proportion to the shaft rotation angle, the fixed voltage applied to the resistor by ECU is modified by the sensor and output to the ECU as a voltage indicating the shaft rotation angle.

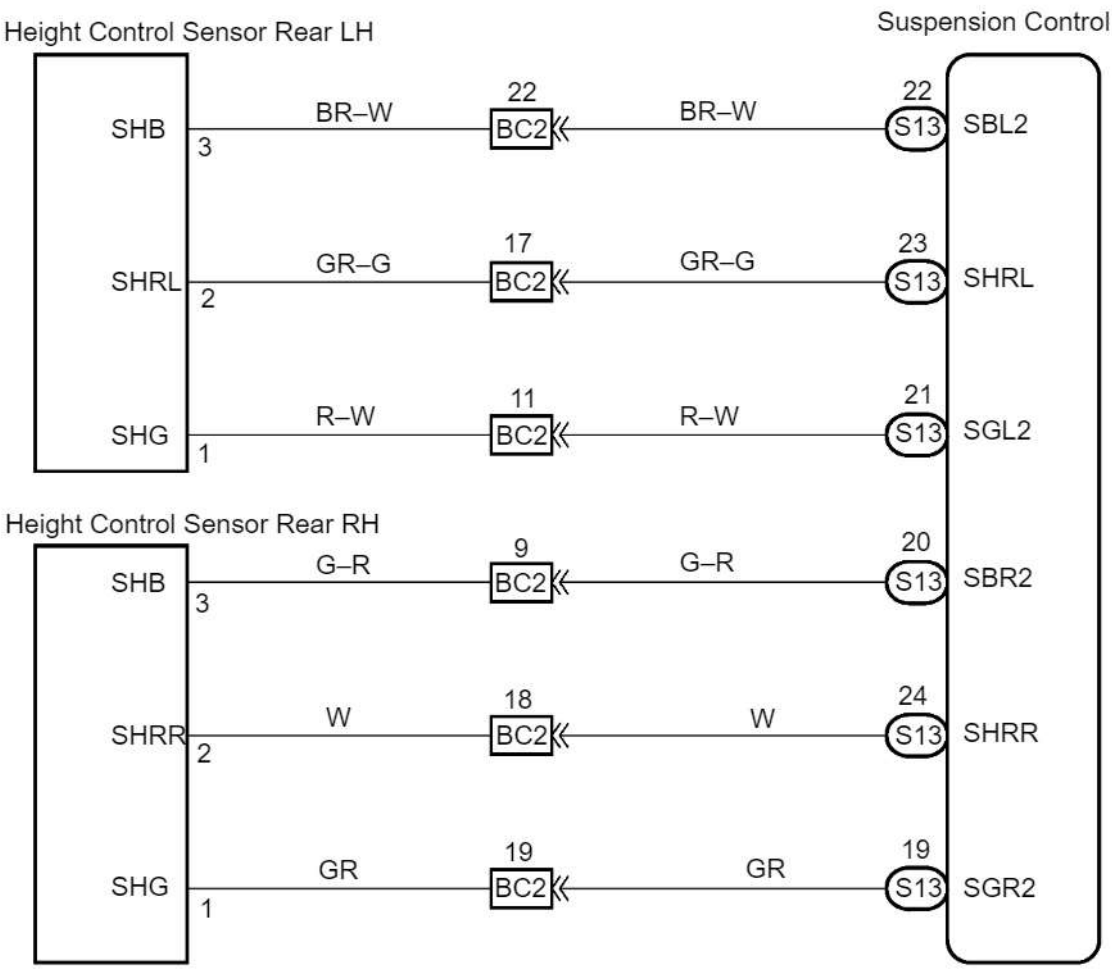
DTC No.	DTC Detecting Condition	Trouble Area
C1713/13	With the ignition switch ON, a voltage of 4.7 V or more or 0.3 V or less at each height control sensor sub–assy rear is detected for 1 sec.	□Height control sensor sub–assy rear RH □Right rear height control sensor circuit □Suspension control ECU
C1714/14		□Height control sensor sub–assy rear LH □Left rear height control sensor circuit □Suspension control ECU

HINT:

- □ Once the ECU stores DTC C1713/13 or C1714/14 in the memory, vehicle height control is suspended not carried out until a normal signal is input to the ECU from the height control sensor sub–assy. However, the control resumes if the ignition switch is once turned OFF, and then turned ON again.
- □ When the suspension control ECU detects a malfunction in the height control sensor, the height control indicator lamp ”N” comes on or blinks, and the height control switch (”HI” and ”LO”) is suspended.
- □ When either one of the right or left height control sensor sub–assy is faulty, the suspension control ECU uses the other one (functioning one) to adjust the vehicle height to the normal height. When both of the height control sensor sub–assy are faulty, the suspension control ECU suspend the height control function immediately.

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WIRING DIAGRAM



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INSPECTION PROCEDURE

HINT:

- □ Proceed to troubleshooting following the flow chart, regardless of whether or not DTC C1713/13 or C1714/14 is displayed.
- □ If DTC C1761/61 (ECU malfunction) and/or C1774/74 (power source circuit) is displayed, perform the inspection necessary for DTC C1761/61 (See page 05–765) and/or C1774/74 (See page 05–767) first.
  (If DTC C1761/61 and C1774/74 are output at the same time, perform the inspection necessary for DTC C1774/74 first.)
- □ Start the inspection from step 1 when using the hand–held tester, and start from step 2 when not using the hand–held tester.

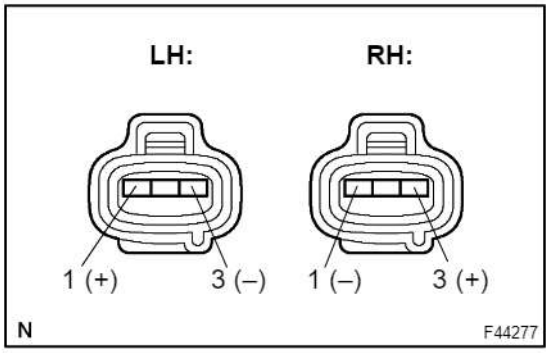
1	READ VALUE OF HAND–HELD TESTER

(a) Connect the hand–held tester to DLC3.
(b) Turn the ignition switch ON, and push the hand–held tester main switch ON.
(c) Select the item "RL HEIGHT" or "RR HEIGHT" in the DATA LIST, and read its value displayed on the hand–held tester.
(d) Check the vehicle height value of the height control sensor sub–assy rear with the hand–held tester while pressing the height control switch "UP" and "DOWN".
Standard:
Vehicle height value changes.

OK	CHECK AND REPLACE SUSPENSION CONTROL ECU (See page 01–35)

NG

2	CHECK HARNESS AND CONNECTOR(HEIGHT CONTROL SENSOR SUB–ASSY REAR POWER SOURCE)



(a) Disconnect the height control sensor sub–assy rear connector.
(b) Height control sensor sub–assy rear LH:
Turn the ignition switch ON, and measure voltage between terminal 1 (SHB) and 3 (SHG) of the height control sensor sub–assy rear wire harness side connector.
Standard:
4.5 to 5.5 V
(c) Height control sensor sub–assy rear RH:
Turn the ignition switch ON, and measure voltage between terminal 1 (SHG) and 3 (SHB) of the height control sensor sub–assy rear wire harness side connector.
Standard:
4.5 to 5.5 V

OK	Go to step 4

NG

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3	CHECK HARNESS AND CONNECTOR(HEIGHT CONTROL SENSOR SUB–ASSY REAR – SUSPENSION CONTROL ECU)

Height control sensor sub–assy rear LH:

(a) Check for open and short circuit in the harness and the connector between terminal 1 (SHB) of the height control sensor sub–assy rear and S13–22 (SBL2) of the suspension control ECU (See page 01–35).

(b) Check for open and short circuit in the harness and the connector between terminal 3 (SHG) of the height control sensor sub–assy rear and S13–21 (SGL2) of the suspension control ECU (See page 01–35).

Height control sensor sub–assy rear RH:

(a) Check for open and short circuit in the harness and the connector between terminal 1 (SHG) of the height control sensor sub–assy rear and S13–19 (SGR2) of the suspension control ECU (See page 01–35).

(b) Check for open and short circuit in the harness and the connector between terminal 3 (SHB) of the height control sensor sub–assy rear and S13–20 (SBR2) of the suspension control ECU (See page 01–35).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

4	CHECK HARNESS AND CONNECTOR(HEIGHT CONTROL SENSOR SUB–ASSY REAR – SUSPENSION CONTROL ECU)

Height control sensor sub–assy rear LH:

(a) Check for open and short circuit in the harness and the connector between terminal 2 (SHRL) of the height control sensor sub–assy rear and S13–23 (SHRL) of the suspension control ECU (See page 01–35).

Height control sensor sub–assy rear RH:

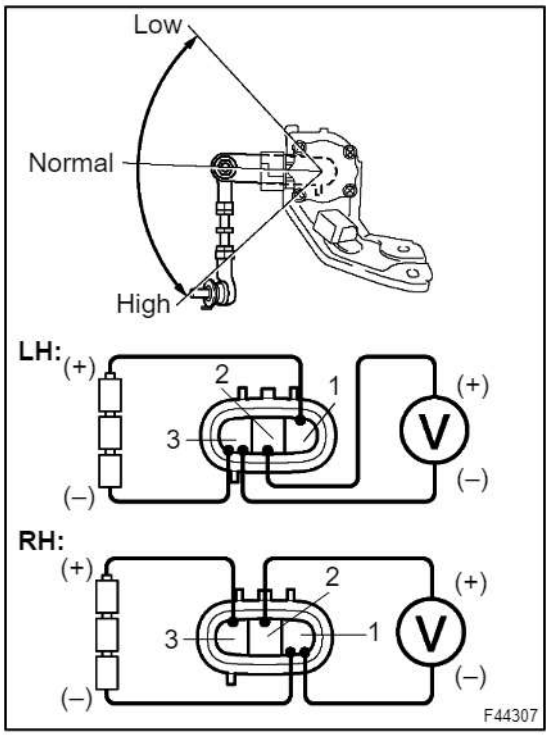
(a) Check for open and short circuit in the harness and the connector between terminal 2 (SHRR) of the height control sensor sub–assy rear and S13–24 (SHRR) of the suspension control ECU (See page 01–35).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

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5 INSPECT HEIGHT CONTROL SENSOR SUB–ASSY REAR



(a) Remove the height control sensor sub–assy rear LH or RH.

(b) Connect 3 dry batteries of 1.5 V in series.

(c) Height control sensor sub–assy rear LH:
Connect terminal 1 (SHB) to the batteries' positive (+) terminal, and terminal 3 (SHG) to the batteries' negative (–) terminal, then apply approximately 4.5 V between terminal 2 (SHRL) and 3 (SHG) in the following conditions.

Standard:

Position	Voltage
High (0 to 45)	Approx. 2.53 to 4.33 V
Normal (0)	Approx. 2.53 V
Low (0 to –45)	Approx. 0.81 to 2.53 V

Result:

OK	A
NG	B

(d) Height control sensor sub–assy rear RH:
Connect terminal 3 (SHB) to the batteries' positive (+) terminal, and terminal 1 (SHG) to the batteries' negative (–) terminal, then apply approximately 4.5 V between terminal 1 (SHG) and 2 (SHRR) in the following conditions.

Standard:

Position	Voltage
High (0 to 45)	Approx. 2.53 to 4.33 V
Normal (0)	Approx. 2.53 V
Low (0 to –45)	Approx. 0.81 to 2.53 V

Result:

OK	A
NG	C

B → **REPLACE HEIGHT CONTROL SENSOR SUB–ASSY REAR LH**

C → **REPLACE HEIGHT CONTROL SENSOR SUB–ASSY REAR RH**

A

CHECK AND REPLACE SUSPENSION CONTROL ECU (See page 01–35)

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DTC	C1733/33	GATE SOLENOID VALVE CIRCUIT

DTC	C1734/34	LEVELING SOLENOID VALVE CIRCUIT

DTC	C1735/35	EXHAUST SOLENOID VALVE CIRCUIT

DTC	C1744/44	TANK SOLENOID VALVE CIRCUIT

CIRCUIT DESCRIPTION

The suspension control ECU opens the height control valve to lead the compressed air to the pneumatic cylinder and raise the vehicle height.
When the vehicle height is lowered, the suspension control ECU opens the height control valve to store the compressed air in the low pressure tank temporarily, and then operates the exhaust solenoid valve to release the compressed air to the outside.
Further, the height control solenoid valve (gate solenoid valve) opens and closes the passage between the right and left pneumatic cylinder.
The height control valve is on the low pressure tank and consists of 3 valves in total, leveling solenoid valve, gate solenoid valve and tank solenoid valve.
The leveling solenoid valve opens and close the passage between the compressor and the pneumatic cylinder. The gate solenoid valve opens and close the passage between the right and left pneumatic cylinder. The tank solenoid valve opens and closes the passage between pneumatic cylinder and the low pressure tank. The exhaust solenoid valve is on the compressor unit and has only one valve.

DTC No.	DTC Detecting Condition	Trouble Area
C1733/33	Either the condition 1 or 2. is detected: 1. With the height control solenoid valve (or exhaust solenoid valve) inactivated, an open signal of the height control solenoid valve is detected for 1 sec. or more. 2. With the height control solenoid valve (or exhaust solenoid valve) activated, a short signal of the valve is detected 8 times successively.	□Gate solenoid valve □Gate solenoid valve circuit □Suspension control ECU
C1734/34		□Leveling solenoid valve □Leveling solenoid valve circuit □Suspension control ECU
C1735/35		□Exhaust solenoid valve □Exhaust solenoid valve circuit □Suspension control ECU
C1744/44		□Tank solenoid valve □Tank solenoid valve circuit □Suspension control ECU

HINT:

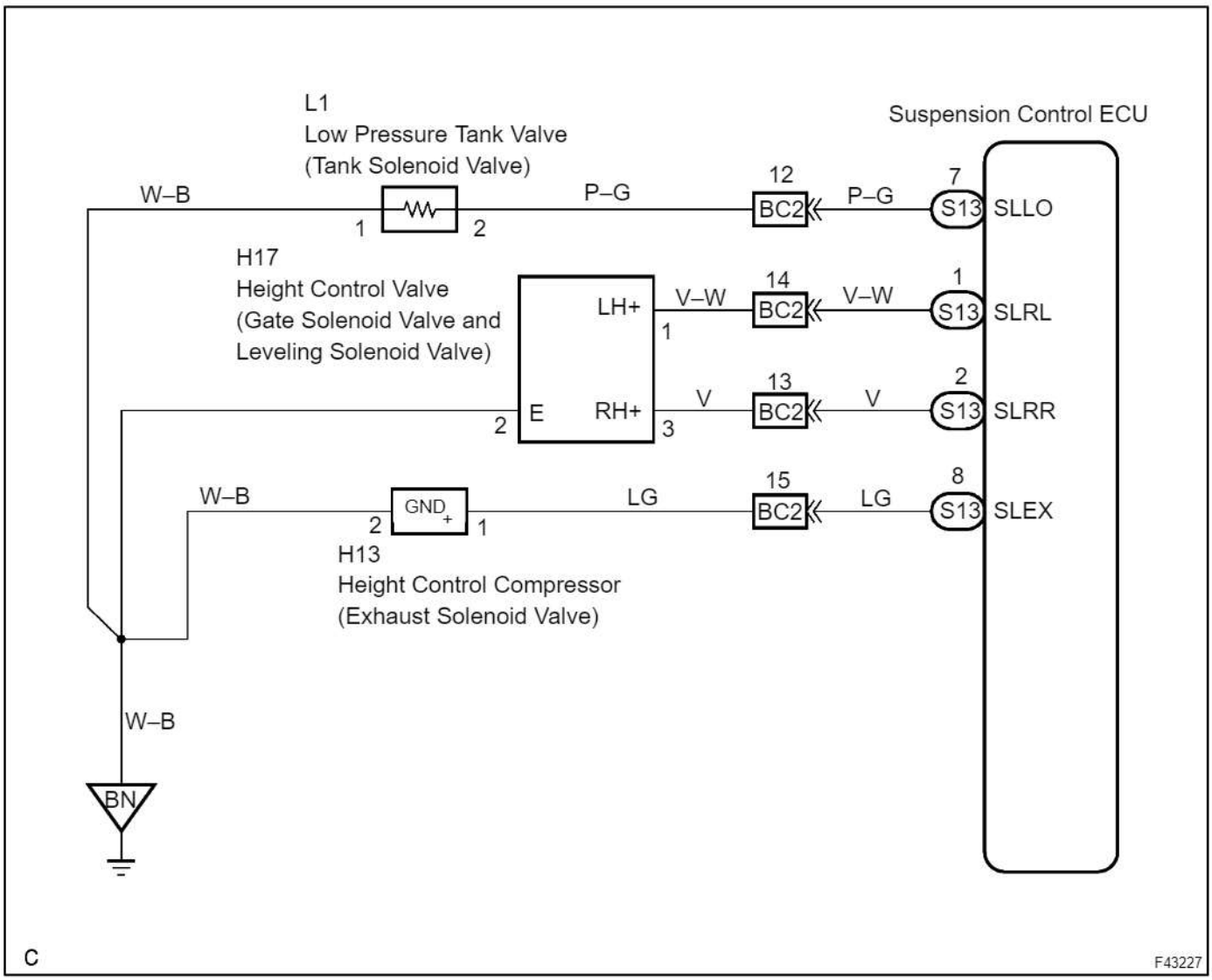
- □ Once ECU stores DTC C1733/33, C1734/34, C1735/35 or C1744/44 in the memory, the vehicle height control is suspended out until a normal signal is input to ECU from the height control solenoid valves and the exhaust solenoid valve. However, control is resumed if the ignition switch is turned OFF, then ON again.
- □ Malfunction in the gate solenoid valve and the leveling solenoid valve:
  The height control operation is suspended, and the height control indicator lamp dose not change by operating the height control switch.

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□ Malfunction in the exhaust solenoid valve:
The vehicle height is lowered to the normal height within 30 sec., and then the height control operation is suspended. The height control indicator lamp ”N” comes on or blinks, and that of ”HI” and ”LO” do not illuminated by operating the height control switch ”UP” and ”DOWN”.

□ Abnormality of the tank solenoid valve:
Although the height control is still possible, the vehicle lowering speed may be slower.

WIRING DIAGRAM



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INSPECTION PROCEDURE

HINT:

- □ Proceed to troubleshooting following the flow chart, regardless of whether or not DTC C1733/33, C1734/34, C1735/35 or C1744/44 is displayed.
- □ If DTC C1761/61 (ECU malfunction) and/or C1774/74 (power source circuit) is displayed, perform the inspection necessary for DTC C1761/61 (See page 05–765) and/or C1774/74 (See page 05–767) first.
  (If DTC C1761/61 the C1774/74 are output at the same time, perform the inspection necessary for DTC C1774/74 first.)
- □ Start the inspection from step 1 when using the hand–held tester, and start from step 2 when not using the hand–held tester
- □ Since the exhaust solenoid valve cannot be tested in ACTIVE TEST, start the inspection from step 2.

1	PERFORM ACTIVE TEST BY HAND–HELD TESTER

(a) Connect the hand–held tester to DLC3.
(b) Turn the ignition switch ON, and push the hand–held tester main switch ON.
(c) Select the item "LEVEL SOL REAR", "GATE SOL REAR", "LOW PRS TNK SOL" in the ACTIVE TEST, and operate it with the hand–held tester.
(d) Check whether the solenoid makes sound.
(e) Check whether the height control solenoid valve has a continuity (will vibrate).
Standard:
The solenoid makes sound, and the height control solenoid valve has a continuity (will vibrate).

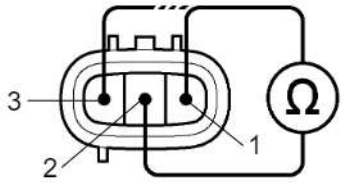
OK → **CHECK AND REPLACE SUSPENSION CONTROL ECU (See page 01–35)**

NG

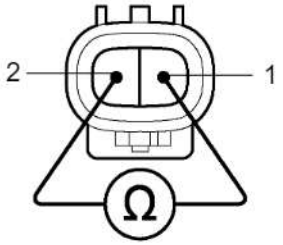
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2 INSPECT HEIGHT CONTROL SOLENOID VALVE OR EXHAUST SOLENOID VALVE

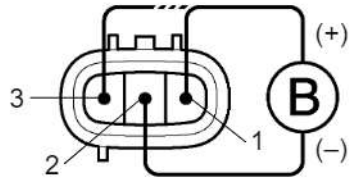
Gate Solenoid Valve:
Leveling Solenoid Valve:



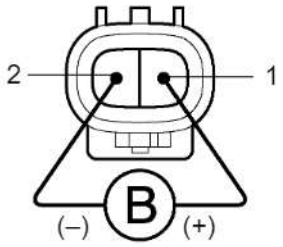
Exhaust Solenoid Valve:
Tank Solenoid Valve:



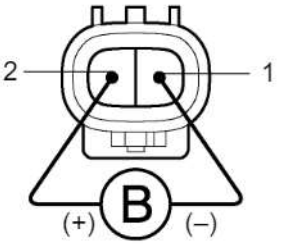
Gate Solenoid Valve:
Leveling Solenoid Valve:



Exhaust Solenoid Valve:



Tank Solenoid Valve:



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(a) Disconnect the valve connector.
(b) Measure resistance between terminals.

Standard:

Solenoid valve	Tester connection	Resistance
Gate solenoid valve	1 – 2	17.5 to 21.5 Ω
Leveling solenoid valve	2 – 3	10 to 14 Ω
Exhaust solenoid valve	1 – 2	10 to 14 Ω
Tank solenoid valve	1 – 2	10 to 14 Ω

HINT:
The height control solenoid valve has 2 connectors.
- The gate solenoid valve and the leveling solenoid valve have a 3–pole connector.
- Tank solenoid valve connector has a 2–pole connector.

(c) Check the operating sound of the valves when battery positive voltage is applied to the terminals as shown below.

Solenoid valve	Battery positive	Battery negative
Gate solenoid valve	1	2
Leveling solenoid valve	3	2
Exhaust solenoid valve	1	2
Tank solenoid valve	2	1

Standard:
It should make an operating sound (click).

HINT:
- When a malfunction is found in the gate solenoid valve, the leveling valve or the tank solenoid valve, replace the height control reservoir assy.
- When a malfunction is found in the exhaust solenoid valve, replace the height control compressor assy.

NG → **REPLACE HEIGHT CONTROL RESERVOIR ASSY**

NG → **REPLACE HEIGHT CONTROL COMPRESSOR ASSY**

OK

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3	CHECK HARNESS AND CONNECTOR(HEIGHT CONTROL SOLENOID VALVE OR EXHAUST SOLENOID VALVE – SUSPENSION CONTROL ECU)

(a) Check for open and short circuit in the harness and the connectors between height control solenoid valve or the exhaust solenoid valve and the suspension control ECU (See page 01–35).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

CHECK AND REPLACE SUSPENSION CONTROL ECU (See page 01–35)

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DTC	C1741/41	AIR SUS RELAY CIRCUIT

CIRCUIT DESCRIPTION

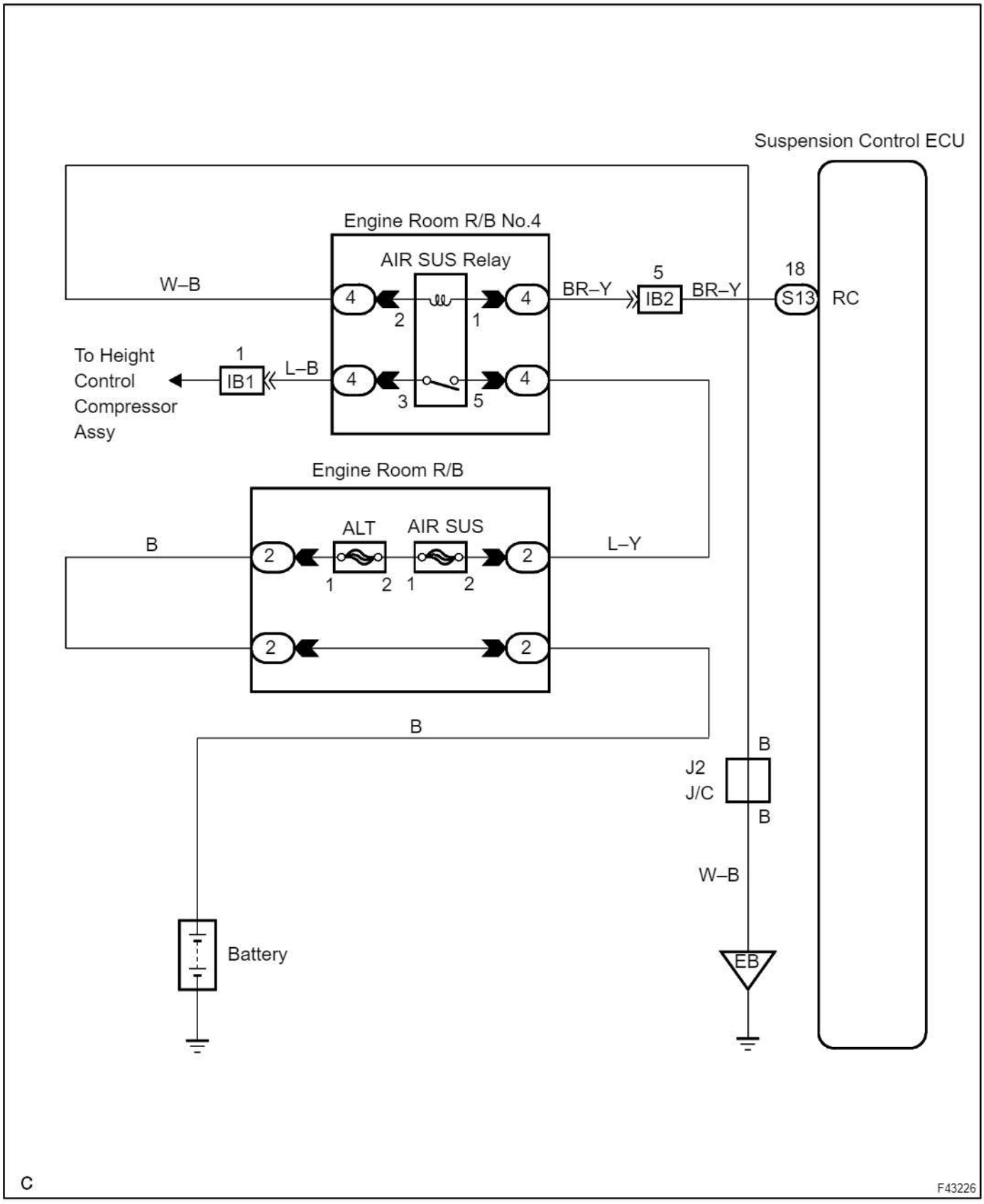
When "UP" side of the height control switch is pressed, a signal is sent from terminal RC of the suspension control ECU to the AIR SUS relay to turn it on.
As a result, the current flows to the AIR SUS relay coil, closing the relay contact, and then the battery positive voltage is applied to the compressor, which causes the compressed air to raise the vehicle height.

DTC No.	DTC Detecting Condition	Trouble Area
C1741/41	Either the condition 1. or 2. is detected. 1. With the AIR SUS relay inactivated, an open signal of the AIR SUS relay is detected for 1 sec. or more. 2. With the AIR SUS relay activated, a short signal of the AIR SUS relay is detected 8 times successively.	□AIR SUS relay □AIR SUS relay circuit □Suspension control ECU

HINT:
Once ECU stores DTC C1741/41 in the memory, the vehicle height control is suspended until a normal signal is input to ECU from the AIR SUS relay. However, the control resumes if the ignition switch is once turned OFF, and then turned ON again.

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WIRING DIAGRAM



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INSPECTION PROCEDURE

HINT:

- If DTC C1761/61 (ECU malfunction) and/or C1774/74 (power source circuit) is displayed, perform the inspection necessary for DTC C1761/61 (See page 05–765) and/or C1774/74 (See page 05–767) first.
  (If DTC C1761/61 and C1774/74 are output at the same time, perform the inspection necessary for DTC C1774/74 first.)
- Start the inspection from step 1 when using the hand–held tester, and start from step 2 when not using the hand–held tester.

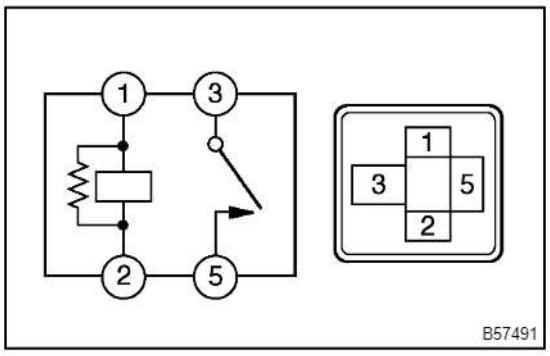
1 PERFORM ACTIVE TEST BY HAND–HELD TESTER

(a) Connect the hand–held tester to DLC3.
(b) Turn the ignition switch ON, and push the hand–held tester main switch ON.
(c) Select the item "MOTOR RELAY" in the ACTIVE TEST, and operate it with the hand–held tester.
(d) Check the operation sound of the AIR SUS relay when operating it with the hand–held tester.
Standard:
The operation sound of the AIR SUS relay can be heard.

OK → **CHECK AND REPLACE SUSPENSION CONTROL ECU (See page 01–35)**

NG

2 INSPECT AIR SUS RELAY



(a) Remove the AIR SUS relay from the engine room R/B No.3.
(b) Check continuity between each terminal of the AIR SUS relay.
Standard:

Tester connection	Specification
1 – 2	Continuity (Reference value 62 Ω)
3 – 5	No continuity

(c) Apply battery positive voltage between terminal 1 and 2.
(d) Check continuity between terminal 3 and 5 of the AIR SUS relay.
Standard:

Tester connection	Specification
3 – 5	Continuity

NG → **REPLACE AIR SUS RELAY**

OK

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3	CHECK HARNESS AND CONNECTOR(AIR SUS RELAY – SUSPENSION CONTROL ECU)

(a) Check for open and short circuit in the harness and the connector between the AIR SUS relay and the suspension control ECU (See page 01–35).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

4	CHECK HARNESS AND CONNECTOR(AIR SUS RELAY – BODY GROUND)

(a) Check for open and short circuit in the harness and the connector between the AIR SUS relay and the body ground (See page 01–35).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

CHECK AND REPLACE SUSPENSION CONTROL ECU (See page 01–35)

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DTC C1742/42 HEIGHT CONTROL COMPRESSOR CIRCUIT

CIRCUIT DESCRIPTION

When "UP" side of the height control is pressed, a signal is sent from terminal RC of the suspension control ECU to switch the AIR SUS relay ON. As a result, the relay contacts close and the compressor motor turns on, producing compressed air.

At this time, the suspension control ECU detects the amount of current flow to the compressor motor by means of the differences in potential at terminal RM+ and RM– of the suspension control ECU. In this way, the suspension control ECU monitors the compressor circuit for abnormalities.

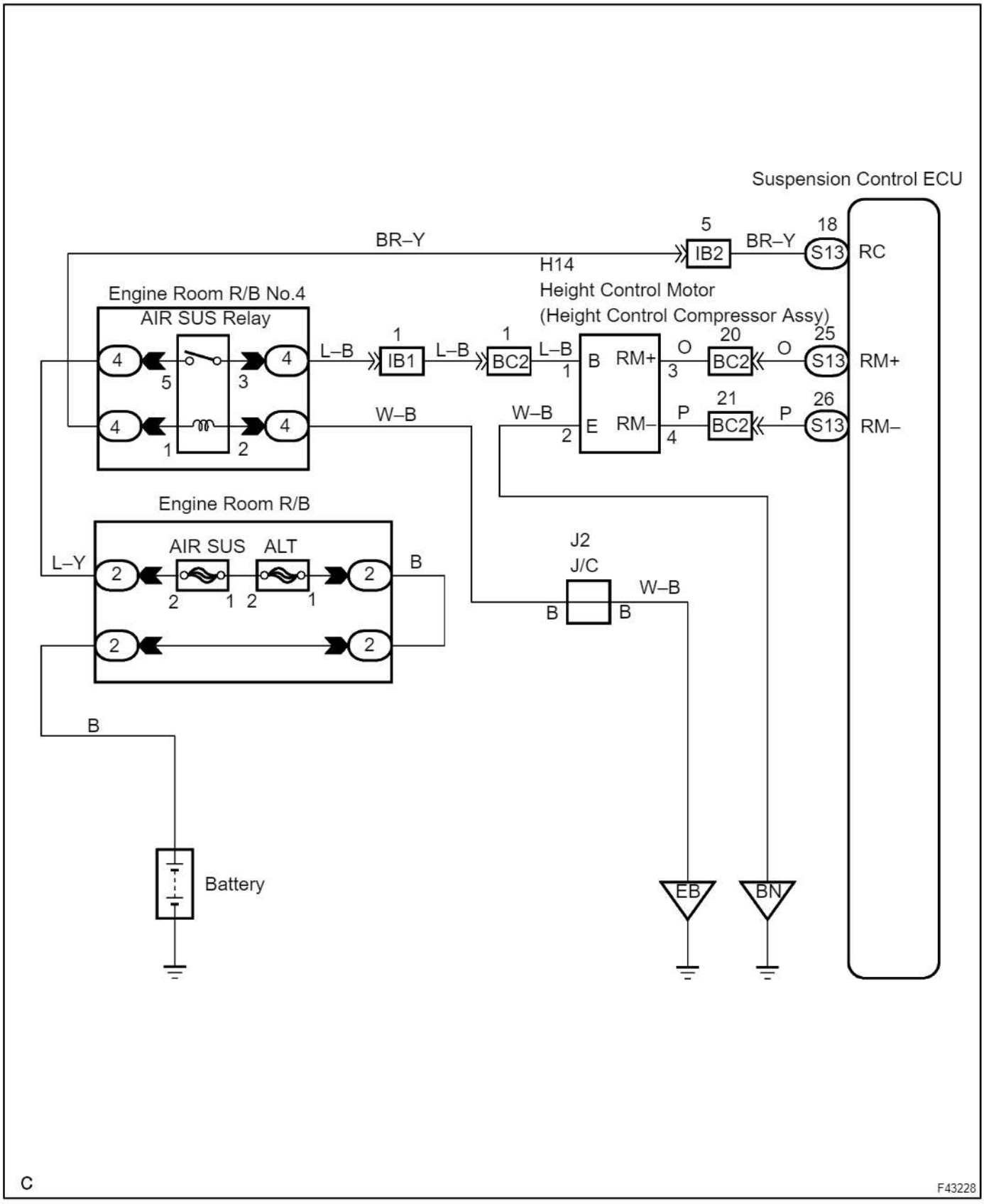
DTC No.	DTC Detecting Condition	Trouble Area
C1742/42	With the AIR SUS relay activated, a lock, open or short signal of the height control compressor motor is detected for 4 sec. or more.	□Height control compressor assy □Height control compressor circuit □Suspension control ECU

HINT:

Once ECU stores DTC C1742/42 in the memory, the vehicle height control is not carried out until the normal signal is input to ECU from the compressor motor. However, the control automatically resumes approx. 70 min. after the ignition switch is turned ON.

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INSPECTION PROCEDURE

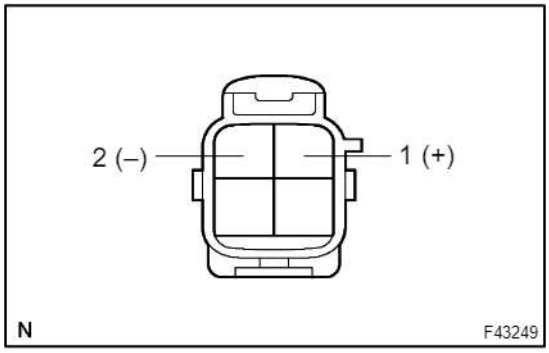
1	RECONFIRM DTC

(a) Check if the other DTC are recorded (See page 05–727).

YES → REPAIR CIRCUIT INDICATED BY OUTPUT CODE

NO

2	INSPECT HEIGHT CONTROL COMPRESSOR ASSY



(a) Disconnect the height control compressor assy connector.

(b) Apply battery voltage between terminal 1 and 2 of the height control compressor assy.

Standard:

Compressor motor operates.

NOTICE:

- **Do not operate the height control compressor assy 90 sec. or more.**
- **Since short and lock inside the height control compressor assy causes enormous current to flow, stop the operation immediately when it dose not rotate.**

NG → REPLACE HEIGHT CONTROL COMPRESSOR ASSY

OK

3	CHECK HARNESS AND CONNECTOR(HEIGHT CONTROL COMPRESSOR ASSY – SUSPENSION CONTROL ECU)

(a) Check for open and short circuit in the harness and the connector between the height control compressor assy and the suspension control ECU (See page 01–35).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

4	CHECK HARNESS AND CONNECTOR(HEIGHT CONTROL COMPRESSOR ASSY – AIR SUS RELAY)

(a) Check for open and short circuit in the harness and the connector between the height control compressor assy and the AIR SUS relay (See page 01–35).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

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5	INSPECT HEIGHT CONTROL SOLENOID VALVE OR EXHAUST SOLENOID VALVE

When using hand–held tester:

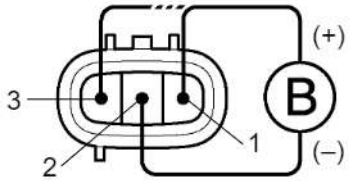
(a) Connect the hand–held tester to DLC3.
(b) Turn the ignition switch ON, and push the hand–held tester main switch ON.
(c) Select the item "LEVEL SOL REAR", "GATE SOL REAR", "LOW PRS TNK SOL" in the ACTIVE TEST, and operate it with the hand–held tester.

HINT:
The exhaust solenoid valve cannot be tested in ACTIVE TEST.

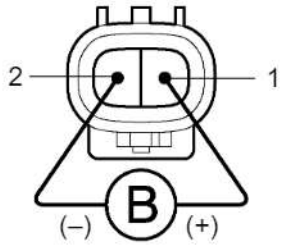
(d) Check whether the solenoid makes sound.
(e) Check whether the height control solenoid valve has a continuity (will vibrate).

Standard:
The solenoid makes sound, the height control solenoid valve has a continuity (will vibrate).

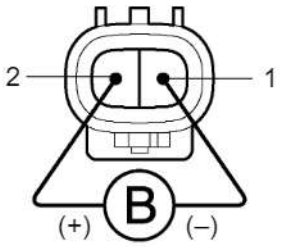
Gate Solenoid Valve:
Leveling Solenoid Valve:



Exhaust Solenoid Valve:



Tank Solenoid Valve:



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When not using hand–held tester:

(a) Disconnect the valve connector.
(b) Check the operating sound of the valves when battery positive voltage is applied to the terminals as shown below.

Solenoid valve	Battery positive	Battery negative
Gate solenoid valve	1	2
Leveling solenoid valve	3	2
Exhaust solenoid valve	1	2
Tank solenoid valve	2	1

Standard:
It should make an operating sound (click).

HINT:

- When a malfunction is found in the gate solenoid valve, the leveling valve or the tank solenoid valve, replace the height control reservoir assy.
- When a malfunction is found in the exhaust solenoid valve, replace the height control compressor assy.

NG → **REPLACE HEIGHT CONTROL RESERVOIR ASSY**

NG → **REPLACE HEIGHT CONTROL COMPRESSOR ASSY**

OK

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6	INSPECT FOR AIR TUBE CLOGGED

(a) Check visually for clog, damage or breakage on the air tube (See page 25–3).

NG → REPAIR OR REPLACE AIR TUBE

OK

CHECK AND REPLACE SUSPENSION CONTROL ECU (See page 01–35)

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DTC	C1751/51	CONTINUOUS ELECTRIC CURRENT TO HEIGHT CONTROL COMPRESSOR

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
C1751/51*1	With the AIR SUS relay activated, the vehicle does not go up to the standard vehicle height after the 100 sec. elapsed.	□Height control compressor assy □Height control compressor circuit □Height control sensor link sub–assy rear □Height control sensor sub–assy rear □Relief valve □AIR SUS relay comes off □Air leakage from the air tube or each valve □Clogging in the air tube or each valve □Suspension control ECU

*1: The relief pressure of the compressed air is 980 kPa (10 kgf/cm^2, 142 psi). If the vehicle height control is attempted on a steeply sloping road, when the vehicle is overloaded, or when the vehicle is jacked up with the engine running, the compressor motor operates continuously to raise vehicle height, and causes electric current to flow to the AIR SUS relay for 100 sec. or longer.
Thus DTC C1751/51 may be output and vehicle height control may be suspended (This is not abnormal.). In this case, however, the vehicle height operation is resumed approx. 10 min. after the ignition switch is turned ON after the ECU detects the first error. If ECU detects another error, it takes 70 minutes until the control is resumed.

INSPECTION PROCEDURE

1	INSPECT HEIGHT CONTROL COMPRESSOR CIRCUIT (See page 05–757)

2	INSPECT AIR LEAKAGE (See page 25–3)

NG → REPAIR OR REPLACE AIR TUBE

OK

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3 INSPECT HEIGHT CONTROL SOLENOID VALVE OR EXHAUST SOLENOID VALVE

When using hand–held tester:

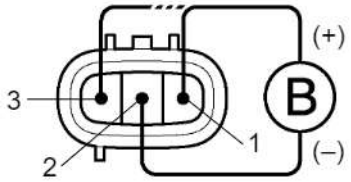
(a) Connect the hand–held tester to DLC3.
(b) Turn the ignition switch ON, and push the hand–held tester main switch ON.
(c) Select the item "LEVEL SOL REAR", "GATE SOL REAR", "LOW PRS TNK SOL" in the ACTIVE TEST, and operate it with the hand–held tester.

HINT:
The exhaust solenoid valve cannot be tested in ACTIVE TEST.

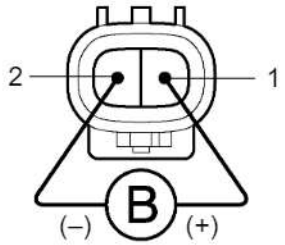
(d) Check whether the solenoid makes sound.
(e) Check whether the height control solenoid valve has a continuity (will vibrate).

Standard:
The solenoid makes sound, the height control solenoid valve has a continuity (will vibrate).

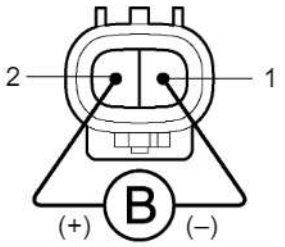
Gate Solenoid Valve:
Leveling Solenoid Valve:



Exhaust Solenoid Valve:



Tank Solenoid Valve:



F44510

When not using hand–held tester:

(a) Disconnect the valve connector.
(b) Check the operating sound of the valves when battery positive voltage is applied to the terminals as shown below.

Solenoid valve	Battery positive	Battery negative
Gate solenoid valve	1	2
Leveling solenoid valve	3	2
Exhaust solenoid valve	1	2
Tank solenoid valve	2	1

Standard:
It make an operating sound (click).

HINT:

- When a malfunction is found in the gate solenoid valve, the leveling valve or the tank solenoid valve, replace the height control reservoir assy.
- When a malfunction is found in the exhaust solenoid valve, replace the height control compressor assy.

NG → **REPLACE HEIGHT CONTROL RESERVOIR ASSY**

NG → **REPLACE HEIGHT CONTROL COMPRESSOR ASSY**

OK

4 INSPECT HEIGHT CONTROL SENSOR LINK SUB–ASSY

(a) Inspect and adjust the height control sensor link sub–assy (See page 25–3).

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5	RECONFIRM DTC

(a) Clear the DTC and repeat the procedure to re–check it (See page 05–727).

HINT:

If the DTC C1751/51 is still output, proceed to the next step.

6	CHECK AND REPAIR OR REPLACE PARTS OF MALFUNCTION CAUSES

(a) Air tube is clogged (See page 25–3)
(b) Compressor is faulty (See page 25–11)
(c) Relief valve is faulty (See page 25–13)
(d) Height control sensor sub–assy rear is faulty (See page 25–17)
(e) Foreign material entered in the height control solenoid valve (gate solenoid valve) and the exhaust solenoid valve
(f) Suspension control ECU malfunctions (See page 05–739)

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DTC C1761/61 ECU MALFUNCTION

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
C1761/61	Suspension control ECU malfunction	□Suspension control ECU

INSPECTION PROCEDURE

HINT:

- □ If DTC C1774/74 (power source circuit) is displayed, perform the inspection necessary for DTC C1774/74 first (See page 05–767).
- □ If DTC C1713/13 (right rear height control sensor circuit), C1714/14 (left rear height control sensor circuit) and C1761/61 (ECU malfunction) are output at the same time, perform the inspection necessary for DTC C1761/61 first.

1 INSPECT HEIGHT CONTROL OFF INDICATOR LAMP

(a) Turn the ignition switch to ON, and check the height control OFF indicator lamp.

Result:

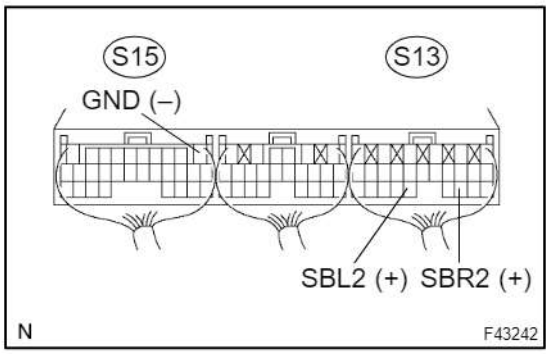
A: Height control OFF indicator lamp come on

B: Height control OFF indicator lamp does not come on

B → **REPLACE SUSPENSION CONTROL ECU (See page 01–35)**

A

2 INSPECT SUSPENSION CONTROL ECU(HEIGHT CONTROL SENSOR SUB–ASSY REAR POWER SOURCE)



(a) Remove the suspension control ECU with connectors being connected.

(b) Turn the ignition switch ON, and measure voltage between terminal S13–20 (SBR2) and S15–1 (GND) and between terminal S13–22 (SBL2) and S15–1 (GND) of the suspension control ECU connector.

Standard:

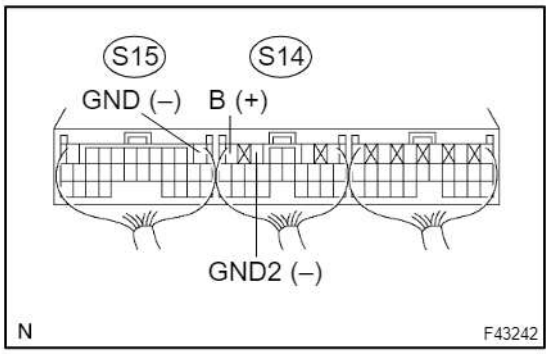
4.5 to 5.5 V

NG → **CHECK HEIGHT CONTROL SENSOR SUB–ASSY CIRCUIT (See page 05–743)**

OK

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3	INSPECT SUSPENSION CONTROL ECU(ECU POWER SOURCE)



(a) Turn the ignition switch OFF, and measure voltage between terminal S14–6 (B) and S15–1 (GND) and between S14–6 (B) and S14–5 (GND2) of the suspension control ECU connector.

Standard:

10 to 14 V

NG → **CHECK POWER SOURCE CIRCUIT (See page 05–767)**

OK

CHECK AND REPLACE SUSPENSION CONTROL ECU (See page 01–35)

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DTC	C1774/74	POWER SOURCE CIRCUIT

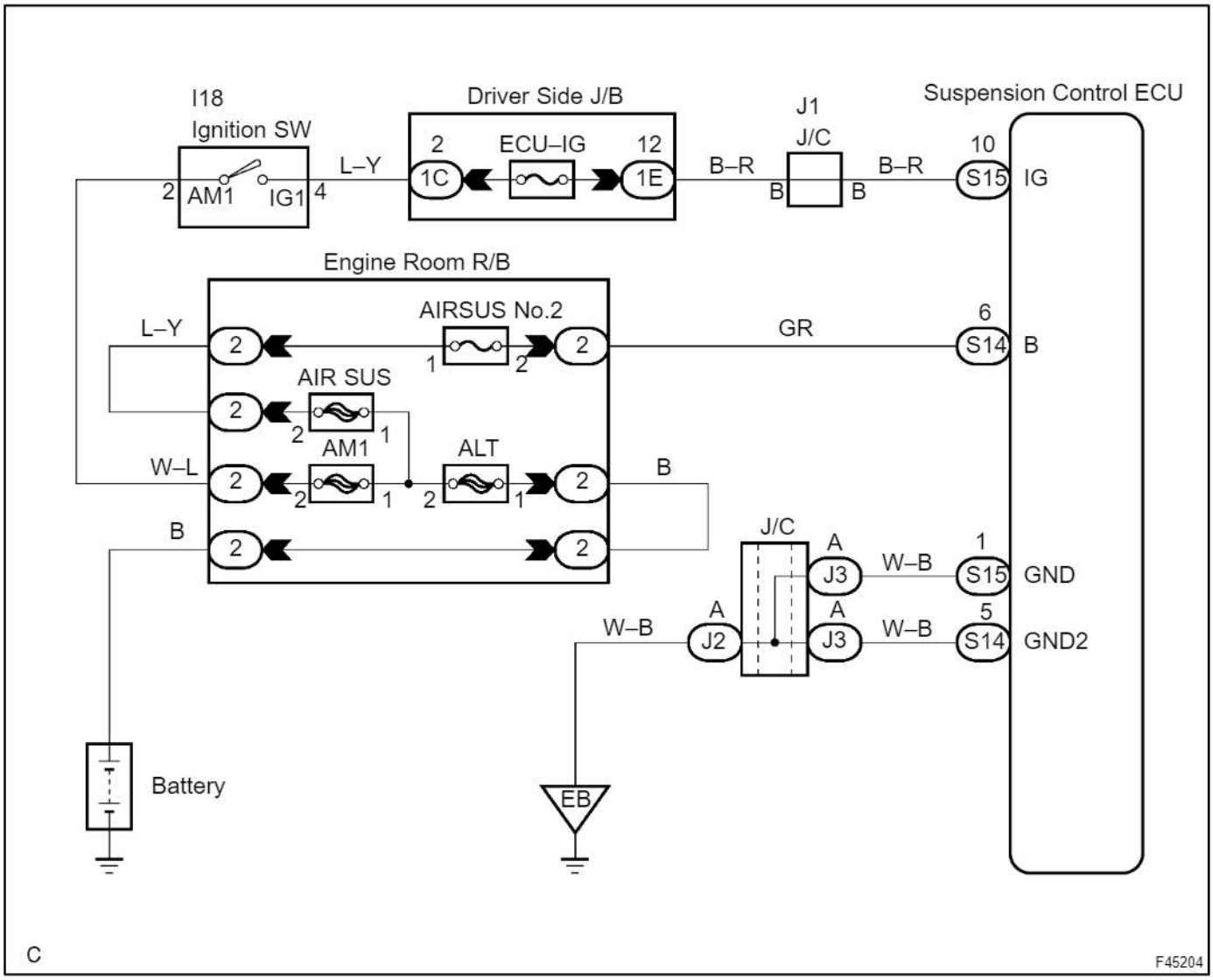
CIRCUIT DESCRIPTION

When turning the ignition switch to ON, the battery positive voltage is input to terminal B and IG of the suspension control ECU. By turning the ignition switch to OFF, the supply of the battery positive voltage to terminal B and IG terminals stops, and the power is turned OFF.

DTC No.	DTC Detecting Condition	Trouble Area
C1774/74	The terminal B or IG voltage is detected being below or above a constant voltage for 0.5 seconds.	□Battery □Power source circuit □Suspension control ECU

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WIRING DIAGRAM



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INSPECTION PROCEDURE

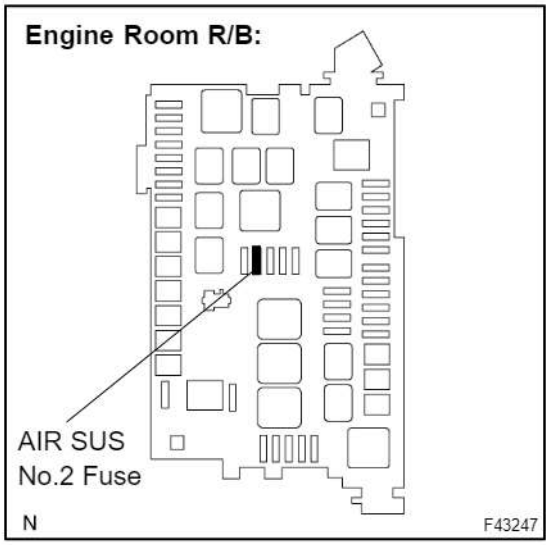
1	INSPECT SOURCE VOLTAGE

(a) Check the battery positive voltage.
Standard:
10 to 14 V

NG → **REPLACE BATTERY**

OK

2	INSPECT FUSE(AIR SUS NO.2)



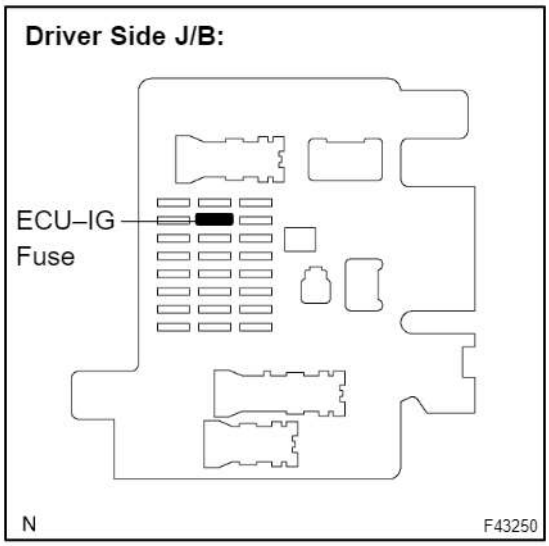
(a) Remove the AIR SUS No.2 fuse from the engine room R/B.
(b) Check continuity of the AIR SUS No.2 fuse.
Standard:
Continuity

NG → **INSPECT FOR SHORT CIRCUIT IN ALL HARNESS AND COMPONENTS CONNECTED TO AIR SUS NO.2 FUSE**

OK

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3 INSPECT FUSE(ECU–IG)

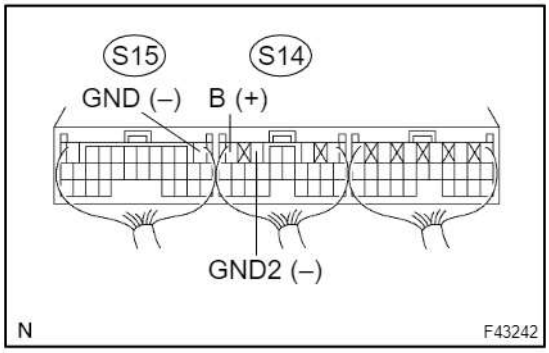


(a) Remove the ECU–IG fuse from the driver side J/B.
(b) Check continuity of the ECU–IG fuse.
Standard:
Continuity

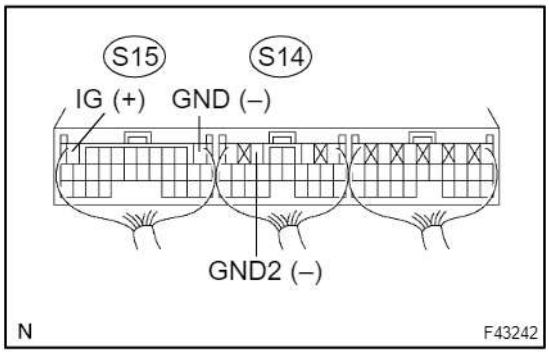
NG → **INSPECT FOR SHORT CIRCUIT IN ALL HARNESS AND COMPONENTS CONNECTED TO ECU–IG FUSE**

OK

4 INSPECT SUSPENSION CONTROL ECU



(a) Remove the suspension control ECU with connectors being connected.
(b) Turn the ignition switch ON, and measure voltage between terminal S14–6 (B) and S15–1 (GND) and between terminal S14–6 (B) and S14–5 (GND2) of the suspension control ECU connector.
Standard:
10 to 14 V



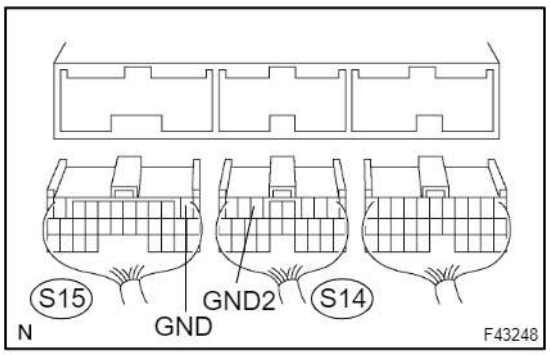
(c) Turn the ignition switch ON, measure voltage between terminal S15–10 (IG) and S15–1 (GND) and between terminal S15–10 (IG) and S14–5 (GND2) of the suspension control ECU connector.
Standard:
10 to 14 V

OK → **CHECK AND REPLACE SUSPENSION CONTROL ECU (See page 01–35)**

NG

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5	CHECK HARNESS AND CONNECTOR(SUSPENSION CONTROL ECU – BODY GROUND)



(a) Disconnect the suspension control ECU connectors.
(b) Turn the ignition switch ON and check continuity between terminal S15–1 (GND) and body ground and between terminal S14–5 (GND2) and body ground.
Standard:
Continuity

HINT:

□ OK:
Repair or replace the harness or the connector between the AIR SUS fuse and the suspension control ECU and/or the ECU–IG fuse and the suspension control ECU.

□ NG:
Repair or replace the harness or the connector between the suspension control ECU and body ground.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR (See page 01–35)**

OK

REPAIR OR REPLACE HARNESS OR CONNECTOR (See page 01–35)

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DTC	C1776/76	SPEED SENSOR CIRCUIT

DTC	C1794/94	RIGHT FRONT SPEED SENSOR CIRCUIT

DTC	C1795/95	LEFT FRONT SPEED SENSOR CIRCUIT

CIRCUIT DESCRIPTION

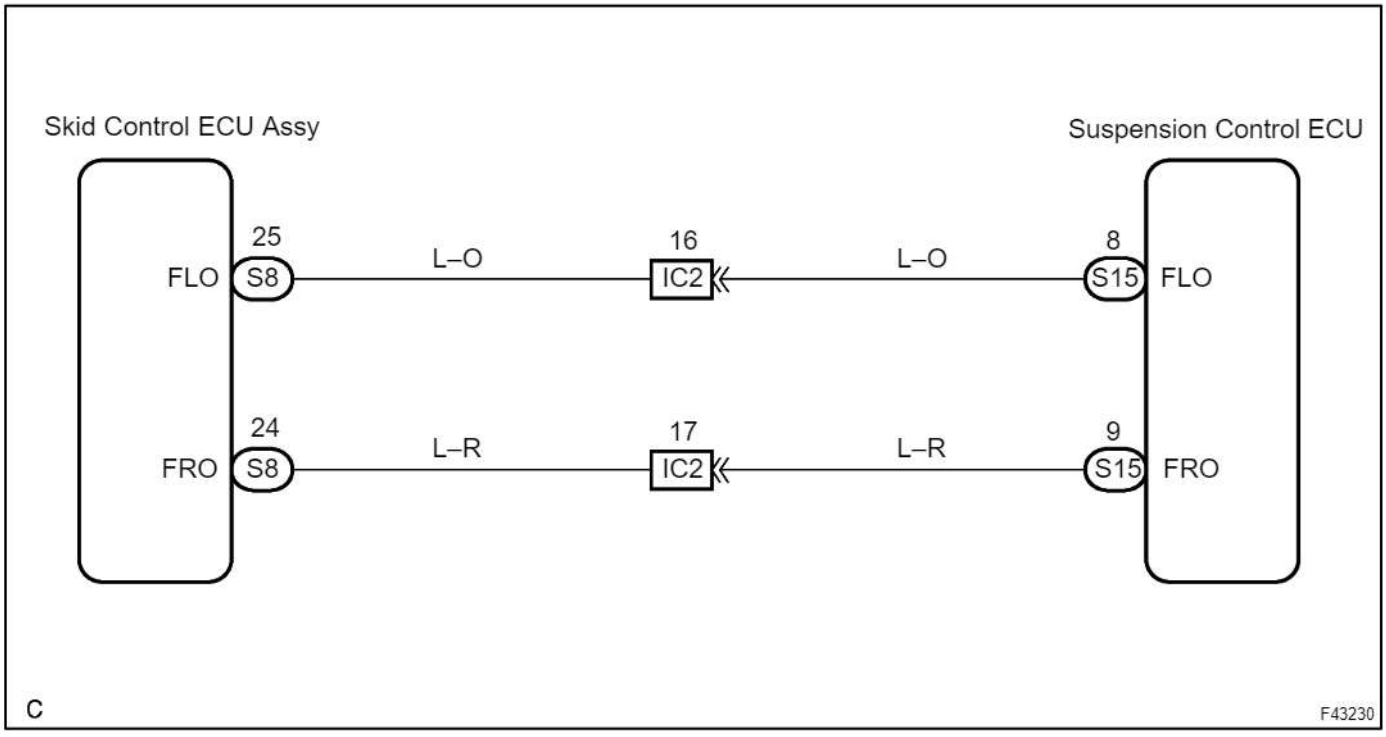
The speed sensor detects the wheel speed and transmits the appropriate vehicle speed signal to the suspension control ECU through the skid control ECU assy.

DTC No.	DTC Detecting Condition	Trouble Area
C1776/76	Speed sensor circuit malfunction.	□Speed sensor □Speed sensor circuit □Skid control ECU assy □Suspension control ECU

HINT:

When DTC C1794/94 and C1795/95 are output, follow the same procedure as DTC1776/76.

WIRING DIAGRAM



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INSPECTION PROCEDURE

HINT:
Start the inspection from step 1 when using the hand–held tester, and start from step 2 when not using the hand–held tester.

1	READ VALUE OF HAND–HELD TESTER

(a) Connect the hand–held tester to DLC3.
(b) Turn the ignition switch ON, and push the hand–held tester main switch ON.
(c) Select the item "VEHICLE SPEED" in the DATA LIST, and read its value displayed on the hand–held tester.
(d) Check that there is no difference between the speed value output from the speed sensor displayed on the hand–held tester and the speed value displayed on the speedometer when driving the vehicle.
Standard:
There is almost no difference in the displayed speed values.

HINT:
There is tolerance of | 10 % in the speedometer indication.

OK → **CHECK AND REPLACE SUSPENSION CONTROL ECU (See page 01–35)**

NG

2	CHECK DIAGNOSTIC CODE OUTPUT

(a) Check if the normal code is output by ABS (See page 05–803).

NG → **REPAIR CIRCUIT INDICATED BY OUTPUT CODE**

OK

3	CHECK HARNESS AND CONNECTOR(SUSPENSION CONTROL ECU – SKID CONTROL ECU ASSY)

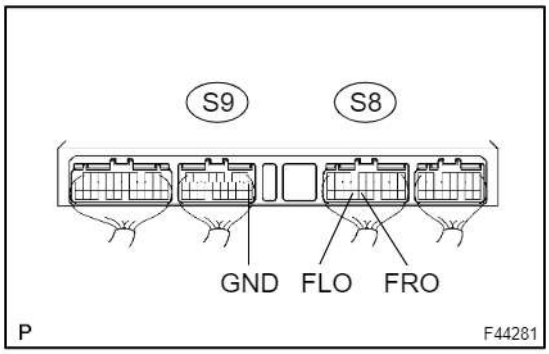
(a) Check for open and short circuit in the harness and the connector between the suspension control ECU and the skid control ECU assy (See page 01–35).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

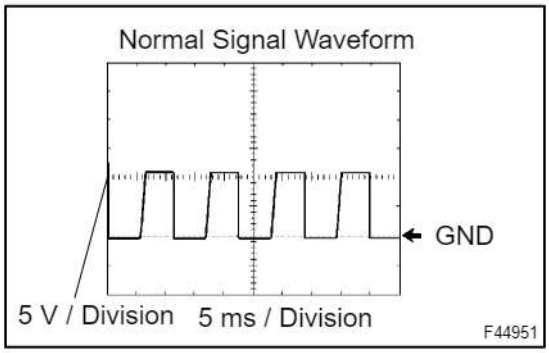
OK

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4	INSPECT SKID CONTROL ECU ASSY(FLO OUTPUT, FRO OUTPUT)



(a) Remove the skid control ECU with connector being connected.
(b) Turn the ignition switch ON.
(c) Connect an oscilloscope to between terminal S8–25 (FLO) and S9–8 (GND) and between terminal S8–24 (FRO) and S9–8 (GND) of the skid control ECU harness side connector.



(d) Drive the vehicle with about 20 km/h (12 mph), and check the signal waveform.
Standard:
Signal waveform appears as shown in the illustration.

HINT:
As the engine speed becomes higher, the waveform cycle gets shorter.

NG → **CHECK AND REPLACE SKID CONTROL ECU ASSY (See page 01–35)**

OK

CHECK AND REPLACE SUSPENSION CONTROL ECU (See page 01–35)

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DTC	C1779/79	CRANKSHAFT POSITION SENSOR CIRCUIT

DTC	C1797/97	CRANKSHAFT POSITION SENSOR CIRCUIT

CIRCUIT DESCRIPTION

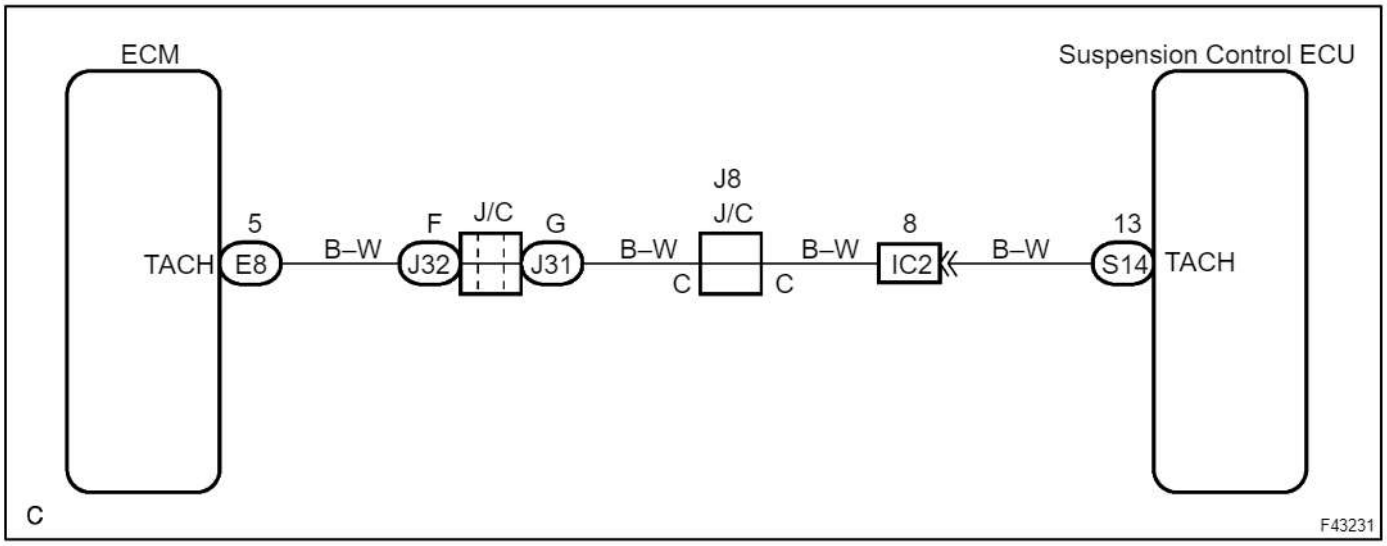
The suspension control ECU receives the engine speed signal from ECM.

DTC No.	DTC Detecting Condition	Trouble Area
C1779/79	TACH signal is not sent to suspension control ECU, and the vehicle is driven for 10 sec. or more at the speed of 30 km/h or higher.	□Crankshaft position sensor □Crankshaft position sensor circuit □ECM □Suspension control ECU

HINT:

When DTC C1797/97 is output, follow the same procedure as that of DTC1779/79.

WIRING DIAGRAM



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INSPECTION PROCEDURE

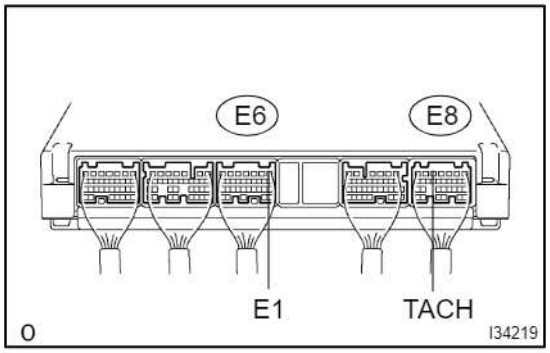
1	CHECK HARNESS AND CONNECTOR(SUSPENSION CONTROL ECU – ECM)

(a) Check for open and short circuit in the harness and the connector between the suspension control ECU and ECM (See page 01–35).

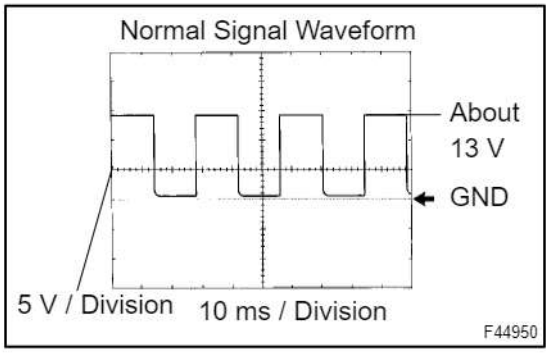
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

2	INSPECT ECM(TACH OUTPUT)



(a) Remove the ECM with connectors being connected.
(b) Turn the ignition switch ON.
(c) Connect an oscilloscope to terminal E8–5 (TACH) and E6–1 (E1) of the ECM harness side connector.



(d) With the engine idling, check the signal waveform.
Standard:
Signal waveform appears as shown in the illustration.

HINT:
As the engine speed becomes higher, the waveform cycle gets shorter.

NG → **CHECK AND REPLACE ECM (See page 01–35)**

OK

CHECK AND REPLACE SUSPENSION CONTROL ECU (See page 01–35)

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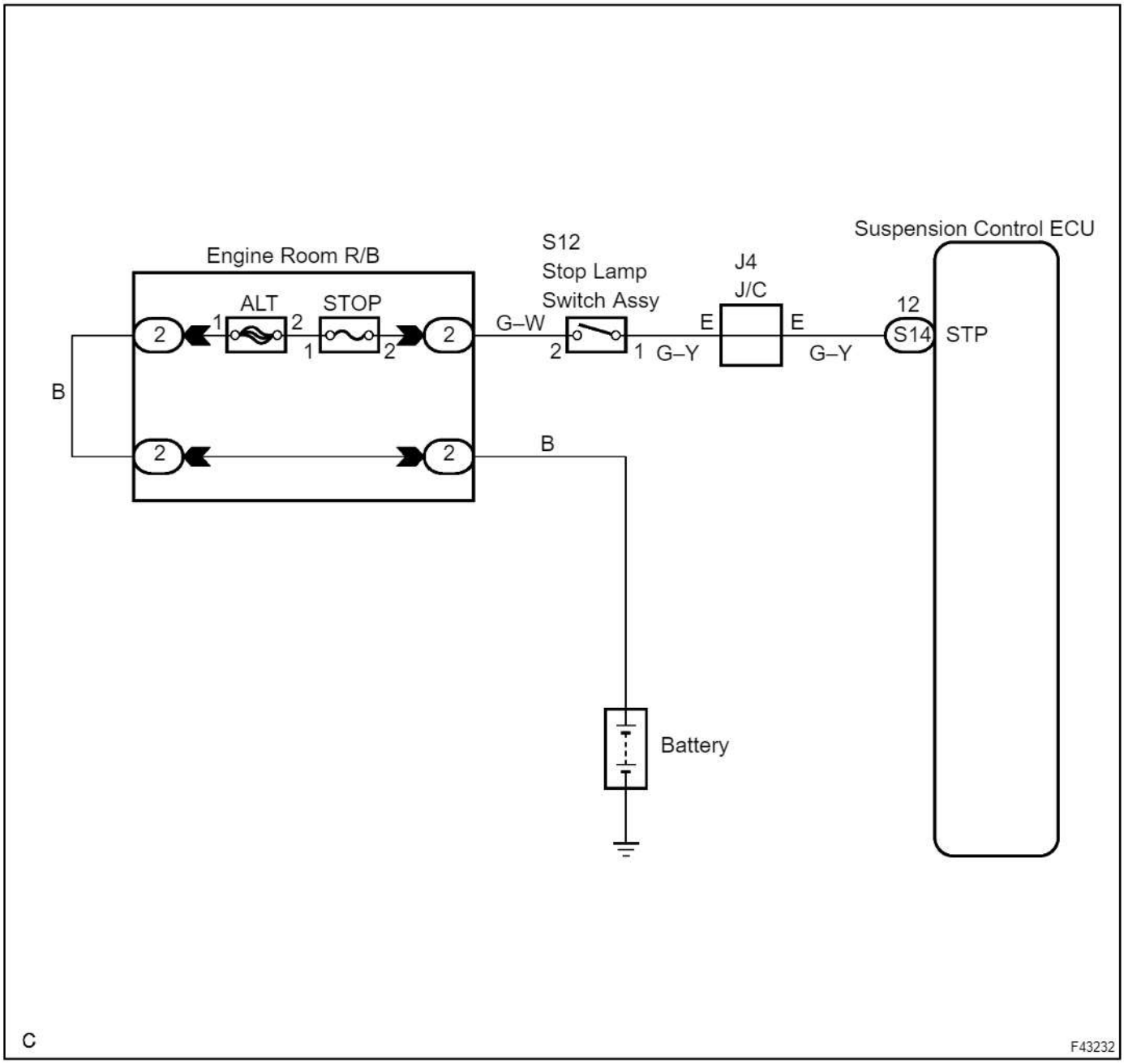
DTC C1782/82 STOP LIGHT SWITCH CIRCUIT

CIRCUIT DESCRIPTION

When the brake pedal is depressed, the stop lamp comes on and the signal is input to the STP terminal of the suspension control ECU.

DTC No.	DTC Detecting Condition	Trouble Area
C1782/82	The signal from the stop lamp switch assy does not change.	□Stop lamp switch assy □Stop light switch circuit □Suspension control ECU

WIRING DIAGRAM



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INSPECTION PROCEDURE

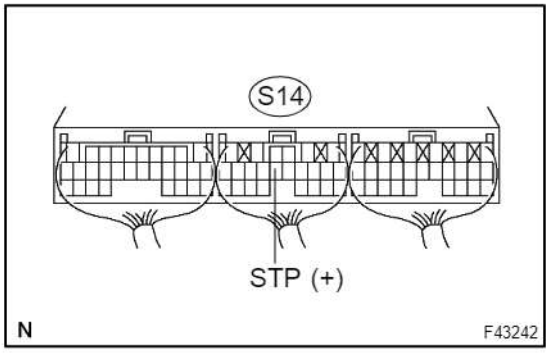
1	INSPECT STOP LAMP

(a) Check that the stop lamp comes on when the brake pedal is depressed and goes off when the brake pedal is released.

NG → **Go to step 3**

OK

2	INSPECT SUSPENSION CONTROL ECU



(a) Remove the suspension control ECU with connectors being connected.
(b) Measure voltage between terminal S14–12 (STP) of the suspension control ECU and body ground when stop lamp switch assy switch is ON and OFF.

Standard:

Switch condition	Voltage
ON	10 to 14 V
OFF	Below 1.5 V

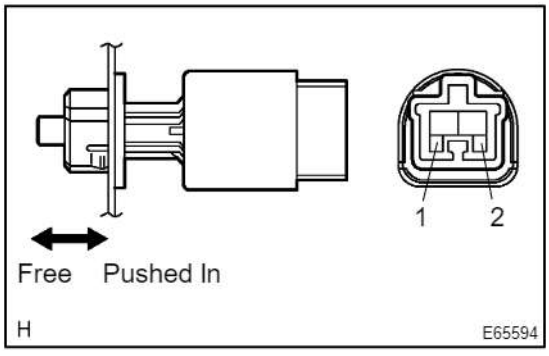
HINT:
NG:
Repair or replace the harness or the connector between the stop lamp switch assy and the suspension control ECU.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE SUSPENSION CONTROL ECU (See page 01–35)

3	INSPECT STOP LAMP SWITCH ASSY



(a) Disconnect the stop lamp switch assy connector.
(b) Check continuity between terminal 1 and 2 of the stop lamp switch assy.

Standard:

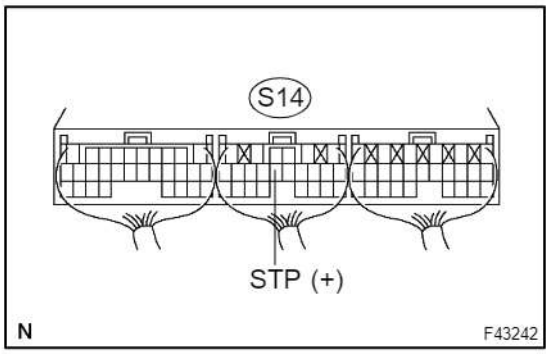
Switch condition	Tester connection	Specification
Switch pin free	1 – 2	No continuity
Switch pin pushed in	1 – 2	Continuity

NG → **REPLACE STOP LAMP SWITCH ASSY**

OK

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4	INSPECT SUSPENSION CONTROL ECU



(a) Remove the suspension control ECU with connectors being connected.

(b) Measure voltage between terminal S14–12 (STP) of the suspension control ECU and body ground when stop lamp switch assy switch pin is free and pushed in.

Standard:

Switch condition	Voltage
Switch pin free	10 to 14 V
Switch pin pushed in	Below 1.5 V

HINT:

NG:

Repair or replace the harness or the connector between the STOP fuse and the suspension control ECU.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE SUSPENSION CONTROL ECU (See page 01–35)

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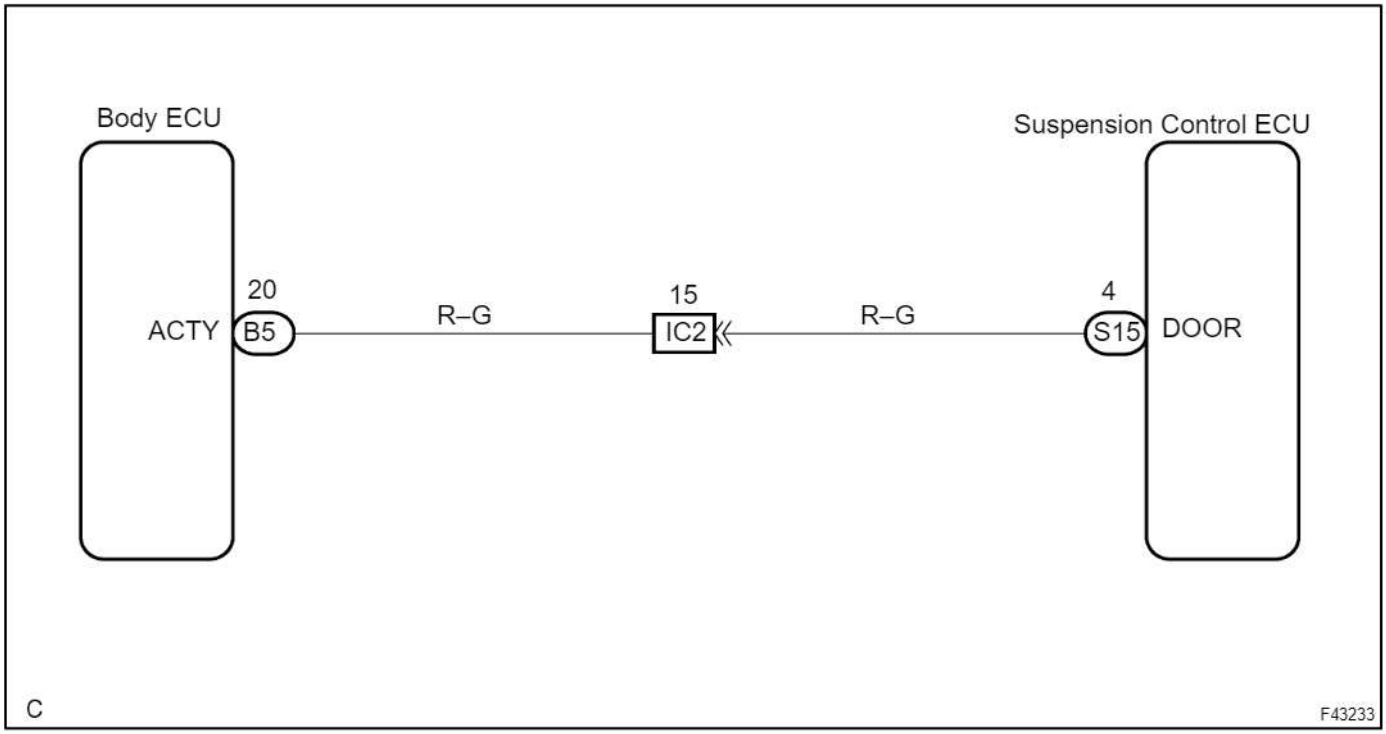
DTC C1783/83 DOOR COURTESY SWITCH CIRCUIT

CIRCUIT DESCRIPTION

The door courtesy switch is turned on, when the door is opened and turned off when the door is closed. The signal is sent from the body ECU into the DOOR terminal of the suspension control ECU when all the doors are open.

DTC No.	DTC Detecting Condition	Trouble Area
C1783/83	Door courtesy switch signal does not change.	□Door courtesy switch □w/ Motor back door assy □Door courtesy switch circuit □Body ECU □Back door ECU □Suspension control ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT COURTESY LAMP SWITCH

(a) Check that the open door warning light comes on when each door and back door is opened and goes off when all the doors are closed.

NG → **CHECK OPEN DOOR WARNING LIGHT CIRCUIT (See page 71–1)**

OK

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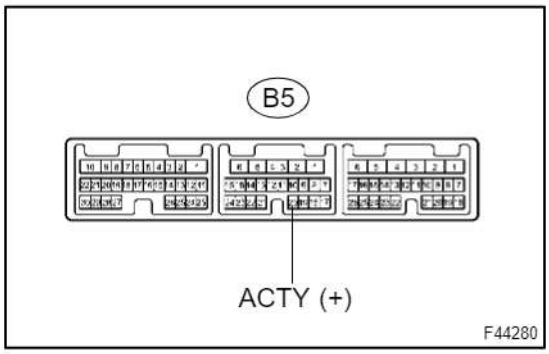
2	CHECK HARNESS AND CONNECTOR(SUSPENSION CONTROL ECU – BODY ECU)

(a) Check for open and short circuit in the harness and the connector between the suspension control ECU and the body ECU assy (See page 01–35).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

3	INSPECT MULTIPLEX NETWORK BODY ECU(ACTY OUTPUT)



(a) Remove the multiplex network body ECU with connectors being connected.

(b) Measure voltage between terminal B5–20 (ACTY) and body ground of the multiplex network body ECU when door is opened and closed.

Standard:

Door condition	Voltage
Each door opened	Below 1.5 V
All door closed	10 to 14 V

NG → CHECK AND REPLACE INSTRUMENT PANEL JUNCTION BLOCK ASSY

OK

CHECK AND REPLACE SUSPENSION CONTROL ECU (See page 01–35)

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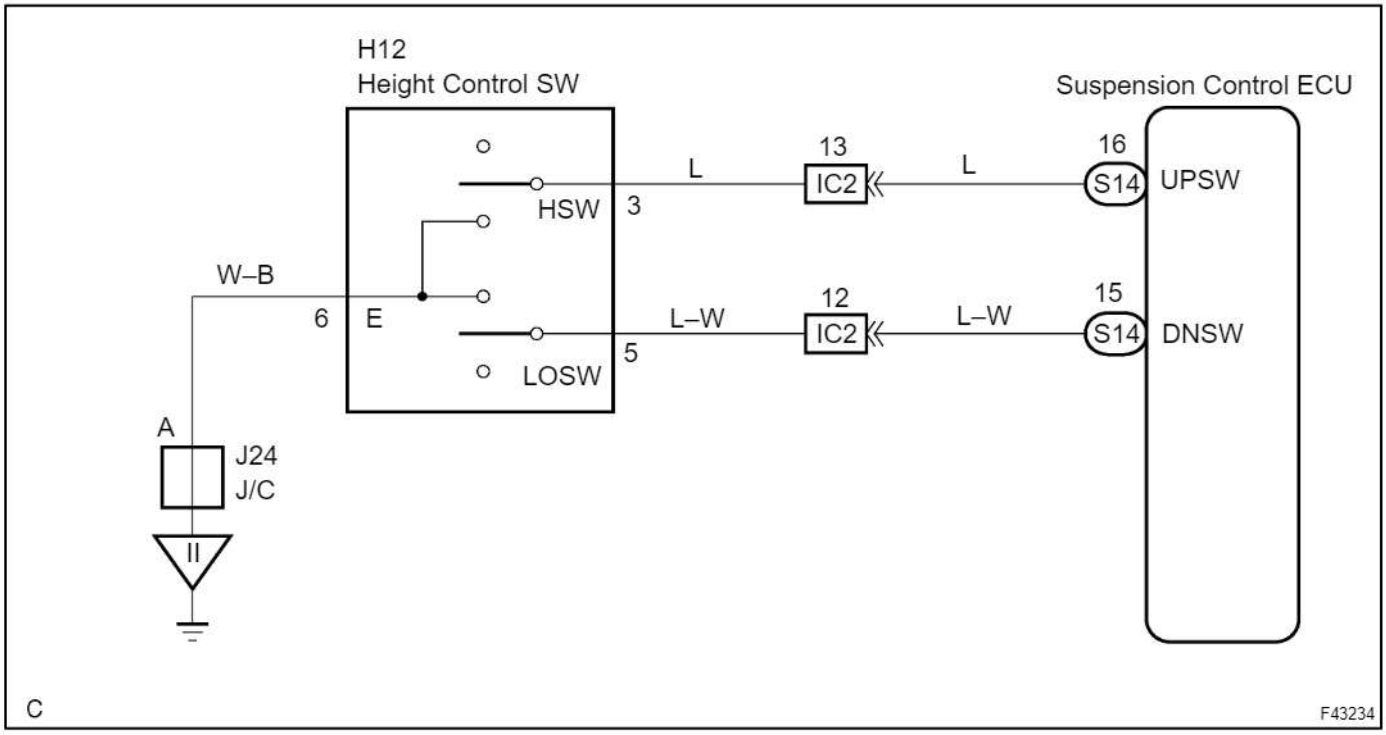
DTC C1786/86 HEIGHT CONTROL SWITCH CIRCUIT

CIRCUIT DESCRIPTION

Vehicle height can be chosen by pressing the height control switch.
By pressing "UP" side, vehicle height goes up.
By pressing "DOWN" side, vehicle height goes down.

DTC No.	DTC Detecting Condition	Trouble Area
C1786/86	Height control switch signal does not change.	□Height control switch □Height control switch circuit □Suspension control ECU

WIRING DIAGRAM



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INSPECTION PROCEDURE

HINT:

Start the inspection from step 1 when using the hand–held tester and start from step 2 when not using the hand–held tester.

1	READ VALUE OF HAND–HELD TESTER

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON, and turn the hand–held tester main switch ON.
(c) Select the item "HEIGHT SW DOWN" or "HEIGHT SW UP" in the DATA LIST, and read its value displayed on the hand–held tester.
(d) Check that the value displayed on the hand–held tester changes by pressing the height control switch "UP" and "DOWN".

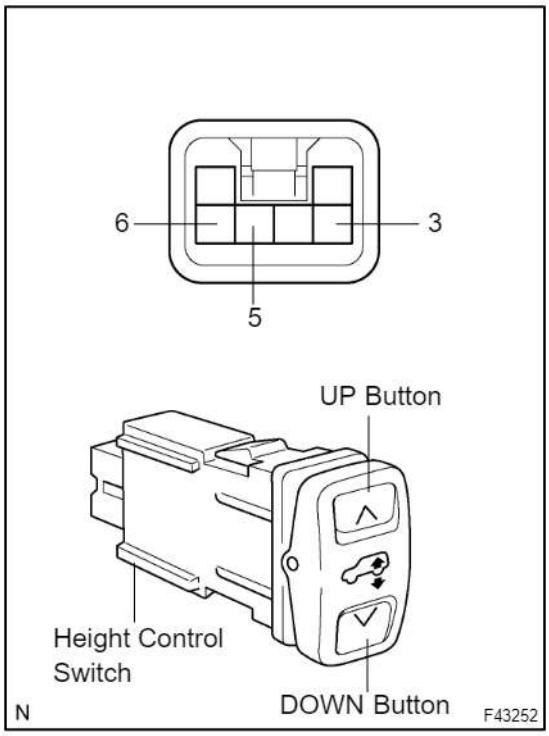
Standard:

Height control switch value changes.

OK → **CHECK AND REPLACE SUSPENSION CONTROL ECU (See page 01–35)**

NG

2	INSPECT HEIGHT CONTROL SWITCH



(a) Remove the height control switch connector.
(b) Check continuity between each terminal of the height control switch when height control switch is "UP" and "DOWN".

Standard:

Tester connection	Switch condition	Specification
"UP" button	3 – 6	Continuity
"DOWN" button		No continuity
"UP" button	5 – 6	No continuity
"DOWN" button		Continuity

NG → **REPLACE HEIGHT CONTROL SWITCH**

OK

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3	CHECK HARNESS AND CONNECTOR(HEIGHT CONTROL SWITCH – SUSPENSION CONTROL ECU)

(a) Check for open and short circuit in the harness and the connector between the height control switch and the suspension control ECU (See page 01–35).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

CHECK AND REPLACE SUSPENSION CONTROL ECU (See page 01–35)

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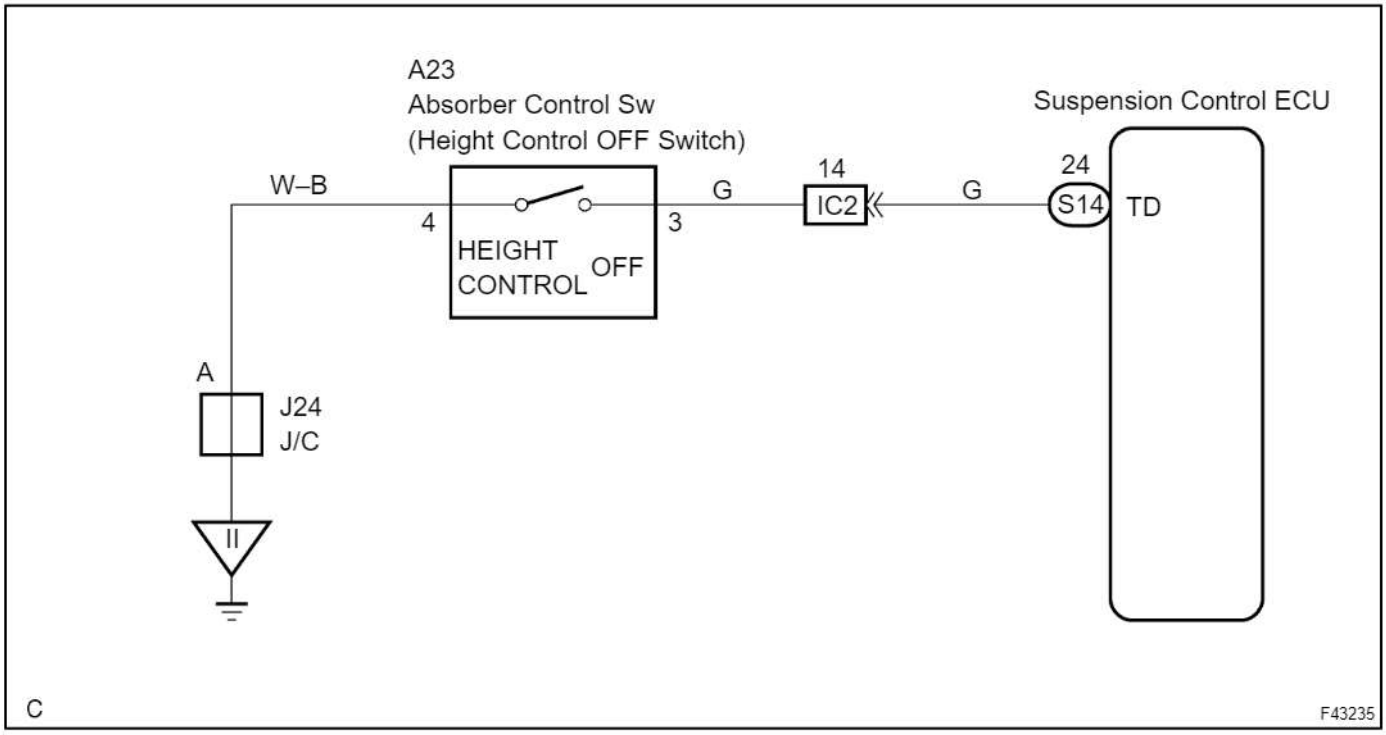
DTC C1788/88 HEIGHT CONTROL OFF SWITCH CIRCUIT

CIRCUIT DESCRIPTION

Height control can be operated or suspended by pressing the height control OFF switch.
By pressing the switch once, height control is suspended.
By pressing the switch one more time, height control is operated.

DTC No.	DTC Detecting Condition	Trouble Area
C1788/88	Height control OFF switch signal does not change.	□Height control OFF switch □Height control OFF switch circuit □Suspension control ECU

WIRING DIAGRAM



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INSPECTION PROCEDURE

HINT:
Start the inspection from step 1 when using the hand–held tester and start from step 2 when not using the hand–held tester.

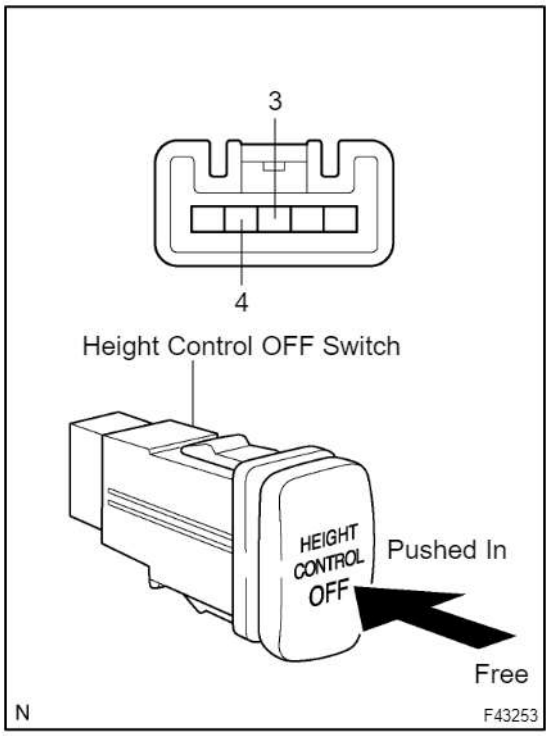
1	READ VALUE OF HAND–HELD TESTER

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch to ON, and turn the hand–held tester main switch ON.
(c) Select the item "HEIGHT SW HOLD" in the DATA LIST, and read its value displayed on the hand–held tester.
(d) Check that the value displayed on the hand–held tester changes by pressing the height control OFF switch.
Standard:
Height control OFF switch value changes.

NG → **CHECK AND REPLACE SUSPENSION CONTROL ECU (See page 01–35)**

OK

2	INSPECT HEIGHT CONTROL OFF SWITCH



(a) Disconnect the height control OFF switch connector.
(b) Check continuity between terminal 3 and 4 of the height control OFF switch when height control OFF switch is pushed in and free.
Standard:

Switch condition	Specification
Pushed in	Continuity
Free	No continuity

NG → **REPLACE HEIGHT CONTROL OFF SWITCH**

OK

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3	CHECK HARNESS AND CONNECTOR(HEIGHT CONTROL OFF SWITCH – SUSPENSION CONTROL ECU)

(a) Check for open and short circuit in the harness and the connector between the height control OFF switch and the suspension control ECU (See page 01–35).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

CHECK AND REPLACE SUSPENSION CONTROL ECU (See page 01–35)

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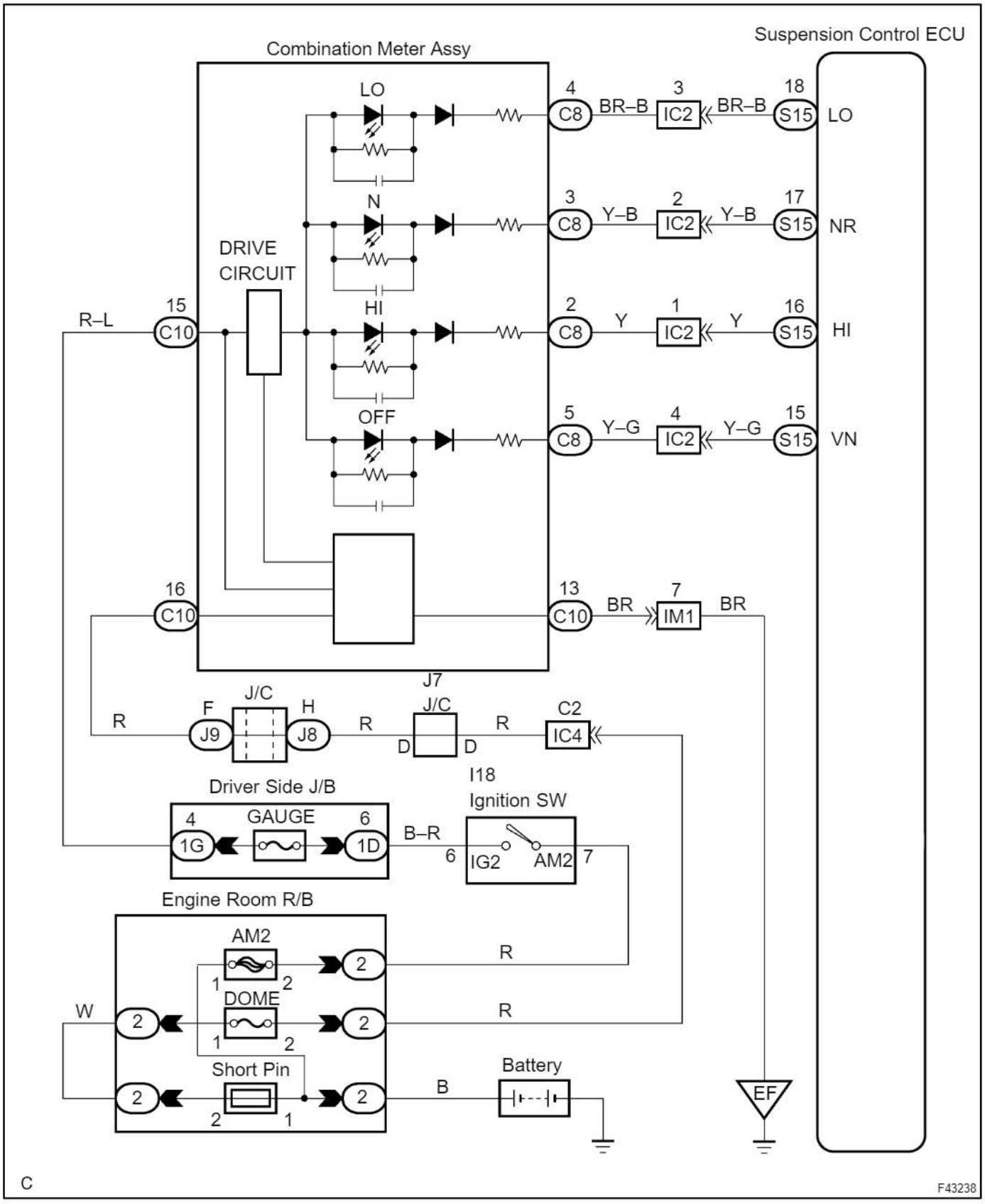
HEIGHT CONTROL INDICATOR LAMP CIRCUIT

CIRCUIT DESCRIPTION

The height control indicator lamp indicates the target height, not the actual height.
It blinks when the height control is operation by pressing the height control switch and stays on when the operation is completed.

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WIRING DIAGRAM



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INSPECTION PROCEDURE

1	INSPECT HEIGHT CONTROL INDICATOR LAMP

HINT:
See combination meter troubleshooting on page 71–1.

NG → REPAIR OR REPLACE BULB OR COMBINATION METER ASSEMBLY

OK

2	CHECK HARNESS AND CONNECTOR(SUSPENSION CONTROL ECU – COMBINATION METER ASSY)

(a) Check for open and short circuit in the harness and the connector between the suspension control ECU and the combination meter assy (height control indicator lamp) (See page 01–35).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

CHECK AND REPLACE SUSPENSION CONTROL ECU (See page 01–35)

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HEIGHT CONTROL OFF INDICATOR LAMP CIRCUIT

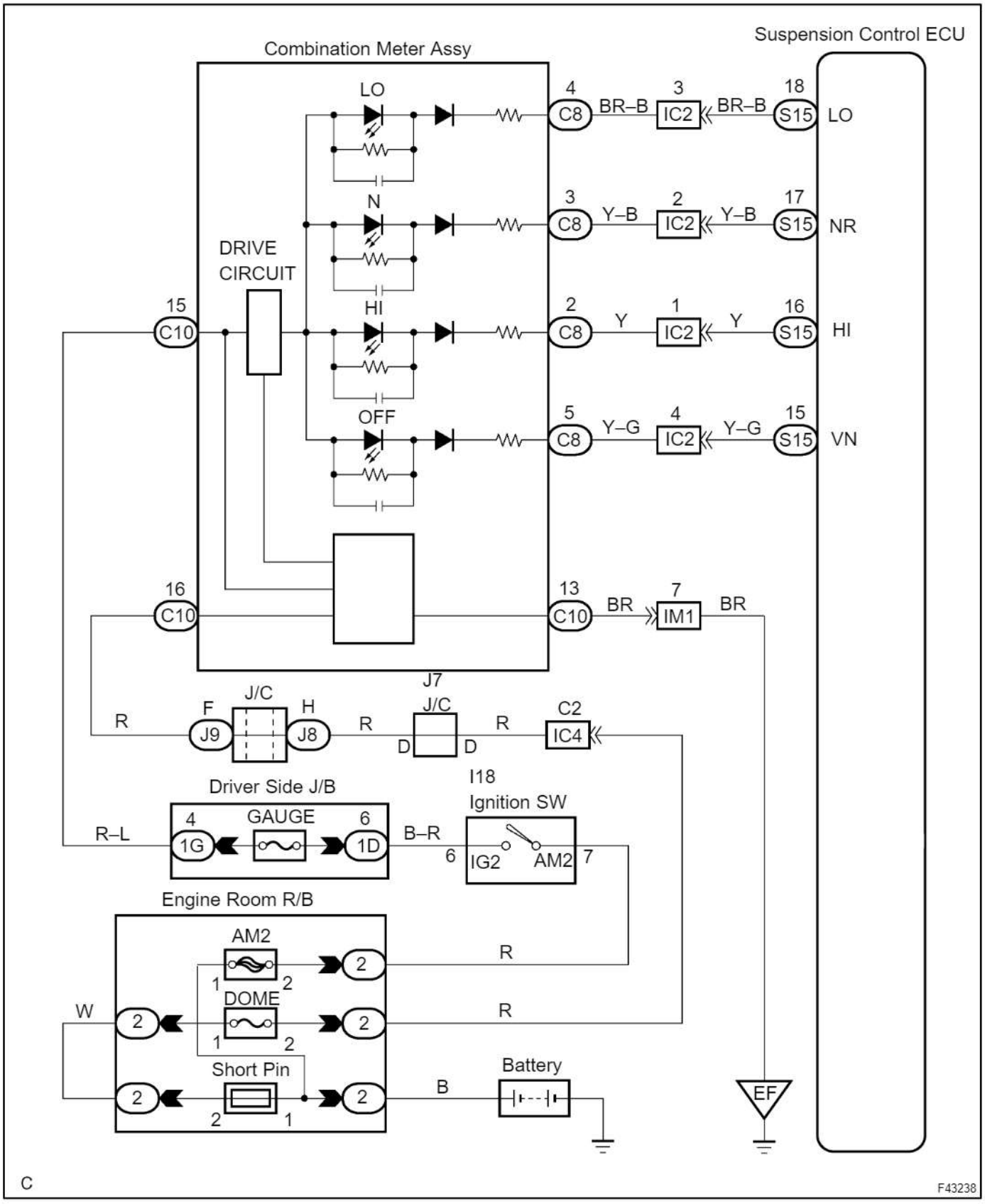
CIRCUIT DESCRIPTION

If the suspension control ECU detects a problem, the height control OFF indicator lamp comes on while suspending the height control function at the same time. At this time, the suspension control ECU records a DTC in the memory.

Connect terminal TC and CG of the DLC3 to make the height control OFF indicator lamp flush and output DTC.

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WIRING DIAGRAM



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INSPECTION PROCEDURE

1	INSPECT HEIGHT CONTROL OFF INDICATOR LAMP OPERATION

(a) Turn the ignition switch to ON, and inspect the height control OFF indicator lamp.
Result:
A: Height control OFF indicator lamp does not come on
B: Height control OFF indicator lamp flushes

B	Go to step 4

A

2	INSPECT HEIGHT CONTROL OFF INDICATOR LAMP

HINT:
See combination meter troubleshooting on page 71–1.

NG	REPAIR OR REPLACE BULB OR COMBINATION METER ASSEMBLY

OK

3	CHECK HARNESS AND CONNECTOR(SUSPENSION CONTROL ECU – COMBINATION METER ASSY)

(a) Check for open and short circuit in the harness and the connector between the suspension control ECU and the combination meter assy (height control OFF indicator lamp) (See page 01–35).

NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

CHECK AND REPLACE SUSPENSION CONTROL ECU (See page 01–35)

4	CHECK SUSPENSION CONTROL ECU CONNECTORS SECURELY CONNECTED

NO	CONNECT CONNECTOR TO ECU

YES

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5	RECONFIRM DTC

(a) Clear and check DTC (See page 05–727).
Result:

Normal code	A
Malfunction code	B

B → **REPAIR CIRCUIT INDICATED BY OUTPUT CODE**

A

6	CHECK HARNESS AND CONNECTOR(SUSPENSION CONTROL ECU – COMBINATION METER ASSY)

(a) Check for open and short circuit in the harness and the connector between the suspension control ECU and the combination meter assy (height control OFF indicator lamp) (See page 01–35).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE SUSPENSION CONTROL ECU (See page 01–35)

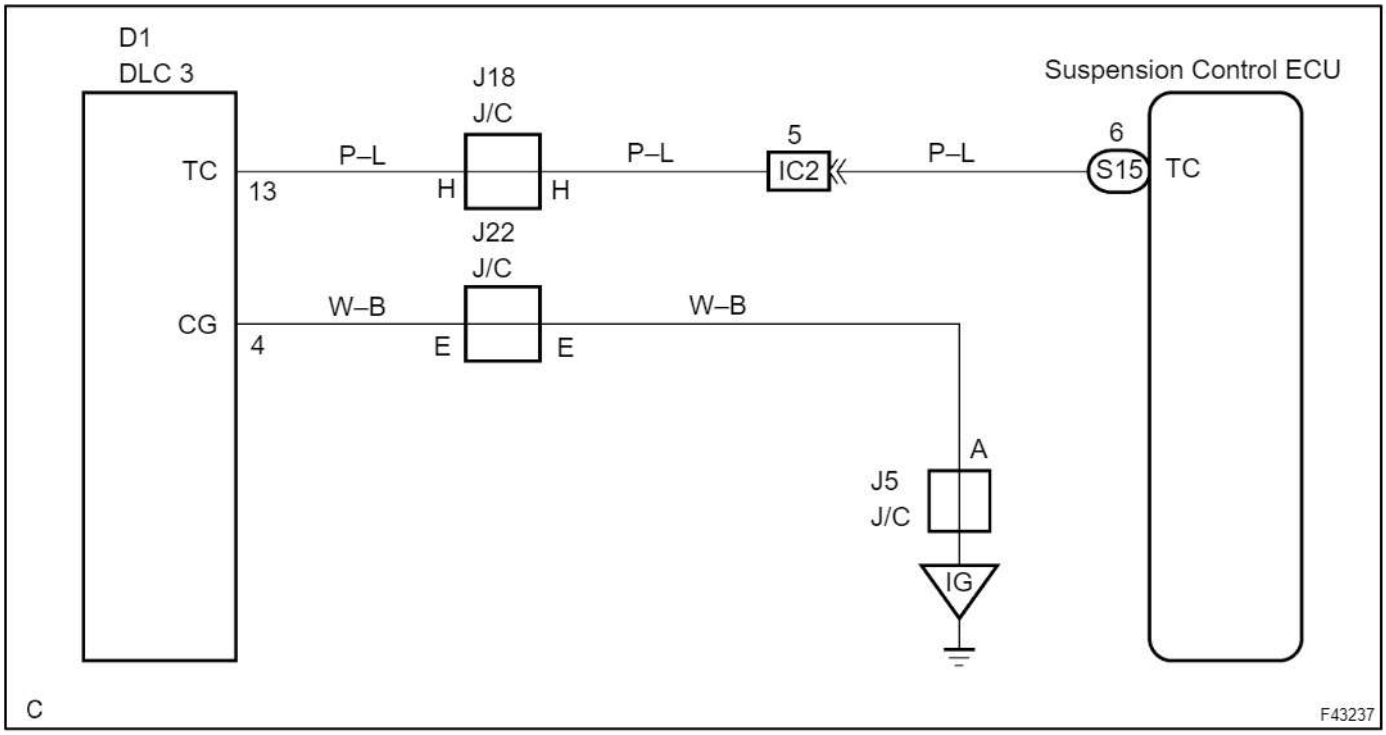
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TC TERMINAL CIRCUIT

CIRCUIT DESCRIPTION

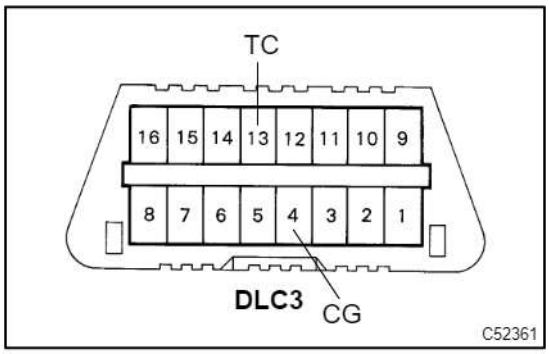
DTC is output when there is a short circuit between terminal TC and CG of DLC3.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT DLC3 TERMINAL VOLTAGE(TC TERMINAL)



(a) Turn the ignition switch ON.
(b) Measure voltage between terminal TC and CG of DLC3.
Standard:
10 to 14 V

OK	Go to step 3

NG

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2	CHECK HARNESS AND CONNECTOR(DLC3 – BODY GROUND)

(a) Check for open and short circuit in the harness and the connector between terminal CG of DLC3 and body ground (See page 01–35).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

3	CHECK HARNESS AND CONNECTOR(DLC3 – SUSPENSION CONTROL ECU)

(a) Check for open and short circuit in the harness and the connector between terminal TC of DLC3 and the suspension control ECU (See page 01–35).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

CHECK AND REPLACE SUSPENSION CONTROL ECU (See page 01–35)

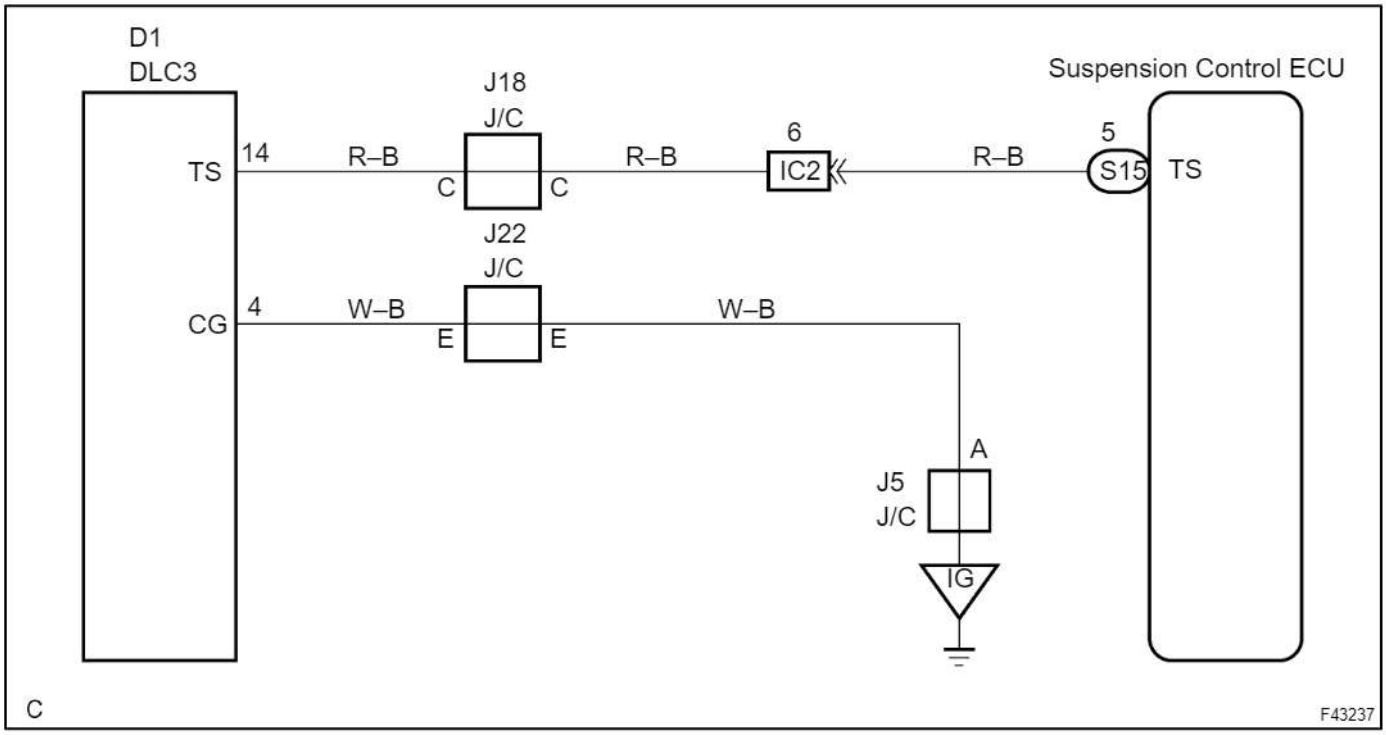
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TS TERMINAL CIRCUIT

CIRCUIT DESCRIPTION

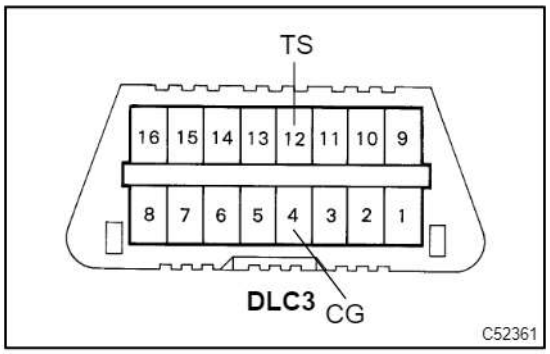
After making short circuit between terminal TS and CG of DLC3 with the ignition switch turned OFF, the mode will change from normal mode to test mode when the ignition switch is turned to ON, and then DTC is output. After the ignition switch is turned ON, there will be DTC output.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT DLC3 TERMINAL VOLTAGE(TS TERMINAL)



(a) Turn the ignition switch ON.
(b) Measure voltage between terminal TS and CG of DLC3.
Standard:
10 to 14 V

OK → **Go to step 3**

NG

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2	CHECK HARNESS AND CONNECTOR(DLC3 – BODY GROUND)

(a) Check for open and short circuit in the harness and the connector between terminal CG of DLC3 and body ground (See page 01–35).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

3	CHECK HARNESS AND CONNECTOR(DLC3 – SUSPENSION CONTROL ECU)

(a) Check for open and short circuit in the harness and the connector between terminal TS of DLC3 and the suspension control ECU (See page 01–35).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

CHECK AND REPLACE SUSPENSION CONTROL ECU (See page 01–35)

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ABS WITH EBD & BA & TRAC & VSC SYSTEM (From November, 2002)

HOW TO PROCEED WITH TROUBLESHOOTING

0529D-06

1	Vehicle Brought to Workshop

2	Customer Problem Analysis (See page 05–801)

3	CHECK DTC and Freeze Frame Date (See page 05–803)

4	Check and Clear DTCs and Freeze Frame Data (See page 05–803)

5	Problem Symptom Confirmation

- Symptom does not occur: Go to step 6
- Symptom occur: Go to step 7

6	Symptom Simulation (See page 01–25)

7	DTC Check (See page 05–803)

- DTC is not output: Go to step 8
- DTC is output: Go to step 9

8	Problem Symptoms Table (See page 05–825)

- Check fof fluid leakage and Go to step 10

9	DTC Chart (See page 05–815)

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10	Circuit Inspection (See page 05–827 – 05–932)

11	Identification of Problem

12	Repair

13	Comfirmation Test

End

HINT:
Step 3, 4, 7, 10:
Diagnostic steps permitting the use of the hand–held tester.
Fail safe function:
When a failure occurs in the ABS & BA & TRAC & VSC systems, the ABS warning light, the VSC warning light and the VSC OFF indicator light are lit and the ABS & BA & TRAC & VSC operations are prohibited. In addition to this, when the failure that disables the EBD operation occurs, the brake warning light is lit as well and the EBD operation is prohibited.

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052AX-06

CUSTOMER PROBLEM ANALYSIS CHECK

ABS & EBD & BA Check Sheet

Inspector's Name :

Customer's Name		**VIN**	
		Production Date	/ /
		Licence Plate No.	
Date Vehicle Brought In	/ /	**Odometer Reading**	km miles

Date Problem First Occurred	/ /
Frequency Problem Occurs	☐ Continuously ☐ Intermittently (times a day)

Symptoms	☐ ABS does not operate.	
	☐ ABS does not operate efficiently.	
	☐ BA does not operate.	
	☐ EBD does not operate.	
	ABS Warning Light Abnormal	☐ Remains ON ☐ Does not Light Up
	Brake Warning Light Abnormal (PKB released)	☐ Remains ON ☐ Does not Light Up

DTC Check	**1st Time**	☐ Normal Code ☐ Malfunction Code (Code)
	2nd Time	☐ Normal Code ☐ Malfunction Code (Code)

Freeze Frame Data	STOP LIGHT SW	☐ ON ☐ OFF
	SYSTEM	☐ NO SYS ☐ ABS ☐ BA ☐ FAIL SF
	#IG ON	
	VEHICLE SPD	km/h MPH

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TRAC & VSC Check Sheet

Inspector's Name :

Customer's Name		**VIN**	
		Production Date	/ /
		Licence Plate No.	
Date Vehicle Brought In	/ /	**Odometer Reading**	km miles

Date Problem First Occurred	/ /
Frequency Problem Occurs	☐ Continuous ☐ Intermittent (times a day)

Symptoms	☐ TRAC does not operate. (Wheels spin when starting rapidly.)	
	☐ VSC does not operate. (Wheels sideslip at the time of sharp turning.)	
	TRAC OFF Indicator Light Abnormal	☐ Remains ON ☐ Does not Light Up
	VSC Warning Indicator Abnormal	☐ Displays ☐ Does not Display
	SLIP Indicator Light Abnormal	☐ Remains ON ☐ Does not Light Up
	Skid Control Buzzer Abnormal	☐ Sounds ☐ Does not Sound

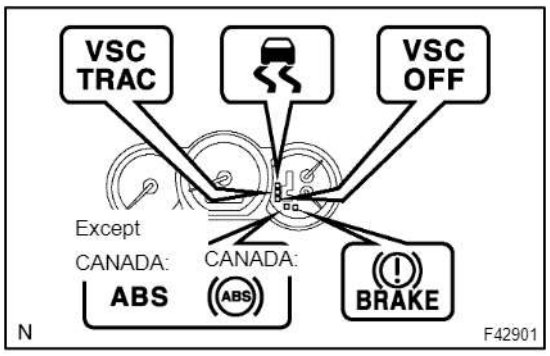
Check Item	**ABS Warning Light**	☐ Normal ☐ Malfunction Code (Code)
	Malfunction Indicator Light	☐ Normal ☐ Malfunction Code (Code)

DTC Check	**1st Time**	☐ Normal Code ☐ Malfunction Code (Code)
	2nd Time	☐ Normal Code ☐ Malfunction Code (Code)

Freeze Frame Data	VSC/TRC OFF SW	☐ ON ☐ OFF
	SYSTEM	☐ VSC/TRC
	SHIFT POSITION	☐ P,N ☐ 2 ☐ R ☐ 3 ☐ D ☐ 4 ☐ L ☐ FAIL
	STEERING ANG	deg
	YAW RAT	deg/s
	MAS CYL PRESS	V
	THROTTLE	deg
	MAS PRESS GRADE	MPa/s
	G (RIGHT&LEFT)	G
	G	G

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052AY-06



PRE–CHECK

1. DIAGNOSIS SYSTEM

(a) Check the warning lights and buzzer.

(1) Release parking brake pedal.

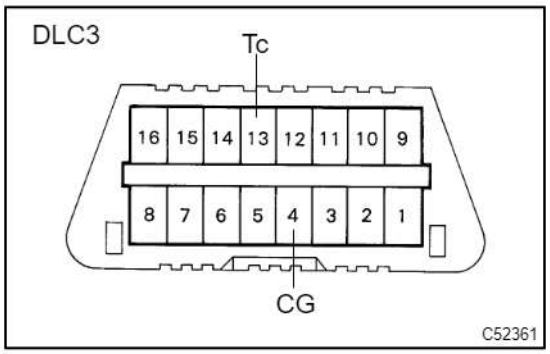
(2) When the ignition switch is turned ON, check that the ABS warning light, BRAKE warning light, VSC warning light, VSC OFF indicator light, SLIP indicator light and DAC indicator light goes on for approx. 3 seconds.

(3) When depressing the brake pedal repeatedly it may turn on the BRAKE warning light and buzzer.

HINT:

- When the parking brake is applied or the level of the brake fluid is low, the BRAKE warning light is lit.
- If the ECU stores DTC, ABS warning light , VSC warning light and VSC OFF indicator light is ON.
- If the indicator check result is not normal, proceed to troubleshooting for the light circuit.

Trouble Area	See page
ABS warning light circuit	05–914
BRAKE warning light circuit	05–923
VSC warning light circuit	05–916
TRAC OFF indicator light circuit	05–918
VSC OFF indicator light circuit	05–921
SLIP indicator light circuit	05–926
Skid control buzzer	05–928



(b) In case of not using hand–held tester:
Check the DTC.

(1) Using SST, connect terminals Tc and CG of DLC3.
SST 09843–18040

(2) Turn the ignition switch ON.

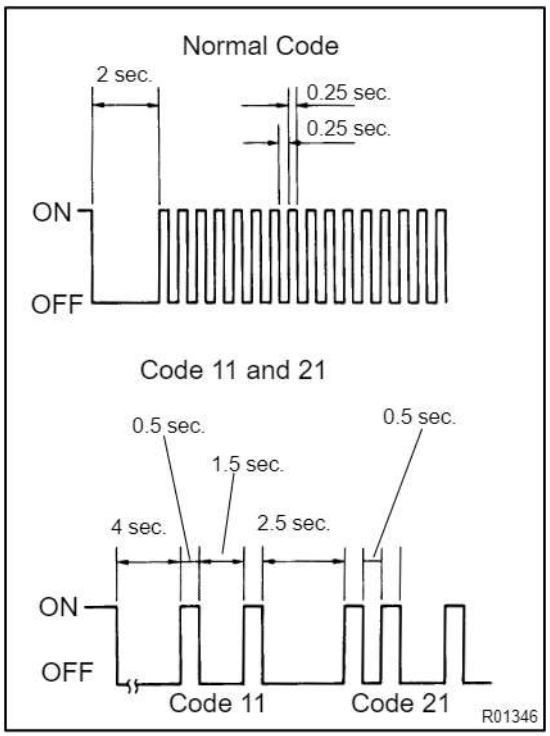
(3) Read the DTC from the ABS warning light or VSC warning light on the combination meter.

HINT:

- If no code appears, inspect the diagnostic circuit, ABS warning light circuit or VSC warning light circuit.

Trouble Area	See page
Tc terminal circuit	05–930
ABS warning light circuit	05–914
VSC warning light circuit	05–916

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□ As an example, the blinking patterns for the normal code and codes 11 and 21 are shown on the left.

(4) Codes are explained in the code table on page 05–815.

(5) After completing the check, disconnect terminal Tc and CG of DLC3, and turn off the display.

If 2 or more malfunctions are detected at the same time, the lowest numbered DTC will be displayed 1st.

(c) In case of using the hand–held tester:

Check the DTC.

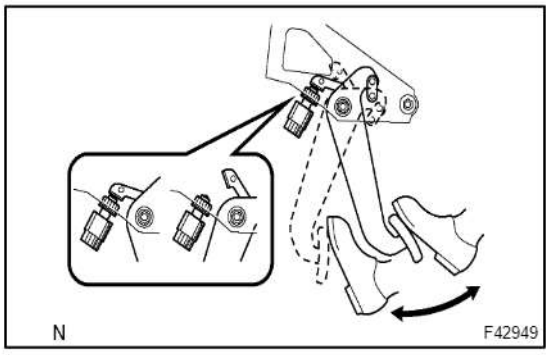
(1) Hook up the hand–held tester to the DLC3.

(2) Turn the ignition switch ON.

(3) Read the DTC by following the prompts on the tester screen.

HINT:

Please refer to the hand–held tester operator's manual for further details.



(d) In case of not using hand–held tester:

Clear the DTC.

(1) Using SST, connect the terminals Tc and CG of the DLC3.

SST 09843–18040

(2) Turn the ignition switch ON.

(3) Clear DTC stored in ECU by depressing the brake pedal 8 or more times within 5 sec.

(4) Check that the ABS warning light and VSC warning light shows the normal code.

(5) Remove the SST from the DLC3.

SST 09843–18040

HINT:

Disconnect the battery cable during repairs will not erase the DTC in the ECU.

(e) In case of using hand–held tester:

Clear the DTC.

(1) Turn the ignition switch ON.

(2) Operate the hand–held tester to erase the codes.

HINT:

Please refer to the hand–held tester operator's manual for further details.

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2. DATA LIST

HINT:

According to the DATA LIST displayed by the hand–held tester, you can read the value of the switch, sensor, actuator and so on without parts removal. Reading the DATA LIST as a first step of troubleshooting is one of the method to shorten the labor time.

(a) Connect the hand–held tester to the DLC3.

(b) Turn the ignition switch ON.

(c) According to the display on tester, read the "DATA LIST".

Item	Measurement Item / Range (Display	Normal Condition	Diagnostic Note
HB MOT RELAY	HB motor relay / ON or OFF	–	–
ABS MOT RELAY	ABS motor relay / ON or OFF	–	–
SOL RELAY	Solenoid relay / ON or OFF	–	–
PRESS HIGH	HIGH hydraulic brake boost pressure / ON or OFF	–	–
PRESS LOW	LOW hydraulic brake boost pressure / ON or OFF	–	–
VSC / TRAC OFF SW	VSC / TRAC OFF switch / ON or OFF	–	–
IDLE SW	Main idle switch / ON or OFF	ON : Accelerator pedal released OFF : Accelerator pedal depressed	–
STOP LIGHT SW	Stop light switch / ON or OFF	ON : Brake pedal depressed OFF : Brake pedal released	–
PKB SW	Parking brake switch / ON or OFF	ON : Parking brake applied OFF : Parking brake released	–
ABS OPERT FR	ABS operation (FR) / BEFORE or OPERATE	BEFORE : No ABS operation (FR) OPERATE : During ABS operation (FR)	–
ABS OPERT FL	ABS operation (FL) / BEFORE or OPERATE	BEFORE : No ABS operation (FL) OPERATE : During ABS operation (FL)	–
ABS OPERT RR	ABS operation (RR) / BEFORE or OPERATE	BEFORE : No ABS operation (RR) OPERATE : During ABS operation (RR)	–
ABS OPERT RL	ABS operation (RL) / BEFORE or OPERATE	BEFORE : No ABS operation (RL) OPERATE : During ABS operation (RL)	–
WHEEL SPD FR	Wheel speed sensor (FR) reading / min.: 0 km/h (0 MPH, max.: 326 km/h (202 MPH)	Actual wheel speed	Speed indicated on speedometer
WHEEL SPD FL	Wheel speed sensor (FL) reading / min.: 0 km/h (0 MPH, max.: 326 km/h (202 MPH)	Actual wheel speed	Speed indicated on speedometer

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Item	Measurement Item / Range (Display	Normal Condition	Diagnostic Note
WHEEL SPD RR	Wheel speed sensor (RR) reading / min.: 0 km/h (0 MPH, max.: 326 km/h (202 MPH)	Actual wheel speed	Speed indicated on speedometer
WHEEL SPD RL	Wheel speed sensor (RL) reading / min.: 0 km/h (0 MPH, max.: 326 km/h (202 MPH)	Actual wheel speed	Speed indicated on speedometer
DECELERAT SENS	Deceleration sensor 1 reading / min.: –1.869 G, max.: 1.869 G	Approximately 0 ± 0.13G at still condition	Reading changes when vehicle is bounced
DECELERAT SENS2	Deceleration sensor 2 reading / min.: –1.869 G, max.: 1.869 G	Approximately 0 ± 0.13G at still condition	Reading changes when vehicle is bounced
IG VOLTAGE	ECU power supply voltage / NORMAL or TOO LOW	NORMAL : 9.5 V or over TOO LOW : Below 9.5 V	–
SFRR	ABS solenoid (SFRR) / ON or OFF	–	–
SFRH	ABS solenoid (SFRH) / ON or OFF	–	–
SFLR	ABS solenoid (SFLR) / ON or OFF	–	–
SFLH	ABS solenoid (SFLH) / ON or OFF	–	–
SRRR (SRR)	ABS solenoid (SRRR (SRR)) / ON or OFF	–	–
SRRH (SRH)	ABS solenoid (SRRH (SRH)) / ON or OFF	–	–
SRLR	ABS solenoid (SRLR) / ON or OFF	–	–
SRLH	ABS solenoid (SRLH) / ON or OFF	–	–
SRCF (SA1)	TRAC solenoid (SRCF (SA1)) / ON or OFF	–	–
SRCR (SA2)	TRAC solenoid (SRCR (SA2)) / ON or OFF	–	–
SRMF (SMCF, SA3)	TRAC solenoid (SRMF (SMCF, SA3)) / ON or OFF	–	–
SRMR (SMCR, STR)	TRAC solenoid (SRMR (SMCR, STR)) / ON or OFF	–	–
THROTTLE	Throttle position sensor reading / min.: 0 deg, max.: 125 deg	–	–
ENGINE SPD	Maximum revolution sensor reading / min.: 0 rpm, max.: 6000 rpm	Actual vehicle speed	Speed indicated on speedometer
VEHICLE SPD	Maximum wheel speed sensor reading / min.: 0 km/h (0 MPH), max.: 326 km/h (202 MPH)	Actual vehicle speed	Speed indicated on speedometer
YAW RATE	Yaw rate sensor reading / min.: –128 deg, max.: 127 deg	–	–

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Item	Measurement Item / Range (Display	Normal Condition	Diagnostic Note
YAW ZERO VALUE	Yaw rate sensor reading / min.: –128 deg, max.: 127 deg	–	–
STEERING ANG	Steering angle sensor reading / min.: –1152 deg, max.: 1150.875 deg	–	–
MAS CYL PRESS 1	Master cylinder pressure sensor 1 reading / min.: 0 V, max.: 5 V	When brake pedal is released : 0.3 – 0.9 V	Reading increases when brake pedal is depressed
AIR BLD SUPPORT	Air bleed support / SUPPORT or NOT SUP	w / BA : Supported w / VSC : Not supported	–
TEST MODE	Test mode / NORMAL or TEST	NORMAL : Normal mode TEST : During test mode	–
#CODES	Number of DTC recorded / min.: 0, max.: 255	Min.: 0, max.: 39	–

3. ACTIVE TEST

HINT:

Performing the ACTIVE TEST using the hand–held tester allows the relay, VSV, actuator and so on to operate without parts removal. Performing the ACTIVE TEST as a first step of troubleshooting is one of the method to shorten the labor time.

It is possible to display the DATA LIST during the ACTIVE TEST.

(a) Connect the hand–held tester to the DLC3.

(b) Turn the ignition switch ON.

(c) According to the display on tester, perform the ”ACTIVE TEST”.

HINT:

IG must be turned ON to proceed Active Test using a hand–held tester.

*1: For VSC equipped vehicles only

Item	Vehicle Condition / Test Details	Diagnostic Note
SFRR	Turns ABS solenoid (SFRR) ON / OFF	Operation of solenoid (clicking sound) can be heard
SFRH	Turns ABS solenoid (SFRH) ON / OFF	Operation of solenoid (clicking sound) can be heard
SFLR	Turns ABS solenoid (SFLR) ON / OFF	Operation of solenoid (clicking sound) can be heard
SFLH	Turns ABS solenoid (SFLH) ON / OFF	Operation of solenoid (clicking sound) can be heard
SRRR	Turns ABS solenoid (SRRR) ON / OFF	Operation of solenoid (clicking sound) can be heard
SRRH	Turns ABS solenoid (SRRH) ON / OFF	Operation of solenoid (clicking sound) can be heard
SRLR	Turns ABS solenoid (SRLR) ON / OFF	Operation of solenoid (clicking sound) can be heard
SRLH	Turns ABS solenoid (SRLH) ON / OFF	Operation of solenoid (clicking sound) can be heard

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Item	Vehicle Condition / Test Details	Diagnostic Note
SRCF (SA1)	Turns TRAC solenoid SRCF (SA1) ON / OFF	Operation of solenoid (clicking sound) can be heard
SRCR (SA2)	Turns TRAC solenoid SRCF (SA2) ON / OFF	Operation of solenoid (clicking sound) can be heard
SRMF (SMCF, SA3)	Turns TRAC solenoid SRMF (SMCF, SA3) ON / OFF	Operation of solenoid (clicking sound) can be heard
SRMR (SMCR, STR)	Turns TRAC solenoid SRMR (SMCR, STR) ON / OFF	Operation of solenoid (clicking sound) can be heard
SFLR & SFLH	Turns ABS solenoid SFLR & SFLH ON / OFF	Operation of solenoid (clicking sound) can be heard
SRH & SRR	Turns ABS solenoid SRH & SRR ON / OFF	Operation of solenoid (clicking sound) can be heard
SRLR & SRLH	Turns ABS solenoid SRLR & SRLH ON / OFF	Operation of solenoid (clicking sound) can be heard
SFRH & SFLH	Turns ABS solenoid SFRH & SFLH ON / OFF	Operation of solenoid (clicking sound) can be heard
SRCF & SRCR	Turns ABS solenoid SRCF & SRCR ON / OFF	Operation of solenoid (clicking sound) can be heard
SRMF & SRMR	Turns ABS solenoid SRMF & SRMR ON / OFF	Operation of solenoid (clicking sound) can be heard
SOL RELAY	Turns ABS solenoid relay ON / OFF	Operation of solenoid (clicking sound) can be heard
ABS MOT RELAY	Turns ABS motor relay ON / OFF	Operation of motor can be heard
TRAC MOT RELAY	Turns TRAC motor relay ON / OFF	Operation of motor can be heard
ABS WARN LIGHT	Turns ABS warning light ON / OFF	Observe combination meter
VSC WARN LIGHT	Turns VSC warning light ON / OFF	Observe combination meter
VSC / TRC OFF IND	Turns VSC / TRAC OFF indicator ON / OFF	Observe combination meter
SLIP INDI LIGHT	Turns SLIP indicator light ON / OFF	Observe combination meter
BRAKE WRN LIGHT	Turns BRAKE warning light ON / OFF	Observe combination meter
VSC / BR WARN BUZ	Turns VSC / BRAKE warning buzzer ON / OFF	Buzzer can be heard
STP LIGHT RELAY	Turns stop light relay ON / OFF	Operation of motor can be heard

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4. FREEZE FRAME DATA

(a) The vehicle (sensor) status memorized during ABS and/or VSC operation or at the time of error code detection can be displayed using the hand–held tester.

(b) Only one record of freeze frame data is stored and the freeze frame data generated during ABS and/or VSC operation are constantly updated. Also, the number of the ignition switch's "ON" after the freeze frame data is stored can be memorized up to 31 and it can be displayed.

HINT:

If the ignition switch "ON" operation exceeds 31 times, "31" appears on the display.

(c) If the diagnosis code abnormality occurs, the freeze frame data at the occurrence of the abnormality is stored but the ABS actuation data is deleted.

Hand–held tester display	Measurement Item	Reference Value*
VEHICLE SPD	Wheel speed sensor reading	Speed indicated on speedometer
STOP LIGHT SW	Stop light switch signal	Stop light switch ON: ON, OFF: OFF
# IG ON	Number of operations of ignition switch ON after memorizing freeze frame data	0 – 31
MAS CYL PRESS	Master cylinder pressure sensor reading	Brake pedal release : 0.3 – 0.9 V Brake pedal depress: 0.8 – 4.5 V
MASS PRESS GRADE	Master cylinder pressure sensor change	–30 – 200 MPa/s
SYSTEM	System status	ABS activated: ABS VSC/TRC activated: VSC/TRC BA activated: BA Fail safe mode activated: FAIL SF No system activated: NO SYS
YAW RATE	Yaw rate angle sensor reading	–100 – 100
STEERING ANG	Steering sensor reading	Left turn: Increase Right turn: Drop
THROTTLE	Throttle position sensor reading	Release accelerator pedal: Approx. 0 deg. Depress accelerator pedal: Approx. 90 deg.
G (RIGHT & LEFT)	Right and left G	–1.869 – 1.869
G (BACK & FORTH)	Back and forth G	–1.869 – 1.869
VSC (TRC) OFF SW	VSC OFF switch signal	TRAC OFF SW ON: ON OFF: OFF
SHIFT POSITION	Shift lever position	FAIL P,N R D 4 3 2 L
THROTTLE	Throttle sensor reading	0 – 125 deg.

*: If no conditions are specifically stated for "Idling", it means the shift lever is at N or P position, the A/C switch is OFF and all accessory switches are OFF.

5. In case of not using hand–held tester: ABS SENSOR SIGNAL CHECK (TEST MODE)

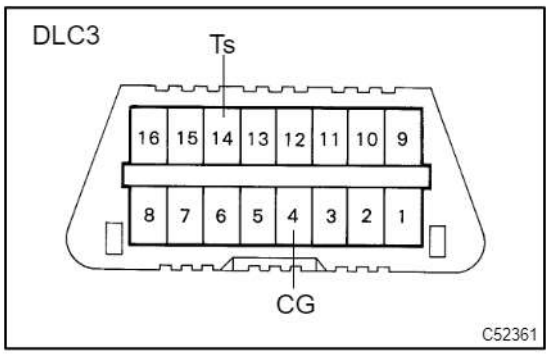
NOTICE:

When having replaced the yaw rate sensor, deceleration sensor and/or ECU, perform zero point calibration of the yaw rate sensor and deceleration sensors (See step 7.).

HINT:

If the ignition switch is turned from ON to ACC or LOCK during test mode, DTC will be erased.

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(a) Procedures for test mode:
(1) Turn the ignition switch OFF.
(2) Using SST, connect terminals Ts and CG of DLC3.
SST 09843–18040
(3) Check that the steering wheel is in the straight–ahead position and shift the shift lever to P range.
(4) Turn the ignition switch ON.
(5) Check that the ABS warning light blinks.

HINT:
If the ABS warning light does not blinks, inspect the ABS warning light circuit or Ts terminal circuit.

Trouble area	See Page
Ts terminal circuit	05–932
ABS warning light circuit	05–914

(b) Check the master cylinder pressure sensor.
(1) Leaving the vehicle in a stationary condition and the brake pedal in free condition for 1 sec. or more, continue to quickly depress the brake pedal with a force of 98 N (10 kgf, 22 lbf) or more for 1 sec. or more.

HINT:
At this time, the ABS warning light goes on for 3 sec.

(c) Check the center diff. lock detecting switch.
(1) Push the center diff. lock switch to ON to put the vehicle in the center diff. lock condition.
(2) Push the center diff. lock switch to OFF to put the vehicle in the center diff. free condition.

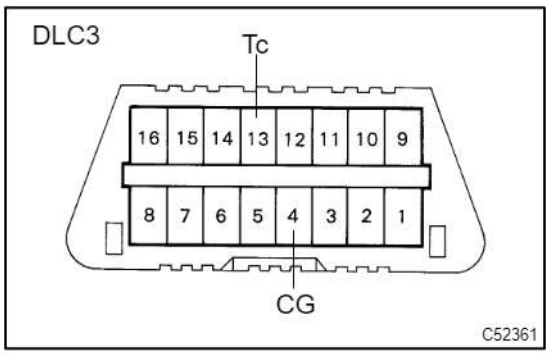
(d) Check the L4 detection switch.
(1) Turn the H–L switch to L position to put the vehicle in the L4 mode.
(2) Turn the H–L switch to H position to put the vehicle in the H4 mode.

(e) Check the speed sensor signal.
(1) Drive the vehicle in reverse more than 1 sec. at 3 km/h (2mph) or higher.
(2) Drive the vehicle straight forward with the speed faster than 45 km/h (28 mph) for several seconds and check that the ABS warning light comes off.

HINT:
The sensor check may not be completed if the wheels spin or the steering wheels steered during this check.

(f) Stop the vehicle.

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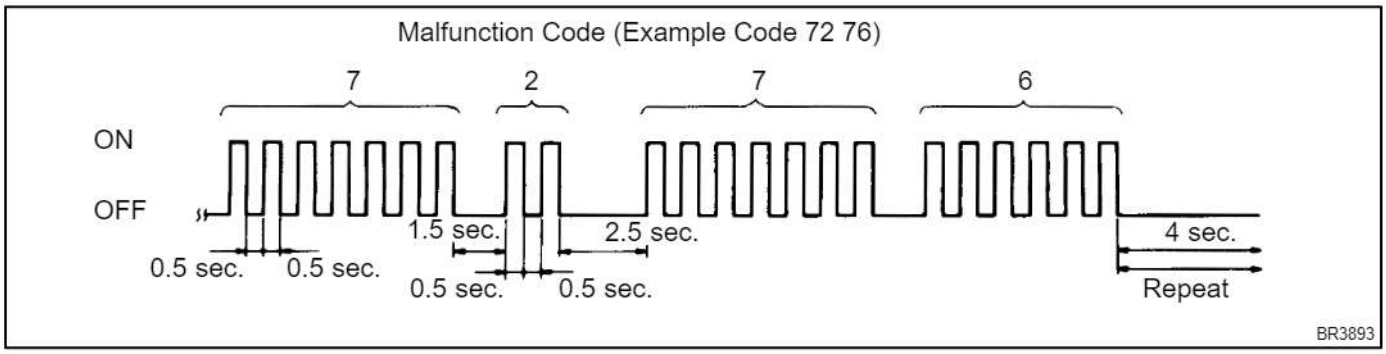


(g) Using SST, connect terminals Tc and CG of DLC3.
SST 09843–18040

(h) Read the number of blinks of the ABS warning light.

HINT:

- See the list of DTC on page 05–815.
- If every sensor is normal, the normal code is output (A cycle of 0.25 sec. ON and 0.25 sec. OFF is repeated).
- If 2 of more malfunctions are detected at the same time, the lowest numbered will be displayed 1st.



(i) After doing the check, disconnect the SST from terminals Ts and CG, Tc and CG of DLC3 and turn the ignition switch OFF.
SST 09843–19040

6. In case of using hand–held tester:
ABS SENSOR SIGNAL CHECK (TEST MODE)

NOTICE:

When having replaced the yaw rate sensor, deceleration sensor and/or ECU, perform zero point calibration of the yaw rate sensor and deceleration sensors (See step 7.). Make sure that this operation should be done before starting the following.

HINT:

If the ignition switch is turned from ON to ACC or LOCK during test mode, DTC will be erased.

(a) Hook up the hand–held tester to the DLC3.

(b) Do step 3. – (a) – (3) and from (b) to (d) on the previous pages.

(c) Read the DTC by following the prompts on the tester screen.

HINT:

Please refer to the hand–held tester operator's manual for further details.

7. In case of not using hand–held tester:
VSC SENSOR SIGNAL CHECK (TEST MODE)

NOTICE:

When having replaced the yaw rate sensor, deceleration sensor and/or ECU, perform zero point calibration of the yaw rate sensor and deceleration sensors (See step 7.).

HINT:

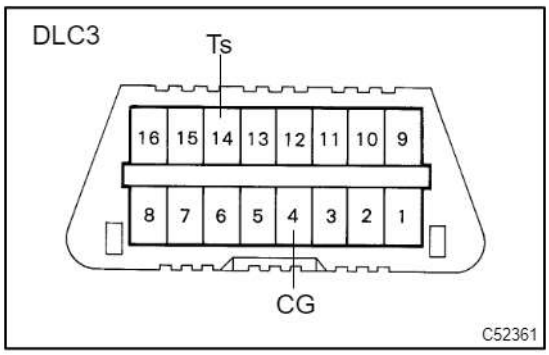
If the ignition switch is turned from ON to ACC or LOCK during test mode, DTC will be erased.

(a) Procedures for test mode:

(1) Turn the ignition switch OFF.

(2) Check that the shift lever position is at P range. Turn the steering wheel to the straight–ahead position.

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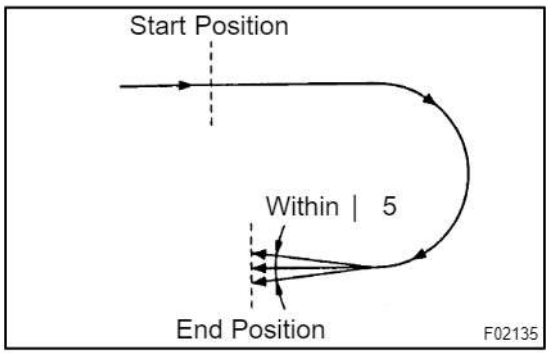
(3) Using SST, connect terminals Ts and CG of DLC3.
SST 09843–18040
(4) Start the engine and the VSC warning light blinks.

HINT:
If the VSC warning light does not blinks, inspect the VSC warning light circuit or Ts terminal circuit.

Trouble Area	See Page
Ts terminal circuit	05–932
VSC warning light circuit	05–916

(5) Keep the vehicle in a stationary on a level place for 1 sec. or more.

(b) Check the DAC operation switch.
(1) Push the DAC operation switch to ON.
(2) Push the DAC operation switch to OFF.



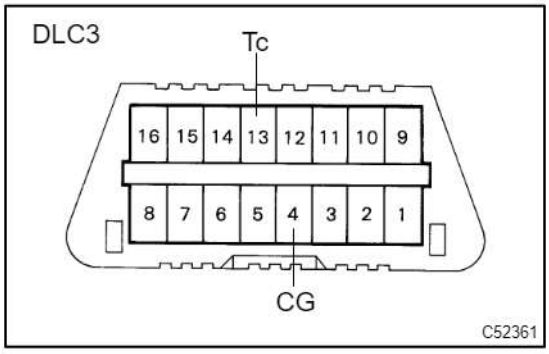
(c) Check the yaw rate sensor.
(1) Shift the shift lever to the D range and drive the vehicle at the vehicle speed of approx. 5 km/h (3 mph). Turn the steering wheel either to left or right for 90 or more, and maintain 180 circular drive for the vehicle.
(2) Stop the vehicle and shift the shift lever to the P range. Check that the skid control buzzer sounds for 3 sec.

If the skid control buzzer sounds, the sensor check is in normal completion.
If the skid control buzzer dose not sound, check the skid control buzzer circuit, then do the sensor check again.

Trouble Area	See Page
Skid control buzzer circuit	05–928

If the skid control buzzer still does not sound, there is malfunction in the VSC sensor, so check the DTC.

HINT:
- Drive the vehicle circularly by 180 . At the end of the turn, the direction of the vehicle should be within 180 | 5 from its start position.
- Do not spin the wheels.



(d) Read the DTC.
(1) Using SST, connect terminals Tc and CG of DLC3.
SST 09843–18040
(2) Read the number of VSC warning light on the combination meter.

HINT:
- See the list of DTC on page 05–815.
- If every sensor is normal, the normal code is output (A cycle of 0.25 sec. ON and 0.25 sec. OFF is repeated).

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□ If 2 of more malfunctions are detected at the same time, the lowest numbered will be displayed 1st.

(3) After doing the check, disconnect the SST from terminals Ts and CG, TC and CG of DLC3 and turn the ignition switch OFF.

SST 09843–18040

8. In case of using hand–held tester:
VSC SENSOR SiGNAL CHECK (TEST MODE)

NOTICE:

When having replaced the yaw rate sensor, deceleration sensor and/or ECU, perform zero point calibration of the yaw rate sensor and deceleration sensors (See step 7.). Make sure that this operation should be done before starting the following.

HINT:

If the ignition switch is turned from ON to ACC or LOCK during test mode. DTC will be erased.

(a) Hook up the hand–held tester to the DLC3.

(b) Do step 5. –(a) – (5), (b) and (c) on the previous page and this page.

(c) Read the DTC by following the prompts on the tester screen.

HINT:

Please refer to the hand–held tester operator's manual for further details.

9. IF NECESSARY, PERFORM ZERO POINT CALEBRATION OF YAW RATE AND DECELERATION SENSORS

HINT:

□ When having replaced the yaw rate sensor, deceleration sensor or the ECU, make sure to perform yaw rate and deceleration sensor's zero point calibration. Be sure to complete this step 7. Once it is started.

□ During step 7., a not–replaced sensor also requires zero point calibration.

NOTICE:

□ **While obtaining the zero point, do not give any vibration to the vehicle by tilting, moving or shaking it and keep it in a stationary condition. (Do not start the engine.)**

□ **Be sure to do this on a level surface (within an inclination of 1 %).**

(a) Clear the zero points of the yaw rate and deceleration sensors.

(1) Shift the shift lever to P range.

(2) Turn the ignition switch ON in stationary condition.

(3) Using SST, repeat a cycle of short and open between terminals Ts and CG of DLC3 4 times or more within 8 sec. Check that the VSC indicator light is lit indicating the recorded zero point is erased.

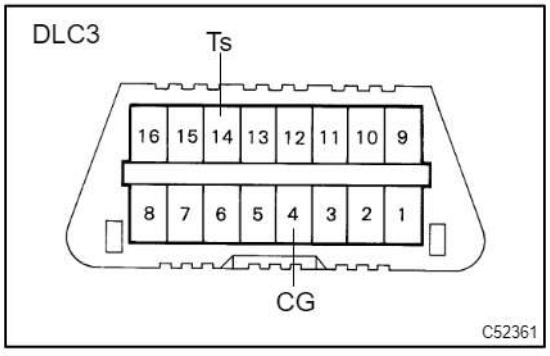
SST 09843–18040

(4) Turn the ignition switch OFF.

(b) Obtain zero point of the yaw rate sensor.

(1) Make the terminals Ts and CG of DLC3 disconnected.

(2) Turn the ignition switch ON.



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HINT:
The vehicle should be in a stationary condition with the shift lever in P range.

(3) Check that the VSC warning light goes off about 15 sec. after the ignition switch is turned ON.

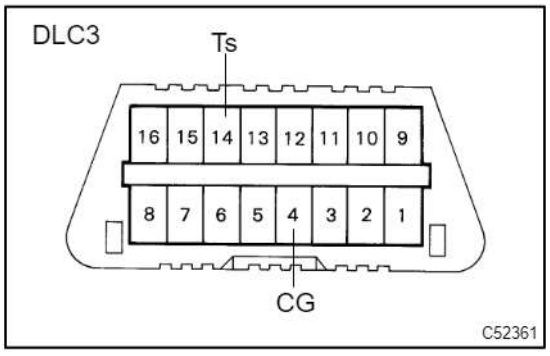
HINT:
Even if the ignition is not turned OFF in step (a) – (4) and remains ON, the yaw rate sensor zero point calibration can be completed. In this case, the VSC warning light is lit for about 15 sec. and then starts blinking. (Normal code)

(4) After ensuring that the VSC warning light remains OFF for 2 sec., turn the ignition switch OFF.

HINT:
If the ignition switch is not turned OFF in step (a) – (4), make sure that the VSC warning light blinks for 2 sec. Then turn the ignition switch OFF.

(c) Perform deceleration sensor zero point calibration.

NOTICE:
After step (b) (the yaw rate sensor zero point calibration), the VSC warning light goes off. At this time, if the vehicle is driven without performing step (c) (deceleration sensor zero point calibration), deceleration sensor zero point calibration malfunction will be detected and the VSC warning light will light up. Therefore, perform step (c) right after step (b).



(1) Using SST, connect the terminal Ts and CG of DLC3.

SST 09843–18040

(2) Turn the ignition switch ON.

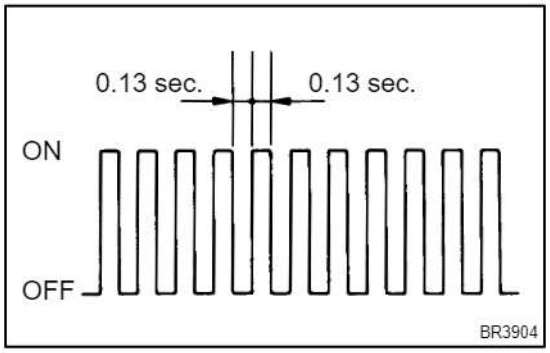
HINT:
Place the vehicle in a stationary condition with the shift lever in P range.

(3) After turning the ignition switch ON, check that the VSC warning light is lit for about 4 sec. and then starts quick blinking at 0.13 sec. intervals.

(4) After ensuring the blinking of the VSC warning light for 2 sec., turn the ignition switch OFF.

(5) Remove the SST and make the terminals Ts and CG of DLC3 disconnected.

SST 09843–18040



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0529E-07

DIAGNOSTIC TROUBLE CODE CHART

NOTICE:

When removing the part, turn the ignition switch OFF.

HINT:

- Using SST 09843–18040, connect the terminals Tc and CG of DLC3.
- If any abnormality is not found when inspecting parts, inspect the ECU.
- If a malfunction code is displayed during the DTC check, check the circuit listed that code. For details of each code, turn to the page referred to under the "See page" for respective "DTC No." in the DTC chart.

DTC Chart of ABS:

DTC No. (See Page)	Detection Item	Trouble Area
C0200 / 31*1 (05–827)	Right front wheel speed sensor signal malfunction	□Right front, left front, right rear and left rear speed sensor □Each speed sensor circuit □Sensor rotor
C0205 / 32*1 (05–827)	Left front wheel speed sensor signal malfunction	
C0210 / 33*1 (05–832)	Right rear wheel speed sensor signal malfunction	
C0215 / 34*1 (05–832)	Left rear wheel speed sensor signal malfunction	
C0226 / 21 (05–837)	Open or short circuit in brake master cylinder solenoid circuit (SFR circuit)	□Brake master cylinder □SFRR or SFRH circuit
C0236 / 22 (05–837)	Open or short circuit in brake master cylinder solenoid circuit (SFL circuit)	□Brake master cylinder □SFLR or SFLH circuit
C0246 / 23 (05–837)	Open or short circuit in brake master cylinder solenoid circuit (SRR circuit)	□Brake master cylinder □SRRR or SRRH circuit
C0256 / 24 (05–837)	Open or short circuit in brake master cylinder solenoid circuit (SRL circuit)	□Brake master cylinder □SRLR or SRLH circuit
C0278 / 11 (05–840)	Open or short circuit in ABS solenoid relay circuit	□ABS solenoid relay □ABS solenoid relay circuit
C0279 / 12 (05–840)	B+ short circuit in ABS solenoid relay circuit	
C1225 / 25 (05–837)	Open or short circuit in brake master cylinder solenoid circuit (SMC (SA1) circuit)	□Brake master cylinder □SMC (SA1) circuit
C1226 / 26 (05–837)	Open or short circuit in brake master cylinder solenoid circuit (SPC (SA2) circuit)	□Brake master cylinder □SPC (SA2) circuit
C1227 / 27 (05–837)	Open or short circuit in brake master cylinder solenoid circuit (SRC (SA3) circuit)	□Brake master cylinder □SRC (SA3) circuit
C1228 / 28 (05–837)	Open or short circuit in brake master cylinder solenoid circuit (STR circuit)	□Brake master cylinder □STR circuit
C1235 / 35 (05–827)	Foreign matters attached on the tip of the right front sensor	□Right front, left front, right rear, left rear speed sensor □Sensor rotor
C1236 / 36 (05–827)	Foreign matters attached on the tip of the left front sensor	
C1238 / 38 (05–832)	Foreign matters attached on the tip of the right rear sensor	
C1239 / 39 (05–832)	Foreign matters attached on the tip of the left rear sensor	
C1241 / 41 (05–864)	Low battery positive voltage or abnormally high battery positive voltage	□Battery □IC regulator □Power source circuit

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C1242 / 42*2 (05–867)	Open circuit in IG2 circuit	□Battery □IC regulator □Power source circuit
C1243 / 43 (05–858)	Malfunction in deceleration sensor (constant output)	□Deceleration sensor □Deceleration sensor circuit
C1244 / 44 (05–858)	Open or short circuit in deceleration sensor circuit	□Deceleration sensor □Deceleration sensor circuit
C1245 / 45 (05–858)	Malfunction in deceleration sensor	□Deceleration sensor □Deceleration sensor circuit
C1246 / 46 (05–870)	Malfunction in master cylinder pressure sensor	□Master cylinder pressure sensor □Master cylinder pressure sensor circuit
C1249 / 49 (05–873)	Open circuit in stop light switch circuit	Stop light switch circuit
C1251 / 51*2 (05–876)	Pump motor is locked Open circuit in pump motor ground	Brake booster pump motor
C1252 / 52*2 (05–876)	Brake booster pump motor malfunction	□Brake booster pump motor □Brake booster pump motor circuit □Pressure switch (PH or PL)
C1253 / 53*2 (05–876)	Brake booster pump motor relay malfunction	□ABS and TRAC motor relay □ABS and TRAC motor relay circuit □Brake booster pump motor circuit
C1254 / 54*2 (05–883)	Pressure switch malfunction	□Pressure switch (PH or PL) □Pressure switch circuit
C1256 / 56*2 (05–886)	Accumulator low pressure malfunction	□Accumulator □Pressure switch (PH or PL) □Brake booster pump motor
C1257 / 57*2 (05–864)	Power supply drive circuit malfunction	□Battery □IC regulator □Power Source circuit
C1268 / 68*3 (05–893)	Transfer L4 position signal transmission failure	□Transfer L4 position switch □Transfer L4 position switch circuit
C1306 / 96 (05–895)	Malfunction in speed sensor power supply	□Speed sensor □Speed sensor circuit
C1337 / 37 (05–900)	Tires of different size	Tire size
Always ON (05–906)	Malfunction in skid control ECU	□Battery □IC regulator □Power source circuit □Skid control ECU

*1: As the DTC cannot be erased by replacing parts alone do either of the following operations.
(1) Clear DTC (See page 05–803).
(2) At the vehicle speed of 20 km/h (12 mph), drive the vehicle for 30 sec. or more.
*2: Using the following table, troubled parts can be specified.
*3: 4WD

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DTC		C1242/42		C1251/51		C1252/52		C1253/53		C1254/54		C1256/56		C1257/57	
BRAKE warning light and buzzer		Light	Buzzer	Light	Buzzer	Light	Buzzer	Light	Buzzer	Light	Buzzer	Light	Buzzer	Light	Buzzer
Pressure switch	PH														
	PL														
Pump motor circuit	Pump motor														
	MTT wire harness														
	MT+ wire harness														
	MT– wire harness														
Accumulator malfunction															
Motor relay circuit	MR1 open circuit														
	MR2 open circuit														
	MR1 welded contact														
	MR2 welded contact														
Brake master cylinder	Pressure leaks														
Power source*	IG2 open circuit														
ECU	Power supply circuit														

*: When IG2 circuit is open, ABS warning light and BRAKE warning light come on.

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DTC Chart of VSC:

DTC No. (See Page)	Detection Item	Trouble Area
C1201 / 51 (05–845)	ECM system malfunction	Engine control system
C1203 / 53 (05–846)	ECM communication circuit malfunction	□TRC+ or TRC – circuit □ENG+ or ENG – circuit □ECM
C1210 / 36 (05–847)	Zero point calibration of yaw rate sensor undone	□Yaw rate sensor □Yaw rate sensor circuit □Neutral start switch circuit
C1223 / 43 (05–850)	Malfunction in ABS control system	ABS control system
C1224 / 44 (05–851)	Open or short circuit in NE signal circuit	□NEO circuit □ECM □Skid control ECU
C1231 / 31 (05–853)	Malfunction in steering angle sensor	□Steering angle sensor □Steering angle sensor circuit □+BI circuit
C1232 / 32 (05–858)	Malfunction in deceleration sensor	□Deceleration sensor □Deceleration sensor circuit
C1233 / 33 (05–861)	Open or short circuit in yaw rate sensor circuit	□Yaw rate sensor □Yaw rate sensor circuit
C1234 / 34 (05–861)	Malfunction in yaw rate sensor	□Yaw rate sensor □Yaw rate sensor circuit
C1258 / 58 *1,*2 (05–891)	Transfer 4WD position switch circuit	□Transfer 4WD position switch □Transfer 4WD position switch circuit
C1335 / 35 (05–853)	Open circuit in steering angle sensor	□Steering angle sensor □Steering angle sensor circuit
C1336 / 39 (05–897)	Zero point calibration of deceleration sensor undone	□Deceleration sensor □Deceleration sensor circuit □Zero point calibration not done
C1340 / 47*1 (05–901)	Open circuit in center differential lock signal	□Center differential lock system □Center differential lock circuit □Center differential lock indicator light circuit
C1380 / 64 (05–904)	Malfunction in stop light operation relay	□Stop light operation relay □STP2 circuit
Always ON (05–910)	Malfunction of skid control ECU	□Battery □IC regulator □Power source circuit □Skid control ECU

*1: 4WD

*2: 1GR–FE

HINT:

There is a case that hand–held tester cannot be used when ABS and/or VSC warning light is always on.

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DTC of ABS sensor check function

Code No.	Diagnosis	Trouble Area
C1271 / 71	Low output voltage of right front speed sensor	□Right front speed sensor □Sensor installation □Sensor rotor
C1272 / 72	Low output voltage of left front speed sensor	□Left front speed sensor □Sensor installation □Sensor rotor
C1273 / 73	Low output voltage of right rear speed sensor	□Right rear speed sensor □Sensor installation □Sensor rotor
C1274 / 74	Low output voltage of left rear speed sensor	□Left rear speed sensor □Sensor installation □Sensor rotor
C1275 / 75	Abnormal change in output voltage of right front speed sensor	Right front sensor rotor
C1276 / 76	Abnormal change in output voltage of left front speed sensor	Left front speed sensor rotor
C1277 / 77	Abnormal change in output voltage of right rear speed sensor	Right rear sensor rotor
C1278 / 78	Abnormal change in output voltage of left rear speed sensor	Left rear speed sensor rotor
C1279 / 79	Deceleration sensor is faulty	□Deceleration sensor □Sensor installation
C1281 / 81	Master cylinder pressure sensor output signal is faulty	Master cylinder pressure sensor
C1282 / 82*	Transfer indicator (center diff.lock) switch malfunction	Transfer indicator (center diff. lock) switch
C1283 / 83*	Transfer L4 position switch malfunction	Transfer L4 position switch

*: 4WD

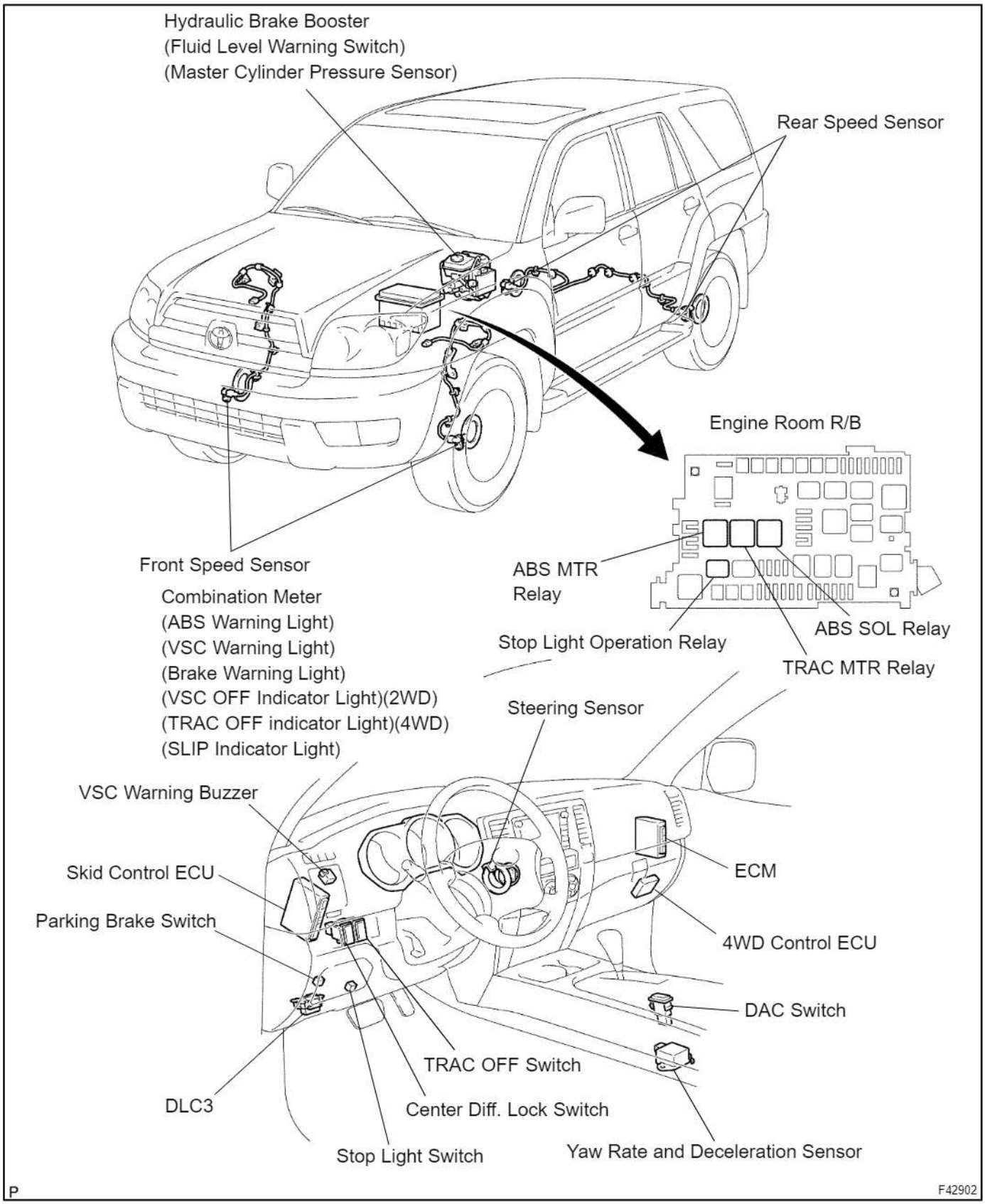
DTC of VSC sensor check function

Code No.	Diagnosis	Trouble Area
C0371 / 71	Yaw rate sensor output signal malfunction	□Yaw rate sensor □Yaw rate sensor circuit
C1379 / 74	DAC operating switch malfunction	□DAC operating switch □DAC operating switch circuit

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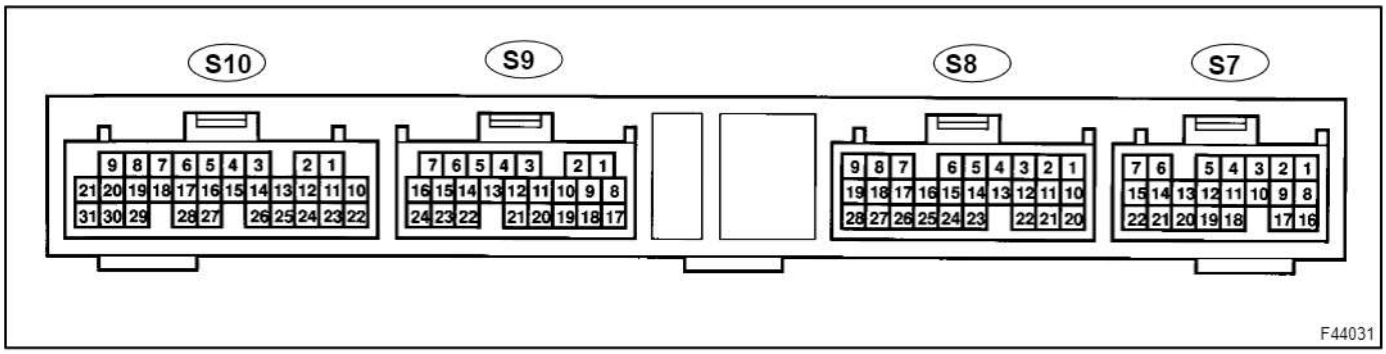
LOCATION



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0529G–08

TERMINALS OF ECU



Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage (V)
STP2 (S8 – 2) – GND (S9 – 8, 17, S10 – 6, 31)	G–Y ↔ W–B	Stop light switch OFF	Below 1.5
		Stop light switch ON	8 – 14
EXI*1 (S8 – 3) – GND (S9 – 8, 17, S10 – 6, 31)	R–L ↔ W–B	IG switch ON, center diff. lock switch ON	Below 2.0
		IG switch ON, center diff. lock switch OFF	10 – 14
VSCW (S8 – 4) – GND (S9 – 8, 17, S10 – 6, 31)	Y–R ↔ W–B	IG switch ON, VSC TRAC warning light ON	Below 2.0
		IG switch ON, VSC TRAC warning light OFF	10 – 14
BRL (S8 – 5) – GND (S9 – 8, 17, S10 – 6, 31)	B–L ↔ W–B	IG switch ON, brake warning light ON	10 – 14
		IG switch ON, brake warning light OFF	Below 2.0
IND (S8 – 6) – GND (S9 – 8, 17, S10 – 6, 31)	R ↔ W–B	IG switch ON, SLIP indicator light ON	Below 2.0
		IG switch ON, SLIP indicator light OFF	10 – 14
WT (S8 – 7) – GND (S9 – 8, 17, S10 – 6, 31)	L–W ↔ W–B	IG switch ON, VSC (TRAC) OFF indicator light ON	Below 2.0
		IG switch ON, VSC (TRAC) OFF indicator light OFF	10 – 14
VYS (S8 – 9) – GND (S9 – 8, 17, S10 – 6, 31)	L ↔ W–B	IG switch ON	4.5 – 5.5
GL2 (S8 – 10) – GYAW (S8 – 27)	W ↔ B	IG switch ON, vehicle is placed on the horizontal surface	2.0 – 3.0
SS1+ (S8 – 14) – SS1– (S8 – 23)	L ↔ P	Engine idling, steering wheel is turned slowly.	Pulse generation
SP1 (S8 – 16) – GND (S9 – 8, 17, S10 – 6, 31)	GR–R ↔ W–B	Vehicle drive at about 20 km/h (12mph)	Pulse generation
EXI4*1 (S8 – 17) – GND (S9 – 8, 17, S10 – 6, 31)	W–L ↔ W–B	IG switch ON, transfer in L4 position	Below 2.0
		IG switch ON, transfer in except L4 position	10 – 14
YSS (S8 – 18) – GND (S9 – 8, 17, S10 – 6, 31)	(Shielded) ↔ W–B	IG switch OFF	Continuity
YD (S8 – 19) – GYAW (S8 – 27)	G ↔ B	IG switch ON, ABS warning light OFF	4.5 – 5.3
GL1 (S8 – 22) – GYAW (S8 – 27)	R ↔ B	IG switch ON, vehicle is placed on the horizontal surface	2.0 – 3.0
FRO (S8 – 24) – GND (S9 – 8, 17, S10 – 6, 31)	L–R ↔ W–B	Vehicle driving at about 20 km/h (12mph)	Pulse generation
FLO (S8 –25) – GND (S9 – 8, 17, S10 – 6, 31)	L–O ↔ W–B	Vehicle driving at about 20 km/h (12mph)	Pulse generation
CSW*2 (S8 – 26) – GND (S9 – 8, 17, S10 – 6, 31)	R–W ↔ W–B	IG switch ON, TRAC OFF switch OFF	10 – 14
		IG switch ON, TRAC OFF switch ON	Below 1.5

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GYAW (S8 – 27) – GND (S9 – 8, 17, S10 – 6, 31)	B ↔ W–B	IG switch OFF	Continuity
YAW (S8 – 28) – GYAW (S8 – 27)	Y ↔ B	IG switch ON, ABS warning light OFF	2.42 – 2.58
WA (S9 – 1) – GND (S9 – 8, 17, S10 – 6, 31)	LG–R ↔ W – B	IG switch ON, ABS warning light ON	10 – 14
		IG switch ON, ABS warning light OFF	Below 2.0
BZ (S9 – 2) – GND (S9 – 8, 17, S10 – 6, 31)	GR–G ↔ W–B	IG switch ON, VSC buzzer is sounded	Below 1.0 ↔ 10 – 14
		IG switch ON, VSC buzzer is not sounded	10 – 14
D/G (S9 – 3) – GND (S9 – 8, 17, S10 – 6, 31)	R–Y ↔ W–B	IG switch ON	10 – 14
P (S9 – 5) – GND (S9 – 8, 17, S10 – 6, 31)	G–B ↔ W–B	IG switch ON, PNP switch in P position	10 – 14
		IG switch ON, PNP switch in except P position	Below 1.5
IG1 (S9 – 6) – GND (S9 – 8, 17, S10 – 6, 31)	B–R ↔ W–B	IG switch ON	10 – 14
NEO (S9 – 7) – GND (S9 – 8, 17, S10 – 6, 31)	P ↔ W–B	Engine idling	Pulse generation
STP (S9 – 10) – GND (S9 – 8, 17, S10 – 6, 31)	G–Y ↔ W–B	IG switch ON, stop light switch ON	10 – 14
TC (S9 – 11) – GND (S9 – 8, 17, S10 – 6, 31)	P–L ↔ W–B	IG switch ON and terminals Tc–E_1 of DLC1 connected	Below 1.5
		IG switch ON and terminals Tc–E_1 of DLC1 not connected	10 – 14
TS (S9 – 12) – GND (S9 – 8, 17, S10 – 6, 31)	R–B ↔ W–B	IG switch ON and terminals Ts–E_1 of DLC1 connected	Below 1.5
		IG switch ON and terminals Ts–E_1 of DLC1 not connected	10 – 14
PKB (S9 – 13) – GND (S9 – 8, 17, S10 – 6, 31)	LG ↔ W–B	IG switch ON, parking brake switch ON	Below 1.5
		IG switch OFF, parking brake switch OFF	10 – 14
ENG+ (S9 – 14) – ENG– (S9 – 22)	R ↔ W	Engine idling	Pulse generation
HDCS*3 (S9 – 15) – GND (S9 – 8, 17, S10 – 6, 31)	W–G ↔ W–B	IG switch ON, DAC switch OFF	10 – 14
		IG switch ON, DAC switch ON	Below 1.5
RL+ (S9 – 18) – GND (S9 – 8, 17, S10 – 6, 31)	P ↔ W–B	IG switch ON	9 – 14
RL– (S9 – 19) – GND (S9 – 8, 17, S10 – 6, 31)	V ↔ W–B	IG switch ON, left rear wheel is turned slowly	Pulse generation
RR+ (S9 – 20) – GND (S9 – 8, 17, S10 – 6, 31)	B ↔ W–B	IG switch ON	9 – 14
RR– (S9 – 21) – GND (S9 – 8, 17, S10 – 6, 31)	W ↔ W–B	IG switch ON, right rear wheel is turned slowly	Pulse generation
CD*1 (S9 – 23) – GND (S9 – 8, 17, S10 – 6, 31)	G–R ↔ W–B	IG switch ON, center diff. lock indicator ON	Below 2.0
		IG switch ON, center diff. lock indicator OFF	10 – 14
TRC+ (S9 – 24) – TRC– (S9 – 16)	B ↔ Y	Engine idling	Pulse generation
SRLR (S7 – 1) – GND (S9 – 8, 17, S10 – 6, 31)	Y–B ↔ W–B	IG switch ON, ABS warning light OFF	10 – 14
MR2 (S7 – 2) – R2+ (S7 – 3)	LG–B ↔ GR–B	IG switch ON, hydraulic brake booster pump motor running	10 – 14
HDCW*2 (S7 – 4) – GND (S9 – 8, 17, S10 – 6, 31)	BR–Y ↔ W–B	IG switch ON, DAC indicator light ON	Below 2.0
		IG switch ON, DAC indicator light OFF	10 – 14
AST (S7 – 6) – GND (S9 – 8, 17, S10 – 6, 31)	Y–R ↔ W–B	IG switch ON, ABS warning light OFF	10 – 14
SRLH (S7 – 7) – GND (S9 – 8, 17, S10 – 6, 31)	Y–G ↔ W–B	IG switch ON, ABC warning light OFF	10 – 14

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SFRR (S7 – 8) – GND (S9 – 8, 17, S10 – 6, 31)	V–G ↔ W–B	IG switch ON, ABS warning light OFF	10 – 14
PL (S7 – 9) – GND (S9 – 8, 17, S10 – 6, 31)	G–Y ↔ W–B	IG switch ON, pressure switch ON	3 – 5
EXI3*4 (S7 – 14) – GND (S9 – 8, 17, S10 – 6, 31)	GR ↔ W–B	IG switch ON, ADD switch ON (4WD)	Below 2.0
		IG switch ON, ADD switch OFF (2WD)	10 – 14
+B1 (S7 – 15) – GND (S9 – 8, 17, S10 – 6, 31)	W–R ↔ W–B	IG switch ON, ABS warning light OFF	10 – 14
SFRH (S7 – 16) – GND (S9 – 8, 17, S10 – 6, 31)	V–R ↔ W–B	IG switch ON, ABS warning light OFF	10 – 14
TRIG (S7 – 20) – GND (S9 – 8, 17, S10 – 6, 31)	GR–R ↔ W–B	IG switch ON, ABS warning light OFF	10 – 14
+BO (S7 – 21) – GND (S9 – 8, 17, S10 – 6, 31)	GR–L ↔ W–B	IG switch ON, ABS warning light OFF	10 – 14
IG2 (S7 – 22) – GND (S9 – 8, 17, S10 – 6, 31)	B–O ↔ W–B	IG switch ON	10 – 14
SA1 (S10 – 2) – GND (S9 – 8, 17, S10 – 6, 31)	L–O ↔ W–B	IG switch ON, ABS warning light OFF	10 – 14
SA2 (S10 – 3) – GND (S9 – 8, 17, S10 – 6, 31)	L–W ↔ W–B	IG switch ON, ABS warning light OFF	10 – 14
SA3 (S10 – 4) – GND (S9 – 8, 17, S10 – 6, 31)	P–L ↔ W–B	IG switch ON, ABS warning light OFF	10 – 14
STR (S10 – 5) – GND (S9 – 8, 17, S10 – 6, 31)	L ↔ W–B	IG switch ON, ABS warning light OFF	10 – 14
SFLR (S10 – 7) – GND (S9 – 8, 17, S10 – 6, 31)	L–B ↔ W–B	IG switch ON, ABS warning light OFF	10 – 14
SRRH (S10 – 8) – GND (S9 – 8, 17, S10 – 6, 31)	L–Y ↔ W–B	IG switch ON, ABS warning light OFF	10 – 14
SRRR (S10 – 9) – GND (S9 – 8, 17, S10 – 6, 31)	Y ↔ W–B	IG switch ON, ABS warning light OFF	10 – 14
VCM (S10 – 10) – GND (S9 – 8, 17, S10 – 6, 31)	B ↔ W–B	IG switch ON	4.5 – 5.5
PH (S10 – 11) – GND (S9 – 8, 17, S10 – 6, 31)	R–W ↔ W–B	IG switch ON, pressure switch (PH) ON	Below 0.9
		IG switch ON, pressure switch (PH) OFF	5 – 8
FR– (S10 – 13) – GND (S9 – 8, 17, S10 – 6, 31)	P ↔ W–B	IG switch ON, right front wheel is turned slowly	Pulse generation
FR+ (S10 – 14) – GND (S9 – 8, 17, S10 – 6, 31)	L ↔ W–B	IG switch ON	9 – 14
FL– (S10 – 15) – GND (S9 – 8, 17, S10 – 6, 31)	R ↔ W–B	IG switch ON, left front wheel is turned slowly	Pulse generation
FL+ (S10 – 16) – GND (S9 – 8, 17, S10 – 6, 31)	G ↔ W–B	IG switch ON	9 – 14
SR (S10 – 19) – R1+ (S10 – 1)	BR–Y ↔ B–Y	IG switch ON, ABS warning light OFF	10 – 14
SFLH (S10 – 21) – GND (S9 – 8, 17, S10 – 6, 31)	V ↔ W–B	IG switch ON, ABS warning light OFF	10 – 14
PMC (S10 – 22) – E2 (S10 – 12)	W ↔ R	IG switch ON, stop light switch released	0.3 – 0.7
MSS (S10 – 23) – GND (S9 – 8, 17, S10 – 6, 31)	(Shielded) ↔ W–B	IG switch OFF	Continuity

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MTT (S10 – 27) – GND (S9 – 8, 17, S10 – 6, 31)	BR–B ↔ W–B	IG switch ON, (Motor relay is OFF)	Below 1.5
MT+ (S10 – 28) – MT– (S10 – 18)	BR–W ↔ BR–R	IG switch ON, (Motor relay is OFF)	Below 1.5
MR1 (S10 – 29) – R1+ (S10 – 1)	V–Y ↔ B–Y	IG switch ON, hydraulic brake booster pump motor running	10 – 14

*1: 4WD
*2: Except 1GR–FE 4WD
*3: Except 1GR–FE 2WD
*4: 1GR–FE 4WD

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0529H-07

PROBLEM SYMPTOMS TABLE

If a normal code is displayed during the DTC check but the problem still occurs, check the circuits for each problem symptom in the order given in the table below and proceed to the relevant troubleshooting page.

NOTICE:

When replacing skid control ECU, sensor or etc., turn the ignition switch OFF.

Symptom	Suspect Area	See page
ABS does not operate BA does not operate EBD does not operate	If the symptoms still occur even after the following circuits in suspect areas are inspected and proved to be normal, replace the skid control ECU. 3. Check the DTC again and make sure that the normal code is output. 4. IG power source circuit 5. Speed sensor circuit Front Rear	 05–803 05–864 05–827 05–832
ABS does not operate efficiently BA does not operate efficiently EBD does not operate efficiently	If the symptoms still occur even after the following circuits in suspect areas are inspected and proved to be normal, replace the skid control ECU. 1. Check the DTC again and make sure that the normal code is output. 2. Speed sensor circuit Front Rear 3. Stop light switch circuit	 05–803 05–827 05–832 05–873
ABS warning light abnormal	1. ABS warning light circuit 2. Skid control ECU	05–914 05–906
DTC of ABS check cannot be done	If the symptoms still occur even after the following circuits in suspect areas are inspected and proved to be normal, replace the skid control ECU. 1. Check the DTC again and make sure that the normal code is output. 2. Tc terminal circuit	 05–803 05–930
Sensor signal check cannot be done	1. Ts terminal circuit 2. Skid control ECU	05–932 05–906
TRAC does not operate	If the symptoms still occur even after the following circuits in suspect areas are inspected and proved to be normal, replace the skid control ECU. 1. Check the DTC again and make sure that the normal code is output. 2. IG power source circuit 3. Check the hydraulic circuit for leakage. 4. Speed sensor circuit Front Rear	 05–803 05–864 – 05–827 05–832

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Symptom	Suspect Area	See page
VSC does not operate	If the symptoms still occur even after the following circuits in suspect areas are inspected and proved to be normal, replace the skid control ECU. 1. Check the DTC again and make sure that the normal code is output. 2. IG power source circuit 3. Check the hydraulic circuit for leakage. 4. Speed sensor circuit Front Rear 5. Deceleration sensor circuit 6. Yaw rate sensor circuit 7. Steering sensor circuit	 05–803 05–864 – 05–827 05–832 05–858 05–897 05–847 05–861 05–853
SLIP indicator light abnormal	1. SLIP indicator light circuit 2. Skid control ECU	05–926 05–906
VSC OFF indicator abnormal	If the symptoms still occur even after the following circuits in suspect areas are inspected and proved to be normal, replace the skid control ECU. 1. Check the DTC again and make sure that the normal code is output. 2. VSC OFF switch circuit	 05–803 05–921
DTC of VSC check cannot be done	If the symptoms still occur even after the following circuits in suspect areas are inspected and proved to be normal, replace the skid control ECU. 1. Check the DTC again and make sure that the normal code is output. 2. Tc terminal circuit	 05–803 05–930
VSC warning light abnormal	If the symptoms still occur even after the following circuits in suspect areas are inspected and proved to be normal, replace the skid control ECU. 1. Check the DTC again and make sure that the normal code is output. 2. VSC warning circuit	 05–803 05–916

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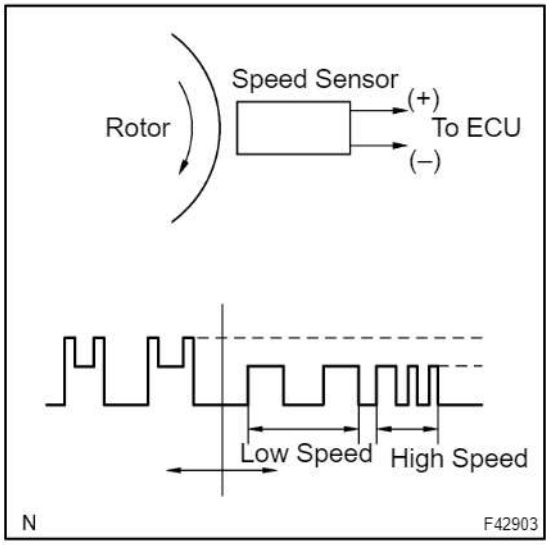
DTC	C0200/31	RIGHT FRONT SPEED SENSOR CIRCUIT

DTC	C0205/32	LEFT FRONT SPEED SENSOR CIRCUIT

DTC	C1235/35	FOREIGN MATTER IS ATTACHED ON TIP OF RIGHT FRONT SENSOR

DTC	C1236/36	FOREIGN MATTER IS ATTACHED ON TIP OF LEFT FRONT SENSOR

CIRCUIT DESCRIPTION



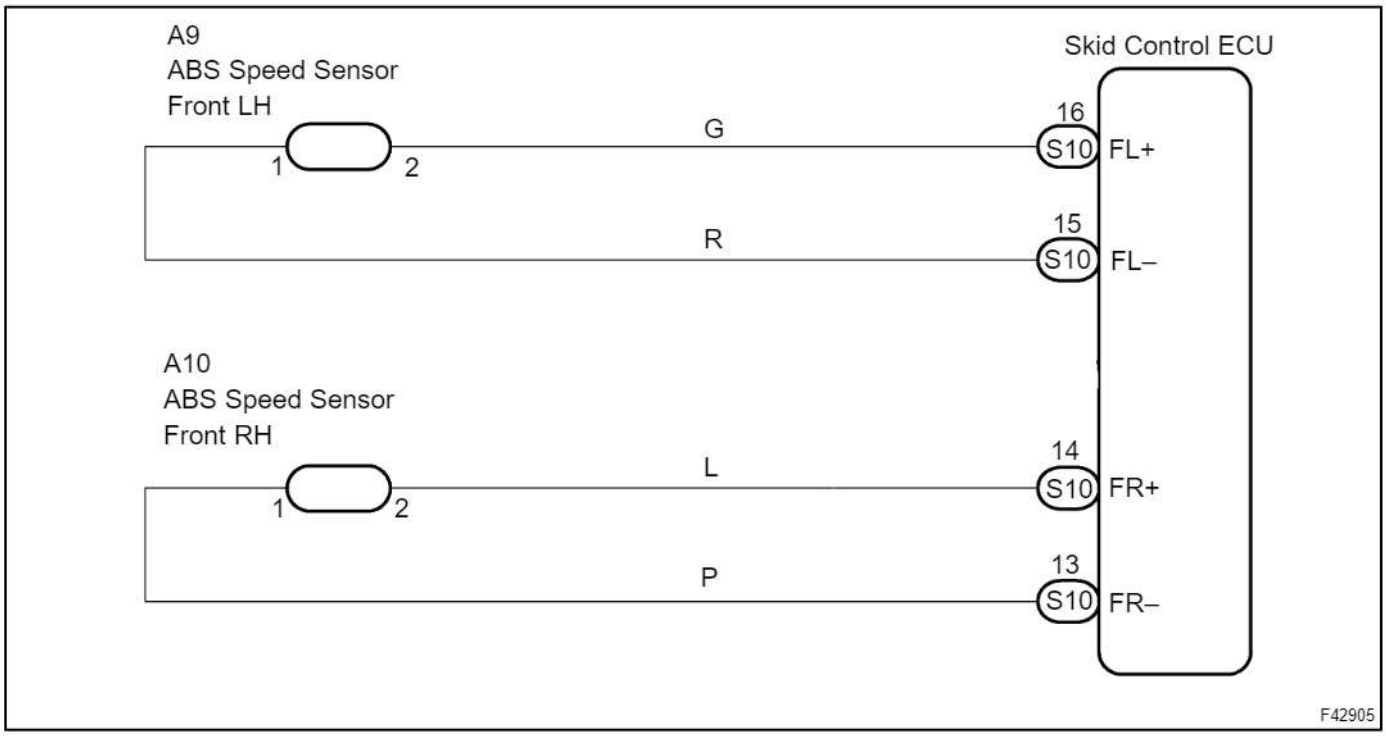
The speed sensor detects wheel speed and sends the appropriate signals to the ECU. These signals are used for control of the ABS and VSC control systems.

DTC No.	DTC Detecting Condition	Trouble Area
C0200/31 C0205/32	Detection of any of conditions 1. through 3.: 1. At vehicle speed of 10 km/h (6 mph) or more, pulses are not input for 15 sec. 2. Momentary interruption of the speed sensor signal occurs at least 7 times in the time between switching the ignition switch ON and switching it OFF. 3. The condition that the speed sensor signal circuit is open continues for 0.5 sec. or more. 4. When the vehicle speed is at 3 km/h (2mph) or higher and any 3 wheels out of 4 wheels are out putting the backup signal, the pulse with less than 300 us is produced 75 times on the other 1 wheel. 5. Changing of the normal rotation pulse and the reverse rotation pulse occur within 6 msec. for 1 sec. continuously. 6. The reverse rotation pulse is produced for 1 sec. with the vehicle speed at 100 km/h (62 mph) or higher.	□Right front and left front speed sensor □Each speed sensor circuit □Speed sensor rotor
C1235/35 C1236/36	At the vehicle speed of 20 km/h (12 mph) or more, the condition that noise is included in the speed sensor signal continues for 5 sec. or more.	□Right front and left front speed sensor □Speed sensor rotor

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HINT:
DTC No. C0200/31 and C1235/35 is the right front speed sensor.
DTC No. C0205/32 and C1236/36 is the left front speed sensor.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- □ Start the inspection from step 1 in case of using hand–held tester and start from step 2 in case of not using hand–held tester.
- □ Start the inspection from step 5 in case of C1235 / 35 and C1236 / 36.

1	READ VALUE OF FRONT SPEED SENSOR

(a) Select the DATALIST mode on the hand–held tester.
(b) Check that there is no difference between the speed value output from the speed sensor displayed by the hand–held tester and the speed value displayed by the speedometer when driving the vehicle. (Compare the value of each 4 wheels with the vehicle speed on the speedometer.)
OK:
There is almost no difference from the displayed speed value.

HINT:
There is tolerance of | 10 % in the speedometer indication.

OK	Go to step 4

NG

Author : Date : 1027

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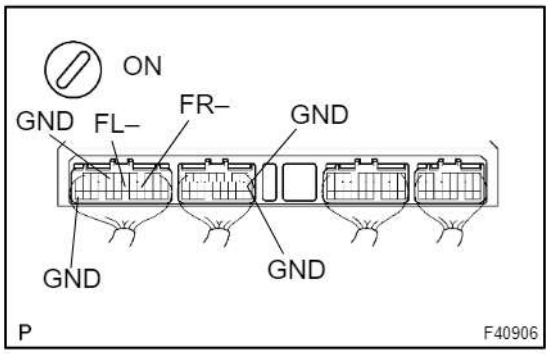
2	CHECK HARNESS AND CONNECTOR(FRONT SPEED SENSOR–SKID CONTROL ECU)

(a) Check for open and short circuit in harness and connector between each speed sensor and skid control ECU connector (See page 01–35).

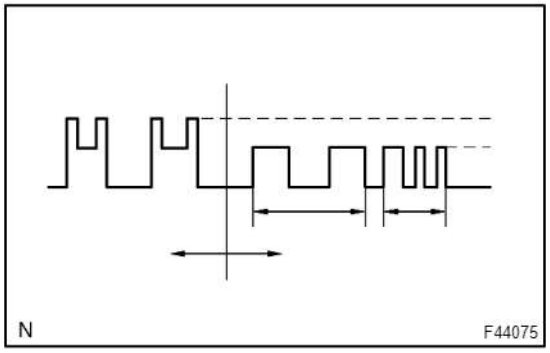
NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

3	INSPECT SPEED SENSOR AND SENSOR ROTOR SERRATIONS



(a) Remove the skid control ECU with the connector still connected.
(b) Turn the ignition switch ON.
(c) Measure resistance between terminal FR– and GND and FL– and GND of skid control ECU.
Resistance: 95 – 105 Ω



(REFERENCE) INSPECTION USING OSCILLOSCOPE

(a) Connect the oscilloscope to the terminals FR– – GND and FL– – GND of the skid control ECU.
(b) Drive the vehicle at about 30 km/h (19 mph), and check the signal waveform.Check that no abnormal waveform appears when driving the vehicle at constant speed for 1 minute.

HINT:

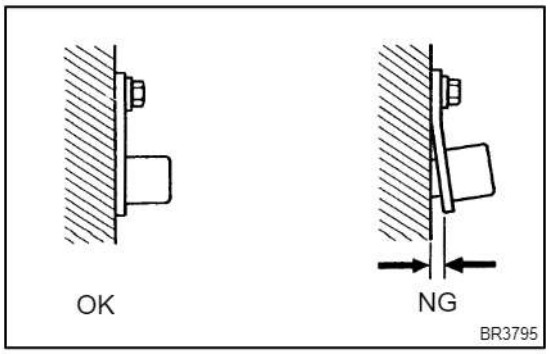
- As the vehicle speed (wheel revolution speed) increases, a cycle of the waveform becomes shorter.
- When noise is identified in the waveform on the oscilloscope, error signals are generated due to the speed sensor rotor's scratches, looseness or foreign matter deposited on it.

OK → CHECK AND REPLACE SKID CONTROL ECU ASSY

NG

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4 INSPECT FRONT SPEED SENSOR INSTALLATION



(a) Check the speed sensor installation.
OK:
The installation bolt is tightened properly and there is no clearance between the sensor and front steering knuckle.
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)

NG → **REPLACE SPEED SENSOR FRONT RH**

NG → **REPLACE SPEED SENSOR FRONT LH**

NOTICE:
Check the speed sensor signal last (See page 05–803).

OK

5 INSPECT SPEED SENSOR TIP

(a) Remove the front speed sensor (See page 32–50).
(b) Check the sensor tip.
OK:
No scratches or foreign objects on the sensor tip.

NG → **CLEAN OR REPAIR SPEED SENSOR**

NOTICE:
Check the speed sensor signal last (See page 05–803).

OK

6 INSPECT SPEED SENSOR ROTOR

(a) Remove the drive shaft, and throughly check around the rotor.
OK:
No scratches or foreign objects.

HINT:
If foreign matter is attached, remove it and after reassembling, check the output waveform.

NG → **CLEAN OR REPAIR SPEED SENSOR ROTOR**

NOTICE:
Check the speed sensor signal last (See page 05–803).

OK → **Go to step 7(When C0200/31and C0205/32)**

OK

CHECK AND REPLACE SKID CONTROL ECU ASSY

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7	INSPECT SPEED SENSOR

(a) Shift the sensor in the front and in the rear, and check the waveform again.
OK:
Not change phenomenon

NG → REPLACE SPEED SENSOR FRONT RH

NG → REPLACE SPEED SENSOR FRONT LH

OK

REPLACE SENSOR ROTOR

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DTC	C0210/33	RIGHT REAR SPEED SENSOR CIRCUIT

DTC	C0215/34	LEFT REAR SPEED SENSOR CIRCUIT

DTC	C1238/38	FOREIGN MATTER IS ATTACHED ON TIP OF RIGHT REAR SENSOR

DTC	C1239/39	FOREIGN MATTER IS ATTACHED ON TIP OF LEFT REAR SENSOR

CIRCUIT DESCRIPTION

Refer to DTC C0200/31, C0205/32, C1235/35, C1236/36 on page 05–827.

DTC No.	DTC Detecting Condition	Trouble Area
C0210/33 C0215/34	Detection of any of conditions 1. through 3.: 1. At vehicle speed of 10 km/h (6 mph) or more, pulses are not input for 15 sec. 2. Momentary interruption of the speed sensor signal occurs at least 7 times in the time between switching the ignition switch ON and switching it OFF. 3. The condition that the speed sensor signal circuit is open continues for 0.12 sec. or more. 4. When the vehicle speed is at 3 km/h (2mph) or higher and any 3 wheels out of 4 wheels are out putting the backup signal, the pulse with less than 300 us is produced 75 times on the other 1 wheel. 5. Changing of the normal rotation pulse and the reverse rotation pulse occur within 6 msec. for 1 sec. continuously. 6. The reverse rotation pulse is produced for 1 sec. with the vehicle speed at 100 km/h (62 mph) or higher.	□Right rear and left rear speed sensor □Each speed sensor circuit □Speed sensor rotor
C1238/38 C1239/39	At the vehicle speed of 20 km/h (12 mph) or more, the condition that noise is included in the speed sensor signal continues for 5 sec. or more.	□Right rear and left rear speed sensor □Speed sensor rotor

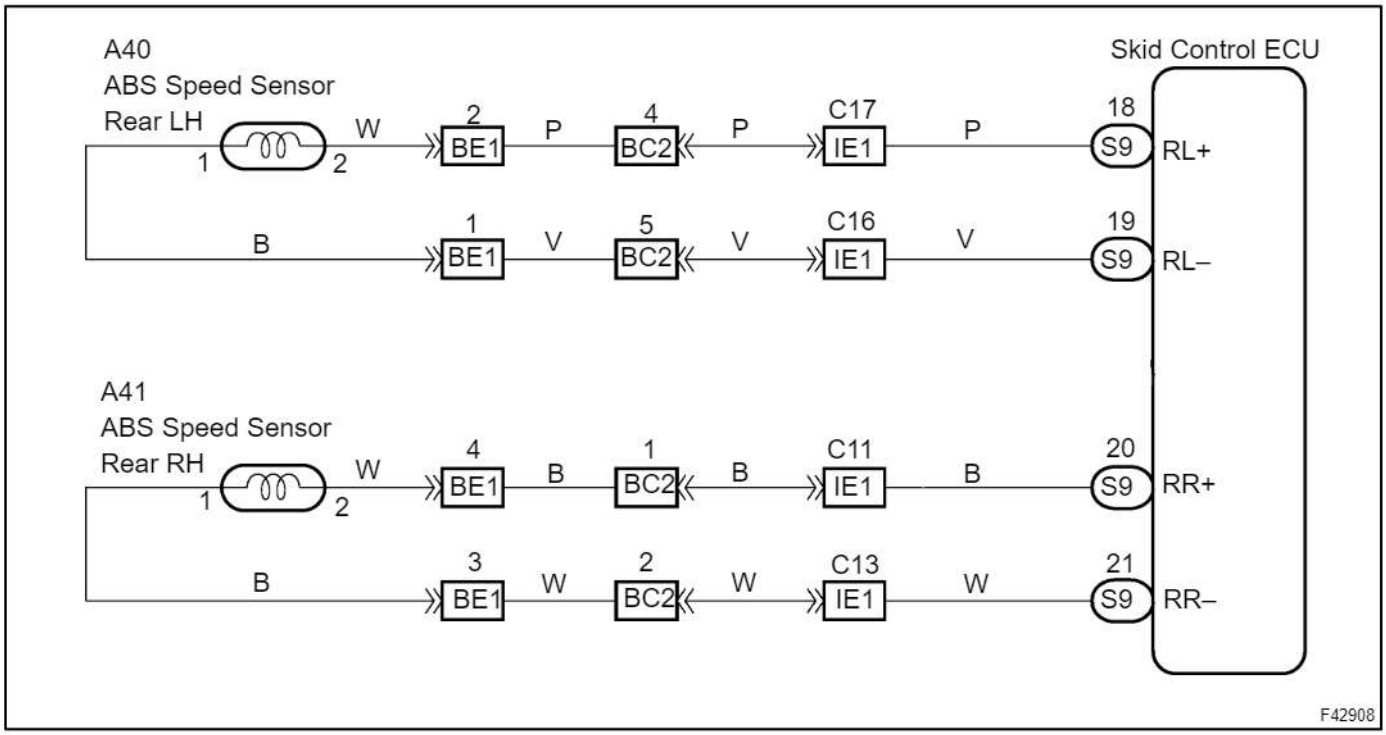
HINT:

DTC No. C0210/33, C1238/38 is the right rear speed sensor.

DTC No. C0215/34, C1239/39 is the left rear speed sensor.

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WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- Start the inspection from step 1 in case of using hand–held tester and start from step 2 in case of not using hand–held tester.
- Start the inspection from step 5 in case of C1238/38 and C1239/39.

1	READ VALUE OF REAR SPEED SENSOR

(a) Check that there is no difference between the speed value output from the speed sensor displayed by the hand–held tester and the speed value displayed by the speedometer when driving the vehicle. (Compere the vehicle of each 4 wheels with the vehicle speed on the speedometer.)

OK:

There is almost no difference from the displayed speed value.

HINT:

There is tolerance of ± 10 % in the speedometer indication.

OK	Go to step 4

NG

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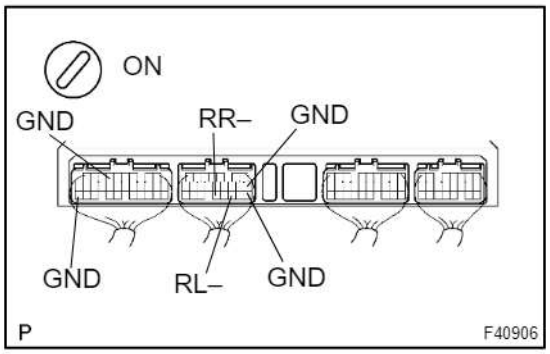
2	CHECK HARNESS AND CONNECTOR(REAR SPEED SENSOR – SKID CONTROL ECU)

(a) Check for open and short circuit in harness and connector between each speed sensor and skid control ECU connector (See page 01–35).

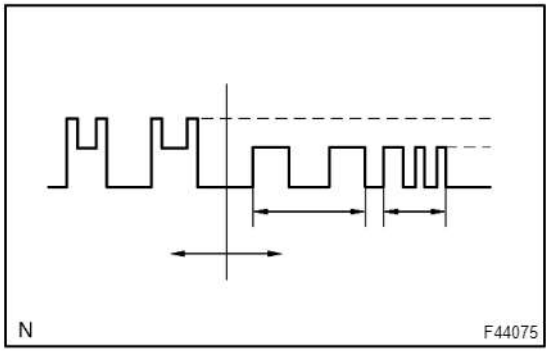
NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

3	INSPECT SPEED SENSOR AND SENSOR ROTOR SERRATIONS



(a) Remove the skid control ECU with the connector still connected.
(b) Turn the ignition switch ON.
(c) Measure resistance between terminal FR– and GND and FL– and GND of skid control ECU.
Resistance: 95 – 105 Ω



(REFERENCE) INSPECTION USING OSCILLOSCOPE

(d) Connect the oscilloscope to the terminals RR+, RR– and and GND of the skid control ECU.
(e) Drive the vehicle at about 30 km/h (19 mph), and check the signal waveform. Check that abnormal waveform appears when driving the vehicle at constant speed for 1 minute.

HINT:

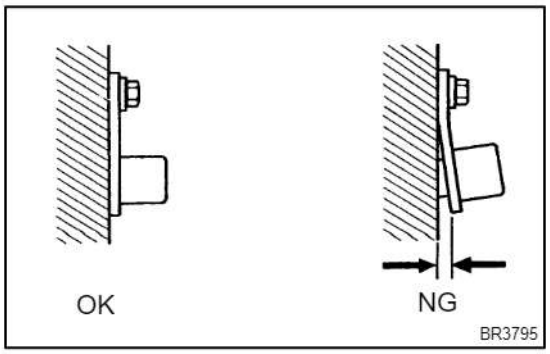
- As the vehicle speed (wheel revolution speed) increases, a cycle of the waveform becomes shorter and the fluctuation in the output voltage becomes greater.
- When noise is identified in the waveform on the oscilloscope, error signals are generated due to the speed sensor rotor's scratches, looseness or foreign matter deposited on it.

OK → CHECK AND REPLACE SKID CONTROL ECU ASSY

NG

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4 INSPECT REAR SPEED SENSOR INSTALLATION



(a) Check the speed sensor installation.
OK:
The installation bolt is tightened properly and there is no clearance between the sensor and front steering knuckle.
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)

NG → **REPLACE SPEED SENSOR REAR RH**

NG → **REPLACE SPEED SENSOR REAR LH**

NOTICE:
Check the speed sensor signal last (See page 05–803).

OK

5 INSPECT SPEED SENSOR TIP

(a) Remove the rear speed sensor (See page 32–52).
(b) Check the sensor tip.
OK:
No scratches or foreign objects on the senaor tip.

NG → **CLEAN OR REPAIR SPEED SENSOR**

NOTICE:
Check the speed sensor signal last (See page 05–803).

OK

6 INSPECT SPEED SENSOR ROTOR

(a) Check the sensor rotor serrations.
OK:
No scratches, missing teeth or foreign objects.

HINT:
If foreign matter is attached, remove it and after reassembling, check the output waveform.

NG → **CLEAN OR REPAIR SPEED SENSOR ROTOR**

NOTICE:
Check the speed sensor signal last (See page 05–803).

OK → **Go to step 7(When C0210/33and C0215/34)**

OK

CHECK AND REPLACE SKID CONTROL ECU ASSY

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7	INSPECT SPEED SENSOR

(a) Shift the sensor in the front and in the rear, and check the waveform again.
OK:
Not change phenomenon

NG → REPLACE SPEED SENSOR REAR RH

NG → REPLACE SPEED SENSOR REAR LH

OK

REPLACE SENSOR ROTOR

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DTC	C0226/21	SFR SOLENOIDO CIRCUIT

DTC	C0236/22	SFL SOLENOID CIRCUIT

DTC	C0246/23	SRR SOLENOID CIRCUIT

DTC	C0256/24	SRL SOLENOID CIRCUIT

DTC	C1225/25	SMC SOLENOID CIRCUIT(SA1)

DTC	C1226/26	SPC SOLENOID CIRCUIT(SA2)

DTC	C1227/27	SRC SOLENOID CIRCUIT(SA3)

DTC	C1228/28	STR SOLENOID CIRCUIT

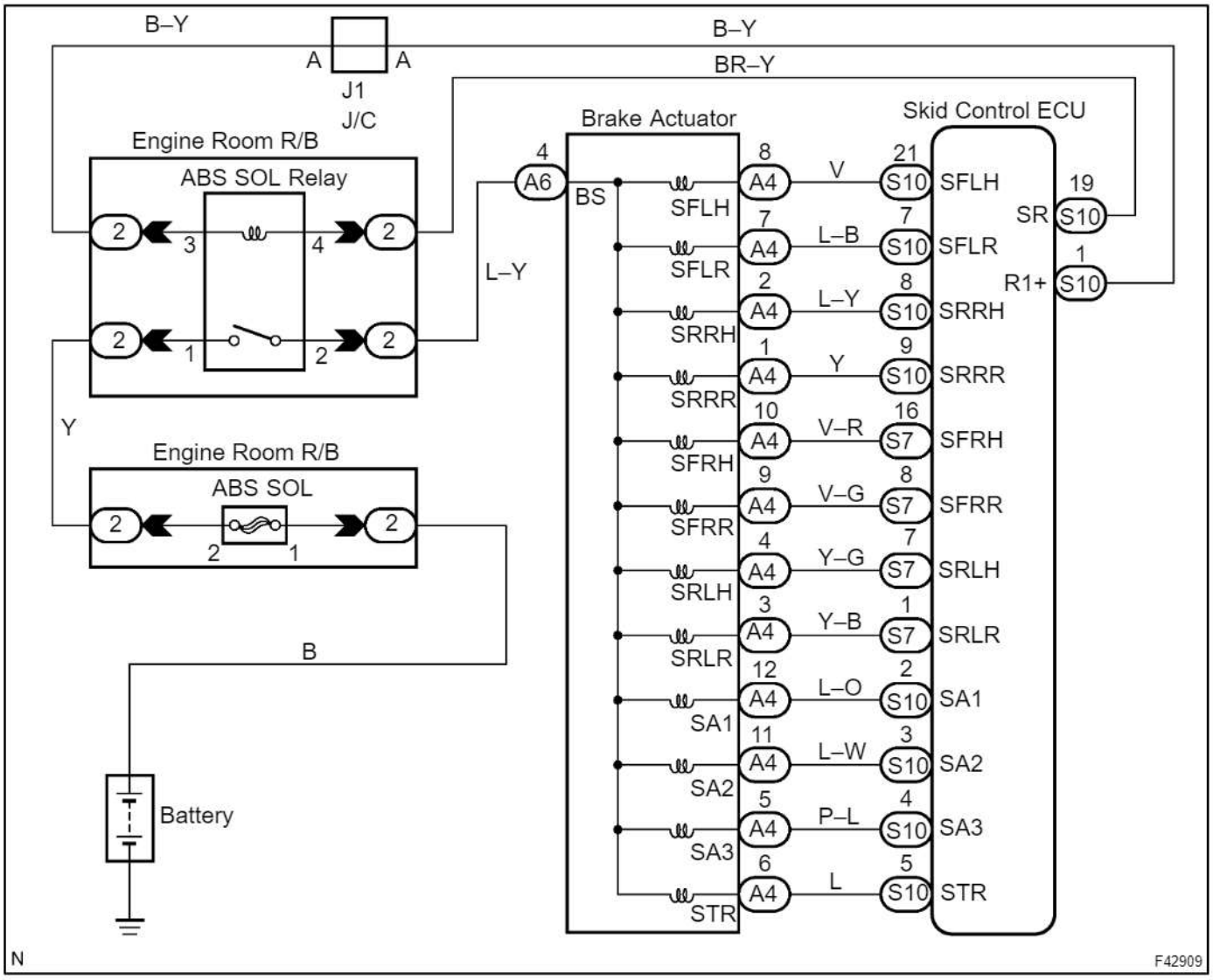
CIRCUIT DESCRIPTION

The solenoid goes on when signals are received from the ECU and controls the pressure action on the wheel cylinders thus controlling the braking force.

DTC No.	DTC Detecting Condition	Trouble Area
C0226/21	Open or short in SFRH or SFRR circuit for 0.05 sec. or more.	□Brake master cylinder □SFRH or SFRR circuit
C0236/22	Open or short in SFLH or SFLR circuit for 0.05 sec. or more.	□Brake master cylinder □SFLH or SFLR circuit
C0246/23	Open or short in SRRH or SRRR circuit for 0.05 sec. or more.	□Brake master cylinder □SRRH or SRRR circuit
C0256/24	Open or short in SRLH or SRLR circuit for 0.05 sec. or more.	□Brake master cylinder □SRLH or SRLR circuit
C1225/25	Open or short in SMC (SA1) circuit for 0.05 sec. or more.	□Brake master cylinder □SMC (SA1) circuit
C1226/26	Open or short in SPC (SA2) circuit for 0.05 sec. or more.	□Brake master cylinder □SPC (SA2) circuit
C1227/27	Open or short in SRC (SA3) circuit for 0.05 sec. or more.	□Brake master cylinder □SRC (SA3) circuit
C1228/28	Open or short in STR circuit for 0.05 sec. or more.	□Brake master cylinder □STR circuit

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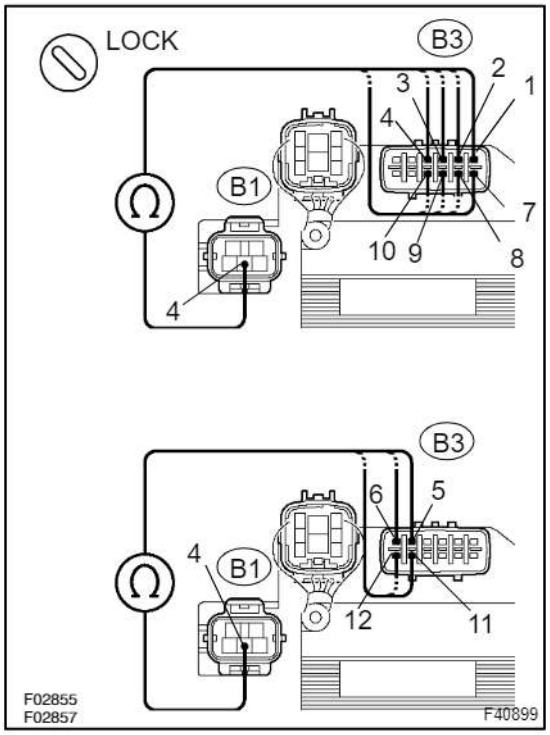
WIRING DIAGRAM



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INSPECTION PROCEDURE

1	INSPECT BRAKE MASTER CYLINDER SUB–ASSY



(a) Disconnect the 2 connectors (B1 and B3) from the brake master cylilnder.

(b) Check continuity between each of terminals B1 – 4 and B3 – 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11and 12 of brake master cylinder connector.

OK:

Continuity

HINT:

Resistance of each solenoid at 20 C (68 F)

SFRH, SFLH, SRRH, SRLH, SA3: 7.0 – 7.4 Ω

SFRR, SFLR, SRRR, SRLR: 2.00 – 2.40 Ω

SA1, SA2, STR: 4.1 – 4.5 Ω

NG	REPLACE BRAKE MASTER CYLINDER SUB–ASSY

OK

2	CHECK HARNESS AND CONNECTOR(BRAKE MASTER CYLINDER – SKID CONTROL ECU)

(a) Check for open and short circuit in harness and connector between each solenoid and skid control ECU (See page 01–35).

NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

CHECK EACH CONNECTION IF SAME CODE IS STILL OUTPUT AFTER DTC DELETION (IF NORMAL, THE ECU MAY BE DEFECTIVE.)

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DTC	C0278/11	OPEN CIRCUIT IN ABS SOLENOID RELAY CIRCUIT

DTC	C0279/12	SHORT CIRCUIT IN ABS SOLENOID RELAY CIRCUIT

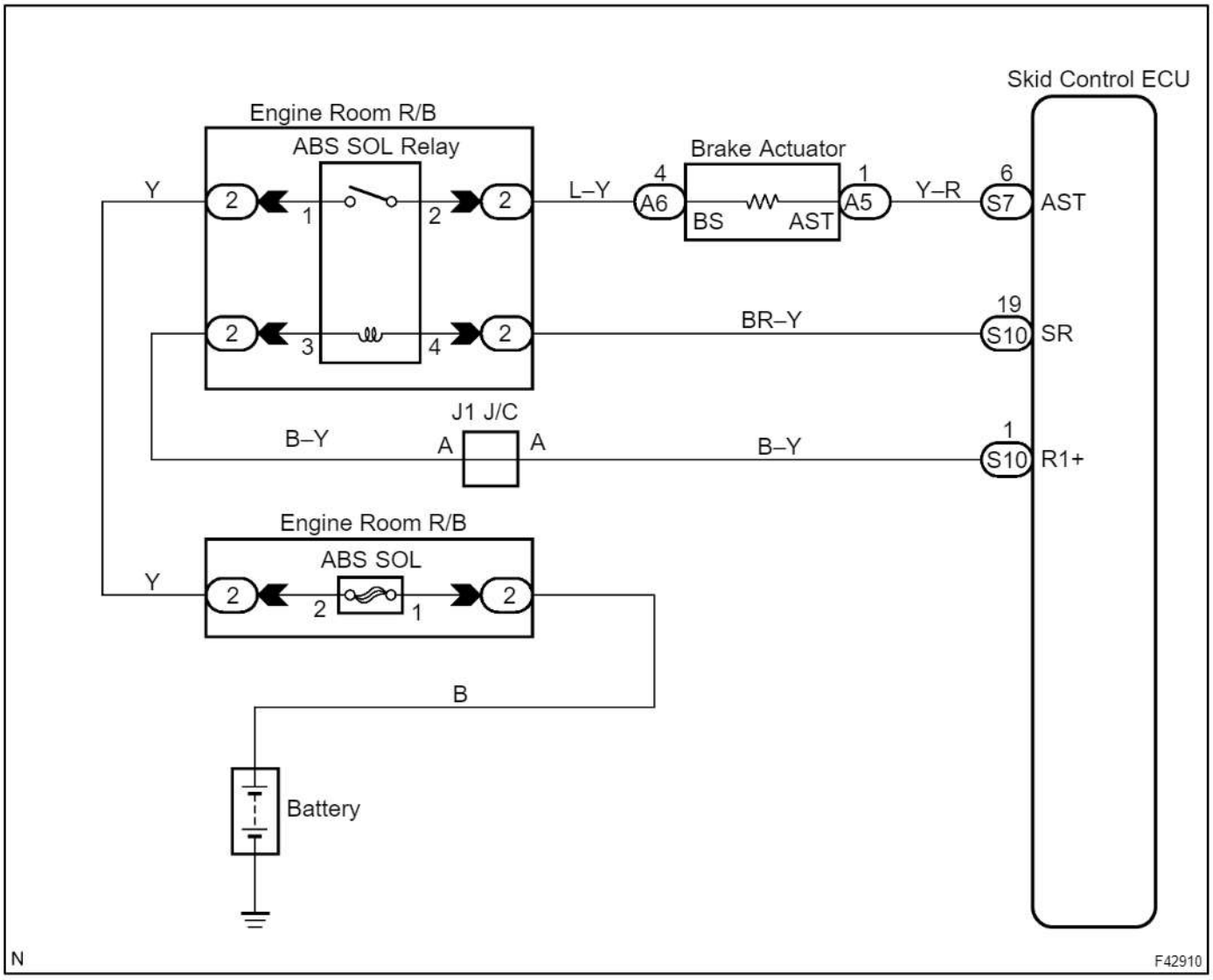
CIRCUIT DESCRIPTION

This relay supplies power to each ABS solenoid. After the ignition switch is turned ON, if the initial check is OK, the relay goes on.

DTC No.	DTC Detecting Condition	Trouble Area
C0278/11	Conditions 1. and 2. continue for 0.2 sec. or more: 1. ECU terminal IG1 voltage is 9.5 V to 17.0 V and the solenoid relay is ON, however, the contact point of the solenoid relay is OFF. 2. With solenoid relay ON, ECU terminal IG1voltage becomes 9.5 V or less and the contact point of the solenoid relay does not become ON.	□ABS solenoid relay □ABS solenoid relay circuit
C0279/12	Immediately after ECU terminal IG1 becomes ON, and solenoid relay is OFF, however, when the condition that the solenoid relay due to the contact point is ON continues for 0.2 sec. or more.	

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WIRING DIAGRAM



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INSPECTION PROCEDURE

HINT:

Start the inspection from step 1 in case of using the hand–held tester and start from step 2 in case of not using the hand–held tester.

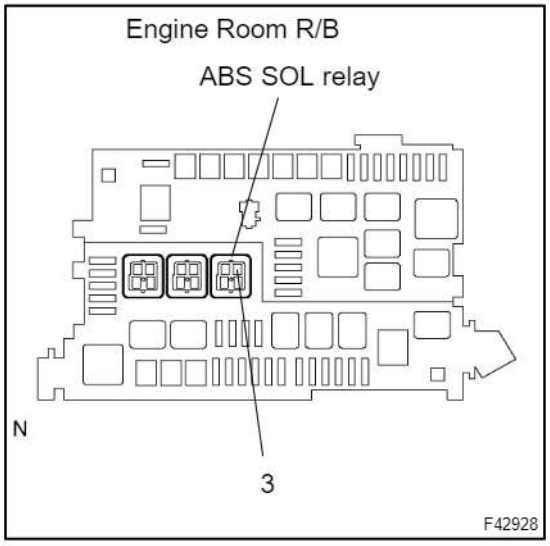
1	PERFORM ACTIVE TEST BY ABS MOTER RELAY

(a) Check the operation sound of the ABS SOL relay when operating it with the hand–held tester.
OK:
The operation sound of the ABS SOL relay should be heard.

OK	Go to step 4

NG

2	INSPECT ENGINE ROOM RELAY BLOCK



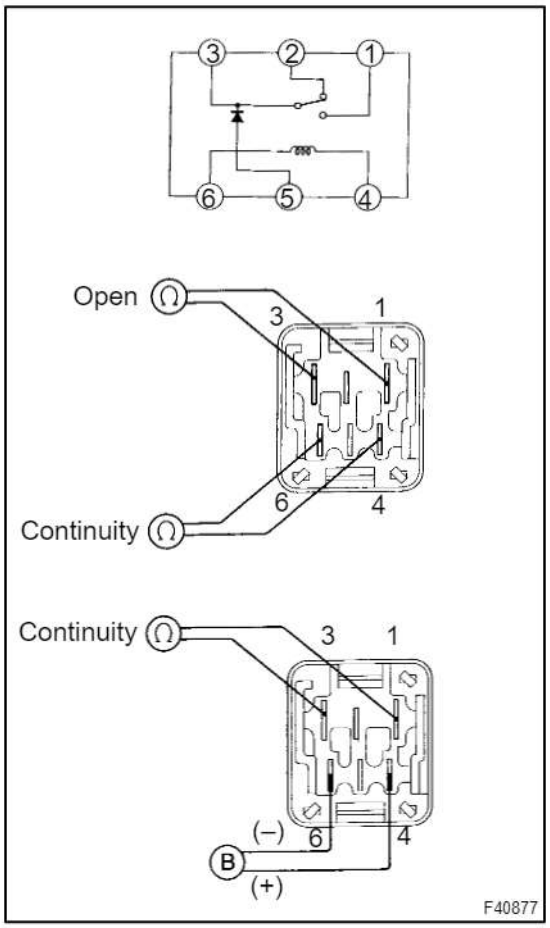
(a) Remove the ABS SOL relay from the engine room R/B.
(b) Measure the voltage between terminal 3 of engine room R/B (for ABS SOL relay) and body ground.
OK:
Voltage: 10 – 14V

NG	CHECK AND REPLACE HARNESS AND CONNECTOR

OK

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3 CHECK ABS MOTER RELAY



(a) Check continuity between each terminal of ABS SOL relay.

OK:

Terminals 4 and 6	Continuity (Reference value 80 Ω)
Terminals 1 and 3	Open

(b) Apply battery positive voltage between terminals 4 and 6.

(c) Check continuity between each terminal of ABS SOL relay.

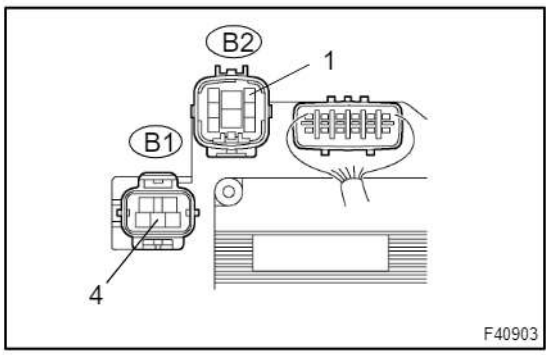
OK:

Terminals 1 and 3	Continuity

NG → **REPLACE ABS MOTER RELAY**

OK

4 INSPECT BRAKE MASTER CYLINDER



(a) Disconnect the 2 connectors (B1 and B2) from the brake master cylinder.

(b) Check continuity between terminal B1 – 4 and B2 – 1 of brake master cylinder.

OK:

Continuity

HINT:

This is a resistance of 30 – 36 Ω

NG → **REPLACE BRAKE MASTER CYLINDER**

OK

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5	CHECK HARNESS AND CONNECTOR(ENGINE ROOM R/B – BRAKE MASTER CYLINDER)

(a) Check for open and short circuit in harness and connector between terminal BS of brake master cylinder and engine room R/B (See page 01–35).

NG → REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

6	CHECK HARNESS AND CONNECTOR(BRAKE MASTER CYLINDER – SKID CONTROL ECU)

(a) Check for open and short circuit in harness and connector between terminal AST of brake master cylinder and skid control ECU (See page 01–35).

NG → REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

CHECK EACH CONNECTION IF SAME CODE IS STILL OUTPUT AFTER DTC DELETION (IF NORMAL, THE SKID CONTROL ECU MAY BE DEFECTIVE)

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DTC C1201/51 ENGINE CONTROL SYSTEM MALFUNCTION

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
C1201/51	Conditions 1. and 2. continue for 5 sec.: 1. Engine speed: 500 rpm or more. 2. A trouble signal in the engine control system is input.	Engine control system

HINT:
If trouble occurs in the engine control system, the ECU prohibits TRAC and VSC control.

INSPECTION PROCEDURE

1	CHECK DTC FOR ENGINE

(a) Check if the DTC of engine.

A	Always ON
B	Malfunction code

B → REPAIR CIRCUIT INDICATED BY OUTPUT CODE

A

CHECK ENGINE WARNING LIGHT CONDITION

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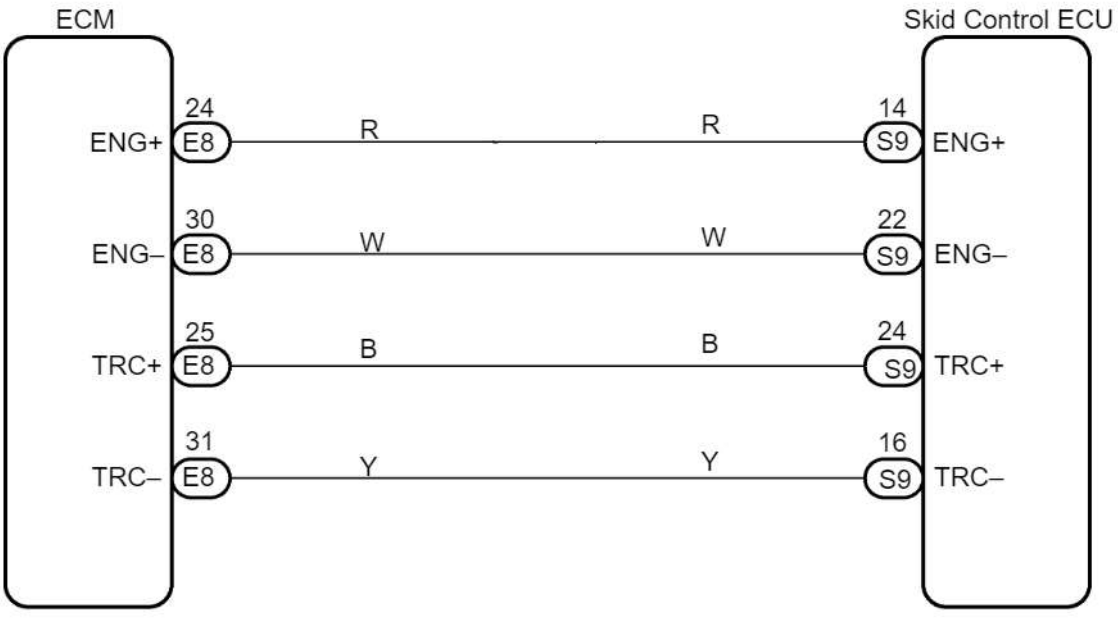
DTC	C1203/53	ECM COMMUNICATION CIRCUIT MALFUNCTION

CIRCUIT DESCRIPTION

The circuit is used to send TRAC & VSC control information from the skid control ECU to the ECM (TRC+, TRC–), and engine control information from the ECM to the skid control ECU (ENG+, ENG–).

DTC No.	DTC Detecting Condition	Trouble Area
C1203/53	Either of the following 1. or 2. continues for 5 sec.: 1. ECU IG1 terminal voltage is 9.5 V to 17.0 V and data transmission to the ECM is impossible. 2. ECU IG1 terminal voltage is 9.5 V to 17.0 V, engine speed is 500rpm or more or vehicle speed is 60 km/h (36 mph) or more and data receiving from the ECM is impossible.	·TRC+ or TRC– circuit ·ENG+ or ENG– circuit ·ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK HARNESS AND CONNECTOR(ECM – SKID CONTROL ECU)

(a) Check for open and short ciruit in harness and connector between each of terminals ENG+, ENG–, TRC+, TRC– of skid control ECU and the same one of the ECM (See page 01–35).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

CHECK AND REPLACE ECM OR SKID CONTROL ECU

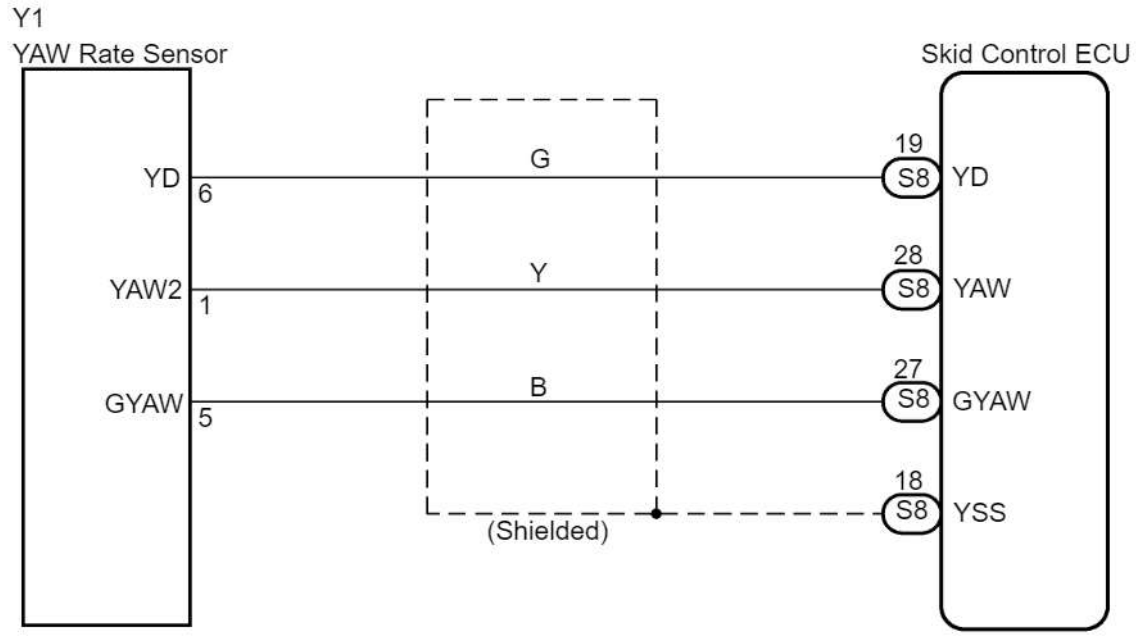
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DTC	C1210/36	ZERO POINT CALIBRATION OF YAW RATE SENSOR UNDONE

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
C1210/36	When any of following 1. through 2. is detected: 1. After battery terminal was connected, when the shift lever was moved other than to P range within 15 sec. soon after ECU terminal IG1 become ON for the first time. 2. When the yaw rate sensor zero point recorded in ECU is deleted.	□Yaw rate sensor □Yaw rate sensor circuit □Neutral start switch circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

1	PERFORM ZERO POINT CALIBRATION OF YAW RATE SENSOR

(a) See page 05–803.

2	CHECK RECONFIRM DTC

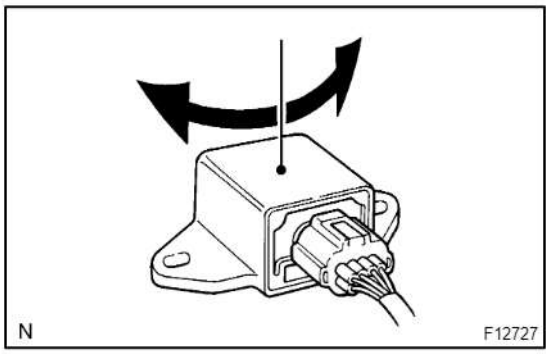
(a) Check if the DTC is output.

NO → NO PROBLEM

YES

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3 READ VALUE OF YAWRATE SENSOR

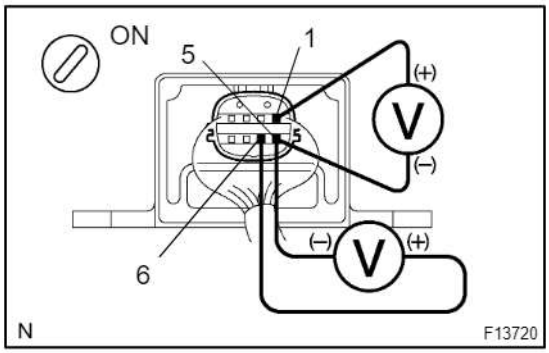


IN CASE OF USING HAND–HELD TESTER:

(a) Remove the consol box.
(b) Remove the yaw rate sensor with the connector still connected to it.
(c) Connect the hand–held tester to the DLC3.
(d) Turn the ignition switch ON and push the hand–held tester main switch ON.
(e) Select the DATALIST mode on the hand–held tester.
(f) Check that the yaw rate sensor value of the yaw rate senor observed in the hand–held tester is changing: Place the yaw rate sensor vertically to the ground and turn the sensor pivoted on its center.

OK:

Yaw rate value must be changing. (Reference)
When the yaw rate sensor is stationary output value:
| 4 deg/s



IN CASE OF NOT USING HAND–HELD TESTER:

(a) Remove the console box then remove the yaw rate sensor with the connector still connected to it.
(b) Turn the ignition switch ON.
(c) Measure voltage between terminals YAW2 (1) – GYAW (5), and terminals YD (6) – GYAW (5) of the yaw rate sensor.

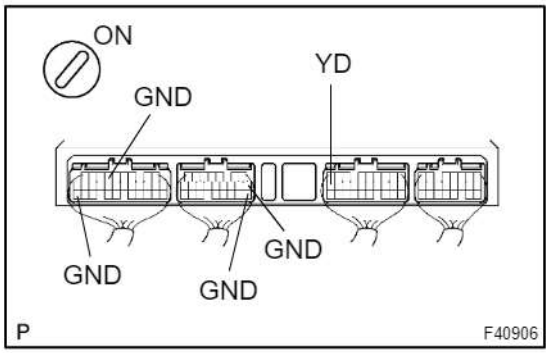
OK:

Terminals 1 and 5 (YAW2 – GYAW)	About 2.42 – 2.58 V
terminals 6 and 5 (YD – GYAW)	About 4.5 – 5.3 V

NG → **REPLACE YAWRATE SENSOR**

OK

4 INSPECT SKID CONTROL ECU TERMINAL VOLTAGE(YD TERMINAL)



(a) Remove the skid control ECU with the connector still connected to it.
(b) Turn the ignition switch ON.
(c) Measure voltage between terminals YD and GND of skid control ECU.

OK:

voltage: 4.5 – 5.3 V

OK → **CHECK AND REPLACE SKID CONTROL ECU ASSY**

NG

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5	CHECK HARNESS AND CONNECTOR(YAW RATE SENSOR – SKID CONTROL ECU)

(a) Check for open and short circuit in harness and connector between terminal YD of yaw rate sensor and skid control ECU (See page 01–35).

NG → REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

CHECK AND REPLACE SKID CONTROL ECU ASSY

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DTC C1223/43 ABS CONTROL SYSTEM MALFUNCTION

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
C1223/43	ABS control system is abnormal.	ABS control system

INSPECTION PROCEDURE

1	CHECK DTC(See page 05–803)

A	Normal Code
B	Malfunction Code

B → REPAIR CIRCUIT INDICATED BY OUTPUT CODE

A

CHECK ABS WARNING LIGHT CIRCUIT

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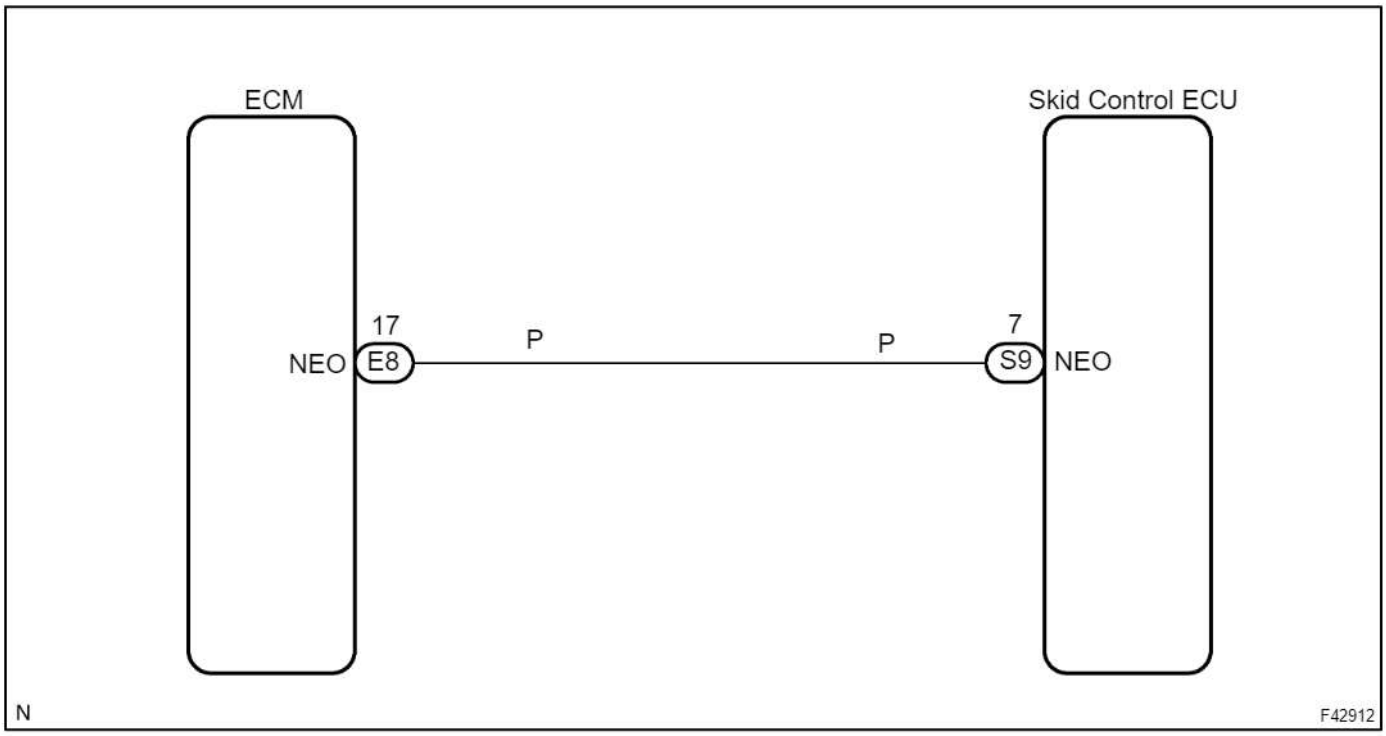
DTC C1224/44 NE SIGNAL CIRCUIT

CIRCUIT DESCRIPTION

The skid control ECU receives engine revolution speed signals (NE signals) from the ECM.

DTC No.	DTC Detecting Condition	Trouble Area
C1224/44	When any of the following 1. through 2. is detected: 1. At vehicle speed of 30 km/h (19 mph) or more, and when data received from the ECM is in normal condition, and open or short circuit for engine revolution signal circuit continues for 10 sec. or more. 2. While TRAC is operating, the conditions that open or short circuit in engine revolution signal circuit is detected, main throttle opening degree is 0 and IDL switch is OFF continue for 0.24 sec. or more.	□NEO circuit □ECM □Skid control ECU

WIRING DIAGRAM



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INSPECTION PROCEDURE

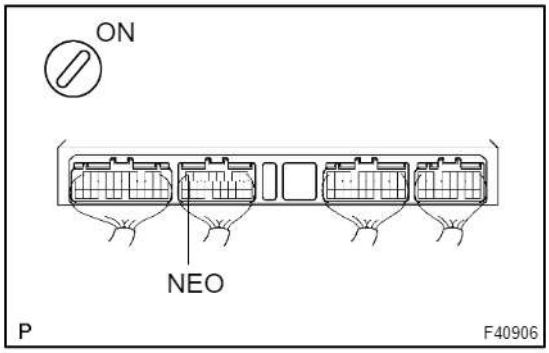
1	CHECK HARNESS AND CONNECTOR(SKID CONTROL ECU – ECM)

(a) Check for open and short cicuit in harness and connector between terminal NEO of skid control ECU and ECM (See page 01–35).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

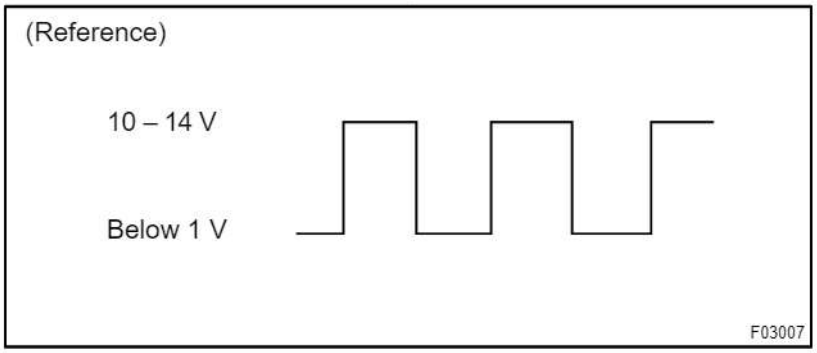
OK

2	INSPECT SKID CONTROL ECU TERMINAL VOLTAGE(NEO TERMINAL)



(a) Remove the skid control ECU with connector still connected.
(b) Turn the ignition switch ON.
(c) Measure voltage between terminal NEO of skid control ECU and body ground for the engine conditions below.
OK:

Engine condition	Voltage
OFF (IG ON)	10 – 14 V or below 1 V
ON (Idling)	10 – 14 V ⇔ below 1 V (Pulse)



NG → CHECK AND REPLACE SKID CONTROL ECU ASSY

OK

CHECK EACH CONNECTION IF SAME CODE IS STILL OUTPUT AFTER DTC DELETION (IF NORMAL, THE ECU MAY BE DEFECTIVE.)

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DTC	C1231/31	STEERING ANGLE SENSOR CIRCUIT

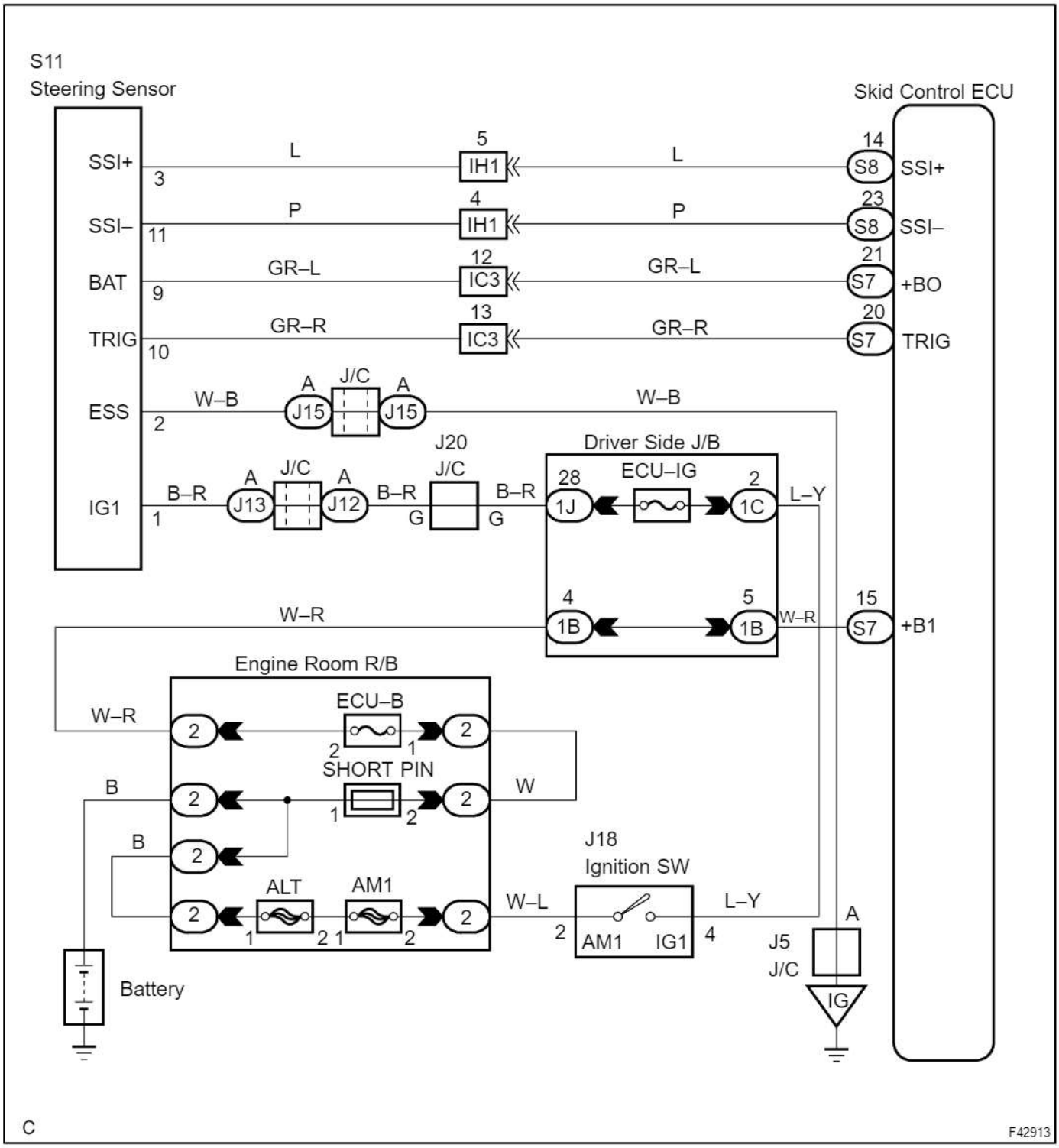
DTC	C1335/35	STEERING ANGLE SENSOR CIRCUIT

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
C1231/31	When ECU IG1 terminal voltage is 9.5 V or more, ECU does not receive data from the steering angle sensor for 1 sec. or more.	□Steering angle sensor □Steering angle sensor circuit □+BI circuit
C1335/35	Detection of either condition 1. or 2.: 1. When the ECU IG1 terminal voltage is 9.5 V or more, data transmission from the steering angle sensor is impossible for 1 sec. or more. 2. Immediately after the terminal BAT is connected and when IG1 terminal voltage is 9.5 V or more, open circuit of terminal TRIG continues for 15 sec. or more.	□Steering angle sensor □Steering angle sensor circuit

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WIRING DIAGRAM



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INSPECTION PROCEDURE

HINT:

Start the inspection from step 1 in case of using the hand–held tester and start from step 2 in case of not using the hand–held tester.

1	READ VALUE OF STEERING SENSOR

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the DATALIST mode on the hand–held tester.
(d) Check that the steering wheel turning angle value of the steering angle position sensor displayed on the hand–held tester is changing when turning the steering wheel.

NOTICE:

The value changes after the steering sensor rechecks 0 point. (Driving the vehicle straight for 10 sec. or more at the speed less than 35 km/h (22 mph)).

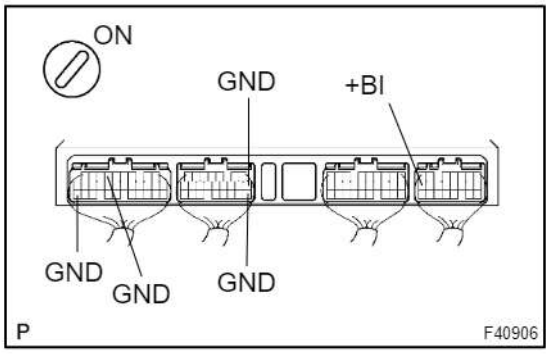
OK:

Steering wheel turning angle value must be changing.

OK → **Go to step 4**

NG

2	INSPECT SKID CONTROL ECU TERMINAL VOLTAGE(+BI TERMINAL)



(a) Remove the skid control ECU with the connector still connected.
(b) Turn the ignition switch ON.
(c) Measure voltage between terminal +BI and GND of skid control ECU and body ground.

OK:

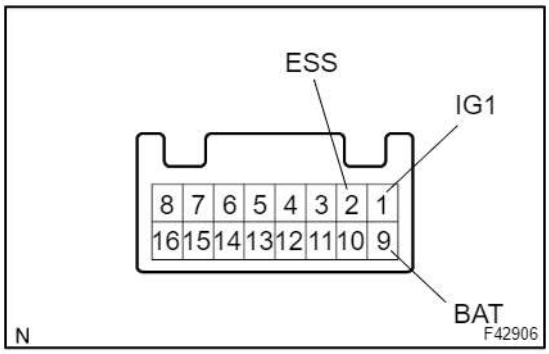
10 – 14 V

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

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3 CHECK HARNESS AND CONNECTOR(STEERING SENSOR)

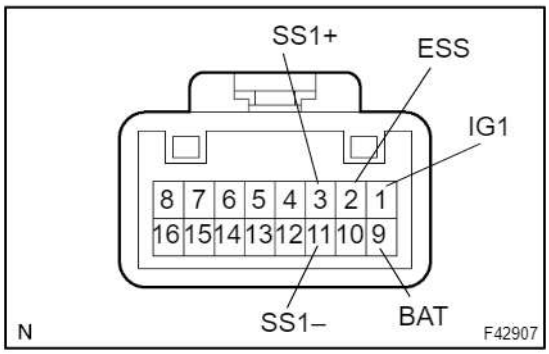


(a) Remove the steering wheel and column lower cover (See page 50–8).
(b) Disconnect the steering sensor connector.
(c) Turn the ignition switch ON.
(d) Measure voltage between terminal IG1 and ESS, BAT and ESS of the steering sensor harness side connector.
OK:
Voltage 10 – 14 V

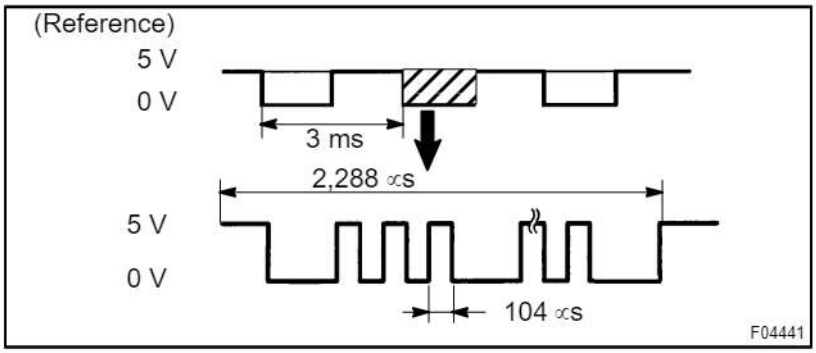
NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

4 INSPECT STEERING SENSOR



(a) Remove the steering wheel and column lower cover (See page 50–8).
(b) Disconnect the steering angle sensor connector.
(c) Apply battery positive voltage between terminals IG1 and ESS, BAT and ESS.
(d) Connect the oscilloscope to the terminals SS1+ and SS1– of the steering angle sensor.
(e) Turn the steering column shaft slowly and check the signal waveform.
OK:



HINT:
The above signal waveform does not repeat ON and OFF regularly and this ON–OFF interval changes case by case according to the data.

NG	REPLACE STEERING SENSOR

OK

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5	INSPECT SENSOR STEERING DISC

NG → REPAIR OR REPLACE DISC, SENSOR STEERING

OK

CHECK AND REPLACE SKID CONTROL ECU ASSY

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DTC	C1232/32	DECELERATION SENSOR DOES NOT FUNCTION

DTC	C1243/43	MALFUNCTION IN DECELERATION SENSOR

DTC	C1244/44	DECELERATION SENSOR CIRCUIT

DTC	C1245/45	MALFUNCTION IN DECELERATION SENSOR

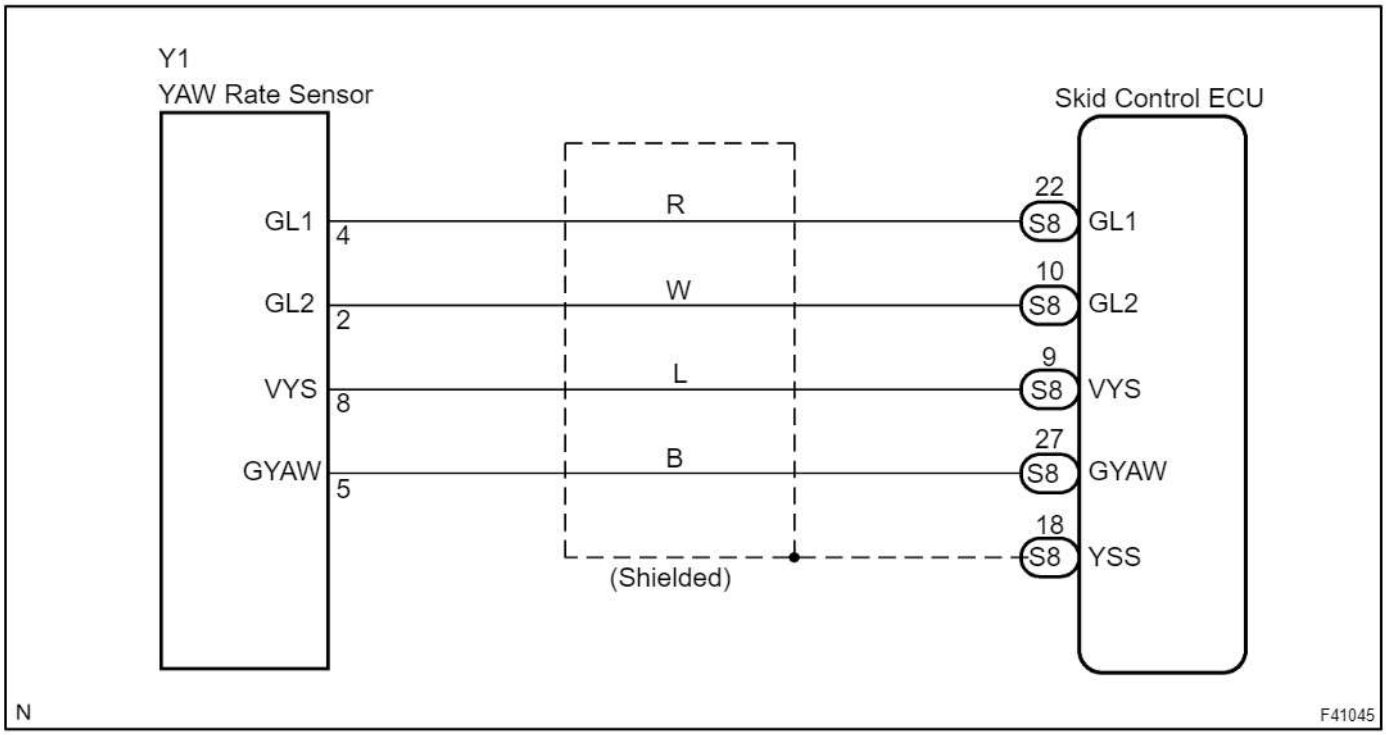
CIRCUIT DESCRIPTION

This sensor detects deceleration on the vehicle. The sensor signal is used in ABS & BA & TRAC & VSC control. If the sensor functions abnormally, the ABS warning light comes on.

DTC No.	DTC Detecting Condition	Trouble Area
C1232/32	While vehicle speed becomes 0 km/h (0 mph) from 30 km/h (18 mph), and the condition that GL1 and GL2 signals of ECU terminals did not change 40 mV or less continued in a sequence 16 times.	□Deceleration sensor □Deceleration sensor circuit
C1243/43		
C1244/44	Either of the following 1., 2., 3. or 4. is detected: 1. The condition that ECU terminals GL1 and GL2 values are 1.5G or less or 1.5G or more continues for 1.2 sec. or more. 2. The condition that the deceleration sensor terminal VGS voltage is 4.4 V or less or 5.6 G or more continues for 1.2 sec. or more. 3. At the vehicle speed of 0 km (0 mph), after the difference of output value between deceleration sensor terminals GL1 and GL2 becomes 0.6 G or more, and the condition that does not become 0.4 G or less continues for 60 sec. or more. 4. Deceleration sensor signal momentary open occurs for 7 times or more.	
C1245/45	At the vehicle speed of 30 km/h (18 mph) or more, and the condition that the difference between acceleration and deceleration values of computation from deceleration sensor and vehicle speed becomes more than 0.35 G continues for 60 sec. or more.	

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WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Start the inspection from step 1 in case of using the hand–held tester and start from step 2 in case of not using the hand–held tester.

1	READ VALUE OF YAWRATE SENSOR(INCLUDE DECELERATION SENSOR)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the DATALIST mode on the hand–held tester.
(d) Check that the deceleration value of the deceleration sensor displayed on the hand–held tester is changing when tilting the vehicle.

OK:

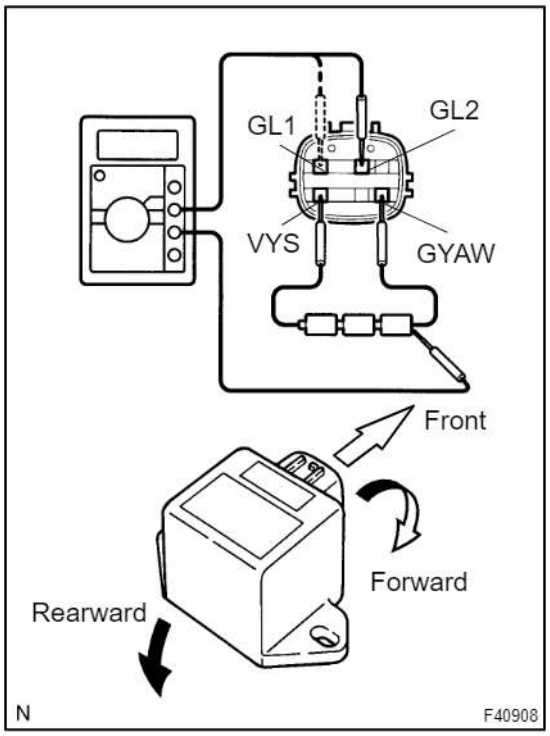
Deceleration value must be changing.

OK → **CHECK AND REPLACE SKID CONTROL ECU ASSY**

NG

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2 INSPECT YAWRATE SENSOR(INCLUDE DECELERATION SENSOR)



(a) Remove the console box and yaw rate sensor.
(b) Connect 3 dry batteries of 1.5 V in series.
(c) Connect VYS terminal to the batteries' positive (+) terminal and GYAW terminal to the batteries' negative (–) terminal. Apply about 4.5 V between VYS and GYAW terminals.

NOTICE:

Do not apply voltage of 6 V or more to terminals VYS and GYAW.

(d) Check the output voltage of GL1 and GL2 terminals when the sensor is tilted forward and rearward.

OK:

Symbols	Condition	Standard Value
GL1	Horizontal	About 2.3 V
GL1	Lean forward	0.4–about 2.3 V
GL1	Lean rearward	About 2.3 V –4.1V
GL2	Horizontal	About 2.3 V
GL2	Lean forward	About 2.3 V –4.1 V
GL2	Lean rearward	0.4 –about 2.3 V

HINT:

- If the sensor is tilted too much it may show the wrong value.
- If dropped, the sensor should be replaced with a new one.
- The sensor removed from the vehicle should not be placed upside down.

NG → **REPLACE YAWRATE SENSOR**

OK

3 CHECK HARNESS AND CONNECTOR(YAW RATE SENSOR – SKID CONTROL ECU)

(a) Check for open and short circuit in harness and connector between yaw rate sensor and skid control ECU (See page 01–35).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE SKID CONTROL ECU ASSY

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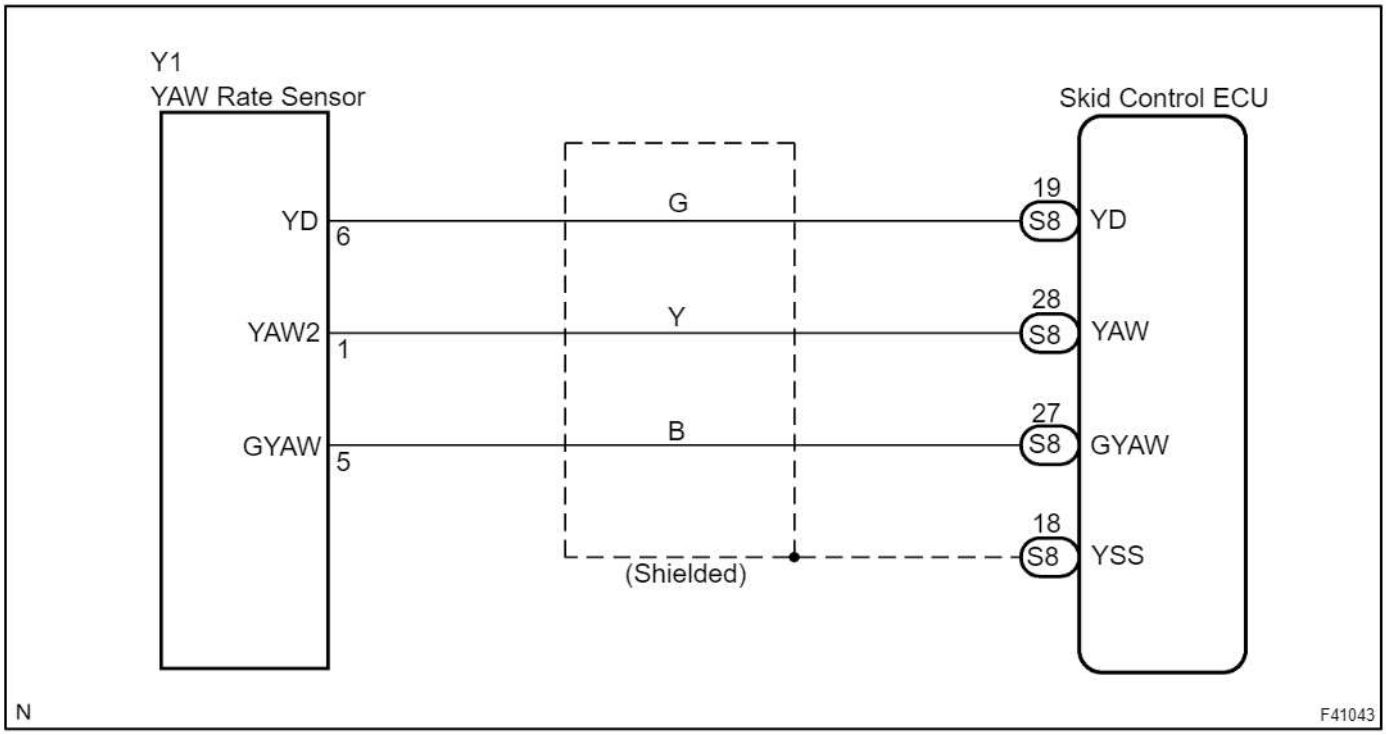
DTC	C1233/33	YAW RATE SENSOR CIRCUIT

DTC	C1234/34	MALFUNCTION IN YAW RATE SENSOR

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
C1233/33	When any of the following 1. through 4. is detected: 1. ECU terminal IG1 voltage is 9.5 V to 17.0 V, and the condition that yaw rate sensor voltage is out of the range from 0.25 V to 4.75 V continued for 1 sec. or more. 2. The conditions that yaw rate sensor open detect circuit signal is ON and the voltage of ECU terminal IG1 is 9.5 to 17 V continued for 1 sec. or more. 3. The conditions that yaw rate sensor power source voltage is out of the range from 4.4 V to 5.6 V and the voltage of ECU terminal IG1 is 9.5 to 17 V continued for 1 sec. or more. 4. When the condition that yaw rate sensor signal is momentarily open occurs 10 times or more and the voltage of ECU terminal IG1 is 9.5 to 17 V.	□Yaw rate sensor □Yaw rate sensor circuit
C1234/34	When the condition that yaw rate sensor VYS terminal voltage is 4.75 V to 5.25 V and YD malfunction signal of yaw rate sensor is ON continued for 5 sec. or more.	

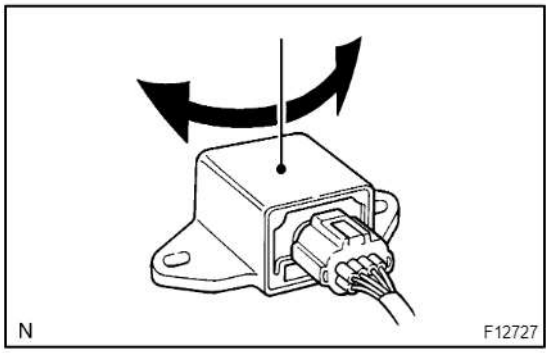
WIRING DIAGRAM



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INSPECTION PROCEDURE

1	READ VALUE OF YAWRATE SENSOR

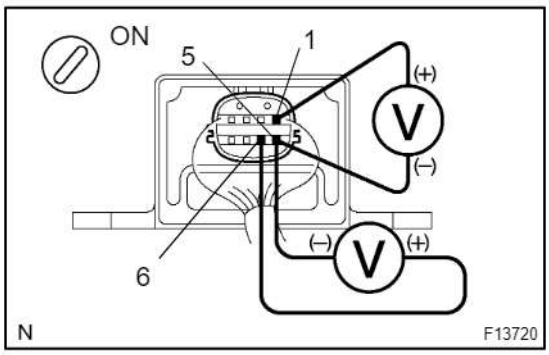


IN CASE OF USING HAND–HELD TESTER:

(a) Remove the console box.
(b) Remove the yaw rate sensor with the connector still connected to it.
(c) Connect the hand–held tester to the DLC3.
(d) Turn the ignition switch ON and push the hand–held tester main switch ON.
(e) Select the DATALIST mode on the hand–held tester.
(f) Check that the yaw rate sensor value of the yaw rate sensor observed in the hand–held tester is changing: Place the yaw rate sensor vertically to the ground and turn the sensor pivoted on its center.

OK:

Yaw rate value must be changing. (Reference)
When the yaw rate sensor is stationary output value: | 4 deg/s.



IN CASE OF NOT USING HAND–HELD TESTER:

(a) Remove the console box then remove the yaw rate sensor with the connector still connected to it.
(b) Turn the ignition switch ON.
(c) Measure voltage between terminals YAW2 (1) –GYAW (5), and terminals YD (6)–GYAW (5) of the yaw rate sensor.

OK:

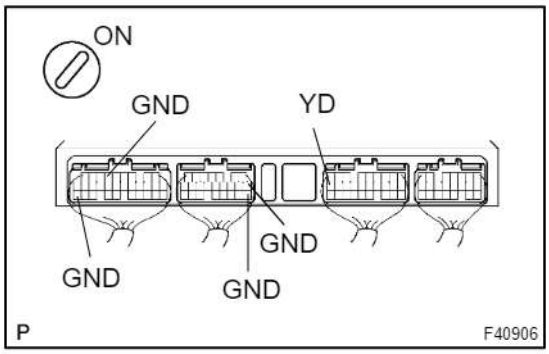
Terminals 1 and 5 (YAW2–GYAW)	About 2.42–2.58 V
Terminals 6 and 5 (YD–GYAW)	About 4.5–5.3 V

NG → **REPLACE YAWRATE SENSOR**

OK

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2	INSPECT SKID CONTROL ECU TERMINAL VOLTAGE(YD TERMINAL)



(a) Remove the skid control ECU with the connector still connected.
(b) Turn the ignition switch ON.
(c) Measure voltage between terminals YD and GND of skid control ECU.
OK:
Voltage: 4.5 – 5.3 V

OK	CHECK AND REPLACE SKID CONTROL ECU ASSY

NG

3	CHECK HARNESS AND CONNECTOR(YAW RATE SENSOR – SKID CONTROL ECU)

(a) Check for open and short circuit in harness and connector between terminal YD of yaw rate sensor and skid control ECU (See page 01–35).

NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

CHECK AND REPLACE SKID CONTROL ECU ASSY

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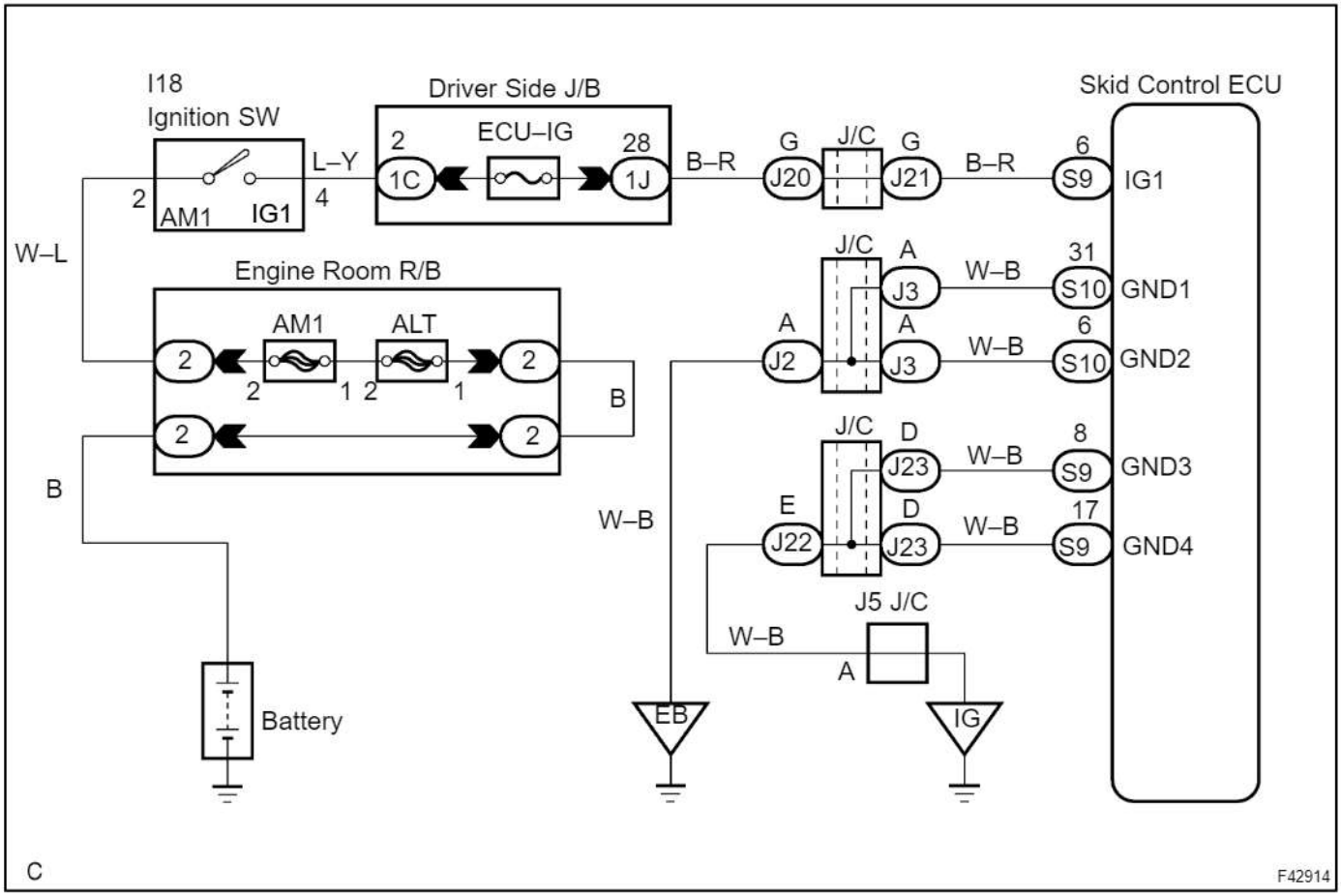
DTC	C1241/41	LOW BATTERY POSITIVE VOLTAGE OR ABNORMALLY HIGH BATTERY POSITIVE VOLTAGE

DTC	C1257/57	POWER SUPPLY DRIVE CIRCUIT MALFUNCTION

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
C1241/41	Detection of any of conditions 1. and 2.: 1. Vehicle speed is 3 km/h (1.9 mph) or more and voltage of ECU terminal IG1 remains at below 9.5 V for more than 10 sec. 2. The condition that ECU terminal IG1 voltage is more than 17.0 V continues for 1.2 sec. or more.	□Battery □IC regulator □Power source circuit
C1257/57	After the ignition switch has been turned ON, open or short circuit in power supply drive system inside ECU continues for more than 1.5 sec.	□Battery □IC regulator □Power source circuit □Skid control ECU

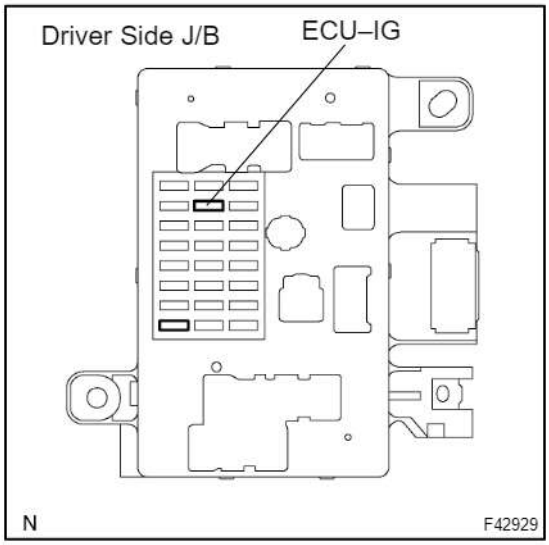
WIRING DIAGRAM



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INSPECTION PROCEDURE

1	INSPECT FUSE(ECU–IG FUSE)



(a) Remove ECU–IG fuse from driver side J/B.
(b) Check continuity of ECU–IG fuse.
OK:
Continuity

NG → **INSPECT FOR SHORT CIRCUIT IN ALL HARNESS AND COMPONENTS CONNECTED TO ABS–IG FUSE**

OK

2	INSPECT BATTERY

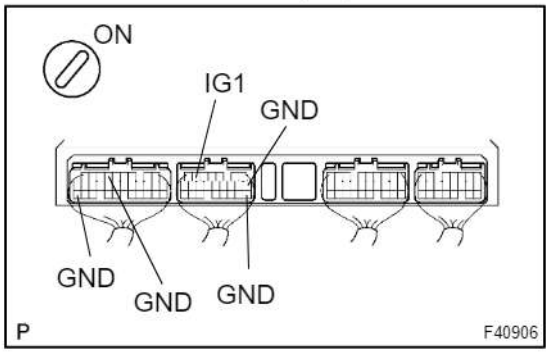
OK:
Voltage: 10 – 14 V

NG → **INSPECT CHARGING SYSTEM**

OK

3	INSPECT SKID CONTROL ECU TERMINAL VOLTAGE(IG1 TERMINAL)

IN CASE OF USING HAND–HELD TESTER:
(a) Check the voltage condition output from the ECU displayed on the hand–held tester.
OK:
"Normal" is displayed.



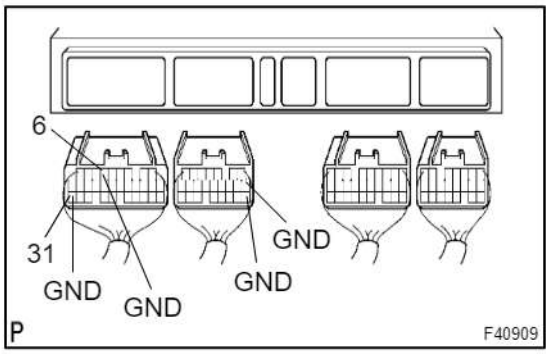
IN CASE OF NOT USING HAND–HELD TESTER:
(a) Remove the skid control ECU with connectors still connected.
(b) Turn the ignition switch ON.
(c) Measure voltage between terminals IG1 and GND of skid control ECU.
OK:
Voltage: 10 – 14 V

OK → **CHECK AND REPLACE SKID CONTROL ECU ASSY**

NG

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4	INSPECT SKID CONTROL ECU CONNECTOR(GND TERMINAL CONTINUITY)



(a) Disconnect the skid control ECU connectors.
(b) Measure resistance between terminals GND of skid control ECU connector and body ground.
OK:
Resistance: 1 Ω or less

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE SKID CONTROL ECU ASSY

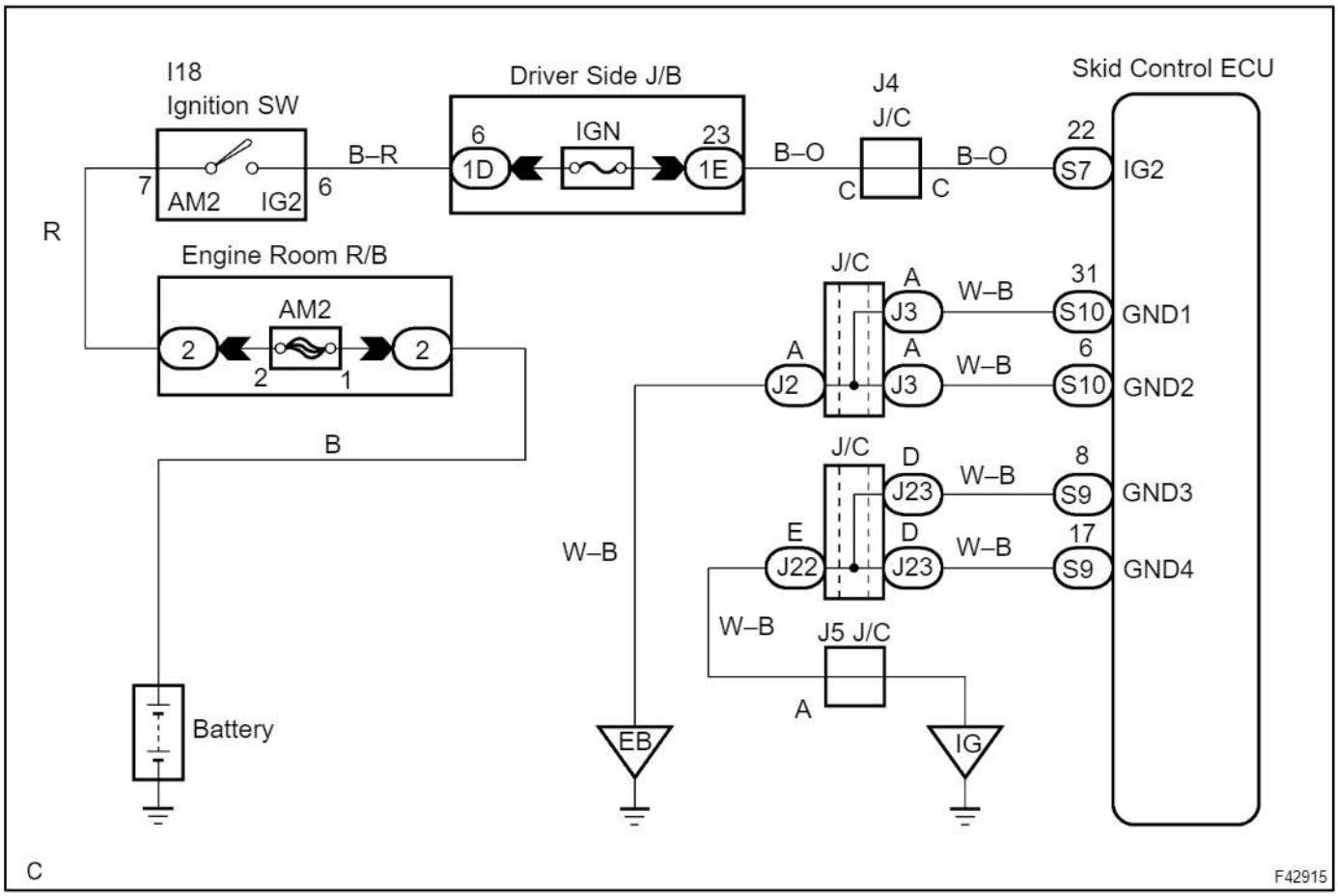
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DTC C1242/42 IG2 POWER SOURCE CIRCUIT

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
C1242/42	With the vehicle running, open in IG2 is detected for more than 7 sec.	□Battery □IC regulator □Power source circuit

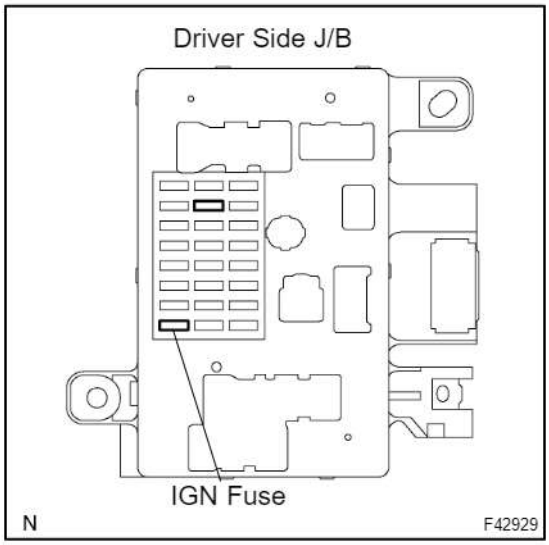
WIRING DIAGRAM



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INSPECTION PROCEDURE

1	INSPECT FUSE(IGN FUSE)



(a) Remove IGN fuse from driver side J/B.
(b) Check continuity of IGN fuse.
OK:
Continuity

NG → **INSPECT FOR SHORT CIRCUIT IN ALL HARNESSES AND COMPONENTS CONNECTED TO IGN FUSE**

OK

2	INSPECT BATTERY

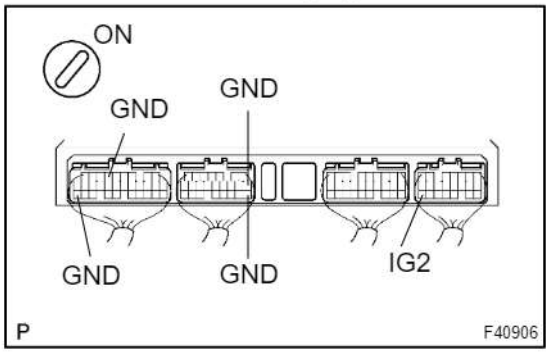
OK:
Voltage: 10 – 14 V

NG → **INSPECT CHARGING SYSTEM**

OK

3	INSPECT SKID CONTROL ECU TERMINAL VOLTAGE(IG2 TERMINAL)

IN CASE OF USING HAND–HELD TESTER:
(a) Check the voltage condition output from the ECU displayed on the hand–held tester.
OK:
" Normal" is displayed.



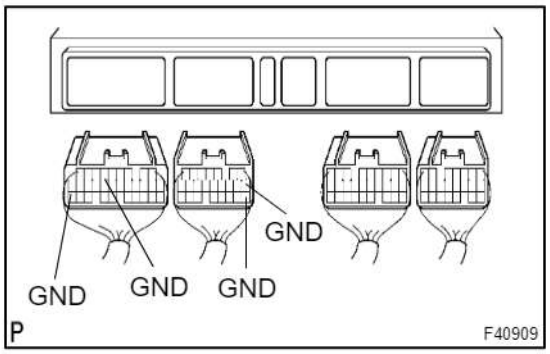
IN CASE OF NOT USING HAND–HELD TESTER:
(a) Remove the skid control ECU with connectors still connected.
(b) Turn the ignition switch ON.
(c) Measure voltage between terminals IG2 and GND of skid control ECU.
OK:
Voltage: 10 – 14 V

OK → **CHECK AND REPLACE SKID CONTROL ECU ASSY**

NG

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4	INSPECT SKID CONTROL ECU CONNECTOR(GND TERMINAL COUTINUITY)



(a) Disconnect the skid control ECU connectors.
(b) Measure resistance between terminals GND of skid control ECU connector and body ground.
OK:
Resistance: 1 Ω or less

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE SKID CONTROL ECU ASSY

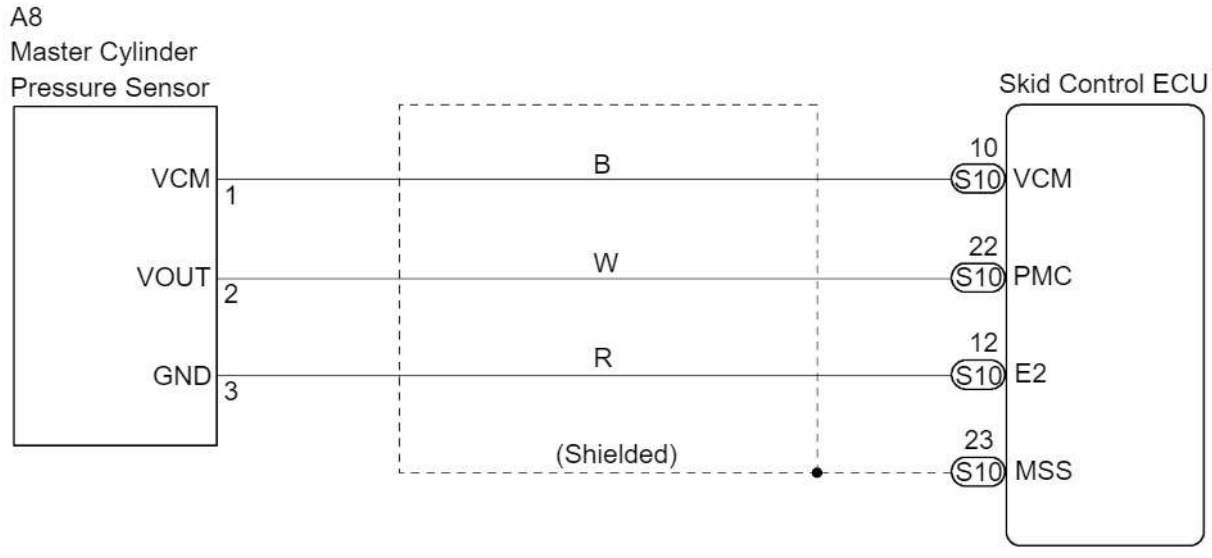
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DTC C1246/46 MASTER CYLINDER PRESSURE SENSOR CIRCUIT

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
C1246/46	Either of the following 1., 2., 3., 4. or 5. is detected: 1. At the vehicle speed of 7 km/h (4 mph) or more, ECU terminal PMC voltage becomes more than 0.86 V and the condition that 0.01 V or less does not change continues for 30 sec. 2. Interference occurs to ECU terminal PMC 7 times or more for 5 sec. 3. ECU terminal STP is OFF, and the condition that terminal PMC voltage becomes more than 0.86 V or less than 0.3 V continues for 5 sec. or more. 4. The condition that ECU terminal IG1 voltage is 9.5 V to 17.0 V, and terminal VCM voltage other than the range from 4.4 V to 5.6 V continues for 1.2 sec. or more. 5. The condition that ECU terminal VCM voltage is 4.4 V to 5.6 V, and terminal PMC voltage other than the range from 0.14 V to 4.85 V continues for 1.2 sec. or more. 6. While stopping the vehicle by STP ON, more than 0.3 V difference occurs in the ECU self check.	☐Master cylinder pressure sensor ☐Master cylinder pressure sensor circuit

WIRING DIAGRAM



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INSPECTION PROCEDURE

HINT:

Start the inspection from step 1 in case of using the hand–held tester and start from step 2 in case of not using the hand–held tester.

1	READ VALUE OF OIL PRESSURE SENSOR

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the DATALIST mode on the hand–held tester.
(d) Check that the brake fluid pressure value of the oil pressure sensor displayed on the hand–held tester is changing when depressing the brake pedal.

OK:

Brake fluid pressure value must be changing.

OK	Go to step 3

NG

2	CHECK HARNESS AND CONNECTOR(OIL PRESSURE SENSOR – SKID CONTROL ECU)

(a) Check for open and short circuit in harness and connector between oil pressure sensor and skid control ECU (See page 01–35).

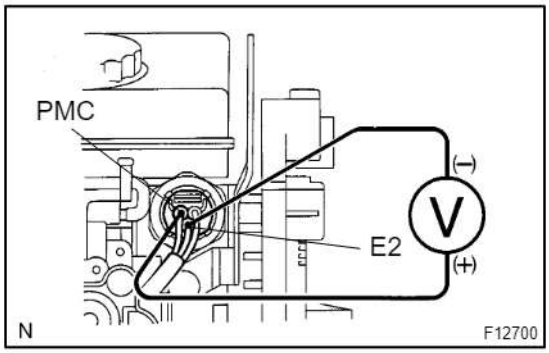
NG	REPLACE BRAKE MASTER CYLINDER SUB–ASSY

OK

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3 INSPECT OIL PRESSURE SENSOR

SST 09709–29018



(a) Install LSPV gauge to the front caliper bleeder plug portion, and bleed LSPV gauge.
(b) Remove the brake master cylinder cover.
(c) Start the engine and depress the brake pedal, then check the relation between the fluid pressure and voltage of PMC and E2 terminals of the oil pressure sensor with connector still connected.

OK:

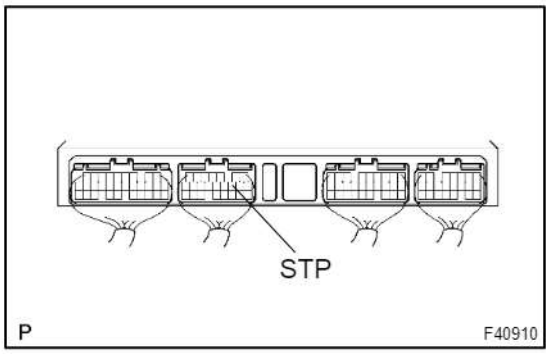
Front brake caliper fluid pressure	Voltage
0 kPa (0 Kgf/cm^2, 0 psi)	0.37 – 0.63 V
5,883 kPa (60 kgf/cm^2, 853 psi)	1.57 – 1.83 V
11,768 kPa (120 kgf/cm^2, 1,706 psi)	2.77 – 3.03 V

Voltage of between terminals VCM and E2: 4.7 – 5.3 V

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4 INSPECT SKID CONTROL ECU TERMINAL VOLTAGE(STP TERMINAL)



(a) Remove the skid control ECU with connectors still connected.
(b) Check that STP terminal voltage changes in response to the stop light switch ON and OFF.

OK:

Changes

NG → **INSPECT STOP LIGHT SWITCH CIRCUIT**

OK

CHECK AND REPLACE SKID CONTROL ECU ASSY

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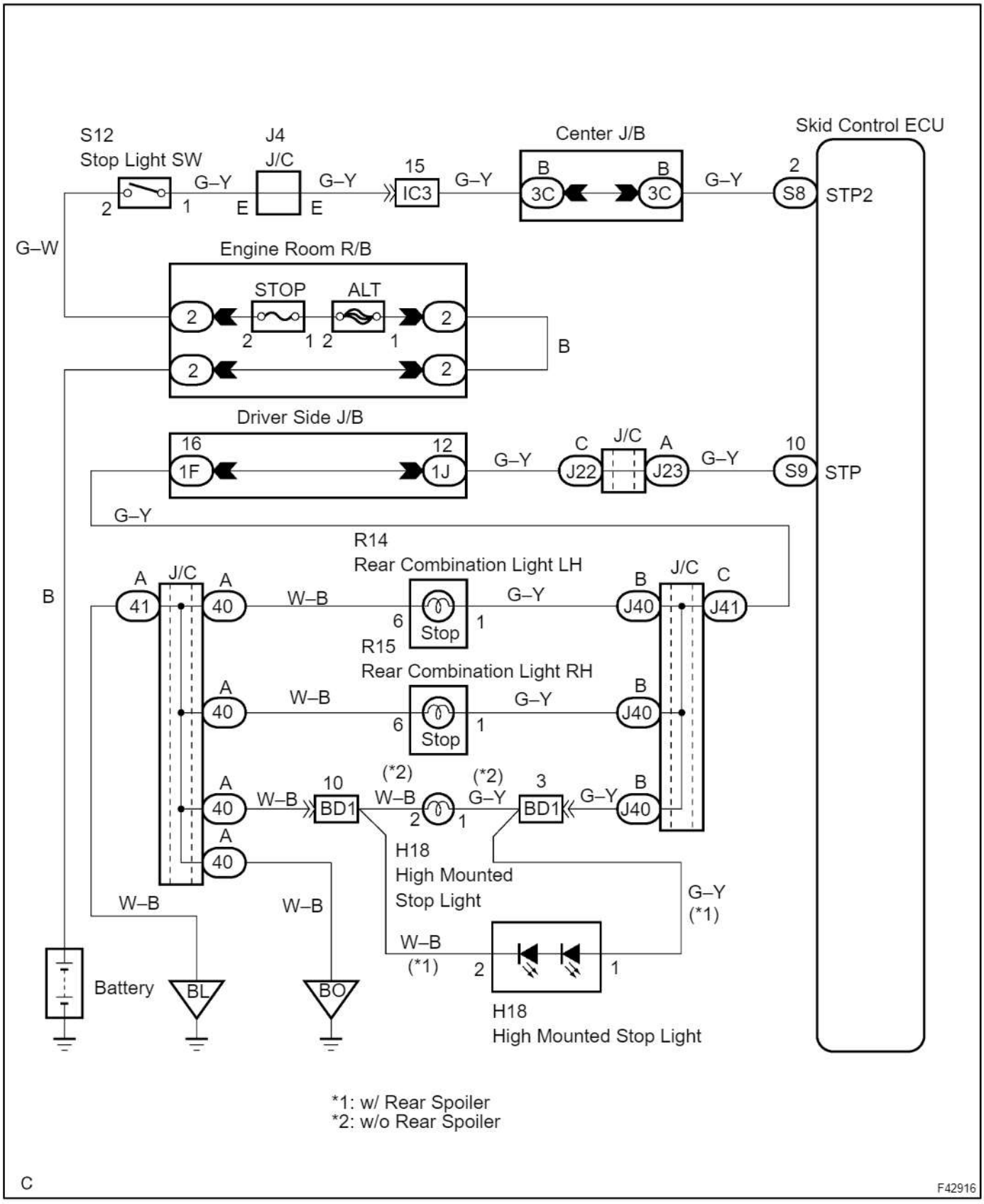
DTC C1249/49 STOP LIGHT SWITCH CIRCUIT

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
C1249/49	ECU terminal IG1 voltage is 9.5 to 17.0 V and ABS is in non–operation, the open in circuit stop light switch circuit continues for 10 sec. or more. (However, DTC is not output within 100 msec. when the stop light operation relay is turned from ON to OFF.)	Stop light switch circuit

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WIRING DIAGRAM



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INSPECTION PROCEDURE

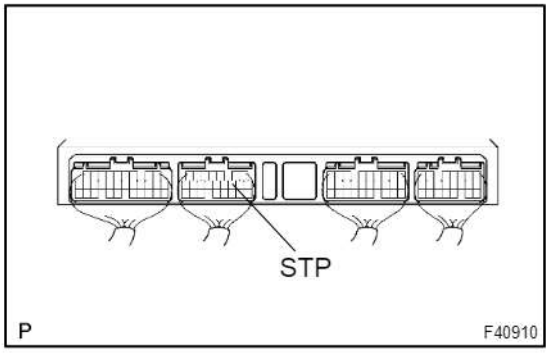
1	INSPECT STOP LAMP SWITCH ASSY

(a) Check that the stop light lights up when brake pedal is depressed and turns OFF when the brake pedal is released.

NG → Go to step 4

OK

2	INSPECT SKID CONTROL ECU TERMINAL VOLTAGE(STP TERMINAL)



(a) Remove the skid control ECU with connectors still connected.

(b) Measure voltage between terminal STP of skid control ECU and body ground when brake pedal is depressed.

OK:

Voltage: 8 – 14 V

OK → CHECK AND REPLACE SKID CONTROL ECU ASSY

NG

3	CHECK HARNESS AND CONNECTOR(STOP LIGHT SWITCH – SKID CONTROL ECU)

(a) Check for open and short circuit in harness and connector between stop light switch and skid control ECU (See page 01–35).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOM TABLE(See page 05–825)

4	CHECK HARNESS AND CONNECTOR(STOP LIGHT CIRCUIT)

(a) Check for open and short circuit in harness and connector of the stop light circuit (See page 01–35).

OK → REPLACE STOP LAMP SWITCH ASSY

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

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DTC	C1251/51	PUMP MOTOR IS LOCKED/OPEN CIRCUIT IN PUMP MOTOR GROUND

DTC	C1252/52	BRAKE BOOSTER PUMP MOTOR ON TIME ABNORMALLY LONG

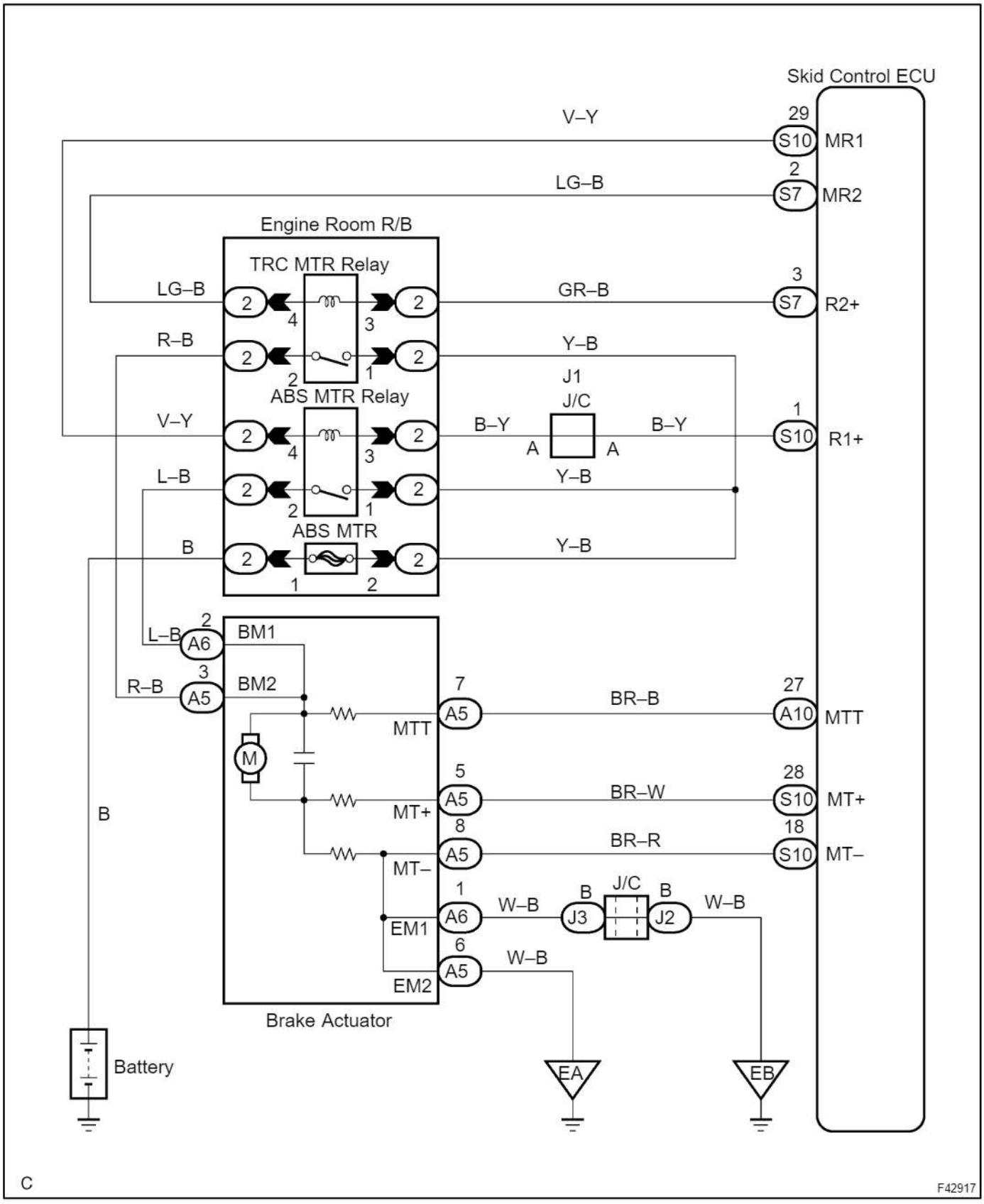
DTC	C1253/53	BRAKE BOOSTER PUMP MOTOR CIRCUIT

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
C1251/51	Either of the following 1. or 2. is detected: 1. After turning the ignition switch ON, the current of more than 28A flows to the motor for more than 1 sec. 2. After turning the ignition switch ON, less than 7A change in current is detected more than 3 times in a low when the motor is ON.	Hydraulic brake booster pump motor
C1252/52	After the ignition switch has been turned ON, when the power is supplied to the pump motor for more than 5 minutes.	□Hydraulic brake booster pump motor □Hydraulic brake booster pump motor circuit □Pressure switch (PH or PL)
C1253/53	When any of the following 1. through 4. is detected: 1. After turning the ignition switch ON, open in the relay coil is detected for more than 1 sec. 2. When the pressure switch does not control motor driving, the status that the motor relay is always ON continues for more than 1 sec. due to short circuit. 3. When the pressure switch (PH) detects the low pressure or while the pump motor operates to increase the pressure, the status that the motor relay does not turn ON continues for more than 0.2 sec. 4. When pressure switch does not control motor driving, the status that the motor relay is always ON due to the welded contact continues for more than 2 sec.	□ABS or TRAC motor relay □ABS or TRAC motor relay circuit □Hydraulic brake booster pump motor circuit

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WIRING DIAGRAM



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INSPECTION PROCEDURE

HINT:

Start the inspection from step 1 in case of using the hand–held tester and start from step 2 in case of not using hand–held tester.

1	INSPECT ABS AND TRAC MOTOR RELAY OPERATION

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the ACTIVE TEST mode on the hand–held tester.
(d) Check the operation sound of the ABS and TRC MTR relays individually when operating it with the hand–held tester.

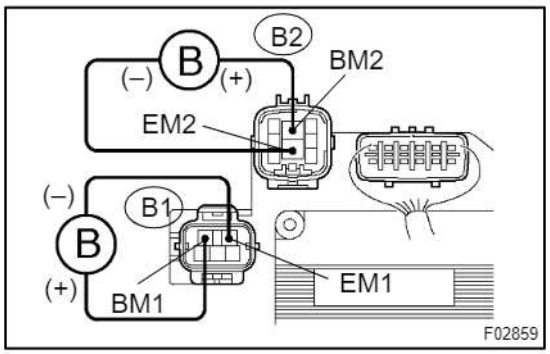
OK:

The operation sound of the ABS and TRC MTR relay should be heard.

NG → **Go to step 6**

OK

2	INSPECT BRAKE BOOSTER PUMP MOTOR OPERATION



(a) Disconnect the 2 connectors (B1 and B2) from the brake master cylinder.
(b) Connect the battery positive (+) lead to BM1 or BM2 terminal and battery negative (–) lead to EM1 or EM2 terminal of the brake master cylinder (pump motor) connector.

OK:

The operation sound of the pump motor should be head.

NG → **REPLACE BRAKE BOOSTER PUMP ASSY**

OK

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3	INSPECT PRESSURE SWITCH(PH)

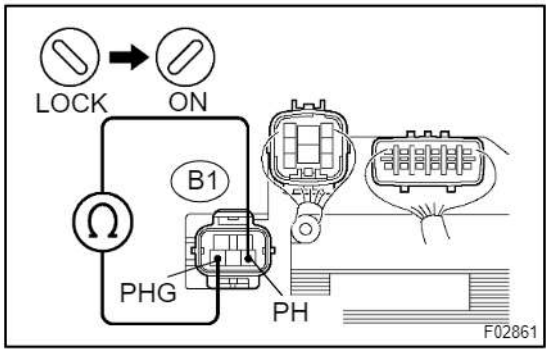
IN CASE OF USING HAND–HELD TESTER:

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the DATALIST mode on the hand–held tester.
(d) Depress the brake pedal more than 40 times with the ignition switch OFF then turn the ignition switch ON and check the pressure switch (PH) condition.

HINT:
When a pressure in power supply system is released, reaction force becomes lightly.

OK:
"OFF" turns to "ON".

HINT:
OFF: Low pressure
ON: High pressure



IN CASE OF NOT USING HAND–HELD TESTER:

(a) Disconnect the connector (B1) from the brake master cylinder.
(b) With the ignition switch OFF, depress the brake pedal more than 40 times to decrease the accumulator pressure.

HINT:
When a pressure in power supply system is released, reaction force becomes lightly.

(c) Measure resistance between terminals PH and PHG of brake master cylinder connector.
OK:
Resistance: 0.9 – 1.1 kΩ
(d) Connect the connector (B1) to the brake master cylinder.
(e) Disconnect the connector (B1) after ignition switch has been ON and the pump motor has stopped.
(f) Measure resistance between terminals PH and PHG of brake master cylinder.
OK:
Resistance: 0 Ω

HINT:
After inspection, connect the connector and clear the DTC (See page 05–803).

NG → **REPLACE BRAKE MASTER CYLINDER**

OK

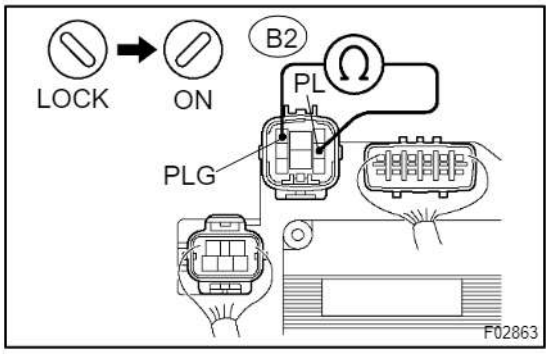
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4	INSPECT PRESSURE SWITCH(PL)

IN CASE OF USING HAND–HELD TESTER:

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the DATALIST mode on the hand–held tester.
(d) Depress the brake pedal more than 40 times with the ignition switch OFF then turn the ignition switch ON and check the pressure switch (PL) condition.

HINT:
When a pressure in power supply system is released, reaction force becomes lightly.
"OFF" turns to "ON".
HINT:
OFF: Low pressure
ON: High pressure



IN CASE OF NOT USING HAND–HELD TESTER:

(a) Disconnect the connector (B2) from the brake master cylinder.
(b) With the ignition switch OFF, depress the brake pedal more than 40 times to decrease the accumulator pressure.

HINT:
When a pressure in power supply system is released, reaction force becomes lightly.

(c) Measure resistance between terminals PL and PLG of brake master cylinder.
OK:
Resistance: 5.1 – 6.3 kΩ
(d) Connect the connector (B2) to the brake master cylinder.
(e) Disconnect the connector (B2) after ignition switch has been ON and the pump motor has stopped.
(f) Measure resistance between terminals PL and PLG of brake master cylinder.
OK:
Resistance: 1.0 kΩ

HINT:
After inspection, connect the connector and clear the DTC (See page 05–803).

NG → **REPLACE BRAKE MASTER CYLINDER**

OK

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5	CHECK HARNESS AND CONNECTOR(BRAKE MASTER CYLINDER – SKID CONTROL ECU)

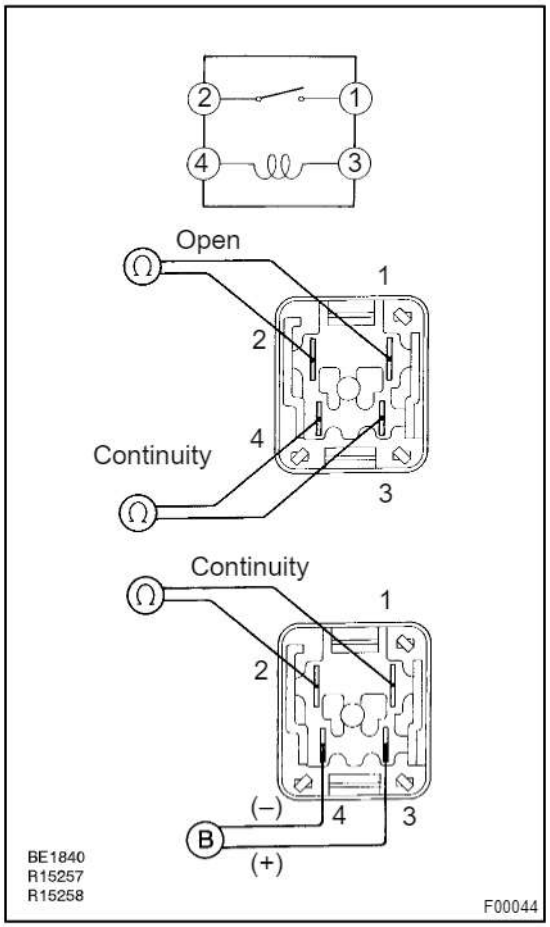
(a) Check for open and short circuit in harness and connector between pressure switch circuit of the brake master cylinder and skid control ECU (See page 01–35).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

CHECK AND REPLACE SKID CONTROL ECU ASSY

6	INSPECT ABS AND TRAC MOTOR RELAY



(a) Remove the ABS MTR relay and TRAC MTR relay from the engine room R/B.

(b) Check continuity between each pair of terminal of motor relay.

OK:

Terminals 3 and 4	Continuity (Reference value *1)
Terminals1 and 2	Open

*1:

ABS MTR relay: 62 Ω

TRAC MTR relay: 54 Ω

(c) Apply battery positive voltage between terminals 3 and 4.

(d) Check continuity between terminals.

OK:

Terminals 1 and 2	Continuity

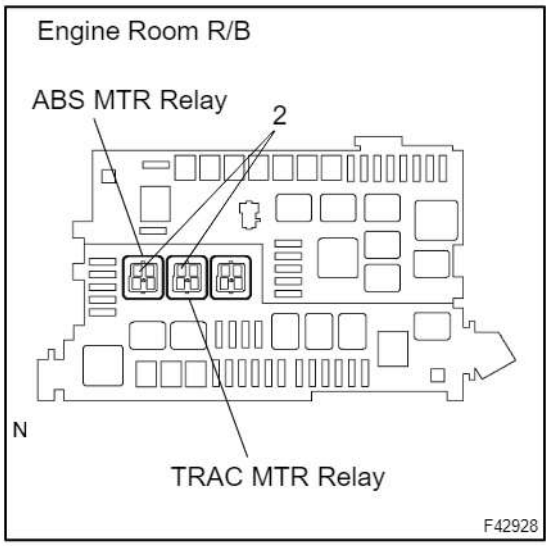
NG → REPLACE ABS MOTER RELAY

NG → REPLACE TRACTION CONTROL RELAY

OK

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7	INSPECT ENGINE ROOM RELAY BLOCK



(a) Measure the voltage between terminal 2 of engine room R/B and body ground.
OK:
Voltage: 10 – 14 V

NG	CHECK AND REPLACE HARNESS AND CONNECTOR

OK

8	CHECK HARNESS AND CONNECTOR(ENGINE ROOM R/B – BRAKE MASTER CYLINDER)

(a) Check for open and short circuit in harness and connector between engine room R/B and the terminals BM1 and BM2 of the brake master cylinder (See page 01–35).

NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

9	CHECK HARNESS AND CONNECTOR(BRAKE MASTER CYLINDER – SKID CONTROL ECU)

(a) Check for open and short circuit in harness and connector between each terminals MTT, MT+ and MT– of the brake master cylinder and the same one of the skid control ECU (See page 01–35).

NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

CHECK AND REPLACE SKID CONTROL ECU ASSY

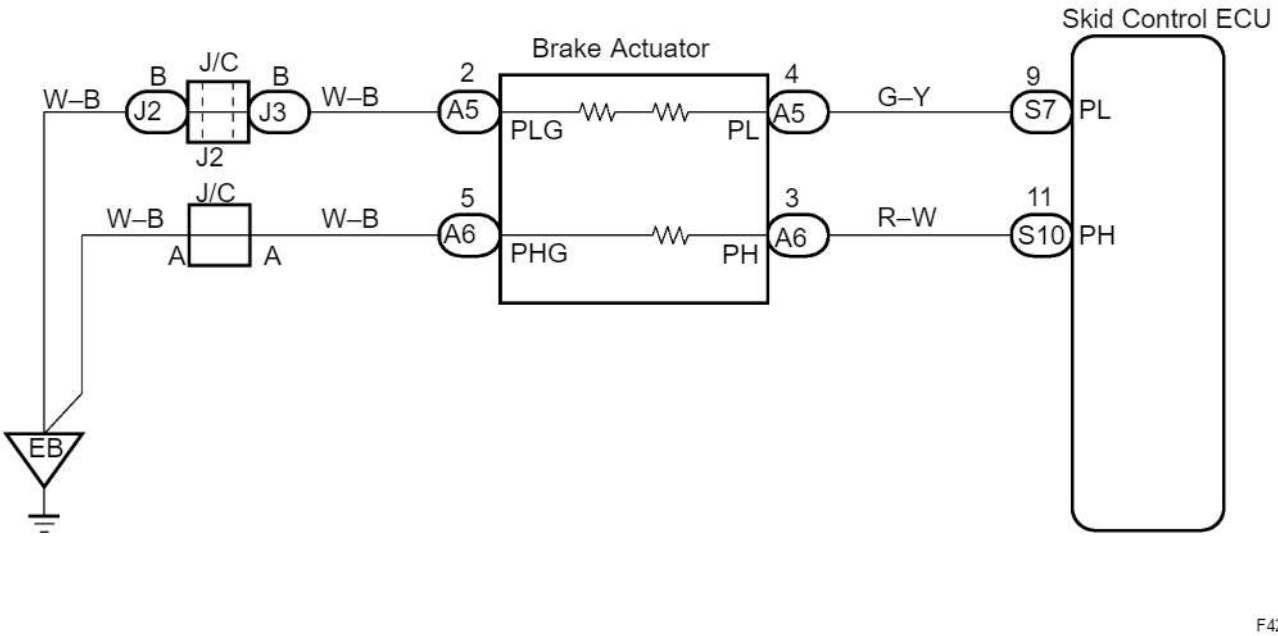
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DTC C1254/54 PESSURE SWITCH CIRCUIT

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
C1254/54	Either of the following 1. or 2. is detected: 1. After turning the ignition switch ON, short or open circuit in pressure switch (PL) continued for more than 1 sec. 2. After turning the ignition switch ON open in pressure switch (PH) continued for more than 1 sec.	□Pressure switch (PH or PL) □Pressure switch circuit

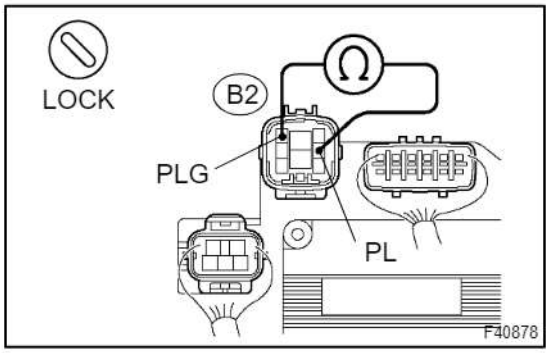
WIRING DIAGRAM



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INSPECTION PROCEDURE

1	INSPECT PRESSURE SWITCH(PL)



(a) Disconnect the connector (B2) from the brake master cylinder.

(b) With ignition switch OFF, depress the brake pedal more than 40 times to decrease the accumulator pressure.

HINT:

When a pressure in power supply system is released, reaction force becomes lightly.

(c) Measure resistance between terminals PL and PLG of brake master cylinder.

OK:

Resistance: 5.1 – 6.3 kΩ

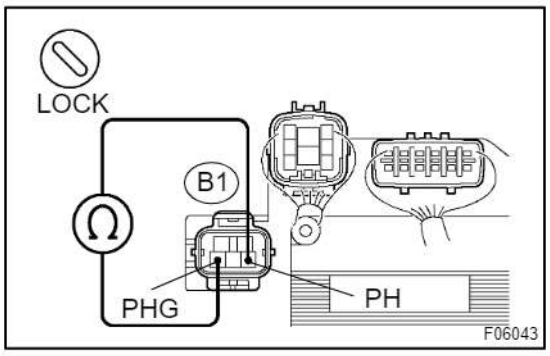
HINT:

After inspection, connect the connector and clear the DTC (See page 05–803).

NG	REPLACE BRAKE MASTER CYLINDER SUB–ASSY

OK

2	INSPECT PRESSURE SWITCH(PH)



(a) Disconnect the connector (B1) from the brake master cylinder.

(b) With ignition switch OFF, depress the brake pedal more than 40 times to decrease the accumulator pressure.

HINT:

When a pressure in power supply system is released, reaction force becomes lightly.

(c) Measure resistance between terminals PH and PHG of brake master cylinder connector.

OK:

Resistance: 0.9 – 1.1 kΩ

HINT:

After inspection, connect the connector and clear the DTC (See page 05–803).

NG	REPLACE BRAKE MASTER CYLINDER SUB–ASSY

OK

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3	CHECK HARNESS AND CONNECTOR(BRAKE MASTER CYLINDER – SKID CONTROL ECU)

(a) Check for open and short circuit in harness and connector between each terminals PL and PH of the brake master cylinder and the same one of the skid control ECU (See page 01–35).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

CHECK AND REPLACE SKID CONTROL ECU ASSY

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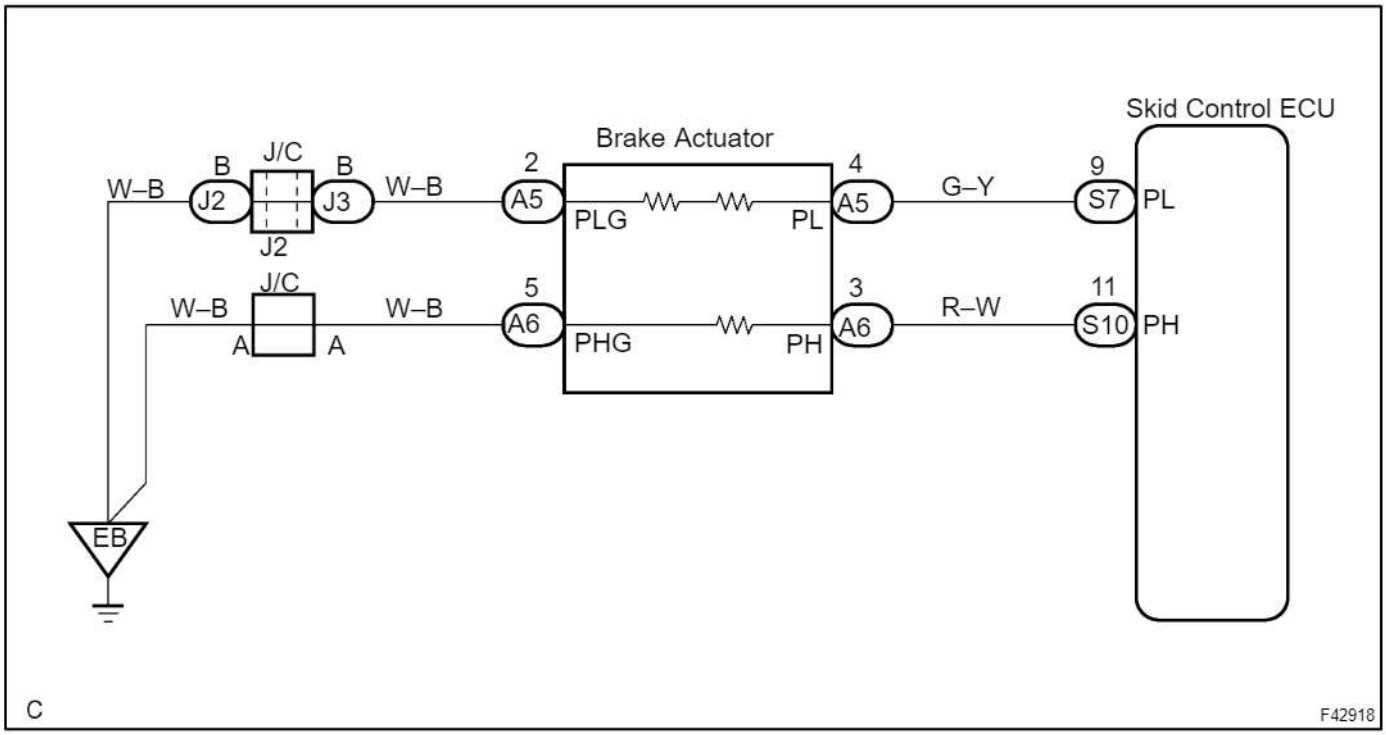
DTC C1256/56 ACCUMULATOR LOW PRESSURE

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
C1256/56	Either of the following 1. through 7. is detected: 1. With the vehicle running, when the pressure switch (PL) detects high pressure, although ABS, TRAC or VSC does not control, the pressure switch (PL) detects low pressure for more than 1.4 sec. 2. With the vehicle running, when the pressure switch (PL) detects high pressure, although ABS, TRAC or VSC controls, the pressure switch (PL) detects low pressure for more than 0.2 sec. 3. After the ignition switch is turned ON, the pressure switch (PL) detects low pressure for more than 60 sec. 4. With the vehicle running, after ignition switch has been ON, the pressure switch (PL) detects low pressure for more than 0.2 sec. although ABS, TRAC, or VSC does not control and when the pressure switch is ON and stuck under high pressure. 5. With the vehicle running, after ignition switch is ON, the pressure switch (PL) detects low pressure for more than 0.2 sec. when ABS, TRAC or VSC controls, the pressure switch is ON and stuck under high pressure. 6. With the vehicle running, after ignition switch is ON, the pressure switch (PL) is stuck to under low pressure although ABS, TRAC or VSC does not control for more than 1.4 sec. 7. With the vehicle running, after ignition switch is ON, the pressure switch (PL) is stuck under low pressure when ABS, TRAC or VSC controls for more than 0.2 sec.	□Accumulator □Pressure switch (PH or PL) □Hydraulic brake booster pump motor

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WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT BRAKE BOOSTER ACCUMULATOR ASSY

SST 09709–29018

(a) Turn the ignition switch OFF, and depress the brake pedal 40 times or more.

HINT:

When a pressure in power supply system is released, reaction force becomes lightly.

(b) Install the LSPV gauge (SST) to rear brake caliper and bleed air.

(c) Depress the brake pedal with force of more than 343 N (35 kgf, 77 lbf) and turn the ignition switch ON, then check the rear brake caliper pressure when an increase of pressure changes from acutely to mildly.

OK:

5,099 – 8,924 kPa (52 – 91 kgf/cm^2, 740 – 1,294 psi) at 20°C (68°F)

HINT:

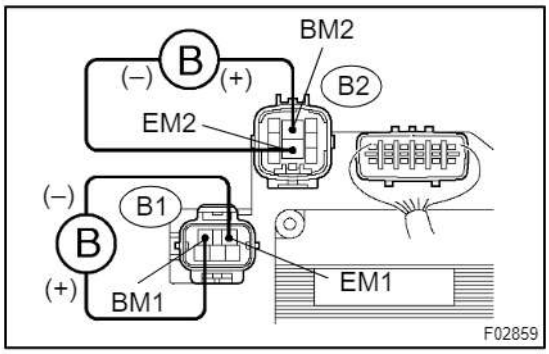
If the value is not within the standard, cool the engine room and check it again.

NG → **REPLACE BRAKE BOOSTER ACCUMULATOR ASSY**

OK

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2 INSPECT BRAKE BOOSTER PUMP ASSY



(a) Disconnect the 2 connectors (B1 and B2)from the brake master cylinder.

(b) Connect battery positive | lead to BM1 or BM2 terminal and battery negative ⊖ lead to EM1 or EM2 terminal of the brake master cylinder (pump motor) connector.

OK:

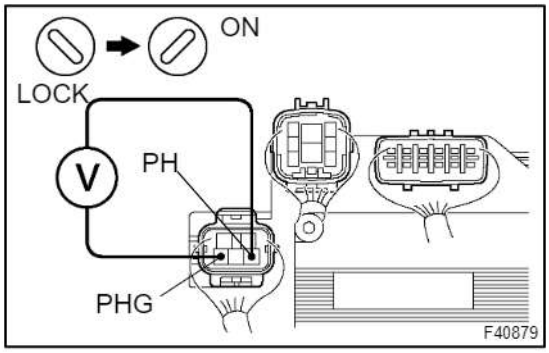
The operation sound of the pump motor should be heard.

NG	Go to step 6

OK

3 INSPECT PRESSURE SWITCH(PH)

SST 09709–29018



(a) Turn the ignition switch OFF, and depress the brake pedal 40 times or more.

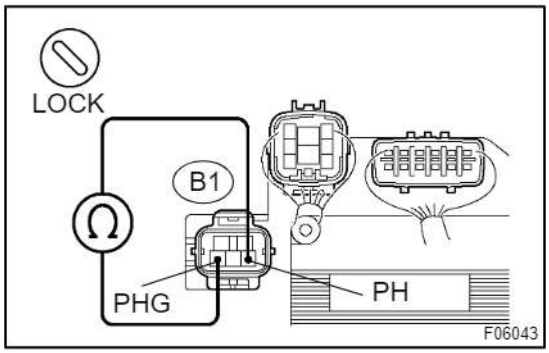
HINT:

When a pressure in power supply system is released, reaction force becomes lightly.

(b) Install the LSPV gauge (SST) to the rear brake caliper and bleed air.

(c) While checking the voltage between terminals PH and PHG of brake master cylinder, depress the brake pedal with force of more than 343 N (35 kgf, 77 lbf) and turn the ignition switch ON, then check the rear wheel cylinder pressure when voltage changes from 6 V to 0 V.

12,553 – 20,104 kpa (128 – 205 kgf·cm^2, 1,820 – 2,916 psi)



(d) Turn the ignition switch OFF and disconnect the connector (B1) from the brake master cylinder.

(e) While checking the resistance between terminals PH and PHG, depress the brake pedal changing the force in the range of 197 N (20 kgf, 44 lbf) to 343 N (35 kgf, 77 lbf) and check the rear wheel cylinder pressure when resistance changes from 0 kΩ to 1 kΩ between PH and PHG.

OK:

11,964 – 18,240 kpa (122 – 186 kgf·cm^2, 1,735 – 2,645 psi)

HINT:

After inspection, connect the connector, fill brake reservoir with brake fluid and clear the DTC (See page 05–803).

OK	Go to step 5

NG

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4	CHECK HARNESS AND CONNECTOR(BRAKE MASTER CYLINDER – SKID CONTROL ECU)

(a) Check for open and short circuit in harness and connector between terminal PH of the brake master cylinder and skid control ECU (See page 01–35).

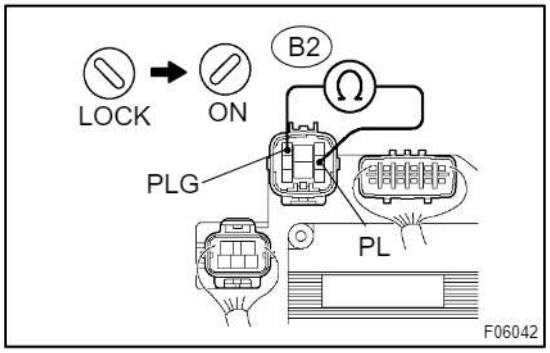
NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE BRAKE MASTER CYLINDER SUB–ASSY

5	INSPECT PRESSURE SWITCH(PL)

SST 09709–29018



(a) Turn the ignition switch OFF, and depress the brake pedal 40 times or more.

HINT:
When a pressure in power supply system is released , reaction force becomes lightly.

(b) Install the LSPV gauge (SST) to the rear brake caliper and bleed air.

(c) Disconnect the connector (B2) from the brake master cylinder.

(d) While checking the resistance between terminals PL and PLG of brake master cylinder, depress the brake pedal with force of more than 343 N (35 kgf, 77 lbf) and turn the ignition switch ON, then check the rear wheel cylinder pressure when the resistance changes from 5.7 kΩ to 1.0 kΩ.

OK:

9,022 – 15,102 kpa (92 – 154 kgf·cm^2, 1,308 – 2,190 psi)

(e) Turn the ignition switch OFF and disconnect the connector (B2) from the brake master cylinder.

(f) While checking the resistance between terminals PL and PLG of brake master cylinder, depress the brake pedal changing the force in the range of 197 N (20 kgf, 44 lbf) to 343 N (35 kgf, 77 lbf) and check the rear wheel cylinder pressure when resistance changes from 1.0 kΩ to 5.7 kΩ.

OK:

8,532 – 13,337 kpa (87 – 136 kgf·cm^2, 1,237 – 1,934 psi)

HINT:
After inspection, connect the connector, fill brake reservoir with brake fluid and clear the DTC (See page 05–803).

NG → REPLACE BRAKE MASTER CYLINDER SUB–ASSY

OK

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CHECK AND REPLACE SKID CONTROL ECU ASSY

6	CHECK HARNESS AND CONNECTOR(BRAKE MASTER CYLINDER – BRAKE BOOSTER PUMP MOTOR)

(a) Check for open and short circuit in harness and connector between brake master cylinder and brake booster pump motor (See page 01–35).

NG → **REPLACE BRAKE CONTROL WIRE**

OK

7	INSPECT BRAKE BOOSTER PUMP ASSY

(a) Inspect the brake booster pump motor operation.

NG → **REPLACE BRAKE BOOSTER PUMP ASSY**

OK

REPLACE BRAKE MASTER CYLINDER SUB–ASSY

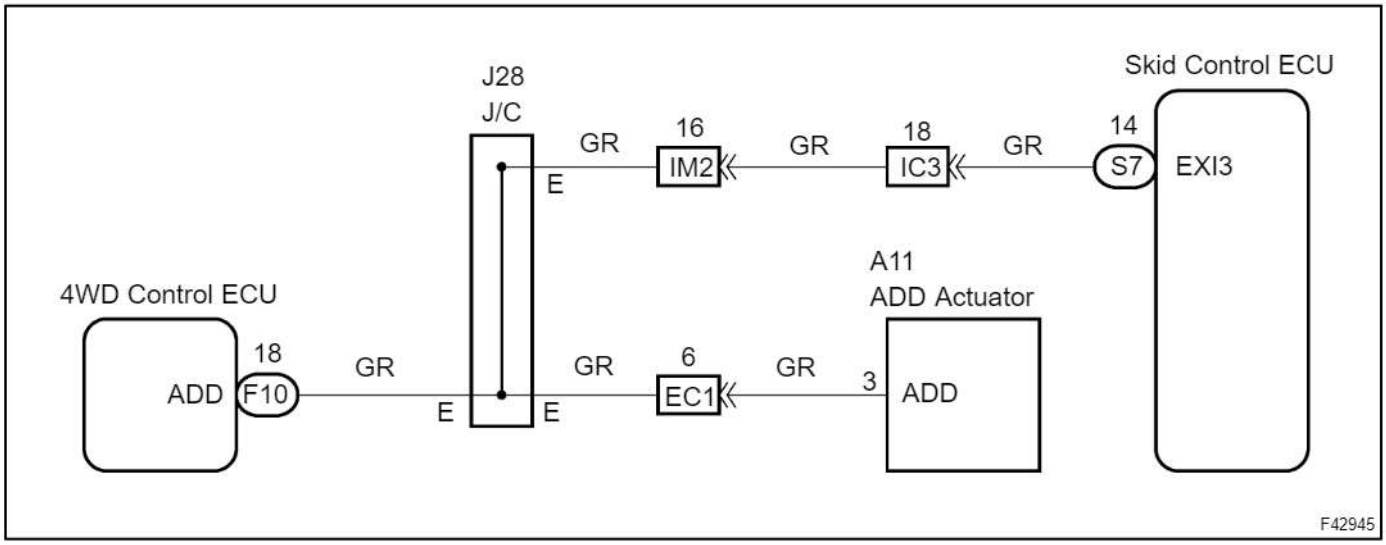
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DTC C1258/58 TRANSFER 4WD POSITION SWITCH CIRCUIT

CIRCUIT DESCRIPTION

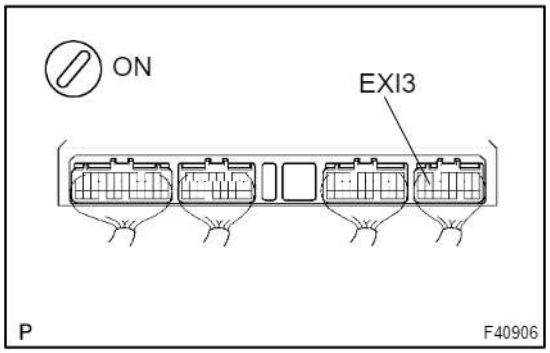
DTC No.	DTC Detecting Condition	Trouble Area
C1258 / 58	Open or short circuit in transfer 4WD position switch circuit.	□Transfer 4WD position switch □Transfer 4WD indicator switch circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK VOLTAGE(EXI3 OF SKID CONTROL ECU – BODY GROUND)



(a) Remove the skid control ECU with the connectors still connected.
(b) Turn the ignition switch ON.
(c) Measure voltage between terminal EXI3 of the skid control ECU and body ground with the transfer shift lever in 4WD position and in other than 4WD position.

OK:
Voltage:
4WD position: Below 2.0 V
Except 4DW position: 10 – 14 V

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE (See page 05–825)**

NG

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2	CHECK TRANSFER 4WD SWITCH

NG → REPLACE TRANSFER 4WD SWITCH

OK

3	CHECK HARNESS AND CONNECTOR(4WD ECU – SKID CONTROL ECU)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

CHECK AND REPLACE SKID CONTROL ECU ASSY

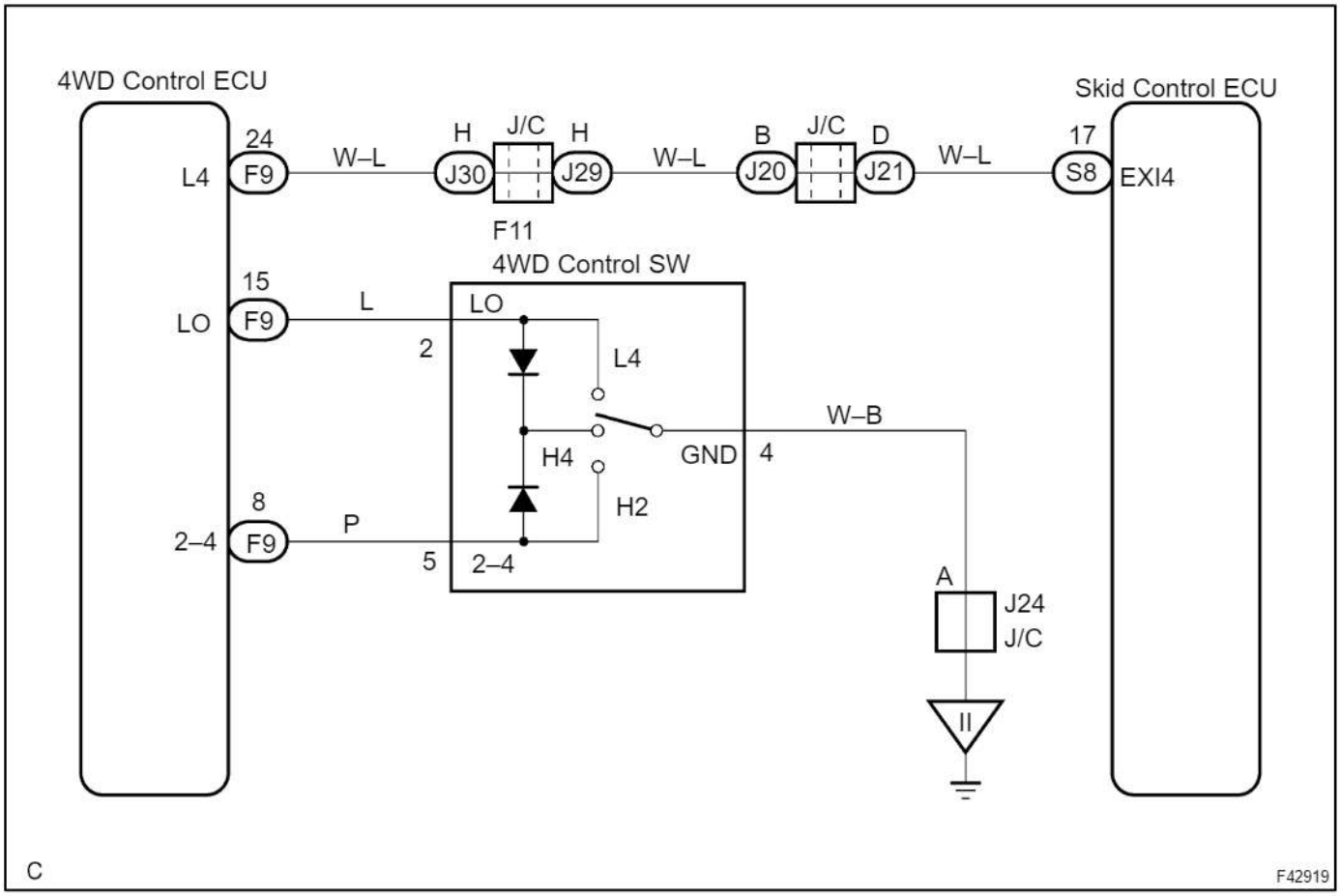
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DTC C1268/68 TRANSFER L4 POSITION SWTCH CIRCUIT

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
C1268 / 68	Open or short circuit in transfer L4 position switch circuit.	□Transfer L4 position switch □Transfer L4 indicator switch circuit

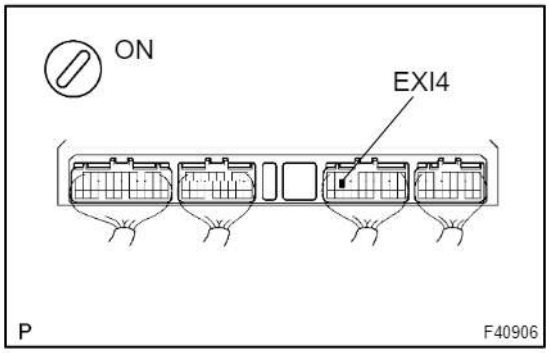
WIRING DIAGRAM



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INSPECTION PROCEDURE

1	CHECK VOLTAGE(EXI4 OF SKID CONTROL ECU AND BODY GROUND)



(a) Remove the skid control ECU with the connectors still connected.
(b) Turn the ignition switch ON.
(c) Measure voltage between terminal EXI4 (V18 – 17) of the skid control ECU and body ground with the transfer shift lever in L4 position and in other than L4 position.
OK:
Voltage:
L4 position: Below 2.0 V
Except L4 position: 10 – 14 V

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE (See page 05–825)**

NG

2	CHECK TRANSFER L4 POSITION SWITCH

NG → **REPAIR TRANSFER L4 POSITION SWITCH**

OK

3	CHECK HARNESS AND CONNECTOR(4WD ECU – SKID CONTROL ECU)

(a) Check for open and short circuit in harness and connector between 4WD ECU and skid control ECU (See page 01–35).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE SKID CONTROL ECU ASSY

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DTC	C1306/96	MALFUNCTION IN SPEED SENSOR POWER SUPPLY

INSPECTION PROCEDURE

1	INSPECT BATTERY

OK:
Voltage: 10 – 14 V

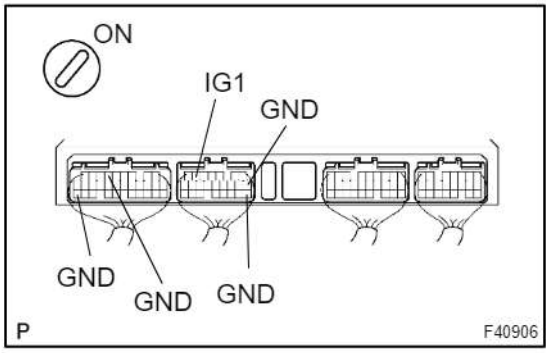
NG → **INSPECT CHARGING SYSTEM**

OK

2	INSPECT SKID CONTROL ECU TERMINAL VOLTAGE(IG1 TERMINAL)

IN CASE OF USING HAND–HELD TESTER:

(a) Check the voltage condition output from the ECU displayed on the hand–held tester.
OK:
"Normal" is displayed.



