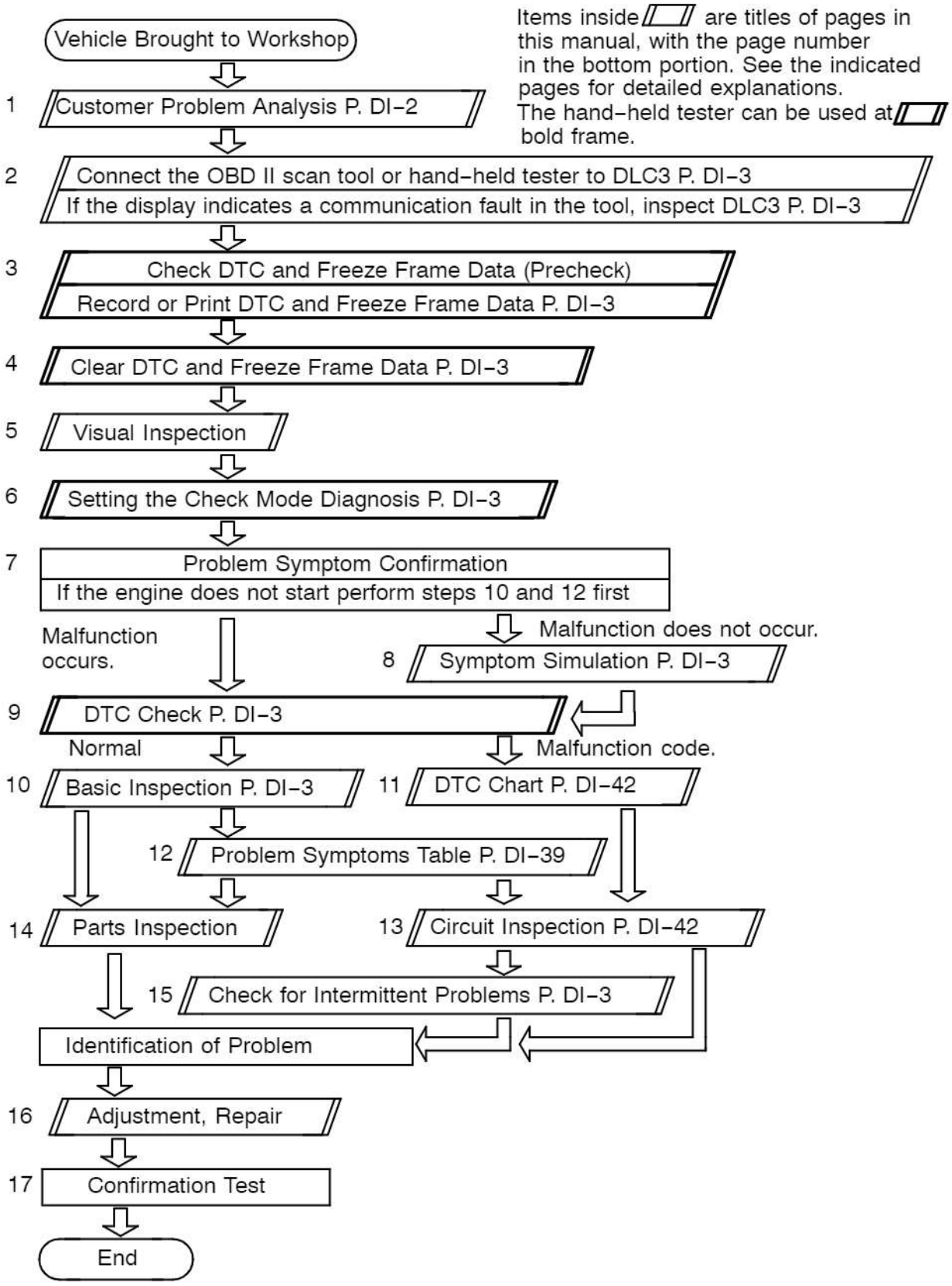
ENGINE (1ZZ–FE)

DI37Q–16

HOW TO PROCEED WITH TROUBLESHOOTING

Troubleshoot in accordance with the procedure on the following page.



DI37R–16

CUSTOMER PROBLEM ANALYSIS CHECK

ENGINE CONTROL SYSTEM Check Sheet

Inspector's Name

Customer's Name		VIN	
Driver's Name		Production Date	
Data Vehicle Brought in		Licence Plate No.	
Engine model		Odometer Reading	km miles

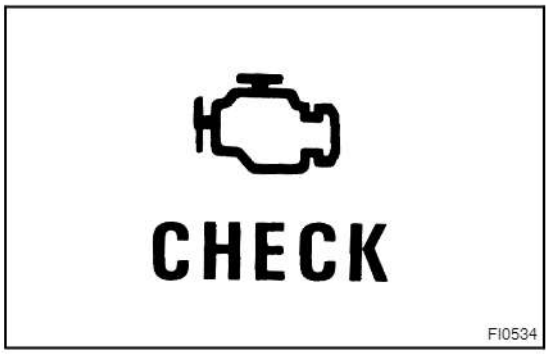
Problem Symptoms	☐ Engine does not Start	☐ Engine does not crank ☐ No initial combustion ☐ No complete combustion
	☐ Difficult to Start	☐ Engine cranks slowly ☐ Other _____
	☐ Poor Idling	☐ Incorrect first idle ☐ Idling rpm is abnormal ☐ High (rpm) ☐ Low (rpm) ☐ Rough idling ☐ Other _____
	☐ Poor Driveability	☐ 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	

Dates 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 light (MIL)		☐ Remains on ☐ Sometimes light 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 ( )

DID52–01

PRE–CHECK

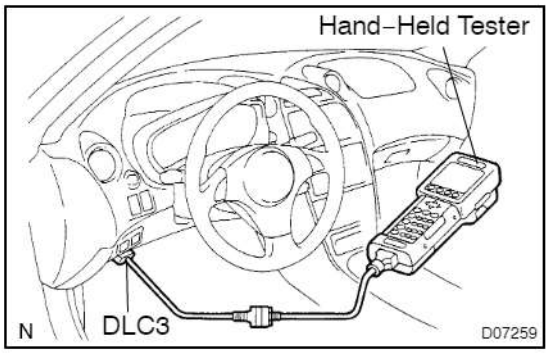


1. DIAGNOSIS SYSTEM

(a) 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 power train 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 DI–42).

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

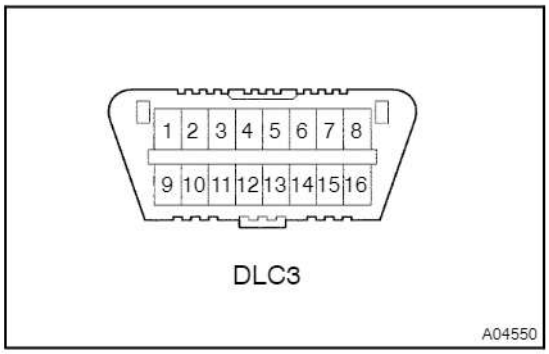


- To check the DTC, connect the hand–held tester or OBD II scan tool to the Data Link Connector 3 (DLC3) of the vehicle. The hand–held tester or OBD II scan tool also enables you to erase the DTC and check the freeze frame data and various forms of engine data (See the instruction manual for the OBD 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 DI–42).

- 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 step 3).
- *2 trip detection logic:
  When a malfunction is first detected, the malfunction is temporarily stored in the ECM memory. This is known as 1st trip detection. If the ignition switch is turned OFF and then ON again, and the same malfunction is detected again, the MIL will illuminate. This is known as 2nd trip detection.
- 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 determining 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 when a 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:

(1) DTCs other than fuel trim malfunction DTCs (P0171 and P0172) and misfire DTCs (P0300 to P0304).
(2) Fuel trim malfunction DTCs (P0171 and P0172).
(3) Misfire DTCs (P0300 to P0304).



(b) Check the 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.

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

HINT:
Connect the cable of 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.

(c) Inspect the battery voltage.
Battery Voltage: 11 to 14 V
If voltage is below 11 V, recharge the battery before proceeding.

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

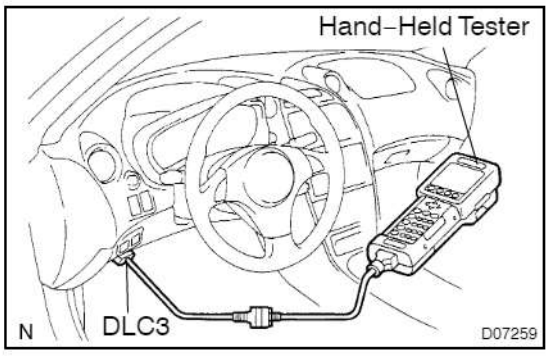
HINT:
If the MIL is not illuminated, troubleshoot the MIL circuit (See page DI–663).

(2) 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.

2. DTC CHECK (Normal Mode)

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.**



(a) Checking DTCs using the OBD II scan tool or hand–held tester.
  (1) Connect the OBD II scan tool or the hand–held tester to DLC3.
  (2) Turn the ignition switch ON.
  (3) 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.
  (4) See page DI–42 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 chart subject to "2 trip detection logic", perform either of the following actions.

- **Check the pending fault code:**
  For the hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / PENDING CODES.
- **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 come on 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.**

(b) Clearing the DTCs using the OBD II scan tool or the hand–held tester.
  (1) Connect the OBD II scan tool or the hand–held tester to the DLC3.
  (2) Turn the ignition switch ON.
  (3) 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.

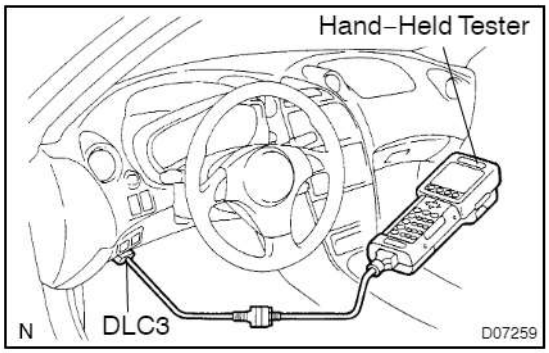
(c) Clearing the DTCs not using the OBD II scan tool or the hand–held tester.
  Remove the EFI fuse from the engine room J/B for more than 60 seconds, or disconnect the battery terminal for more than 60 seconds.
  After disconnecting the battery terminal, perform the "INITIALIZE procedure.

3. DTC CHECK (Check Mode)

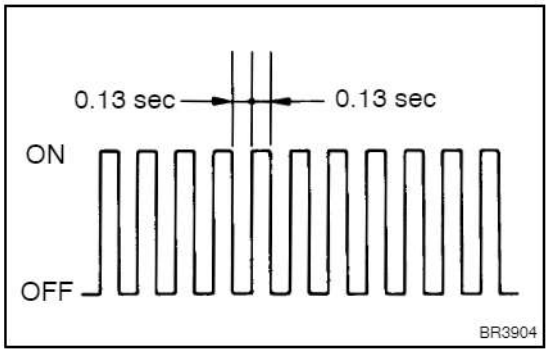
HINT:

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.



(a) Follow these steps when preparing to use the hand–held tester check mode.
  (1) Make sure that the items below are true:
    - Battery positive voltage 11 V or more
    - Throttle valve fully closed
    - Transmission in the 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) Change the ECM to check mode with the hand–held tester. Enter the following menus: DIAGNOSIS / ENHANCED OBD II / CHECK MODE. 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.

(6) Start the engine. The MIL should turn off after the engine starts.
(7) Simulate the conditions of the malfunction described by the customer.
(8) After simulating the malfunction conditions, use the hand–held tester diagnosis selector to check the DTC, freeze frame data and other data.
(9) After checking the DTC, inspect the applicable circuit.

(b) Clearing DTCs using the OBD II scan tool or the hand–held tester.
(1) Connect the OBD II scan tool or the hand–held tester to the DLC3.
(2) Turn the ignition switch ON.
(3) 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.

(c) Clearing the DTCs without using the OBD II scan tool or the hand–held tester.
Remove the EFI fuse from the engine room J/B for more than 60 seconds, or disconnect the battery terminal for more than 60 seconds.
After disconnecting the battery terminal, perform the "INITIALIZE" procedure.

4. FAIL–SAFE CHART

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

DTC No.	Fail–Safe Operation	Fail–Safe Deactivation Conditions
P0100	Ignition timing fixed at 5° BTDC	Returned to normal condition
P0110	Intake air temperature is fixed at 20°C (68°F)	Returned to normal condition
P0115	Engine coolant temperature is fixed at 80°(176°F)	Returned to normal condition
P0120	VTA is fixed at 0°	The following condition must be repeated at least 2 times consecutively VTA ≧ 0.1 V and ≦ 0.95 V
P0325	Max. timing retardation	Ignition switch OFF
P0336	Fuel cut	Returned to normal condition
P0351	Fuel cut	IGF signal is detected for 4 consecutive ignitions

5. CHECK FOR INTERMITTENT PROBLEMS

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 hand–held tester. In check mode, the ECM uses 1 trip detection logic, which has a higher sensitivity to malfunctions than normal mode (default), which uses 2 trip detection logic.

(a) Clear the DTCs. (See step 2)
(b) Set the check mode. (See step 3)
(c) Perform a simulation test (See page IN–30).
(d) Check the connector and terminal (See page IN–30).
(e) Wiggle the harness and connector (See page IN–30).

6. 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	**Is battery positive voltage 11 V or more when engine is stopped?**

NO → **Charge or replace battery.**

YES

2	**Is engine cranked?**

NO → **Proceed to page and continue to troubleshoot.**

YES

3	**Does engine start?**

NO → **Go to step 6.**

YES

4	**Check air filter.**

PREPARATION:

Remove the air filter.

CHECK:

Visual check that the air filter is not excessively dirty or oily.

NG → **Repair or replace.**

OK

5	**Check idle speed.**

PREPARATION:

(a) Warm up the engine to normal operating temperature.
(b) Switch off all accessories.
(c) Switch off air conditioning.
(d) Shift transmission into "N" position.
(e) Connect the OBD II scan tool or the hand–held tester to DLC3 on the vehicle.

CHECK:

Use CURRENT DATA to check the idle speed.

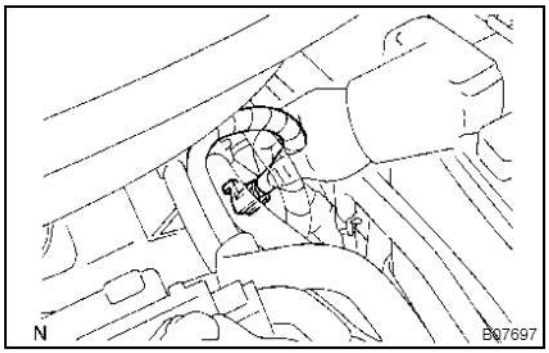
OK:

Idle speed: 650 to 750 rpm

NG → **Proceed to problem symptoms table on page DI–39.**

OK

6	Check fuel pressure.



PREPARATION:

(a) Be sure that enough fuel is in the tank.
(b) Connect the hand–held tester to the DLC3.
(c) Turn the ignition switch ON and push the hand–held tester main switch ON.
(d) Use ACTIVE TEST mode to operate the fuel pump.

HINT:

Please refer to the hand–held tester operator's manual for further details.

(e) If you have no hand–held tester, connect the positive (+) and negative (–) leads from the battery to the fuel pump connector (See page SF–1).

CHECK:

Check for fuel pressure in the fuel inlet hose when it is pinched off.

HINT:

At this time, you will hear a fuel flowing noise.

NG → **Proceed to page SF–1 and continue to troubleshoot.**

OK

7	**Check for spark.**

PREPARATION:

(a) Disconnect the ignition coil assembly from the spark plug.
(b) Remove the spark plug.
(c) Install the spark plug the ignition coil assembly.
(d) Disconnect the injector connector.
(e) Ground the spark plug.

CHECK:

Check if spark occurs while engine is being cranked.

NOTICE:

To prevent excess fuel being injected from the injectors during this test, don't crank the engine for more than 5 – 10 seconds at a time.

NG → **Proceed to page IG–1 and continue to troubleshoot.**

OK

Proceed to problem symptoms table on page DI–39.

7. 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 the 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 OFF.
(c) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(d) Turn the ignition switch ON.
(e) Push the "ON" button of the hand–held tester.
(f) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST.
(g) According to the display on tester, read the "DATA LIST".

Item	Measurement Item/Range (Display)	Normal Condition*1	Diagnostic Note
INJECTOR	Injection period of the No.1 cylinder/ Min.: 0 ms, Max.: 32.64 ms	Idling: 1.1 to 2.1 ms	–
IGN ADVANCE	Ignition timing advance for No.1 cylinder/ Min.: –64 deg., Max.: 63.5 deg.	Idling: BTDC 10 to 18°.	–
IAC DUTY RATIO	Duty ratio of the IAC valve/ Min: 0 %, Max: 99 %	Idling: 25 to 35 %	–
CALC LOAD	Calculated load by ECM/ Min.: 0%, Max.: 100%	• Idling: 11.3 to 16.0% • Racing without load (2,500 rpm): 12.3 to 17.9%	–
MAF	Air flow rate from MAF sensor/ Min.: 0 gm/s, Max.: 655 gm/s	• Idling: 1.4 to 2.0 gm/sec. • Racing without load (2,500 rpm): 5.4 to 7.9 gm/sec.	If value is approximately 0.0 gm/s: • Mass air flow meter power source circuit open • VG circuit open or short If value is 160.0 gm/s or more: • E2G circuit open
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 (–40°F): sensor circuit is open. • If value is 140°C (284°F) or more: sensor circuit is shorted.
INTAKE AIR	Intake air temperature/ Min.: –40 °C, Max.: 140 °C	Equivalent to ambient temp. (After cold soak)	
THROTTLE POS	Absolute throttle position sensor/ Min.: 0%, Max.: 100%	• Throttle fully closed: 6 to16% • Throttle fully open: 64 to 98%	Read value with the ignition switch ON (Do not start engine).
VEHICLE SPD	Vehicle speed/ Min.: 0 km/h, Max.: 255 km/h	Vehicle stopped: 0 km/h (0 mph)	Speed indicated on speedometer
O2S B1 S1	Oxygen sensor output voltage of the bank 1 sensor 1/ Min.: 0 V, Max.: 1.275 V	Idling: 0.1 to 0.9 V	Performing INJ VOL or A/F CONTROL function of ACTIVE TEST enables the technician to check the voltage output of each sensor.
O2S B1 S2	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	Performing INJ VOL or A/F CONTROL function of ACTIVE TEST enables the technician to check the voltage output of each 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
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: 0.8 to 1.2	–
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 #2
O2 LR B1 S1	Response time of the O2 sensor lean to rich (bank 1, sensor 1)/ Min.: 0 ms, Max.: 16,711 ms	Idling after warming up: 0 to 1,000 ms	–
O2 RL B1 S1	Response time of the O2 sensor rich to lean (bank 1, sensor 1)/ Min.: 0 ms, Max.: 16,711 ms	Idling after warming up: 0 to 1,000 ms	–
IGNITION	Ignition counter/ Min.: 0, Max.: 400	0 to 400	–
CYL #1 – CYL #4	Misfire ratio of the cylinder/ Min.: 0%, Max.: 50%	0%	This item is displayed in only idling
CTP SW	Closed throttle position switch/ ON or OFF	• Throttle fully closed: ON • Throttle open: OFF	–
FUEL SYS #1	Fuel system status (Bank1)/ OL or CL or OLDRIVE or OL-FAULT or CLFAULT	Idling after warming up: CL	• OL: Open Loop–has not yet satisfied conditions to go closed loop. • CL: Closed Loop–using oxygen sensor (s) as feed back for fuel control. • OL DRIVE: Open loop due to driving conditions (Power enrichment, deceleration enlargement). • OL FAULT: Open loop due to detected system fault. • CL FAULT: Closed loop, but fault with at least one oxygen sensor may be using single oxygen sensor for fuel control.
FC IDL	Idle fuel cut/ ON or OFF	Fuel cut operation: ON	FC IDL = "ON" when throttle valve 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 range: ON	–
ELECT LOAD SIG	Electrical load signal/ ON or OFF	Defogger switch ON: ON	–
STOP LIGHT SW	Stop light switch/ ON or OFF	• Brake pedal depressed: ON • Brake pedal released: OFF	–
PS OIL PRESS SW	Power steering signal/ ON or OFF	Steering position is; center: OFF Except center: ON	–
PS SIGNAL	Power steering signal/ ON or OFF	• After engine start: OFF • After steer the steering: ON	–
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 operating: ON
VVT CTRL B1	VVT control status (Bank 1)/ ON or OFF	VVT system operation: ON	–

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

8. ACTIVE TEST

HINT:

Performing the ACTIVE TEST using the hand–held tester or the OBD II scan tool 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 diagnostic 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 hand–held tester or the OBD II scan tool to the DLC3.
(d) Turn the ignition switch ON.
(e) Push the "ON" button of the hand–held tester or the OBD II scan tool.
(f) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST.
(g) According to the display on tester, perform the "ACTIVE TEST".

Item	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%
CAN CTRL VSV	[Test Details] Activate the VSV for canister control. ON or OFF	–
TANK BYPASS VSV	[Test Details] Activate the VSV for tank bypass. 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 speed. ON or OFF	–
INTAKE AIR CTL VSV	[Test Details] Activate the VSV for intake air control. 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
TC/TE1	[Test Details] Connect the TC and TE1. ON or OFF	Switch to the same state as the connection between terminal TC and TE1.
FC IDL PROHBT	[Test Details] Control the idle fuel cut prohibit. ON or OFF	–

9. 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	A group of diagnostic trouble codes that are output by the ECM based on the same malfunction detection logic.
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. When a sensor is being monitored, the next sensor or component will not be monitored until the 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 the malfunction only one time during a single driving cycle. "Continuous" means that the ECM detects 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 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.

10. TOYOTA/LEXUS 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 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 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
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 immobiliser system, Immobiliser system	Vehicle anti–theft system

11. The monitor will run whenever the following DTCs are not present (Monitor disablement List)

HINT:

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

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 Sensor 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 Sensor - 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																													
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 Sensor Heater - Sensor3																													
	P0100-P0103	MAF sensor																													
	P0101	MAF sensor												X																	
	P0105-P0108	MAP sensor																													
	P0106	MAP sensor												X																	
	P0110-P0113	IAT sensor																													
	P0115-P0118	ECT sensor																													
	P0116	ECT sensor																													
	P0120-P0223,P2135	TP sensor																													
	P0125	Insufficient ECT for Closed Loop																													
	P0128	Thermostat																				X	X	X	X	X	X	X	X		
	P0130-P0153	O2 Sensor -Sensor1																					X								
	P0134,P0154	O2 Sensor, A/F Sensor(No Activity) - Sensor1																				X			X	X					
	P0136,P0156	O2 Sensor - Sensor2																							X	X					
	P0142,P0162	O2 Sensor - Sensor3																				X	X	X	X	X	X	X	X		
	P0171,P0172	Fuel system																													
	P0300-P0308	Misfire																				X	X	X	X	X	X	X	X		
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 Adsorption 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	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)																														
	P0402	EGR system (open)																														
	P0405,P0406	EGR Lift sensor																														
	P0409	EGR Lift sensor																														
	P0420,P0430	Catalyst																														
	P0440-P0446	EVAP system																														
	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																														
	P0715-P0717	Input speed sensor																														
	P0724	Stop lamp switch																														
	P0741-P0796	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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Note *1: Without input the speed sensor

Note *2: With input the speed sensor

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	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
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 Adsorption 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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Note *1: Without input the speed sensor

Note *2: With input the speed sensor

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																												
	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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Note *1: Without input the speed sensor

Note *2: With input the speed sensor

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 Adsorption 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
	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 Adsorption 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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Note *1: Without input the speed sensor

Note *2: With input the speed sensor

12. O2S TEST RESULT

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 "snap shot" value that is 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:

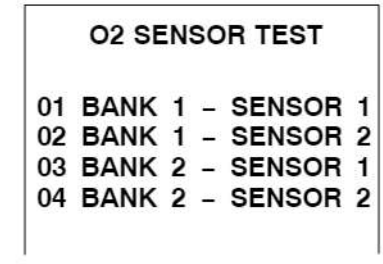
(1) TEST ID (a code applied to each TEST DATA)
(2) Description of TEST DATA
(3) Conversion Factor (When Conversion Factor has a value written in the table, multiply the TEST DATA value appearing on the scan tool by the Conversion Factor value. The result will be the required value.)
(4) Unit
(5) Standard 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 border line of the standard value, the O2S may malfunction very soon.

HOW TO READ O2S TEST RESULT USING HAND–HELD TESTER

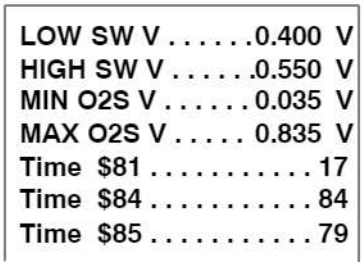
(a) Connect the hand–held tester to the DLC3.

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.

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	Standard Value
$81	Percentage of monitoring time when the HO2S voltage is less than 0.05V	Multiply 0.3906	%	Within 60 %

13. CHECKING MONITOR STATUS

NOTICE:

The monitor status (mode 6) is not applicable to the heated oxygen sensor (HO2S). However, HO2S test values can be checked by O2S TEST RESULT (mode 5). Refer to step 12.

(a) Outline

The monitor results and the test values can be checked with the OBDII scan tool.

The engine control module (ECM) monitors the emissions–related components as the thermostat, catalyst converter and evaporative emissions (EVAP), and determines whether they are functioning normally or not. When finished monitoring, the ECM stores the monitor results and the test values.

The monitor result indicates whether the component is functioning normally or not. The test value is the value that was used to determine the monitor result. If the test value is outside the test limit (malfunction criterion), the ECM determines the component is malfunctioning. Some emissions–related components have multiple test values to determine monitor result. If one of these test values is outside test limit, the ECM determines the component is malfunctioning.

(b) Description

The test value and test limit information are described as shown in the following table. This information is included under "MONITOR RESULT" in the emissions–related DTC sections:

TID $08: Thermostat

TLT	CID	Unit Conversion	Description of Test Value	Description of Test Limit
1	$01	Multiply by 0.625 and subtract 40 [°C]	ECT sensor output when estimated ECT has reached to malfunction criterion	Malfunction criterion for thermostat

- TID (Test Identification Data) is assigned to each emissions–related component.
- TLT (Test Limit Type):
  If TLT is 0, the component is malfunctioning when the test value is higher than the test limit.
  If TLT is 1, the component is malfunctioning when the test value is lower than the test limit.
- CID (Component Identification Data) is assigned to each test value.
- Unit Conversion is used to calculate the test value indicated on generic OBDII scan tools.

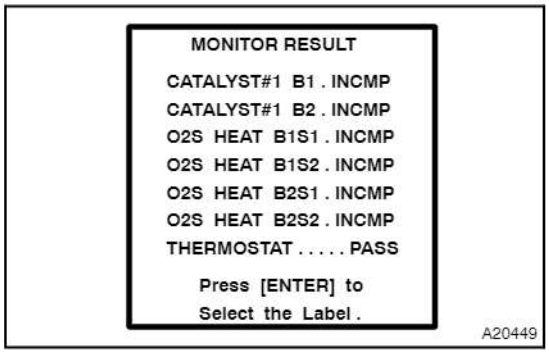
(c) Procedure (using hand–held tester)

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

(2) Turn the ignition switch and hand–held tester ON.

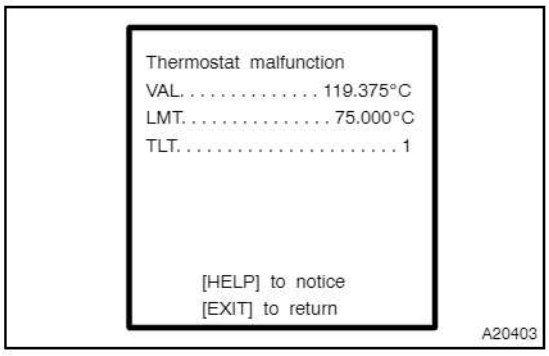
(3) Clear DTCs.

(4) Allow the vehicle to drive, in accordance with the applicable drive pattern described in the READINESS MONITOR DRIVE PATTERN section
(see page DI–33)



(5) Select the hand–held tester menus: DIAGNOSIS, ENHANCED OBDII, MONITOR INFO and MONITOR RESULT. The monitor result appears after the component name.

- INCMP indicates the component has not been monitored yet.
- PASS indicates the component is functioning normally.
- FAIL indicates the component is malfunctioning.



(6) Select the component and press ENTER. If the monitor result has been PASS or FAIL, the accuracy test value appears.

- VAL indicates the test value.
- LMT indicates the test limit (malfunction criterion).
- TLT indicates the test limit type.

(7) Compare the test value with the test limit.

- If TLT is 0, the component is malfunctioning when the test value is higher than the test limit.
- If TLT is 1, the component is malfunctioning when the test value is lower than the test limit.
- If the test value is on the borderline of the test limit, a malfunction is concealed in the component.

HINT:

- The monitor result might on rare occasions be PASS even if the malfunction indicator lamp (MIL) is illuminated. This indicates the system malfunctioned on a previous driving cycle. This might be caused by an intermittent problem.

DID53–01

REGISTRATION

NOTICE:

The Vehicle Identification Number (VIN) must be input into the replaced ECM.

HINT:

The VIN is a 17–digit alphanumeric vehicle identification number. A hand–held tester is required to register the VIN.

1. DESCRIPTION

This registration section consists of three parts, Input Instructions, Read VIN and Write VIN.

(a) Input Instructions: Explains the general VIN input instructions using a hand–held tester.

(b) Read VIN: Explains the VIN reading process in a flowchart. This process allows the VIN stored in the ECM to be read, in order to confirm that the two VINs, provided with the vehicle and stored in the vehicle's ECM, are the same.

(c) Write VIN: Explains the VIN writing process in a flowchart. This process allows the VIN to be input into the ECM. If the ECM is changed, or the VINs do not match, the VIN can be registered, or overwritten in the ECM by following this procedure.

2. INPUT INSTRUCTIONS

(a) Hand–held tester

The arrow buttons (UP, DOWN, RIGHT and LEFT) and numerical buttons (0 to 9) are used, in order to input the VIN.

(b) Cursor Operation

To move the cursor around the tester screen, press the RIGHT and LEFT buttons.

(c) Alphabetical Character Input

(1) Press the UP and DOWN buttons to select the desired alphabetical character.

(2) After selection, the cursor should move.

(d) Numeric Character Input

(1) Press the numerical button corresponding to the number that you want to input.

(2) Select or input the correct character using the UP/DOWN buttons, or the numerical buttons.

HINT:

Numerical characters can be selected by using the UP and DOWN buttons.

(e) Correction

(1) After input, the cursor should move.

(2) When correcting the input character(s), put the cursor onto the character using the RIGHT or LEFT button.

(f) Finishing Input Operation

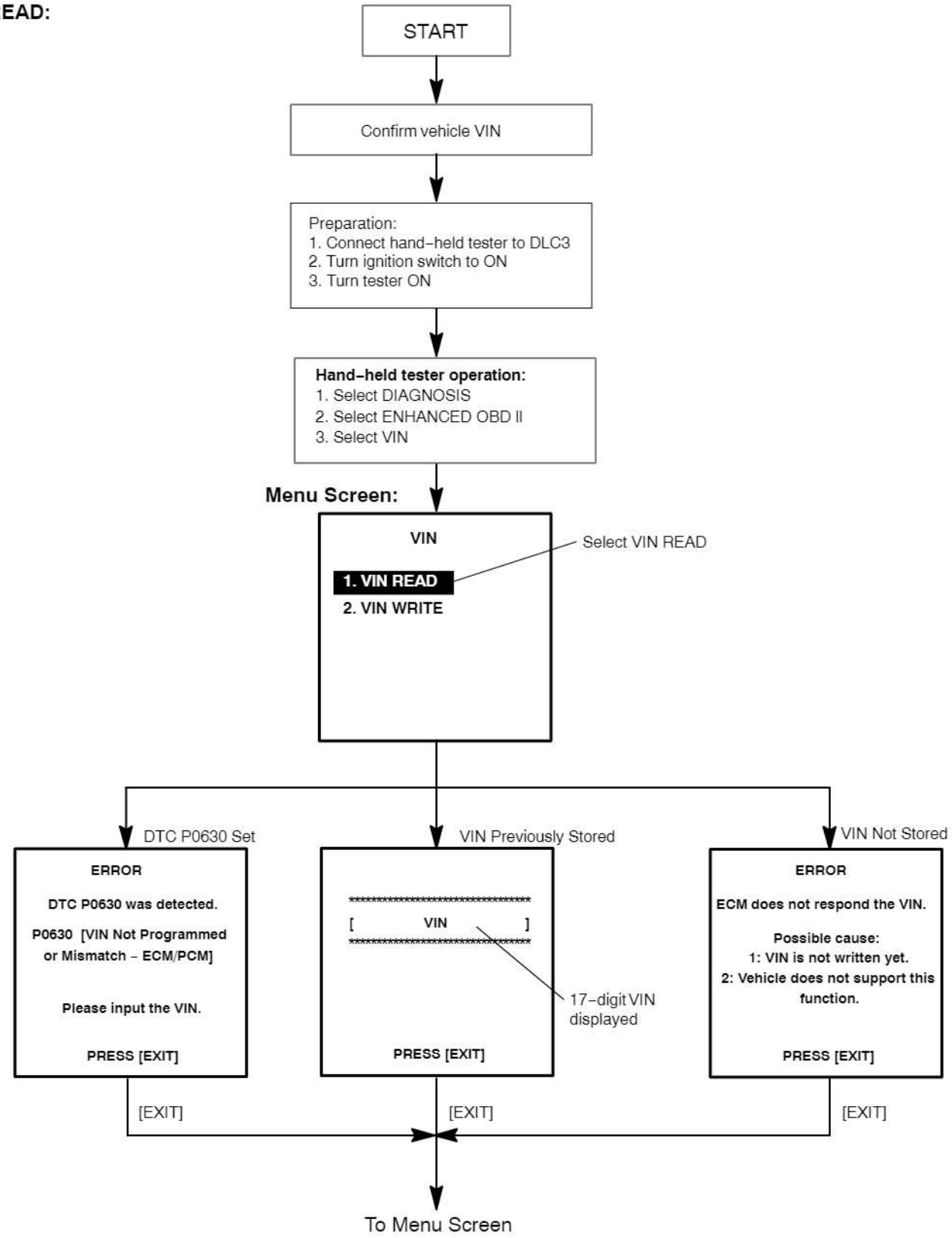
(1) Make sure that the input VIN matches the vehicle VIN after input.

(2) Press the ENTER button on the tester.

3. READ VIN (Vehicle Identification Number)

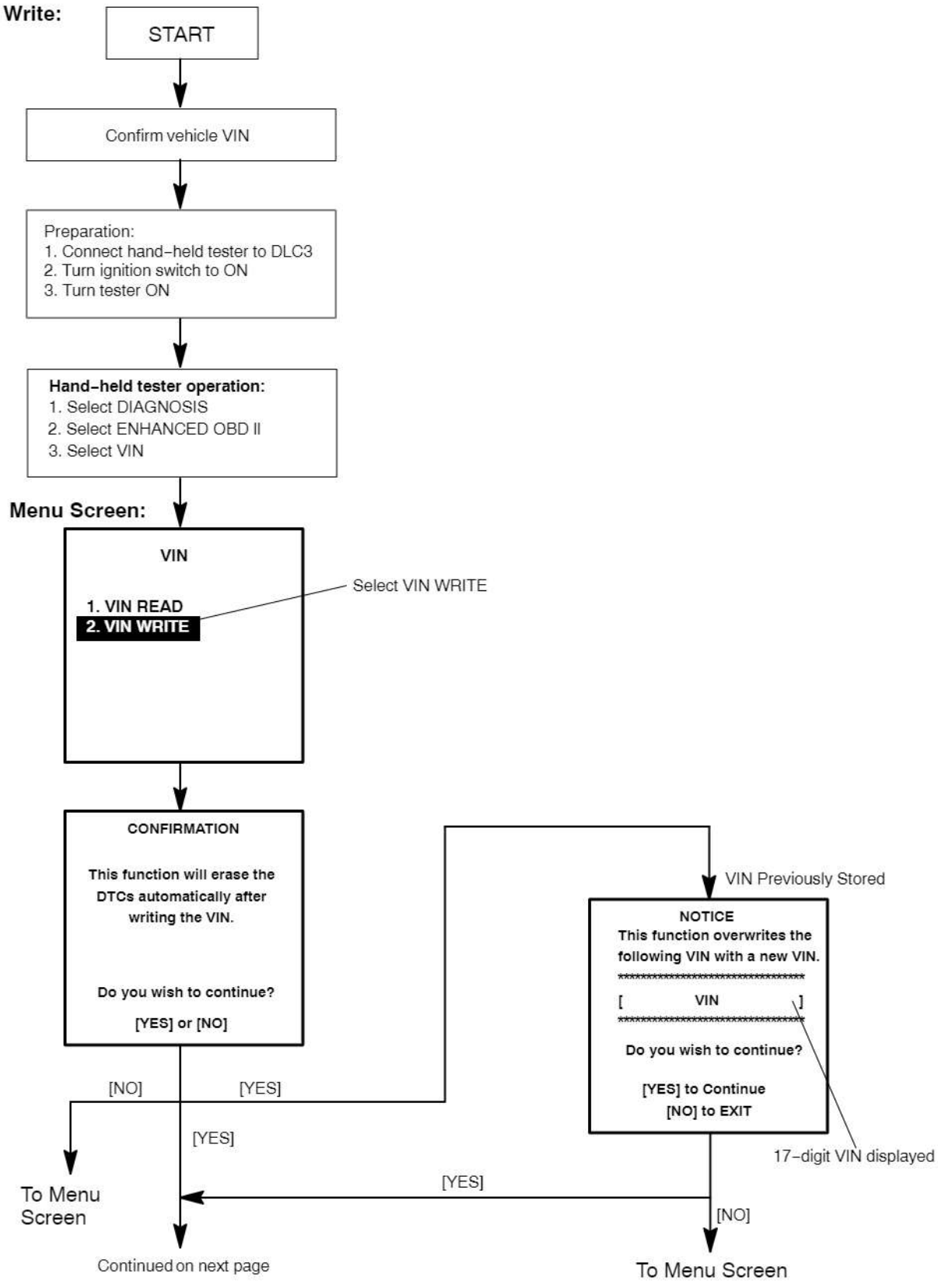
(a) Read VIN using a hand–held tester.

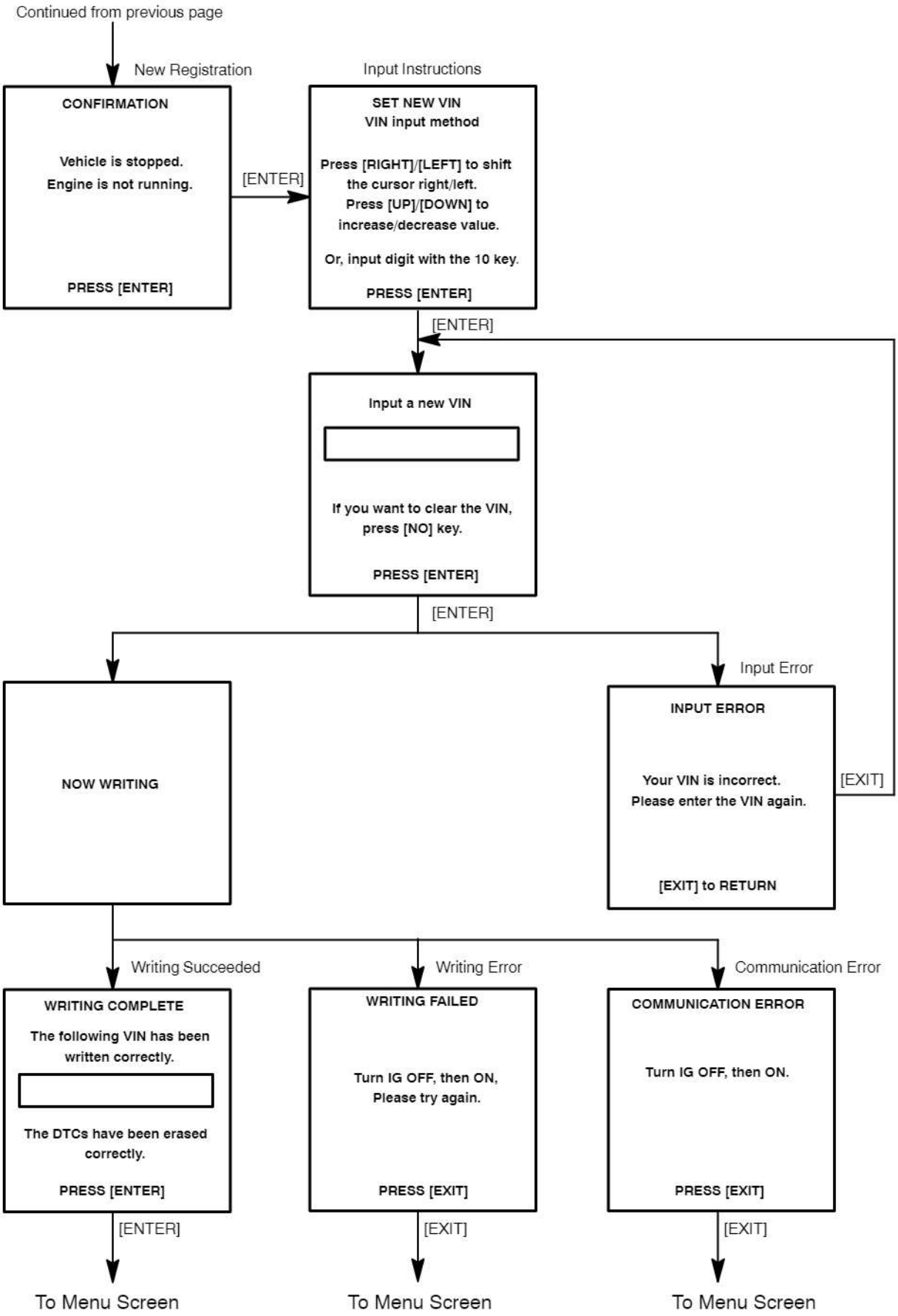
READ:



4. WRITE VIN

(a) Write VIN using the hand–held tester.




Continued from previous page
New Registration
Input Instructions
CONFIRMATION
Vehicle is stopped.
Engine is not running.
PRESS [ENTER]
[ENTER]
SET NEW VIN
VIN input method
Press [RIGHT]/[LEFT] to shift the cursor right/left.
Press [UP]/[DOWN] to increase/decrease value.
Or, input digit with the 10 key.
PRESS [ENTER]
[ENTER]
Input a new VIN
If you want to clear the VIN, press [NO] key.
PRESS [ENTER]
[ENTER]
NOW WRITING
Input Error
INPUT ERROR
Your VIN is incorrect.
Please enter the VIN again.
[EXIT] to RETURN
[EXIT]
Writing Succeeded
Writing Error
Communication Error
WRITING COMPLETE
The following VIN has been written correctly.
The DTCs have been erased correctly.
PRESS [ENTER]
WRITING FAILED
Turn IG OFF, then ON,
Please try again.
PRESS [EXIT]
COMMUNICATION ERROR
Turn IG OFF, then ON.
PRESS [EXIT]
[ENTER]
[EXIT]
[EXIT]
To Menu Screen
To Menu Screen
To Menu Screen

DIBQV–08

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 in the form of Diagnostic Trouble Codes (DTCs). Since the various components need to be monitored during different driving conditions, the OBD II system is designed to run separate monitoring programs called Readiness Monitors. Many state Inspection and Maintenance (I/M) programs require that vehicles complete their Readiness Monitors prior to beginning an emission test.
- The current status of the Readiness Monitors can be seen by using the hand–held tester with version 9.0 software (or newer), or a generic OBD II Scan tool.
- To view the Readiness Monitor status using the hand–held tester, select "Monitor Status" from the Enhanced OBD II Menu.
- A status of "complete" indicates that the necessary conditions have been met to run the performance tests for the related Readiness Monitor.
- The Readiness Monitor will be reset to "incomplete" if:
  - ECM has lost power (battery or fuse).
  - DTCs have been cleared.
  - The conditions for running the Readiness Monitor have not been met.
- In the event that any Readiness Monitor shows "incomplete," follow the appropriate Readiness Monitor Drive Pattern to active the monitor and change the readiness status to "complete."

CAUTION:

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

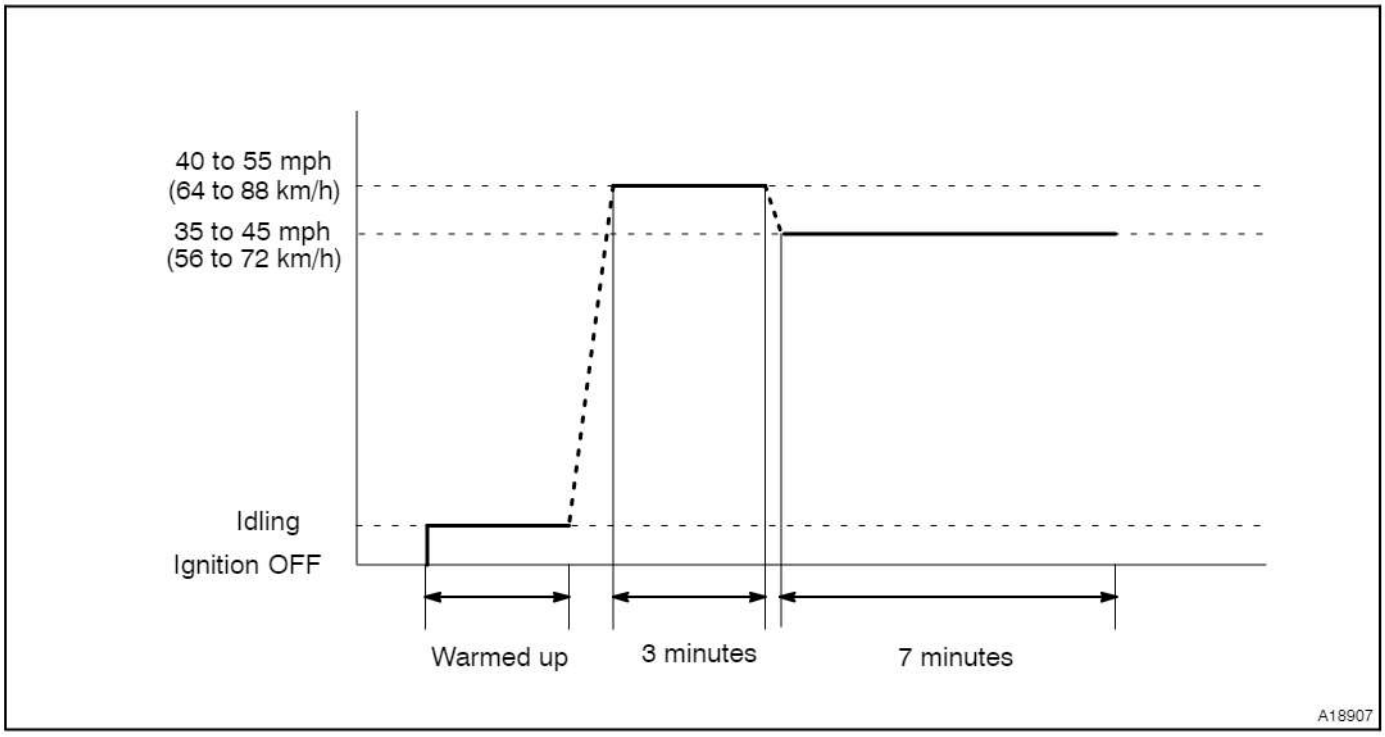
NOTICE:

These drive patterns represent the fastest method to satisfy all necessary conditions which allow the specific readiness monitor to complete.

In the event that the drive pattern must be interrupted (possibly due to traffic conditions or other factors) the drive pattern can be resumed, and in most cases, the readiness monitor will still set to "complete".

To ensure rapid completion of readiness monitors, avoid sudden changes in vehicle load and speed (driving up and down hills and/or sudden acceleration).

2. CATALYST MONITOR (O2S TYPE)



(a) Preconditions

The monitor will not run unless:

- MIL is OFF.
- Engine Coolant Temperature (ECT) is 75°C (167°F) or greater.
- Intake Air Temperature (IAT) is –10°C (14°F) or greater.

NOTICE:

The readiness test can be completed in cold ambient conditions (less than –10°C / 14°F), if the drive pattern is repeated a second time after cycling the ignition off.

(b) Drive Pattern

(1) Connect the OBD II scan tool to the DLC3 to check monitor status and preconditions.

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

NOTICE:

Drive with smooth throttle operation and avoid sudden acceleration.

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

(3) Drive the vehicle at 35 to 45 mph (56 to 72 km/h) for approximately 7 minutes.

NOTICE:

Drive with smooth throttle operation and avoid sudden deceleration as much as possible with the throttle fully closed.

(4) If readiness status does not switch to complete, make sure that the preconditions are met and the ignition switch is turned OFF and then repeat steps (2) and (3).

(5) Release pressure in the fuel tank by removing and then reinstalling the fuel tank cap.

(6) Start the engine and immediately begin driving as directed.

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
- Altitude is 7,800 feet (2,400m) or less

(b) Cold Soak Procedure

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

HINT:

Examples:

- Scenario 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 difference between ECT and IAT is greater than 7°C (13°F)

- Scenario 2

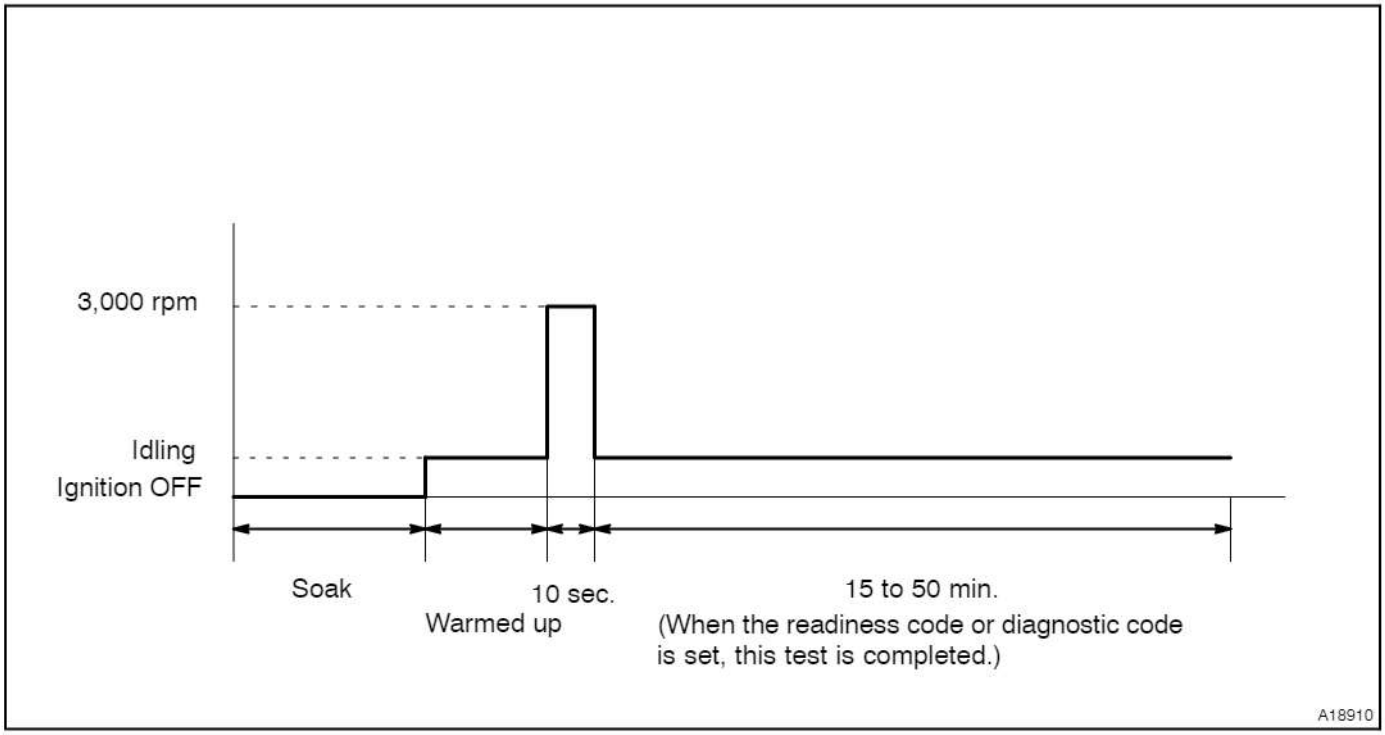
  ECT = 21°C (70°F)

  IAT = 20°C (68°F)

  Difference between ECT and IAT is 1°C (2°F)

  → The monitor will run because difference between ECT and IAT is less than 7°C (13°F)

4. EVAP MONITOR (VACUUM PRESSURE MONITOR) (CONTINUED)



(a) Preconditions

The monitor will not run unless:

- MIL is OFF
- Fuel level is approximately 1/2 to 3/4
- Altitude is 7,800 feet (2,400 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)
- 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:

Examples:

- Scenario 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 difference between ECT and IAT is higher than 7°C (13°F)
- Scenario 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 difference between ECT and IAT is less than 7°C (13°F)

The readiness test can be completed in cold ambient conditions (less than 40°F / 4.4°C) and/or at high altitudes (more than 7,800 feet / 2,400 m) if the drive pattern is repeated a second time after cycling the ignition off.

(b) Drive Pattern

(1) Connect the OBDII scan tool to DLC3 to check monitor status and preconditions (refer to "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 becomes 75°C (167°F) or higher.

(4) Run the engine at 3,000 rpm for about 10 seconds.

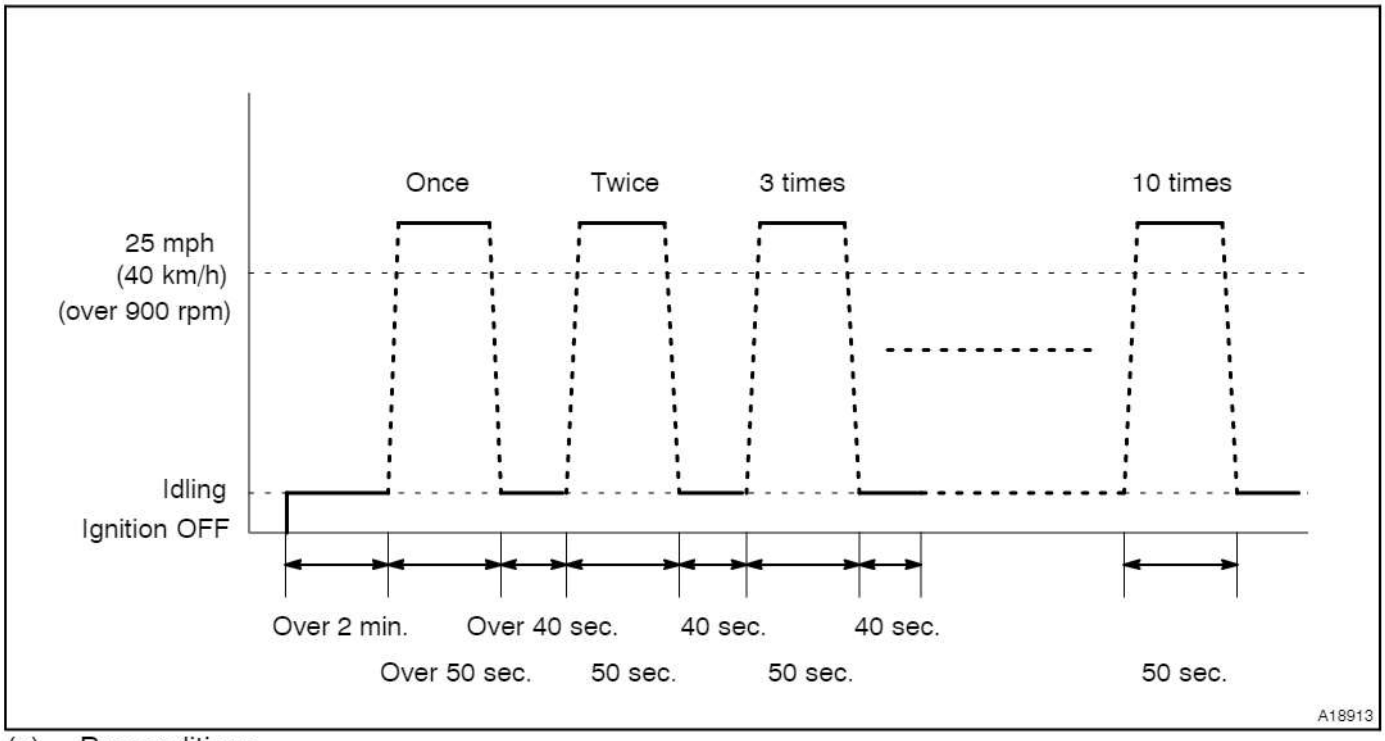
(5) Allow the engine to idle with the A/C ON (to create slight load) for 15 to 50 minutes.

NOTICE:

If the vehicle is not equipped with A/C, put a slight load on the engine by doing the following :

- **Securely set the parking brake.**
- **Block the drive wheels with wheel chocks.**
- **Allow the vehicle to idle in drive for 15 to 50 minutes.**

5. 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 OBDII 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.

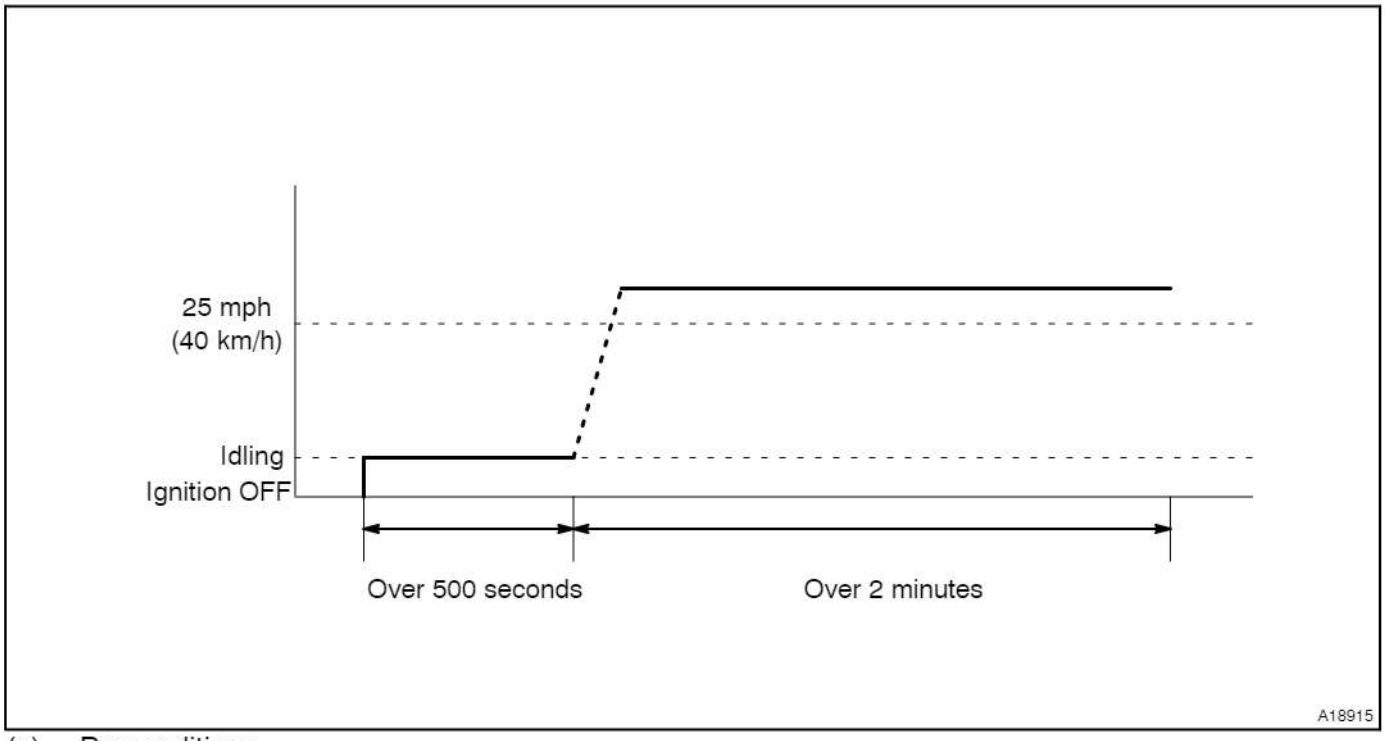
(3) Drive the vehicle at 25 mph (40 km/h) or more for at least 50 seconds.

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

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

(6) Check the status of the readiness monitor on the scan tool display. If readiness status did not switch to complete, ensure preconditions are met, turn the ignition off and then repeat steps (1) and (5).

6. OXYGEN SENSOR HEATER MONITOR



(a) Preconditions

The monitor will not run unless:

- MIL is OFF

(b) Drive Pattern

(1) Connect the OBDII scan tool to the 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 2 minutes.

(4) Check the status of the readiness monitor on the scan tool display. If readiness status did not switch to complete, ensure the preconditions are met, turn the ignition off and then repeat steps (2) and (3).

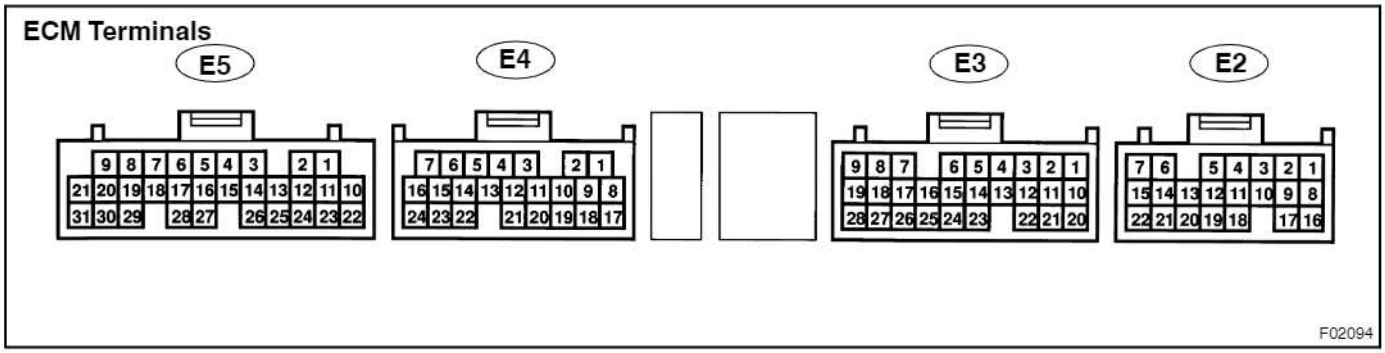
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PROBLEM SYMPTOMS TABLE

Symptom	Suspect Area	See page
Engine does not crank (Does not start)	10.Starter 11.Starter relay 12.Park/neutral position switch	ST–1 ST–17 DI–789
No initial combustion (Does not start)	1. ECM power source circuit 2. Fuel pump control circuit 3. Engine control module (ECM)	DI–279 DI–284 IN–20
No complete combustion (Does not start)	1. Fuel pump control circuit	DI–284
Engine cranks normally but difficult to start	1. Starter signal circuit 2. Fuel pump control circuit 3. Compression	DI–268 DI–284 EM–3
Difficult to start with cold engine	1. Starter signal circuit 2. Fuel pump control circuit	DI–268 DI–284
Difficult to start with hot engine	1. Starter signal circuit 2. Fuel pump control circuit	DI–268 DI–284
High engine idle speed (Poor idling)	1. A/C switch circuit 2. ECM power source circuit	– DI–279
Low engine idle speed (Poor idling)	1. A/C switch circuit 2. Fuel pump control circuit	– DI–284
Rough idling (Poor idling)	1. Compression 2. Fuel pump control circuit	EM–3 DI–284
Hunting (Poor idling)	1. ECM power source circuit 2. Fuel pump control circuit	DI–279 DI–284
Hesitation/Poor acceleration (Poor driveability)	1. Fuel pump control circuit 2. A/T faulty	DI–284 DI–785
Surging (Poor driveability)	1. Fuel pump control circuit	DI–284
Engine stalls soon after starting	1. Fuel pump control circuit	DI–284
Engine stalls during A/C operation	1. A/C switch circuit 2. Engine control module (ECM)	– IN–20
Unable to refuel/Difficult to refuel	1. ORVR system	–

DI37V–18

TERMINALS OF ECM



Each ECM terminals standard normal voltage is shown in the table below. In the table, first follow the information under "Condition".
Look under "Symbols (Terminals No.)" for the terminals to be inspected.
The standard normal 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
BATT (E2 – 1) – E1 (E4 – 17)	W – BR	Always	9 to 14 V
FC (E2 – 3) – E1 (E4 – 17)	G–R – BR	IG switch ON	9 to 14 V
		Idling	0 to 0.3 V
PTNK (E2 – 4) – E1 (E4 – 17)	L–B – BR	IG switch ON, fuel cap taken off	2.9 to 3.7 V
IGSW (E2 – 8) – E1 (E4 – 17)	B–O – BR	IG switch ON	9 to 14 V
W (E2 – 15) – E1 (E4 – 17)	R–B – BR	Idling	9 to 14 V
		IG switch ON	Below 3.0 V
+B (E2 – 16) – E1 (E4 – 17)	B–R – BR	IG switch ON	9 to 14 V
STP (E3 – 6) – E1 (E4 – 17)	G–W – BR	IG switch ON, brake pedal depressed	7.5 to 14 V
		IG switch ON, brake pedal depressed	Below 1.5 V
F/PS (E3 – 8) – E1 (E4 – 17)	P – BR	IG switch ON	Below 1.5 V
VSV (E3 – 9) – E1 (E4 – 17)	R–L – BR	IG switch ON	9 to 14 V
STA (E3 – 11) – E1 (E4 – 17)	L – BR	Cranking	6.0 V or more
HT1B (E3 – 16) – E03 (E2 – 7)	Y–G – W–B	Idling	Below 3.0 V
		IG switch ON	9 to 14 V
MREL (E3 – 21) – E1 (E4 – 17)	L–B – BR	IG switch ON	9 to 14 V
SPD (E3 – 22) – E1 (E4 – 17)	W–R – BR	IG switch ON, rotate driving wheel slowly	Pulse generation
OX1B (E3 – 25) – E2 (E4 – 18)	W – BR	Maintain engine speed at 2,500 rpm for 2 min. after warning up	Pulse generation (See page DI–112)
TACH (E3 – 27) – E1 (E4 – 17)	BR–W – BR	Idling	Pulse generation
VC (E4 – 2) – E2 (E4 – 18)	R – BR	IG switch ON	9 to 14 V
HT1A (E4 – 3) – E03 (E2 – 7)	Y–R – W–B	Idling	Below 3.0 V
		IG switch ON	9 to 14 V
EVP1 (E4 – 4) – E01 (E5 – 21)	G–O – W–B	IG switch ON	9 to 14 V
VG (E4 – 11) – EVG (E4 – 1)	G–W – Y–G	Idling, A/C switch OFF	1.1 to 1.5 V
OX1A (E4 – 12) – E2 (E4 – 18)	B – BR	Maintain engine speed at 2,500 rpm for 2 min. after warning up	Pulse generation (See page DI–112)
THW (E4 – 14) – E2 (E4 – 18)	G – BR	Idling, Engine coolant temp. at 80 °C (176 °F)	0.2 to 1.0 V
NE+ (E4 – 16) – NE– (E4 – 24)	O – W	Idling	Pulse generation (See page DI–178)

THA (E4 – 22) – E2 (E4 – 18)	L–R – BR	Idling, intake air temp. 20 °C (68 °F)	0.5 to 3.4 V
VTA (E4 – 23) – E2 (E4 – 18)	B–W – BR	IG switch ON, throttle valve fully closed	0.3 to 1.0 V
		IG switch ON, throttle valve fully open	3.2 to 4.9 V
#10 (E5 – 1) – E01 (E5 – 21)	R – W–B	IG switch ON	9 to 14 V
		Idling	Pulse generation (See page DI–161)
#20 (E5 – 2) – E01 (E5 – 21)	R–L – W–B	IG switch ON	9 to 14 V
		Idling	Pulse generation (See page DI–161)
#30 (E5 – 3) – E01 (E5 – 21)	R–W – W–B	IG switch ON	9 to 14 V
		Idling	Pulse generation (See page DI–161)
#40 (E5 – 4) – E01 (E5 – 21)	R–B – W–B	IG switch ON	9 to 14 V
		Idling	Pulse generation (See page DI–161)
IGT1 (E5 – 10) – E1 (E4 – 17)	R–B – BR	Idling	Pulse generation (See page DI–187)
IGT2 (E5 – 11) – E1 (E4 – 17)	R–W – BR	Idling	Pulse generation (See page DI–187)
IGT3 (E5 – 12) – E1 (E4 – 17)	G–R – BR	Idling	Pulse generation (See page DI–187)
IGT4 (E5 – 13) – E1 (E4 – 17)	R–Y – BR	Idling	Pulse generation (See page DI–187)
CCV (E5 – 17) – E1 (E4 – 17)	V–W – BR	IG switch ON	9 to 14 V
RSO (E5 – 18) – E01 (E5 – 21)	B–W – W–B	IG switch ON, disconnect E5 of ECM connector	9 to 14 V
MOPS (E5 – 22) – E1 (E4 – 17)	Y–B – BR	Idling	9 to 14 V
OCV+ (E5 – 24) – OCV– (E5 – 23)	G–O – W	IG switch ON	Pulse generation (See page DI–48)
IGF (E5 – 25) – E1 (E4 – 17)	B–Y – BR	IG switch ON	4.5 to 5.5 V
		Idling	Pulse generation (See page DI–187)
KNK1 (E5 – 27) – E1 (E4 – 17)	W – BR	Idling	Pulse generation (See page DI–174)
PS (E5 – 28) – E1 (E4 – 17)	P – BR	IG switch ON	9 to 14 V

DIAIS–03

DIAGNOSTIC TROUBLE CODE CHART

HINT:

Parameters listed in the chart may not be exactly the same as your reading due to the type of instrument or other factors.

If a malfunction code is displayed during the DTC check in check mode, check the circuit for the codes listed in the table below. For details of each code, refer to the "See page" under the respective "DTC No." in the DTC chart.