IN CASE OF NOT USING HAND–HELD TESTER:

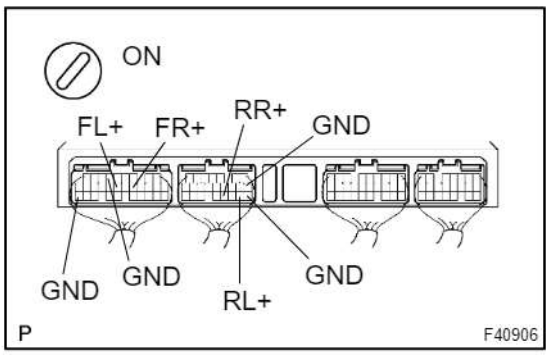
(a) Remove the skid control ECU with connectors still connected.
(b) Turn the ignition switch ON.
(c) Measure voltage between terminals IG1 and GND of skid control ECU.
OK:
Voltage: 10 – 14 V

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

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3	INSPECT SKID CONTROL ECU TERMINAL VOLTAGE(FR+,FL+,RR+,RL+ TERMINAL)



(a) Remove the skid control ECU with connectors still connected.
(b) Turn the ignition switch ON.
(c) Measure voltage between terminals FR+, FL+, RR+ and RL+ and GND of skid control ECU.
OK:
Voltage: 9 – 14 V

NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

CHECK AND REPLACE SKID CONTROL ECU ASSY

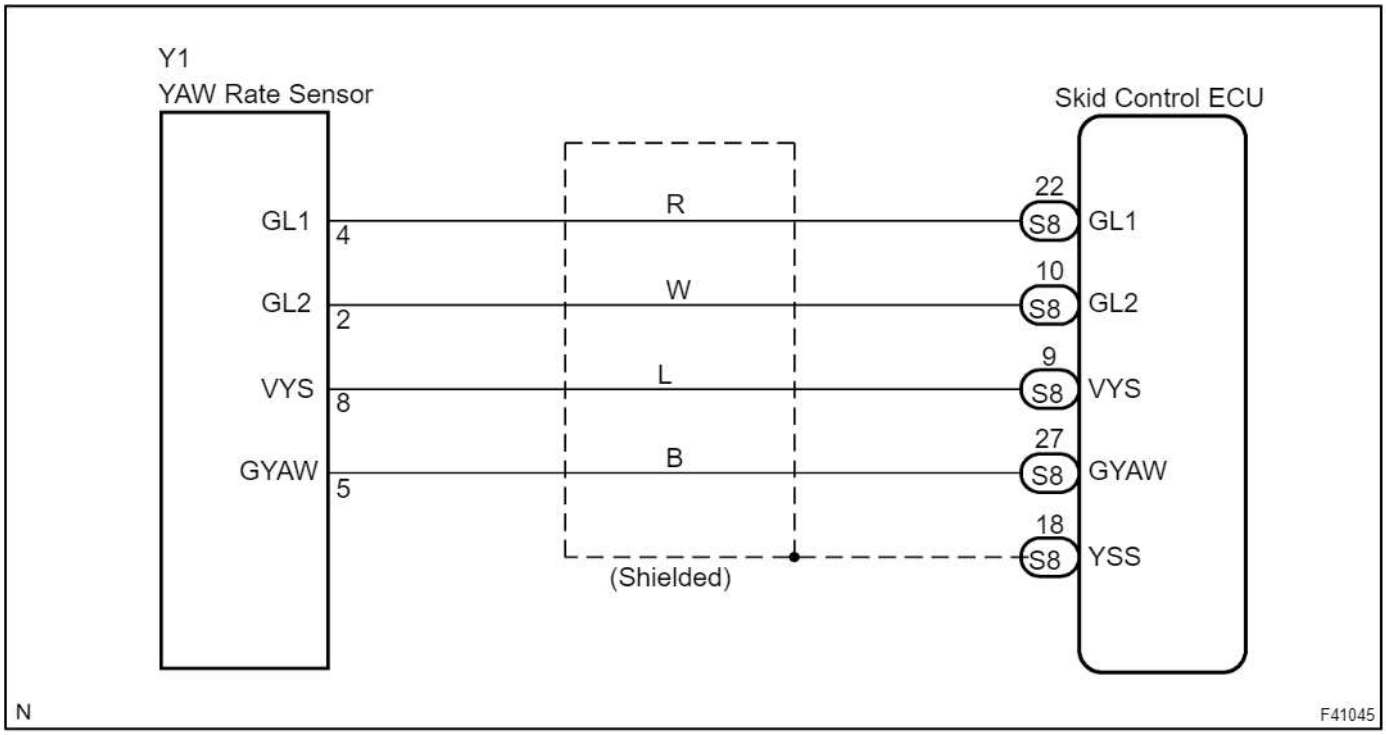
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DTC	C1336/39	ZERO POINT CALIBRATION OF DECELERATION SENSOR UNDONE

CIRCUIT DESCRIPTION

DTC No,	DTC Detecting Condition	Trouble Area
C1336/39	At the initial time after replacing the computer, or after erasing the deceleration sensor memory by operating the terminals Ts and CG of DLC3, the ignition switch is turned ON and the vehicle is driven in any mode except for the test mode.	□Deceleration sensor □Deceleration sensor circuit □Zero point calibration not done

WIRING DIAGRAM



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INSPECTION PROCEDURE

1	PERFORM DECELERATION SENSOR ZERO POINT CALIBRATION

(a) See page 05–803.

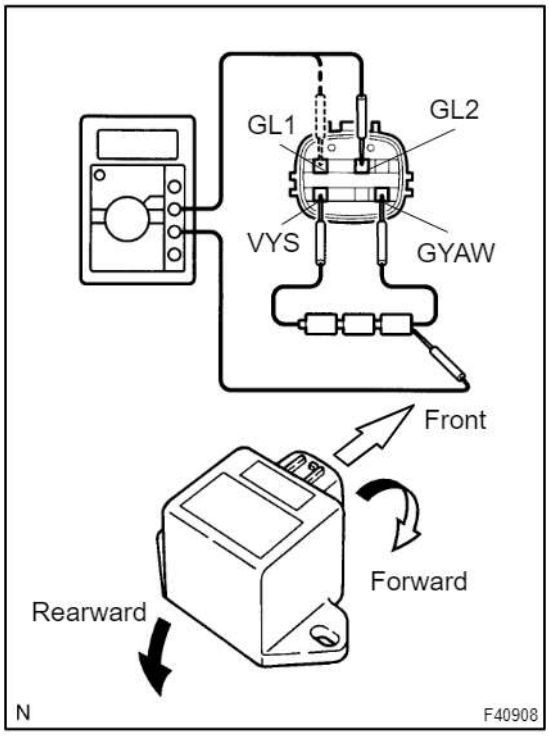
2	CHECK RECONFIRM DTC

(a) Check if the DTC is output.

NO → NO PROBLEM

YES

3	INSPECT YAWRATE SENSOR(INCLUDE DECELERATION SENSOR)



(a) Remove the console box and yaw rate sensor.
(b) Connect 3 dry batteries of 1.5 V in series.
(c) Connect VYS terminal to the batteries' positive (+) terminal and GYAW terminal to the batteries' negative (–) terminal. Apply about 4.5 V between VYS and GYAW terminals.

NOTICE:

Do not apply voltage of 6 V or more to terminals VYS and GYAW.

(d) Check the output voltage of GL1 and GL2 terminals when the sensor is tilted forward and rearward.

OK:

Symbols	Condition	Standard Value
GL1	Horizontal	About 2.3 V
GL1	Lean forward	0.4 – about 2.3 V
GL1	Lean rearward	About 2.3 – 4.1 V
GL2	Horizontal	About 2.3 V
GL2	Lean forward	About 2.3 – 4.1 V
GL2	Lean rearward	0.4 – about 2.3 V

HINT:

- If the sensor is tilted too much to may show the wrong value.
- If dropped, the sensor should be replaced with a new one.
- The sensor removed from the vehicle should not be placed upside down.

NG → REPLACE YAWRATE SENSOR(INCLUDE DECELERATION SENSOR)

OK

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4	CHECK HARNESS AND CONNECTOR(YAW RATE SENSOR – SKID CONTROL ECU)

(a) Check for open and short circuit in harness and connector between yaw rate sensor and skid control ECU (See page 01–35).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

CHECK AND REPLACE SKID CONTROL ECU ASSY

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DTC C1337/37 TIRES OF DIFFERENT SIZE

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
C1337 / 37	The condition of driving at more than 30 km/h (19 mph) for more than 20 seconds with 1 or 2 tires of different size is detected 3 times continuously.	Tire size

INSPECTION PROCEDURE

1	CHECK TIRE SIZE

NG → REPLACE TIRES SO THAT ALL 4 TIRES ARE SAME IN SIZE

OK

CHECK AND REPLACE SKID CONTROL ECU ASSY

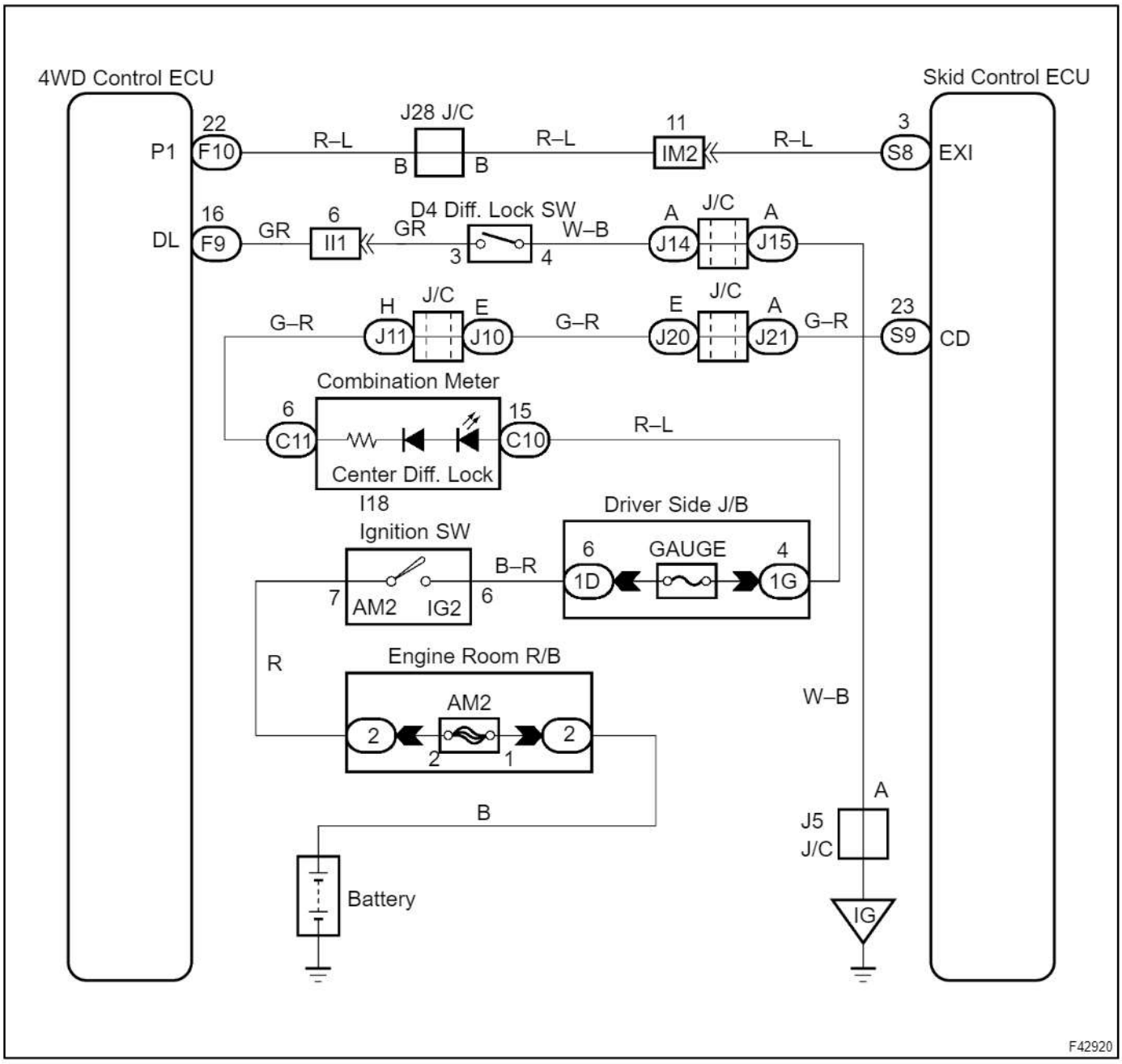
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DTC C1340/47 CENTER DEFFERENTIAL LOCK CIRCUIT

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
C1340 / 47	Open or short circuit in center differential lock circuit.	□Center differential lock system □Center differential lock circuit □Center differential lock indicator light circuit

WIRING DIAGRAM



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INSPECTION PROCEDURE

1	CHECK THAT CENTER DIFFERENTIAL IS FREE AND CENTER DIFF. LOCK SWITCH IS OFF

NG → REPAIR CENTER DIFF. LOCK SYSTEM

OK

2	CHECK RECONFIRM DTC

NO → NO PROBLEM

YES

3	CHECK THAT BULB FOR CENTER DIFF. LOCK INDICATOR LIGHT IS NOT BURNT OUT

YES → CHECK AND REPLACE COMBINATION METER ASSY

NO

4	CHECK HARNESS AND CONNECTOR(CENTER DIFF. LOCK SWITCH – SKID CONTROL ECU)

(a) Check for open and short circuit in harness and connector between center diff. lock switch and skid control ECU (See page 01–35).

NO → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

5	CHECK HARNESS AND CONNECTOR(SKID CONTROL ECU – COMBINATION METER)

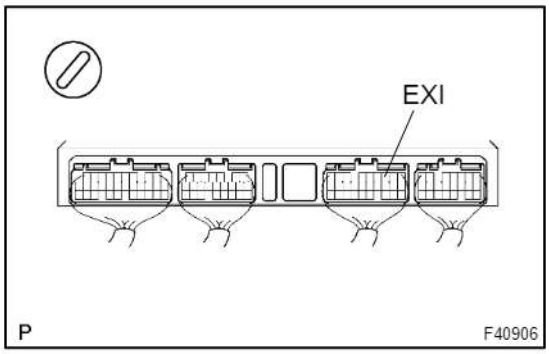
(a) Check for open and short circuit in harness and connector between skid control ECU and combination meter (See page 01–35).

NO → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

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6	INSPECT SKID CONTROL ECU TERMINAL VOLTAGE(EXI TERMINAL)



(a) Remove the skid control ECU with connector still connected.
(b) Turn the ignition switch ON.
(c) Measure the voltage between terminal EXI of skid control ECU and body ground.
OK:
When center diff. lock: Below 2 V
When center diff. free: 8 – 14 V

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

7	INSPECT CENTER DIFF. LOCK DETECTION SWITCH

NG → **REPAIR OR REPLACE CENTER DIFF. LOCK DETECTION SWITCH**

OK

CHECK AND REPLACE SKID CONTROL ECU ASSY

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DTC	C1380/64	MALFUNCTION IN STOP LIGHT OPERATION RELAY

INSPECTION PROCEDURE

1	CHECK HARNESS AND CONNECTOR(STP2 INPUT CIRCUIT)

(a) Check for open and short circuit in harness and connector of STP2 input circuit (See page 01–35).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

2	INSPECT STOP LIGHT SWITCH ASSY

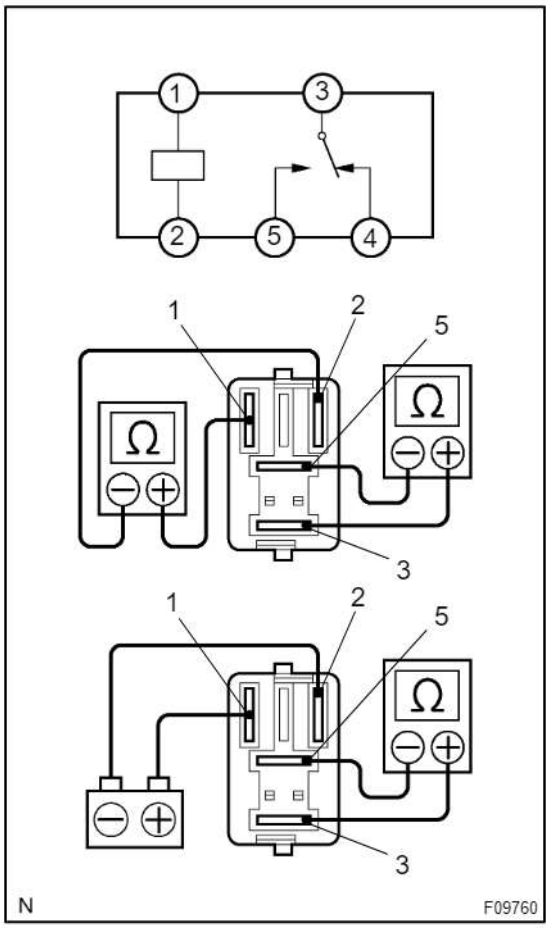
(a) Check that the stop light lights up when brake pedal is depressed and turns OFF when the brake pedal is released.

NG → REPAIR OR REPLACE STOP LIGHT SWITCH ASSY OR HARNESS AND CONNECTOR

OK

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3 CHECK STOP LIGHT OPERATION RELAY



(a) Check continuity between each terminal of stop light operation relay.

OK:

Terminal 1 and 2	Continuity (Reference value 62 Ω)
Terminal 3 and 5	Open

(b) Apply battery voltage between terminal 1 and 2.

(c) Check continuity between terminal 3 and 5 of stop light operation relay.

OK:

Terminal 3 and 5	Contunuity

NG → **REPLACE STOP LIGHT OPERATION RELAY**

OK

4 CHECK HARNESS AND CONNECTOR(STPO OUTPUT CIRCUIT)

(a) Check for open and short circuit in harness and connector of STPO output circuit (See page 01–35).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE SKID CONTROL ECU ASSY

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DTC AlwaysON MALFUNCTION IN ABS ECU

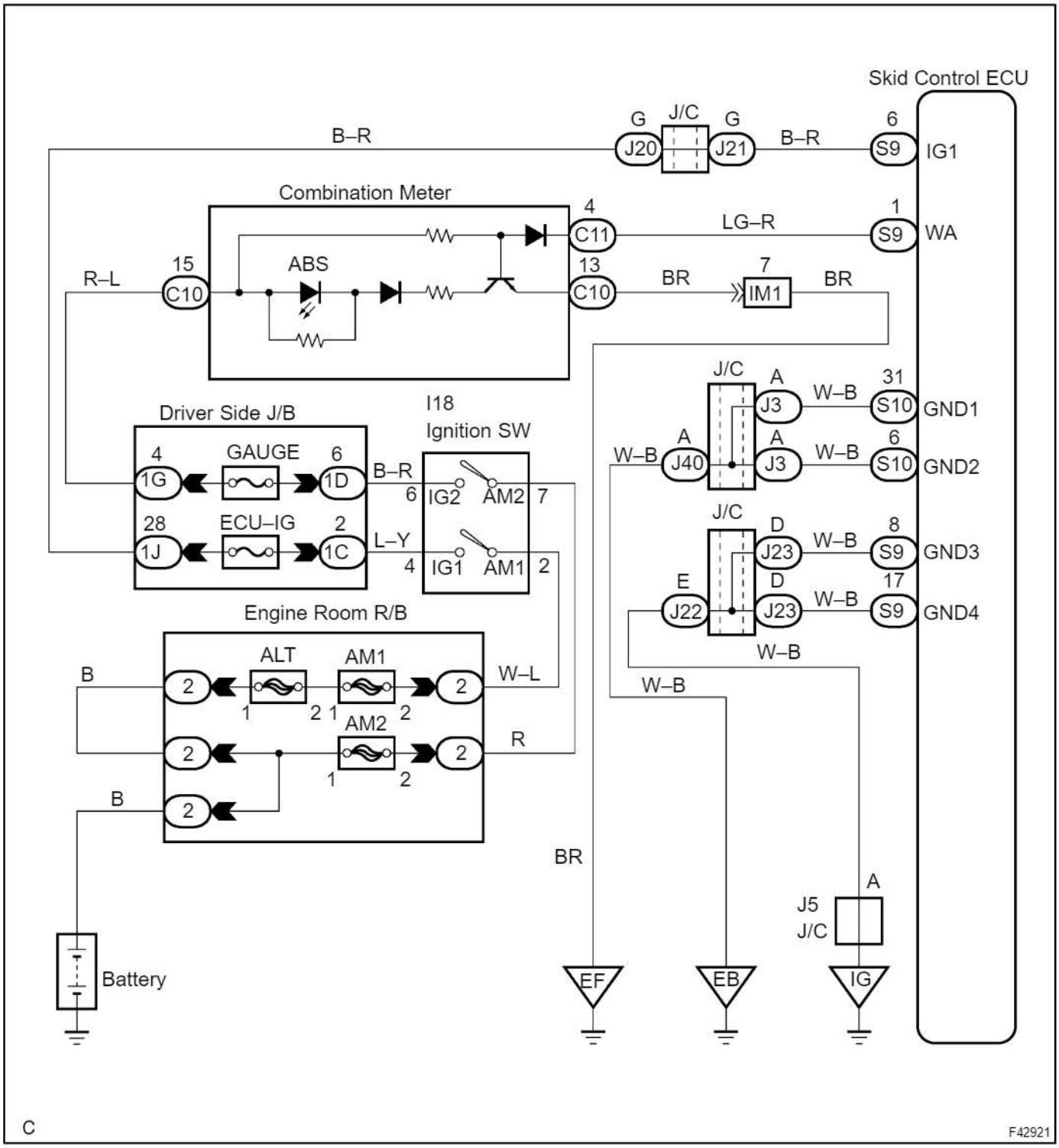
CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
Always ON	Either of the following 1. or 2. is detected: 1. The ECU connectors are OFF from the ECU. 2. There is a malfunction in the ECU internal circuit.	□Battery □IC regulator □Power source circuit □Skid control ECU

HINT:
There is a case that TOYOTA hand–held tester cannot be used when ECU is abnormal.

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WIRING DIAGRAM



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INSPECTION PROCEDURE

1	CHECK DTC FOR ABS

(a) Check DTC on page 05–803.

YES → REPAIR CIRCUIT INDICATED BY OUTPUT CODE

NO

2	INSPECT SKID CONTROL ECU CONNECTOR SECURELY CONNECTED

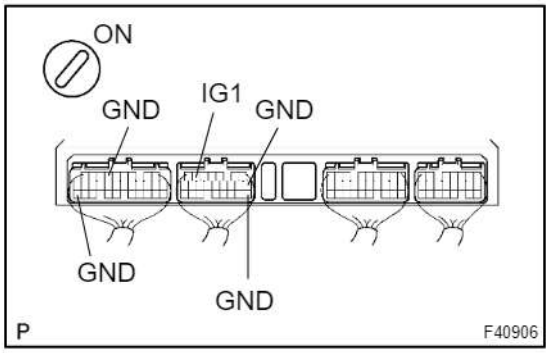
NO → CONNECT CONNECTOR TO ECU

YES

3	INSPECT SKID CONTROL ECU TERMINAL VOLTAGE(IG1 TERMINAL)

IN CASE OF USING HAND–HELD TESTER:

(a) Check the voltage condition output from the ECU displayed on the hand–held tester.
OK:
"Normal" is displayed.



IN CASE OF NOT USING HAND–HELD TESTER:

(a) Remove the skid control ECU with connectors still connected.
(b) Turn the ignition switch ON.
(c) Measure voltage between terminals IG1 and GND of skid control ECU.
OK:
Voltage: 10 – 14 V

OK → Go to step 5

NG

4	INSPECT BATTERY

OK:
Voltage: 10 – 14 V

NG → CHECK AND REPLACE CHARGING SYSTEM

OK

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5	CHECK HARNESS AND CONNECTOR(DLC3 – SKID CONTROL ECU)

(a) Check for short circuit in harness and connector between terminal Tc of DLC3 and skid control ECU (See page 01–35).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

6	INSPECT ABS WARNING LIGHT

(a) See combination meter troubleshooting on page 71–1.

NG → REPAIR OR REPLACE COMBINATION METER ASSEMBLY

OK

7	CHECK HARNESS AND CONNECTOR(SKID CONTROL ECU – COMBINATION METER)

(a) Check for open and short circuit in harness and connector between skid control ECU and combination meter (See page 01–35).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

CHECK AND REPLACE SKID CONTROL ECU ASSY

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DTC	AlwaysON	MALFUNCTION IN ECU(VSC WARNING LIGHT)

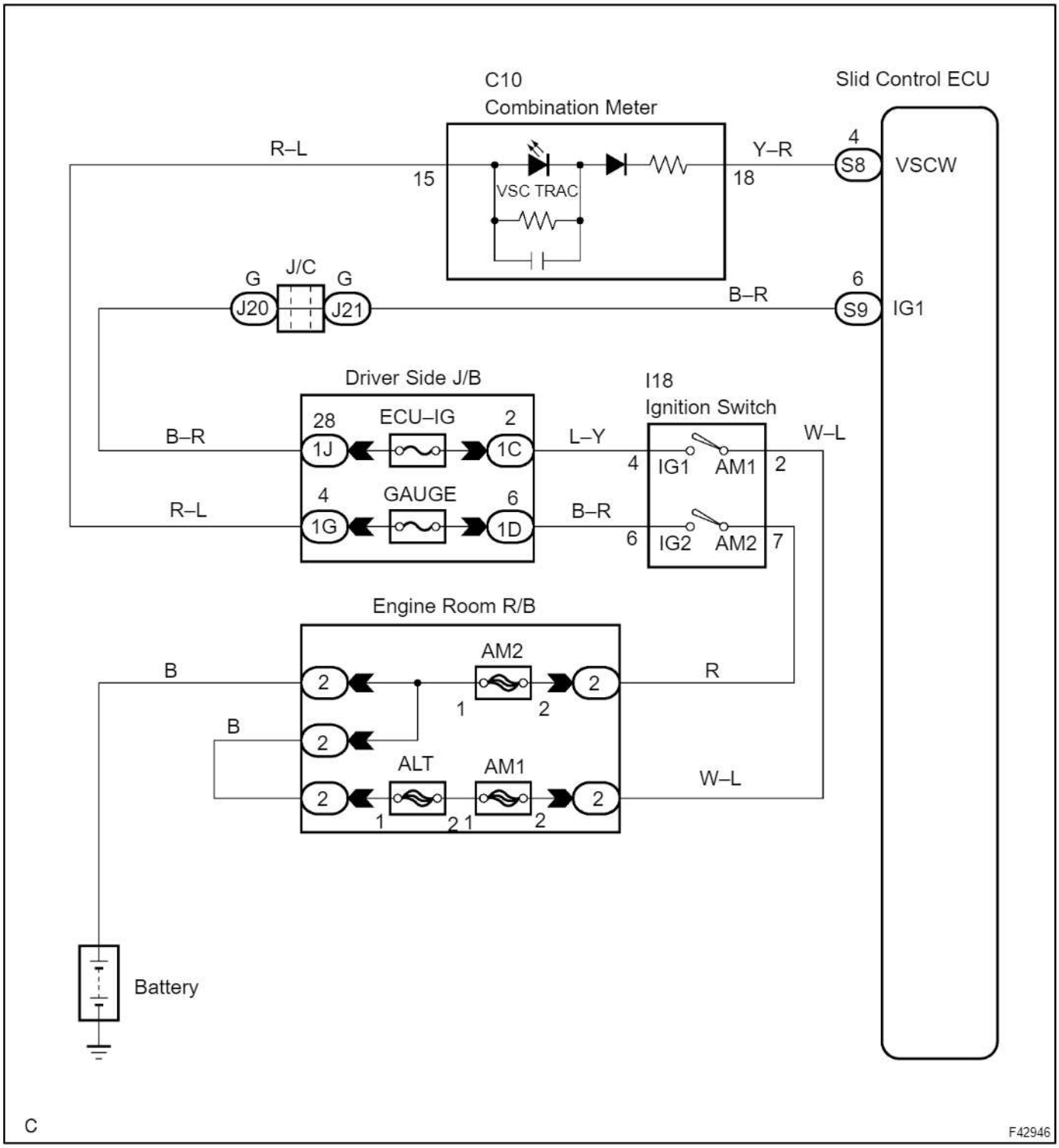
CIRCUIT DESCRIPTION

If the ECU stores DTC, the VSC warning light lights on the combination meter.

DTC No.	DTC Detecting Condition	Trouble Area
Always ON	Malfunction in skid control EU	□Battery □IC regulator □Power source circuit □Skid control ECU

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WIRING DIAGRAM



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INSPECTION PROCEDURE

1	CHECK DTC FOR VSC

(a) Check DTC on page 05–803.

YES → REPAIR CIRCUIT INDICATED BY OUTPUT CODE

NO

2	INSPECT SKID CONTROL ECU CONNECTOR SECURELY CONNECTED

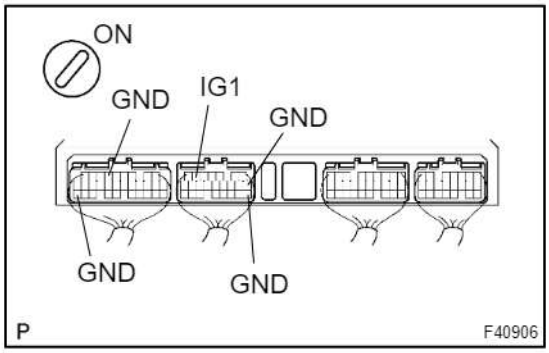
NO → CONNECT CONNECTOR TO ECU

YES

3	INSPECT SKID CONTROL ECU TERMINAL VOLTAGE(IG1 TERMINAL)

IN CASE OF USING HAND–HELD TESTER:

(a) Check the voltage condition output from the ECU displayed on the hand–held tester.
OK:
"Normal" is displayed.



IN CASE OF NOT USING HAND–HELD TESTER:

(a) Remove the skid control ECU with connectors still connected.
(b) Turn the ignition switch ON.
(c) Measure voltage between terminals IG1 and GND of skid control ECU.
OK:
Voltage: 10 – 14 V

OK → Go to step 5

NG

4	INSPECT BATTERY

OK:
Voltage: 10 – 14 V

NG → CHECK AND REPLACE CHARGING SYSTEM

OK

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5	CHECK HARNESS AND CONNECTOR(DLC3 – SKID CONTROL ECU)

(a) Check for short circuit in harness and connector between terminal Tc of DLC3 and skid control ECU (See page 01–35).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

6	CHECK VSC WARNING LIGHT

(a) See combination meter troubleshooting on page 71–1.

NG → REPAIR OR REPLACE COMBINATION METER ASSEMBLY

OK

7	CHECK HARNESS AND CONNECTOR(SKID CONTROL ECU – COMBINATION METER)

(a) Check for open and short circuit in harness and connector between skid control ECU and combination meter (See page 01–35).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

CHECK AND REPLACE SKID CONTROL ECU ASSY

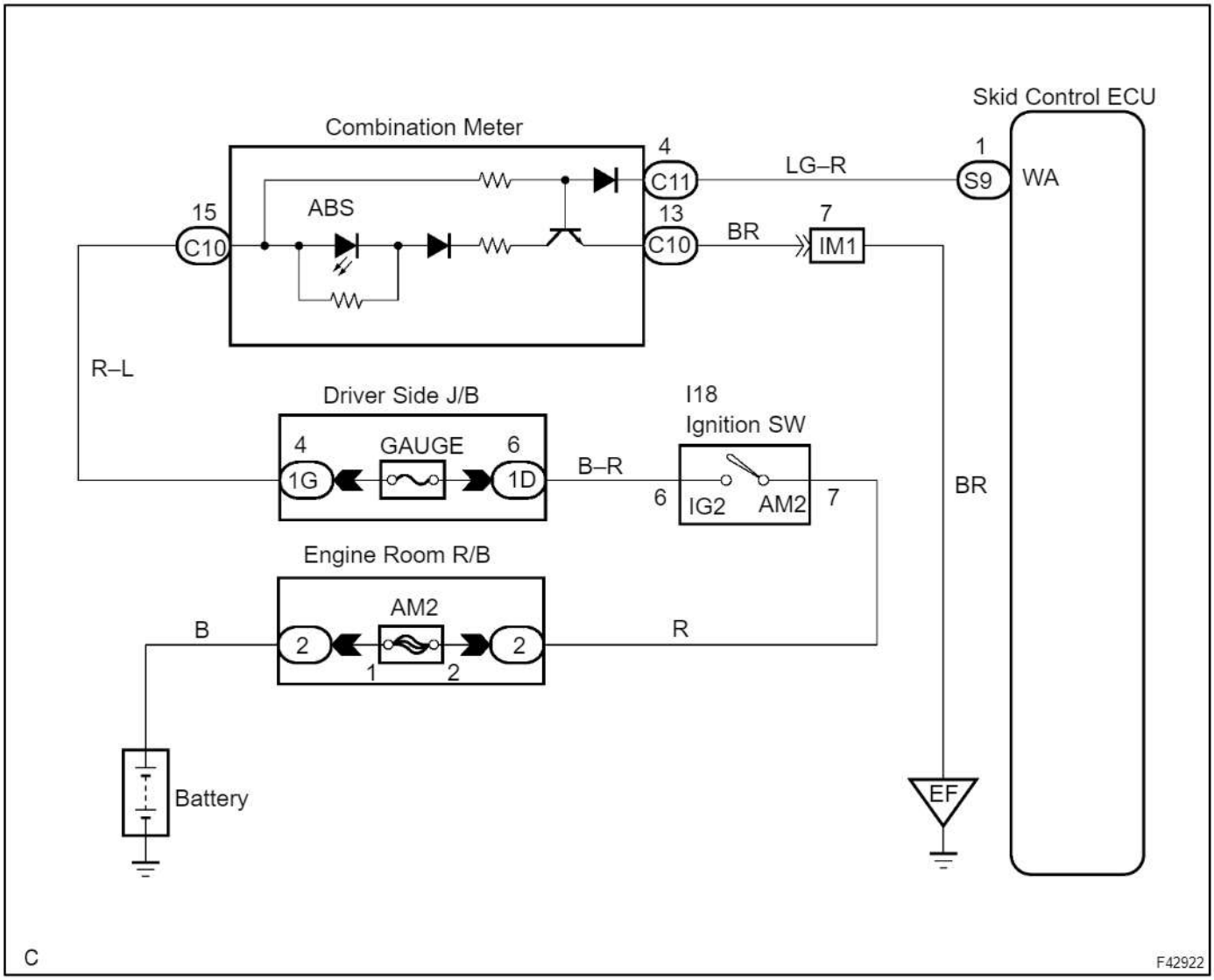
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ABS WARNING LIGHT CIRCUIT (DOES NOT LIGHT UP)

CIRCUIT DESCRIPTION

If the ECU detects trouble, it lights the ABS warning light while at the same time prohibiting ABS control. At this time, the ECU records a DTC in memory.
Connect terminals Tc and CG of the DLC3 to make the ABS warning light blink and output the DTC.

WIRING DIAGRAM



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INSPECTION PROCEDURE

HINT:

Start the inspection from step 1 in case of using the hand–held tester and start from step 2 in case of not using the hand–held tester.

1	PERFORM ACTIVE TEST BY ABS WARNING LIGHT

(a) Check that "ON" and "OFF" of the ABS warning light can be shown on the combination meter on the hand–held tester.

OK → CHECK AND REPLACE SKID CONTROL ECU ASSY

NG

2	INSPECT ABS WARNING LIGHT

(a) See combination meter troubleshooting on page 71–1.

NG → REPAIR OR REPLACE COMBINATION METER ASSEMBLY

OK

3	CHECK HARNESS AND CONNECTOR(SKID CONTORL ECU – COMBINATION METER)

(a) Check for open and short circuit in harness and connector between skid control ECU and combination meter (See page 01–35).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

CHECK AND REPLACE SKID CONTROL ECU ASSY

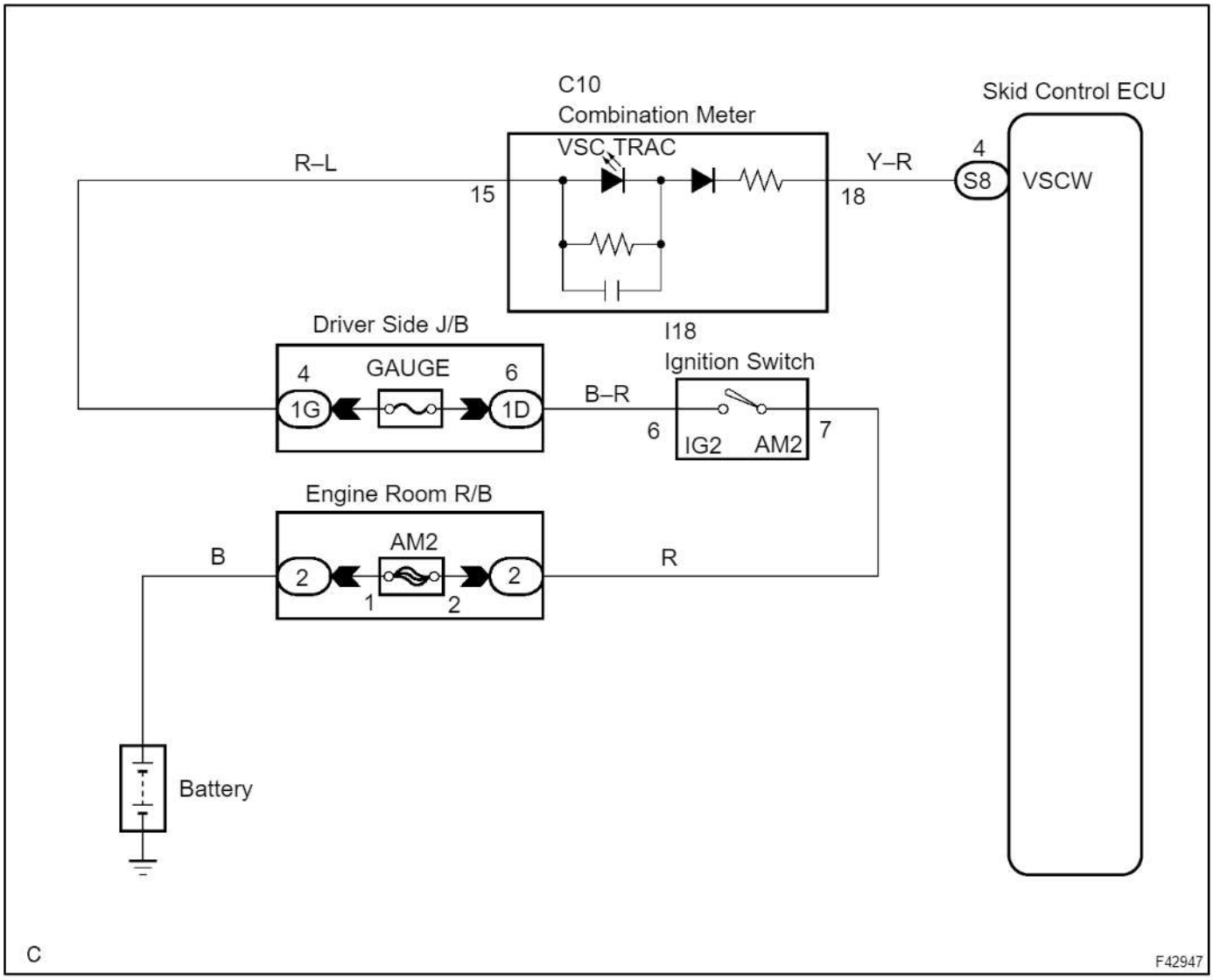
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VSC WARNING LIGHT CIRCUIT (DOES NOT LIGHT UP)

CIRCUIT DESCRIPTION

If the ECU stores DTC, the VSC warning light lights on the combination meter.

WIRING DIAGRAM



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INSPECTION PROCEDURE

HINT:

Start the inspection from step 1 in case of using the hand–held tester and start from step 2 in case of not using the hand–held tester.

1	PERFORM ACTIVE TEST BY VSC WARNING LIGHT

(a) Check that "ON" and "OFF" of the VSC warning light can be shown on the combination meter with the hand–held tester.

OK → CHECK AND REPLACE SKID CONTROL ECU ASSY

NG

2	INSPECT VSC WARNING LIGHT

(a) See combination meter troubleshooting on page 71–1.

NG → REPAIR OR REPLACE COMBINATION METER ASSEMBLY

OK

3	CHECK HARNESS AND CONNECTOR(SKID CONTROL ECU – COMBINATION METER)

(a) Check for open and short circuit in harness and connector between skid control ECU and combination meter (See page 01–35).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

CHECK AND REPLACE SKID CONTROL ECU ASSY

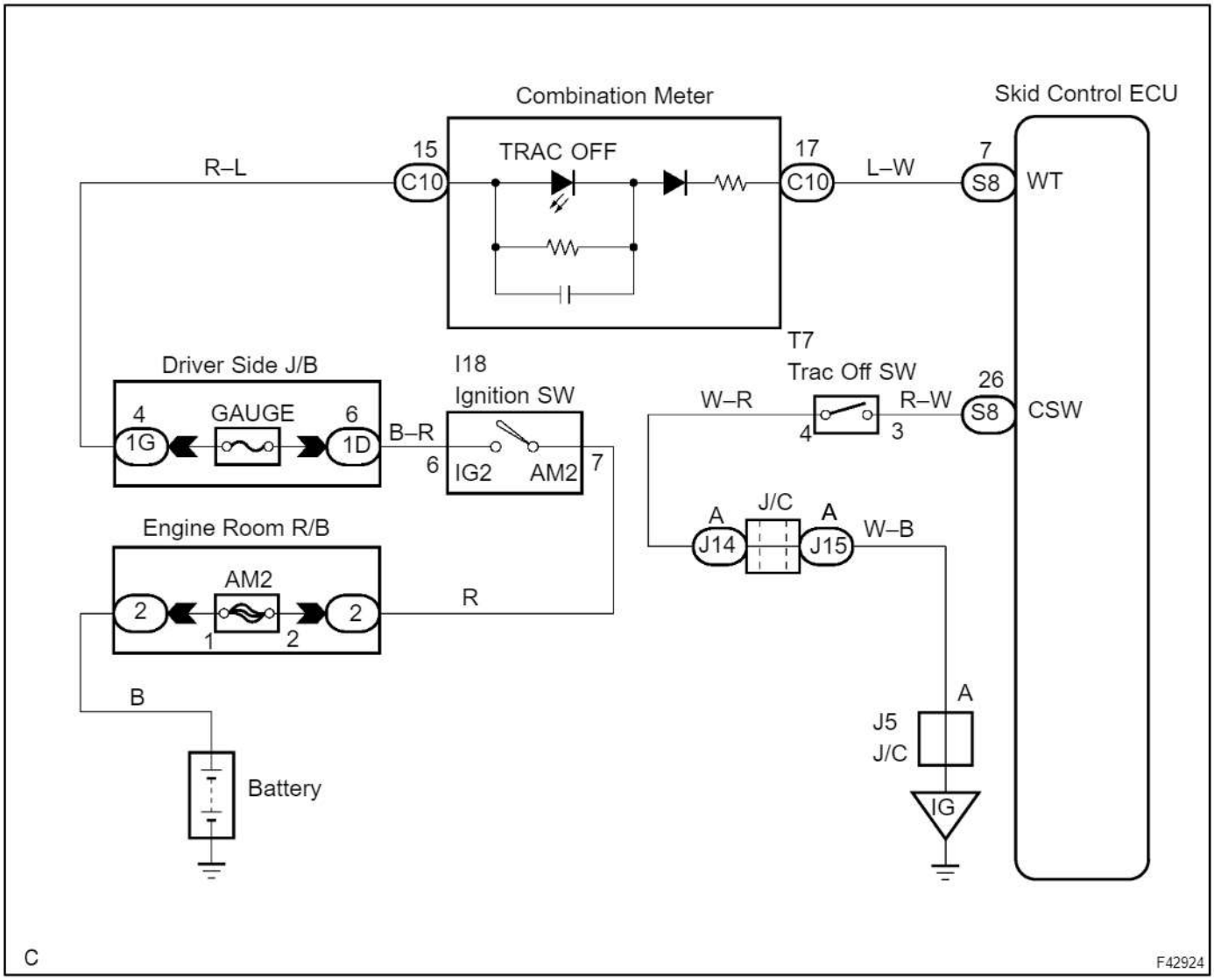
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TRAC OFF INDICATOR LIGHT, TRAC OFF SWITCH CIRCUIT

CIRCUIT DESCRIPTION

This is the TRAC control main switch. When the TRAC OFF switch is pushed on, TRAC control goes off and the TRAC OFF indicator lights up. Turn the ignition switch OFF, TRAC control surely comes on when the ignition switch turns ON next time.

WIRING DIAGRAM



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INSPECTION PROCEDURE

HINT:

Start the inspection from step 1 in case of using the hand–held tester and start from step 2 in case of not using the hand–held tester.

1	PERFORM ACTIVE TEST BY TRAC OFF INDICATOR LIGHT

(a) Check that "ON" and "OFF" of the TRAC OFF indicator light can be shown on the combination meter with the hand–held tester.

OK → Go to step 3

NG

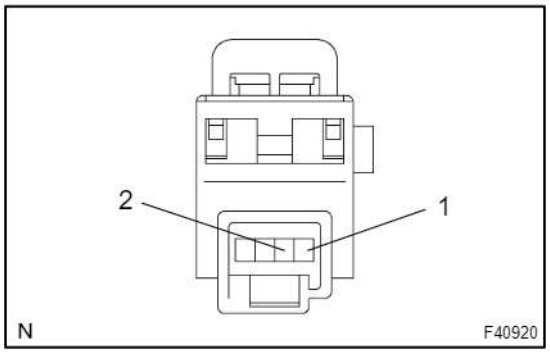
2	INSPECT TRAC OFF INDICATOR LIGHT

(a) See combination meter troubleshooting on page 71–1.

NG → REPAIR OR REPLACE COMBINATION METER ASSEMBLY

OK

3	INSPECT TRAC OFF SWITCH



(a) Remove the TRAC OFF switch.
(b) Disconnect the TRAC OFF switch connector.
(c) Measure resistance between terminals 1 and 2 of the TRAC OFF switch when the TRAC OFF switch is ON and OFF.

OK:

TRAC OFF switch	Resistance
Pushed in	Continuity
Released	1MΩ or higher

NG → REPLACE TRAC OFF SWITCH

OK

4	CHECK HARNESS AND CONNECTOR(SKID CONTROL ECU – TRAC OFF SWITCH)

(a) Check for open and short circuit in harness and connector between terminal CSW of skid control ECU and TRAC OFF switch (See page 01–35).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

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5	CHECK HARNESS AND CONNECTOR(SKID CONTROL ECU – COMBINATION METER)

(a) Check for open and short circuit in harness and connector between skid control ECU and combination meter (See page 01–35).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

CHECK AND REPLACE SKID CONTROL ECU ASSY

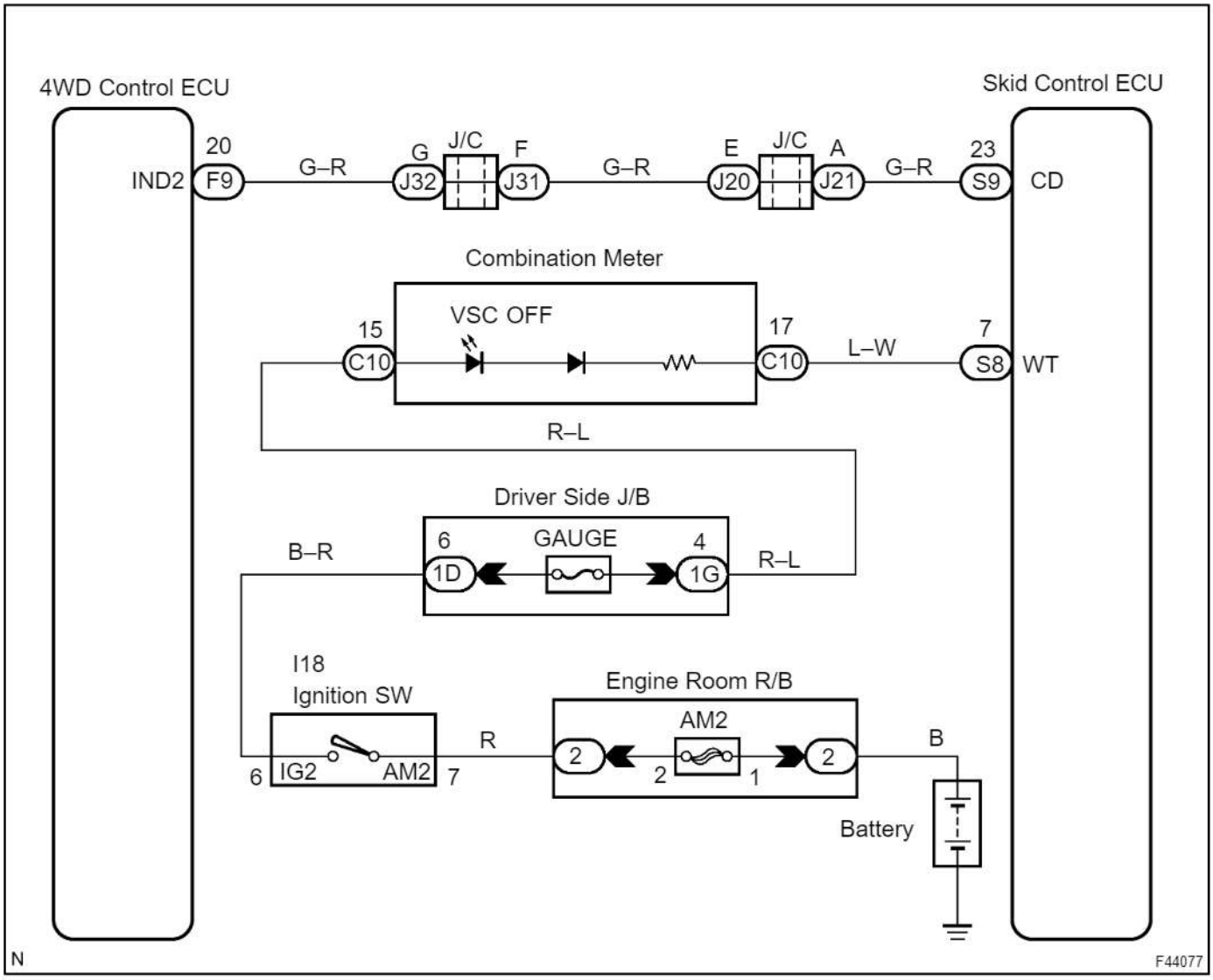
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VSC OFF INDICATOR LIGHT, CENTER DIFF. LOCK SWITCH CIRCUIT

CIRCUIT DESCRIPTION

When the center differential is locked, VSC control goes off and the VSC OFF indicator lights up. Also, the VSC OFF indicator light goes on when the VSC system is at the fail safe control.

WIRING DIAGRAM



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INSPECTION PROCEDURE

HINT:
Start the inspection from step 1 in case of using the hand–held tester and start from step 2 in case of not using the hand–held tester.

1	PERFORM ACTIVE TEST BY VSC OFF INDICATOR LIGHT

(a) Connect the hand–held tester to DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the ACTIVE TEST mode on the hand–held tester.

NG → Go to step 4

OK

2	CHECK CENTER DIFF. LOCK DETECTION SWITCH

NG → REPLACE CENTER DIFF. LOCK DETECTION SWITCH

OK

3	CHECK HARNESS AND CONNECTOR(SKID CONTROL ECU – CENTER DIFF. LOCK DETECTION SWITCH)

(a) Check for open and short circuit in harness and connector between skid control ECU and center diff. lock detection switch (See page 01–35).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

4	CHECK VSC OFF INDICATOR LIGHT

NG → REPAIR OR REPLACE COMBINATION METER ASSY

OK

5	CHECK HARNESS AND CONNECTOR(SKID CONTROL ECU – COMBINATION METER)

(a) Check for open and short circuit in harness and connector between skid control ECU and combination meter (See page 01–35).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

CHECK AND REPLACE SKID CONTROL ECU ASSY

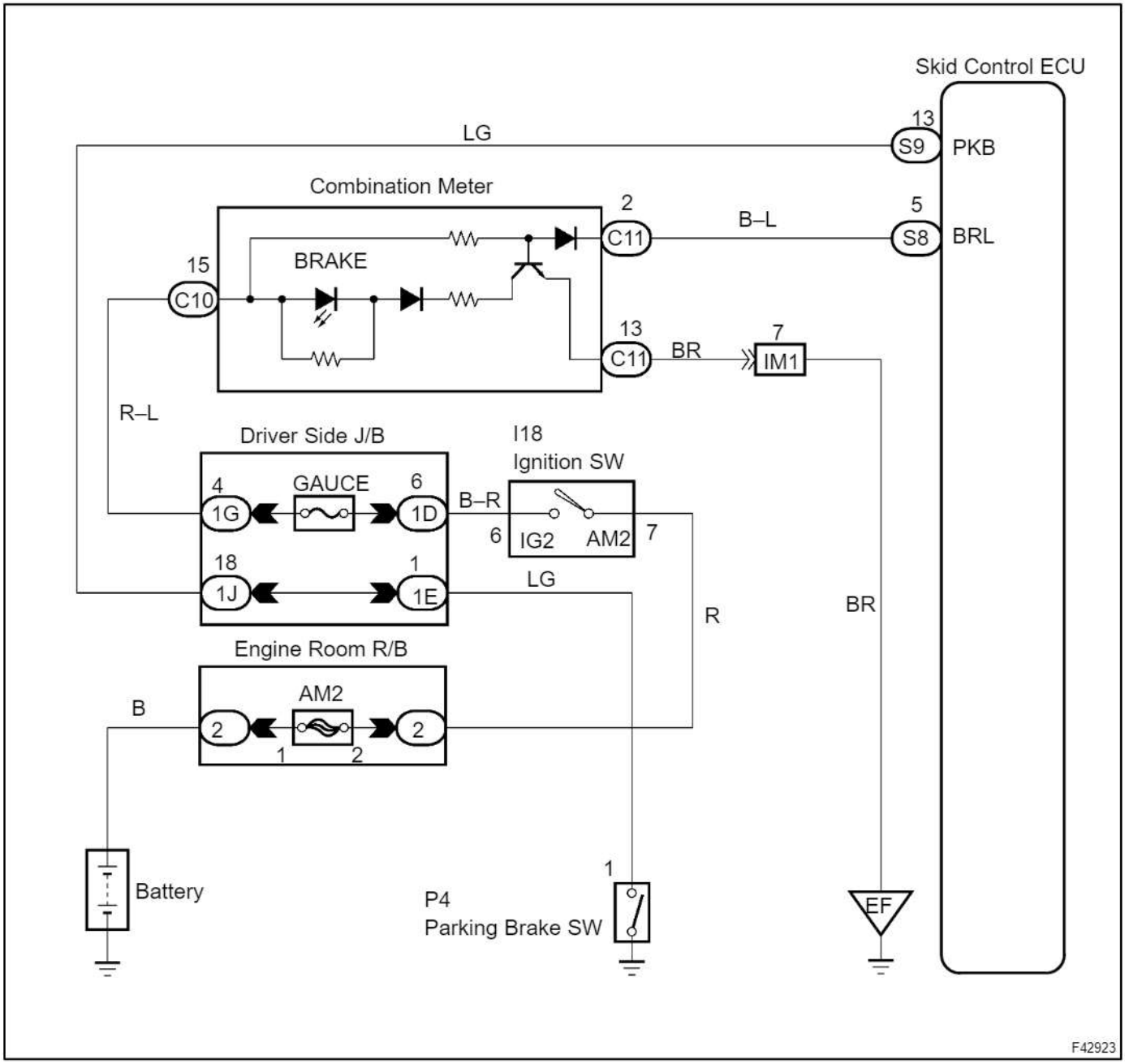
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BRAKE WARNING LIGHT CIRCUIT

CIRCUIT DESCRIPTION

The BRAKE warning light lights up when the brake fluid is insufficient, the parking brake is applied or the EBD is defective.

WIRING DIAGRAM



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INSPECTION PROCEDURE

HINT:

Start the inspection from step 1 in case of using the hand–held tester and start from step 2 in case of not using the hand–held tester.

1	PERFORM ACTIVE TEST BY BRAKE WARNING LIGHT

(a) Check that "ON" and "OFF" of the BRAKE warning light can be shown on the combination meter with the hand–held tester.

OK → Go to step 3

NG

2	INSPECT BRAKE WARNING LIGHT

(a) See combination meter troubleshooting on page 71–1.

NG → REPAIR OR REPLACE COMBINATION METER ASSEMBLY

OK

3	CHECK DTC FOR ABS

(a) Check DTC on page 05–803.

YES → REPAIR CIRCUIT INDICATED BY OUTPUT CODE

NO

4	INSPECT PARKING BRAKE SWITCH ASSY

NG → REPLACE PARKING BRAKE SWITCH ASSY

OK

5	INSPECT BRAKE FLUID LEVEL WARNING SWITCH CIRCUIT

NG → REPAIR OR REPLACE BRAKE FLUID LEVEL WARNING SWITCH CIRCUIT

OK

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6	CHECK HARNESS AND CONNECTOR(SKID CONTROL ECU – PARKING BRAKE SWITCH)

(a) Check for open and short circuit in harness and connector between terminal PKB of skid control ECU and parking brake switch (See page 01–35).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

7	CHECK HARNESS AND CONNECTOR(SKID CONTROL ECU – BRAKE FLUID LEVEL WARNING SWITCH)

(a) Check for open and short circuit in harness and connector between terminal LBL of skid control ECU and brake fluid level warning switch (See page 01–35).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

8	CHECK HARNESS AND CONNECTOR(SKID CONTROL ECU – COMBINATION METER)

(a) Check for open and short circuit in harness and connector between skid control ECU and combination meter (See page 01–35).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

CHECK AND REPLACE SKID CONTROL ECU ASSY

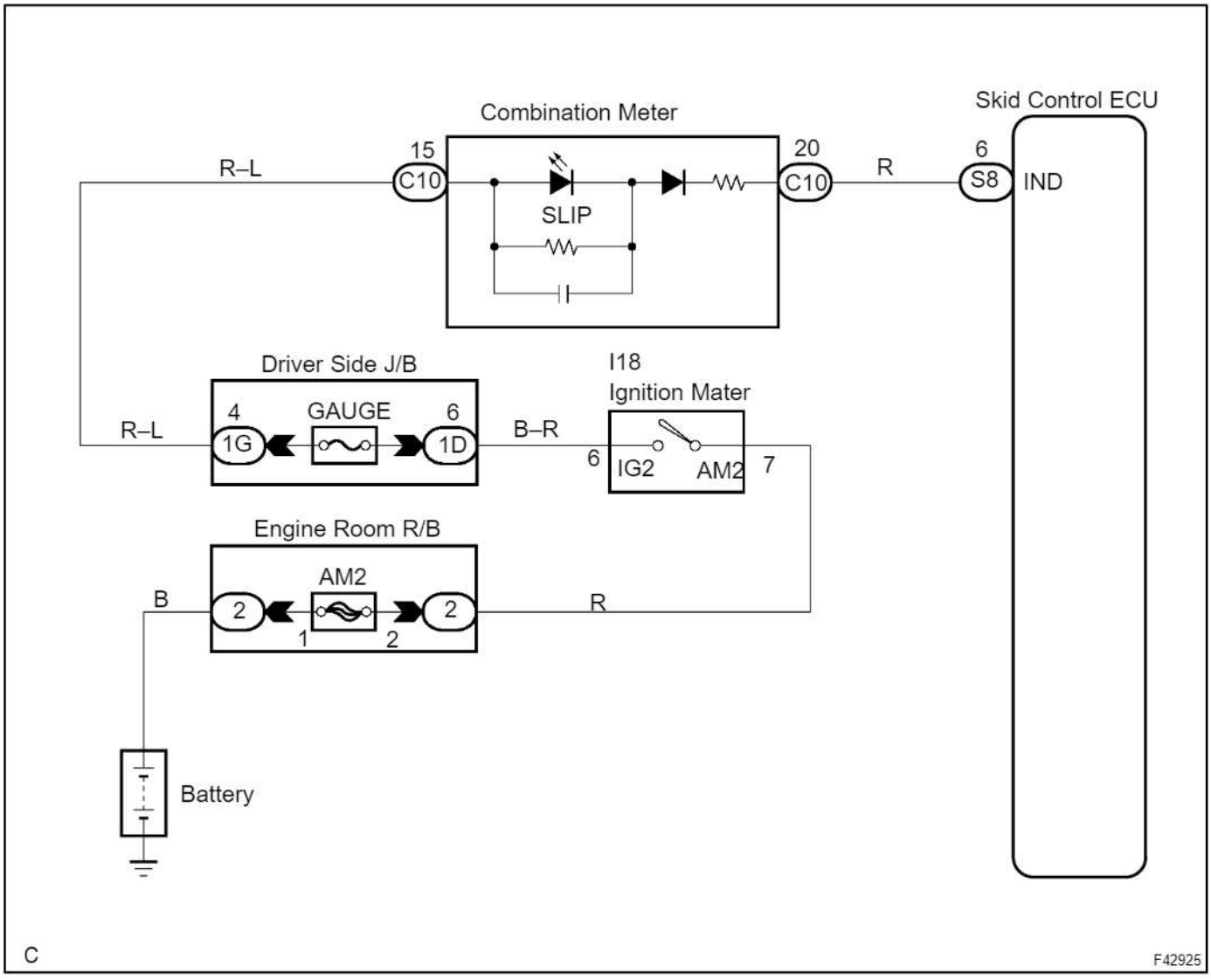
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SLIP INDICATOR LIGHT CIRCUIT

CIRCUIT DESCRIPTION

The SLIP indicator blinks during TRAC & VSC operation.

WIRING DIAGRAM



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INSPECTION PROCEDURE

HINT:

Start the inspection from step 1 in case of using the hand–held tester and start from step 2 in case of not using the hand–held tester.

1	PERFORM ACTIVE TEST BY SLIP INDICATOR LIGHT

(a) Check that "ON" and "OFF" of the SLIP indicator light can be shown on the combination meter with the hand–held tester.

OK → Go to step 3

NG

2	INSPECT SLIP INDICATOR LIGHT

(a) See combination meter troubleshooting on page 71–1.

NG → REPAIR OR REPLACE COMBINATION METER ASSEMBLY

OK

3	CHECK HARNESS AND CONNECTOR(SKID CONTROL ECU – COMBINATION METER)

(a) Check for open and short circuit in harness and connector between skid control ECU and combination meter (See page 01–35).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

CHECK AND REPLACE SKID CONTROL ECU ASSY

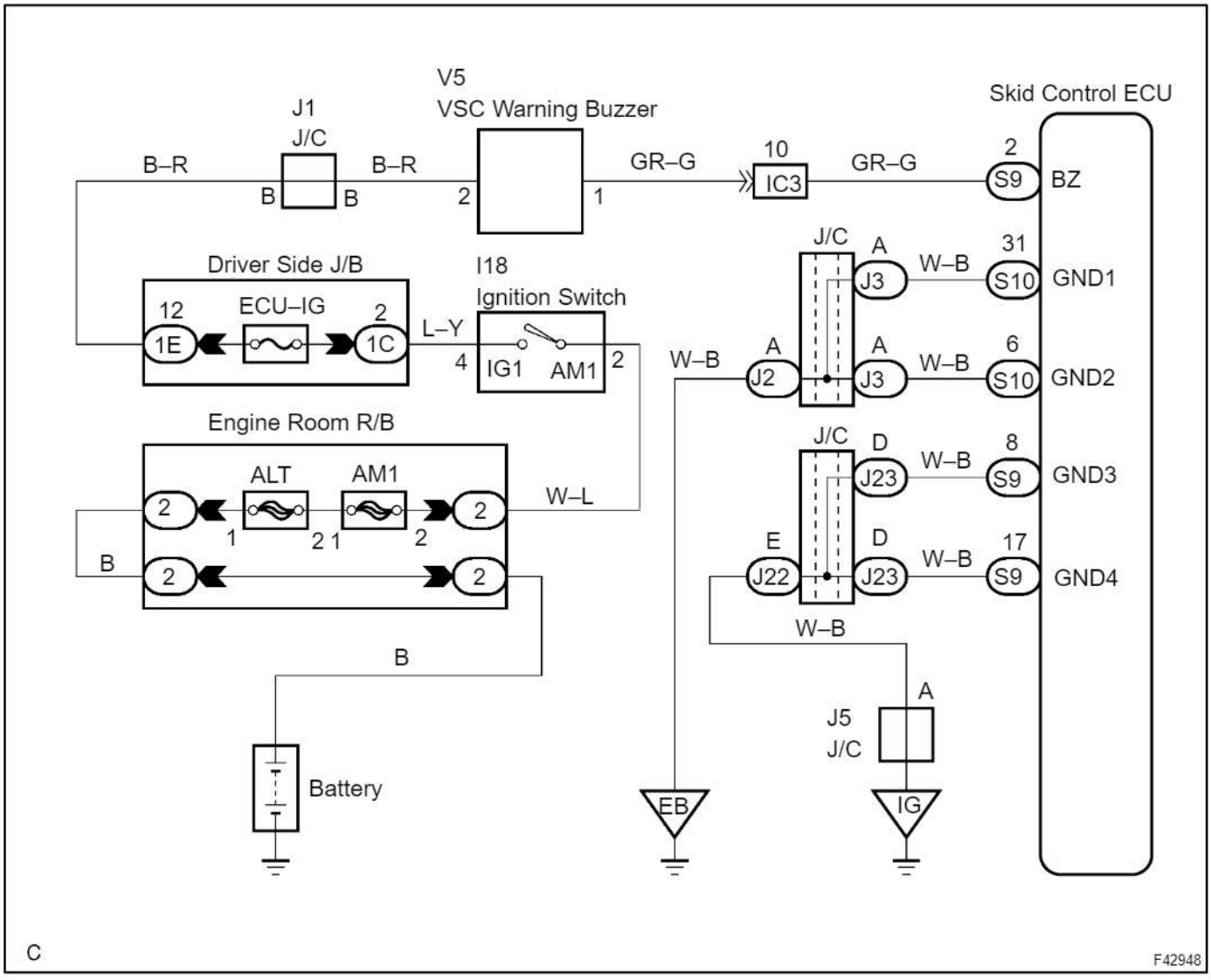
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SKID CONTROL BUZZER CIRCUIT

CIRCUIT DESCRIPTION

The skid control buzzer sounds during VSC operation.

WIRING DIAGRAM



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INSPECTION PROCEDURE

HINT:

Start the inspection from step 1 in case of using the hand–held tester and start from step 2 in case of not using the hand–held tester.

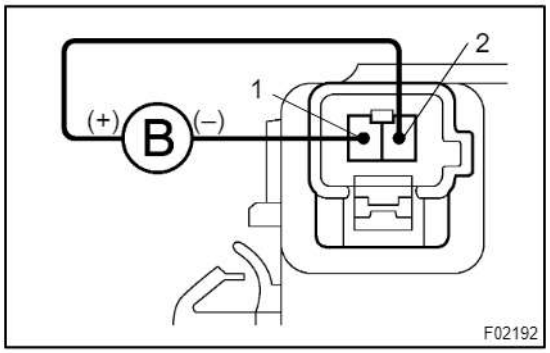
1	PERFORM ACTIVE TEST BY SKID CONTROL BUZZER ASSY

(a) Check that skid control buzzer sounds ”ON” and ”OFF” with the hand–held tester.

OK > Go to step 3

NG

2	INSPECT SKID CONTROL BUZZER ASSY



(a) Disconnect the skid control buzzer connector.
(b) Apply battery positive voltage to the terminals 1 and 2 of skid control buzzer connector, check that the buzzer sounds.

NG > REPLACE SKID CONTROL BUZZER ASSY

OK

3	CHECK HARNESS AND CONNECTOR(SKID CONTROL BUZZER – SKID CONTROL ECU)

(a) Check for open and short circuit in harness and connector between terminal BZ of skid control ECU and skid control buzzer (See page 01–35).

NG > REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

CHECK AND REPLACE SKID CONTROL ECU ASSY

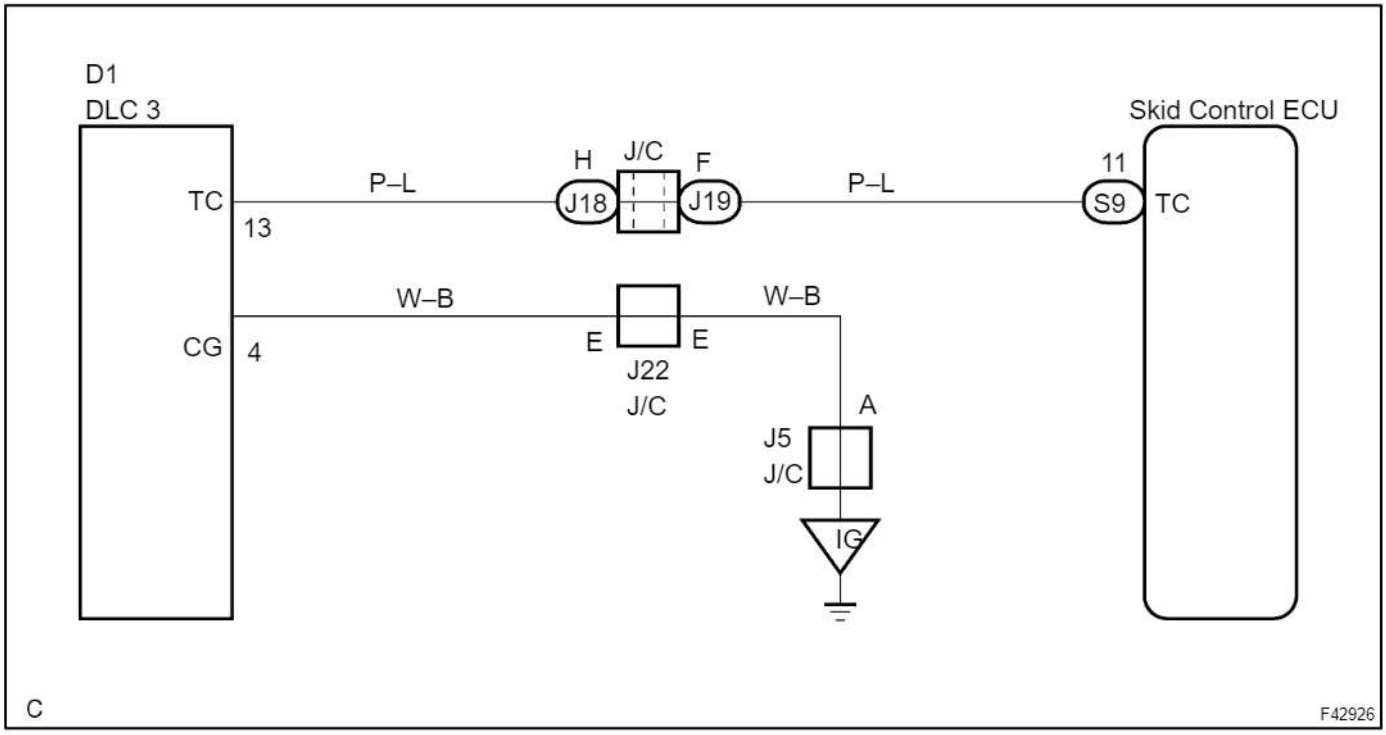
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TC TERMINAL CIRCUIT

CIRCUIT DESCRIPTION

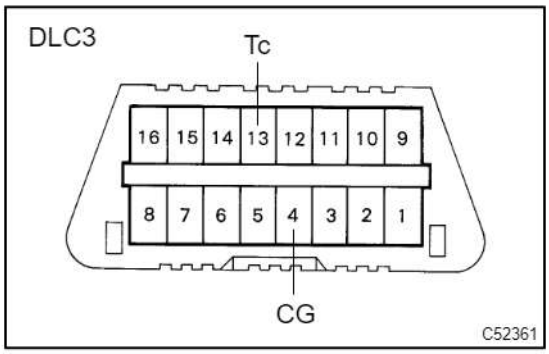
Connecting terminals Tc and CG of the DLC3 causes the ECU to display the DTC by flashing the ABS warning light.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT DLC3 TERMINAL VOLTAGE(Tc TERMINAL)



(a) Turn the ignition switch ON.
(b) Measure voltage between terminals Tc and CG of DLC3.
OK:
Voltage: 10 – 14 V

OK	Go to step 4

NG

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2	CHECK HARNESS AND CONNECTOR(SKID CONTROL ECU – DLC3)

(a) Check for open and short circuit in harness and connector between terminal Tc of the skid control ECU and DLC3 (See page 01–35).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

3	CHECK HARNESS AND CONNECTOR(DLC3 – BODY GROUND)

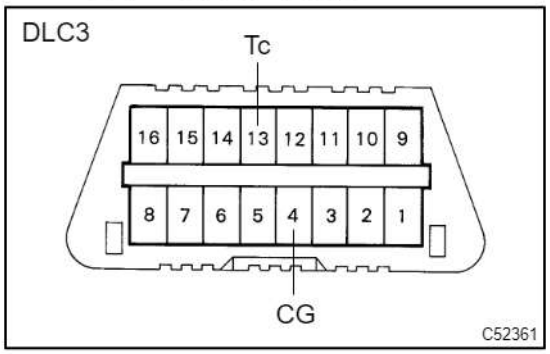
(a) Check for open and short circuit in harness and connector between terminal CG of the DLC3 and body ground (See page 01–35).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

4	INSPECT ABS AND VSC WARNING LIGHT

SST 09843–18040



(a) Using SST, connect the terminals Tc and CG of the DLC3.
(b) Turn the ignition switch ON.
(c) Check the ABS and VSC warning right.

OK:

Warning light blinking

OK → NO PROBLEM

NG

CHECK AND REPLACE SKID CONTROL ECU ASSY

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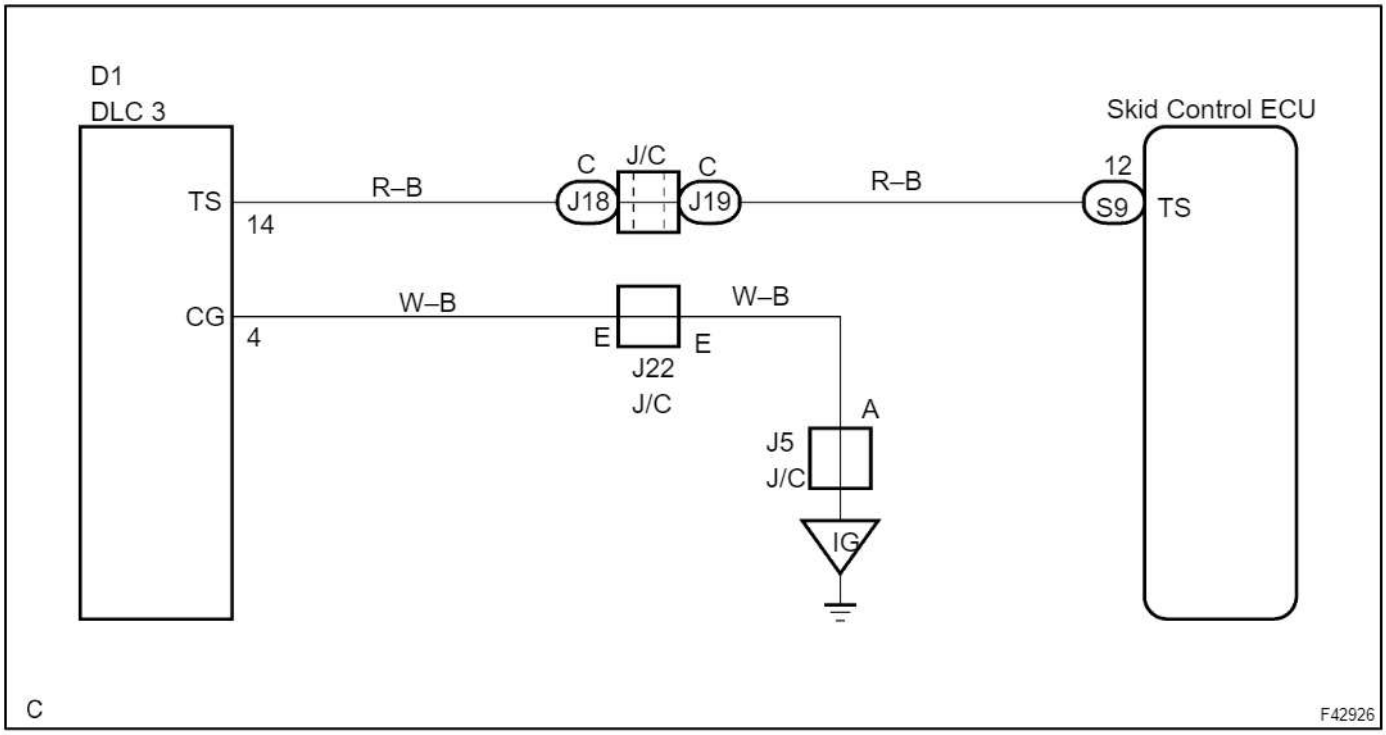
TS TERMINAL CIRCUIT

CIRCUIT DESCRIPTION

The sensor check circuit detects abnormalities in the sensor signal which cannot be detected with the DTC check.

Connecting terminals Ts and CG of the DLC3 starts the check.

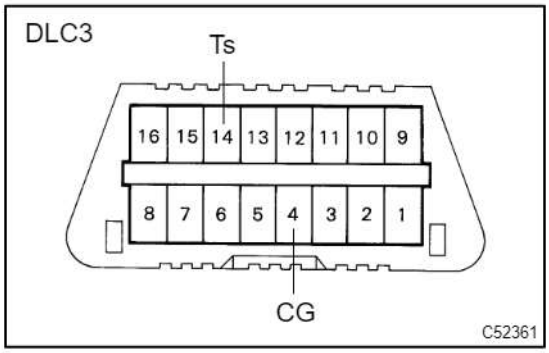
WIRING DIAGRAM



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INSPECTION PROCEDURE

1	INSPECT DLC3 TERMINAL VOLTAGE(Ts TERMINAL)



(a) Turn the ignition switch ON.
(b) Measure voltage between terminals Ts and CG of DLC3.
OK:
Voltage: 10 – 14 V

OK → **Go to step 3**

NG

2	CHECK HARNESS AND CONNECTOR(DLC3 – SKID CONTROL ECU)

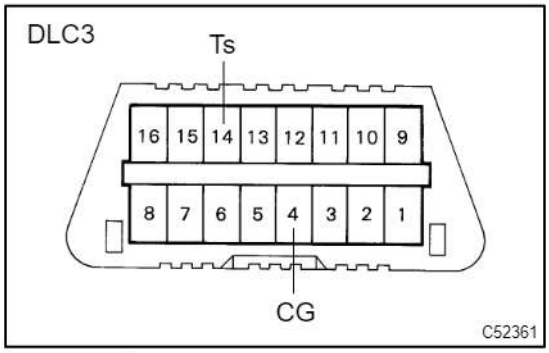
(a) Check for open and short circuit in harness and connector between terminal Ts of the DLC3 and skid control ECU (See page 01–35).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3	INSPECT ABS AND VSC WARNING LIGHT

SST 09843–18040



(a) Using SST, connect the terminals Ts and CG of the DLC3.
(b) Turn the ignition switch ON.
(c) Check the ABS and VSC warning right.
OK:
Warning light blinking

OK → **NO PROBLEM**

NG

CHECK AND REPLACE SKID CONTROL ECU ASSY

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ELECTRONIC CONTROLLED AUTOMATIC TRANSMISSION [ECT] (A750E/A750F) (From August, 2003)

05GBE-01

PRECAUTION

NOTICE:

Perform the RESET MEMORY (AT initialization) when replacing the automatic transmission assy, engine assy or ECM (see page 05–950).

HINT:

Initialization can not be completed by only disconnecting the battery terminal.

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DEFINITION OF TERMS

Term	Definition
Monitor description	Description of what the ECM monitors and how it detects malfunctions (monitoring purpose and its details).
Related DTCs	Diagnostic code
Typical enabling condition	Preconditions that allow the ECM to detect malfunctions. With all preconditions satisfied, the ECM sets the DTC when the monitored value(s) exceeds the malfunction threshold(s).
Sequence of operation	The priority order that is applied to monitoring, if multiple sensors and components are used to detect the malfunction. While another sensor is being monitored, the next sensor or component will not be monitored until the previous monitoring has concluded.
Required sensor/components	The sensors and components that are used by the ECM to detect malfunctions.
Frequency of operation	The number of times that the ECM checks for malfunctions per driving cycle. "Once per driving cycle" means that the ECM detects malfunction only one time during a single driving cycle. "Continuous" means that the ECM detects malfunction every time when enabling condition is met.
Duration	The minimum time that the ECM must sense a continuous deviation in the monitored value(s) before setting a DTC. This timing begins after the "typical enabling conditions" are met.
Malfunction thresholds	Beyond this value, the ECM will conclude that there is a malfunction and set a DTC.
MIL operation	MIL illumination timing after a defect is detected. "Immediately" means that the ECM illuminates MIL the instant the ECM determines that there is a malfunction. "2 driving cycle" means that the ECM illuminates MIL if the same malfunction is detected again in the 2nd driving cycle.

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PART AND SYSTEM NAME LIST

This reference list indicates the part names used in this manual along with their definitions.

Part and system name	Definition
Toyota HCAC system, Hydrocarbon adsorptive Catalyst (HCAC) system, HC adsorptive three–way catalyst	HC adsorptive three–way catalytic converter
Variable Valve Timing sensor, VVT sensor	Camshaft position sensor
Variable valve timing system, VVT system	Camshaft timing control system
Camshaft timing oil control valve, Oil control valve OCV, VVT, VSV	Camshaft timing oil control valve
Variable timing and lift, VVTL	Camshaft timing and lift control
Crankshaft position sensor "A"	Crankshaft position sensor
Engine speed sensor	Crankshaft position sensor
THA	Intake air temperature
Knock control module	Engine knock control module
Knock sensor	Engine knock sensor
Mass or volume air flow circuit	Mass air flow sensor circuit
Vacuum sensor	Manifold air pressure sensor
Internal control module, Control module, Engine control ECU, PCM	Power train control module
FC idle	Deceleration fuel cut
Idle air control valve	Idle speed control
VSV for CCV, Canister close valve VSV for canister control	Evaporative emissions canister vent valve
VSV for EVAP, Vacuum switching valve assembly No. 1, EVAP VAV, Purge VSV	Evaporative emissions canister purge valve
VSV for pressure switching valve, Bypass VSV	Evaporative emission pressure switching valve
Vapor pressure sensor, EVAP pressure sensor, Evaporative emission control system pressure sensor	Fuel tank pressure sensor
Charcoal canister	Evaporative emissions canister
ORVR system	On–boad refueling vapor recovery system
Intake manifold runner control	Intake manifold tuning system
Intake manifold runner valve, IMRV, IACV (runner valve)	Intake manifold tuning valve
Intake control VSV	Intake manifold tuning solenoid valve
AFS	Air fuel ratio sensor
O2 sensor	Heater oxygen sensor
Oxygen sensor pumping current circuit	Oxygen sensor output signal
Oxygen sensor reference ground circuit	Oxygen sensor signal ground
Accel position sensor	Accelerator pedal position sensor
Throttle actuator control motor, Actuator control motor, Electronic throttle motor, Throttle control motor	Electronic throttle actuator
Electronic throttle control system, Throttle actuator control system	Electronic throttle control system
Throttle/pedal position sensor, Throttle/pedal position switch, Throttle position sensor/switch	Throttle position sensor
Turbo press sensor	Turbocharger pressure sensor
Turbo VSV	Turbocharger pressure control solenoid valve
P/S pressure switch	Power–steering pressure switch
VSV for ACM	Active control engine mount
Speed sensor, Vehicle speed sensor "A", Speed sensor for skid control ECU	Vehicle speed sensor
ATF temperature sensor, Trans. fluid temp. sensor, ATF temperature sensor "A"	Transmission fluid temperature sensor
Electronic controlled automatic transmission, ECT	Electronically controlled automatic
Intermediate shaft speed sensor "A"	Couter gear speed sensor

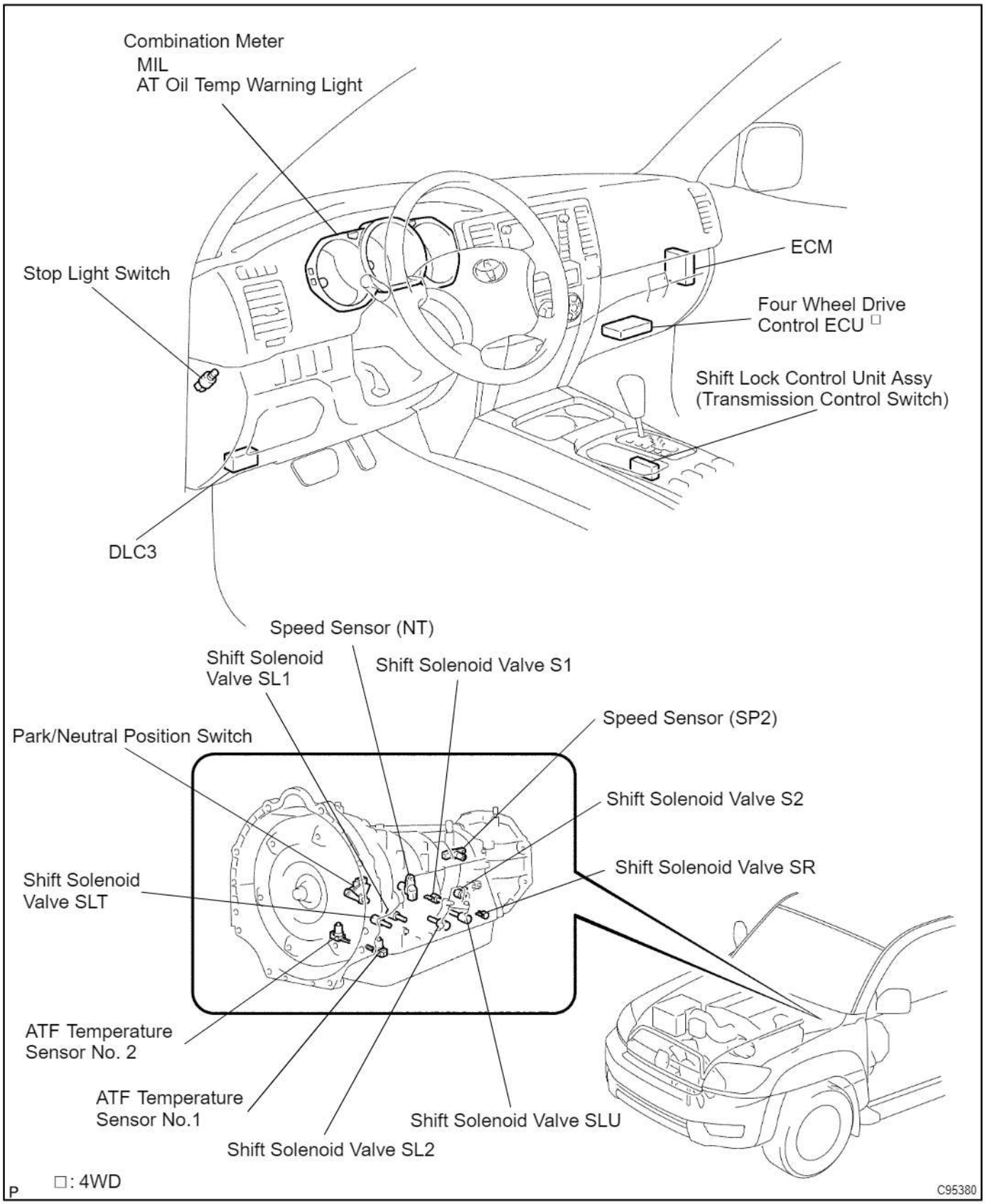
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Part and system name	Definition
Output speed sensor	Output shaft speed sensor
Input speed sensor, Input turbine speed sensor "A", Speed sensor (NT), Turbine speed sensor	Input turbine speed sensor
PNP switch, NSW	Park/neutral position switch
Pressure control solenoid	Transmission pressure control solenoid
Shift solenoid	Transmission shift solenoid valve
Transmission control switch, Shift lock control unit	Shift lock control module
Engine immobilizer system, Immobilizer system	Vehicle anti–theft system

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0527L–27

LOCATION



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0527H–26

HOW TO PROCEED WITH TROUBLESHOOTING

HINT:

- The ECM of this system is connected to the multiplex communication system. Therefore, before starting troubleshooting, make sure to check that there is no trouble in the multiplex communication system.
- The hand–held tester can be used at steps 3, 4, 6, and 9.

1	**Vehicle Brought to Workshop**

2	**Customer Problem Analysis (See page 05–942)**

3	**Connect the OBD II scan tool or hand–held tester to DLC3**

4	**Check and Clear DTC and Freeze Frame Data (See page 05–970)**

5	**Visual Inspection**

6	**Setting the Check Mode Diagnosis (See page 05–972)**

7	**Problem Symptom Confirmation (See page 05–943)**

- **Symptom does not occur: Go to step 8**
- **Symptom occur: Go to step 9**

8	**Symptom Simulation (See page 01–25)**

9	**DTC Check (See page 05–970)**

- **DTC is not output: Go to step 10**
- **DTC is output: Go to step 18**

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10	Basic Inspection (See page 40–4, 40–13 and 40–76)

NG → Go to step 20

OK

11	Mechanical System Test (See page 05–946)

NG → Go to step 17

OK

12	Hydraulic Test (See page 05–948)

NG → Go to step 17

OK

13	Manual Shifting Test (See page 05–949)

NG → Go to step 15

OK

14	Problem Symptoms Table Chapter 1 (See page 05–959)

NG → Go to step 19

OK

15	Problem Symptoms Table Chapter 2 (See page 05–959)

NG → Go to step 17

OK

16	Problem Symptoms Table Chapter 3 (See page 05–959)

17	Part Inspection

→ Go to step 20

18	DTC Chart (See page 05–976)

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19	Circuit Inspection

20	Repair or Replace

21	Confirmation Test

End

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05271-26

CUSTOMER PROBLEM ANALYSIS CHECK

Automatic Transmission System Check Sheet	Inspector's Name :

Customer's Name		VIN	
		Production Date	/ /
		Licence Plate No.	
Date Vehicle Brought In	/ /	Odometer Reading	km mile

Date Problem Occurred	/ /
How Often Does Problem Occur?	☐ Continuous ☐ Intermittent (times a day)

Symptoms	☐ Vehicle does not move (☐ Any position ☐ Particular position)
	☐ No up–shift (☐ 1st → 2nd ☐ 2nd → 3rd ☐ 3rd → 4th ☐ 4th → 5th)
	☐ No down–shift (☐ 5th → 4th ☐ 4th → 3rd ☐ 3rd → 2nd ☐ 2nd → 1st)
	☐ Lock–up malfunction
	☐ Shift point too high or too low
	☐ Harsh engagement (☐ N → D ☐ Lock–up ☐ Any drive position)
	☐ Slip or shudder
	☐ No kick–down
	☐ Others ( )

Check Item	Malfunction Indicator Lamp	☐ Normal ☐ Remains ON

DTC Check	1st Time	☐ Normal code ☐ Malfunction code (DTC)
	2nd Time	☐ Normal code ☐ Malfunction code (DTC)

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05GBH-01

ROAD TEST

1. PROBLEM SYMPTOM CONFIRMATION

(a) Based on the result of the customer problem analysis, try to reproduce the symptoms. If the problem is that the transaxle does not shift up, shift down, or the shift point is too high or too low, conduct the following road test referring to the automatic shift schedule and simulate the problem symptoms.

2. ROAD TEST

NOTICE:

Perform the test at normal operating ATF temperature 50 to 80°C (122 to 176°F).

(a) D position test:

Shift into the D position and fully depress the accelerator pedal and check the following points.

(1) Check up–shift operation.

Check that 1 → 2, 2 → 3, 3 → 4 and 4 → 5th up–shifts take place, and that the shift points conform to the automatic shift schedule (See page 03–55).

HINT:

- 5th Gear Up–shift Prohibition Control (1. Coolant temp. is 55°C (131°F) or less. 2. Vehicle speed is 51 km/h (32 mph) or less.)
- 4th Gear Up–shift Prohibition Control (1. Coolant temp. is 40°C (104°F) or less. 2. Vehicle speed is 45 km/h (28 mph) or less.)
- 5th Gear Lock–up Prohibition Control (1. Brake pedal is depressed. 2. Coolant temp. is 60°C (140°F) or less.)

(2) Check for shift shock and slip.

Check for shock and slip at the 1 → 2, 2 → 3, 3 → 4 and 4 → 5th up–shifts.

(3) Check for abnormal noises and vibration.

Drive in the D position lock–up or 5th gear and check for abnormal noises and vibration.

HINT:

The check for the cause of abnormal noises and vibration must be done very thoroughly as it could also be due to loss of balance in the differential, torque converter clutch, etc.

(4) Check kick–down operation.

While running in the D position, 2nd, 3rd, 4th and 5th gears, check that the possible kick–down vehicle speed limits for 2 → 1, 3 → 2, 4 → 3 and 5th → 4 kick–downs conform to those indicated on the automatic shift schedule (See page 03–55).

(5) Check abnormal shock and slip at kick–down.

(6) Check the lock–up mechanism.

- Drive in D position 5th gear, at a steady speed (lock–up ON) of about 76 km/h (47 mph).
- Lightly depress the accelerator pedal and check that the engine speed does not change abruptly.

If there is a big jump in engine speed, there is no lock–up.

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(b) 4 position test:
Shift into the 4 position and fully depress the accelerator pedal and check the following points.
(1) Check up–shift operation.
Check that the 1 → 2, 2 → 3 and 3 → 4 up–shift takes place and that the shift point conforms to the automatic shift schedule (See page 03–55).

HINT:
- There is no 5th up–shift in the 4 position.
- 4th Gear Lock–up Prohibition Control (1. Brake pedal is depressed. 2. Coolant temp. is 60°C (140°F) or less.)

(2) Check engine braking.
While driving in the 4 position and 4th gear, release the accelerator pedal and check the engine braking effect.
(3) Check for abnormal noises during acceleration and deceleration, and for shock at up–shift and down–shift.
(4) Check the lock–up mechanism.
- Drive in 4 position 4th gear, at a steady speed (lock–up ON) of about 69 km/h (43 mph).
- Lightly depress the accelerator pedal and check that the engine speed does not change abruptly.

If there is a big jump in engine speed, there is no lock–up.

(c) 3 position test:
Shift into the 3 position and fully depress the accelerator pedal and check the following points.
(1) Check up–shift operation.
Check that the 1 → 2 and 2 → 3 up–shift takes place and that the shift point conforms to the automatic shift schedule (See page 03–55).
(2) Check engine braking.
While running in the 3 position and 3rd gear, release the accelerator pedal and check the engine braking effect.
(3) Check for abnormal noises during acceleration and deceleration, and for shock at up–shift and down–shift.

(d) 2 position test:
Shift into the 2 position and fully depress the accelerator pedal and check the following points.
(1) Check up–shift operation.
Check that the 1 → 2 up–shift takes place and that the shift point conforms to the automatic shift schedule (See page 03–55).
(2) Check engine braking.
While running in the 2 position and 2nd gear, release the accelerator pedal and check the engine braking effect.
(3) Check for abnormal noises during acceleration and deceleration, and for shock at up–shift and down–shift.

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(e) L position test:
Shift into the L position and fully depress the accelerator pedal and check the following points.
(1) Check no up–shift.
While running in the L position, check that there is no up–shift to 2nd gear.
(2) Check engine braking.
While running in the L position, release the accelerator pedal and check the engine braking effect.
(3) Check for abnormal noises during acceleration and deceleration.

(f) R position test:
Shift into the R position, lightly depress the accelerator pedal, and check that the vehicle moves backward without any abnormal noise or vibration.

CAUTION:
Before conducting this test ensure that the test area is free from people and obstruction.

(g) P position test:
Stop the vehicle on a grade (more than 5°) and after shifting into the P position, release the parking brake. Then, check that the parking lock pawl holds the vehicle in place.

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05GBI-01

MECHANICAL SYSTEM TESTS

1. MEASURE STALL SPEED

(a) The object of this test is to check the overall performance of the transaxle and engine by measuring the stall speeds in the D and R positions.

NOTICE:

- **Do the test at normal operating fluid temperature 70 to 80°C (158 to 176°F).**
- **Do not continuously run this test longer than 5 seconds.**
- **To ensure safety, conduct this test in a wide, clear and level area which provide good traction.**
- **The stall test should always be carried out in pairs. One technician should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is doing the test.**

(1) Chock the all wheels.
(2) Connect an OBD II scan tool or hand–held tester to DLC3.
(3) Fully apply the parking brake.
(4) Keep your left foot pressing firmly on the brake pedal.
(5) Start the engine.
(6) Shift into the D position. Press all the way down on the accelerator pedal with your right foot. Quickly read the stall speed at this time.

Stall speed: 2,150 ± 150 rpm

(7) Do the same test in R position.

Stall speed: 1,750 ± 150 rpm

Evaluation:

Problem	Possible cause
(a) Stall engine speed is low in D and R positions	□Engine output may be insufficient □Stator one–way clutch is not operating properly HINT: If the value is larger or smaller than the specified value by 600 rpm or more, the torque converter could be faulty.
(b) Stall engine speed is high in D position	□Line pressure too low □Clutch No.1 (C_1) slipping □One–way clutch No.3 (F_3) not operating properly
(c) Stall engine speed is high in R position	□Line pressure too low □Brake No.4 (B_4) slipping □Clutch No.3 (C_3) slipping □One–way clutch No.1 (F_1) not operating properly
(d) Stall engine speed is high in D and R positions	□Line pressure too low □Improper fluid level

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2. MEASURE TIME LAG

(a) When the shift lever is shifted while the engine is idling, there will be a certain time lapse or lag before the shock can be felt. This is used for checking the conditions of the clutch and brake.

NOTICE:

- **Do the test at normal operating fluid temperature 70 to 80°C (158 to 176°F).**
- **Be sure to allow 1 minute interval between tests.**
- **Take 3 measurements and take the average value.**

(1) Fully apply the parking brake.

(2) Start the engine and check idle speed.

Idle speed (In N position and air conditioner OFF): 700 ± 50 rpm.

(3) Shift the shift lever from N to D position. Using a stop watch, measure the time from when the lever is shifted until the shock is felt.

Time lag:

N → D Less than 1.2 seconds

(4) In the same manner, measure the time lag for N → R.

Time lag:

N → R Less than 1.5 seconds

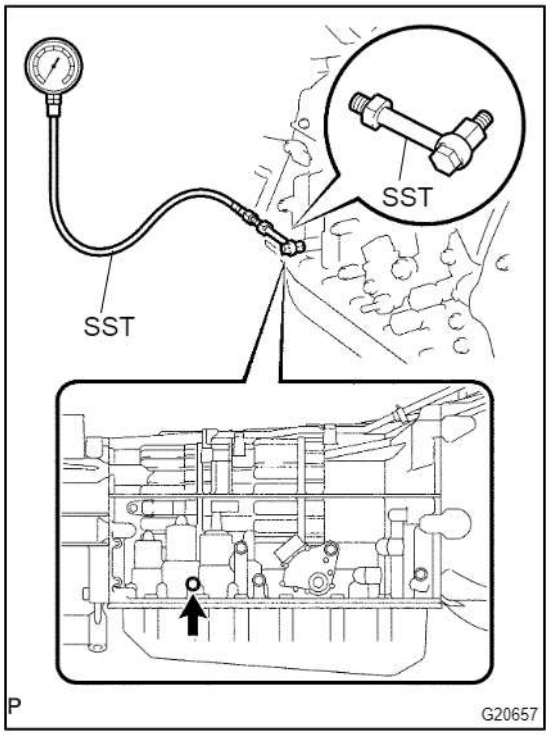
Evaluation (If N → D time or N → R time lag is longer than the specified):

Problem	Possible cause
N → D time lag is longer	□Line pressure too low □Clutch No.1 (C_1) worn □One–way clutch No.3 (F_3) not operating properly
N → R time lag is longer	□Line pressure too low □Clutch No.3 (C_3) worn □Brake No.4 (B_4) worn □One–way clutch No.1 (F_1) not operating properly

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05GBJ-01

HYDRAULIC TEST



1. MEASURE LINE PRESSURE

NOTICE:

- **Do the test at normal operation fluid temperature 70 to 80°C (158 to 176°F).**
- **The line pressure test should always be carried out in pairs. One technician should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is doing the test.**
- **Be careful to prevent SST's hose from interfering with the exhaust pipe.**
- **This check must be conducted after checking and adjusting engine.**
- **Perform under condition that A/C is OFF.**
- **When conducting stall test, do not continue more than 10 seconds.**

(a) Warm up the ATF.

(b) Remove the test plug on the transmission case center right side and connect SST.
SST 09992–00095 (09992–00231, 09992–00271)

(c) Fully apply the parking brake and chock the 4 wheels.

(d) Start the engine and check idling speed.

(e) Keep your left foot pressing firmly on the brake pedal and shift into D position.

(f) Measure the line pressure when the engine is idling.

(g) Depress the accelerator pedal all the way down. Quickly read the highest line pressure when engine speed reaches stall speed.

(h) In the same manner, do the test in R position.

Specified line pressure:

Condition	D position kPa (kgf/cm^2, psi)	R position kPa (kgf/cm^2, psi)
Idling	362 to 420 (3.7 to 4.2, 53 to 59)	500 to 580 (5.1 to 5.9, 73 to 84)
Stall	1,360 to 1,460 (13.8 to 14.9, 196 to 212)	1,295 to 1,415 (13.2 to 14.4, 188 to 205)

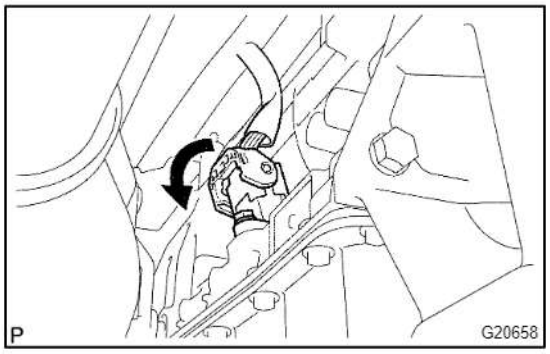
Evaluation

Problem	Possible cause
If the measured value at all positions are higher	□Shift solenoid valve SLT defective □Regulator valve defective
If the measured value at all positions are lower	□Shift solenoid valve SLT defective □Regulator valve defective □Oil pump defective
If pressure is low in the D position only	□D position circuit fluid leakage □Clutch No.1 (C_1) defective
If pressure is low in the R position only	□R position circuit fluid leakage □Clutch No.3 (C_3) defective □Brake No.4 (B_4) defective

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05GBK-01

MANUAL SHIFTING TEST



1. MANUAL SHIFTING TEST

HINT:

By this test, it can be determined whether the trouble is within the electrical circuit or is a mechanical problem in the transmission.

(a) Disconnect the transmission wire.

(b) Inspect the manual driving operation.

Check that the shift and gear positions correspond with the table below.

While driving, shift through the L, 2, 3, 4 and D positions. Check that the gear change corresponds to the shift position.

Shift Position	Gear Position
D	4th
4	4th
3	3rd
2	1st
L	1st
R	Reverse
P	Pawl Lock

HINT:

If the gear positions of the L, 2, 3, 4 and D are difficult to distinguish, do the following road test.

If any abnormality is found in the above test, the problem is in the transmission itself.

(c) Connect the solenoid wire.

(d) Cancel out DTC.

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05GBL-01

INITIALIZATION

1. RESET MEMORY

CAUTION:

Perform the RESET MEMORY (AT initialization) when replacing the automatic transmission assy, engine assy or ECM.

NOTICE:

Hand–held tester only

HINT:

The ECM memorizes the condition that the ECT controls the automatic transmission assy and engine assy according to those characteristics. Therefore, when the automatic transmission assy, engine assy, or ECM has been replaced, it is necessary to reset the memory so that the ECM can memorize the new information. Reset procedure is as follows.

(a) Turn the ignition switch off.
(b) Connect the hand–held tester to the DLC3.
(c) Turn the ignition switch to the ON position and push the hand–held tester main switch on.
(d) Select the item ”DIAGNOSIS/ENHANCED OBD II”.
(e) Perform the reset memory procedure from the ENGINE menu.

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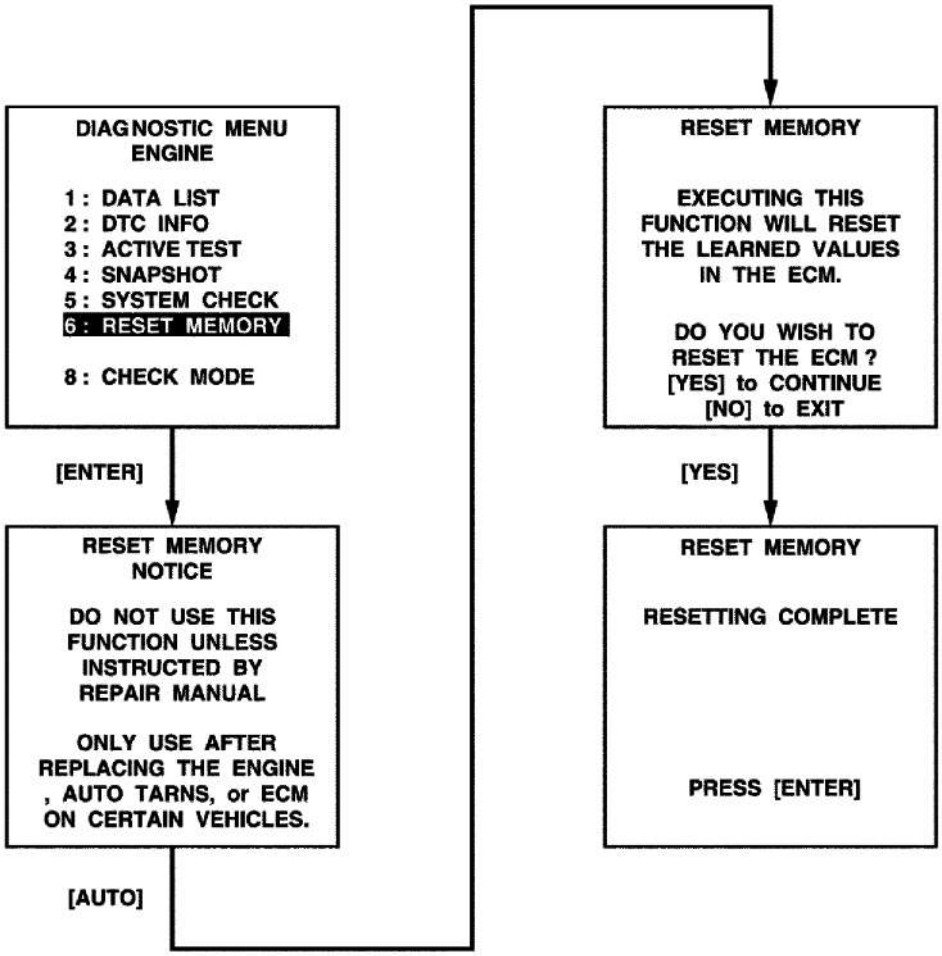
CAUTION:

After performing the RESET MEMORY, be sure to perform the ROAD TEST (see page 05–943) described earlier.

HINT:

The ECM is learned by performing the ROAD TEST.

Tester menu flow:



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05GBM-01

LIST OF DISABLE A MONITOR

HINT:

This table indicates ECM monitoring status for the items in the upper columns if the DTCs in each line on the left are being set.

As for the ”X” mark, when the DTC on the left is stored, detection of the DTC in the upper column is not performed.

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Monitor detected malfunction

Fault code	Fault code	Component/ system	Monitor disablement (X - disabled)																												
			P0010,P0020	P0011	P0012	P0016,P0018	P0021	P0022	P0030,50	P0135,P0155	P0036,56	P0043,44,63,64	P0100	P0101	P0105	P0106	P0110	P0115	P0116	P0120,P0121	P0125	P0128	P0130-P0153	P0134,P0154	P0136,P0156	P0142,P0162	P0171,P0172	P0300-P0308			
P0010,P0020	P0010,P0020	VVT VSV1,2																				X					X				
P0011	P0011	VVT System1 - Advance				X		X														X					X				
P0012	P0012	VVT System1 - Retard				X		X														X					X				
P0016,P0018	P0016,P0018	VVT System - Misalignment																													
P0021	P0021	VVT System2 - Advance			X	X																X					X				
P0022	P0022	VVT System2 - Retard			X																	X					X				
P0030,50	P0031,32,51,52	O2 Sensor Heater - Sensor1																				X	X	X	X	X	X				
P0135,P0155	P0031,32,51,52	A/F Sensor Heater - Sensor1																				X			X	X	X				
P0036,56	P0037,38,57,58	O2 Sensor Heater - Sensor2																							X	X					
P0043,44,63,64	P0043,44,63,64	O2 Sensor Heater - Sensor3																								X					
P0100,P0101	P0100-P0103	MAF sensor		X	X		X	X											X		X	X	X	X	X	X	X	X			
P0105,P0106	P0105-P0108	MAP sensor		X	X		X	X											X		X	X	X	X	X	X	X	X			
P0110	P0110-P0113	IAT sensor																			X	X	X	X	X	X		X			
P0115,P0116	P0115-P0118	ECT sensor		X	X	X	X	X						X		X					X	X	X	X	X	X	X	X			
P0120,P0121	P0120-P0223,P2135	TP sensor												X		X							X	X	X	X	X	X			
P0125	P0125	Insufficient ECT for Closed Loop		X	X		X	X						X		X						X	X	X	X	X	X	X			
P0128	P0128	Thermostat																													
P0130-P0153	P0130-P0153	O2 Sensor - Sensor1																				X		X	X	X					
P0134,P0154	P0134,P0154	O2 Sensor, A/F Sensor(No Activity) - Sensor1								X												X	X		X	X	X				
P0136,P0156	P0136,P0156	O2 Sensor - Sensor2																													
P0142,P0162	P0142,P0162	O2 Sensor - Sensor3																													
P0171,P0172	P0171,P0172	Fuel system																				X	X	X	X	X					
P0300-P0308	P0300-P0308	Misfire							X													X	X	X	X	X					
P0325,P0330	P0325-P0333	Knock sensor																													X
P0335	P0335	CKP sensor		X	X		X	X						X		X						X	X	X	X	X	X	X			
P0340, P0341	P0340, P0341	CMP sensor		X	X		X	X						X		X						X	X	X	X	X	X	X			
P0340-P0346	P0340-P0346	VVT sensor1,2																				X									
P0351-P0358	P0351-P0358	Ignitor		X	X		X	X														X									
P0385	P0385	CKP sensor 2												X		X						X	X	X	X	X	X	X			
P0401	P0401	EGR system (closed)																				X					X				
P0402	P0402	EGR system (open)																				X	X	X	X	X	X				
P0405,P0409	P0405-P0409	Lift sensor																									X				
P0420,P0430	P0420,P0430	Catalyst																													
P0442-P0456	P0442-P0456	EVAP system																					X	X	X	X					
P0450,P0451	P0450-P0453	EVAP press sensor																													

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Monitor detected malfunction

Fault code	Fault code	Component/ system	Monitor disablement (X - disabled)																												
			P0010,P0020	P0011	P0012	P0016,P0018	P0021	P0022	P0030,50	P0135,P0155	P0036,56	P0043,44,63,64	P0100	P0101	P0105	P0106	P0110	P0115	P0116	P0120,P0121	P0125	P0128	P0130-P0153	P0134,P0154	P0136,P0156	P0142,P0162	P0171,P0172	P0300-P0308			
	P0010,P0020	VVT VSV1,2																													
	P0011	VVT System1 -Advance																													
	P0012	VVT System1 - Retard																													
	P0016,P0018	VVT System - Misalignment																													
	P0021	VVT System2 - Advance																													
	P0022	VVT System2 - Retard																													
	P0031,32,51,52	O2 Sensor Heater - Sensor1																													
	P0031,32,51,52	A/F Sensor Heater - Sensor1																													
	P0037,38,57,58	O2 Sensor Heater - Sensor2																													
	P0043,44,63,64	O2 Snesor Heater - Sensor3																													
	P0100-P0103	MAF sensor																													
P0500	P0500	VSS																				X	X	X	X	X	X	X			
P0511	P0511	IAC valve																					X								
P0510	P0510	Idle switch												X		X						X	X		X	X	X	X			
P0560	P0560	System Voltage																													
P0617	P0617	Starter signal																													
P0705	P0705	Shift lever position switch																													
P0710	P0710-P0713	Trans fluid temp sensor																													
P0720-P0793	P0720-P0793	Output speed sensor																													
P0715-P0717	P0715-P0717	Input speed sensor																													
P0724	P0724	Stop lamp switch																													
P0741-P0796	P0741-P0796	Trans solenoid (function)																													
P0748-P0798	P0748-P0799	Trans solenoid (range)																													
P0850	P0850	PNP switch																													X
P1010,P1020	P1010,P1020	VVTL																				X					X				
P1011,12(,21,22)	P1011,12(,21,22)	VVTL system1(,2)																				X					X				
P1126	P1126	Electronic magnet clutch																													
P1129	P1129	Electronic throttle system																													
P1430	P1430	HC adsorber ACT press sensor																													
P2004,6	P2004,6	Intake Manifold Runner Control																													
P2009,10	P2009,10	Intake Manifold Runner Control Circuit																													
P2014,16,17	P2014,16,17	Intake Manifold Runner Position Sensor																													
P2102,P2103	P2102,P2103	Throttle motor																													
P2120-P2138	P2120-P2138	Accel position sensor																													
P2196,P2198	P2196,P2198	A/F sensor (rationality)																				X			X	X					
P2226	P2226	BARO sensor																					X		X	X					
P2237,P2240	P2237,P2240	A/F sensor (open)																				X			X	X					
P2423,24	P2423,24	HC Absorption Catalyst																													
P2430,2,3	P2430,2,3	AIR Pressure Sensor(Low/High)																													
P2431	P2431	AIR Pressure Sensor(Rationality)																													
P2440	P2440	AIR control valve stuck open																					X	X	X	X	X				
P2441	P2441	AIR control valve stuck close																					X	X	X	X	X				
P2444	P2444	AIP stuck On																					X	X	X	X	X				
P2445	P2445	AIP stuck Off																					X	X	X	X	X				
P2714-P2759	P2714-P2759	Trans solenoid(SLU-SLD)																													
P2A00,P2A03	P2A00,P2A03	A/F sensor (slow response)																				X			X	X					

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G31945

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Monitor detected malfunction

| Fault code | Fault code | Component/ system | Monitor disablement (X - disabled) | | |

Monitor detected malfunction

Fault code	Fault code	Component/ system	Monitor disablement (X - disabled)																												
			P0325,P0330	P0335	P0340,P0341	P0340-P0346	P0351-P0358	P0385	P0401	P0402	P0405	P0409	P0420,P0430	P0440-P0446	P0450,P0451	P0500	P0500	P0500	P0511	P0510	P0560	P0617	P0705	P0710	P0720-P0793	P0715-P0717	P0724	P0741-P0796
	P0325-P0333	Knock sensor																													
	P0335	CKP sensor																													
	P0340,P0341	CMP sensor																													
	P0340-P0346	VVT sensor1,2																													
	P0351-P0358	Ignitor																													
	P0385	CKP sensor 2																													
	P0401	EGR system (closed)											X	X					X										X		X
	P0402	EGR system (open)											X	X					X										X		
	P0405,P0406	EGR Lift sensor																													
	P0409	EGR Lift sensor																													
	P0420,P0430	Catalyst											X	X					X										X		X
	P0440-P0446	EVAP system											X	X					X										X		
	P0450-P0453	EVAP press sensor																													
	P0500	VSS(ECT2sensor)																													
	P0500	VSS(ECT1sensor, non-ECT)																													
	P0500	VSS(M/T)																													
	P0511	IAC valve											X	X					X										X		X
	P0510	Idle switch											X	X					X										X		X
	P0560	System Voltage																													
	P0617	Starter signal																													
	P0705	Shift lever position switch																													
	P0710-P0713	Trans fluid temp sensor																													
	P0720-P0793	Output speed sensor																													X
	P0715-P0717	Input speed sensor																													
	P0724	Stop lamp switch																													
	P0741-P0796	Trans solenoid (function)																													
	P0748-P0799	Trans solenoid (range)																							X	X			X		
	P0850	PNP switch																	X										X		
	P1010,P1020	VVTL																													
	P1011,12(,21,22)	VVTL system1(,2)							X	X			X	X					X												
	P1126	Electronic magnet clutch																													
	P1129	Electronic throttle system																													
	P1430	HC adsorber ACT press sensor												X	X																
	P2004,6	Intake Manifold Runner Control																													
	P2009,10	Intake Manifold Runner Control Circuit																													
	P2014,16,17	Intake Manifold Runner Position Sensor																													
	P2102,P2103	Throttle motor																													
	P2120-P2138	Accel position sensor																													
	P2196,P2198	A/F sensor (rationality)							X	X			X						X										X		X
	P2226	BARO sensor																													X
	P2237,P2240	A/F sensor (open)							X	X			X						X										X		X
	P2423,24	HC Absorption Catalyst																													
	P2430,2,3	AIR Pressure Sensor(Low/High)																													
	P2431	AIR Pressure Sensor(Rationality)																													
	P2440	AIR control valve stuck open							X	X			X																		
	P2441	AIR control valve stuck close							X	X			X																		
	P2444	AIP stuck On							X	X			X																		
	P2445	AIP stuck Off							X	X			X																		
	P2714-P2759	Trans solenoid(SLU-SLD)																													X
	P2A00,P2A03	A/F sensor (slow response)							X	X			X						X										X		X

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Monitor detected malfunction	Fault code	Fault code	Component/ system	Monitor disablement (X - disabled)																										
				P0741-P0796	P0748-P0798	P0850	P1010,P1020	P1011,12(,21,22)	P1126	P1129	P1430	P2004,P2006	P2009,P2010	P2014,16,17	P2102,P2103	P2120-P2138	P2196,P2198	P2226	P2237,P2240	P2423,24	P2430,2,3	P2431	P2440	P2441	P2444	P2445	P2714-P2759	P2A00,P2A03
				P0741-P0796	P0748-P0999	P0850	P1010,P1020	P1011,12(,21,22)	P1126	P1129	P1430	P2004,6	P2009,10	P2014,16,17	P2102,P2103	P2120-P2138	P2196,P2198	P2226	P2237,P2240	P2423,24	P2430,2,3	P2431	P2440	P2441	P2444	P2445	P2714-P2759	P2A00,P2A03
				Trans solenoid (function)*2	Trans solenoid (range)	PNP switch	VVTL	VVTL system1(,2)	Electronic magnet clutch	Electronic throttle system	HC adsorber ACT press sensor	Intake Manifold Runner Control	Intake Manifold Runner Control Circuit	Intake Manifold Runner Position Sensor	Throttle motor	Accel position sensor	A/F Sensor(Rationality) - Sensor1	BARO sensor	A/F Sensor(Open) - Sensor1	HC Absorption Catalyst	AIR Pressure Sensor(Low/High)	AIR Pressure Sensor(Rationality)	AIR control valve stuck open	AIR control valve stuck close	AIP stuck On	AIP stuck Off	Trans solenoid(SLU-SLD)	A/F Sensor (Slow response) - Sensor1
	P0010,P0020	P0010,P0020	VVT VSV1,2																				X	X	X	X				
	P0011	P0011	VVT System1 - Advance																				X	X	X	X				
	P0012	P0012	VVT System1 - Retard																				X	X	X	X				
	P0016,P0018	P0016,P0018	VVT System - Misalignment																				X	X	X	X				
	P0021	P0021	VVT System2 - Advance																				X	X	X	X				
	P0022	P0022	VVT System2 - Retard																				X	X	X	X				
	P0030,50	P0031,32,51,52	O2 Sensor Heater - Sensor1																	X			X	X	X	X				
	P0135,P0155	P0031,32,51,52	A/F Sensor Heater - Sensor1														X		X	X			X	X	X	X			X	
	P0036,56	P0037,38,57,58	O2 Sensor Heater - Sensor2														X			X										
	P0043,44,63,64	P0043,44,63,64	O2 Sensor Heater - Sensor3																	X										
	P0100,P0101	P0100-P0103	MAF sensor				X	X									X		X	X			X	X	X	X			X	
	P0105,P0106	P0105-P0108	MAP sensor				X	X									X		X	X			X	X	X	X			X	
	P0110	P0110-P0113	IAT sensor									X					X		X				X	X	X	X			X	
	P0115,P0116	P0115-P0118	ECT sensor	X			X	X				X					X		X	X			X	X	X	X			X	
	P0120,P0121	P0120-P0223,P2135	TP sensor														X		X	X			X	X	X	X			X	
	P0125	P0125	Insufficient ECT for Closed Loop	X			X										X		X	X			X	X	X	X			X	
	P0128	P0128	Thermostat																											
	P0130-P0153	P0130-P0153	O2 Sensor - Sensor1																	X			X	X	X	X				
	P0134,P0154	P0134,P0154	O2 Sensor, A/F Sensor(No Activity) - Sensor1														X		X	X			X	X	X	X			X	
	P0136,P0156	P0136,P0156	O2 Sensor - Sensor2														X			X										
	P0142,P0162	P0142,P0162	O2 Sensor - Sensor3																	X										
	P0171,P0172	P0171,P0172	Fuel system														X		X	X			X	X	X	X			X	
	P0300-P0308	P0300-P0308	Misfire														X		X	X			X	X	X	X			X	
	P0325,P0330	P0325-P0333	Knock sensor																				X	X	X	X				
	P0335	P0335	CKP sensor				X	X									X		X	X			X	X	X	X			X	
	P0340, P0341	P0340, P0341	CMP sensor				X	X									X		X	X			X	X	X	X			X	
	P0340-P0346	P0340-P0346	VVT sensor1,2																				X	X	X	X				
	P0351-P0358	P0351-P0358	Ignitor																	X			X	X	X	X				
	P0385	P0385	CKP sensor 2				X	X									X		X	X			X	X	X	X			X	
	P0401	P0401	EGR system (closed)																	X										
	P0402	P0402	EGR system (open)														X		X	X			X	X	X	X			X	
	P0405,P0409	P0405-P0409	Lift sensor																											
	P0420,P0430	P0420,P0430	Catalyst																											
	P0442-P0456	P0442-P0456	EVAP system														X		X				X	X	X	X			X	
	P0450,P0451	P0450-P0453	EVAP press sensor																				X	X	X	X				

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Monitor detected malfunction

Fault code	Fault code	Component/ system	Monitor disablement (X - disabled)																										
			P0741-P0796	P0748-P0798	P0850	P1010,P1020	P1011,12(,21,22)	P1126	P1129	P1430	P2004,P2006	P2009,P2010	P2014,16,17	P2102,P2103	P2120-P2138	P2196,P2198	P2226	P2237,P2240	P2423,24	P2430,2,3	P2431	P2440	P2441	P2444	P2445	P2714-P2759	P2A00,P2A03
	P0741-P0796	Trans solenoid (function)*2																											
	P0748-P0999	Trans solenoid (range)																											
	P0850	PNP switch																											
	P1010,P1020	VVTL																											
	P1011,12(,21,22)	VVTL system1(,2)																											
	P1126	Electronic magnet clutch																											
	P1129	Electronic throttle system																											
	P1430	HC adsorber ACT press sensor																											
	P2004,6	Intake Manifold Runner Control																											
	P2009,10	Intake Manifold Runner Control Circuit																											
	P2014,16,17	Intake Manifold Runner Position Sensor																											
	P2102,P2103	Throttle motor																											
	P2120-P2138	Accel position sensor																											
	P2196,P2198	A/F Sensor(Rationality) - Sensor1																											
	P2226	BARO sensor																											
	P2237,P2240	A/F Sensor(Open) - Sensor1																											
	P2423,24	HC Absorption Catalyst																											
	P2430,2,3	AIR Pressure Sensor(Low/High)																											
	P2431	AIR Pressure Sensor(Rationality)																											
	P2440	AIR control valve stuck open																											
	P2441	AIR control valve stuck close																											
	P2444	AIP stuck On																											
	P2445	AIP stuck Off																											
	P2714-P2759	Trans solenoid(SLU-SLD)																											
	P2A00,P2A03	A/F Sensor (Slow response) - Sensor1																											
P0500	P0500	VSS	X													X		X	X			X	X	X	X		X
P0511	P0511	IAC valve														X		X										X
P0510	P0510	Idle switch														X		X	X									X
P0560	P0560	System Voltage																											
P0617	P0617	Starter signal																											
P0705	P0705	Shift lever position switch																											
P0710	P0710-P0713	Trans fluid temp sensor																											
P0720-P0793	P0720-P0793	Output speed sensor																											
P0715-P0717	P0715-P0717	Input speed sensor																											
P0724	P0724	Stop lamp switch																											
P0741-P0796	P0741-P0796	Trans solenoid (function)																											
P0748-P0798	P0748-P0799	Trans solenoid (range)	X																										
P0850	P0850	PNP switch																											
P1010,P1020	P1010,P1020	VVTL																				X	X	X	X		
P1011,12(,21,22)	P1011,12(,21,22)	VVTL system1(,2)																				X	X	X	X		X
P1126	P1126	Electronic magnet clutch																											
P1129	P1129	Electronic throttle system																											
P1430	P1430	HC adsorber ACT press sensor																											
P2004,6	P2004,6	Intake Manifold Runner Control																											
P2009,10	P2009,10	Intake Manifold Runner Control Circuit																											
P2014,16,17	P2014,16,17	Intake Manifold Runner Position Sensor																											
P2102,P2103	P2102,P2103	Throttle motor																											
P2120-P2138	P2120-P2138	Accel position sensor																											
P2196,P2198	P2196,P2198	A/F sensor (rationality)																	X			X	X	X	X		X
P2226	P2226	BARO sensor														X		X				X	X	X	X		X
P2237,P2240	P2237,P2240	A/F sensor (open)																	X			X	X	X	X		X
P2423,24	P2423,24	HC Absorption Catalyst																											
P2430,2,3	P2430,2,3	AIR Pressure Sensor(Low/High)																			X	X	X	X	X		
P2431	P2431	AIR Pressure Sensor(Rationality)																				X	X	X	X		
P2440	P2440	AIR control valve stuck open														X		X	X								X
P2441	P2441	AIR control valve stuck close														X		X	X								X
P2444	P2444	AIP stuck On														X		X	X								X
P2445	P2445	AIP stuck Off														X		X	X								X
P2714-P2759	P2714-P2759	Trans solenoid(SLU-SLD)																									
P2A00,P2A03	P2A00,P2A03	A/F sensor (slow response)																	X			X	X	X	X		

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PROBLEM SYMPTOMS TABLE

HINT:

If a normal code is displayed during the diagnostic trouble code check although the trouble still occurs, check the electrical circuits for each symptom in the order given in the charts on the following pages and proceed to the page given for troubleshooting.

The Matrix Chart is divided into 3 chapters.

Chapter 1: Electronic Circuit Matrix Chart

Chapter 2: On–vehicle Repair Matrix Chart

Chapter 3: Off–vehicle Repair Matrix Chart

If the instruction "Proceed to next circuit inspection shown on matrix chart" is given in the flow chart of each circuit, proceed to the circuit with the next highest number in the table to continue the check. If the trouble still occurs even though there are no abnormalities in any of the other circuits, check and replace the ECM.

1. Chapter 1: Electronic Circuit Matrix Chart

HINT:

*1: When a malfunction is on the circuit *1 mark is attached, DTC is output.

*2: 4WD

Symptom	Suspect Area	See page
No up–shift (A particular gear, from 1st to 4th gear, is not up–shifted)	1. Shift solenoid valve (S1) circuit *1 2. Shift solenoid valve (S2) circuit *1 3. ECM	05–1025 05–1028 01–35
No up–shift (4th → 5th)	1. Transmission control switch circuit (D – 4) *1 2. Engine coolant temp. sensor circuit *1 3. Speed sensor NT circuit *1 4. Shift solenoid valve (SL1) circuit *1 5. Shift solenoid valve (SL2) circuit *1 6. Shift solenoid valve (SR) circuit *1 7. ECM	05–978 05–47 05–988 05–996 05–1018 05–1031 01–35
No up–shift (3rd → 4th)	1. Engine coolant temp. sensor circuit *1 2. Shift solenoid valve (S2) circuit *1 3. ECM	05–47 05–1028 01–35
No up–shift (1st → 2nd)	1. Transmission control switch circuit (2 – L) *1 2. Shift solenoid valve (S2) circuit *1 3. ECM	05–978 05–1028 01–35
No down–shift (5th → 4th)	1. Transmission control switch circuit (D – 4) *1 2. Shift solenoid valve (SL1) circuit *1 3. Shift solenoid valve (SL2) circuit *1 4. Shift solenoid valve (SR) circuit *1 5. ECM	05–978 05–996 05–1018 05–1031 01–35
No down–shift (2nd → 1st)	1. Transmission control switch circuit (2 – L) *1 2. Shift solenoid valve (S2) circuit *1 3. ECM	05–978 05–1028 01–35
No down–shift (A particular gear, from 1st to 4th gear, is not down–shifted)	1. Shift solenoid valve (S1) circuit *1 2. Shift solenoid valve (S2) circuit *1 3. ECM	05–1025 05–1028 01–35
No lock–up	1. ATF temperature sensor circuit *1 2. Transfer L4 position switch circuit *1, *2 3. Stop light switch circuit *1 4. Speed sensor NT circuit *1 5. Shift solenoid valve (SLU) circuit *1 6. ECM	05–983 05–1034 05–994 05–988 05–1050 01–35
No lock–up off	ECM	01–35

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Shift point too high or too low	1. Shift solenoid valve (SLT) circuit *1 2. Speed sensor NT circuit *1 3. Speed sensor SP2 circuit *1 4. Throttle position sensor circuit *1 5. ATF temperature sensor circuit *1 6. Transfer L4 position switch circuit *1, *2 7. ECM	05–1040 05–988 05–991 05–47 05–983 05–1034 01–35
Up–shift to 5th from 4th while shift lever is 4 position	1. Transmission control switch circuit (D – 4) *1 2. ECM	05–978 01–35
Up–shift to 5th from 4th while engine is cold	1. Engine coolant temp. sensor circuit *1 2. ECM	05–47 01–35
Up–shift to 4th from 3rd while shift lever is 3 position	1. Park/neutral position switch circuit *1 2. ECM	05–978 01–35
Up–shift to 3rd from 2nd while shift lever is 2 position	1. Park/neutral position switch circuit *1 2. ECM	05–978 01–35
Up–shift to 2nd from 1st while shift lever is L position	1. Transmission control switch circuit (2 – L) *1 2. ECM	05–978 01–35
Harsh engagement (N → D)	1. Speed sensor NT circuit *1 2. Shift solenoid valve (SL1) circuit *1 3. Shift solenoid valve (SLT) circuit *1 4. ECM	05–988 05–996 05–1040 01–35
Harsh engagement (Lock–up)	1. Speed sensor NT circuit *1 2. Speed sensor SP2 circuit *1 3. Shift solenoid valve (SLU) circuit *1 4. ECM	05–988 05–991 05–1050 01–35
Harsh engagement (Any driving position)	ECM	01–35
Poor acceleration	1. ATF temperature sensor No.2 circuit *1 2. Engine coolant temp. sensor circuit *1 3. ECM	05–1043 05–47 01–35
No engine braking	ECM	01–35
No kick–down	ECM	01–35
Engine stalls when starting off or stopping	ECM	01–35
AT Oil Temp. warning light remains on Lock–up at 3rd gear Shift point too high	1. ATF temperature sensor No.2 circuit *1 2. Engine coolant temp. sensor circuit *1 3. ECM	05–1043 05–47 01–35

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2. Chapter 2: On–Vehicle Repair (□: A750E, A750F AUTOMATIC TRANSMISSION Repair Manual Pub. No. RM999U)

Symptom	Suspect Area	See page
Vehicle does not move in any forward position and reverse positions	1. Transmission control cable 2. Manual valve 3. Parking lock pawl 4. Off–vehicle repair matrix chart	40–76 □ □ –
Vehicle does not move in R position	1. Valve body assy 2. Off–vehicle repair matrix chart	40–56 –
No up–shift (1st → 2nd)	1. Valve body assy 2. Off–vehicle repair matrix chart	40–56 –
No up–shift (2nd → 3rd)	1. Valve body assy 2. Off–vehicle repair matrix chart	40–56 –
No up–shift (3rd → 4th)	1. Valve body assy 2. Off–vehicle repair matrix chart	40–56 –
No up–shift (4th → 5th)	1. Valve body assy 2. Off–vehicle repair matrix chart	40–56 –
No down–shift (5th → 4th)	1. Valve body assy 2. Off–vehicle repair matrix chart	40–56 –
No down–shift (4th → 3rd)	1. Valve body assy 2. Off–vehicle repair matrix chart	40–56 –
No down–shift (3rd → 2nd)	1. Valve body assy 2. Off–vehicle repair matrix chart	40–56 –
No down–shift (2nd → 1st)	1. Valve body assy 2. Off–vehicle repair matrix chart	40–56 –
No lock–up or No lock–up off	1. Shift solenoid valve (SLU) 2. Valve body assy 3. Off–vehicle repair matrix chart	05–1047 40–56 –
Harsh engagement (N → D)	1. Shift solenoid valve (SL1) 2. Valve body assy 3. C_1 accumulator 4. Off–vehicle repair matrix chart	05–1010 40–56 □ –
Harsh engagement (Lock–up)	1. Shift solenoid valve (SLU) 2. Valve body assy 3. Off–vehicle repair matrix chart	05–1047 40–56 –
Harsh engagement (N → R)	1. Shift solenoid valve (SLT) 2. Shift solenoid valve (SLU) 3. Valve body assy 4. C_3 accumulator 5. Off–vehicle repair matrix chart	05–1037 05–1047 40–56 □ –
Harsh engagement (1st →2nd → 3rd → 4th → 5th)	1. Shift solenoid valve (SLT) 2. Shift solenoid valve (SL1) 3. Valve body assy	05–1037 05–1010 40–56
Harsh engagement (1st → 2nd)	1. Valve body assy 2. B_3 accumulator 3. Off–vehicle repair matrix chart	40–56 □ –
Harsh engagement (2nd → 3rd)	1. Valve body assy 2. C_3 accumulator 3. Off–vehicle repair matrix chart	40–56 □ –
Harsh engagement (3rd → 4th)	1. Valve body assy 2. C_2 accumulator 3. Off–vehicle repair matrix chart	40–56 □ –

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Harsh engagement (4th → 5th)	1. Shift solenoid valve (SL1) 2. Shift solenoid valve (SL2) 3. Valve body assy 4. Off–vehicle repair matrix chart	05–1010 05–1014 40–56 –
Harsh engagement (5th → 4th)	1. Shift solenoid valve (SL1) 2. Shift solenoid valve (SL2) 3. Valve body assy 4. Off–vehicle repair matrix chart	05–1010 05–1014 40–56 –
Slip or shudder (Forward and reverse)	1. Transmission control cable 2. Valve body assy 3. Oil strainer 4. Off–vehicle repair matrix chart	40–76 40–56 40–56 –
No engine braking (1st: L position)	1. Valve body assy 2. Off–vehicle repair matrix chart	40–56 –
No engine braking (2nd: 2 position)	1. Valve body assy 2. Off–vehicle repair matrix chart	40–56 –
No kick–down	Valve body assy	40–56
Shift point too high or too low	1. Shift solenoid valve (SLT) 2. Shift solenoid valve (SL1) 3. Valve body assy	05–1037 05–1014 40–56
Poor acceleration	1. Shift solenoid valve (SLT) 2. Valve body assy	05–1037 40–56
Engine stalls when starting off or stopping	1. Shift solenoid valve (SLU) 2. Valve body assy	05–1047 40–56

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3. Chapter 3: Off–Vehicle Repair (□: A750E, A750F AUTOMATIC TRANSMISSION Repair Manual Pub. No. RM999U)

Symptom	Suspect Area	See page
Vehicle does not move in any forward position and reverse positions	1. Rear planetary gear unit 2. Torque converter clutch	□ 40–45
Vehicle does not move in R position	1. Clutch No.3 (C_3) 2. Brake No.4 (B_4) 3. One–way clutch No.1 (F_1)	□ □ □
No up–shift (1st → 2nd)	1. Brake No.3 (B_3) 2. One–way clutch No.1 (F_1) 3. One–way clutch No.2 (F_2)	□ □ □
No up–shift (2nd → 3rd)	Clutch No.3 (C_3)	□
No up–shift (3rd → 4th)	Clutch No.2 (C_2)	□
No up–shift (4th → 5th)	1. Brake No.1 (B_1) 2. Clutch No.1 (C_1)	□ □
No lock–up or No lock–up off	Torque converter clutch	40–45
Harsh engagement (N → D)	1. Clutch No.1 (C_1) 2. One–way clutch No.3 (F_3)	□ □
Harsh engagement (N → R)	1. Clutch No.3 (C_3) 2. Brake No.4 (B_4) 3. One–way clutch No.1 (F_1)	□ □ □
Harsh engagement (1 → 2)	1. Brake No.3 (B_3) 2. One–way clutch No.1 (F_1) 3. One–way clutch No.2 (F_2)	□ □ □
Harsh engagement (2 → 3)	Clutch No.3 (C_3)	□
Harsh engagement (3 → 4)	Clutch No.2 (C_2)	□
Harsh engagement (4 → 5th)	1. Brake No.1 (B_1) 2. Clutch No.1 (C_1)	□ □
Harsh engagement (Lock–up)	Torque converter clutch	40–45
Slip or shudder (Forward and reverse: After warm–up)	1. One–way clutch No.1 (F_1) 2. Clutch No.3 (C_3) 3. Torque converter clutch clutch	□ □ □
Slip or shudder (Particular position: Just after engine starts)	Torque converter clutch	40–45
Slip or shudder (R position)	1. Brake No.4 (B_4) 2. One–way clutch No.1 (F_1) 3. Clutch No.3 (C_3)	□ □ □
Slip or shudder (1st)	1. Clutch No.1 (C_1) 2. One–way clutch No.3 (F_3)	□ □
Slip or shudder (2nd)	1. Clutch No.1 (C_1) 2. Brake No.3 (B_3) 3. One–way clutch No.1 (F_1) 4. One–way clutch No.2 (F_2)	□ □ □ □
Slip or shudder (3rd)	1. Clutch No.1 (C_1) 2. Clutch No.3 (C_3) 3. One–way clutch No.1 (F_1)	□ □ □
Slip or shudder (4th)	1. Clutch No.1 (C_1) 2. Clutch No.2 (C_2)	□ □
Slip or shudder (5th)	1. Clutch No.2 (C_2) 2. Clutch No.3 (C_3) 3. Brake No.1 (B_1)	□ □ □
No engine braking (1st – 4th: D position)	Clutch No.1 (C_1)	□

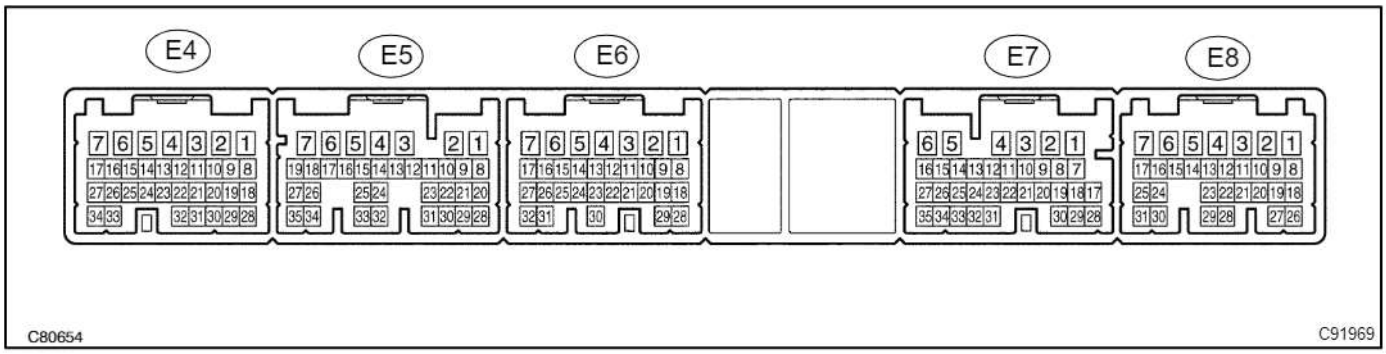
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No engine braking (1st: L position)	Brake No.4 (B_4)	□
No engine braking (2nd: 2 position)	Brake No.2 (B_2)	□
No engine braking (3rd: 3 position)	Brake No.1 (B_1)	□
Poor acceleration (All positions)	Torque converter clutch	40–45
Poor acceleration (5th)	1. Clutch No.1 (C_1) 2. Clutch No.3 (C_3) 3. Brake No.1 (B_1) 4. Front planetary gear unit	□ □ □ □
Engine stalls when starting off or stopping	Torque converter clutch	40–45

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TERMINALS OF ECM



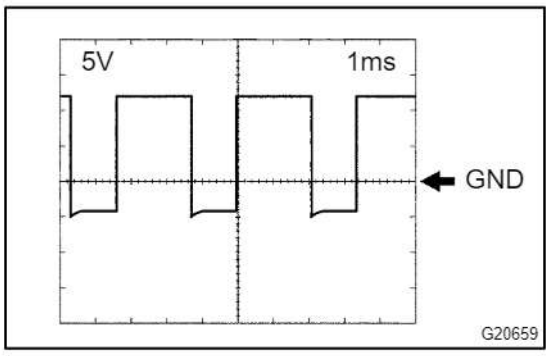
HINT:
Each ECM terminal's standard voltage is shown in the table below.
In the table, first follow the information under "Condition". Lock under "Symbols (Terminal No.)" for the terminals to inspected. The standard voltage between the terminals is shown under "STD Voltage".
Use the illustration above as a reference for the ECM terminals.

Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage (V)
P (E8–6) – E1 (E6–1)	G–B – BR	IG switch ON and shift lever P position	10 to 14
		IG switch ON and shift lever other than P position	Below 1
N (E8–7) – E1 (E6–1)	G–W – BR	IG switch ON and shift lever N position	10 to 14
		IG switch ON and shift lever other than N position	Below 1
L4*1 (E7–4) – E1 (E6–1)	W–L – BR	IG switch ON and Transfer shift lever L position	Below 1.5
		IG switch ON and Transfer shift lever other than L position	9 to 14
L (E7–8) – E1 (E6–1)	B–L – BR	IG switch ON and shift lever L position	9 to 14
		IG switch ON and shift lever other than L position	Below 1.5
2 (E7–9) – E1 (E6–1)	G–R – BR	IG switch ON and shift lever 2 and L position	9 to 14
		IG switch ON and shift lever other than 2 and L position	Below 1.5
D (E7–10) – E1 (E6–1)	V – BR	IG switch ON and shift lever D and 4 position	9 to 14
		IG switch ON and shift lever other than D and 4 position	Below 1.5
R (E7–11) – E1 (E6–1)	R–Y – BR	IG switch ON and shift lever R position	9 to 14
		IG switch ON and shift lever other than R position	Below 1.5
STP (E7–19) – E1 (E6–1)	G–Y – BR	Brake pedal is depressed	7.5 to 14
		Brake pedal is released	Below 1.5
3 (E7–20) – E1 (E6–1)	L – BR	IG switch ON and shift lever 3 position	9 to 14
		IG switch ON and shift lever other than 3 position	Below 1.5
4 (E7–23) – E1 (E6–1)	G – BR	IG switch ON and shift lever 4 position	9 to 14
		IG switch ON and shift lever other than 4 position	Below 1.5
SLU+ (E6–16) – SLU– (E6–15)	R–B – R–W	Engine idle speed	Pulse generation 2 reference
S2 (E5–10) – E1 (E6–1)	W–L – BR	IG switch ON	Below 1.5
		2nd or 3rd gear	9 to 14
		1st, 4th or 5th gear	Below 1.5
S1 (E5–11) – E1 (E6–1)	GR – BR	IG switch ON	9 to 14
		1st or 2nd gear	9 to 14
		3rd, 4th or 5th gear	Below 1.5
SLT^{+} (E5–13) – SLT^{-} (E5–12)	LG–B – L–R	Engine is idling	Pulse generation 1 reference

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SR (E5–15) – E1 (E6–1)	P–L – BR	IG switch ON	Below 1.5
		5th gear	9 to 14
		1st gear	Below 1
SL2+ (E5–17) – SL2– (E5–16)	B–W – B–R	Engine idle speed	Pulse generation 3 reference
SL1+ (E5–19) – SL1– (E5–18)	G–B – B–Y	Engine idle speed	Pulse generation 4 reference
THO2 (E5–24) – E2 (E4–28)	L – BR	ATF temperature: 115°C (239°F) or more	Below 1.5
$SP2^{+}$ (E5–26) – $SP2^{-}$ (E5–34)	L–Y – R–L	Engine is running	Pulse generation 6 reference
NT^{+} (E5–27) – NT^{-} (E5–35)	Y–R – W–R	Engine is idling	Pulse generation 5 reference
THO1 (E5–32) – E2 (E4–28)	Y–G – BR	ATF temperature: 115°C (239°F) or more	Below 1.5
NSW (E4–16) – E1 (E6–1)	P – BR	IG switch ON and shift lever P and N position	Below 1.5
		IG switch ON and shift lever other than P and N position	9 to 14

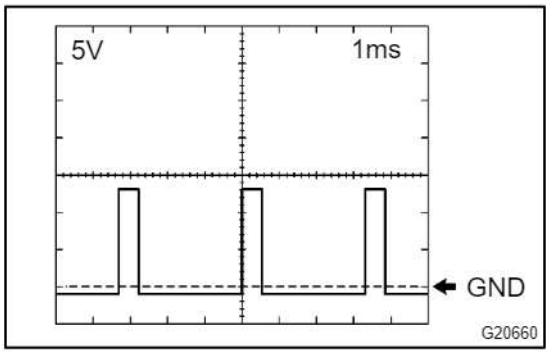
*1: 4WD



Pulse generation 1

Reference:

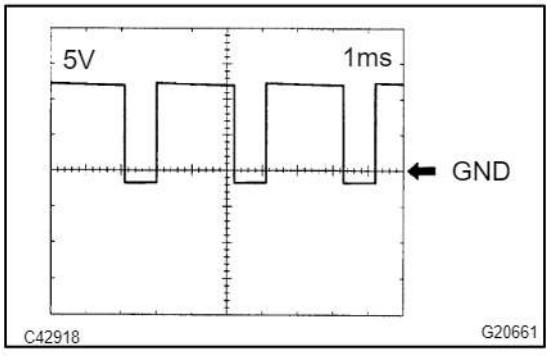
Item	Condition
Terminal	SLT+ – SLT–
Tool setting	5V/DIV, 1ms/DIV
Vehicle condition	Engine idle speed



Pulse generation 2

Reference:

Item	Condition
Terminal	SLU+ – SLU–
Tool setting	5V/DIV, 1ms/DIV
Vehicle condition	Engine idle speed

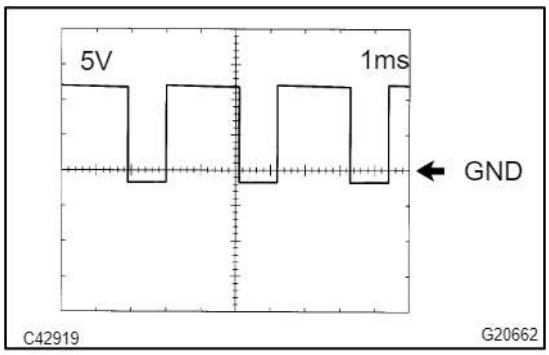


Pulse generation 3

Reference:

Item	Condition
Terminal	SL2+ – SL2–
Tool setting	5V/DIV, 1ms/DIV
Vehicle condition	Engine idle speed

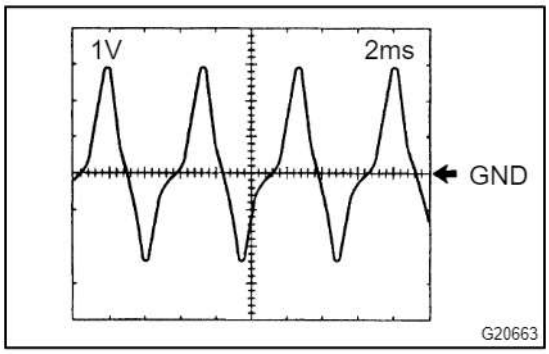
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Pulse generation 4

Reference:

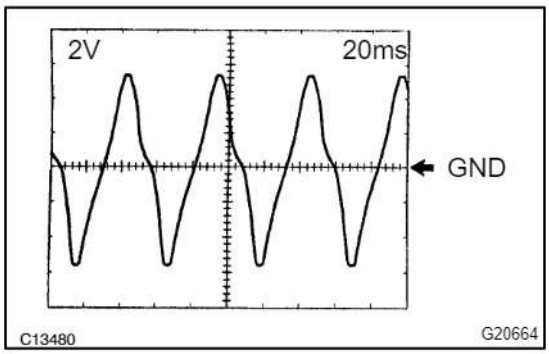
Item	Condition
Terminal	SL1+ – SL1–
Tool setting	5V/DIV, 1ms/DIV
Vehicle condition	Engine idle speed



Pulse generation 5

Reference:

Item	Condition
Terminal	NT+ – NT–
Tool setting	1V/DIV, 2ms/DIV
Vehicle condition	Engine idle speed



Pulse generation 6

Reference:

Item	Condition
Terminal	SP2+ – SP2–
Tool setting	2V/DIV, 20ms/DIV
Vehicle condition	Vehicle speed 20 km/h (12 mph)

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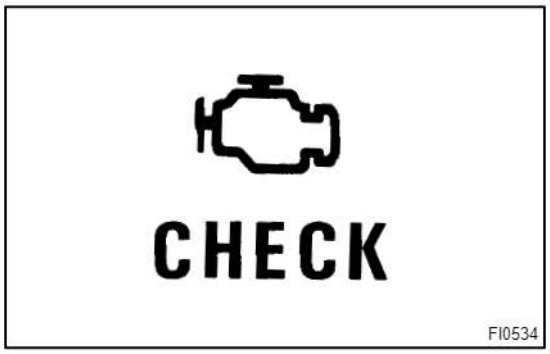
05GBN–01

DIAGNOSIS SYSTEM

1. DIAGNOSIS SYSTEM

(a) Description

(1) When troubleshooting OBD II vehicles, the only difference from the usual troubleshooting procedure is that you need to connect an OBD II scan tool complying with SAE J1987 or a hand–held tester to the vehicle, and read off various data output from the vehicle's ECM.



(2) OBD II regulations require that the vehicle's on–board computer illuminate the Malfunction Indicator Lamp (MIL) on the instrument panel when the computer detects a malfunction in the computer itself or in the drive system components which affect the vehicle emissions. In addition to the MIL illuminating when a malfunction is detected, the applicable DTCs prescribed by SAE J2012 are recorded in the ECM memory (See page 05–976).

If the malfunction does not occur in 3 consecutive trips, the MIL goes off but the DTCs remain in the ECM memory.

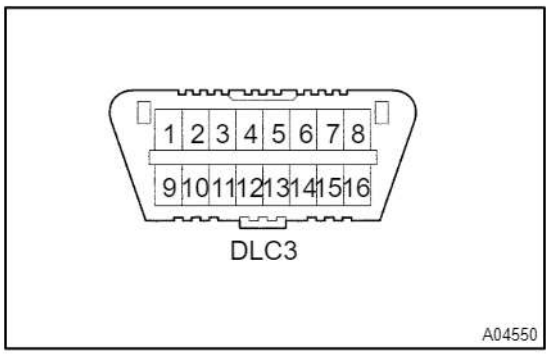
(3) To check the DTCs, connect the OBD II scan tool or hand–held tester to the DLC3 of the vehicle. The OBD II scan tool or hand–held tester also enables you to erase the DTCs and check freeze frame data and various forms of engine data (For instruction book).

(4) The DTCs include SAE controlled codes and Manufacturer controlled codes. SAE controlled codes must be set as prescribed by the SAE, while Manufacturer controlled codes can be set freely by a manufacturer within the prescribed limits (See the DTC chart on page 05–976).

(5) The diagnosis system operates in the normal mode during the normal vehicle use, and also has a check mode for technicians to simulate malfunction symptoms and perform troubleshooting. Most DTCs use 2 trip detection logic(*) to prevent erroneous detection. By switching the ECM to the check mode when troubleshooting, the technician can cause the MIL to light up for a malfunction that is only detected once or momentarily. (hand–held tester).

(6) *2 trip detection logic:
When a malfunction is first detected, the malfunction is temporarily stored in the ECM memory. If the same malfunction is detected again during the second test drive, this second detection causes the MIL to illuminate.

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(b) Inspect the DLC3.
The vehicle's ECM uses ISO 9141–2 for communication. The terminal arrangement of DLC3 complies with SAE J1962 and matches the ISO 9141–2 format.

Tester connection	Condition	Specified condition
7 (Bus | Line) – 5 (Signal ground)	During communication	Pulse generation
4 (Chassis Ground) – Body	Always	1 Ω or less
5 (Signal Ground) – Body	Always	1 Ω or less
16 (B+) – Body	Always	9 to 14 V

HINT:
If your display shows UNABLE TO CONNECT TO VEHICLE when you have connected the cable of the OBD II scan tool or hand–held tester to the DLC3, turned the ignition switch ON and operated the scan tool, there is a problem on the vehicle side or tool side.

- If the communication is normal when the tool is connected to another vehicle, inspect the DLC3 on the original vehicle.
- If the communication is still impossible when the tool is connected to another vehicle, the problem is probably in the tool itself, so consult the Service Department listed in the tool's instruction manual.

(c) Measure the battery voltage.
Battery Voltage: 11 to 14 V

(d) Check the MIL.
(1) The MIL comes on when the ignition switch is turned ON and the engine is not running.

HINT:
If the MIL does not light up, troubleshoot the combination meter.

(2) When the engine is started, the MIL should go off. If the lamp remains on, it means that the diagnosis system has detected a malfunction or abnormality in the system.

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05GBO–01

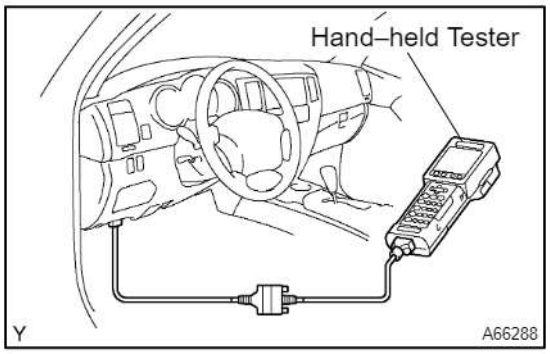
DTC CHECK/CLEAR

1. DTC CHECK (NORMAL MODE)

NOTICE:

Hand–held tester only:

When the diagnostic system is switched from the normal mode to the check mode, all the DTCs and freeze frame data recorded in the normal mode will be erased. So before switching modes, always check the DTCs and freeze frame data, and note them down.



(a) Checking DTCs using the OBD II scan tool or hand–held tester.
  (1) Connect the OBD II scan tool or hand–held tester to DLC3.
  (2) Turn the ignition switch ON.
  (3) Use the OBD II scan tool or hand–held tester to check the DTCs and freeze frame data and note them down (For operating instructions, see the OBD II scan tool's instruction book).
  (4) See page 05–976 to confirm the details of the DTCs.

NOTICE:

When simulating symptoms with an OBD II scan tool (excluding hand–held tester) to check the DTCs, use the normal mode. For codes on the DTCs chart subject to "2 trip detection logic", turn the ignition switch OFF after the symptom is simulated once. Then repeat the simulation process again. When the problem has been simulated twice, the MIL is indicated on the instrument panel and DTCs are recorded in the ECM.

2. DTC CLEAR

(a) When using the OBD II scan tool or hand–held tester:
Clearing the DTCs.
  (1) Connect the OBD II scan tool or hand–held tester to the DLC3.
  (2) Turn the ignition switch to the ON position and push the OBD II scan tool or the hand–held tester main switch on.
  (3) When you use hand–held tester:
  Select the item "DIAGNOSIS/ENHANCED OBD II/ DTC INFO/CLEAR CODES [YES] button".

HINT:

When operating the OBD II scan tool (complying with SAE J1978) or hand–held tester to erase the codes, the DTCs and freeze frame data will be erased. (See the OBD II scan tool's instruction book for operating instructions.)

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(b) When not using the OBD II scan tool or hand–held tester: Clearing the DTCs.

(1) Disconnecting the battery terminal or remove the EFI and ETCS fuses from the engine room J/B for 60 seconds or more. But if you disconnect the battery terminal, you should do the ”INITIALIZE” procedure.

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05GBP–01

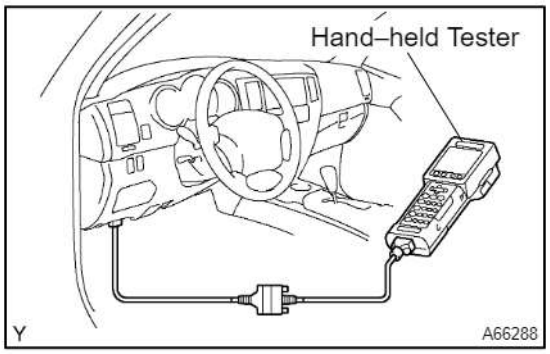
CHECK MODE PROCEDURE

1. DTC CHECK (CHECK MODE)

HINT:

Hand–held tester only:

Compared to the normal mode, the check mode has more sensing ability to detect malfunctions. Furthermore, the same diagnostic items which are detected in the normal mode can also be detected in the check mode.



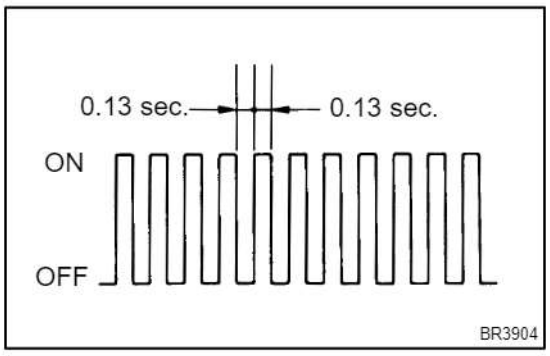
(a) Procedure for Check Mode using the hand–held tester.

(1) Check the initial conditions.
- □ Battery positive voltage 11 V or more
- □ Throttle valve fully closed
- □ Transmission in P or N position
- □ A/C switched OFF

(2) Turn the ignition switch OFF.

(3) Connect the hand–held tester to the DLC3.

(4) Turn the ignition switch ON.



(5) Switch the hand–held tester from the normal mode to the check mode (Check that the MIL flashes).

NOTICE:

If the hand–held tester switches the ECM from the normal mode to the check mode or vice–versa, or if the ignition switch is turned from ON to ACC or OFF during the check mode, the DTC and freeze frame data will be erased.

(6) Start the engine (MIL goes off after the engine starts).

(7) Simulate the conditions of the malfunction described by the customer.

NOTICE:

Leave the ignition switch ON until you have checked the DTCs, etc.

(8) After simulating the malfunction conditions, use the hand–held tester diagnosis selector to check the DTCs and freeze frame data, etc.

HINT:

Be sure not to turn the ignition switch OFF, as turning it OFF switches the diagnosis system from the check mode to the normal mode, which erases all the DTCs, etc.

(9) After checking the DTC, inspect the applicable circuit.

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2. DTC CLEAR

(a) When using the OBD II scan tool or hand–held tester:
Clearing the DTCs.
(1) Connect the OBD II scan tool or hand–held tester to the DLC3.
(2) Turn the ignition switch to the ON position and push the OBD II scan tool or the hand–held tester main switch on.
(3) When you use hand–held tester:
Select the item "DIAGNOSIS/ENHANCED OBD II/ DTC INFO/CLEAR CODES [YES] button".

HINT:
When operating the OBD II scan tool (complying with SAE J1978) or hand–held tester to erase the codes, the DTCs and freeze frame data will be erased. (See the OBD II scan tool's instruction book for operating instructions.)

(b) When not using the OBD II scan tool or hand–held tester:
Clearing the DTCs.
(1) Disconnecting the battery terminal or remove the EFI and ETCS fuses from the engine room J/B for 60 seconds or more. But if you disconnect the battery terminal, you should do the "INITIALIZE" procedure.

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05GBQ–01

DATA LIST/ACTIVE TEST

1. DATA LIST

HINT:

According to the DATA LIST displayed by the OBD II scan tool or Hand–held tester, you can read the value of the switch, sensor, actuator and so on without parts removal. Reading the DATA LIST as a first step of troubleshooting is one method to shorten labor time.

(a) Warm up the engine.
(b) Turn the ignition switch OFF.
(c) Connect the OBD II scan tool or Hand–held tester to the DLC3.
(d) Turn the ignition switch ON.
(e) Push the "ON" button of OBD II scan tool or Hand–held tester.
(f) Select the item "/DIAGNOSIS/ENHANCED OBD II/DATA LIST/ALL (or ATM)".
(g) According to the display on tester, read the "DATA LIST".

Item	Measurement Item/ Display (Range)	Normal Condition	Diagnostic Note
STOP LIGHT SW	Stop light SW Status/ ON or OFF	□Brake Pedal is depressed: ON □Brake Pedal is released: OFF	–
SHIFT	Actual Gear Position/ 1st, 2nd, 3rd, 4th or 5th	Shift Lever Position is; □L: 1st □2: 1st or 2nd □3: 1st, 2nd or 3rd □4: 1st, 2nd, 3rd or 4th □D: 1st, 2nd, 3rd, 4th or 5th	–
PNP SW [NSW]	PNP SW Status/ ON or OFF	Shift lever position is; P or N: ON Except P or N: OFF	The shift lever position and these values are different, there are failures of the PNP switch or shift cable adjustment.
REVERSE	PNP SW Status/ ON or OFF	Shift lever position is; R: ON Except R: OFF	
DRIVE	PNP SW Status/ ON or OFF	Shift lever position is; D and 4: ON Except D and 4: OFF	
4th/DRIVE	PNP SW Status/ ON or OFF	Shift lever position is; 4: ON Except 4: OFF	
3RD	PNP SW Status/ ON or OFF	Shift lever position is; 3: ON Except 3: OFF	
2ND	PNP SW Status/ ON or OFF	Shift lever position is; 2 and L: ON Except 2 and L: OFF	
LOW	PNP SW Status/ ON or OFF	Shift lever position is; L: ON Except L: OFF	
SOLENOID (SLT)	Shift Solenoid SLT Status/ ON or OFF	IG SW ON: ON	–
SOLENOID (SLU)	Shift Solenoid SLU Status/ ON or OFF	□Lock Up: ON □Except Lock Up: OFF	–
SPD (SP2)	Counter Gear Speed display/ min.: 0 km/h (0 mph) max.: 255 km/h (158 mph)	Vehicle stopped: 0 km/h (0 mph)	–
AT FLUID TEMP	ATF Temp. Sensor No. 1 Value/ min.: –40 C (–40 F) max.: 215 C (419 F)	80 C (176 F) (After Stall Test)	If the value is "–40 C (–40 F)" or "215 C (419 F)", ATF temp. sensor No.1 circuit is opened or shorted.

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2. ACTIVE TEST

HINT:

Performing the ACTIVE TEST using the OBD II scan tool or Hand–held tester allows the relay, VSV, actuator and so on to operate without parts removal. Performing the ACTIVE TEST as a first step of troubleshooting is one method to shorten labor time.

It is possible to display the DATA LIST during the ACTIVE TEST.

(a) Warm up the engine.
(b) Turn the ignition switch OFF.
(c) Connect the OBD II scan tool or Hand–held tester to the DLC3.
(d) Turn the ignition switch ON.
(e) Push the "ON" button of Hand–held tester.
(f) Select the item "/DIAGNOSIS/ENHANCED OBD II/ACTIVE TEST".
(g) According to the display on tester, perform the "ACTIVE TEST".

Item	Test Details	Diagnostic Note
SHIFT	[Test Details] Operate the shift solenoid valve and set the each shift position by yourself. [Vehicle Condition] Less than 50 km/h (31 mph) [Others] □Press → button: Shift up □Press ← button: Shift down	Possible to check the operation of the shift solenoid valves. HINT: Shifting to the 5th gear is possible only when the vehicle stops or idle is ON.
LOCK UP	[Test Details] Control the shift solenoid SLU to set the ATM to the lock–up condition. [Vehicle Condition] Vehicle Speed: 58 km/h (36 mph) or more	Possible to check the SLU operation.
LINE PRESS UP *	[Test Details] Operate the shift solenoid SLT and raise the line pressure. [Vehicle Condition] □Vehicle Stopped. □IDL: ON [HINT] OFF: Line pressure up (When the active test of "LINE PRESS UP" is performed, the ECM commands the SLT solenoid to turn off). ON: No action (normal operation)	–

*: "LINE PRESS UP" in the ACTIVE TEST is performed to check the line pressure changes by connecting the SST to the automatic transaxle, which is used in the HYDRAULIC TEST (see page 05–948) as well.

HINT:

The pressure values in ACTIVE TEST and HYDRAULIC TEST are different from each other.

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0527K–26

DIAGNOSTIC TROUBLE CODE CHART

If a DTC is displayed during the DTC check, check the circuit listed in the table below and proceed to the page given.

*1 : □...MIL light up

DTC No. (See Page)	Detection Item	Trouble Area	MIL *1	Memory
P0500 (05–239)	Vehicle Speed Sensor "A"	Open or short in speed sensor circuit Speed sensor Combination meter ECM	□	○
P0705 (05–978)	Transmission Range Sensor Circuit Malfunction (PRNDL Input)	Short in park/neutral position switch circuit Park/neutral position switch ECM	□	○
P0710 (05–983)	Transmission Fluid Temperature Sensor "A" Circuit	Open or short in ATF temperature sensor No.1 circuit ATF temperature sensor No.1 ECM	□	○
P0711 (05–986)	Transmission Fluid Temperature Sensor "A" Performance	ATF temperature sensor No.1 ECM	□	○
P0712 (05–983)	Transmission Fluid Temperature Sensor "A" Circuit Low Input	Short in ATF temperature sensor No.1 circuit ATF temperature sensor No.1 ECM	□	○
P0713 (05–983)	Transmission Fluid Temperature Sensor "A" Circuit High Input	Open in ATF temperature sensor No.1 circuit ATF temperature sensor No.1 ECM	□	○
P0717 (05–988)	Input Speed Sensor Circuit No Signal	Open or short in speed sensor (NT) circuit Speed sensor (NT) ECM	□	○
P0722 (05–991)	Output Speed Sensor	Open or short in speed sensor (SP2) circuit Speed sensor (SP2) ECM	□	○
P0724 (05–994)	Brake Switch "B" Circuit High	Short in stop light switch circuit Stop light switch ECM	□	○
P0748 (05–996)	Pressure Control Solenoid "A" Electrical (Shift Solenoid Valve SL1)	Open or short in shift solenoid valve SL1 circuit Shift solenoid valve SL1 ECM	□	○
P0751 (05–1002)	Shift Solenoid "A" Performance (Shift Solenoid Valve S1)	Shift solenoid valve S1 is stuck open or closed Valve body is blocked up or stuck Shift solenoid valve S1 Automatic transmission assembly ECM	□	○
P0756 (05–1006)	Shift Solenoid "B" Performance (Shift Solenoid Valve S2)	Shift solenoid valve S2 is stuck open or closed Valve body is blocked up or stuck Shift solenoid valve S2 Automatic transmission assembly ECM	□	○
P0771 (05–1010)	Shift Solenoid "E" Performance (Shift Solenoid Valve SR)	Shift solenoid valve SR is stuck open or closed Shift solenoid valve SL1 is stuck open or closed Valve body is blocked up or stuck Shift solenoid valve SR Shift solenoid valve SL1 Automatic transmission assembly ECM	□	○

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P0776 (05–1014)	Pressure Control Solenoid "B" Performance (Shift Solenoid Valve SL2)	Shift solenoid valve SL2 is stuck open or closed Valve body is blocked up or stuck Shift solenoid valve SL2 Automatic transmission assembly ECM	□	○
P0778 (05–1018)	Pressure Control Solenoid "B" Electrical (Shift Solenoid Valve SL2)	Open or short in shift solenoid valve SL2 circuit Shift solenoid valve SL2 ECM	□	○
P0781 (05–1022)	1–2 Shift	Valve body is blocked up or stuck (1–2 shift valve) Automatic transmission assembly ECM	□	○
P0973 (05–1025)	Shift Solenoid "A" Control Circuit Low (Shift Solenoid Valve S1)	Open or short in shift solenoid valve S1 circuit Shift solenoid valve S1 ECM	□	○
P0974 (05–1025)	Shift Solenoid "A" Control Circuit High (Shift Solenoid Valve S1)		□	○
P0976 (05–1028)	Shift Solenoid "B" Control Circuit Low (Shift Solenoid Valve S2)	Open or short in shift solenoid valve S2 circuit Shift solenoid valve S2 ECM	□	○
P0977 (05–1028)	Shift Solenoid "B" Control Circuit High (Shift Solenoid Valve S2)		□	○
P0985 (05–1031)	Shift Solenoid "E" Control Circuit Low (Shift Solenoid Valve SR)	Open or short in shift solenoid valve SR circuit Shift solenoid valve SR ECM	□	○
P0986 (05–1031)	Shift Solenoid "E" Control Circuit High (Shift Solenoid Valve SR)		□	○
P1782 (05–1034)	T/F L4 Range Position Switch Performance	Short in transfer L4 position switch circuit Four wheel drive control ECU ECM	□	○
P2714 (05–1037)	Pressure Control Solenoid "D" Performance (Shift Solenoid Valve SLT)	Shift solenoid valve SLT is stuck open or closed Valve body is blocked up or stuck Shift solenoid valve SLT Automatic transmission assembly ECM	□	○
P2716 (05–1040)	Pressure Control Solenoid "D" Electrical (Shift Solenoid Valve SLT)	Open or short in shift solenoid valve SLT circuit Shift solenoid valve SLT ECM	□	○
P2740 (05–1043)	Transmission Fluid Temperature Sensor "B" Circuit	Open or short in ATF temperature sensor No.1 circuit ATF temperature sensor No.2 ECM	□	○
P2742 (05–1043)	Transmission Fluid Temperature Sensor "B" Circuit Low Input	Short in ATF temperature sensor No.1 circuit ATF temperature sensor No.2 ECM	□	○
P2743 (05–1043)	Transmission Fluid Temperature Sensor "B" Circuit High	Open in ATF temperature sensor No.2 circuit ATF temperature sensor No.2 ECM	□	○
P2757 (05–1047)	Torque Converter Clutch Pressure Control Solenoid Performance (Shift Solenoid Valve SLU)	Shift solenoid valve SLU is stuck open or closed Valve body is blocked up or stuck Shift solenoid valve SLU Automatic transmission assembly ECM	□	○
P2759 (05–1050)	Torque Converter Clutch Pressure Control Solenoid Control Circuit Electrical (Shift Solenoid Valve SLU)	Open or short in shift solenoid valve SLU circuit Shift solenoid valve SLU ECM	□	○

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DTC P0705 TRANSMISSION RANGE SENSOR CIRCUIT MALFUNCTION (PRNDL INPUT)

CIRCUIT DESCRIPTION

The park/neutral position switch detects the shift lever position and sends signals to the ECM.

DTC No.	DTC Detection Condition	Trouble Area
P0705	(2–trip detection logic) □All switches are OFF simultaneously for P, R, N, D, 3 and 2 positions. □2 or more switches are ON simultaneously for P, R, N, (D 4), 3 and (2 L) positions.	□Short in park/neutral position switch circuit □Park/neutral position switch □ECM

MONITOR DESCRIPTION

The park/neutral position switch detects the shift lever position and sends a signal to the ECM.
For security, the park/neutral position switch detects the shift lever position so that engine can be started only when the vehicle is in P or N shift position.
When the park/neutral position switch sends more than one signal at a time from switch positions P, R, N or D, the ECM interprets this as a fault in the switch. The ECM will turn on the MIL and store the DTC.

MONITOR STRATEGY

Related DTCs	P0705: Park/neutral position switch/Verify switch input
Required sensors/Components	Park/neutral position switch
Frequency of operation	Continuous
Duration	Condition (A) (B) and (D): 2 sec. Condition (C): 60 sec.
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present.	See page 05–952
Ignition switch	ON
Battery voltage	10.5 V or more

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TYPICAL MALFUNCTION THRESHOLDS

One of the following conditions is met: Condition (A), (B), (C) or (D)

Condition (A)

Number of the following signal input at the same time	2 or more
P switch	ON
R switch	ON
N switch	ON
D switch	ON
3 switch	ON
2 switch	ON

Condition (B)

Number of the following signal input at the same time	2 or more
NSW switch	ON
R switch	ON
D switch	ON
3 switch	ON
2 switch	ON

Condition (C)

All of following conditions are met

NSW switch	OFF
P switch	OFF
R switch	OFF
N switch	OFF
D switch	OFF
3 switch	OFF
2 switch	OFF

Condition (D)

Both (i) and (ii) are met

(i) One of following conditions is met

NSW switch	ON
P switch	ON
R switch	ON
N switch	ON

(ii) One of following conditions is met

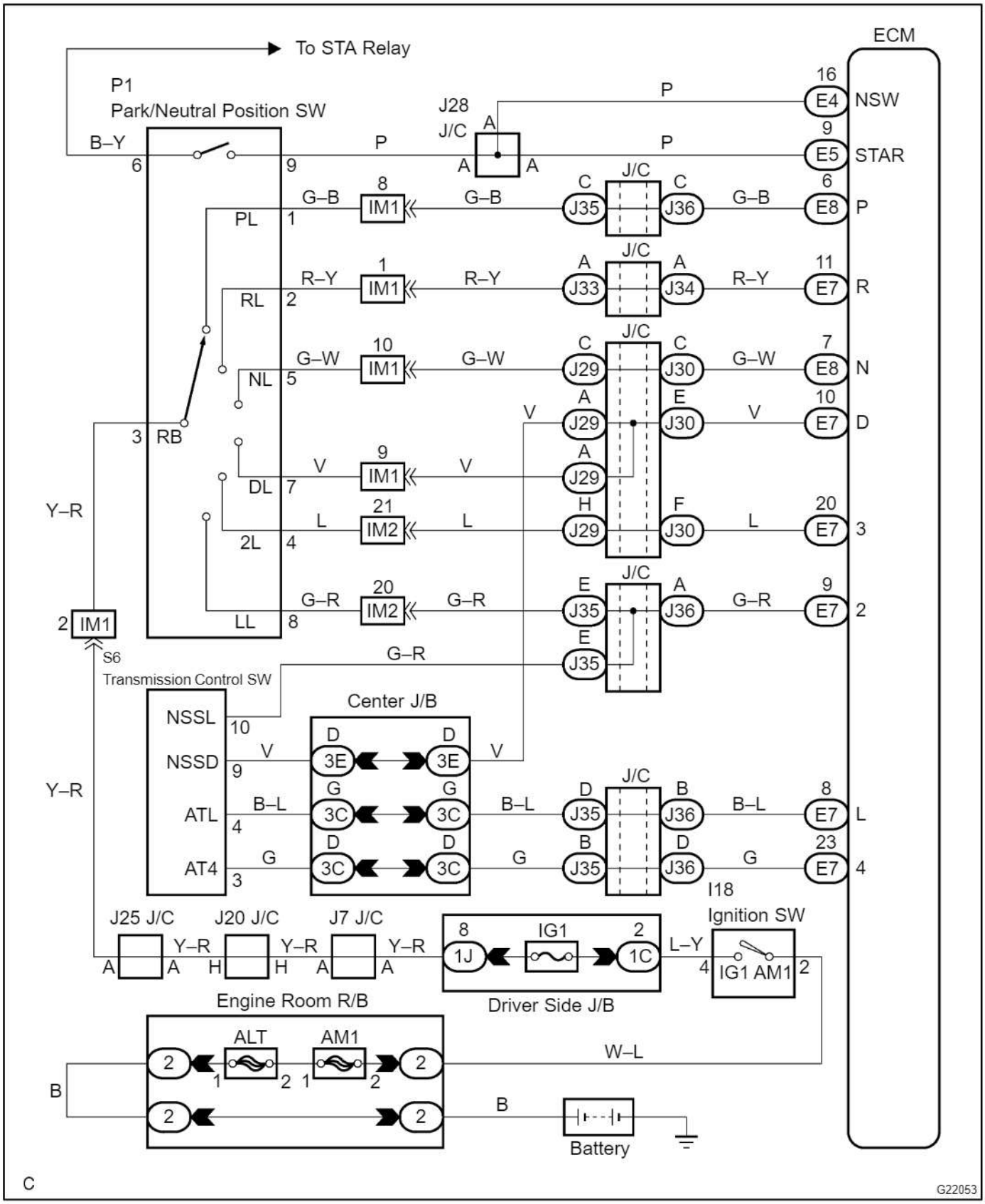
4 switch	ON
L switch	ON

COMPONENT OPERATING RANGE

Park/neutral position switch	The park/neutral position switch sends only one signal to the ECM.

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WIRING DIAGRAM

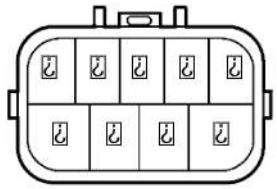


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INSPECTION PROCEDURE

1 INSPECT PARK/NEUTRAL POSITION SWITCH ASSY

Switch Side:
(Connector Front View):



G27076

(a) Jack up the vehicle.
(b) Disconnect the park/neutral position switch connector.
(c) Check continuity between each terminal shown below when the shift lever is moved to each position.

Shift Position	Terminal No. to continuity	
P	1 – 3	6 – 9
R	2 – 3	–
N	3 – 5	6 – 9
D, 4	3 – 7	–
3	3 – 4	–
2, L	3 – 8	–

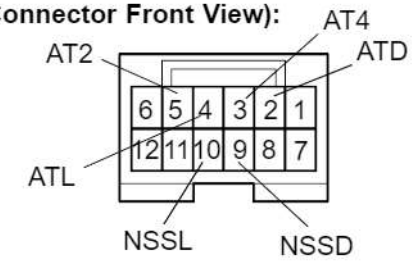
OK:
There is continuity.

NG → **REPLACE PARK/NEUTRAL POSITION SWITCH ASSY (See page 40–12)**

OK

2 INSPECT SHIFT LOCK CONTROL ECU SUB–ASSY(TRANSMISSION CONTROL SWICH)

Component Side:
(Connector Front View):



N F42943 D29380

(a) Connect the park/neutral position switch connector.
(b) Disconnect the shift lock control ECU connector.
(c) Check continuity between each terminal shown below when the shift lever is moved to each position.

Shift position	Tester connection	Specified valve
D	9 – 2 (NSSD – ATD)	Continuity
4		No continuity
D	9 – 3 (NSSD – AT4)	No continuity
4		Continuity
2	10 – 5 (NSSL – AT2)	Continuity
L		No continuity
2	10 – 4 (NSSL – ATL)	No continuity
L		Continuity

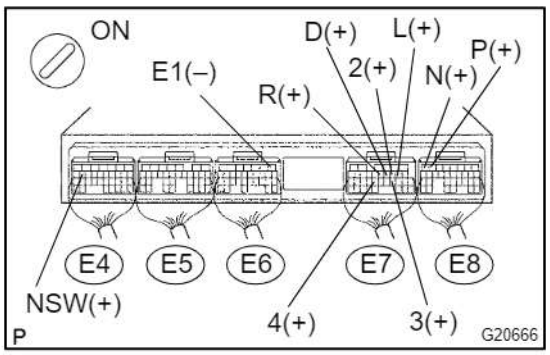
OK:
There is continuity.

NG → **REPLACE SHIFT LOCK CONTROL ECU SUB–ASSY (See page 40–70)**

OK

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3	CHECK HARNESS AND CONNECTOR(PARK/NEUTRAL POSITION SWITCH – ECM)



(a) Connect the shift lock control ECU connector.

(b) Turn the IG switch ON and measure the voltage between terminals NSW, P, R, N, D, 4, 3, 2, and L of ECM and the E1 when the shift lever is shifted to the following position.

OK:

Tester connection	Condition	Specified condition
NSW – E1	Shift lever position: P and N	Below 1 V
	Shift lever position: Except P and N	Battery voltage
P– E1	Shift lever position: P	Battery voltage
R – E1	Shift lever position: R	Battery voltage*
N – E1	Shift lever position: N	Battery voltage
D – E1	Shift lever position: D and 4	Battery voltage
4 – E1	Shift lever position: 4	Battery voltage
3 – E1	Shift lever position: 3	Battery voltage
2 – E1	Shift lever position: 2 and L	Battery voltage
L – E1	Shift lever position: L	Battery voltage

HINT:

*: The voltage will drop slightly due to lighting up of the back up light.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR (See page 01–35)**

OK

CHECK AND REPLACE ECM (See page 10–24)

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DTC	P0710	TRANSMISSION FLUID TEMPERATURE SENSOR "A" CIRCUIT

DTC	P0712	TRANSMISSION FLUID TEMPERATURE SENSOR "A" CIRCUIT LOW INPUT

DTC	P0713	TRANSMISSION FLUID TEMPERATURE SENSOR "A" CIRCUIT HIGH INPUT

CIRCUIT DESCRIPTION

The ATF temperature sensor converts the fluid temperature into a resistance value which is input into the ECM.

DTC No.	DTC Detecting Condition	Trouble Area
P0710	(a) and (b) is detected momentary within 0.5 sec. when neither P0712 or P0713 is not detected (1–trip detection logic) (a) ATF temperature sensor resistance is less than 79 Ω (b) ATF temperature sensor resistance is more than 156 kΩ HINT: Within 0.5 sec. the malfunction switches from (a) to (b) or from (b) to (a)	□Open or short in ATF temperature sensor No.1 circuit □ATF temperature sensor No.1 □ECM
P0712	ATF temperature sensor resistance is less than 79 Ω for 0.5 sec. or more (1–trip detection logic)	
P0713	DTC is detected for 0.5 sec. or more (1–trip detection logic) ATF temperature sensor resistance is more than 156 kΩ after started engine for 15 minutes or more	

MONITOR DESCRIPTION

The automatic transmission fluid (ATF) temperature sensor converts ATF temperature to an electrical resistance value. Based on the resistance, the ECM determines the ATF temperature, and the ECM detects an opens or shorts in the ATF temperature circuit. If the resistance value of the ATF temperature is less than 79 Ω*1 or more than 156 kΩ*2, the ECM interprets this as a fault in the ATF sensor or wiring. The ECM will turn on the MIL and store the DTC.

*1: 150 C (302 F) or more is indicated regardless of the actual ATF temperature.

*2: –40 C (–40 F) is indicated regardless of the actual ATF temperature.

HINT:

The ATF temperature can be checked on the OBD II scan tool or hand–held tester display.

MONITOR STRATEGY

Related DTCs	P0710: ATF temperature sensor/Range check (Fluttering) P0712: ATF temperature sensor/Range check (Low resistance) P0713: ATF temperature sensor/Range check (High resistance)
Required sensors/Components	ATF temperature sensor
Frequency of operation	Continuous
Duration	0.5 sec.
MIL operation	Immediate
Sequence of operation	None

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TYPICAL ENABLING CONDITIONS

P0710: Range check (Fluttering)
P0712: Range check (Low resistance)

The monitor will run whenever the following DTCs are not present.	See page 05–952
The typical enabling condition is not available.	–

P0713: Range check (High resistance)

The monitor will run whenever the following DTCs are not present.	See page 05–952
Time after engine start	15 min. or more

TYPICAL MALFUNCTION THRESHOLDS

P0710: Range check (Fluttering)

ATF temperature sensor resistance	Less than 79 Ω or More than 156 kΩ

P0712: Range check (Low resistance)

ATF temperature sensor resistance	Less than 79 Ω

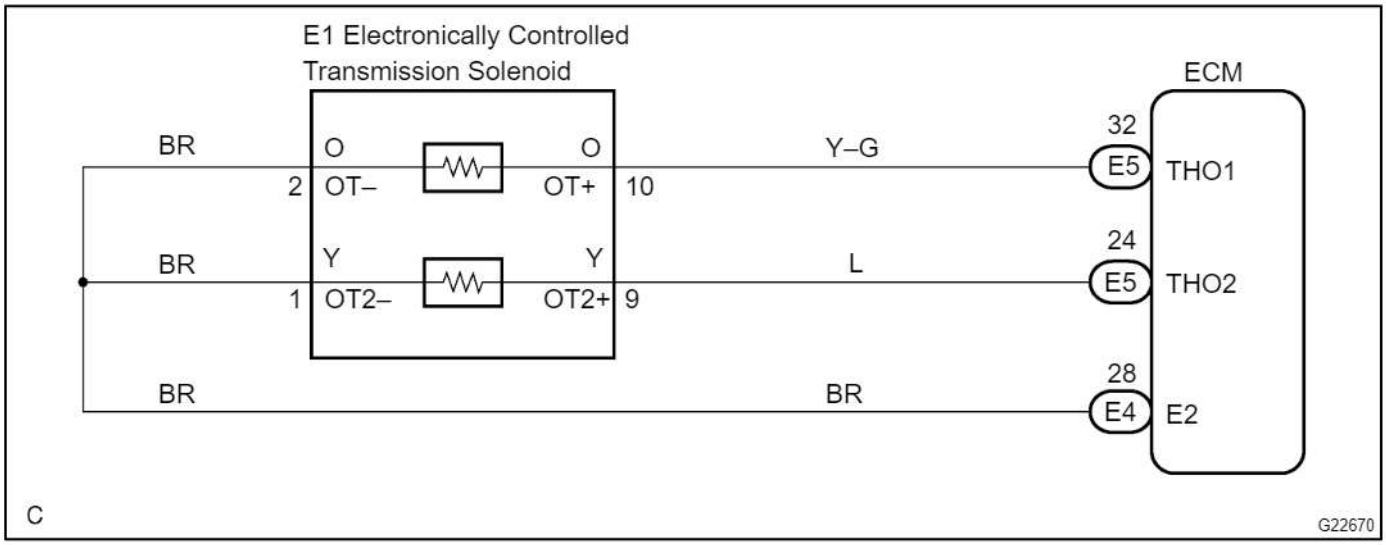
P0713: Range check (High resistance)

ATF temperature sensor resistance	More than 156 kΩ

COMPONENT OPERATING RANGE

ATF temperature sensor	Atmospheric temperature – approx. 130 C (266 F)

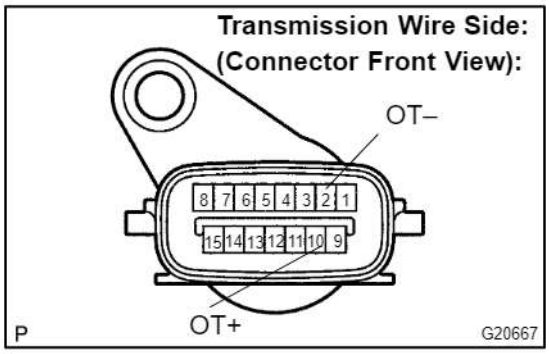
WIRING DIAGRAM



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INSPECTION PROCEDURE

1 INSPECT TRANSMISSION WIRE(ATF TEMPERATURE SENSOR)



(a) Disconnect the transmission wire connector from the transmission.

(b) Measure the resistance between terminals OT+ and OT–.

OK:

79 Ω to 156 kΩ

(c) Check the continuity between the terminals of transmission wire connector and body ground.

OK:

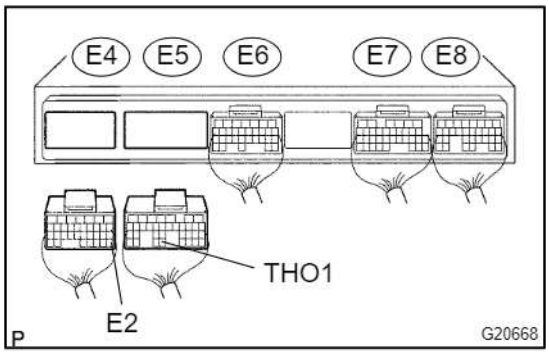
Standard (Check for short):

Symbols	Specified condition
OT+ – Body ground	No continuity
OT– – Body ground	

NG → **REPAIR OR REPLACE TRANSMISSION WIRE (See page 40–63)**

OK

2 CHECK HARNESS AND CONNECTOR(TRANSMISSION WIRE – ECM)



(a) Connect the transmission wire connector.

(b) Disconnect the ECM connectors.

(c) Measure the resistance between terminals THO1 and E2.

OK:

79 Ω to 156 kΩ

(d) Check the continuity between the wire harness side connectors.

OK:

Standard (Check for short):

Symbols	Specified condition
THO1 – Body ground	No continuity
E2 – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR (See page 01–35)**

OK

CHECK AND REPLACE ECM (See page 10–24)

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DTC P0711 TRANSMISSION FLUID TEMPERATURE SENSOR "A" PERFORMANCE

CIRCUIT DESCRIPTION

The ATF temperature sensor converts the fluid temperature into a resistance value which is input into the ECM.

DTC No.	DTC Detecting Condition	Trouble Area
P0711	Both (a) and (b) are detected: (2–trip detection logic) (a) After 12 sec. of engine start, temp. of atmosphere and that of engine coolant is more than –10°C (14 F) (b) After normal driving for over 18 min. and 9 km, ATF temp. is less than 10°C (50 F)	□Open or short in ATF temperature sensor No.1 circuit □ATF temperature sensor No.1 □ECM

MONITOR DESCRIPTION

The ATF temperature sensor converts the ATF temperature to an electrical resistance value. Based on the resistance, the ECM determines the ATF temperature and detects an opens or shorts in the ATF temperature circuit or a fault of the ATF temperature sensor.

After running the vehicle for a certain period, the ATF temperature should increase. If the ATF temperature is below 10 C (50 F) after running the vehicle for a certain period, the ECM interprets this as a fault, and turns on the MIL.

MONITOR STRATEGY

Related DTCs	P0711: ATF temperature sensor/Rationality check
Required sensors/Components	ATF temperature sensor
Frequency of operation	Continuous
Duration	3 sec.
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The following items are common to all conditions below.

The monitor will run whenever the following DTCs are not present.	See page 05–952
ATF temperature sensor "A" circuit ECT (Engine coolant temperature) sensor circuit IAT (Intake air temperature) sensor circuit	There is no malfunction in the circuit shown on the left.
Time after engine start	18 min. and 20 sec. or more
ECT	–15 C (5 F) or more
Driving distance after engine start	9 km (6 mile) or more
IAT (12 sec. after engine start)	–20 C (–4 F) or more
ECT (12 sec. after engine start)	–20 C (–4 F) or more

TYPICAL MALFUNCTION THRESHOLDS

ATF temperature	Less than 10°C (50 F) (ATF temperature = –10 C (14 F) at engine start) (Conditions vary with ATF temperature at engine start)

COMPONENT OPERATING RANGE

ATF temperature	Atmospheric temperature to approx. 130 C (266 F)

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WIRING DIAGRAM

See page 05–983.

INSPECTION PROCEDURE

1	CHECK OTHER DTCS OUTPUT(IN ADDITION TO DTC P0711)

(a) Connect the OBD II scan tool or the hand–held tester to the DLC3.
(b) Turn the ignition switch to the ON position and push the OBD II scan tool or the hand–held tester main switch ON.
(c) When you use hand–held tester:
Select the item "DIAGNOSIS/ENHANCED OBD II/DTC INFO/CURRENT CODES".
(d) Read the DTCs using the OBD II scan tool or the hand–held tester.

Result:

Display (DTC output)	Proceed to
Only "P0711" is output	A
"P0711" and other DTCs	B

HINT:
If any other codes besides "P0711" is output, perform the troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05–976)**

A

2	CHECK TRANSMISSION FLUID LEVEL (See page 40–4)

NG → **ADD FLUID**

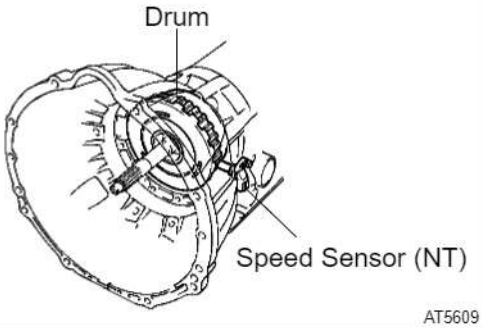
OK

REPLACE TRANSMISSION WIRE (ATF TEMPERATURE SENSOR) (See page 40–63)

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DTC	P0717	INPUT SPEED SENSOR CIRCUIT NO SIGNAL

CIRCUIT DESCRIPTION



This speed sensor (NT) detects the rotation speed of the input shaft from the rotation of the drum.
Its mechanism is the same as that of the speed sensor (SP2). By comparing the speed sensor (NT) signal and speed sensor (SP2) signal, the ECM detects the shift timing of the gears and appropriately controls the engine torque and hydraulic pressure in response to various conditions, thus providing smooth gear shift.

DTC No.	DTC Detection Condition	Trouble Area
P0717	All conditions below are detected for 5 secs. or more (1–trip detection logic) (a) Gear change not being performed (b) Gear position: 4th or 5th (c) T/M input shaft rpm: 300 rpm or less (d) T/M output shaft rpm: 1,000 rpm or more (e) Park/neutral position switch: OFF (f) Shift solenoid valves, park/neutral position switch and vehicle speed sensor are in normal operation	□Open or short in speed sensor (NT) circuit □Speed sensor (NT) □ECM □Automatic transmission assembly

MONITOR DESCRIPTION

The input speed sensor detects the transmission input shaft speed. The ECM determines the gear shift timing based on a comparison of the input speed sensor (input shaft speed) with the output speed sensor (output shaft speed).
When the output shaft speed is higher then the expected value and the input shaft speed is 300 rpm or less while running with the shift in the D position, the ECM will conclude that there is malfunction of the input turbine speed sensor (NT). The ECM will illuminate the MIL and a DTC is set.

MONITOR STRATEGY

Related DTCs	P0717: Speed sensor (NT)/Verify pulse input
Required sensors/Components	Speed sensor (NT), Speed sensor (NC)
Frequency of operation	Continuous
Duration	5 sec.
MIL operation	Immediate
Sequence of operation	None

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TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present.	See page 05–952
Shift change	Shift change is completed and before starting next shift change operation
ECM selected gear	4th or 5th
Output shaft rpm	1,000 rpm or more
NSW switch	OFF
R switch	OFF
L switch	OFF
Engine	Running
Turbine speed sensor malfunction	Not detected

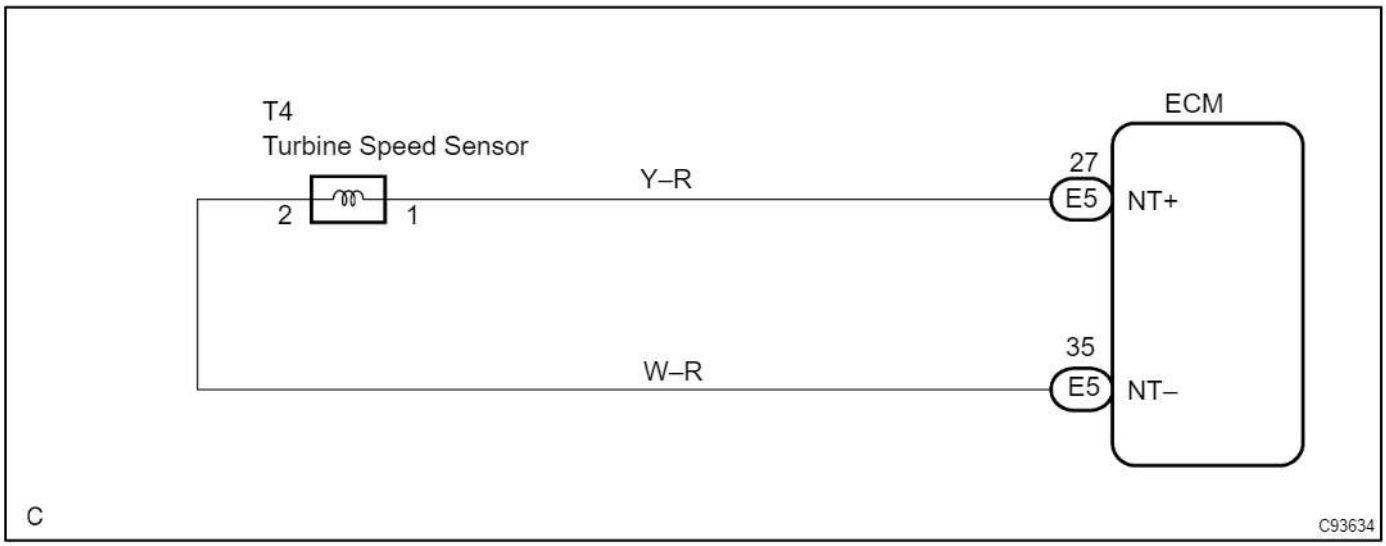
TYPICAL MALFUNCTION THRESHOLDS

Sensor signal rpm	Less than 300 rpm

COMPONENT OPERATING RANGE

Speed sensor (NT)	Input speed is equal to engine speed when lock–up ON.

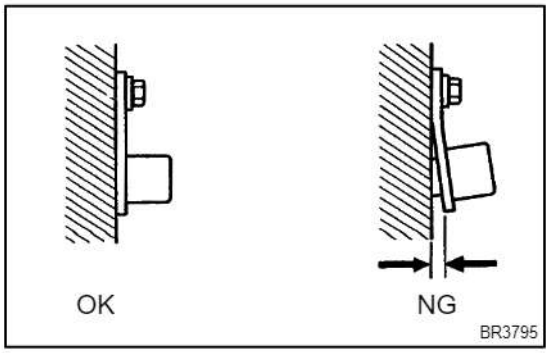
WIRING DIAGRAM



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INSPECTION PROCEDURE

1 INSPECT SPEED SENSOR INSTALLATION

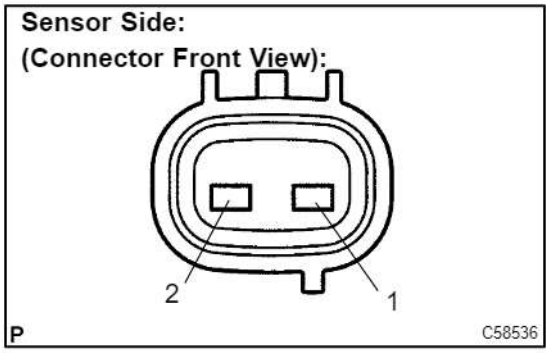


(a) Check the speed sensor installation.
Standard:
The installation bolt is tightened properly and there is no clearance between the sensor and transaxle case.

NG → **REPLACE SPEED SENSOR(NT)**

OK

2 INSPECT SPEED SENSOR(NT)

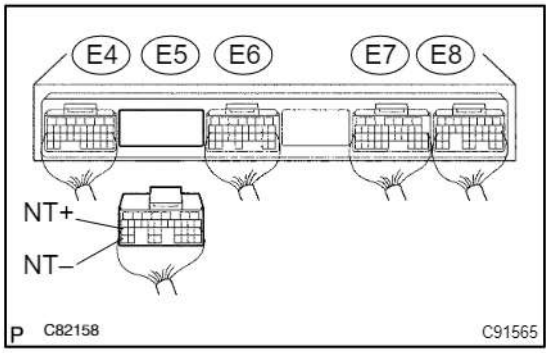


(a) Remove the speed sensor from the transmission.
(b) Measure the resistance between terminals of speed sensor.
OK:
Resistance: 560 to 680 Ω at 20 C (68 F)

NG → **REPLACE SPEED SENSOR(NT)**

OK

3 CHECK HARNESS AND CONNECTOR(SPEED SENSOR – ECM)



(a) Install the speed sensor.
(b) Disconnect the ECM connector.
(c) Measure the resistance between terminals NT+ and NT–.
OK:
Resistance: 560 to 680 Ω at 20 C (68 F)
(d) Check the continuity between the wire harness side connector.
OK:
Standard (Check for short):

Symbols	Specified condition
NT+ – Body ground	No continuity
NT– – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR (See page 01–35)**

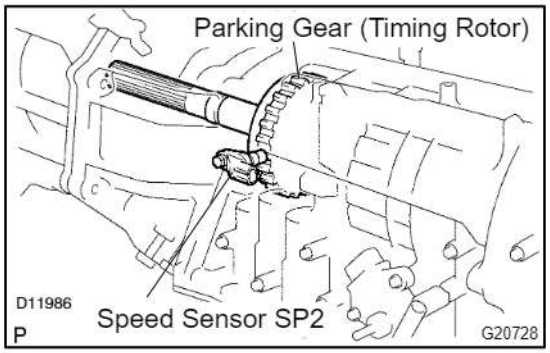
OK

CHECK AND REPLACE ECM (See page 10–24)

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DTC P0722 OUTPUT SPEED SENSOR CIRCUIT NO SIGNAL

CIRCUIT DESCRIPTION



The speed sensor SP2 detects the rotation speed of the transmission output shaft and sends signals to the ECM. The ECM determines the vehicle speed based on these signals. An AC voltage is generated in the speed sensor SP2 coil as the parking gear mounted on the rear planetary gear assy rotates, and this voltage is sent to the ECM. The parking gear on the rear planetary gear is used as the timing rotor for this sensor.
The gear shift point and lock–up timing are controlled by the ECM based on the signals from this vehicle speed sensor and the throttle position sensor signal. If the speed sensor SP2 malfunctions, the ECM uses input signals from the speed sensor NT as a back–up signal.

DTC No.	DTC Detection Condition	Trouble Area
P0722	All conditions below are detected 500 times or more continuously (1–trip detection logic) (a) No signal from speed sensor (SP2) is input to ECM while 4 pulses of No. 1 vehicle speed sensor signal are sent (b) Vehicle speed is 9 km/h (6 mph) or more for at least 4 sec. (c) Park/neutral position switch is OFF. (d) Transfer position is except neutral (4WD).	□Open or short in speed sensor (SP2) circuit □Speed sensor (SP2) □ECM

MONITOR DESCRIPTION

The output speed sensor monitors the output shaft speed. The ECM controls the gearshift point and the lock up timing based on the signals from the output speed sensor and throttle position sensor.
If the ECM detects no signal from the output shaft speed sensor even while the vehicle is moving, it will conclude that is a malfunction of the output speed sensor. The ECM will illuminate the MIL and set a DTC.

MONITOR STRATEGY

Related DTCs	P0722 : Speed sensor SP2/Verify pulse input
Required sensors/Components	Speed sensor SP2
Frequency of operation	Continuous
Duration	500 output shaft revolution
MIL operation	Immediate
Sequence of operation	None

TYPICAL ENABLING CONDITION

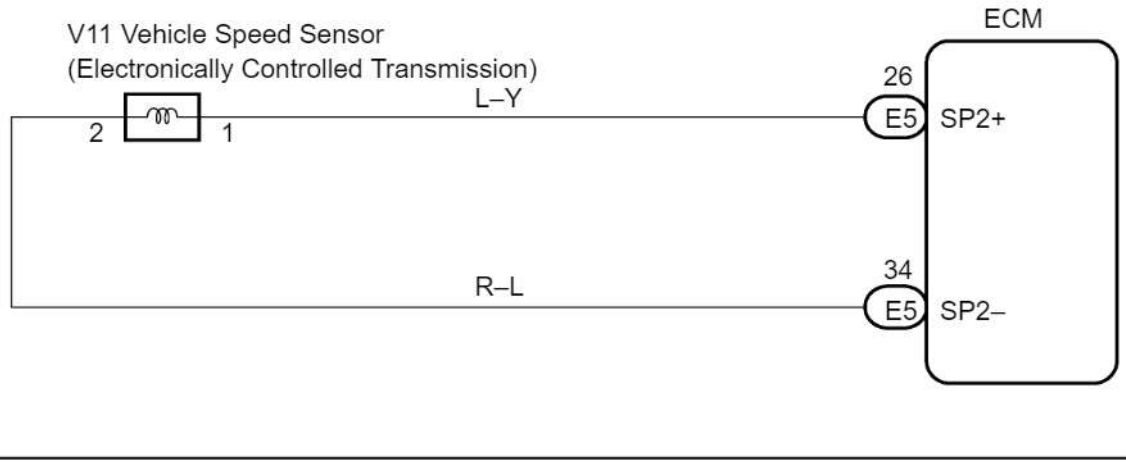
The monitor will run whenever the following DTCs are not present.	See page 05–952
Vehicle speed range (4 sec. or more)	9 km/h (6 mph) or more
NSW switch	OFF

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TYPICAL MALFUNCTION THRESHOLDS

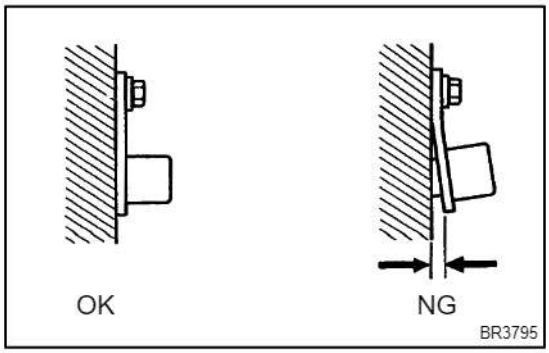
No pulse input during 4 vehicle speed sensor pulse input	500 times or more

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT SPEED SENSOR INSTALLATION

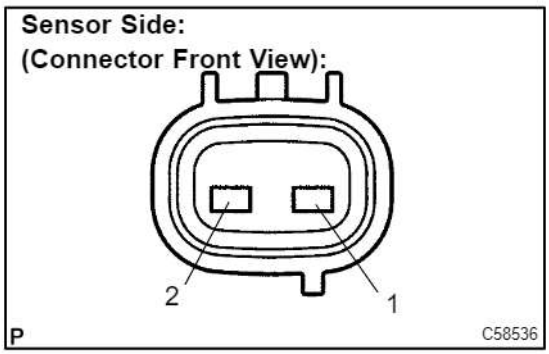


(a) Check the speed sensor installation.
Standard:
The installation bolt is tightened properly and there is no clearance between the sensor and transaxle case.

NG → **REPLACE SPEED SENSOR(SP2)**

OK

2	INSPECT SPEED SENSOR(SP2)



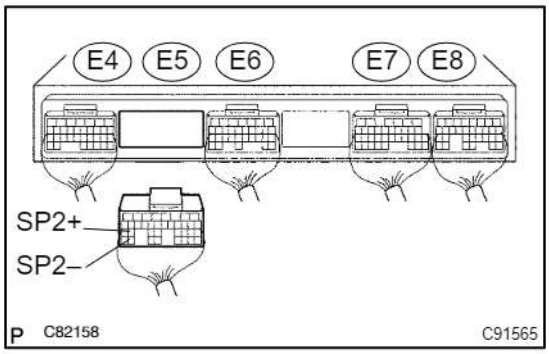
(a) Remove the speed sensor from the transmission.
(b) Measure the resistance between terminals of speed sensor.
OK:
Resistance: 560 to 680 Ω at 20 C (68 F)

NG → **REPLACE SPEED SENSOR(SP2)**

OK

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3	CHECK HARNESS AND CONNECTOR(SPEED SENSOR – ECM)



(a) Install the speed sensor.
(b) Disconnect the ECM connector.
(c) Measure the resistance between terminals SP2+ and SP2–.
OK:
Resistance: 560 to 680 Ω at 20 C (68 F)
(d) Check the continuity between the wire harness side connector.
OK:
Standard (Check for short):

Symbols	Specified condition
SP2+ – Body ground	No continuity
SP2– – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR (See page 01–35)**

OK

CHECK AND REPLACE ECM (See page 10–24)

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DTC P0724 BRAKE SWITCH "B" CIRCUIT HIGH

CIRCUIT DESCRIPTION

The purpose of this circuit is to prevent the engine from stalling while driving in lock–up condition, when brakes are suddenly applied.
When the brake pedal is depressed, this switch sends a signals to the ECM. Then the ECM cancels the operation of the lock–up clutch while braking is in progress.

DTC No.	DTC Detection Condition	Trouble Area
P0724	Stop light switch remains ON while vehicle running (2–trip detection logic)	□Short in stop light switch signal circuit □Stop light switch □ECM

MONITOR DESCRIPTION

When the stop light switch remains ON during "stop and go" driving, the ECM interprets this as a fault in the stop light switch and the MIL comes on and the ECM stores the DTC. The vehicle must stop and go (3 km/h (2 mph) to 30 km/h (19 mph)) ten times for two driving cycles in order to detect malfunction.

MONITOR STRATEGY

Related DTCs	P0724: Stop light switch/Range check/Rationality
Required sensors/Components	Stop light switch, Vehicle speed sensor
Frequency of operation	Continuous
Duration	GO and STOP 10 times
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The stop light switch remains on during GO and STOP 10 times.
GO and STOP are defined as follows;

The monitor will run whenever the following DTCs are not present.	See page 05–952
GO: Vehicle speed	30 km/h (19 mph) or more
STOP: Vehicle speed	Less than 3 km/h (2 mph)

TYPICAL MALFUNCTION THRESHOLDS

Brake switch status	ON stuck

WIRING DIAGRAM

See page 05–242.

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INSPECTION PROCEDURE

1	INSPECT STOP LAMP SWITCH ASSY (See page 65–4)

NG → REPLACE STOP LAMP SWITCH ASSY

OK

2	CHECK HARNESS AND CONNECTOR(STOP LAMP SWITCH ASSY – ECM) (See page 01–35)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

CHECK AND REPLACE ECM (See page 10–24)

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DTC	P0748	PRESSURE CONTROL SOLENOID "A" ELECTRICAL (SHIFT SOLENOID VALVE SL1)

CIRCUIT DESCRIPTION

Shifting from 1st to 5th is performed in combination with ON and OFF of the shift solenoid valves S1, S2, SR, SL1 and SL2, controlled by ECM. If an open or short circuit occurs in either of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valve to allow the vehicle to be operated smoothly (Fail safe function).

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Fail Safe Function:

If either of the shift solenoid valve circuits develops an open or short, the ECM turns the other shift solenoid ON and OFF to shift to the gear positions shown in the table below.

Manual shifting as shown in the following table must be done (In the case of a short circuit, the ECM stops sending current to the short circuited solenoid).

○: ON X: OFF

Position	NORMAL						S1 OFF						S2 OFF						SR OFF					
	Gear	S1	S2	SR	SL1	SL2	Gear	S1	S2	SR	SL1	SL2	Gear	S1	S2	SR	SL1	SL2	Gear	S1	S2	SR	SL1	SL2
"R"	R	○	X	X	X	○	R	X	X	X	X	○	R	○	X	X	X	○	R	○	X	X	X	○
"D"	1 st	○	X	X	X	○	4 th ↓ 3 rd	X	X↓○	X	X	○	1 st	○	X	X	X	○	1 st	○	X	X	X	○
	2 nd	○	○	X	X	○	3 rd	X	○	X	X	○	1 st ↓ 4 th	○↓X	X	X	X	○	2 nd	○	○	X	X	○
	3 rd	X	○	X	X	○	3 rd	X	○	X	X	○	4 th	X	X	X	X	○	3 rd	X	○	X	X	○
	4 th	X	X	X	X	○	4 th	X	X	X	X	○	4 th	X	X	X	X	○	4 th	X	X	X	X	○
	5 th	X	X	○	○	X	5 th	X	X	○	○	X	5 th	X	X	○	○	X	4 th	X	X	X	○	X
"3"	1 st	○	X	X	X	○	3 rd ↓ 3 rd E/B	X	X↓○	X	X	○↓X	1 st	○	X	X	X	○	1 st	○	X	X	X	○
	2 nd	○	○	X	X	○	3 rd ↓ 3 rd E/B	X	○	X	X	○↓X	1 st ↓ 3 rd E/B	○↓X	X	X	X	○↓X	2 nd	○	○	X	X	○
	3 rd E/B	X	○	X	X	X	3 rd E/B	X	○	X	X	X	3 rd E/B	X	X	X	X	X	3 rd E/B ↓ 3 rd	X	○	X	X	X↓○
	4 th	X	X	○	X	○	4 th	X	X	○	X	○	4 th	X	X	○	X	○	3 rd	X	X↓○	X	X	○↓○
	5 th	X	X	○	○	X	5 th	X	X	○	○	X	5 th	X	X	○	○	X	3 rd E/B ↓ 3 rd	X	X↓○	X	○↓X	X↓○
"2"	1 st	○	X	X	X	○	1 st	X	X	X	X	○	1 st	○	X	X	X	○	1 st	○	X	X	X	○
	2 nd E/B	○	○	○	X	X	3 rd E/B	X	○	○	X	X	2 nd E/B ↓ 4 th	○↓X	X	○	X	X↓○	2 nd	○	○	X	X	X
	3 rd E/B	X	○	○	X	X	3 rd E/B	X	○	○	X	X	Fail 4th	X	X	○	X	X↓○	2 nd	X↓○	○	X	X	X
	4 th	X	X	○	X	○	4 th	X	X	○	X	○	4 th	X	X	○	X	○	1 st ↓ 2 nd	X↓○	X↓○	X	X	○↓X
	5 th	X	X	○	○	X	5 th	X	X	○	○	X	5 th	X	X	○	○	X	1 st E/B ↓ 2 nd	X↓○	○	X	○↓X	X
"L"	1 st E/B	○	X	X	X	X	1 st E/B	X	X	X	X	X	1 st E/B	○	X	X	X	X	1 st E/B	○	X	X	X	X
	2 nd E/B	○	○	○	X	X	3 rd E/B	X	○	○	X	X	2 nd E/B ↓ 4 th	○↓X	X	○	X	X↓○	2 nd	○	○	X	X	X
	3 rd E/B	X	○	○	X	X	3 rd E/B	X	○	○	X	X	Fail 4 th	X	X	○	X	X↓○	2 nd	X↓○	○	X	X	X
	4 th	X	X	○	X	○	4 th	X	X	○	X	○	4 th	X	X	○	X	○	1 st ↓ 2 nd	X↓○	X↓○	X	X	○↓X
	5 th	X	X	○	○	X	5 th	X	X	○	○	X	5 th	X	X	○	○	X	1 st E/B ↓ 2 nd	X↓○	X↓○	X	○↓X	X

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○: ON X: OFF

Position	S1 S2 OFF						S2 SR OFF						S1 SR OFF						S1 S2 SR OFF					
	Gear	S1	S2	SR	SL1	SL2	Gear	S1	S2	SR	SL1	SL2	Gear	S1	S2	SR	SL1	SL2	Gear	S1	S2	SR	SL1	SL2
"R"	R	X	X	X	X	○	R	○	X	X	X	○	R	X	X	X	X	○	R	X	X	X	X	○
"D"	4 th	X	X	X	X	○	1 st	○	X	X	X	○	4 th ↓ 3 rd	X	X→○	X	X	○	4 th	X	X	X	X	○
	4 th	X	X	X	X	○	1 st ↓ 4 th	○→X	X	X	X	○	3 rd	X	○	X	X	○	4 th	X	X	X	X	○
	4 th	X	X	X	X	○	4 th	X	X	X	X	○	3 rd	X	○	X	X	○	4 th	X	X	X	X	○
	4 th	X	X	X	X	○	4 th	X	X	X	X	○	4 th	X	X	X	X	○	4 th	X	X	X	X	○
	5 th	X	X	○	○	X	4 th	X	X	X	○→X	X→○	4 th	X	X	X	○→X	X→○	4 th	X	X	X	○→X	X→○
"3"	3 rd ↓ 3 rd E/B	X	X	X	X	○→X	1 st	○	X	X	X	○	3 rd	X	X→○	X	X	○→○	3 rd	X	X	X	X	○→○
	3 rd ↓ 3 rd E/B	X	X	X	X	○→X	1 st ↓ 3 rd	○→X	X	X	X	○→○	3 rd	X	○	X	X	○→○	3 rd	X	X	X	X	○→○
	3 rd E/B	X	X	X	X	X	3 rd E/B ↓ 3 rd	X	X	X	X	X→○	3 rd E/B ↓ 3 rd	X	○	X	X	X→○	3 rd E/B ↓ 3 rd	X	X	X	X	X→○
	4 th	X	X	○	X	○	3 rd	X	X	X	X	○→○	3 rd	X	X→○	X	X	○→○	3 rd	X	X	X	X	○→○
	5 th	X	X	○	○	X	1 st E/B ↓ 3 rd	X	X	X	○→X	X→○	3 rd E/B ↓ 3 rd	X	X→○	X	○→X	X→○	3 rd E/B ↓ 3 rd	X	X	X	○→X	X→○
"2"	1 st	X	X	X	X	○	1 st	○	X	X	X	○	1 st	X	X	X	X	○	1 st	X	X	X	X	○
	Fail 4 th	X	X	○	X	X→○	1 st E/B ↓ 1 st	○	X	X	X	X→○	2 nd	X	○	X	X	X	1 st E/B ↓ 1 st	X	X	X	X	X→○
	Fail 4 th	X	X	○	X	X→○	1 st E/B ↓ 1 st	X→○	X	X	X	X→○	2 nd	X	○	X	X	X	1 st E/B ↓ 1 st	X	X	X	X	X→○
	4 th	X	X	○	X	○	1 st	X→○	X	X	X	○	1 st ↓ 2nd	X	X→○	X	X	○→X	1 st	X	X	X	X	○
	5 th	X	X	○	○	X	1 st E/B ↓ 1 st	X→○	X	X	○→X	X→○	1 st E/B ↓ 2nd	X	X→○	X	○→X	X	1 st E/B ↓ 1 st	X	X	X	○→X	X→○
"L"	1 st E/B	X	X	X	X	X	1 st E/B	○	X	X	X	X	1 st E/B	X	X	X	X	X	1 st E/B	X	X	X	X	X
	Fail 4 th	X	X	○	X	X→○	1 st E/B ↓ 1 st	○	X	X	X	X→○	2 nd	X	○	X	X	X	1 st E/B ↓ 1 st	X	X	X	X	X→○
	Fail 4 th	X	X	○	X	X→○	1 st E/B ↓ 1 st	X→○	X	X	X	X→○	2 nd	X	○	X	X	X	1 st E/B ↓ 1 st	X	X	X	X	X→○
	4 th	X	X	○	X	○	1 st	X→○	X	X	X	○	1 st ↓ 2nd	X	X→○	X	X	○→X	1 st	X	X	X	X	○
	5 th	X	X	○	○	X	1 st E/B ↓ 1 st	X→○	X	X	○→X	X→○	1 st E/B ↓ 2nd	X	X→○	X	○→X	X	1 st E/B ↓ 1 st	X	X	X	○→X	X→○

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DTC No.	DTC Detection Condition	Trouble Area
P0748	ECM checks for an open or short circuit in shift solenoid valves SL1 (1–trip detection logic) (a) When solenoid is energized, duty ratio exceed 100% (b) When solenoid is not energized, duty ratio is less than 3%	Open or short in shift solenoid valve SL1 circuit Shift solenoid valve SL1 ECM

MONITOR DESCRIPTION

The ECM commands gearshift by turning the shift solenoid valves "ON/OFF". When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem and illuminates the MIL and stores the DTC. And the ECM performs the fail–safe function and turns the other shift solenoid valves in good condition "ON/OFF" (In case of an open or short circuit, the ECM stops sending current to the circuit.).

MONITOR STRATEGY

Related DTCs	P0748 : Shift solenoid valve SL1/Range check
Required sensors/Components	Shift solenoid valve SL1
Frequency of operation	Continuous
Duration	1 sec.
MIL operation	1 driving cycle
Sequence of operation	None

TYPICAL ENABLING CONDITION

The monitor will run whenever the following DTCs are not present.	See page 05–952
Battery voltage	10 V or more

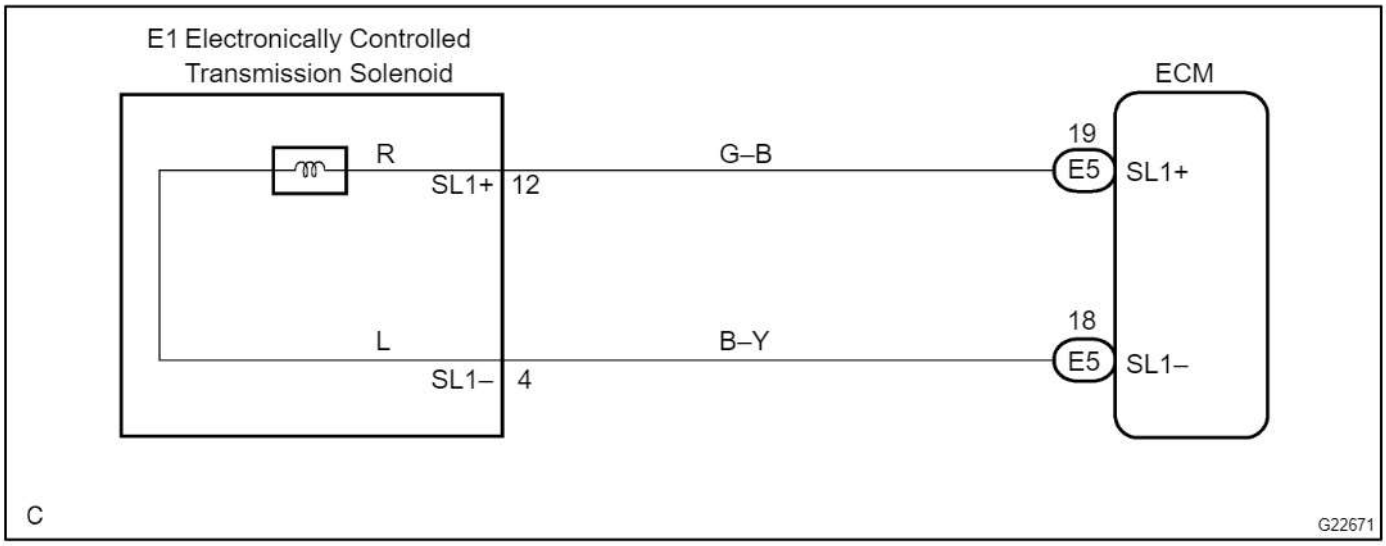
TYPICAL MALFUNCTION THRESHOLDS

Output signal duty	100%

COMPONENT OPERATING RANGE

Output signal duty	Less than 100%

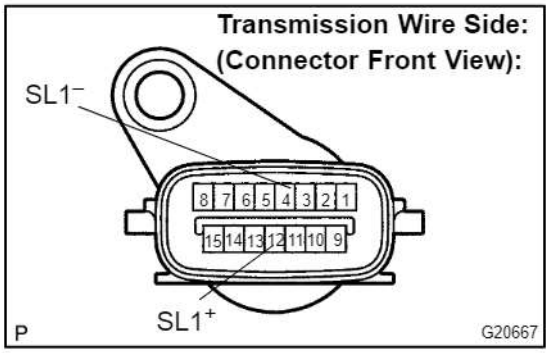
WIRING DIAGRAM



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INSPECTION PROCEDURE

1	INSPECT TRANSMISSION WIRE(SL1)



(a) Disconnect the transmission wire connector from the transmission.

(b) Measure the resistance between terminals SL1+ and SL1–.

OK:

Resistance: 5.0 to 5.6 Ω at 20˚C (68˚F)

(c) Check the continuity between the terminals of transmission wire connector and body ground.

OK:

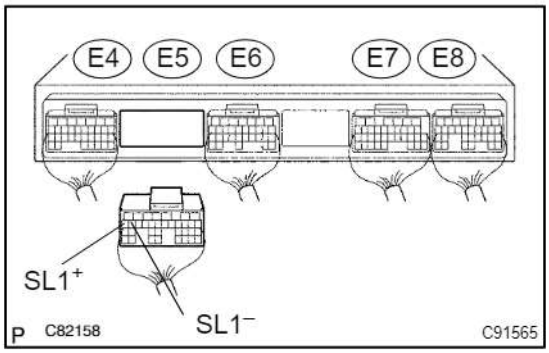
Standard (Check for short):

Symbols	Specified condition
SL1+ – Body ground	No continuity
SL1– – Body ground	

NG → **Go to step 3**

OK

2	CHECK HARNESS AND CONNECTOR(TRANSMISSION WIRE – ECM)



(a) Connect the transmission wire to the transmission.

(b) Disconnect the ECM connector.

(c) Measure resistance between terminals SL1+ and SL1– of ECM.

OK:

Resistance: 5.0 to 5.6 Ω at 20˚C (68˚F)

(d) Check the continuity between the wire harness side connector.

OK:

Standard (Check for short):

Symbols	Specified condition
SL1+ – Body ground	No continuity
SL1– – Body ground	

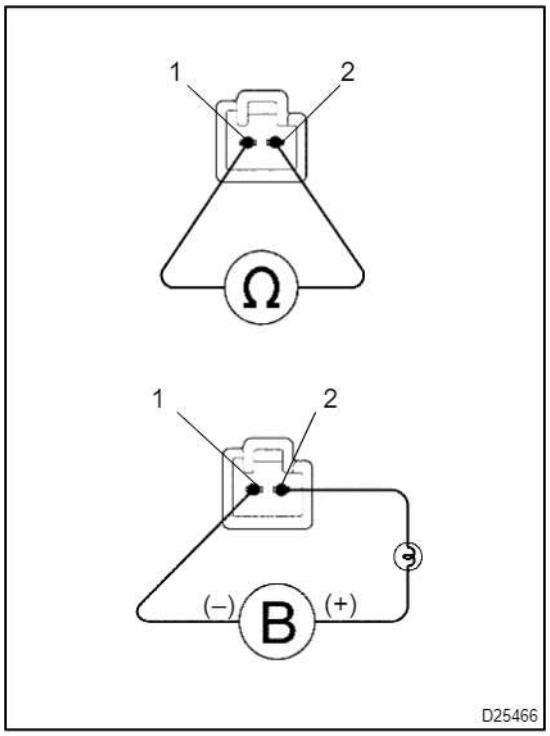
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR (See page 01–35)**

OK

CHECK AND REPLACE ECM (See page 10–24)

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3 INSPECT SHIFT SOLENOID VALVE SL1



(a) Remove the shift solenoid valve SL1.

(b) Measure the resistance between terminals.

OK:

Resistance: 5.0 to 5.6 Ω at 20°C (68°F)

(c) Connect the positive (+) lead with a 21 W bulb to terminal 2 and the negative (–) lead to terminal 1 of the solenoid valve connector, then check the movement of the valve.

OK:

The solenoid makes an operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE SL1 (See page 40–56)**

OK

REPAIR OR REPLACE TRANSMISSION WIRE (See page 40–63)

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DTC	P0751	SHIFT SOLENOID "A" PERFORMANCE (SHIFT SOLENOID VALVE S1)

SYSTEM DESCRIPTION

The ECM uses signals from the vehicle speed sensor and direct clutch speed sensor to detect the actual gear position (1st, 2nd, 3rd, 4th or 5th gear). Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems of the shift solenoid valves, valve body or automatic transmission (clutch, brake or gear etc.).

DTC No.	DTC Detecting Condition	Trouble Area
P0751	The gear required by the ECM does not match the actual gear when driving (2–trip detection logic)	□Shift solenoid valve S1 is stuck open or closed □Valve body is blocked up or stuck □Automatic transmission (clutch, brake or gear etc.)

MONITOR DESCRIPTION

The ECM commands gear shifts by turning the shift solenoid valves "ON/OFF". According to the input shaft revolution and output shaft revolution, the ECM detects the actual gear position (1st, 2nd, 3rd, 4th or 5th gear position). When the gear position commanded by the ECM and the actual gear position are not same, the ECM illuminates the MIL.

MONITOR STRATEGY

Related DTCs	P0751: Shift solenoid valve S1/OFF malfunction Shift solenoid valve S1/ON malfunction
Required sensors/Components	Shift solenoid valve S1, Vehicle speed sensor, Throttle position sensor, Speed sensor (NT), Speed sensor (NO)
Frequency of operation	Continuous
Duration	OFF malfunction (A) and (B): 0.4 sec. OFF malfunction (C): Immediate ON malfunction (A), (B) and (C): 0.4 sec. ON malfunction (D): 3 sec. ON malfunction (E): 0.5 sec.
MIL operation	2 driving cycles
Sequence of operation	None

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TYPICAL ENABLING CONDITIONS

The following items are common to all conditions below:

OFF malfunction (A), (B), (C) and ON malfunction (A), (B), (C), (D), (E)

The monitor will run whenever the following DTCs are not present.	See page 05–952
Turbine speed sensor (NT) circuit Output speed sensor (NO) circuit Shift solenoid "A" (S1) circuit Shift solenoid "B" (S2) circuit Shift solenoid "E" (SR) circuit Pressure control solenoid "A" (SL1) circuit Pressure control solenoid "B" (SL2) circuit ECT (Engine coolant temperature) sensor circuit KCS sensor circuit	There is no malfunction in the sensor circuits shown on the left
ETCS (Electric throttle control system)	Not system down
Transmission shift position	"D"
ECT	40 C (104 F) or more
Spark advance from Max. retard timing by KCS control	0 CA or more
Engine	Running
Transfer range	"High" *1

Transfer range "HIGH" *1 (This condition is applied only 4WD)

*1: Following conditions met

Vehicle speed sensor "A" circuit Output shaft speed sensor circuit	There is no malfunction in the sensor circuits shown on the left
Transfer output speed	143 rpm or more
NO/NOtf (Transfer input speed/Transfer output speed)	0.93 or more and Less than 1.1

OFF malfunction (A)

ECM selected gear	1st
Vehicle speed	2 km/h (1 mph) or more and Less than 40 km/h (25 mph)
Throttle valve opening angle	8% or more and 6.5% or more at engine speed 2,000 rpm (Conditions vary with engine speed)

OFF malfunction (B)

Current ECM selected gear	5th
Last ECM selected gear	4th
Continuous time of ECM selecting 4th gear	2 sec. or more
Actual gear when ECM selected 4th gear	4th

OFF malfunction (C)

Current ECM selected gear	5th
Last ECM selected gear	4th

ON malfunction (A)

ECM selected gear	1st
Vehicle speed	2 km/h (1 mph) or more and Less than 40 km/h (25 mph)
Throttle valve opening angle	6.5% or more at engine speed 2,000 rpm (Conditions vary with engine speed)

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ON malfunction (B)

ECM selected gear	4th
Vehicle speed	2 km/h (1 mph) or more
Throttle valve opening angle	6.5% or more at engine speed 2,000 rpm (Conditions vary with engine speed)

ON malfunction (C)

ECM selected gear	3rd
Vehicle speed	2 km/h (1 mph) or more
Throttle valve opening angle	6.5% or more at engine speed 2,000 rpm (Conditions vary with engine speed)

ON malfunction (D)

Current ECM selected gear	5th
Last ECM selected gear	4th
Vehicle speed (During transition from 4th to 5th gear)	Less than 100 km/h (62 mph)

ON malfunction (E)

ECM selected gear	5th
Engine speed – Turbine speed (NE – NT) (After transition from 4th to 5th gear)	Less than 150 rpm
Vehicle speed (After transition from 4th to 5th gear)	Less than 100 km/h (62 mph)

TYPICAL MALFUNCTION THRESHOLDS

[OFF malfunction]

All of the following conditions are met: OFF malfunction (A), (B) and (C)

It is necessary 2 detections/one driving cycle

1st detection; temporary flag ON

2nd detection; pending fault code ON

OFF malfunction (A)

Turbine speed/Output speed (NT/NO)	0.93 or more and 1.07 or less

OFF malfunction (B)

Turbine speed/Output speed (NT/NO)	0.65 or more and 0.79 or less

OFF malfunction (C)

Output record from ECM for 4th → 5th upshifting	Recorded

[ON malfunction]

Either of the following conditions is met:

□ON malfunction (A) and (B)

□ON malfunction (B) or (C), and ON malfunction (D) or (E)

ON malfunction (A)

Turbine speed/Output speed (NT/NO)	3.30 or more and 7.50 or less

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ON malfunction (B)

Turbine speed/Output speed (NT/NO)	3.30 or more and 7.50 or less

ON malfunction (C)

Turbine speed/Output speed (NT/NO)	1.91 or more and 2.35 or less

ON malfunction (D)

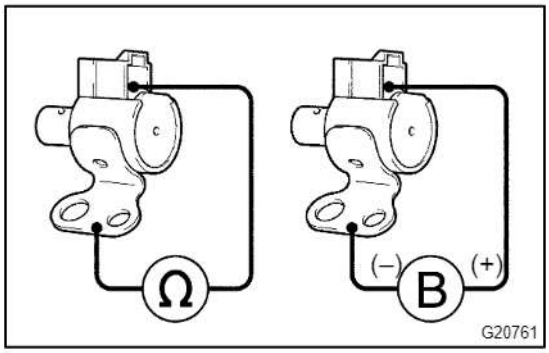
Turbine speed – Output speed x 4th gear ratio (NT – NO x 4th gear ratio)	1,000 rpm or more

ON malfunction (E)

Turbine speed – Output speed x 5th gear ratio (NT – NO x 5th gear ratio)	1,000 rpm or more

INSPECTION PROCEDURE

1	**INSPECT SHIFT SOLENOID VALVE(S1)**



(a) Remove the shift solenoid valve S1.

(b) Measure the resistance between the solenoid connector and the solenoid body.

OK:

Resistance: 11 to 15 Ω at 20°C (68°F)

(c) Connector positive (+) lead to the terminal of solenoid connector, negative (–) lead to the solenoid body.

OK:

The solenoid makes an operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE (S1) (See page 40–56)**

OK

2	**INSPECT TRANSMISSION VALVE BODY ASSY(See chapter 2 in the problem symptoms table) (See page 05–959)**

NG → **REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSY (See page 40–56)**

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSY (See page 40–21 or 40–36)

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DTC	P0756	SHIFT SOLENOID "B" PERFORMANCE (SHIFT SOLENOID VALVE S2)

SYSTEM DESCRIPTION

The ECM uses signals from the vehicle speed sensor and direct clutch speed sensor to detect the actual gear position (1st, 2nd, 3rd, 4th or 5th gear). Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems of the shift solenoid valves, valve body or automatic transmission (clutch, brake or gear etc.).

DTC No.	DTC Detecting Condition	Trouble Area
P0756	The gear required by the ECM does not match the actual gear when driving (2–trip detection logic)	□Shift solenoid valve S2 is stuck open or closed □Valve body is blocked up or stuck □Automatic transmission (clutch, brake or gear etc.)

MONITOR DESCRIPTION

The ECM commands gear shifts by turning the shift solenoid valves "ON/OFF". According to the input shaft revolution and output shaft revolution, the ECM detects the actual gear position (1st, 2nd, 3rd, 4th or 5th gear position). When the gear position commanded by the ECM and the actual gear position are not same, the ECM illuminates the MIL.

MONITOR STRATEGY

Related DTCs	P0756: Shift solenoid valve S2/OFF malfunction Shift solenoid valve S2/ON malfunction
Required sensors/Components	Shift solenoid valve S2, Vehicle speed sensor, Throttle position sensor, Speed sensor (NT), Speed sensor (NO)
Frequency of operation	Continuous
Duration	OFF malfunction (A), (B) and (C): 0.4 sec. OFF malfunction (D): Immediate ON malfunction (A) and (B): 0.4 sec. ON malfunction (C): 3 sec. ON malfunction (D): 0.5 sec.
MIL operation	2 driving cycles
Sequence of operation	None

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TYPICAL ENABLING CONDITIONS

The following items are common to all conditions below:

OFF malfunction (A), (B), (C), (D) and ON malfunction (A), (B), (C), (D)

The monitor will run whenever the following DTCs are not present.	See page 05–952
Turbine speed sensor (NT) circuit Output speed sensor (NO) circuit Shift solenoid "A" (S1) circuit Shift solenoid "B" (S2) circuit Shift solenoid "E" (SR) circuit Pressure control solenoid "A" (SL1) circuit Pressure control solenoid "B" (SL2) circuit ECT (Engine coolant temperature) sensor circuit KCS sensor circuit	There is no malfunction in the sensor circuits shown on the left
ETCS (Electric throttle control system)	Not system down
Transmission shift position	"D"
ECT	40 C (104 F) or more
Spark advance from Max. retard timing by KCS control	0 CA or more
Engine	Running
Transfer range	"High" *1

Transfer range "HIGH" *1 (This condition is applied only 4WD)

*1: Following conditions met

Vehicle speed sensor "A" circuit Output speed sensor circuit	There is no malfunction in the sensor circuits shown on the left
Transfer output speed	143 rpm or more
NO/NOtf (Transfer input speed/Transfer output speed)	0.93 or more and Less than 1.1

OFF malfunction (A)

ECM selected gear	1st
Vehicle speed	2 km/h (1 mph) or more and Less than 40 km/h (25 mph)
Throttle valve opening angle	6.5% or more at engine speed 2,000 rpm (Conditions vary with engine speed)

OFF malfunction (B)

ECM selected gear	2nd
Vehicle speed	2 km/h (1 mph) or more
Output speed	2nd → 1st down shift point or more
Throttle valve opening angle	6.5% or more at engine speed 2,000 rpm (Conditions vary with engine speed)

OFF malfunction (C)

Current ECM selected gear	5th
Last ECM selected gear	4th
Continuous time of ECM selecting 4th gear	2 sec. or more
Actual gear when ECM selected 4th gear	4th

OFF malfunction (D)

Current ECM selected gear	5th
Last ECM selected gear	4th

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ON malfunction (A)

ECM selected gear	1st
Vehicle speed	2 km/h (1 mph) or more and Less than 40 km/h (25 mph)
Throttle valve opening angle	6.5% or more at engine speed 2,000 rpm (Conditions vary with engine speed)

ON malfunction (B)

ECM selected gear	4th
Vehicle speed	2 km/h (1 mph) or more
Throttle valve opening angle	6.5% or more at engine speed 2,000 rpm (Conditions vary with engine speed)

ON malfunction (C)

Current ECM selected gear	5th
Last ECM selected gear	4th
Vehicle speed (During transition from 4th to 5th gear)	Less than 100 km/h (62 mph)

ON malfunction (D)

ECM selected gear	5th
Engine speed – Turbine speed (NE – NT) (After transition from 4th to 5th gear)	Less than 150 rpm
Vehicle speed (After transition from 4th to 5th gear)	Less than 100 km/h (62 mph)

TYPICAL MALFUNCTION THRESHOLDS

[OFF malfunction]

All of the following conditions are met: OFF malfunction (A), (B), (C) and (D)

It is necessary 2 detections/one driving cycle

1st detection; temporary flag ON

2nd detection; pending fault code ON

OFF malfunction (A)

Turbine speed/Output speed (NT/NO)	3.30 or more and 7.50 or less

OFF malfunction (B)

Turbine speed/Output speed (NT/NO)	3.30 or more and 7.50 or less

OFF malfunction (C)

Turbine speed/Output speed (NT/NO)	0.65 or more and 0.79 or less

OFF malfunction (D)

Output record from ECM for 4th → 5th upshifting	Recorded

[ON malfunction]

Both of the following conditions are met: ON malfunction (A) or (B), and ON malfunction (C) or (D)

ON malfunction (A)

Turbine speed/Output speed (NT/NO)	1.91 or more and 2.35 or less

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ON malfunction (B)

Turbine speed/Output speed (NT/NO)	1.28 or more and 1.53 or less

ON malfunction (C)

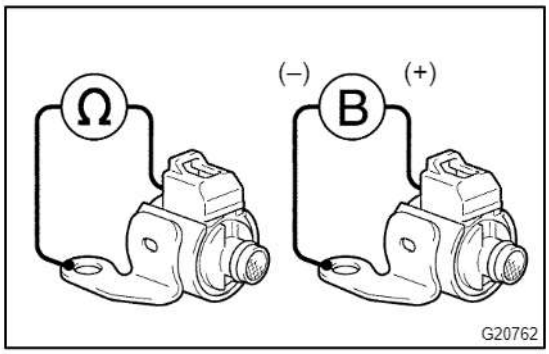
Turbine speed – Output speed x 4th gear ratio (NT – NO x 4th gear ratio)	1,000 rpm or more

ON malfunction (D)

Turbine speed – Output speed x 5th gear ratio (NT – NO x 5th gear ratio)	1,000 rpm or more

INSPECTION PROCEDURE

1	**INSPECT SHIFT SOLENOID VALVE(S2)**



(a) Remove the shift solenoid valve S2.

(b) Measure the resistance between the solenoid connector and the solenoid body.

OK:

Resistance: 11 to 15 Ω at 20°C (68°F)

(c) Connector positive (+) lead to the terminal of solenoid connector, negative (–) lead to the solenoid body.

OK:

The solenoid makes an operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE (S2) (See page 40–56)**

OK

2	**INSPECT TRANSMISSION VALVE BODY ASSY(See chapter 2 in the problem symptoms table) (See page 05–959)**

NG → **REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSY (See page 40–56)**

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSY (See page 40–21 or 40–36)

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DTC	P0771	SHIFT SOLENOID "E" PERFORMANCE (SHIFT SOLENOID VALVE SR)

SYSTEM DESCRIPTION

The ECM uses signals from the vehicle speed sensor and direct clutch speed sensor to detect the actual gear position (1st, 2nd, 3rd, 4th or 5th gear). Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems of the shift solenoid valves, valve body or automatic transmission (clutch, brake or gear etc.).

DTC No.	DTC Detecting Condition	Trouble Area
P0771	The gear required by the ECM does not match the actual gear when driving (2–trip detection logic)	□Shift solenoid valve SR is stuck open or closed □Shift solenoid valve SL1 is stuck open or closed □Valve body is blocked up or stuck □Automatic transmission (clutch, brake or gear etc.)

MONITOR DESCRIPTION

The ECM commands gear shifts by turning the shift solenoid valves "ON/OFF". According to the input shaft revolution and output shaft revolution, the ECM detects the actual gear position (1st, 2nd, 3rd, 4th or 5th gear position). When the gear position commanded by the ECM and the actual gear position are not same, the ECM illuminates the MIL and stores the DTC.

MONITOR STRATEGY

Related DTCs	P0771: Shift solenoid valve SR/OFF malfunction Shift solenoid valve SR/ON malfunction
Required sensors/Components	Shift solenoid valve SR, Speed sensor (NT), Speed sensor (NO), Crankshaft position sensor (NE)
Frequency of operation	Continuous
Duration	OFF malfunction (A): 0.4 sec. OFF malfunction (B) and (C): Immediate ON malfunction: 0.15 sec.
MIL operation	2 driving cycles
Sequence of operation	None

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TYPICAL ENABLING CONDITION

The following items are common to all conditions below:

OFF malfunction (A), (B), (C) and ON malfunction

The monitor will run whenever the following DTCs are not present.	See page 05–952
Turbine speed sensor (NT) circuit Output speed sensor (NO) circuit Shift solenoid "A" (S1) circuit Shift solenoid "B" (S2) circuit Shift solenoid "E" (SR) circuit Pressure control solenoid "A" (SL1) circuit Pressure control solenoid "B" (SL2) circuit ECT (Engine coolant temperature) sensor circuit KCS sensor circuit	There is no malfunction in the sensor circuits shown on the left
ETCS (Electric throttle control system)	Not system down
Transmission shift position	"D"
ECT	40 C (104 F) or more
Spark advance from Max. retard timing by KCS control	0 CA or more
Engine	Running
Transfer range	"High" *1

Transfer range "HIGH" *1 (This condition is applied only 4WD)

*1: Following conditions met

Vehicle speed sensor "A" circuit Output speed sensor circuit	There is no malfunction in the sensor circuits shown on the left
Transfer output speed	143 rpm or more
NO/NOtf (Transfer input speed/Transfer output speed)	0.93 or more and Less than 1.1

OFF malfunction (A)

ECM selected gear	5th
Vehicle speed	2 km/h (1 mph) or more
Throttle valve opening angle	6.5% or more at engine speed 2,000 rpm (Conditions vary with engine speed)

OFF malfunction (B)

Current ECM selected gear	5th
Last ECM selected gear	4th
Continuous time of ECM selecting 4th gear	2 sec. or more

OFF malfunction (C)

Current ECM selected gear	5th
Last ECM selected gear	4th

ON malfunction

Current ECM selected gear	2nd
Last ECM selected gear	1st
Throttle valve opening angle (During transition from 1st to 2nd gear)	4.5% or more at engine speed 2,000 rpm (Conditions vary with engine speed)

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TYPICAL MALFUNCTION THRESHOLDS

[OFF malfunction]

All of the following conditions are met: OFF malfunction (A), (B) and (C)

It is necessary 2 detections/one driving cycle
1st detection; temporary flag ON
2nd detection; pending fault code ON

OFF malfunction (A)

Turbine speed/Output speed (NT/NO)	0.93 or more and 1.07 or less

OFF malfunction (B)

Turbine speed/Output speed (NT/NO)	Not change as follow 0.93 or more and 1.07 or less ↓ 0.65 or more and 0.79 or less

OFF malfunction (C)

Output record from ECM for 4th → 5th upshifting	Recorded

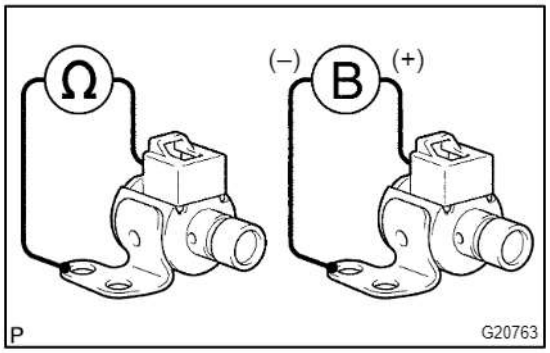
[ON malfunction]

It is necessary 2 detections/one driving cycle
1st detection; temporary flag ON
2nd detection; pending fault code ON

Turbine speed – Output speed x 1st gear ratio (NT – NO x 1st gear ratio)	150 rpm or more

INSPECTION PROCEDURE

1	INSPECT SHIFT SOLENOID VALVE(SR)



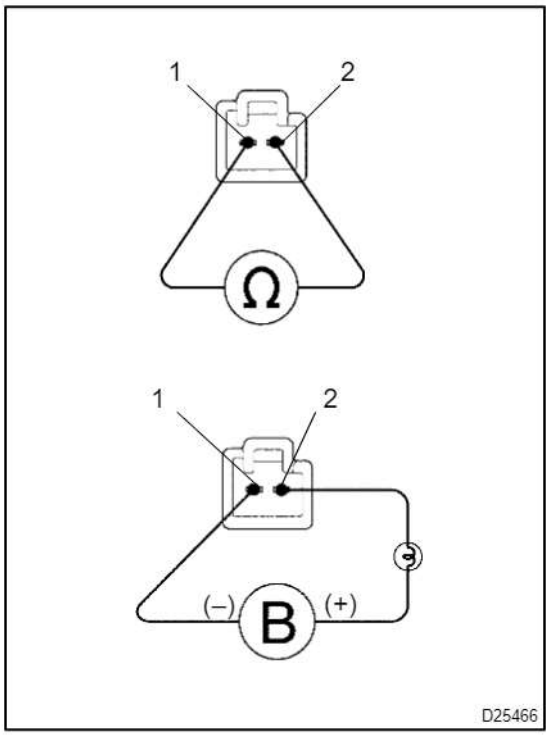
(a) Remove the shift solenoid valve SR.
(b) Measure the resistance between the solenoid connector and the solenoid body.
OK:
Resistance: 11 to 15 Ω at 20°C (68°F)
(c) Connector positive (+) lead to the terminal of solenoid connector, negative (–) lead to the solenoid body.
OK:
The solenoid makes an operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE (SR)** **(See page 40–56)**

OK

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2	INSPECT SHIFT SOLENOID VALVE SL1



(a) Remove the shift solenoid valve SL1.
(b) Measure the resistance between terminals.
OK:
Resistance: 5.0 to 5.6 Ω at 20°C (68°F)
(c) Connect the positive (+) lead with a 21 W bulb to terminal 2 and the negative (–) lead to terminal 1 of the solenoid valve connector, then check the movement of the valve.
OK:
The solenoid makes an operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE SL1 (See page 40–56)**

OK

3	INSPECT TRANSMISSION VALVE BODY ASSY(See chapter 2 in the problem symptoms table) (See page 05–959)

NG → **REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSY (See page 40–56)**

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSY (See page 40–21 or 40–36)

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DTC	P0776	PRESSURE CONTROL SOLENOID "B" PERFORMANCE (SHIFT SOLENOID VALVE SL2)

SYSTEM DESCRIPTION

The ECM uses signals from the vehicle speed sensor and direct clutch speed sensor to detect the actual gear position (1st, 2nd, 3rd, 4th or 5th gear). Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems of the shift solenoid valves, valve body or automatic transmission (clutch, brake or gear etc.).

DTC No.	DTC Detecting Condition	Trouble Area
P0776	The gear required by the ECM does not match the actual gear when driving (2–trip detection logic)	□Shift solenoid valve SL2 is stuck open or closed □Valve body is blocked up or stuck □Automatic transmission (clutch, brake or gear etc.)

MONITOR DESCRIPTION

The ECM commands gear shifts by turning the shift solenoid valves "ON/OFF". According to the input shaft revolution and output shaft revolution, the ECM detects the actual gear position (1st, 2nd, 3rd, 4th or 5th gear position). When the gear position commanded by the ECM and the actual gear position are not same, the ECM illuminates the MIL and stores the DTC.

MONITOR STRATEGY

Related DTCs	P0776: Shift solenoid valve SL2/ON malfunction
Required sensors/Components	Shift solenoid valve SL2, Speed sensor (NT), Speed sensor (NO), Crankshaft position sensor (NE)
Frequency of operation	Continuous
Duration	ON malfunction (A), (B) and (C): 0.4 sec. ON malfunction (D): 3 sec. ON malfunction (E): 0.5 sec.
MIL operation	2 driving cycles
Sequence of operation	None

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TYPICAL ENABLING CONDITION

The following items are common to all conditions below:

ON malfunction (A), (B), (C), (D) and (E)

The monitor will run whenever the following DTCs are not present.	See page 05–952
Turbine speed sensor (NT) circuit Output speed sensor (NO) circuit Shift solenoid "A" (S1) circuit Shift solenoid "B" (S2) circuit Shift solenoid "E" (SR) circuit Pressure control solenoid "A" (SL1) circuit Pressure control solenoid "B" (SL2) circuit ECT (Engine coolant temperature) sensor circuit KCS sensor circuit	There is no malfunction in the sensor circuits shown on the left
ETCS (Electric throttle control system)	Not system down
Transmission shift position	"D"
ECT	40 C (104 F) or more
Spark advance from Max. retard timing by KCS control	0 CA or more
Engine	Running
Transfer range	"High" *1

Transfer range "HIGH" *1 (This condition is applied only 4WD)

*1: Following conditions met

Vehicle speed sensor "A" circuit Output speed sensor circuit	There is no malfunction in the sensor circuits shown on the left
Transfer output speed	143 rpm or more
NO/NOtf (Transfer input speed/Transfer output speed)	0.93 or more and Less than 1.1

ON malfunction (A)

ECM selected gear	1st
Vehicle speed	2 km/h (1 mph) or more and Less than 40 km/h (25 mph)
Throttle valve opening angle	6.5% or more at engine speed 2,000 rpm (Conditions vary with engine speed)

ON malfunction (B)

ECM selected gear	3rd
Vehicle speed	2 km/h (1 mph) or more
Throttle valve opening angle	6.5% or more at engine speed 2,000 rpm (Conditions vary with engine speed)

ON malfunction (C)

ECM selected gear	4th
Vehicle speed	2 km/h (1 mph) or more
Throttle valve opening angle	6.5% or more at engine speed 2,000 rpm (Conditions vary with engine speed)

ON malfunction (D)

Current ECM selected gear	5th
Last ECM selected gear	4th
Vehicle speed (During transition from 4th to 5th gear)	Less than 100 km/h (62 mph)

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ON malfunction (E)

ECM selected gear	5th
Engine speed – Turbine speed (NE – NT) (After transition from 4th to 5th gear)	Less than 150 rpm
Vehicle speed (After transition from 4th to 5th gear)	Less than 100 km/h (62 mph)

TYPICAL MALFUNCTION THRESHOLDS

[ON malfunction]

Both of the following conditions are met:

□ON malfunction (A) and (B), or ON malfunction(C)

□ON malfunction (D) or (E)

ON malfunction (A)

Turbine speed/Output speed (NT/NO)	3.30 or more and 7.50 or less

ON malfunction (B)

Turbine speed/Output speed (NT/NO)	1.28 or more and 1.53 or less

ON malfunction (C)

Turbine speed/Output speed (NT/NO)	0.93 or more and 1.07 or less

ON malfunction (D)

Turbine speed – Output speed x 4th gear ratio (NT – NO x 4th gear ratio)	1,000 rpm or more

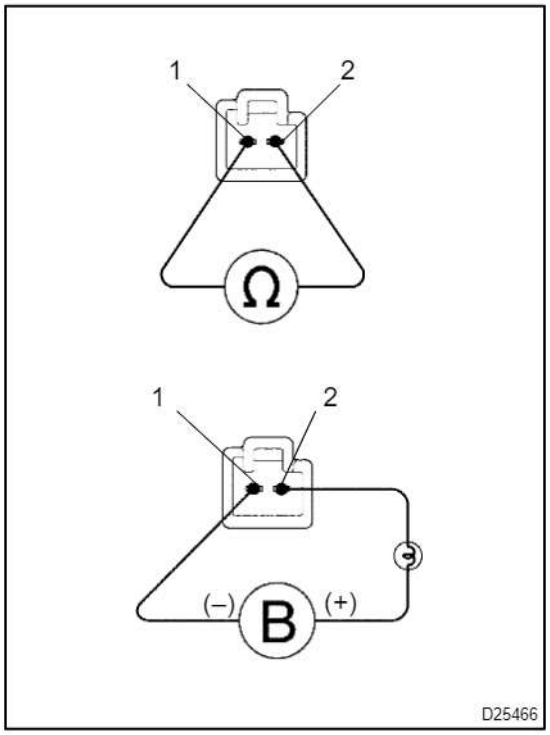
ON malfunction (E)

Turbine speed – Output speed x 5th gear ratio (NT – NO x 5th gear ratio)	1,000 rpm or more

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INSPECTION PROCEDURE

1	INSPECT SHIFT SOLENOID VALVE SL2



(a) Remove the shift solenoid valve SL2.
(b) Measure the resistance between terminals.
OK:
Resistance: 5.0 to 5.6 Ω at 20°C (68°F)
(c) Connect the positive (+) lead with a 21 W bulb to terminal 2 and the negative (–) lead to terminal 1 of the solenoid valve connector, then check the movement of the valve.
OK:
The solenoid makes an operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE SL2 (See page 40–56)**

OK

2	INSPECT TRANSMISSION VALVE BODY ASSY(See chapter 2 in the problem symptoms table) (See page 05–959)

NG → **REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSY (See page 40–56)**

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSY (See page 40–21 or 40–36)

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DTC	P0778	PRESSURE CONTROL SOLENOID "B" ELECTRICAL (SHIFT SOLENOID VALVE SL2)

CIRCUIT DESCRIPTION

See page 05–996.

DTC No.	DTC Detection Condition	Trouble Area
P0778	ECM checks for an open or short circuit in shift solenoid valves SL2 (1–trip detection logic) (a) When solenoid is energized, duty ratio exceed 75% (b) When solenoid is not energized, duty ratio is less than 3%	□Open or short in shift solenoid valve SL2 circuit □Shift solenoid valve SL2 □ECM

MONITOR DESCRIPTION

The ECM commands gearshift by turning the shift solenoid valves "ON/OFF". When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem and illuminates the MIL and stores the DTC. And the ECM performs the fail–safe function and turns the other shift solenoid valves in good condition "ON/OFF" (In case of an open or short circuit, the ECM stops sending current to the circuit.) (see page 05–996).

MONITOR STRATEGY

Related DTCs	P0778 : Shift solenoid valve SL2/Range check
Required sensors/Components	Shift solenoid valve SL2
Frequency of operation	Continuous
Duration	1 sec.
MIL operation	1 driving cycle
Sequence of operation	None

TYPICAL ENABLING CONDITION

The monitor will run whenever the following DTCs are not present.	See page 05–952
Battery voltage	10 V or more

TYPICAL MALFUNCTION THRESHOLDS

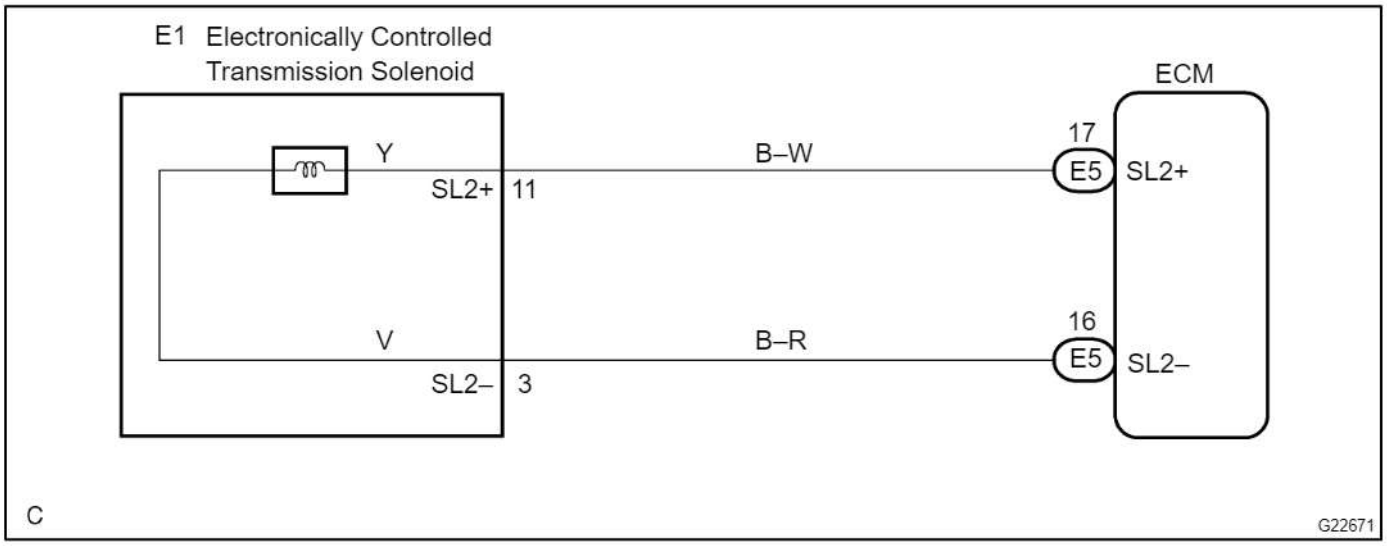
Output signal duty	100%

COMPONENT OPERATING RANGE

Output signal duty	Less than 100%

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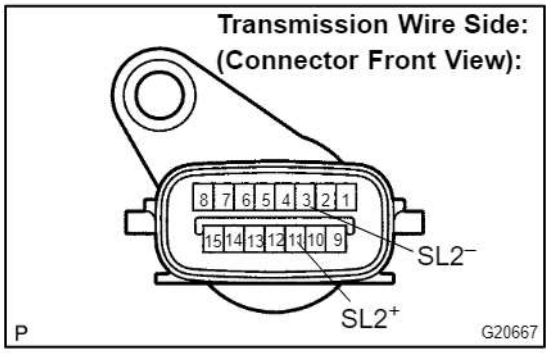
WIRING DIAGRAM



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INSPECTION PROCEDURE

1	INSPECT TRANSMISSION WIRE(SL2)



(a) Disconnect the transmission wire connector from the transmission.

(b) Measure the resistance between terminals SL2+ and SL2–.

OK:

Resistance: 5.0 to 5.6 Ω at 20˚C (68˚F)

(c) Check the continuity between the terminals of transmission wire connector and body ground.

OK:

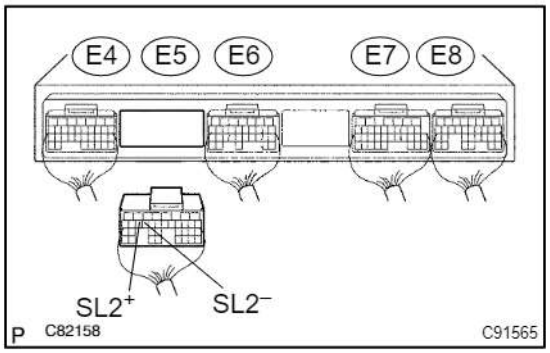
Standard (Check for short):

Symbols	Specified condition
SL2+ – Body ground	No continuity
SL2– – Body ground	

NG	Go to step 3

OK

2	CHECK HARNESS AND CONNECTOR(TRANSMISSION WIRE – ECM)



(a) Connect the transmission wire to the transmission.

(b) Disconnect the ECM connector.

(c) Measure resistance between terminals SL2+ and SL2– of ECM.

OK:

Resistance: 5.0 to 5.6 Ω at 20˚C (68˚F)

(d) Check the continuity between the wire harness side connector.

OK:

Standard (Check for short):

Symbols	Specified condition
SL2+ – Body ground	No continuity
SL2– – Body ground	

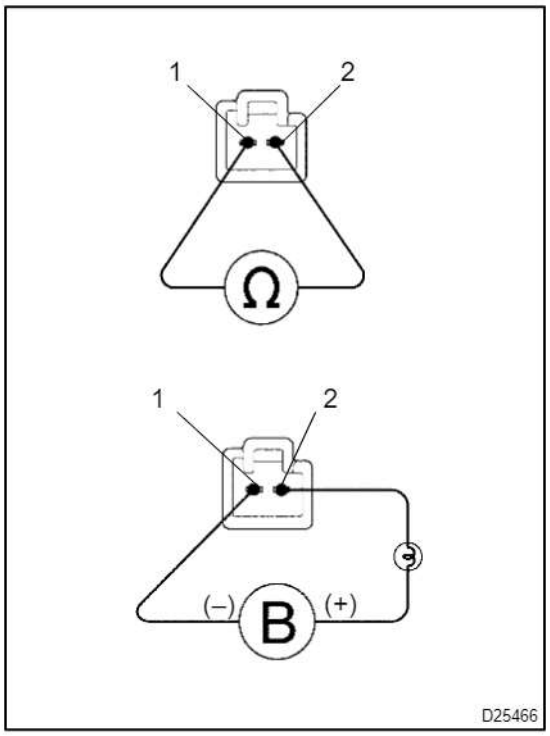
NG	REPAIR OR REPLACE HARNESS OR CONNECTOR (See page 01–35)

OK

CHECK AND REPLACE ECM (See page 10–24)

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3	INSPECT SHIFT SOLENOID VALVE SL2



(a) Remove the shift solenoid valve SL2.

(b) Measure the resistance between terminals.

OK:

Resistance: 5.0 to 5.6 Ω at 20°C (68°F)

(c) Connect the positive (+) lead with a 21 W bulb to terminal 2 and the negative (–) lead to terminal 1 of the solenoid valve connector, then check the movement of the valve.

OK:

The solenoid makes an operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE SL2 (See page 40–56)**

OK

REPAIR OR REPLACE TRANSMISSION WIRE (See page 40–63)

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DTC P0781 1–2 SHIFT (1–2 SHIFT VALVE)

SYSTEM DESCRIPTION

The ECM uses signals from the vehicle speed sensor and direct clutch speed sensor to detect the actual gear position (1st, 2nd, 3rd, 4th or 5th gear). Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems of the shift solenoid valves, valve body or automatic transmission (clutch, brake or gear etc.).

DTC No.	DTC Detecting Condition	Trouble Area
P0781	The gear required by the ECM does not match the actual gear when driving (2–trip detection logic)	□Valve body is blocked up or stuck (1–2 shift) □Automatic transmission assembly □ECM

MONITOR DESCRIPTION

The ECM calculates the ”actual” transmission gear by comparing the signals from the input speed sensor and the output speed sensor. The ECM can detect many mechanical problems in the shift solenoids, valve body, and the transmission clutches, brakes, and gears. If the ECM detects that the actual gear position and the commanded gear position are different, it will illuminate the MIL and a DTC is set.

MONITOR STRATEGY

Related DTCs	P0781 : Valve body/Rationality check
Required sensors/Components	Valve body, Automatic transmission assembly, Speed sensor (NT), Speed sensor (NO), Vehicle speed sensor, Throttle position sensor
Frequency of operation	Continuous
Duration	Condition (A) and (B) 0.4 sec. Condition (C) 3 sec. Condition (D) 0.5 sec.
MIL operation	2 driving cycles
Sequence of operation	None

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TYPICAL ENABLING CONDITION

The following items are common to all conditions below:

Condition (A), (B), (C) and (D)

The monitor will run whenever the following DTCs are not present.	See page 05–952
Turbine speed sensor (NT) circuit Output speed sensor (NO) circuit Shift solenoid "A" (S1) circuit Shift solenoid "B" (S2) circuit Shift solenoid "E" (SR) circuit Pressure control solenoid "A" (SL1) circuit Pressure control solenoid "B" (SL2) circuit ECT (Engine coolant temperature) sensor circuit KCS sensor circuit	There is no malfunction in the sensor circuits shown on the left
ETCS (Electric throttle control system)	Not system down
Transmission shift position	"D"
ECT	40 C (104 F) or more
Spark advance from Max. retard timing by KCS control	0 CA or more
Engine	Running
Transfer range	"High" *1

Transfer range "HIGH" *1 (This condition is applied only 4WD)

*1: Following conditions met

Vehicle speed sensor "A" circuit Output speed sensor circuit	There is no malfunction in the sensor circuits shown on the left
Transfer output speed	143 rpm or more
NO/NOtf (Transfer input speed/Transfer output speed)	0.93 or more and Less than 1.1

Condition (A)

ECM selected gear	2nd
Vehicle speed	2 km/h (1 mph) or more
Output speed	2nd → 1st down shift point or more
Throttle valve opening angle	6.5% or more at engine speed 2,000 rpm (Conditions vary with engine speed)

Condition (B)

ECM selected gear	4th
Vehicle speed	2 km/h (1 mph) or more
Throttle valve opening angle	6.5% or more at engine speed 2,000 rpm (Conditions vary with engine speed)

Condition (C)

Current ECM selected gear	5th
Last ECM selected gear	4th
Vehicle speed (During transition from 4th to 5th gear)	Less than 100 km/h (62 mph)

Condition (D)

ECM selected gear	5th
Engine speed – Turbine speed (NE – NT) (After transition from 4th to 5th gear)	Less than 150 rpm
Vehicle speed (After transition from 4th to 5th gear)	Less than 100 km/h (62 mph)

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TYPICAL MALFUNCTION THRESHOLDS

Both of the following conditions are met:
Condition (A), and Condition (B), (C) or (D)
Condition (A)

Turbine speed/Output speed (NT/NO)	3.30 or more and 7.50 or less

Condition (B)

Turbine speed/Output speed (NT/NO)	1.28 or more and 1.53 or less

Condition (C)

Turbine speed – Output speed x 4th gear ratio (NT – NO x 4th gear ratio)	1,000 rpm or more

Condition (D)

Turbine speed – Output speed x 5th gear ratio (NT – NO x 5th gear ratio)	1,000 rpm or more

INSPECTION PROCEDURE

1	CHECK IF OTHER DTC IS OUTPUT (See page 05–970)

YES → GO TO RELEVANT DTC CHART (See page 05–976)

NO

2	CLEAR THE DTC AND RUNNING TEST (See page 05–943)

(a) Clear the DTC again, and check DTC again after conducting the running test.
OK:
Normal code

OK → END

NG

REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSY (See page 40–56)

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DTC	P0973	SHIFT SOLENOID "A" CONTROL CIRCUIT LOW (SHIFT SOLENOID VALVE S1)

DTC	P0974	SHIFT SOLENOID "A" CONTROL CIRCUIT HIGH (SHIFT SOLENOID VALVE S1)

CIRCUIT DESCRIPTION

See page 05–996.

DTC No.	DTC Detection Condition	Trouble Area
P0973	ECM detects short in solenoid valve S1 circuit 2 times when solenoid valve S1 is operated (1–trip detection logic)	□Short in shift solenoid valve S1 circuit □Shift solenoid valve S1 □ECM
P0974	ECM detects open in solenoid valve S1 circuit 2 times when solenoid valve S1 is not operated (1–trip detection logic)	□Open in shift solenoid valve S1 circuit □Shift solenoid valve S1 □ECM

MONITOR DESCRIPTION

The ECM commands gear shift by turning the shift solenoid valves "ON/OFF". When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem and illuminates the MIL and stores the DTC. And the ECM performs the fail–safe function and turns the other shift solenoid valves in good condition "ON/OFF" (In case of an open or short circuit, the ECM stops sending current to the circuit.) (See page 05–996).

MONITOR STRATEGY

Related DTCs	P0973: Shift solenoid valve S1/Range check (Low resistance) P0974: Shift solenoid valve S1/Range check (High resistance)
Required sensors/Components	Shift solenoid valve S1
Frequency of operation	Continuous
Duration	0.1 sec. x 2 (times) or more
MIL operation	1 driving cycle
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

P0973: Range check (Low resistance)

The monitor will run whenever the following DTCs are not present.	See page 05–952
Solenoid	ON

P0974: Range check (High resistance)

The monitor will run whenever the following DTCs are not present.	See page 05–952
Solenoid	OFF

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TYPICAL MALFUNCTION THRESHOLDS

P0973: Range check (Low resistance)

Intelligent power MOS diagnosis fail signals detected while the solenoid is operated.	Fail as solenoid resistance: 8 Ω or less

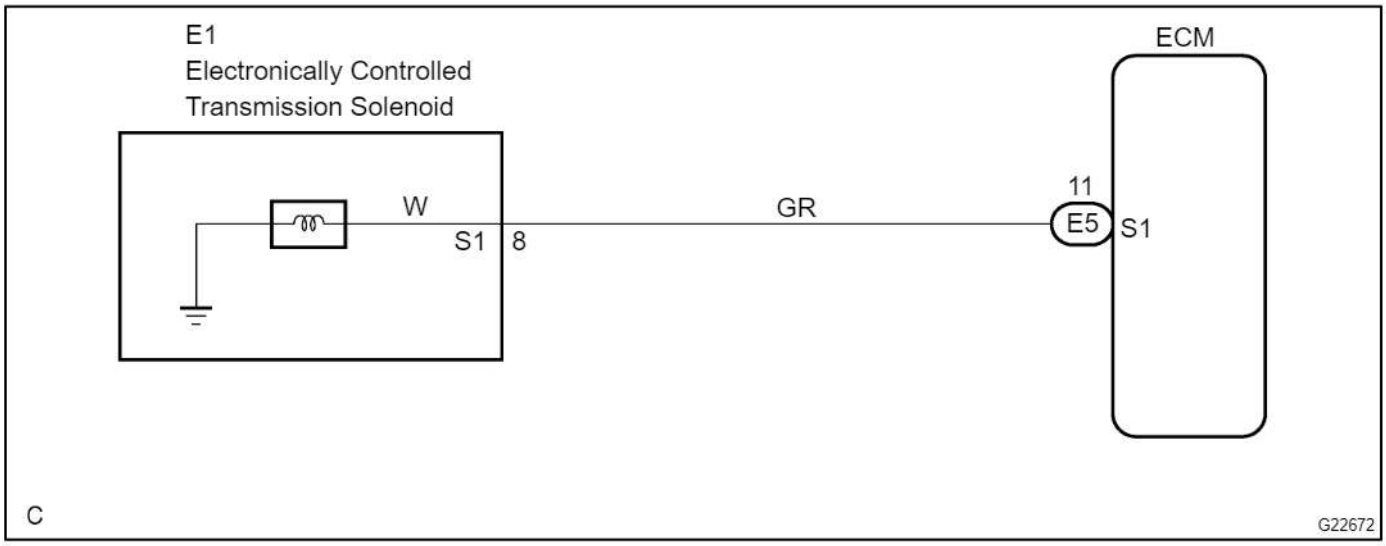
P0974: Range check (High resistance)

Intelligent power MOS diagnosis fail signals detected while the solenoid is not operated.	Fail as solenoid resistance: 100 kΩ or more

COMPONENT OPERATING RANGE

Shift solenoid valve S1 resistance	11 to 15 Ω at 20 C (68 F)

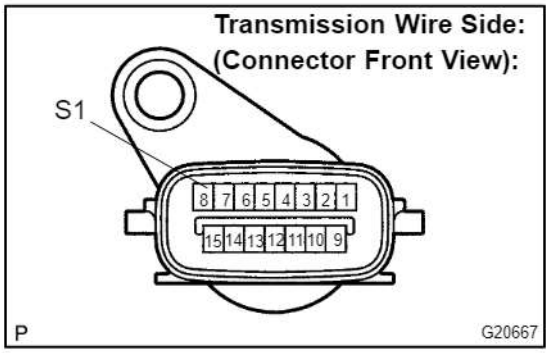
WIRING DIAGRAM



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INSPECTION PROCEDURE

1 INSPECT TRANSMISSION WIRE(S1)

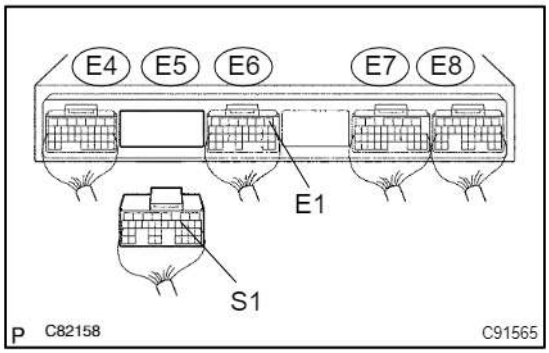


(a) Disconnect the transmission wire connector from the transmission.
(b) Measure resistance between S1 of transmission wire connector and body ground.
OK:
Resistance: 11 to 15 Ω at 20°C (68°F)

NG → **Go to step 3**

OK

2 CHECK HARNESS AND CONNECTOR(TRANSMISSION WIRE – ECM)



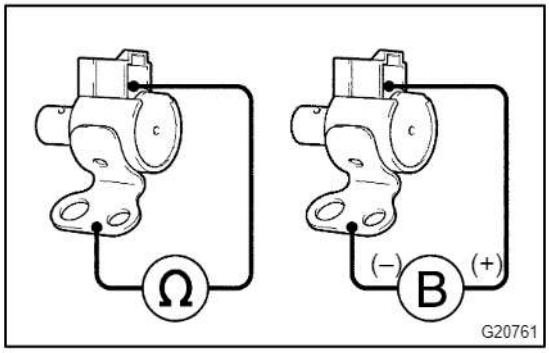
(a) Connect the transmission wire to the transmission.
(b) Disconnect the ECM connector.
(c) Measure resistance between terminals S1 and E1 of ECM connector.
OK:
Resistance: 11 to 15 Ω at 20°C (68°F)

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR (See page 01–35)**

OK

CHECK AND REPLACE ECM (See page 10–24)

3 INSPECT SHIFT SOLENOID VALVE(S1)



(a) Remove the shift solenoid valve S1.
(b) Measure the resistance between the solenoid connector and the solenoid body.
OK:
Resistance: 11 to 15 Ω at 20°C (68°F)
(c) Connector positive (+) lead to the terminal of solenoid connector, negative (–) lead to the solenoid body.
OK:
The solenoid makes an operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE (S1) (See page 40–56)**

OK

REPAIR OR REPLACE TRANSMISSION WIRE (See page 40–63)

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DTC	P0976	SHIFT SOLENOID "B" CONTROL CIRCUIT LOW (SHIFT SOLENOID VALVE S2)

DTC	P0977	SHIFT SOLENOID "B" CONTROL CIRCUIT HIGH (SHIFT SOLENOID VALVE S2)

CIRCUIT DESCRIPTION

See page 05–996.

DTC No.	DTC Detection Condition	Trouble Area
P0976	ECM detects short in solenoid valve S2 circuit 2 times when solenoid valve S2 is operated (1–trip detection logic)	□Short in shift solenoid valve S2 circuit □Shift solenoid valve S2 □ECM
P0977	ECM detects open in solenoid valve S2 circuit 2 times when solenoid valve S2 is not operated (1–trip detection logic)	□Open in shift solenoid valve S2 circuit □Shift solenoid valve S2 □ECM

MONITOR DESCRIPTION

The ECM commands gear shift by turning the shift solenoid valves "ON/OFF". When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem and illuminates the MIL and stores the DTC. And the ECM performs the fail–safe function and turns the other shift solenoid valves in good condition "ON/OFF" (In case of an open or short circuit, the ECM stops sending current to the circuit.) (see page 05–996).

MONITOR STRATEGY

Related DTCs	P0976: Shift solenoid valve S2/Range check (Low resistance) P0977: Shift solenoid valve S2/Range check (High resistance)
Required sensors/Components	Shift solenoid valve S2
Frequency of operation	Continuous
Duration	0.1 sec. x 2 (times) or more
MIL operation	1 driving cycle
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

P0976: Range check (Low resistance)

The monitor will run whenever the following DTCs are not present.	See page 05–952
Solenoid	ON

P0977: Range check (High resistance)

The monitor will run whenever the following DTCs are not present.	See page 05–952
Solenoid	OFF

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TYPICAL MALFUNCTION THRESHOLDS

P0976: Range check (Low resistance)

Intelligent power MOS diagnosis fail signals detected while the solenoid is operated.	Fail at solenoid resistance: 8 Ω or less

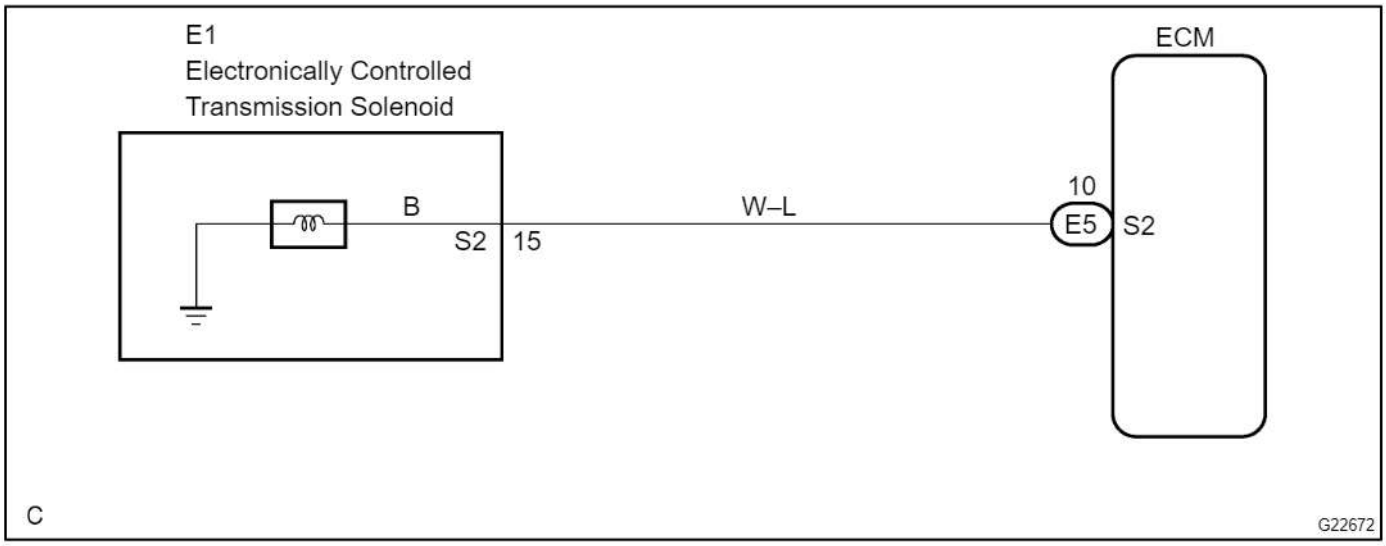
P0977: Range check (High resistance)

Intelligent power MOS diagnosis fail signals detected while the solenoid is not operated.	Fail at solenoid resistance: 100 kΩ or more

COMPONENT OPERATING RANGE

Shift solenoid valve S2 resistance	11 to 15 Ω at 20 C (68 F)

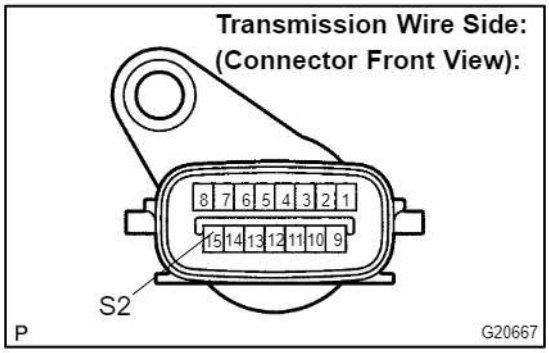
WIRING DIAGRAM



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INSPECTION PROCEDURE

1	INSPECT TRANSMISSION WIRE(S2)

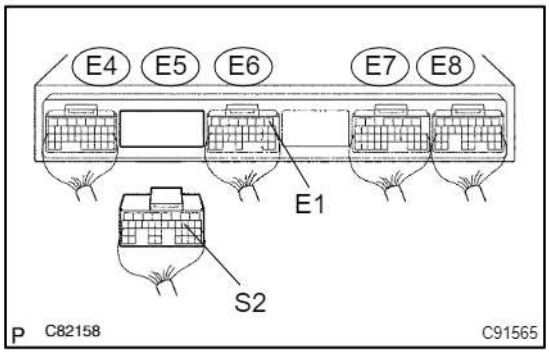


(a) Disconnect the transmission wire connector from the transmission.
(b) Measure resistance between S2 of transmission wire connector and body ground.
OK:
Resistance: 11 to 15 Ω at 20°C (68°F)

NG → **Go to step 3**

OK

2	CHECK HARNESS AND CONNECTOR(TRANSMISSION WIRE – ECM)



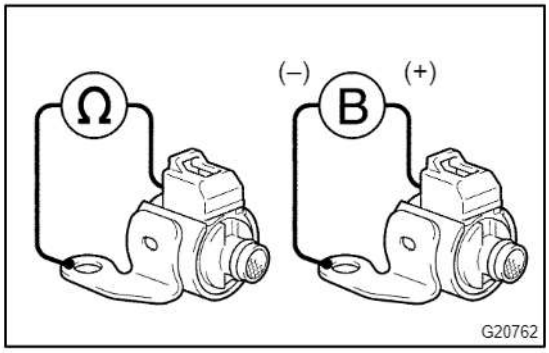
(a) Connect the transmission wire to the transmission.
(b) Disconnect the ECM connector.
(c) Measure resistance between terminals S2 and E1 of ECM connector.
OK:
Resistance: 11 to 15 Ω at 20°C (68°F)

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR (See page 01–35)**

OK

CHECK AND REPLACE ECM (See page 10–24)

3	INSPECT SHIFT SOLENOID VALVE(S2)



(a) Remove the shift solenoid valve S2.
(b) Measure the resistance between the solenoid connector and the solenoid body.
OK:
Resistance: 11 to 15 Ω at 20°C (68°F)
(c) Connector positive (+) lead to the terminal of solenoid connector, negative (–) lead to the solenoid body.
OK:
The solenoid makes an operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE (S2) (See page 40–56)**

OK

REPAIR OR REPLACE TRANSMISSION WIRE (See page 40–63)

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DTC	P0985	SHIFT SOLENOID "E" CONTROL CIRCUIT LOW (SHIFT SOLENOID VALVE SR)

DTC	P0986	SHIFT SOLENOID "E" CONTROL CIRCUIT HIGH (SHIFT SOLENOID VALVE SR)

CIRCUIT DESCRIPTION

See page 05–996.

DTC No.	DTC Detection Condition	Trouble Area
P0985	ECM detects short in solenoid valve SR circuit 2 times when solenoid valve SR is operated (1–trip detection logic)	□Short in shift solenoid valve SR circuit □Shift solenoid valve SR □ECM
P0986	ECM detects open in solenoid valve SR circuit 2 times when solenoid valve SR is not operated (1–trip detection logic)	□Open in shift solenoid valve SR circuit □Shift solenoid valve SR □ECM

MONITOR DESCRIPTION

The ECM commands gear shift by turning the shift solenoid valves "ON/OFF". When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem and illuminates the MIL and stores the DTC. And the ECM performs the fail–safe function and turns the other shift solenoid valves in good condition "ON/OFF" (In case of an open or short circuit, the ECM stops sending current to the circuit.) (see page 05–996).

MONITOR STRATEGY

Related DTCs	P0985: Shift solenoid valve SR/Range check (Low resistance) P0986: Shift solenoid valve SR/Range check (High resistance)
Required sensors/Components	Shift solenoid valve SR
Frequency of operation	Continuous
Duration	0.1 sec. x 2 (times) or more
MIL operation	1 driving cycle
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

P0985: Range check (Low resistance)

The monitor will run whenever the following DTCs are not present.	See page 05–952
Solenoid	ON

P0986: Range check (High resistance)

The monitor will run whenever the following DTCs are not present.	See page 05–952
Solenoid	OFF

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TYPICAL MALFUNCTION THRESHOLDS

P0985: Range check (Low resistance)

Intelligent power MOS diagnosis fail signals detected while the solenoid is operated.	Fail at solenoid resistance: 8 Ω or less

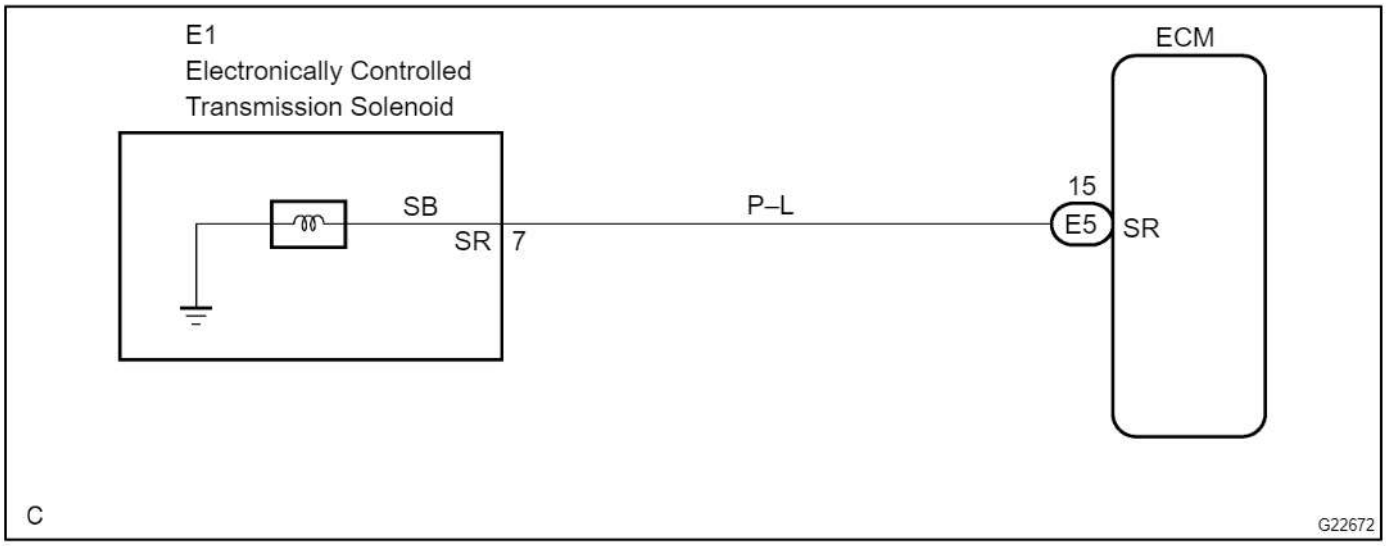
P0986: Range check (High resistance)

Intelligent power MOS diagnosis fail signals detected while the solenoid is not operated.	Fail at solenoid resistance: 100 kΩ or more

COMPONENT OPERATING RANGE

Shift solenoid valve SR resistance	11 to 15 Ω at 20 C (68 F)

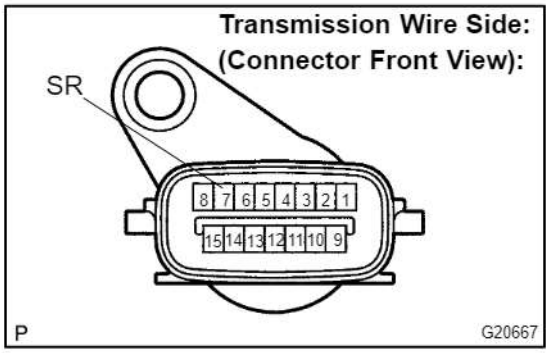
WIRING DIAGRAM



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INSPECTION PROCEDURE

1 INSPECT TRANSMISSION WIRE(SR)

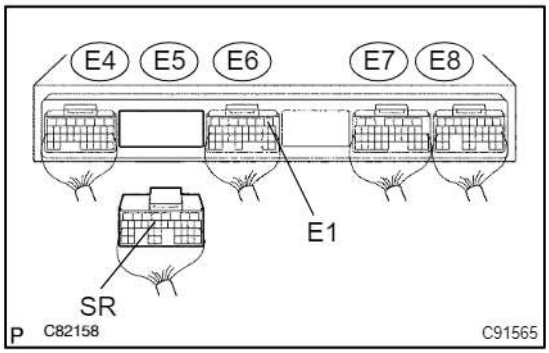


(a) Disconnect the transmission wire connector from the transmission.
(b) Measure resistance between SR of transmission wire connector and body ground.
OK:
Resistance: 11 to 15 Ω at 20°C (68°F)

NG → **Go to step 3**

OK

2 CHECK HARNESS AND CONNECTOR(TRANSMISSION WIRE – ECM)



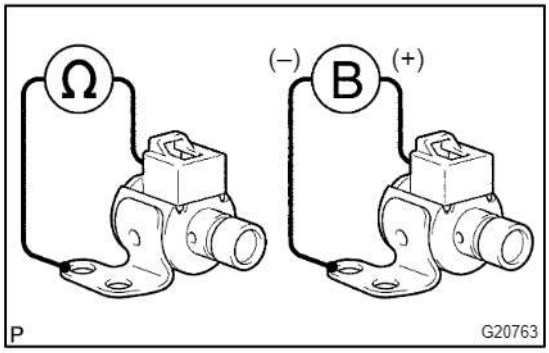
(a) Connect the transmission wire to the transmission.
(b) Disconnect the ECM connector.
(c) Measure resistance between terminals SR and E1 of ECM connector.
OK:
Resistance: 11 to 15 Ω at 20°C (68°F)

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR (See page 01–35)**

OK

CHECK AND REPLACE ECM (See page 10–24)

3 INSPECT SHIFT SOLENOID VALVE(SR)



(a) Remove the shift solenoid valve SR.
(b) Measure the resistance between the solenoid connector and the solenoid body.
OK:
Resistance: 11 to 15 Ω at 20°C (68°F)
(c) Connector positive (+) lead to the terminal of solenoid connector, negative (–) lead to the solenoid body.
OK:
The solenoid makes an operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE (SR) (See page 40–56)**

OK

REPAIR OR REPLACE TRANSMISSION WIRE (See page 40–63)

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DTC P1782 T/F L4 RANGE POSITION SWITCH PERFORMANCE

CIRCUIT DESCRIPTION

The ECM detects the signal from the transfer L4 position switch.
This DTC indicates that the transfer L4 position switch remains ON.

DTC No.	DTC Detecting Condition	Trouble Area
P1782	Transfer L4 position switch remains ON while vehicle running under conditions for 18 seconds or more (1–trip detection logic) (a) Output shaft speed 3000 rpm or less (b) Transfer shift position is H	□Short in transfer L4 position switch circuit □Four wheel drive control ECU □ECM

MONITOR DESCRIPTION

The ECM monitors the transfer–case L4 position switch to determine when the transfer–case L4 gear is engaged. If the transfer–case L4 gears remain engaged under the following conditions, the ECM will conclude that there is a malfunction of the L4 position switch:

- □ L4 switch indicated that the L4 transfer–case gears are engaged.
- □ Transfer–case shifter is in the ”H” position.
- □ Transfer–case output shaft rpm is between 750 and 3,000 rpm.
- □ The specified time period has elapsed.

If all of the above conditions are detected, the ECM will conclude that there is a malfunction of the L4 switch, illuminate the MIL and store the DTC.

MONITOR STRATEGY

Related DTCs	P1782 : Transfer L4 position switch/ON malfunction
Required sensors/Components	Transfer L4 position switch
Frequency of operation	Continuous
Duration	ON malfunction (A) 1.8 sec. ON malfunction (B) 0.5 sec.
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITION

The following items are common to all conditions below:

ON malfunction (A) and (B)

The monitor will run whenever the following DTCs are not present.	See page 05–952
Output speed sensor (NO) circuit Vehicle speed sensor ”A” circuit	There is no malfunction in the circuits shown on the left
Transmission neutral position switch	OFF

ON malfunction (A)

Output speed (Transfer output speed)	1,000 rpm or more and Less than 3,000 rpm

ON malfunction (B)

Output speed (Transfer output speed)	143 rpm or more

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TYPICAL MALFUNCTION THRESHOLDS

Both of the following conditions are met: ON malfunction (A) and (B)

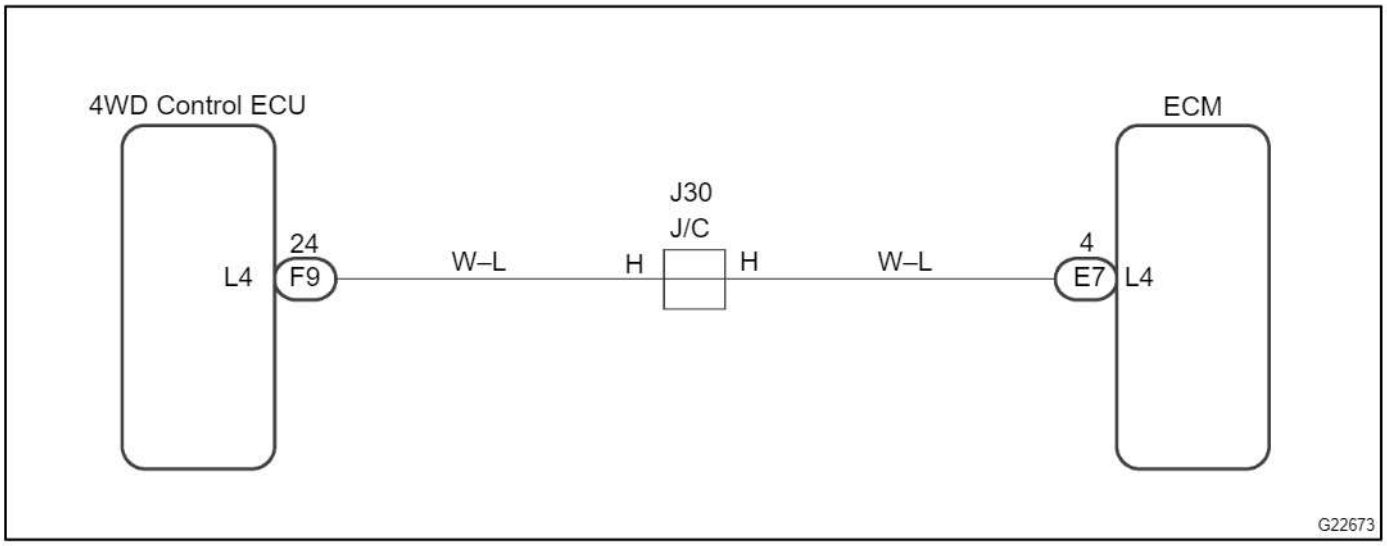
ON malfunction (A)

L4 switch	ON

ON malfunction (B)

Actual transfer gear ratio Transfer input speed/Transfer output speed (NO/NOtf)	0.93 or more and Less than 1.1

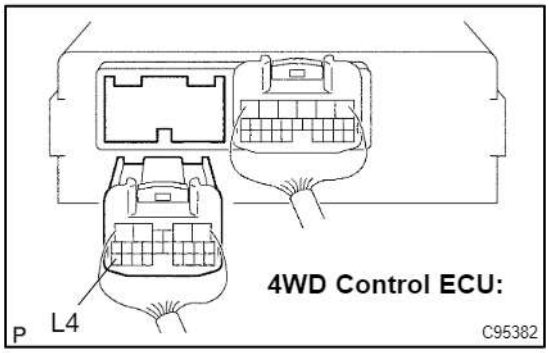
WIRING DIAGRAM



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INSPECTION PROCEDURE

1	INSPECT TERMINAL VOLTAGE(L4 – BODY GROUND)

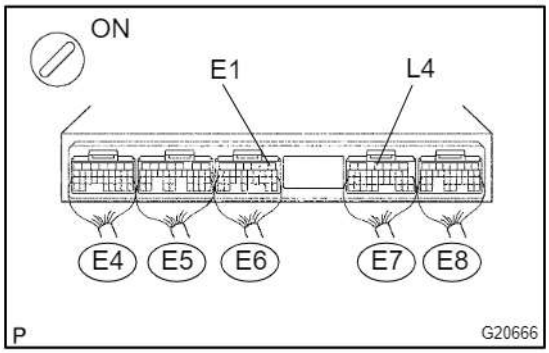


(a) Disconnect the four wheel drive control ECU connector.
(b) Turn the ignition switch ON.
(c) Measure the voltage between terminal L4 of four wheel drive control ECU and body ground.
OK:
Voltage: 10 to 14 V

OK	CHECK AND REPLACE FOUR WHEEL DRIVE CONTROL ECU (See page 01–35)

NG

2	INSPECT TERMINAL VOLTAGE(L4 – E1)



(a) Turn the ignition switch ON.
(b) Measure the voltage between terminal L4 and E1 of ECM.
OK:
Voltage: 10 to 14 V

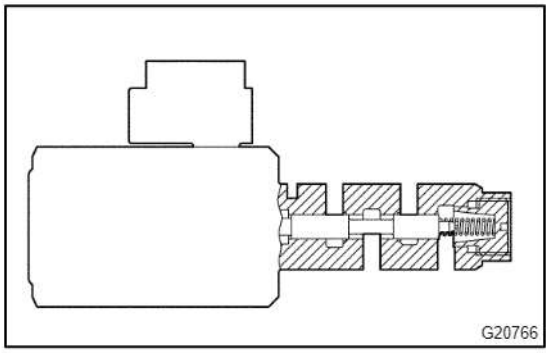
OK	REPAIR OR REPLACE HARNESS OR CONNECTOR (See page 01–35)

NG

CHECK AND REPLACE ECM (See page 10–24)

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DTC	P2714	PRESSURE CONTROL SOLENOID ”D” PERFORMANCE (SHIFT SOLENOID VALVE SLT)



SYSTEM DESCRIPTION

The ECM calculates the shifting condition by using the signals from the vehicle speed sensor, throttle position sensor, etc.. And compares this result with the signal that ECM sends to SLT to detect mechanical trouble of the shift solenoid valve SLT, valve body, torque converter clutch and automatic transmission assembly (clutch, brake or gear etc.).

DTC No.	DTC Detecting Condition	Trouble Area
P2714	ECM detects a malfunction on SLT (ON side) according to the revolution difference of the turbine and the output shaft, and also by the oil pressure.	□Shift solenoid valve SLT is stuck open or closed □Valve body blocked up or stuck □Automatic transmission assembly

MONITOR DESCRIPTION

The ECM sends (ED: delete ”the”) signals (Duty Ratio) to the shift solenoid valve SLT based on the information such as the signal from throttle position sensor and the vehicle speed sensor.
Based on the signal’s duty–ratio, the shift solenoid valve SLT adjusts the hydraulic pressure to the primary regulator valve to an appropriate level. This function enables a smooth vehicle operation by adjusting the line hydraulic pressure to match the engine output and running condition.
The ECM calculates the ”actual” transmission gear by comparing the signals from the input speed sensor and the output speed sensor. The ECM can detect many mechanical problems in the shift solenoids, valve body, and the transmission clutches, brakes, and gears. If the ECM detects that the actual gear position and the commanded gear position are different, it will illuminate the MIL and store the DTC.

MONITOR STRATEGY

Related DTCs	P2714 : Shift solenoid valve SLT/ON malfunction
Required sensors/Components	Shift solenoid valve SLT, Valve body, ATF temperature sensor, Speed sensor (NT), Speed sensor (NO)
Frequency of operation	Continuous
Duration	Immediate
MIL operation	2 driving cycles
Sequence of operation	None

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TYPICAL ENABLING CONDITION

The monitor will run whenever the following DTCs are not present.	See page 05–952
Turbine speed sensor (NT) circuit Output speed sensor (NO) circuit Transmission fluid temperature sensor "A" circuit Shift solenoid "A" (S1) circuit Shift solenoid "B" (S2) circuit Shift solenoid "E" (SR) circuit Pressure control solenoid "A" (SL1) circuit Pressure control solenoid "B" (SL2) circuit Pressure control solenoid "D" (SLT) circuit ECT (Engine coolant temperature) sensor circuit KCS sensor circuit	There is no malfunction in the sensor circuits shown on the left
ETCS (Electric throttle control system)	Not system down
Transmission shift position	"D"
ECT	40 C (104 F) or more
Spark advance from Max. retard timing by KCS control	0 CA or more
Engine	Running
Transfer range	"High" *1
ATF temperature	10°C (50°F) or more

Transfer range "HIGH" *1 (This condition is applied only 4WD)

*1: Following conditions met

Vehicle speed sensor "A" circuit Output speed sensor circuit	There is no malfunction in the sensor circuits shown on the left
Transfer output speed	143 rpm or more
NO/NOtf (Transfer input speed/Transfer output speed)	0.93 or more and Less than 1.1

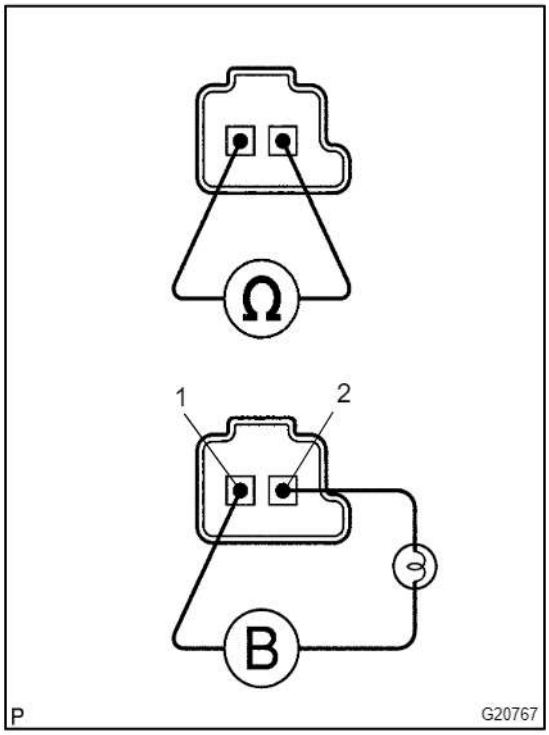
TYPICAL MALFUNCTION THRESHOLDS

Summation of C1 clutch heat generations = Σ (Turbine speed – Output speed x Temporary ratio)	Specified value

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INSPECTION PROCEDURE

1	INSPECT SHIFT SOLENOID VALVE(SLT)



(a) Remove the shift solenoid valve SLT.
(b) Measure the resistance between terminals.
OK:
Resistance: 5.0 to 5.6 Ω at 20˚C (68˚F)
(c) Connect the positive (+) lead with a 21 W bulb to terminal 2 and the negative (–) lead to terminal 1 of the solenoid valve connector, then check the movement of the valve.
OK:
The solenoid makes an operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE (SLT) (See page 40–56)**

OK

2	INSPECT TRANSMISSION VALVE BODY ASSY(See chapter 2 in the problem symptoms table) (See page 05–959)

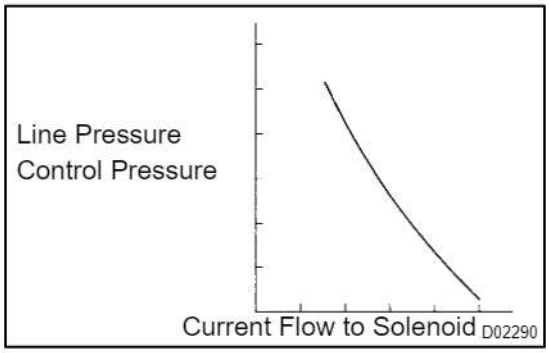
NG → **REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSY (See page 40–56)**

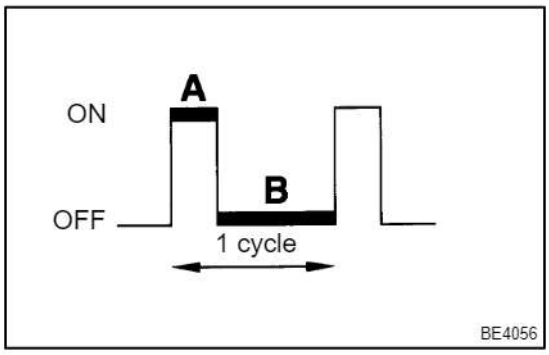
OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSY (See page 40–21 or 40–36)

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DTC P2716 PRESSURE CONTROL SOLENOID "D" ELECTRICAL (SHIFT SOLENOID SLT)





CIRCUIT DESCRIPTION

The throttle pressure that is applied to the primary regulator valve (which modulates the line pressure) causes the solenoid valve SLT, under electronic control, to precisely and minutely modulate and generate the line pressure according the extent of the accelerator pedal depressed or the output of engine power.

This controls the line pressure and provides smooth shifting characteristics.

Upon receiving a signal of the throttle valve opening angle, the ECM controls the line pressure by sending a predetermined (*) duty ratio to the solenoid valve, modulating the line pressure and generating throttle pressure.

(*): Duty Ratio

The duty ratio is the ratio of the period of continuity in one cycle. For example, if A is the period of continuity in one cycle, and B is the period of non–continuity, then

Duty Ratio=A/(A+B) x 100 (%)

DTC No.	DTC Detection Condition	Trouble Area
P2716	ECM detects solenoid SLT circuit malfunction for 1 sec. or more (1–trip detection logic)	□Open or short in shift solenoid valve SLT circuit □Shift solenoid valve SLT □ECM

MONITOR DESCRIPTION

When an open or short in the linear solenoid valve (SLT) circuit is detected, the ECM interprets this as a fault. The ECM will turn ON the MIL and store the DTC.

MONITOR STRATEGY

Related DTCs	P2716: Shift solenoid valve SLT/Range check
Required sensors/Components	Shift solenoid valve SLT
Frequency of operation	Continuous
Duration	1 sec.
MIL operation	1 driving cycle
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present.	See page 05–952
Solenoid current cut status	Not cut
Battery voltage	11 V or more
CPU command duty ratio to SLT	19% or more

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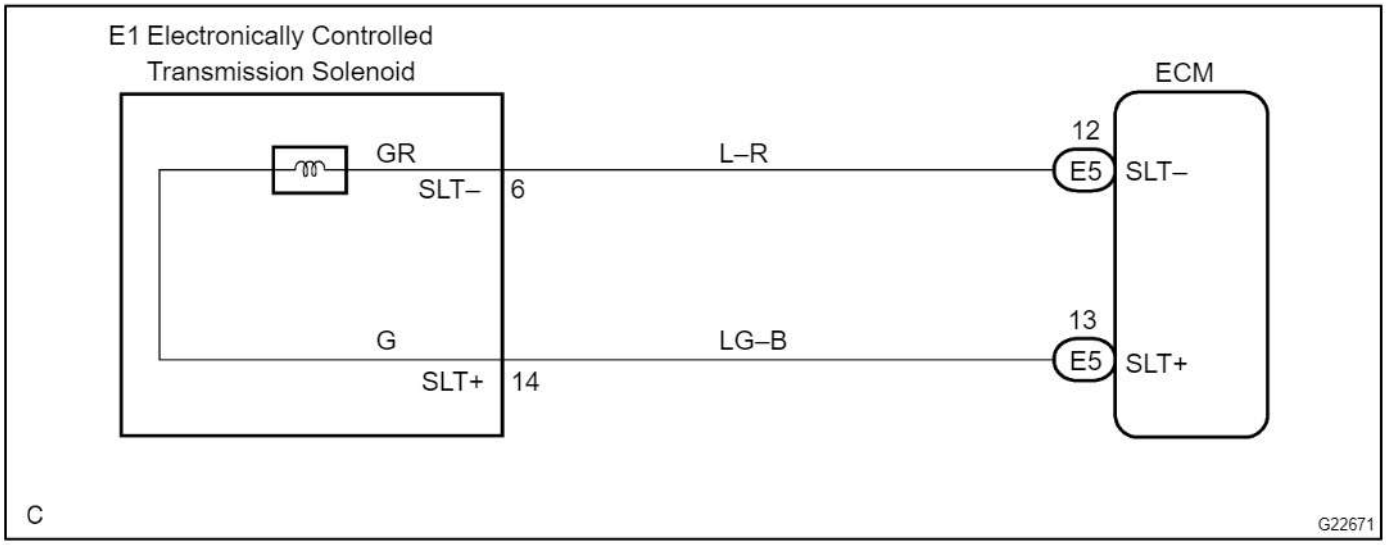
TYPICAL MALFUNCTION THRESHOLDS

Solenoid status (SLT) from IC	Fail (Open or short)

COMPONENT OPERATING RANGE

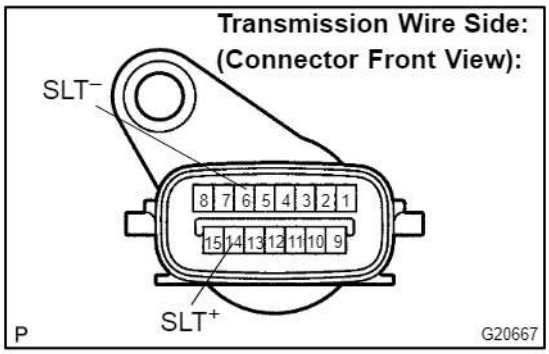
Output signal duty	Less than 100%

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT TRANSMISSION WIRE(SLT)



(a) Disconnect the transmission wire connector from the transmission.

(b) Measure the resistance between terminals SLT+ and SLT–.

OK:

Resistance: 5.0 to 5.6 Ω at 20˚C (68˚F)

(c) Check the continuity between the terminals of transmission wire connector and body ground.

OK:

Standard (Check for short):

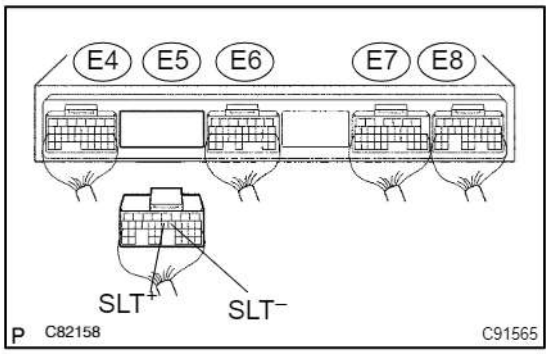
Symbols	Specified condition
SLT+ – Body ground	No continuity
SLT– – Body ground	

NG	Go to step 3

OK

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2 CHECK HARNESS AND CONNECTOR(TRANSMISSION WIRE – ECM)



(a) Connect the transmission wire to the transmission.
(b) Disconnect the ECM connector.
(c) Measure resistance between terminals SLT+ and SLT– of ECM.
OK:
Resistance: 5.0 to 5.6 Ω at 20˚C (68˚F)
(d) Check the continuity between the wire harness side connector.
OK:
Standard (Check for short):

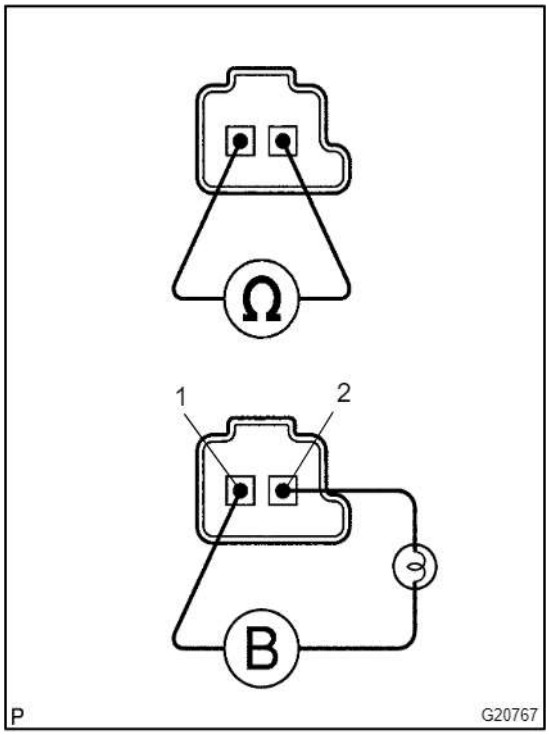
Symbols	Specified condition
SLT+ – Body ground	No continuity
SLT– – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR (See page 01–35)**

OK

CHECK AND REPLACE ECM (See page 10–24)

3 INSPECT SHIFT SOLENOID VALVE(SLT)



(a) Remove the shift solenoid valve SLT.
(b) Measure the resistance between terminals.
OK:
Resistance: 5.0 to 5.6 Ω at 20˚C (68˚F)
(c) Connect the positive (+) lead with a 21 W bulb to terminal 2 and the negative (–) lead to terminal 1 of the solenoid valve connector, then check the movement of the valve.
OK:
The solenoid makes an operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE(SLT) (See page 40–56)**

OK

REPAIR OR REPLACE TRANSMISSION WIRE (See page 40–63)

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DTC	P2740	TRANSMISSION FLUID TEMPERATURE SENSOR "B" CIRCUIT

DTC	P2742	TRANSMISSION FLUID TEMPERATURE SENSOR "B" CIRCUIT LOW INPUT

DTC	P2743	TRANSMISSION FLUID TEMPERATURE SENSOR "B" CIRCUIT HIGH INPUT

CIRCUIT DESCRIPTION

ATF temperature sensor No.2 is on the transmission and just before the oil cooler inlet pipeline.
If ECM detects the abnormally high temperature of ATF by this sensor, it draws driver's attention by illuminating the warning lamp.
HINT:

- The temperature of ATF easily raises when towing, climbing hills and in traffic, etc.
- If the ATF temperature sensor No.2 shorts, the signal that indicates the ATF temperature is 150 C (302 F) or higher is input in ECM.

Vehicle conditions when sensor is in normal and when the sensor is in short are indicated in the table below.

ATF temperature No.2 Sensor State	Detection Condition	Symptom	Recovery Condition
Sensor is normal	□AT fluid temp. more than 150 C (302 F).	□AT Oil Temp. warning light remains on	□AT fluid temp. less than 135 C (275 F). *2
	□AT fluid temp. more than 130 C (266 F).	□Shift point too high.	□AT fluid temp. less than 110 C (230 F).
	When the conditions (a) and (b) are satisfied continuity. (a) AT fluid temp. more than 130 C (266 F). (b) Engine coolant temp. more than 95 C (203 F).	□Lock–up at 3rd gear. *1	□AT fluid temp. less than 110 C (230 F) *2 and engine coolant temp. less than 95 C (203 F).
Sensor is in short	□Any conditions.	□AT Oil Temp. warning light remains on □Shift point too high.	□Symptoms still occur
	□Engine coolant temp. more than 95 C (203 F).	□Lock–up at 3rd gear. *1	□Symptoms still occur

HINT:
*1: When AT fluid temperature is normal, transmission locks up at 5th gear with the shift lever in D position and at 4th gear with the shift lever in 4 position.
*2: When AT fluid temperature is in normal range, it decreases to less than 135 C (275 F) within 5 minutes with the shift lever in P or N position in a idling state.

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DTC No.	DTC Detecting Condition	Trouble Area
P2740	(a) and (b) is detected momentary within 0.5 sec. when neither P2742 or P2743 is not detected (1–trip detection logic) (a) ATF temperature sensor resistance is less than 25 Ω (b) ATF temperature sensor resistance is more than 156 kΩ HINT: Within 0.5 sec. the malfunction switches from (a) to (b) or from (b) to (a)	□Open or short in ATF temperature sensor No.2 circuit □ATF temperature sensor No.2 □ECM
P2742	ATF temperature sensor resistance is less than 25 Ω for 0.5 sec. or more (1–trip detection logic)	
P2743	DTC is detected for 0.5 sec. or more (1–trip detection logic) ATF temperature sensor resistance is more than 156 kΩ after started engine for 15 minutes or more	

MONITOR DESCRIPTION

The Automatic Transmission Fluid (ATF) temperature sensor converts ATF temperature to an electrical resistance value. Based on the resistance, the ECM determines the ATF temperature, and the ECM detects an open or short in the AFT temperature circuit. If the resistance value of the ATF temperature is less than 25 Ω or more than 156 kΩ, the ECM interprets this as a fault in the ATF sensor or wiring. The ECM will turn on the MIL and store the DTC.

MONITOR STRATEGY

Related DTCs	P2740 : ATF temperature sensor/Range check (Fluttering) P2742 : ATF temperature sensor/Range check (Low resistance) P2743 : ATF temperature sensor/Range check (High resistance)
Required sensors/Components	ATF temperature sensor
Frequency of operation	Continuous
Duration	0.5 sec.
MIL operation	Immediate
Sequence of operation	None

TYPICAL ENABLING CONDITION

P2740: Range check (Fluttering)

The monitor will run whenever the following DTCs are not present.	See page 05–952
The typical enabling condition is not available.	–

P2742: Range check (Low resistance)

The monitor will run whenever the following DTCs are not present.	See page 05–952
The typical enabling condition is not available.	–

P2743: Range check (High resistance)

The monitor will run whenever the following DTCs are not present.	See page 05–952
Time after engine start up	15 min. or more

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TYPICAL MALFUNCTION THRESHOLDS

P2740: Range check (Fluttering)

ATF temperature sensor resistance	Less than 25 Ω or More than 156 kΩ

P2742: Range check (Low resistance)

ATF temperature sensor resistance	Less than 25 Ω

P2743: Range check (High resistance)

ATF temperature sensor resistance	More than 156 kΩ

COMPONENT OPERATING RANGE

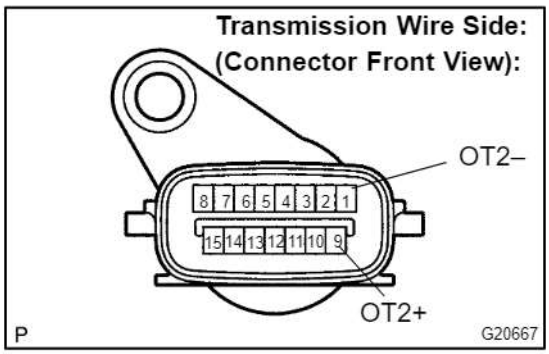
ATF temperature sensor	Atmospheric temperature to approx. 130 C (266 F)

WIRING DIAGRAM

Refer to DTC P0710 on page 05–983.

INSPECTION PROCEDURE

1	INSPECT TRANSMISSION WIRE(ATF TEMPERATURE SENSOR)



(a) Disconnect the transmission wire connector from the transmission.

(b) Measure the resistance between terminals OT2+ and OT2–.

OK:

79 Ω to 156 kΩ

(c) Check the continuity between the terminals of transmission wire connector and body ground.

OK:

Standard (Check for short):

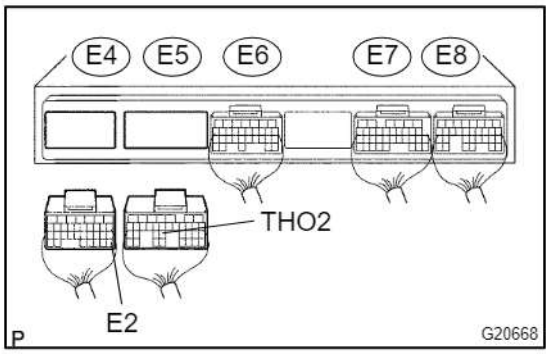
Symbols	Specified condition
OT2+ – Body ground	No continuity
OT2– – Body ground	

NG → **REPAIR OR REPLACE TRANSMISSION WIRE (See page 40–63)**

OK

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2	CHECK HARNESS AND CONNECTOR(TRANSMISSION WIRE – ECM)



(a) Connect the transmission wire connector.
(b) Disconnect the ECM connectors.
(c) Measure the resistance between terminals THO2 and E2.
OK:
79 Ω to 156 kΩ
(d) Check the continuity between the wire harness side connectors.
OK:
Standard (Check for short):

Symbols	Specified condition
THO2 – Body ground	No continuity
E2 – Body ground	

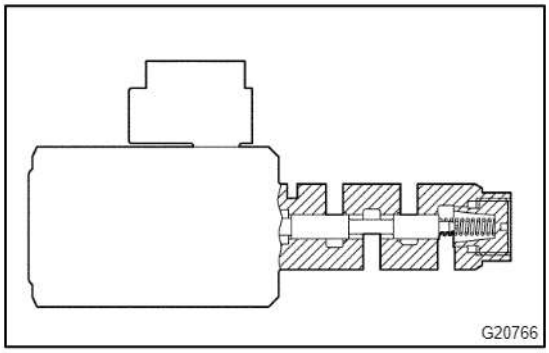
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR (See page 01–35)**

OK

CHECK AND REPLACE ECM (See page 10–24)

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DTC	P2757	TORQUE CONVERTER CLUTCH PRESSURE CONTROL SOLENOID PERFORMANCE (SHIFT SOLENOID VALVE SLU)



SYSTEM DESCRIPTION

The ECM uses the signals from the Throttle Position Sensor and Air–flow Meter to monitor the engagement condition of the lock–up clutch.

Then the ECM compares the engagement condition of the lock–up clutch with the lock–up schedule in the ECM memory to detect mechanical trouble of the shift solenoid valve SLU, valve body, torque converter clutch and automatic transmission assembly (clutch, brake or gear etc.).

DTC No.	DTC Detecting Condition	Trouble Area
P2757	Lock–up does not occur when driving in the lock–up range (normal driving at 80 km/h [50 mph]), or lock–up remains ON in the lock–up OFF range. (2–trip detection logic)	□Shift solenoid valve SLU is stuck open or closed □Valve body blocked up or stuck □Lock–up clutch □Automatic transmission assembly

MONITOR DESCRIPTION

The ECM controls the oil pressure to the lock–up clutch based on engine–load information from the throttle position sensor, crankshaft position sensor, input speed sensor, and the oil pressure sensor for shift–solenoid SLU. The ECM commands the shift–solenoid SLU using a duty–cycle control signal. In turn, the shift solenoid operates the lock–up control valve and causes lock–up or flexible lock–up of the torque converter clutch.

To monitor the condition of the lock up clutch, the ECM monitors the signals from the input speed sensor, crank position sensor, the throttle position sensor, and air flow meter. The ECM uses this information to determine when the vehicle's torque converter clutch should be locked–up. The ECM can detect many mechanical problems in the shift solenoids, valve body, and the transmission clutches, brakes, and gears. If the ECM detects that the torque converter clutch locked below the minimum lock–up speed, it will illuminate the MIL and store the DTC.

MONITOR STRATEGY

Related DTCs	P2757: Shift solenoid valve SLU/OFF malfunction Shift solenoid valve SLU/ON malfunction
Required sensors/Components	Shift solenoid valve SLU, Valve body, Vehicle speed sensor, Throttle position sensor, Speed sensor (NT), Speed sensor (NO)
Frequency of operation	Continuous
Duration	OFF malfunction: 2 sec. ON malfunction: 1.8 sec.
MIL operation	2 driving cycles
Sequence of operation	None

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TYPICAL ENABLING CONDITIONS

The following items are common to all conditions below:

OFF malfunction and ON malfunction

The monitor will run whenever the following DTCs are not present.	See page 05–952
Turbine speed sensor (NT) circuit Output speed sensor (NO) circuit Shift solenoid "A" (S1) circuit Shift solenoid "B" (S2) circuit Shift solenoid "E" (SR) circuit Pressure control solenoid "B" (SL2) circuit Torque converter clutch pressure control solenoid circuit KCS sensor circuit 1 – 2 shift valve	There is no malfunction in the sensor circuits shown on the left
ETCS (Electric throttle control system)	Not system down
Transmission shift position	"D"
ECT	40 C (104 F) or more
Spark advance from Max. retard timing by KCS control	0 CA or more
Engine	Running
ECM selected gear	4th or 5th
Vehicle speed	25 km/h (16 mph) or more
Transfer neutral position switch	OFF
Transfer range	"High" *1

Transfer range "HIGH" *1 (This condition is applied only 4WD)

*1: Following conditions met

Vehicle speed sensor "A" circuit Output speed sensor circuit	There is no malfunction in the sensor circuits shown on the left
Transfer output speed	143 rpm or more
NO/NOtf (Transfer input speed/Transfer output speed)	0.9 or more and Less than 1.1

OFF malfunction

ECM lock – up command	ON (SLU pressure: 513 kPa or more)
Vehicle speed	Less than 100 km/h (62 mph)

ON malfunction

ECM lock – up command	OFF (SLU pressure: less than 4 kPa)
Throttle valve opening angle	9% or more
Vehicle speed	Less than 60 km/h (38 mph)

TYPICAL MALFUNCTION THRESHOLDS

OFF malfunction

Engine speed – Turbine speed	70 rpm or more

ON malfunction

It is necessary 2 detections/one driving cycle
1st detection; temporary flag ON
2nd detection; pending fault code ON
Vehicle speed must be under 10 km/h (6 mph) once before 2nd detection.

|Engine speed – Turbine speed|	Less than 35 rpm

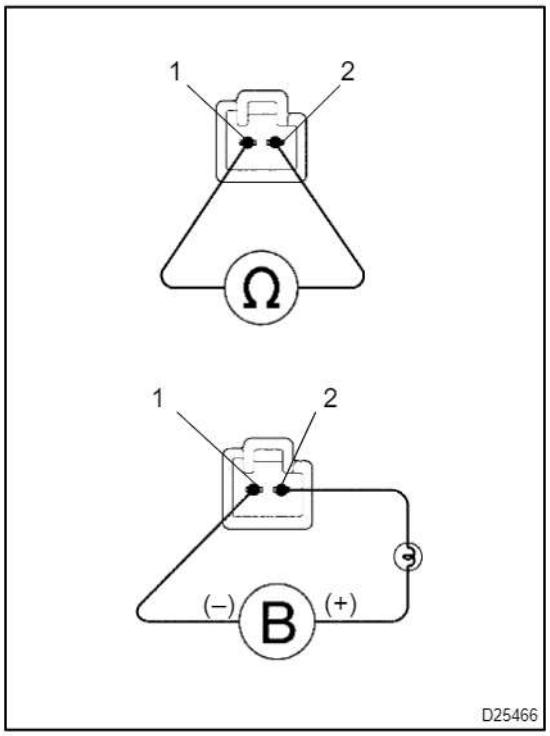
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COMPONENT OPERATING RANGE

Speed sensor (NT)	Input speed is equal to engine speed when lock–up ON.

INSPECTION PROCEDURE

1	INSPECT SHIFT SOLENOID VALVE(SLU)



(a) Remove the shift solenoid valve SLU.
(b) Measure the resistance between terminals.
OK:
Resistance: 5.0 to 5.6 Ω at 20˚C (68˚F)
(c) Connect the positive (+) lead with a 21 W bulb to terminal 2 and the negative (–) lead to terminal 1 of the solenoid valve connector, then check the movement of the valve.
OK:
The solenoid makes an operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE (SLU) (See page 40–56)**

OK

2	INSPECT TRANSMISSION VALVE BODY ASSY(See chapter 2 in the problem symptoms table) (See page 05–959)

NG → **REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSY (See page 40–56)**

OK

3	INSPECT TORQUE CONVERTER CLUTCH ASSY (See page 40–45)

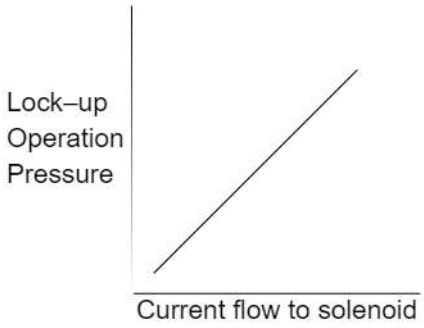
OK → **REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSY (See page 40–21 or 40–36)**

NG

REPLACE TORQUE CONVERTER CLUTCH ASSY

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DTC	P2759	TORQUE CONVERTER CLUTCH PRESSURE CONTROL SOLENOID CONTROL CIRCUIT ELECTRICAL (SHIFT SOLENOID VALVE SLU)

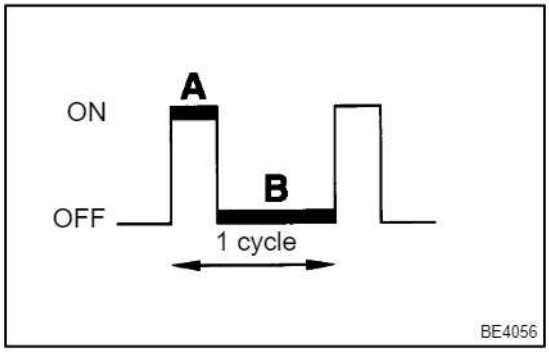


CIRCUIT DESCRIPTION

The amount of current flow to the solenoid is controlled by the (*) duty ratio of the ECM output signal. The higher the duty ratio becomes, the higher the lock–up hydraulic pressure becomes during the lock–up operation.

(*) Duty Ratio

The duty ratio is the ratio of the period of continuity in one cycle. For example, if A is the period of continuity in one cycle, and B is the period of non–continuity, then Duty Ratio = A/(A+B) x 100(%).



DTC No.	DTC detection condition	Trouble Area
P2759	The following condition is detected (1–trip detection logic). SLU output signal's duty ON of 3.3 msec. or more with duty ratio of least 95% lasts for 1 second.	□Open or short in shift solenoid valve SLU circuit □Shift solenoid valve SLU □ECM

MONITOR DESCRIPTION

The ECM controls the oil pressure to the lock–up clutch based on engine–load information from the throttle position sensor, crankshaft position sensor, input speed sensor, and the oil pressure sensor for shift–solenoid SLU. The ECM commands the shift–solenoid SLU using a duty–cycle control signal. In turn, the shift solenoid operates the lock–up control valve and cause lock–up or flexible lock–up of the torque converter clutch. The ECM illuminates the MIL and store the DTC when ECM detects an open or a short circuit malfunction in the shift solenoid valve SLU.

MONITOR STRATEGY

Related DTCs	P2759: Shift solenoid valve SLU/Range check
Required sensors/Components	Shift solenoid valve SLU
Frequency of operation	Continuous
Duration	1 sec.
MIL operation	Immediate
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present.	See page 05–952
Battery voltage	10 V or more

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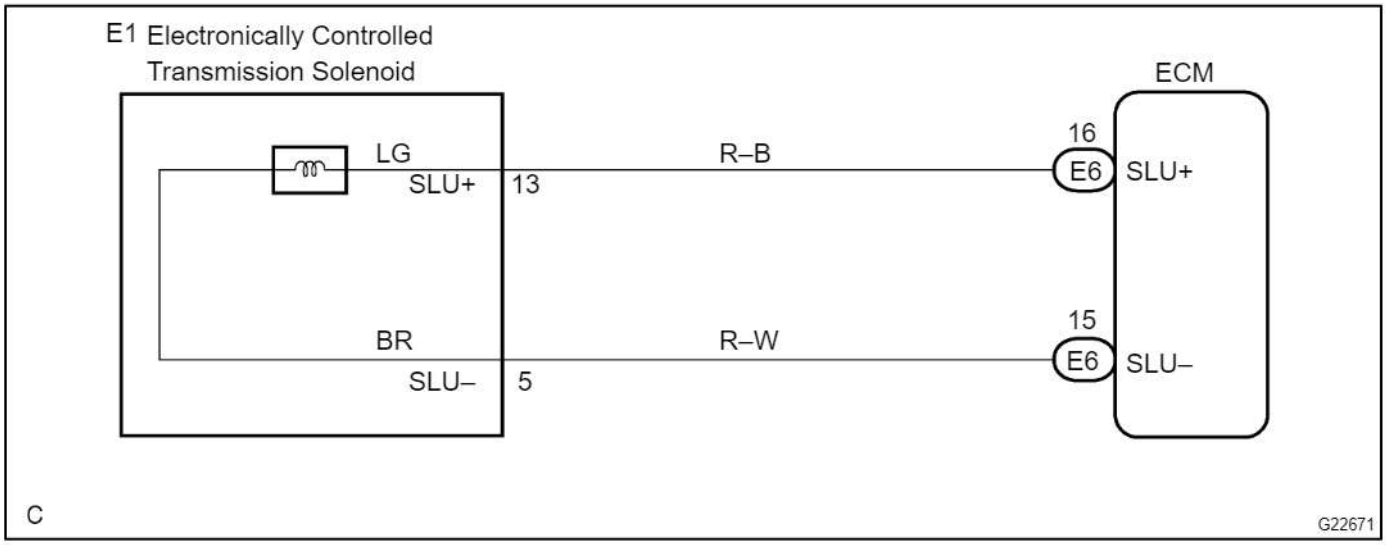
TYPICAL MALFUNCTION THRESHOLDS

Output signal duty	100%

COMPONENT OPERATING RANGE

Output signal duty	Less than 100%

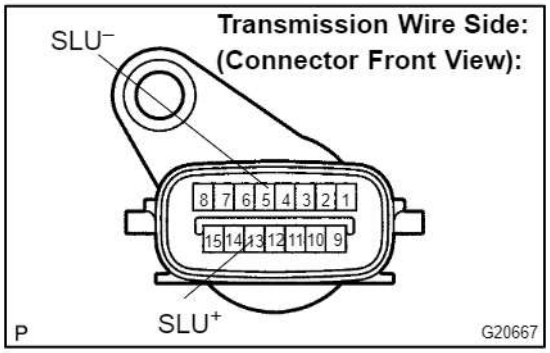
WIRING DIAGRAM



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INSPECTION PROCEDURE

1	INSPECT TRANSMISSION WIRE(SLU)



(a) Disconnect the transmission wire connector from the transmission.

(b) Measure the resistance between terminals SLU+ and SLU–.

OK:

Resistance: 5.0 to 5.6 Ω at 20˚C (68˚F)

(c) Check the continuity between the terminals of transmission wire connector and body ground.

OK:

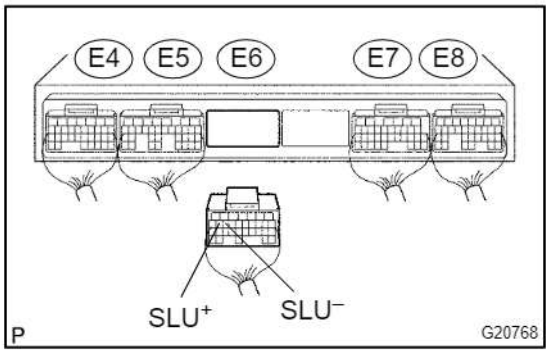
Standard (Check for short):

Symbols	Specified condition
SLU+ – Body ground	No continuity
SLU– – Body ground	

NG → **Go to step 3**

OK

2	CHECK HARNESS AND CONNECTOR(TRANSMISSION WIRE – ECM)



(a) Connect the transmission wire to the transmission.

(b) Disconnect the ECM connector.

(c) Measure resistance between terminals SLU+ and SLU– of ECM.

OK:

Resistance: 5.0 to 5.6 Ω at 20˚C (68˚F)

(d) Check the continuity between the wire harness side connector.

OK:

Standard (Check for short):

Symbols	Specified condition
SLU+ – Body ground	No continuity
SLU– – Body ground	

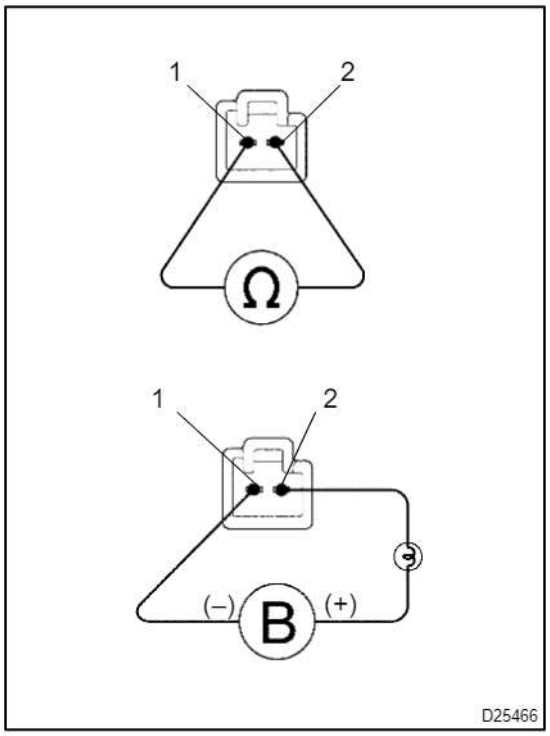
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR (See page 01–35)**

OK

CHECK AND REPLACE ECM (See page 10–24)

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3	INSPECT SHIFT SOLENOID VALVE(SLU)



(a) Remove the shift solenoid valve SLU.

(b) Measure the resistance between terminals.

OK:

Resistance: 5.0 to 5.6 Ω at 20°C (68°F)

(c) Connect the positive (+) lead with a 21 W bulb to terminal 2 and the negative (–) lead to terminal 1 of the solenoid valve connector, then check the movement of the valve.

OK:

The solenoid makes an operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE (SLU) (See page 40–56)**

OK

REPAIR OR REPLACE TRANSMISSION WIRE (See page 40–63)

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ELECTRONIC CONTROLLED AUTOMATIC TRANSMISSION [ECT] (A340E/A340F) (From August, 2003)

05GBV-01

PRECAUTION

NOTICE:

Perform the RESET MEMORY (AT initialization) when replacing the automatic transmission assy, engine assy or ECM (see page 05–1069).

HINT:

Initialization can not be completed by only disconnecting the battery terminal.

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DEFINITION OF TERMS

Term	Definition
Monitor description	Description of what the ECM monitors and how it detects malfunctions (monitoring purpose and its details).
Related DTCs	Diagnostic code
Typical enabling condition	Preconditions that allow the ECM to detect malfunctions. With all preconditions satisfied, the ECM sets the DTC when the monitored value(s) exceeds the malfunction threshold(s).
Sequence of operation	The priority order that is applied to monitoring, if multiple sensors and components are used to detect the malfunction. While another sensor is being monitored, the next sensor or component will not be monitored until the previous monitoring has concluded.
Required sensor/components	The sensors and components that are used by the ECM to detect malfunctions.
Frequency of operation	The number of times that the ECM checks for malfunctions per driving cycle. "Once per driving cycle" means that the ECM detects malfunction only one time during a single driving cycle. "Continuous" means that the ECM detects malfunction every time when enabling condition is met.
Duration	The minimum time that the ECM must sense a continuous deviation in the monitored value(s) before setting a DTC. This timing begins after the "typical enabling conditions" are met.
Malfunction thresholds	Beyond this value, the ECM will conclude that there is a malfunction and set a DTC.
MIL operation	MIL illumination timing after a defect is detected. "Immediately" means that the ECM illuminates MIL the instant the ECM determines that there is a malfunction. "2 driving cycle" means that the ECM illuminates MIL if the same malfunction is detected again in the 2nd driving cycle.

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PART AND SYSTEM NAME LIST

This reference list indicates the part names used in this manual along with their definitions.

Part and system name	Definition
Toyota HCAC system, Hydrocarbon adsorptive Catalyst (HCAC) system, HC adsorptive three–way catalyst	HC adsorptive three–way catalytic converter
Variable Valve Timing sensor, VVT sensor	Camshaft position sensor
Variable valve timing system, VVT system	Camshaft timing control system
Camshaft timing oil control valve, Oil control valve OCV, VVT, VSV	Camshaft timing oil control valve
Variable timing and lift, VVTL	Camshaft timing and lift control
Crankshaft position sensor "A"	Crankshaft position sensor
Engine speed sensor	Crankshaft position sensor
THA	Intake air temperature
Knock control module	Engine knock control module
Knock sensor	Engine knock sensor
Mass or volume air flow circuit	Mass air flow sensor circuit
Vacuum sensor	Manifold air pressure sensor
Internal control module, Control module, Engine control ECU, PCM	Power train control module
FC idle	Deceleration fuel cut
Idle air control valve	Idle speed control
VSV for CCV, Canister close valve VSV for canister control	Evaporative emissions canister vent valve
VSV for EVAP, Vacuum switching valve assembly No. 1, EVAP VAV, Purge VSV	Evaporative emissions canister purge valve
VSV for pressure switching valve, Bypass VSV	Evaporative emission pressure switching valve
Vapor pressure sensor, EVAP pressure sensor, Evaporative emission control system pressure sensor	Fuel tank pressure sensor
Charcoal canister	Evaporative emissions canister
ORVR system	On–boad refueling vapor recovery system
Intake manifold runner control	Intake manifold tuning system
Intake manifold runner valve, IMRV, IACV (runner valve)	Intake manifold tuning valve
Intake control VSV	Intake manifold tuning solenoid valve
AFS	Air fuel ratio sensor
O2 sensor	Heater oxygen sensor
Oxygen sensor pumping current circuit	Oxygen sensor output signal
Oxygen sensor reference ground circuit	Oxygen sensor signal ground
Accel position sensor	Accelerator pedal position sensor
Throttle actuator control motor, Actuator control motor, Electronic throttle motor, Throttle control motor	Electronic throttle actuator
Electronic throttle control system, Throttle actuator control system	Electronic throttle control system
Throttle/pedal position sensor, Throttle/pedal position switch, Throttle position sensor/switch	Throttle position sensor
Turbo press sensor	Turbocharger pressure sensor
Turbo VSV	Turbocharger pressure control solenoid valve
P/S pressure switch	Power–steering pressure switch
VSV for ACM	Active control engine mount
Speed sensor, Vehicle speed sensor "A", Speed sensor for skid control ECU	Vehicle speed sensor
ATF temperature sensor, Trans. fluid temp. sensor, ATF temperature sensor "A"	Transmission fluid temperature sensor
Electronic controlled automatic transmission, ECT	Electronically controlled automatic
Intermediate shaft speed sensor "A"	Couter gear speed sensor

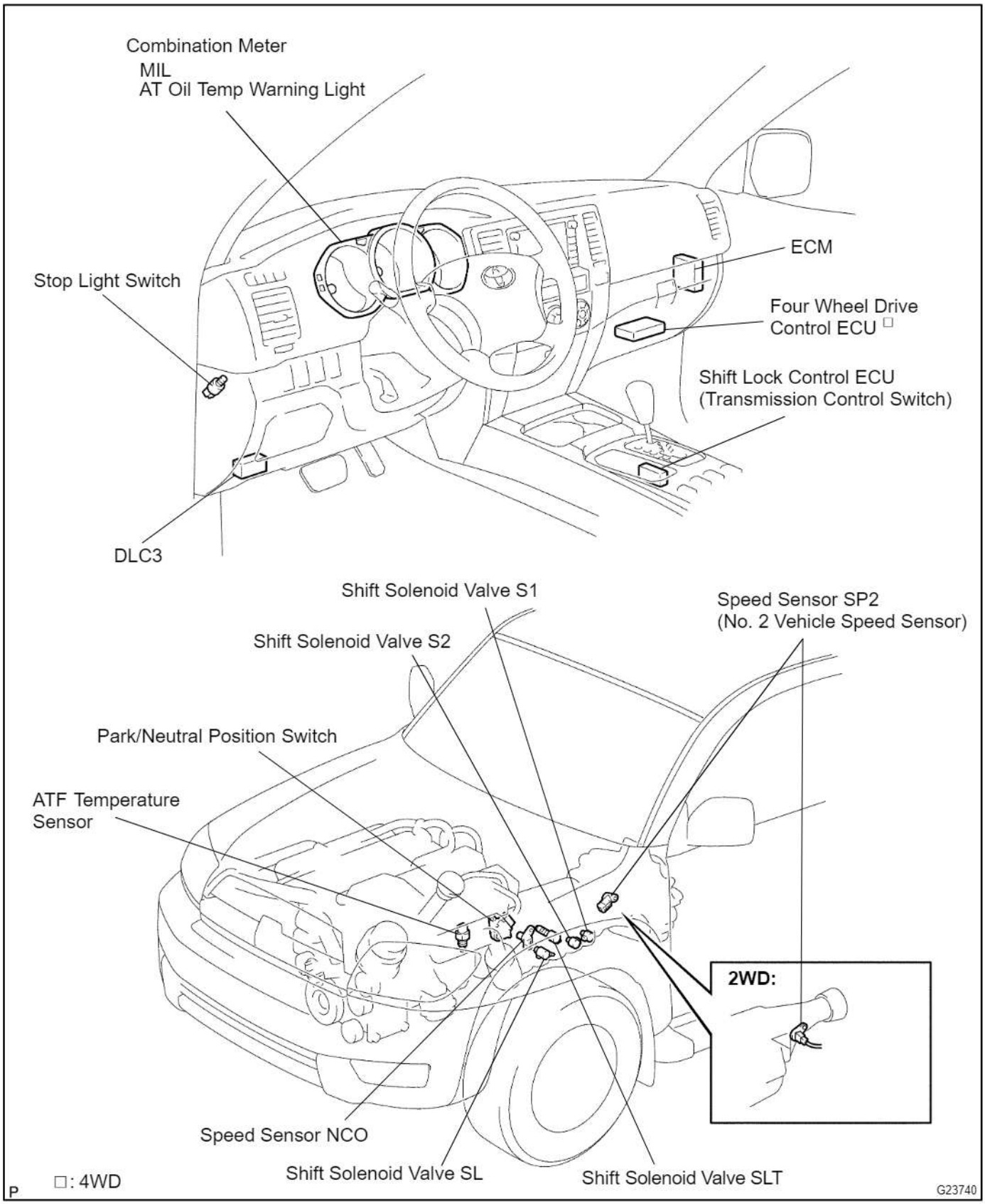
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Part and system name	Definition
Output speed sensor	Output shaft speed sensor
Input speed sensor, Input turbine speed sensor "A", Speed sensor (NT), Turbine speed sensor	Input turbine speed sensor
PNP switch, NSW	Park/neutral position switch
Pressure control solenoid	Transmission pressure control solenoid
Shift solenoid	Transmission shift solenoid valve
Transmission control switch, Shift lock control unit	Shift lock control module
Engine immobilizer system, Immobilizer system	Vehicle anti–theft system

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0527L–28

LOCATION



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0527H–27

HOW TO PROCEED WITH TROUBLESHOOTING

HINT:

- The ECM of this system is connected to the multiplex communication system. Therefore, before starting troubleshooting, make sure to check that there is no trouble in the multiplex communication system.
- The hand–held tester can be used at steps 3, 4, 6, and 9.

1	**Vehicle Brought to Workshop**

2	**Customer Problem Analysis (See page 05–1062)**

3	**Connect the OBD II scan tool or hand–held tester to DLC3**

4	**Check and Clear DTC and Freeze Frame Data (See page 05–1087)**

5	**Visual Inspection**

6	**Setting the Check Mode Diagnosis (See page 05–1089)**

7	**Problem Symptom Confirmation (See page 05–1063)**

- **Symptom does not occur: Go to step 8**
- **Symptom occur: Go to step 9**

8	**Symptom Simulation (See page 01–25)**

9	**DTC Check (See page 05–1087)**

- **DTC is not output: Go to step 10**
- **DTC is output: Go to step 18**

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10	Basic Inspection (See page 40–3, 40–13 and 40–76)

NG → Go to step 20

OK

11	Mechanical System Test (See page 05–1065)

NG → Go to step 17

OK

12	Hydraulic Test (See page 05–1067)

NG → Go to step 17

OK

13	Manual Shifting Test (See page 05–1068)

NG → Go to step 15

OK

14	Problem Symptoms Table Chapter 1 (See page 05–1078)

NG → Go to step 19

OK

15	Problem Symptoms Table Chapter 2 (See page 05–1078)

NG → Go to step 17

OK

16	Problem Symptoms Table Chapter 3 (See page 05–1078)

17	Part Inspection

→ Go to step 20

18	DTC Chart (See page 05–1093)

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19	Circuit Inspection

20	Repair or Replace

21	Confirmation Test

End

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05271-27

CUSTOMER PROBLEM ANALYSIS CHECK

Automatic Transmission System Check Sheet	Inspector's Name :

Customer's Name		VIN	
		Production Date	/ /
		Licence Plate No.	
Date Vehicle Brought In	/ /	Odometer Reading	km mile

Date Problem Occurred	/ /
How Often Does Problem Occur?	☐ Continuous ☐ Intermittent (times a day)

Symptoms	☐ Vehicle does not move (☐ Any position ☐ Particular position)
	☐ No up–shift (☐ 1st → 2nd ☐ 2nd → 3rd ☐ 3rd → 4th ☐ 4th → 5th)
	☐ No down–shift (☐ 5th → 4th ☐ 4th → 3rd ☐ 3rd → 2nd ☐ 2nd → 1st)
	☐ Lock–up malfunction
	☐ Shift point too high or too low
	☐ Harsh engagement (☐ N → D ☐ Lock–up ☐ Any drive position)
	☐ Slip or shudder
	☐ No kick–down
	☐ Others ( )

Check Item	Malfunction Indicator Lamp	☐ Normal ☐ Remains ON

DTC Check	1st Time	☐ Normal code ☐ Malfunction code (DTC)
	2nd Time	☐ Normal code ☐ Malfunction code (DTC)

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05GBY-01

ROAD TEST

1. PROBLEM SYMPTOM CONFIRMATION

(a) Based on the result of the customer problem analysis, try to reproduce the symptoms. If the problem is that the transaxle does not shift up, shift down, or the shift point is too high or too low, conduct the following road test referring to the automatic shift schedule and simulate the problem symptoms.

2. ROAD TEST

NOTICE:

Perform the test at normal operating ATF temperature 50 to 80 ˚C (122 to 176 ˚F).

(a) D position test

Shift into the D position and fully depress the accelerator pedal and check the following points:

(1) Check up–shift operation.

Check that the 1 → 2, 2 → 3 and 3 → O/D up–shift take place, at the shift point shown in the automatic shift schedule (See page 03–55).

HINT:

- □ O/D Gear Up–shift Prohibition Control (1. Coolant temp. is 47 ˚C (117 ˚F) or less. 2. Vehicle speed is 70 km/h (43 mph) or less.)
- □ 3rd Gear Up–shift Prohibition Control (1. Coolant temp. is 40 ˚C (104 ˚F) or less. 2. Vehicle speed is 55 km/h (34 mph) or less.)
- □ O/D Gear Lock–up Prohibition Control (1. Brake pedal is depressed. 2. Accelerator pedal is released)

(2) Check for shift shock and slip.

Check for shock and slip at the 1 → 2, 2 → 3 and 3 → O/D up–shift.

(3) Check for abnormal noises and vibration.

Drive in D position lock–up or O/D gear and check for abnormal noises and vibration.

HINT:

The check for the cause of abnormal noises and vibration must be done very thoroughly as it could also be sure to loss of balance in the differential, torque converter, etc..

(4) Check kick–down operation.

While running in the D position, 2nd, 3rd and O/D gears, check to see that the possible kick–down vehicle speed limits for 2 → 1, 3 → 2 and O/D → 3 kick–downs conform to those indicated on the automatic shift schedule (See page 03–55).

(5) Check abnormal shock and slip at kick–down.

(6) Check the lock–up mechanism.

- □ Drive in D position O/D gear, at a steady speed (lock–up ON) of about 80 km/h (50 mph).
- □ Lightly depress the accelerator pedal and check that the engine speed does not change abruptly.

If there is a big jump in engine speed, there is no lock–up.

(b) 2 position test

Shift into the 2 position and fully depress the accelerator pedal and check the following points:

(1) Check up–shift operation.

Check that the 1 → 2 up–shift takes place and that the shift point conforms to the automatic shift schedule (See page 03–55).

HINT:

There is no O/D up–shift and lock–up in the 2 position.

(2) Check engine braking.

While running in the 2 position and 2nd gear, release the accelerator pedal and check the engine braking effect.

(3) Check for abnormal noises during acceleration and deceleration, and for shock at up–shift and down–shift.

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(c) L position test

Shift into the L position and fully depress the accelerator pedal and check the following points:

(1) Check no up–shift.

While running in the L position, check that there is no up–shift to 2nd gear.

(2) Check engine braking.

While running in the L position, release the accelerator pedal and check the engine braking effect.

(3) Check for abnormal noises during acceleration and deceleration.

(d) R position test

Shift into the R position, lightly depress the accelerator pedal, and check that the vehicle moves backward without any abnormal noise or vibration.

CAUTION:

Before conducting this test ensure that the test area is free from people and obstruction.

(e) P position test.

Stop the vehicle on a grade (more than 5°) and after shifting into the P position, release the parking brake. Then, check to see that the parking lock pawl holds the vehicle in place.

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05GBZ–01

MECHANICAL SYSTEM TESTS

1. MEASURE STALL SPEED

(a) The object of this test is to check the overall performance of the transmission and engine by measuring the stall speeds in the D and R positions.

NOTICE:

- **Do the test at normal operating fluid temperature 50 to 80°C (122 to 176°F).**
- **Do not continuously run this test longer than 5 seconds.**
- **To ensure safety, conduct this test in a wide, clear and level area which provide good traction.**
- **The stall test should always be carried out in pairs. One technician should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is doing the test.**

(1) Chock the all wheels.
(2) Connect an OBD II scan tool or hand–held tester to DLC3.
(3) Fully apply the parking brake.
(4) Keep your left foot pressing firmly on the brake pedal.
(5) Start the engine.
(6) Shift into the D position. Press all the way down on the accelerator pedal with your right foot. Quickly read the stall speed at this time.

Stall speed: 2,350 ± 150 rpm

(7) Do the same test in R position.

Stall speed: 2,350 ± 150 rpm

Evaluation:

Problem	Possible cause
(a) Stall speed low in D and R positions	□Engine output may be insufficient □Stator one–way clutch is operating properly HINT: If the value is larger or smaller than the specified value by 600 rpm or more, the torque converter could be faulty.
(b) Stall speed high in D position	□Line pressure too low □Forward clutch slipping □No. 2 one–way clutch not operating properly □O/D one–way clutch not operating properly
(c) Stall speed high in R position	□Line pressure too low □Direct clutch slipping □1st & reverse brake slipping □O/D one–way clutch not operating properly
(d) Stall speed high in D and R positions	□Line pressure too low □Improper fluid level □O/D one–way clutch not operating properly

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2. MEASURE TIME LAG

(a) When the shift lever is shifted while the engine is idling, there will be a certain time lapse or lag before the shock can be felt. This is used for checking the condition of the O/D direct clutch, forward clutch, and 1st & reverse brake.

NOTICE:

- **Do the test at normal operating ATF temperature 50 to 80 °C (122 to 176 °F).**
- **Be sure to allow 1 minute interval between tests.**
- **Perform measurement 3 times and take the average value.**

(1) Fully apply the parking brake.

(2) Start the engine and check idle speed.

Idle speed (In N position and air conditioner OFF): 700 ± 50 rpm

(3) Shift the shift lever from N to D position. Using a stop watch, measure the time from when the lever is shifted until the shock is felt.

Time lag: N → D Less than 1.2 seconds

(4) In the same manner, measure the time lag for N → R.

Time lag: N → R Less than 1.5 seconds

Evaluation (If N → D time or N → R time lag is longer than the specified):

Problem	Possible cause
N → D time lag is longer	□Line pressure too low □Forward clutch worn □O/D one–way clutch not operating properly
N → R time lag is longer	□Line pressure too low □Direct clutch worn □1st & reverse brake worn □O/D one–way clutch not operating properly

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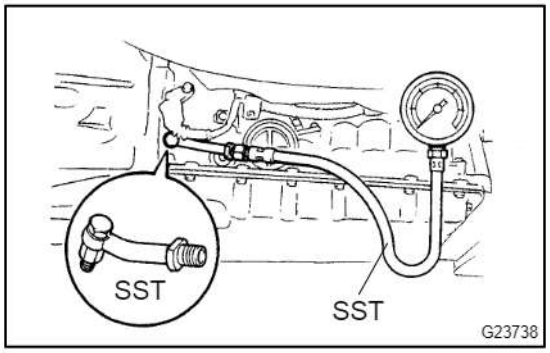
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HYDRAULIC TEST

1. MEASURE LINE PRESSURE

NOTICE:

- **Do the test at normal operation ATF temperature 50 to 80 ˚C (122 to 176 ˚F).**
- **The line pressure test should always be carried out in pairs. One technician should observe the conditions of wheels or wheel stopper outside the vehicle while the other is doing the test.**
- **Be careful to prevent SST's hose from interfering with the exhaust pipe.**
- **This check must be conducted after checking and adjusting engine.**
- **Perform under condition that A/C is OFF.**



(a) Warm up the ATF.
(b) Remove the test plug on the front side of the transmission case and connect SST.
SST 09992–00095 (09992– 00231, 09992–00271)
(c) Fully apply the parking brake and chock the 4 wheels.
(d) Start the engine and check idling speed.
(e) Keep your left foot pressing firmly on the brake pedal and shift into D position.
(f) Measure the line pressure when the engine is idling.
(g) Depress the accelerator pedal all the way down. Quickly read the highest line pressure when engine speed reaches stall speed.
(h) In the same way, do the test in R position.

Specified line pressure:

Condition	D position kPa (kgf / cm^2, psi)	R position kPa (kgf / cm^2, psi)
Idling	385 to 445 (3.9 to 4.5, 55 to 64)	596 to 696 (6.1 to 7.1, 87 to 101)
Stall	1,197 to 1,337 (12.2 to 13.6, 174 to 193)	1,600 to 1,940 (16.3 to 19.8, 232 to 282)

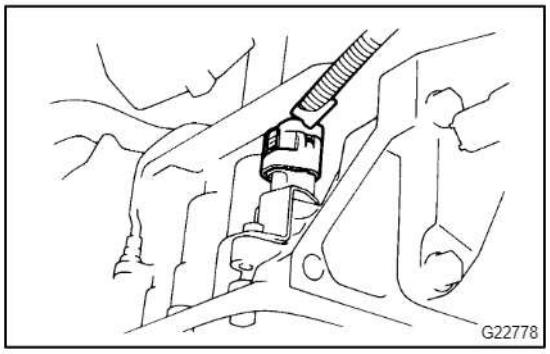
Evaluation:

Problem	Possible cause
If the measured values at all positions are higher	□Shift solenoid valve SLT defective □Regulator valve detective
If the measured values at all positions are lower	□Shift solenoid valve SLT defective □Regulator valve detective □Oil pump defective □O/D direct clutch defect
If pressure is low in the D position only	□D position circuit fluid leak □Forward clutch defective
If pressure is low in the R position only	□R position circuit fluid leak □Direct clutch defective □1st & reverse brake defective

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05GC1-01

MANUAL SHIFTING TEST



1. MANUAL SHIFTING TEST

HINT:

By this test, it can be determined whether the trouble is within the electrical circuit or is a mechanical problem in the transmission.

(a) Disconnect the transmission wire connector.

(b) Inspect the manual driving operation.

Check that the shift and gear positions correspond to the table below.

While driving, shift through the L, 2 and D positions.

Check that the gear change corresponds to the shift position.

Shift position	Gear position
D	O/D
2	3rd
L	1st
R	Reverse
P	Pawl Lock

HINT:

If the L, 2 and D position gear positions are difficult to distinguish, do the above road test.

If any abnormality is found in the above test, the problem is in the transmission itself.

(c) Connect the transmission wire connector.

(d) Clear the DTC.

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05GC2-01

INITIALIZATION

1. RESET MEMORY

CAUTION:

Perform the RESET MEMORY (AT initialization) when replacing the automatic transmission assy, engine assy or ECM.

NOTICE:

Hand–held tester only

HINT:

The ECM memorizes the condition that the ECT controls the automatic transmission assy and engine assy according to those characteristics. Therefore, when the automatic transmission assy, engine assy, or ECM has been replaced, it is necessary to reset the memory so that the ECM can memorize the new information. Reset procedure is as follows.

(a) Turn the ignition switch off.
(b) Connect the hand–held tester to the DLC3.
(c) Turn the ignition switch to the ON position and push the hand–held tester main switch on.
(d) Select the item "DIAGNOSIS/ENHANCED OBD II".
(e) Perform the reset memory procedure from the ENGINE menu.

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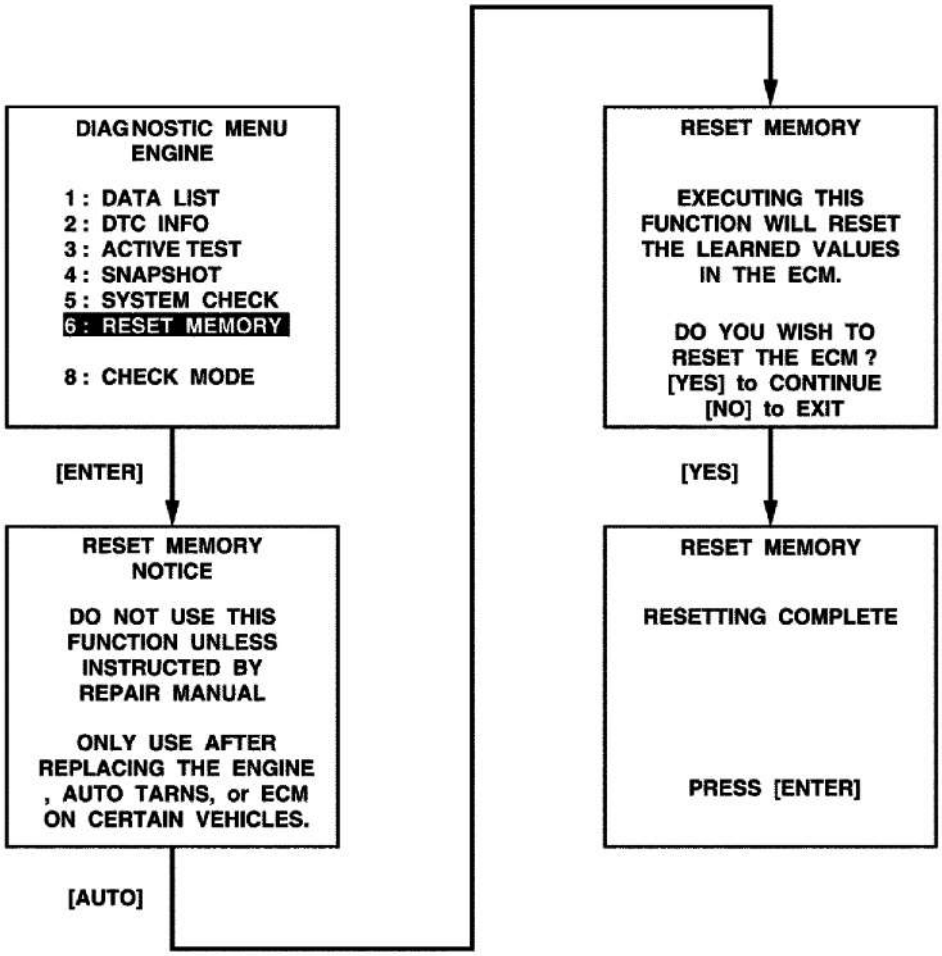
CAUTION:

After performing the RESET MEMORY, be sure to perform the ROAD TEST (see page 05–1063) described earlier.

HINT:

The ECM is learned by performing the ROAD TEST.

Tester menu flow:



P G23367

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05GC3-01

LIST OF DISABLE A MONITOR

HINT:

This table indicates ECM monitoring status for the items in the upper columns if the DTCs in each line on the left are being set.

As for the ”X” mark, when the DTC on the left is stored, detection of the DTC in the upper column is not performed.

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Monitor detected malfunction

Fault code	Fault code	Component/ system	Monitor disablement (X - disabled)																												
			P0010,P0020	P0011	P0012	P0016,P0018	P0021	P0022	P0030,50	P0135,P0155	P0036,56	P0043,44,63,64	P0100	P0101	P0105	P0106	P0110	P0115	P0116	P0120,P0121	P0125	P0128	P0130-P0153	P0134,P0154	P0136,P0156	P0142,P0162	P0171,P0172	P0300-P0308			
P0010,P0020	P0010,P0020	VVT VSV1,2																				X					X				
P0011	P0011	VVT System1 - Advance				X		X														X					X				
P0012	P0012	VVT System1 - Retard				X		X														X					X				
P0016,P0018	P0016,P0018	VVT System - Misalignment																													
P0021	P0021	VVT System2 - Advance			X	X																X					X				
P0022	P0022	VVT System2 - Retard			X																	X					X				
P0030,50	P0031,32,51,52	O2 Sensor Heater - Sensor1																				X	X	X	X	X	X				
P0135,P0155	P0031,32,51,52	A/F Sensor Heater - Sensor1																				X			X	X	X				
P0036,56	P0037,38,57,58	O2 Sensor Heater - Sensor2																							X	X					
P0043,44,63,64	P0043,44,63,64	O2 Sensor Heater - Sensor3																								X					
P0100,P0101	P0100-P0103	MAF sensor		X	X		X	X											X		X	X	X	X	X	X	X	X			
P0105,P0106	P0105-P0108	MAP sensor		X	X		X	X											X		X	X	X	X	X	X	X	X			
P0110	P0110-P0113	IAT sensor																			X	X	X	X	X	X		X			
P0115,P0116	P0115-P0118	ECT sensor		X	X	X	X	X						X		X					X	X	X	X	X	X	X	X			
P0120,P0121	P0120-P0223,P2135	TP sensor												X		X							X	X	X	X	X	X			
P0125	P0125	Insufficient ECT for Closed Loop		X	X		X	X						X		X						X	X	X	X	X	X	X			
P0128	P0128	Thermostat																													
P0130-P0153	P0130-P0153	O2 Sensor - Sensor1																				X		X	X	X					
P0134,P0154	P0134,P0154	O2 Sensor, A/F Sensor(No Activity) - Sensor1								X												X	X		X	X	X				
P0136,P0156	P0136,P0156	O2 Sensor - Sensor2																								X					
P0142,P0162	P0142,P0162	O2 Sensor - Sensor3																													
P0171,P0172	P0171,P0172	Fuel system																				X	X	X	X	X					
P0300-P0308	P0300-P0308	Misfire							X													X	X	X	X	X					
P0325,P0330	P0325-P0333	Knock sensor																													
P0335	P0335	CKP sensor		X	X		X	X						X		X						X	X	X	X	X	X	X			
P0340, P0341	P0340, P0341	CMP sensor		X	X		X	X						X		X						X	X	X	X	X	X	X			
P0340-P0346	P0340-P0346	VVT sensor1,2																				X									
P0351-P0358	P0351-P0358	Ignitor		X	X		X	X														X									
P0385	P0385	CKP sensor 2												X		X						X	X	X	X	X	X	X			
P0401	P0401	EGR system (closed)																				X					X				
P0402	P0402	EGR system (open)																				X	X	X	X	X	X				
P0405,P0409	P0405-P0409	Lift sensor																									X				
P0420,P0430	P0420,P0430	Catalyst																													
P0442-P0456	P0442-P0456	EVAP system																					X	X	X	X					
P0450,P0451	P0450-P0453	EVAP press sensor																													

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Monitor detected malfunction

Fault code	Fault code	Component/ system	Monitor disablement (X - disabled)																												
			P0010,P0020	P0011	P0012	P0016,P0018	P0021	P0022	P0030,50	P0135,P0155	P0036,56	P0043,44,63,64	P0100	P0101	P0105	P0106	P0110	P0115	P0116	P0120,P0121	P0125	P0128	P0130-P0153	P0134,P0154	P0136,P0156	P0142,P0162	P0171,P0172	P0300-P0308			
			P0010,P0020	P0011	P0012	P0016,P0018	P0021	P0022	P0031,32,51,52	P0031,32,51,52	P0037,38,57,58	P0043,44,63,64	P0100-P0103	P0101	P0105-P0108	P0106	P0110-P0113	P0115-P0118	P0116	P0120-P0223,P2135	P0125	P0128	P0130-P0153	P0134,P0154	P0136,P0156	P0142,P0162	P0171,P0172	P0300-P0308			
			VVT VSV1,2	VVT System1 -Advance	VVT System1 - Retard	VVT System - Misalignment	VVT System2 - Advance	VVT System2 - Retard	O2 Sensor Heater - Sensor1	A/F Sensor Heater - Sensor1	O2 Sensor Heater - Sensor2	O2 Snesor Heater - Sensor3	MAF sensor	MAF sensor	MAP sensor	MAP sensor	IAT sensor	ECT sensor	ECT sensor	TP sensor	Insufficient ECT for Closed Loop	Thermostat	O2 Sensor -Sensor1	O2 Sensor, A/F Sensor(No Activity) - Sensor1	O2 Sensor - Sensor2	O2 Snesor - Sensor3	Fuel system	Misfire			
P0500	P0500	VSS																				X	X	X	X	X	X	X	X		
P0511	P0511	IAC valve																					X								
P0510	P0510	Idle switch												X		X						X	X		X	X	X	X	X		
P0560	P0560	System Voltage																													
P0617	P0617	Starter signal																													
P0705	P0705	Shift lever position switch																													
P0710	P0710-P0713	Trans fluid temp sensor																													
P0720-P0793	P0720-P0793	Output speed sensor																													
P0715-P0717	P0715-P0717	Input speed sensor																													
P0724	P0724	Stop lamp switch																													
P0741-P0796	P0741-P0796	Trans solenoid (function)																													
P0748-P0798	P0748-P0799	Trans solenoid (range)																													
P0850	P0850	PNP switch																													X
P1010,P1020	P1010,P1020	VVTL																				X					X				
P1011,12(,21,22)	P1011,12(,21,22)	VVTL system1(,2)																				X					X				
P1126	P1126	Electronic magnet clutch																													
P1129	P1129	Electronic throttle system																													
P1430	P1430	HC adsorber ACT press sensor																													
P2004,6	P2004,6	Intake Manifold Runner Control																													
P2009,10	P2009,10	Intake Manifold Runner Control Circuit																													
P2014,16,17	P2014,16,17	Intake Manifold Runner Position Sensor																													
P2102,P2103	P2102,P2103	Throttle motor																													
P2120-P2138	P2120-P2138	Accel position sensor																													
P2196,P2198	P2196,P2198	A/F sensor (rationality)																				X			X	X					
P2226	P2226	BARO sensor																					X		X	X					
P2237,P2240	P2237,P2240	A/F sensor (open)																				X			X	X					
P2423,24	P2423,24	HC Absorption Catalyst																													
P2430,2,3	P2430,2,3	AIR Pressure Sensor(Low/High)																													
P2431	P2431	AIR Pressure Sensor(Rationality)																													
P2440	P2440	AIR control valve stuck open																					X	X	X	X	X				
P2441	P2441	AIR control valve stuck close																					X	X	X	X	X				
P2444	P2444	AIP stuck On																					X	X	X	X	X				
P2445	P2445	AIP stuck Off																					X	X	X	X	X				
P2714-P2759	P2714-P2759	Trans solenoid(SLU-SLD)																													
P2A00,P2A03	P2A00,P2A03	A/F sensor (slow response)																				X			X	X					

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Monitor detected malfunction

Fault code	Fault code	Component/ system	Monitor disablement (X - disabled)																														
			P0325,P0330	P0335	P0340,P0341	P0340-P0346	P0351-P0358	P0385	P0401	P0402	P0405	P0409	P0420,P0430	P0440-P0446	P0450,P0451	P0500	P0500	P0500	P0511	P0510	P0560	P0617	P0705	P0710	P0720-P0793	P0715-P0717	P0724	P0741-P0796
			P0325-P0333	P0335	P0340,P0341	P0340-P0346	P0351-P0358	P0385	P0401	P0402	P0405,P0406	P0409	P0420,P0430	P0440-P0446	P0450-P0453	P0500	P0500	P0500	P0511	P0510	P0560	P0617	P0705	P0710-P0713	P0720-P0793	P0715-P0717	P0724	P0741-P0796
			Knock sensor	CKP sensor	CMP sensor	VVT sensor1,2	Ignitor	CKP sensor 2	EGR system (closed)	EGR system (open)	EGR Lift sensor	EGR Lift sensor	Catalyst	EVAP system	EVAP press sensor	VSS(ECT1sensor, non-ECT)	VSS(M/T)	IAC valve	Idle switch	System Voltage	Starter signal	Shift lever position switch	Trans fluid temp sensor	Output speed sensor	Input speed sensor	Stop lamp switch	Trans solenoid (function)*1
P0010,P0020	P0010,P0020	VVT VSV1,2																															X
P0011	P0011	VVT System1 - Advance							X	X			X	X				X										
P0012	P0012	VVT System1 - Retard							X	X			X	X				X										
P0016,P0018	P0016,P0018	VVT System - Misalignment																										
P0021	P0021	VVT System2 - Advance							X	X			X	X				X										
P0022	P0022	VVT System2 - Retard							X	X			X	X				X										
P0030,50	P0031,32,51,52	O2 Sensor Heater - Sensor1							X	X			X					X										X
P0135,P0155	P0031,32,51,52	A/F Sensor Heater - Sensor1							X	X			X					X										
P0036,56	P0037,38,57,58	O2 Sensor Heater - Sensor2											X															
P0043,44,63,64	P0043,44,63,64	O2 Sensor Heater - Sensor3																										
P0100,P0101	P0100-P0103	MAF sensor							X	X			X	X			X	X										X
P0105,P0106	P0105-P0108	MAP sensor							X	X			X	X			X	X										X
P0110	P0110-P0113	IAT sensor							X	X				X														X
P0115,P0116	P0115-P0118	ECT sensor							X	X		X	X	X			X	X										X
P0120,P0121	P0120-P0223,P2135	TP sensor							X	X			X	X		X		X										X
P0125	P0125	Insufficient ECT for Closed Loop							X	X		X	X	X			X	X										X
P0128	P0128	Thermostat																										
P0130-P0153	P0130-P0153	O2 Sensor - Sensor1							X	X			X	X				X										X
P0134,P0154	P0134,P0154	O2 Sensor, A/F Sensor(No Activity) - Sensor1							X	X			X					X										X
P0136,P0156	P0136,P0156	O2 Sensor - Sensor2											X															
P0142,P0162	P0142,P0162	O2 Sensor - Sensor3																										
P0171,P0172	P0171,P0172	Fuel system							X	X			X	X				X										X
P0300-P0308	P0300-P0308	Misfire											X	X				X										X
P0325,P0330	P0325-P0333	Knock sensor							X	X																		X
P0335	P0335	CKP sensor							X	X			X	X				X										X
P0340, P0341	P0340, P0341	CMP sensor							X	X			X	X				X										X
P0340-P0346	P0340-P0346	VVT sensor1,2																										
P0351-P0358	P0351-P0358	Ignitor							X	X			X	X				X										X
P0385	P0385	CKP sensor 2							X	X			X	X				X										
P0401	P0401	EGR system (closed)											X															X
P0402	P0402	EGR system (open)											X	X				X										X
P0405,P0409	P0405-P0409	Lift sensor																										
P0420,P0430	P0420,P0430	Catalyst																										
P0442-P0456	P0442-P0456	EVAP system																X										
P0450,P0451	P0450-P0453	EVAP press sensor												X														

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Monitor detected malfunction

Fault code	Fault code	Component/ system	Monitor disablement (X - disabled)																												
			P0325,P0330	P0335	P0340,P0341	P0340-P0346	P0351-P0358	P0385	P0401	P0402	P0405	P0409	P0420,P0430	P0440-P0446	P0450,P0451	P0500	P0500	P0500	P0511	P0510	P0560	P0617	P0705	P0710	P0720-P0793	P0715-P0717	P0724	P0741-P0796
	P0325-P0333	Knock sensor																													
	P0335	CKP sensor																													
	P0340,P0341	CMP sensor																													
	P0340-P0346	VVT sensor1,2																													
	P0351-P0358	Ignitor																													
	P0385	CKP sensor 2																													
	P0401	EGR system (closed)											X	X					X												X
	P0402	EGR system (open)											X	X					X												
	P0405,P0406	EGR Lift sensor																													
	P0409	EGR Lift sensor																													
	P0420,P0430	Catalyst											X	X					X							X					X
	P0440-P0446	EVAP system											X	X					X							X					X
	P0450-P0453	EVAP press sensor																													
	P0500	VSS(ECT2sensor)																													
	P0500	VSS(ECT1sensor, non-ECT)																													
	P0500	VSS(M/T)																													
	P0511	IAC valve																													
	P0510	Idle switch																													
	P0560	System Voltage																													
	P0617	Starter signal																													
	P0705	Shift lever position switch																													
	P0710-P0713	Trans fluid temp sensor																													
	P0720-P0793	Output speed sensor																													X
	P0715-P0717	Input speed sensor																													
	P0724	Stop lamp switch																													
	P0741-P0796	Trans solenoid (function)																													
	P0748-P0798	Trans solenoid (range)																								X	X				X
	P0850	PNP switch																	X												X
	P1010,P1020	VVTL																													
	P1011,12(,21,22)	VVTL system1(,2)							X	X			X	X					X												
	P1126	Electronic magnet clutch																													
	P1129	Electronic throttle system																													
	P1430	HC adsorber ACT press sensor												X	X																
	P2004,6	Intake Manifold Runner Control																													
	P2009,10	Intake Manifold Runner Control Circuit																													
	P2014,16,17	Intake Manifold Runner Position Sensor																													
	P2102,P2103	Throttle motor																													
	P2120-P2138	Accel position sensor																													
	P2196,P2198	A/F sensor (rationality)							X	X			X						X												X
	P2226	BARO sensor																													X
	P2237,P2240	A/F sensor (open)							X	X			X						X												X
	P2423,24	HC Absorption Catalyst																													
	P2430,2,3	AIR Pressure Sensor(Low/High)																													
	P2431	AIR Pressure Sensor(Rationality)																													
	P2440	AIR control valve stuck open							X	X			X																		
	P2441	AIR control valve stuck close							X	X			X																		
	P2444	AIP stuck On							X	X			X																		
	P2445	AIP stuck Off							X	X			X																		
	P2714-P2759	Trans solenoid(SLU-SLD)																													X
	P2A00,P2A03	A/F sensor (slow response)							X	X			X						X												X

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G31947

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Monitor detected malfunction

Fault code	Fault code	Component/ system	Monitor disablement (X - disabled)																										
			P0741-P0796	P0748-P0798	P0850	P1010,P1020	P1011,12(,21,22)	P1126	P1129	P1430	P2004,P2006	P2009,P2010	P2014,16,17	P2102,P2103	P2120-P2138	P2196,P2198	P2226	P2237,P2240	P2423,24	P2430,2,3	P2431	P2440	P2441	P2444	P2445	P2714-P2759	P2A00,P2A03
	P0741-P0796	Trans solenoid (function)*2																											
	P0748-P0999	Trans solenoid (range)																											
	P0850	PNP switch																											
	P1010,P1020	VVTL																											
	P1011,12(,21,22)	VVTL system1(,2)																											
	P1126	Electronic magnet clutch																											
	P1129	Electronic throttle system																											
	P1430	HC adsorber ACT press sensor																											
	P2004,P2006	Intake Manifold Runner Control																											
	P2009,P2010	Intake Manifold Runner Control Circuit																											
	P2014,16,17	Intake Manifold Runner Position Sensor																											
	P2102,P2103	Throttle motor																											
	P2120-P2138	Accel position sensor																											
P0010,P0020	P0010,P0020	VVT VSV1,2																				X	X	X	X				
P0011	P0011	VVT System1 - Advance																				X	X	X	X				
P0012	P0012	VVT System1 - Retard																				X	X	X	X				
P0016,P0018	P0016,P0018	VVT System - Misalignment																				X	X	X	X				
P0021	P0021	VVT System2 - Advance																				X	X	X	X				
P0022	P0022	VVT System2 - Retard																				X	X	X	X				
P0030,50	P0031,32,51,52	O2 Sensor Heater - Sensor1																	X			X	X	X	X				
P0135,P0155	P0031,32,51,52	A/F Sensor Heater - Sensor1														X		X	X			X	X	X	X			X	
P0036,56	P0037,38,57,58	O2 Sensor Heater - Sensor2														X			X										
P0043,44,63,64	P0043,44,63,64	O2 Sensor Heater - Sensor3																	X										
P0100,P0101	P0100-P0103	MAF sensor				X	X									X		X	X			X	X	X	X			X	
P0105,P0106	P0105-P0108	MAP sensor				X	X									X		X	X			X	X	X	X			X	
P0110	P0110-P0113	IAT sensor									X					X		X				X	X	X	X			X	
P0115,P0116	P0115-P0118	ECT sensor	X			X	X				X					X		X	X			X	X	X	X			X	
P0120,P0121	P0120-P0223,P2135	TP sensor														X		X	X			X	X	X	X			X	
P0125	P0125	Insufficient ECT for Closed Loop	X			X										X		X	X			X	X	X	X			X	
P0128	P0128	Thermostat																											
P0130-P0153	P0130-P0153	O2 Sensor - Sensor1																	X			X	X	X	X				
P0134,P0154	P0134,P0154	O2 Sensor, A/F Sensor(No Activity) - Sensor1														X		X	X			X	X	X	X			X	
P0136,P0156	P0136,P0156	O2 Sensor - Sensor2														X			X										
P0142,P0162	P0142,P0162	O2 Sensor - Sensor3																	X										
P0171,P0172	P0171,P0172	Fuel system														X		X	X			X	X	X	X			X	
P0300-P0308	P0300-P0308	Misfire														X		X	X			X	X	X	X			X	
P0325,P0330	P0325-P0333	Knock sensor																				X	X	X	X				
P0335	P0335	CKP sensor				X	X									X		X	X			X	X	X	X			X	
P0340, P0341	P0340, P0341	CMP sensor				X	X									X		X	X			X	X	X	X			X	
P0340-P0346	P0340-P0346	VVT sensor1,2																				X	X	X	X				
P0351-P0358	P0351-P0358	Ignitor																	X			X	X	X	X				
P0385	P0385	CKP sensor 2				X	X									X		X	X			X	X	X	X			X	
P0401	P0401	EGR system (closed)																	X										
P0402	P0402	EGR system (open)														X		X	X			X	X	X	X			X	
P0405,P0409	P0405-P0409	Lift sensor																											
P0420,P0430	P0420,P0430	Catalyst																											
P0442-P0456	P0442-P0456	EVAP system														X		X				X	X	X	X			X	
P0450,P0451	P0450-P0453	EVAP press sensor																				X	X	X	X				

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Monitor detected malfunction

Fault code	Fault code	Component/ system	Monitor disablement (X - disabled)																										
			P0741-P0796	P0748-P0798	P0850	P1010,P1020	P1011,12(,21,22)	P1126	P1129	P1430	P2004,P2006	P2009,P2010	P2014,16,17	P2102,P2103	P2120-P2138	P2196,P2198	P2226	P2237,P2240	P2423,24	P2430,2,3	P2431	P2440	P2441	P2444	P2445	P2714-P2759	P2A00,P2A03
	P0741-P0796	Trans solenoid (function)*2																											
	P0748-P0999	Trans solenoid (range)																											
	P0850	PNP switch																											
	P1010,P1020	VVTL																											
	P1011,12(,21,22)	VVTL system1(,2)																											
	P1126	Electronic magnet clutch																											
	P1129	Electronic throttle system																											
	P1430	HC adsorber ACT press sensor																											
	P2004,6	Intake Manifold Runner Control																											
	P2009,10	Intake Manifold Runner Control Circuit																											
	P2014,16,17	Intake Manifold Runner Position Sensor																											
	P2102,P2103	Throttle motor																											
	P2120-P2138	Accel position sensor																											
P0500	P0500	VSS	X													X		X	X			X	X	X	X		X
P0511	P0511	IAC valve														X		X										X
P0510	P0510	Idle switch														X		X	X									X
P0560	P0560	System Voltage																											
P0617	P0617	Starter signal																											
P0705	P0705	Shift lever position switch																											
P0710	P0710-P0713	Trans fluid temp sensor																											
P0720-P0793	P0720-P0793	Output speed sensor																											
P0715-P0717	P0715-P0717	Input speed sensor																											
P0724	P0724	Stop lamp switch																											
P0741-P0796	P0741-P0796	Trans solenoid (function)																											
P0748-P0798	P0748-P0799	Trans solenoid (range)	X																										
P0850	P0850	PNP switch																											
P1010,P1020	P1010,P1020	VVTL																				X	X	X	X		
P1011,12(,21,22)	P1011,12(,21,22)	VVTL system1(,2)																				X	X	X	X		X
P1126	P1126	Electronic magnet clutch																											
P1129	P1129	Electronic throttle system																											
P1430	P1430	HC adsorber ACT press sensor																											
P2004,6	P2004,6	Intake Manifold Runner Control																											
P2009,10	P2009,10	Intake Manifold Runner Control Circuit																											
P2014,16,17	P2014,16,17	Intake Manifold Runner Position Sensor																											
P2102,P2103	P2102,P2103	Throttle motor																											
P2120-P2138	P2120-P2138	Accel position sensor																											
P2196,P2198	P2196,P2198	A/F sensor (rationality)																	X			X	X	X	X		X
P2226	P2226	BARO sensor														X		X				X	X	X	X		X
P2237,P2240	P2237,P2240	A/F sensor (open)																	X			X	X	X	X		X
P2423,24	P2423,24	HC Absorption Catalyst																											
P2430,2,3	P2430,2,3	AIR Pressure Sensor(Low/High)																			X	X	X	X	X		
P2431	P2431	AIR Pressure Sensor(Rationality)																				X	X	X	X		
P2440	P2440	AIR control valve stuck open														X		X	X								X
P2441	P2441	AIR control valve stuck close														X		X	X								X
P2444	P2444	AIP stuck On														X		X	X								X
P2445	P2445	AIP stuck Off														X		X	X								X
P2714-P2759	P2714-P2759	Trans solenoid(SLU-SLD)																									
P2A00,P2A03	P2A00,P2A03	A/F sensor (slow response)																	X			X	X	X	X		

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PROBLEM SYMPTOMS TABLE

HINT:

If a normal code is displayed during the DTC check but the trouble still occurs, check the circuits for each symptom in the order given in the charts on the following pages and proceed to the page given for trouble-shooting.

The Matrix Chart is divided into 3 chapters.

When troubleshooting, check Chapter 1 first. If instructions are given in Chapter 1 to proceed to Chapter 2 or 3, proceed as instructed.

If the instruction "Proceed to next circuit inspection shown on matrix chart" is given in the flow chart for each circuit, proceed to the circuit with the next highest number in the table to continue the check. If the trouble still occurs even though there are no abnormalities in any of the other circuits, then check and replace the ECM.

1. CHAPTER 1: ELECTRONIC CIRCUIT MATRIX CHART

Symptom	Suspect Area	See page
No up–shift (1st → 2nd)	ECM	01–35
No up–shift (2nd → 3rd)	ECM	01–35
No up–shift (3rd → O/D)	1. Transmission control switch circuit 2. ECM	05–1095 01–35
No down–shift (O/D → 3rd)	1. Transmission control switch circuit 2. ECM	05–1095 01–35
No down–shift (3rd → 2nd)	ECM	01–35
No down–shift (2nd → 1st)	ECM	01–35
No lock–up or No lock–up off	1. Stop light switch circuit 2. L4 position switch circuit 3. ECM	05–1109 05–1127 01–35
Shift point too high or too low	ECM	01–35
Up–shift to 2nd while in L position	1. Park/neutral position switch circuit 2. ECM	05–1095 01–35
Up–shift to 3rd while in 2 position	1. Park/neutral position switch circuit 2. ECM	05–1095 01–35
Up–shift to O/D from 3rd while shift lever is 3 position	1. Transmission control switch circuit 2. ECM	05–1095 01–35
Up–shift to O/D from 3rd while engine is cold	ECM	01–35
Poor acceleration	ECM	01–35
No kick–down	ECM	01–35
Engine stalls when starting off or stopping	ECM	01–35

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2. CHAPTER 2: ON–VEHICLE REPAIR
(□: A340E, A340F, A343F AUTOMATIC TRANSMISSION Repair Manual Pub. No. RM998U)

Symptom	Suspect Area	See page
Vehicle does not move in any forward position and reverse position	1. Shift solenoid valve SLT 2. Transmission control cable 3. Manual valve 4. Parking lock pawl 5. Off–vehicle repair matrix chart	05–1130 40–76 □ □ –
Vehicle does not move in R position	Off–vehicle repair matrix chart	–
Vehicle does not move in particular position or positions (except R position)	Off–vehicle repair matrix chart	–
No up–shift (1st → 2nd)	1. 1–2 shift valve 2. Off–vehicle repair matrix chart	□ –
No up–shift (2nd → 3rd)	1. 2–3 shift valve 2. Off–vehicle repair matrix chart	□ –
No up–shift (3rd → O/D)	1. 3–4 shift valve 2. Off–vehicle repair matrix chart	□ –
No down–shift (O/D → 3rd)	1. 3–4 shift valve 2. Off–vehicle repair matrix chart	□ –
No down–shift (3rd → 2nd)	1. 2–3 shift valve 2. Off–vehicle repair matrix chart	□ –
No down–shift (2nd → 1st)	1. 1–2 shift valve 2. Off–vehicle repair matrix chart	□ –
No lock–up or No lock–up off	1. Lock–up control valve 2. Lock–up relay valve 3. Off–vehicle repair matrix chart	□ □ –
Harsh engagement (N → D)	1. Accumulator control valve 2. Off–vehicle repair matrix chart	□ –
Harsh engagement (Lock–up)	1. Lock–up control valve 2. Lock–up relay valve 3. Off–vehicle repair matrix chart	□ □ –
Harsh engagement (N → R)	1. Accumulator control valve 2. C_2 accumulator 3. Off–vehicle repair matrix chart	□ □ –
Harsh engagement (N → L)	Low coast modulator valve	□
Harsh engagement (1st → 2nd / D position)	1. Accumulator control valve 2. B_2 accumulator	□ □
Harsh engagement (1st → 2nd / 2 position)	1. Accumulator control valve 2. B_2 accumulator	□ □
Harsh engagement (1st → 2nd → 3rd → O/D)	1. Accumulator control valve 2. Throttle valve	□ □
Harsh engagement (2nd → 3rd)	1. Accumulator control valve 2. C_2 accumulator 3. Off–vehicle repair matrix chart	□ □ –
Harsh engagement (3rd → O/D)	1. Accumulator control valve 2. Solenoid modulator valve 3. Off–vehicle repair matrix chart	□ □ –
Harsh engagement (O/D → 3rd)	1. Accumulator control valve 2. C_0 accumulator 3. Off–vehicle repair matrix chart	□ □ –

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Slip or shudder (Forward and reverse)	1. Shift solenoid valve SLT 2. Transmission control cable 3. Oil strainer 4. Pressure relief valve 5. Off–vehicle repair matrix chart	05–1130 40–76 □ □ –
Slip or shudder (Particular position)	1. Shift solenoid valve SLT 2. Transmission control cable 3. Off–vehicle repair matrix chart	05–1130 40–76 –
No engine braking (1st / L position)	1. Low coast modulator valve 2. Off–vehicle repair matrix chart	□ –
No engine braking (2nd / 2 position)	1. 2nd coast modulator valve 2. Off–vehicle repair matrix chart	□ –
No kick–down	1. 1–2 shift valve 2. 2–3 shift valve	□ □

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3. CHAPTER 3: OFF–VEHICLE REPAIR
(□: A340E, A340F, A343F AUTOMATIC TRANSMISSION Repair Manual Pub. No. RM998U)

Symptom	Suspect Area	See page
Vehicle does not move in any forward position and reverse position	1. O/D one–way clutch (F_0) 2. O/D direct clutch (C_0) 3. O/D brake (B_0) 4. O/D planetary gear unit 5. Torque converter clutch	□ □ □ □ 40–43
Vehicle does not move in R position	1. 2nd coast brake (B_1) 2. Front and rear planetary gear unit 3. Direct clutch (C_2) 4. 1st & reverse brake (B_3) 5. O/D direct clutch (C_0)	□ □ □ □ □
Vehicle does not move in D, 2 and L positions	Forward clutch (C_2)	□
Vehicle does not move in D and 2 positions	No.2 one–way clutch (F_2)	□
Vehicle does not move in 2 position	1st & reverse (B_3)	□
Vehicle does not move in L position	1. 2nd brake (B_2) 2. 2nd coast brake (B_1) 3. Direct clutch (C_2)	□ □ □
No up–shift (1st → 2nd)	1. 2nd brake (B_2) 2. No. 1 one–way clutch (F_1)	□ □
No up–shift (2nd → 3rd)	Direct clutch (C_2)	□
No up–shift (3rd → O/D)	O/D brake (B_0)	□
No down–shift (2nd → 1st)	1. 2nd coast brake (B_1) 2. 2nd brake (B_2)	□ □
No lock–up or No lock–up off	Torque converter clutch	40–43
Harsh engagement (N → D)	Forward clutch (C_1)	□
Harsh engagement (N → R)	1. Direct clutch (C_2) 2. 1st & reverse brake (B_3)	□ □
Harsh engagement (2nd → 3rd)	2nd coast brake (B_1)	□
Harsh engagement (3rd → O/D)	1. O/D direct clutch (C_0) 2. O/D brake (B_0) 3. O/D planetary gear unit	□ □ □
Harsh engagement (O/D → 3rd)	O/D brake (B_0)	□
Harsh engagement (Lock–up)	Torque converter clutch	40–43
Slip or shudder (Forward and reverse / After warm–up)	1. Torque converter clutch 2. O/D one–way clutch (F_0) 3. O/D direct clutch (C_0)	□ □ □
Slip or shudder (Forward and reverse / Just after engine starts)	Torque converter clutch	40–43
Slip or shudder (R position)	1. Direct clutch (C_2) 2. 1st & reverse brake (B_3)	□ □
Slip or shudder (1st)	1. Forward clutch (C_1) 2. No. 2 one–way clutch (F_2)	□ □
Slip or shudder (2nd)	1. 2nd brake (B_2) 2. 2nd coast brake (B_1) 3. No. 1 one–way clutch (F_1)	□ □ □
Slip or shudder (3rd)	Direct clutch (C_2)	□
Slip or shudder (O/D)	O/D brake (B_0)	□
No engine braking (1st ~ 3rd: D position)	O/D direct clutch (C_0)	□
No engine braking (1st: L position)	1st & reverse brake (B_3)	□

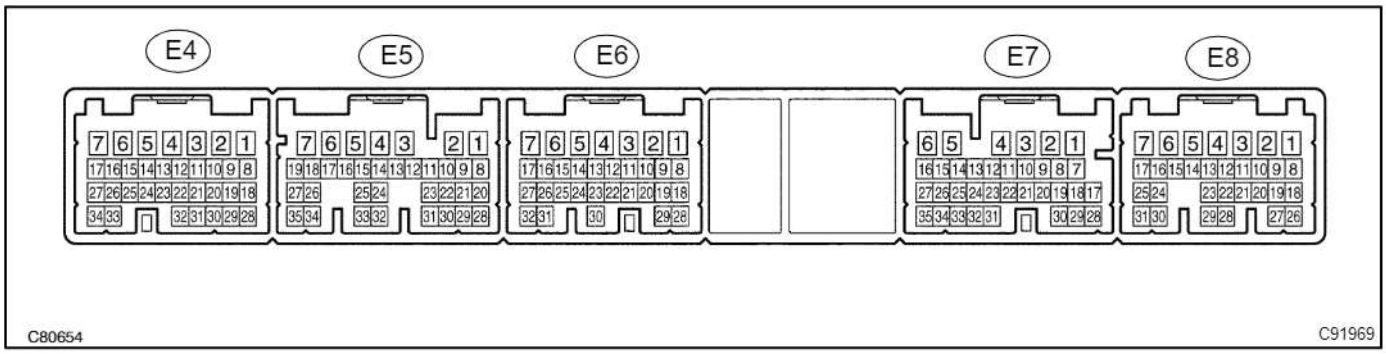
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No engine braking (2nd: 2 position)	2nd coast brake (B_1)	□
Poor acceleration (All position)	Torque converter clutch	40–43
Poor acceleration (O/D)	1. O/D direct clutch (C_0) 2. O/D planetary gear unit	□ □
Poor acceleration (other than O/D)	O/D brake (B_0)	□
Poor acceleration (other than 2nd)	1. 2nd coast brake (B_1) 2. 2nd brake (B_2)	□ □
Poor acceleration (1st and 2nd)	Direct clutch (C_2)	□
Poor acceleration (L and R positions)	1st & reverse brake (B_3)	□
Poor acceleration (R position)	Forward clutch (C_1)	□
Engine stalls when starting off or stopping	Torque converter clutch	40–43

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TERMINALS OF ECM



HINT:
Each ECM terminal's standard voltage is shown in the table below.
In the table, first follow the information under "Condition". Lock under "Symbols (Terminal No.)" for the terminals to inspected. The standard voltage between the terminals is shown under "STD Voltage".
Use the illustration above as a reference for the ECM terminals.

Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage (V)
NSW (E4–16) ↔ E1 (E6–1)	P ↔ BR	IG ON and Shift lever P or N position	Below 3
		IG ON and Shift lever other than P or N position	9 – 14
S2 (E5–10) ↔ E1 (E6–1)	L–W ↔ BR	IG ON	Below 1.5
		2nd or 3rd gear	9 – 14
		1st or O/D gear	Below 1.5
S1 (E5–11) ↔ E1 (E6–1)	L–R ↔ BR	IG ON	9 – 14
		1st or 2nd gear	9 – 14
		3rd or O/D gear	Below 1.5
SLT+ (E5–13) ↔ SLT– (E5–12)	G–Y ↔ L–B	IG ON	Below 3
		Engine is idling	Pulse signal is output Below 3 ↔ 9 – 14
SL (E5–15) ↔ E1 (E6–1)	G ↔ BR	IG ON	Below 1.5
		Vehicle driving under lock–up position	9 – 14
SP2+ (E5–26) ↔ SP2– (E5–34)	G ↔ R	Vehicle is running	Pulse signal is output Below 1.5 ↔ 4 – 6
NC^{O+} (E5–27) – NC^{O-} (E5–35)	W–R ↔ Y–R	Engine is idling	Pulse signal is output Below 1.5 ↔ 4 – 6
THOC (E5–32) ↔ E2 (E4–28)	B–Y ↔ BR	ATF temperature: 115 °C (239 °F) or more	Below 1.5
L4*1 (E7–4) – E1 (E6–1)	W–L ↔ BR	IG ON and Transfer L4 position	Below 1.5
		IG ON and Transfer other than L4 position	9 – 14
L (E7–8) ↔ E1 (E6–1)	B–L ↔ BR	IG ON and Shift lever L position	7.5 – 14
		IG ON and Shift lever other than L position	Below 1.5
2 (E7–9) ↔ E1 (E6–1)	P–L ↔ BR	IG ON and Shift lever 2 position	7.5 – 14
		IG ON and Shift lever other than 2 position	Below 1.5
D (E7–10) ↔ E1 (E6–1)	G–Y ↔ BR	IG ON and Shift lever D and 3 position	7.5 – 14
		IG ON and Shift lever other than D and 3 position	Below 1.5
R (E7–11) ↔ E1 (E6–1)	R–Y ↔ BR	IG ON and Shift lever R position	7.5 – 14
		IG ON and Shift lever other than R position	Below 1.5
STP (E7–19) ↔ E1 (E6–1)	G–Y ↔ BR	IG ON and Brake pedal is depressed	7.5 – 14
		IG ON and Brake pedal is released	Below 1.5

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3 (E7–20) ↔ E1 (E6–1)	L ↔ BR	IG ON and Shift lever 3 position	7.5 – 14
		IG ON and Shift lever other than 3 position	Below 1.5
OILW*1 (E7–25) – E1 (E6–1)	P ↔ BR	Engine stops and IG ON	Below 1.5
		Engine is idling	9 – 14

*1: 4WD

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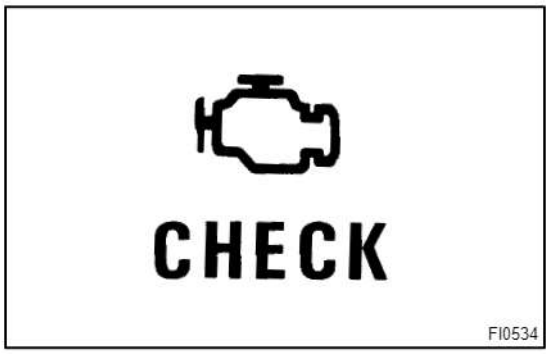
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DIAGNOSIS SYSTEM

1. DIAGNOSIS SYSTEM

(a) Description

(1) When troubleshooting OBD II vehicles, the only difference from the usual troubleshooting procedure is that you need to connect an OBD II scan tool complying with SAE J1987 or a hand–held tester to the vehicle, and read off various data output from the vehicle's ECM.



(2) OBD II regulations require that the vehicle's on–board computer illuminate the Malfunction Indicator Lamp (MIL) on the instrument panel when the computer detects a malfunction in the computer itself or in the drive system components which affect the vehicle emissions. In addition to the MIL illuminating when a malfunction is detected, the applicable DTCs prescribed by SAE J2012 are recorded in the ECM memory (See page 05–1093).

If the malfunction does not occur in 3 consecutive trips, the MIL goes off but the DTCs remain in the ECM memory.

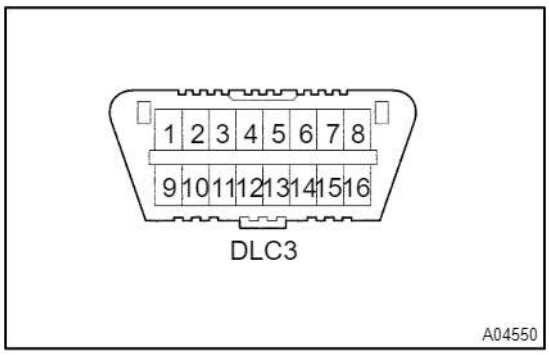
(3) To check the DTCs, connect the OBD II scan tool or hand–held tester to the DLC3 of the vehicle. The OBD II scan tool or hand–held tester also enables you to erase the DTCs and check freeze frame data and various forms of engine data (For instruction book).

(4) The DTCs include SAE controlled codes and Manufacturer controlled codes. SAE controlled codes must be set as prescribed by the SAE, while Manufacturer controlled codes can be set freely by a manufacturer within the prescribed limits (See the DTC chart on page 05–1093).

(5) The diagnosis system operates in the normal mode during the normal vehicle use, and also has a check mode for technicians to simulate malfunction symptoms and perform troubleshooting. Most DTCs use 2 trip detection logic(*) to prevent erroneous detection. By switching the ECM to the check mode when troubleshooting, the technician can cause the MIL to light up for a malfunction that is only detected once or momentarily. (hand–held tester).

(6) *2 trip detection logic:
When a malfunction is first detected, the malfunction is temporarily stored in the ECM memory. If the same malfunction is detected again during the second test drive, this second detection causes the MIL to illuminate.

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(b) Inspect the DLC3.
The vehicle's ECM uses ISO 9141–2 for communication. The terminal arrangement of DLC3 complies with SAE J1962 and matches the ISO 9141–2 format.

Tester connection	Condition	Specified condition
7 (Bus | Line) – 5 (Signal ground)	During communication	Pulse generation
4 (Chassis Ground) – Body	Always	1 Ω or less
5 (Signal Ground) – Body	Always	1 Ω or less
16 (B+) – Body	Always	9 to 14 V

HINT:
If your display shows UNABLE TO CONNECT TO VEHICLE when you have connected the cable of the OBD II scan tool or hand–held tester to the DLC3, turned the ignition switch ON and operated the scan tool, there is a problem on the vehicle side or tool side.

- If the communication is normal when the tool is connected to another vehicle, inspect the DLC3 on the original vehicle.
- If the communication is still impossible when the tool is connected to another vehicle, the problem is probably in the tool itself, so consult the Service Department listed in the tool's instruction manual.

(c) Measure the battery voltage.
Battery Voltage: 11 to 14 V

(d) Check the MIL.
(1) The MIL comes on when the ignition switch is turned ON and the engine is not running.

HINT:
If the MIL does not light up, troubleshoot the combination meter.

(2) When the engine is started, the MIL should go off. If the lamp remains on, it means that the diagnosis system has detected a malfunction or abnormality in the system.

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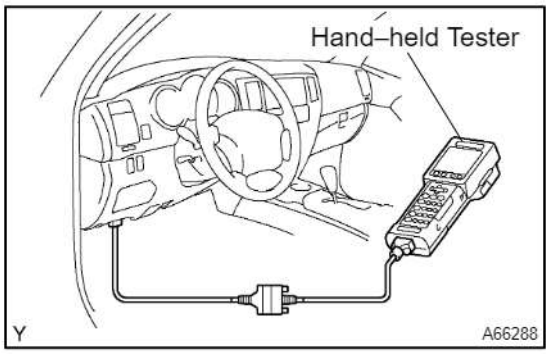
DTC CHECK/CLEAR

1. DTC CHECK (NORMAL MODE)

NOTICE:

Hand–held tester only:

When the diagnostic system is switched from the normal mode to the check mode, all the DTCs and freeze frame data recorded in the normal mode will be erased. So before switching modes, always check the DTCs and freeze frame data, and note them down.



(a) Checking DTCs using the OBD II scan tool or hand–held tester.
  (1) Connect the OBD II scan tool or hand–held tester to DLC3.
  (2) Turn the ignition switch ON.
  (3) Use the OBD II scan tool or hand–held tester to check the DTCs and freeze frame data and note them down (For operating instructions, see the OBD II scan tool's instruction book).
  (4) See page 05–1093 to confirm the details of the DTCs.

NOTICE:

When simulating symptoms with an OBD II scan tool (excluding hand–held tester) to check the DTCs, use the normal mode. For codes on the DTCs chart subject to "2 trip detection logic", turn the ignition switch OFF after the symptom is simulated once. Then repeat the simulation process again. When the problem has been simulated twice, the MIL is indicated on the instrument panel and DTCs are recorded in the ECM.

2. DTC CLEAR

(a) When using the OBD II scan tool or hand–held tester:
Clearing the DTCs.
  (1) Connect the OBD II scan tool or hand–held tester to the DLC3.
  (2) Turn the ignition switch to the ON position and push the OBD II scan tool or the hand–held tester main switch on.
  (3) When you use hand–held tester:
  Select the item "DIAGNOSIS/ENHANCED OBD II/ DTC INFO/CLEAR CODES [YES] button".

HINT:

When operating the OBD II scan tool (complying with SAE J1978) or hand–held tester to erase the codes, the DTCs and freeze frame data will be erased. (See the OBD II scan tool's instruction book for operating instructions.)

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(b) When not using the OBD II scan tool or hand–held tester: Clearing the DTCs.

(1) Disconnecting the battery terminal or remove the EFI and ETCS fuses from the engine room J/B for 60 seconds or more. But if you disconnect the battery terminal, you should do the ”INITIALIZE” procedure.

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05GC6-01

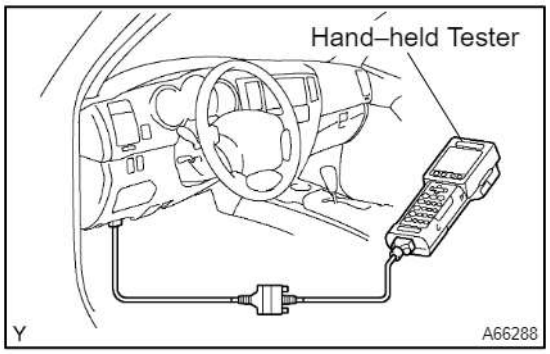
CHECK MODE PROCEDURE

1. DTC CHECK (CHECK MODE)

HINT:

Hand–held tester only:

Compared to the normal mode, the check mode has more sensing ability to detect malfunctions. Furthermore, the same diagnostic items which are detected in the normal mode can also be detected in the check mode.



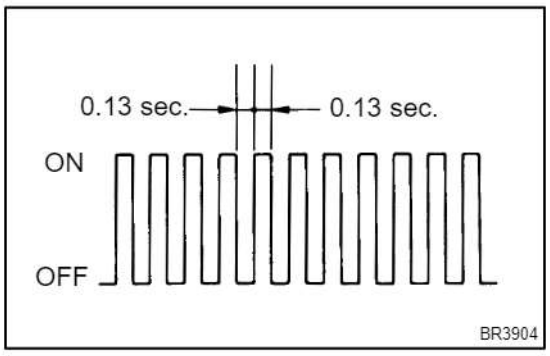
(a) Procedure for Check Mode using the hand–held tester.

(1) Check the initial conditions.
- □ Battery positive voltage 11 V or more
- □ Throttle valve fully closed
- □ Transmission in P or N position
- □ A/C switched OFF

(2) Turn the ignition switch OFF.

(3) Connect the hand–held tester to the DLC3.

(4) Turn the ignition switch ON.



(5) Switch the hand–held tester from the normal mode to the check mode (Check that the MIL flashes).

NOTICE:

If the hand–held tester switches the ECM from the normal mode to the check mode or vice–versa, or if the ignition switch is turned from ON to ACC or OFF during the check mode, the DTC and freeze frame data will be erased.

(6) Start the engine (MIL goes off after the engine starts).

(7) Simulate the conditions of the malfunction described by the customer.

NOTICE:

Leave the ignition switch ON until you have checked the DTCs, etc.

(8) After simulating the malfunction conditions, use the hand–held tester diagnosis selector to check the DTCs and freeze frame data, etc.

HINT:

Be sure not to turn the ignition switch OFF, as turning it OFF switches the diagnosis system from the check mode to the normal mode, which erases all the DTCs, etc.

(9) After checking the DTC, inspect the applicable circuit.

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2. DTC CLEAR

(a) When using the OBD II scan tool or hand–held tester:
Clearing the DTCs.
(1) Connect the OBD II scan tool or hand–held tester to the DLC3.
(2) Turn the ignition switch to the ON position and push the OBD II scan tool or the hand–held tester main switch on.
(3) When you use hand–held tester:
Select the item "DIAGNOSIS/ENHANCED OBD II/ DTC INFO/CLEAR CODES [YES] button".

HINT:
When operating the OBD II scan tool (complying with SAE J1978) or hand–held tester to erase the codes, the DTCs and freeze frame data will be erased. (See the OBD II scan tool's instruction book for operating instructions.)

(b) When not using the OBD II scan tool or hand–held tester:
Clearing the DTCs.
(1) Disconnecting the battery terminal or remove the EFI and ETCS fuses from the engine room J/B for 60 seconds or more. But if you disconnect the battery terminal, you should do the "INITIALIZE" procedure.

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05GC7-01

DATA LIST/ACTIVE TEST

1. DATA LIST

HINT:

According to the DATA LIST displayed by the OBD II scan tool or Hand–held tester, you can read the value of the switch, sensor, actuator and so on without parts removal. Reading the DATA LIST as a first step of troubleshooting is one of the method to shorten the labor time.

(a) Warm up the engine.
(b) Turn the ignition switch OFF.
(c) Connect the OBD II scan tool or Hand–held tester to the DLC3.
(d) Turn the ignition switch ON.
(e) Push the "ON" button of OBD II scan tool or Hand–held tester.
(f) Select the item "/DIAGNOSIS/ENHANCED OBD II/DATA LIST/ALL (or ATM)".
(g) According to the display on tester, read the "DATA LIST".

Item	Measurement Item/ Display (Range)	Normal Condition	Diagnostic Note
STOP LIGHT SW	Stop light SW Status/ ON or OFF	□Brake Pedal is depressed: ON □Brake Pedal is released: OFF	–
SHIFT	Actual Gear Position/ 1st, 2nd, 3rd, 4th (O/D)	Shift Lever Position is; □L: 1st □2: 1st or 2nd □3: 1st, 2nd or 3rd □D: 1st, 2nd, 3rd or 4th (O/D)	–
LOCK UP SOL	Lock Up Solenoid Status/ ON or OFF	□Lock Up: ON □Except Lock Up: OFF	–
PNP SW [NSW]	PNP SW Status/ ON or OFF	Shift lever position is; P or N: ON Except P or N: OFF	The shift lever position and these values are different, there are failures of the PNP switch or shift cable adjustment.
REVERSE	PNP SW Status/ ON or OFF	Shift lever position is; R: ON Except R: OFF	
DRIVE	PNP SW Status/ ON or OFF	Shift lever position is; D and 3: ON Except D and 3: OFF	
3RD	PNP SW Status/ ON or OFF	Shift lever position is; 3: ON Except 3: OFF	
2ND	PNP SW Status/ ON or OFF	Shift lever position is; 2: ON Except 2: OFF	
LOW	PNP SW Status/ ON or OFF	Shift lever position is; L: ON Except L: OFF	
SOLENOID (SLT)	Shift Solenoid SLT Status/ ON or OFF	IG SW ON: ON	–
SPD (SP2)	Counter Gear Speed display/ min.: 0 km/h (0 mph) max.: 255 km/h (158 mph)	Vehicle stopped: 0 km/h (0 mph)	–
SPD (NCO)	Input Speed display: 50 r/min	4th (O/D) gear and lock–up Position; Same as engine speed	–

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2. ACTIVE TEST

HINT:

Performing the ACTIVE TEST using the OBD II scan tool or Hand–held tester allows the relay, VSV, actuator and so on to operate without parts removal. Performing the ACTIVE TEST as a first step of troubleshooting is one of the method to shorten the labor time.

It is possible to display the DATA LIST during the ACTIVE TEST.

(a) Warm up the engine.
(b) Turn the ignition switch OFF.
(c) Connect the OBD II scan tool or Hand–held tester to the DLC3.
(d) Turn the ignition switch ON.
(e) Push the "ON" button of Hand–held tester.
(f) Select the item "/DIAGNOSIS/ENHANCED OBD II/ACTIVE TEST".
(g) According to the display on tester, perform the "ACTIVE TEST".

Item	Test Details	Diagnostic Note
SHIFT	[Test Details] Operate the shift solenoid valve and set the each shift position by yourself. [Vehicle Condition] Less than 50 km/h (31 mph) [Others] □Press → button: Shift up □Press ← button: Shift down	Possible to check the operation of the shift solenoid valves.
LOCK UP	[Test Details] Control the shift solenoid SL to set the ATM to the lock–up condition. [Vehicle Condition] Vehicle Speed: 58 km/h (36 mph) or more	Possible to check the SL operation.
LINE PRESS UP *	[Test Details] Operate the shift solenoid SLT and raise the line pressure. [Vehicle Condition] □Vehicle Stopped. □IDL: ON [HINT] OFF: Line pressure up (When the active test of "LINE PRESS UP" is performed, the ECM commands the SLT solenoid to turn off). ON: No action (normal operation)	–

*: "LINE PRESS UP" in the ACTIVE TEST is performed to check the line pressure changes by connecting the SST to the automatic transaxle, which is used in the HYDRAULIC TEST (see page 05–1067) as well.

HINT:

The pressure values in ACTIVE TEST and HYDRAULIC TEST are different from each other.

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0527K–29

DIAGNOSTIC TROUBLE CODE CHART

If a DTC is displayed during the DTC check, check the circuit listed in the table below and proceed to the page given.

*1 : □...MIL light up

DTC No. (See Page)	Detection Item	Trouble Area	MIL *1	Memory
P0500 (05–547)	Vehicle Speed Sensor "A"	Open or short in speed sensor circuit Speed sensor Combination meter ECM	□	○
P0705 (05–1095)	Transmission Range Sensor Circuit Malfunction (PRNDL Input)	Short in park/neutral position switch circuit Park/neutral position switch ECM	□	○
P0710 (05–1100)	Transmission Fluid Temperature Sensor "A" Circuit	Open or short in ATF temperature sensor circuit ATF temperature sensor ECM	□	○
P0712 (05–1100)	Transmission Fluid Temperature Sensor "A" Circuit Low Input	Short in ATF temperature sensor circuit ATF temperature sensor ECM	□	○
P0713 (05–1100)	Transmission Fluid Temperature Sensor "A" Circuit High Input	Open in ATF temperature sensor circuit ATF temperature sensor ECM	□	○
P0717 (05–1103)	Input Speed Sensor Circuit No Signal	Open or short in speed sensor (NCO) circuit Speed sensor (NCO) ECM	□	○
P0722 (05–1106)	Output Speed Sensor	Open or short in speed sensor (SP2) circuit Speed sensor (SP2) ECM	□	○
P0724 (05–1109)	Brake Switch "B" Circuit High	Short in stop light switch circuit Stop light switch ECM	□	○
P0741 (05–1111)	Torque Converter Clutch Solenoid Performance (Shift Solenoid Valve SL)	Shift solenoid valve SL is stuck open or closed Valve body is blocked up or stuck Lock–up clutch	□	○
P0751 (05–1114)	Shift Solenoid "A" Performance (Shift Solenoid Valve S1)	Shift solenoid valve S1 is stuck open or closed Valve body is blocked up or stuck Shift solenoid valve S1 Automatic transmission assembly ECM	□	○
P0756 (05–1118)	Shift Solenoid "B" Performance (Shift Solenoid Valve S2)	Shift solenoid valve S2 is stuck open or closed Valve body is blocked up or stuck Shift solenoid valve S2 Automatic transmission assembly ECM	□	○
P0850 (05–1095)	Park/Neutral Switch Input Circuit	Short in park/neutral position switch circuit Park/neutral position switch ECM	□	○
P0973 (05–1122)	Shift Solenoid "A" Control Circuit Low (Shift Solenoid Valve S1)	Open or short in shift solenoid valve S1 circuit Shift solenoid valve S1 ECM	□	○
P0974 (05–1122)	Shift Solenoid "A" Control Circuit High (Shift Solenoid Valve S1)		□	○

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P0976 (05–1122)	Shift Solenoid "B" Control Circuit Low (Shift Solenoid Valve S2)	Open or short in shift solenoid valve S2 circuit Shift solenoid valve S2 ECM	□	○
P0977 (05–1122)	Shift Solenoid "B" Control Circuit High (Shift Solenoid Valve S2)		□	○
P1782 (05–1127)	T/F L4 Range Position Switch Performance	Short in transfer L4 position switch circuit Four wheel drive control ECU ECM	□	○
P2716 (05–1130)	Pressure Control Solenoid "D" Electrical (Shift Solenoid Valve SLT)	Open or short in shift solenoid valve SLT circuit Shift solenoid valve SLT ECM	□	○
P2769 (05–1134)	Torque Converter Clutch Solenoid Circuit Low (Shift Solenoid Valve SL)	Open or short in shift solenoid valve SL circuit Shift solenoid valve SL ECM	□	○
P2770 (05–1134)	Torque Converter Clutch Solenoid Circuit High (Shift Solenoid Valve SL)	Open or short in shift solenoid valve SL circuit Shift solenoid valve SL ECM	□	○

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DTC	P0705	TRANSMISSION RANGE SENSOR CIRCUIT MALFUNCTION (PRNDL INPUT)

DTC	P0850	PARK/NEUTRAL SWITCH INPUT CIRCUIT

CIRCUIT DESCRIPTION

The park/neutral position switch detects the shift lever position and sends signals to the ECM.

DTC No.	DTC Detection Condition	Trouble Area
P0705	(2–trip detection logic) □2 or more switches are ON simultaneously for P, R, N, (D 3), 2 and L positions.	□Short in park/neutral position switch circuit □Park/neutral position switch □ECM
P0850	Park/neutral position switch remains ON (P, N position) during driving under conditions (a) and (b) for 30 sec. (2–trip detection logic) (a) Vehicle speed: 70 km/h (44 mph) or more (b) Engine speed: 1,200 – 2,500 rpm	

MONITOR DESCRIPTION

The park/neutral position switch detects the shift lever position and sends a signal to the ECM.
For security, the park/neutral position switch detects the shift lever position so that engine can be started only when the vehicle is in P or N shift position.
When the park/neutral position switch sends more than one signal at a time from switch positions P, R, N or D, the ECM interprets this as a fault in the switch. The ECM will turn on the MIL and store the DTC.

MONITOR STRATEGY

P0705:

Related DTCs	Park/neutral position switch/Verify switch input
Required sensors/Components	Park/neutral position switch
Frequency of operation	Continuous
Duration	0.5 sec.
MIL operation	2 driving cycles
Sequence of operation	None

P0850:

Related DTCs	P0850 : Park/Neutral position switch/Verify switch cycling
Required sensors/Components	Park/Neutral position switch
Frequency of operation	Continuous
Duration	30 sec.
MIL operation	2 driving cycle
Sequence of operation	None

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TYPICAL ENABLING CONDITIONS

P0705:

The monitor will run whenever the following DTCs are not present.	See page 05–1071
The typical enabling conditions are not available.	–

P0850:

The monitor will run whenever the following DTCs are not present.	See page 05–1071
Vehicle speed	70 km/h (43 mph) or more
Engine speed	1,200 rpm or more and 2,500 rpm or less
Intake air amount per revolution	0.6 g/rev. or more

TYPICAL MALFUNCTION THRESHOLDS

P0705:

Number of the following signal input at the same time	2 or more
NSW switch	ON
R switch	ON
D switch	ON
2 switch	ON
L switch	ON

P0850:

NSW switch	ON

COMPONENT OPERATING RANGE

P0705:

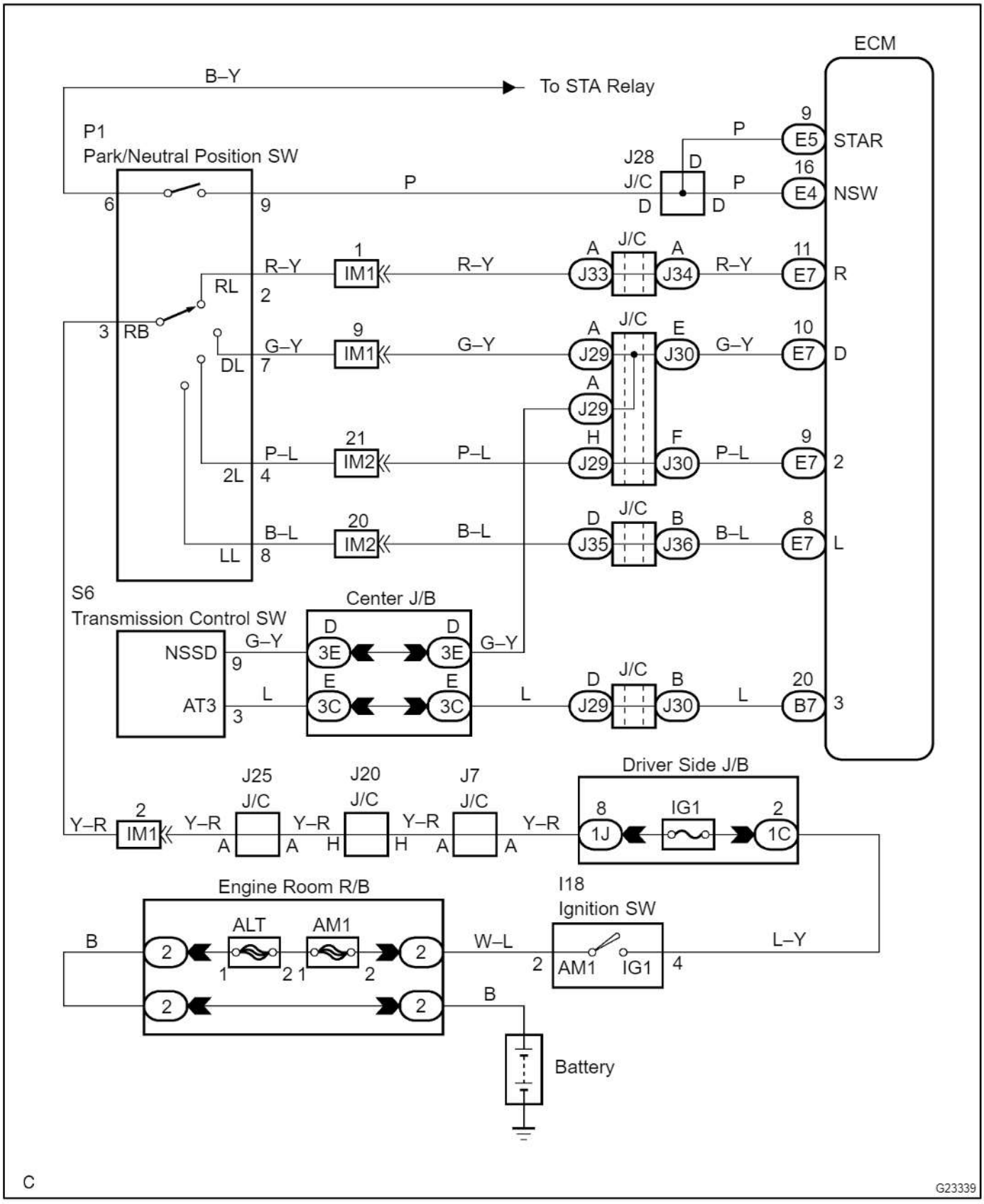
Park/neutral position switch	The park/neutral position switch sends only one signal to the ECM.

P0850:

Park/neutral position switch	The park/neutral position switch is OFF when above condition.

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WIRING DIAGRAM



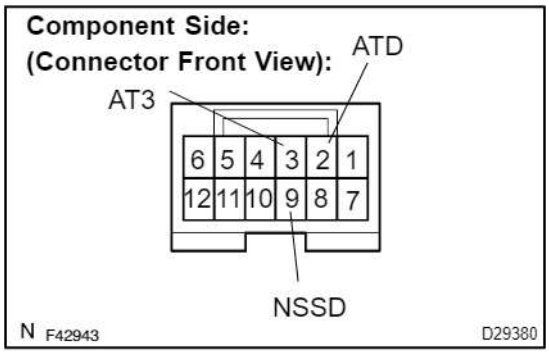
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INSPECTION PROCEDURE

HINT:

Start the inspection from the step 1 when the malfunction is found in the 3 position, and start from step 2 when the malfunction is in the other position.

1	INSPECT SHIFT LOCK CONTROL ECU SUB–ASSY(TRANSMISSION CONTROL SWICH)



(a) Disconnect the shift lock control ECU connector.

(b) Check continuity between each terminal shown below when the shift lever is moved to each position.

OK:

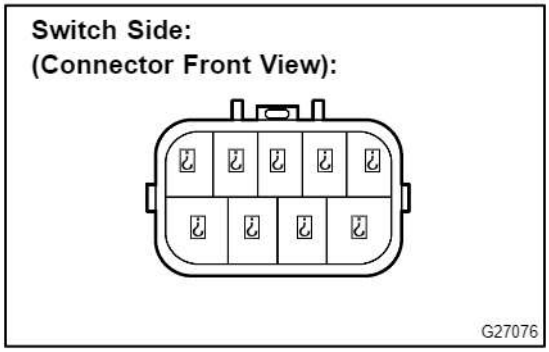
Standard:

Shift position	Tester connection	Specified valve
D	9 – 2 (NSSD – ATD)	Continuity
3		No continuity
D	9 – 3 (NSSD – AT3)	No continuity
3		Continuity

NG	REPLACE SHIFT LOCK CONTROL ECU SUB–ASSY (See page 40–70)

OK

2	INSPECT PARK/NEUTRAL POSITION SWITCH ASSY



(a) Connect the shift lock control ECU connector.

(b) Jack up the vehicle.

(c) Disconnect the park/neutral position switch connector.

(d) Check continuity between each terminal shown below when the shift lever is moved to each position.

Shift Position	Terminal No. to continuity	
P	1 – 3	6 – 9
R	2 – 3	–
N	3 – 5	6 – 9
D, 3	3 – 7	–
2	3 – 4	–
L	3 – 8	–

OK:

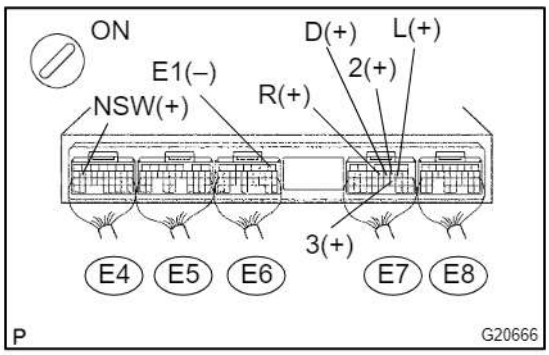
There is continuity.

NG	REPLACE PARK/NEUTRAL POSITION SWITCH ASSY (See page 40–12)

OK

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3	CHECK HARNESS AND CONNECTOR(PARK/NEUTRAL POSITION SWITCH – ECM)



(a) Connect the park/neutral position switch connector.
(b) Turn the IG switch ON and measure the voltage between each terminal shown below when the shift lever is shifted to the following position.

OK:

Tester connection	Condition	Specified condition
NSW – E1	Shift lever position: P and N	Below 1 V
	Shift lever position: Except P and N	Battery voltage
R – E1	Shift lever position: R	Battery voltage*
D – E1	Shift lever position: D and 3	Battery voltage
3 – E1	Shift lever position: 3	Battery voltage
2 – E1	Shift lever position: 2	Battery voltage
L – E1	Shift lever position: L	Battery voltage

HINT:
*: The voltage will drop slightly due to lighting up of the back up light.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR (See page 01–35)**

OK

CHECK AND REPLACE ECM (See page 10–11)

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DTC	P0710	TRANSMISSION FLUID TEMPERATURE SENSOR ”A” CIRCUIT

DTC	P0712	TRANSMISSION FLUID TEMPERATURE SENSOR ”A” CIRCUIT LOW INPUT

DTC	P0713	TRANSMISSION FLUID TEMPERATURE SENSOR ”A” CIRCUIT HIGH INPUT

CIRCUIT DESCRIPTION

The ATF temperature sensor converts the fluid temperature into a resistance value which is input into the ECM.

DTC No.	DTC Detecting Condition	Trouble Area
P0710	(a) and (b) is detected momentary within 0.5 sec. when neither P0712 or P0713 is not detected (1–trip detection logic) (a) ATF temperature sensor resistance is less than 79 Ω. (b) ATF temperature sensor resistance is more than 156 kΩ. HINT: Within 0.5 sec. the malfunction switches from (a) to (b) or from (b) to (a)	□Open or short in ATF temperature sensor circuit □ATF temperature sensor □ECM
P0712	ATF temperature sensor resistance is less than 79 Ω. for 0.5 sec. or more (1–trip detection logic)	
P0713	DTC is detected for 0.5 sec. or more (1–trip detection logic) ATF temperature sensor resistance is more than 156 kΩ. after started engine for 15 minutes or more	

MONITOR DESCRIPTION

The automatic transmission fluid (ATF) temperature sensor converts ATF temperature to an electrical resistance value. Based on the resistance, the ECM determines the ATF temperature, and the ECM detects an opens or shorts in the ATF temperature circuit. If the resistance value of the ATF temperature is less than 79 Ω*1 or more than 156 kΩ*2, the ECM interprets this as a fault in the ATF sensor or wiring. The ECM will turn on the MIL and store the DTC.

*1: 150 C (302 F) or more is indicated regardless of the actual ATF temperature.

*2: –40 C (–40 F) is indicated regardless of the actual ATF temperature.

HINT:

The ATF temperature can be checked on the OBD II scan tool or hand–held tester display.

MONITOR STRATEGY

Related DTCs	P0710: ATF temperature sensor/Range check (Chattering) P0712: ATF temperature sensor/Range check (Low resistance) P0713: ATF temperature sensor/Range check (High resistance)
Required sensors/Components	ATF temperature sensor
Frequency of operation	Continuous
Duration	0.5 sec.
MIL operation	Immediate
Sequence of operation	None

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TYPICAL ENABLING CONDITIONS

P0710: Range check (Fluttering)
P0712: Range check (Low resistance)

The monitor will run whenever the following DTCs are not present.	See page 05–1071
The typical enabling condition is not available.	–

P0713: Range check (High resistance)

The monitor will run whenever the following DTCs are not present.	See page 05–1071
Time after engine start	15 min. or more

TYPICAL MALFUNCTION THRESHOLDS

P0710: Range check (Chattering)

ATF temperature sensor resistance	Less than 79 Ω or More than 156 kΩ

P0712: Range check (Low resistance)

ATF temperature sensor resistance	Less than 79 Ω

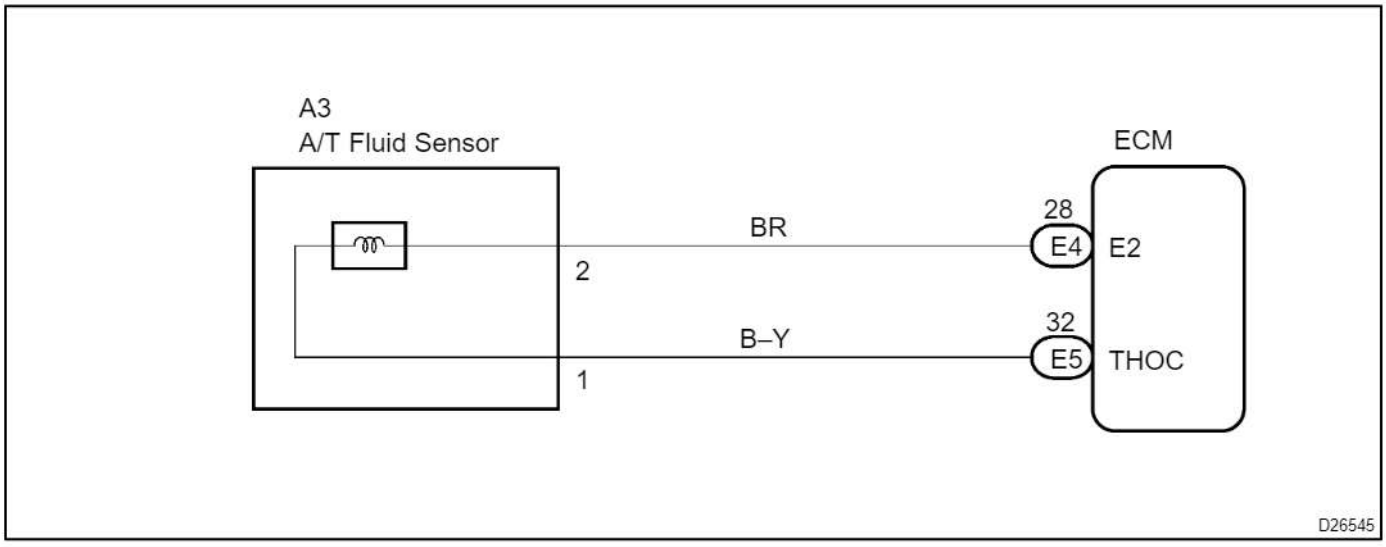
P0713: Range check (High resistance)

ATF temperature sensor resistance	More than 156 kΩ

COMPONENT OPERATING RANGE

ATF temperature sensor	Atmospheric temperature – approx. 130 C (266 F)

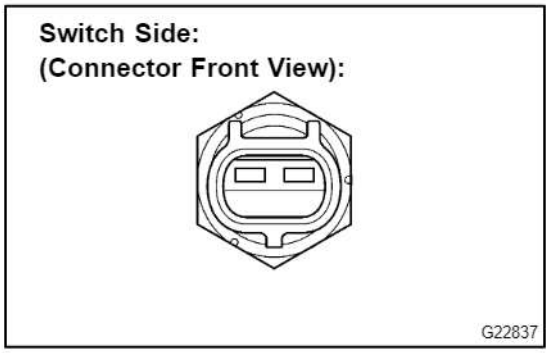
WIRING DIAGRAM



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INSPECTION PROCEDURE

1	INSPECT TEMPERATURE SENSOR(ATF TEMPERATURE SENSOR)

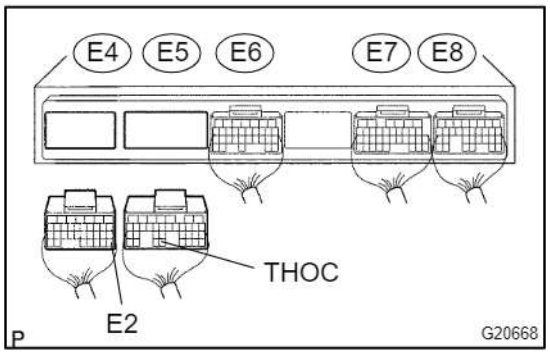


(a) Disconnect the ATF temperature sensor connector from the transmission.
(b) Measure the resistance between the sensor connector terminals.
OK:
Resistance: 79 Ω to 156 kΩ

NG → **REPLACE TEMPERATURE SENSOR (See page 40–50)**

OK

2	CHECK HARNESS AND CONNECTOR(ATF TEMPERATURE SENSOR–ECM)



(a) Connect the ATF temperature sensor connector to the transmission.
(b) Disconnect the ECM connector.
(c) Measure resistance between terminals THOC and E2.
OK:
Resistance: 79 Ω to 156 kΩ
(d) Check the continuity between the wire harness side connectors.
OK:
Standard (Check for short):

Symbols	Specified condition
THOC ⇔ Body ground	No continuity
E2 ⇔ Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR (See page 01–35)**

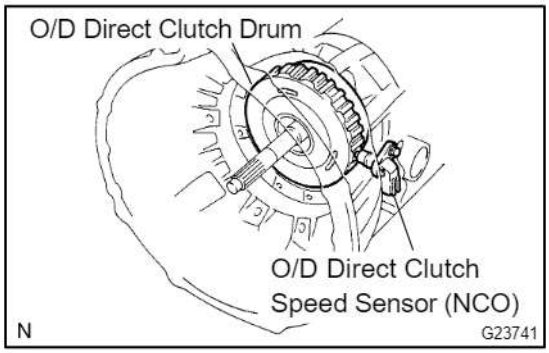
OK

CHECK AND REPLACE ECM (See page 10–11)

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DTC	P0717	INPUT SPEED SENSOR CIRCUIT NO SIGNAL

CIRCUIT DESCRIPTION



The O/D direct clutch speed sensor (NCO) detects the rotation speed of the O/D input shaft from the rotation of the O/D direct clutch drum. Its construction is the same as that of the No.2 vehicle speed sensor (SP2).
By comparing the O/D direct clutch speed signal and No.2 vehicle speed sensor (SP2) signal, the ECM detects the shift timing of the gears and appropriately controls the engine torque and hydraulic pressure in response to various conditions, thus doing smooth gear shift.

DTC No.	DTC Detection Condition	Trouble Area
P0717	All conditions below are detected for 5 secs. or more (1–trip detection logic) (a) Gear change not being performed (b) Gear position: 1st, 2nd or 3rd (c) T/M input shaft rpm: 300 rpm or less (d) T/M output shaft rpm: 500 rpm or more (e) Park/neutral position switch: OFF (f) Shift solenoid valves No. 1, No. 2, SL and vehicle speed sensor are in normal operation	□Open or short in O/D direct clutch speed sensor (NCO) circuit □O/D direct clutch speed sensor (NCO) □ECM

MONITOR DESCRIPTION

The input speed sensor detects the transmission input shaft speed. The ECM determines the gear shift timing based on a comparison of the input speed sensor (input shaft speed) with the output speed sensor (output shaft speed).
When the output shaft speed is higher then the expected value and the input shaft speed is 300 rpm or less while running with the shift in the D position, the ECM will conclude that there is malfunction of the input turbine speed sensor (NC0). The ECM will illuminate the MIL and a DTC is set.

MONITOR STRATEGY

Related DTCs	P0717: Speed sensor (NC0)/Verify pulse input
Required sensors/Components	Speed sensor (NC0), Speed sensor (NO)
Frequency of operation	Continuous
Duration	5 sec.
MIL operation	Immediate
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present.	See page 05–1071
ECM selected gear	1st, 2nd or 3rd
Output shaft rpm	500 rpm or more

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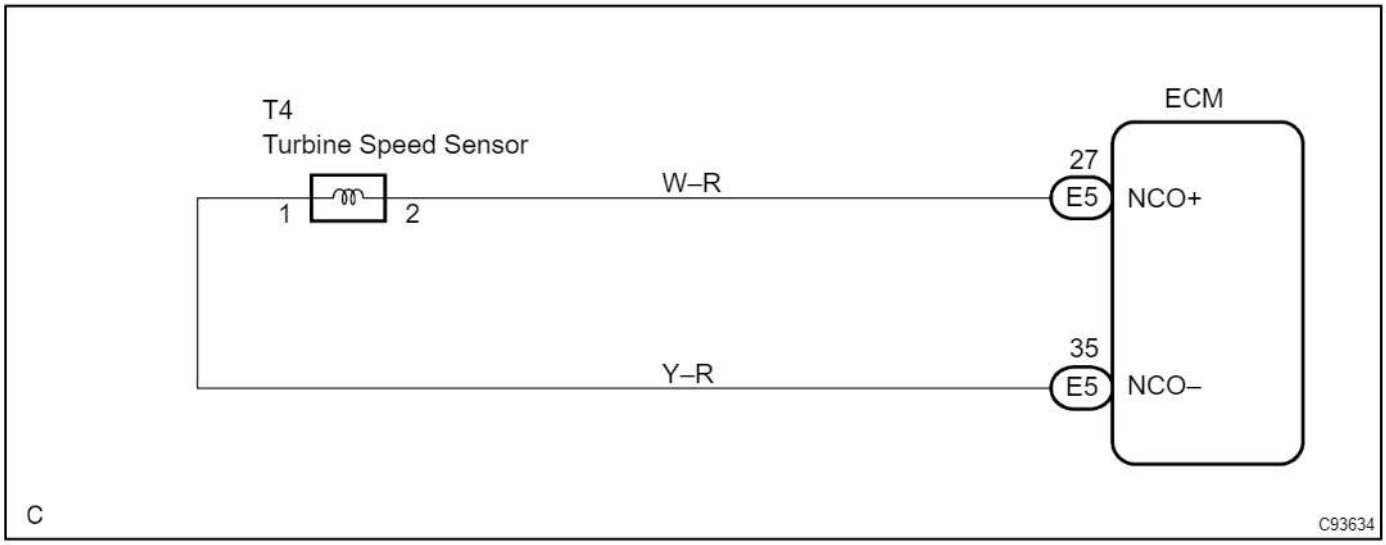
TYPICAL MALFUNCTION THRESHOLDS

Sensor signal rpm	Less than 300 rpm

COMPONENT OPERATING RANGE

Speed sensor (NC0)	Input speed is equal to engine speed when lock–up ON.

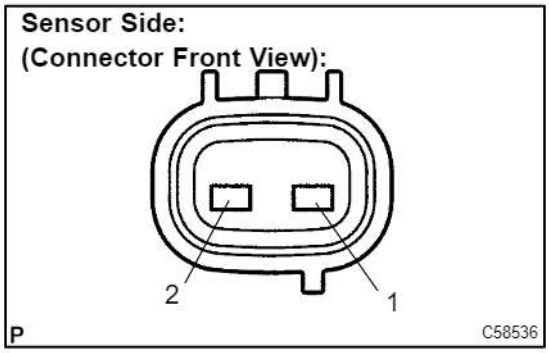
WIRING DIAGRAM



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INSPECTION PROCEDURE

1	INSPECT SPEED SENSOR(NCO)

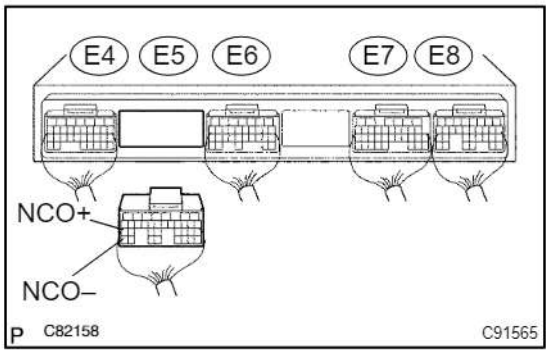


(a) Remove the speed sensor (NCO) from the transmission.
(b) Measure the resistance between terminals of speed sensor.
OK:
Resistance: 560 to 680 Ω at 20 C (68 F)

NG → **REPLACE SPEED SENSOR(NCO)**

OK

2	CHECK HARNESS AND CONNECTOR(SPEED SENSOR – ECM)



(a) Install the speed sensor (NCO).
(b) Disconnect the ECM connector.
(c) Measure the resistance between terminals NCO+ and NCO–.
OK:
Resistance: 560 to 680 Ω at 20 C (68 F)
(d) Check the continuity between the wire harness side connectors.
OK:
Standard (Check for short):

Symbols	Specified condition
NCO+ ⇔ Body ground	No continuity
NCO– ⇔ Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR (See page 01–35)**

OK

CHECK AND REPLACE ECM (See page 10–11)

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DTC	P0722	OUTPUT SPEED SENSOR CIRCUIT NO SIGNAL

CIRCUIT DESCRIPTION

The speed sensor SP2 detects the rotation speed of the transmission output shaft and sends signals to the ECM. The ECM determines the vehicle speed based on these signals.
An AC voltage is generated in the speed sensor SP2 coil as the rotor mounted on the output shaft rotates, and this voltage is sent to the ECM.
The gear shift point and lock–up timing are controlled by the ECM based on the signals from this speed sensor and the throttle position sensor signal.

DTC No.	DTC Detection Condition	Trouble Area
P0722	All conditions below are detected 500 times or more continuously (2–trip detection logic) (a) No signal from speed sensor (SP2) is input to ECM while 4 pulses of No. 1 vehicle speed sensor signal are sent (b) Vehicle speed is 9 km/h (6 mph) or more for at least 4 sec. (c) Park/neutral position switch is OFF. (d) Transfer position is except neutral (4WD).	□Open or short in speed sensor SP2 (No. 2 vehicle speed sensor) circuit □Speed sensor SP2 (No. 2 vehicle speed sensor) □ECM

MONITOR DESCRIPTION

The output speed sensor monitors the output shaft speed. The ECM controls the gearshift point and the lock up timing based on the signals from the output speed sensor and throttle position sensor.
If the ECM detects no signal from the output shaft speed sensor even while the vehicle is moving, it will conclude that is a malfunction of the output speed sensor. The ECM will illuminate the MIL and set a DTC.

MONITOR STRATEGY

Related DTCs	P0722 : Speed sensor SP2/Verify pulse input
Required sensors/Components	Speed sensor SP2
Frequency of operation	Continuous
Duration	500 output shaft revolution
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITION

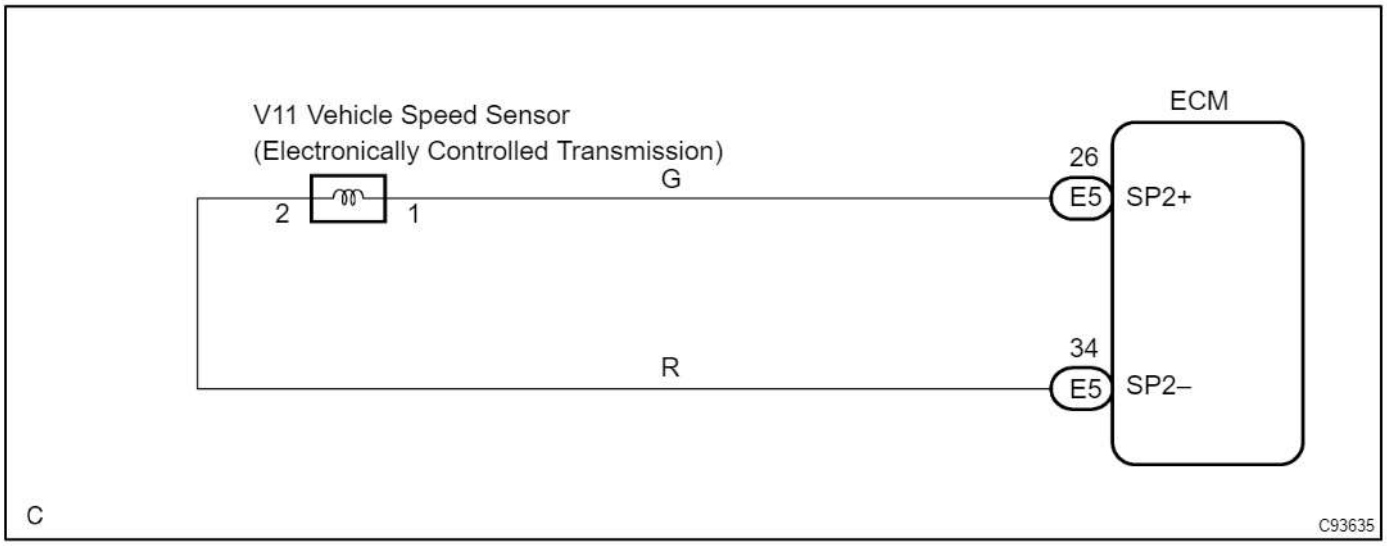
The monitor will run whenever the following DTCs are not present.	See page 05–1071
Vehicle speed range (4 sec. or more)	9 km/h (6 mph) or more
NSW switch	OFF

TYPICAL MALFUNCTION THRESHOLDS

No pulse input during 4 vehicle speed sensor pulse input	500 times or more

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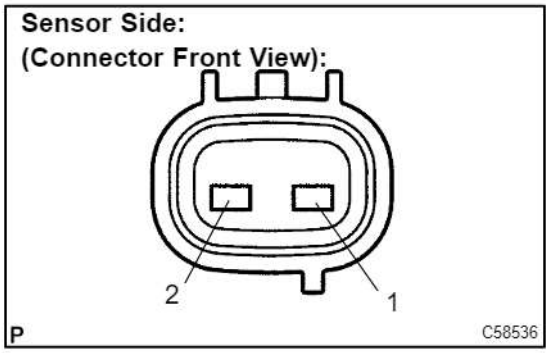
WIRING DIAGRAM



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INSPECTION PROCEDURE

1	INSPECT SPEED SENSOR(SP2)

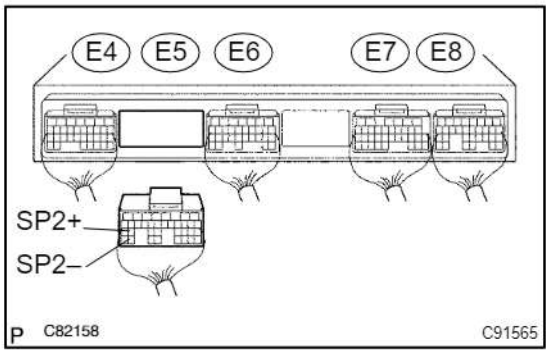


(a) Remove the speed sensor (SP2) from the transmission.
(b) Measure the resistance between terminals of speed sensor.
OK:
Resistance: 560 to 680 Ω at 20 C (68 F)

NG → **REPLACE SPEED SENSOR(SP2)**

OK

2	CHECK HARNESS AND CONNECTOR(SPEED SENSOR – ECM)



(a) Install the speed sensor (SP2).
(b) Disconnect the ECM connector.
(c) Measure the resistance between terminals SP2+ and SP2–.
OK:
Resistance: 560 to 680 Ω at 20 C (68 F)
(d) Check the continuity between the wire harness side connectors.
OK:
Standard (Check for short):

Symbols	Specified condition
SP2+ ⇔ Body ground	No continuity
SP2– ⇔ Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR (See page 01–35)**

OK

CHECK AND REPLACE ECM (See page 10–11)

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DTC P0724 BRAKE SWITCH "B" CIRCUIT HIGH

CIRCUIT DESCRIPTION

The purpose of this circuit is to prevent the engine from stalling while driving in lock–up condition, when brakes are suddenly applied.
When the brake pedal is depressed, this switch sends a signals to the ECM. Then the ECM cancels the operation of the lock–up clutch while braking is in progress.

DTC No.	DTC Detection Condition	Trouble Area
P0724	Stop light switch remains ON while vehicle running (2–trip detection logic)	□Short in stop light switch signal circuit □Stop light switch □ECM

MONITOR DESCRIPTION

When the stop light switch remains ON during "stop and go" driving, the ECM interprets this as a fault in the stop light switch and the MIL comes on and the ECM stores the DTC. The vehicle must stop and go (3 km/h (2 mph) to 30 km/h (19 mph)) ten times for two driving cycles in order to detect malfunction.

MONITOR STRATEGY

Related DTCs	P0724: Stop light switch/Range check/Rationality
Required sensors/Components	Stop light switch, Vehicle speed sensor
Frequency of operation	Continuous
Duration	GO and STOP 10 times
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The stop light switch remains on during GO and STOP 10 times.
GO and STOP are defined as follows;

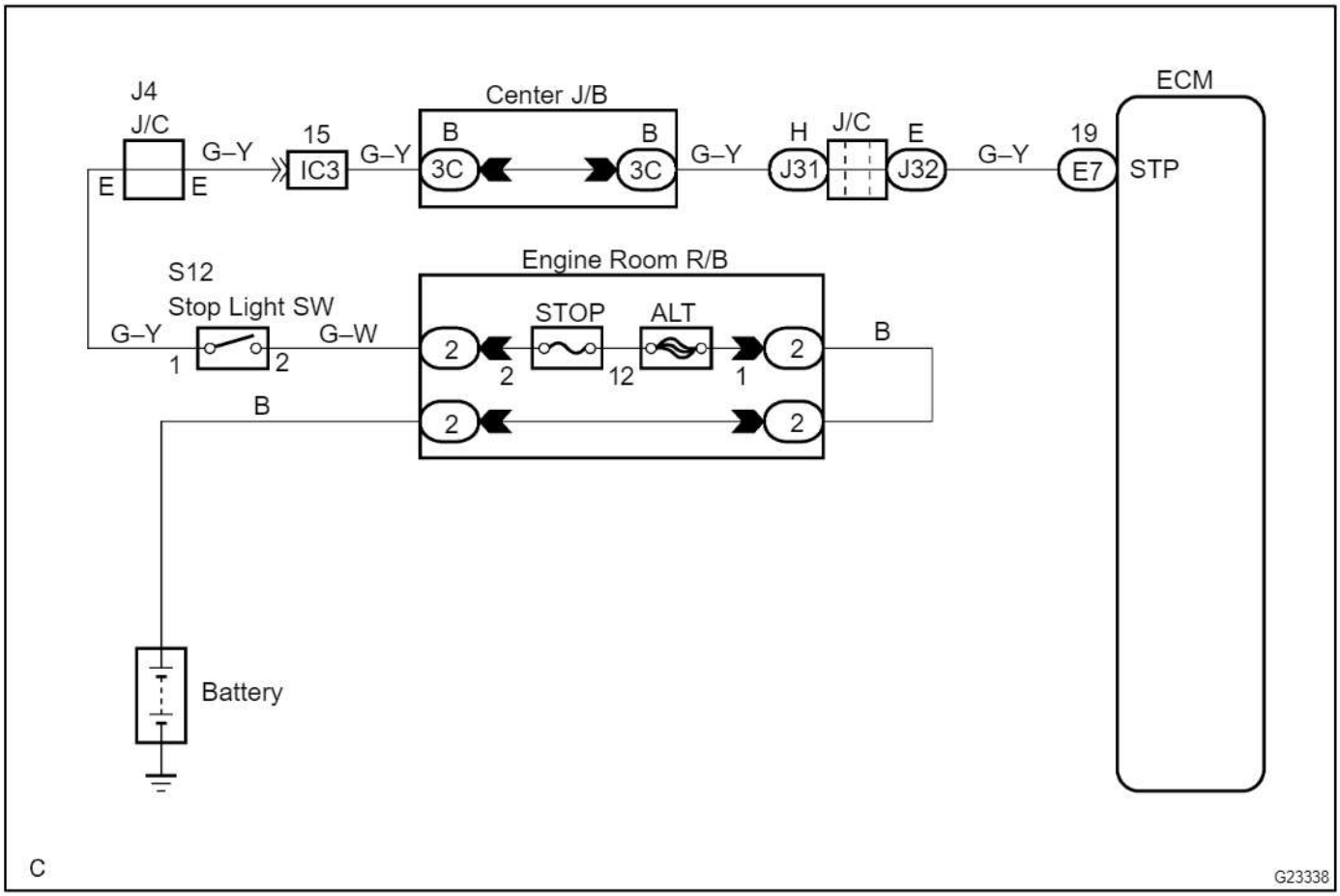
The monitor will run whenever the following DTCs are not present.	See page 05–1071
GO: Vehicle speed	30 km/h (19 mph) or more
STOP: Vehicle speed	Less than 3 km/h (2 mph)

TYPICAL MALFUNCTION THRESHOLDS

Brake switch status	ON stuck

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WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT STOP LAMP SWITCH ASSY (See page 65–4)

NG → REPLACE STOP LAMP SWITCH ASSY

OK

2	CHECK HARNESS AND CONNECTOR(STOP LAMP SWITCH ASSY – ECM) (See page 01–35)

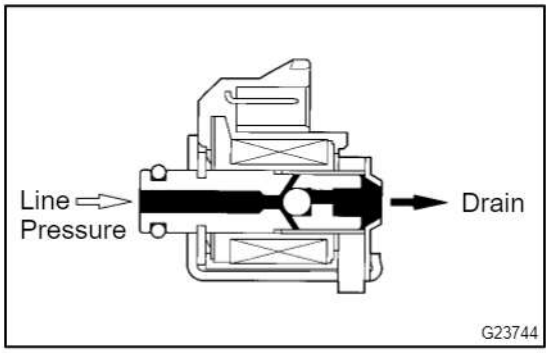
NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

CHECK AND REPLACE ECM (See page 10–11)

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DTC	P0741	TORQUE CONVERTER CLUTCH SOLENOID PERFORMANCE (SHIFT SOLENOID VALVE SL)



SYSTEM DESCRIPTION

The ECM uses the signals from the Throttle position sensor, Air–flow meter and crankshaft position sensor to monitor the engagement condition of the lock–up clutch.
Then the ECM compares the engagement condition of the lock–up clutch with the lock–up schedule in the ECM memory to detect mechanical trouble of the shift solenoid valve SL, valve body and torque converter clutch.

DTC No.	DTC Detection Condition	Trouble Area
P0741	Lock–up does not occur when driving in the lock–up range (normal driving at 80 km/h [50 mph]), or lock–up remains ON in the lock–up OFF range (2–trip detection logic)	□Shift solenoid valve SL is stuck open or closed □Valve body blocked up or stuck □Lock–up clutch

MONITOR DESCRIPTION

Torque converter lock–up is controlled by the ECM based on O/D direct clutch (input) speed sensor NC0, output speed sensor SP2, throttle position, engine temperature, transmission temperature, and gear selection. The ECM determines the lock–up status of the torque converter by comparing the engine rpm (NE) to the input shaft rpm (NC0) or output shaft rpm (SP2). The ECM calculates the actual transmission gear by comparing input shaft rpm (NC0) to output shaft rpm (SP2). When conditions are appropriate, the ECM requests ”lock–up” by applying control voltage to shift solenoid SL. When the SL is turned on, solenoid SL applies pressure to the lock–up relay valve and locks the torque converter clutch.
If the ECM detects no lock–up after lock–up has been requested or if it detects lock–up when it is not requested, the ECM interprets this as a fault in the shift solenoid valve SL or lock–up system performance. The ECM will turn on the MIL and store the DTC.
Example:
When any of the following is met, the system judges it as a malfunction.

(a) There is a difference in rotation between before and after torque converters even when the ECM commands lock–up.
(Engine speed is at least 75 rpm greater than input turbine speed.)

(b) There is no difference in rotation between before and after torque converters even when the ECM commands lock–up off.
(The difference between engine speed and input turbine speed is less than 35 rpm.)

MONITOR STRATEGY

Related DTCs	P0741: Shift solenoid valve SL/OFF malfunction P0741: Shift solenoid valve SL/ON malfunction
Required sensors/Components	Shift solenoid valve SL, Speed sensor (NC0), Speed sensor (SP2),Crankshaft position sensor (NE), Throttle position sensor (VPA1), Mass air flow sensor (MAF), Transmission temperature sensor (THO1), Engine coolant temperature sensor (ECT)
Frequency of operation	Continuous
Duration	1 sec.
MIL operation	2 driving cycles
Sequence of operation	None

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TYPICAL ENABLING CONDITIONS

The following items are common to all conditions below: OFF malfunction and ON malfunction

The monitor will run whenever the following DTCs are not present.	See page 05–1071
Transmission range	"D"
ECM selected gear	3rd or 4th
Engine coolant temperature	40°C (104°F) or more
Shift solenoid "A" (S1) circuit Shift solenoid "B" (S2) circuit ECT sensor circuit Torque converter clutch solenoid (SL) circuit Input speed sensor circuit Output speed sensor circuit Torque converter clutch solenoid circuit	There is no malfunction in the circuit shown on the left.
Spark adovance from Max.retard by KCS control	0° CA or more
Engine	Running
Transfer range	"High" *1

Transfer range "HIGH" *1 (This condition is applied only 4WD)

*1: Following conditions met

The monitor will run whenever the following DTCs are not present.	See page 05–1071
Vehicle speed sensor "A" circuit Output speed sensor circuit	There is no malfunction in the circuit shown on the left.
Throttle valve opening angle	0 % or more
Transmission output speed	150 rpm or more
Transsfer input speed/Transfer output speed (NO/NOtf)	0.93 or more and Less than 1.8

OFF malfunction

ECM lock–up command	ON
Vehicle speed	25 km/h (16 mph) or more and Less than 100 km/h (62 mph)
IAT (Intake air temperature)	–10 °C (14 °F) or more and Less than 90 °C (194 °F)

ON malfunction

ECM lock–up command	OFF
Vehicle speed	25 km/h (16 mph) or more and Less than 60 km/h (37 mph)
Throttle valve opening angle	9 % or more
IAT (Intake air temperature)	–10 °C (14 °F) or more and Less than 90 °C (158 °F)

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TYPICAL MALFUNCTION THRESHOLDS

Both of following conditions are met:

OFF malfunction

Engine speed – output speed x 4th gear ratio (NE – NO x 4th gear ratio)	70 rpm or more

ON malfunction

It is necessary 2 detections/one driving cycle

1st detection; temporary flag ON

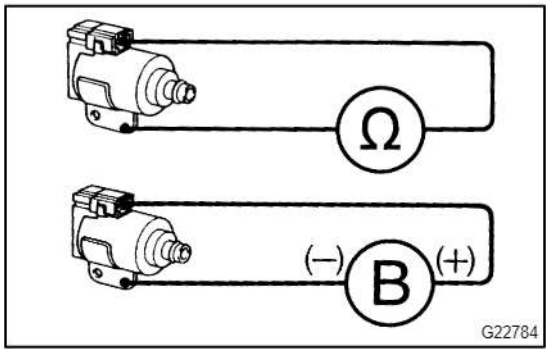
2nd detection; pending fault code ON

Vehicle speed must be under 10 km/h (6 mph) once before 2nd detection

|Engine speed – output speed| (|NE – NC0|)	Less than 35 rpm

INSPECTION PROCEDURE

1 INSPECT SHIFT SOLENOID VALVE(SL)



(a) Remove the shift solenoid valve SL.

(b) Measure the resistance between the solenoid connector and the solenoid body.

OK:

Resistance: 11 to 15 Ω at 20°C (68°F)

(c) Connector positive (+) lead to the terminal of solenoid connector, negative (–) lead to the solenoid body.

OK:

The solenoid makes an operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE(SL) (See page 40–51)**

OK

2 INSPECT TRANSMISSION VALVE BODY ASSY(See chapter 2 in the problem symptoms table) (See page 05–1078)

NG → **REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSY (See page 40–51)**

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSY (See page 40–14 to 40–28)

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DTC	P0751	SHIFT SOLENOID "A" PERFORMANCE (SHIFT SOLENOID VALVE S1)

SYSTEM DESCRIPTION

The ECM uses signals from the vehicle speed sensor and direct clutch speed sensor to detect the actual gear position (1st, 2nd, 3rd or O/D gear). Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical troubles of the shift solenoid valves, valve body or automatic transaxle (clutch, brake or gear etc.).

DTC No.	DTC Detecting Condition	Trouble Area
P0751	The gear required by the ECM does not match the actual gear when driving (2–trip detection logic)	□Shift solenoid valve S1 is stuck open or closed □Valve body is blocked up or stuck □Automatic transaxle (clutch, brake or gear etc.)

MONITOR DESCRIPTION

The ECM commands gear shifts by turning the shift solenoid valves "ON/OFF". According to the input shaft revolution and output shaft revolution, the ECM detects the actual gear position (1st, 2nd, 3rd or O/D gear position). When the gear position commanded by the ECM and the actual gear position are not same, the ECM illuminates the MIL.

MONITOR STRATEGY

Related DTCs	P0751: Shift solenoid valve S1/OFF malfunction Shift solenoid valve S1/ON malfunction
Required sensors/Components	Shift solenoid valve S1, Vehicle speed sensor, Throttle position sensor, Speed sensor (NC0), Speed sensor (NO)
Frequency of operation	Continuous
Duration	OFF malfunction (A) 0.5 sec. OFF malfunction (B) 0.4 sec. ON malfunction (A) 0.3 sec. ON malfunction (B) 0.4 sec. or 0.5 sec.
MIL operation	2 driving cycles
Sequence of operation	None

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TYPICAL ENABLING CONDITIONS

The following items are common to all conditions below:

OFF malfunction (A), (B) and ON malfunction (A), (B)

The monitor will run whenever the following DTCs are not present.	See page 05–1071
Transmission shift position	"D"
ECT (Engine coolant temperature)	40 C (104 F) or more
Shift solenoid "A" (S1) circuit Shift solenoid "B" (S2) circuit ECT (Engine coolant temperature) sensor circuit Input speed sensor (NC0) circuit Output speed sensor (NO) circuit	There is no malfunction in the circuits shown on the left
Spark advance from Max. retard timing by KCS control	0 CA or more
Engine	Running
Transfer range	"High" *1

Transfer range "HIGH" *1 (This condition is applied only 4WD)

*1: Following conditions met

Vehicle speed sensor "A" circuit Output shaft speed sensor circuit	There is no malfunction in the circuits shown on the left
Throttle opening angle	0% or more
Transmission output speed	150 rpm or more
Transfer input speed/Transfer output speed (NO/NOtf)	0.93 or more and Less than 1.8

OFF malfunction (A)

ECM selected gear	1st
Vehicle speed	3 km/h (2 mph) or more and Less than 40 km/h (25 mph)
Throttle valve opening angle	10% or more and 6.5% or more at engine speed 2,000 rpm (Conditions vary with engine speed)

OFF malfunction (B)

Current ECM selected gear	4th
Last ECM selected gear	3th
Actual gear when ECM selected 3th gear	3th
Vehicle speed	3 km/h (1 mph) or more
Throttle valve opening angle	6.5% or more at engine speed 2,000 rpm (Conditions vary with engine speed)

ON malfunction (A)

ECM selected gear	4th
Vehicle speed at current ECM selected gear – Vehicle speed at last ECM selected gear	Less than 10 km/h (6 mph)
Throttle valve opening angle at current ECM selected gear – Throttle valve opening angle at last ECM selected gear	Less than 10%
Throttle valve opening angle	Less than 25%
Vehicle speed	Less than 85 km/h (53 mph)

ON malfunction (B)

Current ECM selected gear	4th
Last ECM selected gear	3th
Vehicle speed	3 km/h (2 mph) or more
Throttle valve opening angle	6.5% or more at engine speed 2,000 rpm (Conditions vary with engine speed)

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TYPICAL MALFUNCTION THRESHOLDS

[OFF malfunction]

Both of the following conditions are met: OFF malfunction (A), (B)

It is necessary 2 detections/one driving cycle

1st detection; temporary flag ON

2nd detection; pending fault code ON

OFF malfunction (A) and (B)

Input speed/Output speed (NC0/NO)	0.00 or more and 0.22 or less

[ON malfunction]

Both of the following conditions are met: ON malfunction (A) and (B)

ON malfunction (A)

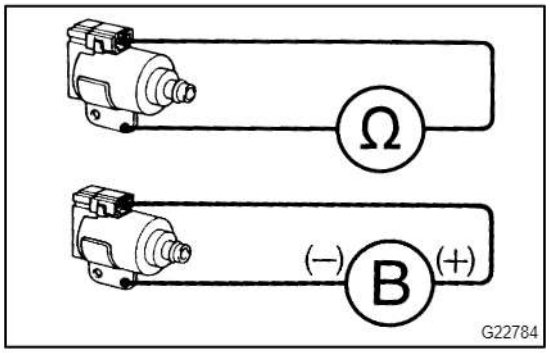
Engine speed at current ECM selected gear – Engine speed at last ECM selected gear	500 rpm or more

ON malfunction (B)

Input speed/Output speed (NC0/NO)	Not change as follows 0.93 or more and 1.07 or less ↓ 0.00 or more and 1.22 or less

INSPECTION PROCEDURE

1	INSPECT SHIFT SOLENOID VALVE(S1)



(a) Remove the shift solenoid valve S1.

(b) Measure the resistance between the solenoid connector and the solenoid body.

OK:

Resistance: 11 to 15 Ω at 20°C (68°F)

(c) Connector positive (+) lead to the terminal of solenoid connector, negative (–) lead to the solenoid body.

OK:

The solenoid makes an operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE (S1) (See page 40–51)**

OK

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2	INSPECT TRANSMISSION VALVE BODY ASSY(See chapter 2 in the problem symptoms table) (See page 05–1078)

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSY (See page 40–51)

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSY (See page 40–14 to 40–28)

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DTC	P0756	SHIFT SOLENOID "B" PERFORMANCE (SHIFT SOLENOID VALVE S2)

SYSTEM DESCRIPTION

The ECM uses signals from the vehicle speed sensor and direct clutch speed sensor to detect the actual gear position (1st, 2nd, 3rd or O/D gear). Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical troubles of the shift solenoid valves, valve body or automatic transaxle (clutch, brake or gear etc.).

DTC No.	DTC Detecting Condition	Trouble Area
P0756	The gear required by the ECM does not match the actual gear when driving (2–trip detection logic)	□Shift solenoid valve S2 is stuck open or closed □Valve body is blocked up or stuck □Automatic transaxle (clutch, brake or gear etc.)

MONITOR DESCRIPTION

The ECM commands gear shifts by turning the shift solenoid valves "ON/OFF". According to the input shaft revolution and output shaft revolution, the ECM detects the actual gear position (1st, 2nd, 3rd or O/D gear position). When the gear position commanded by the ECM and the actual gear position are not same, the ECM illuminates the MIL.

MONITOR STRATEGY

Related DTCs	P0756: Shift solenoid valve S2/OFF malfunction Shift solenoid valve S2/ON malfunction
Required sensors/Components	Shift solenoid valve S2, Vehicle speed sensor, Throttle position sensor, Speed sensor (NC0), Speed sensor (NO)
Frequency of operation	Continuous
Duration	0.5 sec.
MIL operation	2 driving cycles
Sequence of operation	None

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TYPICAL ENABLING CONDITIONS

The following items are common to all conditions below:

OFF malfunction (A), (B) and ON malfunction (A), (B), (C)

The monitor will run whenever the following DTCs are not present.	See page 05–1071
Transmission shift position	"D"
ECT (Engine coolant temperature)	40 C (104 F) or more
Shift solenoid "A" (S1) circuit Shift solenoid "B" (S2) circuit ECT sensor circuit Input speed sensor circuit Output speed sensor circuit	There is no malfunction in the sensor circuits shown on the left
Spark advance from Max. retard timing by KCS control	0 CA or more
Engine	Running
Transfer range	"High" *1

Transfer range "HIGH" *1 (This condition is applied only 4WD)

*1: Following conditions met

Vehicle speed sensor "A" circuit Output speed sensor circuit	There is no malfunction in the circuits shown on the left
Throttle valve opening angle	0% or more
Transmission output speed	150 rpm or more
NO/NOtf (Transfer input speed/Transfer output speed)	0.93 or more and Less than 1.8

OFF malfunction (A)

ECM selected gear	2nd
Vehicle speed	3 km/h (2 mph) or more
Throttle valve opening angle	6.5% or more at engine speed 2,000 rpm (Conditions vary with engine speed)

OFF malfunction (B)

ECM selected gear	3rd
Vehicle speed	3 km/h (2 mph) or more
Throttle valve opening angle	6.5% or more at engine speed 2,000 rpm (Conditions vary with engine speed)

ON malfunction (A)

ECM selected gear	1st
Vehicle speed	3 km/h (2 mph) or more and Less than 40 km/h (25 mph)
Throttle valve opening angle	6.5% or more at engine speed 2,000 rpm (Conditions vary with engine speed)

ON malfunction (B)

ECM selected gear	3rd
Vehicle speed	3 km/h (2 mph) or more
Throttle valve opening angle	6.5% or more at engine speed 2,000 rpm (Conditions vary with engine speed)

ON malfunction (C)

ECM selected gear	4th
Vehicle speed	3 km/h (2 mph) or more
Throttle valve opening angle	6.5% or more at engine speed 2,000 rpm (Conditions vary with engine speed)

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TYPICAL MALFUNCTION THRESHOLDS

[OFF malfunction]

Both of the following conditions are met: OFF malfunction (A) and (B)

It is necessary 2 detections/one driving cycle

1st detection; temporary flag ON

2nd detection; pending fault code ON

OFF malfunction (A)

Input speed/Output speed (NC0/NO)	2.63 or more and 3.20 or less

OFF malfunction (B)

Input speed/Output speed (NC0/NO)	0.00 or more and 0.22 or less

[ON malfunction]

All of the following conditions are met: ON malfunction (A), (B) and (C)

ON malfunction (A)

Input speed/Output speed (NC0/NO)	1.40 or more and 1.67 or less

ON malfunction (B)

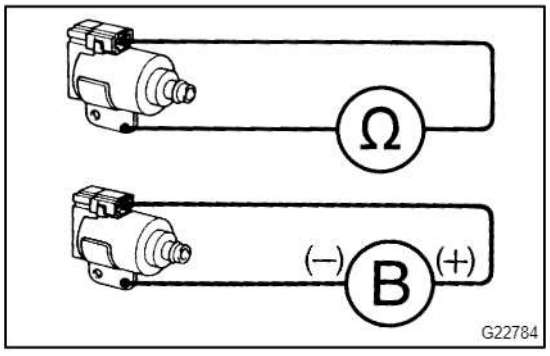
Input speed/Output speed (NC0/NO)	0.93 or more and 1.07 or less

ON malfunction (C)

Input speed/Output speed (NC0/NO)	0.93 or more and 1.07 or less

INSPECTION PROCEDURE

1	INSPECT SHIFT SOLENOID VALVE(S2)



(a) Remove the shift solenoid valve S2.

(b) Measure the resistance between the solenoid connector and the solenoid body.

OK:

Resistance: 11 to 15 Ω at 20°C (68°F)

(c) Connector positive (+) lead to the terminal of solenoid connector, negative (–) lead to the solenoid body.

OK:

The solenoid makes an operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE(S2) (See page 40–51)**

OK

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2	INSPECT TRANSMISSION VALVE BODY ASSY(See chapter 2 in the problem symptoms table) (See page 05–1078)

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSY (See page 40–51)

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSY (See page 40–14 to 40–28)

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DTC	P0973	SHIFT SOLENOID "A" CONTROL CIRCUIT LOW (SHIFT SOLENOID VALVE S1)

DTC	P0974	SHIFT SOLENOID "A" CONTROL CIRCUIT HIGH (SHIFT SOLENOID VALVE S1)

DTC	P0976	SHIFT SOLENOID "B" CONTROL CIRCUIT LOW (SHIFT SOLENOID VALVE S2)

DTC	P0977	SHIFT SOLENOID "B" CONTROL CIRCUIT HIGH (SHIFT SOLENOID VALVE S2)

CIRCUIT DESCRIPTION

Shifting from 1st to O/D is done in combination with ON and OFF of the shift solenoid valves No. 1 and No. 2 controlled by ECM. If an open or short circuit occurs in either of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valve to allow the vehicle to be operated safely (Fail safe function).

Fail Safe Function:

If either of the shift solenoid valve circuits develops an open or short, the ECM turns the other shift solenoid ON and OFF to shift to the gear positions shown in the table above. The ECM also turns the shift solenoid valve SL OFF at the same time. If both solenoids are malfunctioning, hydraulic control cannot be done electronically so it must be done manually. Manual shifting as shown in the following table must be done (In the case of a short circuit, the ECM stops sending current to the short circuited solenoid).

Position	NORMAL			SHIFT SOLENOID S1 MALFUNCTIONING			SHIFT SOLENOID S2 MALFUNCTIONING			BOTH SOLENOIDS MALFUNCTIONING
	Solenoid valve		Gear	Solenoid valve		Gear	Solenoid valve		Gear	Gear when shift selector is manually operated
	S1	S2		S1	S2		S1	S2		
D	ON	OFF	1st	X	ON	3rd	ON	X	1st	O/D
	ON	ON	2nd	X	ON	3rd	OFF	X	O/D	O/D
	OFF	ON	3rd	X	ON	3rd	OFF	X	O/D	O/D
	OFF	OFF	O/D	X	OFF	O/D	OFF	X	O/D	O/D
2	ON	OFF	1st	X	ON	3rd	ON	X	1st	3rd
	ON	ON	2nd	X	ON	3rd	OFF	X	3rd	3rd
	OFF	ON	3rd	X	ON	3rd	OFF	X	3rd	3rd
L	ON	OFF	1st	X	OFF	1st	ON	X	1st	1st
	ON	ON	2nd	X	ON	2nd	ON	X	1st	1st

X: Malfunctions

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DTC No.	DTC Detection Condition	Trouble Area
P0973	ECM detects short in solenoid valve S1 circuit 4 times when solenoid valve S1 is operated (1–detection logic)	□Short in shift solenoid valve S1 circuit □Shift solenoid valve S1 □ECM
P0974	ECM detects open in solenoid valve S1 circuit 4 times when solenoid valve S1 is not operated (1–detection logic)	□Open in shift solenoid valve S1 circuit □Shift solenoid valve S1 □ECM
P0976	ECM detects short in solenoid valve S2 circuit 4 times when solenoid valve S2 is operated (1–trip detection logic)	□Short in shift solenoid valve S2 circuit □Shift solenoid valve S2 □ECM
P0977	ECM detects open in solenoid valve S2 circuit 4 times when solenoid valve S2 is not operated (1–trip detection logic)	□Open in shift solenoid valve S2 circuit □Shift solenoid valve S2 □ECM

MONITOR DESCRIPTION

The ECM commands gear shift by turning the shift solenoid valves ”ON/OFF”. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem and illuminates the MIL and stores the DTC. And the ECM performs the fail–safe function and turns the other shift solenoid valves in good condition ”ON/OFF” (In case of an open or short circuit, the ECM stops sending current to the circuit.)

MONITOR STRATEGY

P0973, P0974:

Related DTCs	P0973: Shift solenoid valve S1/Range check (Low resistance) P0974: Shift solenoid valve S1/Range check (High resistance)
Required sensors/Components	Shift solenoid valve S1
Frequency of operation	Continuous
Duration	0.1 sec. x 2 (times) or more
MIL operation	1 driving cycle
Sequence of operation	None

P0976, P0977:

Related DTCs	P0976: Shift solenoid valve S2/Range check (Low resistance) P0977: Shift solenoid valve S2/Range check (High resistance)
Required sensors/Components	Shift solenoid valve S2
Frequency of operation	Continuous
Duration	0.1 sec. x 2 (times) or more
MIL operation	1 driving cycle
Sequence of operation	None

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TYPICAL ENABLING CONDITIONS

P0973: Range check (Low resistance)

The monitor will run whenever the following DTCs are not present.	See page 05–1071
Solenoid	ON

P0974: Range check (High resistance)

The monitor will run whenever the following DTCs are not present.	See page 05–1071
Solenoid	OFF

P0976: Range check (Low resistance)

The monitor will run whenever the following DTCs are not present.	See page 05–1071
Solenoid	ON

P0977: Range check (High resistance)

The monitor will run whenever the following DTCs are not present.	See page 05–1071
Solenoid	OFF

TYPICAL MALFUNCTION THRESHOLDS

P0973: Range check (Low resistance)

Intelligent power MOS diagnosis fail signals detected while the solenoid is operated	Fail as solenoid resistance: 8 Ω or less

P0974: Range check (High resistance)

Intelligent power MOS diagnosis fail signals detected while the solenoid is not operated	Fail as solenoid resistance: 100 kΩ or more

P0976: Range check (Low resistance)

Intelligent power MOS diagnosis fail signals detected while the solenoid is operated	Fail at solenoid resistance: 8 Ω or less

P0977: Range check (High resistance)

Intelligent power MOS diagnosis fail signals detected while the solenoid is not operated	Fail at solenoid resistance: 100 kΩ or more

COMPONENT OPERATING RANGE

P0973, P0974:

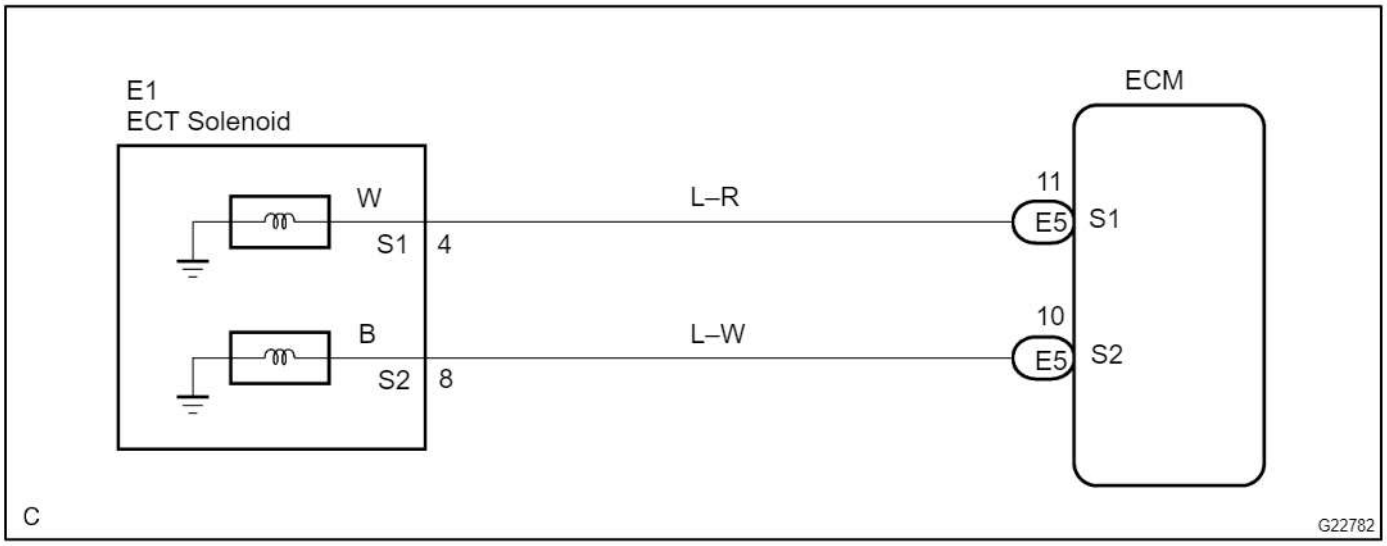
Shift solenoid valve S1 resistance	11 to 15 Ω at 20 C (68 F)

P0976, P0977:

Shift solenoid valve S2 resistance	11 to 15 Ω at 20 C (68 F)

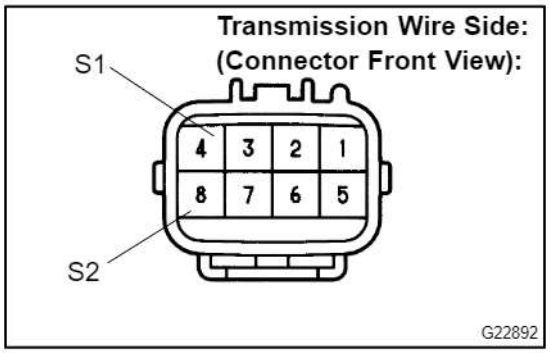
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WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT TRANSMISSION WIRE(S1/S2)



(a) Disconnect the transmission wire connector from the transmission.

(b) Measure resistance between terminal S1 or S2 of transmission wire connector and body ground.

OK:

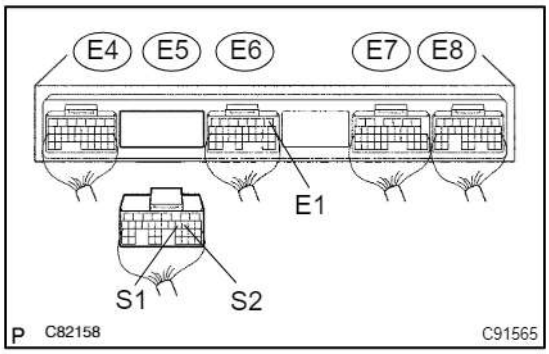
Resistance: 11 to 15 Ω at 20°C (68°F)

NG → **Go to step 3**

OK

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2	CHECK HARNESS AND CONNECTOR(TRANSMISSION WIRE – ECM)



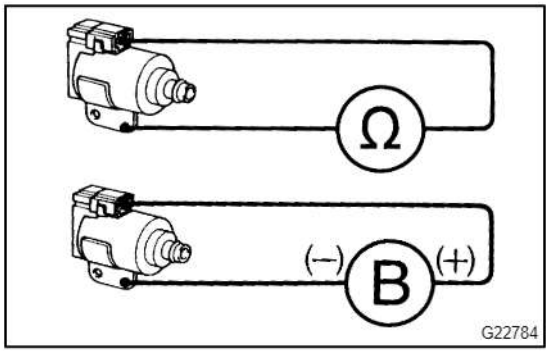
(a) Connect the transmission wire from the transmission.
(b) Disconnect the ECM connector.
(c) Measure resistance between terminals.
OK:
Resistance:
S1 – E1: 11 to 15 Ω at 20°C (68°F)
S2 – E1: 11 to 15 Ω at 20°C (68°F)

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR (See page 01–35)**

OK

CHECK AND REPLACE ECM (See page 10–11)

3	INSPECT SHIFT SOLENOID VALVE(S1/S2)



(a) Remove the shift solenoid valve S1 or S2.
(b) Measure the resistance between the solenoid connector and the solenoid body.
OK:
Resistance: 11 to 15 Ω at 20°C (68°F)
(c) Connector positive (+) lead to the terminal of solenoid connector, negative (–) lead to the solenoid body.
OK:
The solenoid makes an operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE (S1/S2) (See page 40–51)**

OK

REPAIR OR REPLACE TRANSMISSION WIRE (See page 40–60)

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DTC	P1782	T/F L4 RANGE POSITION SWITCH PERFORMANCE

CIRCUIT DESCRIPTION

The ECM detects the signal from the four wheel drive control ECU.
This DTC indicates that the transfer L4 position switch remains ON.

DTC No.	DTC Detecting Condition	Trouble Area
P1782	Transfer L4 position switch remains ON while vehicle running under conditions for 1.8 seconds or more (1–trip detection logic) (a) Output shaft speed 3000 rpm or less (b) Transfer shift position is H	□Short in transfer L4 position switch circuit □Four wheel drive control ECU □ECM

MONITOR DESCRIPTION

The ECM monitors the transfer–case L4 position switch to determine when the transfer–case L4 gear is engaged. If the transfer–case L4 gears remain engaged under the following conditions, the ECM will conclude that there is a malfunction of the L4 position switch:

- □ L4 switch indicated that the L4 transfer–case gears are engaged.
- □ Transfer–case shifter is in the ”H” position.
- □ Transfer–case output shaft rpm is between 750 and 3,000 rpm.
- □ The specified time period has elapsed.

If all of the above conditions are detected, the ECM will conclude that there is a malfunction of the L4 switch, illuminate the MIL and store the DTC.

MONITOR STRATEGY

Related DTCs	P1782 : Transfer L4 position switch/ON malfunction
Required sensors/Components	Transfer L4 position switch
Frequency of operation	Continuous
Duration	ON malfunction (A) 1.8 sec. ON malfunction (B) 0.5 sec.
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITION

The following items are common to all conditions below: ON malfunction (A) and (B)

The monitor will run whenever the following DTCs are not present.	See page 05–1071
Output speed sensor (NC) circuit Vehicle speed sensor ”A” circuit	There is no malfunction in the circuits shown on the left
Transmission neutral position switch	OFF

ON malfunction

Output speed (Transfer output speed)	750 rpm or more and Less than 3,000 rpm
Throttle opening angle	0% or more
Vehicle speed	5 km/h (3mph) or more

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TYPICAL MALFUNCTION THRESHOLDS

Both of the following conditions are met: ON malfunction (A) and (B)

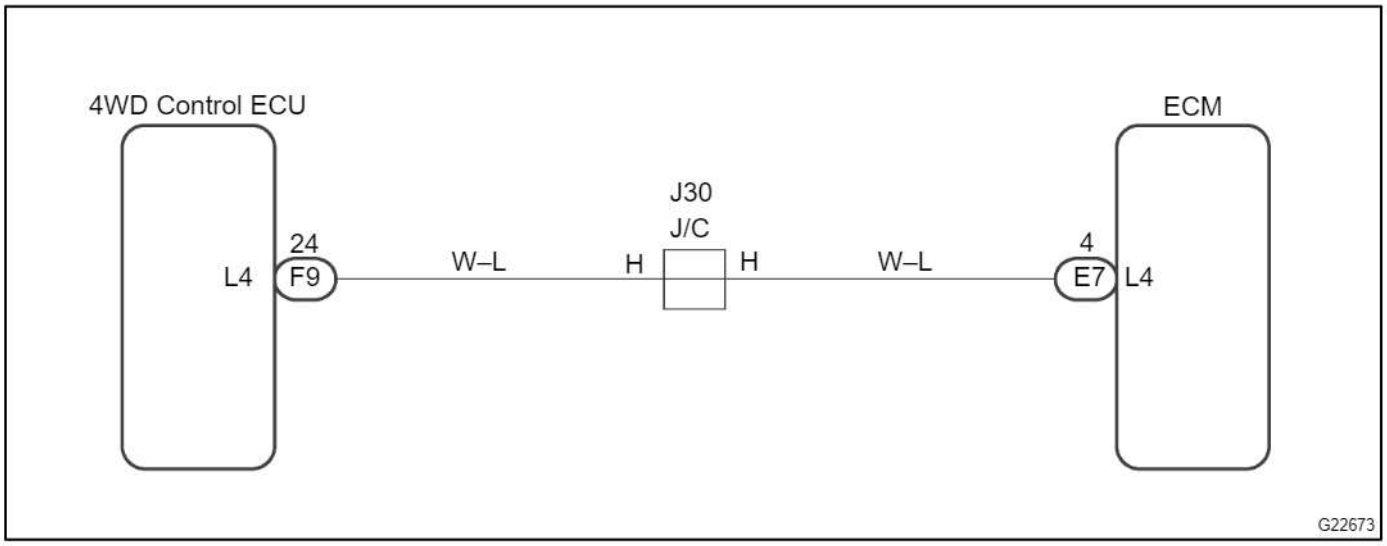
ON malfunction (A)

L4 switch	ON

ON malfunction (B)

Actual transfer gear ratio Transfer input speed/Transfer output speed (NO/NOtf)	0.93 or more and Less than 1.8

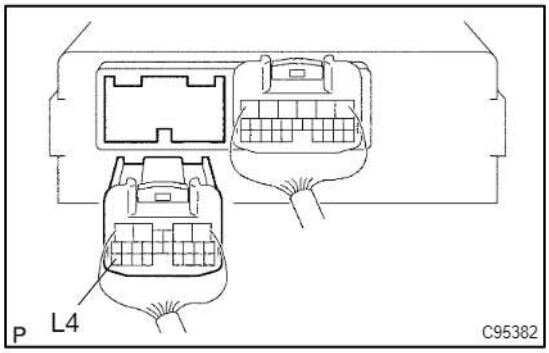
WIRING DIAGRAM



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INSPECTION PROCEDURE

1	INSPECT TERMINAL VOLTAGE(L4 – BODY GROUND)

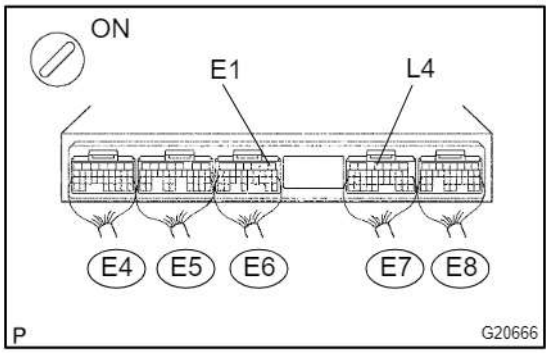


(a) Disconnect the four wheel drive control ECU connector.
(b) Turn the ignition switch ON.
(c) Measure the voltage between terminal L4 of four wheel drive control ECU and body ground.
OK:
Voltage: 10 to 14 V

OK → **CHECK AND REPLACE FOUR WHEEL DRIVE CONTROL ECU (See page 01–35)**

NG

2	INSPECT TERMINAL VOLTAGE(L4 – E1)



(a) Turn the ignition switch ON.
(b) Measure the voltage between terminal L4 and E1 of ECM.
OK:
Voltage: 10 to 14 V

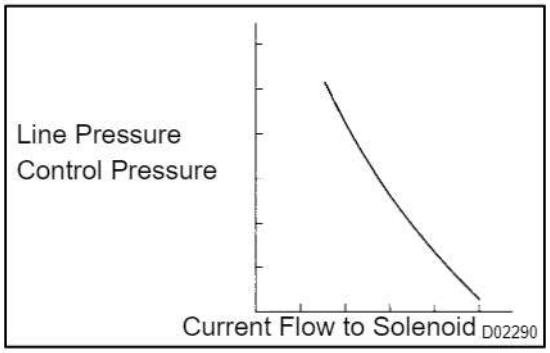
OK → **REPAIR OR REPLACE HARNESS OR CONNECTOR (See page 01–35)**

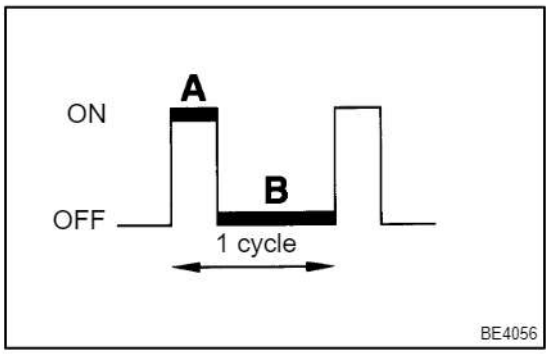
NG

CHECK AND REPLACE ECM (See page 10–11)

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DTC	P2716	PRESSURE CONTROL SOLENOID "D" ELECTRICAL (SHIFT SOLENOID SLT)





CIRCUIT DESCRIPTION

The throttle pressure that is applied to the primary regulator valve (which modulates the line pressure) causes the solenoid valve SLT, under electronic control, to precisely and minutely modulate and generate the line pressure according the extent of the accelerator pedal depressed or the output of engine power.

This controls the line pressure and provides smooth shifting characteristics.

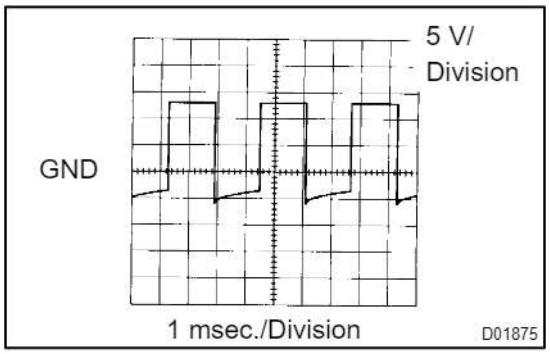
Upon receiving a signal of the throttle valve opening angle, the ECM controls the line pressure by sending a predetermined (*) duty ratio to the solenoid valve, modulating the line pressure and generating throttle pressure.

(*): Duty Ratio

The duty ratio is the ratio of the period of continuity in one cycle. For example, if A is the period of continuity in one cycle, and B is the period of non–continuity, then

Duty Ratio=A/(A+B) x 100 (%)

DTC No.	DTC Detection Condition	Trouble Area
P2716	ECM detects solenoid SLT circuit malfunction for 1 sec. or more (1–trip detection logic)	□Open or short in shift solenoid valve SLT circuit □Shift solenoid valve SLT □ECM



Reference:

Refer to the chart for the waveform between terminals SLT^+ and SLT^- during engine idling.

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MONITOR DESCRIPTION

When an open or short in the linear solenoid valve (SLT) circuit is detected, the ECM interprets this as a fault. The ECM will turn ON the MIL and store the DTC.

MONITOR STRATEGY

Related DTCs	P2716: Shift solenoid valve SLT/Range check
Required sensors/Components	Shift solenoid valve SLT
Frequency of operation	Continuous
Duration	1 sec.
MIL operation	1 driving cycle
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present.	See page 05–1071
Solenoid current cut status	Not cut
Battery voltage	11 V or more
CPU command duty ratio to SLT	19% or more

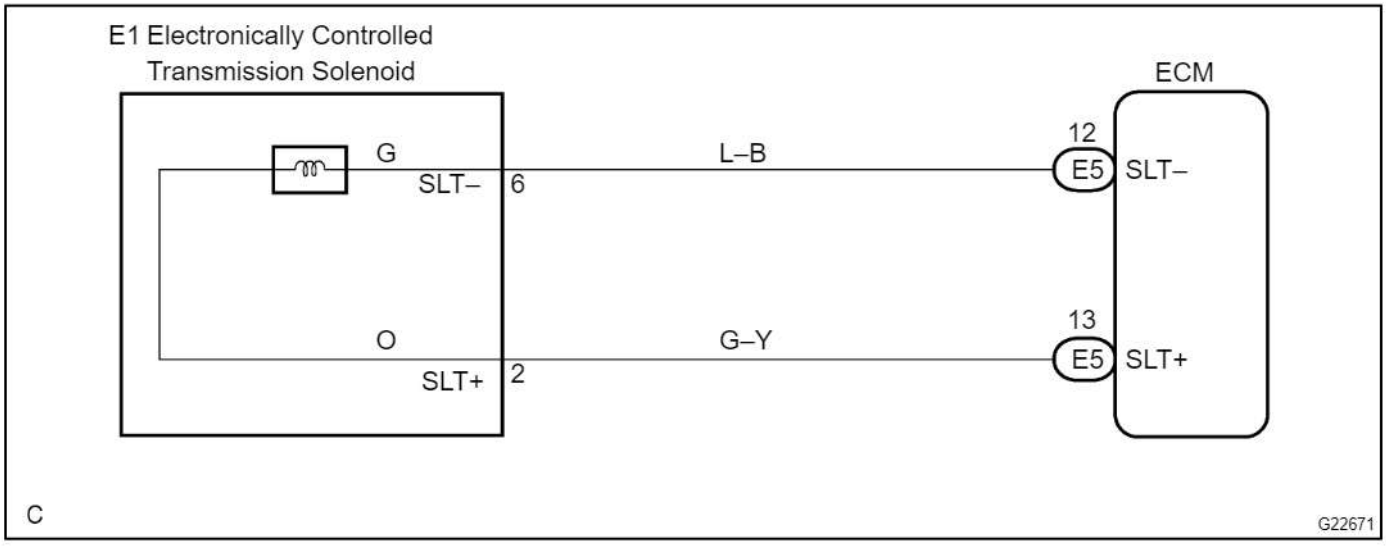
TYPICAL MALFUNCTION THRESHOLDS

Solenoid status (SLT) from IC	Fail (Open or short)

COMPONENT OPERATING RANGE

Output signal duty	Less than 100%

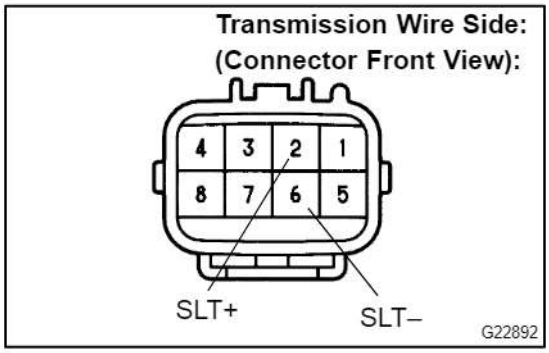
WIRING DIAGRAM



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INSPECTION PROCEDURE

1	INSPECT TRANSMISSION WIRE(SLT)



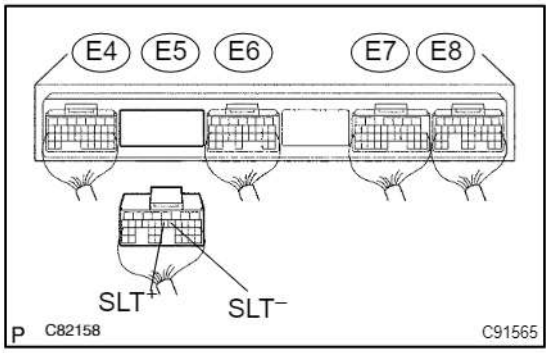
(a) Disconnect the transmission wire from the transmission.
(b) Measure resistance between terminals SLT+ and SLT– of transmission wire.
OK:
Resistance: 5.0 to 5.6 Ω at 20 °C (68 °F)
(c) Check the continuity between the wire harness side connectors.
OK:
Standard (Check for short):

Symbols	Specified condition
SLT+ ⇔ Body ground	No continuity
SLT– ⇔ Body ground	

NG → **Go to step 3**

OK

2	CHECK HARNESS AND CONNECTOR(TRANSMISSION WIRE – ECM)



(a) Connect the transmission wire from the transmission.
(b) Disconnect the ECM connector.
(c) Measure resistance between terminals SLT+ and SLT– of ECM.
OK:
Resistance: 5.0 to 5.6 Ω at 20°C (68°F)
(d) Check the continuity between the wire harness side connectors.
OK:
Standard (Check for short):

Symbols	Specified condition
SLT+ ⇔ Body ground	No continuity
SLT– ⇔ Body ground	

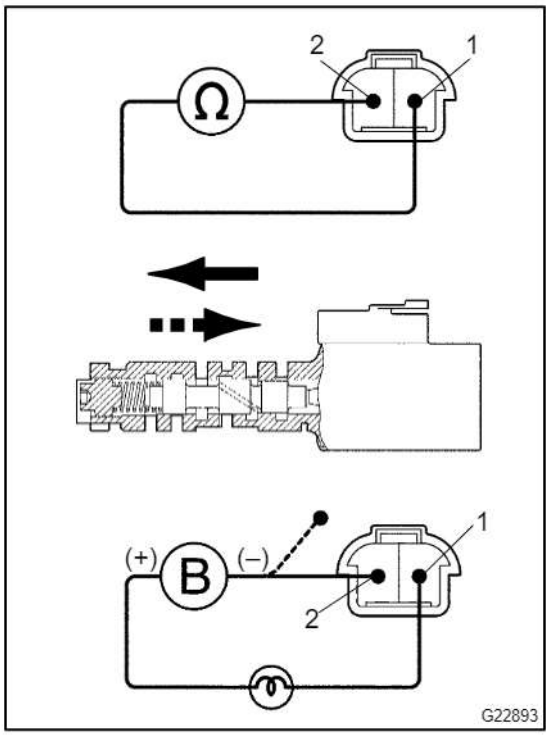
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR (See page 01–35)**

OK

CHECK AND REPLACE ECM (See page 10–11)

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3	INSPECT SHIFT SOLENOID VALVE(SLT)



(a) Remove the shift solenoid valve SLT.

(b) Measure resistance between terminals 1 and 2 of solenoid connector.

Resistance: 5.0 to 5.6 Ω at 20 °C (68 °F)

(c) Connect positive (+) lead with an 8 to 10W bulb to terminal 1 of solenoid connector and negative (–) lead to terminal 2, then check the movement of the valve.

OK:

When battery positive voltage is applied.	Valve moves in ◄ direction in illustration on the left.
When battery positive voltage is cut off.	Valve moves in ■■► direction in illustration on the left.

NG → **REPLACE SHIFT SOLENOID VALVE(SLT) (See page 40–51)**

OK

REPAIR OR REPLACE TRANSMISSION WIRE (See page 40–60)

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DTC	P2769	TORQUE CONVERTER CLUTCH SOLENOID CIRCUIT LOW (SHIFT SOLENOID VALVE SL)

DTC	P2770	TORQUE CONVERTER CLUTCH SOLENOID CIRCUIT HIGH (SHIFT SOLENOID VALVE SL)

CIRCUIT DESCRIPTION

The shift solenoid valve SL is turned ON and OFF by signals from the ECM to control the hydraulic pressure acting on the lock–up relay valve, which then controls operation of the lock–up clutch.

DTC No.	DTC Detection Condition	Trouble Area
P2769	ECM detects short in solenoid valve SL circuit (0.1 sec.) when solenoid valve SL is operated (2–trip detection logic)	□Short in shift solenoid valve SL circuit □Shift solenoid valve SL □ECM
P2770	ECM detects open in solenoid valve SL circuit (0.1 sec.) when solenoid valve SL is not operated (2–trip detection logic)	□Open in shift solenoid valve SL circuit □Shift solenoid valve SL □ECM

Fail safe function

If the ECM detects a malfunction, it turns the shift solenoid valve SL OFF.

MONITOR DESCRIPTION

Torque converter lock–up is controlled by the ECM based on engine rpm, engine load, engine temperature, vehicle speed, transmission temperature, and shift range selection. The ECM determines the lock–up status of the torque converter by comparing the engine rpm (NE) to the input turbine rpm (NC0). The ECM calculates the actual transmission gear by comparing input turbine rpm (NC0) to output shaft rpm (SP2). When conditions are appropriate, the ECM requests ”lock–up” by applying control voltage to shift solenoid SL. When the SL is opened, solenoid SL applies pressure to the lock–up relay valve and locks the torque converter clutch. If the ECM detects an open or short in the SL solenoid circuit, the ECM interprets this as a fault in the SL solenoid or circuit. The ECM will turn on the MIL and store the DTC.

MONITOR STRATEGY

Related DTCs	P2769: Shift solenoid valve SL/Range check (Low resistance) P2770: Shift solenoid valve SL/Range check (High resistance)
Required sensors/Components	Shift solenoid valve SL
Frequency of operation	Continuous
Duration	0.1 sec.
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

P2769: Range check (Low resistance)

The monitor will run whenever the following DTCs are not present.	See page 05–1071
The typical enabling conditions are not available.	–

P2770: Range check (High resistance)

The monitor will run whenever the following DTCs are not present.	See page 05–1071
The typical enabling conditions are not available.	–

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TYPICAL MALFUNCTION THRESHOLDS

P2769: Range check (Low resistance)

Intelligent power MOS diagnosis fail signals detected while the solenoid is operated	Fail at solenoid resistance: 8 Ω or less

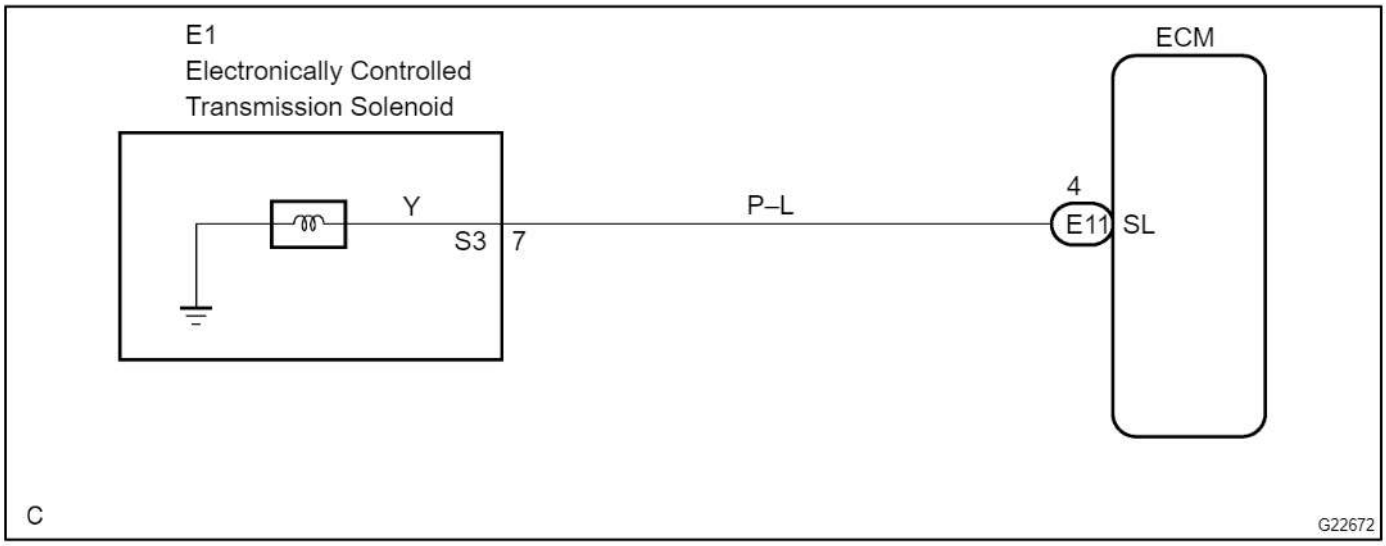
P2770: Range check (High resistance)

Intelligent power MOS diagnosis fail signals detected while the solenoid is not operated	Fail at solenoid resistance: 100 kΩ or more

COMPONENT OPERATING RANGE

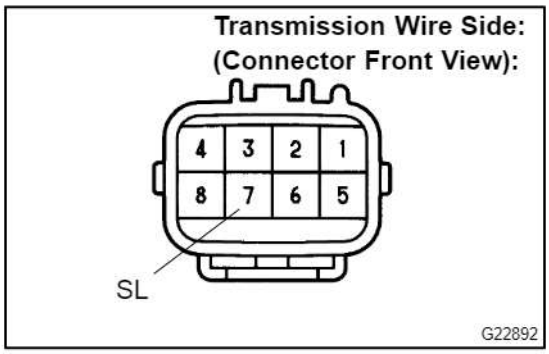
Shift solenoid valve SL	Resistance: 11 to 13 Ω at 20 C (68 F)

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT TRANSMISSION WIRE(SL)



(a) Disconnect the transmission wire connector from the transmission.

(b) Measure resistance between SL of transmission wire connector and body ground.

OK:

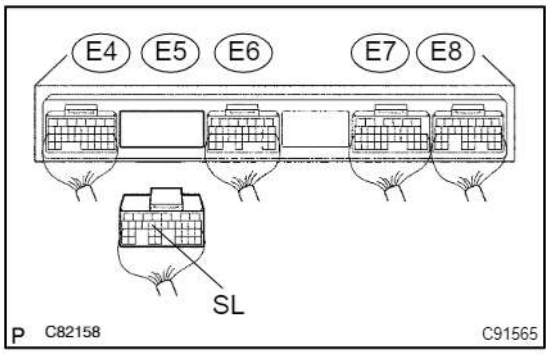
Resistance: 11 to 15 Ω at 20°C (68°F)

NG → **Go to step 3**

OK

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2	CHECK HARNESS AND CONNECTOR(TRANSMISSION WIRE – ECM)



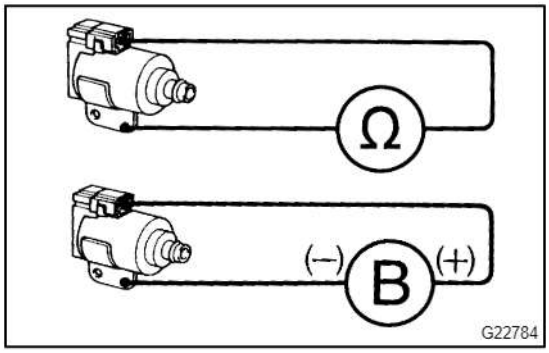
(a) Connect the transmission wire from the transmission.
(b) Disconnect the ECM connector.
(c) Measure resistance between terminals SL and E1 of ECM connector.
OK:
Resistance: 11 to 15 Ω at 20°C (68°F)

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR (See page 01–35)**

OK

CHECK AND REPLACE ECM (See page 10–11)

3	INSPECT SHIFT SOLENOID VALVE(SL)



(a) Remove the shift solenoid valve SL.
(b) Measure the resistance between the solenoid connector and the solenoid body.
OK:
Resistance: 11 to 15 Ω at 20°C (68°F)
(c) Connector positive (+) lead to the terminal of solenoid connector, negative (–) lead to the solenoid body.
OK:
The solenoid makes an operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE(SL) (See page 40–51)**

OK

REPAIR OR REPLACE TRANSMISSION WIRE (See page 40–60)

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AIR CONDITIONING SYSTEM

056CG-08

HOW TO PROCEED WITH TROUBLESHOOTING

1	VEHICLE BROUGHT TO WORK SHOP

2	CUSTOMER PROBLEM ANALYSIS (See page 05–1139)

3	CHECK AND CLEAR DTC (See page 05–1140)

4	PROBLEM SYMPTOM CONFIRMATION

→ SYMPTOM OCCUR (GO TO STEP 6)

SYMPTOM DOES NOT OCCUR (GO TO STEP 5)

5	SYMPTOM SIMULATION (See page 01–25)

6	DTC CHECK (See page 05–1140)

→ MALFUNCTION CODE (GO TO STEP 7)

→ NORMAL CODE (GO TO STEP 8)

7	DTC CHART (See page 05–1145)

→ GO TO STEP 10

8	PROBLEM SYMPTOMS TABLE (See page 05–1153)

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9	ACTUATOR CHECK (See page 01–25)

10	CIRCUIT INSPECTION (See page 05–1155 – 05–1233)

11	IDENTIFICATION OF PROBLEM

12	PARTS INSPECTION

13	REPAIR

14	CONFIRMATION TEST

15	END

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056CH-05

CUSTOMER PROBLEM ANALYSIS CHECK

AIR CONDITIONING SYSTEM Check Sheet

Inspector's name:

Customer's Name		**Registration No.**	
		Registration Year	
		Frame No.	
Date vehicle Brought In	/ /	**Odometer Reading**	**km Miles**

Date of Problem Occurrence	/ /
How Often does Problem Occur?	☐ Continuous ☐ Intermittent (times a day)
Weather	☐ Fine ☐ Cloudy ☐ Snowy ☐ Various / Other
Outdoor Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold (Approx. °F °C)

Symptoms	**Air Flow Control is Faulty**	☐ Blower motor does not operate ☐ Blower motor speed does not change (Always Hi, Always Med, Always Lo)
	Temperature Control is Faulty	☐ Cabin temperature does not go down ☐ Cabin temperature does not rise ☐ Response is slow
	Air Inlet Control is Faulty	☐ Cannot change between FRS and REC (Always Fresh or always Recirculating)
	Vent Control is Faulty	☐ Mode does not change ☐ Desired mode cannot be entered

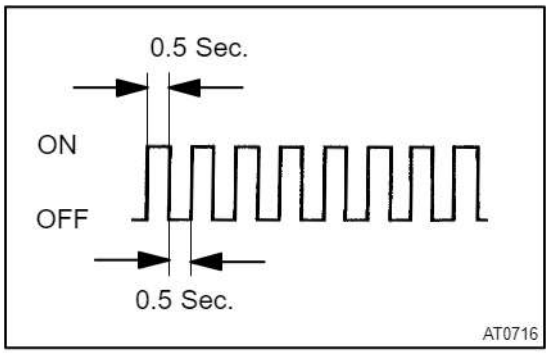
DTC Check	**1st Time**	☐ Normal Code ☐ Malfunction Code (Code)
	2nd Time	☐ Normal Code ☐ Malfunction Code (Code)

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059WM-02

PRE–CHECK

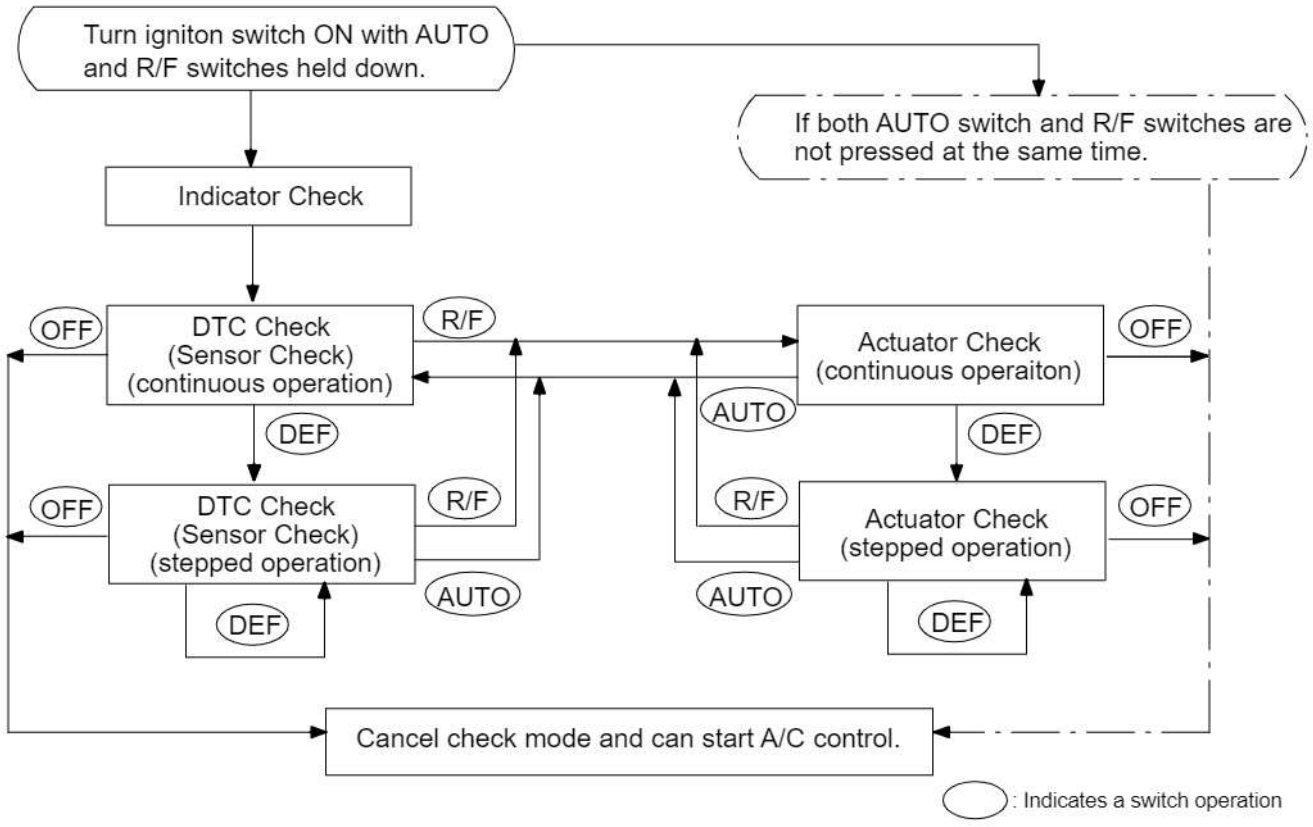


1. WANING FOR A/C COMPRESSOR LOCK

(a) If the compressor lock occurs during A/C operation, the A/C switch indicator on the A/C control panel starts blinking. When this occurs, check for compressor lock (DTC 22) using diagnosis trouble code. And then proceed to inspect the circuit or the component.
Compressor lock sensor circuit → (See page 05–1172)

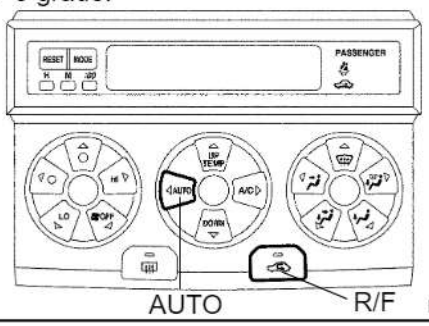
2. LIST OF OPERATION METHODS

(a) By operating each of the A/C control switches as shown in the diagram below, it is possible to enter the diagnosis check mode.

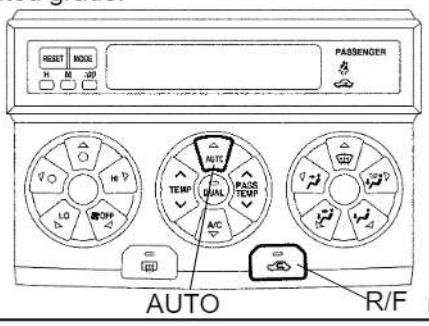


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SR–5 grade:

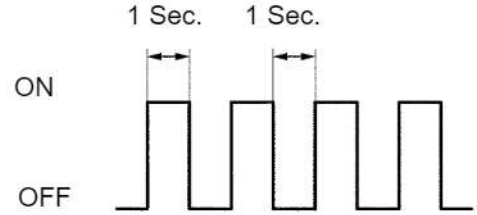


Limited grade:

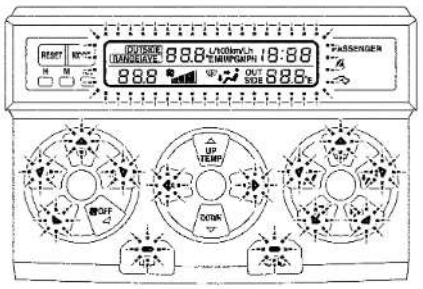


3. INDICATOR CHECK

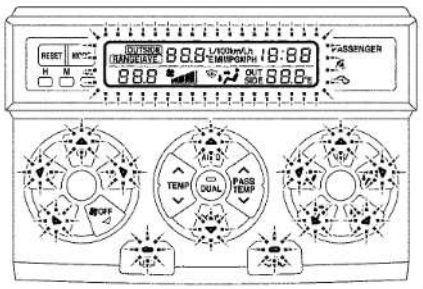
(a) Turn the ignition switch to ON while pressing the A/C control "AUTO" switch and "R/F" switch simultaneously.



SR–5 grade:



Limited grade:

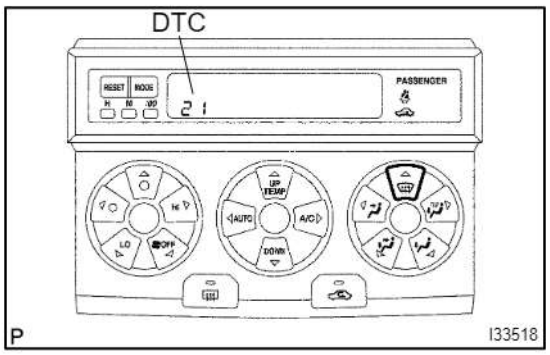


(b) Check that the indicators come on and go off 4 times at 1 second intervals in succession.

HINT:

- After the indicator check is completed, the system enters the DTC automatically.
- Press the OFF switch when canceling the check mode.

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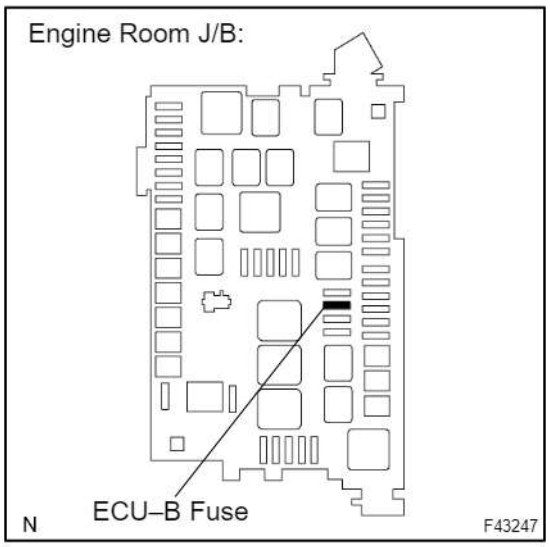


4. DTC CHECK (SENSOR CHECK)

(a) Perform an indicator check. After the indicator check is completed, the system enters the DTC check mode automatically.

(b) Read the code displayed on the panel. Refer to the list of codes on page 05–1145 when reading the codes. (Trouble codes are output on the temperature display.)

(c) If the slower display is desired, press the FRONT DEF switch and change it to stepped operation. Each time the FRONT DEF switch is pressed, the display changes by 1 step.



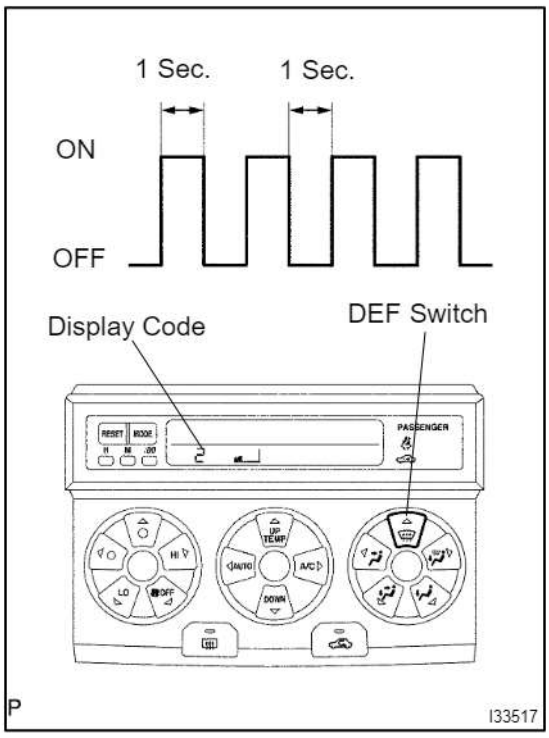
5. CLEARING DTC

(a) Clear DTC memory by one of the following methods.

(1) Method 1:
During the sensor check, press ”DEF” switch and ”REAR DEF” switch at the same time.

(2) Method 2:
Pull the ECU–B fuse in the engine room J/B for 20 sec. or longer.

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6. ACTUATOR CHECK

(a) After entering the DTC check mode (Sensor Check Mode), press the R/F switch.

(b) Since each damper, motor and relay automatically operates at 1 sec. intervals beginning in order from 10 in the temperature display, check the temperature and air flow visually and by hand.

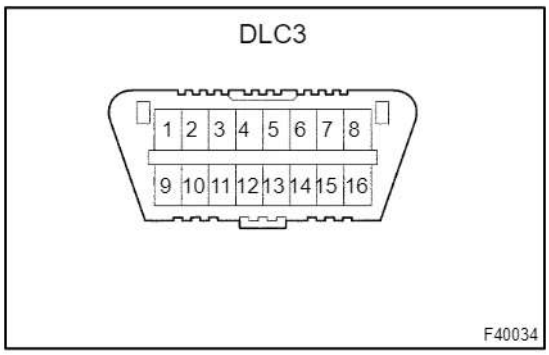
If slower display is desired, press the DEF switch and change it to the step operation. Each time the DEF switch is pressed, the display changes by 1 step.

HINT:

- Code are displayed in order from the smaller to the larger numbers.
- To cancel the check mode, press the OFF switch.

Step No.	Display code	Conditions				
		Blower level	Air flow vent	Air inlet damper	Magnetic clutch	Air mix damper
1	0	0	FACE	RECIRCULATION	OFF	"COLD" side (Fully closed)
2	1	1	FACE	RECIRCULATION	OFF	"COLD" side (Fully closed)
3	2	17	B/L	FRESH/ RECIRCULATION	ON	"COLD" side (Fully closed)
4	3	17	B/L	FRESH/ RECIRCULATION	ON	"COLD"/ "HOT " (50 % open)
5	4	17	FOOT	FRESH	ON	"COLD"/ "HOT " (50 % open)
6	5	17	FOOT	FRESH	ON	"COLD"/ "HOT " (50 % open)
7	6	17	FOOT	FRESH	ON	"HOT" side (Fully opened)
8	7	17	FOOT/ DEF	FRESH	ON	"HOT" side (Fully opened)
9	8	17	FOOT/ DEF	FRESH	ON	"HOT" side (Fully opened)
10	9	31	DEF	FRESH	ON	"HOT" side (Fully opened)

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7. DIAGNOSIS SYSTEM

(a) Check DLC3.

The vehicle's ECM uses ISO 9141–2 for communication. The terminal arrangement of DLC3 complies with SAE J1962 and matches the ISO 9141–2 format.

Terminal No	Connection/Voltage or Resistance	Condition
4	Chassis Ground – Body Ground/1 Ω or less	Always
16	Battery Positive – Body Ground/9 – 14 V	Always

HINT:

If your display shows UNABLE TO CONNECT TO VEHICLE when you have connected the cable of the hand–held tester to the DLC3, turned the ignition switch ON and operated the scan tool, there is a problem on the vehicle side or tool side.

- □ If the communication is normal when the tool is connected to another vehicle, inspect the DLC3 on the original vehicle.
- □ If the communication is still impossible when the tool is connected to another vehicle, the problem is probably in the tool itself, so consult the Service Department listed in the tool's instruction manual.

8. DATA LIST

HINT:

By the DATA LIST displayed by the Hand–held tester, you can read the value of the switch, sensor, actuator, etc. Without removing any parts. Reading the DATA LIST as a first step of troubleshooting is one of the method to shorten the labor time.

(a) Connect the Hand–held tester to the DLC3.
(b) Turn the ignition switch ON.
(c) According to the display on tester, read the "DATA LIST".

Item	Measurement Item/Range (Display)	Normal Condition	Diagnostic Note
A/C SIG	A/C signal/ ON, OFF	–	–
A/C CUT SIG	A/C cut signal/ ON, OFF	–	–

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056DH-03

DIAGNOSTIC TROUBLE CODE CHART

If malfunction code is displayed during the DTC check (sensor check), check the circuit listed for that code in the table below (Proceed to the page given for that circuit).

DTC No. (See Page)	Detection Item	Trouble Area	Memory
00	Normal	–	–
11*1 (05–1155)	Room temperature sensor circuit	□Cooler thermistor (Room temp. sensor) □A/C amplifier □Harness or connector between cooler thermistor (room temp. sensor) and A/C amplifier	○ (8.5 min. or more)
12*2 (05–1159)	Ambient temperature sensor circuit	□Thermistor assy (Ambient temp. sensor) □Harness or connector between thermistor assy (ambient temp. sensor) and A/C amplifier □A/C amplifier	○ (8.5 min. or more)
13 (05–1163)	Evaporator temperature sensor circuit	□Cooler thermistor No. 1 (Evaporator temp. sensor) □Harness or connector between cooler thermistor No. 1 (evaporator temp. sensor) and A/C amplifier □A/C amplifier	○ (8.5 min. or more)
14 (05–1167)	Engine coolant temperature communication circuit	□Harness or connector between ECM and A/C amplifier □ECM □A/C amplifier	–
21*3 (05–1169)	Solar sensor circuit (short) (Passenger side)	□Solar sensor □Harness or connector between cooler (solar sensor) thermistor and A/C amplifier □A/C amplifier	○ (8.5 min. or more)
	Solar sensor circuit (open)		–
22*4 (05–1172)	Compressor lock sensor circuit	□Compressor Drive Belt □Compressor lock sensor □Compressor □ECM □Harness or connector between ECM and compressor lock sensor, A/C amplifier □A/C amplifier	–
23 (05–1176)	Pressure switch circuit	□Pressure switch □A/C amplifier □Harness or connector between pressure switch and A/C amplifier	–
24*3 *7 (05–1179)	Solar sensor circuit (short) (Driver side)	□Cooler (Solar sensor) thermistor □Harness or connector between cooler (solar sensor) thermistor and A/C amplifier □A/C amplifier	○ (8.5 min. or more)
	Solar sensor circuit (open)		–
31 (05–1182)	Air mix damper position sensor circuit (Passenger side)	□Damper servo sub–assy (Air mix damper position sensor) □A/C amplifier □Harness or connector between damper servo sub–assy (air mix damper position sensor) and A/C amplifier	–
32 (05–1186)	Air inlet damper position sensor circuit	□Blower damper servo sub–assy (Air inlet damper position sensor) □A/C amplifier □Harness or connector between air inlet damper position sensor and A/C amplifier	○ (1 min. or more)
33 (05–1190)	Air outlet damper position sensor circuit	□Mode damper servo sub–assy (Air outlet damper position sensor) □A/C amplifier □Harness or connector between mode damper servo sub–assy (air outlet damper position sensor) and A/C amplifier	○ (1 min. or more)

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36 *7 (05–1194)	Air mix damper position sensor circuit (Driver side)	□Damper servo sub–assy (Air mix damper position sensor) □A/C amplifier □Harness or connector between damper servo sub–assy (air mix damper position sensor) and A/C amplifier	○ (1 min. or more)
41 (05–1198)	Air mix damper control servomotor (Passenger side)	□Damper servo sub–assy (Air mix damper control servomotor) □Harness or connector between damper servo sub–assy (air mix damper control servomotor) and A/C amplifier □A/C amplifier	○ (15 sec.)
42 (05–1201)	Air inlet damper control servomotor	□Blower damper servo sub–assy (Air inlet damper control servomotor) □Harness or connector between blower damper servo sub–assy (Air inlet damper control servomotor) and A/C amplifier □A/C amplifier	○ (15 sec.)
43 (05–1204)	Air outlet damper control servomotor	□Mode damper servo sub–assy (Air outlet damper control servomotor) □Harness or connector between mode damper servo sub–assy (air outlet damper control servomotor) and A/C amplifier □A/C amplifier	○ (15 sec.)
46 *7 (05–1207)	Air mix damper control servomotor (Driver side)	□Damper servo sub–assy (Air mix damper control servomotor) □Harness or connector between damper servo sub–assy (air mix damper control servomotor) and A/C amplifier □A/C amplifier	○ (15 sec.)

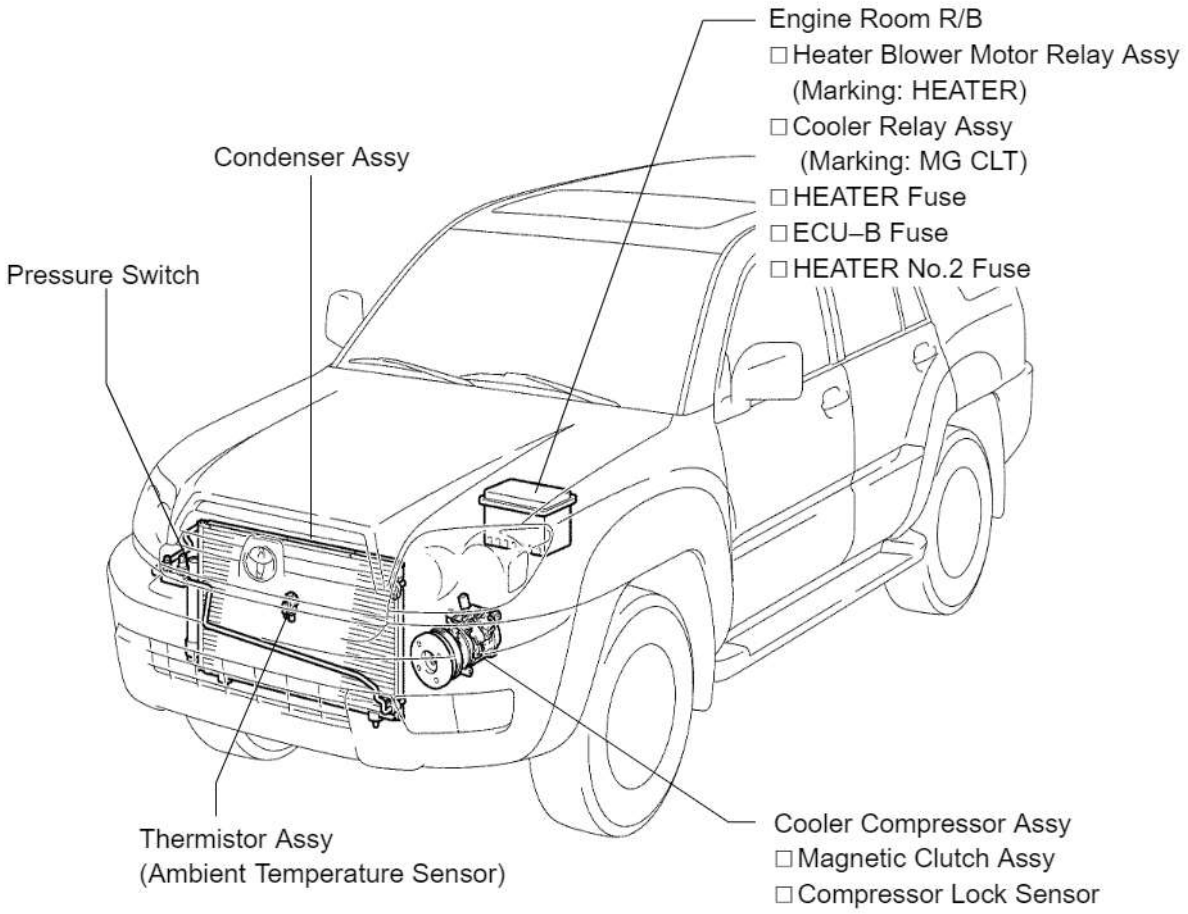
HINT:

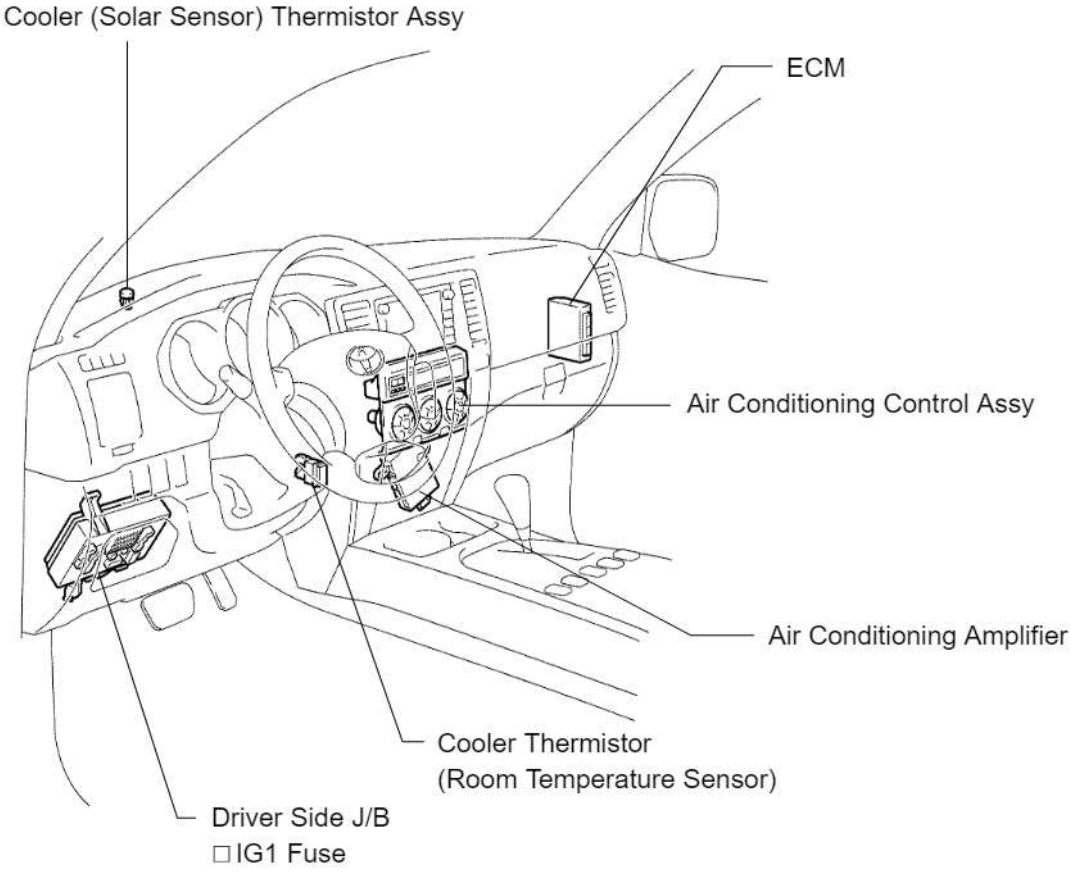
- □ *1: If the room temp. is approx. –18.6 °C (–3.7 °F) or lower, trouble code 11 may be output even though the system is normal.
- □ *2: If the ambient temp. is approx. –52.9 °C (–61.4 °F) or lower, a malfunction code may be output even though the system is normal.
- □ *3: If the check is performed in a dark place, DTC 21, 24 (solar sensor circuit) could be displayed.
- □ *4: Compressor lock (DTC 22) is indicated only for a existing malfunction (See page 05–1172).
  To confirm DTC 22, perform the following steps.
  (1) With the engine ON, enter the DTC check mode.
  (2) Press the R/F switch to enter actuator check mode, and set the operation to Step No. 3.
  (3) Press the AUTO switch to return to DTC check mode.
  (4) The DTC is displayed after approx. 3 sec.
- □ *5: The A/C amplifier memorizes the DTC of the respective malfunction which occurred within the period of the time indicated in the brackets.
- □ *6: Even though the system is in good condition, DTC is output when the seat sensor temperature senses below –40 C (–104 F) and over 99 C (210.2 F).
- □ *7: DTC 24, 36 and 46 are indicated only for limited grade (right/left independent temperature control system).

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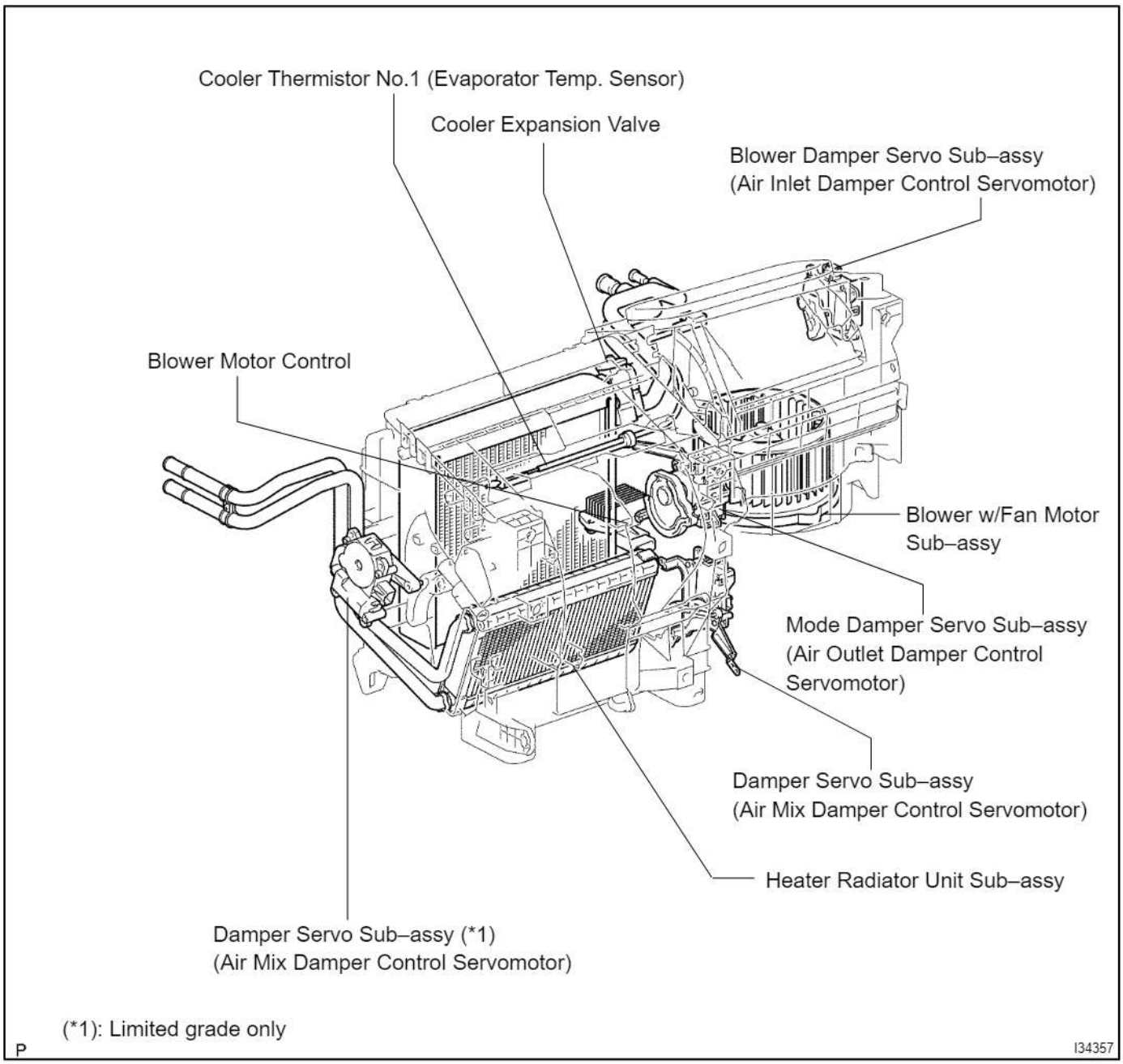
LOCATION





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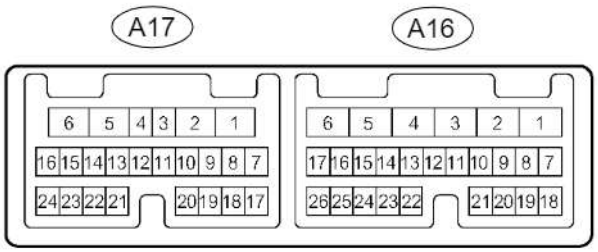


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058X4–02

TERMINALS OF ECU

Air conditioning amplifier:



I33903

Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage (V)
IG ⇔ GND (A16–1 ⇔ A16–5)	Y–R ⇔ W–B	Ignition switch: ON	10 – 14 V
+B ⇔ GND (A16–2 ⇔ A16–5)	W–R ⇔ W–B	Always	10 – 14 V
BLW ⇔ GND (A16–3 ⇔ A16–5)	LG–B ⇔ W–B	Ignition switch: ON Blower motor: Operating	Pulse generation (*3)
LIN1 (A16–4)	L–B	Heater control panel communication circuit	–
GND ⇔ Body ground (A16–5 ⇔ Body ground)	W–B ⇔ Body ground	Always	Continuity
TWI ⇔ GND (A16–7 ⇔ A16–5)	L–B ⇔ W–B	Ignition switch: ON	Pulse generation (*4)
SPD ⇔ GND (A16–8 ⇔ A16–5)	V–R ⇔ W–B	Ignition switch: ON Turn propeller shaft slowly	0 ⇔ 4.5 – 5.5 V (Voltage is generated intermittently)
TSDR ⇔ S5 (A16–12 ⇔ A17–1) (*1)	R ⇔ P (*1)	Ignition switch: ON Solar sensor subject to electric light	4.0 – 5.5 V
		Ignition switch: ON Solar sensor covered by a cloth	Below 1.0 V
TS ⇔ S5 (A16–12 ⇔ A17–1) (*2)	V–G ⇔ P (*2)	Ignition switch: ON Solar sensor subject to electric light	4.0 – 5.5 V
		Ignition switch: ON Solar sensor covered by a cloth	Below 1.0 V
TR ⇔ SG (A16–15 ⇔ A16–6)	V–Y ⇔ Y–G	Ignition switch: ON Room temp.: 25 □C (77 □F)	1.35 – 1.75 V
		Ignition switch: ON Room temp.: 40 □C (104 □F)	0.85 – 1.25 V
TPI ⇔ SG (A16–16 ⇔ A16–6)	P–B ⇔ Y–G	Ignition switch: ON Set air intake: RECIRCULATION	3.5 – 4.5 V
		Ignition switch: ON Set air intake: FRESH	0.5 – 1.8 V
TPO ⇔ SG (A16–17 ⇔ A16–6)	LG–R ⇔ Y–G	Ignition switch: ON Set air flow: FACE	3.5 – 4.5 V
		Ignition switch: ON Set air flow: DEF	0.5 – 1.8 V
ACLD ⇔ GND (A16–18 ⇔ A16–5)	B–R ⇔ W–B	Start engine Blower speed: LO Magnetic clutch: Engaged	10 – 14 V
		Start engine Blower speed: LO Magnetic clutch: Not engaged	Below 1.0 V
HR ⇔ GND (A16–21 ⇔ A16–5)	L ⇔ W–B	Ignition switch: ON Blower switch: ON	Below 1.0 V
		Ignition switch: ON Blower switch: OFF	10 – 14 V
TAM ⇔ SG (A16–22 ⇔ A16–6)	GR ⇔ Y–G	Ignition switch: ON Ambient temp.: 25 □C (77 □F)	1.35 – 1.75 V
		Ignition switch: ON Ambient temp.: 40 □C (104 □F)	0.85 – 1.25 V
TPPA ⇔ SG (A16–23 ⇔ A16–6) (*1)	L–W ⇔ Y–G	Ignition switch: ON Set passnger side temp.: Max COLD	3.5 – 4.5 V
		Ignition switch: ON Set passnger side temp.: Max HOT	0.5 – 1.5 V
TE ⇔ SG (A16–24 ⇔ A16–6)	G ⇔ Y–G	Ignition switch: ON Evaporator temp.: 0 □C (32 □F)	2.0 – 2.4 V
		Ignition switch: ON Evaporator temp.: 15 □C (59 □F)	1.4 – 1.8 V
TPDR ⇔ SG (A16–25 ⇔ A16–6) (*1)	L–O ⇔ Y–G	Ignition switch: ON Set (driver side *1) temp.: Max COLD	3.5 – 4.5 V
		Ignition switch: ON Set (driver side *1) temp.: Max HOT	0.5 – 1.5 V

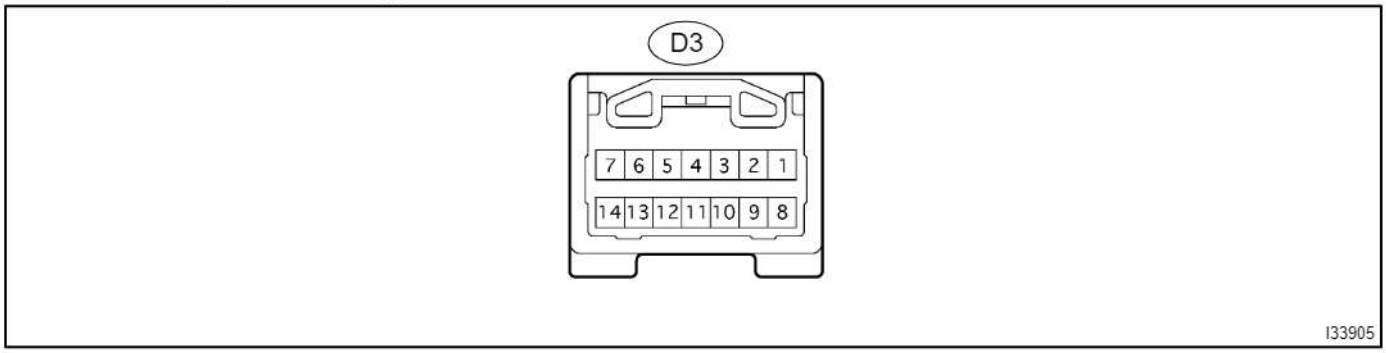
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Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage (V)
TP ⇔ SG (A16–25 ⇔ A16–6) (*2)	L–O ⇔ Y–G	Ignition switch: ON Set (driver side *1) temp.: Max COLD	3.5 – 4.5 V
		Ignition switch: ON Set (driver side *1) temp.: Max HOT	0.5 – 1.5 V
TSPA ⇔ S5 (A16–26 ⇔ A17–1) (*1)	B–O ⇔ P	Ignition switch: ON Solar sensor subject to electric light	4.0 – 5.5 V
		Ignition switch: ON Solar sensor covered by a cloth	Below 1.0 V
S5 ⇔ SG (A17–1 ⇔ A16–6)	P ⇔ Y–G	Ignition swtich: ON	4.5 – 5.5 V
AOF ⇔ GND (A17–3 ⇔ A16–5)	LG–R ⇔ W–B	Ignition switch: ON Set air flow: FACE	10 – 14 V
		Ignition switch: ON Set air flow: Except FACE	Below 1.0 V
AOD ⇔ GND (A17–4 ⇔ A16–5)	LG ⇔ W–B	Ignition switch: ON Set air flow: DEF	10 – 14 V
		Ignition switch: ON Set air flow: Except DEF	Below 1.0 V
AIR ⇔ GND (A17–5 ⇔ A16–5)	P–L ⇔ W–B	Ignition switch: ON Set air intake: RECIRCULATION	10 – 14 V
		Ignition switch: ON Set air intake: FRESH	Below 1.0 V
THE ⇔ GND (A17–7 ⇔ A16–5)	GR–G ⇔ W–B	Start engine Blower speed: LO Magnetic clutch: Engaged	10 – 14 V
		Start engine Blower speed: LO Magnetic clutch: Not engaged	Below 1.0 V
PSW ⇔ GND (A17–9, ⇔ A16–5)	LG–R ⇔ W–B	Start engine Operate A/C system Refrigerant pressure: Abnormal pressure (More than 3,140 kPa and less than 196 kPa)	Below 1.0 V
		Start engine Operate A/C system Refrigerant pressure: Normal pressure (Less than 3,140 kPa and less than 196 kPa)	10 – 14 V
AMHDR ⇔ GND (A17–14 ⇔ A16–5) (*1)	V–W ⇔ W–B	Ignition switch: ON Set (driver side *1) temp.: Max. HOT	10 – 14 V
		Ignition switch: ON Set (driver side *1) temp.: Max. COLD	Below 1.0 V
AMH ⇔ GND (A17–14 ⇔ A16–5) (*2)	V–W ⇔ W–B	Ignition switch: ON Set (driver side *1) temp.: Max. HOT	10 – 14 V
		Ignition switch: ON Set (driver side *1) temp.: Max. COLD	Below 1.0 V
AMHPA ⇔ GND (A17–16 ⇔ A16–5) (*1)	L–R ⇔ W–B	Ignition switch: ON Set passenger temp.: Max. HOT	10 – 14 V
		Ignition switch: ON Set passenger side temp.: Max. COLD	Below 1.0 V
ACS ⇔ GND (A17–17 ⇔ A16–5)	BR–B ⇔ W–B	Ignition switch: ON A/C swtich: ON	10 – 14 V
		Ignition switch: ON A/C swtich: OFF	Blow 1.0 V
DMOT (A17–19)	BR–B	Multiplex communication circuit	–
DMIN (A17–20)	W–L	Multiplex communication circuit	–
AMCDR ⇔ GND (A17–23 ⇔ A16–5) (*1)	V–R ⇔ W–B	Ignition switch: ON Set (driver side *1) temp.: Max. COLD	10 – 14 V
		Ignition switch: ON Set (driver side *1) temp.: Max. HOT	Below 1.0 V
AMC ⇔ GND (A17–23 ⇔ A16–5) (*2)	V–R ⇔ W–B	Ignition switch: ON Set (driver side *1) temp.: Max. COLD	10 – 14 V
		Ignition switch: ON Set (driver side *1) temp.: Max. HOT	Below 1.0 V
AMCPA ⇔ GND (A17–24 ⇔ A16–5) (*1)	L–Y ⇔ W–B	Ignition switch: ON Set passenger temp.: Max. COLD	10 – 14 V
		Ignition switch: ON Set passenger side temp.: Max. HOT	Below 1.0 V

(*1): Limeted grade
(*2): SR–5 grade

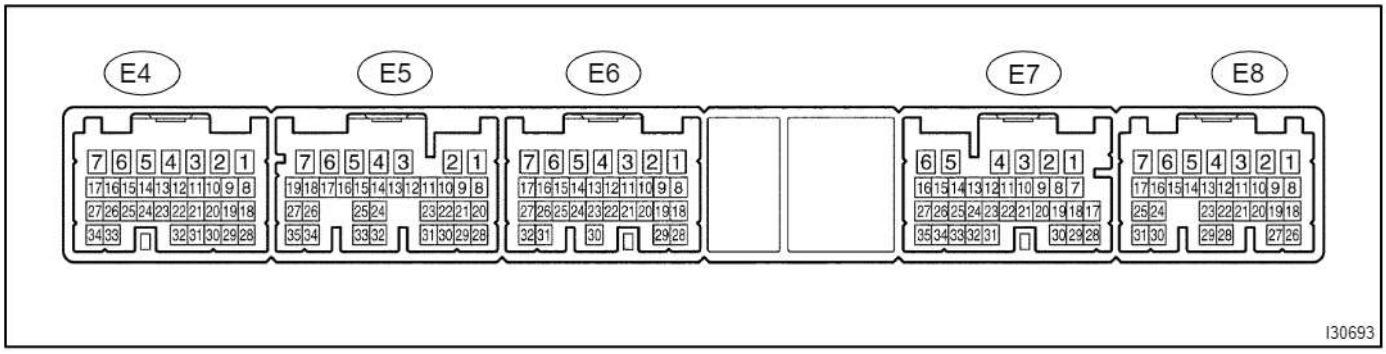
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Air conditioning contol assy:



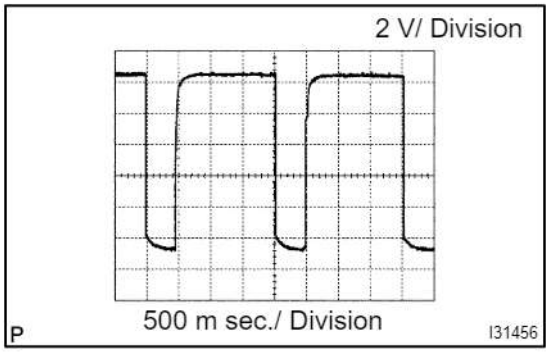
Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage (V)
B ⇔ GND (D3–1 ⇔ D3–7)	R ⇔ W–B	Always	10 – 14 V
IG+ ⇔ GND (D3 –2 ⇔ D3–7)	Y–R ⇔ W–B	Ignition switch: ON	10 – 14 V
		Ignition switch: Except ON	Below 1.0 V
ACC ⇔ GND (D3–8 ⇔ D3–7)	GR ⇔ W–B	Ignition swtich: ACC	10 – 14 V
		Ignition switch: Except ACC	Below 1.0 V
GND ⇔ Body ground (D3–7 ⇔ Body ground)	W–B ⇔ Body ground	Always	Continuity
LIN–B (D3–14)	L–B	A/C amplifier communiction circuit	–

ECM:

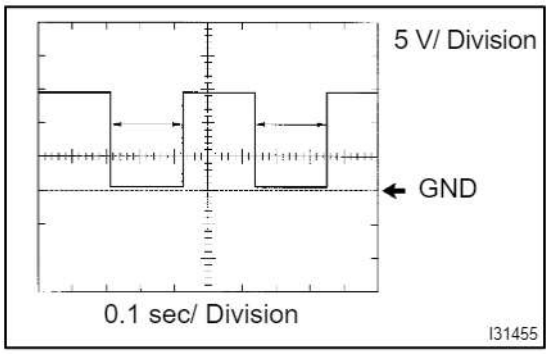


Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage (V)
THWO ⇔ E1 (E7–14 ⇔ E6–1)	L–B ⇔ BR	Engine running: Idle speed	Pulse generation (*4)
LCKI ⇔ E1 (E6–23 ⇔ E6–1)	R–Y ⇔ BR	Engine running: Idle speed A/C system: Operating Magnitic clutch: Engaged	Pulse generation (*5)
ACMG ⇔ E1 (E7–2 ⇔ E6–1)	B–Y ⇔ BR	Engine running: Idle speed A/C system: Operating Magnitic clutch: Engaged	Below 1.0 V
		Engine running: Idle speed A/C system: Operating Magnitic clutch: Not engaged	10 – 14 V
A/CS ⇔ E1 (E7–31 ⇔ E6–1)	BR–B ⇔ BR	Engine running: Idle speed A/C system: Operating Magnitic clutch: Engaged	Below 1.0 V
		Engine running: Idle speed A/C system: Operating Magnitic clutch: Not engaged	10 – 14 V
THE ⇔ E1 (E7–32 ⇔ E6–1)	GR–G ⇔ BR	Engine running: Idle speed A/C system: Operating Magnitic clutch: Engaged	1.3 – 2.6 V
		Engine running: Idle speed A/C system: Operating Magnitic clutch: Not engaged	3.7 – 4.5 V
ACLD ⇔ E1 (E7–33 ⇔ E6–1)	B–R ⇔ BR	Engine running: Idle speed A/C system: Operating Magnitic clutch: Engaged	10 – 14 V
		Engine running: Idle speed A/C system: Operating Magnitic clutch: Not engaged	Below 1.0 V

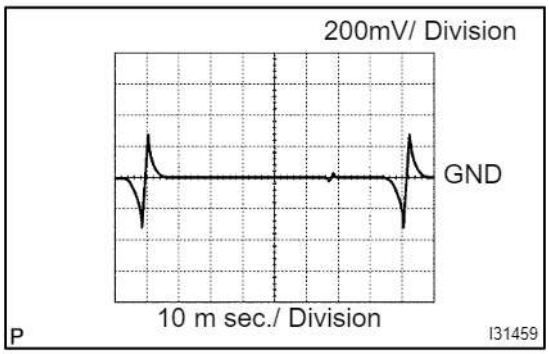
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(*3): Oscilloscope waveform:
Terminal to be measured: BLC of A/C amplifier
Setting for measurement: 2 V DIV 500 m sec./DIV
Conditon: Ignition switch ON



(*4): Oscilloscope waveform:
Terminal to be measured:
TW2 of A/C amplifier and TWHO of ECM
Setting for measurement: 5 V DIV 0.1 sec./DIV
Conditon: Ignition switch ON



(*5): Oscilloscope waveform:
Terminal to be measured: LCKI of A/C amplifier and ECM
Setting for measurement: 200 mV DIV 10 m sec./DIV
Conditon: Ignition switch ON

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056CK-03

PROBLEM SYMPTOMS TABLE

If the normal code is displayed during DTC check although the problem still occurs, check the circuits for each problem symptom in the order given in the table below, and proceed to the relevant troubleshooting.

Symptom	Suspect Area	See page
Whole functions of the A/C system does not operate.	1. IG power source circuit	05–1210
	2. Heater control power supply circuit	05–1231
	3. Heater control panel ommunication circuit	05–1233
Air Flow Control : No blower operation	1. Heater relay circuit	05–1215
	2. Blower motor circuit	05–1219
	3. Heater control panel communication circuit	05–1233
Air Flow Control : No blower control	1. Blower motor circuit	05–1219
Temperature Control : No cool air comes out	1. Volume of refrigerant	55–2
	2. Drive belt tension	14–190
	3. Refrigerant pressure	55–2
	4. Compressor lock sensor circuit	05–1172
	5. Compressor circuit	05–1223
	6. Pressure switch circuit	05–1176
	7. Air mix control servomotor circuit (Driver side)(*1)	05–1207
	(Passenger side)	05–1198
	8. Air mix damper position sensor circuit (Driver side)(*1)	05–1194
	(Passenger side)	05–1182
	9. Room temp. sensor circuit	05–1155
	10.Ambient temp. sensor circuit	05–1159
	11.Vehicle speed signal circuit	05–1228
	12.Heater control panel communication circuit	05–1233
Temperature Control : No warm air comes out	1. Air mix control servomotor circuit (Driver side)(*1)	05–1207
	(Passenger side)	05–1198
	2. Air mix damper position sensor circuit (Driver side)(*1)	05–1194
	(Passenger side)	05–1182
	3. Ambient temp. sensor circuit	05–1159
	4. Vehicle speed signal circuit	05–1228
	5. Room temp. sensor circuit	05–1155
	6. Evaporator temp. sensor circuit	05–1163
	7. Heater control panel communication circuit	05–1233
	8. Heater radiator	–
Temperature Control : Output air is warmer or cooler than the set temperature or response is slow.	1. Room temp. sensor circuit	05–1155
	2. Ambient temp. sensor circuit	05–1159
	3. Vehicle speed signal circuit	05–1228
	4. Solar sensor circuit (Driver side)(*1)	05–1179
	(Passenger side)	05–1169
	5. Air mix damper position sensor circuit (Driver side)(*1)	05–1207
	(Passenger side)	05–1198
	6. Air mix control servomotor circuit (Driver side)(*1)	05–1194
	(Passenger side)	05–1182
	7. Engine coolant temperature communication circuit	05–1167
	8. Heater control panel communication circuit	05–1233
Temperature Control : No temperature control (only Max. cool or Max. warm)	1. Air mix control servomotor circuit (Driver side)(*1)	05–1207
	(Passenger side)	05–1198
	2. Air mix damper position sensor circuit (Driver side)(*1)	05–1194
	(Passenger side)	05–1182
	3. Heater control panel communication circuit	05–1233
No air inlet control	1. Air inlet damper control servomotor circuit	05–1201
	2. Air inlet damper position sensor circuit	05–1186
	3. Heater control panel communication circuit	05–1233

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Symptom	Suspect Area	See page
No air outlet control	1. Air outlet damper position sensor circuit 2. Air outlet control servomotor circuit 3. Heater control panel communication circuit	05–1204 05–1190 05–1233
Engine idle up does not occur, or is continuous	1. Compressor circuit 2. Heater control panel communication circuit	05–1223 05–1233
Set temperature value displayed does not much up with operation of temperature control switch.	1. Heater control panel communication circuit	05–1233
Brightness does not changes when rheostat volume or light control switch it turned.	1. Illumination light system 2. Heater control panel	– –
Unable to access the diagnosis mode.	1. Heater control panel communication circuit	05–1233
DTC not recorded. Set mode is cleared when IG switch is turned off.	1. Back–up power source circuit 2. A/C amplifier	05–1213 01–35

(*1): Limited grade only

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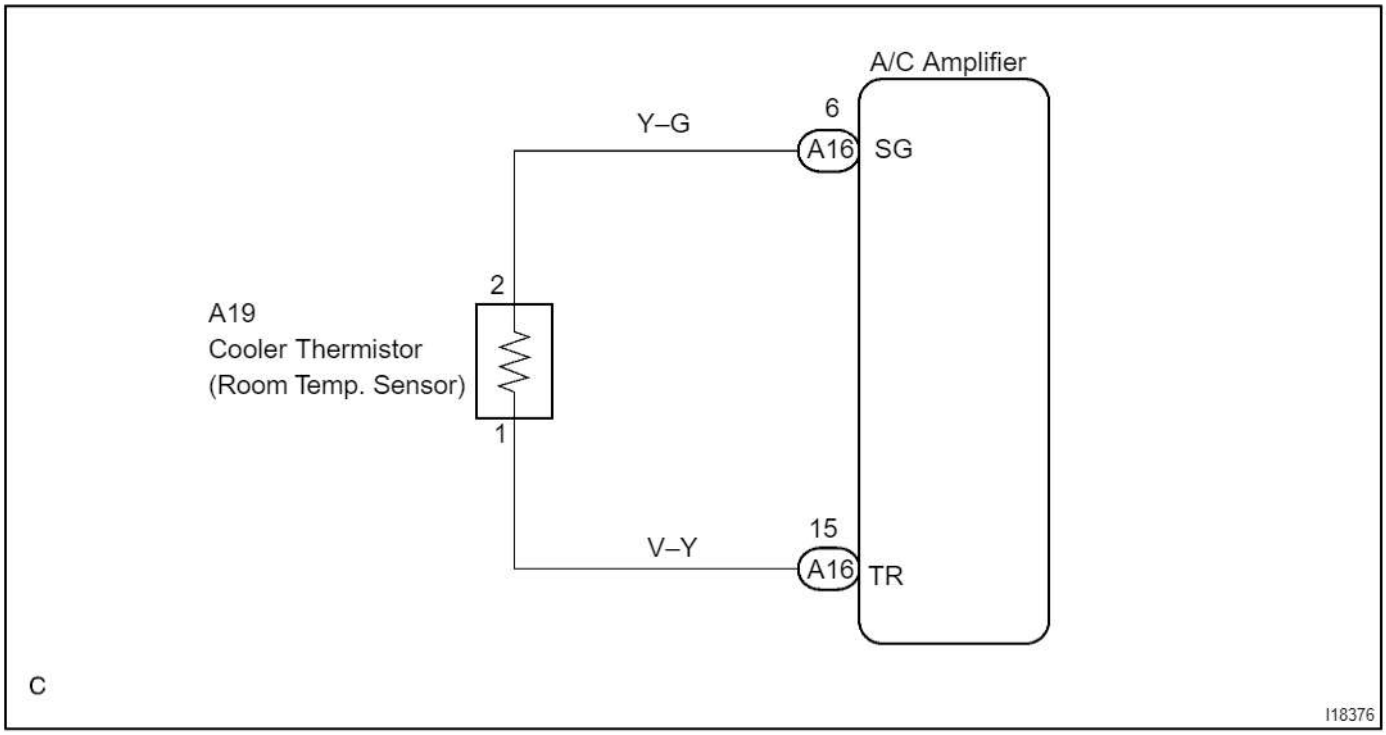
DTC	11	ROOM TEMPERATURE SENSOR CIRCUIT

CIRCUIT DESCRIPTION

This sensor detects the temperature inside the cabin and sends appropriate signals to the A/C amplifier.

DTC No.	Detection item	Trouble Area
11	Open or short in room temperature sensor circuit	□Cooler thermistor (Room temperature sensor) □Harness or connector between cooler thermistor (room temperature sensor) and A/C amplifier □A/C amplifier

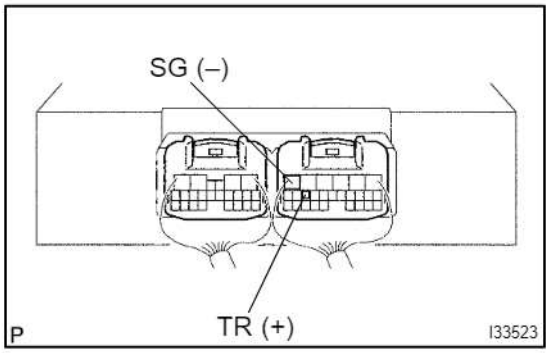
WIRING DIAGRAM



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INSPECTION PROCEDURE

1	INSPECT AIR CONDITIONING AMPLIFIER(TR, SG)



(a) Remove the A/C amplifier with the connectors being connected.
(b) Turn ignition switch to ON.
(c) Measure voltage between terminal TR and SG of the A/C amplifier connector at each temperature.
Voltage:
at 25 C (77 F) : 1.8 – 2.2 V
at 40 C (104 F) : 1.2 – 1.6 V

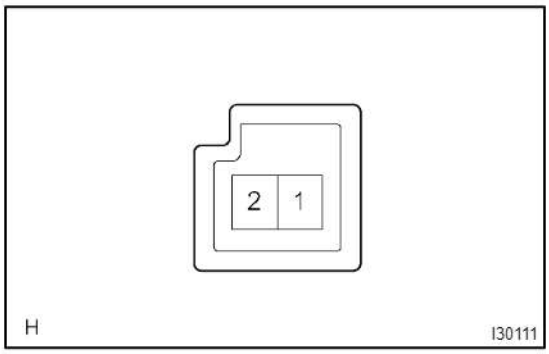
HINT:
As the temperature increases, the voltage decreases.

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE**

NG

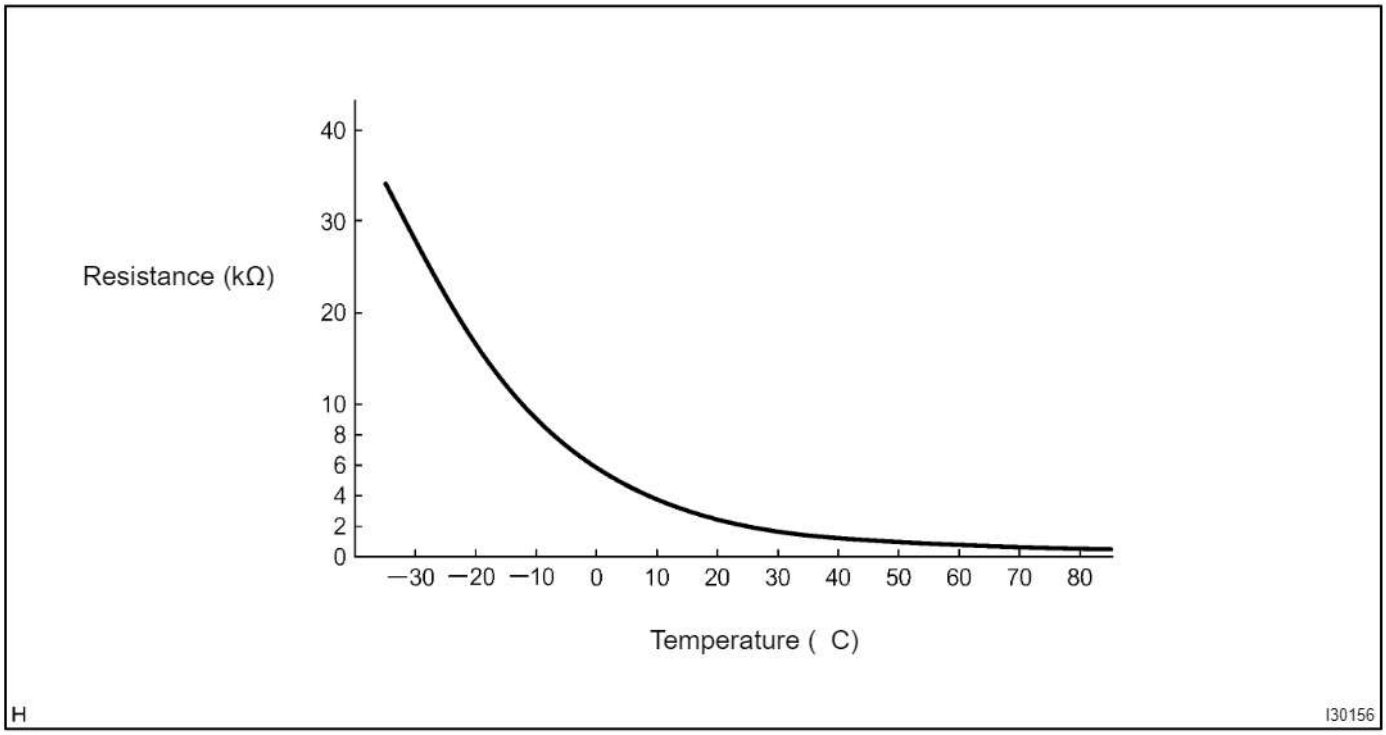
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2	INSPECT COOLER THERMISTOR



(a) Remove the cooler thermistor (room temp. sensor).
(b) Measure resistance between terminals of the cooler thermistor (Room temp. sensor) connector at each temperature.
Resistance:
at 25 C (77 F): 1.65 – 1.75 kΩ
at 40 C (104 F): 0.55 – 0.65 kΩ

HINT:
As the temperature increases, the resistance decreases, as shown in the illustration.



NG → REPLACE COOLER THERMISTOR

OK

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3	CHECK HARNESS AND CONNECTOR(BETWEEN COOLER THERMISTOR (ROOM TEMP. SENSOR) AND AIR CONDITIONING AMPLIFIER)

(a) Check for open and short circuit in the harness and the connector between the cooler thermistor (room temp. sensor) and the A/C amplifier (See page 01–35).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

4	CHECK DIAGNOSTIC TROUBLE CODE

(a) Start up the DTC check mode.
(b) Check that DTC 11 is not output again.
Standard: DTC 11 is not output.

OK → SYSTEM OK

NG

CHECK AND REPLACE AIR CONDITIONING AMPLIFIER

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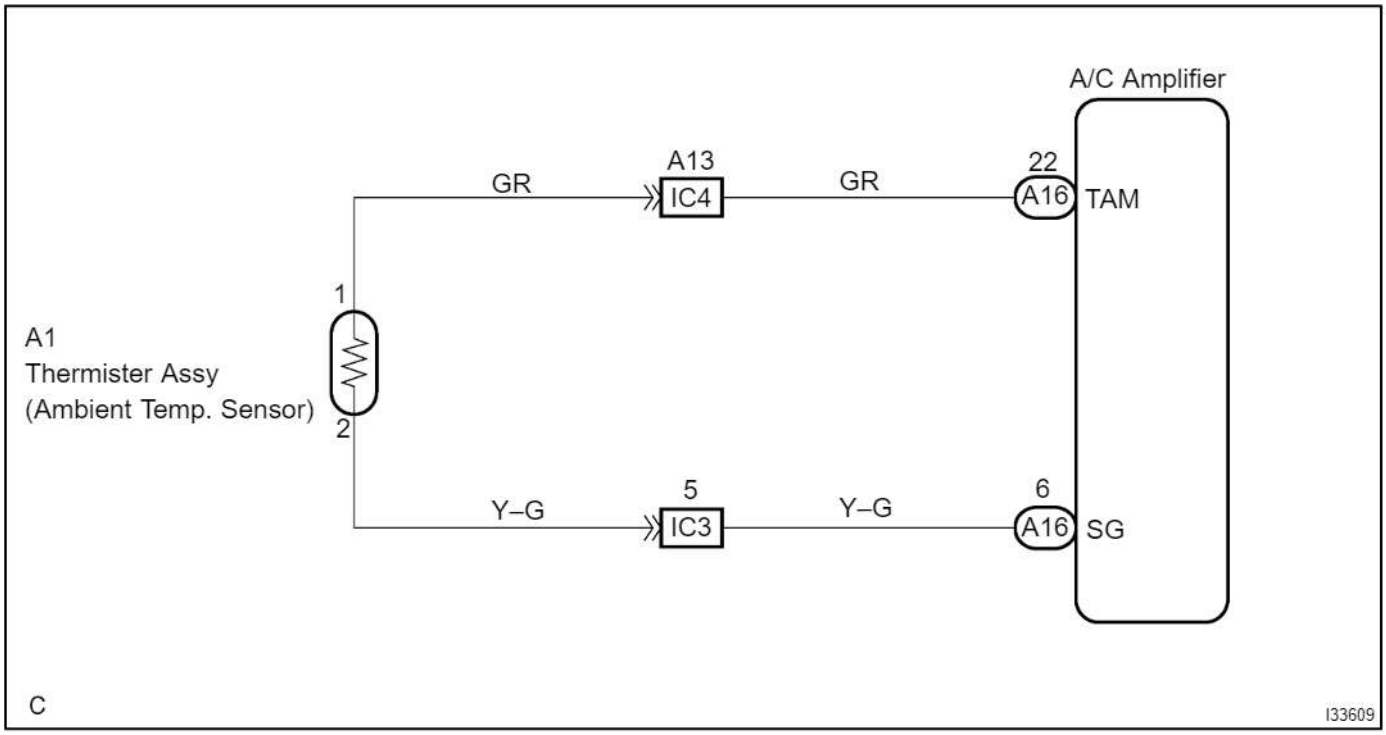
DTC	12	AMBIENT TEMPERATURE SENSOR CIRCUIT

CIRCUIT DESCRIPTION

This sensor detects the temperature outside the cabin and sends appropriate signals to the A/C amplifier.

DTC No.	Detection item	Trouble Area
12	Open or short in ambient temperature sensor circuit	□Thermistor assy (Ambient temperature sensor) □Harness or connector between thermistor assy (ambient temperature sensor) and A/C amplifier □A/C amplifier

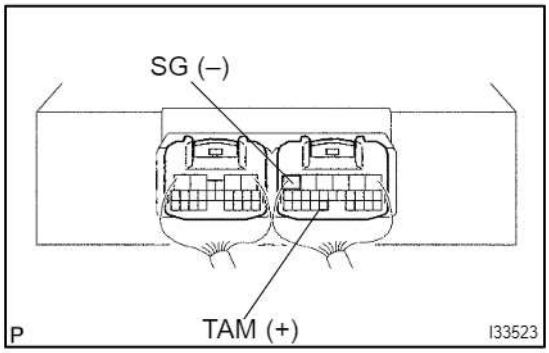
WIRING DIAGRAM



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INSPECTION PROCEDURE

1	INSPECT AIR CONDITIONING AMPLIFIER(TAM, SG)



(a) Remove the A/C amplifier with the connectors being connected.
(b) Turn the ignition switch to ON.
(c) Measure voltage between terminal TAM and SG of the A/C amplifier connector at each temperature.
Voltage:
at 25 C (77 F) : 1.4 – 1.8 V
at 40 C (104 F) : 0.9 – 1.3 V

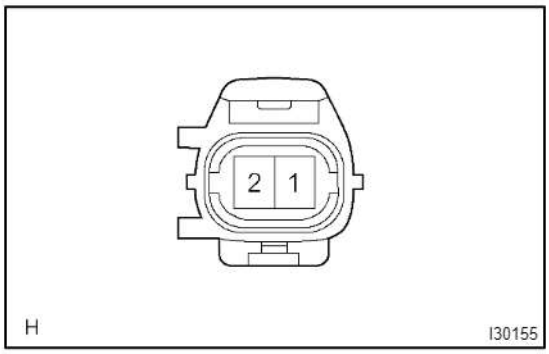
HINT:
As the temperature increases, the voltage decreases.

NG → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE**

OK

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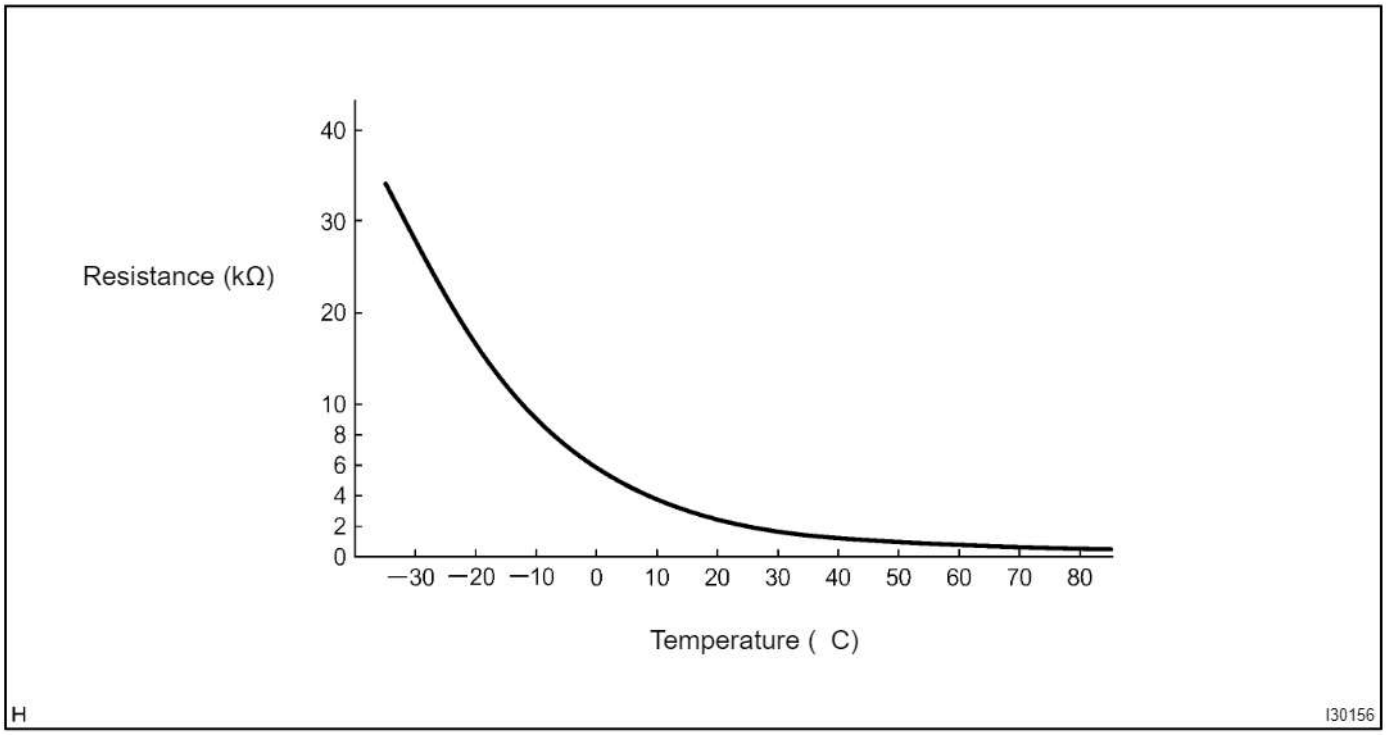
2	INSPECT THERMISTOR ASSY



(a) Remove the thermistor assy (ambient temp. sensor).
(b) Measure resistance between terminal of the thermistor assy (ambient temp. sensor) connector at each temperature.

Resistance:
at 25 C (77 F) : 1.65 – 1.75 kΩ
at 40 C (104 F) : 0.85 – 0.95 kΩ

HINT:
As the temperature increases, the resistance decreases as shown in the illustration.



NG → REPLACE THERMISTOR ASSY

OK

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3	CHECK HARNESS AND CONNECTOR(BETWEEN THERMISTOR ASSY (AMBIENT TEMP. SENSOR) AND AIR CODITIONING AMPLIFIER)

(a) Check for open and short circuit in the harness and the connector between the thermistor assy (ambient temp. sensor) and the A/C amplifier (See page 01–35).

NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

4	CHECK DIAGNOSTIC TROUBLE CODE

(a) Start up the DTC check mode.
(b) Check that the DTC 12 is not output again.
Standard: DTC 12 is not output.

OK	SYSTEM OK

NG

CHECK AND REPLACE AIR CONDITIONING AMPLIFIER

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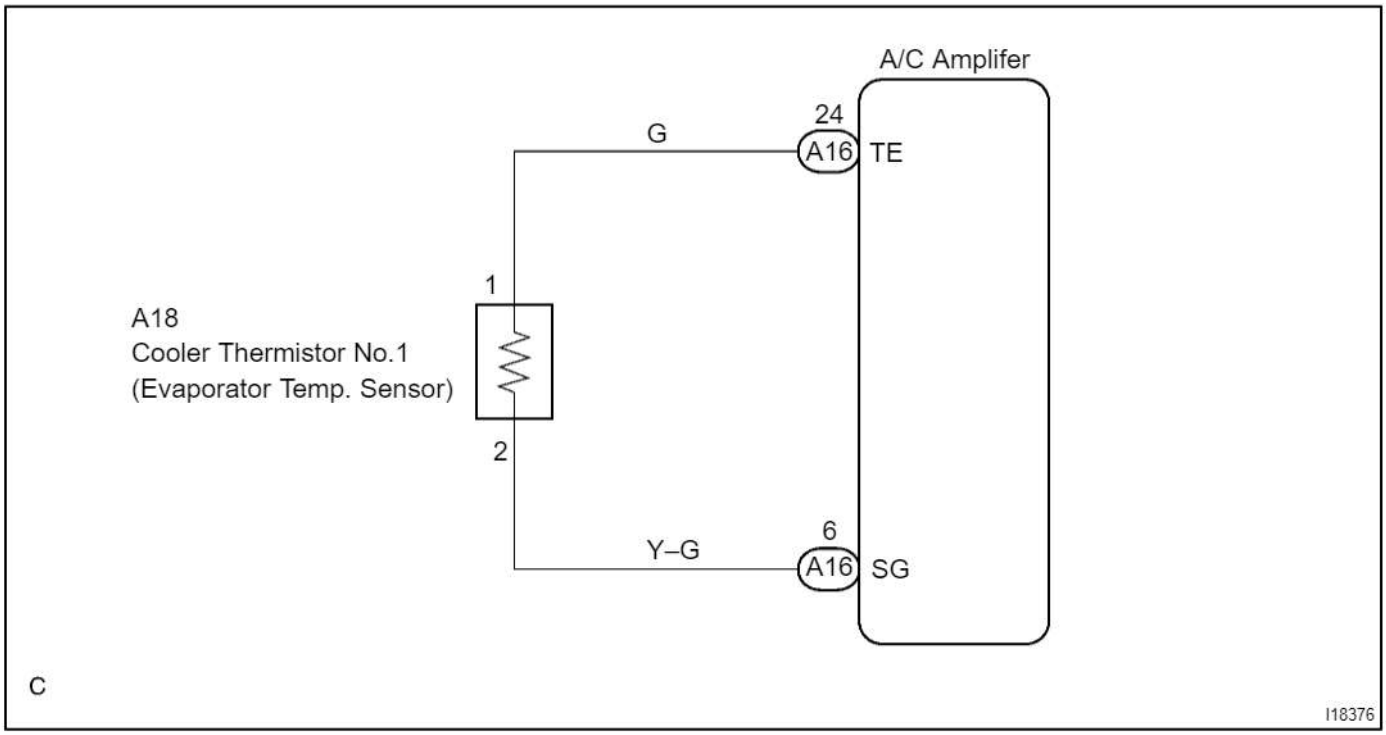
DTC	13	EVAPORATOR TEMPERATURE SENSOR CIRCUIT

CIRCUIT DESCRIPTION

This sensor detects the temperature inside the cooling unit and sends appropriate signals to the A/C amplifier.

DTC No.	Detection Item	Trouble Area
13	Open or short in evaporator temperature sensor circuit.	□Cooler thermistor No. 1 (Evaporator temperature sensor) □Harness or connector between cooler thermistor No. 1 (evaporator temperature sensor) and A/C amplifier □A/C amplifier

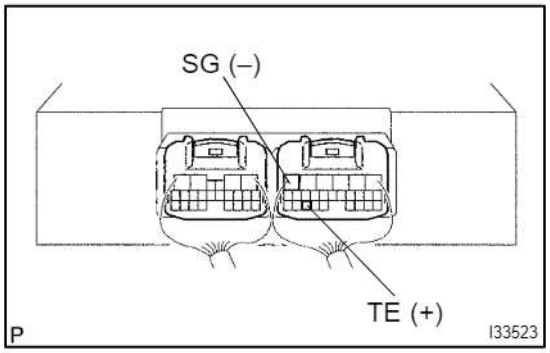
WIRING DIAGRAM



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CIRCUIT DESCRIPTION

1	INSPECT AIR CONDITIONING AMPLIFIER(TE, SG)



(a) Remove the A/C amplifier with the connectors still connected.
(b) Turn ignition switch to ON.
(c) Measure voltage between terminal TE and SG of the A/C amplifier connector at each temperature.

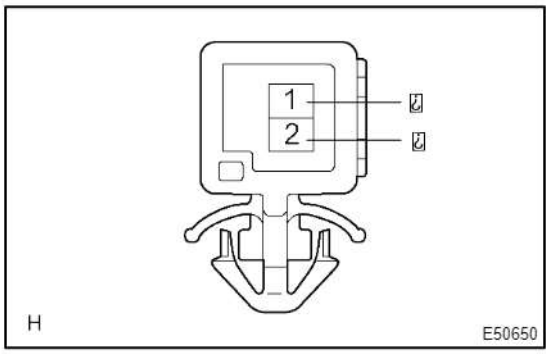
Voltage
at 0 °C (32 °F) : 2.0 – 2.4 V
at 15 °C (59 °F) : 1.4 – 1.8 V

NG → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE**

OK

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2	INSPECT COOLER THERMISTOR NO.1



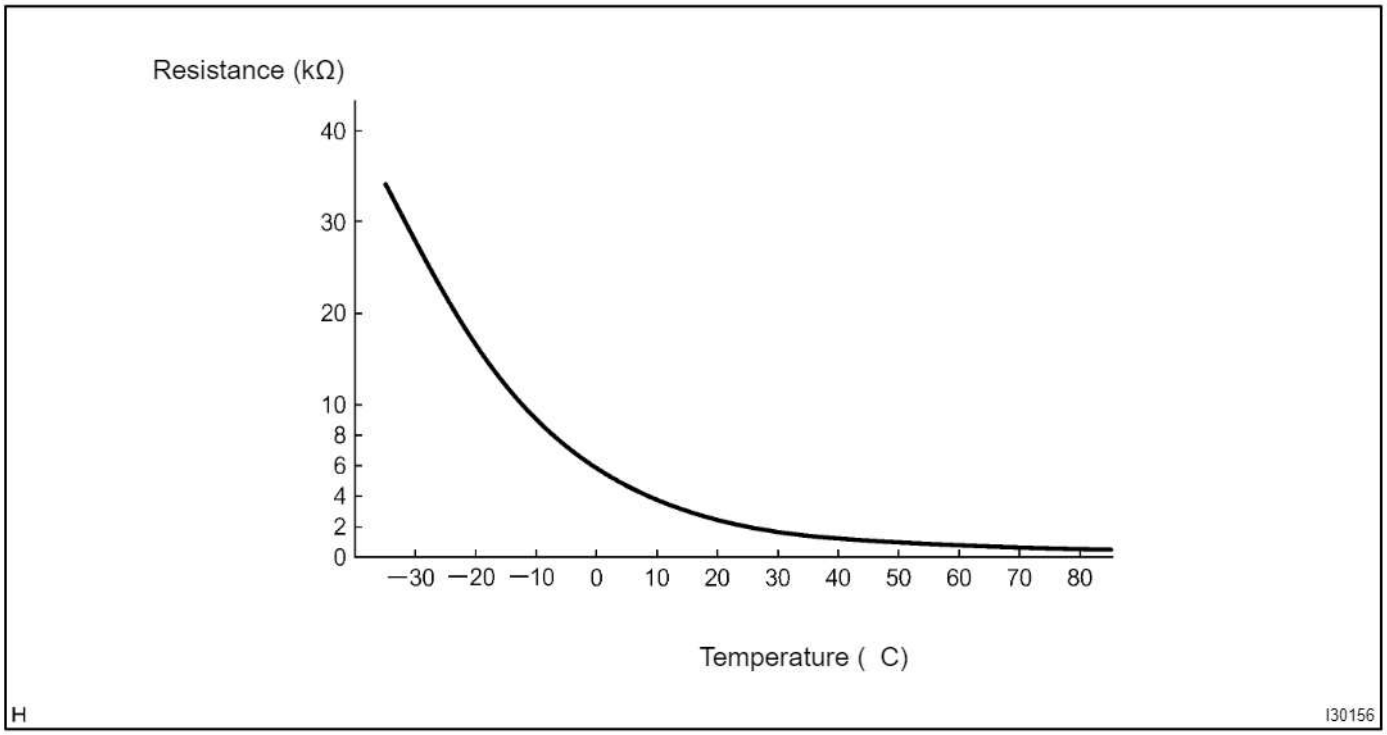
(a) Remove the cooler thermistor No. 1 (evaporator temp. sensor).

(b) Measure resistance between terminal of the cooler thermistor No. 1 (evaporator temp. sensor) at each temperature, as shown in the chart.

HINT:

As the temperature increases, the resistance decreases as shown in the illustration.

Resistance:



NG → REPLACE COOLER THERMISTOR NO.1

OK →

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3	CHECK HARNESS AND CONNECTOR(BETWEEN COOLER THERMISTOR NO.1 (EVAPORATOR TEMP. SENSOR) AND AIR CONDITIONING AMPLIFIER)

(a) Check for open and short in the harness and the connector between the cooler thermistor No. 1 (evaporator temp. sensor) and the A/C amplifier (See page 01–35).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

4	CHECK DIAGNOSTIC TROUBLE CODE

(a) Start up the DTC check mode.
(b) Check that DTC 11 is not output again.
Standard: DTC 11 is not output.

OK → SYSTEM OK

NG

CHECK AND REPLACE AIR CONDITIONING AMPLIFIER

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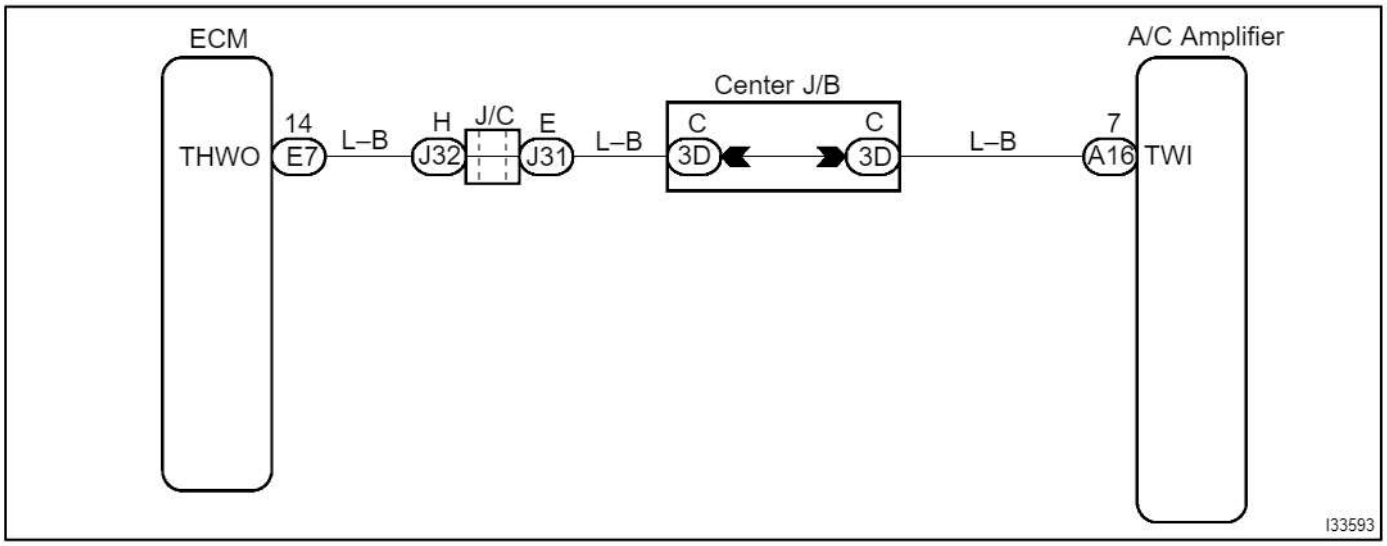
DTC	14	ENGINE COOLANT TEMPERATURE COMMUNICATION CIRCUIT

CIRCUIT DESCRIPTION

This circuit converts the resistance of the engine coolant temperature sensor into a pulse signal and transmits to the A/C amplifier.

DTC No.	Detection Item	Trouble Area
14	Open or short in A/C amplifier and ECM circuit.	□ECM □Harness or connector between ECM and A/C amplifier assy □A/C amplifier assy

WIRING DIAGRAM



INSPECTION PROCEDURE

1	DIAGNOSTIC TROUBLE CODE CHECK

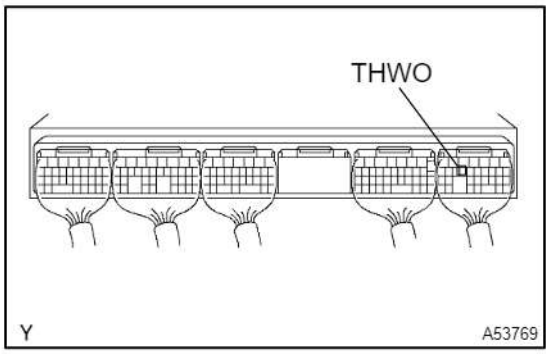
(a) Check that the DTC P0115 is not output.
Standard: DTC P0115 is not output.

NG → **GO TO ENGINE CONTROL SYSTEM (See page 05–6 or 05–327)**

OK

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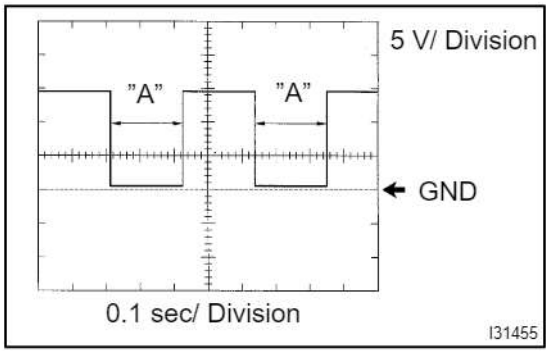
2 INSPECT ECM(THWO)



(a) Remove ECM with the connectors being connected.
(b) Turn the ignition switch to ON.
(c) Check the signal waveform between terminal THWO of the ECM connector and body ground.
Standard:
The correct signal waveform appears, as shown in the illustration.

HINT:
The waveform "A" becomes longer as the engine coolant temperature becomes higher.

Engine Coolant temp.	Below 30 C (86 F)	Approx. 75 C (167 F)	90 C – 100 C (194 – 212 F)
A	16 ms	102 ms	262 ms



NG → CHECK AND REPLACE ECM

OK

3 CHECK HARNESS AND CONNECTOR(BETWEEN ECM AND AIR CONDITIONING AMPLIFIER)

(a) Check for open and short circuit in the harness and the connector between ECM and the A/C amplifier (See page 01–35).

Result:

A	NG
B	OK (when checking using PROBLEM SYMPTOMS TABLE)
C	OK (when checking using DTC)

B → PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE

C → REPAIR OR REPLACE HARNESS OR CONNECTOR

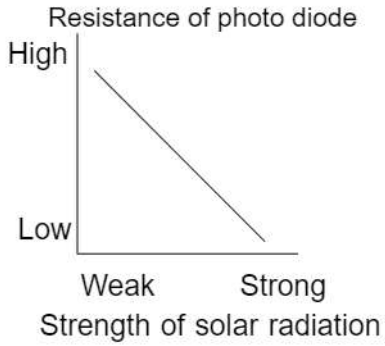
A

CHECK AND REPLACE AIR CONDITIONING AMPLIFIER

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DTC	21	SOLAR SENSOR CIRCUIT(PASSENGER SIDE)

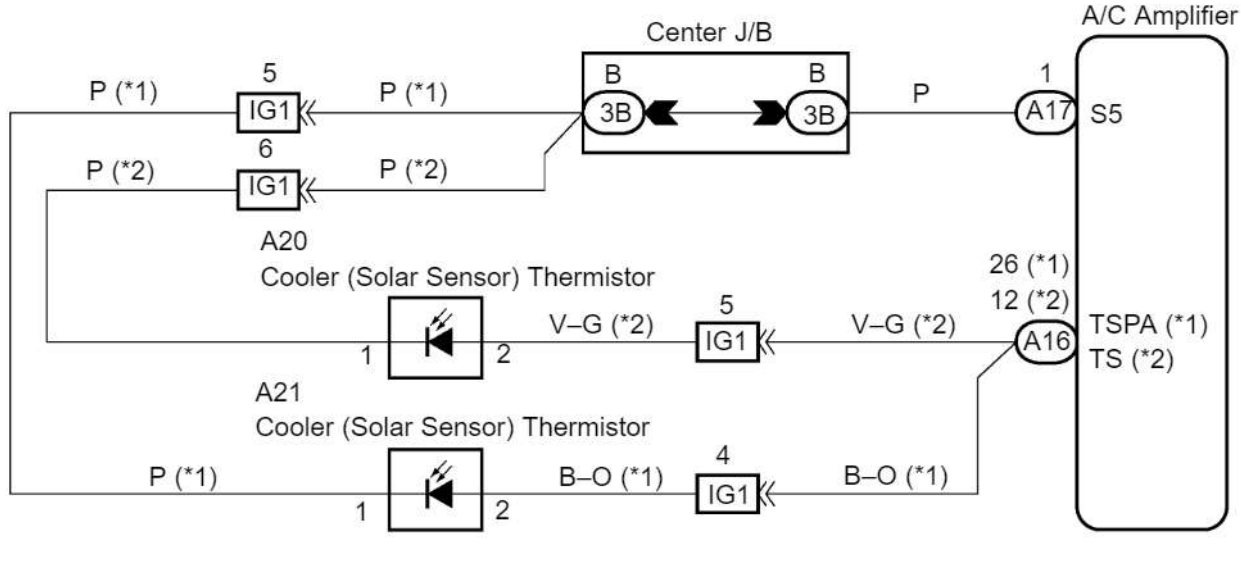
CIRCUIT DESCRIPTION



A photo diode in the cooler (solar sensor) thermistor detects solar radiation and sends signals to the A/C amplifier.

DTC No.	Detection Item	Trouble Area
21	Open or short in solar sensor circuit. (Please note that display of DTC 21 is not abnormal when the sensor is not receiving solar radiation.)	□Cooler (solar sensor) thermistor □Harness or connector between cooler (solar sensor) thermistor and A/C amplifier □A/C amplifier

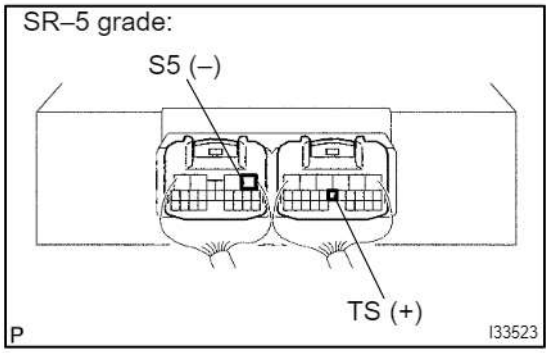
WIRING DIAGRAM

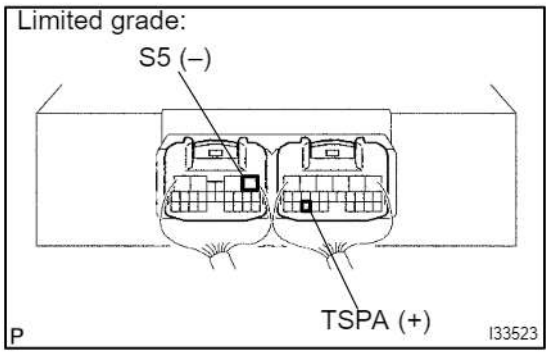


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INSPECTION PROCEDURE

1	INSPECT AIR CONDITIONING AMPLIFIER(TS, TSP, S5)





(a) Remove the A/C amplifier assy with the connectors being connected.

(b) Turn the ignition switch to ON

(c) Check voltage.

(1) SR–5 grade:

Measure voltage between terminal TS and S5 of the A/C amplifier connector when the cooler (solar sensor) thermistor is subjected to an electric light and when the cooler (solar sensor) thermistor is covered by a cloth.

Voltage:

Sensor is subjected to electrical light: 0.8 – 3.3 V

Sensor is covered by a cloth: Below 0.8 V

(2) Limited grade:

Measure voltage between terminal TSPA and S5 of the A/C amplifier connector when the cooler (solar sensor) thermistor is subjected to an electric light and when the cooler (solar sensor) thermistor is covered by a cloth.

Voltage:

Sensor is subjected to electrical light: 0.8 – 3.3 V

Sensor is covered by a cloth: Below 0.8 V

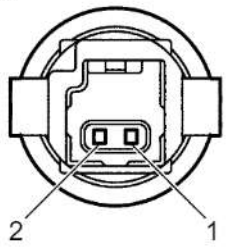
NG → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE**

OK

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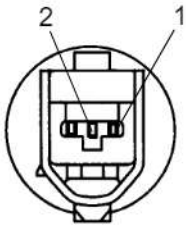
2	INSPECT COOLER (SOLAR SENSOR) THERMISTOR

SR–5 grade:



I33907

Limited grade:



I33908

(a) Remove the cooler (solar sensor) thermistor.
(b) Cover sensor with a cloth, and check and measure resistance between terminal 1 and 2 of the cooler (solar sensor) thermistor.
Resistance: ∞ Ω (No continuity)

HINT:
Connect the ohmmeter positive (+) lead to terminal 2 and the ohmmeter negative (–) lead to terminal 1 of the cooler (solar sensor) thermistor.

(c) Remove the cloth from the cooler (solar sensor) thermistor and subject the sensor to the electric light and measure resistance between terminal 1 and 2 of the cooler (solar sensor) thermistor.
Resistance: Approx. 10 kΩ (Continuity)

HINT:
Connect the ohmmeter positive (+) lead to terminal 2 and the ohmmerter negative (–) lead to terminal 1 of the cooler (solar sensor) thermistor.

NG → **REPLACE COOLER (SOLAR SENSOR) THERMISTOR**

OK

3	CHECK HARNESS AND CONNECTOR(BETWEEN COOLER (SOLAR SENSOR) THERMISTOR AND AIR CONDITONING AMPLIFIER)

(a) Check for open and short circuit in the harness and the connector between the cooler (solar sensor) thermistor and the A/C amplifier (See page 01–35).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4	CHECK DIAGNOSTIC TROUBLE CODE

(a) Start up the DTC check mode.
(b) Check that DTC 21 is not output again.
Standard: DTC 21 is not output.

OK → **SYSTEM OK**

NG

CHECK AND REPLACE AIR CONDITIONING AMPLIFIER

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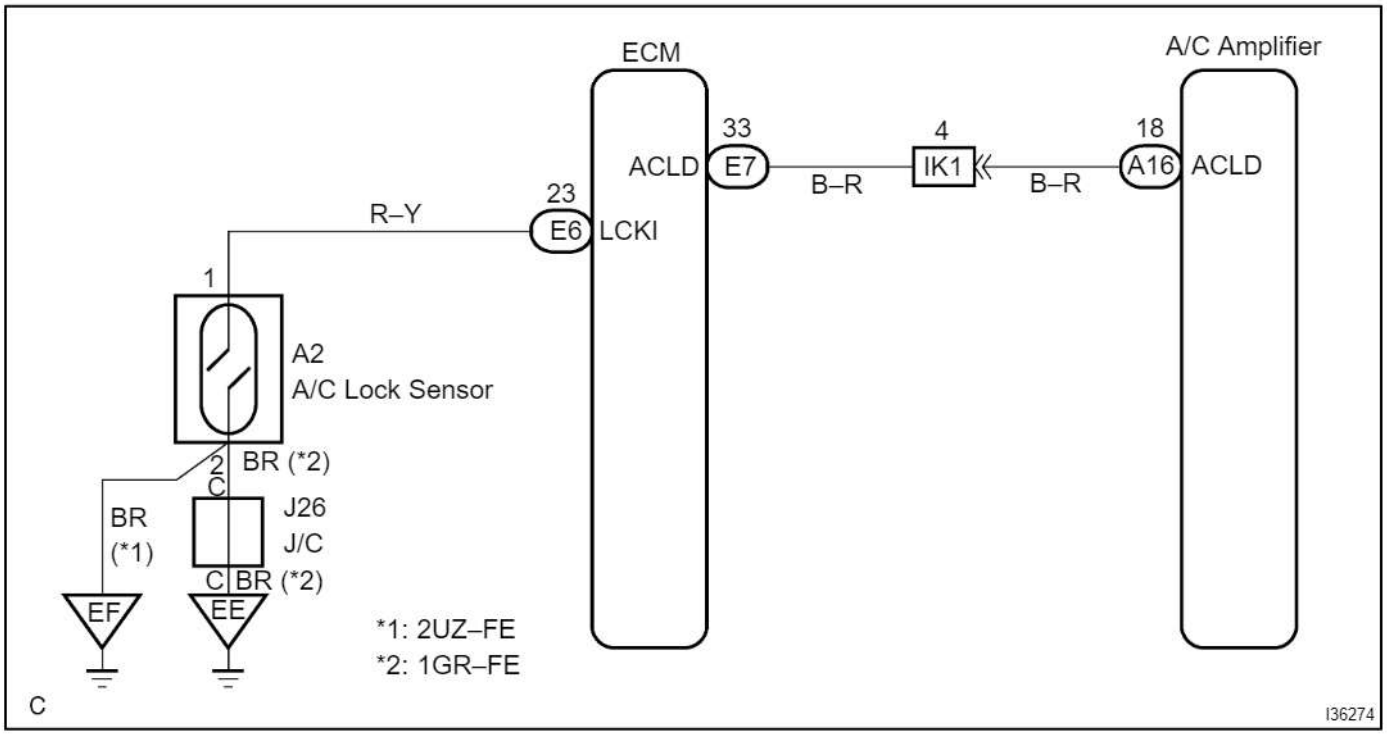
DTC	22	COMPRESSOR LOCK SENSOR CIRCUIT

CIRCUIT DESCRIPTION

This sensor sends 4 pulses par engine revolution to the A/C amplifier. If the ratio of the compressor speed divided by the engine speed is smaller than a predetermined value, the A/C amplifier turns the compressor off, and the indicator flashes at about 1 sec. intervals.

DTC No.	Detection Item	Trouble Area
22	All conditions below are detected for 3 sec. or more. (a) Engine speed : 450 rpm or more. (b) Ratio between engine and compressor speed deviates 20 % or more in comparison to normal operation.	□Cooler compressor assy □Compressor drive belt □Compressor lock sensor □Harness or connector between ECM and compressor lock sensor, A/C amplifier assy □A/C amplifier assy □ECM

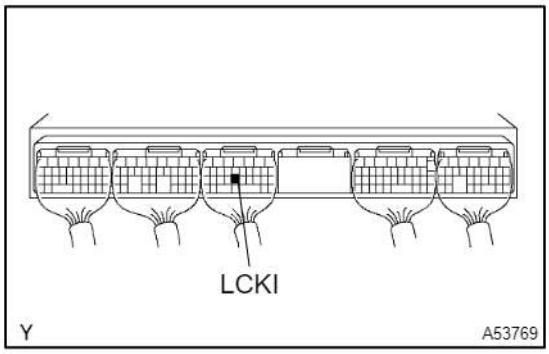
WIRING DIAGRAM



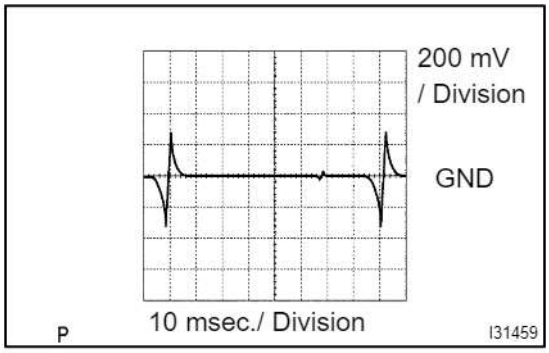
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INSPECTION PROCEDURE

1	INSPECT ECM(LCKI)



(a) Remove ECM with the connectors being connected.
(b) Start the engine.
(c) Operate the A/C system.
(d) Check the signal waveform between terminal LCKI of ECM and body ground.
Standard:
The correct waveform appears as shown in the illustration.



OK > **Go to step 6**

NG

2	CHECK COOLER COMPRESSOR ASSY

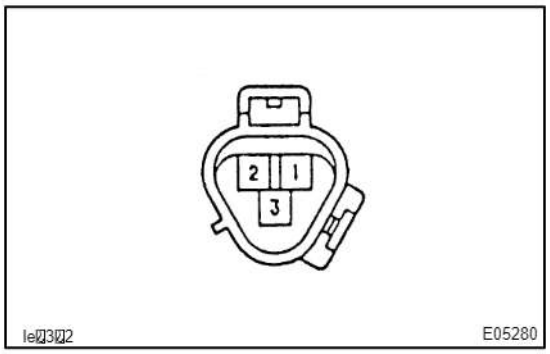
(a) Check and adjust the compressor drive belt tension (See page 14–190).
(b) Check if the cooler compressor assy does not lock while running the engine and operating the A/C system.
Standard: Cooler compressor assy does not lock during the operation.

NG > **REPLACE COOLER COMPRESSOR ASSY**

OK

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3	INSPECT COOLER COMPRESSOR ASSY(COMPRESSOR LOCK SENSOR)



(a) Disconnect the cooler compressor assy connector.
(b) Measure resistance between terminal 1 and 2 of the cooler compressor assy connector.
Resistance: at 20 C (68 F): 165 – 205 Ω

NG → **REPLACE COOLER COMPRESSOR ASSY**

OK

4	CHECK HARNESS AND CONNECTOR(BETWEEN ECM AND AIR CONDITIONING AMPLIFIER)

(a) Check for open and short circuit in the harness and the connector between the cooler compressor assy and the A/C amplifier (See page 01–35).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

5	CHECK HARNESS AND CONNECTOR(BETWEEN COOLER COMPRESSOR ASSY AND BODY GROUND)

(a) Check for open and short circuit in the harness and the connector between the cooler compressor assy and body ground (See page 01–35).

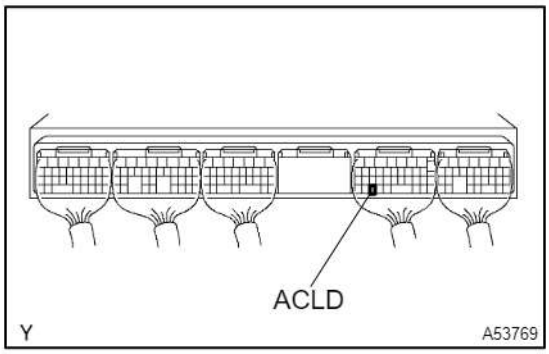
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM

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6 INSPECT ECM(ACLD)

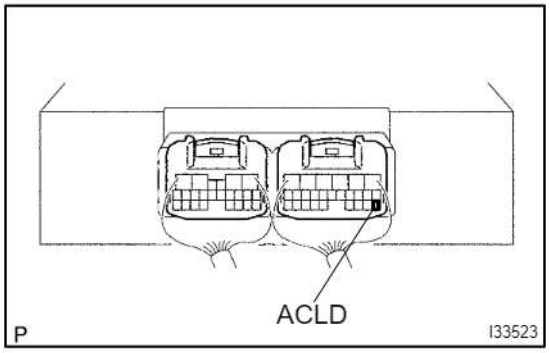


(a) Remove ECM with the connectors being connected.
(b) Operate A/C system.
(c) Measure voltage between terminal ACLD of ECM and body ground under each condition.
Voltage:
Magnetic clutch is engaged: Below 1.0 V
Magnetic clutch is not engaged: 10 – 14 V

NG → **CHECK AND REPLACE ECM**

OK

7 INSPECT AIR CONDITIONING AMPLIFIER(ACLD)



(a) Remove the A/C amplifier assy with the connectors being connected.
(b) Operate the A/C system.
(c) Measure voltage between terminal ACLD of the A/C amplifier assy and body ground under each condition.
Voltage:
Magnetic clutch is engaged: Below 1.0 V
Magnetic clutch is not engaged: 10 – 14 V

Result:

A	NG
B	OK (when checking using PROBLEM SYMPTOM TABLE)
C	OK (when checking using DTC)

B → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE**

C → **CHECK AND REPLACE AIR CONDITIONING AMPLIFIER**

A

REPAIR OR REPLACE HARNESS OR CONNECTOR

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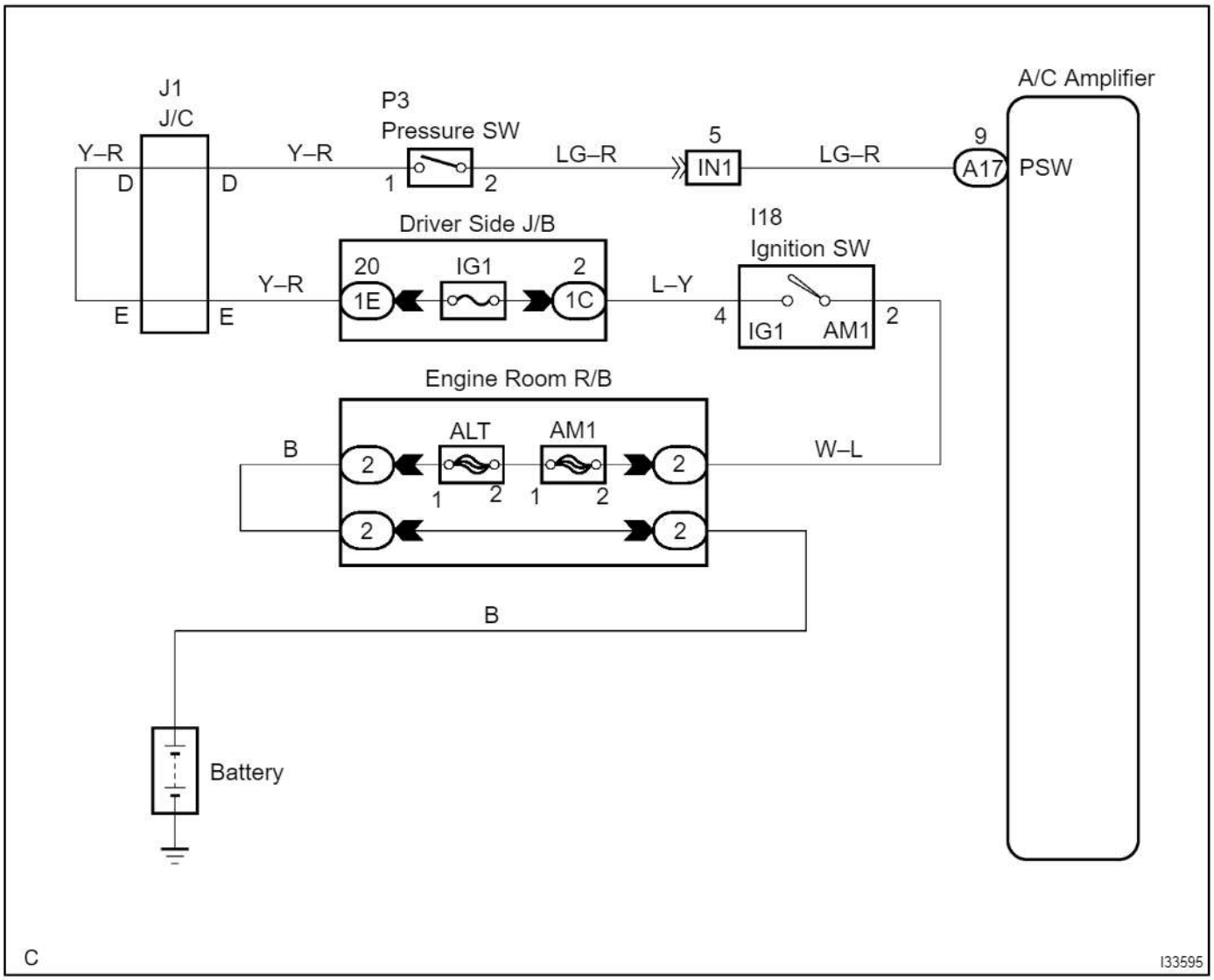
DTC 23 PRESSURE SWITCH CIRCUIT

CIRCUIT DESCRIPTION

The pressure switch sends appropriate signals to the A/C amplifier when the A/C refrigerant pressure drops too low or rises too high. When the A/C amplifier receives these signals, it outputs signals via the A/C amplifier to switch OFF the compressor relay and turn OFF the magnetic clutch.

DTC No.	Detection Item	Trouble Area
23	□Open in pressure sensor circuit. □Abnormal refrigerant pressure. below 196 kPa (2.0 kgf/cm^2, 28 psi) over 3,140 kPa (32.0 kgf/cm^2, 455 psi)	□Pressure switch □Harness or connector between pressure switch and A/C amplifier □Refrigerant pipe line □A/C amplifier

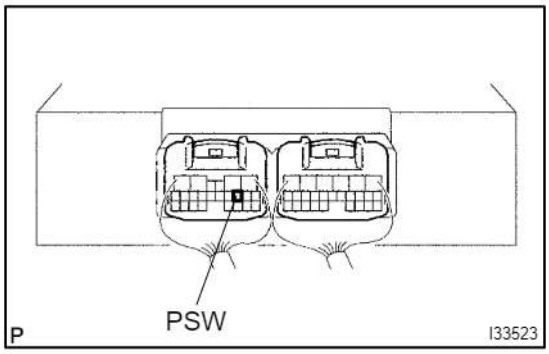
WIRING DIAGRAM



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INSPECTION PROCEDURE

1 INSPECT AIR CONDITIONING AMPLIFIER(PSW)



(a) Install the manifold gauge set.
(b) Remove the A/C amplifier with the connectors being connected.
(c) Turn the ignition switch to ON.
(d) Check voltage between terminal PSW of the A/C amplifier assy connector and body ground when refrigerant pressure is changed.
(e) The voltage changes with refrigerant pressure as shown in the diagram below.

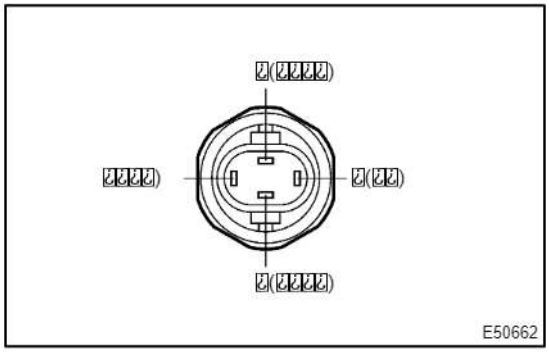
Voltage:

Low Pressure Cut Side	Reference : High Pressure Cut Side
ON (0V) 225 kPa 196 kPa OFF (12V)	ON (0V) 2,550 kPa 3,140 kPa OFF (12V)

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE**

NG

2 INSPECT CONDENSER ASSY(PRESURE SW)



(a) Turn the ignition switch to ON.
(b) Check continuity between terminal 1 and 4 of the pressure switch when refrigerant pressure is changed.
(c) The continuity changes with refrigerant pressure as shown in the diagram below.

Continuity:

Low Pressure Cut Side	Reference : High Pressure Cut Side
ON (continuity) 225 kPa 196 kPa OFF (continuity)	ON (continuity) 2,550 kPa 3,140 kPa OFF (continuity)

NG → **REPLACE CONDENSER ASSY**

OK

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3	CHECK HARNESS AND CONNECTOR(BETWEEN PRESSURE SWITCH AND AIR CONDITIONING AMPLIFIER)

(a) Check for open and short circuit in the harness and the connector between the pressure switch and the A/C amplifier (See page 01–35).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

4	CHECK DIAGNOSTIC TROUBLE CODE

(a) Start up the DTC check mode.
(b) Check that DTC 23 is not output again.
Standard: DTC 23 is not output.

OK → SYSTEM OK

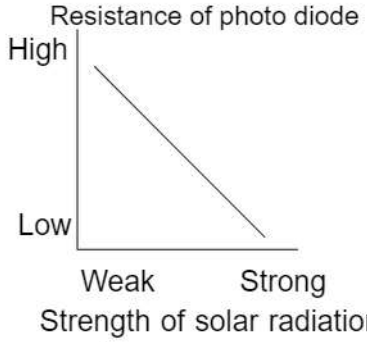
NG

CHECK AND REPLACE AIR CONDITIONING AMPLIFIER

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DTC	24	SOLAR SENSOR CIRCUIT (DRIVER SIDE)

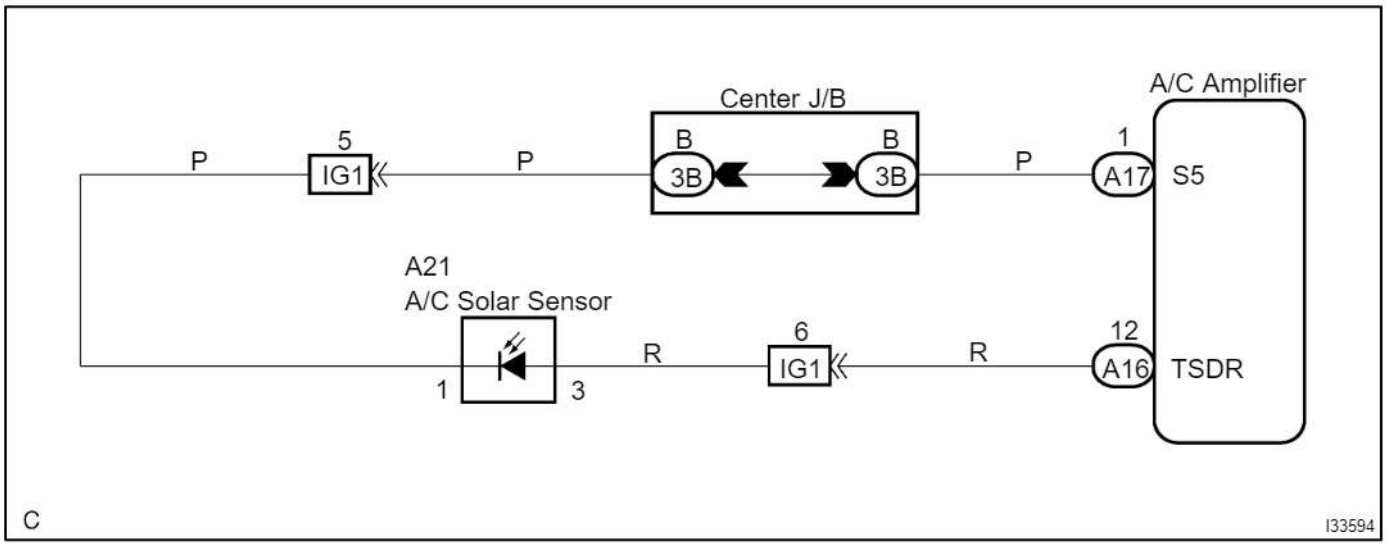
CIRCUIT DESCRIPTION



A photo diode in the solar sensor detects solar radiation and sends signals to the A/C amplifier.
HINT:
This DTC is indicated only for limited grade (right/left independent temperature control system).

DTC No.	Detection Item	Trouble Area
24	Open or short in solar sensor circuit. (Please note that display of DTC 24 is not abnormal when the sensor is not receiving solar radiation.)	□Cooler (Solar sensor) thermistor □Harness or connector between cooler (solar sensor) thermistor and A/C amplifier □A/C amplifier

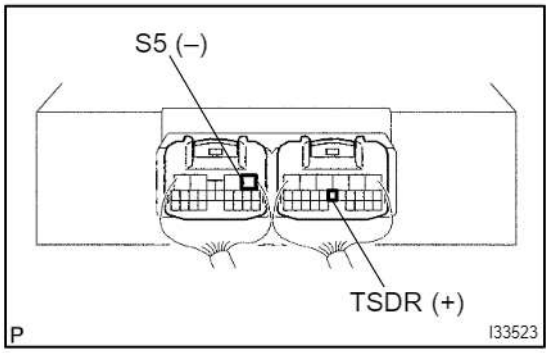
WIRING DIAGRAM



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INSPECTION PROCEDURE

1	INSPECT AIR CONDITIONING AMPLIFIER(TS, S5)



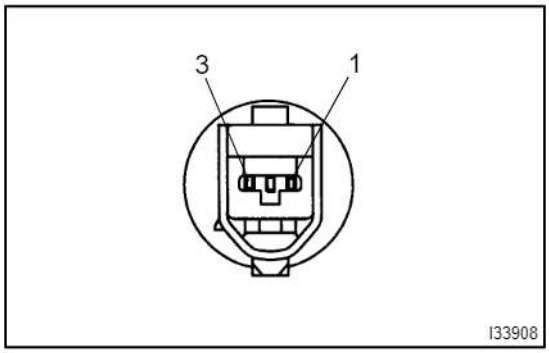
(a) Remove the A/C amplifier with the connectors still connected.
(b) Turn the ignition switch to ON.
(c) Measure voltage between terminal TSDR and S5 of the A/C amplifier connector when the cooler (solar sensor) thermistor is subjected to an electric light and when the cooler (solar sensor) thermistor is covered by a cloth.

Voltage:
Sensor is subjected to electrical light: 0.8 – 3.3 V
Sensor is covered by a cloth: Below 0.8 V

OK	PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE

NG

2	INSPECT COOLER (SOLAR SENSOR) THERMISTOR



(a) Remove cooler (solar sensor) thermistor.
(b) Cover the sensor with a cloth, and check the cooler (solar sensor) thermistor resistance.
  (1) Measure resistance between terminals 1 and 3 of the cooler (solar sensor) thermistor.

Resistance: ∞ Ω (No continuity)

HINT:
Connect the ohmmter positive (+) lead to terminal 3 and the ohmmeter negative (–) lead to terminal 1 of the cooler (solar sensor) thermistor.

(c) Remove the cloth from the cooler (solar sensor) thermistor, and subject the sensor to the electric light and check the cooler (solar sensor) thermistor resistance.
  (1) Measure resistance between terminal 1 and 3 of the cooler (solar sensor) thermistor.

Resistance: Approx. 10 kΩ (Continuity)

HINT:
Connect the positive (+) lead to ohmmeter to terminal 3 and negative (–) lead to terminal 1 of the cooler (solar sensor) thermistor.

NG	REPLACE COOLER (SOLAR SENSOR) THERMISTOR

OK

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3	CHECK HARNESS AND CONNECTOR(BETWEEN COOLER (SOLAR SENSOR) THERMISTOR AND AIR CONDITONING AMPLIFIER)

(a) Check for open and short circuit in the harness and the connector between the cooler (solar sensor) thermistor and the air conditioning amplifier (See page 01–35).

NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

4	CHECK DIAGNOSTIC TROUBLE CODE

(a) Start up the DTC check mode.
(b) Check that DTC 24 is not output again.
Standard: DTC 24 is not output.

OK	SYSTEM OK

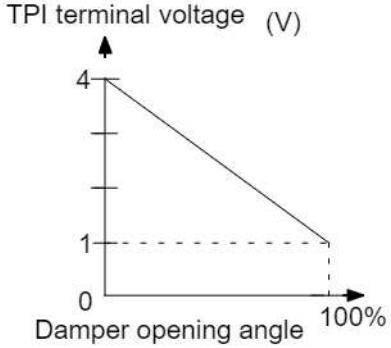
NG

CHECK AND REPLACE AIR CONDITIONING AMPLIFIER

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DTC	31	AIR MIX DAMPER POSITION SENSOR CIRCUIT(PASSENGER SIDE)

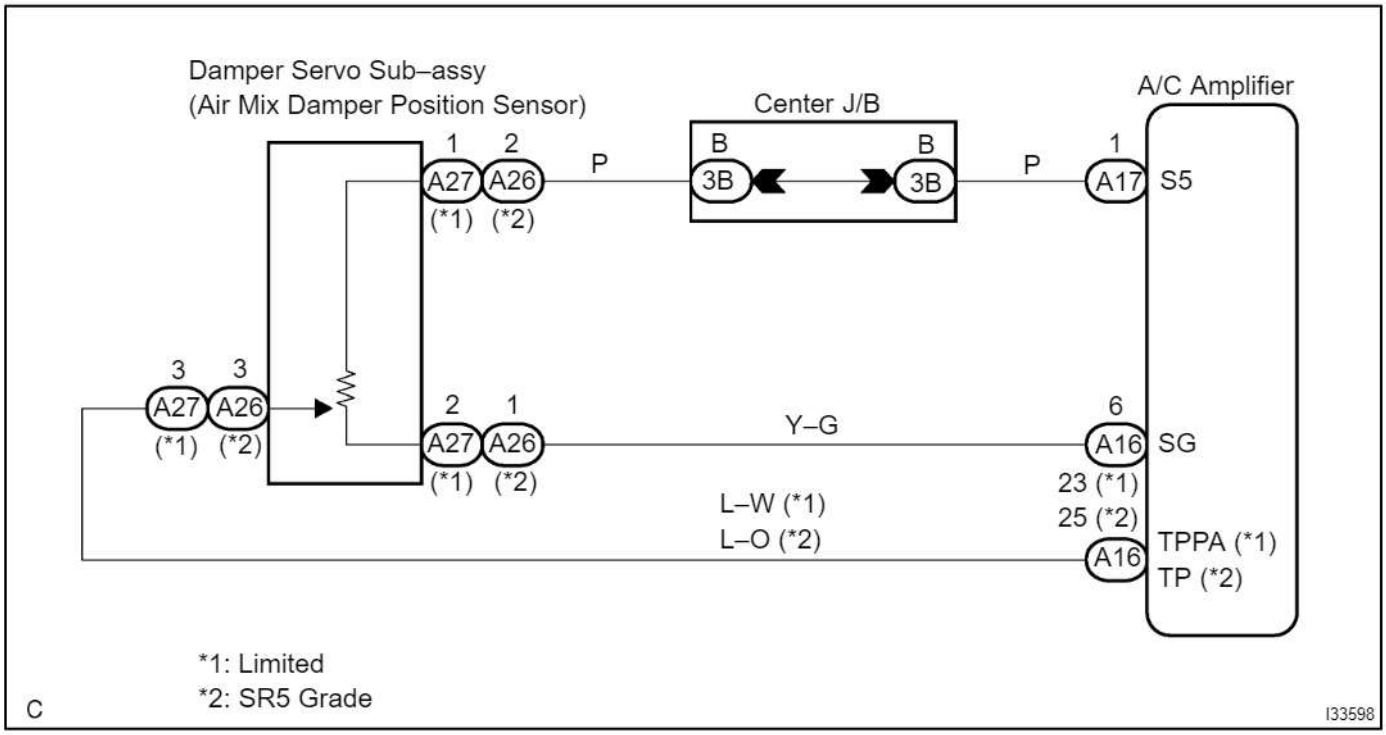
CIRCUIT DESCRIPTION



This sensor detects the position of the air mix damper and sends the appropriate signals to the A/C amplifier. The position sensor is built into the damper servo sub–assy (air mix control servomotor.

DTC No.	Detection Item	Trouble Area
31	Open or short in air mix damper position sensor circuit.	□Damper servo sub–assy (air mix damper position sensor) □Harness of connector between air mix control servomotor and A/C amplifier □A/C amplifier

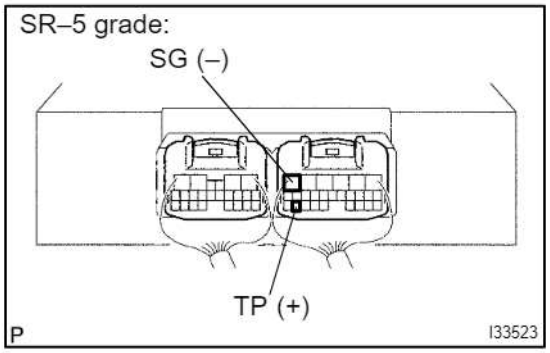
WIRING DIAGRAM

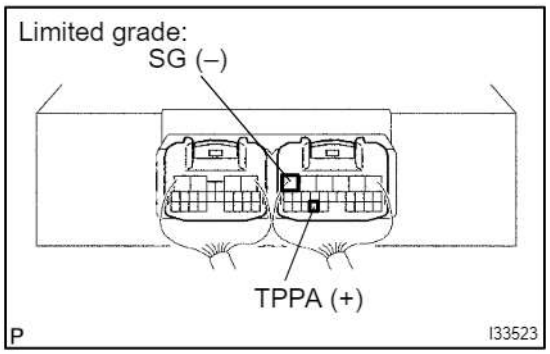


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INSPECTION PROCEDURE

1	INSPECT AIR CONDITIONING AMPLIFIER(TP, TPPA, SG)





(a) Remove the A/C amplifier with the connectors being connected.
(b) Turn ignition switch to ON.
(c) Check voltage.
(1) SR–5 grade:
Change the set temperature to activate the air mix damper, and measure the voltage between terminal TP and SG of the A/C amplifier.
Voltage:
MAX. COLD: 3.5 – 4.5 V
MAX. HOT: 0.5 – 1.8 V
(2) Limited grade:
Change the set temperature to activate the air mix damper, and measure the voltage between terminal TPPA and SG of the A/C amplifier.
Voltage:
MAX. COLD: 3.5 – 4.5 V
MAX. HOT: 0.5 – 1.8 V

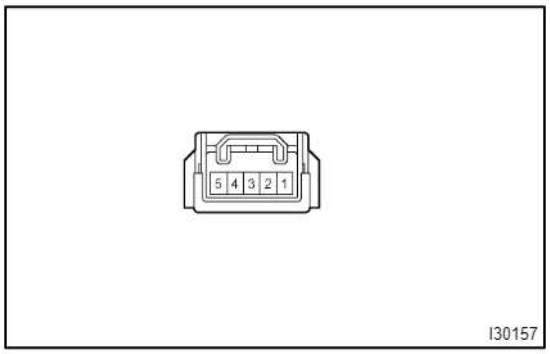
HINT:
As the set temperature increases, the voltage decreases gradually without interruption.

OK	PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE

NG

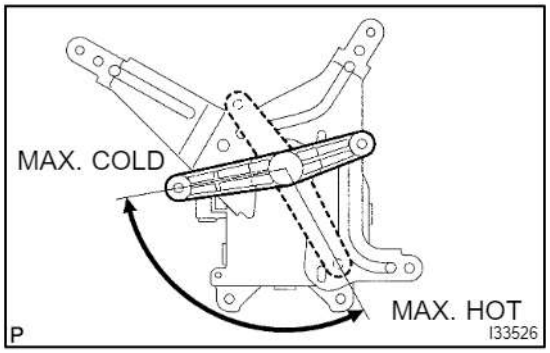
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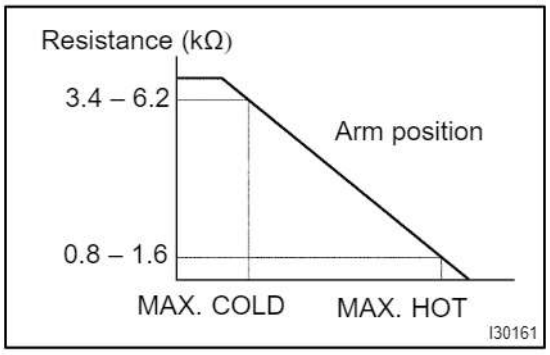
2	INSPECT DAMPER SERVO SUB–ASSY



(a) Remove the damper servo sub–assy.
(b) Measure resistance between terminal 1 and 2 of damper servo sub–assy connector.
Resistance: 4.2 – 7.8 kΩ
(c) While operating the damper servo sub–assy as shown in the procedure on page 05–1198, measure resistance between terminal 1 and 3 of the damper servo sub–assy.
Resistance:
MAX. COLD: 3.4 – 6.2 kΩ
MAX. HOT: 0.8 – 1.6 kΩ

HINT:
As the damper servo sub–assy moves from COLD side to HOT side, the resistance decreases gradually without interruption.





NG → **REPLACE DAMPER SERVO SUB–ASSY**

OK

3	CHECK HARNESS AND CONNECTOR(BETWEEN AIR MIX DAMPER POSITION SENSOR AND AIR CONDITIONING AMPLIFIER)

(a) Check for open and short in the harness and the connector between the damper servo sub–assy (air mix damper position sensor) and the A/C amplifier (See page 01–35).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

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4	CHECK DIAGNOSTIC TROUBLE CODE

(a) Start up the DTC check mode.
(b) Check that DTC 11 is not output again.
Standard: DTC 11 is not output.

OK → SYSTEM OK

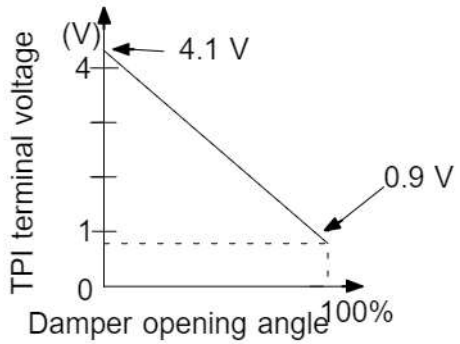
NG

CHECK AND REPLACE AIR CONDITIONING AMPLIFIER

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DTC	32	AIR INLET DAMPER POSITION SENSOR CIRCUIT

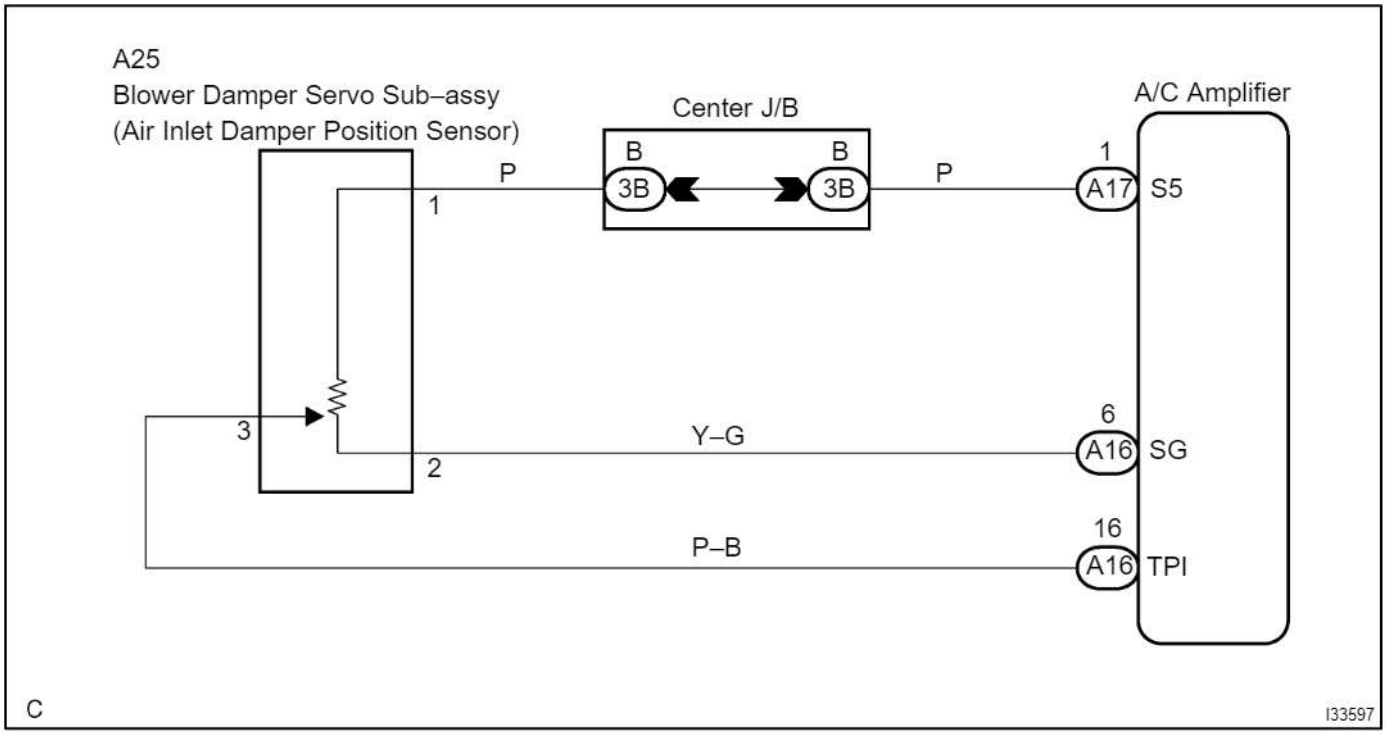
CIRCUIT DESCRIPTION



This sensor detects the position of the air inlet damper and sends appropriate signals to the A/C amplifier. The position sensor is built into the blower damper servo sub–assy (air inlet damper control control servomotor).

DTC No.	Detection Item	Trouble Area
32	Open or short in air inlet damper position sensor circuit.	□Blower damper servo sub–assy (air inlet damper position sensor) □Harness or connector between blower damper servo sub–assy (air inlet damper position sensor) and A/C amplifier □A/C amplifier

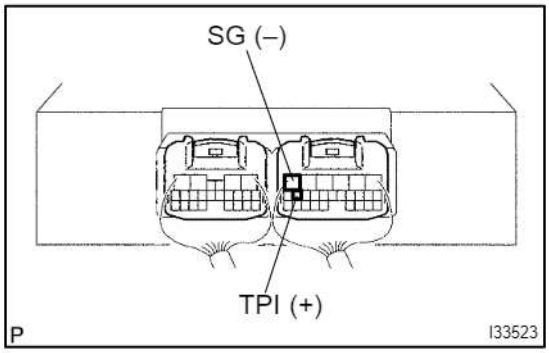
WIRING DIAGRAM



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INSPECTION PROCEDURE

1	INSPECT AIR CONDITIONING AMPLIFIER(TPI, SG)



(a) Remove the A/C amplifier with the connectors being connected .
(b) Turn ignition switch to ON.
(c) Change the set RECIRCULATION/ FRESH to activate the blower damper servo sub–assy, and measure the voltage between terminal TPI and SG of the A/C amplifier.
Voltage:
RECIRCULATION: 3.5 – 4.5 V
FRESH: 0.5 – 1.8 V

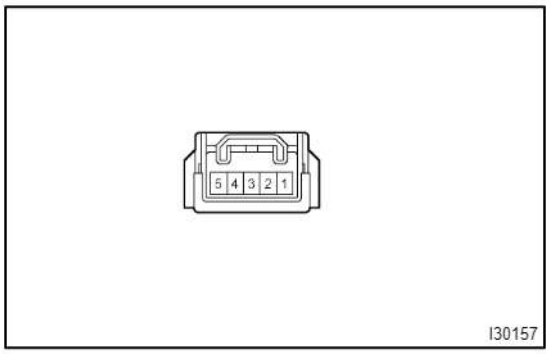
HINT:
As the recirculation damper servo sub–assy is moved from RECIRCULATION side to FRESH side, the voltage decreases gradually without interruption.

OK	**PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE**

NG

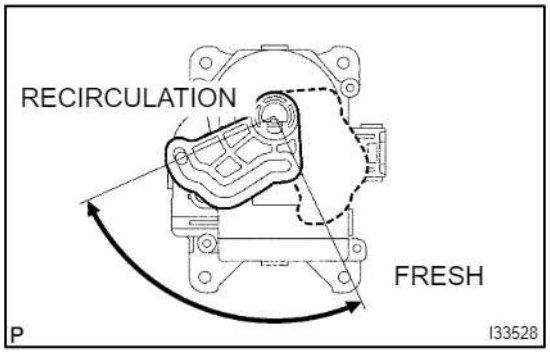
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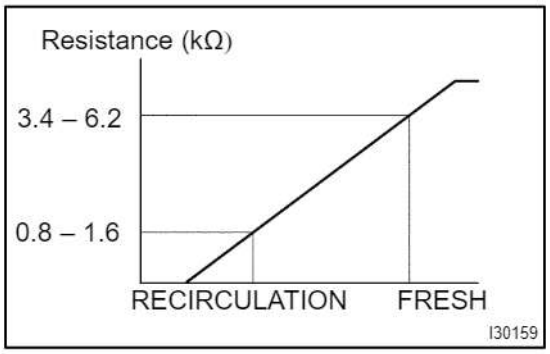
2	INSPECT BLOWER DAMPER SERVO SUB–ASSY



(a) Remove the blower damper servo sub–assy.
(b) Measure resistance between terminal 1 and 2 of the blower damper servomotor connector.
Resistance: 4.2 – 7.8 kΩ
(c) While operating blower damper servo sub–assy as shown in the procedure on page 05–1201, measure resistance between terminal 1 and 3 of the blower damper servo sub–assy.
Resistance:
FRESH: 3.4 – 6.2 kΩ
RECIRCULATION: 0.8 – 1.6 kΩ

HINT:
As the blower damper servo sub–assy moves from FRESH side to RECIRCULATION side, the resistance decreases gradually without interruption.





NG → **REPLACE BLOWER DAMPER SERVO SUB–ASSY**

OK

3	CHECK HARNESS AND CONNECTOR(BETWEEN AIR INLET DAMPER POSITION SENSOR AND AIR CONDITIONING AMPLIFIER)

(a) Check for open and short circuit in the harness and the connector between the blower damper servo sub–assy (air inlet damper position sensor) and the A/C amplifier (See page 01–35).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

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4	CHECK DIAGNOSTIC TROUBLE CODE

(a) Start up the DTC check mode.
(b) Check that DTC 32 is not output again.
Standard: DTC 32 is not output.

OK → SYSTEM OK

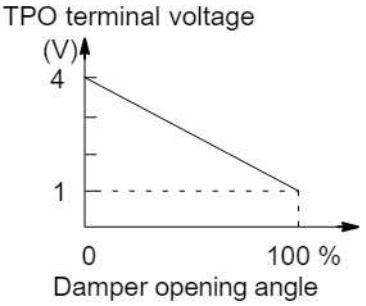
NG

CHECK AND REPLACE AIR CONDITIONING AMPLIFIER

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DTC	33	AIR OUTLET DAMPER POSITION SENSOR CIRCUIT

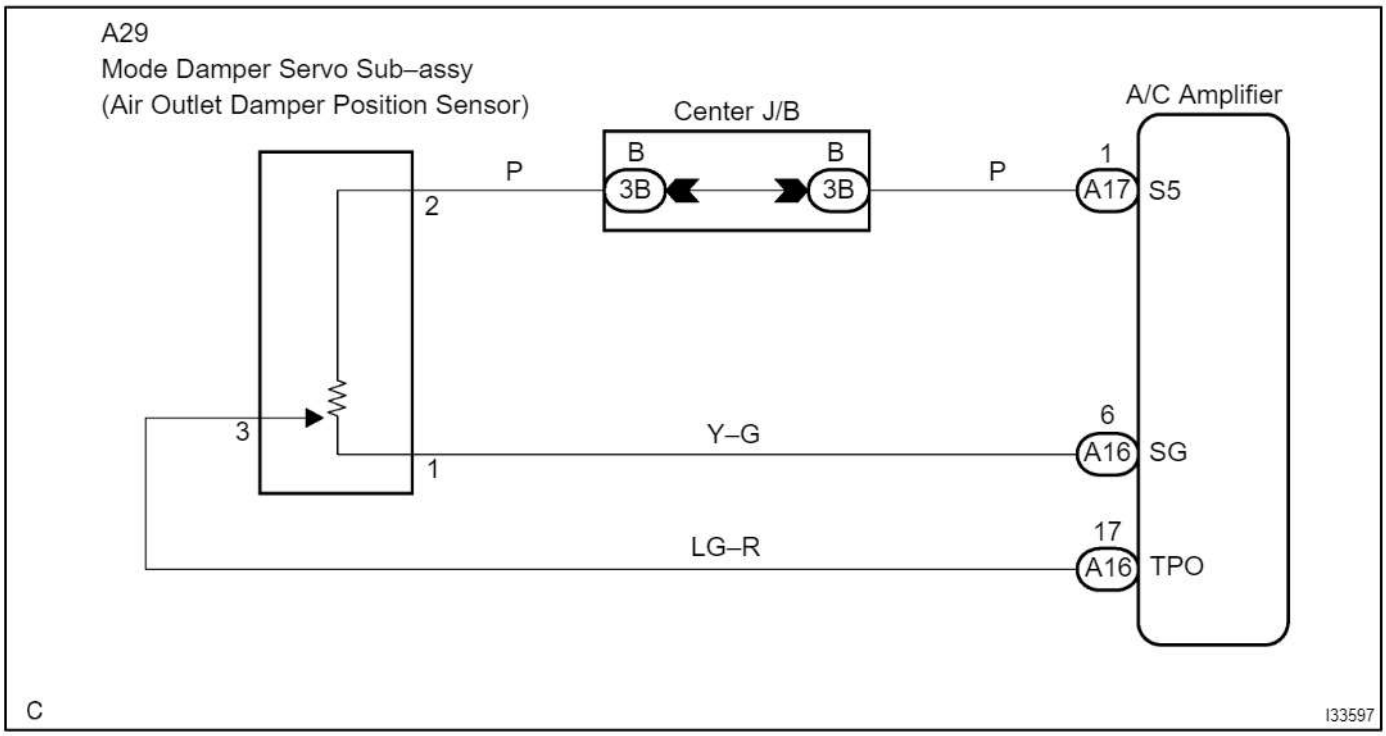
CIRCUIT DESCRIPTION



This sensor detects the position of the air outlet damper and sends appropriate signals to the A/C amplifier. The position sensor is built into the mode damper servo sub–assy (air outlet servomotor).

DTC No.	Detection Item	Trouble Area
33	Open or short in air outlet damper position sensor circuit.	□Mode damper servo sub–assy (air outlet damper position sensor) □Harness or connector between mode damper servo sub–assy and A/C amplifier □A/C amplifier

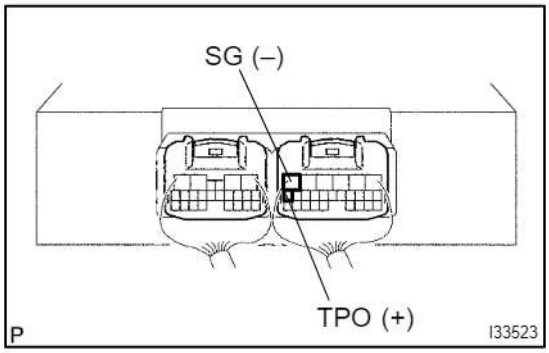
WIRING DIAGRAM



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INSPECTION PROCEDURE

1	INSPECT AIR CONDITIONING AMPLIFIER(TPO, SG)



(a) Remove the A/C amplifier with the connectors being connected.
(b) Turn the ignition switch to ON.
(c) Change the set air flow mode to activate the mode damper servo sub–assy, and measure voltage between terminal TPO and SG of the A/C amplifier.
Voltage:
FACE: 3.5 – 4.5 V
DEF: 0.5 – 1.5 V

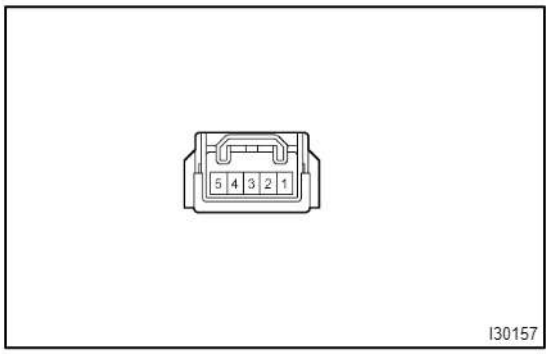
HINT:
As the mode damper is moved from FACE side to DEF side, the voltage decreases gradually without interruption.

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE**

NG

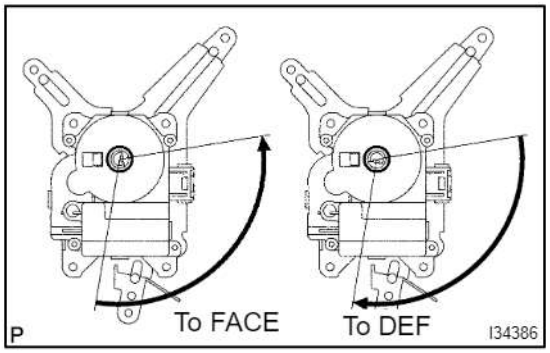
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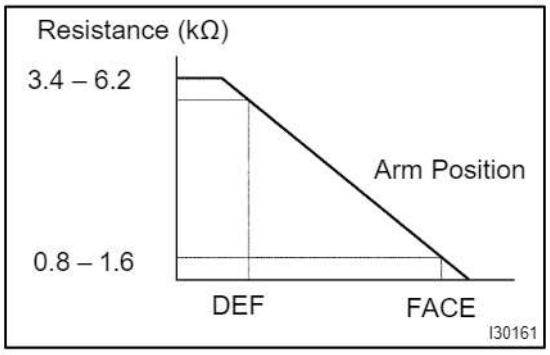
2 INSPECT MODE DAMPER SERVO SUB–ASSY



(a) Remove the mode damper servo sub–assy.
(b) Measure resistance between terminal 1 and 2 of the mode damper servo sub–assy connector.
Resistance: 4.2 – 7.8 kΩ
(c) While operating the mode damper servo sub–assy as in the procedure on page 05–1204, measure resistance between terminal 1 and 3 of mode damper servo sub–assy.
Resistance:
DEF: 3.4 – 6.2 kΩ
FACE: 0.8 – 1.6 kΩ

HINT:
As the mode damper servo sub–assy moved from DEF side to FACE side, the resistance decreases gradually without interruption.





NG → **REPLACE MODE DAMPER SERVO SUB–ASSY**

OK

3 CHECK HARNESS AND CONNECTOR(BETWEEN AIR OUTLET DAMPER POSITION SENSOR AND AIR CONDITIONING AMPLIFIER)

(a) Check for open and short circuit in the harness and the connector between the mode damper servo sub–assy (air outlet damper position sensor) and the A/C amplifier (See page 01–35).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

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4	CHECK DIAGNOSTIC TROUBLE CODE

(a) Start up the DTC check mode.
(b) Check that DTC 33 is not output again.
Standard: DTC 33 is not output.

OK → SYSTEM OK

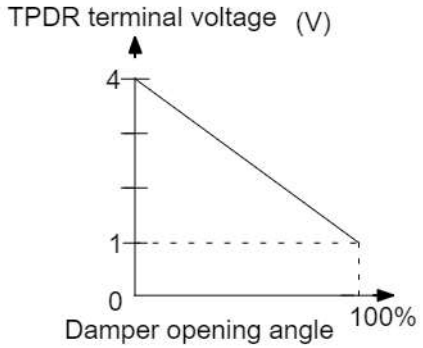
NG

CHECK AND REPLACE AIR CONDITIONING AMPLIFIER

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DTC	36	AIR MIX DAMPER POSITION SENSOR CIRCUIT (DRIVER SIDE)

CIRCUIT DESCRIPTION



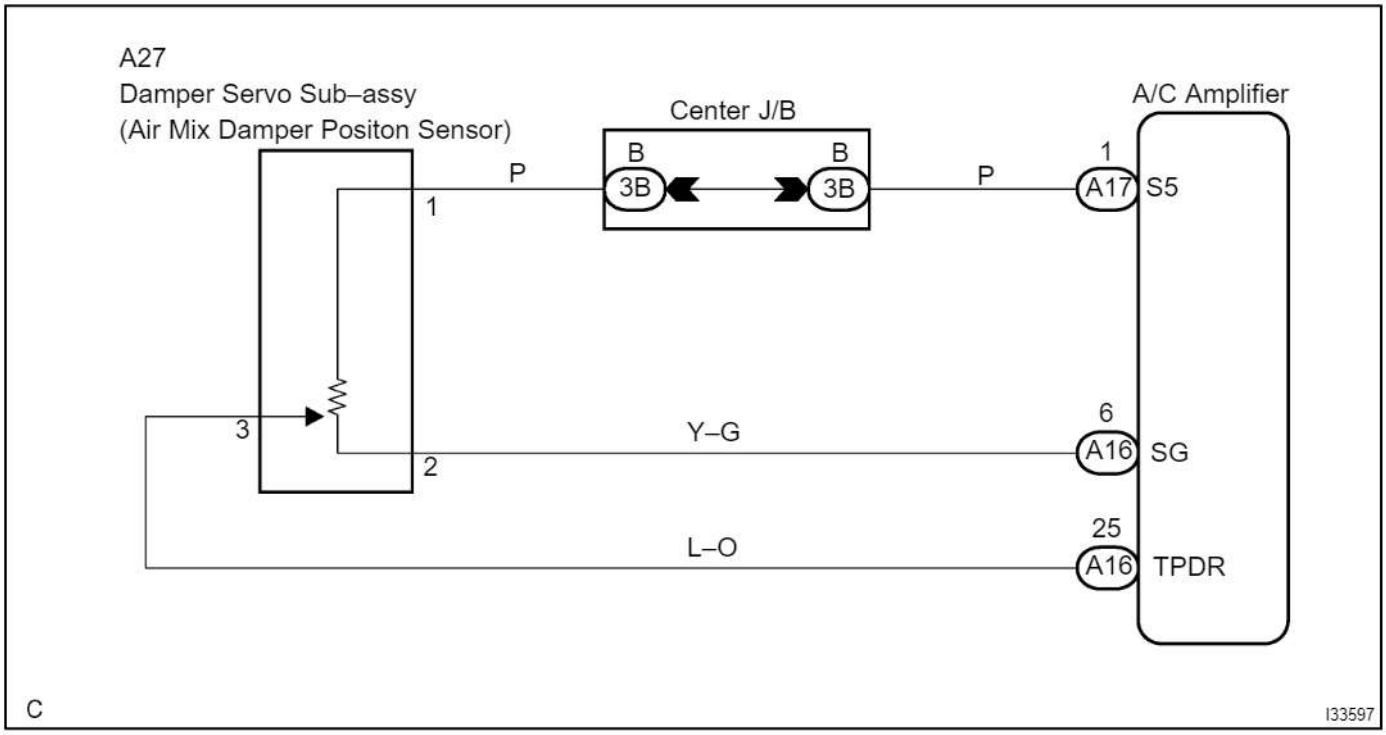
This sensor detects the position of the air mix damper and sends the appropriate signals to the A/C amplifier. The position sensor is built into the damper servo sub–assy (air mix damper control servomotor).

HINT:

This DTC is indicated only for limited grade (right/left independent temperature control system).

DTC No.	Detection Item	Trouble Area
36	Short to ground or power source circuit in air mix damper position sensor circuit.	□Damper servo sub–assy (air mix damper position sensor) □Harness of connector between damper servo sub–assy (air mix damper position sensor) and A/C amplifier □A/C amplifier

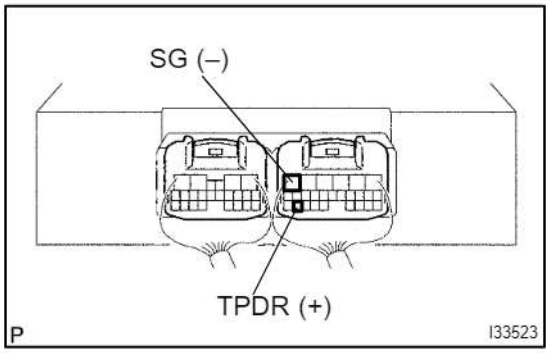
WIRING DIAGRAM



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INSPECTION PROCEDURE

1	INSPECT AIR CONDITIONING AMPLIFIER(TPDR, SG)



(a) Remove the A/C amplifier with the connectors being connected.
(b) Turn the ignition switch to ON.
(c) Change the set temperature to activate the air mix damper, and measure the voltage between terminal TPDR and SG of the A/C amplifier.
Voltage:
MAX. COLD: 3.5 – 4.5 V
MAX. HOT: 0.5 – 1.8 V

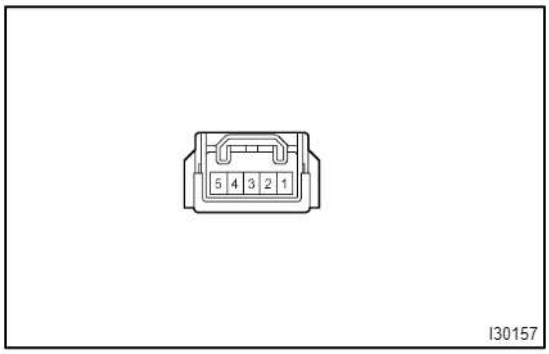
HINT:
As the set temperature increases, the voltage decreases gradually without interruption.

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE**

NG

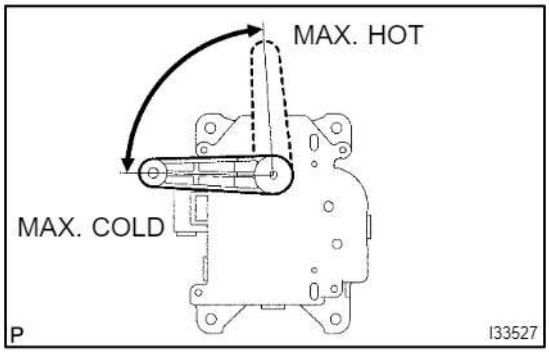
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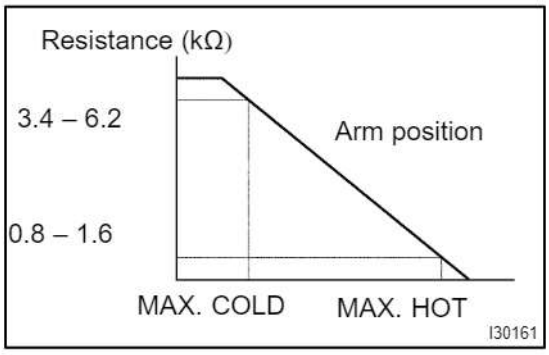
2 INSPECT DAMPER SERVO SUB–ASSY



(a) Remove the damper servo sub–assy.
(b) Measure resistance between terminal 1 and 2 of the damper servo sub–assy connector.
Resistance: 4.2 – 7.8 kΩ
(c) While operating damper servo sub–assy as shown in the procedure on page 05–1207, measure resistance between terminal 1 and 3 of damper servo sub–assy.
Resistance:
MAX. COLD: 3.4 – 6.2 kΩ
MAX. HOT: 0.8 – 1.6 kΩ

HINT:
As the damper servo sub–assy moves from COLD side to HOT side, the resistance decreases gradually without interruption.





NG → **REPLACE DAMPER SERVO SUB–ASSY**

OK

3 CHECK HARNESS AND CONNECTOR(BETWEEN AIR MIX DAMPER POSITION SENSOR AND AIR CONDITIONING AMPLIFIER)

(a) Check for open and short circuit in the harness and the connector between the damper servo sub–assy (air mix damper position sensor) and the A/C amplifier (See page 01–35).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

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4	CHECK DIAGNOSTIC TROUBLE CODE

(a) Start up the DTC check mode.
(b) Check that DTC 36 is not output again.
Standard: DTC 36 is not output.

OK → SYSTEM OK

NG

CHECK AND REPLACE AIR CONDITIONING AMPLIFIER

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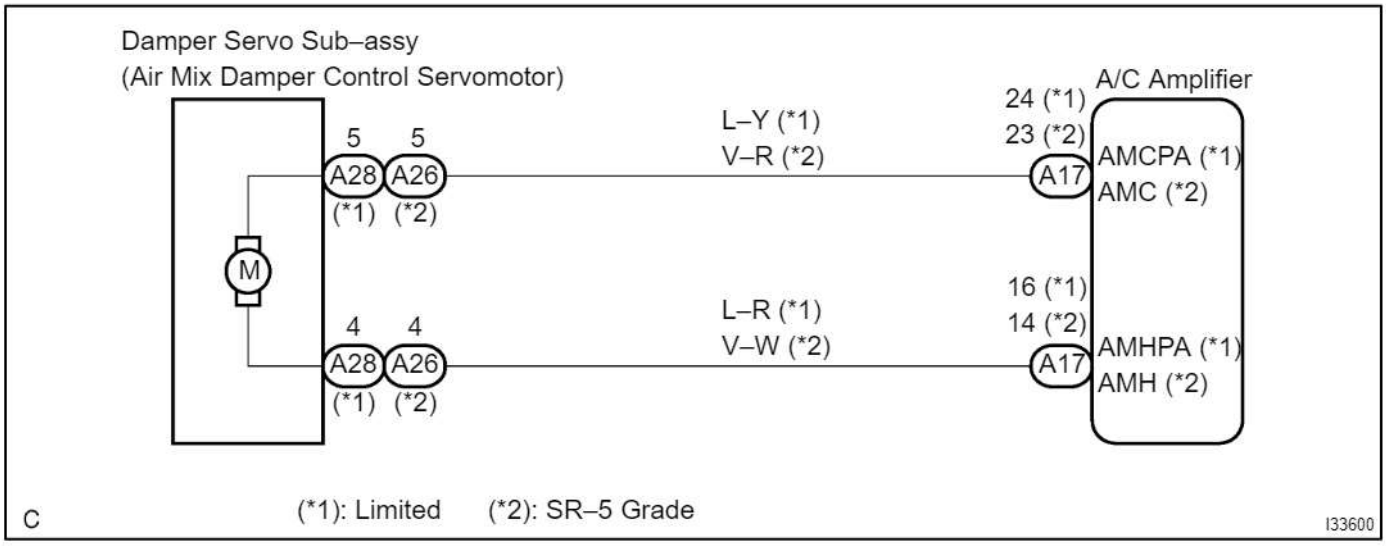
DTC	41	AIR MIX DAMPER CONTROL SERVOMOTOR CIRCUIT(PASSENGER SIDE)

CIRCUIT DESCRIPTION

This damper servo sub–assy (air mix damper control servomotor) is controlled by the A/C amplifier and moves the air mix damper to the desired position.

DTC No.	Detection Item	Trouble Area
41	Air mix damper position sensor value does not change even if A/C amplifier operates air mix servomotor.	□Damper servo sub–assy (air mix damper control servomotor) □Harness or connector between A/C amplifier and damper servo sub–assy (air mix damper control servomotor) □A/C amplifier

WIRING DIAGRAM



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INSPECTION PROCEDURE

1	PERFORM ACTUATOR CHECK

(a) Operate A/C control panel to enter the actuator check mode (See page 05–1140).
(b) Press the DEF switch to enter the step operation.
(c) Check the air flow temperature by hand.

Standard:

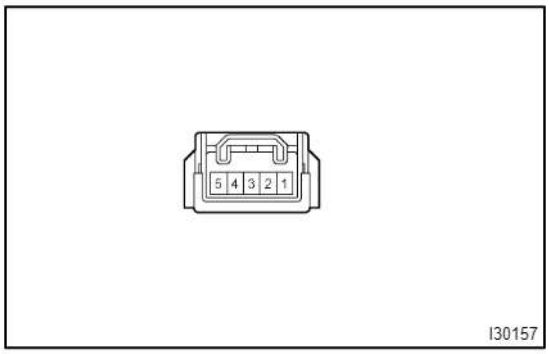
Display Code	Air Mix Damper Operation
0	COLD side (0 % open)
1	COLD side (0 % open)
2	COLD side (0 % open)
3	COLD/HOT (50 % open)
4	COLD/HOT (50 % open)
5	COLD/HOT (50 % open)
6	HOT side (100 % open)
7	HOT side (100 % open)
8	HOT side (100 % open)
9	HOT side (100 % open)

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE**

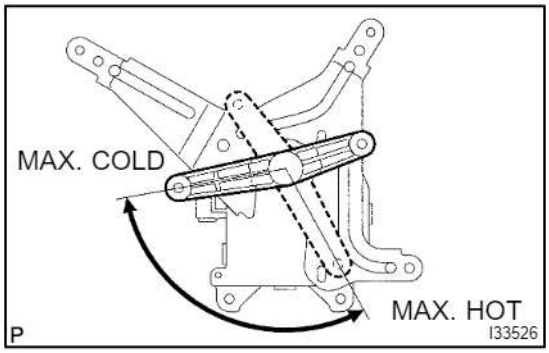
NG

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2	INSPECT DAMPER SERVO SUB–ASSY



(a) Remove the damper servo sub–assy (LH).
(b) Connect the battery positive (+) lead to terminal 4 and the battery negative (–) lead to terminal 5, then check that the lever turns to "COLD" side smoothly.
(c) Connect the battery positive (+) lead to terminal 5 and the battery negative (–) lead to terminal 4, then check that the lever turns to "HOT" side smoothly.
Standard: Motor operates is smoothly.



NG → **REPLACE DAMPER SERVO SUB–ASSY**

OK

3	CHECK HARNESS AND CONNECTOR(BETWEEN DAMPER SERVO SUB–ASSY AND AIR CONDITIONING AMPLIFIER)

(a) Check for open and short circuit in the harness and the connector between the damper servo sub–assy (air mix damper control servomotor) and the A/C amplifier (See page 01–35).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4	CHECK DIAGNOSTIC TROUBLE CODE

(a) Start up the DTC check mode.
(b) Check that DTC 41 is not output again.
Standard: DTC 41 is not output.

OK → **SYSTEM OK**

NG

CHECK AND REPLACE AIR CONDITIONING AMPLIFIER

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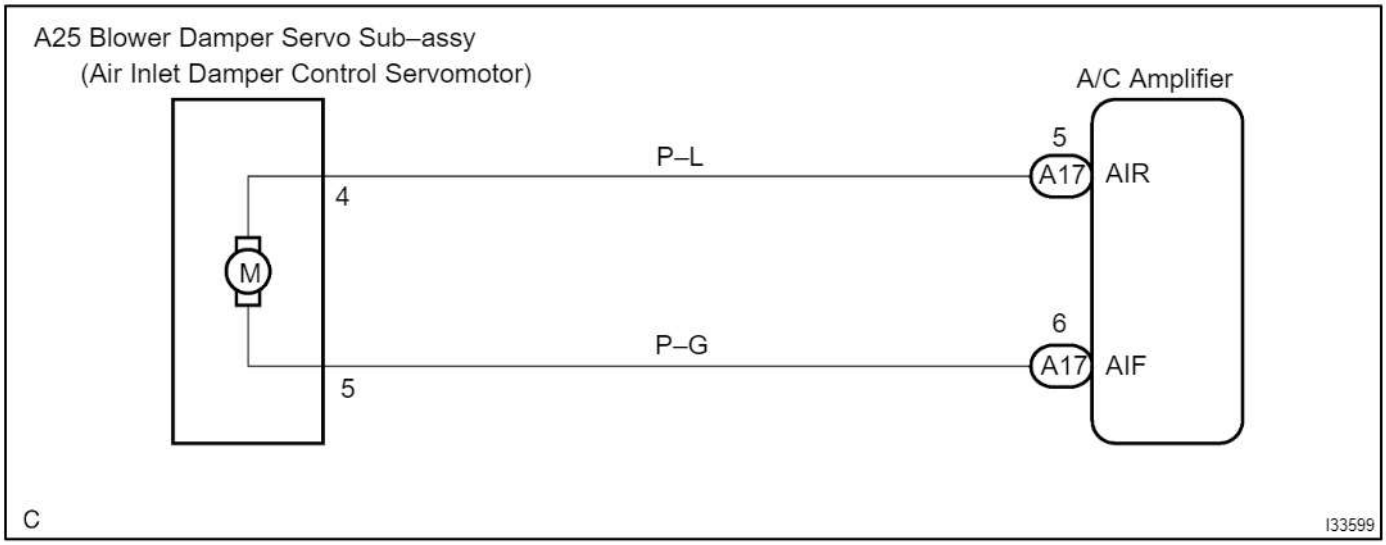
DTC	42	AIR INLET DAMPER CONTROL SERVOMOTOR CIRCUIT

CIRCUIT DESCRIPTION

The blower damper servo sub–assy (air inlet damper control servomotor) is controlled by the A/C amplifier and moves the air inlet damper to the desired position.