DTC No.	Detection Item	Trouble Area	MIL*1	Memory
P0010 (DI–48)	OCV Circuit Malfunction (for VVT–i)	• Open or short in OCV circuit • OCV • ECM	○	○
P0011 (DI–53)	VVT System Malfunction (Bank 1)	• Valve timing • OCV • VVT controller assembly • ECM	○	○
P0012 (DI–53)	Camshaft Position "A" –Timing Over– Retarded (Bank 1)		○	○
P0016 (DI–63)	VVT Sensor/Camshaft Position Sensor Circuit Range/Performance Problem (Bank 1)	• Mechanical system (Timing chain has jumped a tooth, chain is stretched) • ECM	○	○
P0031 (DI–65)	Oxygen Sensor Heater Circuit Malfunction (Bank 1 Sensor 1)	• Open or short in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • ECM	○	○
P0032 (DI–65)	Oxygen Sensor Heater Control Circuit High (Bank 1 Sensor 1)	• Short in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • ECM	○	○
P0037 (DI–65)	Oxygen Sensor Heater Circuit Malfunction (Bank 1 Sensor 2)	• Open or short in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • EFI relay • ECM	○	○
P0038 (DI–65)	Oxygen Sensor Heater Control Circuit High (Bank 1 Sensor 2)	• Short in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • EFI relay • ECM	○	○
P0100 (DI–71)	Mass Air Flow Circuit Malfunction	• Open or short in mass air flow meter circuit • Mass air flow meter • ECM	○	○
P0101 (DI–77)	Mass Air Flow Circuit Range/Performance Problem	• Mass air flow meter	○	○
P0110 (DI–80)	Intake Air Temp. Circuit Malfunction	• Open or short in intake air temp. sensor circuit • Intake air temp. sensor (built into mass air flow meter) • ECM	○	○
P0115 (DI–87)	Engine Coolant Temp. Circuit Malfunction	• Open or short in engine coolant temp. sensor circuit • Engine coolant temp. sensor • ECM	○	○
P0116 (DI–94)	Engine Coolant Temp. Circuit Range/Performance Problem	• Cooling system • Engine coolant temp. sensor	○	○
P0120 (DI–96)	Throttle/Pedal Position Sensor/Switch "A" Circuit Malfunction	• Open or short in throttle position sensor circuit • Throttle position sensor • ECM	○	○
P0121 (DI–103)	Throttle/Pedal Position Sensor/Switch "A" Circuit Range/Performance Problem	• Throttle position sensor • ECM	○	○

P0125 (DI–105)	Insufficient Coolant Temperature for Closed Loop Fuel Control	• Cooling system • Engine coolant temp. sensor • Thermostat	○	○
P0128 (DI–108)	Thermostat Malfunction	• Thermostat • Cooling system • Engine coolant temperature sensor • ECM	○	○
P0130 (DI–112)	Heated Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 1)	• Open or short in heated oxygen sensor (bank 1 sensor 1) 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 (DI–123)	Oxygen Sensor Circuit Slow Response (Bank 1 Sensor 1)	• Open or short in heated oxygen sensor circuit • Heated oxygen sensor • Air induction system • Fuel pressure • Injector • ECM	○	○
P0134 (DI–132)	Insufficient Coolant Temp. for Closed Loop Fuel Control	• Open or short in heated oxygen sensor circuit • Heated oxygen sensor • EFI relay • Air induction system • Fuel pressure • Injector • Gas leakage in exhaust system • ECM • PCV piping	○	○
P0136 (DI–140)	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	○	○
P0138 (DI–140)	Oxygen Sensor Circuit High Voltage (Bank 1 Sensor 2)	• HO2 sensor (sensor 2) • Short in HO2 sensor (sensor 2) circuit	○	○
P0171 (DI–148)	System too Lean (Fuel Trim)	• Air induction system • Injector blockage • Mass air flow sensor • Engine coolant temperature sensor • Fuel pressure • Gas leakage in exhaust system • Open or short in heated oxygen sensor (bank 1, sensor 1) 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	○	○

P0172 (DI–148)	System too Rich (Fuel Trim)	• Injector leak, blockage • Mass air flow sensor • Engine coolant temperature sensor • Ignition system • Fuel pressure • Gas leakage in exhaust system • Open or short in heated oxygen sensor (bank 1, sensor 1) circuit • Heated oxygen sensor (bank 1, sensor 1) • Heated oxygen sensor heater (bank 1, sensor 1) • EFI relay • ECM	○	○
P0300 (DI–161)	Random/Multiple Cylinder Misfire Detected	• Open or short in engine wire • Connector connection • Vacuum hose connection • Ignition system • Injector • Fuel pressure • Mass air flow meter • Engine coolant temp. sensor • Compression pressure • Valve clearance • Valve timing • PCV hose connection • PCV hose • ECM	○	○
P0301 (DI–161)	Cylinder 1 Misfire Detected			
P0302 (DI–161)	Cylinder 2 Misfire Detected			
P0303 (DI–161)	Cylinder 3 Misfire Detected			
P0304 (DI–161)	Cylinder 4 Misfire Detected			
P0325 (DI–174)	Knock Sensor 1 Circuit Malfunction (Bank 1)	• Open or short in knock sensor 1 circuit • Knock sensor 1 (looseness) • ECM	○	○
P0335 (DI–178)	Crankshaft Position Sensor "A" Circuit Malfunction	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Signal plate • ECM	○	○
P0339 (DI–178)	Crankshaft Position Sensor Circuit Malfunction (During engine running)		○	○
P0340 (DI–183)	Camshaft Position Sensor Circuit Malfunction	• Open or short in camshaft position sensor circuit • Camshaft position sensor • Camshaft timing pulley • Timing chain has jumped a tooth • ECM	○	○
P0341 (DI–183)	Camshaft Position Sensor "A" Circuit Range/Performance (Bank 1 or Single Sensor)		○	○
P0351 (DI–187)	Igniter Circuit Malfunction (No.1)	• Ignition system • Open or short in IGF and IGT1 circuit from No.1 ignition coil with igniter to ECM • No.1 ignition coil with igniter • ECM	○	○
P0352 (DI–187)	Igniter Circuit Malfunction (No.2)	• Ignition system • Open or short in IGF and IGT2 circuit from No.2 ignition coil with igniter to ECM • No.2 ignition coil with igniter • ECM	○	○
P0353 (DI–187)	Igniter Circuit Malfunction (No.3)	• Ignition system • Open or short in IGF and IGT3 circuit from No.3 ignition coil with igniter to ECM • No.3 ignition coil with igniter • ECM	○	○

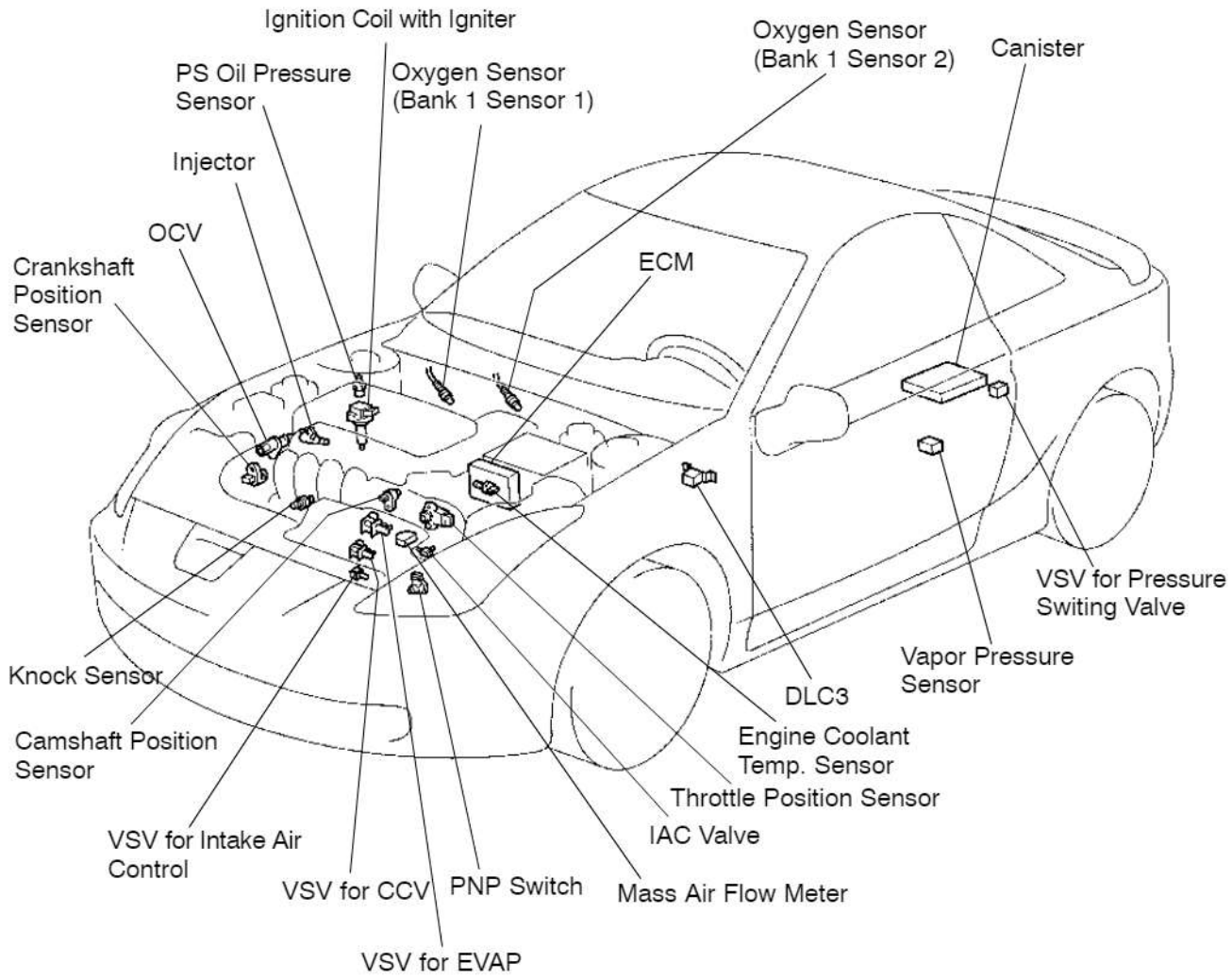
P0354 (DI–187)	Igniter Circuit Malfunction (No.4)	• Ignition system • Open or short in IGF and IGT4 circuit from No.4 ignition coil with igniter to ECM • No.4 ignition coil with igniter • ECM	○	○
P0420 (DI–195)	Catalyst System Efficiency Below Threshold (Bank 1)	• Gas leakage in exhaust system • Open or short in heated oxygen sensor circuit • Heated oxygen sensor • Three–way catalytic converter	○	○
P0441 (DI–202)	Evaporative Emission Control System Incorrect Purge Flow	• Vacuum hose is cracked, holed, blocked, damaged or disconnected ((1), (2), (3), (4), (5), (6), (7), (8), (9), (10) and (11) in Fig. 1) • Fuel tank cap is incorrectly installed • Fuel tank cap is cracked or damaged • Open or short in vapor pressure sensor circuit • Vapor pressure sensor • Open or short in VSV circuit for EVAP • EVAP VSV • Open or short in VSV circuit for CCV • CCV • Open or short in VSV circuit for pressure switching valve • Pressure switching valve • Fuel tank is cracked, holed or damaged • Charcoal canister is cracked, holed or damaged • Fuel tank over fill check valve is cracked damaged • ECM	○	○
P0442 (DI–225)	Evaporative Emission Control System Malfunction	• Vacuum hose is cracked, holed, blocked, damaged or disconnected • Fuel tank cap is incorrectly installed • Fuel tank cap is cracked or damaged • Open or short in vapor pressure sensor circuit • Vapor pressure sensor • Open or short in VSV circuit for EVAP • EVAP VSV • Open or short in VSV circuit for CCV • CCV • Fuel tank is cracked, holed or damaged • Charcoal canister is cracked, holed or damaged • Fuel tank over fill check valve is cracked or damaged • ECM	○	○
P0446 (DI–202)	Evaporative Emission Control System Vent Control Malfunction	• Same as DTC No. P0441	○	○
P0451 (DI–247)	Evaporative Emission Control System Pressure Sensor/Switch Range/Performance	• Open or short in vapor pressure sensor circuit • Vapor pressure sensor • ECM	○	○
P0452 (DI–247)	Evaporative Emission Control System Pressure Sensor/Switch Low Input	• Same as DTC No. P0451	○	○
P0453 (DI–247)	Evaporative Emission Control System Pressure Sensor/Switch High Input	• Same as DTC No. P0451	○	○
P0456 (DI–225)	Evaporative Emission Control System Leak Detected (Small Leak)	• Same as DTC No. P0442	○	○

P0500 (DI–253)	Vehicle Speed Sensor Malfunction	• Combination meter • Open or short in vehicle speed sensor circuit • Vehicle speed sensor • ECM	○	○
P0505 (DI–256)	Idle Control System Malfunction	• Open or short in idle air control (IAC) valve circuit • Idle air control (IAC) valve is stuck or closed • A/C switch circuit • Air induction system • PCV valve and hose • ECM	○	○
P0511 (DI–256)	Idle Control Systemcircuit		○	○
P0560 (DI–265)	ECM BATT Malfunction	• Open in back up power source circuit • EFI fuse • ECM	○	○
P0617 (DI–268)	Starter Relay Circuit High	• Short in Park/Neutral position switch circuit (A/T) • Park/Neutral position switch (A/T) • Clutch start switch (M/T) • ECM	○	○
P0630 (DI–276)	VIN not Programmed or Mismatch – ECM/PCM	• ECM	○	○
P1645 (DI–278)	Body ECU Malfunction	• Body ECU • A/C ECU • Communication bus	–	–

*1: ○ · · · MIL lights up

DI37U–18

PARTS LOCATION



C

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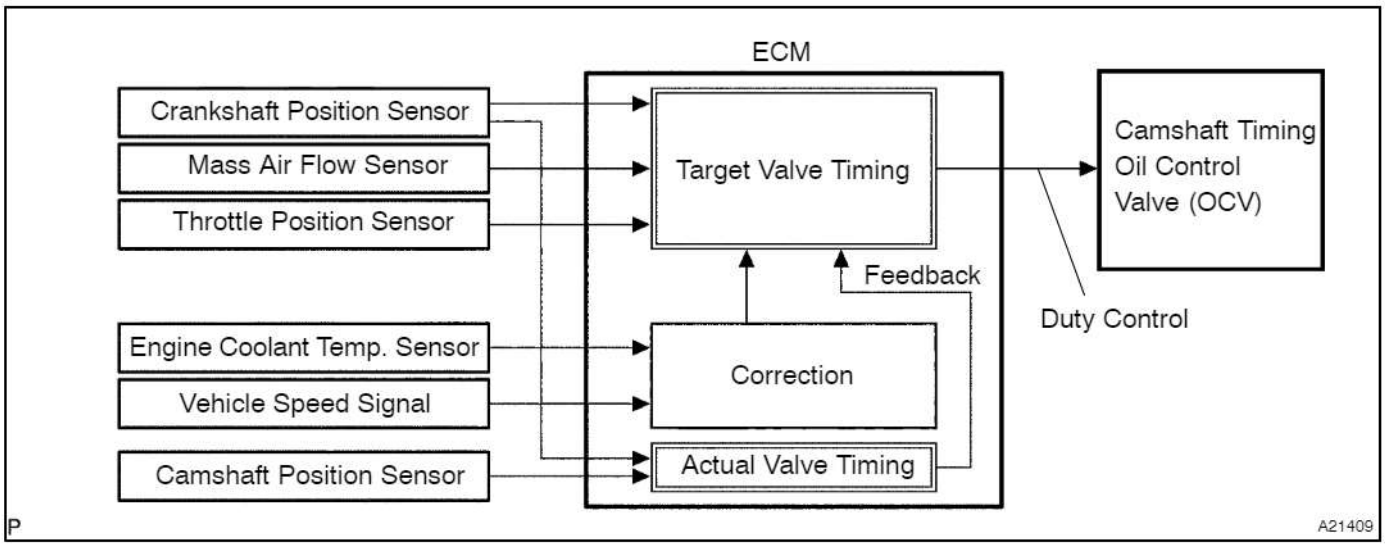
DIC8I–02

CIRCUIT INSPECTION

DTC	P0010	Camshaft Position "A" Actuator circuit (Bank 1)

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, sent to the OCV, regulates the oil pressure applied to the VVT controller. Camshaft timing control is performed based on engine operation conditions such as the intake air volume, throttle position and engine coolant temperature. The ECM controls the OCV, based on the signals output from the sensors. The VVT controller regulates the intake camshaft angle using oil pressure through the OCV. As a result, the relative position between the camshaft and the crankshaft is optimized, and the engine torque and fuel economy improve, and exhaust emissions decrease under overall driving conditions. Also, the ECM detects the actual valve timing using signals from the camshaft position sensor and the crankshaft position sensor, and performs the feedback control. This is how target valve timing is verified by the ECM.



DTC No.	DTC Detecting Condition	Trouble Area
P0010	Open or short in Oil Control Valve (OCV) 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 (Oil Control Valve), the ECM monitors the OCV current to establish an "actual" duty–cycle. When the actual duty–cycle ratio varies from the forget duty–cycle ratio, the ECM sets a DTC.

MONITOR STRATEGY

Related DTCs	P0010	VVT oil control valve bank 1 range check
Required sensors/components	OCV	
Frequency of operation	Continuous	
Duration	1 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–3	
Battery voltage	11 V	13 V
Target duty ratio	–	70%
Starter	OFF	
Current cut status	Not cut	

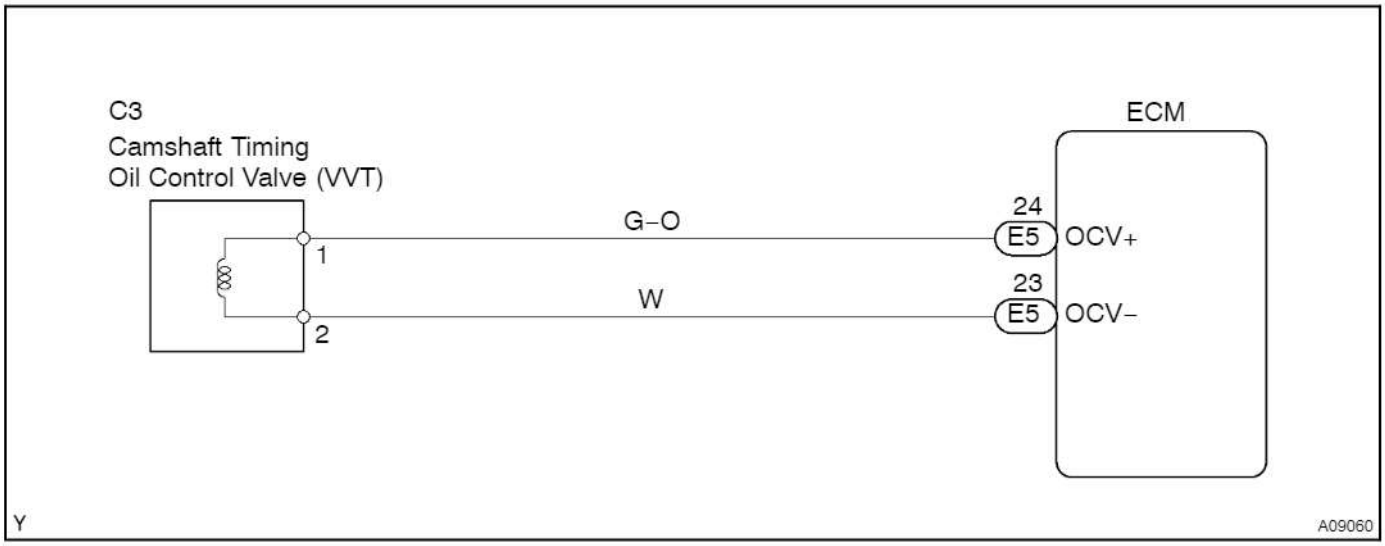
TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Either of the following conditions is met:	A or B
A. Output signal duty for OCV	Output duty ratio is 100% (always ON) but target duty ratio is less than 70%
B. Output signal duty for OCV	Output duty is 3% or less despite the ECM supplying current to the OCV

COMPONENT OPERATING RANGE

Parameter	Standard Value
Output signal duty for OCV	"More than 3%" and "less than 100%"

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	**Check OCV circuit.**

PREPARATION:

(a) Connect the hand–held tester to the DLC3.
(b) Start the engine and warm it up.
(c) Turn the ignition switch ON and push the hand–held tester main switch ON.
(d) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / VVT CTRL B1.

CHECK:

Check the engine speed when operating the Oil control valve (OCV) by the hand–held tester.

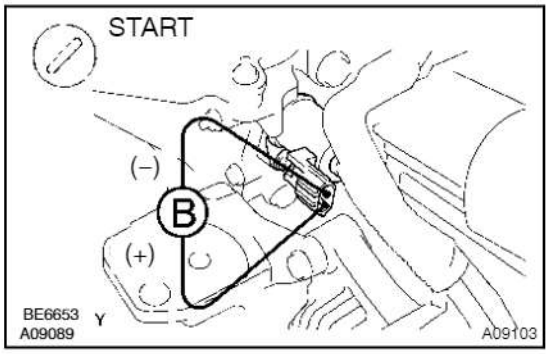
OK:

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 DI–3).**

NG

2	**Check operation of OCV.**



PREPARATION:

(a) Start the engine and warm it up.
(b) Disconnect the OCV connector.
(c) Apply battery positive voltage between terminals of the OCV.

CHECK:

Check the engine speed.

OK:

Rough idle or engine stalled.

NG → **Replace OCV.**

OK

3	**Check for open and short in harness and connector between OCV and ECM (See page IN–30).**

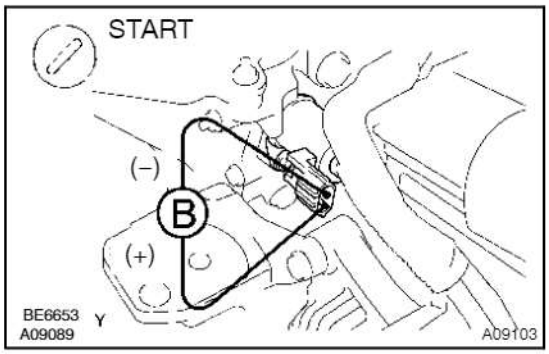
NG → **Repair or replace harness or connector.**

OK

Check and replace ECM (See page SF–78).

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

1	**Check operation of OCV.**



PREPARATION:

(a) Start the engine and warm it up.
(b) Disconnect the OCV connector.
(c) Apply battery positive voltage between terminals of the OCV.

CHECK:

Check the engine speed.

OK:

Rough idle or engine stalled

NG → **Replace OCV.**

OK

2	**Check for open and short in harness and connector between OCV and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Check and replace ECM (See page SF–78).

DTC	P0011	Camshaft Position "A" –Timing Over– Advanced or System Performance (Bank 1)

DTC	P0012	Camshaft Position "A" –Timing Over– Retarded (Bank 1)

CIRCUIT DESCRIPTION

Refer to DTC P0010 on page DI–48.

DTC	Detecting Condition	Trouble Area
P0011	Valve timing does not change at advanced position (1 trip detection logic) when: • Engine is warmed–up • Engine speed is less than 4000 rpm	• VVT controller assembly • OCV • Valve timing • ECM
P0012	Valve timing does not change at retarded position (2 trip detection logic) when: • Engine is warmed–up • Engine speed is less than 4000 rpm	

MONITOR DESCRIPTION

The ECM optimizes the valve timing using the VVT (Variable Valve Timing) system to control the intake valve camshaft. The VVT system includes the ECM, the OCV (Oil Control Valve) and the VVT controller. The ECM sends a target "duty–cycle" control signal to the OCV. This control signal, sent to the OCV, regulates the oil pressure applied to the VVT controller. The VVT controller can advance or retard the intake valve camshaft.
Example:
A DTC will be set if: 1) the difference between the target and actual valve timing is more than 5 degrees of the crankshaft angle (CA) and the condition continues for more than 5 sec.; 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.

MONITOR STRATEGY

Related DTCs	P0011	VVT system advance (Bank 1)
	P0012	VVT system retard (Bank 1)
Required sensors/components	Main sensors/components	Camshaft position sensor
	Related sensors/components	Engine coolant temperature sensor, Crankshaft position sensor
Frequency of operation	Once per drive cycle	
Duration	10 sec.	
MIL operation	P0011: Immediate P0012: 2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–3	
Battery voltage	11 V	–
Throttle position learing	Completed	
Engine RPM	550 rpm	4,000 rpm
Engine coolant temperature	75°C (167°F)	100°C (212°F)

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Deviation of valve timing	More than 5°CA
OCV activation	63 times or more
Response of valve timing	1 sec./1°CA or more

WIRING DIAGRAM

Refer to DTCs P0010 on page DI–48.

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, as well as other data from the time when a malfunction occurred.

Hand–held tester:

1	**Check valve timing (Check for loose and jumped tooth of timing chain) (See page EM–16).**

NG → **Adjust valve timing.**

OK

2	Check operation of OCV.

PREPARATION:

(a) Connect the hand–held tester to the DLC3.
(b) Start the engine and warm it up.
(c) Turn the ignition switch ON and push the hand–held tester main switch ON.
(d) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / VVT CTRL B1.

CHECK:

Check the engine speed when operating the OCV by the hand–held tester.

OK:

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 outputs reoccur.

CHECK:

(a) Clear the DTCs.
(b) Warm up the engine and drive the vehicle for 10 minutes or more.
(c) Check DTCs.

OK:

No DTC output.

HINT:

DTCs P0011 or P0012 is present when a foreign object in the engine oil enters the system. These DTCs will stay even if the system returns to normal after a short time. Foreign objects are filtered out by the oil filter.

OK → **VVT system is OK.**

NG ↓

4	Check oil control valve filter.

NG → **Replace oil control valve filter.**

OK ↓

5	Check oil control valve (See page SF–50).

OK → Go to step 7.

NG

6	Replace oil control valve.

Go

7	Check VVT controller assembly (See page EM–50).

OK → Go to step 9.

NG

8	Replace VVT controller assembly.

Go

9	Check blockage of OCV, oil check valve and oil pipe No.1.

NG → Repair or replace.

OK

10	**Check whether or not DTC P0011 or P0012 is stored.**

CHECK:

(a) Clear the DTCs.
(b) Warm up the engine and drive the vehicle for 10 minutes or more.
(c) Check DTCs.

OK:

No DTC output.

HINT:

DTCs P0011 or P0012 is present when a foreign object in the engine oil enters the system. These DTCs will stay even if the system returns to normal after a short time. Foreign objects are filtered out by the oil filter.

OK → **VVT system is OK.**

NG

Replace ECM (See page SF–78).

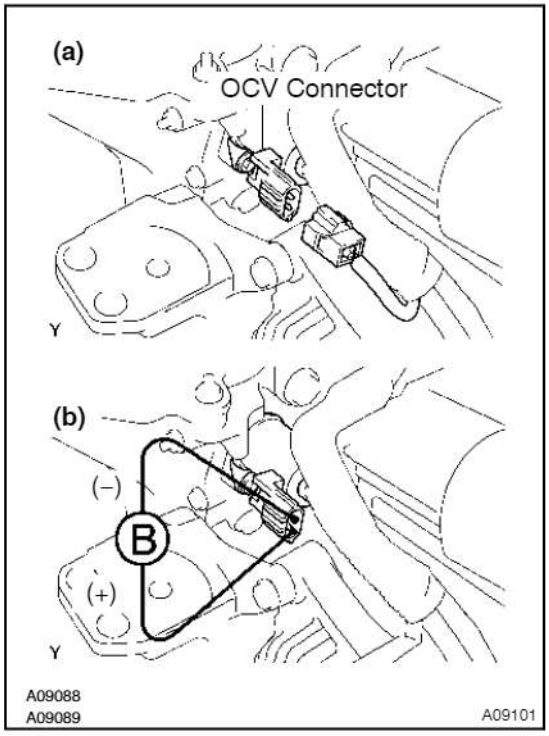
OBD II scan tool (excluding hand–held tester):

1	**Check valve timing (Check for loose and jumped tooth of timing chain) (See page EM–16).**

NG → **Adjust valve timing.**

OK

2	**Check operation of OCV.**



PREPARATION:

Start the engine.

CHECK:

(a) Check the engine speed when disconnect the OCV connector.

(b) Check the engine speed when apply battery positive voltage between terminals of OCV.

RESULT:

Result	Check (a)	Check (b)
1	Normal engine speed	Rough idle or engine stall
2	Except 1	

2 → **Replace OCV.**

1

3	**Check whether or not DTC P0011 or P0012 is stored.**

CHECK:

(a) Clear the DTCs.
(b) Warm up the engine and drive the vehicle for 10 minutes or more.
(c) Check DTCs.

OK:

No DTC output.

HINT:

DTCs P0011 or P0012 is present when a foreign object in the engine oil enters the system. These DTCs will stay even if the system returns to normal after a short time. Foreign objects are filtered out by the oil filter.

OK → **VVT system is OK.**

NG

4	**Check oil control valve filter.**

NG → **Replace oil control valve filter.**

OK

5	**Check oil control valve (See page SF–50).**

OK → **Go to step 7.**

NG

6	**Replace oil control valve.**

Go

7	**Check VVT controller assembly (See page EM–50).**

OK → **Go to step 9.**

NG

8	**Replace VVT controller assembly.**

Go

9	**Check blockage of OCV, oil check valve and oil pipe No. 1.**

NG → **Repair or replace.**

OK

10	**Check whether or not DTC P0011 or P0012 is stored.**

CHECK:

(a) Clear the DTCs.
(b) Warm up the engine and drive the vehicle for 10 minutes or more.
(c) Check DTCs.

OK:

No DTC output.

HINT:

DTCs P0011 or P0012 is present when a foreign object in the engine oil enters the system. These DTCs will stay even if the system returns to normal after a short time. Foreign objects are filtered out by the oil filter.

OK → **VVT system is OK.**

NG

Replace ECM (See page SF–78).

–MEMO–

–MEMO–

D/C6J–02

DTC	P0016	Crankshaft Position – Camshaft Position Correlation (Bank 1 Sensor A)

CIRCUIT DESCRIPTION

Refer to DTC P0335 on page DI–178.

DTC No.	DTC Detecting Condition	Trouble Area
P0016	Deviation in crankshaft position sensor signal and camshaft position sensor signal (2 trip detection logic)	• Mechanical system (Timing chain has jumped a tooth, chain is stretched) • ECM

MONITOR DESCRIPTION

The ECM optimizes the valve timing using the VVT (Variable Valve Timing) system to control the intake valve camshaft. The VVT system includes the ECM, the OCV (Oil Control Valve) and the VVT controller. The ECM sends a target duty–cycle control signal to the OCV. This control signal, sent to the OCV, regulates the oil pressure applied 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 value as a VVT learning 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 learning 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) The VVT learning value is less than 24°CA (crankshaft angle) or more than 46°CA.

(b) The above condition continues for more than 18 sec.

MONITOR STRATEGY

Related DTCs	P0016	Deviation in crankshaft position sensor signal and camshaft position sensor signal (Bank 1)
Required sensors/components	Crankshaft position sensor, Camshaft position sensor	
Frequency of operation	Once per drive cycle	
Duration	60 sec.	
MIL operation	2 drive cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–3	
Engine speed	600 rpm	1,400 rpm

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Duration that either of the following conditions 1 or 2 is met:	18 sec. or more
1. VVT angle when camshaft is at the most retarded position	Less than 24°CA
2. VVT angle when camshaft is at the most retarded position	More than 46°CA

WIRING DIAGRAM

Refer to DTC P0335 on page DI–178.

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, as well as other data from the time when a malfunction occurred.

1	**Check valve timing (Check for loose and jumped tooth of timing chain) (See page EM–16).**

NG → **Adjust valve timing (Repair or replace timing chain).**

OK

Replace ECM (See page SF–78).

DIC8K–02

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)

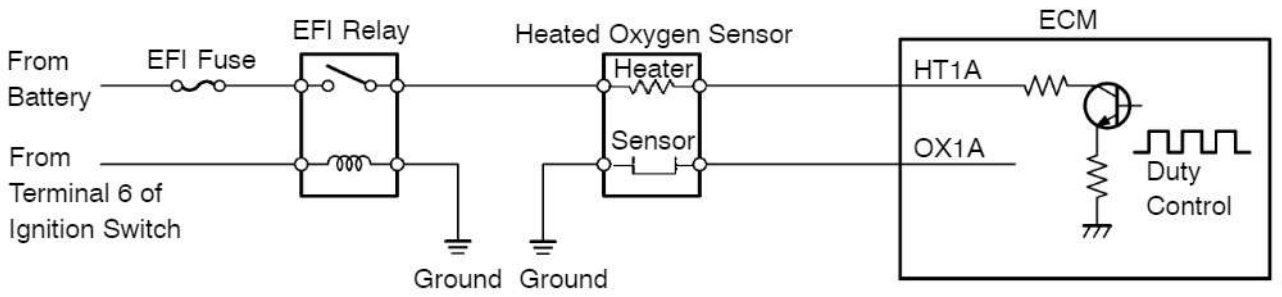
CIRCUIT DESCRIPTION

Refer to DTC P0130 on page DI–112.

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	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 • ECM
P0032 P0038	Heated current exceeds 3.5 A when heater operates (1 trip detection logic)	

HINT:

- Sensor 1 is the sensor closer to the engine body.
- Sensor 2 is the sensor farther away from the engine body.

MONITOR DESCRIPTION

The sending portion of the heated oxygen sensor has a zirconia element that is used to detect oxygen concentration in the exhaust. If the zirconia element is at the proper temperature and the difference of the oxygen concentration between the inside and outside surface of the 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	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)
Required sensors/components	Main sensors/components	Heated oxygen sensor
	Related sensors/components	Vehicle speed sensor
Frequency of operation	Continuous	
Duration	0.3 sec.	
MIL operation	1 driving cycle	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–3	
P0031, P0037 (Low current):		
Either of the following conditions is met:	Condition 1 or 2	
1. Following conditions are met:	Conditions (a), (b), (c), (d) and (e)	
(a). Time after engine start	250 sec.	500 sec.
(b). Battery voltage	10.5 V	–
(c). Vehicle speed	–	96.6 km/h (60 mph)
(d). Misfire	Not detected	
(e). Pass/Fail detection in this driving cycle	Not detected	
2. Following conditions are met:	Conditions (a), (b), (c), (d) and (e)	
(a). Time after engine start	500 sec.	–
(b). Battery voltage	10.5 V	–
(c). Vehicle speed	40 km/h (25 mph)	–
(d). Misfire	Not detected	
(e). Pass/Fail detection in this driving cycle	Not detected	
P0032, P0038 (High current):		
Intrusive heating is OFF		

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P0031, P0037 (Low current):	
Heated oxygen sensor heater current	Less than 0.25 A (at 0.2 sec. after heater "ON")
P0032, P0038 (High current):	
Heated oxygen sensor heater current	More than 2 A (while intrusive heating is OFF)

COMPONENT OPERATING RANGE

Parameter	Standard Value
Heated oxygen sensor heater current under the following conditions: (a) Engine has been warmed up (b) Engine is idling (c) Battery voltage is 11 to 14 V	0.4 to 1.0 A

MONITOR RESULT

Refer to page DI–3 for detailed information.

The test value and test limit information are described as shown in the following table. Check the monitor result and test values after performing the monitor drive pattern (see page DI–33).

- TID (Test Identification Data) is assigned to each emissions–related component.
- TLT (Test Limit Type):
  If TLT is 0, the component is malfunctioning when the test value is higher than the test limit.
  If TLT is 1, the component is malfunctioning when the test value is lower than the test limit.
- CID (Component Identification Data) is assigned to each test value.
- Unit Conversion is used to calculate the test value indicated on generic OBD II scan tools.

TID $04: HO2S heater

TLT	CID	Unit Conversion	Description of Test Data	Description of Test Limit
1	$01	Multiply by 0.000076 (A)	Maximum HO2S heater current (Bank 1 Sensor 1)	Malfunction threshold for HO2S heater
1	$02	Multiply by 0.000076 (A)	Maximum HO2S heater current (Bank 1 Sensor 2)	Malfunction threshold for HO2S heater

WIRING DIAGRAM

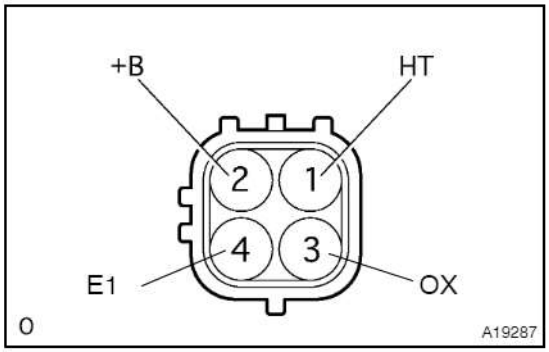
Refer to DTC P0130 on page DI–112.

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, as well as other data from the time when a malfunction occurred.

1	**Check resistance of heated oxygen sensor heater.**



PREPARATION:

Disconnect the heated oxygen sensor connector.

CHECK:

Measure resistance between the terminals HT and +B of the heated oxygen sensor.

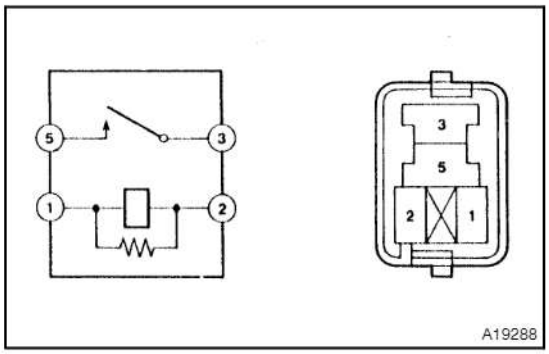
Resistance: Bank 1 Sensor 1: 5 to 10 Ω (20 °C (68 °F))

Bank 1 Sensor 2: 11 to 16 Ω (20 °C (68 °F))

NG → **Replace heated oxygen sensor.**

OK

2	**Check EFI relay.**



PREPARATION:

Remove the EFI relay from the engine room J/B.

CHECK:

Inspect the EFI relay.

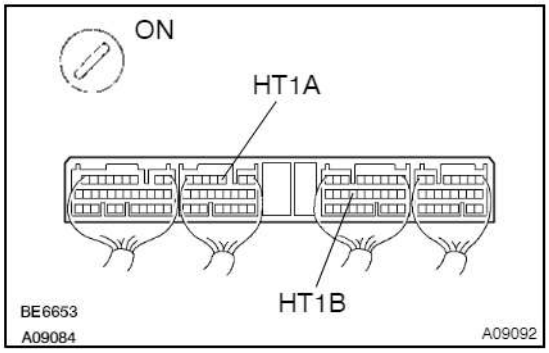
OK:

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

NG → **Replace EFI relay.**

OK

3	Check voltage between terminals HT1, HT2 of ECM connectors and body ground.



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure voltage between terminals HT1A, HT1B of ECM connectors and body ground.

HINT:

- Connect terminal HT1A to bank 1 sensor 1.
- Connect terminal HT1B to bank 1 sensor 2.

OK:

Voltage: 9 to 14 V

OK	Replace ECM (See page SF–78).

NG

4	Check for open and short in harness and connector between heated oxygen sensor and ECM, heated oxygen sensor and EFI main relay (Marking: EFI) (See page IN–30).

NG	Repair or replace harness or connector.

OK

Replace ECM (See page SF–78).

D095-26

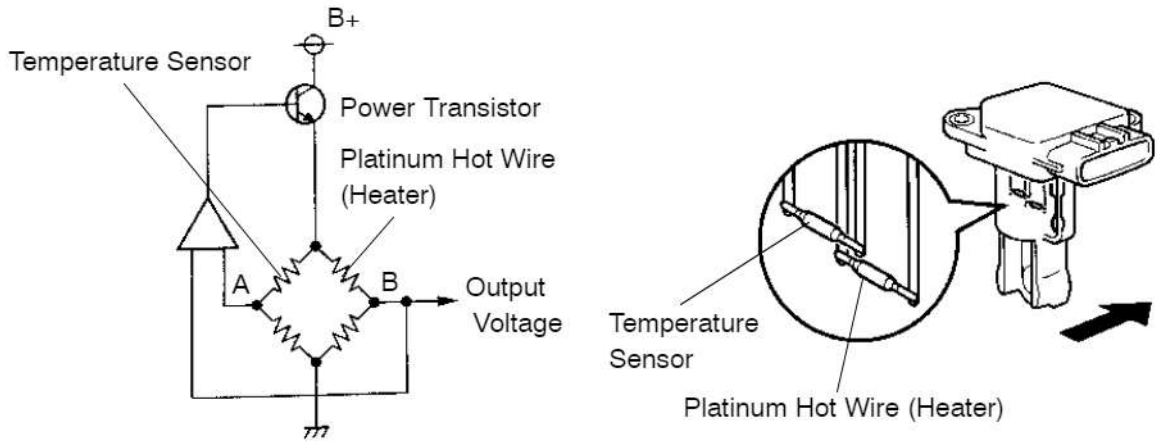
DTC	P0100	Mass or Volume Air Flow Circuit

CIRCUIT DESCRIPTION

The MAF (Mass Air Flow) meter 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 thermister, 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 air flow through the sensor and the ECM interprets this voltage as the intake air amount.

The circuit is constructed so that the platinum hot wire and the temperature sensor provides 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 Detecting Condition	Trouble Area
P0100	Open or short in mass air flow meter circuit for more than 3 sec. with 4,000 rpm or less engine speed	• Open or short in mass air flow meter circuit • Mass air flow meter • ECM

HINT:

After confirming DTC P0100, confirm the mass air flow ratio in the "DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL" using the hand–held tester or the OBD II scan tool.

Mass Air Flow Value (gm/sec.)	Malfunction
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 MAF (Mass Air Flow) meter, 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:
The MAF meter voltage output is less than 0.2 V, or more than 4.9 V, and either condition continues for more than 3 sec.

MONITOR STRATEGY

Related DTCs	P0100	Mass air flow meter circuit range check (Fluttering)
		Mass air flow meter circuit range check (Low voltage)
		Mass air flow meter circuit range check (High voltage)
Required sensors/components	Mass air flow meter	
Frequency of operation	Continuous	
Duration	3 sec.	
MIL operation	Immediate (When engine speed is at less than 4,000 rpm) 2 driving cycles (When engine speed is at 4,000 rpm or more)	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

The monitor will run whenever this DTC is not present	See page DI–3
The typical enabling condition is not available	–

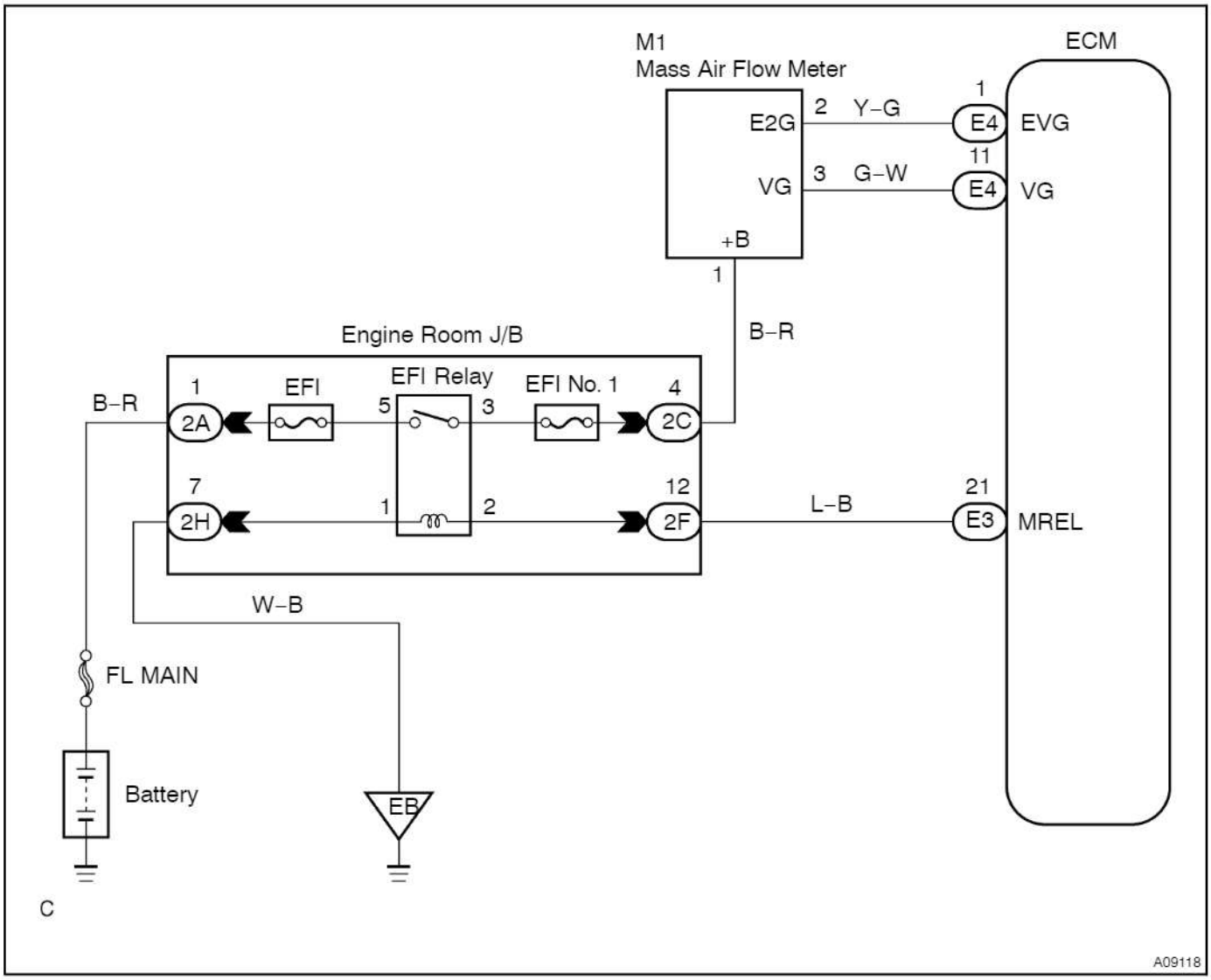
TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Mass air flow meter circuit range check (Fluttering):	
Mass air flow meter voltage	Less than 0.2 V, or more than 4.9 V
Mass air flow meter circuit range check (Low voltage):	
Mass air flow meter voltage	Less than 0.2 V
Mass air flow meter circuit range check (High voltage):	
Mass air flow meter voltage	More than 4.9 V

COMPONENT OPERATING RANGE

Parameter	Standard Value
Mass air flow meter voltage	0.4 to 2.2 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, as well as other data from the time when a malfunction occurred.

1	**Connect OBD II scan tool or hand–held tester, and read value of mass air flow rate.**

PREPARATION:

(a) Connect the OBD II scan tool or hand–held tester to the DLC3.
(b) Turn ignition switch ON and push the OBD II scan tool or hand–held tester main switch ON.
(c) Start the engine.
(d) When using hand–held tester, enter the following menus: DIAGNOSIS/ENHANCED OBD II/DATA LIST/ALL/MAF.

CHECK:

Read mass air flow rate on the OBD II scan tool or hand–held tester.

RESULT:

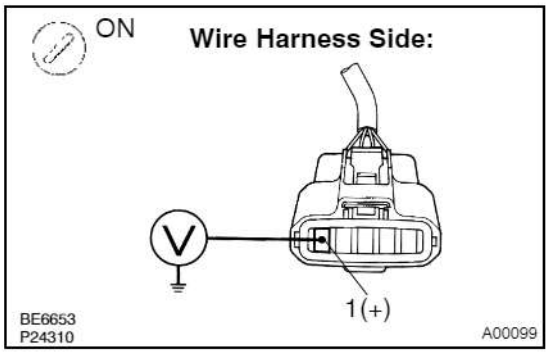
Air Flow Rate (gm/s)	Proceed to
0.0	A
271.0 or more	B
Between 1.0 and 270.0 (*1)	C

*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 DI–3).**

A

2	Check voltage of mass air flow meter power source.



PREPARATION:

(a) Disconnect the mass air flow meter connector.

(b) Turn ignition switch ON.

CHECK:

Measure voltage between terminal 1 of mass air flow meter connector and body ground.

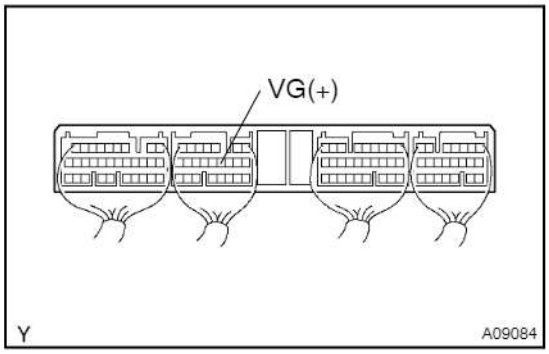
OK:

Voltage: 9 to 14 V

NG	Go to step 5.

OK

3	Check voltage between terminal VG of ECM connector and body ground.



PREPARATION:

(a) Remove the ECM cover.

(b) Start the engine.

CHECK:

Measure voltage between terminal VG of ECM and body ground while engine is idling.

OK:

Voltage:

1.1 to 1.5 V (P or N position and A/C switch OFF)

OK	Replace ECM (See page SF–78).

NG

4	Check for open and short in harness and connector between mass air flow meter and ECM (See page IN–30).

NG	Repair or replace harness or connector.

OK

Replace mass air flow meter.

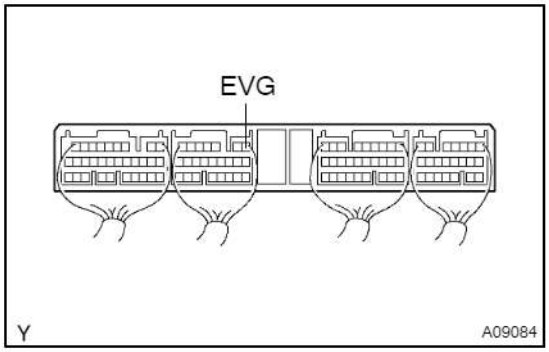
5	**Check for open and short in harness and connector between mass air flow meter and EFI relay (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Check ECM power source circuit (See page DI–279).

6	**Check continuity between terminal EVG of ECM connector and body ground.**



PREPARATION:
Remove the ECM cover.
CHECK:
Check continuity between terminal EVG of ECM connector and body ground.
OK:
Below 1 Ω

NG → **Replace ECM (See page SF–78).**

OK

7	**Check for open in harness and connector between mass air flow meter and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Replace mass air flow meter.

DTC	P0101	Mass Air Flow Circuit Range/Performance Problem

CIRCUIT DESCRIPTION

Refer to DTC P0100 on page DI–71.

DTC No.	DTC Detecting Condition	Trouble Area
P0101	• High voltage: Conditions (a), (b) and (c) continue for more than 10 seconds (2 trip detection logic): (a) Engine speed less than 2,000 rpm (b) Engine coolant temperature 70°C (158°F) or higher (c) Voltage output of Mass Air Flow (MAF) meter more than 2.2 V (varies with Throttle Position [TP] sensor voltage) • Low voltage: Conditions (a) and (b) continue for more than 10 seconds (2 trip detection logic): (a) Engine speed more than 300 rpm (b) Voltage output of MAF meter less than 0.93 V (varies with TP sensor voltage)	• Mass air flow meter

MONITOR DESCRIPTION

The MAF (Mass Air Flow) meter 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 air flow through the MAF meter. The ECM interprets this voltage as the intake air amount. If there is a defect in the MAF meter 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 with idling or less than 0.4 V without idling, the ECM interprets this as a defect in the MAF meter and sets a DTC.

MONITOR STRATEGY

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

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–3	
High voltage:		
Engine RPM	–	900 rpm
Idle	ON	
Engine coolant temperature	70°C (158°F)	–
Low voltage:		
Engine RPM	0 rpm	–
Throttle position	0.1 V	–

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Mass air flow meter voltage (High voltage)	More than 2.2 V
Mass air flow meter voltage (Low voltage)	Less than 0.4 V

WIRING DIAGRAM

Refer to DTC P0100 on page DI–71.

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, as well as other data from the time when a malfunction occurred.

1	**Are there any other codes (besides DTC P0101) being output?**

PREPARATION:

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

CHECK:

Read the DTCs.

RESULT:

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

HINT:

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

B → **Replace mass air flow meter.**

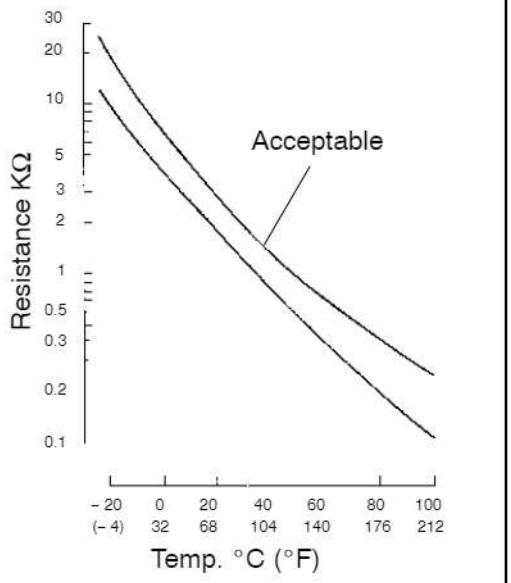
A → **Go to relevant DTC chart (See page DI–42).**

DI97Z–17

DTC	P0110	Intake Air Temp. Circuit Malfunction

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 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 the intake air temperature, the potential at terminal THA also changes. Based on this signal, the ECM increases the fuel injection volume to improve the driveability during cold engine operation.

DTC No.	DTC Detecting Condition	Trouble Area
P0110	Open or short in intake air temperature sensor circuit	• Open or short in intake air temp. sensor circuit • Intake air temperature sensor (built into mass air flow meter) • ECM

HINT:

After confirming DTC P0110, confirm the intake air temperature in the "DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL" using the hand–held tester or OBD II scan tool.

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

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 (Intake Air Temperature) sensor and sets a DTC.

Example:

The sensor voltage output equals to –40°C (–40°F), or more than 140°C (284°F).

MONITOR STRATEGY

Related DTCs	P0110	Intake air temperature sensor range check (Fluttering)
		Intake air temperature sensor range check (Low voltage)
		Intake air temperature sensor range check (High voltage)
Required sensors/components	Intake air temperature sensor	
Frequency of operation	Continuous	
Duration	0.5 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

The monitor will run whenever this DTC is not present	See page DI–3
The typical enabling condition is not available	–

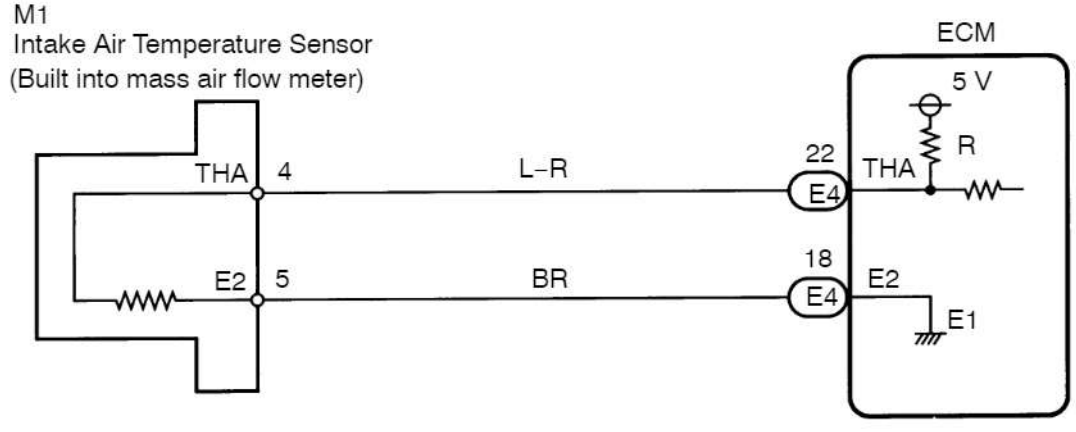
TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Intake air temperature sensor range check (Fluttering):	
Intake air temperature sensor resistance (Intake air temperature)	Less than 98.5 Ω, or more than 156 kΩ (More than 140°C (284°F), or less than –40°C (–40°F))
Intake air temperature sensor range check (Low voltage):	
Intake air temperature sensor resistance (Intake air temperature)	Less than 98.5 Ω (More than 140°C (284°F))
Intake air temperature sensor range check (High voltage):	
Intake air temperature sensor resistance (Intake air temperature)	More than 156 kΩ (Less than –40°C (–40°F))

COMPONENT OPERATING RANGE

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

WIRING DIAGRAM



2005 CELICA (RM1131U)

A00310

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, as well as other data from the time when a malfunction occurred.

1	**Connect OBD II scan tool or hand–held tester, and read value of intake air temperature.**

PREPARATION:

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester or the OBD II scan tool main switch ON.
(c) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / INTAKE AIR.

CHECK:

Read temperature value displayed on the hand–held tester or the OBD II scan tool.

OK:

Same as the actual intake air temperature and temperature displayed on the hand–held tester or OBD II scan tool.

RESULT:

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

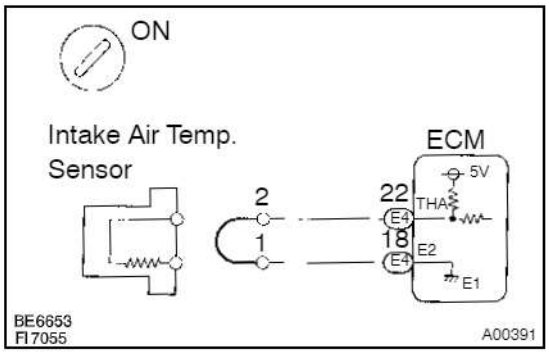
HINT:

- 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 DI–3).**

A

2	Check for open in harness or ECM.



PREPARATION:

(a) Disconnect the intake temp. sensor connector.
(b) Connect sensor wire harness terminals together.
(c) Turn the ignition switch ON.
(d) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / INTAKE AIR.

CHECK:

Read temperature value on the OBD II scan tool or the hand–held tester.

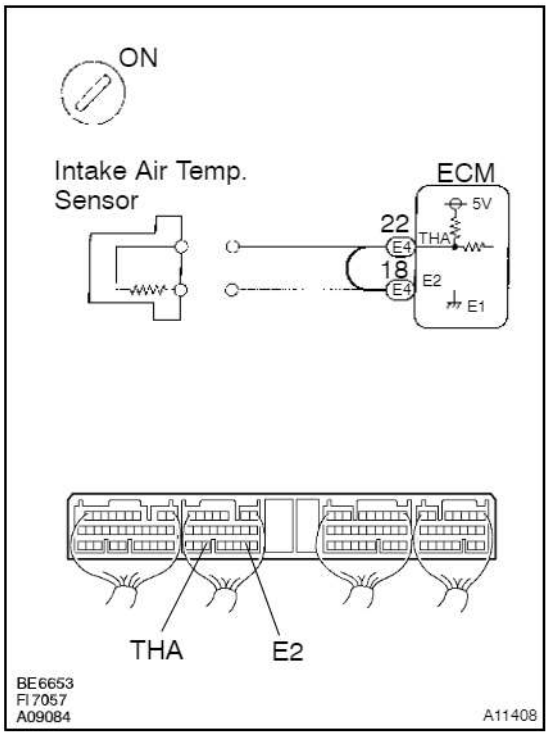
OK:

Temperature value: 140°C (284°F) or more

OK	Confirm good connection at sensor. If OK, replace intake air temperature sensor.

NG

3	Check for open in harness or ECM.



PREPARATION:

(a) Remove the ECM cover.

(b) Connect between terminals THA and E2 of the ECM connector.

HINT:

In take air temp. sensor connector is disconnected.

Before checking, do a visual and contact pressure checks for the ECM connector (See page IN–30).

(c) Turn the ignition switch ON.

(d) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / INTAKE AIR.

CHECK:

Read temperature value on the OBD II scan tool or hand–held tester.

OK:

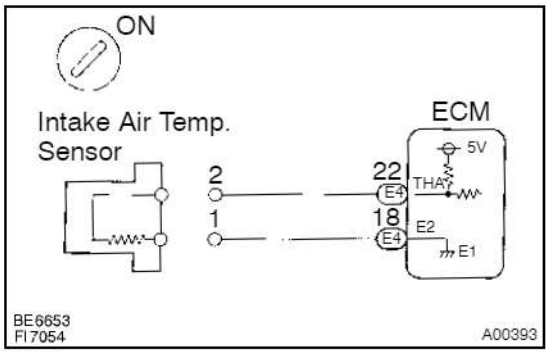
Temperature value: 140°C (284°F) or more

OK	Repair or replace harness or connector.

NG

Confirm good connection at ECM. If OK, replace ECM (See page SF–78).

4	Check for short in harness and ECM.



PREPARATION:

(a) Disconnect the mass air flow meter connector.
(b) Turn the ignition switch ON.
(c) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / INTAKE AIR.

CHECK:

Read temperature value on the OBD II scan tool or hand–held tester.

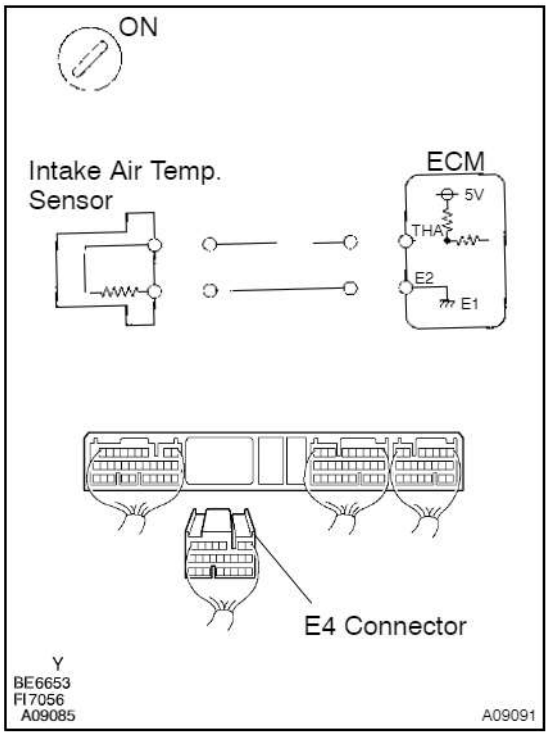
OK:

Temperature value: –40°C (–40°F)

OK	Replace mass air flow meter.

NG

5	Check for short in harness or ECM.



PREPARATION:

(a) Remove the ECM cover.

(b) Disconnect the E4 connector of the ECM.

HINT:

Intake air temp. sensor connector is disconnected.

(c) Turn the ignition switch ON.

(d) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / INTAKE AIR.

CHECK:

Read temperature value on the OBD II scan tool or hand–held tester.

OK:

Temperature value: –40°C (–40°F)

OK	Repair or replace harness or connector.

NG

Replace ECM (See page SF–78).

DTC	P0115	Engine Coolant Temperature Circuit

CIRCUIT DESCRIPTION

A thermistor is built into 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 are the same as the Intake Air Temperature (IAT) sensor.
HINT:
If the ECM detects DTC P0115, it operates fail safe function in which the engine coolant temperature is assumed to be 80°C (176°F).

DTC No.	Detection Item	Trouble Area
P0115	Open or short in engine coolant temperature sensor circuit	• Open or short in engine coolant temperature sensor circuit • Engine coolant temperature sensor • ECM

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

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

MONITOR DESCRIPTION

The ECT (Engine Coolant Temperature) 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 less than –40°C (–40°F), or more than 140°C (284°F), and if either condition continues for 0.5. sec. or more, the ECM will set a DTC.

MONITOR STRATEGY

Related DTCs	P0115	Engine coolant temperature sensor range check (Fluttering)
		Engine coolant temperature sensor range check (Low voltage)
		Engine coolant temperature sensor range check (High voltage)
Required sensors/components	Engine coolant temperature sensor	
Frequency of operation	Continuous	
Duration	0.5 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

The monitor will run whenever this DTC is not present	See page DI–3
The typical enabling condition is not available	–

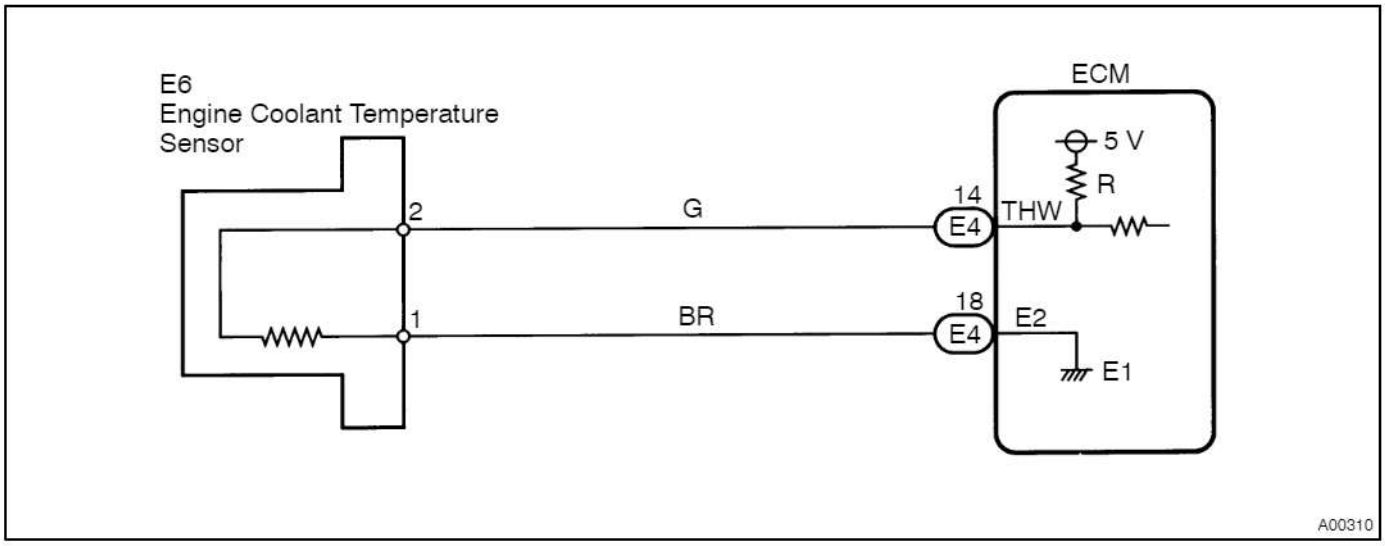
TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Engine coolant temperature sensor range check (Fluttering)	
Engine coolant temperature sensor resistance (Coolant temperature)	Less than 79 Ω, or more than 156 kΩ (More than 140°C (284°F), or less than –40°C (–40°F))
Engine coolant temperature sensor range check (Low voltage)	
Engine coolant temperature sensor resistance (Coolant temperature)	Less than 79 Ω (More than 140°C (284°F))
Engine coolant temperature sensor range check (High voltage)	
Engine coolant temperature sensor resistance (Coolant temperature)	More than 156 kΩ (Less than –40°C (–40°F))

COMPONENT OPERATING RANGE

Parameter	Standard Value
Engine coolant temperature sensor resistance	79 Ω (140°C (284°F)) to 156 kΩ (–40°C (–40°F))

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, as well as other data from the time when a malfunction occurred.

1	**Connect OBD II scan tool or hand–held tester, and read value of engine coolant temperature.**

PREPARATION:

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester or the OBD II scan tool main switch ON.
(c) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / COOLANT TEMP.

CHECK:

Read temperature value displayed on the hand–held tester or the OBD II scan tool.

OK:

Same value as the actual engine coolant temperature and temperature displayed on the hand–held tester or the OBD II scan tool.

RESULT:

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

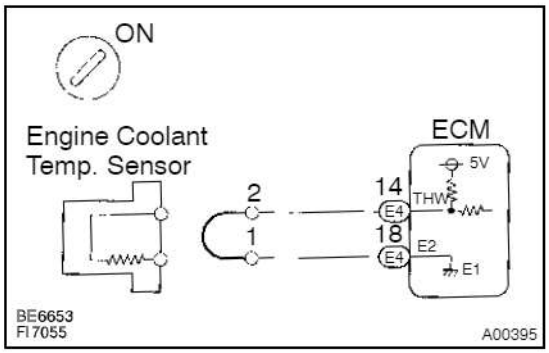
HINT:

- 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 DI–3).**

A

2	Check for open in harness or ECM.



PREPARATION:

(a) Disconnect the engine coolant temp. sensor connector.
(b) Connect the sensor wire harness terminals together.
(c) Turn the ignition switch ON.
(d) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / COOLANT TEMP.

CHECK:

Read temperature value on the OBD II scan tool or hand–held tester.

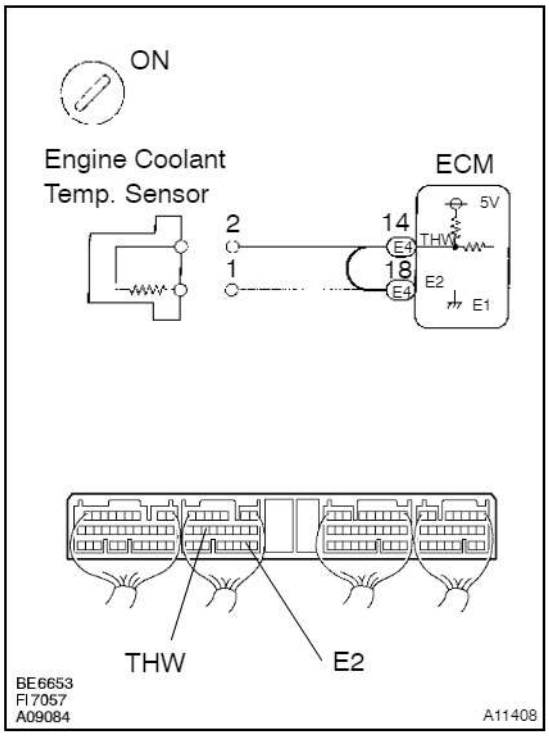
OK:

Temperature value: 140°C (284°F) or more

OK	**Confirm good connection at sensor. If OK, replace engine coolant temperature sensor.**

NG

3	Check for open in harness or ECM.



PREPARATION:

(a) Remove the ECM cover.

(b) Connect between terminals THW and E2 of the ECM connector.

HINT:

Engine coolant temp. sensor connector is disconnected. Before checking, do a visual and contact pressure checks for the ECM connector (See page IN–30).

(c) Turn the ignition switch ON.

(d) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / COOLANT TEMP.

CHECK:

Read temperature value on the OBD II scan tool or hand–held tester.

OK:

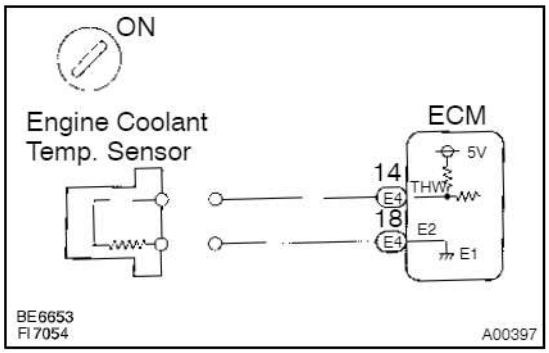
Temperature value: 140°C (284°F) or more

OK	Repair or replace harness or connector.

NG

Confirm good connection at ECM. If OK, replace ECM (See page SF–78).

4	Check for short in harness and ECM.



PREPARATION:

(a) Disconnect the engine coolant temp. sensor connector.
(b) Turn the ignition switch ON.
(c) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / COOLANT TEMP.

CHECK:

Read temperature value on the OBD II scan tool or hand–held tester.

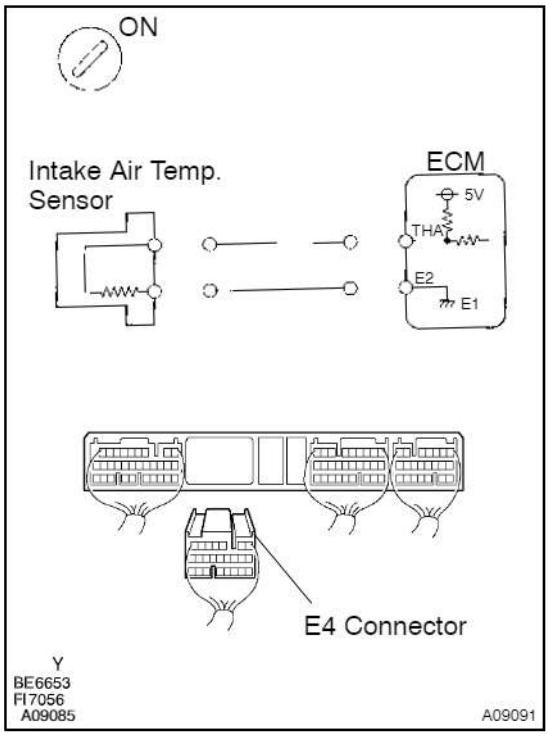
OK:

Temperature value: – 40°C (– 40°F)

OK	Replace engine coolant temperature sensor.

NG

5	Check for short in harness or ECM.



PREPARATION:

(a) Remove the ECM cover.

(b) Disconnect the E4 connector of the ECM.

HINT:

Engine coolant temp. sensor connector is disconnected.

(c) Turn the ignition switch ON.

(d) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / COOLANT TEMP.

CHECK:

Read temperature value on the OBD II scan tool or hand–held tester.

OK:

Temperature value: –40°C (–40°F)

OK	Repair or replace harness or connector.

NG

Replace ECM (See page SF–78).

DI381-13

DTC	P0116	Engine Coolant Temperature Circuit Range/ Performance Problem

CIRCUIT DESCRIPTION

Refer to DTC P0115 on page DI–87.

DTC No.	DTC Detecting Condition	Trouble Area
P0116	The ECT is 35°C (95°F) or more but less than 60°C (140°F) when the engine is started, and 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)	• ECT sensor
	• The ECT is more than 60°C (140°F) when the engine is started and the vehicle has accelerated and decelerated • The ECT sensor records a temperature variation is below 1°C (1.8°F) successively 6 times (6 trip detection logic)	

MONITOR DESCRIPTION

The ECT (Engine Coolant Temperature) 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 ECT is between 35°C (95°F) and 60°C (140°F). If after driving for 250 sec., the ECT still remains within 3°C (5.4°F) of the starting temperature, a DTC will be set (2 trip detection logic).

(2) Upon starting the engine, the ECT is over 60°C (140°F). If after driving for 250 sec., 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 range check (Stuck)
Required sensors/components	Main sensors	Engine coolant temperature sensor
	Related sensors	Intake air temperature sensor, Crankshaft position sensor, Mass air flow meter
Frequency of operation	Continuous	
Duration	250 sec.	
MIL operation	2 driving cycles (When temperature is fixed between 35°C (95°F) and 60°C (140°F)) 6 driving cycles (When temperature is fixed at 60°C (140°F) or more)	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–3	
Case 1 (When temperature is fixed between 35°C (95°F) and 60°C (140°F)):		
Cumulative idle off period	250 sec.	–
Speed increase to 30 km/h (18.6 mph) or more	10 times	–
Engine coolant temperature	35°C (95°F)	60°C (140°F)
Intake air temperature	–6.7°C (20°F)	–
Case 2 (When temperature is fixed at 60°C (140°F) or more):		
Engine coolant temperature	60°C (140°F)	104.4°C (220°F)
Intake air temperature	–6.7°C (20°F)	–
Stop and go	Once or more (Stop for 20 sec. or more and accelerate to more than 70 km/h (43 mph) within 40 sec.)	
Steady driving and stop *	Once or more	

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

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Case1 (When temperature is fixed between 35°C (95°F) and 60°C (140°F)):	
Change of engine coolant temperature value	Less than 3°C (5.4°F)
Case2 (When temperature is fixed at 60°C (140°F) or more):	
Change of engine coolant temperature value	1°C (1.8°F) or less

COMPONENT OPERATING RANGE

Standard Value
Engine coolant temperature changes with the actual engine coolant temperature

INSPECTION PROCEDURE

HINT:

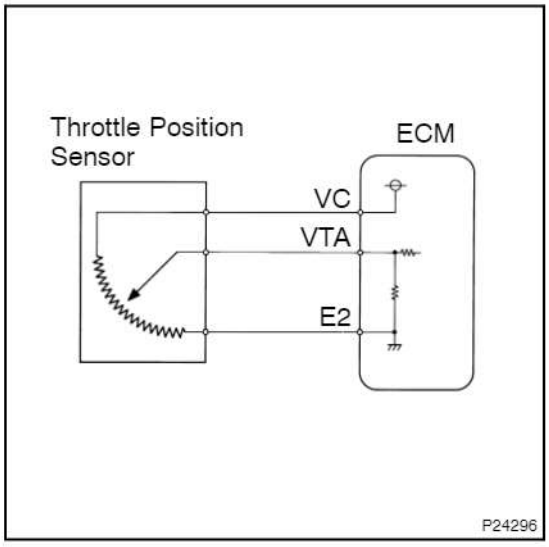
- If DTCs P0115 and P0125 are output simultaneously, the engine coolant temperature sensor circuit may be open or shorted. Perform the troubleshooting of DTC P0115 first.
- Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when 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, as well as other data from the time when a malfunction occurred.

Replace engine coolant temperature sensor.

D/C6L–02

DTC	P0120	Throttle Position Sensor/Switch "A" Circuit Malfunction

CIRCUIT DESCRIPTION



The throttle position sensor is mounted in the throttle body and detects the throttle valve opening angle. When the throttle valve is fully closed, a voltage of approximately 0.3 to 0.8 V is applied to terminal VTA of the ECM. The voltage applied to terminal VTA of the ECM increases in proportion to the opening angle of the throttle valve and becomes approximately 3.2 to 4.9 V when the throttle valve is fully opened. The ECM judges the vehicle driving conditions from this signal input from terminal VTA. Based on the conditions, the air–fuel ratio, power increase, and fuel–cut control, etc. are decided.

DTC No.	DTC Detecting Condition	Trouble Area
P0120	Condition (a) or (b) continues for more than 5 sec.: (a) VTA < 0.1 V (b) VTA > 4.9 V	• Open or short in throttle position sensor circuit • Throttle position sensor • ECM

HINT:

After confirming DTC P0120, confirm the throttle valve opening percentage and closed throttle position switch condition using the hand–held tester or the OBD II scan tool.

Throttle valve opening position expressed as percentage		Trouble Area
Throttle valve closed	Throttle valve fully open	
0 %	0 %	VC circuit open VTA circuit open or shorted
Approx. 100 %	Approx. 100 %	E2 circuit open

MONITOR DESCRIPTION

The throttle position sensor varies its resistance with the angle of the throttle valve. The ECM applies a regulated reference voltage to the throttle position sensor positive terminal and calculates the angle of the throttle valve based on the current voltage at the throttle position sensor "signal" terminal.

When the throttle valve is near the fully closed position, the output voltage of the throttle position sensor is low. When it is near the fully open position, the output voltage is high.

If the ECM detects that the output voltage of the throttle position sensor is out of the normal range, the ECM interprets this as a malfunction in the throttle position sensor and sets a DTC.

MONITOR STRATEGY

Related DTCs	P0120	Throttle position sensor range check (Fluttering)
		Throttle position sensor range check (Low voltage)
		Throttle position sensor range check (High voltage)
Required sensors/components	Throttle position sensor	
Frequency of operation	Continuous	
Duration	5 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

The monitor will run whenever this DTC is not present	See page DI–3
The typical enabling condition is not available	–

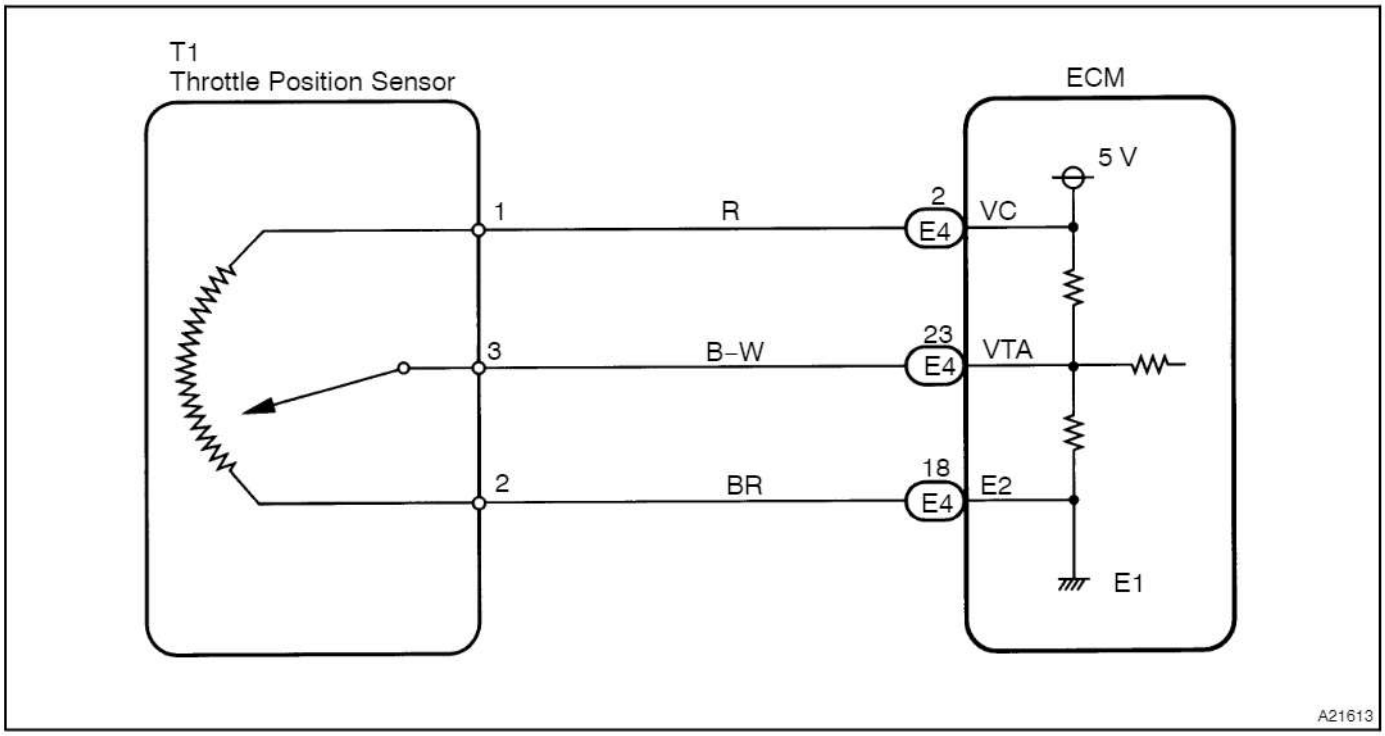
TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
Throttle position sensor range check (Fluttering)	
Throttle position sensor voltage	Less than 0.1 V, or more than 4.9 V
Throttle position sensor range check (Low voltage)	
Throttle position sensor voltage	Less than 0.1 V
Throttle position sensor range check (High voltage)	
Throttle position sensor voltage	More than 4.9 V

COMPONENT OPERATING RANGE

Parameter	Standard value
Throttle position sensor voltage	0.1 to 4.9 V

WIRING DIAGRAM



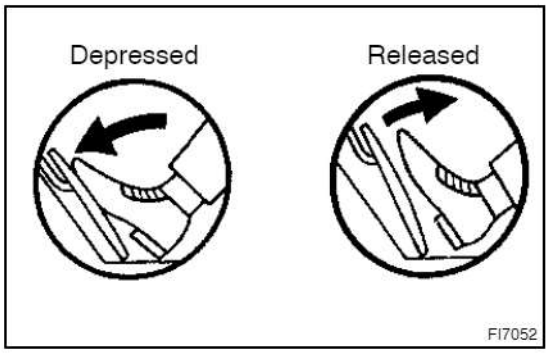
INSPECTION PROCEDURE

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, as well as other data from the time when a malfunction occurred.

Hand–held tester:

1	**Connect hand–held tester or OBD II scan tool, and read value of throttle valve opening percentage.**



PREPARATION:

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON.
(c) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ETCS / THROTTLE POS.

CHECK:

Read its value displayed on the hand–held tester.

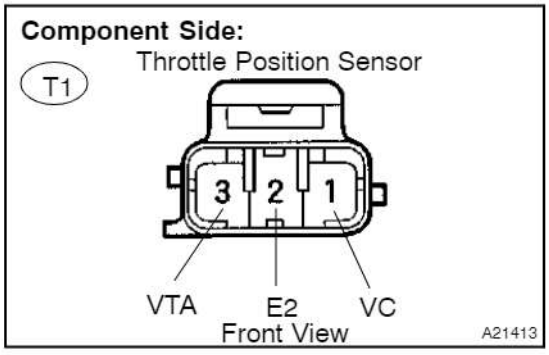
RESULT:

Accelerator Pedal Operation	Throttle Valve Opening Position (%)	Proceed to
Releasing and depressing	0	A
	From approx. 0 to 75	B
	Approx. 100	C

B	**Check for intermittent problems (See page DI–3).**
C	**Go to step 4.**

A

2	**Check throttle position sensor.**



(a) Disconnect the T1 throttle position sensor connector.
(b) Measure the resistance between the terminals of the throttle position sensor.

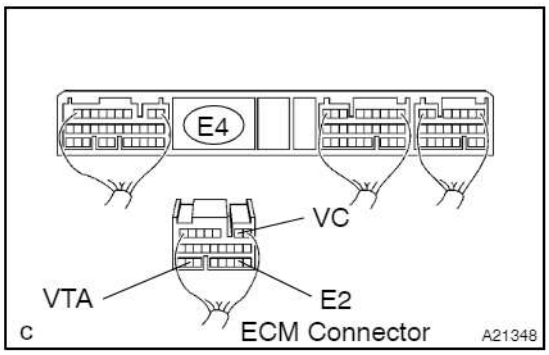
OK:

Tester Connection	Throttle Valve	Specified Condition
VC (T1–1) – E2 (T1–2)	—	2.5 to 5.9 kΩ
VTA (T1–3) – E2 (T1–2)	Fully closed	0.2 to 5.7 kΩ
	Fully open	2.0 to 10.2 kΩ

NG	**Replace throttle position sensor.**

OK

3	Check for open and short in harness and connector between ECM and throttle position sensor.



PREPARATION:

(a) Reconnect the throttle position sensor connector.
(b) Disconnect the ECM connector.

CHECK:

(a) Measure the resistance between terminals VC and E2 of ECM connector.
(b) Measure the resistance between terminals VTA and E2 of ECM connector.

OK:

Tester Connection	Throttle Valve	Specified Condition
VC (E4–2) – E2 (E4–18)	—	2.5 to 5.9 kΩ
VTA (E4–23) – E2 (E4–18)	Fully closed	0.2 to 5.7 kΩ
	Fully open	2.0 to 10.2 kΩ

CHECK:

Measure the resistance between the terminals of VC and VTA of ECM connector and body ground.

OK:

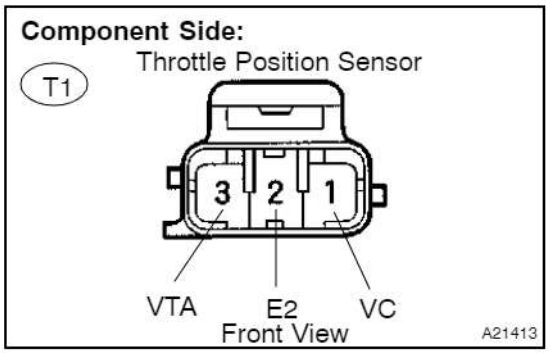
Resistance: 10 kΩ or higher

NG	Repair or replace harness or connector.

OK

Replace ECM (See page SF–78).

4	Check throttle position sensor.



(a) Disconnect the T1 throttle position sensor connector.
(b) Measure the resistance between the terminals of the throttle position sensor.

OK:

Tester Connection	Throttle Valve	Specified Condition
VC (T1–1) – E2 (T1–2)	—	2.5 to 5.9 kΩ
VTA (T1–3) – E2 (T1–2)	Fully closed	0.2 to 5.7 kΩ
	Fully open	2.0 to 10.2 kΩ

NG	Replace throttle position sensor.

OK

5	**Check for open and short in harness and connector between ECM and throttle position sensor (See page IN–30).**

NG → **Repair or replace harness or connector.**

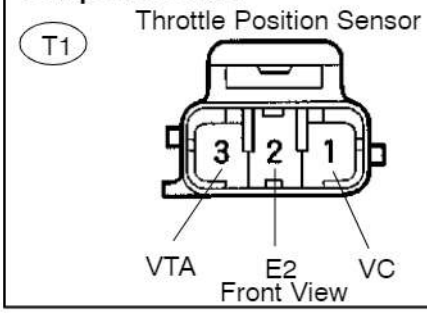
OK

Replace ECM (See page SF–78).

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

1	**Check throttle position sensor.**

Component Side:



(a) Disconnect the T1 throttle position sensor connector.
(b) Measure the resistance between the terminals of the throttle position sensor.

OK:

Tester Connection	Throttle Valve	Specified Condition
VC (T1–1) – E2 (T1–2)	—	2.5 to 5.9 kΩ
VTA (T1–3) – E2 (T1–2)	Fully closed	0.2 to 5.7 kΩ
	Fully open	2.0 to 10.2 kΩ

NG → **Replace throttle position sensor.**

OK

2	**Check for open and short in harness and connector between ECM and throttle position sensor (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Replace ECM (See page SF–78).

DI383-15

DTC	P0121	Throttle/Pedal Position Sensor/Switch "A" Circuit Range/Performance Problem

CIRCUIT DESCRIPTION

Refer to DTC P0120 on page DI–96.

DTC No.	Detection Item	Trouble Area
P0121	After the vehicle speed has been exceeded 30 km/h (19 mph) even once, the output value of the throttle position sensor is out of the applicable range while the vehicle speed is between 30 km/h (19 mph) and 0 km/h (0 mph). (2 trip detection logic)	• Throttle position sensor • ECM

MONITOR DESCRIPTION

The throttle position sensor varies its resistance with the angle of the throttle valve. The ECM applies a regulated reference voltage to the throttle position sensor positive terminal and calculates the angle of the throttle valve based on the current voltage at the throttle position sensor "signal" terminal.
When the throttle valve is near the fully closed position, the output voltage of the throttle position sensor is low. When it is near the fully open position, the output voltage is high.
The ECM checks the indicated angle of the throttle valve during "stop and go" conditions. If the indicated angle (or voltage) in the "closed throttle" position is out of the specified range 8 times or more, the ECM interprets this as a malfunction in the throttle position sensor and sets a DTC.

MONITOR STRATEGY

Related DTCs	P0121	Throttle position sensor rationality
Required sensors/components	Main sensors/components	Throttle position sensor
	Related sensors/components	Vehicle speed sensor
Frequency of operation	Continuous	
Duration	8 times or more	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–3	
Malfunction criteria and its threshold are met 8 times from once GO is judged until STOP is judged		
GO: Vehicle speed	30 km/h (18.63 mph)	–
STOP: Vehicle speed	–	0 km/h (0mph)

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Closed throttle position learning value	26.254° (1.05 V) or more or less than 7.456° (0.298 V)

COMPONENT OPERATING RANGE

Parameter	Standard Value
Closed throttle position learning value	Less than 26.254° (1.05 V) and 7.456° (0.298 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, as well as other data from the time when a malfunction occurred.

1	**Are there any other codes (besides DTC P0121) being output?**

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

CHECK:
Read the DTCs.

RESULT:

Display (DTC output)	Proceed to
"P0121" and other DTCs	A
P0121	B

HINT:
If any other codes besides P0121 is output, perform the troubleshooting for those DTCs first.

B → **Replace throttle position sensor.**

A → **Go to relevant DTC chart (See page DI–42).**

DIC6M–02

DTC	P0125	Insufficient coolant temperature for closed loop fuel control

CIRCUIT DESCRIPTION

Refer to DTC P0115 on page DI–87.

DTC No.	DTC Detection Condition	Trouble Area
P0125	The engine coolant temperature (ECT) is less than –6.6°C (20°F) when starting the engine, and 20 minutes after the engine start, the ECT sensor still indicates below 20°C (68°F)	• Cooling system • Engine coolant temperature sensor • Thermostat
	The ECT is between –6.6°C (20°F) and 10°C (50°F) when start, 5 minutes after the start, the ECT sensor still indicates below 20°C (68°F)	
	The ECT is greater than 10°C (50°F) when starting the engine, and 2 minutes after the engine start, ECT sensor still indicates below 20°C (68°F)	

MONITOR DESCRIPTION

The ECT (Engine Coolant Temperature) 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 warmed up 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 is 0°C (32°F) at engine start. After 5 min. running time, the ECT sensor still indicates that the engine is not warmed up enough to begin air fuel ratio 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 coolant temperature for closed loop fuel control
Required sensors/components	Main sensors/components	Engine coolant temperature sensor, Cooling system, Thermostat
	Related sensors/components	Mass air flow meter
Frequency of operation	Continuous	
Duration	2 min. (at engine start, engine coolant or intake air temperature of 10°C (50°F) or more) 5 min. (at engine start, engine coolant or intake air temperature of –6.6°C (20°F) to 10°C (50°F)) 20 min. (at engine start, engine coolant or intake air temperature of less than –6.6°C (20°F))	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–3	
Engine	Running	
Fuel cut	OFF	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Time until "engine coolant temperature" detection temperature reaches feedback start temperature	
When the temperature at the time of engine starting is 10°C (50°F) or more	Engine coolant temperature is less than "closed–loop enable temperature" 2 min. or more after engine start
When the temperature at the time of engine starting is "–6.6°C (20°F)" to "10°C (50°F)"	Engine coolant temperature is less than "closed–loop enable temperature" 5 min. or more after engine start
When the temperature at the time of engine starting is –6.6°C (20°F) or less	Engine coolant temperature is less than "closed–loop enable temperature" 20 min. or more after engine start

WIRING DIAGRAM

Refer to DTC P0115 on page DI–87.

INSPECTION PROCEDURE

HINT:

- If DTCs P0115, P0116 and P0125 are output simultaneously, the engine coolant temperature sensor circuit may be open or shorted. Perform the troubleshooting of DTC P0115 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, as well as other data from the time when a malfunction occurred.

1	**Are there any other codes (besides DTC P0125) being output.**

PREPARATION:

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

CHECK:

Read the DTCs.

RESULT:

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

HINT:

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

B → **Go to relevant DTC chart (See page DI–42).**

A

2	**Check thermostat (See page CO–10).**

NG → **Replace thermostat (See page CO–8).**

OK

3	**Check cooling system.**

CHECK:

Check that there is defect 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.

DIC8N–02

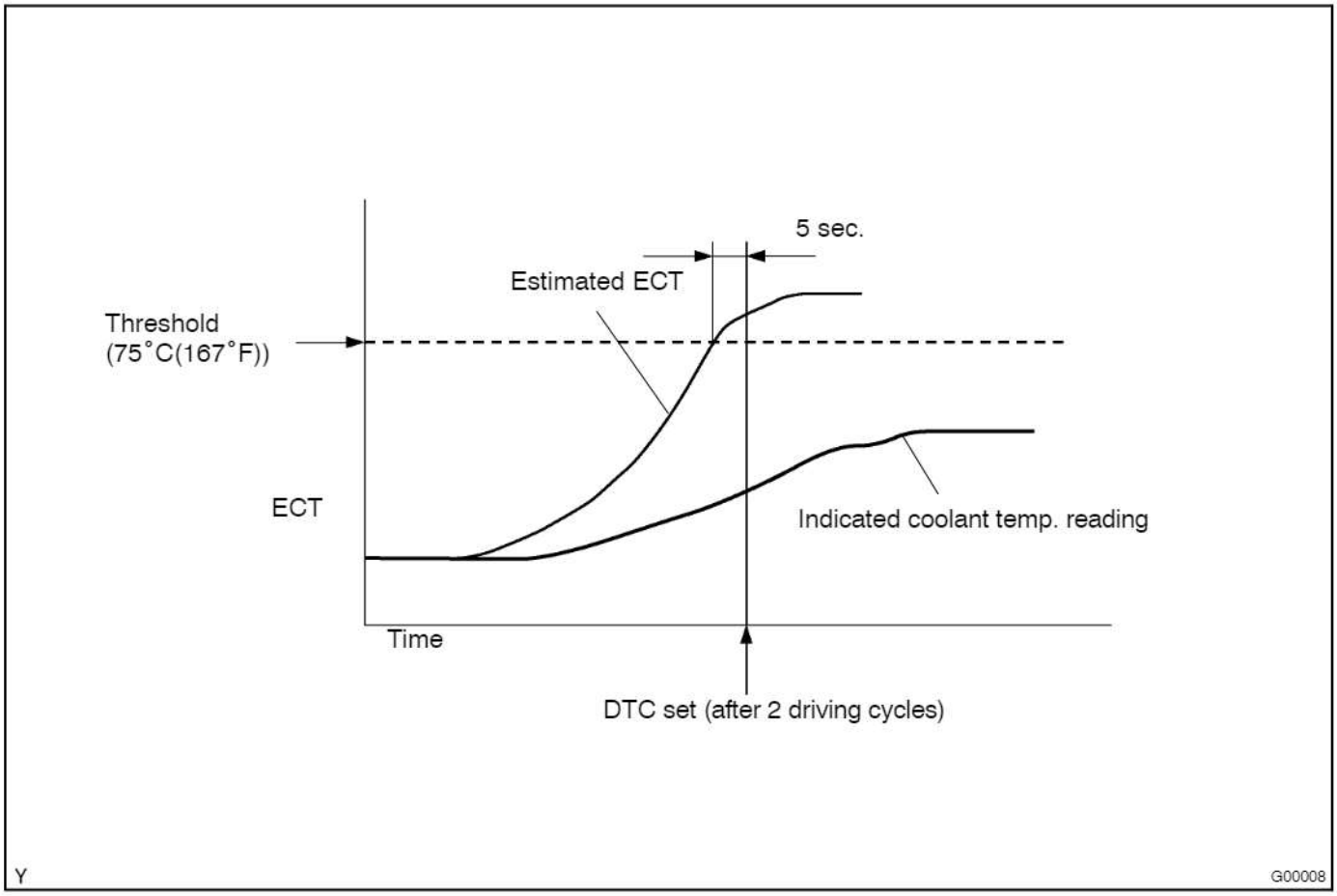
DTC	P0128	Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature)

CIRCUIT DESCRIPTION

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

DTC No.	DTC Detecting condition	Trouble Area
P0128	Conditions (a), (b) and (c) are met: (a) After starting engine, ECT is –10 to 30°C (–22 to 86°F) (b) Engine is warmed up (c) THW < 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 ECT (Engine Coolant Temperature). 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 thermostat or engine cooling system and set a DTC.

MONITOR STRATEGY

Related DTCs	P0128	Thermostat
Required sensors/components	Main sensors/components	Engine coolant temperature sensor, Engine cooling system, Thermostat
	Related sensors/components	Intake air temperature sensor, Vehicle speed sensor
Frequency of operation	Once per driving cycle	
Duration	15 min.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–3	
Battery voltage	11.0 V	–
Throttle position learning	Completed	
Intake air temperature at engine start	–10°C (14°F)	35°C (95°F)
Engine coolant temperature at engine start	–10°C (14°F)	35°C (95°F)
Engine coolant temperature at engine start – Intake air temperature at engine start	–15°C (–27°F)	7°C (12.6°F)
Accumulated time that vehicle speed reaches 128 km/h (80 mph) or more	–	20 sec.

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Duration that both of the following conditions 1 and 2 are met:	5 sec. or more
1. Estimated engine coolant temperature	75°C (167°F) or more
2. Engine coolant temperature sensor output	Less than 75°C (167°F)

COMPONENT OPERATING RANGE

Parameter	Standard Value
Engine coolant temperature sensor output value after engine warm–up	75°C (167°F) or more

MONITOR RESULT

Refer to page DI–3 for detailed information.

The test value and test limit information are described as shown in the following table. Check the monitor result and test values after performing the monitor drive pattern (see page DI–3).

- TID (Test Identification Data) is assigned to each emissions–related component.
- TLT (Test Limit Type):
  If TLT is 0, the component is malfunctioning when the test value is higher than the test limit.
  If TLT is 1, the component is malfunctioning when the test value is lower than the test limit.
- CID (Component Identification Data) is assigned to each test value.
- Unit Conversion is used to calculate the test value indicated on generic OBD II scan tools.

TID $08: Thermostat

TLT	CID	Unit Conversion	Description of Test Data	Description of Test Limit
1	$01	Multiply by 0.625 and subtract 40 (°C)	ECT sensor output when estimated ECT has reached to malfunction criterion	Malfunction criteria for thermostat

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, as well as other data from the time when a malfunction occurred.

1	**Are there any other codes (besides DTC P0128) being output?**

PREPARATION:

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

CHECK:

Read the DTCs.

RESULT:

Display (DTC output)	Proceed to
P0128	A
P0128 and other DTCs	B

HINT:

If any other codes besides P0128 is output, perform the troubleshooting for those DTCs first.

B → **Go to relevant DTC chart (See page DI–42).**

A

2	**Check cooling system.**

CHECK:

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

NG → **Repair or replace cooling system.**

OK ↓

3	**Check thermostat (See page CO–10).**

NG → **Replace thermostat.**

YES ↓

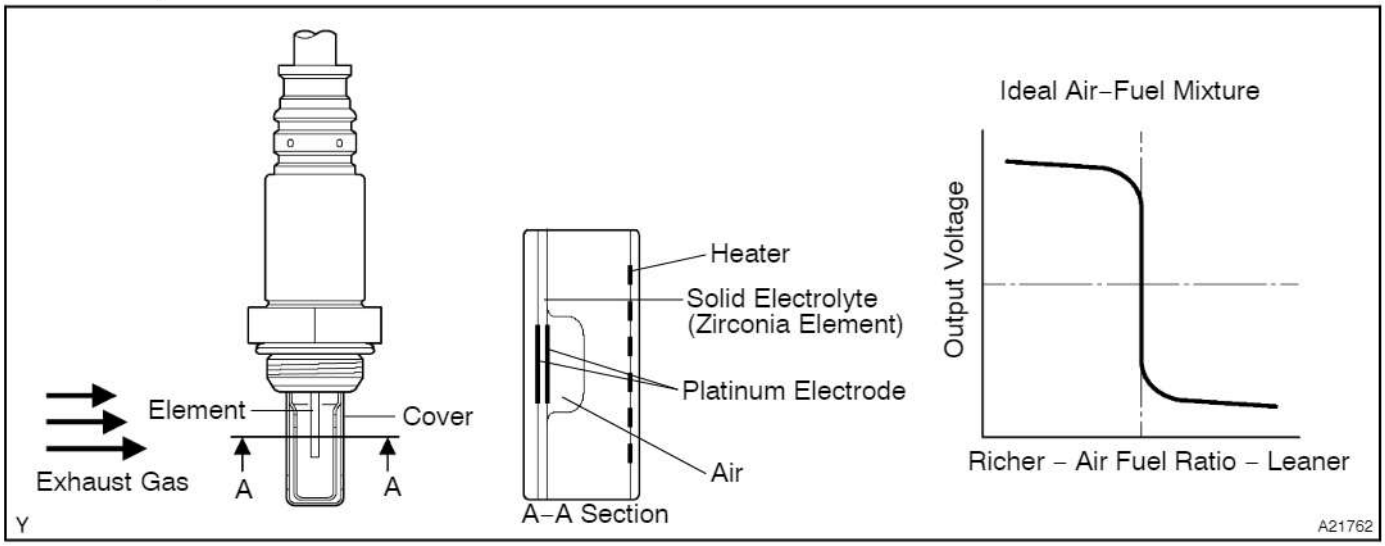
Replace ECM (See page SF–78).

DIC6O–02

DTC	P0130	Oxygen Sensor Circuit (Bank 1 Sensor 1)

CIRCUIT DESCRIPTION

The heated oxygen sensor is used to monitor oxygen concentration in the exhaust gas. For optimum catalytic converter operation, the air fuel mixture must be maintained near the ideal stoichiometric ratio. The heated oxygen sensor output voltage changes suddenly in the vicinity of the stoichiometric ratio. The ECM adjusts the fuel injection time so that the air–fuel ratio is nearly stoichiometric.
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 will be vanished from the exhaust gas. And the heated oxygen sensor informs the ECM of the RICH condition (high voltage, i.e. more than 0.45 V).

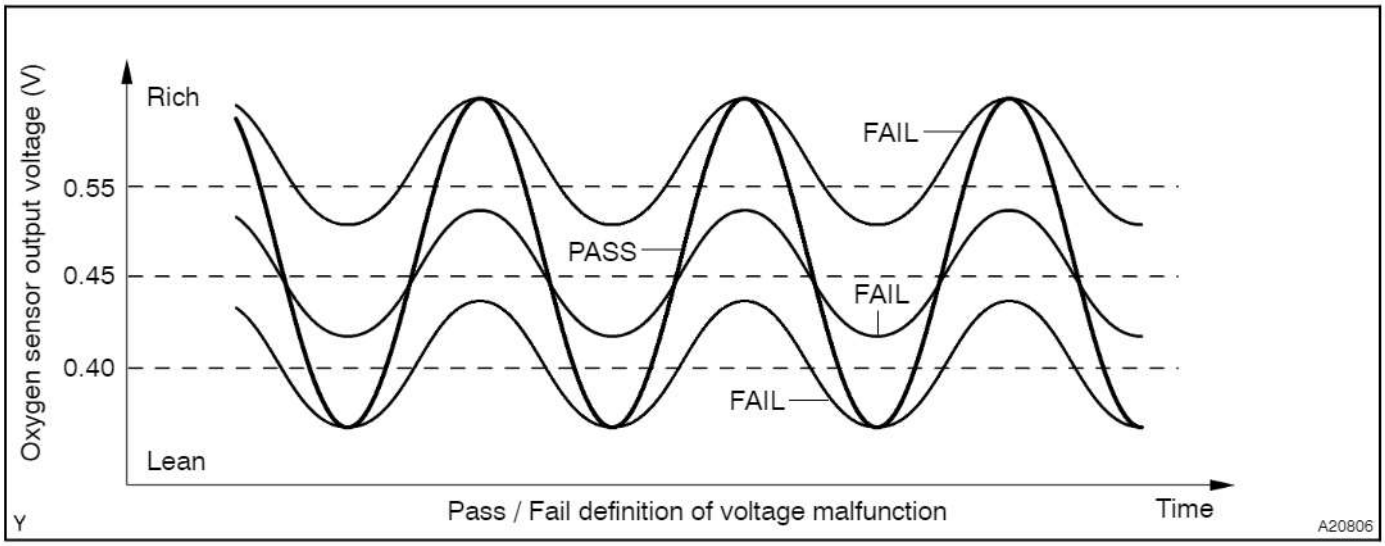


DTC No.	DTC Detection Condition	Trouble Area
P0130	Output voltage of heated oxygen sensor remains at 0.4 V or more, or 0.5 V or less, during idling after engine is warmed up (2 trip detection logic)	• Open or short in heated oxygen sensor (bank 1 sensor 1) circuit • Heated oxygen sensor (bank 1 sensor 1) • Heated oxygen sensor heater (bank 1 sensor 1) • EFI relay • Air induction system • Fuel pressure • Injector • ECM

HINT:

- Sensor 1 is the sensor closest to the engine assembly.
- 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.

MONITOR DESCRIPTION



The ECM uses the heated oxygen sensor information to regulate the air–fuel ratio to be close to a stoichiometric ratio. This maximizes the catalytic converter's ability to purify the exhaust gas. The sensor detects oxygen level 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 heated oxygen sensor has the characteristic whereby its output voltage changes 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 exhaust gas. 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 0.4 V or less, the ECM judges that the air–fuel ratio is LEAN.

Under normal condition, the output voltage from the heated oxygen sensor alternates RICH and LEAN sides periodically. If the heated oxygen sensor outputs RICH signal (or LEAN signal) constantly, or if the heated oxygen sensor cannot output enough voltage to reach the minimum specification, the ECM interprets this as a malfunction in the heated oxygen sensor and sets a DTC.

MONITOR STRATEGY

Related DTCs	P0130	Front heated oxygen sensor voltage is constant at lean side or rich side
Required sensors/components	Main sensors/components	Front heated oxygen senor
	Related sensors/components	Crank position sensor, Vehicle speed sensor
Frequency of operation	Once per driving cycle	
Duration	20 to 36 sec. x (3 times)	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–3	
There is a history that following conditions 1 and 2 were met:	20 sec. (Continuously)	
1. Vehicle speed	40 km/h (24.9 mph)	–
2. Engine speed	900 rpm	–
Time after engine start	120 sec.	–
Idle	ON	
Fuel system status	Closed loop	
Vehicle speed	–	5 km/h (3.1 mph)

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Either of the following conditions 1 or 2 is met:	3 times or more
1. Front oxygen sensor voltage is 0.55 V or less	For 18 sec. or more
2. Front oxygen sensor voltage is 0.4 V or more	For 18 sec. or more

COMPONENT OPERATING RANGE

Parameter	Standard value
Heated oxygen sensor voltage in normal condition	0 to 1 V

O2S TEST RESULT

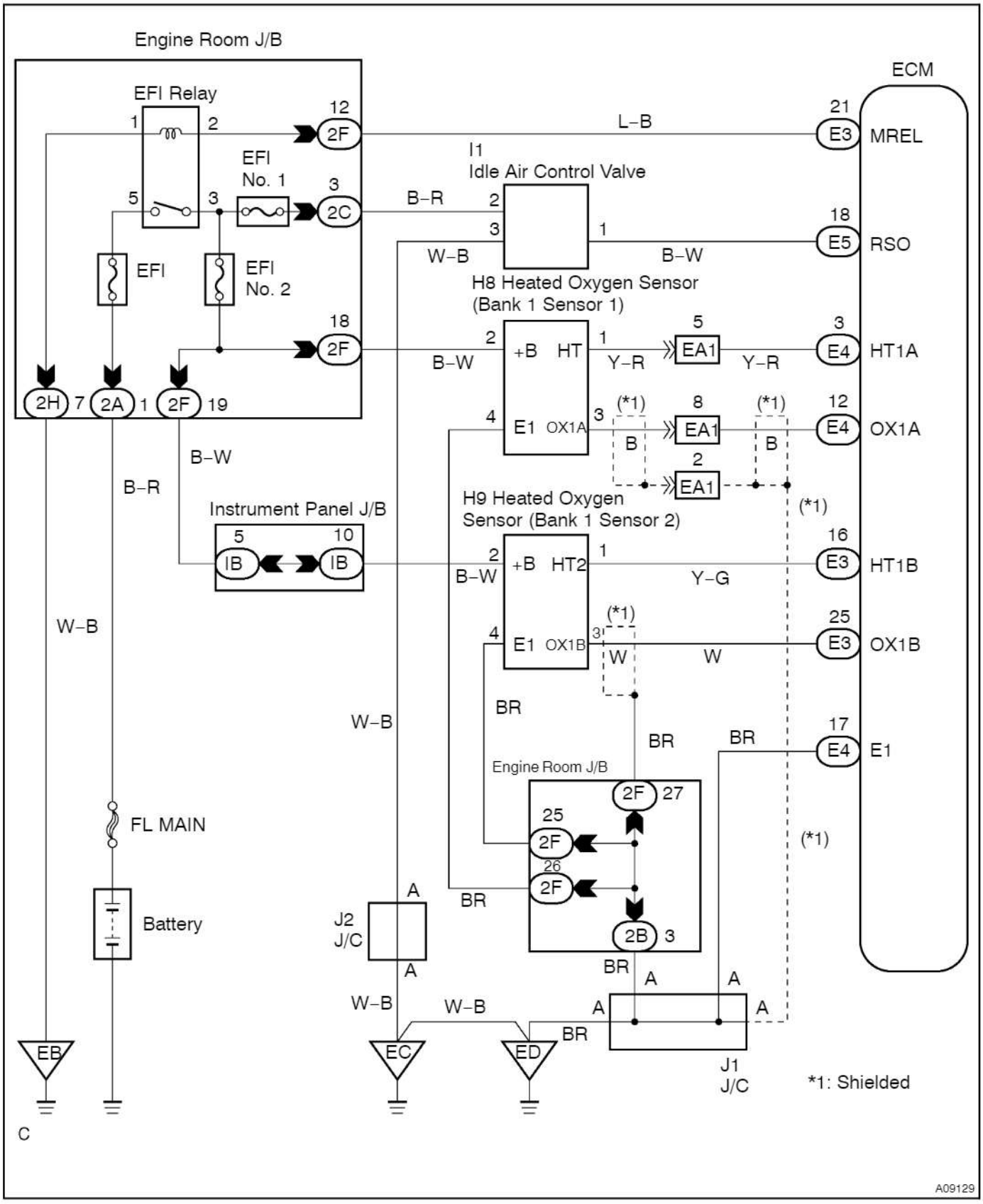
Refer to page DI–3 for detailed information.

Front HO2S voltage monitor

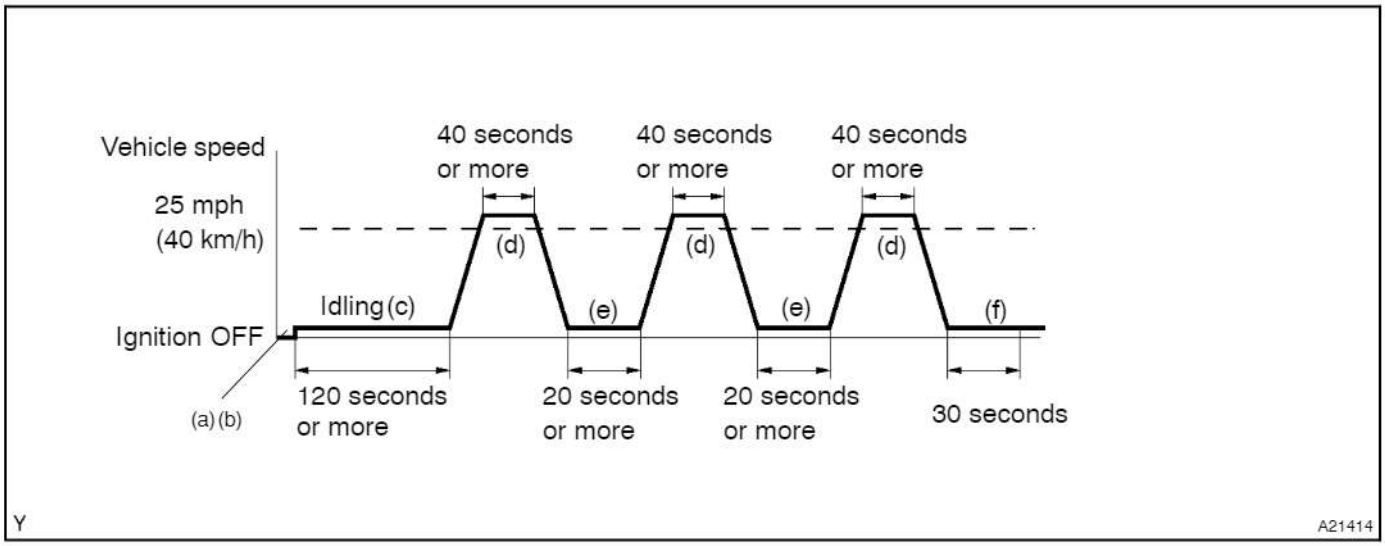
If the HO2S voltage is out of the standard value, the ECM interprets this as a malfunction.

TEST ID	Description of TEST DATA	Conversion Factor	Unit	Standard Value of TEST LIMIT
$07	Minimum front HO2S voltage	N/A	V	Between 0 and 0.4 V
$08	Maximum front HO2S voltage	N/A	V	Between 0.55 and 1.275 V

WIRING DIAGRAM



CONFIRMATION DRIVING PATTERN



(a) Connect the hand–held tester to the DLC3.
(b) Switch the hand–held tester from the "normal mode" to the "check mode" (See page DI–3).
(c) Start the engine and let the engine idle for 120 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 20 seconds or more. Perform steps (d) and (e) at least 3 times.
(f) Let the engine idle for 30 seconds.

HINT:

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

NOTICE:

If the conditions in this test are not strictly followed, detection of a malfunction will not occur.
If you do not have the hand–held tester, turn the ignition switch OFF after performing steps from (c) to (f), then perform steps from (c) to (f) again.

INSPECTION PROCEDURE

HINT:

Hand–held tester only:

Narrowing down the trouble area is possible by performing "A/F CONTROL" ACTIVE TEST (heated oxygen sensor or other trouble areas can be distinguished).

Perform ACTIVE TEST using hand–held tester (A/F CONTROL).

HINT:

"A/F CONTROL" is the ACTIVE TEST which changes the injection volume to –12.5 % or +25 %.

(1) Connect the hand–held tester to the DLC3 on the vehicle.
(2) Turn the ignition switch ON.
(3) Warm up the engine by running the engine speed at 2,500 rpm for approximately 90 seconds.
(4) Select the item "DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL".
(5) Perform "A/F CONTROL" 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)	Mainly suspect trouble area
Case 1	Injection volume +25 % –12.5 % Output voltage More than 0.5 V Less than 0.4 V OK	Injection volume +25 % –12.5 % Output voltage More than 0.5 V Less than 0.4 V 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 0.4 V 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 0.4 V 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 of A/F CONTROL procedure enables the technician to check and graph the voltage outputs of both the heated oxygen sensors.

For displaying the graph indication, enter "ACTIVE TEST / A/F CONTROL / USER DATA", then select "O2S B1S1 and O2S B1S2" by pressing "YES" button and push "ENTER" button before pressing "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 comes on.

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, as well as other data from the time when a 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	**Are there any other codes (besides DTC P0130) being output?**

PREPARATION:

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

CHECK:

Read the DTCs.

RESULT:

Display (DTC output)	Proceed to
P0130	A
"P0130" and other DTCs	B

HINT:

If any other codes besides P0130 is output, perform the troubleshooting for those DTCs first.

B → **Go to relevant DTC chart (See page DI–42).**

A

2	Check the output voltage of oxygen sensor during idling.

PREPARATION:

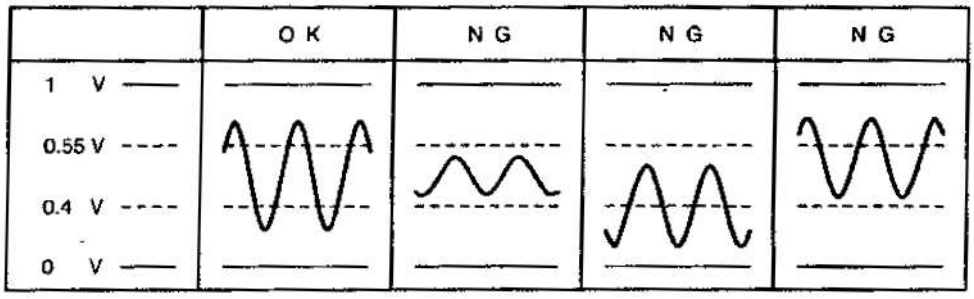
(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Start the engine and push the hand–held tester or the OBD II scan tool main switch ON.
(c) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / O2S B1S1.
(d) Warm up the heated oxygen sensor with the engine speed at 2,500 rpm for approximately 90 seconds.

CHECK:

Read the output voltage of the heated oxygen sensor during idling.

OK:

Heated oxygen sensor output voltage:
Alternates repeatedly between less than 0.4 V and more than 0.5 V (See the following table).

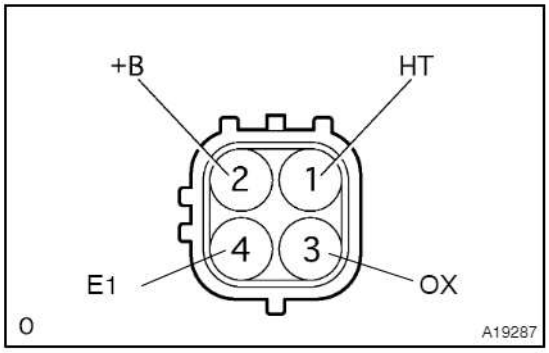


P18349

OK	Go to step 9.

NG

3	Check resistance of heated oxygen sensor heater.



A19287

PREPARATION:

Disconnect the heated oxygen sensor connector.

CHECK:

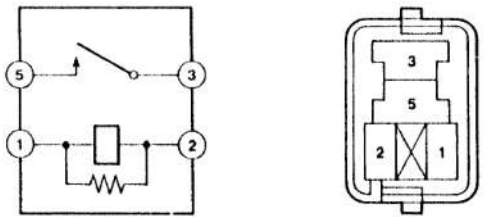
Measure resistance between the terminals HT and +B of the heated oxygen sensor.

Resistance: Bank 1 Sensor 1: 5 to 10 Ω (20 °C (68 °F))
Bank 1 Sensor 2: 11 to 16 Ω (20 °C (68 °F))

NG	Replace heated oxygen sensor.

OK

4	Check EFI relay.



A19288

PREPARATION:

Remove the EFI relay from the engine room J/B.

CHECK:

Inspect the EFI relay.

OK:

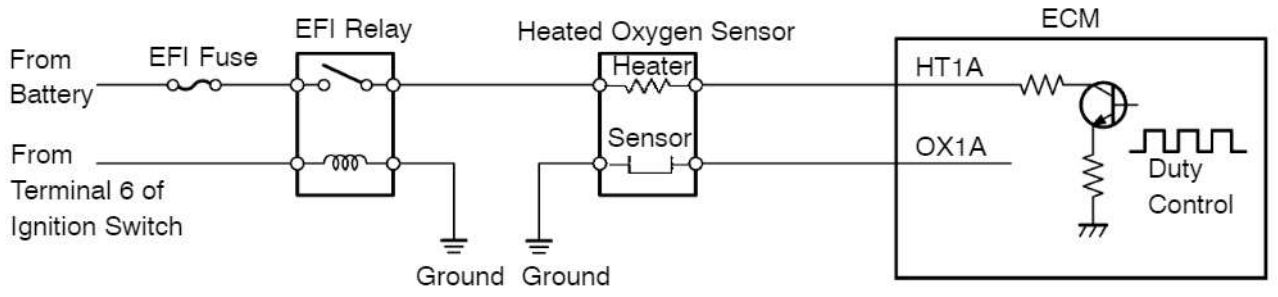
Tester Connection	Specified Condition
1 – 2	Continuity
3 – 5	No continuity
	Continuity (Apply battery voltage to terminals 1 and 2)

NG → **Replace EFI relay.**

OK

5	Check for open and short in harness and connector between ECM and oxygen sensor (bank 1 sensor 1) (See page IN–30).

Reference (Bank 1 Sensor 1 System Drawing)



A21410

NG → **Repair or replace harness or connector.**

OK

6	**Check air induction system (See page SF–1).**

CHECK:

Check the air induction system for vacuum leaks.

NG → **Repair or replace induction system.**

OK ↓

7	**Check fuel pressure (See page SF–1).**

CHECK:

Check the fuel pressure (high or low pressure).

NG → **Check and repair fuel pump, fuel pipe line and filter (See page SF–6).**

OK ↓

8	**Check injector injection (See page SF–22).**

NG → **Replace injector.**

OK ↓

Replace heated oxygen sensor (bank 1 sensor 1).

9	**Perform confirmation driving pattern.**

HINT:

Clear all DTCs prior to performing the confirmation driving pattern.

Go ↓

10	Is there DTC P130 being output again?

NO → Check for intermittent problems (See page DI–3).

YES →

Replace heated oxygen sensor (bank 1 sensor 1).

D/C6P–02

DTC	P0133	Oxygen Sensor Circuit Slow Response (Bank 1 Sensor 1)

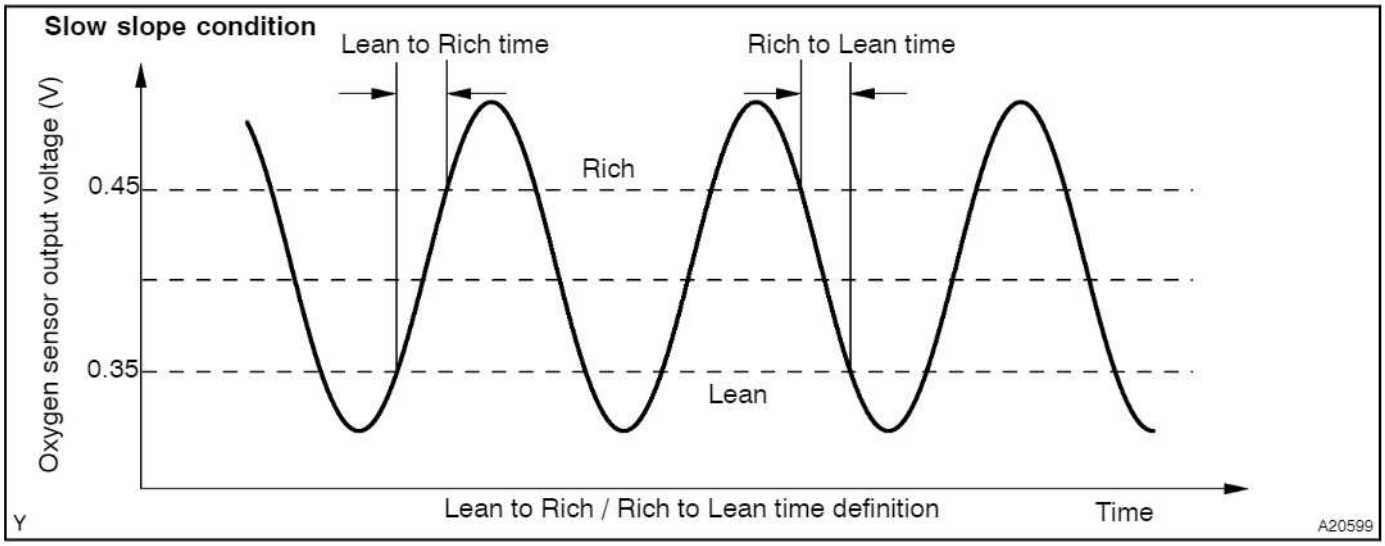
CIRCUIT DESCRIPTION

Refer to DTC P0130 on page DI–65.

DTC No.	DTC Detecting Condition	Trouble Area
P0133	After engine has been warmed up, response time that heated oxygen sensor's output voltage changing between RICH and LEAN is 0.6 second or more during idling. (2 trip detection logic)	• Open or short in heated oxygen sensor circuit • Heated oxygen sensor • EFI relay • Air induction system • Fuel pressure • Injector • ECM
	Response time of heated oxygen sensor's output voltage in one RICH–LEAN cycle is 6 seconds or more during idling. (2 trip detection logic)	

HINT:
Sensor 1 is the sensor closer to the engine assembly.

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 gas. The sensor detects oxygen level 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 heated oxygen sensor has the characteristic whereby its output voltage changes 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 exhaust gas. 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 0.4 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 heated oxygen sensor output status change from RICH to LEAN or vice versa becomes longer, the ECM interprets this as a malfunction in the heated oxygen sensor and sets a DTC.

MONITOR STRATEGY

Related DTCs	P0133	Front heated oxygen sensor response monitor
Required sensors/components	Main sensors/components	Front heated oxygen sensor
	Related sensors/components	Crank position sensor, Vehicle speed sensor, Mass air flow meter
Frequency of operation	Once per driving cycle	
Duration	Within 60 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–3	
Slow slope condition:		
There is a history that the following conditions were met for 20 sec.:	Condition 1 and 2	
1. Vehicle speed	40 km/h (25 mph)	–
2. Engine RPM	900 rpm	–
Idle	ON	
Vehicle speed	–	5 km/h (3.1 mph)
Fuel system status	Closed loop	
Time after engine start	120 sec.	–
Frequency cruise condition:		
Number of fail judgement is incremented under the following conditions:	(1 and 2) or (3 and 4) is met	
1. Number of cycle time data summation	10 times	–
2. Sum of cycle time data	Sum of cycle threshold	
3. Number of cycle time data summation	1 time	10 times
4. Sum of cycle time data	Sum of cycle threshold x 1.2 x 10 / number of summation	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Slow slope condition:	
Time that output voltage of front heated oxygen sensor increase. from 0.35 V to 0.5 V and that it decreases from 0.5 V to 0.35 V	0.6 sec. or more
Frequency cruise condition:	
Oxygen sensor frequency is judged malfunction under the following conditions:	Both 1 and 2 are met
1. Number of fail judgement	1 time or more
2. Neither pass nor fail determined yet	

COMPONENT OPERATING RANGE

Parameter	Standard value
Voltage output from heated oxygen sensor	Quickly fluctuates between 0.35 V and 0.5 V

WIRING DIAGRAM

Refer to DTC P0130 on page DI–112.

INSPECTION PROCEDURE

HINT:
Hand–held tester only:
Narrowing down the trouble area is possible by performing "A/F CONTROL" ACTIVE TEST (heated oxygen sensor or other trouble areas can be distinguished). Perform ACTIVE TEST using hand–held tester (A/F CONTROL).
Perform ACTIVE TEST using the hand–held tester (A/F CONTROL).
HINT:
"A/F CONTROL" is the ACTIVE TEST which changes the injection volume to –12.5 % or +25 %.

(1) Connect the hand–held tester to the DLC3 on the vehicle.
(2) Turn the ignition switch ON.
(3) Warm up the engine by running the engine speed at 2,500 rpm for approximately 90 seconds.
(4) Select the item "DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL".
(5) Perform "A/F CONTROL" 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)	Mainly 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 of A/F CONTROL procedure enables the technician to check and graph the voltage outputs of both the heated oxygen sensors.

For displaying the graph indication, enter "ACTIVE TEST / A/F CONTROL / USER DATA", then select "O2S B1S1 and O2S B1S2" by pressing "YES" button and push "ENTER" button before pressing "F4" button.

NOTICE:

If the vehicle is short of fuel, the air–fuel ratio becomes LEAN and DTC P0133 will be recorded, and the MIL then comes on.

NOTICE:

- 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, as well as other data from the time when a 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	**Are there any other codes (besides DTC P0133) being output?**

PREPARATION:

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

CHECK:

Read the DTCs using the hand–held tester or the OBD II scan tool.

RESULT:

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

NOTICE:

If any other codes besides P0133 are output, perform the troubleshooting for those DTCs first.

B → **Go to relevant DTC chart (See page DI–42).**

A

2	Check the output voltage of oxygen sensor during idling.

PREPARATION:

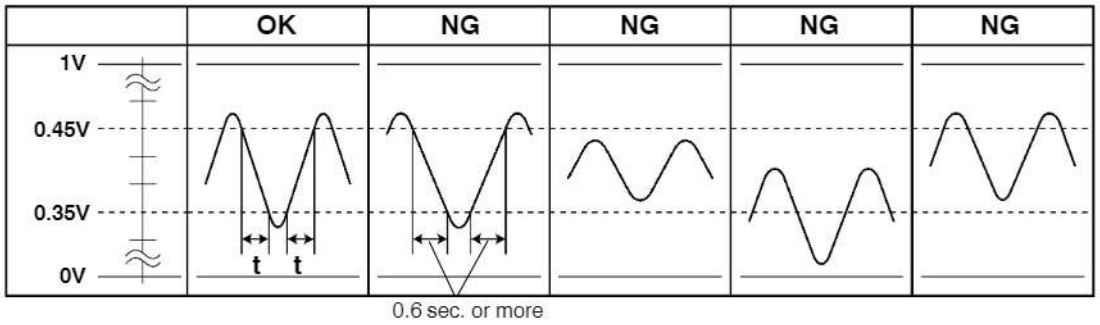
(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Start the engine and push the hand–held tester or the OBD II scan tool main switch ON.
(c) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / O2S B1S1.
(d) Warm up the heated oxygen sensor with the engine speed at 2,500 rpm for approximately 90 seconds.

CHECK:

Read the output voltage of the heated oxygen sensor during idling.

OK:

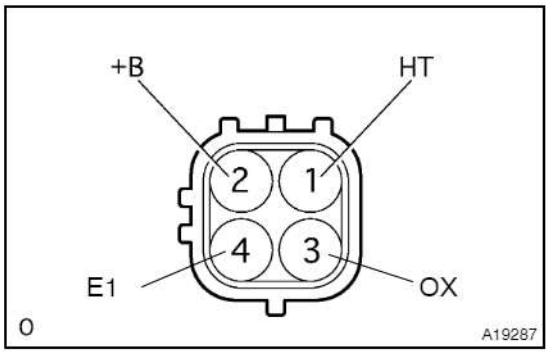
Heated oxygen sensor output voltage:
Alternates between less than 0.35 V and more than 0.45 V, and period of "t" must be less than 0.6 sec. (See the following table).



OK	Go to step 9.

NG

3	Check resistance of heated oxygen sensor heater.



PREPARATION:

Disconnect the heated oxygen sensor connector.

CHECK:

Measure resistance between the terminals HT and +B of the heated oxygen sensor.

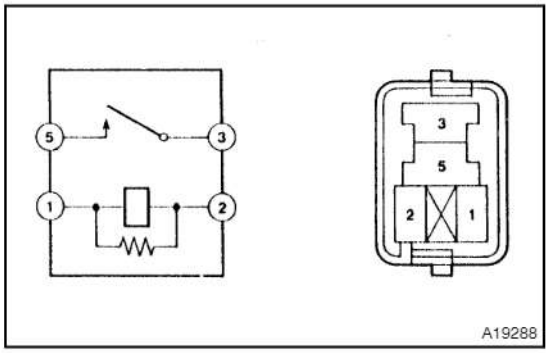
Resistance: Bank 1 Sensor 1: 5 to 10 Ω (20 °C (68 °F))

Bank 1 Sensor 2: 11 to 16 Ω (20 °C (68 °F))

NG → **Replace heated oxygen sensor.**

OK

4	Check EFI relay.



PREPARATION:

Remove the EFI relay from the engine room J/B.

CHECK:

Inspect the EFI relay.

OK:

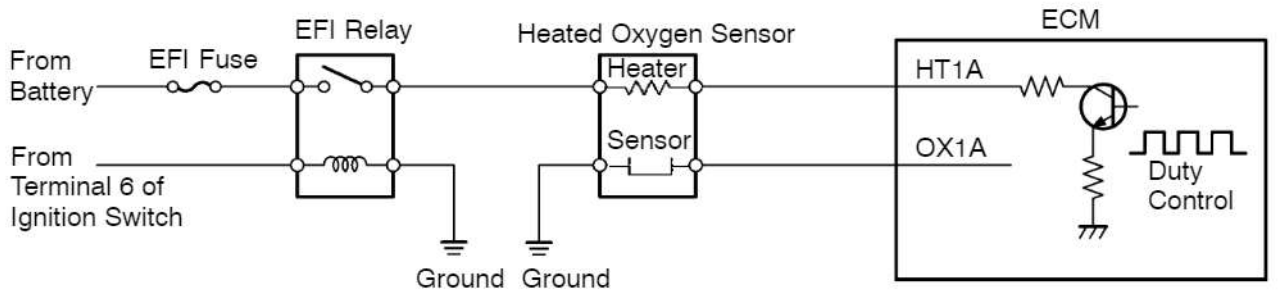
Tester Connection	Specified Condition
1 – 2	Continuity
3 – 5	No continuity
	Continuity (Apply battery voltage to terminals 1 and 2)

NG → **Replace EFI relay.**

OK

5	**Check for open and short in harness and connector between ECM and oxygen sensor (bank 1 sensor 1) (See page IN–30).**

Reference (Bank 1 Sensor 1 System Drawing)



NG → **Repair or replace harness or connector.**

OK ↓

6	**Check air induction system (See page SF–1).**

CHECK:

Check the air induction system vacuum leaks.

NG → **Repair or replace induction system.**

OK ↓

7	**Check fuel pressure (See page SF–1).**

CHECK:

Check the fuel pressure (high or low pressure).

NG → **Check and repair fuel pump, fuel pipe line and filter (See page SF–6).**

OK ↓

8	**Check injector injection (See page SF–22).**

NG → **Replace injector.**

OK

Replace heated oxygen sensor (bank 1 sensor 1).

9	**Perform confirmation driving pattern (See page DI–33).**

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

Go

10	**Is there DTC P0133 being output again?**

YES → **Check for intermittent problems (See page DI–3).**

NO

Replace heated oxygen sensor (bank 1 sensor 1).

DIC6Q–02

DTC	P0134	Oxygen Sensor Circuit No Activity Detected (Bank 1 Sensor 1)

CIRCUIT DESCRIPTION

Refer to DTC P0130 on page DI–112.

DTC No.	DTC Detecting Condition	Trouble Area
P0134	After engine is warmed up, heated oxygen sensor (bank 1, 2 sensor 1) output does not indicate RICH (≧0.45 V) even once when conditions (a), (b), (c) and (d) continue for at least 65 sec.: (a) Engine speed: 1,400 rpm or more (b) Vehicle speed: 40 to 130 km/h (25 to 81 mph) (c) Throttle valve is not fully closed (d) 180 sec. or more after starting engine	• Open or short in heated oxygen sensor (bank 1 sensor 1) circuit • Heated oxygen sensor (bank 1 sensor 1) • EFI relay • Air induction system • Fuel pressure • Injector • Gas leakage in exhaust system • ECM • PCV piping

HINT:

After confirming DTC P0134, check the output voltage of the heated oxygen sensor (bank 1 sensor 1) in the "DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL" using the hand–held tester or the OBD II scan tool. If the output voltage of the heated oxygen sensor is always less than 0.1 V, the sensor circuit may be open or shorted.

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 0.55 V, the air–fuel ratio is RICH. If the conditions for the 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 the closed–loop fuel control is malfunctioning. The ECM will illuminate the MIL and a DTC will be set.

MONITOR STRATEGY

Related DTCs	P0134	Excessive time to enter closed loop
Required sensors/components	Main sensors/components	Front heated oxygen sensor
	Related sensors/components	Crank position sensor, Engine coolant temperature sensor, Vehicle speed sensor
Frequency of operation	Once per driving cycle	
Duration	65 sec.	
MIL operation	1 driving cycle	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–3	
Time after following conditions are met:	50 sec.	–
Engine coolant temperature	40°C (104°F)	–
Engine RPM	1,400 rpm	–
Vehicle speed	40 km/h (24.9 mph)	250 km/h (155.4 mph)
Idle	OFF	
Time after engine start	3 min.	–

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Front heated oxygen sensor voltage	Less than 0.45 V

COMPONENT OPERATING RANGE

Parameter	Standard value
In the normal condition, the front heated oxygen sensor voltage	0 to 1 V

WIRING DIAGRAM

Refer to DTC P0130 on page DI–112.

INSPECTION PROCEDURE

HINT:

Hand–held tester only:

Determining the trouble area is possible by performing "A/F CONTROL" ACTIVE TEST (heated oxygen sensor or other trouble areas can be distinguished).

Perform ACTIVE TEST using a hand–held tester (A/F CONTROL).

HINT:

"A/F CONTROL" is the ACTIVE TEST which changes the injection volume to –12.5 % or +25 %.

(1) Connect the hand–held tester to the DLC3 on the vehicle.
(2) Turn the ignition switch 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 "A/F CONTROL" with the engine idling (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 0.55 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)	Mainly 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 of A/F CONTROL procedure enables the technician to check and graph the voltage outputs of both the heated oxygen sensors.

For displaying the graph indication, enter "ACTIVE TEST / A/F CONTROL / USER DATA", then select "O2S B1S1 and O2S B1S2" by pressing "YES" button and push "ENTER" button before pressing "F4" button.

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.
- 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	**Are there any other codes (besides DTC P0134) being output ?**

PREPARATION:

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

CHECK:

Read the DTCs.

RESULT:

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

HINT:

If any other codes besides P0134 are output, perform the troubleshooting for those DTCs first.

B → **Go to relevant DTC chart (See page DI–42).**

A

2	**Connect the OBD II scan tool or hand–held tester and read value for voltage output of oxygen sensor (bank 1 sensor 1).**

PREPARATION:

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester or the OBD II scan tool main switch ON.
(c) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / O2S B1S1."
(d) Warm up the engine to the normal operating engine coolant temperature above 75°C (169°F).

CHECK:

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.

OK:

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

OK → **Go to step 12.**

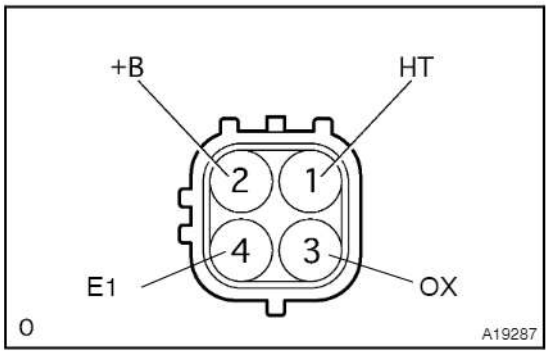
NG

3	Check connection of PCV piping.

NG → Repair or replace PCV piping.

OK

4	Check resistance of heated oxygen sensor heater.

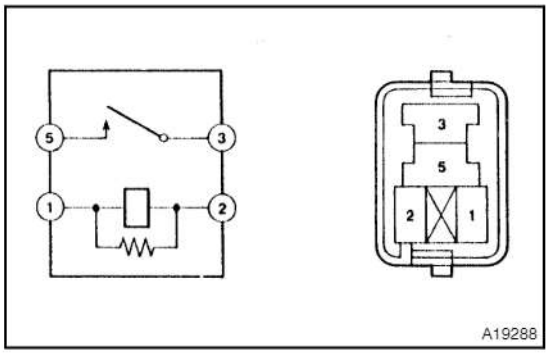


PREPARATION:
Disconnect the heated oxygen sensor connector.
CHECK:
Measure resistance between the terminals HT and +B of the heated oxygen sensor.
Resistance: Bank 1 Sensor 1: 5 to 10 Ω (20 °C (68 °F))
Bank 1 Sensor 2: 11 to 16 Ω (20 °C (68 °F))

NG → Replace heated oxygen sensor.

OK

5	Check EFI relay.



PREPARATION:
Remove the EFI relay from the engine room J/B.
CHECK:
Inspect the EFI relay.
OK:

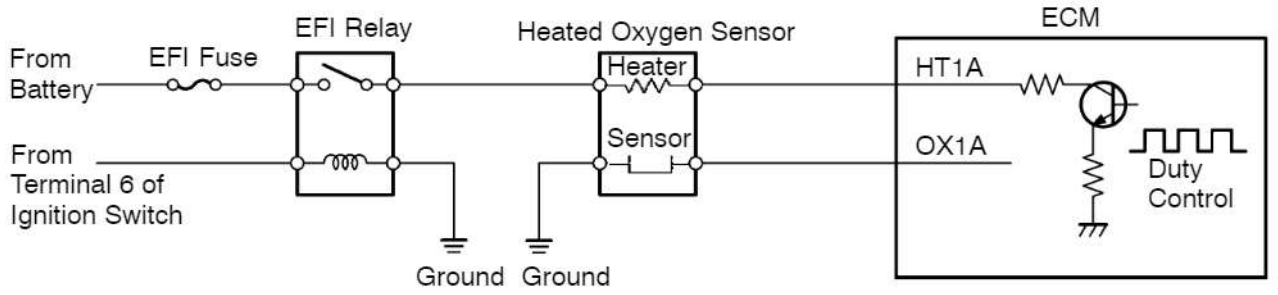
Tester Connection	Specified Condition
1 – 2	Continuity
3 – 5	No continuity
	Continuity (Apply battery voltage to terminals 1 and 2)

NG → Replace EFI relay.

OK

6	**Check for open and short in harness and connector between ECM and oxygen sensor (bank 1 sensor 1) (See page IN–30).**

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 DI–161).**

OK ↓

8	**Check air induction system (See page SF–1).**

CHECK:

Check the air induction system for vacuum leaks.

NG → **Repair or replace induction system.**

OK ↓

9	**Check fuel pressure (See page SF–1).**

CHECK:

Check the fuel pressure (high or low pressure).

NG → **Check and repair fuel pump, fuel pipe line and filter (See page SF–6).**

OK ↓

10	**Check injector injection (See page SF–22).**

NG → **Replace injector.**

OK ↓

11	**Check gas leakage on exhaust system.**

NG → **Repair or replace exhaust gas leakage point.**

OK ↓

Replace heated oxygen sensor (bank 1 sensor 1).

12	**Perform confirmation driving pattern (See page DI–33).**

HINT:

Clear all DTCs prior to performing the confirmation pattern.

Go ↓

13	Is there DTC P0134 being output again?

YES → Replace ECM (See page SF–78).

NO

14	Did vehicle run out of fuel in the past?

NO → Check for intermittent problems.

YES

DTC P0134 is caused by running out of fuel.

DID54–01

DTC	P0136	Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 2)

DTC	P0138	Heated Oxygen Sensor Circuit High Voltage (Bank 1 Sensor 2)

CIRCUIT DESCRIPTION

Refer to DTC P0130 on page DI–112.

DTC No.	DTC Detection Condition	Trouble Area
P0136	Voltage output of heated oxygen sensor remains at 0.4 V or more or 0.5 V or less after engine is warmed up (2 trip detection logic)	• Open or short in heated oxygen sensor circuit • Heated oxygen sensor • Heated oxygen sensor heater • EFI relay
P0138	One of the following conditions is met: • HO2 sensor (sensor 2) voltage does not drop below 0.2 V immediately when fuel–cut starts	• HO2 sensor (sensor 2) • Short in HO2 sensor (sensor 2) circuit

MONITOR DESCRIPTION

The ECM monitors the rear heated oxygen sensor in the following 3 items:

(1) If the rear heated oxygen sensor voltage changes between RICH and LEAN while the vehicle is running (repeating acceleration and deceleration), the ECM interprets this as a malfunction and illuminates the MIL, and then sets a DTC.

(2) If the rear heated oxygen sensor voltage does not remain less than 0.05 V for a long period of time while the vehicle is running, the ECM interprets this as a malfunction and illuminates the MIL, and then sets a DTC.

(3) If the sensor's voltage drops below 0.2 V (extremely LEAN status) immediately when the vehicle decelerates and the fuel cut is working. If not, the ECM interprets this as a sensor's response feature deterioration and illuminates the MIL, and then sets DTC.

MONITOR STRATEGY

Related DTCs	P0136: Rear Heated Oxygen (HO2) sensor output voltage P0138: Rear Heated Oxygen (HO2) sensor output voltage
Required sensors/ components (Main)	Rear HO2 sensor
Required sensors/ components (Related)	Mass air flow meter, vehicle speed sensor and engine coolant temperature sensor
Frequency of operation	Continuous: P0138 output voltage Once per driving cycle: Others
Duration	Within 6 minutes: P0136 Within 6 seconds: P0138
MIL operation	Immediate: P0138 output voltage 2 driving cycles: Others
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–3	
Case 1 (Output voltage (Crack)):		
Vehicle speed	3 km/h (1.9 mph)	–
Idle	OFF	
Fuel cut	OFF	
Time after fuel cut is turned from ON to OFF	5 sec.	–
Intake air amount per revolution	0.22 g/rev	–
Case 2 (Output voltage):		
All of the following conditions are met:	Conditions 1, 2, 3 and 4	
1. Pass/fail detection in this driving cycle	Not detected	
2. Engine	Running	
3. Time after engine start	0 sec.	–
4. Either of the following conditions is met:	Condition (a) or (b)	
(a) Cumulative time while heated oxygen sensor heater is ON	22 sec.	–
(b) Heated oxygen sensor voltage	0.2 V	–
Case 3 (Slow response):		
Rear oxygen sensor voltage before the fuel cut	0.2 V	–
Catalyst condition	Warmed up	
Engine coolant temperature	70°C (158°F)	–
Fuel cut	Continues	
Pass/fail detection in this driving cycle	Not detected	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Case 1 (Output voltage (Crack)):	
All of the following conditions are met:	Conditions 1, 2 and 3
1. Cumulative heated oxygen sensor monitor time	190 sec. or more
2. Time while heated oxygen sensor voltage is less than 0.05V	114 sec. or more
3. Maximum heated oxygen sensor rich time (0.45V or more)	Less than 20 sec.
Case 2 (Output voltage):	
Number of heated oxygen sensor voltage "switching"	0 times or less
"Switching" is counted when the sensor signal crosses the minimum or maximum voltage	
Minimum voltage	0.4 V or less
Maximum voltage	0.5 V or more
Case 3 (Slow response):	
Time until the rear oxygen sensor voltage drops to 0.2 V after fuel cut starts operating	7 sec. or more

COMPONENT OPERATING RANGE

Parameter	Standard Value
Heated oxygen sensor voltage	0 to 1 V

O2S TEST RESULT (MODE 05 DATA)

Refer to page DI–3 for detailed information.

Rear HO2S voltage monitor

If the HO2S 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	Minimum rear HO2S voltage	N/A	V
$08	Maximum rear HO2S voltage	N/A	V

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 (<0.4 V) to RICH (≧0.5 V)	N/A	sec.
$32	Time to change from RICH (≧0.5 V) to LEAN (<0.4 V)	N/A	sec.

Rear HO2S slow response monitor

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

TEST ID	Description of TEST DATA	Conversion Factor	Unit
$37	Until rear HO2S voltage drops to 0.2 V after fuel–cut starting	N/A	sec.

Rear HO2S 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 0.05 V	Multiplied by 0.3906	%
$84	Percentage of monitoring time when the HO2S voltage is more than 0.7 V	Multiplied by 0.3906	%
$85	Time when the HO2S voltage is 0.45 V or more	Multiplied by 0.2621	sec.
$87	Percentage of monitoring time when the HO2S voltage is more than 0.45 V	Multiplied by 0.3906	%

WIRING DIAGRAM

Refer to DTC P0130 on page DI–112.