DTC No.	Detection Item	Trouble Area
42	Air inlet damper position sensor value does not change even if A/C amplifier operates air inlet control servomotor.	□Blower damper servo sub–assy (air inlet damper control servomotor) □Harness or connector between blower damper servo sub–assy (air inlet damper control servomotor) and A/C amplifier □A/C amplifier

WIRING DIAGRAM



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INSPECTION PROCEDURE

1	PERFORM ACTUATOR CHECK

(a) Remove the glove compartment to see and check the recirculation damper operation.
  (1) Operate A/C control panel to enter the actuator check mode (See page 05–1140).
  (2) Press the DEF switch and change it to step operation.
  (3) Press the DEF switch in order, and visually check the recirculation damper operation.

Standard:

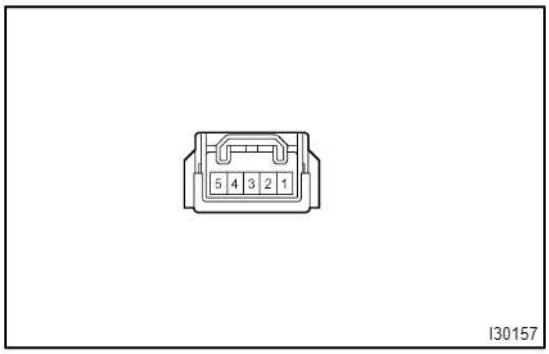
Display code	Recirculation damper position
0	RECIRCULATION
1	RECIRCULATION
2	FRESH/RECIRCULATION
3	FRESH/RECIRCULATION
4	FRESH
5	FRESH
6	FRESH
7	FRESH
8	FRESH
9	FRESH

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE**

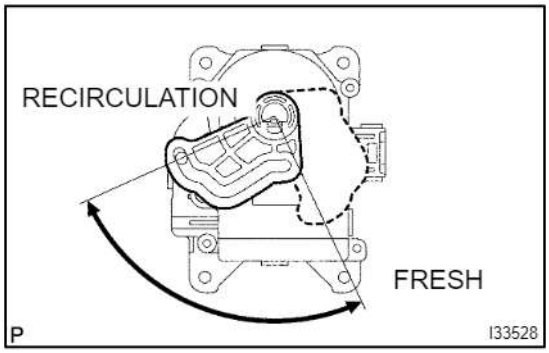
NG

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2	INSPECT BLOWER DAMPER SERVO SUB–ASSY



(a) Remove the blower damper servo sub–assy.
(b) Connect the battery positive (+) lead to terminal 4 and the battery negative (–) lead to terminal 5, then check that the lever turns to "RECIRCULATION" side smoothly.
(c) Connect the battery positive (+) lead to terminal 5 and the battery negative (–) lead to terminal 4, then check that the lever turns to "FRESH" side smoothly.
Standard: Motor operates smoothly.



NG → **REPLACE BLOWER DAMPER SERVO SUB–ASSY**

OK

3	CHECK HARNESS AND CONNECTOR(BETWEEN BLOWER DAMPER SERVO SUB–ASSY AND AIR CONDITIONER AMPLIFIER ASSY)

(a) Check for open and short circuit in the harness and the connector between the blower damper servo sub–assy (air inlet dmper control servomotor) and the A/C amplifier (See page 01–35).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4	CHECK DIAGNOSTIC TROUBLE CODE

(a) Start up the DTC check mode.
(b) Check that DTC 42 is not output again.
Standard: DTC 42 is not output.

OK → **SYSTEM OK**

NG

CHECK AND REPLACE AIR CONDITIONING AMPLIFIER

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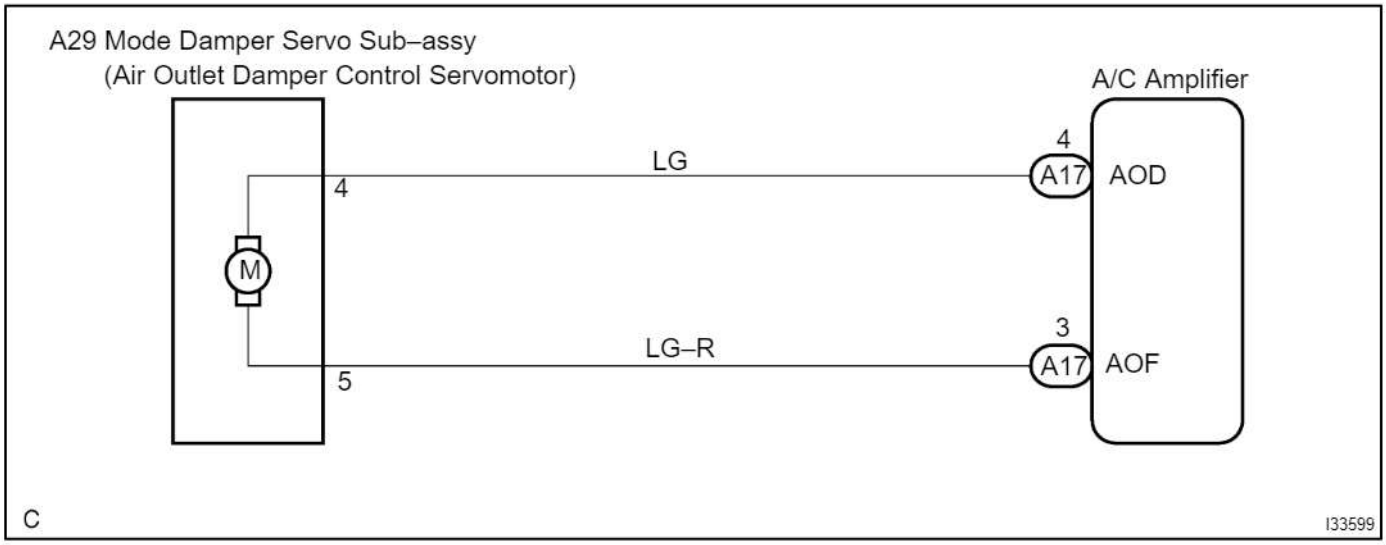
DTC	43	AIR OUTLET DAMPER CONTROL SERVOMOTOR CIRCUIT

CIRCUIT DESCRIPTION

This circuit turns the servomotor and changes each mode damper position by the signals from the A/C amplifier. When the AUTO switch is on, the A/C amplifier changes the mode automatically between (FACE), (BI–LEVEL) and (FOOT) according to the temperature setting.

DTC No.	Detection Item	Trouble Area
43	Air outlet damper position sensor value does not change even if A/C amplifier operated air outlet damper control servomotor.	□Mode damper servo sub–assy (air outlet damper control servomotor) □Harness or connector between A/C amplifier and mode damper servo sub–assy (air outlet damper control servomotor) □A/C amplifier

WIRING DIAGRAM



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INSPECTION PROCEDURE

1	PERFORM ACTUATOR CHECK

(a) Warm up engine.
(b) Operate A/C control panel to enter actuator check mode (See page 05–1140).
(c) Press the DEF switch to enter the step operation.
(d) Press the DEF switch, and check the air flow by hand.

Standard:

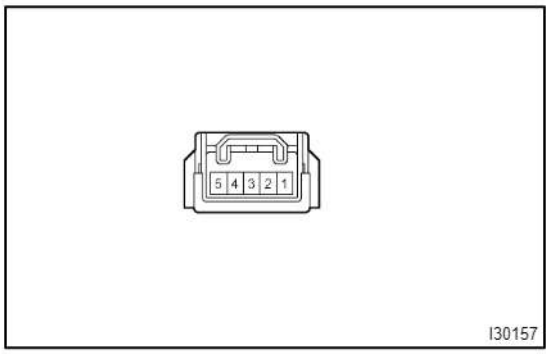
Display code	Air flow condition
0	FACE
1	FACE
2	B/L
3	B/L
4	FOOT
5	FOOT
6	FOOT
7	FOOT
8	FOOT/DEF
9	DEF

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE**

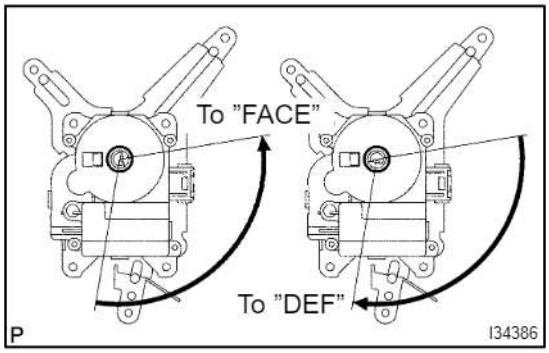
NG

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2	INSPECT MODE DAMPER SERVO SUB–ASSY



(a) Remove the mode damper servo sub–assy.
(b) Connect the battery positive (+) lead to terminal 4 and the battery negative (–) lead to terminal 5, then check that the lever turns to "DEF" position smoothly.
(c) Connect the battery positive (+) lead to terminal 5 and the battery negative (–) lead to terminal 4, then check that the lever turn to "FACE" position smoothly.
Standard: Motor operates is smoothly.



NG → **REPLACE MODE DAMPER SERVO SUB–ASSY**

OK

3	CHECK HARNESS AND CONNECTOR(BETWEEN MODE DAMPER SERVO SUB–ASSY AND AIR CONDTIONING AMPLIFIER)

(a) Check for open and short circuit in the harness and the connector between the mode damper servo sub–assy (air outlet damper control servomotor) and the A/C amplifier (See page 01–35).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4	CHECK DIAGNOSTIC TROUBLE CODE

(a) Start up the DTC check mode.
(b) Check that DTC 43 is not output again.
Standard: DTC 43 is not output.

NG → **SYSTEM OK**

NG

CHECK AND REPLACE AIR CONDITIONING AMPLIFIER

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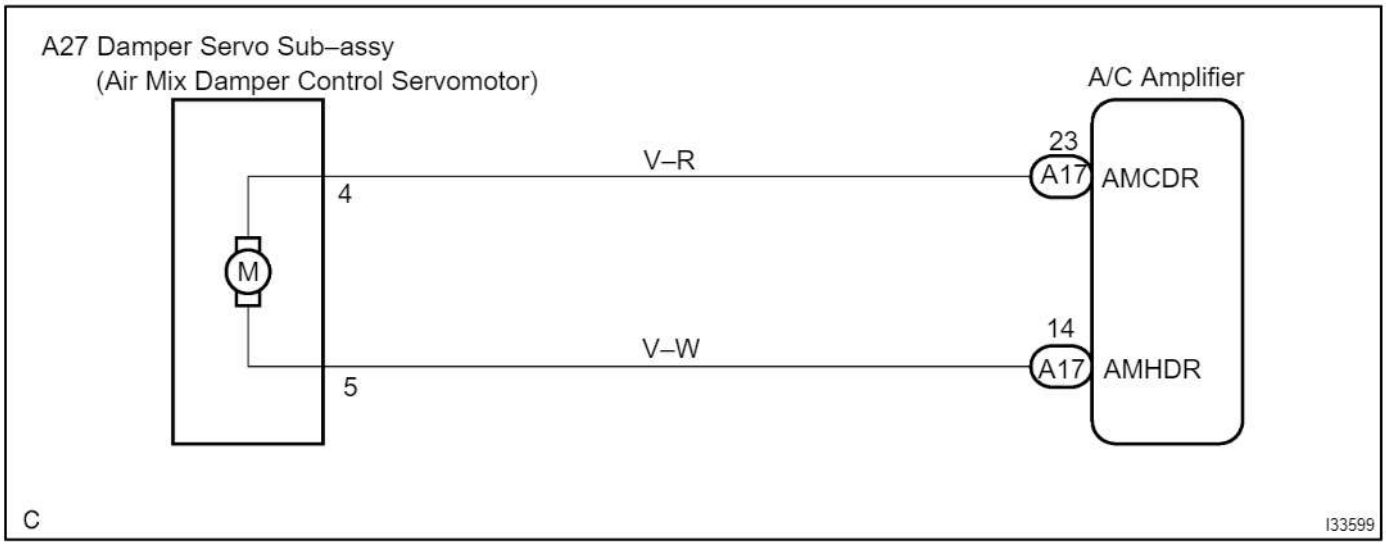
DTC	46	AIR MIX DAMPER CONTROL SERVOMOTOR CIRCUIT (DRIVER SIDE)

CIRCUIT DESCRIPTION

The damper servo sub–assy (air mix damper control servomotor) is controlled by the A/C amplifier and moves the air mix damper to the desired position.
HINT:
This DTC is displayed for only limited grade (right/left independent temperature control system).

DTC No.	Detection Item	Trouble Area
46	Air mix damper position sensor value does not change even if A/C amplifier operates air mix control servomotor.	□Damper servo sub–assy (air mix damper control servomotor) □Harness or connector between damper servo sub–assy (air mix control servomotor) and A/C amplifier □A/C amplifier

WIRING DIAGRAM



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INSPECTION PROCEDURE

1	PERFORM ACTUATOR CHECK

(a) Operate A/C control panel to enter the actuator check mode (See page 05–1140).
(b) Press the DEF switch and change to step operation.
(c) Check the air flow temperature by hand.

Standard:

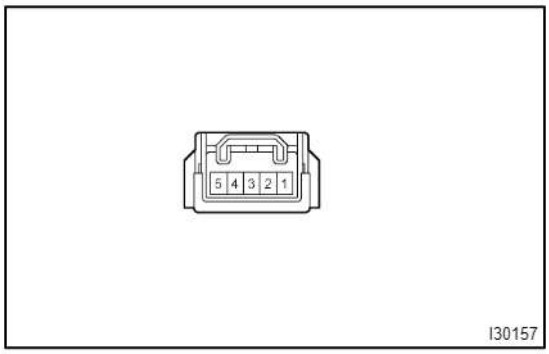
Display Code	Air Mix Damper Operation
0	COLD side (0 % open)
1	COLD side (0 % open)
2	COLD side (0 % open)
3	COLD/HOT (50 % open)
4	COLD/HOT (50 % open)
5	COLD/HOT (50 % open)
6	COLD/HOT (50 % open)
7	HOT side (100 % open)
8	HOT side (100 % open)
9	HOT side (100 % open)

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE**

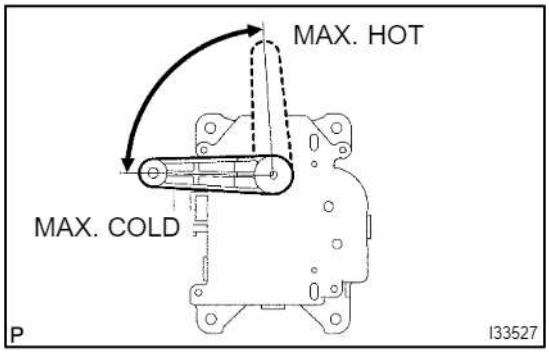
NG

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2	INSPECT DAMPER SERVO SUB–ASSY



(a) Remove the damper servo sub–assy.
(b) Connect the battery positive (+) lead to terminal 4 and the battery negative (–) lead to terminal 5, then check that the lever turns to "COLD" side smoothly.
(c) Connect the battery positive (+) lead to terminal 5 and the battery negative (–) lead to terminal 4, then check that the lever turns to "HOT" side smoothly.
Standard: Motor operates is smoothly.



NG → **REPLACE DAMPER SERVO SUB–ASSY**

OK

3	CHECK HARNESS AND CONNECTOR(BETWEEN DAMPER SERVO SUB–ASSY AND AIR CONDITIONING AMPLIFIER)

(a) Check for open and short in the harness and the connector between the damper servo sub–assy (air mix damper control servomotor) and the A/C amplifier (See page 01–35).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4	CHECK DIAGNOSTIC TROUBLE CODE

(a) Start up the DTC check mode.
(b) Check that DTC 46 is not output again.
Standard: DTC 46 is not output.

OK → **SYSTEM OK**

NG

CHECK AND REPLACE AIR CONDITIONING AMPLIFIER

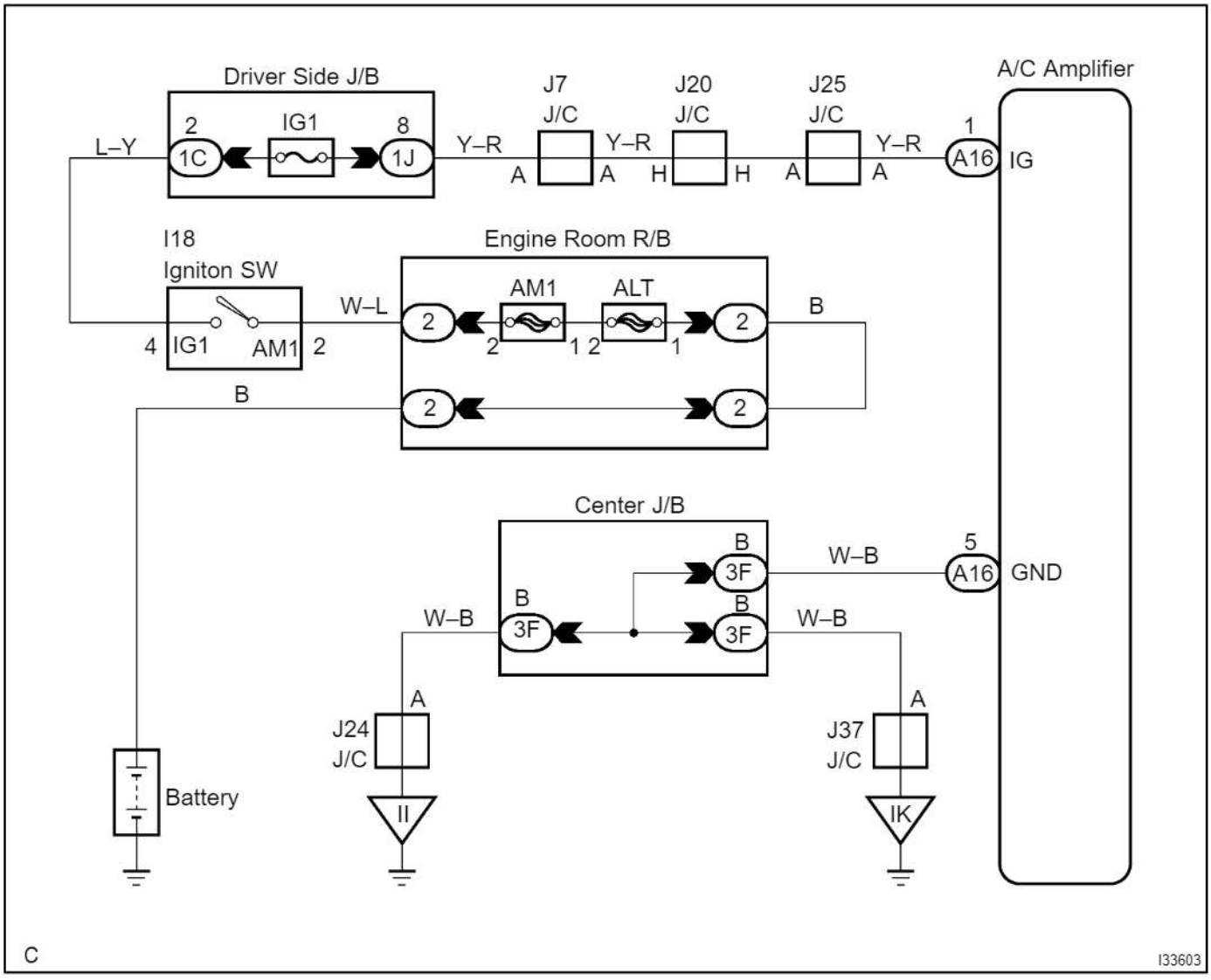
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IG POWER SOURCE CIRCUIT

CIRCUIT DESCRIPTION

This circuit is the power source for the A/C amplifier assy (contains the ECU), servomotor, etc.

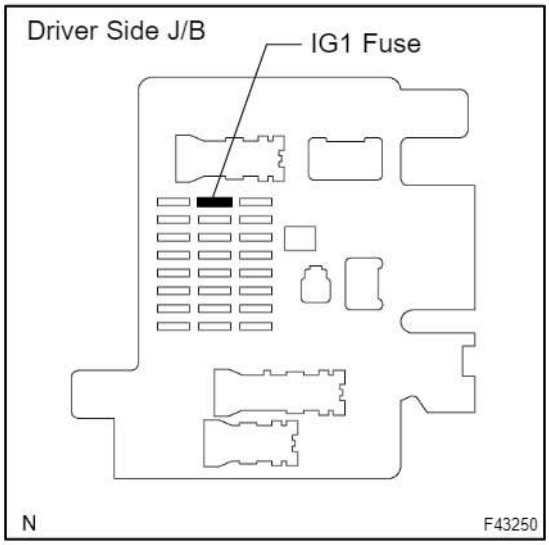
WIRING DIAGRAM



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INSPECTION PROCEDURE

1	CHECK FUSE(IG1)

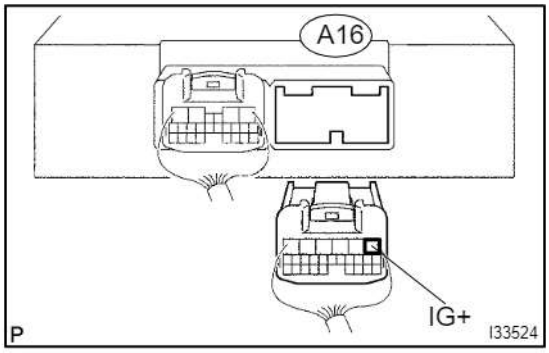


(a) Remove the IG1 fuse from the driver side J/B.
(b) Check that continuity exists in the IG1 fuse.
Standard: Continuity exists.

NG → **REPLACE FUSE**

OK

2	CHECK HARNESS AND CONNECTOR(BETWEEN AIR CONDITIONING AMPLIFIER AND BATTERY)



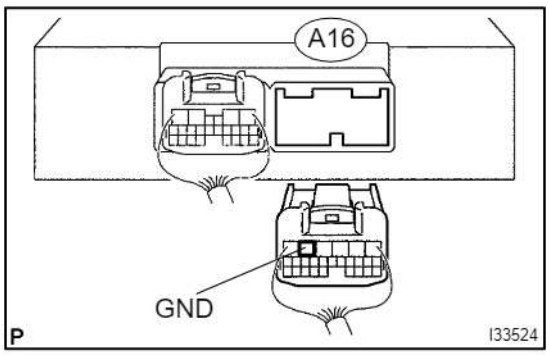
(a) Disconnect the "A16" connector from the A/C amplifier.
(b) Turn the ignition switch to ON.
(c) Measure voltage between terminal IG+ of the A/C amplifier and body ground.
Voltage: 10 – 14 V

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

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3	CHECK HARNESS AND CONNECTOR(BETWEEN AIR CONDITIONING AMPLIFIER AND BODY GROUND)



(a) Disconnect the "A16" connector from the A/C amplifier assy.

(b) Measure resistance between terminal GND of the A/C amplifier and body ground.
Resistance: Below 1.0 Ω (Continuity)

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE

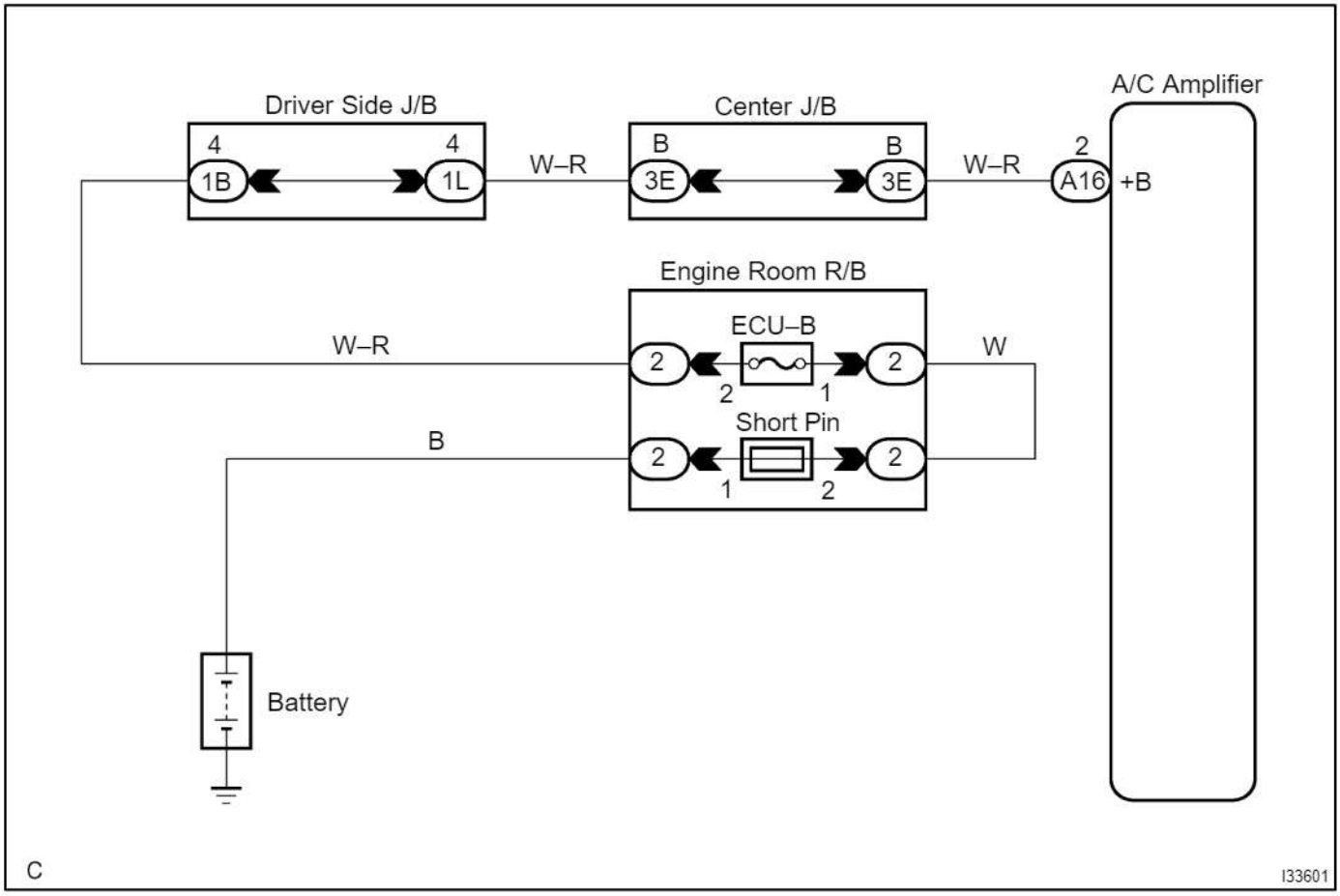
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BACK–UP POWER SOURCE CIRCUIT

CIRCUIT DESCRIPTION

This is the back–up power source for the A/C amplifier. Power is supplied even when the ignition switch is off and the power is used for backing up diagnostic trouble code memory, etc.

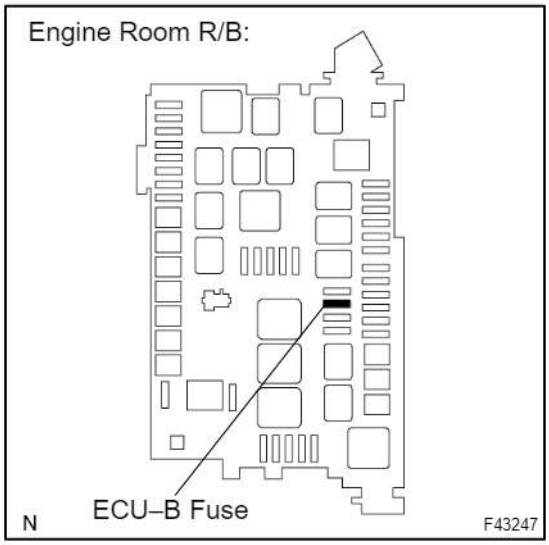
WIRING DIAGRAM



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INSPECTION PROCEDURE

1	CHECK FUSE(ECU–B)

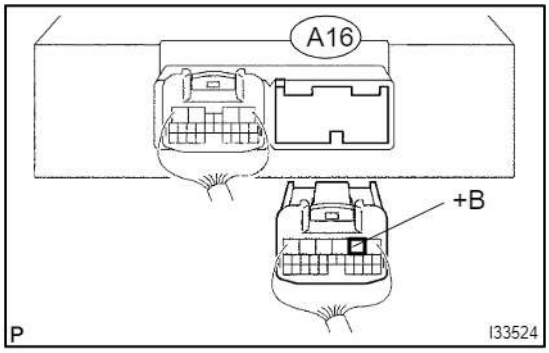


(a) Remove the ECU–B fuse from the engine room R/B.
(b) Check that the continuity exists of ECU–B fuse.
Standard: Continuity exists.

NG → **REPLACE FUSE**

OK

2	CHECK HARNESS AND CONNECTOR(BETWEEN AIR CONDITIONING AMPLIFIER AND BATTERY)



(a) Disconnect the "A16" connector from the A/C amplifier assy.
(b) Measure voltage between terminal +B of the A/C amplifier assy and body ground.
Voltage: 10 – 14 V

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE

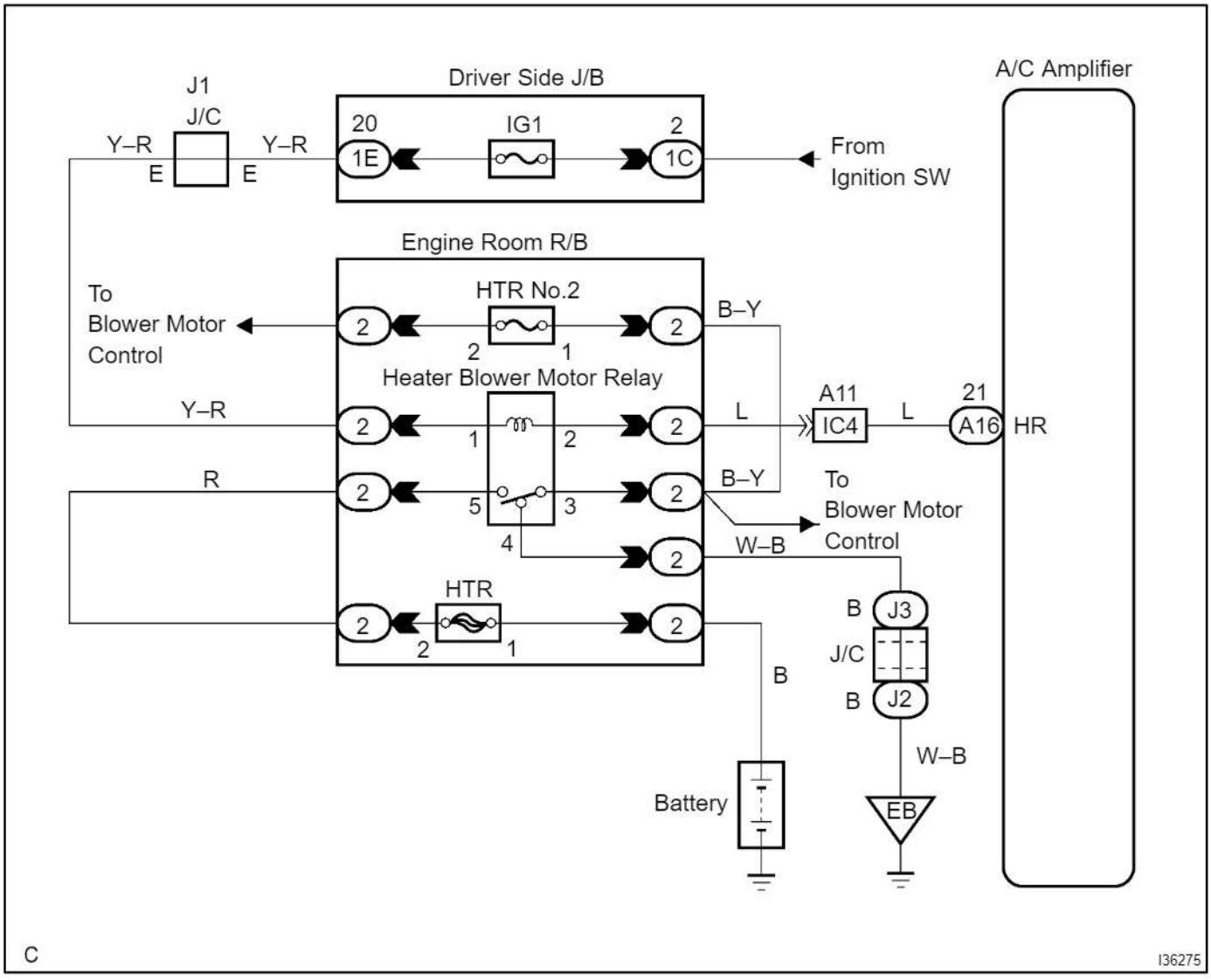
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HEATER RELAY CIRCUIT

CIRCUIT DESCRIPTION

The heater relay is switched on by signals from the A/C amplifier. It supplies power to the blower motor.

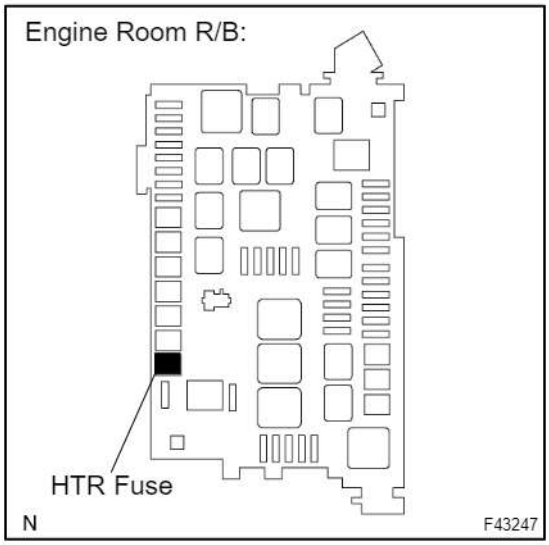
WIRING DIAGRAM



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INSPECTION PROCEDURE

1	CHECK FUSE(HTR)

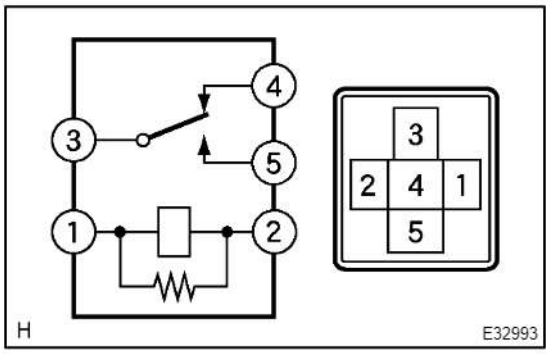


(a) Remove the HTR fuse from the engine room R/B.
(b) Check that the continuity exists in the HTR fuse.
Standard: Continuity exists.

NG → **REPLACE FUSE**

OK

2	INSPECT HEATER BLOWER MOTOR RELAY ASSY



(a) Check that the continuity exists between each pair of terminals on the heater blower motor relay assy, as shown in the chart.
Standard:

Tester connection	Specified condition
3 – 5	No continuity
3 – 4	Continuity
1 – 2	62.5 – 90.9 Ω

(b) Apply battery voltage between terminal 1 and 2.
(c) Check continuity each pair of terminals as shown in the chart.
Standard:

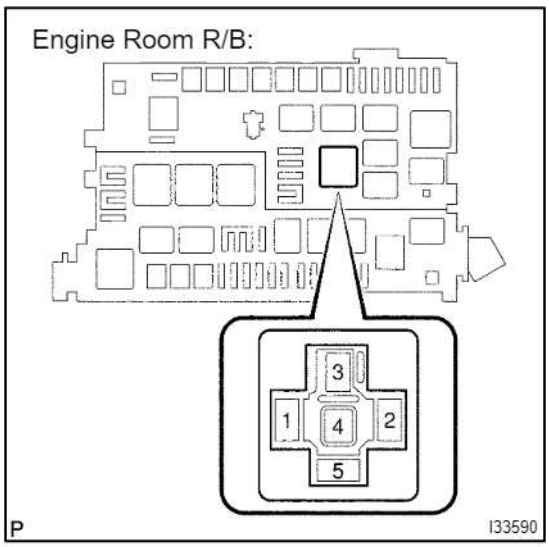
Tester connection	Specified condition
3 – 4	Continuity
3 – 5	No continuity

NG → **REPLACE HEATER BLOWER MOTOR RELAY ASSY**

OK

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3	CHECK HARNESS AND CONNECTOR(BETWEEN HEATER BLOWER MOTOR RELAY AND BATTERY)



(a) Remove the heater blower motor relay assy from the engine room R/B.

(b) Measure voltage between each terminal of engine room R/B and body ground under each condition, as shown in the chart below.

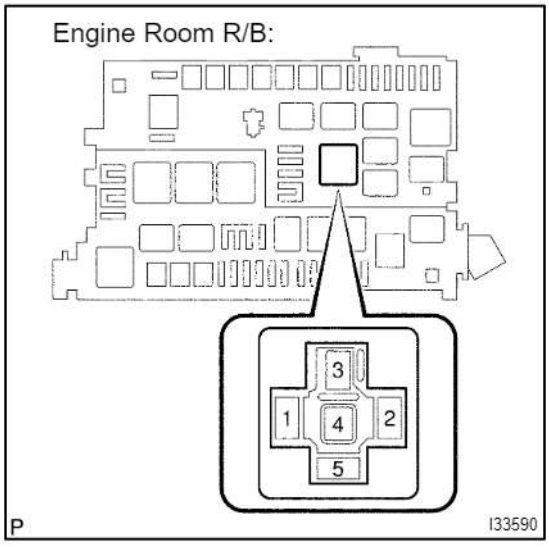
Voltage:

Tester connection	Condition	Voltage (V)
1 – Body ground	Turn ignition switch to ON	10 – 14 V
5 – Body ground	Always	10 – 14 V

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4	CHECK HARNESS AND CONNECTOR(BETWEEN HEATER BLOWER MOTOR RELAY AND BODY GROUND)



(a) Remove the heater blower motor relay assy from the engine room R/B

(b) Measure resistance between terminal 4 of the engine room R/B and body ground.

Resistance: Below 1.0 Ω (Continuity)

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

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5	CHECK HARNESS AND CONNECTOR(BETWEEN HEATER BLOWER MOTOR RELAY AND AIR CONDITIONING AMPLIFIER)

(a) Check for open and short circuit in the harness and the connector between the heater blower motor relay and the A/C amplifier (See page 01–35).

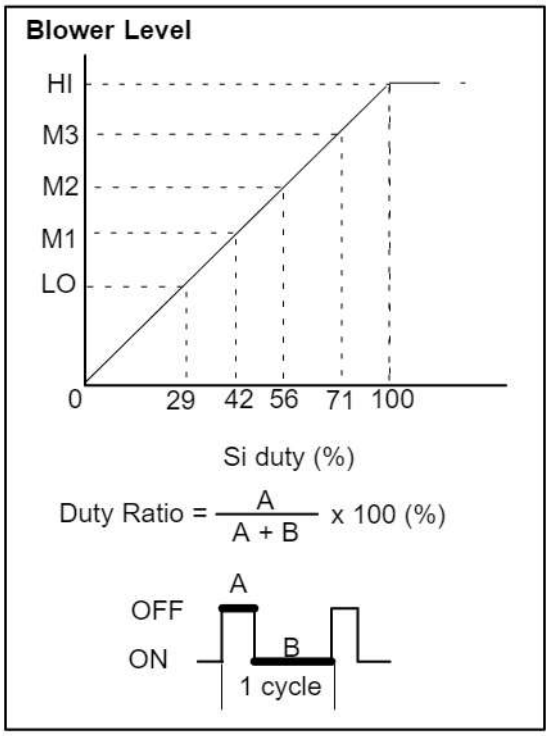
NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE

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BLOWER MOTOR CIRCUIT



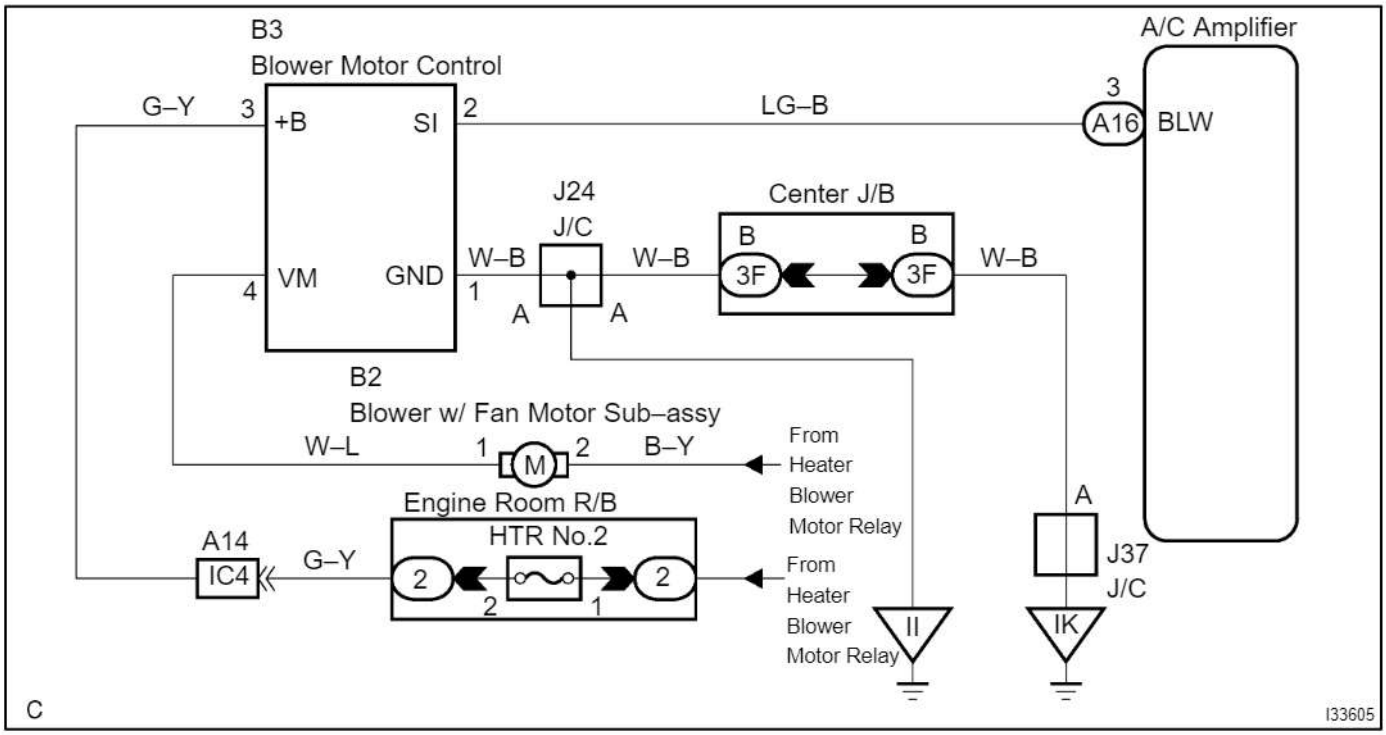
CIRCUIT DESCRIPTION

The blower motor is operated by signals from the A/C amplifier. Blower motor speed signals are transmitted by changes in the Duty Ratio.

Duty Ratio

The duty ratio is the ratio of the period of continuity in one cycle. For example, if A is the period of continuity in one cycle, and B is the period of non–continuity, then.

WIRING DIAGRAM



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INSPECTION PROCEDURE

1	PERFORM ACTUATOR CHECK

(a) Operate A/C control panel to enter the actuator check mode (See page 05–1140).
(b) Press the blower switch and change to step operation.
(c) Check the air flow level by hand.

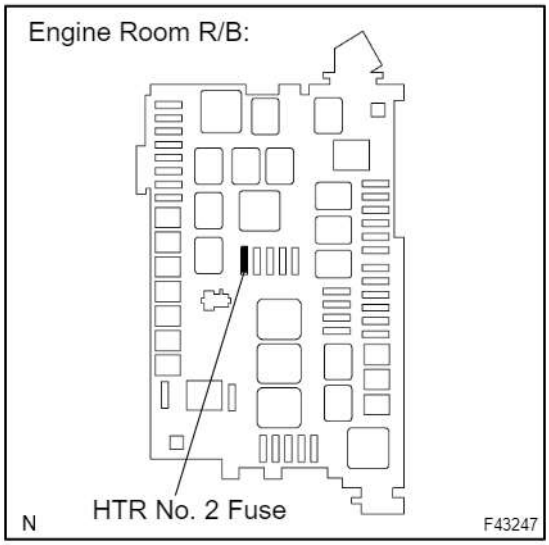
Standard:

Display Code	Blower level
0	0 (No blower)
1	1 (LO)
2	17 (Medium)
3	17 (Medium)
4	17 (Medium)
5	17 (Medium)
6	17 (Medium)
7	17 (Medium)
8	17 (Medium)
9	31 (HI)

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE**

NG

2	CHECK FUSE(HTR NO.2)



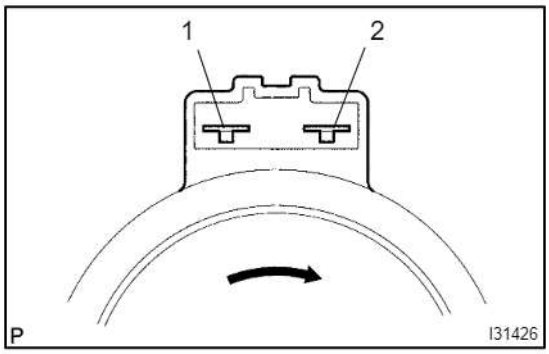
(a) Remove the HTR No. 2 fuse from the engine room R/B.
(b) Check that the continuity exists in the HTR No. 2 fuse.
Standard: Continuity exists.

NG → **REPLACE FUSE**

OK

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3	INSPECT BLOWER W/FAN MOTOR SUB–ASSY



(a) Remove the blower w/ fan motor sub–assy.
(b) Connect the battery positive (+) lead to terminal 2 and the battery negative (–) lead to terminal 1.
Standard: Blower motor operates smoothly.

NG → REPLACE BLOWER W/FAN MOTOR SUB–ASSY

OK

4	CHECK HARNESS AND CONNECTOR(BETWEEN HEATER BLOWER MOTOR RELAY AND BLOWER MOTOR CONTROL)

(a) Check for open and short circuit in the harness and the connector between the blower motor relay and the blower motor control (See page 01–35).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

5	CHECK HARNESS AND CONNECTOR(BETWEEN BLOWER MOTOR CONTROL AND BODY GROUND)

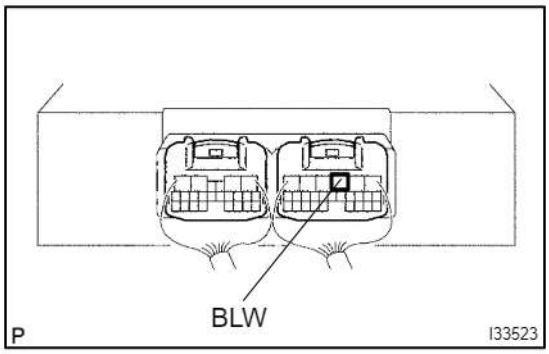
(a) Check for open and short circuit in the harness and the connecter between the blower motor control and body ground (See page 01–35).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

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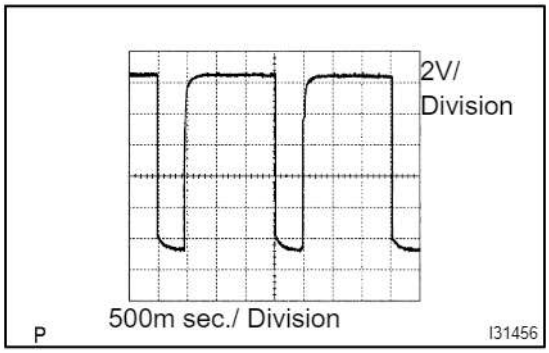
6	INSPECT AIR CONDITIONING AMPLIFIER ASSY(BLW)



(a) Remove the A/C amplifier with the connectors being connected.
(b) Turn the ignition switch to ON.
(c) Set blower speed to LO.
(d) Check the waveform between terminal BLW of the A/C amplifier and body ground.

Standard:

The correct waveform appears as shown in the illustration.



NG → **CHECK AND REPLACE AIR CONDITIONING AMPLIFIER ASSY**

OK

7	CHECK HARNESS OR CONNECTOR(BETWEEN BLOWER MOTOR CONTROL AND AIR CONDITIONING AMPLIFIER)

(a) Check for open and short circuit in the harness and the connecter between the blower motor control and the A/C amplifier (See page 01–35).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE BLOWER MOTOR CONTROL

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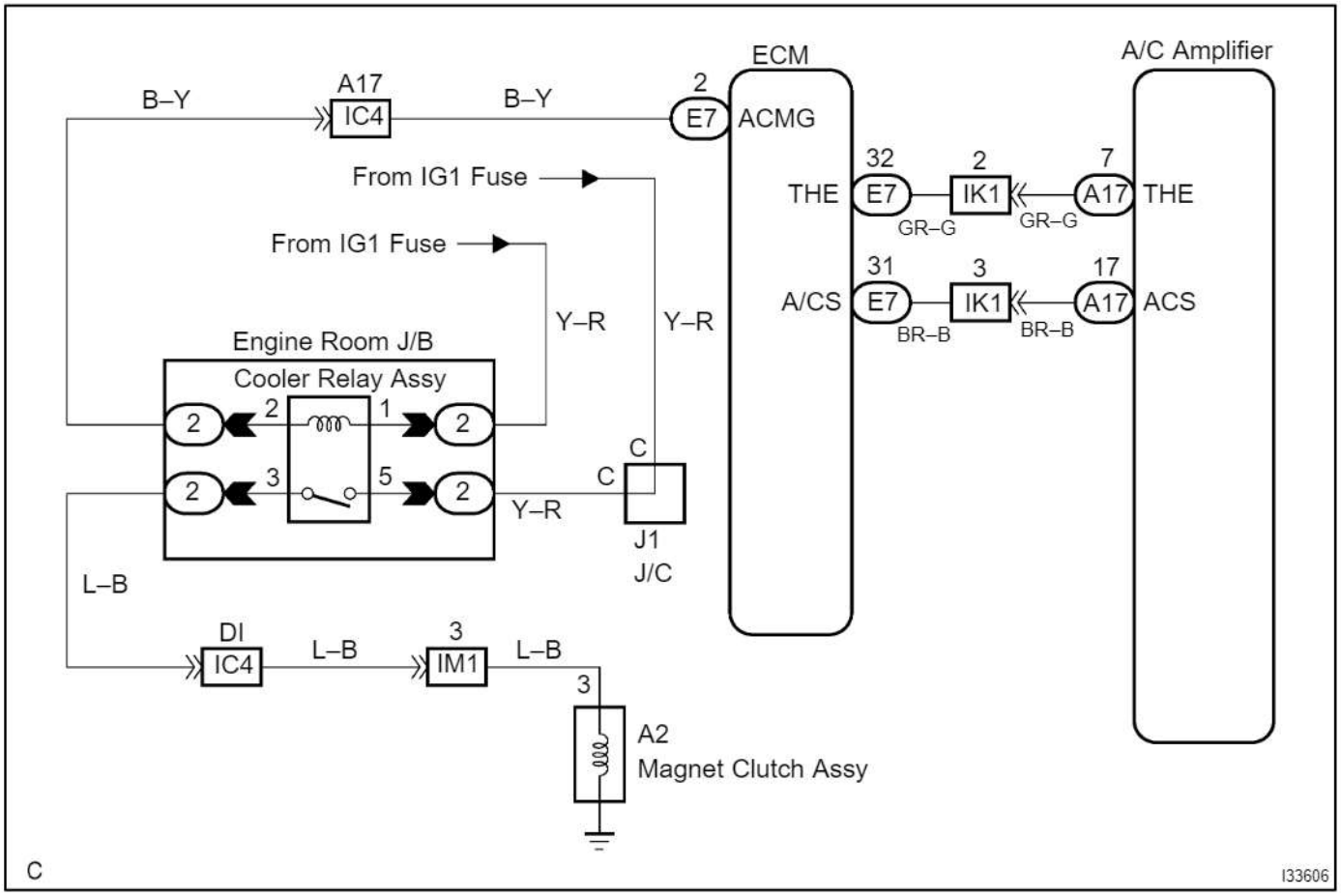
COMPRESSOR CIRCUIT

CIRCUIT DESCRIPTION

This is a driving circuit of the A/C magnetic clutch and controlled by the ECU terminal below.

- □ ACS of the A/C amplifier: Output the A/C switch condition ”ON” or ”OFF”.
- □ THE of A/C amplifier: Output the request signal to drive the magnetic clutch, and send it to ECM.
- □ ACMG of ECM: Operates the cooler relay assy and drive the magnetic clutch.

WIRING DIAGRAM



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INSPECTION PROCEDURE

1 READ VALUE OF HAND–HELD TESTER

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main SW ON.
(c) Check the A/C magnet clutch input signal using DATA LIST.

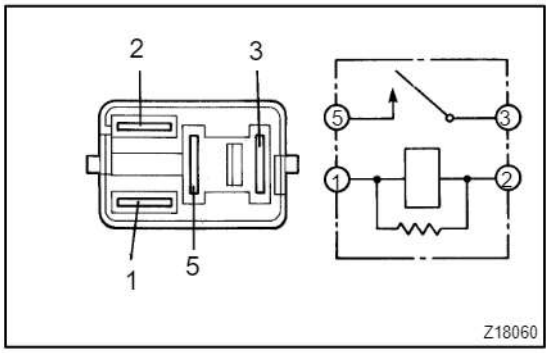
ECM:

Description	Tester display	Check condition
Magnet clutch inputsignal	A/C SIG	ON – OFF

NG → **Go to step 7**

OK

2 INSPECT COOLER RELAY ASSY



(a) Remove the cooler relay assy from the engine room J/B.
(b) Check continuity between each pair of terminals as shown in the chart.

Standard:

Tester connection	Specified condition
1 – 2	Continuity
3 – 5	No continuity

(c) Apply battery voltage between terminal 1 and 2.
(d) Check that continuity exists between terminal 3 and 5.

Standard: Continiuty exists.

NG → **REPLACE COOLER RELAY ASSY**

OK

3 READ VALUE OF HAND–HELD TESTER

(a) Connect the hand–held tester to DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main SW ON.
(c) Check the A/C magnet clutch using DATA LIST.

ECM:

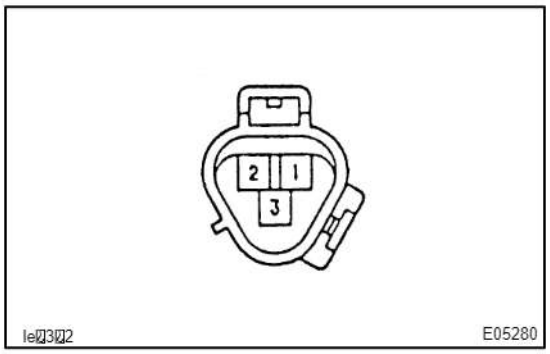
Description	Tester display	Check condition
Magnet clutch outputsignal	A/C MAG CLUTCH	ON – OFF

NG → **Go to step 9**

OK

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4	INSPECT MAGNET CLUTCH ASSY

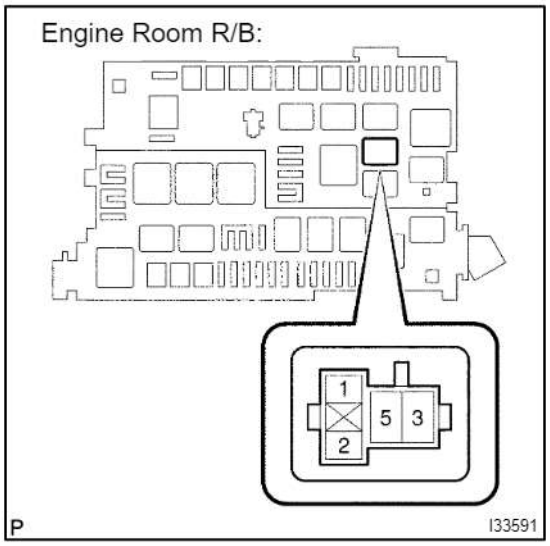


(a) Disconnect the connector from the compressor.
(b) Connect the battery positive (+) lead to terminal 3 and the battery negative (–) lead to terminal body ground, then check that the magnetic clutch is engaged.
Standard: Magnetic clutch is engaged.

NG → **REPLACE MAGNET CLUTCH ASSY**

OK

5	CHECK HARNESS AND CONNECTOR(BETWEEN BATTERY AND COOLER RELAY ASSY)



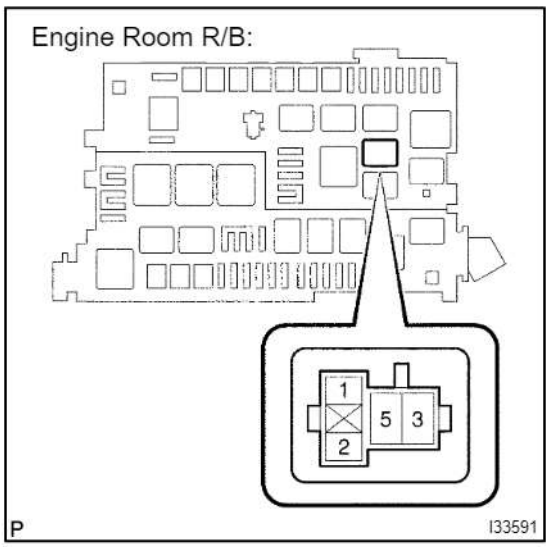
(a) Remove the cooler relay assy from the engine room R/B.
(b) Turn the ignition switch to ON.
(c) Measure voltage between terminal 5, 6 of the engine room J/B and body ground.
Voltage: 10 – 14 V

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

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6	CHECK HARNESS AND CONNECTOR(BETWEEN COOLER RELAY ASSY AND BODY GROUND)



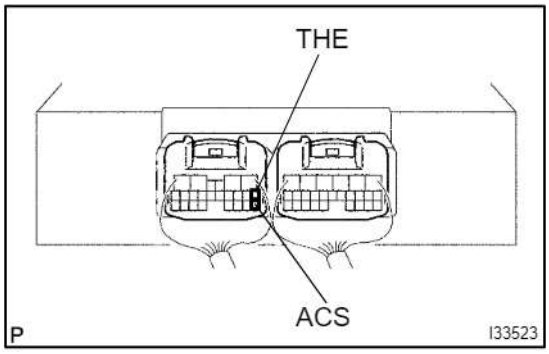
(a) Remove the cooler relay assy from the engine room R/B.
(b) Measure resistance between terminal 3 of the engine room R/B and body ground.
Resistance: Below 1.0 Ω (Continuity)

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE

7	INSPECT AIR CONDITIONING AMPLIFIER(ACS, THE)



(a) Remove the A/C amplifier with the connectors being connected.
(b) Start the engine and push AUTO switch.
(c) Measure voltage between terminal THE and ACS of the A/C amplifier and body ground when the magnetic clutch is turned ON and OFF by operating the A/C switch.
Voltage:

Switch operation	Tester connection	Specified condition
ON	THE – Body ground	1.3 – 2.6 V
OFF	THE – Body ground	3.7 – 4.5 V
ON	ACS – Body ground	10 – 14 V
OFF	ACS – Body ground	Below 1 V

NG → **CHECK AND REPLACE AIR CONDITIONING AMPLIFIER**

OK

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8	CHECK HARNESS AND CONNECTOR

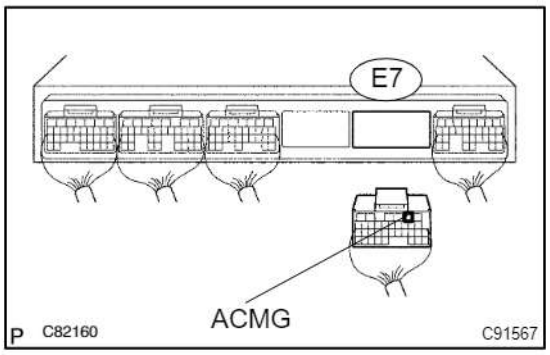
(a) Check for open and short circuit in the harness and the connector between ECM and the A/C amplifier (See page 01–35).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

CHECK AND REPLACE ECM

9	CHECK HARNESS AND CONNECTOR



(a) Disconnect the "E7" connector from ECM.
(b) Turn the ignition switch to ON.
(c) Measure voltage between terminal ACMG of ECM and body ground.
Voltage: 10 – 14 V

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

CHECK AND REPLACE ECM

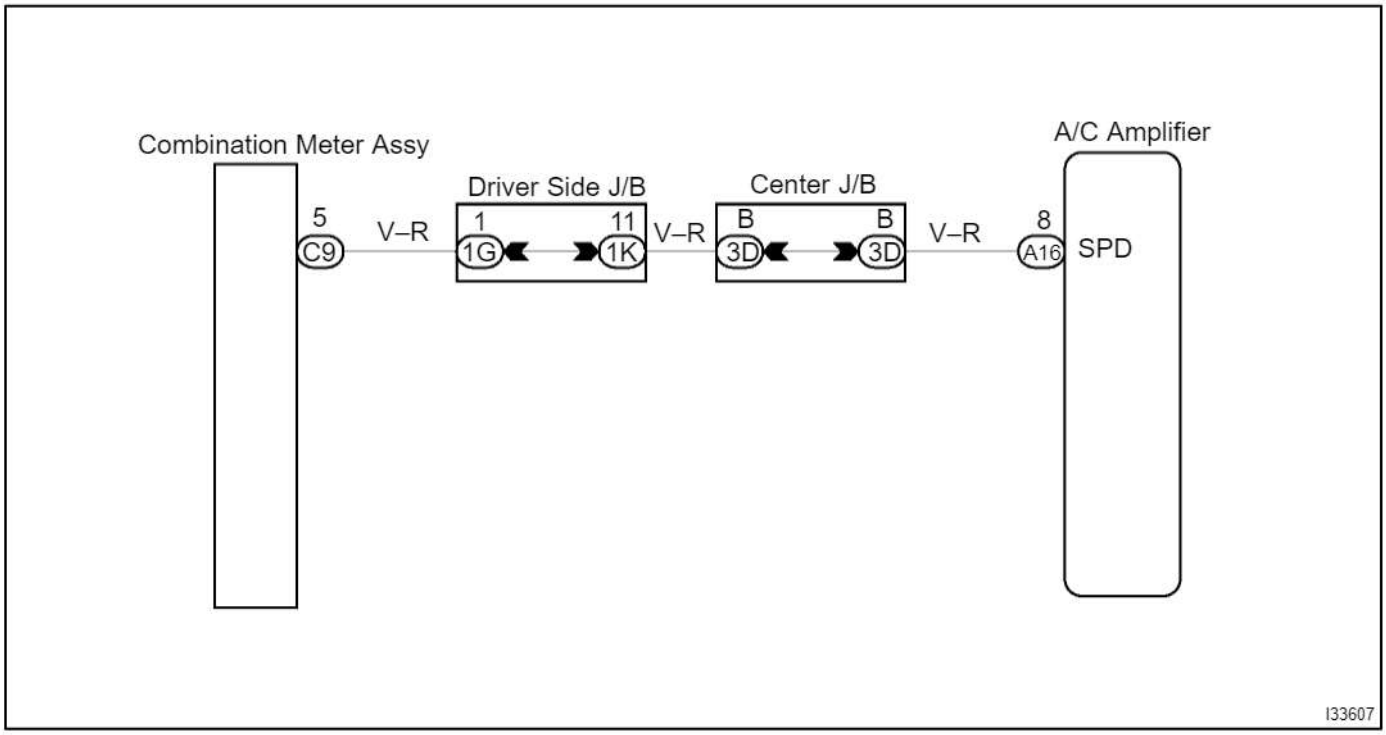
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VEHICLE SPEED SIGNAL CIRCUIT

CIRCUIT DESCRIPTION

The A/C amplifier monitors the vehicle speed through the signals sent from the speed sensor. The A/C amplifier uses these signals to revise the ambient temperature sensor signal.

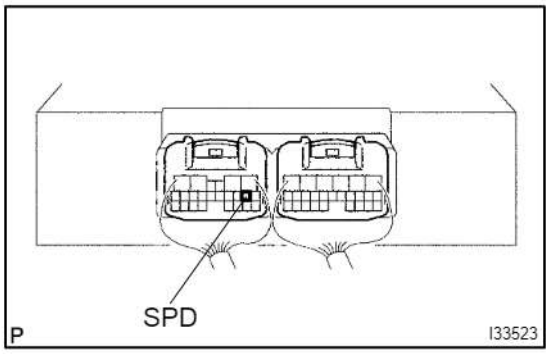
WIRING DIAGRAM



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INSPECTION PROCEDURE

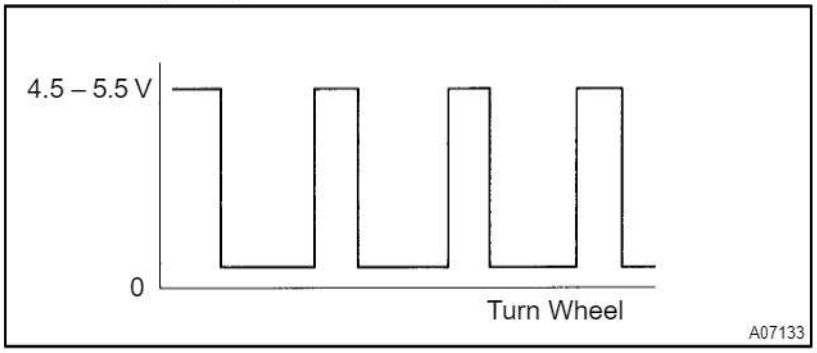
1	INSPECT AIR CONDITIONING AMPLIFIER(SPD)



(a) Remove the A/C amplifier assy with the connector being connected.
(b) Shift the shift lever to neutral.
(c) Lift up the vehicle.
(d) Turn the ignition switch to ON.
(e) Measure voltage between terminal SPD of the A/C amplifier assy connector and body ground when turning the rear wheel slowly.

Standard:

Voltage is generated intermittently.



OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE**

NG

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2	CHECK HARNESS AND CONNECTOR(BETWEEN COMBINAION METER ASSY AND AIR CONDITIONING AMPLIFIER)

(a) Check for open and short circuit in the harness and the connector between the combination meter assy and the A/C amplifier (See page 01–35).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

CHECK AND REPLACE COMBINATION METER ASSY

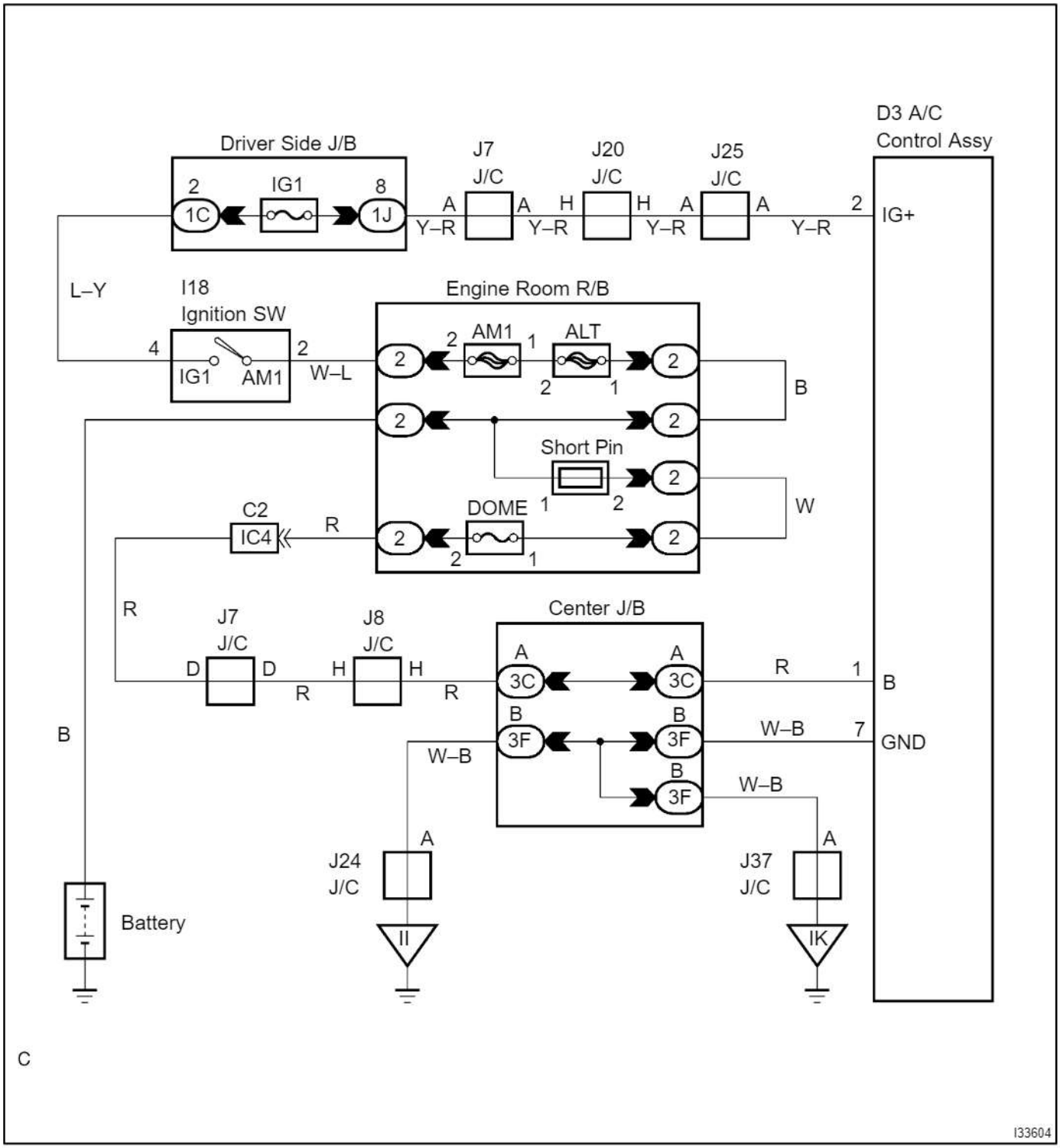
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HEATER CONTROL POWER SUPPLY CIRCUIT

CIRCUIT DESCRIPTION

This circuit is a power supply for the air conditioning control assy (heater control panel).

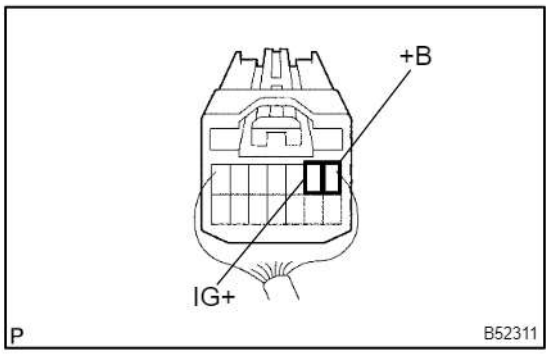
WIRING DIAGRAM



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CIRCUIT INSPECTION

1	CHECK HARNESS AND CONNECTOR(BETWEEN AIR CONDITIONING CONTROL ASSY AND BATTERY)



(a) Disconnect the connector form air conditioning control panel assy.

(b) Check voltage (B, +IG).

(1) Measure voltage between terminal B of the air conditioning control panel assy and body ground.

Voltage: 10 – 14 V

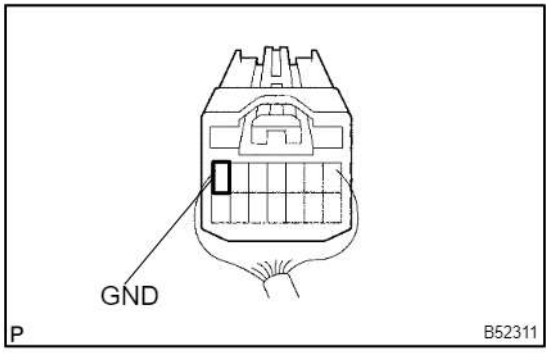
(2) Turn the ignition switch to ON, and measure voltage between terminal IG+ of the air conditioning control panel assy and body ground.

Voltage: 10 – 14 V

NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

2	CHECK HARNESS AND CONNECTOR(BETWEEN AIR CONDITIONING CONTROL ASSY AND BODY GROUND)



(a) Disconnect the connector form the air conditioning control panel assy.

(b) Measure resistance between terminal GND of the air conditioning control panel assy and body ground.

Resistance: Below 1.0 Ω (Continuity)

NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE

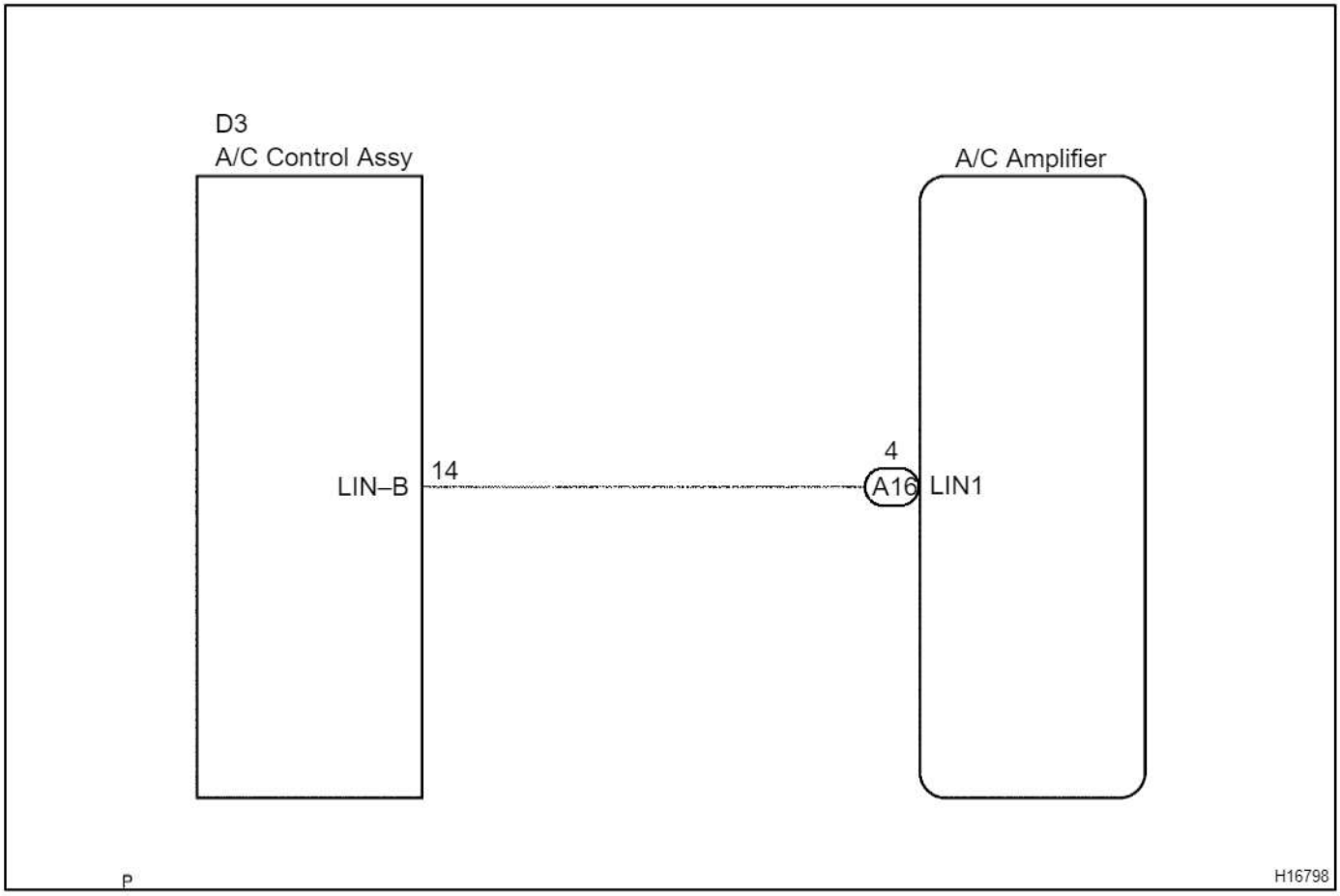
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HEATER CONTROL PANEL COMMUNICATION CIRCUIT

CIRCUIT DESCRIPTION

This circuit is a communication line between the air conditioning control assy (heater control panel) and the A/C amplifier.

WIRING DIAGRAM



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CIRCUIT INSPECTION

1	CHECK HARNESS AND CONNECTOR(BETWEEN AIR CONDITIONING CONTROL ASSY AND AIR CONDITONING AMPLIFIER)

(a) Check for open and short circuit in the harness and the connector between the air conditioning control assy and A/C amplifier (See page 01–35).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

2	INSPECT AIR CONDITIONING CONTROL ASSY

(a) Check that the malfunction disappear when a good air conditioning control assy is installed.

Result:

A	Malfunction disappeared
B	Malfunction did not disappear

B → CHECK AND REPLACE AIR CONDITIONING AMPLIFIER

A

CHECK AND REPLACE AIR CONDITIONING CONTROL ASSY

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SUPPLEMENTAL RESTRAINT SYSTEM (From August, 2003)

05256-20

HOW TO PROCEED WITH TROUBLESHOOTING

1	VEHICLE BROUGHT TO WORKSHOP

2	CUSTOMER PROBLEM ANALYSIS (See page 05–1237)

3	DTC CHECK (Past and Present DTC) (See page 05–1238)

- DTC IS OUTPUT: Go to step 4
- DTC IS NOT OUTPUT: Go to step 10

4	DTC CHART (See page 05–1245)

5	CIRCUIT INSPECTION (See page 05–1254 to 05–1447)

- MALFUNCTION CODE IS OUTPUT: Go to step 10
- NORMAL CODE IS OUTPUT: Go to step 4

6	IDENTIFICATION OF PROBLEM

7	REPAIR

8	CLEAR DTC (Past and Present DTC) (See page 05–1238)

9	DTC CHECK (See page 05–1245)

- DTC CODE IS NOT OUTPUT: Go to step 10
- DTC CODE IS OUTPUT: Go to step 4

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10	SYMPTOM SIMULATION (See page 01–25)

WARNING LIGHT REMAINS OFF: Go to step 6

WARNING LIGHT IS ON: Go to step 3

11	CONFIRMATION TEST

END

HINT:
Step 3, 5, 7, 8, 9:
Diagnostic steps permitting the use of the hand–held tester.

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05257–14

CUSTOMER PROBLEM ANALYSIS CHECK

Supplemental Restraint System Check Sheet	Inspector's Name

Customer's Name		VIN	
		Production Date	
		Licence Plate No.	
Date Vehicle Brought In		Odometer Reading	km Miles

Date Problem Occurred	
Weather	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Other
Temperature	Approx.

Vehicle Operation	☐ Starting ☐ Idling ☐ Driving [☐ Constant speed ☐ Acceleration ☐ Deceleration ☐ Other]
Road Condition	
Details of Problem	

Vehicle Inspection, Repair History Prior to Occurrence of Malfunction (Including Supplemental Restraint System)	

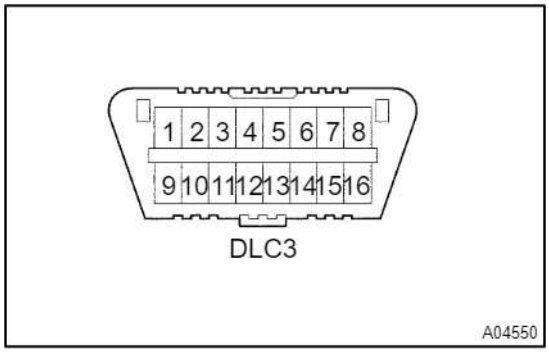
Diagnosis System Inspection

SRS Warning Light Inspection	1st Time	☐ Remains ON ☐ Sometimes Lights Up ☐ Does Not Light Up
	2nd Time	☐ Remains ON ☐ Sometimes Lights Up ☐ Does Not Light Up
DTC Inspection	1st Time	☐ Normal Code ☐ Malfunction Code [Code.]
	2nd Time	☐ Normal Code ☐ Malfunction Code [Code.]

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05A11-02



PRE–CHECK

1. DIAGNOSIS SYSTEM

(a) Check the DLC3.

HINT:

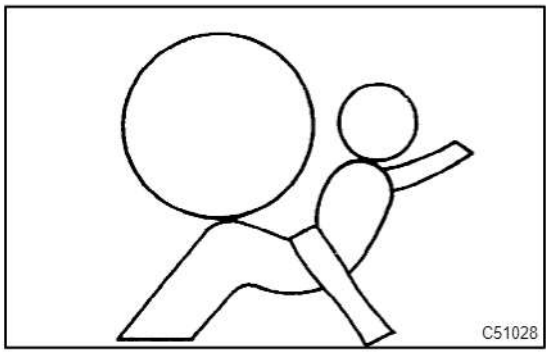
The vehicle's ECM conforms to ISO 9141–2 for communication. The terminal arrangement of the DLC3 complies with SAE J1962 and matches the ISO 9141–2 format.

Terminal No.	Connection/Voltage or Resistance	Condition
7	Bus + Line/Pulse generation	During Transmission
4	Chassis Ground ⇔ Body ground/1 Ω or less	Always
16	Battery Positive ⇔ Body ground/9 – 14 V	Always

HINT:

If the display shows UNABLE TO CONNECT TO VEHICLE when you have connected the cable of the OBD II scan tool or the hand–held tester to the DLC3, turned the ignition switch ON and operated the scan tool, there is a problem on the vehicle side or tool side.

- If communication is normal when the tool is connected to another vehicle, inspect the DLC3 on the original vehicle.
- If communication is still not possible when the tool is connected to another vehicle, the problem is probably in the tool itself, so consult the Service Department listed in the tool's instruction manual.



2. SRS WARNING LIGHT CHECK

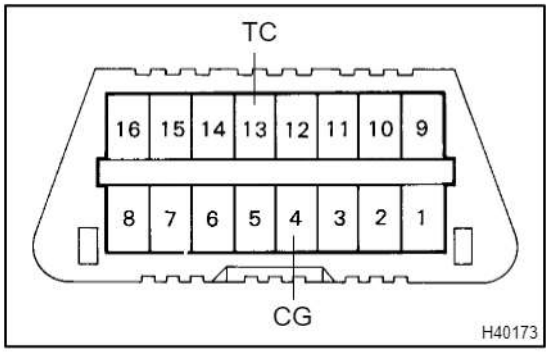
(a) Turn the ignition switch to ON position, and check that the SRS warning light comes on.

(b) Check that the SRS warning light goes out after approx. 6 seconds.

HINT:

- When the ignition switch is ON and the SRS warning light remains on or blinks, the airbag sensor assy center has detected a malfunction code.
- After approx. 6 seconds have elapsed, if the SRS warning light sometimes comes on even when the ignition switch is in LOCK position, short in the SRS warning light circuit or the incompletion of the connector fitting of the airbag sensor assy center may be suspected. Proceed to "SRS warning light circuit malfunction" on page 05–1442 and 05–1445.

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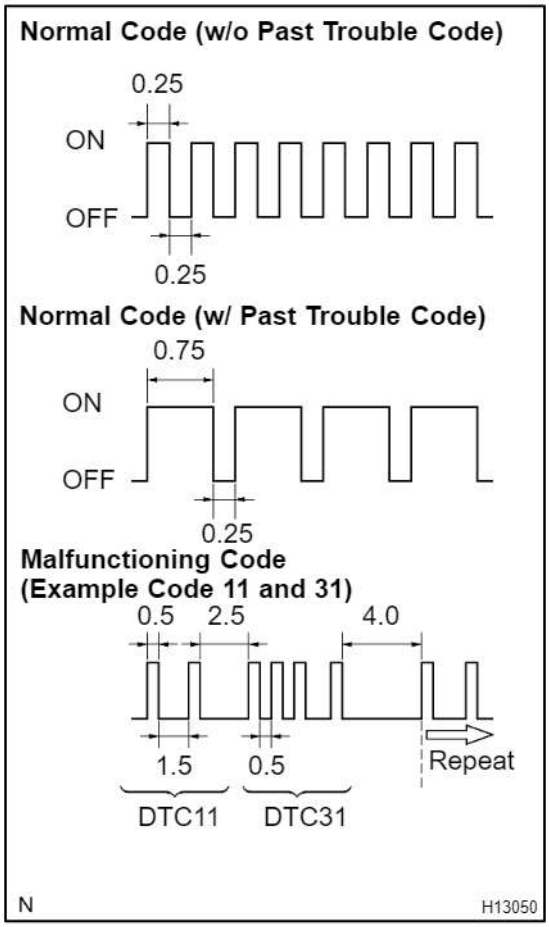
3. DTC CHECK (Using a diagnosis check wire)

(a) Present troubles codes:
Output the DTC.
(1) Turn the ignition switch to ON position, and wait for approx. 60 seconds.
(2) Using SST, connect the terminal TC and terminal CG of the DLC3.
SST 09843–18040

NOTICE:
Pay attention to the terminal connecting position to avoid a malfunction.

(b) Past trouble codes:
Output the DTC.
(1) Using SST, connect the terminal TC and terminal CG of the DLC3.
SST 09843–18040
(2) Turn the ignition switch to ON position, and wait for approx. 60 seconds.

NOTICE:
Pay attention to the terminal connecting position to avoid a malfunction.



(c) Read the DTC.
Read the DTC by counting the blinking times. As an example, the blinking patterns of normal code and malfunctioning codes (code 11 and 31 are) are shown in the illustration.

- Normal code indication (w/o past trouble code)
  The light blinks 2 times per second.
- Normal code indication (w/ past trouble code)
  When the past troubles code is stored in the airbag sensor assembly, the light blinks only once a second.
- Malfunction code indication
  The first blinking indicates the first DTC. Second blinking occurs after 1.5–second of pausing.

If there are 2 or more codes, there will be a 2.5–second pause between each code. After all the codes are shown, there will be a 4.0–second pausing, and they will all be repeated.

HINT:

- If 2 or more malfunctions are found, the indication starts from the smaller numbered code.
- If the light does not blink or come on all, or if DTCs are indicated without a connection of the terminals, proceed to the "TC terminal" circuit inspection on page 05–1447.

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4. DTC CHECK (Using a hand–held tester)

(a) Hook up the hand–held tester to the DLC3.

(b) Read the DTCs by following the prompts on the tester screen.

HINT:

Please refer to the hand–held tester operator's manual for further details.

5. DTC CLEARANCE (Not using a service wire)

(a) When the ignition switch is turned off, the diagnostic trouble code is cleared.

HINT:

Depending on the DTC, the code might not be cleared by turning the ignition switch OFF. In this case, proceed to the next step.

6. DTC CLEARANCE (Using a service wire)

(a) Using SST, connect the terminal TC and terminal CG of the DLC3.
SST 09084–18040

(b) Disconnect the terminal TC of DLC3 within 10 seconds after the DTCs appear, and check if the warning light comes on within 3.0 seconds.

(c) Within 2.0 seconds to 4.0 seconds after the SRS warning light comes on, re–connect the terminal TC and terminal CG of the DLC3.

(d) The SRS warning light goes off 3.0 seconds after re–connecting the terminal TC and terminal CG of the DLC3. Then disconnect the terminal TC of the DLC3 within 2.0 to 4.0 seconds after the SRS warning light goes off.

(e) The SRS warning light comes on within 3.0 seconds after re–disconnecting the terminal TC and terminal CG of the DLC3.

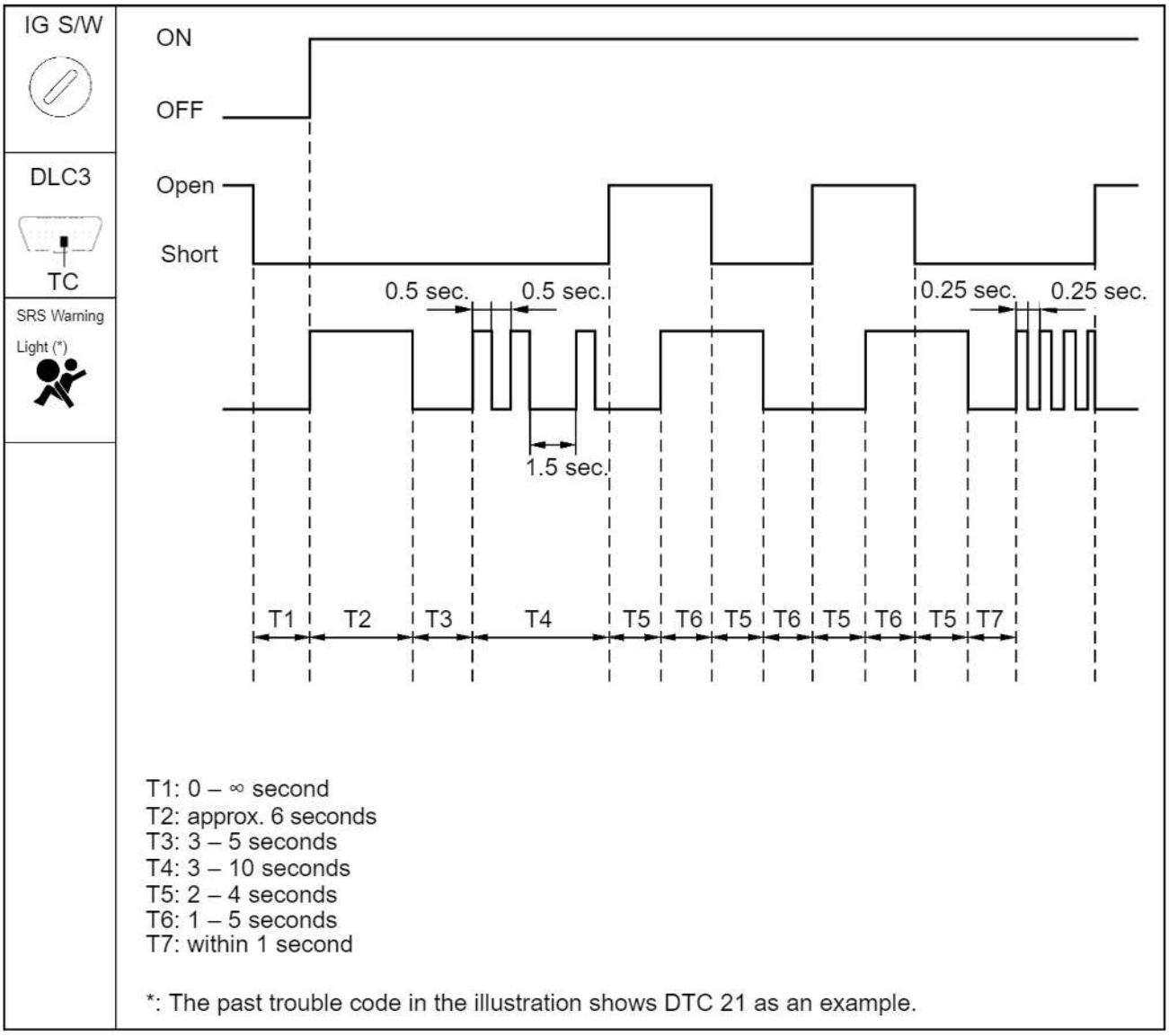
(f) Within 2.0 seconds to 4.0 seconds after the SRS warning light comes on, re–connect the terminal TC and terminal CG of the DLC3.

(g) The SRS warning light goes off 3.0 seconds after reconnecting the terminal TC and terminal CG of the DLC3.

(h) A normal code appears 1.0 second after the SRS warning light goes off.

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If DTCs are not cleared, repeat the above procedure until the codes are cleared.



T1: 0 – ∞ second
T2: approx. 6 seconds
T3: 3 – 5 seconds
T4: 3 – 10 seconds
T5: 2 – 4 seconds
T6: 1 – 5 seconds
T7: within 1 second

*: The past trouble code in the illustration shows DTC 21 as an example.

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7. DTC CLEARANCE (Using a hand–held tester)

(a) Hook up the hand–held tester to the DLC3.

(b) Clear the DTCs by following the prompts on the tester screen.

HINT:

Please refer to the hand–held tester operation's manual for further details.

8. RELEASE METHOD OF AIRBAG ACTIVATION PREVENTION MECHANISM

(a) An airbag activation prevention mechanism is built into the connector for the squib circuit of the SRS. As explained in the troubleshooting later, insert a paper with the same thickness as the male terminal between the terminal and the short spring to release it (Refer to illustrations on next 2 pages).

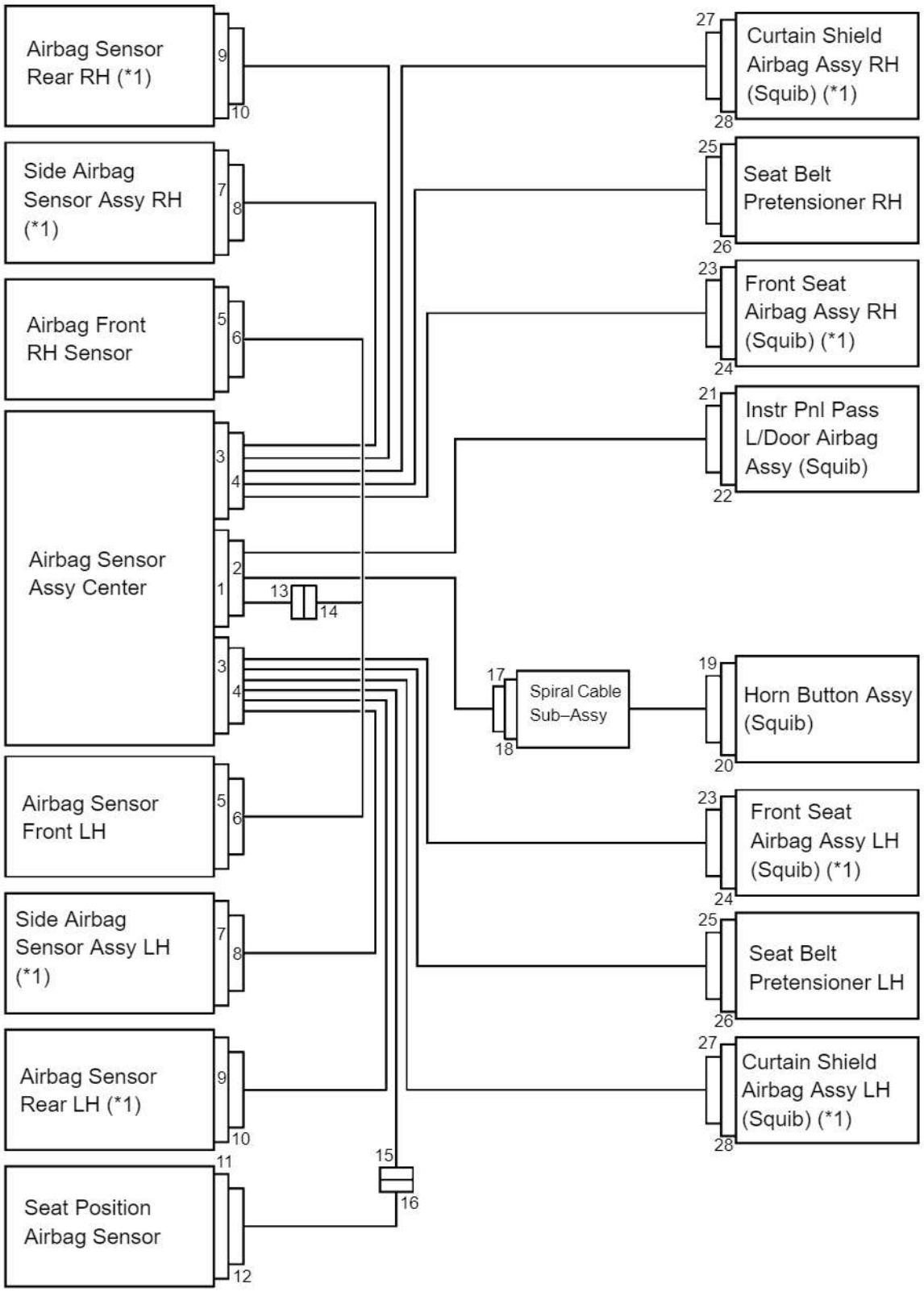
CAUTION:

Never release the airbag activation prevention mechanism on the squib connector.

NOTICE:

- **Do not release the airbag activation prevention mechanism unless specifically directed by the troubleshooting procedure.**
- **To prevent the terminal and the short spring to be damaged, always use a paper with the same thickness as the male terminals.**

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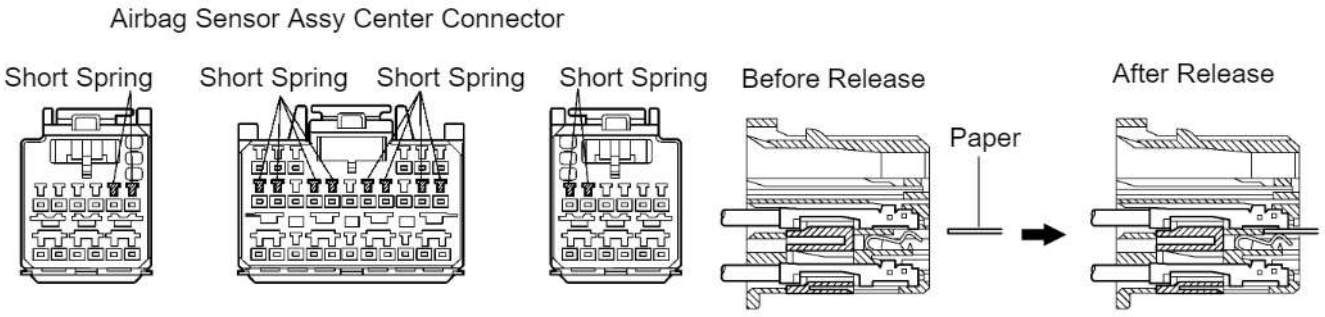


*1: w/ Side Airbag

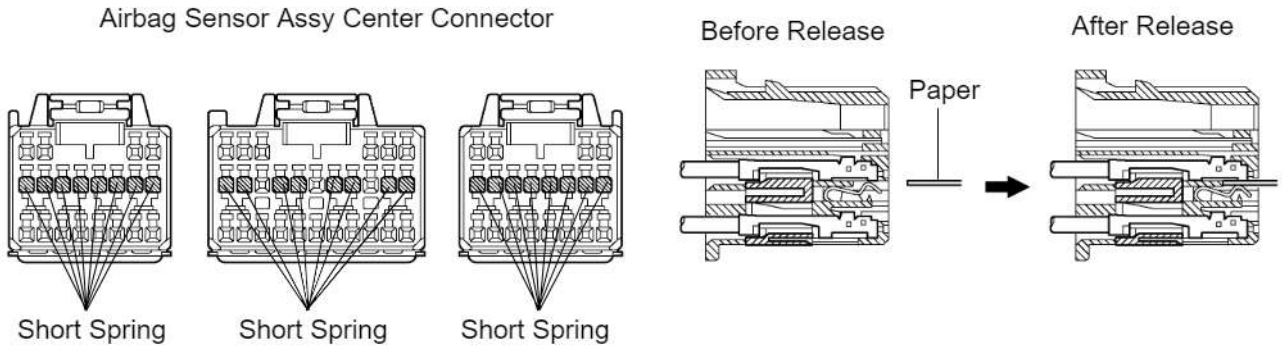
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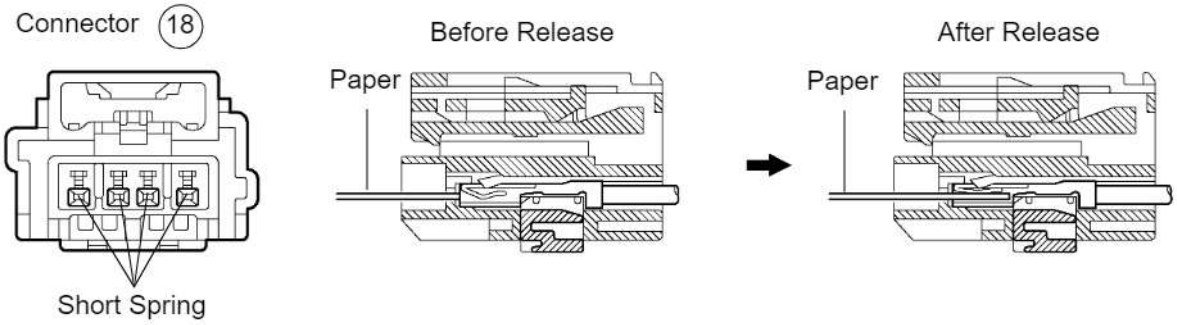
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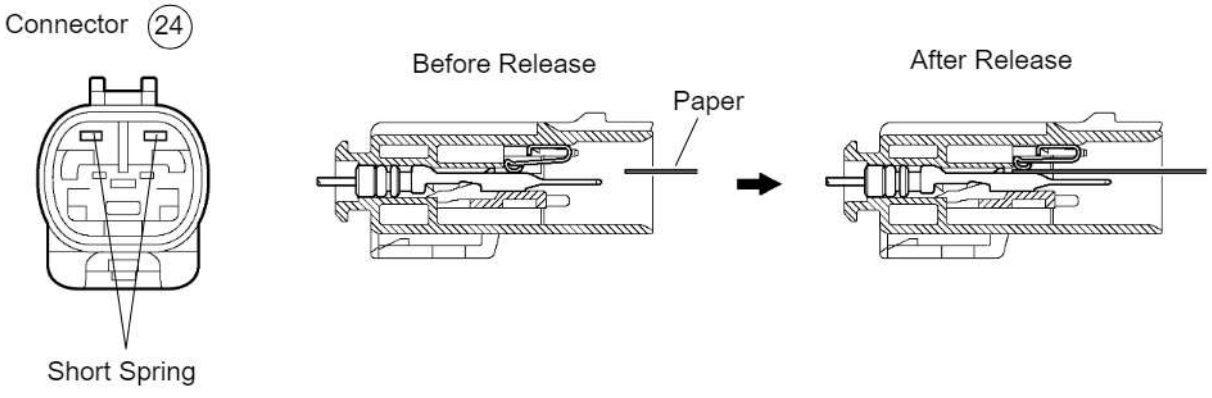
w/o Side Airbag:



w/ Side Airbag:







H42327

Author : Date : 1443

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05259–19

DIAGNOSTIC TROUBLE CODE CHART

DTC No. (See page)	Detection Item	Trouble Area	SRS Warning Light
B0100/13 (05–1254)	□Short in D squib circuit	□Horn button assy (squib) □Spiral cable sub–assy □Airbag sensor assy center □Instrument panel wire	ON
B0101/14 (05–1259)	□Open in D squib circuit	□Horn button assy (squib) □Spiral cable sub–assy □Airbag sensor assy center □Instrument panel wire	ON
B0102/11 (05–1263)	□Short in D squib circuit (to ground)	□Horn button assy (squib) □Spiral cable sub–assy □Airbag sensor assy center □Instrument panel wire	ON
B0103/12 (05–1267)	□Short in D squib circuit (to B+)	□Horn button assy (squib) □Spiral cable sub–assy □Airbag sensor assy center □Instrument panel wire	ON
B0105/53 (05–1271)	□Short in P squib circuit	□Instrument panel passenger airbag assy (squib) □Airbag sensor assy center □Instrument panel wire	ON
B0106/54 (05–1274)	□Open in P squib circuit	□Instrument panel passenger airbag assy (squib) □Airbag sensor assy center □Instrument panel wire	ON
B0107/51 (05–1277)	□Short in P squib circuit (to ground)	□Instrument panel passenger airbag assy (squib) □Airbag sensor assy center □Instrument panel wire	ON
B0108/52 (05–1280)	□Short in P squib circuit (to B+)	□Instrument panel passenger airbag assy (squib) □Airbag sensor assy center □Instrument panel wire	ON
B0110/43 (*1) (05–1283)	□Short in side squib (RH) circuit	□Front seat airbag assembly RH (squib) □Airbag sensor assy center □Floor wire	Blink
B0111/44 (*1) (05–1286)	□Open in side squib (RH) circuit	□Front seat airbag assembly RH (squib) □Airbag sensor assy center □Floor wire	Blink
B0112/41 (*1) (05–1289)	□Short in side squib (RH) circuit (to ground)	□Front seat airbag assembly RH (squib) □Airbag sensor assy center □Floor wire	Blink
B0113/42 (*1) (05–1292)	□Short in side squib (RH) circuit (to B+)	□Front seat airbag assembly RH (squib) □Airbag sensor assy center □Floor wire	Blink
B0115/47 (*1) (05–1295)	□Short in side squib (LH) circuit	□Front seat airbag assembly LH (squib) □Airbag sensor assy center □Floor wire No.2	Blink
B0116/48 (*1) (05–1298)	□Open in side squib (LH) circuit	□Front seat airbag assembly LH (squib) □Airbag sensor assy center □Floor wire No.2	Blink
B0117/45 (*1) (05–1301)	□Short in side squib (LH) circuit (to ground)	□Front seat airbag assembly LH (squib) □Airbag sensor assy center □Floor wire No.2	Blink
B0118/46 (*1) (05–1304)	□Short in side squib (LH) circuit (to B+)	□Front seat airbag assembly LH (squib) □Airbag sensor assy center □Floor wire No.2	Blink
B0126/B0127/27 (05–1307)	□Open in front seat inner belt (LH) circuit □Short in front seat inner belt (LH) circuit	□Front seat inner belt LH □Airbag sensor assy center □Floor wire No.2	ON

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B0130/63 (05–1311)	□Short in P/T squib (RH) circuit	□Seat belt pretensioner RH (squib) □Airbag sensor assy center □Floor wire	Blink
B0131/64 (05–1315)	□Open in P/T squib (RH) circuit	□Seat belt pretensioner RH (squib) □Airbag sensor assy center □Floor wire	Blink
B0132/61 (05–1318)	□Short in P/T squib (RH) circuit (to ground)	□Seat belt pretensioner RH (squib) □Airbag sensor assy center □Floor wire	Blink
B0133/62 (05–1321)	□Short in P/T squib (RH) circuit (to B+)	□Seat belt pretensioner RH (squib) □Airbag sensor assy center □Floor wire	Blink
B0135/73 (05–1324)	□Short in P/T squib (LH) circuit	□Seat belt pretensioner LH (squib) □Airbag sensor assy center □Floor wire No.2	Blink
B0136/74 (05–1328)	□Open in P/T squib (LH) circuit	□Seat belt pretensioner LH (squib) □Airbag sensor assy center □Floor wire No.2	Blink
B0137/71 (05–1331)	□Short in P/T squib (LH) circuit (to ground)	□Seat belt pretensioner LH (squib) □Airbag sensor assy center □Floor wire No.2	Blink
B0138/72 (05–1334)	□Short in P/T squib (LH) circuit (to B+)	□Seat belt pretensioner LH (squib) □Airbag sensor assy center □Floor wire No.2	Blink
B1100/31 (05–1337)	□Airbag sensor assy center malfunction	□Airbag sensor assy center	ON
B1140/32 (*1) (05–1346)	□Side airbag sensor assy (RH) malfunction	□Side airbag sensor assy RH □Airbag sensor assy center □Floor wire	Blink
B1141/33 (*1) (05–1351)	□Side airbag sensor assy (LH) malfunction	□Side airbag sensor assy LH □Airbag sensor assy center □Floor wire No.2	Blink
B1148/36 (05–1356)	□Front airbag sensor (RH) malfunction	□Airbag front RH sensor □Airbag sensor assy center □Instrument panel wire □Engine room main wire	ON
B1149/37 (05–1360)	□Front airbag sensor (LH) malfunction	□Airbag sensor front LH □Airbag sensor assy center □Instrument panel wire □Engine room main wire	ON
B1153/25 (05–1364)	□Seat position sensor malfunction □Short in seat position sensor circuit (to ground and to B+)	□Seat position sensor □Airbag sensor assy center □Floor wire No.2 □Front seat wire No.2	ON
B1154/38 (05–1370)	□Airbag sensor rear (RH) malfunction	□Airbag sensor rear RH □Airbag sensor assy center □Floor wire	Blink
B1155/39 (05–1375)	□Airbag sensor rear (LH) malfunction	□Airbag sensor rear LH □Airbag sensor assy center □Floor wire No.2	Blink
B1160/83 (*1) (05–1380)	□Short in curtain shield squib (RH) circuit	□Curtain shield airbag assy RH (squib) □Airbag sensor assy center □Floor wire	Blink
B1161/84 (*1) (05–1384)	□Open in curtain shield squib (RH) circuit	□Curtain shield airbag assy RH (squib) □Airbag sensor assy center □Floor wire	Blink
B1162/81 (*1) (05–1387)	□Short in curtain shield squib (RH) circuit (to ground)	□Curtain shield airbag assy RH (squib) □Airbag sensor assy center □Floor wire	Blink

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B1163/82 (*1) (05–1390)	□Short in curtain shield squib (RH) circuit (to B+)	□Curtain shield airbag assy RH (squib) □Airbag sensor assy center □Floor wire	Blink
B1165/87 (*1) (05–1393)	□Short in curtain shield squib (LH) circuit	□Curtain shield airbag assy LH (squib) □Airbag sensor assy center □Floor wire No.2	Blink
B1166/88 (*1) (05–1397)	□Open in curtain shield squib (LH) circuit	□Curtain shield airbag assy LH (squib) □Airbag sensor assy center □Floor wire No.2	Blink
B1167/85 (*1) (05–1400)	□Short in curtain shield squib (LH) circuit (to ground)	□Curtain shield airbag assy LH (squib) □Airbag sensor assy center □Floor wire No.2	Blink
B1168/86 (*1) (05–1403)	□Short in curtain shield squib (LH) circuit (to B+)	□Curtain shield airbag assy LH (squib) □Airbag sensor assy center □Floor wire No.2	Blink
B1180/17 (05–1406)	□Short in D squib (2nd step) circuit	□Horn button assy (squib (2nd step)) □Spiral cable sub–assy □Airbag sensor assy center □Instrument panel wire	ON
B1181/18 (05–1410)	□Open in D squib (2nd step) circuit	□Horn button assy (squib (2nd step)) □Spiral cable sub–assy □Airbag sensor assy center □Instrument panel wire	ON
B1182/19 (05–1414)	□Short in D squib (2nd step) circuit (to ground)	□Horn button assy (squib (2nd step)) □Spiral cable sub–assy □Airbag sensor assy center □Instrument panel wire	ON
B1183/22 (05–1418)	□Short in D squib (2nd step) circuit (to B+)	□Horn button assy (squib (2nd step)) □Spiral cable sub–assy □Airbag sensor assy center □Instrument panel wire	ON
B1185/57 (05–1422)	□Short in P squib (2nd step) circuit	□Instrument panel passenger airbag assy (squib (2nd step)) □Airbag sensor assy center □Instrument panel wire	ON
B1186/58 (05–1425)	□Open in P squib (2nd step) circuit	□Instrument panel passenger airbag assy (squib (2nd step)) □Airbag sensor assy center □Instrument panel wire	ON
B1187/55 (05–1428)	□Short in P squib (2nd step) circuit (to ground)	□Instrument panel passenger airbag assy (squib (2nd step)) □Airbag sensor assy center □Instrument panel wire	ON
B1188/56 (05–1431)	□Short in P squib (2nd step) circuit (to B+)	□Instrument panel passenger airbag assy (squib (2nd step)) □Airbag sensor assy center □Instrument panel wire	ON
B1628/29 (05–1434)	□RSCA off indicator malfunction	□Combination meter assy (RSCA off indicator) □Airbag sensor assy center □Instrument panel wire	Blink
Normal (05–1439)	□System normal	–	OFF
	□Voltage source drop	□Battery □Airbag sensor assy center	ON

*1: w/ Side Airbag

HINT:

- □ When the SRS warning light remains lit up and the DTC is the normal code, a voltage source drop is possible.
  This malfunction is not stored in memory by the airbag sensor assy center and if the power source voltage returns to normal, the SRS warning light will automatically go out.
- □ When 2 or more codes are indicated, smaller numbered code will be shown first.
- □ If a code not listed on the chart is displayed, the airbag sensor assy center is at fault.

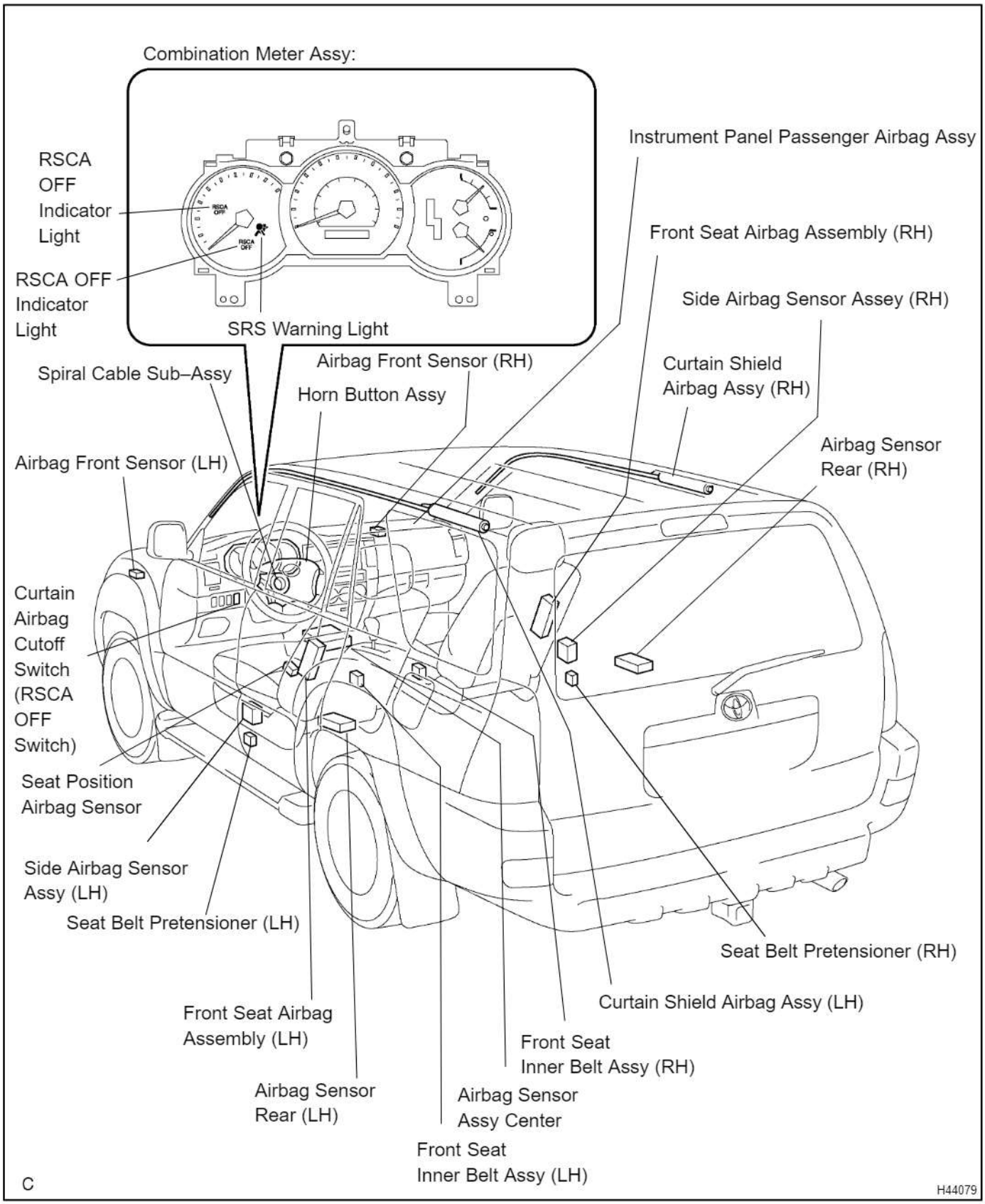
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□ In the case of any malfunction concerning open circuit, ground short, or B+ short due to squib, another malfunction code may not be detected. In this case, correct the malfunction currently indicated and then perform malfunction diagnosis again. Another malfunction code may then be detected.

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0525A–18

LOCATION

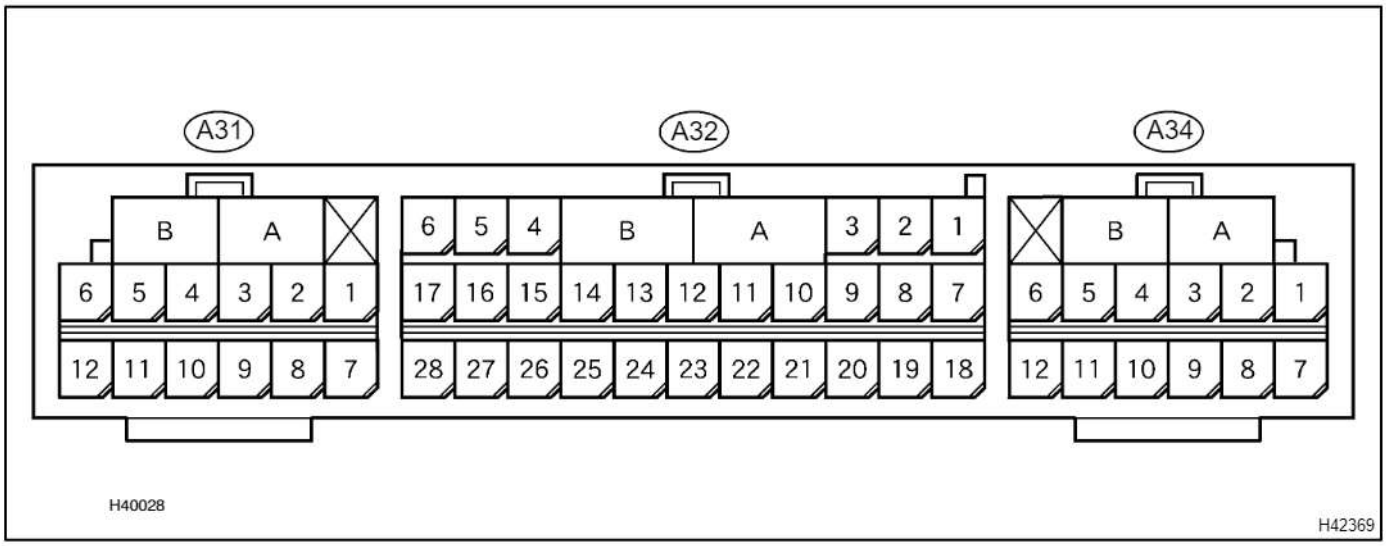


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05A12-02

TERMINALS OF ECU

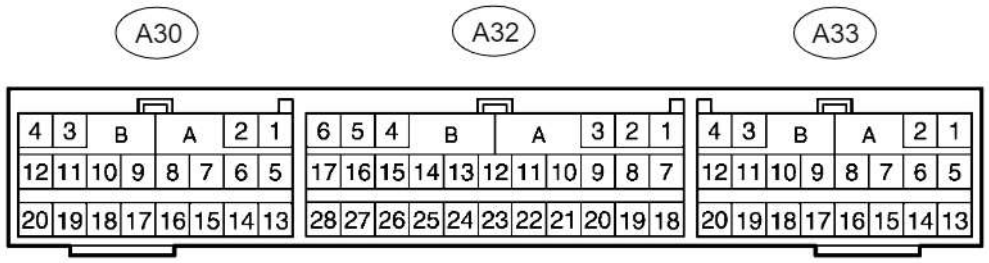
w/o Side Airbag:



Terminal No.	Symbol	Terminal Name
A	–	Electrical Connector Check Mechanism
B	–	Electrical Connector Check Mechanism
A32–3	LA	SRS Warning Light
A32–5	IG2	Power Source (SRS Fuse)
A32–7	P2–	Squib (Passenger, 2nd step)
A32–8	P2+	Squib (Passenger, 2nd step)
A32–9	+SR	Front Airbag Sensor RH
A32–10	P+	Squib (Passenger)
A32–11	P–	Squib (Passenger)
A32–12	SIL	Diagnosis
A32–13	D–	Squib (Driver)
A32–14	D+	Squib (Driver)
A32–15	+SL	Front Airbag Sensor LH
A32–16	D2+	Squib (Driver, 2nd step)
A32–17	D2–	Squib (Driver, 2nd step)
A32–19	TC	Diagnosis
A32–20	–SR	Front Airbag sensor LH
A32–23	GSW2	ECM
A32–26	–SL	Front Airbag Sensor LH
A32–27	E1	Ground
A32–28	E2	Ground
A31–1	PL–	Squib (Seat Belt Pretensioner, LH)
A31–2	PL+	Squib (Seat Belt Pretensioner, LH)
A31–3	LSP+	Seat Position Sensor
A31–8	LSP–	Seat Position Sensor
A31–11	LBE+	Seat Belt Buckle Switch LH
A34–5	PR+	Squib (Seat Belt Pretensioner, RH)
A34–6	PR–	Squib (Seat Belt Pretensioner, RH)

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w/ Side Airbag:



P H40533

No.	Symbol	Terminal Name
A	–	Electrical Connector Check Mechanism
B	–	Electrical Connector Check Mechanism
A32–3	LA	SRS Warning Light
A32–5	IG2	Power Source (SRS Fuse)
A32–6	RMIL	RSCA Off Indicator Light
A32–7	P2–	Squib (Passenger, 2nd step)
A32–8	P2+	Squib (Passenger, 2nd step)
A32–9	+SR	Airbag Front RH Sensor
A32–10	P+	Squib (Passenger)
A32–11	P–	Squib (Passenger)
A32–12	SIL	Diagnosis
A32–13	D–	Squib (Driver)
A32–14	D+	Squib (Driver)
A32–15	+SL	Airbag Sensor Front LH
A32–16	D2+	Squib (Driver, 2nd step)
A32–17	D2–	Squib (Driver, 2nd step)
A32–19	TC	Diagnosis
A32–20	–SR	Airbag Front RH Sensor
A32–21	RMSW	Curtain Airbag Cutoff Switch
A32–23	GSW2	ECM
A32–26	–SL	Airbag Sensor Front LH
A32–27	E1	Ground
A32–28	E2	Ground
A30–1	CSL–	Airbag Sensor Rear LH
A30–3	LSP–	Seat Position Sensor
A30–4	LSP+	Seat Position Sensor
A30–7	PL–	Squib (Seat Belt Pretensioner, LH)
A30–8	PL+	Squib (Seat Belt Pretensioner, LH)
A30–9	ICL+	Squib (Curtain Shield Airbag Assy, LH)
A30–10	ICL–	Squib (Curtain Shield Airbag Assy, LH)
A30–11	SFL–	Squib (Side Airbag Assy, LH)
A30–12	SFL+	Squib (Side Airbag Assy, LH)
A30–13	ESCL	Airbag Sensor Rear LH
A30–14	VUCL	Airbag Sensor Rear LH

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No.	Symbol	Terminal Name
A30–15	CSL+	Airbag Sensor Rear LH
A30–16	VUPL	Side Airbag Sensor Assy LH
A30–17	SSL+	Side Airbag Sensor Assy LH
A30–18	ESL	Side Airbag Sensor Assy LH
A30–19	LBE+	Seat Belt Buckle Switch LH
A30–20	SSL–	Side Airbag Sensor Assy LH
A33–4	CSR–	Airbag Sensor Rear RH
A33–5	SFR+	Squib (Side Airbag Assy, RH)
A33–6	SFR–	Squib (Side Airbag Assy, RH)
A33–7	ICR–	Squib (Curtain Shield Airbag Assy, RH)
A33–8	ICR+	Squib (Curtain Shield Airbag Assy, RH)
A33–9	PR+	Squib (Seat Belt Pretensioner, RH)
A33–10	PR–	Squib (Seat Belt Pretensioner, RH)
A33–13	SSR–	Side Airbag Sensor Assy RH
A33–15	ESR	Side Airbag Sensor Assy RH
A33–16	SSR+	Side Airbag Sensor Assy RH
A33–17	VUPR	Side Airbag Sensor Assy RH
A33–18	CSR+	Airbag Sensor Rear RH
A33–19	VUCR	Airbag Sensor Rear RH
A33–20	ESCR	Airbag Sensor Rear RH

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0525C–18

PROBLEM SYMPTOMS TABLE

HINT:

Proceed with troubleshooting of each circuit in the table below.

Symptom	Suspect Area	See page
□When the ignition switch in ACC or ON position, the SRS warning light sometimes lights up after approx. 6 seconds have elapsed.	□SRS warning light circuit malfunction (Always lights up, when ignition switch is LOCK position).	05–1442
□SRS warning light is always lit up even when ignition switch is in the LOCK position.		
□With the ignition switch in ACC or ON position, the SRS warning light does not light up.	□SRS warning light circuit malfunction (Does not light up, when ignition switch is turned to ACC or ON).	05–1445
□DTC is not displayed.	□TC terminal circuit	05–1447
□SRS warning light is always lit up at the time of DTC check procedure.		
□DTC is displayed without TC and CG terminal connection.		

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DTC B0100/13 SHORT IN D SQUIB CIRCUIT

CIRCUIT DESCRIPTION

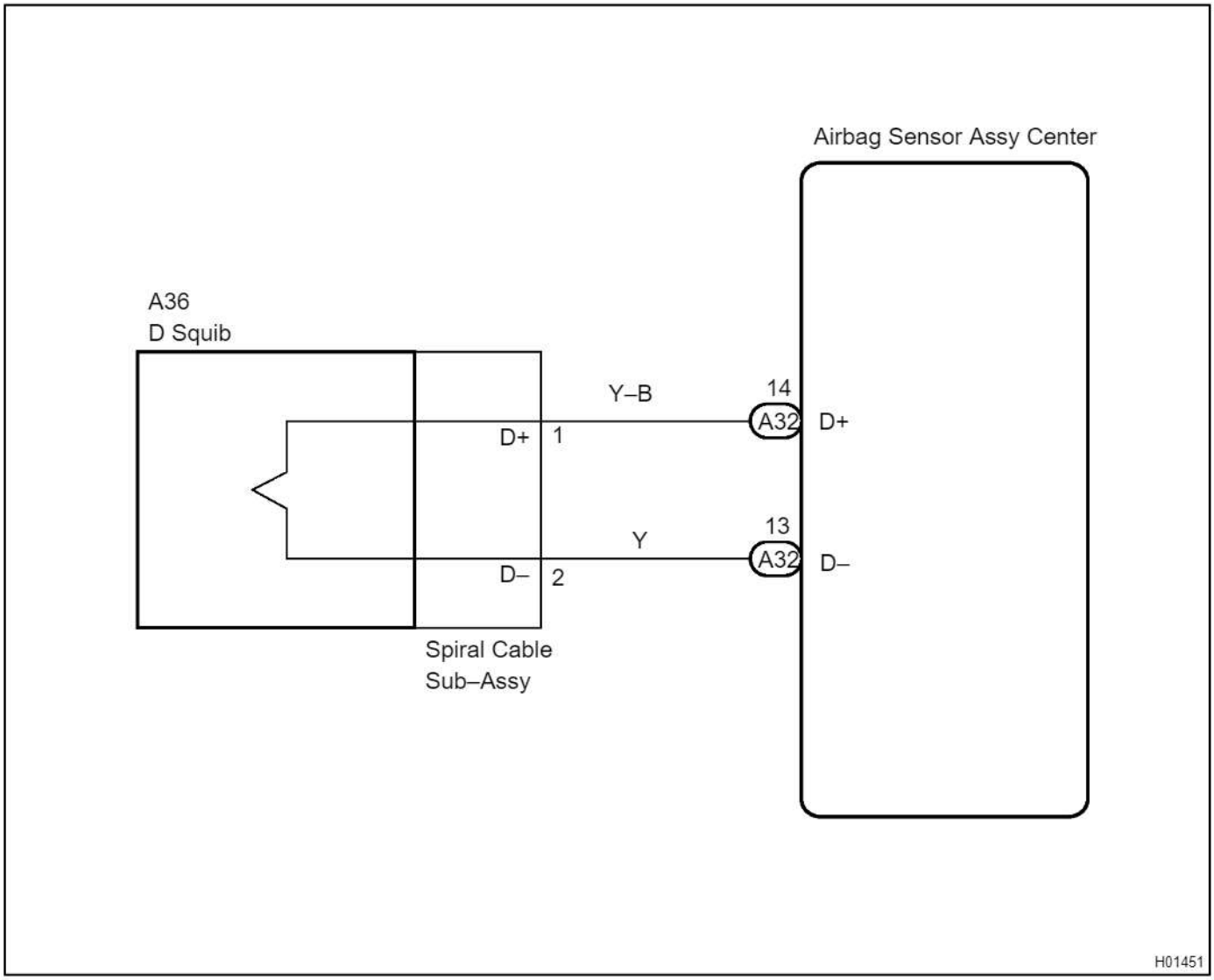
The D squib circuit consists of the airbag sensor assy center, the spiral cable sub–assy and the horn button assy.

It causes the SRS to deploy when the SRS deployment conditions are satisfied.

DTC B0100/13 is recorded when a short is detected in the D squib circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B0100/13	□Short in D squib circuit □D squib malfunction □Spiral cable sub–assy malfunction □Airbag sensor assy center malfunction	□Horn button assy (D squib) □Spiral cable sub–assy □Airbag sensor assy center □Instrument panel wire

WIRING DIAGRAM



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INSPECTION PROCEDURE

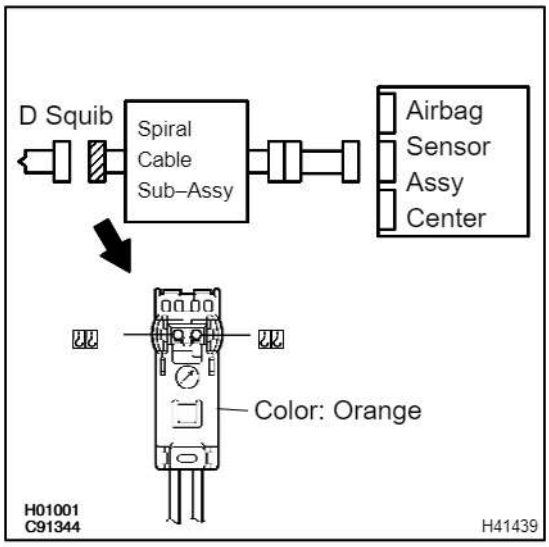
1	CHECK CONNECTOR

(a) Make sure that the connector is not damaged.
OK:
The lock button is not disengaged, or the claw of the lock is not deformed or damaged.

NG → **REPLACE SPIRAL CABLE SUB–ASSY**

OK

2	CHECK D SQUIB CIRCUIT(AIRBAG SENSOR ASSY CENTER – HORN BUTTON ASSY)



(a) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(b) Disconnect the connectors between the airbag sensor assy center and the horn button assy.
(c) Release the airbag activation prevention mechanism built in the connector on the airbag sensor assy center side between the airbag sensor assy center and the spiral cable sub–assy (See page 05–1238).
(d) Measure the resistance between the D+ and D– of the connector on the horn button assy side between the airbag sensor assy center and the horn button assy.
OK:
Resistance: 1 MΩ or Higher

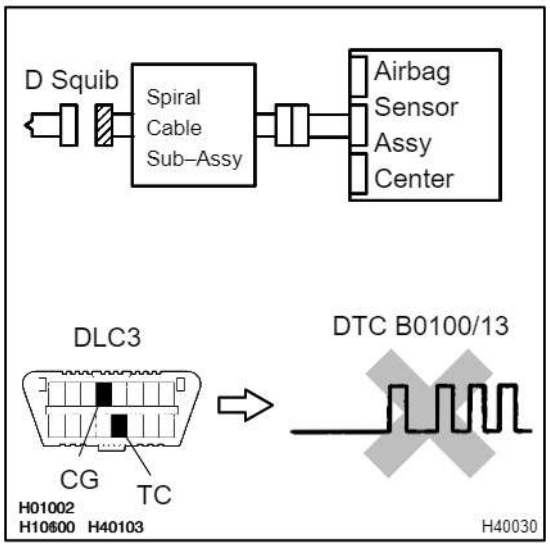
NG → **Go to step 5**

OK

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3 CHECK AIR BAG SENSOR ASSY CENTER

SST 09843–18040



(a) Connect the connector to the airbag sensor assy center.
(b) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(c) Turn the ignition switch to ON, and wait at least for 10 seconds.
(d) Clear the DTC stored in memory (See page 05–1238).
(e) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(f) Turn the ignition switch to ON, and wait at least for 10 seconds.
(g) Check the DTC (See page 05–1238).

OK:

DTC B0100/13 is not output.

HINT:

Codes other than code B0100/13 may be output at this time, but they are not relevant to this check.

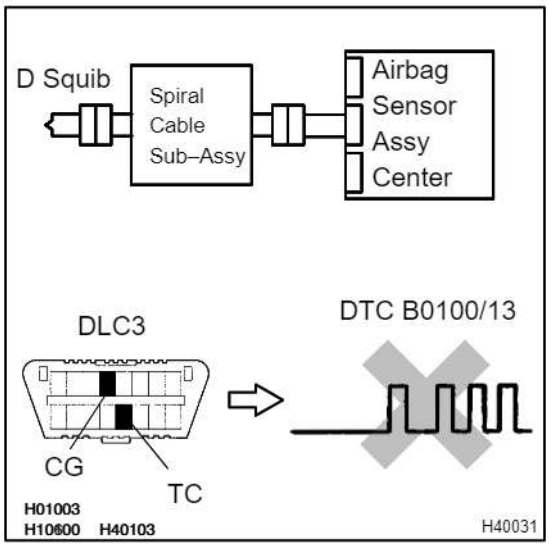
NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

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4 CHECK D SQUIB

SST 09843–18040



(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the horn button assy connectors.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(e) Turn the ignition switch to ON, and wait at least for 10 seconds.
(f) Clear the DTC stored in memory (See page 05–1238).
(g) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(h) Turn the ignition switch to ON, and wait at least for 10 seconds.
(i) Check the DTC (See page 05–1238).

OK:

DTC B0100/13 is not output.

HINT:

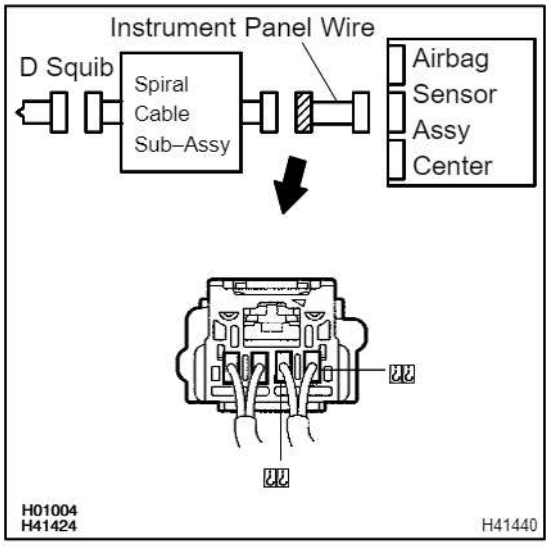
Codes other than code B0100/13 may be output at this time, but they are not relevant to this check.

NG → **REPLACE HORN BUTTON ASSY**

OK

USE SIMULATION METHOD TO CHECK

5 CHECK INSTRUMENT PANEL WIRE



(a) Disconnect the connector of the instrument panel wire.
(b) Release the airbag activation prevention mechanism built in the connector of the instrument panel wire on the airbag sensor assy center side (See page 05–1238).
(c) Measure the resistance between D+ and D– of the instrument panel wire connector on the spiral cable sub–assy side.

OK:

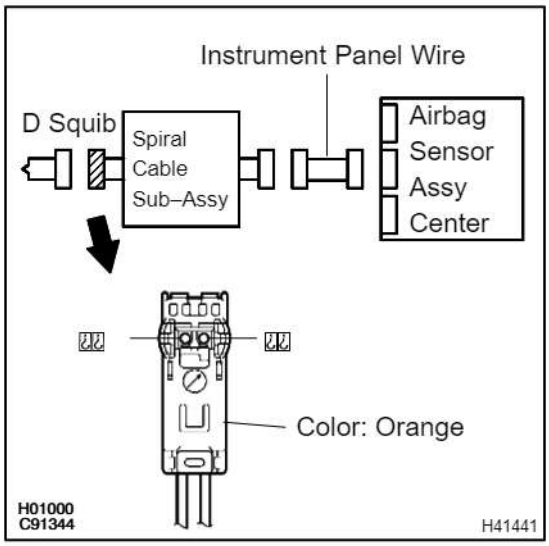
Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE INSTRUMENT PANEL WIRE**

OK

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6 CHECK SPIRAL CABLE SUB–ASSY



(a) Release the airbag activation prevention mechanism built in the spiral cable sub–assy connector on the airbag sensor assy center side (See page 05–1238).

(b) Measure the resistance between D+ and D– of the orange spiral cable sub–assy connector on the horn button assy side.

OK:

Resistance: 1 MΩ or Higher

NG → **REPLACE SPIRAL CABLE SUB–ASSY**

OK

USE SIMULATION METHOD TO CHECK

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DTC B0101/14 OPEN IN D SQUIB CIRCUIT

CIRCUIT DESCRIPTION

The D squib circuit consists of the airbag sensor assy center, the spiral cable sub–assy and the horn button assy.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
DTC B0101/14 is recorded when an open is detected in the D squib circuit.

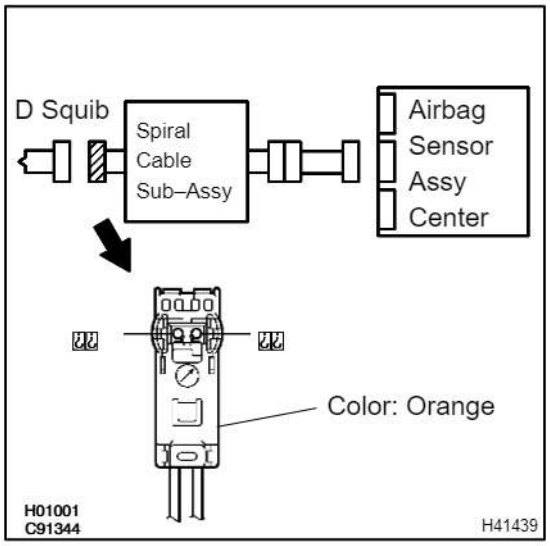
DTC No.	DTC Detecting Condition	Trouble Area
B0101/14	□Open in D squib circuit □D squib malfunction □Spiral cable sub–assy malfunction □Airbag sensor assy center malfunction	□Horn button assy (D squib) □Spiral cable sub–assy □Airbag sensor assy center □Instrument panel wire

WIRING DIAGRAM

See page 05–1254.

INSPECTION PROCEDURE

1	CHECK D SQUIB CIRCUIT(AIRBAG SENSOR ASSY CENTER – HORN BUTTON ASSY)



(a) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(b) Disconnect the connectors between the airbag sensor assy center and the horn button assy.
(c) Measure the resistance between D+ and D– of the connector on the horn button assy side between the airbag sensor assy center and the horn button assy.
OK:
Resistance: Below 1 Ω

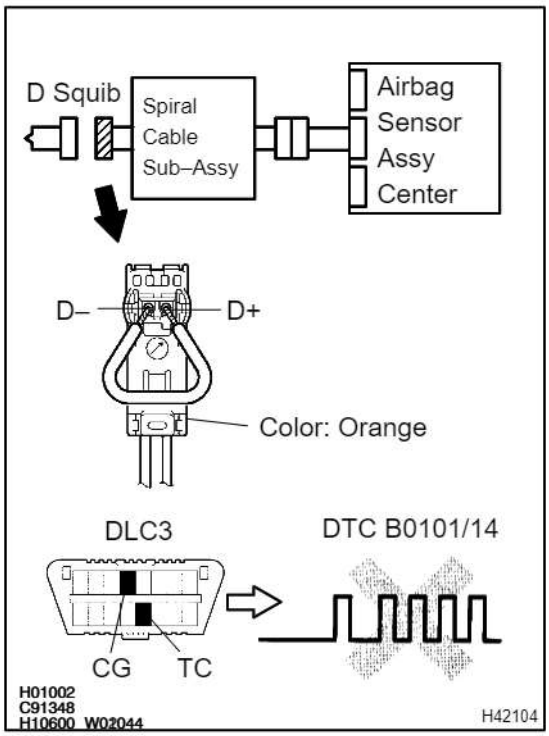
NG → **Go to step 4**

OK

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2 CHECK AIR BAG SENSOR ASSY CENTER

SST 09843–18040



(a) Connect the connector to the airbag sensor assy center.
(b) Using a service wire, connect D+ and D– of the orange connector on the horn button assy side between the horn button assy and the airbag sensor assy center.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Clear the DTC stored in memory (See page 05–1238).
(f) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(g) Turn the ignition switch to ON, and wait at least for 10 seconds.
(h) Check the DTC (See page 05–1238).

OK:

DTC B0101/14 is not output.

HINT:

Codes other than code B0101/14 may be output at this time, but they are not relevant to this check.

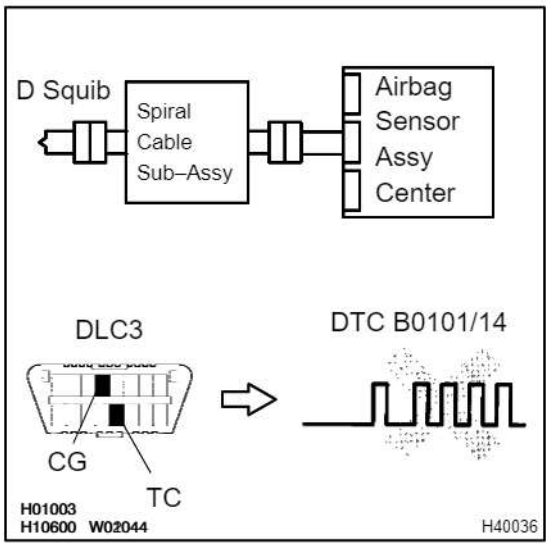
NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

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3	CHECK D SQUIB

SST 09843–18040



(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the horn button assy connectors.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(e) Turn the ignition switch to ON, and wait at least for 10 seconds.
(f) Clear the DTC stored in memory (See page 05–1238).
(g) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(h) Turn the ignition switch to ON, and wait at least for 10 seconds.
(i) Check the DTC (See page 05–1238).

OK:

DTC B0101/14 is not output.

HINT:

Codes other than code B0101/14 may be output at this time, but they are not relevant to this check.

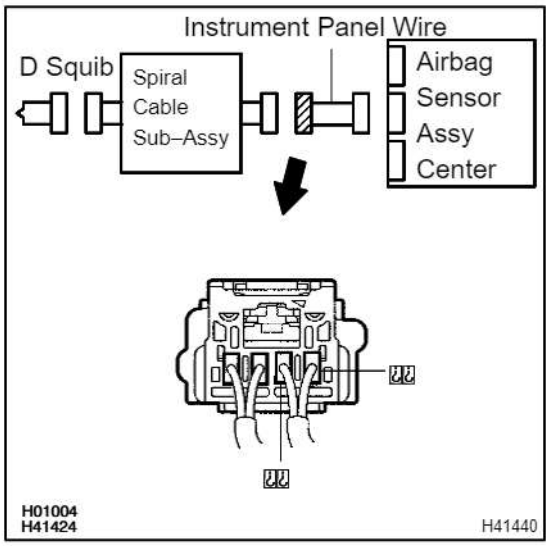
NG → **REPLACE HORN BUTTON ASSY**

OK →

USE SIMULATION METHOD TO CHECK

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4 CHECK INSTRUMENT PANEL WIRE



(a) Disconnect the spiral cable sub–assy connector from the instrument panel wire.

(b) Measure the resistance between D+ and D– of the instrument panel wire connector on the spiral cable sub–assy side.

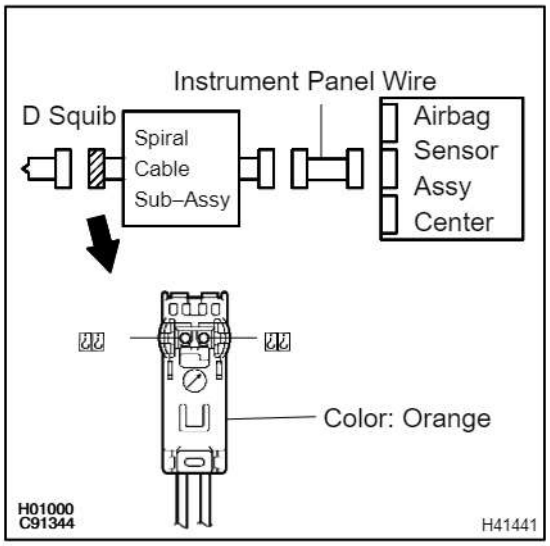
OK:

Resistance: Below 1 Ω

NG	REPAIR OR REPLACE INSTRUMENT PANEL WIRE

OK

5 CHECK SPIRAL CABLE SUB–ASSY



(a) Measure the resistance between D+ and D– of the orange spiral cable sub–assy connector on the horn button assy.

OK:

Resistance: Below 1 Ω

NG	REPLACE SPIRAL CABLE SUB–ASSY

OK

USE SIMULATION METHOD TO CHECK

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DTC B0102/11 SHORT IN D SQUIB CIRCUIT (TO GROUND)

CIRCUIT DESCRIPTION

The D squib circuit consists of the airbag sensor assy center, the spiral cable sub–assy and the horn button assy.

It causes the SRS to deploy when the SRS deployment conditions are satisfied.

DTC B0102/11 is recorded when a ground short is detected in the D squib circuit.

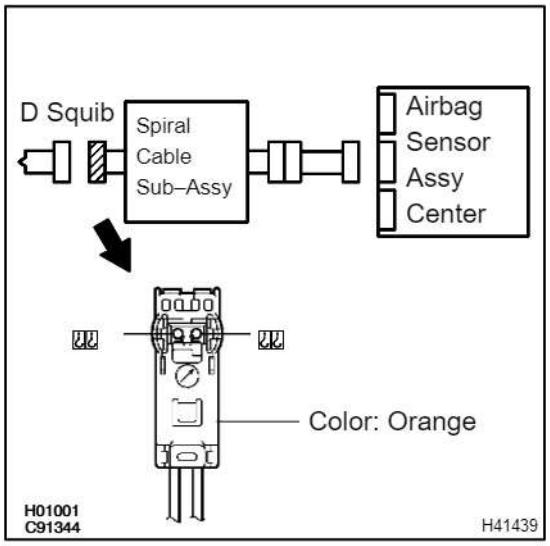
DTC No.	DTC Detecting Condition	Trouble Area
B0102/11	□Short in D squib circuit (to ground) □D squib malfunction □Spiral cable sub–assy malfunction □Airbag sensor assy center malfunction	□Horn button assy (D squib) □Spiral cable sub–assy □Airbag sensor assy center □Instrument panel wire

WIRING DIAGRAM

See page 05–1254.

INSPECTION PROCEDURE

1	CHECK D SQUIB CIRCUIT(AIRBAG SENSOR ASSY CENTER – HORN BUTTON ASSY)



(a) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.

(b) Disconnect the connectors between the airbag sensor assy center and the horn button assy.

(c) Measure the resistance between the body ground and D+ of the connector on the horn button assy side between the airbag sensor assy center and the horn button assy.

OK:

Resistance: 1 MΩ or Higher

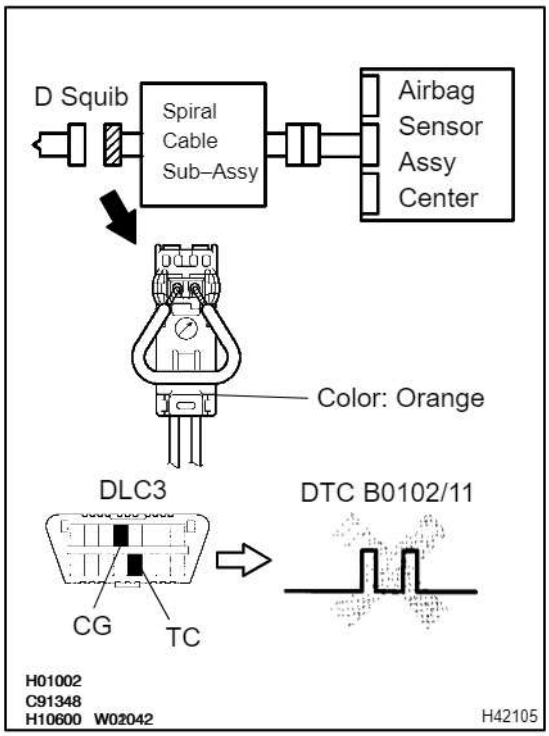
NG → **Go to step 5**

OK

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2 CHECK AIR BAG SENSOR ASSY CENTER

SST 09843–18040



(a) Connect the connector to the airbag sensor assy center.
(b) Using a service wire, connect D+ and D– of the orange connector on the horn button assy side between the horn button assy and the airbag sensor assy center.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(d) Turn the ignition switch to ON, and wait t least for 10 seconds.
(e) Clear the DTC stored in memory (See page 05–1238).
(f) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(g) Turn the ignition switch to ON, and wait at least for 10 seconds.
(h) Check the DTC (See page 05–1238).

OK:

DTC B0102/11 is not output.

HINT:

Codes other than code B0102/11 may be output at this time, but they are not relevant to this check.

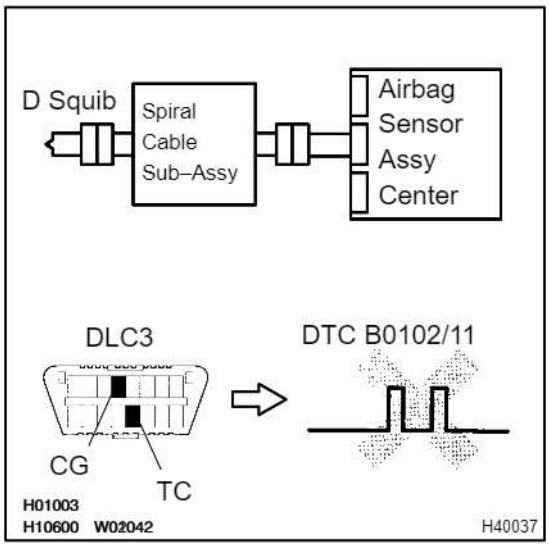
NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

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3	CHECK D SQUIB

SST 09843–18040



(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the horn button assy connectors.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(e) Turn the ignition switch to ON, and wait at least for 10 seconds.
(f) Clear the DTC stored in memory (See page 05–1238).
(g) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(h) Turn the ignition switch to ON, and wait at least for 10 seconds.
(i) Check the DTC (See page 05–1238).

OK:

DTC B0102/11 is not output.

HINT:

Codes other than code B0102/11 may be output at this time, but they are not relevant to this check.

NG → **REPLACE HORN BUTTON ASSY**

OK

4	USE SIMULATION METHOD TO CHECK

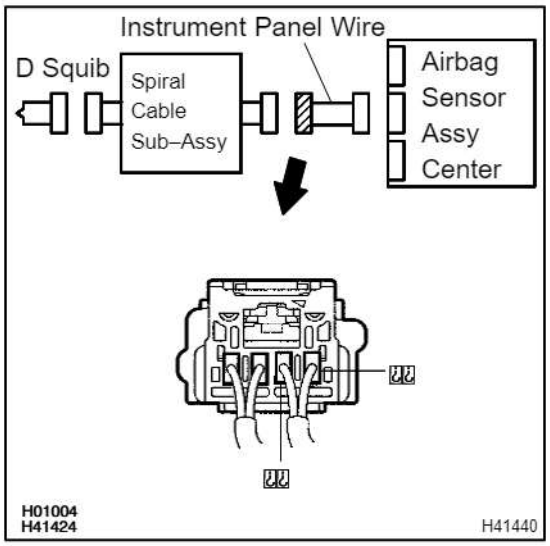
NG → **Go to step 1**

OK

REPLACE ALL SRS COMPONENTS INCLUDING WIRE HARNESS

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5 CHECK INSTRUMENT PANEL WIRE



(a) Disconnect the spiral cable sub–assy connector from the instrument panel wire.

(b) Measure the resistance between the body ground and D+ of the instrument panel wire connector on the spiral cable sub–assy side.

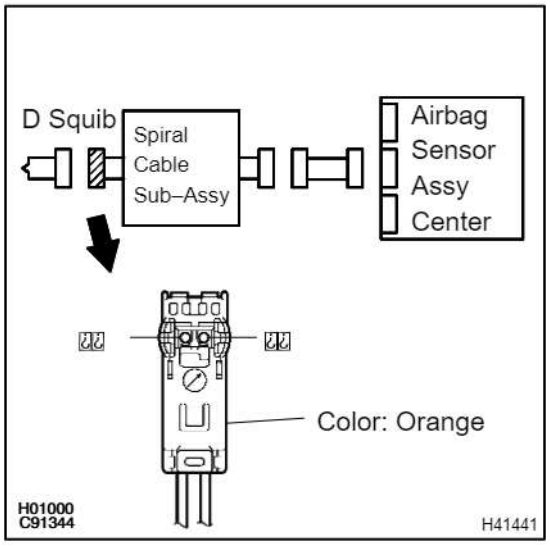
OK:

Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE INSTRUMENT PANEL WIRE**

OK

6 CHECK SPIRAL CABLE SUB–ASSY



(a) Measure the resistance between the body ground and D+ of the orange spiral cable sub–assy connector on the horn button assy side.

OK:

Resistance: 1 MΩ or Higher

NG → **REPLACE SPIRAL CABLE SUB–ASSY**

OK

7 USE SIMULATION METHOD TO CHECK

NG → **Go to step 1**

OK

REPLACE ALL SRS COMPONENTS INCLUDING WIRE HARNESS

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DTC B0103/12 SHORT IN D SQUIB CIRCUIT (TO B+)

CIRCUIT DESCRIPTION

The D squib circuit consists of the airbag sensor assy center, the spiral cable sub–assy and the horn button assy.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
DTC B0103/12 is recorded when a B+ short is detected in the D squib circuit.

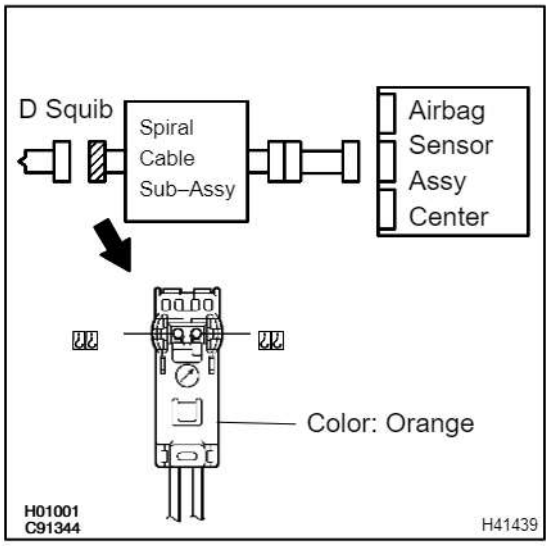
DTC No.	DTC Detecting Condition	Trouble Area
B0103/12	□Short in D squib circuit (to B+) □D squib malfunction □Spiral cable sub–assy malfunction □Airbag sensor assy center malfunction	□Horn button assy (D squib) □Spiral cable sub–assy □Airbag sensor assy center □Instrument panel wire

WIRING DIAGRAM

See page 05–1254.

INSPECTION PROCEDURE

1	CHECK D SQUIB CIRCUIT(AIRBAG SENSOR ASSY CENTER – HORN BUTTON ASSY)



(a) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(b) Disconnect the connectors between the airbag sensor assy center and the horn button assy.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(d) Turn the ignition switch to ON.
(e) Measure the voltage between the body ground and D+ of the connector on the horn button assy side between the airbag sensor assy center and the horn button assy.
OK:
Voltage: Below 1 V

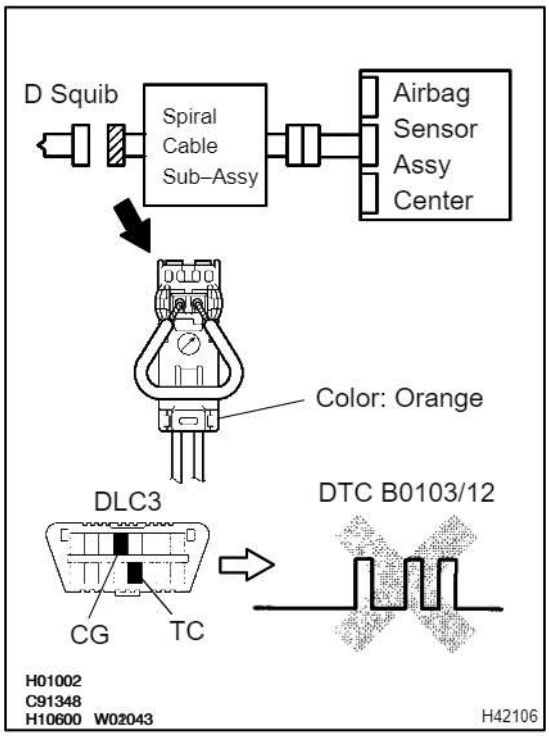
NG → **Go to step 5**

OK

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2 CHECK AIR BAG SENSOR ASSY CENTER

SST 09843–18040



(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the connector to the airbag sensor assy center.
(d) Using a service wire, connect D+ and D– of the orange connector on the horn button assy side between the horn button assy and the airbag sensor assy center.
(e) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(f) Turn the ignition switch to ON, and wait at least for 10 seconds.
(g) Clear the DTC stored in memory (See page 05–1238).
(h) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(i) Turn the ignition switch to ON, and wait at least for 10 seconds.
(j) Check the DTC (See page 05–1238).

OK:

DTC B0103/12 is not output.

HINT:

Codes other than code B0103/12 may be output at this time, but they are not relevant to this check.

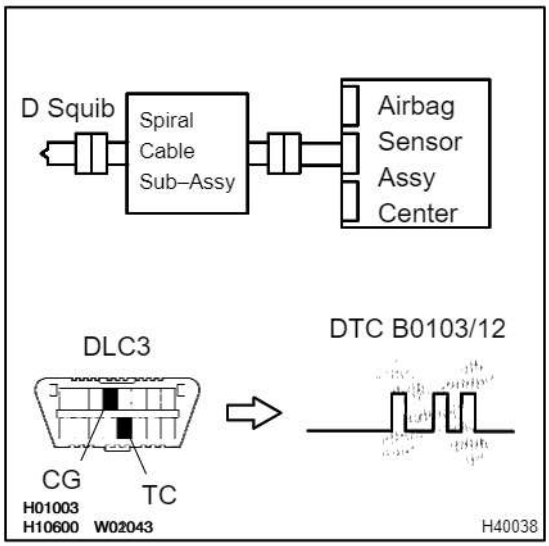
NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

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3	CHECK D SQUIB

SST 09843–18040



(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the horn button assy connectors.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(e) Turn the ignition switch to ON, and wait at least for 10 seconds.
(f) Clear the DTC stored in memory (See page 05–1238).
(g) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(h) Turn the ignition switch to ON, and wait at least for 10 seconds.
(i) Check the DTC (See page 05–1238).

OK:

DTC B0103/12 is not output.

HINT:

Codes other than code B0103/12 may be output at this time, but they are not relevant to this check.

NG → **REPLACE HORN BUTTON ASSY**

OK

4	USE SIMULATION METHOD TO CHECK

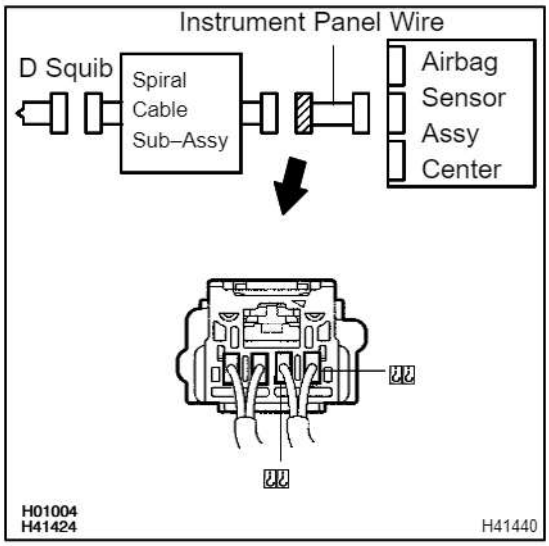
NG → **Go to step 1**

OK

REPLACE ALL SRS COMPONENTS INCLUDING WIRE HARNESS

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5 CHECK INSTRUMENT PANEL WIRE



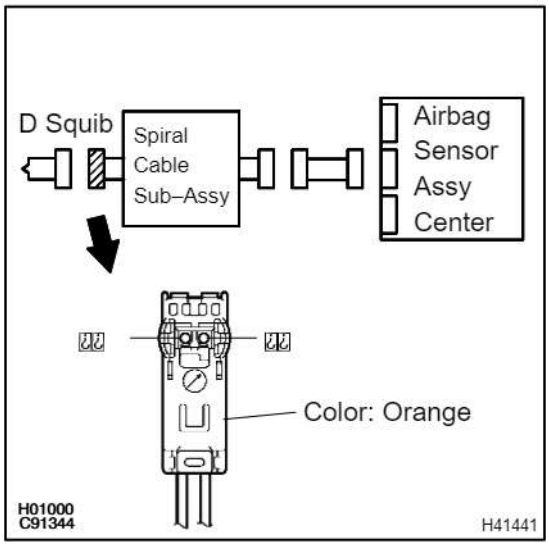
(a) Turn the ignition switch to LOCK.
(b) Disconnect the spiral cable sub–assy connector from the instrument panel wire.
(c) Turn the ignition switch to ON.
(d) Measure the voltage between the body ground and D+ of the instrument panel wire connector on the spiral cable sub–assy side.

OK:
Voltage: Below 1 V

NG → **REPAIR OR REPLACE INSTRUMENT PANEL WIRE**

OK

6 CHECK SPIRAL CABLE SUB–ASSY



(a) Measure the voltage between the body ground and D+ of the orange spiral cable sub–assy connector on the horn button assy side.

OK:
Voltage: Below 1 V

NG → **REPLACE SPIRAL CABLE SUB–ASSY**

OK

7 USE SIMULATION METHOD TO CHECK

NG → **Go to step 1**

OK

REPLACE ALL SRS COMPONENTS INCLUDING WIRE HARNESS

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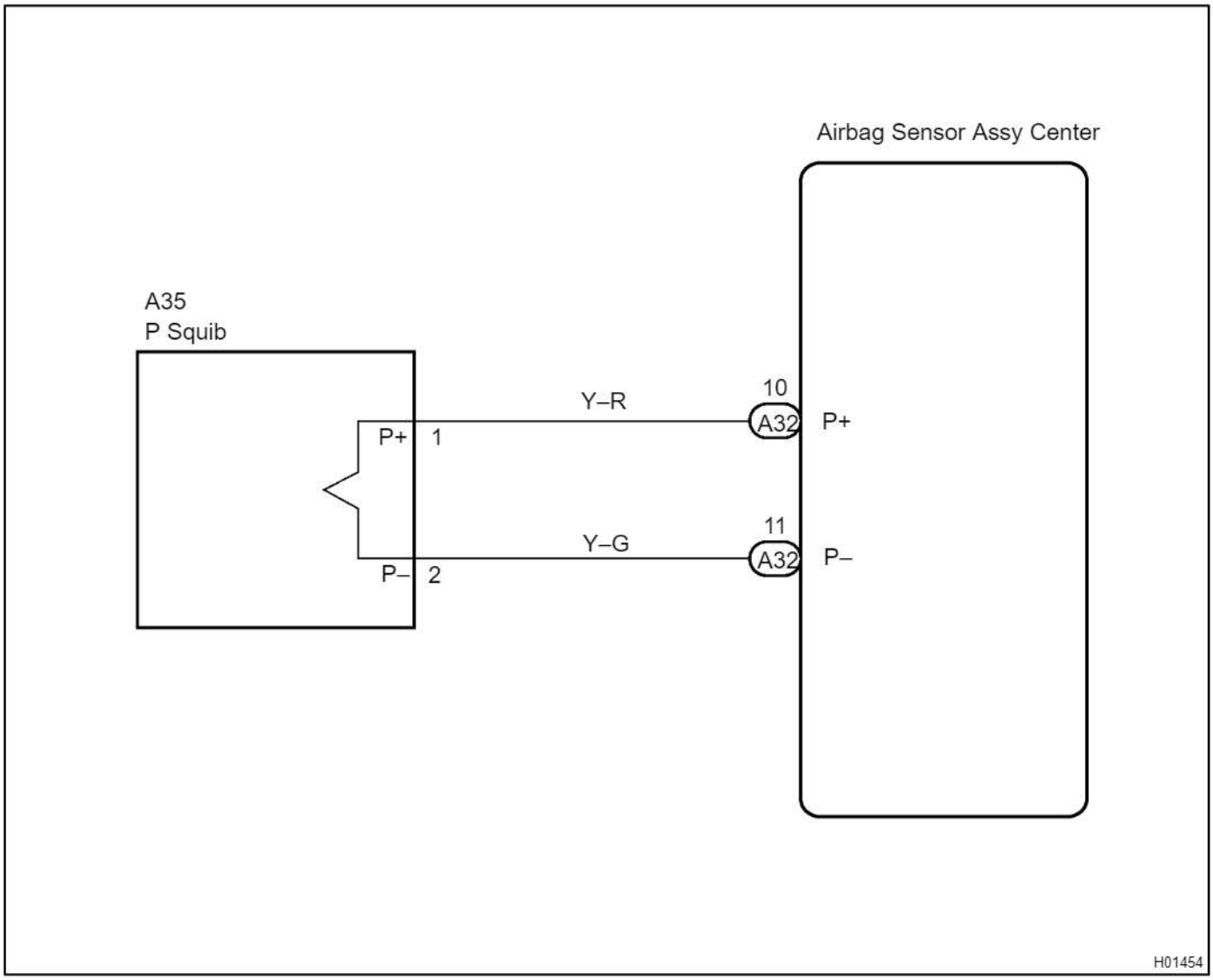
DTC B0105/53 SHORT IN P SQUIB CIRCUIT

CIRCUIT DESCRIPTION

The P squib circuit consists of the airbag sensor assy center and the instr pnl pass l/door airbag assy. It causes the SRS to deploy when the SRS deployment conditions are satisfied.
DTC B0105/53 is recorded when a short is detected in the P squib circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B0105/53	□Short in P squib circuit □P squib malfunction □Airbag sensor assy center malfunction	□Instr pnl pass l/door airbag assy (P squib) □Airbag sensor assy center □Instrument panel wire

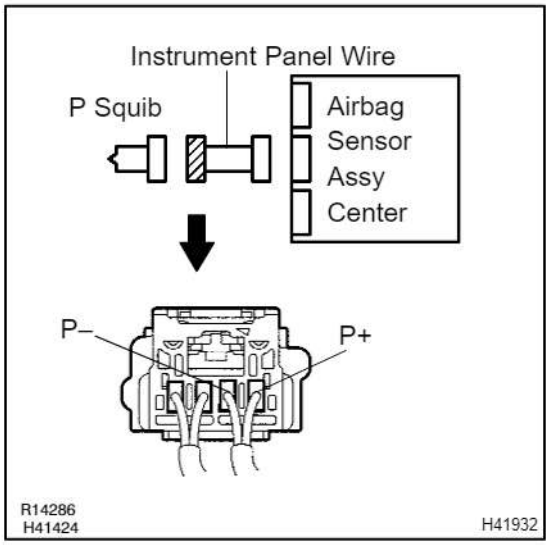
WIRING DIAGRAM



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INSPECTION PROCEDURE

1 CHECK INSTRUMENT PANEL WIRE(P SQUIB CIRCUIT)



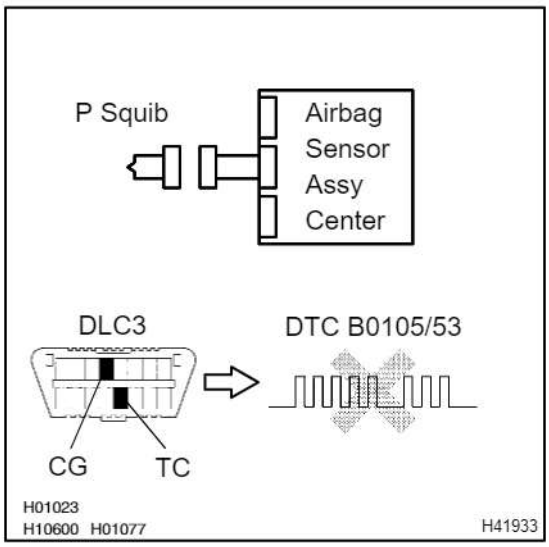
(a) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(b) Disconnect the instrument panel wire connectors from the airbag sensor assy center and the instr pnl pass l/door airbag assy.
(c) Release the airbag activation prevention mechanism built in the connector of the instrument panel wire on the airbag sensor assy center side (See page 05–1238).
(d) Measure the resistance between P+ and P– of the black instrument panel wire connector on the instr pnl pass l/door airbag assy side.
OK:
Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE INSTRUMENT PANEL WIRE**

OK

2 CHECK AIR BAG SENSOR ASSY CENTER

SST 09843–18040



(a) Connect the connector to the airbag sensor assy center.
(b) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(c) Turn the ignition switch to ON, and wait at least for 10 seconds.
(d) Clear the DTC stored in memory (See page 05–1238).
(e) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(f) Turn the ignition switch to ON, and wait at least for 10 seconds.
(g) Check the DTC (See page 05–1238).
OK:
DTC B0105/53 is not output.

HINT:
Codes other than code B0105/53 may be output at this time, but they are not relevant to this check.

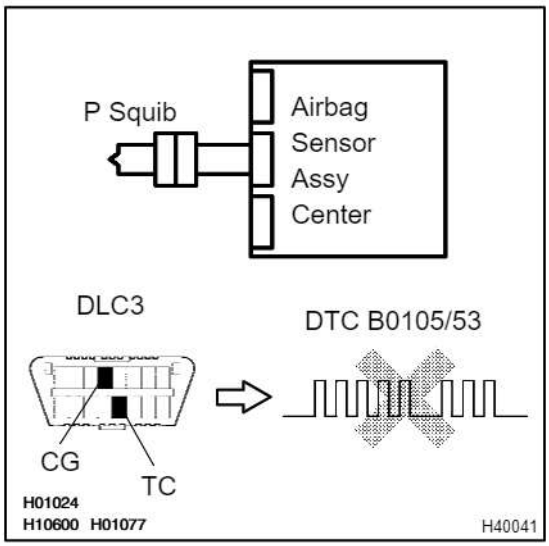
NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

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3	CHECK P SQUIB

SST 09843–18040



(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the instr pnl pass l/door airbag assy connectors.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(e) Turn the ignition switch to ON, and wait at least for 10 seconds.
(f) Clear the DTC stored in memory (See page 05–1238).
(g) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(h) Turn the ignition switch to ON, and wait at least for 10 seconds.
(i) Check the DTC (See page 05–1238).

OK:

DTC B0105/53 is not output.

HINT:

Codes other than code B0105/53 may be output at this time, but they are not relevant to this check.

NG	REPLACE INSTR PNL PASS L/DOOR AIR BAG ASSY

OK

USE SIMULATION METHOD TO CHECK

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DTC B0106/54 OPEN IN P SQUIB CIRCUIT

CIRCUIT DESCRIPTION

The P squib circuit consists of the airbag sensor assy center and the instr pnl pass l/door airbag assy. It causes the SRS to deploy when the SRS deployment conditions are satisfied.
DTC B0106/54 is recorded when an open is detected in the P squib circuit.

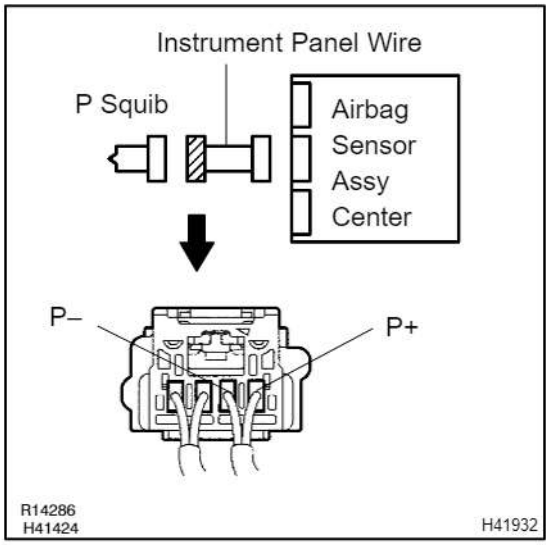
DTC No.	DTC Detecting Condition	Trouble Area
B0106/54	□Open in P squib circuit □P squib malfunction □Airbag sensor assy center malfunction	□Instr pnl pass l/door airbag assy (P squib) □Airbag sensor assy center □Instrument panel wire

WIRING DIAGRAM

See page 05–1271.

INSPECTION PROCEDURE

1 CHECK INSTRUMENT PANEL WIRE(P SQUIB CIRCUIT)



(a) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(b) Disconnect the instrument panel wire connectors from the airbag sensor assy center and the instr pnl pass l/door airbag assy.
(c) Measure the resistance between P+ and P– of the black instrument panel wire connector on the instr pnl pass l/door airbag assy side.
OK:
Resistance: Below 1 Ω

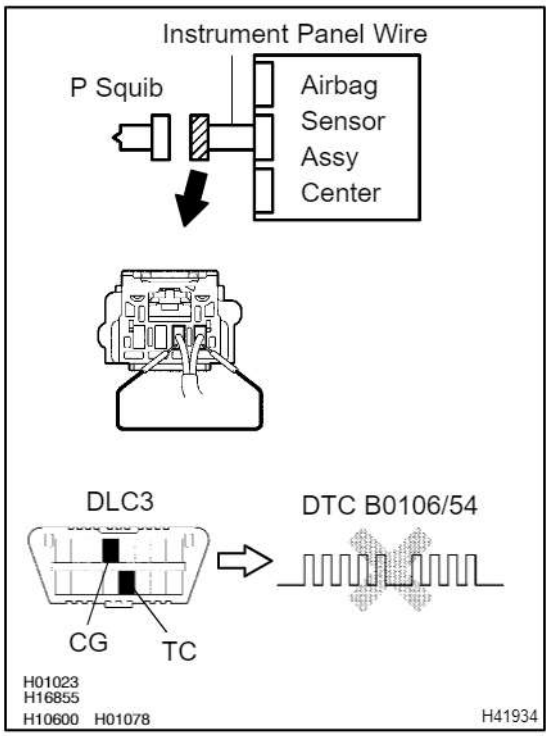
NG → **REPAIR OR REPLACE INSTRUMENT PANEL WIRE**

OK

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2 CHECK AIR BAG SENSOR ASSY CENTER

SST 09843–18040



(a) Connect the connector to the airbag sensor assy center.
(b) Using a service wire, connect P+ and P– of the black instrument panel wire connector on the instr pnl pass l/ door airbag assy side.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Clear the DTC stored in memory (See page 05–1238).
(f) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(g) Turn the ignition switch to ON, and wait at least for 10 seconds.
(h) Check the DTC (See page 05–1238).

OK:

DTC B0106/54 is not output.

HINT:

Codes other than code B0106/54 may be output at this time, but they are not relevant to this check.

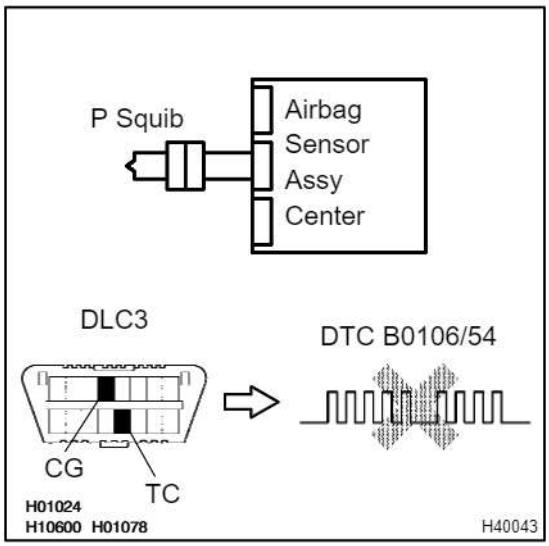
NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

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3	CHECK P SQUIB

SST 09843–18040



(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the instr pnl pass l/door airbag assy connectors.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(e) Turn the ignition switch to ON, and wait at least for 10 seconds.
(f) Clear the DTC stored in memory (See page 05–1238).
(g) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(h) Turn the ignition switch to ON, and wait at least for 10 seconds.
(i) Check the DTC (See page 05–1238).

OK:

DTC B0106/54 is not output.

HINT:

Codes other than code B0106/54 may be output at this time, but they are not relevant to this check.

NG	REPLACE INSTR PNL PASS L/DOOR AIR BAG ASSY

OK

USE SIMULATION METHOD TO CHECK

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DTC B0107/51 SHORT IN P SQUIB CIRCUIT (TO GROUND)

CIRCUIT DESCRIPTION

The P squib circuit consists of the airbag sensor assy center and the instr pnl pass l/door airbag assy. It causes the SRS to deploy when the SRS deployment conditions are satisfied.
DTC B0107/51 is recorded when a ground short is detected in the P squib circuit.

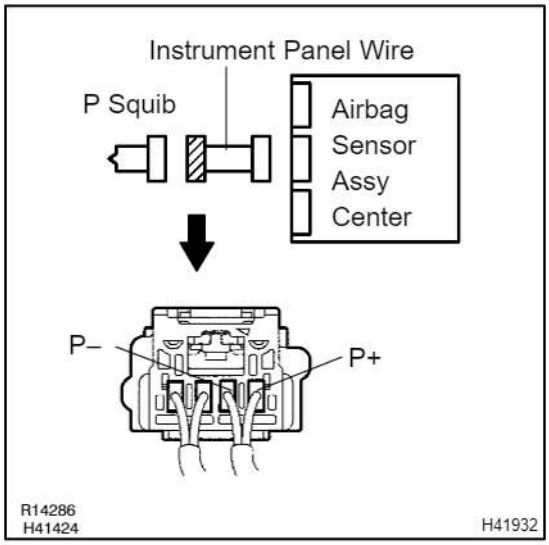
DTC No.	DTC Detecting Condition	Trouble Area
B0107/51	□Short in P squib circuit (to ground) □P squib malfunction □Airbag sensor assy center malfunction	□Instr pnl pass l/door airbag assy (P squib) □Airbag sensor assy center □Instrument panel wire

WIRING DIAGRAM

See page 05–1271.

INSPECTION PROCEDURE

1 CHECK INSTRUMENT PANEL WIRE(P SQUIB CIRCUIT)



(a) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(b) Disconnect the instrument panel wire connectors from the airbag sensor assy center and the instr pnl pass l/door airbag assy.
(c) Measure the resistance between the body ground and P+ of the instrument panel wire connector on the instr pnl pass l/door airbag assy side.
OK:
Resistance: 1 MΩ or Higher

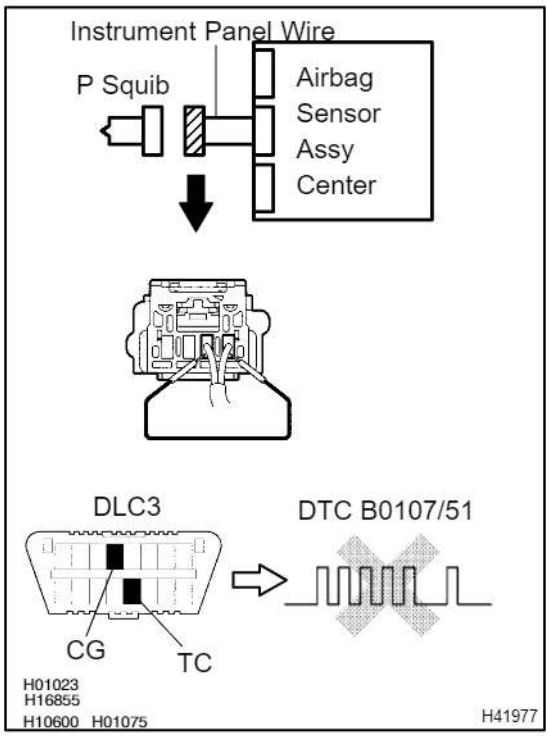
NG → **REPAIR OR REPLACE INSTRUMENT PANEL WIRE**

OK

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2 CHECK AIR BAG SENSOR ASSY CENTER

SST 09843–18040



(a) Connect the connector to the airbag sensor assy center.
(b) Using a service wire, connect P+ and P– of the black instrument panel wire connector on the instr pnl pass I/ door airbag assy side.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Clear the DTC stored in memory (See page 05–1238).
(f) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(g) Turn the ignition switch to ON, and wait at least for 10 seconds.
(h) Check the DTC (See page 05–1238).

OK:

DTC B0107/51 is not output.

HINT:

Codes other than code B0107/51 may be output at this time, but they are not relevant to this check.

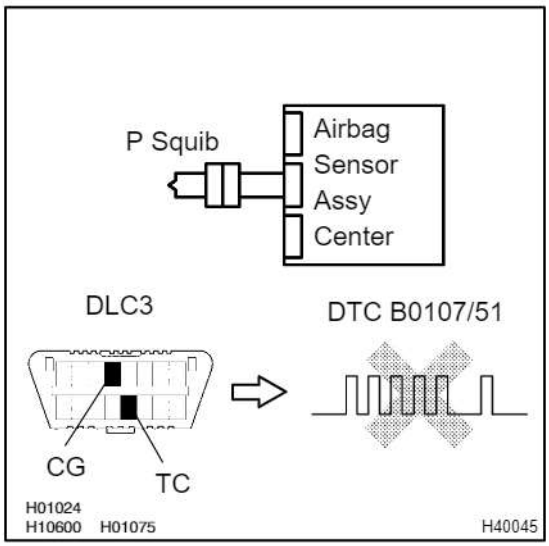
NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

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3	CHECK P SQUIB

SST 09843–18040



(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the instr pnl pass l/door airbag assy connectors.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(e) Turn the ignition switch to ON, and wait at least for 10 seconds.
(f) Clear the DTC stored in memory (See page 05–1238).
(g) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(h) Turn the ignition switch to ON, and wait at least for 10 seconds.
(i) Check the DTC (See page 05–1238).

OK:

DTC B0107/51 is not output.

HINT:

Codes other than code B0107/51 may be output at this time, but they are not relevant to this check.

NG → **REPLACE INSTR PNL PASS L/DOOR AIR BAG ASSY**

OK

4	USE SIMULATION METHOD TO CHECK

NG → **Go to step 1**

OK

REPLACE ALL SRS COMPONENTS INCLUDING WIRE HARNESS

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DTC B0108/52 SHORT IN P SQUIB CIRCUIT (TO B+)

CIRCUIT DESCRIPTION

The P squib circuit consists of the airbag sensor assy center and the instr pnl pass l/door airbag assy. It causes the SRS to deploy when the SRS deployment conditions are satisfied.
DTC B0108/52 is recorded when a B+ short is detected in the P squib circuit.

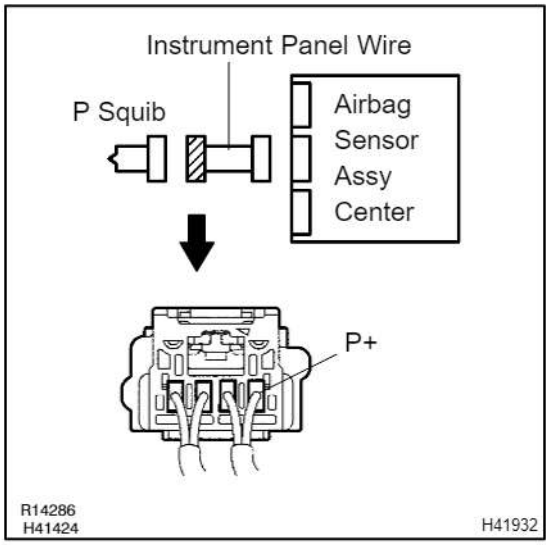
DTC No.	DTC Detecting Condition	Trouble Area
B0108/52	□Short in P squib circuit (to B+) □P squib malfunction □Airbag sensor assy center malfunction	□Instr pnl pass l/door airbag assy (P squib) □Airbag sensor assy center □Instrument panel wire

WIRING DIAGRAM

See page 05–1271.

INSPECTION PROCEDURE

1 CHECK INSTRUMENT PANEL WIRE(P SQUIB CIRCUIT)



(a) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(b) Disconnect the instrument panel wire connectors from the airbag sensor assy center and the instr pnl pass l/door airbag assy.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(d) Turn the ignition switch to ON.
(e) Measure the voltage between the body ground and P+ of the instrument panel wire connector on the instr pnl pass l/door airbag assy side.
OK:
Voltage: Below 1 V

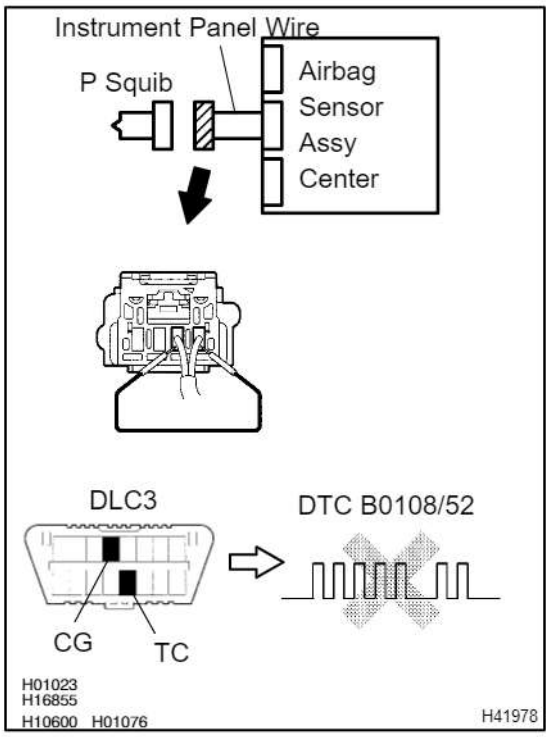
NG → **REPAIR OR REPLACE INSTRUMENT PANEL WIRE**

OK

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2 CHECK AIR BAG SENSOR ASSY CENTER

SST 09843–18040



(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the connector to the airbag sensor assy center.
(d) Using a service wire, connect P+ and P– of the black instrument panel wire connector on the instr pnl pass I/door airbag assy side.
(e) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(f) Turn the ignition switch to ON, and wait at least for 10 seconds.
(g) Clear the DTC stored in memory (See page 05–1238).
(h) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(i) Turn the ignition switch to ON, and wait at least for 10 seconds.
(j) Check the DTC (See page 05–1238).

OK:

DTC B0108/52 is not output.

HINT:

Codes other than code B0108/52 may be output at this time, but they are not relevant to this check.

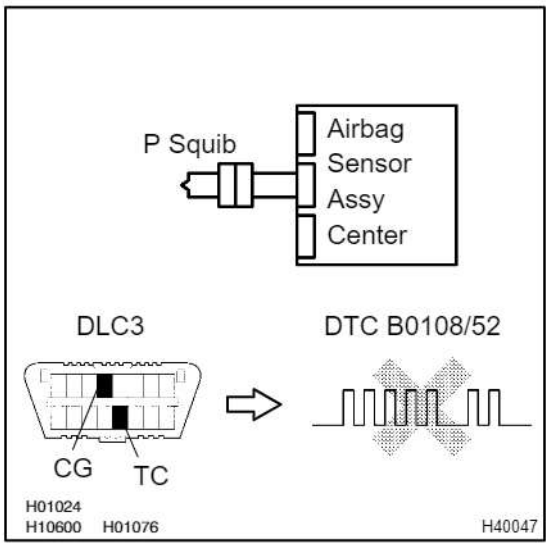
NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

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3	CHECK P SQUIB

SST 09843–18040



(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the instr pnl pass l/door airbag assy connectors.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(e) Turn the ignition switch to ON, and wait at least for 10 seconds.
(f) Clear the DTC stored in memory (See page 05–1238).
(g) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(h) Turn the ignition switch to ON, and wait at least for 10 seconds.
(i) Check the DTC (See page 05–1238).

OK:

DTC B0108/52 is not output.

HINT:

Codes other than code B0108/52 may be output at this time, but they are not relevant to this check.

NG → **REPLACE INSTR PNL PASS L/DOOR AIR BAG ASSY**

OK

4	USE SIMULATION METHOD TO CHECK

NG → **Go to step 1**

OK

REPLACE ALL SRS COMPONENTS INCLUDING WIRE HARNESS

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DTC B0110/43 SHORT IN SIDE SQUIB (RH) CIRCUIT

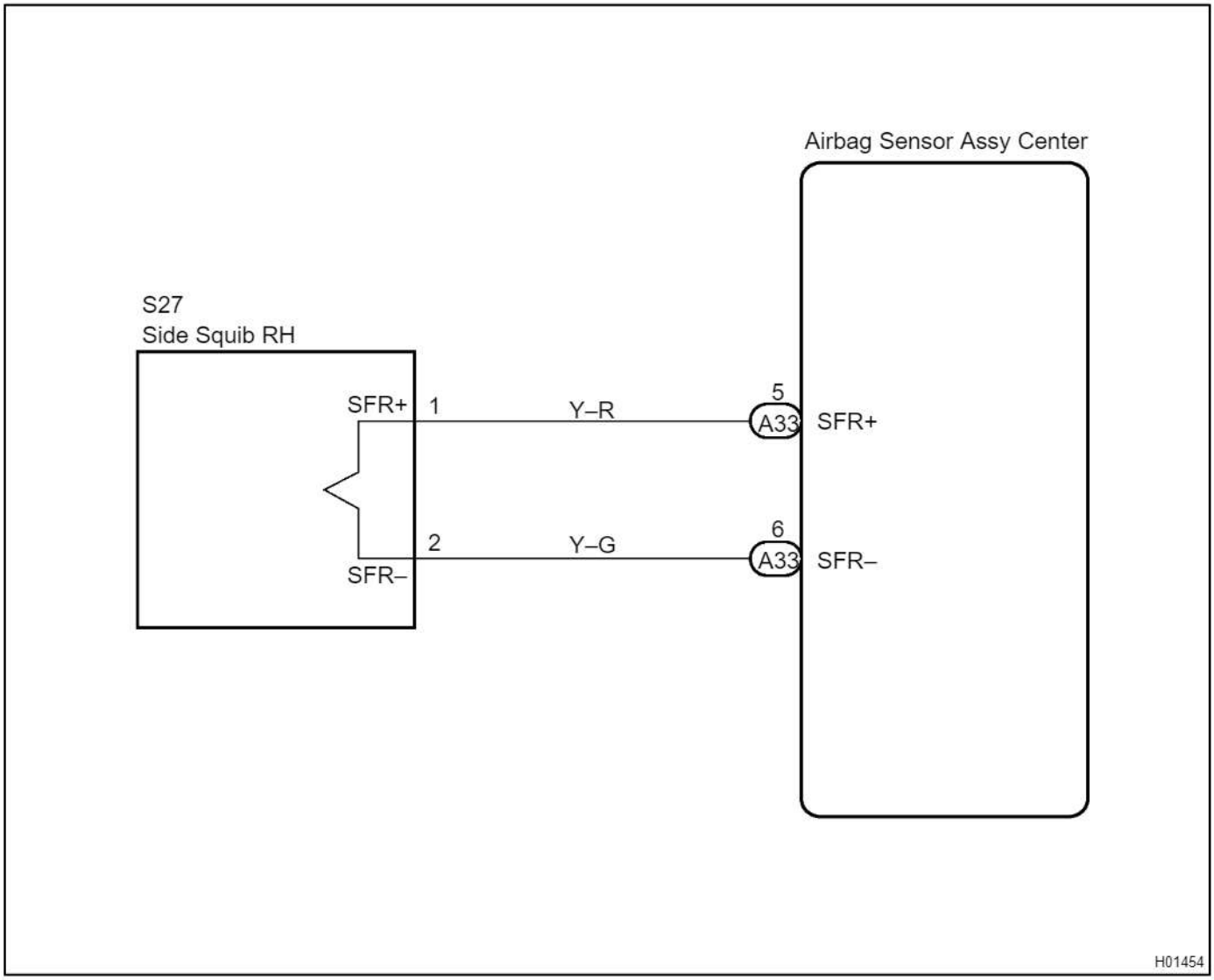
CIRCUIT DESCRIPTION

The side squib RH circuit consists of the airbag sensor assy center and the front seat airbag assy RH. It causes the SRS to deploy when the SRS deployment conditions are satisfied.
DTC B0110/43 is recorded when a short is detected in the side squib RH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B0110/43	□Short in side squib RH circuit □Side squib RH malfunction □Airbag sensor assy center malfunction	□Front seat airbag assy RH (side squib RH) □Airbag sensor assy center □Floor wire

HINT:
DTC B0110/43 is indicated only for the vehicle equipped with the side airbag.

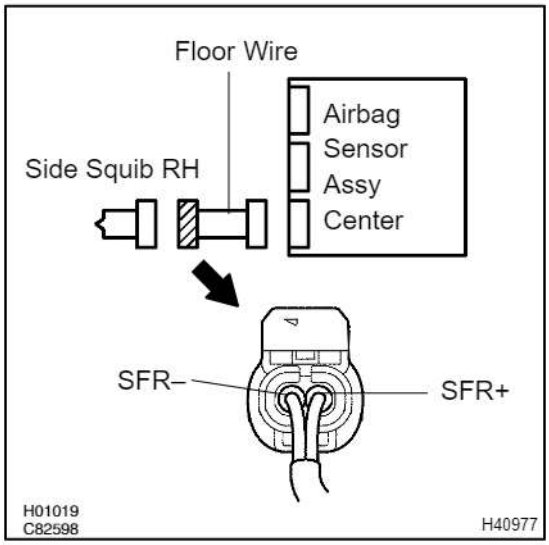
WIRING DIAGRAM



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INSPECTION PROCEDURE

1 CHECK FLOOR WIRE(SIDE SQUIB RH CIRCUIT)



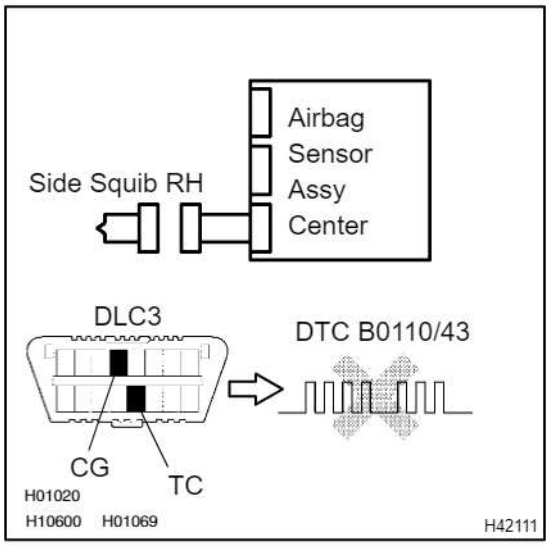
(a) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(b) Disconnect the floor wire connectors from the airbag sensor assy center and the front seat airbag assy RH.
(c) Release the airbag activation prevention mechanism built in the connector on the airbag sensor assy center side (See page 05–1238).
(d) Measure the resistance between SFR+ and SFR– of the floor wire connector on the front seat airbag assy side.
OK:
Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

2 CHECK AIR BAG SENSOR ASSY CENTER

SST 09843–18040



(a) Connect the the connector to the airbag sensor assy center.
(b) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(c) Turn the ignition switch to ON, and wait at least for 10 seconds.
(d) Clear the DTC stored in memory (See page 05–1238).
(e) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(f) Turn the ignition switch to ON, and wait at least for 10 seconds.
(g) Check the DTC (See page 05–1238).
OK:
DTC B0110/43 is not output.

HINT:
Codes other than code B0110/43 may be output at this time, but they are not relevant to this check.

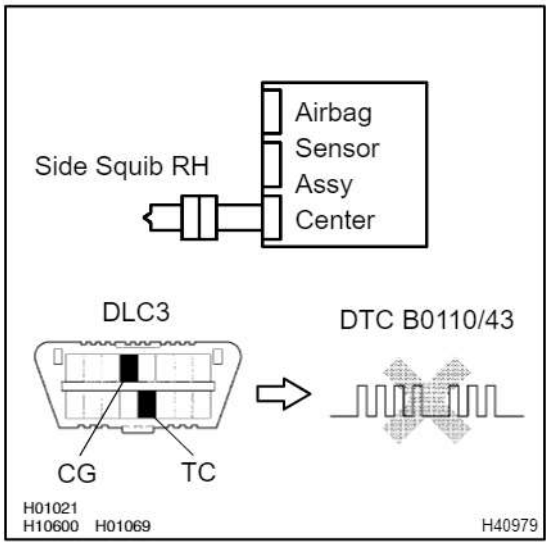
NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

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3	CHECK SIDE SQUIB (RH)

SST 09843–18040



(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the front seat airbag assy RH connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(e) Turn the ignition switch to ON, and wait at least for 10 seconds.
(f) Clear the DTC stored in memory (See page 05–1238).
(g) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(h) Turn the ignition switch to ON, and wait at least for 10 seconds.
(i) Check the DTC (See page 05–1238).

OK:

DTC B0110/43 is not output.

HINT:

Codes other than code B0110/43 may be output at this time, but they are not relevant to this check.

NG → **REPLACE FRONT SEAT BACK ASSEMBLY RH**

OK →

USE SIMULATION METHOD TO CHECK

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DTC B0111/44 OPEN IN SIDE SQUIB (RH) CIRCUIT

CIRCUIT DESCRIPTION

The side squib RH circuit consists of the airbag sensor assy center and the front seat airbag assy RH. It causes the SRS to deploy when the SRS deployment conditions are satisfied.
DTC B0111/44 is recorded when an open is detected in the side squib RH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B0111/44	□Open in side squib RH circuit □Side squib RH malfunction □Airbag sensor assy center malfunction	□Front seat airbag assy RH (Side squib RH) □Airbag sensor assy center □Floor wire

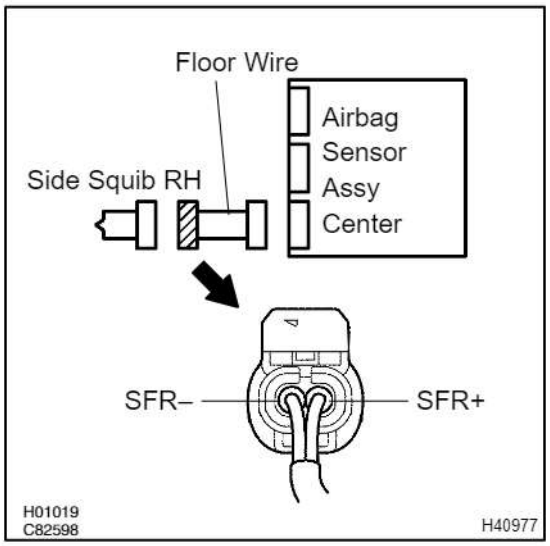
HINT:
DTC B0111/44 is indicated only for the vehicle equipped with the side airbag.

WIRING DIAGRAM

See page 05–1283.

INSPECTION PROCEDURE

1	CHECK FLOOR WIRE(SIDE SQUIB RH CIRCUIT)



(a) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(b) Disconnect the floor wire connectors from the airbag sensor assy center and the front seat airbag assy RH.
(c) Measure the resistance between SFR+ and SFR– of the floor wire connector on the front seat airbag assy side.
OK:
Resistance: Below 1 Ω

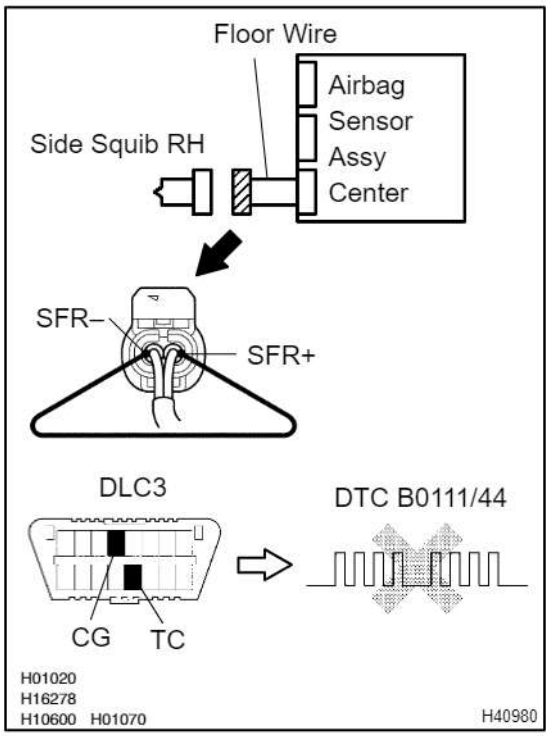
NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

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2 CHECK AIR BAG SENSOR ASSY CENTER

SST 09843–18040



(a) Connect the connector to the airbag sensor assy center.
(b) Using a service wire, connect SFR+ and SFR– of the floor wire connector on the front seat airbag assy RH side.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Clear the DTC stored in memory (See page 05–1238).
(f) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(g) Turn the ignition switch to ON, and wait at least for 10 seconds.
(h) Check the DTC (See page 05–1238).

OK:

DTC B0111/44 is not output.

HINT:

Codes other than code B0111/44 may be output at this time, but they are not relevant to this check.

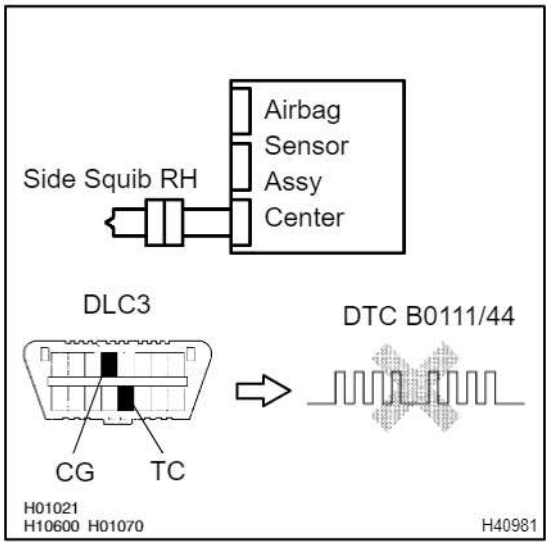
NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

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3 CHECK SIDE SQUIB (RH)

SST 09843–18040



(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the front seat airbag assy RH connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(e) Turn the ignition switch to ON, and wait at least for 10 seconds.
(f) Clear the DTC stored in memory (See page 05–1238).
(g) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(h) Turn the ignition switch to ON, and wait at least for 10 seconds.
(i) Check the DTC (See page 05–1238).

OK:

DTC B0111/44 is not output.

HINT:

Codes other than code B0111/44 may be output at this time, but they are not relevant to this check.

NG → **REPLACE FRONT SEAT BACK ASSEMBLY RH**

OK

USE SIMULATION METHOD TO CHECK

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DTC	B0112/41	SHORT IN SIDE SQUIB (RH) CIRCUIT (TO GROUND)

CIRCUIT DESCRIPTION

The side squib RH circuit consists of the airbag sensor assy center and the front seat airbag assy RH. It causes the SRS to deploy when the SRS deployment conditions are satisfied.
DTC B0112/41 is recorded when a ground short is detected in the side squib RH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B0112/41	□Short in side squib RH circuit (to ground) □Side squib RH malfunction □Airbag sensor assy center malfunction	□Front seat airbag assy RH (Side squib RH) □Airbag sensor assy center □Floor wire

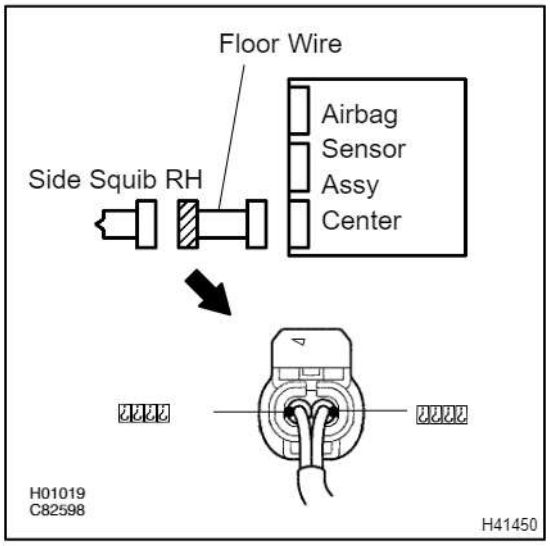
HINT:
DTC B0112/41 is indicated only for the vehicle equipped with the side airbag.

WIRING DIAGRAM

See page 05–1283.

INSPECTION PROCEDURE

1	CHECK FLOOR WIRE(SIDE SQUIB RH CIRCUIT)



(a) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(b) Disconnect the floor wire connect from the airbag sensor assy center and the front seat airbag assy RH.
(c) Measure the resistance between the body ground and SFR+ of the floor wire connector on the front seat airbag assy RH side.
OK:
Resistance: 1 MΩ or Higher

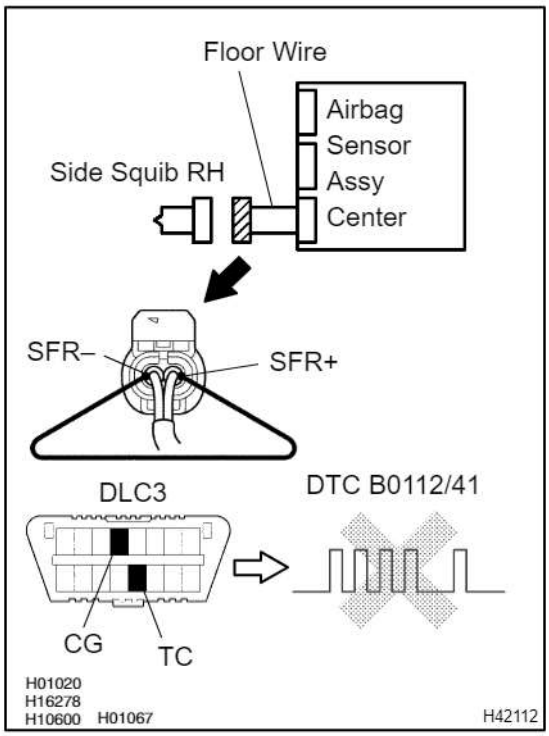
NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

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2 CHECK AIR BAG SENSOR ASSY CENTER

SST 09843–18040



(a) Connect the connector to the airbag sensor assy center.
(b) Using a service wire, connect SFR+ and SFR– of the floor wire connector on the front seat airbag assy RH side.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Clear the DTC stored in memory (See page 05–1238).
(f) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(g) Turn the ignition switch to ON, and wait at least for 10 seconds.
(h) Check the DTC (See page 05–1238).

OK:

DTC B0112/41 is not output.

HINT:

Codes other than code B0112/41 may be output at this time, but they are not relevant to this check.

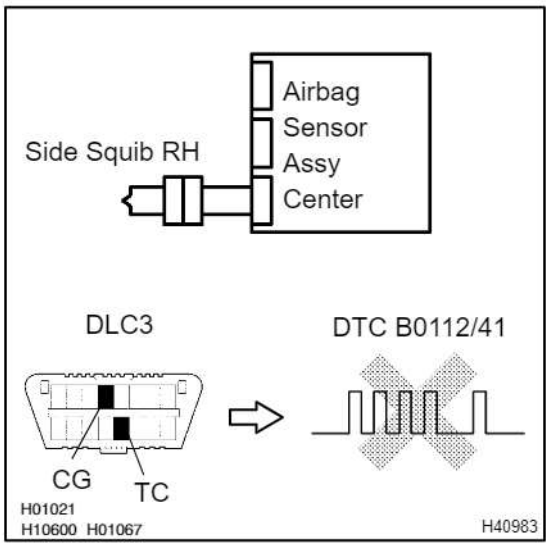
NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

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3	CHECK SIDE SQUIB (RH)

SST 09843–18040



(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the front seat airbag assy RH connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(e) Turn the ignition switch to ON, and wait at least for 10 seconds.
(f) Clear the DTC stored in memory (See page 05–1238).
(g) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(h) Turn the ignition switch to ON, and wait at least for 10 seconds.
(i) Check the DTC (See page 05–1238).

OK:

DTC B0112/41 is not output.

HINT:

Codes other than code B0112/41 may be output at this time, but they are not relevant to this check.

NG → **REPLACE FRONT SEAT BACK ASSEMBLY RH**

OK

4	USE SIMULATION METHOD TO CHECK

NG → **Go to step 1**

OK

REPLACE ALL SRS COMPONENTS INCLUDING WIRE HARNESS

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DTC	B0113/42	SHORT IN SIDE SQUIB (RH) CIRCUIT (TO B+)

CIRCUIT DESCRIPTION

The side squib RH circuit consists of the airbag sensor assy center and the front seat airbag assy RH. It causes the SRS to deploy when the SRS deployment conditions are satisfied.
DTC B0113/42 is recorded when a B+ short is detected in the side squib RH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B0113/42	□Short in side squib RH circuit (to B+) □Side squib RH malfunction □Airbag sensor assy center malfunction	□Front seat airbag assy RH (Side squib RH) □Airbag sensor assy center □Floor wire

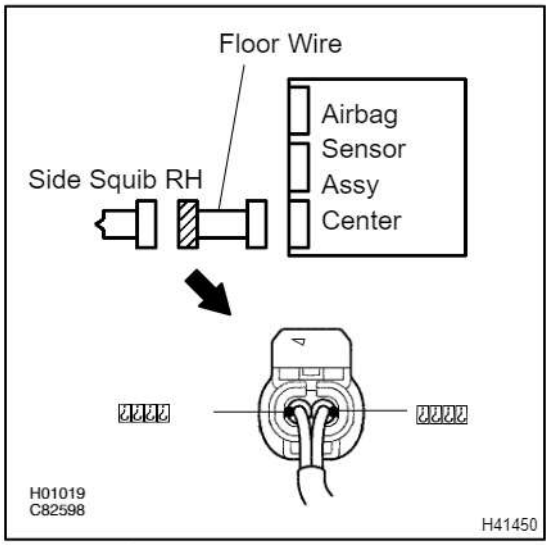
HINT:
DTC B0113/42 is indicated only for the vehicle equipped with the side airbag.

WIRING DIAGRAM

See page 05–1283.

INSPECTION PROCEDURE

1	CHECK FLOOR WIRE(SIDE SQUIB RH CIRCUIT)



(a) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(b) Disconnect the floor wire connectors from the airbag sensor assy center and the front seat airbag assy RH.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(d) Turn the ignition switch to ON.
(e) Measure the voltage between the body ground and SFR+ of the floor wire connector on the front seat airbag assy RH side.
OK:
Voltage: Below 1 V

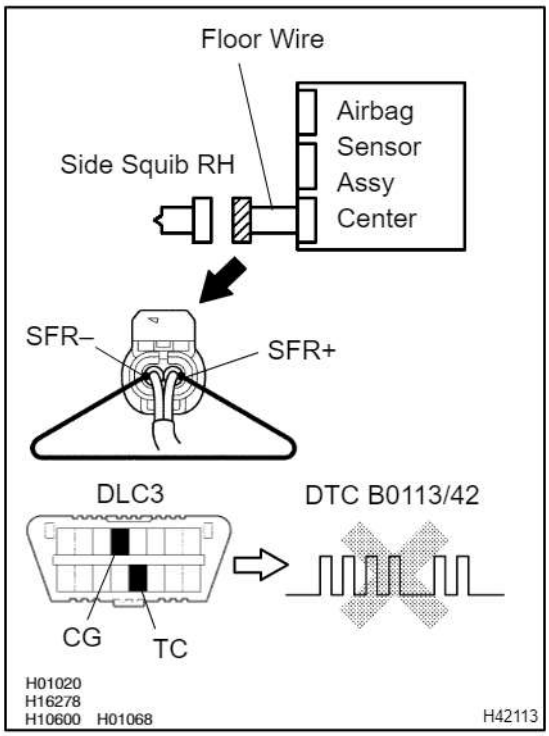
NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

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2 CHECK AIR BAG SENSOR ASSY CENTER

SST 09843–18040



(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the connector to the airbag sensor assy center.
(d) Using a service wire, connect SFR+ and SFR– of the floor wire connector on the front seat airbag assy RH side.
(e) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(f) Turn the ignition switch to ON, and wait at least for 10 seconds.
(g) Clear the DTC stored in memory (See page 05–1238).
(h) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(i) Turn the ignition switch to ON, and wait at least for 10 seconds.
(j) Check the DTC (See page 05–1238).

OK:

DTC B0113/42 is not output.

HINT:

Codes other than code B0113/42 may be output at this time, but they are not relevant to this check.

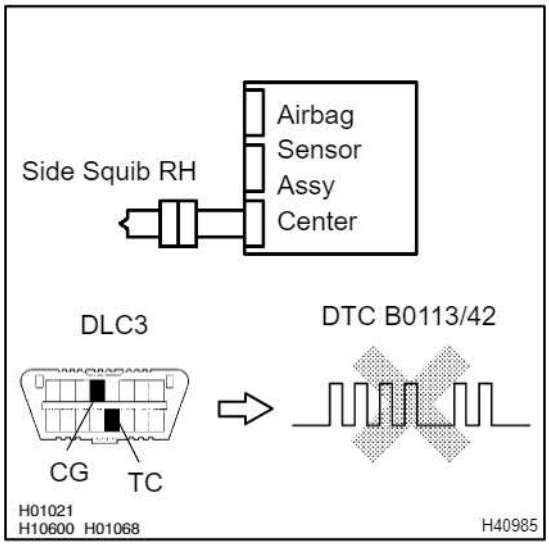
NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

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3	CHECK SIDE SQUIB (RH)

SST 09843–18040



(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the front seat airbag assy RH connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(e) Turn the ignition switch to ON, and wait at least for 10 seconds.
(f) Clear the DTC stored in memory (See page 05–1238).
(g) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(h) Turn the ignition switch to ON, and wait at least for 10 seconds.
(i) Check the DTC (See page 05–1238).

OK:

DTC B0113/42 is not output.

HINT:

Codes other than code B0113/42 may be output at this time, but they are not relevant to this check.

NG → **REPLACE FRONT SEAT BACK ASSEMBLY RH**

OK

4	USE SIMULATION METHOD TO CHECK

NG → **Go to step 1**

OK

REPLACE ALL SRS COMPONENTS INCLUDING WIRE HARNESS

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DTC B0115/47 SHORT IN SIDE SQUIB (LH) CIRCUIT

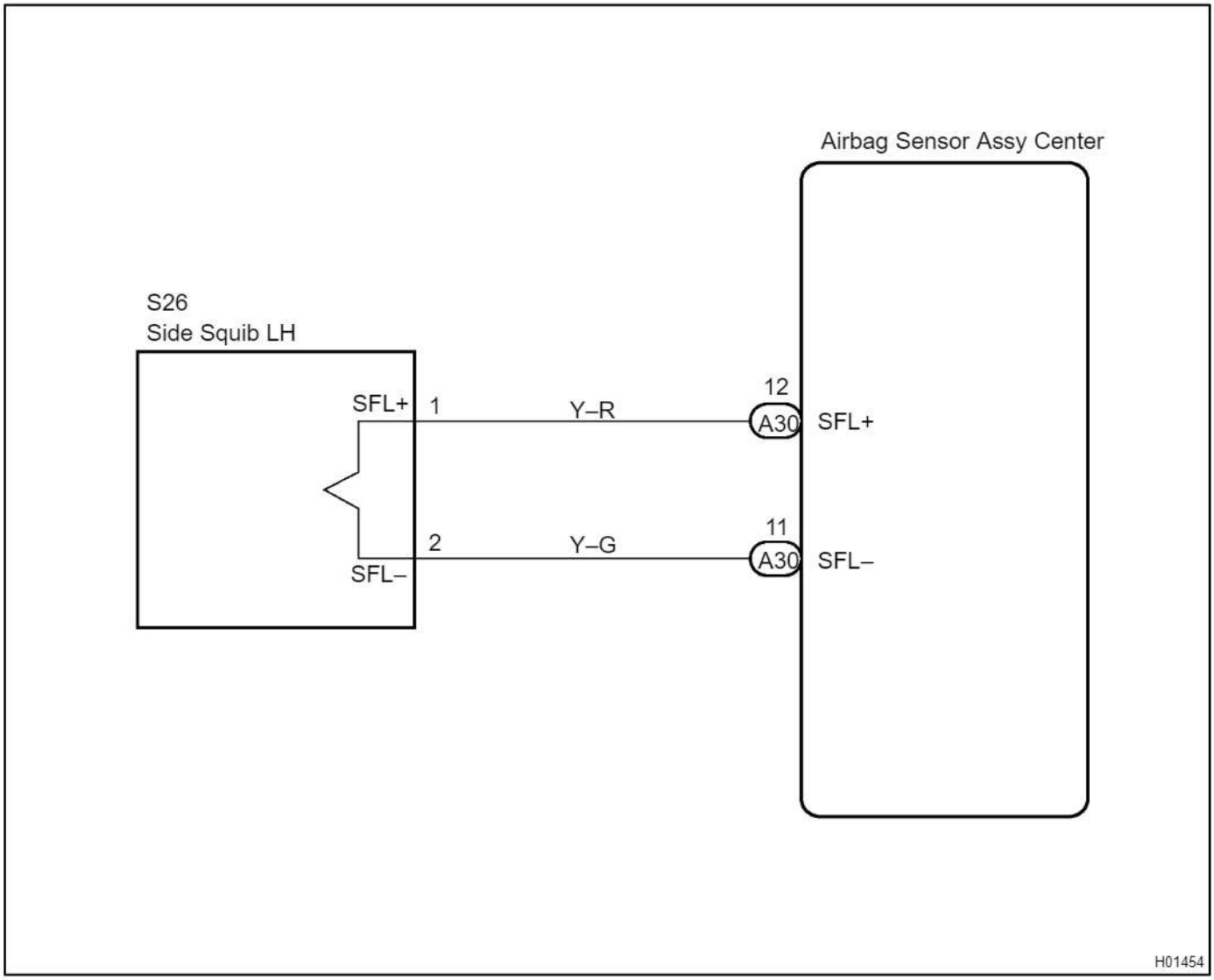
CIRCUIT DESCRIPTION

The side squib LH circuit consists of the airbag sensor assy center and the front seat airbag assy LH. It causes the SRS to deploy when the SRS deployment conditions are satisfied.
DTC B0115/47 is recorded when a short is detected in the side squib LH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B0115/47	□Short in side squib LH circuit □Side squib LH malfunction □Airbag sensor assy center malfunction	□Front seat airbag assy LH (Side squib LH) □Airbag sensor assy center □Floor wire No.2

HINT:
DTC B0115/47 is indicated only for the vehicle equipped with the side airbag.

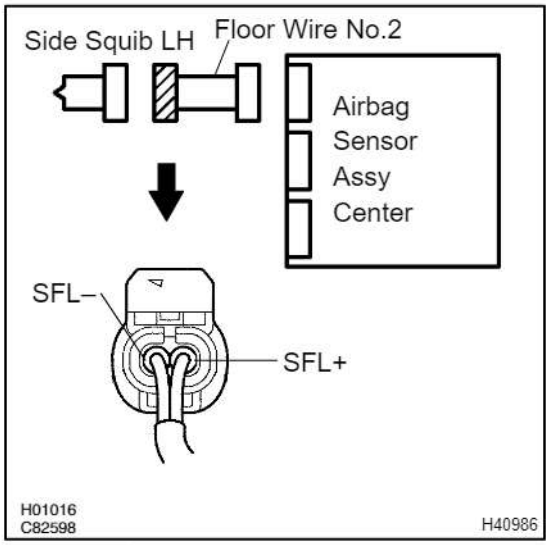
WIRING DIAGRAM



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INSPECTION PROCEDURE

1 CHECK FLOOR WIRE NO.2(SIDE SQUIB LH CIRCUIT)



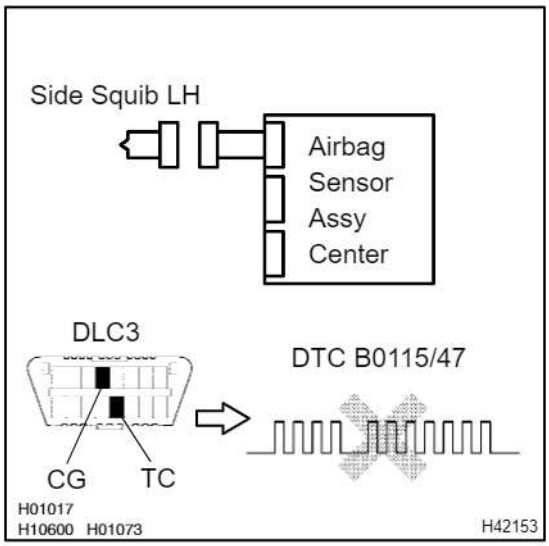
(a) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(b) Disconnect the floor wire No.2 connectors from the airbag sensor assy center and the front seat airbag assy LH.
(c) Release the airbag activation prevention mechanism built in the connector on the airbag sensor assy center side (See page 05–1238).
(d) Measure the resistance between SFL+ and SFL– of the floor wire No.2 connector on the front seat airbag assy LH side.
OK:
Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

2 CHECK AIR BAG SENSOR ASSY CENTER

SST 09843–18040



(a) Connect the connector to the airbag sensor assy center.
(b) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(c) Turn the ignition switch to ON, and wait at least for 10 seconds.
(d) Clear the DTC stored in memory (See page 05–1238).
(e) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(f) Turn the ignition switch to ON, and wait at least for 10 seconds.
(g) Check the DTC (See page 05–1238).
OK:
DTC B0115/47 is not output.

HINT:
Codes other than code B0115/47 may be output at this time, but they are not relevant to this check.

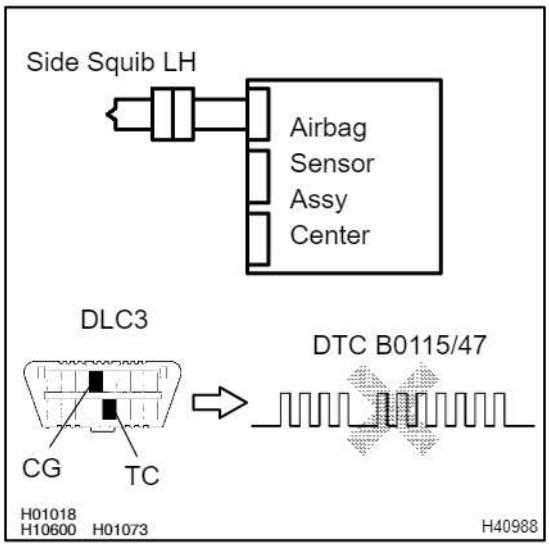
NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

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3	CHECK SIDE SQUIB (LH)

SST 09843–18040



(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the front seat airbag assy LH connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(e) Turn the ignition switch to ON, and wait at least for 10 seconds.
(f) Clear the DTC stored in memory (See page 05–1238).
(g) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(h) Turn the ignition switch to ON, and wait at least for 10 seconds.
(i) Check the DTC (See page 05–1238).

OK:

DTC B0115/47 is not output.

HINT:

Codes other than code B0115/47 may be output at this time, but they are not relevant to this check.

NG → **REPLACE FRONT SEAT BACK ASSEMBLY LH**

OK

USE SIMULATION METHOD TO CHECK

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DTC B0116/48 OPEN IN SIDE SQUIB (LH) CIRCUIT

CIRCUIT DESCRIPTION

The side squib LH circuit consists of the airbag sensor assy center and the front seat airbag assy LH. It causes the SRS to deploy when the SRS deployment conditions are satisfied.
DTC B0116/48 is recorded when an open is detected in the side squib LH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B0116/48	□Open in side squib LH circuit □Side squib LH malfunction □Airbag sensor assy center malfunction	□Front seat airbag assy LH (Side squib LH) □Airbag sensor assy center □Floor wire No.2

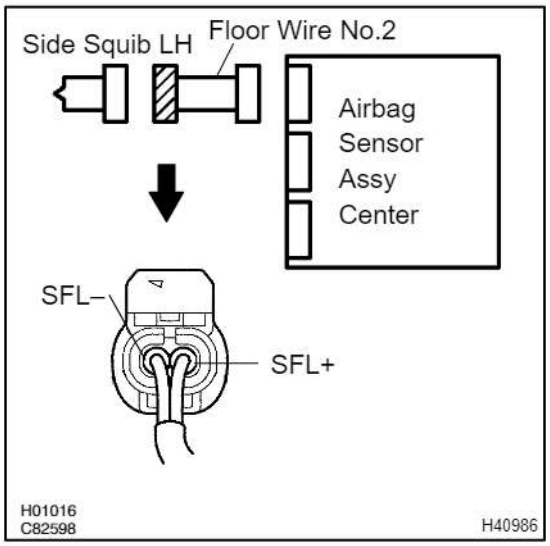
HINT:
DTC B0116/48 is indicated only for the vehicle equipped with the side airbag.

WIRING DIAGRAM

See page 05–1295.

INSPECTION PROCEDURE

1	CHECK FLOOR WIRE NO.2(SIDE SQUIB LH CIRCUIT)



(a) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(b) Disconnect the floor wire No.2 connectors from the airbag sensor assy center and the front seat airbag assy LH.
(c) Measure the resistance between SFL+ and SFL– of the floor wire No.2 connector on the front seat airbag assy LH side.
OK:
Resistance: Below 1 Ω

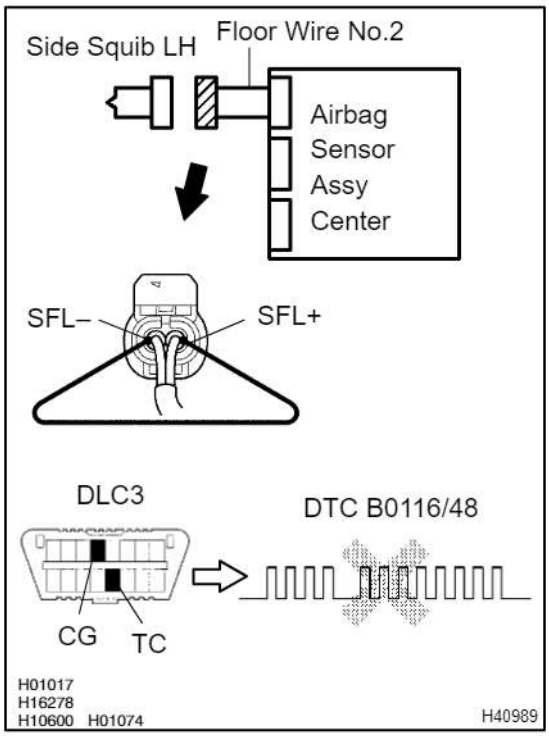
NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

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2 CHECK AIR BAG SENSOR ASSY CENTER

SST 09843–18040



(a) Connect the connector to the airbag sensor assy center.
(b) Using a service wire, connect SFL+ and SFL– of the floor wire No.2 connector on the front seat airbag assy LH side.
(c) Connect the negative (–) terminal cable to the battery, and wait at least 2 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Clear the DTC stored in memory (See page 05–1238).
(f) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(g) Turn the ignition switch to ON, and wait at least for 10 seconds.
(h) Check the DTC (See page 05–1238).

OK:

DTC B0116/48 is not output.

HINT:

Codes other than code B0116/48 may be output at this time, but they are not relevant to this check.

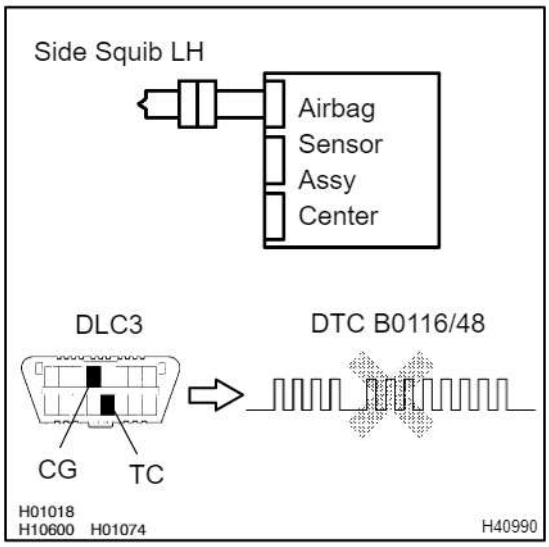
NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

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3 CHECK SIDE SQUIB (LH)

SST 09843–18040



(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the front seat airbag assy LH connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(e) Turn the ignition switch to ON, and wait at least for 10 seconds.
(f) Clear the DTC stored in memory (See page 05–1238).
(g) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(h) Turn the ignition switch to ON, and wait at least for 10 seconds.
(i) Check the DTC (See page 05–1238).

OK:

DTC B0116/48 is not output.

HINT:

Codes other than code B0116/48 may be output at this time, but they are not relevant to this check.

NG → **REPLACE FRONT SEAT BACK ASSEMBLY LH**

OK

USE SIMULATION METHOD TO CHECK

cardiagn.com

DTC	B0117/45	SHORT IN SIDE SQUIB (LH) CIRCUIT (TO GROUND)

CIRCUIT DESCRIPTION

The side squib LH circuit consists of the airbag sensor assy center and the front seat airbag assy LH.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
DTC B0117/45 is recorded when a ground short is detected in the side squib LH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B0117/45	□Short in side squib LH circuit (to ground) □Side squib LH malfunction □Airbag sensor assy center malfunction	□Front seat airbag assy LH (Side squib LH) □Airbag sensor assy center □Floor wire No.2

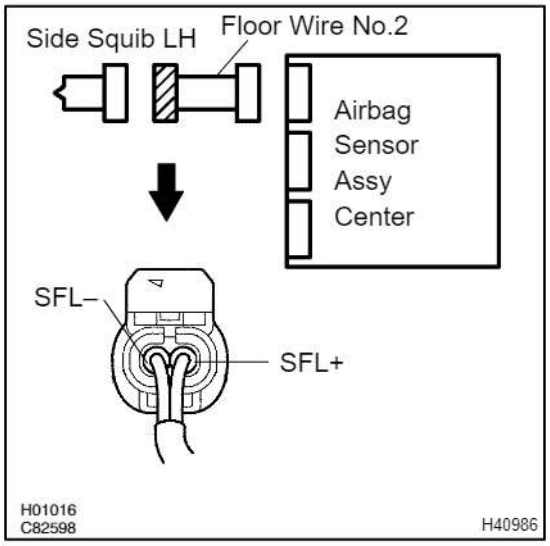
HINT:
DTC B0117/45 is indicated only for the vehicle equipped with the side airbag.

WIRING DIAGRAM

See page 05–1295.

INSPECTION PROCEDURE

1	CHECK FLOOR WIRE NO.2(SIDE SQUIB LH CIRCUIT)



(a) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(b) Disconnect the floor wire No.2 connectors from the airbag sensor assy center and the front seat airbag assy LH.
(c) Measure the resistance between the body ground and SFL+ of the floor wire No.2 connector on the front seat airbag assy LH side.
OK:
Resistance: 1 MΩ or Higher

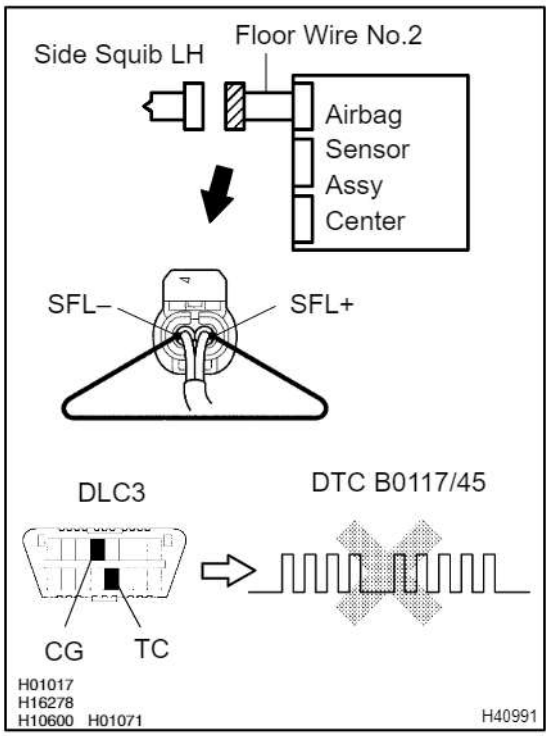
NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

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2 CHECK AIR BAG SENSOR ASSY CENTER

SST 09843–18040



(a) Connect the connector to the airbag sensor assy center.
(b) Using a service wire, connect SFL+ and SFL– of the floor wire No.2 connector on the front seat airbag assy LH side.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Clear the DTC stored in memory (See page 05–1238).
(f) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(g) Turn the ignition switch to ON, and wait at least for 10 seconds.
(h) Check the DTC (See page 05–1238).

OK:

DTC B0117/45 is not output.

HINT:

Codes other than code B0117/45 may be output at this time, but they are not relevant to this check.

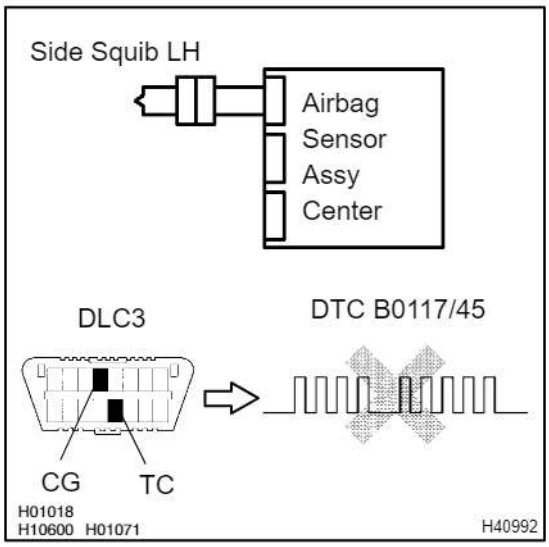
NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

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3	CHECK SIDE SQUIB (LH)

SST 09843–18040



(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the front seat airbag assy LH connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(e) Turn the ignition switch to ON, and wait at least for 10 seconds.
(f) Clear the DTC stored in memory (See page 05–1238).
(g) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(h) Turn the ignition switch to ON, and wait at least for 10 seconds.
(i) Check the DTC (See page 05–1238).

OK:

DTC B0117/45 is not output.

HINT:

Codes other than code B0117/45 may be output at this time, but they are not relevant to this check.

NG → **REPLACE FRONT SEAT BACK ASSEMBLY LH**

OK

4	USE SIMULATION METHOD TO CHECK

NG → **Go to step 1**

OK

REPLACE ALL SRS COMPONENTS INCLUDING WIRE HARNESS

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DTC	B0118/46	SHORT IN SIDE SQUIB (LH) CIRCUIT (TO B+)

CIRCUIT DESCRIPTION

The side squib LH circuit consists of the airbag sensor assy center and the front seat airbag assy LH.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
DTC B0118/46 is recorded when a B+ short is detected in the side squib LH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B0118/46	□Short in side squib LH circuit (to B+) □Side squib LH malfunction □Airbag sensor assy center malfunction	□Front seat airbag assy LH (Side squib LH) □Airbag sensor assy center □Floor wire No.2

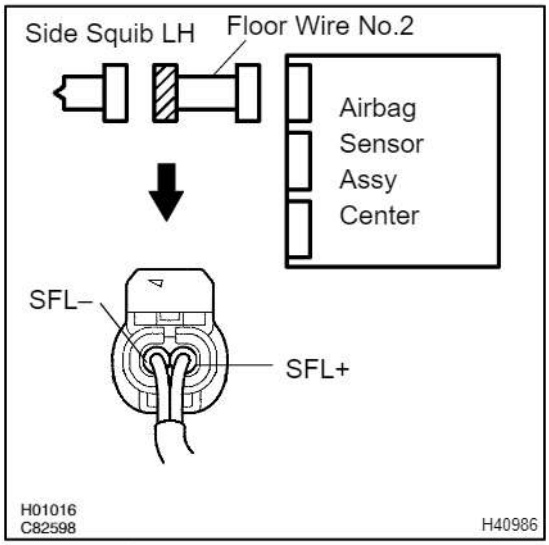
HINT:
DTC B0118/46 is indicated only for the vehicle equipped with the side airbag.

WIRING DIAGRAM

See page 05–1295.

INSPECTION PROCEDURE

1	CHECK FLOOR WIRE NO.2(SIDE SQUIB LH CIRCUIT)



OK

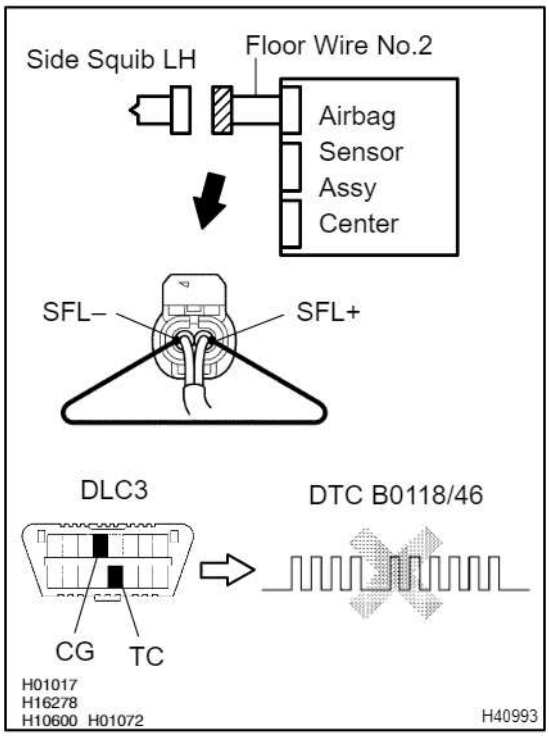
(a) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(b) Disconnect the floor wire No.2 connectors from the airbag sensor assy center and the front seat airbag assy LH.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(d) Turn the ignition switch to ON.
(e) Measure the voltage between the body ground and SFL+ of the floor wire No.2 connector on the front seat airbag assy LH side.
OK:
Voltage: Below 1 V

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

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2 CHECK AIR BAG SENSOR ASSY CENTER

SST 09843–18040



(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the connector to the airbag sensor assy center.
(d) Using a service wire, connect SFL+ and SFL– of the floor wire No.2 connector on the front seat airbag assy LH side.
(e) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(f) Turn the ignition switch to ON, and wait at least for 10 seconds.
(g) Clear the DTC stored in memory (See page 05–1238).
(h) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(i) Turn the ignition switch to ON, and wait at least for 10 seconds.
(j) Check the DTC (See page 05–1238).

OK:

DTC B0118/46 is not output.

HINT:

Codes other than code B0118/46 may be output at this time, but they are not relevant to this check.

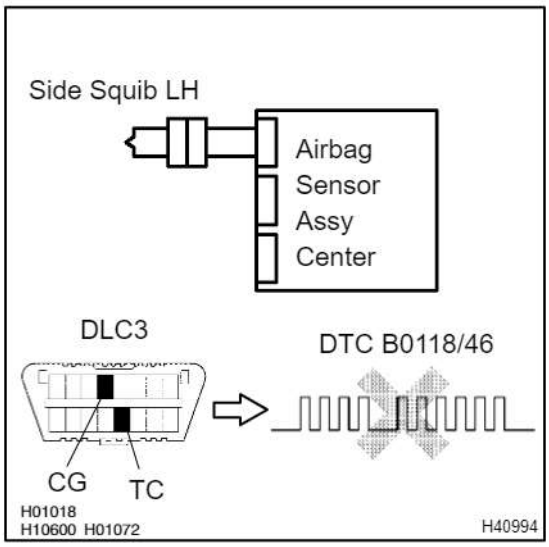
NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

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3	CHECK SIDE SQUIB (LH)

SST 09843–18040



(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the front seat airbag assy LH connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(e) Turn the ignition switch to ON, and wait at least for 10 seconds.
(f) Clear the DTC stored in memory (See page 05–1238).
(g) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(h) Turn the ignition switch to ON, and wait at least for 10 seconds.
(i) Check the DTC (See page 05–1238).

OK:

DTC B0118/46 is not output.

HINT:

Codes other than code B0118/46 may be output at this time, but they are not relevant to this check.

NG → **REPLACE FRONT SEAT BACK ASSEMBLY LH**

OK

4	USE SIMULATION METHOD TO CHECK

NG → **Go to step 1**

OK

REPLACE ALL SRS COMPONENTS INCLUDING WIRE HARNESS

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DTC	B0126/27	SEAT BELT BUCKLE SWITCH (LH) MALFUNCTION

DTC	B0127/27	SEAT BELT BUCKLE SWITCH (LH) MALFUNCTION

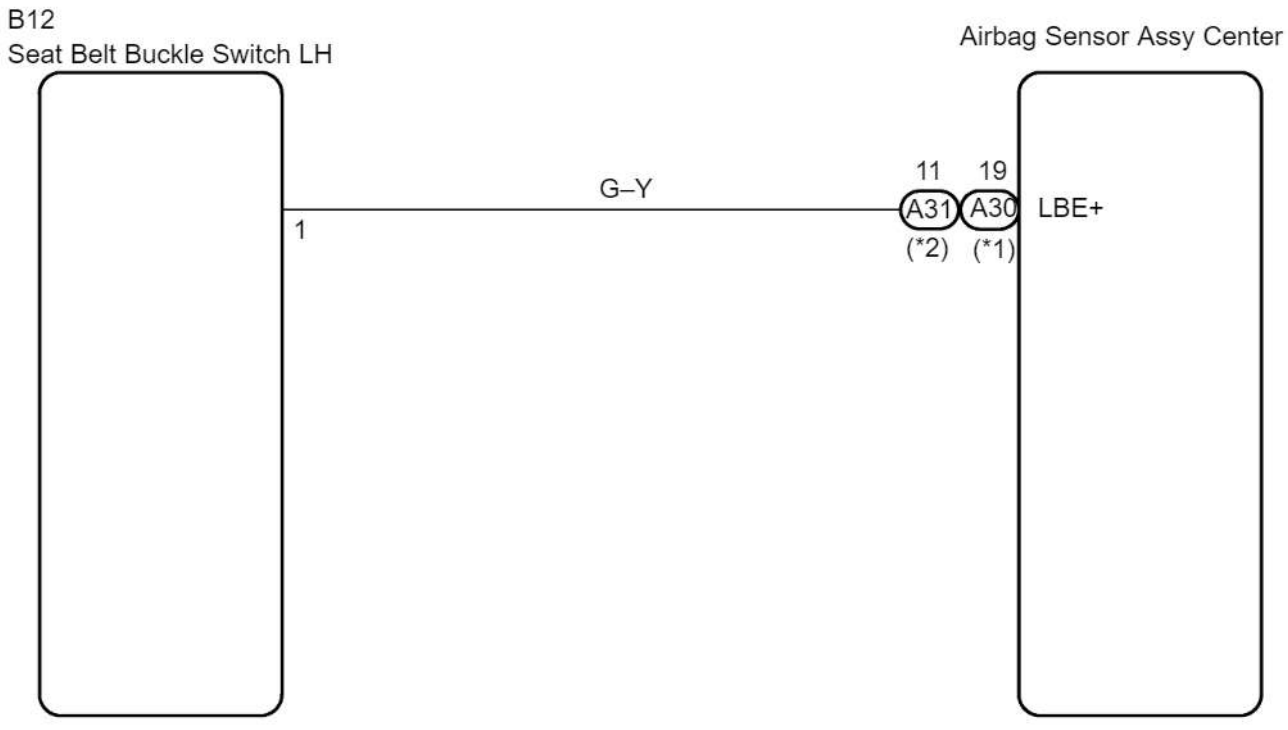
CIRCUIT DESCRIPTION

The seat belt buckle switch LH circuit consists of the airbag sensor assy center and the front seat inner belt assy LH.

DTC B0126/B0127/27 is recorded when a malfunction is detected in the seat belt buckle switch LH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B0126/B0127/27	□Short in LBE+ circuit (to ground) □Short in LBE+ circuit (to B+) □Front seat inner belt assy LH malfunction □Airbag sensor assy center malfunction	□Front seat inner belt assy LH □Airbag sensor assy center □Floor wire No.2

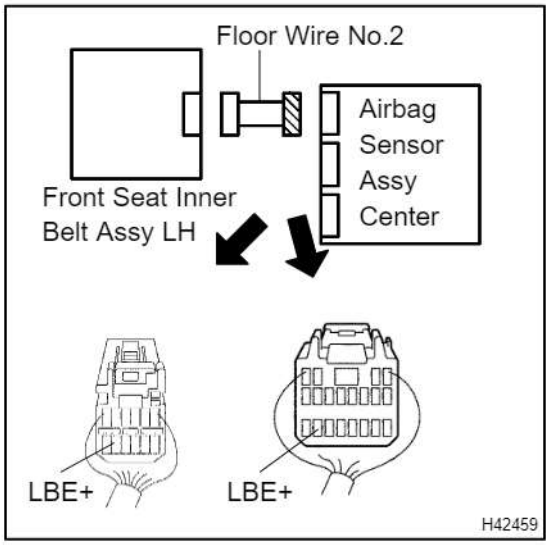
WIRING DIAGRAM



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INSPECTION PROCEDURE

1	CHECK FLOOR WIRE NO.2(TO GROUND) (TO GROUND)

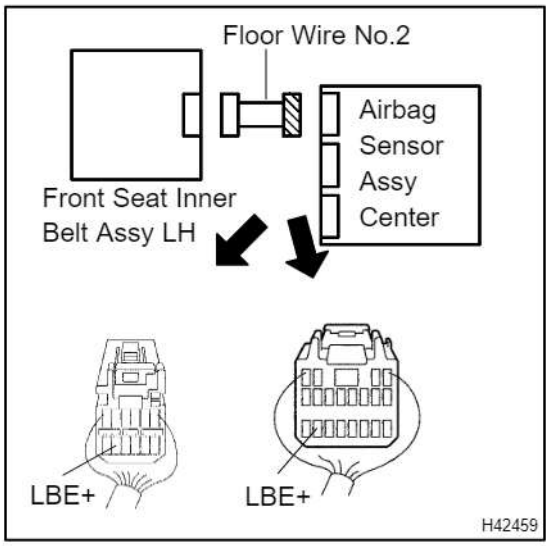


(a) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(b) Disconnect the floor wire No.2 connector from the airbag sensor assy center and the front seat inner belt assy LH.
(c) Measure the resistance between the body ground and LBE+ of the floor wire No.2 connector on the airbag sensor assy center side.
OK:
Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

2	CHECK FLOOR WIRE NO.2(TO B+) (TO B+)



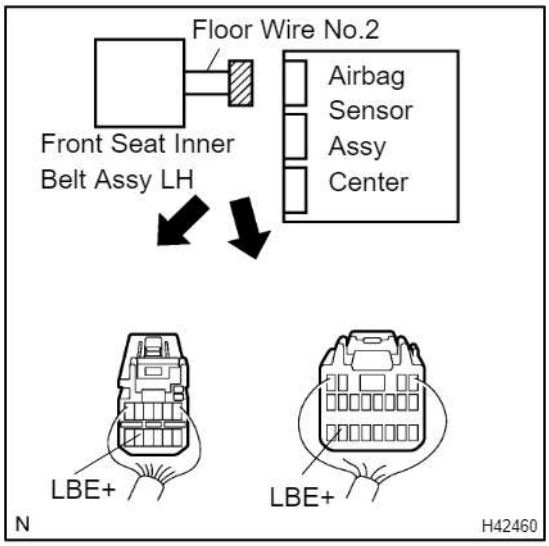
(a) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(b) Turn the ignition switch to ON.
(c) Measure the voltage between the body ground and LBE+ of the floor wire No.2 connector on the airbag sensor assy center side.
OK:
Voltage: Below 1 V

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

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3	CHECK FRONT SEAT INNER BELT ASSY LH

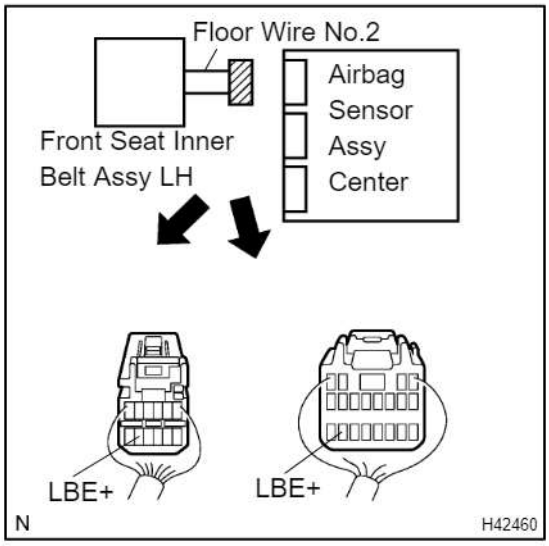


(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the connector of the front seat inner belt assy LH.
(d) Unlock the seat belt for the front seat LH.
(e) Measure the resistance between the body ground and LBE+ of the floor wire No.2 connector on the airbag sensor assy center side.
OK:
Resistance: 1.0 kΩ – 1.6 kΩ

NG → **REPLACE FRONT SEAT INNER BELT ASSY LH**

OK

4	CHECK FRONT SEAT INNER BELT ASSY LH



(a) Lock the seat belt for the front seat LH.
(b) Measure the resistance between the body ground and LBE+ of the floor wire No.2 connector on the airbag sensor assy center side.
OK:
Resistance: 100 Ω – 500 Ω

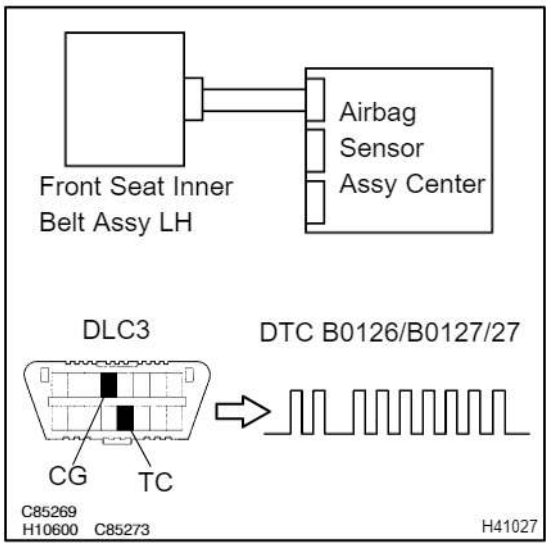
NG → **REPLACE FRONT SEAT INNER BELT ASSY LH**

OK

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5 CHECK AIR BAG SENSOR ASSY CENTER

SST 09843–18040



(a) Connect the connector to the airbag sensor assy center.
(b) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(c) Turn the ignition switch to ON, and wait at least for 10 seconds.
(d) Clear the DTC stored in memory (See page 05–1238).
(e) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(f) Turn the ignition switch to ON, and wait at least for 10 seconds.
(g) Check the DTC (See page 05–1238).
OK:
DTC B0126/B0127/27 is not output.

HINT:
Codes other than code B0126/B0127/27 may be output at this time, but they are not relevant to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

USE SIMULATION METHOD TO CHECK

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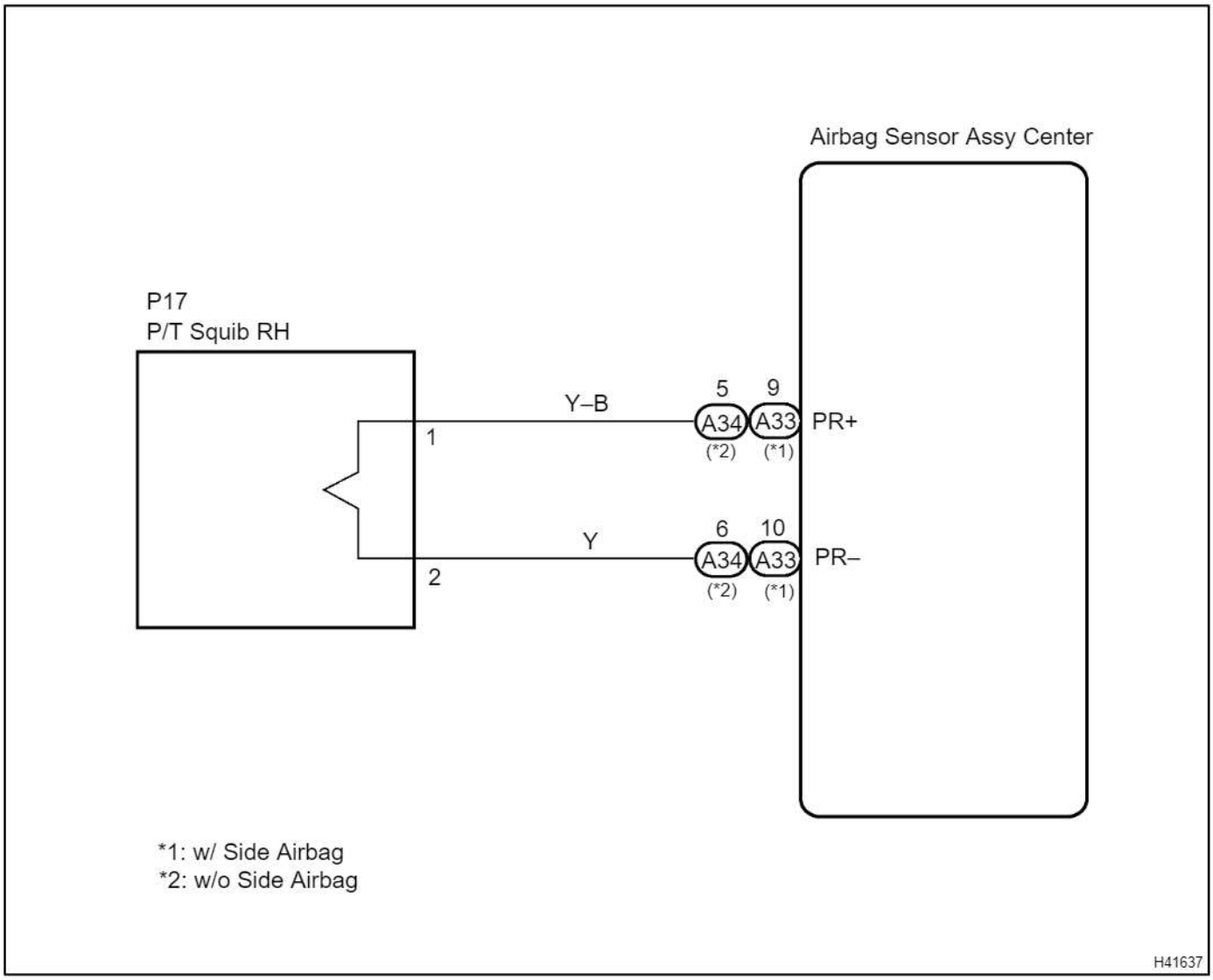
DTC B0130/63 SHORT IN P/T SQUIB (RH) CIRCUIT

CIRCUIT DESCRIPTION

The P/T squib RH circuit consists of the airbag sensor assy center and the seat belt pretensioner RH. It causes the SRS to deploy when the SRS deployment conditions are satisfied.
DTC B0130/63 is recorded when a short is detected in the P/T squib RH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B0130/63	□Short in P/T squib RH circuit □P/T squib RH malfunction □Airbag sensor assy center malfunction	□Seat belt pretensioner RH (P/T squib RH) □Airbag sensor assy center □Floor wire

WIRING DIAGRAM



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INSPECTION PROCEDURE

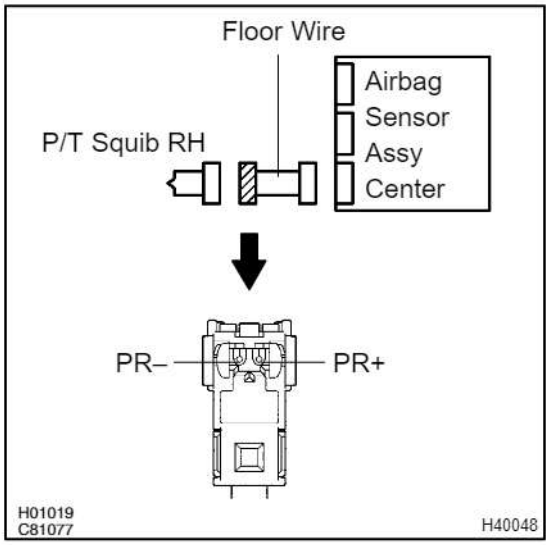
1	CHECK CONNECTOR

(a) Make sure that the connector is not damaged.
OK:
The lock button is not disengaged, or the claw of the lock is not deformed or damaged.

NG → REPAIR OR REPLACE FLOOR WIRE

OK

2	CHECK FLOOR WIRE (P/T SQUIB RH CIRCUIT)



(a) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(b) Disconnect the floor wire connectors from the airbag sensor assy center and the seat belt pretensioner RH.
(c) Release the airbag activation prevention mechanism built in the connector (on the airbag sensor assy center side) between the airbag sensor assy center and the seat belt pretensioner RH (See page 05–1238).
(d) Measure the resistance between PR+ and PR– of the floor wire connector on the seat belt pretensioner RH side.
OK:
Resistance: 1 MΩ or Higher

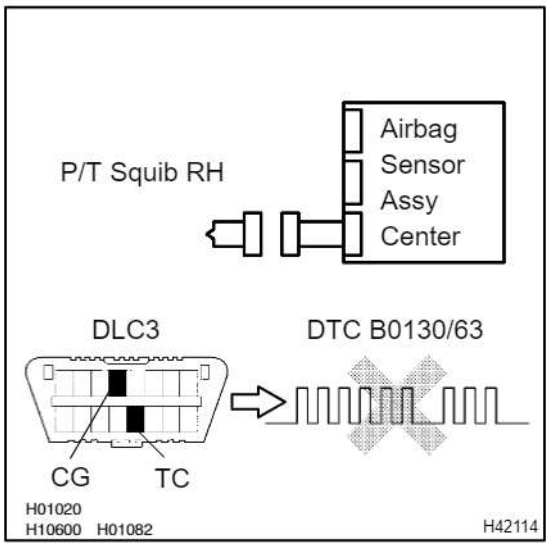
NG → REPAIR OR REPLACE FLOOR WIRE

OK

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3 CHECK AIR BAG SENSOR ASSY CENTER

SST 09843–18040



(a) Connect the connector to the airbag sensor assy center.
(b) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(c) Turn the ignition switch to ON and wait at least for 10 seconds.
(d) Clear the DTC stored in memory (See page 05–1238).
(e) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(f) Turn the ignition switch to ON, and wait at least for 10 seconds.
(g) Check the DTC (See page 05–1238).
OK:
DTC B0130/63 is not output.

HINT:
Codes other than code B0130/63 may be output at this time, but they are not relevant to this check.

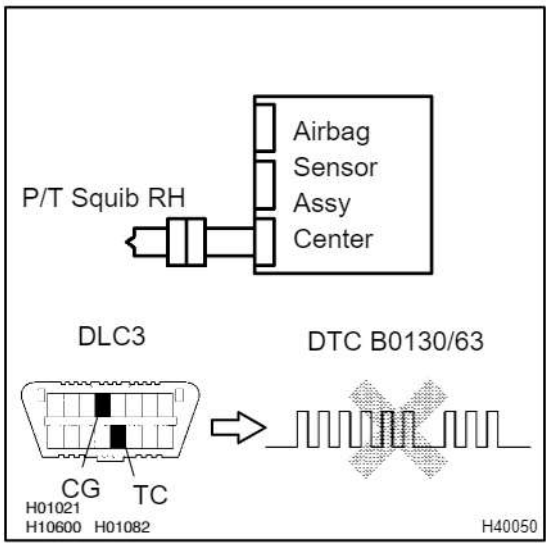
NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

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4	CHECK P/T SQUIB (RH)

SST 09843–18040



(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the seat belt pretensioner RH connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(e) Turn the ignition switch to ON, and wait at least for 10 seconds.
(f) Clear the DTC stored in memory (See page 05–1238).
(g) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(h) Turn the ignition switch to ON, and wait at least for 10 seconds.
(i) Check the DTC (See page 05–1238).

OK:

DTC B0130/63 is not output.

HINT:

Codes other than code B0130/63 may be output at this time, but they are not relevant to this check.

NG → **REPLACE FRONT SEAT OUTER BELT ASSY RH**

OK

USE SIMULATION METHOD TO CHECK

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DTC B0131/64 OPEN IN P/T (RH) CIRCUIT

CIRCUIT DESCRIPTION

The P/T squib RH circuit consists of the airbag sensor assy center and the seat belt pretensioner RH.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
DTC B0131/64 is recorded when an open is detected in the P/T squib RH circuit.

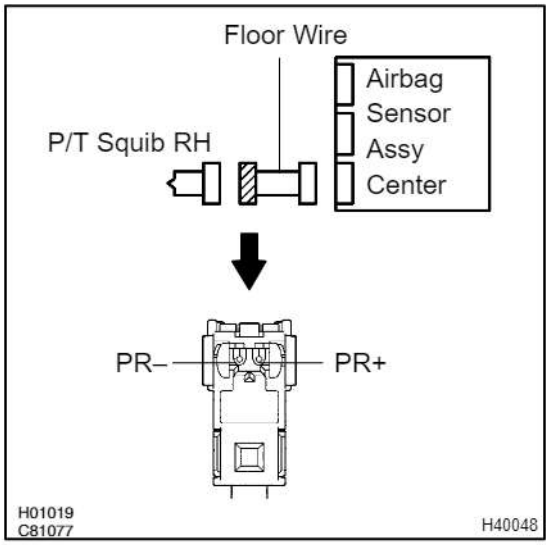
DTC No.	DTC Detecting Condition	Trouble Area
B0131/64	□Open in P/T squib RH circuit □P/T squib RH malfunction □Airbag sensor assy center malfunction	□Seat belt pretensioner RH (P/T squib RH) □Airbag sensor assy center □Floor wire

WIRING DIAGRAM

See page 05–1311.

INSPECTION PROCEDURE

1 CHECK FLOOR WIRE (P/T SQUIB RH CIRCUIT)



(a) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(b) Disconnect the floor wire connectors from the airbag sensor assy center and the seat belt pretensioner RH.
(c) Measure the resistance between PR+ and PR– of the floor wire connector on the seat belt pretensioner RH side.
OK:
Resistance: Below 1 Ω

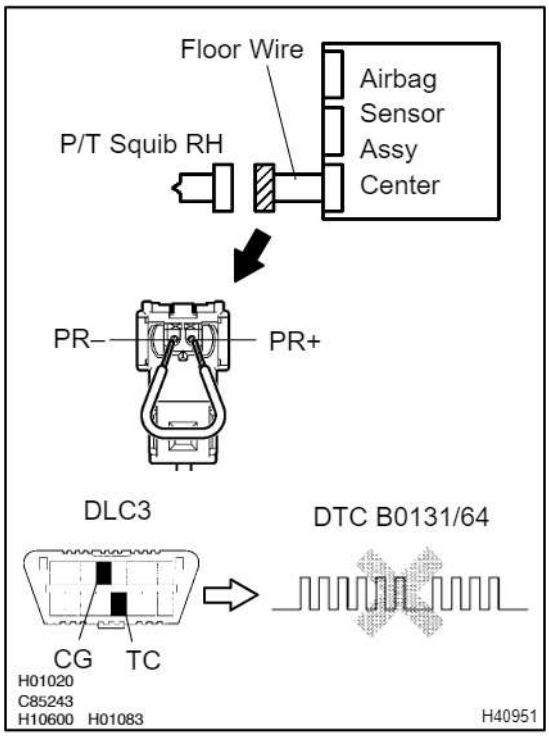
NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

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2 CHECK AIR BAG SENSOR ASSY CENTER

SST 09843–18040



(a) Connect the connector to the airbag sensor assy center.
(b) Using a service wire, connect PR+ and PR– of the floor wire connector on the seat belt pretensioner RH side.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Clear the DTC stored in memory (See page 05–1238).
(f) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(g) Turn the ignition switch to ON, and wait at least for 10 seconds.
(h) Check the DTC (See page 05–1238).

OK:

DTC B0131/64 is not output.

HINT:

Codes other than code B0131/64 may be output at this time, but they are not relevant to this check.

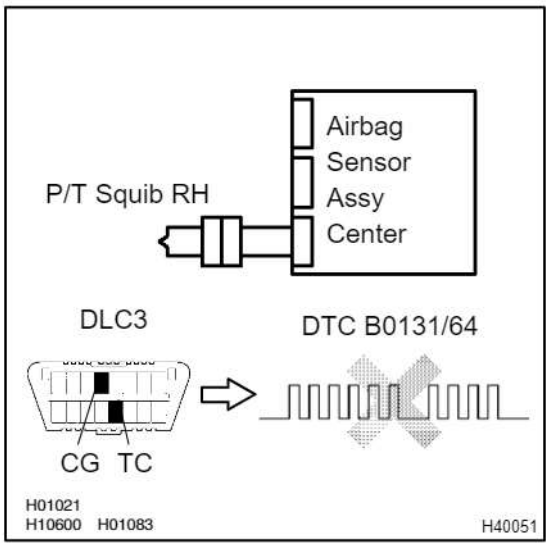
NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

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3	CHECK P/T SQUIB (RH)

SST 09843–18040



(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the seat belt pretensioner RH connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(e) Turn the ignition switch to ON, and wait at least for 10 seconds.
(f) Clear the DTC stored in memory (See page 05–1238).
(g) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(h) Turn the ignition switch to ON, and wait at least for 10 seconds.
(i) Check the DTC (See page 05–1238).

OK:

DTC B0131/64 is not output.

HINT:

Codes other than code B0131/64 may be output at this time, but they are not relevant to this check.

NG → **REPLACE FRONT SEAT OUTER BELT ASSY RH**

OK

USE SIMULATION METHOD TO CHECK

cardiagn.com

DTC	B0132/61	SHORT IN P/T SQUIB (RH) CIRCUIT (TO GROUND)

CIRCUIT DESCRIPTION

The P/T squib RH circuit consists of the airbag sensor assy center and the seat belt pretensioner RH.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
DTC B0132/61 is recorded when a ground short is detected in the P/T squib RH circuit.

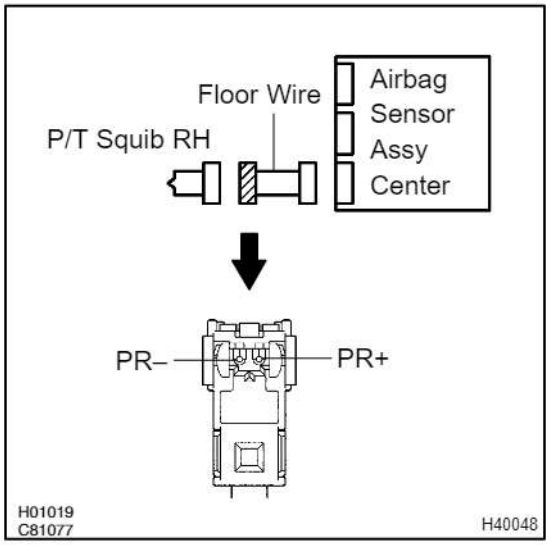
DTC No.	DTC Detecting Condition	Trouble Area
B0132/61	□Short in P/T squib RH circuit (to ground) □P/T squib RH malfunction □Airbag sensor assy center malfunction	□Seat belt pretensioner RH (P/T squib RH) □Airbag sensor assy center □Floor wire

WIRING DIAGRAM

See page 05–1311.

INSPECTION PROCEDURE

1	CHECK FLOOR WIRE (P/T SQUIB RH CIRCUIT)



(a) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(b) Disconnect the floor wire connectors from the airbag sensor assy center and the seat belt pretensioner RH.
(c) Measure the resistances between the body ground and PR+ of the floor wire connector on the seat belt pretensioner RH side.
OK:
Resistance: 1 MΩ or Higher

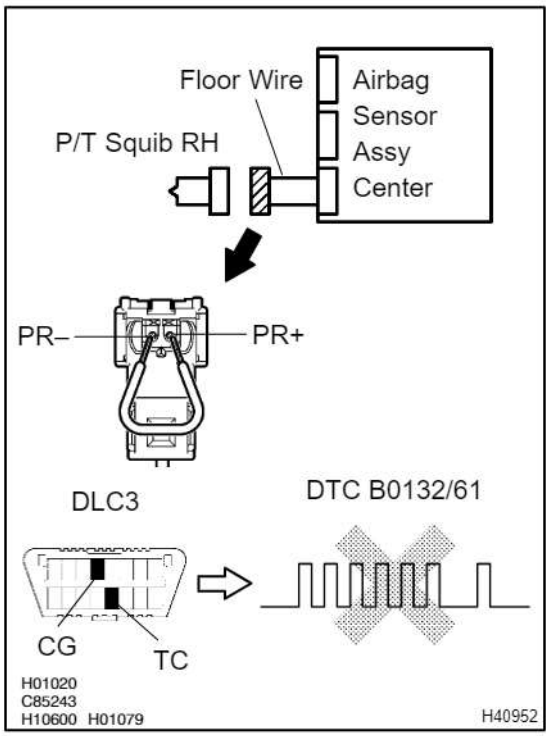
NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

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2 CHECK AIR BAG SENSOR ASSY CENTER

SST 09843–18040



(a) Connect the connector to the airbag sensor assy center.
(b) Using a service wire, connect PR+ and PR– of the floor wire connector on the seat belt pretensioner RH side.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Clear the DTC stored in memory (See page 05–1238).
(f) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(g) Turn the ignition switch to ON, and wait at least for 10 seconds.
(h) Check the DTC (See page 05–1238).

OK:

DTC B0132/61 is not output.

HINT:

Codes other than code B0132/61 may be output at this time, but they are not relevant to this check.

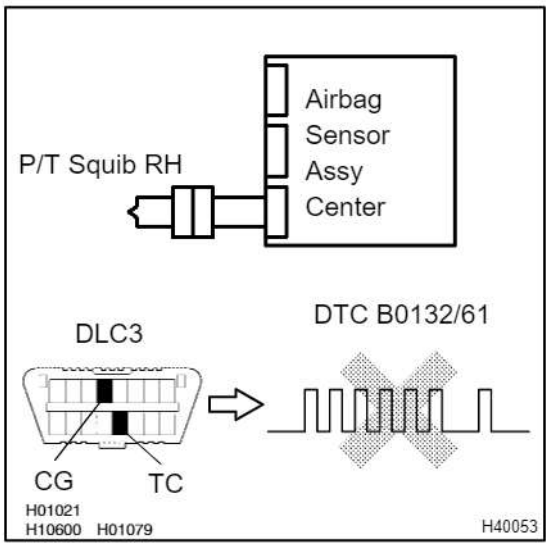
NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

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3	CHECK P/T SQUIB (RH)

SST 09843–18040



(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the seat belt pretensioner RH connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(e) Turn the ignition switch to ON, and wait at least for 10 seconds.
(f) Clear the DTC stored in memory (See page 05–1238).
(g) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(h) Turn the ignition switch to ON, and wait at least for 10 seconds.
(i) Check the DTC (See page 05–1238).

OK:

DTC B0132/61 is not output.

HINT:

Codes other than code B0132/61 may be output at this time, but they are not relevant to this check.

NG → **REPLACE FRONT SEAT OUTER BELT ASSY RH**

OK

4	USE SIMULATION METHOD TO CHECK

NG → **Go to step 1**

OK

REPLACE ALL SRS COMPONENTS INCLUDING WIRE HARNESS

cardiagn.com

DTC B0133/62 SHORT IN P/T SQUIB (RH) CIRCUIT (TO B+)

CIRCUIT DESCRIPTION

The P/T squib RH circuit consists of the airbag sensor assy center and the seat belt pretensioner RH. It causes the SRS to deploy when the SRS deployment conditions are satisfied.
DTC B0133/62 is recorded when a B+ short is detected in the P/T squib RH circuit.

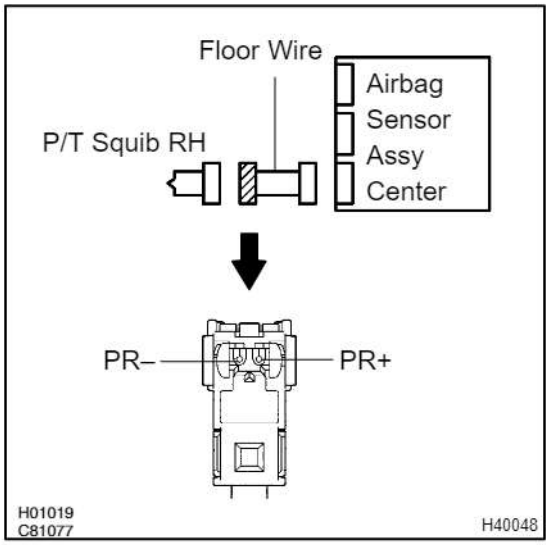
DTC No.	DTC Detecting Condition	Trouble Area
B0133/62	□Short in P/T squib RH circuit (to B+) □P/T squib RH malfunction □Airbag sensor assy center malfunction	□Seat belt pretensioner RH (P/T squib RH) □Airbag sensor assy center □Floor wire

WIRING DIAGRAM

See page 05–1311.

INSPECTION PROCEDURE

1	CHECK FLOOR WIRE (P/T SQUIB RH CIRCUIT)



(a) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(b) Disconnect the floor wire connectors from the airbag sensor assy center and the seat belt pretensioner RH.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(d) Turn the ignition switch to ON.
(e) Measure the voltage between the body ground and PR+ of the floor wire connector on the seat belt pretensioner RH side.
OK:
Voltage: Below 1V

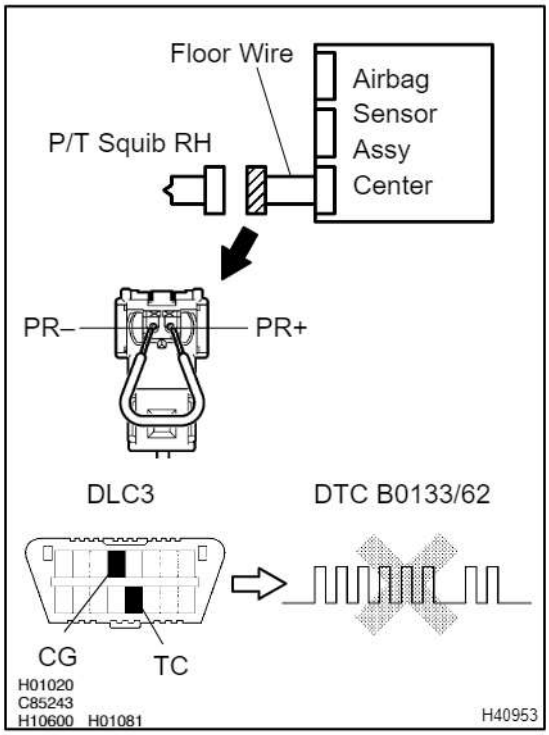
NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

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2 CHECK AIR BAG SENSOR ASSY CENTER

SST 09843–18040



(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the connector to the airbag sensor assy center.
(d) Using a service wire, connect PR+ and PR– of the floor wire connector on the seat belt pretensioner RH side.
(e) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(f) Turn the ignition switch to ON and wait at least for 10 seconds.
(g) Clear the DTC stored in memory (See page 05–1238).
(h) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(i) Turn the ignition switch to ON, and wait at least for 10 seconds.
(j) Check the DTC (See page 05–1238).

OK:

DTC B0133/62 is not output.

HINT:

Codes other than code B0133/62 may be output at this time, but they are not relevant to this check.

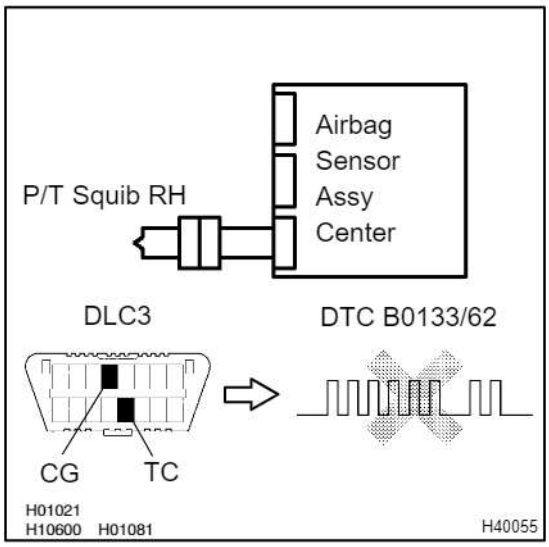
NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

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3	CHECK P/T SQUIB (RH)

SST 09843–18040



(a) Turn ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the seat belt pretensioner RH connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(e) Turn the ignition switch to ON, and wait at least for 10 seconds.
(f) Clear the DTC stored in memory (See page 05–1238).
(g) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(h) Turn the ignition switch to ON, and wait at least for 10 seconds.
(i) Check the DTC (See page 05–1238).

OK:

DTC B0133/62 is not output.

HINT:

Codes other than code B0133/62 may be output at this time, but they are not relevant to this check.

NG → **REPLACE FRONT SEAT OUTER BELT ASSY RH**

OK

4	USE SIMULATION METHOD TO CHECK

NG → **Go to step 1**

OK

REPLACE ALL SRS COMPONENTS INCLUDING WIRE HARNESS

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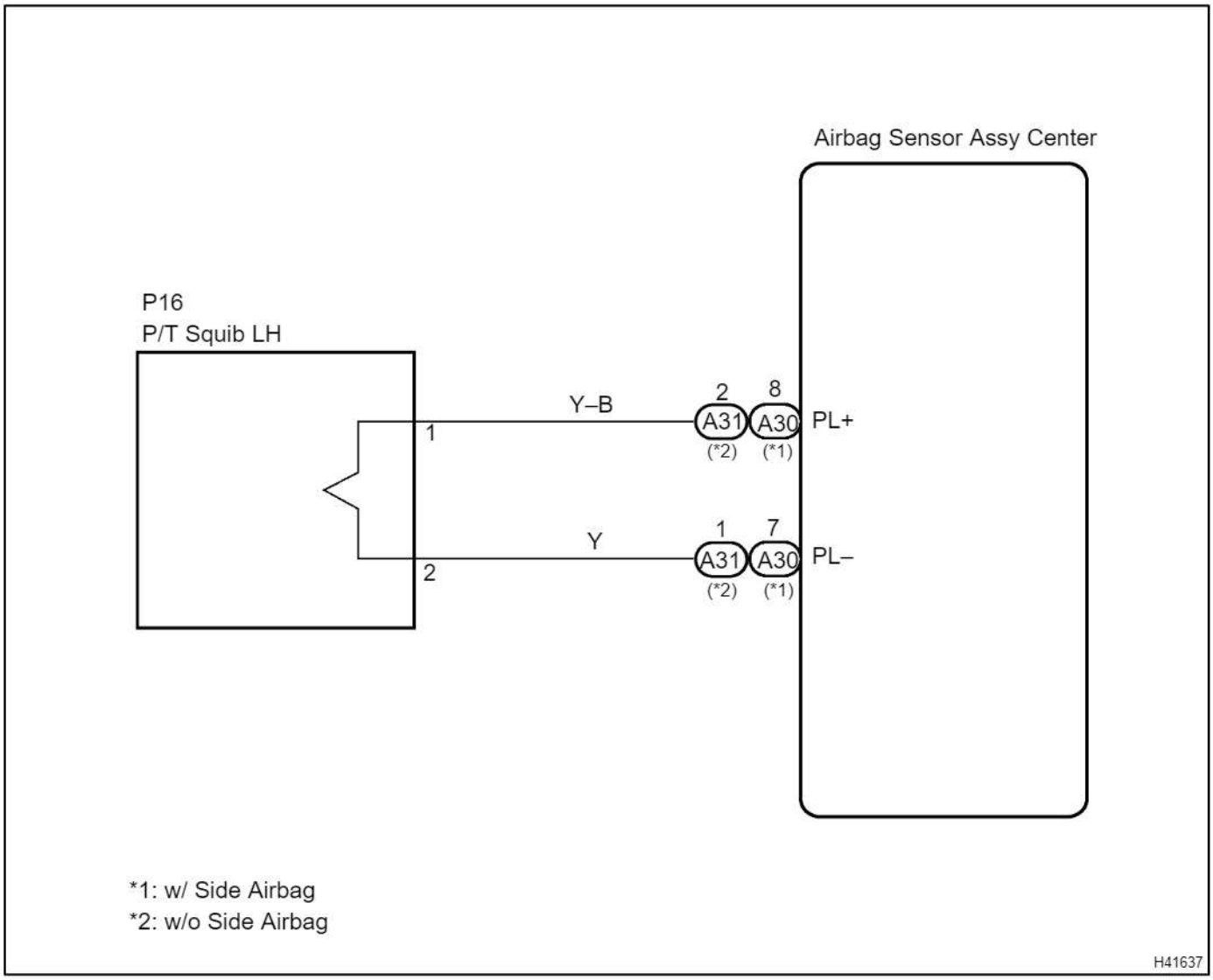
DTC B0135/73 SHORT IN P/T SQUIB (LH) CIRCUIT

CIRCUIT DESCRIPTION

The P/T squib LH circuit consists of the airbag sensor assy center and the seat belt pretensioner LH.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
DTC B0135/73 is recorded when a short is detected in the P/T squib LH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B0135/73	□Short in P/T squib LH circuit □P/T squib LH malfunction □Airbag sensor assy center malfunction	□Seat belt pretensioner LH (P/T squib LH) □Airbag sensor assy center □Floor wire No.2

WIRING DIAGRAM



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INSPECTION PROCEDURE

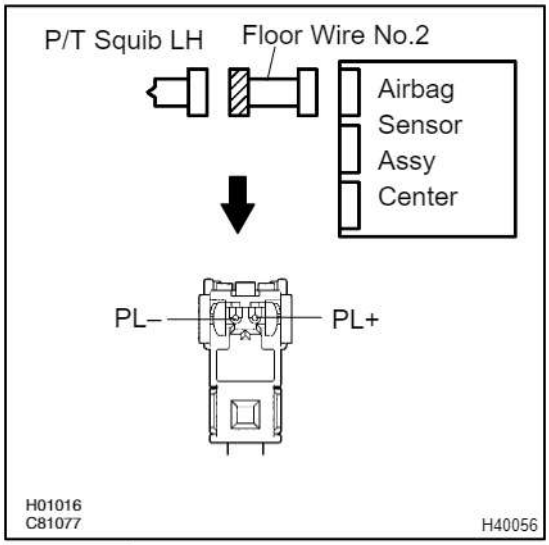
1	CHECK CONNECTOR

(a) Make sure that the connector is not damaged.
OK:
The lock button is not disengaged, or the claw of the lock is not deformed or damaged.

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

2	CHECK FLOOR WIRE NO.2(P/T SQUIB LH CIRCUIT)



(a) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(b) Disconnect the floor wire No.2 connectors from the airbag sensor assy center and the seat belt pretensioner LH.
(c) Release the airbag activation prevention mechanism built in the connector on the airbag sensor assy center side (See page 05–1238).
(d) Measure the resistance between PL+ and PL– of the floor wire No.2 on the seat belt pretensioner LH side.
OK:
Resistance: 1 MΩ or Higher

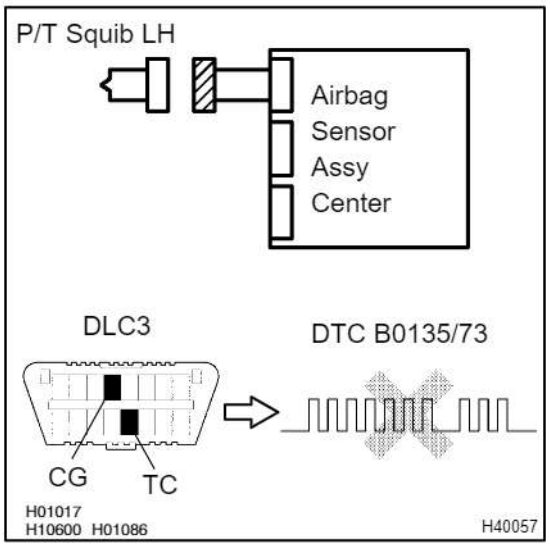
NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

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3	CHECK AIR BAG SENSOR ASSY CENTER

SST 09843–18040



(a) Connect the connector to the airbag sensor assy center.
(b) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(c) Turn the ignition switch to ON, and wait at least for 10 seconds.
(d) Clear the DTC stored in memory (See page 05–1238).
(e) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(f) Turn the ignition switch to ON, and wait at least for 10 seconds.
(g) Check the DTC (See page 05–1238).
OK:
DTC B0135/73 is not output.

HINT:
Codes other than code B0135/73 may be output at this time, but they are not relevant to this check.

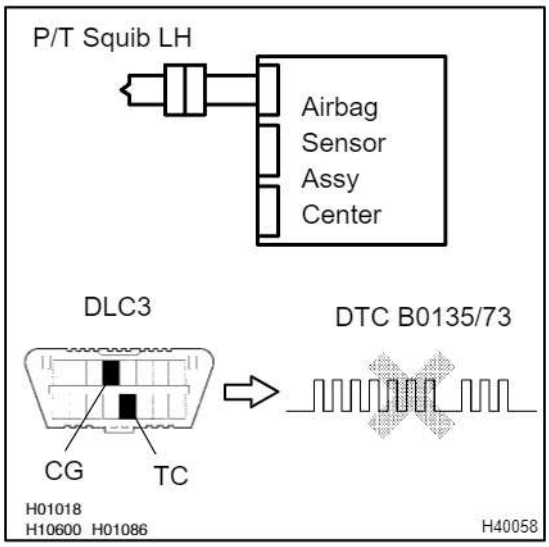
NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

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4	CHECK P/T SQUIB (LH)

SST 09843–18040



(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the seat belt pretensioner LH connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(e) Turn the ignition switch to ON, and wait at least for 10 seconds.
(f) Clear the DTC stored in memory (See page 05–1238).
(g) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(h) Turn the ignition switch to ON, and wait at least for 10 seconds.
(i) Check the DTC (See page 05–1238).

OK:

DTC B0135/73 is not output.

HINT:

Codes other than code B0135/73 may be output at this time, but they are not relevant to this check.

NG → **REPLACE FRONT SEAT OUTER BELT ASSY LH**

OK

USE SIMULATION METHOD TO CHECK

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DTC B0136/74 OPEN IN P/T SQUIB (LH) CIRCUIT

CIRCUIT DESCRIPTION

The P/T squib LH circuit consists of the airbag sensor assy center and the seat belt pretensioner LH.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
DTC B0136/74 is recorded when an open is detected in the P/T squib LH circuit.

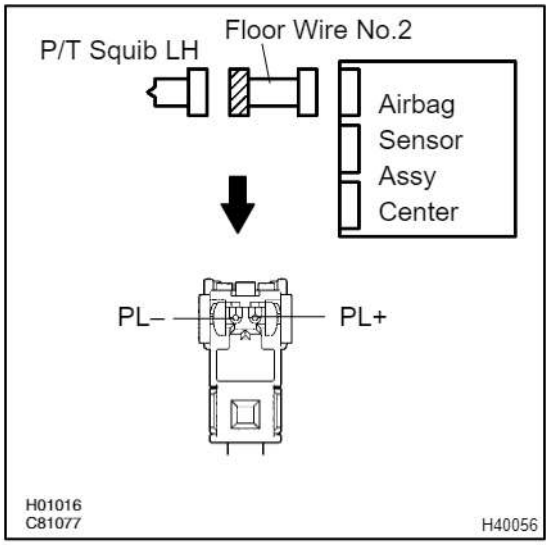
DTC No.	DTC Detecting Condition	Trouble Area
B0136/74	□Open in P/T squib LH circuit □P/T squib LH malfunction □Airbag sensor assy center malfunction	□Seat belt pretensioner LH (P/T squib LH) □Airbag sensor assy center □Floor wire No.2

WIRING DIAGRAM

See page 05–1324.

INSPECTION PROCEDURE

1 CHECK FLOOR WIRE NO.2(P/T SQUIB LH CIRCUIT)



(a) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(b) Disconnect the floor wire No.2 connectors from the airbag sensor assy center and the seat belt pretensioner LH.
(c) Measure the resistance between PL+ and PL– of the floor wire No.2 connector on the seat belt pretensioner LH side.
OK:
Resistance: Below 1 Ω

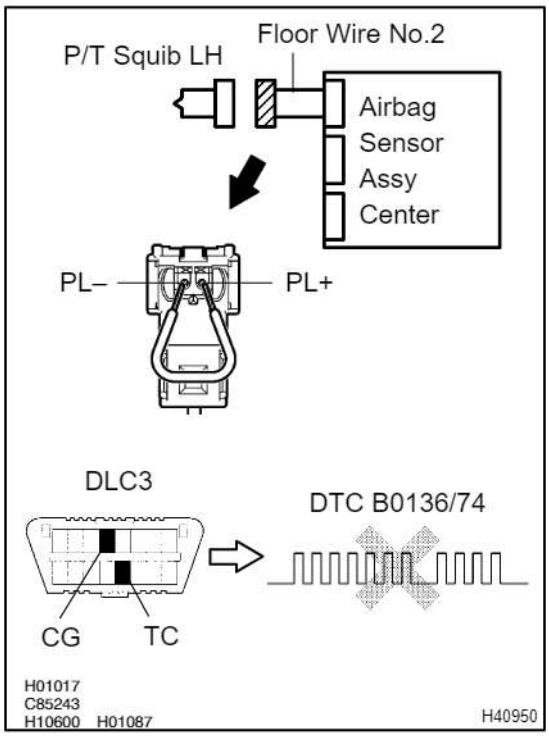
NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

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2 CHECK AIR BAG SENSOR ASSY CENTER

SST 09843–18040



(a) Connect the connector to the airbag sensor assy center.
(b) Using a service wire, connect PL+ and PL– of the floor wire No.2 connector on the seat belt pretensioner LH side.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Clear the DTC stored in memory (See page 05–1238).
(f) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(g) Turn the ignition switch to ON, and wait at least for 10 seconds.
(h) Check the DTC (See page 05–1238).

OK:

DTC B0136/74 is not output.

HINT:

Codes other than code B0136/74 may be output at this time, but they are not relevant to this check.

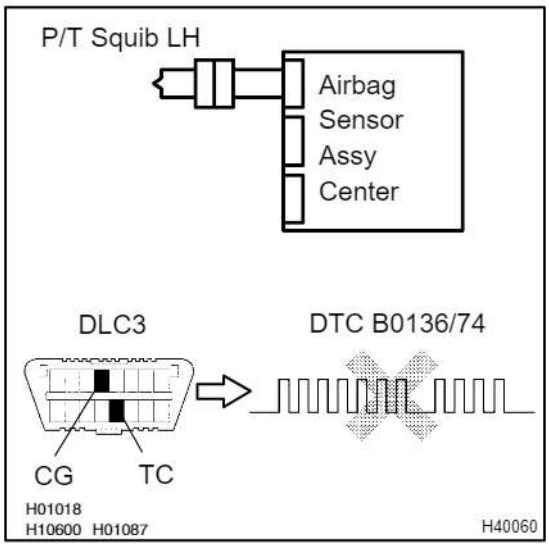
NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

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3	CHECK P/T SQUIB (LH)

SST 09843–18040



(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the seat belt pretensioner LH connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(e) Turn the ignition switch to ON, and wait at least for 10 seconds.
(f) Clear the DTC stored in memory (See page 05–1238).
(g) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(h) Turn the ignition switch to ON, and wait at least for 10 seconds.
(i) Check the DTC (See page 05–1238).

OK:

DTC B0136/74 is not output.

HINT:

Codes other than code B0136/74 may be output at this time, but they are not relevant to this check.

NG → **REPLACE FRONT SEAT OUTER BELT ASSY LH**

OK

USE SIMULATION METHOD TO CHECK

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DTC	B0137/71	SHORT IN P/T SQUIB (LH) CIRCUIT (TO GROUND)

CIRCUIT DESCRIPTION

The P/T squib LH circuit consists of the airbag sensor assy center and the seat belt pretensioner LH.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
DTC B0137/71 is recorded when a ground short is detected in the P/T squib LH circuit.

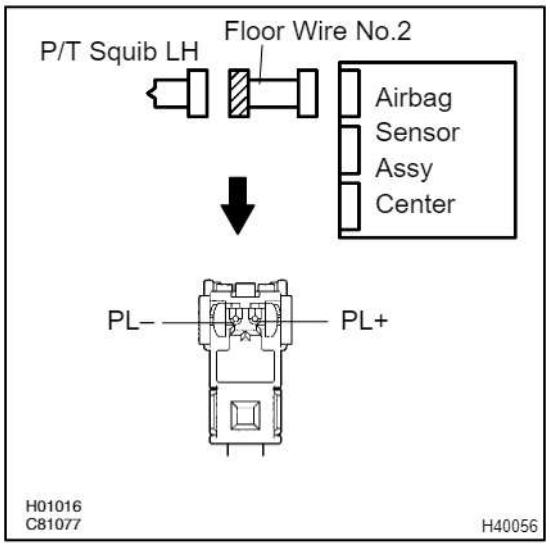
DTC No.	DTC Detecting Condition	Trouble Area
B0137/71	□Short in P/T squib LH circuit (to ground) □P/T squib LH malfunction □Airbag sensor assy center malfunction	□Seat belt pretensioner LH (P/T squib LH) □Airbag sensor assy center □Floor wire No.2

WIRING DIAGRAM

See page 05–1324.

INSPECTION PROCEDURE

1	CHECK FLOOR WIRE NO.2(P/T SQUIB LH CIRCUIT)



(a) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(b) Disconnect the floor wire No.2 connectors from the airbag sensor assy center and the seat belt pretensioner LH.
(c) Measure the resistance between the body ground and PL+ of the floor wire No.2 connector on the seat belt pretensioner LH side.
OK:
Resistance: 1 MΩ or Higher

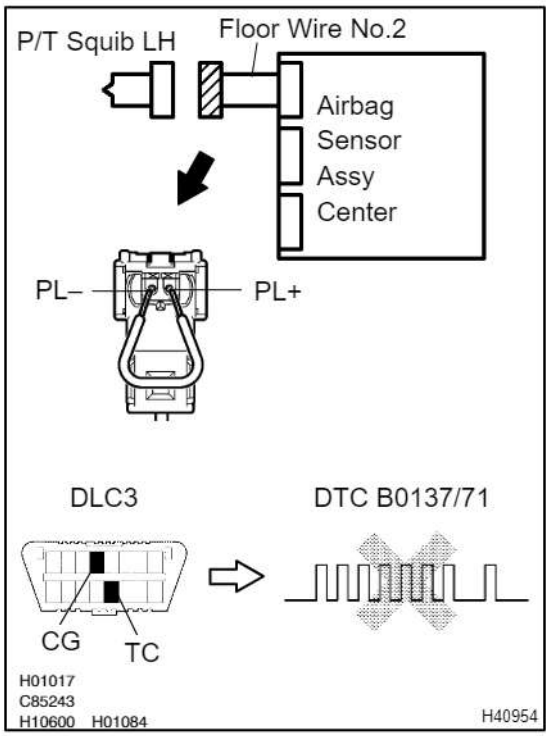
NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

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2 CHECK AIR BAG SENSOR ASSY CENTER

SST 09843–18040



(a) Connect the connector to the airbag sensor assy center.
(b) Using a service wire, connect PL+ and PL– of the floor wire No.2 connector on the seat belt pretensioner LH side.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Clear the DTC stored in memory (See page 05–1238).
(f) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(g) Turn the ignition switch to ON, and wait at least for 10 seconds.
(h) Check the DTC (See page 05–1238).

OK:

DTC B0137/71 is not output.

HINT:

Codes other than code B0137/71 may be output at this time, but they are not relevant to this check.

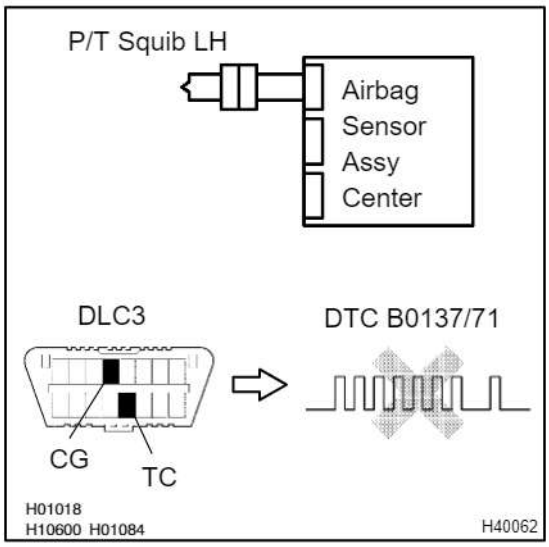
NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

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3	CHECK P/T SQUIB (LH)

SST 09843–18040



(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the seat belt pretensioner LH connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(e) Turn the ignition switch to ON, and wait at least for 10 seconds.
(f) Clear the DTC stored in memory (See page 05–1238).
(g) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(h) Turn the ignition switch to ON, and wait at least for 10 seconds.
(i) Check the DTC (See page 05–1238).

OK:

DTC B0137/71 is not output.

HINT:

Codes other than code B0137/71 may be output at this time, but they are not relevant to this check.

NG → **REPLACE FRONT SEAT OUTER BELT ASSY LH**

OK

4	USE SIMULATION METHOD TO CHECK

NG → **Go to step 1**

OK

REPLACE ALL SRS COMPONENTS INCLUDING WIRE HARNESS

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DTC B0138/72 SHORT IN P/T SQUIB (LH) CIRCUIT (TO B+)

CIRCUIT DESCRIPTION

The P/T squib LH circuit consists of the airbag sensor assy center and the seat belt pretensioner LH.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
DTC B0138/72 is recorded when a B+ short is detected in the P/T squib LH circuit.

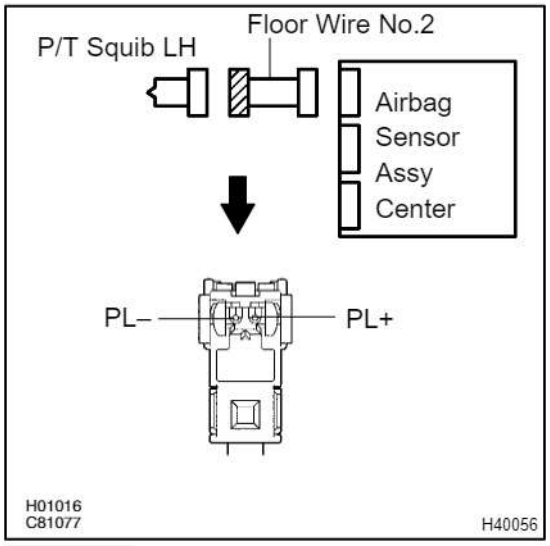
DTC No.	DTC Detecting Condition	Trouble Area
B0138/72	□Short in P/T squib LH circuit (to B+) □P/T squib LH malfunction □Airbag sensor assy center malfunction	□Seat belt pretensioner LH (P/T squib LH) □Airbag sensor assy center □Floor wire No.2

WIRING DIAGRAM

See page 05–1324.

INSPECTION PROCEDURE

1	CHECK FLOOR WIRE NO.2(P/T SQUIB LH CIRCUIT)



(a) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(b) Disconnect the floor wire No.2 connectors from the airbag sensor assy center and the seat belt pretensioner LH.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(d) Turn the ignition switch to ON.
(e) Measure the voltage between the body ground and PL+ of the floor wire No.2 connector on the seat belt pretensioner LH side.
OK:
Voltage: Below 1V

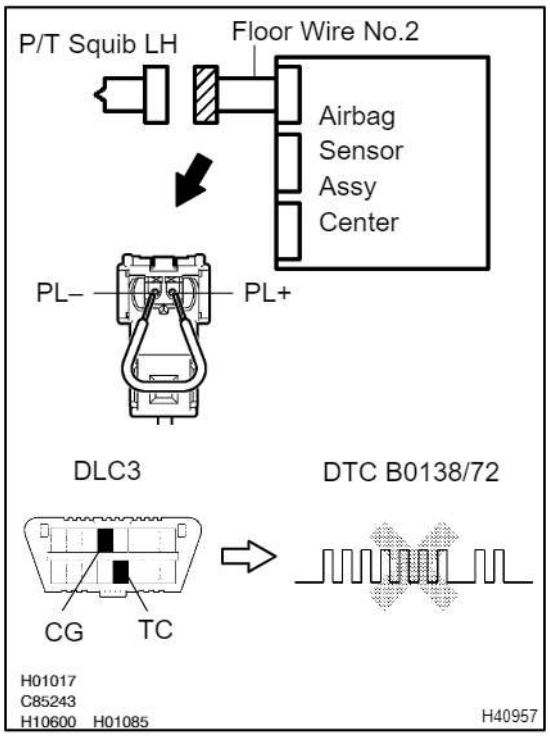
NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

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2 CHECK AIR BAG SENSOR ASSY CENTER

SST 09843–18040



(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery and wait at least for 90seconds.
(c) Connect the connector to the airbag sensor assy center.
(d) Using a service wire, connect PL+ and PL– of the floor wire No.2 connector on the seat belt pretensioner LH side.
(e) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(f) Turn the ignition switch to ON, and wait at least for 10 seconds.
(g) Clear the DTC stored in memory (See page 05–1238).
(h) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(i) Turn the ignition switch to ON, and wait at least for 10 seconds.
(j) Check the DTC (See page 05–1238).

OK:

DTC B0138/72 is not output.

HINT:

Codes other than code B0138/72 may be output at this time, but they are not relevant to this check.

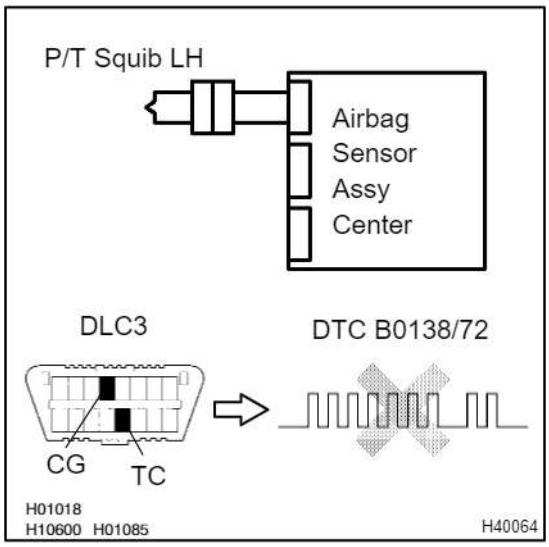
NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

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3	CHECK P/T SQUIB (LH)

SST 09843–18040



(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the seat belt pretensioner LH connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(e) Turn the ignition switch to ON, and wait at least for 10 seconds.
(f) Clear the DTC stored in memory (See page 05–1238).
(g) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(h) Turn the ignition switch to ON, and wait at least for 10 seconds.
(i) Check the DTC (See page 05–1238).

OK:

DTC B0138/72 is not output.

HINT:

Codes other than code B0138/72 may be output at this time, but they are not relevant to this check.

NG → **REPLACE FRONT SEAT OUTER BELT ASSY LH**

OK

4	USE SIMULATION METHOD TO CHECK

NG → **Go to step 1**

OK

REPLACE ALL SRS COMPONENTS INCLUDING WIRE HARNESS

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DTC B1100/31 AIRBAG SENSOR ASSY MALFUNCTION

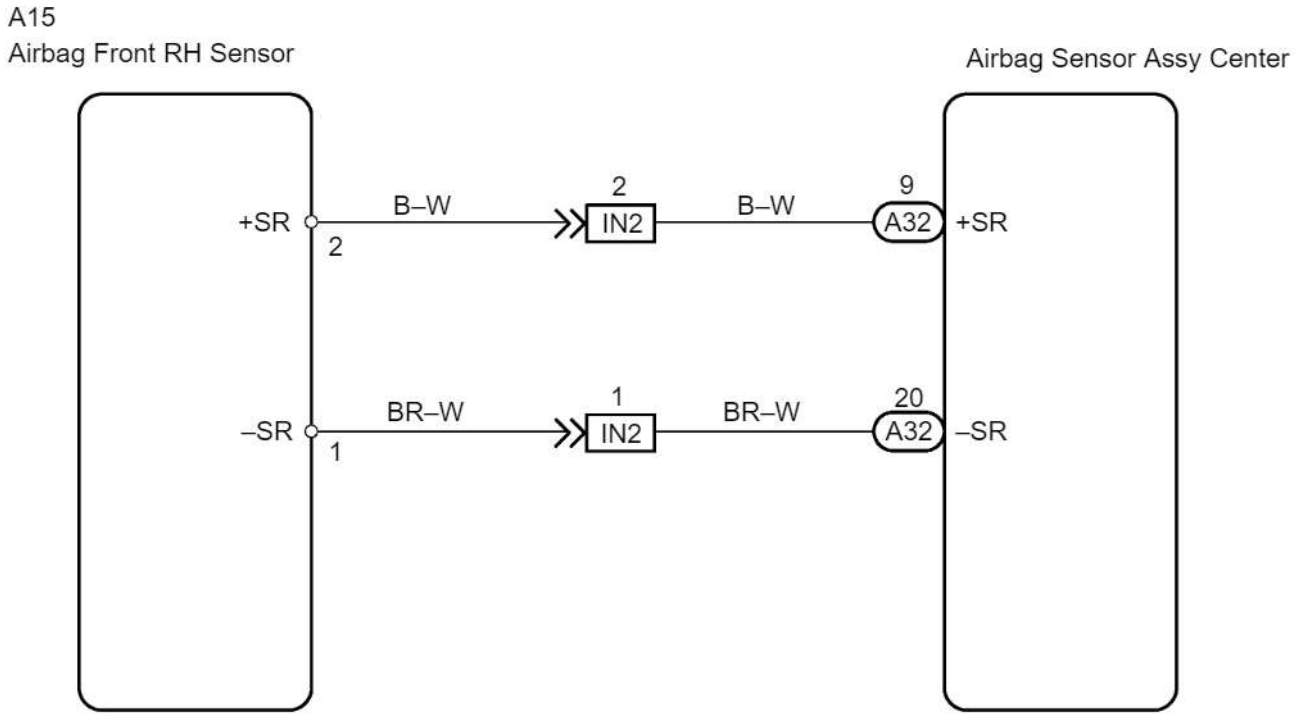
CIRCUIT DESCRIPTION

The airbag sensor assy center consists of a airbag sensor assy center, a safing sensor, a drive circuit, a diagnosis circuit and an ignition control, etc.
It receives signals from the airbag sensor, judges whether or not the SRS must be activated, and detects a diagnosis system malfunction.
DTC B1100/31 is recorded when occurrence of a malfunction in the airbag sensor assy center is detected.

DTC No.	DTC Detecting Condition	Trouble Area
B1100/31	□Short in front airbag sensor RH circuit (to ground) □Short in front airbag sensor RH circuit (to B+) □Short in front airbag sensor RH circuit □Short in front airbag sensor LH circuit (to ground) □Short in front airbag sensor LH circuit (to B+) □Short in front airbag sensor LH circuit □Airbag sensor assy center malfunction	□Airbag sensor assy center □Instrument panel wire □Engine room main wire

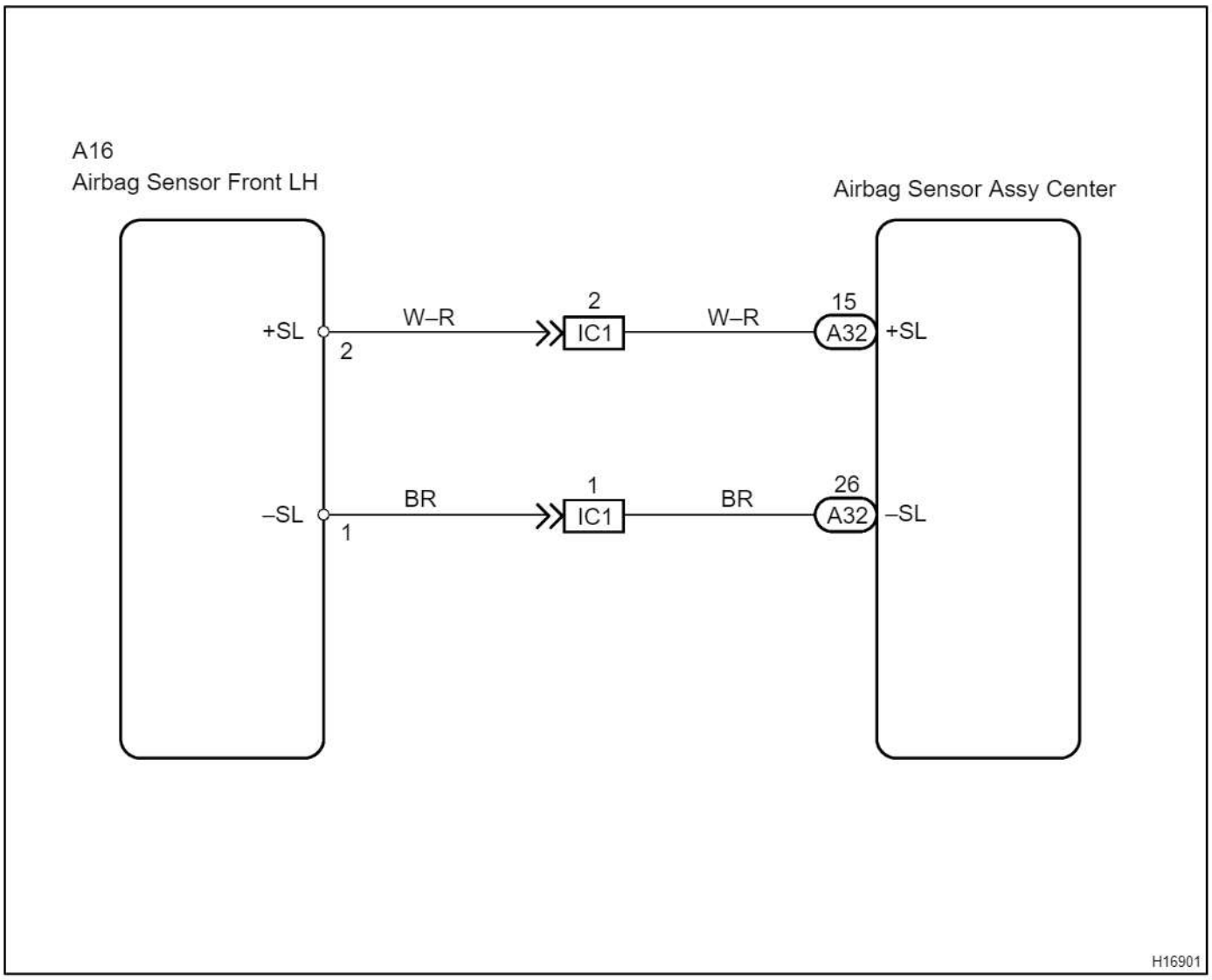
HINT:
When a malfunction code other than code B1100/31 is displayed at the same time, first repair the malfunction indicated by the malfunction code other than code B1100/31.

WIRING DIAGRAM



H16901

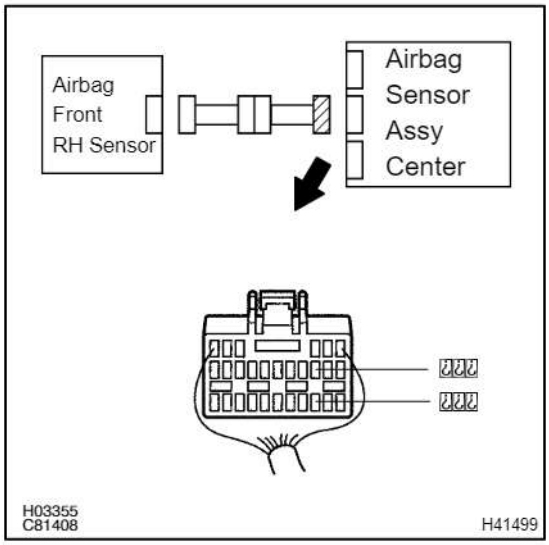
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INSPECTION PROCEDURE

1	CHECK FRONT AIRBAG SENSOR (RH) CIRCUIT (TO GROUND)

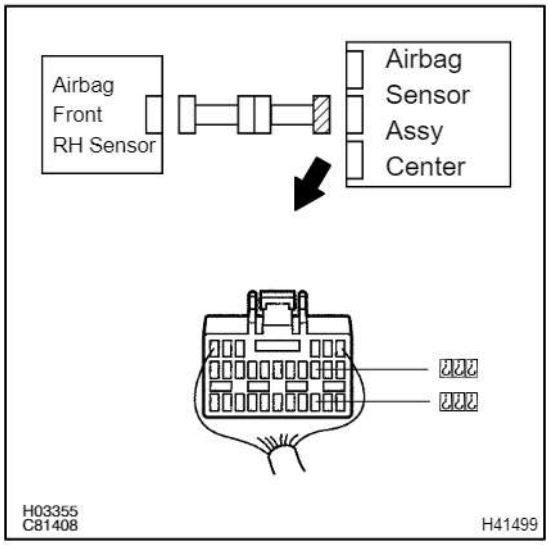


(a) Turn the ignition switch to LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Disconnect the connectors between the airbag front RH sensor and the airbag sensor assy center.
(d) Measure the resistance between the body ground and each of +SR and –SR of the connector on the airbag sensor assy center side between the airbag front RH sensor and the airbag sensor assy center.
OK:
Resistance: 1 MΩ or Higher

NG → **Go to step 8**

OK

2	CHECK FRONT AIRBAG SENSOR (RH) CIRCUIT (TO B+)



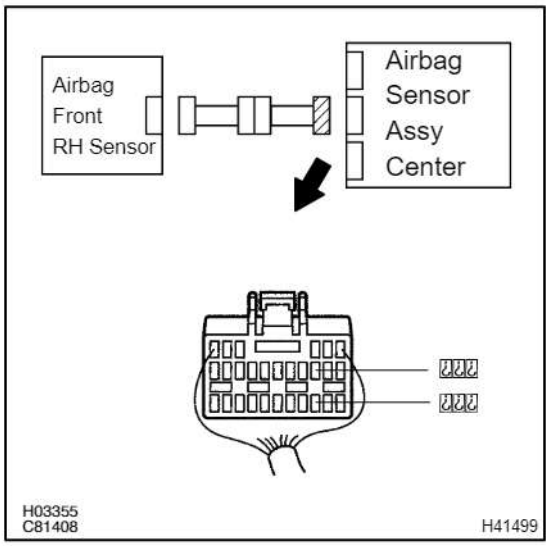
(a) Connect the negative (–) terminal cable to the battery.
(b) Turn the ignition switch to ON position.
(c) Measure the voltage between the body ground and each of +SR and –SR of the connector on the airbag sensor assy center side between the airbag front RH sensor and the airbag sensor assy center.
OK:
Voltage: Below 1 V

NG → **Go to step 9**

OK

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3 CHECK FRONT AIRBAG SENSOR (RH) CIRCUIT(SHORT)



(a) Turn the ignition switch to LOCK position.
(b) Measure the resistance between +SR and –SR of the connector on the airbag sensor assy center side between the airbag front RH sensor and the airbag sensor assy center.

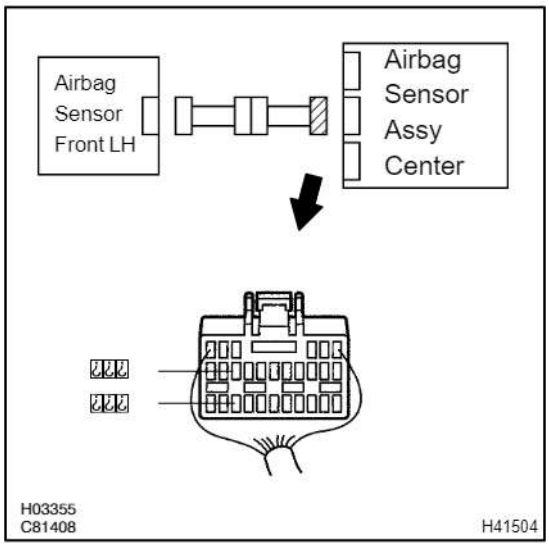
OK:

Resistance: 1 MΩ or Higher

NG → **Go to step 10**

OK

4 CHECK FRONT AIRBAG SENSOR (LH) CIRCUIT (TO GROUND)



(a) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(b) Disconnect the connectors between the airbag sensor front LH and the airbag sensor assy center.
(c) Measure the resistance between the body ground and each of +SL and –SL of the connector on the airbag sensor assy center side between the airbag sensor front LH and the airbag sensor assy center.

OK:

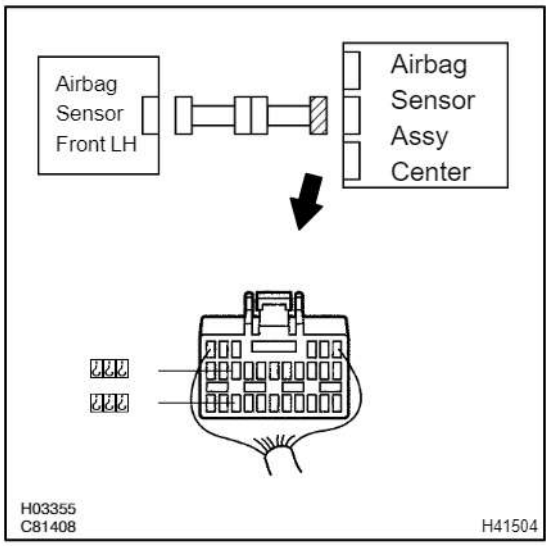
Resistance: 1 MΩ or Higher

NG → **Go to step 11**

OK

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5 CHECK FRONT AIRBAG SENSOR (LH) CIRCUIT (TO B+)



(a) Connect the negative (–) terminal cable to the battery.
(b) Turn the ignition switch to ON position.
(c) Measure the voltage between the body ground and each of +SL and –SL of the connector on the airbag sensor assy center side between the airbag sensor front LH and the airbag sensor assy center.

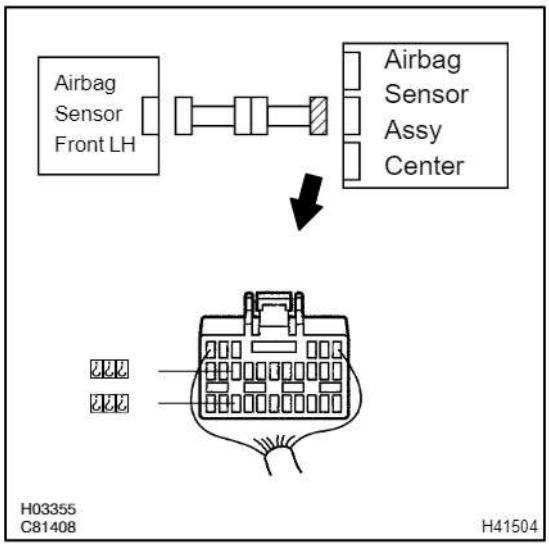
OK:

Voltage: Below 1 V

NG → **Go to step 12**

OK

6 CHECK FRONT AIRBAG SENSOR (LH) CIRCUIT(SHORT)



(a) Turn the ignition switch to LOCK position.
(b) Measure the resistance between +SL and –SL of the connector on the airbag sensor assy center side between the airbag sensor front LH and the airbag sensor assy center.

OK:

Resistance: 1 MΩ or Higher

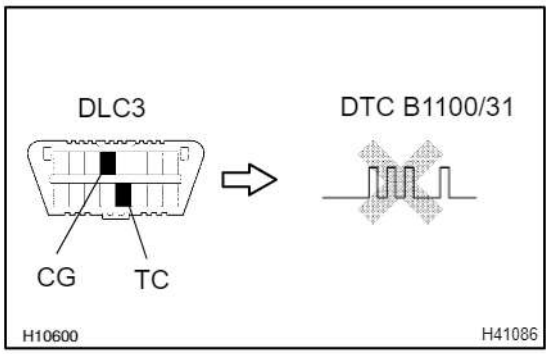
NG → **Go to step 13**

OK

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7 CHECK AIR BAG SENSOR ASSY CENTER

SST 09843–18040



(a) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(b) Connect the connectors of all the SRS components.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(d) Turn the ignition switch to ON position, and wait at least for 10 seconds.
(e) Clear the DTC stored in the memory (See page 05–1238).
(f) Turn the ignition switch to LOCK position, and wait at least for 10 seconds.
(g) Turn the ignition switch to ON position, and wait at least for 10 seconds.
(h) Check the DTC (See page 05–1238).

OK:

DTC B1100/31 is not output.

HINT:

Codes other than code B1100/31 may be output at this time, but they are not relevant to this check.

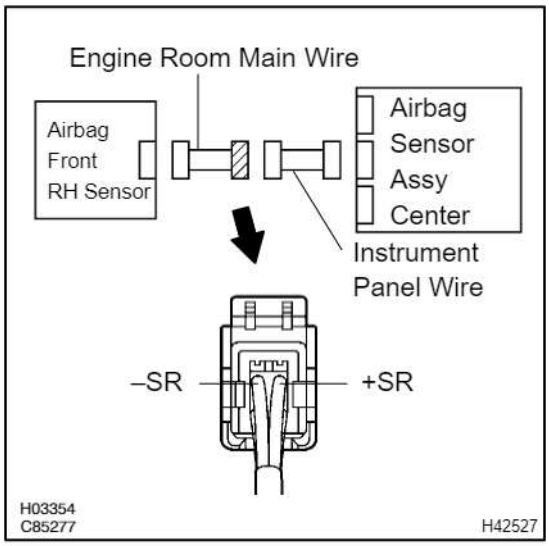
NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

USE SIMULATION METHOD TO CHECK

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8 CHECK ENGINE ROOM MAIN WIRE(TO GROUND)



(a) Turn the ignition switch to LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Disconnect the engine room main wire connector from the instrument panel wire.
(d) Measure the resistance between the body ground and each of +SR and –SR of the engine room main wire connector on the instrument panel wire side.

OK:

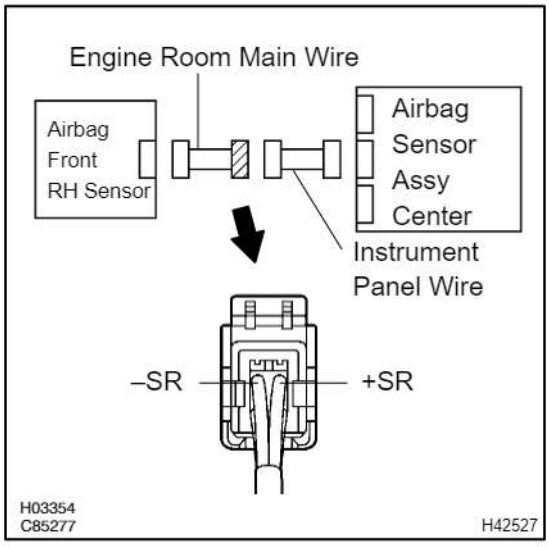
Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE ENGINE ROOM MAIN WIRE**

OK

REPAIR OR REPLACE INSTRUMENT PANEL WIRE

9 CHECK ENGINE ROOM MAIN WIRE(TO B+)



(a) Turn the ignition switch to LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Disconnect the engine room main wire connector from the instrument panel wire.
(d) Connect the negative (–) terminal cable to the battery.
(e) Turn the ignition switch to ON position.
(f) Measure the voltage between the body ground and each of +SR and –SR of the engine room main wire connector on the instrument panel wire side.

OK:

Voltage: Below 1 V

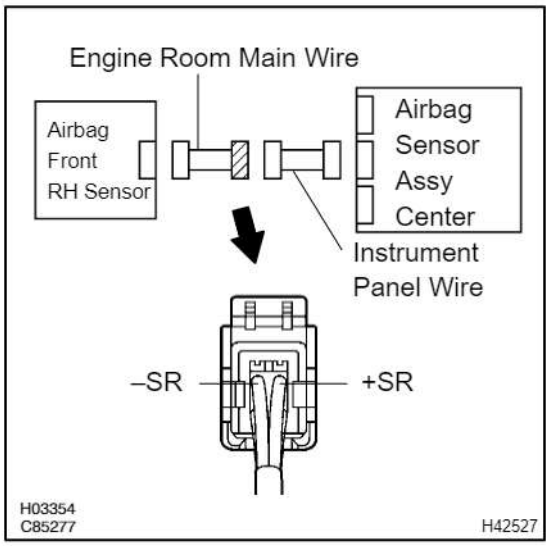
NG → **REPAIR OR REPLACE ENGINE ROOM MAIN WIRE**

OK

REPAIR OR REPLACE INSTRUMENT PANEL WIRE

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10 CHECK ENGINE ROOM MAIN WIRE(SHORT)



(a) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(b) Disconnect the engine room main wire connector from the instrument panel wire.
(c) Measure the resistance between +SR and –SR of the engine room main wire connector on the instrument panel wire side.

OK:

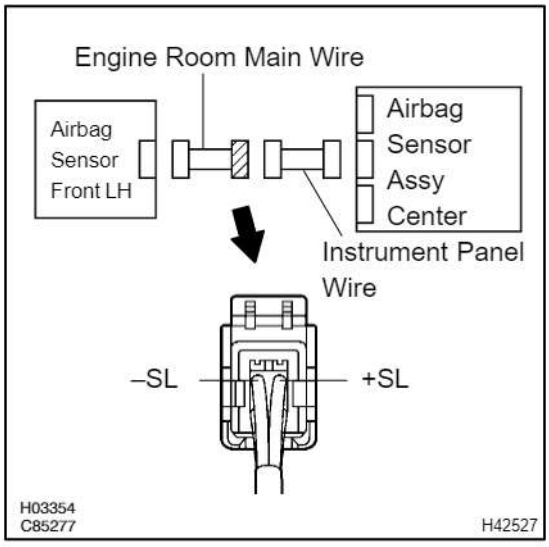
Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE ENGINE ROOM MAIN WIRE**

OK

REPAIR OR REPLACE INSTRUMENT PANEL WIRE

11 CHECK ENGINE ROOM MAIN WIRE(TO GROUND)



(a) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(b) Disconnect the engine room main wire connector from the instrument panel wire.
(c) Measure the resistance between the body ground and each of +SL and –SL of the engine room main wire connector on the instrument panel wire side.

OK:

Resistance: 1 MΩ or Higher

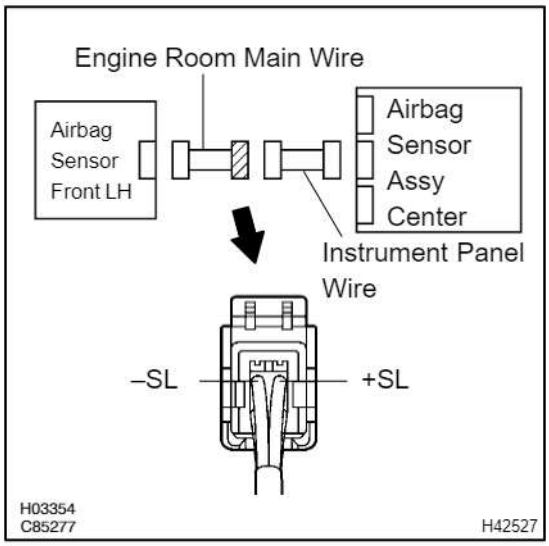
NG → **REPAIR OR REPLACE ENGINE ROOM MAIN WIRE**

OK

REPAIR OR REPLACE INSTRUMENT PANEL WIRE

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12 CHECK ENGINE ROOM MAIN WIRE(TO B+)



(a) Turn the ignition switch to LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Disconnect the engine room main wire connector from the instrument panel wire.
(d) Connect the negative (–) terminal cable to the battery.
(e) Turn the ignition switch to ON position.
(f) Measure the voltage between the body ground and each of +SL and –SL of the engine room main wire connector on the instrument panel wire side.

OK:

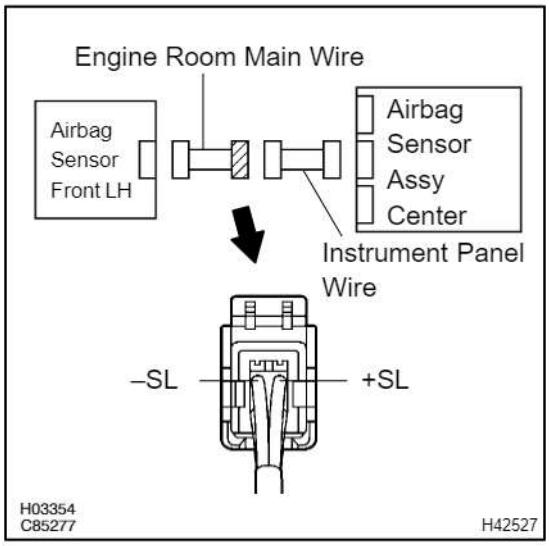
Voltage: Below 1 V

NG	REPAIR OR REPLACE ENGINE ROOM MAIN WIRE

OK

REPAIR OR REPLACE INSTRUMENT PANEL WIRE

13 CHECK ENGINE ROOM MAIN WIRE(SHORT)



(a) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(b) Disconnect the engine room main wire connector from the instrument panel wire.
(c) Measure the resistance between +SL and –SL of the engine room main wire connector on the instrument panel wire side.

OK:

Resistance: 1 MΩ or Higher

NG	REPAIR OR REPLACE ENGINE ROOM MAIN WIRE

OK

REPAIR OR REPLACE INSTRUMENT PANEL WIRE

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DTC B1140/32 SIDE AIRBAG SENSOR ASSY (RH) MALFUNCTION

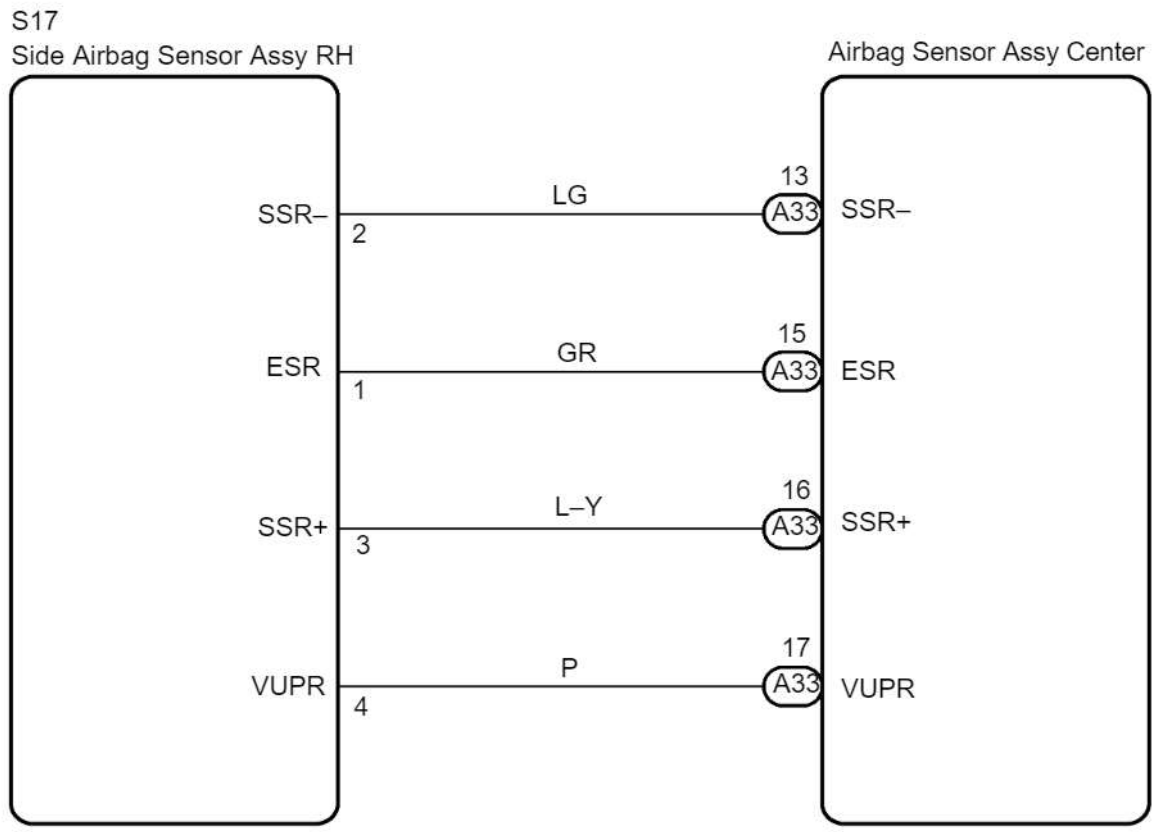
CIRCUIT DESCRIPTION

The side airbag sensor assy RH consists of the diagnosis circuit and lateral deceleration sensor, etc.
It receives signals from the lateral deceleration sensor, judges whether or not the SRS must be activated, and detects diagnosis system malfunction.
DTC B1140/32 is recorded when occurrence of a malfunction in the side airbag sensor assy RH is detected.

DTC No.	DTC Detecting Condition	Trouble Area
B1140/32	□Short in side airbag sensor RH circuit (to ground) □Short in side airbag sensor RH circuit (to B+) □Open in side airbag sensor RH circuit □Side airbag sensor assy RH malfunction □Airbag sensor assy center malfunction	□Side airbag sensor assy RH □Airbag sensor assy center □Floor wire

HINT:
DTC B1140/32 is indicated only for the vehicle equipped with the side airbag.

WIRING DIAGRAM

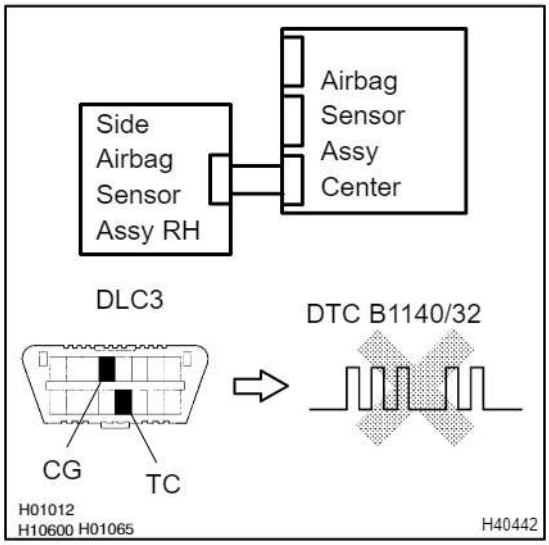


H01450

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INSPECTION PROCEDURE

1	CHECK SIDE AIR BAG SENSOR ASSY LH



(a) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(b) Turn the ignition switch to ON, and wait at least for 10 seconds.
(c) Clear the DTC stored in memory (See page 05–1238).
(d) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(e) Turn the ignition switch to ON, and wait at least for 10 seconds.
(f) Check the DTC (See page 05–1238).
OK:
DTC B1140/32 is not output.

HINT:
Codes other than code B1140/32 may be output at this time, but they are not relevant to this check.

OK → **USE SIMULATION METHOD TO CHECK**

NG

2	CHECK AIRBAG SENSOR ASSY CENTER CONNECTOR

(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Check that the connector is properly connected to the airbag sensor assy center.
OK:
The connectors are connected.

NG → **CONNECT CONNECTORS**

OK

3	CHECK SIDE AIRBAG SENSOR ASSY CONNECTOR

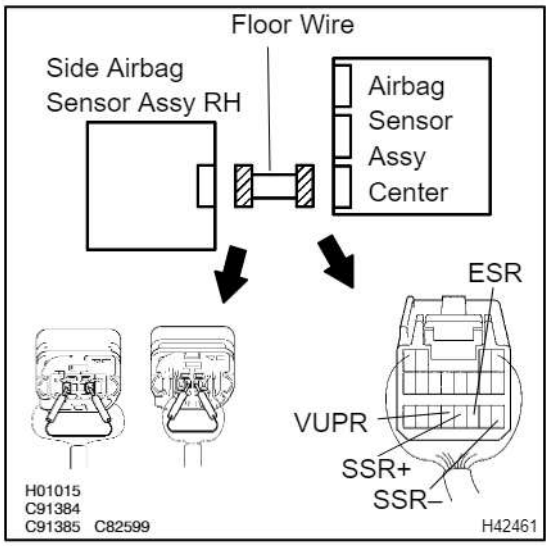
(a) Check that the connector is properly connected to the side airbag sensor assy RH.
OK:
The connector is connected.

NG → **CONNECT CONNECTORS**

OK

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4 CHECK FLOOR WIRE(OPEN)



(a) Disconnect the floor wire connectors from the airbag sensor assy center and the side airbag sensor assy RH.
(b) Using a service wire, connect VUPR and ESR of the floor wire connector on the side airbag sensor assy RH side.
(c) Using a service wire, connect SSR+ and SSR– of the floor wire connector on the side airbag sensor assy RH side.
(d) Measure the resistance between VUPR, SSR+, SSR– and ESR of the floor wire connector on the airbag sensor assy center side.

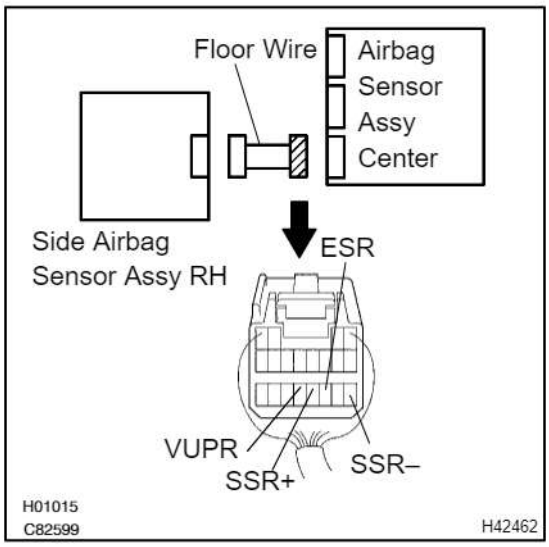
OK:

Resistance: Below 1 Ω

NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

5 CHECK FLOOR WIRE(TO GROUND)



(a) Disconnect the service wire from the floor wire connector on the side airbag sensor assy RH side.
(b) Measure the resistance between the body ground and each of VUPR, SSR+, SSR– and ESR of the floor wire connector on the airbag sensor assy center side.