CONFIRMATION DRIVING PATTERN

CAUTION:

Strictly observe posted speed limits, traffic laws, and road conditions when conducting the drive pattern.

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch to ON.
(c) Turn the tester ON.
(d) Clear DTCs.
(e) Run the engine at idle for 2 minutes.
(f) Warm up the engine until the engine coolant temperature (ECT) reaches 75°C (167°F).
(g) Allow the vehicle to run at 30 mph (48 km/h) or more for 40 seconds or more.
(h) Stop the vehicle and run the engine at idle for 20 seconds or more.
(i) Repeat the steps (g) and (h) at least 8 times in one driving cycle.
(j) Move the shift lever into the second gear.
(k) Depress the accelerator pedal for at least 10 seconds.
(l) Allow the vehicle to run at 30 mph (48 km/h) or more.
(m) Immediately after step (l), release the accelerator pedal for at least 10 seconds without depressing the brake pedal (to execute fuel–cut).
(n) Decelerate the vehicle until the vehicle speed drops less than 6 mph (10 km/h).
(o) Repeat the steps (k), (l), (m) and (n) at least twice in one driving cycle.

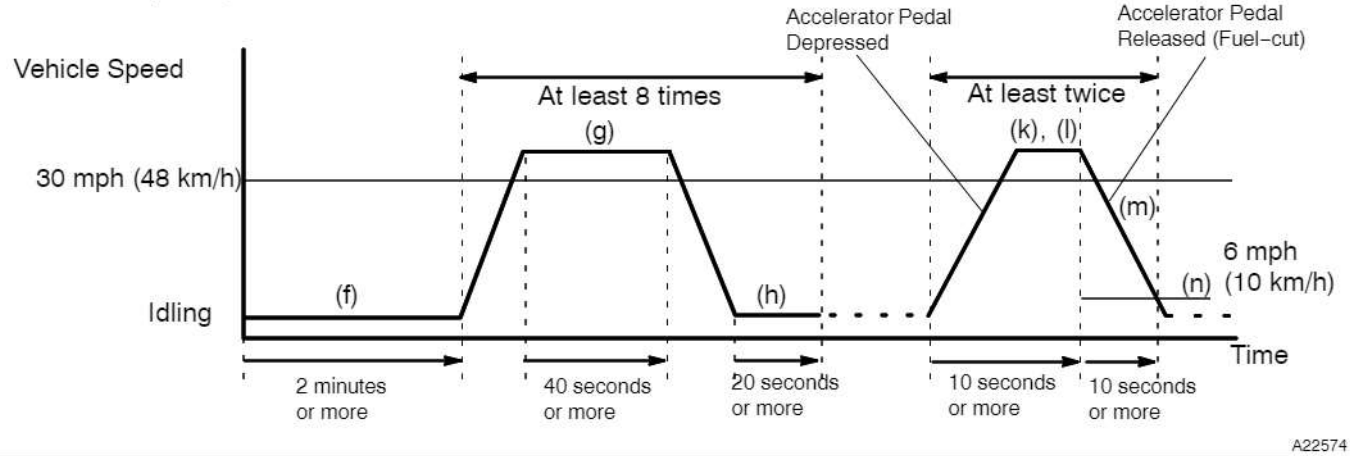
HINT:

The HO2 sensor operates when the following conditions are met:

- 2 minutes or more passed after the engine start.
- The ECT is 75°C (167°F) or more.
- Cumulative running time at 30 mph (48 km/h) or more exceeds 6 minutes.
- Closed loop.
- Fuel–cut is operated for 8 seconds or more.

HO2 sensor Monitor Drive Pattern

ECT: 75°C (167°F) or more



INSPECTION PROCEDURE

HINT:

Hand–held tester only:

Malfunctioning areas can be found by performing the ACTIVE TEST / A/F CONTROL operation (Heated Oxygen [HO2] sensor or other trouble areas). The A/F CONTROL operation can determine whether the front HO2 sensor (sensor1), rear HO2 sensor (sensor 2) and other potential trouble areas are malfunctioning or not.

(a) Perform A/F CONTROL using the hand–held tester.

HINT:

The A/F Control operation lowers the fuel injection volume by 12.5 % or increases the injection volume by 25 %.

(1) Connect the hand–held tester to the DLC3.
(2) Turn the ignition switch to ON and turn the hand–held tester ON.
(3) Warm up the engine by running the engine at 2,500 rpm for approximately 90 seconds.
(4) On the hand–held tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL.
(5) Perform the A/F CONTROL operation with the engine idling (press the right or left button).

Result:

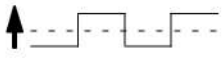
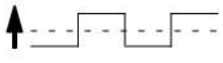
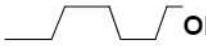
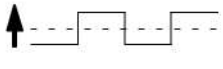
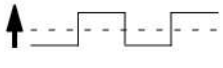
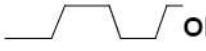
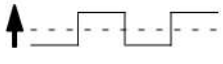
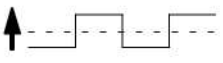
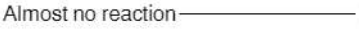
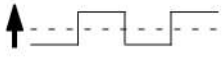
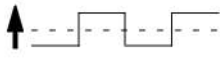
The heated oxygen sensor reacts in accordance with increase and decrease of the fuel injection volume.

+25 % → Rich output: More than 0.5 V

–12.5 % → Lean output: Less than 0.4 V

NOTICE:

The front heated oxygen sensor has an output delay of a few seconds and the rear heated oxygen sensor has a maximum output delay of approximately 20 seconds.

Result	Output voltage of heated oxygen sensor (sensor 1: front sensor)	Output voltage of heated oxygen sensor (sensor 2: rear sensor)	Main Suspected Trouble Areas
Case 1	Injection volume +25 % –12.5 %  Output voltage More than 0.5 V Less than 0.4 V  **OK**	Injection volume +25 % –12.5 %  Output voltage More than 0.5 V Less than 0.4 V  **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 0.4 V  **OK**	Sensor 1: front sensor (sensor 1, sensor heater, sensor 1 circuit)
Case 3	Injection volume +25 % –12.5 %  Output voltage More than 0.5 V Less than 0.4 V  **OK**	Injection volume +25 % –12.5 %  Output voltage Almost no reaction  **NG**	Sensor 2: rear sensor (sensor 2, sensor 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 from exhaust system, etc.)

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

To display the graph, enter ACTIVE TEST/ A/F CONTROL / USER DATA, select "O2S B1S1 and O2S B1S2" by pressing the "YES" button and then the "ENTER". Then press the "F4" button.

NOTICE:

If the vehicle is short of fuel, the air–fuel ratio becomes LEAN and heated oxygen sensor DTCs are set, and the MIL then comes on.

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 malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, 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 OX1B wire from the ECM connector is short–circuited to the +B wire, DTC P0136 is set.

1	**Are there any other codes (besides DTC P0136 or P0138) being output?**

YES → **Go to relevant DTC chart (See page DI–42).**

NO

2	**Check output voltage of heated oxygen sensor.**

PREPARATION:

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

(b) After warming up the engine, run the engine at 2,500 rpm for 3 minutes.

CHECK:

Read the voltage output of the heated oxygen sensor when the engine speed is suddenly increased.

HINT:

Quickly accelerate the engine to 4,000 rpm for 3 minutes by using the accelerator pedal.

OK:

Heated oxygen sensor output voltage: Fluctuates repeatedly between less than 0.4 V and more than 0.5 V.

OK → **Go to step 6.**

NG

3	**Inspect heated oxygen sensor (heater resistance) (See page SF–75).**

NG → **Replace heated oxygen sensor.**

OK

4	**Inspect EFI relay (See page SF–56).**

NG → **Replace EFI relay.**

OK

5	Check for open and short in harness and connectors between ECM and heated oxygen sensor (See page IN–30).

NG → Repair or replace harness or connector.

OK ↓

6	Perform confirmation of driving pattern.

GO ↓

7	Is DTC P0136 or P0138 output again?

NO → Check for intermittent problems (See page DI–3).

YES ↓

Replace heated oxygen sensor.

D/C6S–02

DTC	P0171	System too Lean (Bank 1)

DTC	P0172	System too Rich (Bank 1)

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 long–term fuel trim is the overall fuel compensation carried out in long–term fuel trim to compensate for a continual deviation of the short–term fuel trim from the central value, due to individual engine differences, wear overtime and changes in the operating environment.

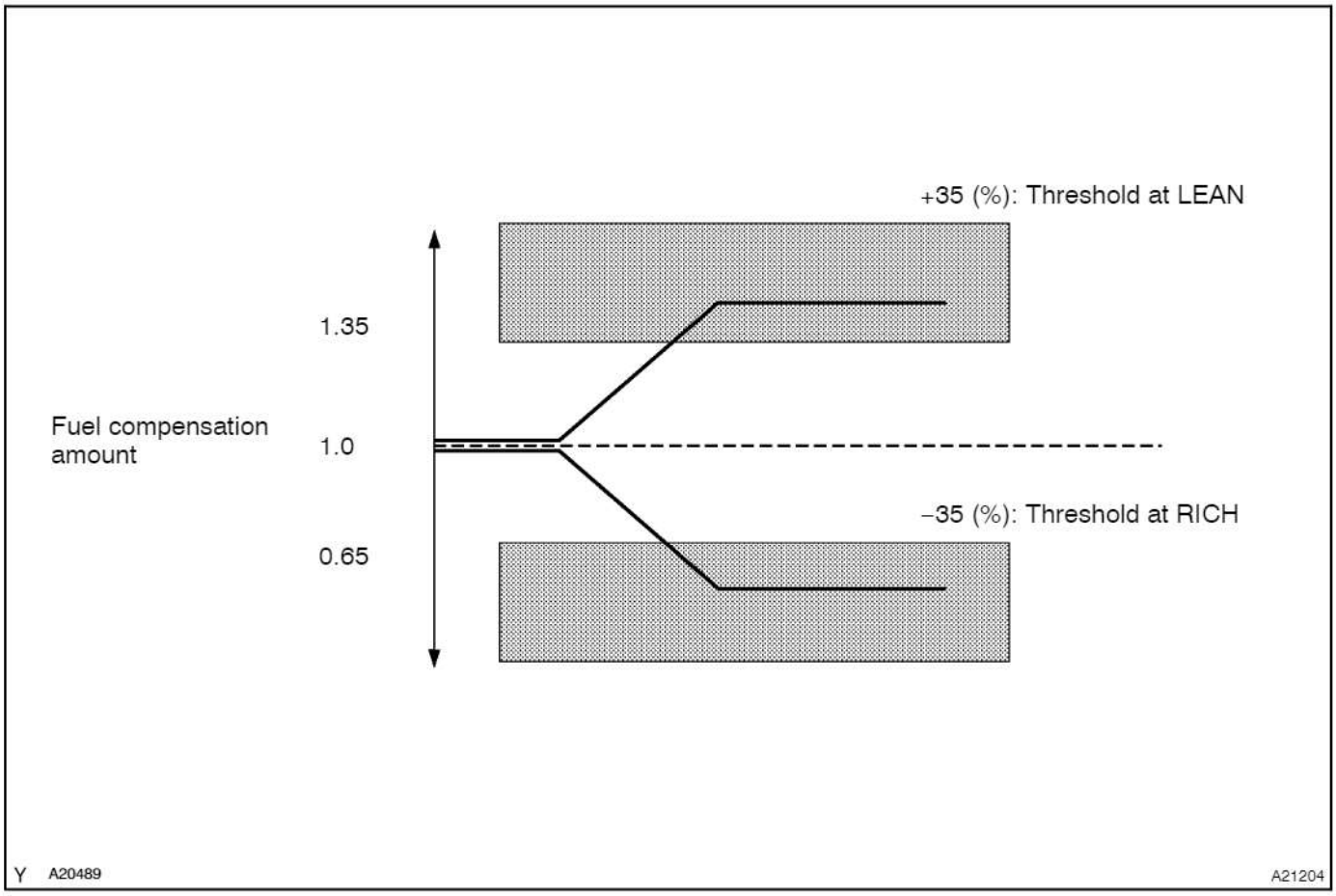
If both the short–term fuel trim and the long–term fuel trim are LEAN or RICH beyond a certain value, it is detected as a malfunction and the MIL is illuminated.

DTC No.	DTC Detection Condition	Trouble Area
P0171	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 • Heated oxygen sensor (bank 1, sensor 1) • EFI relay • PCV valve and hose • ECM
P0172	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 • Heated oxygen sensor (bank 1, sensor 1) • EFI relay • ECM

HINT:

- When DTC P0171 is recorded, the actual air–fuel ratio is on the LEAN side. When DTC P0172 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 may be recorded. The MIL then comes on.
- 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.

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 a 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:
If the smoothed fuel trim learning value is more than 1.35 or less than 0.65, the ECM interprets this as a malfunction in the fuel system.

MONITOR STRATEGY

Related DTCs	P0171	Fuel system lean (Bank 1)
	P0172	Fuel system rich (Bank 1)
Required sensors/components	Main sensors/components	Front oxygen sensor
	Related sensors/components	Engine coolant temperature sensor, Mass air flow meter, Crankshaft position sensor
Frequency of operation	Continuous	
Duration	10 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–3	
Battery voltage	11 V	–
Fuel system	Closed–loop	
Throttle position learning	Completed	
Either of the following conditions is met:	Condition 1 or 2	
1. Engine RPM	–	1,100 rpm
2. Intake air amount per revolution	0.14 g/sec.	–

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Purge–cut	Executing
Either of the following conditions is met:	Condition 1 or 2
1. Average between short–term fuel trim and long–term fuel trim	35% or more (varies with ECT)
2. Average between short–term fuel trim and long–term fuel trim	–35% or less (varies with ECT)

WIRING DIAGRAM

Refer to DTC P0130 on page DI–112.

INSPECTION PROCEDURE

HINT:
Hand–held tester only:
Determining the trouble area is possible by performing "A/F CONTROL" ACTIVE TEST (heated oxygen sensor or other trouble areas can be distinguished).
Perform ACTIVE TEST using a hand–held tester (A/F CONTROL).
HINT:
"A/F CONTROL" is the ACTIVE TEST which changes the injection volume to –12.5 % or +25 %.

(1) Connect the hand–held tester to the DLC3 on the vehicle.
(2) Turn the ignition switch 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 "A/F CONTROL" with the engine idling (press the right or left button).

RESULT:

Heated oxygen sensor reacts in accordance with increase and decrease of the 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)	Mainly 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 sensors.

For displaying the graph indication, enter "ACTIVE TEST / A/F CONTROL / USER DATA", then select "O2S B1S1 and O2S B1S2" by pressing "YES" button and push "ENTER" button before pressing "F4" button.

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.
- 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 (See page SF–1).**

CHECK:

Check the air induction system for vacuum leaks.

NG → **Repair or replace air induction system.**

OK ↓

2	**Check connection of PCV piping.**

NG → **Repair or replace PCV piping.**

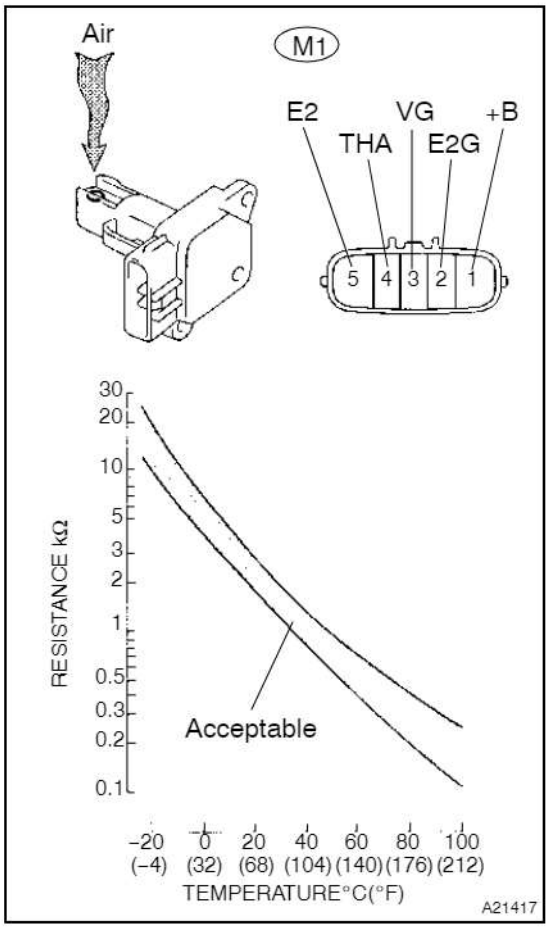
OK ↓

3	**Check injector injection (See page SF–22).**

NG → **Replace injector.**

OK ↓

4	Check mass air flow meter.



PREPARATION:

Remove the mass air flow sensor.

CHECK:

(a) Inspect output voltage.

(1) Apply battery voltage terminals +B and E2G.

(2) Connect the positive (+) tester probe to terminal VG, and negative (–) tester probe to terminal E2G.

(3) Blow air into the mass air flow sensor, and check that the voltage fluctuates.

(b) Resistance inspection.

Measure the resistance between the terminals of the intake air temperature sensor.

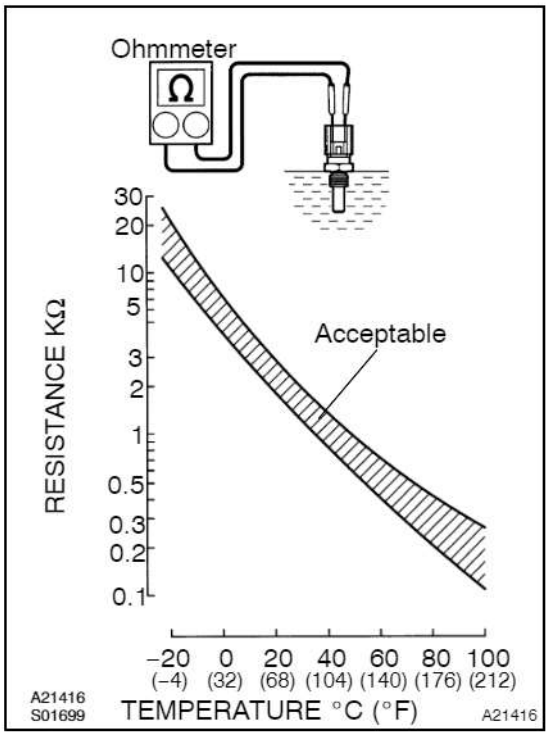
OK:

Tester Connection	Temperature	Specified Condition
THA (M1–4) – E2 (M1–5)	–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

NG → **Replace mass air flow meter.**

OK

5	Check engine coolant temperature sensor.



PREPARATION:

Remove the engine coolant temperature sensor.

CHECK:

Measure the resistance between the terminals of the engine coolant temperature sensor.

OK:

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

NOTICE:

If you checking the engine coolant temperature sensor in water, be careful not to allow water to go into 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 IG–1).

NG	Repair or replace.

OK

7	**Check fuel pressure (See page SF–1).**

CHECK:

Check the fuel pressure (high or low pressure).

NG → **Check and repair fuel pump, fuel pipe line and filter (See page SF–6).**

OK

8	**Check gas leakage on exhaust system.**

NG → **Repair or replace exhaust gas leakage point.**

OK

9	Check the output voltage of oxygen sensor during idling.

PREPARATION:

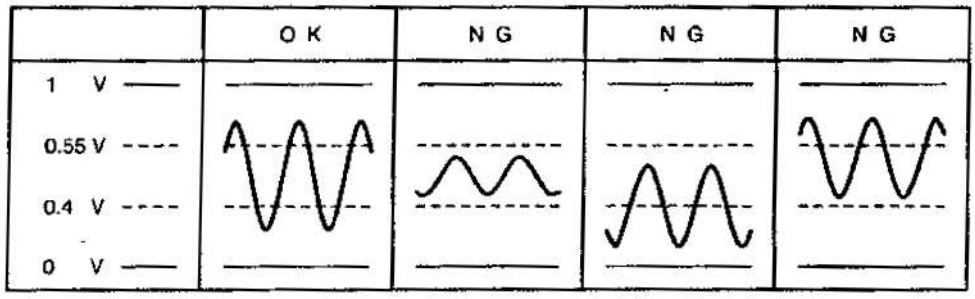
(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Start the engine and push the hand–held tester or the OBD II scan tool main switch ON.
(c) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / O2S B1S1."
(d) Warm up the heated oxygen sensor with the engine speed at 2,500 rpm for approximately 90 seconds.

CHECK:

Read the output voltage of the heated oxygen sensor during idling.

OK:

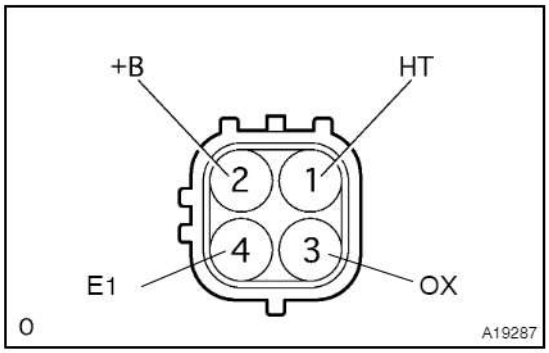
Heated oxygen sensor output voltage:
Alternates repeatedly between less than 0.4 V and more than 0.5 V (See the following table).



OK	Go to step 17.

NG

10	Check resistance of heated oxygen sensor heater.



PREPARATION:

Disconnect the heated oxygen sensor connector.

CHECK:

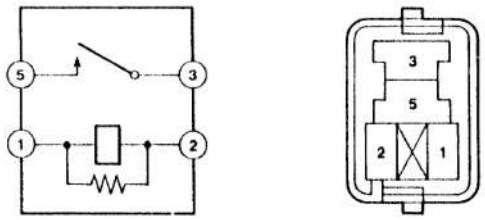
Measure resistance between the terminals HT and +B of the heated oxygen sensor.

Resistance: Bank 1 Sensor 1: 5 to 10 Ω (20 °C (68 °F))
Bank 1 Sensor 2: 11 to 16 Ω (20 °C (68 °F))

NG	Replace heated oxygen sensor.

OK

11	Check EFI relay.



A19288

PREPARATION:

Remove the EFI relay from the engine room J/B.

CHECK:

Inspect the EFI relay.

OK:

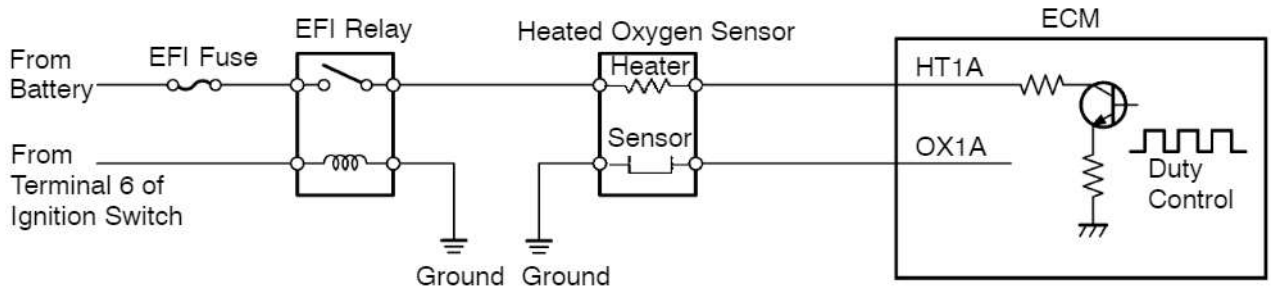
Tester Connection	Specified Condition
1 – 2	Continuity
3 – 5	No continuity
	Continuity (Apply battery voltage to terminals 1 and 2)

NG → **Replace EFI relay.**

OK

12	Check for open and short in harness and connector between ECM and oxygen sensor (See page IN–30).

Reference (Bank 1 Sensor 1 System Drawing)



A21410

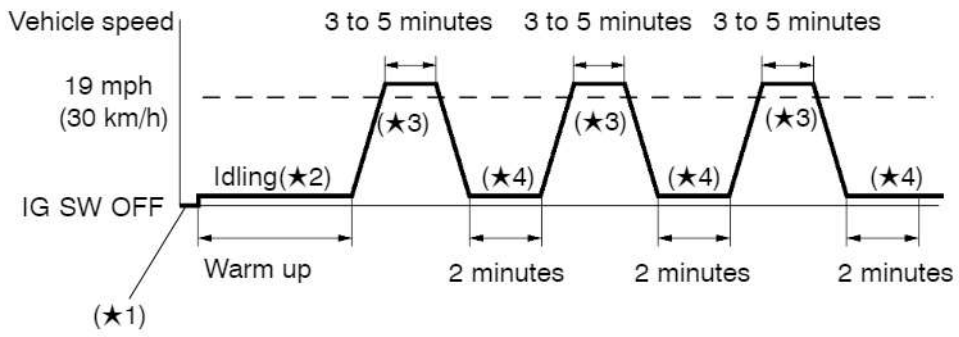
NG → **Repair or replace harness or connector.**

OK

13	**Replace heated oxygen sensor.**

Go

14	**Perform confirmation driving pattern.**



(a) Disconnect the battery terminal and wait for a 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 the normal mode to the check mode (See page DI–3). (★1)
(d) Start the engine and let it idle until engine coolant temperature is 75 °C (167 °F) or more. (★2)
(e) Drive the vehicle at 19 mph (30 km/h) or more for 3 minutes or more. (★3)
(f) Let the engine idle for approx. 2 minutes. (★4)
(g) Perform steps (e) and (g) at least 3 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, detecting a malfunction may be difficult. If you do not have a hand–held tester, turn the ignition switch OFF after performing steps (e) to (f), and then do step (f) again.

Go

15	Is there DTC P0171 or P0172 being output again?

YES → Replace ECM (See page SF–78) and perform confirmation driving pattern (Refer to step 14).

NO

16	Confirm if vehicle has run out of fuel in past.

NO → Check for intermittent problems (See page DI–3).

YES

DTC P0171 or P0172 is caused by running out of fuel.

17	Perform confirmation driving pattern.

HINT:
Clear all DTCs prior to performing the confirmation driving pattern (Refer to step 14).

Go

18	Is there DTC P0171 or P0172 being output again?

No → Go to step 22.

Yes

19	Replace heated oxygen sensor.

Go

20	**Perform confirmation driving pattern.**

HINT:
Clear all DTCs prior to performing the confirmation driving pattern (Refer to step 14).

Go

21	**Is there DTC P0171 or P0172 being output again?**

B → **Replace ECM (See page SF–78) 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 DI–3).**

YES

DTC P0171 or P0172 is caused by running out of fuel.

DIC6T–02

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

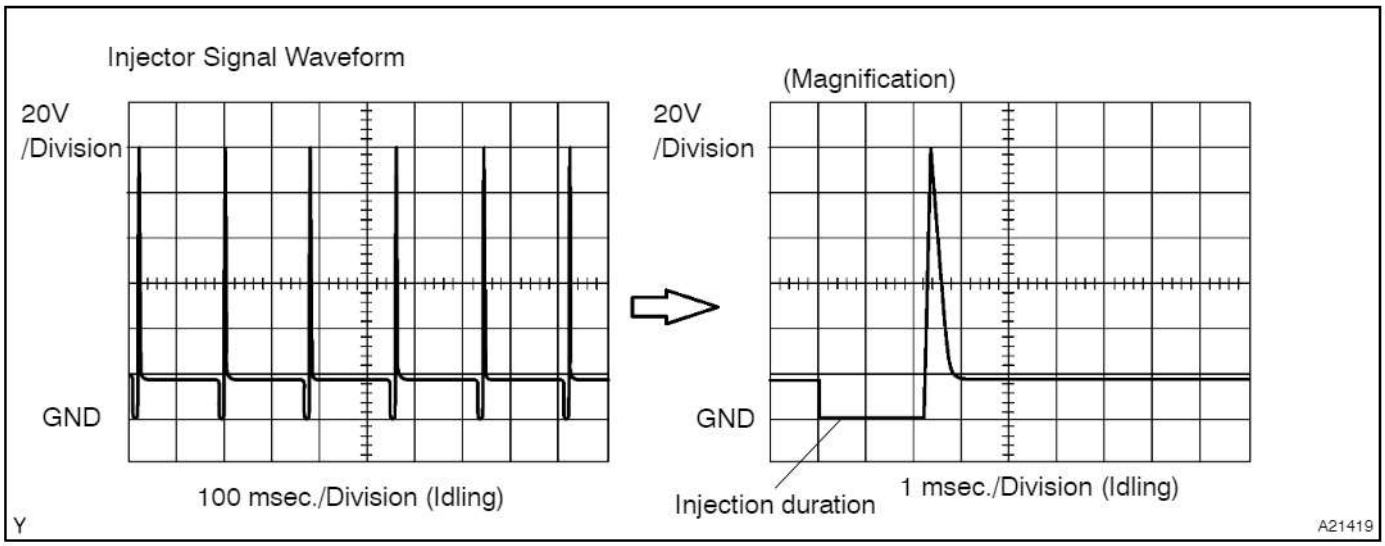
CIRCUIT DESCRIPTION

When a misfire occurs in the engine, hydrocarbons (HC) are output in high concentrations. If this HC concentration is high enough, there could be an increase in exhaust emission levels. High concentrations of HC can also cause the temperature of the catalyst to increase, possibly damaging the catalyst. To prevent increases 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 a 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. A misfire is counted 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.

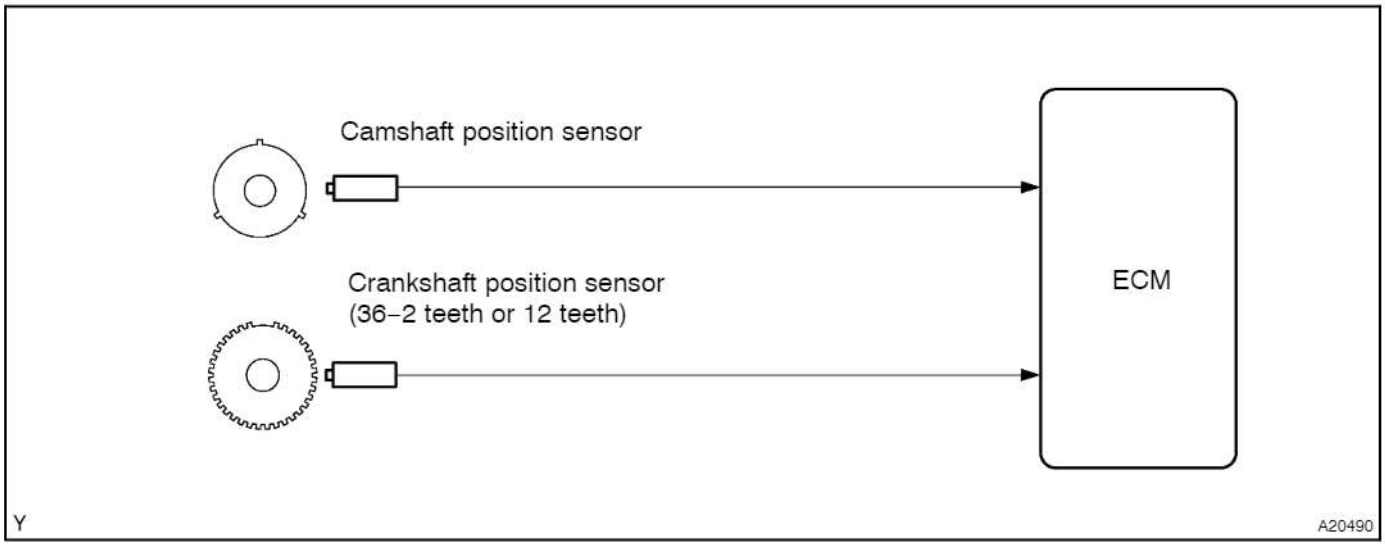
DTC No.	DTC Detection Condition	Trouble Area
P0300	Misfiring of random cylinder is detected	• Open or short in engine wire • Connector connection • Vacuum hose connection • Ignition system • Injector • Fuel pressure • Mass air flow sensor • Engine coolant temperature sensor • Compression pressure • Valve clearance • Valve timing • PCV hose connection • PCV hose • ECM
P0301 P0302 P0303 P0304	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 #40 and E01 of the ECM connectors.
HINT:
The correct waveform is as shown.



MONITOR DESCRIPTION



The ECM illuminates the MIL (2 trip detection logic) if:
The ECM will illuminate the MIL when the percentage of misfire exceeds the specified limit per 1,000 engine revolutions. One occurrence of excessive misfire during engine start will illuminate the MIL. Four occurrences are required to illuminate 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 "percentage of misfire causing catalyst damage" is reached 1 time.
- Within 200 engine revolutions at a normal rpm, the threshold for "percentage 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
Required sensors/components	Main sensors/components	Camshaft position sensor, Crankshaft position sensor
	Related sensors/components	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: once, 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 of operation	None	

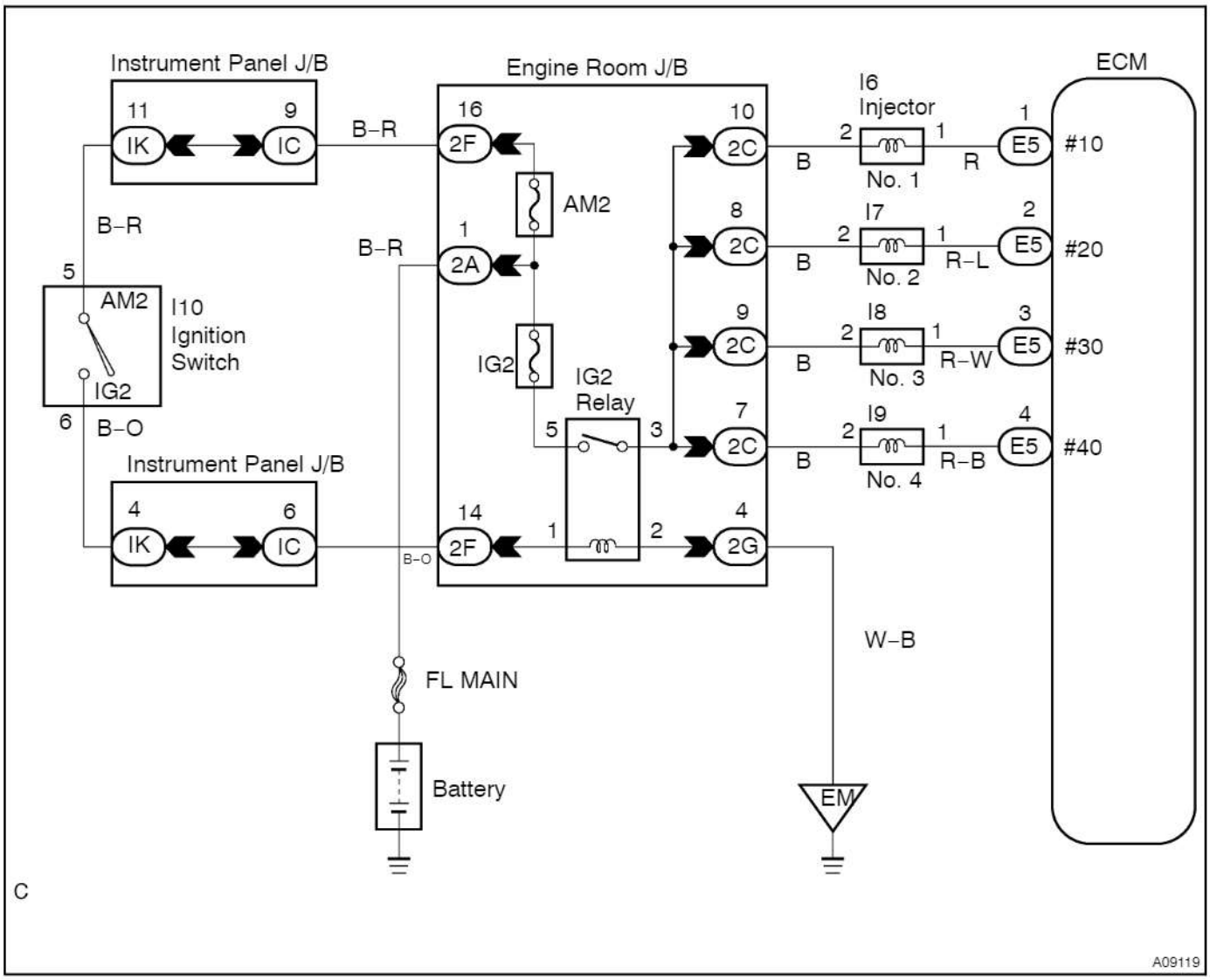
TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–3	
Battery voltage	8 V	–
Throttle position learning	Completed	
VVT system	Normal operate (by scan tool)	
Engine speed fluctuation	Engine speed should not have changed rapidly	
Engine RPM	450 rpm	7,000 rpm
Engine coolant temperature	–10°C (14°F)	–
Fuel–cut	OFF	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Emission–related–misfire:	
Misfire rate	1.6 % or more
Catalyst–damage–misfire (MIL blinks):	
Number of misfire per 200 revolutions	88 or more (varies with intake air amount and RPM)

WIRING DIAGRAM



CONFIRMATION DRIVING PATTERN

(a) Connect the hand–held tester to the DLC3.
(b) Record DTCs and the freeze frame data.
(c) Set the check mode using the hand–held tester (See page DI–3).
(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:

Do not turn the ignition switch OFF during the confirmation driving pattern. This switches the diagnosis system from the check mode to the normal mode, so all the DTCs and freeze frame data will be erased.

Engine Speed	Time
Idling	5 minutes and 45 seconds or more
1,000 rpm	4 minutes or more
2,000 rpm	3 minutes and 30 seconds or more
3,000 rpm	1 minute and 30 seconds or more

(f) Check whether there is misfire, and DTC and the freeze frame data. After that, record them.
(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, as well as other data from the time when a 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 code P0300 will 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 pattern (See page DI–33).
- 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 repairs, drive the confirmation pattern again and confirm that no misfire occurs.
- When either of SHORT FT #1, LONG FT #1 in the freeze frame data is over the range of ±20 %, there is a possibility that the air–fuel ratio is becoming to RICH (–20 % or less) or LEAN (+20 % or more).
- 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	**Are there any other codes (besides DTC P0300, P0301, P0302, P0303 or P0304) being output?**

PREPARATION:

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

CHECK:

Read the DTCs.

RESULT:

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

HINT:

If any other codes besides P0300, P0301, P0302, P0303 or P0304 are output, perform the troubleshooting for those DTCs first.

B → **Go to relevant DTC chart (See page DI–42).**

A

2	**Check harness, connector and vacuum hose in engine room.**

CHECK:

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

NG → **Repair or replace, then confirm that there is no misfire (See confirmation driving pattern).**

OK

3	**Check connection of PCV piping.**

NG → **Repair or replace PCV piping.**

OK

4	**Connect hand–held tester, and read the number of misfire.**

PREPARATION:

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester or the OBD II scan tool main switch ON.
(c) Start the engine.
(d) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / CYL#1 to CYL#4.

CHECK:

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.

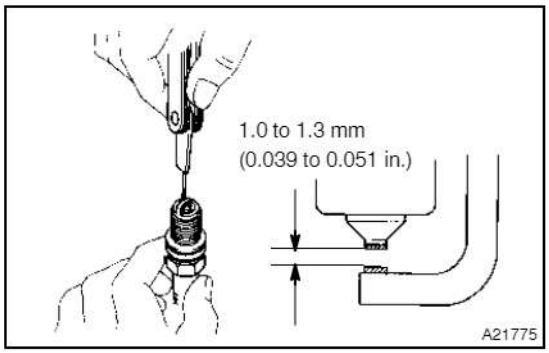
RESULT:

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.



PREPARATION:

(a) Disconnect the ignition coil assembly.
(b) Remove the spark plug.

CHECK:

(a) Check for carbon deposits on electrode.
(b) Check the spark plug type (See page IG–1).
(c) Check electrode gap.

OK:

(b) No large carbon deposit present.
Not wet with gasoline or oil.
(c) Electrode gap: 1.0 to 1.3 mm (0.039 to 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.

PREPARATION:

(a) Install the spark plug to the ignition coil assembly.
(b) Disconnect the injector connector.
(c) Ground spark plug.

CHECK:

Check if spark occurs while engine is being cracked.

CAUTION:

Always disconnect each injector connector.

NOTICE:

Do not crank the engine for more than 2 seconds.

OK:

Spark jumps across electrode gap.

OK	Go to step 8.

NG

6	**Change normal spark plug and check spark of misfiring cylinder.**

PREPARATION:

(a) Change to the normal spark plug.
  (1) Remove the spark plug that may be faulty from the ignition coil assembly.
  (2) Install the spark plug to the ignition coil assembly.
(b) Disconnect the injector connector.
(c) Ground the spark plug.

CHECK:

Check if spark occurs while the engine is being cranked.

CAUTION:

Always disconnect each injector connector.

NOTICE:

Do not crank the engine for more than 2 seconds.

OK:

Spark jumps across electrode gap.

OK → **Replace spark plug.**

NG

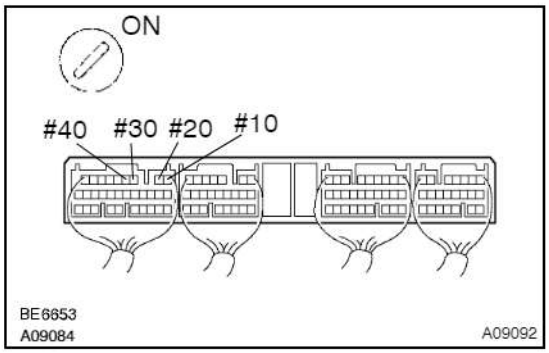
7	**Check for open and short in harness and connector between ignition coil and ECM (See page IN–30).**

OK → **Replace ignition coil with igniter, then confirm that there is no misfire.**

NG

Repair or replace harness or connector.

8	**Check voltage of ECM terminal for injector of failed cylinder.**



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure voltage between applicable terminal of the ECM connector and body ground.

OK:

Voltage: 9 to 14 V

OK	**Go to step 11.**

NG

9	**Check resistance of injector of misfiring cylinder (See page SF–22).**

NG	**Replace injector.**

OK

10	**Check for open and short in harness and connector between ignition switch and injector, injector and ECM of misfiring cylinder (See page IN–30).**

NG	**Repair or replace harness or connector.**

OK

11	**Check injector injection and volume of misfiring cylinder (See page SF–22).**

NG	**Replace injector.**

OK

12	Check compression pressure of misfiring cylinder (See page EM–3).

NG → Repair or replace.

OK

13	Check valve clearance of misfiring cylinder (See page EM–4).

NG → Adjust valve clearance.

OK

14	Check result of step 4 switch step by number of misfire cylinder.

High misfire rate cylinder	Proceed to
1 or 2 cylinders	A
more than 3 cylinders	B

B → Check for intermittent problems (See page DI–3).

A

15	Check valve timing (Check for loose or a jumped tooth of the timing chain) (See page EM–16).

NG → Adjust valve timing.

OK

16	**Check fuel pressure (See page SF–1).**

CHECK:

Check the fuel pressure (high or low pressure).

NG → **Check and repair fuel pump, fuel pipe line and filter (See page SF–6).**

OK

17	**Check mass air flow meter.**

PREPARATION:

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

(b) Turn the ignition switch ON.

CHECK:

(a) Check the intake air temperature.

(1) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / INTAKE AIR.

(2) Read its value displayed on the hand–held tester or the OBD II scan tool.

OK:

Equivalent to ambient temperature

(b) Check the air flow rate.

(1) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / MAF.

(2) Read its value displayed on the hand–held tester or the OBD II scan tool.

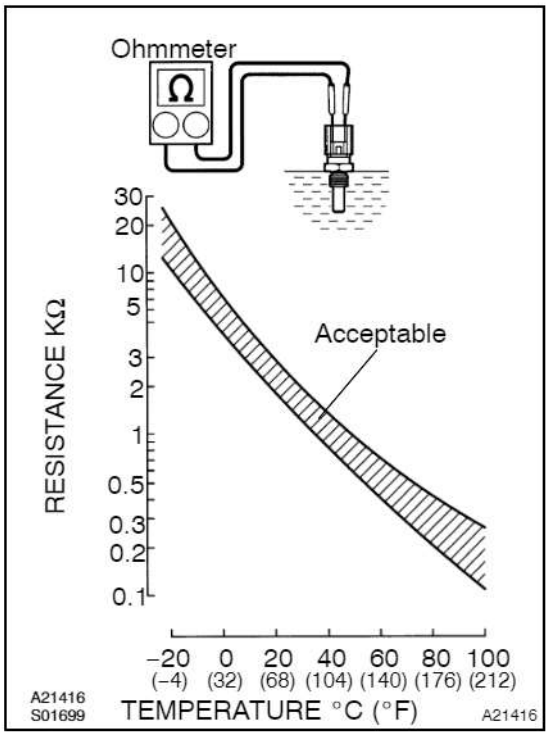
OK:

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
From idling to quickly accelerating	Air flow rate fluctuates

NG → **Repair mass air flow meter.**

OK

18	Check engine coolant temperature sensor.



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

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

NOTICE:
If you check the engine coolant temperature sensor in water, be careful not to allow water to go into 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

19	Check result of step 4 switch step by number of misfire cylinder.

High misfire rate cylinder	Proceed to
1 or 2 cylinders	A
more than 3 cylinders	B

B → **Go to step 5.**

A

Check intermittent problems (See page DI–3).

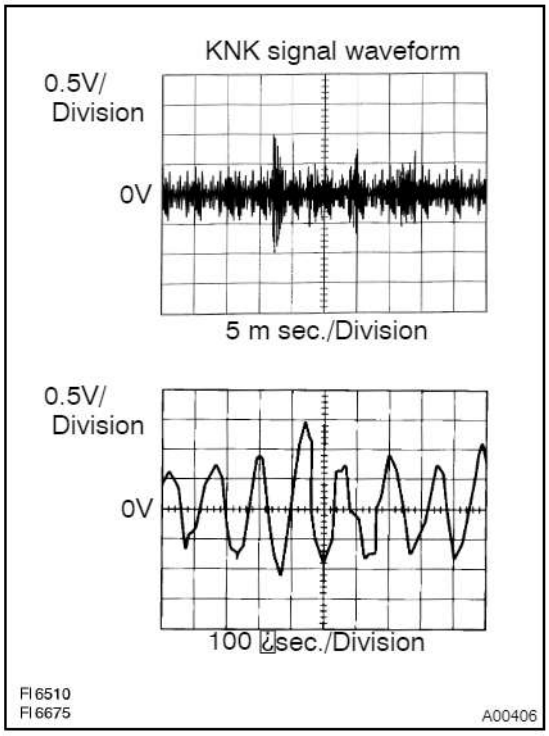
DTC	P0325	Knock Sensor 1 Circuit (Bank 1 or Single Sensor)

CIRCUIT DESCRIPTION

The knock sensor is fitted to the cylinder block to detect engine knocking. This sensor contains a piezoelectric element which generates a voltage when it becomes deformed, which occurs when the cylinder block vibrates due to knocking. If engine knocking occurs, ignition timing is retarded to suppress it.

DTC No.	DTC Detecting Condition	Trouble Area
P0325	No knock sensor 1 signal to ECM with engine speed, 2,000 rpm or more	• Open or short in knock sensor 1 circuit • Knock sensor 1 (looseness) • ECM

HINT:
If the ECM detects above diagnosis conditions, it operates the fail safe function in which the corrective retard angle value is set to the maximum value.



Reference: INSPECTION USING OSCILLOSCOPE

- With the engine racing (4,000 rpm), measure between terminal KNK of the ECM connector and body ground.

HINT:
The correct waveforms are as shown.

- Spread the time on the horizontal axis, and confirm that period of the wave is 80 μ sec.
  (Normal mode vibration frequency of knock sensor: 12.5 kHz

HINT:
If normal mode vibration frequency is not 7.6 kHz the sensor is malfunctioning.

MONITOR DESCRIPTION

The knock sensor located on the cylinder block, detects spark knock.
When spark knock occurs, the sensor pick–up vibrates in a specific frequency range. 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 sec., 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) range check or rationality
Required sensors/components	Main sensors/components	Knock sensor
	Related sensors/components	Crankshaft position sensor, Camshaft position sensor, Engine coolant temperature sensor, Mass air flow meter
Frequency of operation	Continuous	
Duration	10 sec.	
MIL operation	Immediate	
Sequence of operation	None	

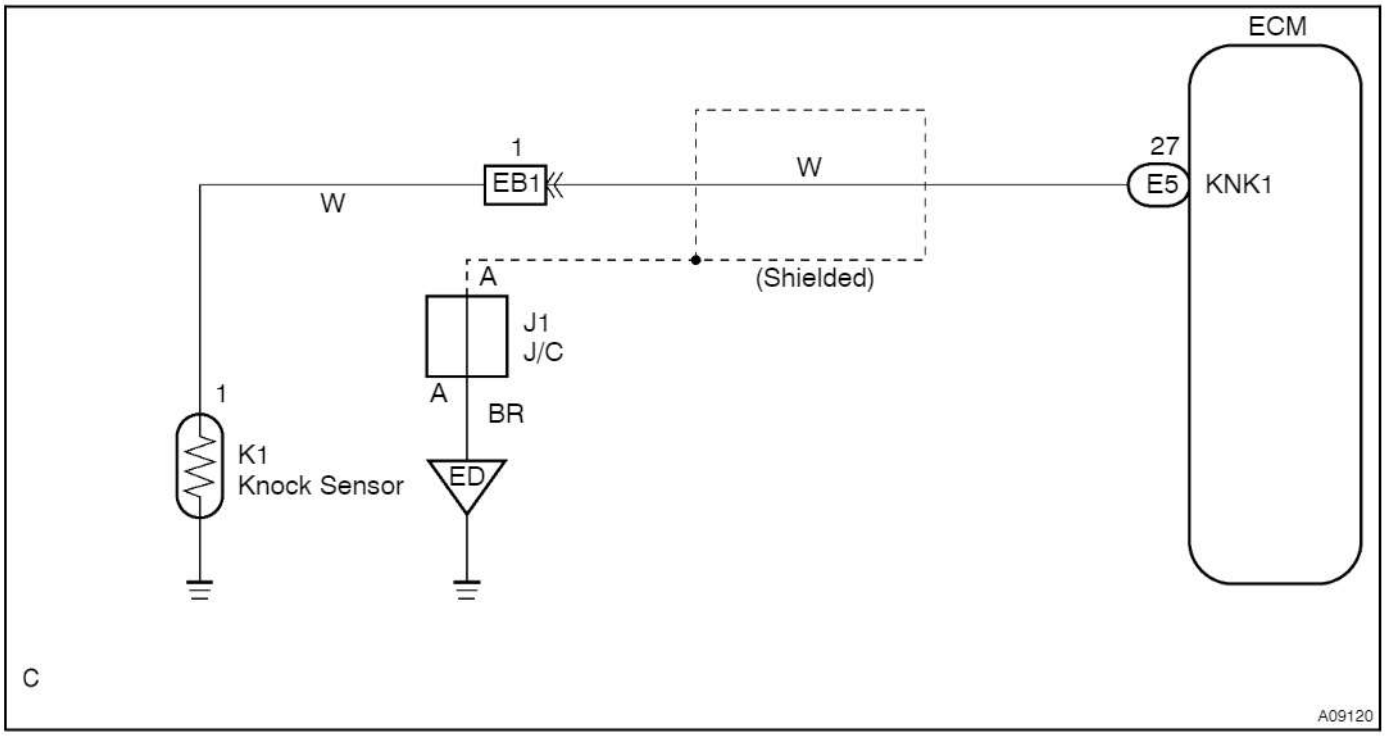
TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–3	
Battery voltage	10 V	–
Idle	OFF	
Time after engine start	5 sec.	–
Engine coolant temperature	60°C (140°F)	–
Intake air amount per revolution	0.3 g/rev	–

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Sensor failure is indicated when the knock sensor output level is below the specific threshold for:	10 sec.

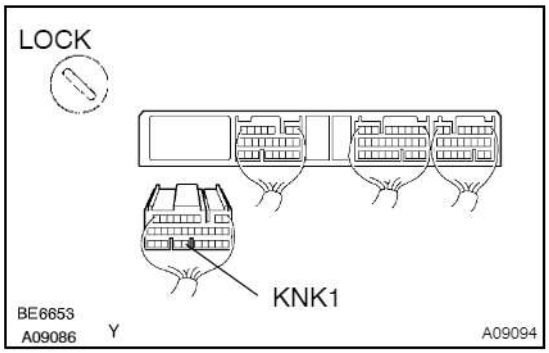
WIRING DIAGRAM



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, as well as other data from the time when a malfunction occurred.

1	Check continuity between terminal KNK1 of ECM connector and body ground.



PREPARATION:

(a) Remove the ECM cover.

(b) Disconnect the E5 connector of the ECM.

CHECK:

Measure resistance between terminal KNK1 of the ECM connector and body ground.

OK:

Resistance: 10 kΩ or higher

OK	Go to step 3.

NG

2	Check knock sensor 1 (See page SF–72).

NG	Replace knock sensor 1.

OK

3	Check for open and short in harness and connector between ECM and knock sensor 1 (See page IN–30).

NG	Repair or replace harness or connector.

OK

4	Does malfunction disappear when a good knock sensor 1 is installed?

YES	Replace knock sensor 1.

NO

Replace ECM (See page SF–78).

DIC6U–02

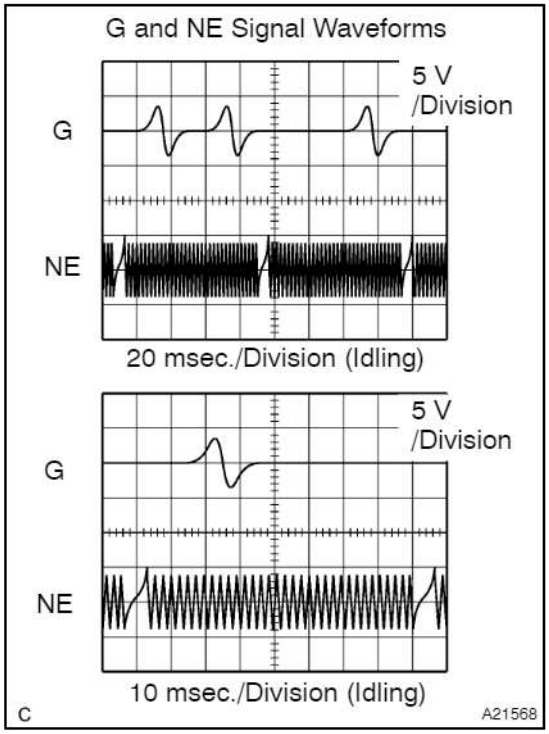
DTC	P0335	Crankshaft Position Sensor "A" Circuit Malfunction

DTC	P0339	Crankshaft Position Sensor "A" Circuit Intermittent

CIRCUIT DESCRIPTION

The crankshaft position sensor (NE signal) consists of a magnet, iron core and pickup coil.
The NE signal plate (crankshaft position sensor plate) has 34 teeth and is installed on the crankshaft. The NE signal sensor generates 34 signals for each engine revolution. This sensor monitors a plate (timing rotor) located on the crankshaft timing pulley and is used by the ECM to detect crankshaft angle and engine speed (RPM/NE). As the crankshaft timing pulley rotates through an engine revolution, this sensor communicates the rotation of the NE signal plate as a pulse signal to the ECM. Based on the signal, the ECM controls fuel injection time and ignition timing.

DTC No.	DTC Detecting 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 • ECM
	No crankshaft position sensor signal to ECM with engine speed 600 rpm or more (2 trip detection logic)	
P0339	If conditions (a) through (c) are met: (a) NE ≧ 1,000 rpm (b) NE signal is not detected for over 50 m sec. (c) Engine is not cranking	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Signal plate • ECM



Reference: Inspection by using the oscilloscope.
HINT:
The correct waveform is as shown on the left.

Item	Contents
Terminal	CH1: G+ – NE– CH2: NE+ – NE–
Equipment Setting	5V/Division, 20ms/Division
Condition	During cranking or idling

MONITOR DESCRIPTION

If there is no signal from the crankshaft sensor even though the engine is cranking, 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 sensors/components	Crankshaft position sensor
	Related sensors/components	Engine speed sensor
Frequency of operation	Continuous	
Duration	Case 1: 4.7 sec. Case 2: 0.016 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

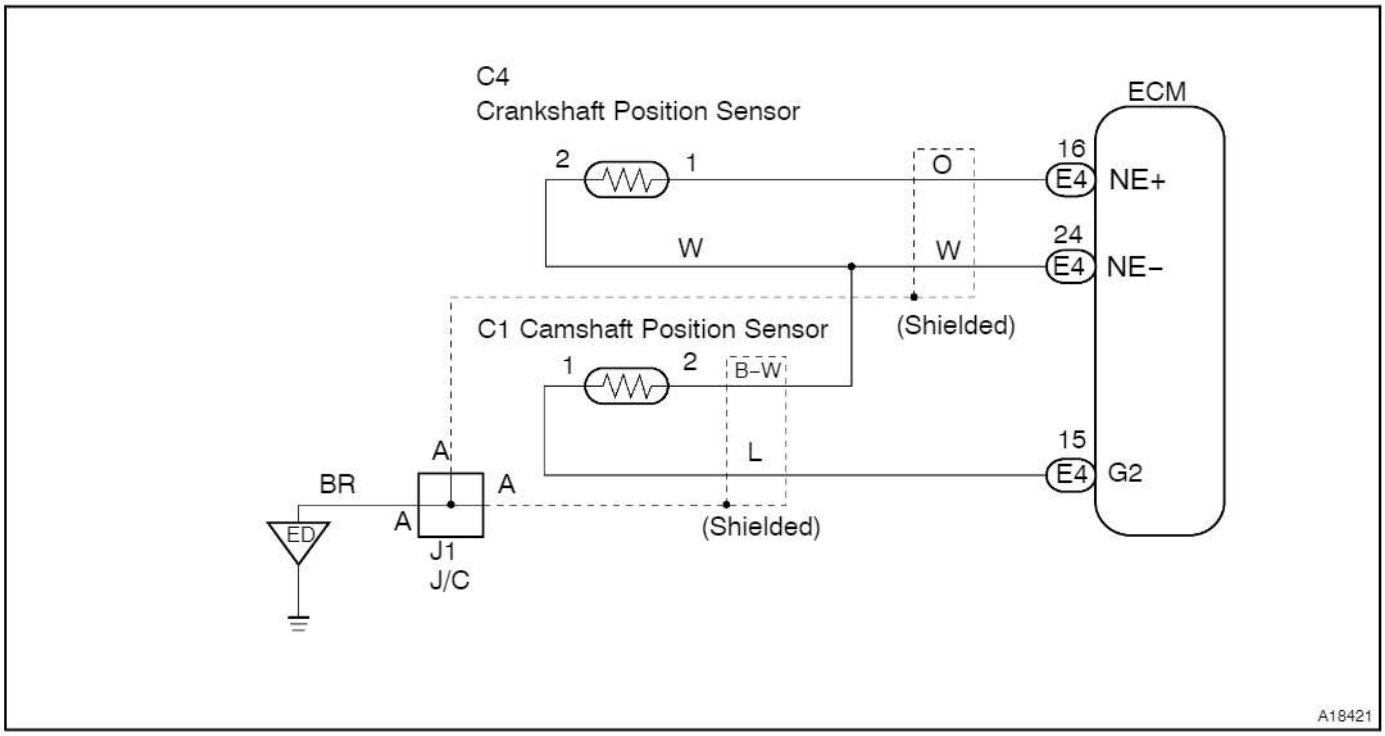
TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–3	
Case 1:		
Starter	ON	
Minimum battery voltage while starter is ON	–	11 V
Case 2:		
Engine speed	600 rpm	–
Starter	OFF	
Time after starter turns from ON to OFF	3 sec.	–

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Case 1:	
Engine speed signal	No signal for 4.7 sec.
Case 2:	
Engine speed signal	No signal for 0.016 sec.

WIRING DIAGRAM



INSPECTION PROCEDURE

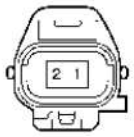
HINT:

- 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, as well as other data from the time when a 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 push the hand–held tester or the OBD II scan tool main switch ON.
  (c) When using hand–held tester, enter the following menus: 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 revolution, 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 RPM (than the actual RPM).

1	Check resistance of crankshaft position sensor.

Component Side:

Crankshaft Position Sensor



Front View

Y A21420

PREPARATION:

Disconnect the crankshaft position sensor connector.

CHECK:

Measure the resistance between the terminals of the crankshaft position sensor connector.

OK:

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).

NG → **Replace crankshaft position sensor.**

OK

2	Check for open and short in harness and connector between ECM and crankshaft position sensor (See page IN–30).

NG → **Repair or replace harness or connector.**

OK

3	Inspect sensor installation.

CHECK:

Check the crankshaft position sensor installation.

NG → **Tighten the sensor.**

OK

4	**Check teeth of crankshaft timing pulley.**

PREPARATION:

Remove the crankshaft angle sensor plate (See page EM–16).

CHECK:

Check the teeth of sensor plate.

NG → **Replace crankshaft timing pulley.**

OK

Replace ECM (See page SF–78).

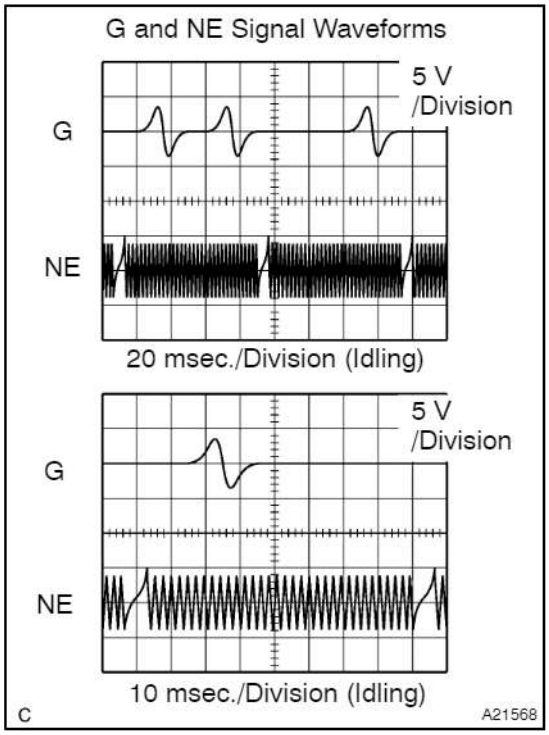
DTC	P0340	Camshaft Position Sensor "A" Circuit (Bank 1 or Single Sensor)

DTC	P0341	Camshaft Position Sensor "A" Circuit Range/Performance

CIRCUIT DESCRIPTION

The camshaft position sensor (G2 signal) consists of a magnet, iron core and pickup coil.
The G22+ 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 changes, causing fluctuations in the magnetic field and generating an electromotive force in the pickup coil.
The NE+ signal plate (crankshaft timing pulley) has 34 teeth and is installed to the crankshaft. The NE+ signal sensor generates 34 signals at every engine revolution. The ECM detects the crankshaft angle and the engine revolution based on the NE+ signals, and the cylinder and the angle of the VVT based on the combination of 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 with engine speed 600 rpm or more (1 trip detection logic)	• Open or short in camshaft position sensor circuit • Camshaft position sensor • Camshaft timing pulley • Timing chain has a jumped tooth • ECM
P0341	While crankshaft rotates twice, camshaft position sensor signal is input to ECM 12 times or more (1 trip detection logic) • Hint: Under normal condition, the camshaft position sensor signal is input into the ECM 3 times per 2 engine revolutions	



Reference: Inspection by using the oscilloscope.
HINT:
The correct waveform is as shown on the left.

Item	Contents
Terminal	CH1: G+ – NE– CH2: NE+ – NE–
Equipment Setting	5V/Division, 20ms/Division
Condition	During cranking or idling

MONITOR DESCRIPTION

If there is no signal from the camshaft position sensor even though the engine is cranking, or if the rotations of the camshaft and the crankshaft are 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 sensors/components	Camshaft position sensor
	Related sensors/components	Crankshaft position sensor, Engine speed sensor
Frequency of operation	Continuous	
Duration	5 sec.	
MIL operation	P0340 case 1 (no signal): 2 driving cycles P0340 case 2 (mis–aligned), P0341: Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–3	
P0340 Case 1 (No signal):		
Starter	ON	
Minimum battery voltage while starter is ON	–	11 V
P0340 Case 2 (Mis–aligned):		
Engine speed	600 rpm	–
Starter	OFF	
P0341:		
Engine revolution angle	720°CA	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P0340 Case 1 (No signal):	
Camshaft position sensor signal	No signal
P0340 Case 2 (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

Parameter	Standard Value
Camshaft position sensor signal input during every 720°CA	3

WIRING DIAGRAM

Refer to DTC P0335 on page DI–178.

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, as well as other data from the time when a malfunction occurred.

1	**Check resistance of camshaft position sensor (Signal generator).**

Component Side:



Camshaft Position Sensor

Y A21420

CHECK:
Measure the resistance between the terminals of camshaft position sensor connector.

Standard:

Tester Connection	Specified Condition
1 – 2	825 to 1,400 Ω at cold
	1,060 to 1,645 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).

NG → **Replace camshaft position sensor.**

OK

2	**Check for open and short in harness and connector between ECM and camshaft position sensor (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

3	**Inspect sensor installation.**

CHECK:

Check the camshaft position sensor installation.

NG → **Tighten the sensor.**

OK

4	**Inspect camshaft (See page EM–50).**

NG → **Replace camshaft.**

OK

Replace ECM (See page SF–78).

DIC6W–02

DTC	P0351	Igniter Coil "A" Primary/Secondary Circuit

DTC	P0352	Igniter Coil "B" Primary/Secondary Circuit

DTC	P0353	Igniter Coil "C" Primary/Secondary Circuit

DTC	P0354	Igniter Coil "D" Primary/Secondary Circuit

HINT:

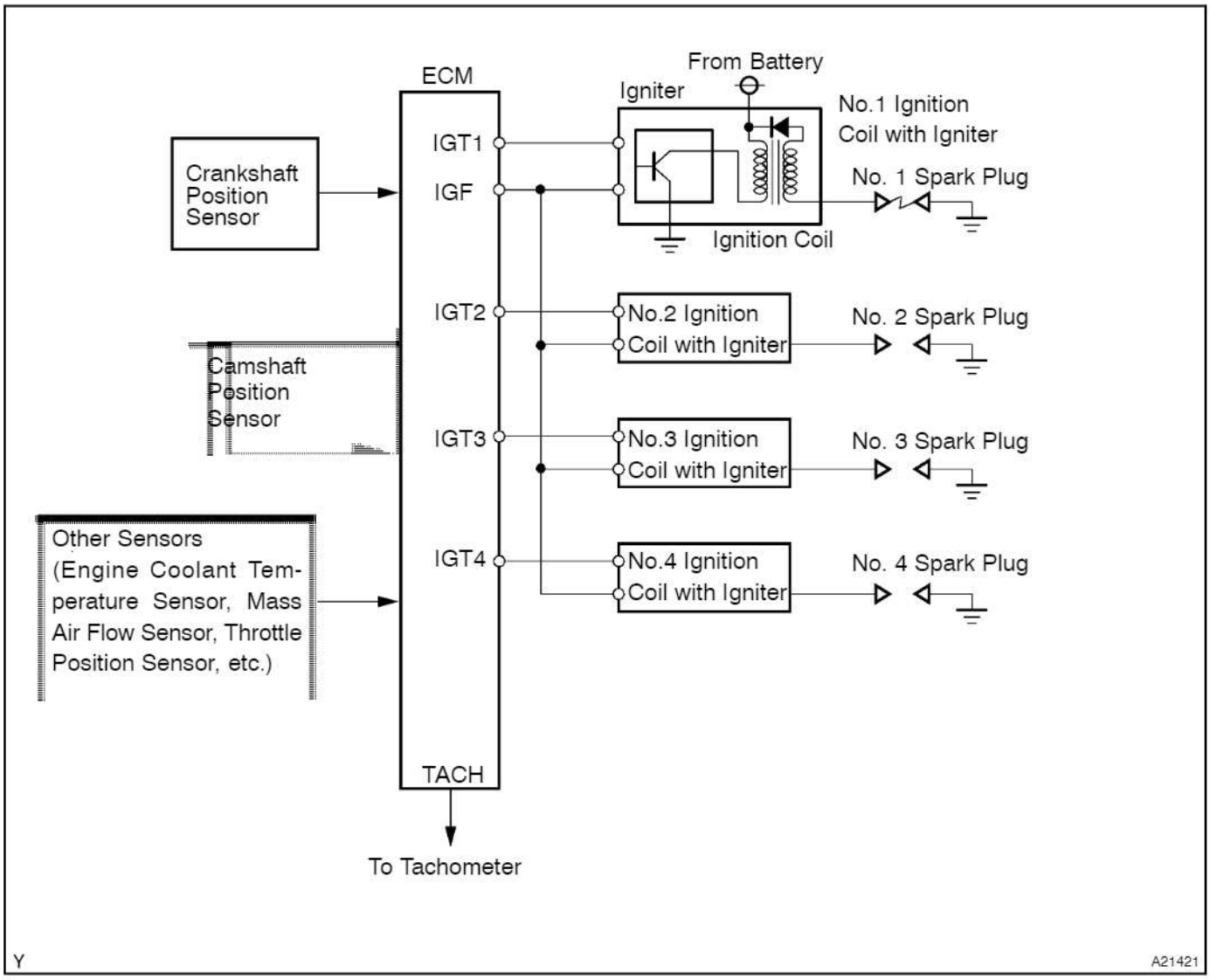
- These DTCs indicate a malfunction related to the primary circuit.
- If DTC P0351 is displayed, check the No.1 ignition coil with igniter circuit.
- If DTC P0352 is displayed, check the No.2 ignition coil with igniter circuit.
- If DTC P0353 is displayed, check the No.3 ignition coil with igniter circuit.
- If DTC P0354 is displayed, check the No.4 ignition coil with igniter circuit.

CIRCUIT DESCRIPTION

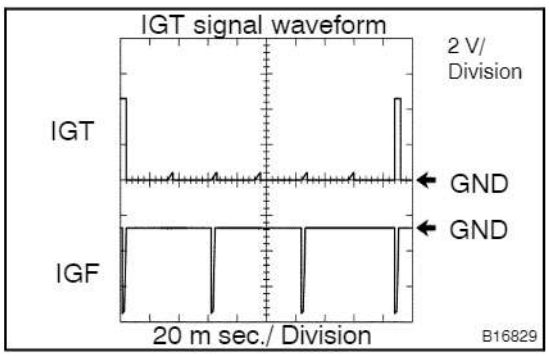
A Direct Ignition System (DIS) is used on this vehicle.

The DIS is a 1–cylinder ignition system which ignites one cylinder with one ignition coil. In the 1–cylinder ignition system, one spark plug is connected to the end of the secondary winding. High–voltage is generated in the secondary winding and 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 signals (IGTs) for each cylinder. Using the IGT, the ECM turns on and off the power transistor inside the igniter, which switches on and off of current to the primary coil. When current 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 create sparks inside the cylinders. As the ECM cuts the current to the primary coil, the igniter sends back the ignition confirmation signal (IGF) for each cylinder ignition to the ECM.