OK:

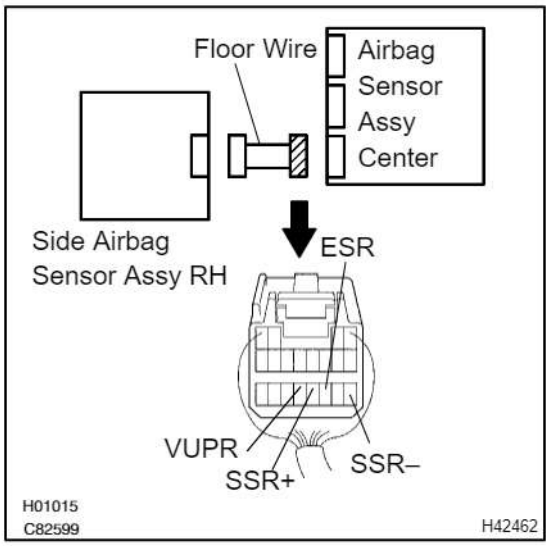
Resistance: 1MΩ or Higher

NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

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6	CHECK FLOOR WIRE



(a) Measure the resistance between VUPR, SSR+, SSR– and ESR of the floor wire connector on the airbag sensor assy center side.

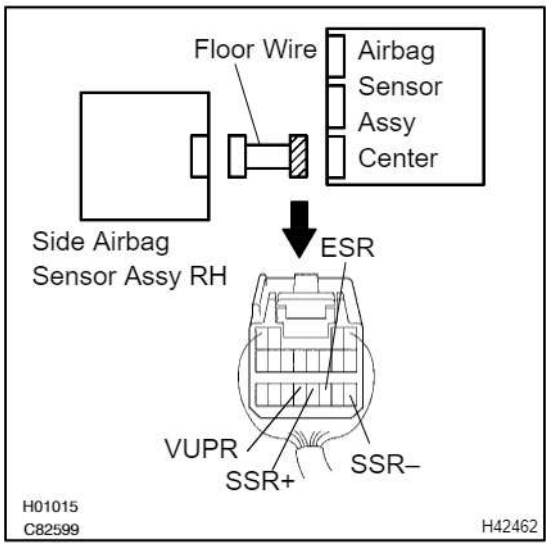
OK:

Resistance: 1MΩ or Higher

NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

7	CHECK FLOOR WIRE(TO B+)



(a) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

(b) Turn the ignition switch to ON.

(c) Measure the voltage between the body ground and VUPR, SSR+, SSR– and ESR of the floor wire connector on the airbag sensor assy center side.

OK:

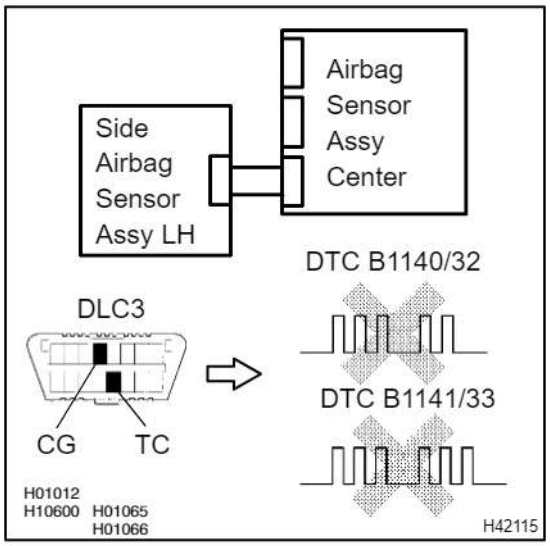
Voltage: Below 1 V

NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

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8	CHECK SIDE AIR BAG SENSOR ASSY LH



(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the airbag sensor assy center connector.
(d) Interchange the side airbag sensor assy RH and LH and connect the connectors to them.
(e) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(f) Turn the ignition switch to ON, and wait at least for 10 seconds.
(g) Clear the DTC stored in memory (See page 05–1238).
(h) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(i) Turn the ignition switch to ON, and wait at least for 10 seconds.
(j) Check the DTC (See page 05–1238).

OK:
(A): DTC B1140/32 is not output.
(B): DTC B1141/33 is not output.

NG(A) → **REPLACE AIR BAG SENSOR ASSY CENTER**

NG(B) → **REPLACE SIDE AIR BAG SENSOR ASSY LH**

OK

USE SIMULATION METHOD TO CHECK

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DTC	B1141/33	Side and Curtain Shield Airbag Sensor Assembly (LH) Malfunction

CIRCUIT DESCRIPTION

The side airbag sensor assy LH circuit consists of the diagnosis circuit and lateral deceleration sensor, etc. It receives signals from the lateral deceleration sensor, judges whether or not the SRS must be activated, and detects diagnosis system malfunction.

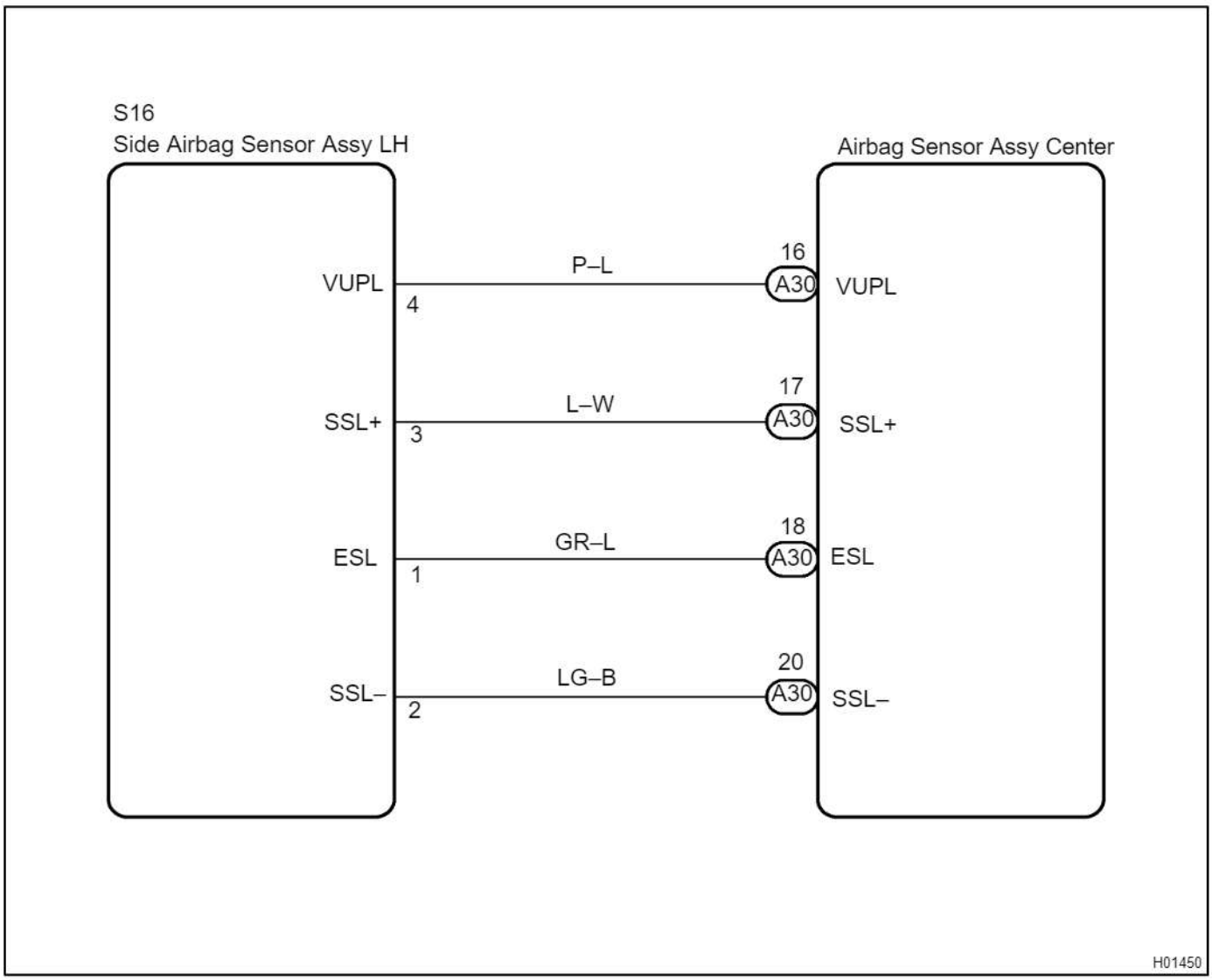
DTC B1141/33 is recorded when occurrence of a malfunction in the side airbag sensor assy LH is detected.

DTC No.	DTC Detecting Condition	Trouble Area
B1141/33	□Short in side airbag sensor LH circuit (to ground) □Short in side airbag sensor LH circuit (to B+) □Side airbag sensor assy LH malfunction □Airbag sensor assy center	□Side airbag sensor assy LH □Airbag sensor assy center □Floor wire No.2

HINT:

DTC B1141/33 is indicated only for the vehicle equipped with the side airbag.

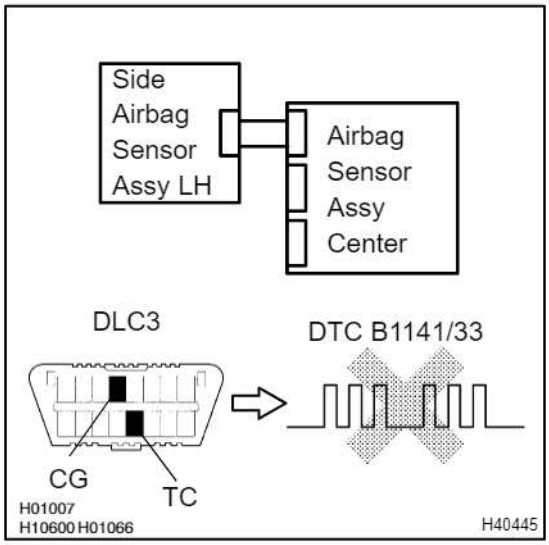
WIRING DIAGRAM



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INSPECTION PROCEDURE

1 CHECK SIDE AIR BAG SENSOR ASSY LH



(a) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(b) Turn the ignition switch to ON, and wait at least for 10 seconds.
(c) Clear the DTC stored in memory (See page 05–1238).
(d) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(e) Turn the ignition switch to ON, and wait at least for 10 seconds.
(f) Check the DTC (See page 05–1238).
OK:
DTC B1141/33 is not output.

OK → **USE SIMULATION METHOD TO CHECK**

NG

2 CHECK AIRBAG SENSOR ASSY CENTER CONNECTOR

(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Check that the connector is properly connected to the airbag sensor assy center.
OK:
The connectors are connected.

NG → **CONNECT CONNECTORS**

OK

3 CHECK SIDE AIRBAG SENSOR ASSY CONNECTOR

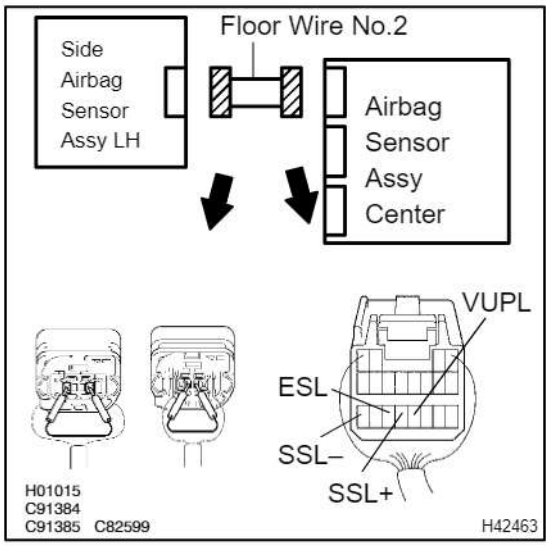
(a) Check that the connector is properly connected to the side airbag sensor assy LH.
OK:
The connector is connected.

NG → **CONNECT CONNECTORS**

OK

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4 CHECK FLOOR WIRE NO.2(OPEN)



(a) Disconnect the floor wire No.2 connectors from the airbag sensor assy center and the side airbag sensor assy LH.

(b) Using a service wire, connect VUPL and ESL of the floor wire No.2 connector on the side airbag sensor assy LH side.

(c) Using a service wire, connect SSL+ and SSL– of the floor wire No.2 connector on the side airbag sensor assy LH side.

(d) Measure the resistance between VUPL, SSL+, SSL– and ESL of the floor wire No.2 connector on the airbag sensor assy center side.

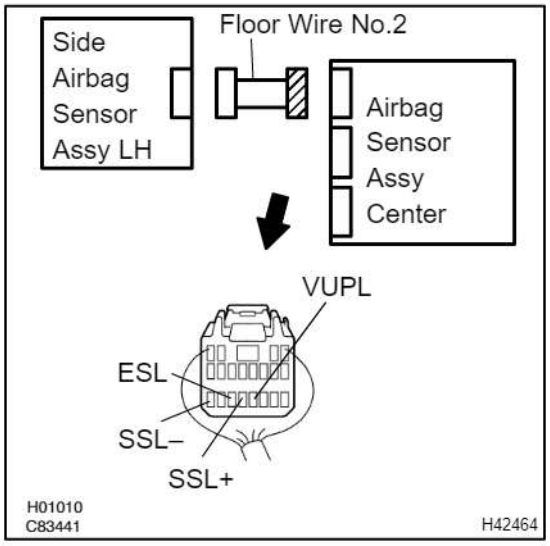
OK:

Resistance: Below 1 Ω

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

5 CHECK FLOOR WIRE NO.2(TO GROUND)



(a) Disconnect the service wire from the floor wire No.2 connector on the side airbag sensor assy LH side.

(b) Measure the resistance between the body ground and VUPL, SSL+, SSL– and ESR of the floor wire No.2 connector on the airbag sensor assy center side.

OK:

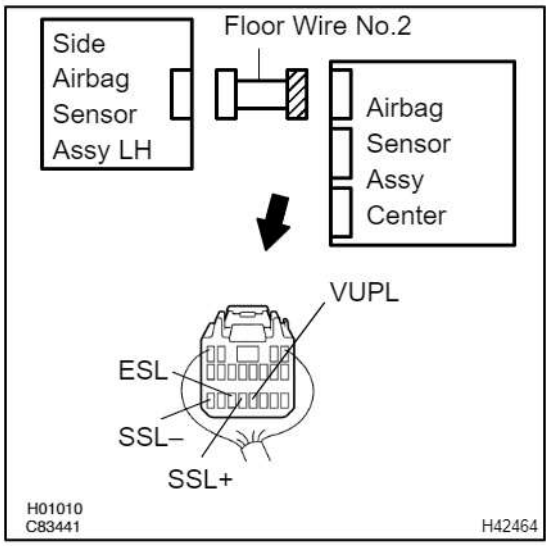
Resistance: 1MΩ or Higher

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

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6 CHECK FLOOR WIRE NO.2



(a) Measure the resistance between VUPL, SSL+, SSL– and ESL of the floor wire No.2 connector on the airbag sensor assy center side.

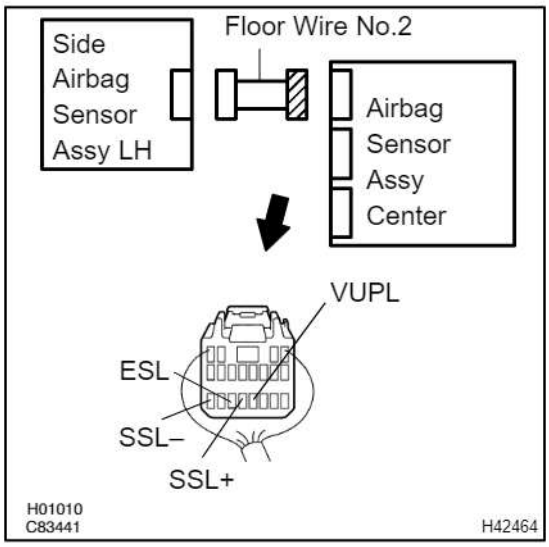
OK:

Resistance: 1MΩ or Higher

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

7 CHECK FLOOR WIRE NO.2(TO B+)



(a) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

(b) Turn the ignition switch to ON.

(c) Measure the voltage between the body ground and each of VUPL, SSL+, SSL– and ESL of the floor wire No.2 connector on the airbag sensor assy center side.

OK:

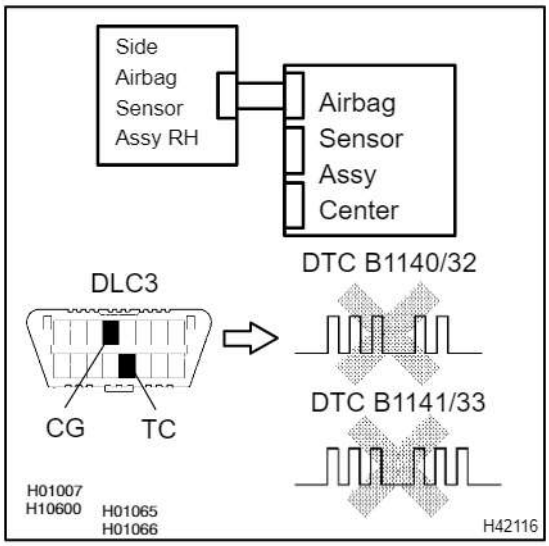
Voltage: Below 1V

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

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8 CHECK SIDE AIR BAG SENSOR ASSY LH



(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the airbag sensor assy center connectors.
(d) Interchange the side airbag sensor assy RH and LH and connect the connectors to them.
(e) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(f) Turn the ignition switch to ON, and wait at least for 10 seconds.
(g) Clear the DTC stored in memory (See page 05–1238).
(h) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(i) Turn the ignition switch to ON, and wait at least for 10 seconds.
(j) Check the DTC (See page 05–1238).

OK:
(A): DTC B1140/32 is not output.
(B): DTC B1141/33 is not output.

NG(A) > **REPLACE SIDE AIR BAG SENSOR ASSY LH**

NG(B) > **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

USE SIMULATION METHOD TO CHECK

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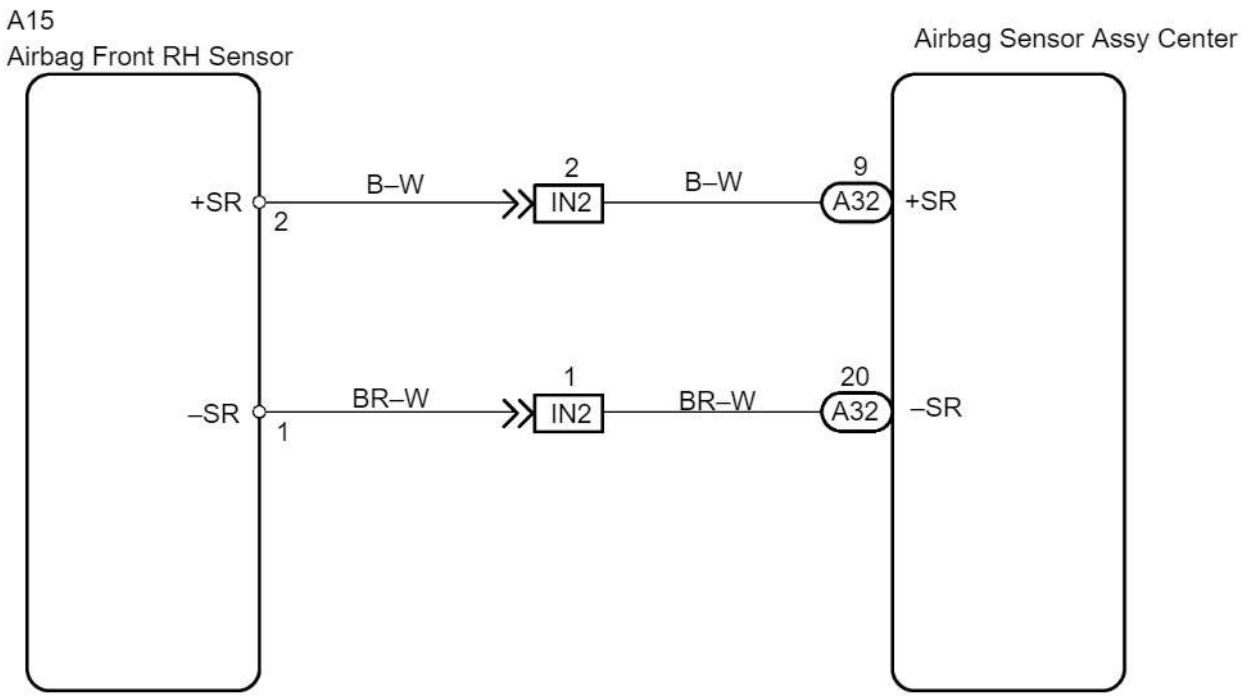
DTC	B1148/36	FRONT AIRBAG SENSOR (RH) MALFUNCTION

CIRCUIT DESCRIPTION

The airbag front RH sensor circuit consists of a diagnosis circuit and a frontal deceleration sensor, etc. It receives signals from the frontal deceleration sensor, judges whether or not the SRS must be activated, and detects a diagnosis system malfunction.
DTC B1148/36 is recorded when occurrence of a malfunction in the airbag front RH sensor is detected.

DTC No.	DTC Detecting Condition	Trouble Area
B1148/36	□Open in airbag front RH sensor circuit □Airbag front RH sensor malfunction □Airbag sensor assy center malfunction	□Airbag front RH sensor □Airbag sensor assy center □Instrument panel wire □Engine room main wire

WIRING DIAGRAM



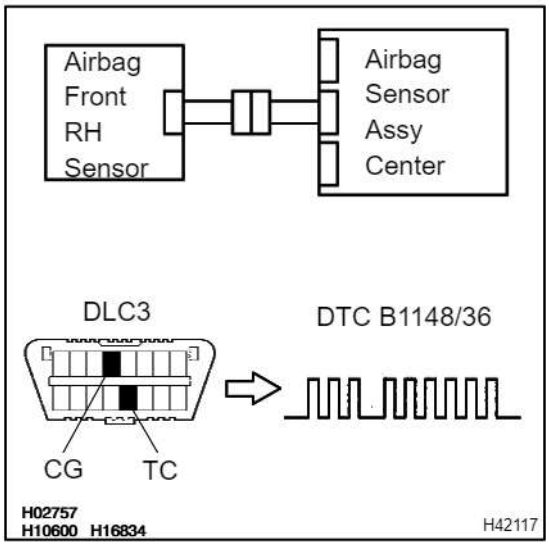
H16901

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INSPECTION PROCEDURE

1	CHECK AIR BAG FRONT RH SENSOR

SST 09843–18040



(a) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(b) Turn the ignition switch to ON position, and wait at least for 10 seconds.
(c) Clear the DTC stored in memory (See page 05–1238).
(d) Turn the ignition switch to LOCK position, and wait at least for 10 seconds.
(e) Turn the ignition switch to ON position, and wait at least for 10 seconds.
(f) Check the DTC (See page 05–1238).
OK:
DTC B1148/36 is not output.

HINT:
Codes other than code B1148/36 may be output at this time, but they are not relevant to this check.

OK → **USE SIMULATION METHOD TO CHECK**

NG

2	CHECK AIRBAG SENSOR ASSY CENTER CONNECTOR

(a) Turn the ignition switch to LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Check that the connector is properly connected to the airbag sensor assy center.
OK:
The connectors are connected.

NG → **CONNECT CONNECTORS**

OK

3	CHECK FRONT AIRBAG SENSOR CONNECTOR

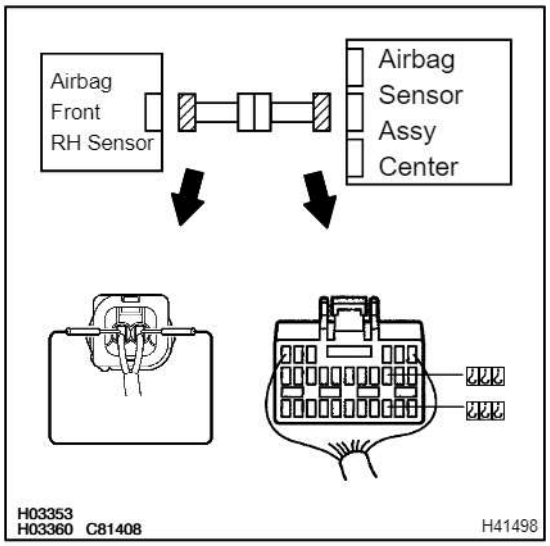
(a) Check that the connector is properly connected to the airbag front RH sensor.
OK:
The connector is connected.

NG → **CONNECT CONNECTORS**

OK

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4 CHECK FRONT AIRBAG SENSOR (RH) CIRCUIT (OPEN)

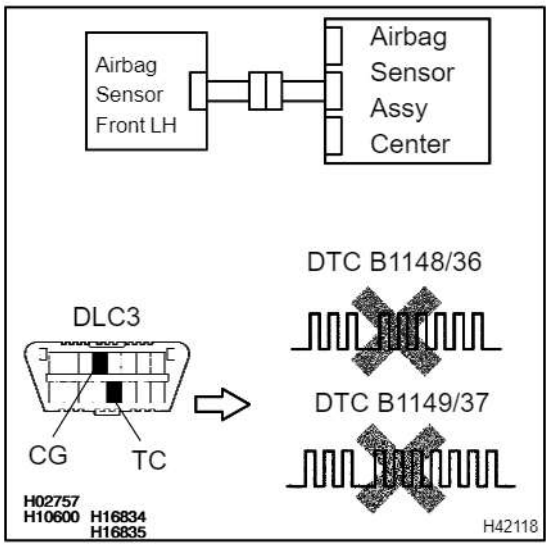


(a) Disconnect the connectors between the airbag sensor assy center and the airbag front RH sensor.
(b) Using a service wire, connect +SR and –SR of the connector on the airbag front RH sensor side between the airbag sensor assy center and the airbag front RH sensor.
(c) Measure the resistance between +SR and –SR of the connector on the airbag sensor assy center side between the airbag sensor assy center and the airbag front RH sensor.
OK:
Resistance: Below 1 Ω

NG → **Go to step 6**

OK

5 CHECK AIR BAG SENSOR FRONT LH



(a) Turn the ignition switch to LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the airbag sensor assy center connector.
(d) Interchange the airbag front sensor RH with LH, and connect the connectors to them.
(e) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(f) Turn the ignition switch to ON position, and wait at least for 10 seconds.
(g) Clear the DTC stored in memory (See page 05–1238).
(h) Turn the ignition switch to LOCK position, and wait at least for 10 seconds.
(i) Turn the ignition switch to ON position, and wait at least for 10 seconds.
(j) Check the DTC (See page 05–1238).
OK:
(A): DTC B1148/36 is not output.
(B): DTC B1149/37 is not output.

NG(A) → **REPLACE AIR BAG SENSOR ASSY CENTER**

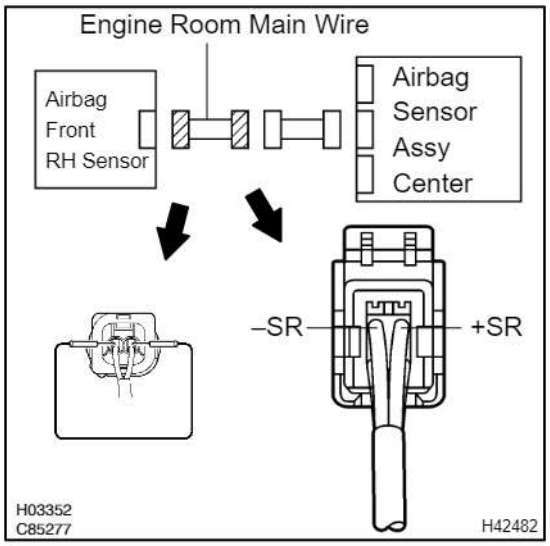
NG(B) → **REPLACE AIR BAG FRONT RH SENSOR**

OK

USE SIMULATION METHOD TO CHECK

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6	CHECK ENGINE ROOM MAIN WIRE(OPEN)



(a) Disconnect the engine room main wire connector from the instrument panel wire.

(b) Measure the resistance between +SR and –SR of the engine room main wire connector on the airbag sensor assy center side.

OK:

Resistance: Below 1 Ω

NG → **REPAIR OR REPLACE ENGINE ROOM MAIN WIRE**

OK →

REPAIR OR REPLACE INSTRUMENT PANEL WIRE

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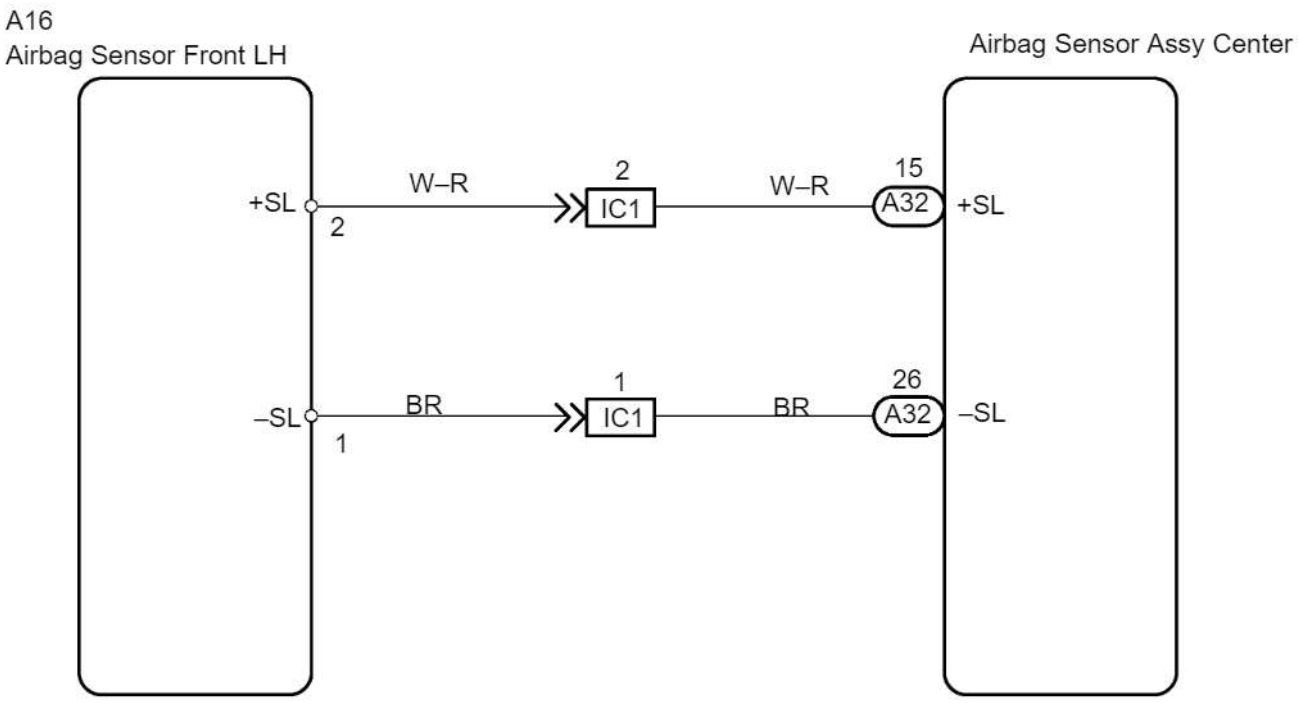
DTC	B1149/37	FRONT AIRBAG SENSOR (LH) MALFUNCTION

CIRCUIT DESCRIPTION

The airbag sensor front LH circuit consists of a diagnosis circuit and a frontal deceleration sensor, etc. It receives signals from the frontal deceleration sensor, judges whether or not the SRS must be activated, and detects a diagnosis system malfunction.
DTC B1149/37 is recorded when malfunction is detected in the airbag sensor front LH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B1149/37	□Open in airbag sensor front LH circuit □Airbag sensor front LH malfunction □Airbag sensor assy center malfunction	□Airbag sensor front LH □Airbag sensor assy center □Instrument panel wire □Engine room main wire

WIRING DIAGRAM

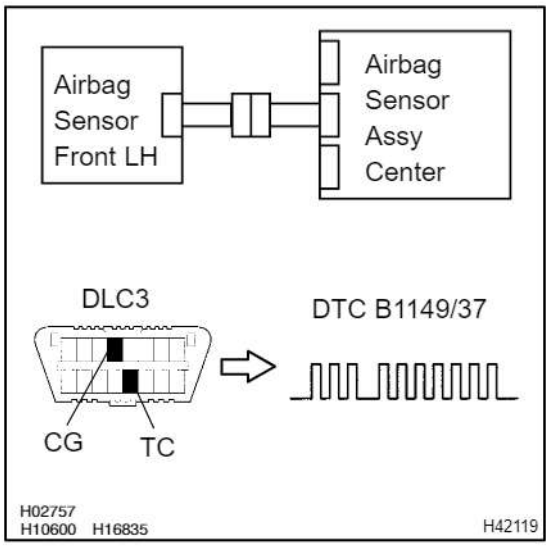


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INSPECTION PROCEDURE

1 CHECK AIRBAG SENSOR FRONT LH

SST 09843–18040



(a) Connect negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(b) Turn the ignition switch to ON position, and wait at least for 10 seconds.
(c) Clear the DTC stored in memory (See page 05–1238).
(d) Turn the ignition switch to LOCK position, and wait at least for 10 seconds.
(e) Turn the ignition switch to ON position, and wait at least for 10 seconds.
(f) Check the DTC (See page 05–1238).
OK:
DTC B1149/37 is not output.

HINT:
Codes other than code B1149/37 may be output at this time, but they are not relevant to this check.

OK → USE SIMULATION METHOD TO CHECK

NG

2 CHECK AIRBAG SENSOR ASSY CENTER CONNECTOR

(a) Turn the ignition switch to LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Check that the connector is properly connected to the airbag sensor assy center.
OK:
The connectors are connected.

NG → CONNECT CONNECTORS

OK

3 CHECK FRONT AIRBAG SENSOR CONNECTOR

(a) Check that the connector is properly connected to the airbag sensor front LH.
OK:
The connector is connected.

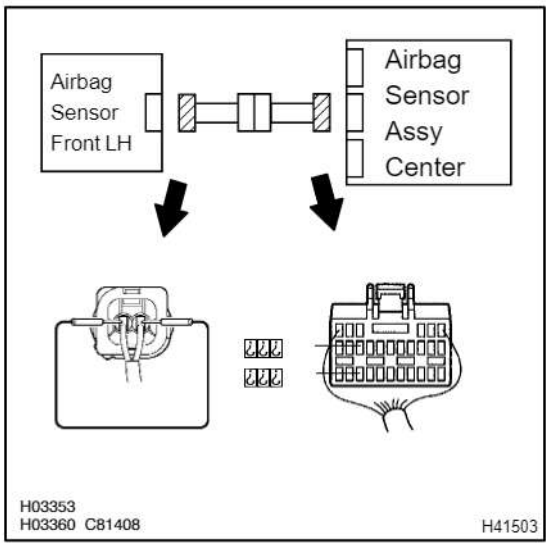
NG → CONNECT CONNECTORS

OK

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4 CHECK FRONT AIRBAG SENSOR (LH) CIRCUIT (OPEN)

SST 09843–18040



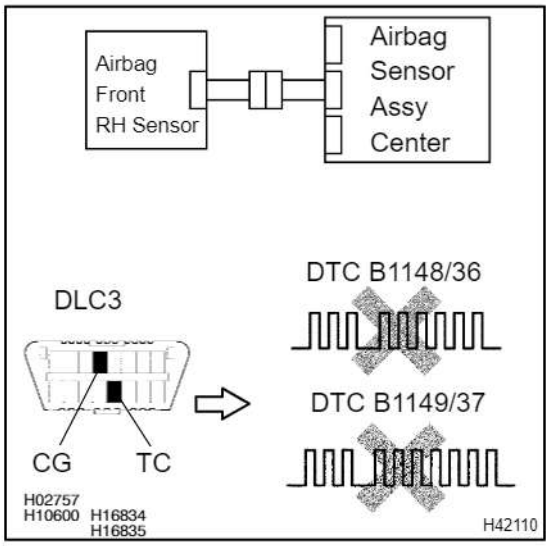
(a) Disconnect the connectors between the airbag sensor assy center and the airbag sensor front LH.
(b) Using a service wire, connect +SL and –SL of the connector on the airbag sensor front LH side between the airbag sensor assy center and the airbag sensor front LH.
(c) Measure the resistance between +SL and –SL of the connector on the airbag sensor assy center side between the airbag sensor assy center and the airbag sensor front LH.
OK:
Resistance: Below 1 Ω

NG → **Go to step 6**

OK

5 CHECK AIR BAG FRONT RH SENSOR

SST 09843–18040



(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the airbag sensor assy center connector.
(d) Interchange the airbag front sensor RH with LH and connect the connectors to them.
(e) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(f) Turn the ignition switch to ON position, and wait at least for 10 seconds.
(g) Clear the DTC stored in memory (See page 05–1238).
(h) Turn the ignition switch to LOCK position, and wait at least for 10 seconds.
(i) Turn the ignition switch to ON position, and wait at least for 10 seconds.
(j) Check the DTC (See page 05–1238).
OK:
(A): DTC B1148/36 is not output.
(B): DTC B1149/37 is not output.

NG(A) → **REPLACE AIR BAG SENSOR FRONT LH**

NG(B) → **REPLACE AIR BAG SENSOR ASSY CENTER**

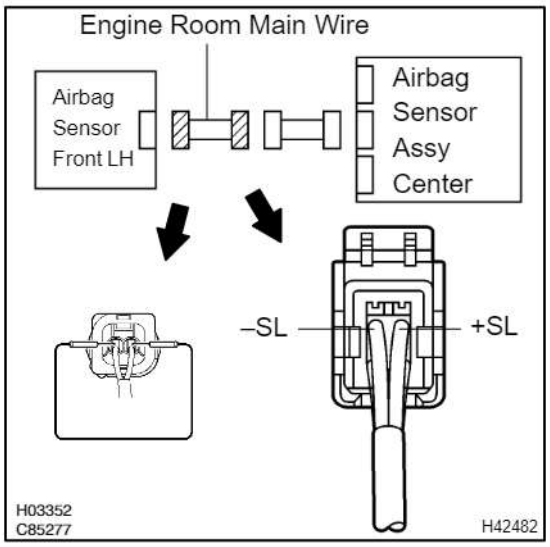
OK

USE SIMULATION METHOD TO CHECK

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6	CHECK ENGINE ROOM MAIN WIRE(OPEN)

SST 09843–18040



(a) Disconnect the engine room main wire connector from the instrument panel wire.

(b) Using a service wire, connect +SL and –SL of the engine room main wire connector on the airbag sensor front LH side.

(c) Measure the resistance between +SL and –SL of the engine room main wire connector on the airbag sensor assy center side.

OK:

Resistance: Below 1 Ω

NG → **REPAIR OR REPLACE ENGINE ROOM MAIN WIRE**

OK

REPAIR OR REPLACE INSTRUMENT PANEL WIRE

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DTC	B1153/25	SEAT POSITION AIRBAG SENSOR MALFUNCTION

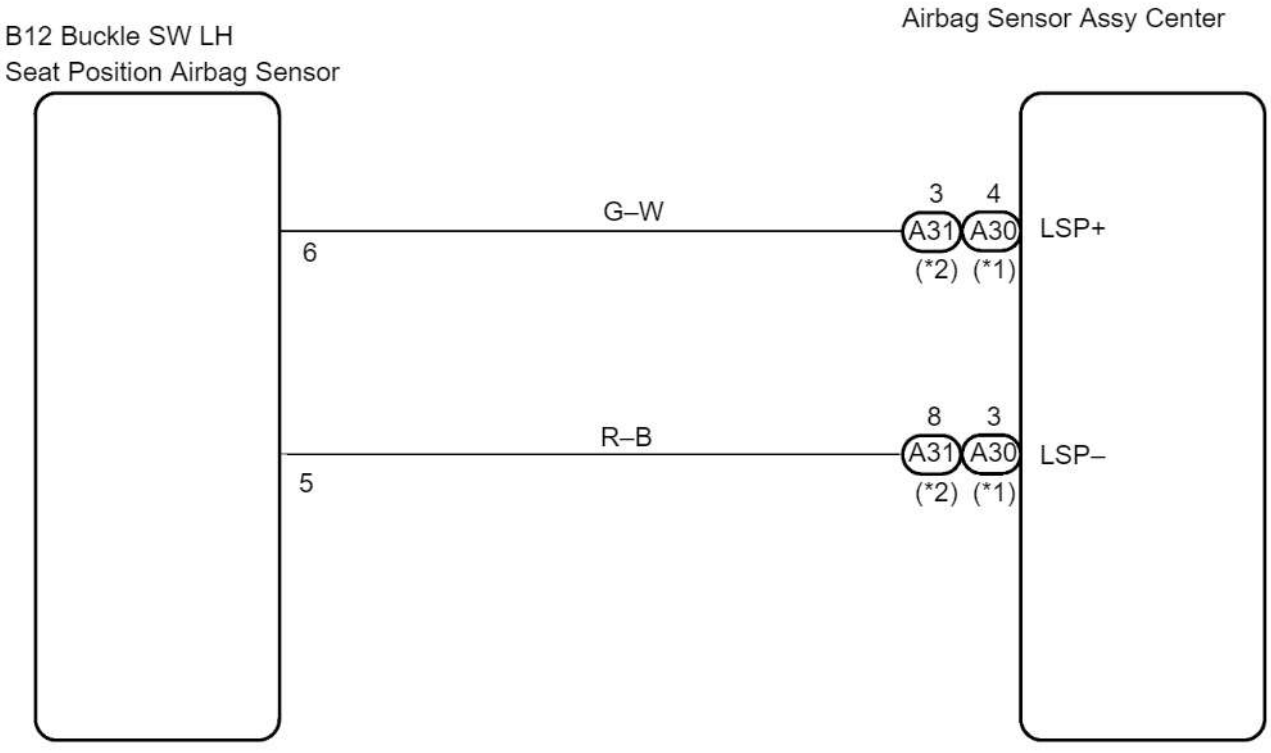
CIRCUIT DESCRIPTION

The seat position airbag sensor circuit consists of the airbag sensor assy center and seat position airbag sensor.

DTC B1153/25 is recorded when a malfunction is detected in the seat position airbag sensor circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B1153/25	□Short in seat position airbag sensor circuit □Short in seat position airbag sensor (to ground) □Open in seat position airbag sensor circuit □Seat position airbag sensor malfunction □Airbag sensor assy center malfunction	□Seat position airbag sensor □Airbag sensor assy center □Floor wire No.2

WIRING DIAGRAM

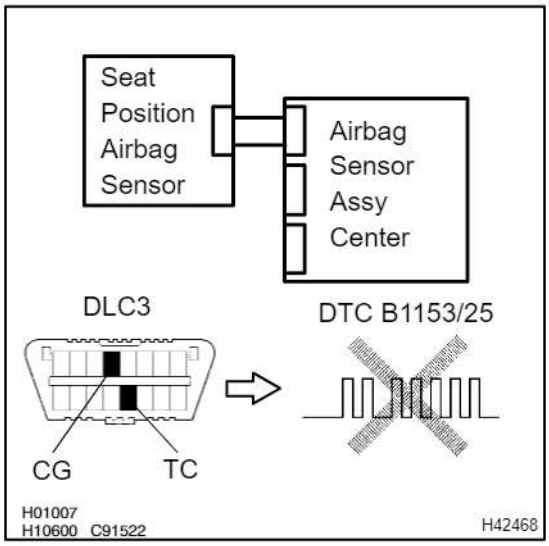


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INSPECTION PROCEDURE

1 CHECK SEAT POSITION AIR BAG SENSOR

SST 09843–18040



(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page 05–1238).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Check the DTC (See page 05–1238).
OK:
DTC B1153/25 is not output.

HINT:
Codes other than code B1153/25 may be output at this time, but they are not relevant to this check.

OK → **USE SIMULATION METHOD TO CHECK**

NG

2 CHECK AIRBAG SENSOR ASSY CENTER CONNECTOR

(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Check that the connector is properly connected to the airbag sensor assy center.
OK:
The connectors are connected.

NG → **CONNECT CONNECTORS**

OK

3 CHECK SEAT POSITION AIRBAG SENSOR CONNECTOR

(a) Check that the connector is properly connected to the seat position airbag sensor.
OK:
The connector is connected.

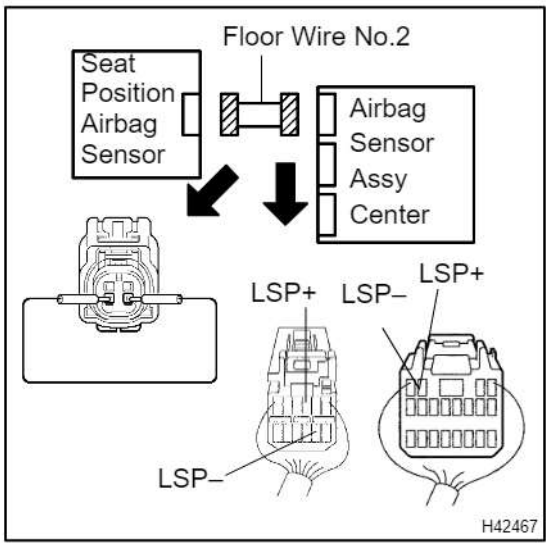
NG → **CONNECT CONNECTORS**

OK

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4 CHECK FLOOR WIRE NO.2(OPEN)

SST 09843–18040



(a) Disconnect the connectors between the airbag sensor assy center and the seat position airbag sensor.

(b) Using a service wire, connect LSP+ and LSP– of the floor wire No.2 connector on the seat position airbag sensor side.

(c) Measure the resistance between LSP+ and LSP– of the floor wire No.2 connector on the airbag sensor assy center side.

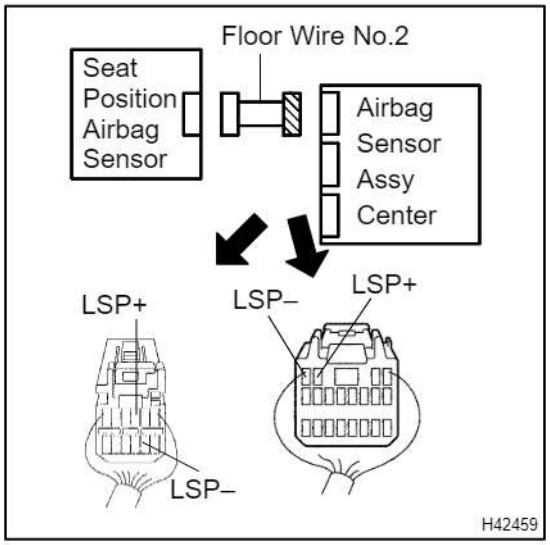
OK:

Resistance: Below 1 Ω

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

5 CHECK FLOOR WIRE NO.2(TO GROUND)



(a) Release the service wire from the floor wire No.2 connector on the seat position sensor side.

(b) Measure the resistance between the body ground and each of LSP+ and LSP– of the floor wire No.2 connector on the airbag sensor assy center side.

OK:

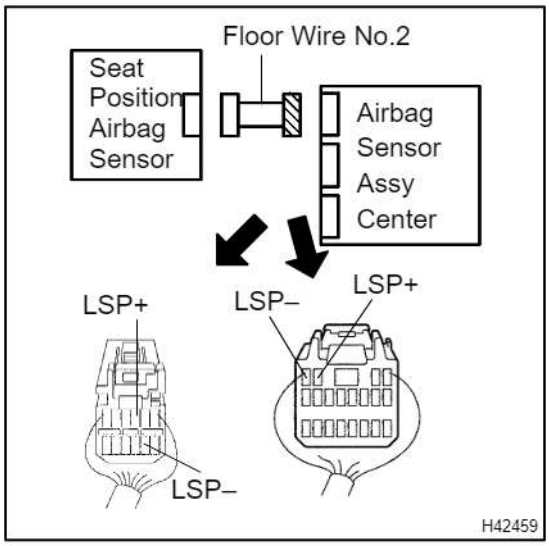
Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

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6	CHECK FLOOR WIRE NO.2



(a) Measure the resistance between LSP+ and LSP– of the floor wire No.2 connector on the airbag sensor assy center side.

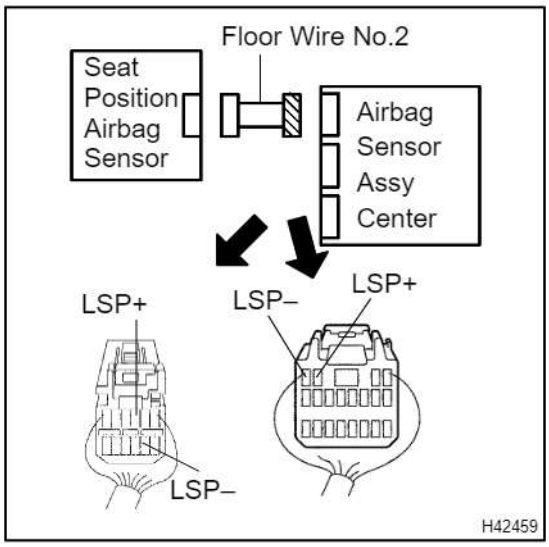
OK:

Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

7	CHECK FLOOR WIRE NO.2(TO B+)



(a) Connect the negative (–) terminal cable to the battery.
(b) Turn the ignition switch to ON.
(c) Measure the voltage between the body ground and each of LSP+ and LSP– of the floor wire No.2 connector on the airbag sensor assy center side.

OK:

Voltage: Below 1 V

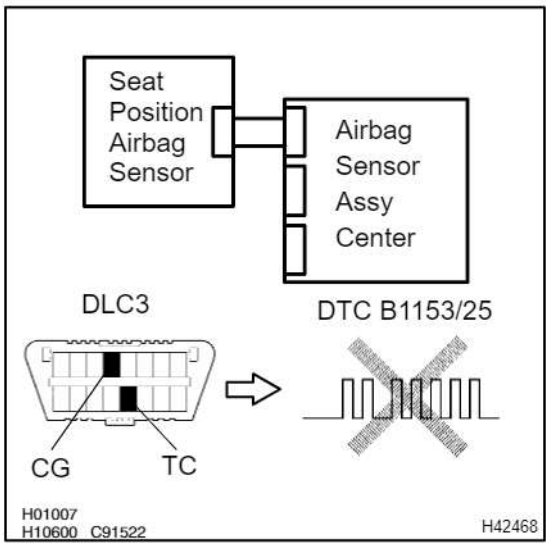
NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

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8 CHECK SEAT POSITION AIR BAG SENSOR

SST 09843–18040



(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the connector of the seat position airbag sensor.
(d) Connect the connector of the airbag sensor assy center.
(e) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(f) Turn the ignition switch to ON, and wait at least for 10 seconds.
(g) Clear the DTC stored in memory (See page 05–1238).
(h) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(i) Turn the ignition switch to ON, and wait at least for 10 seconds.
(j) Check the DTC (See page 05–1238).

OK:

DTC D1153/25 is not output.

HINT:

Codes other that code B1153/25 may be output at this time, but they are not relevant to this check.

NG → **REPLACE SEAT POSITION AIR BAG SENSOR**

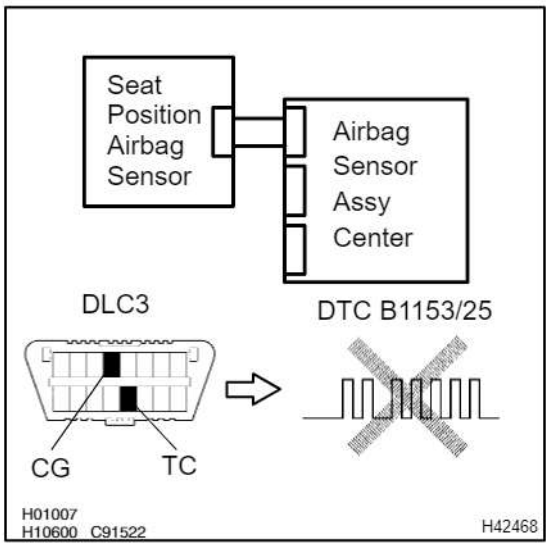
OK

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9 CHECK AIR BAG SENSOR ASSY CENTER

SST 09843–18040



(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the connector of the seat position airbag sensor.
(d) Connect the connector of the airbag sensor assy center.
(e) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(f) Turn the ignition switch to ON, and wait at least for 10 seconds.
(g) Clear the DTC stored in memory (See page 05–1238).
(h) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(i) Turn the ignition switch to ON, and wait at least for 10 seconds.
(j) Check the DTC (See page 05–1238).

OK:

DTC D1153/25 is not output.

HINT:

Codes other that code B1153/25 may be output at this time, but they are not relevant to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

USE SIMULATION METHOD TO CHECK

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DTC B1154/38 AIRBAG SENSOR REAR (RH) MALFUNCTION

CIRCUIT DESCRIPTION

The airbag sensor rear RH consists of the safing sensor, diagnosis circuit and lateral deceleration sensor, etc.

It receives signals from the lateral deceleration sensor, judges whether or not the SRS must be activated, and detects diagnosis system malfunction.

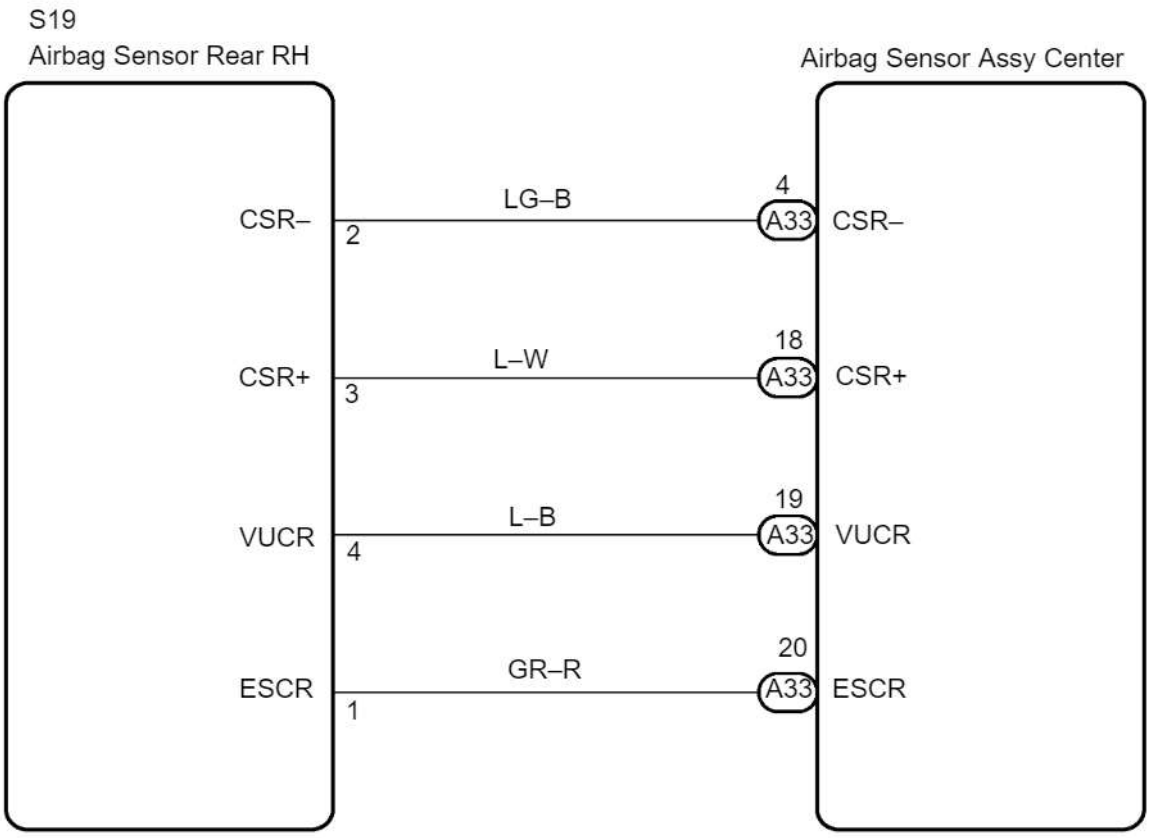
DTC B1154/38 is recorded when occurrence of a malfunction in the airbag sensor rear RH is detected.

DTC No.	DTC Detecting Condition	Trouble Area
B1154/38	□Short in airbag sensor rear RH circuit (to ground) □Short in airbag sensor rear RH circuit (to B+) □Open in airbag sensor rear RH □Airbag sensor rear RH malfunction □Airbag sensor assy center malfunction	□Airbag sensor rear RH □Airbag sensor assy center □Floor wire

HINT:

DTC B1154/38 is indicated only for the vehicle equipped with the side airbag.

WIRING DIAGRAM



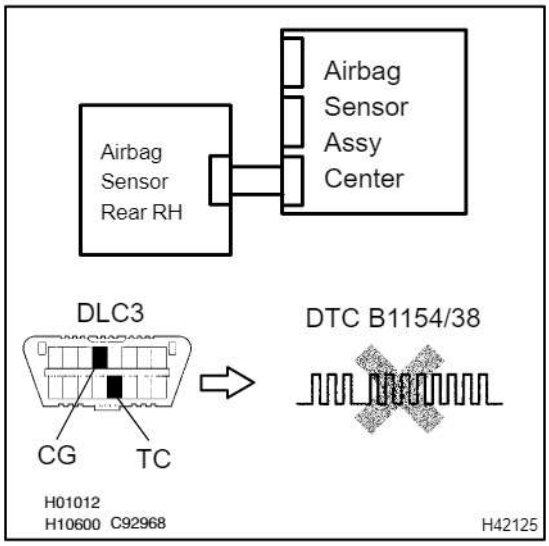
H01450

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INSPECTION PROCEDURE

1 CHECK AIR BAG SENSOR REAR RH

SST 09843–18040



(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page 05–1238).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Check the DTC (See page 05–1238).
OK:
DTC B1154/38 is not output.

HINT:
During this check, DTC B1155/39 may also be output at the same time.

OK → **USE SIMULATION METHOD TO CHECK**

NG

2 CHECK AIRBAG SENSOR ASSY CENTER CONNECTOR

(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Check that the connector is properly connected to the airbag sensor assy center.
OK:
The connectors are connected.

NG → **CONNECT CONNECTORS**

OK

3 CHECK AIRBAG SENSOR REAR CONNECTOR

(a) Check that the connector is properly connected to the airbag sensor rear RH.
OK:
The connector is connected.

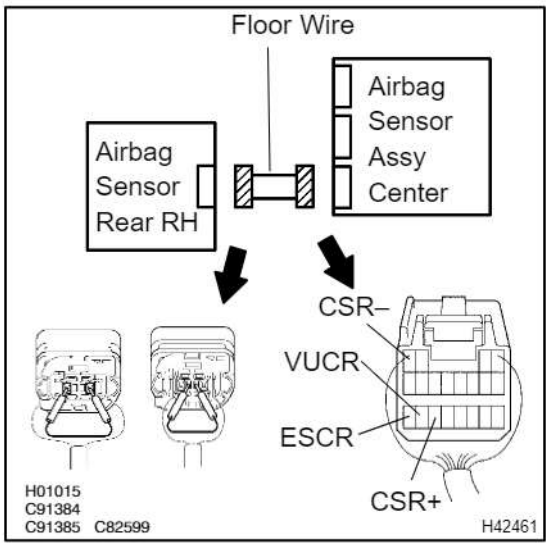
NG → **CONNECT CONNECTORS**

OK

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4	CHECK FLOOR WIRE(OPEN)

SST 09843–18040



(a) Disconnect the floor wire connectors from the airbag sensor assy center and the airbag sensor rear RH.

(b) Using a service wire, connect VUCR and ESCR of the floor wire connector on the airbag sensor rear RH side.

(c) Using a service wire, connect CSR+ and CSR– of the floor wire connector on the airbag sensor rear RH side.

(d) Measure the resistance between VUCR and ESCR, between CSR+ and CSR– of the floor wire connector on the airbag sensor assy center side.

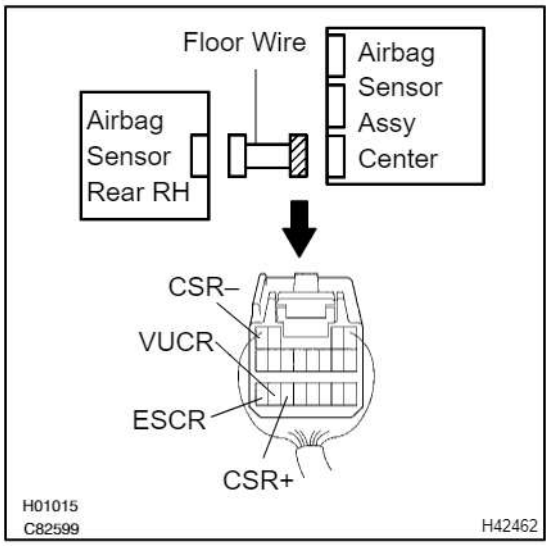
OK:

Resistance: Below 1 Ω

NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

5	CHECK FLOOR WIRE(TO GROUND)



(a) Release the service wire from the floor wire connector on the airbag sensor rear RH side.

(b) Measure the resistance between the body ground and each of VUCR, CSR+ and CSR– of the floor wire connector on the airbag sensor assy center side.

OK:

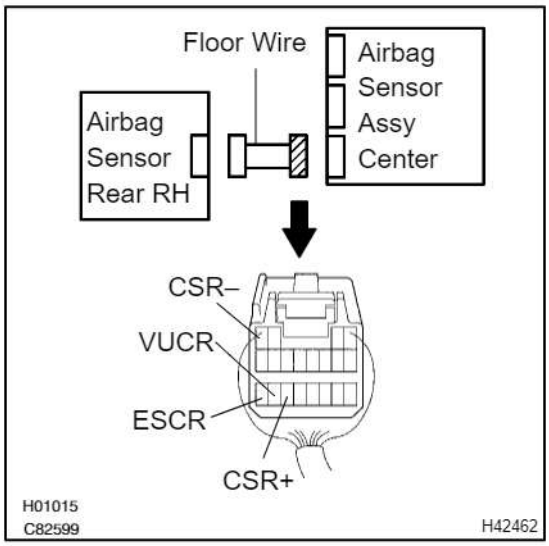
Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

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6	CHECK FLOOR WIRE

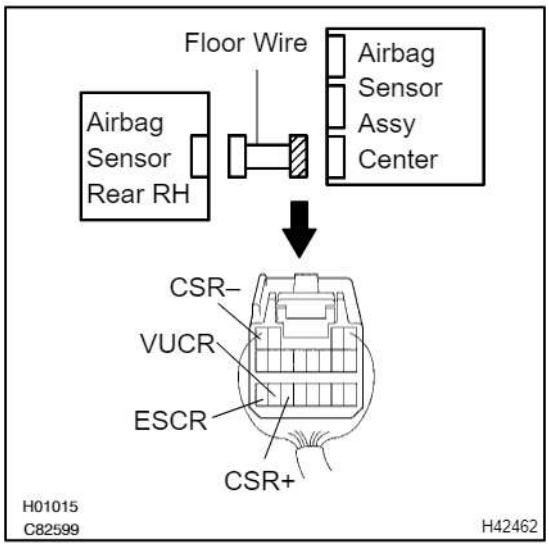


(a) Measure the resistance between VUCR and ESCR, and between CSR+ and CSR– of the floor wire connector on the airbag sensor assy center side.
OK:
Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

7	CHECK FLOOR WIRE(TO B+)



(a) Measure the voltage between the body ground and each of VUCR, CSR+, CSR– and ESCR of the floor wire connector on the airbag sensor assy center side.
OK:
Resistance: 1 MΩ or Higher

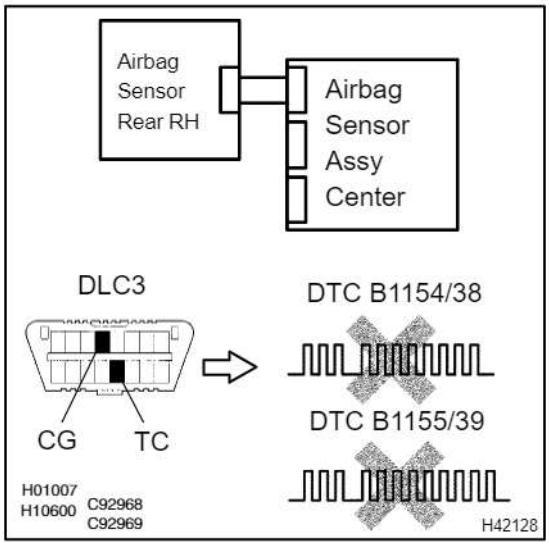
NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

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8 CHECK AIR BAG SENSOR REAR RH

SST 09843–18040



(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the airbag sensor assy center connector.
(d) Interchange the airbag sensor rear LH and RH and connect the connectors to them.
(e) Install the airbag sensor rear RH and LH to the vehicle securely.

NOTICE:
Do not impact on the airbag sensor rear when installation.

(f) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(g) Turn the ignition switch to ON, and wait at least for 10 seconds.
(h) Clear the DTC stored in memory (See page 05–1238).
(i) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(j) Turn the ignition switch to ON, and wait at least for 10 seconds.
(k) Check the DTC (See page 05–1238).

OK:
(A): DTC B1154/38 is not output.
(B): DTC B1155/39 is not output.

NG(A)	REPLACE AIR BAG SENSOR REAR RH
NG(B)	REPLACE AIR BAG SENSOR ASSY CENTER

OK

USE SIMULATION METHOD TO CHECK

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DTC	B1155/39	AIRBAG SENSOR REAR (LH) MALFUNCTION

CIRCUIT DESCRIPTION

The airbag sensor rear LH circuit consists of the safing sensor,diagnosis circuit and lateral deceleration sensor, etc.

It receives signals from the lateral deceleration sensor, judges whether or not the SRS must be activated, and detects diagnosis system malfunction.

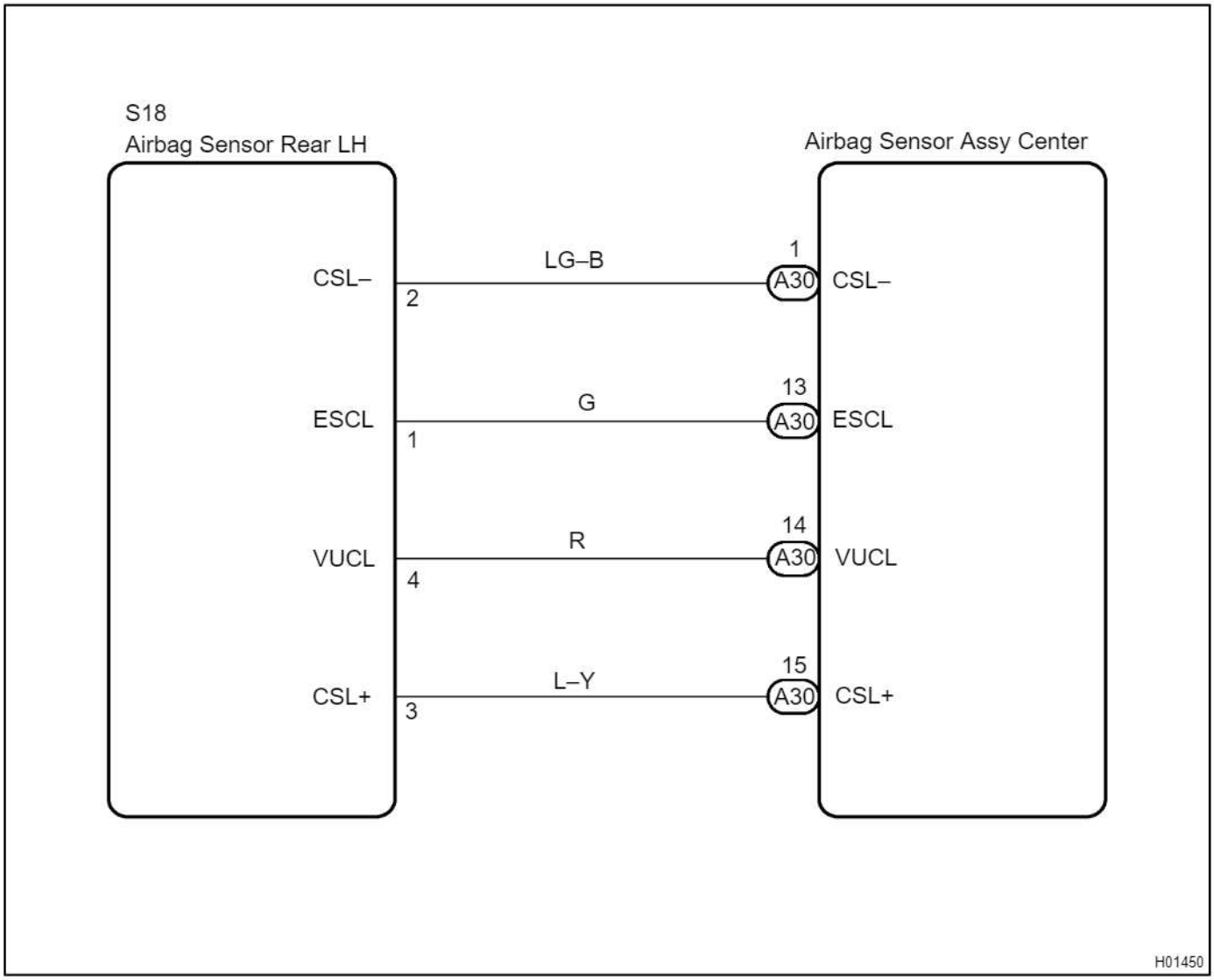
DTC B1155/39 is recorded when occurrence of a malfunction in the airbag sensor rear LH is detected.

DTC No.	DTC Detecting Condition	Trouble Area
B1155/39	□Short in airbag sensor rear LH circuit (to ground) □Short in airbag sensor rear LH circuit (to B+) □Open in airbag sensor rear LH circuit □Airbag sensor rear LH malfunction □Airbag sensor assy center malfunction	□Airbag sensor rear LH □Airbag sensor assy center □Floor wire No.2

HINT:

DTC B1155/39 is indicated only for the vehicle equipped with the side airbag.

WIRING DIAGRAM

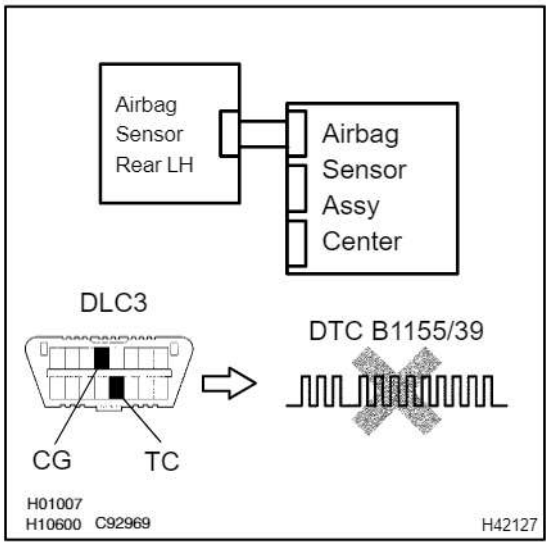


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INSPECTION PROCEDURE

1	CHECK AIR BAG SENSOR REAR LH

SST 09843–18040



(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page 05–1238).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Check the DTC (See page 05–1238).
OK:
DTC B1154/38 is not output.

HINT:
During this check, DTC B1154/38 may also be output at this same time. In this case, check DTC B1154/38 before DTC B1155/39.

OK → **USE SIMULATION METHOD TO CHECK**

NG

2	CHECK AIRBAG SENSOR ASSY CENTER CONNECTOR

(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Check that the connector is properly connected to the airbag sensor assy center.
OK:
The connectors are connected.

NG → **CONNECT CONNECTORS**

OK

3	CHECK AIRBAG SENSOR REAR CONNECTOR

(a) Check that the connector is properly connected to the airbag sensor rear LH.
OK:
The connector is connected.

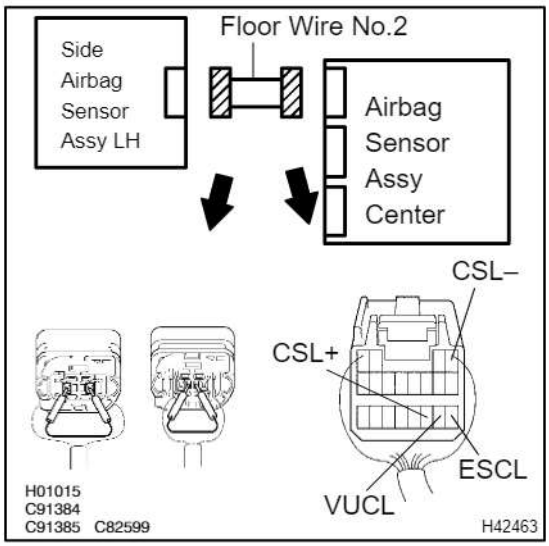
NG → **CONNECT CONNECTORS**

OK

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4 CHECK FLOOR WIRE NO.2(OPEN)

SST 09843–18040



(a) Disconnect the floor wire No.2 connectors from the airbag sensor assy center and airbag sensor rear LH.

(b) Using a service wire, connect VUCL and ESCL of the floor wire No.2 connector on the airbag sensor rear LH side.

(c) Using a service wire, connect CSL+ and CSL– of the floor wire No.2 connector on the airbag sensor rear LH side.

(d) Measure the resistance between VUCL and ESCL, and between CSL+ and CSL– of the floor wire No.2 connector on the airbag sensor assy center side.

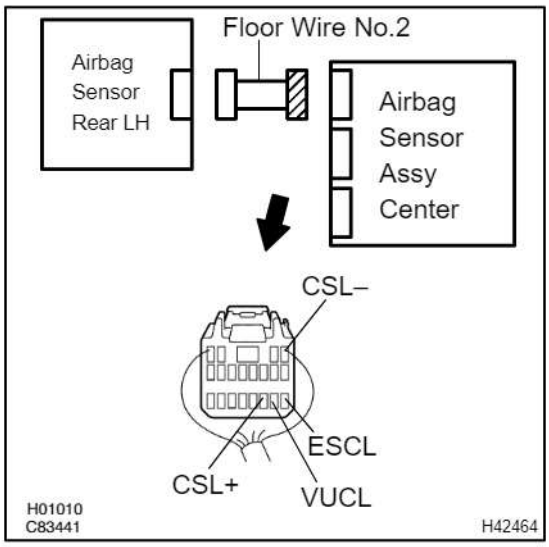
OK:

Resistance: Below 1 Ω

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

5 CHECK FLOOR WIRE NO.2(TO GROUND)



(a) Release the service wire from the floor wire No.2 connector on the airbag sensor rear LH side.

(b) Measure the resistance between the body ground and each of VUCL, CSL+ and CSL– of the floor wire No.2 connector on the airbag sensor assy center side.

OK:

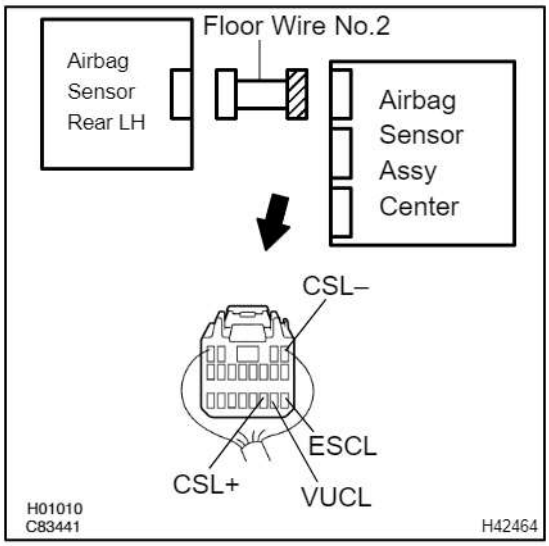
Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

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6 CHECK FLOOR WIRE NO.2



(a) Measure the resistance between VUCL and ESCL, and between CSL+ and CSL– of the floor wire No.2 connector on the airbag sensor assy center side.

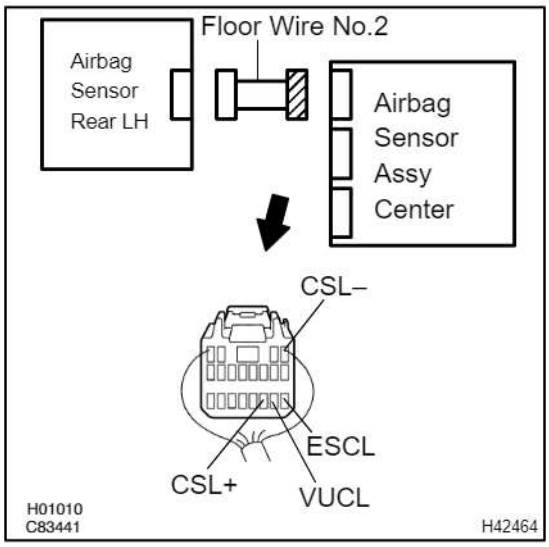
OK:

Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

7 CHECK FLOOR WIRE NO.2(TO B+)



(a) Connect the negative (–) terminal cable to the battery.

(b) Turn the ignition switch to ON.

(c) Measure the voltage between the body ground and each of VUCL, CSL+ and CSL– of the floor wire No.2 connector on the airbag sensor assy center side.

OK:

Voltage: Below 1 V

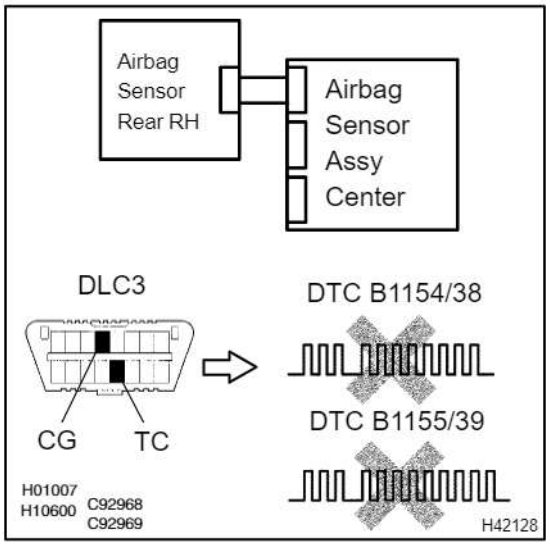
NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

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8	CHECK AIR BAG SENSOR REAR LH

SST 09843–18040



(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the airbag sensor assy center connector.
(d) Interchange the airbag sensor rear LH and RH and connect the connectors to them.
(e) Install the airbag sensor rear RH and LH to the vehicle securely.

NOTICE:

Do not impact on the airbag sensor rear when installation.

(f) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(g) Turn the ignition switch to ON, and wait at least for 10 seconds.
(h) Clear the DTC stored in memory (See page 05–1238).
(i) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(j) Turn the ignition switch to ON, and wait at least for 10 seconds.
(k) Check the DTC (See page 05–1238).

OK:

(A): DTC B1154/38 is not output.
(B): DTC B1155/39 is not output.

NG(A)	REPLACE AIR BAG SENSOR REAR LH

NG(B)	REPLACE AIR BAG SENSOR ASSY CENTER

OK

USE SIMULATION METHOD TO CHECK

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DTC	B1160/83	SHORT IN CURTAIN SHIELD SQUIB (RH) CIRCUIT

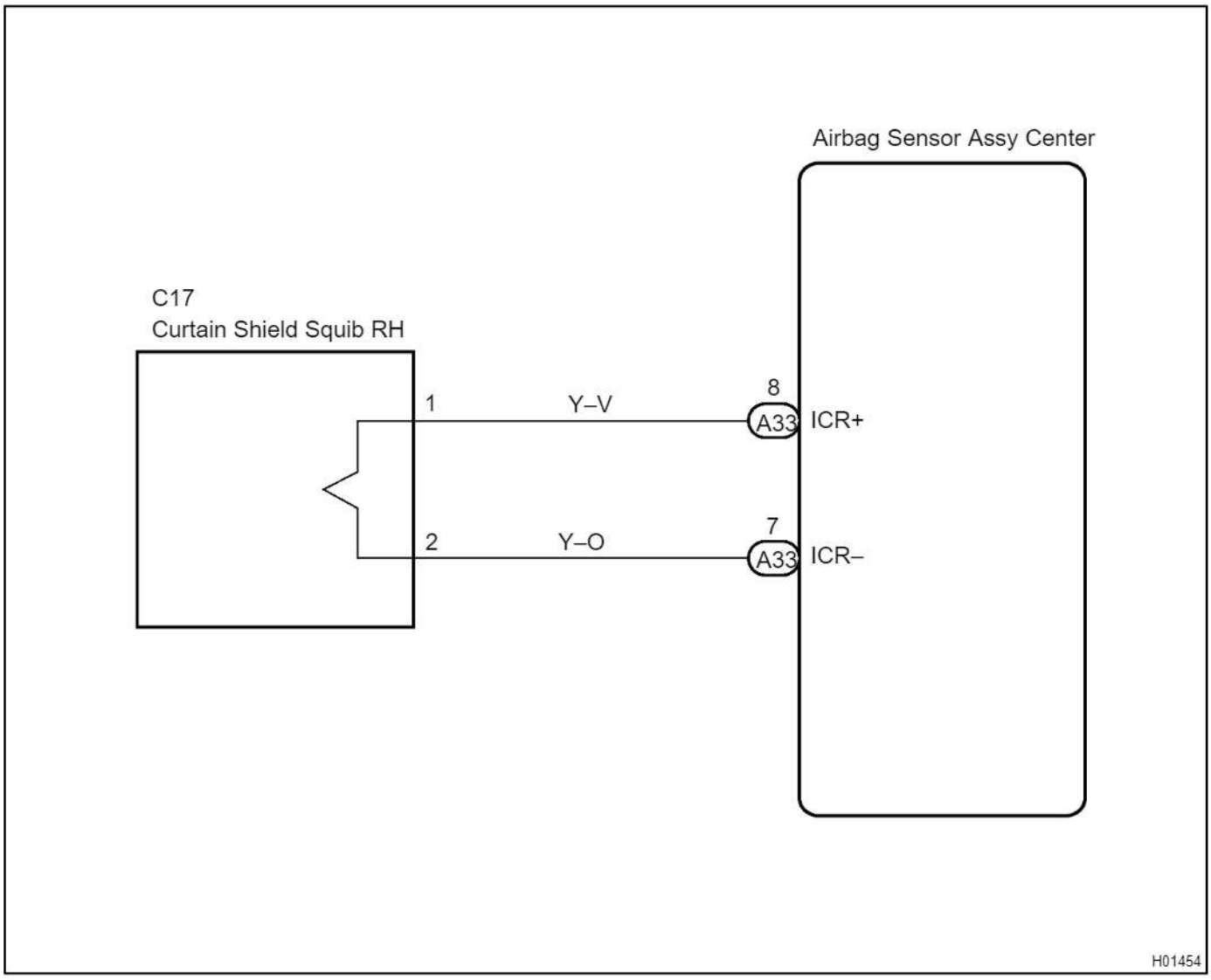
CIRCUIT DESCRIPTION

The curtain shield squib RH circuit consists of the airbag sensor assy center and the curtain shield airbag assy RH.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
DTC B1160/83 is recorded when a short is detected in the curtain shield squib RH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B1160/83	□Short in curtain shield squib RH circuit □Curtain shield squib RH malfunction □Airbag sensor assy center malfunction	□Curtain shield airbag assy RH (Curtain shield squib RH) □Airbag sensor assy center □Floor wire

HINT:
DTC B1160/83 is indicated only for the vehicle equipped with the side airbag.

WIRING DIAGRAM



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INSPECTION PROCEDURE

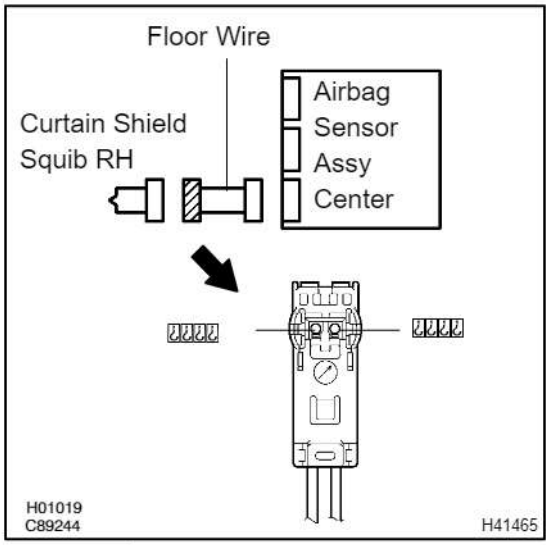
1	CHECK CONNECTOR

(a) Make sure that the connector is not damaged.
OK:
The lock button is not disengaged, or the claw of the lock is not deformed or damaged.

NG → REPAIR OR REPLACE FLOOR WIRE

OK

2	CHECK FLOOR WIRE(CURTAIN SHIELD SQUIB RH CIRCUIT)



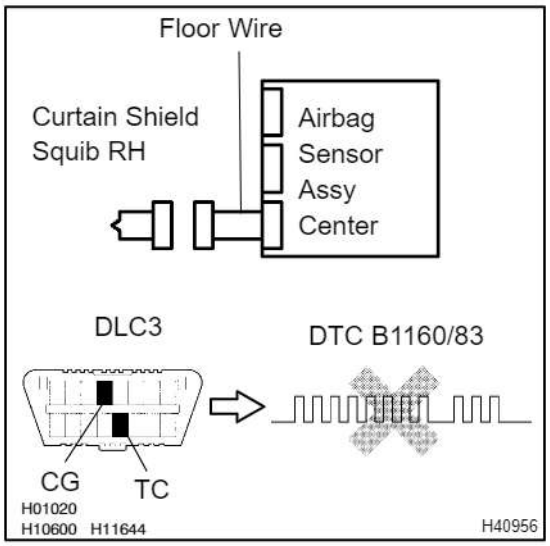
(a) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(b) Disconnect the floor wire connectors from the airbag sensor assy center and the curtain shield airbag assy RH.
(c) Release the airbag activation prevention mechanism built in the floor wire connector on the airbag sensor assy center side (See page 05–1238).
(d) Measure the resistance between ICR+ and ICR– of the floor wire connector on the curtain shield airbag assy RH side.
OK:
Resistance: 1 MΩ or Higher

NG → REPAIR OR REPLACE FLOOR WIRE

OK

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3	CHECK AIR BAG SENSOR ASSY CENTER



(a) Connect the connector to the airbag sensor assy center.
(b) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(c) Turn the ignition switch to ON, and wait at least for 10 seconds.
(d) Clear the DTC stored in memory (See page 05–1238).
(e) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(f) Turn the ignition switch to ON, and wait at least for 10 seconds.
(g) Check the DTC (See page 05–1238).

OK:

DTC B1160/83 is not output.

HINT:

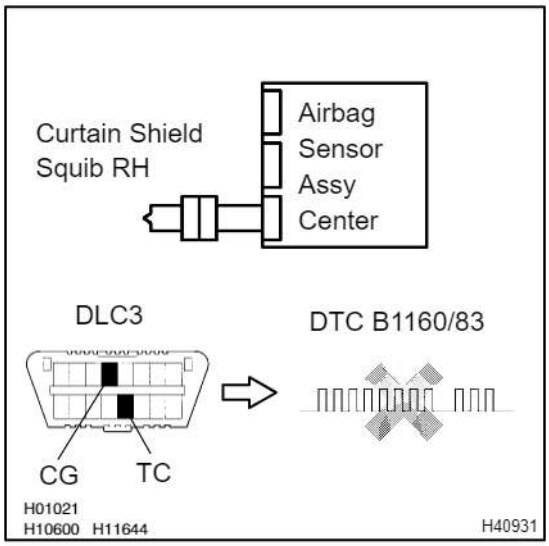
Codes other than code B1160/83 may be output at this time, but they are not relevant to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

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4	CHECK CURTAIN SHIELD SQUIB (RH)



(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the curtain shield airbag assy RH connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(e) Turn the ignition switch to ON, and wait at least for 10 seconds.
(f) Clear the DTC stored in memory (See page 05–1238).
(g) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(h) Turn the ignition switch to ON, and wait at least for 10 seconds.
(i) Check the DTC (See page 05–1238).

OK:

DTC B1160/83 is not output.

HINT:

Codes other than code B1160/83 may be output at this time, but they are not relevant to this check.

NG → **REPLACE CURTAIN SHIELD AIR BAG ASSY RH**

OK

USE SIMULATION METHOD TO CHECK

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DTC	B1161/84	OPEN IN CURTAIN SHIELD SQUIB (RH) CIECUIT

CIRCUIT DESCRIPTION

The curtain shield squib RH circuit consists of the airbag sensor assy center and the curtain shield airbag assy RH.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
DTC B1161/84 is recorded when an open is detected in the curtain shield squib RH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B1161/84	□Open in curtain shield squib RH circuit □Curtain shield squib RH malfunction □Airbag sensor assy center malfunction	□Curtain shield airbag assy RH (Curtain shield squib RH) □Airbag sensor assy center □Floor wire

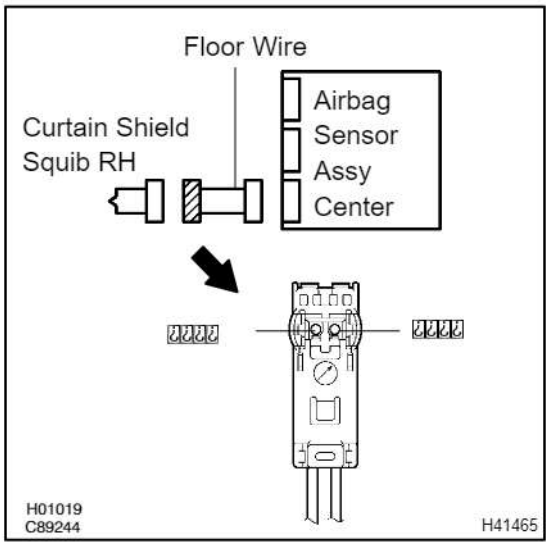
HINT:
DTC B1161/84 is indicated only for the vehicle equipped with the side airbag.

WIRING DIAGRAM

See page 05–1380.

INSPECTION PROCEDURE

1	CHECK FLOOR WIRE(CURTAIN SHIELD SQUIB RH CIRCUIT)



(a) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(b) Disconnect the floor wire connectors from the airbag sensor assy center and the curtain shield airbag assy RH.
(c) Measure the resistance between ICR+ and ICR– of the floor wire connector on the curtain shield airbag assy RH side.
OK:
Resistance: Below 1 Ω

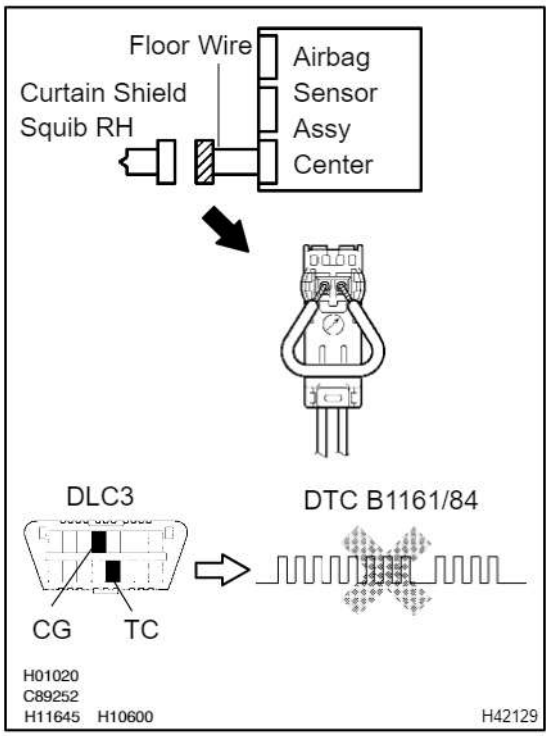
NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

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2 CHECK AIR BAG SENSOR ASSY CENTER

SST 09843–18040



(a) Connect the connector to the airbag sensor assy center.
(b) Using a service wire, connect ICR+ and ICR– of the floor wire connector on the curtain shield airbag assy RH side.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Clear the DTC stored in memory (See page 05–1238).
(f) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(g) Turn the ignition switch to ON, and wait at least for 10 seconds.
(h) Check the DTC (See page 05–1238).

OK:

DTC B1161/84 is not output.

HINT:

Codes other than code B1161/84 may be output at this time, but they are not relevant to this check.

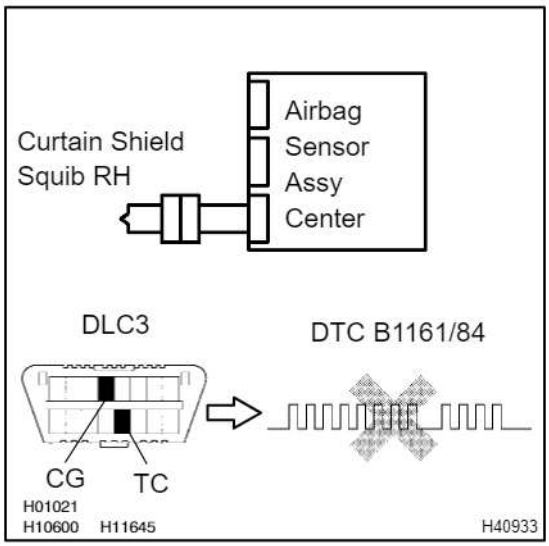
NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

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3 CHECK CURTAIN SHIELD SQUIB (RH)

SST 09843–18040



(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the curtain shield airbag assy RH connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(e) Turn the ignition switch to ON, and wait at least for 10 seconds.
(f) Clear the DTC stored in memory (See page 05–1238).
(g) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(h) Turn the ignition switch to ON, and wait at least for 10 seconds.
(i) Check the DTC (See page 05–1238).

OK:

DTC B1161/84 is not output.

HINT:

Codes other than code B1161/84 may be output at this time, but they are not relevant to this check.

NG → **REPLACE CURTAIN SHIELD AIR BAG ASSY RH**

OK →

USE SIMULATION METHOD TO CHECK

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DTC	B1162/81	SHORT IN CURTAIN SHIELD SQUIB (RH) CIRCUIT (TO GROUND)

CIRCUIT DESCRIPTION

The curtain shield squib RH circuit consists of the airbag sensor assy center and the curtain shield airbag assy RH.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
DTC B1162/81 is recorded when a ground short is detected in the curtain shield squib RH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B1162/81	□Short in curtain shield squib RH circuit (to ground) □Curtain shield squib RH malfunction □Airbag sensor assy center malfunction	□Curtain shield airbag assy RH (Curtain shield squib RH) □Airbag sensor assy center □FLoor wire

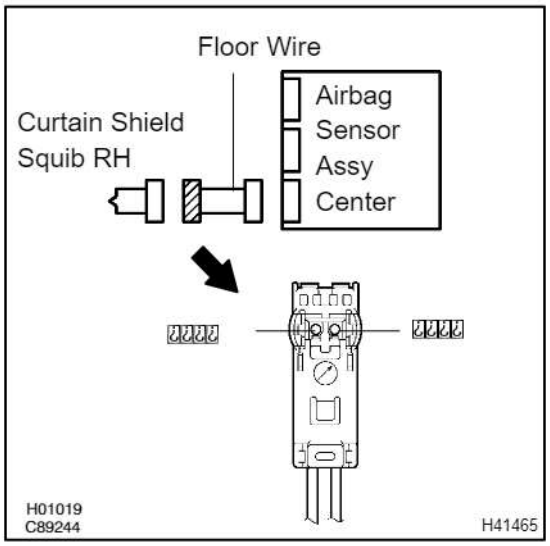
HINT:
DTC B1162/81 is indicated only for the vehicle equipped with the side airbag.

WIRING DIAGRAM

See page 05–1380.

INSPECTION PROCEDURE

1	CHECK FLOOR WIRE(CURTAIN SHIELD SQUIB RH CIRCUIT)



(a) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(b) Disconnect the floor wire connectors from the airbag sensor assy center and the curtain shield airbag assy RH.
(c) Measure the resistance between the body ground and ICR+ and ICR– of the floor wire connector on the curtain shield airbag assy RH side.
OK:
Resistance: 1M Ω or Higher

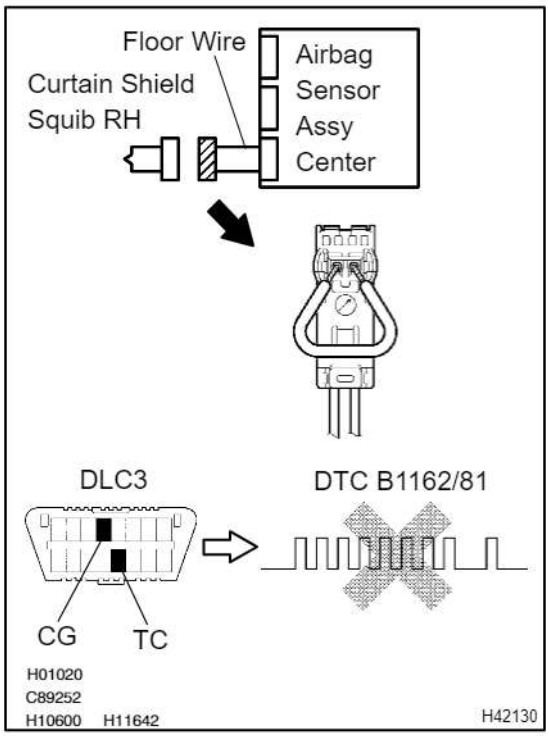
NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

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2 CHECK AIR BAG SENSOR ASSY CENTER

SST 09843–18040



(a) Connect the connector to the airbag sensor assy center.
(b) Using a service wire, connect ICR+ and ICR– of the floor wire connector on the curtain shield airbag assy RH side.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Clear the DTC stored in memory (See page 05–1238).
(f) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(g) Turn the ignition switch to ON, and wait at least for 10 seconds.
(h) Check the DTC (See page 05–1238).

OK:

DTC B1162/81 is not output.

HINT:

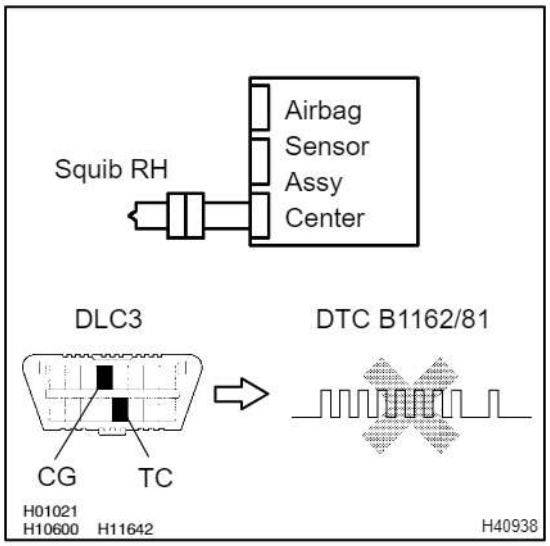
Codes other than code B1162/81 may be output at this time, but they are not relevant to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

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3	CHECK CURTAIN SHIELD SQUIB (RH)



(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the curtain shield airbag assy RH connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(e) Turn the ignition switch to ON, and wait at least for 10 seconds.
(f) Clear the DTC stored in memory (See page 05–1238).
(g) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(h) Turn the ignition switch to ON, and wait at least for 10 seconds.
(i) Check the DTC (See page 05–1238).

OK:

DTC B1162/81 is not output.

HINT:

Codes other than code B1162/81 may be output at this time, but they are not relevant to this check.

NG	REPLACE CURTAIN SHIELD AIR BAG ASSY RH

OK

4	USE SIMULATION METHOD TO CHECK

NG	Go to step 1

OK

REPLACE ALL SRS COMPONENTS INCLUDING WIRE HARNESS

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DTC	B1163/82	SHORT IN CURTAIN SHIELD SQUIB (RH) CIRCUIT (TO B+)

CIRCUIT DESCRIPTION

The curtain shield squib RH circuit consists of the airbag sensor assy center and the curtain shield airbag assy RH.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
DTC B1163/82 is recorded when a B+ short is detected in the curtain shield squib RH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B1163/82	□Short in curtain shield squib RH circuit (to B+) □Curtain shield squib RH malfunction □Airbag sensor assy center malfunction	□Curtain shield airbag assy RH (Curtain shield squib RH) □Airbag sensor assy center □Floor wire

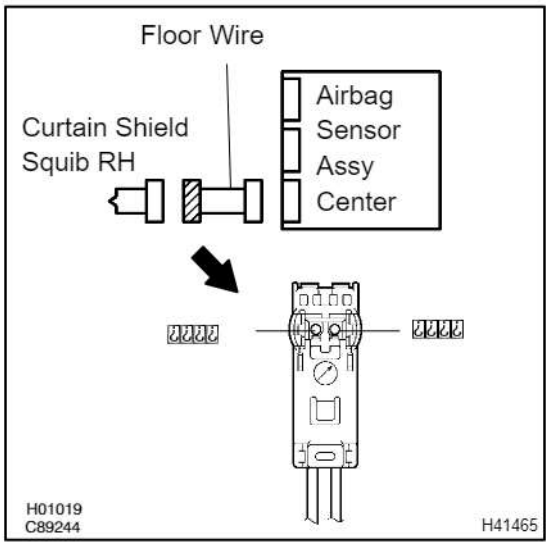
HINT:
DTC B1163/82 is indicated only for the vehicle equipped with the side airbag.

WIRING DIAGRAM

See page 05–1380.

INSPECTION PROCEDURE

1	CHECK FLOOR WIRE(CURTAIN SHIELD SQUIB RH CIRCUIT)



(a) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(b) Disconnect the floor wire connectors from the airbag sensor assy center and the curtain shield airbag assy RH.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(d) Turn the ignition switch to ON.
(e) Measure the voltage between the body ground and ICR+ of the floor wire connector on the curtain shield airbag assy RH side.
OK:
Voltage: Below 1 V

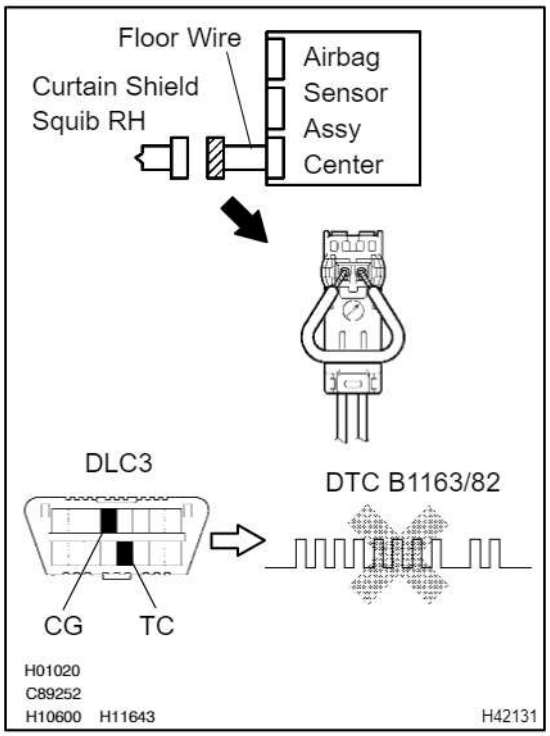
NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

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2 CHECK AIR BAG SENSOR ASSY CENTER

SST 09843–18040



(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the connector to the airbag sensor assy center.
(d) Using a service wire, connect ICR+ and ICR– of the floor wire connector on the curtain shield airbag assy RH side.
(e) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(f) Turn the ignition switch to ON, and wait at least for 10 seconds.
(g) Clear the DTC stored in memory (See page 05–1238).
(h) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(i) Turn the ignition switch to ON, and wait at least for 10 seconds.
(j) Check the DTC (See page 05–1238).

OK:

DTC B1163/82 is not output.

HINT:

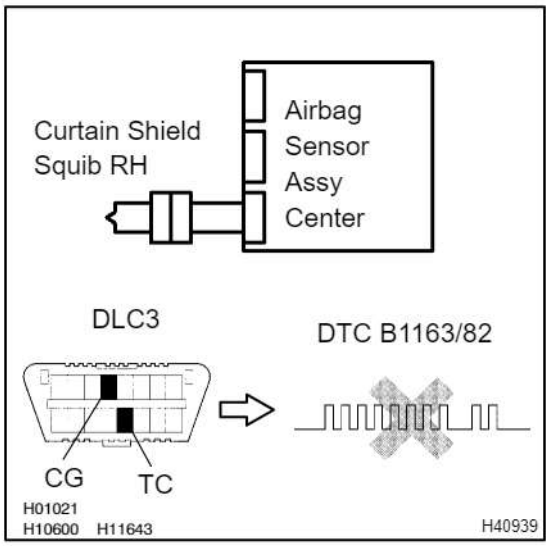
Codes other than code B1163/82 may be output at this time, but they are not relevant to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

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3	CHECK CURTAIN SHIELD SQUIB (RH)



(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the curtain shield airbag assy RH connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(e) Turn the ignition switch to ON, and wait at least for 10 seconds.
(f) Clear the DTC stored in memory (See page 05–1238).
(g) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(h) Turn the ignition switch to ON, and wait at least for 10 seconds.
(i) Check the DTC (See page 05–1238).

OK:

DTC B1163/82 is not output.

HINT:

Codes other than code B1163/82 may be output at this time, but they are not relevant to this check.

NG	REPLACE CURTAIN SHIELD AIR BAG ASSY RH

OK

4	USE SIMULATION METHOD TO CHECK

NG	Go to step 1

OK

REPLACE ALL SRS COMPONENTS INCLUDING WIRE HARNESS

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DTC	B1165/87	SHORT IN CURTAIN SHIELD SQUIB (LH) CIRCUIT

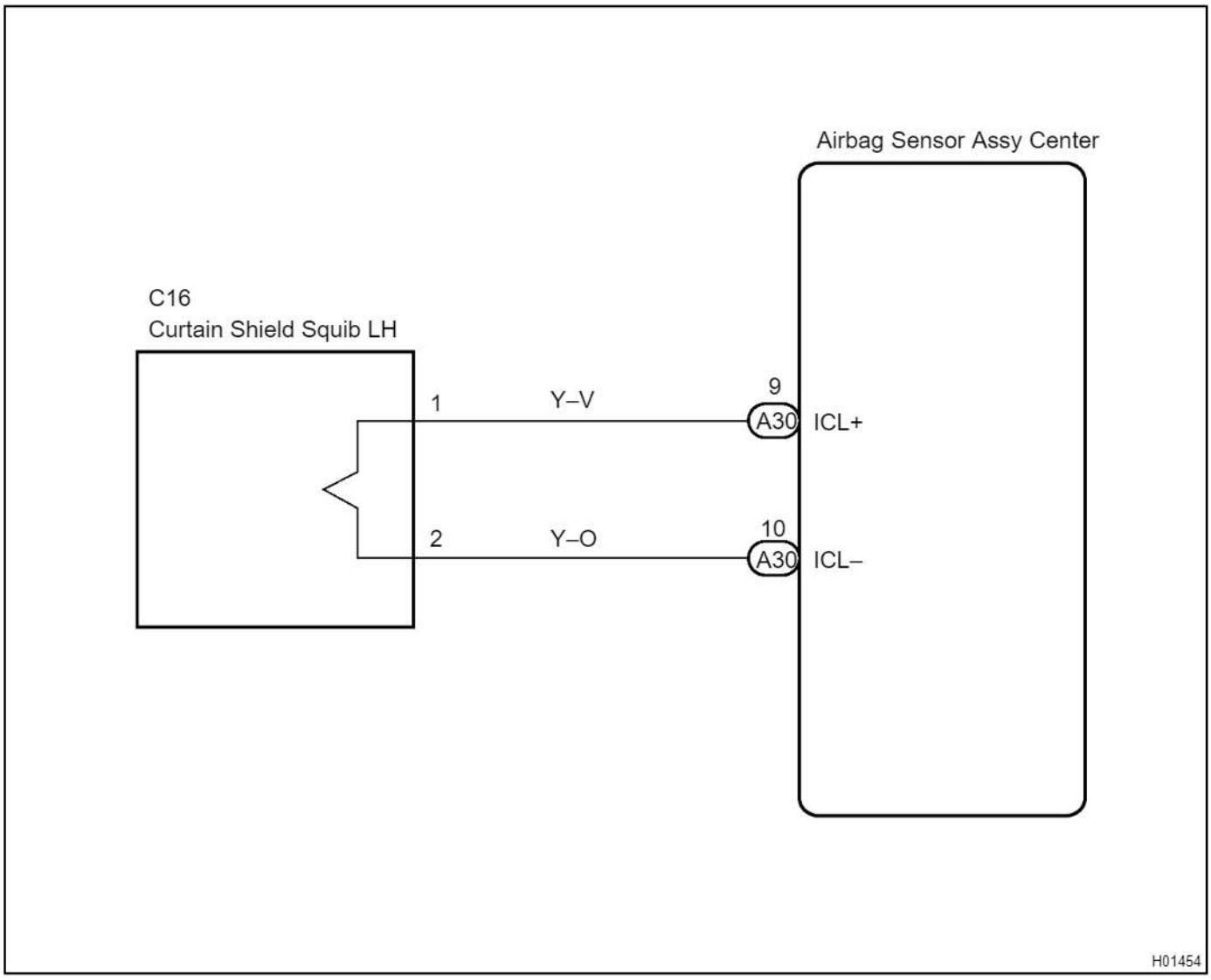
CIRCUIT DESCRIPTION

The curtain shield squib LH circuit consists of the airbag sensor assy center and the curtain shield airbag assy LH.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
DTC B1165/87 is recorded when a short is detected in the curtain shield squib LH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B1165/87	□Short in curtain shield squib LH circuit □Curtain shield squib LH malfunction □Airbag sensor assy center malfunction	□Curtain shield airbag assy LH (Curtain shield squib LH) □Airbag sensor assy center □Floor wire No.2

HINT:
DTC B1165/87 is indicated only for the vehicle equipped with the side airbag.

WIRING DIAGRAM



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INSPECTION PROCEDURE

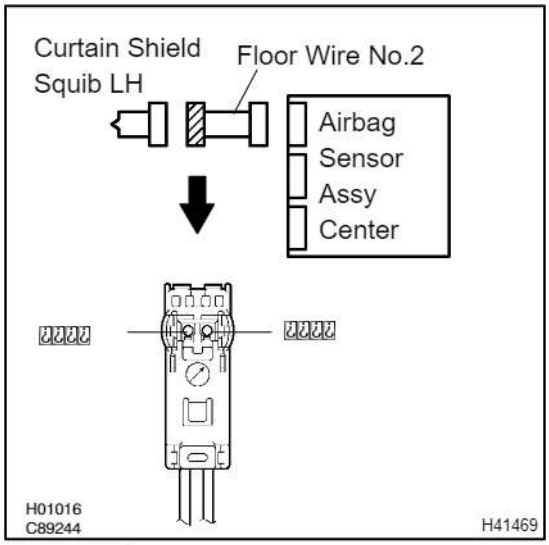
1	CHECK CONNECTOR

(a) Make sure that the connector is not damaged.
OK:
The lock button is not disengaged, or the claw of the lock is not deformed or damaged.

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

2	CHECK FLOOR WIRE NO.2(CURTAIN SHIELD SQUIB LH CIRCUIT)



(a) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(b) Disconnect the floor wire No.2 connectors from the airbag sensor assy center and the curtain shield airbag assy LH.
(c) Release the airbag activation prevention mechanism built in the connector of the floor wire No.2 on the airbag sensor assy center side (See page 05–1238).
(d) Measure the resistance between ICL+ and ICL– of the floor wire No.2 connector on the curtain shield airbag assy LH side.
OK:
Resistance: 1 MΩ or Higher

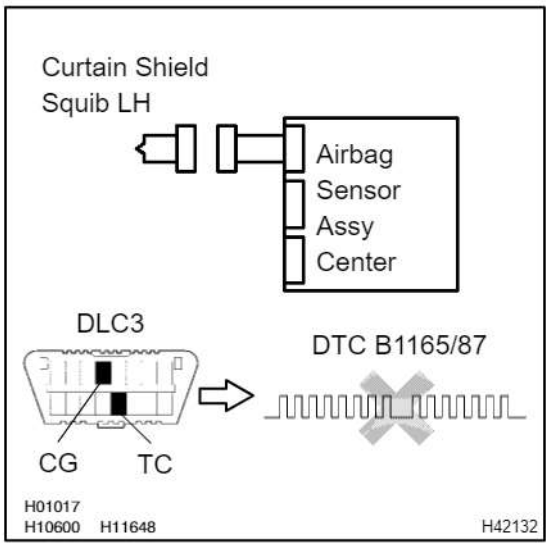
NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

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3 CHECK AIR BAG SENSOR ASSY CENTER

SST 09843–18040



(a) Connect the connector to the airbag sensor assy center.
(b) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(c) Turn the ignition switch to ON, and wait at least for 10 seconds.
(d) Clear the DTC stored in memory (See page 05–1238).
(e) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(f) Turn the ignition switch to ON, and wait at least for 10 seconds.
(g) Check the DTC (See page 05–1238).

OK:

DTC B1165/87 is not output.

HINT:

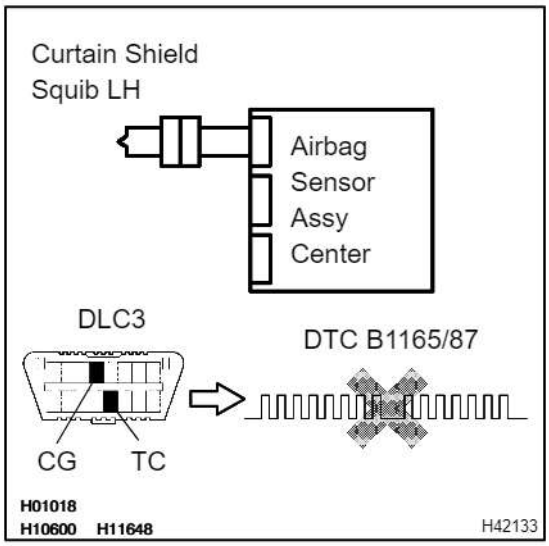
Codes other than code B1165/87 may be output at this time, but they are not relevant to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

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4 CHECK CURTAIN SHIELD SQUIB (LH)



(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the curtain shield airbag assy LH connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(e) Turn the ignition switch to ON, and wait at least for 10 seconds.
(f) Clear the DTC stored in memory (See page 05–1238).
(g) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(h) Turn the ignition switch to ON, and wait at least for 10 seconds.
(i) Check the DTC (See page 05–1238).

OK:

DTC B1165/87 is not output.

HINT:

Codes other than code B1165/87 may be output at this time, but they are not relevant to this check.

NG → **REPLACE CURTAIN SHIELD AIR BAG ASSY LH**

OK

USE SIMULATION METHOD TO CHECK

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DTC	B1166/88	OPEN IN CURTAIN SHIELD SQUIB (LH) CIRCUIT

CIRCUIT DESCRIPTION

The curtain shield squib LH circuit consists of the airbag sensor assy center and the curtain shield airbag assy LH.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
DTC B1166/88 is recorded when an open is detected in the curtain shield squib LH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B1166/88	□Open in curtain shield squib LH circuit □Curtain shield squib LH malfunction □Airbag sensor assy center malfunction	□Curtain shield airbag assy LH (Curtain shield squib LH) □Airbag sensor assy center □Floor wire No.2

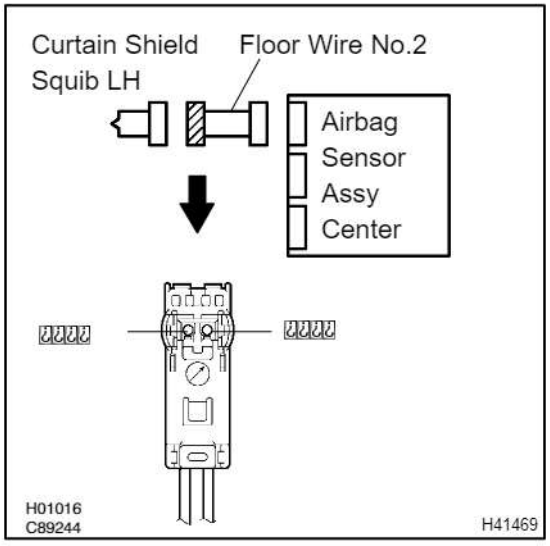
HINT:
DTC B1166/88 is indicated only for the vehicle equipped with the side airbag.

WIRING DIAGRAM

See page 05–1393.

INSPECTION PROCEDURE

1	CHECK FLOOR WIRE NO.2(CURTAIN SHIELD SQUIB LH CIRCUIT)



(a) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(b) Disconnect the floor wire No.2 connectors from the airbag sensor assy center and the curtain shield airbag assy LH.
(c) Measure the resistance between ICL+ and ICL– of the floor wire connector on the curtain shield airbag assy LH side.
Resistance: Below 1 Ω

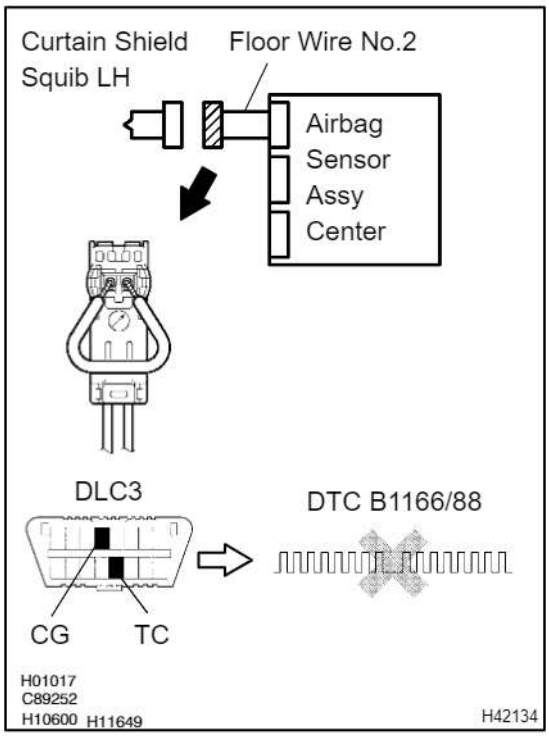
NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

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2 CHECK AIR BAG SENSOR ASSY CENTER

SST 09843–18040



(a) Connect the connector to the airbag sensor assy center.
(b) Using a service wire, connect ICL+ and ICL– of the floor wire No.2 connector on the curtain shield airbag assy LH side.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Clear the DTC stored in memory (See page 05–1238).
(f) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(g) Turn the ignition switch to ON, and wait at least for 10 seconds.
(h) Check the DTC (See page 05–1238).

OK:

DTC B1166/88 is not output.

HINT:

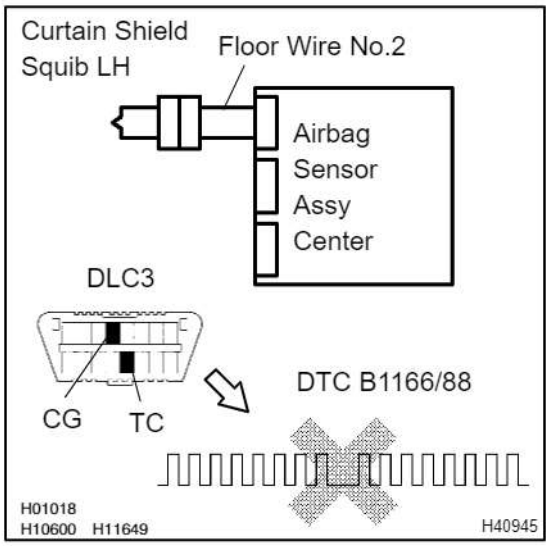
Codes other than code B1166/88 may be output at this time, but they are not relevant to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

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3	CHECK CURTAIN SHIELD SQUIB (LH)



(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the curtain shield airbag assy LH connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(e) Turn the ignition switch to ON, and wait at least for 10 seconds.
(f) Clear the DTC stored in memory (See page 05–1238).
(g) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(h) Turn the ignition switch to ON, and wait at least for 10 seconds.
(i) Check the DTC (See page 05–1238).

OK:

DTC B1166/88 is not output.

HINT:

Codes other than code B1166/88 may be output at this time, but they are not relevant to this check.

NG → **REPLACE CURTAIN SHIELD AIR BAG ASSY LH**

OK

USE SIMULATION METHOD TO CHECK

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DTC	B1167/85	SHORT IN CURTAIN SHIELD SQUIB (LH) CIRCUIT (TO GROUND)

CIRCUIT DESCRIPTION

The curtain shield squib LH circuit consists of the airbag sensor assy center and the curtain shield airbag assy LH.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
DTC B1167/85 is recorded when a ground short is detected in the curtain shield squib LH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B1167/85	□Short in curtain shield squib LH circuit (to ground) □Curtain shield squib LH malfunction □Airbag sensor assy malfunction	□Curtain shield airbag assy LH (Curtain shield squib LH) □Airbag sensor assy center □Floor wire No.2

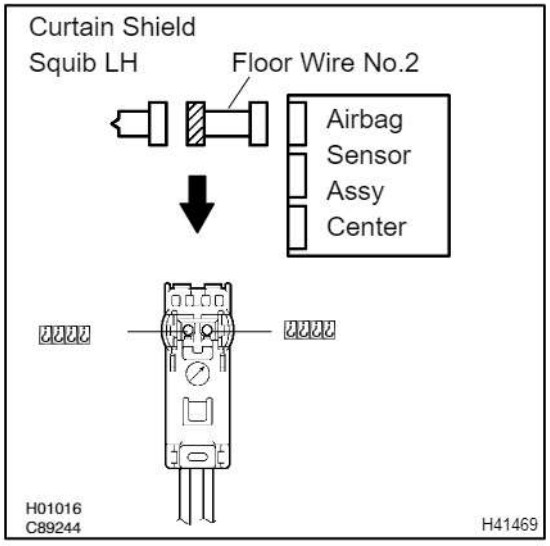
HINT:
DTC B1167/85 is indicated only for the vehicle equipped with the side airbag.

WIRING DIAGRAM

See page 05–1393.

INSPECTION PROCEDURE

1	CHECK FLOOR WIRE NO.2(CURTAIN SHIELD SQUIB LH CIRCUIT)



(a) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(b) Disconnect the floor wire No.2 connectors from the airbag sensor assy center and the curtain shield airbag assy LH.
(c) Measure the resistance between the body ground and ICL+ of the floor wire No.2 connector on the curtain shield airbag assy LH side.
OK:
Resistance: 1 MΩ or Higher

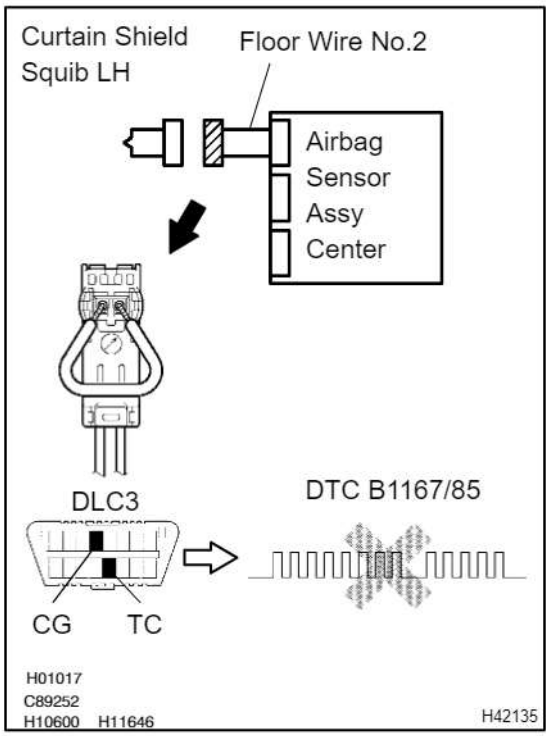
NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

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2 CHECK AIR BAG SENSOR ASSY CENTER

SST 09843–18040



(a) Connect the connector to the airbag sensor assy center.
(b) Using a service wire, connect ICL+ and ICL– of the floor wire No.2 connector on the curtain shield airbag assy LH side.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Clear the DTC stored in memory (See page 05–1238).
(f) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(g) Turn the ignition switch to ON, and wait at least for 10 seconds.
(h) Check the DTC (See page 05–1238).

OK:

DTC B1167/85 is not output.

HINT:

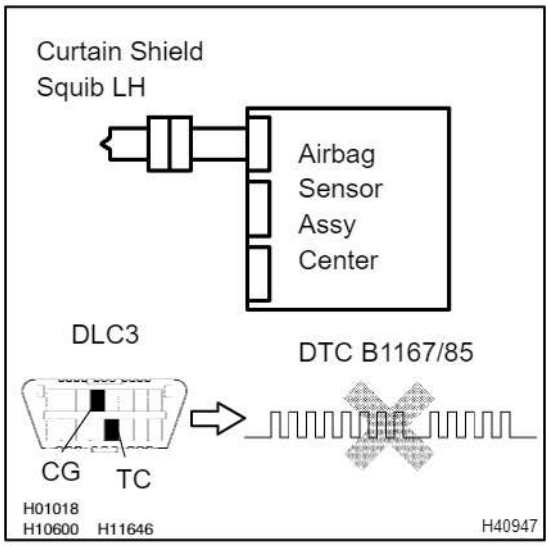
Codes other than code B1167/85 may be output at this time, but they are not relevant to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

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3	CHECK CURTAIN SHIELD SQUIB (LH)



(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the curtain shield airbag assy LH connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(e) Turn the ignition switch to ON, and wait at least for 10 seconds.
(f) Clear the DTC stored in memory (See page 05–1238).
(g) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(h) Turn the ignition switch to ON, and wait at least for 10 seconds.
(i) Check the DTC (See page 05–1238).

OK:

DTC B1167/85 is not output.

HINT:

Codes other than code B1167/85 may be output at this time, but they are not relevant to this check.

NG → **REPLACE CURTAIN SHIELD AIR BAG ASSY LH**

OK

4	USE SIMULATION METHOD TO CHECK

NG → **Go to step 1**

OK

REPLACE ALL SRS COMPONENTS INCLUDING WIRE HARNESS

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DTC	B1168/86	SHORT IN CURTAIN SHIELD SQUIB (LH) CIRCUIT (TO B+)

CIRCUIT DESCRIPTION

The curtain shield squib LH circuit consists of the airbag sensor assy center and the curtain shield airbag assy LH.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
DTC B1168/86 is recorded when a B+ short is detected in the curtain shield squib LH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B1168/86	□Short in curtain shield squib LH circuit (to B+) □Curtain shield squib LH malfunction □Airbag sensor assy center malfunction	□Curtain shield airbag assy LH (Curtain shield squib LH) □Airbag sensor assy center □Floor wire No.2

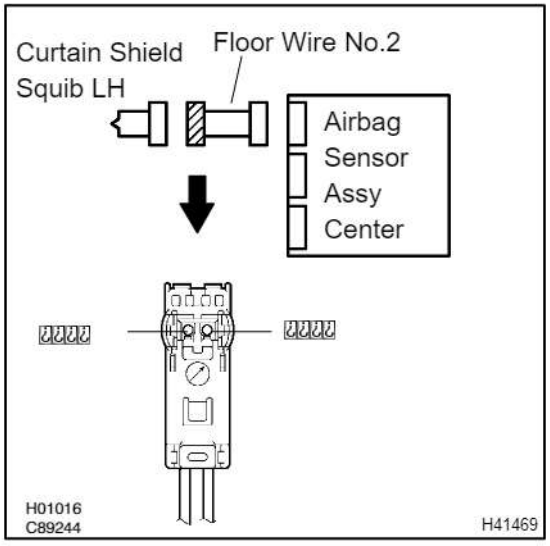
HINT:
DTC B1168/86 is indicated only for the vehicle equipped with the side airbag.

WIRING DIAGRAM

See page 05–1393.

INSPECTION PROCEDURE

1	CHECK FLOOR WIRE NO.2(CURTAIN SHIELD SQUIB LH CIRCUIT)



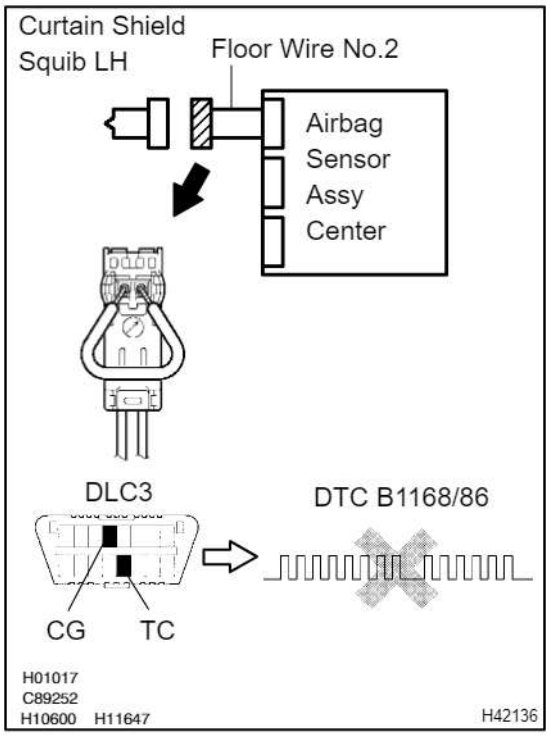
(a) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(b) Disconnect the floor wire No.2 connectors from the airbag sensor assy center and the curtain shield airbag assy LH.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(d) Turn the ignition switch to ON.
(e) Measure the voltage between the body ground and ICL+ of the floor wire No.2 connector on the curtain shield airbag assy side.
OK:
Voltage: Below 1 V

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

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2 CHECK AIR BAG SENSOR ASSY CENTER



(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the connector to the airbag sensor assy center.
(d) Using a service wire, connect ICL+ and ICL– of the floor wire No.2 connector on the curtain shield airbag assy LH side.
(e) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(f) Turn the ignition switch to ON, and wait at least for 10 seconds.
(g) Clear the DTC stored in memory (See page 05–1238).
(h) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(i) Turn the ignition switch to ON, and wait at least for 10 seconds.
(j) Check the DTC (See page 05–1238).

OK:

DTC B1168/86 is not output.

HINT:

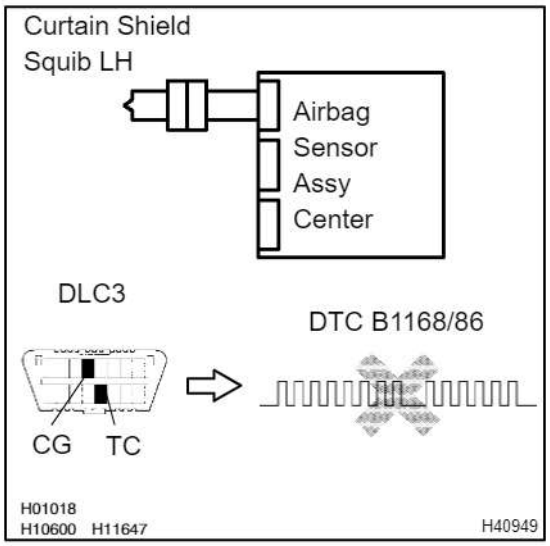
Codes other than code B1168/86 may be output at this time, but they are not relevant to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

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3	CHECK CURTAIN SHIELD SQUIB (LH)



(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the curtain shield airbag assy LH connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(e) Turn the ignition switch to ON, and wait at least for 10 seconds.
(f) Clear the DTC stored in memory (See page 05–1238).
(g) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(h) Turn the ignition switch to ON, and wait at least for 10 seconds.
(i) Check the DTC (See page 05–1238).

OK:

DTC B1168/86 is not output.

HINT:

Codes other than code B1168/86 may be output at this time, but they are not relevant to this check.

NG	REPLACE CURTAIN SHIELD AIR BAG ASSY LH

OK

4	USE SIMULATION METHOD TO CHECK

NG	Go to step 1

OK

REPLACE ALL SRS COMPONENTS INCLUDING WIRE HARNESS

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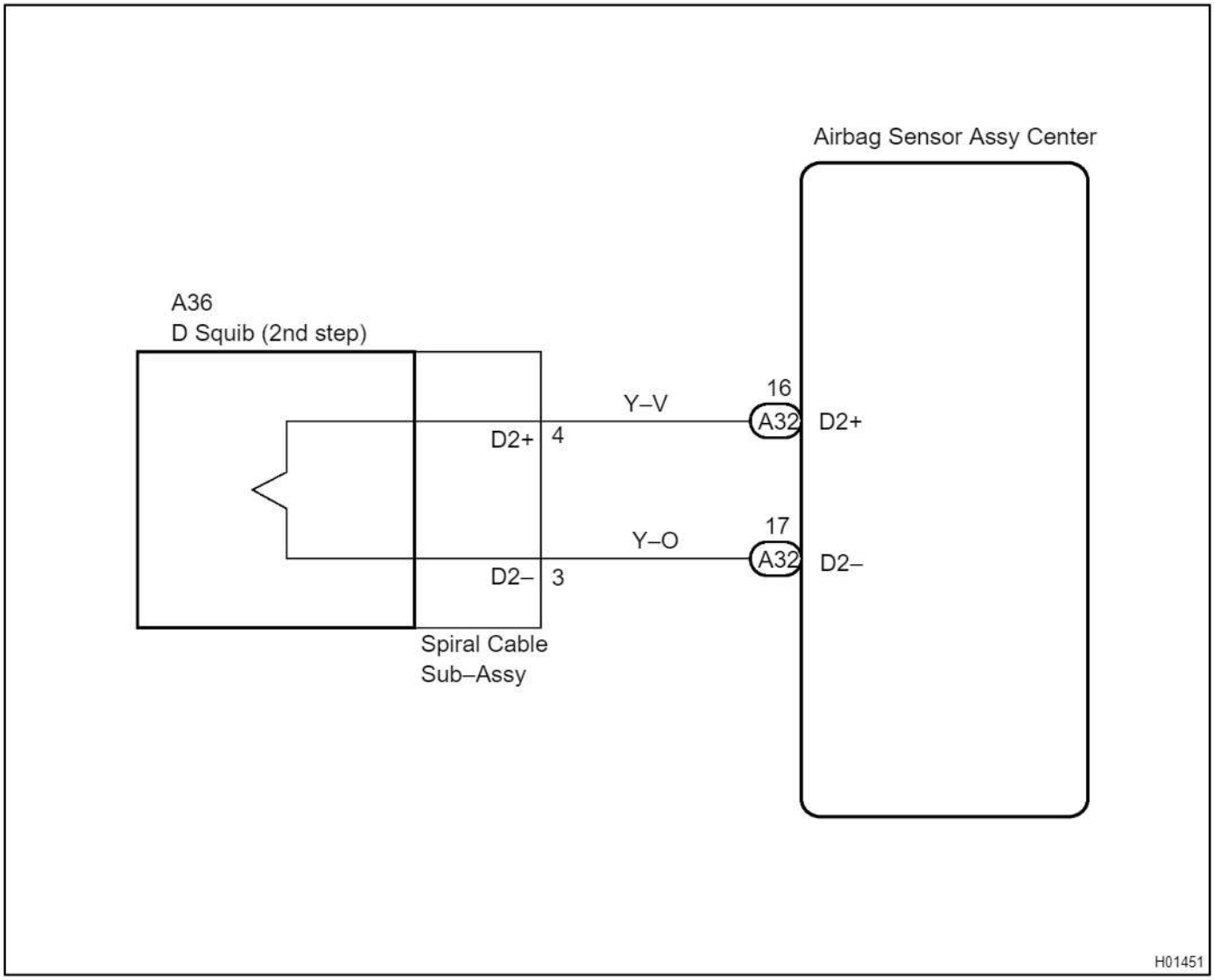
DTC B1180/17 SHORT IN D SQUIB (2ND STEP) CIRCUIT

CIRCUIT DESCRIPTION

The D squib (2nd step) circuit consists of the airbag sensor assy center, the spiral cable sub–assy and the horn button assy.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
DTC B1180/17 is recorded when a short is detected in the D squib (2nd step) circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B1180/17	□Short in D squib (2nd step) circuit □D squib (2nd step) malfunction □Spiral cable sub–assy malfunction □Airbag sensor assy center malfunction	□Horn button assy (D squib, 2nd step) □Spiral cable sub–assy □Airbag sensor assy center □Instrument panel wire

WIRING DIAGRAM



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INSPECTION PROCEDURE

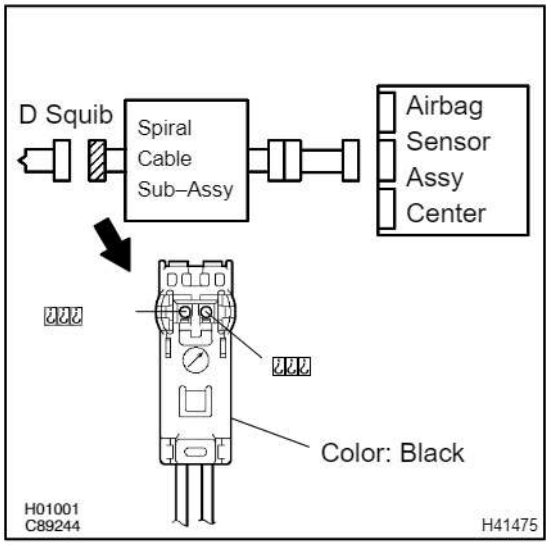
1	CHECK CONNECTOR

(a) Make sure that the connector is not damaged.
OK:
The lock button is not disengeged, or the claw of the lock is not deformed or damaged.

NG → **REPLACE SPIRAL CABLE SUB–ASSY**

OK

2	CHECK D SQUIB CIRCUIT



(a) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(b) Disconnect the connectors between the airbag sensor assy center and the horn button assy.
(c) Release the airbag activation prevention mechanism built in the connector on the airbag sensor assy center side between the airbag sensor assy center and the horn button assy (See page 05–1238).
(d) Measure the resistance between D2+ and D2– of the connector on the horn button assy side between the airbag sensor assy center and the horn button assy.
OK:
Resistance: 1 MΩ or Higher

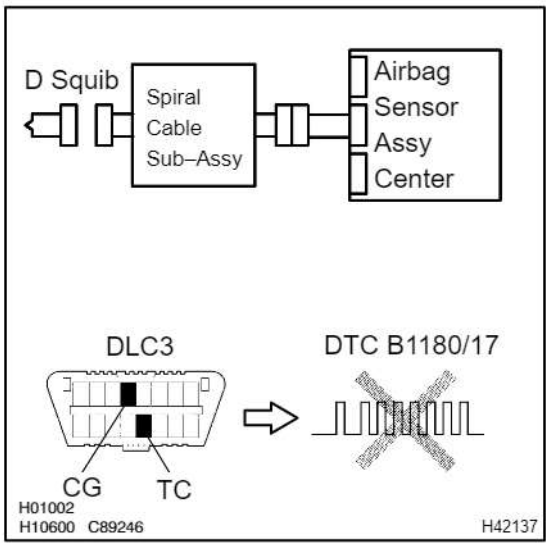
NG → **Go to step 5**

OK

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3 CHECK AIR BAG SENSOR ASSY CENTER

SST 09843–18040



(a) Connect the connector to the airbag sensor assy center.
(b) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(c) Turn the ignition switch to ON, and wait at least for 10 seconds.
(d) Clear the DTC stored in memory (See page 05–1238).
(e) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(f) Turn the ignition switch to ON, and wait at least for 10 seconds.
(g) Check the DTC (See page 05–1238).

OK:

DTC B1180/17 is not output.

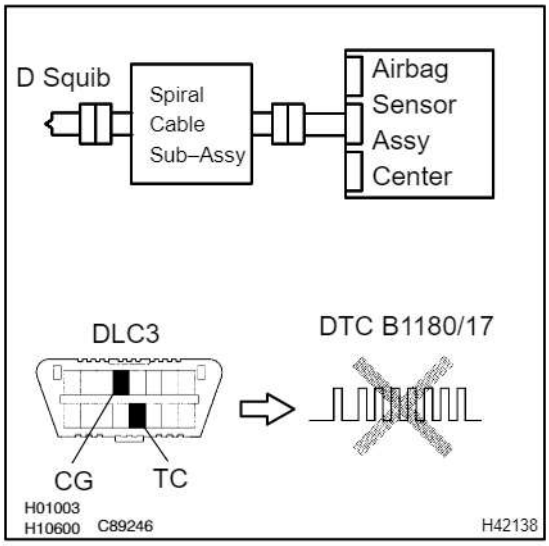
HINT:

Codes other than code B1180/17 may be output at this time, but they are not relevant to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

4 CHECK D SQUIB



(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the horn button assy connectors.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(e) Turn the ignition switch to ON, and wait at least for 10 seconds.
(f) Clear the DTC stored in memory (See page 05–1238).
(g) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(h) Turn the ignition switch to ON, and wait at least for 10 seconds.
(i) Check the DTC (See page 05–1238).

OK:

DTC B1180/17 is not output.

HINT:

Codes other than code B1180/17 may be output at this time, but they are not relevant to this check.

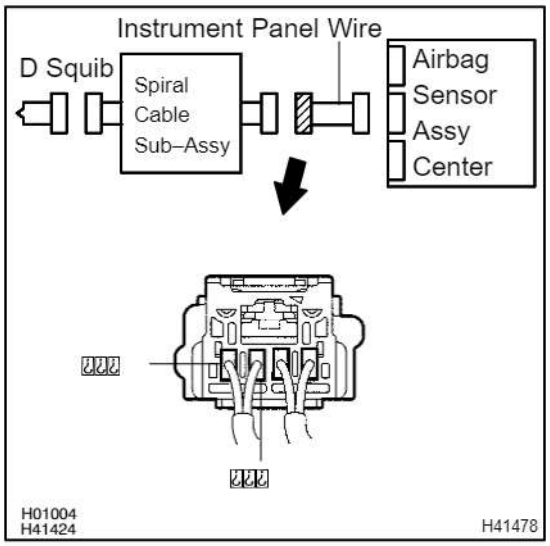
NG → **REPLACE HORN BUTTON ASSY**

OK

USE SIMULATION METHOD TO CHECK

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5 CHECK INSTRUMENT PANEL WIRE



(a) Disconnect the spiral cable sub–assy connector from the instrument panel wire.

(b) Release the airbag activation prevention mechanism built in the instrument panel wire connector on the airbag sensor assy center side (See page 05–1238).

(c) Measure the resistance between D2+ and D2– of the instrument panel wire connector on the spiral cable sub–assy side.

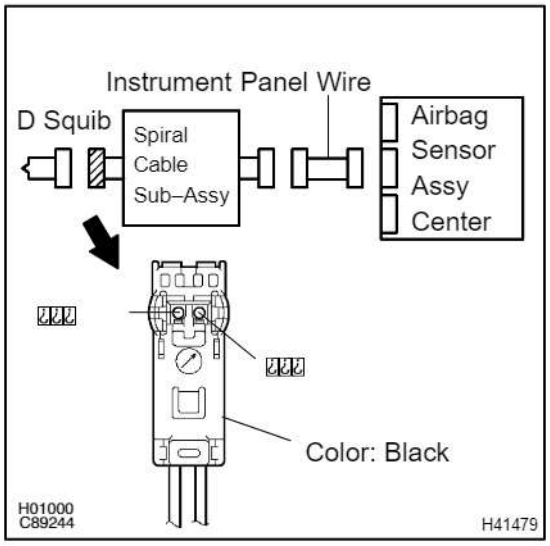
OK:

Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE INSTRUMENT PANEL WIRE**

OK

6 CHECK SPIRAL CABLE SUB–ASSY



(a) Release the airbag activation prevention mechanism built in the spiral cable sub–assy connector on the airbag sensor assy center side (See page 05–1238).

(b) Measure the resistance between D2+ and D2– of the black spiral cable sub–assy connector on the horn button assy side.

OK:

Resistance: 1 MΩ or Higher

NG → **REPLACE SPIRAL CABLE SUB–ASSY**

OK

USE SIMULATION METHOD TO CHECK

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DTC B1181/18 OPEN IN D SQUIB (2ND STEP) CIRCUIT

CIRCUIT DESCRIPTION

The D squib (2nd step) circuit consists of the airbag sensor assy center, the spiral cable sub–assy and the horn button assy.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
DTC B1181/18 is recorded when an open is detected in the D squib (2nd step) circuit.

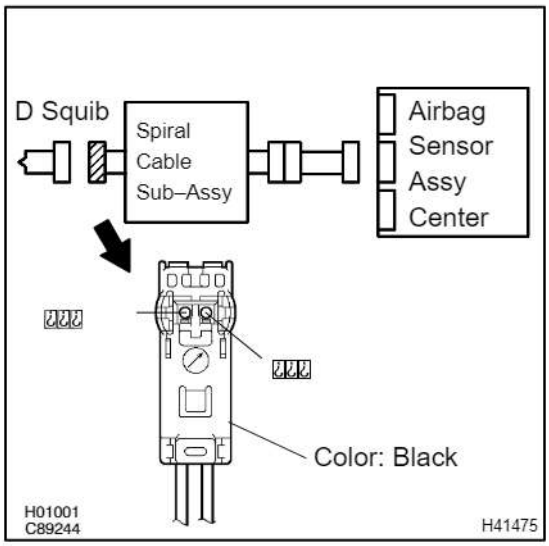
DTC No.	DTC Detecting Condition	Trouble Area
B1181/18	□Open in D squib (2nd step) circuit □D squib (2nd step) malfunction □Spiral cable sub–assy malfunction □Airbag sensor assy center malfunction	□Horn button assy (D squib, 2nd step) □Spiral cable sub–assy □Airbag sensor assy center □Instrument panel wire

WIRING DIAGRAM

See page 05–1406.

INSPECTION PROCEDURE

1	CHECK D SQUIB CIRCUIT



(a) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(b) Disconnect the connectors between the airbag sensor assy center and the horn button assy.
(c) Measure the resistance between D2+ and D2– of the black connector on the horn button assy side between the horn button assy and the airbag sensor assy center.
OK:
Resistance: Below 1 Ω

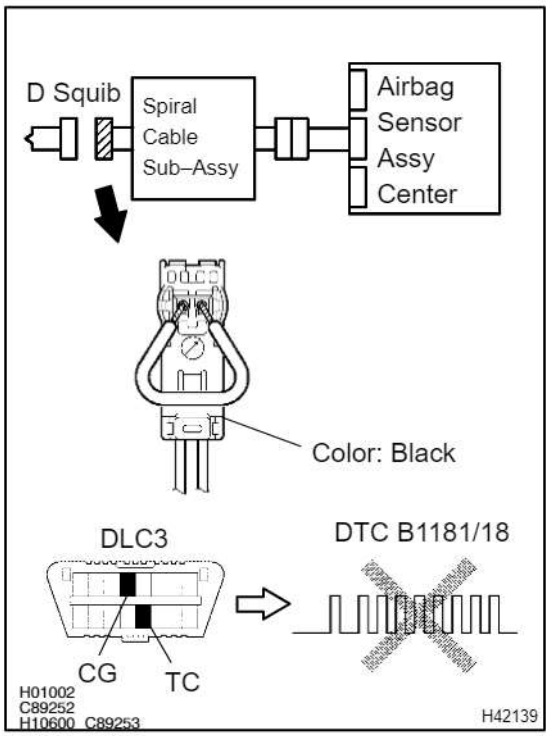
NG → **Go to step 4**

OK

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2 CHECK AIR BAG SENSOR ASSY CENTER

SST 09843–18040



(a) Connect the connector to the airbag sensor assy center.
(b) Using a service wire, connect D2+ and D2– of the black connector on the horn button assy side between the horn button assy and the airbag sensor assy center.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Clear the DTC stored in memory (See page 05–1238).
(f) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(g) Turn the ignition switch to ON, and wait at least for 10 seconds.
(h) Check the DTC (See page 05–1238).

OK:

DTC B1181/18 is not output.

HINT:

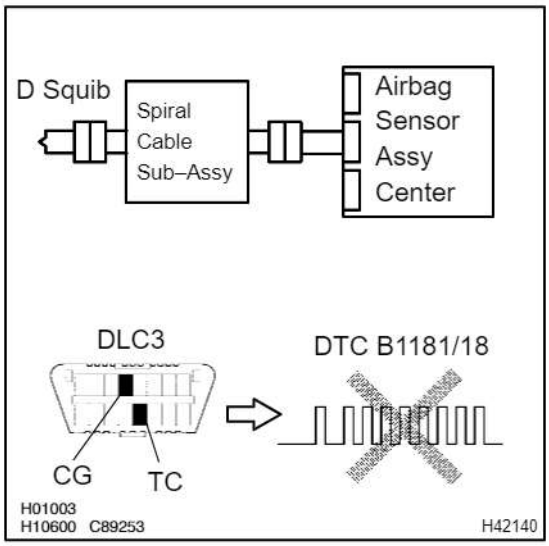
Codes other than code B1181/18 may be output at this time, but they are not relevant to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

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3 CHECK D SQUIB



(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the horn button assy connectors.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(e) Turn the ignition switch to ON, and wait at least for 10 seconds.
(f) Clear the DTC stored in memory (See page 05–1238).
(g) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(h) Turn the ignition switch to ON, and wait at least for 10 seconds.
(i) Check the DTC (See page 05–1238).

OK:

DTC B1181/18 is not output.

HINT:

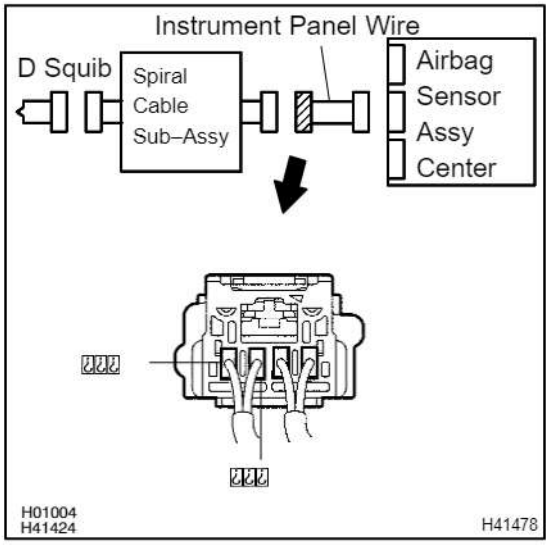
Codes other than code B1181/18 may be output at this time, but they are not relevant to this check.

NG → **REPLACE HORN BUTTON ASSY**

OK

USE SIMULATION METHOD TO CHECK

4 CHECK INSTRUMENT PANEL WIRE



(a) Disconnect the spiral cable sub–assy connector from the instrument panel wire.
(b) Measure the resistance between D2+ and D2– of the instrument panel wire connector on the spiral cable sub–assy side.

OK:

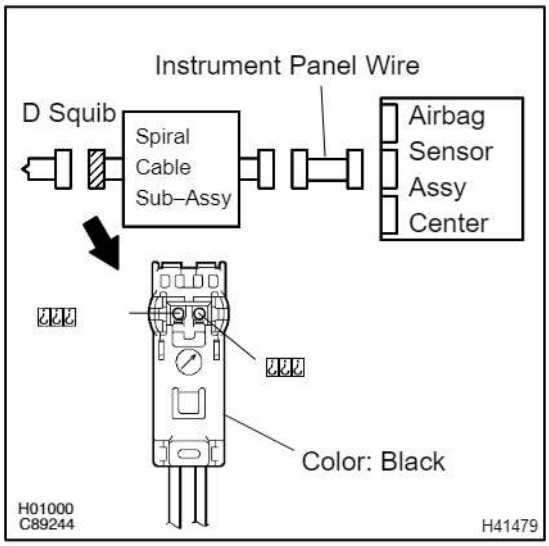
Resistance: Below 1 Ω

NG → **REPAIR OR REPLACE INSTRUMENT PANEL WIRE**

OK

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5	CHECK SPIRAL CABLE SUB–ASSY



(a) Measure the resistance between D2+ and D2– of the black spiral cable sub–assy connector on the horn button assy side.

OK:

Resistance: Below 1 Ω

NG → **REPLACE SPIRAL CABLE SUB–ASSY**

OK →

USE SIMULATION METHOD TO CHECK

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DTC	B1182/19	SHORT IN D SQUIB (2ND STEP) CIRCUIT (TO GROUND)

CIRCUIT DESCRIPTION

The D squib (2nd step) circuit consists of the airbag sensor assy center, the spiral cable sub–assy and the horn button assy.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
DTC B1182/19 is recorded when a ground short is detected in the D squib (2nd step) circuit.

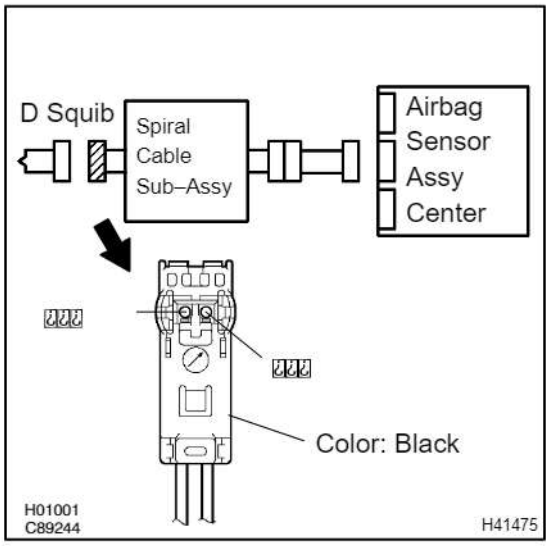
DTC No.	DTC Detecting Condition	Trouble Area
B1182/19	□Short in D squib (2nd step) circuit (to ground) □D squib (2nd step) malfunction □Spiral cable sub–assy malfunction □Airbag sensor assy center malfunction	□Horn button assy (D squib, 2nd step) □Spiral cable sub–assy □Airbag sensor assy center □Instrument panel wire

WIRING DIAGRAM

See page 05–1406.

INSPECTION PROCEDURE

1	CHECK D SQUIB CIRCUIT



(a) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(b) Disconnect the connector between the airbag sensor assy center and the horn button assy.
(c) Measure the resistance between the body ground and D2+ of the black connector on the horn button assy side between the horn button assy and the airbag sensor assy center.
OK:
Resistance: 1 MΩ or Higher

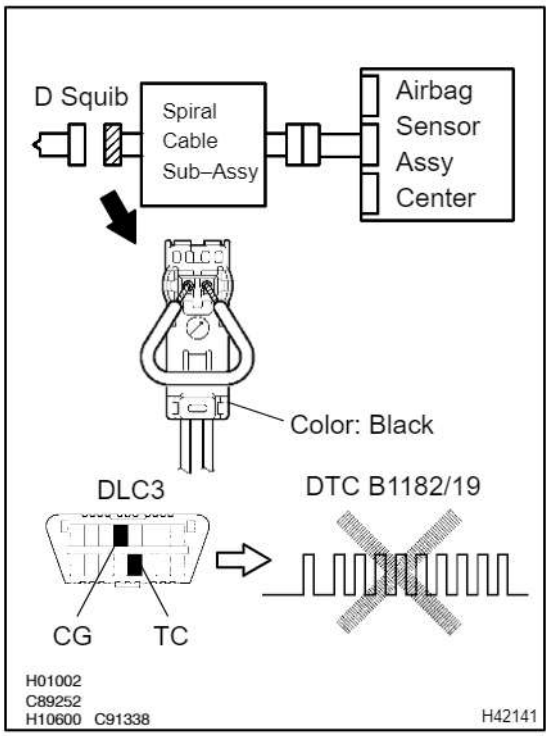
NG → **Go to step 5**

OK

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2 CHECK AIR BAG SENSOR ASSY CENTER

SST 09843–18040



(a) Connect the connector to the airbag sensor assy center.
(b) Using a service wire, connect D2+ and D2– of the black connector on the horn button assy side between the horn button assy and the airbag sensor assy center.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Clear the DTC stored in memory (See page 05–1238).
(f) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(g) Turn the ignition switch to ON, and wait at least for 10 seconds.
(h) Check the DTC (See page 05–1238).

OK:

DTC B1182/19 is not output.

HINT:

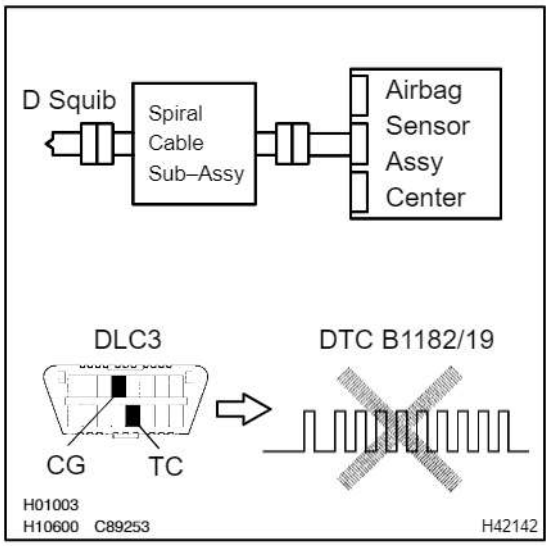
Codes other than code B1182/19 may be output at this time, but they are not relevant to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

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3	CHECK D SQUIB



(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the horn button assy connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(e) Turn the ignition switch to ON, and wait at least for 10 seconds.
(f) Clear the DTC stored in memory (See page 05–1238).
(g) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(h) Turn the ignition switch to ON, and wait at least for 10 seconds.
(i) Check the DTC (See page 05–1238).

OK:

DTC B1182/19 is not output.

HINT:

Codes other than code B1182/19 may be output at this time, but they are not relevant to this check.

NG	REPLACE HORN BUTTON ASSY

OK

4	USE SIMULATION METHOD TO CHECK

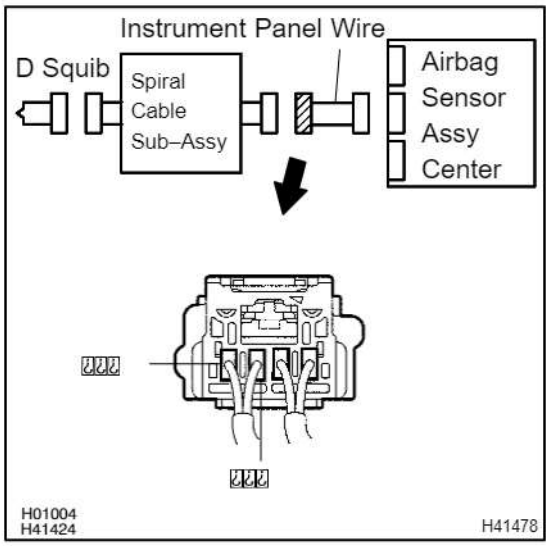
NG	Go to step 1

OK

REPLACE ALL SRS COMPONENTS INCLUDING WIRE HARNESS

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5	CHECK INSTRUMENT PANEL WIRE



(a) Disconnect the spiral cable sub–assy connectors from the instrument panel wire.

(b) Measure the resistance between the body ground and D2+ of the instrument panel wire connector on the spiral cable sub–assy side.

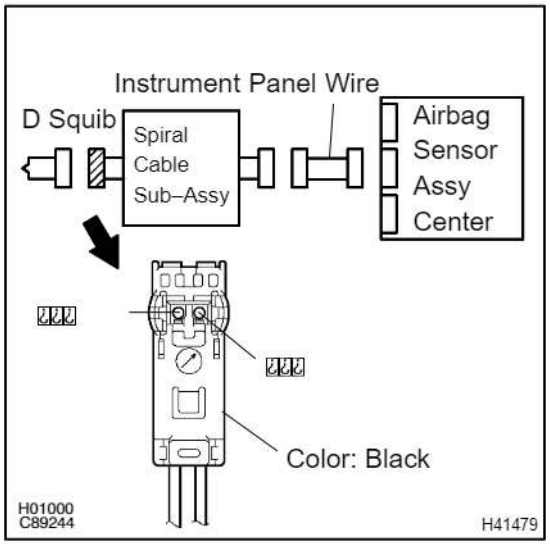
OK:

Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE INSTRUMENT PANEL WIRE**

OK

6	CHECK SPIRAL CABLE SUB–ASSY



(a) Measure the resistance between the body ground and D2+ of the black spiral cable sub–assy connector on the horn button assy side.

OK:

Resistance: 1 MΩ or Higher

NG → **REPLACE SPIRAL CABLE SUB–ASSY**

OK

USE SIMULATION METHOD TO CHECK

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DTC	B1183/22	SHORT IN D SQUIB (2ND STEP) CIRCUIT (TO B+)

CIRCUIT DESCRIPTION

The D squib (2nd step) circuit consists of the airbag sensor assy center, the spiral cable sub–assy and the horn button assy.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
DTC B1183/22 is recorded when a B+ short is detected in the D squib (2nd step) circuit.

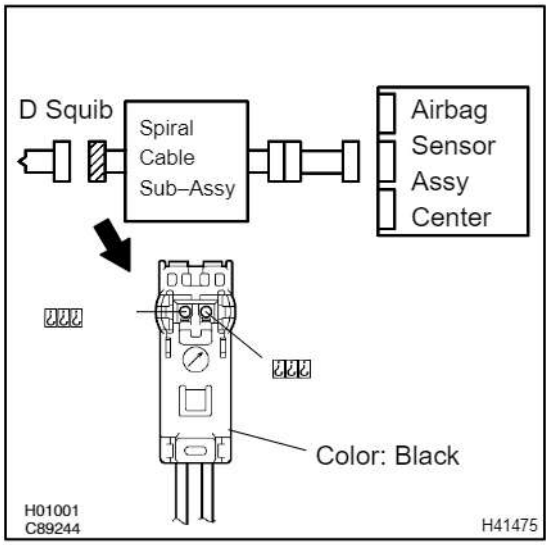
DTC No.	DTC Detecting Condition	Trouble Area
B1183/22	□Short in D squib (2nd step) circuit (to B+) □D squib (2nd step) malfunction □Spiral cable sub–assy malfunction □Airbag sensor assy center malfunction	□Horn button assy (D squib, 2nd step) □Spiral cable sub–assy □Airbag sensor assy center □Instrument panel wire

WIRING DIAGRAM

See page 05–1406.

CIRCUIT INSPECTION

1	CHECK D SQUIB CIRCUIT



(a) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(b) Disconnect the connectors between the airbag sensor assy center and the horn button assy.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(d) Turn the ignition switch to ON.
(e) Measure the voltage between the body ground and D2+ of the black connector on the horn button assy side between the airbag sensor assy center and the horn button assy.
OK:
Voltage: Below 1 V

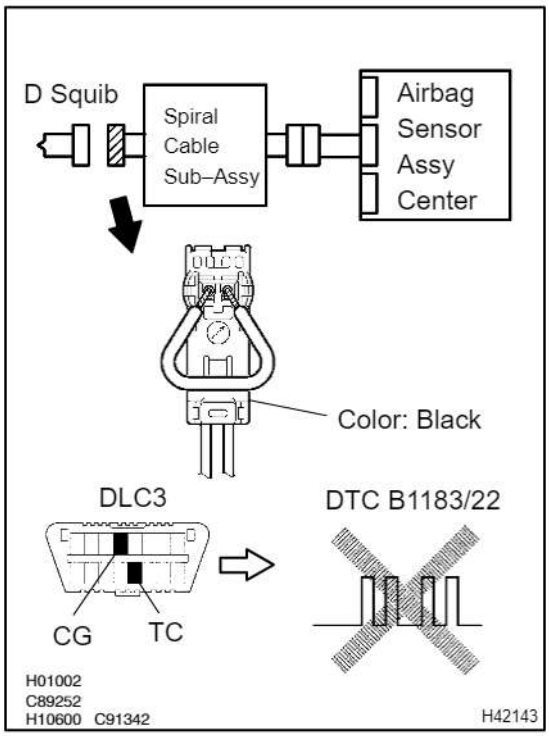
NG → **Go to step 5**

OK

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2 CHECK AIR BAG SENSOR ASSY CENTER

SST 09843–18040



(a) Turn the ignition switch to LOCK.
(b) Disconnect negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the connector to the airbag sensor assy center.
(d) Using a service wire, connect D2+ and D2– of the black connector on the horn button assy side between the horn button assy and the airbag sensor assy center.
(e) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(f) Turn the ignition switch to ON, and wait at least for 10 seconds.
(g) Clear the DTC stored in memory (See page 05–1238).
(h) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(i) Turn the ignition switch to ON, and wait at least for 10 seconds.
(j) Check the DTC (See page 05–1238).

OK:

DTC B1183/22 is not output.

HINT:

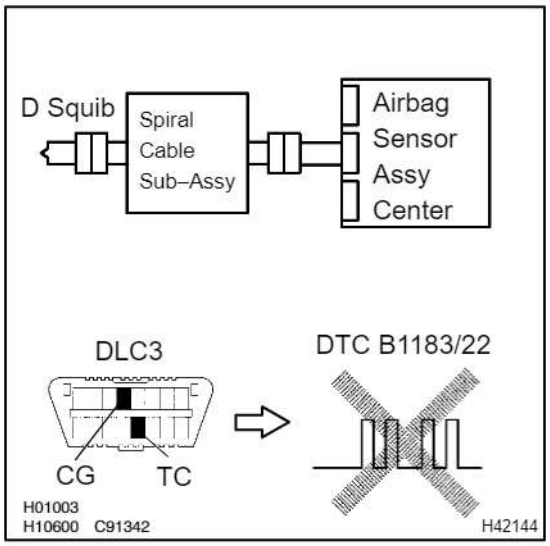
Codes other than code B1183/22 may be output at this time, but they are not relevant to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

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3	CHECK D SQUIB



(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the horn button assy connectors.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(e) Turn the ignition switch to ON, and wait at least for 10 seconds.
(f) Clear the DTC stored in memory (See page 05–1238).
(g) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(h) Turn the ignition switch to ON, and wait at least for 10 seconds.
(i) Check the DTC (See page 05–1238).

OK:

DTC B1183/22 is not output.

HINT:

Codes other than code B1183/22 may be output at this time, but they are not relevant to this check.

NG	REPLACE HORN BUTTON ASSY

OK

4	USE SIMULATION METHOD TO CHECK

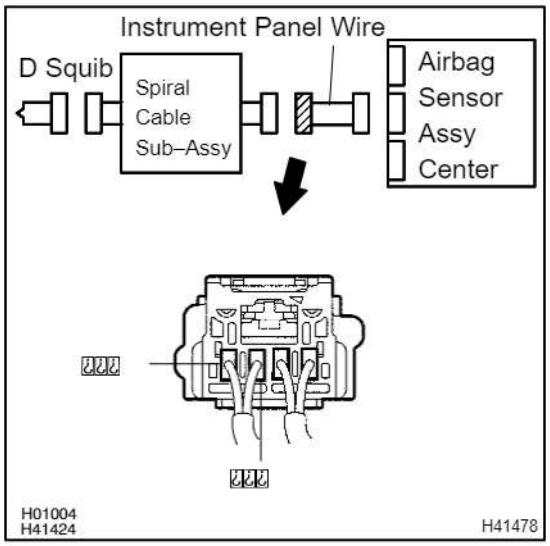
NG	Go to step 1

OK

REPLACE ALL SRS COMPONENTS INCLUDING WIRE HARNESS

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5 CHECK INSTRUMENT PANEL WIRE



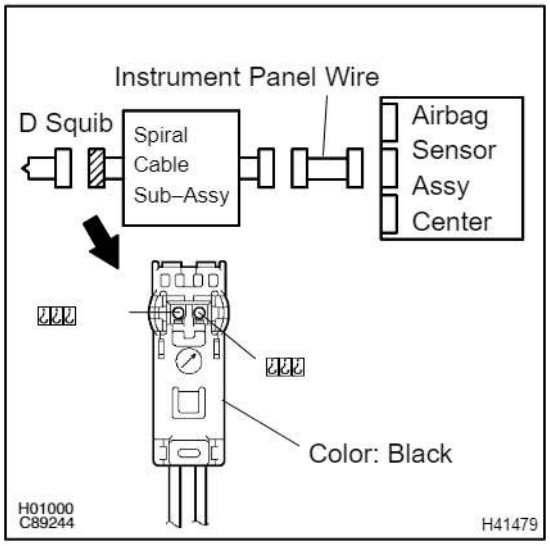
(a) Turn the ignition switch to LOCK.
(b) Disconnect the spiral cable sub–assy connector from the instrument panel wire.
(c) Turn the ignition switch to ON.
(d) Measure the voltage between the body ground and D2+ of the instrument panel wire connector on the spiral cable sub–assy side.

OK:
Voltage: Below 1 V

NG → **REPAIR OR REPLACE INSTRUMENT PANEL WIRE**

OK

6 CHECK SPIRAL CABLE SUB–ASSY



(a) Measure the voltage between the body ground and D2+ of the black spiral cable sub–assy connector on the horn button assy side.

OK:
Voltage: Below 1 V

NG → **REPLACE SPIRAL CABLE SUB–ASSY**

OK

USE SIMULATION METHOD TO CHECK

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DTC B1185/57 SHORT IN P SQUIB (2ND STEP) CIRCUIT

CIRCUIT DESCRIPTION

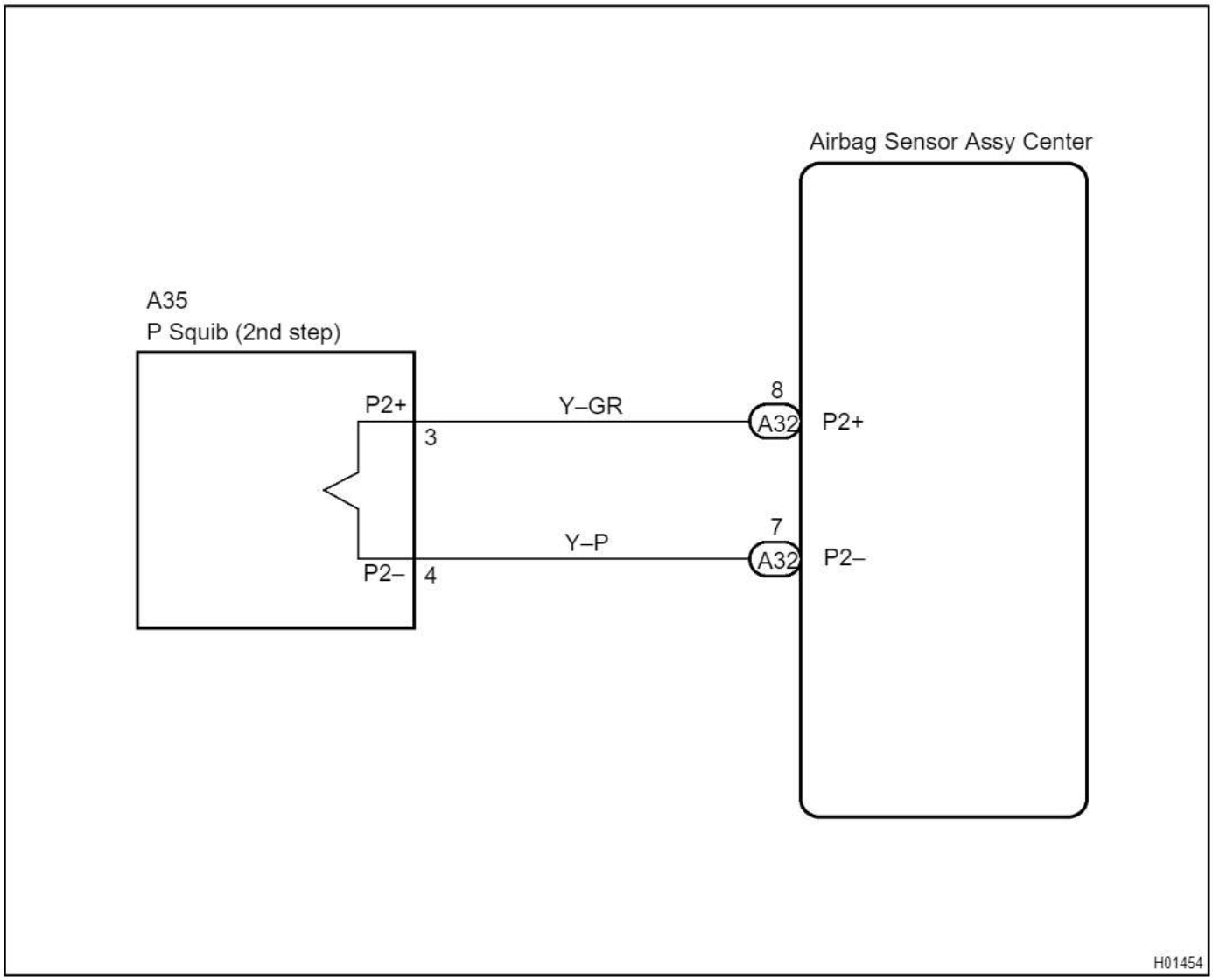
The P squib (2nd step) circuit consists of the airbag sensor assy center and the instr pnl pass l/door airbag assy.

It causes the SRS to deploy when the SRS deployment conditions are satisfied.

DTC B1185/57 is recorded when a short is detected in the P squib (2nd step) circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B1185/57	□Short in P squib (2nd step) circuit □P squib (2nd step) malfunction □Airbag sensor assy center malfunction	□Instr pnl pass l/door airbag assy (P squib, 2nd step) □Airbag sensor assy center □Instrument panel wire

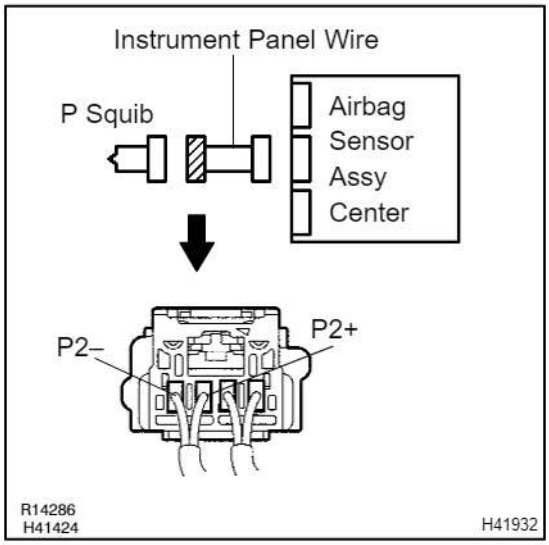
WIRING DIAGRAM



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INSPECTION PROCEDURE

1 CHECK INSTRUMENT PANEL WIRE(P SQUIB (2ND STEP) CIRCUIT)



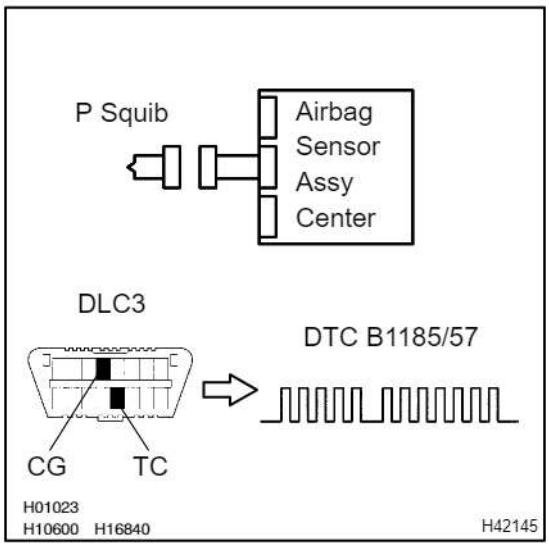
(a) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(b) Disconnect the instrument panel wire connectors from the airbag sensor assy center and the instr pnl pass l/door airbag assy.
(c) Release the airbag activation prevention mechanism built in the instrument panel wire connector on the airbag sensor assy center side (See page 05–1238).
(d) Measure the resistance between P2+ and P2– of the instrument panel wire connector on the instr pnl pass l/door airbag assy side.
OK:
Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE INSTRUMENT PANEL WIRE**

OK

2 CHECK AIR BAG SENSOR ASSY CENTER

SST 09843–18040



(a) Connect the connector to the airbag sensor assy center.
(b) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(c) Turn the ignition switch to ON, and wait at least for 10 seconds.
(d) Clear the DTC stored in memory (See page 05–1238).
(e) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(f) Turn the ignition switch to ON, and wait at least for 10 seconds.
(g) Check the DTC (See page 05–1238).
OK:
DTC B1185/57 is not output.

HINT:
Codes other than code B1185/57 may be output at this time, but they are not relevant to this check.

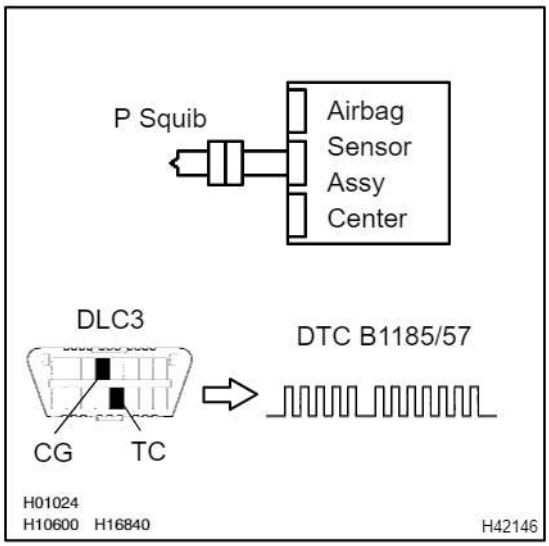
NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

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3	CHECK P SQUIB

SST 09843–18040



(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the instr pnl pass l/door airbag assy connectors.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(e) Turn the ignition switch to ON, and wait at least for 10 seconds.
(f) Clear the DTC stored in memory (See page 05–1238).
(g) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(h) Turn the ignition switch to ON, and wait at least for 10 seconds.
(i) Check the DTC (See page 05–1238).

OK:

DTC B1185/57 is not output.

HINT:

Codes other than code B1185/57 may be output at this time, but they are not relevant to this check.

NG → **REPLACE INSTR PNL PASS L/DOOR AIR BAG ASSY**

OK

USE SIMULATION METHOD TO CHECK

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DTC B1186/58 OPEN IN P SQUIB (2ND STEP) CIRCUIT

CIRCUIT DESCRIPTION

The P squib (2nd step) circuit consists of the airbag sensor assy center and the instr pnl pass l/door airbag assy.

It causes the SRS to deploy when the SRS deployment conditions are satisfied.

DTC B1186/58 is recorded when an open is detected in the P squib (2nd step) circuit.

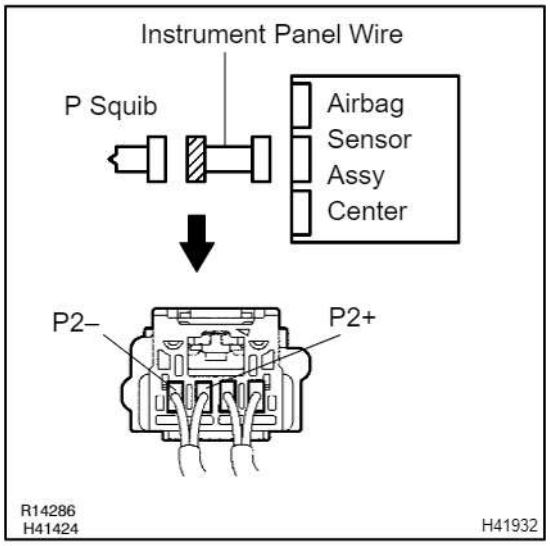
DTC No.	DTC Detecting Condition	Trouble Area
B1186/58	□Open in P squib (2nd step) circuit □P squib (2nd step) malfunction □Airbag sensor assy center malfunction	□Instr pnl pass l/door airbag assy (P squib, 2nd step) □Airbag sensor assy center □Instrument panel wire

WIRING DIAGRAM

See page 05–1422.

INSPECTION PROCEDURE

1	CHECK INSTRUMENT PANEL WIRE(P SQUIB (2ND STEP) CIRCUIT)



(a) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.

(b) Disconnect the instrument panel wire connectors from the airbag sensor assy center and the instr pnl pass l/door airbag assy.

(c) Measure the resistance between P2+ and P2– of the instrument panel wire connector on the instr pnl pass l/door airbag assy side.

OK:

Resistance: Below 1 Ω

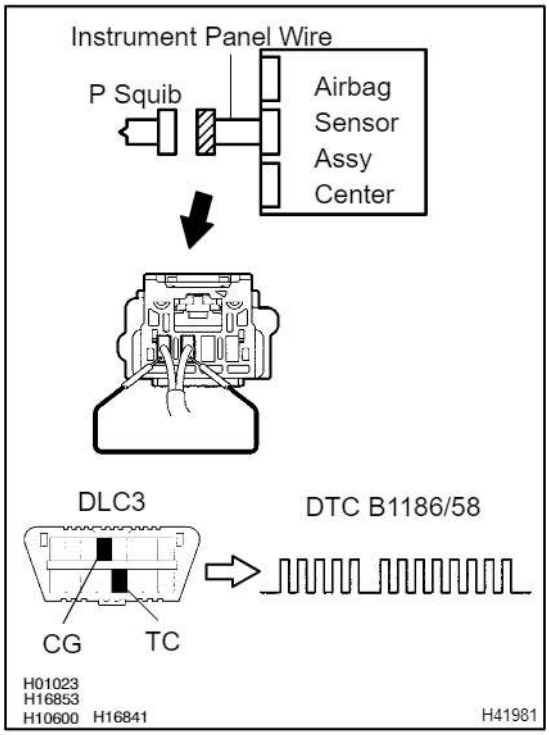
NG → **REPAIR OR REPLACE INSTRUMENT PANEL WIRE**

OK

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2 CHECK AIR BAG SENSOR ASSY CENTER

SST 09843–18040



(a) Connect the connector to the airbag sensor assy center.
(b) Using a service wire, connect P2+ and P2– of the orange instrument panel wire connector on the instr pnl pass I/ door airbag assy side.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Clear the DTC stored in memory (See page 05–1238).
(f) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(g) Turn the ignition switch to ON, and wait at least for 10 seconds.
(h) Check the DTC (See page 05–1238).

OK:

DTC B1186/58 is not output.

HINT:

Codes other than code B1186/58 may be output at this time, but they are not relevant to this check.

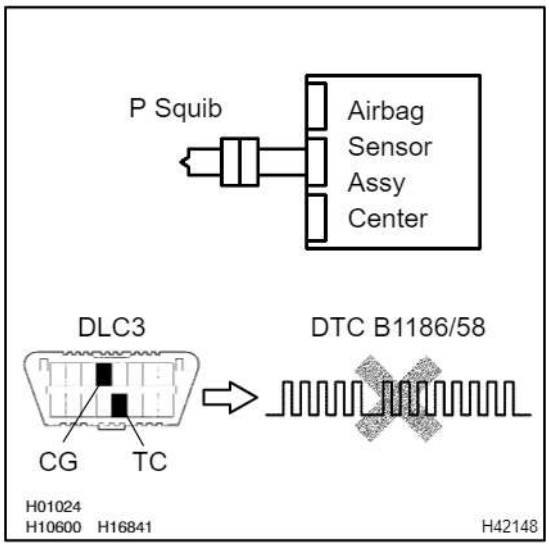
NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

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3	CHECK P SQUIB

SST 09843–18040



(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the instr pnl pass l/door airbag assy connectors.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(e) Turn the ignition switch to ON, and wait at least for 10 seconds.
(f) Clear the DTC stored in memory (See page 05–1238).
(g) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(h) Turn the ignition switch to ON, and wait at least for 10 seconds.
(i) Check the DTC (See page 05–1238).

OK:

DTC B1186/58 is not output.

HINT:

Codes other than code B1186/58 may be output at this time, but they are not relevant to this check.

NG	REPLACE INSTR PNL PASS L/DOOR AIR BAG ASSY

OK

USE SIMULATION METHOD TO CHECK

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DTC	B1187/55	SHORT IN P SQUIB (2ND STEP) CIRCUIT (TO GROUND)

CIRCUIT DESCRIPTION

The P squib (2nd step) circuit consists of the airbag sensor assy center and the instr pnl pass l/door airbag assy.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
DTC B1187/55 is recorded when ground short is detected in the P squib (2nd step) circuit.

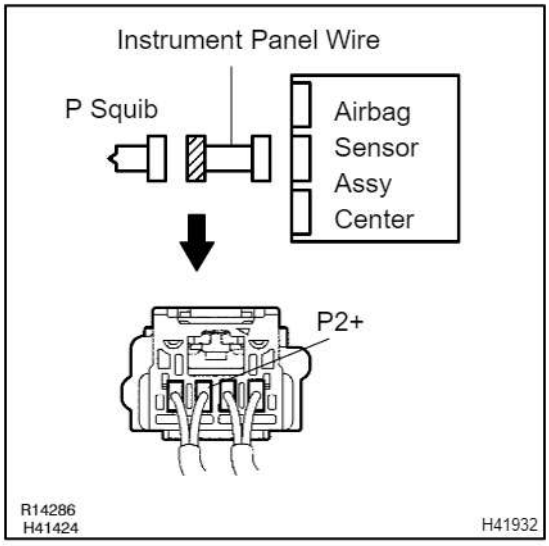
DTC No.	DTC Detecting Condition	Trouble Area
B1187/55	□Short in P squib (2nd step) circuit (to ground) □P squib (2nd step) malfunction □Airbag sensor assy center malfunction	□Instr pnl pass l/door airbag assy (P squib, 2nd step) □Airbag sensor assy center □Instrument panel wire

WIRING DIAGRAM

See page 05–1422.

INSPECTION PROCEDURE

1	CHECK INSTRUMENT PANEL WIRE(P SQUIB (2ND STEP) CIRCUIT)



(a) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(b) Disconnect the instrument panel wire connectors from the airbag sensor assy center and the instr pnl pass l/door airbag assy.
(c) Measure the resistance between the body ground and P2+ of the orange instrument panel wire connector on the instr pnl pass l/door airbag assy side.
OK:
Resistance: 1 MΩ or Higher

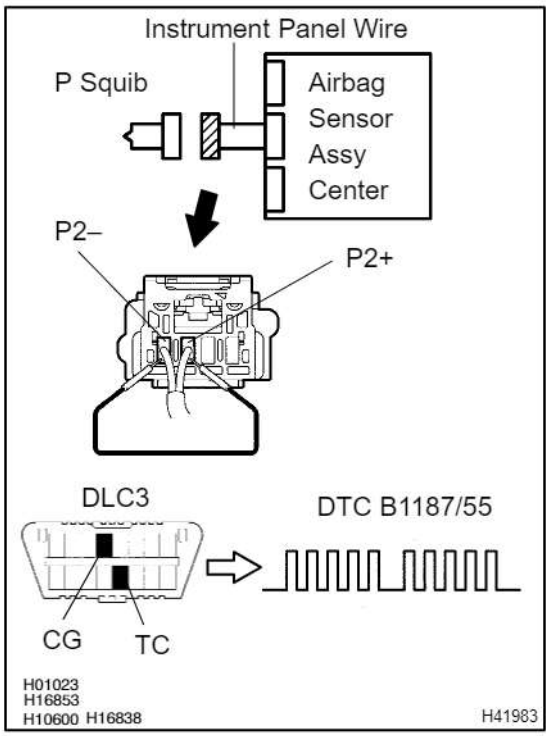
NG → **REPAIR OR REPLACE INSTRUMENT PANEL WIRE**

OK

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2 CHECK AIR BAG SENSOR ASSY CENTER

SST 09843–18040



(a) Connect the connector to the airbag sensor assy center.
(b) Using a service wire, connect P2+ and P2– of the orange instrument panel wire connector on the instr pnl pass l/ door airbag assy side.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Clear the DTC stored in memory (See page 05–1238).
(f) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(g) Turn the ignition switch to ON, and wait at least for 10 seconds.
(h) Check the DTC (See page 05–1238).

OK:

DTC B1187/55 is not output.

HINT:

Codes other than code B1187/55 may be output at this time, but they are not relevant to this check.

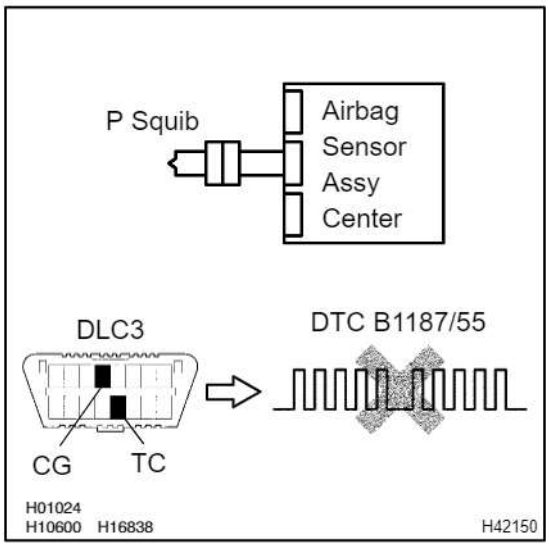
NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

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3	CHECK P SQUIB

SST 09843–18040



(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the instr pnl pass l/door airbag assy connectors.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(e) Turn the ignition switch to ON, and wait at least for 10 seconds.
(f) Clear the DTC stored in memory (See page 05–1238).
(g) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(h) Turn the ignition switch to ON, and wait at least for 10 seconds.
(i) Check the DTC (See page 05–1238).

OK:

DTC B1187/55 is not output.

HINT:

Codes other than code B1187/55 may be output at this time, but they are not relevant to this check.

NG → **REPLACE INSTR PNL PASS L/DOOR AIR BAG ASSY**

OK

4	USE SIMULATION METHOD TO CHECK

NG → **Go to step 1**

OK

REPLACE ALL SRS COMPONENTS INCLUDING WIRE HARNESS

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DTC	B1188/56	SHORT IN P SQUIB (2ND STEP) CIRCUIT (TO B+)

CIRCUIT DESCRIPTION

The P squib (2nd step) circuit consists of the airbag sensor assy center and the instr pnl pass l/door airbag assy.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
DTC B1188/56 is recorded when a B+ short is detected in the P squib (2nd step) circuit.

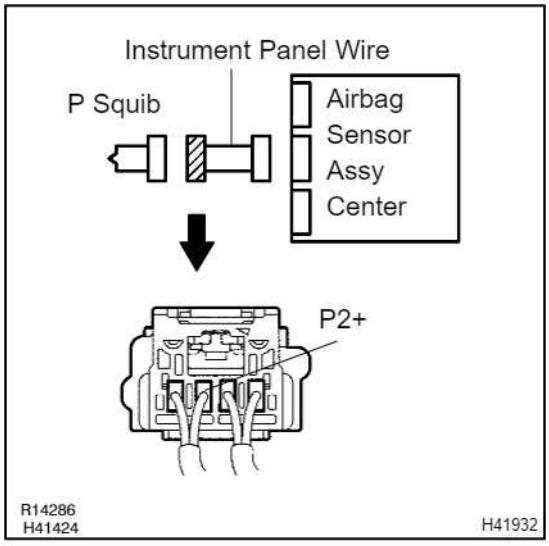
DTC No.	DTC Detecting Condition	Trouble Area
B1188/56	□Short in P squib (2nd step) circuit (to B+) □P squib (2nd step) malfunction □Airbag sensor assy center malfunction	□Instr pnl pass l/door airbag assy (P squib, 2nd step) □Airbag sensor assy center □Instrument panel wire

WIRING DIAGRAM

See page 05–1422.

INSPECTION PROCEDURE

1	CHECK INSTRUMENT PANEL WIRE



(a) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(b) Disconnect the instrument panel wire connectors from the airbag sensor assy center and the instr pnl pass l/door airbag assy.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(d) Turn the ignition switch to ON.
(e) Measure the voltage between the body ground and P2+ of the orange instrument panel wire connector on the instr pnl pass l/door airbag assy side.
OK:
Voltage: Below 1 V

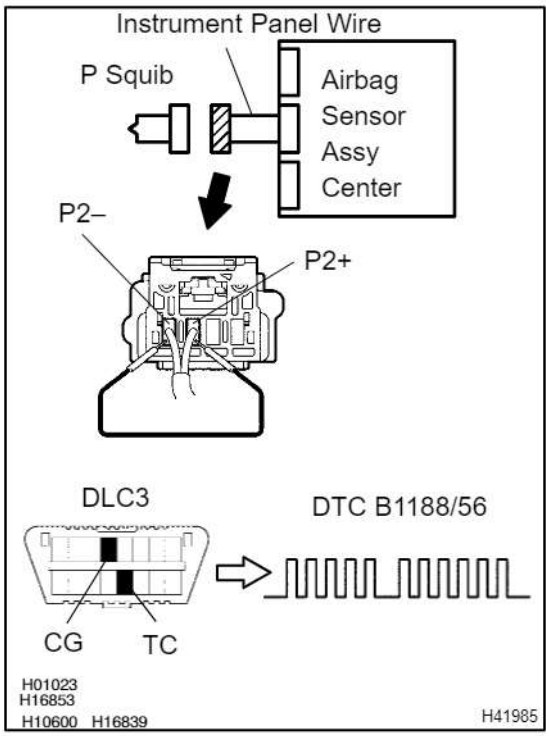
NG → **REPAIR OR REPLACE INSTRUMENT PANEL WIRE**

OK

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2 CHECK AIR BAG SENSOR ASSY CENTER

SST 09843–18040



(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the connector to the airbag sensor assy center.
(d) Using a service wire, connect P2+ and P2– of the orange instrument panel wire connector on the instr pnl pass l/door airbag assy side.
(e) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(f) Turn the ignition switch to ON, and wait at least for 10 seconds.
(g) Clear the DTC stored in memory (See page 05–1238).
(h) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(i) Turn the ignition switch to ON, and wait at least for 10 seconds.
(j) Check the DTC (See page 05–1238).

OK:

DTC B1188/56 is not output.

HINT:

Codes other than code B1188/56 may be output at this time, but they are not relevant to this check.

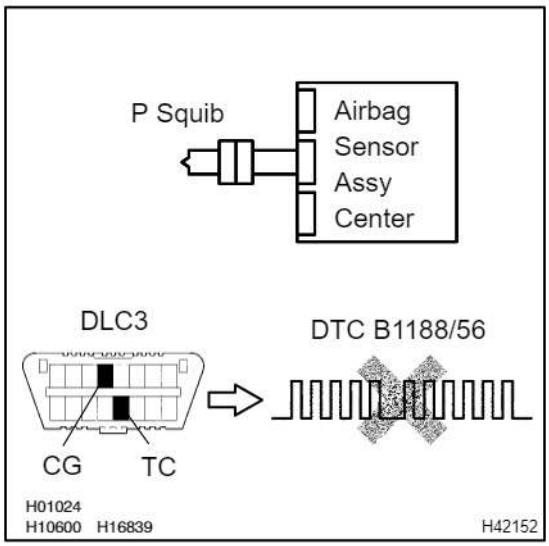
NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

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3	CHECK P SQUIB

SST 09843–18040



(a) Turn the ignition switch to LOCK.
(b) Disconnect negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the instr pnl pass l/door airbag assy connectors.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(e) Turn the ignition switch to ON, and wait at least for 10 seconds.
(f) Clear the DTC stored in memory (See page 05–1238).
(g) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(h) Turn the ignition switch to ON, and wait at least for 10 seconds.
(i) Check the DTC (See page 05–1238).

OK:

DTC B1188/56 is not output.

HINT:

Codes other than code B1188/56 may be output at this time, but they are not relevant to this check.

NG	REPLACE INSTR PNL PASS L/DOOR AIR BAG ASSY

OK

4	USE SIMULATION METHOD TO CHECK

NG	Go to step 1

OK

REPLACE ALL SRS COMPONENTS INCLUDING WIRE HARNESS

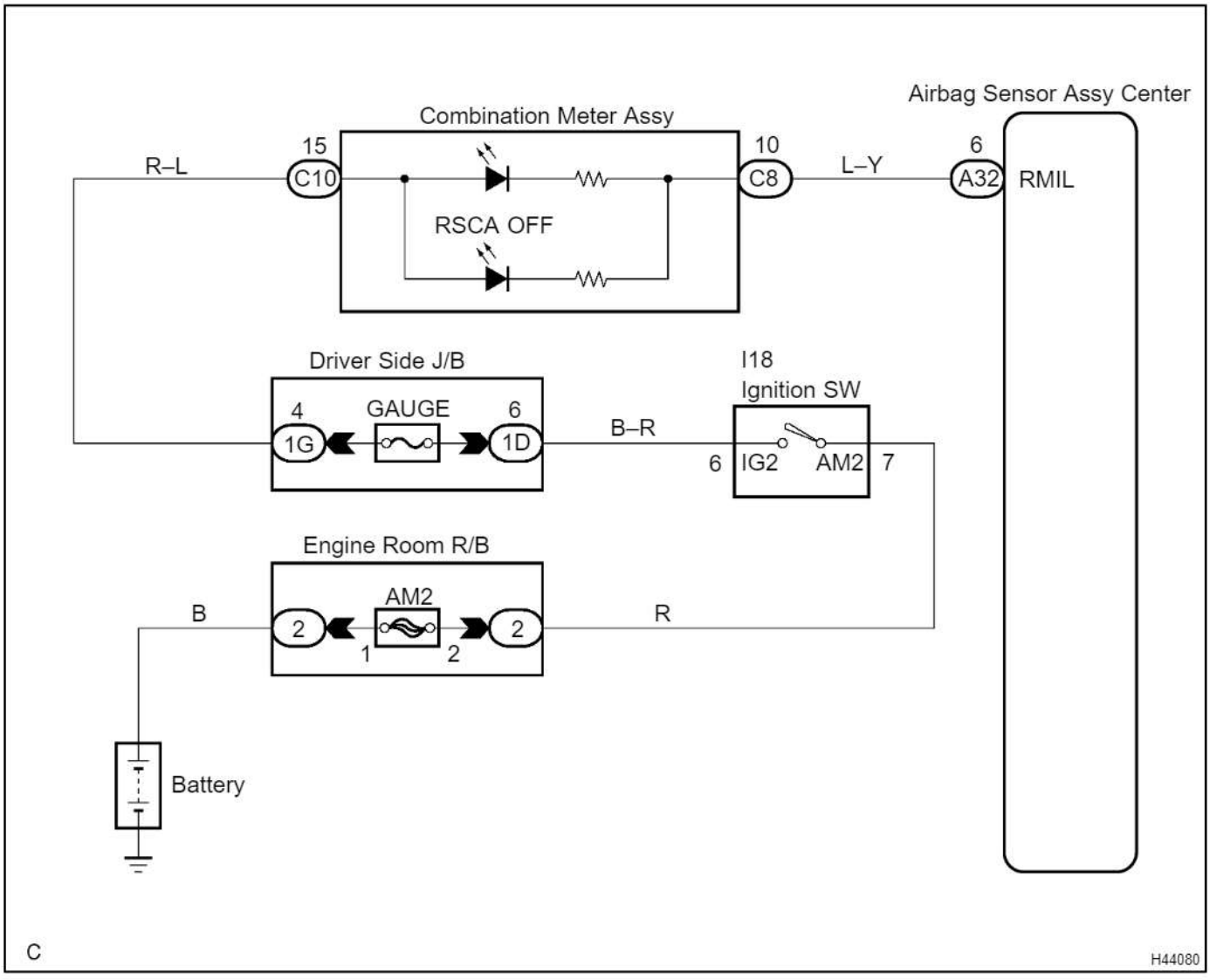
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DTC B1628/29 RSCA OFF INDICATOR MALFUNCTION

The curtain airbag cutoff switch is a mechanism that operates both right and left side of the curtain shield airbag assy and the seat belt pretensioner when the airbag sensor assy center detects a roll–over.
The RSCA off indicator light is installed in the combination meter assy.
As operating the curtain airbag cutoff switch, the indicator light comes on to inform the driver that the roll–over detection system is not working.
The initial setting of the roll–over detection system is on. It automatically operates every time the ignition switch is turned on.

DTC No.	DTC Detecting Condition	Trouble Area
B1628/29	□When the airbag sensor assy center receives an open signal or short to ground in the RSCA off indicator circuit. □RSCA off indicator malfunction □Airbag sensor assy center malfunction	□Instrument panel wire □Combination meter assy (RSCA off indicator) □Airbag sensor assy center

WIRING DIAGRAM



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INSPECTION PROCEDURE

1	CHECK RSCA OFF INDICATOR CONDITION

(a) Confirm the RSCA off indicator condition.

Result:

A: The RSCA off indicator does not come on when the curtain airbag cutoff switch is operating (remains off).

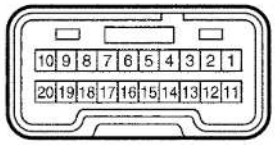
B: The RSCA off indicator remains on when the curtain airbag cut off switch is operating.

B → **Go to step 6**

A

2	CHECK COMBINATION METER ASSY(SOURCE VOLTAGE)

Combination Meter Assy:



H44462

(a) Disconnect the connector from the combination meter assy.

(b) Turn the ignition switch to the ON position.

(c) Measure the voltage between the body ground and C8–10 of the combination meter assy.

OK:

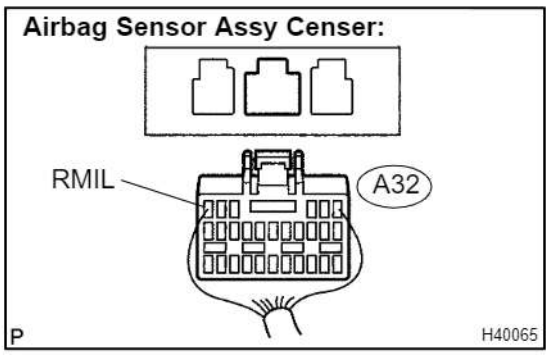
Voltage: 10 – 14 V

NG → **GO TO COMBINATION METER SYSTEM**

OK

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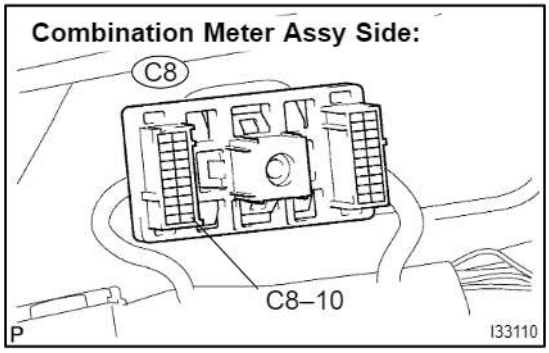
3	CHECK INSTRUMENT PANEL WIRE(AIRBAG SENSOR ASSY CENTER – COMBINATION METER ASSY)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connector from the airbag sensor assy center.
(d) Measure the resistance between the C8–10 of the connector on the combination meter assy side and A32–6 of the connector on the airbag sensor assy center side.

OK:

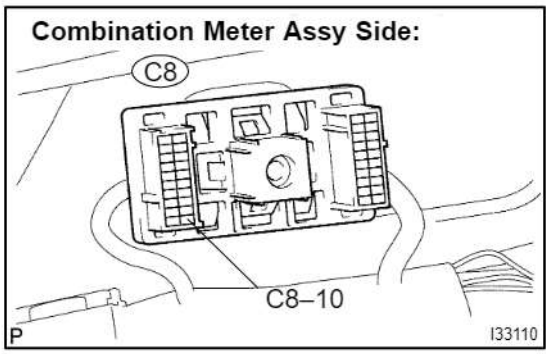
Resistance: Below 1 Ω



NG → **REPAIR OR REPLACE INSTRUMENT PANEL WIRE**

OK

4	CHECK INSTRUMENT PANEL WIRE(TO B+)



(a) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(b) Turn the ignition switch to the ON position.
(c) Measure the voltage between the body ground and C8–10 of the combination meter assy.

OK:

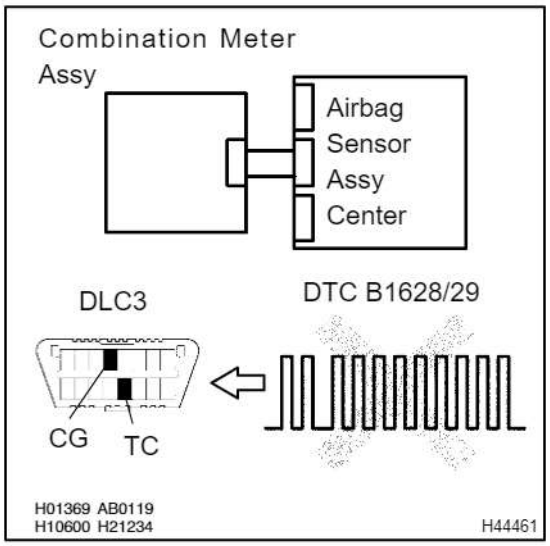
Voltage: Below 1 V

NG → **REPAIR OR REPLACE INSTRUMENT PANEL WIRE**

OK

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5	CHECK AIR BAG SENSOR ASSY CENTER



(a) Turn the ignition switch to LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the connector to the airbag sensor assy center.
(d) Connect the negative (–) terminal cable to the battery, and wait at least 2 seconds.
(e) Turn the ignition switch to ON position, and wait for at least 60 seconds.
(f) Clear the DTC stored in memory (See page 05–1238).
(g) Turn the ignition switch to LOCK position.
(h) Turn the ignition switch to ON position, and wait for at least 60 seconds.
(i) Check the DTC (See page 05–1238).

OK:

DTC B1628/29 is not output.

HINT:

Codes other than code B1628/29 may be output at this time, but they are not relevant to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

HINT:

If the DTC B1628/29 is output after replacing the airbag sensor assy center, there may be trouble in the combination meter (RSCA OFF indicator).

OK

USE SIMULATION METHOD TO CHECK

HINT:

If RSCA OFF indicator remains off when DTC B1628/29 is output, there may be trouble in the combination meter (RSCA OFF indicator).

6	CHECK AIR BAG SENSOR ASSY CENTER

(a) Turn the ignition switch to LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connector from the airbag sensor assy center.
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to ON position.
(f) Check the RSCA off indicator condition.

OK:

The RSCA off indicator does not come on.

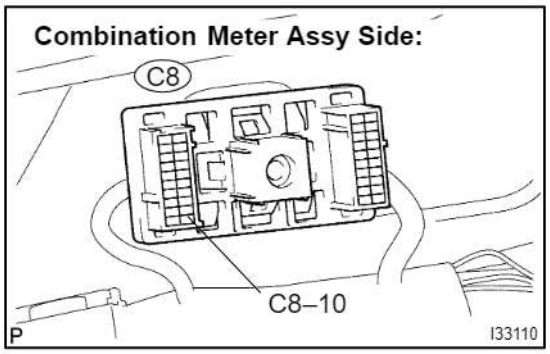
NG → **Go to step 7**

OK

REPLACE AIR BAG SENSOR ASSY CENTER

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7	CHECK INSTRUMENT PANEL WIRE(TO GROUND)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connector from the combination meter assy.
(d) Measure the resistance between the C8–10 of the connector on the combination meter assy side.

OK:

Resistance: 1 M Ω or Higher

NG → **REPAIR OR REPLACE INSTRUMENT PANEL WIRE**

OK

REPLACE COMBINATION METER ASSY

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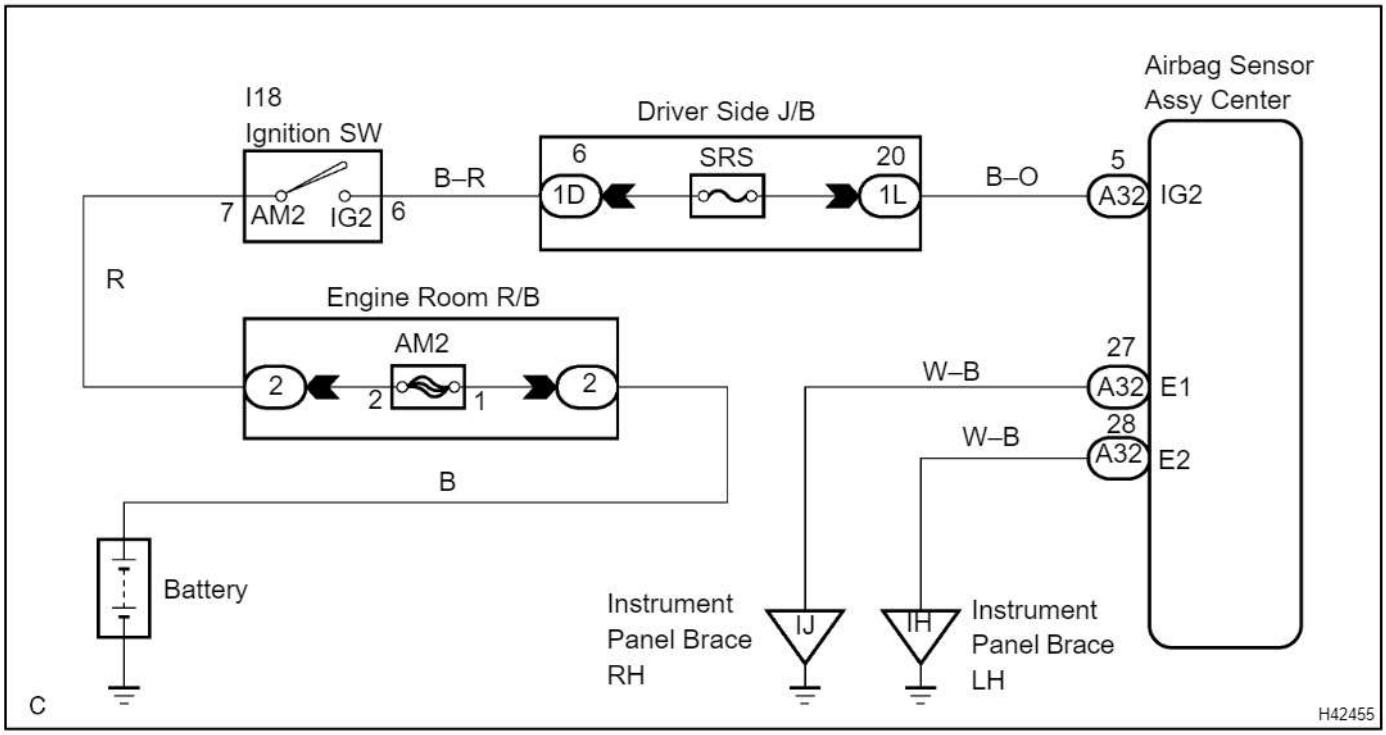
SOURCE VOLTAGE DROP

CIRCUIT DESCRIPTION

The SRS is equipped with a voltage–increase circuit (DC–DC converter) in the airbag sensor assy center in case the source voltage drops.
When the battery voltage drops, the voltage–increase circuit (DC–DC converter) functions to increase the voltage of the SRS to normal voltage.
The diagnosis system malfunction display for this circuit is different from other circuits, that is, the SRS warning light remains on and the normal system code is indicated when the source voltage drops.
Malfunction in this circuit is not recorded in the airbag sensor assy center, and when the source voltage returns to normal, the SRS warning light automatically goes off.

DTC No.	Diagnosis
(Normal)	Source voltage drop

WIRING DIAGRAM



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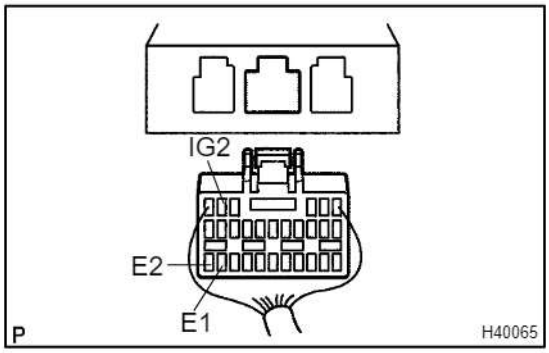
INSPECTION PROCEDURE

1	PREPARE FOR INSPECTION

(a) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(b) Remove the horn button assy (See page 60–15).
(c) Disconnect the connector of the instr pnl pass l/door airbag assy (See page 60–26).
(d) Disconnect the connector of the front seat airbag assy RH and LH (See page 72–10 and 72–15).
(e) Disconnect the connector of the seat belt pretensioner RH and LH (See page 61–10).
(f) Disconnect the connector of the curtain shield airbag RH and LH (See page 60–35).
(g) Disconnect the connectors of the airbag sensor assy center (See page 60–47).
(h) Disconnect the connector of the airbag front RH sensor and airbag sensor front LH (See page 60–49 and 60–50).
(i) Disconnect the connector of the side airbag sensor assy RH and LH (See page 60–52).
(j) Disconnect the connector of the airbag sensor rear RH and LH (See page 60–54).
(k) Disconnect the connector of the seat position airbag sensor (See page 60–56).

CAUTION:
Store the horn button assy, instr pnl pass l/door airbag assy and front seat airbag assy with the front surface facing upward.

2	CHECK SOURCE VOLTAGE



(a) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(b) Turn the ignition switch to ON, and wait at least for 10 seconds.
(c) Measure the voltage between E1 (E2) and IG2 on the airbag sensor assy center side and operate electric system (defogger, wiper, headlight, heater blower, etc.).
OK:
Voltage: 10 – 14 V

NG	REPAIR OR REPLACE HARNESS BETWEEN BATTERY AND AIRBAG SENSOR ASSY CENTER, AND CHARGING SYSTEM

OK

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3	CHECK SRS WARNING LIGHT TURN OFF

(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the horn button assy connectors.
(d) Connect the instr pnl pass l/door airbag assy connectors.
(e) Connect the front seat airbag assy RH and LH connectors.
(f) Connect the seat belt pretensioner RH and LH connectors.
(g) Connect the connector of the curtain shield airbag RH and LH connectors.
(h) Connect the airbag sensor assy center connectors.
(i) Connect the front airbag sensor RH and LH connectors.
(j) Connect the side airbag sensor assy RH and LH connectors.
(k) Connect the airbag sensor rear RH and LH connectors.
(l) Connect the seat position airbag sensor connector.
(m) Connect the negative (–) terminal cable to the battery.
(n) Turn the ignition switch to ON, and wait at least for 60 seconds.
(o) Operate electric system (defogger, wiper headlight, heater blower, etc.) and check that SRS warning light goes off.

OK:

SRS warning light is not light up.

NG → **REPAIR OR REPLACE HARNESS BETWEEN BATTERY AND AIRBAG SENSOR ASSY CENTER, AND CHARGING SYSTEM**

OK

4	CHECK AIR BAG SENSOR ASSY CENTER

SST 09843–18040

(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Clear the DTC stored in memory (See page 05–1238).
(f) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(g) Turn the ignition switch to ON, and wait at least for 10 seconds.
(h) Check the DTC (See page 05–1238).

OK:

DTC is not output.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

USE SIMULATION METHOD TO CHECK

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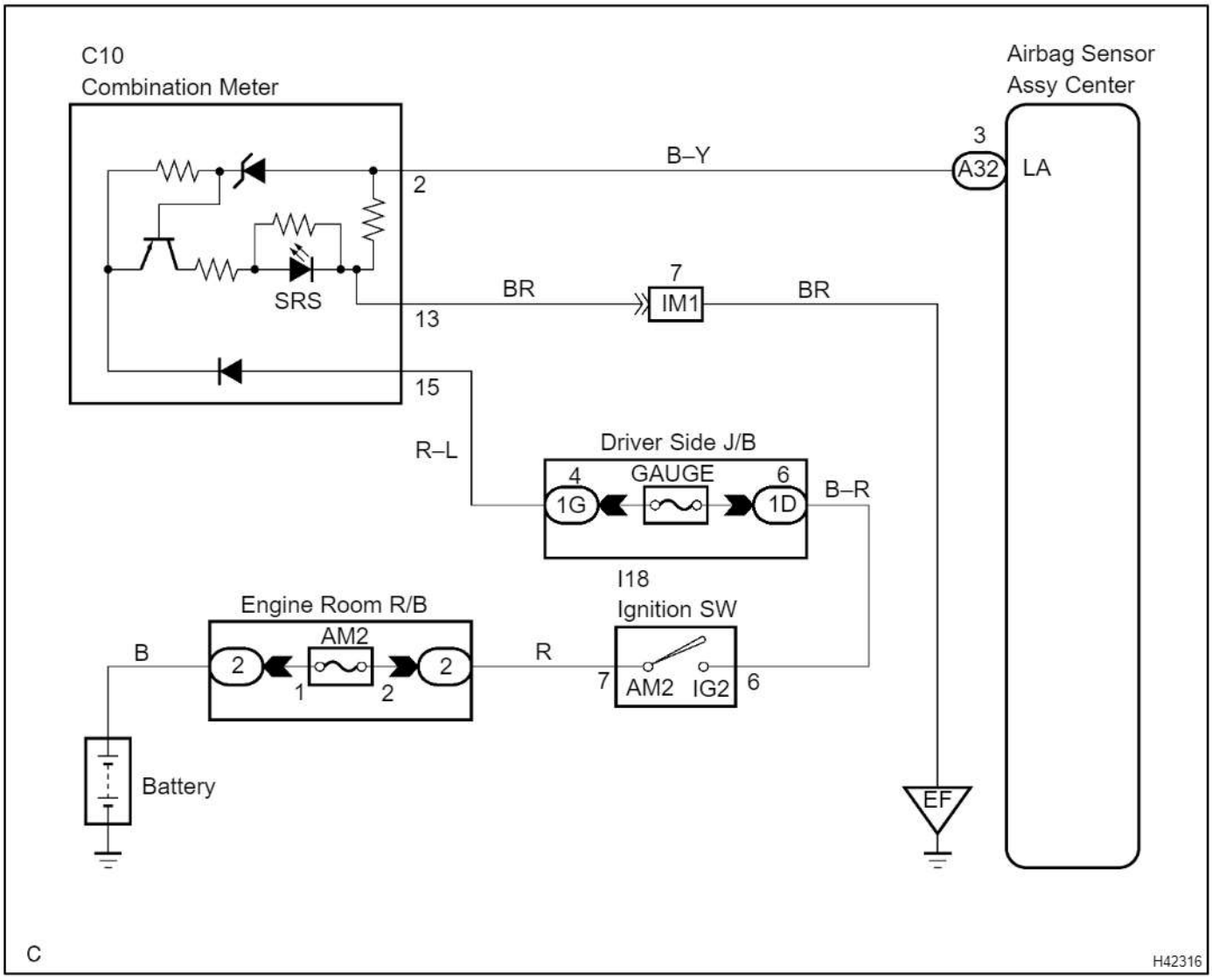
SRS WARNING LIGHT CIRCUIT MALFUNCTION (ALWAYS LIGHT UP, WHEN IGNITION SWITCH IS LOCK POSITION.)

CIRCUIT DESCRIPTION

The SRS warning light is located on the combination meter.
When the SRS is normal, the SRS warning light lights up for approx. 6 seconds after the ignition switch is turned from the LOCK position to ON position, and then turns off automatically.
If there is a malfunction in the SRS, the SRS warning light lights up to inform the driver of an abnormality.
When the terminal TC and terminal CG of the DLC3 are connected, the DTC is displayed by blinking the SRS warning light.
The airbag warning light on the combination meter assy stays when;

- The fitting of the connector of the airbag sensor assy center is incomplete
- The wire harness between the airbag sensor assy center and the combination meter assy has a short with B+
- The combination meter assy malfunctions

WIRING DIAGRAM



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INSPECTION PROCEDURE

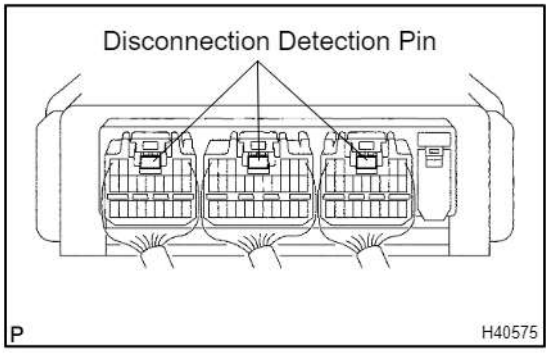
1	CHECK CONNECTOR

(a) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(b) Check the connection of the airbag sensor assy center connectors.

NG → CONNECT CONNECTORS

OK

2	PERFORM A VISUAL CHECK OF THE DISCONNECTION DETECTION PIN

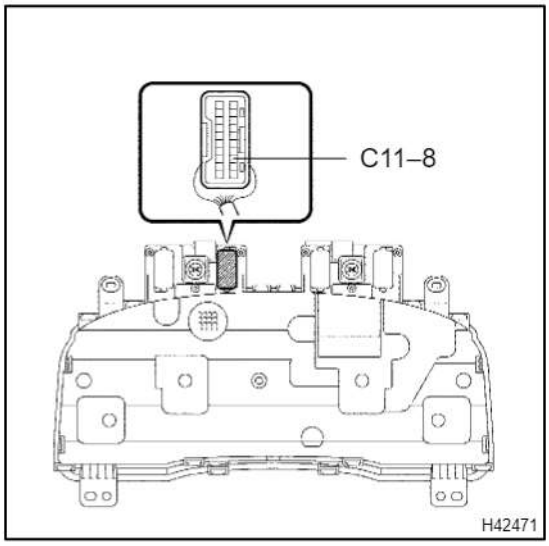


(a) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(b) With 3 connectors being connected to the airbag sensor assy center, place tester leads onto any 2 or 3 disconnection detection pins and check for continuity.
OK:
Continuity

NG → REPLACE AIRBAG SENSOR ASSY CENTER CONNECTOR

OK

3	CHECK COMBINATION METER ASSY



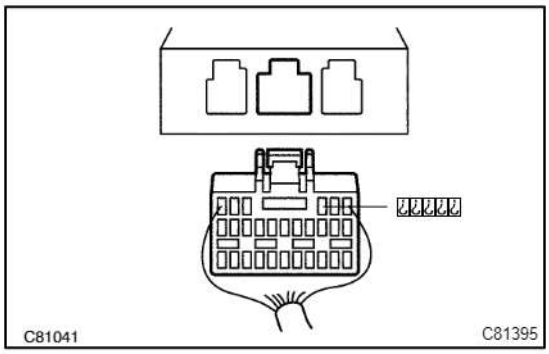
(a) Remove the combination meter assy (See page 71–22).
(b) Connect the negative (–) terminal cable to the battery.
(c) Turn the ignition switch to ON position.
(d) Measure the voltage between the body ground and terminal C11–8 of the combination meter assy.
OK:
Voltage: 8 – 16 V

NG → REPAIR OR REPLACE COMBINATION METER ASSY

OK

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4	CHECK WIRE HARNESS



(a) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(b) Disconnect the connector from the airbag sensor assy center.
(c) Measure the resistance between the body ground and the terminal LA.

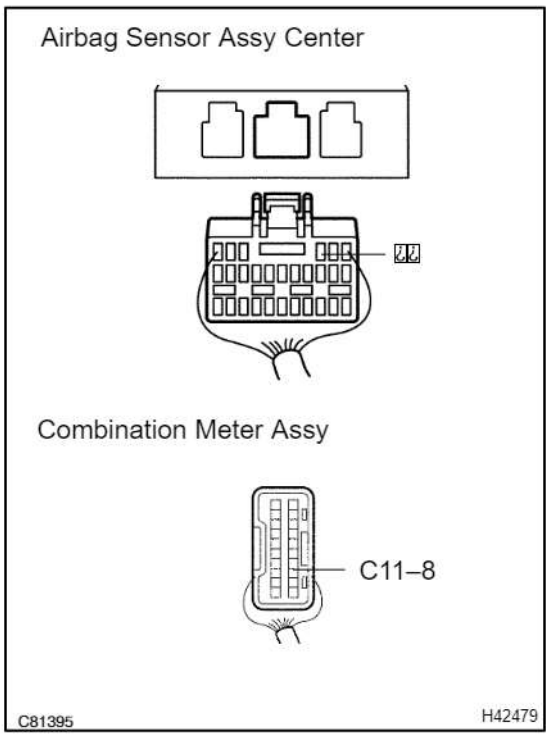
OK:

Resistance : 1 MΩ or Higher

NG	REPAIR OR REPLACE WIRE HARNESS (AIRBAG SENSOR ASSY CENTER – COMBINATION METER ASSY)

OK

5	CHECK WIRE HARNESS



(a) Measure the resistance between the terminal C11–8 of the combination meter assy connector and the terminal LA of the airbag sensor assy center connector.

OK:

Resistance: Below 1 Ω

NG	REPAIR OR REPLACE WIRE HARNESS (AIRBAG SENSOR ASSY CENTER – COMBINATION METER ASSY)

OK

REPLACE AIR BAG SENSOR ASSY CENTER

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SRS WARNING LIGHT CIRCUIT MALFUNCTION (DOES NOT LIGHT UP, WHEN IGNITION SWITCH IS TURNED TO ACC OR ON)

CIRCUIT DESCRIPTION

The SRS warning light is located on the combination meter.
When the SRS is normal, the SRS warning light lights up for approx. 6 seconds after the ignition switch is turned from the LOCK position to ON position, and then turns off automatically.
If there is a malfunction in the SRS, the SRS warning light lights up to inform the driver of the abnormality.
When terminal TC and CG of the DLC3 are connected, the DTC is displayed by blinking the SRS warning light.

WIRING DIAGRAM

See page 05–1442.

INSPECTION PROCEDURE

1	CHECK SOURCE VOLTAGE

(a) Measure the voltage of the battery.
OK:
Voltage: 10 – 14 V

NG → **REPAIR OR REPLACE HARNESS BETWEEN BATTERY AND AIRBAG SENSOR ASSY CENTER, AND CHARGING SYSTEM**

OK

2	CHECK AIR BAG SENSOR ASSY CENTER

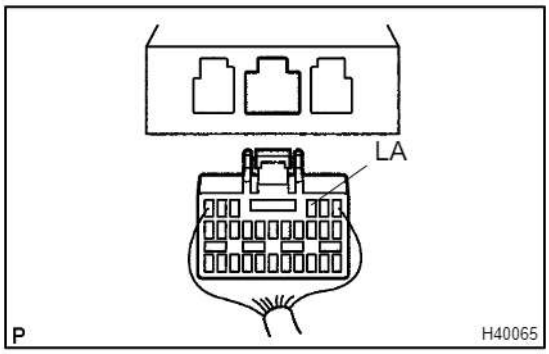
(a) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(b) Disconnect the connector from the airbag sensor assy center.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(d) Turn the ignition switch to ON.
(e) Check SRS warning light light up in the combination meter assy.
OK:
Not SRS warning light light up.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

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3	CHECK WIRE HARNESS



(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Disconnect the connector from the combination meter.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(e) Turn the ignition switch to ON.
(f) For the connector (on the airbag sensor assy center side) between the airbag sensor assy center and the combination meter, measure the voltage between LA and body ground.

OK:

Voltage: Below 1 V

NG	REPAIR OR REPLACE HARNESS BETWEEN AIRBAG SENSOR ASSY CENTER AND COMBINATION METER ASSY

OK

REPAIR OR REPLACE COMBINATION METER ASSY

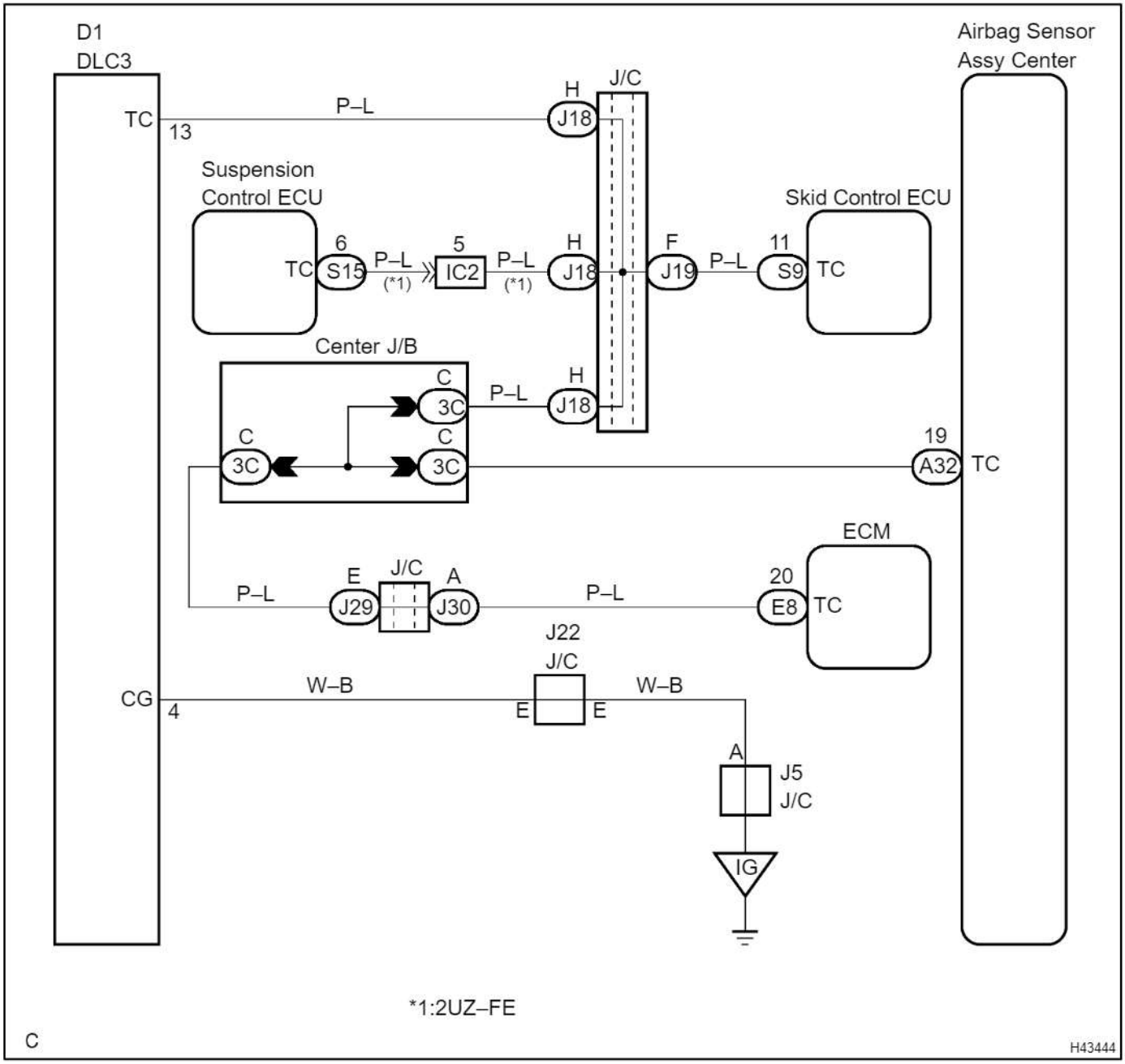
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TC TERMINAL CIRCUIT

CIRCUIT DESCRIPTION

DTC output mode is set by connecting terminals TC and CG of the DLC3.
The DTCs are displayed by blinking the SRS warning light.

WIRING DIAGRAM



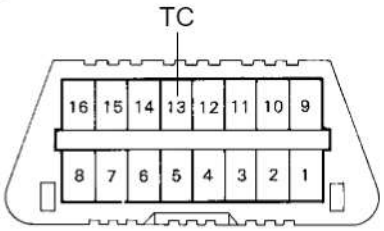
HINT:
When each warning light stays blinking, a ground short in the wiring of terminal TC of the DLC3 or an internal ground short in each ECU is suspected.

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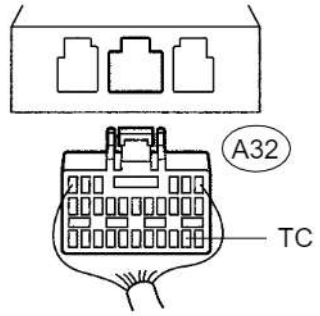
INSPECTION PROCEDURE

1 CHECK WIRE HARNESS(DLC3 – AIRBAG SENSOR ASSY CENTER)

DLC3:



Airbag Sensor Assy Center:



H40173
H40065
H43360

(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the airbag sensor assy center connector.
(c) Measure the resistance according to the value(s) in the table below.

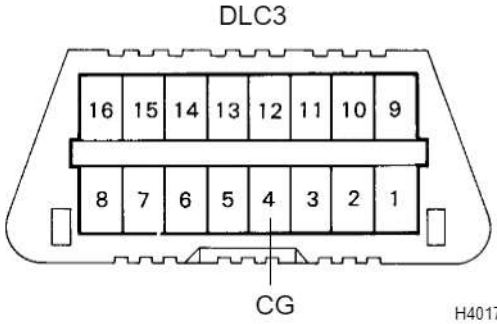
Standard:

Tester connection	Condition	Specified condition
DLC3 (TC) – A32–19 (TC)	Always	Below 1 Ω

NG → **REPAIR OR REPLACE WIRE HARNESS(TC of DLC3 – TC of AIRBAG SENSOR ASSY CENTER)**

OK

2 CHECK WIRE HARNESS(CG of DLC3 – BODY GROUND)



H40173

(a) Measure the resistance according to the value(s) in the table below.

Standard:

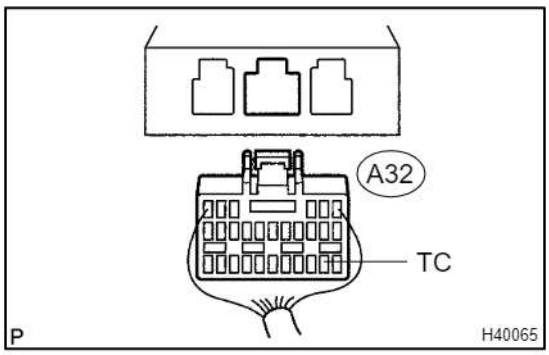
Tester connection	Condition	Specified condition
DLC3 (CG) – Body ground	Always	Below 1 Ω

NG → **REPAIR OR REPLACE WIRE HARNESS(CG of DLC3 – BODY GROUND)**

OK

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3	CHECK WIRE HARNESS(TC of AIRBAG SENSOR ASSY CENTER – BODY GROUND)



(a) Measure the resistance according to the value(s) in the table below.

Standard:

Tester connection	Condition	Specified condition
A32–19 (TC) – Body ground	Always	1 MΩ or Higher

NG → **REPAIR OR REPLACE WIRE HARNESS AND EACH ECU**

OK →

REPLACE AIR BAG SENSOR ASSY CENTER

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LIGHTING SYSTEM

059VY-01

PRECAUTION

1. PRECAUTION OF HEADLIGHT BULB REPLACEMENT

(a) If the adhered oil is left unremoved from the halogen lamp surface, the lamp service life is shortened as it becomes hot when it is turned on.

(b) Since the internal pressure of a halogen lamp is high, dropping, hitting or damaging the bulb may cause the glass to scatter. Therefore, handle it with great care.

(c) When replacing bulbs, do not remove until a new bulb is prepared. because if it is left being removed for a long period of time, the lens may be covered with dirt or moisture.

(d) Be sure to use the bulb of the same watt when replacing bulbs.

(e) Firmly reinstall the socket after replacing the bulb. Otherwise, cloudy lens or invasion by water will be caused.

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056DL-02

HOW TO PROCEED WITH TROUBLESHOOTING

1	VEHICLE BROUGHT TO WORK SHOP

2	CUSTOMER PROBLEM ANALYSIS (See page 05–1453)

3	CHECK BODY MULTIPLEX COMMUNICATION SYSTEM (See page 05–1909)

(a) Check that the DTC outputs.

- DTC OUTPUTS (PROCEED TO "BODY MULTIPLEX COMMUNICATION SYSTEM")
- DTC DOES NOT OUTPUT (GO TO STEP 4)

4	DTC CHECK (See Page 05–1454)

- MALFUNCTION CODE (GO TO STEP 5)
- NORMAL CODE (GO TO STEP 6)

5	DTC CHART (See Page 05–1457)

- GO TO STEP 8

6	PROBLEM SYMPTOMS TABLE (See page 05–1463)

7	TERMINAL OF ECU (See page 05–1460)

8	CIRCUIT INSPECTION (See Page 05–1465 – 05–1490)

9	IDENTIFICATION OF PROBLEM

10	REPAIR OR REPLACE

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11	CONFIRMATION TEST

END

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056DM–02

CUSTOMER PROBLEM ANALYSIS CHECK

LIGHTING SYSTEM Check Sheet

Inspector's name: _____

Customer's Name		**Registration No.**	
		Registration Year	
		Frame No.	
Date Vehicle Brought in	/ /	**Odometer Reading**	**km Mile**

Date Problem First Occurred		/ /
Frequency Problem Occurs		☐ Always ☐ Sometimes (times per day, month) ☐ Once only
Weather Conditions When Problem Occurred	**Weather**	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Various/ Others
	Outdoor Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold (Approx. °F (°C))

Malfunction System	☐ Fog light system
	☐ Turn signal and hazard warning system
	☐ Illumination light system
	☐ Interior system
	☐ Headlight system
	☐ Taillight system
	☐ Stop light system

N

I30682

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056DN–02

PRE–CHECK

1. USING HAND–HELD TESTER

(a) Hook up the hand–held tester to the DLC3.

(b) Monitor the ECU data by following the prompts on the tester screen.

HINT:

Hand–held tester has a ”Snapshot” function which records the monitored data.

Please refer to the hand–held tester operator’s manual for further details.

2. DTC CLEAR

(a) DTCs and freeze frame data will be erased by the hand–held tester operating.

3. DATA LIST

HINT:

According to the DATA LIST displayed by the hand–held tester, you can read the value of the switch, sensor, actuator and so on without parts removal. Reading the DATA LIST as a first step of troubleshooting is one of the method to shorten the labor time.

(a) Connect the hand–held tester to the DLC3.

(b) Turn the ignition switch to ON.

(c) According to the display on tester, read the ”DATA LIST”.

Item	Measurement Item/ Display (Range)	Normal Condition	Diagnostic Note
D DOR CTY SW	Driver’s door courtesy SW signal/ON or OFF	ON: Driver’s door is open OFF: Driver’s door is close	–
P DOR CYT SW	Passenger’s door courtesy SW signal/ ON or OFF	ON: Passenger’s door is open OFF: Passenger’s door is close	–
Rr DOR CTY SW	Rear door courtesy SW signal/ON or OFF	ON: Either right or left rear door is open OFF: Both the right and left doors are closed.	–
HIGH FLASHER SW	High flasher SW signal/ON or OFF	ON: High flasher SW is on OFF: High flasher SW is off	–
AUTO LIGHT SW	Auto light SW signal/ ON or OFF	ON: Light control SW is in Auto position OFF: Light control SW is in except Auto position	–
HEAD LIGHT SW	Head light SW signal/ ON or OFF	ON: Light control SW is in HEAD position OFF: Light control SW is in except HEAD position	–
TAIL LIGHT SW	Taillight SW signal/ON or OFF	ON: Light control SW is in TAIL or HEAD position OFF: Light control SW is in OFF or AUTO position	–
ACC SW	ACC SW signal/ON or OFF	ON: IG key is in ACC, ON or START position OFF: IG key is in OFF position	–
IG SW	IG SW signal/ON or OFF	ON: IG key is in ON or START position OFF: IG key is in OFF or ACC position	–

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4. ACTIVE TEST

HINT:

Performing the ACTIVE TEST using the hand–held tester allows the relay, VSV, actuator and so on to operate without parts removal. Performing the ACTIVE TEST as a first step of troubleshooting is one of the method to shorten the labor time.

It is possible to display the DATA LIST during the ACTIVE TEST.

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON.
(c) According to the display on tester, perform the "ACTIVE TEST".

Item	Test Details	Diagnostic Note
HAZARD	Turns Hazard light flasher relay ON/OFF	–
DRL RLY	(Test Details) Turns DRL relay ON/OFF (Vehicle Condition) IG SW is ON, Engine is stopped and Light control SW is in OFF position.	–
HEAD LIGHT	Turns Head light relay ON/OFF	–
TAIL LIGHT	Turns Tail light relay ON/OFF	–
ILLUMI OUTPUT	(Test Details) Turns Interior light and Key illumination ON/OFF (Vehicle Condition) Interior light SW is in Door position	–
DOME RLY CUT	Dome relay cut ON/OFF	–

5. ILLUMINATED ENTRY SYSTEM OPERATION CHECK

(a) The light that is lit in the illuminated entry system is explained below:
(b) Turn the ignition switch to OFF, close all the doors, and set the driver's door in the lock condition.
(c) Unlock the door and open any other door, and check that the room light comes on. Close the door, and check that the room light goes off within 15 seconds.
(d) Turn the ignition switch to ON and open and close any other door. Check that the room light immediately goes off.
(e) Turn ignition switch to OFF.
(f) Open and close any door to light the room light. Before the room light goes off within 15 seconds, turn the ignition switch to ON, and check that the room light goes off immediately.
(g) Turn the ignition switch OFF.
(h) Open and close any door to light the room light. Before the light goes off within 15 seconds, lock the driver door. Check that the light goes off immediately.

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6. DOME RELAY CUT OPERATION CHECK

(a) Remove the ignition key and close all doors.
(b) Open the driver door to light the room light, and leave it as opened. Check that the light goes off in about 30 min.
(c) After the room light goes off, close the driver door.
(d) Open any door except the driver's door to turn the room light on, and then open the driver's door. Check that room light goes off within 30 min. after opening the driver's door.
(e) Close all the doors. With the ignition key inserted, open any door to light the room light, and then, remove the ignition key. Check that the room light goes off within 30 min.
(f) One of the room lamp switch is on and close all doors.
(g) Lock all doors, and check that the room light goes off within 3 sec.

7. SIDE STEP LAMP OPERATION CHECK

(a) Turn the ignition switch to OFF, close all the doors, and set the driver door in the lock condition.
(b) Unlock the door and open front or rear doors, and check that the side step lamp comes on. Close the door and check that the side step lamp goes off within 15 seconds.
(c) Under the conditions that the ignition switch is ON, one of the front or rear doors opens and the shift range is at any positions except for P positions, check that the side step lamp goes off when the vehicle speed exceeds 8 km/h (4.8 mph).
(d) Then, check that the side step lamp comes on when the vehicle speed become 4 km/h (2.4 mph) or less.

8. LAMP AUTO CUT OPERATION CHECK

(a) Turn the ignition switch to ON, and turn the headlamp switch to TAIL or HEAD.
(b) Turn the ignition switch to OFF and open and close the driver's door, check the headlamp goes off within 30 sec.

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056DO-02

DIAGNOSTIC TROUBLE CODE CHART

1. DTC CHECK

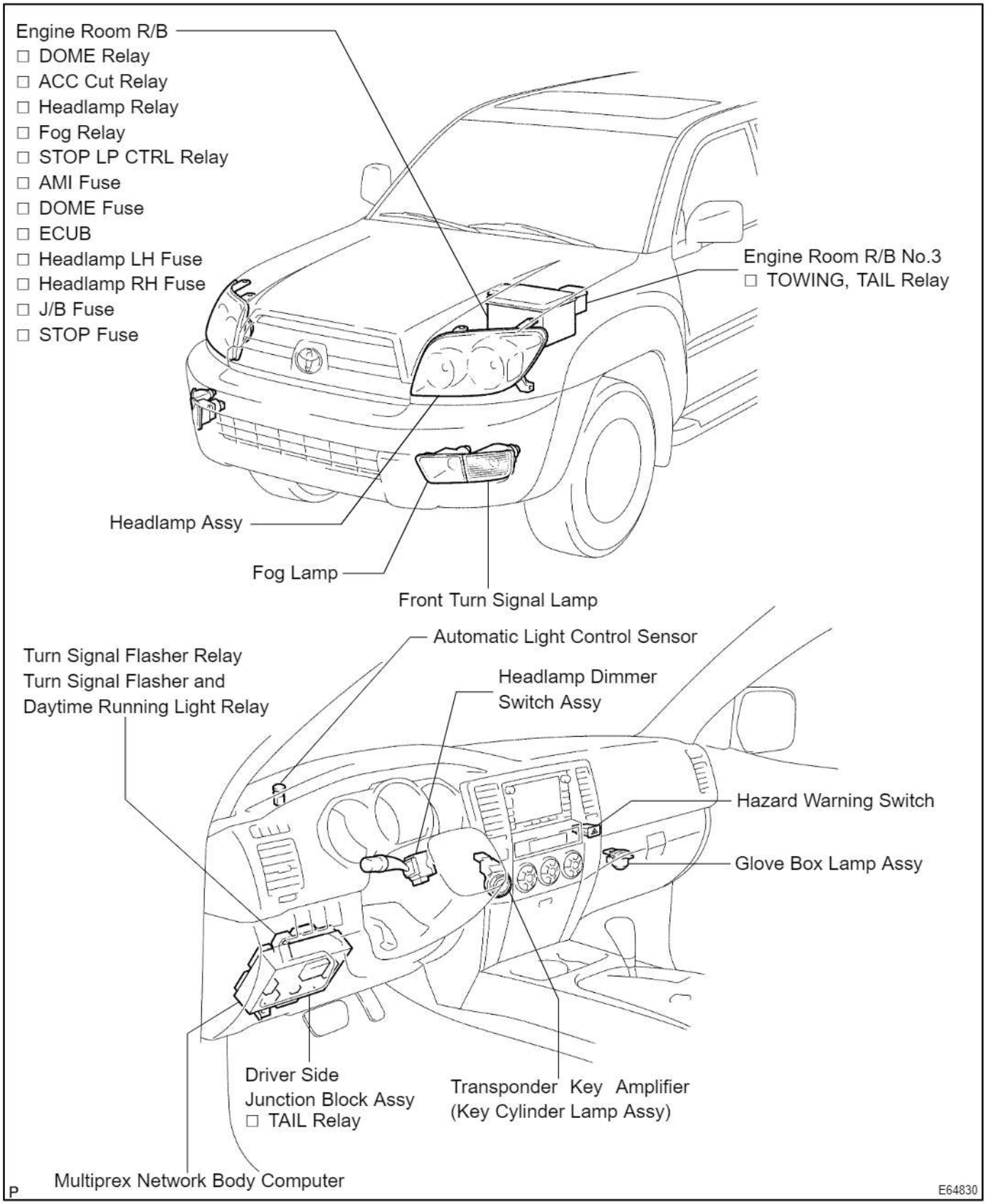
If a malfunction code is displayed during the DTC check, check the suspected area listed for that code in the table below, and proceed to the appropriate page.

DTC No. (See Page)	Symptom	Suspect Area
B1244 (05–1465)	Light sensor fail	□Light sensor □Wire harness □Driver side junction block assy

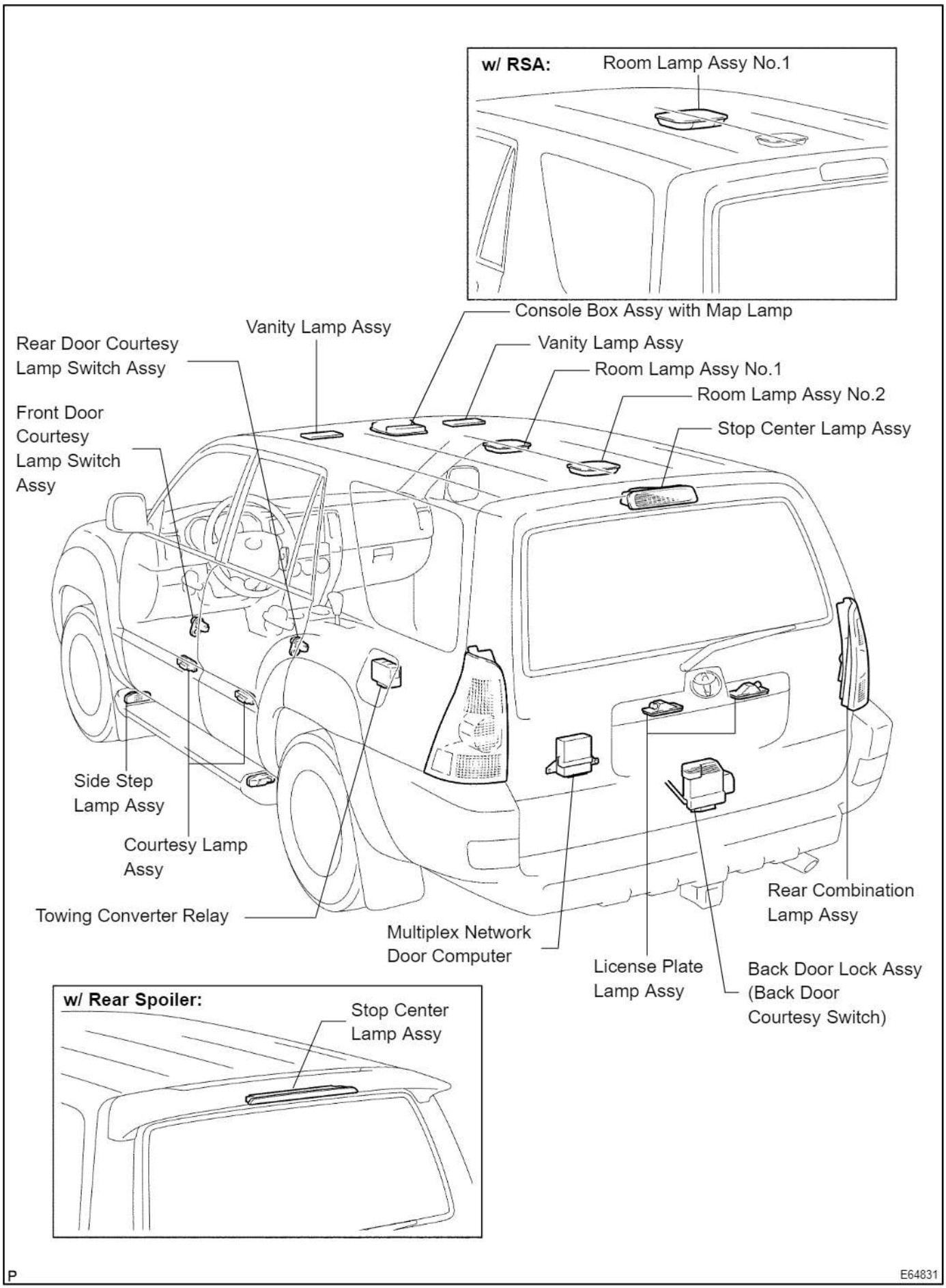
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056DP-02

LOCATION



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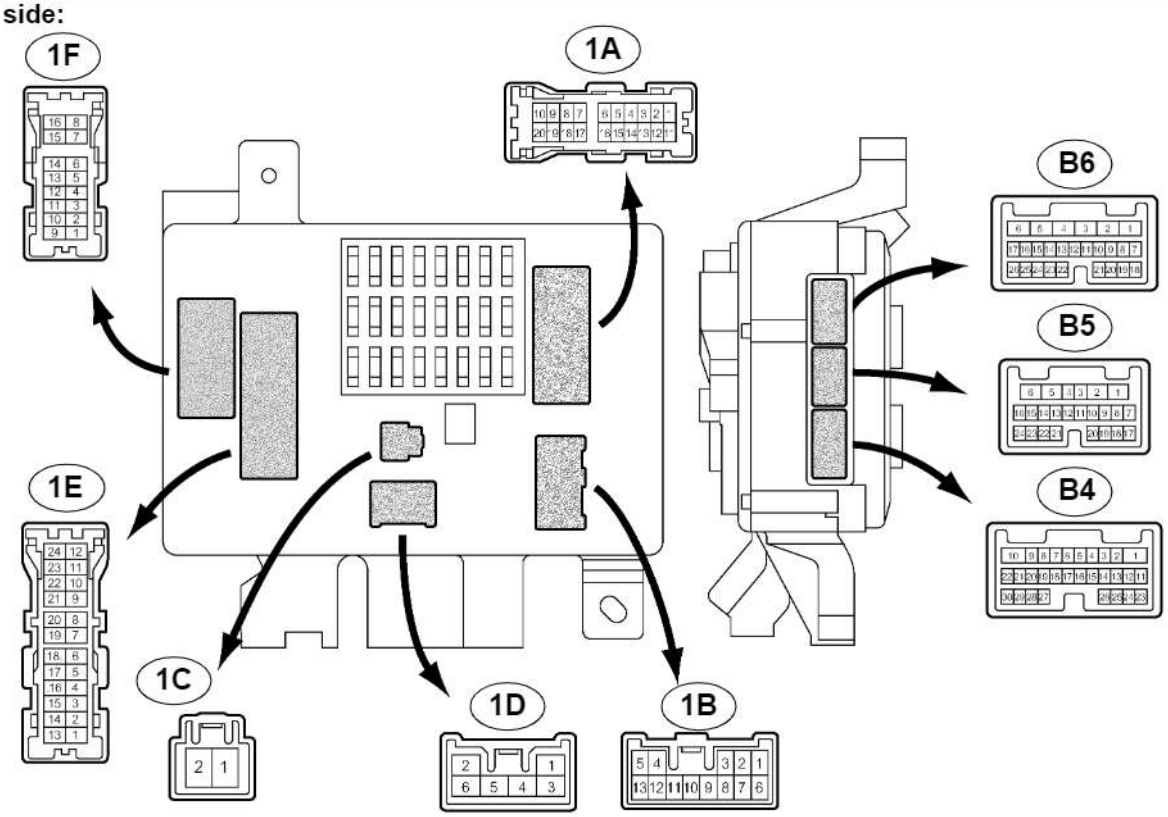
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058VZ-01

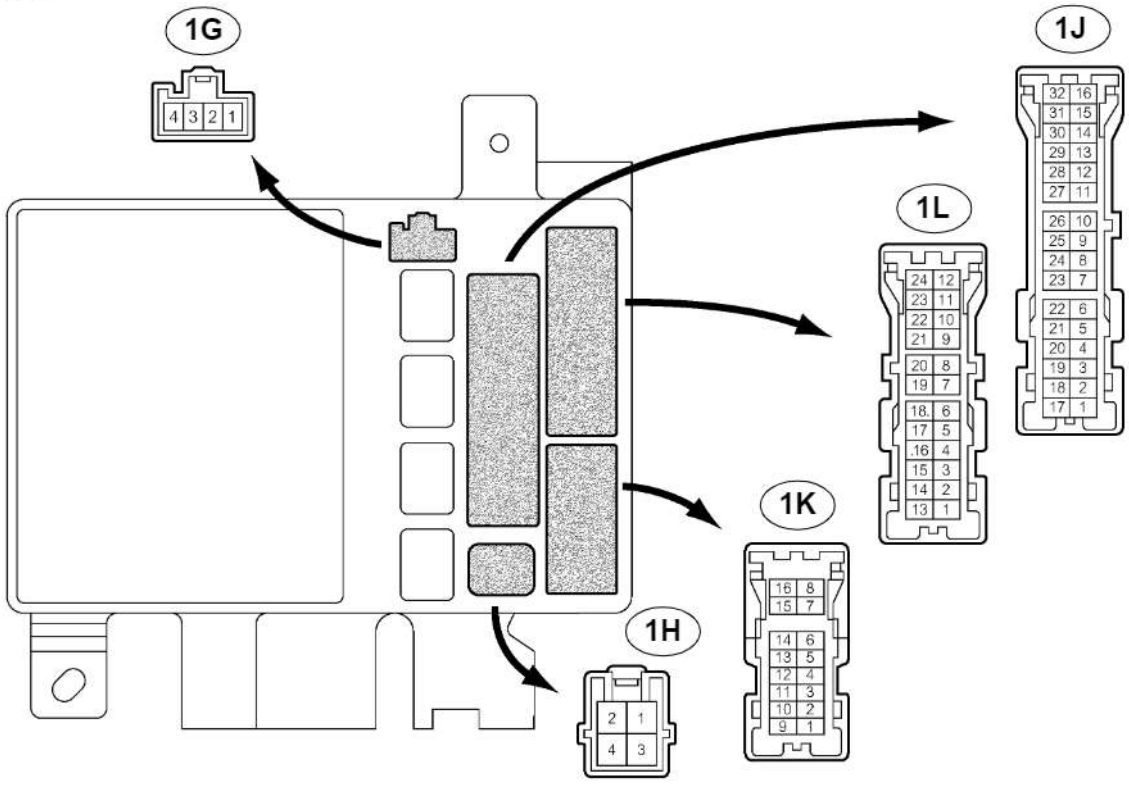
TERMINALS OF ECU

1. Multiplex Network Body Computer

Front side:



Back side:



H E65748 E65749

I34371

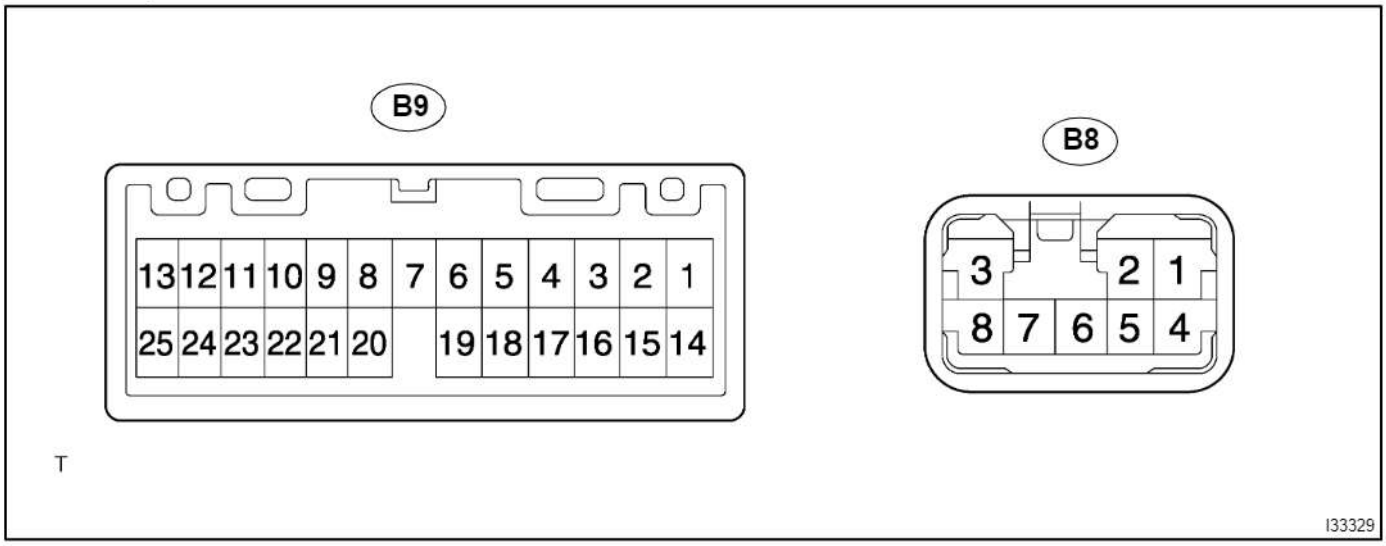
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Terminal No. (Symbols)	Wiring color	Condition	Specified condition
1H–2 ⇔ Body ground (GND1 ⇔ Body ground)	–	Constant	Below 1 V
1K–15, 1L–16 ⇔ 1H–2 (LSR ⇔ GND1, 2)	–	Rear door lock switch is unlock position	Below 1 V
		Rear door lock switch is lock position	10 – 14 V
1C–2 ⇔ 1H–2 (SIG ⇔ GND1,2)	–	Ignition switch is OFF	Below 1 V
		Ignition switch is ON	10 – 14 V
1B–4 ⇔ 1H–2 (BECU ⇔ GND1,2)	–	Constant	10 – 14 V
1A–8, 1A–9 ⇔ 1H–2 (ILE ⇔ GND1,2)	–	Key cylinder illumination, room lamp is OFF	Below 1 V
		Key cylinder illumination, room lamp is ON	10 – 14 V
1H–2 ⇔ Body ground (GND2 ⇔ Body ground)	–	Constant	Below 1 V
1B–8 ⇔ 1H–2 (HRLY ⇔ GND1, 2)	–	Ignition switch is ON and combination switch is OFF	Below 1 V
		Ignition switch is ON and combination switch is HEAD	10 – 14 V
1C–1 ⇔ 1H–2 (TRLY ⇔ GND1, 2)	–	Ignition switch is ON and combination switch is OFF	Below 1 V
		Ignition switch is ON and combination switch is TAIL	10 – 14 V
1D–5 ⇔ 1H–2 (ACC ⇔ GND1, 2)	–	Ignition switch is OFF	Below 1 V
		Ignition switch is ON	10 – 14 V
B4–3 ⇔ 1H–2 (LMRY ⇔ GND1, 2)	R ⇔ –	Ignition switch is OFF	Below 1 V
		Ignition switch is ON	10 – 14 V
B4–7 ⇔ 1H–2 (DRL ⇔ GND1, 2)	LG–R ⇔ –	Ignition switch is OFF	Below 1 V
		Ignition switch is ON	10 – 14 V
B4–21 ⇔ 1H–2 (LSWD ⇔ GND1, 2)	W–R ⇔ –	Front LH door lock switch is unlock position	Below 1 V
		Front LH door lock switch is lock position	10 – 14 V
B4–23 ⇔ 1H–2 (MPX2 ⇔ GND1, 2)	BR–R ⇔ –	Constant	Signal waveform
B4–25 ⇔ 1H–2 (PCYL ⇔ GND1, 2)	Y ⇔ –	Front RH courtesy lamp is OFF	10 – 14 V
		Front RH courtesy lamp is ON	Below 1 V
B4–26 ⇔ 1H–2 (DCYL ⇔ GND1, 2)	W–G ⇔ –	Front LH courtesy lamp is OFF	10 – 14 V
		Front LH courtesy lamp is ON	Below 1 V
B4–30 ⇔ 1H–2 (LSWP ⇔ GND1, 2)	B–W ⇔ –	Front RH door lock switch is unlock position	Below 1 V
		Front RH door lock switch is lock position	10 – 14 V
B5–6 ⇔ 1H–2 (LP ⇔ GND1, 2)	W–R ⇔ –	Side step lamp is OFF	Below 1 V
		Side step lamp is ON	10 – 14 V
B5–11 ⇔ 1H–2 (RLCY ⇔ GND1, 2)	P–B ⇔ –	Rear LH door is close	10 – 14 V
		Rear LH door is open	Below 1 V
B5–12 ⇔ 1H–2 (RRCY ⇔ GND1, 2)	P–L ⇔ –	Rear RH door is close	10 – 14 V
		Rear RH door is open	Below 1 V
B5–21 ⇔ 1H–2 (LCYL ⇔ GND1, 2)	P–G ⇔ –	Rear LH courtesy lamp is OFF	10 – 14 V
		Rear LH courtesy lamp is ON	Below 1 V
B5–22 ⇔ 1H–2 (RCYL ⇔ GND1, 2)	L–R ⇔ –	Rear RH courtesy lamp is OFF	10 – 14 V
		Rear RH courtesy lamp is ON	Below 1 V
B5–23 ⇔ 1H–2 (DCTY ⇔ GND1, 2)	R–B ⇔ –	Front LH door is close	10 – 14 V
		Front LH door is open	Below 1 V
B5–24 ⇔ 1H–2 (PCTY ⇔ GND1, 2)	R–Y ⇔ –	Front RH door is close	10 – 14 V
		Front RH door is open	Below 1 V

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B6–1 ⇔ 1H–2 (HEAD ⇔ GND1, 2)	R ⇔ –	Ignition switch is ON and combination switch is OFF	10 – 14 V
		Ignition switch is ON and combination switch is ON	Below 1 V
B6–3 ⇔ 1H–2 (A ⇔ GND1, 2)	G–O ⇔ –	Ignition switch is ON and combination switch is OFF	10 – 14 V
		Ignition switch is ON and combination switch is AUTO	Below 1 V
B6–4 ⇔ 1H–2 (CLTS ⇔ GND1, 2)	Y ⇔ –	Cover the sensor with hand → Stop covering	Signal waveform
B6–6 ⇔ 1H–2 (CLTB ⇔ GND1, 2)	L–Y ⇔ –	Ignition switch is OFF	Below 1 V
		Ignition switch is ON	10 – 14 V
B6–8 ⇔ 1H–2 (TAIL ⇔ GND1, 2)	G ⇔ –	Ignition switch is ON and combination switch is OFF	10 – 14 V
		Ignition switch is ON and combination switch is TAIL	Below 1 V
B6–21 ⇔ 1H–2 (CLTE ⇔ GND1, 2)	G–W ⇔ –	Constant	Below 1 V

2. Multiplex Network Door ECU:



Terminal No. (Symbols)	Wiring Color	Condition	STD Voltage (V)
B8–1 ⇔ B8–3 (MPX2 ⇔ GND)	R ⇔ W–B	Constant	Signal waveform
B8–3 ⇔ Body ground (GND ⇔ Body ground)	W–B ⇔ –	Constant	Below 1 V
B8–4 ⇔ B8–3 (BDR ⇔ GND)	L ⇔ W–B	Constant	10 – 14 V
B8–5 ⇔ B8–3 (BECU ⇔ GND)	L–R ⇔ W–B	Constant	10 – 14V
B8–6 ⇔ B8–3 (SIG ⇔ GND)	B ⇔ W–B	Ignition switch is OFF	Below 1 V
		Ignition switch is ON	10 – 14 V
B9–7 ⇔ B8–3 (FULL ⇔ GND)	G–Y ⇔ W–B	Backdoor is close	10 – 14 V
		Backdoor is open	Below 1 V
B9–8 ⇔ B8–3 (POS ⇔ GND)	BR–W ⇔ W–B	Backdoor lock switch is unlock position	Below 1 V
		Backdoor lock switch is lock position	10 – 14 V
B9–21 ⇔ B8–3 (LSE ⇔ GND)	B–R ⇔ W–B	Constant	10 – 14 V

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056DR-02

PROBLEM SYMPTOMS TABLE

1. HEADLAMP AND TAIL LAMP

Symptom	Suspect Area	See page
Only one headlamp comes on.	1. Bulb 2. HEAD LH fuse (LWR, UPR) 3. HEAD RH fuse (LWR, UPR) 4. Harness or connector	– – – –
Headlamp does not light up.	–	05–1481
"HI–Beam" does not light (All).	1. Headlamp dimmer switch 2. Harness or connector	65–4 –
"HI–Beam" does not light (One side).	1. Bulb 2. Harness or connector	– –
"Flash" does not light.	1. Headlamp Dimmer Switch 2. Turn signal flasher relay 3. Harness or connector	65–4 65–4 –
Headlamp is dark.	1. Bulb 2. Harness or connector	– –
Only one tail lamp light up.	1. Bulb 2. Harness or connector	– –
Tail lamp does not light up. (Headlamp is normal)	–	05–1483
Tail lamp does not light up. (Headlamp does not light)	1. Light Control Switch 2. Harness or connector	65–4 –
Rear combination light does not light up.	1. Bulb 2. Harness or connector	– –
Headlamp does not light up with engine running and light control switch is in OFF (Day time running light operation).	1. Turn signal flasher and DRL relay 2. Generator L terminal 3. Parking brake switch 4. Multiplex network body ECU 5. Harness or connector	65–4 – – 05–1460 –

2. AUTOMATIC LIGHT CONTROL SYSTEM

Symptom	Suspect Area	See page
Automatic light control system does not operate	–	05–1487

3. LIGHT AUTO CUT SYSTEM

Symptom	Suspect Area	See page
Light auto turn off system does not operate.	–	05–1490
Headlamp and tail lamp do not come on.	1. Multiplex network body ECU 2. Harness or connector	05–1460 –
Headlamp and taillight stay on.	1. Multiplex network body ECU 2. Harness or connector	05–1460 –

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4. FOG LAMP SYSTEM

Symptom	Suspect Area	See page
Front fog lamp does not light up with light control SW HEAD (Headlamp is normal).	1. FOG Fuse 2. FOG relay 3. Fog lamp switch 4. Harness or connector	– – 65–4 –
Only one front fog lamp does not light up.	1. Bulb 2. Harness or connector	– –

5. TURN SIGNAL AND HAZARD WARNING SYSTEM

Symptom	Suspect Area	See page
"Hazard" and "Turn" do not light up.	1. IG1Fuse 2. Ignition switch 3. Turn signal flasher 4. Harness or connector	– – 65–2 –
Hazard warning light does not light up. (Turn is normal)	1. Hazard warning switch 2. Harness or connector	65–4 –
Turn signal does not light up. (Hazard is normal)	1. Turn signal switch 2. Harness or connector	65–4 –
Turn signal does not light up in one direction.	1. Turn signal switch 2. Harness or connector	65–4 –
Only one bulb does not light up.	1. Bulb 2. Harness or connector	– –

6. ILLUMINATED ENTRY SYSTEM

Symptom	Suspect Area	See page
Room lamp assy No.1 does not light up.	–	05–1469
Room lamp assy No.1 does not go off.	–	05–1475
Courtesy lamp does not light up.	1. Courtesy lamp 2. Courtesy lamp switch 3. Harness or connector 4. Driver side junction block assy	– – – –
Courtesy lamp does not goes off.	1. Courtesy lamp switch 2. Harness or connector 3. Courtesy lamp 4. Driver side junction block assy	– – – –
Side step lamp does not light up.	1. Side step lamp 2. Courtesy lamp switch 3. Harness or connector 4. Multiplex network body ECU	– – – –
Side step lamp does not goes off.	1. Courtesy lamp switch 2. Harness or connector 3. Side step lamp 4. Multiplex network body ECU	– – – –

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DTC	B1244	LIGHT SENSOR CIRCUIT MALFUNCTION

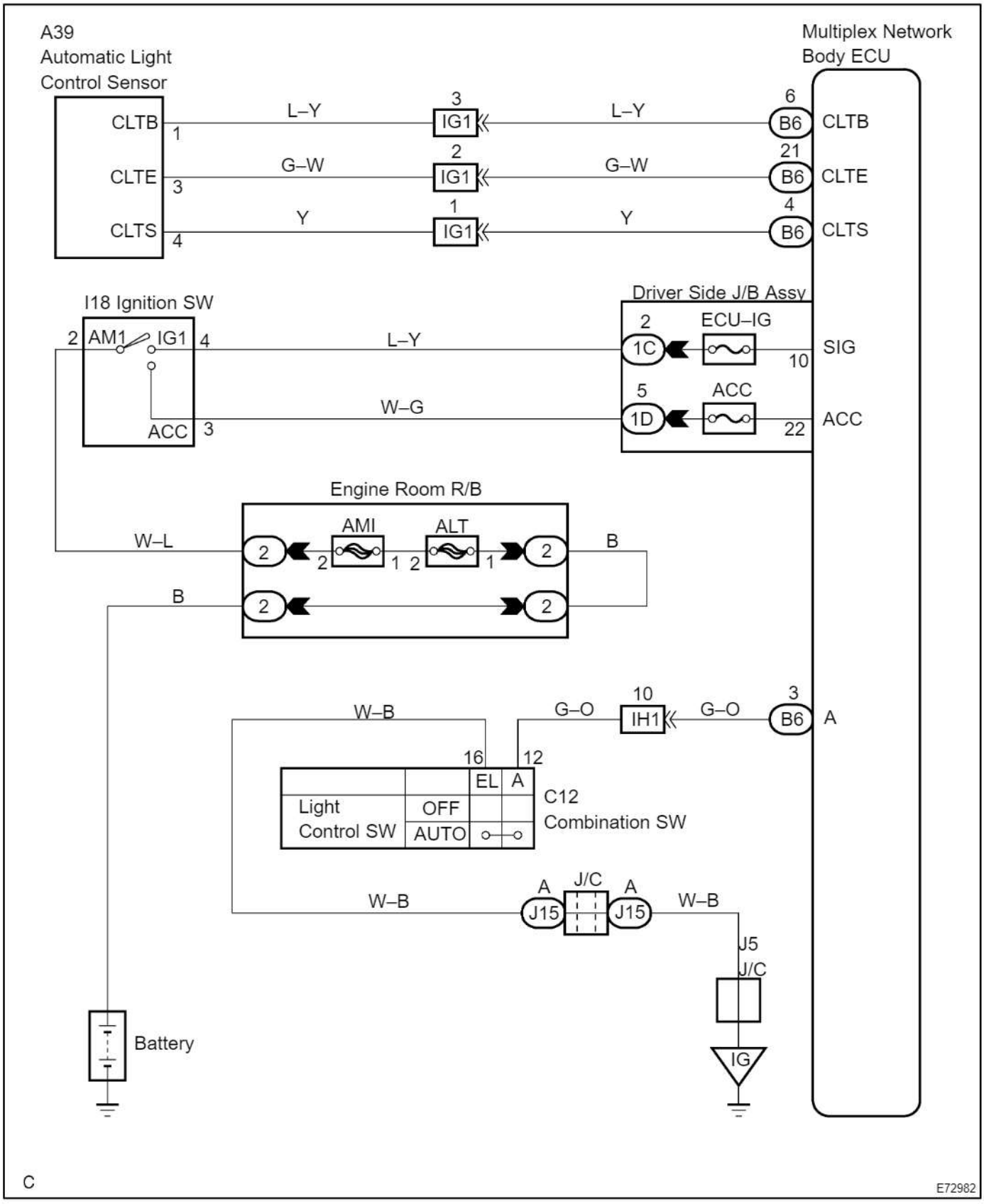
CIRCUIT DESCRIPTION

This DTC is output when failure in the light sensor circuit is detected.

DTC No.	DTC Detecting Condition	Trouble Area
B1244	□Malfunction of light sensor □Open or short of light sensor circuit	□Automatic light control sensor □Harness or connector □Driver side junction block assy

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WIRING DIAGRAM



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INSPECTION PROCEDURE

1	CHECK LIGHT

(a) Check that the headlamp and the tail lamp comes on.

NG → FLOW CHART (GO TO FLOW CHART OF HEADLIGHT OR TAILLIGHT)

OK

2	READ VALUE OF HAND–HELD TESTER

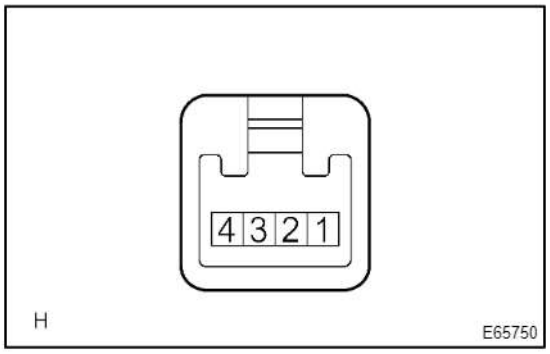
(a) Connect the hand–held tester to DLC3.
(b) Turn the ignition switch to ON and push the hand–held tester main SW ON.
(c) Select the item "AUTO LIGHT SW" in the DATA LIST, and read its value displayed on the hand–held tester.

OK:
Light control SW AUTO → ON
Light control SW except AUTO → OFF

NG → Go to step 5

OK

3	CHECK AUTOMATIC LIGHT CONTROL SENSOR



(a) Measure voltage between terminals as shown in the chart below.
(b) Check the continuity between terminal 3 (CLTE) and body ground as shown in the chart below.
(c) Using an oscilloscope, check that signal waveform appears between terminals.

Standard:

Terminal No. (Symbol)	Tester connection	Condition	Specified condition
1 (CLTB)	1 – 3	Constant	10 – 14 V
3 (CLTE)	3 – Body ground	Constant	Continuity
4 (CLTS)	4 – 3	IG SW ON Dimmer SW AUTO	Signal waveform appears depending on outside brightness

NG → REPLACE AUTOMATIC LIGHT CONTROL SENSOR

OK

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4	CHECK HARNESS AND CONNECTOR(BETWEEN MULTIPLEX NETWORK BODY ECU AND AUTOMATIC LIGHT CONTROL SENSOR)

(a) Check that signal waveform appears between terminal B6–4 (CLTS) and B6–21 (CLTE) of the multiplex network body ECU.
Standard: Bar appears

(b) Measure voltage between terminals B6–6 (CLTB) and B6–21 (CLTE) of the multiplex network body ECU.
Standard: 10 – 14 V

(c) Check the continuity between terminal B6–21 (CLTE) of the multiplex network body ECU and body ground.
Standard: There is continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE MULTIPLEX NETWORK BODY ECU

5	CHECK HARNESS AND CONNECTOR(BETWEEN HEADLAMP DIMMER SWITCH ASSY AND MULTIPLEX NETWORK BODY ECU)

(a) Check for open and short circuit in harness and connector (See page 01–35).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

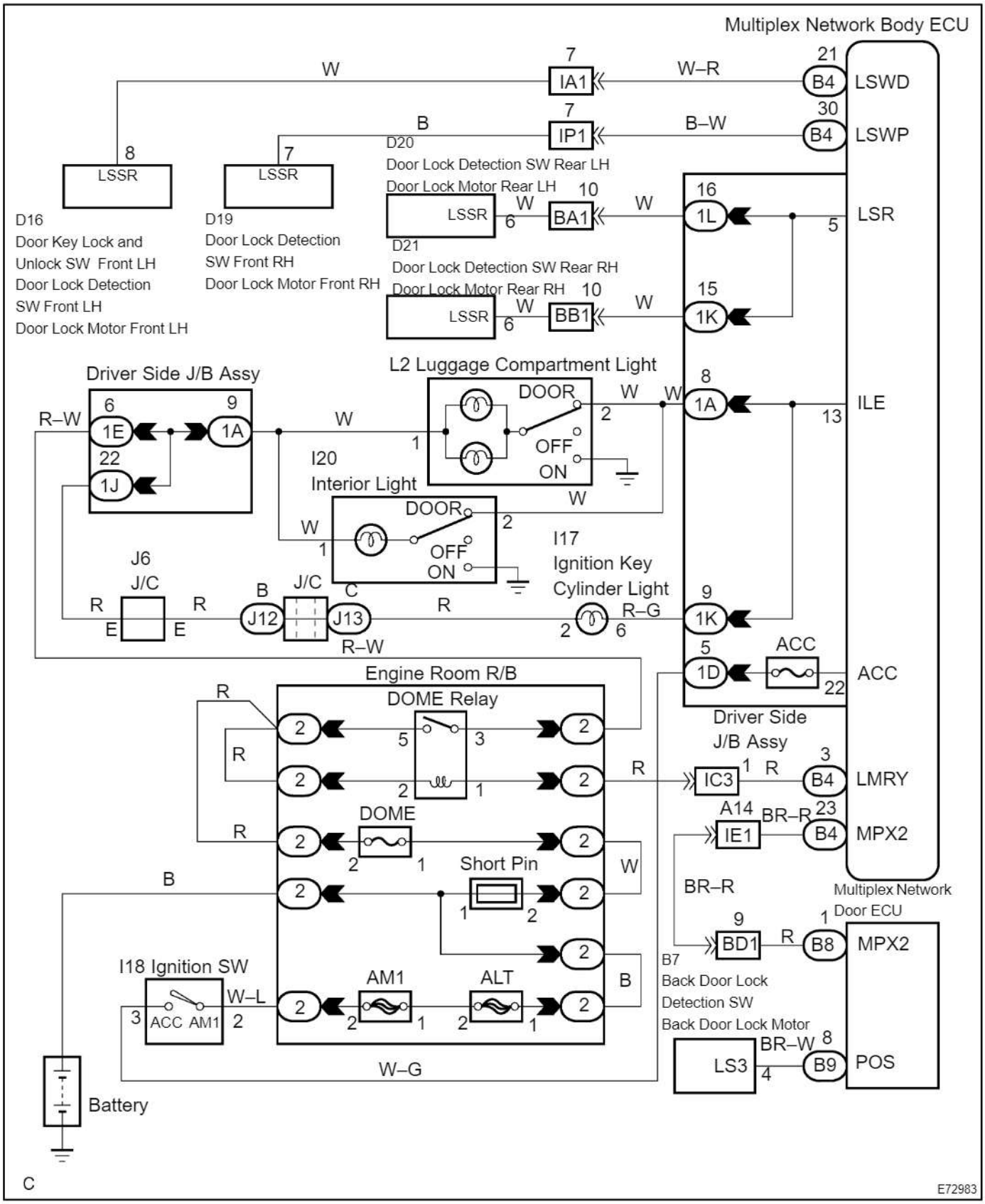
OK

REPLACE HEADLAMP DIMMER SWITCH ASSY

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ROOM LAMP ASSY NO.1 DOES NOT LIGHT UP

WIRING DIAGRAM



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INSPECTION PROCEDURE

1	CHECK LIGHT

(a) Check the condition A or B, when room lamp assy No.1 does not light up.

A	Door Lock → Door Unlock
B	IG Switch ACC → OFF

B → **Go to step 10**

A

2	CHECK DOOR LOCK

(a) Check which door lamp does not light up.

A	Driver side door
B	Passenger side door
C	Rear door
D	Back door

B → **Go to step 5**

C → **Go to step 7**

D → **Go to step 9**

A

3	CHECK FRONT DOOR W/MOTOR LOCK ASSY LH

(a) Check the continuity between terminal 8 (LSSR) of front door w/motor lock assy LH and body ground.

Standard:

Door lock position	Specified condition
Lock	No continuity
Unlock	Continuity

NG → **REPLACE FRONT DOOR W/MOTOR LOCK ASSY LH**

OK

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4	CHECK HARNESS AND CONNECTOR(BETWEEN MULTIPLEX NETWORK BODY ECU AND FRONT DOOR W/MOTOR LOCK ASSY)

(a) Check the continuity between terminal 8 (LSSR) of the front door w/motor door lock assy LH and B4–21 (LSWD) of the multiplex network body ECU.
Standard: There is continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE MULTIPLEX NETWORK BODY ECU

5	CHECK FRONT DOOR W/MOTOR LOCK ASSY RH

(a) Check the continuity between terminal 7 (LSSR) of the front door w/motor lock assy RH and body ground.

Standard:

Door lock position	Specified condition
Lock	No continuity
Unlock	Continuity

NG → **REPLACE FRONT DOOR W/MOTOR LOCK ASSY RH**

OK

6	CHECK HARNESS AND CONNECTOR(BETWEEN MULTIPLEX NETWORK BODY ECU AND FRONT DOOR W/MOTOR LOCK ASSY)

(a) Check the continuity between terminal 7 (LSSR) of the front door w/motor door lock assy RH and B4–30 (LSWP) of the multiplex network body ECU.
Standard: There is continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE MULTIPLEX NETWORK BODY ECU

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7	CHECK REAR DOOR LOCK

(a) Check which door lamp does not light up.
(b) Measure voltage between terminals when unlocking the door.

Standard:

Malfunction part	Tester connection	Specified condition
Rear door LH	6 (LSSR) – Body ground	No continuity → Continuity
Rear door RH	6 (LSSR) – Body ground	No continuity → Continuity

NG → REPLACE REAR DOOR LOCK

OK

8	CHECK HARNESS AND CONNECTOR(BETWEEN DRIVER SIDE JUNCTION BLOCK AND REAR DOOR LOCK)

(a) Check the continuity between terminals as shown in the chart below.

Standard:

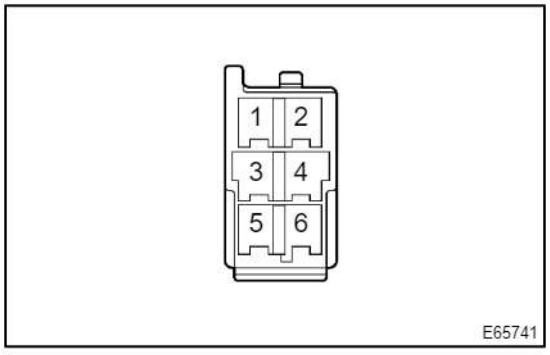
Malfunction part	Tester connection	Condition
Rear door LH	1L–16 (LSR) – Rear door lock LH	Continuity
Rear door RH	1K–15 (LSR) – Rear door lock RH	Continuity

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

CHECK AND REPLACE DRIVE SIDE JUNCTION BLOCK

9	CHECK W/MOTOR BACK DOOR LOCK ASSY



(a) Measure voltage between terminals 4 (LS3) of w/motor back door lock assy and body ground.

Standard:

Door lock position	Specified condition
Lock	No continuity
Unlock	Continuity

NG → REPLACE W/MOTOR BACK DOOR LOCK ASSY

OK

REPAIR OR REPLACE HARNESS OR CONNECTOR

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10	CHECK DRIVE SIDE JUNCTION BLOCK

(a) Measure voltage between terminal 1D–5 (ACC) of the driver side junction block and body ground.

Standard:

IG SW	Specified condition
ACC	10 – 14 V
OFF	Below 1 V

OK → **Go to step 12**

NG

11	CHECK HARNESS AND CONNECTOR(BETWEEN DRIVER SIDE JUNCTION BLOCK AND IGNITION SWITCH ASSY)

(a) Check the continuity between terminal 1D–5 (ACC) of the driver side junction block and the ignition switch assy.

Standard: There is continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE IGNITION OR STARTER SWITCH ASSY

12	CHECK DRIVE SIDE JUNCTION BLOCK(ILE)

(a) Measure voltage between terminals as shown in the chart below when turning the ignition switch to OFF.

Standard:

Item	Tester connection	Specified condition
Transponder key amplifier (Ignition key cylinder light)	1K–9 (ILE) – Body ground	10 – 14 V → Below 1 V
Room lamp assy No.1, No.2 (Interior light, Luggage compartment Light)	1A–8 (ILE) – Body ground	10 – 14 V → Below 1 V

NG → **CHECK AND REPLACE DRIVE SIDE JUNCTION BLOCK**

OK

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13	CHECK HARNESS AND CONNECTOR(BETWEEN DRIVER SIDE JUNCTION BLOCK AND LAMP)

(a) Disconnect the connector of the driver side junction block.
(b) Check the continuity between terminals as shown in the chart below.

Standard:

Item	Tester connection	Specified condition
Transponder key amplifier	1K–9 (ILE) – Transponder key amplifier	Continuity
Room lamp assy No.1, No.2	1A–8 (ILR) – Room lamp assy	Continuity

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

14	CHECK TRANSPONDER KEY AMPLIFIER(IGNITION KEY CYLINDER LIGHT)

(a) Check the continuity between terminals of transponder key amplifier (ignition key cylinder light).
Standard: There is continuity.

NG → REPLACE TRANSPONDER KEY AMPLIFIER

OK

15	CHECK ROOM LAMP ASSY NO.1

(a) Check the continuity between terminals of the room lamp assy No.1.
Standard: There is continuity.

NG → REPLACE ROOM LAMP ASSY NO.1

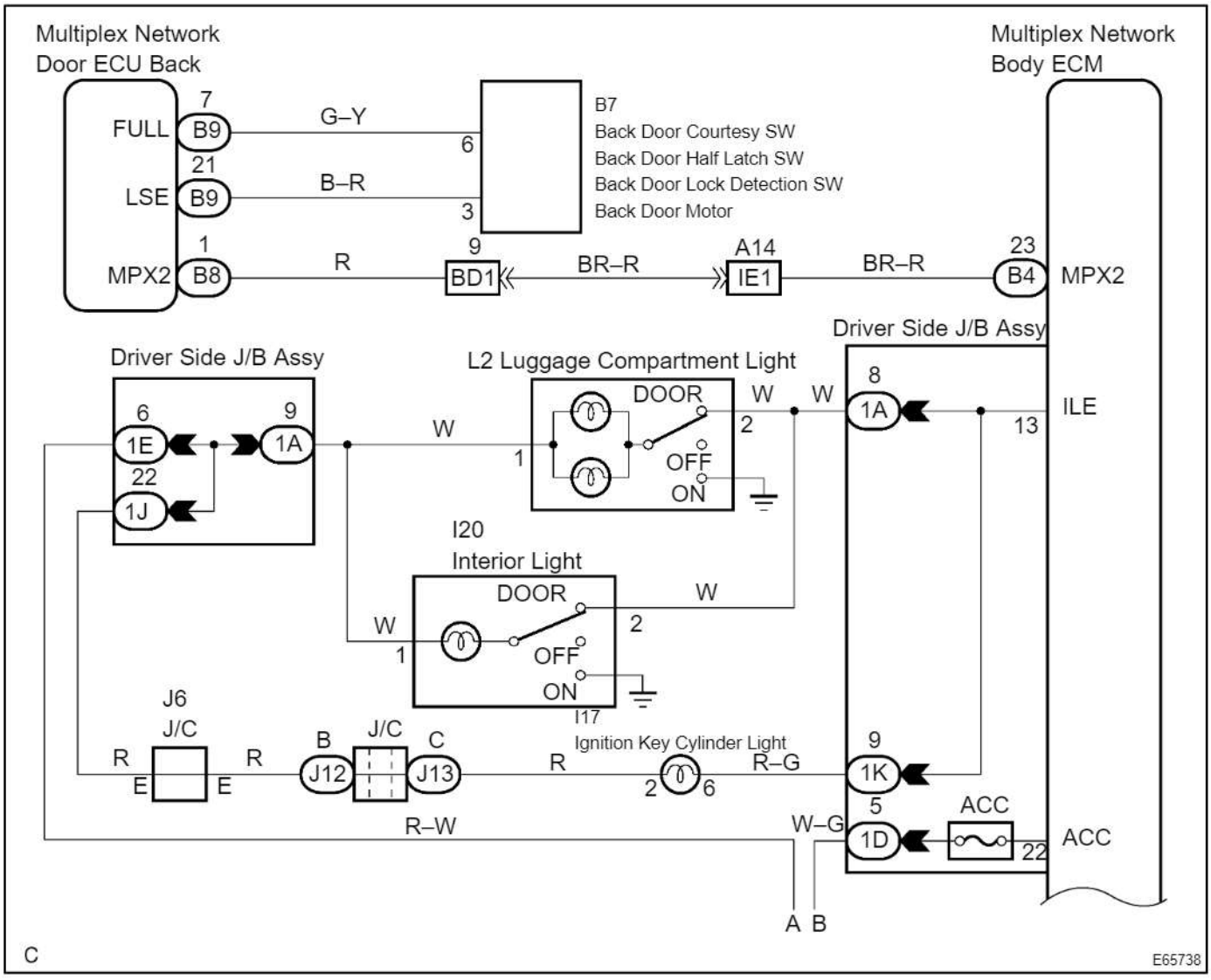
OK

REPLACE ROOM LAMP ASSY NO.2

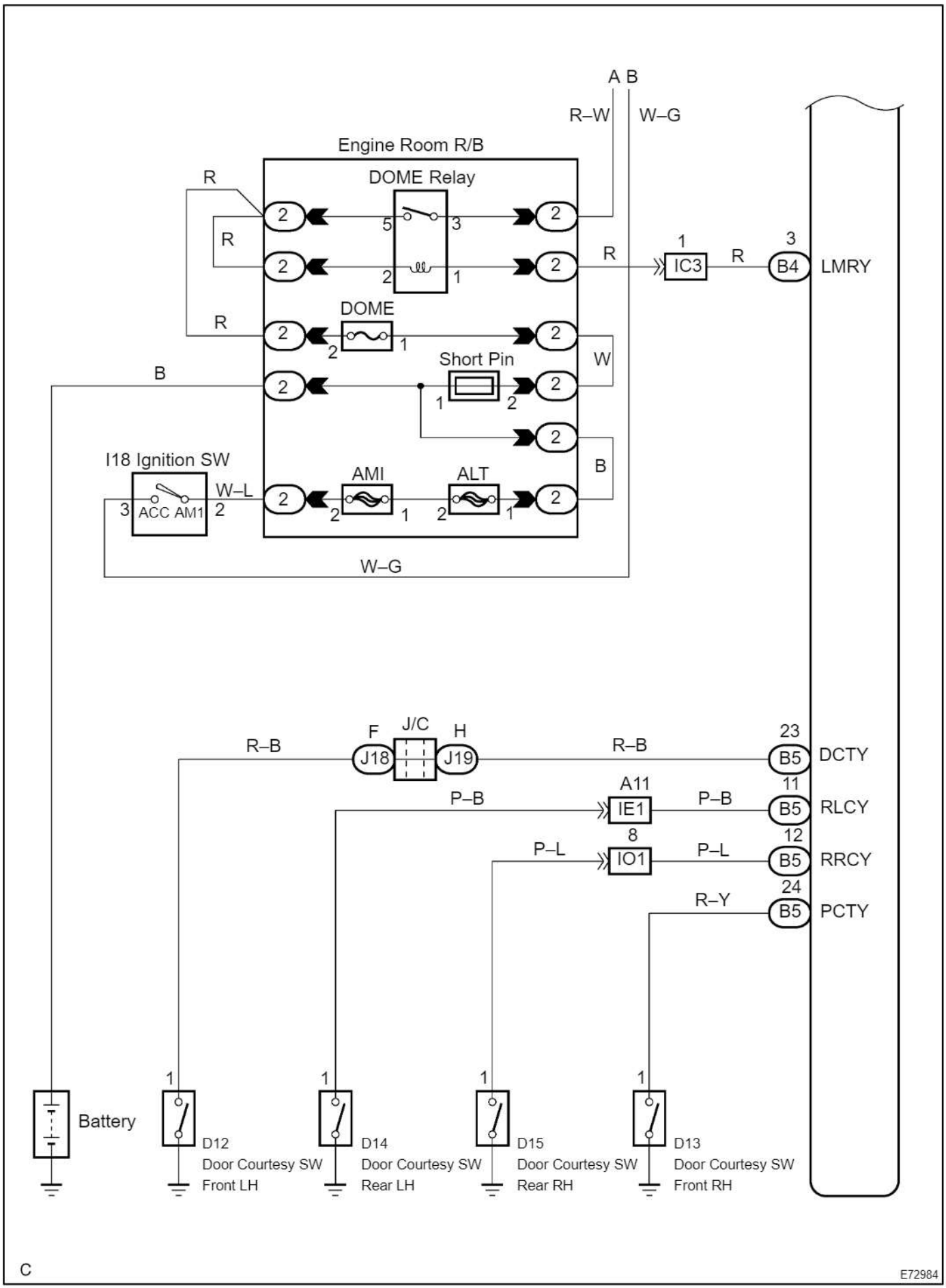
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ROOM LAMP ASSY NO.1 DOES NOT GO OFF

WIRING DIAGRAM



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INSPECTION PROCEDURE

1	CHECK MULTIPLEX NETWORK BODY ECU

(a) Measure voltage between terminals when opening the front door LH only.

Standard:

Front door LH	Tester connection	Specified condition
Close	B5–23 (DCTY) – Body ground	10 – 14 V
Open	B5–23 (DCTY) – Body ground	Below 1 V

OK → **CHECK AND REPLACE MULTIPLEX NETWORK BODY ECU**

NG

2	INSPECT COURTESY LAMP SWITCH(DRIVER SIDE DOOR)

(a) Inspect the front door courtesy lamp switch continuity.

(1) Check that there is a continuity between terminal 1 and body ground when operating the switch.

Standard:

ON (When shaft is pressed): No continuity

OFF (When shaft is not pressed): Continuity

NG → **REPLACE COURTESY LAMP SWITCH(DRIVER SIDE DOOR)**

OK

3	CHECK HARNESS AND CONNECTOR(BETWEEN MULTIPLEX NETWORK BODY ECU AND FRONT DOOR COURTESY LAMP SWITCH LH)

(a) Disconnect the connector of the multiplex network body ECU.

(b) Check the continuity between terminal B5–23 (DCTY) and the front door courtesy lamp switch.

Standard: There is continuity.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4	CHECK MULTIPLEX NETWORK BODY ECU

(a) Measure voltage between terminals when opening the front door RH only.

Standard:

Front door RH	Tester connection	Specified condition
Close	B5–24 (PCTY) – Body ground	10 – 14 V
Open	B5–24 (PCTY) – Body ground	Below 1 V

OK → **CHECK AND REPLACE MULTIPLEX NETWORK BODY ECU**

NG

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5	INSPECT COURTESY LAMP SWITCH(PASSENGER SIDE DOOR)

(a) Inspect front door courtesy lamp switch continuity.
(1) Check that the continuity exists between terminal 1 and body ground when switch operating the switch.

Standard:
ON (When shaft is pressed): No continuity
OFF (When shaft is not pressed): Continuity

NG → **REPLACE COURTESY LAMP SWITCH(PASSENGER SIDE DOOR)**

OK

6	CHECK HARNESS AND CONNECTOR(BETWEEN MULTIPLEX NETWORK BODY ECU AND FRONT DOOR COURETESY LAMP SWITCH RH)

(a) Disconnect the connector of the multiplex network body ECU.
(b) Check the continuity between terminal B5–24 (PCTY) and the front door courtesy lamp switch.
Standard: There is continuity.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

7	CHECK MULTIPLEX NETWORK BODY ECU

(a) Measure voltage between terminals when opening the rear door LH only.

Standard:

Rear door LH	Tester connection	Specified condition
Close	B5–11 (RLCY) – Body ground	10 – 14 V
Open	B5–11 (RLCY) – Body ground	Below 1 V

OK → **CHECK AND REPLACE MULTIPLEX NETWORK BODY ECU**

NG

8	INSPECT COURTESY LAMP SWITCH(REAR DOOR RH)

(a) Inspect rear door courtesy lamp switch RH continuity.
(1) Check that the continuity exists between terminal 1 and body ground when operating the switch.

Standard:
ON (When shaft is pressed): No continuity
OFF (When shaft is not pressed): Continuity

NG → **REPLACE COURTESY LAMP SWITCH(REAR DOOR RH)**

OK

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9	CHECK HARNESS AND CONNECTOR(BETWEEN MULTIPLEX NETWORK BODY ECU AND REAR DOOR COUTESY LAMP SWITCH LH)

(a) Disconnect the connector of the multiplex network body ECU.
(b) Check the continuity between terminal B5–11 (RLCY) and the rear door courtesy lamp switch RH.
Standard: There is continuity.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

10	CHECK MULTIPLEX NETWORK BODY ECU

(a) Measure voltage between terminals when opening the rear door RH only.
Standard:

Rear door RH	Tester connection	Specified condition
Close	B5–12 (RRCY) – Body ground	10 – 14 V
Open	B5–12 (RRCY) – Body ground	Below 1 V

OK → **CHECK AND REPLACE MULTIPLEX NETWORK BODY ECU**

NG

11	INSPECT COURTESY LAMP SWITCH(REAR DOOR LH)

(a) Inspect rear door courtesy lamp switch LH continuity.
(1) Check that the continuity exists between terminal 1 and body ground when operating the switch.
Standard:
ON (When shaft is pressed): No continuity
OFF (When shaft is not pressed): Continuity

NG → **REPLACE COURTESY LAMP SWITCH**

OK

12	CHECK HARNESS AND CONNECTOR(BETWEEN MUTIPLEX NETWORK BODY ECU AND REAR DOOR COUTESY LAMP SWITCH RH)

(a) Disconnect the connector of the multiplex network body ECU.
(b) Check the continuity between terminal B5–12 (RRCY) and body ground.
Standard: There is continuity.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

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13	INSPECT W/MOTOR BACK DOOR LOCK ASSY

(a) Disconnect the connector of the w/motor back door lock assy.
(b) Check the continuity between terminal 3 (LSE) and 6 (LS2) of the w/motor back door lock assy.

Standard:

Back door	Tester connection	Specified condition
Close	3 (LSE) – 6 (LS2)	No continuity
Open	3 (LSE) – 6 (LS2)	Continuity

NG → **REPLACE W/MOTOR BACK DOOR LOCK ASSY**

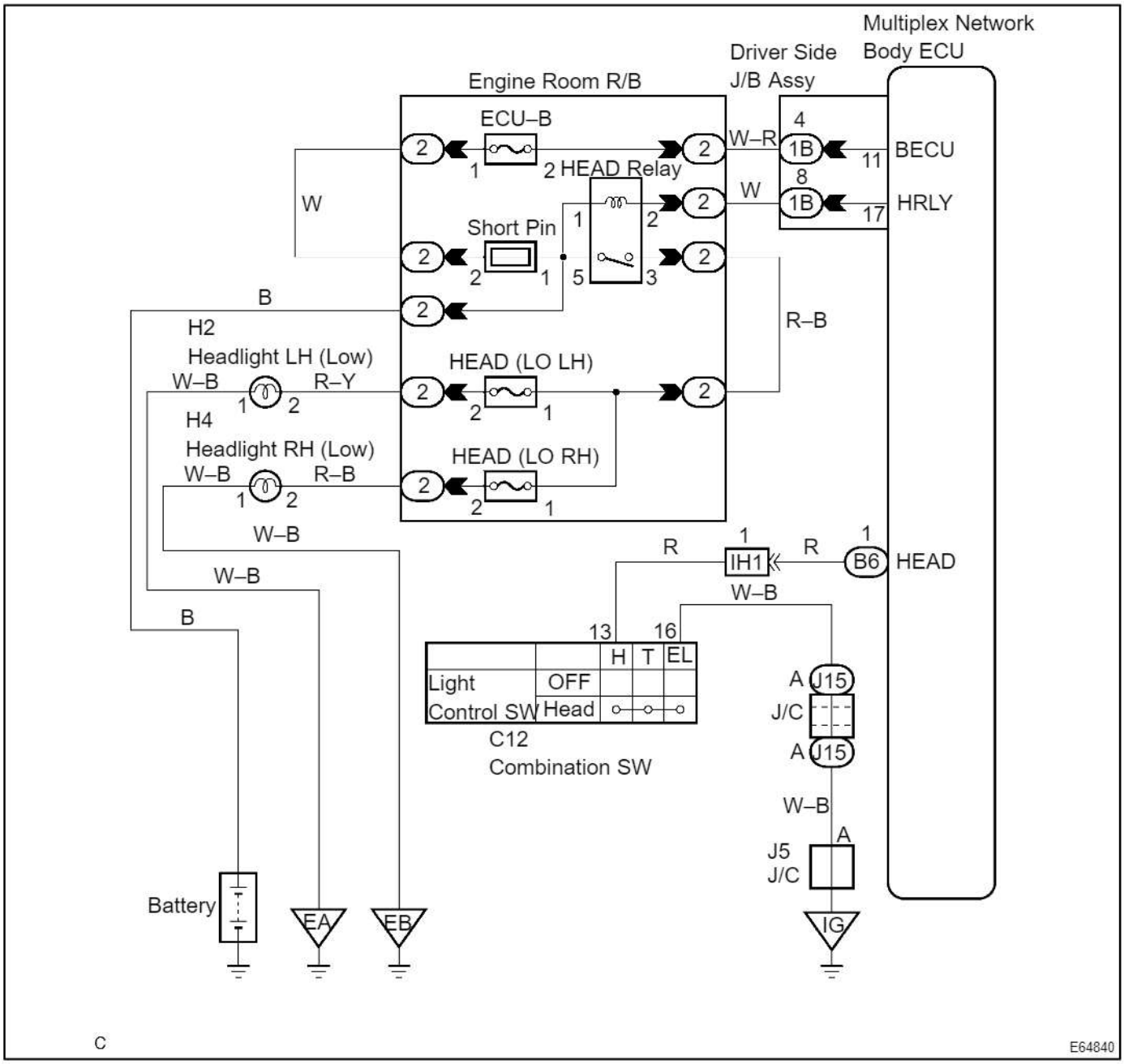
OK

REPAIR OR REPLACE HARNESS OR CONNECTOR

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HEADLIGHT DOES NOT LIGHT UP

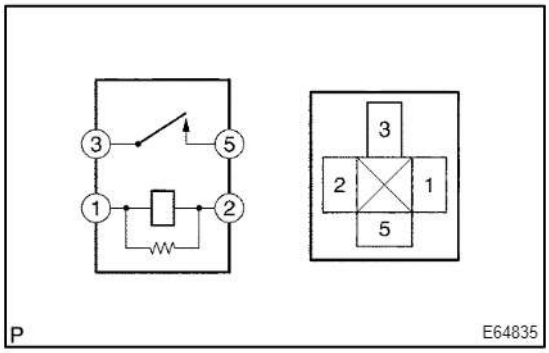
WIRING DIAGRAM



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INSPECTION PROCEDURE

1 INSPECT HEADLAMP RELAY



(a) Check the continuity of the headlamp relay.

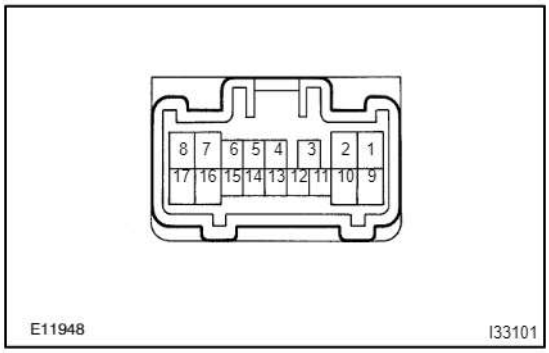
Standard:

Condition	Tester connection	Specified condition
Constant	1 – 2	Continuity
Constant	3 – 5	No continuity
Apply B+ between terminal 1 and 2	3 – 5	Continuity

NG → **REPLACE HEADLAMP RELAY**

OK

2 INSPECT HEADLAMP DIMMER SWITCH ASSY(HEAD)



(a) Inspect light control switch continuity.

(1) Check that there is a continuity between terminals at each switch position as shown in the chart.

Standard:

Switch operation	Tester connection	Specified condition
OFF	–	No continuity
HEAD	13 – 16 – 14	Continuity

NG → **REPLACE HEADLAMP DIMMER SWITCH ASSY**

OK

3 CHECK HARNESS AND CONNECTOR(BETWEEN MULTIPLEX NETWORK BODY ECU AND HEADLAMP DIMMER SWITCH ASSY)

(a) Check the continuity terminal B6–1 (HEAD) of the multiplex network body ECU and the headlamp dimmer switch assy.

Standard: There is continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

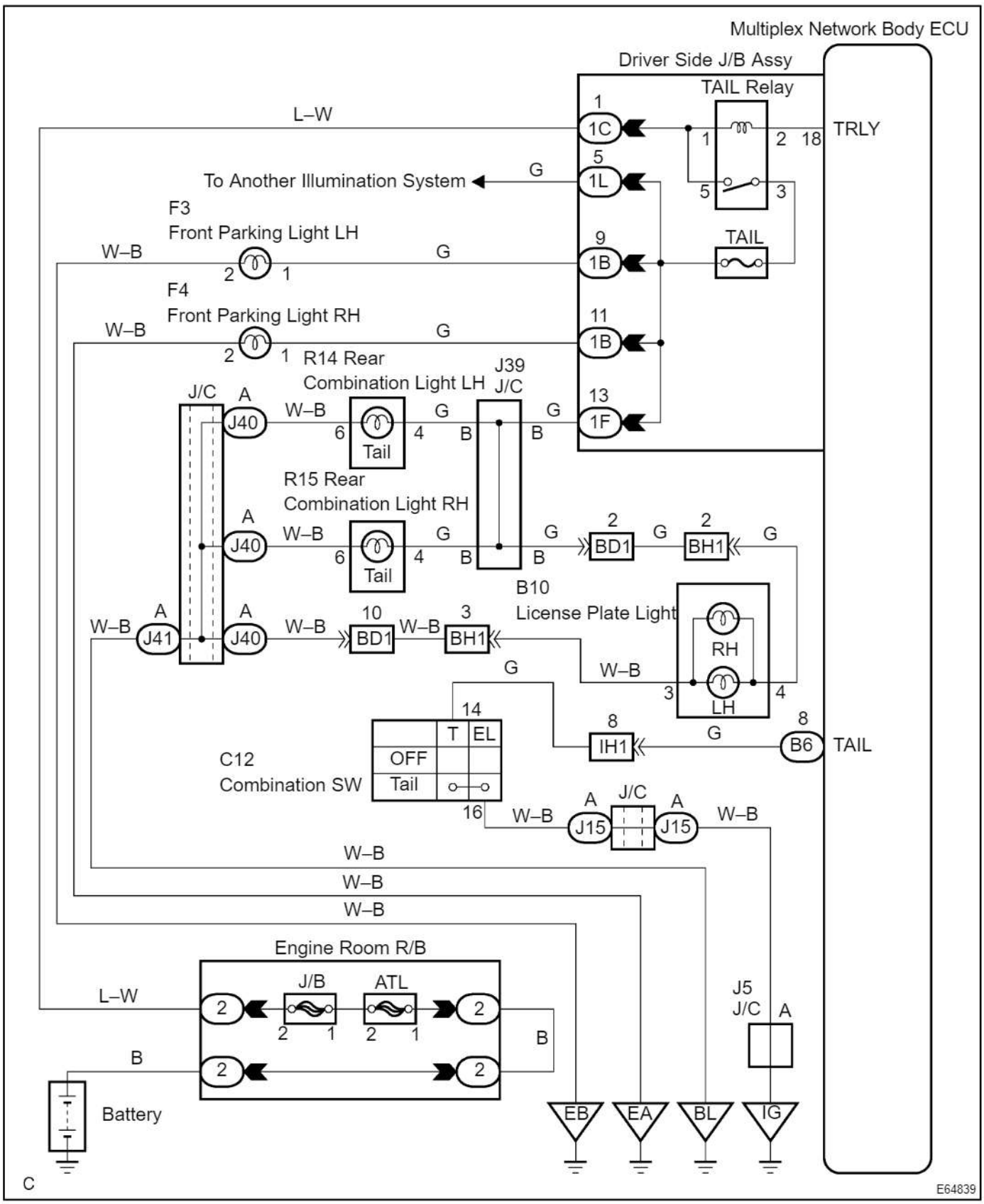
OK

CHECK AND REPLACE MULTIPLEX NETWORK BODY ECU

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TAILLIGHT DOES NOT LIGHT UP

WIRING DIAGRAM



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INSPECTION PROCEDURE

1 CHECK LIGHT

(a) Check the condition A, B or C, when tail lamp does not light up.

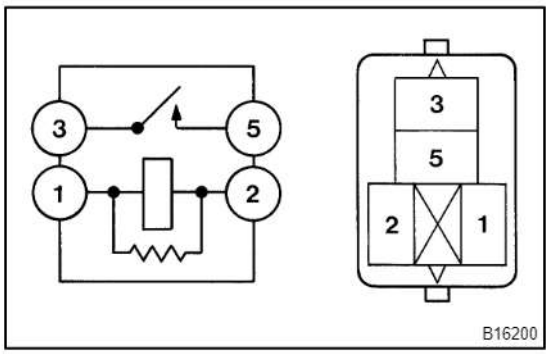
A	All
B	Parking lamp only
C	Combination lamp only

B → **Go to step 5**

C → **Go to step 7**

A

2 INSPECT TAIL LAMP RELAY



(a) Inspect tail lamp relay continuity.

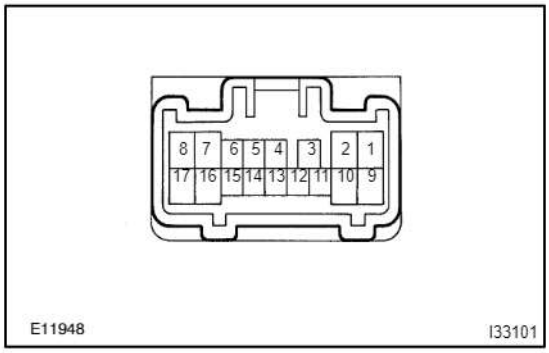
Standard:

Condition	Tester connection	Specified condition
Constant	1 – 2	Continuity
Constant	3 – 5	No continuity
Apply B+ between terminal 1 and 2	3 – 5	Continuity

NG → **REPLACE TAIL LAMP RELAY**

OK

3 INSPECT HEADLAMP DIMMER SWITCH ASSY



(a) Inspect light control switch continuity.

(1) Check that there is continuity between terminals at each switch position as shown in the chart.

Standard:

Switch operation	Tester connection	Specified condition
OFF	–	No continuity
TAIL	14 – 16	Continuity

NG → **REPLACE HEADLAMP DIMMER SWITCH ASSY**

OK

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4	CHECK HARNESS AND CONNECTOR(BETWEEN MULTIPLEX NETWORK BODY ECU AND HEAD LAMP DIMMER SWITCH ASSY)

(a) Check the continuity between terminal B6–8 (TAIL) of the multiplex network body ECU and the headlamp dimmer switch assy.
Standard: There is continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE MULTIPLEX NETWORK BODY ECU

5	INSPECT LH HEADLAMP ASSY(PARKING LAMP)

(a) Check that there is a continuity between terminals of headlamp assy.
Standard:
ON: Continuity
OFF: No continuity

OK → **REPLACE LH HEADLAMP ASSY**

NG

6	CHECK HARNESS AND CONNECTOR(BETWEEN DRIVER SIDE JUNCTION BLOCK AND LH HEADLAMP ASSY)

(a) Check the continuity between the terminal parking lamp assy and driver side junction block.
Standard:

Item	Tester connection	Specified condition
Parking lamp LH	1 – 1B–9	Continuity
Parking lamp RH	1 – 1B–11	Continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE DRIVE SIDE JUNCTION BLOCK

7	INSPECT REAR COMBINATION LAMP ASSY LH

(a) Check that there is a continuity between terminals of rear combination lamp assy.
Standard:
ON: Continuity
OFF: No continuity

OK → **REPLACE REAR COMBINATION LAMP ASSY LH**

NG

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8	CHECK HARNESS AND CONNECTOR(BETWEEN DRIVER SIDE JUNCTION BLOCK AND REAR COMBINTIONLAMP ASSY)

(a) Check the continuity terminals 4 of the combination lamp and 1F–13 of the driver side junction block.
Standard: There in continuity

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

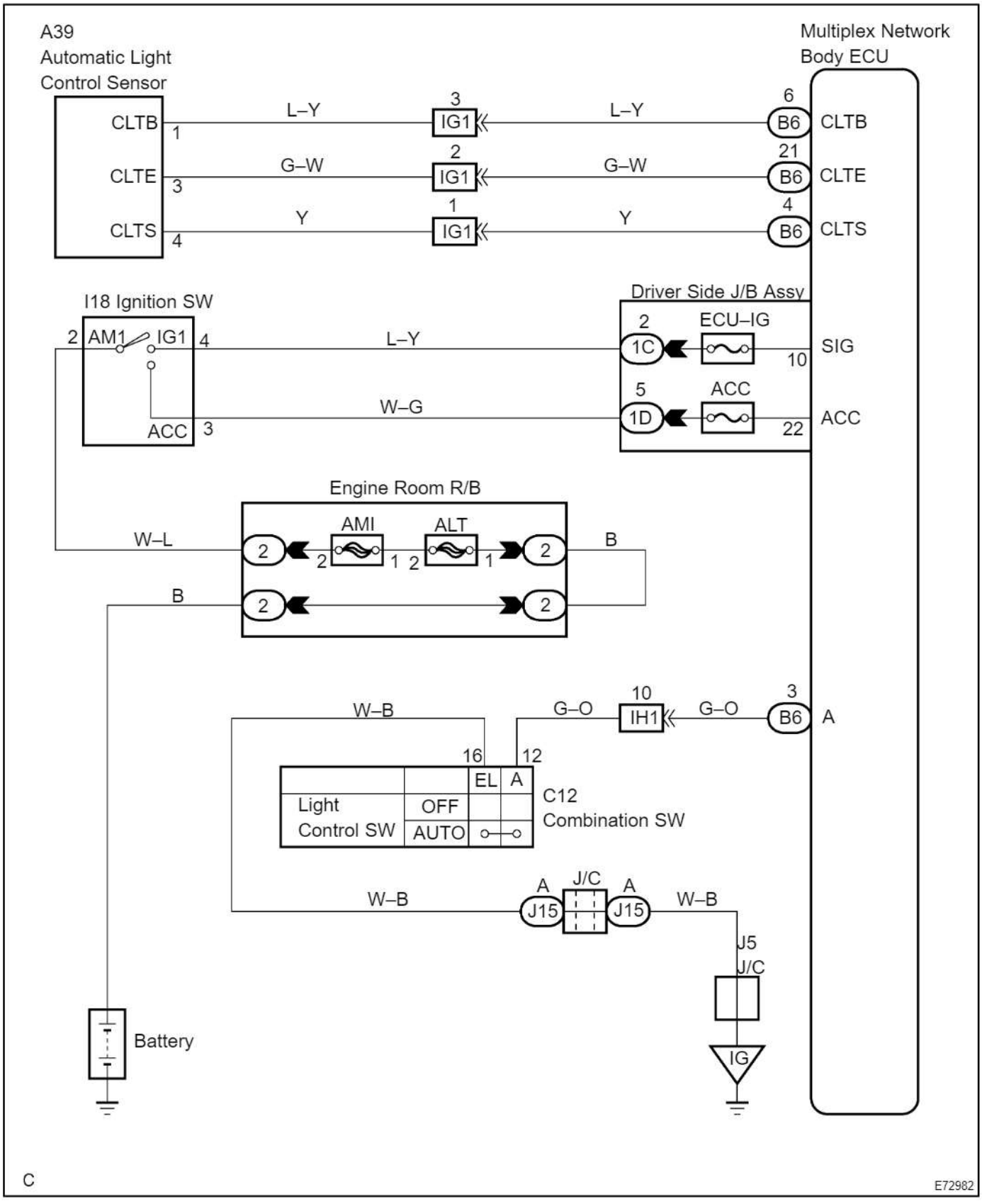
OK

CHECK AND REPLACE DRIVE SIDE JUNCTION BLOCK

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AUTOMATIC LIGHT CONTROL SYSTEM DOES NOT OPERATE

WIRING DIAGRAM



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INSPECTION PROCEDURE

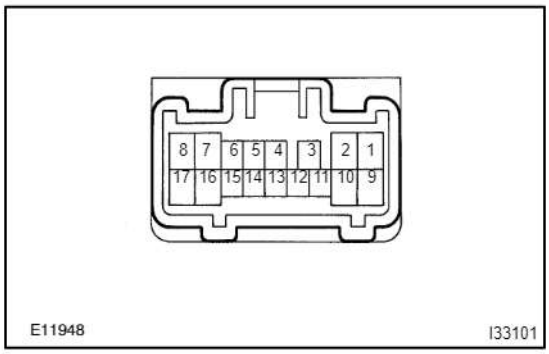
1	CHECK LIGHT

(a) Check that headlamp and taillight light up.

NG → FLOW CHART (GO TO FLOW CHART OF HEADLIGHT OR TAILLIGHT)

OK

2	INSPECT HEADLAMP DIMMER SWITCH ASSY



(a) Inspect light control switch continuity.
  (1) Check that there is a continuity between terminals at each switch position as shown in the chart.

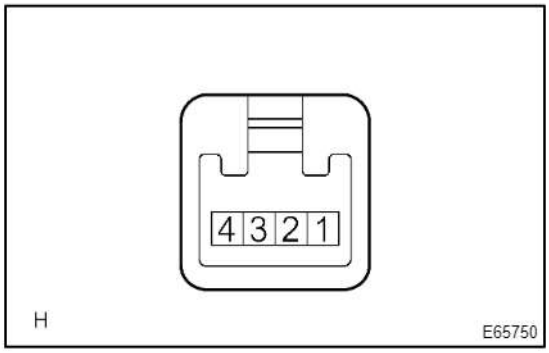
Standard:

Switch operation	Tester connection	Specified condition
OFF	–	No continuity
TAIL	14 – 16	Continuity
HEAD	13 – 16 – 14	Continuity
AUTO	16 – 12	Continuity

NG → REPLACE HEADLAMP DIMMER SWITCH ASSY

OK

3	CHECK AUTOMATIC LIGHT CONTROL SENSOR



(a) Measure voltage between terminals as shown in the chart below.
(b) Check the continuity between terminal 3 (CLTE) and body ground as shown in the chart below.
(c) Using an oscilloscope, check that signal waveform appears between terminals.

Standard:

Terminal No. (Symbol)	Tester connection	Condition	Specified condition
1 (CLTB)	1 – 3	Constant	10 – 14 V
3 (CLTE)	3 – Body ground	Constant	Continuity
4 (CLTS)	4 – 3	IG SW ON Dimmer SW AUTO	Signal waveform appears depending on outside brightness

NG → REPLACE AUTOMATIC LIGHT CONTROL SENSOR

OK

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4	CHECK HARNESS AND CONNECTOR(BETWEEN MULTIPLEX NETWORK BODY ECU AND AUTOMATIC LIGHT CONTROL SENSOR)

(a) Check that signal waveform appears between terminal B6–4 (CLTS) and B6–21 (CLTE) of the multiplex network body ECU.
Standard: Bar appears

(b) Measure voltage between terminals B6–6 (CLTB) and B6–21 (CLTE) of the multiplex network body ECU.
Standard: 10 – 14 V

(c) Check the continuity between terminal B6–21 (CLTE) of the multiplex network body ECU and body ground.
Standard: There is continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

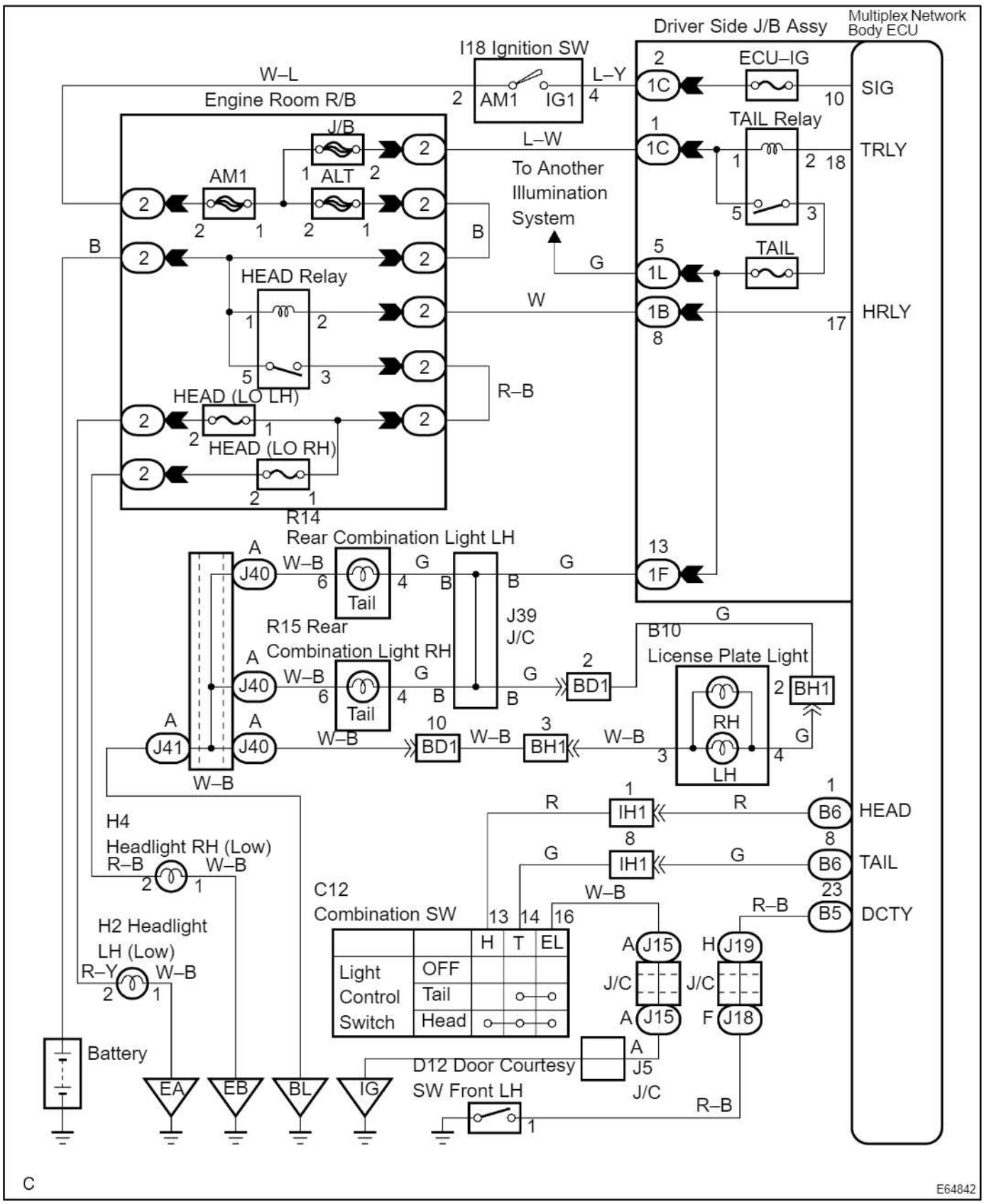
OK

CHECK AND REPLACE MULTIPLEX NETWORK BODY ECU

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LIGHT AUTO TURN OFF SYSTEM LIGHT DOES NOT OPERATE

WIRING DIAGRAM



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INSPECTION PROCEDURE

1	INSPECT COURTESY LAMP SWITCH(DRIVER SIDE DOOR)

(a) Inspect front door courtesy lamp switch continuity.
(1) Check that there is continuity between terminal 1 and body ground, when switch is operated.
Standard:
ON (When shaft is pressed): No continuity
OFF (When shaft is not pressed): Continuity

NG → **REPLACE COURTESY LAMP SWITCH**

OK

2	INSPECT DRIVE SIDE JUNCTION BLOCK(SIG)

(a) Insert the ignition key to the key cylinder.
(b) Measure the voltage between terminal 1C–2 of driver side junction block and body ground.
Standard:

Ignition key	Specified condition
Insert	10 – 14 V
Uninsert	Below 1V

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE DRIVE SIDE JUNCTION BLOCK

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WIPER AND WASHER SYSTEM

052AJ-04

HOW TO PROCEED WITH TROUBLESHOOTING

1	VEHICLE BROUGHT TO WORK SHOP

2	CUSTOMER PROBLEM ANALYSIS (See page 05–1493)

3	PROBLEM SYMPTOMS TABLE (See page 05–1500)

4	TERMINAL OF ECU (See page 05–1497)

5	CIRCUIT INSPECTION (See page 05–1501 – 05–1509)

6	IDENTIFICATION OF PROBLEM

7	REPAIR OR REPLACE

8	CONFIRMATION TEST

END

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052AK-04

CUSTOMER PROBLEM ANALYSIS CHECK

FRONT AND REAR WIPER SYSTEM Check Sheet

Inspector's name: _____

Customer's Name		**Registration No.**	
		Registration Year	
		Frame No.	
Date Vehicle Brought in	/ /	**Odometer Reading**	**km Mile**

Date Problem First Occurred		/ /
Frequency Problem Occurs		☐ Constant ☐ Sometimes (times per day, month) ☐ Once only
Weather Conditions When Problem Occurred	**Weather**	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Various/ Others
	Outdoor Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold (Approx. °F (°C))

Malfunction System	☐ Front Wiper System
	☐ Front Washer System
	☐ Rear Wiper System
	☐ Rear Washer System

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052AL-04

PRE–CHECK

1. DATA LIST

HINT:

According to the DATA LIST displayed by the hand–held tester, you can read the value of the switch, sensor, actuator and so on without parts removal. Reading the DATA LIST as a first step of troubleshooting is one of the method to shorten the labor time.

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch to ON.
(c) According to the display on tester, read the "DATA LIST".

Item	Measurement Item/ Display (Range)	Normal Condition	Diagnostic Note
WIPER TURN SW	Rear wiper turn position switch signal/ON or OFF	ON: Rear wiper is turning position OFF: Rear wiper is other position	–
WIPER RTRCT SW	Rear wiper retracting switch signal/ON or OFF	ON: Rear wiper is retract position OFF: Rear wiper is other position	–
WIPER STOP POS	Rear wiper stop position signal/ON or OFF	ON: Rear wiper is stop position OFF: Rear wiper is other position	–

2. ACTIVE TEST

HINT:

Performing the ACTIVE TEST using the hand–held tester allows the relay, VSV, actuator and so on to operate without parts removal. Performing the ACTIVE TEST as a first step of troubleshooting is one of the method to shorten the labor time.

It is possible to display the DATA LIST during the ACTIVE TEST.

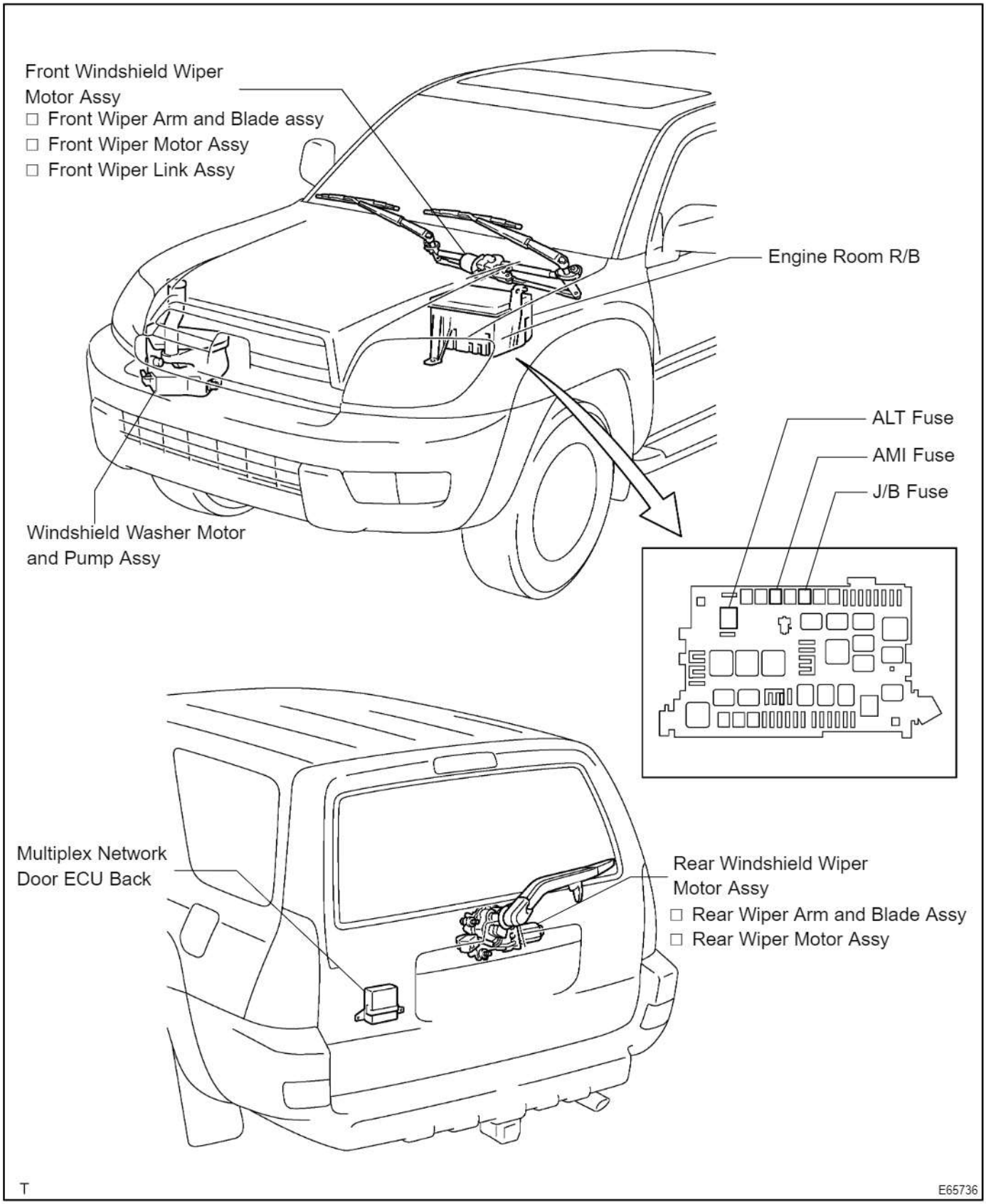
(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch to ON.
(c) According to the display on tester, perform the "ACTIVE TEST".