DTC No.	DTC Detection Condition	Trouble Area
P0351 P0352 P0353 P0354	No IGF signal to ECM while engine is running	• Ignition system • Open or short in IGF or IGT circuit from ignition coil with igniter to ECM (ignition coil circuit 1 through 4) • No. 1 to No. 4 ignition coil with igniter (primary ignition) • ECM



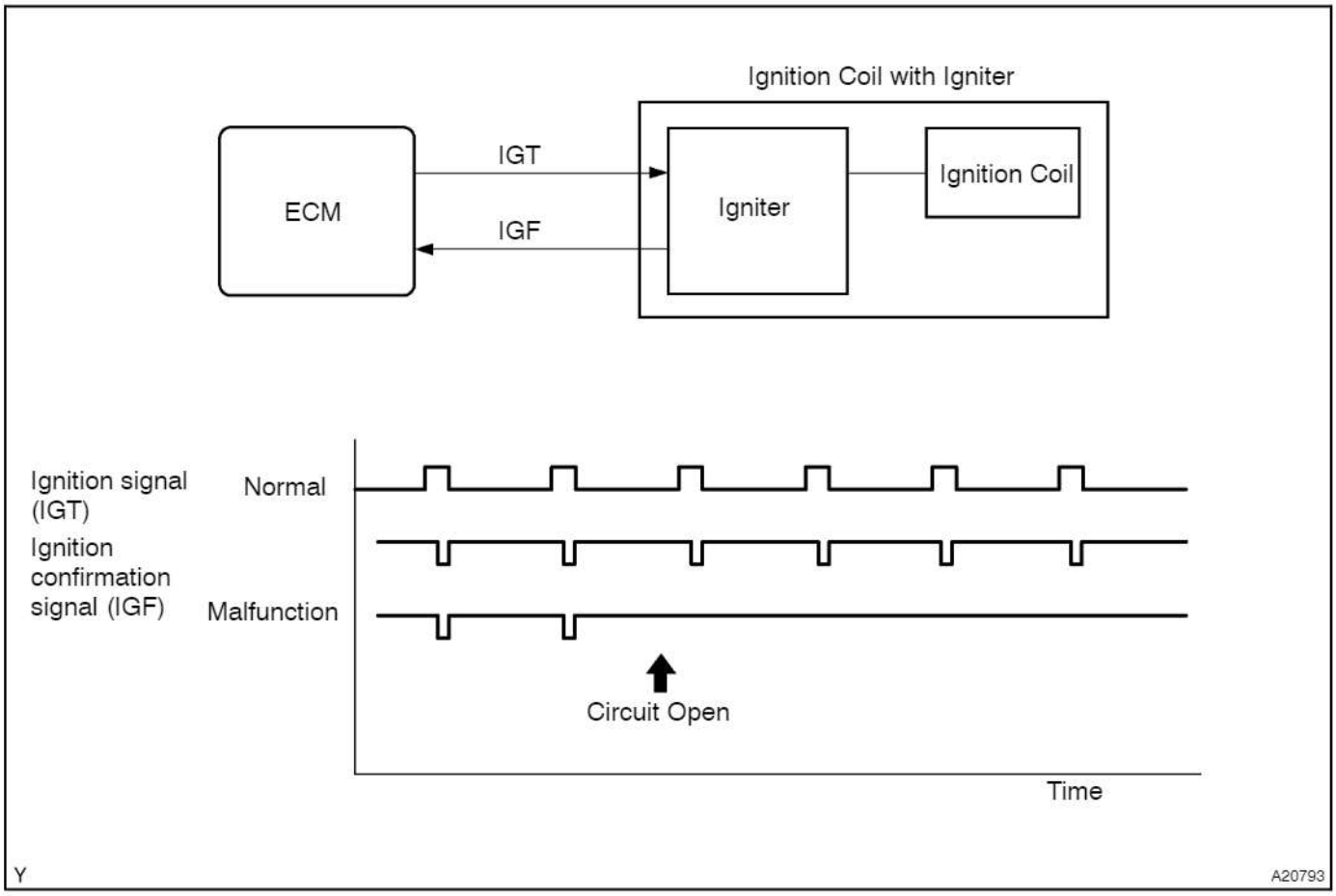
Reference: INSPECTION USING OSCILLOSCOPE

During cranking or idling, check waveform between terminals IGT1 – 4 and E1 of the ECM connector.

HINT:

Correct waveform appears as shown, with rectangle waves.

MONITOR DESCRIPTION



If the ECM does not receive the IGF after sending the IGT, it interprets this as a fault in the igniter and sets a DTC.

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
Required sensors/components	Igniter	
Frequency of operation	Continuous	
Duration	0.256 sec. + 4 sparks	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–3	
Either of the following conditions is met:	Condition 1 or 2	
1. Following conditions are met:	Conditions (a) and (b)	
(a) Engine speed	–	500 rpm
(b) Battery voltage	6 V	–
2. Following conditions are met:	Conditions (a) and (b)	
(a) Engine speed	500 rpm	–
(b) Battery voltage	10 V	–

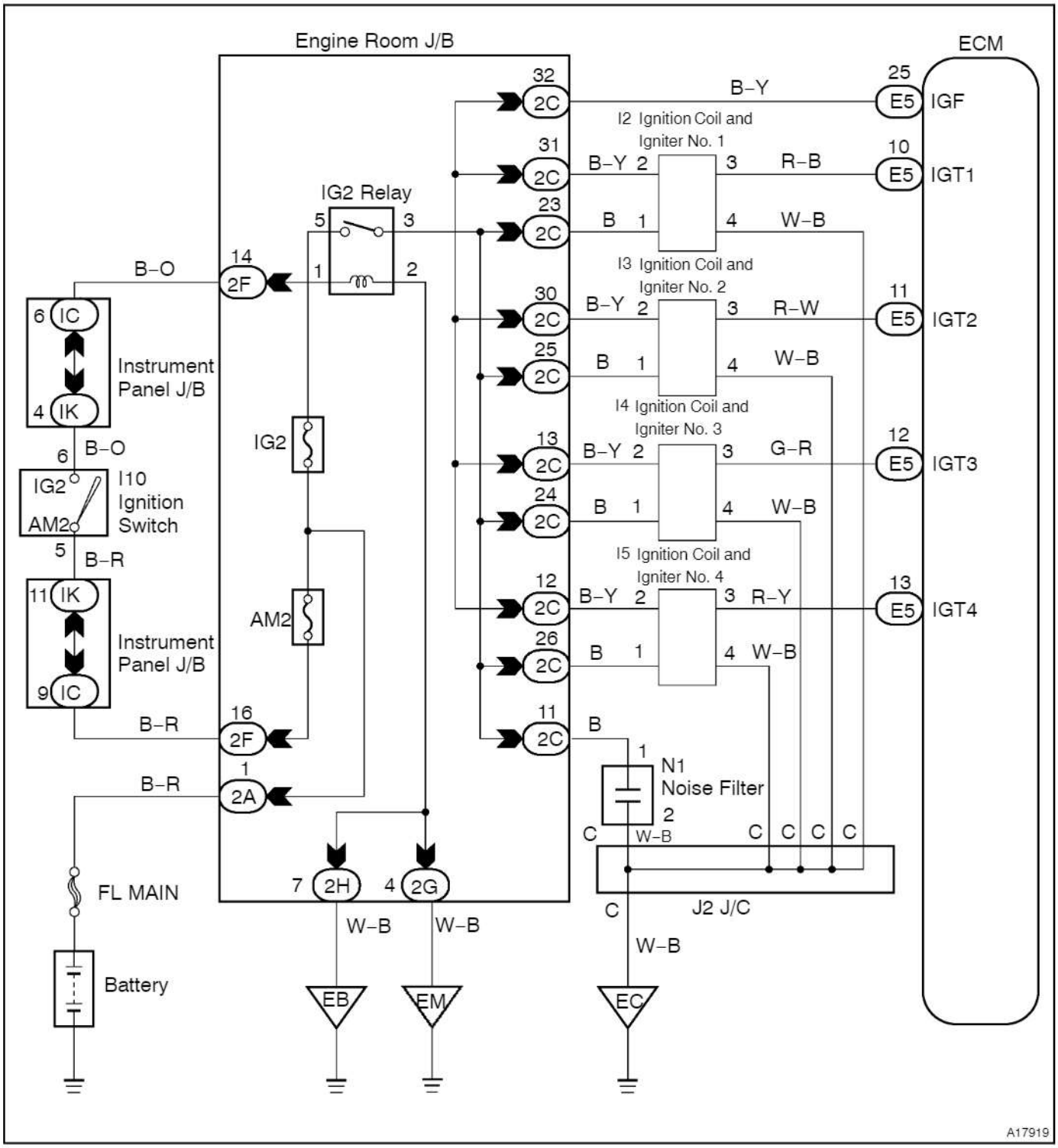
TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
"Ignition signal fail count"	More than 2 times
"Ignition signal fail count" is as follows:	When IGF should have returned despite sending IGT.

COMPONENT OPERATING RANGE

Standard Value
Confirmed signal number = ignition signal number

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, as well as other data from the time when a malfunction occurred.

1	**Check spark plug and spark of misfiring cylinder (See page IG–1).**

NG → **Go to step 4.**

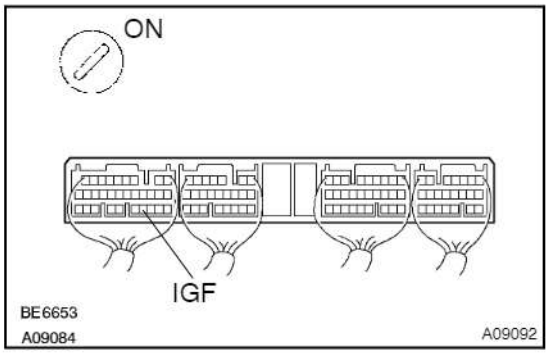
OK

2	**Check for open and short in harness and connector in IGF signal circuit between ECM and ignition coil with igniter (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

3	**Check voltage between terminals IGF of ECM connector and body ground.**



PREPARATION:

(a) Remove the ECM cover.
(b) Disconnect the ignition coil with igniter connector.
(c) Turn the ignition switch ON.

CHECK:

Measure voltage between terminals IGF of the ECM connector and body ground when engine is cranked.

OK:

Voltage: 4.5 to 5.5 V

NG → **Replace ECM (See page SF–78).**

OK

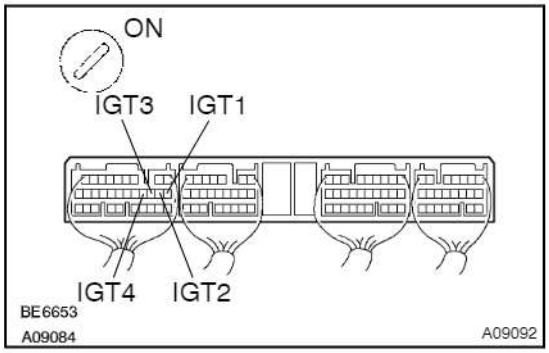
Replace ignition coil with igniter.

4	**Check for open and short in harness and connector in IGT signal circuit between ECM and ignition coil with igniter (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

5	**Check voltage between terminals IGT1 to 4 of ECM connector and body ground.**



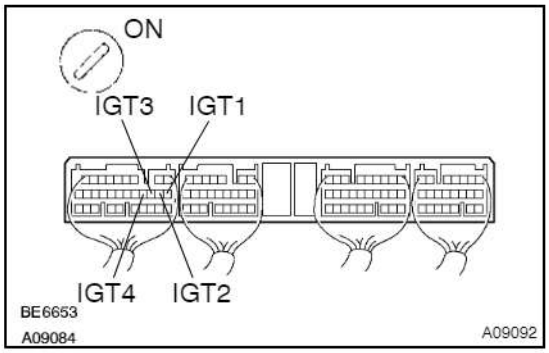
PREPARATION:
Remove the ECM cover.
CHECK:
Measure voltage between terminals IGT1 to 4 of the ECM connector and body ground when engine is cranked.
OK:

Voltage: More than 0.1 V and less than 4.5 V

NG → **Replace ECM (See page SF–78).**

OK

6	**Check voltage between terminals IGT1 to 4 of ECM connector and body ground.**



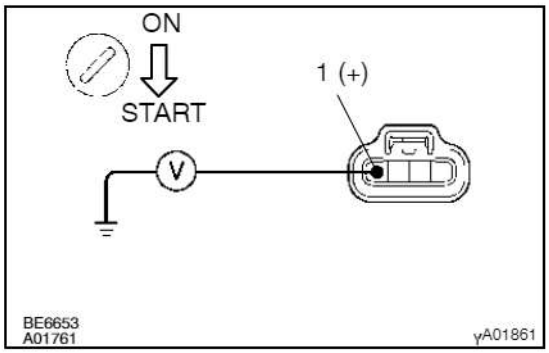
PREPARATION:
Disconnect the ignition coil with igniter connector.
CHECK:
Measure voltage between terminals IGT1 to 4 of the ECM connector and body ground when engine is cranked.
OK:

Voltage: 4.5 V or more

NG → **Replace ECM (See page SF–78).**

OK

7	**Check ignition coil with igniter power source circuit.**



PREPARATION:

Disconnect the ignition coil with igniter connector.

CHECK:

Measure voltage between terminal 1 of ignition coil with igniter connector and body ground, when ignition switch is turned to "ON" and "START" position.

OK:

Voltage: 9 to 14 V

OK	**Repair ignition coil with igniter.**

OK

8	**Check for open and short in harness and connector between ignition switch and ignition coil with igniter (See page SF–78).**

NG	**Repair or replace harness or connector.**

OK

Replace ignition coil with igniter.

DIC8X–02

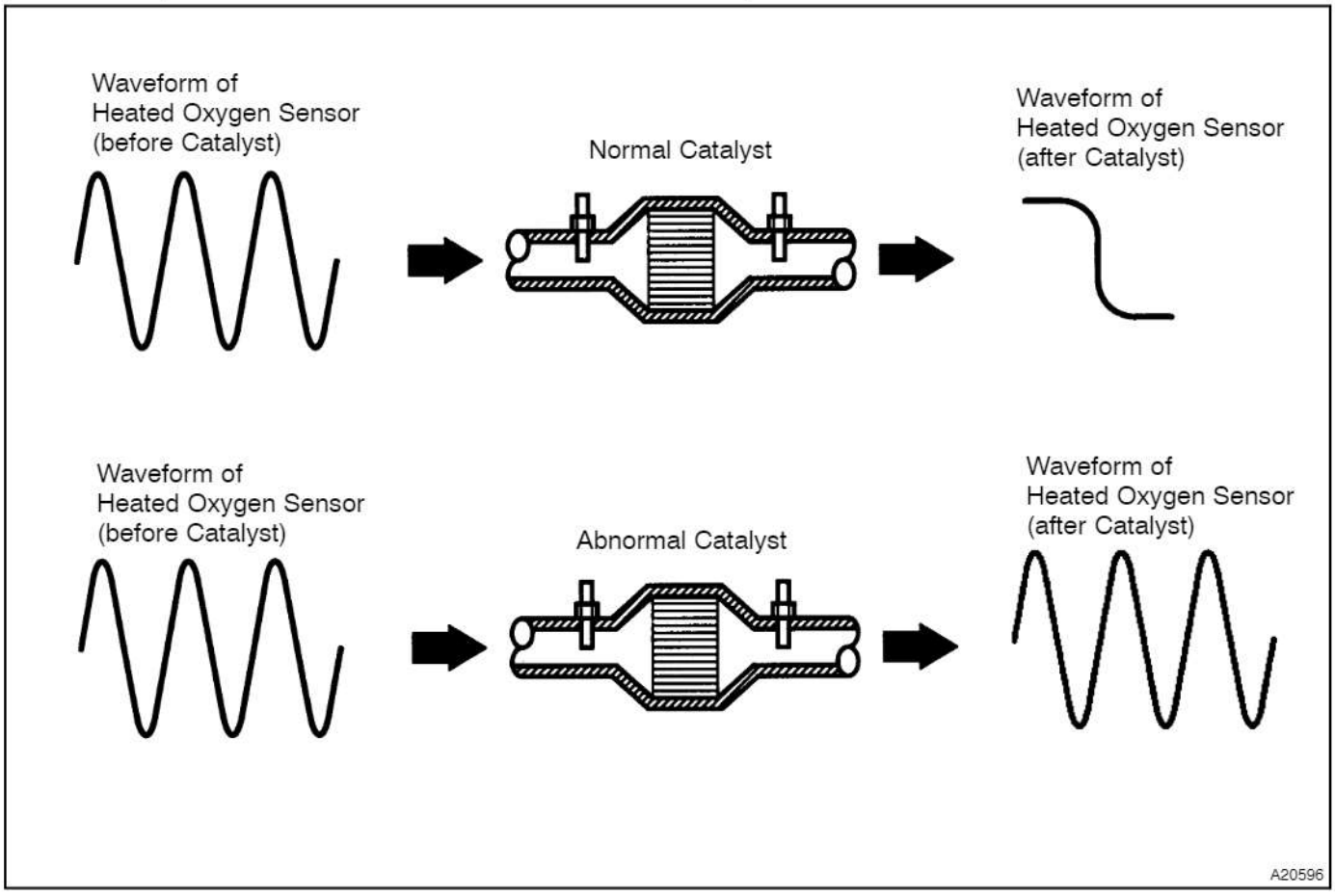
DTC	P0420	Catalyst System Efficiency Below Threshold (Bank 1)

MONITOR DESCRIPTION

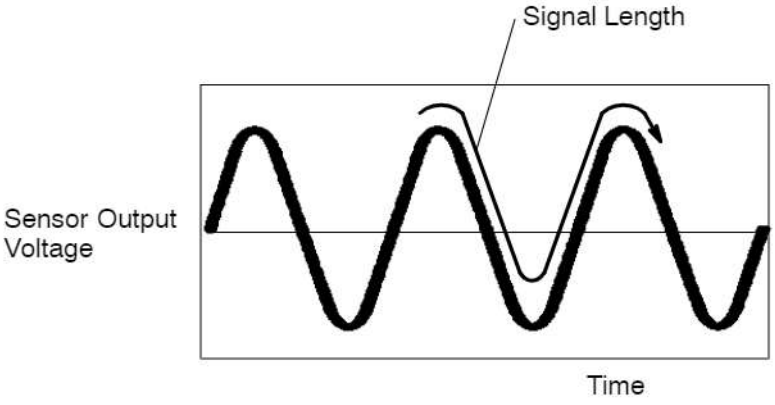
The vehicle is equipped with two heated oxygen sensors. One is mounted upstream from the TWC (Three–Way Catalytic) converter (Front Oxygen Sensor, "sensor 1"), the second is mounted downstream (Rear Oxygen Sensor "sensor 2"). The catalyst efficiency monitor compares the sensor 1 and sensor 2 signals in order to calculate TWC ability to store the 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 below.

DTC	Detecting Condition	Trouble Area
P0420	After the engine and the catalyst are warmed up, and while the vehicle is driven within the set vehicle and engine speed range, the waveforms of the oxygen sensors (bank 1 sensor 1 and bank 1 sensor 2) have the same amplitude (2 trip detection logic).	• Front exhaust pipe (catalyst) • Gas leakage in exhaust system • Heated oxygen sensor (bank 1 sensor 1) • Heated oxygen sensor (bank 1 sensor 2)



Heated Oxygen Sensor Signal Length



MONITOR STRATEGY

Required sensors/components (main)	Catalyst
Required sensors/components (related)	Front and rear heated oxygen sensors
Frequency of operation	Once per driving cycle
Duration	90 sec (30 sec x 3 times)
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

Item	Minimum	Maximum
These DTC is not present	See page DI–3	
Accumulated time that all of the following conditions are met:	30 sec	
Battery voltage	11 V	–
Intake air temperature	–10°C (14°F)	–
Idle status	OFF	
MAF	5.1 g/sec	30 g/sec
Engine RPM	–	4500 rpm
Engine coolant temperature	75°C (167°F)	
Fuel system status	Closed loop	
Catalyst temperature	450°C (842°F)	750°C (1382°F)

TYPICAL MALFUNCTION THRESHOLDS

Catalyst deterioration level	0.4 or more
Frequency of detection	3 times

MONITOR RESULT

Refer to page DI–3 for detailed information.

Check the monitor result and test values after performing the drive pattern below.

TID $01: Catalyst monitor

TLT	CID	Unit Conversion	Description of Test Data	Description of Test Limit
0	$01	Multiplied by 0.0078 (no dimension)	Catalyst deterioration level	Malfunction criteria for catalyst deterioration

CONFIRMATION DRIVING PATTERN

(a) Clear the DTC.

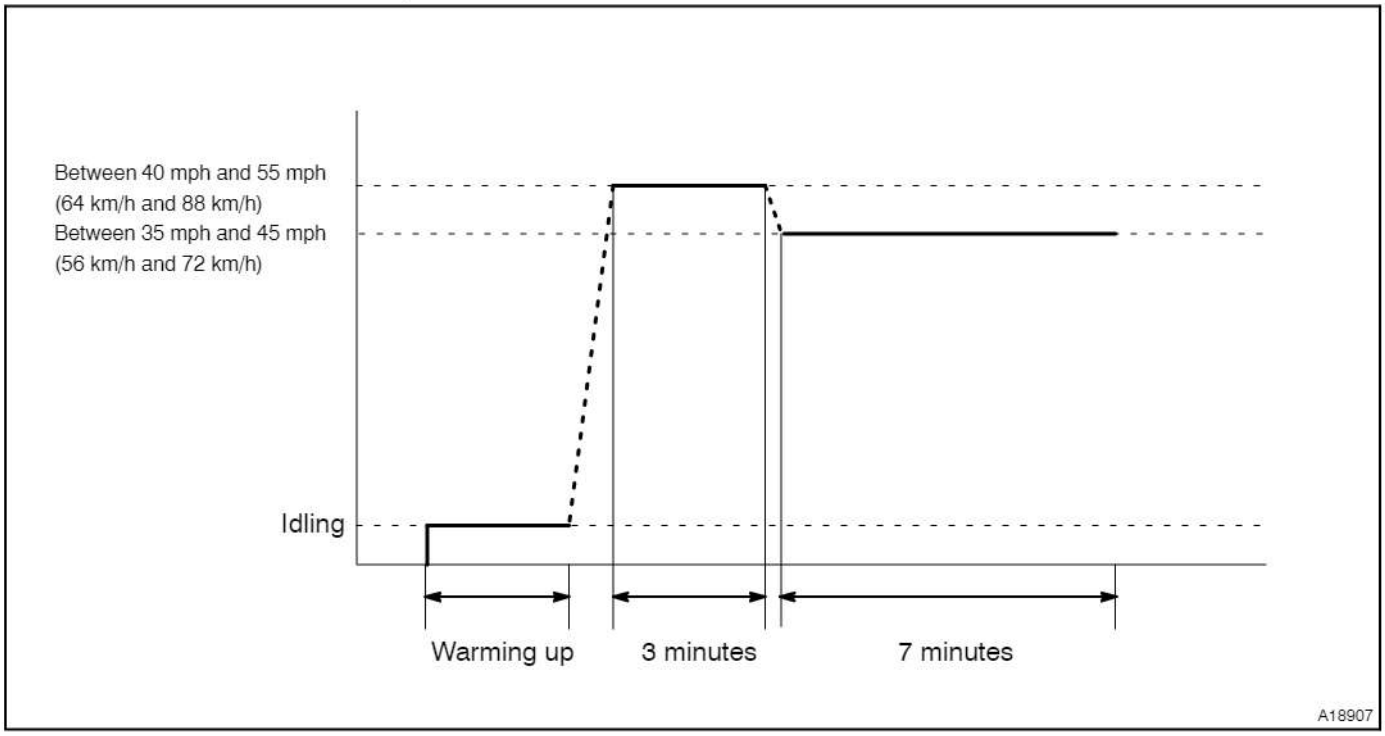
(b) Warm up the engine until the engine coolant temperature reaches 75°C (167°F).

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

(d) Drive the vehicle at 35 to 45 mph (56 to 72 km/h) for at least 7 minutes.

NOTICE:

Drive with smooth throttle operation and avoid sudden acceleration.



INSPECTION PROCEDURE

1	**Check DTC other than P0420.**

If DTCs other than P0420 are present, troubleshoot those DTCs first.

RESULT:

DTC	Proceed to
P0420	A
P0420 and others	B

B → **Go to relevant DTC chart (See page DI–42).**

A

2	**Check gas leakage on exhaust system.**

NG → **Repair or replace exhaust gas leakage point.**

OK

3	**Perform A/F CONTROL active test.**

(a) Connect the hand–held tester to the DLC3.
(b) Run the engine at 2500 rpm for 90 seconds.
(c) Allow the engine to idle.
(d) Select from the tester menus: DIAGNOSIS / ENHANCED OBDII / ACTIVE TEST / A/F CONTROL.
(e) Switch the injection volume between +25% and –12.5%, and then check the oxygen sensor voltages.

Result

Go to	Front heated oxygen sensor (sensor 1)	Rear heated oxygen sensor (sensor 2)	Suspected Trouble Area
A	Injection volume +25 % –12.5% Output voltage More than 0.55 V Less than 0.4 V	Injection volume +25 % –12.5% Output voltage More than 0.5 V Less than 0.4 V	Catalysts
B	Injection volume +25 % –12.5% Output voltage Almost no reaction	Injection volume +25 % –12.5% Output voltage More than 0.5 V Less than 0.4 V	Front heated oxygen sensor (sensor 1)
C	Injection volume +25 % –12.5% Output voltage More than 0.55 V Less than 0.4 V	Injection volume +25 % –12.5% Output voltage Almost no reaction	Rear heated oxygen sensor (sensor 2)
D	Injection volume +25 % –12.5% Output voltage Almost no reaction	Injection volume +25 % –12.5% Output voltage Almost no reaction	Extremely rich or lean fuel–trim Exhaust gas leak, etc.

NOTICE:

The front heated oxygen sensor has an output delay of a few seconds.

The rear heated oxygen sensor has a maximum output delay of approximately 20 seconds.

B → Replace heated oxygen sensor (bank 1 sensor 1) (See page EM–117).

C → Replace heated oxygen sensor (bank 1 sensor 2) (See page EM–117).

D → Check fuel trim (See page DI–148).

A

Replace front exhaust pipe (catalyst) (See page EM–117).

–MEMO–

DTC	P0441	Evaporative Emission Control System Incorrect Purge Flow

DTC	P0446	Evaporative Emission Control System Vent Control Malfunction

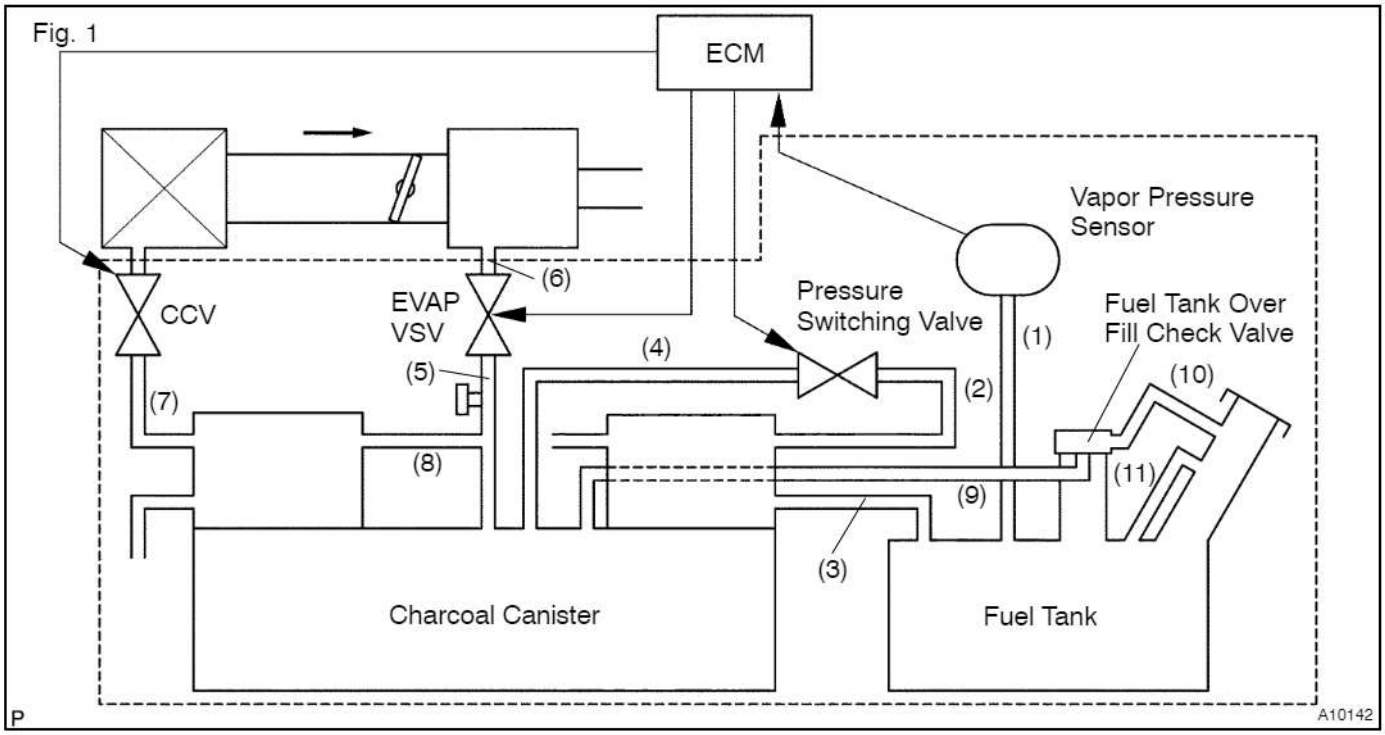
CIRCUIT DESCRIPTION

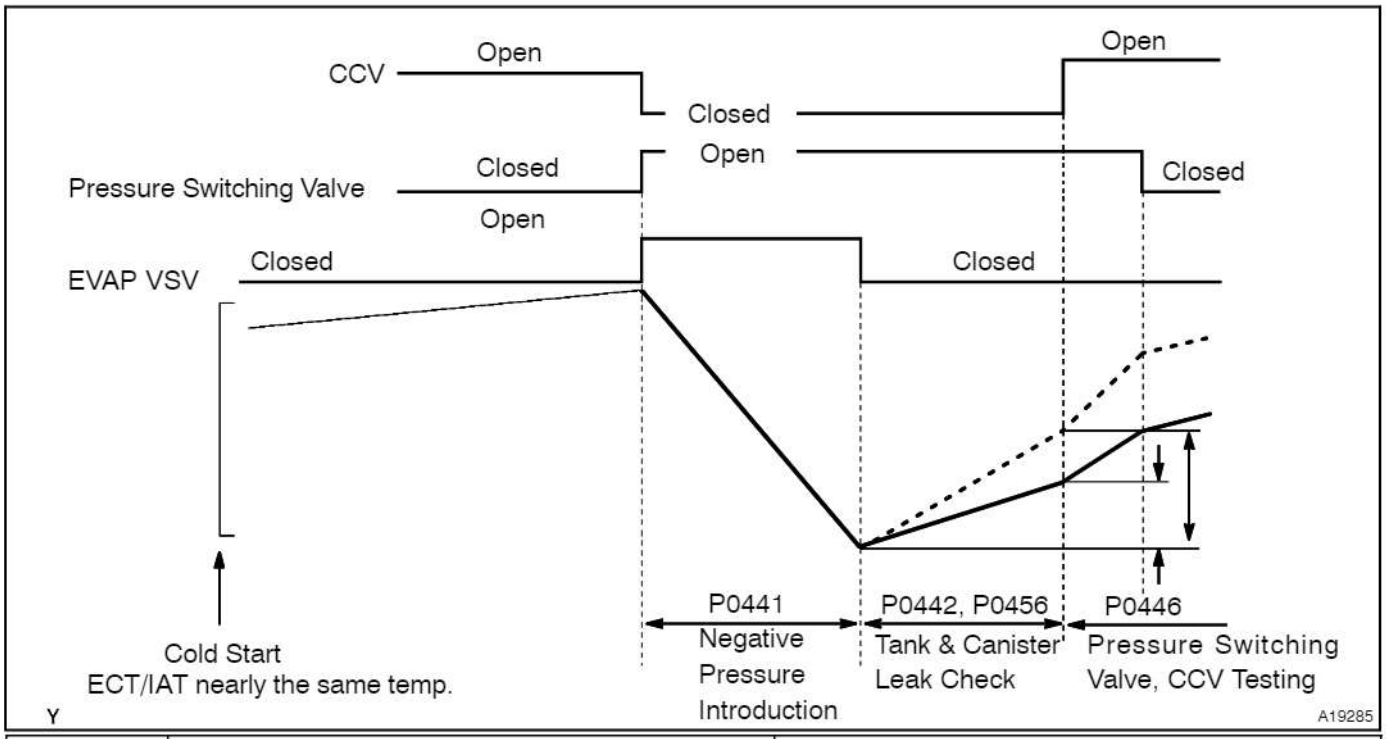
The vapor pressure sensor, canister closed valve (CCV), pressure switching valve are used to detect abnormalities in the evaporative emission control system.

The ECM decides whether there is an abnormality in the evaporative emission control system based on the vapor pressure sensor signal.

DTCs P0441 and P0446 are recorded by the ECM when evaporative emissions leak from the components within the dotted line in Fig. 1 below, or when there is a malfunction in either the EVAP VSV, the pressure switching valve, or in the vapor pressure sensor itself.

Fig. 1





DTC No.	DTC Detecting Condition	Trouble Area
P0441	Pressure in charcoal canister and fuel tank does not drop during purge control (2 trip detection logic)	• Vacuum hose is cracked, holed, blocked, damaged or disconnected ((1), (2), (3), (4), (5), (6), (7), (8), (9), (10) and (11) in Fig. 1) • Fuel tank cap is incorrectly installed • Fuel tank cap is cracked or damaged • Open or short in vapor pressure sensor circuit • Vapor pressure sensor • Open or short in VSV circuit for EVAP • EVAP VSV • Open or short in VSV circuit for CCV • CCV • Open or short in VSV circuit for pressure switching valve • Pressure switching valve • Fuel tank is cracked, holed or damaged • Charcoal canister is cracked, holed or damaged • Fuel tank over fill check valve is cracked or damaged • ECM
	Negative pressure incoming in the charcoal canister and fuel tank does not stop during purge cut–off. (2 trip detection logic)	
P0446	No rising of the fuel tank pressure when commanding the CCV to open after the EVAP leak test	
	No changing of the fuel tank pressure when commanding the pressure switching valve to be checked after the EVAP leak test	
	A high negative pressure (vacuum) does not occur in the system when commanding the EVAP VSV to open with the CCV closed	

HINT:

Typical DTC output of each trouble part is shown in the table below.

Trouble part		Typical DTC output (*1)
Small Leak		"P0442" and / or "P0456" (*2)
Medium Leak (ex: Vacuum hose loose)		P0442
Large Leak (ex: Fuel tank cap loose)		P0442, P0441 and P0446
EVAP VSV	Open Malfunction	P0441
	Close Malfunction	P0442, P0441 and P0446
CCV	Open Malfunction	P0442, P0441 and P0446
	Close Malfunction	P0446
Pressure Switching Valve	Open Malfunction	P0446
	Close Malfunction	P0442, P0441 and P0446

*1: ECM may output some other DTC combination.

*2: Refer to P0442 and P0456 on page DI–278.

MONITOR DESCRIPTION

P0441

The ECM checks for a stuck closed malfunction in the EVAP VSV by commanding it to open with the CCV closed. If a high negative pressure does not develop in the fuel tank, the ECM determines that the EVAP VSV remains closed. The ECM turns on the MIL and a DTC is set.
The ECM checks for EVAP VSV "stuck open" fault by commanding both valves (EVAP VSV and CCV) to close at a time when the fuel tank is at atmospheric pressure. If the fuel tank develops a high negative pressure at this early stage of the test, the ECM determines that the EVAP VSV is stuck open.
The ECM will turn on the MIL and a DTC will be set.

P0446

If there is a malfunction detected in the evaporative emission (EVAP) VSV, the canister closed valve (CCV) and the pressure switching valve, the ECM will illuminate the MIL and set a DTC.
This portion of the EVAP diagnosis checks the following EVAP system functions:

(a) CCV stuck closed.
The ECM checks for a CCV "stuck closed" malfunction by commanding the CCV to open after an EVAP leak test. If the fuel tank pressure does not rise (no vacuum generated), the ECM determines that the CCV is stuck closed. The ECM will turn on the MIL and a DTC will be set.

(b) Pressure switching valve stuck closed.
The ECM checks for a pressure switching valve "stuck closed" malfunction by commanding the pressure switching valve to close after an EVAP leak test. If the fuel tank pressure does not change, the ECM determines that the pressure switching valve is malfunctioning. The ECM will turn on the MIL and a DTC will be set.

(c) EVAP VSV (Purge line to intake manifold) stuck closed.
The ECM checks for a stuck closed malfunction in the EVAP VSV by commanding it to open with the CCV closed. If a high negative pressure does not develop in the fuel tank, the ECM determines that the EVAP VSV remains closed. The ECM will turn on the MIL and a DTC will be set.

MONITOR STRATEGY

Related DTCs	P0441	EVAP VSV malfunction
	P0446	Canister close valve stuck closed Pressure switching valve malfunction EVAP VSV malfunction
Required sensors/components	Main sensors/components	Vapor pressure sensor
	Related sensors/components	Engine coolant temperature sensor, Intake air temperature sensor, Vehicle speed sensor
Frequency of operation	Once per driving cycle	
Duration	P0441 : 90 sec. P0446 : 10 sec.	
MIL operation	2 drive cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Criteria	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–3	
The same as that for DTC P0442		

TYPICAL MALFUNCTION THRESHOLDS

P0441

Detection Criteria	Threshold
Purge VSV stuck closed:	
Fuel tank pressure change during vacuum introduction	Less than 0.933 kPa (7.0 mmHg)
Purge VSV stuck open:	
Either of the following conditions is met:	Condition 1 or 2
1. (Minimum fuel tank pressure before leak check) – (Fuel tank pressure 14 sec. after leak check)	0.467 kPa (3.5 mmHg) or more
2. Fuel tank pressure 14 sec. after leak check	Less than –3.733 kPa (28 mmHg)

P0446

Detection Criteria	Threshold
Case 1: CCV stuck closed	
Fuel tank pressure when the CCV is opened	No change
Case 2: CCV stuck open	
Purge VSV stuck closed	Detected
Case 3: EVAP VSV stuck closed	
Fuel tank pressure after the EVAP VSV is opened and manifold vacuum is introduced to the fuel tank	No change

MONITOR RESULT

Refer to page DI–3 for detailed information.

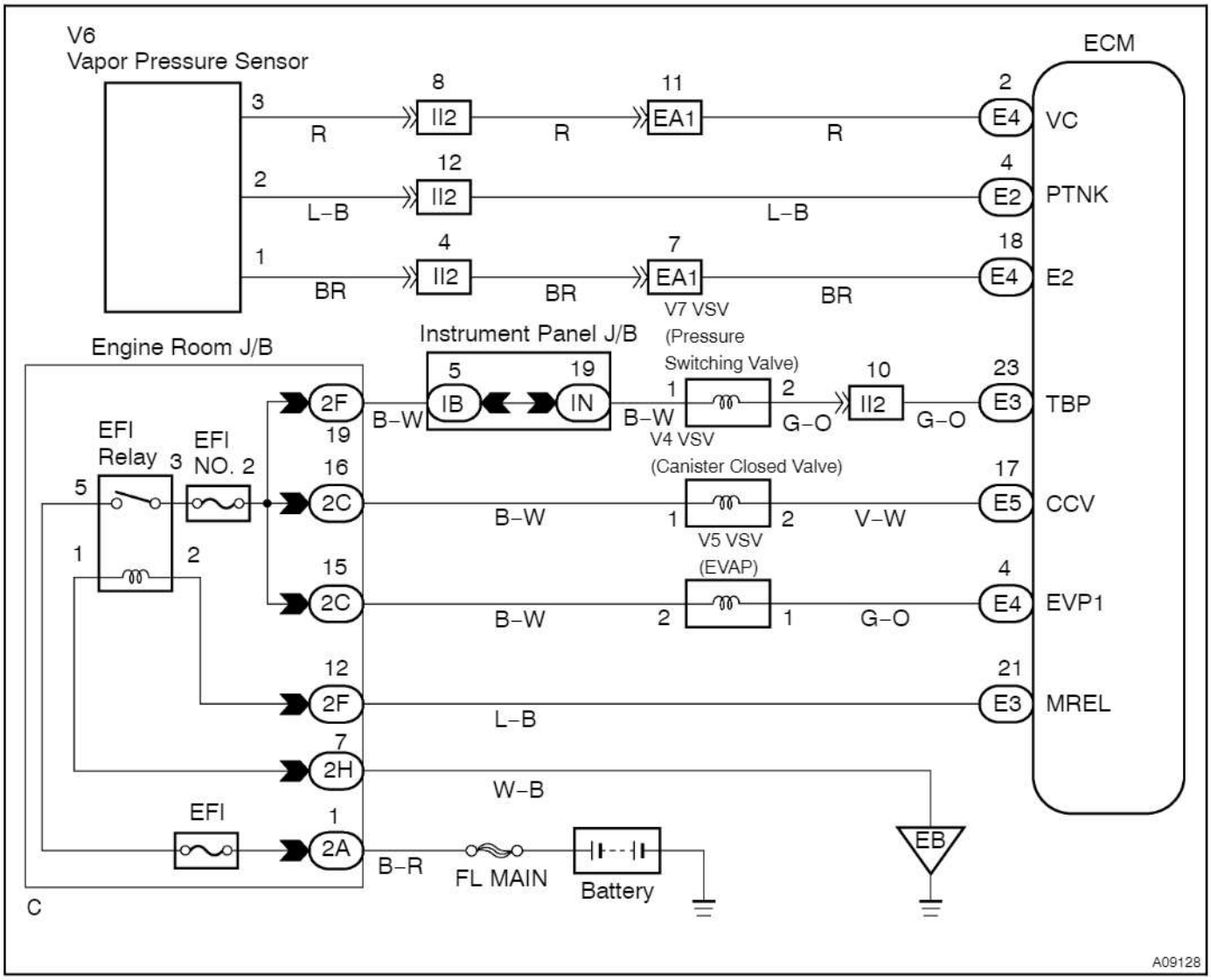
The test value and test limit information are described as shown in the following table. Check the monitor result and test values after performing the monitor drive pattern (see page DI–3).

- TID (Test Identification Data) is assigned to each emissions–related component.
- TLT (Test Limit Type):
  If TLT is 0, the component is malfunctioning when the test value is higher than the test limit.
  If TLT is 1, the component is malfunctioning when the test value is lower than the test limit.
- CID (Component Identification Data) is assigned to each test value.
- Unit Conversion is used to calculate the test value indicated on generic OBD II scan tools.

TID $02: EVAP system – Vacuum monitor

TLT	CID	Unit Conversion	Description of Test Data	Description of Test Limit
1	$01	Multiplied by 0.0916 (mmHg)	Test value of EVAP VSV: Determined by fuel tank pressure change during vacuum introduction	Malfunction criteria for EVAP VSV
1	$02	Multiplied by 0.0458 subtract 2.93 (mmHg)	Test value of canister closed valve (CCV) and bypass VSV: Determined by fuel tank pressure change at switching over CCV and bypass VSV	Malfunction criteria for CCV and bypass VSV
0	$03	Multiplied by 0.0458 (mmHg)	Test value of 0.04 inch leak: Determined by fuel tank pressure change	Malfunction criteria for 0.04 inch leak
0	$04	Multiplied by 0.0458 (mmHg)	Test value of 0.02 inch leak: Determined by fuel tank pressure change	Malfunction criteria for 0.02 inch leak

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If DTC P0441 (Purge Flow), P0446 (CCV or pressure switching valve), P0451, P0452 or P0453 (See page DI–247) is output with DTC P0442 or P0456 (See page DI–225), 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, as well as other data from the time when a malfunction occurred.
- When the ENGINE RUN TIME in the freeze frame data is less than 200 seconds, carefully check the vapor pressure sensor.

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	Check fuel tank cap (See page EC–6).

NG → Replace fuel tank cap.

OK

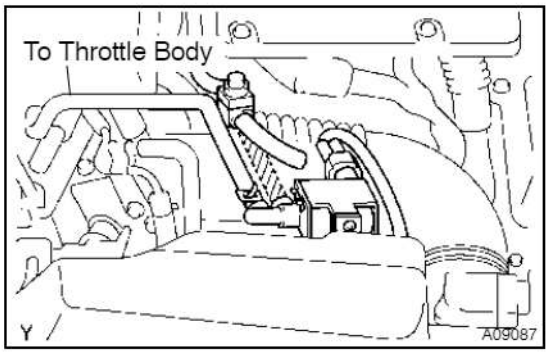
4	Check filler neck for damage.

PREPARATION:
Remove the fuel tank cap.
CHECK:
Visually inspect the filler neck for damage.

NG → Replace filler pipe.

OK

5	Check purge flow.



PREPARATION:

(a) Connect the hand–held tester to the DLC3.
(b) Select the "ENHANCED OBD II / ACTIVE TEST" mode on the hand–held tester.
(c) Disconnect the vacuum hose for the EVAP VSV from the charcoal canister.
(d) Start the engine.
(e) Select the item "EVAP VSV (ALON) / ALL" in the ACTIVE TEST and operate EVAP VSV (Press the right or left button).

CHECK:

When the EVAP VSV is operated by the hand–held tester, check whether the disconnected hose applies suction to your finger.

OK:

VSV is ON:
Disconnected hose applies suction to your finger.
VSV is OFF:
Disconnected hose applies no suction to your finger.

OK	Go to step 9.

NG

6	Check vacuum hose between intake manifold and EVAP VSV, and EVAP VSV and charcoal canister.

CHECK:

(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, hole, damage and blockage.

NG	Repair or replace vacuum hoses.

OK

7	Check operation of EVAP VSV (See page SF–61).

NG → Replace EVAP VSV.

OK

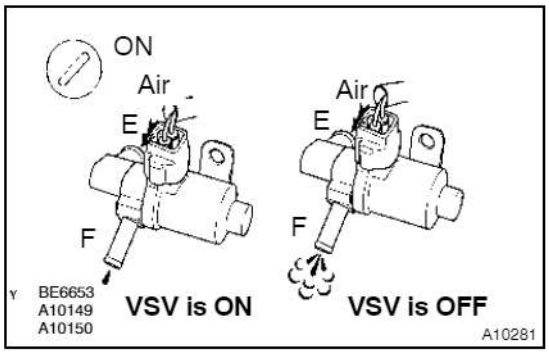
8	Check for open and short in harness and connector between EFI main relay (Marking: EFI) and EVAP VSV, and EVAP VSV and ECM (See page IN–30).

NG → Repair or replace harness or connector.

OK

Replace ECM (See page SF–78).

9	Check CCV.



PREPARATION:

(a) Disconnect the vacuum hose for the CCV from the charcoal canister.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the "ENHANCED OBD II / ACTIVE TEST" mode on the hand–held tester.
(d) Select the item "CAN CTRL VSV / ALL" in the ACTIVE TEST and operate CAN CTRL VSV (Press the right or left button).

CHECK:

Check the VSV operation when it is operated by the hand–held tester.

OK:

VSV is ON:
Air does not flow from port E to port F.
VSV is OFF:
Air from port E flows out through port F.

OK	Go to step 13.

NG

10	Check vacuum hose between CCV and charcoal canister.

CHECK:

(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, hole damage and blockage.

NG	Repair or replace vacuum hoses.

OK

11	Check operation of CCV (See page SF–63).

NG	Replace CCV.

OK

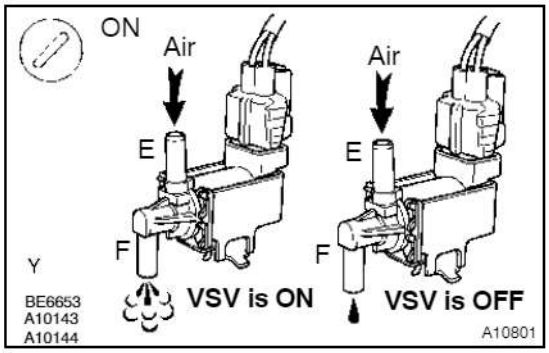
12	**Check for open and short in harness and connector between EFI main relay (Marking: EFI) and CCV, and CCV and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Replace ECM (See page SF–78).

13	**Check pressure switching valve.**



PREPARATION:

(a) Turn the ignition switch ON and push the hand–held tester main switch ON.

(b) Select the "ENHANCED OBD II / ACTIVE TEST" mode on the hand–held tester.

(c) Select the item "TANK BYPASS VSV / ALL" in the ACTIVE TEST and operate TANK BYPASS VSV (Press the right or left button).

(d) Check the VSV operation when it is operated by the hand–held tester.

CHECK:

Check the VSV operation when it is operated by the hand–held tester.

OK:

VSV is ON:
Air from port E flows out through port F.
VSV is OFF:
Air does not flow from port E to port F.

OK → **Go to step 16.**

NG

14	**Check operation of pressure switching valve (See page SF–65).**

NG → **Replace pressure switching valve.**

OK

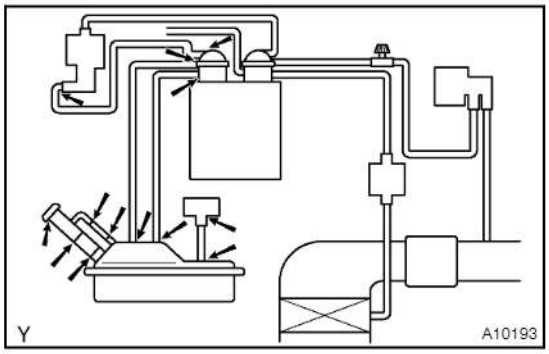
15	**Check for open and short in harness and connector between EFI main relay (Marking: EFI) and pressure switching valve, and pressure switching valve and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Replace ECM (See page SF–78).

16	**Check whether hose close to fuel tank has been modified, and check whether there are signs of any accident near fuel tank.**



CHECK:

Check for cracks, deformation and loose connection of the following parts:

- Fuel tank
- Fuel tank filler pipe
- Hoses and tubes around fuel tank

NG → **Repair or replace evaporative emission leak part.**

OK

17	**Check vacuum hoses between vapor pressure sensor and fuel tank, charcoal canister and pressure switching valve.**

CHECK:

(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, hole and damage.

NG → **Repair or replace vacuum hose.**

OK

18	Check hose and tube between fuel tank and charcoal canister.

CHECK:

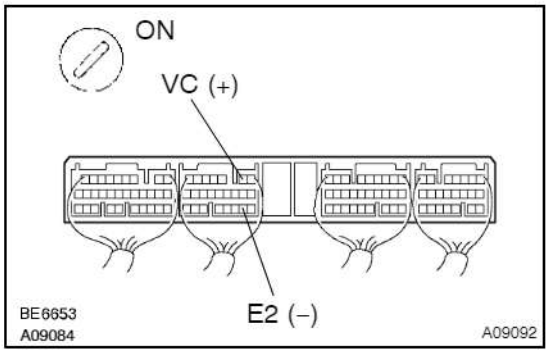
(a) Check for proper connection of the fuel tank and fuel evap pipe (See page EC–2), fuel evap pipe and fuel tube under the floor, fuel tube under the floor and charcoal canister.

(b) Check the hose and tube for cracks, hole and damage.

NG → **Repair or replace hose and tube.**

OK

19	Check voltage between terminals VC and E2 of ECM connector.



CHECK:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals VC and E2 of the ECM connector.

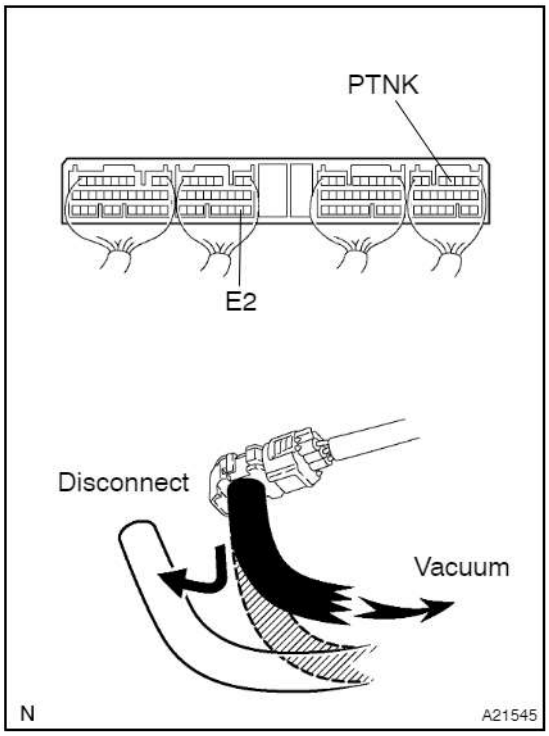
OK:

Voltage: 4.5 to 5.5 V

NG → **Replace ECM (See page SF–78).**

OK

20	Check voltage between terminals PTNK and E2 of ECM connectors.



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals PTNK and E2 of the ECM connectors at following condition (1) and (2).

(1) Disconnect the vacuum hose from the vapor pressure sensor.

(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:

Vacuum applied to vapor pressure sensor must be less than 66.7 kPa (500 mmHg, 19.7 in.Hg).

OK:

Condition (1) Voltage: 2.9 to 3.7 V

Condition (2) Voltage: 0.5 V or less

OK	Go to step 22.

NG

21	Check for open and short in harness and connector between vapor pressure sensor and ECM (See page IN–30).

NG	Repair or replace harness or connector.

OK

Replace ECM (See page SF–78).

22	Check fuel tank inlet valve.

NG	Replace fuel tank inlet valve.

OK

23	Check fuel tank.

NG → Replace fuel tank.

OK

24	Check charcoal canister for cracks, hole and damage.

NG → Repair or replace charcoal canister.

OK

Replace ECM (See page SF–78).

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	Check fuel tank cap (See page EC–6).

NG → Replace fuel tank cap.

OK

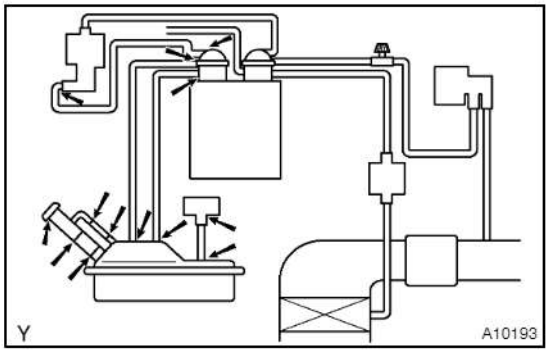
4	Check filler neck for damage.

PREPARATION:
Remove the fuel tank cap.
CHECK:
Visually inspect the filler neck for damage.

NG → Replace filler pipe.

OK

5	**Check whether hose close to fuel tank has been modified, and check whether there are signs of any accident near fuel tank or charcoal canister.**



CHECK:

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 evaporative emission leakage point.**

OK →

6	**Check vacuum hoses between vapor pressure sensor and fuel tank, charcoal canister and pressure switching valve, and pressure switching valve and charcoal canister.**

CHECK:

(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, hole and damage.

NG → **Repair or connect VSV or sensor connector.**

OK →

7	**Check hose and tube between fuel tank and charcoal canister.**

CHECK:

(a) Check for proper connection of the fuel tank and fuel evap pipe (See page EC–2), fuel evap pipe and fuel tube under the floor, fuel tube under the floor and charcoal canister.
(b) Check the hose and tube for cracks, hole and damage.

NG → **Repair or replace hose and tube.**

OK →

8	**Check vacuum hoses ((8), (9) , (10) and (11) in Fig. 1 in circuit description).**

CHECK:

(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, hole damage and blockage.

NG → **Repair or replace vacuum hose.**

OK

9	**Check connector for EVAP VSV, connector for CCV, connector for pressure switching valve and vapor pressure sensor connector for looseness and disconnection.**

NG → **Repair or connect or sensor connector.**

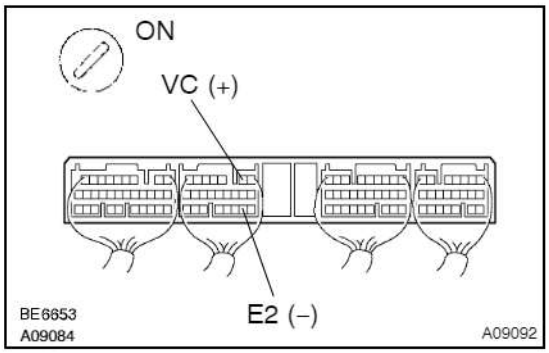
OK

10	**Check charcoal canister for cracks, hole and damage.**

NG → **Check and replace charcoal canister.**

OK

11	Check voltage between terminals VC and E2 of ECM connector.



CHECK:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals VC and E2 of the ECM connector.

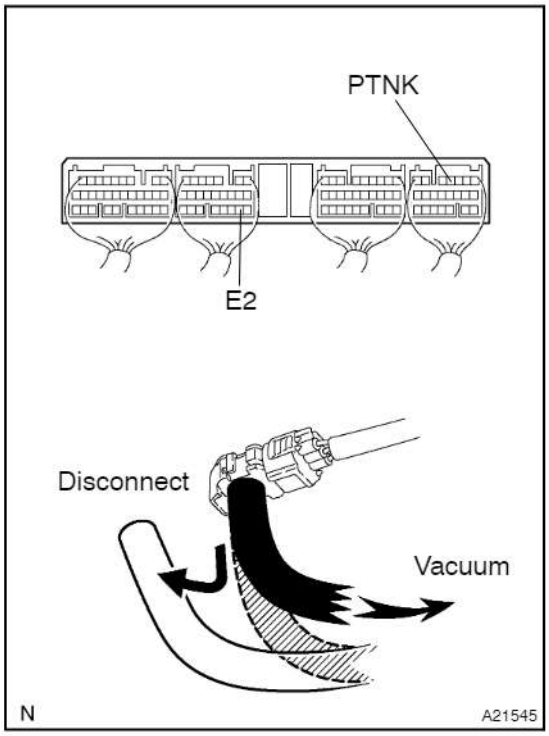
OK:

Voltage: 4.5 to 5.5 V

NG	Replace ECM (See page SF–78).

OK

12	Check voltage between terminals PTNK and E2 of ECM connectors.



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals PTNK and E2 of the ECM connectors at following condition (1) and (2).

(1) Disconnect the vacuum hose from the vapor pressure sensor.

(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:

Vacuum applied to vapor pressure sensor must be less than 66.7 kPa (500 mmHg, 19.7 in.Hg).

OK:

Condition (1) Voltage: 2.9 to 3.7 V

Condition (2) Voltage: 0.5 V or less

OK	Go to step 14.

NG

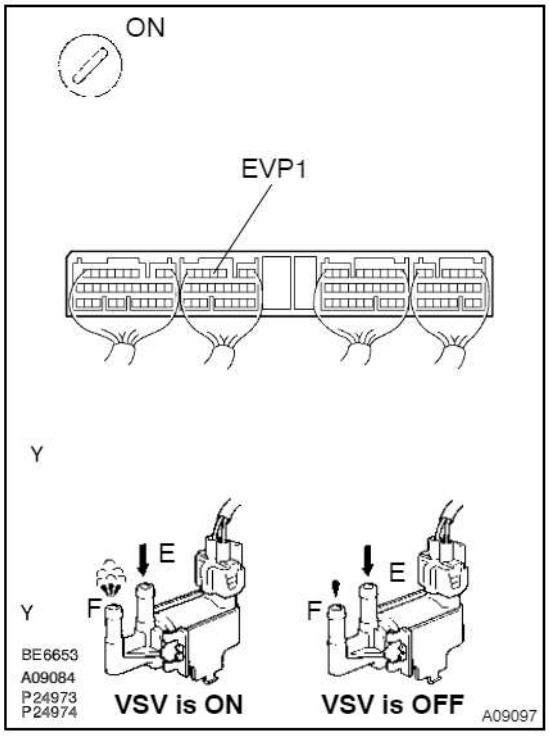
13	**Check for open and short in harness and connector between vapor pressure sensor and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Replace ECM (See page SF–78).

14	**Check EVAP VSV.**



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Check VSV function.

(1) Connect between terminal EVP1 of the ECM connector and body ground (VSV ON).

(2) Disconnect between terminal EVP1 of the ECM connector and body ground (VSV OFF).

OK:

(1) VSV is ON:
Air from port E flows out through port F.
(2) VSV is OFF:
Air does not flow from port E to port F.

OK → **Go to step 17.**

NG

15	**Check operation of EVAP VSV (See page SF–61).**

NG → **Replace EVAP VSV.**

OK

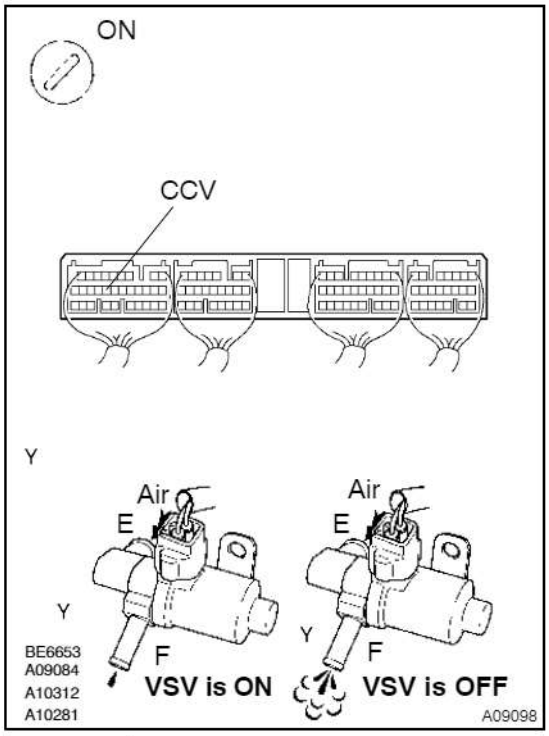
16	**Check for open and short in harness and connector between EFI main relay (Marking: EFI) and EVAP VSV, and EVAP VSV and ECM (See page IN–30)**

NG → **Repair or replace harness or connector.**

OK

Replace ECM (See page SF–78).

17	**Check CCV.**



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Check the VSV function.

(1) Connect between terminal CCV of the ECM connector and body ground (VSV ON).

(2) Disconnect between terminal CCV of the ECM connector and body ground (VSV OFF).

OK:

(1) VSV is ON:
Air does not flow from port E to port F.
(2) VSV is OFF:
Air from port E flows out through port F.

OK → **Go to step 20.**

NG

18	**Check operation of CCV (See page SF–63).**

NG → **Replace CCV.**

OK

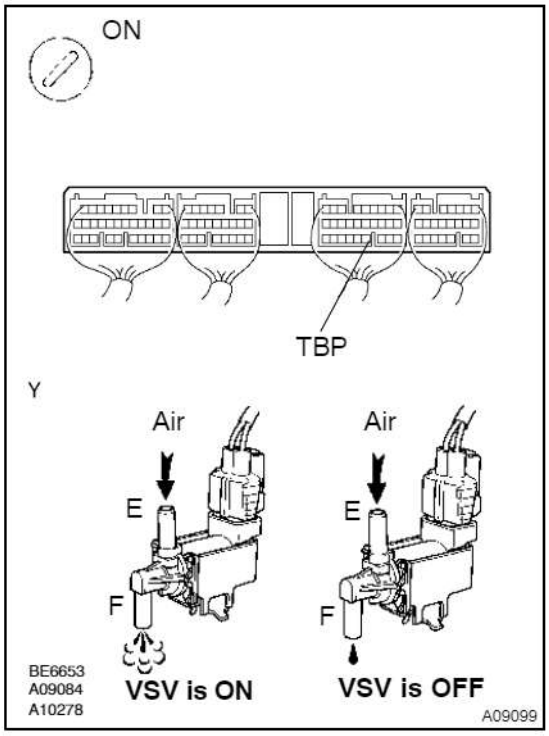
19	**Check for open and short in harness and connector between EFI main relay (Marking: EFI) and CCV, and CCV and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Replace ECM (See page SF–78).

20	**Check pressure switching valve.**



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Check the VSV function.

(1) Connect between terminal TBP of the ECM connector and body ground (VSV ON).

(2) Disconnect between terminal TBP of the ECM connector and body ground (VSV OFF).

OK:

(1) VSV is ON:
Air from port E flows out through port F.
(2) VSV is OFF:
Air does not flow from port E to port F.

OK → **Go to step 23.**

NG

21	**Check operation of pressure switching valve (See page SF–65).**

NG → **Replace pressure switching valve.**

OK

22	Check for open and short in harness and connector between EFI main relay (Marking: EFI) and pressure switching valve, and pressure switching valve and ECM (See page IN–30).

NG → Repair or replace harness or connector.

OK →

Replace ECM (See page SF–78).

23	Check fuel tank inlet valve.

NG → Replace fuel tank inlet valve.

OK →

24	Check fuel tank.

NG → Replace fuel tank.

OK →

It is likely that vehicle user did not properly close fuel tank cap.

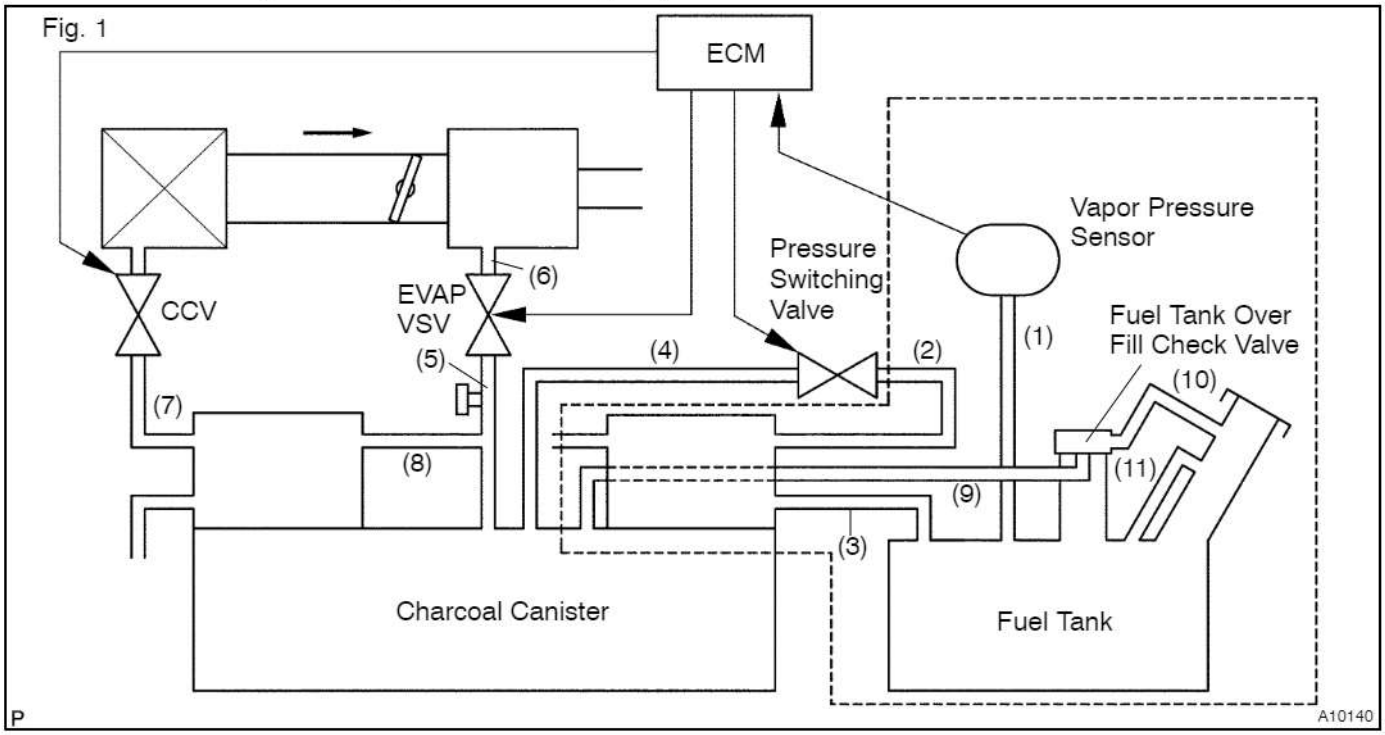
DTC	P0442	Evaporative Emission Control System Leak Detected (Small Leak)

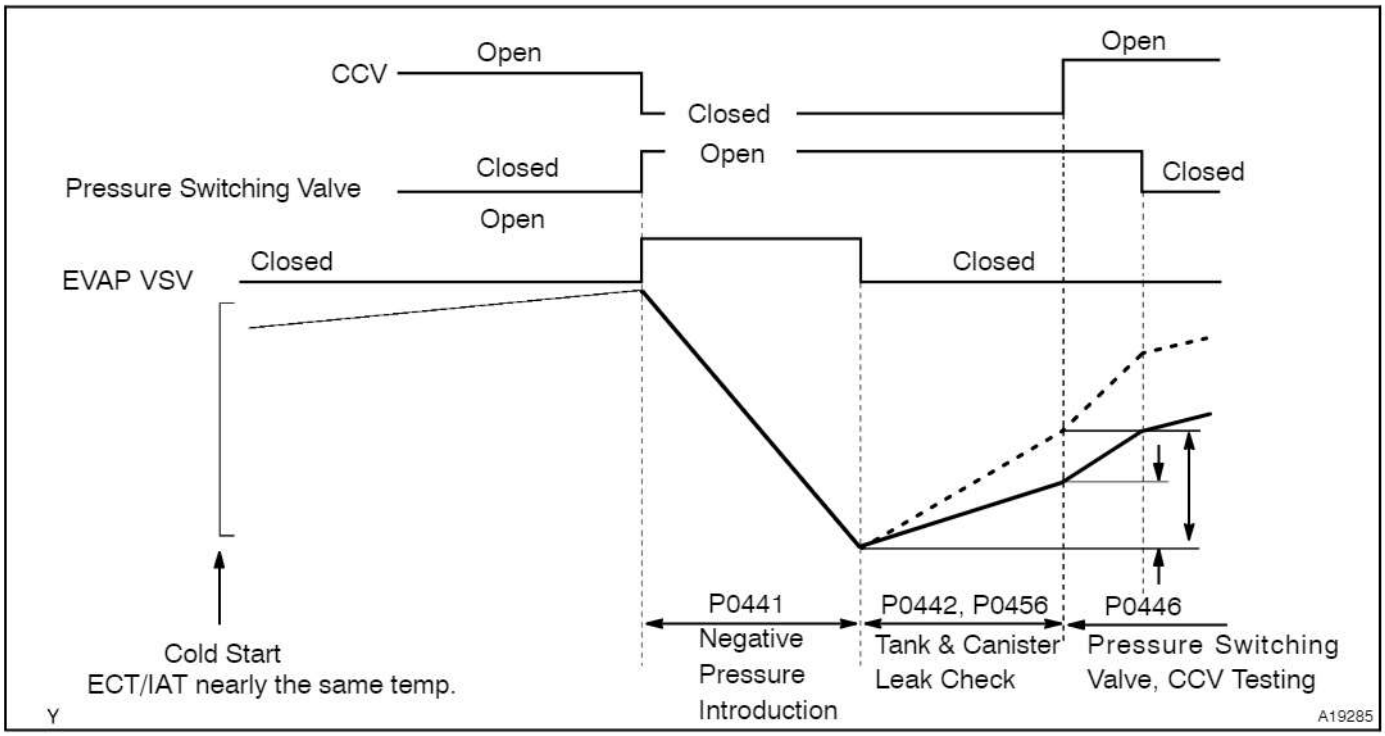
DTC	P0456	Evaporative Emission Control System Leak Detected (Very Small Leak)

CIRCUIT DESCRIPTION

The vapor pressure sensor and the canister closed valve (CCV) are used to detect abnormalities in the evaporative emission control system. The ECM decides whether there is an abnormality in the evaporative emission control system based on the vapor pressure sensor signal.
DTC P0442 or P0456 is recorded by the ECM when evaporative emissions leak from the components within the dotted line in Fig. 1 below, or when the vapor pressure sensor malfunctions.

Fig. 1





DTC No.	DTC Detection Condition	Trouble Area
P0442	After negative pressure introduction is completed, the pressure in the EVAP system sharply increases. (small leak) (2 trip detection logic)	• Vacuum hose is cracked, holed, blocked, damaged or disconnected • Fuel tank cap is incorrectly installed • Fuel tank cap is cracked or damaged • Open or short in vapor pressure sensor circuit • Vapor pressure sensor • Open or short in circuit for EVAP • EVAP VSV • Open or short in circuit for CCV • CCV • Fuel tank is cracked, holed, or damaged • Charcoal canister is cracked, holed, or damaged • Fuel tank over fill check valve is cracked or damaged • ECM
P0456	The pressure in the EVAP system slightly increases while the ECM performs a leak check. (very small leak) (2 trip detection logic)	

HINT:

Typical DTC output of each trouble part is shown in the table below.

Trouble part		Typical DTC output (*1)
Small Leak		P0442 and/or P0456 (*2)
Medium Leak (ex: Vacuum hose loose)		P0442
Large Leak (ex: Fuel tank cap loose)		P0441, P0442 and P0446
EVAP VSV	Open Malfunction	P0441
	Close Malfunction	P0441, P0442 and P0446
CCV	Open Malfunction	P0441, P0442 and P0446
	Close Malfunction	P0446
Pressure Switching Valve	Open Malfunction	P0446
	Close Malfunction	P0441, P0442 and P0446

*1: ECM may output some other DTCs combination.

*2: Refer to DTC P0441 and P0446 on page DI–202

MONITOR DESCRIPTION

The evaporative emission system consists of the vapor pressure sensor, the CCV (Canister Close Valve), the pressure switching valve and the EVAP VSV (Purge VSV), and those are used to detect malfunctions in the system by ECM.

This test will run once per driving cycle when the ECM detects stable vapor pressure in the fuel tank. While the vehicle is being driven on rough or winding roads, the movement of the fuel in the tank will cause unstable fuel tank vapor pressure and the diagnostic test will not executed.

The ECM performs the following steps:

(a) Closes the CCV (shutting the system)

(b) Checks the stability of the fuel tank pressure. The diagnostic is disabled if the pressure change is more than the specified value.

(c) Opens the EVAP VSV. This introduces a negative pressure from the intake manifold to the fuel tank.

(d) Closes the EVAP VSV to seal the fuel tank for storing the negative pressure.

(e) Monitors the increase in fuel tank pressure for:

  (1) Rapid increase in the internal pressure, i. e. a large leak: 0.040" or more

  (2) A pressure rise just above normal, i. e. a small leak: 0.020".

If the ECM detects either of the above conditions, it will interpret this as a leak in the EVAP system. The ECM will illuminate the MIL (2 trip detection logic) and set a DTC.