Item	Test Details	Diagnostic Note
REAR WIPER	Rear wiper ON/OFF	–

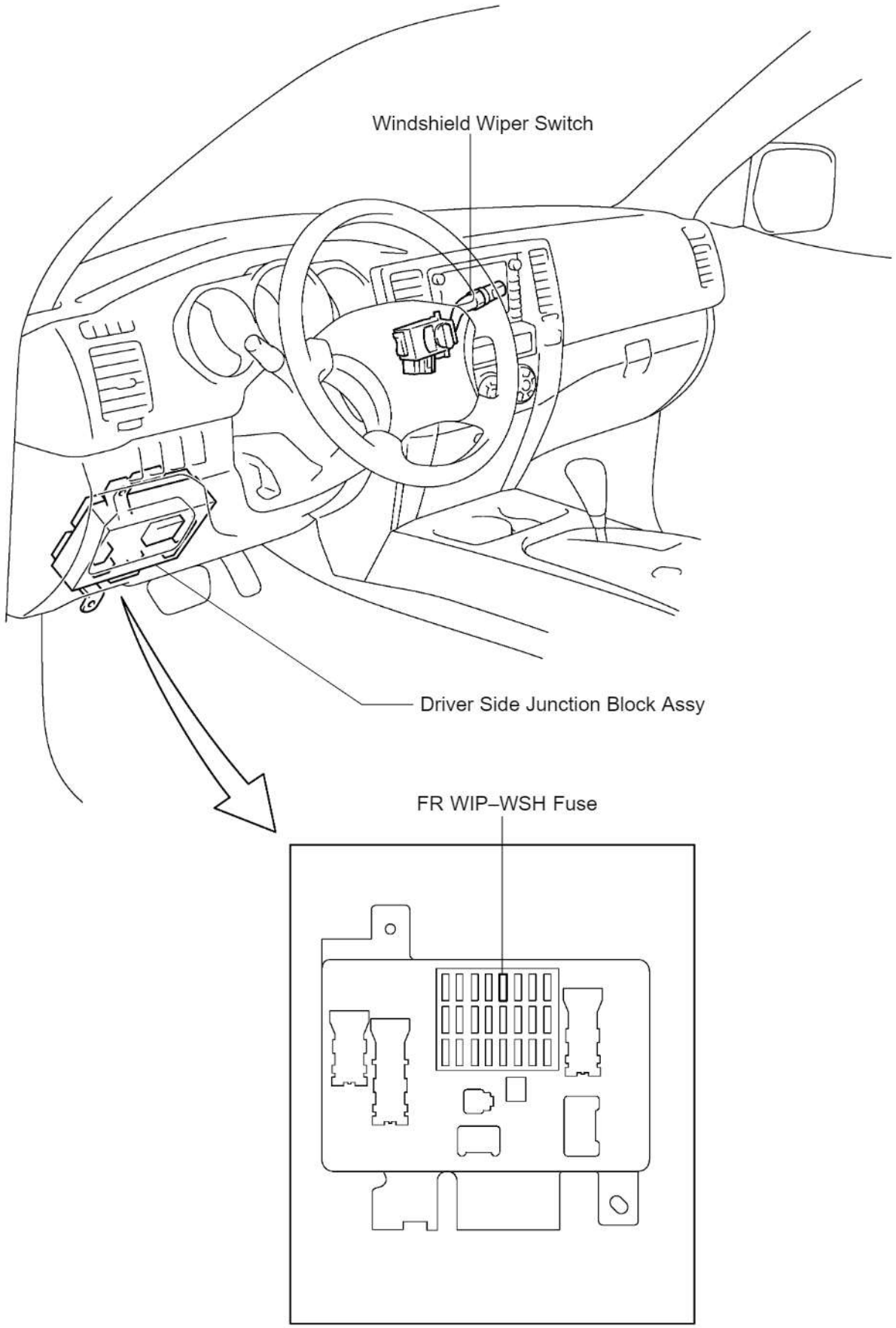
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059W6-01

LOCATION



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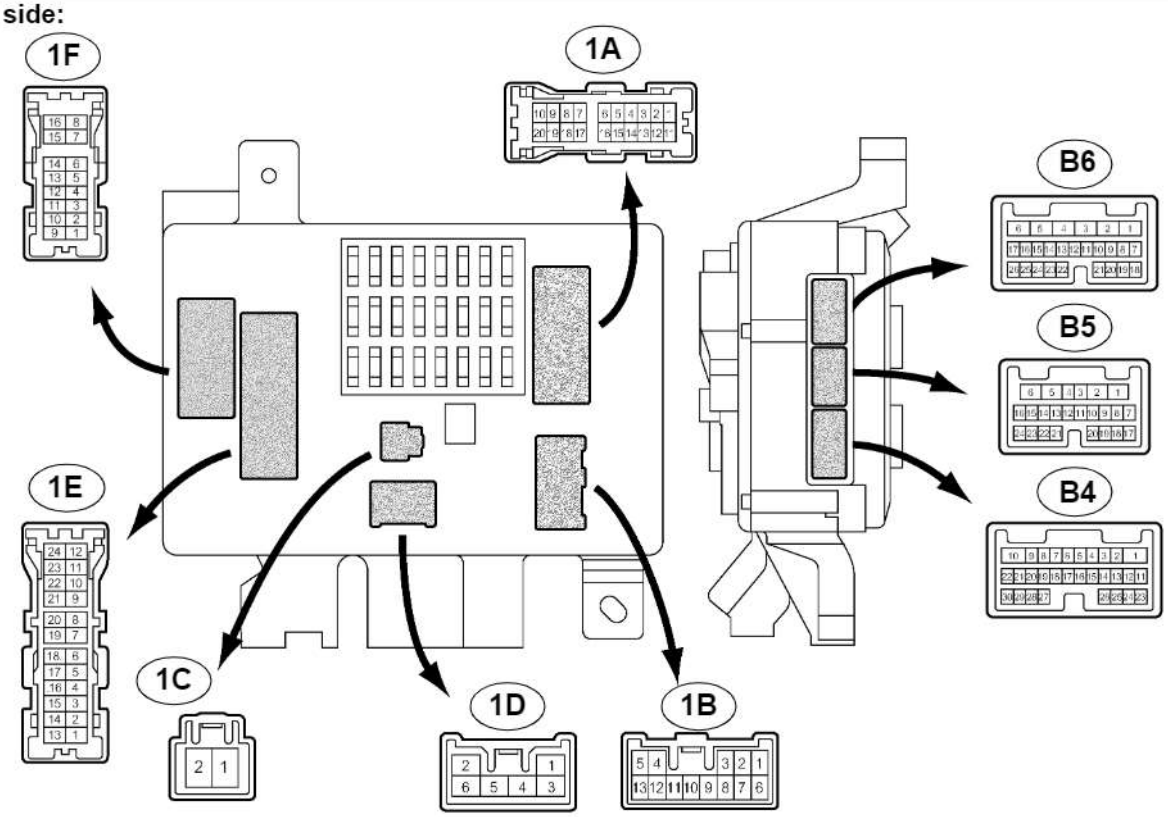
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056E4-02

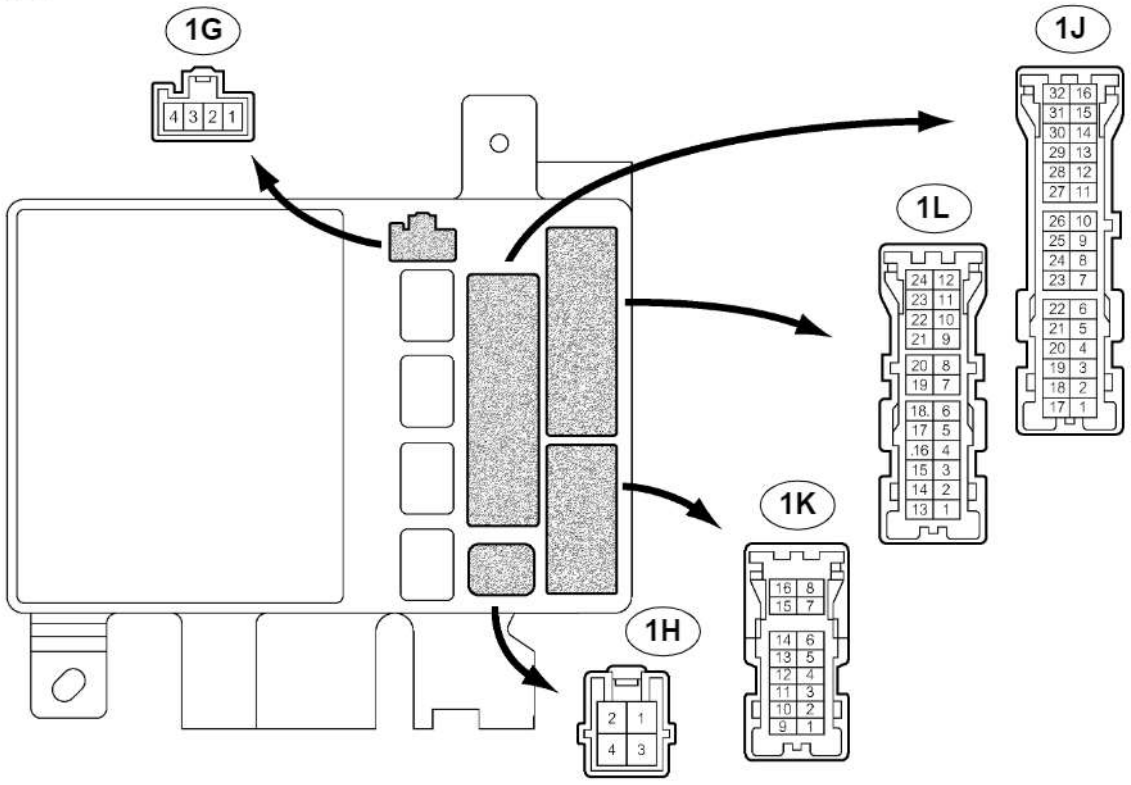
TERMINALS OF ECU

1. Multiplex Network Body Computer

Front side:



Back side:



H E65748 E65749

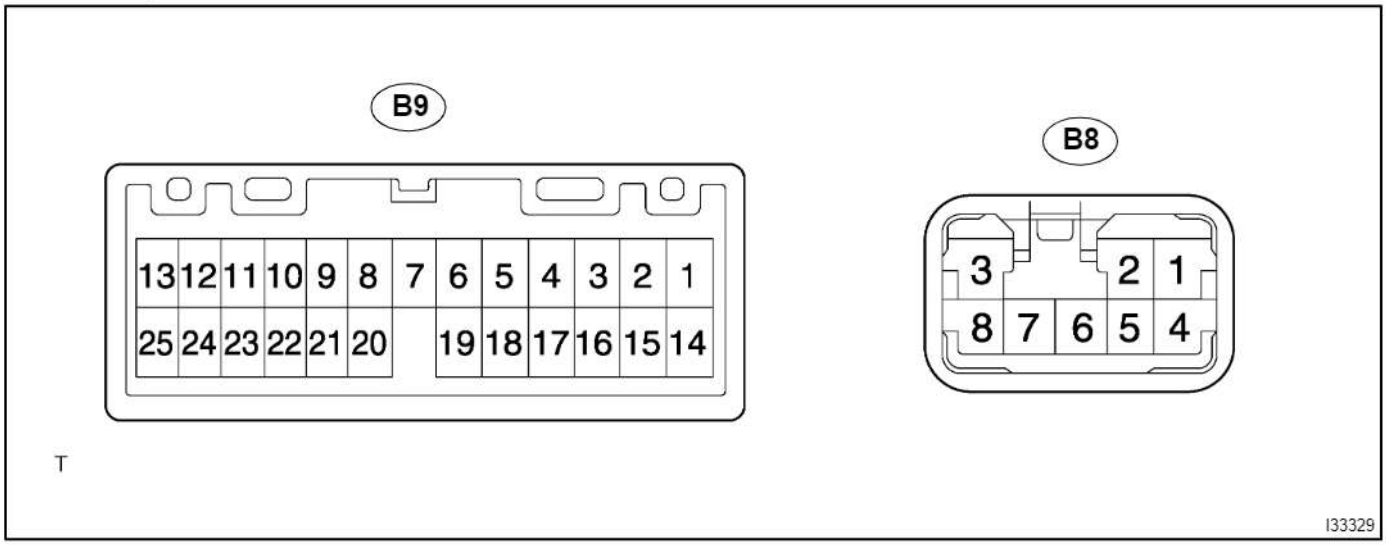
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Terminal No. (Symbols)	Wiring color	Condition	Specified condition
1B–1 ⇔ 1H–2 (WMTR ⇔ GND1,2)	–	Rear washer switch OFF → ON	10 – 14 V → Below 1 V
1H–2 ⇔ Body ground (GND1 ⇔ Body ground)	–	Constant	Below 1 V
1C–2 ⇔ 1H–2 (SIG ⇔ GND1,2)	–	Ignition switch is OFF → ON	Below 1 V → 10 – 14 V
1H–2 ⇔ Body Ground (GND2 ⇔ Body ground)	–	Constant	Bellow 1 V
B4–23 ⇔ 1H–2 (MPX2 ⇔ GND1, 2)	BR–R ⇔ –	Ignition switch is ON	Signal waveform
B6–9 ⇔ 1H–2 (RWINT ⇔ GND1, 2)	BR–W ⇔ –	Ignition switch is ON and rear wiper switch is OFF → INT	10 – 14 V → Below 1 V
B6–10 ⇔ 1H–2 (RWON ⇔ GND1, 2)	GR–R ⇔ –	Ignition switch is ON and rear wiper switch is OFF → ON	10 – 14 V → Below 1 V

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2. Multiplex Network Door ECU Back:



Terminal No. (Symbols)	Wiring Color	Condition	STD Voltage (V)
B8–1 ⇔ B8–3 (MPX2 ⇔ GND)	R ⇔ W–B	Ignition switch is ON	Signal waveform
B8–3 ⇔ Body ground (GND ⇔ Body ground)	W–B ⇔ –	Constant	Below 1 V
B8–4 ⇔ B8–3 (BDR ⇔ GND)	L ⇔ W–B	Constant	10 – 14 V
B8–6 ⇔ B8–3 (SIG ⇔ GND)	B ⇔ W–B	Ignition switch is OFF → ON	Below 1 V → 10 – 14 V
B9–1 ⇔ B8–3 (WIP– ⇔ GND)	R–G ⇔ W–B	Ignition switch is ON and wiper switch ON or INT	Puls generation
B9–2 ⇔ B8–3 (WIP+ ⇔ GND)	Y–G ⇔ W–B	Ignition switch is ON and wiper switch ON or INT	Puls generation
B9–3 ⇔ B8–3 (W ⇔ GND)	BR–B ⇔ W–B	Ignition switch is ON	Puls generation
B9–11 ⇔ B8–3 (IC+ ⇔ GND)	Y–G ⇔ W–B	Ignition switch is ON	Below 1 V → 10 – 14 V
B9–16 ⇔ B8–3 (IC1 ⇔ GND)	B–O ⇔ W–B	Back door power window up and down	Puls generation
B9–17 ⇔ B8–3 (IC2 ⇔ GND)	W–R ⇔ W–B	Back door power window up and down	Puls generation
B9–23 ⇔ B8–3 (IC– ⇔ GND)	L–W ⇔ W–B	Constant	Below 1 V

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052AN-04

PROBLEM SYMPTOMS TABLE

FRONT WIPER AND WASHER SYSTEM:

Symptom	Suspect Area	See page
Front wiper and washer system does not operate (All).	1. FR WIP–WSH Fuse 2. Windshield wiper switch assy 3. Harness or connector	– 66–3 –
Front wiper system does not operate.	1. Windshield wiper switch assy 2. Front wiper motor assy 3. Harness or connector	66–3 66–3 –
Front washer system does not operate.	1. Windshield wiper switch assy 2. Front washer motor assy 3. Harness or connector	66–3 66–2 –

REAR WIPER AND WASHER SYSTEM:

Symptom	Suspect Area	See page
Rear wiper and washer system does not operate (All).	1. ALT, AMI ECU–IG Fuse 2. Combination switch power source circuit	– 05–1501
Rear wiper system does not operate.	1. Combination switch power source circuit 2. Rear wiper motor circuit	05–1501 05–1506
Rear washer system does not operate.	1. Combination switch power source circuit 2. Rear washer motor circuit	05–1501 05–1509

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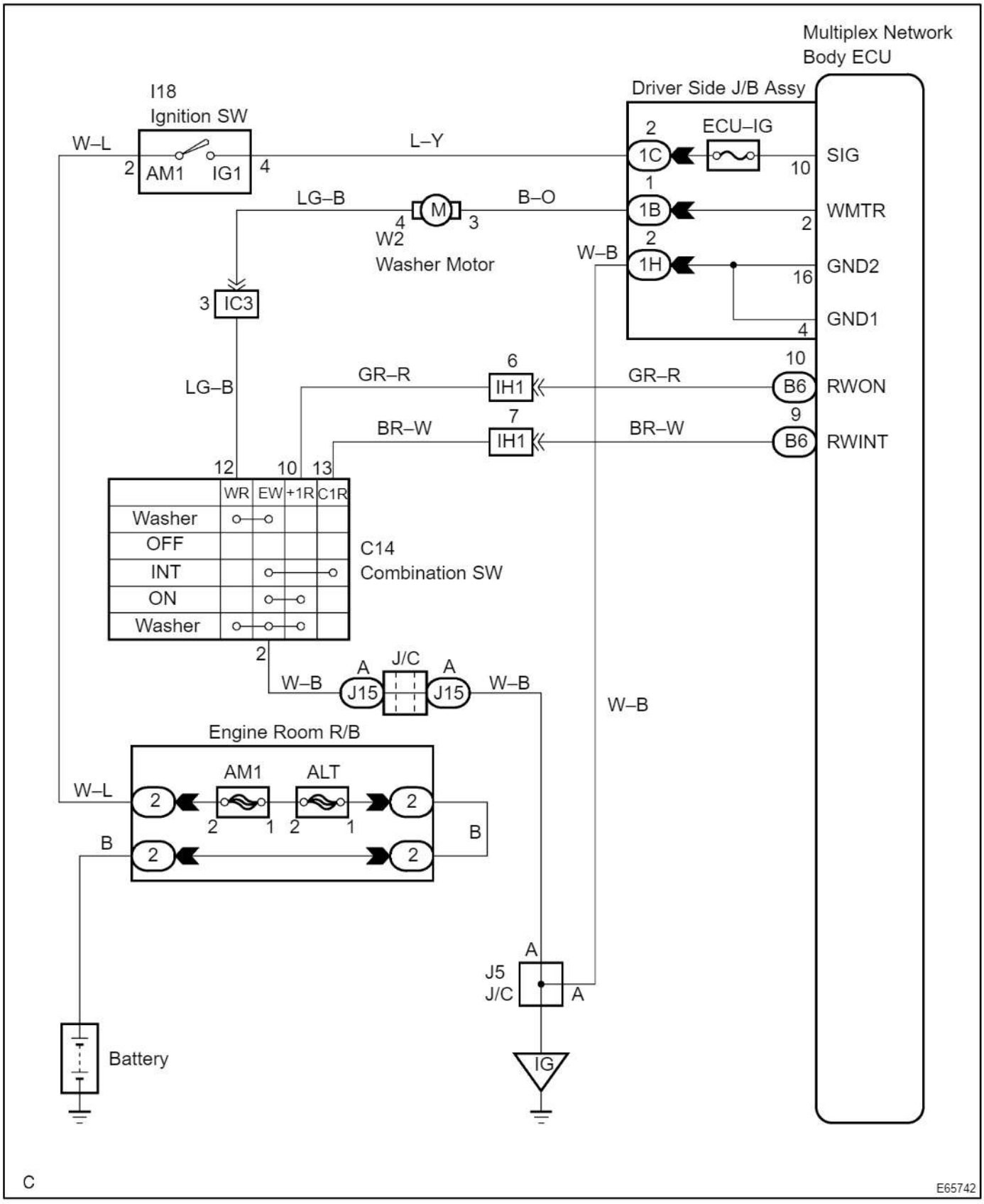
COMBINATION SWITCH POWER SOURCE CIRCUIT

CIRCUIT DESCRIPTION

- This circuit provides power to operate the combination switch.
- Perform this inspection with the back door window glass fully closed.

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WIRING DIAGRAM



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INSPECTION PROCEDURE

1 CHECK VEHICLE CONDITION

(a) Check the condition A, B or C, when rear wiper or rear washer system does not operate.

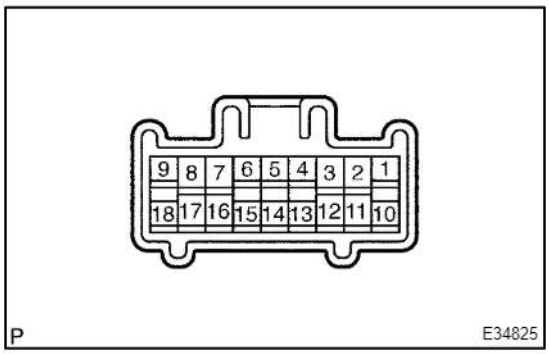
A	Rear wiper and washer system does not operate.
B	Rear wiper system does not operate.
C	Rear washer system does not operate.

B → **Go to step 4**

C → **Go to step 6**

A

2 INSPECT WINDSHIELD WIPER SWITCH ASSY



(a) Check the continuity the windshield wiper switch assy.

Rear Wiper Switch

Switch position	Tester connection	Specified condition
OFF	–	No Continuity
INTO	2 (EW) – 13 (C1R)	Continuity
ON	2 (EW) – 10 (+1R)	Continuity

Rear Washer Switch

Switch position	Tester connection	Specified condition
OFF	–	No continuity
ON (OFF position side)	2 (EW) – 12 (WR)	Continuity
ON (ON position side)	2 (EW) – 10 (+1R) – 12 (WR)	Continuity

(b) Check the continuity the terminals 2 (EW) of windshield wiper switch assy and body ground.
Standard: There is continuity

NG → **REPLACE WINDSHIELD WIPER SWITCH ASSY**

OK

3 INSPECT DRIVE SIDE JUNCTION BLOCK(SIG)

(a) Measure the voltage between terminals 1C–2 and 1H–2 of driver side junction block when ignition key is ON.

Standard:

Switch position	Tester connection	Specified condition
OFF	1C–2 (SIG) – 1H–2 (GND)	Below 1 V
ON	1C–2 (SIG) – 1H–2 (GND)	10 – 14 V

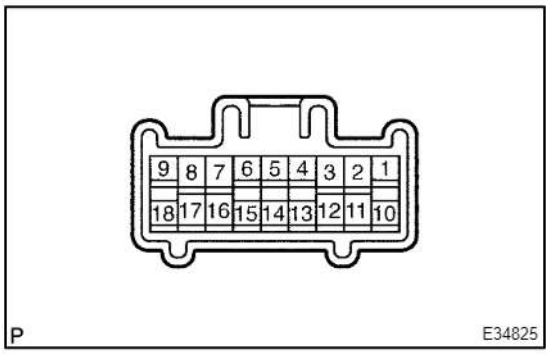
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPAIR OR REPLACE POWER WINDOW REGULATOR MOTOR ASSY LH

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4 INSPECT WINDSHIELD WIPER SWITCH ASSY



(a) Check the continuity the windshield wiper switch assy.

Rear Wiper Switch

Switch position	Tester connection	Specified condition
OFF	–	No Continuity
INTO	2 (EW) – 13 (C1R)	Continuity
ON	2 (EW) – 10 (+1R)	Continuity

NG → **REPLACE WINDSHIELD WIPER SWITCH ASSY**

OK

5 CHECK MULTIPLEX NETWORK BODY ECU

(a) Check the continuity terminals multiplex network body ECU and body ground, when rear wiper switch operated.

Standard:

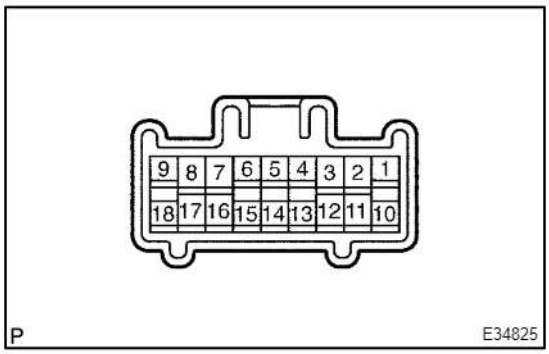
Switch position	Tester connection	Specified condition
INT	B6–9 (RWINT) – Body ground	No continuity → Continuity
ON	B6–10 (RDON) – Body ground	No continuity → Continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE
(See page 05–1500)

6 INSPECT WINDSHIELD WIPER SWITCH ASSY



(a) Check the continuity the windshield wiper switch assy.

Rear Washer Switch

Switch position	Tester connection	Specified condition
OFF	–	No continuity
ON (OFF position side)	2 (EW) – 12 (WR)	Continuity
ON (ON position side)	2 (EW) – 10 (+1R) – 12 (WR)	Continuity

NG → **REPLACE WINDSHIELD WIPER SWITCH ASSY**

OK

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7	INSPECT DRIVE SIDE JUNCTION BLOCK

(a) Check the continuity terminals driver side junction block and body ground, when rear washer switch operated.

Standard:

Switch position	Tester connection	Specified condition
ON (OFF position side)	1B–1 (WMTR) – Body ground	No continuity → Continuity
ON (ON position side)	1B–1 (WMTR) – Body ground	No continuity → Continuity

OK → **REPLACE RR WASHER MOTOR & PUMP ASSY**

NG

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE
(See page 05–1500)

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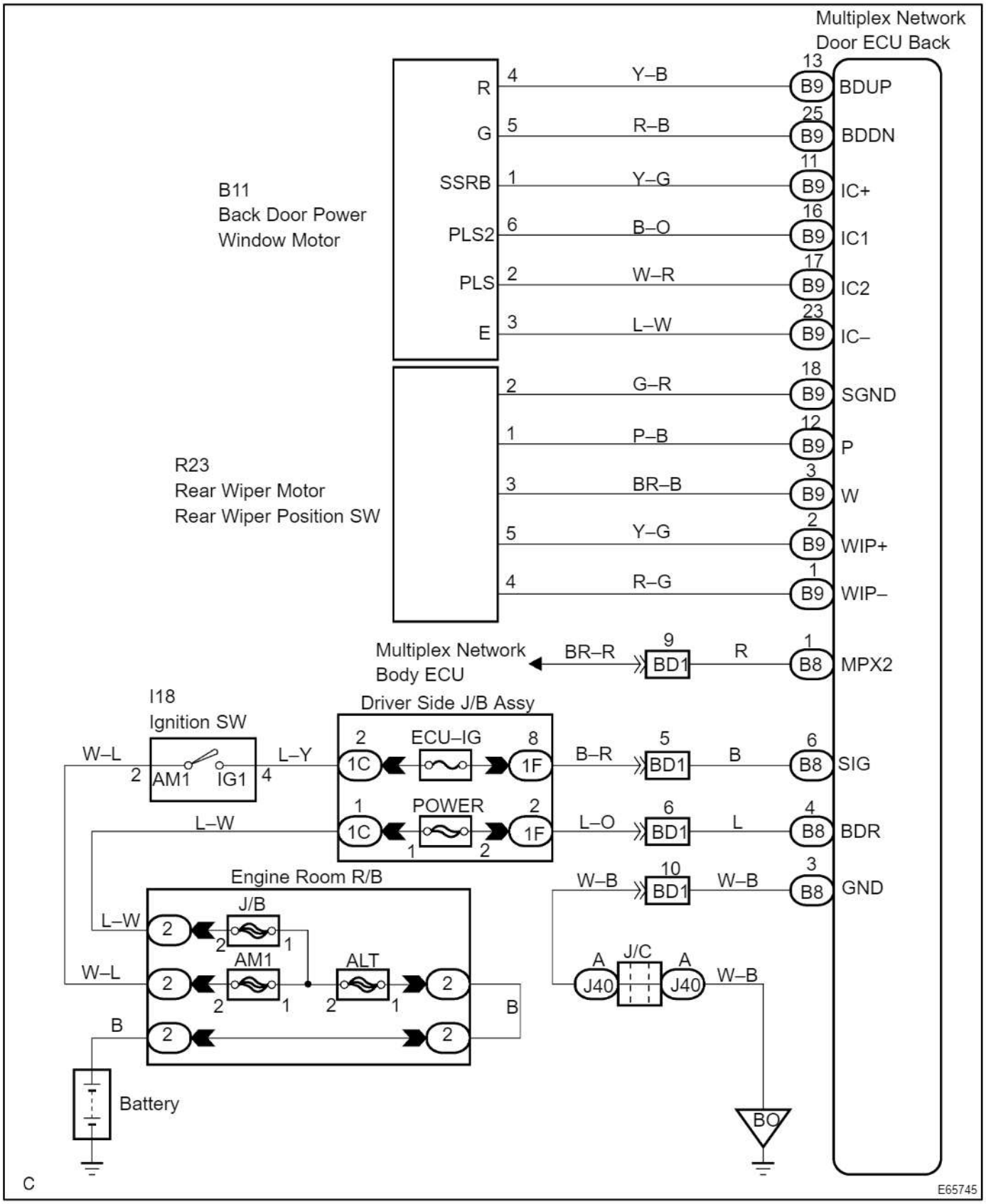
REAR WIPER MOTOR CIRCUIT

CIRCUIT DESCRIPTION

- This circuit provides power to operate the combination switch.
- Perform this inspection with the back door window glass fully closed.

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WIRING DIAGRAM



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INSPECTION PROCEDURE

1	CHECK MULTIPLEX NETWORK DOOR ECU BACK(BACK DOOR POWER WINDOW MOTOR CIRCUIT)

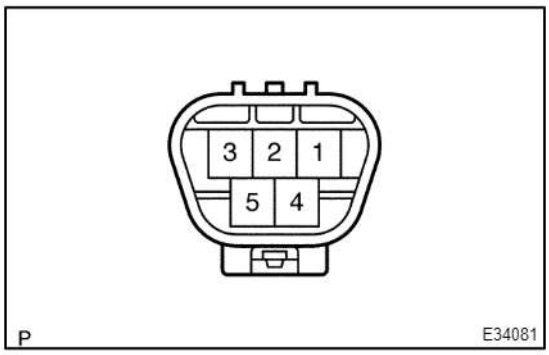
(a) Inspect the back door power window motor operation (See page 05–1761).

NG → REPLACE POWER WINDOW REGULATOR MOTOR ASSY LH

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

2	INSPECT REAR WIPER MOTOR ASSY



(a) Measure voltage between terminals 4 and 5 of windshield wiper switch assy, when rear wiper switch is ON.
Standard: 10 – 14 V

OK → REPLACE REAR WIPER MOTOR ASSY

NG

3	CHECK MULTIPLEX NETWORK DOOR ECU BACK(REAR WIPER MOTOR CIRCUIT)

(a) Measure voltage between terminals B9–1 (WIP–) and B9–2 (WIP+) of multiplex network door ECU back, when rear wiper switch is ON.
Standard: 10 – 14 V

OK → REPAIR OR REPLACE HARNESS OR CONNECTOR

NG

REPLACE REAR WIPER MOTOR ASSY

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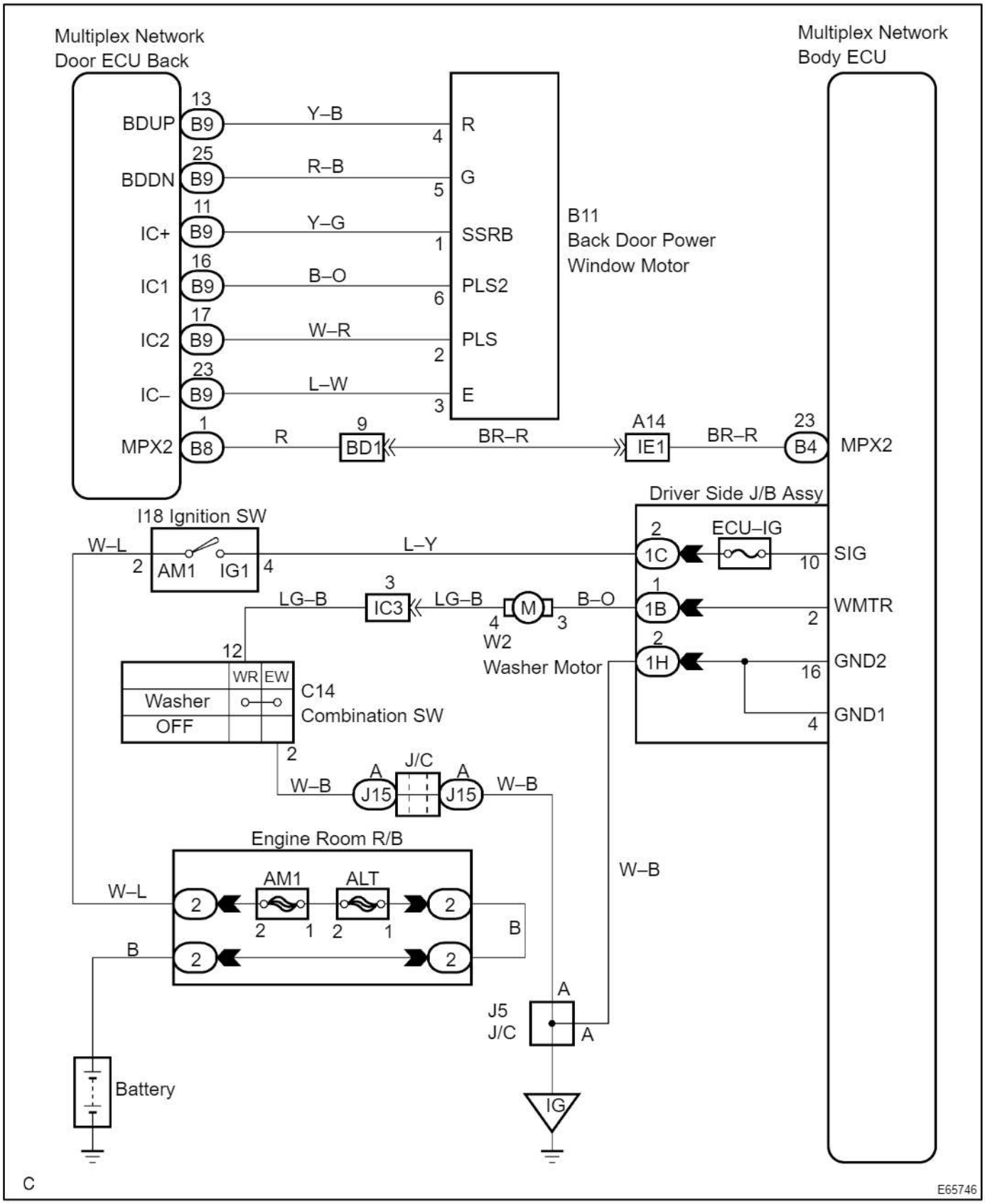
REAR WASHER MOTOR CIRCUIT

CIRCUIT DESCRIPTION

- This circuit provides power to operate the combination switch.
- Perform this inspection with the back door window glass fully closed.

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WIRING DIAGRAM



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INSPECTION PROCEDURE

1	CHECK MULTIPLEX NETWORK DOOR ECU BACK(BACK DOOR POWER WINDOW MOTOR CIRCUIT)

(a) Inspect the back door power window motor operation (See page 05–1761).

NG → REPAIR OR REPLACE POWER WINDOW REGULATOR MOTOR ASSY LH

OK

REPAIR OR REPLACE DRIVE SIDE JUNCTION BLOCK

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AUDIO SYSTEM (From August, 2003)

0569A-05

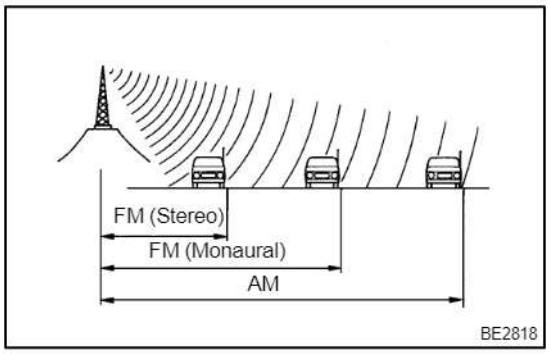
DESCRIPTION

1. RADIO WAVE BAND

The radio wave bands used in radio broadcasting are as follows:

Frequency	30 kHz	300 kHz	3 MHz	30 MHz	300 MHz
Designation	LF	MF	HF	VHF	
Radio wave		AM ⟷		FM ⟷	
Modulation	Amplitude modulation			Frequency modulation	

LF: Low Frequency
MF: Medium Frequency
HF: High Frequency
VHF: Very High Frequency

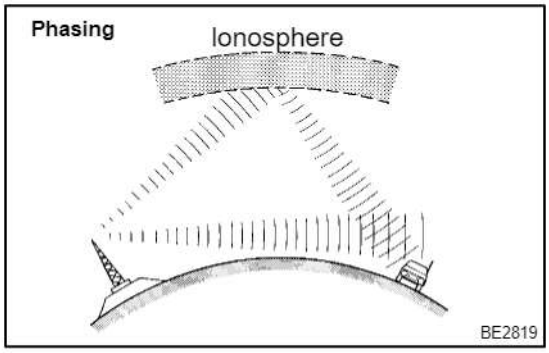


2. SERVICE AREA

(a) There are great differences in the size of the service area for AM and FM broadcasting. Sometimes FM stereo broadcast cannot be received even through AM can be received very clearly.
Not only does FM stereo have the smallest service area, but it also picks up static and other types of interference (”noise”) easily.

3. RECEPTION PROBLEMS

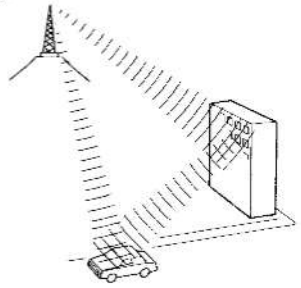
HINT:
Besides the problem of static, there are also the problems called ”phasing”, ”multipath” and ”fade out”. These problems are caused not by electrical noise but by the nature of the radio waves themselves.



(a) Phasing
Besides electrical interference, AM broadcasts are also susceptible to other types of interference, especially at night. This is because AM radio waves bounce off the ionosphere at night. These radio waves then interfere with the signals from the same transmitter that reach the vehicle’s antenna directly. This type of interference is called ”phasing”.

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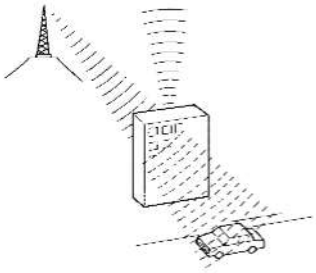
Multipath



BE2820

(b) Multipath
Interference caused by reflection of radio waves against obstructions is called "Multipath". Multipath occurs when radio signals emitted from the broadcast transmitter antenna are reflected against tall buildings or mountains and interferes with other signals which is to be received directly.

Fade Out



BE2821

(c) Fade Out
Because of the frequency higher than that of AM, FM radio wave tends to be reflected against obstructions such as tall buildings or mountains. For this reason, FM signals often seems to gradually disappear or fade away as the vehicle goes behind those obstructions. This phenomenon is called "fade out".

4. NOISE PROBLEMS

(a) It is very important for noise troubleshooting to understand a customer's claim clearly. Use the following table to diagnose the phenomenon.

Radio wave	Condition in which noise occurs	Probable cause
AM	Noise occurs at a specific place.	Strong possibility of foreign noise.
	Noise occurs when listening to faint broadcasting.	The same program may be broadcasted from some local stations. If the program is the same, one of those may be tuned in.
FM	Noise occurs only at night.	Strong possibility of beat from a distant broadcasting.
	Noise occurs at a specific place during driving.	Strong possibility of multipath noise and fading noise caused by changes of FM frequency.

HINT:
If the condition where the noise occurs does not meet any of the above, find out the cause based on "Reception Problems". Refer to the description about Multipath and Phasing mentioned previously.

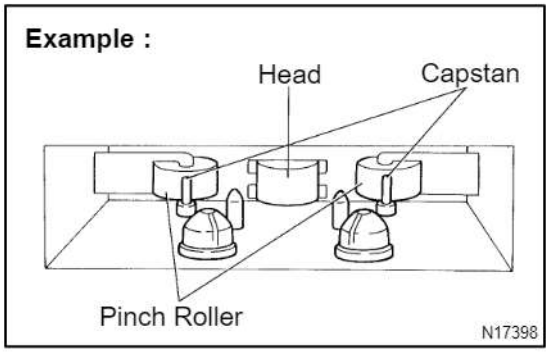
5. COMPACT DISC PLAYER

(a) Compact Disc (hereafter called "CD") Players use a laser beam pick–up to read the digital signals recorded on the CD and reproduce analog signals of the music, etc. There are 4.7 in. (12 cm) and 3.2 in. (8 cm) discs available for the CD player.

HINT:
Never attempt to disassemble or oil any part of the player unit. Do not insert any object other than a disc into the magazine.

NOTICE:
CD players use an invisible laser beam which could cause hazardous radiation exposure. Be sure to operate the player correctly as instructed.

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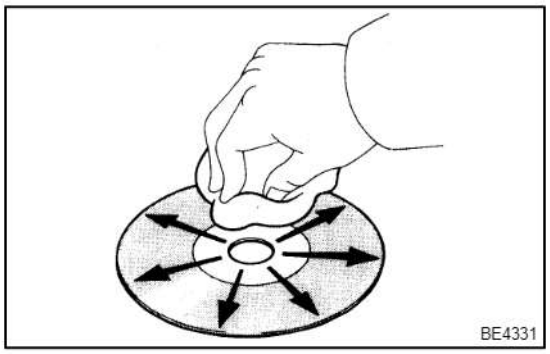


6. MAINTENANCE

Tape Player / Head Cleaning:

(a) Raise the cassette door with your finger.
Using a pencil or similar object, push in the guide.

(b) Using a cleaning pen or cotton applicator soaked in cleaner, clean the head surface, pinch rollers and capstans.



7. MAINTENANCE

CD Player / Disc Cleaning:

If the disc gets dirty, clean the disc by wiping the surface from the center to outside in the radial directions with a soft cloth.

NOTICE:

Do not use a conventional record cleaner or anti–static preservative.

8. COMMUNICATION SYSTEM

(a) Components in the audio system communicate each other though AVC–LAN. (Radio receiver with CD changer control function)

(b) The master component of AVC–LAN is the radio receiver assy with a resistance (60 – 80 Ω), which is necessary for communication.

(c) When short circuit or circuit breakdown occurs in the AVC–LAN circuit, the audio system does not operate normally due to the communication cutoff.

9. DIAGNOSIS FUNCTION

(a) The audio system has diagnosis function (The diagnosis result is displayed on the LCD of the radio receiver assy). (Radio receiver with CD changer control function)

(b) The component code (physical address), or three–digit number (in hexadecimal) is set for each component comprising AVC–LAN.

(c) The logical address, or two–digit number (in hexadecimal) is set for each function and component unit in each component.

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HOW TO PROCEED WITH TROUBLESHOOTING

1	VEHICLE BROUGHT TO WORKSHOP

2	CUSTOMER PROBLEM ANALYSIS (SEE PAGE 05–1517)

3	CHECK AND CLEAR DTC (SEE PAGE 05–1518)

4	PROBLEM SYMPTOM CONFIRMATION

- SYMPTOM OCCURS (GO TO STEP 6)
- SYMPTOM DOES NOT OCCUR (GO TO STEP 5)

5	SYMPTOM SIMULATION (SEE PAGE 01–35)

6	DTC CHECK (SEE PAGE 05–1518)

- MALFUNCTION CODE (GO TO STEP 7)
- NORMAL CODE (GO TO STEP 8)

7	DTC CHART (SEE PAGE 05–1525)

- GO TO STEP 9

8	PROBLEM SYMPTOMS TABLE (SEE PAGE 05–1536)

9	CIRCUIT INSPECTION (SEE PAGE 05–1537 – 05–1583)

10	CONFIRMATION TEST

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END

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CUSTOMER PROBLEM ANALYSIS CHECK

AUDIO SYSTEM Check Sheet

Inspector's name: _____

Customer's Name		**Registration No.**	
		Registration Year/Date	
		Frame No.	
Brought–in Date	/ /	**Odometer Reading**	**km Mile**

Date of First Occurrence	/ /
Frequency of Problem Occurrence	☐ Constant ☐ Intermittent (Times a day)

Problem Symptom	☐ **Switch**
	☐ **Radio**
	☐ **CD**
	☐ **Noise**

	Parts name	**DTC (1st time).**	**DTC (2nd time).**
DTC Check	Radio receiver assy		
	Stereo component amplifier assy		
	Stereo component controller assy		

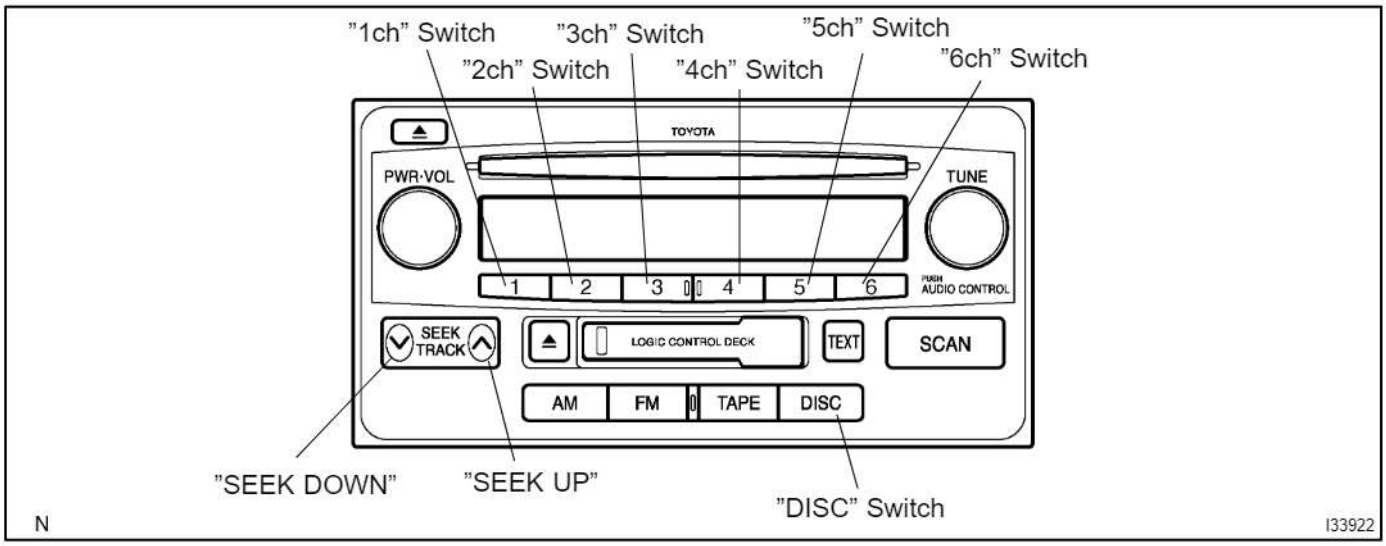
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PRE–CHECK

1. DIAGNOSIS CHECK



(a) Starting Diagnosis Mode (All elements are lighting and in SW check mode).
  (1) Turn off the audio system and turn the IG switch to ACC. While pressing the preset switches "1" and "6" at the same time, press "DISC" 3 times.
  (2) Reference:
    - □ Beep sound is given 3 times and the system enters the all elements are lighting and in SW check mode.
    - □ It may take about 40 sec. to complete the check.
    - □ Turn all the elements in the LCD on.
    - □ Make a sound of beeps when pressing the switch.
    - □ "SEEK TRACK" button switches to "Service Check Screen".

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(b) Service Check Screen.

(1) Reference

□ In the service check mode, the system check and the diagnosis memory check are performed, and the check results are displayed in ascending order of the device codes (physical address.)

Terms	Meaning
Component code (Physical address)	Three–digit code (In hexadecimal) given to each device comprising AVC–LAN. Corresponding to its function, individual symbol is provided.
Logical address	Two–digit code (In hexadecimal) given to each function and device unit in each device comprising AVC–LAN.

Code No. (physical address) List

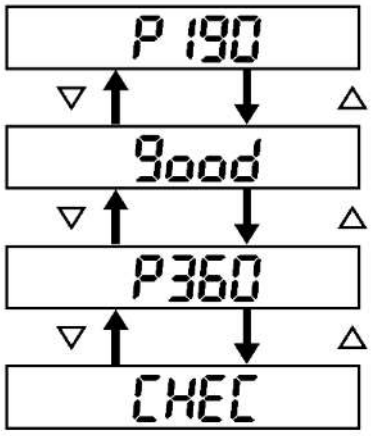
Code No. (physical address)	Equipment name
190/160	Radio receiver assy (Audio head unit)
440	Stereo component amplifier

(c) Finishing Diagnosis Mode.

(1) Press "DISC" for 2 sec. or more, or turn the IG switch OFF.

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(d) Service Check Mode Result Display (for checking the current and the past system conditions).
(1) Press the "SEEK TRACK" switch to see the check result of each device.



P——indicates physical address
190——physical address

good——"The component is normal".

P——indicates physical address
360——physical address

CHEC——"Check needed".

The illustration shows the case that the system has 2 devices with codes 190 and 360, and the device (code 360) has a trouble.
The check result is displayed in ascending order of device code. The device code is displayed first, then the check result.

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(2) Check Result Display.

Display	Original Language	Meaning	Action to be taken
good	Good (normal)	No DTC is detected in both "System Check Mode" and "Diagnosis Memory Mode".	–
nCon	No connection	The system recognized the component when it was registered, but the component gives no response to the "Diagnosis Mode ON Request".	Check the power source circuit and the communication circuit of the device indicated by the device code (physical address).
ECHn	Exchange	One or more DTC for "Exchange" is detected in either "System Check Mode" or "Diagnosis Memory Mode".	Go to the detail information mode to check the trouble area referring to the DTC list.
CHEC	Check	When no DTC is detected for "Exchange", one or more DTC for "Check is detected in either "System Check Mode" or "Diagnosis Memory Mode".	Go to the detail information mode to check the trouble area referring to the DTC list.

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Display	Original Language	Meaning	Action to be taken
Old	Old version	Old DTC application is identified and DTC is detected in either "System Check Mode" or "Diagnosis Memory Mode".	–
nrES	No response	The device gives no response to any one of "System Check Mode ON Request", "System Check Result Request" and "Diagnosis Memory Request".	Check the power source circuit and the communication circuit of the device indicated by the device code (physical code).

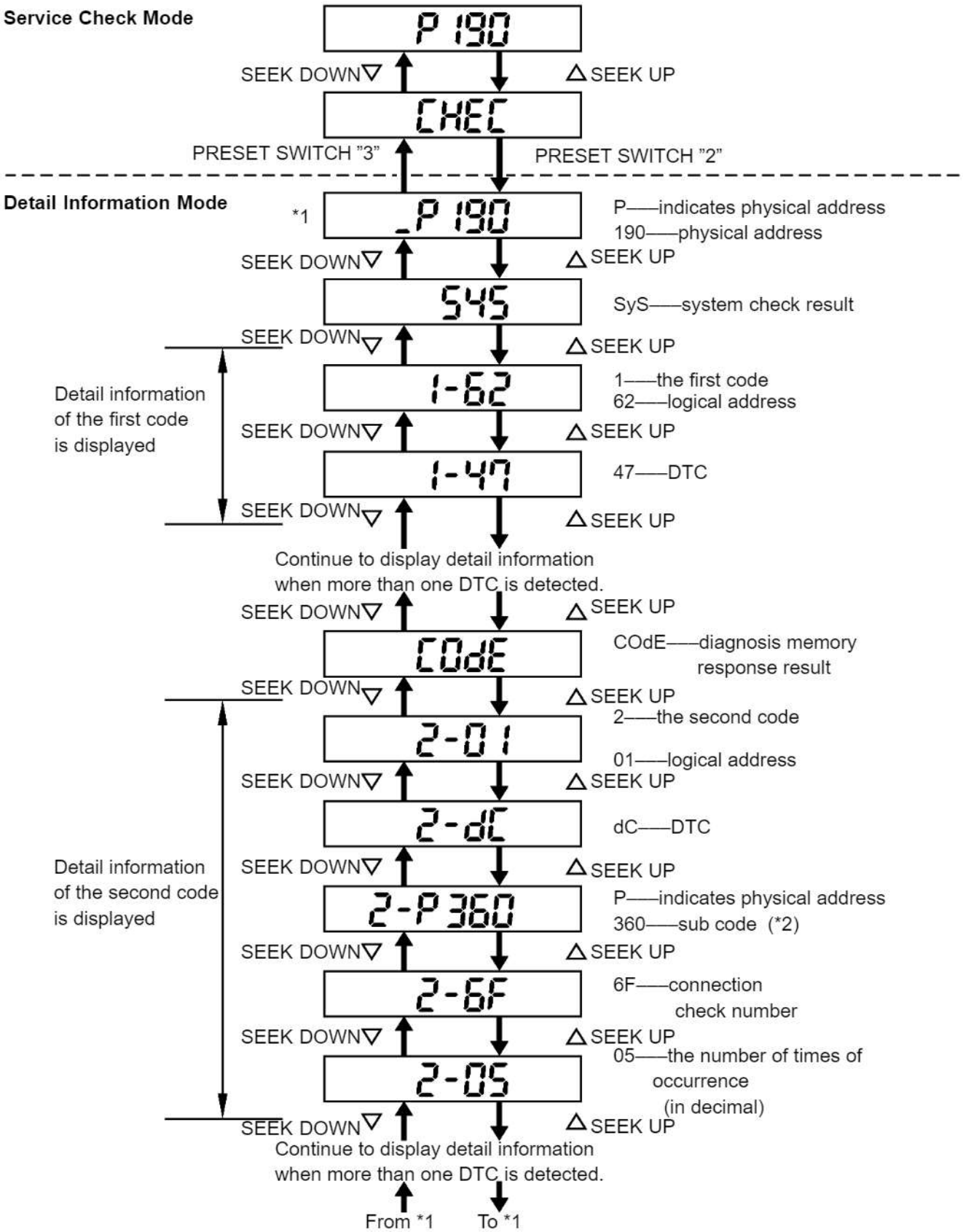
(3) To perform the Service Check again, press the preset switch "1".

(e) Detail information Mode (when displaying the troubled device's DTC)

(1) With "CHEC" or "ECHn" being display, press the preset switch "2" to go to the detail information mode.

(2) Press the "TUNE" switch to display "System Check Result (SyS)" and "Diagnosis Memory Response (COdE)".

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The illustration shows the case that the component with code 190 has DTC "47" and "dC" as a result of the system check and the diagnosis memory response.

The detail information mode shows the system check result first, then the diagnosis memory response result.

(*2): As for DTC that does not have any sub code, sub code is not displayed.

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(3) Displayed Items in Detail Information Mode

Division Code for DTC display	Meaning	Order of detailed information displayed when the "SEEK DOWN UP" switch is pressed. (The order is reversed when the "SEEK DOWN DOWN" switch is pressed.)
SyS	System check result is displayed.	Logical address → DTC
COdE	Diagnosis memory check result is displayed.	Logical address→ DTC→ Sub code→ Connection confirmation number→ The number of times of occurrence

(4) Check the trouble area referring to the DTC list.

(5) To return to the service check mode, press the preset switch "3".

(f) Clearing Individual DTC Memory (when clearing the memory of DTC detected in the past individually)

(1) Press the preset switch "5" for 2 sec. or more while the "ECHn" is displayed in the service check mode or during the detail information mode.

HINT:

- □ Beep sound is given once when the DTC memory is completely cleared.
- □ When DTC memory is cleared, only the component code (physical address) is displayed for the target component.
- □ To check DTC, press the preset switch "1" and perform the service check again.

(g) Clearance of all DTC memory (when clearing all the memory of DTC detected in the past)

(1) Start the diagnosis mode after repairing the trouble area.

(2) Press the preset switch "5" for 2 sec. or more. ("CLr" is displayed at this time.)

HINT:

- □ Beep sound is given once when the DTC memory is completely cleared.
- □ When DTC memory for all the device is cleared, only the component codes (physical address) are displayed.

(3) Press the preset switch "1" to perform the service check again, and check that no DTC is displayed for all the component codes (physical address).

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2. IDENTIFICATION OF NOISE SOURCE

(a) Identify the condition under which the noise occurs, and check the noise filter on the related part.

Condition in which noise occurs	Noise Source
Depressing the acceleration pedal increases noise, and stopping the engine erases the noise immediately.	Generator
Noise occurs during the A/C or the heater operation.	Blower motor
Rapid acceleration during driving on the unpaved road or after the IG switch is turned ON makes noise.	Fuel pump
Pressing and then releasing the horn switch, and keeping pressing the horn switch makes unusual noise.	Horn
Stopping the engine erases small noise that has been heard.	Ignition
Noise occurs synchronously with the turn signal flash.	Flasher
Noise occurs during the window washer operation.	Washer
Noise occurs during the engine running, and it continues after the engine is stopped.	Engine coolant temperature sensor
Noise occurs during the wiper operation.	Wiper
Noise occurs when the brake pedal is depressed.	Stop light switch
Others.	Static electricity stored on the vehicle

(b) Reference:

- □ Make sure first that there is no noise from outside. Failing to do so makes the noise source detection difficult and leads to misunderstanding.
- □ The noise should be removed in descending order of loudness.
- □ Setting the radio unSEEK DOWNd makes noise noticeable, making the recognition of the phenomenon easier.

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DIAGNOSTIC TROUBLE CODE CHART

Terms	Meaning
Physical address	Three–digit code (shown in hexadecimal) which is given to each component comprising the AVC–LAN. Corresponding to the function, individual symbols are specified.
Logical address	Two–digit code (shown in hexadecimal) which is given to each function comprising the inner system of the AVC–LAN.

1. PIONEER MADE: RADIO RECEIVER ASSY (Physical address: 190)

HINT:

- □ *1: Even if no failure is detected, it may be stored depending on the battery condition or voltage for starting an engine.
- □ *2: It is stored when 180 sec. has passed after the power supply connector is pulled out after engine start.
- □ *3: It may be stored when the engine key is turned 1 min. after engine start.
- □ *4: It may be stored when the engine key is turned again after engine start.
- □ *5: When 210 sec. has passed after pulling out the power supply connector of the master component with the ignition switch in ACC or ON, this code is stored.

(a) Logical address: 01 (Communication control)

DTC	Diagnosis item	Description	Action to be taken
D6 *1	Absence of Master	Component in which this code is recorded had been disconnected from system or master component with ignition in ACC or ON.	□Check harness for power supply system of radio receiver assy. □Check harness for communication system of radio receiver assy.
D7 *5	Connection check Error	Component in which this code is recorded had been disconnected from system or master component ignition with in ACC or ON.	□Check harness for power supply of radio receiver assy. □Check harness for communication system of radio receiver assy.
D8 *2	No Response to Connection Check	Component shown by sub code is or had been disconnected from system after engine start.	□Check harness for power supply system of component shown by sub code. □Check harness for communication system of component shown by sub code.
D9 *1	Last Mode Error	Audio or visual component operated before engine stop is or had been disconnected with ignition switch in ACC or ON.	□Check harness for power supply system of component shown by sub code. □Check harness for communication system of component shown by sub code.
DA	No Response to ON/OFF Instruction	No response is identified when changing mode (audio and visual mode change). Detected when sound and picture does not change by button operation.	□Check harness for power supply system of component shown by sub code. □Check harness for communication system of component shown by sub code. □If error occurs again, replace component shown by sub code.
DB *1	Mode Status Error	Dual alarm is detected.	□Check harness for power supply of component shown by sub code. □Check harness for communication system of component shown by sub code.
DC *3	Transmission Error	Transmission to component shown by auxiliary code has been failed. (Detecting this DTC does not necessarily mean actual failure.)	If same sub code is recorded in other component, check harness for power supply and communication system of all components shown by code. (If not, delete DTC and recheck.)

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DD *4	Master Reset (Momentary Interruption)	After engine is started, master component had been disconnected from system.	□Check harness for power supply system of multi–display. □Check harness for communication system of radio receiver assy. □If this error occurs frequently, replace radio receiver assy.
DE *4	Slave Reset (Momentary Interruption)	After engine is started, component shown by sub code had been disconnected from system.	□Check harness for power supply of component shown by sub code. □Check harness for communication system of component shown by sub code.
E0 *1	Registration Completion Instruction Error	"Registration Completion Instruction" command from master cannot be received.	Since this DTC is provided for engineering purpose, it may be detected when no actual failure exists.
E2	ON/OFF Instruction Parameter Error	Error occures in ON/OFF controlling command from master component.	Replace radio receiver assy
E3 *1	Registration Request Transmission	Registration Request command is output from component shown by sub code. Receiving Connection Check Instruction, Registration Request command is output from sub–master component.	Since this DTC is provided for engineering purpose, it may be detected when no actual failure exists.

(b) Logical address: 61 (Cassette switch)

DTC	Diagnosis item	Description	Action to be taken
40	Mechanical Error of Media	Malfunction due to mechanical failure is identified. Or cassette tape is cut or entangled.	□Inspect cassette tape. □Replace radio receiver assy.

(c) Logical address: 62 (CD player)

DTC	Diagnosis item	Description	Action to be taken
42	No Disc Readout	Disc cannot be read.	□Inspect CD. □Replace radio receiver assy.
44	CD player Error	Error is detected in CD player.	Replace radio receiver assy.
45	EJECT Error	Magazine cannot be ejected.	Replace radio receiver assy.
47	Detection of hight temperature	–	–
48	Detection of eddy current	–	–

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2. STEREO COMPONENT AMPLIFIER ASSY (Physical address: 440)

HINT:

- □ *1: Even if no failure is detected, this code may be stored depending on the battery condition or voltage for starting an engine.
- □ *2: This code be stored when the engine key is turned again 1 min. after engine start.
- □ *3: This code may be stored when the engine key is turned again after engine start.
- □ *4: When 210 sec. has passed after pulling out the power supply connector of the master component with the ignition switch in ACC or ON, this code is stored.

Logical address: 01 (Communication control)

DTC	Diagnosis item	Condition	Countermeasure and inspected parts
D1	Transmission Error (System check – ” ” Diagnosis memory – ” ”)	Transmission to component shown by auxiliary code has been failed. (Detecting this DTC does not necessarily mean actual failure.)	If same auxiliary code is recorded in other component, check harness for power supply and communication system of all components shown by code.
D4	Periodic communication error (System check – ”X” Diagnosis memory –” ”)	Connection confirmation has not come from the equipment that is communicating.	□Replace radio receiver assy □Check wire harness
D6 *1	Absence of Master	Component in which this code is recorded has been disconnected from system with ignition in ACC or ON. Or, when this code was recorded, radio receiver assy was disconnected.	□Check harness for power supply of radio receiver assy. □Check harness for communication system of radio receiver assy. □Check harness for power supply of stereo component amplifier. □Check harness for communication system of stereo component amplifier.
D7	Communication Check Error	Component in which this code is recorded is or was disconnected from system after engine start. Or, when this code was recorded, radio receiver assy was disconnected.	□Check harness for power supply of radio receiver assy. □Check harness for communication system of radio receiver assy. □Check harness for power supply of stereo component amplifier. □Check harness for communication system of stereo component amplifier.
DC *2	Transmission Error	Transmission to component shown by auxiliary code has been failed. (Detecting this DTC does not necessarily mean actual failure.)	If same auxiliary code is recorded in other component, check harness for power supply and communication system of all components shown by code.
DD *3	Master Reset (Momentary Interruption)	After engine was started, radio receiver assy was disconnected from system.	□Check harness for power supply of radio receiver assy. □Check harness for communication system of radio receiver assy. □Check harness for power supply of stereo component amplifier. □Check harness for communication system of stereo component amplifier. □If this error occurs frequently, replace radio receiver assy.
DF *4	Master Error	Due to defective condition of component with a display, master function is switched to audio equipment. Error occurs in communication between sub–master (audio) and master component.	□Check harness for power supply of radio receiver assy. □Check harness for communication system of radio receiver assy. □Check harness for communication system between radio receiver assy and sub–master component.

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E0 *1	Registration Completion Instruction Error	"Registration Completion Instruction" command from master cannot be received.	Since this DTC is provided for engineering purpose, it may be detected when no actual failure exists.
E1 *1	Audio processor ON error	While source equipment is operating, AMP output is stopped.	□Check harness for power supply of radio receiver assy. □Check harness for communication system of radio receiver assy.
E2	ON/OFF Instruction Parameter Error	Error occurs in ON/OFF controlling command from radio receiver assy.	Replace radio receiver assy.
E3 *1	Registration Request Transmission	□Registration Request command is output from slave component. □Registration Connection Check Instruction, Registration Request command is output from sub–master component.	Since this DTC is provided for engineering purpose, it may be detected when no actual failure exists.

3. STEREO COMPONENT CONTROLLER ASSY

HINT:

- □ *1: Even if no failure is detected, this code may be stored depending on the battery condition or voltage for starting an engine.
- □ *2: This code be stored when the engine key is turned again 1 min. after engine start.
- □ *3: This code may be stored when the engine key is turned again after engine start.
- □ *4: When 210 sec. has passed after pulling out the power supply connector of the master component with the ignition switch in ACC or ON, this code is stored.

Logical address: 01 (Communication control)

DTC	Diagnosis item	Condition	Countermeasure and inspected parts
D6 *1	Absence of Master	Component in which this code is recorded has been disconnected from system with ignition in ACC or ON. Or, when this code was recorded, radio receiver assy was disconnected.	□Check harness for power supply of radio receiver assy. □Check harness for communication system of radio receiver assy. □Check harness for power supply of stereo component controller assy. □Check harness for communication system of stereo component controller assy.
D7	Communication Check Error	Component in which this code is recorded is or was disconnected from system after engine start. Or, when this code was recorded, radio receiver assy was disconnected.	□Check harness for power supply of radio receiver assy. □Check harness for communication system of radio receiver assy. □Check harness for power supply of stereo component controller assy. □Check harness for communication system of stereo component controller assy.
DC *2	Transmission Error	Transmission to component shown by auxiliary code has been failed. (Detecting this DTC does not necessarily mean actual failure.)	If same auxiliary code is recorded in other component, check harness for power supply and communication system of all components shown by code.
DD *3	Master Reset (Momentary Interruption)	After engine was started, radio receiver assy was disconnected from system.	□Check harness for power supply of radio receiver assy. □Check harness for communication system of radio receiver assy. □Check harness for power supply of stereo component controller assy. □If this error occurs frequently, replace radio receiver assy.

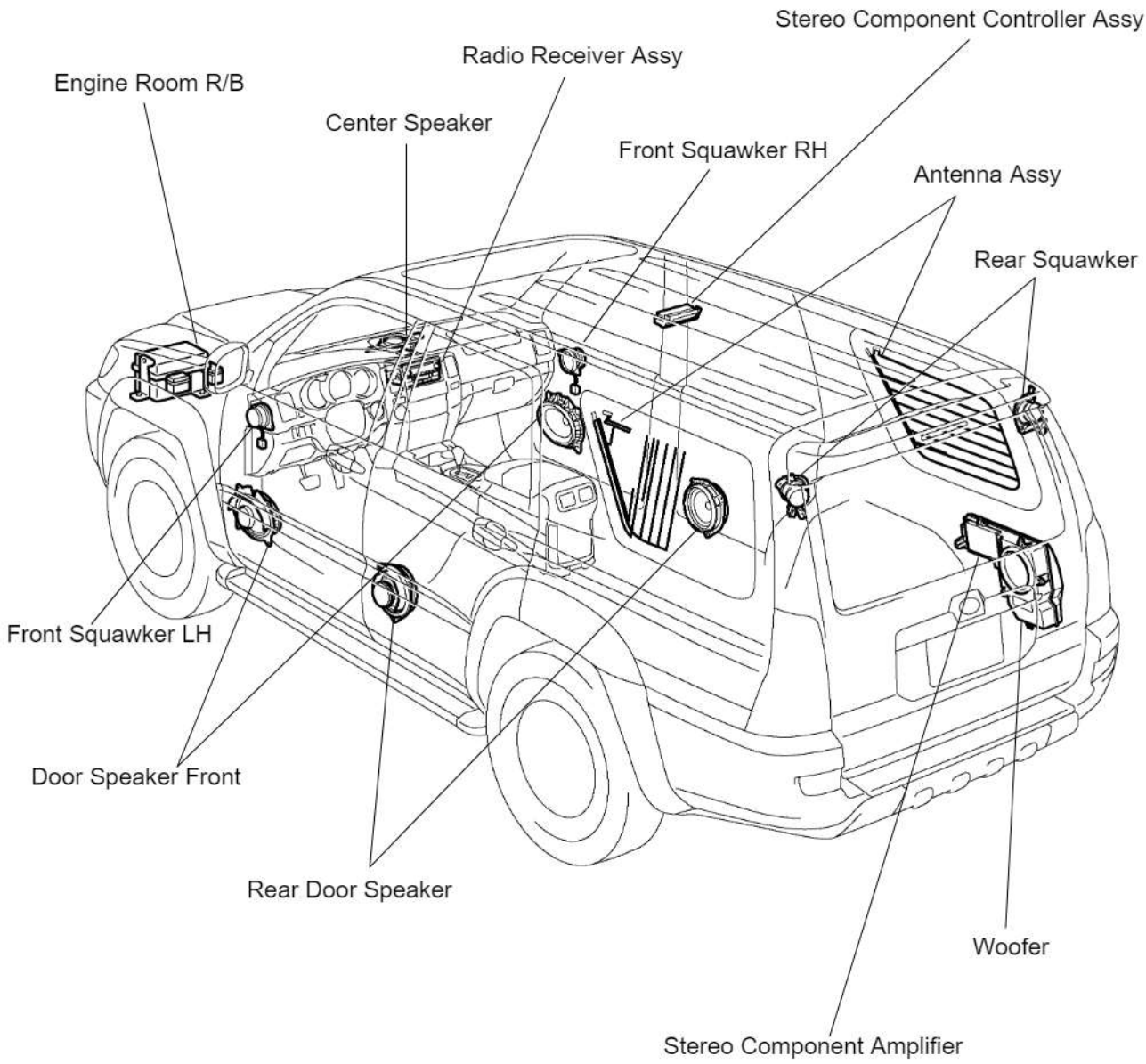
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DF *4	Master Error	Due to defective condition of component with a display, master function is switched to audio equipment. Error occurs in communication between sub–master (audio) and master component.	□Check harness for power supply of radio receiver assy. □Check harness for communication system of radio receiver assy. □Check harness for communication system between radio receiver assy and sub–master component.
E0 *1	Registration Completion Instruction Error	"Registration Completion Instruction" command from master cannot be received.	Since this DTC is provided for engineering purpose, it may be detected when no actual failure exists.
E1 *1	Audio processor ON error	While source equipment is operating, AMP output is stopped.	□Check harness for power supply of radio receiver assy. □Check harness for communication system of radio receiver assy.
E3 *1	Registration Request Transmission	□Registration Request command is output from slave component. □Registration Connection Check Instruction, Registration Request command is output from sub–master component.	Since this DTC is provided for engineering purpose, it may be detected when no actual failure exists.
E4 *1	Plural Frame Abort	□Registration Request command is output from slave component. □Registration Connection Check Instruction, Registration Request command is output from sub–master component.	Since this DTC is provided for engineering purpose, it may be detected when no actual failure exists.

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LOCATION



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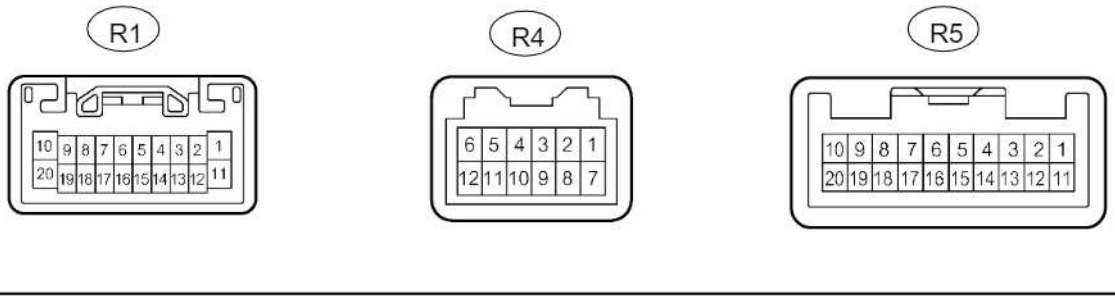
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TERMINALS OF ECU

1. RADIO RECEIVER ASSY (Except 6 Speaker)

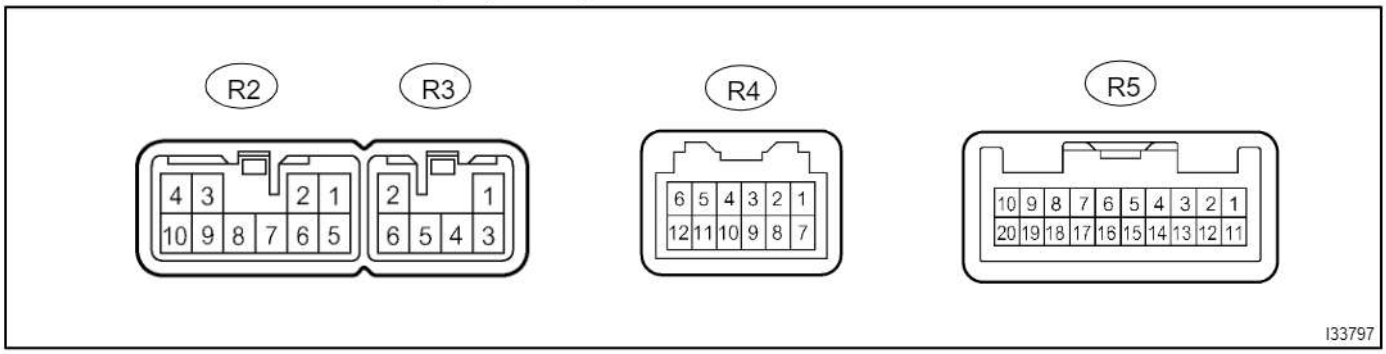


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Terminal No. (Symbols)	Wiring Color	Condition	Specified condition
R1–1 ⇔ R1–20 (BU+B ⇔ GND)	L–Y ⇔ BR	Constant	10 – 14V
R1–2 ⇔ R1–20 (ILL+ ⇔ GND)	G ⇔ BR	Light control switch TAIL or HEAD	10 – 14V
R1–5 (TX+)	B	See "Service check mode"	–
R1–7 ⇔ R1–20 (MUTE ⇔ GND)	W–R ⇔ BR	Radio switch is ON	3.5V or more
R1–8 ⇔ R1–20 (R+ ⇔ GND)	B ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
R1–9 ⇔ R1–20 (L+ ⇔ GND)	R ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
R1–10 ⇔ Body ground (SGND ⇔ Body ground)	Shieided ⇔ Body ground	Constant	Below 1V
R1–11 ⇔ R1–20 (ACC+B ⇔ GND)	GR ⇔ BR	Ignition switch OFF	Below 1V
		Ignition switch ACC or ON	10 – 14V
R1–12 ⇔ R1–20 (ILL– ⇔ GND)	W–G ⇔ BR	Light control switch ON	10 – 14V
R1–15 (TX–)	W	See "Service check mode"	–
R1–18 ⇔ R1–20 (R– ⇔ GND)	W ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
R1–19 ⇔ R1–20 (L– ⇔ GND)	G ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
R1–20 ⇔ Body ground (GND ⇔ Body ground)	BR ⇔ Body ground	Constant	Below 1V
R4–9 (TX+)	R	See "Service check mode"	–
R4–10 (TX–)	G	See "Service check mode"	–
R5–15 ⇔ R1–20 (RSR+ ⇔ GND)	B ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
R5–16 ⇔ R1–20 (RSR– ⇔ GND)	W ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
R5–17 ⇔ R1–20 (RSL+ ⇔ GND)	R ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
R5–18 ⇔ R1–20 (RSL– ⇔ GND)	G ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output

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2. RADIO RECEIVER ASSY (6 Speaker)



Terminal No. (Symbols)	Wiring Color	Condition	Specified condition
R2–1 ⇔ R2–7 (FR+ ⇔ GND)	LG ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
R2–2 ⇔ R2–7 (FL+⇔ GND)	P ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
R2–3 ⇔ R2–7 (ACC+B ⇔ GND)	GR ⇔ BR	Ignition switch OFF	Below 1V
R2–3 ⇔ R2–7 (ACC+B ⇔ GND)	GR ⇔ BR	Ignition switch ACC or ON	10 – 14V
R2–4 ⇔ R2–7 (BU+B ⇔ GND)	L–Y ⇔ BR	Constant	10 – 14V
R2–5 ⇔ R2–7 (FR– ⇔ GND)	L ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
R2–6 ⇔ R2–7 (FL– ⇔ GND)	V ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
R2–7 ⇔ Body ground (GND ⇔ Body ground)	BR ⇔ Body ground	Constant	Below 1V
R2–10 ⇔ R2–7 (ILL+ ⇔ GND)	G ⇔ BR	Light control switch TAIL or HEAD	10 – 14V
R3–1 ⇔ R2–7 (RR+⇔ GND)	R ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
R3–2 ⇔ R2–7 (RL+⇔ GND)	B ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
R3–3 ⇔ R2–7 (RR–⇔ GND)	W ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
R3–5 ⇔ R2–7 (ILL– ⇔ GND)	W–G ⇔ BR	Light control switch HI or FLASH	10 – 14V
R3–6 ⇔ R2–7 (RL–⇔ GND)	Y ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
R4–6 ⇔ R2–7 (MUTE ⇔ GND)	P ⇔ BR	Radio switch is ON	3.5V or more
R4–9 (TX+)	R	See "Service check mode"	–
R4–10 (TX–)	G	See "Service check mode"	–
R5–15 ⇔ R2–7 (RSR+ ⇔ GND)	B ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output

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R5–16 ⇔ R2–7 (RSR– ⇔ GND)	W ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
R5–17 ⇔ R2–7 (RSL+ ⇔ GND)	R ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
R5–18 ⇔ R2–7 (RSL– ⇔ GND)	G ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output

3. STEREO COMPONENT AMPLIFIER ASSY



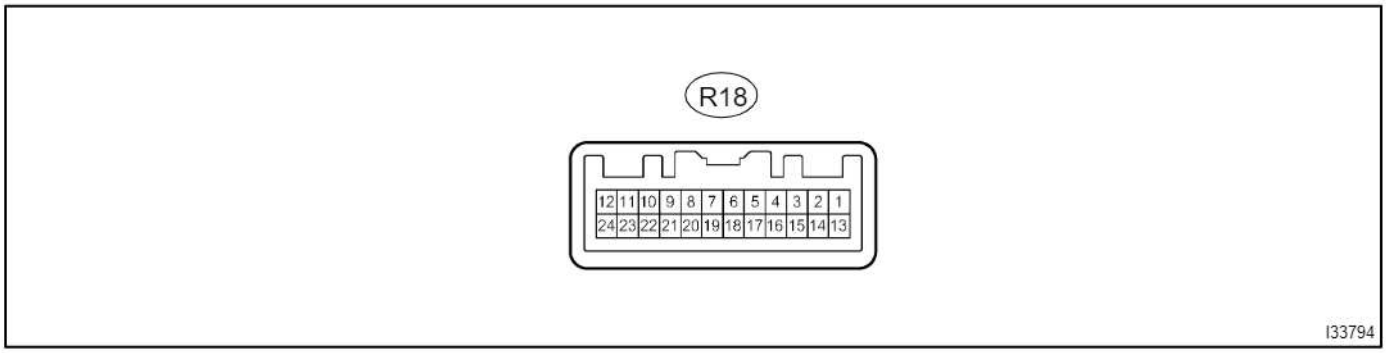
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Terminal No. (Symbols)	Wiring Color	Condition	Specified condition
S22–1 ⇔ S23–15 (MUTE ⇔ GND)	W–R ⇔ BR	Audio system is sounding	3.5V or more
S22–2 ⇔ S23–15 (L– ⇔ GND)	G ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
S22–3 ⇔ S23–15 (L+ ⇔ GND)	R ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
S22–4 ⇔ S23–15 (R– ⇔ GND)	W ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
S22–5 ⇔ S23–15 (R+ ⇔ GND)	B ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
S22–7 (TX–)	W	See "Service Check Mode"	–
S22–8 (TX+)	B	See "Service Check Mode"	–
S22–12 ⇔ S23–15 (ACC ⇔ GND)	GR ⇔ BR	Ignition switch OFF	Below 1 V
		Ignition switch ACC or ON	10 – 14 V
S23–1 ⇔ S23–15 (+B⇔ GND)	W–L ⇔ BR	Constant	10 – 14V
S23–2 ⇔ S23–15 (RS+ ⇔ GND)	G–W ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
S23–3 ⇔ S23–15 (CSP+ ⇔ GND)	G ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
S23–4 ⇔ S23–15 (RL+⇔ GND)	B ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
S23–5 ⇔ S23–15 (RR+⇔ GND)	R ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
S23–6 ⇔ S23–15 (FL+⇔ GND)	P ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output

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S23–7 ⇔ S23–15 (FR+ ⇔ GND)	LG ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
S23–8 ⇔ S23–15 (WFL+⇔ GND)	BR ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
S23–9 ⇔ S23–15 (WFR+⇔ GND)	L–B ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
S23–10 ⇔ S23–15 (+B2⇔ GND)	W–L ⇔ BR	Constant	10 – 14V
S23–11 ⇔ S23–15 (RS– ⇔ GND)	BR ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
S23–12 ⇔ S23–15 (CSP– ⇔ GND)	G–B ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
S23–13 ⇔ S23–15 (RL–⇔ GND)	Y ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
S23–14 ⇔ S23–15 (RR–⇔ GND)	W ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
S23–15 ⇔ Body ground (GND ⇔ Body ground)	BR ⇔ Body ground	Constant	Below 1V
S23–16 ⇔ Body ground (E ⇔ Body ground)	BR ⇔ Body ground	Constant	Below 1V
S23–17 ⇔ S23–15 (FL– ⇔ GND)	V ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
S23–18 ⇔ S23–15 (FR– ⇔ GND)	L ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
S23–19 ⇔ S23–15 (WFL–⇔ GND)	G–W ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
S23–20 ⇔ S23–15 (WFR–⇔ GND)	L–R ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output

4. STEREO COMPONENT CONTROLLER ASSY



Terminal No. (Symbols)	Wiring Color	Condition	Specified condition
R18–6 ⇔ R18–17 (RSL– ⇔ GND)	W ⇔ LG	Audio system is sounding	A waveform synchronized with sounds is output
R18–7 ⇔ R18–17 (RSL+ ⇔ GND)	W ⇔ LG	Audio system is sounding	A waveform synchronized with sounds is output

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R18–8 ⇔ R18–17 (RSR– ⇔ GND)	W ⇔ LG	Audio system is sounding	A waveform synchronized with sounds is output
R18–9 ⇔ R18–17 (RSR+ ⇔ GND)	W ⇔ LG	Audio system is sounding	A waveform synchronized with sounds is output
R18–12 ⇔ R18–17 (+B ⇔ GND)	LG ⇔ LG	Constant	10 – 14V
R18–17 ⇔ Body ground (GND ⇔ Body ground)	LG ⇔ Body ground	Constant	Below 1V
R18–21 ⇔ R18–17 (MUTE ⇔ GND)	LG ⇔ LG	Radio switch is ON	3.5V or more
R18–22 (TX+)	LG	See "Service check mode"	–
R18–23 (TX–)	W	See "Service check mode"	–
R18–24 ⇔ R18–17 (ACC ⇔ GND)	LG ⇔ LG	Ignition switch OFF	Below 1V
		Ignition switch ACC or ON	10 – 14V

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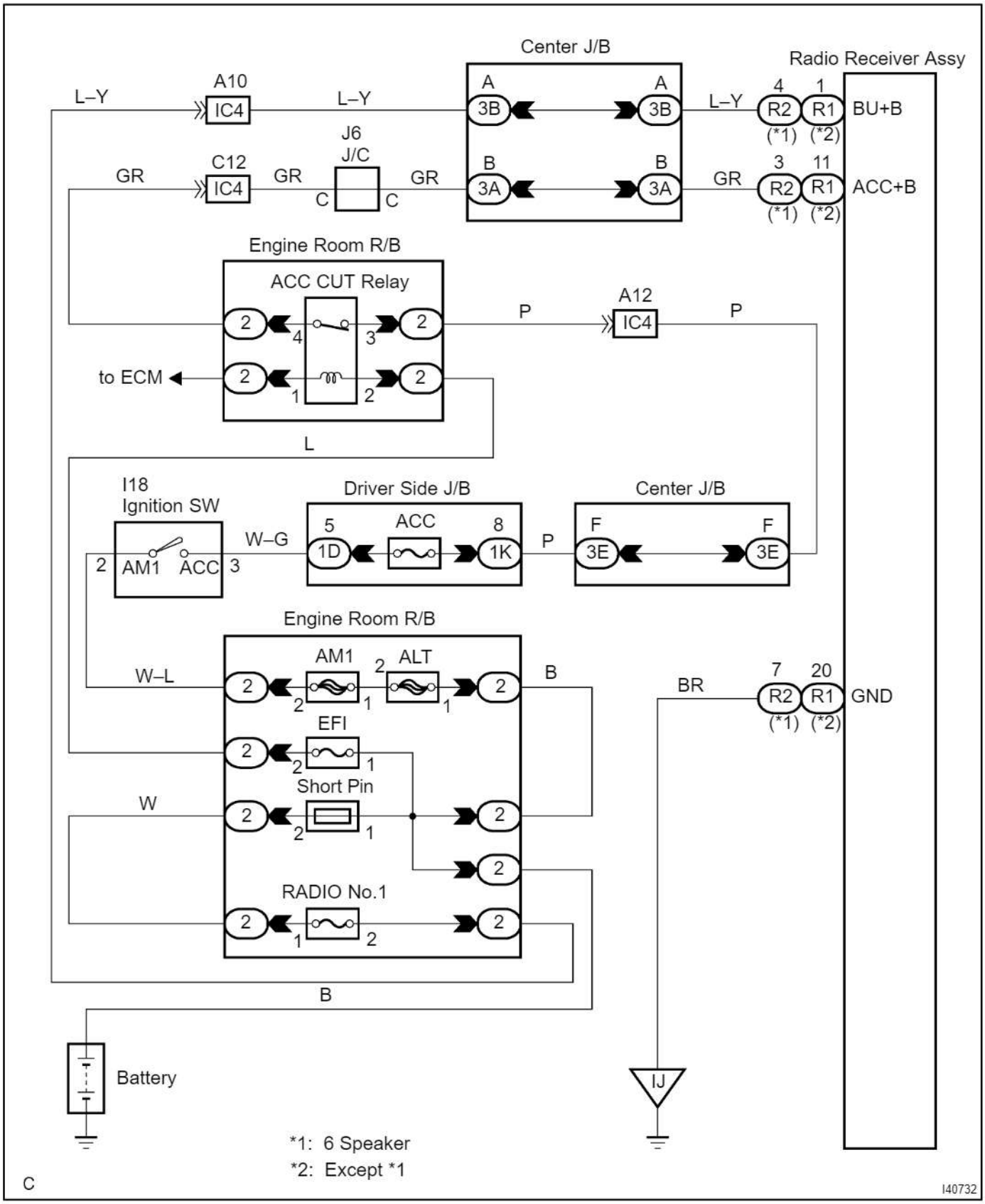
PROBLEM SYMPTOMS TABLE

Symptom	Suspect Area	See page
Pressing power switch does not start system.	3. Radio receiver assy power source circuit 4. Radio receiver assy	05–1537
Turning on light switch does not light up night time illumination of radio receiver.	1. Radio receiver assy ILL terminal circuit 2. Radio receiver assy	05–1539
No sound is heard from speaker in all modes.	1. Speaker circuit 2. Radio receiver assy power source circuit 3. Radio receiver assy	05–1542
Sound quality is bad in all modes. (Volume is too low)	1. Speaker circuit 2. Radio receiver assy power source circuit 3. Radio receiver assy	05–1549
Radio broadcast cannot be received. (Bad reception)	1. Antenna circuit 2. Radio receiver assy	05–1557
Cassette tape cannot be inserted or played.	1. Cassette tape 2. Radio receiver assy power source circuit 3. Radio receiver assy	05–1559
Cassette tape cannot be ejected.	1. Cassette tape 2. Radio receiver assy power source circuit 3. Radio receiver assy	05–1561
Sound quality is bad only when playing tape.	1. Cassette tape 2. Radio receiver assy	05–1564
Tape is tangled due to incorrect tape speed or auto–reverse malfunction.	1. Cassette tape 2. Radio receiver assy	05–1565
CD cannot be inserted or is ejected right after insertion.	1. CD 2. Radio receiver assy power source circuit 3. Radio receiver assy	05–1566
Although system is powered, CD cannot be played.	1. CD 2. Radio receiver assy power source circuit 3. Radio receiver assy	05–1569
CD cannot be taken out.	1. CD 2. Radio receiver assy power source circuit 3. Radio receiver assy	05–1572
Sound quality is bad only when CD is played.(Volume is too low)	1. CD	05–1574
CD sound skips.	1. CD 2. Radio installation	05–1575
Noise occurs.	–	05–1577
Quality of sound from wireless headphone is poor or no sound can be heard.	1. Battery 2. Radio receiver assy 3. Stereo component controller assy	05–1578
Rear seat entertainment system does not respond to any remote control operations.	1. Battery 2. Radio receiver assy 3. Stereo component controller assy	05–1583

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PRESSING POWER SWITCH DOES NOT START SYSTEM

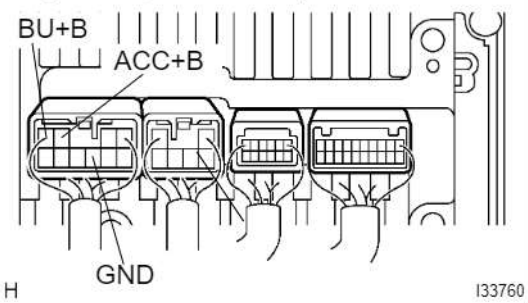
WIRING DIAGRAM



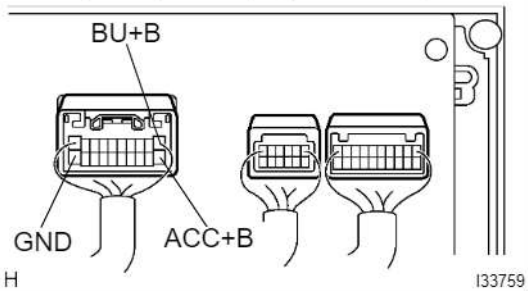
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1 INSPECT RADIO RECEIVER ASSY(BU+B, ACC+B, GND)

6 Speaker (Built–in AMP):



Except 6 Speaker (Separate AMP):



(a) Check that the continuity between terminals at each condition, as shown in the chart.

Standard:

Tester connection	Condition	Specified condition
GND ⇔ Body ground	Constant	Continuity

(b) Check that the voltage between terminals at each condition, as shown in the chart.

Standard:

Tester connection	Condition	Specified condition
BU+B ⇔ GND	Constant	10 – 14 V
ACC+B ⇔ GND	Ignition switch ACC or ON	10 – 14 V

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

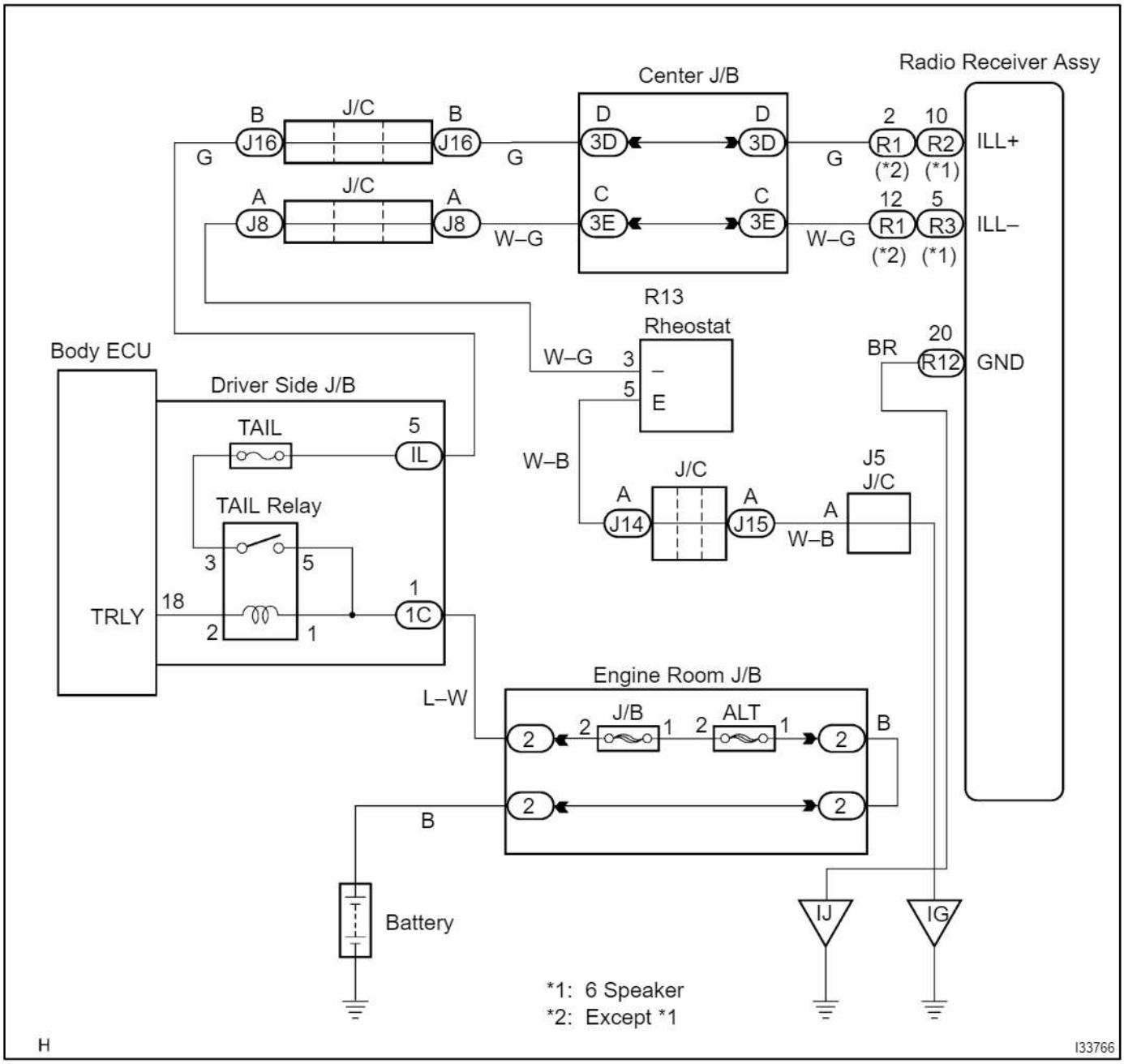
OK

CHECK AND REPLACE RADIO RECEIVER ASSY

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TURNING ON LIGHT SWITCH DOES NOT LIGHT UP NIGHT TIME ILLUMINATION OF RADIO RECEIVER

WIRING DIAGRAM

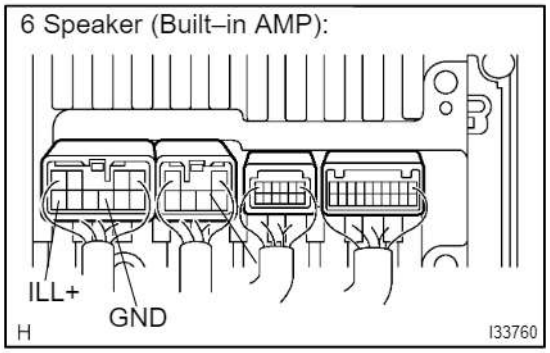


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INSPECTION PROCEDURE

1 INSPECT RADIO RECEIVER ASSY(ILL+, GND)

6 Speaker (Built–in AMP):

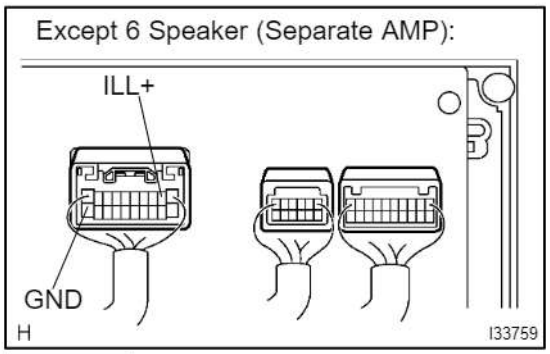


(a) Check that the voltage between terminals at each condition, as shown in the chart.

Standard:

Tester connection	Condition	Specified condition
ILL+ ⇔ GND	Light control switch TAIL or HEAD	10 – 14 V

Except 6 Speaker (Separate AMP):

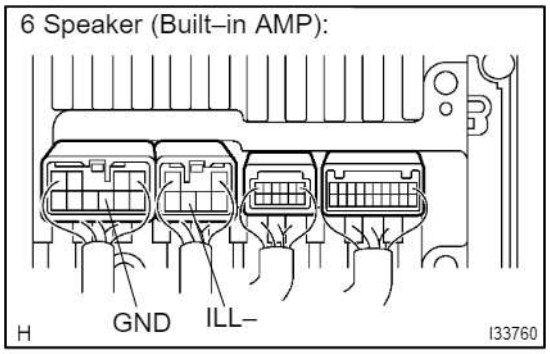


NG

OK → CHECK AND REPLACE RADIO RECEIVER ASSY

2 INSPECT RADIO RECEIVER ASSY(ILL–, GND)

6 Speaker (Built–in AMP):

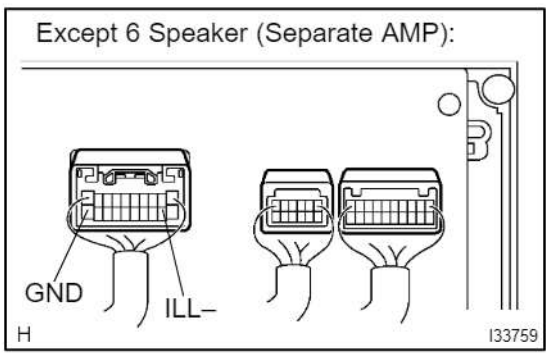


(a) Check that the voltage between terminals at each condition, as shown in the chart.

Standard:

Tester connection	Condition	Specified condition
ILL– ⇔ GND	Light control switch TAIL or HEAD	Continuity

Except 6 Speaker (Separate AMP):



OK → CHECK AND REPLACE RADIO RECEIVER ASSY

NG

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3	INSPECT LIGHT CONTROL RHEOSTAT (See Page71–7)

OK → CHECK AND REPLACE RADIO RECEIVER ASSY

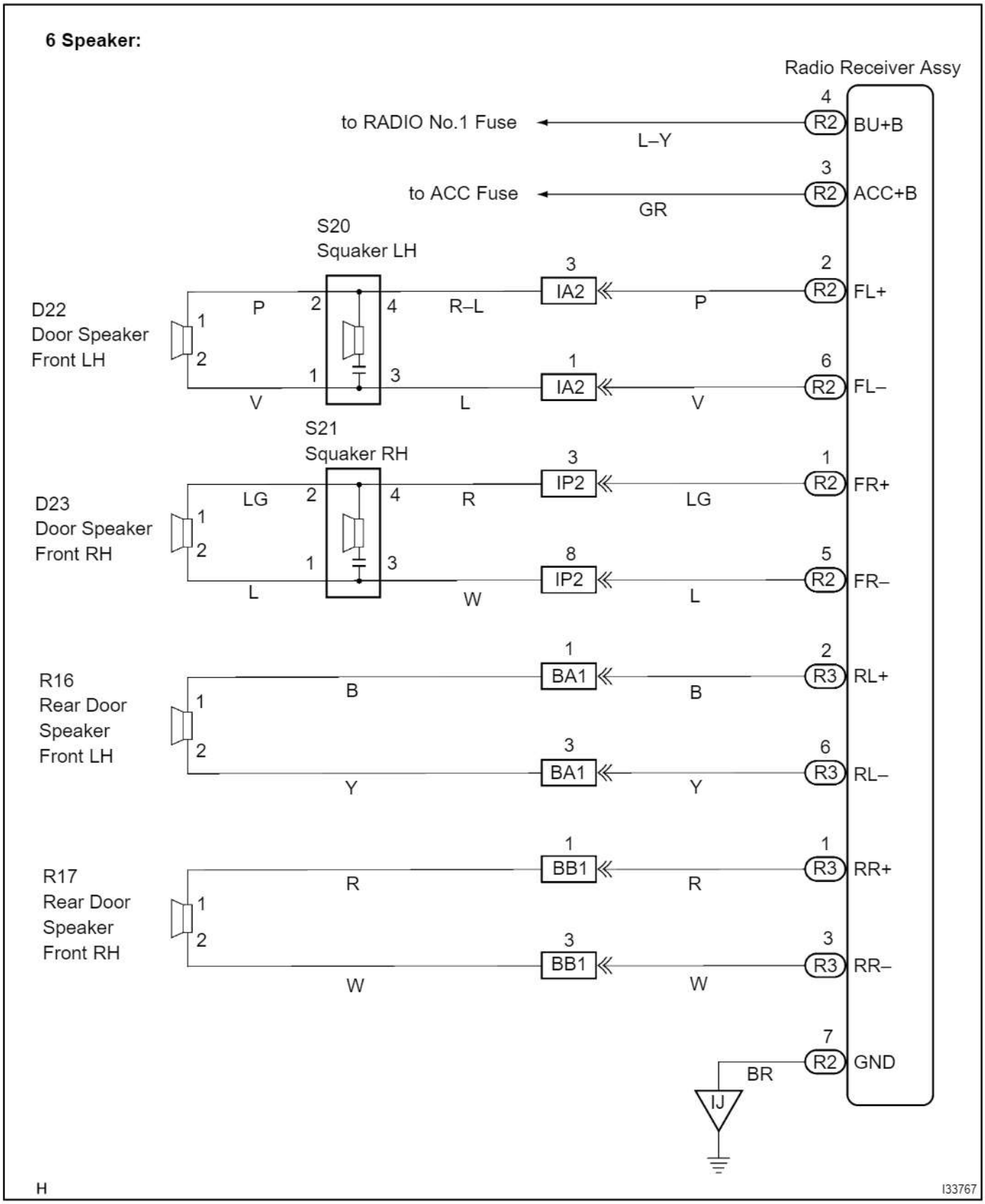
NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

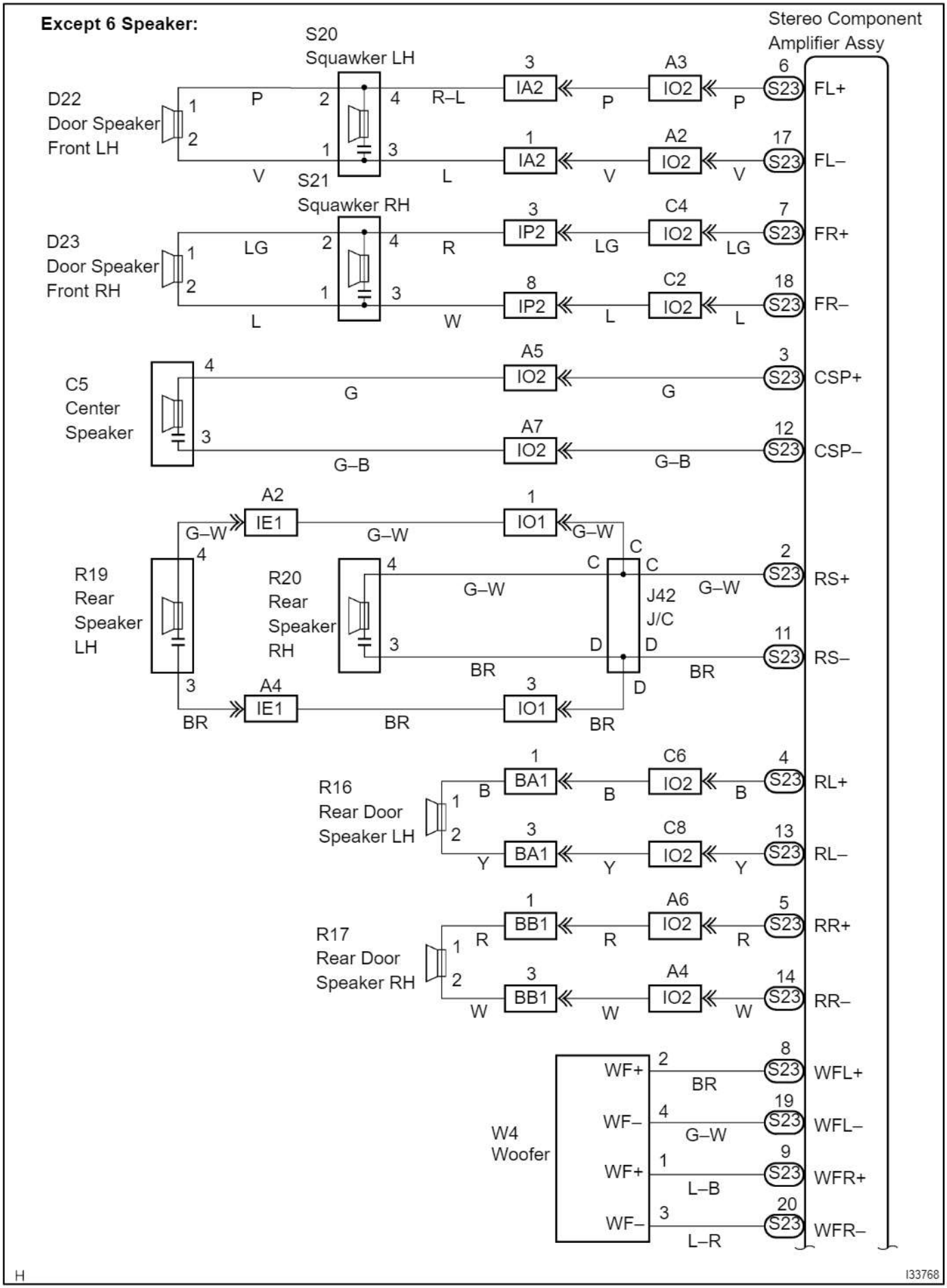
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NO SOUND IS HEARD FROM SPEAKER IN ALL MODES

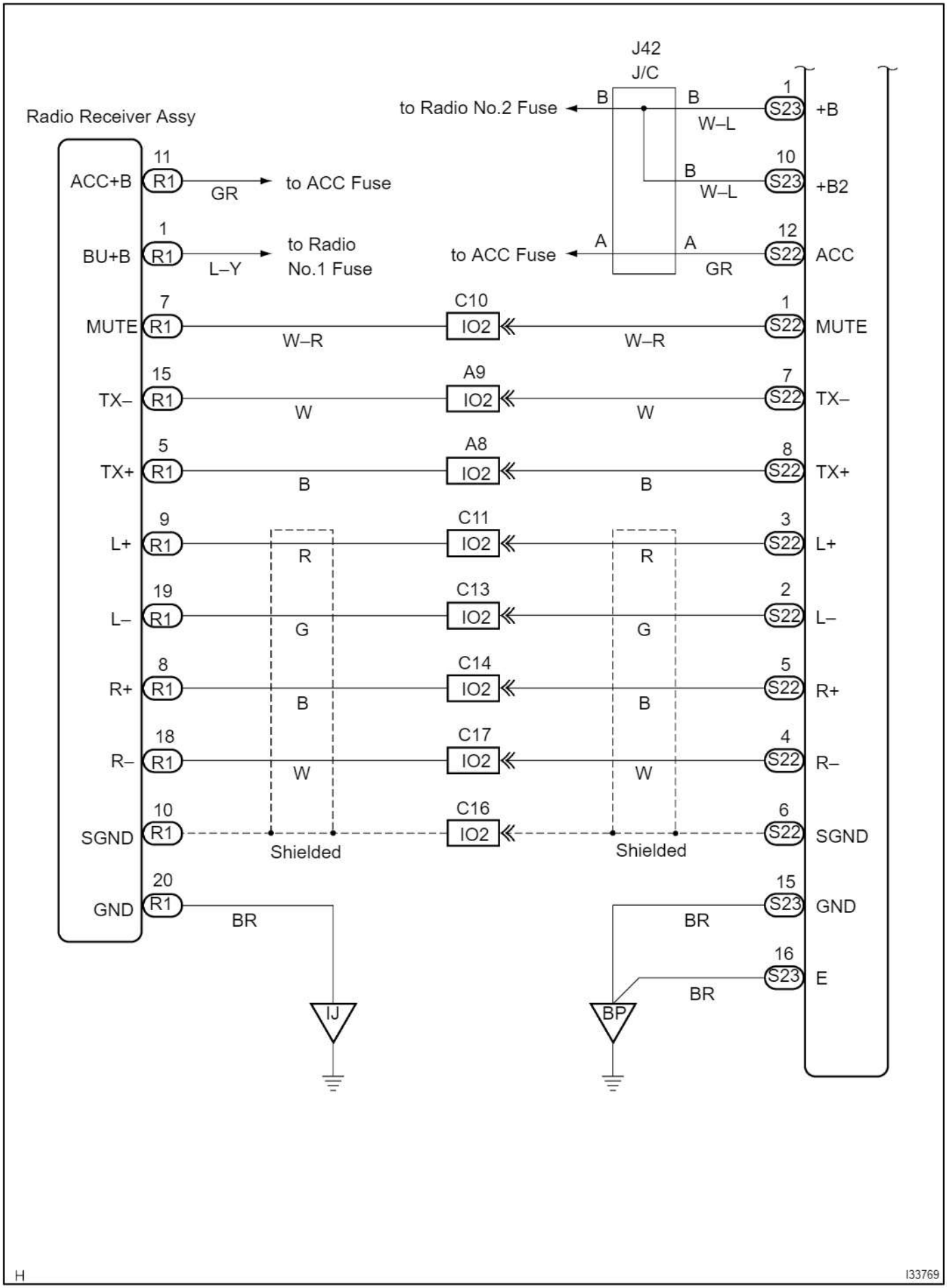
WIRING DIAGRAM



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INSPECTION PROCEDURE

1	INSPECT SYSTEM

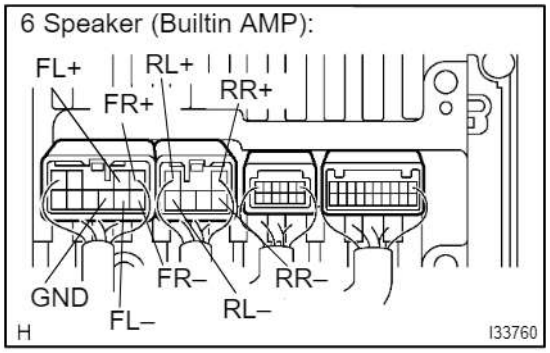
(a) Check the system.
(1) Check whether the stereo component amplifier assy is a built–in type or a separate type.

(A)	(B)
Built–in type amplifier	Separate type amplifier

B → Go to step 4

A

2	INSPECT RADIO RECEIVER ASSY(OUTPUT SIGNAL)



(a) Check that the voltage between terminals at each condition, as shown in the chart.

Standard:

Terminal	Condition	Specified condition
FL+/– ⇔ GND	Audio system is sounding	A waveform synchronized with sounds is output
FR+/– ⇔ GND	Audio system is sounding	A waveform synchronized with sounds is output
RL+/– ⇔ GND	Audio system is sounding	A waveform synchronized with sounds is output
RR+/– ⇔ GND	Audio system is sounding	A waveform synchronized with sounds is output

NG → CHECK AND REPLACE RADIO RECEIVER ASSY

OK

3	CHECK SPEAKER(RESISTANCE)

(a) Check continuity.
(1) Check that the continuity exists between terminals of speaker.
Standard: 2 – 8Ω

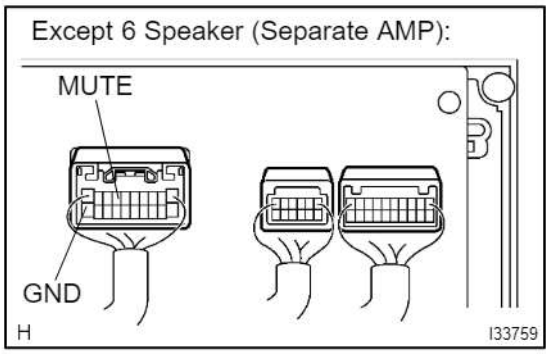
NG → REPLACE SPEAKER

OK

REPAIR OR REPLACE HARNESS OR CONNECTOR

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4 INSPECT RADIO RECEIVER ASSY(MUTE, GND)



(a) Check that the voltage between terminals at each condition, as shown in the chart.

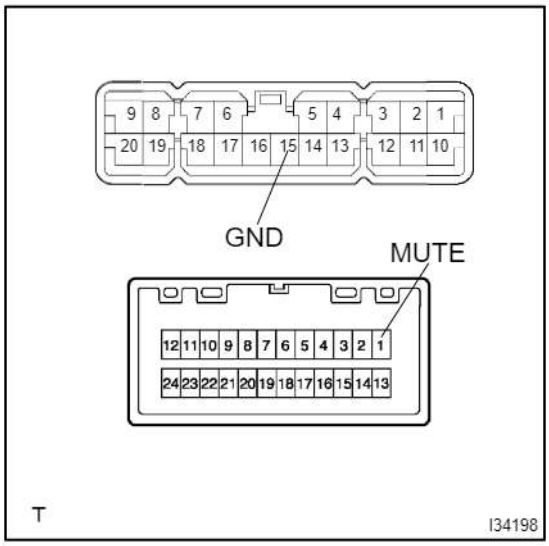
Standard:

Terminal	Condition	Specified condition
MUTE ⇔ GND	Audio system is sounding	3.5V or more

NG → **CHECK AND REPLACE RADIO RECEIVER ASSY**

OK

5 INSPECT STEREO COMPONENT AMPLIFIER ASSY(MUTE,GND)



(a) Check that the voltage between terminals at each condition, as shown in the chart.

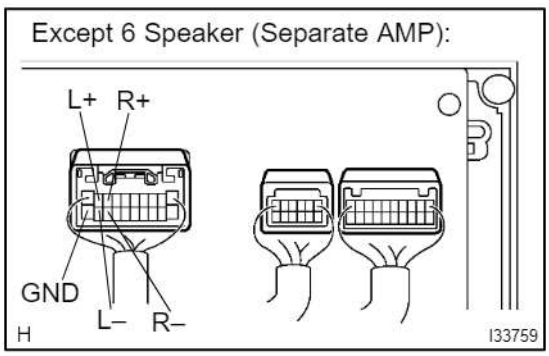
Standard:

Terminal	Condition	Specified condition
MUTE ⇔ GND	Audio system is sounding	3.5V or more

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

6 INSPECT RADIO RECEIVER ASSY(OUTPUT SIGNAL)



(a) Check that the continuity between terminals at each condition, as shown in the chart.

Standard:

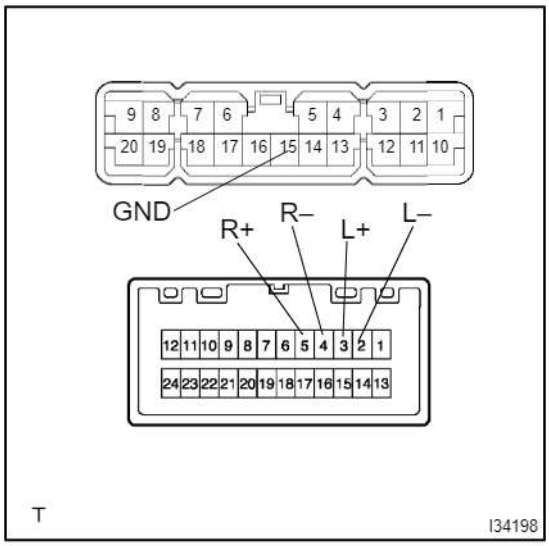
Terminal	Condition	Specified condition
R+/– ⇔ GND	Audio system is sounding	A waveform synchronized with sounds is output
L+/– ⇔ GND	Audio system is sounding	A waveform synchronized with sounds is output

NG → **CHECK AND REPLACE RADIO RECEIVER ASSY**

OK

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7 INSPECT STEREO COMPONENT AMPLIFIER ASSY(INPUT SIGNAL)



(a) Check that the continuity between terminals at each condition, as shown in the chart.

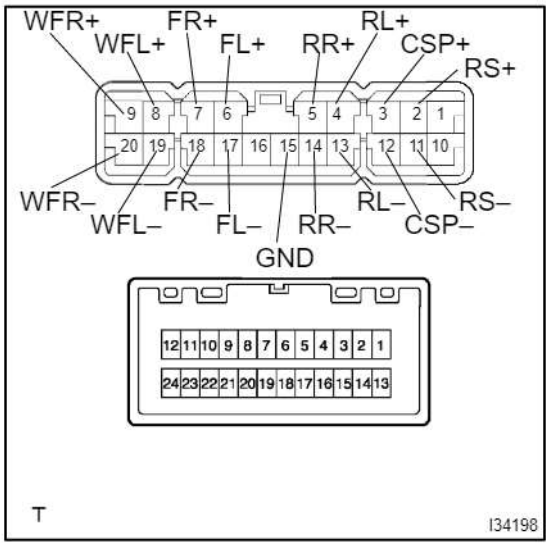
Standard:

Terminal	Condition	Specified condition
R+/– ⇔ GND	Audio system is sounding	A waveform synchronized with sounds is output
L+/– ⇔ GND	Audio system is sounding	A waveform synchronized with sounds is output

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

8 INSPECT STEREO COMPONENT AMPLIFIER ASSY(OUTPUT SIGNAL)



(a) Check that the continuity between terminals at each condition, as shown in the chart.

Standard:

Terminal	Condition	Specified condition
FL+/– ⇔ GND	Audio system is sounding	A waveform synchronized with sounds is output
FR+/– ⇔ GND	Audio system is sounding	A waveform synchronized with sounds is output
RL+/– ⇔ GND	Audio system is sounding	A waveform synchronized with sounds is output
RR+/– ⇔ GND	Audio system is sounding	A waveform synchronized with sounds is output
WFL+/– ⇔ GND	Audio system is sounding	A waveform synchronized with sounds is output
WFR+/– ⇔ GND	Audio system is sounding	A waveform synchronized with sounds is output
CSP+/– ⇔ GND	Audio system is sounding	A waveform synchronized with sounds is output
RS+/– ⇔ GND	Audio system is sounding	A waveform synchronized with sounds is output

NG → CHECK AND REPLACE STEREO COMPONENT AMPLIFIER ASSY

OK

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9	CHECK SPEAKER(RESISTANCE)

(a) Check continuity.
(1) Check that the continuity exists between terminals of speaker.
Standard: 2 – 8Ω

NG → **REPLACE SPEAKER**

OK

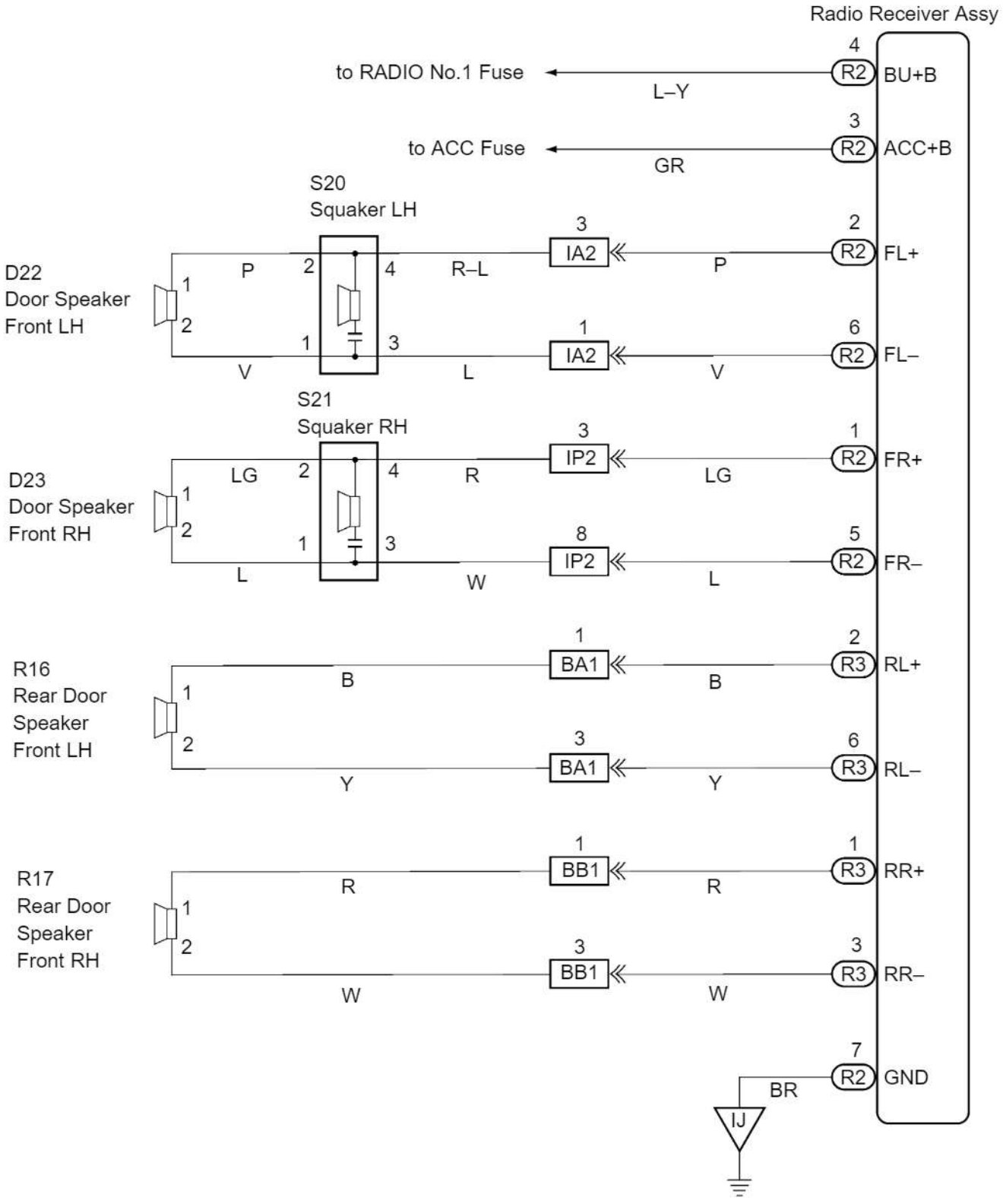
REPAIR OR REPLACE HARNESS OR CONNECTOR

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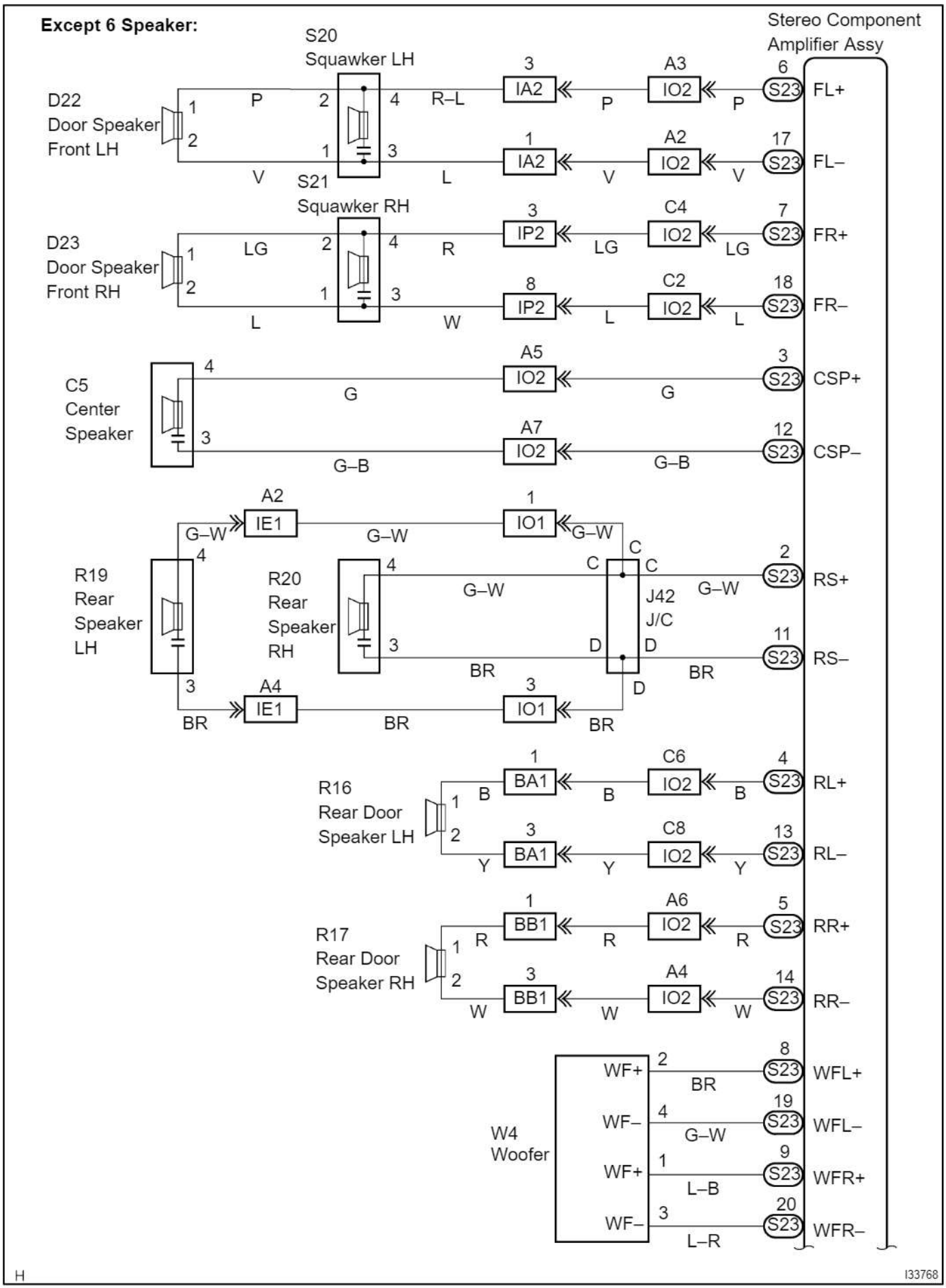
SOUND QUALITY IS BAD IN ALL MODES (VOLUME IS TOO LOW)

WIRING DIAGRAM

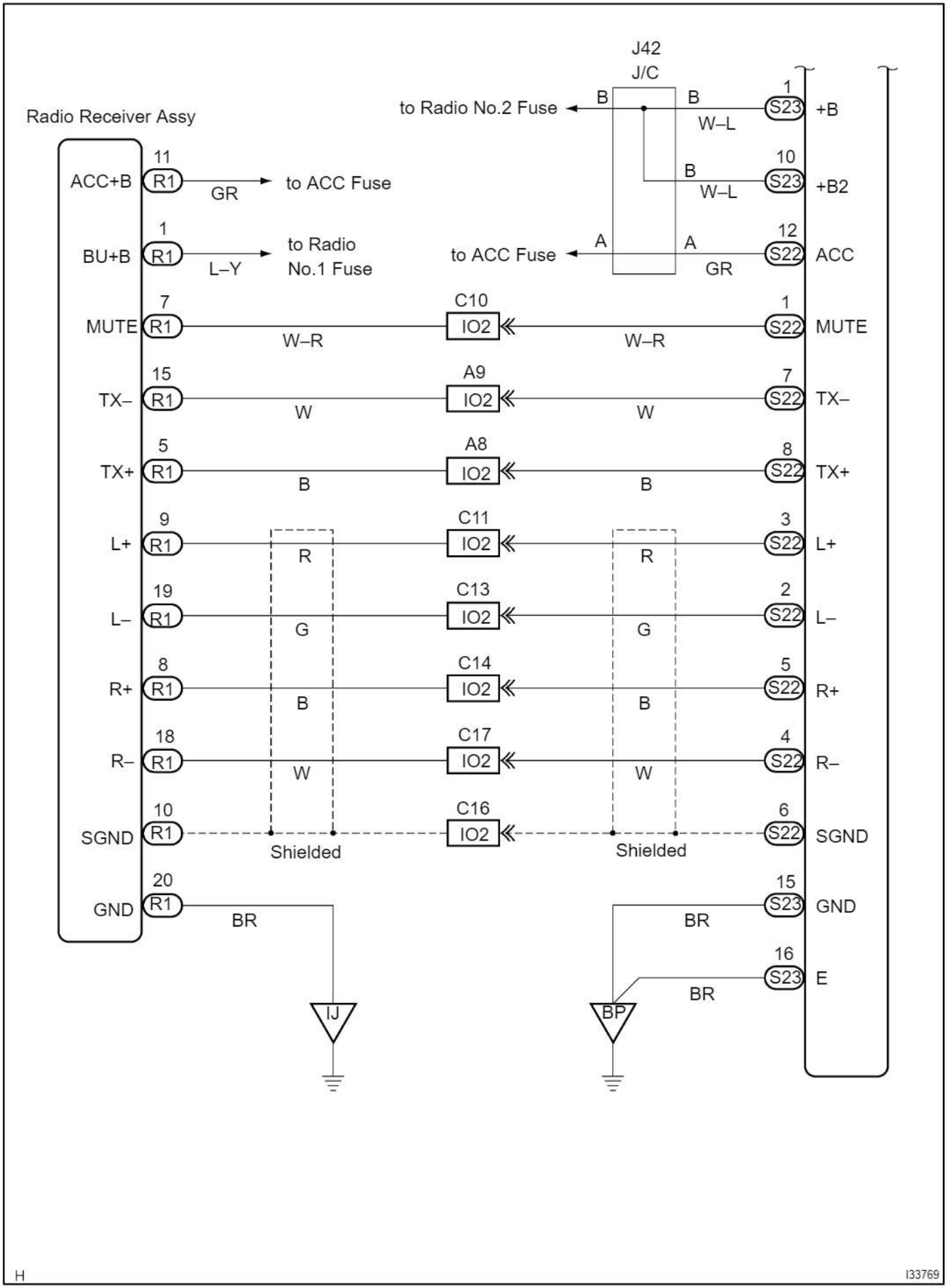
6 Speaker:



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INSPECTION PROCEDURE

1	ADJUST SOUND QUALITY

(a) Adjust the sound quality.
(1) Operate the radio receiver assy to adjust the sound quality.
Standard: The condition returns to be normal.

OK	BAD SOUND QUALITY

NG

2	COMPARE IT WITH ANOTHER CAR OF SAME MODEL

(a) Compare it with another vehicle of the same model.
(1) Compare with the vehicle of the same type which does not have a trouble to see if there is any difference in the condition of trouble occurrence.
Standard: No difference found.

OK	NORMAL

NG

3	INSPECT SYSTEM

(a) Check the system.
(1) Check whether the stereo component amplifier assy is a built–in type or a separate type.

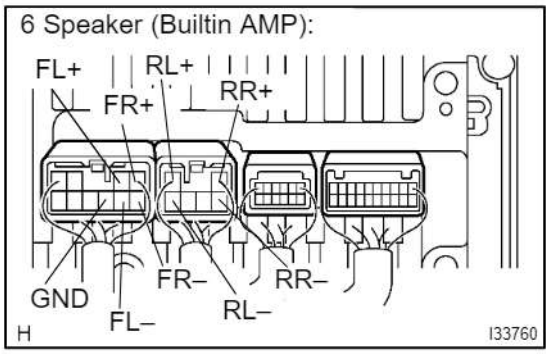
(A)	(B)
Built–in type amplifier	Separate type amplifier

B	Go to step 6

A

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4 INSPECT RADIO RECEIVER ASSY(OUTPUT SIGNAL)



(a) Check that the voltage between terminals at each condition, as shown in the chart.

Standard:

Terminal	Condition	Specified condition
FL+/– ⇔ GND	Audio system is sounding	A waveform synchronized with sounds is output
FR+/– ⇔ GND	Audio system is sounding	A waveform synchronized with sounds is output
RL+/– ⇔ GND	Audio system is sounding	A waveform synchronized with sounds is output
RR+/– ⇔ GND	Audio system is sounding	A waveform synchronized with sounds is output

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

5 CHECK SPEAKER(RESISTANCE)

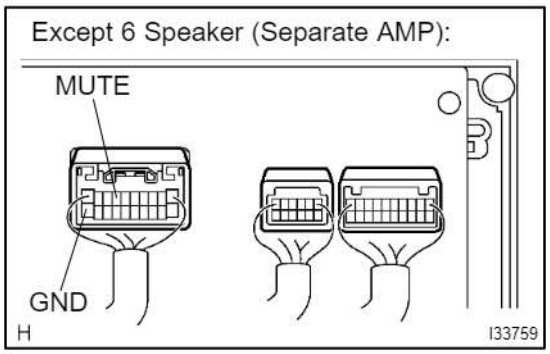
(a) Check continuity.
(1) Check that the continuity exists between terminals of speaker.
Standard: 2 – 8Ω

NG → **REPLACE SPEAKER**

OK

NORMAL

6 INSPECT RADIO RECEIVER ASSY(MUTE, GND)



(a) Check that the voltage between terminals at each condition, as shown in the chart.

Standard:

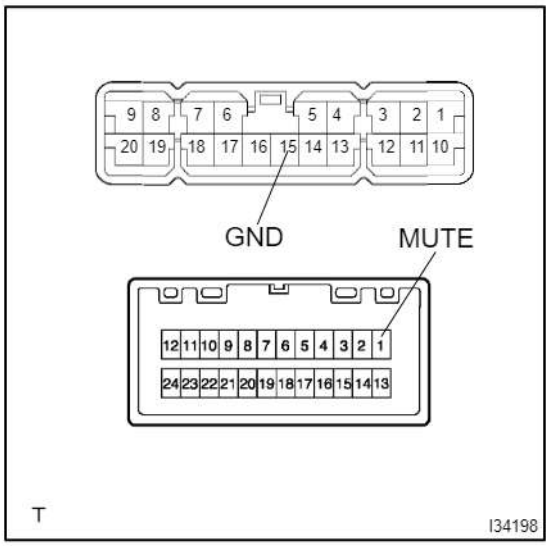
Terminal	Condition	Specified condition
MUTE ⇔ GND	Audio system is sounding	3.5V or more

NG → **CHECK AND REPLACE RADIO RECEIVER ASSY**

OK

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7 INSPECT STEREO COMPONENT AMPLIFIER ASSY(MUTE, GND)



(a) Check that the voltage between terminals at each condition, as shown in the chart.

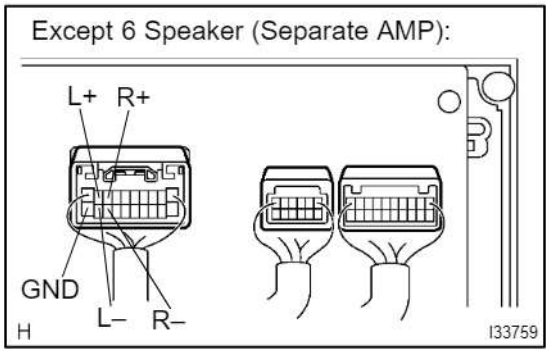
Standard:

Terminal	Condition	Specified condition
MUTE ⇔ GND	Audio system is sounding	3.5V or more

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

8 INSPECT RADIO RECEIVER ASSY(OUTPUT SIGNAL)



(a) Check that the continuity between terminals at each condition, as shown in the chart.

Standard:

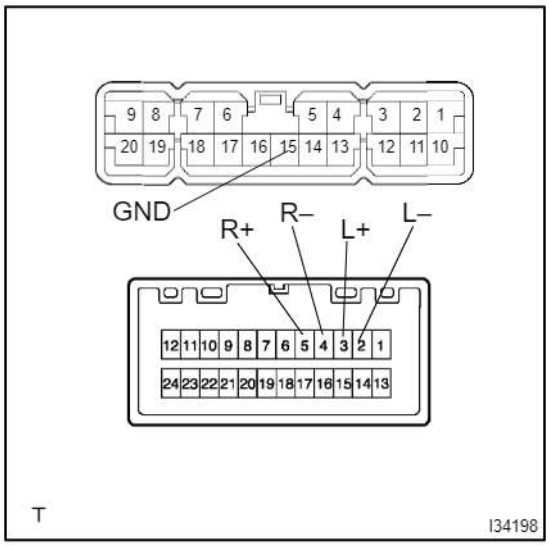
Terminal	Condition	Specified condition
R+/– ⇔ GND	Audio system is sounding	A waveform synchronized with sounds is output
L+/– ⇔ GND	Audio system is sounding	A waveform synchronized with sounds is output

NG → **CHECK AND REPLACE RADIO RECEIVER ASSY**

OK

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9 INSPECT STEREO COMPONENT AMPLIFIER ASSY(INPUT SIGNAL)



(a) Check that the continuity between terminals at each condition, as shown in the chart.

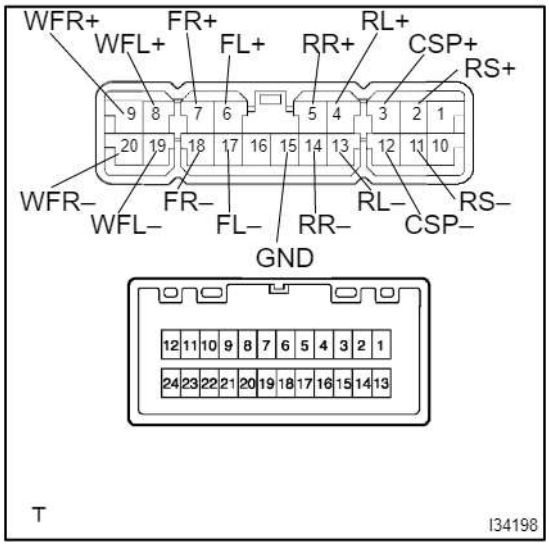
Standard:

Terminal	Condition	Specified condition
R+/– ⇔ GND	Audio system is sounding	A waveform synchronized with sounds is output
L+/– ⇔ GND	Audio system is sounding	A waveform synchronized with sounds is output

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

10 INSPECT STEREO COMPONENT AMPLIFIER ASSY(OUTPUT SIGNAL)



(a) Check that the continuity between terminals at each condition, as shown in the chart.

Standard:

Terminal	Condition	Specified condition
FL+/– ⇔ GND	Audio system is sounding	A waveform synchronized with sounds is output
FR+/– ⇔ GND	Audio system is sounding	A waveform synchronized with sounds is output
RL+/– ⇔ GND	Audio system is sounding	A waveform synchronized with sounds is output
RR+/– ⇔ GND	Audio system is sounding	A waveform synchronized with sounds is output
WFL+/– ⇔ GND	Audio system is sounding	A waveform synchronized with sounds is output
WFR+/– ⇔ GND	Audio system is sounding	A waveform synchronized with sounds is output
CSP+/– ⇔ GND	Audio system is sounding	A waveform synchronized with sounds is output
RS+/– ⇔ GND	Audio system is sounding	A waveform synchronized with sounds is output

NG → **CHECK AND REPLACE STEREO COMPONENT AMPLIFIER ASSY**

OK

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11	CHECK SPEAKER(RESISTANCE)

(a) Check continuity.
(1) Check that the continuity exists between terminals of speaker.
Standard: 2 – 8Ω

NG → REPLACE SPEAKER

OK

REPAIR OR REPLACE HARNESS OR CONNECTOR

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RADIO BROADCAST CANNOT BE RECEIVED (BAD RECEPTION)

INSPECTION PROCEDURE

1	CHECK IF RADIO AUTO–SEARCH FUNCTIONS PROPERLY

(a) Check if the radio auto–search functions properly.
(1) Perform the auto–search of the radio and check that it functions normally.
Standard: The radio auto–search functions properly.

OK → CHECK AND REPLACE RADIO RECEIVER ASSY

NG

2	CHECK OPTIONAL COMPONENT

(a) Check optional component (Sun shade film, telephone antenna etc.).
(1) Check whether or not any optional component is installed, such as the sunshade film and the telephone antenna, is installed.
Standard: Optional component is installed.

OK → EFFECT FROM OPTIONAL COMPONENT

NG

3	CHECK ANTENNA FOR NOISE PRODUCTION

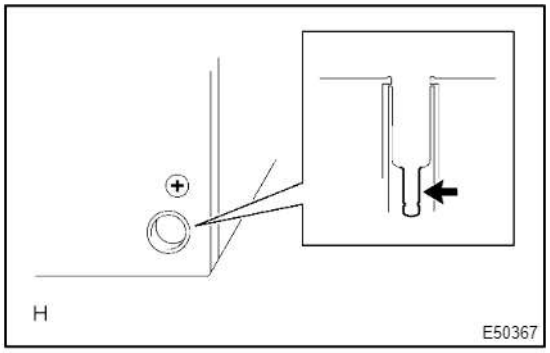
(a) Noise Check with Antenna
(1) With the ignition switch in ACC, turn on the radio and choose the AM mode.
(2) Place a tip of a screwdriver or the antenna of the antenna assembly w/ holder and check that the noise heard from the speaker.
Standard: Noise occurs.

OK → CHECK AND REPLACE RADIO RECEIVER ASSY

NG

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4	INSPECT RADIO RECEIVER ASSY(ANTENNA)



(a) Preparation for Check
  (1) Remove the antenna plug of the radio receiver assembly.

(b) Noise Check
  (1) With the radio receiver assembly connector connected, turn the ignition switch to ACC.
  (2) Turn on the radio and choose the AM mode.
  (3) Place a flat–head screwdriver or a metal such as a thin wire on the antenna jack of the radio receiver assembly and check that the noise heard from the speaker.

Standard: Noise occurs.

OK	CHECK AND REPLACE RADIO RECEIVER ASSY

NG

REPLACE ANTENNA CORD SUB–ASSY

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CASSETTE TAPE CANNOT BE INSERTED OR PLAYED

INSPECTION PROCEDURE

1	CHECK FOR ANY FOREIGN OBJECT

(a) Check for any foreign object.
(1) Check that no foreign object or defect is detected in the cassette tape player of radio receiver assembly.
Standard: No foreign object and defect detected.

NG → REMOVE FOREIGN OBJECT

OK

2	CHECK CASSETTE TAPE

(a) Check the cassette tape.
(1) Check that the cassette tape is a normal tape to which music or voice is recorded.
Standard: Proper cassette tape to which music or voice is recorded

NG → CASSETTE TAPE FAULTY

OK

3	REPLACE CASSETTE TAPE WITH ANOTHER AND RECHECK

(a) Replace the cassette tape with another and recheck.
(1) Replace the faulty cassette tape with the normal one to see if the same trouble occurs again.
Standard: The function is recovered to be normal.

OK → CASSETTE TAPE FAULTY

NG

4	CHECK IF RADIO AUTO–SEARCH FUNCTIONS PROPERLY

(a) Check if the radio auto–search functions properly.
(1) Perform the auto–search of the radio and check that the operation is normal.
Standard: The operation returns to be normal.

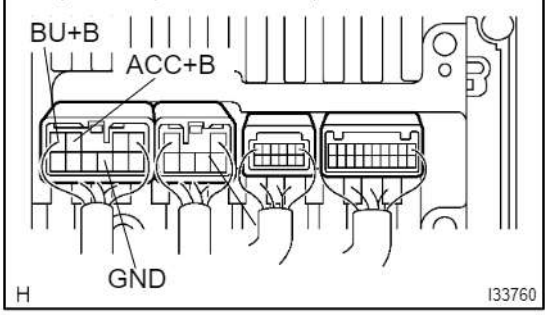
OK → CHECK AND REPLACE RADIO RECEIVER ASSY

NG

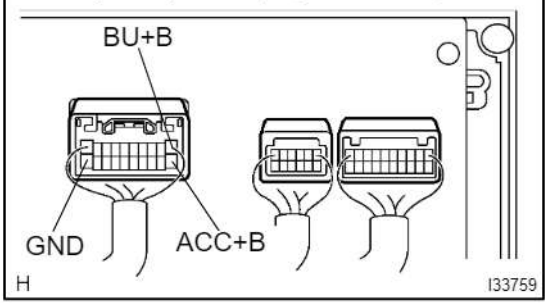
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5	INSPECT RADIO RECEIVER ASSY(BU+B, ACC+B, GND)

6 Speaker (Built–in AMP):



Except 6 Speaker (Separate AMP):



(a) Check that the continuity between terminals at each condition, as shown in the chart.

Standard:

Tester connection	Condition	Specified condition
GND – Body ground	Constant	Continuity

(b) Check that the voltage between terminals at each condition, as shown in the chart.

Standard:

Tester connection	Condition	Specified condition
BU+B – GND/E	Constant	10 – 14 V
ACC+B – GND/E	Ignition switch ACC or ON	10 – 14 V

OK → **CHECK AND REPLACE RADIO RECEIVER ASSY**

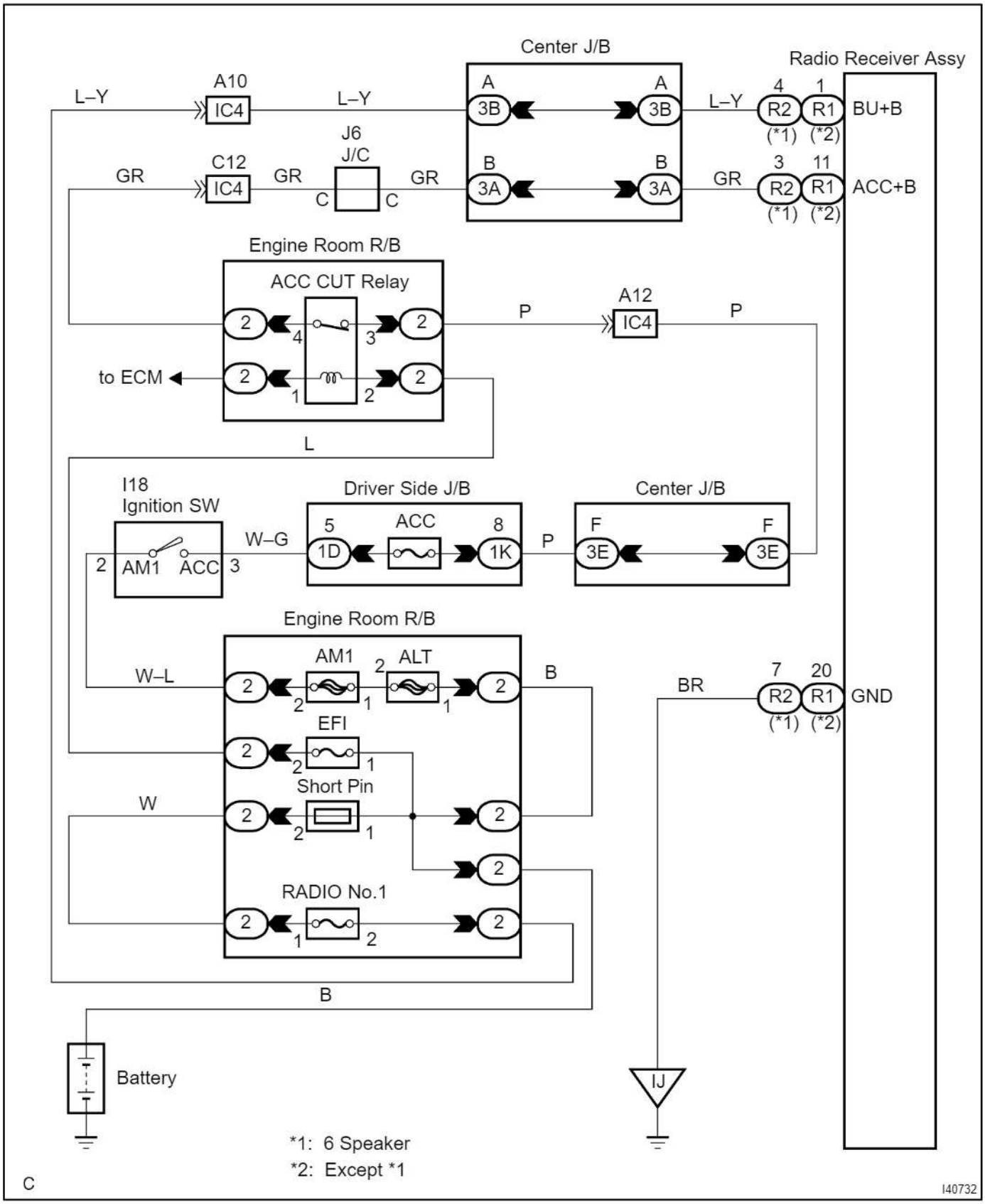
NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

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CASSETTE TAPE CANNOT BE EJECTED

WIRING DIAGRAM



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INSPECTION PROCEDURE

1	CHECK IF RADIO AUTO–SEARCH FUNCTIONS PROPERLY

(a) Check if the radio auto–search function properly.
(1) Perform the auto–research of the radio and check that the operation is normal.
Standard: malfunction disappear.

NG → **Go to step 5**

OK

2	PRESS "EJECT" AND CHECK OPERATION

(a) Press "EJECT" and check the operation.
(1) Press the cassette tape EJECT switch of the radio receiver assembly for 2 sec or more and check that the cassette tape is ejected.
Standard: The cassette tape is ejected.

NG → **CHECK AND REPLACE RADIO RECEIVER ASSY**

OK

3	CHECK CASSETTE TAPE

(a) Check the cassette tape.
(1) Check that the ejected cassette tape does not have the label peeling, cassette body deformation and others.
Standard: No fault on the cassette tape.

NG → **CASSETTE TAPE FAULTY**

OK

4	REPLACE CASSETTE TAPE WITH ANOTHER AND RECHECK

(a) Replace the cassette tape with another and recheck.
(1) Replace the faulty cassette tape with the normal one to see if the same trouble occurs again.
Standard: malfunction disappear.

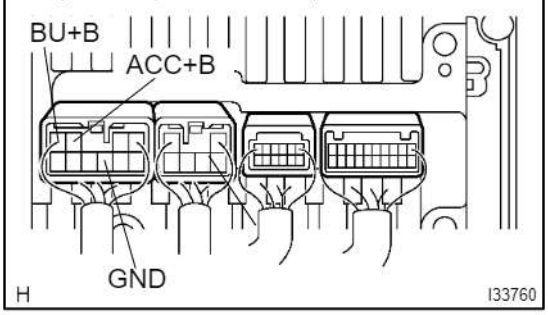
OK → **CASSETTE TAPE FAULTY**

NG

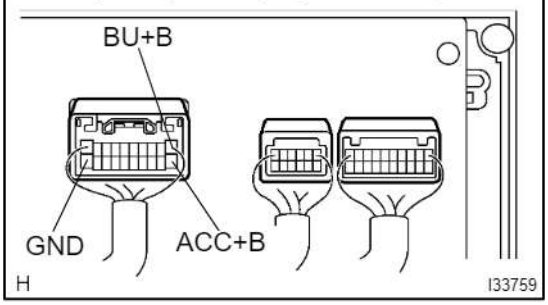
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5	INSPECT RADIO RECEIVER ASSY(BU+B, ACC+B, GND)

6 Speaker (Built–in AMP):



Except 6 Speaker (Separate AMP):



(a) Check that the continuity between terminals at each condition, as shown in the chart.

Standard:

Tester connection	Condition	Specified condition
GND – Body ground	Constant	Continuity

(b) Check that the voltage between terminals at each condition, as shown in the chart.

Standard:

Tester connection	Condition	Specified condition
BU+B – GND/E	Constant	10 – 14 V
ACC+B – GND/E	Ignition switch ACC or ON	10 – 14 V

OK → **CHECK AND REPLACE RADIO RECEIVER ASSY**

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

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SOUND QUALITY IS BAD ONLY WHEN PLAYING TAPE

INSPECTION PROCEDURE

1	REPLACE CASSETTE TAPE WITH ANOTHER AND RECHECK

(a) Replace the cassette tape with another and recheck.
(1) Replace the faulty cassette tape with the normal one to see if the same trouble occurs again.
Standard: malfunction disappear.

OK → CASSETTE TAPE FAULTY

NG

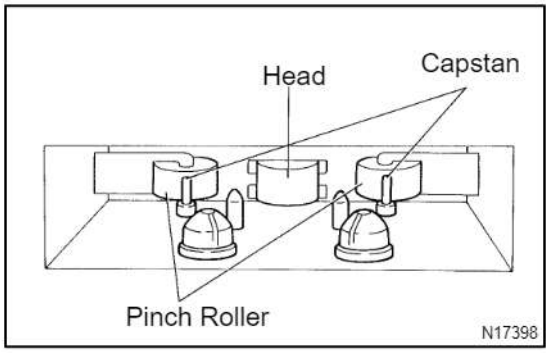
2	CHECK FOR ANY FOREIGN OBJECT

(a) Check for foreign object.
(1) Check that no foreign material and troubles are detected in the radio receiver assembly cassette tape player.

NG → REMOVE FOREIGN OBJECT

OK

3	CLEAN HEAD AND CHECK OPERATION



(a) Head cleaning
(1) Raise the cassette door with your finger. Next, using a pencil or similar object, push in the guide.
(2) Using a cleaning pen or cotton applicator soaked in cleaner, clean the head surface, pinch rollers and capstans.
(3) Check that the same trouble occurs again.

OK → HEAD DIRTY

NG

CHECK AND REPLACE RADIO RECEIVER ASSY

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TAPE IS TANGLED DUE TO INCORRECT TAPE SPEED OR AUTO–REVERSE MALFUNCTION

INSPECTION PROCEDURE

1	CHECK FOR ANY FOREIGN OBJECT

(a) Check for any foreign object.
  (1) Check that no foreign material and troubles are detected in the radio receiver assembly cassette tape player.
  Standard: No foreign material and trouble detected.

NG > REMOVE FOREIGN OBJECT

OK

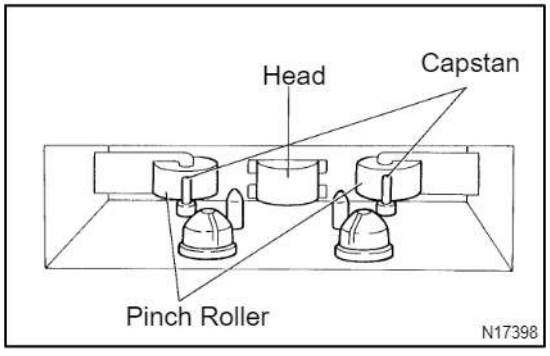
2	REPLACE CASSETTE TAPE WITH ANOTHER AND RECHECK(BELOW 90 MIN.)

(a) Replace the cassette tape with another and recheck.
  (1) Replace the faulty cassette tape with the normal one (90min or less) to see if the same trouble occurs again.
  Standard: malfunction disappear.

OK > CASSETTE TAPE FAULTY

NG

3	CLEAN HEAD AND CHECK OPERATION



(a) Head cleaning
  (1) Raise the cassette door with your finger. Next, using a pencil or similar object, push in the guide.
  (2) Using a cleaning pen or cotton applicator soaked in cleaner, clean the head surface, pinch rollers and capstans.
  (3) Check that the same trouble occurs again.

OK > HEAD DIRTY

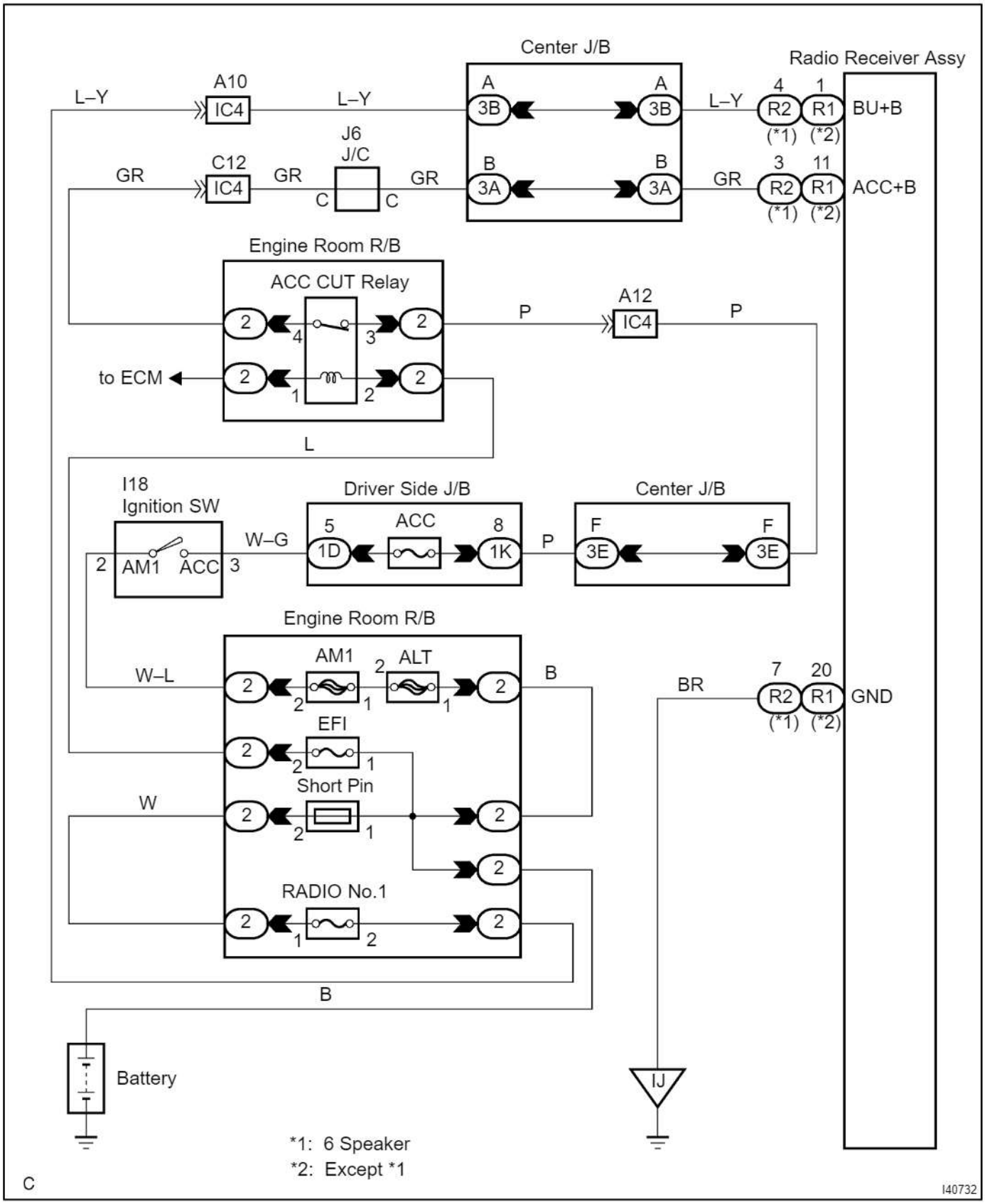
NG

CHECK AND REPLACE RADIO RECEIVER ASSY

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CD CANNOT BE INSERTED OR IS EJECTED RIGHT AFTER INSERTION

WIRING DIAGRAM



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INSPECTION PROCEDURE

1	CHECK IF A PROPER CD IS INSERTED

(a) Check that a proper CD is inserted.
(1) Make sure that the CD is normal audio CD, and that there is no deformation, flaw, stain, burr and other defects on the CD.
Standard: Normal audio CD.

Reference:
- □ Translucent or different–shaped CD cannot be played.
- □ CD–ROM for personal computers (with music recorded in) and recorded CD –R may not be played.
- □ Playing an 8–cm CD does not require an adapter.

NG → **CD FAULTY**

OK

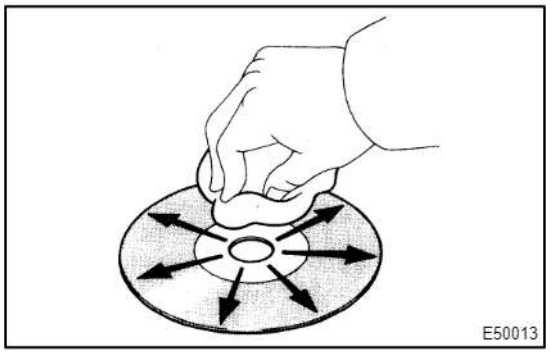
2	CHECK THAT A PROPER CD IS INSERTED

(a) Check that a proper CD is inserted.
(1) Check whether or not the CD is inserted upside down.
Standard: Not upside down.

NG → **SET DISC CORRECTLY**

OK

3	DISC CLEANING



(a) Disc cleaning
(1) If the disc gets dirty, clean the disc by wiping the surface from the center to outside in the radial directions with a soft cloth.

NOTICE:
Do not use a conventional record cleaner or anti–static preservative.

OK → **DISC DIRTY**

NG

4	REPLACE CD WITH ANOTHER AND RECHECK

(a) Replace the CD with another and recheck.
(1) Replace the faulty CD with the normal one to see if the same trouble occurs again.
Standard: malfunction disappear.

OK → **CD FAULTY**

NG

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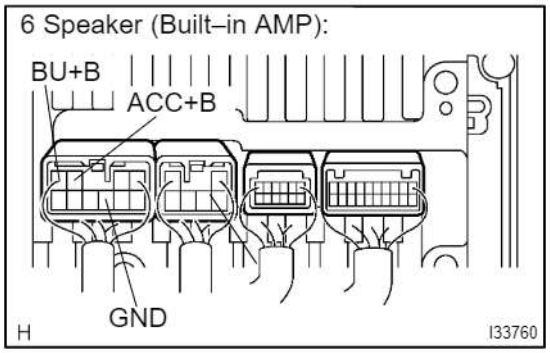
5	CHECK IF RADIO AUTO–SEARCH FUNCTIONS PROPERLY

(a) Check if the radio auto–search function properly.
(1) Perform the auto–research of the radio and check that the operation is normal.
Standard: malfunction disappear.

OK → CHECK AND REPLACE RADIO RECEIVER ASSY

NG

6	INSPECT RADIO RECEIVER ASSY(BU+B, ACC+B, GND)



(a) Check that the continuity between terminals at each condition, as shown in the chart.

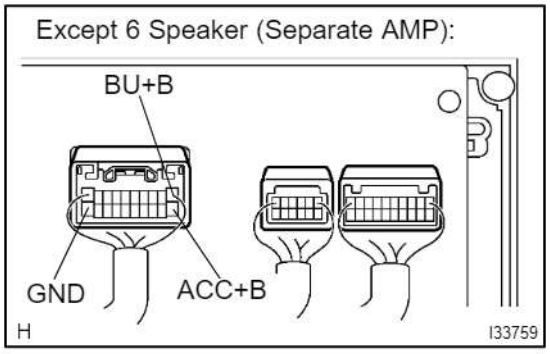
Standard:

Tester connection	Condition	Specified condition
GND – Body ground	Constant	Continuity

(b) Check that the voltage between terminals at each condition, as shown in the chart.

Standard:

Tester connection	Condition	Specified condition
BU+B – GND/E	Constant	10 – 14 V
ACC+B – GND/E	Ignition switch ACC or ON	10 – 14 V



OK → CHECK AND REPLACE RADIO RECEIVER ASSY

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

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ALTHOUGH SYSTEM IS POWERED, CD CANNOT BE PLAYED

INSPECTION PROCEDURE

1	CHECK IF A PROPER CD IS INSERTED

(a) Check that a proper CD is inserted.
  (1) Make sure that the CD is a normal audio CD, and that there is no deformation, flaw, stain, burr and other defects on the CD.

Standard: Normal audio CD.

Reference:
- □ Translucent or different–shaped CD cannot be played.
- □ CD–ROM for personal computers (with music recorded in) and recorded CD–R may not be played.
- □ Playing an 8–cm CD does not require an adapter.

NG > CD FAULTY

OK

2	CHECK THAT A PROPER CD IS INSERTED

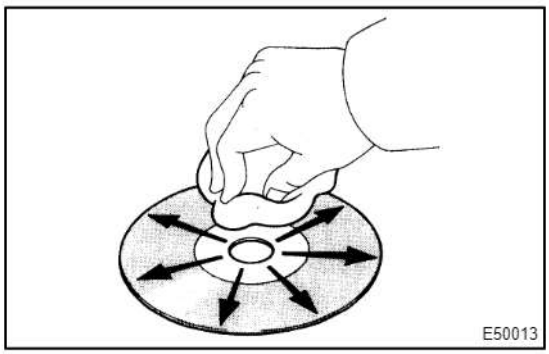
(a) Check that a proper CD is inserted.
  (1) Check whether or not the CD is inserted upside down.

Standard: Not upside down.

NG > SET DISC CORRECTLY

OK

3	DISC CLEANING



(a) Disc cleaning
  (1) If the disc gets dirty, clean the disc by wiping the surface from the center to outside in the radial directions with a soft cloth.

NOTICE:
Do not use a conventional record cleaner or anti–static preservative.

OK > DISC DIRTY

NG

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4	REPLACE CD WITH ANOTHER AND RECHECK

(a) Replace the CD with another and recheck.
(1) Replace the faulty CD with the normal one to see if the same trouble occurs again.
Standard: malfunction disappear.

OK	CD FAULTY

NG

5	CHECK IF RADIO AUTO–SEARCH FUNCTIONS PROPERLY

(a) Check if the radio auto–search function properly.
(1) Perform the auto–research of the radio and check that the operation is normal.
Standard: malfunction disappear.

NG	Go to step 7

OK

6	DID TEMPERATURE IN CABIN CHANGE RAPIDLY?

(a) Did the temperature in the cabin change rapidly?
(1) Check whether or not the rapid temperature change occurred in the cabin.
Standard: The rapid temperature change occurred.

Reference:
The rapid temperature change creates condensation inside the CD player, which may disable playing CD.

OK	CONDENSATION DUE TO TEMPERATURE CHANGE (LEAVE IT AS IT IS FOR A WHILE BEFORE USING)

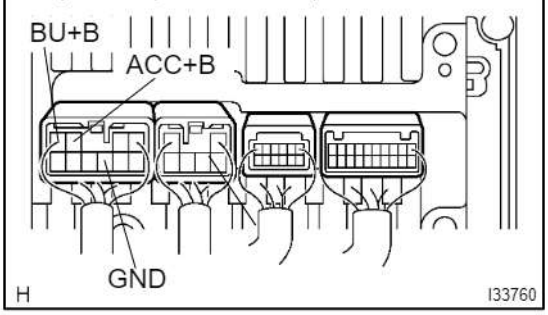
NG

CHECK AND REPLACE RADIO RECEIVER ASSY

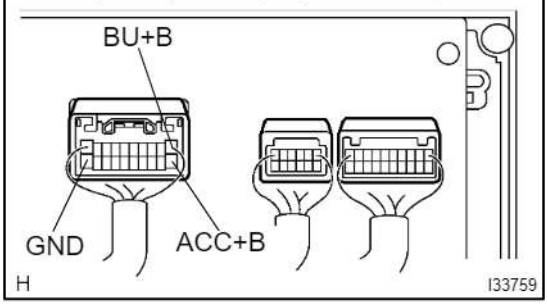
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7 INSPECT RADIO RECEIVER ASSY(BU+B, ACC+B, GND)

6 Speaker (Built–in AMP):



Except 6 Speaker (Separate AMP):



(a) Check that the continuity between terminals at each condition, as shown in the chart.

Standard:

Tester connection	Condition	Specified condition
GND ⇔ Body ground	Constant	Continuity

(b) Check that the voltage between terminals at each condition, as shown in the chart.

Standard:

Tester connection	Condition	Specified condition
BU+B ⇔ GND	Constant	10 – 14 V
ACC+B ⇔ GND	Ignition switch ACC or ON	10 – 14 V

OK → **CHECK AND REPLACE RADIO RECEIVER ASSY**

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

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CD CANNOT BE TAKEN OUT

INSPECTION PROCEDURE

1	CHECK IF RADIO AUTO–SEARCH FUNCTIONS PROPERLY

(a) Check if the radio auto–search function properly.
(1) Perform the auto–research of the radio and check that the operation is normal.
Standard: malfunction disappear.

NG → **Go to step 5**

OK

2	PRESS ”EJECT” AND CHECK OPERATION

(a) Press ”EJECT”and check the operation
(1) Press the CD EJECT switch of the radio receiver assembly for 2 sec or more to see if the CD is ejected.
Standard: CD is ejected.

Reference:
If the CD is not ejected, send the vehicle for repair.
Do not try to drag it out by force.

NG → **CHECK AND REPLACE RADIO RECEIVER ASSY**

OK

3	CHECK IF A PROPER CD IS INSERTED

(a) Check that a proper CD is inserted.
(1) Check that in what conditions the sound skipping occurs.
Standard: Driving on the bad road.

NG → **CD FAULTY**

OK

4	REPLACE CD WITH ANOTHER AND RECHECK

(a) Replace the CD with another and recheck.
(1) Check the installation condition of the radio receiver assembly.
Standard: Installed properly.

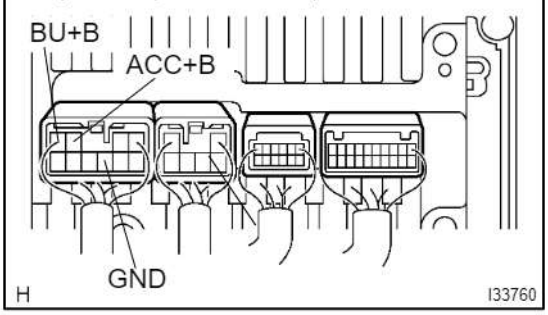
OK → **CD FAULTY**

NG

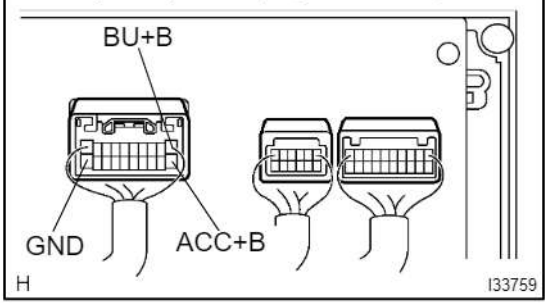
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5 INSPECT RADIO RECEIVER ASSY(BU+B, ACC+B, GND)

6 Speaker (Built–in AMP):



Except 6 Speaker (Separate AMP):



(a) Check that the continuity between terminals at each condition, as shown in the chart.

Standard:

Tester connection	Condition	Specified condition
GND – Body ground	Constant	Continuity

(b) Check that the voltage between terminals at each condition, as shown in the chart.

Standard:

Tester connection	Condition	Specified condition
BU+B – GND/E	Constant	10 – 14 V
ACC+B – GND/E	Ignition switch ACC or ON	10 – 14 V

OK → **CHECK AND REPLACE RADIO RECEIVER ASSY**

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

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SOUND QUALITY IS BAD ONLY WHEN CD IS PLAYED (VOLUME IS TOO LOW)

INSPECTION PROCEDURE

1	REPLACE CD WITH ANOTHER AND RECHECK

(a) Replace the CD with another and recheck.
(1) Check the installation condition of the radio receiver assembly.
Standard: malfunction disappear.

NG → CD FAULTY

OK

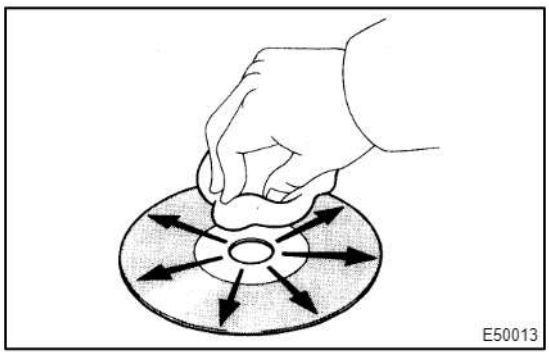
CHECK AND REPLACE RADIO RECEIVER ASSY

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CD SOUND SKIPS

INSPECTION PROCEDURE

1	DISC CLEANING



(a) Disc cleaning
  (1) If the disc gets dirty, clean the disc by wiping the surface from the center to outside in the radial directions with a soft cloth.

NOTICE:
Do not use a conventional record cleaner or anti–static preservative.

Standard: malfunction disappear.

OK	DISC DIRTY

NG

2	REPLACE CD WITH ANOTHER AND RECHECK

(a) Replace the CD with another and recheck.
  (1) Check the installation condition of the radio receiver assembly.
  Standard: malfunction disappear.

OK	CD FAULTY

NG

3	CHECK WHEN THIS HAPPENS

(a) Check then this happens.
  (1) Check that in what condition (place) noise occurs.
  Standard: Driving on the bumpy road.

OK	Go to step 5

NG

4	COMPARE IT WITH ANOTHER CAR OF SAME MODEL

(a) Compare it with another vehicle of the same model.
  (1) Compare with the vehicle of the same type which does not have a trouble to see if there is any difference in the condition of trouble occurrence.
  Standard: No difference found.

OK	SETTING

NG

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5	CHECK OF RADIO RECEIVER ASSEMBLY INSTALLATION

(a) Check of radio receiver assembly installation.
(1) Check the installation condition of the radio receiver assembly.
Standard: Installed properly.

NG → **INSTALL THE RADIO RECEIVER ASSEMBLY PROPERLY**

OK

6	DID TEMPERATURE IN CABIN CHANGE RAPIDLY?

(a) Did the temperature in the cabin change rapidly?
(1) Check whether or not the rapid temperature change occurred in the cabin.
Standard: The rapid temperature change occurred.

Reference:
The rapid temperature change creates condensation inside the CD player, which may disable playing CD.

OK → **CONDENSATION DUE TO TEMPERATURE CHANGE (LEAVE IT AS IT IS FOR A WHILE BEFORE USING)**

NG

CHECK AND REPLACE RADIO RECEIVER ASSY

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NOISE OCCURS

INSPECTION PROCEDURE

1	CHECK OF SPEAKER INSTALLATION

(a) Check speaker installation condition.
  (1) Check that each speaker is securely installed.
  Standard: malfunction disappear.

HINT:
The radio is equipped with noise prevention system that does not work against the regular use of the radio, thereby excessively large noise cannot occur in the radio. If large noise occurs, check whether or not the earth on the antenna installation part and the proper noise–prevention equipment are all installed, and whether or not the improper wiring is held.

Condition in which noise occurs	Noise type
Depressing the acceleration pedal increases noise, and stopping the engine erases the noise immediately.	Alternator noise
Noise occurs during the A/C or the heater operation.	Blower motor noise
Rapid acceleration during the drive on the unpaved road or after the IG switch is turned ON makes noise.	Fuel pump noise
Pressing and then releasing the horn switch, and keeping pressing the horn switch makes noise.	Horn noise
Stopping the engine erases the small noise that has been heard.	Ignition noise
Noise occurs in turn with the blink of the turn signal flash.	Flasher noise
Noise occurs during the window washer operation.	Washer noise
Noise occurs during the engine running, and it continues to occur after the engine is stopped.	Water temperature sensor noise
Noise occurs during the wiper operation.	Wiper noise
Noise occurs when the brake pedal is depressed.	Stop light switch noise
Others.	Static electricity on the vehicle

HINT:
- □ Identify the condition under which the noise occurs, and check the noise filter on the related part.
- □ Make sure first that there is no noise from outside. Failing to do so makes the noise occurrence source detection impossible and leads to misunderstanding.
- □ The noise should be removed in descending order of loudness.

NG → INSTALL IT PROPERLY

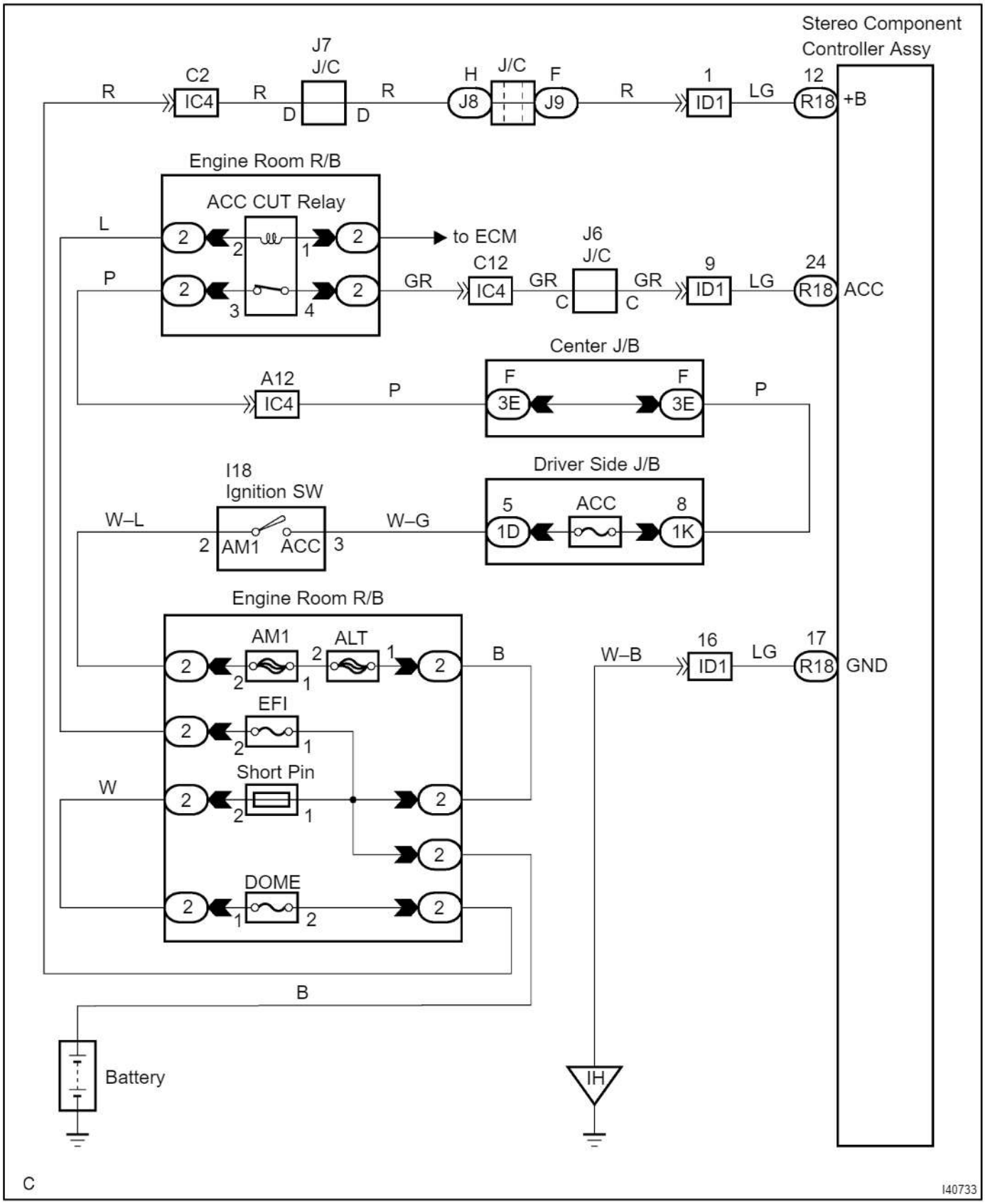
OK

IDENTIFICATION OF NOISE SOURCE

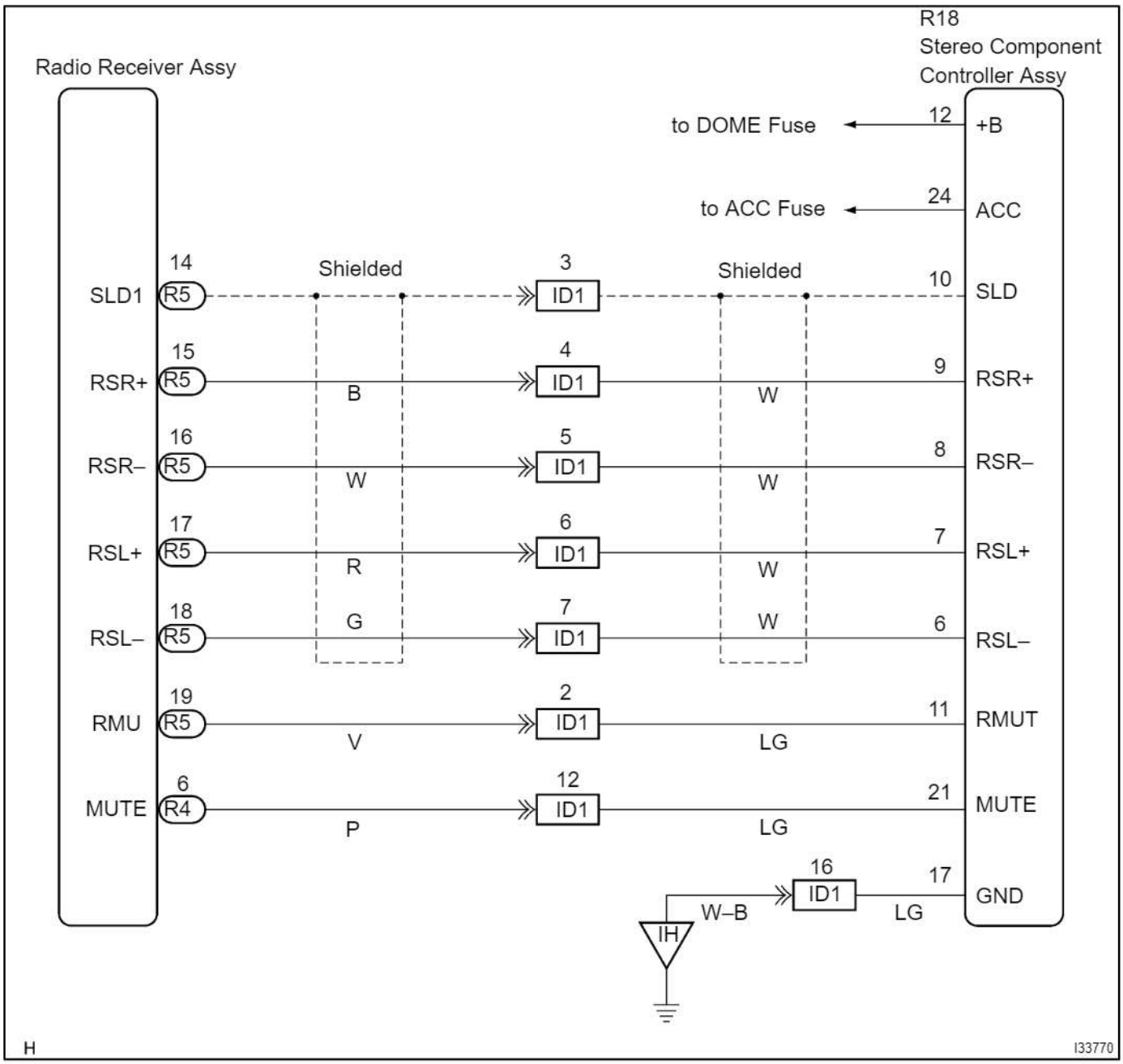
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QUALITY OF SOUND FROM WIRELESS HEADPHONE IS POOR OR NO SOUND CAN BE HEARD

WIRING DIAGRAM



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INSPECTION PROCEDURE

1	CHECK SYMPTOMS

(a) Check the masking object.
  (1) Check for the masking object between the wireless headphone and the stereo component control.
  Standard: Return to normal control.

HINT:
Since the voice sound of the wireless headphone is converted into the infrared light for the transmission, the voice sound cannot be transmitted if there is a masking object between the emission part and the receiving part.

OK > NORMAL

NG

2	CHECK BATTERY(HEADPHONE STEREO ASSY)

(a) Check the dry cell battery.
  (1) Chech that the dry cell battery is not used up.
  Standard: The dry cell battery is not used up.

NG > BATTERY EMPTY

OK

3	CLEANING IR RECEIVER SENSOR

(a) Clean up the infrared light emission part.
  (1) Clean up the infrared light emission part of the stereo component control.
  (2) Check if the same abnormality occurs again.
  Standard: Function return to normal condition.

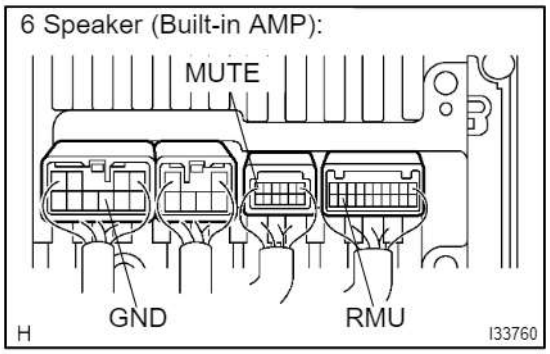
OK > IR LED DIRTY

NG

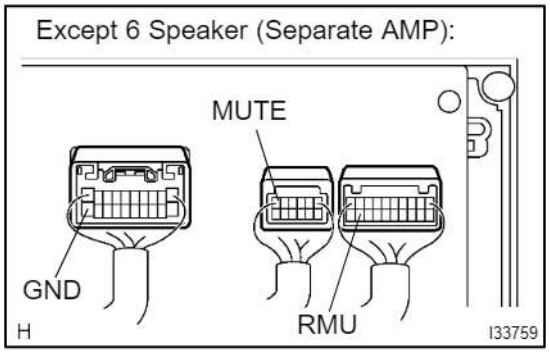
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4 INSPECT RADIO RECEIVER ASSY(RMUT, GND)

6 Speaker (Built-in AMP):



Except 6 Speaker (Separate AMP):



(a) Check that the voltage between terminals at each condition, as shown in the chart.

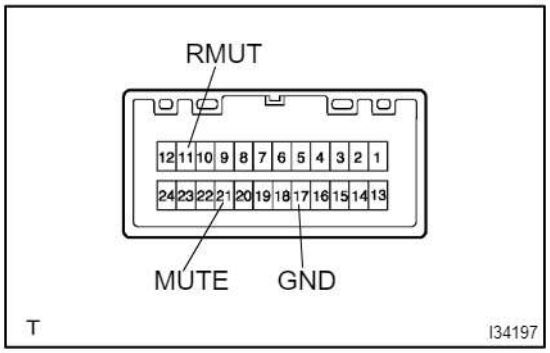
Standard:

Terminal	Condition	Specified condition
MUTE ⇔ GND	Audio system is sounding	10 – 14 V
RMU ⇔ GND	Audio system is sounding	10 – 14 V

NG → **CHECK AND REPLACE RADIO RECEIVER ASSY**

OK

5 CHECK AND REPLACE STEREO COMPONENT CONTROLLER ASSY(RMUT, GND)



(a) Check that the voltage between terminals at each condition, as shown in the chart.

Standard:

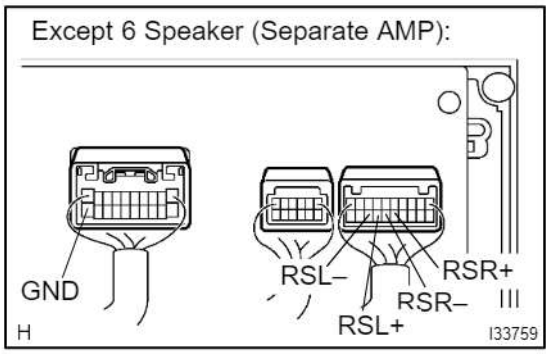
Terminal	Condition	Specified condition
MUTE ⇔ GND	Audio system is sounding	10 – 14 V

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

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6 INSPECT RADIO RECEIVER ASSY(OUTPUT SIGNAL)



(a) Check that the continuity between terminals at each condition, as shown in the chart.

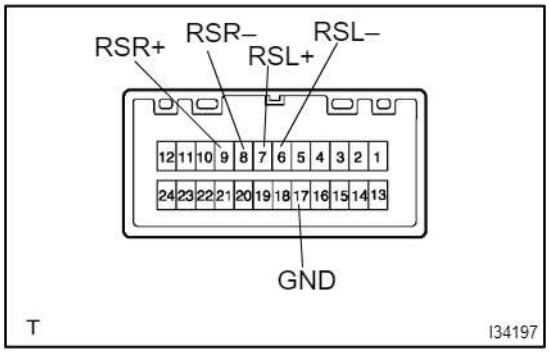
Standard:

Terminal	Condition	Specified condition
RSR+/– ⇔ GND	Audio system is sounding	A waveform synchronized with sounds is output
RSL+/– ⇔ GND	Audio system is sounding	A waveform synchronized with sounds is output

NG → **CHECK AND REPLACE RADIO RECEIVER ASSY**

OK

7 INSPECT STEREO COMPONENT CONTROLLER ASSY(INPUT SIGNAL)



(a) Check that the continuity between terminals at each condition, as shown in the chart.

Standard:

Terminal	Condition	Specified condition
RSR+/– ⇔ GND	Audio system is sounding	A waveform synchronized with sounds is output
RSL+/– ⇔ GND	Audio system is sounding	A waveform synchronized with sounds is output

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE STEREO COMPONENT CONTROLLER ASSY

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REAR SEAT ENTERTAINMENT SYSTEM DOES NOT RESPOND TO ANY REMOTE CONTROL OPERATIONS

INSPECTION PROCEDURE

1	CLEANING IR RECEIVER SENSOR

(a) Clean up the infrared light emission part.
  (1) Clean up the infrared light emission part of the stereo component control.
  (2) Check if the same abnormality occurs again.
  Standard: Function return to normal condition.

OK	IR RECEIVER DIRTY

NG

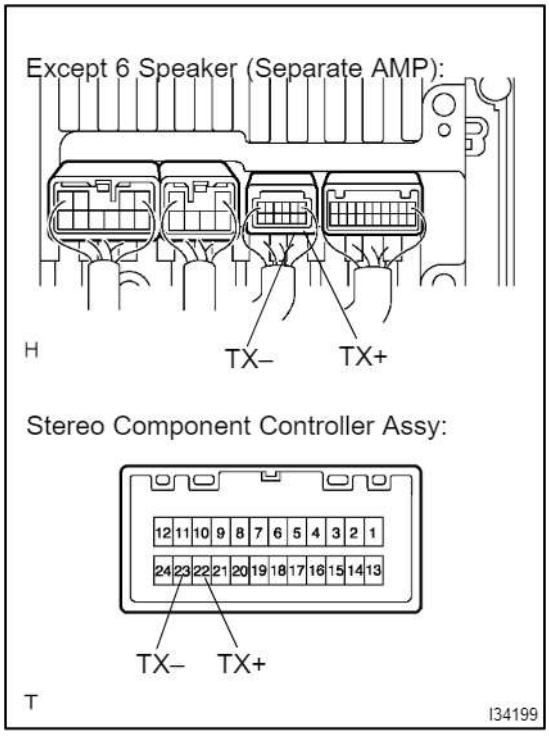
2	CHECK BATTERY(REMOTE CONTROLLER ASSY)

(a) Check the dry cell battery.
  (1) Chech that the dry cell battery is not used up.
  Standard: The dry cell battery is not used up.

NG	BATTERY EMPTY

OK

3	INSPECT HARNESS OR CONNECTOR(RADIO RECEIVER ASSY – STEREO COMPONENT CONTROLLER ASSY)

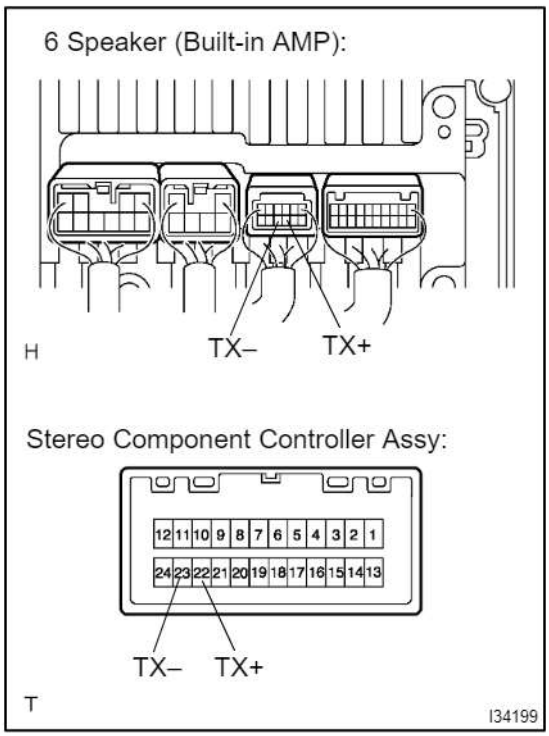


(a) Except 6 Speaker (Separate AMP):
Check that the continuity between terminals at each condition, as shown in the chart.

Standard:

Terminal	Condition	Specified condition
TX+ ⇔ TX+	Constant	Continuity
TX– ⇔ TX–	Constant	Continuity

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(b) 6 Speaker (Built–in AMP):
Check that the continuity between terminals at each condition, as shown in the chart.

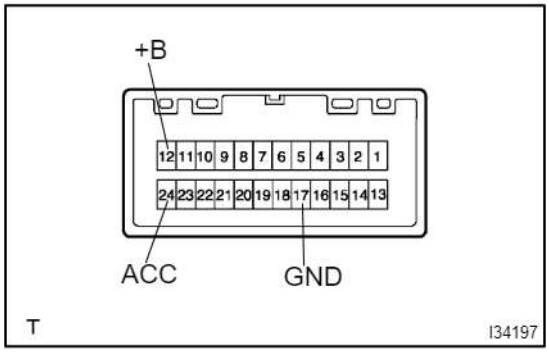
Standard:

Terminal	Condition	Specified condition
TX+ ⇔ TX+	Constant	Continuity
TX– ⇔ TX–	Constant	Continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4 CHECK STEREO COMPONENT CONTROLLER ASSY(+B, ACC, GND)



(a) Check that the continuity between terminals at each condition, as shown in the chart.

Standard:

Tester connection	Condition	Specified condition
GND ⇔ Body ground	Constant	Continuity

(b) Check that the voltage between terminals at each condition, as shown in the chart.

Standard:

Tester connection	Condition	Specified condition
+B ⇔ GND	Constant	10 – 14 V
ACC ⇔ GND	Ignition switch ACC or ON	10 – 14 V

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE RADIO SWITCH AND VOLUME ASSY

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NAVIGATION SYSTEM (From August, 2003)

0559M-06

HOW TO PROCEED WITH TROUBLESHOOTING

1	Vehicle Brought to Workshop

2	Customer Problem Analysis (See page 05–1587)

3	Problem Symptom Confirmation (See page 01–35)

- Symptom does not occur (Go to step 4)
- Symptom occurs (Go to step 5)

4	Symptom Simulation (See page 01–35)

5	DTC Check (See page 05–1588)

- Normal code (Go to step 7)
- Malfunction code (Go to step 6)

6	DTC Chart (See page 05–1603)

Go to step 8

7	Problem Symptoms Table (See page 05–1618)

8	Terminal of ECU (See page 05–1611)

9	Identification of Problem

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10	Repair or Replace

11	Confirmation Test

End

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055YE-03

CUSTOMER PROBLEM ANALYSIS CHECK

NAVIGATION SYSTEM Check Sheet

Inspector's name: _____

Customer's Name		**Registration No.**	
		Registration Year	
		Frame No.	
Date of Vehicle Brought in	/ /	**Odometer Reading**	**km Mile**

Date Problem First Occurred	/ /
Frequency Problem Occurs	☐ Constant ☐ Intermittent (Times a day)

Problem Symptom	**Navigation malfunction**	☐ Cursor movement is defective.
		☐ Cursor does not move.
		☐ GPS mark does not appear.
		☐ Map is not displayed.
		☐ Others ( )
	Display malfunction	☐ Screen is dark.
		☐ Screen is white.
		☐ Color is not uniform.
		☐ Screen is in disorder.
		☐ Others ( )
	Control Switch malfunction	☐ Can not operate with panel switches.
		☐ Can not operate with touch switches.
		☐ Others ( )

DTC Check	Parts name	1st time malfunction code.	2nd time malfunction code.
	Navigation ECU		
	Radio Receiver Assy		
	Stereo component Controller Assy		
	Disk Player Assy (DVD)		

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055YG–04

PRE–CHECK

1. USER TROUBLES UNDER NORMAL CONDITION OF THE NAVIGATION SYSTEM

(a) Voice guidance is not performed even though the system is in normal condition when:
  (1) The destination is not set up.
  (2) The vehicle is not driving on the set route. (The remaining distance is not displayed at the lower left of the map screen that tells the current position of the vehicle.)
  (3) ”Guidance in Other Modes” is not set up. (In this case no voice guidance is given except on the map screen.)

(b) The vehicle icon turns around arbitrarily on the screen even when the system is in normal condition. If the ignition switch is turned to ”ACC” or ”ON” while the vehicle is turning around such as being on the turntable, the Navigation System memorizes the angle speed of that moment as the standard figure. To solve this problem, at the vehicle speed of 0 MPH (0 km/h), turn off the ignition switch and, then turn it to ”ACC” or ”ON” again, and see whether any trouble occurs again.

2. INSPECTION OF THE LOCATION WITH TROUBLE OCCURRENCE

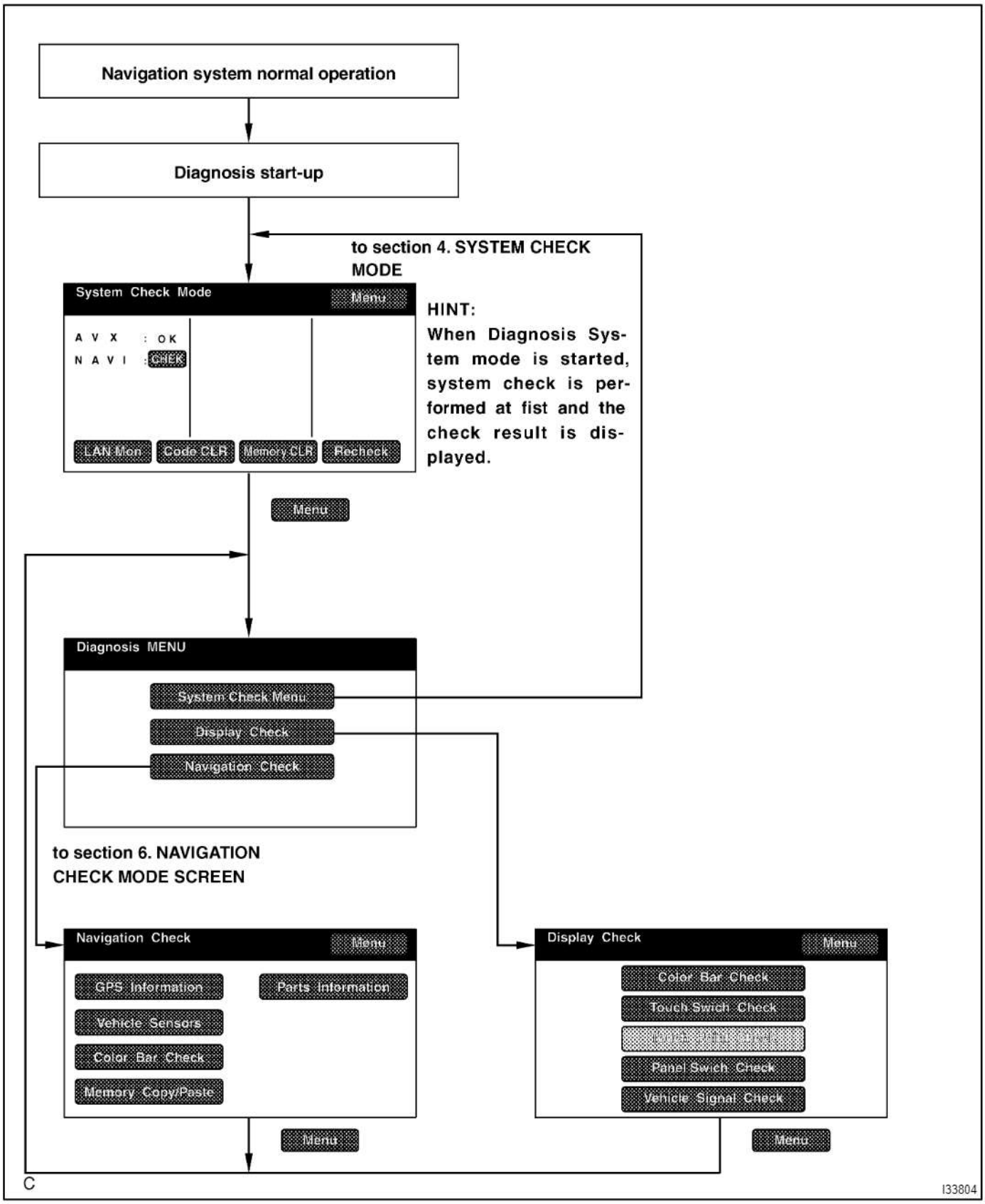
(a) Examine whether the wrong display of the vehicle icon appears in a certain location or in several locations.

HINT:

It is difficult to determine the accurate vehicle position when driving on a freeway, a looped road or a road which runs in parallel with another, and immediately after going a out of the parking area. In such cases the vehicle icon can be displayed off the real position of the vehicle.

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3. DIAGNOSIS SYSTEM MODE

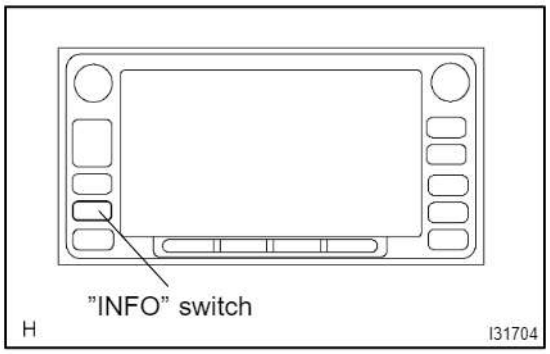


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(a) Start–up And Finishing Of The Diagnosis

HINT:

Before starting the Diagnosis System, make sure that the map appears on the screen after turning on the IG switch.
If not, some items cannot be checked.



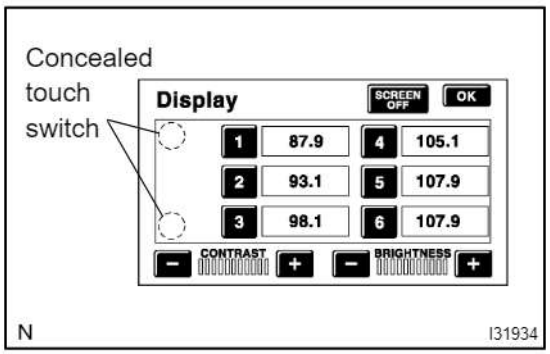
(b) Diagnosis Start–up by light control switch.

(1) Vehicle speed should be 0 km/h (0 mph).
(2) Apply the parking brake.
(3) Turn the ignition switch to ACC or ON.
(4) While pressing the "INFO" switches on the Multi Display, turn the Light Control switch from OFF → TAIL → OFF → TAIL → OFF → TAIL → OFF.

Display	Description
Service Check	By performing system check and collecting data of diagnosis memory, this mode checks the current and past condition of each connection device.
Display Check	It displays the Display Check on the screen.
Navigation Check	It displays the Navigation ECU Check on the screen.

HINT:

- When Diagnosis System starts, Service Check screen is displayed and the service check begins.
- Select MENU to display Diagnosis Check Menu.



(c) Diagnosis Start–Up by touch switch.

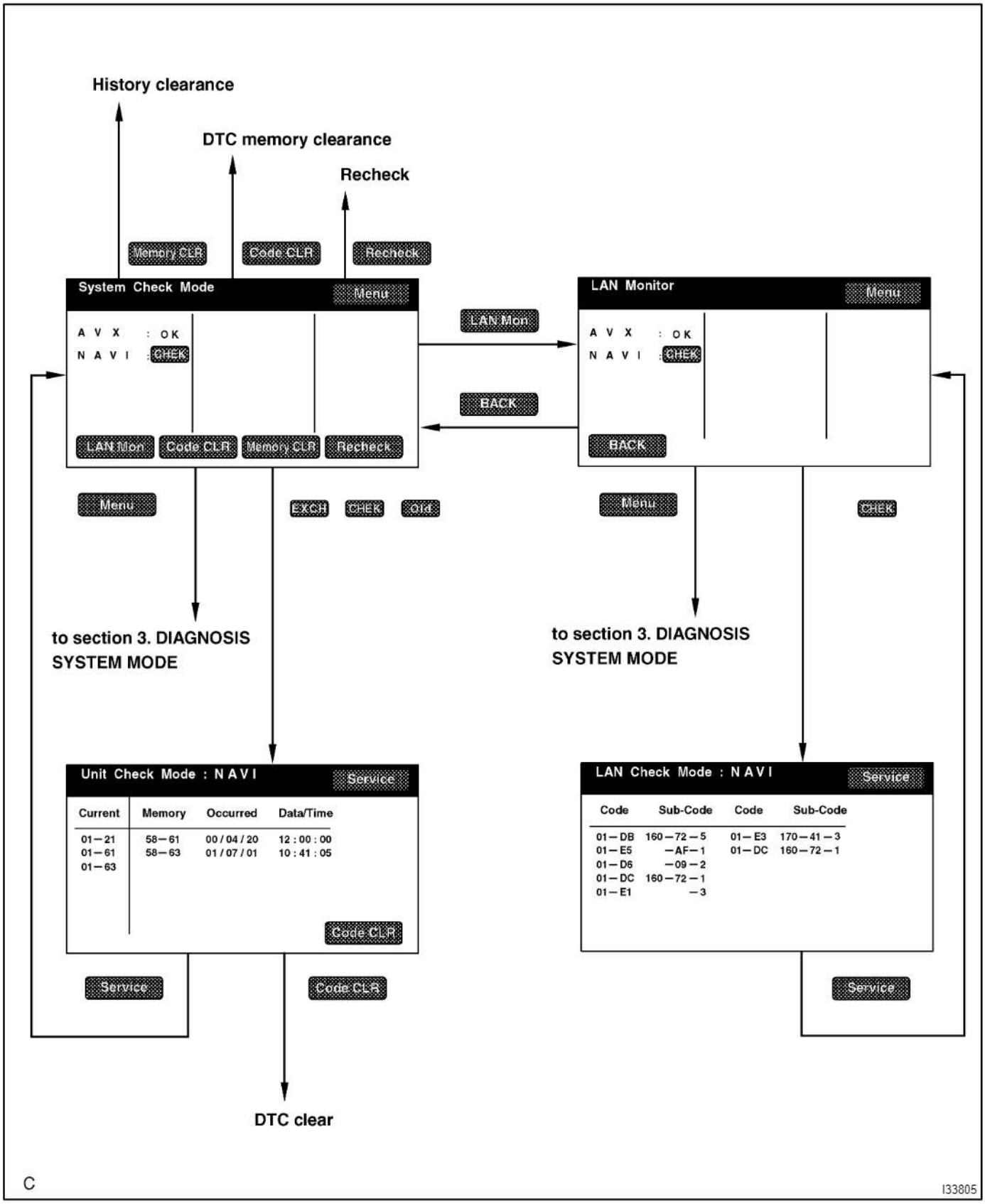
(1) Vehicle speed should be 0 km/h (0 mph).
(2) Apply the parking brake.
(3) Turn the ignition switch to ACC or ON.
(4) Activate the screen adjustment screen.
(5) Alternately touch the upper and lower bottom parts of the left end of the screen 3 times.

(d) Finishing the Diagnosis System

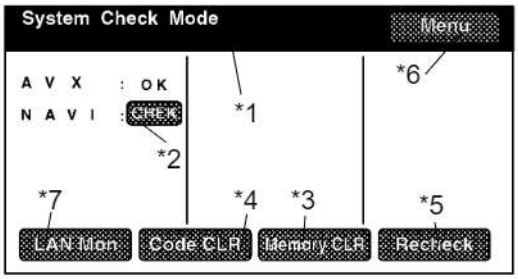
Turn the ignition switch off to finish the mode.

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4. SYSTEM CHECK MODE



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C I34233

(a) SYSTEM CHECK MODE

(b) System Check

(1) Start the Diagnosis System.

Display Item	Function
Components Name/*1	List of component names including optional components (15 components max.) are displayed. When the names are not identified, their physical addresses are displayed.
Check/*2	Check results are displayed.
Memory CLR/*3	Pressing this switch for 3 sec. deletes all the information about master component registration.
Code CLR/*4	Pressing this switch for 3 sec. deletes diagnosis memory of all the components. It deletes Service Check results and the screen displaying the check results.
Recheck/*5	Pressing this switch performs Service Check again.
Menu/*6	Pressing this switch activates the Diagnosis Menu screen.
LAN Mon/*7	Pressing this switch activates the LAN monitor screen.

HINT:

System Check displays the check results based on the information obtained from each component's response to "System Check Execution" and "Diagnosis Memory Request", and the information of "Current DTC Notification" (the Unit Check and the LAN Check information that will be displayed on the next screens.).

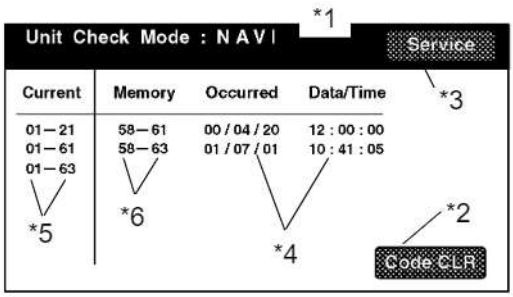
(2) Read Check Result

Check Result	Meaning
OK	No DTC is identified.
EXCH	One or more DTC requesting for exchange are detected.
CHEK	One or more DTC requesting for check are detected.
NCON	No connection response to Diagnosis System start–up, whereas it has the connection response to the AVC LAN system when the power switch is turned on (when IG is turned to ACC).
Old	One or more DTC are detected because of old version.
NRES	No response to the information about the Diagnosis System, whereas it responds to the Diagnosis System start–up.
No Err	No DTC is identified.

HINT:

- □ After repair and check, press "Code CLR" for more than 3 sec. to delete diagnosis memory.
- □ After deleting diagnosis memory, press "Recheck" and make sure "OK" is displayed on the screen.

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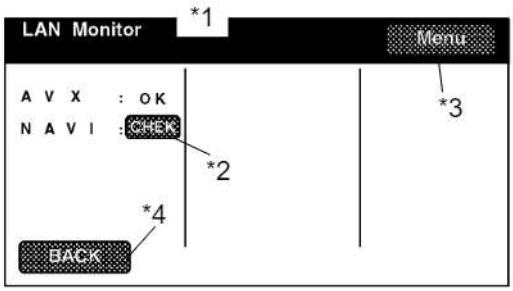
C I34235

(3) "EXCH", "CHEK" and "Old" can be used as switches to activate "Unit Check Mode" for detail information. Check troubled parts of the components in these modes by referring to the DTC code list.

Display Item	Description
Components name/*1	Names of components to be checked are displayed.
Code CLR/*2	Pressing this switch for 3 sec. deletes DTC memory of the selected diagnosis component.
Service/*3	Pressing this returns to the Service Check Mode screen.
Date/Time/*4	The date and time stamped at the time of DTC occurrence are displayed in the order of month–day–year–hour–minute–second. (If the date and time data is invalid, it is displayed as a blank.)
Current/ *5	Up to 6 DTC codes detected during the System Check are displayed.
Memory/ *6	DTC memories stored and current DTC Notification are displayed.

HINT:

- □ Detecting Unit DTC activates the Unit Check Mode on the screen.
- □ In the Unit Check Mode, DTC which is identified as "EXCH" in the Service Check, is displayed as classified into Current DTC and Past DTC.



C I34234

(c) LAN Monitor

(1) Start the Diagnosis System.

Display Item	Function
Components Name/*1	List of component names including optional components (15 components max.) are displayed. When the names are not identified, their physical addresses are displayed.
Check/*2	Check is displayed.
Menu/*3	Pressing this switch activates the Diagnosis Menu screen.
BACK/*4	Pressing this switch activates the System Check Mode screen.

HINT:

System Check displays the check results based on the information obtained from each component's response to "System Check Execution" and "Diagnosis Memory Request", and the information of "Current DTC Notification" (the LAN Monitor that will be displayed on the next screens.).

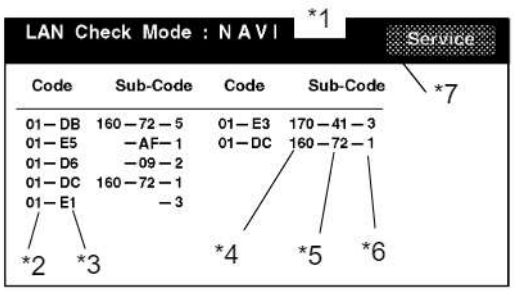
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(2) Read Check Result

Check Result	Meaning
OK	No DTC is identified.
EXCH	One or more DTC requesting for exchange are detected.
CHEK	One or more DTC requesting for check are detected.
NCON	No connection response to Diagnosis System start–up, whereas it has the connection response to the AVC LAN system when the power switch is turned on (when IG is turned to ACC).
Old	One or more DTC are detected because of old version.
NRES	No response to the information about the Diagnosis System, whereas it responds to the Diagnosis System start–up.
No Err	No DTC is identified.

HINT:

- □ After repair and check, press "Code CLR" for more than 3 sec. to delete diagnosis memory.
- □ After deleting diagnosis memory, press "Recheck" and make sure "OK" is displayed on the screen.



C I34236

(3) "CHEK" can be used as switches to activate "LAN Monitor" for detail information. Check troubled parts of the components in these modes by referring to the DTC code list.

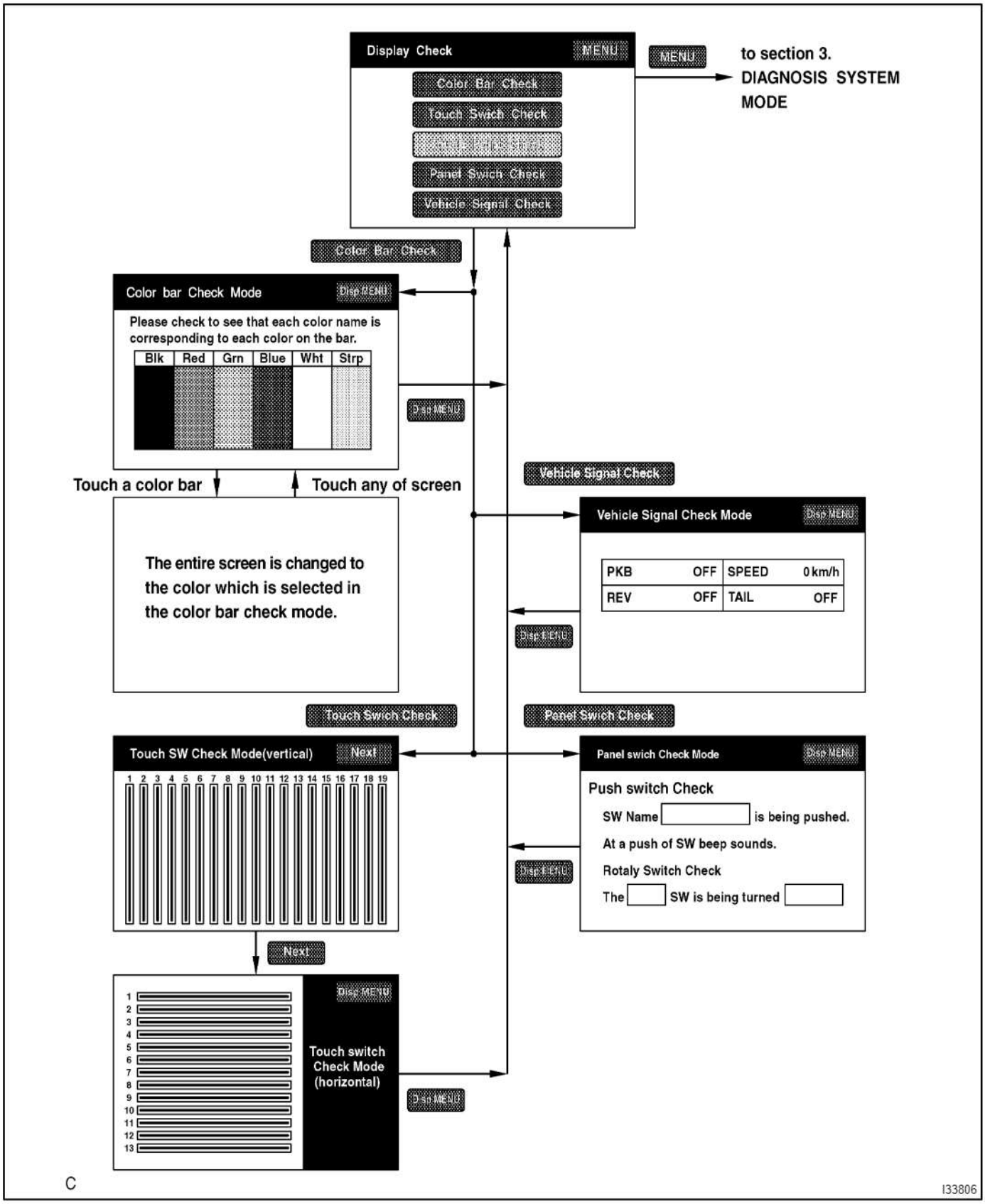
Display Item	Description
Components name/*1	Names of components to be checked are displayed.
Segment/*2	Logical address codes corresponding to DTC are displayed.
DTC/*3	DTC is displayed.
Sub–Code (address numbers of related components)/*4	Physical address codes memorized together with DTC are displayed.
Sub–code (Connection confirmation number) /*5	Connection confirmation numbers memorized together with DTC are displayed.
Sub–code (Number of occurrence) /*6	The number of occurrence of the same DTC is displayed.
Service check mode screen switch/*7	Pressing this returns to the System Check Mode screen.

HINT:

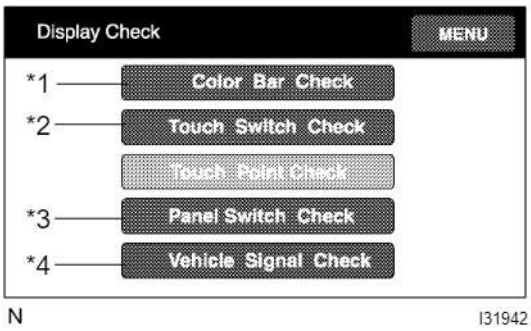
Detecting no LAN DTC activates the LAN Check Mode on the screen.

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5. DISPLAY CHECK MODE



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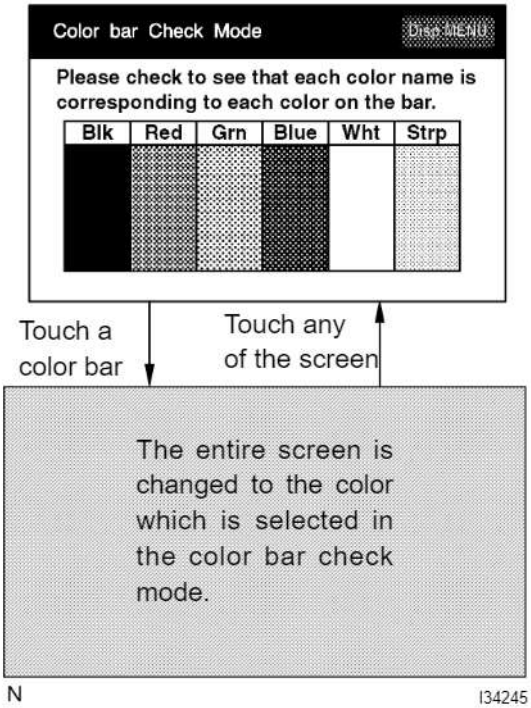


(a) DISPLAY CHECK MODE

Display	Contents
Color Bar Check/*1	Color display is checked.
Touch Switch Check/*2	Operating condition of touch switch display is checked.
Panel Switch Check/*3	Operating condition of switches on both sides of the display is checked.
Vehicle Signal Check/*4	Status of the vehicle signal which has been loaded into the display is checked.

HINT:
In Display Check Mode, above checks can be performed.

Display Item	Meaning
MENU	Pressing this switch activates the "Diagnosis MENU".



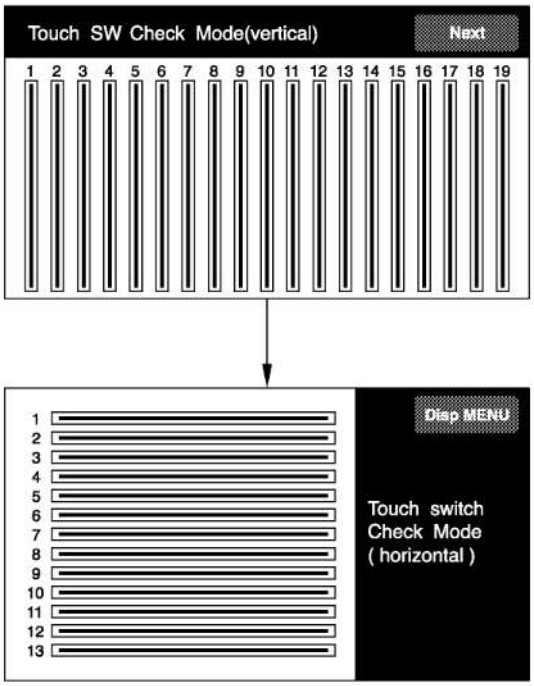
(b) Display Color Bar Check
(1) Start the Diagnosis System.
(2) Select "MENU".
(3) Select "Display Check".
(4) Select "Color Bar Check".
(5) Make sure that each color name is corresponding to each color on the bar.

HINT:
Select Black, Red, Green, Blue, White and Stripe to display selected colors and stripe on the entire screen.

(6) Compare with the Color Bar Check in the Navigation Check and make sure that no difference is found.

Display Item	Meaning
Disp MENU	Pressing this switch activates the "Display Check".

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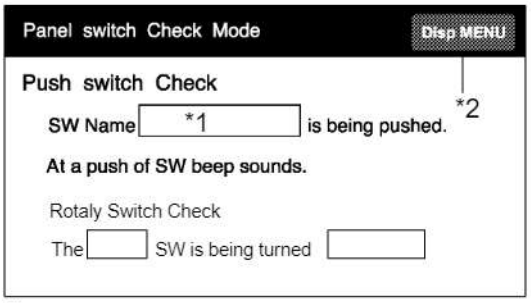


N I31943

(c) Display Touch Switch Check
(1) Start the Diagnosis system.
(2) Select "MENU".
(3) Select "Display Check".
(4) Select "Touch Switch Check".
(5) Touch the screen and make sure that every line reacts to the touch.

HINT:
After the Touch Switch Check for vertical lines, press "Next" to check horizontal lines.

Display Item	Meaning
Disp MENU	Pressing this switch activates the "Display Check".

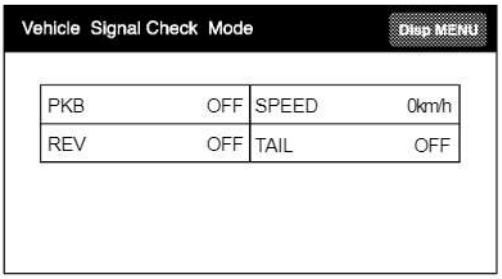


N I31936

(d) Display Panel Switch Check
(1) Start the Diagnosis system.
(2) Select "MENU".
(3) Select "Display Check".
(4) Select "Panel Switch Check".
(5) Press each switch and make sure that it corresponds to the display on the screen.

Display Data	Description
Names of push–button switches/*1	Names of push–button switches pressed are displayed. Pressing 2 or more push–button switches is displayed as "MULTIPLE". After that if the number of push–button switches being pressed becomes 1, the name of the push–button switch being pressed is displayed.
Disp MENU/*2	Pressing this switch activates Display Check Menu.

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I31948

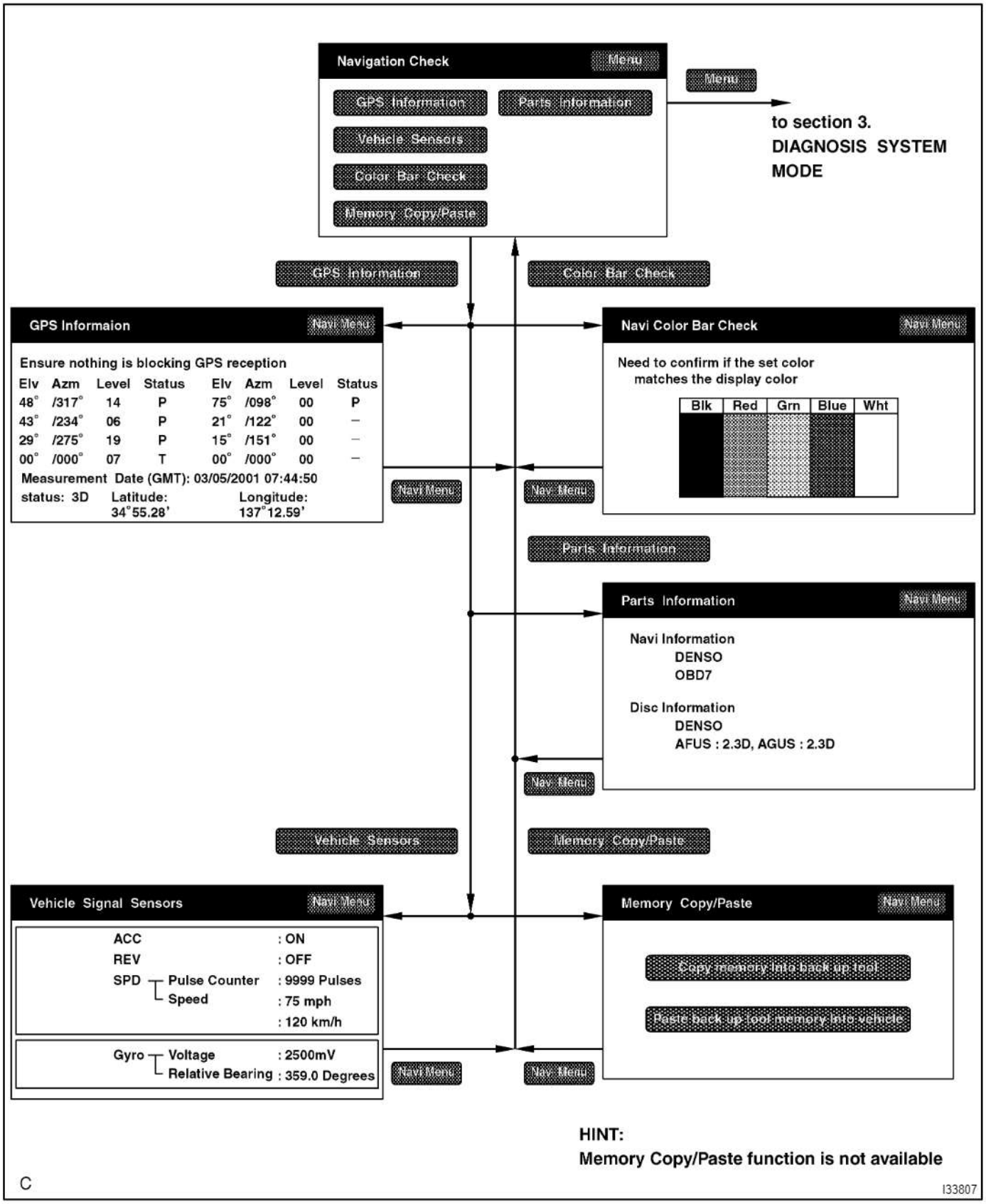
(e) Display Vehicle Signal Check
(1) Start the Diagnosis system.
(2) Select "MENU".
(3) Select "Display Check".
(4) Select "Vehicle Signal Check".
(5) Check the status of the vehicle signal (PKB, SPEED, TAIL, REV) loaded into the display.

HINT:
Vehicle signal data is updated every 1 second.

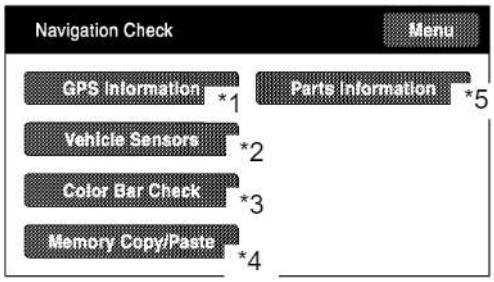
Display Item	Meaning
PKB	IG (Signal State) is displayed by ON/OFF. (IG switch ON)
SPEED	SPD is displayed by calculatingthe vehicle speed from the pulse signal.
REV	REV (Signal State) is displayed by ON/OFF. (IG switch ON)
TAIL	TAIL (Signal State) is displayed by ON/OFF.
Disp MENU/*2	Pressing this switch activates Display Check Menu.

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6. NAVIGATION CHECK MODE



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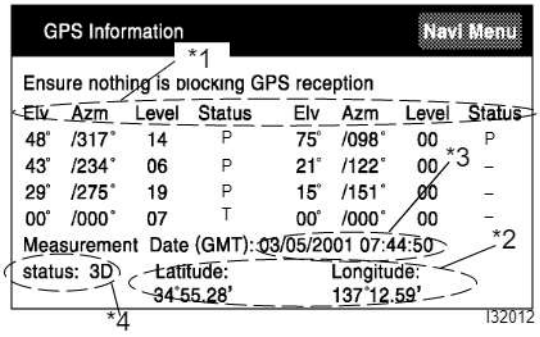
(a) NAVIGATION CHECK MODE

Display	Description
GPS Information/*1	Information related to GPS is displayed (updated every 1 second.).
Vehicle Sensors/*2	Vehicle signal information to be loaded in the Navigation ECU is displayed (updated every 1 second.).
Color Bar Check/*3	Color display of the Navigation ECU is checked. (Compare with the Color Bar Check results in the Display Check.)
Memory Copy / Paste/*4	Using hand–held tester, read and write user data such as a placement of shop, restaurant etc. stored in memory.
Parts Information/*5	Navigation program version and disc version are displayed.

HINT:

- □ In the Navigation Check mode, the checks mentioned above can be conducted.
- □ The Navigation ECU operates each Navigation Check screen.

Display Item	Meaning
Menu	Pressing this switch activates the "Diagnosis MENU".



I32012

(b) GPS Information

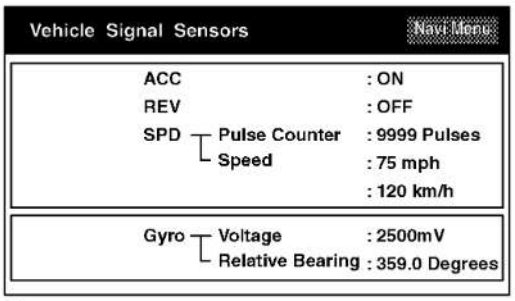
(1) Start the Diagnosis system.
(2) Select "MENU".
(3) Select "Navigation Check".
(4) Select "GPS Information".
(5) Check the GPS–related information.

Display Data	Description
Satellite Information/*1	"Angle of elevation", "Azimuth", "Level of Signal" and "Status of Wave Reception" of the Satellite captured by the antenna are displayed (for 8 satellites max.)
Position Data/*2	The latitude and longitude of the current position are displayed in degree, minute and second.
Time Data/*3	Date and time data obtained from the GPS receiver is displayed.
Navi Menu	Pressing this switch activates the "Navigation Check".

Measurement Status: /*4

Display	Conditions
2D	Measurement on 2 dimensions
3D	Measurement on 3 dimensions
NG	GPS information cannot be used.
Error	Reception error occurs.
–	Other than the above

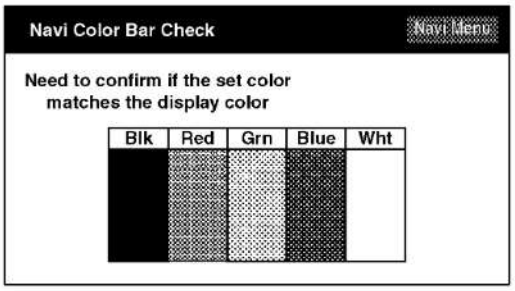
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C I34239

(c) Vehicle Sensors
(1) Start the Diagnosis system.
(2) Select "MENU".
(3) Select "Navigation Check".
(4) Select "Vehicle sensors".
(5) Check the vehicle signals (ACC, REV, SPD) and the output signal of the gyro sensor introduced into the navigation ECU.

Items	Display Method
ACC signal status	Displayed as ON/OFF.
REV signal status	Displayed as ON/OFF.
SPD signal status	The cumulative value of input pulse count and the vehicle speed [km/h] [mph] are displayed. [The cumulative value of input pulse count is set to be 0 when this screen is displayed. When the vehicle starts to drive, it is counted and displayed continually.]
Output signal of the gyro sensor	Voltage [V] and relative azimuthal angle [degree] are displayed. [The position of the vehicle when this screen is displayed is set to be 0 degree in azimuth. Based on this, relative azimuthal angle is measured and displayed continually.]
Navi Menu	Pressing this switch activates the "Navigation Check".

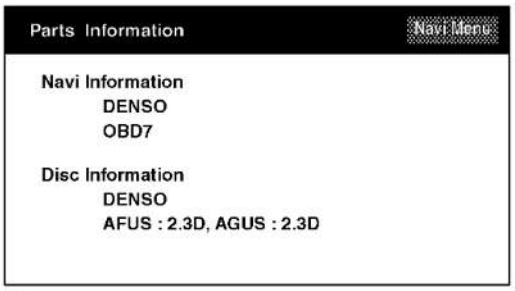


C I34237

(d) Navigation Color Bar Check
(1) Start the Diagnosis system.
(2) Select "MENU".
(3) Select "Navigation Check".
(4) Select "Color Bar Check".
(5) Make sure that the set color matches the display color.
(6) Compare with the Color Bar Check in the Display Check and make sure that no difference is found.

Display Item	Meaning
Navi Menu	Pressing this switch activates the "Navigation Check".

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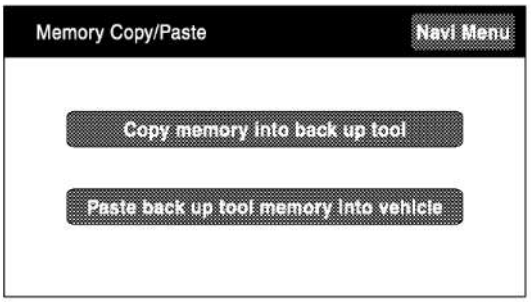


C I34238

(e) Parts Information

(1) Start the Diagnosis system.
(2) Select "MENU".
(3) Select "Navigation Check".
(4) Select "Parts Information".
(5) Check the program and disc version.

Display Item	Meaning
Navi Menu	Pressing this switch activates the "Navigation Check".



N I30955

(f) Memory Copy/ Paste

HINT:

This function is not available.

Display Item	Meaning
Navi Menu	Pressing this switch activates the "Navigation Check".

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DIAGNOSTIC TROUBLE CODE CHART

Terms	Meaning
Physical address	Three–digit code (shown in hexadecimal) which is given to each component comprising the AVC–LAN. Corresponding to the function, individual symbols are specified.
Logical address	Two–digit code (shown in hexadecimal) which is given to each function comprising the inner system of the AVC–LAN.

1. RADIO RECEIVER ASSY (Physical address: 140)

HINT:

- □ *1: Even if no failure is detected, this code may be stored depending on the battery condition or voltage for starting an engine.
- □ *2: This code is stored when 180 sec. has passed after the power supply connector is pulled out after engine start.
- □ *3: This code may be stored when the engine key is turned again after engine start.
- □ *4: This code may be stored when the engine key is turned again 1 min. after engine start.

(a) Logical address: 01 (Communication control)

DTC	Diagnosis item	Condition	Countermeasure and inspected parts
21	ROM Error	Abnormal condition of ROM is detected.	Replace radio receiver assy.
22	RAM Error	Abnormal condition of RAM is detected.	Replace radio receiver assy.
D5 *1	Registered component disconnected	Component shown by sub–code is or was disconnected from system with ignition switch in ACC or ON. Communication with component shown by sub–code is not ensured when engine is started.	□Check harness for power supply of component shown by sub–code. □Check harness for communication system of component shown by sub–code.
D6 *1	Absence of Master	Component in which this code is recorded has been disconnected from system with ignition in ACC or ON. Or, when this code was recorded, Radio receiver assy was disconnected.	□Check harness for power supply system of Radio receiver assy display. □Check harness for communication system of radio receiver assy display. □Check harness for power supply system of radio receiver assy. □Check harness for communication system of Radio receiver assy.
D8 *2	No response to connection check	Component shown by sub–code is or was disconnected from system after engine is started.	□Check harness for power supply of component shown by sub–code. □Check harness for communication system of component shown by sub–code.
D9 *1	Last Mode Error	Component operated (sound and/or image was provided) before engine stop is or was disconnected with ignition switch in ACC or ON.	□Check harness for power supply of component shown by sub–code. □Check harness for communication system of component shown by sub–code.
DA	No Response to ON/OFF Instruction	No response is identified when changing mode (audio and visual mode change). Detected when sound and picture does not change by button operation	□Check harness for power supply system of component shown by sub–code. □Check harness for communication system of component shown by sub–code. □If error occurs again, replace component shown by auxilxary code
DB *1	Mode Status Error	Dual alarm is detected.	□Check harness for power supply system of component shown by sub–code. □Check harness for communication system of component shown by sub–code.
DC *4	Transmission Error	Transmission to component shown by sub–code has been failed. (This code does not necessarily mean actual failure.)	If same sub–code is recorded in other component(s), check harness for power supply and communication system of all components shown by code.

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DD *4	Master Reset (Momentary Interruption)	After engine is started, radio receiver assy was disconnected from system.	□Check harness for power supply system of Radio receiver assy. □Check harness for communication system of radio receiver assy. □Check harness for power supply system of radio receiver assy. □Check harness for communication system of radio receiver assy. □If this error occurs frequently, replace radio receiver assy.
DE *3	Slave Reset (Momentary Interruption)	After engine start, slave component has been disconnected. DB	□Check harness for power supply system of component shown by sub–code. □Check harness for communication system of component shown by sub–code.
DF *5	Master Error	Due to defective condition of component with a display, master function is switched to audio equipment. Error occurs in communication between sub–master (audio) and master component.	□Check harness for power supply of Radio receiver assy. □Check harness for communication system of radio receiver assy.
E0 *1	Registration Completion Instruction Error	"Registration Completion Instruction" command from master cannot be received.	Since this DTC is provided for engineering purpose, it may be detected when no actual failure exists.
E1 *1	Audio processor ON error	While source equipment is operating, AMP output is stopped.	□Check harness for power supply of Radio receiver assy. □Check harness for communication system of radio receiver assy.
E2	ON/OFF Instruction Parameter Error	Error occurs in ON/OFF controlling command from radio receiver assy.	Replace radio receiver assy.
E3 *1	Registration Request Transmission	Registration Request command is output from slave component. Receiving Connection Check Instruction, Registration Request command is output from sub–master component.	Since this DTC is provided for engineering purpose, it may be detected when no actual failure exists.
E4 *1	Multiple Frame Abort	Multiple frame transmission is aborted.	Since this DTC is provided for engineering purpose, it may be detected when no actual failure exists.

(b) Logical address: 21 (Switch)

DTC	Diagnosis item	Condition	Countermeasure and inspected parts
10	Panel Switch Error	Error in panel switch input part is detected. (Error in switch control part, or internal communication error with switch control part is detected.)	□Inspect all switches on panel switch test screen in display check mode. If any of them does not function, replace A/C control assembly. □If all switches function without problem, observe them for a while.
11	Touch Switch Error	Error in touch switch sensor is detected. (Light level of LED is detected to be less than a fixed value.)	□Inspect all touch switches on touch switch test screen in display check mode. If any of lines does not react, replace radio receiver assy. □If all of vertical and horizontal lines react normally, observe them for a while.

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(c) Logical address: 34 (Front passenger monitor)

DTC	Diagnosis item	Condition	Countermeasure and inspected parts
10	Error in Picture Circuit	Error in power supply system for picture circuit (abnormal voltage) is detected.	Replace radio receiver assy.
11	Back–light Error (No current)	Decline in power output from inverter circuit for back–light.	Replace radio receiver assy.
12	Back–light Error (Excess current)	Excess power output from inverter circuit for back–light.	Replace radio receiver assy.

(d) Logical address: 61 (Cassette tape player)

DTC	Diagnosis item	Condition	Countermeasure and inspected parts
40	Mechanical Error of Media	Malfunction due to mechanical failure is identified. Or cassette tape is cut or entangled.	□Inspect cassette tape. □Replace radio receiver assy.

(e) Logical address: 62 (CD player)

DTC	Diagnosis item	Description	Action to be taken
42	No Disc Readout	Disc cannot be read.	□Inspect CD. □Replace radio receiver assy.
44	CD player Error	Error is detected in CD player.	Replace radio receiver assy.
45	EJECT Error	Magazine cannot be ejected.	Replace radio receiver assy.
47	Detection of hight temperature	–	–
48	Detection of eddy current	–	–

2. NAVIGATION ECU (Physical address: 178)

HINT:

- □ *1: Even if no failure is detected, this code may be stored depending on the battery condition or voltage for starting the engine.
- □ *2: When 210 sec. has passed after pulling out the power supply connector of the master component with the ignition switch in ACC or ON, this code is stored.
- □ *3: This code may be stored when the engine key is turned 1 min. again after engine start.
- □ *4: This code may be stored when the engine key is turned again after engine start.

(a) Logical address: 01 (Communication control)

DTC	Diagnosis item	Condition	Countermeasure and inspected parts
D6 *1	Absence of Master	Component in which this code is recorded has been disconnected from system with ignition in ACC or ON. Or, when this code was recorded, radio receiver assy was disconnected.	□Check harness for power supply system of Radio receiver assy. □Check harness for communication system of radio receiver assy. □Check harness for power supply system of navigation ECU. □Check harness for communication system of navigation ECU.
D7 *2	Connection Check Error	Component in which this code is recorded has been disconnected from system after engine start. Or, when this code was recorded, radio receiver assy disconnected. D6	□Check harness for power supply system of Radio receiver assy. □Check harness for communication system of radio receiver assy. □Check harness for power supply system of navigation ECU. □Check harness for communication system of navigation ECU.
DC *3	Transmission Error	Transmission to component shown by sub–code has been failed. (This code does not necessarily mean actual failure.)	If same sub–code is recorded in other component(s), check harness for power supply and communication system of all components shown by code.

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DD *4	Master Reset (Momentary Interruption)	Component that is to be master has been disconnected after engine start.	□Check harness for power supply system of Radio receiver assy. □Check harness for communication system of Radio receiver assy. □If error occurs frequently, replace radio receiver assy.
E0 *1	Registration Completion Instruction Error	"Registration Completion Instruction" command from master cannot be received.	Since this DTC is provided for engineering, it may be detected when no actual failure exists.
E2	ON/OFF Instruction Parameter Error	Error is detected in ON/OFF control command from radio receiver assy .	Replace Radio receiver assy.
E3 *1	Registration Request Transmission	□Registration Request command is output from slave component. □Registration Request command is output from sub–master component.	Since this DTC is provided for engineering, it may be detected when no actual failure exists.
DF *4	Master Error	Due to defective condition of component with a display, master function is switched to audio equipment. Error occurs in communication between sub–master (audio) and master component.	□Check harness for power supply of Radio receiver assy. □Check harness for communication system of Radio receiver assy.
E4 *1	Multiple Frame Abort	Multiple frame transmission is aborted.	Since this DTC is provided for engineering purpose, it may be detected when no actual failure exists.

(b) Logical address: 58 (Navigation ECU)

DTC	Diagnosis item	Condition	Countermeasure and inspected parts
10	Gyro Error	Error in gyro sensor is detected. (Abnormal value in voltage output from sensor is detected for more than specified time.)	Replace navigation ECU.
42	Map Disc Error	Data cannot be read for a certain time due to scratches or dirt on disc surface or insertion of wrong disc.	Inspect disc and replace if necessary. (Visually check disc surface and wipe it with soft cloth.)
43	Vehicle Signal Error	Input error of vehicle signal is detected. (When no vehicle signal has been input for a certain time.)	□Inspect wire harness. □If wire harness is normal, replace navigation ECU.
44	Player Error	Malfunction of playre continues for a certain length of time.	□Check if disc can be inserted/taken out or not. If not, replance navigation ECU. □If it can be inserted/taken out and this code is output, replace navigation ECU.

(c) Logical address: 80 (GPS receiver)

DTC	Diagnosis item	Condition	Countermeasure and inspected parts
11	GPS Receiver Error	Operation error of GPS receiver is detected.	At an outdoor site with a clear view, operate to display GPS data. If GPS mark is not properly displayed after 15 min. or more, replace navigation ECU.
40	GPS Antenna Error	Open condition of GPS antenna is detected. (Open circuit, connection failure of connectors, etc.)	Inspect antenna and replace if necessary.

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41	Power Supply Error of GPS Antenna	Abnormal voltage of GPS antenna cable or short circuit is detected.	□Inspect GPS antenna and replace if necessary. (When no continuity is identified between connector's core and sealed part, GPS antenna is normal.) □If GPS antenna is normal, replace navigation ECU.
45	Player Temp. Too High	Readout cannot be dome because temperature around player's pickup (reading part) is too high.	□With ignition switch OFF, leave in cool shaded place for a while and recheck. □If same code detected, replace navigation ECU.

3. DISC PLAYER ASSY (Physical address: 250)

DTC	Diagnosis item	Condition	Countermeasure and inspected parts
42	No Disc Readout	Disc cannot be read.	Inspect DVD.
44	DVD Error	Error is detected in DVD player.	Replace DVD automatic changer.
45	EJECT Error	Disc cannot be ejected.	Replace DVD automatic changer.
46	DVD High Temp.	High temperature is detected in DVD changer.	Replace DVD automatic changer.
52	DVD Excess Current	Excess current is applied to DVD changer.	Replace DVD automatic changer.

4. STEREO COMPONENT AMPLIFIER ASSY (Physical address: 440)

HINT:

- □ *1: Even if no failure is detected, this code may be stored depending on the battery condition or voltage for starting an engine.
- □ *2: This code be stored when the engine key is turned again 1 min. after engine start.
- □ *3: This code may be stored when the engine key is turned again after engine start.
- □ *4: When 210 sec. has passed after pulling out the power supply connector of the master component with the ignition switch in ACC or ON, this code is stored.

Logical address: 01 (Communication control)

DTC	Diagnosis item	Condition	Countermeasure and inspected parts
D1	Transmission Error (System check – " " Diagnosis memory – " ")	Transmission to component shown by auxiliary code has been failed. (Detecting this DTC does not necessarily mean actual failure.)	If same auxiliary code is recorded in other component, check harness for power supply and communication system of all components shown by code.
D4	Periodic communication error (System check – "X" Diagnosis memory –" ")	Connection confirmation has not come from the equipment that is communicating.	□Replace radio receiver assy □Check wire harness
D6 *1	Absence of Master	Component in which this code is recorded has been disconnected from system with ignition in ACC or ON. Or, when this code was recorded, radio receiver assy was disconnected.	□Check harness for power supply of radio receiver assy. □Check harness for communication system of radio receiver assy. □Check harness for power supply of stereo component amplifier. □Check harness for communication system of stereo component amplifier.
D7	Communication Check Error	Component in which this code is recorded is or was disconnected from system after engine start. Or, when this code was recorded, radio receiver assy was disconnected.	□Check harness for power supply of radio receiver assy. □Check harness for communication system of radio receiver assy. □Check harness for power supply of stereo component amplifier. □Check harness for communication system of stereo component amplifier.

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DC *2	Transmission Error	Transmission to component shown by auxiliary code has been failed. (Detecting this DTC does not necessarily mean actual failure.)	If same auxiliary code is recorded in other component, check harness for power supply and communication system of all components shown by code.
DD *3	Master Reset (Momentary Interruption)	After engine was started, radio receiver assy was disconnected from system.	□Check harness for power supply of radio receiver assy. □Check harness for communication system of radio receiver assy. □Check harness for power supply of stereo component amplifier. □Check harness for communication system of stereo component amplifier. □If this error occurs frequently, replace radio receiver assy.
DF *4	Master Error	Due to defective condition of component with a display, master function is switched to audio equipment. Error occurs in communication between sub–master (audio) and master component.	□Check harness for power supply of radio receiver assy. □Check harness for communication system of radio receiver assy. □Check harness for communication system between radio receiver assy and sub–master component.
E0 *1	Registration Completion Instruction Error	"Registration Completion Instruction" command from master cannot be received.	Since this DTC is provided for engineering purpose, it may be detected when no actual failure exists.
E1 *1	Audio processor ON error	While source equipment is operating, AMP output is stopped.	□Check harness for power supply of radio receiver assy. □Check harness for communication system of radio receiver assy.
E2	ON/OFF Instruction Parameter Error	Error occurs in ON/OFF controlling command from radio receiver assy.	Replace radio receiver assy.
E3 *1	Registration Request Transmission	□Registration Request command is output from slave component. □Registration Connection Check Instruction, Registration Request command is output from sub–master component.	Since this DTC is provided for engineering purpose, it may be detected when no actual failure exists.

5. STEREO COMPONENT CONTROLLER ASSY

HINT:

- □ *1: Even if no failure is detected, this code may be stored depending on the battery condition or voltage for starting an engine.
- □ *2: This code be stored when the engine key is turned again 1 min. after engine start.
- □ *3: This code may be stored when the engine key is turned again after engine start.
- □ *4: When 210 sec. has passed after pulling out the power supply connector of the master component with the ignition switch in ACC or ON, this code is stored.

Logical address: 01 (Communication control)

DTC	Diagnosis item	Condition	Countermeasure and inspected parts
D6 *1	Absence of Master	Component in which this code is recorded has been disconnected from system with ignition in ACC or ON. Or, when this code was recorded, radio receiver assy was disconnected.	□Check harness for power supply of radio receiver assy. □Check harness for communication system of radio receiver assy. □Check harness for power supply of stereo component controller assy. □Check harness for communication system of stereo component controller assy.

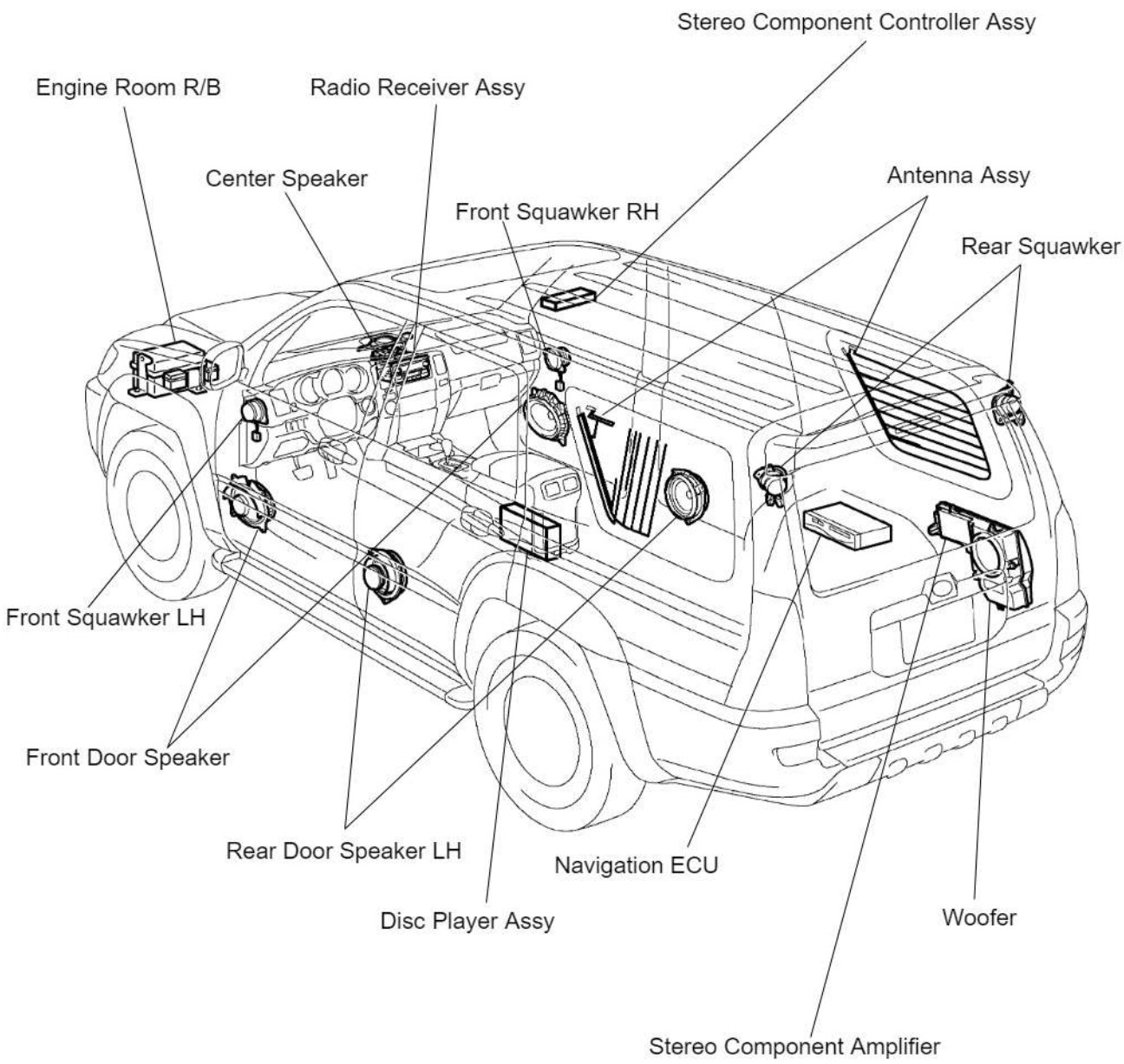
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D7	Communication Check Error	Component in which this code is recorded is or was disconnected from system after engine start. Or, when this code was recorded, radio receiver assy was disconnected.	□Check harness for power supply of radio receiver assy. □Check harness for communication system of radio receiver assy. □Check harness for power supply of stereo component controller assy. □Check harness for communication system of stereo component controller assy.
DC *2	Transmission Error	Transmission to component shown by auxiliary code has been failed. (Detecting this DTC does not necessarily mean actual failure.)	If same auxiliary code is recorded in other component, check harness for power supply and communication system of all components shown by code.
DD *3	Master Reset (Momentary Interruption)	After engine was started, radio receiver assy was disconnected from system.	□Check harness for power supply of radio receiver assy. □Check harness for communication system of radio receiver assy. □Check harness for power supply of stereo component controller assy. □If this error occurs frequently, replace radio receiver assy.
DF *4	Master Error	Due to defective condition of component with a display, master function is switched to audio equipment. Error occurs in communication between sub–master (audio) and master component.	□Check harness for power supply of radio receiver assy. □Check harness for communication system of radio receiver assy. □Check harness for communication system between radio receiver assy and sub–master component.
E0 *1	Registration Completion Instruction Error	”Registration Completion Instruction” command from master cannot be received.	Since this DTC is provided for engineering purpose, it may be detected when no actual failure exists.
E1 *1	Audio processor ON error	While source equipment is operating, AMP output is stopped.	□Check harness for power supply of radio receiver assy. □Check harness for communication system of radio receiver assy.
E3 *1	Registration Request Transmission	□Registration Request command is output from slave component. □Registration Connection Check Instruction, Registration Request command is output from sub–master component.	Since this DTC is provided for engineering purpose, it may be detected when no actual failure exists.
E4 *1	Plural Frame Abort	□Registration Request command is output from slave component. □Registration Connection Check Instruction, Registration Request command is output from sub–master component.	Since this DTC is provided for engineering purpose, it may be detected when no actual failure exists.

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055YK-03

LOCATION

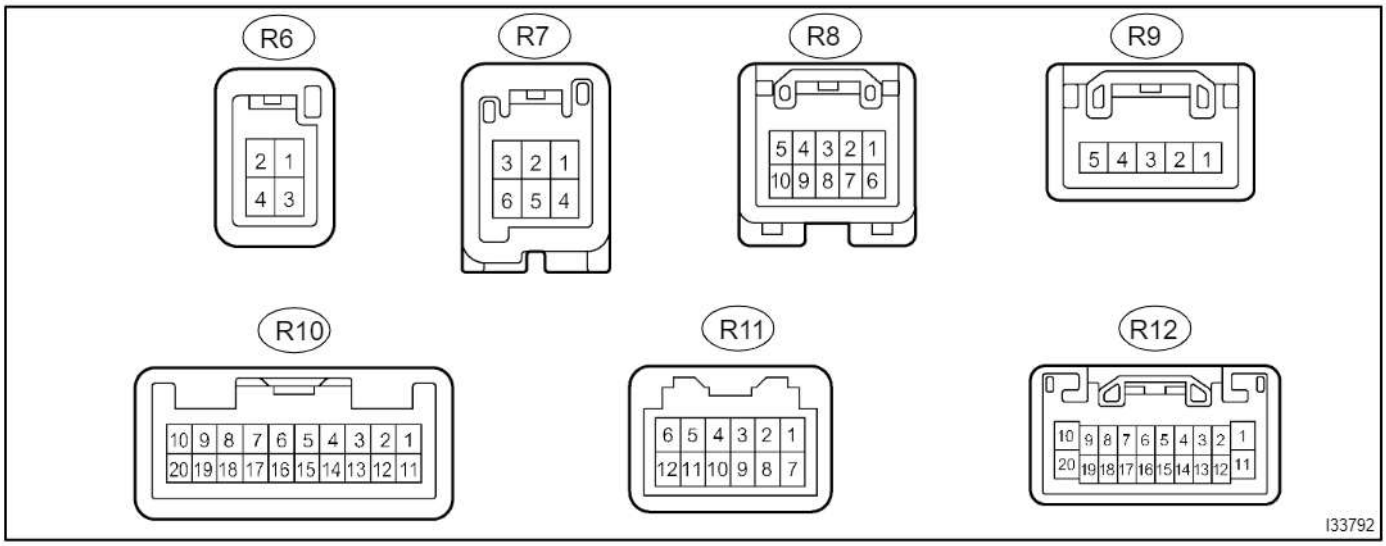


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059U8-02

TERMINALS OF ECU

1. RADIO RECEIVER ASSY



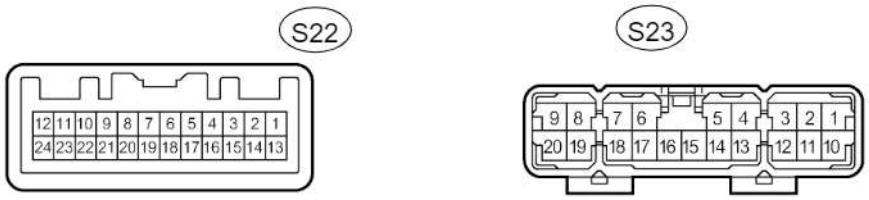
Terminal No. (Symbols)	Wiring Color	Condition	Specifeid condition
GND ⇔ Body ground (R6–4 ⇔ Body ground)	W ⇔ Body ground	Constant	Below 1V
VR ⇔ GND (R8–1 ⇔ R12–20)	Y ⇔ BR	Ignition switch OFF	Below 1 V
R ⇔ GND (R8–2 ⇔ R12–20)	B ⇔ BR	Navigation switch is switched	Pulse generation *1
B ⇔ GND (R8–3 ⇔ R12–20)	R ⇔ BR	Navigation switch is switched	Pulse generation *1
TX+ (R8–5)	R	See "Service Check Mode"	–
VG ⇔ Body ground (R8–6 ⇔ Body ground)	Shielded ⇔ Body ground	Constant	Continuity
G ⇔ GND (R8–7 ⇔ R12–20)	W ⇔ BR	Navigation switch is switched	Pulse generation *1
SYNC ⇔ GND (R8–8 ⇔ R12–20)	G ⇔ BR	Navigation switch is switched	Pulse generation *2
TX– (R8–10)	G	See "Service Check Mode"	–
PKB⇔ GND (R9–1 ⇔ R12–20)	LG ⇔ BR	See "Vehicle Signal Check Mode"	–
SPD ⇔ GND (R9–3 ⇔ R12–20)	V–R ⇔ BR	See "Vehicle Signal Check Mode"	–
REV (R9–5)	R–Y	See "Vehicle Signal Check Mode"	–
GND ⇔ Body ground (R10–6 ⇔ Body ground)	W–R ⇔ Body ground	Constant	Below 1V
SLD1 ⇔ Body ground (R10–14 ⇔ Body ground)	Shielded ⇔ Body ground	Constant	Continuity
RSR+ ⇔ GND (R10–15 ⇔ R12–20)	B ⇔ BR	Audio system is sounding (Rear Seat Audio System)	A waveform synchronized with sounds is output
RSR– ⇔ GND (R10–16 ⇔ R12–20)	R ⇔ BR	Audio system is sounding (Rear Seat Audio System)	A waveform synchronized with sounds is output
RSL+ ⇔ GND (R10–17 ⇔ R12–20)	W ⇔ BR	Audio system is sounding (Rear Seat Audio System)	A waveform synchronized with sounds is output

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RSL– ⇔ GND (R10–18 ⇔ R12–20)	G ⇔ BR	Audio system is sounding (Rear Seat Audio System)	A waveform synchronized with sounds is output
RMU ⇔ GND (R10–19 ⇔ R12–20)	V ⇔ BR	Radio switch is ON (Rear Seat Audio System)	3.5V or more
SLD ⇔ Body ground (R11–1 ⇔ Body ground)	Shielded ⇔ Body ground	Constant	Continuity
R+ ⇔ GND (R11–2 ⇔ R12–20)	B ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
R– ⇔ GND (R11–3 ⇔ R12–20)	W ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
L+ ⇔ GND (R11–4 ⇔ R12–20)	R ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
L– ⇔ GND (R11–5 ⇔ R12–20)	G ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
MUTE ⇔ GND (R11–6 ⇔ R12–20)	P ⇔ BR	Radio switch is ON	3.5V or more
TX+ (R11–9)	R	See "Service Check Mode"	–
TX– (R11–10)	G	See "Service Check Mode"	–
+B ⇔ GND (R12–1 ⇔ R12–20)	L–Y ⇔ BR	Constant	10 – 14V
ILL+ ⇔ GND (R12–2 ⇔ R12–20)	G ⇔ BR	Light control switch TAIL or HEAD	10 – 14V
TX+ (R12–5)	B	See "Service Check Mode"	–
MUTE ⇔ GND (R12–7 ⇔ R12–20)	W–R ⇔ BR	Radio switch is ON	3.5V or more
R+ ⇔ GND (R12–8 ⇔ R12–20)	B ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
L+ ⇔ GND (R12–9 ⇔ R12–20)	R ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
SGND ⇔ Body ground (R12–10 ⇔ Body ground)	Shielded ⇔ Body ground	Constant	Below 1V
ACC ⇔ GND (R12–11 ⇔ R12–20)	GR ⇔ BR	Ignition switch OFF	Below 1V
		Ignition switch ACC or ON	10 – 14V
ILL– ⇔ GND (R12–12 ⇔ R12–20)	W–G ⇔ BR	Light control switch ON	10 – 14V
ANT ⇔ GND (R12–13 ⇔ R12–20)	B ⇔ BR	Radio switch is ON	10 – 14V
TX– (R12–15)	W	See "Service Check Mode"	–
R– ⇔ GND (R12–18 ⇔ R12–20)	W ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
L– ⇔ GND (R12–19 ⇔ R12–20)	G ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
GND ⇔ Body ground (R12–20 ⇔ Body ground)	BR ⇔ Body ground	Constant	Below 1V

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2. STEREO COMPONENT AMPLIFIER ASSY



I33793

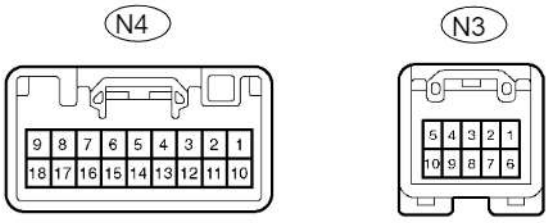
Terminal No. (Symbols)	Wiring Color	Condition	Specifeid condition
S22–1 ⇔ S23–15 (MUTE ⇔ GND)	W–R ⇔ BR	Audio system is sounding	3.5V or more
S22–2 ⇔ S23–15 (L– ⇔ GND)	G ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
S22–3 ⇔ S23–15 (L+ ⇔ GND)	R ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
S22–4 ⇔ S23–15 (R– ⇔ GND)	W ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
S22–5 ⇔ S23–15 (R+ ⇔ GND)	B ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
S22–7 (TX–)	W	See "Service Check Mode"	–
S22–8 (TX+)	B	See "Service Check Mode"	–
S22–12 ⇔ S23–15 (ACC ⇔ GND)	GR ⇔ BR	Ignition switch OFF	Below 1 V
		Ignition switch ACC or ON	10 – 14 V
S23–1 ⇔ S23–15 (+B⇔ GND)	W–L ⇔ BR	Constant	10 – 14V
S23–3 ⇔ S23–15 (CSP+ ⇔ GND)	G ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
S23–4 ⇔ S23–15 (RL+⇔ GND)	B ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
S23–5 ⇔ S23–15 (RR+⇔ GND)	R ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
S23–6 ⇔ S23–15 (FL+⇔ GND)	P ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
S23–7 ⇔ S23–15 (FR+ ⇔ GND)	LG ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
S23–8 ⇔ S23–15 (WFL+⇔ GND)	BR ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
S23–9 ⇔ S23–15 (WFR+⇔ GND)	L–B ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
S23–10 ⇔ S23–15 (+B2⇔ GND)	W–L ⇔ BR	Constant	10 – 14V

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S23–12 ⇔ S23–15 (CSP– ⇔ GND)	G–B ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
S23–13 ⇔ S23–15 (RL–⇔ GND)	Y ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
S23–14 ⇔ S23–15 (RR–⇔ GND)	W ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
S23–15 ⇔ Body ground (GND ⇔ Body ground)	BR ⇔ Body ground	Constant	Below 1V
S23–16 ⇔ Body ground (E ⇔ Body ground)	BR ⇔ Body ground	Constant	Below 1V
S23–17 ⇔ S23–15 (FL– ⇔ GND)	V ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
S23–18 ⇔ S23–15 (FR– ⇔ GND)	L ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
S23–19 ⇔ S23–15 (WFL–⇔ GND)	G–W ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
S23–20 ⇔ S23–15 (WFR–⇔ GND)	L–R ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output

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3. NAVIGATION ECU



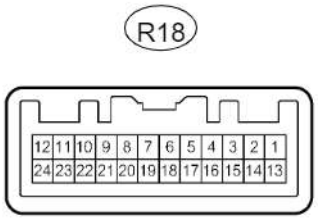
N

I15499

Symbols (Terminals No.)	Wiring Color	Condition	Specifeid condition
VR ⇔ VG (N3–1 ⇔ N3–6)	Y ⇔ Shielded	Ignition switch OFF	Below 1 V
R ⇔ VG (N3–2 ⇔ N3–6)	B ⇔ Shielded	Navigation map is switched	Pulse generation *1
B ⇔ VG (N3–3 ⇔ N3–6)	R ⇔ Shielded	Navigation map is switched	Pulse generation *1
TX+ (N3–5)	R	See "Service Check Mode"	–
VG ⇔ GND (N3–6 ⇔ N4–17)	Shielded ⇔ BR	Ignition switch OFF	Below 1 V
G ⇔ VG (N3–7 ⇔ N3–6)	W ⇔ Shielded	Navigation map is switched	Pulse generation *1
SYNC ⇔ VG (N3–8 ⇔ N3–6)	G ⇔ Shielded	Navigation display is displayed	Pulse generation *2
TX– (N3–10)	G	See "Service Check Mode"	–
AUI+ ⇔ GND (N4–1 ⇔ N4–17)	LG ⇔BR	Audio system is sounding	A waveform synchronized with sounds is output
AUO+ ⇔ GND (N4–2⇔ N4–17)	LG ⇔BR	Sound quality test	–
SPD ⇔ GND (N4–5 ⇔ N4–17)	V–R ⇔ BR	See "Vehicle Signal Check Mode"	–
+B ⇔GND (N4–9 ⇔ N4–17)	L–Y ⇔ BR	Constant	10 – 14 V
AUI– ⇔ GND (N4–10 ⇔ N4–17)	L ⇔ BR	Audio system is sounding	A waveform synchronized with sounds is output
AUO– ⇔ GND (N4–11 ⇔ N4–17)	L ⇔ BR	Sound quality test	–
REV (N4–14)	R–Y	See "Vehicle Signal Check Mode"	–
MUTE ⇔ GND (N4–15 ⇔ N4–17)	V–W ⇔ BR	Navigation voice sounding	Below 1 V
GND ⇔ Body ground (N4–17 ⇔ Body ground)	BR ⇔ Body ground	Constant	Below 1 V
ACC ⇔ GND (N4–18 ⇔ N4–17)	GR ⇔ BR	Ignition switch OFF	Below 1 V
		Ignition switch ACC or ON	10 – 14 V

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4. STEREO COMPONENT CONTROLLER ASSY

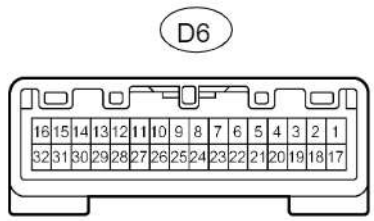


I33794

Terminal No. (Symbols)	Wiring Color	Condition	Specifeid condition
R18–6 ⇔ R18–17 (RSL– ⇔ GND)	W ⇔ LG	Audio system is sounding	A waveform synchronized with sounds is output
R18–7 ⇔ R18–17 (RSL+ ⇔ GND)	W ⇔ LG	Audio system is sounding	A waveform synchronized with sounds is output
R18–8 ⇔ R18–17 (RSR– ⇔ GND)	W ⇔ LG	Audio system is sounding	A waveform synchronized with sounds is output
R18–9 ⇔ R18–17 (RSR+ ⇔ GND)	W ⇔ LG	Audio system is sounding	A waveform synchronized with sounds is output
R18–12 ⇔ R18–17 (+B ⇔ GND)	LG ⇔ LG	Constant	10 – 14V
R18–17 ⇔ Body ground (GND ⇔ Body ground)	LG ⇔ Body ground	Constant	Below 1V
R18–21 ⇔ R18–17 (MUTE ⇔ GND)	LG ⇔ LG	Radio switch is ON	3.5V or more
R18–22 (TX+)	LG	See "Service check mode"	–
R18–23 (TX–)	W	See "Service check mode"	–
R18–24 ⇔ R18–17 (ACC ⇔ GND)	LG ⇔ LG	Ignition switch OFF	Below 1V
		Ignition switch ACC or ON	10 – 14V

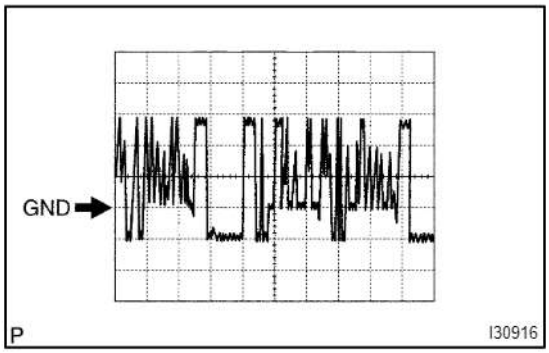
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5. DISC PLAYER ASSY:



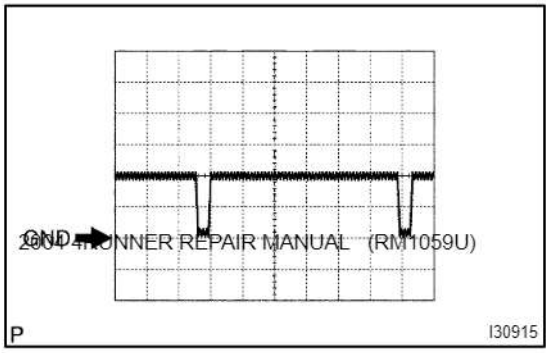
I33795

Terminal No. (Symbols)	Wiring Color	Condition	Specifeid condition
D6–1 ⇔ D6–21 (MUTE ⇔ GND)	P–B ⇔ W–B	Navigation voice sounding	3.5V or more
D6–2 ⇔ D6–21 (L– ⇔ GND)	G ⇔ W–B	Audio system is sounding	A waveform synchronized with sounds is output
D6–3 ⇔ D6–21 (L+ ⇔ GND)	R ⇔ W–B	Audio system is sounding	A waveform synchronized with sounds is output
D6–4 ⇔ D6–21 (R– ⇔ GND)	W ⇔ W–B	Audio system is sounding	A waveform synchronized with sounds is output
D6–5 ⇔ D6–21 (R+ ⇔ GND)	B ⇔ W–B	Audio system is sounding	A waveform synchronized with sounds is output
D6–6 ⇔ D6–21 (SLD ⇔ GND)	Shielded ⇔ W–B	Ignition switch OFF	Below 1 V
D6–17 ⇔ D6–21 (+B⇔ GND)	L–Y ⇔ W–B	Constant	10 – 14V
D6–18 ⇔ D6–21 (ACC ⇔ GND)	GR ⇔ W–B	Ignition switch OFF	Below 1 V
		Ignition switch ACC or ON	10 – 14 V
D6–19 (TX1–)	LG	See "Service Check Mode"	–
D6–20 (TX1+)	L	See "Service Check Mode"	–
D6–21 ⇔ Body ground (GND ⇔ Body ground)	W–B ⇔ Body ground	Constant	Below 1V



I30916

*1: Oscilloscope wave
Terminal to be measured: R, G, B – GND
Setting for measurement: 200 mV/DIV10 ∝s/DIV
Condition: Navigation map is switched.



I30915

*2: Oscilloscope wave
Terminal to be measured: SYNC – GND
Setting for measurement: 500 mV/DIV10 ∝s/DIV
Condition: Navigation display is displayed.

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0559S–07

PROBLEM SYMPTOMS TABLE

Flow chart No.	Symptom	See page
1	Even when pressing "PWR/VOL" switch or any audio switch, the screen remains black.	05–1619
2	Panel switch does not function.	05–1621
3	Although "PWR/VOL" switch is pressed, no sound is heard (Display and switch operation is normal).	05–1622
4	No navigation screen displayed when "NAVI" "MAP/VOICE" or "DEST" switch pressed (Screen cannot be switched).	05–1624
5	Navigation screen not stabilized (Syncronous error).	05–1627
6	Color on navigation screen is unusual (RGB signal error).	05–1631
7	Front speaker (Driver side) only is not heard (Radio, casette tape, CD).	05–1636
8	Map DVD cannot be ejected or played.	05–1639
9	Map screen displayed does not appear (Disc caution screen does not change).	05–1641
10	Map is displayed in white or blue screen (Switched and vehicle position mark are displayed).	05–1642
11	Screen cannot be dimmed when light control switch is turned to "TAIL" position.	05–1643
12	Touch switch does not function (Navigation screen only).	05–1646
13	Vehicle position is deviated from correct point badly.	05–1647
14	GPS mark does not appear.	05–1649
15	No voice navigation.	05–1650
16	Vehicle position mark rotates without control (Map rotates without control).	05–1652
17	Driving derections opposite to moving derection of vehicle position mark.	05–1654
18	CD cannot be inserted / is ejected right after insertion / cannot be played.	05–1656
19	CD cannot be ejected.	05–1658
20	Cassette tape cannot be inserted or played.	05–1662
21	Cassette tape cannot be ejected.	05–1664
22	CD sound skips.	05–1660
23	Noise occurs.	05–1666
24	Radio broadcast cannot be received. (Bad reception).	05–1668
25	Rear seat entertainment system does not respond to any remote control operations.	05–1670
26	Quality of sound from wireless headphone is poor or no sound can be heard.	05–1672

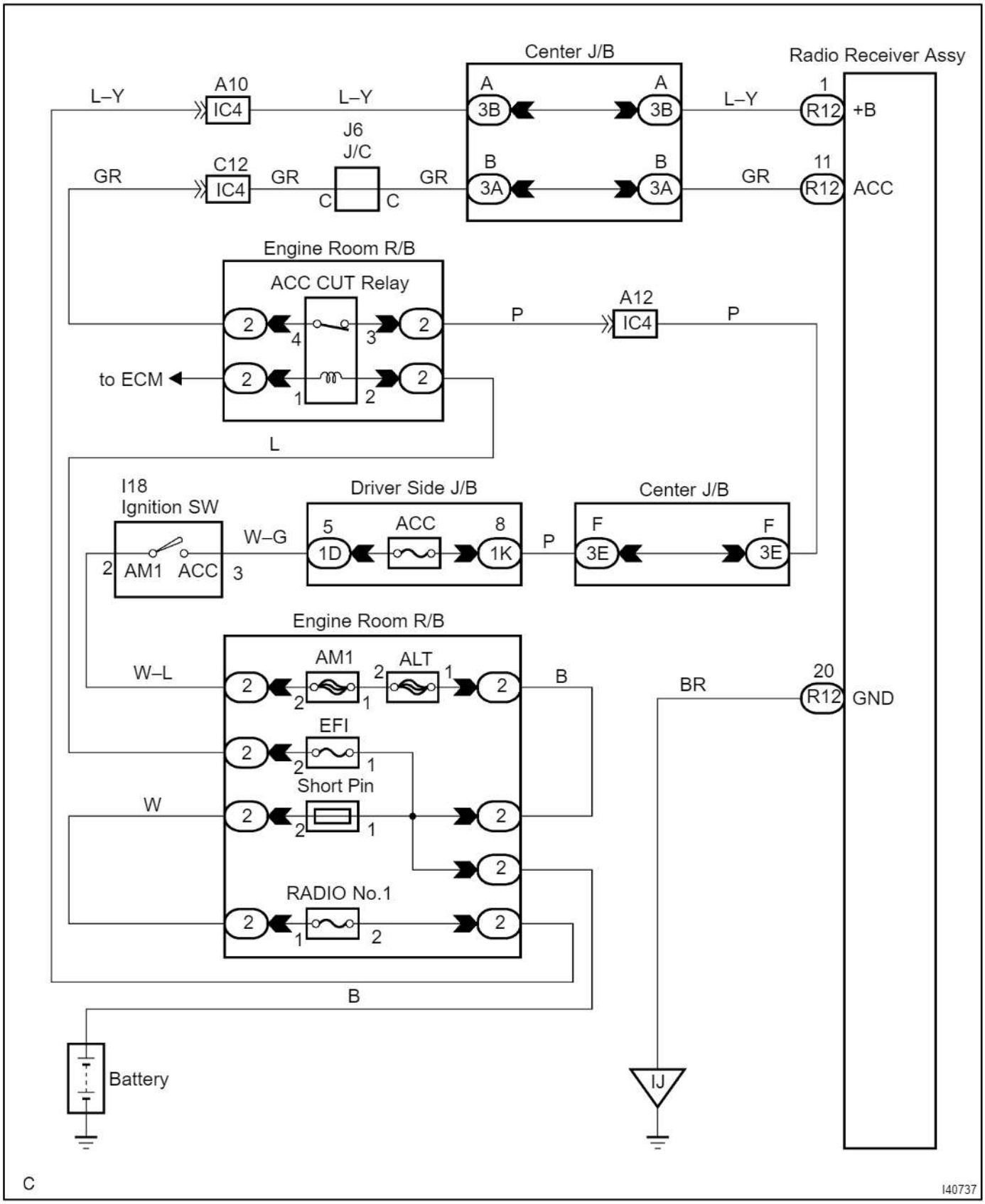
EXAMPLES OF MISUNDERSTANDING SYMPTOMS AS MALFUNCTIONS

Condition	Cause	Procedure to recover
Screen displays "AUDIO OFF", even when "PWR/VOL" switch is turned off.	"PWR/VOL" switch turns the audio off, but not the screen. To turn off the screen, "SCREEN OFF" switch must be pressed.	Press "DISPLAY" switch → Press "SCREEN OFF" switch on screen
The screen is too dark or too bright, when the screen is changed between navigation and audio.	The contrast set up of the screen between navigation and audio is different. The contrast needs to be set up for each of the navigation and audio screen.	*Navigation: Press "DISPLAY" and adjust by "BRIGHTNESS" switch. *AUDIO: Press "DISPLAY" and adjust by "CONTRAST" switch.
Present position is not displayed even when "NAVI" switch is pressed.	Pressing "NAVI" switch displays the previous screen. For present position, "MAP/VOICE" switch must be pressed.	Press "NAVI" switch → Press "MAP/VOICE" switch.
Even when pressing the panel switch, it doesn't function.	*Since this switch is pressure sensitive type, press the switch scurely. *The panel switch toned down does not work even if is pressed.	Press the panel switch securely, if the pressure is weak or time is insufficient, the switch does not function.

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EVEN WHEN PRESSING "PWR/VOL" SWITCH OR ANY AUDIO SWITCH, THE SCREEN REMAINS BLACK

WIRING DIAGRAM



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INSPECTION PROCEDURE

1	CHECK SCREEN MODE

(a) Check the screen mode
(1) Press "AUDIO" or "NAVI" switch to check if the screen turns on.

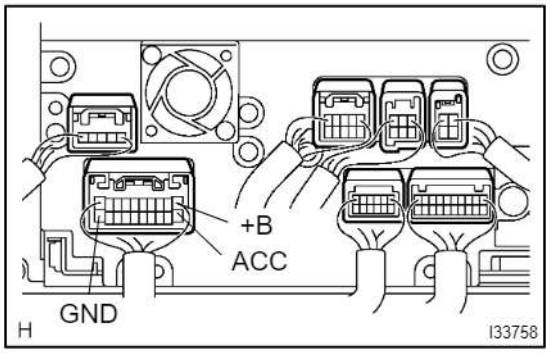
HINT:
If the mode is "SCREEN OFF" the screen remains black but the sound is heard.

A	Screen remains black.
B	Screen displays audio or navi mode.

B → **NORMAL**

A

2	INSPECT RADIO RECEIVER ASSY(+B, ACC, GND)



(a) Remove the radio receiver assy with connectors with still connected.
(b) Check voltage.
(1) Measure voltage between terminals +B, ACC and GND of radio receiver assy at each conditions, as shown in the chart.

Standard:

Terminal	Condition	Voltage (v)
+B ⇔ GND	Constant	10 – 14 V
ACC ⇔ GND	Turn ignition switch ACC	10 – 14 V

(c) Check continuity.
(1) Check that the continuity exists between terminal GND of radio receiver assy and body ground.
Standard: Continuity exists.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE RADIO RECEIVER ASSY

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PANEL SWITCH DOES NOT FUNCTION

INSPECTION PROCEDURE

1	CHECK SWITCH

(a) Check the switch
(1) Check that the switch is not pressed double by the foreign objects near the radio receiver switch.
Standard: No foreign objects

NG → REMOVE FOREIGN OBJECT

OK

2	DISPLAY CHECK MODE

(a) Inspect the display
(1) Boot the diagnosis, preform ”Panel Switch Check” to check that the function is normal.
Standard: The function is normal

OK → NORMAL

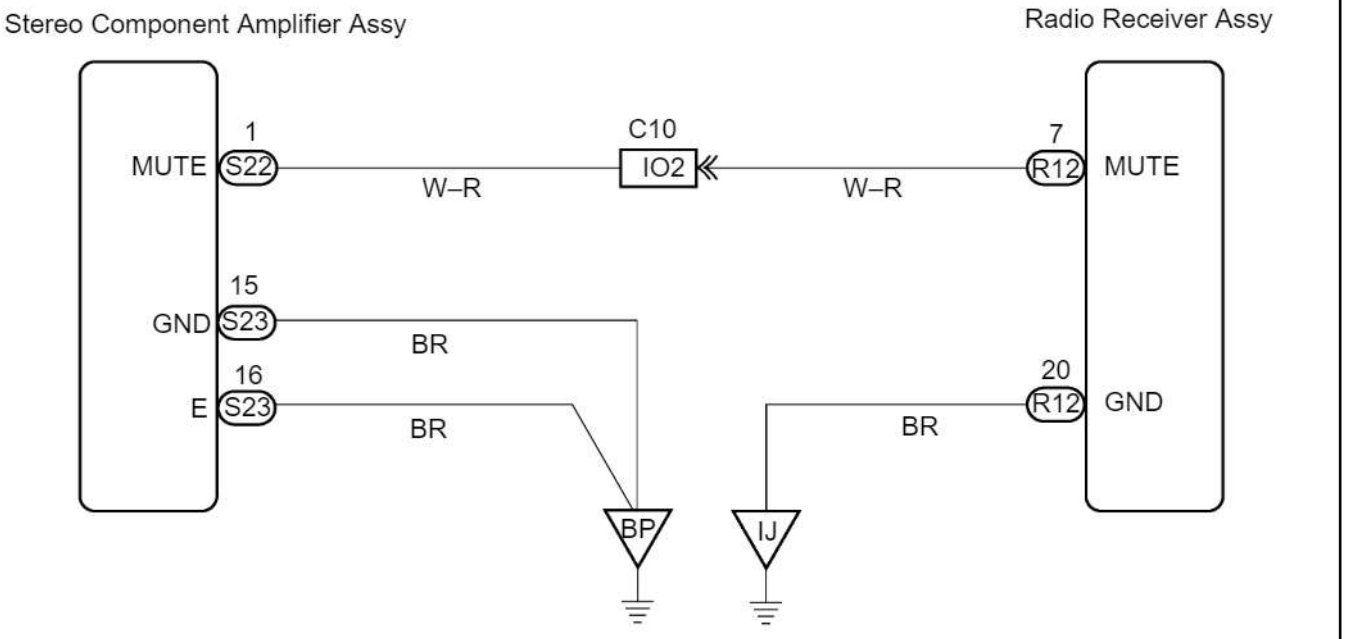
NG

CHECK AND REPLACE RADIO RECEIVER ASSY

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ALTHOUGH "PWR/VOL" SWITCH IS PRESSED, NO SOUND IS HEARD (DISPLAY AND SWITCH OPERATION IS NORMAL)

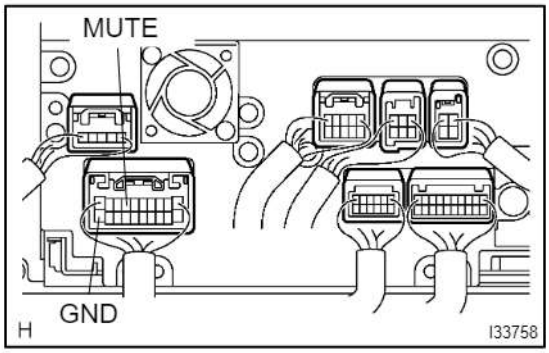
WIRING DIAGRAM



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INSPECTION PROCEDURE

1 INSPECT RADIO RECEIVER ASSY(MUTE, GND)



(a) Remove the radio receiver assy with connectors with still connected.

(b) Check voltage.

(1) Measure voltage between terminals MUTE of radio receiver assy at each conditions, as shown in the chart.

Standard:

Terminal	Condition	Voltage (v)
MUTE ⇔ GND	Radio switch is ON	Below 1 V

(c) Check continuity.

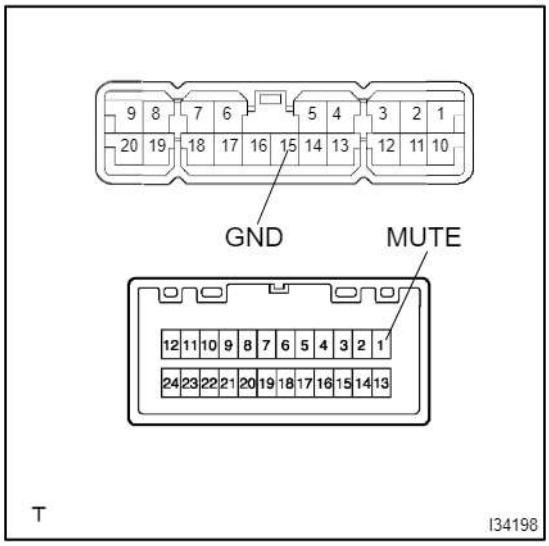
(1) Check that the continuity exists between terminal GND of radio receiver assy and body ground.

Standard: Continuity exists.

NG → **CHECK AND REPLACE RADIO RECEIVER ASSY**

OK

2 INSPECT STEREO COMPONENT AMPLIFIER ASSY(MUTE, GND)



(a) Remove the stereo component amprifier with connectors with still connected.

(b) Check voltage.

(1) Measure voltage between terminals MUTE of stereo component amprifier at each conditions, as shown in the chart.

Standard:

Terminal	Condition	Voltage (v)
MUTE ⇔ GND	Radio switch is ON	3.5V or more

(c) Check continuity.

(1) Check that the continuity exists between terminal GND of stereo component amprifier and body ground.

Standard: Continuity exists.

NG → **CHECK AND REPLACE STEREO COMPONENT AMPLIFIER ASSY**

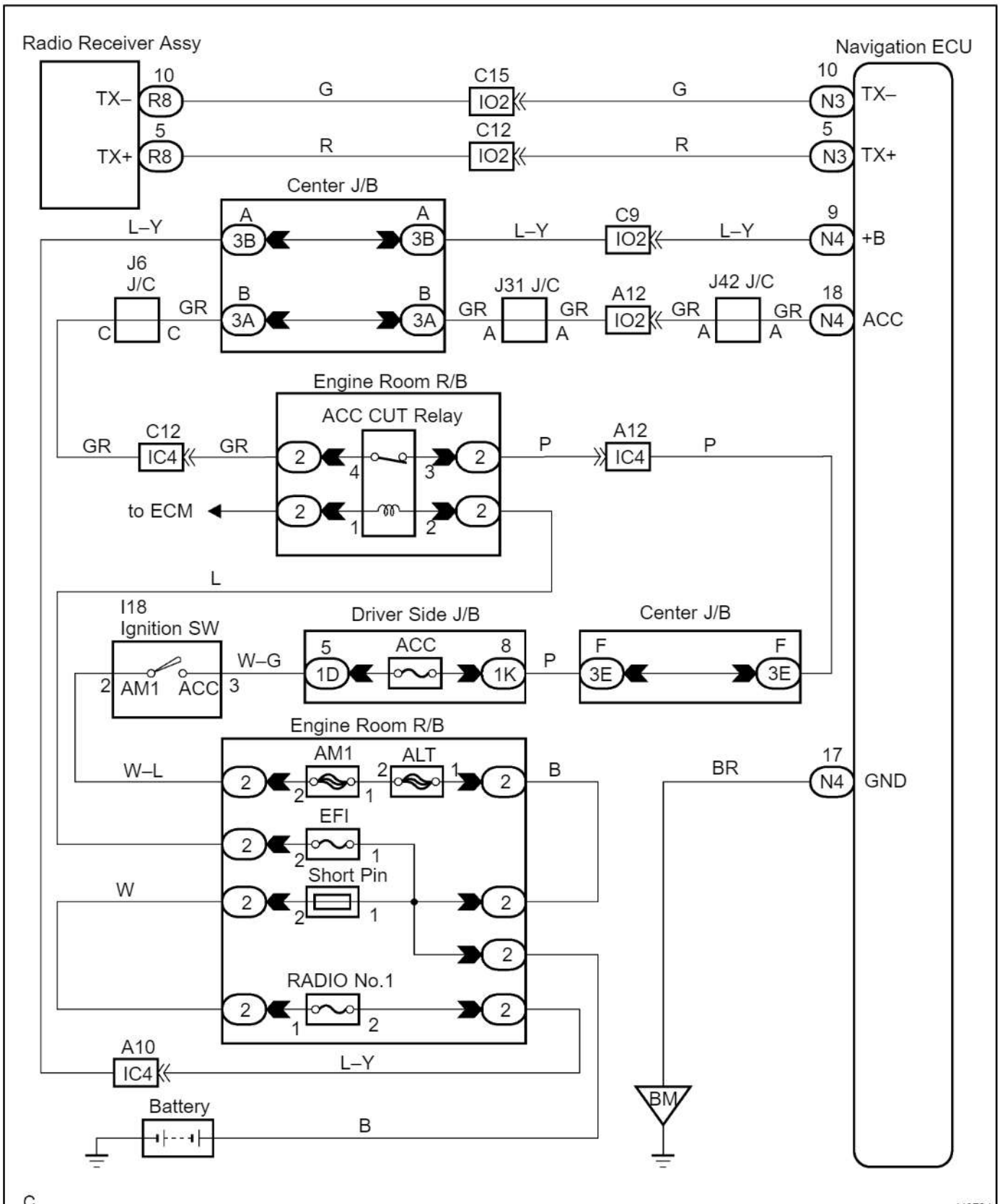
OK

CHECK AND REPLACE APPLICABLE PART (INCLUDE WIRE HARNESS)

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NO NAVIGATION SCREEN DISPLAYED WHEN "MAP/VOICE", "NAVI" OR "DEST" SWITCH PRESSED (SCREEN CANNOT BE SWITCHED)

WIRING DIAGRAM



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INSPECTION PROCEDURE

1 SERVICE CHECK MODE(NAVIGATION ECU)

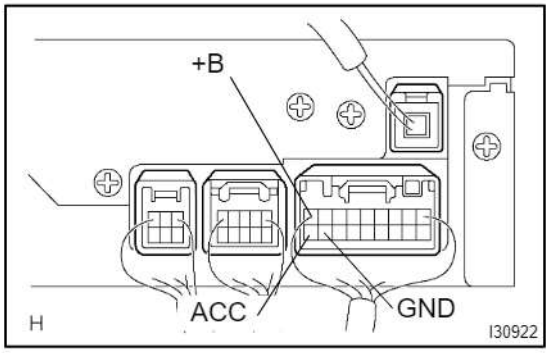
(a) Perform service check
(1) Start up the diagnosis system and read result of navigation ECU in the service check mode.

A	"NCON" is displayed or "NAVI" is not displayed
B	"NAVI: OK" is displayed

B → **CHECK AND REPLACE RADIO RECEIVER ASSY**

A

2 INSPECT NAVIGATION ECU(+B, ACC, GND)



(a) Remove the navigation ECU with connectors with still connected.
(b) Check voltage.
(1) Measure voltage between terminals +B, ACC and GND of navigation ECU at each conditions, as shown in the chart.

Standard:

Terminal	Condition	Voltage (v)
+B ⇔ GND	Constant	10 – 14 V
ACC ⇔ GND	Turn ignition switch ACC	10 – 14 V

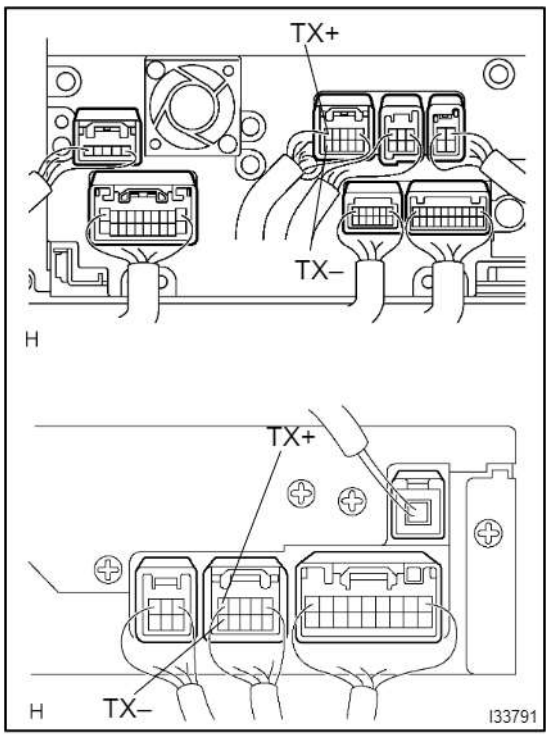
(c) Check continuity.
(1) Check that the continuity exists between terminal GND of navigation ECU and body ground.
Standard: Continuity exists.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

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3	CHECK HARNESS AND CONNECTOR(RADIO RECEIVER ASSY–NAVIGATION ECU)



(a) Disconnect the connector from the navigation ECU.
(b) Disconnect the connector from the radio receiver assy.
(c) Check continuity.
  (1) Check that the continuity between navigation ECU and radio receiver assy.

Standard:

Tester connection	Specified condition
TX+ ⇔ TX+	Continuity
TX– ⇔ TX–	Continuity
TX+ ⇔ Body ground	No continuity
TX– ⇔ Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

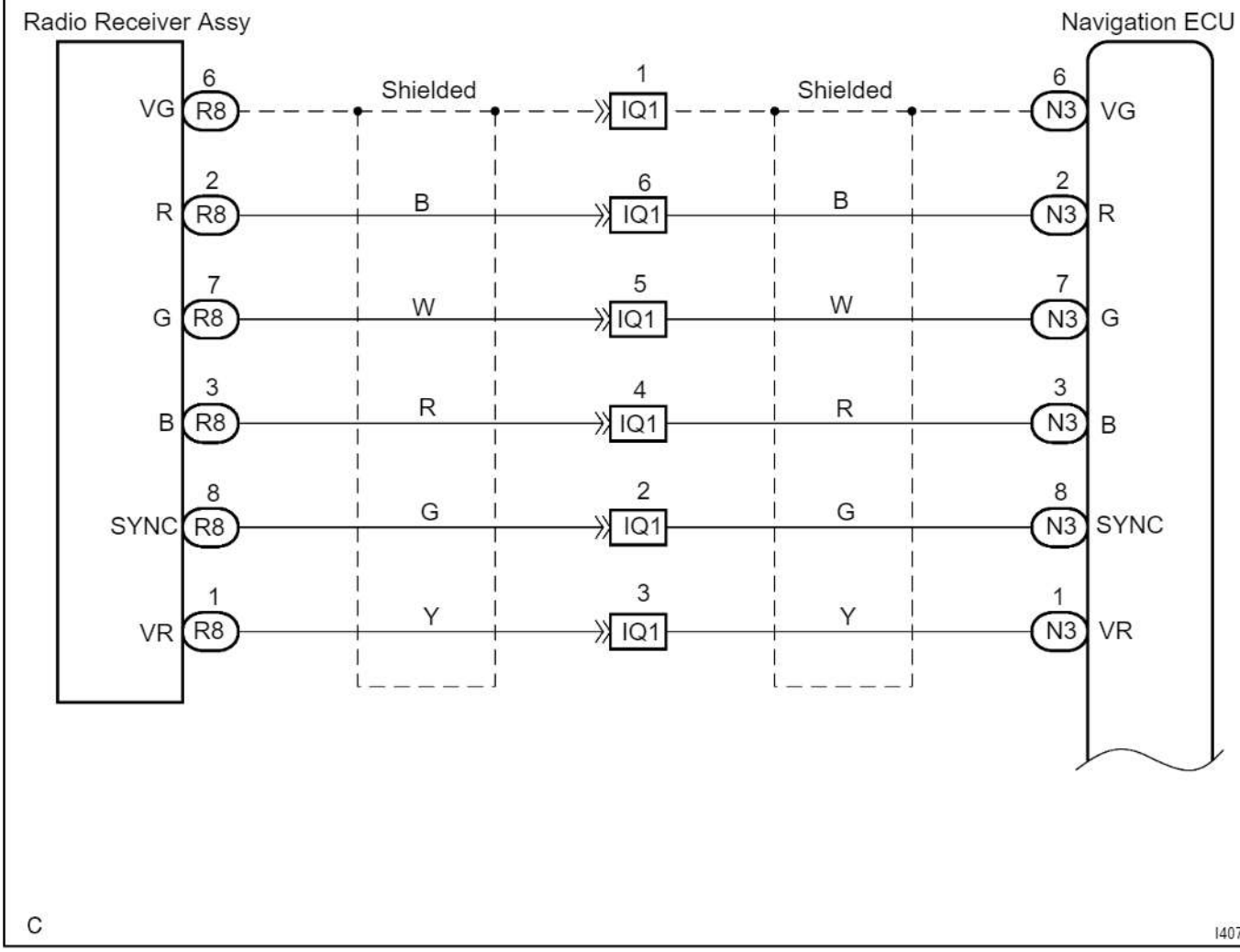
OK

CHECK AND REPLACE NAVIGATION ECU

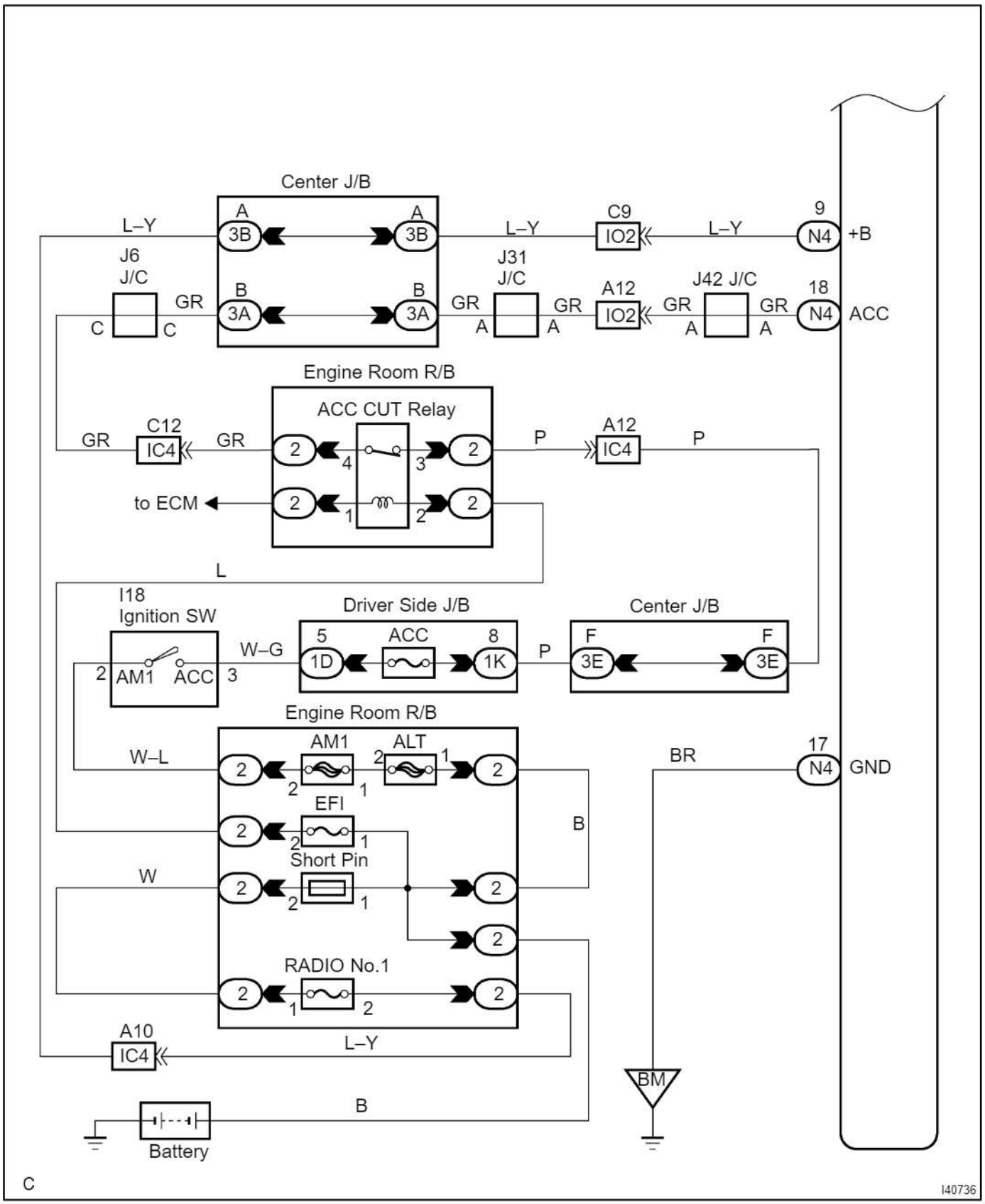
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NAVIGATION SCREEN IS NOT STABILIZED(SYNCRONOUS ERROR)

WIRING DIAGRAM



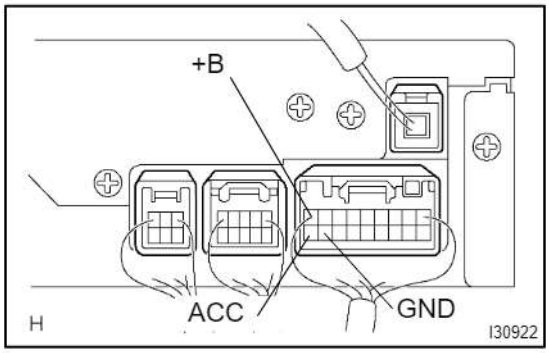
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INSPECTION PROCEDURE

1 INSPECT NAVIGATION ECU(+B, ACC, GND)



(a) Remove the navigation ECU with connectors with still connected.

(b) Check voltage.

(1) Measure voltage between terminals +B, ACC and GND of navigation ECU at each conditions, as shown in the chart.

Standard:

Terminal	Condition	Voltage (v)
+B ⇔ GND	Constant	10 – 14 V
ACC ⇔ GND	Turn ignition switch ACC	10 – 14 V

(c) Check continuity.

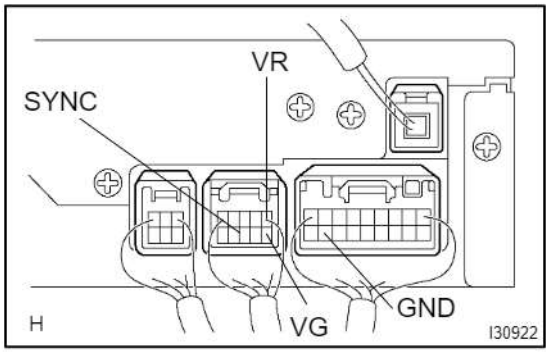
(1) Check that the continuity exists between terminal GND of navigation ECU and body ground.

Standard: Continuity exists.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

2 INSPECT NAVIGATION ECU(SYNC, VR, VG)



(a) Check continuity.

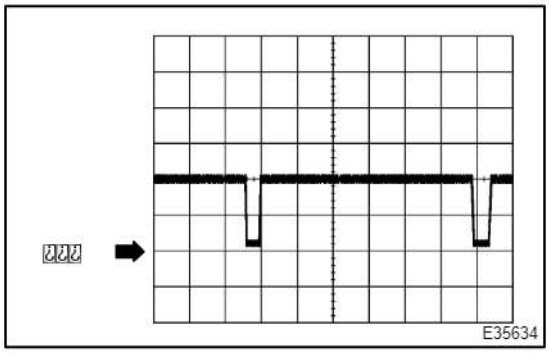
(1) Check that the continuity exists between each terminals, as shown in the chart.

Standard:

Terminal	Condition	Specified condition
VR ⇔ Body ground	Constant	Continuity
VG ⇔ Body ground	Constant	Continuity

(b) Check signal waveform.

(1) Using an oscilloscope, check signal waveform between terminals SYNC and GND of navigation ECU



Item	Contents
Tool setting	500 mV/ DIV, 10 ∝s/ DIV
Condition	Navigation display is displayed

HINT:

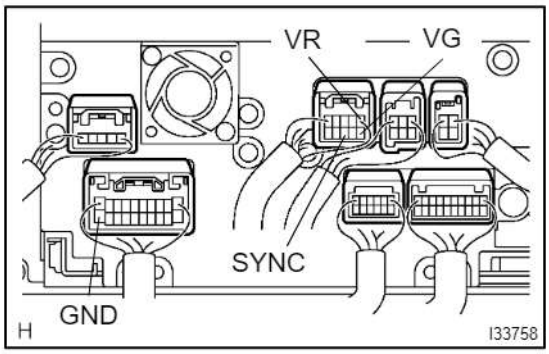
Signal wave from is shown in the chart.

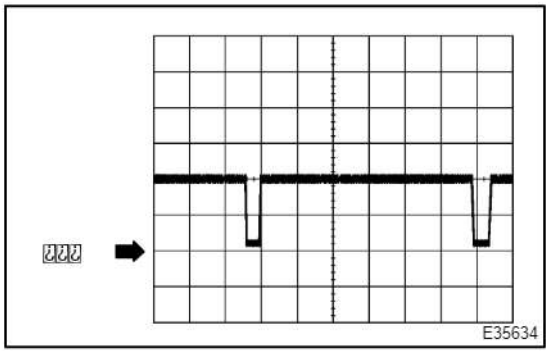
NG → **CHECK AND REPLACE RADIO RECEIVER ASSY**

OK

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3 INSPECT RADIO RECEIVER ASSY(SYNC, VR, VG)





(a) Check continuity.
(1) Check that the continuity exists between each terminals, as shown in the chart.

Standard:

Terminal	Condition	Specified condition
VR ⇔ Body ground	Constant	Continuity
VG ⇔ Body ground	Constant	Continuity

(b) Check signal waveform.
(1) Using an oscilloscope, check signal waveform between terminals SYNC and GND of radio receiver assy.

Item	Contents
Tool setting	500 mV/ DIV, 10 ∝s/ DIV
Condition	Navigation display is displayed

HINT:
Signal wave from is shown in the chart.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

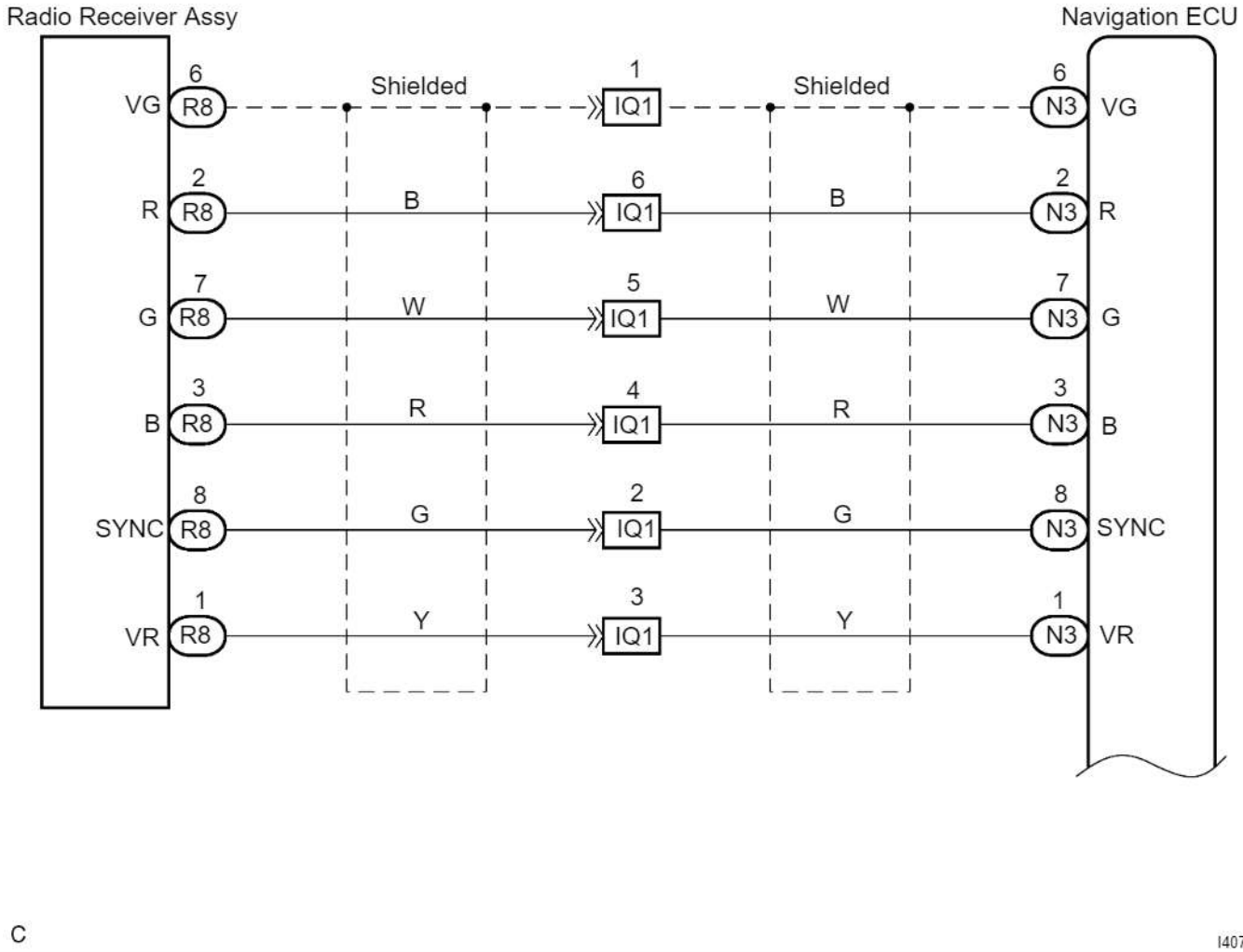
OK

CHECK AND REPLACE RADIO RECEIVER ASSY

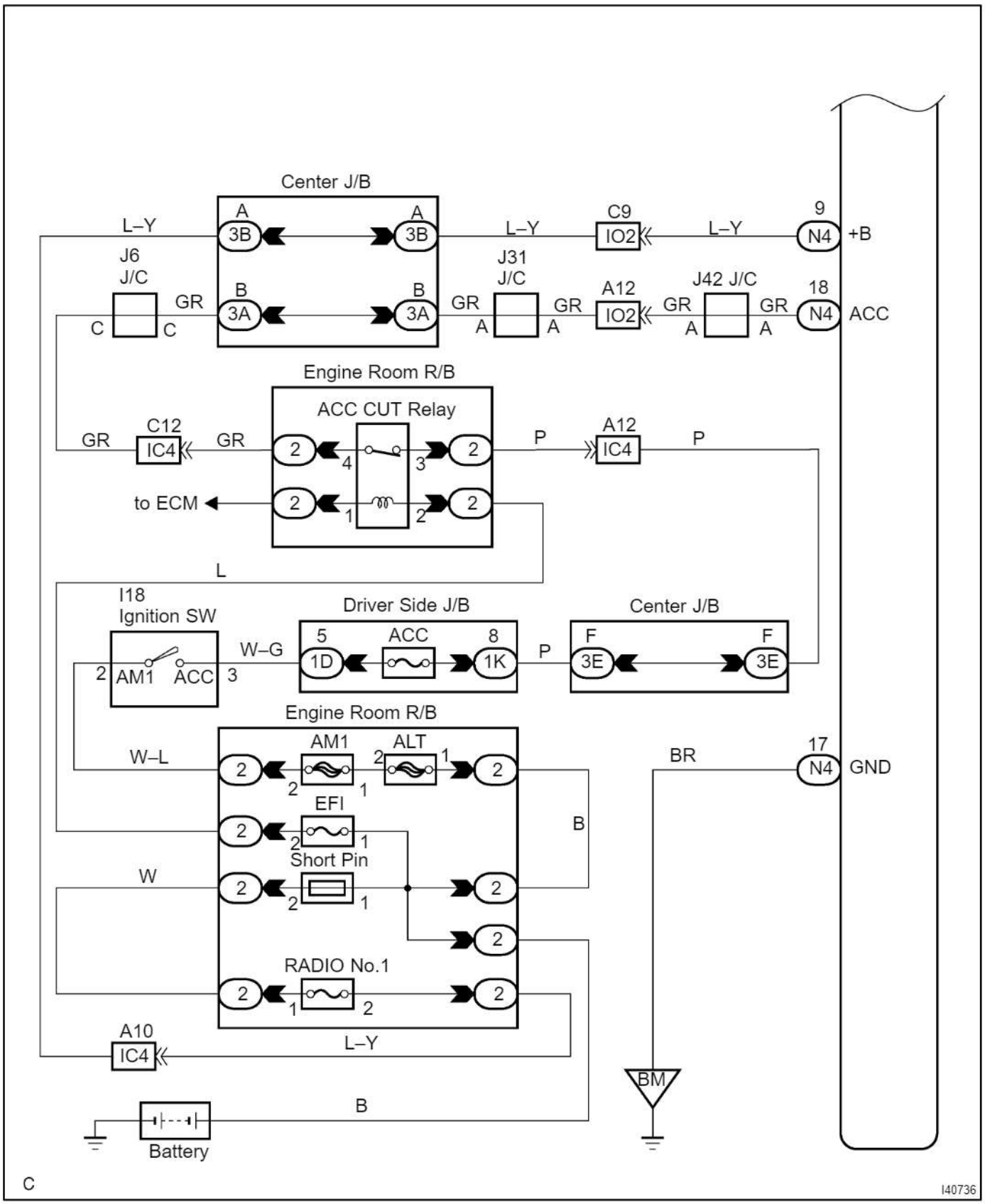
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COLOR ON NAVIGATION SCREEN IS UNUSUAL (RGB SIGNAL ERROR)

WIRING DIAGRAM



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INSPECTION PROCEDURE

1	DISPLAY CHECK MODE(COLOR BAR CHECK)

(a) Perform display check mode
(1) Start the diagnosis system and perform display color bar check of display check mode.
Standard: Color bar check is normally

NG → **CHECK AND REPLACE RADIO RECEIVER ASSY**

OK

2	NAVIGATION CHECK MODE(NAVI COLOR BAR CHECK)

(a) Perform navigation check mode
(1) Start the diagnosis system and perform navigation color bar check of navigation check mode.
Standard: Color bar check is normally

NG → **Go to step 4**

OK

3	CHECK SETTING(NAVIGATION SETTING)

(a) Check the color settings of each daytime screen/night screen at the "Navigation setting" on the menu.
Standard: Color setting is normally

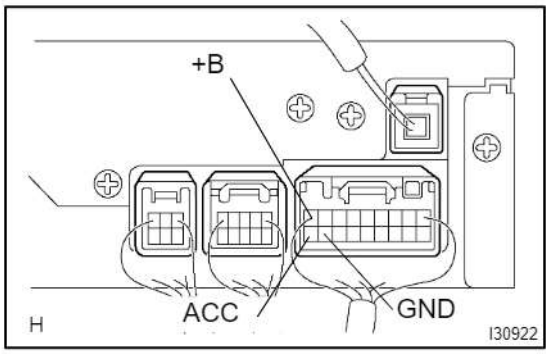
NG → **CHECK AND REPLACE NAVIGATION ECU**

OK

NORMAL

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4 INSPECT NAVIGATION ECU(+B, ACC, GND)



(a) Remove the navigation ECU with connectors with still connected.

(b) Check voltage.

(1) Measure voltage between terminals +B, ACC and GND of navigation ECU at each conditions, as shown in the chart.

Standard:

Terminal	Condition	Voltage (v)
+B ⇔ GND	Constant	10 – 14 V
ACC ⇔ GND	Turn ignition switch ACC	10 – 14 V

(c) Check continuity.

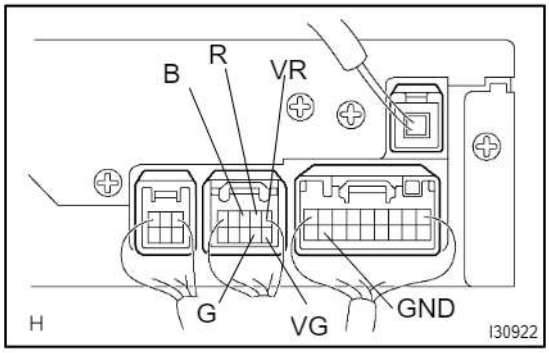
(1) Check that the continuity exists between terminal GND of navigation ECU and body ground.

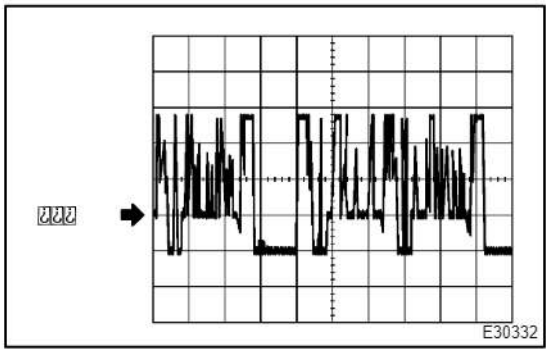
Standard: Continuity exists.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

5 INSPECT NAVIGATION ECU(R, G, B, VR, VG)





(a) Check continuity.

(1) Check that the continuity exists between each terminals, as shown in the chart.

Standard:

Terminal	Condition	Specified condition
VR ⇔ Body ground	Constant	Continuity
VG ⇔ Body ground	Constant	Continuity

(b) Check signal waveform.

(1) Using an oscilloscope, check signal waveform between terminals R, G, B and GND of navigation ECU.

Item	Contents
Tool setting	200 mV/ DIV, 10 ∝s/ DIV
Condition	Navigation display is displayed

HINT:

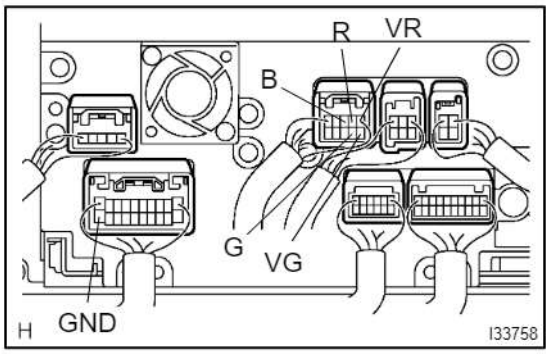
Signal wave from is shown in the chart.

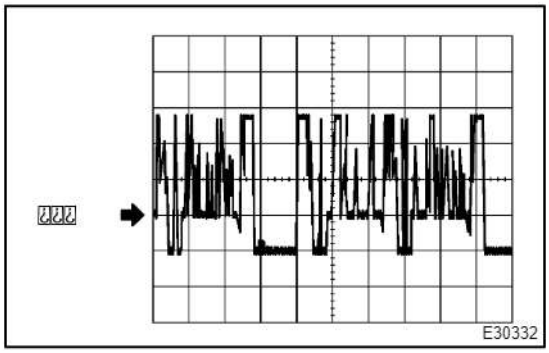
NG → **CHECK AND REPLACE NAVIGATION ECU**

OK

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6 INSPECT RADIO RECEIVER ASSY(R, G, B, VR, VG)





(a) Check continuity.

(1) Check that the continuity exists between each terminals, as shown in the chart.

Standard:

Terminal	Condition	Specified condition
VR ⇔ Body ground	Constant	Continuity
VG ⇔ Body ground	Constant	Continuity

(b) Check signal waveform.

(1) Using an oscilloscope, check signal waveform between terminals R, G, B and GND of radio receiver assy.

Item	Contents
Tool setting	200 mV/ DIV, 10 ∝s/ DIV
Condition	Navigation display is displayed

HINT:

Signal wave from is shown in the chart.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

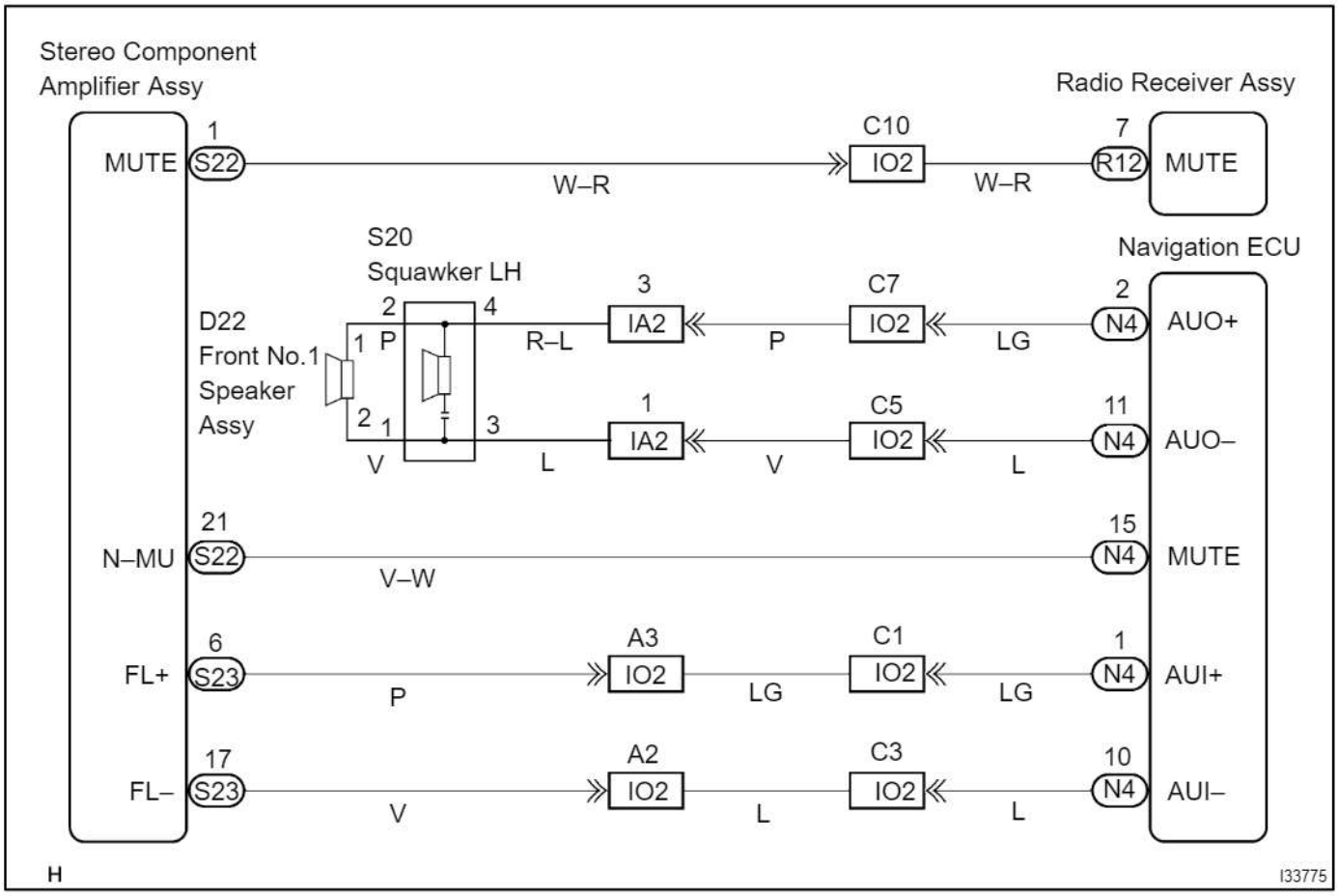
OK

CHECK AND REPLACE RADIO RECEIVER ASSY

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FRONT SPEAKER (DRIVER SIDE) ONLY IS NOT HEARD (RADIO, CASETTE TAPE, CD)

WIRING DIAGRAM



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INSPECTION PROCEDURE

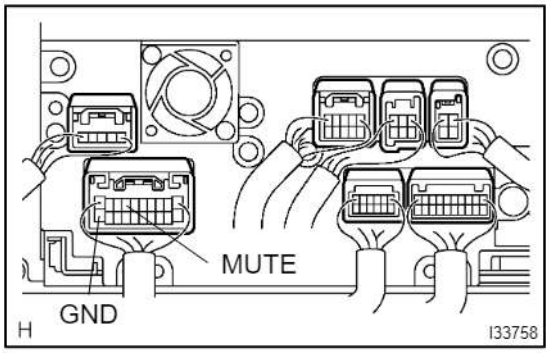
1	CHECK SETTING(THE VOLUME OF THE NAVIGATION VOICE SOUND)

(a) Check the settings
(1) Set the volume MAX at the voice sound settings on the menu.
STANDARD: "This system will guide you in this volume"is produced.

NG → **Go to step 6**

OK

2	INSPECT RADIO RECEIVER ASSY(MUTE, GND)



(a) Remove the radio receiver assy with connectors with still connected.
(b) Using an oscilloscope, check signal waveform between terminals MUTE and GND of radio receiver assy.

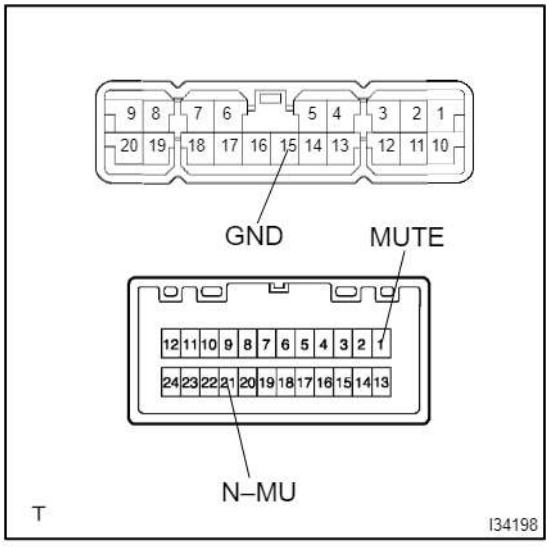
Standard:

Terminal	Condition	Specified condition
MUTE ⇔ GND	While voice sound is being produced	3.5V or more

NG → **CHECK AND REPLACE RADIO RECEIVER ASSY**

OK

3	INSPECT STEREO COMPONENT AMPLIFIER ASSY(MUTE, N–MU, GND)



(a) Remove the stereo component amplifier assy with connectors with still connected.
(b) Using an oscilloscope, check signal waveform between terminals MUTE (N–MU) and GND of stereo component amplifier assy.

Standard:

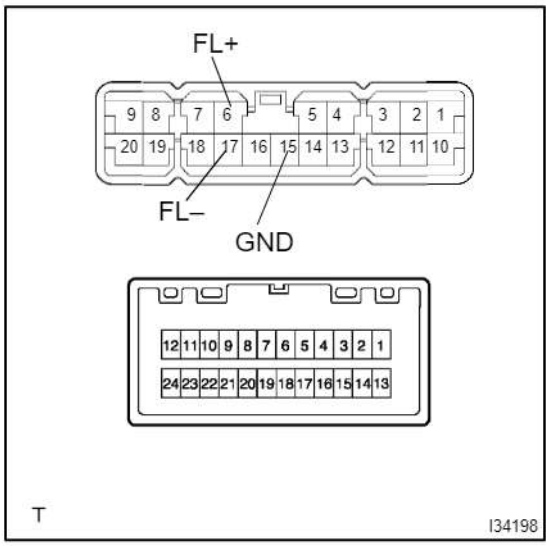
Terminal	Condition	Specified condition
MUTE (N–MU) ⇔ GND	While voice sound is being produced	A waveform synchronized with sound is output

NG → **CHECK AND REPLACE STEREO COMPONENT AMPLIFIER ASSY**

OK

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4 INSPECT STEREO COMPONENT AMPLIFIER ASSY(OUTPUT SIGNAL)



(a) Remove the radio receiver assy with connectors with still connected.

(b) Using an oscilloscope, check signal waveform between terminals FL+, FL– and GND of radio receiver assy.

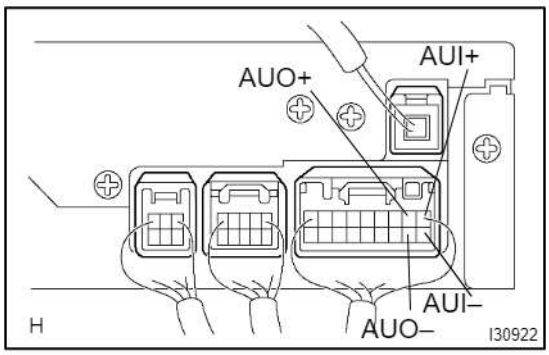
Standard:

Terminal	Condition	Specified condition
FL+ ⇔ GND	While voice sound is being produced	A waveform synchronized with sound is output
FL– ⇔ GND	While voice sound is being produced	A waveform synchronized with sound is output

NG → CHECK AND REPLACE STEREO COMPONENT AMPLIFIER ASSY

OK

5 INSPECT NAVIGATION ECU(INPUT SIGNAL)



(a) Check continuity.

(1) Check that the continuity exists between each terminals, as shown in the chart.

Standard:

Terminal	Condition	Specified condition
AUI+ ⇔ AUO+	Constant	Continuity
AUI– ⇔ AUO–	Constant	Continuity

NG → CHECK AND REPLACE NAVIGATION ECU

OK

REPAIR OR REPLACE HARNESS OR CONNECTOR

6 INSPECT FRONT NO.1 SPEAKER ASSY

(a) Check continuity.

(1) Check that the continuity exists between terminals of front No.1 speaker.

Standard: 2–8Ω

NG → REPLACE FRONT NO.1 SPEAKER ASSY

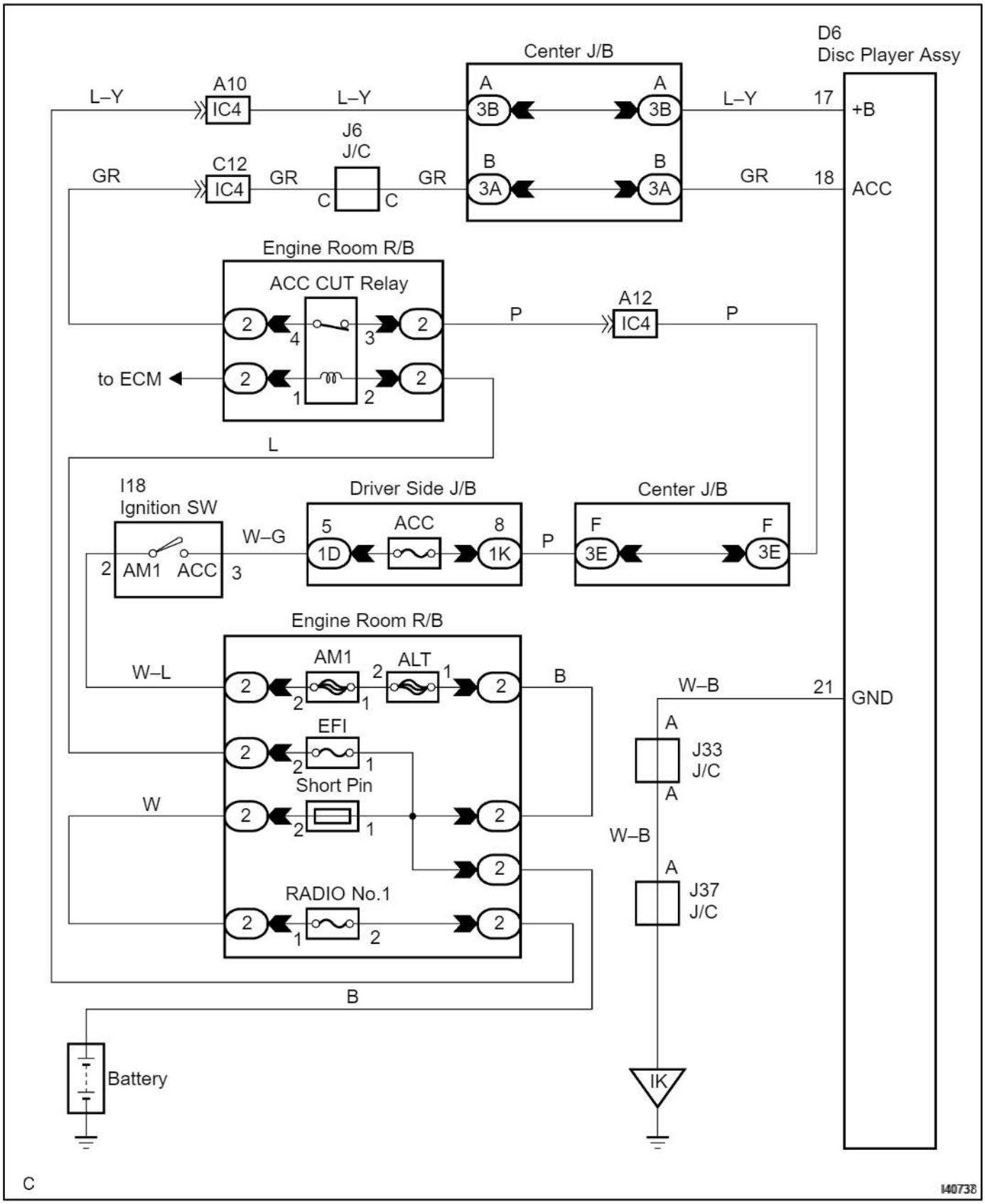
OK

REPAIR OR REPLACE HARNESS OR CONNECTOR

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MAP DVD CANNOT BE EJECTED OR PLAYED

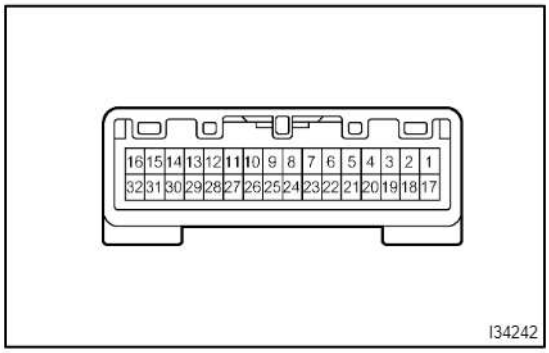
WIRING DIAGRAM



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INSPECTION PROCEDURE

1	INSPECT DISC PLAYER ASSY



(a) Remove the Disc player assy with connectors with still connected.

(b) Check voltage.

(1) Measure voltage between terminals +B, ACC and GND of radio receiver assy at each conditions, as shown in the chart.

Standard:

Terminal	Condition	Voltage (v)
+B ⇔ GND	Constant	10 – 14 V
ACC ⇔ GND	Turn ignition switch ACC	10 – 14 V

(c) Check continuity.

(1) Check that the continuity exists between terminal GND of Disc player assy and body ground.

Standard: Continuity exists.

OK ⇒ **REPLACE DISC PLAYER ASSY**

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

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MAP SCREEN DISPLAYED DOES NOT APPEAR (DISC CAUTION SCREEN DOES NOT CHANGE)

INSPECTION PROCEDURE

1	TAKE APPROPRIATE MESURES ACCORDING TO CAUTION SCREEN

(a) Take appropriate measures according to caution screen.

CAUTION SCREEN

CAUTION MESSAGE	CAUSE	CORRECTIVE ACTION
The DVD cover is open. Close it and perform operation again.	The cover of the map disc slot is open.	Close the cover.
No DVD. Please insert map DVD.	No map disc is inserted.	Insert a proper map disc.
unable to read DVD correctly. Check if the DVD is damaged or dirty.	Cannot read correctly due to flaw or dirt.	Insert a correct map disc.
Unable to read data. Check if map DVD is correct.	Something other than map disc i s inserted.	Insert a correct map disc.
Unable read data. Temperature is too high	Pick–up part of the player is heated to a high temperature.	Stop the vehicle at a shaded cool place and turn the ignition switch OFF. When confirming that the temperature of the navigation ECU has been lowered, turn the ignition switch ON.
Unable to read data. Consult your dealer.	Player cannot read map disc temporarily.	Turn the IG switch from OFF to ON. (*1)

*1: If the same ”CAUTION MESSAGE” is displayed again even after turning the ignition switch to ON, replace the navigation ECU.

STANDARD: Correctly functions.

OK → **NORMAL**

NG

2	REPLACE DISC PLAYER DISC

NG

CHECK AND REPLACE NAVIGATION ECU

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MAP IS DISPLAYED IN WHITE OR BLUE SCREEN (SWITCHED AND VEHICLE POSITION MARK ARE DISPLAYED)

INSPECTION PROCEDURE

1	CHECK SETTING

(a) Check the settings
(1) Check that the map display is normal when set up the scale of the map widest area.
STANDARD: Map display is normal

OK > NORMAL

NG

2	CHECK AND OPERATE AGAIN

(a) Clean the map disc
(1) After wiping the map disc in the circumference direction with a soft cloth, insert it again.

OK > NORMAL

NG

3	REPLACE DISC PLAYER DISC

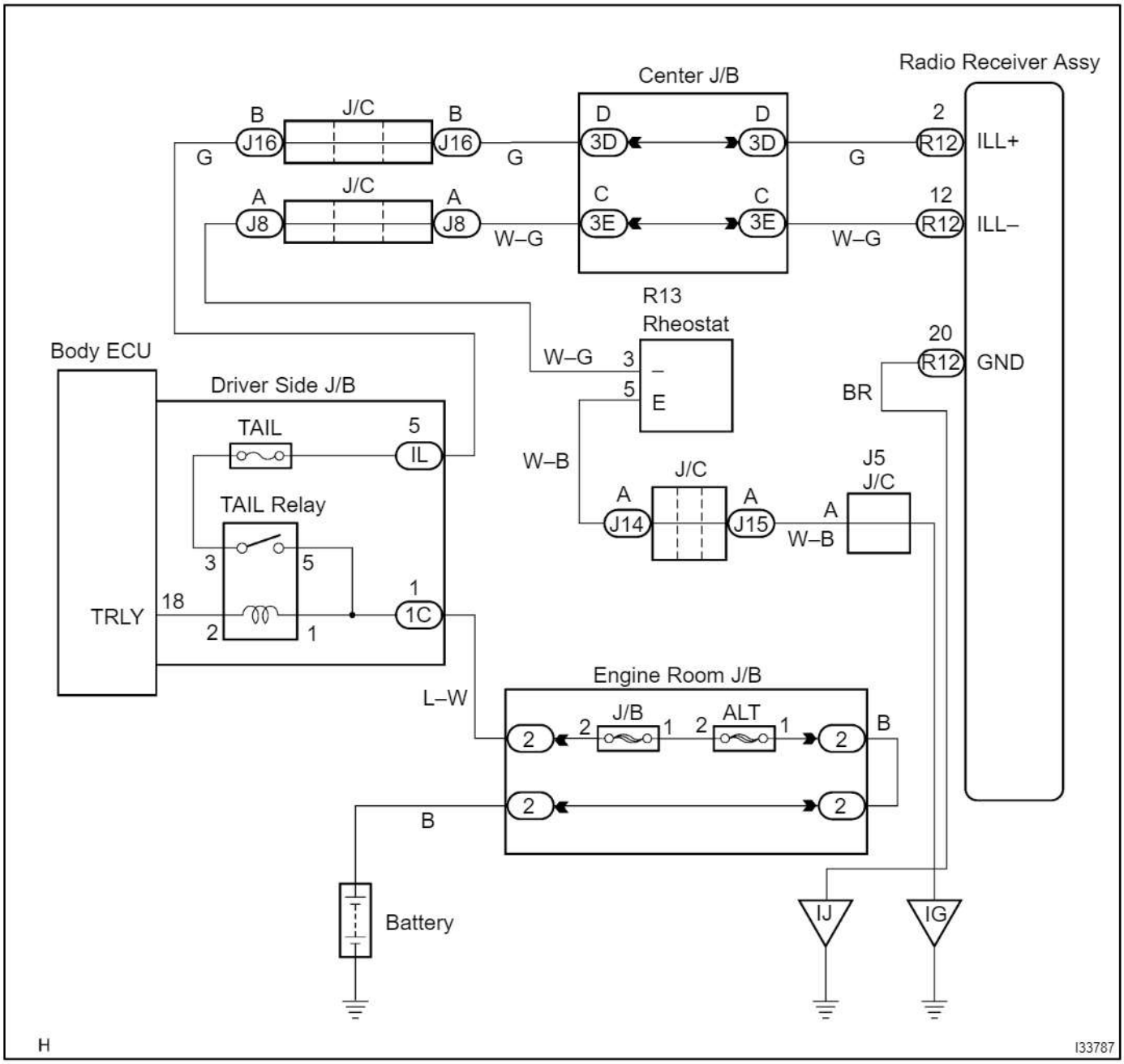
NG

CHECK AND REPLACE NAVIGATION ECU

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SCREEN CANNOT BE DIMMED WHEN LIGHT CONTROL SWITCH IS TURNED TO "TAIL" POSITION

WIRING DIAGRAM



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INSPECTION PROCEDURE

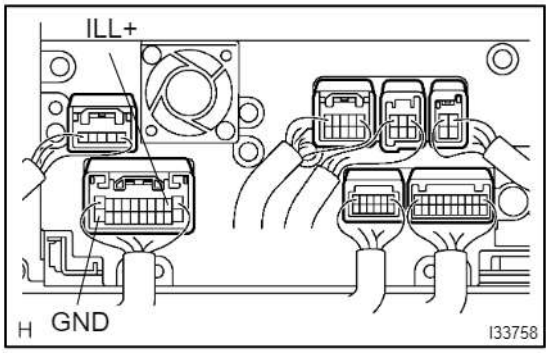
1	DISPLAY CHECK MODE

(a) Perform display check.
(1) Set up diagnosis system and read result of display vehicle check mode.
STANDARD: Input signal is normal (TAIL)

OK → **Go to step 5**

NG

2	INSPECT RADIO RECEIVER ASSY(ILL+, GND)



(a) Check voltage.
(1) Measure voltage between terminals ILL+ and GND of radio receiver assy at each conditions, as shown in the chart.

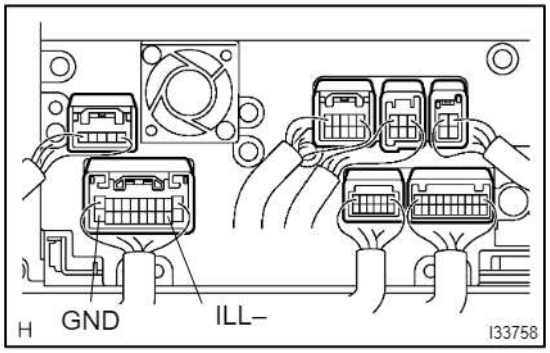
Standard:

Headlight dimmer switch position	condition
OFF	0V
TAIL or HEAD	10 – 14V

OK → **CHECK AND REPLACE RADIO RECEIVER ASSY**

NG

3	INSPECT RADIO RECEIVER ASSY(ILL–, GND)



(a) Check continuity.
(1) Check that the continuity exists between terminals ILL– and GND of radio receiver assy and body ground.

Standard:Continuity exists.

OK → **CHECK AND REPLACE RADIO RECEIVER ASSY**

NG

4	INSPECT LIGHT CONTROL RHEOSTAT(See Page71–7)

OK → **CHECK AND REPLACE RADIO RECEIVER ASSY**

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

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5	INSPECT DISPLAY

(a) Check the screen display.
(1) Check that the screen dimmed by turning the headlight dimmer switch to ON.
STANDARD: The screen dimming function is normal

NG → **CHECK AND REPLACE RADIO RECEIVER ASSY**

OK

6	CHECK SETTING

(a) Check the settings.
(1) Turn the ignition switch ON.
(2) Turn the power switch of the radio receiver assy ON to display the map.
(3) Operate the radio receiver assy, and check that "The color of night screen is standard" is set at the navigation condition setting.
STANDARD: The setting is normal

NG → **THE SETTING IS ABNORMAL**

OK

CHECK AND REPLACE NAVIGATION ECU

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TOUCH SWITCH DOES NOT FUNCTION (NAVIGATION SCREEN ONLY)

INSPECTION PROCEDURE

1	DISPLAY CHECK MODE(TOUCH SWITCH CHECK)

(a) Perform display touch switch check of display check mode.
(1) Start up the diagnosis system and perform display touch switch check of display check mode.
STANDARD: Touch switch is normal

NG → CHECK AND REPLACE RADIO RECEIVER ASSY

OK

2	CHECK SWITCH(BEEP SOUND)

(a) Check the switch(Beep sound).
(1) Press each touch switch on the navigation screen to check that the beep sounds are produced.
STANDARD: Beep sound is normal

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

CHECK AND REPLACE NAVIGATION ECU

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VEHICLE POSITION IS DEVIATED FROM CORRECT POINT BADLY

INSPECTION PROCEDURE

1	CHECK DISPLAY(GPS MARK DISPLAY)

(a) Preparation for the pre–check.
  (1) Move the vehicle in the place with a fine view to GPS mark is displayed.
(b) Check the screen display.
  (1) Turn the ignition switch ON.
  (2) Turn the power switch of the radio receiver assy ON to display the map.
  STANDARD: ”GPS” mark is appeared

NG → **GO TO TROBLESHOOT FOR ”GPS MARK DOES NOT APPEAR”**

OK

2	CHECK WHEN THIS HAPPENS

(a) Check the abnormal condition.
  (1) Check the point in which the trouble occurs.

STANDARD:

A	The trouble occur in the not specific area
B	The trouble occur in the specific area

HINT:
At the place difficult specify the vehicle position (a by–pass road, a high–level road, a loop road, or several–storied car park, etc.), the vehicle position may be of the point due to the wrong matching.