MONITOR STRATEGY

Related DTCs	P0442	Small leak (0.040 inch or more large hole) is detected
	P0456	Very small leak (0.020 inch hole) is detected
Required sensors/components	Main sensors/components	Vapor pressure sensor
	Related sensors/components	Mass air flow sensor, Engine coolant temperature sensor EVAP VSV (purge VSV), CCV
Frequency of operation	Once per driving cycles	
Duration	60 sec.	
MIL operation	2 drive cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Criteria	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–3	
All:		
Altitude	–	2,400 m (7,872 ft.)
Battery voltage	11 V	–
Throttle position learning	Completed	
Fuel tank pressure sensor malfunction	Not detected	
Intake air temperature at engine start – Engine coolant temperature at engine start	–7°C (–12.6°F)	11.1°C (20°F)
EVAP VSV, CCV, bypass VSV	Not operated by scan tool	
P0456 (0.02 inch leak):		
Engine coolant temperature at engine start	10°C (50°F)	32°C (89.6°F)
Intake air temperature at engine start	10°C (50°F)	32°C (89.6°F)
Intake air temperature	10°C (50°F)	–
Vehicle speed change	Vehicle is driven at steady speed	
Time after engine start	–	50 min.
Either of the following conditions is met:	Condition 1 or 2	
1. Purge duty cycle	15% (When vehicle speed is 8 g/sec. or more)	–
2. Purge concentration for 30 sec.	–5%/% (When vehicle speed is less than 10 km/h (6.2 mph))	–
Fuel slosh	No sloshing (i.e fairy smooth road)	
Fuel tank pressure change before vacuum introduction	Minimum change	
Fuel level	–	90%
0.04 inch leak detection	Not detected	
CCV malfunction, pressure switching valve malfunction	Not detected	
Vehicle speed	–	130 km/h (81 mph)
Purge VSV malfunction	Not detected	
P0442 (0.04 inch leak):		
Engine coolant temperature at engine start	10°C (50°F)	35°C (95°F)
Intake air temperature at engine start	10°C (50°F)	35°C (95°F)
Intake air temperature	10°C (50°F)	–
Vehicle speed change	Vehicle is driven at steady speed	
Either of the following conditions is met:	Condition 1 or 2	
1. Purge duty cycle	15% (When vehicle speed is 8 g/sec. or more)	–
2. Purge concentration for 30 sec.	–5%/% (When vehicle speed is less than 10 km/h (6.2 mph))	–
Fuel slosh	No sloshing (i.e fairy smooth road)	

Time after engine start	–	50 min.
Fuel tank pressure change before vacuum introduction	Minimum change	
Fuel level	–	90%
Purge VSV malfunction	Not detected	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P0456 (0.02 inch leak):	
Both of the following conditios are met:	Condition 1 and 2
1. Fuel tank pressure change for 5 sec. when fuel tank pressure is at –2.0 kPa (–15 mmHg) point	0.067 kPa (0.5 mmHg) or more
2. Fuel tank pressure change for 5 sec. when fuel tank pressure is at –2.7 kPa (–20 mmHg) point	0.067 kPa (0.5 mmHg) or more
P0442 (0.040 inch leak):	
Both of the following conditios are met:	Condition 1 and 2
1. Fuel tank pressure change for 5 sec. when fuel tank pressure is at –2.0 kPa (–15 mmHg) point	0.24 kPa (1.8 mmHg) or more
2. Fuel tank pressure change for 5 sec. when fuel tank pressure is at –2.7 kPa (–20 mmHg) point	0.24 kPa (1.8 mmHg) or more

MONITOR RESULT

Refer to page DI–3 for detailed information.

The test value and test limit information are described as shown in the following table. Check the monitor result and test values after performing the monitor drive pattern (see page DI–3).

- TID (Test Identification Data) is assigned to each emissions–related component.
- TLT (Test Limit Type):
  If TLT is 0, the component is malfunctioning when the test value is higher than the test limit.
  If TLT is 1, the component is malfunctioning when the test value is lower than the test limit.
- CID (Component Identification Data) is assigned to each test value.
- Unit Conversion is used to calculate the test value indicated on generic OBD II scan tools.

TID $02: EVAP system – Vacuum monitor

TLT	CID	Unit Conversion	Description of Test Data	Description of Test Limit
1	$01	Multiplied by 0.0916 (mmHg)	Test value of EVAP VSV: Determined by fuel tank pressure change during vacuum introduction	Malfunction criteria for EVAP VSV
1	$02	Multiplied by 0.0458 subtract 2.93 (mmHg)	Test value of canister closed valve (CCV) and bypass VSV: Determined by fuel tank pressure change at switching over CCV and bypass VSV	Malfunction criteria for CCV and bypass VSV
0	$03	Multiplied by 0.0458 (mmHg)	Test value of 0.04 inch leak: Determined by fuel tank pressure change	Malfunction criteria for 0.04 inch leak
0	$04	Multiplied by 0.0458 (mmHg)	Test value of 0.02 inch leak: Determined by fuel tank pressure change	Malfunction criteria for 0.02 inch leak

INSPECTION PROCEDURE

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	Check fuel tank cap (See page EC–6).

NG → Replace fuel tank cap.

OK

4	Check filler neck for damage.

PREPARATION:

Remove the fuel tank cap.

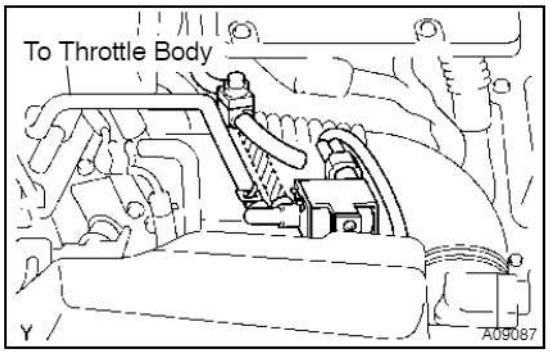
CHECK:

Visually inspect the filler neck for damage.

NG → Replace filler pipe.

OK

5	Check purge flow.



PREPARATION:

(a) Connect the hand–held tester to the DLC3.
(b) Select the "ENHANCED OBD II / ACTIVE TEST" mode on the hand–held tester.
(c) Disconnect the vacuum hose for the EVAP VSV from the charcoal canister.
(d) Start the engine.
(e) Select the item "EVAP VSV (ALON) / ALL" in the ACTIVE TEST and operate EVAP VSV (Press the right or left button).

CHECK:

When the EVAP VSV is operated by the hand–held tester, check whether the disconnected hose applies suction to your finger.

OK:

VSV is ON:
Disconnected hose applies suction to your finger.
VSV is OFF:
Disconnected hose applies no suction to your finger.

OK	Go to step 9.

NG

6	Check vacuum hose between intake manifold and EVAP VSV, and EVAP VSV and charcoal canister.

CHECK:

(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, hole, damage and blockage.

NG	Repair or replace vacuum hose.

OK

7	Check operation of EVAP VSV (See page SF–61).

NG → Replace EVAP VSV.

OK

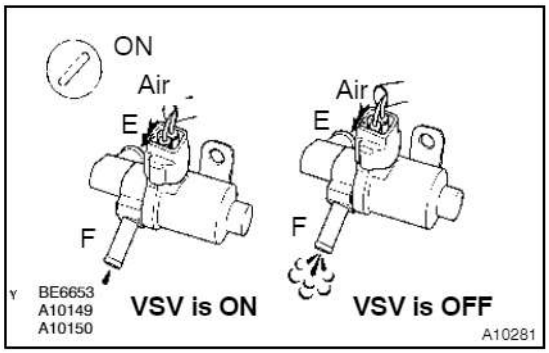
8	Check for open and short in harness and connector between EFI main relay (Marking: EFI) and EVAP VSV, and EVAP VSV and ECM (See page IN–30).

NG → Repair or replace harness or connector.

OK

Replace ECM (See page SF–78).

9	Check CCV.



PREPARATION:

(a) Disconnect the vacuum hose for the CCV from the charcoal canister.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the "ENHANCED OBD II / ACTIVE TEST" mode on the hand–held tester.
(d) Select the item "CAN CTRL VSV / ALL" in the ACTIVE TEST and operate CAN CTRL VSV (Press the right or left button).

CHECK:

Check the VSV operation when it is operated by the hand–held tester.

OK:

VSV is ON:
Air does not flow from port E to port F.
VSV is OFF:
Air from port E flows out through port F.

OK	Go to step 13.

NG

10	Check vacuum hose between CCV and charcoal canister.

CHECK:

(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, hole damage and blockage.

NG	Repair or replace vacuum hose.

OK

11	Check operation of CCV (See page SF–63).

NG	Replace CCV.

OK

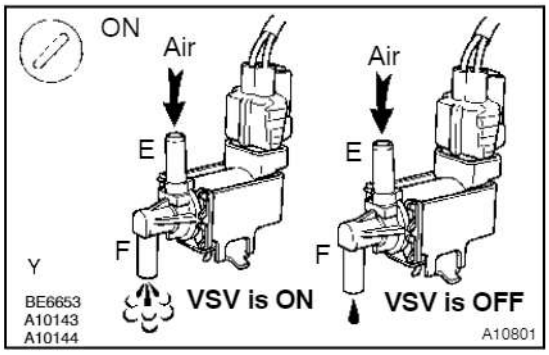
12	**Check for open and short in harness and connector between EFI main relay (Marking: EFI) and CCV, and CCV and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Replace ECM (See page SF–78).

13	**Check pressure switching valve.**



PREPARATION:

(a) Turn the ignition switch ON and push the hand–held tester main switch ON.

(b) Select the "ENHANCED OBD II / ACTIVE TEST" mode on the hand–held tester.

(c) Select the item "TANK BYPASS VSV / ALL" in the ACTIVE TEST and operate TANK BYPASS VSV (Press the right or left button).

(d) Check the VSV operation when it is operated by the hand–held tester.

CHECK:

Check the VSV operation when it is operated by the hand–held tester.

OK:

VSV is ON:
Air from port E flows out through port F.
VSV is OFF:
Air does not flow from port E to port F.

OK → **Go to step 16.**

NG

14	**Check operation of pressure switching valve (See page SF–65).**

NG → **Replace pressure switching valve.**

OK

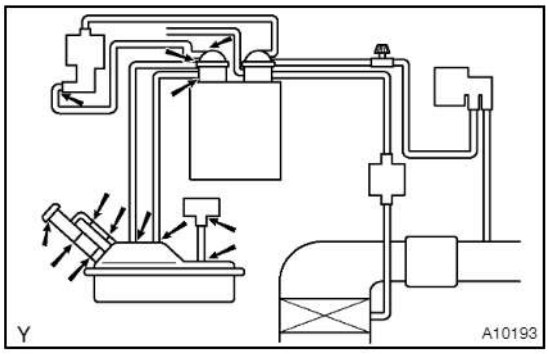
15	**Check for open and short in harness and connector between EFI main relay (Marking: EFI) and pressure switching valve, and pressure switching valve and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Replace ECM (See page SF–78).

16	**Check whether hose close to fuel tank has been modified, and check whether there are signs of any accident near fuel tank.**



CHECK:

Check for cracks, deformation and loose connection of the following parts:

- Fuel tank
- Fuel tank filler pipe
- Hoses and tubes around fuel tank

NG → **Repair or replace evaporative emission leak part.**

OK

17	**Check vacuum hoses between vapor pressure sensor and fuel tank, and charcoal canister and pressure switching valve.**

CHECK:

(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, hole and damage.

NG → **Repair or replace vacuum hose.**

OK

18	**Check hose and tube between fuel tank and charcoal canister.**

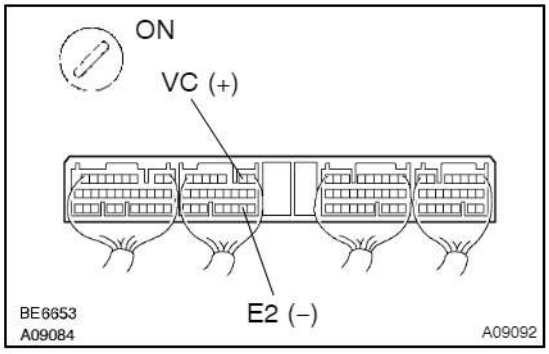
CHECK:

(a) Check for proper connection of the fuel tank and fuel evap pipe (See page EC–2), fuel evap pipe and fuel tube under the floor, fuel tube under the floor and charcoal canister.
(b) Check the hose and tube for cracks, hole and damage.

NG → **Repair or replace hose and tube.**

OK

19	**Check voltage between terminals VC and E2 of ECM connector.**



CHECK:

(a) Remove the ECM cover.
(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals VC and E2 of the ECM connector.

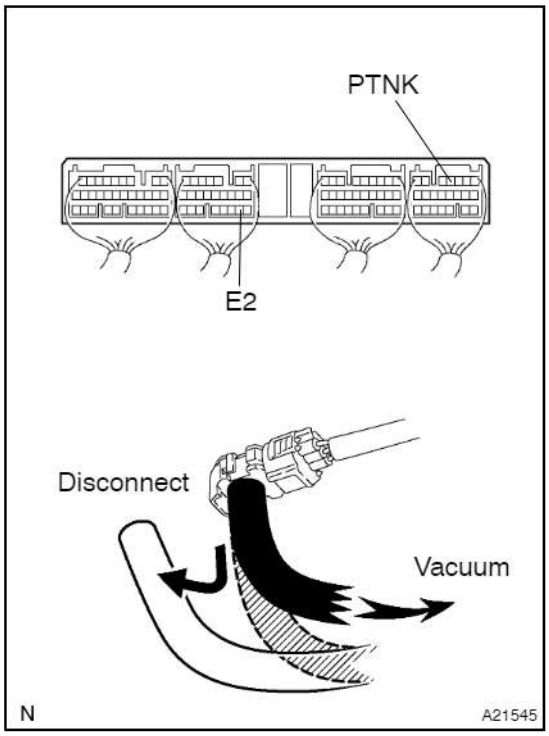
OK:

Voltage: 4.5 to 5.5 V

NG → **Replace ECM (See page SF–78).**

OK

20	Check voltage between terminals PTNK and E2 of ECM connectors.



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals PTNK and E2 of the ECM connectors at following condition (1) and (2).

(1) Disconnect the vacuum hose from the vapor pressure sensor.

(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:

Vacuum applied to vapor pressure sensor must be less than 66.7 kPa (500 mmHg, 19.7 in.Hg).

OK:

Condition (1) Voltage: 2.9 to 3.7 V

Condition (2) Voltage: 0.5 V or less

OK	Go to step 22.

NG

21	Check for open and short in harness and connector between vapor pressure sensor and ECM (See page IN–30).

NG	Repair or replace harness or connector.

OK

Replace ECM (See page SF–78).

22	Check fuel tank inlet valve.

NG	Replace fuel tank inlet valve.

OK

23	Check fuel tank.

NG → Replace fuel tank.

OK

24	Check charcoal canister for cracks, hole and damage.

NG → Repair or replace charcoal canister.

OK

Replace ECM (See page SF–78).

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	Check fuel tank cap (See page EC–6).

NG → Replace fuel tank cap.

OK

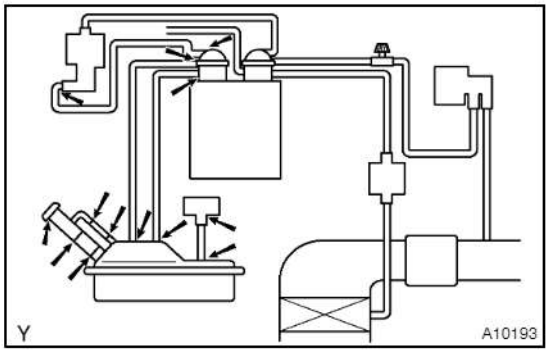
4	Check filler neck for damage.

PREPARATION:
Remove the fuel tank cap.
CHECK:
Visually inspect the filler neck for damage.

NG → Replace filler pipe.

OK

5	Check whether hose close to fuel tank has been modified, and check whether there are signs of any accident near fuel tank or charcoal canister.



CHECK:

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 evaporative emission leak part.**

OK

6	Check vacuum hoses between vapor pressure sensor and fuel tank, charcoal canister and pressure switching valve, and pressure switching valve and charcoal canister.

CHECK:

(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, hole and damage.

NG → **Repair or replace vacuum hose.**

OK

7	Check hose and tube between fuel tank and charcoal canister.

CHECK:

(a) Check for proper connection of the fuel tank and fuel evap pipe (See page EC–2), fuel evap pipe and fuel tube under the floor, fuel tube under the floor and charcoal canister.
(b) Check the hose and tube for cracks, hole and damage.

NG → **Repair or replace hose and tube.**

OK

8	**Check vacuum hoses ((8), (9), (10) and (11) in Fig. 1 in circuit description).**

CHECK:

(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, hole damage, and blockage.

NG → **Repair or replace vacuum hose.**

OK

9	**Check connector for EVAP VSV, connector for CCV, connector for pressure switching valve and vapor pressure sensor connector for looseness and disconnection.**

NG → **Repair or connect or sensor connector.**

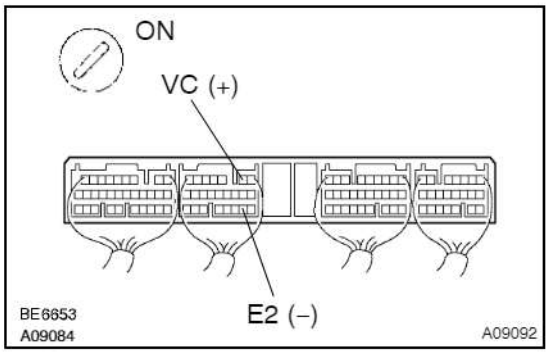
OK

10	**Check charcoal canister for cracks, hole and damage.**

NG → **Check and replace charcoal canister.**

OK

11	Check voltage between terminals VC and E2 of ECM connector.



CHECK:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals VC and E2 of the ECM connector.

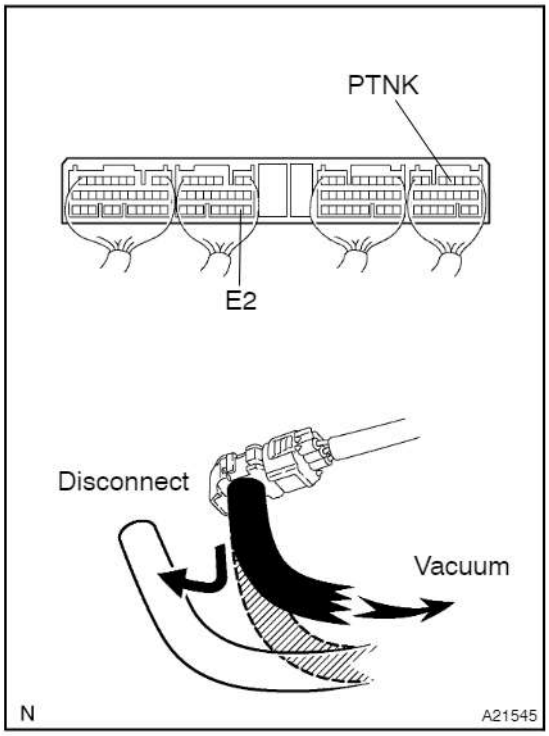
OK:

Voltage: 4.5 to 5.5 V

NG	Replace ECM (See page SF–78).

OK

12	Check voltage between terminals PTNK and E2 of ECM connectors.



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals PTNK and E2 of the ECM connectors at following condition (1) and (2).

(1) Disconnect the vacuum hose from the vapor pressure sensor at following condition (1) and (2).

(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:

Vacuum applied to vapor pressure sensor must be less than 66.7 kPa (500 mmHg, 19.7 in.Hg).

OK:

Condition (1) Voltage: 2.9 to 3.7 V

Condition (2) Voltage: 0.5 V or less

OK	Go to step 14.

NG

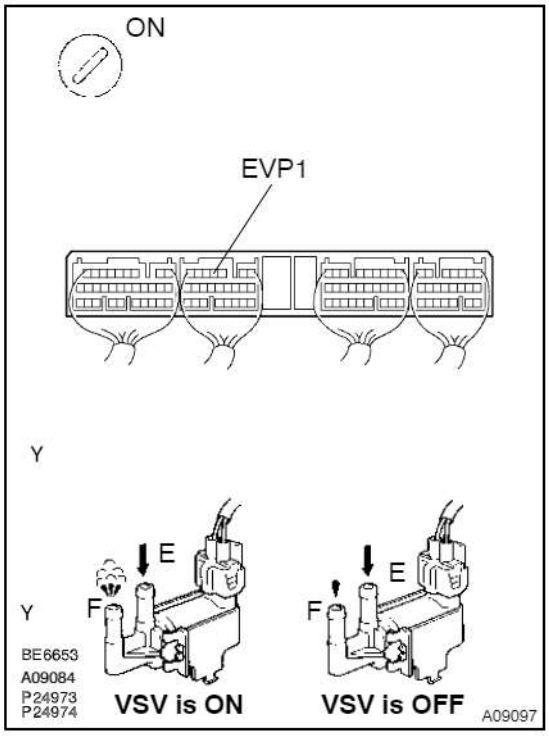
13	Check for open and short in harness and connector between vapor pressure sensor and ECM (See page IN–30).

NG → Repair or replace harness or connector.

OK

Replace ECM (See page SF–78).

14	Check EVAP VSV.



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Check VSV function.

(1) Connect between terminal EVP1 of the ECM connector and body ground (VSV ON).

(2) Disconnect between terminal EVP1 of the ECM connector and body ground (VSV OFF).

OK:

(1) VSV is ON:
Air from port E flows out through port F.
(2) VSV is OFF:
Air does not flow from port E to port F.

OK → Go to step 17.

NG

15	Check operation of EVAP VSV (See page SF–61).

NG → Replace EVAP VSV.

OK

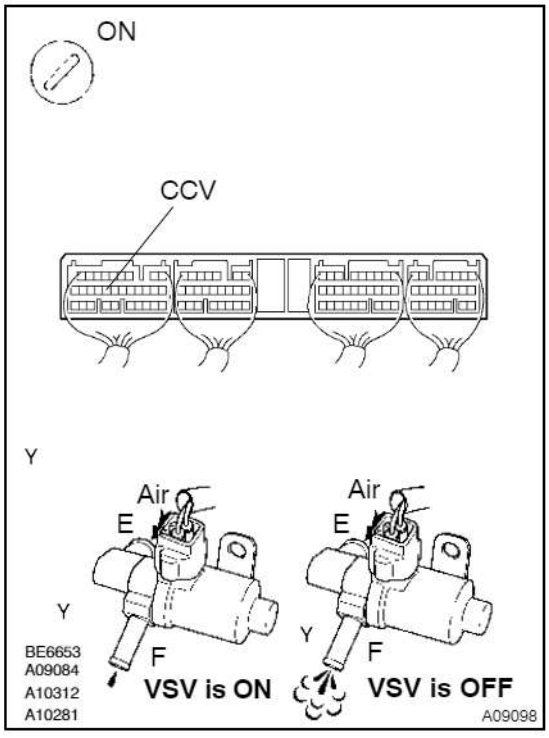
16	**Check for open and short in harness and connector between EFI main relay (Marking: EFI) and EVAP VSV, and EVAP VSV and ECM (See page IN–30)**

NG → **Repair or replace harness or connector.**

OK

Replace ECM (See page SF–78).

17	**Check CCV.**



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Check the VSV function.

(1) Connect between terminal CCV of the ECM connector and body ground (VSV ON).

(2) Disconnect between terminal CCV of the ECM connector and body ground (VSV OFF).

OK:

(1) VSV is ON:
Air does not flow from port E to port F.
(2) VSV is OFF:
Air from port E flows out through port F.

OK → **Go to step 20.**

NG

18	**Check operation of CCV (See page SF–63).**

NG → **Replace CCV.**

OK

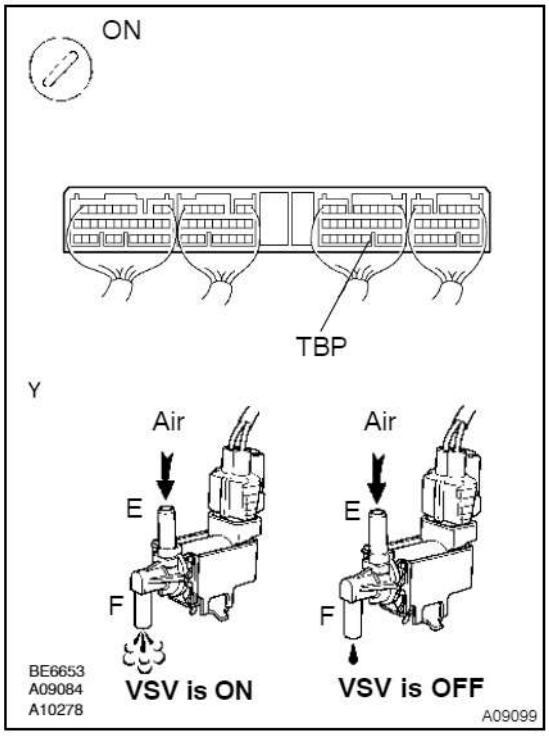
19	**Check for open and short in harness and connector between EFI main relay (Marking: EFI) and CCV, and CCV and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Replace ECM (See page SF–78).

20	**Check pressure switching valve.**



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Check the VSV function.

(1) Connect between terminal TBP of the ECM connector and body ground (VSV ON).

(2) Disconnect between terminal TBP of the ECM connector and body ground (VSV OFF).

OK:

(1) VSV is ON:
Air from port E flows out through port F.
(2) VSV is OFF:
Air does not flow from port E to port F.

OK → **Go to step 23.**

NG

21	**Check operation of pressure switching valve (See page SF–65).**

NG → **Replace pressure switching valve.**

OK

22	Check for open and short in harness and connector between EFI main relay (Marking: EFI) and pressure switching valve, and pressure switching valve and ECM (See page IN–30).

NG → Repair or replace harness or connector.

OK →

Replace ECM (See page SF–78).

23	Check fuel tank inlet valve.

NG → Replace fuel tank inlet valve.

OK →

24	Check fuel tank.

NG → Replace fuel tank.

OK →

It is likely that vehicle user did not properly close fuel tank cap.

DTC	P0451	Evaporative Emission Control System Pressure Sensor/Switch 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 sensor pressure in the fuel tank using the vapor pressure sensor. The ECM supplies the sensor with a regulated 5 V reference voltage and the sensor returns a signal voltage between 0.5 V and 4.5 V according to the pressure level in the fuel tank.
When the pressure in the fuel tank is low, the output voltage of the vapor pressure sensor is low. When it is high, the output voltage is high.
For this DTC P0451, the ECM checks for a "noisy" sensor or a "stuck" sensor.
The ECM checks for a "noisy" sensor by monitoring the fuel tank pressures when the vehicle is stationary and there should be little variation in the tank pressure. If the indicated pressure varies beyond specified limits, the ECM will illuminate the MIL (2–trip detection logic) and a DTC will be set.
The ECM checks for a "stuck" sensor by monitoring the fuel tank pressure for an extended time period. If the indicated pressure does not change over this period, the ECM will conclude that the fuel tank pressure sensor is malfunctioning, The ECM will illuminate the MIL and a DTC will be set.

P0452 and P0453

The ECM sensor pressure in the fuel tank using the vapor pressure sensor. The ECM supplies the sensor with a regulated 5 V reference voltage and the sensor returns a signal voltage between 0.5 V and 4.5 V according to the pressure level in the fuel tank.
If the output voltage of the vapor pressure sensor is out of normal range, the ECM will determine that there is a malfunction in the sensor or sensor circuit.
When pressure indicated by the vapor pressure sensor deviates below –3.999 kPa (–30 mmHg, –1.18 in.Hg) or above 1.999 kPa (15 mmHg, 0.59 in.Hg), 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.

DTC No.	DTC Detecting Condition	Trouble Area
P0451	Vapor pressure sensor output extremely changes under conditions of (a) and (b): (2 trip detection logic) (a) Vehicle speed: 0 km/h (0mph), Engine speed: Idling and pressure switching valve is OFF (b) Vapor pressure sensor value ≧ opening pressure valve of charcoal canister	• Open or short in vapor pressure sensor circuit • Vapor pressure sensor • ECM
P0452	10 seconds or less after engine starting, vapor pressure sensor value remains less than the fixed value: (2 trip detection logic)	
P0453	10 seconds or less after engine starting condition, vapor pressure sensor value remains more than the fixed value: (2 trip detection logic)	

MONITOR STRATEGY

P0451

Related DTCs	P0451	Evaporative emission control system pressure sensor range/performance
Required sensors/components	Main sensors/components	Vapor pressure sensor
	Related sensors/components	Mass air flow meter, Engine coolant temperature sensor
Frequency of operation	Once per driving cycle	
Duration	Fuel tank pressure sensor "Noise" monitor: 10 sec. Fuel tank pressure sensor "Stuck" monitor: 20 min.	
MIL operation	2 driving cycles	
Sequence of 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 sensors/components	Vapor pressure sensor
	Related sensors/components	Mass air flow meter, Engine coolant temperature sensor
Frequency of operation	Once per driving cycle	
Duration	17 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

P0451

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–3	
Fuel tank pressure sensor "Noise" monitor:		
Altitude	–	2,400 m (7,872 ft)
Battery voltage	11 V	–
Throttle position learning	Completed	
Fuel tank temperature sensor malfunction (P0452, P0453)	Not detected	
Intake coolant temperature at engine start – Engine coolant temperature at engine start	–7°C (–12.6°F)	11.1°C (20°F)
EVAP VSV, CCV, bypass VSV	Not operated by scan tool	
Engine coolant temperature at engine start	4.4°C (40°F)	35°C (95°F)
Intake coolant temperature at engine start	4.4°C (40°F)	35°C (95°F)
Time after vehicle stop and idling	5 sec.	15 sec.
Bypass VSV	Closed	
Fuel tank pressure sensor "Stuck" monitor:		
Altitude	–	2,400 m (7,872 ft)
Battery voltage	11 V	–
Throttle position learning	Completed	
Fuel tank temperature sensor malfunction (P0452, P0453)	Not detected	
Intake coolant temperature at engine start – Engine coolant temperature at engine start	–7°C (–12.6°F)	11.1°C (20°F)
EVAP VSV, CCV, bypass VSV	Not operated by scan tool	
Engine coolant temperature at engine start	4.4°C (40°F)	35°C (95°F)
Intake air coolant temperature at engine start	4.4°C (40°F)	35°C (95°F)
Time after engine start	6 sec.	–

P0452 and P0453

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–3	
Difference between intake air temperature and engine coolant temperature at engine start	–	12°C (21.6°F)
Engine coolant temperature at engine start	10°C (50°F)	35°C (95°F)

Intake air temperature at engine start	10°C (50°F)	35°C (95°F)
Engine	Running	

TYPICAL MALFUNCTION THRESHOLDS

P0451

Detection Criteria	Threshold
Fuel tank pressure sensor "Noise" monitor:	
Frequency that fuel tank pressure change is 0.667 kPa (5.0 mmHg) or more	7 times or more for 10 sec.
Fuel tank pressure sensor "Stuck" monitor:	
Fuel tank pressure change	No change for 20 min.

P0452 and P0453

Detection Criteria	Threshold
P0452:	
Fuel tank pressure	Less than –3.999 kPa (–30 mmHg, –1.18 in.Hg) when engine running
P0453:	
Fuel tank pressure	1.999 kPa (15 mmHg, 0.59 in.Hg) or more when engine running

WIRING DIAGRAM

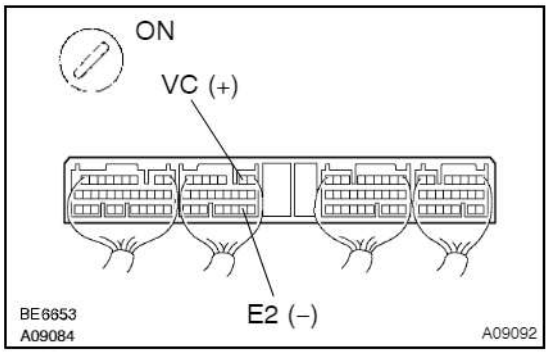
Refer to DTC P0441 on page DI–202.

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.
- If DTC P0441 (Purge Flow), P0446 (CCV) or P0451 (Evaporative Pressure Sensor) is output with DTC P0442 or P0456, troubleshoot DTC P0441, P0446 or P0451 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, as well as other data from the time when a malfunction occurred.
- If the ENGINE RUN TIME in the freeze frame data is less than 200 seconds, carefully check the vapor pressure sensor.

1	Check voltage between terminals VC and E2 of ECM connector.



CHECK:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals VC and E2 of the ECM connector.

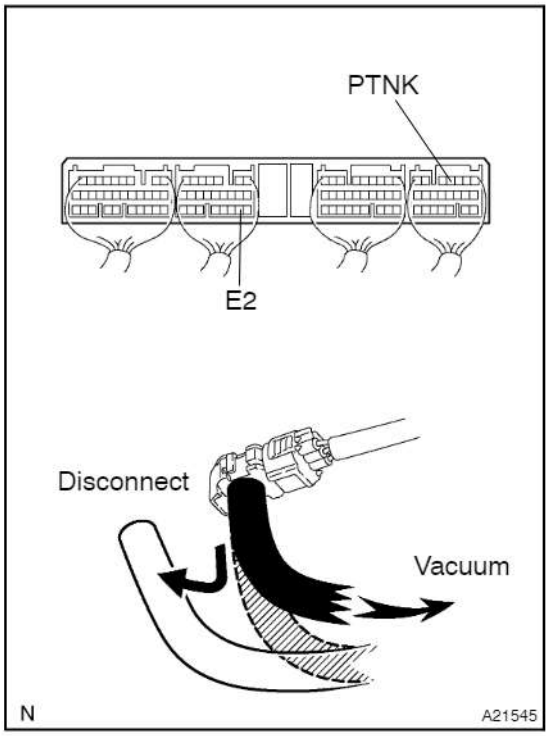
OK:

Voltage: 4.5 to 5.5 V

NG	Replace ECM (See page SF–78).

OK

2	Check voltage between terminals PTNK and E2 of ECM connectors.



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals PTNK and E2 of the ECM connectors.

(1) Disconnect the vacuum hose from the vapor pressure sensor.

(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.

(3) Check the vapor pressure sensor output waveform using a hand–held tester.

NOTICE:

Vacuum applied to vapor pressure sensor must be less than 66.7 kPa (500 mmHg, 19.7 in.Hg).

OK:

(1) Voltage: 2.9 to 3.7 V

(2) Voltage: 0.5 V or less

(3) A consecutive waveform presents.

OK	Check for intermittent problems (See page DI–3).

NG

3	**Check for open and short in harness and connector between vapor pressure sensor and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

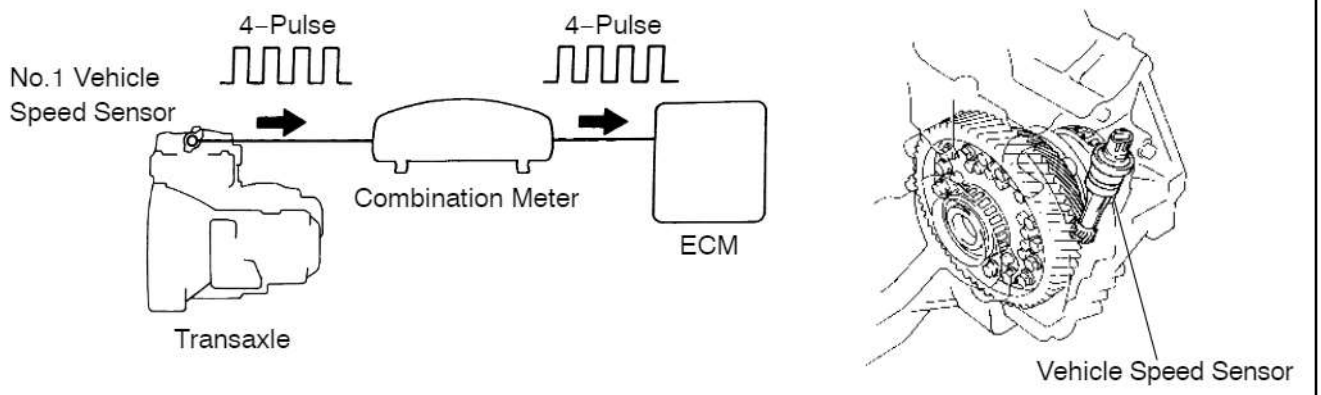
Replace vapor pressure sensor.

DI38H–12

DTC	P0500	Vehicle Speed Sensor Malfunction

CIRCUIT DESCRIPTION

The No.1 vehicle speed sensor outputs a 4–pulse signal for every revolution of the rotor shaft, which is rotated by the transmission output shaft via the driven gear. After this signal is converted into a more precise rectangular waveform by the waveform shaping circuit inside the combination meter, it is then transmitted to the ECM. The ECM determines the vehicle speed based on the frequency of these pluse signals.



DTC No.	DTC Detecting Condition	Trouble Area
P0500	While vehicle is being driven, no vehicle speed sensor signal to ECM (2 trip detection logic)	• Combination meter • Open or short in vehicle speed sensor circuit • Vehicle speed sensor • ECM

MONITOR DESCRIPTION

The ECM assumes that the vehicle is driven when over 30 sec. 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 will be set.

MONITOR STRATEGY

Related DTCs	P0500	Vehicle speed sensor "A" pulse input error
Required sensors/components	Main sensors/components	Vehicle speed sensor
	Related sensors/components	Park/Neutral position switch, Engine coolant temperature sensor, Combination meter
Frequency of operation	Continuous	
Duration	8 sec.	
MIL operation	Manual transaxle: 2 driving cycles Automatic transaxle: Immediate	
Sequence of operation	None	

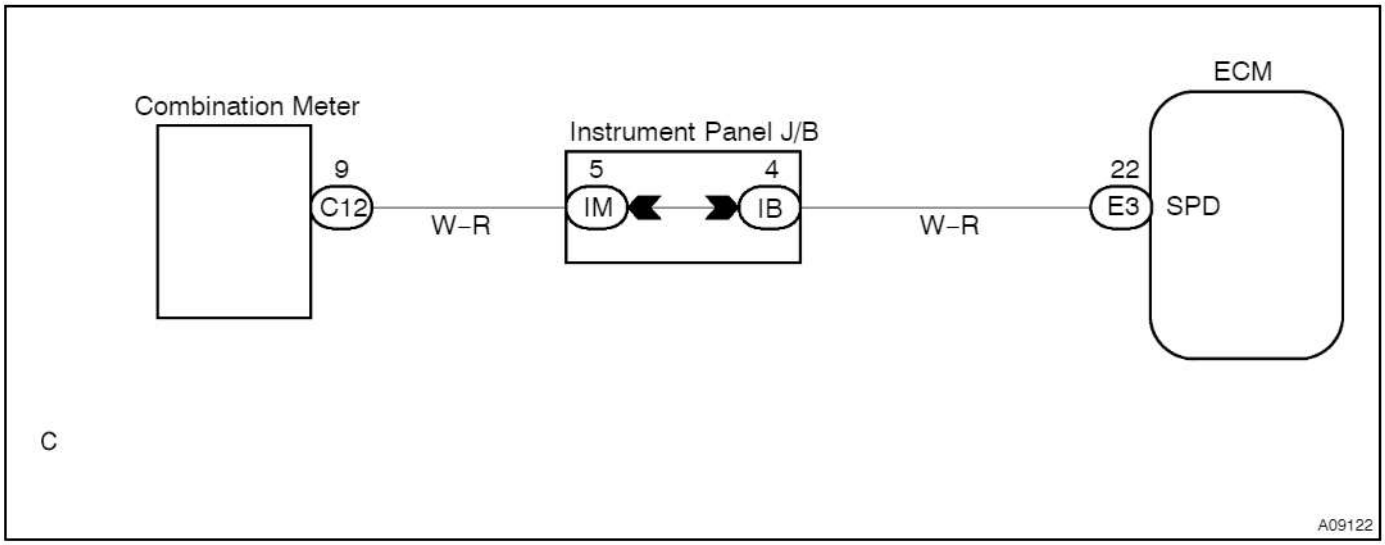
TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–3	
Manual transaxle:		
Engine coolant temperature	70°C (158°F)	–
Engine speed	2,000 rpm	5,000 rpm
Intake air amount per engine revolution	0.44 g/rev	–
Fuel cut at high engine speed	Not executing	
Automatic tranxaxle:		
Either of the following conditions is met:	A or B	
A. Following conditions are met:	(a) and (b)	
(a) Time after park/neutral position switch turns from ON to OFF	10 sec.	–
(b) Engine coolant temperature	20°C (68°F)	–
B. Following conditions are met:	(a) and (b)	
(a) Time after park/neutral position switch turns from ON to OFF	30 sec.	–
(b) Engine coolant temperature	–	20°C (68°F)
Time after ignition SW is ON	2 sec.	–
Engine speed	Vary with throttle opening angle	
Detection time that intake air temperature is –10°C (14°F) or more	2 sec.	–
Detection time that intake air temperature is less than –10°C (14°F)	8 sec.	–

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Vehicle speed sensor signal	No pulse input

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, as well as other data from the time when a malfunction occurred.

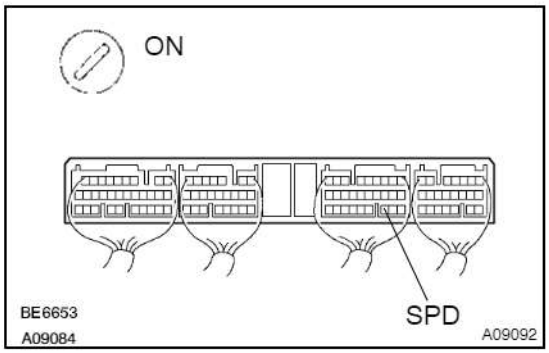
1	**Check operation of speedometer.**

CHECK:
Drive the vehicle and check if the operation of the speedmeter 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 combination meter troubleshooting (See page BE–2).**

OK

2	**Check voltage between terminal SPD of ECM connector and body ground.**

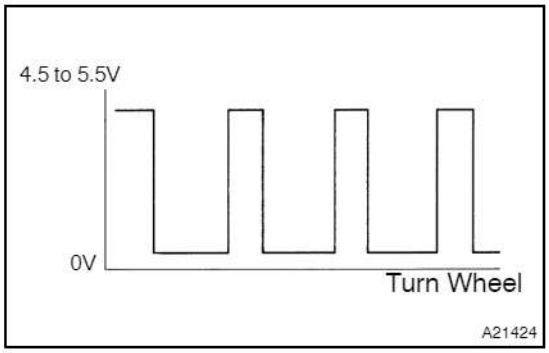


PREPARATION:
(a) Remove the ECM cover.
(b) Shift the shift lever to neutral.
(c) Jack up one of the front wheels.
(d) Turn the ignition switch ON.

CHECK:
Measure voltage between terminal SPD of ECM connector and body ground when the wheel is turned slowly.

OK:
Voltage is 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

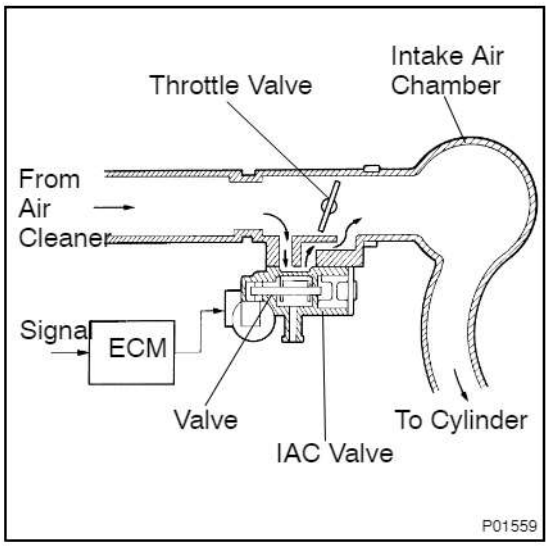
Replace ECM (See page SF–78).

DIC70–02

DTC	P0505	Idle Air Control System

DTC	P0511	Idle Air Control Circuit

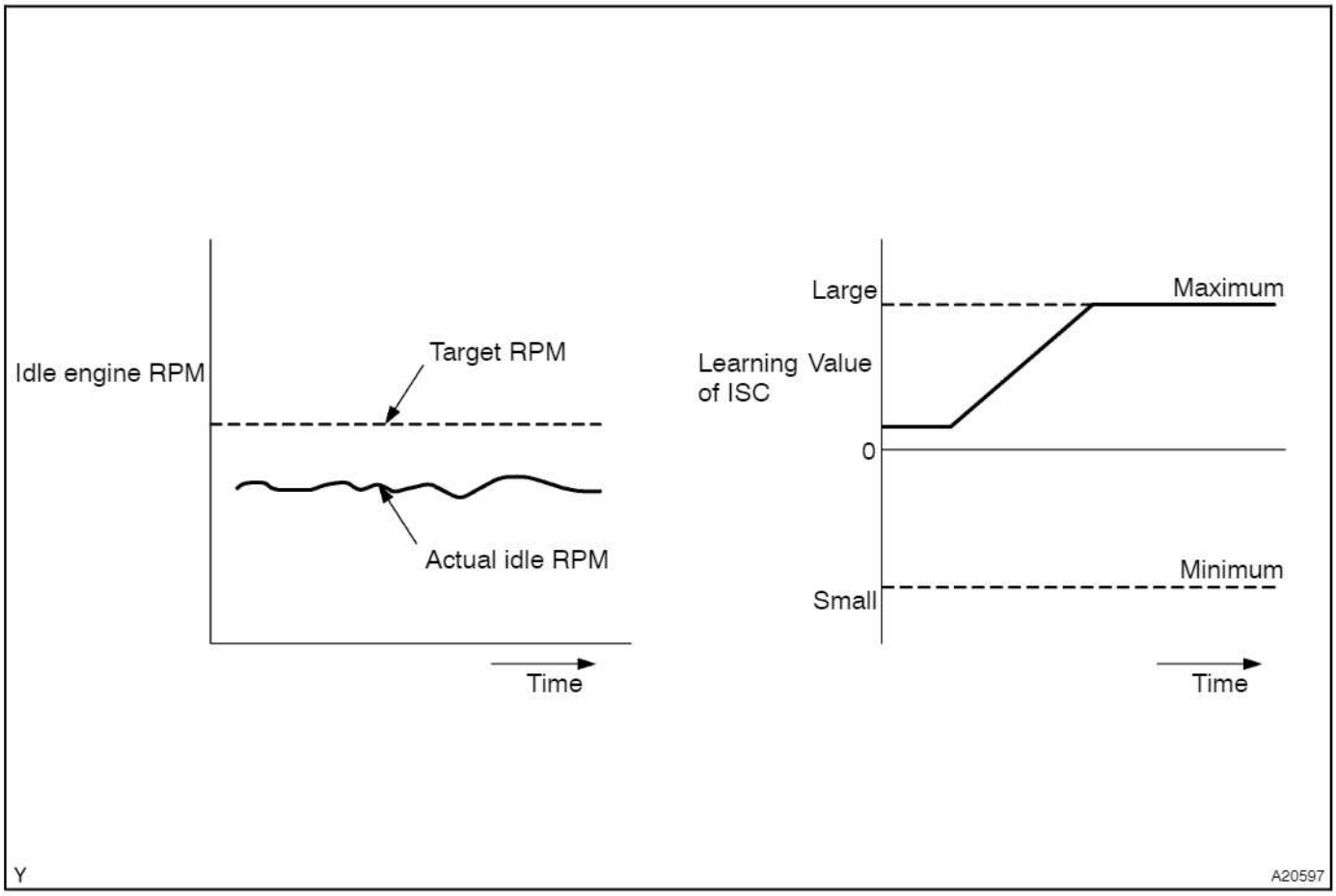
CIRCUIT DESCRIPTION



The rotary solenoid type idle air control (IAC) valve is located under the throttle body and intake air bypassing the throttle valve flows into the IAC valve through the passage.
In this way, the intake air volume bypassing the throttle valve is regulated, controlling the engine speed.
The ECM operates the IAC valve only to perform idle–up and provide feedback for the target idling speed.

DTC No.	DTC Detecting Condition	Trouble Area
P0505	Idle air continues to vary greatly from target speed (2 trip detection logic)	• Open or short in idle air control (IAC) valve circuit • Idle air control (IAC) valve is stuck or closed • A/C switch circuit • Air induction system • PCV valve and hose • ECM
P0511	Open or short in IAC circuit	

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 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, or 2) a learning value of the idle speed control remains at the maximum or minimum five times or more during a driving cycle. The ECM will turn on the MIL and set a DTC.
Example:
If the RPM difference between the target and actual idle engine RPM exceeds 200 rpm (*1) with the vehicle stopped with idling, and this occurs 5 times, or if the learning value angle of the IAC remains at its maximum or minimum angle for 5 seconds, P0505 is detected.
P0511 is detected as an open or short in the IAC circuit if the rate of duty signal input to the IAC valve has stuck at 0 or 100%.
HINT:
*1: RPM threshold varies with engine load.

MONITOR STRATEGY

Related DTCs	P0505	Idle air control valve
	P0511	Idle air control valve
Required sensors/components	Main sensors/components	Crankshaft position sensor
	Related sensors/components	Vehicle speed sensor, Engine coolant temperature sensor
Frequency of operation	P0505 : Once per driving cycle P0511 : Continuous	
Duration	P0505 : 10 min. P0511 : 10 sec.	
MIL operation	P0505 : 2 driving cycles P0511 : Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–3	
P0505		
Battery voltage	11 V	–
Engine coolant temperature	75°C (167°F)	–
Idle	ON (more than 6 sec.)	
Vehicle speed	–	3 km/h (1.9 mph)
Engine speed	400 rpm	–
P0511:		
Output signal duty	10%	90%
Battery voltage	10V	–
Time after first missing of voltage change	10 sec.	–

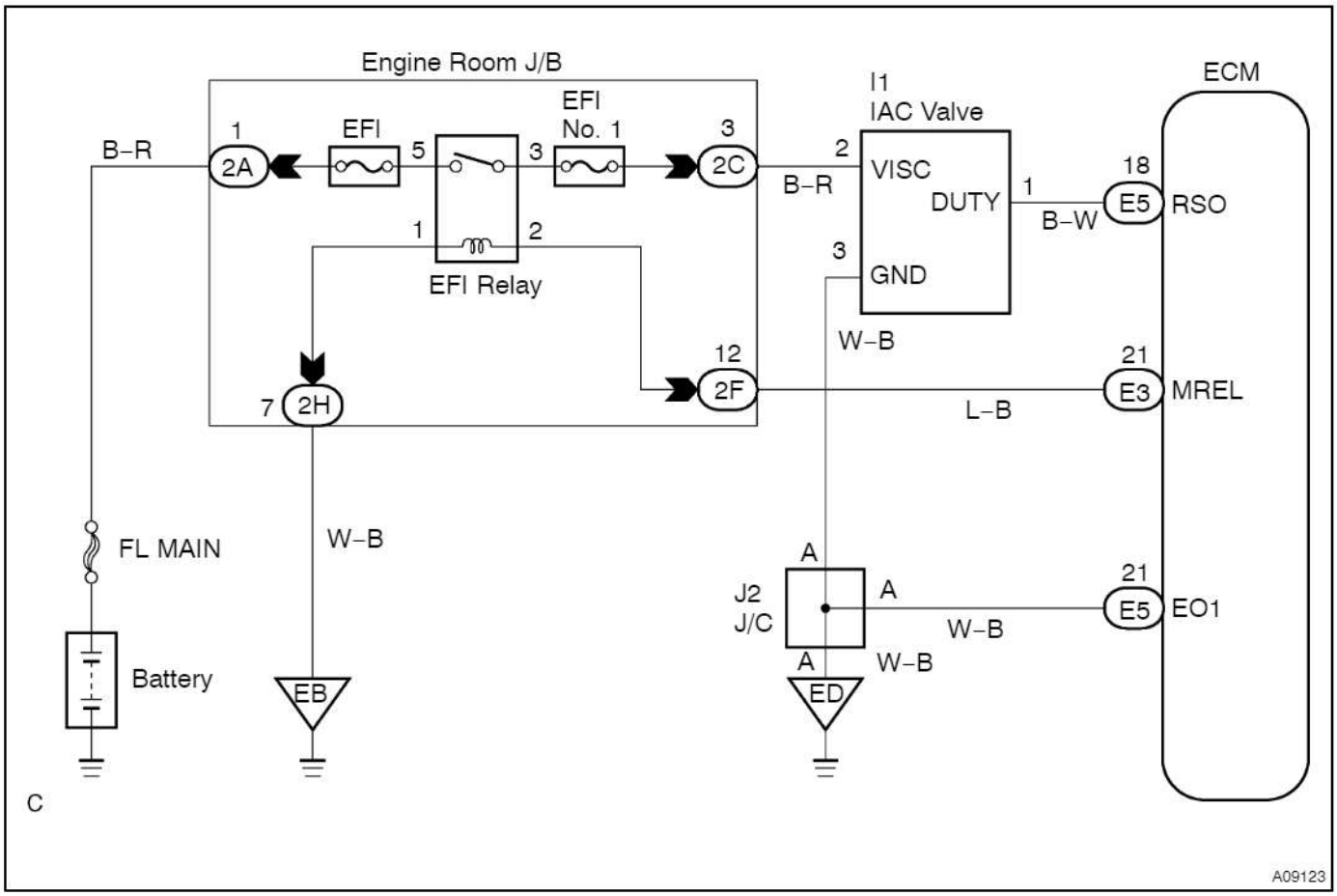
TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P0505 Functional check:	
Following conditions are met : At idle (After running at more than 10 km/h (6.2 mph) per trip)	Conditions 1, 2 and 3
1. Either of the following conditions is met:	Condition (a) or (b)
(a) Deviation of engine speed (When shift position is in N or A/C is ON)	Less than – 100 rpm or more than 200 rpm
(b) Deviation of engine speed (When shift position is in D or A/C is OFF)	Less than – 100 rpm or more than 150 rpm
2. Either of the following conditions is met:	Condition (a) or (b)
(a) IAC flow rate learning value (A/C OFF)	–0.2 L/sec. or less or 0.88 L/sec. or more
(b) IAC flow rate learning value (A/C ON)	0.22 L/sec. or less or 0.98 L/sec. or more
3. Number of detections	5 times/trip
P0511:	
Number of missing output voltage change	2,000 times or more

COMPONENT OPERATING RANGE

Parameter	Standard value
P0511:	
Time while no missing voltage change	0.5 sec. or more

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- When the throttle position is slightly opened (the accelerator pedal is slightly depressed) because a floor carpet is overlapped on the accelerator pedal, or if not fully releasing the accelerator pedal, etc., DTC P505 will possibly be detected.
- 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, as well as other data from the time when a malfunction occurred.

Hand–held tester:

1	**Are there any other codes (besides DTC P0505 and P0511) being output?**

PREPARATION:

(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) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / MAF.

CHECK:

Read the DTCs.

RESULT:

Display (DTC Output)	Proceed to
P0505 and P0511	A
P0505, P0511 and other DTCs	B

HINT:

If any other codes besides P0505 and P0511 are output, perform the troubleshooting for those DTCs first.

B → **Go to relevant DTC chart (See page DI–42).**

A

2	**Check connection of PCV piping.**

NG → **Repair or replace PCV piping.**

OK

3	**Check air induction system.**

CHECK:

Check the air induction system vacuum leaks.

NG → **Repair or replace air induction system.**

OK

4	**Check engine idle speed.**

PREPARATION:

(a) Warm up the engine to the normal operating temperature.
(b) Switch off all the accessories.
(c) Switch off the A/C.
(d) Shift the lever into the neutral position.
(e) Connect the hand–held tester to the DLC3.
(f) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / ISC DUTY RATIO.

CHECK:

Check that the engine RPM varies when changing the ISC duty ratio.

OK:

Engine PRM fluctuates up and down in response to the ISC duty ratio variation.

OK → **Check for intermittent problems (See page DI–3).**

NG

5	**Check A/C signal circuit.**

NG → **Repair or replace A/C signal circuit.**

OK

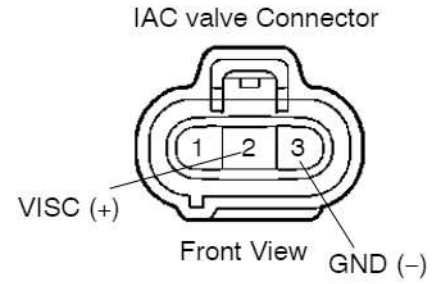
6	**Check blockage of IAC valve and passage to bypass throttle valve.**

NG → **Replace IAC valve.**

OK

7	**Check voltage between terminals VISC and GND of IAC valve connector.**

Wire Harness Side:



PREPARATION:

(a) Disconnect the IAC valve connector.
(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between the terminals VISC and IAC of IAC valve connector.

OK:

Voltage: 9 to 14 V

NG → **Repair or replace harness or connector.**

OK

8	**Check for open and short in harness and connector between IAC valve and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

9	**Check IAC valve (See page SF–48).**

NG → **Replace IAC valve.**

Ok

Replace ECM (See page SF–78).

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

1	Check connection of PCV piping.

NG → Repair or replace PCV piping.

OK

2	Check air induction system.

CHECK:

Check the air induction system vacuum leaks.

NG → Repair or replace air induction system.

OK

3	Check A/C signal circuit.

NG → Repair or replace A/C signal circuit.

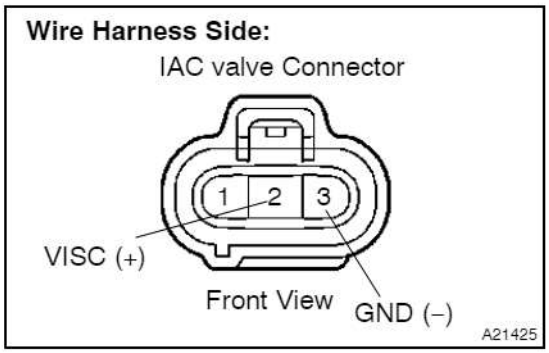
OK

4	Check blockage of IAC valve and passage to bypass throttle valve.

NG → Replace IAC valve.

OK

5	**Check voltage between terminals VISC and GND of IAC valve connector.**



PREPARATION:

(a) Disconnect the IAC valve connector.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between the terminals VISC and IAC of IAC valve connector.

OK:

Voltage: 9 to 14 V

NG → **Repair or replace harness or connector.**

OK

6	**Check for open and short in harness and connector between IAC valve and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

7	**Check IAC valve (See page SF–48).**

NG → **Replace IAC valve.**

OK

Replace ECM (See page SF–78).

DI38N–15

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 starts, the ECM will turn on the MIL and a DTC will be set.

DTC No.	DTC Detecting Condition	Trouble Area
P0560	Open in back up power source circuit	• Open in back up power source circuit • EFI fuse • ECM

HINT:
If DTC P0560 is present, the ECM will not store other DTC.

MONITOR STRATEGY

Related DTCs	P0560	System voltage malfunction
Required sensors/components	ECM	
Frequency of operation	Continuous	
Duration	3 sec.	
MIL operation	Immediate (*1)	
Sequence of operation	None	

*1: The DTC is set immediately. The MIL will be illuminated after the engine starts in the next time.

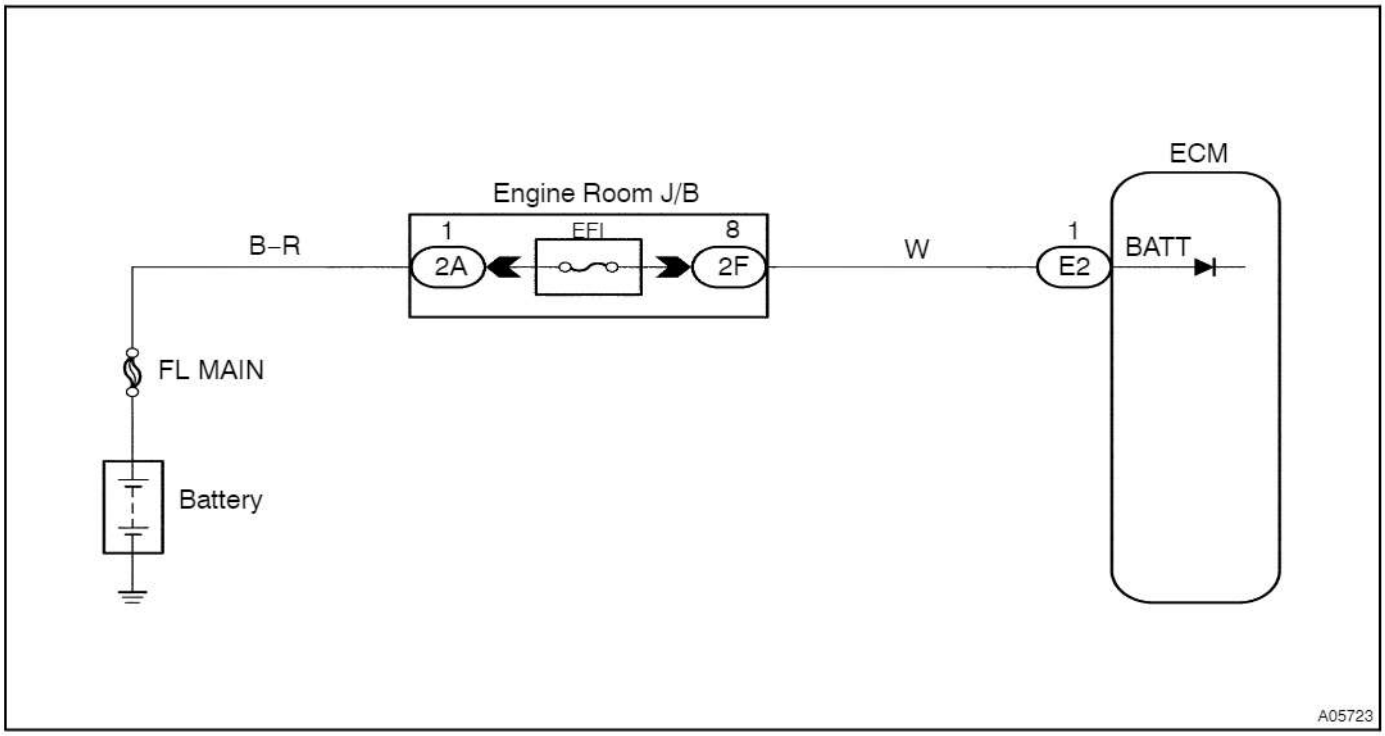
TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–3	
Stand–by RAM	Initialized	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Battery voltage	Less than 3.5 V

WIRING DIAGRAM

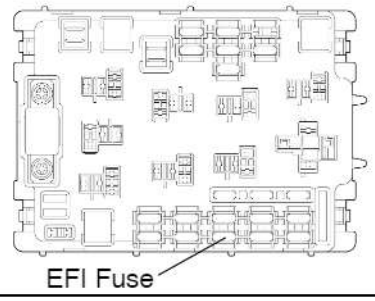


INSPECTION PROCEDURE

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, as well as other data from the time when a malfunction occurred.

1	**Check EFI fuse.**

Engine Room J/B



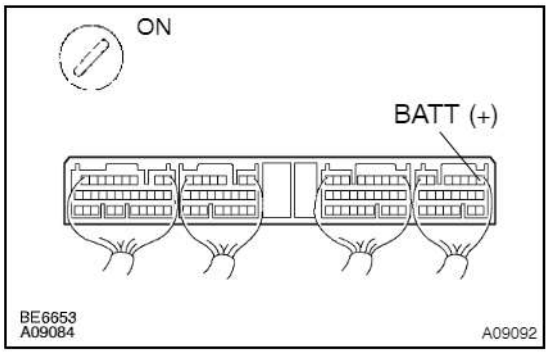
PREPARATION:
Remove the EFI fuse from the engine room J/B.
CHECK:
Check continuity of EFI fuse.
OK:

Continuity

NG → **Check for short in all the harness and components connected to EFI fuse.**

OK

2	Check voltage between terminal BATT of ECM connector and body ground.



PREPARATION:
Remove the ECM cover.
CHECK:
Measure voltage between terminal BATT of the ECM connector and body ground.
OK:
Voltage 9 to 14 V

OK → **Check for intermittent problems (See page DI–3).**

NG

3	Check for open and short in harness and connector between ECM and EFI fuse, EFI fuse and battery (See page IN–30).

NG → **Repair or replace harness or connector.**

OK

Check and replace engine room J/B.

DIC71–02

DTC	P0617	Starter Relay Circuit High

MONITOR DESCRIPTION

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 will be set.

DTC No.	DTC Detection Condition	Trouble Area
P0617	When all conditions (a), (b) and (c) are satisfied when battery (+B) voltage is 10.5 V or more for 20 seconds: (a) Vehicle speed greater than 12 mph (20 km/h) (b) Engine revolution greater than 1,000 rpm (c) STA signal ON	• Short in Park/Neutral position switch circuit (A/T) • Park/Neutral position switch (A/T) • Clutch start switch (M/T) • ECM

MONITOR STRATEGY

Related DTCs	P0617	Starter signal error
Required sensors/components	Main sensors/components	Starter signal
	Related sensors/components	Vehicle speed sensor, Engine speed sensor
Frequency of operation	Continuous	
Duration	20 sec.	
MIL operation	Immediate	
Sequence of operation	None	

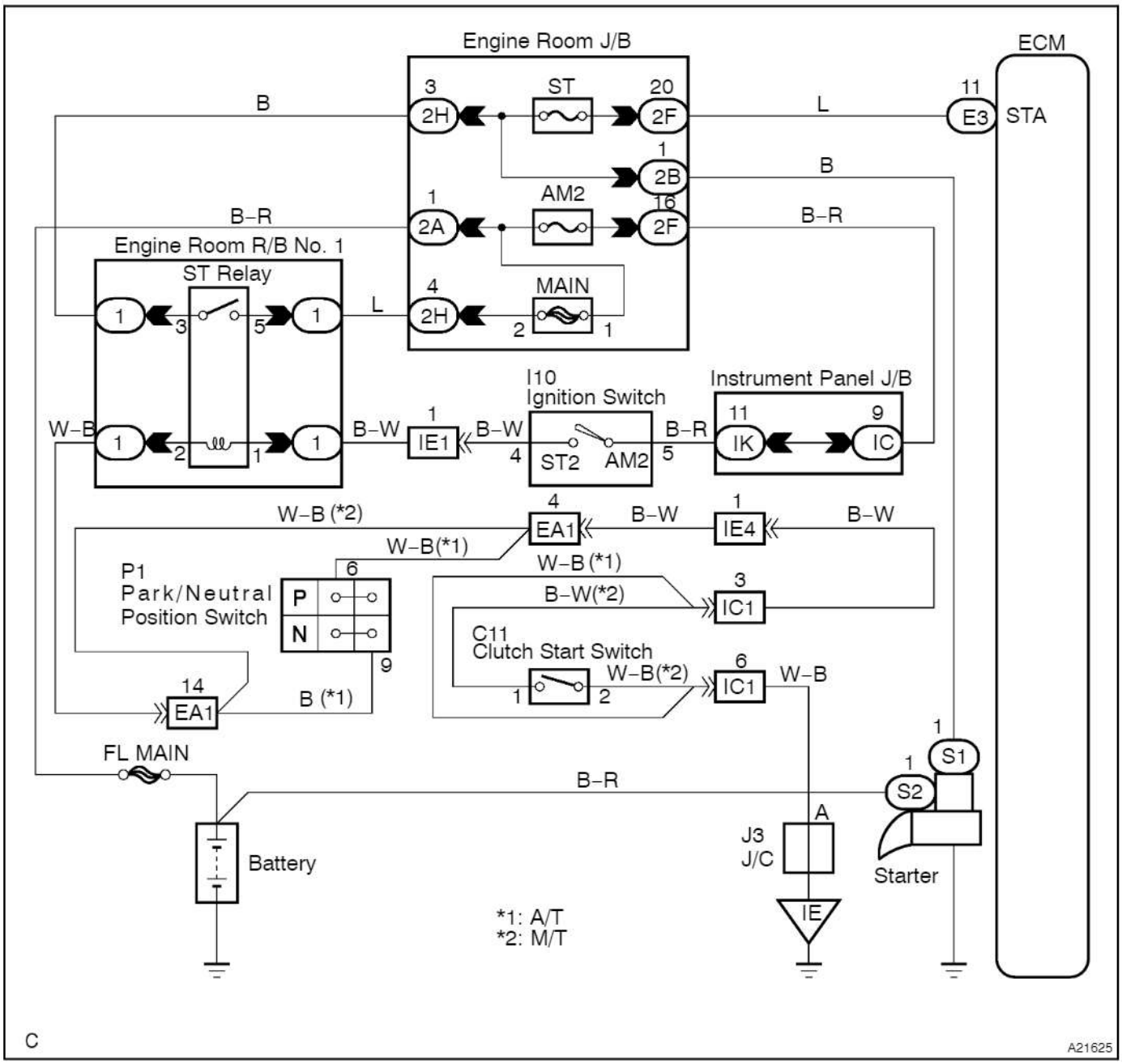
TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–3	
Battery voltage	10.5 V	–
Vehicle speed	20 km/h (12.4 mph)	–
Engine speed	1,000 rpm	–

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Starter signal	ON (at "more than 20 km/h (12.4 mph) and more than 1,000 rpm")

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, as well as other data from the time when a malfunction occurred.

Hand–held tester:

1	**Check STA signal.**

PREPARATION:

(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) Enter the following menus: DIAGNOSIS / ENHANCED / OBD II / DATA LIST / ALL / STARTER SIG.

CHECK:

Read the STA signal on the hand–held tester while the starter is operating.

OK:

Ignition Switch Position	ON	START
STA Signal	OFF	ON

OK → **Go to step 5**

NG

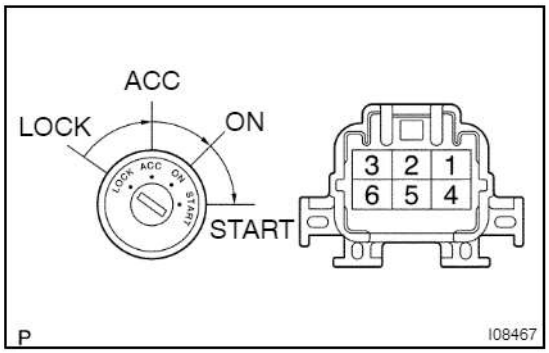
2	**Check park/neutral position switch or clutch start switch.**

(a) Inspect the park/neutral position switch (A/T) (See page DI–789).
(b) Inspect the clutch start switch (M/T) (See page CL–2).

NG → **Replace park/neutral position switch or clutch start switch. Go to next step 5 after the replacement.**

OK

3	Check ignition switch.



Check continuity between the connector terminals shown in the chart below.

Switch	Terminal No.	Resistance
LOCK	All Terminal to Terminal	10 kΩ or higher
ACC	2 – 3	Below 1 Ω
ON	2 – 3 – 4 6 – 7	Below 1 Ω
START	1 – 2 – 4 6 – 7 – 8	Below 1 Ω

NG → **Replace ignition switch.**
Go to next step 5 after the replacement.

OK

4	Check STA signal.

PREPARATION:

(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) Enter the following menus: DIAGNOSIS / ENHANCED / OBD II / DATA LIST / ALL / STARTER SIG.

CHECK:

Read the STA signal on the hand–held tester while the starter is operating.

OK:

Ignition Switch Position	ON	START
STA Signal	OFF	ON

NG → **Repair or replace harness or connector.**

OK

5	Check DTC reoccur

PREPARATION:

(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) Clear DTC (See page DI–3)
Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CLEAR CODE and press YES.
(d) Drive the vehicle more than 40 km/h (25 mph) for 20 seconds or more.

CHECK:

Check the DTC reoccur.

RESULT:

Display (DTC Output)	Proceed to
P0617	A
No DTC output	B

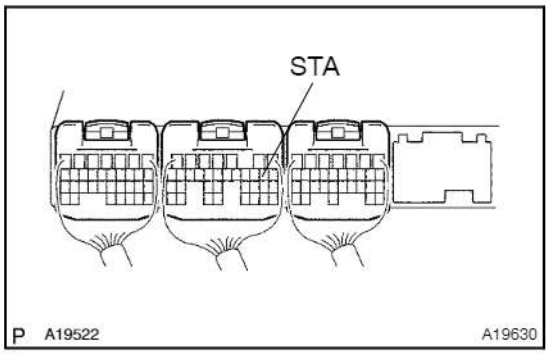
A → **Replace ECM (See page SF–78)**

B →

Check for intermittent problems (See page DI–3)

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

1	**Check voltage between terminal STA of ECM connector and body ground.**



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminal STA of the ECM connector and body ground during the engine cranking.

OK:

Voltage:

0 V (Ignition switch ON)

6 V or more (Engine cranking)

OK	**Go to step 5.**

NG

2	**Check park/neutral position switch or clutch start switch.**

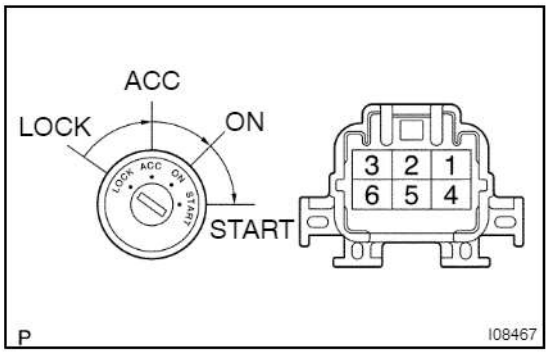
(a) Inspect the park/neutral position switch (A/T) (See page DI–789).

(b) Inspect the clutch start switch (M/T) (See page CL–2).