B → **NORMAL(RECHECK THE OPERATION)**

A

3	CHECK DISPLAY(AUTOMATIC CALIBRATION)

(a) Check the screen display.
  (1) Check the color of ”Automatic calibration” switch at the distance correction screen.
  STANDARD: Green (”Automatic calibration” switch)

OK → **NORMAL(RECHECK THE OPERATION), OBSERVE UNTIL THE AUTOMATIC CALIBRATION FINISHES(RUNS AT MORE THAN 10KM/H)**

NG

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4	NAVIGATION CHECK MODE(VEHICLE SENSORS)

(a) Perform vehicle signal check of navigation check mode.
(1) Start up the diagnosis system and read result of SPD signal in vehicle sensors mode.
STANDARD: Input signal is normal (SPD)

NG → **Go to step 6**

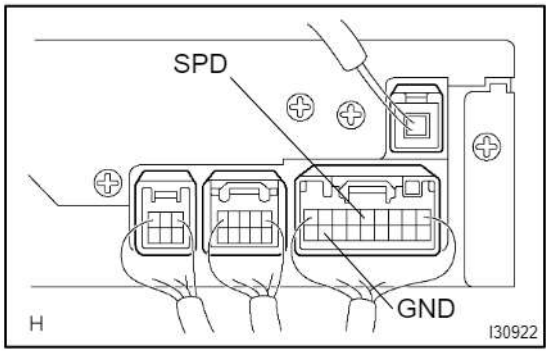
OK

5	CHECK AND OPERATE AGAIN

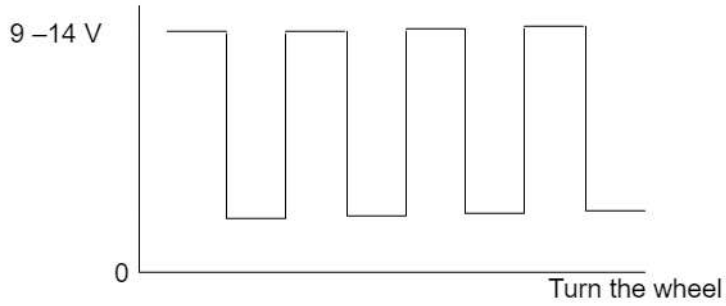
NG

CHECK AND REPLACE NAVIGATION ECU

6	INSPECT NAVIGATION ECU(SPD, GND)



(a) Remove the navigation ECU with connectors still connected.
(b) Check voltage.
(1) Shift the shift lever to neutral.
(2) Jack up one of the front wheel.
(3) Turn ignition switch ON.
(4) Measure voltage between terminals SPD and GND of navigation ECU when the front wheel are turned slowly.
Voltage is generated intermittently.



OK → **CHECK AND REPLACE NAVIGATION ECU**

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

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GPS MARK DOES NOT APPEAR

INSPECTION PROCEDURE

1	CHECK MARK DISPLAY

(a) Check that the malfunction disappear when move the vehicle in the place with a fine view.
Standard: GPS mark is displayed.

HINT:
At the place surrounded by the architecture, vehicle cannot receive the GPS radio wave.

OK → NORMAL

NG

2	CHECK OPTIONAL COMPONENT

(a) Check optional component.
(1) Check that there is the optional component on the vehicle.
Standard: There is not optional component on the vehicle.
(2) Check that there is anything such as film stuck to the window or any metal object on the instrument panel.
Standard: There is not anything such as film stuck to the window or any metal object on the instrument panel.

NG → EFFECT FROM OPTIONAL COMPONENT

OK

3	CHECK NAVIGATION ANTENNA ASSY

NG → REPLACE NAVIGATION ANTENNA ASSY

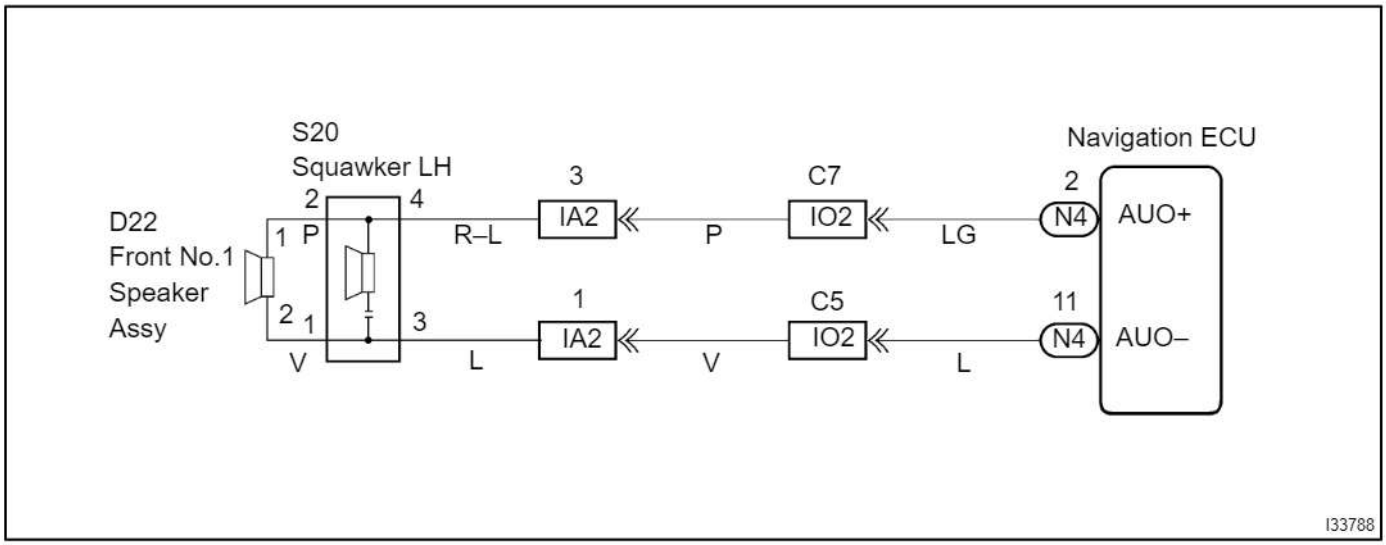
OK

CHECK AND REPLACE NAVIGATION ECU

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NO VOICE NAVIGATION

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK SETTING(THE VOLUME OF THE NAVIGATION SOUND)

(a) Check the settings
(1) Set the volume MAX at the voice sound settings on the menu.
STANDARD: Vocalize "This system will guide you in the volume"

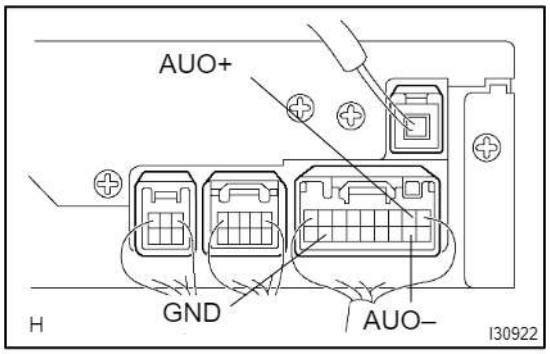
HINT:
- In the following cases, no voice sound guidance is made even if the system is normal.
- When the destination is not set.
- When not running on the rout (the remaining distance at the left bottom on the present point is not displayed)
- When "other modes guidance" is not set (voise sound guidance is made only on the map screen)

OK → **NORMAL(RECHECK THE OPERATION)**

NG

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2	INSPECT NAVIGATION ECU(AUO+/–, GND)



(a) Check signal waveform.
(1) Using an oscilloscope, check signal waveform between terminals AUO+, AUO– and GND of navigation ECU.

Standard:

Terminal	Condition	Specified condition
AUO+ ⇔ GND	While voice sound is being produced	A waveform synchronized with sound is output
AUO– ⇔ GND	While voice sound is being produced	A waveform synchronized with sound is output

NG → **CHECK AND REPLACE NAVIGATION ECU**

OK

REPAIR OR REPLACE HARNESS OR CONNECTOR

3	INSPECT FRONT NO.1 SPEAKER ASSY

(a) Check continuity.
(1) Check that the continuity exists between terminals of front No.1 speaker.
Standard: 2 – 8Ω

NG → **REPLACE FRONT NO.1 SPEAKER ASSY**

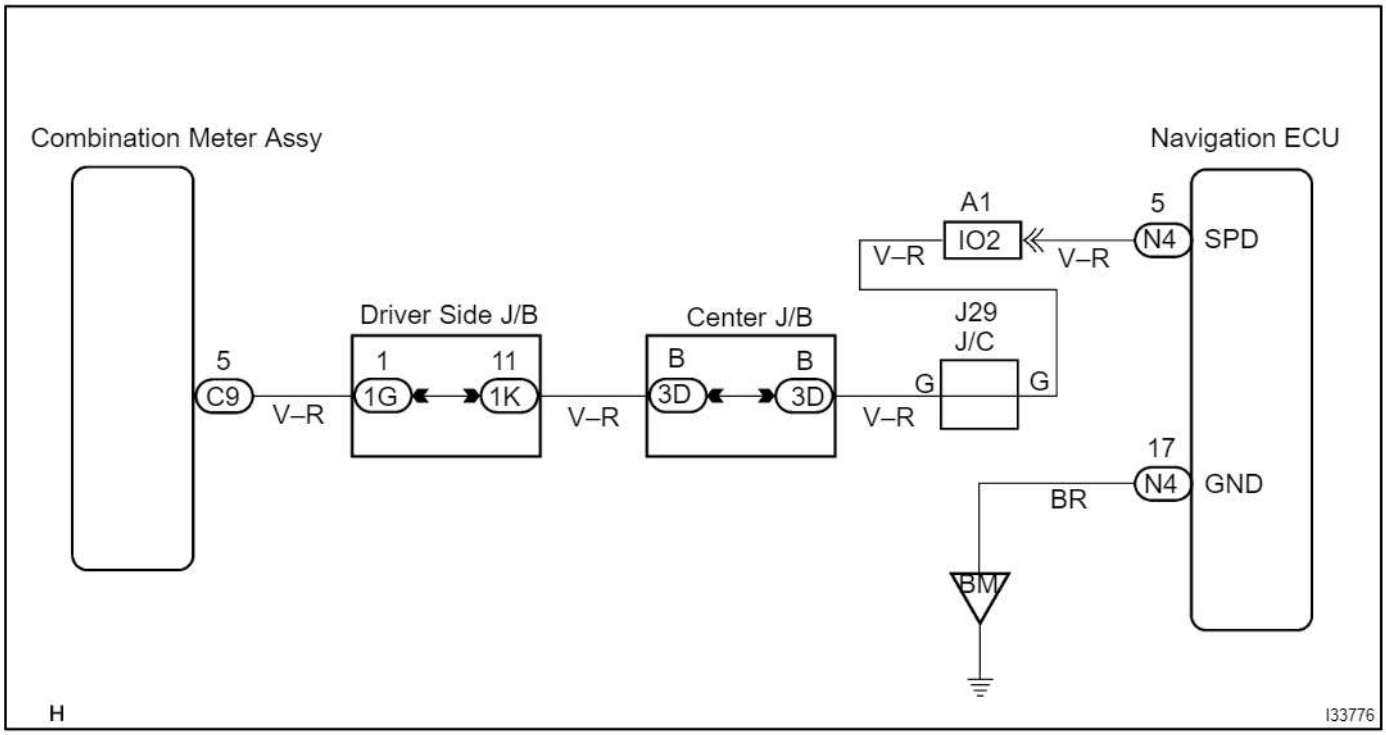
OK

REPAIR OR REPLACE HARNESS OR CONNECTOR

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VEHICLE POSITION MARK ROTATES WITHOUT CONTROL (MAP ROTATES WITHOUT CONTROL)

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK AND OPERATE AGAIN

(a) Turn the ignition switch from OFF to ON, the check that the malfunction disappear.
STANDARD: Malfunction disappear

HINT:
Even if the works correctly, the following conditions may be seen, vehicle position mark turns, or the map turns unwillingly. (It is because by turning the IG switch to ACC or ON during turning, navigation system stores based on the angular speed). In that case, turn the IG switch from OFF to ACC or ON to return the correct function.

OK → **NORMAL(RECHECK THE OPERATION)**

NG

2	NAVIGATION CHECK MODE(VEHICLE SENSORS)

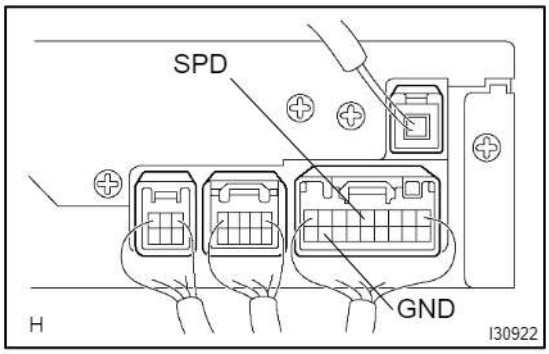
(a) Perform vehicle signal check of navigation check mode.
(1) Start up the diagnosis system and read of "SPD" signal in vehicle sensors mode.
STANDARD: Input signal is normal

OK → **CHECK AND REPLACE NAVIGATION ECU**

NG

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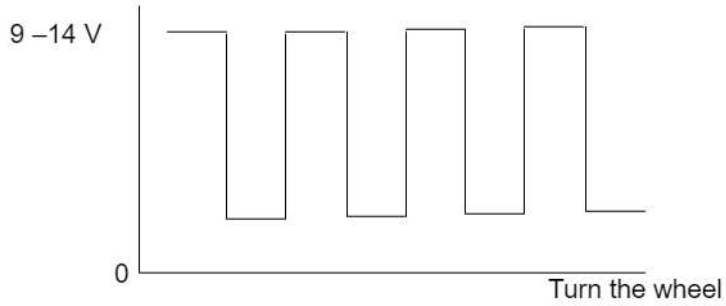
3	INSPECT NAVIGATION ECU(SPD, GND)



(a) Remove the navigation ECU with connectors still connected.

(b) Check voltage.
  (1) Shift the shift lever to neutral.
  (2) Jack up one of the front wheel.
  (3) Turn ignition switch ON.
  (4) Measure voltage between terminals SPD and GND of navigation ECU when the front wheel are turned slowly.

Voltage is generated intermittently.



OK → **CHECK AND REPLACE NAVIGATION ECU**

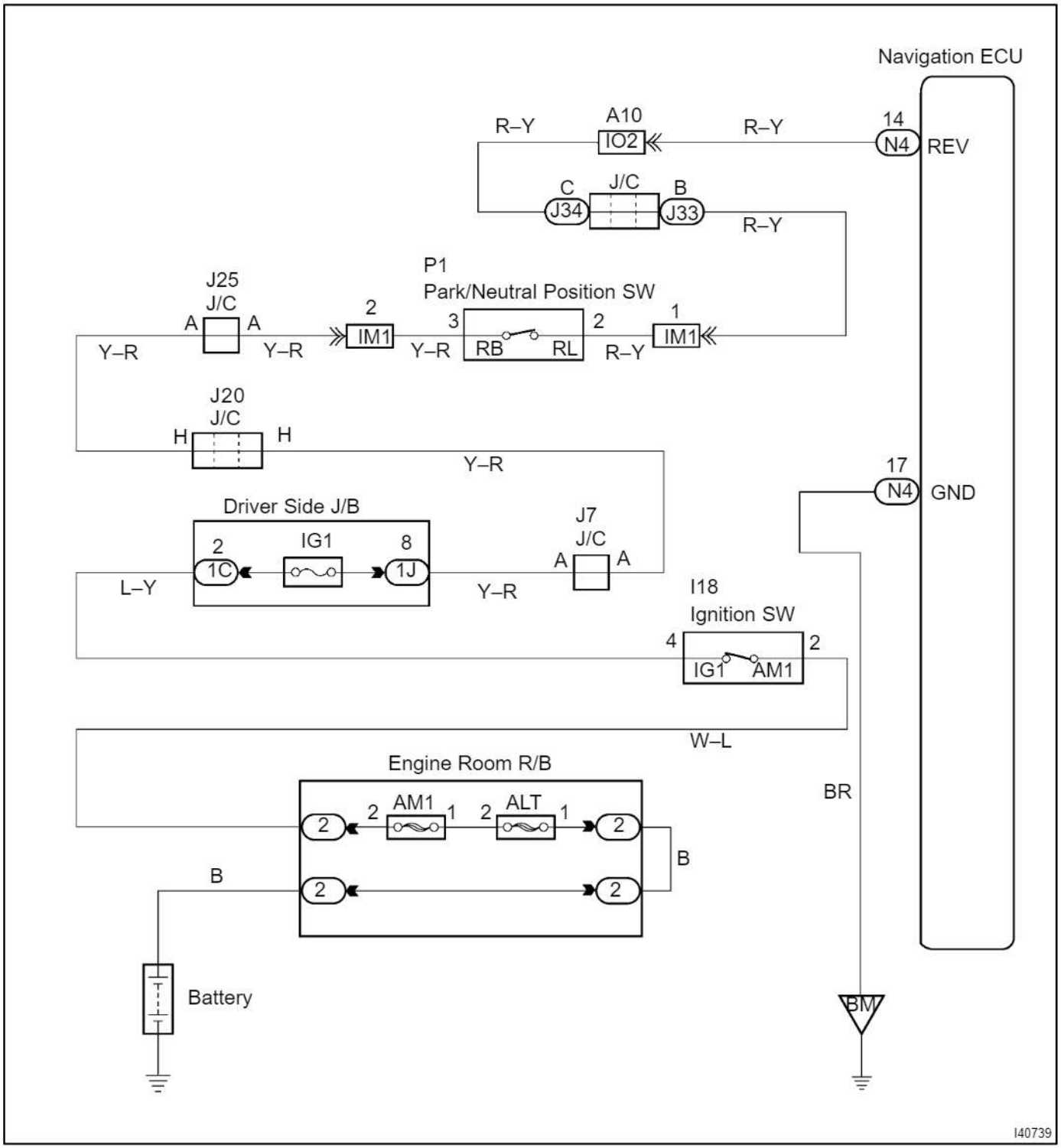
NG

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DRIVING DIRECTIONS OPPOSITE TO MOVING DIRECTION OF VEHICLE POSITION MARK

WIRING DIAGRAM



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INSPECTION PROCEDURE

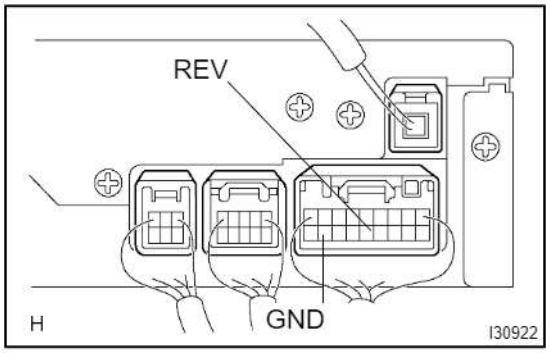
1	NAVIGATION CHECK MODE(VEHICLE SENSORS)

(a) Perform vehicle signal check of navigation check mode
(1) Start up the diagnosis system and read result of REV signal in vehicle sensors mode.
STANDARD: Input signal is normal (REV)

OK → CHECK AND REPLACE NAVIGATION ECU

NG

2	INSPECT NAVIGATION ECU(REV, GND)



(a) Remove the navigation ECU with connectors still connected.
(b) Check voltage.
(1) Measure voltage between terminal REV and GND of navigation ECU.

Voltage:

Terminal	Condition	Voltage (V)
REV ⇔ GND	Turn ignition switch ON and put gear shift in R range	10 – 14 V

OK → CHECK AND REPLACE NAVIGATION ECU

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

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CD CANNOT BE INSERTED/IS EJECTED RIGHT AFTER INSERTION/CANNOT BE PLAYED

INSPECTION PROCEDURE

1	CHECK IF A PROPER CD IS INSERTED

(a) Check that a proper CD is inserted.
(1) Make sure that the CD is normal audio CD, and that there is no deformation, flaw, stain, burr and other defects on the CD.
Standard: Normal audio CD.

Reference:
- □ Translucent or different–shaped CD cannot be played.
- □ CD–ROM for personal computers (with music recorded in) and recorded CD –R, CD–R/W may not be played.
- □ Playing an 8–cm CD does not require an adapter.

NG → CD FAULTY

OK

2	CHECK THAT A PROPER CD IS INSERTED

(a) Check that a proper CD is inserted.
(1) Check whether or not the CD is inserted upside down.
Standard: Not upside down.

NG → SET DISC CORRECTLY

OK

3	REPLACE CD WITH ANOTHER AND RECHECK

(a) Replace the CD with another and recheck.
(1) Replace the faulty CD with the normal one to see if the same trouble occurs again.
Standard: malfunction disappear.

OK → CD FAULTY

NG

4	CHECK IF RADIO AUTO–SEARCH FUNCTIONS PROPERLY

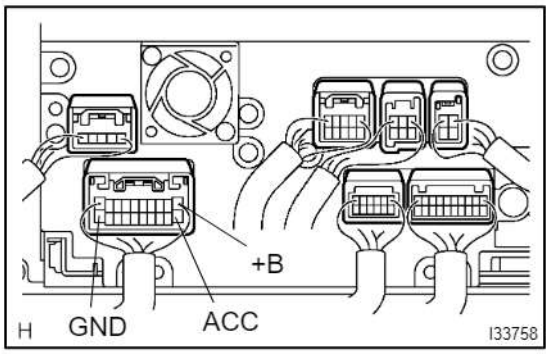
(a) Check if the radio auto–search function properly.
(1) Perform the auto–research of the radio and check that the operation is normal.
Standard: malfunction disappear.

OK → REPLACE RADIO RECEIVER ASSY

NG

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5	INSPECT RADIO RECEIVER ASSY(+B, ACC, GND)



(a) Remove the radio receiver assy with connectors with still connected.

(b) Check voltage.

(1) Measure voltage between terminals +B, ACC and GND of radio receiver assy at each conditions, as shown in the chart.

Standard:

Terminal	Condition	Voltage (v)
+B ⇔ GND	Constant	10 – 14 V
ACC ⇔ GND	Turn ignition switch ACC	10 – 14 V

(c) Check continuity.

(1) Check that the continuity exists between terminal GND of radio receiver assy and body ground.

Standard: Continuity exists.

OK ⇒ **REPLACE RADIO RECEIVER ASSY**

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

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CD CANNOT BE EJECTED

INSPECTION PROCEDURE

1	CHECK IF RADIO AUTO–SEARCH FUNCTIONS PROPERLY

(a) Check if the radio auto–search function properly.
(1) Perform the auto–research of the radio and check that the operation is normal.
Standard: malfunction disappear.

NG → **Go to step 5**

OK

2	PRESS ”EJECT” AND CHECK OPERATION

(a) Press ”EJECT” and check the operation.
(1) Press the CD EJECT switch of the radio receiver assembly for 2 sec. or more to see if the CD is ejected.
Standard: CD is ejected

HINT:
- □ If the CD is not ejected, send the vehicle for repair.
- □ Do not try top draw it out by force.

NG → **CHECK AND REPLACE RADIO RECEIVER ASSY**

OK

3	CHECK IF A PROPER CD IS INSERTED

(a) Check that a proper CD is inserted.
(1) Make sure that the CD is a normal music CD, and that there is no deformation, flaw, stain, burr and other defects on the CD.
Standard: Normal music CD.

HINT:
- □ Translucent or different–shaped CD cannot be played.
- □ CD–ROM for personal computers (with music recorded in) and recorded CD–R, CD–R/W may not be played.
- □ Playing an 8–cm CD does not require an adapter.

NG → **CD FAULTY**

OK

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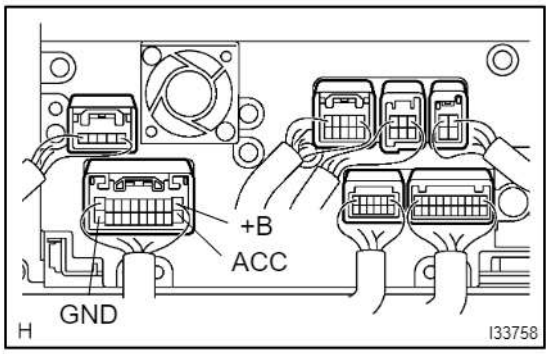
4	REPLACE CD WITH ANOTHER AND RECHECK

(a) Replace the CD with another and recheck.
(1) Replace the faulty CD with normal one to see if the same trouble occurs again.
Standard: The operation returns to be normal.

OK	CD FAULTY

NG

5	INSPECT RADIO RECEIVER ASSY(+B, ACC, GND)



(a) Remove the radio receiver assy with connectors with still connected.
(b) Check voltage.
(1) Measure voltage between terminals +B, ACC and GND of radio receiver assy at each conditions, as shown in the chart.

Standard:

Terminal	Condition	Voltage (v)
+B ⇔ GND	Constant	10 – 14 V
ACC ⇔ GND	Turn ignition switch ACC	10 – 14 V

(c) Check continuity.
(1) Check that the continuity exists between terminal GND of radio receiver assy and body ground.
Standard: Continuity exists.

OK	CHECK AND REPLACE RADIO RECEIVER ASSY

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

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CD SOUND SKIPS

INSPECTION PROCEDURE

1	REPLACE CD WITH ANOTHER AND RECHECK

(a) Replace the CD with normal one and check it the same trouble occurs again.
(1) Check the installation condition of the radio receiver assembly.
Standard: The operation returns to be normal.

OK	CD FAULTY

NG

2	CHECK WHEN THIS HAPPENS

(a) Check when this happens.
(1) Check that in what condition (place) sound skips.
Cause: Driving on the bumpy road.

OK	Go to step 4

NG

3	COMPARE IT WITH ANOTHER CAR OF SAME MODEL

(a) Compare it with another vehicle of the same model.
(1) Compare with the vehicle of the same type which does not have a trouble to see if there is any difference in the condition of trouble occurrence.
Standard: No difference found.

OK	SETTING

NG

4	CHECK OF RADIO RECEIVER ASSEMBLY INSTALLATION

(a) Check of the radio receiver assembly installation.
(1) Check the installation condition of the radio receiver assembly.
Standard: Installed properly.

NG	INSTALL THE RADIO RECEIVER ASSEMBLY PROPERLY

OK

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5	DID TEMPERATURE IN CABIN CHANGE RAPIDLY?

(a) Did the temperature in the cabin change rapidly?
(1) Check whether or not rapid temperature change occurred in the cabin.
Cause: Rapid temp. change.

Reference:
Rapid temperature change my cause condensation inside the CD player, which may affect its normal operation.

OK → CONDENSATION DUE TO TEMPERATURE CHANGE (LEAVE IT AS IT IS FOR A WHILE BEFORE USING)

NG

CHECK AND REPLACE RADIO RECEIVER ASSY

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CASSETTE TAPE CANNOT BE INSERTED OR PLAYED

INSPECTION PROCEDURE

1	CHECK FOR ANY FOREIGN OBJECT

(a) Check for any foreign object.
(1) Check that no foreign object or defect is detected in the cassette tape player of radio receiver assembly.
Standard: No foreign object and defect detected.

NG → REMOVE FOREIGN OBJECT

OK

2	CHECK CASSETTE TAPE

(a) Check the cassette tape.
(1) Check that the cassette tape is a normal tape to which music or voice is recorded.
Standard: Proper cassette tape to which music or voice is recorded

NG → CASSETTE TAPE FAULTY

OK

3	REPLACE CASSETTE TAPE WITH ANOTHER AND RECHECK

(a) Replace the cassette tape with another and recheck.
(1) Replace the faulty cassette tape with the normal one to see if the same trouble occurs again.
Standard: The function is recovered to be normal.

OK → CASSETTE TAPE FAULTY

NG

4	CHECK IF RADIO AUTO–SEARCH FUNCTIONS PROPERLY

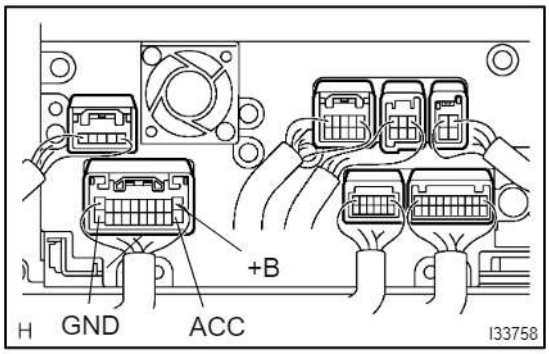
(a) Check if the radio auto–search functions properly.
(1) Perform the auto–search of the radio and check that the operation is normal.
Standard: The operation returns to be normal.

OK → CHECK AND REPLACE RADIO RECEIVER ASSY

NG

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5	INSPECT RADIO RECEIVER ASSY(+B, ACC, GND)



(a) Remove the radio receiver assy with connectors with still connected.

(b) Check voltage.

(1) Measure voltage between terminals +B, ACC and GND of radio receiver assy at each conditions, as shown in the chart.

Standard:

Terminal	Condition	Voltage (v)
+B ⇔ GND	Constant	10 – 14 V
ACC ⇔ GND	Turn ignition switch ACC	10 – 14 V

(c) Check continuity.

(1) Check that the continuity exists between terminal GND of radio receiver assy and body ground.

Standard: Continuity exists.

OK → **CHECK AND REPLACE RADIO RECEIVER ASSY**

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

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CASSETTE TAPE CANNOT BE EJECTED

INSPECTION PROCEDURE

1	CHECK IF RADIO AUTO–SEARCH FUNCTIONS PROPERLY

(a) Check if the radio auto–search function properly.
(1) Perform the auto–research of the radio and check that the operation is normal.
Standard: malfunction disappear.

NG → **Go to step 5**

OK

2	PRESS "EJECT" AND CHECK OPERATION

(a) Press "EJECT" and check the operation.
(1) Press the cassette tape EJECT switch of the radio receiver assembly for 2 sec or more and check that the cassette tape is ejected.
Standard: The cassette tape is ejected.

NG → **CHECK AND REPLACE RADIO RECEIVER ASSY**

OK

3	CHECK CASSETTE TAPE

(a) Check the cassette tape.
(1) Check that the ejected cassette tape does not have the label peeling, cassette body deformation and others.
Standard: No fault on the cassette tape.

NG → **CASSETTE TAPE FAULTY**

OK

4	REPLACE CASSETTE TAPE WITH ANOTHER AND RECHECK

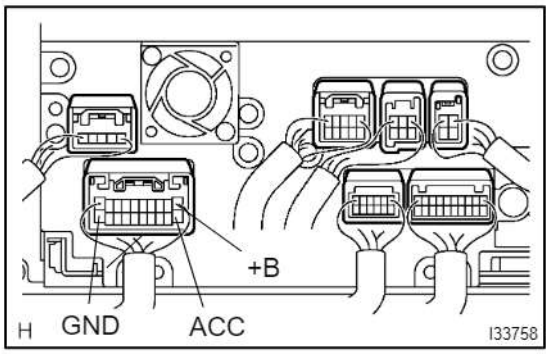
(a) Replace the cassette tape with another and recheck.
(1) Replace the faulty cassette tape with the normal one to see if the same trouble occurs again.
Standard: malfunction disappear.

OK → **CASSETTE TAPE FAULTY**

NG

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5	INSPECT RADIO RECEIVER ASSY(+B, ACC, GND)



(a) Remove the radio receiver assy with connectors with still connected.

(b) Check voltage.

(1) Measure voltage between terminals +B, ACC and GND of radio receiver assy at each conditions, as shown in the chart.

Standard:

Terminal	Condition	Voltage (v)
+B ⇔ GND	Constant	10 – 14 V
ACC ⇔ GND	Turn ignition switch ACC	10 – 14 V

(c) Check continuity.

(1) Check that the continuity exists between terminal GND of radio receiver assy and body ground.

Standard: Continuity exists.

OK → **CHECK AND REPLACE RADIO RECEIVER ASSY**

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

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NOISE OCCURS

INSPECTION PROCEDURE

1 CHECK NOISE–INCLUDED DEVICE

(a) Identify the faulty mode where noise occurs.
(1) Operate the radio receiver assy to find out the noise source.

Standard:

A	B
Noise occurs in the radio mode only.	Noise occurs in any mode.

B → **Go to step 6**

A

2 CHECK WHEN THIS HAPPENS

(a) Check when this happens.
(1) Check that in what condition (place) noise occurs.

Standard:

A	B
Noise occurs at any place.	Noise occurs at a particular place.

B → **WAVE DISTURBANCE**

A

3 CHECK OPTIONAL COMPONENT

(a) Check optical component.

HINT:
As noise prevention is implemented to the degree which is practically allowed, excessively large noise cannot occur in the radio broadcasting.
However, in case that happens, check for grounding of the antenna–installed part, installation of all the proper noise–prevention parts, and proper wiring.

OK → **EFFECT FROM OPTIONAL COMPONENT**

NG

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4	CHECK BY REMOVING ANTENNA PLUG

(a) Check for noise by removing the antenna plug.
(1) With the antenna plug being removed from the radio receiver assy, operate the radio receiver assy again to see if any noise occurs.
Standard: Noise occurs.

OK → CHECK AND REPLACE RADIO RECEIVER ASSY

NG

5	CHECK AMPLIFIER ANTENNA ASSY

(a) Check of the w/holder antenna assy installation.
Standard: Installed properly.

NG → REPLACE AMPLIFIER ANTENNA ASSY

OK

6	CHECK OF SPEAKER INSTALLATION

(a) Check of speaker installation.
(1) Check that the ground part of the antenna is securelyinstalled to the vehicle bode.
Standard: Installed properly.

NG → INSTALL THE SPEAKER PROPERLY

OK

IDENTIFICATION OF NOISE SOURCE

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RADIO BROADCAST CANNOT BE RECEIVED (BAD RECEPTION)

INSPECTION PROCEDURE

1	CHECK IF RADIO AUTO–SEARCH FUNCTIONS PROPERLY

(a) Check if the radio auto–search functions properly.
(1) Perform the auto–search of the radio and check that it functions normally.
Standard: The radio auto–search functions properly.

OK → CHECK AND REPLACE RADIO RECEIVER ASSY

NG

2	CHECK OPTIONAL COMPONENT

(a) Check optional component (Sun shade film, telephone antenna etc.).
(1) Check whether or not any optional component is installed, such as the sunshade film and the telephone antenna, is installed.
Standard: Optional component is installed.

OK → EFFECT FROM OPTIONAL COMPONENT

NG

3	CHECK ANTENNA FOR NOISE PRODUCTION

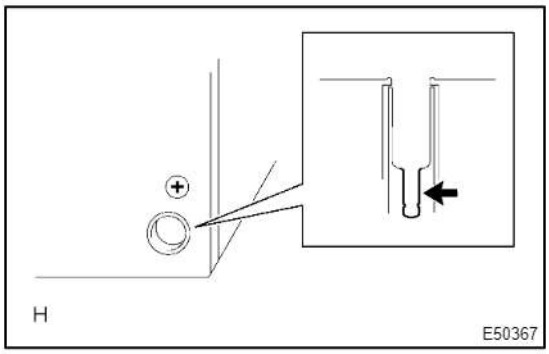
(a) Noise Check with Antenna
(1) With the ignition switch in ACC, turn on the radio and choose the AM mode.
(2) Place a tip of a screwdriver or the antenna of the antenna assembly w/ holder and check that the noise heard from the speaker.
Standard: Noise occurs.

OK → CHECK AND REPLACE RADIO RECEIVER ASSY

NG

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4 INSPECT RADIO RECEIVER ASSY



(a) Preparation for Check
  (1) Remove the antenna plug of the radio receiver assembly.

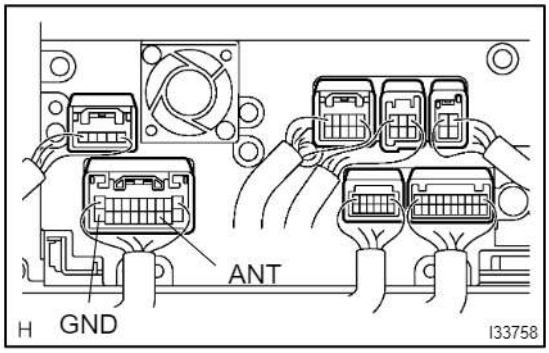
(b) Noise Check
  (1) With the radio receiver assembly connector connected, turn the ignition switch to ACC.
  (2) Turn on the radio and choose the AM mode.
  (3) Place a flat–head screwdriver or a metal such as a thin wire on the antenna jack of the radio receiver assembly and check that the noise heard from the speaker.

Standard: Noise occurs.

NG	CHECK AND REPLACE RADIO RECEIVER ASSY

OK

5 INSPECT RADIO RECEIVER ASSY(ANT, GND)



(a) Remove the radio receiver assy with connectors with still connected.

(b) Check voltage.
  (1) Measure voltage between terminals ANT and GND of radio receiver assy at each conditions, as shown in the chart.

Standard:

Terminal	Condition	Voltage (v)
ANT ⇔ GND	Constant	10 – 14 V

NG	CHECK AND REPLACE RADIO RECEIVER ASSY

OK

REPLACE AMPLIFIER ANTENNA ASSY

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REAR SEAT ENTERTAINMENT SYSTEM DOES NOT RESPOND TO ANY REMOTE CONTROL OPERATIONS

INSPECTION PROCEDURE

1	CLEANING IR RECEIVER SENSOR

(a) Clean up the infrared light emission part.
  (1) Clean up the infrared light emission part of the stereo component control.
  (2) Check if the same abnormality occurs again.
  Standard: Function return to normal condition.

OK	IR RECEIVER DIRTY

NG

2	CHECK BATTERY(REMOTE CONTROLLER ASSY)

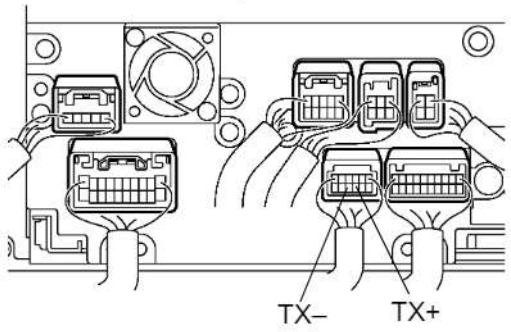
(a) Check the dry cell battery.
  (1) Chech that the dry cell battery is not used up.
  Standard: The dry cell battery is not used up.

NG	BATTERY EMPTY

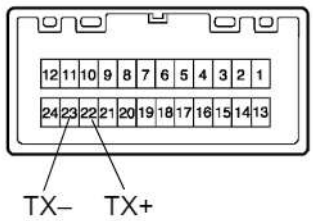
OK

3	INSPECT HARNESS OR CONNECTOR(RADIO RECEIVER ASSY – STEREO COMPONENT CONTROLLER)

Radio Receiver Assy:



Stereo Component Controller Assy:



T

I33789

(a) Check that the continuity between terminals at each condition, as shown in the chart.

Standard:

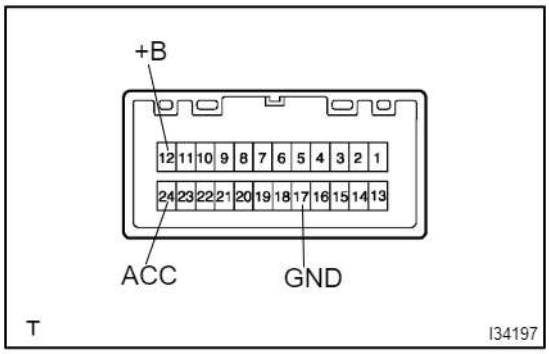
Terminal	Condition	Specified condition
TX+ ⇔ TX+	Constant	Continuity
TX– ⇔ TX–	Constant	Continuity

NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

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4	CHECK STEREO COMPONENT CONTROLLER ASSY(+B, ACC, GND)



(a) Check that the continuity between terminals at each condition, as shown in the chart.

Standard:

Tester connection	Condition	Specified condition
GND ⇔ Body ground	Constant	Continuity

(b) Check that the voltage between terminals at each condition, as shown in the chart.

Standard:

Tester connection	Condition	Specified condition
+B ⇔ GND	Constant	10 – 14 V
ACC ⇔ GND	Ignition switch ACC or ON	10 – 14 V

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

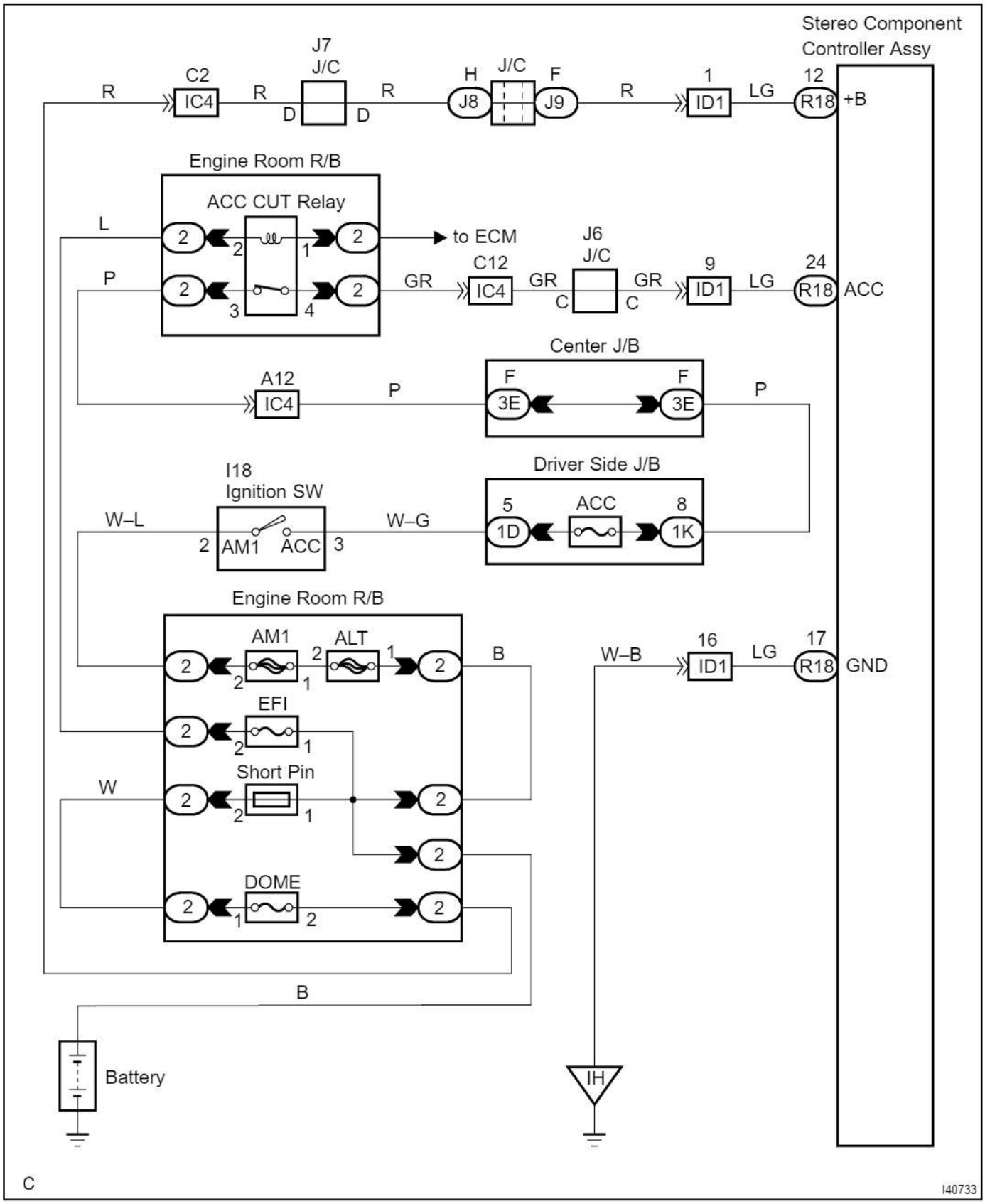
OK

CHECK AND REPLACE STEREO COMPONENT CONTROLLER ASSY

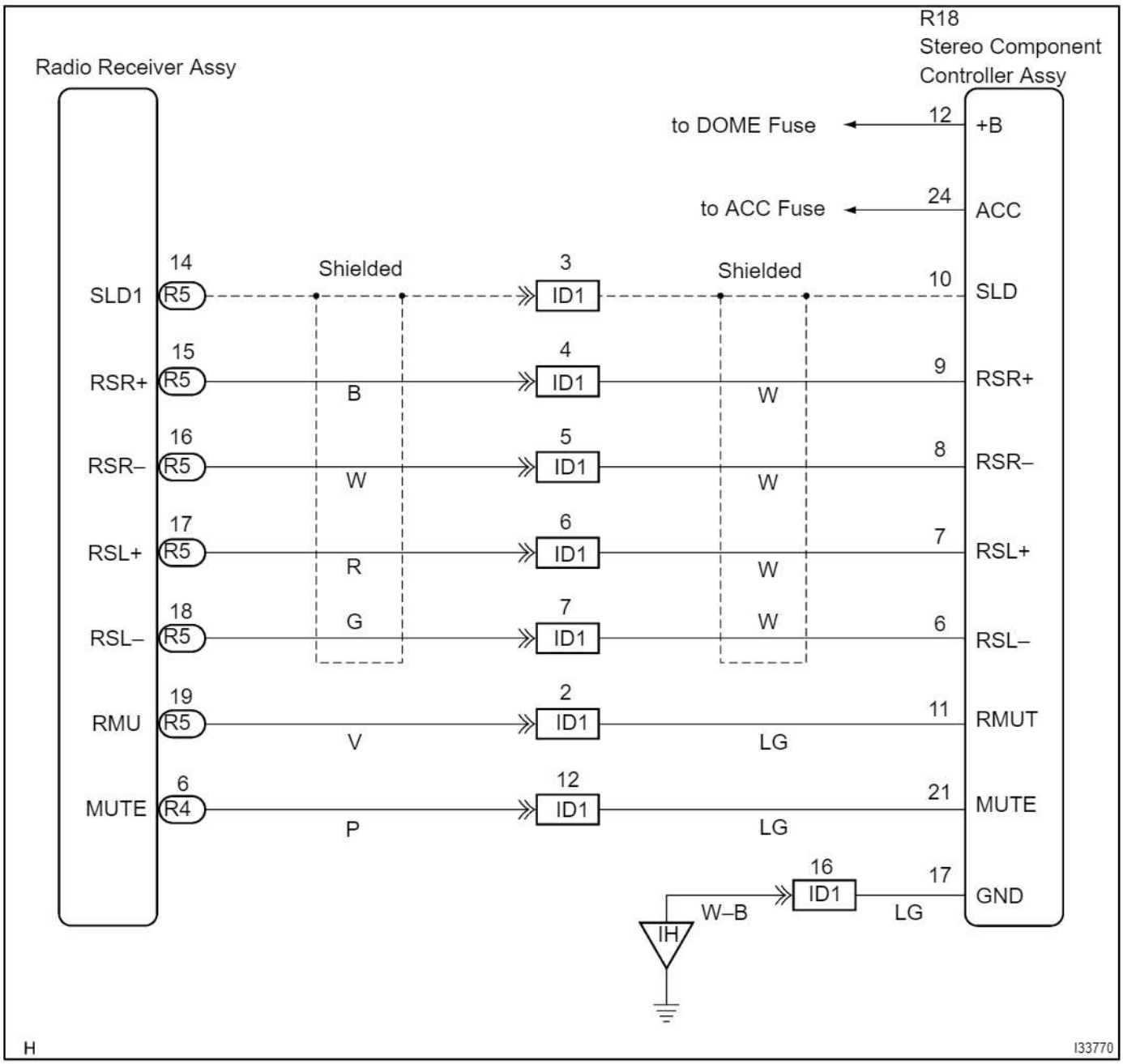
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QUALITY OF SOUND FROM WIRELESS HEADPHONE IS POOR OR NO SOUND CAN BE HEARD

WIRING DIAGRAM



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INSPECTION PROCEDURE

1	CHECK THE MASKING OBJECT

(a) Check the masking object.
(1) Check for the masking object between the wireless headphone and the stereo component control.
Standard: Return to normal control.

HINT:
Since the voice sound of the wireless headphone is converted into the infrared light for the transmission, the voice sound cannot be transmitted if there is a masking object between the emission part and the receiving part.

OK ⇒ **NORMAL**

NG

2	CHECK BATTERY(HEADPHONE STEREO ASSY)

(a) Check the dry cell battery.
(1) Chech that the dry cell battery is not used up.
Standard: The dry cell battery is not used up.

NG ⇒ **BATTERY EMPTY**

OK

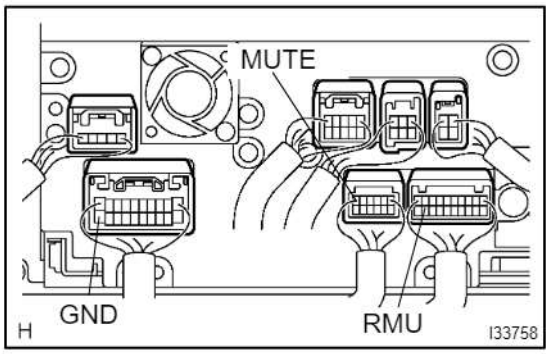
3	CLEANING IR RECEIVER SENSOR

(a) Clean up the infrared light emission part.
(1) Clean up the infrared light emission part of the stereo component control.
(2) Check if the same abnormality occurs again.
Standard: Function return to normal condition.

OK ⇒ **IR LED DIRTY**

NG

4	INSPECT RADIO RECEIVER ASSY(MUTE, RMUT, GND)



(a) Check that the voltage between terminals at each condition, as shown in the chart.

Standard:

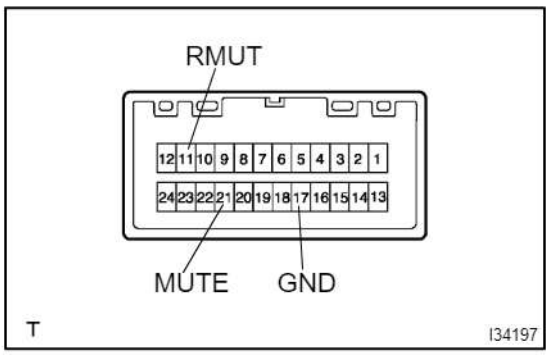
Terminal	Condition	Specified condition
MUTE ⇔ GND	Audio system is sounding	3.5V or more
RMU ⇔ GND	Audio system is sounding	3.5V or more

NG ⇒ **CHECK AND REPLACE RADIO RECEIVER ASSY**

OK

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5 CHECK AND REPLACE STEREO COMPONENT CONTROLLER ASSY(MUTE, RMUT, GND)



(a) Check that the voltage between terminals at each condition, as shown in the chart.

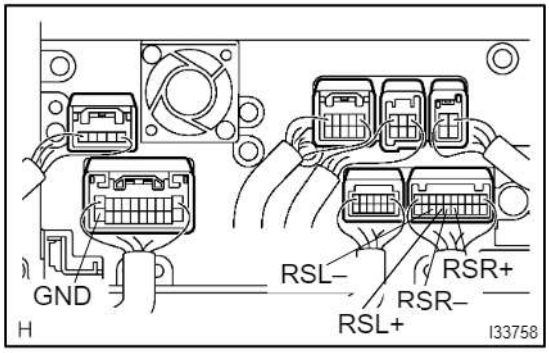
Standard:

Terminal	Condition	Specified condition
MUTE ⇔ GND	Audio system is sounding	3.5V or more
RMU ⇔ GND	Audio system is sounding	3.5V or more

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

6 INSPECT RADIO RECEIVER ASSY(OUTPUT SIGNAL)



(a) Check that the continuity between terminals at each condition, as shown in the chart.

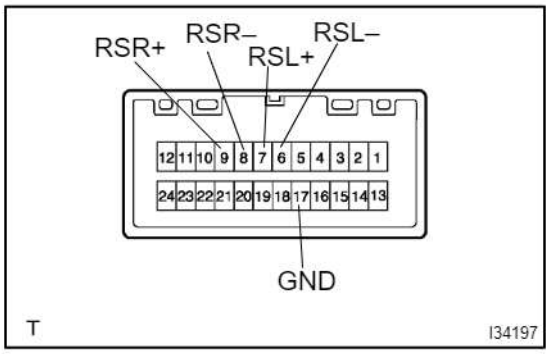
Standard:

Terminal	Condition	Specified condition
RSR+/– ⇔ GND	Audio system is sounding	A waveform synchronized with sounds is output
RSL+/– ⇔ GND	Audio system is sounding	A waveform synchronized with sounds is output

NG → **CHECK AND REPLACE RADIO RECEIVER ASSY**

OK

7 INSPECT STEREO COMPONENT CONTROLLER ASSY(INPUT SIGNAL)



(a) Check that the continuity between terminals at each condition, as shown in the chart.

Standard:

Terminal	Condition	Specified condition
RSR+/– ⇔ GND	Audio system is sounding	A waveform synchronized with sounds is output
RSL+/– ⇔ GND	Audio system is sounding	A waveform synchronized with sounds is output

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE STEREO COMPONENT CONTROLLER ASSY

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BACK MONITOR SYSTEM

059F9-01

HOW TO PROCEED WITH TROUBLESHOOTING

HINT:
Troubleshoot in accordance with the procedure on the following pages.

1	VEHICLE BROUGHT TO WORKSHOP

2	PROBLEM SYMPTOM CONFIRMATION

(a) If the symptom does not occur, proceed to A.
(b) If the symptom occurs, proceed to B.

A	SYMPTOM SIMULATION

B

3	PROBLEM SYMPTOMS TABLE (See page 05–1682)

4	INSPECTION (See page 05–1677)

5	IDENTIFICATION OF PROBLEM

6	REPAIR OR REPLACE

7	CONFIRMATION TEST

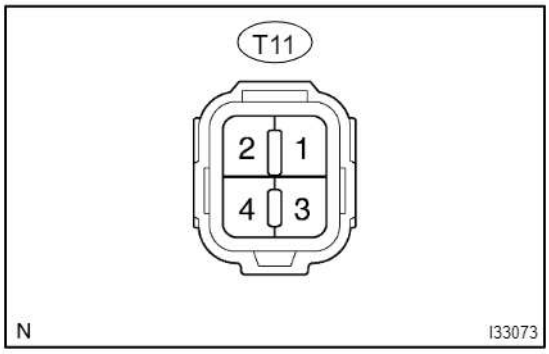
END

Before troubleshooting:
(a) Using the tester, check the battery voltage.
Standard Voltage: 10 – 14 V
(b) Perform a visual check for blown fuses, and poor connections in connectors.

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058FA-01

PRE–CHECK



1. INSPECT TELEVISION CAMERA ASSY:

(a) Standard signal check

(1) Using the tester, measure the voltage and the continuity between terminals.

HINT:

Leave the connector being connected.

(2) Using the oscilloscope, check wave forms between terminals.

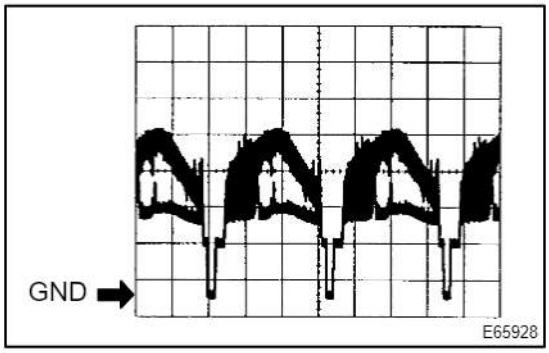
HINT:

- □ Leave the connector being connected.
- □ The waveform shown is merely an example.
  Noise waveform and chattering waveform are omitted.

Standard:

Connector T11

Terminal No.	Terminal symbol	Input/Output	Tester connection (Wiring color)	Item	Condition	specified condition	Problem symptom when open circuit is detected. / Problem symptom when short circuit is detected.
1	CB+	Input	T11–1 – T11–2 (R – Body ground)	Voltage	IG SW ON, Shift lever R range / IG SW ON, Shift lever R range	8 – 9 V	Fuse blow out
2	CGND	Output	T11–2 – Body ground (W – Body ground)	Continuity	Always	Continuity	Back monitor dose not display images
3	CV–	Output	T11–3 – Body ground (BR – Body ground)	Continuity	IG SW ON, Shift lever R range	Continuity	Back monitor dose not display images
4	CV+	Output	T11–4 – T11–3 (B – BR)	Waveform	IG SW ON, Shift lever R range	Approx. 0.65 V (Waveform1)	Back monitor dose not display images



<Reference>

(b) Oscilloscope waveform.

(1) Waveform 1.

Standard:

Item	Content
Terminal	CV+⇔ CV–
Tool setting	0.2 V/DIV, 0.2 ∝s/DIV
Condition	IG SW ON, shift lever R range

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2. INSPECT RADIO RECEIVER ASSY (BACK MONITOR CONTROLLER)

(a) Standard signal check.

(1) Using the tester, measure the voltage and the continuity between terminals.

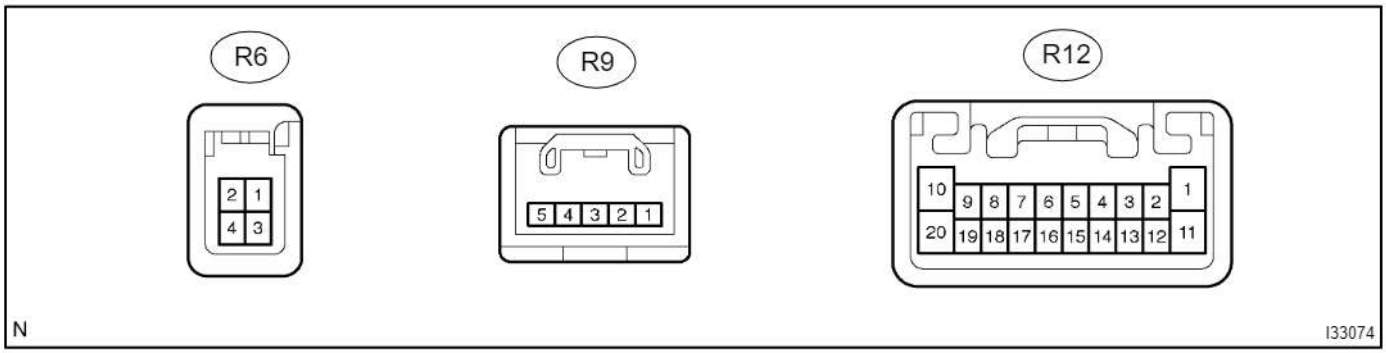
HINT:

Leave the connectors being connected.

(2) Check waveforms between terminals.

HINT:

- □ Leave the connectors being connected.
- □ The waveform shown is merely or example. Noise waveform and chattering waveform are omitted.



Standard:

Connector R12

Terminal No.	Terminal symbol	Input/Output	Tester connection	Item	Condition	specified condition	Problem symptom when open circuit is detected.
							Problem symptom when short circuit is detected.
1	+B	Input	R12–1 – R12–20 (L–Y – BR)	Voltage	Always	10 – 14 V	Radio receiver ASSY does not operate.
							Fuse blow out.
11	ACC	Input	R12–11 – R12–20 (GR – BR)	Voltage	IG SW ACC	10 – 14 V	Radio receiver ASSY does not operate.
							Fuse blow out.
20	GND	Output	R12–20 – Body ground (BR – Body ground)	Continuity	Always	Continuity	Back monitor dose not display images.

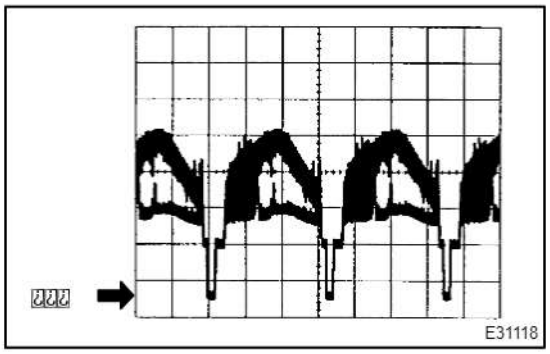
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Connector R9

Terminal No.	Terminal symbol	Input/Output	Tester connection (Wiring color)	Item	Condition	specified condition	Problem symptom when open circuit is detected. / Problem symptom when short circuit is detected.
5	REV	Input	R9–5 – R12–20 (R–Y – BR)	Voltage	Except R range → R range	Less than 1 V → 10 – 14 V	Back monitor does not display images.

Connector R6

Terminal No.	Terminal symbol	Input/Output	Tester connection (Wiring color)	Item	Condition	specified condition	Problem symptom when open circuit is detected. / Problem symptom when short circuit is detected.
1	V+	Input	R6–1 – R6–3 (B – Shielded)	Waveform	IG SW ON, shift lever R range	Approx. 0.65 V (Waveform 1)	Back monitor does not display images.
2	CA+	Input	R6–2 – R6–4 (R – W)	Voltage	IG SW ON, shift lever R range	6 V	Back monitor does not display images. / Fuse blow out.
3	V–	Input	R6–3 – R6–4 (Shielded – W)	Continuity	IG SW ON, shift lever R range	Continuity	Back monitor dose not display images.
4	GND	Input	R6–4 – Body ground (W – Body ground)	Continuity	Always	Continuity	Back monitor dose not display images.



<Reference>

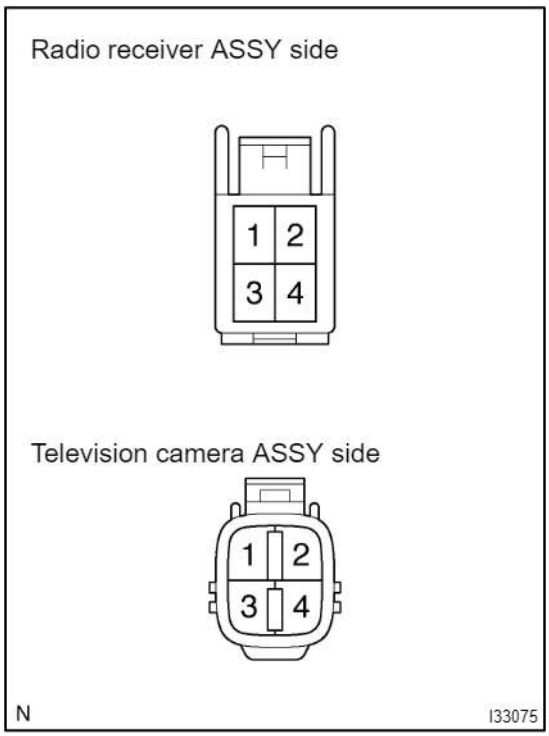
(b) Oscilloscope waveform.

(1) Waveform 1.

Standard:

Item	Content
Terminal	V+ ⇔ V–
Tool setting	0.2 V / DIV, 0.2 ∝S / DIV
Condition	IG SW ON, shift lever R range

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3. INSPECT BACK MONITOR CAMERA WIRE

(a) Continuity check.

(1) Using the tester, measure the continuity between terminals.

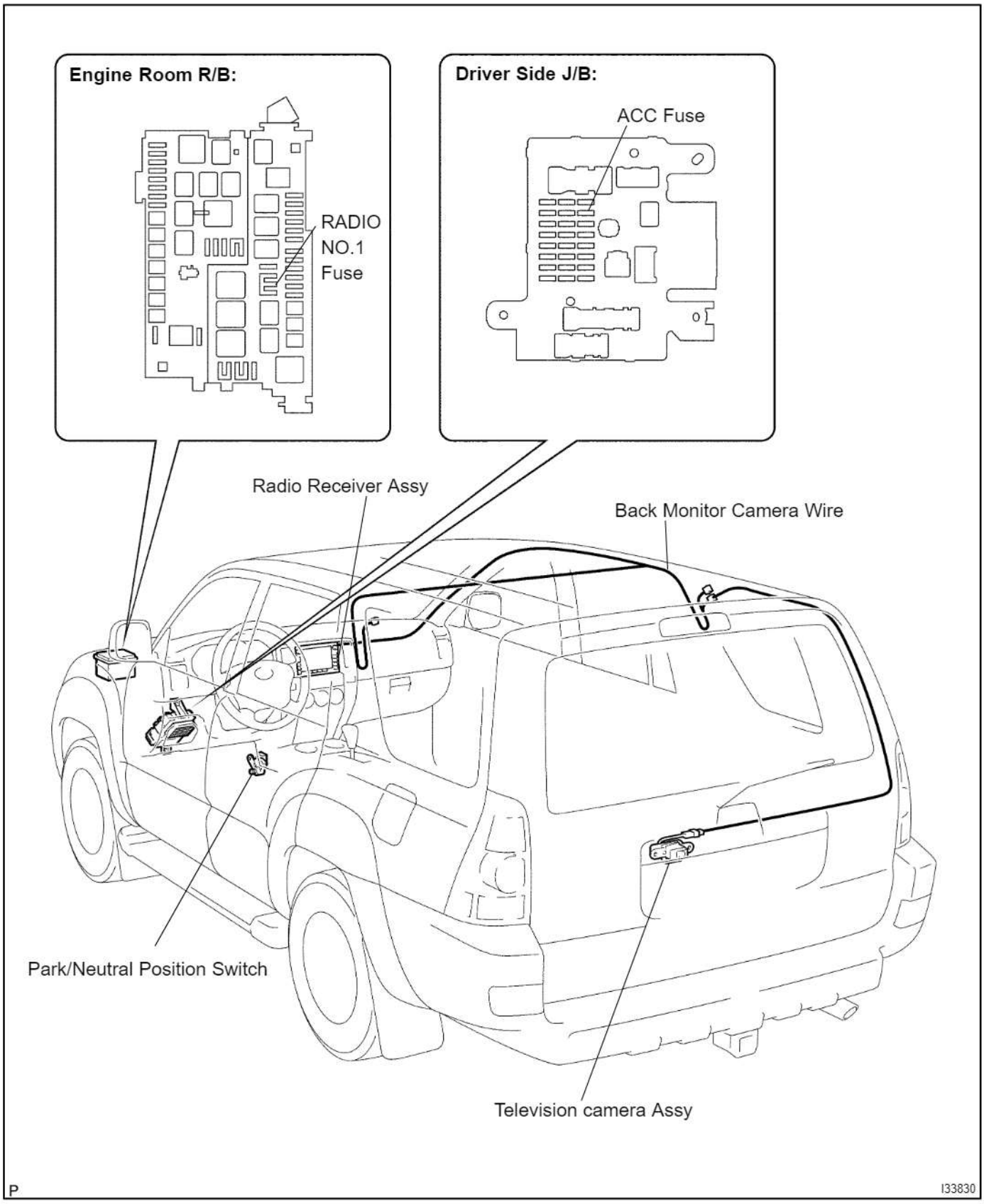
Standard:

Tester Connection	Specified Condition
A–1 (Radio receiver ASSY side) ⇔ B–4 (Television camera ASSY side)	Continuity
A–2 (Radio receiver ASSY side) ⇔ B–1 (Television camera ASSY side)	Continuity
A–3 (Radio receiver ASSY side) ⇔ B–3 (Television camera ASSY side)	Continuity
A–4 (Radio receiver ASSY side) ⇔ B–2 (Television camera ASSY side)	Continuity

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058FB-01

LOCATION



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058FC-01

PROBLEM SYMPTOMS TABLE

Chart No.	Problem Symptom	See page
1	Back monitor system does not display images when the shift lever is in R range.	(05–1683)
2	Back monitor system displays images even if the shift lever is not in R range.	(05–1684)
3	Images become faint.	(05–1685)
4	Images change too slow.	(05–1686)

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BACK MONITOR SYSTEM DOES NOT DISPLAY IMAGES WHEN THE SHIFT LEVER IS IN R RANGE

INSPECTION PROCEDURE

1	INSPECT PARK/NEUTRAL POSITION SWITCH ASSY

(a) Check the park/neutral position switch ASSY (A750E/A750F: See page 05–978, A340E/A340F: See page 05–1095).

NG → **REPLACE PARK/NEUTRAL POSITION SWITCH ASSY(See page 40–12)**

OK

2	INSPECT RADIO RECEIVER ASSY

(a) Check the radio receiver ASSY (See page 05–1677).

NG → **REPLACE RADIO RECEIVER ASSY (See page 67–6)**

OK

3	INSPECT TELEVISION CAMERA ASSY

(a) Check the television camera ASSY (See page 05–1677).

NG → **REPLACE TELEVISION CAMERA ASSY (See page 67–18)**

OK

4	INSPECT BACK MONITOR CAMERA WIRE

(a) Check the back monitor camera wire (See page 05–1677).

NG → **REPLACE BACK MONITOR CAMERA WIRE (See page 67–16)**

OK

REPAIR OR REPLACE HARNESS OR CONNECTOR(See page 01–35)

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BACK MONITOR SYSTEM DISPLAYS IMAGES EVEN IF THE SHIFT LEVER IS NOT IN R RANGE

INSPECTION PROCEDURE

1	INSPECT PARK/NEUTRAL POSITION SWITCH ASSY

(a) Check the park/neutral position switch ASSY (A750E/A750F: See page 05–978, A340E/A340F: See page 05–1095).

NG → REPLACE PARK/NEUTRAL POSITION SWITCH ASSY(See page 40–13)

OK

2	INSPECT RADIO RECEIVER ASSY

(a) Check the radio receiver ASSY (See page 05–1677).

NG → REPLACE RADIO RECEIVER ASSY (See page 67–6)

OK

REPAIR OR REPLACE HARNESS OR CONNECTOR(See page 01–35)

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IMAGES BECOME FAINT

INSPECTION PROCEDURE

1	INSPECT TELEVISION CAMERA ASSY

(a) Check the television camera ASSY (See page 05–1677).

NG → **REPLACE TELEVISION CAMERA ASSY (See page 67–18)**

OK

2	INSPECT RADIO RECEIVER ASSY

(a) Check the radio receiver ASSY (See page 05–1677).

NG → **REPLACE RADIO RECEIVER ASSY (See page 67–6)**

OK

REPAIR OR REPLACE HARNESS OR CONNECTOR (See page 01–35)

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IMAGES CHANGE TOO SLOW

INSPECTION PROCEDURE

1	INSPECT RADIO RECEIVER ASSY

(a) Check the radio receiver ASSY (See page 05–1677).

NG → REPLACE RADIO RECEIVER ASSY (See page 67–6)

OK

REPAIR OR REPLACE HARNESS OR CONNECTOR (See page 01–35)

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COMBINATION METER (From August, 2003)

056E6-06

HOW TO PROCEED WITH TROUBLESHOOTING

1	VEHICLE BROUGHT TO WORKSHOP

2	CUSTOMER PROBLEM ANALYSIS (See page 05–1688)

3	PROBLEM SYMPTOM CONFIRMATION

4	PROBLEM SYMPTOMS TABLE (See page 05–1701)

5	CIRCUIT INSPECTION (See page 05–1702 – 05–1730)

6	REPAIR OR REPLACE

7	CONFIRMATION TEST

8	END

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056E7-06

CUSTOMER PROBLEM ANALYSIS CHECK

COMBINATION METER SYSTEM Check Sheet

Inspector's name:

Customer's Name		**VIN**	
		Production Date	
		Licence Plate No.	
Date of Vehicle Brought In	/ /	**Odometer Reading**	**km Mile**

Date Problem First Occurred		/ /
Frequency Problem Occurs		Constant Sometimes (Times per day/month) Once only
Weather Conditions When Problem Occurred	**Weather**	Fine Cloudy Rainy Snowy Various/Others
	Outside temperature	Hot Warm Cool Cold (Approx. °F (°C))

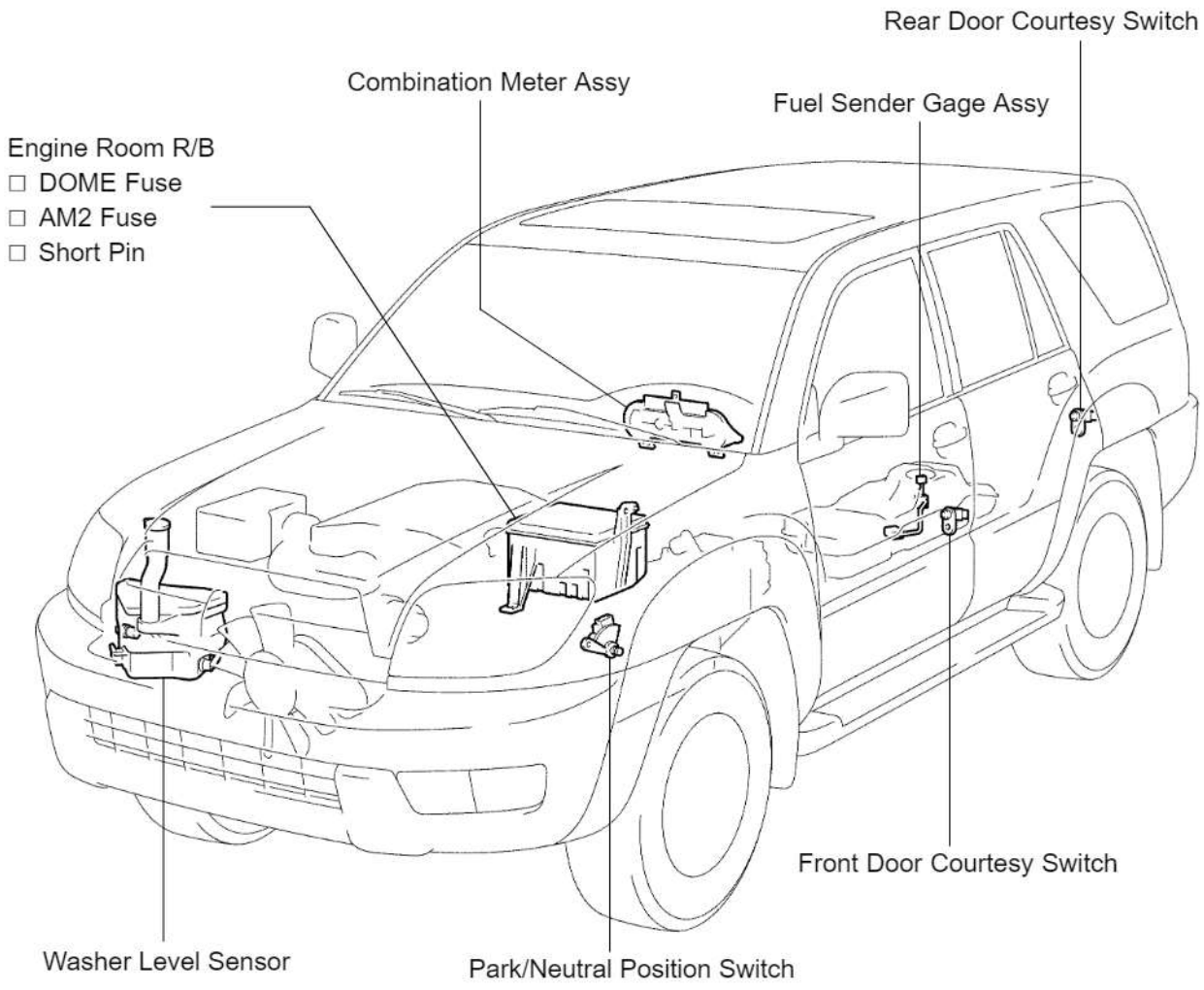
Problem Symptom	**Gauge**	☐ Malfunction in speedometer
		☐ Malfunction in tachometer
		☐ Malfunction in water temperature receiver gauge
		☐ Malfunction in fuel receiver gauge
	Others	☐ Operating light control rheostat does not change light brightness
		☐ Entire combination meter does not operate
		☐ Buzzer does not sound (Key reminder warning, Seat belt warning)
		☐ Seat belt warning lamp for driver's seat does not operate
		☐ Seat belt warning lamp for front passenger's seat does not flash
		☐ Malfunction in average fuel consumption/instantaneous fuel consumption/ possible running distance display

I30453

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05A06-02

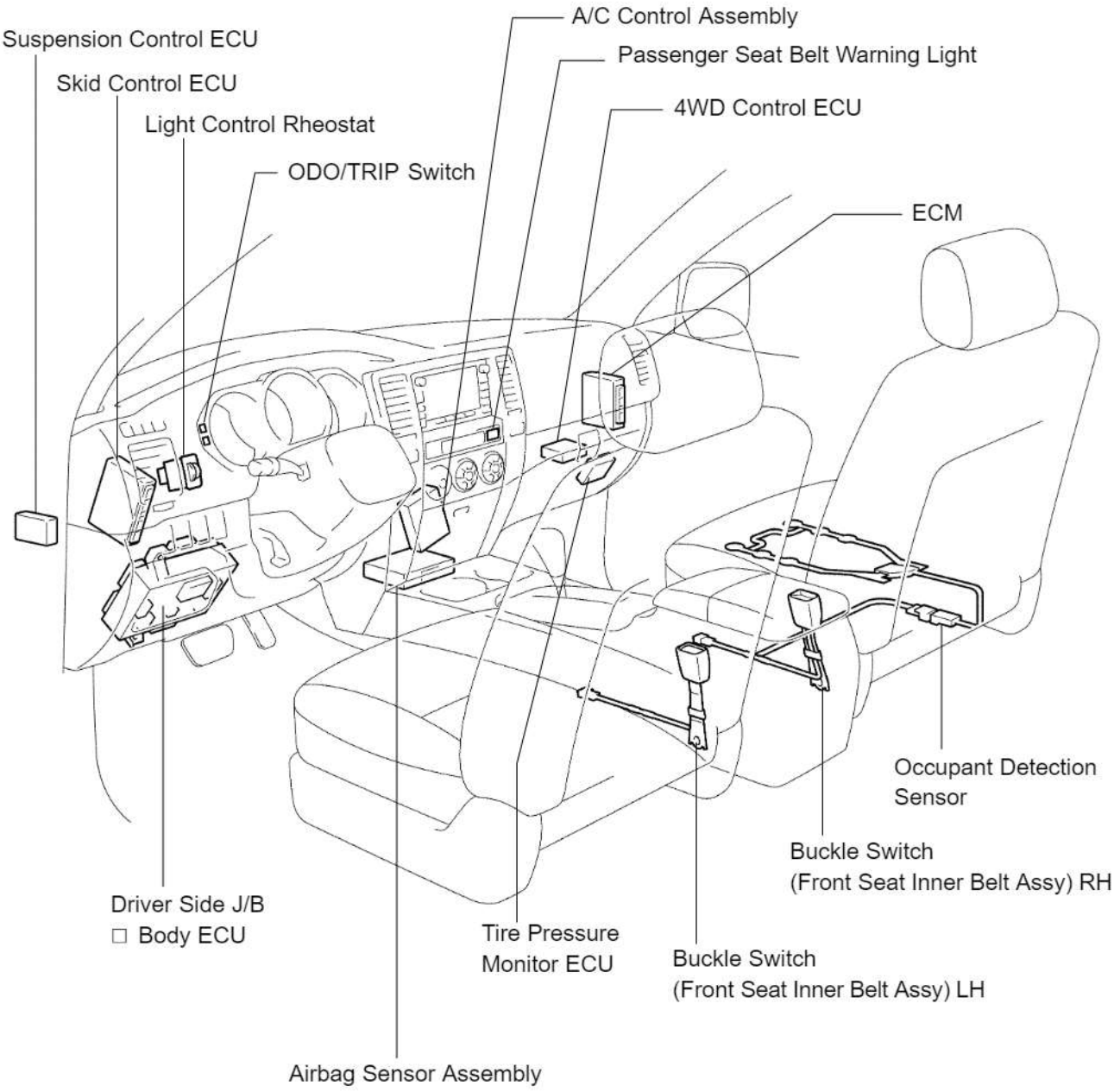
LOCATION



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I33096

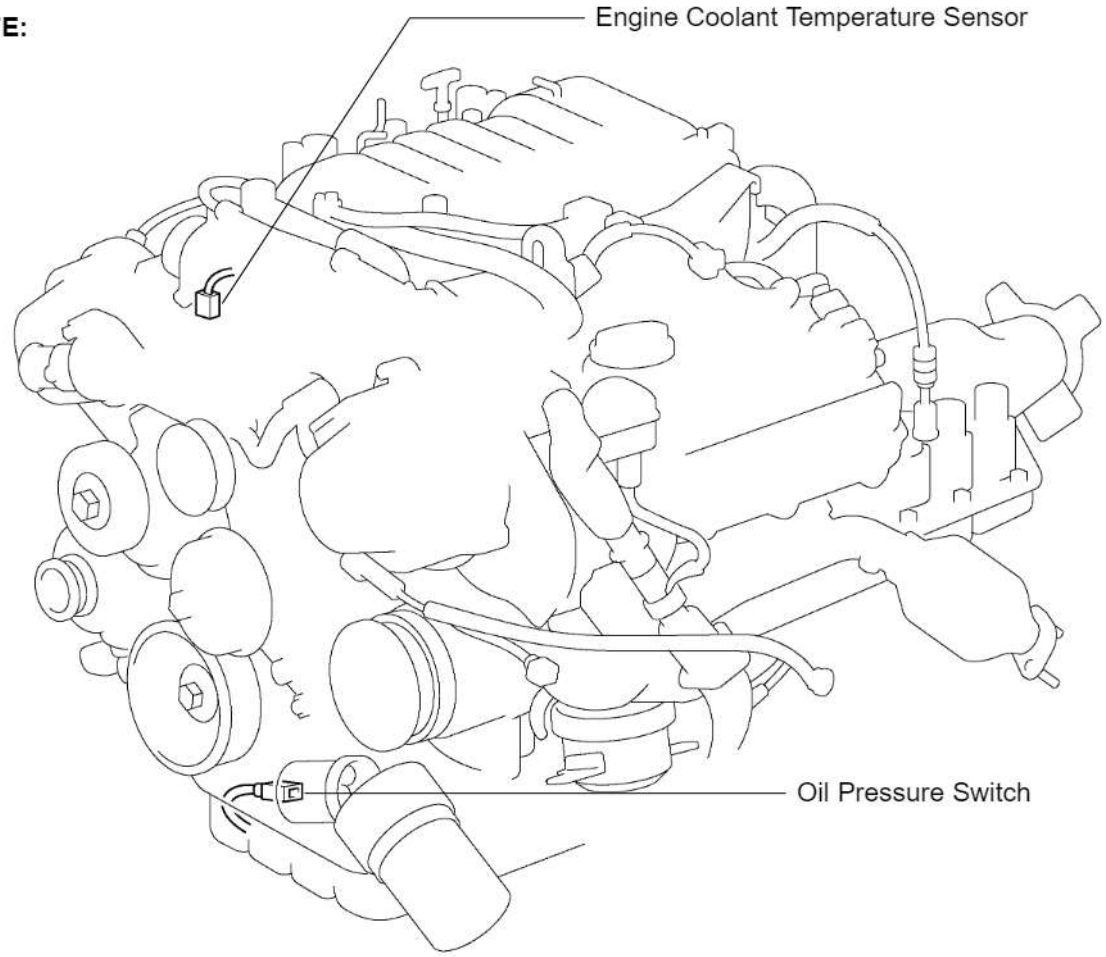
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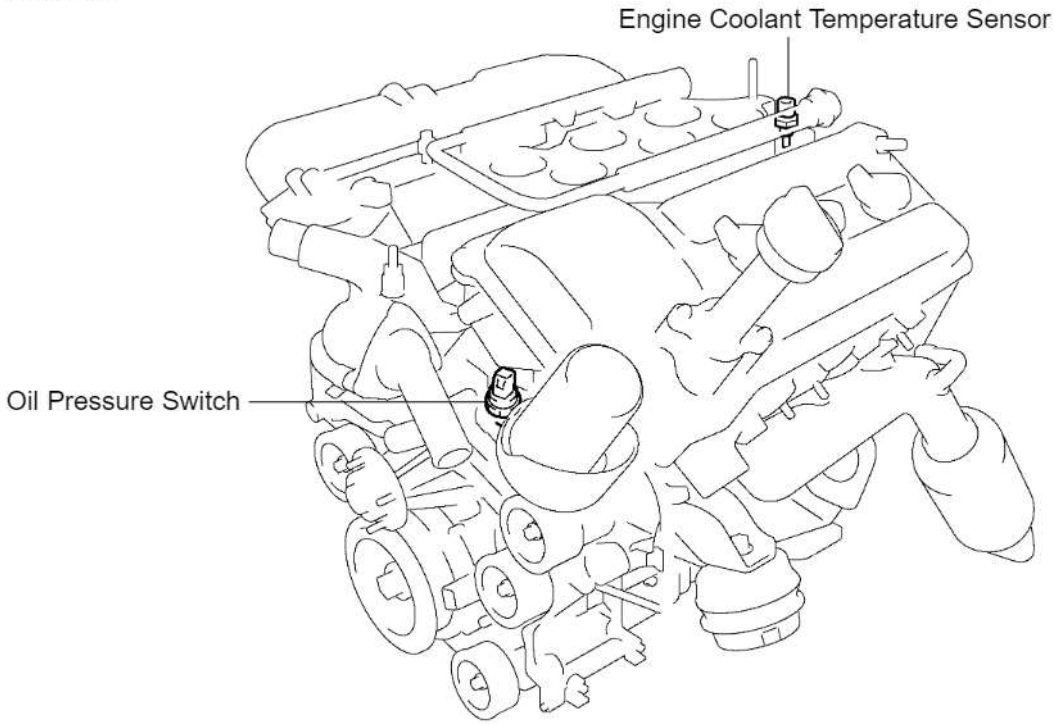
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2UZ–FE:



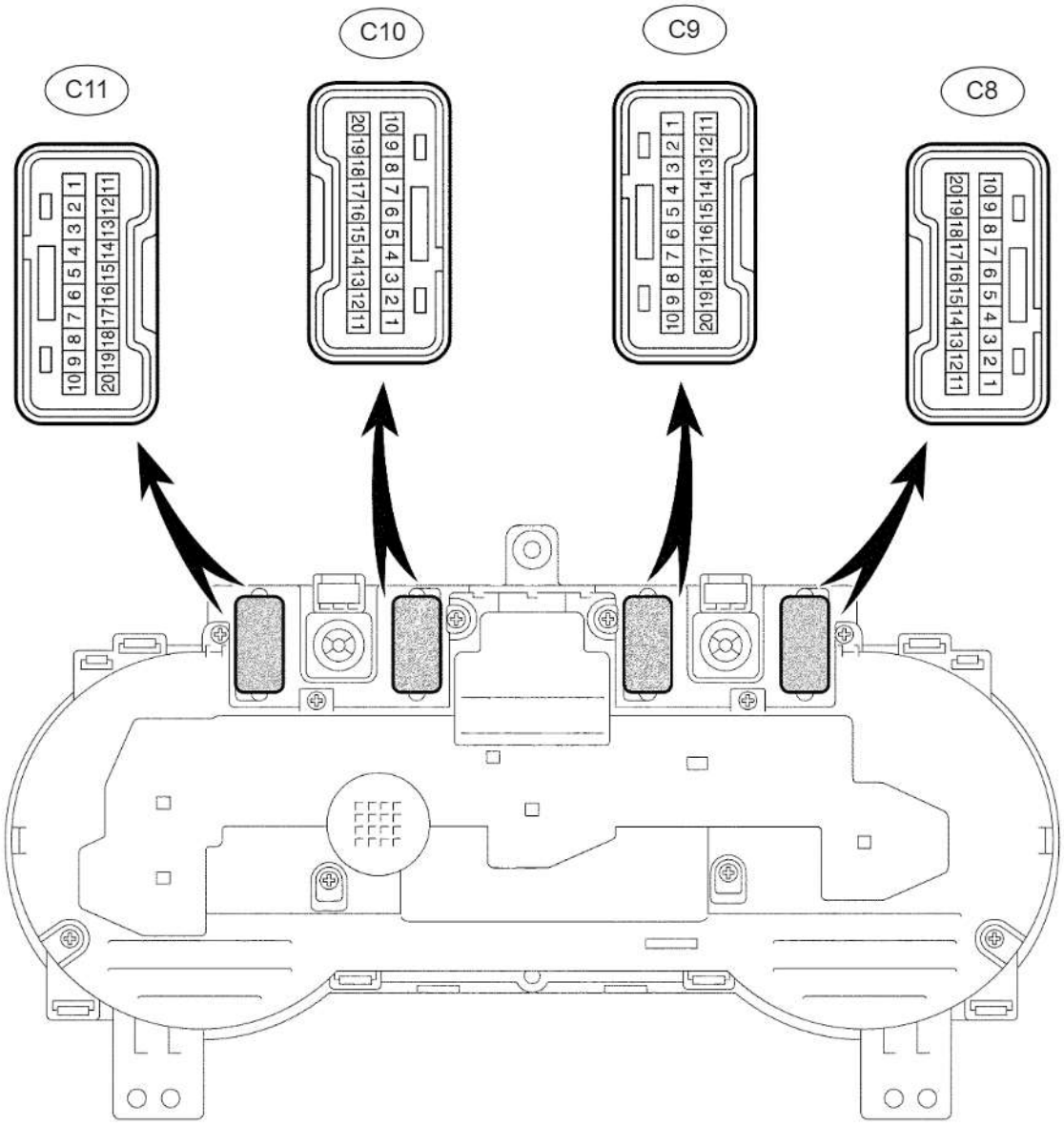
1GR–FE:



I33331
I33333

I38327

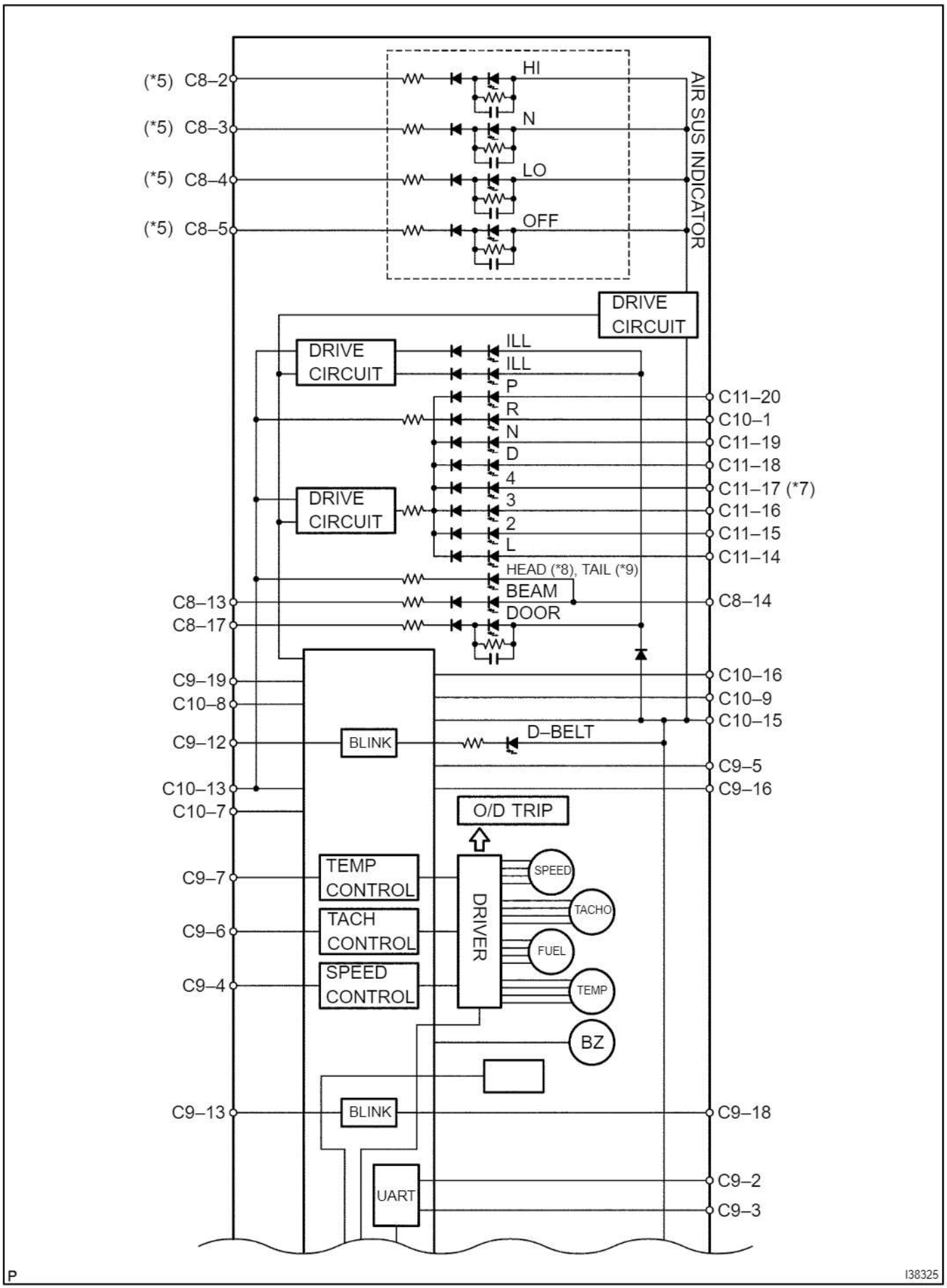
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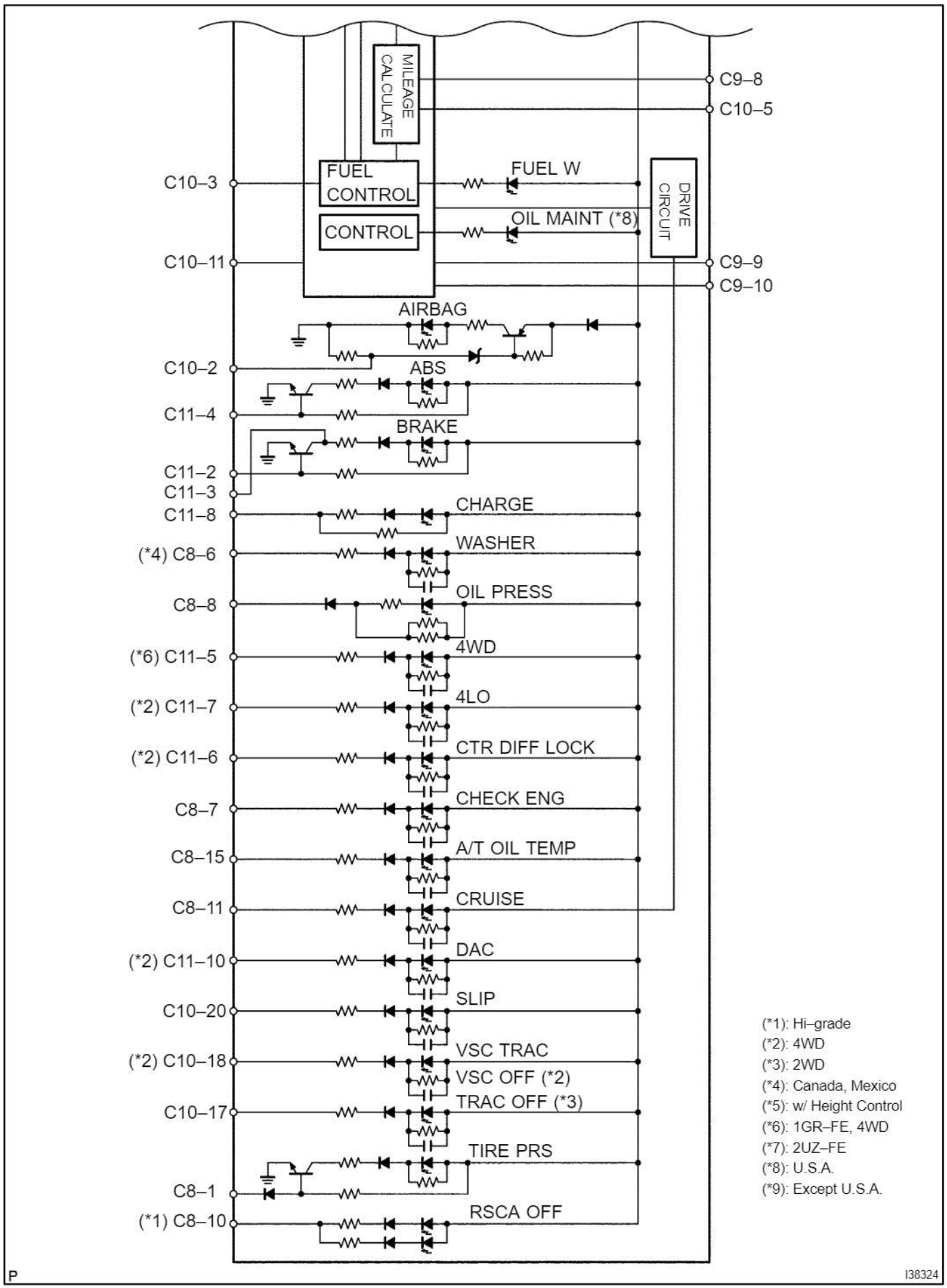
P

I33099

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(*1): Hi–grade
(*2): 4WD
(*3): 2WD
(*4): Canada, Mexico
(*5): w/ Height Control
(*6): 1GR–FE, 4WD
(*7): 2UZ–FE
(*8): U.S.A.
(*9): Except U.S.A.

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Terminal No.		Wire harness side
C8	1	Tire Pressure Monitor ECU
	2	Suspension Control ECU (HI) (*5)
	3	Suspension Control ECU (N) (*5)
	4	Suspension Control ECU (LO) (*5)
	5	Suspension Control ECU (OFF) (*5)
	6	Washer Level Sensor (*4)
	7	ECM (CHECK ENGINE)
	8	Oil Pressure Switch
	10	Airbag Sensor Assembly (RSCA OFF) (*1)
	11	ECM (CRUISE)
	13	Combination Switch (BEAM–)
	14	Headlight (HI) Fuse (BEAM+)
	15	ECM (A/T OIL TEMP)
	17	Body ECU (ALL DOOR INPUT)
C9	2	A/C Control Assembly (UART IN)
	3	A/C Control Assembly (UART OUT)
	4	Skid Control ECU (SP INPUT)
	5	4P OUT
	6	ECM (TM INPUT)
	7	A/C Control Assembly (TEMP COMMUNICATION INPUT)
	8	ECM (TAU–G INPUT)
	9	ODO/TRIP Switch (ODO/TRIP SEL INPUT)
	10	ODO/TRIP Switch (TRIP RESET INPUT)
	12	Buckle Switch LH (D SEAT BELT INPUT)
	13	Buckle Switch RH (P SEAT BELT INPUT)
	16	STA Relay (ST SIGNAL INPUT)
	18	Passenger Seat Belt Warning Light (P SEAT BELT OUTPUT)
	19	Body ECU (KEY INPUT)

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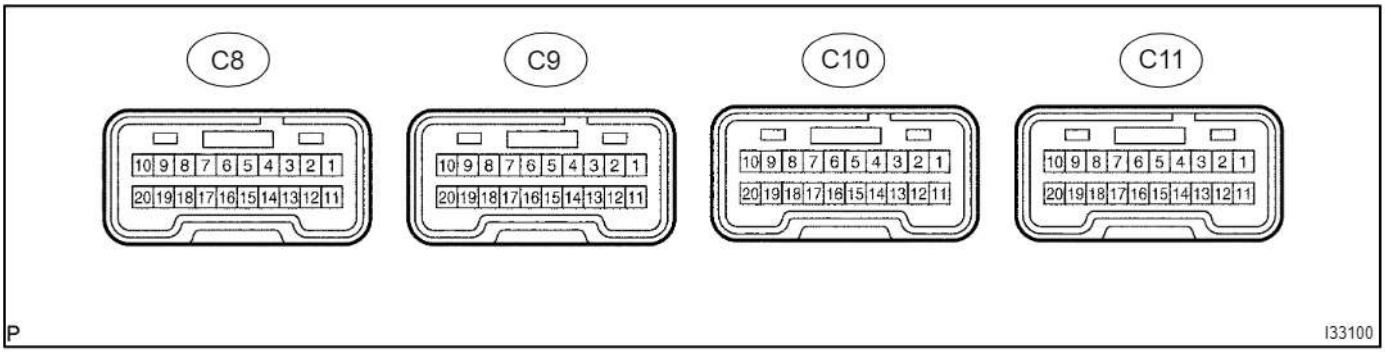
Terminal No.		Wire harness side
C10	1	Park/Neutral Position Switch (A/T R)
	2	Airbag Sensor Assembly (ACTIVE AIRBAG INPUT)
	3	Fuel Sender Gage (FR)
	5	IGN Fuse (TAU–B INPUT)
	7	Rheostat (TR)
	8	Body ECU (D DOOR INPUT)
	9	Tail Relay (ILL+)
	11	Fuel Ground
	13	Engine Ground
	15	GAUGE Fuse (IGN2)
	16	DOME Fuse (+B)
	17	Skid Control ECU (VSC OFF (*2), TRAC OFF (*3))
	18	Skid Control ECU (VSC TRAC) (*2)
	20	Skid Control ECU (SLIP)
C11	2	Skid Control ECU (ACTIVE BRAKE)
	3	ABS & BA & TRAC & VSC Actuator (BRAKE LEVEL)
	4	Skid Control ECU (ACTIVE ABS)
	5	4WD Control ECU (4WD) (*6)
	6	4WD Control ECU (CTR DIFF LOCK) (*2)
	7	4WD Control ECU (4LO) (*2)
	8	Generator (CHARGE)
	10	Skid Control ECU (DAC) (*2)
	14	Transmission Control Switch (*7), Park/Neutral Position Switch (*8) (A/T L)
	15	Transmission Control Switch (*7), Park/Neutral Position Switch (*8) (A/T 2)
	16	Park/Neutral Position Switch (*7), Transmission Control Switch (*8) (A/T 3)
	17	Transmission Control Switch (A/T 4) (*7)
	18	Transmission Control Switch (A/T D)
	19	Park/Neutral Position Switch (A/T N)
	20	Park/Neutral Position Switch (A/T P)

(*1): Hi–grade model
(*2): 4WD
(*3): 2WD
(*4): Canada, Mexico model
(*5): w/ Height Control
(*6): 1GR–FE, 4WD
(*7): 2UZ–FE
(*8): 1GR–FE

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TERMINALS OF ECU



Symbols (Terminals No.)	Wiring Color	Terminal Description	Condition	Specified Condition
C8–1 – Body ground	P–B – Body ground	Tire pressure signal	Ignition switch ON, tire pressure indicator light OFF → ON	10 to 14 V → Below 1 V
C8–2 – Body ground (*5)	Y – Body ground	Height control signal (HI)	Ignition switch ON, height control indicator light (HI) OFF → ON	10 to 14 V → Below 1 V
C8–3 – Body ground (*5)	Y–B – Body ground	Height control signal (N)	Ignition switch ON, height control indicator light (N) OFF → ON	10 to 14 V → Below 1 V
C8–4 – Body ground (*5)	BR–B – Body ground	Height control signal (LO)	Ignition switch ON, height control indicator light (LO) OFF → ON	10 to 14 V → Below 1 V
C8–5 – Body ground (*5)	Y–G – Body ground	Height control signal (OFF)	Ignition switch ON, height control indicator light (OFF) OFF → ON	10 to 14 V → Below 1 V
C8–6 – Body ground (*4)	V–W – Body ground	Washer level signal	Ignition switch ON, washer level indicator light OFF → ON	10 to 14 V → Below 1 V
C8–7 – Body ground	R–B – Body ground	Check engine signal	Ignition switch ON, check engine warning light OFF → ON	10 to 14 V → Below 1 V
C8–8 – Body ground	LG–B – Body ground	Oil pressure signal	Ignition switch ON, oil pressure indicator light OFF → ON	10 to 14 V → Below 1 V
C8–10 – Body ground (*1)	L–Y – Body ground	Roll sensing of curtain shield airbag OFF signal	Ignition switch ON, RSCA OFF indicator light OFF → ON	10 to 14 V → Below 1 V
C8–11 – Body ground	LG – Body ground	CRUISE signal	Ignition switch ON, CRUISE indicator light OFF → ON	10 to 14 V → Below 1 V
C8–13 – Body ground	R–G – Body ground	Hi–beam signal (–)	Ignition switch ON, beam indicator light OFF → ON	10 to 14 V → Below 1 V
C8–14 – Body ground	R–W – Body ground	Hi–beam signal (+)	Always	10 to 14 V
C8–15 – Body ground	P – Body ground	A/T OIL TEMP signal	Ignition switch ON, A/T OIL TEMP warning light OFF → ON	10 to 14 V → Below 1 V
C8–17 – Body ground	V–Y – Body ground	All door condition signal	Door OPEN → CLOSE	Below 1 V → 10 to 14 V
C9–2 – Body ground	BR–B – Body ground	A/C signal (UART input)	Ignition switch OFF → ON	Signal wave
C9–3 – Body ground	W–L – Body ground	A/C signal (UART output)	Ignition switch OFF → ON	Signal wave
C9–4 – Body ground	GR–R – Body ground	Speed signal (Input)	Ignition switch ON, turn the wheel slowly	Pulse generation (*8)
C9–5 – Body ground	V–R – Body ground	Speed signal (Output)	Ignition switch ON, turn the wheel slowly	Pulse generation (*8)
C9–6 – Body ground	B–W – Body ground	Tachometer signal (Input)	Ignition switch OFF → ON	Pulse generation (*9)

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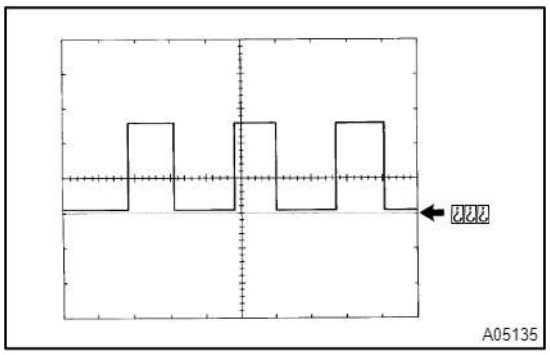
Symbols (Terminals No.)	Wiring Color	Terminal Description	Condition	Specified Condition
C9–7 – Body ground	L–B – Body ground	A/C signal (Temp. input)	Ignition switch OFF → ON	Pulse generation (*10)
C9–8 – Body ground	R–L – Body ground	Injector No.1 signal	Ignition switch OFF → ON	Pulse generation (*11)
C9–9 – Body ground	B – Body ground	ODO/TRIP switch signal	ODO/TRIP switch OFF → ON	Below 1 V → 10 to 14 V
C9–10 – Body ground	B–L – Body ground	ODO/TRIP switch signal	TRIP RESET switch OFF → ON	Below 1 V → 10 to 14 V
C9–12 – Body ground	G–Y – Body ground	Driver seat belt condition signal	Ignition switch ON, sit on the driver seat, driver side seat belt unfastened → fastened	Below 1 V → 10 to 14 V
C9–13 – Body ground	GR–B – Body ground	Passenger seat belt condition signal (Input)	Ignition switch ON, sit on the passenger seat, passenger side seat belt unfastened → fastened	Below 1 V → 10 to 14 V
C9–16 – Body ground	B–Y – Body ground	Start signal	Ignition switch ON → START	10 to 14 V → Below 1 V
C9–18 – Body ground	LG – Body ground	Passenger seat belt condition signal (Output)	Ignition switch ON, passenger side seat belt warning light OFF → ON	Below 1 V → 10 to 14 V
C9–19 – Body ground	V–G – Body ground	Key signal	Ignition switch OFF, key is inserted → Not inserted	Below 1 V → 10 to 14 V
C10–1 – Body ground	R–Y – Body ground	A/T shift signal (R)	Ignition switch ON, A/T R indicator light OFF → ON	Below 1 V → 10 to 14 V
C10–2 – Body ground	B–Y – Body ground	AIRBAG signal	Ignition switch ON, AIRBAG warning light OFF → ON	Below 1 V → 10 to 14 V
C10–3 – Body ground	BR–R – Body ground	Fuel signal	Ignition switch ON, fuel level FULL → EMPTY	Below 1 V → 4 to 5 V
C10–5 – Body ground	B–O – Body ground	IG2 signal	Ignition switch OFF → ON	Below 1 V → 10 to 14 V
C10–7 – Body ground	W–G – Body ground	Rheostat signal	Ignition switch ON, light control rheostat is turned volume up → volume down	Pulse generation (*12)
C10–8 – Body ground	W–L – Body ground	Driver door condition signal	Driver side door OPEN → CLOSE	Below 1 V → 10 to 14 V
C10–9 – Body ground	G – Body ground	Illumination signal	Light control switch OFF → Tail	Below 1 V → 10 to 14 V
C10–11 – Body ground	Y–B – Body ground	Fuel ground	Always	Below 1 Ω
C10–13 – Body ground	BR – Body ground	Engine ground	Always	Below 1 Ω
C10–15 – Body ground	R–L – Body ground	IG2 signal	Ignition switch OFF → ON	Below 1 V → 10 to 14 V
C10–16 – Body ground	R – Body ground	Battery	Always	10 to 14 V
C10–17 – Body ground	L–W – Body ground	VSC OFF signal (*2) TRAC OFF signal (*3)	Ignition switch ON, VSC OFF (*2), TRAC OFF (*3) indicator light OFF → ON	10 to 14 V → Below 1 V
C10–18 – Body ground (*2)	Y–R – Body ground	VSC TRAC signal	Ignition switch ON, VSC TRAC indicator light OFF → ON	10 to 14 V → Below 1 V
C10–20 – Body ground	R – Body ground	SLIP signal	Ignition switch ON, SLIP indicator light OFF → ON	10 to 14 V → Below 1 V

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Symbols (Terminals No.)	Wiring Color	Terminal Description	Condition	Specified Condition
C11–2 – Body ground	B–L – Body ground	BRAKE signal	Ignition switch ON, BRAKE warning light OFF → ON	10 to 14 V → Below 1 V
C11–3 – Body ground	LG – Body ground	BRAKE signal	Ignition switch ON, BRAKE warning light OFF → ON	10 to 14 V → Below 1 V
C11–4 – Body ground	LG–R – Body ground	ABS signal	Ignition switch ON, ABS indicator light OFF → ON	Below 1 V → 10 to 14 V
C11–5 – Body ground (*6)	W–G – Body ground	4WD signal	Ignition switch ON, 4WD indicator light OFF → ON	10 to 14 V → Below 1 V
C11–6 – Body ground (*2)	G–R – Body ground	CTR DIFF LOCK signal	Ignition switch ON, CTR DIFF LOCK indicator light OFF → ON	10 to 14 V → Below 1 V
C11–7 – Body ground (*2)	BR–W – Body ground	Low speed four–wheel drive signal	Ignition switch ON, 4 LO indicator light OFF → ON	10 to 14 V → Below 1 V
C11–8 – Body ground	GR – Body ground	Charge signal	Ignition switch ON, charge warning light OFF → ON	10 to 14 V → Below 1 V
C11–10 – Body ground (*2)	BR–Y – Body ground	Downhill assist control signal	Ignition switch ON, DAC indicator light OFF → ON	10 to 14 V → Below 1 V
C11–14 – Body ground	B–L – Body ground	A/T shift signal (L)	Ignition switch ON, A/T L indicator light OFF → ON	Below 1 V → 10 to 14 V
C11–15 – Body ground	P–L – Body ground	A/T shift signal (2)	Ignition switch ON, A/T 2 indicator light OFF → ON	Below 1 V → 10 to 14 V
C11–16 – Body ground	L – Body ground	A/T shift signal (3)	Ignition switch ON, A/T 3 indicator light OFF → ON	Below 1 V → 10 to 14 V
C11–17 – Body ground (*7)	G – Body ground	A/T shift signal (4)	Ignition switch ON, A/T 4 indicator light OFF → ON	Below 1 V → 10 to 14 V
C11–18 – Body ground	W – Body ground	A/T shift signal (D)	Ignition switch ON, A/T D indicator light OFF → ON	Below 1 V → 10 to 14 V
C11–19 – Body ground	G–W – Body ground	A/T shift signal (N)	Ignition switch ON, A/T N indicator light OFF → ON	Below 1 V → 10 to 14 V
C11–20 – Body ground	G–B – Body ground	A/T shift signal (P)	Ignition switch ON, A/T P indicator light OFF → ON	Below 1 V → 10 to 14 V

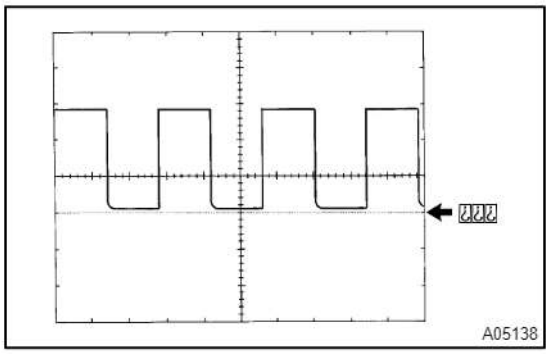
(*1): Hi–grade model
(*2): 4WD
(*3): 2WD
(*4): Canada, Mexico model
(*5): w/ Height Control
(*6): 1GR–FE, 4WD
(*7): 2UZ–FE

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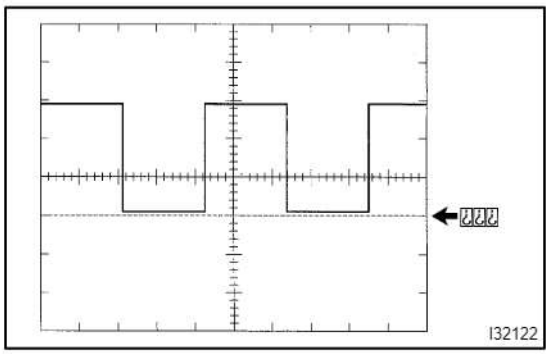
(*8): Reference: Using oscilloscope:

Item	Condition
Tool setting	5 V/DIV, 20 ms/DIV
Vehicle condition	Driving at approx. 20 km/h



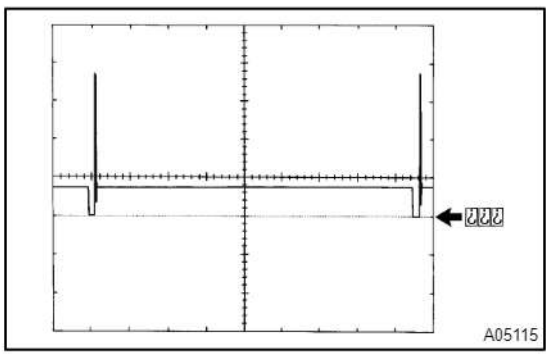
(*9): Reference: Using oscilloscope:

Item	Condition
Tool setting	5 V/DIV, 10 ms/DIV
Vehicle condition	Engine idle speed



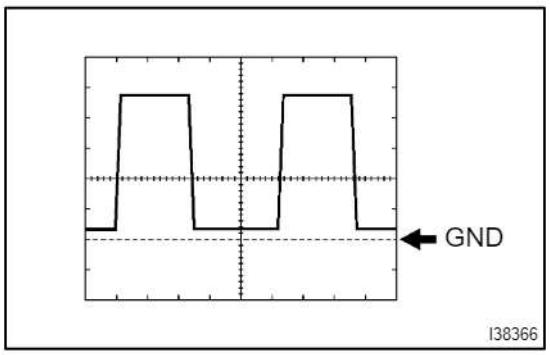
(*10): Reference: Using oscilloscope:

Item	Condition
Tool setting	5 V/DIV, 100 ms/DIV
Vehicle condition	Engine idle speed



(*11): Reference: Using oscilloscope:

Item	Condition
Tool setting	10 V/DIV, 20 ms/DIV
Vehicle condition	Engine idle speed



(*12): Reference: Using oscilloscope:

Item	Condition
Tool setting	2 V/DIV, 1 ms/DIV
Vehicle condition	Ignition switch ON
Vehicle condition	Light control switch TAIL or HEAD

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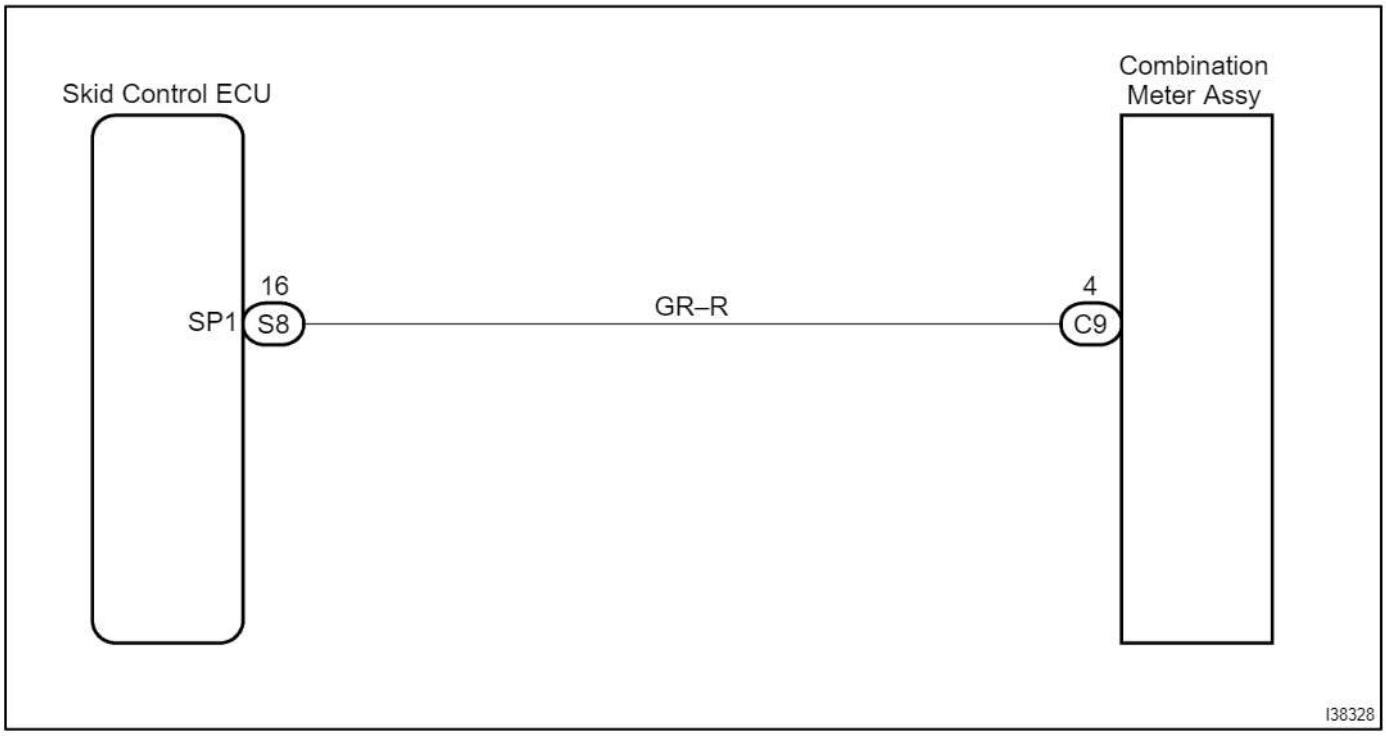
PROBLEM SYMPTOMS TABLE

Chart No.	Symptom	See page
1	Malfunction in speedometer	05–1702
2	Malfunction in tachometer	05–1705
3	Malfunction in water temperature receiver gauge	05–1708
4	Malfunction in fuel receiver gauge	05–1711
5	Operating light control rheostat does not change light brightness	05–1714
6	Entire combination meter does not operate	05–1718
7	Buzzer does not sound (Key reminder warning, Seat belt warning)	05–1720
8	Seat belt warning lamp for driver's seat does not operate	05–1724
9	Seat belt warning lamp for front passenger's seat does not flash	05–1726
10	Malfunction in average fuel consumption/instantaneous fuel consumption/possible running distance display	05–1730

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MALFUNCTION IN SPEEDOMETER

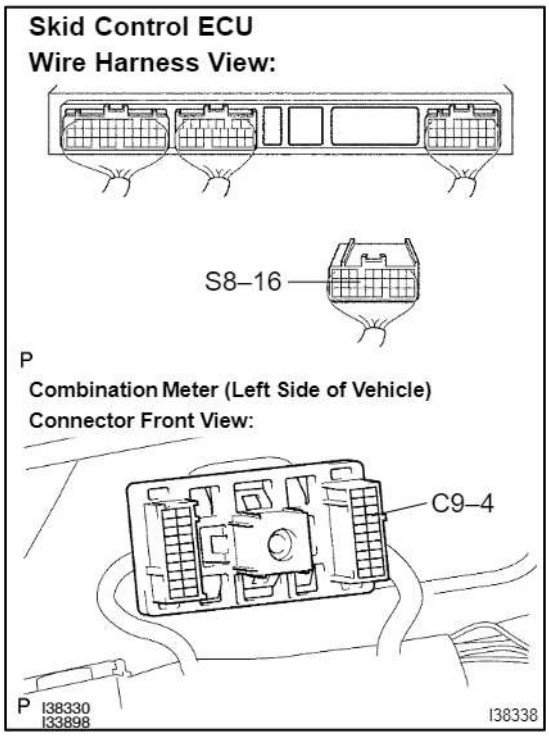
WIRING DIAGRAM



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INSPECTION PROCEDURE

1	CHECK HARNESS AND CONNECTOR(BETWEEN SKID CONTROL ECU ASSY AND COMBINATION METER ASSY)



(a) Disconnect the S8 and C9 connectors.
(b) Measure the resistance according to the value(s) in the table below.

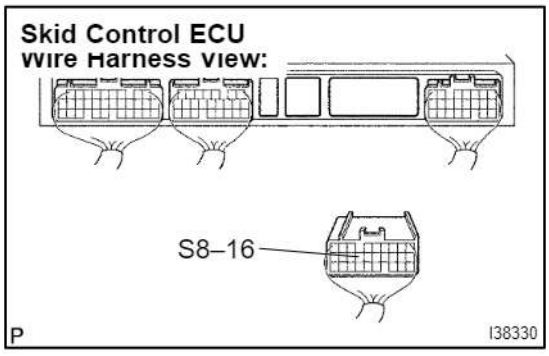
Standard:

Tester Connection	Specified Condition
S8–16 – C9–4	Below 1 Ω
S8–16 – Body ground	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

2	INSPECT SKID CONTROL ECU ASSY



(a) Reconnect the C9 connector.
(b) Measure the voltage according to the value(s) in the table below.

Standard :

Tester Connection	Condition	Specified Condition
S8–16 – Body ground	Ignition switch ON	10 to 14 V

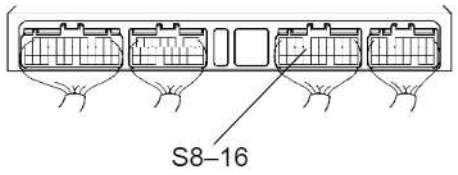
NG → **REPLACE COMBINATION METER ASSY (See page 71–22)**

OK

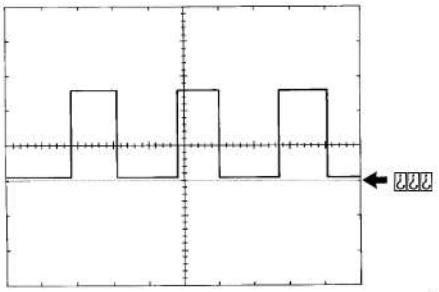
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3 INSPECT COMBINATION METER ASSY

Skid Control ECU
Wire Harness View:



P F40910



A05135

INSPECTION USING OSCILLOSCOPE

(a) Check the input signal waveform.
  (1) Remove the skid control ECU assy.
  (2) Connect the oscilloscope to terminal S8–16 and body ground.
  (3) Start the engine.
  (4) Check the signal waveform according to the condition(s) in the table below.

Item	Condition
Tool setting	5 V/DIV, 20 ms/DIV
Vehicle condition	Driving at approx. 20 km/h

HINT:
As vehicle speed increases, the cycle of the signal waveform narrows.

NG → **GO TO BRAKE SYSTEM (See page 05–799)**

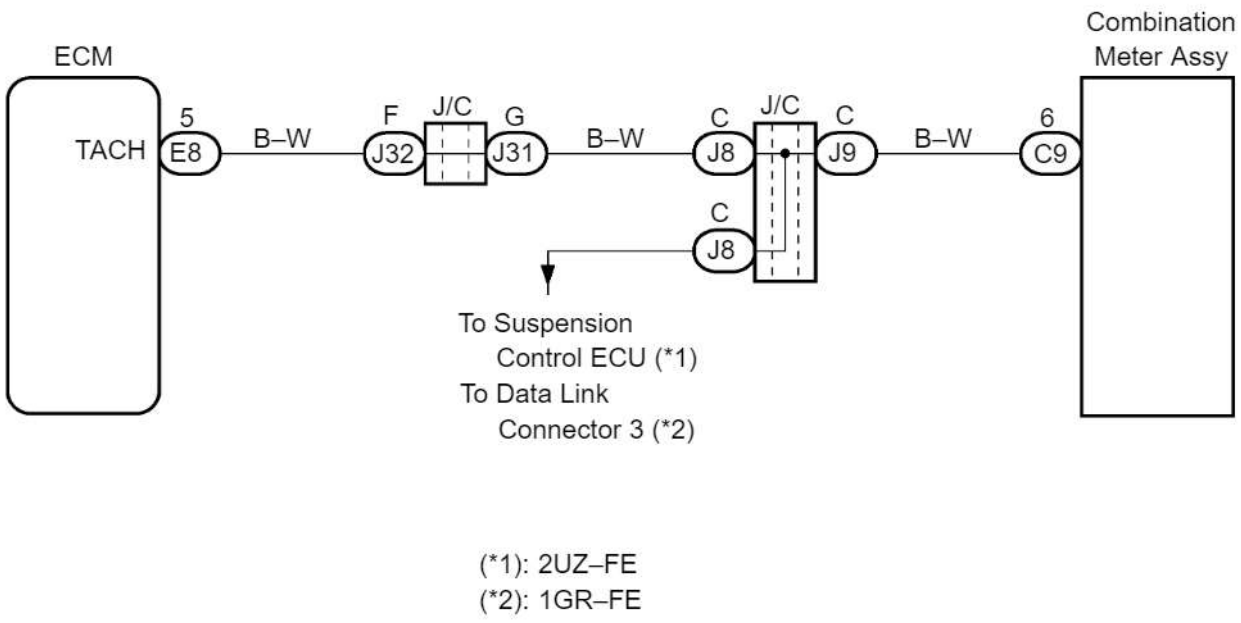
OK

REPLACE COMBINATION METER ASSY (See page 71–22)

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MALFUNCTION IN TACHOMETER

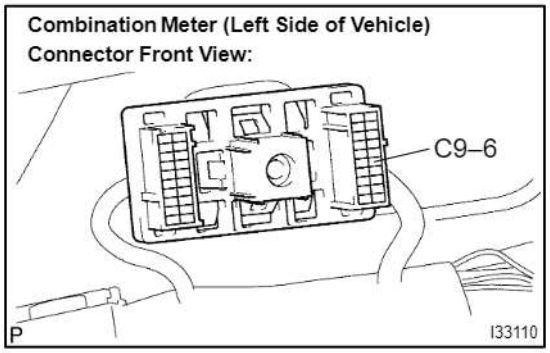
WIRING DIAGRAM

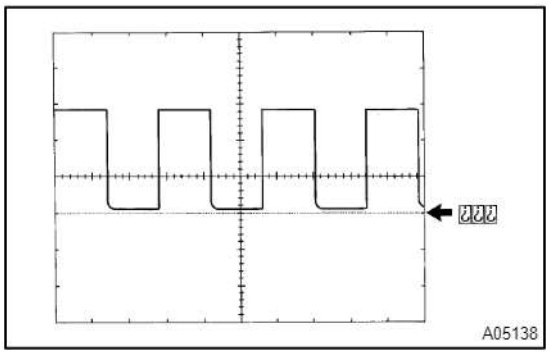


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INSPECTION PROCEDURE

1	INSPECT COMBINATION METER ASSY





INSPECTION USING OSCILLOSCOPE

(a) Check the input signal waveform.
  (1) Remove the combination meter assy.
  (2) Connect the oscilloscope to terminal C9–6 and body ground.
  (3) Start the engine.
  (4) Check the signal waveform according to the condition(s) in the table below.

Item	Condition
Tool setting	5 V/DIV, 10 ms/DIV
Vehicle condition	Engine idle speed

HINT:
As the engine speed goes higher, the frequency becomes shorter.

NG → **Go to step 2**

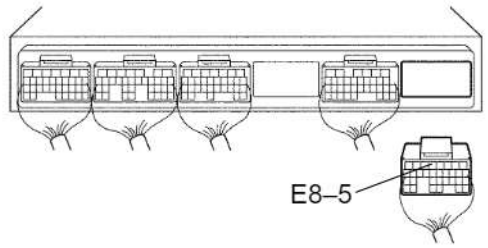
OK

REPLACE COMBINATION METER ASSY (See page 71–22)

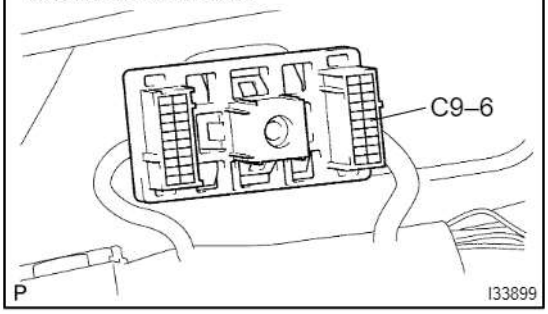
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2	CHECK HARNESS AND CONNECTOR(BETWEEN ECM AND COMBINATION METER ASSY)

ECM
Wire Harness View:



Combination Meter (Left Side of Vehicle)
Connector Front View:



(a) Disconnect the E8 and C9 connectors.
(b) Measure the resistance according to the value(s) in the table below.

Standard:

Tester Connection	Specified Condition
E8–5 – C9–6	Below 1 Ω
E8–5 – Body ground	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

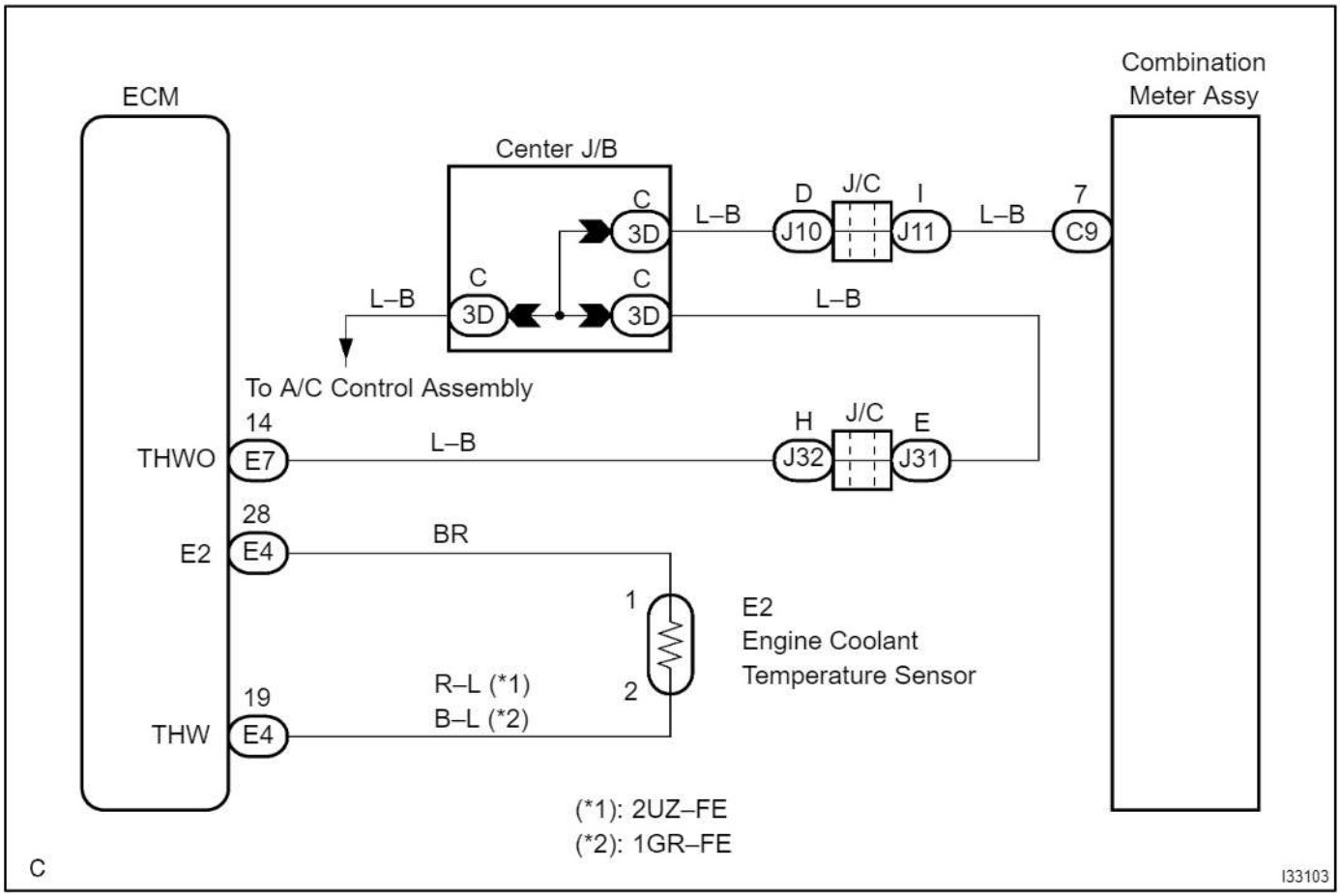
OK

REPLACE ECM (2UZ–FE: See page 10–24)(1GR–FE: See page 10–11)

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MALFUNCTION IN WATER TEMPERATURE RECEIVER GAUGE

WIRING DIAGRAM



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INSPECTION PROCEDURE

1 CHECK DIAGNOSTIC TROUBLE CODE(ECM)

(a) Start up the DTC check mode.
(b) Check that DTC P0115 is output.
Standard:
DTC P0115 is output.
Result:

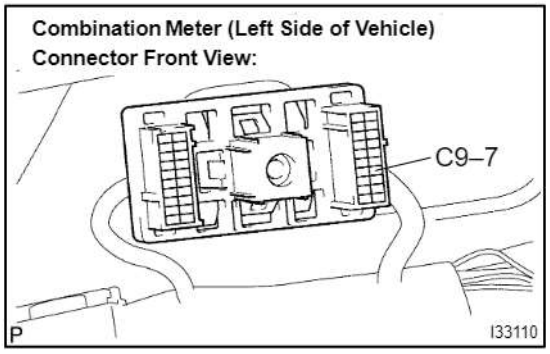
A	OK
B	NG (2UZ–FE)
C	NG (1GR–FE)

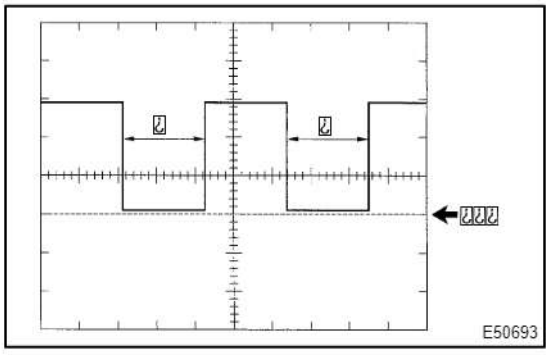
B → **GO TO SFI SYSTEM (2UZ–FE) (See page 05–78)**

C → **GO TO SFI SYSTEM (1GR–FE) (See page 05–417)**

A

2 INSPECT COMBINATION METER ASSY





INSPECTION USING OSCILLOSCOPE

(a) Check the input signal waveform.
(1) Remove the combination meter assy.
(2) Connect the oscilloscope to terminal C9–7 and body ground.
(3) Start the engine.
(4) Check the signal waveform according to the condition(s) in the table below.

Item	Condition
Tool setting	5 V/DIV, 100 ms/DIV
Vehicle condition	Engine idle speed

HINT:
As the coolant temperature raises, frequency "A" becomes longer.

NG → **Go to step 3**

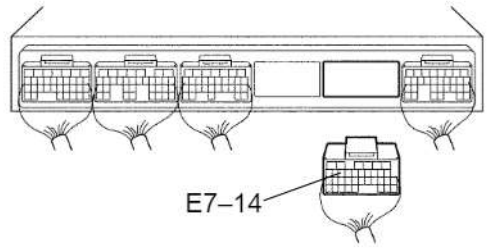
OK

REPLACE COMBINATION METER ASSY (See page 71–22)

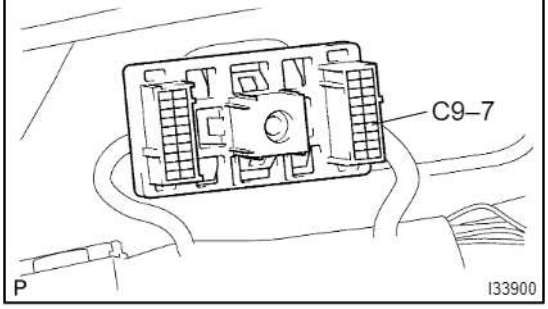
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3	CHECK HARNESS AND CONNECTOR(BETWEEN ECM AND COMBINATION METER ASSY)

ECM
Wire Harness View:



Combination Meter (Left Side of Vehicle)
Connector Front View:



(a) Disconnect the E7 and C9 connectors.
(b) Measure the resistance according to the value(s) in the table below.

Standard:

Tester Connection	Specified Condition
E7–14 – C9–7	Below 1 Ω
E7–14 – Body ground	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

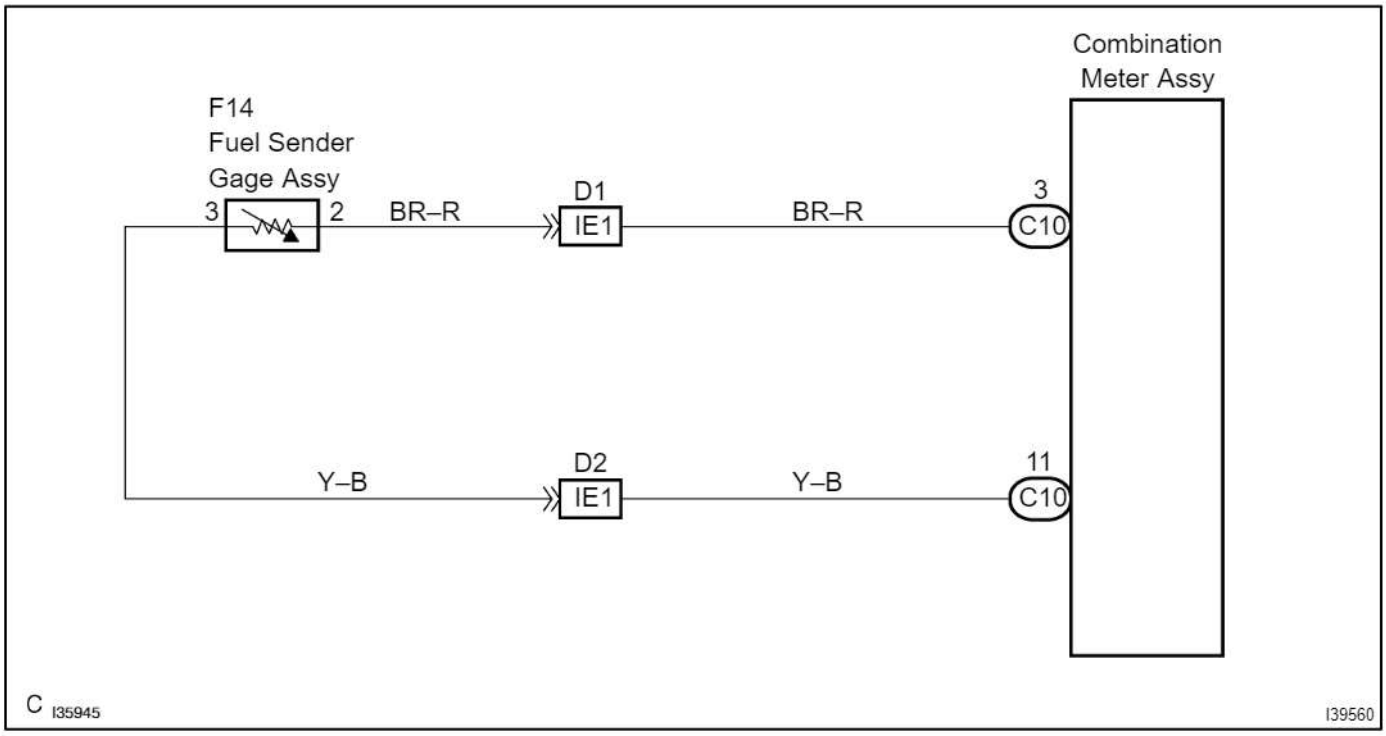
OK

REPLACE ECM (2UZ–FE: See page 10–24)(1GR–FE: See page 10–11)

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MALFUNCTION IN FUEL RECEIVER GAUGE

WIRING DIAGRAM

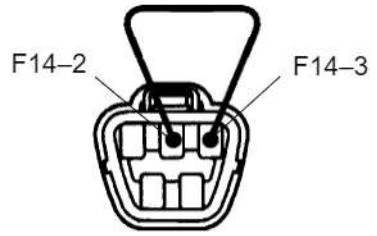


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INSPECTION PROCEDURE

1 INSPECT HARNESS OR CONNECTOR

Fuel Sender Gage
Connector Front View:



(a) Disconnect the connector from the fuel sender gage assy.
(b) Check the meter indicator conditions according to the table below.

Standard:

Tester Connection	Condition	Specified Condition
2 – 3	Short circuit (Ignition switch ON)	Fuel gage indicates "F" or more (Combination meter)

(c) Measure the voltage according to the value(s) in the table below.

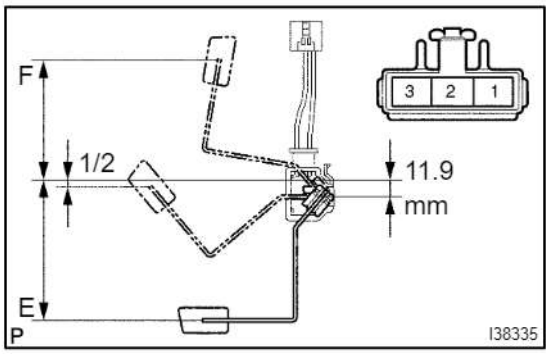
Standard:

Tester Connection	Condition	Specified Condition
2 – Body ground	Ignition switch ON	4 to 5 V

NG → **Go to step 3**

OK

2 INSPECT FUEL SENDER GAGE ASSY



(a) Remove the fuel sender gage assy.
(b) Check that the float position is between E and F and measure the resistance between terminals 2 and 3 of the connector.
(c) Measure the resistance according to the value(s) in the table below.

Standard:

Float level	Float position mm (in.)	Resistance (Ω)
F	88.6 (3.49) | 3 (0.12)	4.0 | 1
1/2	6.4 (0.25)	59
E	102.9 (4.05) | 3 (0.12)	110.0 | 2.5

NG → **REPLACE FUEL SENDER GAGE ASSY**

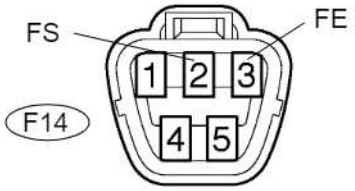
OK

Go to step 4

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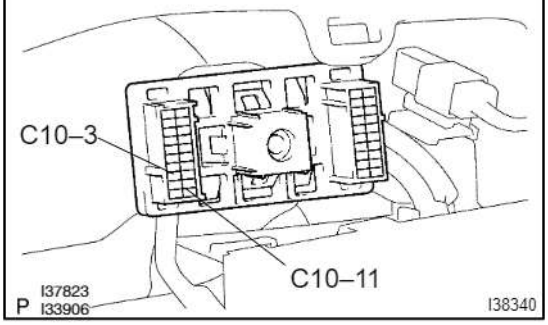
3	CHECK HARNESS AND CONNECTOR(BETWEEN FUEL SENDER GAGE ASSY AND COMBINATION METER ASSY)

Fuel Sender Gage
Connector Front View:



N

Combination Meter (Right Side of Vehicle)
Connector Front View:



(a) Disconnect the F14 and C10 connectors.
(b) Measure the resistance according to the value(s) in the table below.

Standard:

Tester Connection	Specified Condition
F14–2 – C10–3	Below 1 Ω
F14–2 – Body ground	10 kΩ or higher
F14–3 – C10–11	Below 1 Ω
F14–3 – Body ground	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4	INSPECT INCLINATION SENSOR ASSY

(a) Inspect the inclination sensor assy (See page 71–7).

NG → **REPLACE INCLINATION SENSOR ASSY**

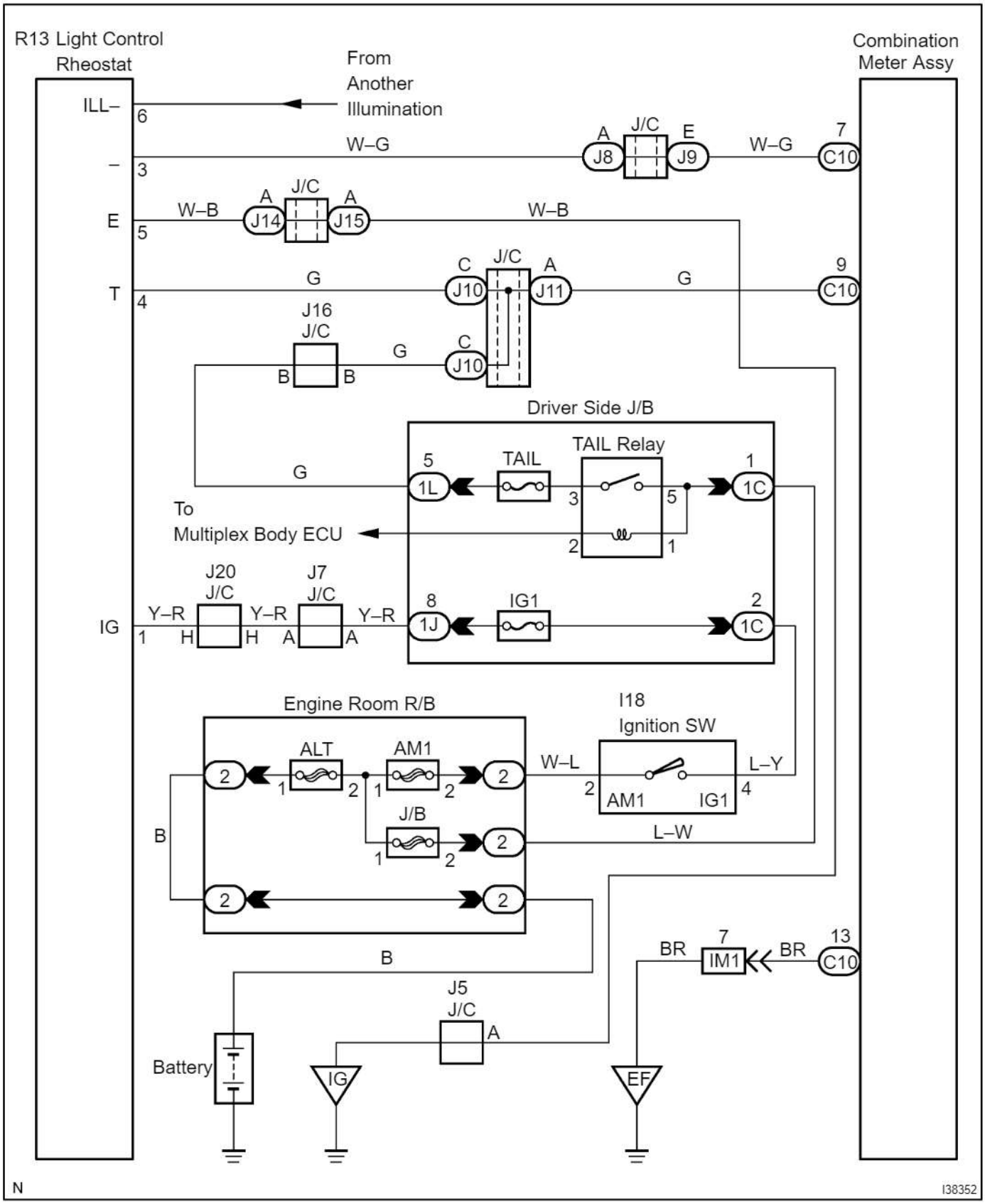
OK

REPLACE COMBINATION METER ASSY (See page 71–22)

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OPERATING LIGHT CONTROL RHEOSTAT DOES NOT CHANGE LIGHT BRIGHTNESS

WIRING DIAGRAM



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INSPECTION PROCEDURE

1	CHECK TAIL LIGHT

(a) Check that the tail light comes on when the ignition switch is turned to the ON position and light control switch is in the TAIL or HEAD position.
Standard:
Tail light comes on.

NG → **GO TO LIGHTING SYSTEM (See page 05–1483)**

OK

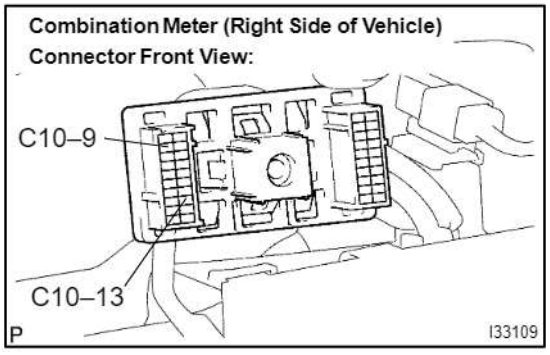
2	CHECK ILLUMINATION

(a) Check that the illumination of the radio and player, center cluster module switch, etc. can be adjusted by the rheostat switch.
Standard:
The illumination can be adjusted.

NG → **Go to step 6**

OK

3	INSPECT COMBINATION METER ASSY



(a) Disconnect the C10 connector.
(b) Measure the voltage according to the value(s) in the table below.
Standard:

Tester Connection	Condition	Specified Condition
C10–9 – Body ground	Ignition switch ON and Light control switch TAIL or HEAD	10 to 14 V

(c) Measure the resistance according to the value(s) in the table below.
Standard:

Tester Connection	Specified Condition
C10–13 – Body ground	Below 1 Ω

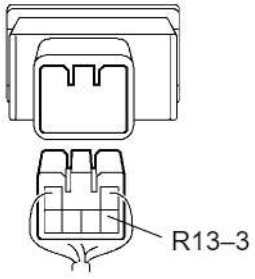
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

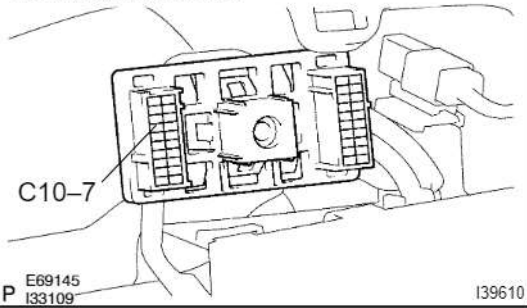
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4	CHECK HARNESS AND CONNECTOR(BETWEEN LIGHT CONTROL RHEOSTAT AND COMBINATION METER ASSY)

Light Control Rheostat Wire Harness View:



Combination Meter (Right Side of Vehicle) Connector Front View:



(a) Disconnect the R13 and C10 connectors.

(b) Measure the resistance according to the value(s) in the table below.

Standard:

Tester Connection	Specified Condition
R13–3 – C10–7	Below 1 Ω
R13–3 – Body ground	10 kΩ or higher

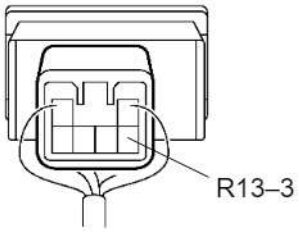
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

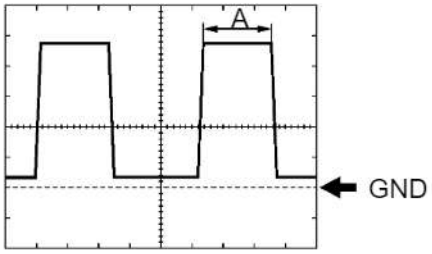
OK

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5 INSPECT LIGHT CONTROL RHEOSTAT

Light Control Rheostat
Wire Harness View:





(a) Measure the voltage according to the value(s) in the table below.

Standard:

Tester Connection	Condition	Specified Condition
R13–3 – Body ground	Light control rheostat is turned volume up → volume down	Pulse generation (*1)

HINT:
Inspection using oscilloscope (*1).

Item	Condition
Tool setting	2 V/DIV, 1 ms/DIV
Vehicle condition	Ignition switch ON
Vehicle condition	Light control switch TAIL or HEAD

HINT:
Duty ratio changes as illumination becomes darker ("A" becomes longer).

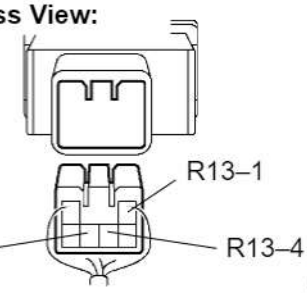
NG → **REPLACE LIGHT CONTROL RHEOSTAT**

OK

REPLACE COMBINATION METER ASSY (See page 71–22)

6 INSPECT LIGHT CONTROL RHEOSTAT(POWER SOURCE)

Light Control Rheostat
Wire Harness View:



(a) Disconnect the R13 connector.
(b) Measure the voltage according to the value(s) in the table below.

Standard:

Tester Connection	Condition	Specified Condition
R13–1 – Body ground	Ignition switch ON	10 to 14 V
R13–4 – Body ground	Light control switch TAIL or HEAD	10 to 14 V

(c) Measure the resistance according to the value(s) in the table below.

Standard:

Tester Connection	Specified Condition
R13–5 – Body ground	Below 1 Ω

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

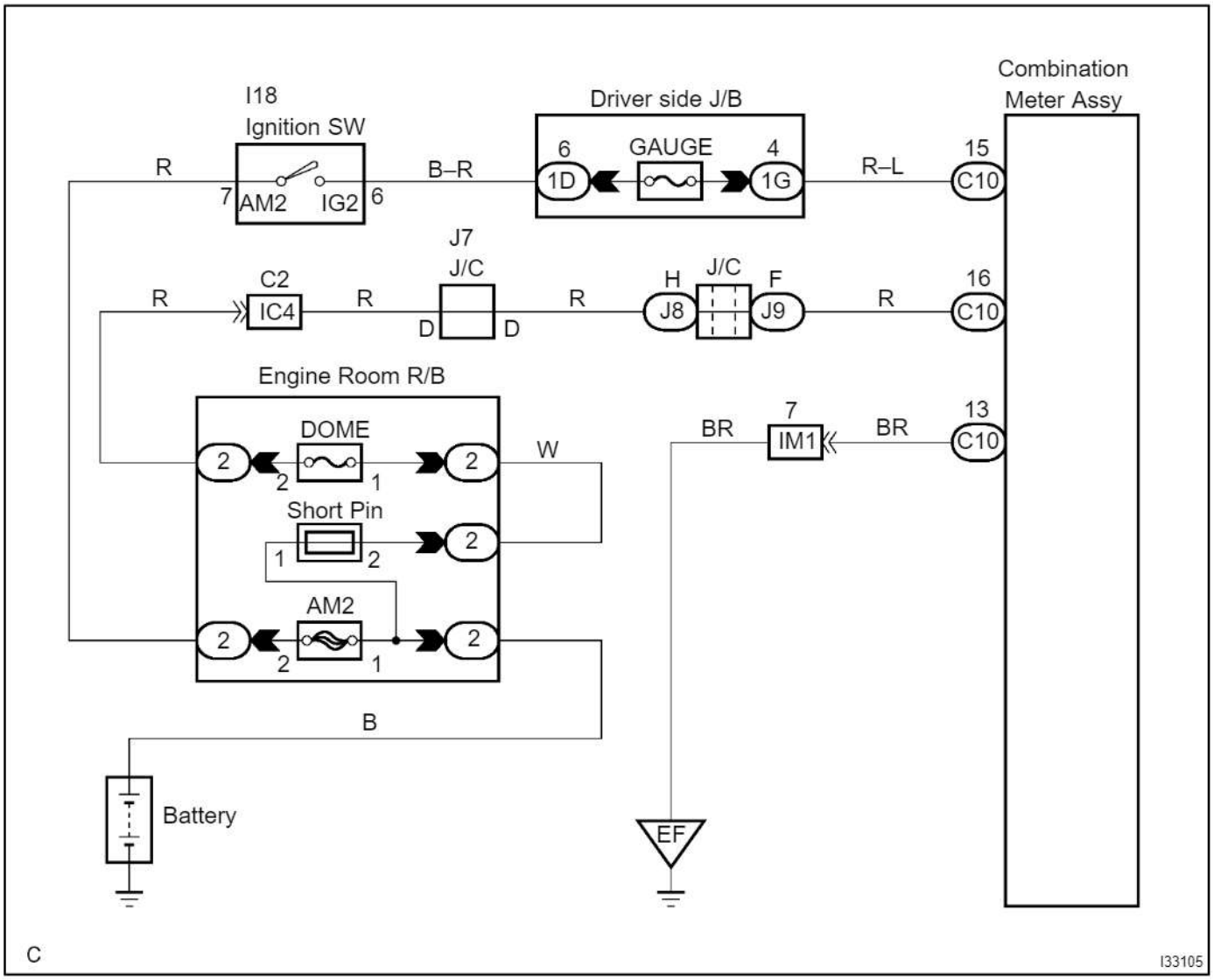
OK

REPLACE LIGHT CONTROL RHEOSTAT

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ENTIRE COMBINATION METER DOES NOT OPERATE

WIRING DIAGRAM



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INSPECTION PROCEDURE

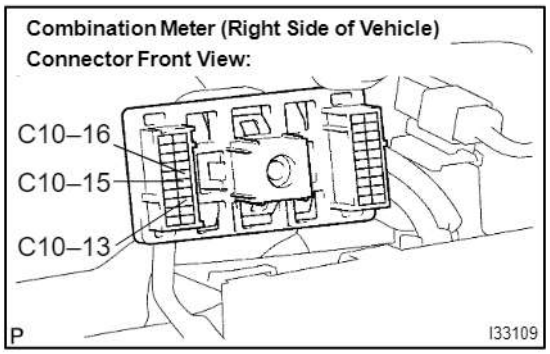
1	INSPECT FUSE

(a) Check the AM2 fuse in the engine room R/B.
Standard:
Below 1 Ω
(b) Check the GAUGE fuse in the driver side J/B.
Standard:
Below 1 Ω
(c) Check the DOME fuse in the engine room R/B.
Standard:
Below 1 Ω

NG → **REPLACE FUSE**

OK

2	INSPECT COMBINATION METER ASSY



(a) Disconnect the C10 connector.
(b) Measure the voltage according to the value(s) in the table below.
Standard:

Tester Connection	Condition	Specified Condition
C10–16 – Body ground	Always	10 to 14 V
C10–15 – Body ground	Ignition switch ON	10 to 14 V

(c) Measure the resistance according to the value(s) in the table below.
Standard:

Tester Connection	Condition	Specified Condition
C10–13 – Body ground	Always	Below 1 Ω

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

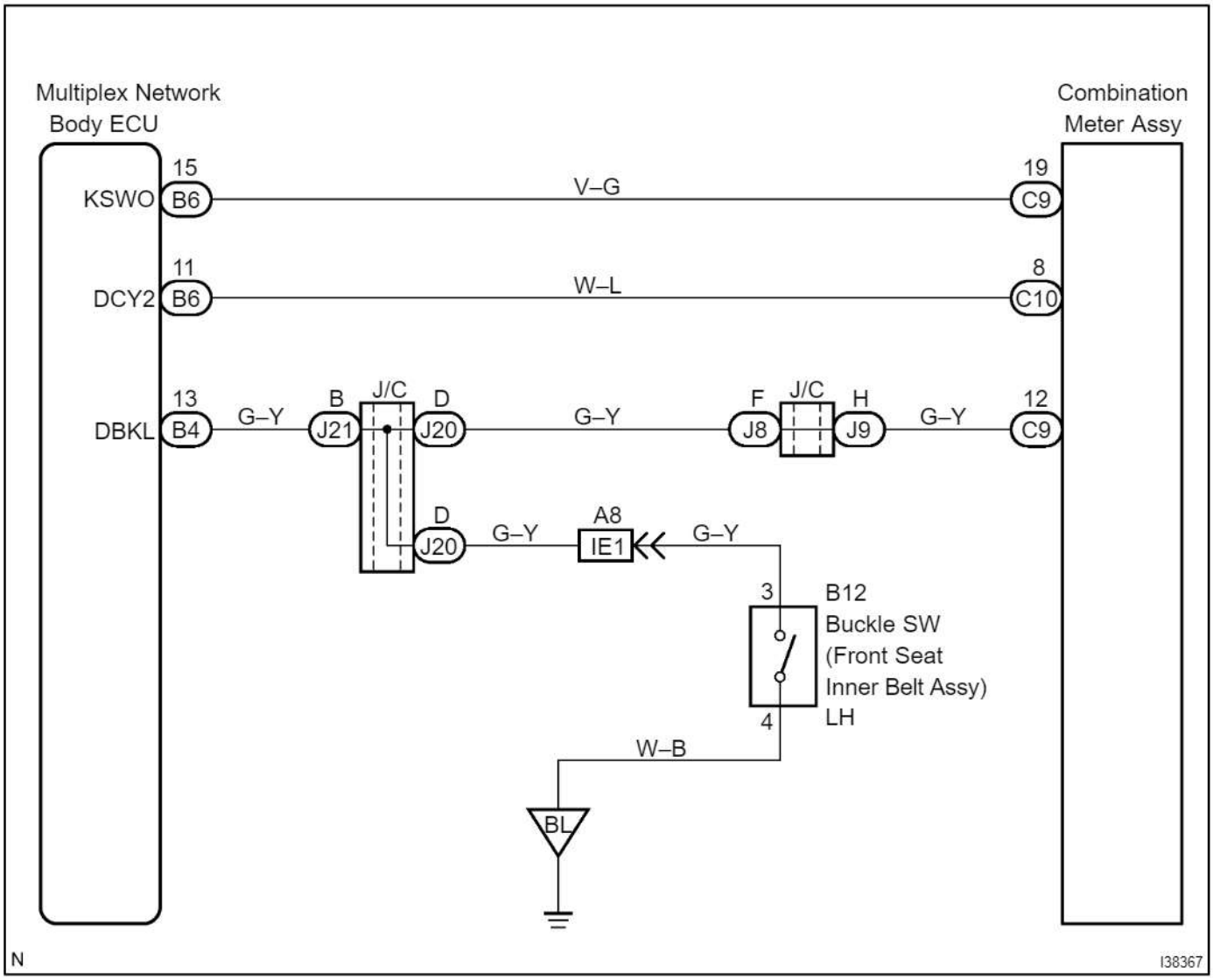
OK

REPLACE COMBINATION METER ASSY (See page 71–22)

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BUZZER DOES NOT SOUND (KEY REMINDER WARNIING, SEAT BELT WARNING)

WARNING DIAGRAM



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INSPECTION PROCEDURE

1 CHECK BUZZER

(a) Check that all of the warning buzzers sound.

A	All warning buzzers do not sound
B	Key reminder warning buzzer does not sound
C	Seat belt warning buzzer does not sound

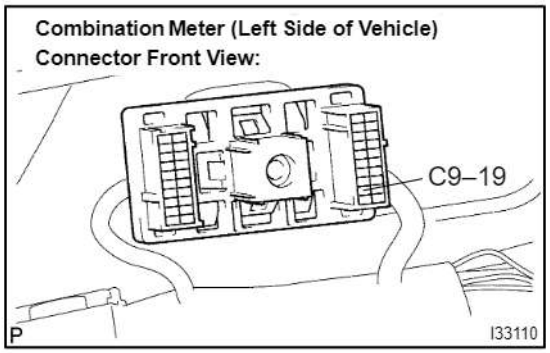
B → **Go to step 2**

C → **Go to step 4**

A

REPLACE COMBINATION METER ASSY (See page 71–22)

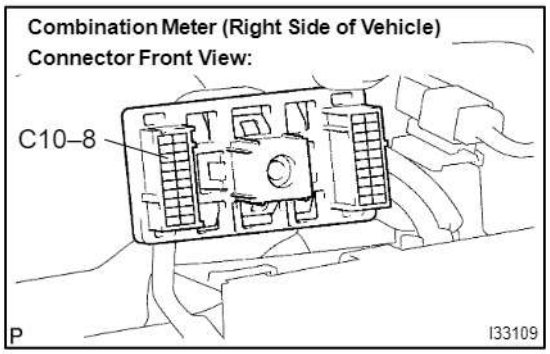
2 INSPECT COMBINATION METER ASSY



(a) Disconnect the C9 connector.
(b) Measure the voltage according to the value(s) in the table below.

Standard:

Tester Connection	Condition	Specified Condition
C9–19 – Body ground	Key is inserted	Below 1 V
C9–19 – Body ground	Key is not inserted	10 to 14 V



(c) Disconnect the C10 connector.
(d) Measure the voltage according to the value(s) in the table below.

Standard:

Tester Connection	Condition	Specified Condition
C10–8 – Body ground	Door is open	Below 1 V
C10–8 – Body ground	Door is closed	10 to 14 V

NG → **Go to step 3**

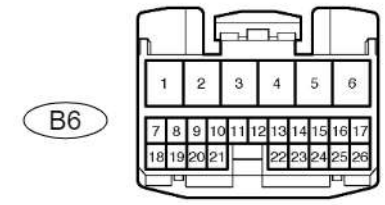
OK

REPLACE COMBINATION METER ASSY (See page 71–22)

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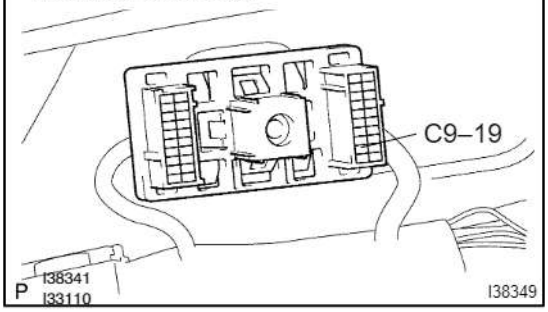
3	CHECK HARNESS AND CONNECTOR(BETWEEN MULTIPLEX NETWORK BODY ECU AND COMBINATION METER ASSY)

Multiplex Network Body ECU
Connector Front View:



N

Combination Meter (Left Side of Vehicle)
Connector Front View:

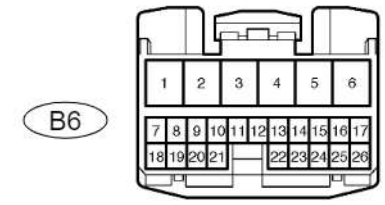


(a) Disconnect the B6 and C9 connectors.
(b) Measure the resistance according to the value(s) in the table below.

Standard:

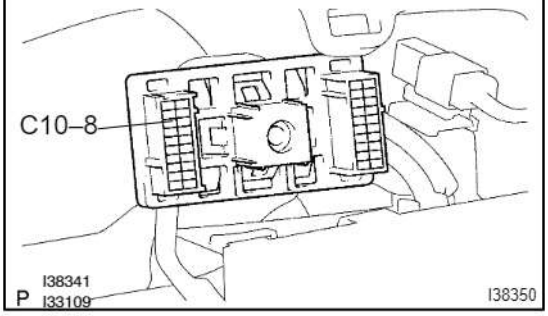
Tester Connection	Specified Condition
B6–15 – C9–19	Below 1 Ω
B6–15 – Body ground	10 kΩ or higher

Multiplex Network Body ECU
Connector Front View:



N

Combination Meter (Right Side of Vehicle)
Connector Front View:



(c) Disconnect the B6 and C10 connectors.
(d) Measure the resistance according to the value(s) in the table below.

Standard:

Tester Connection	Specified Condition
B6–11 – C10–8	Below 1 Ω
B6–11 – Body ground	10 kΩ or higher

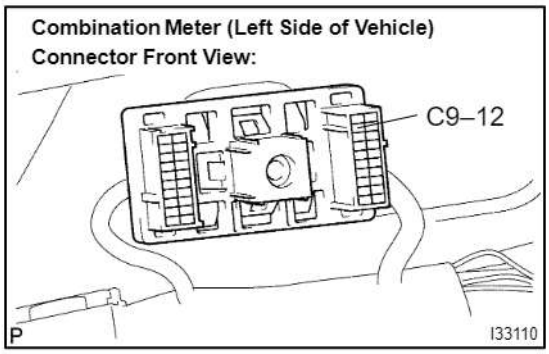
NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

GO TO KEY REMINDER WARNING SYSTEM (See page 05–1854)

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4 INSPECT COMBINATION METER ASSY



(a) Disconnect the C9 connector.
(b) Measure the resistance according to the value(s) in the table below.

Standard:

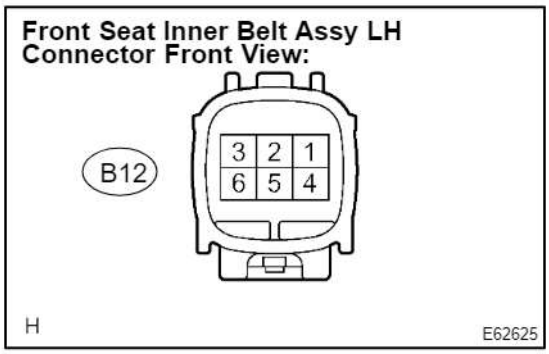
Tester Connection	Condition	Specified Condition
C9–12 – Body ground	Seat belt is unfastened	Below 1 Ω
C9–12 – Body ground	Seat belt is fastened	10 kΩ or higher

NG → **Go to step 5**

OK

REPLACE COMBINATION METER ASSY (See page 71–22)

5 INSPECT FRONT SEAT INNER BELT ASSY LH



(a) Measure the resistance according to the value(s) in the table below.

Standard:

Tester Connection	Condition	Specified Condition
3 – 4	Seat belt is unfastened	Below 1 Ω
3 – 4	Seat belt is fastened	10 kΩ or higher

NG → **REPLACE FRONT SEAT INNER BELT ASSY LH**

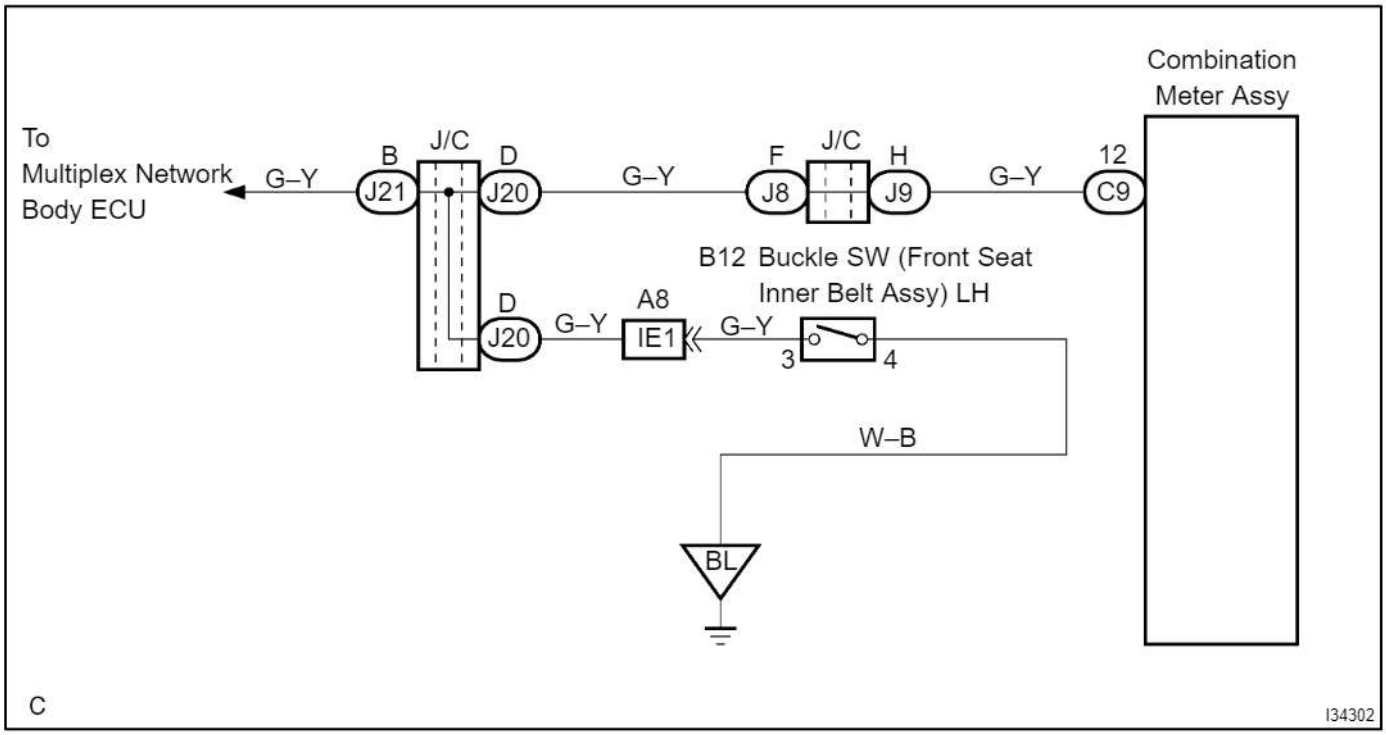
OK

REPAIR OR REPLACE HARNESS OR CONNECTOR

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SEAT BELT WARNING LAMP FOR DRIVER'S SEAT DOES NOT OPERATE

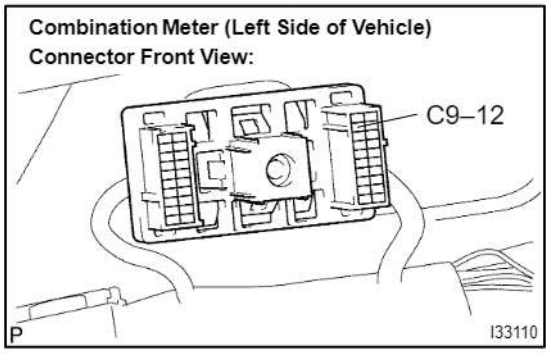
WIRING DIAGRAM



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INSPECTION PROCEDURE

1 INSPECT COMBINATION METER ASSY



(a) Disconnect the C9 connector.
(b) Measure the resistance according to the value(s) in the table below.

Standard:

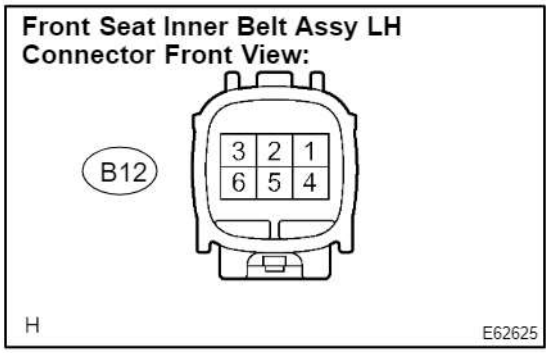
Tester Connection	Condition	Specified Condition
C9–12 – Body ground	Seat belt is unfastened	Below 1 Ω
C9–12 – Body ground	Seat belt is fastened	10 kΩ or higher

NG → **Go to step 2**

OK

REPLACE COMBINATION METER ASSY (See page 71–22)

2 INSPECT FRONT SEAT INNER BELT ASSY LH



(a) Measure the resistance according to the value(s) in the table below.

Standard:

Terminal No.	Condition	Specified Condition
3 – 4	Seat belt is unfastened	Below 1 Ω
3 – 4	Seat belt is fastened	10 kΩ or higher

NG → **REPLACE FRONT SEAT INNER BELT ASSY LH**

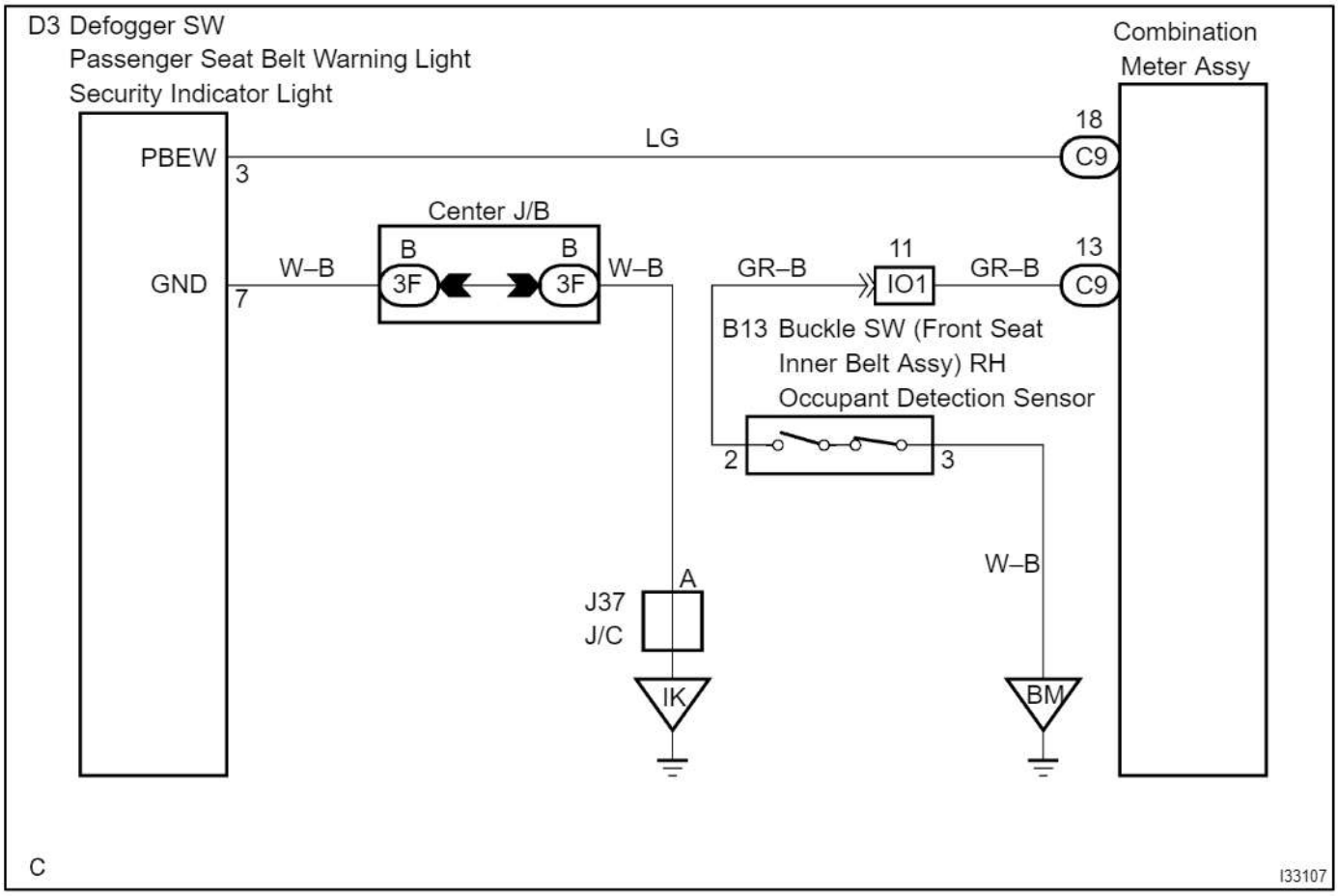
OK

REPAIR OR REPLACE HARNESS OR CONNECTOR

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SEAT BELT WARNING LAMP FOR FRONT PASSENGER'S SEAT DOES NOT FLASH

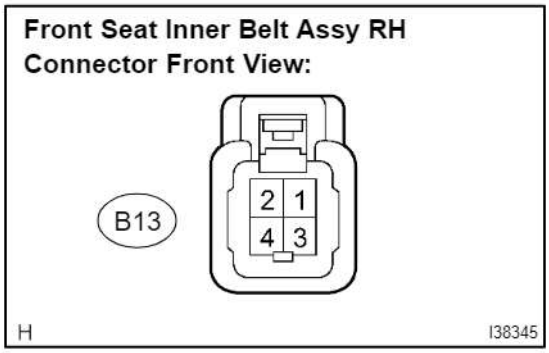
WIRING DIAGRAM



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INSPECTION PROCEDURE

1 INSPECT FRONT SEAT INNER BELT ASSY RH



(a) Measure the resistance according to the value(s) in the table below.

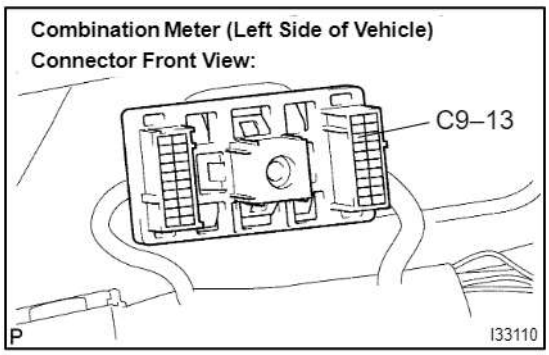
Standard:

Tester Connection	Condition	Specified Condition
2 – 3	Seat belt is unfastened	Below 1 Ω
2 – 3	Seat belt is fastened	10 kΩ or higher

NG → **REPLACE FRONT SEAT INNER BELT ASSY RH**

OK

2 INSPECT COMBINATION METER ASSY



(a) Disconnect the C9 connector.

(b) Measure the resistance according to the value(s) in the table below.

Standard:

Tester Connection	Condition	Specified Condition
C9–13 – Body ground	Seat belt is unfastened	Below 1 Ω
C9–13 – Body ground	Seat belt is fastened	10 kΩ or higher

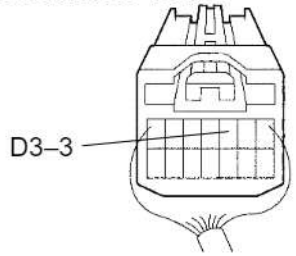
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

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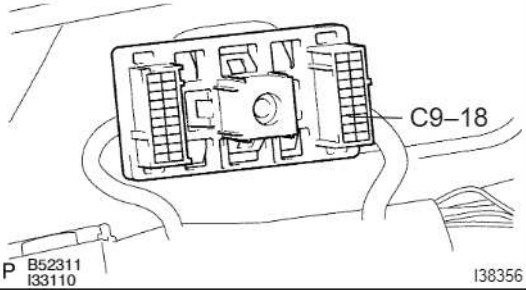
3	CHECK HARNESS AND CONNECTOR(BETWEEN AIR CONDITIONING CONTROL ASSY AND COMBINATION METER ASSY)

Air Conditioning Control Assy
Wire Harness View:



P

Combination Meter (Left Side of Vehicle)
Connector Front View:



P B52311
I33110

I38356

(a) Disconnect the D3 and C9 connectors.
(b) Measure the resistance according to the value(s) in the table below.

Standard:

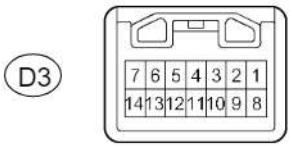
Tester Connection	Specified Condition
D3–3 – C9–18	Below 1 Ω
D3–3 – Body ground	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4	INSPECT AIR CONDITIONING CONTROL ASSY(PASSENGER SEAT BELT WARNING LIGHT)

Air Conditioning Control Assy
Connector Front View:



I33901

(a) Disconnect air conditioning control connector.
(b) Connect the positive (+) lead from the battery to the terminal 3 and negative (–) lead from the battery to the terminal 7.

Standard:
Warning light blinks.

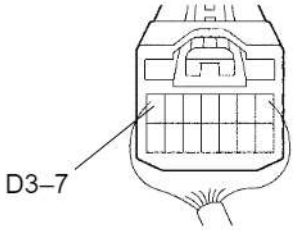
NG → **REPLACE AIR CONDITIONING CONTROL ASSY**

OK

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5	CHECK HARNESS AND CONNECTOR(BETWEEN AIR CONDITIONING CONTROL ASSY AND GROUND CIRCUIT)

Air Conditioning Control Assy Wire Harness View:



(a) Disconnect the D3 connector.
(b) Measure the resistance according to the value(s) in the table below.

Standard:

Tester Connection	Specified Condition
D3–7 – Body ground	Below 1 Ω

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE COMBINATION METER ASSY (See page 71–22)

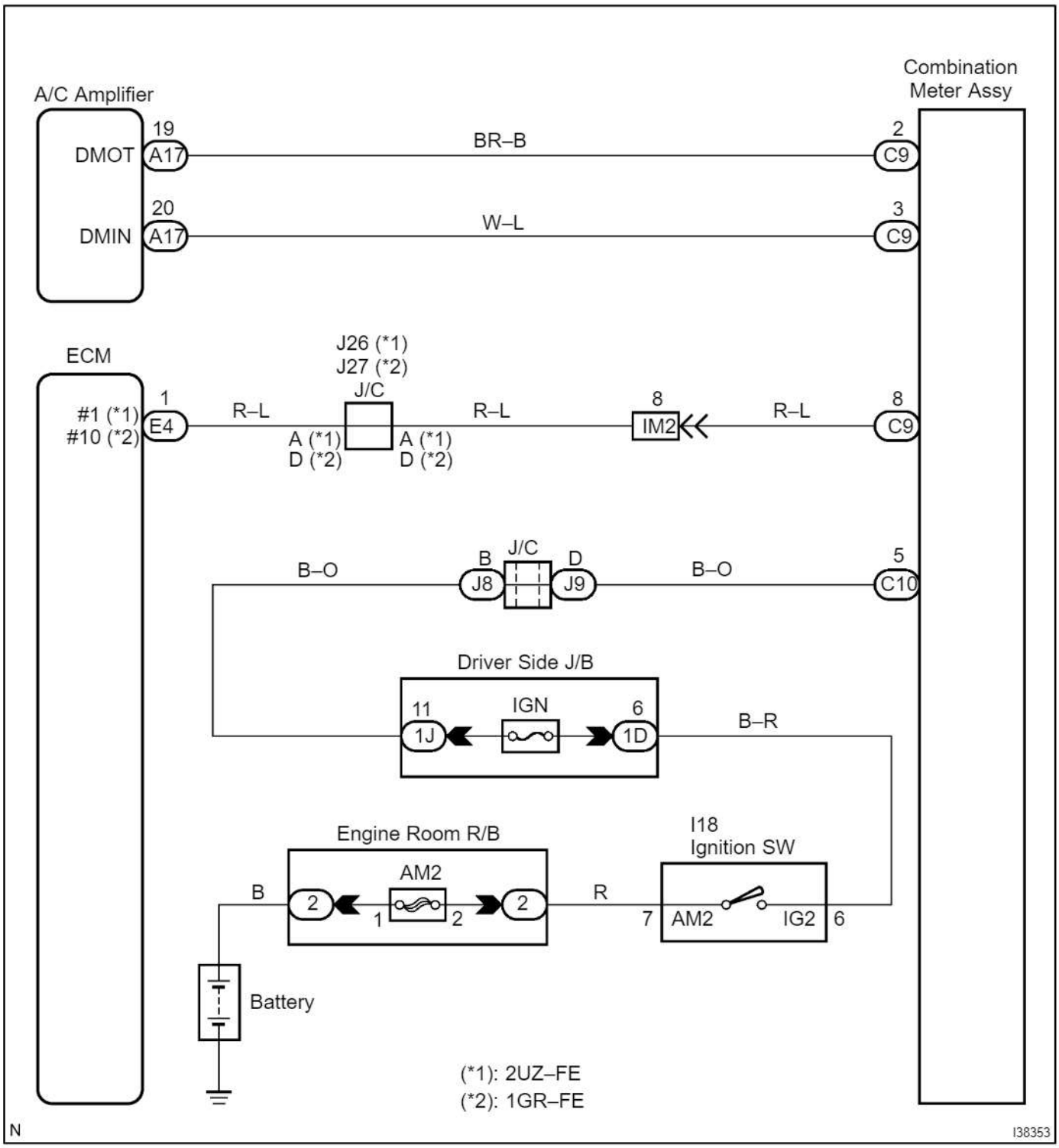
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MALFUNCTION IN AVERAGE FUEL CONSUMPTION/INSTANTANEOUS FUEL CONSUMPTION/POSSIBLE RUNNING DISTANCE DISPLAY

CIRCUIT DESCRIPTION

Confirm that the speedometer, the tachometer, the fuel receiver gauge and SFI system are normal, then check this circuit.
Refer to SFI system for 2UZ–FE (See page 05–156) or 1GR–FE (See page 05–469).

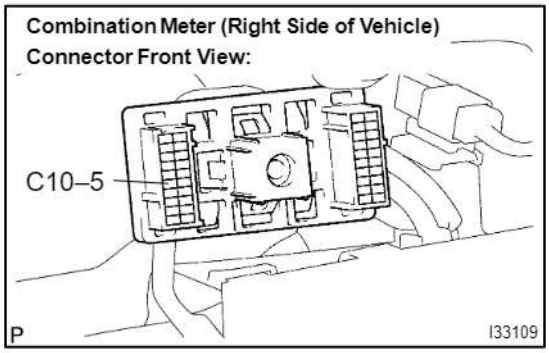
WIRING DIAGRAM



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INSPECTION PROCEDURE

1 INSPECT COMBINATION METER ASSY(TAU–B)



(a) Disconnect the C10 connector.
(b) Measure the voltage according to the value(s) in the table below.

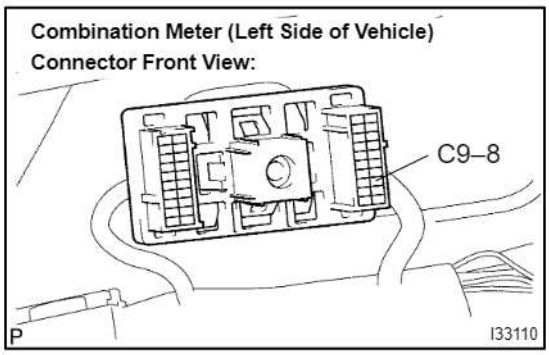
Standard:

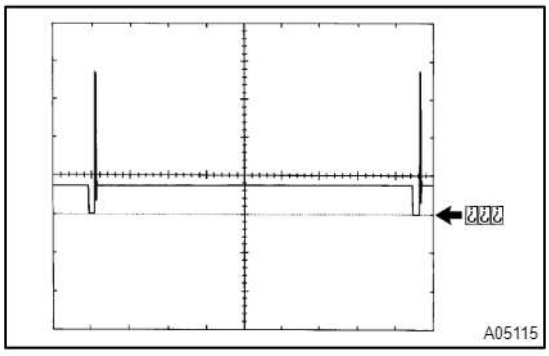
Tester Connection	Condition	Specified Condition
C10–5 – Body ground	Ignition switch ON	10 to 14 V

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

2 INSPECT COMBINATION METER ASSY(TAU–G)





INSPECTION USING OSCILLOSCOPE

(a) Check the input signal waveform.
  (1) Remove the combination meter assy.
  (2) Connect the oscilloscope to terminal C9–8 and body ground.
  (3) Start the engine.
  (4) Check the signal waveform according to the condition(s) in the table below.

Item	Condition
Tool setting	10 V/DIV, 20 ms/DIV
Vehicle condition	Engine idle speed

HINT:
As the engine speed goes higher, the frequency becomes shorter.

NG → **Go to step 3**

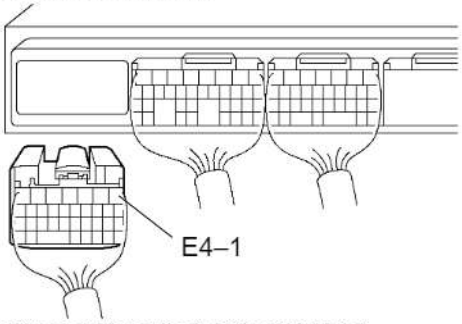
OK

Go to step 4

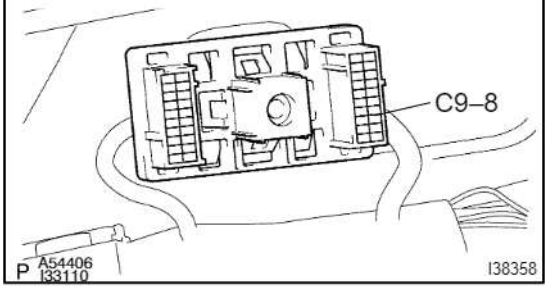
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3	CHECK HARNESS AND CONNECTOR(BETWEEN ECM AND COMBINATION METER ASSY)

ECM
Wire Harness View:



Combination Meter (Left Side of Vehicle)
Connector Front View:



(a) Disconnect the E4 and C9 connectors.
(b) Measure the resistance according to the value(s) in the table below.

Standard:

Tester Connection	Specified Condition
E4–1 – C9–8	Below 1 Ω
E4–1 – Body ground	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4	CHECK HEATER CONTROL PANEL(LCD DISPLAY)

(a) Check the LCD display appears.

Standard:
LCD display appears.

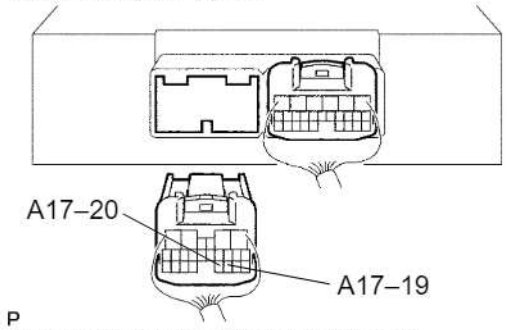
NG → **GO TO AIR CONDITIONING SYSTEM (See page 05–1210)**

OK

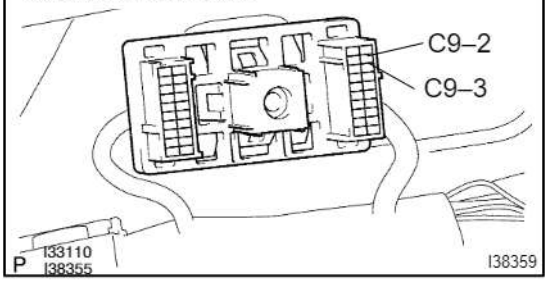
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5	CHECK HARNESS AND CONNECTOR(BETWEEN AIR CONDITIONING AMPLIFIER AND COMBINATION METER ASSY)

Air Conditioning Amplifier Wire Harness View:



Combination Meter (Left Side of Vehicle) Connector Front View:



(a) Disconnect the A17 and C9 connectors.
(b) Measure the resistance according to the value(s) in the table below.

Standard:

Tester Connection	Specified Condition
A17–19 – C9–2	Below 1 Ω
A17–19 – Body ground	10 kΩ or higher
A17–20 – C9–3	Below 1 Ω
A17–20 – Body ground	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE COMBINATION METER ASSY (See page 71–22)

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POWER WINDOW CONTROL SYSTEM

059YM-01

HOW TO PROCEED WITH TROUBLESHOOTING

HINT:

Troubleshoot in accordance with the procedures on the following pages.

1	VEHICLE BROUGHT TO WORKSHOP

2	CUSTOMER PROBLEM ANALYSIS CHECK AND SYMPTOM CHECK (See page 05–1735)

3	PROBLEM SYMPTOMS TABLE (See page 05–1739)

4	PERFORM TROUBLESHOOTING

(a) Pre–check (See page 05–1736)

(b) Circuit inspection (See pages 05–1740 – 05–1757)

5	ADJUST, REPAIR OR REPLACE

6	RESET POWER WINDOW MOTOR

(a) If any of the power window switch illuminations is blinking after repair, reset the power window.

(1) Turn the ignition switch ON.

(2) Open the driver side door glass.

(3) Fully pull up the AUTO switch of the power window master switch until the door glass is fully closed.

(4) Check that the AUTO UP/DOWN function operates normally.

END

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059YN-01

CUSTOMER PROBLEM ANALYSIS CHECK

POWER WINDOW CONTROL SYSTEM Check Sheet

Inspector's name: _____

Customer's Name		**Registration No.**	
		Registration Year	
		Frame No.	
Date Vehicle Brought in	/ /	**Odometer Reading**	km miles

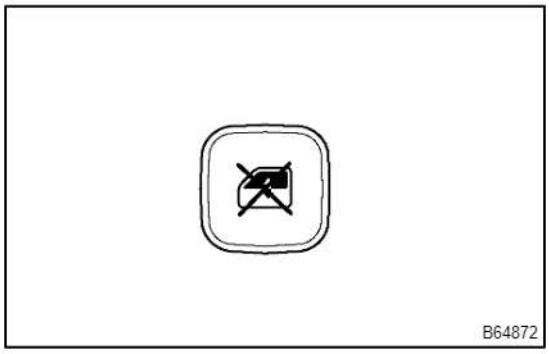
Date Problem First Occurred		/ /
Frequency Problem Occurs		Constant Sometimes (times per day, month) Once only
Weather Conditions When Problem Occurred	**Weather**	Fine Cloudy Rainy Snowy Various/Others
	Outdoor Temperature	Hot Warm Cool Cold (°C [°F])

Malfunction Symptoms	AUTO UP/DOWN function does not operate	
	Remote UP/DOWN function does not operate	
	Door glass goes down during AUTO UP operation	
	Manual UP/DOWN function does not operate	
	All Driver side Passenger side Rear LH Rear RH	
Condition When Recovered Normal		IG ON Engine started ( ) Switch operated
Condition When Problem Occurred	Yes ☐ No	IG OFF ☐ ON ( ) Switch operated Others ( )

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059YQ–01

PRE–CHECK



1. CHECK WINDOW LOCK SWITCH

(a) Check that operation of the door glasses except the driver side door glass and the back door glass and the roof glass is disabled when the window lock switch of the power window master switch is pressed.

(b) Check that the door glasses, the back door glass and the roof glass can be operated when the window lock switch is pressed again.

2. CHECK MANUAL UP/DOWN FUNCTION

(a) Check that the door glass can be operated using the master switch as follows.

Standard:

Condition	Master Switch	Switch Operation	Door Glass
Ignition switch ON	AUTO	Pull halfway UP	UP (Closed)
		Push halfway DOWN	DOWN (Open)

(b) Check that each door glass can be operated using each power window switch as follows.

Standard:

Condition	Switch	Switch Operation	Door Glass
□Ignition switch ON □Window lock switch OFF	Passenger Side	Pull UP	UP (Closed)
		Push DOWN	DOWN (Open)
	Rear LH	Pull UP	UP (Closed)
		Push DOWN	DOWN (Open)
	Rear RH	Pull UP	UP (Closed)
		Push DOWN	DOWN (Open)

3. CHECK AUTO UP/DOWN FUNCTION

(a) Check that the door glass can be operated using the master switch as follows.

Standard:

Condition	Master Switch	Switch Operation	Door Glass
Ignition switch ON	AUTO	Pull fully UP	AUTO UP (Fully closed)
		Push fully DOWN	AUTO DOWN (Fully open)

4. CHECK REMOTE UP/DOWN FUNCTION

(a) Check that the door glasses other than the driver side door glass can be operated using the master switch as follows.

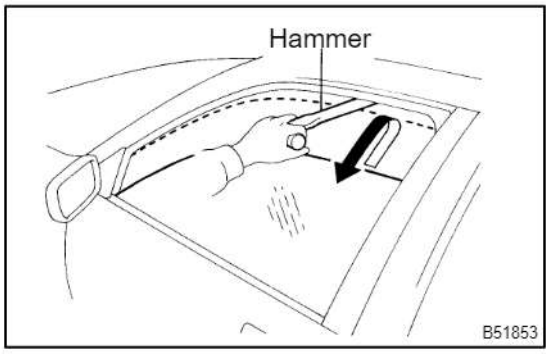
Standard:

Condition	Master Switch	Switch Operation	Door Glass
□Ignition switch ON □Window lock switch OFF	Passenger side	Pull UP	UP (Closed)
		Push DOWN	DOWN (Open)
	Rear LH	Pull UP	UP (Closed)
		Push DOWN	DOWN (Open)
	Rear RH	Pull UP	UP (Closed)
		Push DOWN	DOWN (Open)

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5. CHECK POWER WINDOW OPERATION FUNCTION AFTER IGNITION OFF

(a) When both of the following conditions are fulfilled, check that the door glasses, the back door glass and the roof glass can be operated even after the ignition switch is turned OFF:
- □ Within 45 seconds after the ignition switch is turned OFF
- □ The driver side door is closed



6. CHECK JAM PROTECTION FUNCTION (DRIVER SIDE)

HINT:

The jam protection function prevents any part of your body from getting caught by accident between the door frame and the door glass during power window operation.

(a) Check that the door glass goes down by approximately 50 mm (2.0 in.) right when something gets caught between the door frame and door glass during power window operation. However, when the opening amount between the vehicle body and the door glass is less than 200 mm (7.9 in.), the door glass keeps going down until the opening amount reaches 200 mm (7.9 in.) and stops there.

Operative condition:
- □ AUTO UP
- □ AUTO UP operation after the ignition switch OFF
- □ MANUAL UP operation after the ignition switch OFF

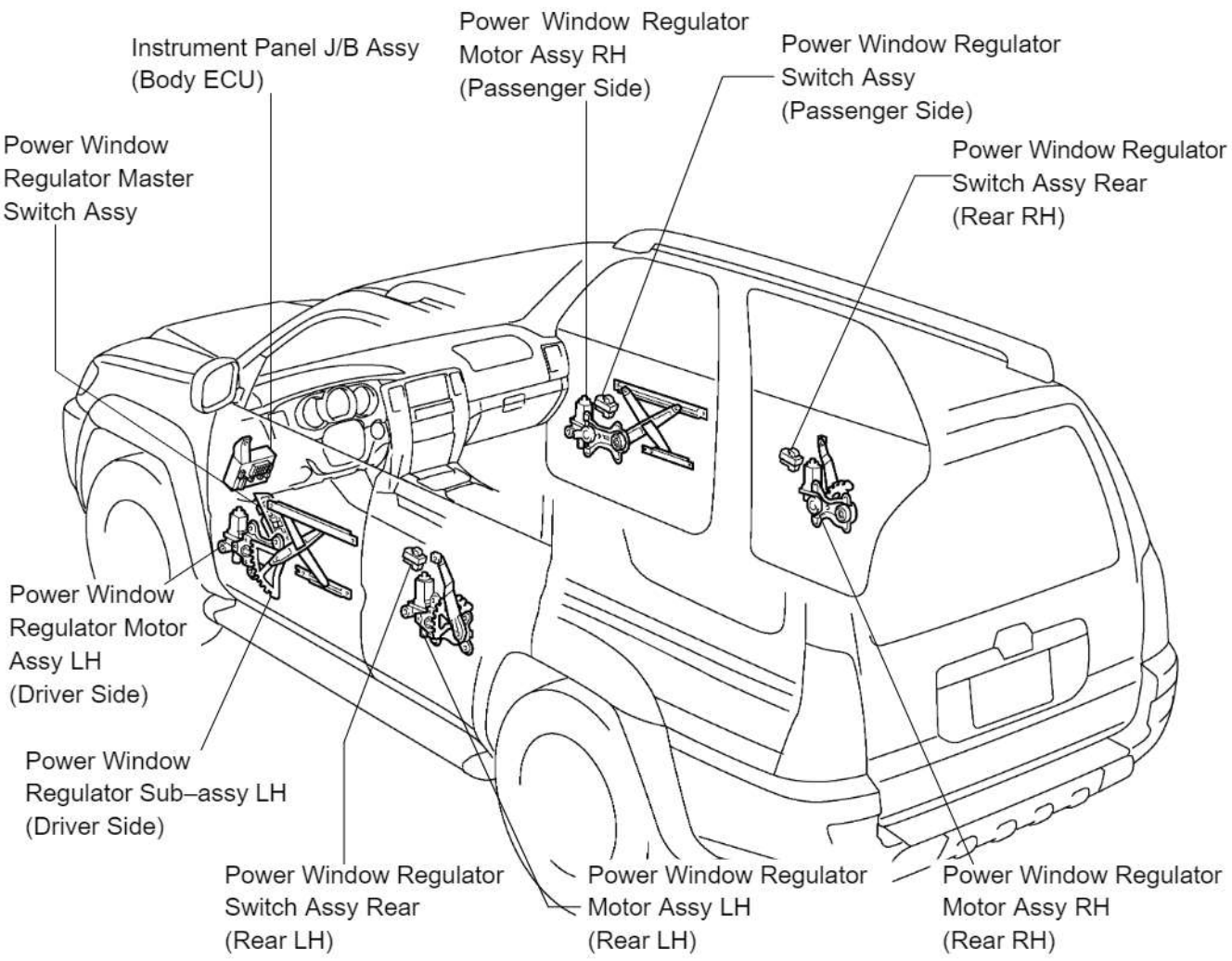
7. CHECK POWER WINDOW FAIL–SAFE FUNCTION

(a) If the pulse sensor of the power window motor malfunctions, the power window functions will be restricted:
- □ The AUTO UP/DOWN and the remote UP/DOWN functions are disabled.
- □ The manual UP/DOWN function can be performed via each power window switch.

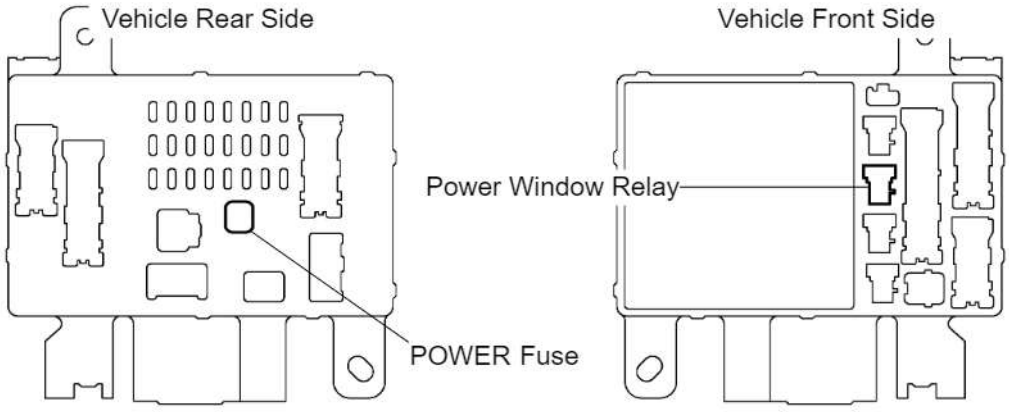
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059YO–01

LOCATION



Instrument Panel J/B Assy (Body ECU)



B62912

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059YP-01

PROBLEM SYMPTOMS TABLE

Symptoms	Suspected Part	See Page
AUTO UP/DOWN function does not operate	1. Power window regulator motor assy LH (Driver side) 2. Wire harness 3. Power window regulator master switch assy	05–1740
Remote UP/DOWN function does not operate	1. Power window regulator motor assy LH (Driver side) 2. Power window regulator master switch assy 3. Wire harness	05–1743
Manual UP/DOWN function does not operate on driver side	1. Power window regulator master switch assy 2. Power window regulator motor assy LH (Driver side) 3. Wire harness	05–1746
Manual UP/DOWN function does not operate on passenger side	1. Power window regulator switch assy (Passenger side) 2. Power window regulator motor assy RH (Passenger side) 3. Wire harness	05–1748
Manual UP/DOWN function does not operate on rear LH	1. Power window regulator switch assy rear (Rear LH) 2. Power window regulator motor assy LH (Rear LH) 3. Wire harness	05–1751
Manual UP/DOWN function does not operate on rear RH	1. Power window regulator switch assy rear (Rear RH) 2. Power window regulator motor assy RH (Rear RH) 3. Wire harness	05–1754
Power windows do not operate at all	1. POWER fuse 2. Power window relay 3. Power window regulator master switch assy 4. Wire harness 5. Instrument panel J/B assy	05–1757
Door glass goes down during AUTO UP operation	1. Front door glass run LH 2. Front door window glass LH 3. Front door window regulator sub–assy LH	05–1760

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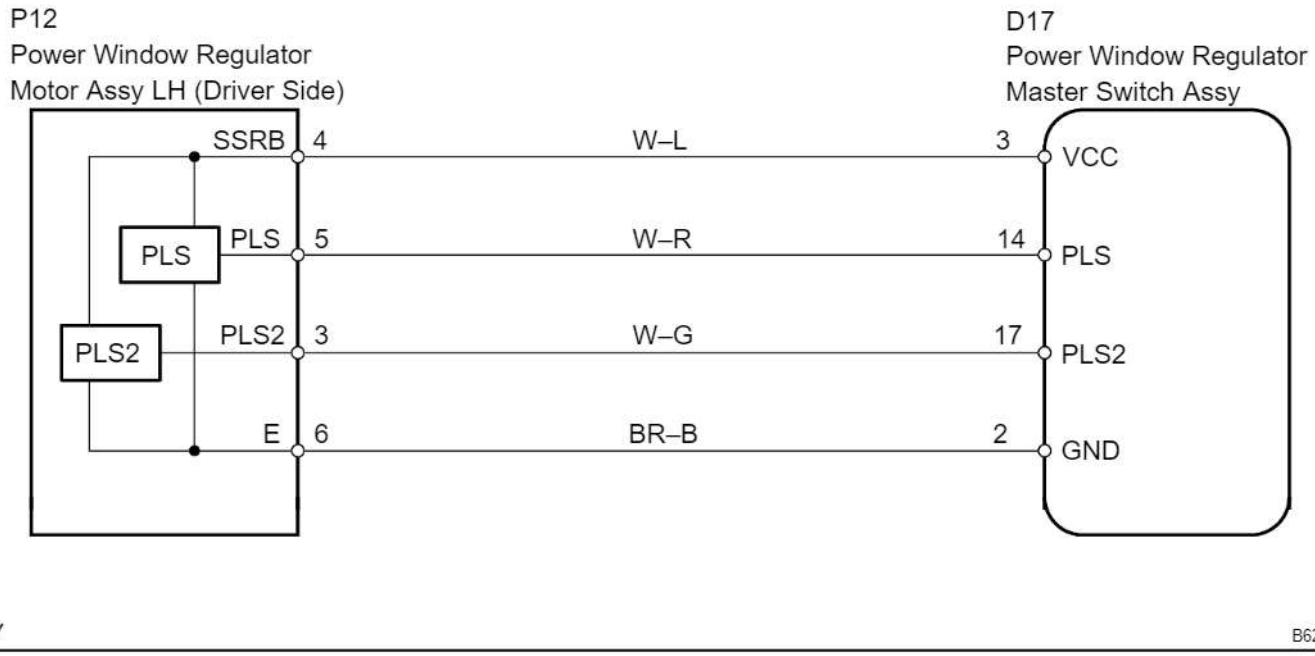
AUTO UP/DOWN FUNCTION DOES NOT OPERATE

CIRCUIT DESCRIPTION

If the AUTO UP/DOWN function does not operate, any of the following troubles may be the cause:

- When the POWER fuse and the POWER relay are replaced with new ones, or when the battery terminal and the connectors of the power window master switch are disconnected, the power window memory of the fully closed position which is recorded in the power window master switch is erased.
- The pulse sensors in the driver side power window motor has a malfunction.
- There is an open or short circuit in the wiring between the power window master switch and the driver side power window motor.
- The power window master switch has a malfunction.

WIRING DIAGRAM



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INSPECTION PROCEDURE

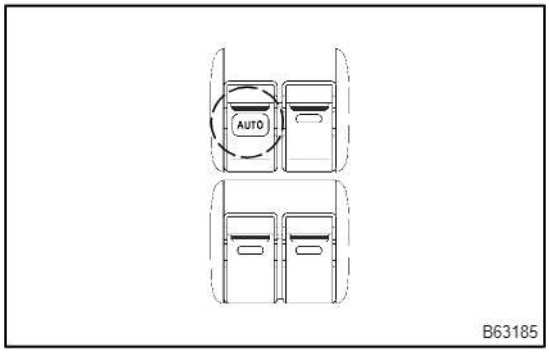
1	CHECK MANUAL UP/DOWN FUNCTION (DRIVER SIDE)

(a) Check that the door glass can be operated manually.

NG → OTHER PROBLEM (See page 05–1746)

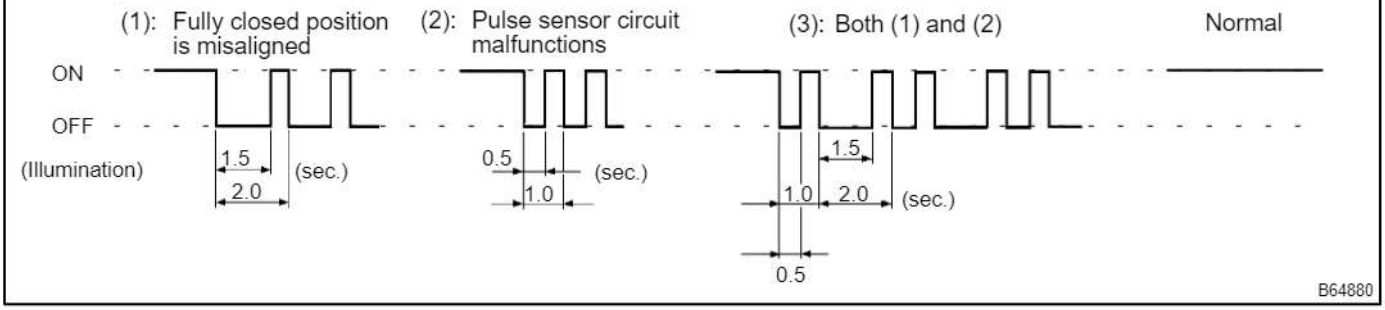
OK

2	CHECK POWER WINDOW REGULATOR MASTER SWITCH ASSY



(a) Turn the ignition switch ON.
(b) Operate the power window switch on the driver side.
(c) Check the blinking pattern of the illumination as shown in the illustration.
  (1) If the switch indicates (1), proceed to A.
  (2) If the switch indicates (2) or (3), proceed to B.
  (3) If the switch indicates normal, proceed to C.

Blinking Pattern of Illumination



B → Go to step 4

C → REPLACE POWER WINDOW REGULATOR MASTER SWITCH ASSY

A

3	RESET POWER WINDOW REGULATOR MOTOR (DRIVER SIDE)

(a) Turn the ignition switch ON.
(b) Open the door glass.
(c) Fully pull up the AUTO switch of the power window master switch until the door glass is fully closed.
(d) Check that the AUTO UP/DOWN function operates normally.

OK → END

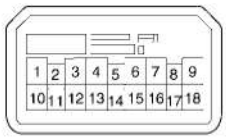
NG

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4 CHECK WIRE HARNESS (MASTER SWITCH ⇔ MOTOR)

Wire Harness Side

D17
Power Window Regulator
Master Switch Assy



P12
Power Window Regulator
Motor Assy LH (Driver Side)



B62894

(a) Disconnect the D17 switch connector.
(b) Disconnect the P12 motor connector (driver side).
(c) Check the continuity between the wire harness side connectors.

Standard:

Terminal No.	Specified Condition
D17–14 ⇔ P12–5	Continuity
D17–17 ⇔ P12–3	Continuity
D17–3 ⇔ P12–4	Continuity
D17–2 ⇔ P12–6	Continuity
D17–2 ⇔ P12–3	No continuity
D17–2 ⇔ P12–4	No continuity
D17–2 ⇔ P12–5	No continuity

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

REPLACE POWER WINDOW REGULATOR MOTOR ASSY LH (DRIVER SIDE)

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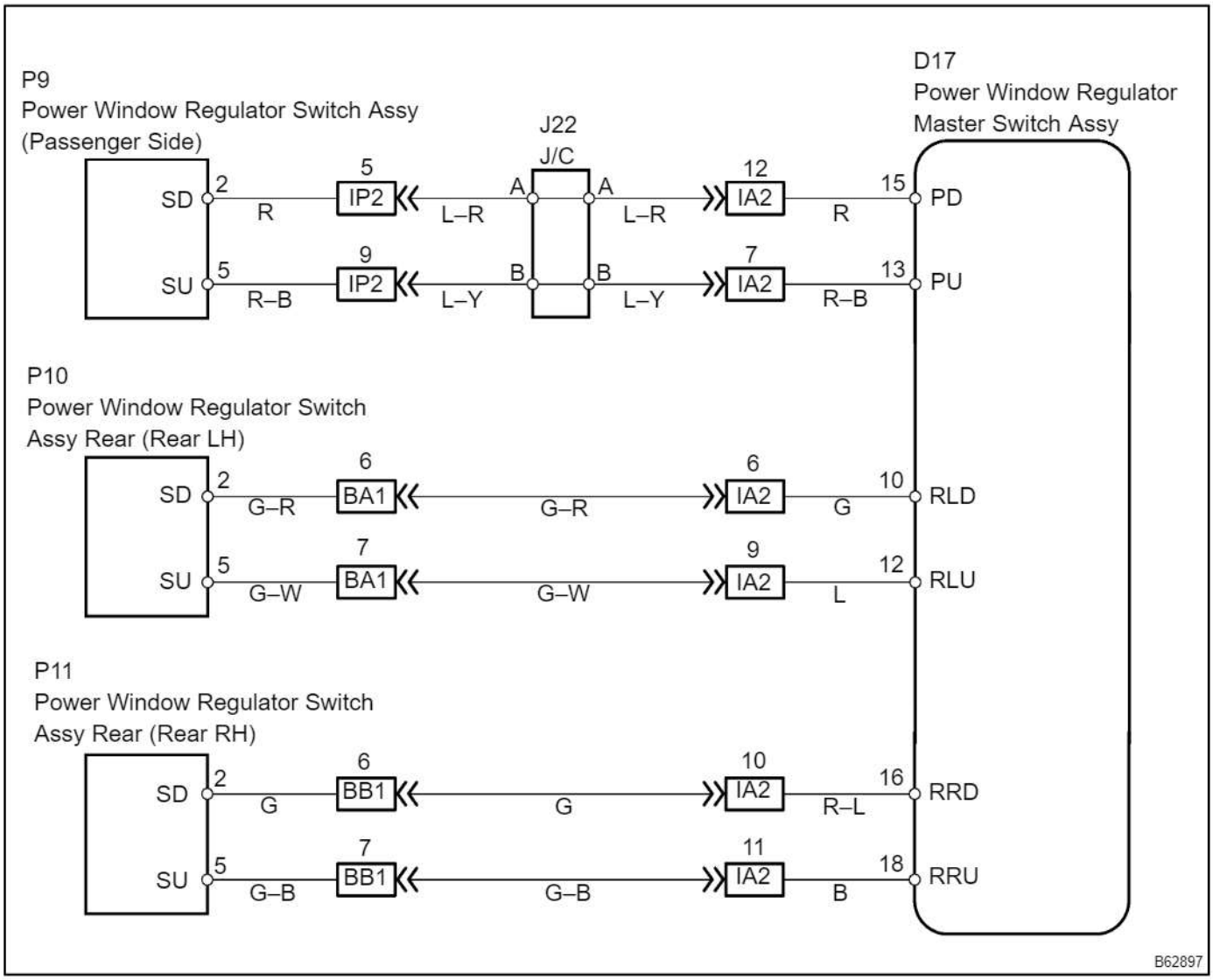
REMOTE UP/DOWN FUNCTION DOES NOT OPERATE

CIRCUIT DESCRIPTION

If the REMOTE UP/DOWN function does not operate, any of the following troubles may be the cause:

- When the POWER fuse and the POWER relay are replaced with new ones, or when the battery terminal and the connectors of the power window master switch are disconnected, the power window memory of the fully closed position which is recorded in the power window master switch is erased.
- The pulse sensors in the driver side power window motor has a malfunction.
- There is an open or short circuit in the wiring between the power window master switch and the applicable power window switch.
- The power window master switch has a malfunction.

WIRING DIAGRAM



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INSPECTION PROCEDURE

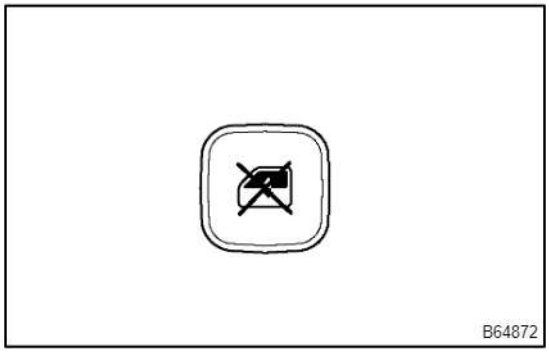
1	CHECK AUTO UP/DOWN FUNCTION

(a) Check that the AUTO UP/DOWN function operates normally.

NG → OTHER PROBLEM (See page 05–1740)

OK

2	CHECK POWER WINDOW LOCK SWITCH



(a) Turn the window lock switch OFF and check that the remote UP/DOWN function operates normally.

OK → END

NG

3	CHECK MANUAL UP/DOWN FUNCTION

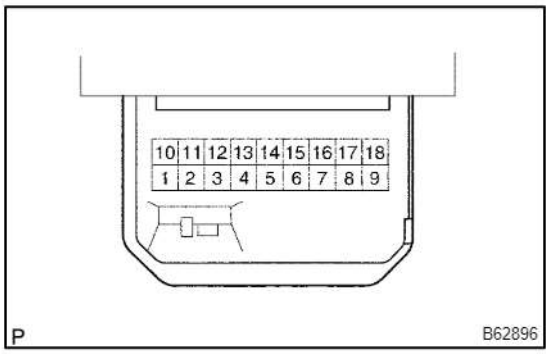
(a) Check that each door glass can be operated via each power window switch.

NG → OTHER PROBLEM (See page 05–1739)

OK

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4 INSPECT POWER WINDOW REGULATOR MASTER SWITCH ASSY



HINT:
Inspect the switch with which the remote function can not be operated.

(a) Remove the master switch.
(b) Check the continuity between the terminals of the master switch connector when the switch is operated.

Standard:

Passenger switch

Window Lock Switch	Power Window Switch	Terminal No.	Specified Condition
OFF	UP	6 ⇔ 13, 15 ⇔ 1	Continuity
	OFF	13 ⇔ 1 ⇔ 15	
	DOWN	6 ⇔ 15, 13 ⇔ 1	
ON	UP	6 ⇔ 13	
	OFF	13 ⇔ 15	
	DOWN	6 ⇔ 15	

Rear RH switch

Window Lock Switch	Power Window Switch	Terminal No.	Specified Condition
OFF	UP	6 ⇔ 18, 16 ⇔ 1	Continuity
	OFF	18 ⇔ 1 ⇔ 6	
	DOWN	6 ⇔ 16, 18 ⇔ 1	
ON	UP	6 ⇔ 18	
	OFF	16 ⇔ 18	
	DOWN	6 ⇔ 16	

Rear LH switch

Window Lock Switch	Power Window Switch	Terminal No.	Specified Condition
OFF	UP	6 ⇔ 12, 10 ⇔ 1	Continuity
	OFF	12 ⇔ 1 ⇔ 10	
	DOWN	6 ⇔ 10, 12 ⇔ 1	
ON	UP	6 ⇔ 12	
	OFF	12 ⇔ 10	
	DOWN	6 ⇔ 10	

NG → **REPLACE POWER WINDOW REGULATOR MASTER SWITCH ASSY**

OK

REPAIR OR REPLACE HARNESS AND CONNECTOR (MASTER SWITCH ⇔ EACH POWER WINDOW SWITCH)

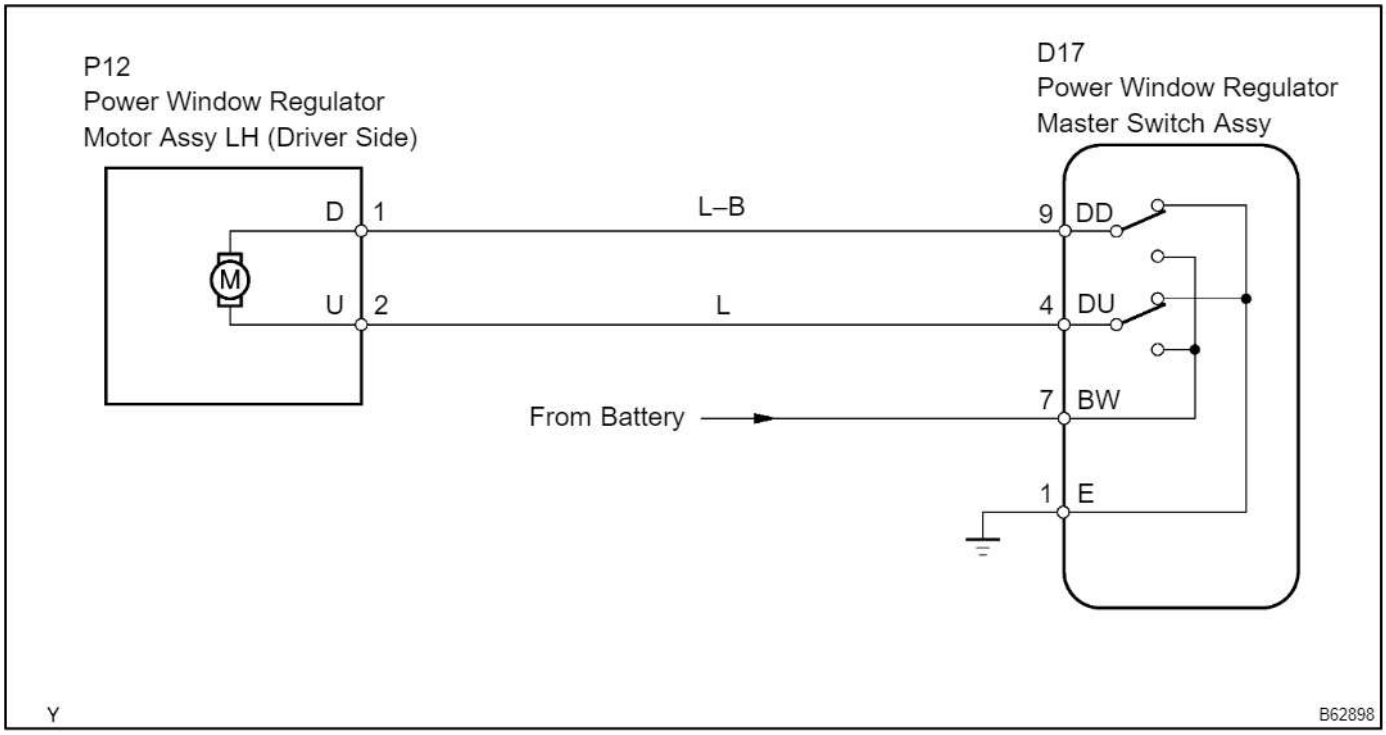
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MANUAL UP/DOWN FUNCTION DOES NOT OPERATE ON DRIVER SIDE

CIRCUIT DESCRIPTION

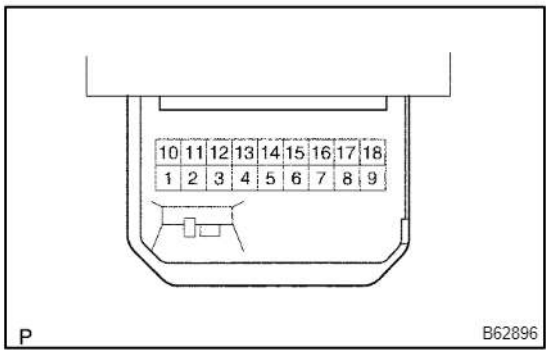
If the manual UP/DOWN function does not operate, the power window motor, the power window master switch or the wire harness is abnormal.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT POWER WINDOW REGULATOR MASTER SWITCH ASSY



(a) Remove the master switch.

(b) Check the continuity between the terminals of the switch connector when the AUTO switch is operated.

Standard:

Terminals No.	AUTO Switch	Specified Condition
7 ⇔ 4, 9 ⇔ 1	UP	Continuity
4 ⇔ 9 ⇔ 1	OFF	Continuity
7 ⇔ 9, 4 ⇔ 1	DOWN	Continuity

NG → **REPLACE POWER WINDOW REGULATOR MASTER SWITCH ASSY**

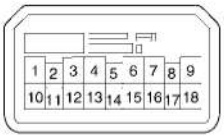
OK

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2	CHECK WIRE HARNESS (MASTER SWITCH ⇔ MOTOR) (MASTER SWITCH ⇔ BODY GROUND)

Wire Harness Side

D17
Power Window Regulator
Master Switch Assy



P12
Power Window Regulator
Motor Assy LH (Driver Side)



B62894

(a) Disconnect the D17 switch connector.
(b) Disconnect the P12 motor connector.
(c) Check the continuity between the wire harness side connectors.

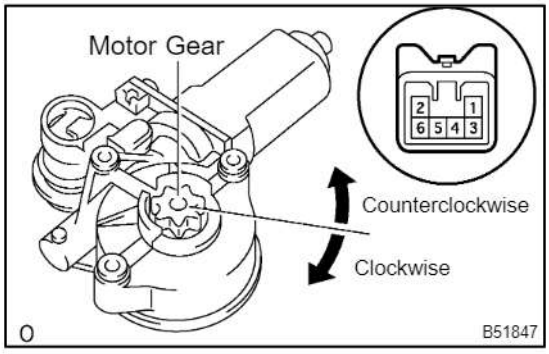
Standard:

Terminal No.	Specified Condition
D17–9 ⇔ P12–1	Continuity
D17–4 ⇔ P12–2	Continuity

(d) Check the continuity between the D17 switch connector and the body ground.

Standard:

Terminal No.	Specified Condition
D17–4 ⇔ Body ground	No continuity
D17–9 ⇔ Body ground	No continuity



(e) Reference:
Check operation of the power window motor (driver side).
(1) Remove the motor (See page 75–14).
(2) Apply battery voltage to connector terminals 1 and 2.
(3) Check that the motor gear rotates smoothly.

NOTICE:
Do not apply battery voltage to any terminal except terminals 1 and 2.

Standard:

Terminal No.	Motor Gear Rotation
Battery positive voltage → 2 Battery negative voltage → 1	Clockwise
Battery positive voltage → 1 Battery negative voltage → 2	Counterclockwise

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

REPLACE POWER WINDOW REGULATOR MOTOR ASSY LH (DRIVER SIDE)

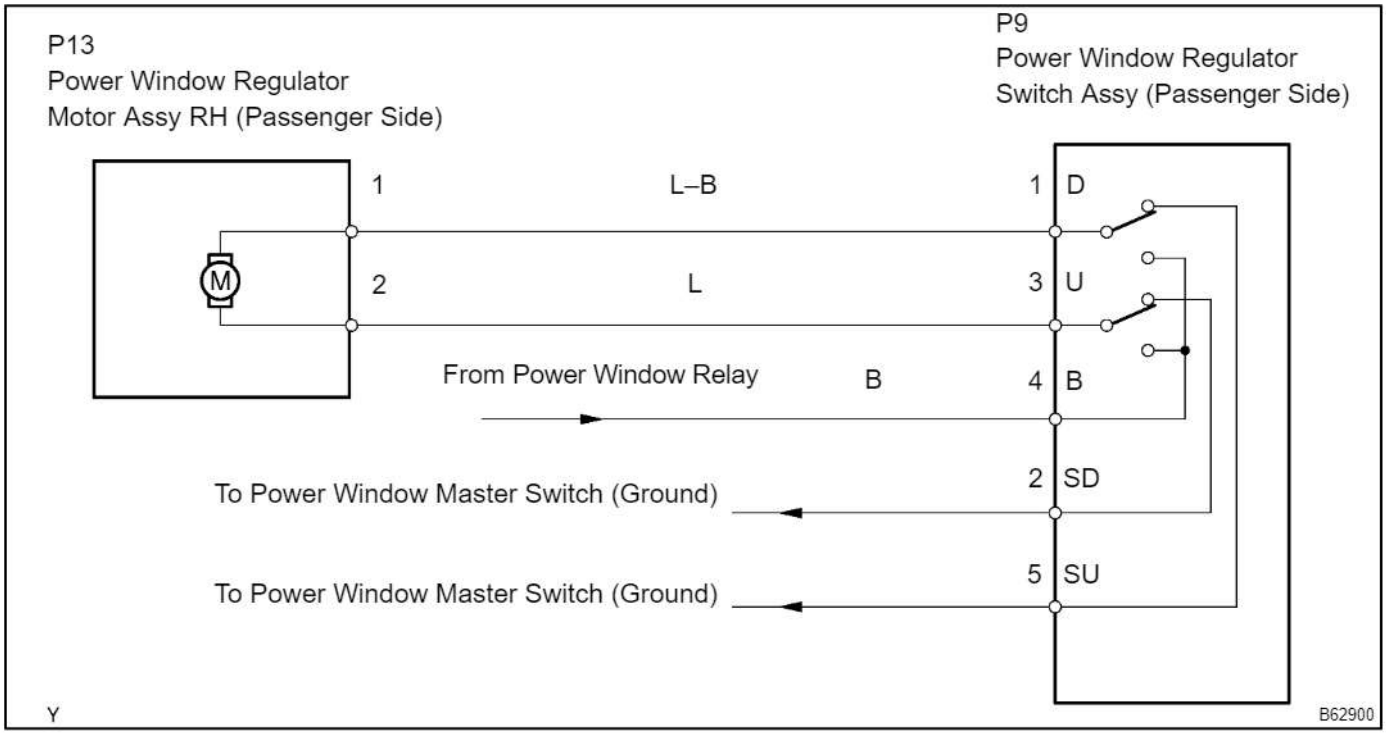
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MANUAL UP/DOWN FUNCTION DOES NOT OPERATE ON PASSENGER SIDE

CIRCUIT DESCRIPTION

If the manual UP/DOWN function does not operate, the power window motor, the power window switch or the wire harness is abnormal.

WIRING DIAGRAM

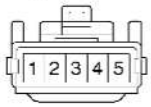


INSPECTION PROCEDURE

1	CHECK WIRE HARNESS (POWER SOURCE)

Wire Harness Side

P9
Power Window Regulator
Switch Assy (Passenger Side)



B62901

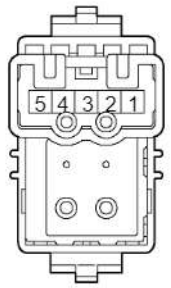
(a) Disconnect the P9 switch connector.
(b) Turn the ignition switch ON.
(c) Check the voltage between terminal 4 of the wire harness side connector of the switch and the body ground.
Standard: 10 – 14 V

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR (SWITCH ⇔ RELAY)**

OK

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2 INSPECT POWER WINDOW REGULATOR SWITCH ASSY (PASSENGER SIDE)



Y B63163

(a) Remove the power window switch.
(b) Check the continuity between the terminals of the switch connector when the switch is operated.

Standard:

Terminal No.	Switch	Specified Condition
1 ⇔ 2, 3 ⇔ 4	UP	Continuity
1 ⇔ 2, 3 ⇔ 5	OFF	Continuity
1 ⇔ 4, 3 ⇔ 5	DOWN	Continuity

NG → **REPLACE POWER WINDOW REGULATOR SWITCH ASSY (PASSENGER SIDE)**

OK

3 CHECK WIRE HARNESS (SWITCH ⇔ MOTOR) (SWITCH ⇔ BODY GROUND)

Wire Harness Side

P9
Power Window Regurator
Switch Assy (Passenger Side)



P13
Power Window Regulator
Motor Assy RH (Passenger Side)



B63164

(a) Disconnect the P13 motor connector.
(b) Check the continuity between the wire harness side connectors.

Standard:

Terminal No.	Specified Condition
P9–1 ⇔ P13–1	Continuity
P9–3 ⇔ P13–2	Continuity

(c) Check the continuity between the P9 switch connector and the body ground.

Standard:

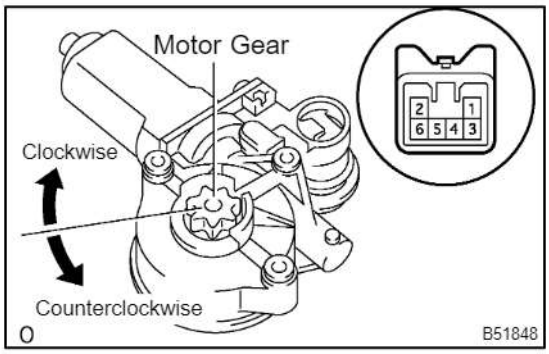
Terminal No.	Specified Condition
P9–1 ⇔ Body ground	No continuity
P9–3 ⇔ Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

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4 INSPECT POWER WINDOW REGULATOR MOTOR ASSY RH (PASSENGER SIDE)



(a) Remove the motor (See page 75–14).
(b) Apply battery voltage to connector terminals 1 and 2.
(c) Check that the motor rotates smoothly.

Standard:

Terminal No.	Motor Gear Rotation
Battery positive voltage → 1 Battery negative voltage → 2	Clockwise
Battery positive voltage → 2 Battery negative voltage → 1	Counterclockwise

NG → **REPLACE POWER WINDOW REGULATOR MOTOR ASSY RH (PASSENGER SIDE)**

OK

REPAIR OR REPLACE HARNESS AND CONNECTOR (MASTER SWITCH ⇔ SWITCH)

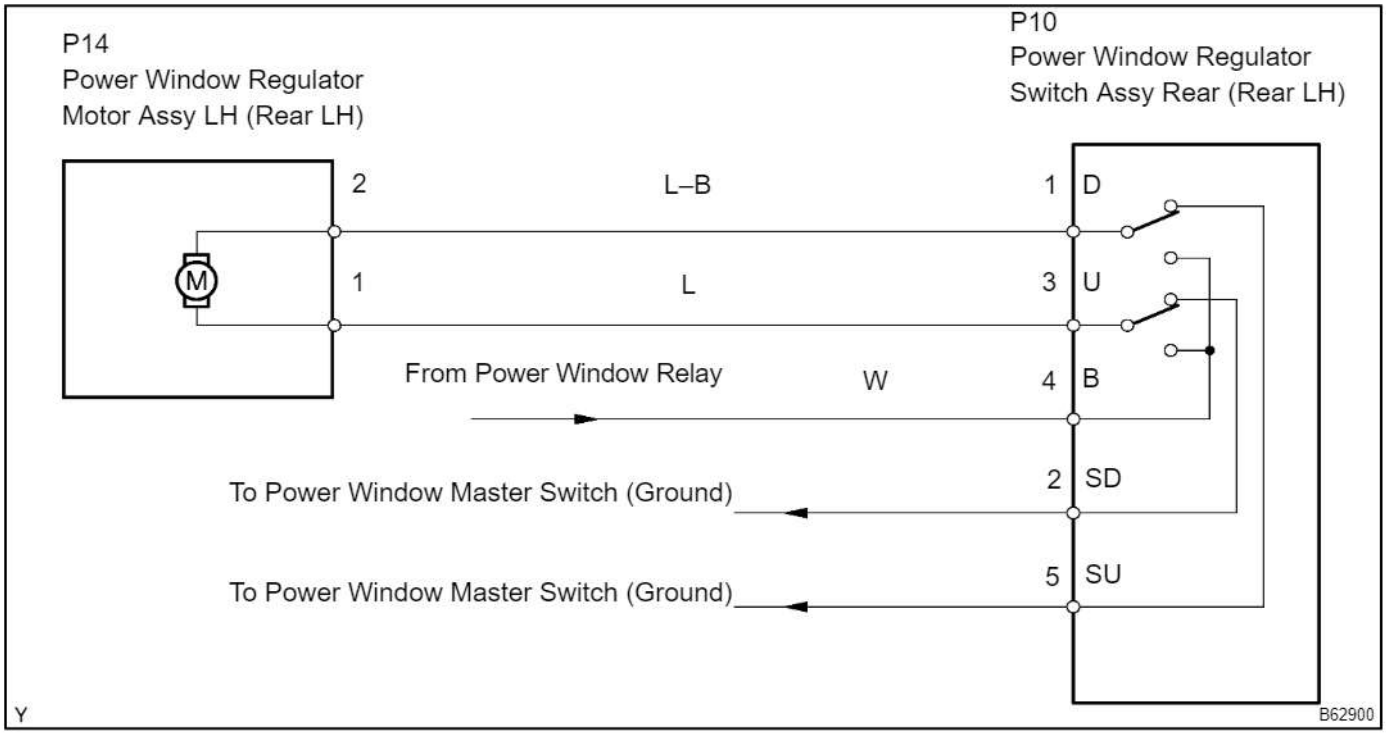
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MANUAL UP/DOWN FUNCTION DOES NOT OPERATE ON REAR LH

CIRCUIT DESCRIPTION

If the manual UP/DOWN function does not operate, the power window motor, the power window switch or the wire harness is abnormal.

WIRING DIAGRAM

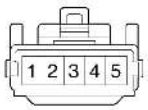


INSPECTION PROCEDURE

1	CHECK WIRE HARNESS (POWER SOURCE)

Wire Harness Side

P10
Power Window Regulator
Switch Assy Rear (Rear LH)



B62901

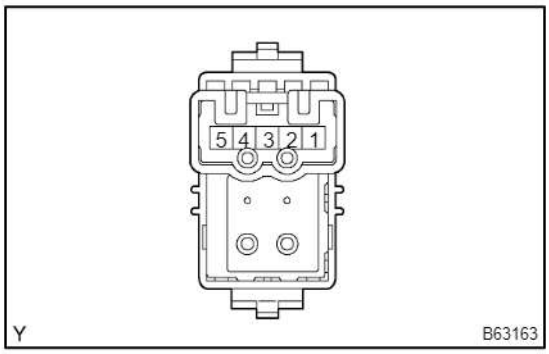
(a) Disconnect the P10 switch connector.
(b) Turn the ignition switch ON.
(c) Check the voltage between terminal 4 of the wire harness side connector of the switch and the body ground.
Standard: 10 – 14 V

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR (SWITCH ⇔ RELAY)**

OK

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2 INSPECT POWER WINDOW REGULATOR SWITCH ASSY REAR (REAR LH)



(a) Remove the power window switch.
(b) Check the continuity between the terminals of the switch connector when the switch is operated.

Standard:

Terminal No.	Switch	Specified Condition
1 ⇔ 2, 3 ⇔ 4	UP	Continuity
1 ⇔ 2, 3 ⇔ 5	OFF	Continuity
1 ⇔ 4, 3 ⇔ 5	DOWN	Continuity

NG → **REPLACE POWER WINDOW REGULATOR SWITCH ASSY REAR (REAR LH)**

OK

3 CHECK WIRE HARNESS (SWITCH ⇔ MOTOR) (SWITCH ⇔ BODY GROUND)

Wire Harness Side

P10
Power Window Regulator
Switch Assy Rear (Rear LH)



P14
Power Window Regulator
Motor Assy LH (Rear LH)



B63164

(a) Disconnect the P14 motor connector.
(b) Check the continuity between the wire harness side connectors.

Standard:

Terminal No.	Specified Condition
P10–3 ⇔ P14–1	Continuity
P10–1 ⇔ P14–2	Continuity

(c) Check the continuity between the P10 switch connector and the body ground.

Standard:

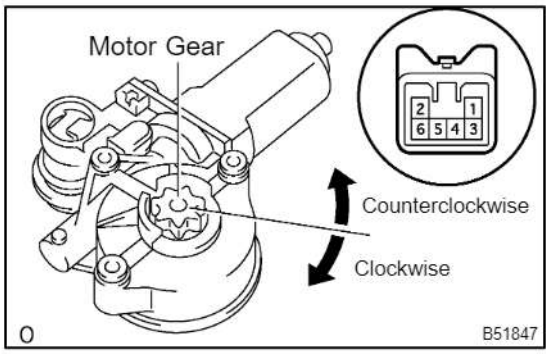
Terminal No.	Specified Condition
P10–1 ⇔ Body ground	No continuity
P10–3 ⇔ Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

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4	INSPECT POWER WINDOW REGULATOR MOTOR ASSY LH (REAR LH)



(a) Remove the motor (See page 75–26).
(b) Apply battery voltage to connector terminals 1 and 2.
(c) Check that the motor rotates smoothly.

Standard:

Terminal No.	Motor Gear Rotation
Battery positive voltage → 2 Battery negative voltage → 1	Clockwise
Battery positive voltage → 1 Battery negative voltage → 2	Counterclockwise

NG → **REPLACE POWER WINDOW REGULATOR MOTOR ASSY LH (REAR LH)**

OK

REPAIR OR REPLACE HARNESS AND CONNECTOR (MASTER SWITCH ⇔ SWITCH)

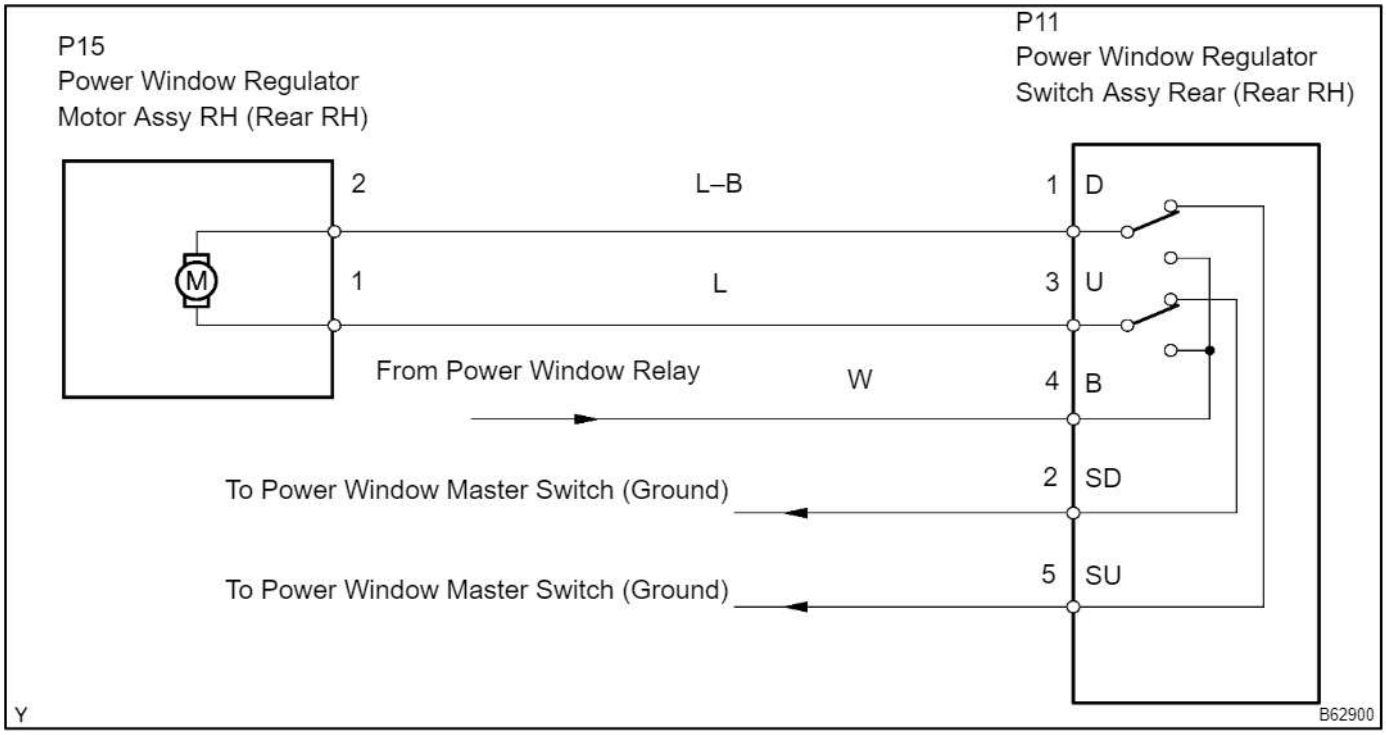
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MANUAL UP/DOWN FUNCTION DOES NOT OPERATE ON REAR RH

CIRCUIT DESCRIPTION

If the manual UP/DOWN function does not operate, the power window motor, the power window switch or the wire harness is abnormal.

WIRING DIAGRAM

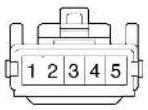


INSPECTION PROCEDURE

1	CHECK WIRE HARNESS (POWER SOURCE)

Wire Harness Side

P11
Power Window Regulator
Switch Assy Rear (Rear RH)



B62901

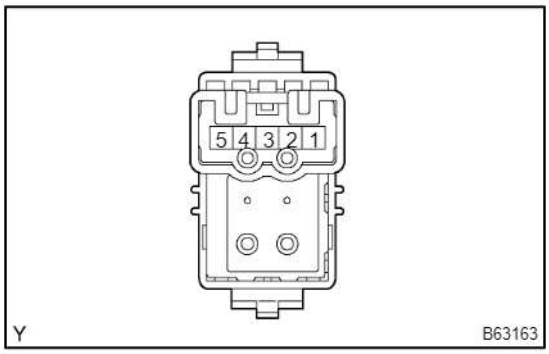
(a) Disconnect the P11 switch connector.
(b) Turn the ignition switch ON.
(c) Check the voltage between terminal 4 of the wire harness side connector of the switch and the body ground.
Standard: 10 – 14 V

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR (SWITCH ⇔ RELAY)**

OK

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2 INSPECT POWER WINDOW REGULATOR SWITCH ASSY REAR (REAR RH)



(a) Remove the power window switch.
(b) Check the continuity between the terminals of the switch connector when the switch is operated.

Standard:

Terminal No.	Switch	Specified Condition
1 ⇔ 2, 3 ⇔ 4	UP	Continuity
1 ⇔ 2, 3 ⇔ 5	OFF	Continuity
1 ⇔ 4, 3 ⇔ 5	DOWN	Continuity

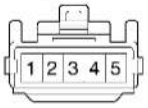
NG → **REPLACE POWER WINDOW REGULATOR SWITCH ASSY REAR (REAR RH SIDE)**

OK

3 CHECK WIRE HARNESS (SWITCH ⇔ MOTOR) (SWITCH ⇔ BODY GROUND)

Wire Harness Side

P11
Power Window Regulator
Switch Assy Rear (Rear RH)



P15
Power Window Regulator
Motor Assy RH (Rear RH)



B63164

(a) Disconnect the P15 motor connector.
(b) Check the continuity between the wire harness side connectors.

Standard:

Terminal No.	Specified Condition
P11–3 ⇔ P15–1	Continuity
P11–1 ⇔ P15–2	Continuity

(c) Check the continuity between the P9 switch connector and the body ground.

Standard:

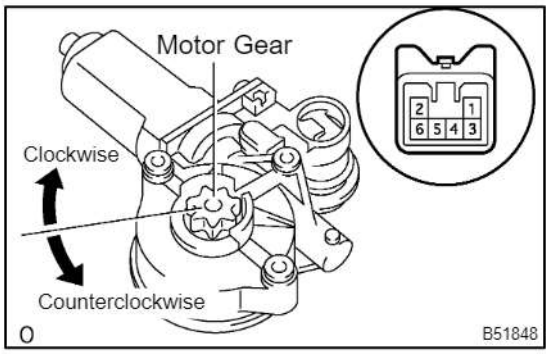
Terminal No.	Specified Condition
P11–1 ⇔ Body ground	No continuity
P11–3 ⇔ Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

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4	INSPECT POWER WINDOW REGULATOR MOTOR ASSY RH (REAR RH)



(a) Remove the motor (See page 75–26).
(b) Apply battery voltage to connector terminals 1 and 2.
(c) Check that the motor rotates smoothly.

Standard:

Terminal No.	Motor Gear Rotation
Battery positive voltage → 1 Battery negative voltage → 2	Clockwise
Battery positive voltage → 2 Battery negative voltage → 1	Counterclockwise

NG → **REPLACE POWER WINDOW REGULATOR MOTOR ASSY RH (REAR RH)**

OK

REPAIR OR REPLACE HARNESS AND CONNECTOR (MASTER SWITCH ⇔ SWITCH)

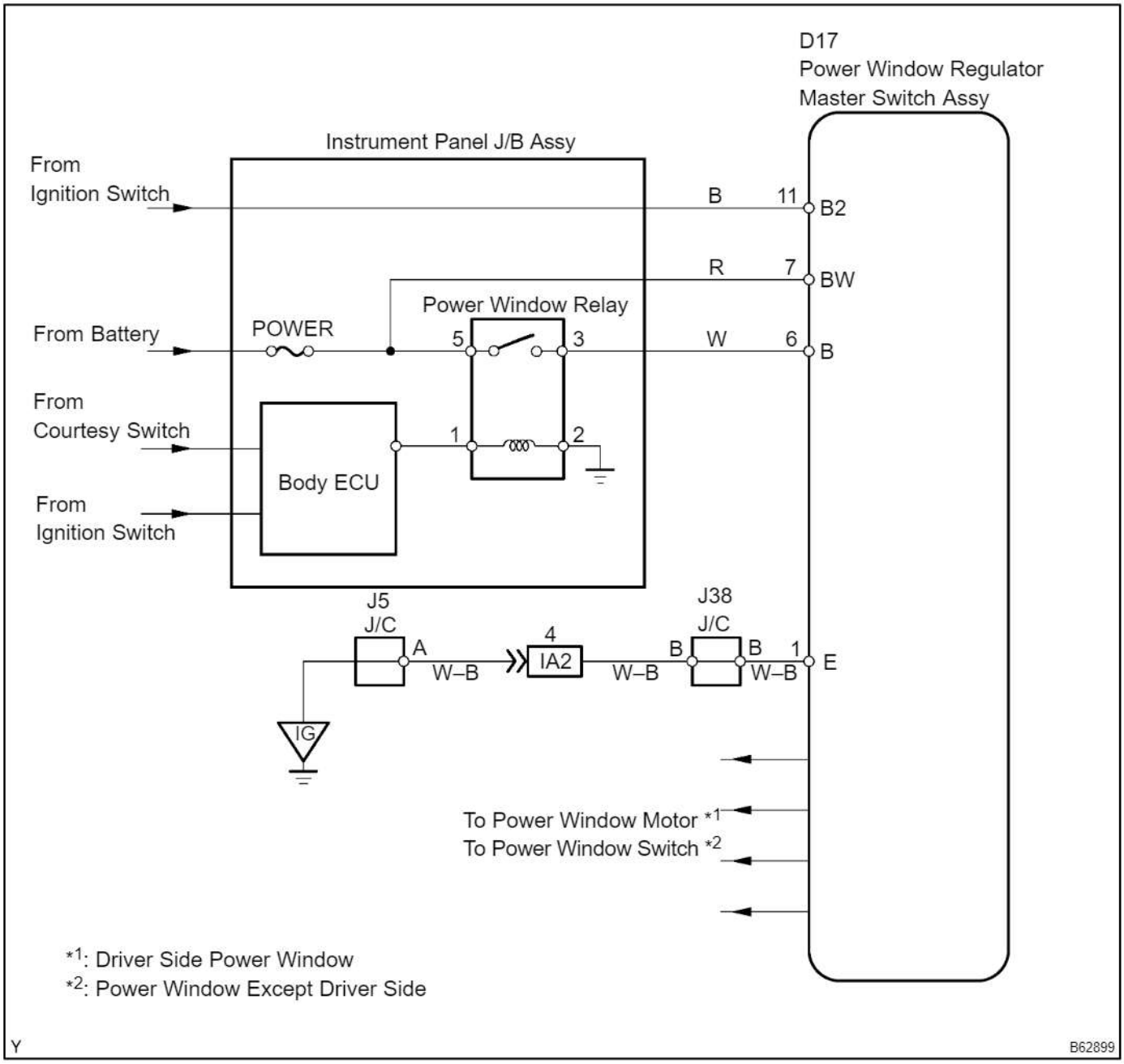
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POWER WINDOWS DO NOT OPERATE AT ALL

CIRCUIT DISCRIPTION

If all the door glasses do not operate or if the operation function after the ignition switch is turned OFF does not operate, no power may be supplied to the power window master switch or the power window master switch itself may malfunction.

WIRING DIAGRAM



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INSPECTION PROCEDURE

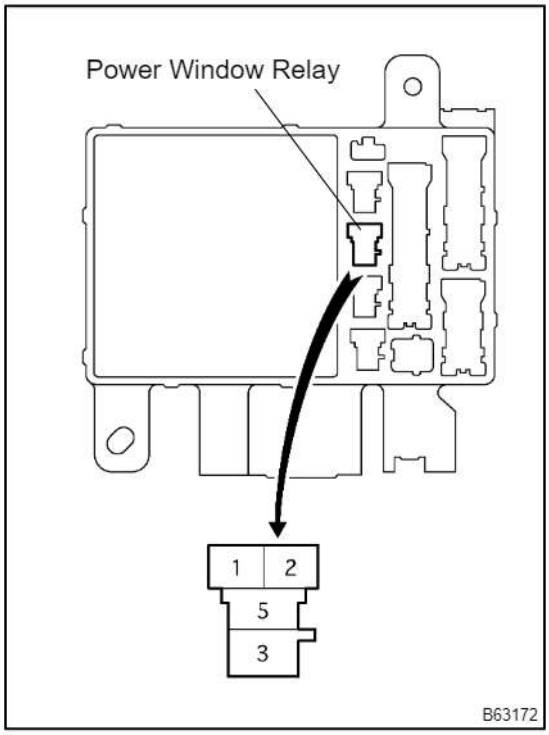
1	INSPECT FUSE (POWER)

(a) Remove the fuse from the instrument panel J/B assy.
(b) Check the continuity.
Standard: Continuity

NG → **REPLACE FUSE**

OK

2	INSPECT INSTRUMENT PANEL JUNCTION BLOCK ASSY

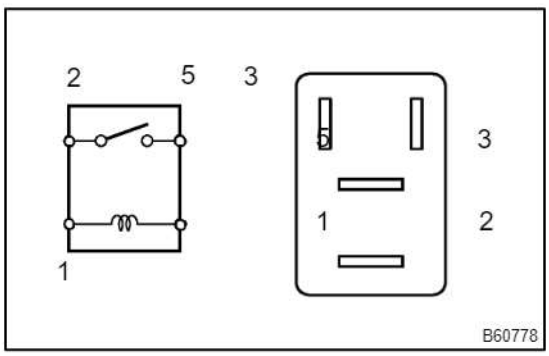


(a) Remove the power window relay.
(b) Turn the ignition switch ON.
(c) Check the voltage between the J/B terminals 1 and 2.
Standard: 10 – 14 V

NG → **REPLACE INSTRUMENT PANEL JUNCTION BLOCK ASSY**

OK

3	INSPECT POWER WINDOW RELAY (POWER)



(a) Remove the relay from the backside of the instrument panel J/B assy.
(b) Check the continuity.
Standard:

Terminal No.	Condition	Specified Condition
1 ⇔ 2	Constant	Continuity
3 ⇔ 5	Apply battery voltage to terminals 1 and 2	Continuity

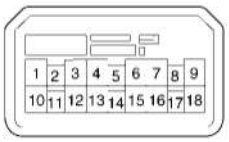
NG → **REPLACE POWER WINDOW RELAY**

OK

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4 CHECK WIRE HARNESS (TERMINAL B2, BW OR E)

Wire Harness Side
D17
Power Window Regulator
Master Switch Assy



B62895

(a) Disconnect the D17 switch connector.
(b) Check the voltage or continuity between each terminal of the wire harness side connector and the body ground.

Standard:

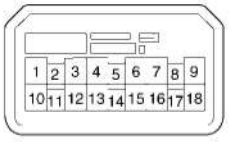
Symbols (Terminal No.)	Condition	Specified Condition
B2 (D17–11) ⇔ Body ground	Ignition ON	10 – 14 V
BW (D17–7) ⇔ Body ground	Constant	10 – 14 V
E (D17–1) ⇔ Body ground	Constant	Continuity

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

5 CHECK WIRE HARNESS (TERMINAL B)

Wire Harness Side
D17
Power Window Regulator
Master Switch



B62895

(a) Turn the ignition switch ON.
(b) Check the voltage between terminal 6 of the wire harness side connector and the body ground.

Standard:

Symbols (Terminal No.)	Condition	Specified Condition
B (D17–6) ⇔ Body ground	Ignition ON	10 – 14 V

OK → **REPLACE POWER WINDOW REGULATOR MASTER SWITCH ASSY**

NG

REPAIR OR REPLACE HARNESS AND CONNECTOR (POWER WINDOW RELAY ⇔ MASTER SWITCH)

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DOOR GLASS GOES DOWN DURING AUTO UP OPERATION

CIRCUIT DESCRIPTION

If the door glass or the power window regulator does not smoothly operate, the jam protection function may operate abnormally, resulting in this symptom.

INSPECTION PROCEDURE

1	RESET POWER WINDOW REGULATOR MOTOR

(a) Turn the ignition switch ON.
(b) Open the driver side door glass.
(c) Fully pull up the AUTO switch of the power window master switch until the door glass is fully closed.
(d) Check that the AUTO UP/DOWN function operates normally.

OK → END

NG

2	CHECK POWER WINDOW REGULATOR W/MOTOR (DRIVER SIDE)

(a) Remove the driver side door glass (See page 75–14).
(b) Operate the power window regulator via the power window master switch while the door glass is not installed.
(c) Check that the power window regulator operates smoothly.

OK → REPLACE FRONT DOOR GLASS RUN LH

NG

REPLACE FRONT DOOR WINDOW REGULATOR SUB–ASSY LH

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BACK DOOR POWER WINDOW CONTROL SYSTEM

0593M-01

HOW TO PROCEED WITH TROUBLESHOOTING

HINT:

Troubleshoot in accordance with the procedures on the following pages.

1	VEHICLE BROUGHT TO WORKSHOP

2	CUSTOMER PROBLEM ANALYSIS CHECK AND SYMPTOM CHECK (See page 05–1763)

3	DTC CHECK (See page 05–1767)

(a) Check for DTCs and make a note of the code that is output.
(b) Delete the DTC.
(c) Check if the DTC will be output once again when the problem symptom is simulated based on the noted code.
  (1) With an output of the code, proceed to A.
  (2) Without an output of the code, proceed to B.

A	Go to step 5

B

4	PROBLEM SYMPTOMS TABLE (See page 05–1771)

5	PERFORM TROUBLESHOOTING

(a) Pre–check (See page 05–1764)
(b) Terminals of ECU (See page 05–1769)
(c) Circuit inspection (See pages 05–1772 – 05–1780)

6	ADJUST, REPAIR OR REPLACE

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7	RESET POWER WINDOW MOTOR

(a) Turn the ignition switch ON.
(b) Open the back door glass.
(c) Push the back door power window switch until the door glass is fully closed, and continue to hold the switch 1 second more even after the door glass is fully closed.
(d) Check that the AUTO UP/DOWN function operates normally.

END

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058ZQ-01

CUSTOMER PROBLEM ANALYSIS CHECK

BACK DOOR POWER WINDOW CONTROL SYSTEM Check Sheet

Inspector's name; _____

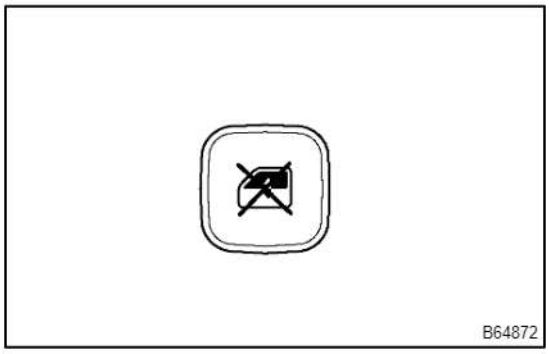
Customer's Name		**Registration No.**	
		Registration Year	
		Frame No.	
Date Vehicle Brought in	/ /	**Odometer Reading**	km miles

Date Problem First Occurred		/ /
Frequency Problem Occurs		Constant Sometimes (times per day, month) Once only
Weather Conditions When Problem Occurred	**Weather**	Fine Cloudy Rainy Snowy Various/Others
	Outdoor Temperature	Hot Warm Cool Cold (°C [°F])

Malfunction Symptoms	AUTO UP/DOWN function does not operate	
	Door glass goes down during AUTO UP operation	
	Manual UP/DOWN function does not operate	
	Manual UP/DOWN function via back door lock key cylinder does not operate	
DTC	No code B1241 B1287 B2221	
Condition When Recovered Normal	IG ON Engine started ( ) Switch operated	
Condition When Problem Occurred	Yes☐No	IG OFF☐ON ( ) Switch operated Others ( )

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PRE–CHECK



1. CHECK WINDOW LOCK SWITCH

(a) Check that operation of the door glasses except for the driver side door glass, the back door glass and the roof glass is disabled when the window lock switch of the power window master switch is pressed.

(b) Check that the door glasses, the back door glass and the roof glass can be operated when the window lock switch is pressed again.

2. CHECK MANUAL UP/DOWN FUNCTION

(a) Check that the back door glass can be operated using the back power window switch as follows.

Standard:

Condition	Switch Operation	Door Glass
□Ignition switch ON □Window lock switch OFF □Rear wiper is retracted	Press on up side within 0.3 sec.	UP (Closed)
	Press on down side within 0.3 sec.	DOWN (Open)

3. CHECK AUTO UP/DOWN FUNCTION

(a) Check that the back door glass can be operated using the back power window switch as follows.

Standard:

Condition	Switch Operation	Door Glass
□Ignition switch ON □Window lock switch OFF □Rear wiper retracts	Press on up side within 0.3 sec.	UP (Fully closed)
	Press on down side within 0.3 sec.	DOWN (Fully open)

4. CHECK MANUAL UP/DOWN FUNCTION VIA BACK DOOR LOCK KEY CYLINDER

(a) Check that the back door glass operates when the back door lock key cylinder is operated using the key as follows.

Standard:

Condition	Key Operation	Door Glass
Rear wiper is retracted	Turn right (LOCK) for more than 0.75 sec.	UP (Closed)
	Turn left (UNLOCK) for more than 0.75 sec.	DOWN (Open)

5. CHECK MANUAL DOWN FUNCTION VIA TRANSMITTER

(a) Check that the back door glass keeps opening while the back door power window switch on the transmitter is pressed with the rear wiper in the retract position.

6. CHECK POWER WINDOW OPERATION FUNCTION AFTER IGNITION OFF

(a) Under both of the following conditions, check that the door glasses, the back door glass and the roof glass can be operated even after the ignition switch is turned OFF:

- □ Within 45 seconds after the ignition switch is turned OFF
- □ The driver side door is closed

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7. CHECK JAM PROTECTION FUNCTION

HINT:

The jam protection function prevents any part of your body from getting caught by accident between the door frame and the door glass during power window operation.

(a) Check that the door glass goes down by 50 mm (2.0 in.) right when something gets caught between the door frame and door glass during power window operation. However, when the opening amount between the vehicle body and the door glass is less than 200 mm (7.9 in.), the door glass keeps going down until the opening amount reaches 200 mm (7.9 in.) and stops there.

Operative condition:

- □ AUTO UP via the back door power window switch
- □ AUTO/MANUAL UP operation after ignition OFF
- □ MANUAL UP via the back door lock key cylinder

8. CHECK FAIL–SAFE FUNCTION

(a) If the pulse sensor in the back door power window motor malfunctions (DTC B2221 is output), the power window functions will be restricted:

- □ The AUTO UP/DOWN function is disabled.
- □ The MANUAL DOWN function via the transmitter is disabled.
- □ The MANUAL UP/DOWN function via the back door power window switch can be performed (the ignition switch ON).
- □ The MANUAL UP/DOWN function via the back door lock key cylinder can be performed (the ignition switch ON).

9. CHECK DATA LIST WITH HAND–HELD TESTER

(a) According to the data list displayed by the hand–held tester, you can read the value of the switch, sensor, actuator without parts removal. Reading the data list as a first step of troubleshooting is one of the method to shorten the labor time.

DATA LIST of back door ECU:

Measurement Item	Label	Parameter
Rear wiper retract switch	WIPER RTRCT SW	ON/OFF
Rear door lock key switch at LOCK position	KEY SW (UNLK)	ON/OFF
Rear door lock key switch at UNLOCK position	KEY SW (LOCK)	ON/OFF
Back door glass position	P/W POSITION	CLOSE/OPEN
Back door glass position (Fully closed – 1/4)	GLASS POS – 1/4	CAUTION/OK*
Back door glass position (1/4 – 2/4)	GLASS POS – 2/4	CAUTION/OK*
Back door glass position (2/4 – 3/4)	GLASS POS – 3/4	CAUTION/OK*
Back door glass position (3/4 – Fully opened)	GLASS POS – OPEN	CAUTION/OK*

*: If CAUTION is displayed even when no resistance is applied in each range, there must be a caught somewhere in that range.

10. USING HAND–HELD TESTER, CHECK SWITCH CONDITION BY DTC

(a) DTC B1241 is output when the back door power window switch, the defogger switch and the rear power window switch are on. When these switches are off, this DTC is not output.
Using this DTC, you can check whether these switches are normal or not.

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11. PERFORM ACTIVE TEST WITH HAND–HELD TESTER

(a) The active test will indicate if the part is normal or malfunctioning.

ACTIVE TEST for back door ECU:

Operation Item	Label	Operation
Operate back door power window UP/DOWN	P/W UP/DOWN	Close/Open

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058ZR-01

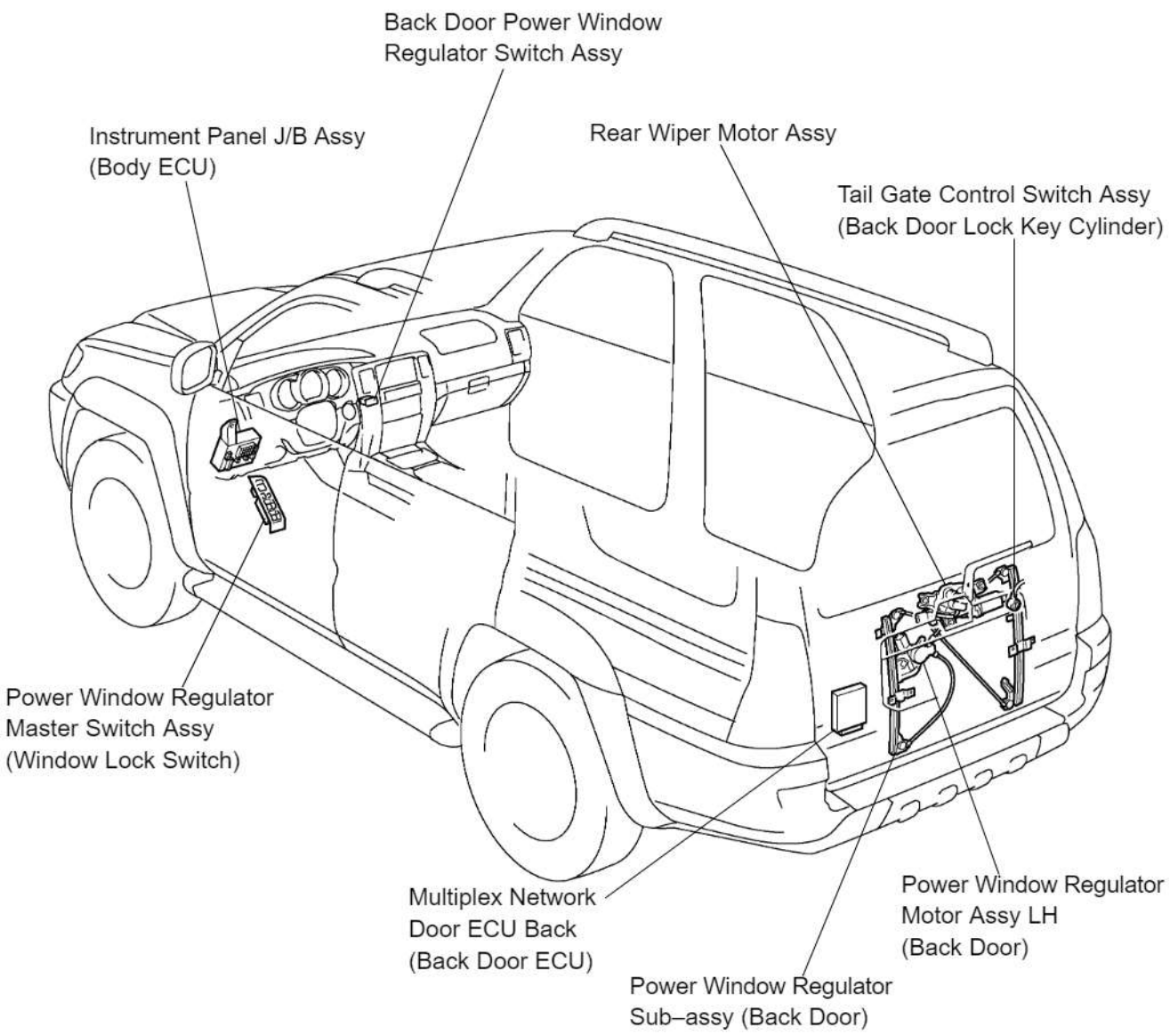
DIAGNOSTIC TROUBLE CODE CHART

DTC No. (See Page)	Detection Item	Suspected Part
B1241 (05–1772)	Body ECU switch circuit diagnosis	□Back door power window regulator switch assy □Defogger switch assy □Rear wiper switch assy □Wire harness
B2221 (05–1774)	Jam protection pulse sensor circuit on back door	□Power window regulator motor assy LH (Back door) □Wire harness

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058ZS–01

LOCATION



O

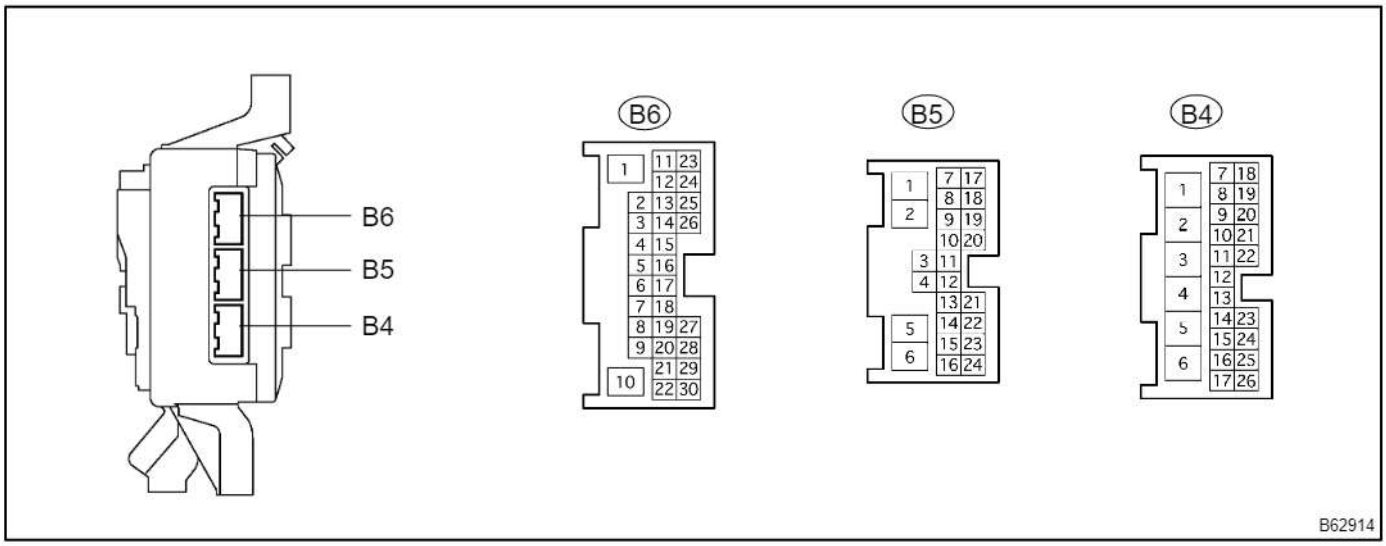
B62913

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058ZT-01

TERMINALS OF ECU

1. CHECK INSTRUMENT PANEL JUNCTION BLOCK ASSY (BODY ECU)



(a) Check the voltage or resistance between the terminals of the connectors.

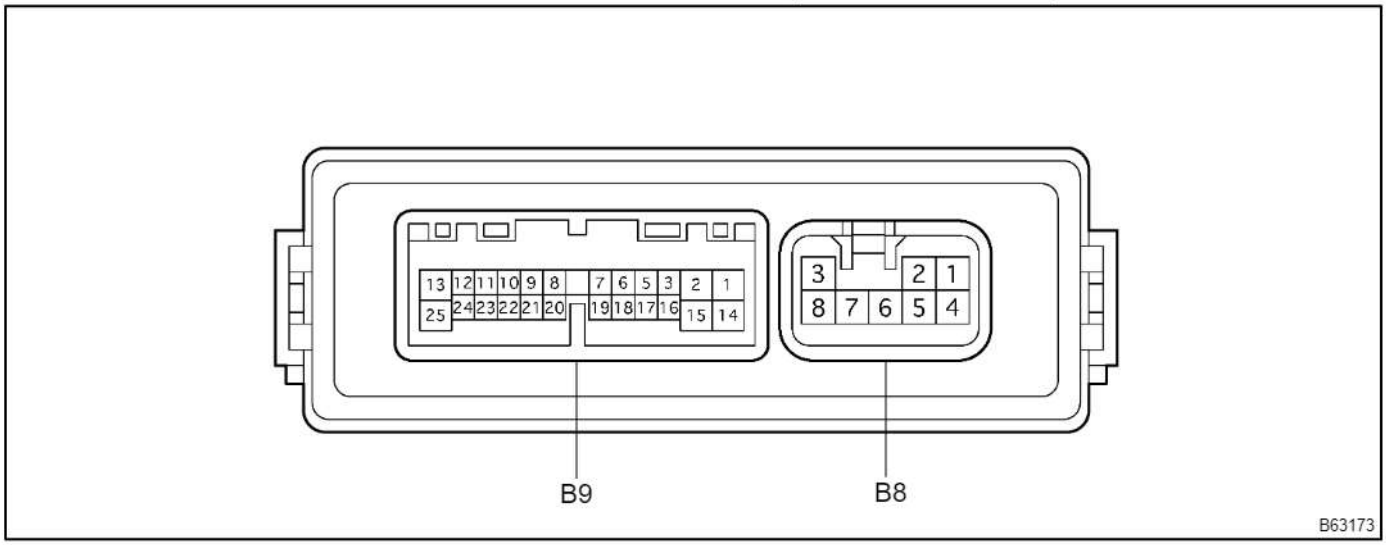
Standard:

Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
BUP (B5–10) ⇔ COM (B5–19)	Y–R ⇔ B–Y	□Ignition switch ON □Back door power window switch UP	Less than 1.5 V
		□Back door power window switch OFF	More than 5 kΩ
BDN (B5–8) ⇔ COM (B5–19)	B–L ⇔ B–Y	□Ignition switch ON □Back door power window switch DOWN	Less than 1.5 V
		□Back door power window switch OFF	More than 5 kΩ
W/L1 (B6–24) ⇔ W/L2 (B6–22)	L–Y ⇔ L–R	□Window lock switch ON	Less than 1.0 V
		□Window lock switch OFF	More than 1 kΩ

If the result is not as specified, the instrument panel J/B assy (body ECU) malfunctions.

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2. CHECK MULTIPLEX NETWORK DOOR ECU BACK (BACK DOOR ECU)



(a) Check the voltage or continuity between the terminals of the connectors.

Standard:

Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
BDR (B8–4) ⇔ Body ground	L ⇔ –	Constant	10 – 14 V
BECU (B8–5) ⇔ Body ground	L–R ⇔ –	Constant	10 – 14 V
SIG (B8–6) ⇔ Body ground	B ⇔ –	Ignition switch OFF	Less than 1 V
		Ignition switch ON	10 – 14 V
SGND (B9–18) ⇔ GND (B8–3)	G–R ⇔ W–B	Constant	Continuity
GND (B8–3) ⇔ Body ground	W–B ⇔ –	Constant	Continuity
BDUP (B9–13) ⇔ BDDN (B9–25)	Y–B ⇔ R–B	Back door power window in close operation	10 – 14 V
BDDN (B9–25) ⇔ BDUP (B9–13)	R–B ⇔ Y–B	Back door power window in open operation	10 – 14 V
IC+ (B9–11) ⇔ IC– (B9–23)	Y–G ⇔ L–W	Constant	6 – 14 V
IC1 (B9–16) ⇔ IC– (B9–23)	B–O ⇔ L–W	Back door power window in operation	Pulse generates
IC2 (B9–17) ⇔ IC– (B9–23)	W–R ⇔ L–W	Back door power window in operation	Pulse generates
UP (B9–5) ⇔ E (B9–19)	V–Y ⇔ LG–B	Back door lock key cylinder turned right using key	Continuity
DOWN (B9–4) ⇔ E (B9–19)	GR–R ⇔ LG–B	Back door lock key cylinder turned left using key	Continuity
E (B9–19) ⇔ SGND (B9–18)	LG–B ⇔ G–R	Constant	Continuity
P (B9–12) ⇔ SGND (B9–18)	P–B ⇔ G–R	Rear wiper in retract position	Less than 1 V

If the result is not as specified, the multiplex network door ECU back (back door ECU) malfunctions.

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058ZU-01

PROBLEM SYMPTOMS TABLE

Symptoms	Suspected Part	See Page
AUTO UP/DOWN function does not operate	1. Power window regulator motor assy LH (Back door) 2. Wire harness	05–1774
Door glass goes down during AUTO UP operation	1. Back door glass run 2. Back door power window regulator sub–assy 3. Back door glass	05–1776
Manual UP/DOWN function does not operate	1. Rear wiper motor assy 2. Power window regulator motor assy LH (Back door) 3. Wire harness 4. Multiplex network door ECU back (Back door ECU)	05–1777
Manual UP/DOWN function via back door lock key cylinder does not operate	1. Back door lock key cylinder assy 2. Wire harness 3. Multiplex network door ECU back (Back door ECU)	05–1780

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Author : Date : 1970

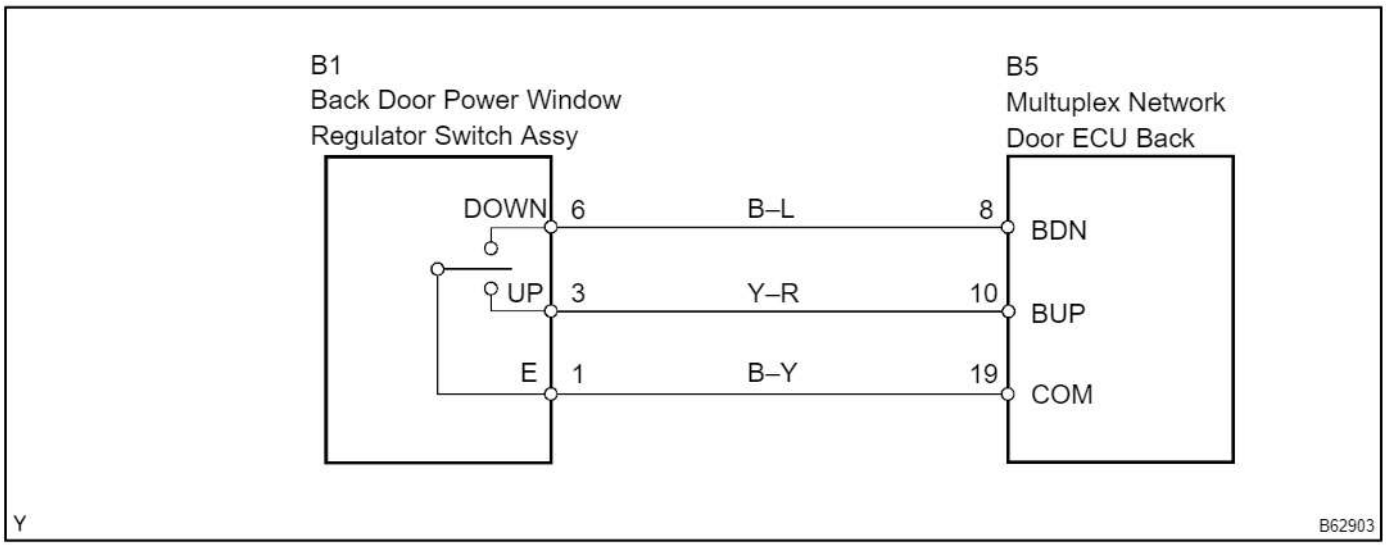
DTC B1241 BODY ECU SWITCH CIRCUIT DIAGNOSIS

CIRCUIT DESCRIPTION

DTC B1241 is output when the back door power window switch, the defogger switch and the rear power window switch are on. When these switches are off, this DTC is not output.
Using this DTC, you can check whether these switches are normal or not.

DTC No.	DTC Detection Condition	Suspected Part
B1241	Back door power window switch, defogger switch and rear wiper switch is operating	□Back door power window regulator switch assy □Defogger switch assy □Rear wiper switch assy □Wire harness

WIRING DIAGRAM



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INSPECTION PROCEDURE

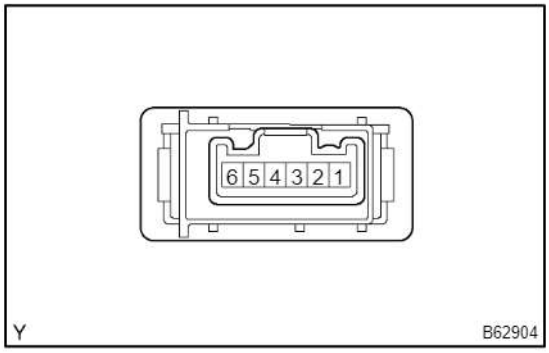
1	CHECK BACK DOOR POWER WINDOW OPERATION

(a) Check that the back door power window operates via the back door power window switch.

OK → INSPECT DEFOGGER SWITCH OR REAR WIPER SWITCH

NG

2	INSPECT BACK DOOR POWER WINDOW REGULATOR SWITCH ASSY



(a) Remove the power window switch.
(b) Check the continuity between the terminals of the switch connector when the switch is operated.

Standard:

Terminal No.	Switch	Specified Condition
3 ⇔ 1	Down	Continuity
6 ⇔ 3 ⇔ 1	OFF	No continuity
6 ⇔ 1	Up	Continuity

OK → REPAIR OR REPLACE HARNESS AND CONNECTOR (SWITCH ⇔ BODY ECU)

NG

REPLACE BACK DOOR POWER WINDOW REGULATOR SWITCH ASSY

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DTC	B2221	JAM PROTECTION PULSE SENSOR CIRCUIT ON BACK DOOR

AUTO UP/DOWN FUNCTION DOES NOT OPERATE

CIRCUIT DESCRIPTION

The back door ECU monitors the condition of the power window motor and detects the position of the door glass by using pulse signals output from the 2 pulse sensors in the power window motor.

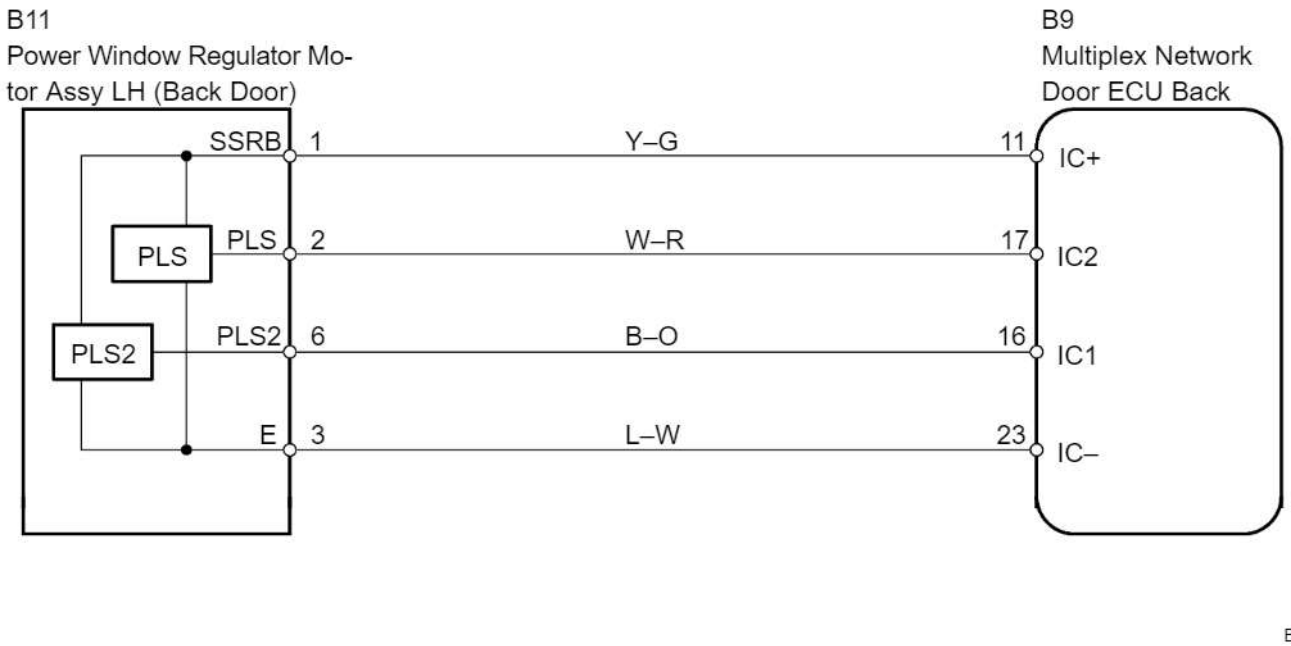
DTC No.	DTC Detection Condition	Suspected Part
B2221	□PLS pulse sensor circuit malfunction □PLS2 pulse sensor circuit malfunction □Pulse direction is opposite to motor rotating direction (Short circuit between PLS and PLS2) □PLS and PLS2 pulse sensors circuit malfunction □Fully closed position is misaligned	□Power window regulator motor assy LH (Back door) □Wire harness

FAIL–SAFE

If the pulse sensor in the back door power window motor malfunctions (DTC B2221 is output), the power window functions will be restricted:

- □ The AUTO UP/ DOWN function is disabled.
- □ The MANUAL DOWN function via the transmitter is disabled.
- □ The MANUAL UP/DOWN function via the back door power window switch can be performed (the ignition switch ON).
- □ The MANUAL UP/DOWN function via the back door lock key cylinder can be performed (the ignition switch ON).

WIRING DIAGRAM



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INSPECTION PROCEDURE

1	RESET POWER WINDOW REGULATOR MOTOR

(a) Turn the ignition switch ON.
(b) Open the back door glass.
(c) Press the back door power window switch until the door glass is fully closed, and continue to hold the switch 1 second more even after the door glass is fully closed.
(d) Check that the AUTO UP/DOWN function operates normally.

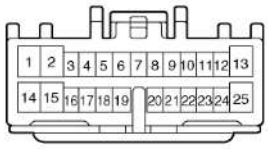
OK → END

NG

2	CHECK WIRE HARNESS (BACK DOOR ECU ⇔ POWER WINDOW MOTOR) (BACK DOOR ECU ⇔ BODY GROUND)

Wire Harness Side

B9
Multiplex Network Door ECU Back
(Back Door ECU)



B11
Power Window Regulator
Motor Assy LH (Back Door)



B62905

(a) Disconnect the B9 ECU connector.
(b) Disconnect the B11 motor connector.
(c) Check the continuity between the wire harness side connectors.

Standard:

Terminal No.	Specified Condition
B9–23 ⇔ B11–3	Continuity
B9–17 ⇔ B11–2	Continuity
B9–16 ⇔ B11–6	Continuity
B9–11 ⇔ B11–1	Continuity

(d) Check the continuity between the B9 ECU connector and the body ground.

Standard:

Terminal No.	Specified Condition
B9–11 ⇔ Body ground	No continuity
B9–16 ⇔ Body ground	No continuity
B9–17 ⇔ Body ground	No continuity

OK → REPLACE POWER WINDOW REGULATOR MOTOR ASSY LH

NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

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DOOR GLASS GOES DOWN DURING AUTO UP OPERATION

CIRCUIT DESCRIPTION

If the door glass or the power window regulator does not smoothly operate, the jam protection function may operate abnormally, resulting in this symptom.

INSPECTION PROCEDURE

1	RESET POWER WINDOW REGULATOR MOTOR

(a) Turn the ignition switch ON.
(b) Open the back door glass.
(c) Press the back door power window switch until the door glass is fully closed, and continue to hold the switch 1 second more even after the door glass is fully closed.
(d) Check that the AUTO UP/DOWN function operates normally.

OK → END

NG

2	CHECK POWER WINDOW REGULATOR W/MOTOR

(a) Remove the back door glass (See page 75–38).
(b) Operate the power window regulator via the back door power window switch while the back door glass is not installed.
(c) Check that the power window regulator operates smoothly.

OK → REPLACE BACK DOOR GLASS RUN

NG

REPLACE BACK DOOR POWER WINDOW REGULATOR SUB–ASSY

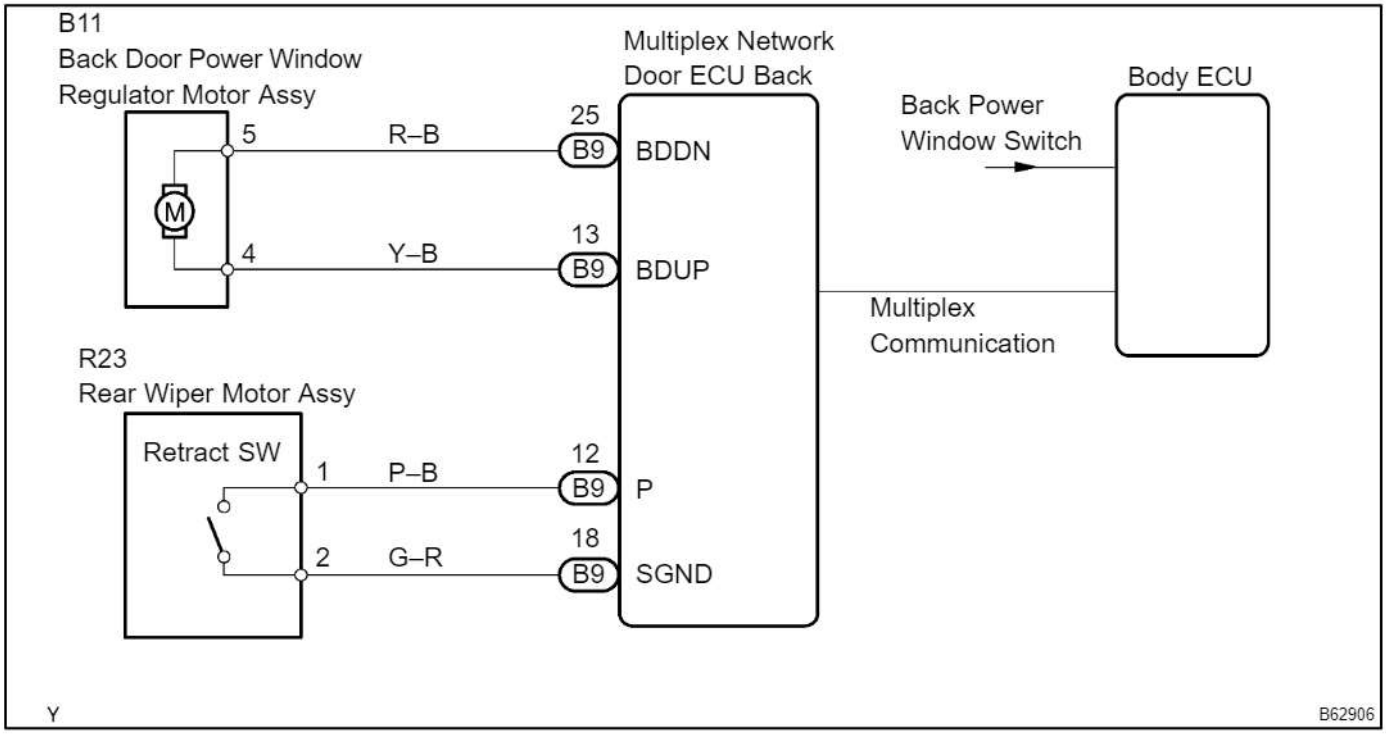
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MANUAL UP/DOWN FUNCTION DOES NOT OPERATE

CIRCUIT DESCRIPTION

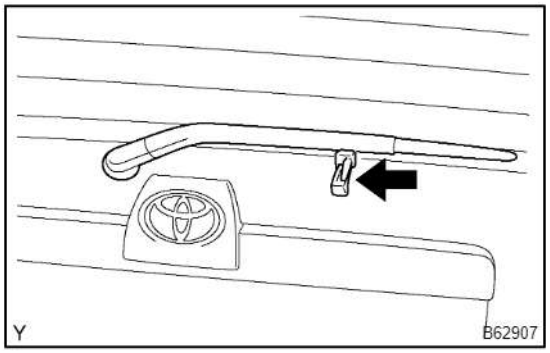
If the back door power window does not operate, the retract switch in the rear wiper motor, the back door power window motor or the wire harness may be abnormal.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK REAR WIPER OPERATION



(a) Turn the ignition switch ON.
(b) Operate the rear wiper and turn the rear wiper switch OFF.
(c) Check that the rear wiper stops at the retract position when the rear wiper switch is turned OFF.

NG → CHECK REAR WIPER MOTOR ASSY

OK

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2	INSPECT BACK DOOR POWER WINDOW REGULATOR SWITCH ASSY

(a) Using the hand–held tester, read the DTC when the back power window switch is operated.
(1) When DTC B1287 is output, proceed to A.
(2) When no DTC is output, proceed to B.
(3) When DTC B1241 is output, proceed to C.

A → **INSPECT MULTIPLEX COMMUNICATION SYSTEM (See page 05–1926)**

B → **INSPECT BACK DOOR POWER WINDOW REGULATOR SWITCH ASSY (See page 05–1772)**

C

3	READ VALUE OF HAND–HELD TESTER

(a) Check the condition of the retract switch using the data list.
Standard:

Data list for back door ECU:

Measurement Item	Label	Parameter
Wiper retract switch	WIPER RTRCT SW	ON

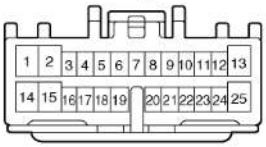
NG → **Go to step 6**

OK

4	CHECK WIRE HARNESS (BACK DOOR ECU ⇔ POWER WINDOW MOTOR) (BACK DOOR ECU ⇔ BODY GROUND)

Wire Harness Side

B9
Multiplex Network Door ECU Back
(Back Door ECU)



B11
Power Window Regulator
Motor Assy LH (Back Door)



B62905

(a) Disconnect the B9 ECU connector.
(b) Disconnect the B11 motor connector.
(c) Check the continuity between the wire harness side connectors.
Standard:

Terminal No.	Specified Condition
B9–25 ⇔ B11–5	Continuity
B9–13 ⇔ B11–4	Continuity

(d) Check the continuity between the B9 ECU connector and the body ground.
Standard:

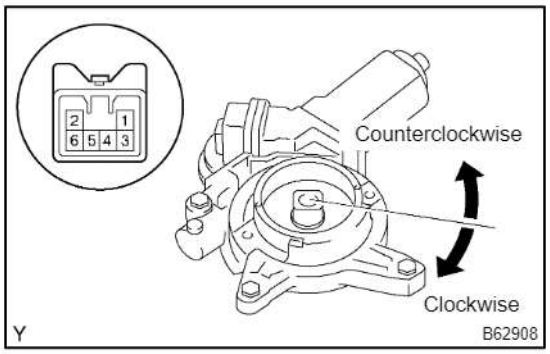
Terminal No.	Specified Condition
B9–13 ⇔ Body ground	No continuity
B9–25 ⇔ Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

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5 INSPECT POWER WINDOW REGULATOR MOTOR ASSY LH (BACK DOOR)



(a) Remove the motor.
(b) Apply battery voltage between the connector terminals and check that the motor gear rotates smoothly.

NOTICE:

Do not apply battery voltage to any terminals except terminals 4 and 5.

Standard:

Terminal No.	Motor gear rotation
Battery positive voltage → 5 Battery negative voltage → 4	Counterclockwise
Battery positive voltage →4 Battery negative voltage → 5	Clockwise

NG → **REPLACE POWER WINDOW REGULATOR MOTOR ASSY LH (BACK DOOR)**

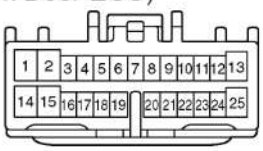
OK

CHECK AND REPLACE MULTIPLEX NETWORK DOOR ECU BACK

6 CHECK WIRE HARNESS (BACK DOOR ECU ⇔ REAR WIPER MOTOR) (BACK DOOR ECU ⇔ BODY GROUND)

Wire Harness Side

B9
Multiplex Network Door ECU Back
(Back Door ECU)



R23
Rear Wiper Motor Assy



B62909

(a) Disconnect the B9 ECU connector.
(b) Disconnect the R23 motor connector.
(c) Check the continuity between the wire harness side connectors.

Standard:

Terminal No.	Specified Condition
B9–12 ⇔ R23–1	Continuity
B9–18 ⇔ R23–2	Continuity

(d) Check the continuity between the B9 ECU connector and the body ground.

Standard:

Terminal No.	Specified Condition
B9–12 ⇔ Body ground	No continuity
B9–18 ⇔ Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

REPLACE REAR WIPER MOTOR ASSY

Author : Date : 1978

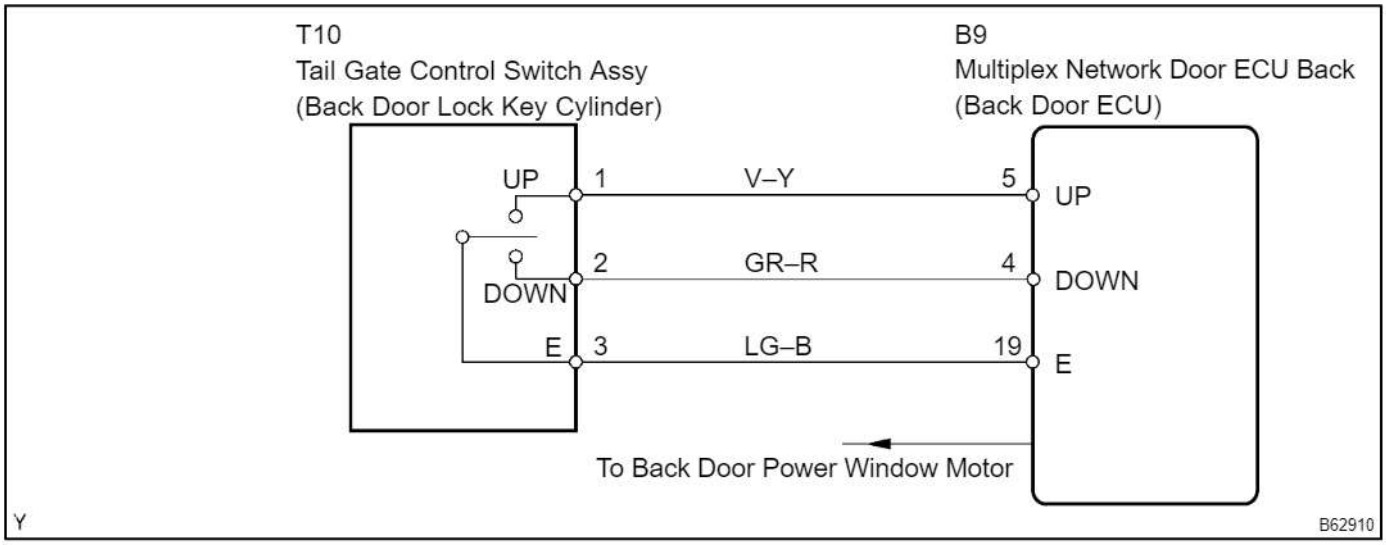
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MANUAL UP/DOWN FUNCTION VIA BACK DOOR LOCK KEY CYLINDER DOES NOT OPERATE

CIRCUIT DESCRIPTION

If the manual UP/DOWN function via the back door lock key cylinder does not operate, the back door lock key cylinder or the wire harness may be abnormal.

WIRING DIAGRAM



INSPECTION PROCEDURE

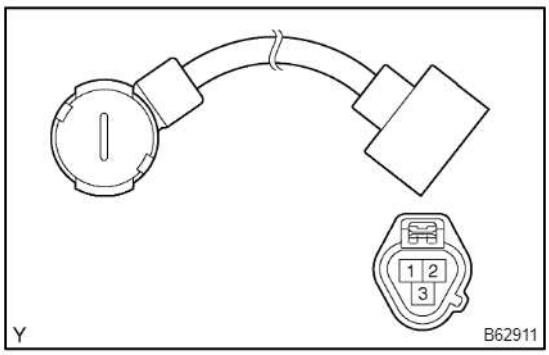
1	CHECK BACK DOOR POWER WINDOW OPERATION

(a) Check that the back door power window operates via the back door power window switch.

NG > OTHER PROBLEM (See page 05–1777)

OK

2	INSPECT TAIL GATE CONTROL SWITCH ASSY (BACK DOOR LOCK KEY CYLINDER)



(a) Disconnect the switch connector.
(b) Insert the key into the key cylinder.
(c) Check the continuity between the terminals of the switch connector when turning the key.

Standard:

Terminal No.	Operation	Specified Condition
1 ⇔ 3	Turn key to right	Continuity
1 ⇔ 2	No operation	No continuity
2 ⇔ 3	Turn key to left	Continuity

NG > REPLACE TAIL GATE CONTROL SWITCH ASSY

OK

REPAIR OR REPLACE HARNESS AND CONNECTOR (BACK DOOR ECU ⇔ SWITCH)

Author : Date : 1979

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POWER DOOR LOCK CONTROL SYSTEM

055Y6-03

HOW TO PROCEED WITH TROUBLESHOOTING

HINT:

Troubleshoot in accordance with the procedures on the following pages.

1	VEHICLE BROUGHT TO WORKSHOP

2	CUSTOMER PROBLEM ANALYSIS CHECK AND SYMPTOM CHECK (See page 05–1783)

3	INSPECT COMMUNICATION FUNCTION OF LARGE–SCALE MULTIPLEX COMMUNICATION SYSTEM (BEAN)

(a) Check that there is no abnormality in the communication system by inspecting the communication function of the multiplex communication system with the hand–held tester.
  (1) (ECU unconnected, communication line abnormal) Without code outputs, proceed to A.
  (2) (ECU unconnected, communication line abnormal) With code outputs, proceed to B.

B	GO TO MULTIPLEX COMMUNICATION SECTION (See page 05–1909)

A

4	PROBLEM SYMPTOMS TABLE (See page 05–1792)

(a) Without applicable symptoms, proceed to A.
(b) With applicable symptoms, proceed to B.

B	Go to step 6

A

5	PERFORM TROUBLESHOOTING IN FOLLOWING METHOD, DEPENDING ON MALFUNCTION SYMPTOM

(a) Pre–check (See page 05–1784).
  (1) Inspection with the hand–held tester (ECU DATA LIST).
  (2) Inspection with the hand–held tester (ACTIVE TEST).
(b) On–vehicle inspection (See page 73–1).
(c) Inspection (See page 73–3).
(d) Terminals of ECU (See page 05–1788).

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6	ADJUST, REPAIR OR REPLACE

END

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055Y7–03

CUSTOMER PROBLEM ANALYSIS CHECK

POWER DOOR LOCK CONTROL SYSTEM Check Sheet Inspector's name: _____

Customer's Name		**Registration No.**	
		Registration Year	
		Frame No.	
Date Vehicle Brought in	/ /	**Odometer Reading**	**km miles**

Date Problem First Occurred		/ /
Frequency Problem Occurs		Constant Sometimes (Times per day, month) Once only
Weather Conditions When Problem Occurred	**Weather**	Fine Cloudy Rainy Snowy Various/Others
	Outdoor temperature	Hot Warm Cool Cold (Approx. □C (□F))

Problem Symptoms	Malfunction in Door Lock/Unlock Operation Using Door Lock Control Switch.	Driver side door lock control switch.	Driver side door Passenger side door Rear left door Rear right door
		Passenger side door lock control switch.	Driver side door Passenger side door Rear left door Rear right door
	Malfunction in Door Lock/Unlock Operation Using Key.	Driver side door key lock and unlock control switch.	Driver side door Passenger side door Rear left door Rear right door
		2–step unlocking function of driver side door key lock and unlock switch.	
	Malfunction in Key Lock–in Prevention Function.		
	Malfunction in Back Door Opener Function.		
	Others.		

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058XJ–01

PRE–CHECK

1. USING HAND–HELD TESTER

(a) Hook up the hand–held tester to the DLC3.
(b) Monitor the ECU data by following the prompts on the tester screen.

HINT:
Hand–held tester has a Snapshot function which records the monitored data.
Refer to the hand–held tester operator's manual for further details.

2. DTC CLEAR

(a) The DTCs and freeze frame data will be erased by the hand–held tester to erase the codes.

3. DATA LIST

HINT:
According to the DATA LIST displayed by the hand–held tester, you can read the value of the switch, sensor, actuator and so on without parts removal. Reading the DATA LIST as a first step of troubleshooting is one of the method to shorten the labor time.

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON.
(c) According to the display on tester, read the DATA LIST.

Standard (Body ECU):

Item	Measurement Item/ Display (Range)	Normal Condition	Diagnostic Note
KEY UNLK WRN SW	Key unlock warning switch signal/ON or OFF	ON: Key is in ignition key cylinder OFF: No key is in ignition key cylinder	–
D DOR CTY SW	Driver side door courtesy switch signal/ON or OFF	ON: Driver side door is open OFF: Driver side door is closed	–
P DOR CYT SW	Passenger side door courtesy switch signal/ ON or OFF	ON: Passenger side door is open OFF: Passenger side door is closed	–
Rr DOR CTY SW	Rear door courtesy switch signal/ON or OFF	ON: Either right or left rear door is open OFF: Both right and left doors are closed	–
P LOCK POS SW	Passenger side door lock position switch signal/ON or OFF	ON: Passenger side door lock is in unlock position OFF: Passenger side door lock is in lock position	–
Rr LOCK POS SW	Rear door lock position switch signal/ON or OFF	ON: Rear door lock is in unlock position OFF: Rear door lock is in lock position	–
IG SW	IG switch signal/ON or OFF	ON: Key is in ON or START position OFF: Key is in OFF or ACC position	–
D LOCK POS SW	Driver side door lock position switch signal/ ON or OFF	ON: Driver side door lock is in unlock position OFF: Driver side door lock is in lock position	–
D/L SW–LOCK	Manual door lock switch LOCK signal/ ON or OFF	ON: Manual door lock switch is in lock position OFF: Manual door lock switch is in neutral position (Common to driver side and passenger side mode)	–
D/L SW–UNLOCK	Manual door lock switch UNLOCK signal/ON or OFF	ON: Manual door lock switch is in unlock position OFF: Manual door lock switch is in neutral position (Common to driver side and passenger side mode)	–
DOR KEY SW–LOCK	Key operation door lock switch signal/ON or OFF	ON: Key operation door lock switch is in lock position OFF: Key operation door lock switch is in neutral position (Common to driver side and passenger side mode)	–

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Item	Measurement Item/ Display (Range)	Normal Condition	Diagnostic Note
P DOR KEY SW–UL	Key operation passenger door unlock switch signal/ON or OFF	ON: Passenger key operation door lock switch is in unlock position OFF: Passenger key operation door lock switch is in neutral position	–
D DOR KEY SW–UL	Key operation driver door unlock switch signal/ON or OFF	ON: Driver key operation door lock switch is in unlock position OFF: Driver key operation door lock switch is in neutral position	–
UNLK/KEY TWICE	Key operation driver door 2–step unlock switch signal/ON or OFF	ON: All doors are unlocked when driver side door key cylinder is turned to unlock twice (2–step unlocking function) OFF: Only driver side door is unlocked when driver side door key cylinder is turned to unlock once	–
UNLOCK/PARK	Park/neutral position switch signal/ON or OFF	ON: Ignition switch ON, vehicle speed 0 km/h and shift to any position except P position → Shift to P position → all door unlock OFF: Ignition switch ON, vehicle speed 0 km/h and shift to any position except P position	–
AUTO LOCK/SHIFT	Park/neutral position switch signal/ON or OFF	ON: Driver key operation door lock switch is in unlock position OFF: Driver key operation door lock switch is in neutral position	–
OPEN DOOR WARN	Door courtesy switch signal/ON or OFF	ON: Each door is open OFF: All door is closed	–
AUTO LOCK DELAY	Door courtesy switch signal/60s or 30s	60s: Door auto locking time is 60 sec. 30s: Door auto locking time is 30 sec.	–

Standard (Back Door ECU):

Item	Measurement Item/ Display (Range)	Normal Condition	Diagnostic Note
KEY SW(UNLK)	Back door key lock and unlock switch signal/ON or OFF	ON: Back door lock key cylinder is turned to unlock OFF: Key is in back door lock key cylinder (original position)	–
KEY SW(LOCK)	Back door key lock and unlock switch signal/ON or OFF	ON: Back door lock key cylinder is turned to lock OFF: Key is in back door lock key cylinder (original position)	–
HALF LATCH SW	Back door half latch switch signal/ON or OFF	ON: Back door is open OFF: Back door is closed	–
FULL LATCH SW	Back door full latch switch (courtesy SW) signal/ON or OFF	ON: Back door is closed OFF: Back door is open	–
DOOR HANDLE SW	Back door opener switch signal/ON or OFF	ON: Back door opener is pushed OFF: Back door opener is not pushed	–
LOCK STATUS	Back door position switch signal/UNLOCK or LOCK	UNLOCK: Back door is unlock LOCK: Back door is lock	–

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4. ACTIVE TEST

HINT:

Performing the ACTIVE TEST using the hand–held tester allows the relay, VSV, actuator and so on to operate without parts removal. Performing the ACTIVE TEST as a first step of troubleshooting is one of the method to shorten the labor time.

It is possible to display the DATA LIST during the ACTIVE TEST.

(a) Connect the hand–held tester to the DLC3.

(b) Turn the ignition switch ON.

(c) According to the display on the tester, perform the ACTIVE TEST.

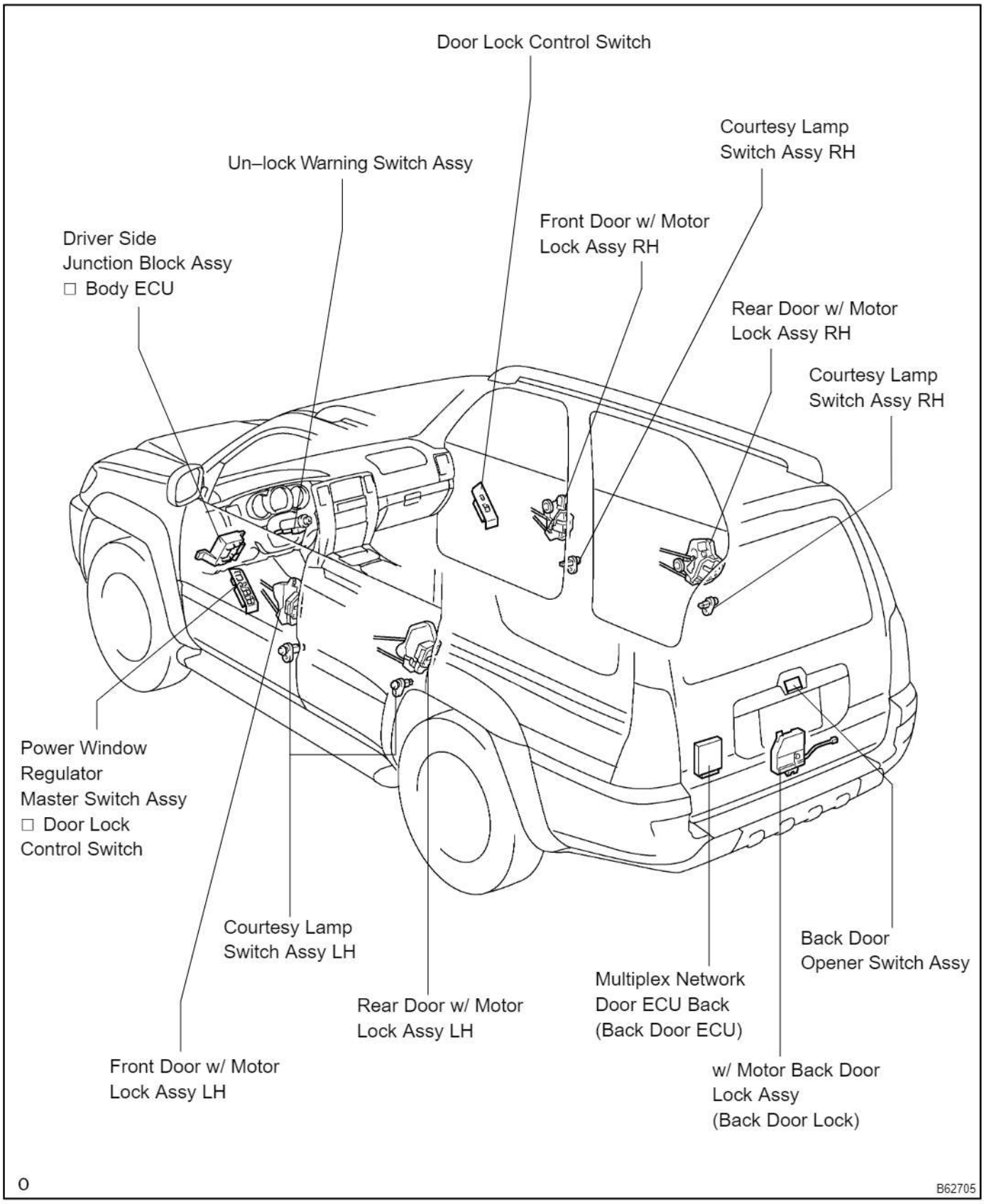
Standard (Body ECU):

Item	Test Details	Diagnostic Note
OPN DOR WRN LGT	Turn open door warning light ON/OFF (All doors are closed)	–
DOOR LOCK	Drive door lock motor at all doors LOCK/OFF	–
DOOR LOCK	Drive door lock motor at all doors UNLOCK/OFF	–

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055YA–03

LOCATION



O

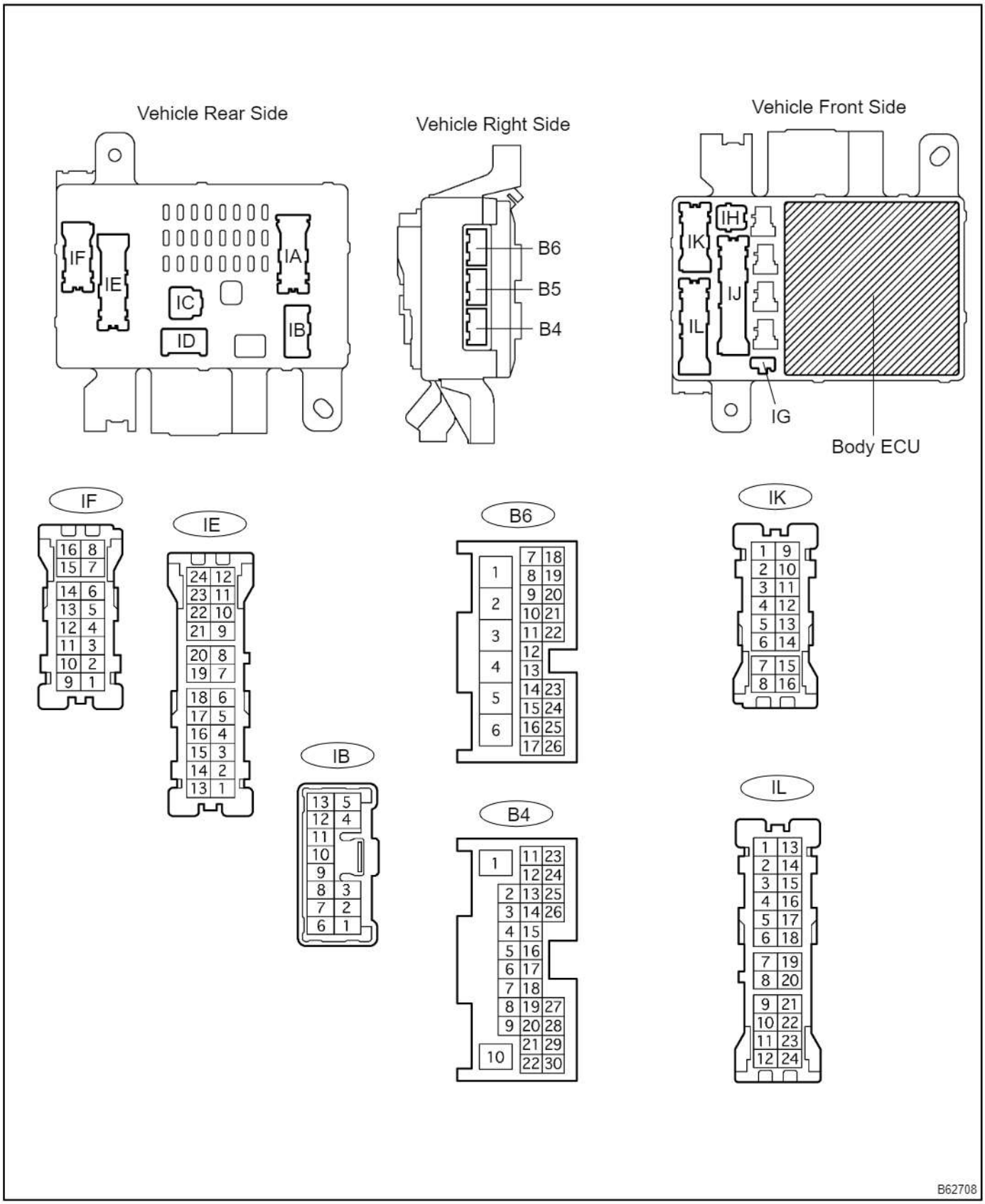
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055YB-03

TERMINALS OF ECU

1. CHECK INSTRUMENT PANEL JUNCTION BLOCK ASSY (BODY ECU)



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(a) Disconnect the IB, IE, IF, IH, IK, IL, B4 and B6 J/B connectors, and check the voltage or continuity of each terminal of the vehicle side connectors.
Standard:

Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
BDR1 (IE–9) ⇔ Body Ground	G–W ⇔ –	Constant	10 – 14 V
BECU (IB–4) ⇔ Body Ground	W–R ⇔ –	Constant	10 – 14 V
BECU (IF–12) ⇔ Body Ground			
BECU (IL–4) ⇔ Body Ground			
GND1 or GND2 (IH–2) ⇔ Body Ground	W–B ⇔ –	Constant	Continuity
KSW (B6–14) ⇔ Body Ground	G–Y ⇔ –	No key inserted in ignition key cylinder → Key inserted	No continuity → Continuity
L1(IK–5) ⇔ Body Ground	L–W ⇔ –	Door control switch (Master switch) OFF → LOCK	No continuity → Continuity
UL1 (IK–1) ⇔ Body Ground	L–O ⇔ –	Door control switch (Master switch) OFF → UNLOCK	No continuity → Continuity
L2 (IK–3) ⇔ Body Ground	L ⇔ –	Driver side door key cylinder OFF → LOCK	No continuity → Continuity
UL3 (B4–12) ⇔ Body Ground	G ⇔ –	Driver side door key cylinder OFF → UNLOCK twice (within 3 sec.)	No continuity → Continuity

If the result is not as specified, there may be a malfunction on the wire harness side.

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(b) Reconnect the J/B connectors IB, IE, IF, IH, IK, IL, B4 and B6, and check the voltage of each terminal of the connectors.

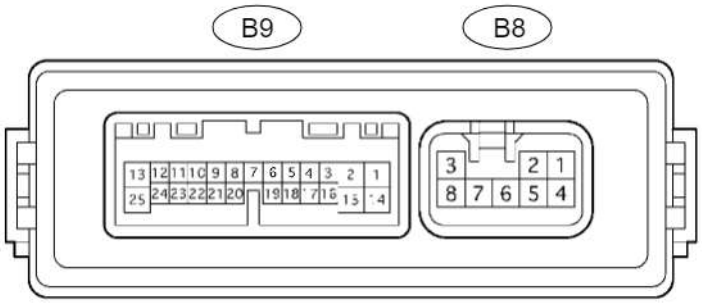
Standard:

Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
DCTY (B5–23) ⇔ Body Ground	R–B ⇔ –	Driver door CLOSED → OPEN	10 – 14 V → Below 1 V
ACT+ (IL–9) ⇔ Body Ground	L–R ⇔ –	Door control switch (master switch or passenger side switch) or driver door key cylinder OFF → LOCK	Below 1 V → 10 – 14 V → Below 1 V
ACT+ (IL–6) ⇔ Body Ground	L–R ⇔ –		
ACT+ (IL–11) ⇔ Body Ground	L–R ⇔ –		
ACT+ (IL–10) ⇔ Body Ground	L–R ⇔ –		
ACT– (IL–18) ⇔ Body Ground	L–B ⇔ –	Door control switch (master switch or passenger side switch) or driver door key cylinder OFF → LOCK	Below 1 V → 10 – 14 V → Below 1 V
ACT– (IL–23) ⇔ Body Ground	L–B ⇔ –		
ACT– (IL–22) ⇔ Body Ground	L–B ⇔ –		
ACTD (B4–10) ⇔ Body Ground	L–B ⇔ –	Driver side door key cylinder OFF → 2–step unlocking	Below 1 V → 10 – 14 V → Below 1 V
LSWD (B4–21) ⇔ Body Ground	W–R ⇔ –	Driver side door UNLOCK → LOCK	10 – 14 V → Below 1 V
LSWP (B4–30) ⇔ Body Ground	B–W ⇔ –	Passenger side door UNLOCK → LOCK	10 – 14 V → Below 1 V
LSR (IL–16) ⇔ Body Ground	W ⇔ –	Rear left door UNLOCK → LOCK	10 – 14 V → Below 1 V
LSR (IK–15) ⇔ Body Ground	W ⇔ –	Rear right door UNLOCK → LOCK	10 – 14 V → Below 1 V

If the result is not as specified, the vehicle may be defective. In this case, check the harness, connector and fuse between the ECU and battery. Then repair or replace it if necessary.

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2. CHECK MULTIPLEX NETWORK DOOR ECU BACK (BACK DOOR ECU)



(a) Disconnect the B8 and B9 ECU connectors, and check the voltage or continuity of each terminal of the wire harness side connectors.

Standard:

Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
BDR (B8–4) ⇔ Body Ground	L ⇔ –	Constant	10 – 14 V
BECU (B8–5) ⇔ Body Ground	L–R ⇔ –	Constant	10 – 14 V
GND (B8–3) ⇔ Body Ground	W–B ⇔ –	Constant	Continuity
SIG (B8–6) ⇔ Body Ground	B ⇔ –	No key inserted in ignition key cylinder → Key inserted	No continuity → Continuity
HSW+ (B9–10) ⇔ Body Ground	V–W ⇔ –	Back door opener switch OFF → ON	No continuity → Continuity
HSW– (B9–22) ⇔ Body Ground	LG–R ⇔ –		
HALF (B9–6) ⇔ Body Ground	R–G ⇔ –	Back door OPEN → CLOSED	Continuity → No continuity
LSE (B9–21) ⇔ Body Ground	B–R ⇔ –	Constant	Continuity

If the result is not as specified, there may be a malfunction on the wire harness side.

(b) Reconnect the connectors, and check the voltage of each terminal of the connectors.

Standard:

Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
ACT+ (B9–15) ⇔ Body Ground	L–B ⇔ –	Back door OPEN ⇩ NOT COMPLETELY CLOSED ⇩ Motor in normal rotation (Right turn) ⇩ Motor in revers rotation (Left turn) ⇩ Operation completed (Back door CLOSED)	Below 1 V → Below 1 V → 10 – 14 V → Below 1 V → Below 1 V
ACT– (B9–14) ⇔ Body Ground	L–R ⇔ –	Back door OPEN ⇩ NOT COMPLETELY CLOSED ⇩ Motor in normal rotation (Right turn) ⇩ Motor in revers rotation (Left turn) ⇩ Operation completed (Back door CLOSED)	Below 1 V → Below 1 V → Below 1 V → 10 – 14 V→ Below 1 V
FULL (B9–7) ⇔ Body Ground	G–Y ⇔ –	Back door CLOSED → OPEN	10 – 14 V → Below 1 V
POS (B9–8) ⇔ Body Ground	BR–W ⇔ –	Back door OPEN → Closer in operation ⇩ CLOSED	Below 1 V ⇩ 10 – 14 V → Below 1 V

If the result is not as specified, the vehicle may be defective. In this case, check the harness, connector and fuse between the ECU and battery. Then repair or replace it if necessary.

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055YC-04

PROBLEM SYMPTOMS TABLE

Symptom	Suspected Area	See Page
All doors lock and unlock functions do not operate via master switch, driver side door key cylinder	4. DOOR1 fuse 5. ECU–B fuse 6. Power window regulator master switch assy 7. Front door lock assy LH 8. Instrument panel junction block assy (body ECU) 9. Wire harness	05–1793
Key lock–in prevention function does not work properly (Manual operation and operation interlocked with key are active)	1. Unlock warning switch assy 2. Courtesy lamp switch assy LH (Driver side door) 3. Instrument panel junction block assy (body ECU) 4. Wire harness	05–1797
Only back door can not be opened (Unlocked)	1. Back door opener switch assy 2. w/ Motor back door lock assy LH (Back door lock) 3. Instrument panel junction block assy (body ECU) 4. Wire harness	05–1801

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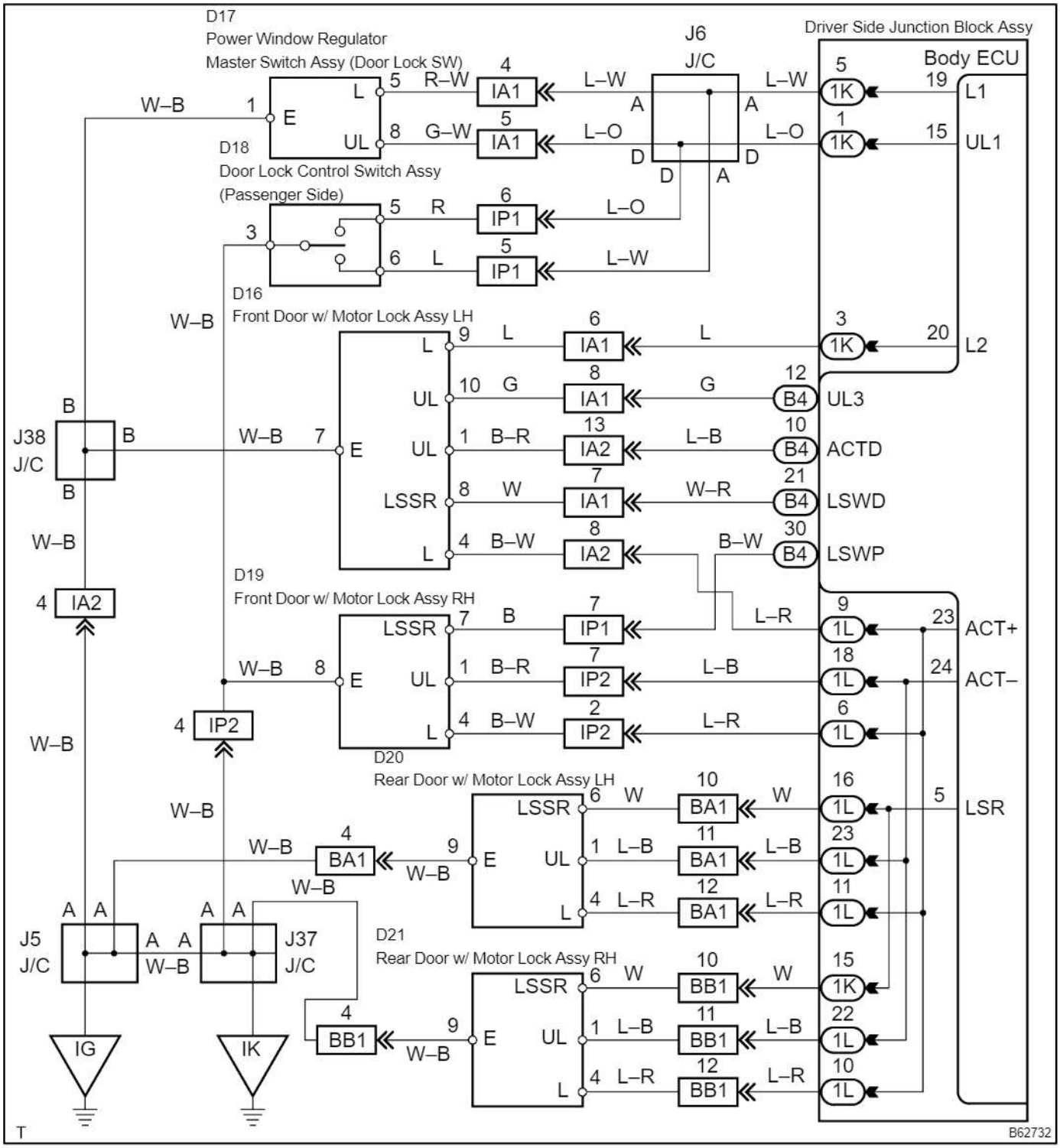
Author : Date : 1991

ALL DOORS LOCK AND UNLOCK FUNCTIONS DO NOT OPERATE VIA MASTER SWITCH, DRIVER SIDE DOOR KEY CYLINDER

CIRCUIT DESCRIPTION

The body ECU receives a switch signal from the master switch and the driver side door key cylinder, and then drives the door lock motor.

WIRING DIAGRAM



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INSPECTION PROCEDURE

1	PERFORM ACTIVE TEST BY HAND–HELD TESTER

(a) Select the active test, and then check that the power door lock operates.

HINT:

During the active test, the hand–held tester sends signal to the body ECU to drive all the power door lock motor. If the all power door lock operates, the power door lock motor itself and the wire harness between the power door lock motor and body ECU is considered normal.

Standard (Body ECU):

Item	Test Details	Diagnostic Note
DOOR LOCK	Drive door lock motor at all doors LOCK/OFF	–
DOOR LOCK	Drive door lock motor at all doors UNLOCK/OFF	–

NG → **REPLACE INSTRUMENT PANEL JUNCTION BLOCK ASSY**

OK

2	MASTER SWITCH OR KEY CYLINDER OPERATION

(a) When manual door lock/unlock operation via the master switch can not be performed, proceed to A.

(b) When manual door lock/unlock operation via the door lock control switch (passenger side) can not be performed, proceed to B.

(c) When manual door lock/unlock operation interlocked with the driver side door lock key cylinder can not be performed. proceed to C.

B → **Go to step 4**

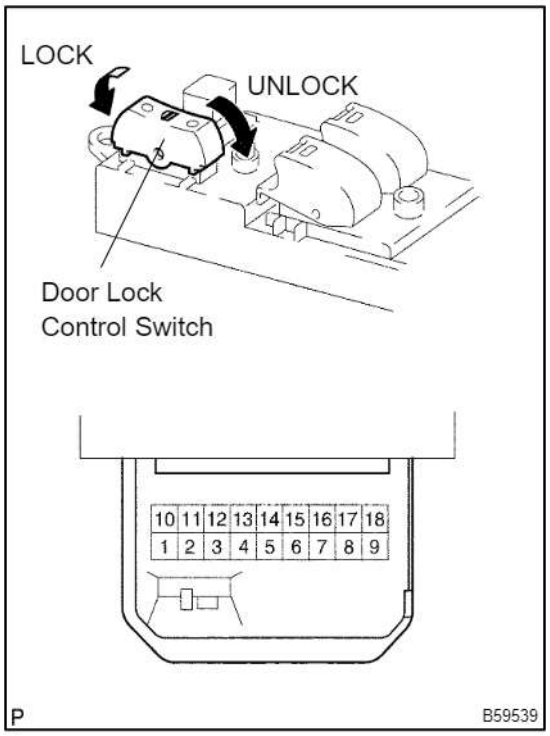
C → **Go to step 5**

A

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Author : Date : 1993

3 INSPECT POWER WINDOW REGULATOR MASTER SWITCH ASSY



(a) Remove the master switch.
(b) Inspect the door lock control switch continuity.

Standard:

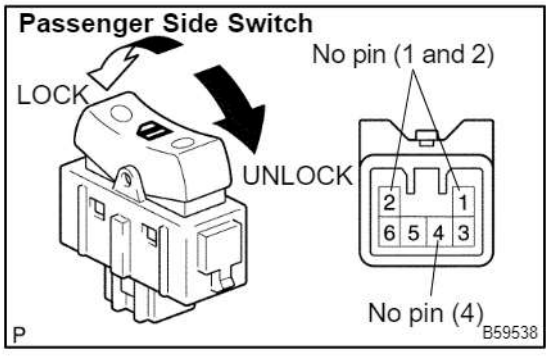
Terminal No.	Switch Position	Specified Condition
1 ⇔ 5	Lock	Continuity
–	OFF	No continuity
1 ⇔ 8	Unlock	Continuity

NG → **REPLACE POWER WINDOW REGULATOR MASTER SWITCH ASSY**

OK

REPAIR OR REPLACE HARNESS AND CONNECTOR (POWER WINDOW REGULATOR MASTER SWITCH ASSY ⇔ DRIVER SIDE JUNCTION BLOCK ASSY (BODY ECU))

4 INSPECT DOOR CONTROL SWITCH ASSY



(a) Passenger side switch:
Inspect the door lock control switch continuity.

Standard:

Terminal No.	Switch Position	Specified Condition
3 ⇔ 6	Lock	Continuity
–	OFF	No continuity
3 ⇔ 5	Unlock	Continuity

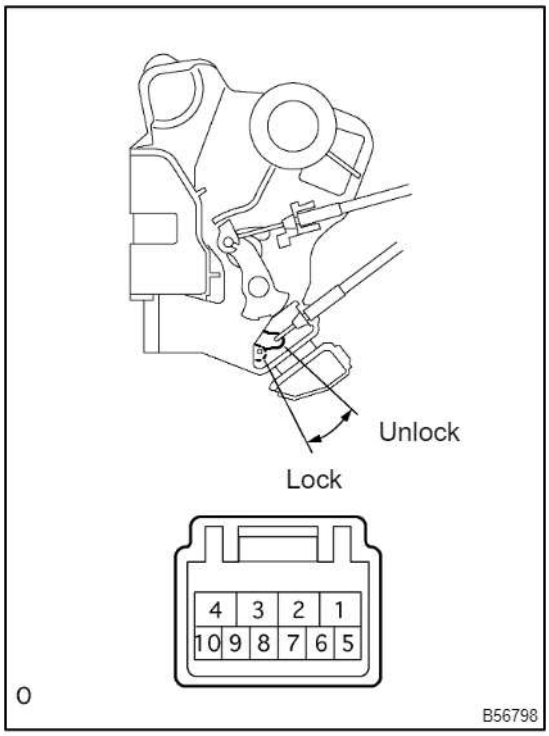
NG → **REPLACE DOOR CONTROL SWITCH ASSY**

OK

REPAIR OR REPLACE HARNESS AND CONNECTOR (DOOR LOCK CONTROL SWITCH ASSY ⇔ DRIVER SIDE JUNCTION BLOCK ASSY (BODY ECU))

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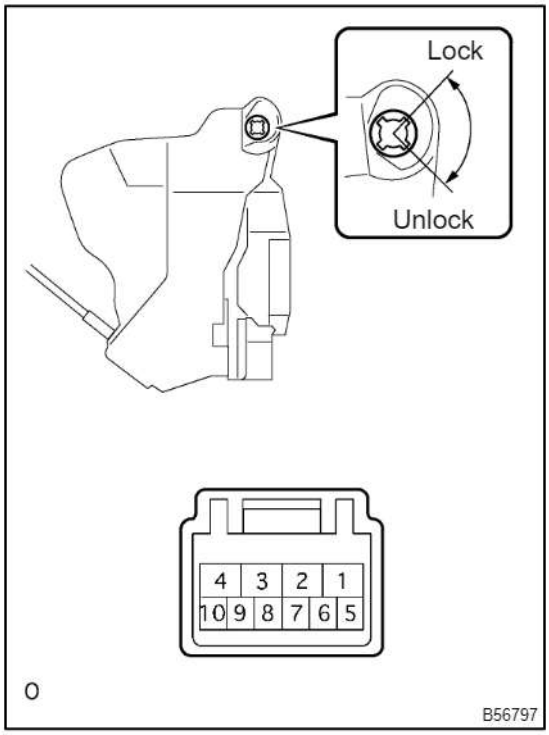
5	INSPECT FRONT DOOR W/MOTOR LOCK ASSY LH



(a) Apply battery voltage and inspect operation of the door lock motor.

Standard:

Measurement Condition	Specified Condition
Battery positive (+) ⇔ Terminal 4 Battery negative (–) ⇔ Terminal 1	Lock
Battery positive (+) ⇔ Terminal 1 Battery negative (–) ⇔ Terminal 4	Unlock



(b) Inspect the door lock and unlock switch continuity.

Standard:

Terminal No.	Door Lock Position	Specified Condition
7 ⇔ 9	Lock	Continuity
–	OFF	–
7 ⇔ 10	Unlock	Continuity

(c) Inspect the position switch continuity.

Standard:

Terminal No.	Door Lock Position	Specified Condition
7 ⇔ 8	Lock	No continuity
	Unlock	Continuity

NG → **REPLACE FRONT DOOR W/MOTOR LOCK ASSY LH**

OK

REPAIR OR REPLACE HARNESS AND CONNECTOR (FRONT DOOR LOCK W/MOTOR LOCK ASSY LH ⇔ DRIVER SIDE JUNCTION BLOCK ASSY (BODY ECU))

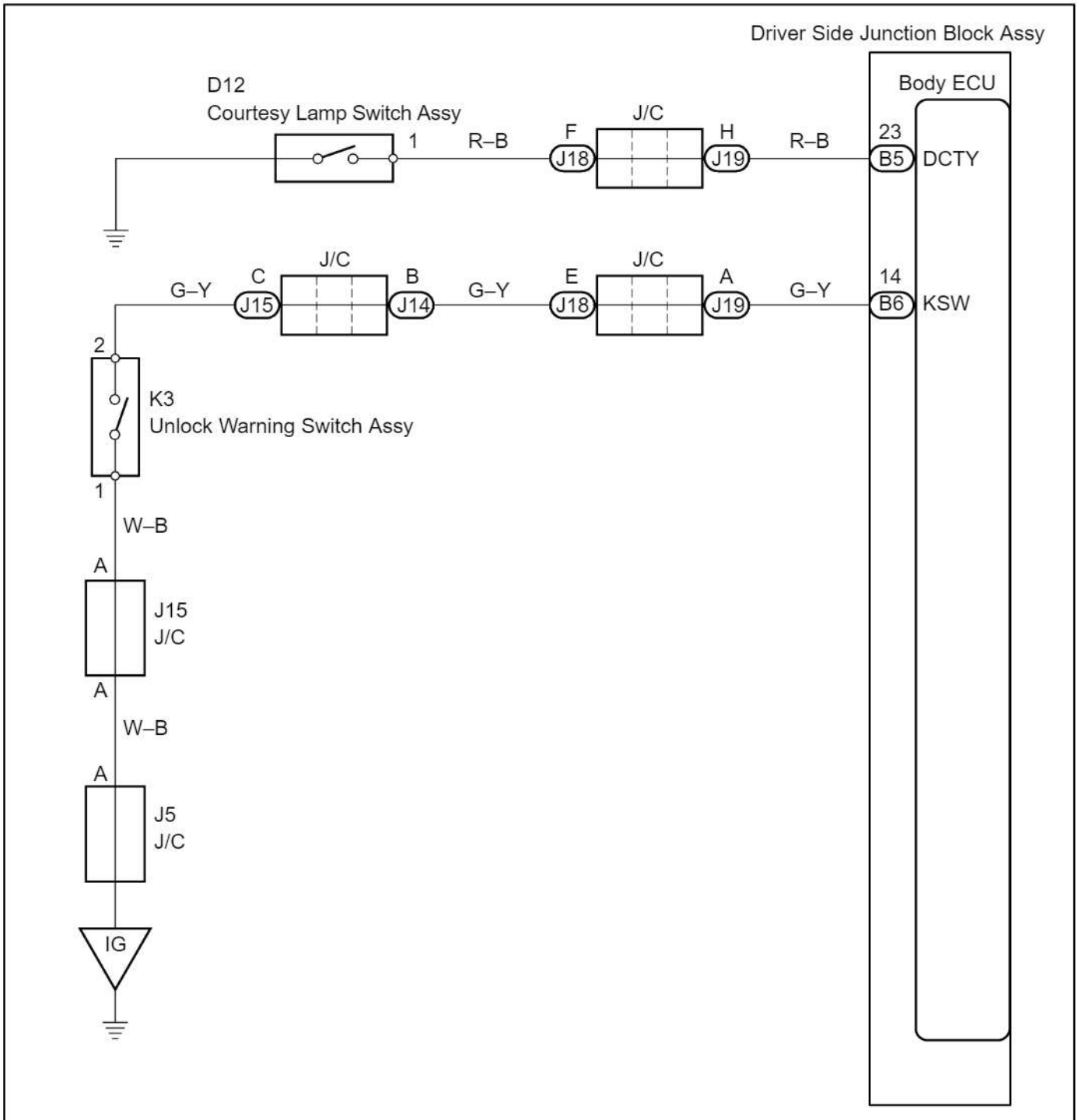
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KEY LOCK–IN PREVENTION FUNCTION DOES NOT WORK PROPERLY (MANUAL OPERATION AND OPERATION INTERLOCKED WITH KEY ARE ACTIVE)

CIRCUIT DESCRIPTION

The un–lock warning switch turns ON when the key is inserted in the ignition key cylinder. The courtesy lamp switch turns ON when the driver side door is opened. These 2 switches are monitored by the body ECU. In order to prevent the key from being locked in, the body ECU controls door locking operation according to conditions of these switches, so tat doors are not locked.

WIRING DIAGRAM



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INSPECTION PROCEDURE

1	READ VALUE OF HAND–HELD TESTER

(a) Using the hand–held tester, check that the un–lock warning switch signal is output when the switch is operated.

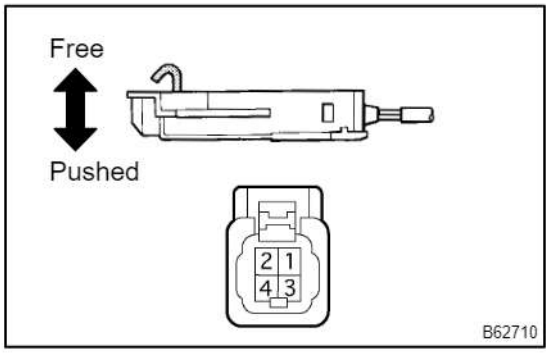
Standard (Body ECU (Switch condition)):

Item	Measurement Item/ Display (Range)	Normal Condition	Diagnostic Note
KEY UNLK WRN SW	Key un–lock warning SW signal/ON or OFF	ON: Key is in ignition key cylinder OFF: Key is not in ignition key cylinder	–

OK → **Go to step 4**

NG

2	INSPECT UN–LOCK WARNING SWITCH ASSY



(a) Remove the un–lock warning switch.
(b) Inspect the un–lock warning switch continuity.

Standard:

Terminal No.	Condition	Specified Condition
1 ⇔ 2	Free	No continuity
	Pushed	Continuity

NG → **REPLACE UN–LOCK WARNING SWITCH ASSY**

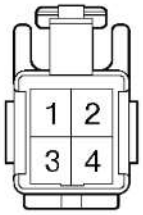
OK

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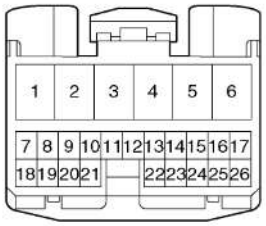
3	CHECK WIRE HARNESS (UN–LOCK WARNING SWITCH ASSY ⇔ DRIVER SIDE JUNCTION BLOCK ASSY (BODY ECU))

Wire Harness Side

K3
Unlock Warning Switch



B6
Body ECU



B65425

(a) Disconnect the K3 un–lock warning switch and B12 body ECU connectors.

(b) Check the continuity between the terminals of the un–lock warning switch (K3) and body ECU (B6) connectors.

Standard (Check for open) :

Symbols (Terminal No.)	Specified Condition
– (K3–2) ⇔ KSW (B6–14)	Continuity
– (K3–1) ⇔ Body ground	

NG	REPAIR OR REPLACE HARNESS AND CONNECTOR

OK	REPLACE INSTRUMENT PANEL JUNCTION BLOCK ASSY

4	READ VALUE OF HAND–HELD TESTER

(a) Using the hand–held tester, check that the driver door courtesy switch signal is output when the switch is operated.

Standard (Body ECU (Switch condition)):

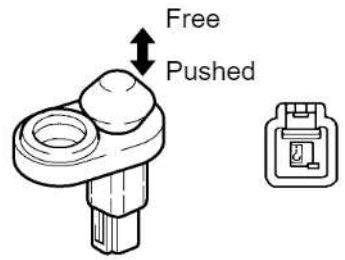
Item	Measurement Item/ Display (Range)	Normal Condition	Diagnostic Note
D DOR CTY SW	Driver door courtesy SW signal/ON or OFF	ON: Driver door is open OFF: Driver door is closed	–

OK	REPLACE COURTESY LAMP SWITCH

NG

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5 INSPECT COURTESY LAMP SWITCH



(a) Remove the courtesy lamp switch.
(b) Inspect the courtesy lamp switch continuity.
Standard:

Terminal No.	Condition	Specified Condition
1 ⇔ Body ground	Free	Continuity
	Pushed	No continuity

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

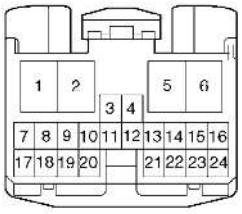
6 CHECK WIRE HARNESS

Wire Harness Side

D12
Front Door Courtesy Lamp Switch



B5
Body ECU



(a) Disconnect the courtesy lamp switch and body ECU connectors.
(b) Check the continuity between the terminals of the courtesy lamp switch (D12) and body ECU (B5) connectors.
Standard (Check for open) :

Symbols (Terminal No.)	Specified Condition
– (D12–1) ⇔ DCTY (B5–23)	Continuity

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

REPLACE INSTRUMENT PANEL JUNCTION BLOCK ASSY

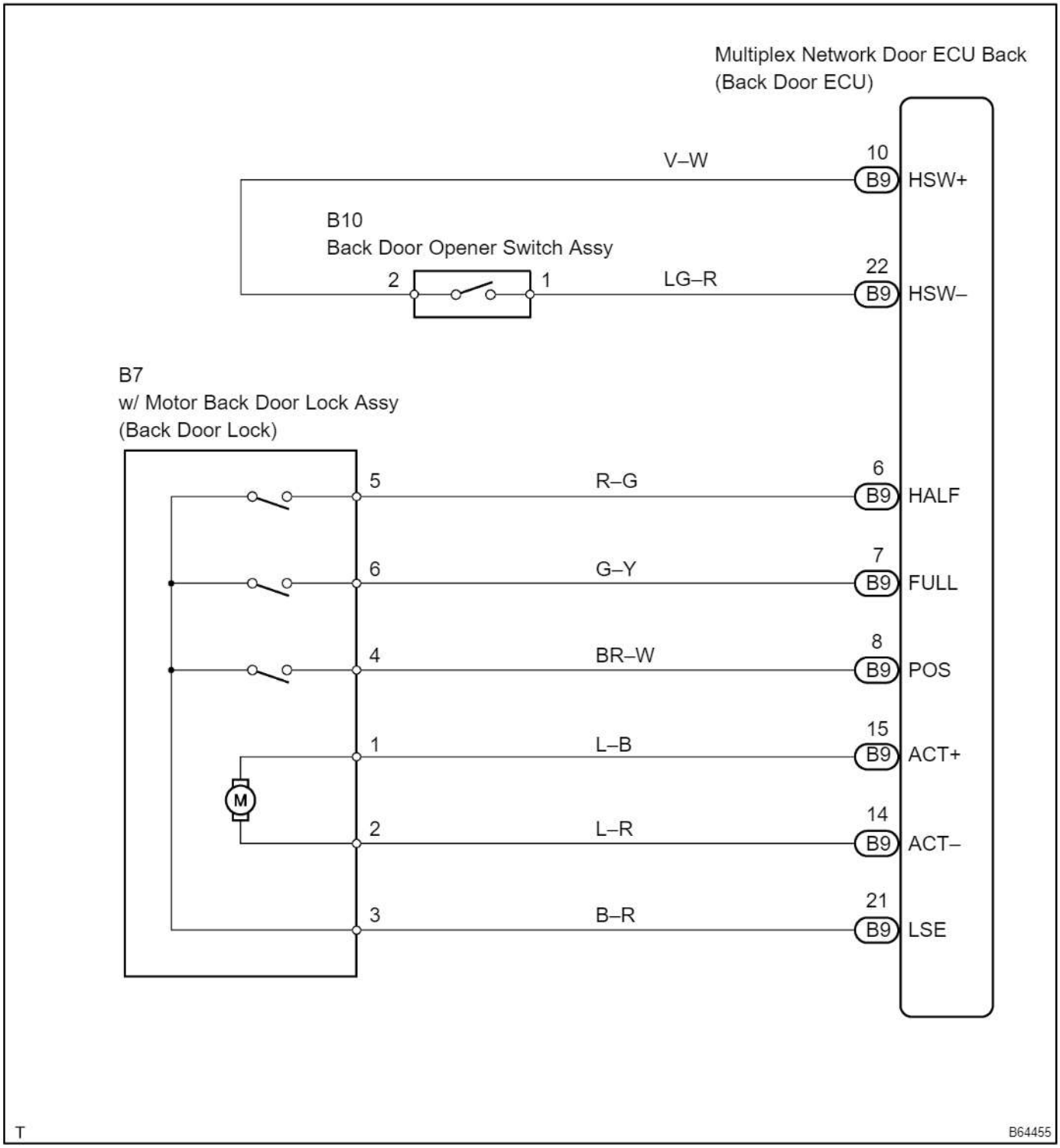
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ONLY BACK DOOR CAN NOT BE OPENED (UNLOCKED)

CIRCUIT DESCRIPTION

The signal for manual unlocking operation on driver side door and the signal for unlocking operation interlocked with the driver side door lock key cylinder are sent to the back door ECU from the body ECU using the MPX line. Also, the signal of the back door opener switch is directly sent to the back door ECU. In response to these signals, the back door ECU controls the back door lock.

WIRING DIAGRAM



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INSPECTION PROCEDURE

1	READ VALUE OF HAND–HELD TESTER

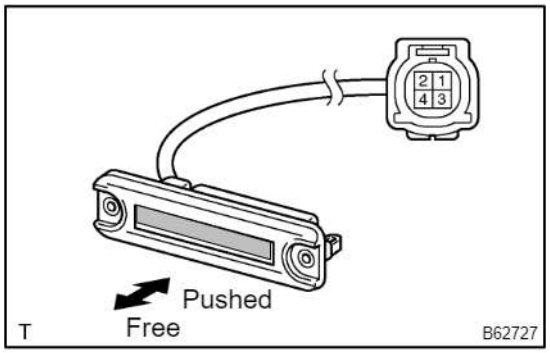
(a) Check the data list of back door opener switch.
Standard (Back door ECU):

Item	Measurement Item/ Display (Range)	Normal Condition	Diagnostic Note
DOOR HANDLE SW	Back door opener SW signal/ON or OFF	ON: Back door opener is pushed OFF: Back door opener is not pushed	–

OK → **Go to step 4**

NG

2	INSPECT BACK DOOR OPENER SWITCH ASSY



(a) Remove the back door opener switch.
(b) Inspect the back door opener switch continuity.
Standard:

Terminal No.	Condition	Specified Condition
1 ⇔ 2	Free	No continuity
	Pushed	Continuity

NG → **REPLACE BACK DOOR OPENER SWITCH ASSY**

OK

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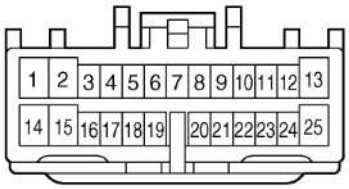
3	CHECK WIRE HARNESS (BACK DOOR OPENER SWITCH ASSY ⇔ MULTIPLEX NETWORK DOOR ECU BACK (BACK BODY ECU))

Wire Harness Side

B10
Back Door Opener Switch



B9
Back Door ECU



B65426

(a) Disconnect the B10 back door opener switch and B9 back door ECU connectors.

(b) Check the continuity between the terminals of the back door opener switch (B10) and back door ECU (B9) connectors.

Standard (Check for open) :

Symbols (Terminal No.)	Specified Condition
– (B10–1) ⇔ HSW– (B9–22)	Continuity
– (B10–2) ⇔ HSW+ (B9–10)	Continuity

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

4	PERFORM ACTIVE TEST BY HAND–HELD TESTER

(a) Select the active test, and then check that the power door lock operates.

HINT:

During the active test, the hand–held tester sends signal to the body ECU to drive the all power door lock motor. If the all power door lock operates, the power door lock motor itself and the wire harness between the power door lock motor and body ECU is considered normal.

Standard (Body ECU):

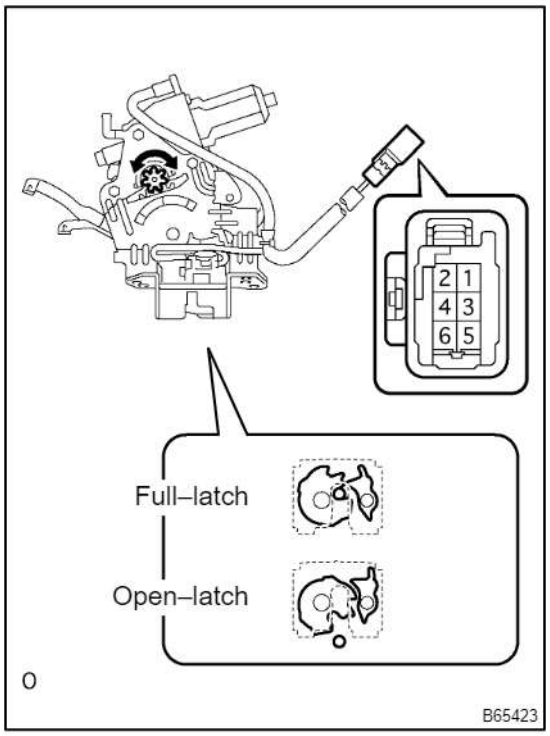
Item	Test Details	Diagnostic Note
DOOR LOCK	Drive the door lock motor at all doors LOCK/OFF	–
DOOR LOCK	Drive the door lock motor at all doors UNLOCK/OFF	–

OK → **REPLACE INSTRUMENT PANEL JUNCTION BLOCK ASSY**

NG

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5	INSPECT W/MOTOR BACK DOOR LOCK ASSY



(a) Check operation of the door lock.

(1) Using a screwdriver, push the latch in order to put the back door lock in the locked condition (full–latch position).

(2) Connect the positive (+) lead to terminal 1 and the negative (–) lead to terminal 2. Then, check operation of the latch.

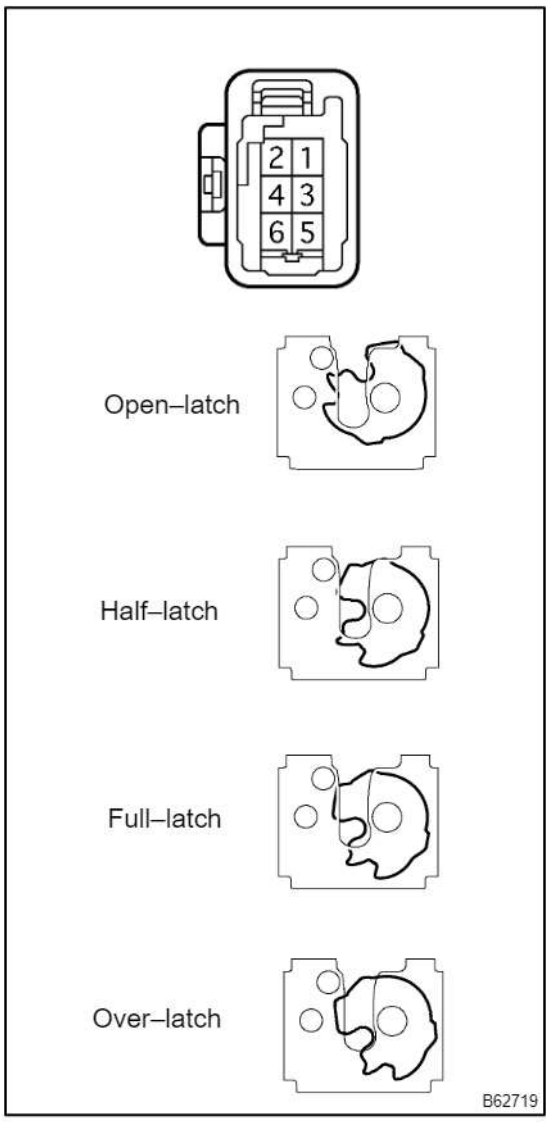
Standard: The latch turns to the open–latch position

(3) Inspect motor operation when battery voltage is applied to the terminals.

Standard:

Measurement Condition	Specified Condition
Battery positive (+) ⇔ Terminal 2 Battery negative (–) ⇔ Terminal 1	Clockwise (Motor in normal rotation)
Battery positive (+) ⇔ Terminal 1 Battery negative (–) ⇔ Terminal 2	Counterclockwise (Motor in reverse rotation)

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(b) Check the back door courtesy switch continuity.

(1) Check the continuity between the terminals of the courtesy switch.

Standard:

Door Lock Latch Position	Terminal No.	Specified Condition
Open–latch position, Half–latch position	4 ⇔ 5	Continuity
Full–latch position, Over–latch position	4 ⇔ 5	No continuity

(c) Check the back door latch switch continuity.

(1) Check the continuity between the terminals of the latch switch.

Standard:

Door Lock Latch Position	Terminal No.	Specified Condition
Open–latch position, Over–latch position	4 ⇔ 6	Continuity
Half–latch position, Full–latch position	4 ⇔ 6	No continuity

(d) Check the position switch continuity.

(1) Connect the battery positive (+) lead to connector terminal 1 and the negative (–) lead to connector terminal 2.

Standard:

Door Lock Latch Position	Terminal No.	Specified Condition
Any position other than motor stop position (Motor in operation)	3 ⇔ 4	Continuity
Motor stop position (Gear in original position	3 ⇔ 4	No continuity

NG → **REPLACE BACK DOOR OPENER SWITCH ASSY**

OK

REPAIR OR REPLACE HARNESS AND CONNECTOR (W/MOTOR BACK DOOR LOCK ASSY (BACK DOOR LOCK) ⇔ MULTIPLEX NETWORK DOOR ECU BACK (BACK BODY ECU))

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BACK DOOR CLOSER SYSTEM

HOW TO PROCEED WITH TROUBLESHOOTING

059XN-01

HINT:

Troubleshoot in accordance with the procedures on the following pages.

1	VEHICLE BROUGHT TO WORKSHOP

2	CUSTOMER PROBLEM ANALYSIS CHECK AND SYMPTOM CHECK (See page 05–1783)

3	INSPECT COMMUNICATION FUNCTION OF LARGE–SCALE MULTIPLEX COMMUNICATION SYSTEM (BEAN)

(a) Check that there is no abnormality in the communication system by inspecting the communication function of the multiplex communication system with the hand–held tester.
  (1) (ECU unconnected, communication line abnormal) Without code outputs, proceed to A.
  (2) (ECU unconnected, communication line abnormal) With code outputs, proceed to B.

B	GO TO BODY MULTIPLEX COMMUNICATION SECTION (See page 05–1909)

A

4	DIAGNOSTIC TROUBLE CODE CHECK (See page 05–1812)

(a) Check the diagnostic trouble code.
  (1) Without code outputs, proceed to A.
  (2) With code outputs, proceed to B.

B	Go to step 6

A

5	PROBLEM SYMPTOMS TABLE (See page 05–1814)

(a) Without applicable symptoms, proceed to A.
(b) With applicable symptoms, proceed to B.

B	Go to step 6

A

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6	PERFORM TROUBLESHOOTING IN FOLLOWING METHOD, DEPENDING ON MALFUNCTION SYMPTOM

(a) Pre–check (See page 05–1784)
  (1) Inspection with the hand–held tester (ECU DATA LIST)
  (2) Inspection with the hand–held tester (ACTIVE TEST)
(b) On–vehicle inspection (See page 73–9).
(c) Inspection (See page 73–3).
(d) Terminals of ECU (See page 05–1788).

7	ADJUST, REPAIR OR REPLACE

END

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CUSTOMER PROBLEM ANALYSIS CHECK

BACK DOOR CLOSER SYSTEM Check Sheet

Inspector's name: _____

Customer's Name		**Registration No.**	
		Registration Year	
		Frame No.	
Date Vehicle Brought in	/ /	**Odometer Reading**	**km miles**

Date Problem First Occurred		/ /
Frequency Problem Occurs		Constant Sometimes (Times per day, month) Once only
Weather Conditions When Problem Occurred	**Weather**	Fine Cloudy Rainy Snowy Various/Others
	Outdoor temperature	Hot Warm Cool Cold (Approx. □C (□F))

Problem Symptoms	DTC is output.	B2215
	Malfunction in back door closer system.	
	Others.	

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058XP-01

PRE–CHECK

1. USING HAND–HELD TESTER

(a) Hook up the hand–held tester to the DLC3.

(b) Monitor the ECU data by following the prompts on the tester screen.

HINT:

Hand–held tester has a Snapshot function which records the monitored data.

Refer to the hand–held tester operator's manual for further details.

2. DTC CLEAR

(a) The DTCs and freeze frame data can be erased by the hand–held tester.

3. DATA LIST

HINT:

According to the DATA LIST displayed by the hand–held tester, you can read the value of the switch, sensor, actuator and so on without parts removal. Reading the DATA LIST as a first step of troubleshooting is one of the method to shorten the labor time.

(a) Connect the hand–held tester to the DLC3.

(b) Turn the ignition switch ON.

(c) According to the display on tester, read the DATA LIST.

Standard (Back Door ECU):

Item	Measurement Item/ Display (Range)	Normal Condition	Diagnostic Note
KEY SW(UNLK)	Back door key lock and unlock SW signal/ ON or OFF	ON: Back door lock key cylinder is turned to unlock OFF: Key is in back door lock key cylinder (Neutral position)	–
KEY SW(LOCK)	Back door key lock and unlock SW signal/ ON or OFF	ON: Back door lock key cylinder is turned to lock OFF: Key is in back door lock key cylinder (Neutral position)	–
HALF LATCH SW	Back door half latch SW signal/ON or OFF	ON: Back door is open OFF: Back door is closed	–
FULL LATCH SW	Back door full latch SW (courtesy SW) signal/ON or OFF	ON: Back door is closed OFF: Back door is open	–
DOOR HANDLE SW	Back door opener SW signal/ON or OFF	ON: Back door opener is pushed OFF: Back door opener is not pushed	–
LOCK STATUS	Back door position SW signal/UNLOCK or LOCK	UNLOCK: Back door is unlock LOCK: Back door is lock	–

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4. ACTIVE TEST

HINT:

Performing the ACTIVE TEST using the hand–held tester allows the relay, VSV, actuator and so on to operate without parts removal. Performing the ACTIVE TEST as a first step of troubleshooting is one of the method to shorten the labor time.

It is possible to display the DATA LIST during the ACTIVE TEST.

(a) Connect the hand–held tester to the DLC3.

(b) Turn the ignition switch ON.

(c) According to the display on tester, perform the ACTIVE TEST.

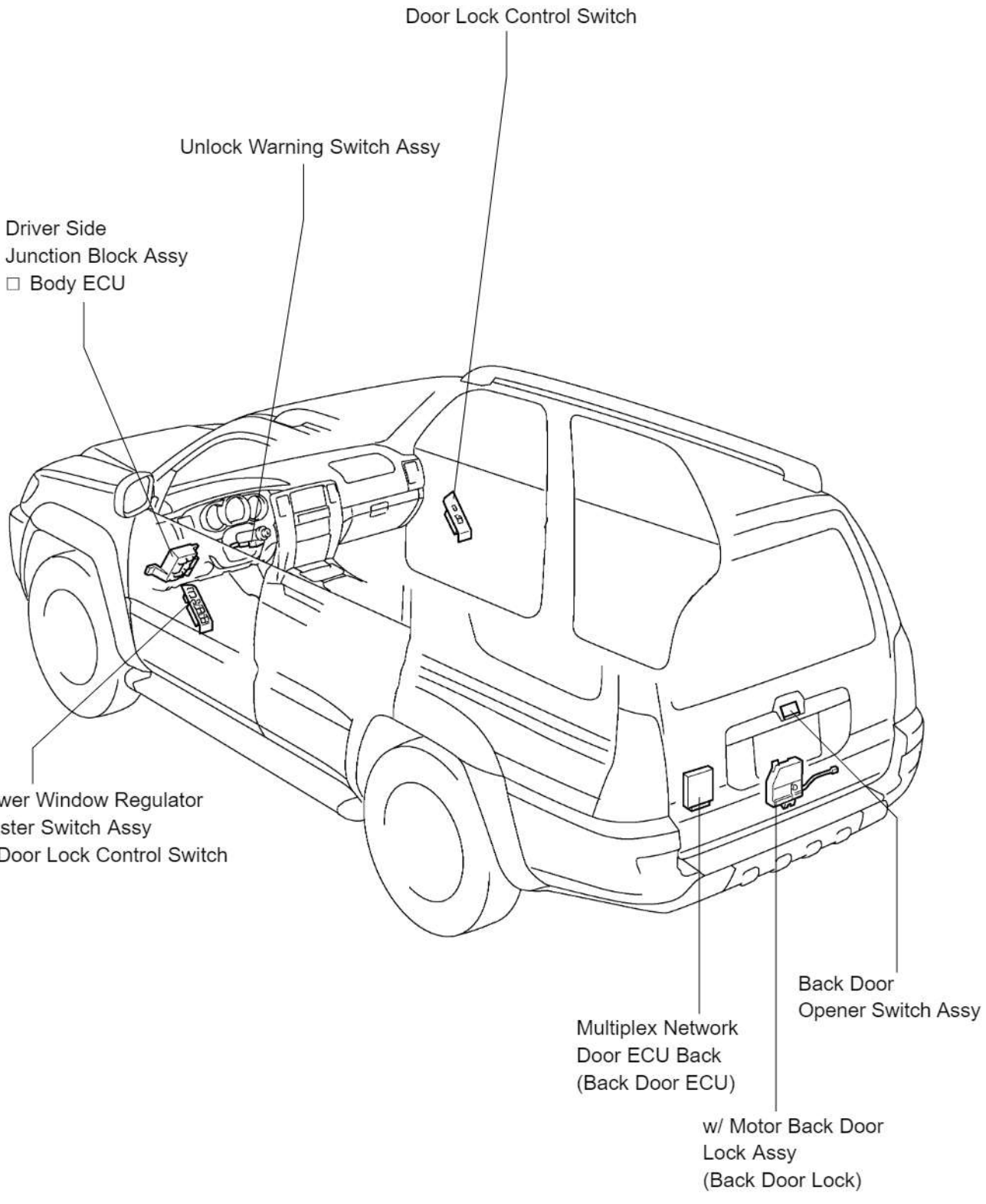
Standard (Back Door ECU):

Item	Test Details	Diagnostic Note
LATCH RELEASE	Back door lock latch is release ON/OFF	–

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058XR-01

LOCATION



O

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058XQ-01

DIAGNOSTIC TROUBLE CODE CHART

If a malfunction code is displayed during the DTC check, check the circuit listed for that code in the table below. (Proceed to the page given for that circuit.)

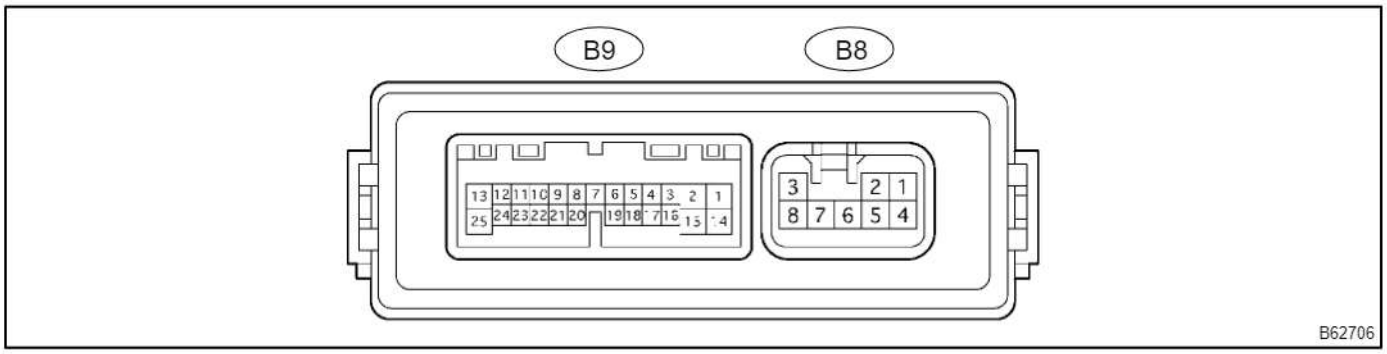
DTC No. (See page)	Detection Item	Trouble Area
B2215 (05–1815)	Back door closer switch malfunction	□w/ Motor back door lock assy (back door lock) □Multiplex network door ECU back (back door ECU) □Back door opener switch assy □Wire harness

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058XS-01

TERMINALS OF ECU

1. CHECK MULTIPLEX NETWORK DOOR ECU BACK (BACK DOOR ECU)



(a) Disconnect the B8 and B9 ECU connectors, and check the voltage or continuity of each terminal of the wire harness side connectors.

Standard:

Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
BDR (B8–4) ⇔ Body Ground	L ⇔ –	Constant	10 – 14 V
BECU (B8–5) ⇔ Body Ground	L–R ⇔ –	Constant	10 – 14 V
GND (B8–3) ⇔ Body Ground	W–B ⇔ –	Constant	Continuity
SIG (B8–6) ⇔ Body Ground	B ⇔ –	No key inserted in ignition key cylinder → Key inserted	No continuity → Continuity
HSW+ (B9–10) ⇔ Body Ground	V–W ⇔ –	Back door opener switch OFF → ON	No continuity → Continuity
HSW– (B9–22) ⇔ Body Ground	LG–R ⇔ –		
HALF (B9–6) ⇔ Body Ground	R–G ⇔ –	Back door OPEN → CLOSED	Continuity → No continuity
LSE (B9–21) ⇔ Body Ground	B–R ⇔ –	Constant	Continuity

If the result is not as specified, there may be a malfunction on the wire harness side.

(b) Reconnect the connectors, and check the voltage of each terminal of the connectors.

Standard:

Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
ACT+ (B9–15) ⇔ Body Ground	L–B ⇔ –	Back door OPEN ⇨ NOT COMPLETELY CLOSED ⇨ Motor in normal rotation (Right turn) ⇨ Motor in revers rotation (Left turn) ⇨ Operation completed (Back door CLOSED)	Below 1 V → Below 1 V → 10 – 14 V → Below 1 V → Below 1 V
ACT– (B9–14) ⇔ Body Ground	L–R ⇔ –	Back door OPEN ⇨ NOT COMPLETELY CLOSED ⇨ Motor in normal rotation (Right turn) ⇨ Motor in revers rotation (Left turn) ⇨ Operation completed (Back door CLOSED)	Below 1 V → Below 1 V → Below 1 V → 10 – 14 V→ Below 1 V
FULL (B9–7) ⇔ Body Ground	G–Y ⇔ –	Back door CLOSED → OPEN	10 – 14 V → Below 1 V
POS (B9–8) ⇔ Body Ground	BR–W ⇔ –	Back door OPEN → Closer in operation ⇨ CLOSED	Below 1 V ⇨ 10 – 14 V → Below 1 V

If the result is not as specified, the vehicle may be defective. In this case, check the harness, connector and fuse between the ECU and battery. Then repair or replace it if necessary.

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058XT-01

PROBLEM SYMPTOMS TABLE

Symptom	Suspected Area	See Page
Back door closer does not operate	1. w/ Motor back door lock assy (back door lock) 2. Multiplex network door ECU back (back door ECU) 3. Wire harness	05–1819 05–1819 –

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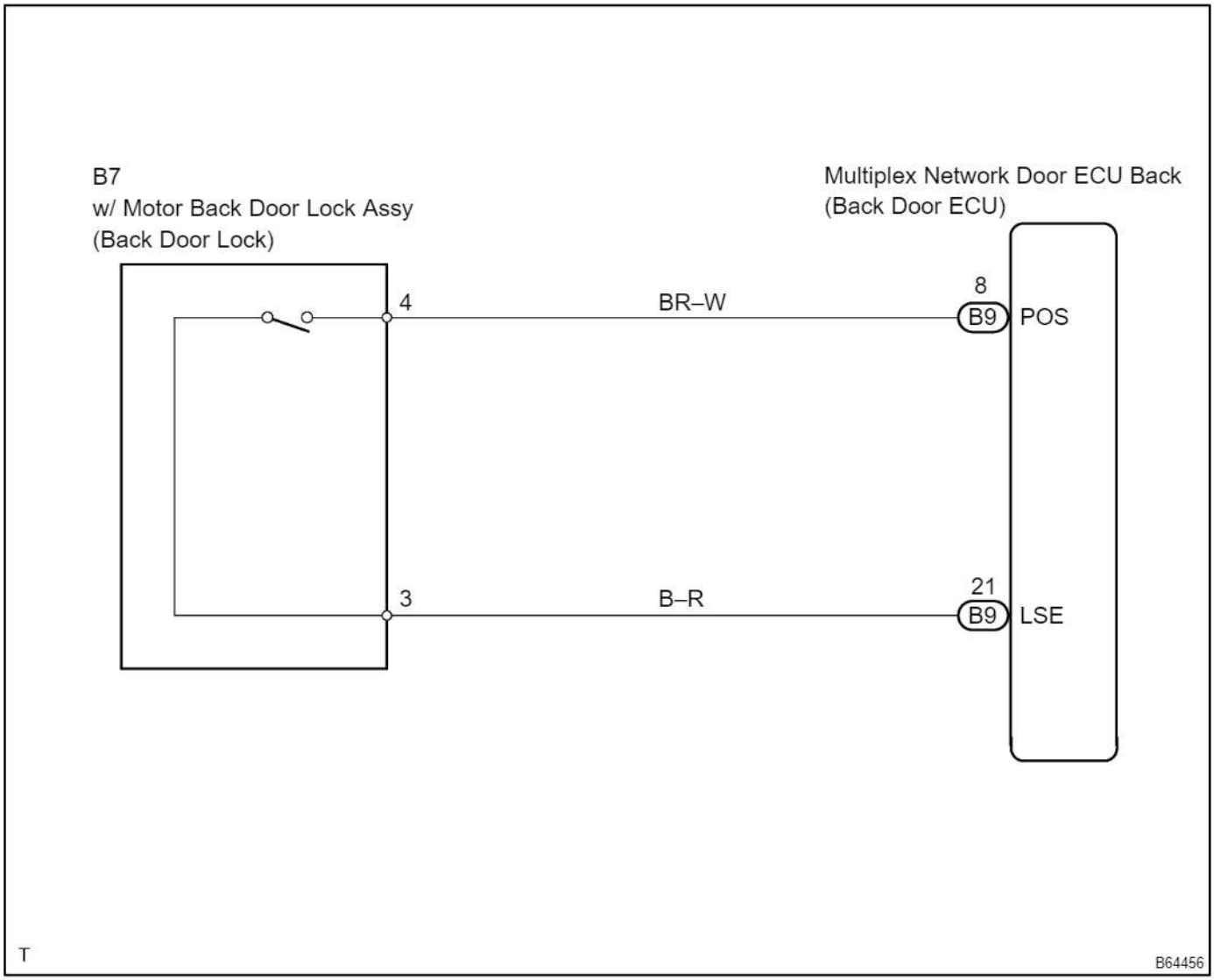
DTC	B2215	BACK DOOR CLOSER SWITCH MALFUNCTION

CIRCUIT DESCRIPTION

This DTC is output when the position switch in the back door malfunctions. This position switch detects the back door LOCK/UNLOCK and sends it to the back door ECU.

DTC No.	DTC Detection Condition	Trouble Area
B2215	Back door does not operate	□w/ Motor back door lock assy (back door lock) □Multiplex network door ECU back (back door ECU) □Wire harness

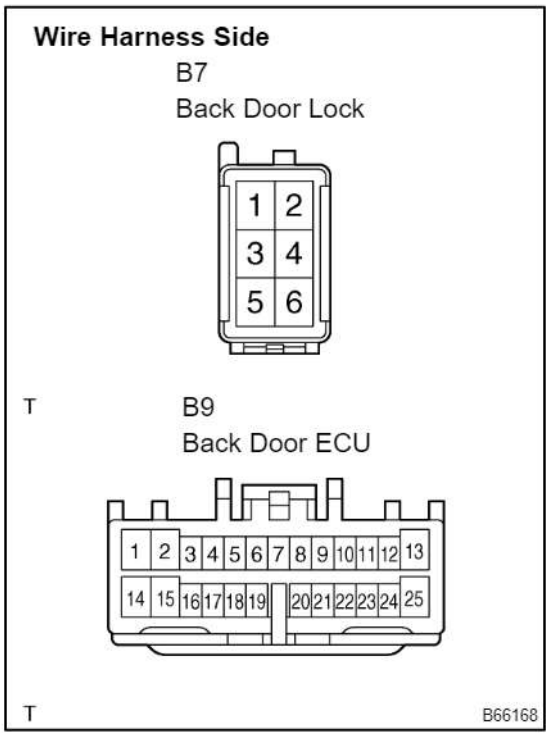
WIRING DIAGRAM



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INSPECTION PROCEDURE

1	CHECK WIRE HARNESS (W/MOTOR BACK DOOR LOCK ASSY (BACK DOOR LOCK) ⇔ MULTIPLEX NETWORK DOOR ECU BACK (BACK BODY ECU))



(a) Disconnect the B7 back door lock and B9 back door ECU connectors.

(b) Check the continuity between the terminals of the back door lock (B7) and back door ECU (B9) connectors.

Standard (Check for open) :

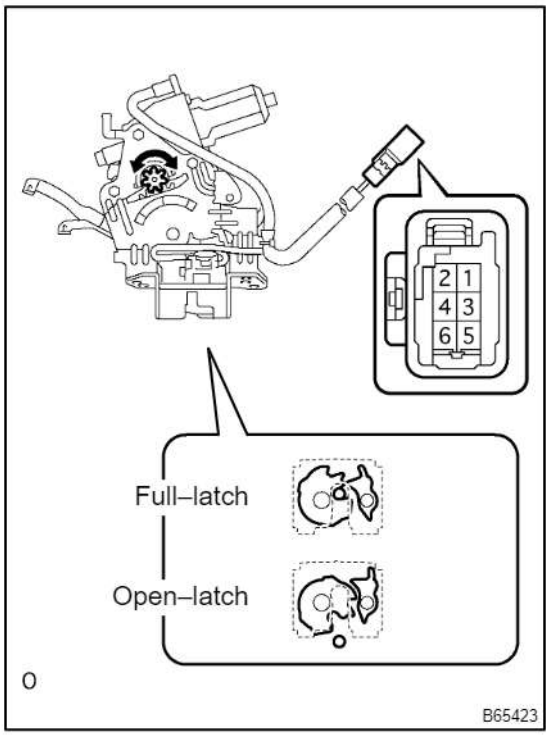
Symbols (Terminal No.)	Specified Condition
– (B7–4) ⇔ POS (B9–8)	Continuity
– (B7–3) ⇔ LSE (B9–21)	

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK →

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2 INSPECT W/MOTOR BACK DOOR LOCK ASSY



(a) Check operation of the door lock.

(1) Using a screwdriver, push the latch in order to put the back door lock in the locked condition (full–latch position).

(2) Connect the positive (+) lead to terminal 1 and the negative (–) lead to terminal 2. Then, check operation of the latch.

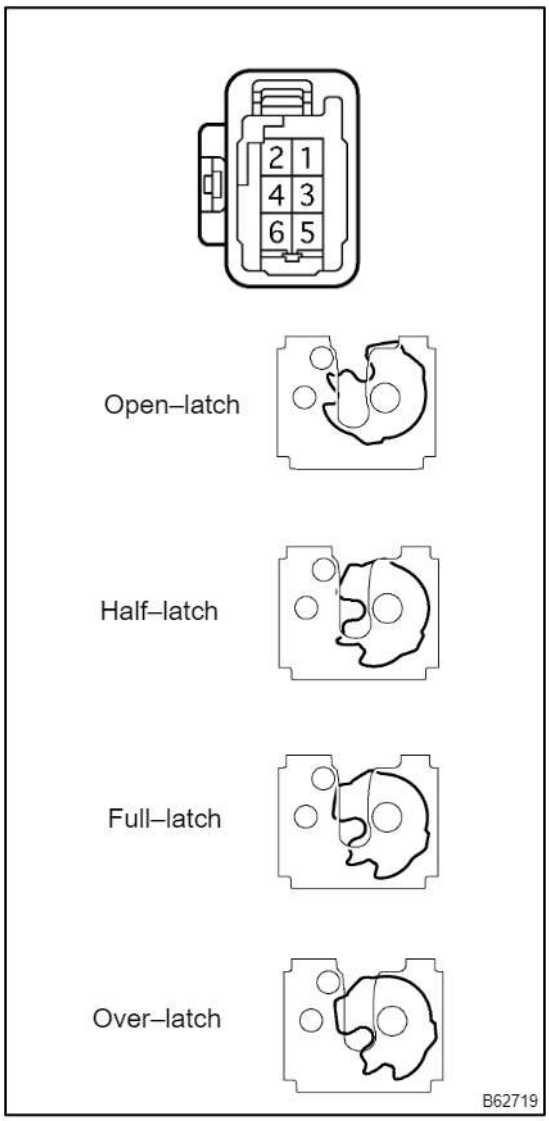
Standard: The latch turns to the open–latch position

(3) Inspect motor operation when battery voltage is applied to the terminals.

Standard:

Measurement Condition	Specified Condition
Battery positive (+) ⇔ Terminal 2 Battery negative (–) ⇔ Terminal 1	Clockwise (Motor in normal rotation)
Battery positive (+) ⇔ Terminal 1 Battery negative (–) ⇔ Terminal 2	Counterclockwise (Motor in reverse rotation)

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(b) Check the back door courtesy switch continuity.

(1) Check the continuity between the terminals of the courtesy switch.

Standard:

Door Lock Latch Position	Terminal No.	Specified Condition
Open–latch position, Half–latch position	4 ⇔ 5	Continuity
Full–latch position, Over–latch position	4 ⇔ 5	No continuity

(c) Check the back door latch switch continuity.

(1) Check the continuity between the terminals of the latch switch.

Standard:

Door Lock Latch Position	Terminal No.	Specified Condition
Open–latch position, Over–latch position	4 ⇔ 6	Continuity
Half–latch position, Full–latch position	4 ⇔ 6	No continuity

(d) Check the position switch continuity.

(1) Connect the battery positive (+) lead to connector terminal 1 and the negative (–) lead to connector terminal 2.

Standard:

Door Lock Latch Position	Terminal No.	Specified Condition
Any position other than motor stop position (Motor in operation)	3 ⇔ 4	Continuity
Motor stop position (Gear in original position	3 ⇔ 4	No continuity

NG → **REPLACE W/MOTOR BACK DOOR LOCK ASSY**

OK

REPLACE MULTIPLEX NETWORK DOOR ECU BACK

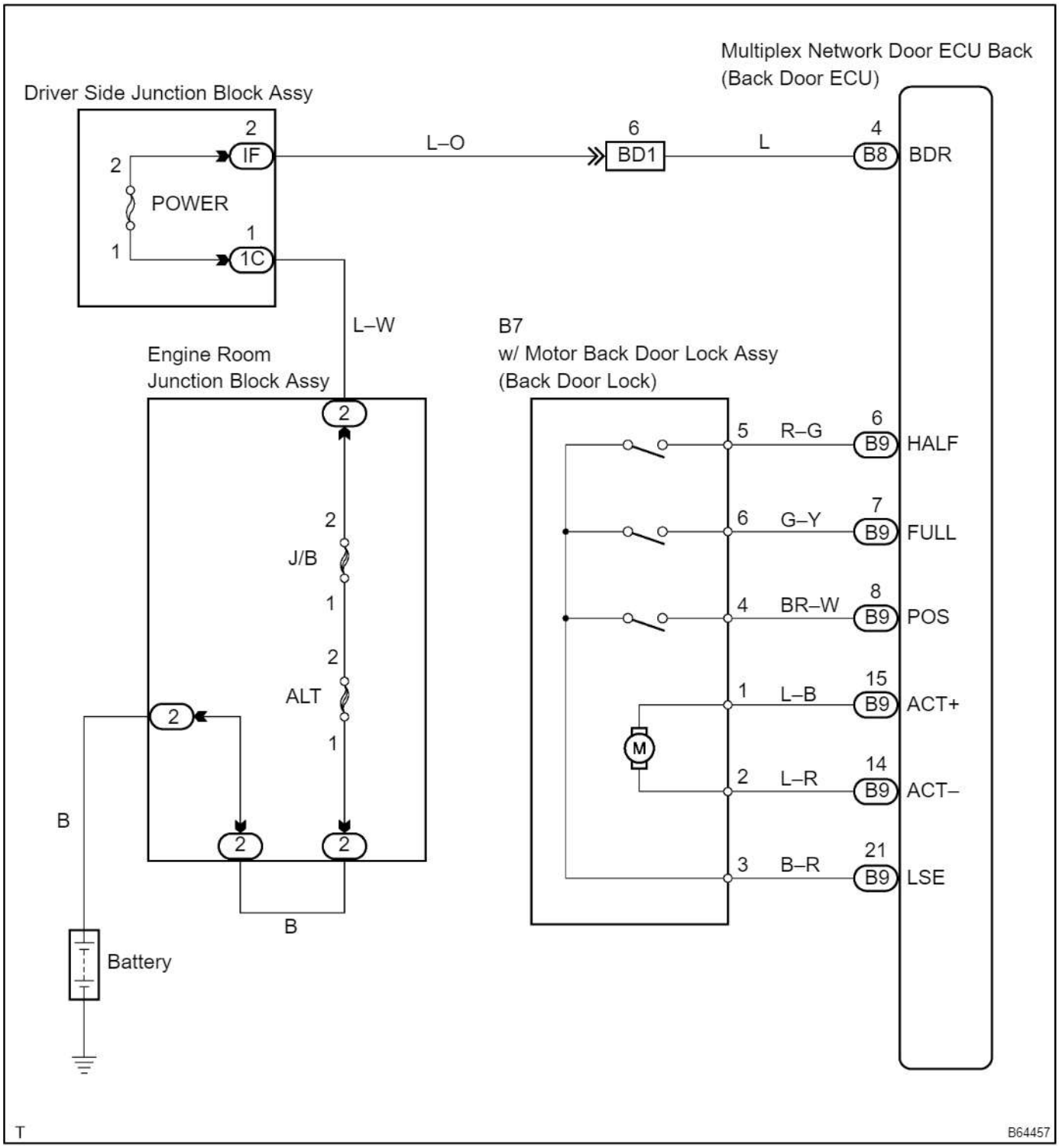
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BACK DOOR CLOSER DOES NOT OPERATE

CIRCUIT DESCRIPTION

The back door ECU controls the back door closer. In response to the signals output from the switches in the back door lock, the back door closer drives the closer motor.

WIRING DIAGRAM



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INSPECTION PROCEDURE

1	INSPECT BACK DOOR LOCK

(a) Check that the back door fully closes (fully locked) when the door is closed by hand.

NG → IMPROPER FIT OF BACK DOOR, OR A FOREIGN OBJECT IS STUCK IN BACK DOOR

OK

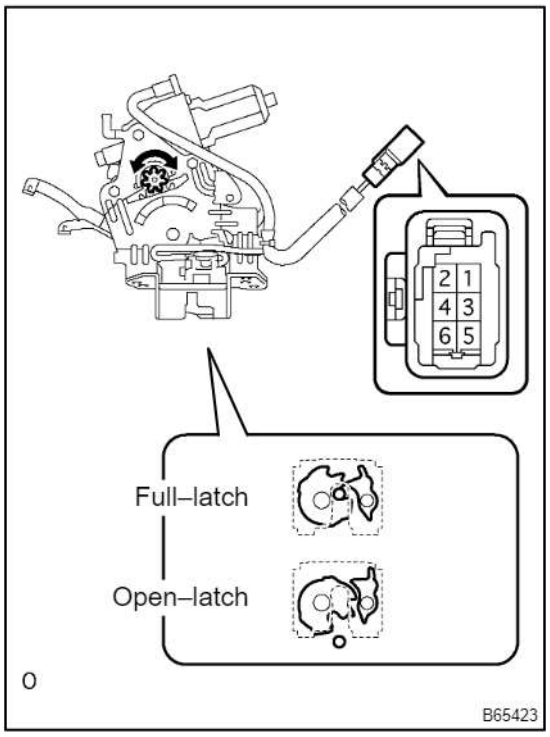
2	POWER SOURCE RESET

(a) Disconnect the POWER DOOR 30A fuse and reconnect it. 10 seconds later, check that the back door closer is operational.

OK → NORMAL

NG

3	INSPECT W/MOTOR BACK DOOR LOCK ASSY



(a) Check operation of the door lock.
(1) Using a screwdriver, push the latch in order to put the back door lock in the locked condition (full–latch position).
(2) Connect the positive (+) lead to terminal 1 and the negative (–) lead to terminal 2. Then, check operation of the latch.

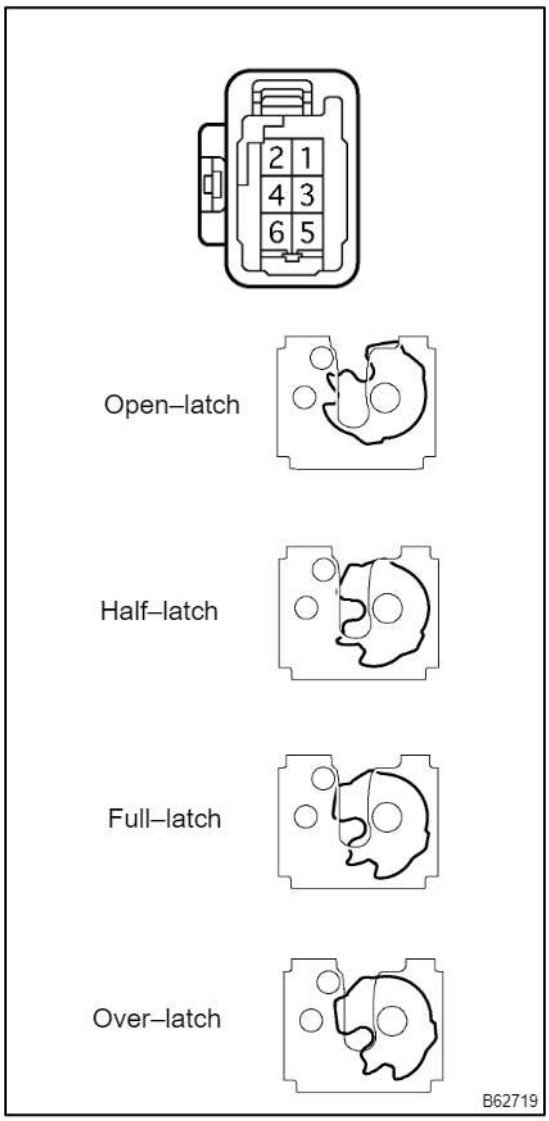
Standard: The latch turns to the open–latch position

(3) Inspect motor operation when battery voltage is applied to the terminals.

Standard:

Measurement Condition	Specified Condition
Battery positive (+) ⇔ Terminal 2 Battery negative (–) ⇔ Terminal 1	Clockwise (Motor in normal rotation)
Battery positive (+) ⇔ Terminal 1 Battery negative (–) ⇔ Terminal 2	Counterclockwise (Motor in reverse rotation)

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(b) Check the back door courtesy switch continuity.

(1) Check the continuity between the terminals of the courtesy switch.

Standard:

Door Lock Latch Position	Terminal No.	Specified Condition
Open–latch position, Half–latch position	4 ⇔ 5	Continuity
Full–latch position, Over–latch position	4 ⇔ 5	No continuity

(c) Check the back door latch switch continuity.

(1) Check the continuity between the terminals of the latch switch.

Standard:

Door Lock Latch Position	Terminal No.	Specified Condition
Open–latch position, Over–latch position	4 ⇔ 6	Continuity
Half–latch position, Full–latch position	4 ⇔ 6	No continuity

(d) Check the position switch continuity.

(1) Connect the battery positive (+) lead to connector terminal 1 and the negative (–) lead to connector terminal 2.

Standard:

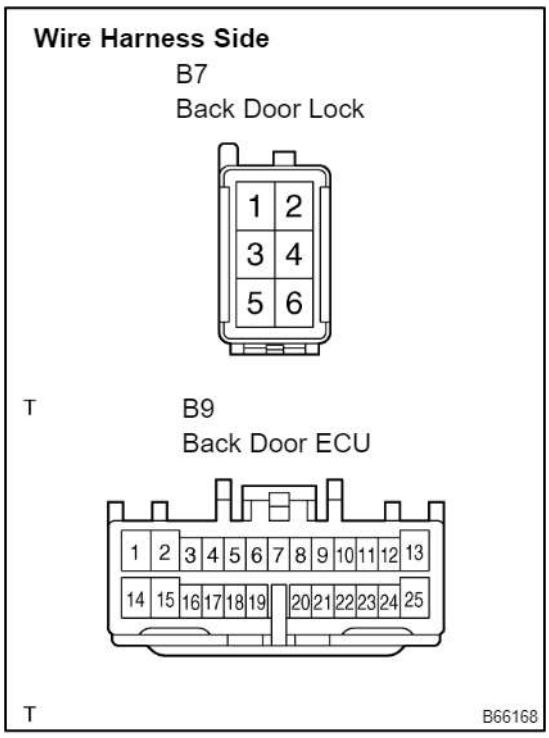
Door Lock Latch Position	Terminal No.	Specified Condition
Any position other than motor stop position (Motor in operation)	3 ⇔ 4	Continuity
Motor stop position (Gear in original position	3 ⇔ 4	No continuity

NG

OK → **REPLACE W/MOTOR BACK DOOR LOCK ASSY**

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4	CHECK WIRE HARNESS (W/MOTOR BACK DOOR LOCK ASSY (BACK DOOR LOCK) ⇔ MULTIPLEX NETWORK DOOR ECU BACK (BACK BODY ECU))



(a) Disconnect the B7 back door lock and B9 back door ECU connectors.

(b) Check the continuity between the terminals of the back door lock (B7) and back door ECU (B9) connectors.

Standard (Check for open) :

Symbols (Terminal No.)	Specified Condition
– (B7–5) ⇔ HALF (B9–6)	Continuity
– (B7–6) ⇔ FULL (B9–7)	
– (B7–4) ⇔ POS (B9–8)	
– (B7–1) ⇔ ACT+ (B9–15)	
– (B7–2) ⇔ ACT– (B9–14)	
– (B7–3) ⇔ LSE (B9–21)	

OK → **REPLACE MULTIPLEX NETWORK DOOR ECU BACK**

NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

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WIRELESS DOOR LOCK CONTROL SYSTEM

056B7-02

HOW TO PROCEED WITH TROUBLESHOOTING

HINT:

Troubleshooting of the wireless door lock control system is based on the premise that the power door lock system and the back power window control system are operating normally. Therefore, before troubleshooting the wireless door lock control system, first make certain that the the power door lock system and the back power window control system are operating normally.

Troubleshoot in accordance with the procedures on the following pages.

1	**VEHICLE BROUGHT TO WORKSHOP**

2	**CUSTOMER PROBLEM ANALYSIS CHECK AND SYMPTOM CHECK (See page 05–1825)**

3	**DTC CHECK (See page 05–1827)**

(a) Check for DTC and make a note of the code that is output.
(b) Delete the DTC.
(c) Check if the DTC is output once again, when the problem symptom is simulated based on the noted code.
  (1) Without code outputs, proceed to A.
  (2) With code outputs, proceed to B.

B	**Go to step 6**

A

4	**PROBLEM SYMPTOMS TABLE (See page 05–1831)**

(a) When problem is not listed on problem symptoms table, proceed to A.
(b) When problem is listed on problem symptoms table, proceed to B.

B	**Go to step 6**

A

5	**PERFORM TROUBLESHOOTING ACCORDING TO MALFUNCTION SYMPTOM**

(a) Pre–check (See page 05–1826)
  (1) Inspection with the hand–held tester (ECU DATA LIST)
  (2) Inspection with the hand–held tester (ACTIVE TEST)
(b) Terminals of ECU (See page 05–1829)
(c) On–vehicle inspection (See page 73–11)

Author : Date : 2022

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6	ADJUST, REPAIR OR REPLACE

7	CONFIRMATION TEST

END

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056B6-02

CUSTOMER PROBLEM ANALYSIS CHECK

WIRELESS DOOR LOCK CONTROL SYSTEM Check Sheet

Inspector's Name _____

Customer's Name		Registration No.	
		Registration Year	/ /
		Frame No.	
Date Vehicle Brought in	/ /	Odometer Reading	km miles

Date Problem First Occurred		/ /
Frequency Problem Occurs		☐ Constant ☐ Sometimes (times/per day, month) ☐ Once only
Weather Conditions When Problem Occurred	Weather	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Various/Others
	Outdoor Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold (Approx. °C (°F))
	Place	☐ Everywhere ☐ Specific Locality ( )
Date Transmitter Battery Last Replaced		/ /

Problem Symptoms	☐ Whole wireless door lock control system does not operate.
	☐ Only door unlock function does not operate.
	☐ Only door lock function does not operate.
	☐ Doors are locked by wireless door lock operation even when doors are opened.
	☐ Wireless door lock functions are abnormal.
	☐ Others

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Author : Date : 2024

056B9-02

PRE–CHECK

1. USING HAND–HELD TESTER

(a) Connect the hand–held tester to the DLC3.
(b) Monitor the ECU data by following the prompts on the tester screen.

HINT:
The hand–held tester has a "Snapshot" function which records the monitored data.
Refer to the hand–held tester operator's manual for further details.

2. DTC CLEAR

(a) Using the hand–held tester, erase the DTCs and freeze frame data.

3. DATA LIST

HINT:
Using the DATA LIST displayed by the hand–held tester, you can read the value of the switch, sensor, actuator, etc. without parts removal. Reading the DATA LIST as the first step of troubleshooting is one way to shorten the labor time.

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON.
(c) Read the DATA LIST according to the display on the tester.

Standard (Body ECU):

Item	Measurement Item/Display (Range)	Normal Condition	Diagnostic Note
KEY UNLK WRN SW	Un–lock warning SW signal/ ON or OFF	ON: Key is in IG key cylinder OFF: No key is in IG key cylinder	–

4. ACTIVE TEST

HINT:
Performing the ACTIVE TEST using the hand–held tester allows you to operate the relay, VSV, actuator, etc. without parts removal. Performing the ACTIVE TEST as the first step of troubleshooting is one way to shorten the labor time.
It is possible to display the DATA LIST during the ACTIVE TEST.

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON.
(c) Perform the ACTIVE TEST according to the display on the tester.

Standard (Body ECU):

Item	Test Detail	Diagnostic Note
HAZARD	Turns turn signal flasher relay ON/OFF	–
BUZZ CONT SOUND	[Test Details] Turns wireless buzzer ON/OFF [Vehicle Condition] Sets wireless buzzer volume at MAX	–
BUZZ RESP SOUND	[Test Details] Turns wireless buzzer ON/OFF [Vehicle Condition] Sets wireless buzzer volume at MAX	–

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056BA-02

DIAGNOSTIC TROUBLE CODE CHART

If a malfunction code is displayed during the DTC check, check the circuit listed for that code in the chart below (Proceed to the page given for that circuit).

HINT:

The DTC detection method (See page 05–1826).

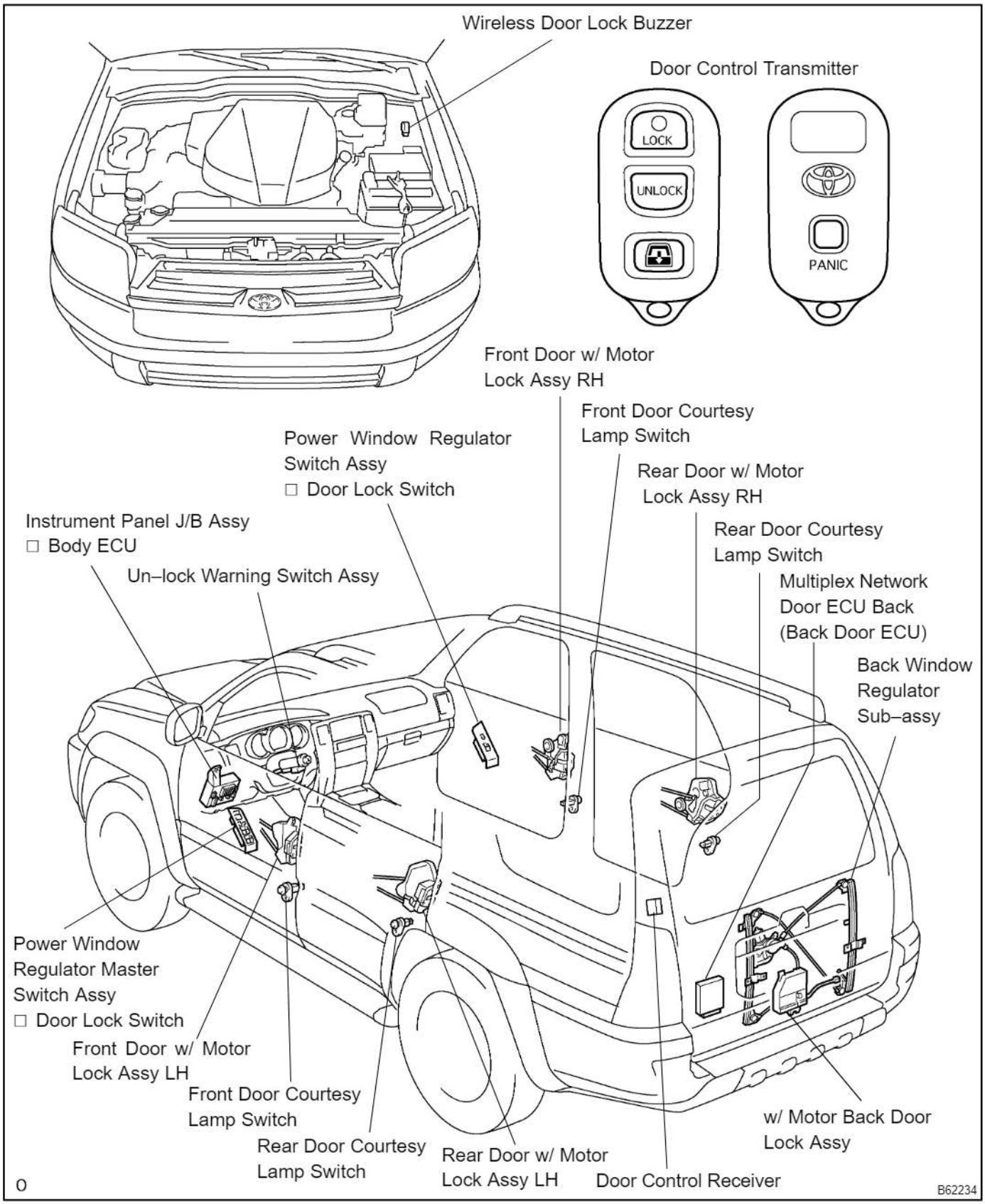
DTC No. (See Page)	Detection Item	Trouble Area
B1242 (05–1832)	Wireless Door Lock Tuner Circuit Malfunction	□Door control receiver □Instrument panel J/B assy (Body ECU) □Wire harness

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Author : Date : 2026

056BB-02

LOCATION

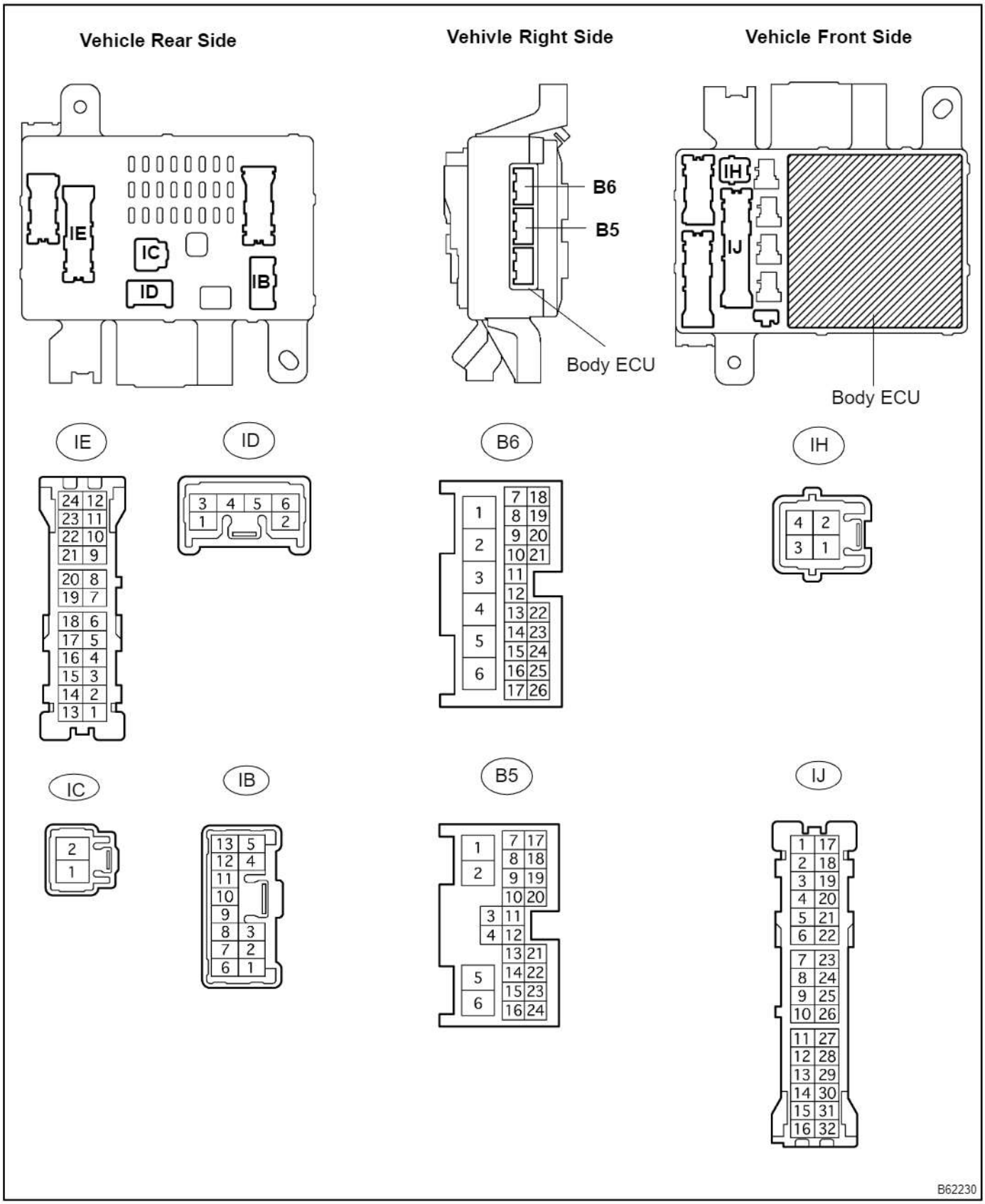


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058TQ-01

TERMINALS OF ECU

1. CHECK INSTRUMENT PANEL JUNCTION BLOCK ASSY (BODY ECU)



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(a) Disconnect the B6 J/B connector.
(b) Disconnect the IB, IC, ID, IE and IH J/B connectors.
(c) Check the voltage or continuity of each terminal of the wire harness side connectors.

Standard:

Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
KSW (B6–14) ⇔ Body ground	G–Y ⇔ –	No key in ignition key cylinder → Key inserted	No continuity → Continuity
BDR1 (IE–9) ⇔ Body ground	G–W ⇔ –	Constant	10 – 14 V
BECU (IB–4) ⇔ Body ground	W–R ⇔ –	Constant	10 – 14 V
SIG (IC–2) ⇔ Body ground	L–Y ⇔ –	Ignition switch ON	10 – 14 V
ACC (ID–5) ⇔ Body ground	W–G ⇔ –	Ignition switch ON	10 – 14 V
GND1 (IH–2) ⇔ Body ground	W–B ⇔ –	Constant	Continuity
GND2 (IH–2) ⇔ Body ground	W–B ⇔ –	Constant	Continuity

If the result is not as specified, there may be a malfunction on the wire harness side.

(d) Reconnect the B6 J/B connector.
(e) Reconnect the IB, IC, ID, IE and IH J/B connectors.
(f) Check the voltage of each terminal of the connectors.

Standard:

Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
RDA (B5–4) ⇔ Body ground	L–R ⇔ –	Ignition switch OFF, no key in ignition key cylinder, all doors closed and transmitter switch OFF → ON	Below 1 V → 6 V → Below 1 V
DCTY (B5–23) ⇔ Body ground	R–B ⇔ –	Driver's door CLOSED → OPEN	10 – 14 V → Below 1 V
PCTY (B5–24) ⇔ Body ground	R–Y ⇔ –	Passenger's door CLOSED → OPEN	10 – 14 V → Below 1 V
RLCY (B5–11) ⇔ Body ground	P–B ⇔ –	Rear door LH CLOSED → OPEN	10 – 14 V → Below 1 V
RRCY (B5–12) ⇔ Body ground	P–L ⇔ –	Rear door RH CLOSED → OPEN	10 – 14 V → Below 1 V
HAZ (IJ–14) ⇔ Body ground	W ⇔ –	Answer–back OFF → Answer–back ON	Pulse generation
BZR (IB–10) ⇔ BZR2 (IB–6)	P–B ⇔ Y–B	Wireless buzzer OFF → ON	Pulse generation

If the result is not as specified, the J/B assy (body ECU) may have a malfunction.

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056BD-02

PROBLEM SYMPTOMS TABLE

Symptom	Suspected Area	See Page
Only wireless control function does not operate (Prepare new or normal transmitter of the same type vehicle)	4. Transmitter battery	05–1834
	5. Door control transmitter	05–1834
	6. Door control receiver	05–1834
	7. Un–lock warning switch assy	05–1834
	8. Wire harness	–
	9. Instrument panel J/B (Body ECU)	–
No answer–back (Hazard warning lamp and wireless door lock buzzer)	1. Wireless door lock buzzer	05–1842
	2. Lighting system	05–1450
	3. Wire harness	–
	4. Instrument panel J/B (Body ECU)	–

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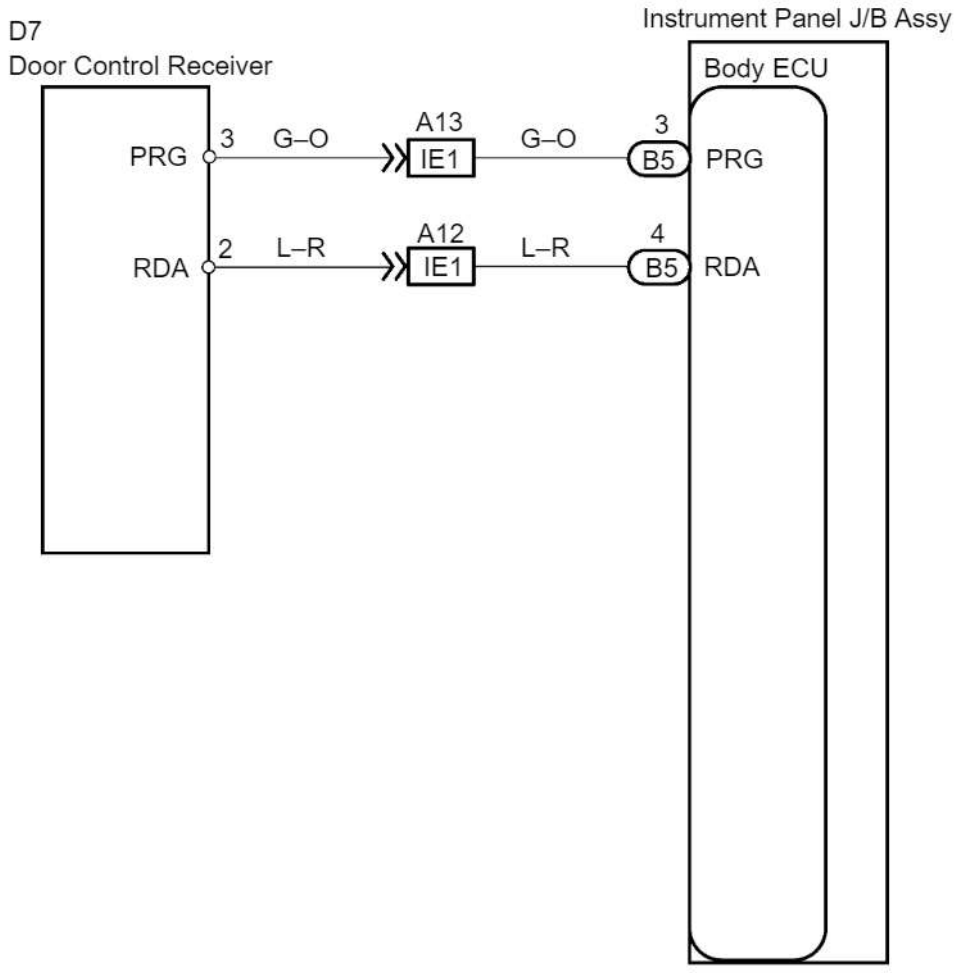
DTC	B1242	WIRELESS DOOR LOCK TUNER CIRCUIT MALFUNCTION

CIRCUIT DESCRIPTION

This DTC is output when a ground short is detected in terminal RDA or PRG.

DTC No.	DTC Detection Condition	Trouble Area
B1242	Ground short in terminal RDA or PRG	□Door control receiver □Wire harness □Instrument panel J/B assy (Body ECU)

WIRING DIAGRAM



Y B62222

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INSPECTION PROCEDURE

1	CHECK DOOR CONTROL RECEIVER

(a) Check that the wireless system operates when a new or normal door control receiver is installed.
(b) Check that no DTC is output.

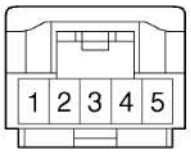
OK → REPLACE DOOR CONTROL RECEIVER

NG

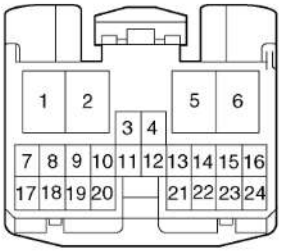
2	CHECK WIRE HARNESS (DOOR CONTROL RECEIVER ⇔ INSTRUMENT PANEL JUNCTION BLOCK (BODY ECU)) (DOOR CONTROL RECEIVER OR INSTRUMENT PANEL JUNCTION BLOCK (BODY ECU) ⇔ BODY GROUND)

Wire Harness Side

D7
Door Control Receiver



B5
Instrument Panel J/B Assy



Y B62225

(a) Disconnect the D7 receiver connector.
(b) Disconnect the B5 J/B connector.
(c) Check the continuity between the wire harness side connectors.

Standard:

Symbols (Terminal No.)	Specified Condition
RDA (D7–2) ⇔ RDA (B5–4)	Continuity
PRG (D7–3) ⇔ PRG (B5–3)	Continuity

(d) Check the continuity between the D7 receiver connector or B5 J/B connector and body ground.

Standard:

Symbols (Terminal No.)	Specified Condition
RDA (D7–2) or RDA (B5–4) ⇔ Body ground	No continuity
PRG (D7–3) or PRG (B5–3) ⇔ Body ground	No continuity

NG → REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

REPLACE INSTRUMENT PANEL JUNCTION BLOCK ASSY

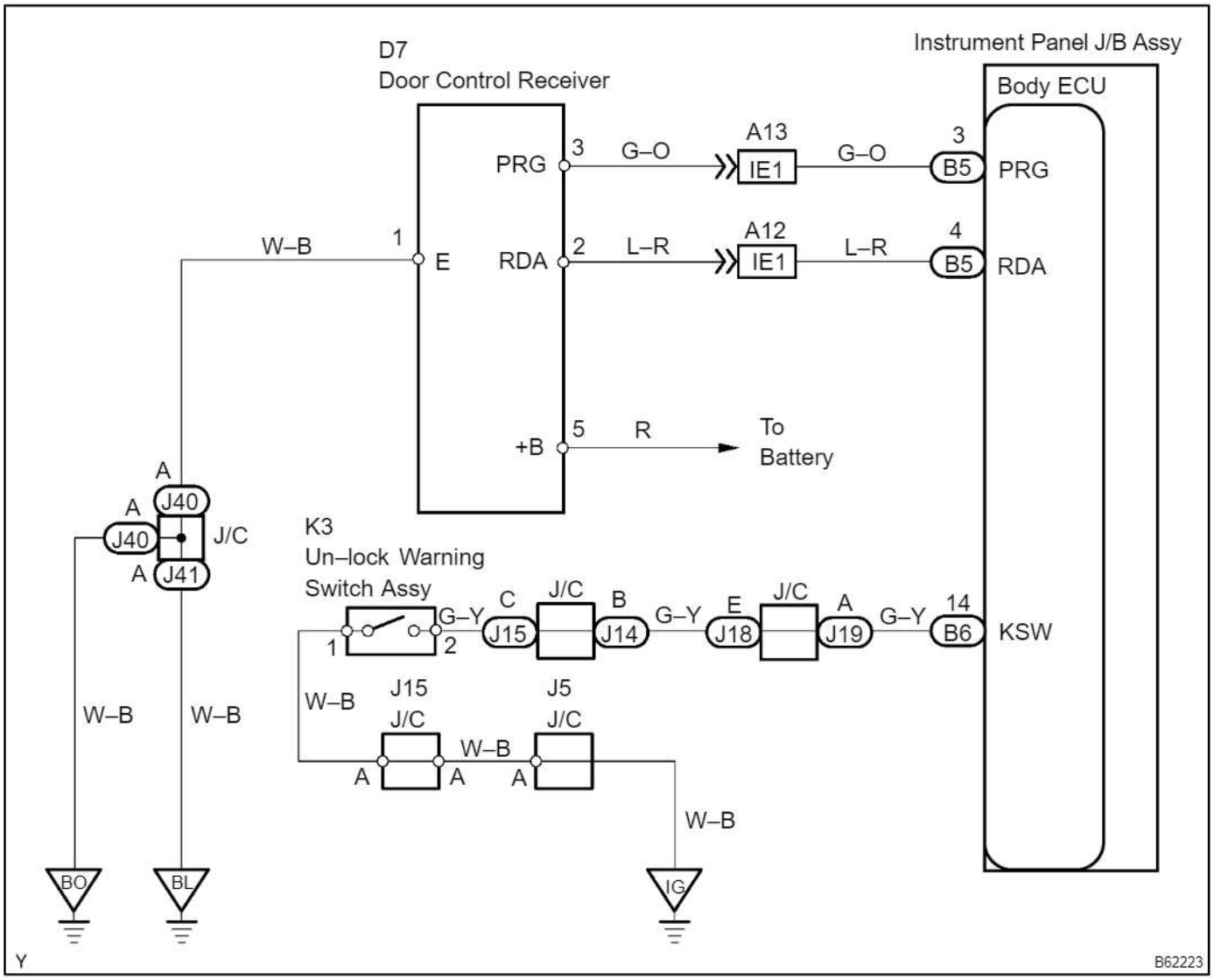
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ONLY WIRELESS CONTROL FUNCTION DOES NOT OPERATE (PREPARE NEW OR NORMAL TRANSMITTER OF THE SAME TYPE VEHICLE)

CIRCUIT DESCRIPTION

The door control receiver receives a signal from the transmitter and sends this signal to the body ECU. Then, the body ECU controls operation of the door locks except the back door lock in response to this signal, while the body ECU sends a signal to the back door ECU at the same time. Receiving this signal, the back door ECU controls operation of the back door lock. Also, the back door ECU causes the back window to open, receiving a signal from the transmitter via the body ECU.

WIRING DIAGRAM



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INSPECTION PROCEDURE

1	CHECK WIRELESS DOOR LOCK FUNCTIONS (See page 73–11)

OK → NORMAL

NG

2	SIMPLY CHECK TRANSMITTER BATTERY

(a) After replacing the transmitter battery with a new or normal one and then operating the transmitter LOCK/UNLOCK in the standard operation, check that the doors can lock and unlock even after operating it more than 3 times.

NOTICE:

Standard operation, herein, means operation by pressing the transmission switch for 1 second, directing the transmitter to the vehicle in a location that is 100 cm (39.37 in.) away from the driver side door outside handle in the right direction.

NG → Go to step 7

OK

REPLACE TRANSMITTER BATTERY

3	CHECK WIRELESS DOOR LOCK BUZZER

(a) Check that the wireless door lock buzzer sounds.

NG → GO TO FLOW CHART (See page 05–1842)

OK

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4	SWITCH TO SELF–DIAGNOSTIC MODE

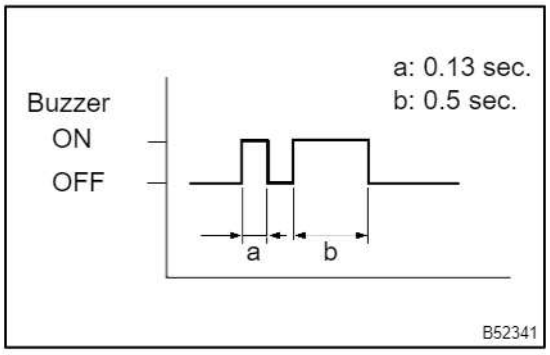
(a) When using the hand–held tester:
Switch to the self–diagnostic mode by operating the hand–held tester.
(1) Connect the hand–held tester to the DLC3.
(2) Turn the ignition switch ON and hand–held tester main switch ON.

HINT:
Please refer to the hand–held tester operator's manual for further details.

(b) When not using the hand–held tester:
Switch to the self–diagnostic mode by operating the ignition key cylinder.
(1) Insert the key into the ignition key cylinder and remove it under the initial vehicle condition (See page 73–11).
(2) Within 5 seconds after the above step, insert the key into the ignition key cylinder and turn the ignition switch ON → OFF once.
(3) Within 30 seconds after the above step, turn the ignition switch ON → OFF 9 times.

NOTICE:
If operation has failed, the system will return to the normal mode.

HINT:
- Operation of the ignition switch OFF → ON will end the self–diagnostic mode.
- Do not lock or unlock doors during the self–diagnostic mode.



(c) Check that the system has switched to self–diagnostic mode by the answer–back of the wireless door lock buzzer sound.

NG → **Go to step 9**

OK

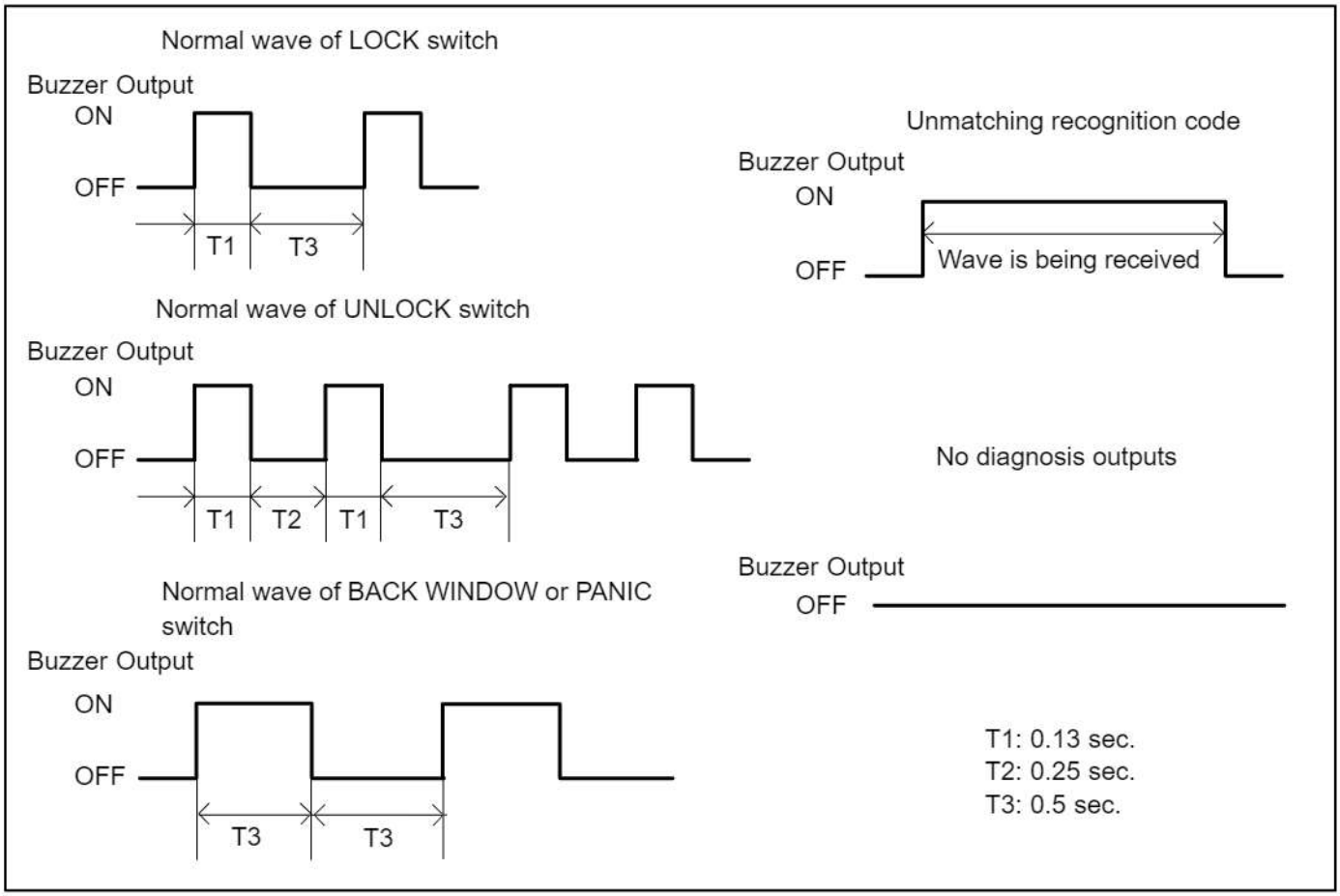
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5	CHECK BY SELF–DIAGNOSTIC MODE

(a) Inspect the diagnosis outputs when the door control transmitter switch is held down (The diagnosis outputs can be checked with the sound of the wireless door lock buzzer).

HINT:

- In the case of a reception of the normal wave of the LOCK, UNLOCK, BACK WINDOW or PANIC switch (wireless door lock buzzer sounds), go to step A.
- In the case of an unmatching recognition code (wireless door lock buzzer ON), go to step B.
- In the case of no diagnosis outputs (wireless door lock buzzer OFF), go to step C.



A	REPLACE INSTRUMENT PANEL JUNCTION BLOCK ASSY

C	Go to step 7

B

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6	REGISTER RECOGNITION CODE

(a) Check that the system can switch to the rewrite mode or the add mode and also a recognition code can be registered.

NG → Go to step 8

OK

NORMAL (CARRY OUT INSPECTION OF FUNCTIONS)

7	CHECK RESPONSE OF DOOR CONTROL RECEIVER

(a) When a new or normal door control transmitter switch for the same type vehicle is held down, check that a diagnosis of unmatching recognition code is output.

NG → Go to step 12

OK

REPLACE DOOR CONTROL TRANSMITTER

8	REPLACE DOOR CONTROL RECEIVER WITH NORMAL ONE

NG → REPLACE INSTRUMENT PANEL JUNCTION BLOCK ASSY

OK

REPLACE DOOR CONTROL RECEIVER

9	CONFIRM INPUT METHOD OF SELF–DIAGNOSTIC MODE

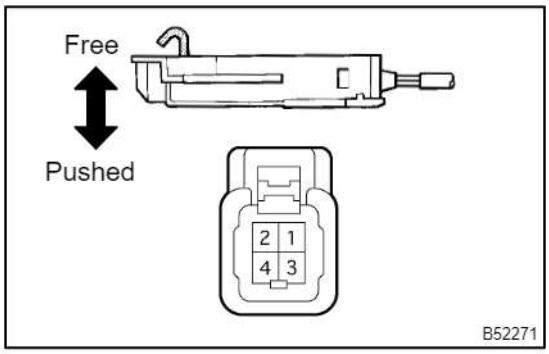
(a) When the method for switching the system to self–diagnostic mode works, proceed to A.
(b) When the method or switching the system to self–diagnostic mode does not work, proceed to B.

B → Go to step 4

A

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10	INSPECT UN–LOCK WARNING SWITCH ASSY



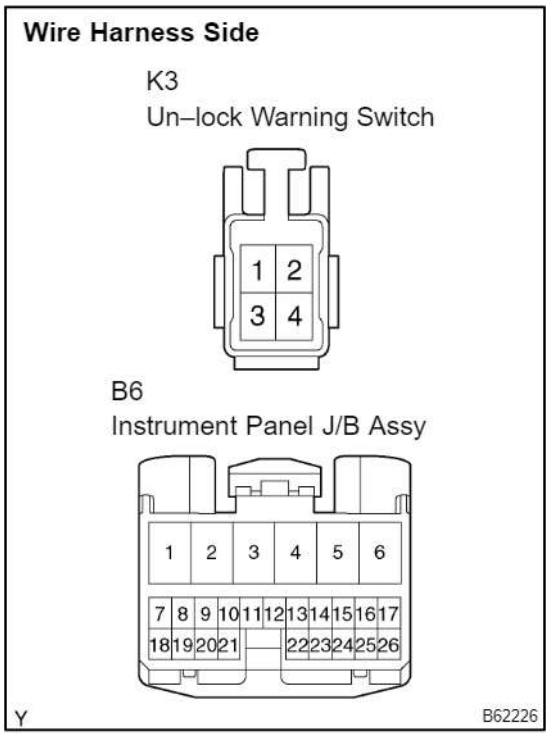
(a) Inspect the continuity of the un–lock warning switch.
Standard:

Terminal No.	Condition	Specified Condition
1 ⇔ 2	Switch free (Key removed)	No continuity
	Switch pushed (Key set)	Continuity

NG → **REPLACE UN–LOCK WARNING SWITCH ASSY**

OK

11	CHECK WIRE HARNESS (UN–LOCK WARNING SWITCH ⇔ INSTRUMENT PANEL JUNCTION BLOCK (BODY ECU)) (UN–LOCK WARNING SWITCH ⇔ BODY GROUND)



(a) Disconnect the K3 warning switch connector.
(b) Disconnect the B6 J/B connector.
(c) Check the continuity between the wire harness side connectors.
Standard:

Terminal No.	Specified Condition
K3–2 ⇔ B6–14	Continuity

(d) Check the continuity between the K3 warning switch connector and body ground.
Standard:

Terminal No.	Specified Condition
K3–1 ⇔ Body ground	Continuity

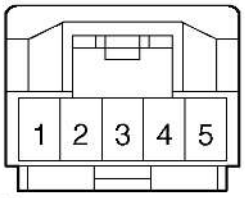
NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

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12 CHECK DOOR CONTROL RECEIVER (POWER SOURCE AND GROUND)

Wire Harness Side



D7
Door Control Receiver

B59092

(a) Disconnect the D7 receiver connector.
(b) Check the voltage or continuity between the D7 receiver wire harness side connector and body ground.

Standard:

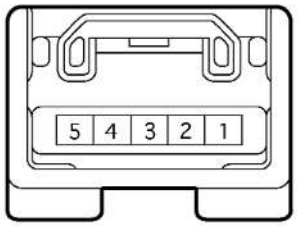
Symbols (Terminal No.)	Specified Condition
+B (D7–5) ⇔ Body ground	10 – 14 V
E (D7–1) ⇔ Body ground	Continuity

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

13 CHECK DOOR CONTROL RECEIVER (OUTPUT)

Door Control Receiver



B51174

(a) Reconnect the D7 receiver connector, and check the voltage between the terminal and body ground.

Standard:

Symbols (Terminal No.)	Condition	Specified Condition
RDA (D7–2) ⇔ Body ground	Ignition switch OFF, no key in ignition key cylinder, all doors closed and each transmitter switch OFF → ON	Below 1 V → Approx. 6 – 7 V → Below 1 V

NOTICE:
Check the output voltage with the bar graph display.

OK → **Go to step 15**

NG

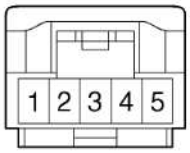
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14	CHECK WIRE HARNESS (DOOR CONTROL RECEIVER ⇔ INSTRUMENT PANEL JUNCTION BLOCK (BODY ECU)) (DOOR CONTROL RECEIVER OR INSTRUMENT PANEL JUNCTION BLOCK (BODY ECU) ⇔ BODY GROUND)

Wire Harness Side

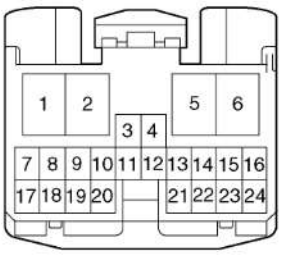
D7

Door Control Receiver



B5

Instrument Panel J/B Assy



Y B62225

(a) Disconnect the D7 receiver connector.

(b) Disconnect the B5 J/B connector.

(c) Check the continuity between the wire harness side connectors.

Standard:

Symbols (Terminal No.)	Specified Condition
RDA (D7–2) ⇔ RDA (B5–4)	Continuity

(d) Check the continuity between the D7 receiver connector or B5 J/B connector and body ground.

Standard:

Symbols (Terminal No.)	Specified Condition
RDA (D7–2) ⇔ Body ground	No continuity
RDA (B5–4) ⇔ Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

15	REPLACE DOOR CONTROL RECEIVER WITH NORMAL ONE

OK → **REPLACE DOOR CONTROL RECEIVER**

NG

REPLACE INSTRUMENT PANEL JUNCTION BLOCK ASSY

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NO ANSWER–BACK (HAZARD WARNING LAMP AND WIRELESS DOOR LOCK BUZZER)

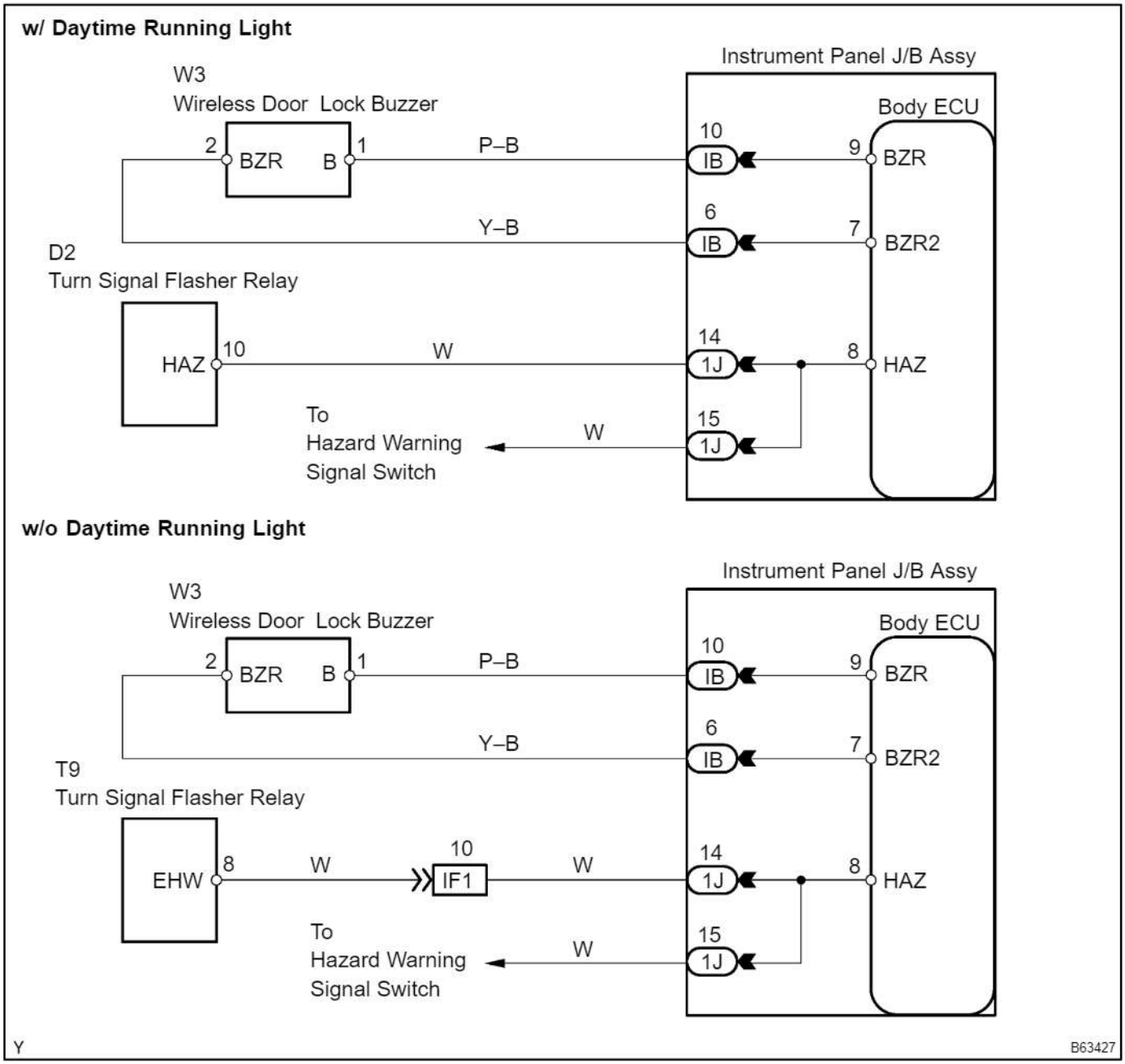
CIRCUIT DESCRIPTION

If there is no answer–back although the wireless control function is operating normally, there might be an abnormality in the hazard lamp signal and the wireless door lock buzzer signal which are output from the body ECU.

NOTICE:

Troubleshooting should be started after confirming that the answer–back function has been switched ON through customization.

WIRING DIAGRAM



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INSPECTION PROCEDURE

When using hand–held tester:

1	CHECK WIRELESS DOOR LOCK FUNCTIONS

(a) Check the wireless door lock functions by operating the transmitter switch.

HINT:

When the wireless door LOCK/UNLOCK operation can be performed, it means that the wireless signal from the transmitter is properly input to the body ECU.

NG → GO TO FLOW CHART (See page 05–1834)

OK

2	PERFORM ACTIVE TEST USING HAND–HELD TESTER

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item "HAZARD" in the ACTIVE TEST and check the turn signal flasher relay ON/OFF.
(d) Select the item "BUZZ CONT SOUND" or "BUZZ RESP SOUND" in the ACTIVE TEST and check the wireless buzzer ON/OFF.

HINT:

- In the case of no wireless buzzer ON/OFF, go to step A.
- In the case of no turn signal flasher assy ON/OFF, go to step B.
- In the case of turn signal flasher assy ON/OFF and wireless buzzer ON/OFF, go to step C.

A → Go to step 4

C → REPLACE INSTRUMENT PANEL JUNCTION BLOCK ASSY

B

3	CHECK OUTPUTS OF HAZARD WARNING LAMPS

(a) Check that the hazard warning lamps blink when the hazard warning signal switch is pressed.

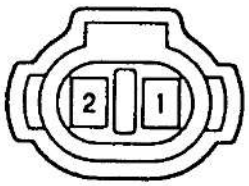
NG → GO TO LIGHTING SYSTEM

OK

REPLACE INSTRUMENT PANEL JUNCTION BLOCK ASSY

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4 INSPECT WIRELESS DOOR LOCK BUZZER



B30785

(a) Check the buzzer resistance.

NOTICE:

- **The buzzer circuit is built into the body ECU, not into the buzzer itself.**
- **When battery voltage is directly applied to the buzzer, the buzzer does not sound.**

(1) Check the resistance between terminals 1 and 2 of the buzzer.

Standard: Approx. 1 kΩ

NG → **REPLACE WIRELESS DOOR LOCK BUZZER**

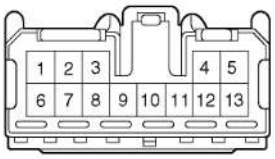
OK

5 CHECK WIRE HARNESS (BUZZER ⇔ INSTRUMENT PANEL JUNCTION BLOCK ASSY)

Wire Harness Side



W3
Wireless Door Lock Buzzer



IB
Instrument Panel J/B Assy

Y
B62227

(a) Disconnect the W3 wireless buzzer connector.
(b) Disconnect the IB J/B connector.
(c) Check the continuity between the wire harness side connectors.

Standard:

Symbols (Terminal No.)	Specified Condition
W3–1 ⇔ BZR (IB–10)	Continuity
W3–2 ⇔ BZR2 (IB–6)	Continuity

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

REPLACE INSTRUMENT PANEL JUNCTION BLOCK ASSY

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When not using hand–held tester:

1	CHECK WIRELESS DOOR LOCK FUNCTIONS

(a) Check the wireless door lock functions by operating the transmitter switch.

HINT:

When the wireless door LOCK/UNLOCK operation can be performed, it means that the wireless signal from the transmitter is properly input to the body ECU.

HINT:

- If the wireless door lock functions are OK but no answer–back (wireless door lock buzzer) occurs, go to step A.
- If the wireless door lock functions are OK but no answer–back (hazard warning lamps) occurs, go to step B.
- If the wireless door lock functions are NG, go to step C.

A → **Go to step 3**

C → **GO TO FLOW CHART (See page 05–1834)**

B

2	CHECK OUTPUTS OF HAZARD WARNING LAMPS

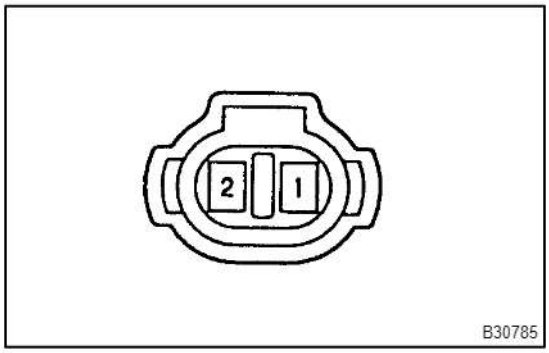
(a) Check that the hazard warning lamps blink when the hazard warning signal switch is pressed.

NG → **GO TO LIGHTING SYSTEM**

OK

REPLACE INSTRUMENT PANEL JUNCTION BLOCK ASSY

3	INSPECT WIRELESS DOOR LOCK BUZZER



(a) Check the buzzer resistance.

NOTICE:

- **The buzzer circuit is built into the body ECU, not into the buzzer itself.**
- **When battery voltage is directly applied to the buzzer, the buzzer does not sound.**

(1) Check the resistance between terminals 1 and 2 of the buzzer.

Standard: Approx. 1 kΩ

NG → **REPLACE WIRELESS DOOR LOCK BUZZER**

OK

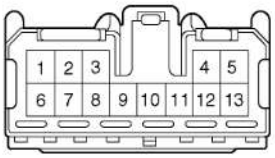
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4	CHECK WIRE HARNESS (BUZZER ⇔ INSTRUMENT PANEL JUNCTION BLOCK ASSY)

Wire Harness Side



W3
Wireless Door Lock Buzzer



IB
Instrument Panel J/B Assy

Y B62227

(a) Disconnect the W3 wireless buzzer connector.
(b) Disconnect the IB J/B connector.
(c) Check the continuity between the wire harness side connectors.

Standard:

Symbols (Terminal No.)	Specified Condition
B (W –1) ⇔ BZR (IB–10)	Continuity
BZR (W3–2) ⇔ BZR2 (IB–6)	Continuity

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

REPLACE INSTRUMENT PANEL JUNCTION BLOCK ASSY

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KEY REMINDER WARNING SYSTEM

HOW TO PROCEED WITH TROUBLESHOOTING

059XC-01

HINT:

Troubleshoot in accordance with the procedures on the following pages.

1	VEHICLE BROUGHT TO WORKSHOP

2	CUSTOMER PROBLEM ANALYSIS CHECK AND PROBLEM SYMPTOM

3	PROBLEM SYMPTOMS TABLE (See page 05–1853)

(a) Without an applicable problem symptom table, proceed to A.
(b) With an applicable problem symptom table, proceed to B.

B → Go to step 5

A

4	PERFORM TROUBLESHOOTING BY FOLLOWING METHOD, DEPENDING ON MALFUNCTION SYMPTOM

(a) Pre–check (See page 05–1849)
  (1) Inspection with the hand–held tester (ECU DATA MONITOR).
(b) Terminals of ECU (See page 05–1851)
(c) On – vehicle inspection (See page 73–22)

5	ADJUST, REPAIR OR REPLACE

6	CONFIRMATION TEST

END

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052G0-02

CUSTOMER PROBLEM ANALYSIS CHECK

KEY REMINDER WARNING SYSTEM Check Sheet

Inspector's Name :

Customer's Name		Registration No.	
		Registration Year	/ /
		Frame No.	
Date Vehicle Brought In	/ /	Odometer Reading	km miles

Date Problem First Occurred		/ /
Frequency Problem Occurs		☐ Constant ☐ Intermittent (times a day) ☐ Only once
Weather Conditions When Problem Occurred	Weather	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Various/Others
	Outdoor Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold (Approx. □C (□F))

Problem Symptoms	☐ Key reminder buzzer does not sound

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052G1–02

PRE–CHECK

1. USING HAND–HELD TESTER

(a) Hook up hand–held tester to the DLC3.

(b) Monitor the ECU data by following the prompts on the tester screen.

HINT:

The hand–held tester has a ”Snapshot” function which records the monitored data.

Refer to the hand–held tester operator’s manual for further details.

2. DATA LIST

HINT:

According to the DATA LIST displayed by the hand–held tester, you can read the value of the switch, sensor, actuator and so on without parts removal. Reading the DATA LIST as a first step of troubleshooting is one of the method to shorten the labor time.

(a) Connect the hand–held tester to the DLC3.

(b) Turn the ignition switch ON.

(c) According to the display on tester, read the DATA LIST.

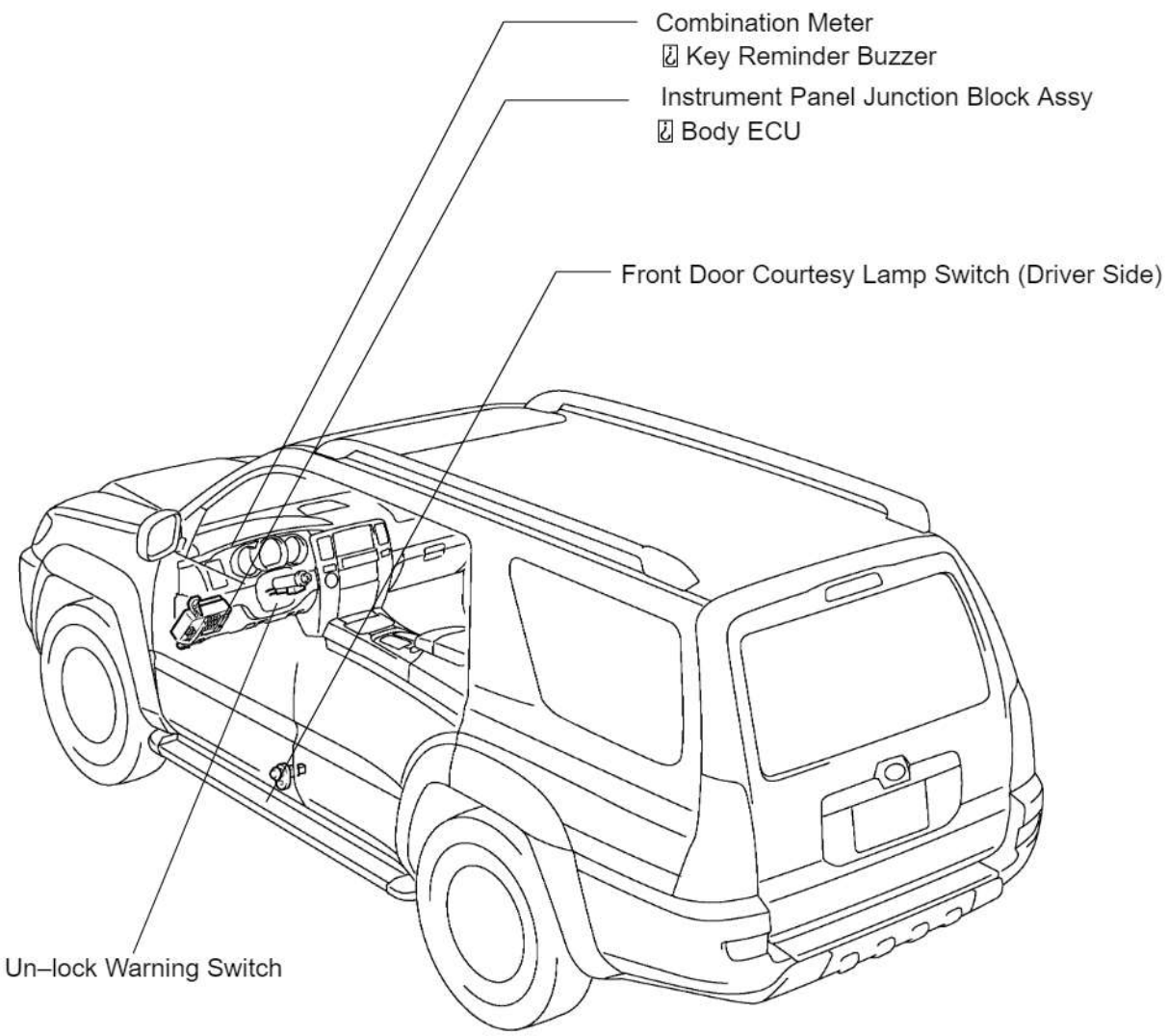
Standard (Body ECU):

Item	Measurement Item/Display (Range)	Normal Condition	Diagnostic Note
KEY UNLK WRN SW	Key unlock warning SW signal/ ON or OFF	ON: Key is in IG key cylinder OFF: No key is in IG key cylinder	–
D DOOR CTY SW	Driver’s door courtesy SW signal/ ON or OFF	ON: Driver’s door is open OFF: Driver’s door is closed	–

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052G3-02

LOCATION



O

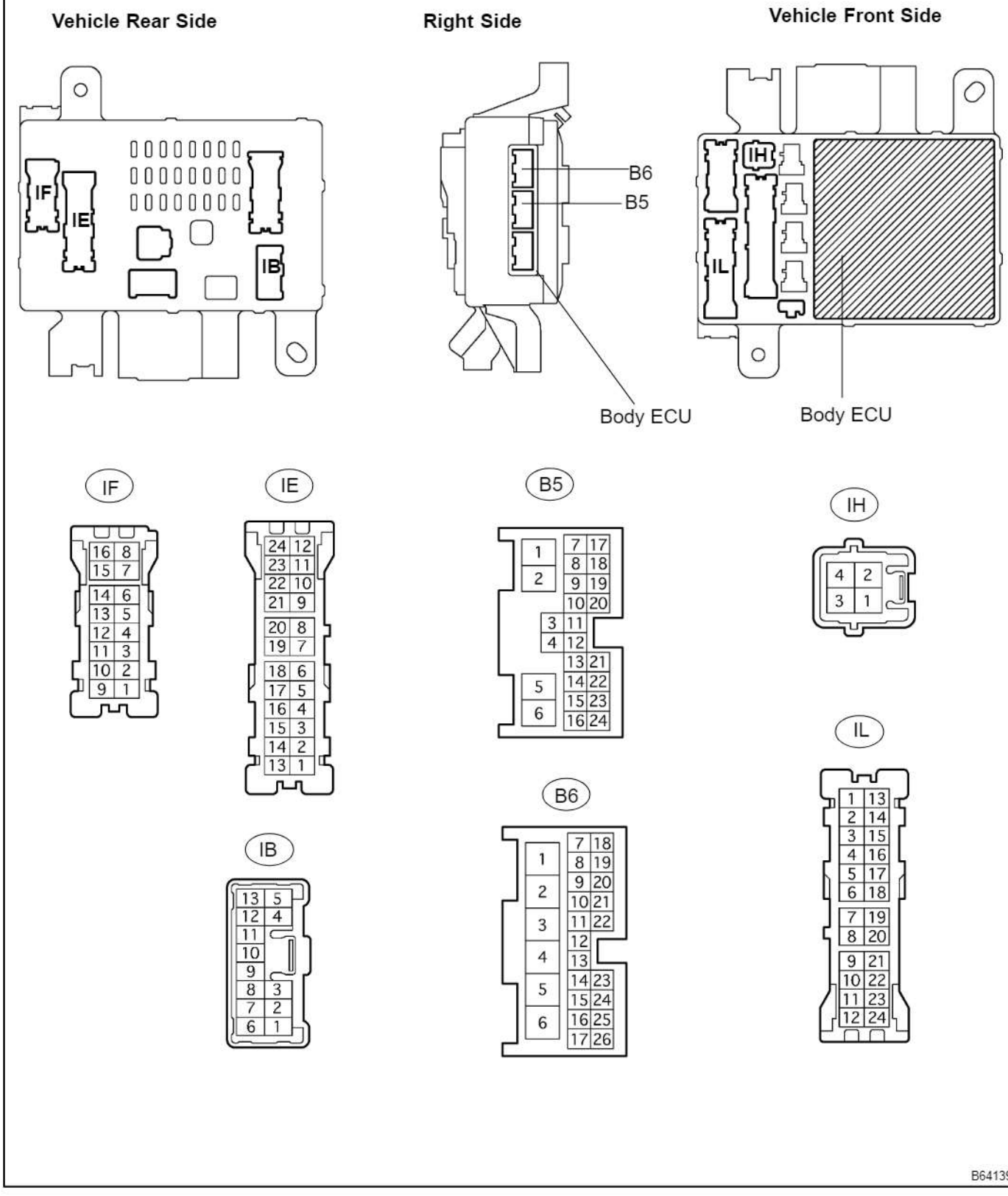
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058X6-01

TERMINALS OF ECU

1. INSPECT INSTRUMENT PANEL JUNCTION BLOCK ASSY (BODY ECU)



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(a) Disconnect the B6 ECU connector.
(b) Disconnect the IF, IE, IB, IL and IH instrument panel junction block connectors.
(c) Check the voltage or continuity of each terminal of the wire harness side connectors.

Standard:

Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
BECU (IF–2) ⇔ Body ground	W–R ⇔ –	Constant	10 – 14 V
BECU (IB–4) ⇔ Body ground	W–R ⇔ –		
BECU (IL–4) ⇔ Body ground	W–R ⇔ –		
BDR1 (IE–9) ⇔ Body ground	G–W ⇔ –		
GND1, 2 (IH–2) ⇔ Body ground	W–B ⇔ –		Continuity
KSW (B6–14) ⇔ Body ground	G–Y ⇔ –	No key in ignition switch lock cylinder → Yes	No continuity → Continuity

If the result is not as specified, there may be a malfunction on the instrument panel junction block (body ECU).

(d) Reconnect the B6 ECU connector.
(e) Reconnect the instrument panel junction block connectors, and check the voltage of each terminal of the connectors.

Standard:

Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
DCTY (B5–23) ⇔ Body ground	R–B ⇔ –	Drive door CLOSED → OPEN	10 – 14 → 0 V

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052G5-02

PROBLEM SYMPTOMS TABLE

Symptom	Suspected Area	See Page
Key reminder buzzer does not sound	1. Un–lock warning switch assy	05–1854
	2. Front door courtesy lamp switch (Driver side)	05–1854
	3. Instrument panel junction block assy (Body ECU)	05–1851
	4. Combination meter	–
	5. Wire harness	–

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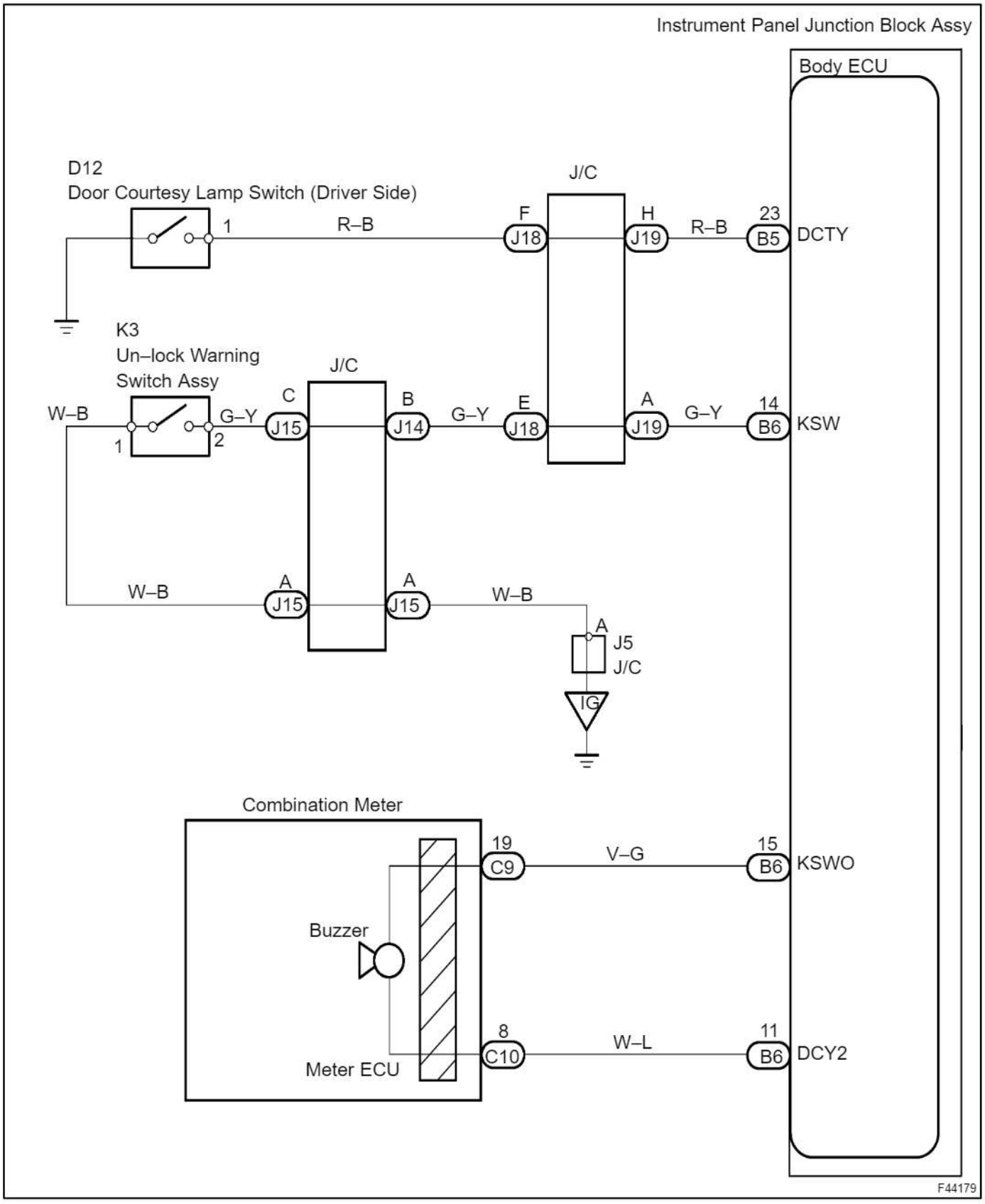
KEY REMINDER BUZZER DOES NOT SOUND

CIRCUIT DESCRIPTION

When the ignition switch is OFF, the key is in the ignition key cylinder, and the driver side door is opened, the body ECU operates the combination meter to cause the buzzer to sound.

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WIRING DIAGRAM



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INSPECTION PROCEDURE

When using hand–held tester:

1	READ VALUE OF HAND–HELD TESTER (COURTESY LAMP SWITCH)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item "D DOR CTY SW" in the DATA LIST and read its value displayed on the hand–held tester.

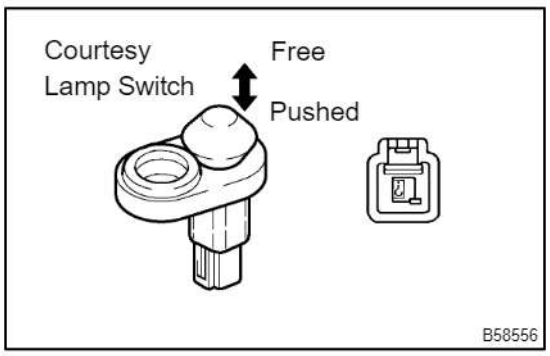
Standard:

ON: Driver side door is open
OFF: Driver side door is closed

OK → **Go to step 4**

NG

2	INSPECT COURTESY LAMP SWITCH (DRIVER SIDE)



(a) Remove the courtesy lamp switch.
(b) Check the switch continuity.

Standard:

Terminal No.	Condition	Specified Condition
1 ⇔ Body ground	Switch Free	Continuity
	Switch Pushed	No continuity

NG → **REPLACE COURTESY LAMP SWITCH**

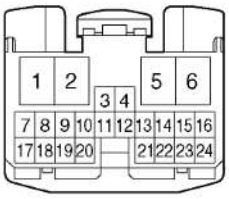
OK

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3 CHECK WIRE HARNESS (BODY ECU ⇔ COURTESY LAMP SWITCH)

Wire Harness Side

B5
Instrument Panel Junction Block Assy (Body ECU)



D12
Front Door Courtesy Lamp Switch (Driver Side)



Y B64136

(a) Disconnect the D12 door courtesy lamp switch (driver side) and B5 ECU connectors.
(b) Check the continuity between the wire harness side connectors.

Standard:

Symbols (Terminal No.)	Specified Condition
DCTY (B5–23) ⇔ – (D12–1)	Continuity

NG → **REPAIR OR REPLACE WIRE HARNESS**

OK

4 CHECK BUZZER (COMBINATION METER) (See page 05–1701)

NG → **GO TO COMBINATION METER SYSTEM (See page 05–1701)**

OK

5 READ VALUE OF HAND–HELD TESTER (KEY UN–LOCK WARNING SW)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item "KEY UNLK WRN SW" in the DATA LIST and read its value displayed on the hand–held tester.

Standard:

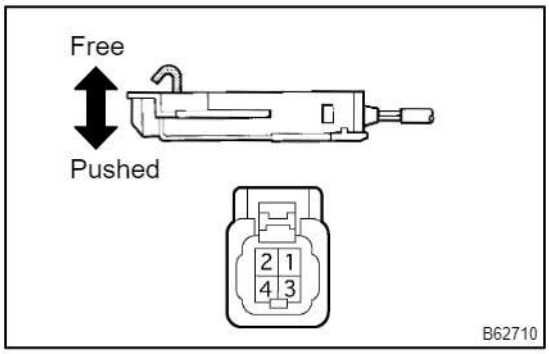
ON: The key is in the ignition key cylinder
OFF: No key is in the ignition key cylinder

OK → **REPLACE INSTRUMENT PANEL JUNCTION BLOCK ASSY**

NG

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6 INSPECT UN–LOCK WARNING SWITCH ASSY



(a) Remove the un–lock warning switch.
(b) Check the switch continuity.

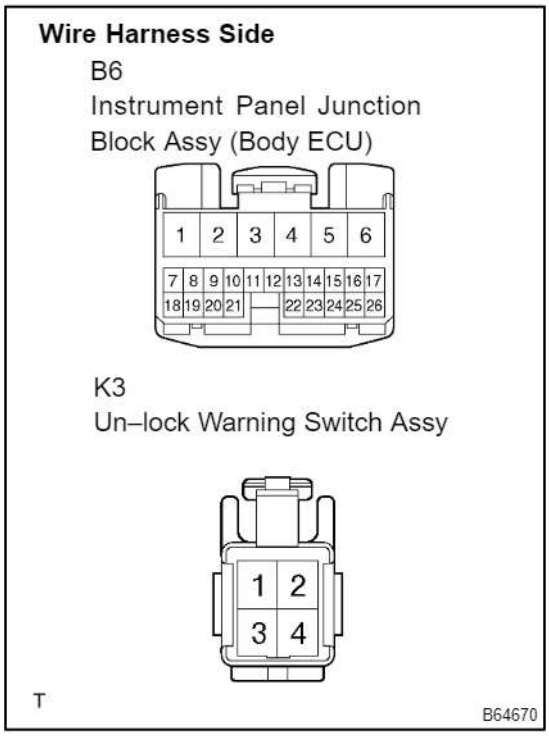
Standard:

Terminal No.	Condition	Specified Condition
1 ⇔ 2	Free	No continuity
	Pushed	Continuity

NG → **REPLACE UN–LOCK WARNING SWITCH ASSY**

OK

7 CHECK WIRE HARNESS (BODY ECU ⇔ UN–LOCK WARNING SWITCH ASSY) (UN–LOCK WARNING SWITCH ⇔ BODY GROUND)



(a) Disconnect the B6 ECU connector.
(b) Disconnect the K3 warning switch connector.
(c) Check the continuity between the wire hareness side connectors.

Standard:

Symbols (Terminal No.)	Specified Condition
KSW (B6–14) ⇔ – (K3–2)	continuity

(d) Check the continuity between the K3 warning switch connector and body ground.

Standard:

Symbols (Terminal No.)	Specified Condition
K3–1 ⇔ Body ground	continuity

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

REPLACE INSTRUMENT PANEL JUNCTION BLOCK ASSY

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When not using hand–held tester:

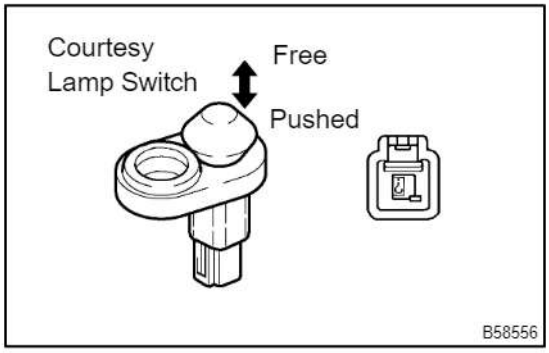
1	CHECK COURTESY LAMP SWITCH (DRIVER SIDE)

(a) Put the dome lamp assy No. 2 switch in the door position and open the driver side door. Then check that the courtesy lamp switch comes on.

OK ⇒ Go to step 3

NG

2	INSPECT COURTESY LAMP SWITCH (DRIVER SIDE)



(a) Remove the courtesy lamp switch.
(b) Check the switch continuity.

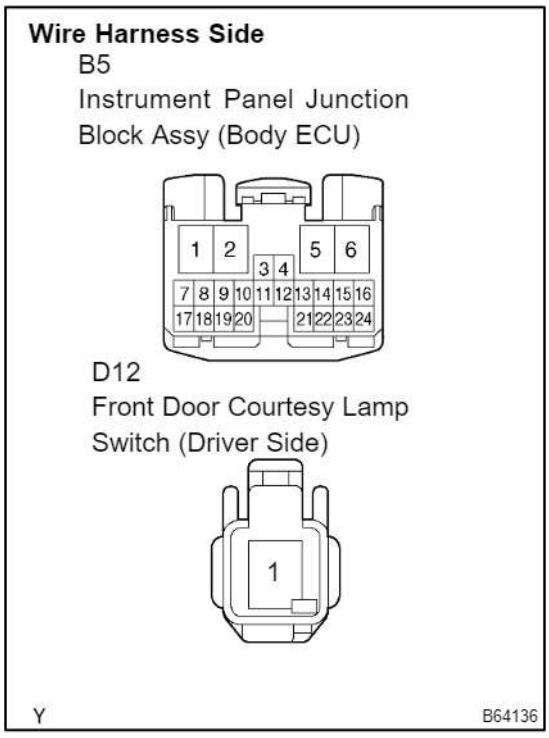
Standard:

Terminal No.	Condition	Specified Condition
1 ⇔ Body ground	Free	Continuity
	Pushed	No continuity

NG ⇒ REPLACE COURTESY LAMP SWITCH

OK

3	CHECK WIRE HARNESS (BODY ECU ⇔ COURTESY LAMP SWITCH)



(a) Disconnect the D12 door courtesy lamp switch (driver side) and B5 ECU connectors.
(b) Check the continuity between the wire harness side connectors.

Standard:

Symbols (Terminal No.)	Specified Condition
DCTY (B5–23) ⇔ – (D12–1)	Continuity

NG ⇒ REPAIR OR REPLACE WIRE HARNESS

OK

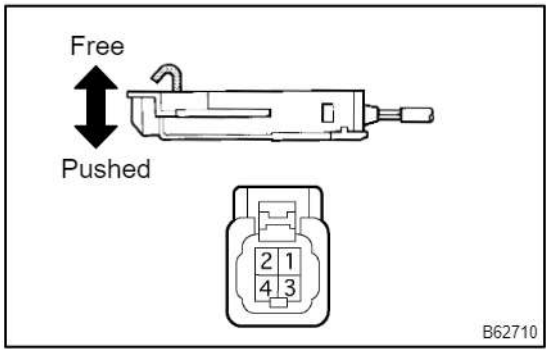
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4	CHECK BUZZER (COMBINATION METER) (See page 05–1701)

NG → GO TO COMBINATION METER SYSTEM (See page 05–1701)

OK

5	INSPECT UN–LOCK WARNING SWITCH ASSY



(a) Remove the un–lock warning switch.
(b) Check the switch continuity.

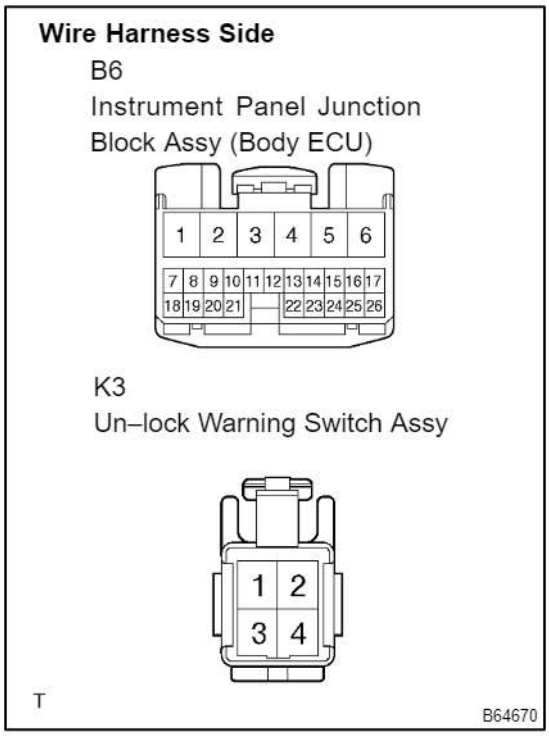
Standard:

Terminal No.	Condition	Specified Condition
1 ⇔ 2	Free	No continuity
	Pushed	Continuity

NG → REPLACE UN–LOCK WARNING SWITCH ASSY

OK

6	CHECK WIRE HARNESS(BODY ECU ⇔ UN–LOCK WARNING SWITCH ASSY) (UN–LOCK WARNING SWITCH ⇔ BODY GROUND)



(a) Disconnect the B6 ECU connectors.
(b) Disconnect the K3 warning switch connector.
(c) Check the continuity between the wire hareness side connectors.

Standard:

Symbols (Terminal No.)	Specified Condition
KSW (B6–14) ⇔ – (K3–2)	continuity

(d) Check the continuity between the K3 warning switch connector and body ground.

Standard:

Symbols (Terminal No.)	Specified Condition
K3–1 ⇔ Body ground	continuity

NG → REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

REPLACE INSTRUMENT PANEL JUNCTION BLOCK ASSY

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ENGINE IMMOBILISER SYSTEM

0521A-10

HOW TO PROCEED WITH TROUBLESHOOTING

HINT:

Troubleshoot in accordance with the procedures on the following pages.

1	VEHICLE BROUGHT TO WORKSHOP

2	CUSTOMER PROBLEM ANALYSIS CHECK AND PROBLEM SYMPTOM CONFIRMATION

3	CRANK ENGINE FOR MORE THAN 10 SECONDS

4	CHECK DIAGNOSTIC TROUBLE CODE

(a) Check for a DTC.

(1) When any of code B2780, B2784, B2794, B2795, B2796, B2797, B2798 or B2799 is output, proceed to A.

(2) When a code except B2780, B2784, B2794, B2795, B2796, B2797, B2798 or B2799 is output, proceed to B.

B → GO TO SFI SYSTEM (See page 05–1 or 05–322)

A

5	READ VALUE OF HAND–HELD TESTER (IMMOBILISER ECU (TRANSPONDER KEY ECU ASSY) (SWITCH CONDITION))

(a) Connect the hand–held tester to the DLC3.

(b) Turn the ignition switch ON and push the hand–held tester main SW ON.

(c) Select the item "KEY SW" in the "DATA LIST" and read its value displayed on the hand–held tester.

TRANSPONDER KEY ECU:

Item	Measurement Item/ Display (Range)	Normal Condition	Diagnostic Note
KEY SW	Un–lock warning SW signal/ ON or OFF	ON: Key is in the IG key cylinder OFF: Key is not in IG key cylinder	–

NG → GO TO DTC B2780 (See page 05–1874)

OK

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6	CHECK DIAGNOSTIC TROUBLE CODE OF TRANSPONDER KEY ECU ASSY

(a) Check for a DTC and make a note of the code that is output.
(b) Delete the DTC.
(c) Check if the DTC will be output once again, when the problem symptom is simulated based on the noted code.
  (1) Without an output of the code, proceed to A.
  (2) With an output of the code, proceed to B.

B → Go to step 8

A

7	PROBLEM SYMPTOMS TABLE (See page 05–1873)

(a) Without an applicable problem symptoms table, proceed to A.
(b) With an applicable problem symptoms table, proceed to B.

B → Go to step 9

A

8	ACCORDING TO PROBLEM SYMPTOM, PERFORM TROUBLESHOOTING

(a) Pre–check (See page 05–1864)
  (1) Inspect with the hand–held tester (ECU data monitor).
  (2) Inspect with the hand–held tester (Active test).
(b) Terminals of ECU (See page 05–1869)

9	ADJUST, REPAIR OR REPLACE

END

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0521B-02

CUSTOMER PROBLEM ANALYSIS CHECK

ENGINE IMMOBILISER SYSTEM Check Sheet

Inspector's Name :

Customer's Name		**Registration No.**	
		Registration Year	/ /
		Frame No.	
Date Vehicle Brought in	/ /	**Odometer Reading**	**km miles**

Date Problem First Occurred		/ /
Frequency Problem Occurs		☐ Constant ☐ Intermittent (times a day) ☐ Only once
Weather Conditions When Problem Occurred	**Weather**	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Various/Others
	Outdoor Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold (Approx. □C (□F)

Symptoms	☐ Immobiliser is not set. (Engine starts with key codes other than the registered key code.)
	☐ Engine does not start.

DTC Check	**1st Time**	☐ Normal code ☐ Malfunction code (Code)
	2nd Time	☐ Normal code ☐ Malfunction code (Code)

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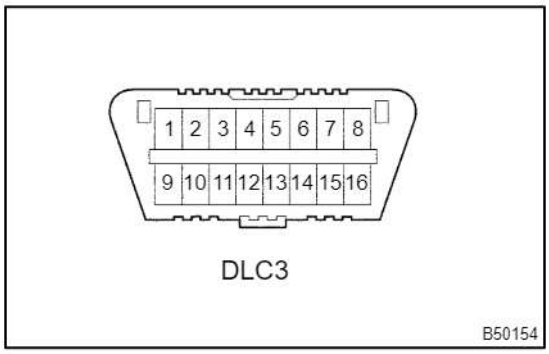
05A23-01

PRE–CHECK

1. DIAGNOSIS SYSTEM

(a) Description

(1) The ECM controls the function of the immobiliser on this vehicle.
Data of the immobiliser system and the Diagnostic Trouble Code (DTC) can be read in the Data Link Connector 3 (DLC3) of the vehicle. When a trouble occurs in the immobiliser, the Malfunction Indicator Lamp (MIL) does not come on, however DTC can be checked.
Therefore, when there seems to be a trouble with the immobiliser system, use the hand–held tester to check and troubleshoot it.



(b) Inspect the DLC3.
The vehicle's ECM uses the ISO 9141–2 for communication.
The terminal arrangement of the DLC3 complies with the SAE J1962 and matches the ISO 9141–2 format.

Standard:

Terminal No.	Condition	Specified Condition
7 (Bus + Line) ⇔ 5 (Signal Ground)	During communication	Pulse generation
4 (Chassis Ground) ⇔ Body Ground	Always	1 Ω or less
5 (Signal Ground) ⇔ Body Ground	Always	1 Ω or less
16 (B+) ⇔ Body Ground	Always	9 – 14 V

HINT:
If the display shows "UNABLE TO CONNECT TO VEHICLE" when you have connected the cable of the hand–held tester to the DLC3, turned the ignition switch ON and operated the hand–held tester, there is a problem on the vehicle side or the tool side.

- If the communication is normal when the tool is connected to other vehicle, inspect the DLC3 of the original vehicle.
- If the communication is still impossible when the tool is connected to other vehicle, the problem is probably in the tool itself, so consult the Service Department listed in the tool's instruction manual.

2. INSPECT DIAGNOSIS

(a) Using the hand–held tester, check for DTC.

NOTICE:

Hand–held tester only:

When the diagnosis system is switched from the normal mode to the check mode, all the DTCs and freeze frame data recorded in the normal mode is erased. So before switching the modes, always check the DTCs and freeze frame data, and make a note of them.

(1) Prepare the hand–held tester.
(2) Connect the hand–held tester to the DLC3 under the instrument panel lower pad.
(3) Turn the ignition switch ON and push the hand–held tester switch ON.
(4) Use the hand–held tester to check for DTCs and freeze frame data, and make a note of them (For operating instructions, see the hand–held tester instruction book).
(5) Confirm the details of the DTCs.

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(b) Either of the following procedures will erase the DTCs and freeze frame data.
  (1) Operating the hand–held tester to erase the codes (See the hand–held tester instruction book for operating instructions).
  (2) Disconnecting the battery terminals or ECU–B fuse.

3. DATA LIST

HINT:

According to the DATA LIST displayed by the hand–held tester, you can read the value of the switch, sensor, actuator and so on without parts removal. Reading the DATA LIST as a first step of troubleshooting is one of the method to shorten the labor time.

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON.
(c) According to the display on the tester, read the DATA LIST.

Transponder key ECU:

Item	Measurement Item/ Display (Range)	Normal Condition	Diagnostic Note
KEY SW	Un–lock warning SW signal/ ON or OFF	OFF: Key is in IG key cylinder ON: Key is not in IG key cylinder	–
IG SW	IG SW signal/ ON or OFF	OFF: IG SW is ON or START position ON: IG SW is OFF or ON position	–
IMMOBILISER	Immobiliser system status/ SET or UNSET	UNSET: Without key SET: Ignition switch ON	–
RESPONSE	–	NG/OK	–
FRAME	–	NG/OK	–
SERIAL NUMBER	–	NG/OK	–
ENCRYPT CODE	–	NG/OK	–
STATUS	–	NG/OK	–
BCC	–	NG/OK	–
SUB KEY	–	NOMATCH/MATCHH	–
MASTER KEY	–	NOMATCH/MATCHH	–
REGIST SUB CODE	Number of registered master key/ min. 0, max. 15	Number of registered master key	–
REGIST MAS CODE	Number of registered sub–key/ min. 0, max. 15	Number of registered sub–key	–
REG CODE SPACE	–	NOT FUL/FULL	–
+B	–	NORMAL/BREAK	–
ANTENNA COIL	–	NOMAL/FAIL	–
G–CODE SUPPORT	–	NOT SUP/SUPPORT	–

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4. ACTIVE TEST

HINT:

Performing the ACTIVE TEST using the hand–held tester allows the relay, VSV, actuator and so on without parts removal. Performing the ACTIVE TEST as a first step of troubleshooting is one of the method to shorten the labor time.

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON.
(c) According to the display on the tester, perform the ACTIVE TEST.

Transponder key ECU:

Item	Test Details	Diagnostic Note
SECURITY INDIC	Turn security indicator ON/OFF	Key reminder buzzer is installed in combination meter

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DIAGNOSTIC TROUBLE CODE CHART

1. TRANSPONDER KEY ECU DIAGNOSTIC TROUBLE CODE CHART

DTC No. (See page)	Detection Item	Trouble Area
B2780 (05–1874)	Push Switch/Key unlock Warning Switch Malfunction	□Un–lock warning switch □Wire harness □Transponder key ECU assy
B2784 (05–1877)	Antenna Coil Open/Short	□Key
B2793 (05–1879)	Transponder Chip Malfunction	□Key
B2794 (05–1880)	Unmatched Encryption Code	□Key
B2795 (05–1881)	Unmatched Key Code	□Key
B2796 (05–1882)	No Communication in Immobiliser System	□Key □Transponder key amplifier (Transponder key coil) □Wire harness □Transponder key ECU assy
B2797 (05–1885)	Communication Malfunction No.1	□Key □Wire harness □Transponder key amplifier □Transponder key ECU assy
B2798 (05–1882)	Communication Malfunction No.2	□Key □Transponder key amplifier (Transponder key coil) □Wire harness □Transponder key ECU assy

2. ECM DIAGNOSTIC TROUBLE CODE CHART

NOTICE:

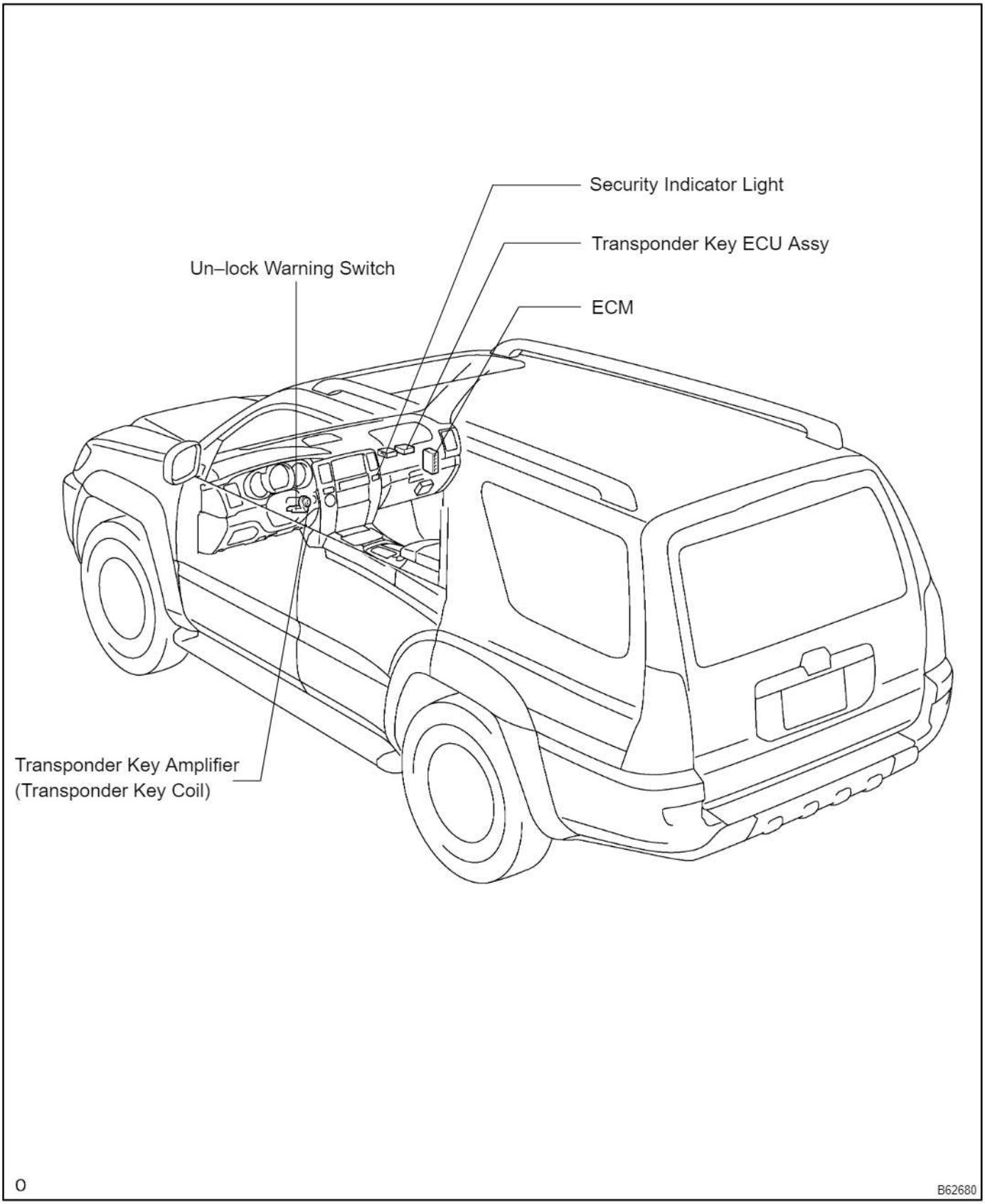
The DTC for the immobiliser system is specified. If the other codes are output, check the DTC chart of the engine control system.

DTC No. (See page)	Detection Item	Trouble Area
B2799 (05–1886)	Engine Immobiliser System Malfunction	□Wire harness □Transponder key ECU assy □Transponder key amplifier (Transponder key coil) □ECM

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0521E-02

LOCATION

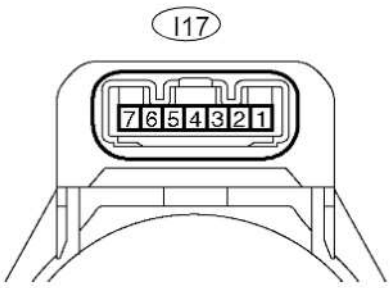


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05A27-01

TERMINALS OF ECU

1. CHECK TRANSPONDER KEY AMPLIFIER



B65593

(a) Disconnect the I17 amplifier connector, and check the continuity of each terminal of the wire harness side connector.

Standard:

Symbols (Terminal No.)	Wiring Color	Condition	Standard
GND (I17–7) ⇔ Body ground	L ⇔ –	Constant	Continuity

If the result is not as specified, there may be a malfunction on the wire harness side.

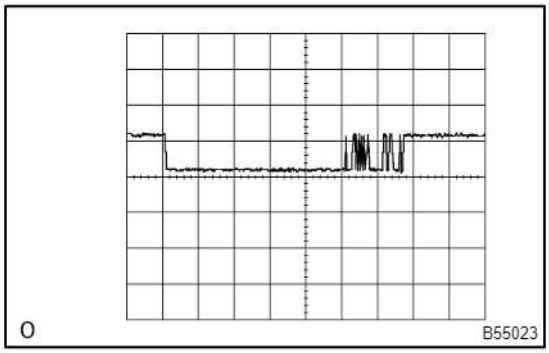
(b) Reconnect the I17 amplifier connector, and check the continuity or voltage of each terminal of the connector.

Standard:

Symbols (Terminal No.)	Wiring Color	Condition	Standard
VC5 (I17–1) ⇔ GND (I17–7)	GR–B ⇔ L	No key in ignition key cylinder → With key	0 V → 10 – 14 V
CODE(I17–4) ⇔ GND (I17–7)	P–G ⇔ L	No key in ignition key cylinder → With key	Waveform 1
TXCK (I17–5) ⇔ GND (I17–7)	LG–R ⇔ L	No key in ignition key cylinder → With key	Waveform 2
GND (I17–7) ⇔ Body ground	L ⇔ –	Constant	Continuity

If the result is not as specified, the amplifier may malfunction.

(c) Inspect using an oscilloscope.

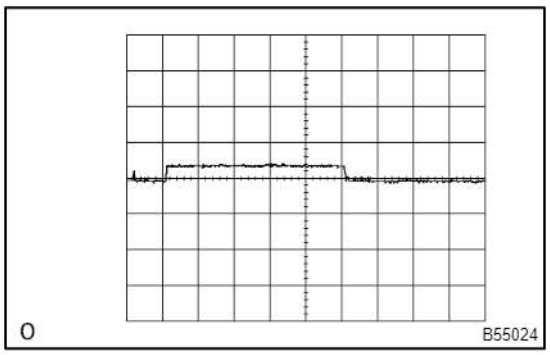


B55023

Waveform 1 (Reference):

Terminal	CODE ⇔ GND
Tool setting	10 V/DIV., 10 ms/DIV.
Condition	Ignition switch ON

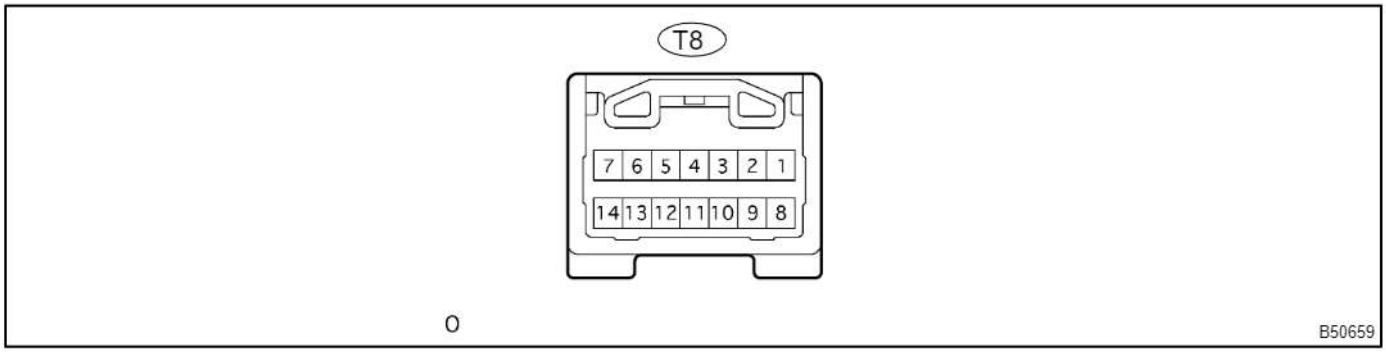
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Waveform 2 (Reference):

Terminal	TXCK ⇔ GND
Tool setting	10 V/DIV., 10 ms/DIV.
Condition	Ignition switch ON

2. CHECK TRANSPONDER KEY ECU ASSY



(a) Disconnect the the T8 ECU connector, and check the voltage or continuity between each terminal of the wire harness side connector.

Standard:

Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
AGND (T8–13) ⇔ Body ground	L ⇔ –	Constant	Continuity
+B (T8–1) ⇔ GND (T8–14)	W–R ⇔ W–B	Constant	10 – 14 V
IG (T8–2) ⇔ AGND (T8–13)	B–O ⇔ L	Ignition switch OFF → ON	0 V → 10 – 14 V
KSW (T8–10) ⇔ AGND (T8–13)	G–Y ⇔ L	No key in the ignition key cylinder → With key	No continuity → Continuity

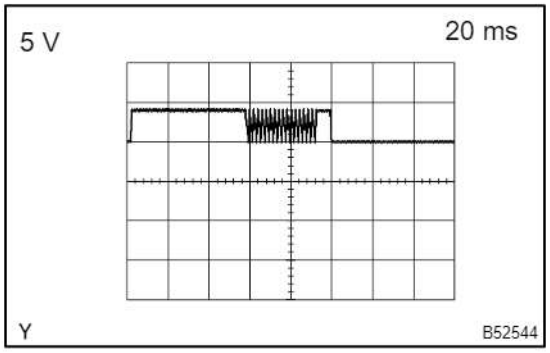
If the result is not as specified, there may be a malfunction on the wire harness side.

(b) Reconnect the T8 ECU connector, and check the voltage between each terminal of the connector.

Standard:

Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
KSW (T8–10) ⇔ AGND (T8–13)	G–Y ⇔ L	No key in the ignition key cylinder → With key	10 – 14 V → 0 V
VC5 (T8–8) ⇔ AGND (T8–13)	GR–B ⇔ L	Ignition switch OFF → ON	0 V → 10 – 14 V
TXCT (T8–12) ⇔ AGND (T8–13)	LG–R ⇔ L	Ignition switch OFF → ON	Waveform 1
CODE (T8–11) ⇔ AGND (T8–13)	P–G ⇔ L	Ignition switch OFF → ON	Waveform 2
EFIO (T8–6) ⇔ AGND (T8–13)	W–R ⇔ L	Ignition switch OFF → ON	Waveform 3
EFII (T8–7) ⇔ AGND (T8–13)	L–R ⇔ L	Ignition switch OFF → ON	Waveform 4

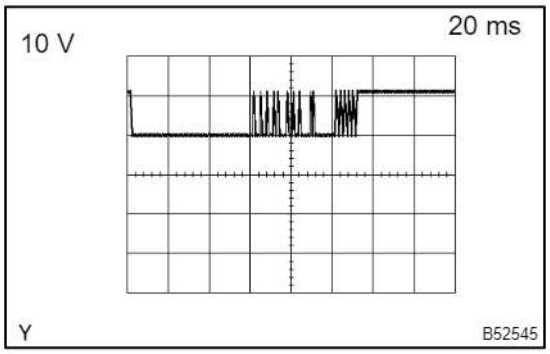
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(c) Inspect using an oscilloscope.

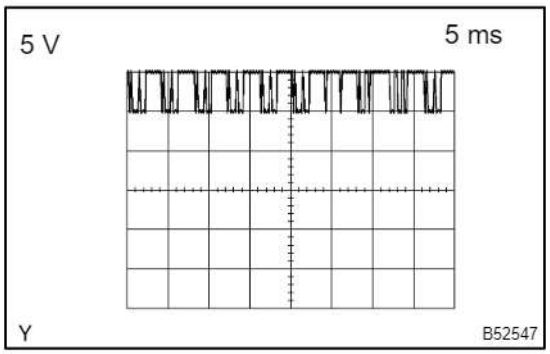
Waveform 1 (Reference):

Terminal	TXCT ⇔ GND
Tool setting	5 V/DIV., 20 ms/DIV.
Vehicle condition	Ignition switch ON



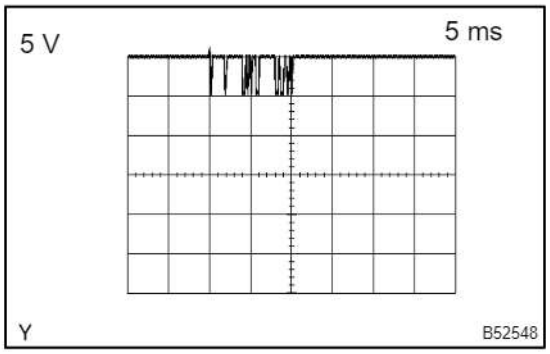
Waveform 2 (Reference):

Terminal	CODE ⇔ GND
Tool setting	10 V/DIV., 20 ms/DIV.
Vehicle condition	Ignition switch ON



Waveform 3 (Reference):

Terminal	EFIO ⇔ GND
Tool setting	5 V/DIV., 5 ms/DIV.
Vehicle condition	Ignition switch ON



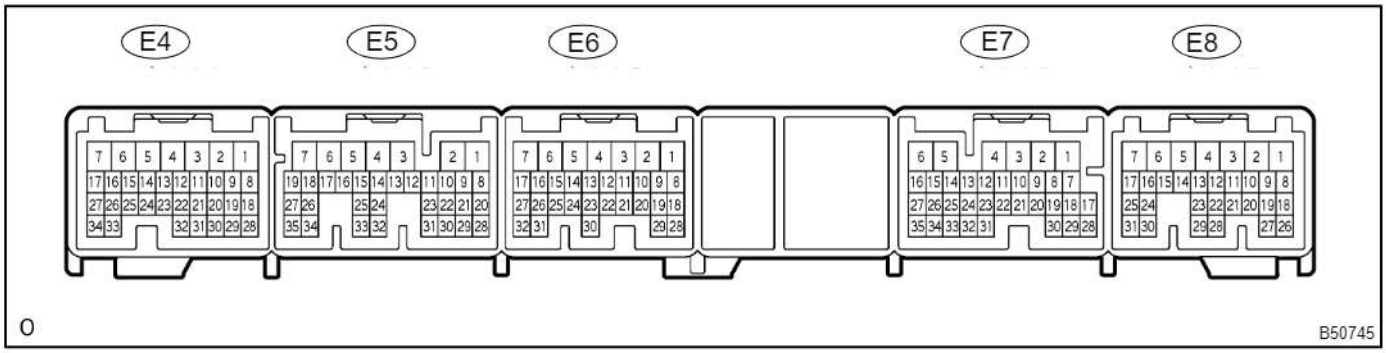
Waveform 4 (Reference):

Terminal	EFII ⇔ GND
Tool setting	5 V/DIV., 5 ms/DIV.
Vehicle condition	Constant

If the result is not as specified, the T8 ECU may malfunction.

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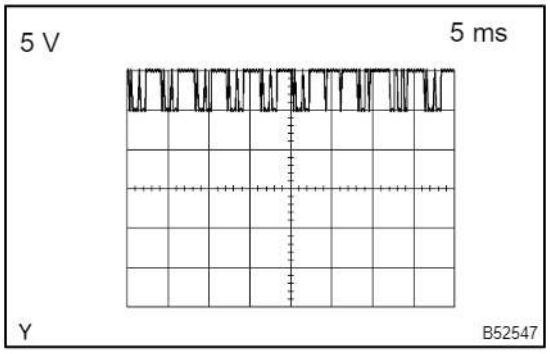
3. CHECK ECM



(a) Disconnect the the E6, E7 and E8 ECU connectors, and check the voltage or continuity between each terminal of the wire harness side connectors.

Standard:

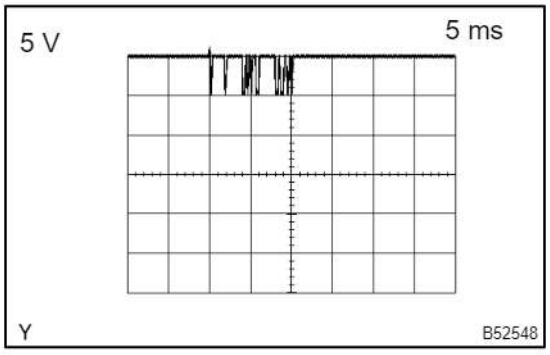
Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
BATT (E8–4) ⇔ E1 (E6–1)	L ⇔ BR	Constant	9 – 14 V
+B (E8–6) ⇔ E1 (E6–1)	B ⇔ BR	Ignition switch OFF → ON	9 – 14 V
+B1 (E8–2) ⇔ E1 (E6–1)	B ⇔ BR	Ignition switch OFF → ON	9 – 14 V
IMI (E7–27) ⇔ E1 (E6–1)	W–R ⇔ BR	No key in ignition key cylinder → With key	Waveform 1
IMO (E7–26) ⇔ E1 (E6–1)	L–R ⇔ BR	No key in ignition key cylinder → With key	Waveform 2
E1 (E6–1) ⇔ Body ground	BR ⇔ –	Constant	Continuity



(b) Inspect using an oscilloscope.

Waveform 1 (Reference):

Terminal	IMI ⇔ GND
Tool setting	5 V/DIV., 5 ms/DIV.
Vehicle condition	Ignition switch ON



Waveform 2 (Reference):

Terminal	IMO ⇔ GND
Tool setting	5 V/DIV., 5 ms/DIV.
Vehicle condition	Constant

If the result is not as specified, there may be a malfunction on the wire harness side.

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0521G-02

PROBLEM SYMPTOMS TABLE

Problem Symptom	Suspected Area	See Page
Engine does not start	1. Key	05–1879 05–1880 05–1881 05–1882 05–1885
	2. Transponder key amplifier (transponder key coil)	05–1882 05–1885 05–1886
	3. Transponder key ECU assy	05–1882 05–1885

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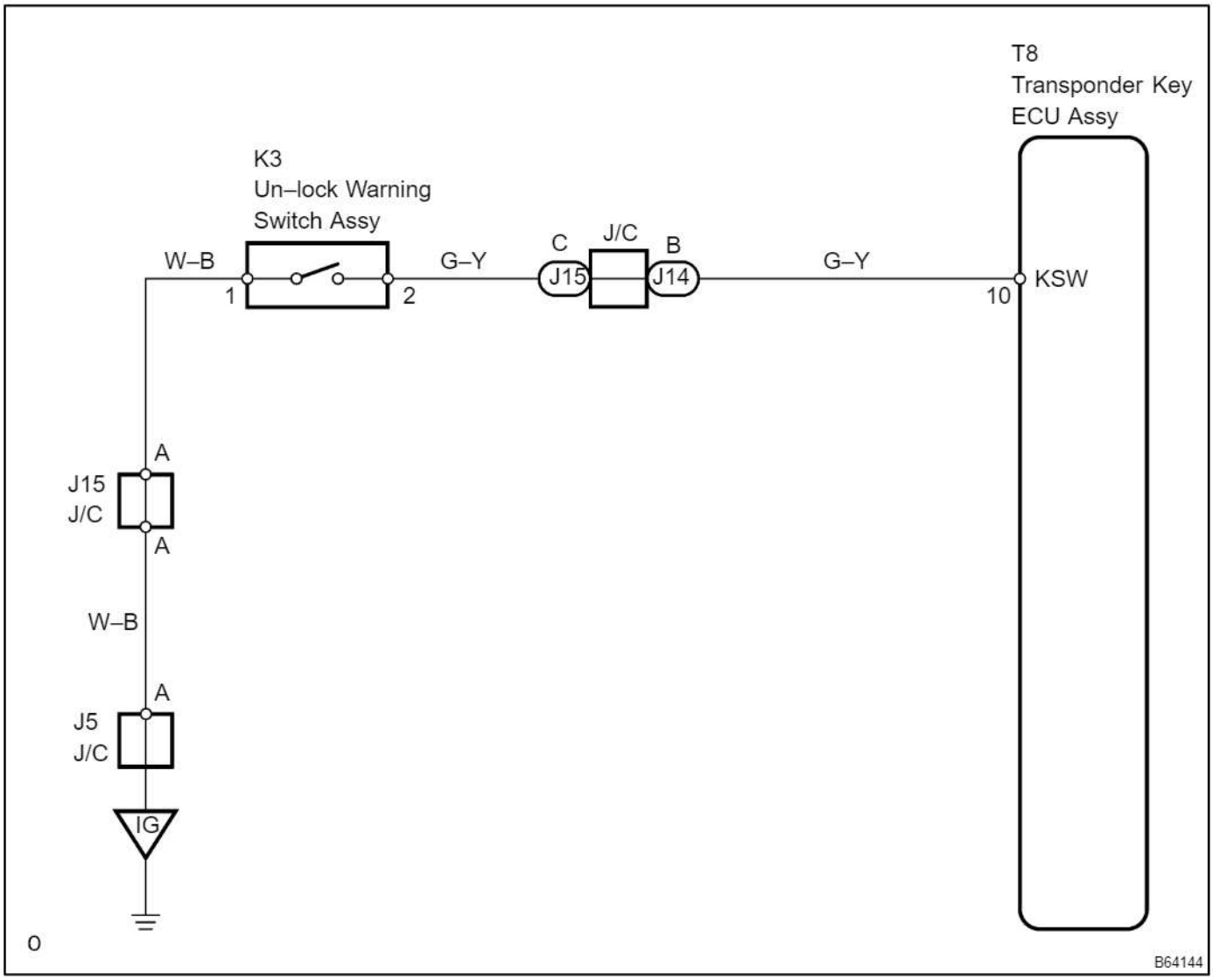
DTC	B2780	PUSH SWITCH/KEY UNLOCK WARNING SWITCH MALFUNCTION

CIRCUIT DESCRIPTION

This DTC will be output if the transponder key ECU does not detect the un–lock warning switch ON even when the ignition switch is ON (In the normal condition, the un–lock warning switch should be ON when the ignition switch is ON).

DTC No.	DTC Detection Condition	Trouble Area
B2780	Un–lock warning switch ON is not detected when ignition switch is ON	□Un–lock warning switch □Wire harness □Transponder key ECU assy

WIRING DIAGRAM



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INSPECTION PROCEDURE

HINT:

Start the inspection from step 1 when using the hand–held tester and start from step 2 when not using the hand–held tester.

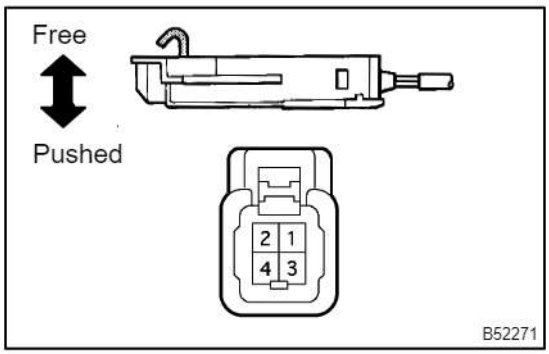
1	READ VALUE OF HAND–HELD TESTER (TRANSPONDER KEY ECU (SWITCH CONDITION))

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON with the key with which the engine does not start.
(c) Select the item ”KEY SW” on the hand–held tester.
OK: NORMAL
NG: FAIL

OK → REPLACE TRANSPONDER KEY ECU ASSY

NG

2	INSPECT UN–LOCK WARNING SWITCH ASSY



(a) Remove the un–lock warning switch.
(b) Inspect the un–lock warning switch continuity.
Standard:

Terminal No.	Condition	Specified Condition
1 ⇔ 2	Switch pushed (Key removed)	Continuity
	Switch free (Key set)	No continuity

NG → REPLACE UN–LOCK WARNING SWITCH ASSY

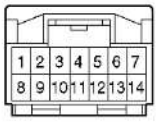
OK

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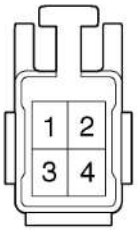
3	CHECK WIRE HARNESS (TRANSPONDER KEY ECU ASSY ⇔ UN–LOCK WARNING SWITCH)

Wire Harness Side

T8
Transponder Key ECU Assy



K3
Un–lock Warning Switch



B63404
B69245

B64973

(a) Disconnect the T8 ECU and K3 un–lock warning switch connectors.

(b) Check the continuity between the wire harness side connectors.

Standard:

Symbols (Terminal No.)	Specified Condition
KSW (T8–10) ⇔ – (K3–2)	Continuity

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

REPLACE TRANSPONDER KEY ECU ASSY

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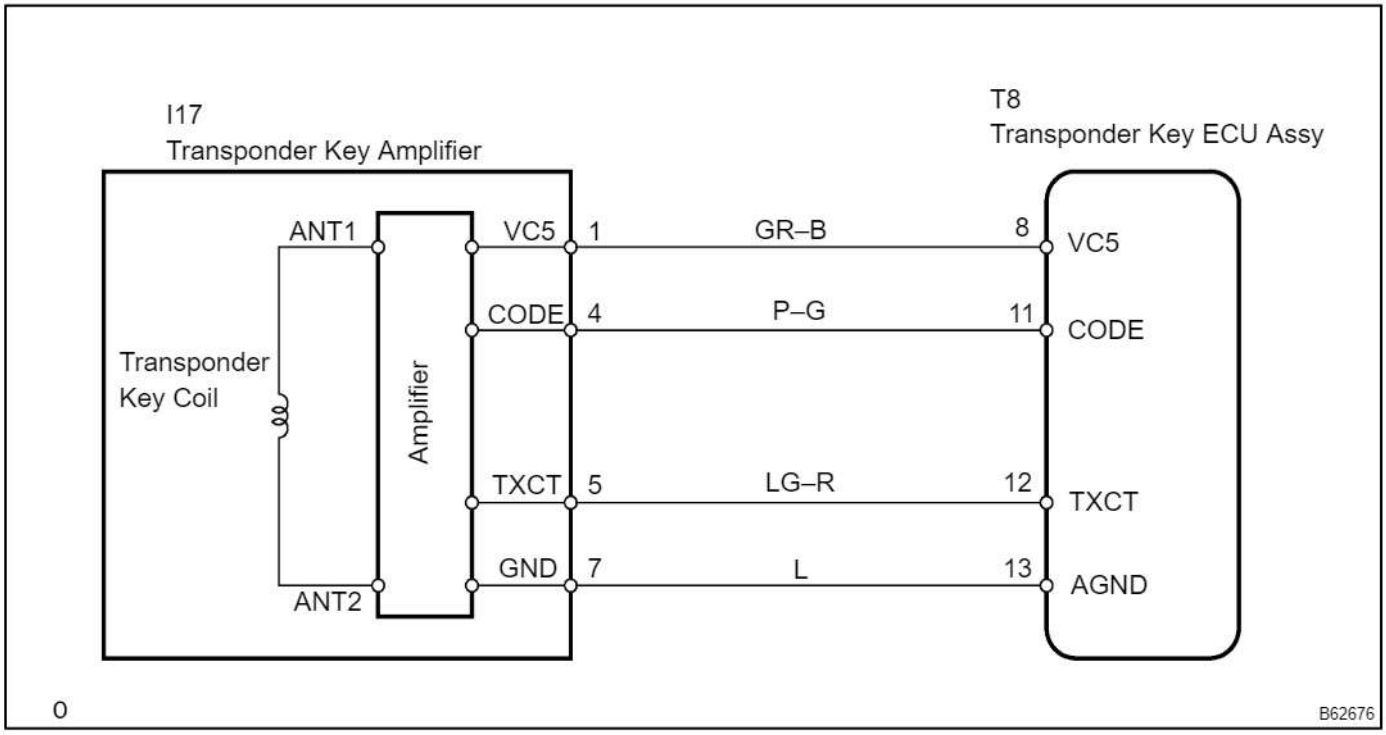
DTC	B2784	ANTENNA COIL OPEN/SHORT

CIRCUIT DESCRIPTION

The transponder key coil is built in the transponder key amplifier and receives a key code signal from the transponder chip in the key. This signal is amplified by the amplifier, then it is output to the transponder key ECU.

DTC No.	DTC Detection Condition	Trouble Area
B2784	Antenna coil is open	□Transponder key amplifier (transponder key coil) □Wire harness □Transponder key ECU assy

WIRING DIAGRAM



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INSPECTION PROCEDURE

HINT:
Start the inspection from step 1 when using the hand–held tester and start from step 2 when not using the hand–held tester.

1	READ VALUE OF HAND–HELD TESTER (IMMOBILISER ECU (TRANSPONDER KEY ECU ASSY) (SWITCH CONDITION))

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON with the key with which the engine does not start.
(c) Select the item "ANTENNA COIL" on the hand–held tester.
OK: NORMAL
NG: FAIL

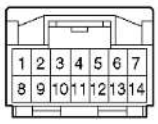
OK	CHECK AND REPLACE TRANSPONDER KEY ECU ASSY

NG

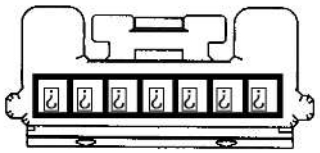
2	CHECK WIRE HARNESS (TRANSPONDER KEY ECU ASSY ⇔ TRANSPONDER KEY AMPLIFIER)

Wire Harness Side

T8
Transponder Key ECU Assy



I17
Transponder Key Amplifier



B63404
B55013
B64974

(a) Disconnect the T8 ECU and I17 amplifier connectors.
(b) Check the continuity between the wire harness side connectors.
Standard:

Symbols (Terminal No.)	Specified Condition
VC5 (T8–8) ⇔ VC5 (I17–1)	Continuity
CODE (T8–11) ⇔ CODE (I17–4)	Continuity
TXCT (T8–12) ⇔ TXCT (I17–5)	Continuity
AGND (T8–13) ⇔ GND (I17–7)	Continuity

(c) Check the continuity between the T8 ECU or I17 amplifier wire harness side connector and body ground.
Standard:

Symbols (Terminal No.) (ECU or Amplifier ⇔ –)	Specified Condition
VC5 (T8–8) or VC5 (I17–1) ⇔ Body ground	No continuity
CODE (T8–11) or CODE (I17–4) ⇔ Body ground	No continuity
TXCT (T8–12) or TXCT (I17–5) ⇔ Body ground	No continuity
AGND (T8–13) or GND (I17–7) ⇔ Body ground	No continuity

NG	REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

REPLACE TRANSPONDER KEY AMPLIFIER

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DTC B2793 TRANSPONDER CHIP MALFUNCTION

CIRCUIT DESCRIPTION

This DTC is output when a trouble is found in a key during the key code registration, also if the key code is not registered normally, this DTC is output.

DTC No.	DTC Detection Condition	Trouble Area
B2793	Transponder chip malfunction	□Key

INSPECTION PROCEDURE

1	CHECK DTC

(a) Delete the DTC.
(b) Insert the key into ignition key cylinder.
(c) Check that no code is output.

OK → NO PROBLEM

NG

2	RE–REGISTER KEY

(a) Delete the DTC.
(b) Re–register the key, and check that engine starts with the key.

OK → NORMAL

NG

REPLACE KEY

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DTC	B2794	UNMATCHED ENCRYPTION CODE

CIRCUIT DESCRIPTION

This DTC is output when a key without the key code is inserted.

DTC No.	DTC Detection Condition	Trouble Area
B2794	Key with unregistered key code is inserted	□Key

INSPECTION PROCEDURE

REPLACE KEY

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DTC	B2795	UNMATCHED KEY CODE

CIRCUIT DESCRIPTION

This DTC is output when an unregistered key is inserted.

DTC No.	DTC Detection Condition	Trouble Area
B2795	Key with different ID code inserted in ignition switch	□Key

INSPECTION PROCEDURE

1	DELETE DTC AND INSERT ALL PRESENTLY AVAILABLE KEYS TO CHECK WHETHER ENGINE STARTS OR NOT

(a) Check whether the engine starts, after the re–registration of the key with which the engine does not start.

OK → NO PROBLEM (BECAUSE OF KEY RE–REGISTRATION)

NG

REPLACE KEY WITH WHICH ENGINE DOES NOT START

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DTC	B2796	NO COMMUNICATION IN IMMOBILISER SYSTEM

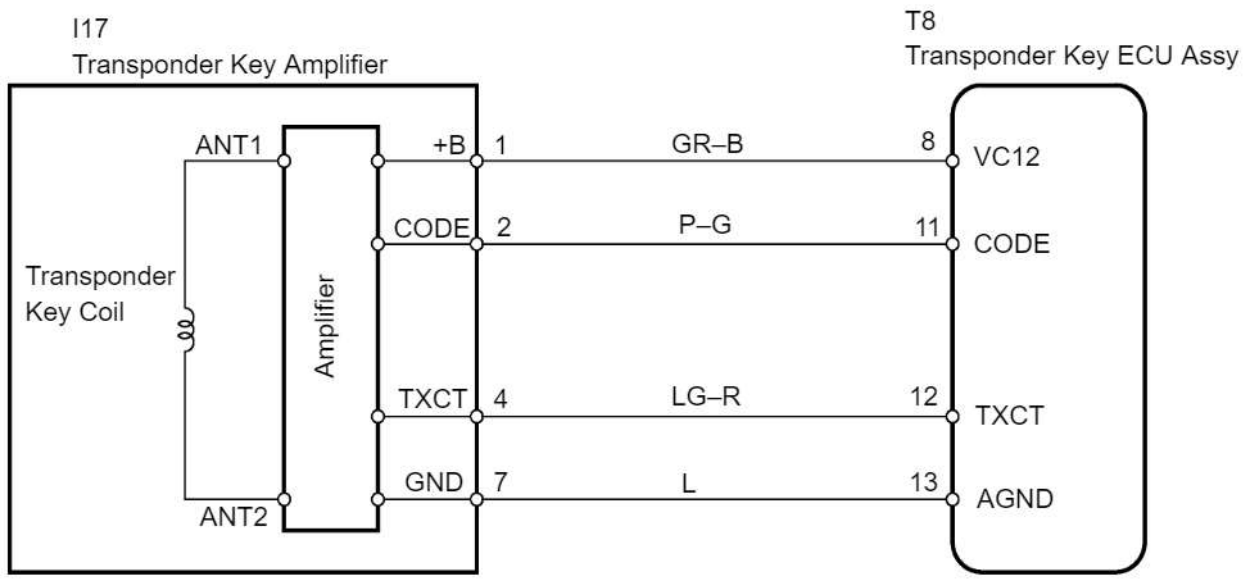
DTC	B2798	COMMUNICATION MALFUNCTION NO.2

CIRCUIT DESCRIPTION

This code is stored in memory when inserting the key that does not have transponder chip or if the communication between the key and transponder key ECU is impossible.

DTC No.	DTC Detection Condition	Trouble Area
B2796	No communication	□Key □Transponder key amplifier (transponder key coil) □Wire harness □Transponder key ECU assy
B2798	Communication error	□Key □Transponder key amplifier (transponder key coil) □Wire harness □Transponder key ECU assy

WIRING DIAGRAM



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INSPECTION PROCEDURE

HINT:
Start the inspection from step 1 when using the hand–held tester and start from step 2 when not using the hand–held tester.

1	**READ VALUE OF HAND–HELD TESTER (IMMOBILISER ECU (TRANSPONDER KEY ECU ASSY) (SWITCH CONDITION))**

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON with the key with which the engine does not start.
(c) Select the item "IMMOBILISER" on the hand–held tester.
OK:
SET → Without key
UNSET → Ignition switch ON

OK → **NORMAL**

NG

2	**CHECK WHETHER ENGINE STARTS WITH OTHER KEYS**

(a) Check whether the engine starts with the other keys for the vehicle.

OK → **RE–REGISTER OR REPLACE KEY WITH WHICH ENGINE DOES NOT START**

NG

HINT:
Start the inspection from step 3 when using the hand–held tester and start from step 4 when not using the hand–held tester.

3	**READ VALUE OF HAND–HELD TESTER (IMMOBILISER ECU (TRANSPONDER KEY ECU ASSY) (SWITCH CONDITION))**

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON with the key with which the engine does not start.
(c) Select the item "ANTENNA COIL" on the hand–held tester.
OK: NORMAL
NG: FAIL

OK → **CHECK AND REPLACE TRANSPONDER KEY ECU ASSY**

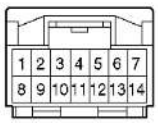
NG

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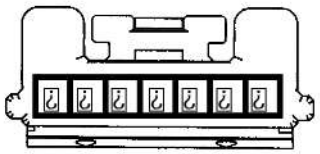
4	CHECK WIRE HARNESS (TRANSPONDER KEY ECU ASSY ⇔ TRANSPONDER KEY AMPLIFIER)

Wire Harness Side

T8
Transponder Key ECU Assy



I17
Transponder Key Amplifier



B63404
B55013
B64974

(a) Disconnect the T8 ECU and I17 amplifier connectors.
(b) Check the continuity between the wire harness side connectors.

Standard:

Symbols (Terminal No.)	Specified Condition
VC5 (T8–8) ⇔ VC5 (I17–1)	Continuity
CODE (T8–11) ⇔ CODE (I17–4)	Continuity
TXCT (T8–12) ⇔ TXCT (I17–5)	Continuity
AGND (T8–13) ⇔ GND (I17–7)	Continuity

(c) Check the continuity between the T8 ECU or I17 amplifier wire harness side connector and body ground.

Standard:

Symbols (Terminal No.) (ECU or Amplifier ⇔ –)	Specified Condition
VC5 (T8–8) or VC5 (I17–1) ⇔ Body ground	No continuity
CODE (T8–11) or CODE (I17–4) ⇔ Body ground	No continuity
TXCT (T8–12) or TXCT (I17–5) ⇔ Body ground	No continuity
AGND (T8–13) or GND (I17–7) ⇔ Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

5	CHECK OPERATION OF TRANSPONDER KEY AMPLIFIER

(a) After exchanging the transponder key ECU, check that the engine starts.

NG → **NORMAL (TRANSPONDER KEY AMPLIFIER DEFECTIVE)**

OK

REPLACE TRANSPONDER KEY ECU ASSY

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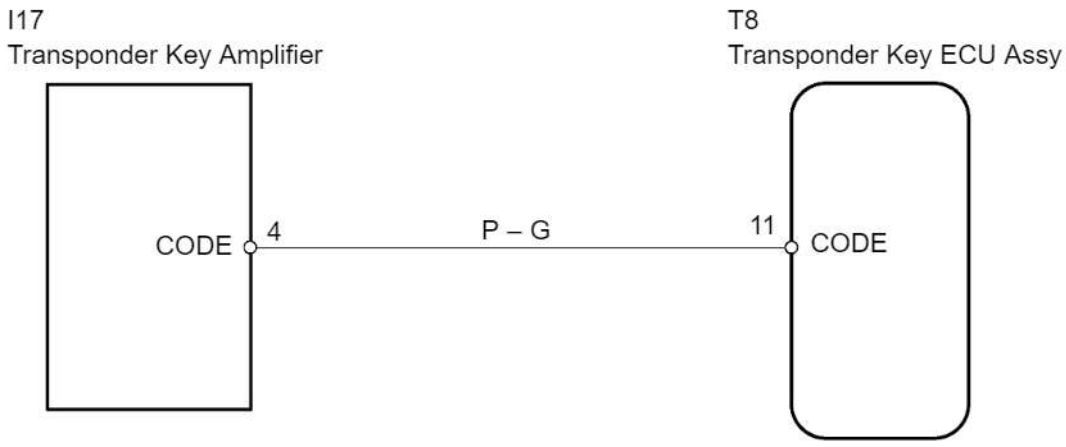
DTC	B2797	COMMUNICATION MALFUNCTION NO.1

CIRCUIT DESCRIPTION

This DTC is output when an error occurs in the normal communication.
HINT:
Some noise exists in the communication line.

DTC No.	DTC Detection Condition	Trouble Area
B2797	Keys are positioned too close each other, or noise occurred in communication line	□Key □Wire harness □Transponder key amplifier (transponder key coil) □Transponder key ECU assy

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK OPERATION OF TRANSPONDER KEY AMPLIFIER

(a) After exchanging the transponder key ECU, check that the engine starts.

OK → NORMAL (TRANSPONDER KEY AMPLIFIER DEFECTIVE)

NG

REPLACE TRANSPONDER KEY ECU ASSY

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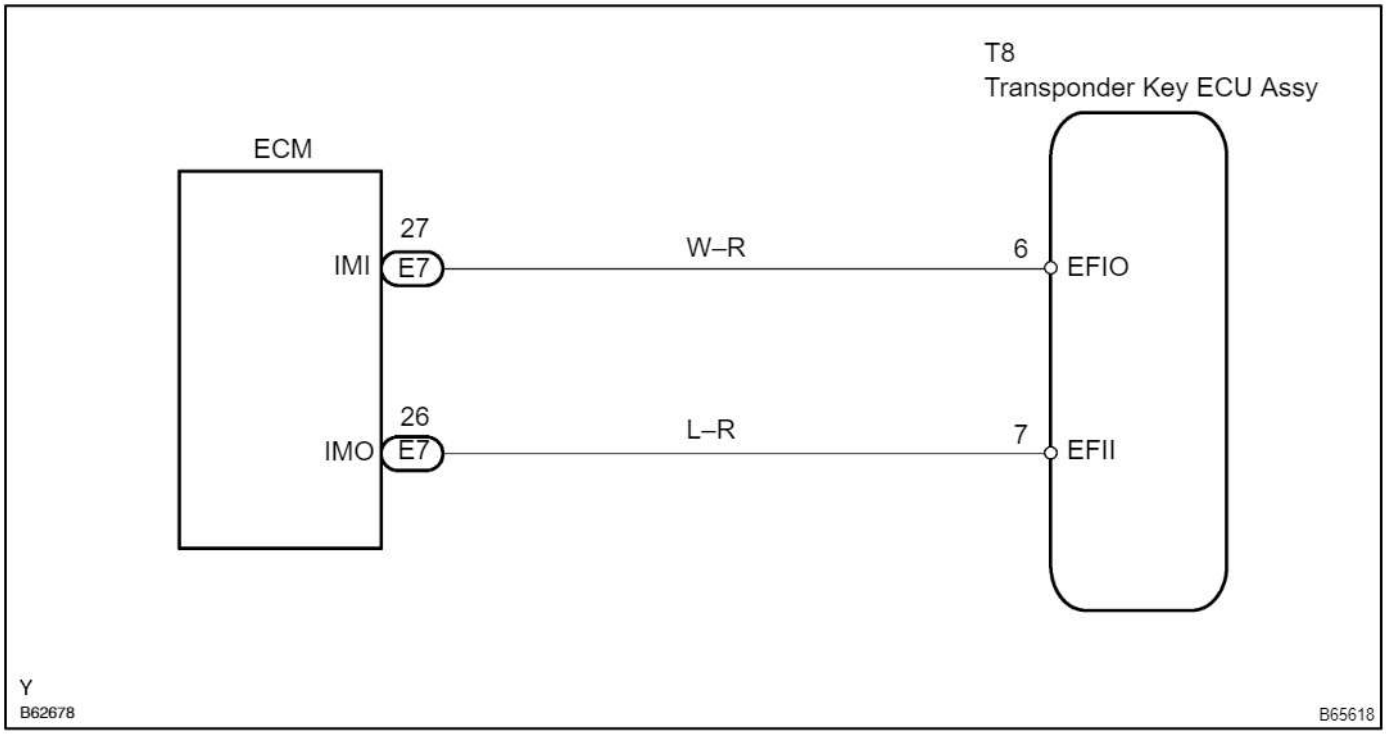
DTC	B2799	ENGINE IMMOBILISER SYSTEM MALFUNCTION

CIRCUIT DESCRIPTION

This DTC is output from the ECM when there is a open or short circuit in the wire harness between the transponder key ECU assy and the ECM.

DTC No.	DTC Detection Condition	Trouble Area
B2799	□Error in communication between ECM and transponder key ECU assy, and in communication line □Communication key code is different in communication with transponder key ECU	□Wire harness □Transponder key ECU assy □Transponder key amplifier (transponder key coil) □ECM

WIRING DIAGRAM



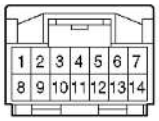
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INSPECTION PROCEDURE

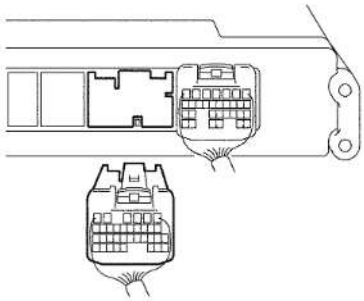
1 CHECK WIRE HARNESS (TRANSPONDER KEY ECU ASSY ⇔ ECM)

Wire Harness Side

T8
Transponder Key ECU Assy



E6
ECM



B63404
B51935

B65617

(a) Disconnect the T8 ECU and E6 ECM connectors.

(b) Check the continuity between the wire harness side connectors.

Standard:

Symbols (Terminal No.)	Specified Condition
EFIO (T8–6) ⇔ IMI (E6–27)	Continuity
EFII (T8–7) ⇔ IMO (E6–26)	Continuity

(c) Check the continuity between the T8 or E6 wire harness side connectors and body ground.

Standard:

Symbols (Terminal No.) (ECU or Amplifier ⇔ –)	Specified Condition
EFIO (T8–6) or IMI (E6–27) ⇔ Body ground	No continuity
EFII (T8–7) or IMO (E6–26) ⇔ Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

2 CHECK OPERATION OF TRANSPONDER KEY AMPLIFIER

(a) After exchanging the transponder key ECU, check that the engine starts.

NG → **NORMAL (TRANSPONDER KEY AMPLIFIER DEFECTIVE)**

OK

REPLACE TRANSPONDER KEY ECU ASSY

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THEFT DETERRENT SYSTEM

HOW TO PROCEED WITH TROUBLESHOOTING

05AY7-01

HINT:
Troubleshoot in accordance with the procedures on the following pages.

1	VEHICLE BROUGHT TO WORKSHOP

2	CUSTOMER PROBLEM ANALYSIS CHECK AND SYMPTOM CHECK (See page 05–1889)

3	INSPECT COMMUNICATION FUNCTION OF LARGE–SCALE MULTIPLEX COMMUNICATION SYSTEM (BEAN)

(a) Check that there is no abnormality in the communication system by inspecting the communication function of the multiplex communication system with the hand–held tester.
  (1) (ECU unconnected, communication line abnormal) Without code outputs, proceed to A.
  (2) (ECU unconnected, communication line abnormal) With code outputs, proceed to B.

B	Go to MULTIPLEX COMMUNICATION SECTION (See page 05–1909)

A

4	PROBLEM SYMPTOMS TABLE (See page 05–1895)

(a) Without applicable symptoms, proceed to A.
(b) With applicable symptoms, proceed to B.

B	Go to step 6

A

5	ACCORDING TO PROBLEM SYMPTOM, PERFORM TROUBLESHOOTING

(a) Terminals of ECU (See page 05–1891)
(b) On–vehicle inspection (See page 73–30)

6	ADJUST, REPAIR OR REPLACE

END

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058Z6-01

CUSTOMER PROBLEM ANALYSIS CHECK

THEFT DETERRENT SYSTEM Check Sheet

Inspector's name: _____

Customer's Name		**Registration No.**	
		Registration Year	
		Frame No.	
Date Vehicle Brought in	/ /	**Odometer Reading**	**km miles**

Date Problem First Occurred		/ /
Frequency Problem Occurs		☐ Constant ☐ Sometimes (Times per day, month) ☐ Once only
Weather Conditions When Problem Occurred	**Weather**	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Various/Others
	Outdoor Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold (Approx. °C (°F))

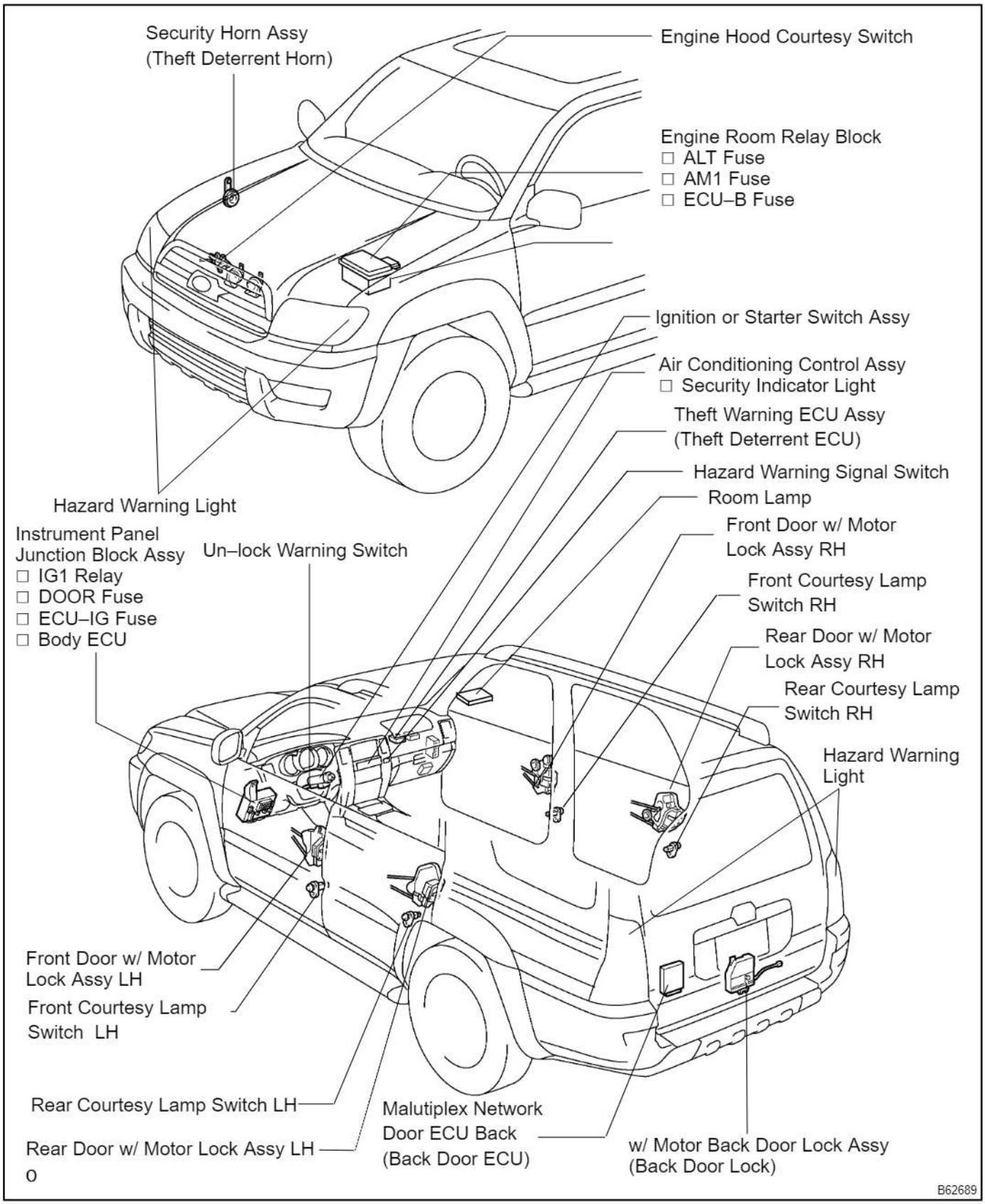
Problem Symptom

☐ Theft deterrent system cannot be set.		
☐ Security indicator light does not flash when theft deterrent system is set. (It stays ON or does not light up at all.)		
☐ Theft deterrent system does not operate.	☐ When door is opened. ☐ When engine hood is opened.	Malfunction ☐ Horns only ☐ Theft deterrent horn only ☐ Headlights only ☐ Taillights only ☐ Door lock operation only ☐ Hazard warning light only ☐ Room lamp only
☐ Theft deterrent system cannot be canceled, once set.	☐ When door is unlocked using wireless door lock control system.	
☐ Theft deterrent system cannot be canceled during warning operation.	☐ When door is unlocked using wireless door lock control system. ☐ When key is inserted in ignition key cylinder and ignition switch is turned ON–OFF 10 times within 15 seconds.	
☐ Warning operation does not start when theft deterrent system is set and door is opened with key.		
☐ Others.		

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058Z7–01

LOCATION

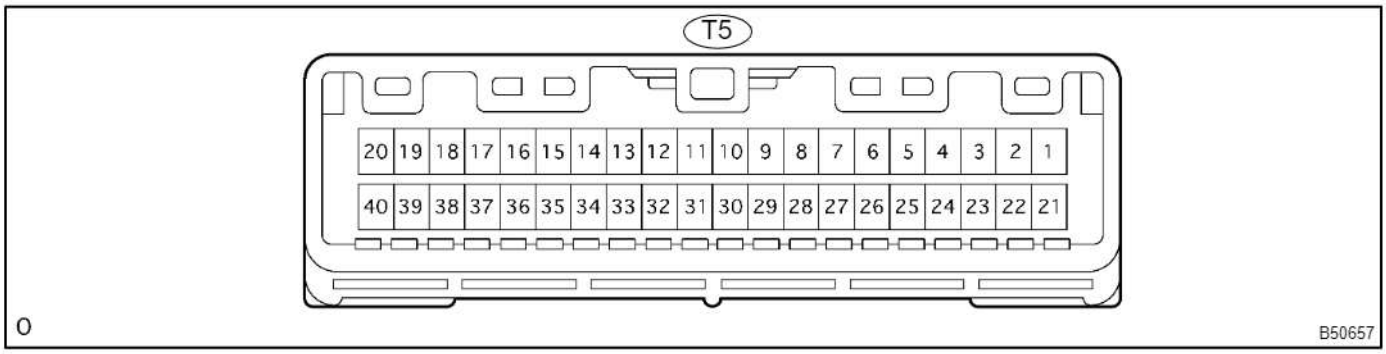


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058Z8-01

TERMINALS OF ECU

1. CHECK THEFT WARNING ECU ASSY (THEFT DETERRENT ECU)



(a) Disconnect the T5 ECU connector, and check the voltage or continuity between each terminal of the wire harness side connector.

Standard:

Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
E (T5–29) ⇔ Body ground	W–B ⇔ –	Constant	Continuity
+B2 (T5–3) ⇔ E (T5–29)	W–L ⇔ W–B	Constant	10 – 14 V
IG (T5–10) ⇔ E (T5–29)	B–R ⇔ W–B	Ignition switch OFF → ON	0 V → 10 – 14 V
+B1 (T5–2) ⇔ E (T5–29)	W–R ⇔ W–B	Constant	10 – 14 V

If the result is not as specified, there may be a malfunction on the wire harness side.

(b) Reconnect the T5 ECU connector, and check the voltage between each terminal of the connector.

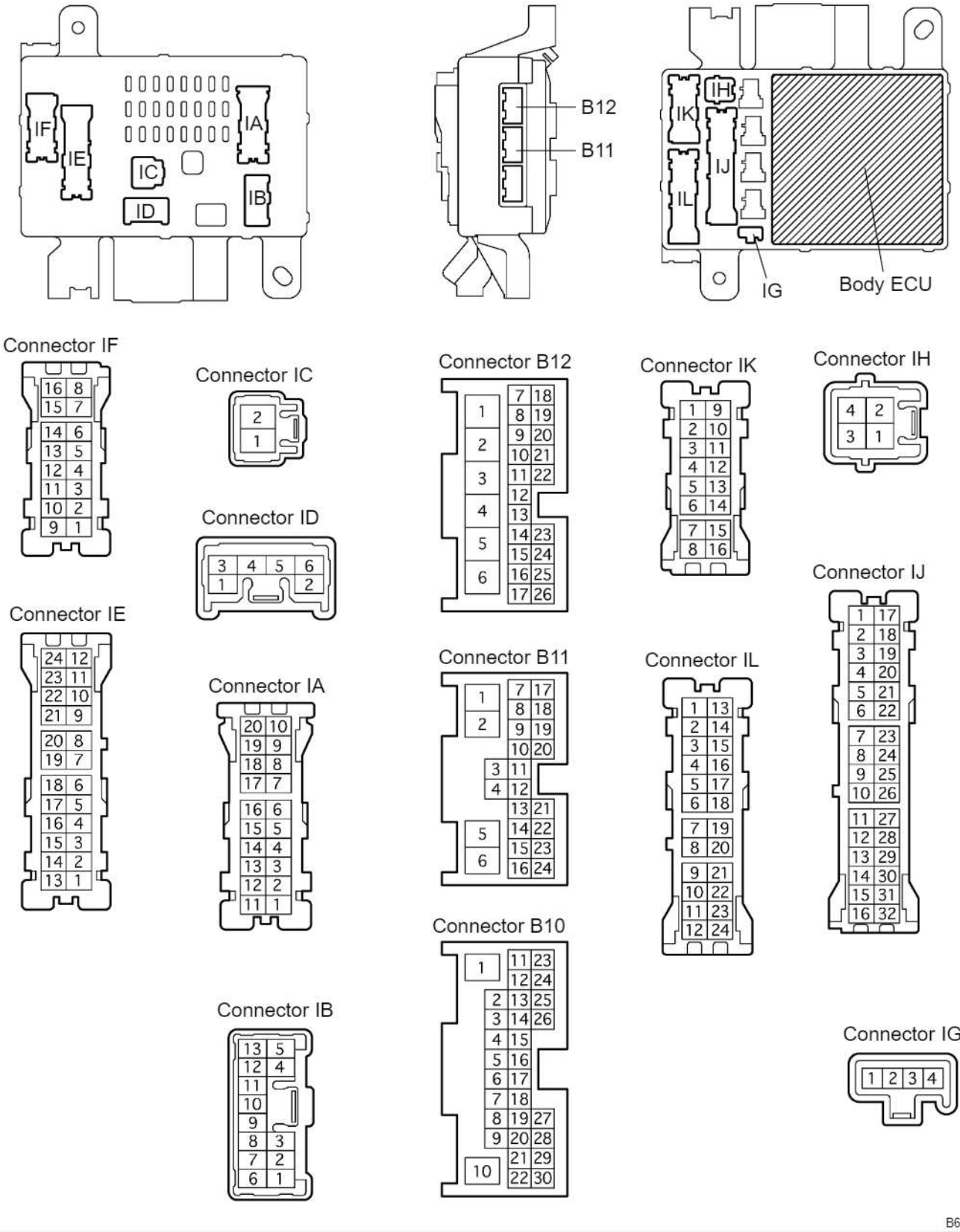
Standard:

Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
IND (T5–25) ⇔ E (T5–29)	GR–G ⇔ W–B	Security indicator light lights up. (It lights up only for 30 sec. in alarming sounding state. It flashes when imobiliser system is operating)	3 – 6 V
SH– (T5–1) ⇔ E (T5–29)	BR–B ⇔ W–B	Security horn is sounding. (Theft deterrent system is in alarming sounding state)	10 – 14 V

If the result is not as specified, the ECU may malfunction.

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2. CHECK INSTRUMENT PANEL JUNCTION BLOCK ASSY (BODY ECU)



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(a) Disconnect the the J/B connector, and check the voltage or continuity between each terminal of the wire harness side connector.

Standard:

Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
BDR1 (1E–9) ⇔ Body ground	G–W ⇔ Body ground	Constant	10 – 14 V
GND1 (IH–2) ⇔ Body ground	W–B ⇔ –	Constant	Continuity
GND2 (IH–2) ⇔ Body ground	W–B ⇔ –	Constant	Continuity
KSW (B6–14) ⇔ Body ground	G–Y ⇔ Body ground	No key in ignition key cylinder → Key inserted	No continuity → Continuity

If the result is not as specified, there may be a malfunction on the wire harness side.

(b) Reconnect the J/B connector, and check the voltage between each terminal of the connector.

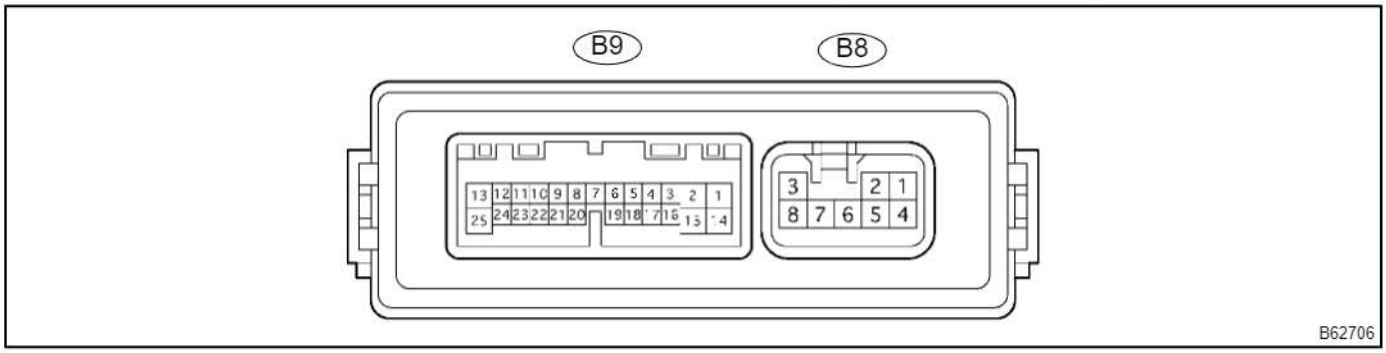
Standard:

Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
DCTY (B5–23) ⇔ Body ground	R–B ⇔ Body ground	Driver side door CLOSED → OPEN	10 – 14 V → Below 0 V
PCTY (B5–24) ⇔ Body ground	R–Y ⇔ Body ground	Passenger side door CLOSED → OPEN	10 – 14 V → Below 0 V
RLCY (B5–11) ⇔ Body ground	P–B ⇔ Body ground	Rear door LH CLOSED → OPEN	10 – 14 V → Below 0 V
RRCY (B5–12) ⇔ Body ground	P–L ⇔ Body ground	Rear door RH CLOSED → OPEN	10 – 14 V → Below 0 V
ACT+ (IL–9) ⇔ Body ground	L–R ⇔ Body ground	Master switch and driver side door key cylinder OFF → LOCK	0 V → 10 – 14 V → 0 V
ACT– (IL–18) ⇔ Body ground	L–B ⇔ Body ground	Master switch and driver side door key cylinder OFF → UNLOCK	0 V → 10 – 14 V → 0 V

If the result is not as specified, the ECU may malfunction.

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3. INSPECT MALUTIPLEX NETWORK DOOR ECU BACK (BACK DOOR ECU)



(a) Disconnect the B8 ECU connector, and check the voltage of each terminal of the wire harness side connector.

Standard:

Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
BDR (B8–4) ⇔ Body ground	L ⇔ –	Constant	10 – 14 V
BECU (B8–5) ⇔ Body ground	L–R ⇔ W–B	Constant	10 – 14 V
GND (B8–3) ⇔ Body ground	W–B ⇔ W–B	Ignition switch OFF → ON	0 V → 10 – 14 V

If the result is not as specified, there may be a malfunction on the wire harness side.

(b) Reconnect the B8 ECU connector, and check the voltage of each terminal of the connector.

Standard:

Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
ACT+ (B9–15) ⇔ Body ground	L–B ⇔ –	Back door OPEN → NOT COMPLETELY CLOSED → Monitor in normal rotation (Right turn) → Motor in revers rotation (left turn) → Operation completed (Back door CLOSED)	Below 1 V → Below 1 V → 10 – 14 V → Below 1 V → Below 1 V
ACT– (B9–14) ⇔ Body ground	L–R ⇔ –	Back door OPEN → NOT COMPLETELY CLOSED → Monitor in normal rotation (Right turn) → Motor in revers rotation (left turn) → Operation completed (Back door CLOSED)	Below 1 V → Below 1 V → Below 1 V → 10 – 14 V → Below 1 V

If the result is not as specified, the ECU may malfunction.

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058Z9-01

PROBLEM SYMPTOMS TABLE

Proceed to the reference page shown in the table below for each malfunction symptom and troubleshoot each circuit.

HINT:

Troubleshooting of the theft deterrent system is based on the premise that the door lock control system and the wireless door lock control system are operating normally. Accordingly, before troubleshooting the theft deterrent system, first make certain that the door lock control system and the wireless door lock control system are operating normally.

Symptom	Suspected Area	See Page
Theft deterrent system cannot be set.	1. Security indicator light circuit 2. ECU power source circuit 3. Un–lock warning switch circuit 4. Door key lock and unlock switch 5. Back door key lock and unlock switch 6. Door courtesy switch circuit 7. Back door courtesy switch circuit 8. Engine hood courtesy switch circuit	05–1896 05–1899 05–1854 73–3 73–3 05–1891 05–1891 05–1903
Security indicator light does not blink when theft deterrent system is set.	1. Security indicator light circuit	05–1896
Alarm sounding state is not canceled when ignition switch is turned ON–OFF 10 times within 15 seconds.	1. Ignition switch circuit 2. Un–lock warning switch circuit	05–1901 05–1854
Theft deterrent theft deterrent system can be set even when any door is open.	1. Door courtesy switch circuit	05–1891
Horn does not sound while theft deterrent system is in warning operation.	1. Theft deterrent horn circuit	05–1906
Headlights do not flash while theft deterrent system is in warning operation.	1. Headlight circuit	05–1481
Taillights do not flash while theft deterrent system is in warning operation.	1. Taillights circuit	05–1483
Hazard warning lights do not flash while theft deterrent system is in warning operation.	1. Hazard warning switch	65–2
Room lamp does not flash while theft deterrent system is in warning operation.	1. Room lamp circuit	05–1469
Horn sounds even when theft deterrent system is not set.	1. Theft deterrent horn circuit	05–1906
Headlights flash even when theft deterrent system is not set.	1. Headlight circuit	05–1481
Taillights flash even when theft deterrent system is not set.	1. Taillights circuit	05–1483
Hazard warning lights flash even when theft deterrent system is not set.	1. Hazard warning switch circuit	65–2
Room lamp flashes even when theft deterrent system is not set.	1. Room lamp circuit	05–1469

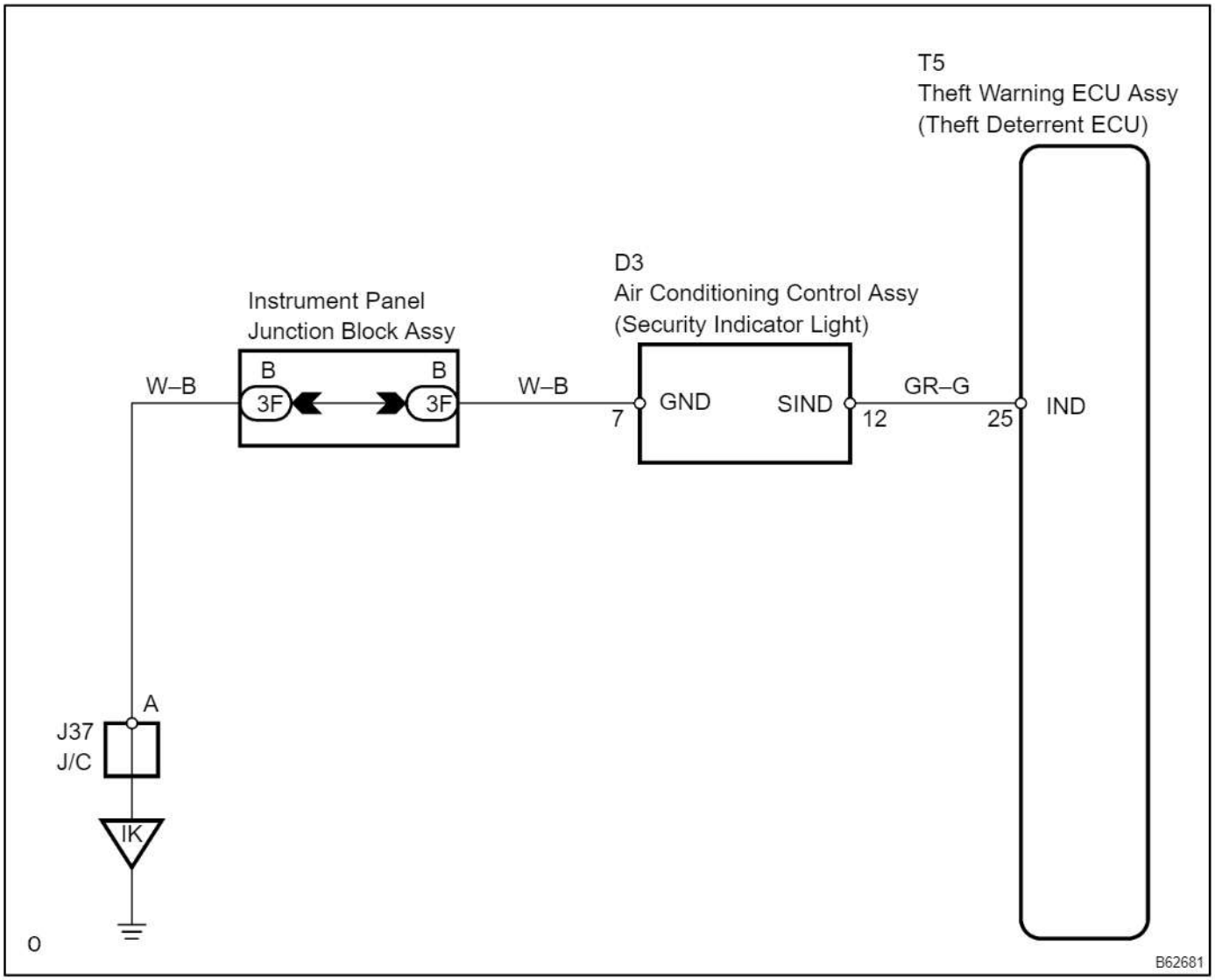
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SECURITY INDICATOR LIGHT CIRCUIT

CIRCUIT DESCRIPTION

Even in the disarming state, the security indicator light flashes due to a signal output from the immobiliser system. The security indicator light always flashes by receiving a signal from the immobiliser system at any time in the armed state.
The theft warning ECU assy causes the security indicator light to light up or blink only during the customizing function mode or the add mode of the transmitter.

WIRING DIAGRAM

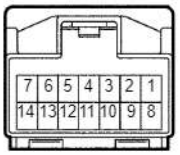


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INSPECTION PROCEDURE

1	CHECK AIR CONDITIONING CONTROL ASSY (SECURITY INDICATOR LIGHT OPERATION)

D3
A/C Control Assy
(Security Indicator Light)



B63397

(a) Disconnect the A/C control connector.
(b) Connect 3 dry batteries of 1.5 V in series.
(c) Apply 4.5 V positive voltage between each terminal of the A/C control, and check the lighting condition of the security indicator light.

Standard:

Symbols (Terminal No.)	Specified Condition
SIND (D3–12) ⇔ GND (D3–7)	Lights up

NOTICE:

- **If the positive (+) lead and the negative (–) lead are incorrectly connected, the security indicator light does not light up.**
- **Voltage of more than 4.5 V will damage the security indicator light.**
- **If the voltage is too low, the security indicator light does not light up.**

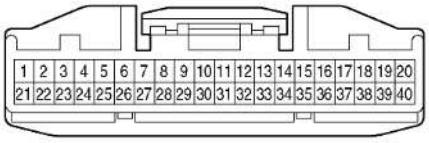
NG → **REPLACE AIR CONDITIONING CONTROL ASSY**

OK

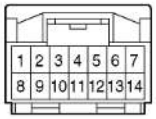
2	CHECK WIRE HARNESS (THEFT WARNING ECU ASSY ⇔ SECURITY INDICATOR LIGHT)

Wire Harness Side

T5
Theft Warning ECU Assy
(Theft Deterrent ECU)



D3
A/C Control Assy
(Security Indicator Light)



B63407
B63404

B65620

(a) Disconnect the T5 ECU and D3 A/C control connectors.
(b) Check the continuity between the wire harness side connectors.

Standard:

Symbols (Terminal No.)	Specified Condition
IND (T5–25) ⇔ SIND (D3–12)	Continuity

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

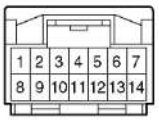
OK

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3	CHECK WIRE HARNESS (SECURITY INDICATOR LIGHT ⇔ BODY GROUND)

Wire Harness Side

D3
A/C Control Assy
(Security Indicator Light)



B63404 B65619

(a) Disconnect the D3 A/C control connector.
(b) Check the continuity between the wire harness side connectors.

Standard:

Symbols (Terminal No.)	Specified Condition
SIND (D3–12) ⇔ Body ground	Continuity

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

CHECK AND REPLACE THEFT WARNING ECU ASSY

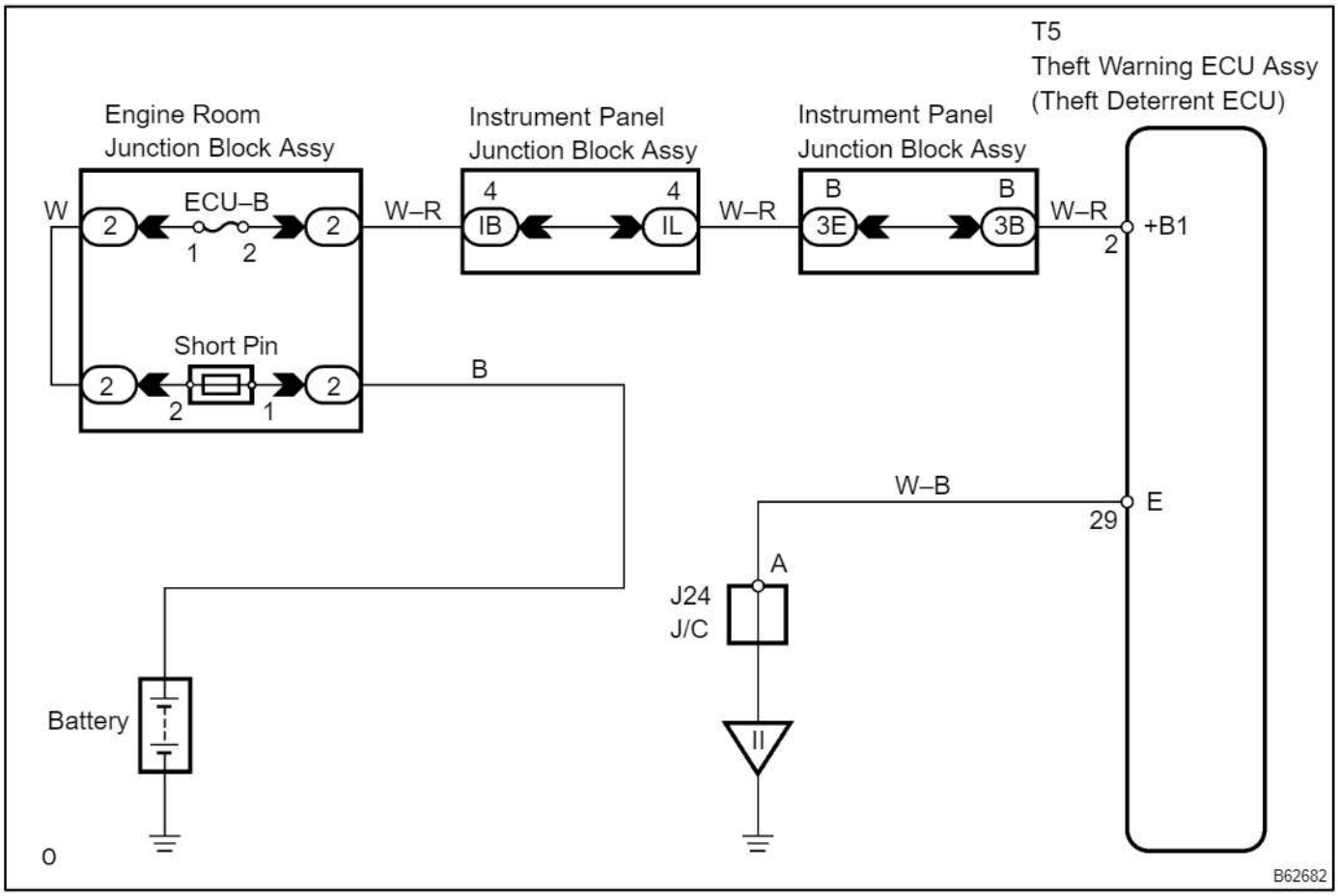
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ECU POWER SOURCE CIRCUIT

CIRCUIT DESCRIPTION

This circuit provides power to operate the theft warning ECU assy.

WIRING DIAGRAM



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INSPECTION PROCEDURE

1	INSPECT FUSE (ECU–B)

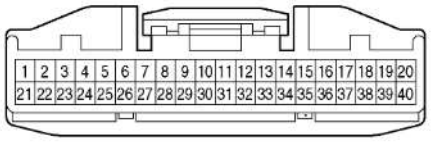
(a) Remove the ECU–B fuse from the engine room J/B.
(b) Check the continuity.
Standard: Continuity

NG → **REPLACE FUSE**

OK

2	CHECK THEFT WARNING ECU ASSY (POWER SOURCE)

Wire Harness Side
T5
Theft Warning ECU Assy
(Theft Deterrent ECU)



B63408

(a) Disconnect the T5 ECU connector.
(b) Check the voltage between the wire harness side connector and body ground.
Standard:

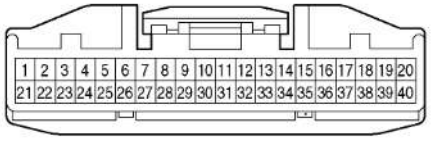
Symbols (Terminal No.)	Specified Condition
+B1 (T5–2) ⇔ Body ground	10 – 14 V

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

3	CHECK THEFT WARNING ECU ASSY (GROUND)

Wire Harness Side
T5
Theft Warning ECU Assy
(Theft Deterrent ECU)



B63408

(a) Disconnect the T5 ECU connector.
(b) Check the continuity between the wire harness side connector and body ground.
Standard:

Symbols (Terminal No.)	Specified Condition
E (T5–29) ⇔ Body ground	Continuity

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

CHECK AND REPLACE THEFT WARNING ECU ASSY

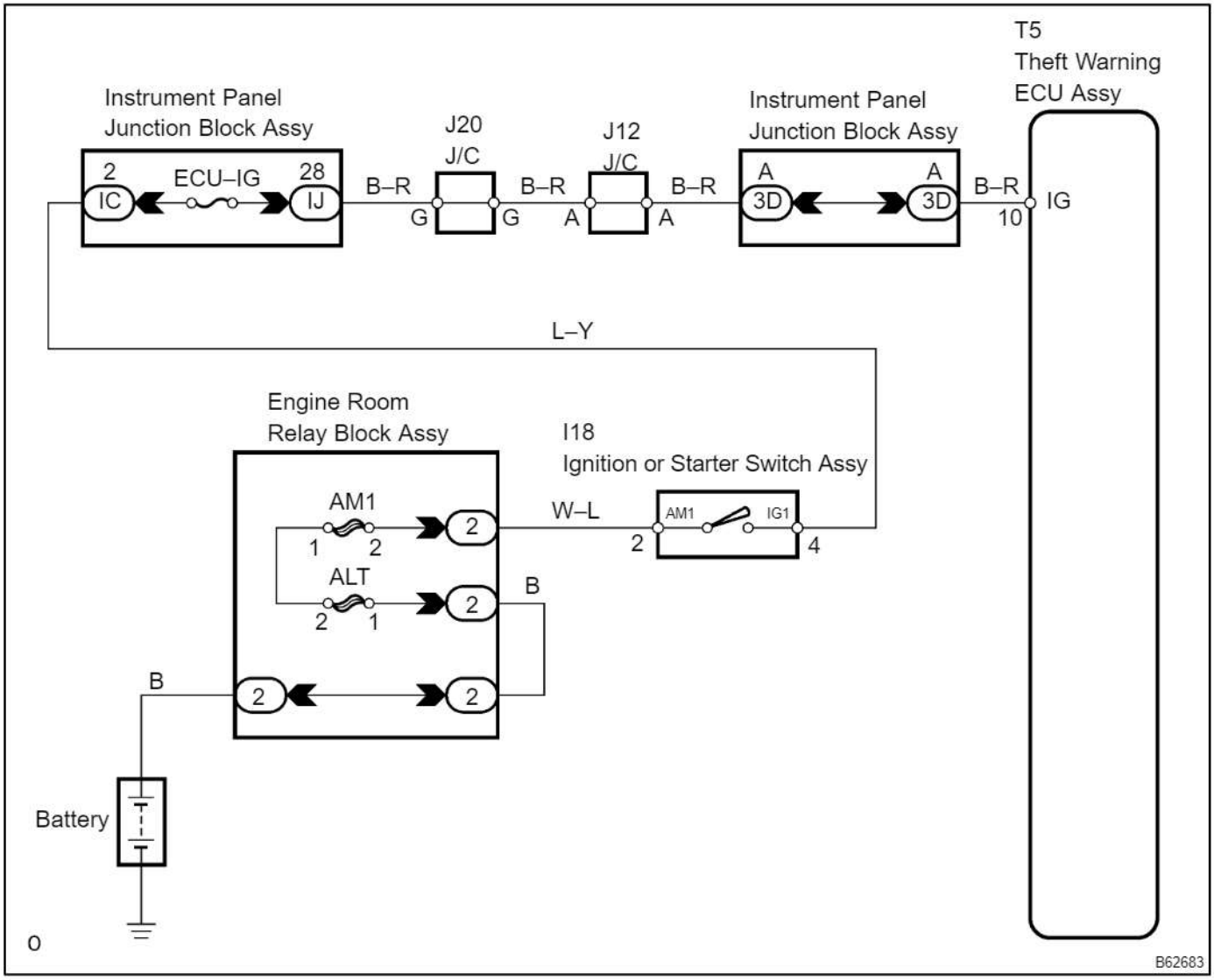
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IGNITION SWITCH CIRCUIT

CIRCUIT DESCRIPTION

When the ignition switch is turned to the ON position, battery positive voltage is applied to terminal IG of the theft warning ECU assy.

WIRING DIAGRAM



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INSPECTION PROCEDURE

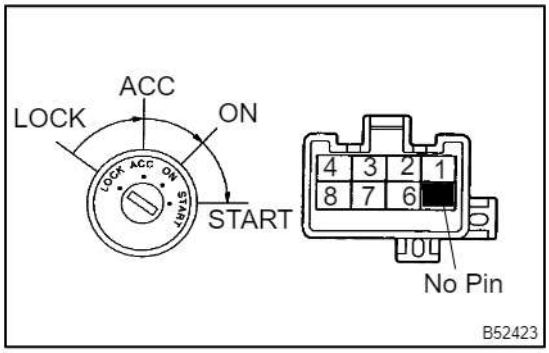
1 INSPECT FUSE (ECU–IG)

(a) Remove the ECU–IG fuse from the instrument panel J/B.
(b) Check the continuity.
Standard: Continuity

NG → **REPLACE FUSE**

OK

2 INSPECT IGNITION OR STARTER SWITCH ASSY



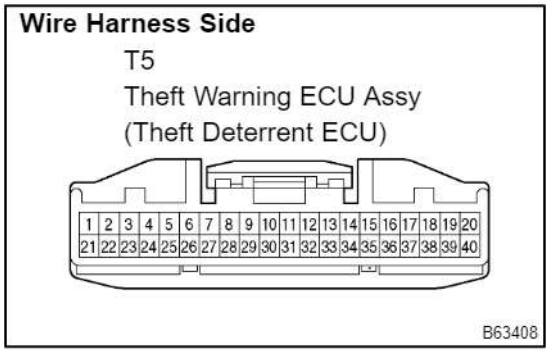
(a) Check the switch continuity.
Standard:

Terminal No.	Switch Position	Specified Condition
–	LOCK	No continuity
2 ⇔ 3	ACC	Continuity
2 ⇔ 3 ⇔ 4 6 ⇔ 7	ON	Continuity
1 ⇔ 2 ⇔ 4 6 ⇔ 7 ⇔ 8	START	Continuity

NG → **REPAIR OR REPLACE IGNITION OR STARTER SWITCH ASSY**

OK

3 CHECK THEFT WARNING ECU ASSY (POWER SOURCE)



(a) Disconnect the T5 ECU connector.
(b) Turn the ignition switch ON.
(c) Check the voltage between the wire harness side connector and body ground.
Standard:

Symbols (Terminal No.)	Condition	Specified Condition
IG (T5–10) ⇔ Body ground	Ignition switch ON	10 – 14 V

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

CHECK AND REPLACE THEFT WARNING ECU ASSY

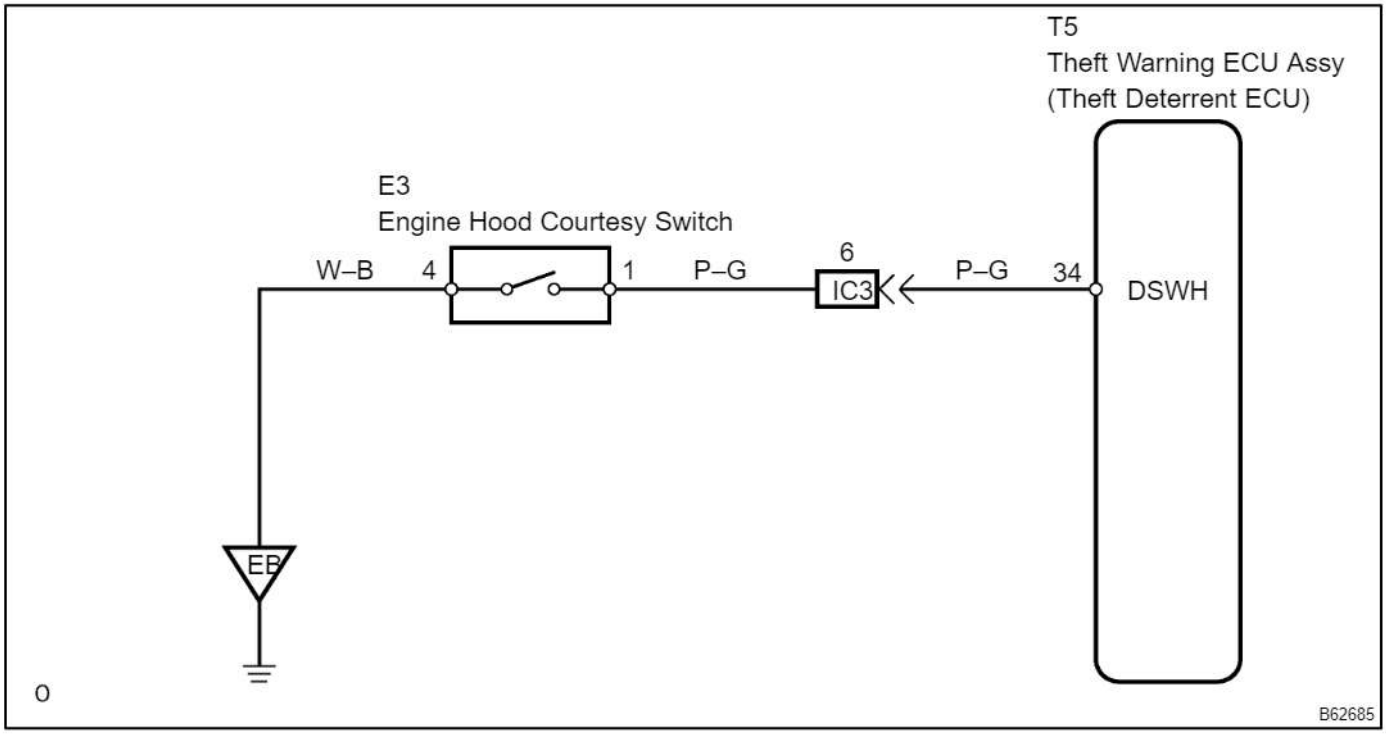
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ENGINE HOOD COURTESY SWITCH CIRCUIT

CIRCUIT DESCRIPTION

The engine hood courtesy switch is installed together with the hood lock assy, This switch comes on when the engine hood is opened and goes off when the engine hood is closed.

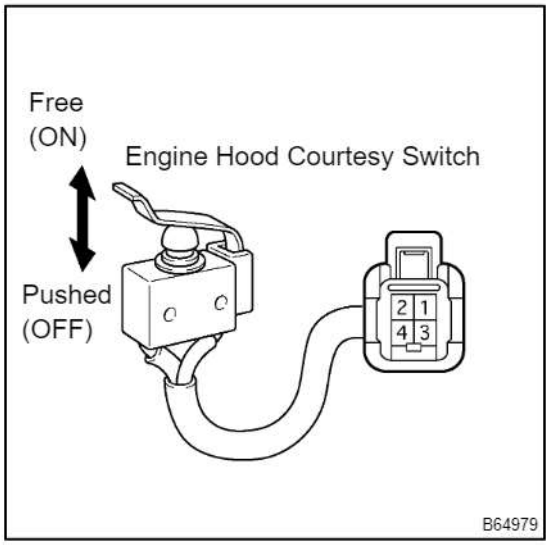
WIRING DIAGRAM



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INSPECTION PROCEDURE

1	INSPECT HOOD LOCK ASSY (ENGINE HOOD COURTESY SWITCH)



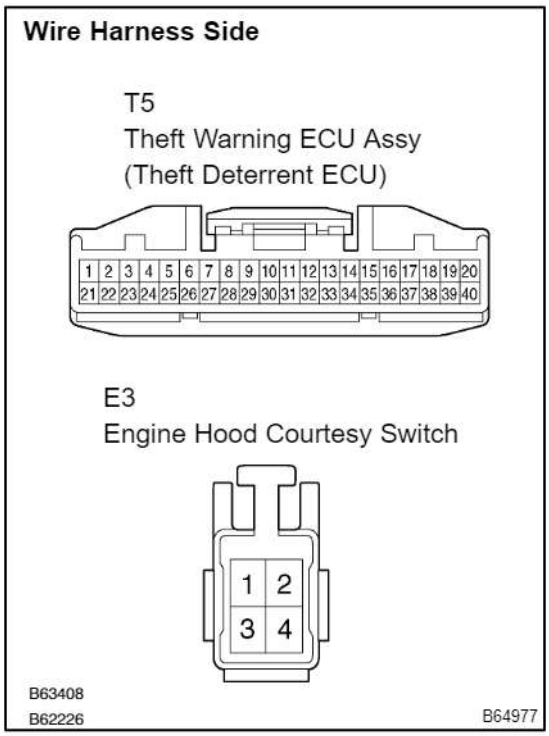
(a) Remove the engine hood courtesy switch from the hood lock assy.
(b) Check the continuity.

Terminal No.	Condition	Specified condition
–	Pushed (OFF (Lock))	No continuity
1 ⇔ 4	Free (ON (Unlock))	Continuity

NG → REPLACE HOOD LOCK ASSY (ENGINE HOOD COURTESY SWITCH)

OK

2	CHECK WIRE HARNESS (THEFT WARNING ECU ASSY ⇔ ENGINE HOOD COURTESY SWITCH)



(a) Disconnect the T5 ECU connector.
(b) Disconnect the E3 switch connector.
(c) Check the continuity between the wire harness side connectors.

Standard:

Symbols (Terminal No.)	Specified Condition
HCTY (T5–34) ⇔ – (E3–1)	Continuity

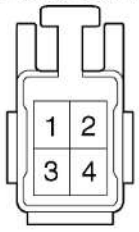
NG → REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

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3	CHECK WIRE HARNESS (ENGINE HOOD COURTESY SWITCH ⇔ BODY GROUND)

Wire Harness Side
E3
Engine Hood Courtesy Switch



B65288

(a) Disconnect the E3 switch connector.
(b) Check the continuity between the wire harness side connector and body ground.

Standard:

Terminal No.	Specified Condition
E3–4 ⇔ Body ground	Continuity

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

CHECK AND REPLACE THEFT WARNING ECU ASSY

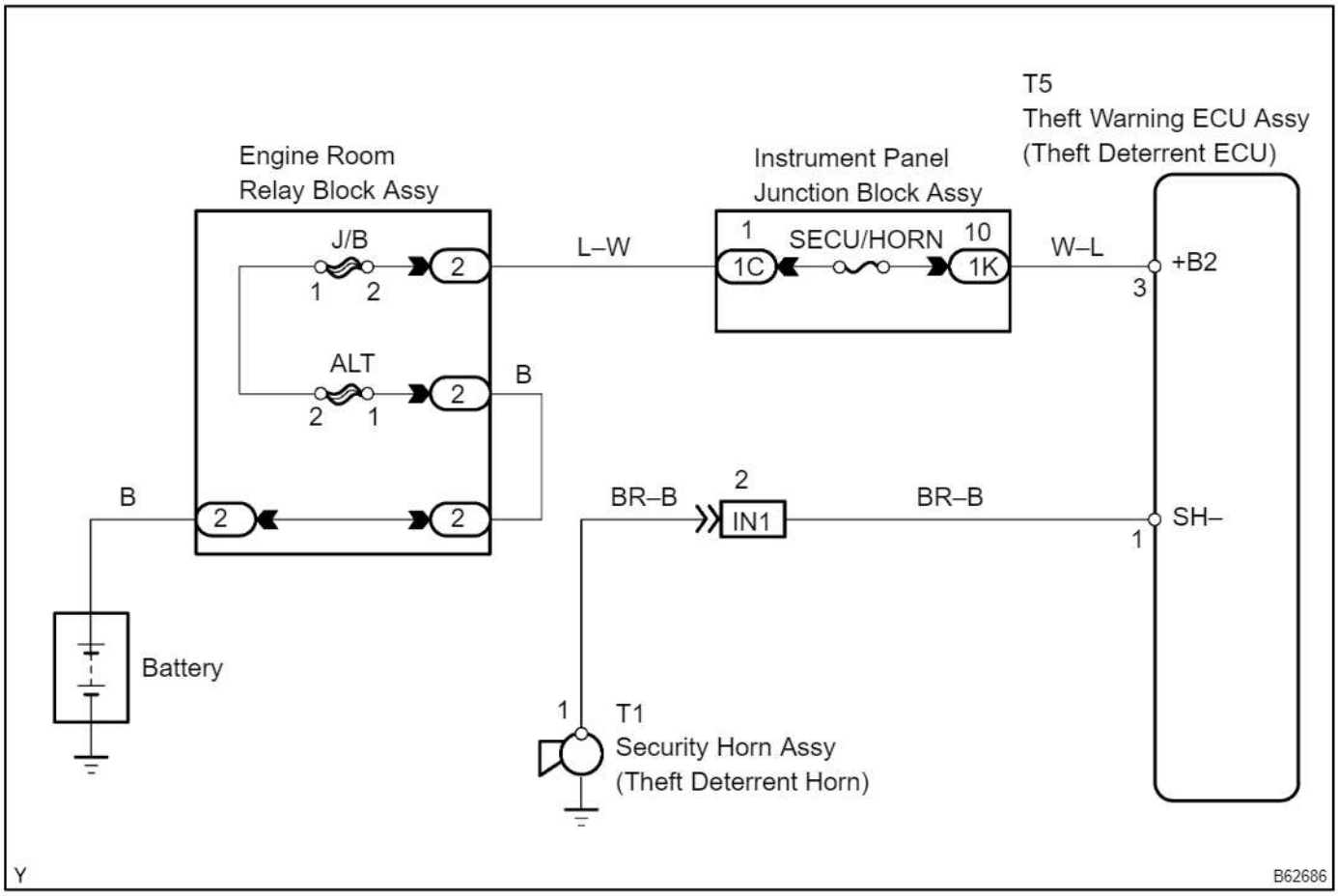
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THEFT DETERRENT HORN CIRCUIT

CIRCUIT DESCRIPTION

When the theft deterrent system is operating, the relay in the ECU turns ON and OFF in a cycle of approximately 0.2 second, causing the theft deterrent horn to blow.
In this condition, if any of the following operations has been performed, the relay in the ECU turns OFF, thus the theft deterrent horn stops blowing.

WIRING DIAGRAM

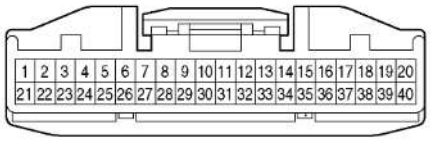


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INSPECTION PROCEDURE

1 INSPECT THEFT WARNING ECU ASSY

Wire Harness Side
T5
Theft Warning ECU Assy
(Theft Deterrent ECU)



B63408

(a) Disconnect the T5 ECU connector.
(b) Check the voltage between the T5 ECU connector and body ground.

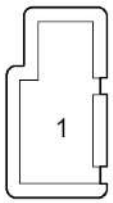
Standard:

Symbols (Terminal No.)	Specified condition
SH– (T5–1) ⇔ Body ground	10 – 14 V

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

2 INSPECT SECURITY HORN ASSY



Y B51580 B64984

(a) Connect the positive (+) lead from the battery to terminal 1 and negative (–) lead to the body ground.
(b) Check operation of the security horn.

Standard:

Measurement Condition	Specified Condition
Battery positive (+) ⇔ Terminal 1 Battery negative (–) ⇔ Body ground	Security horn blows

NG → **REPLACE SECURITY HORN ASSY**

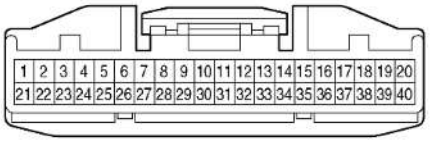
OK

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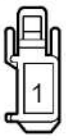
3	CHECK WIRE HARNESS (THEFT WARNING ECU ASSY ⇔ SECURITY HORN ASSY)

Wire Harness Side

T5
Theft Warning ECU Assy
(Theft Deterrent ECU)



T1
Security Horn Assy



B63408
B58961
B64978

(a) Disconnect the T5 ECU connector.
(b) Disconnect the T1 security horn connector.
(c) Check the continuity between the wire harness side connectors.

Standard:

Symbols (Terminal No.)	Specified condition
SH– (T5–1) ⇔ – (T1–1)	Continuity

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

CHECK AND REPLACE THEFT WARNING ECU ASSY

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MULTIPLEX COMMUNICATION SYSTEM

0523R–03

HOW TO PROCEED WITH TROUBLESHOOTING

Troubleshoot in accordance with the procedures on the following pages.

1	VEHICLE BROUGHT TO WORKSHOP

2	CUSTOMER PROBLEM ANALYSIS CHECK AND SYMPTOM CHECK (See page 05–1916)

3	INSPECT COMMUNICATION FUNCTION OF LARGE–SCALE MULTIPLEX COMMUNICATION SYSTEM (BEAN)

(a) Check that there is no abnormality in the communication system by inspecting the communication function of the multiplex communication system.
   (1) (ECU communication stop, communication line abnormal) With code outputs, proceed to A.
   (2) (ECU communication stop, communication line abnormal) Without code outputs, proceed to B.

B → GO TO SECTION OF EACH SYSTEM

A

4	DIAGNOSTIC TROUBLE CODE CHECK (See page 05–1912)

(a) Check for DTCs and make a note of the code that is output.
(b) Delete the DTC.
(c) Check if the DTC will be output once again, when the problem symptom is simulated based on the noted code.
   (1) When no code is output (symptom check and simulation is possible), proceed to A.
   (2) When a code is output, proceed to B.

B → Go to step 7

A

5	PROBLEM SYMPTOMS TABLE (See page 05–1916)

(a) Without applicable symptoms, proceed to A.
(b) With applicable symptoms, proceed to B.

B → Go to step 7

A

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6	**PERFORM TROUBLESHOOTING IN FOLLOWING METHOD, DEPENDING ON MALFUNCTION SYMPTOM**

(a) Pre–check (See page 05–1911)
(b) Terminals of ECU (See page 05–1914)

7	**ADJUST, REPAIR OR REPLACE**

END

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058X8-01

PRE–CHECK

1. MULTIPLEX COMMUNICATION SYSTEM (BEAN)

(a) The BEAN communication line consists of 2 systems:
One is a system with a loop–shaped line that the back door ECU are united with the body ECU present in the center of the line. Another is a system that the body ECU and the theft deterrent ECU are connected alone.
Since the line for the back door ECU is loop–shaped, the communication can be maintained by the line that is not open even if part of the line become open for some reason. In the case that there is a short–circuit (bus–down) in the line, however, all the BEAN communication becomes impossible in the system and some DTCs are output.

HINT:

- When bus–down occurs, communication from the related ECU stops. Therefore, DTC cannot be output, so perform a DTC (SAE code) inspection using the hand–held tester.
- The theft deterrent ECU and the back door ECU has a single communication line. Therefore, if the line has a short–circuit (bus–down), the BEAN communication will be impossible and DTCs will not be output, either.

2. COMMUNICATION FUNCTION INSPECTION

(a) Inspect the battery voltage.
Standard: 10 – 14 V

(b) Inspect the diagnosis monitor code output.
(1) Check a diagnosis code for the body ECU by connecting the hand–held tester to the DLC3 and turning the ignition switch ON.
(2) When the display shows diagnostic codes of the ECU unconnected and the communication bus defective, perform the inspection depending on the troubleshooting.

HINT:
When other diagnostic code is output, refer to the diagnostic code table and check the applicable section.

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0523T–02

DIAGNOSTIC TROUBLE CODE CHART

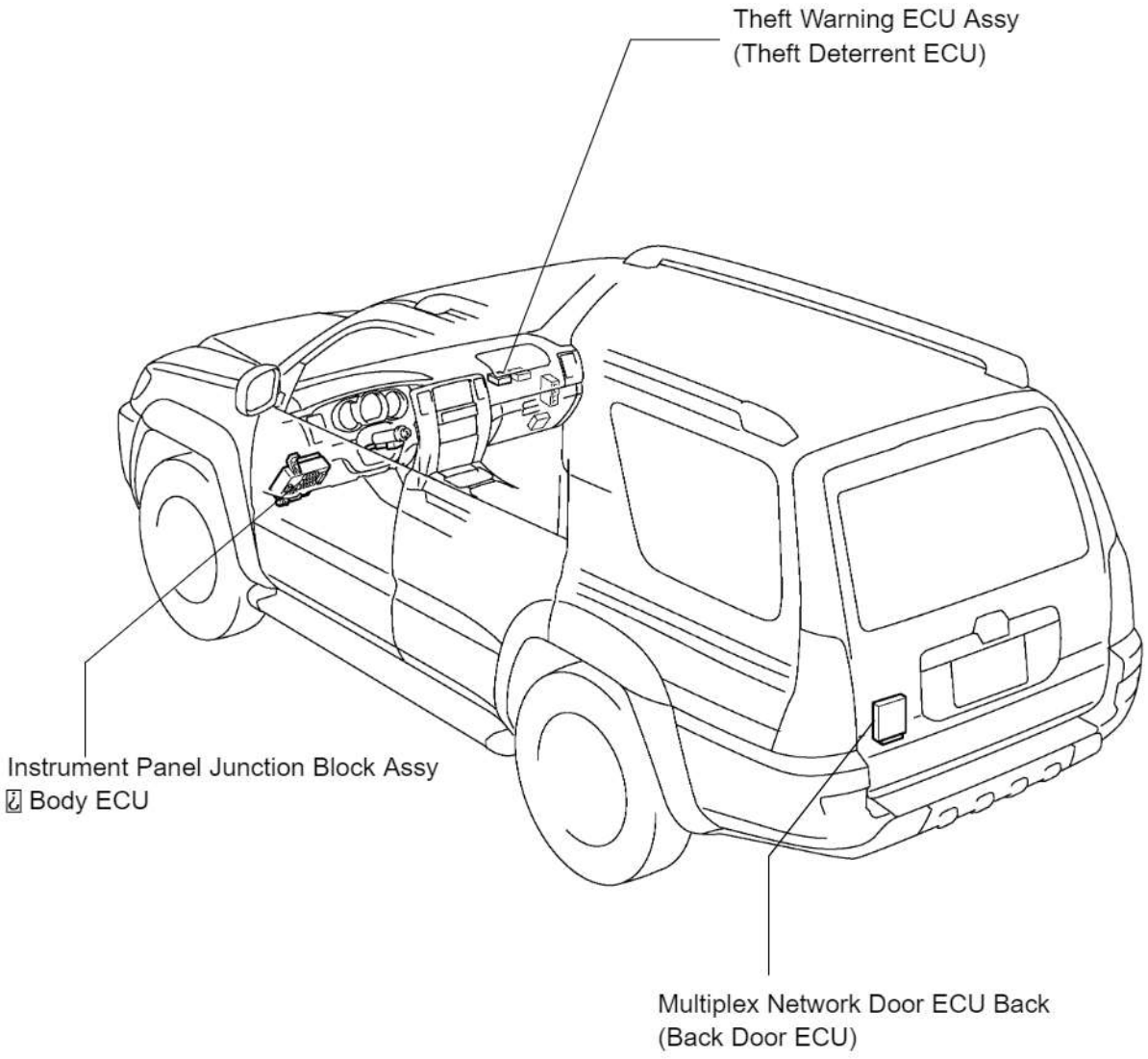
If a malfunction code is displayed during the DTC check, check the circuit listed for that code in the chart below (Proceed to the page given for that circuit).

DTC No. (See page)	Diagnostic Item	Trouble Area
B1214 (05–1917)	Door system communicatin bus malfunction (+B short)	□Theft warning ECU assy (Theft deterrent ECU) □Multiplex network door ECU back (Back door ECU) □Wire harness □Instrument panel junction block assy (Body ECU)
B1215 (05–1917)	Door system communicatin bus malfunction (GND short)	□Theft warning ECU assy (Theft deterrent) □Multiplex network door ECU back (Back door ECU) □Wire harness □Instrument panel junction block assy (Body ECU)
B1269 (05–1922)	Theft deterrent ECU communication stop	□Theft warning ECU assy (Theft deterrent ECU) □Wire harness
B1287 (05–1926)	Back door ECU communication stop	□Multiplex network door ECU back (Back door ECU) □Wire harness

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0523U-02

LOCATION



O

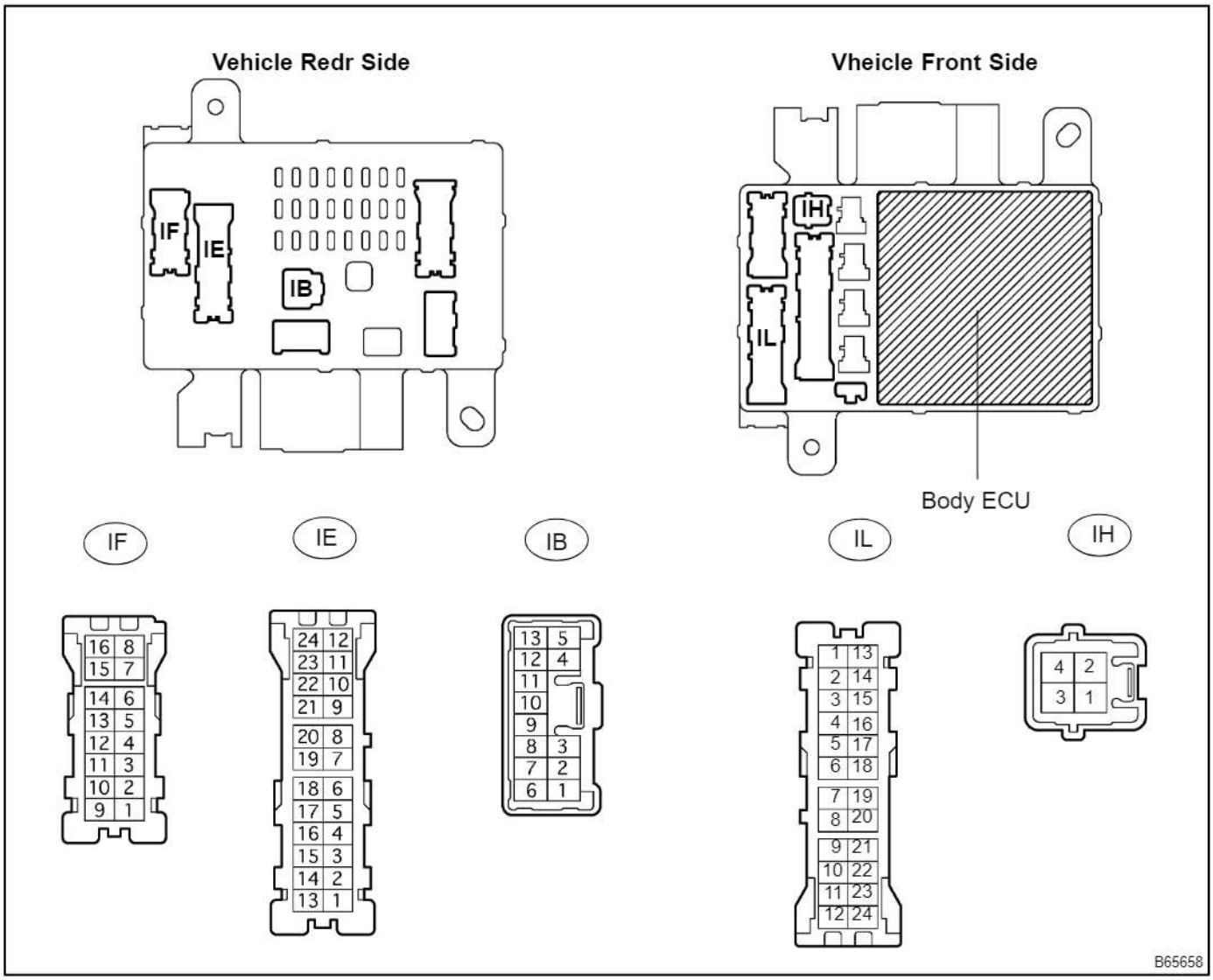
B64048

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058X9-01

TERMINALS OF ECU

1. CHECK DRIVER SIDE JUNCTION BLOCK ASSY (BODY ECU)



(a) Disconnect the IB, IE, IF, IH and IL J/B connectors.

(b) Check the voltage or continuity of each terminal of the wire harness side connectors.

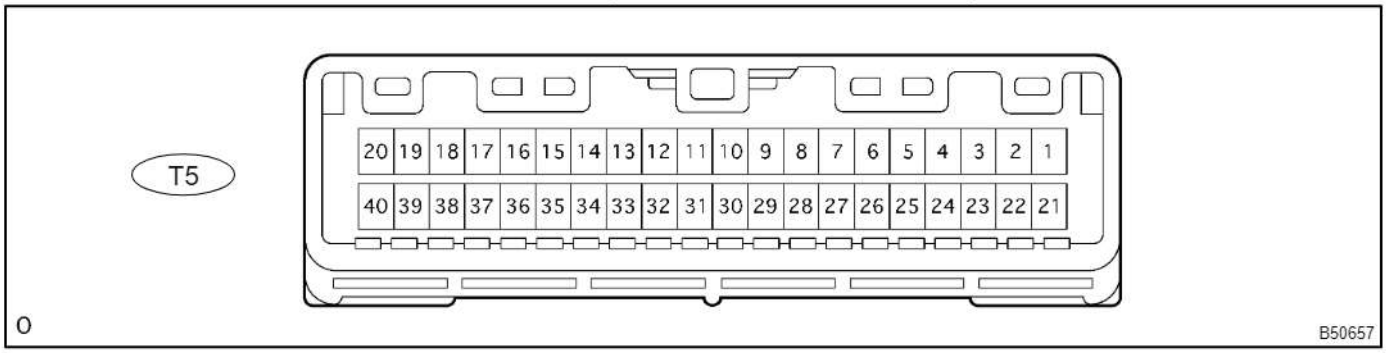
Standard:

Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
BECU (IF–12) ⇔ Body ground	W–R ⇔ –	Constant	10 – 14 V
BECU (IB–4) ⇔ Body ground	W–R ⇔ –		
BECU (IL–4) ⇔ Body ground	W–R ⇔ –		
BDR1 (IE–9) ⇔ Body ground	G–W ⇔ –		
GND1 (IH–2)⇔ Body ground	W–B ⇔ –	Constant	Continuity
GND2 (IH–2)⇔ Body ground	W–B ⇔ –	Constant	Continuity

If the result is not as specified, there may be a malfunction on the wire harness side.

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2. CHECK THEFT WARNING ECU ASSY (THEFT DETERRENT ECU)

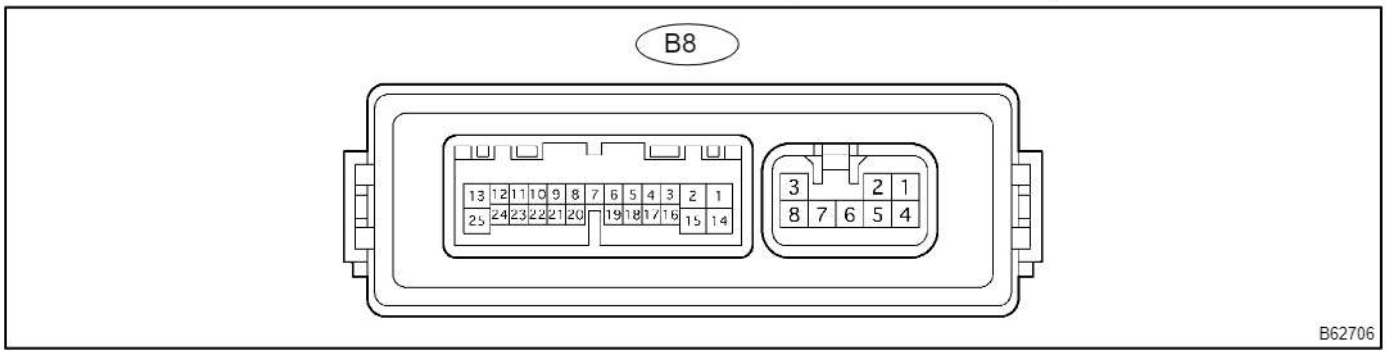


(a) Disconnect the T5 ECU connector.
(b) Check the voltage or continuity of each terminal of the wire harness side connector.
Standard:

Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
E (T5–29) ⇔ Body ground	W–B ⇔ –	Constant	Continuity
+B1 (T5–2) ⇔ E (T5–29)	W–R ⇔ W–B	Constant	10 – 14 V
+B2 (T5–3) ⇔ E (T5–29)	W–L ⇔ W–B	Constant	10 – 14 V

If the result is not as specified, there may be a malfunction on the wire harness side.

3. CHECK MULTIPLEX NETWORK DOOR ECU BACK (BACK DOOR ECU)



(a) Disconnect the B8 ECU connector.
(b) Check the voltage or continuity of each terminal of the wire harness side connector.
Standard:

Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
GND (B8–3) ⇔ Body ground	W–B ⇔ –	Constant	Continuity
BECU (B8–5) ⇔ GND (B8–3)	L–R ⇔ W–B	Constant	10 – 14 V
BDR (B8–4) ⇔ GND (B8–3)	L ⇔ W–B	Constant	10 – 14 V

If the result is not as specified, there may be a malfunction on the wire harness side.

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0523W-02

PROBLEM SYMPTOMS TABLE

1. TROUBLESHOOTING FOR EACH PROBLEM SYMPTOM

NOTICE:

Confirm the problem symptom and make an inspection depending on the applicable flowchart.

Symptom	Suspected Area	See Page
B1214 (short in communication circuit and +B power source system)	2. Theft warning ECU assy (Theft deterrent ECU) 3. Multiplex network door ECU back (Back door ECU) 4. Instrument panel junction block assy (Body ECU)	05–1917
B1215 (short in communication circuit and body ground)	1. Theft warning ECU assy (Theft deterrent ECU) 2. Multiplex network door ECU back (Back door ECU) 3. Instrument panel junction block assy (Body ECU)	05–1917
B1269 (no communication from theft deterrent ECU for more than 10 seconds)	1. Theft warning ECU assy (Theft deterrent ECU) 2. Wire harness	05–1922
B1287 (no communication from back door ECU for more than 10 seconds)	1. Multiplex network door ECU back (Back door ECU) 2. Wire harness	05–1926

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DTC	B1214	DOOR SYSTEM COMMUNICATION BUS MALFUNCTION (+B SHORT)

DTC	B1215	DOOR SYSTEM COMMUNICATION BUS MALFUNCTION (GND SHORT)

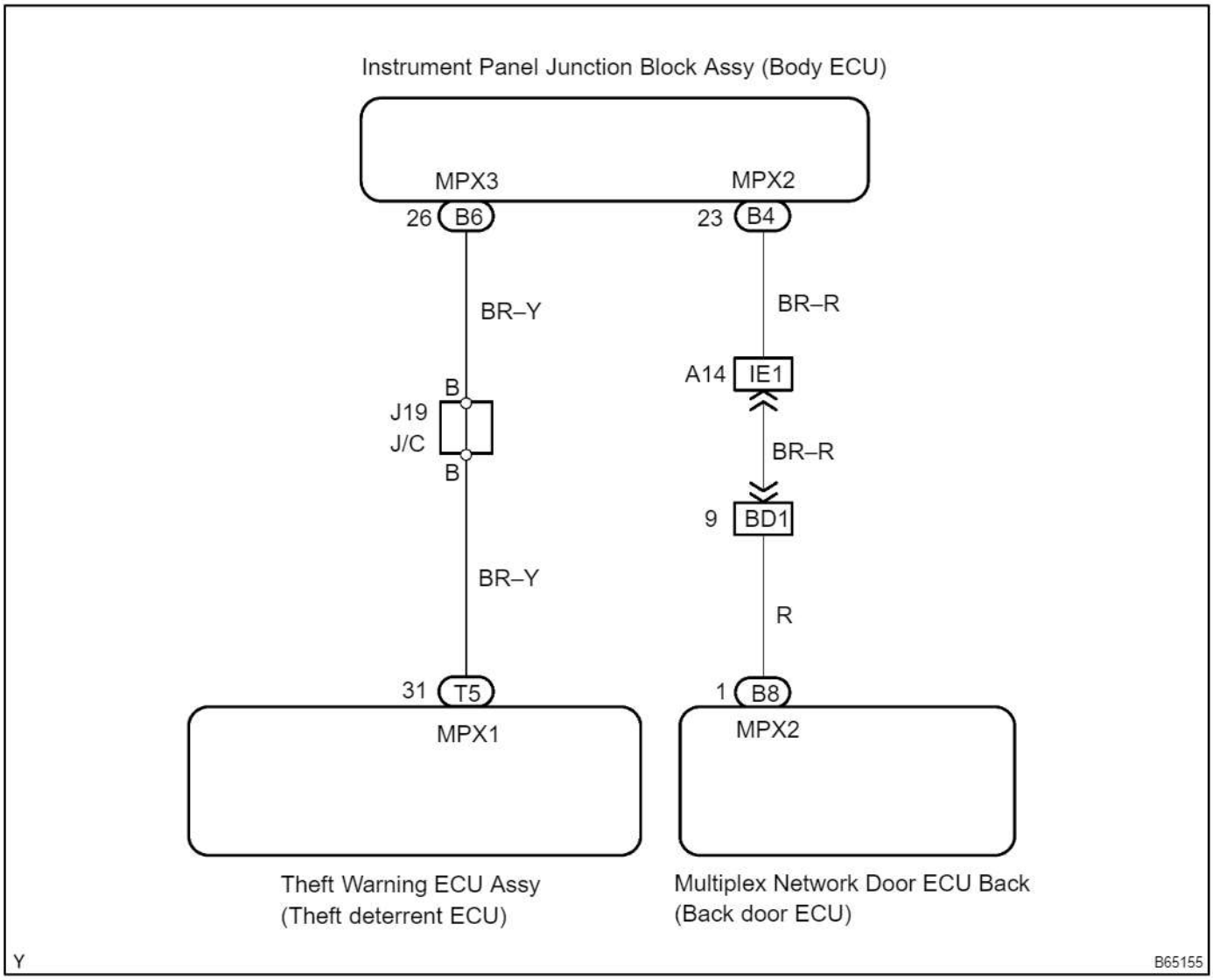
CIRCUIT DESCRIPTION

B1214 and B1215 are output when +B and the body ground is short–circuited on the communication bus. Detecting this condition disables all the BEAN communication and outputs some DTCs.

DTC No.	DTC Detection Condition	Trouble Area
B1214	Communication circuit and +B battery system short	□Theft warning ECU assy (Theft deterrent ECU) □Multiplex network door ECU back (Back door ECU) □Wire harness □Instrument panel junction block assy (Body ECU)
B1215	Communication circuit and body ground short	□Theft warning ECU assy (Theft deterrent ECU) □Wire harness □Multiplex network door ECU back (Back door ECU) □Instrument panel junction block assy (Body ECU)

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WIRING DIAGRAM

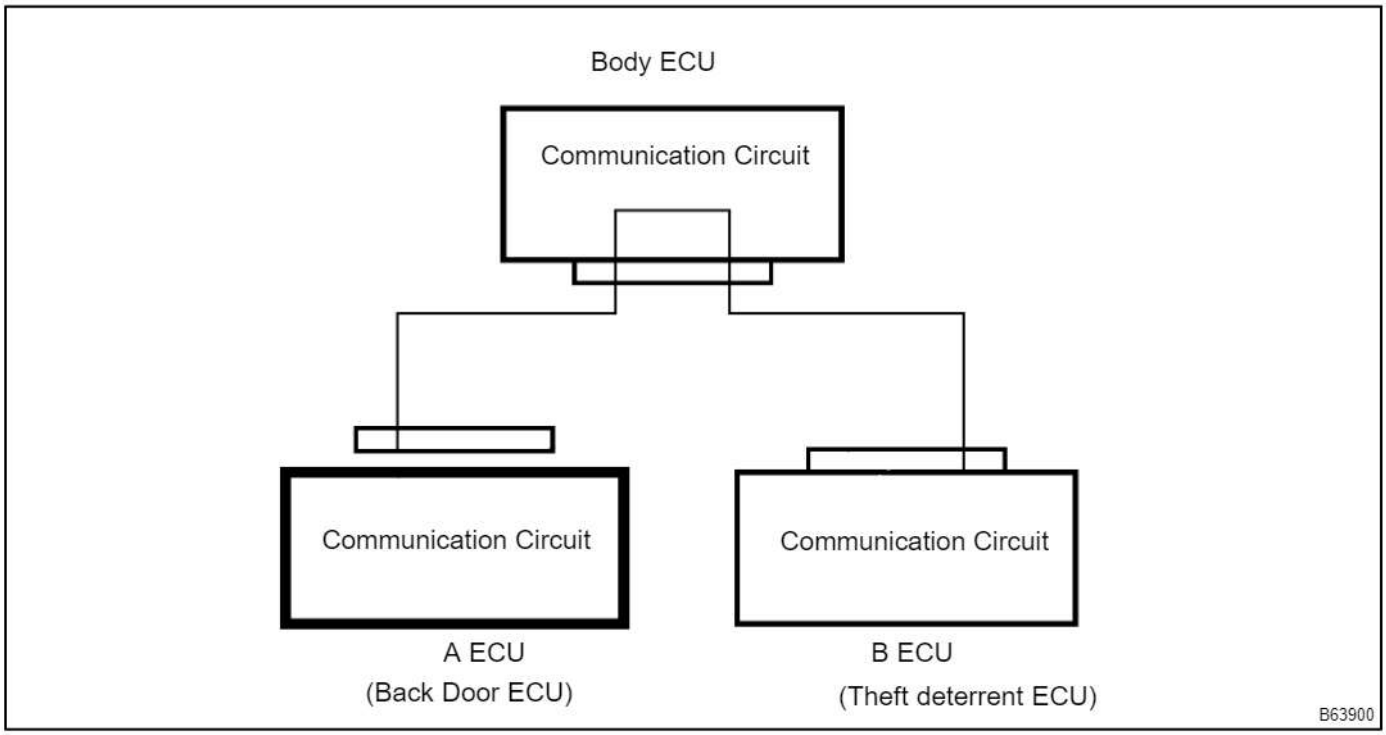


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INSPECTION PROCEDURE

1	CHECK DIAGNOSTIC TROUBLE CODE (A ECU)

(a) Check whether the output of the DTC stops when the A ECU connector is disconnected.



NOTICE:
Disconnect the connectors in the operational sequence, and start the next Step after the connector is connected.
HINT:
In this case, the A ECU represents the back door ECU.

Standard: When the output of the DTC stops, the disconnected A ECU is abnormal .

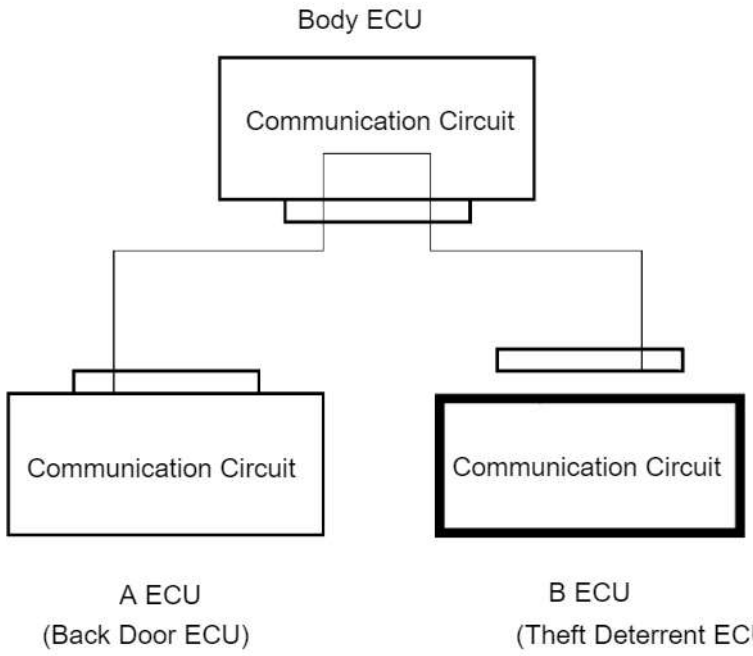
OK	REPLACE A ECU

NG

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2	CHECK DIAGNOSTIC TROUBLE CODE (B ECU)

(a) Check whether the output of the DTC stops when the B ECU connector is disconnected.



NOTICE:
Disconnect the connectors in the operational sequence, and start the next step after the connector is connected.
HINT:
In this case, the B ECU represents the theft deterrent ECU.

Standard: When the output of the DTC stops, the disconnected B ECU is abnormal.

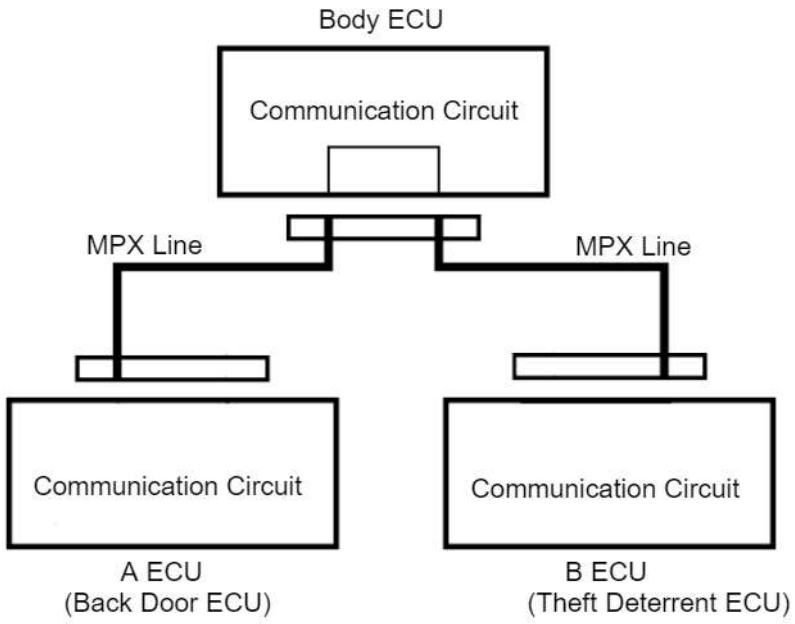
OK	REPLACE B ECU

NG

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3	CHECK WIRE HARNESS BETWEEN BODY ECU AND A ECU OR B ECU

(a) Disconnect the A ECU, B ECU and body ECU connectors.
(b) Check the wire harness (MPX line) between the A ECU, B ECU and body ECU.



(1) Turn the ignition switch ON.
(2) Check the voltage between the wire harness (MPX lines) and body ground.

Standard:

MPX Line ⇔ Body ground	Voltage
Body ECU or A ECU (Back door ECU) ⇔ Body ground	0 V
Body ECU or B ECU (Theft deterrent ECU) ⇔ Body ground	

If the output voltage is not 0 V, the wire harness (MPX line) may be short–circuited with +B.

(3) Check the continuity of the wire harness (MPX lines) and body ground.

Standard:

MPX Line ⇔ Body ground	Continuity
Body ECU or A ECU (Back door ECU) ⇔ Body ground	No continuity
Body ECU or B ECU (Theft deterrent ECU) ⇔ Body ground	

If there is continuity, the wire harness (MPX line) and body ground may be short–circuited with the body ground.

NG → **REPAIR OR REPLACE WIRE HARNESS BETWEEN BODY ECU AND A ECU OR B ECU**

OK

REPLACE INSTRUMENT PANEL JUNCTION BLOCK ASSY

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DTC	B1269	THEFT DETERRENT ECU COMMUNICATION STOP

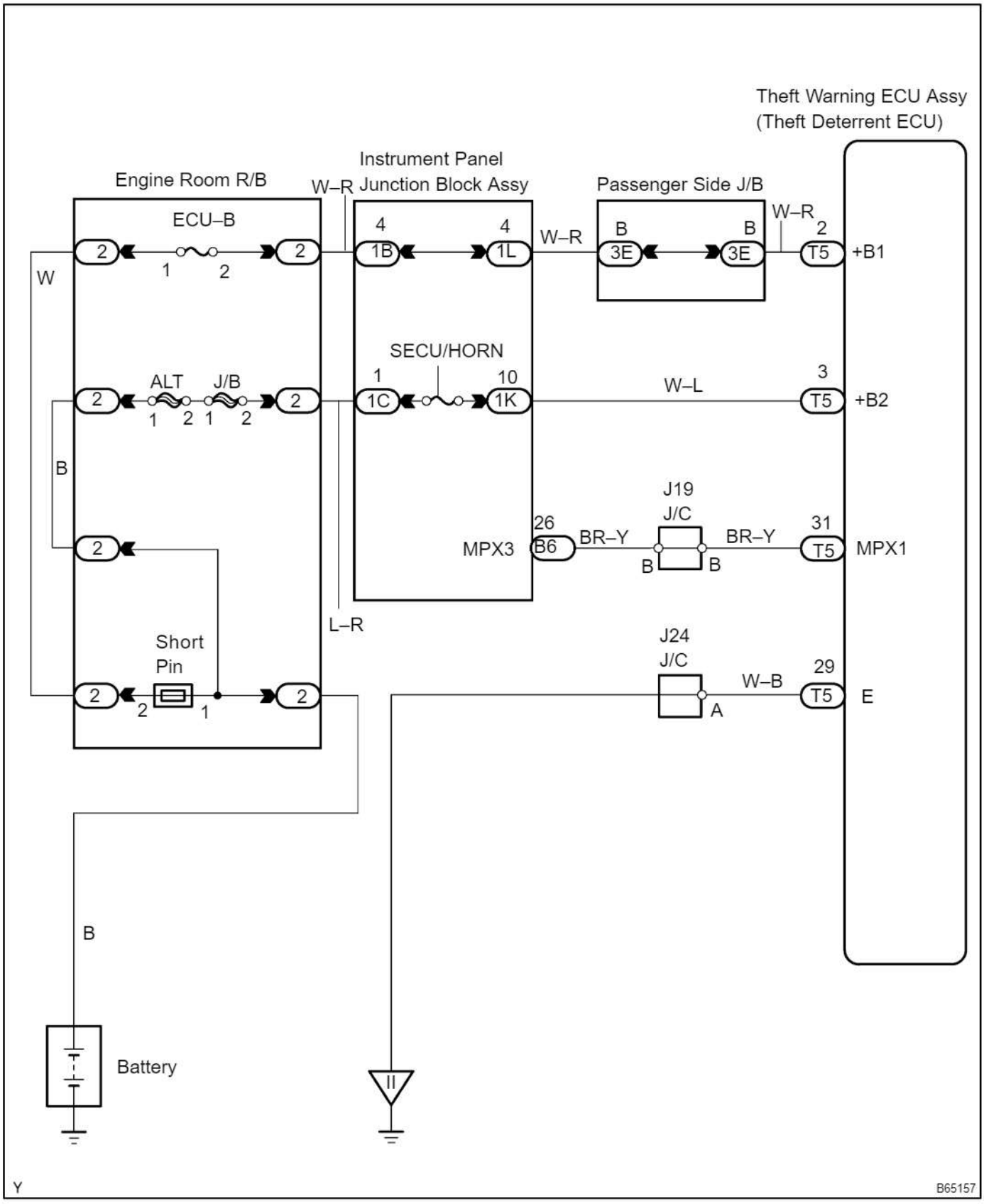
CIRCUIT DESCRIPTION

DTC B1269 is output when the communication between the theft deterrent ECU and the body ECU stops for more than 10 seconds.

DTC No.	DTC Detection Condition	Trouble Area
B1269	No communication from theft deterrent ECU for more than 10 seconds	□Theft warning ECU assy (Theft deterrent ECU) □Wire harness

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WIRING DIAGRAM



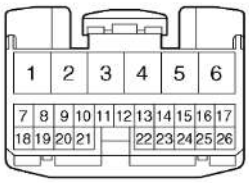
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INSPECTION PROCEDURE

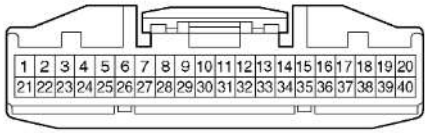
1 CHECK CONTINUITY OF COMMUNICATION LINE

Wire Harness Side

B6
Instrument Panel Junction Block Assy (Body ECU)



T5
Theft Warning ECU Assy (Theft Deterrent ECU)



B64050

(a) Check the wire harness between the body ECU and theft deterrent ECU.
  (1) Disconnect the B6 ECU and T5 ECU connectors.
  (2) Check the continuity between wire harness side connector.

Standard:

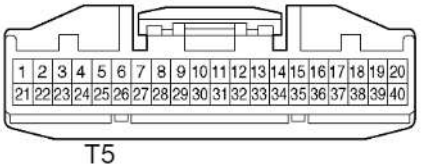
Symbols (Terminal No.)	Specified Condition
MPX3 (B6–26) ⇔ MPX1 (T5–31)	Continuity

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

2 CHECK THEFT WARNING ECU ASSY (THEFT DETERRENT ECU) (POWER SOURCE)

Wire Harness Side



T5
Theft Warning ECU (Theft Deterrent ECU)

Y

B65163

(a) Disconnect the T5 ECU connector.
(b) Check the voltage between the wire harness side connector and body ground.

Standard:

Symbols (Terminal No.)	Specified Condition
+B1 (T5–2) ⇔ Body ground	10 – 14 V
+B2 (T5–3) ⇔ Body ground	10 – 14 V

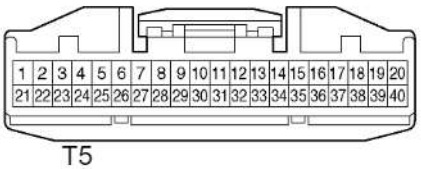
NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

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3	CHECK THEFT WARNING ECU ASSY (THEFT DETERRENT ECU) (GROUND)

Wire Harness Side



T5
Theft Warning ECU Assy
(Theft Deterrent ECU)

Y B65163

(a) Disconnect the T5 ECU connector.
(b) Check the continuity between the wire harness side connector and body ground.

Standard:

Symbols (Terminal No.)	Specified Condition
E (T5–29) ⇔ Body ground	Continuity

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK →

REPLACE THEFT WARNING ECU ASSY

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DTC	B1287	BACK DOOR ECU COMMUNICATION STOP

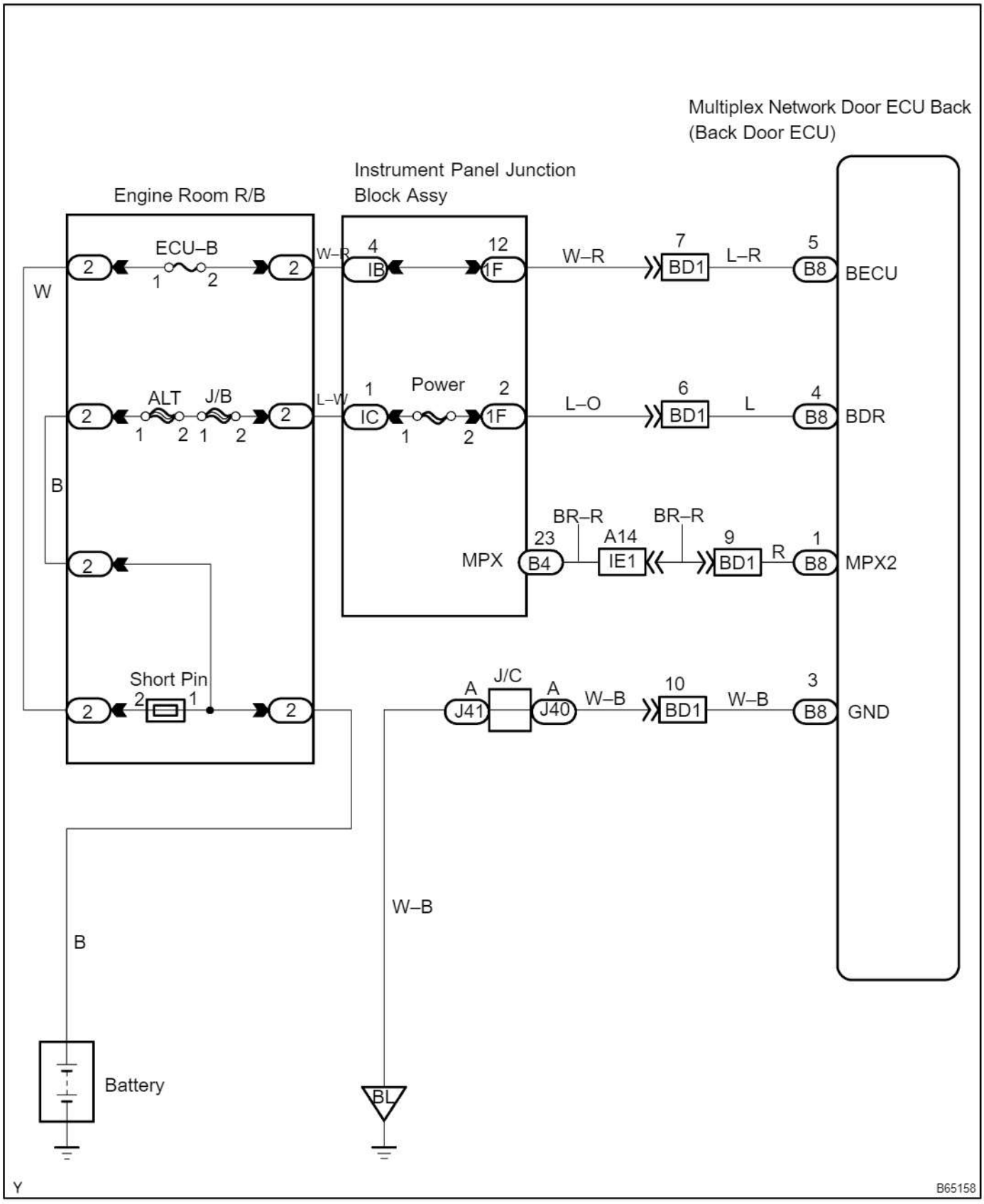
CIRCUIT DESCRIPTION

B1287 is output when the communication between the multiplex network door ECU back (back door ECU) and multiplex network body ECU stops for more than 10 seconds.

DTC No.	DTC Detection Condition	Trouble Area
B1287	No communication from back door ECU for more than 10 seconds	□Multiplex network door ECU back (Back door ECU) □Wire harness

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WIRING DIAGRAM



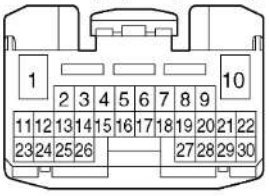
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INSPECTION PROCEDURE

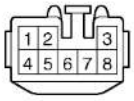
1 CHECK CONTINUITY OF COMMUNICATION LINE

Wire Harness Side

B4
Instrument Panel Junction Block Assy (Body ECU)



B8
Multiplex Network Door ECU Back (Back Door ECU)



B64051

(a) Check the wire harness between the body ECU and back door ECU.
(1) Disconnect the B4 ECU and B8 ECU connectors.
(2) Check the continuity between wire harness side connectors.

Standard:

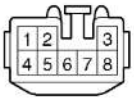
Symbols (Terminal No.)	Specified Condition
MPX2 (B4–23) ⇔ MPX2 (B8–1)	Continuity

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

2 CHECK MULTIPLEX NETWORK DOOR ECU BACK (BACK DOOR ECU) (POWER SOURCE)

Wire Harness Side



B8
Multiplex Network Door ECU Back (Back Door ECU)

Y B65162

(a) Disconnect the B8 ECU connector.
(b) Check the voltage between the wire harness side connector and body ground.

Standard:

Symbols (Terminal No.)	Specified Condition
BECU (B8–5) ⇔ Body ground	10 – 14 V
BDR (B8–4) ⇔ Body ground	10 – 14 V

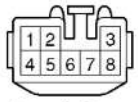
NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

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3	CHECK MULTIPLEX NETWORK DOOR ECU BACK (BACK DOOR ECU) (GROUND)

Wire Harness Side



B8
Multiplex Network Door ECU Back (Back Door ECU)

Y B65162

(a) Disconnect the B8 ECU connector.
(b) Check the continuity between wire harness side connector and body ground.

Standard:

Symbols (Terminal No.)	Specified Condition
GND (B8–3) ⇔ Body ground	Continuity

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

CHECK MULTIPLEX NETWORK DOOR ECU BACK

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CRUISE CONTROL SYSTEM

052J2-03

HOW TO PROCEED WITH TROUBLESHOOTING

1	VEHICLE BROUGHT TO WORK SHOP

2	CUSTOMER PROBLEM ANALYSIS (See page 05–1932)

3	CHECK AND CLEAR DTCS (See page 05–1933)

4	PROBLEM SYMPTOM CONFIRMATION

- SYMPTOM DOES NOT OCCUR (GO TO STEP 5)
- SYMPTOM OCCURS (GO TO STEP 6)

5	SYMPTOM SIMULATION (See page 01–35)

6	DTC CHECK (See page 05–1933)

- MALFUNCTION CODE (GO TO STEP 7)
- NORMAL CODE (GO TO STEP 8)

7	DTC CHART (See page 05–1938)

GO TO STEP 9

8	PROBLEM SYMPTOMS TABLE (See page 05–1941)

9	CIRCUIT INSPECTION (See page 05–1942 – 05–1951)

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10	CHECK TERMINAL OF ECM (See page 05–1940)

11	INDEMNIFICATION OF PROBLEM

12	REPAIR OR REPLACE

13	CONFIRMATION TEST

END

HINT:
Step 3, 6, 9, 13:
Diagnostic steps permitting the use of the hand–held tester.

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059WB-01

CUSTOMER PROBLEM ANALYSIS CHECK

CRUISE CONTROL SYSTEM Check Sheet

Inspector's name: _____

Customer's Name		**Registration No.**	
		Registration Year	
		Frame No.	
Date of Vehicle Brought in	/ /	**Odometer Reading**	**km Mile**

Condition of Problem Occurrence	**Date of Problem Occurrence**	/ /
	Frequency Problem Occurs?	☑ Continuous ☑ Intermittent (Times a day)
	Vehicle Speed when Problem Occurred	**km Mile**

Symptoms	☑ Auto cancel occurs	☐ Driving condition City driving Freeway Up hill Down hill ☐ After cancel occurred, did the driver activate cruise control again? Yes No
	Cancel does not occur	With brake ON Except D position shift When control SW turns to CANCEL position
	Cruise control malfunction	Slip to acceleration side Slip to deceleration side Hunting occurs O/D cut off does not occur O/D does not return
	Switch malfunction	SET '+' '–' RES CANCEL
	Cruise MAIN indicator light	Remains ON Does not light up Blinks

DTC Check	**1st Time**	Normal Code Malfunction Code (Code)
	2nd Time	Normal Code Malfunction Code (Code)

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052J6-04

PRE–CHECK

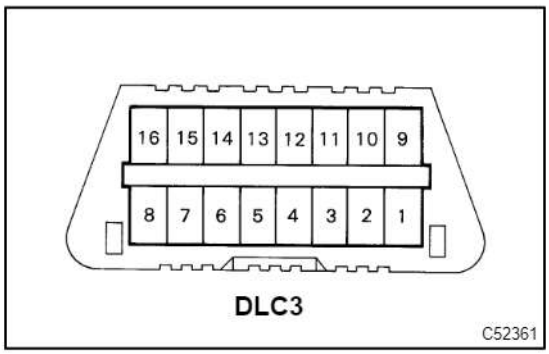
1. DIAGNOSIS SYSTEM

(a) Description

ECM controls the function of the cruise control on a vehicle.

Data on the cruise control and on the DTC can be read from the DLC3 on the vehicle. If CRUISE MAIN indicator light does not comes on after the DTC check, there is a malfunction on the cruise control.

Use the hand–held tester or SST to check and solve the problem.



DLC3

(b) Check the DLC3.

The vehicle's ECM uses ISO 9141–2 for communication. The terminal arrangement of DLC3 complies with SAE J1962 and matches the ISO 9141–2 format.

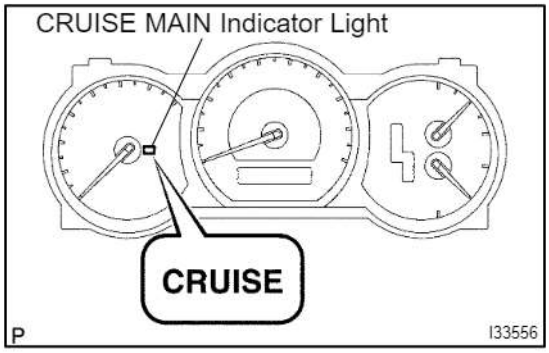
Terminal No.	Connection/Specified Condition	Condition
4	Chassis Ground ↔ Body Ground / 1 Ω or less	Always
7	Bus ⊕ Line / Pulse Generation	During Communication
16	Battery Positive ↔ Body Ground / 9 – 14 V	Always

HINT:

If the display shows "UNABLE TO CONNECT TO VEHICLE" as connecting the hand–held tester to the DLC3 and turn the ignition ON, there is a problem either on the vehicle or on the tool.

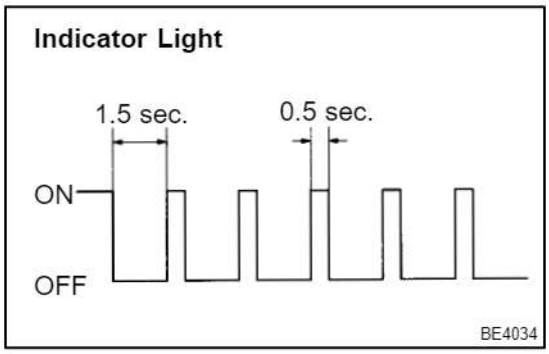
- □ If communication is normal when connecting the tool to another vehicle, inspect DLC3 on the original vehicle.
- □ If communication is still not possible when connecting the tool to another vehicle, the problem is probably in the tool itself. Consult the Service Department listed in the tool's instruction manual in that case.

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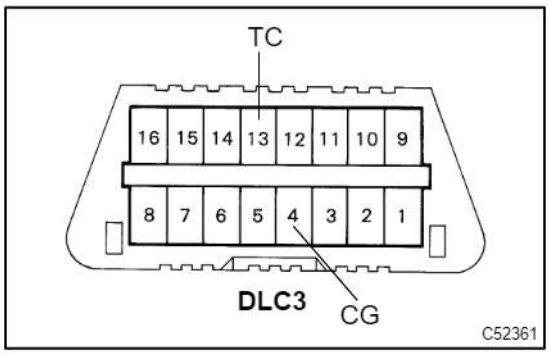
(c) Check the indicator.
(1) Turn the ignition switch to ON.
(2) Check that the CRUISE MAIN indicator light comes on when the main switch button is turned on, and that the indicator light goes off when the main switch is turned OFF.

HINT:
If the indicator check result is not normal, proceed to troubleshooting (See page 05–1687) for the combination meter section.

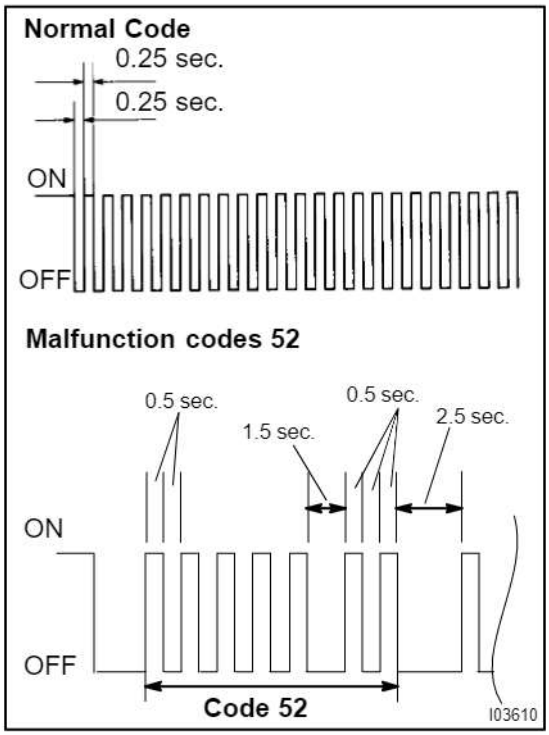


(d) Check the DTC.

HINT:
If a malfunction occurs in the vehicle speed sensors or stop lamp switch assy, etc. during cruise control driving, the ECU actuates AUTO CANCEL of the cruise control and turns on and off the CRUISE MAIN indicator light to inform the driver of a malfunction. At the same time, the malfunction is stored in memory as a diagnostic trouble code.



(e) Output of DTC using diagnosis check wire.
(1) Turn the ignition switch to ON.
(2) Using SST, connect terminals TC and CG of DLC3.
SST 09843–18040
(3) Read the DTC on the CRUISE MAIN indicator light.



HINT:
If the DTC is not output, inspect the cruise main indicator light circuit (See page 05–1949).
As an example, the blinking patterns for codes; normal, 52 are shown in the illustration.

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2. USING HAND–HELD TESTER

(a) Hook up the hand–held tester to the DLC3.
(b) Monitor the ECU data by following the prompts on the tester screen.

HINT:
Hand–held tester has a "Snapshot" function which records the monitored data.
Please refer to the hand–held tester operator's manual for further details.

3. DATA LIST

HINT:
According to the DATA LIST displayed on the the hand–held tester, you can read the value of the switch, the sensor and so on without removing parts. Reading the DATA LIST as a first step of troubleshooting is one of the method to shorten the labor time.

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch to ON.
(c) According to the display on tester, read the "DATA LIST".

Item	Measurement Item / Display (Range)	Normal Condition	Diagnostic Note
VEHICLE SPD	Vehicle speed / min.: 0 km/h (0 mph), max.: 255 km/h (158 mph)	Actual vehicle speed	–
MEMORY SPD	Stored vehicle speed / min.: 0 km/h (0 mph), max.: 255 km/h (158 mph)	Actual stored vehicle speed	–
THROTTLE	Required throttle opening angle / min.: 0 , max.: 125	Actual required throttle opening	–
CRUISE CONTROL	Cruise control system active condition / ON or OFF	ON : Cruise control activated OFF : Cruise control inactivated	–
MAIN SW (MAIN)	Main SW signal (Main CPU) / ON or OFF	ON : Main SW ON (Pressed in) OFF: Main SW OFF (Pressed out)	"3"
MAIN SW (SUB)	Main SW signal (Sub CPU) / ON or OFF	ON : Main SW ON (Pressed in) OFF: Main SW OFF (Pressed out)	"3"
CCS READY M	Cruise control system standby condition (Main CPU) / ON or OFF	ON ⇔ OFF : Change ON/OFF each time Main SW is pushed in.	"1"
CCS READY S	Cruise control system standby condition (Sub CPU) / ON or OFF	ON ⇔ OFF : Change ON/OFF each time Main SW is pushed in.	"1"
CCS INDICATOR M	Cruise indicator signal (Main CPU) / ON or OFF	ON : "CCS READY" ON OFF : "CCS READY" OFF	"2"
CCS INDICATOR S	Cruise indicator signal (Sub CPU) / ON or OFF	ON : "CCS READY" ON OFF : "CCS READY" OFF	"2"
CANCEL SW	CANCEL SW signal / ON or OFF	ON : CANCEL SW ON OFF : CANCEL SW OFF	–
SET/COAST SW	–/SET SW signal / ON or OFF	ON : –/SET SW ON OFF : –/SET SW OFF	–
RES/ACC SW	+/RES SW signal / ON or OFF	ON : +/RES SW ON OFF : +/RES SW OFF	–
STP LIGHT SW2 M	Stop lamp SW signal (Main CPU) / ON or OFF	ON : Brake pedal depressed OFF : Brake pedal released	–
STP LIGHT SW2 S	Stop lamp SW signal (Sub CPU) / ON or OFF	ON : Brake pedal depressed OFF : Brake pedal released	–

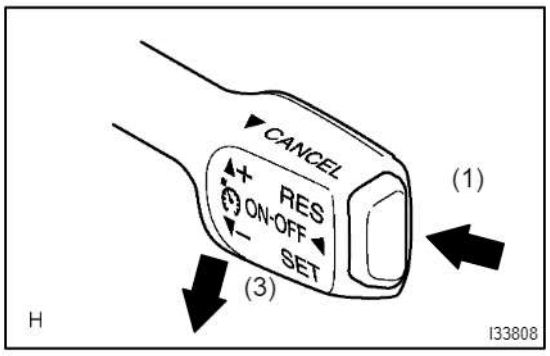
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STP LIGHT SW1 S	Stop light SW signal (Sub CPU) / ON or OFF	ON : Brake pedal depressed OFF : Brake pedal released	–
SHIFT D POS	PNP SW signal (D position) / ON or OFF	ON : Shift D position OFF : Except shift D position	–

HINT:
"3" is OK but "1" is NG → ECM failure
"1" is OK but "2" is NG → DTC output or ECM failure
"3" is OK but cruise indicator not turn on → CRUISE MAIN indicator or wire harness or ECM failure

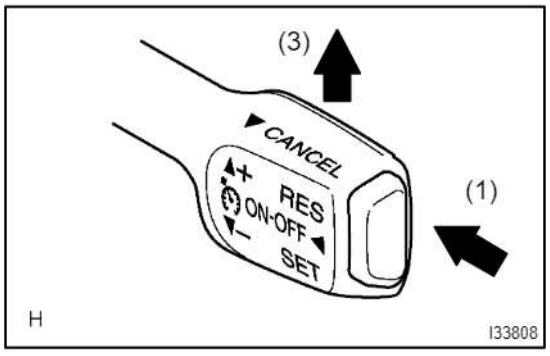
4. DTC CLEAR

(a) The following actions will erase the DTCs and freeze frame data.
  (1) Hand–Held Tester:
    Operating the hand–held tester to erase the codes.
  (2) Except Hand–Held Tester:
    Disconnecting the battery terminals or EFI fuse.
(b) After completing repairs, the DTC retained in memory can be cleared by removing the EFI fuse for 1 minutes or more with the ignition switch OFF.
(c) Check that the normal code is displayed after connecting the fuse.



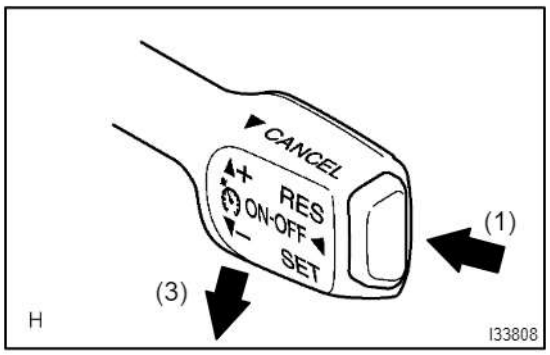
5. PROBLEM SYMPTOM CONFIRMATION (ROAD TEST)

(a) Inspect the SET switch.
  (1) Push the main switch button to ON.
  (2) Drive at a desired speed (40 km/h (25 mph) or higher).
  (3) Push down the control switch to the –/SET.
  (4) After releasing the switch, check that the vehicle cruises at the desired speed.

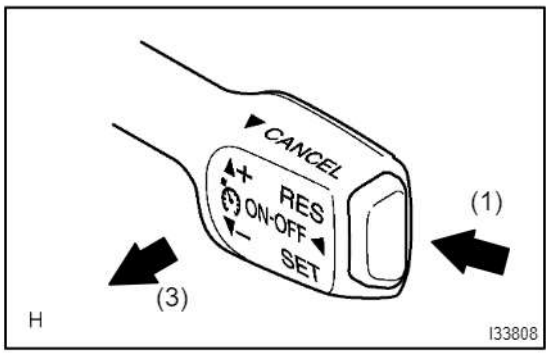


(b) Inspect the '+' switch.
  (1) Push the main switch button to ON.
  (2) Drive at a desired speed (40 km/h (25 mph) or higher).
  (3) Check that the vehicle speed increases while the control switch is pull up to +/RES, and that the vehicle cruises at the set speed when the switch is released.
  (4) Momentarily push the control switch upward to the +/RES, and then immediately release it. Check that the vehicle speed increases by about 1.5 km/h (Tap–up function).

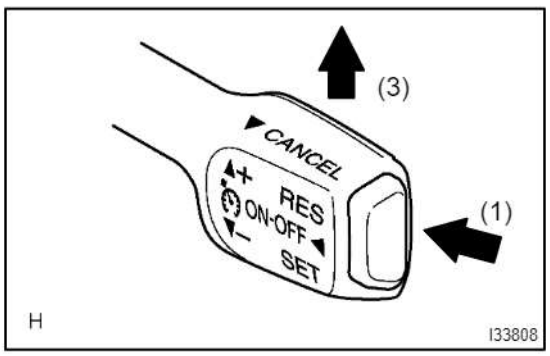
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(c) Inspect the '–' switch.
(1) Push the main switch button to ON.
(2) Drive at a desired speed (40 km/h (25 mph) or higher).
(3) Check that the vehicle speed decreases while the control switch is push down to –/SET, and the vehicle cruises at the set speed when the switch is released.
(4) Momentarily push the control switch downward to –/SET, and then immediately release it. Check that the vehicle speed decreases by about 1.5 km/h (Tap–down function).



(d) Inspect the CANCEL switch.
(1) Push the main switch button to ON.
(2) Drive at a desired speed (40 km/h (25 mph) or higher).
(3) When operating one of the followings, check that the cruise control system is cancelled and that the normal driving mode is reset.
□ Depress the brake pedal.
□ Shift to except D position.
□ Push the main switch button to OFF.
□ Pull the control switch to CANCEL.



(e) Inspect the RES switch.
(1) Push the main switch button to ON.
(2) Drive at a desired speed (40 km/h (25 mph) or higher).
(3) When operating one of the followings, check that the cruise control system is cancelled and that the normal driving mode is reset.
□ Depress the brake pedal.
□ Shift to except D position.
□ Pull the control switch to CANCEL.
(4) After the control switch is pull up to +/RES at the driving speed of more than 40 km/h (25 mph), check that the vehicle restores the speed before the cancellation.

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052J8-03

DIAGNOSTIC TROUBLE CODE CHART

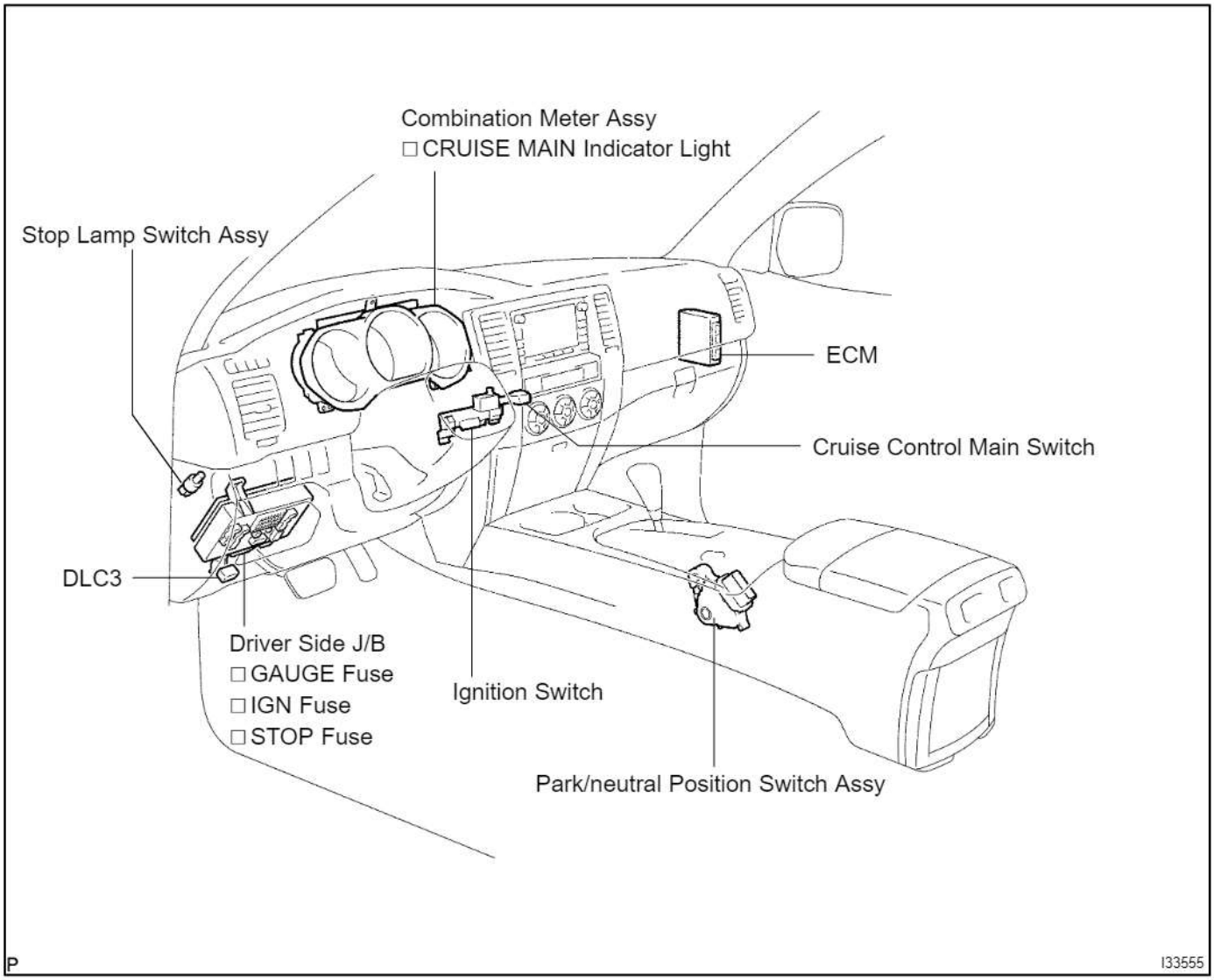
If a malfunction code is indicated during the DTC check, check the circuit listed for that code in the table below, and proceed to the appropriate page.

DTC No. (See Page)	Circuit Inspection	Trouble Area
P0500/21 (05–1942)	Vehicle Speed Sensor "A"	□Combination meter assy □Vehicle speed sensor □Vehicle speed sensor circuit □ECM
P0503/23 (05–1942)	Vehicle Speed Sensor "A" Intermittent/Erratic/High	
P0571/52 (05–1943)	Brake Switch "A" Circuit	□Stop lamp switch assy □Stop lamp switch assy circuit □ECM
P0607/54 (05–1946)	Control Module Performance	□ECM

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052JA-03

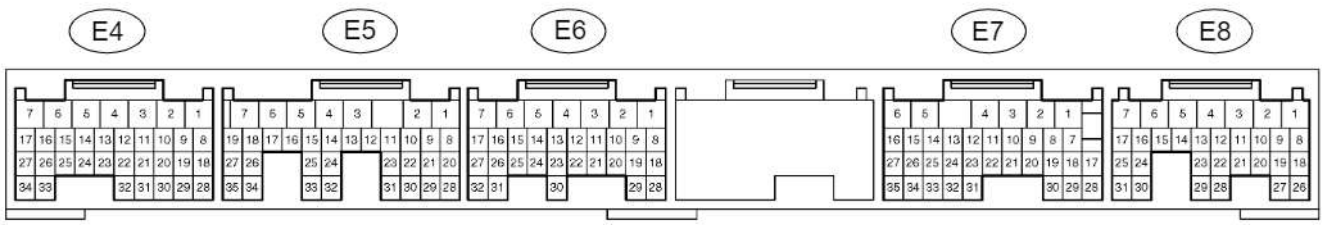
LOCATION



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059WC–01

TERMINALS OF ECM



Y

I33809

Symbols (Terminals No.)	Wiring Color	Condition	Specified Condtion
TC ⇔ E1 (E8–20 ⇔ E6–1)	P–L ⇔ BR	Ignition switch ON	10 – 14 V
		Ignition switch ON Connect terminals TC and CG of DLC3	Below 2 V
ST1– ⇔ E1 (E7–12 ⇔ E6–1)	R–L ⇔ BR	Ignition switch ON Depress brake pedal	Below 1 V
		Ignition switch ON Release brake pedal	10 – 14 V
PI ⇔ E1 (E7–13 ⇔ E6–1)	LG ⇔ BR	Ignition switch ON Cruise control main switch ON	0 – 3 V
		Ignition switch ON Cruise control main switch OFF	9 – 14 V
STP ⇔ E1 (E7–19 ⇔ E6–1)	G–Y ⇔ BR	Ignition switch ON Depress brake pedal	10 – 14 V
		Ignition switch ON Release brake pedal	Below 1 V
CCS ⇔ E1 (E7–24 ⇔ E6–1)	L–B ⇔ BR	Ignition switch ON	9 – 14 V
		Ignition switch ON CANCEL switch hold ON	6 – 10.1 V
		Ignition switch ON –/SET switch hold ON	4 – 7.1 V
		Ignition switch ON +/RES switch hold ON	2.1 – 4 V
		Ignition switch ON MAIN switch hold ON	Below 1 V

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052JC-06

PROBLEM SYMPTOMS TABLE

If a normal code is displayed during the DTC check but the problem still occurs, check the circuits for each problem symptom in the order given in the table below and proceed to the relevant troubleshooting page.

Symptom	Suspect Area		See page
Main switch cannot be turned ON. (Cruise indicator light in combination meter is not lit.)	3. Cruise control switch circuit 4. CRUISE MAIN indicator light circuit 5. ECM		05–1947 05–1949 01–35
Vehicle speed setting cannot be done. (Although indicator light in combination meter is lit when the main switch is turned ON, they go off when vehicle speed is set.)	1. Cruise control switch circuit 2. ECM		05–1947 01–35
Setting cannot be done. (Indicator light in combination meter is lit when the main switch is turned ON and they remain ON while setting.)	1. Cruise control switch circuit 2. Stop lamp switch circuit 3. PNP switch circuit 4. Combination meter system 5. ECM	 A750 A340 	05–1947 05–1943 05–978 05–1095 05–1687 01–35
While the vehicle is driving with cruise control, the set control is canceled. (Indicator light and CRUISE remain ON.)	1. Cruise control switch circuit 2. Vehicle speed sensor circuit 3. Stop lamp switch circuit 4. CRUISE MAIN indicator light circuit 5. PNP switch circuit 6. ECM	 A750 A340 	05–1947 05–1942 05–1943 05–1949 05–978 05–1095 01–35
Hunting (Speed is not constant.)	1. Vehicle speed sensor circuit 2. ECM		05–1942 01–35
Setting cannot be cancelled. (When Coast, Acceleration, Resume, Set speed change and Control switch are operated.)	1. Cruise control switch circuit 2. ECM		05–1947 01–35
DTC is not output, or is output when should not be.	1. Diagnosis circuit 2. ECM		05–1951 01–35
CRUISE MAIN indicator light does not light up.	1. Cruise control switch circuit 2. CRUISE MAIN Indicator light circuit 3. ECM		05–1947 05–1949 01–35

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DTC	P0500/21	VEHICLE SPEED SENSOR ”A”

DTC	P0503/23	VEHICLE SPEED SENSOR ”A” INTERMITTENT/ERRATIC/HIGH

CIRCUIT DESCRIPTION

2UZ–FE: See page 05–239.
1GR–FE: See page 05–547

DTC No.	DTC Detection Condition	Trouble Area
P0500/21 P0503/23	No vehicle speed sensor signal to ECM under following conditions (a) and (b): (2 trip detection logic). (a) Park/neutral position switch is OFF (b) Vehicle is being driven	□Combination meter assy □Vehicle speed sensor □Vhicle speed sensor circuit □ECM

WIRING DIAGRAM

2UZ–FE: See page 05–239.
1GR–FE: See page 05–547

INSPECTION PROCEDURE

2UZ–FE: See page 05–239.
1GR–FE: See page 05–547

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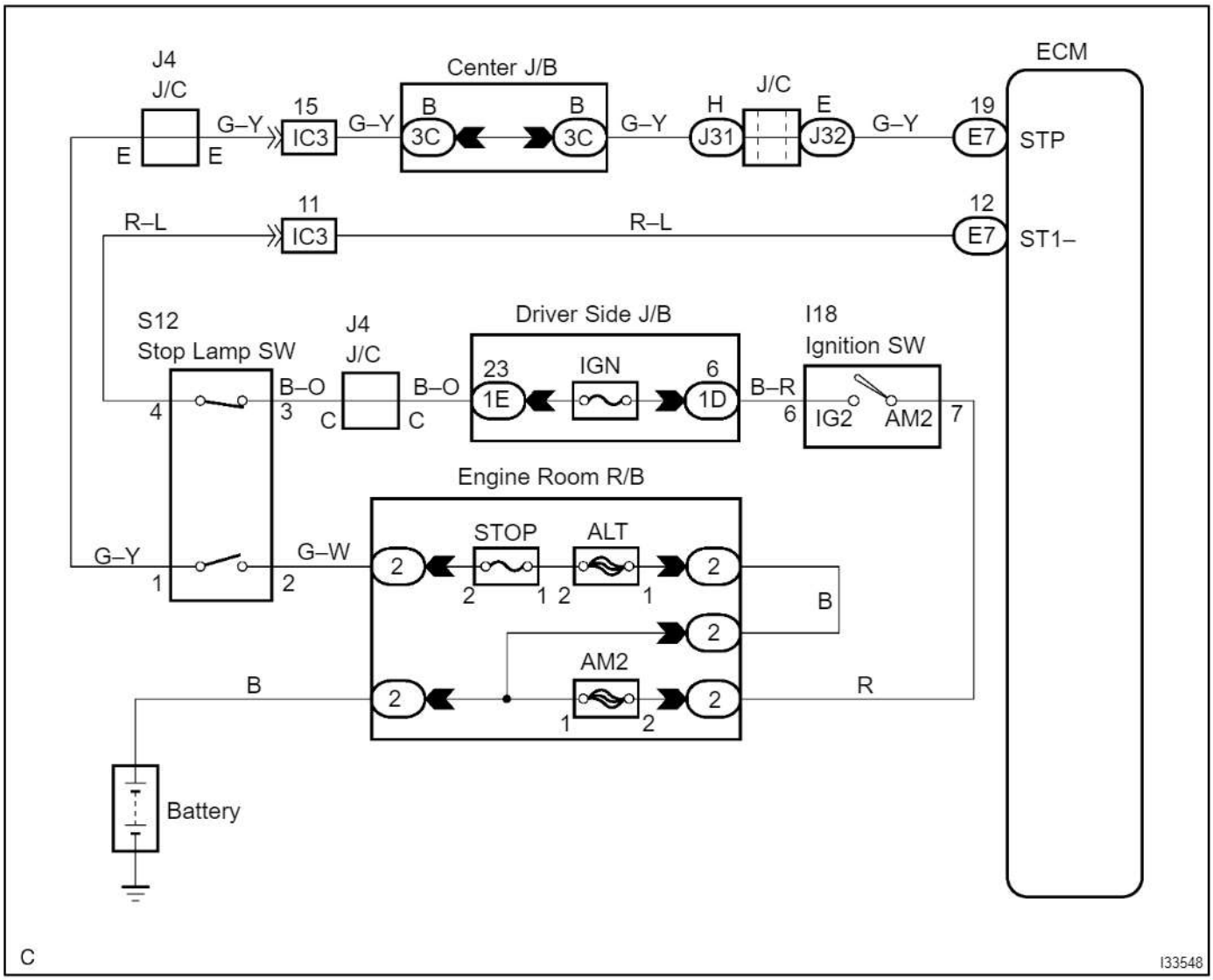
DTC P0571/52 BRAKE SWITCH "A" CIRCUIT

CIRCUIT DESCRIPTION

When the brake pedal is depressed, the stop lamp switch assy sends a signal to the ECM. When the ECM receives this signal, it cancels the cruise control.
A fail–safe function is provided so that the functions normally, even if there is a malfunction in the stop lamp signal circuit.
The cancel condition occurs as battery positive voltage is supplied to terminal STP.
When the brake is on, battery positive voltage is normally applied through the STOP fuse and the stop lamp switch assy to terminal STP of the ECM, and the ECM turns the cruise control OFF.
If the harness connected to terminal STP has an open circuit, terminal STP will have battery positive voltage and the cruise control will be turned OFF.

DTC No.	DTC Detection Condition	Trouble Area
P0571/52	Stop lamp switch assy does not turn off even once the vehicle is driven.	□Stop lamp switch assy □Stop lamp switch assy circuit □ECM

WIRING DIAGRAM



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INSPECTION PROCEDURE

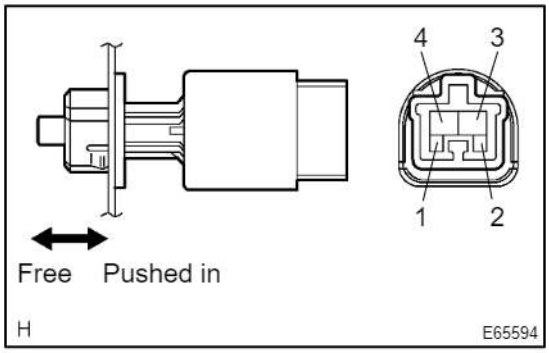
1	INSPECT STOP LAMP SWITCH OPERATION

(a) Check that the stop lamp lights up when brake pedal is depressed and turns OFF when the brake pedal is released.

NG → **INSPECT STOP LAMP SWITCH CIRCUIT (See page 05–1463)**

OK

2	INSPECT STOP LAMP SWITCH ASSY



(a) Disconnect the stop lamp switch assy connector.
(b) Measure the continuity between each terminal of the stop lamp switch assy.

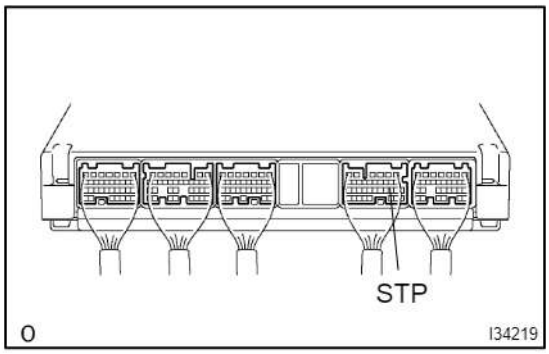
Standard:

Switch condition	Tester connection	Specification
Switch pin free	1 – 2	No continuity
Switch pin free	3 – 4	Continuity
Switch pin pushed in	1 – 2	Continuity
Switch pin pushed in	3 – 4	No continuity

NG → **REPLACE STOP LAMP SWITCH ASSY**

OK

3	INSPECT ECM

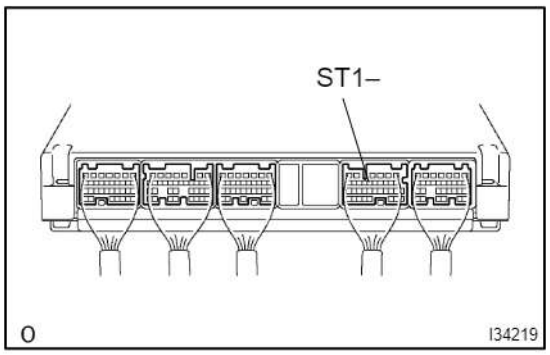


(a) Remove the ECM with connectors still connected.
(b) Turn the ignition switch to ON.
(c) Measure voltage between terminal STP of ECM connector and body ground when the brake pedal is depressed and released.

Standard:

Condition	Voltage (V)
Depressed	10 – 14
Released	Below 1

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(d) Measure voltage between terminal ST1– of ECM connector and body ground when the brake pedal is depressed and released.

Standard:

Condition	Voltage (V)
Depressed	Below 1
Released	10 – 14

OK → **CHECK AND REPLACE ECM (See page 01–35)**

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

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DTC	P0607/54	CONTROL MODULE PERFORMANCE

CIRCUIT DESCRIPTION

This DTC expresses the internal abnormalities of ECM.

DTC No.	Detection Item	Trouble Area
P0607/54	□Cruise control input signal abnormal. □Stop lamp switch input signal abnormal.	□ECM

INSPECTION PROCEDURE

1	CHECK AND REPLACE ECM (See page 01–35)

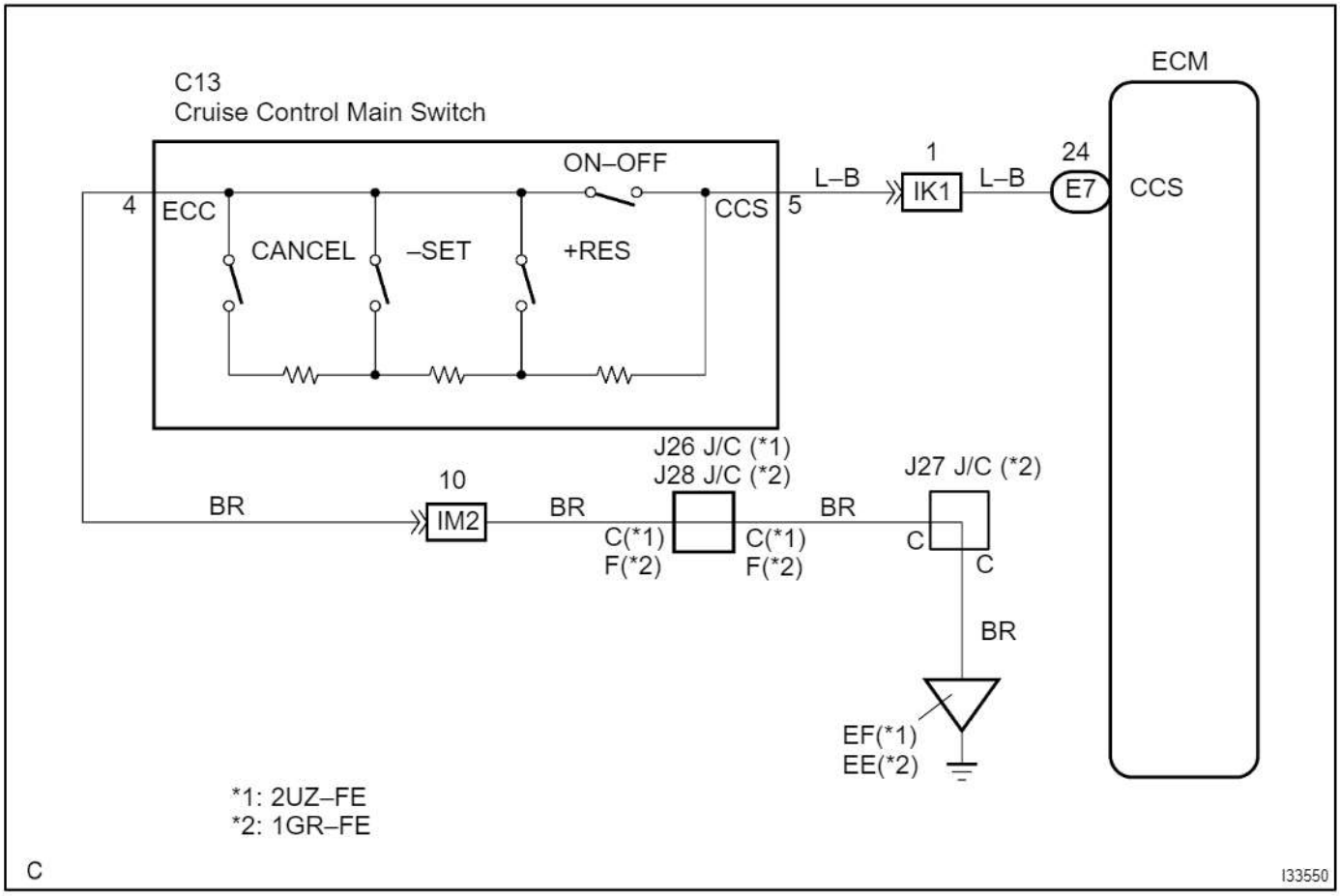
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CRUISE CONTROL SWITCH CIRCUIT

CIRCUIT DESCRIPTION

This circuit carries the –/SET, +/RES and CANCEL signals (each voltage) to the ECM.

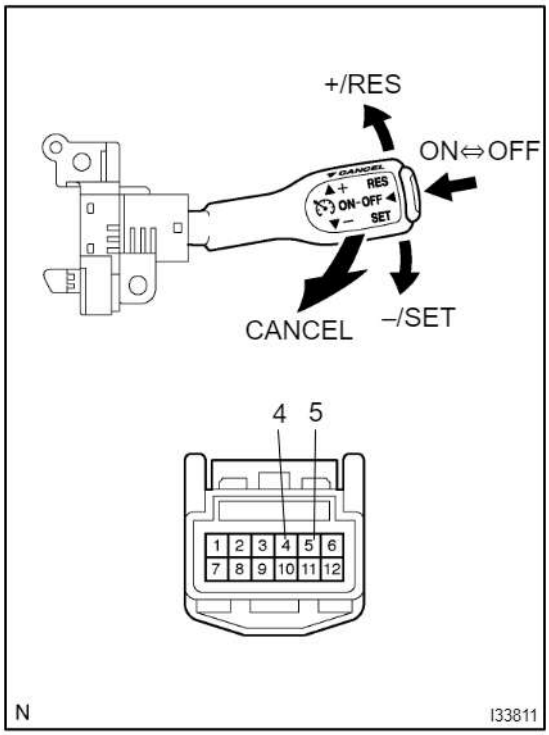
WIRING DIAGRAM



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INSPECTION PROCEDURE

1 INSPECT CRUISE CONTROL MAIN SWITCH



(a) Disconnect the cruise control main switch connector.

(b) Measure resistance between terminal 4 and 5 of the cruise control switch connector when cruise control main switch is operated.

Standard:

Switch position	Resistance (Ω)
Neutral	∞ (No continuity)
+/RES	210 – 270
–/SET	560 – 700
CANCEL	1,380 – 1,700

(c) Check continuity between terminals 4 and 5 of cruise control main switch connector when main switch button is held on and off.

Standard:

Switch position	Tester connection	Specification
OFF	4 – 5	No continuity
ON	4 – 5	Continuity

NG → **REPLACE CRUISE CONTROL MAIN SWITCH**

OK

2 CHECK HARNESS AND CONNECTOR(CRUISE CONTROL MAIN SWITCH, BODY GROUND – ECM)

(a) Check for open and short circuit in harness and connector between cruise control main switch and ECM (See page 01–35).

(b) Check for open and short circuit in harness and connector between cruise control main switch and body ground (See page 01–35).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (See page 05–1941)

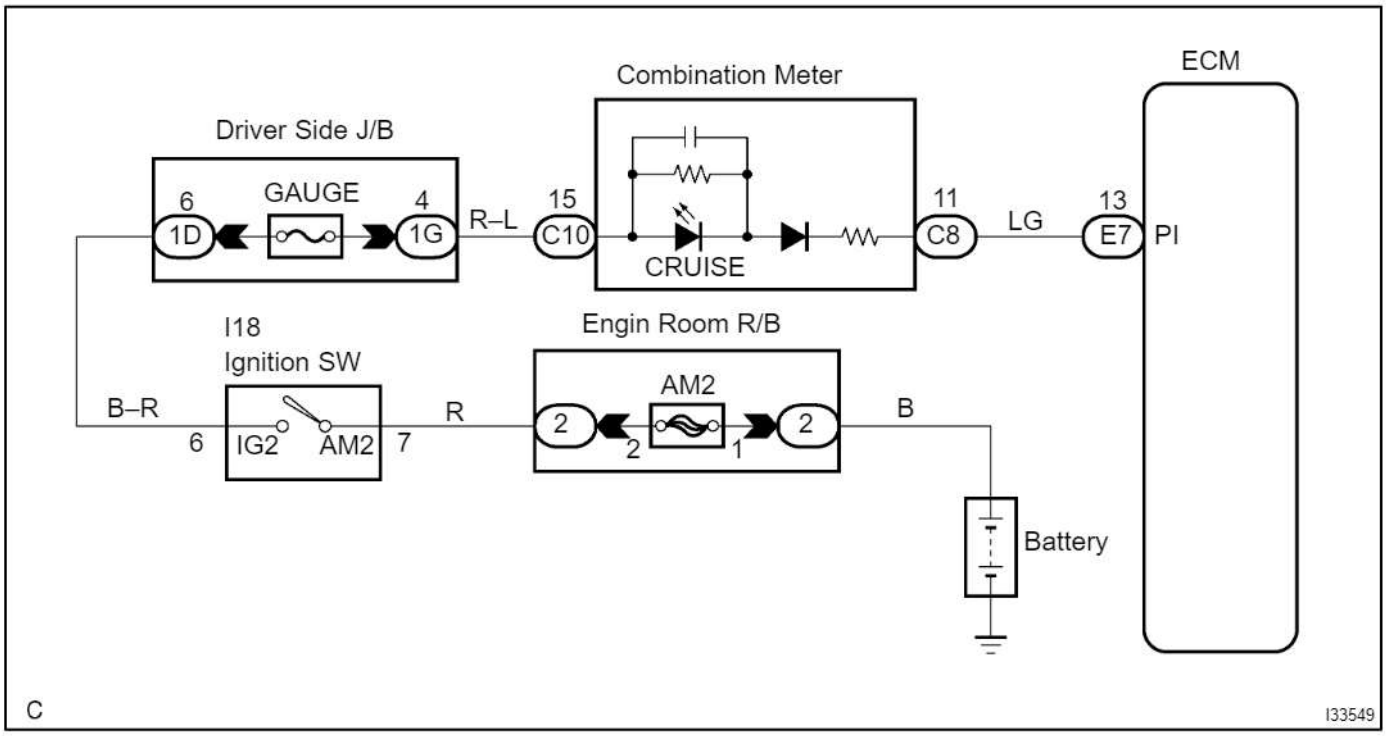
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CRUISE MAIN INDICATOR LIGHT CIRCUIT

CIRCUIT DESCRIPTION

When the cruise control main switch is turned off, the cruise control does not operate.

WIRING DIAGRAM



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INSPECTION PROCEDURE

1	INSPECT COMBINATION METER ASSY

(a) See combination meter troubleshooting on page 05–1687.

NG → REPAIR OR REPLACE COMBINATION METER ASSY

OK

2	CHECK HARNESS AND CONNECTOR(COMBINAITON METER ASSY – ECM)

(a) Check for open and short circuit in harness and connector between combination meter assy and ECM (See page 01–35).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (See page 05–1941)

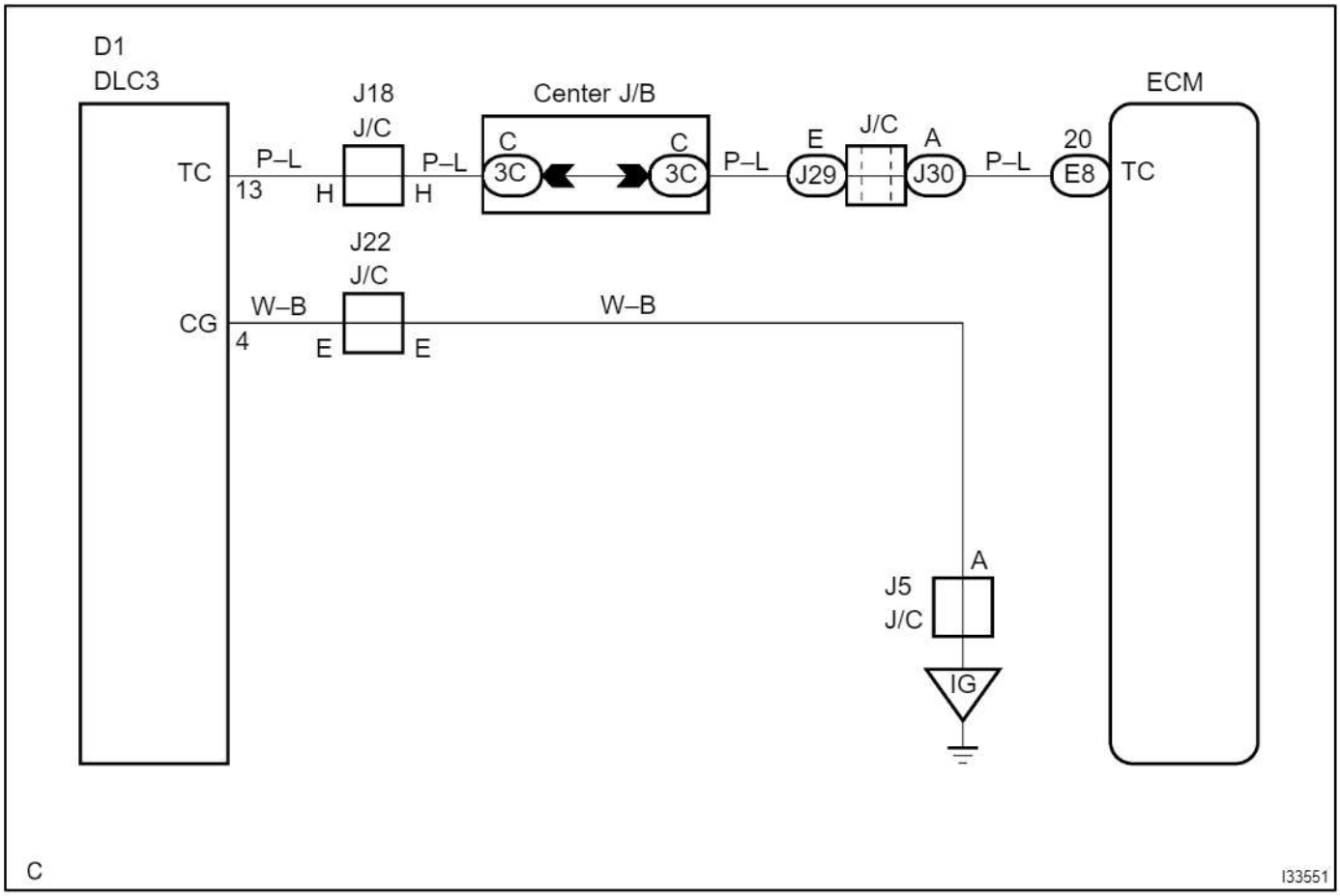
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DIAGNOSIS CIRCUIT

CIRCUIT DESCRIPTION

Making short circuit between terminal TC and CG of DLC3 will output DTC from the DLC3.

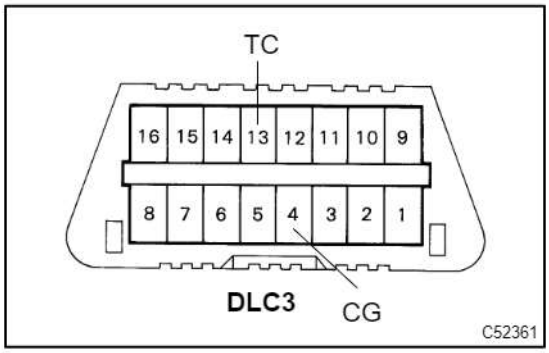
WIRING DIAGRAM



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INSPECTION PROCEDURE

1	INSPECT DLC3(TC TERMINAL VOLTAGE)



(a) Turn the ignition switch to ON.
(b) Measure voltage between terminals TC and CG of DLC3.
Standard:
10 – 14 V

OK	Go to step 3

NG

2	CHECK HARNESS AND CONNECTOR(DLC3 – BODY GROUND)

(a) Check for open and short circuit in harness and connector between terminal CG of DLC3 and body ground (See page 01–35).

NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

3	CHECK HARNESS AND CONNECTOR(DLC3 – ECM)

(a) Check for open and short circuit in harness and connector between terminal TC of DLC3 and ECM (See page 01–35).

NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

CHECK AND REPLACE ECM (See page 01–35)

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