NG	**Replace park/neutral position switch or clutch start switch. Go to next step 5 after the replacement.**

OK

3	Check ignition switch.



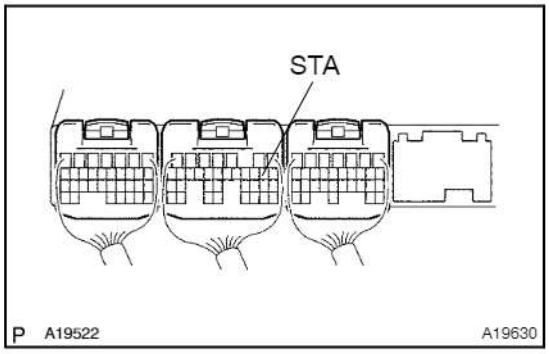
Check continuity between the connector terminals shown in the chart below.

Switch	Terminal No.	Resistance
LOCK	All Terminal to Terminal	1 MΩ or more
ACC	2 – 3	1 Ω or less
ON	2 – 3 – 4 6 – 7	1 Ω or less
START	1 – 2 – 4 6 – 7 – 8	1 Ω or less

NG → **Replace ignition switch.**
Go to next step 5 after the replacement.

OK

4	Check voltage between terminal STA of ECM connector and body ground.



PREPARATION:
(a) Remove the ECM cover.
(b) Turn the ignition switch ON.

CHECK:
Measure the voltage between terminal STA of the ECM connector and body ground during the engine cranking.

OK:
Voltage:
0 V (Ignition switch ON)
6 V or more (Engine cranking)

NG → **Repair or replace harness or connector.**

OK

5	Check DTC reoccur

PREPARATION:

(a) Connect the OBD II scan tool to the DLC3.
(b) Turn the ignition switch ON and push the OBD II scan tool main switch ON.
(c) Clear DTC (See page DI–3).
(d) Drive the vehicle more than 40 km/h (25 mph) for 20 seconds or more.

CHECK:

Check DTC reoccur.

RESULT:

Display (DTC Output)	Proceed to
P0617	A
No DTC output	B

A → **Replace ECM (See page SF–78)**

B →

Check for intermittent problems (See page DI–3)

DID56–01

DTC	P0630	VIN not Programmed or Mismatch ECM/PCM

CIRCUIT DESCRIPTION

DTC P0630 is set when the Vehicle Identification Number (VIN) is not stored in the Engine Control Module (ECM) or the input VIN is not accurate. Input the VIN with the hand–held tester.

DTC No.	DTC Detecting Condition	Trouble Area
P0630	• VIN is not stored in ECM. • Input VIN to ECM is not accurate.	ECM

MONITOR STRATEGY

Related DTCs	P0630	VIN not programed
Required sensors/components	Main sensors/components	ECM
	Related sensors/components	–
Frequency of operation	Continuous	
Duration	0.5 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–3	
Battery voltage	8 V	–
Ignition switch	ON	
Starter	OFF	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
VIN code	Not programmed

COMPONENT OPERATING RANGE

Prameter	Standard Value
VIN code	Programmed

INSPECTION PROCEDURE

1	**Read current DTC.**

NOTICE:
If P0630 is present, the VIN must be input to the ECM using the hand–held tester. However, all DTCs are cleared automatically by the tester when the VIN is input. If DTCs other than P0630 are present, check them first.

NEXT

2	**Input VIN with hand–held tester (See page DI–29).**

NEXT

END

D1MG–12

DTC	P1645	Body ECU Malfunction

CIRCUIT DESCRIPTION

ECM receives the operating condition (ON/OFF) of A/C from A/C ECU and it also receives the electrical load information from the body ECU.
ECM uses these information to control the engine (idle up, etc.).

DTC No.	DTC Detecting Condition	Trouble Area
P1645	Condition (a) or (b) continues for 3.0 sec. (a) No communication from body ECU (b) No communication from A/C ECU	• Body ECU • A/C ECU • Communication bus

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.
Perform troubleshooting the Multiplex Communication System (See page BE–2).

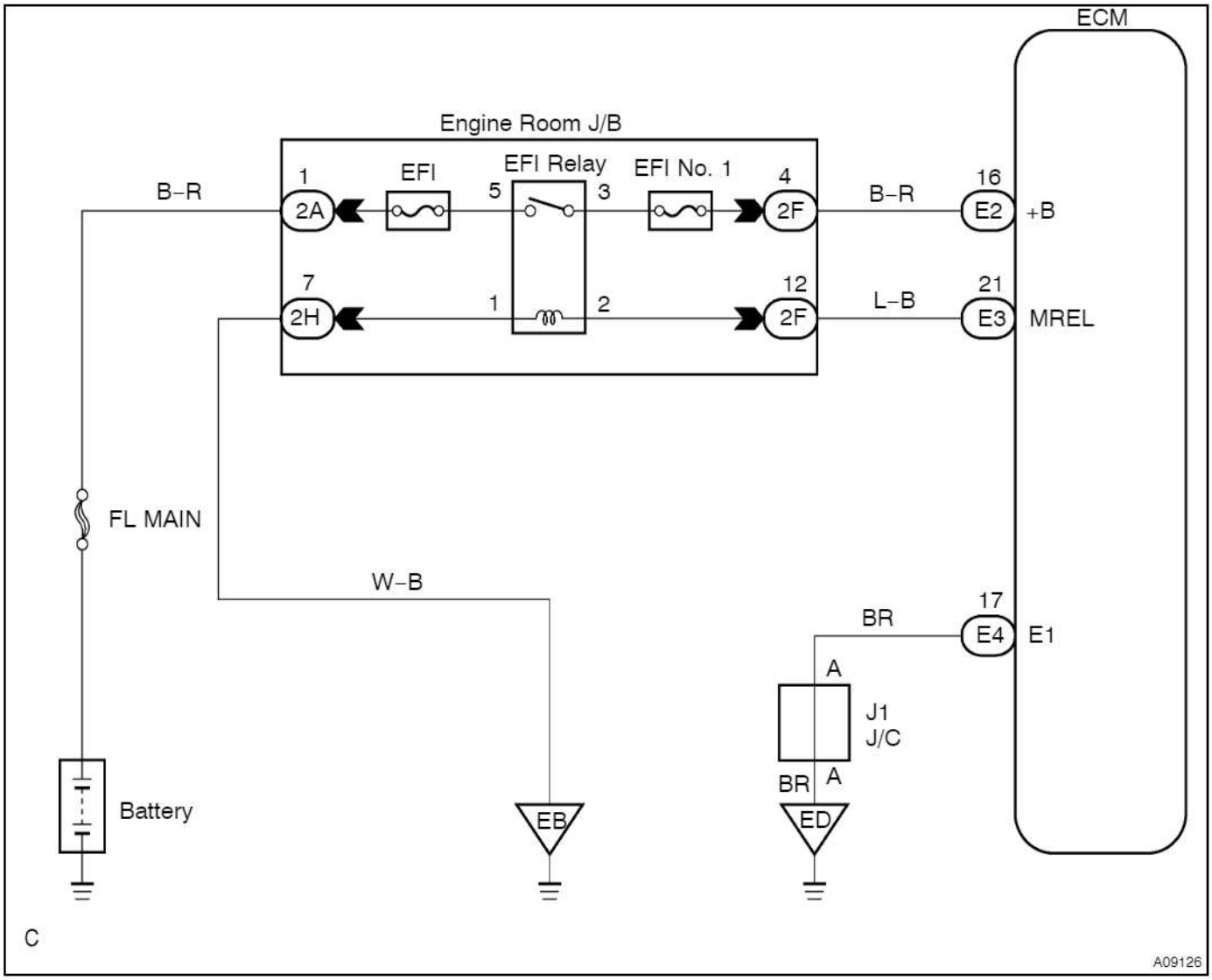
DIC72–02

ECM Power Source Circuit

CIRCUIT DESCRIPTION

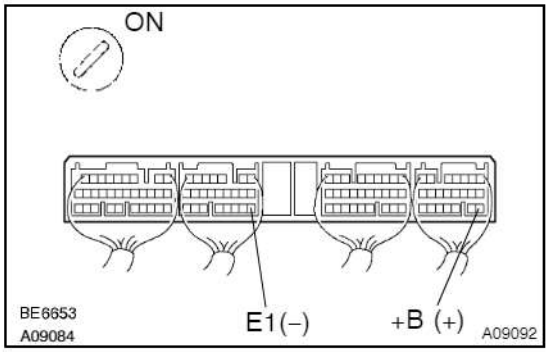
When the ignition switch is turned ON, battery voltage is applied to terminal IGSW of the ECM. The ECM "MREL" output signal causes current to flow to the coil, closing the contacts of the EFI relay and supplying power to terminal +B of the ECM.
If the ignition switch is turned OFF, the ECM holds the EFI relay ON for a maximum of 2 seconds to allow for the initial setting of the throttle valve.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check voltage between terminals +B and E1 of ECM connector.



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure voltage between terminals +B and E1 of the ECM connector.

OK:

Voltage: 9 to 14 V

OK	Proceed to next circuit inspection shown on problem symptoms table (See page DI–39).

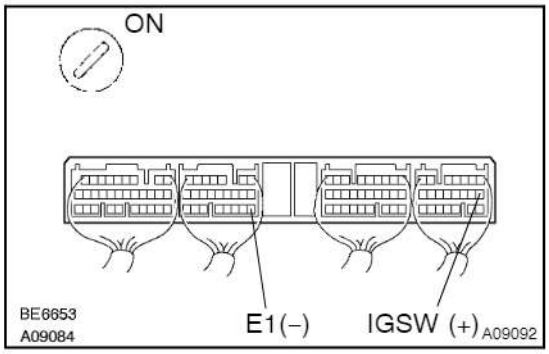
NG

2	Check for open in harness and connector between terminal E1 of ECM and body ground (See page IN–30).

NG	Repair or replace harness or connector.

OK

3	Check voltage between terminals IGSW and E1 of ECM connector.



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure voltage between terminals IGSW and E1 of the ECM connector.

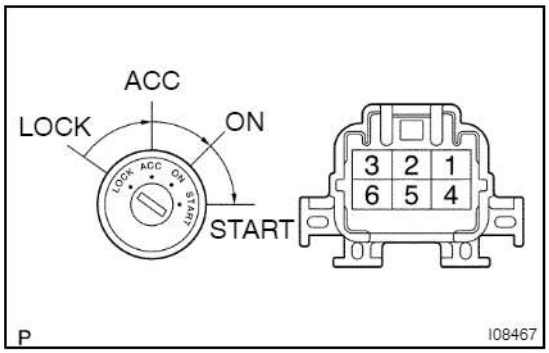
OK:

Voltage: 9 to 14 V

OK	Go to step 5.

NG

4	Check ignition switch.



Check continuity between the connector terminals shown in the chart below.

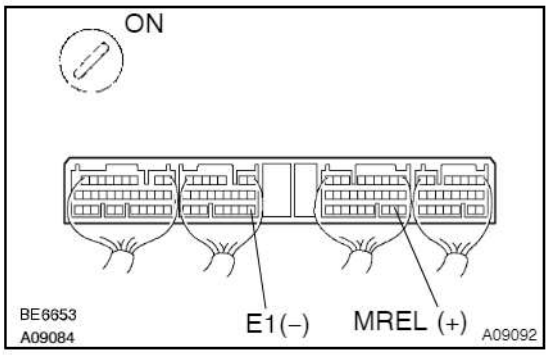
Switch	Terminal No.	Resistance
LOCK	All Terminal to Terminal	No continuity
ACC	1 – 3	Continuity
ON	1 – 2 – 3 5 – 6	Continuity
START	1 – 2 4 – 5 – 6	Continuity

NG → **Replace ignition switch.**

OK

Check and repair harness and connector between battery and ignition switch, ignition switch and ECM (See page IN–30).

5	Check voltage between terminals MREL and E1 of ECM connector.



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure voltage between terminals MREL and E1 of the ECM connector.

OK:

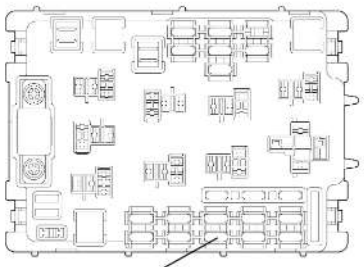
Voltage: 9 to 14 V

OK → **Replace ECM (See page SF–78).**

NG

6	Check EFI fuse.

Engine Room J/B



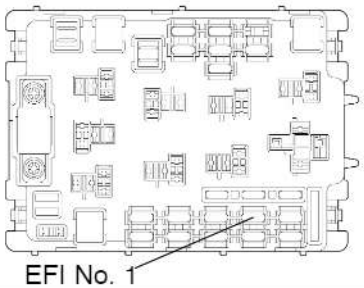
PREPARATION:
Remove the EFI fuse from the engine room J/B.
CHECK:
Check continuity of EFI fuse.
OK:
Continuity

NG	Check for short in all the harness and components connected to EFI fuse.

OK

7	Check EFI No. 1 fuse.

Engine Room J/B



PREPARATION:
Remove EFI No. 1 fuse from engine room J/B.
CHECK:
Check continuity of EFI No. 1 fuse.
OK:
Continuity

NG	Check for short in all the harness and components connected to EFI No. 1 fuse.

OK

8	Check EFI main relay (Marking: EFI) (See page SF–56).

NG	Replace EFI main relay.

OK

9	**Check for open and short in harness and connector between EFI relay and ECM, EFI relay and body ground (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

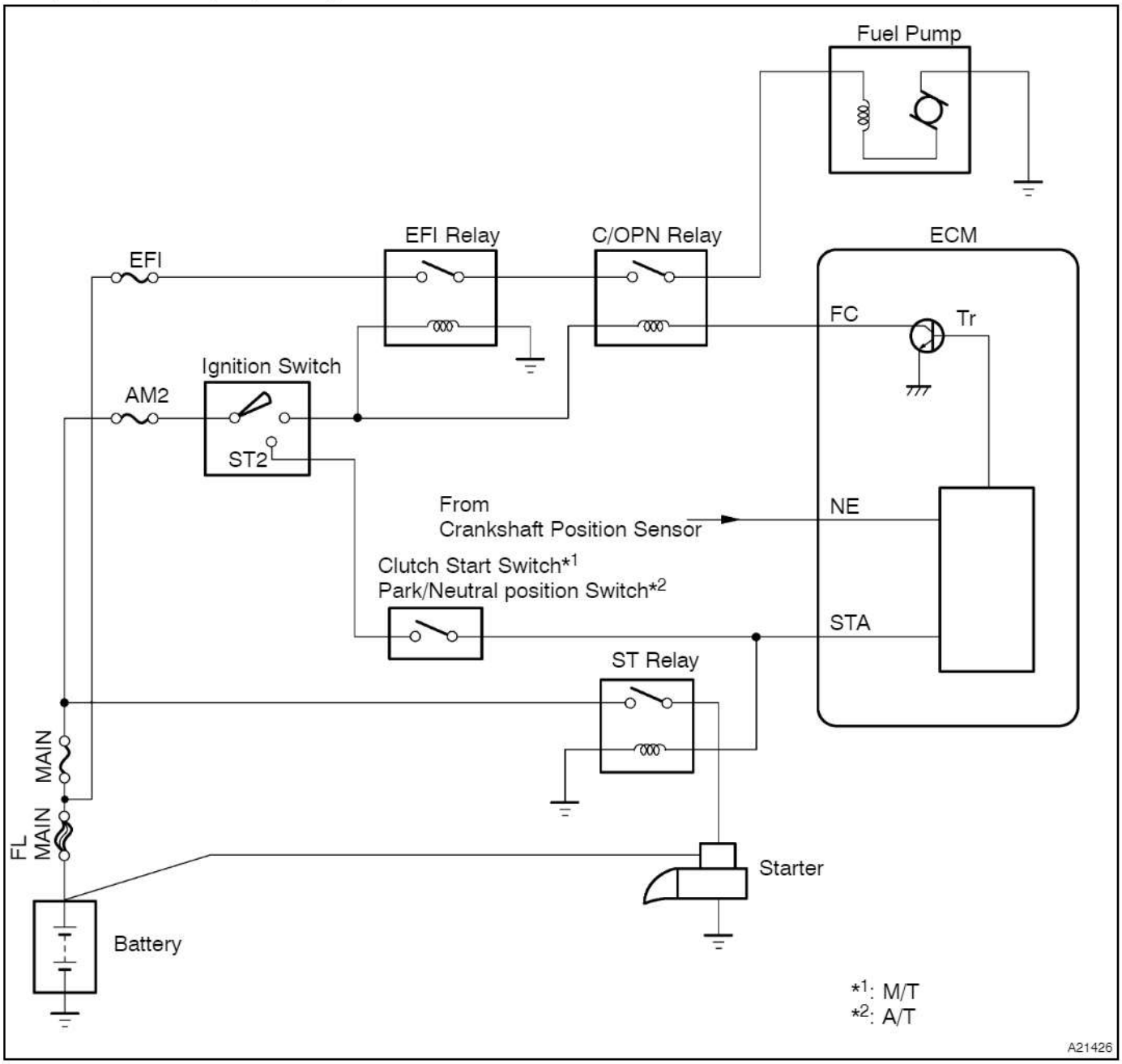
Check and replace harness and connector between terminal +B of ECM and battery positive terminal (See page IN–30).

DIC73–02

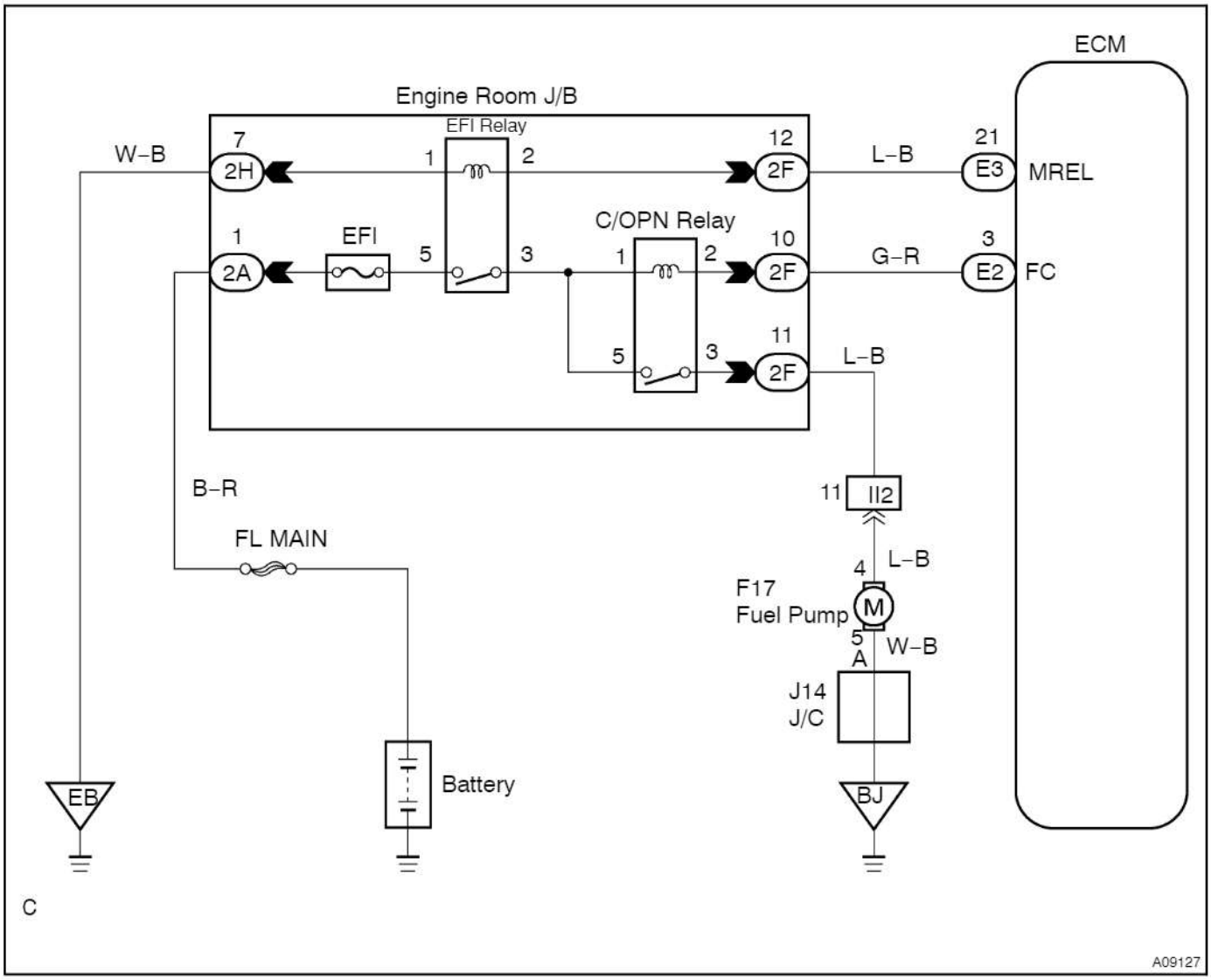
Fuel Pump Control Circuit

CIRCUIT DESCRIPTION

In the diagram below, when the engine is cranked, current flows from terminal ST2 of the ignition switch 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, Tr 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 Tr ON (circuit opening relay ON) and the fuel pump also keeps operating.



WIRING DIAGRAM



INSPECTION PROCEDURE

Hand–held tester:

1	**Connect the hand–held tester and check operation of fuel pump.**

PREPARATION:

(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) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / FUEL PUMP / SPD.

CHECK:

Check the relay operation while operating it with the hand–held tester.

OK:

Operating noise can be heard from the relay.

OK → **Go to step 5.**

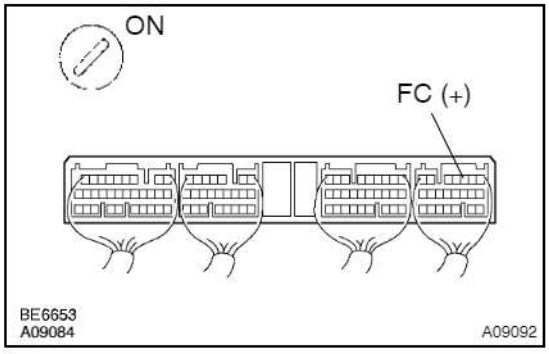
NG

2	**Check circuit opening relay (Marking: C/OPN) (See page SF–57).**

NG → **Replace circuit opening relay.**

OK

3	**Check voltage between terminal FC of ECM and body ground.**



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure voltage between terminal FC of the ECM and body ground.

OK:

Voltage 9 to 14 V

OK → **Replace ECM (See page SF–78).**

NG

4	Check for open and short in harness and connector between circuit opening relay (Marking: C/OPN) and ECM, circuit opening relay (Marking: C/OPN) and ignition switch (See page IN–30).

NG → Repair or replace harness or connector.

OK →

Replace ECM (See page SF–78).

5	Check fuel pump (See page SF–6).

NG → Repair or replace fuel pump.

OK →

6	Check for open in harness and connector between circuit opening relay (Marking: C/OPN) and fuel pump, fuel pump and body ground (See page IN–30).

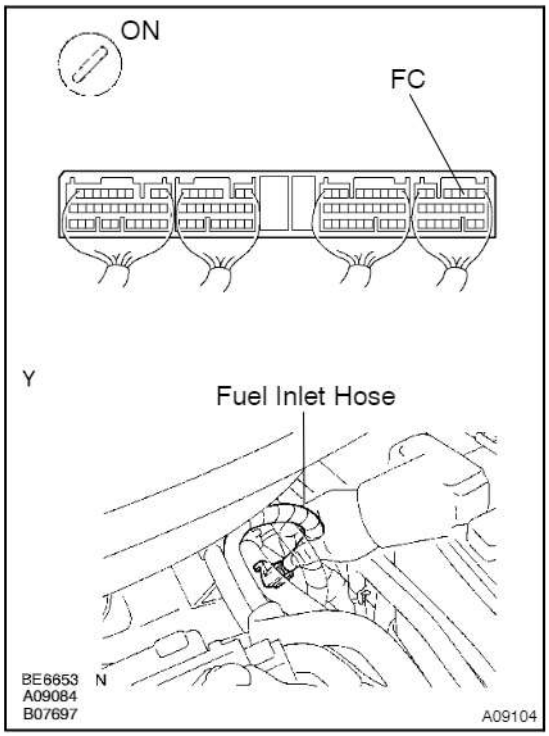
NG → Repair or replace harness or connector.

OK →

Replace ECM (See page SF–78).

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

1	Check operation of fuel pump.



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

(a) Connect between terminal FC of the ECM connector and body ground.

(b) Check for fuel pressure in the fuel inlet hose when it is pinched off.

OK:

There is pressure in fuel inlet hose.

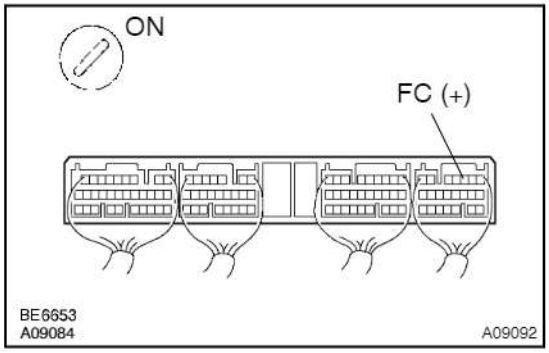
HINT:

At this time, you will hear a fuel return flowing noise.

OK	Proceed to next circuit inspection shown on problem symptoms table (See page DI–39).

NG

2	Check operation of circuit opening relay (Marking: C/OPN).



CHECK:

When connecting between terminal FC of the ECM connector and the body ground, check the relay operation.

OK:

Noise can be heard from the circuit opening relay.

OK	Go to step 6.

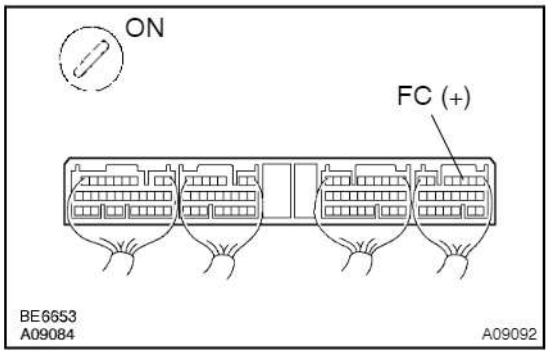
NG

3	**Check circuit opening relay (Marking: C/OPN) (See page SF–57).**

NG → **Replace circuit opening relay.**

OK

4	**Check voltage between terminal FC of ECM and body ground .**



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure voltage between terminal FC of the ECM and body ground.

OK:

Voltage 9 to 14 V

OK → **Replace ECM (See page SF–78).**

NG

5	**Check for open and short in harness and connector between circuit opening relay (Marking: C/OPN) and ECM, circuit opening relay (Marking: C/OPN) and ignition switch (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Replace ECM (See page SF–78).

6	Check fuel pump (See page SF–6).

NG → Repair or replace fuel pump.

OK

7	Check for open in harness and connector between circuit opening relay (Marking: C/OPN) and fuel pump, fuel pump and body ground (See page IN–30).

NG → Repair or replace harness or connector.

OK

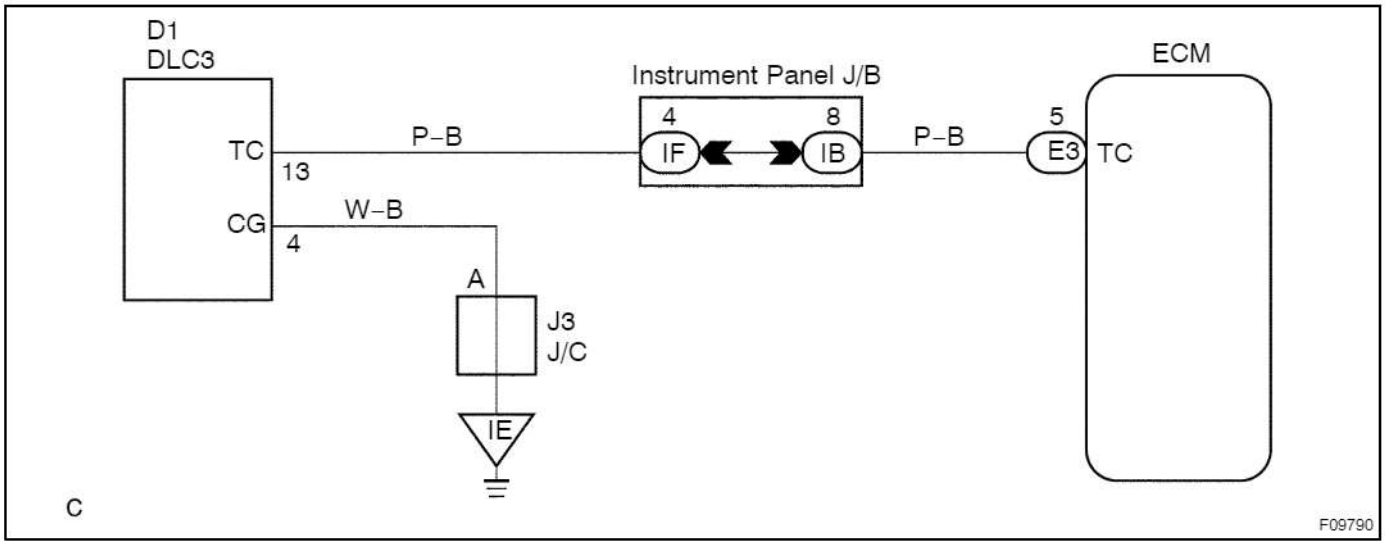
Replace ECM (See page SF–78).

TC Terminal Circuit

CIRCUIT DESCRIPTION

Terminal TC and CG are located in the DLC3. When connecting these terminals, DTCs in normal mode or test mode can be read through the MIL flashing in the combination meter.

WIRING DIAGRAM

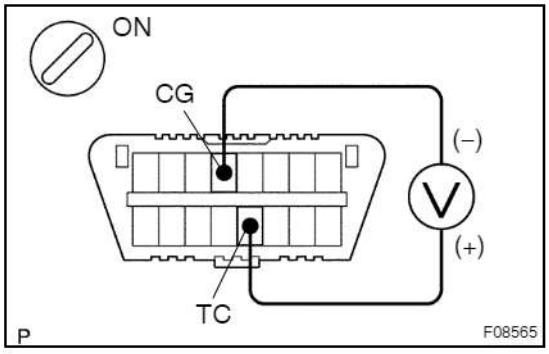


INSPECTION PROCEDURE

HINT:

- Even though terminal TC is not connected with terminal CG, the MIL blinks.
- For the above phenomenon, an open or short in the wire harness, or malfunction inside the ECM is the likely cause.

1	**Check voltage between terminals TC and CG of DLC3.**



PREPARATION:

Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals TC and CG of the DLC3.

OK:

Voltage: 9 to 14 V

OK	**Replace ECM (See page SF–78).**

NG

2	Check continuity between terminal CG of DLC3 and body ground.

NG → Repair or replace harness or connector.

OK

3	Check for open and short circuit in harness and connector between ECM and DLC3, and DLC3 and body ground (See page IN–30).

NG → Repair or replace harness or connector.

OK

Replace ECM (See page SF–78).

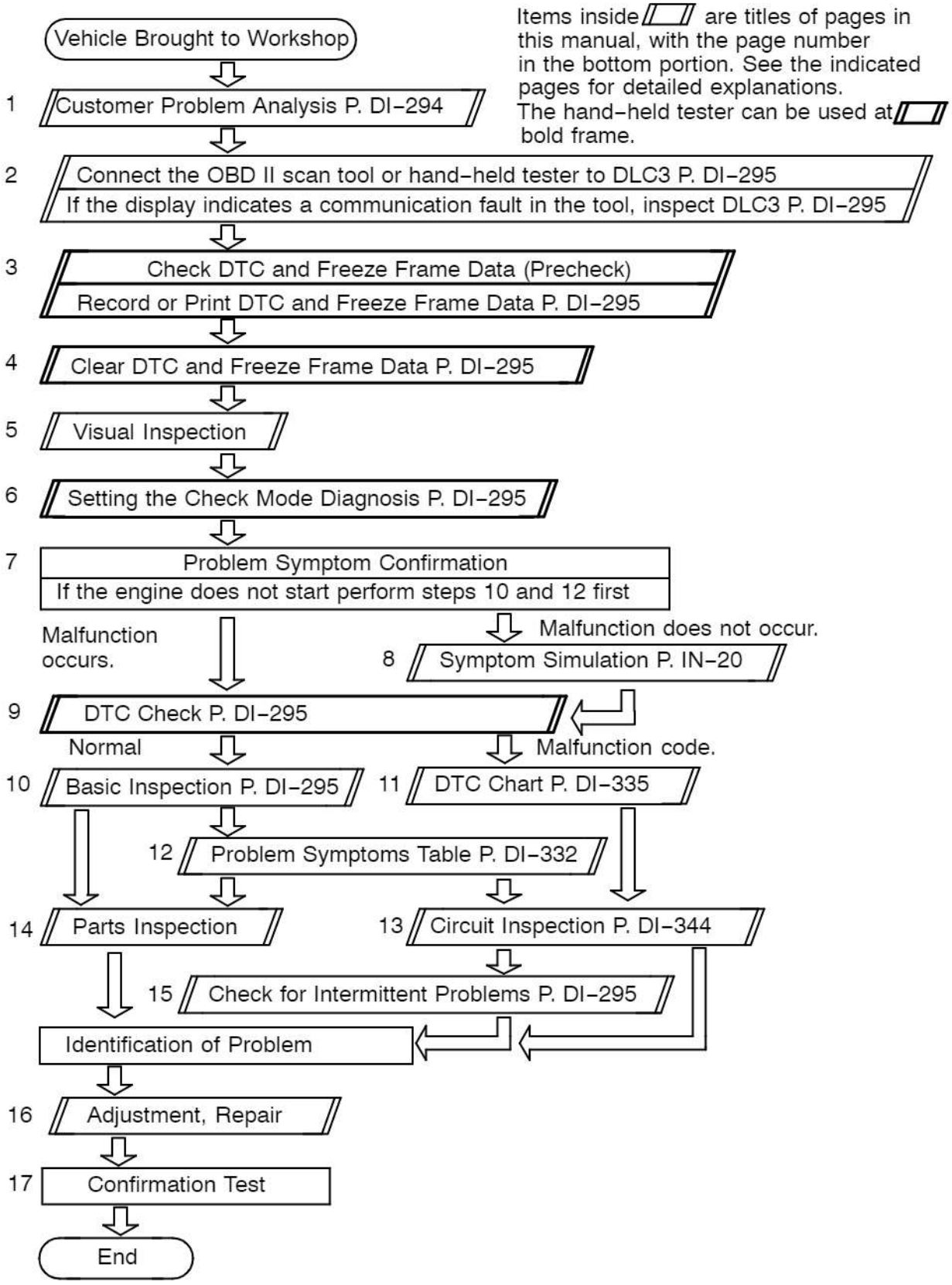
ENGINE (2ZZ–GE)

DI37Q–17

HOW TO PROCEED WITH TROUBLESHOOTING

Troubleshoot in accordance with the procedure on the following page.

Items inside ▱ are titles of pages in this manual, with the page number in the bottom portion. See the indicated pages for detailed explanations. The hand–held tester can be used at ▰ bold frame.



DI37R–17

CUSTOMER PROBLEM ANALYSIS CHECK

ENGINE CONTROL SYSTEM Check Sheet

Inspector's Name

Customer's Name		VIN	
Driver's Name		Production Date	
Data Vehicle Brought in		Licence Plate No.	
Engine model		Odometer Reading	km miles

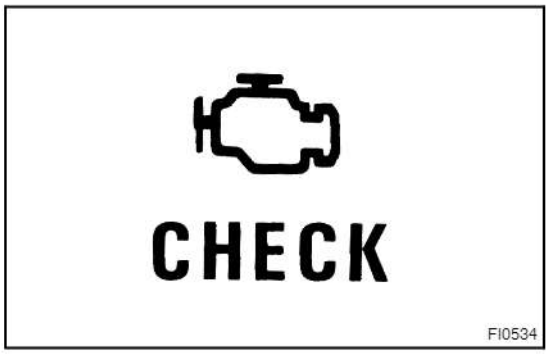
Problem Symptoms	☐ Engine does not Start	☐ Engine does not crank ☐ No initial combustion ☐ No complete combustion
	☐ Difficult to Start	☐ Engine cranks slowly ☐ Other _____
	☐ Poor Idling	☐ Incorrect first idle ☐ Idling rpm is abnormal ☐ High (rpm) ☐ Low (rpm) ☐ Rough idling ☐ Other _____
	☐ Poor Driveability	☐ 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	

Dates 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 light (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 ( )

DID57–01

PRE–CHECK

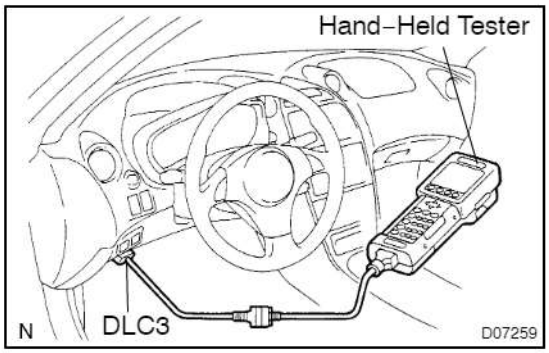


1. DIAGNOSIS SYSTEM

(a) 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 power train 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 DI–335).

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

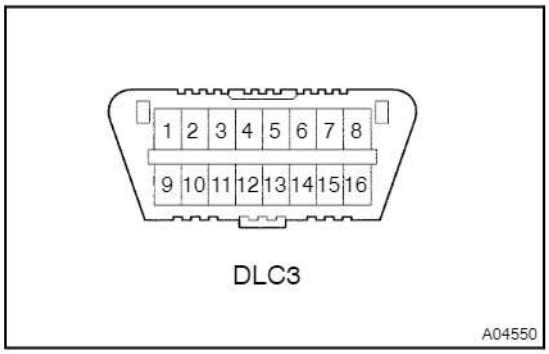


- To check the DTC, connect the hand–held tester or OBD II scan tool to the Data Link Connector 3 (DLC3) of the vehicle. The hand–held tester or OBD II scan tool also enables you to erase the DTC and check the freeze frame data and various forms of engine data (See the instruction manual for the OBD 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 DI–335).

- 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 step 3).
- *2 trip detection logic:
  When a malfunction is first detected, the malfunction is temporarily stored in the ECM memory. This is known as 1st trip detection. If the ignition switch is turned OFF and then ON again, and the same malfunction is detected again, the MIL will illuminate. This is known as 2nd trip detection.
- 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 determining if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a 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:

(1) DTCs other than fuel trim malfunction DTCs (P0171 and P0172) and misfire DTCs (P0300 to P0304).
(2) Fuel trim malfunction DTCs (P0171 and P0172).
(3) Misfire DTCs (P0300 to P0304).



(b) Check the 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.

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

HINT:
Connect the cable of 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.

(c) Inspect the battery voltage.
Battery Voltage: 11 to 14 V
If voltage is below 11 V, recharge the battery before proceeding.

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

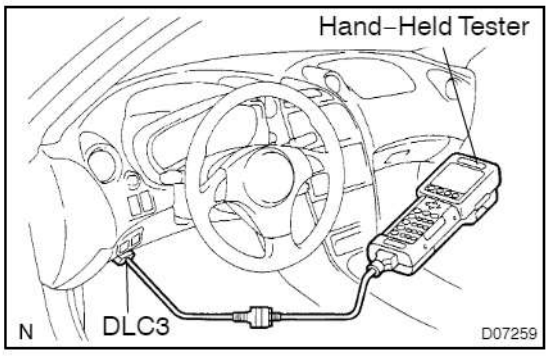
HINT:
If the MIL is not illuminated, troubleshoot the MIL circuit (See page DI–663).

(2) 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.

2. DTC CHECK (Normal Mode)

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.**



(a) Checking DTCs using the OBD II scan tool or hand–held tester.
  (1) Connect the OBD II scan tool or the hand–held tester to DLC3.
  (2) Turn the ignition switch ON.
  (3) 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 CODES. For the OBD II scan tool, see its instruction manual.
  (4) See page DI–295 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 DTC chart subject to "2 trip detection logic", perform either of the following actions.

- **Check the pending fault code:**
  For the hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / PENDING CODES.
- **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 comes on 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.**

(b) Clear the DTCs using the OBD II scan tool or the hand–held tester.
  (1) Connect the OBD II scan tool or the hand–held tester to the DLC3.
  (2) Turn the ignition switch ON.
  (3) 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.

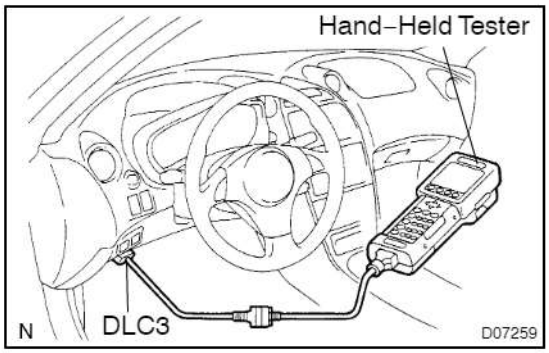
(c) Clear the DTCs not using the OBD II scan tool or the hand–held tester.
  Remove the EFI and ETCS fuses from the engine room J/B for more than 60 seconds, or disconnect the battery terminal for more than 60 seconds.
  After disconnecting the battery terminal, perform the "INITIALIZE procedure.

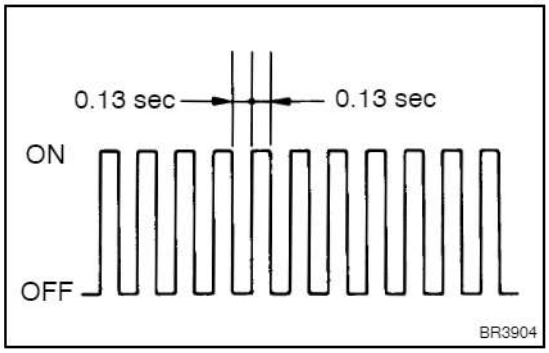
3. DTC CHECK (Check Mode)

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.





(a) Follow these steps when preparing to use the hand–held tester check mode.
  (1) Make sure that the items below are true:
    - Battery positive voltage 11 V or more
    - Throttle valve fully closed
    - Transmission in the 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) Change the ECM to check mode with the hand–held tester. Enter the following menus: DIAGNOSIS / ENHANCED OBD II / CHECK MODE. 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.

(6) Start the engine. The MIL should turn off after the engine starts.
(7) Simulate the conditions of the malfunction described by the customer.
(8) After simulating the malfunction conditions, use the hand–held tester diagnosis selector to check the DTC, freeze frame data and other data.
(9) After checking the DTC, inspect the applicable circuit.

(b) Clear DTCs using the OBD II scan tool or the hand–held tester.
(1) Connect the OBD II scan tool or the hand–held tester to the DLC3.
(2) Turn the ignition switch ON.
(3) 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.

(c) Clear the DTCs without using the OBD II scan tool or the hand–held tester.
Remove the EFI and ETCS fuses from the engine room J/B for more than 60 seconds, or disconnect the battery terminal for more than 60 seconds.
After disconnecting the battery terminal, perform the "INITIALIZE" procedure.

4. FAIL–SAFE CHART

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

DTC No.	Fail–Safe Operation	Fail–Safe Deactivation Conditions
P0031 P0032 P0037 P0038	The heater circuit in which an abnormality is detected is turned off	Ignition switch OFF
P0100 P0101 P0102	Ignition timing calculated from engine speed	Returned to normal condition
P0110 P0112 P0113	Intake air temperature is fixed at 20°C (68°F)	Returned to normal condition
P0115 P0117 P0118	Engine coolant temperature is fixed at 80°(176°F)	Returned to normal condition

P0120 P0121 P0122 P0123 P0220 P0222 P0223 P0604 P0607 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 is detected and then the ignition switch is turned OFF, the fail–safe operation will stop and the system will return to normal condition.
P0325 P0330	Max. timing retardation	Ignition switch OFF
P0351 P0352 P0353 P0354	Fuel cut	IGF signal is detected for 4 consecutive ignitions
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 remaining circuit is used to calculate the accelerator pedal opening 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 is detected and then the ignition switch is turned OFF, the fail–safe operation will stop and the system will return to normal condition.

5. CHECK FOR INTERMITTENT PROBLEMS

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 hand–held tester. In check mode, the ECM uses 1 trip detection logic, which has a higher sensitivity to malfunctions than normal mode (default), which uses 2 trip detection logic.

(a) Clear the DTCs (See step 2).
(b) Set the check mode (See step 3).
(c) Perform a simulation test (See page IN–20).
(d) Check the connector and terminal (See page IN–30).
(e) Wiggle the harness and connector (See page IN–30).

6. 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	**Is battery positive voltage 11 V or more when engine is stopped?**

NO → **Charge or replace battery.**

YES

2	**Is engine cranked?**

NO → **Proceed to page ST–15 and ST–17, and continue to troubleshoot.**

YES

3	**Does engine start?**

NO → **Go to step 6.**

YES

4	**Check air filter.**

PREPARATION:

Remove the air filter.

CHECK:

Visually check that the air filter is not excessively dirty or oily.

NG → **Repair or replace.**

OK

5	Check idle speed.

PREPARATION:

(a) Warm up the engine to normal operating temperature.
(b) Switch off all accessories.
(c) Switch off air conditioning.
(d) Shift transmission into "N" position.
(e) Connect the OBD II scan tool or hand–held tester to DLC3 on the vehicle.

CHECK:

Use CURRENT DATA to check the idle speed.

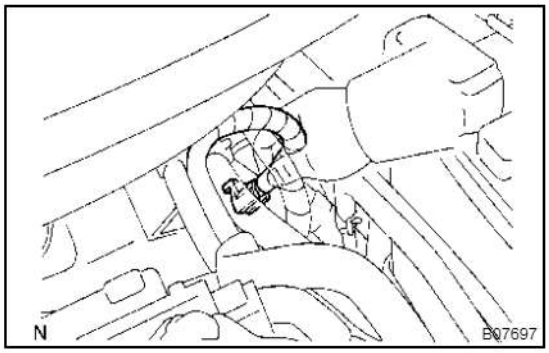
OK:

Idle speed:
(M/T): 750 to 850 rpm
(A/T): 700 to 800 rpm

NG → **Proceed to problem symptoms table on page DI–332.**

OK

6	Check fuel pressure.



PREPARATION:

(a) Be sure that enough fuel is in the tank.
(b) Connect the hand–held tester to the DLC3.
(c) Turn the ignition switch ON and push the hand–held tester main switch ON.
(d) Use ACTIVE TEST mode to operate the fuel pump.

HINT:

Please refer to the hand–held tester operator's manual for further details.

(e) If you have no hand–held tester, connect the positive (+) and negative (–) leads from the battery to the fuel pump connector (See page SF–6).

CHECK:

Check for fuel pressure in the fuel inlet hose when it is pinched off.

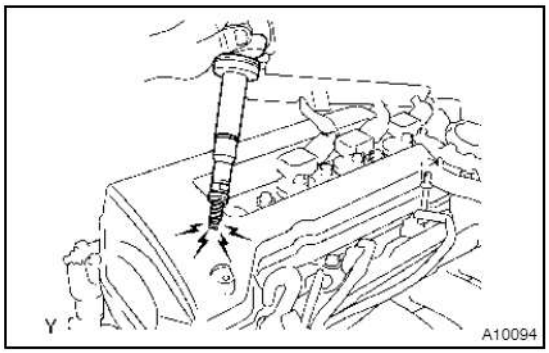
HINT:

At this time, you will hear a fuel flowing noise.

NG → **Proceed to page SF–6 and continue to troubleshoot.**

OK

7	Check for spark.



PREPARATION:

(a) Disconnect the ignition coil assembly.
(b) Remove the spark plug.
(c) Install the spark plug the ignition coil assembly.
(d) Disconnect the injector connector.
(e) Ground the spark plug.

CHECK:

Check if spark occurs while engine is being cranked.

NOTICE:

To prevent excess fuel being injected from the injectors during this test, don't crank the engine for more than 5 – 10 seconds at a time.

NG → **Proceed to page IG–1 and continue to troubleshoot.**

OK

Proceed to problem symptoms table on page DI–332.

7. 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 the 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 OFF.
(c) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(d) Turn the ignition switch ON.
(e) Push the "ON" button of the hand–held tester.
(f) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST.
(g) According to the display on tester, read the "DATA LIST".

Hand–held Tester Display	Measurement Item/Range (Display)	Normal Condition *1	Diagnostic Note
INJECTOR	Injection period of the No. 1 cylinder/ Min.: 0 ms, Max: 32.64 ms	Idling: 0.8 to 2.0 ms	—
IGN ADVANCE	Ignition timing advance for No. 1 cylinder/ Min.: –64 deg., Max.: 63.5 deg.	Idling: BTDC 4 to 12°	—
IAC DUTY RATIO	Intake air control valve duty ratio Opening ratio rotary solenoid type ISC valve/ Min.: 0 %, Max.: 99 %	Idling: 25 to 45 % Running without load (2,500 rpm): 25 to 45 %	—
CALC LOAD	Calculated load by ECM/ Min.: 0 %, Max.: 100 %	Idling: 9.1 to 20.0 % Running without load (2,500 rpm): 11.0 to 23.0 %	—
MAF	Air flow rate from MAF sensor/ Min.: 0 gm/s, Max.: 655 gm/s	Idling: 1.5 to 5.0 gm/s. Racing without load (2,500 rpm): 5.0 to 15.0 gm/s	If the value is approximately 0.0 gm/s: • Mass air flow meter power source circuit open • VG circuit open or short If the value is 160.0 gm/s or more: • E2G circuit open
ENGINE SPD	Engine speed/ Min.: 0 rpm, Max.: 16,383 rpm	Idling: 750 to 850 rpm	—
COOLANT TEMP	Coolant temperature/ Min.: –40 °C, Max.: 140 °C	After warming up: 80 to 95°C (176 to 203°F)	• If the value is –40°C (–40°F): sensor circuit is open • If the value is greater than 140°C (284°F): sensor circuit is shorted
INTAKE AIR	Intake air temperature/ Min.: –40 °C, Max.: 140 °C	Equivalent to Ambient Temperature	
THROTTLE POS	Absolute throttle position sensor/ Min.: 0 %, Max.: 100 %	Throttle fully closed: 8 to 18 % Throttle fully open: 64 to 98 %	Read the value with the 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 mph (0 km/h)	—

O2S B1 S1	Heated oxygen sensor output voltage for bank 1 sensor 1/ Min.: 0 V, Max.: 1.275 V	Idling: 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 B1 S2	Heated oxygen sensor output voltage for bank 1 sensor 2/ Min.: 0 V, Max.: 1.275 V	Idling: 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 the fuel tank can be read by the vapor pressure sensor
SHORT FT #1	Short term fuel trim of bank 1/ Min.: –100 %, Max.: 100 %	0 ± 20%	—
LONG FT #1	Long term fuel trim of bank 1/ Min.: –100 %, Max.: 100 %	0 ± 20%	This item is the overall fuel compensation The long–term fuel trim is carried out to compensate a continual deviation from the theoretical central value caused by the short–term fuel trim
TOTAL FT #1	Total fuel trim of bank 1: Average value for fuel trim system of bank 1/ 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 2/ 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 #2
FUEL SYS #1	Fuel system status (Bank 1)/ OL or CL or OL DRIVE or OL FAULT or CL FAULT	Idling after warming up: CLOSED	• 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 functioning improperly
FC IDL	Fuel cut idle/ON or OFF	Fuel cut operating: ON	FC IDL = "ON" when throttle valve is fully closed and engine speed is over 1,500 rpm
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 m/s	—
O2 RL B1 S1	Response time of the heated oxygen sensor, from rich to lean (bank 1 sensor 1)/ Min.: 0 ms, Max.: 16,711 ms	Idling after warming up: 0 to 1,000 m/s	—
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	—
ELECT LOAD SIG	Electrical load signal / ON or OFF	Defogger switch ON: ON	—

PS OIL PRESS SW	Power steering signal / ON or OFF	When the steering wheel position is straightforward: OFF Other than above: ON	—
PS SIGNAL	Power steering signal/ ON or OFF	When the steering wheel is turned	This signal is usually ON status until the Ignition switch is turned 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 B1	VVT control status (bank 1)/ ON or OFF	VVT system operation: ON	—
IGNITION	Ignition counter/ Min.: 0, Max.: 400	0 to 400	—
CYL #1, #2, #3, #4	Misfire ratio of the cylinder 1 to 4/ 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	—
O2 LR B1 S2	Response time of the heated oxygen sensor, lean to rich (bank 1 sensor 2)/ Min.: 0 ms, Max.: 16,711 ms	Idling after warming up: 0 to 1,000 m/s	—
FC TAU	Fuel cut TAU: Fuel cut during very light load	Fuel cut operating: ON	The fuel cut is performed under very light load to prevent the engine combustion from becoming incomplete
O2 RL B1 S2	Response time of the heated oxygen sensor, rich to lean (bank 1 sensor 2)/ Min.: 0 ms, Max.: 16,711 ms	Idling after warming up: 0 to 1,000 m/s	—
SECOND AIR VSV	VSV status for secondary air control	VSV operating: ON	—
INTAKE AIR CTL VSV	VSV status for intake air control/ ON or OFF	VSV operating: ON	—
SECONDARY AIR	Second air system status/ ON or OFF	Second air system operating: ON	—
2ND AIR PRESS	Second air system status/ Min.: 0 kPs, Max.: 225 kPs	Second air system operating: ON: 2.5 kpa or more OFF: 2.5 kpa or less	—
CHECK MODE	Check mode/ON or OFF	Check mode ON:OFF	—

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

8. ACTIVE TEST

HINT:

Performing the ACTIVE TEST using the hand–held tester or the OBD II scan tool 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 diagnostic 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 hand–held tester or the OBD II scan tool to the DLC3.
(d) Turn the ignition switch ON.
(e) Push the "ON" button of the hand–held tester or the OBD II scan tool.
(f) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST.
(g) According to the display on 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.: 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 –12.5 % or 25 %.) [Vehicle Condition] Engine speed: 3,000 rpm or less	The following A/F CONTROL procedure enables the technician to check and graph the voltage outputs of both the A/F sensor and heated oxygen sensor For displaying the graph indication, enter "ACTIVE TEST/A/F CONTROL/USER DATA," then select "O2S B1S1 and O2S B1S2" by pressing "YES" button and push "ENTER" button before pressing "F4" button
IAC DUTY RATIO	[Test Details] Control the ISC duty ratio 0 to 90 % [Vehicle Condition] • Engine speed: Idling (CTP switch ON) • Vehicle speed: 0 mph (0 km/h) • Battery voltage: 8.5 V or more	–
CAN CTRL VSV	[Test Details] Activate the VSV for canister control ON or OFF	–
TANK BYPASS VSV	[Test Details] Activate the VSV for tank bypass 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
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	–
SECOND AIR VSV	[Test Details] Active the VSV for secondary air ON or OFF	–
INTAKE AIR CTL VSV	[Test Details] Activate the VSV for intake air control ON or OFF	–
VVTL CTRL B1	[Test Details] Control the idle fuel cut prohibit ON or OFF	• ON: Rough idle or engine stall • OFF: Normal engine speed

9. 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	A group of diagnostic trouble codes that are output by the ECM based on the same malfunction detection logic.
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. When a sensor is being monitored, the next sensor or component will not be monitored until the 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 the malfunction only one time during a single driving cycle. "Continuous" means that the ECM detects 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 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.

10. TOYOTA/LEXUS 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 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 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 transmission
Intermediate shaft speed sensor "A"	Counter gear speed sensor
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 immobiliser system, Immobiliser system	Vehicle anti–theft system

11. The monitor will run whenever the following DTCs are not present (Monitor disablement List)

HINT:

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

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 Sensor 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 Sensor - 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																													
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 Sensor Heater - Sensor3																													
	P0100-P0103	MAF sensor																													
	P0101	MAF sensor												X								X									
	P0105-P0108	MAP sensor														X						X									
	P0106	MAP sensor																													
	P0110-P0113	IAT sensor																													
	P0115-P0118	ECT sensor																													
	P0116	ECT sensor																													
	P0120-P0223,P2135	TP sensor																													
	P0125	Insufficient ECT for Closed Loop																													
	P0128	Thermostat																				X	X	X	X	X	X	X			
	P0130-P0153	O2 Sensor -Sensor1																					X								
	P0134,P0154	O2 Sensor, A/F Sensor(No Activity) - Sensor1																				X		X	X						
	P0136,P0156	O2 Sensor - Sensor2																							X	X	X	X			
	P0142,P0162	O2 Sensor - Sensor3																							X	X	X	X			
	P0171,P0172	Fuel system																													
	P0300-P0308	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 Adsorption 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	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)																														
	P0402	EGR system (open)																														
	P0405,P0406	EGR Lift sensor																														
	P0409	EGR Lift sensor																														
	P0420,P0430	Catalyst																														
	P0440-P0446	EVAP system																														
	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																														
	P0715-P0717	Input speed sensor																														
	P0724	Stop lamp switch																														
	P0741-P0796	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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Note *1: Without input the speed sensor

Note *2: With input the speed sensor

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	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			
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 Adsorption 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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Note *1: Without input the speed sensor

Note *2: With input the speed sensor

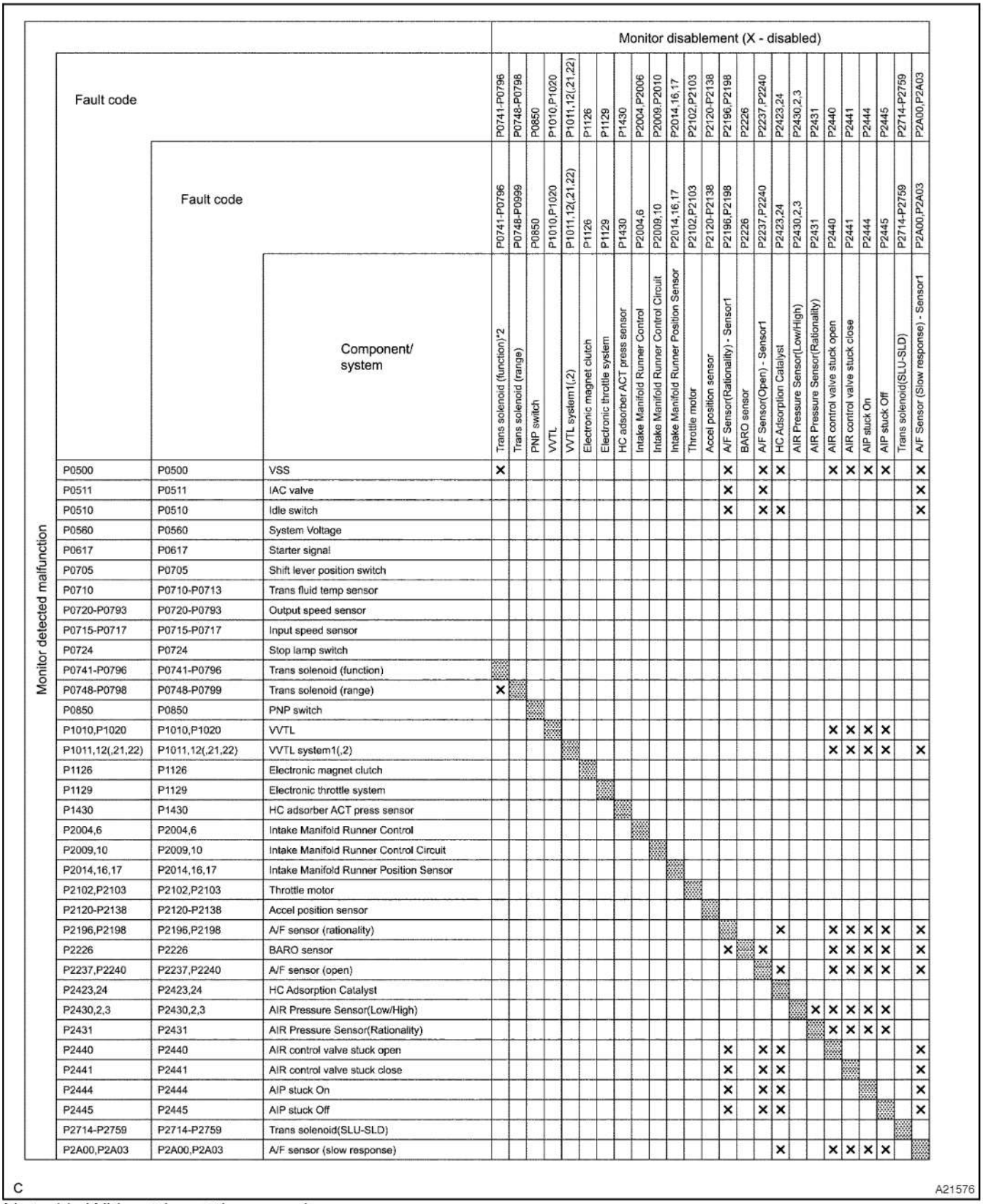
Monitor detected malfunction	Fault code	Fault code	Component/ system	Monitor disablement (X - disabled)																											
				P0741-P0796	P0748-P0798	P0850	P1010,P1020	P1011,12(,21,22)	P1126	P1129	P1430	P2004,P2006	P2009,P2010	P2014,16,17	P2102,P2103	P2120-P2138	P2196,P2198	P2226	P2237,P2240	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 Adsorption 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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Note *1: Without input the speed sensor

Note *2: With input the speed sensor



Note *1: Without input the speed sensor

Note *2: With input the speed sensor

12. O2S TEST RESULT

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 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:

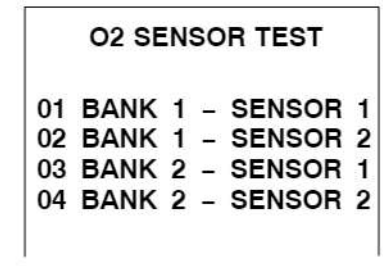
(1) TEST ID (a code applied to each TEST DATA)
(2) Description of TEST DATA
(3) Conversion Factor (When Conversion Factor has a value written in the table, multiply the TEST DATA value appearing on the scan tool by the Conversion Factor value. The result will be the required value.)
(4) Unit
(5) Standard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

HOW TO READ O2S TEST RESULT USING HAND–HELD TESTER

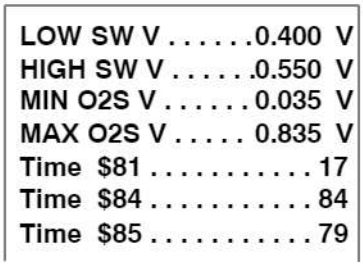
(a) Connect the hand–held tester to the DLC3.

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.

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	Standard Value
$81	Percentage of monitoring time when the HO2S voltage is less than 0.05V	Multiply 0.3906	%	Within 60 %

13. CHECKING MONITOR STATUS

NOTICE:

The monitor status (mode 6) is not applicable to the heated oxygen sensor (HO2S). However, HO2S test values can be checked by O2S TEST RESULT (mode 5). Refer to step 12.

(a) Outline

The monitor results and the test values can be checked with the OBDII scan tool.

The engine control module (ECM) monitors the emissions–related components as the thermostat, catalyst converter and evaporative emissions (EVAP), and determines whether they are functioning normally or not. When finished monitoring, the ECM stores the monitor results and the test values.

The monitor result indicates whether the component is functioning normally or not. The test value is the value that was used to determine the monitor result. If the test value is outside the test limit (malfunction criterion), the ECM determines the component is malfunctioning. Some emissions–related components have multiple test values to determine monitor result. If one of these test values is outside test limit, the ECM determines the component is malfunctioning.

(b) Description

The test value and test limit information are described as shown in the following table. This information is included under "MONITOR RESULT" in the emissions–related DTC sections:

TID $08: Thermostat

TLT	CID	Unit Conversion	Description of Test Value	Description of Test Limit
1	$01	Multiply by 0.625 and subtract 40 [°C]	ECT sensor output when estimated ECT has reached to malfunction criterion	Malfunction criterion for thermostat

- TID (Test Identification Data) is assigned to each emissions–related component.
- TLT (Test Limit Type):
  If TLT is 0, the component is malfunctioning when the test value is higher than the test limit.
  If TLT is 1, the component is malfunctioning when the test value is lower than the test limit.
- CID (Component Identification Data) is assigned to each test value.
- Unit Conversion is used to calculate the test value indicated on generic OBDII scan tools.

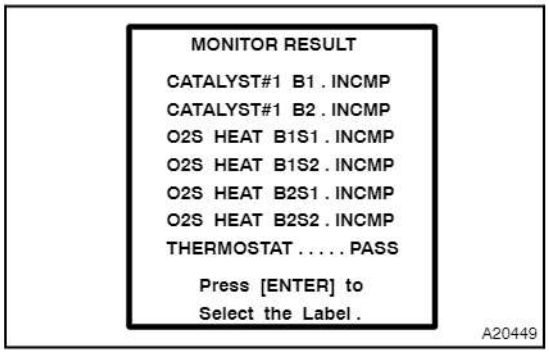
(c) Procedure (using hand–held tester)

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

(2) Turn the ignition switch and hand–held tester ON.

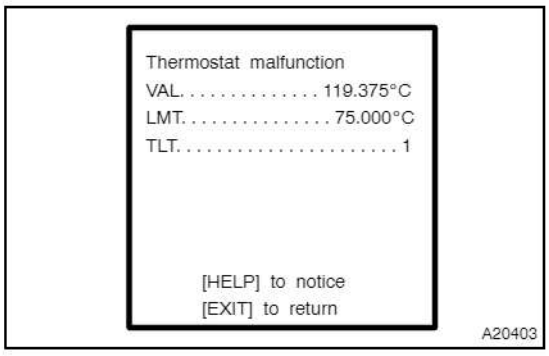
(3) Clear DTCs.

(4) Allow the vehicle to drive, in accordance with the applicable drive pattern described in the READINESS MONITOR DRIVE PATTERN section
(see page DI–33)



(5) Select the hand–held tester menus: DIAGNOSIS, ENHANCED OBDII, MONITOR INFO and MONITOR RESULT. The monitor result appears after the component name.

- INCMP indicates the component has not been monitored yet.
- PASS indicates the component is functioning normally.
- FAIL indicates the component is malfunctioning.



(6) Select the component and press ENTER. If the monitor result has been PASS or FAIL, the accuracy test value appears.

- VAL indicates the test value.
- LMT indicates the test limit (malfunction criterion).
- TLT indicates the test limit type.

(7) Compare the test value with the test limit.

- If TLT is 0, the component is malfunctioning when the test value is higher than the test limit.
- If TLT is 1, the component is malfunctioning when the test value is lower than the test limit.
- If the test value is on the borderline of the test limit, a malfunction is concealed in the component.

HINT:

- The monitor result might on rare occasions be PASS even if the malfunction indicator lamp (MIL) is illuminated. This indicates the system malfunctioned on a previous driving cycle. This might be caused by an intermittent problem.

DID58–01

REGISTRATION

NOTICE:

The Vehicle Identification Number (VIN) must be input into the replaced ECM.

HINT:

The VIN is a 17–digit alphanumeric vehicle identification number. A hand–held tester is required to register the VIN.

1. DESCRIPTION

This registration section consists of three parts, Input Instructions, Read VIN and Write VIN.

(a) Input Instructions: Explains the general VIN input instructions using a hand–held tester.

(b) Read VIN: Explains the VIN reading process in a flowchart. This process allows the VIN stored in the ECM to be read, in order to confirm that the two VINs, provided with the vehicle and stored in the vehicle's ECM, are the same.

(c) Write VIN: Explains the VIN writing process in a flowchart. This process allows the VIN to be input into the ECM. If the ECM is changed, or the VINs do not match, the VIN can be registered, or overwritten in the ECM by following this procedure.

2. INPUT INSTRUCTIONS

(a) Hand–held tester

The arrow buttons (UP, DOWN, RIGHT and LEFT) and numerical buttons (0 to 9) are used, in order to input the VIN.

(b) Cursor Operation

To move the cursor around the tester screen, press the RIGHT and LEFT buttons.

(c) Alphabetical Character Input

(1) Press the UP and DOWN buttons to select the desired alphabetical character.

(2) After selection, the cursor should move.

(d) Numeric Character Input

(1) Press the numerical button corresponding to the number that you want to input.

(2) Select or input the correct character using the UP/DOWN buttons, or the numerical buttons.

HINT:

Numerical characters can be selected by using the UP and DOWN buttons.

(e) Correction

(1) After input, the cursor should move.

(2) When correcting the input character(s), put the cursor onto the character using the RIGHT or LEFT button.

(f) Finishing Input Operation

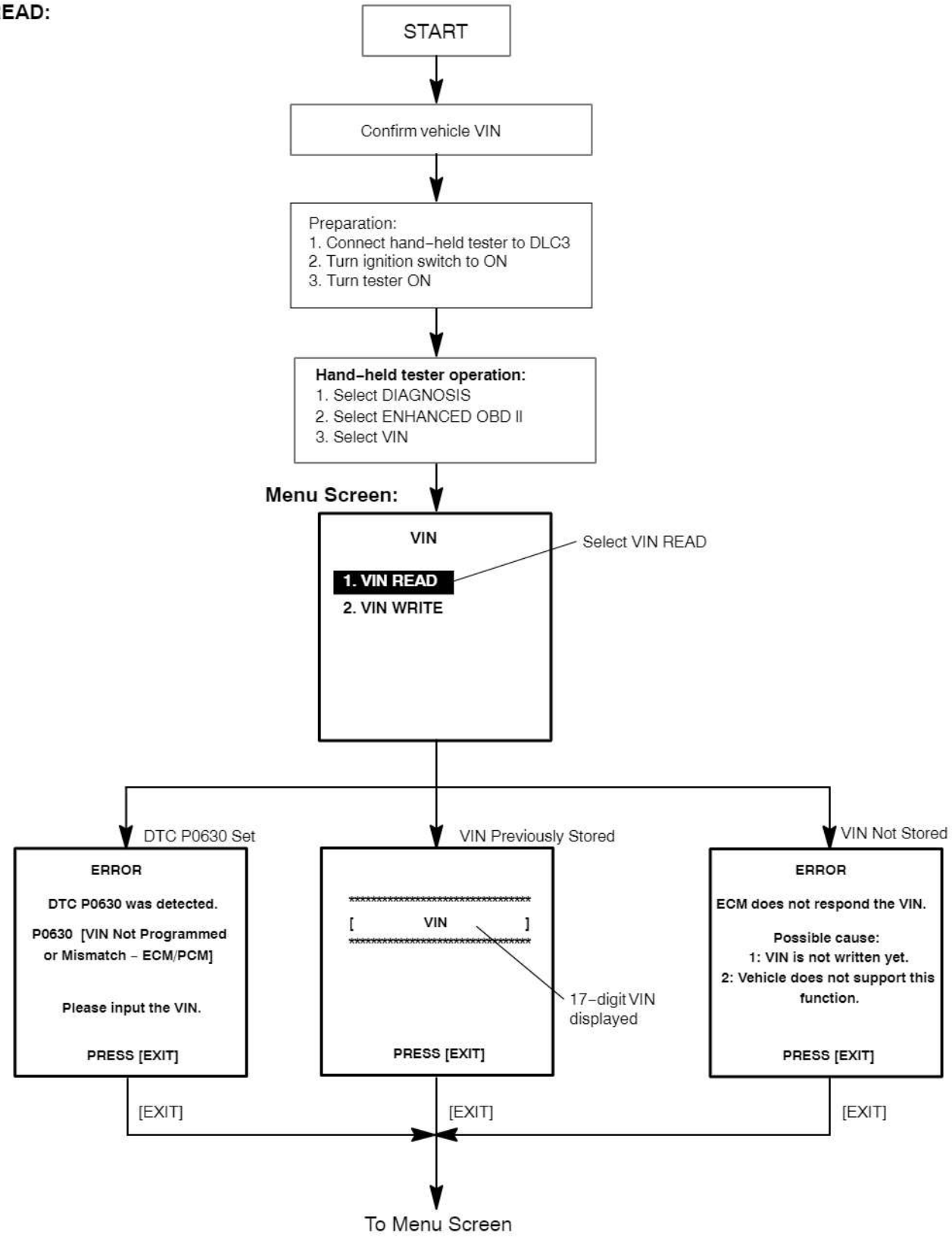
(1) Make sure that the input VIN matches the vehicle VIN after input.

(2) Press the ENTER button on the tester.

3. READ VIN (Vehicle Identification Number)

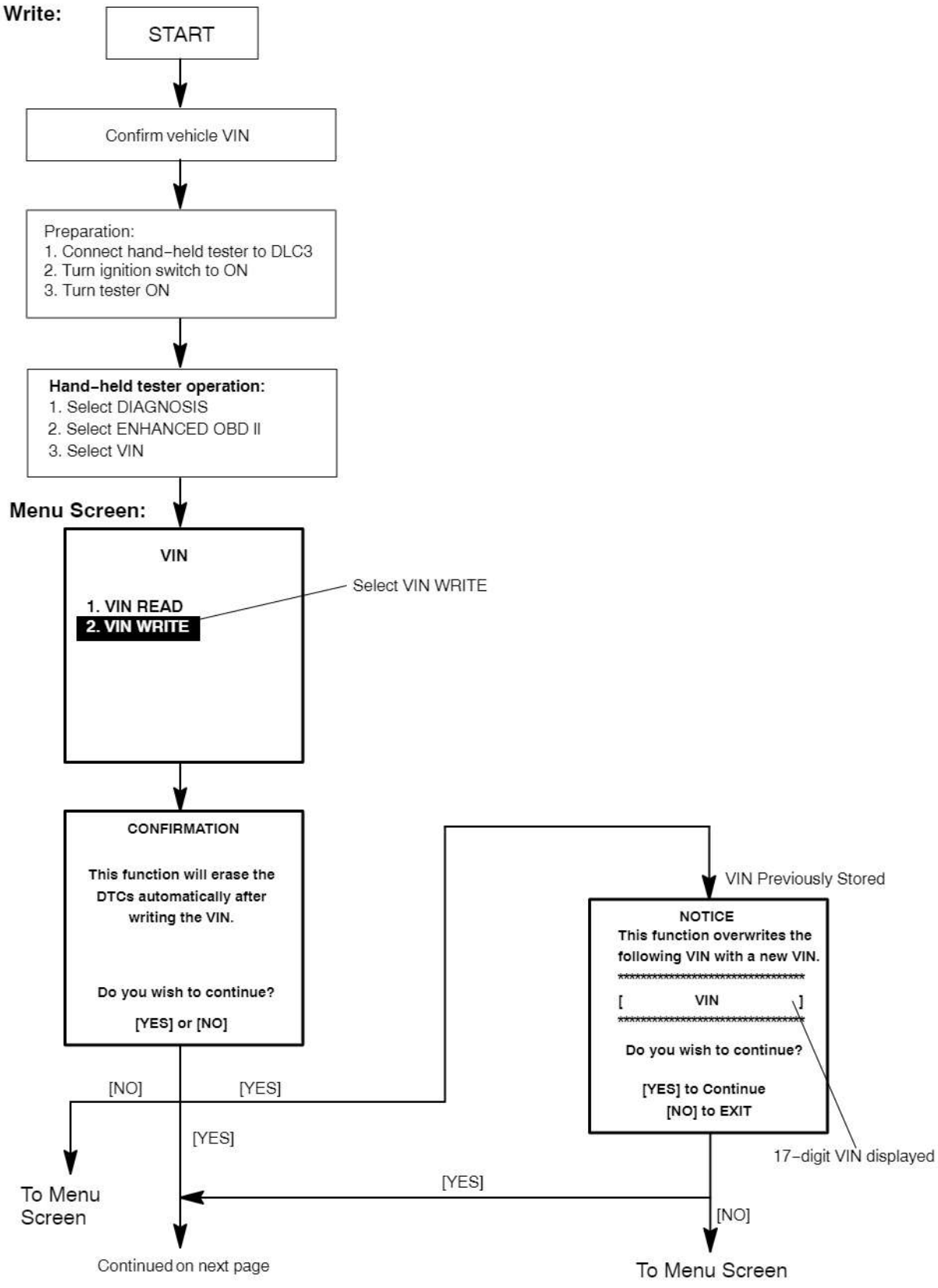
(a) Read VIN using a hand–held tester.

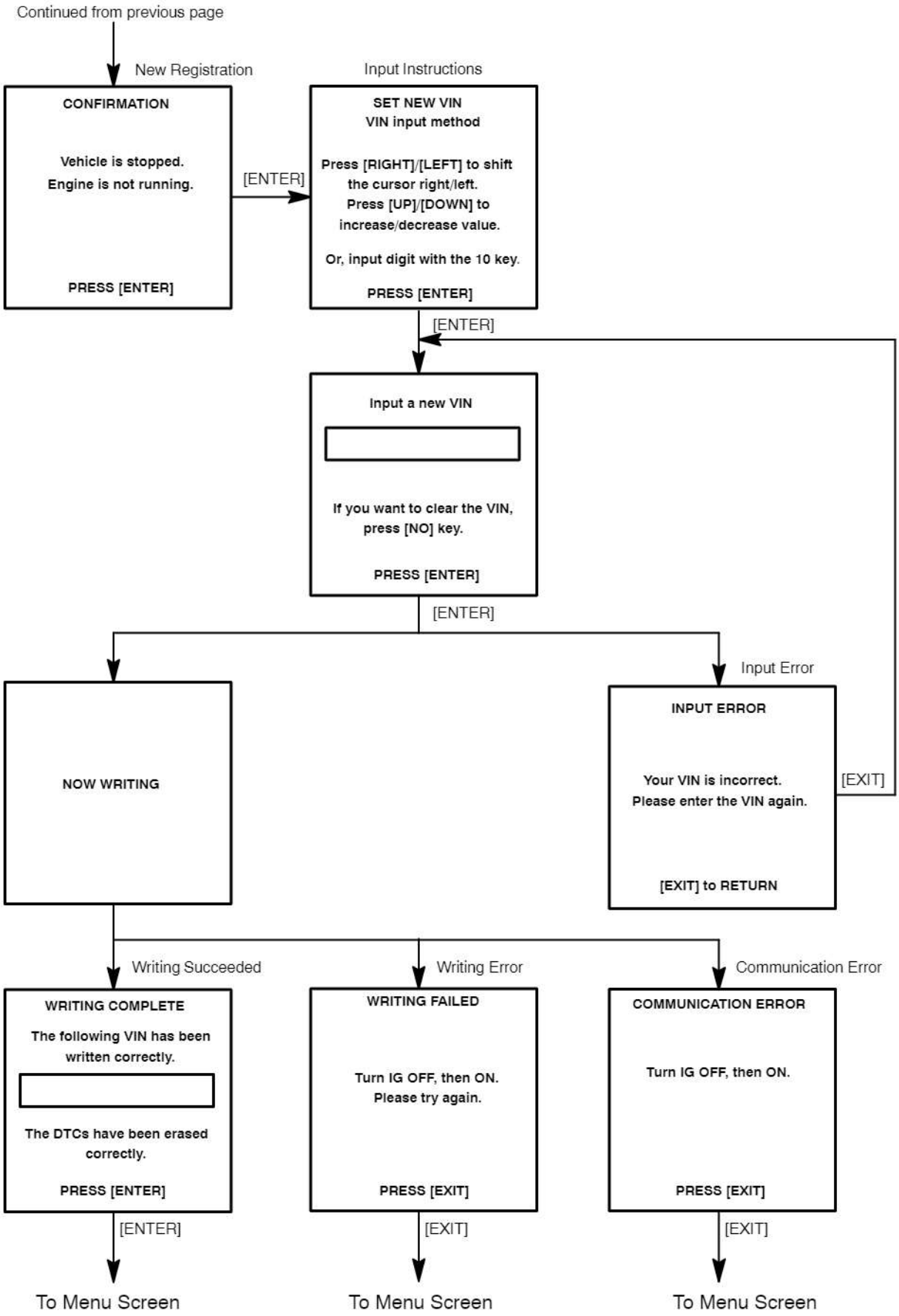
READ:



4. WRITE VIN

(a) Write VIN using the hand–held tester.




Continued from previous page
New Registration
Input Instructions
CONFIRMATION
Vehicle is stopped.
Engine is not running.
PRESS [ENTER]
[ENTER]
SET NEW VIN
VIN input method
Press [RIGHT]/[LEFT] to shift the cursor right/left.
Press [UP]/[DOWN] to increase/decrease value.
Or, input digit with the 10 key.
PRESS [ENTER]
[ENTER]
Input a new VIN
If you want to clear the VIN, press [NO] key.
PRESS [ENTER]
[ENTER]
NOW WRITING
Input Error
INPUT ERROR
Your VIN is incorrect.
Please enter the VIN again.
[EXIT] to RETURN
[EXIT]
Writing Succeeded
Writing Error
Communication Error
WRITING COMPLETE
The following VIN has been written correctly.
The DTCs have been erased correctly.
PRESS [ENTER]
WRITING FAILED
Turn IG OFF, then ON.
Please try again.
PRESS [EXIT]
COMMUNICATION ERROR
Turn IG OFF, then ON.
PRESS [EXIT]
[ENTER]
[EXIT]
[EXIT]
To Menu Screen
To Menu Screen
To Menu Screen

DIBQV–09

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 in the form of Diagnostic Trouble Codes (DTCs). Since the various components need to be monitored during different driving conditions, the OBD II system is designed to run separate monitoring programs called Readiness Monitors. Many state Inspection and Maintenance (I/M) programs require that vehicles complete their Readiness Monitors prior to beginning an emissions test.
- The current status of the Readiness Monitors can be seen by using the hand–held tester with version 9.0 software (or newer), or a generic OBD II Scan tool.
- To view the Readiness Monitor status using the hand–held tester, select "Monitor Status" from the Enhanced OBD II Menu.
- A status of "complete" indicates that the necessary conditions have been met to run the performance tests for the related Readiness Monitor.
- The Readiness Monitor will be reset to "incomplete" if:
  - ECM has lost power (battery or fuse).
  - DTCs have been cleared.
  - The conditions for running the Readiness Monitor have not been met.
- In the event that any Readiness Monitor shows "incomplete," follow the appropriate Readiness Monitor Drive Pattern to active the monitor and change the readiness status to "complete."

CAUTION:

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

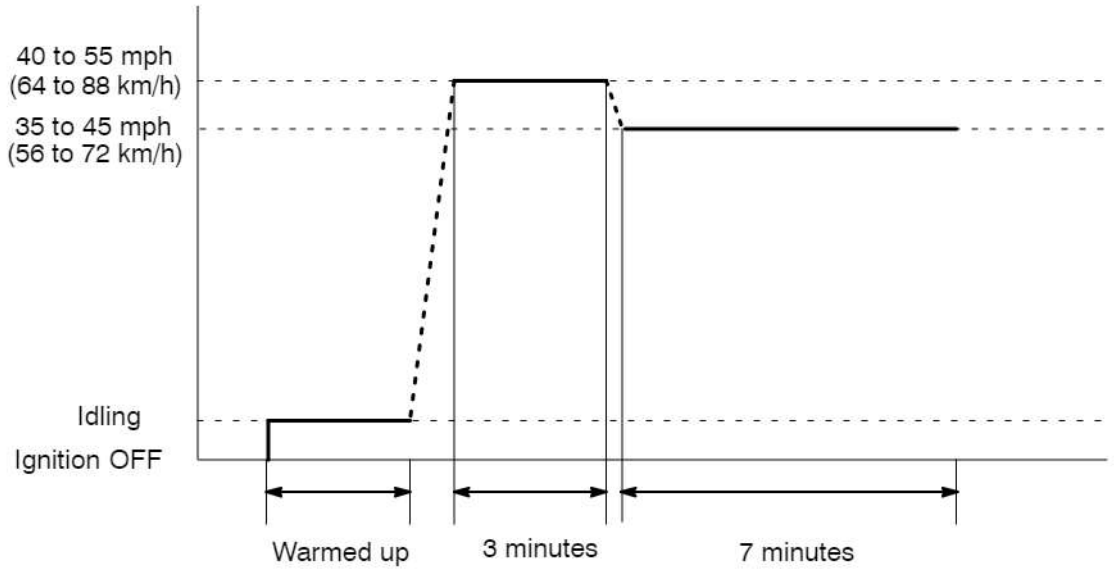
NOTICE:

These drive patterns represent the fastest method to satisfy all necessary conditions which allow the specific readiness monitor to complete.

In the event that the drive pattern must be interrupted (possibly due to traffic conditions or other factors) the drive pattern can be resumed, and in most cases, the readiness monitor will still set to "complete".

To ensure rapid completion of readiness monitors, avoid sudden changes in vehicle load and speed (driving up and down hills and/or sudden acceleration).

2. CATALYST MONITOR (O2S TYPE)



(a) Preconditions

The monitor will not run unless:

- MIL is OFF.
- Engine Coolant Temperature (ECT) is 75°C (167°F) or greater.
- Intake Air Temperature (IAT) is –10°C (14°F) or greater

NOTICE:

The readiness test can be completed in cold ambient conditions (less than –10°C / 14°F), if the drive pattern is repeated a second time after cycling the ignition off.

(b) Drive Pattern

(1) Connect the OBD II scan tool to the DLC3 to check monitor status and preconditions.

(2) Drive the vehicle at 40 to 55 mph (64 to 88 km/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 engine was started, drive the vehicle at 40 to 55 mph (64 to 88 km/h) for additional 4 minutes.

(3) Drive the vehicle at 35 to 45 mph (56 to 72 km/h) for approximately 7 minutes.

NOTICE:

Drive with smooth throttle operation and avoid sudden deceleration as much as possible with the throttle fully closed.

(4) If readiness status does not switch to complete, make sure that the preconditions are met and the ignition switch is turned OFF and then repeat steps (2) and (3).

(5) Release pressure in the fuel tank by removing and then reinstalling the fuel tank cap.

(6) Start the engine and immediately begin driving as directed.

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
- Altitude is 7,800 feet (2,400m) or less

(b) Cold Soak Procedure

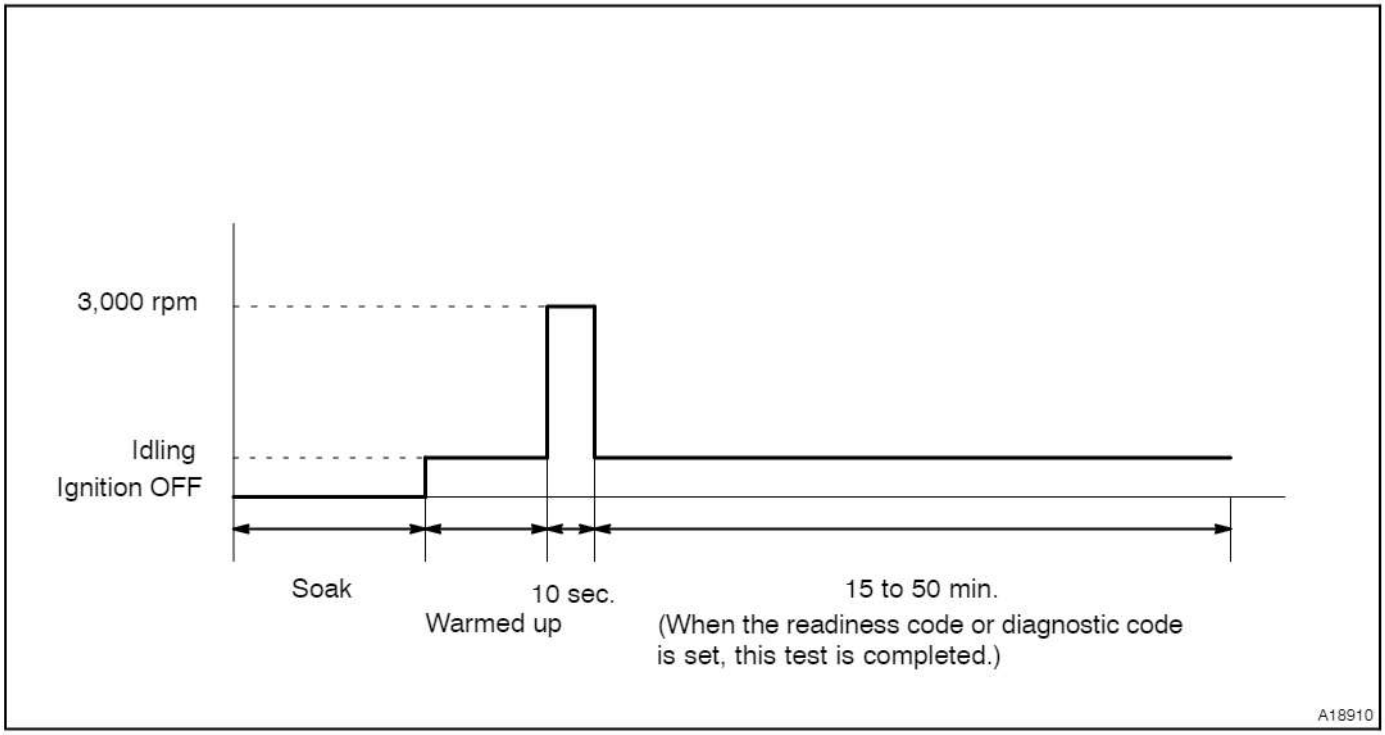
Let the vehicle cold soak for 8 hours or until the difference between IAT and ECT becomes less than 7°C (13°F)

HINT:

Examples:

- Scenario 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 difference between ECT and IAT is greater than 7°C (13°F)
- Scenario 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 difference between ECT and IAT is less than 7°C (13°F)

4. EVAP MONITOR (VACUUM PRESSURE MONITOR) (CONTINUED)



(a) Preconditions

The monitor will not run unless:

- MIL is OFF
- Fuel level is approximately 1/2 to 3/4
- Altitude is 7,800 feet (2,400 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)
- 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:

Examples:

- Scenario 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 difference between ECT and IAT is higher than 7°C (13°F)

- Scenario 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 difference between ECT and IAT is less than 7°C (13°F)

The readiness test can be completed in cold ambient conditions (less than 40°F / 4.4°C) and/or at high altitudes (more than 7,800 feet / 2,400 m) if the drive pattern is repeated a second time after cycling the ignition off.

(b) Drive Pattern

(1) Connect the OBDII scan tool to DLC3 to check monitor status and preconditions (refer to (a)).

(2) Release pressure in fuel tank by removing the fuel tank cap and then reinstall it.

(3) Start the engine and allow it to idle until ECT becomes 75°C (167°F) or higher.

(4) Run the engine at 3,000 rpm for approximately 10 seconds.

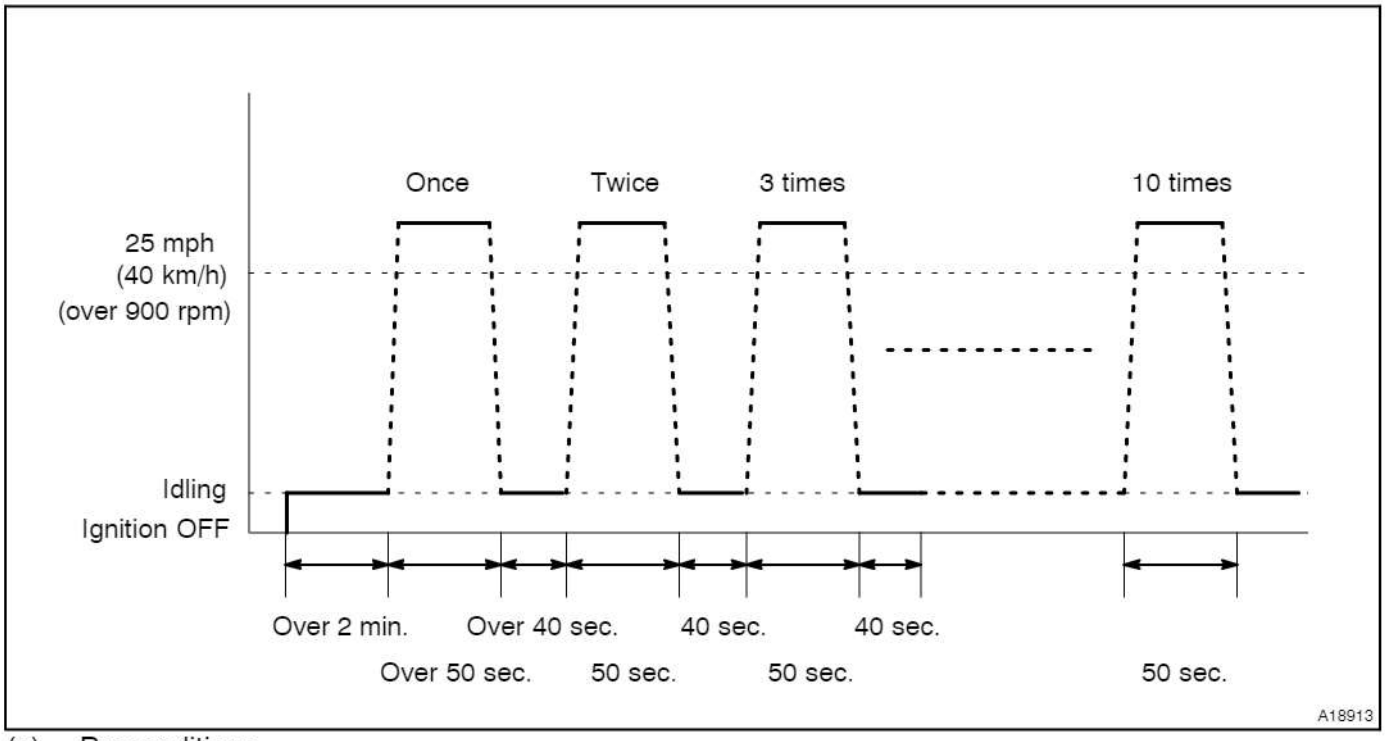
(5) Allow the engine to idle with the A/C ON (to create slight load) for 15 to 50 minutes.

NOTICE:

If the vehicle not equipped with A/C, put a slight load on the engine by doing the following :

- **Securely set the parking brake.**
- **Block the drive wheels with wheel chocks.**
- **Allow the vehicle to idle in drive for 15 to 50 minutes.**

5. 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 OBDII scan tool to DLC3 to check monitor status and preconditions (refer to (a)).

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

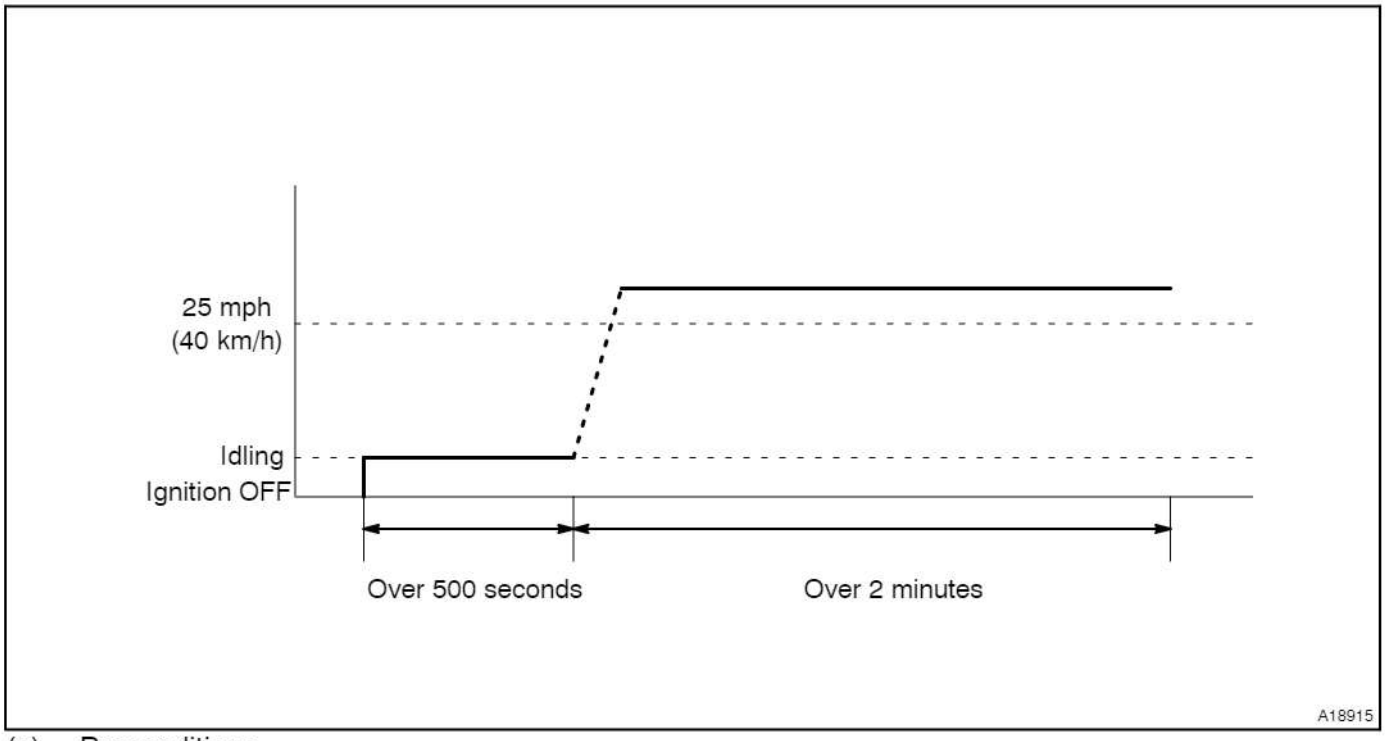
(3) Drive the vehicle at 25 mph (40 km/h) or more for at least 50 seconds.

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

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

(6) Check the status of the readiness monitor on the scan tool display. If readiness status did not switch to complete, ensure preconditions are met, turn the ignition off and then repeat steps (1) and (5).

6. OXYGEN SENSOR HEATER MONITOR



(a) Preconditions

The monitor will not run unless:

- MIL is OFF

(b) Drive Pattern

(1) Connect the OBDII scan tool to the DLC3 to check monitor status and preconditions (refer to (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 for at least 2 minutes.

(4) Check the status of the readiness monitor on the scan tool display. If readiness status did not switch to complete, ensure the preconditions are met, turn the ignition off and then repeat steps (2) and (3).

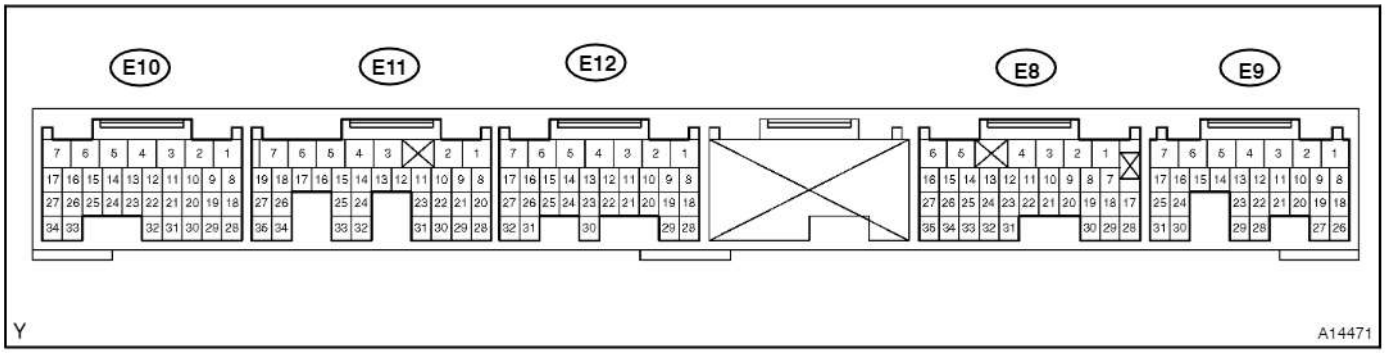
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PROBLEM SYMPTOMS TABLE

Symptom	Suspect Area	See page
Engine does not crank (Does not start)	2. Starter 3. Starter relay 4. Park/neutral position switch	ST–15 ST–17 DI–701
No initial combustion (Does not start)	1. ECM power source circuit 2. Fuel pump control circuit 3. Engine control module (ECM)	DI–652 DI–656 IN–30
No complete combustion (Does not start)	1. Fuel pump control circuit	DI–656
Engine cranks normally but difficult to start	1. Starter signal circuit 2. Fuel pump control circuit 3. Compression	DI–571 DI–656 EM–3
Difficult to start with cold engine	1. Starter signal circuit 2. Fuel pump control circuit	DI–571 DI–656
Difficult to start with hot engine	1. Starter signal circuit 2. Fuel pump control circuit	DI–571 DI–656
High engine idle speed (Poor idling)	1. A/C switch circuit 2. ECM power source circuit	– DI–652
Low engine idle speed (Poor idling)	1. A/C switch circuit 2. Fuel pump control circuit	– DI–656
Rough idling (Poor idling)	1. Compression 2. Fuel pump control circuit	EM–3 DI–656
Hunting (Poor idling)	1. ECM power source circuit 2. Fuel pump control circuit	DI–652 DI–656
Hesitation/Poor acceleration (Poor driveability)	1. Fuel pump control circuit 2. A/T faulty	DI–656 DI–698
Surging (Poor driveability)	1. Fuel pump control circuit	DI–656
Engine stalls soon after starting	1. Fuel pump control circuit	DI–656
Engine stalls during A/C operation	1. A/C switch circuit 2. Engine control module (ECM)	– IN–30
Unable to refuel/Difficult to refuel	1. ORVR system	–

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TERMINALS OF ECM



Each ECM terminals' standard voltage is shown in the table below. In the table, first follow the information under "Condition".
Look under "Symbols (Terminals No.)" for the terminals to be inspected.
The standard normal voltage between the terminals is shown under "STD Voltage".
Use the illustration above as a reference for the ECM terminals.

Symbols (Terminal No.)	Wiring Color	Condition	STD Voltage
+B (E9–1) – E1 (E12–1)	B–R – BR	IG switch ON	9 to 14 V
BATT (E9–3) – E1 (E12–1)	W–L – BR	Always	9 to 14 V
TBP (E9–4) – E1 (E12–1)	G–O – BR	IG Switch ON, Disconnect vacuum hose from VSV for pressure switching valve	9 to 14 V
TACH (E9–5) – E1 (E12–1)	BR–W – BR	Idling	Pulse generation
MREL (E9–8) – E1 (E12–1)	GR – BR	IG switch ON	9 to 14 V
IGSW (E9–9) – E1 (E12–1)	B–O – BR	IG switch ON	9 to 14 V
FC (E9–10) – E1 (E12–1)	G–R – BR	IG switch ON	9 to 14 V
W (E9–11) – E1 (E12–1)	R–B – BR	IG switch ON	Below 3.0 V
SIL (E9–18) – E1 (E12–1)	W – BR	During transmission	Pulse generation
PTNK (E9–21) – E2 (E10–28)	L–B – BR	Ignition switch ON	2.9 to 3.7 V
		Apply vacuum 4.0 kPa (30 mmHg, 1.18 in.Hg)	Below 0.5 V
VPA (E9–22) – EPA (E9–28)	L–Y – L–R	IG switch ON, Accelerator pedal released	0.3 to 0.9 V
		IG switch ON, Accelerator pedal depressed	3.2 to 4.8 V
VPA2 (E9–23) – EPA2 (E9–29)	L–O – LG–R	IG switch ON, Accelerator pedal released	1.8 to 2.7 V
		IG switch ON, Accelerator pedal depressed	4.7 to 5.1 V
VCPA (E9–26) – EPA (E9–28)	L–W – L–R	IG switch ON	4.5 to 5.5 V
VCP2 (E9–27) – EPA2 (E9–29)	L – LG–R	IG switch ON	4.5 to 5.5 V
ACMG (E8–2) – E1 (E12–1)	Y–O – BR	A/C switch ON (at idling)	Below 3.0 V
		A/C switch OFF	9 to 14 V
+BM (E8–6) – E1 (E12–1)	W–R – BR	Always	9 to 14 V
ST1– (E8–12) – E1 (E12–1)	R–Y – BR	Brake pedal is depressed	Below 1.5 V
		Brake pedal is released	7.5 to 14 V
SPD (E8–17) – E1 (E12–1)	W–R – BR	IG switch ON, Rotate driving wheel slowly	Pulse generation (See page DI–552)
STP (E8–19) – E1 (E12–1)	G–W – BR	Brake pedal is depressed	7.5 to 14 V
		Brake pedal is released	Below 1.5 V
M+ (E12–3) – E1 (E12–1) M– (E12–2) – E1 (E12–1)	B – BR W – BR	Idling	Pulse generation (See page DI–582)
HT1B (E12–6) – E1 (E12–1)	Y–G – BR	Idling	Below 3.0 V
		IG switch ON	9 to 14 V

EVP (E12–11) – E1 (E12–1)	G–Y – BR	IG switch ON	9 to 14 V
CCV (E12–12) – E1 (E12–1)	V–W – BR	IG switch ON	9 to 14 V
OCVL+ (E12–14) – OCVL– (E12–13)	L–W – L–B	Engine speed at 6,000 rpm or more	9 to 14 V
OCV+ (E12–16) – OCV– (E12–15)	G–O – W	IG switch ON	Pulse generation (See page DI–349)
G22+ (E12–27) – NE– (E10–34)	L – W	Idling	Pulse generation (See page DI–477)
KNK1 (E11–2) – EKNK (E11–1)	B – W	Maintain engine speed at 4,000 rpm after warming up	Pulse generation (See page DI–472)
HT1A (E11–4) – E1 (E12–1)	Y–R – BR	Idling	Below 3.0 V
		IG switch ON	9 to 14 V
STA (E11–9) – E1 (E12–1)	L – BR	Shift lever range P or N, ignition switch START	6.0 V or more
OX1A (E11–23) – E1 (E12–1) OX1B (E11–29) – E1 (E12–1)	B – BR R – BR	Maintain engine speed at 2,500 rpm for 90 sec. after warming up	Pulse generation (See page DI–494)
VG (E11–24) – EVG (E11–32)	G–W – Y–G	Idling, P or N range, A/C switch OFF	0.5 to 3.0 V
#10 (E10–1) – E01 (E10–7) #20 (E10–2) – E01 (E10–7) #30 (E10–3) – E01 (E10–7) #40 (E10–4) – E01 (E10–7)	L–R – W–B L–O – W–B L–B – W–B L – W–B	IG switch ON	9 to 14 V
		Idling	Pulse generation (See page DI–459)
IGT1 (E10–8) – E1 (E12–1) IGT2 (E10–9) – E1 (E12–1) IGT3 (E10–10) – E1 (E12–1) IGT4 (E10–11) – E1 (E12–1)	R–G – BR GR–R – BR G–R – BR R–Y – BR	Idling	Pulse generation (See page DI–486)
VC (E10–18) – E2 (E10–28)	R–B – BR	IG switch ON	4.5 to 5.5 V
THW (E10–19) – E2 (E10–28)	G – BR	Idling, Engine coolant temp. 80°C (176°F)	0.2 to 1.0 V
THA (E10–20) – E2 (E10–28)	Y–R – BR	Idling, Intake air temp. 20°C (68°F)	0.5 to 3.4 V
VTA (E10–21) – E2 (E10–28)	B–W – BR	IG switch ON, Accelerator pedal released	0.4 to 1.0 V
		IG switch ON, Accelerator pedal depressed	3.2 to 4.8 V
IGF (E10–24) – E1 (E12–1)	B–Y – BR	IG switch ON	4.5 to 5.5 V
		Idling	Pulse generation (See page DI–486)
NE+ (E10–27) – NE– (E10–34)	O – W	Idling	Pulse generation (See page DI–477)
VTA2 (E10–31) – E2 (E10–28)	B–L – BR	IG switch ON, Accelerator pedal released	2.0 to 2.9 V
		IG switch ON, Accelerator pedal depressed	4.7 to 5.1 V

DIAJX–03

DIAGNOSTIC TROUBLE CODE CHART

HINT:

Parameters listed in the chart may not be exactly the same as your reading due to the type of instrument or other factors.

If a malfunction code is displayed during the DTC check in check mode, check the circuit for the codes listed in the table below. For details of each code, refer to the page under the "See page" for the respective "DTC No." in the DTC chart.

DTC No. (See page)	Detection Item	Trouble Area	MIL*1	Memory
P0010 (DI–344)	Camshaft Position "A" Actuator Circuit (Bank 1)	• Open or short in oil control valve circuit • Oil control valve for VVT–i • ECM	○	○
P0011 (DI–349)	Camshaft Position "A" –Timing Over– Advanced or System Performance (Bank 1)	• Valve timing • Oil control valve for VVT–i • VVT controller assembly • ECM	○	○
P0012 (DI–349)	Camshaft Position "A" –Timing Over– Retarded (Bank 1)	• Same as DTC No. P0011	○	○
P0016 (DI–358)	Crankshaft Position – Camshaft Position Correlation (Bank 1 Sensor A)	• Mechanical system (Timing chain has a jumped tooth, chain is stretched) • ECM	○	○
P0031 (DI–360)	Oxygen Sensor Heater Control Circuit Low (Bank 1 Sensor 1)	• Open in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • EFI relay • ECM	○	○
P0032 (DI–360)	Oxygen Sensor Heater Control Circuit High (Bank 1 Sensor 1)	• Short in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • EFI relay • ECM	○	○
P0037 (DI–360)	Oxygen Sensor Heater Control Circuit Low (Bank 1 Sensor 2)	• Open in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • EFI relay • ECM	○	○
P0038 (DI–360)	Oxygen Sensor Heater Control Circuit High (Bank 1 Sensor 2)	• Short in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • EFI relay • ECM	○	○
P0100 (DI–366)	Mass or Volume Air Flow Circuit	• Open or short in mass air flow meter circuit • Mass air flow meter • ECM	○	○
P0101 (DI–372)	Mass or Volume Air Flow Circuit Range/Performance Problem	• Mass air flow meter	○	○
P0102 (DI–366)	Mass or Volume Air Flow Circuit Low Input	• Open or short in mass air flow meter circuit • Mass air flow meter • ECM	○	○
P0103 (DI–366)	Mass or Volume Air Flow Circuit High Input	• Open or short in mass air flow meter circuit • Mass air flow meter • ECM	○	○
P0110 (DI–375)	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 (DI–375)	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 (DI–375)	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 (DI–382)	Engine Coolant Temperature Circuit	• Open or short in engine coolant temperature sensor circuit • Engine coolant temperature sensor • ECM	○	○
P0116 (DI–389)	Engine Coolant Temperature Circuit Range/Performance Problem	• Cooling system • Engine coolant temperature sensor	○	○
P0117 (DI–382)	Engine Coolant Temperature Circuit Low Input	• Short in engine coolant temperature sensor circuit • Engine coolant temperature sensor • ECM	○	○
P0118 (DI–382)	Engine Coolant Temperature Circuit High Input	• Open in engine coolant temperature sensor circuit • Engine coolant temperature sensor • ECM	○	○
P0120 (DI–391)	Throttle Pedal Position Sensor/ Switch "A" Circuit	• Throttle position sensor • ECM	○	○
P0121 (DI–402)	Throttle/Pedal Position Sensor/ Switch "A" Circuit Range/Performance Problem	• Throttle position sensor	○	○
P0122 (DI–391)	Throttle/Pedal Position Sensor/ Switch "A" Circuit Low Input	• Throttle position sensor • VC circuit open • VTA1 circuit short • ECM	○	○
P0123 (DI–391)	Throttle/Pedal Position Sensor/ Switch "A" Circuit High Input	• Throttle position sensor • VTA1 circuit open • E2 circuit open • VC and VTA1 circuits are short–circuited • ECM	○	○
P0125 (DI–404)	Insufficient Coolant Temperature for Closed Loop Fuel Control	• Cooling system • Engine coolant temperature sensor • Thermostat	○	○
P0128 (DI–407)	Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature)	• Thermostat • Cooling system • Engine coolant temperature sensor • ECM	☑	☑
P0130 (DI–411)	Oxygen Sensor Circuit (Bank 1 Sensor 1)	• Open or short in heated oxygen sensor (bank 1 sensor 1) 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 (DI–422)	Oxygen Sensor Circuit Slow Response (Bank 1 Sensor 1)	• Open or short in heated oxygen sensor circuit (Bank 1 Sensor 1) • Heated oxygen sensor (Bank 1 Sensor 1) • EFI relay • Air induction system • Fuel pressure • Injector • ECM	○	○

P0134 (DI–431)	Oxygen Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	• Open or short in heated oxygen sensor (bank 1 sensor 1) circuit • Heated oxygen sensor (bank 1 sensor 1) • Heated oxygen sensor heater (bank 1 sensor 1) • EFI relay • Air induction system • Fuel pressure • PCV hose connection • PCV valve and hose • Injector • Gas leakage in exhaust system • PCV piping • ECM	○	○
P0136 (DI–439)	Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 2)	• Open or short in HO2 sensor (sensor 2) circuit • HO2 sensor (sensor 2) • HO2 sensor heater (sensor 2) • EFI relay	○	○
P0138 (DI–439)	Oxygen Sensor Circuit High Voltage (Bank 1 Sensor 2)	• HO2 sensor (sensor 2) • Short in HO2 sensor (sensor 2) circuit	○	○
P0171 (DI–446)	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 (bank 1, sensor 1) 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	○	○
P0172 (DI–446)	System too Rich (Bank 1)	• Injector leak, 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 (bank 1, sensor 1) circuit • Heated oxygen sensor (bank 1, sensor 1) • Heated oxygen sensor heater (bank 1, sensor 1) • EFI relay • ECM	○	○
P0220 (DI–391)	Throttle/Pedal Position Sensor/ Switch "B" Circuit	• Throttle position sensor • ECM	○	○
P0222 (DI–391)	Throttle/Pedal Position Sensor/ Switch "B" Circuit Low Input	• Throttle position sensor • VTA2 circuit short • VC circuit open • ECM	○	○
P0223 (DI–391)	Throttle/Pedal Position Sensor/ Switch "B" Circuit High Input	• Throttle position sensor • VTA2 circuit open • E2 circuit open • VC and VTA2 circuits are short–circuited • ECM	○	○

P0300 (DI–459)	Random/Multiple Cylinder Misfire Detected	• Open or short in engine wire • Connector connection • Vacuum hose connection • Ignition system • Injector • Fuel pressure • Mass air flow meter • Engine coolant temperature sensor • Compression pressure • Valve clearance • Valve timing • VVT–L system (locker arm) • PCV hose connection • PCV hose • ECM	○*2	○
P0301 (DI–459)	Cylinder 1 Misfire Detected		○*2	○
P0302 (DI–459)	Cylinder 2 Misfire Detected		○*2	○
P0303 (DI–459)	Cylinder 3 Misfire Detected		○*2	○
P0304 (DI–459)	Cylinder 4 Misfire Detected		○*2	○
P0327 (DI–472)	Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)	• Open or short in knock sensor 1 circuit • Knock sensor 1 (looseness) • ECM	○	○
P0328 (DI–472)	Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)	• Open or short in knock sensor 1 circuit • Knock sensor 1 (looseness) • ECM	○	○
P0335 (DI–477)	Crankshaft Position Sensor "A" Circuit	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Signal plate • ECM	○	○
P0339 (DI–477)	Crankshaft Position Sensor "A" Circuit Intermittent	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Signal plate • ECM	○	○
P0340 (DI–482)	Camshaft Position Sensor "A" Circuit (Bank 1 or Single Sensor)	• Open or short in camshaft position sensor circuit • Camshaft position sensor • Camshaft timing pulley • Timing chain has a jumped tooth • ECM	○	○
P0341 (DI–482)	Camshaft Position Sensor "A" Circuit Range/Performance (Bank 1 or Single Sensor)		○	○
P0351 (DI–486)	Ignition Coil "A" Primary/Secondary Circuit	• Open or short in IGF and IGT1 circuit from No. 1 ignition coil with igniter to ECM • No. 1 ignition coil with igniter • Ignition system • ECM	○	○
P0352 (DI–486)	Ignition Coil "B" Primary/Secondary Circuit	• Open or short in IGF and IGT2 circuit from No. 2 ignition coil with igniter to ECM • No. 2 ignition coil with igniter • Ignition system • ECM	○	○
P0353 (DI–486)	Ignition Coil "C" Primary/Secondary Circuit	• Open or short in IGF and IGT3 circuit from No. 3 ignition coil with igniter to ECM • No. 3 ignition coil with igniter • Ignition system • ECM	○	○
P0354 (DI–486)	Ignition Coil "D" Primary/Secondary Circuit	• Open or short in IGF and IGT4 circuit from No. 4 ignition coil with igniter to ECM • No. 4 ignition coil with igniter • Ignition system • ECM	○	○

P0420 (DI–494)	Catalyst System Efficiency Below Threshold (Bank 1)	• Gas leakage in exhaust system • Heated oxygen sensor • Three–way catalytic converter	○	○
P0441 (DI–501)	Evaporative Emission Control System Incorrect Purge Flow	• Vacuum hose is cracked, holed, blocked, damaged or disconnected ((1), (2), (3), (4), (5), (6), (7), (8), (9), (10) and (11) in Fig. 1) • Fuel tank cap is incorrectly installed • Fuel tank cap is cracked or damaged • Open or short in vapor pressure sensor circuit • Vapor pressure sensor • Open or short in VSV circuit for EVAP • EVAP VSV • Open or short in VSV circuit for CCV • CCV • Open or short in VSV circuit for pressure switching valve • Pressure switching valve • Fuel tank is cracked, holed or damaged • Charcoal canister is cracked, holed or damaged • Fuel tank over fill check valve is cracked or damaged • ECM	○	○
P0442 (DI–524)	Evaporative Emission Control System Leak Detected (Small Leak)	• Fuel tank cap is incorrectly installed • Fuel tank cap is cracked or damaged • Vacuum hose is cracked, blocked, damaged or disconnected ((1), (2), (3), (4), (5), (6), (7), (8), (9), (10) and (11) in Fig. 1) • Open or short in vapor pressure sensor circuit • Vapor pressure sensor • Open or short in VSV circuit for EVAP • EVAP VSV • Open or short in VSV circuit for CCV • CCV • Open or short in VSV circuit for pressure switching valve • Pressure switching valve • Fuel tank is cracked, or damaged • Charcoal canister is cracked, or damaged • Fuel tank over fill check valve is cracked or damaged • ECM	○	○
P0446 (DI–501)	Evaporative Emission Control System Vent Control Circuit	• Same as DTC No. P0441	○	○
P0451 (DI–545)	Evaporative Emission Control System Pressure Sensor/Switch Range/Performance	• Open or short in vapor pressure sensor circuit • Vapor pressure sensor • ECM	○	○
P0452 (DI–545)	Evaporative Emission Control System Pressure Sensor/Switch Low Input	• Open in vapor pressure sensor circuit • Vapor pressure sensor • ECM	○	○
P0453 (DI–545)	Evaporative Emission Control System Pressure Sensor/Switch High Input	• Short in vapor pressure sensor circuit • Vapor pressure sensor • ECM	○	○
P0456 (DI–524)	Evaporative Emission Control System Leak Detected (Very Small Leak)	• Same as DTC No. P0442	○	○
P0500 (DI–552)	Vehicle Speed Sensor "A"	• Combination meter • Open or short in vehicle speed sensor circuit • Vehicle speed sensor • ECM	○	○

P0503 (DI–552)	Vehicle Speed Sensor "A" Intermittent/Erratic/High	• Combination meter • Open or short in vehicle speed sensor circuit • Vehicle speed sensor • ECM	–	○
P0504 (DI–556)	Brake Switch "A"/"B" Correlation	• Short in stop lamp switch signal circuit • Stop lamp fuse • Stop lamp switch • ECM	–	○
P0505 (DI–562)	Idle Air Control System	• Air induction system • Electric throttle control system • Electric throttle control system circuit • PCV piping • ECM	○	○
P0560 (DI–566)	System Voltage	• Open in back–up power source circuit • EFI fuse • ECM	○	○
P0604 (DI–569)	Internal Control Module Random Access Memory (RAM) Error	• ECM	○	○
P0606 (DI–569)	ECM/PCM Processor	• ECM	○	○
P0607 (DI–569)	Control Module Performance	• ECM	○	○
P0617 (DI–571)	Starter Relay Circuit High	• Park/neutral position switch (A/T) • Clutch start switch (M/T) • Starter relay • Ignition switch • ECM	○	○
P0630 (DI–579)	VIN not Programmed or Mismatch – ECM/PCM	• ECM	○	○
P0657 (DI–569)	Actuator Supply Voltage Circuit / Open	• ECM	○	○
P1645 (DI–581)	Body ECU Malfunction	• Body ECU • A/C ECU • Communication bus	○	○
P2102 (DI–582)	Throttle Actuator Control Motor Circuit Low	• Open in throttle control motor circuit • Throttle control motor • ECM	○	○
P2103 (DI–582)	Throttle Actuator Control Motor Circuit High	• Short in throttle control motor circuit • Throttle control motor • Throttle valve • Throttle body assembly • ECM	○	○
P2111 (DI–586)	Throttle Actuator Control System – Stuck Open	• Throttle control motor circuit • Throttle control motor • Throttle body • Throttle valve	○	○
P2112 (DI–586)	Throttle Actuator Control System – Stuck Closed	• Same as DTC No. P2111	○	○
P2118 (DI–589)	Throttle Actuator Control Motor Current Range/Performance	• Open in ETCS power source circuit • ETCS fuse • ECM	○	○
P2119 (DI–594)	Throttle Actuator Control Throttle Body Range/Performance	• Electric throttle control system • ECM	○	○

P2120 (DI–597)	Throttle/Pedal Position Sensor/ Switch "D" Circuit	• Accelerator pedal position sensor • ECM	○	○
P2121 (DI–607)	Throttle/Pedal Position Sensor/ Switch "D" Circuit Range/Performance	• Accelerator pedal position sensor circuit • Accelerator pedal position sensor • ECM	○	○
P2122 (DI–597)	Throttle/Pedal Position Sensor/ Switch "D" Circuit Low Input	• Accelerator pedal position sensor • Open in VCP1 circuit • VPA circuit open or ground short • ECM	○	○
P2123 (DI–597)	Throttle/Pedal Position Sensor/ Switch "D" Circuit High Input	• Accelerator pedal position sensor • Open in EPA circuit • ECM	○	○
P2125 (DI–597)	Throttle/Pedal Position Sensor/ Switch "E" Circuit	• Accelerator pedal position sensor • ECM	○	○
P2127 (DI–597)	Throttle/Pedal Position Sensor/ Switch "E" Circuit Low Input	• Accelerator pedal position sensor • Open in VCP2 circuit • VPA2 circuit open or ground short • ECM	○	○
P2128 (DI–597)	Throttle/Pedal Position Sensor/ Switch "E" Circuit High Input	• Accelerator pedal position sensor • Open in EPA2 circuit • ECM	○	○
P2135 (DI–391)	Throttle Pedal Position Sensor/ Switch "A" / "B" Voltage Correlation	• VTA1 and VTA2 circuit are short–circuited • Throttle position sensor • ECM	○	○
P2138 (DI–597)	Throttle Pedal Position Sensor/ Switch "D" / "E" Voltage Correlation	• VPA and VPA2 circuit are short circuited • Accelerator pedal position sensor • ECM	○	○
P2195 (DI–411)	Oxygen Sensor Signal Stuck Lean (Bank 1 Sensor 1)	• Same as DTC No. P0130	○	○
P2196 (DI–411)	Oxygen Sensor Signal Stuck Rich (Bank 1 Sensor 1)		○	○
P2430 (DI–611)	Secondary Air Injection System Air Flow/Pressure Sensor Circuit Bank 1	• Pressure sensor • Open or short in pressure sensor circuit • Vacuum hose • Check valve • ECM	○	○
P2431 (DI–611)	Secondary Air Injection System Air Flow/Pressure Sensor Circuit Range/Performance Bank 1		○	○
P2432 (DI–611)	Secondary Air Injection System Air Flow/Pressure Sensor Circuit Low Bank 1		○	○
P2433 (DI–611)	Secondary Air Injection System Air Flow/Pressure Sensor Circuit Low Bank 1		○	○
P2440 (DI–617)	Secondary Air Injection System Switching Valve Stuck Open Bank 1	• VSV • Air switching valve • Open or short in VSV circuit • Pressure sensor • Open or short in pressure sensor circuit • ECM	○	○

P2441 (DI–617)	Secondary Air Injection System Switching Valve Stuck Closed Bank 1	• VSV • Air switching valve • Open or short in VSV circuit • Vacuum hose and check valve • Air injection hose • Pressure sensor • Open or short in pressure sensor circuit • ECM	○	○
P2444 (DI–628)	Secondary Air Injection System Pump Stuck On Bank 1	• Short in air pump circuit • Pressure sensor • Air pump assembly • Open or short in pressure sensor circuit • ECM	○	○
P2445 (DI–628)	Secondary Air Injection System Pump Stuck OFF Bank 1	• Air pump fuse • Vacuum hose • Air pump assembly • Open in air pump circuit • Secondary air injection system piping • Pressure sensor • Open or short in pressure sensor circuit • ECM	○	○
P2645 (DI–640)	OCV for VVTL Circuit (Bank 1)	• Open or short in oil control valve circuit • Oil control valve for VVT–L • Oil pressure switch for VVT–L • ECM	○	○
P2646 (DI–645)	OCV for VVTL Close Malfunction (Bank 1)	• Open or short in oil control valve circuit • Oil control valve for VVT–L • Oil pressure switch for VVT–L • ECM	○	○
P2647 (DI–645)	OCV for VVTL Open Malfunction (Bank 1)	• Open or short in oil control valve circuit • Oil control valve for VVT–L • Oil pressure switch for VVT–L • ECM	○	○

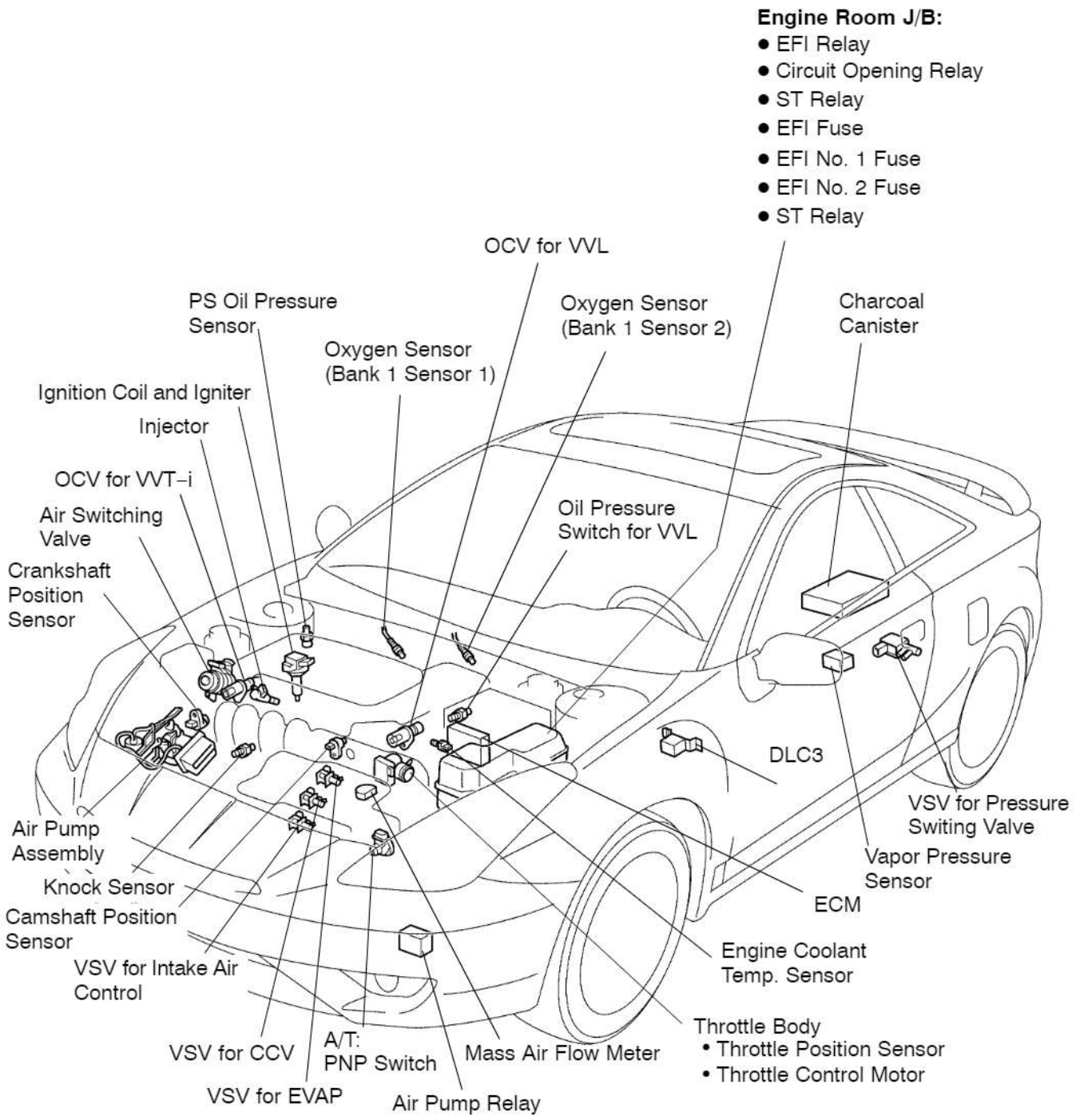
*1: MIL lights up.

*2: MIL lights up or blinks.

*: – .... MIL does not light up, ○ .... MIL lights up

DI37U–19

PARTS LOCATION



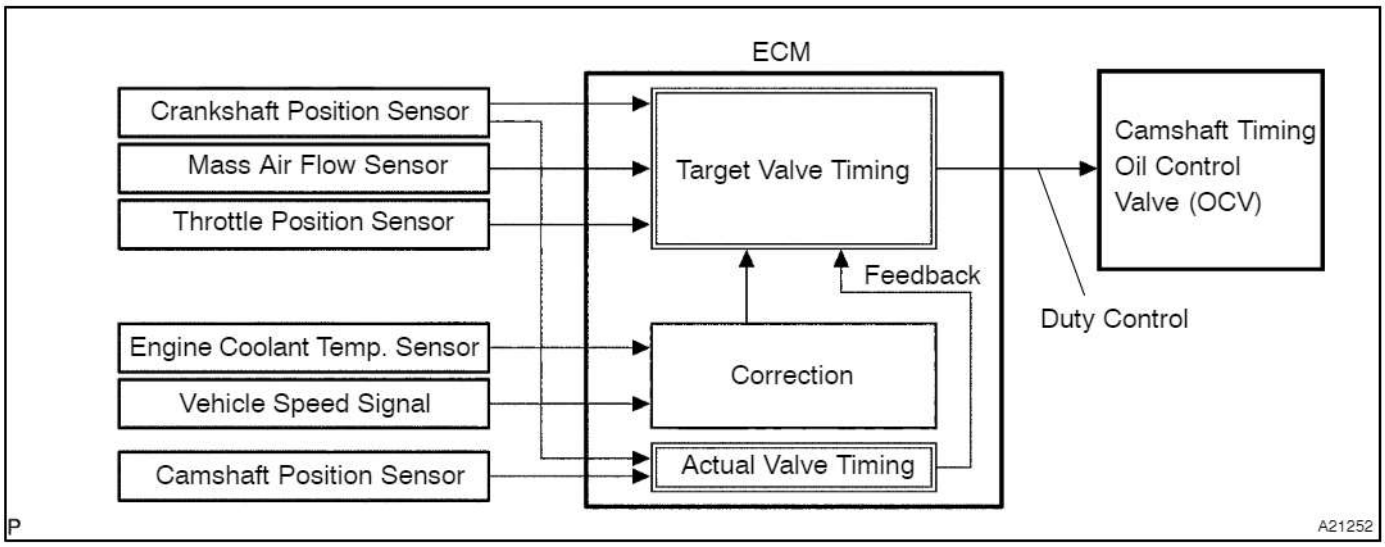
DIC75–02

CIRCUIT INSPECTION

DTC	P0010	Camshaft Position "A" Actuator circuit (Bank 1)

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, sent to the OCV, regulates the oil pressure applied to the VVT controller. Camshaft timing control is performed based on engine operation conditions such as the intake air volume, throttle position and engine coolant temperature. The ECM controls the OCV, based on the signals output from the sensors. The VVT controller regulates the intake camshaft angle using oil pressure through the OCV. As a result, the relative position between the camshaft and the crankshaft is optimized, and the engine torque and fuel economy improve, and exhaust emissions decrease under overall driving conditions. Also, the ECM detects the actual valve timing using signals from the camshaft position sensor and crankshaft position sensor, and performs the feedback control. This is how target valve timing is verified by the ECM.



DTC No.	DTC Detecting Condition	Trouble Area
P0010	Open or short in Oil Control Valve (OCV) circuit (1 trip detection logic)	• Open or short in oil control valve circuit • Oil control valve for VVT–i • ECM

MONITOR DESCRIPTION

After the ECM sends the "target" duty–cycle signal to the OCV (Oil Control Valve), the ECM monitors the OCV current to establish an "actual" duty–cycle. When the actual duty–cycle ratio varies from the target duty–ratio, the ECM sets a DTC.

MONITOR STRATEGY

Related DTCs	P0010	VVT oil control valve bank 1 range check
Required sensors/components	OCV	
Frequency of operation	Continuous	
Duration	1 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–295	
Battery Voltage	11 V	13 V
Target duty ratio	–	70%
Starter	OFF	
Current cut status	Not cut	

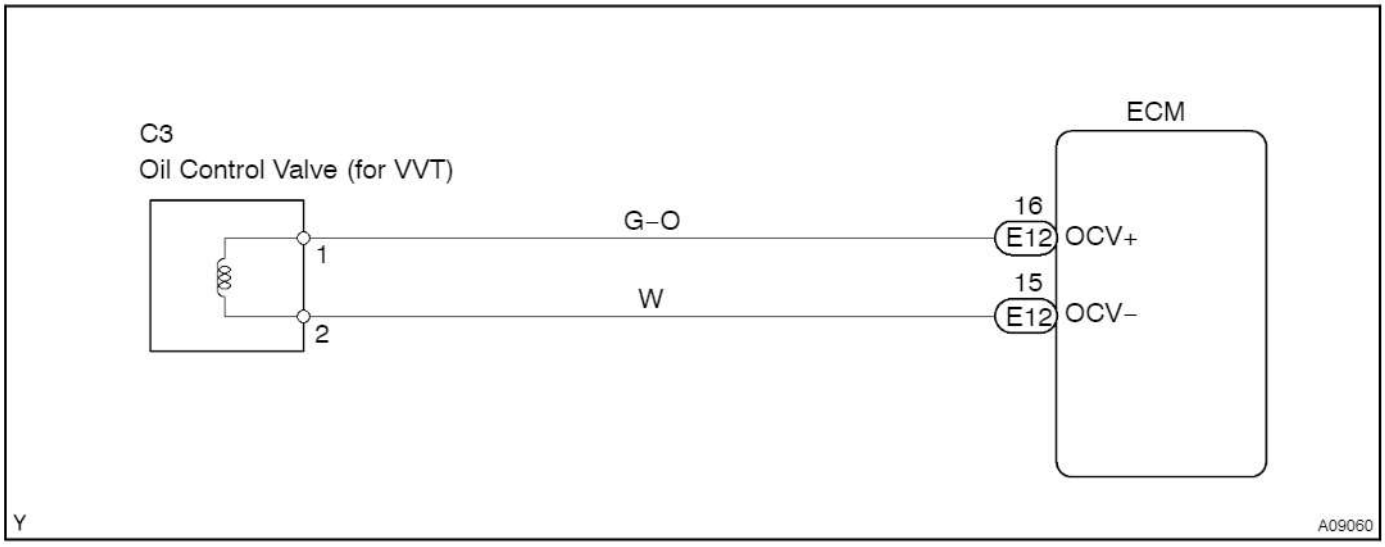
TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Either of the following condition is met:	A or B
A. Output signal duty for OCV	Output duty ratio is 100% (always ON) but target duty ratio is less than 70%
B. Output signal duty for OCV	Output duty ratio is 3% or less despite the ECM supplying the current to the OCV

COMPONENT OPERATING RANGE

Parameter	Standard Value
Output signal duty for OCV	Between 3% and 100%

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, as well as other data from the time when a malfunction occurred.

Hand–held tester:

1	**Check OCV circuit.**

PREPARATION:

(a) Connect the hand–held tester to the DLC3.
(b) Start the engine and warm it up.
(c) Turn the ignition switch ON and push the hand–held tester main switch ON.
(d) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / VVT CTRL B1.

CHECK:

Check the engine speed when operating the OCV by the hand–held tester.

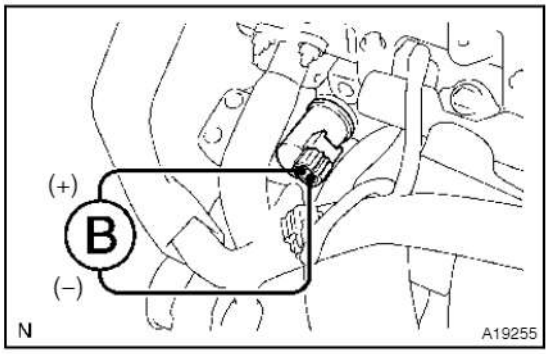
OK:

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 DI–295).**

NG

2	**Check operation of OCV.**



PREPARATION:

(a) Start the engine and warm it up.
(b) Disconnect the OCV connector.
(c) Apply battery voltage between the terminals of the OCV.

CHECK:

Check the engine speed.

OK:

Rough idle or engine stalled.

NG → **Replace OCV.**

OK

3	**Check for open and short in harness and connector between OCV and ECM (See page IN–30).**

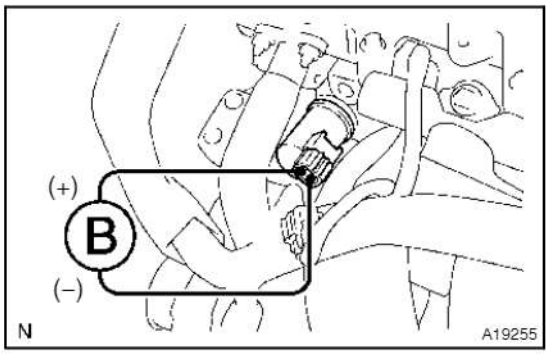
NG → **Repair or replace harness or connector.**

OK

Check and replace ECM (See page SF–78).

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

1	**Check operation of OCV.**



PREPARATION:

(a) Start the engine and warm it up.
(b) Disconnect the OCV connector.
(c) Apply battery voltage between the terminals of the OCV.

CHECK:

Check the engine speed.

OK:

Rough idle or engine stalled

NG → **Replace OCV.**

OK

2	**Check for open and short in harness and connector between OCV and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Check and replace ECM (See page SF–78).

DTC	P0011	Camshaft Position "A" –Timing Over–Advanced or System Performance (Bank 1)

DTC	P0012	Camshaft Position "A" –Timing Over–Retarded (Bank 1)

CIRCUIT DESCRIPTION

Refer to DTCs P0010 on page DI–344.

DTC No.	DTC Detecting Condition	Trouble Area
P0011	Advanced cam timing: After engine is warmed up and engine speed is at 550 to 4,000 rpm, condition (a) continues. (1 trip detection logic) (a) Valve timing does not change from current valve timing (The problem of the advanced OCV.)	• Valve timing • Oil control valve for VVT–i • VVT controller assembly • ECM
P0012	Retarded cam timing: After engine is warmed up and engine speed is at 550 to 4,000 rpm, condition (a) continues. (2 trip detection logic) (a) Valve timing does not change from current valve timing (The problem of the retarded OCV.)	• Same as DTC No. P0011

MONITOR DESCRIPTION

The ECM optimizes the valve timing using the VVT (Variable Valve Timing) system to control the intake valve camshaft. The VVT system includes the ECM, the OCV (Oil Control Valve) and the VVT controller. The ECM sends a target "duty–cycle" control signal to the OCV. This control signal, sent to the OCV, regulates the oil pressure applied to the VVT controller. The VVT controller can advance or retard the intake valve camshaft.
Example:
A DTC will be set if: 1) the difference between the target and actual valve timing is more than 5 degrees of the crankshaft angle (CA) and the condition continues for more than 4.5 sec.; 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.

MONITOR STRATEGY

Related DTCs	P0011	VVT system advanced (Bank 1)
	P0012	VVT system retarded (Bank 1)
Required sensors/components	Main sensors/components	Camshaft position sensor
	Related sensors/components	Engine coolant temperature sensor, Crankshaft position sensor
Frequency of operation	Once per driving cycle	
Duration	10 sec.	
MIL operation	P0011: Immediate P0012: 2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–295	
Battery voltage	11 V	–
Throttle position learning	Completed	
Engine RPM	550 rpm	4,000 rpm
Engine coolant temperature	75°C (167°F)	100°C (212°F)

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
OCV actiation	63 times or more
Deviation of valve timing	More than 10°CA (Crankshaft angle)
Response of valve timing	1 sec./°CA or more (Valve timing does not change)

WIRING DIAGRAM

Refer to DTCs P0010 on page DI–344.

INSPECTION PROCEDURE

HINT:

Advanced timing over (Valve timing is out of specified range)	P0011
Retarded timing over (Valve timing is out of specified range)	P0012

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, as well as other data from the time when a malfunction occurred.

Hand–held tester:

1	**Check valve timing (Check for loose and jumped tooth of timing chain) (See page EM–26).**

NG → **Adjust valve timing.**

OK

2	Check operation of OCV.

PREPARATION:

(a) Connect the hand–held tester to the DLC3.
(b) Start the engine and warm it up.
(c) Turn the ignition switch ON and push the hand–held tester main switch ON.
(d) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / VVT CTRL B1.

CHECK:

Check the engine speed when operating the OCV by the hand–held tester.

OK:

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.

PREPARATION:

(a) Clear the DTCs.
  (1) Operating the hand–held tool to erase the codes, or disconnect the battery terminal or remove the EFI fuse for more than 60 seconds.
(b) Start and warm up the engine.
(c) Drive the vehicle around for 10 minutes or more.

CHECK:

Read output DTCs using the hand–held tool.

OK:

No DTC output.

OK → **VVT system OK***

*: DTCs P0011 and P0012 are output when a foreign object in the engine oil enters the system. These codes will stay even if the system returns to normal after a short time. Foreign objects are filtered out by the oil filter.

NG ↓

4	Check oil control valve filter.

NG → Replace oil control valve filter.

OK

5	Check oil control valve (See page SF–54).

OK → Go to step 7.

NG

6	Replace oil control valve.

Go

7	Check VVT controller assembly (See page EM–50).

OK → Go to step 9.

NG

8	Replace VVT controller assembly (See page EM–44).

Go

9	Check blockage of OCV, oil check valve and oil pipe No. 1.

NG → Repair or replace.

OK

10	Check whether or not DTC P0011 or P0012 is stored.

PREPARATION:

(a) Clear the DTCs.
Operate the hand–held tester to erase the codes, or disconnect the battery terminal or remove the EFI fuse for more than 60 seconds.
(b) Start and warm up the engine.
(c) Drive the vehicle around for 10 minutes or more.

CHECK:

Read output DTC using the hand–held tester.

OK:

No DTC output.

OK → **VVT system is OK.***

*: DTCs P0011 and P0012 are output when a foreign object in the engine oil enters the system. These codes will stay 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 SF–78).

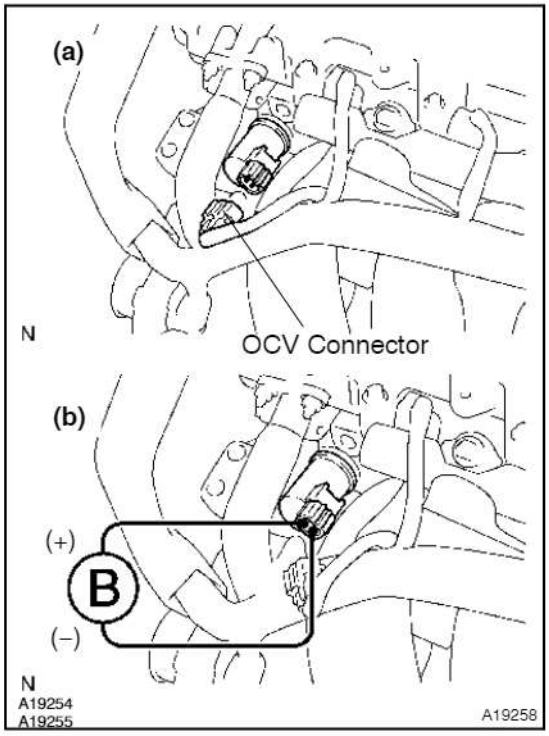
OBD II scan tool (excluding hand–held tester):

1	**Check valve timing (Check for looseness and jumped tooth of timing chain) (See page EM–26).**

NG → **Adjust valve timing.**

OK

2	**Check operation of OCV.**



PREPARATION:

Start the engine.

CHECK:

(a) Check the engine speed when disconnecting the OCV connector.

(b) Check the engine speed when applying battery voltage between the terminals of the OCV.

RESULT:

Result	Check (a)	Check (b)
1	Normal engine speed	Rough idle or engine stall
2	Except 1	

2 → **Go to step 4.**

1

3	**Check if DTC output reoccurs.**

PREPARATION:

(a) Clear the DTCs.
Operate the OBD II scan tool to erase the codes, or disconnect the battery terminal or remove the EFI fuse for more than 60 seconds.
(b) Start and warm up the engine.
(c) Drive the vehicle around for 10 minutes or more.

CHECK:

Read output DTCs using the OBD II scan tool.

OK:

No DTC output.

OK	**VVT system OK***

*: DTCs P0011 and P0012 are output when a foreign object in the engine oil enters the system. These codes will stay even if the system returns to normal after a short time. Foreign objects are filtered out by the oil filter.

NG

4	**Check oil control valve filter.**

NG	**Replace oil control valve filter.**

OK

5	**Check OCV (See page SF–54).**

OK	**Go to step 7.**

NG

6	**Replace OCV (See page EM–44).**

Go

7	Check VVT controller assembly (See page EM–50).

OK → Go to step 9.

NG

8	Replace VVT controller assembly (See page EM–44).

Go

9	Check blockage of OCV, oil check valve and oil pipe No. 1.

NG → Repair or replace.

OK

10	Check whether or not DTC P0011 or P0012 is stored.

PREPARATION:

(a) Clear the DTCs.
Operate the OBD II scan tool to erase the codes, or disconnect the battery terminal or remove the EFI fuse for more than 60 seconds.

(b) Start and warm up the engine.

(c) Drive the vehicle around for 10 minutes or more.

CHECK:

Read output DTC using the OBD II scan tool.

OK:

No DTC output.

OK → **VVT system is OK.***

*: DTCs P0011 and P0012 are output when a foreign object in the engine oil enters the system. These codes will stay 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 SF–78).

DIC76–02

DTC	P0016	Crankshaft Position – Camshaft Position Correlation (Bank 1 Sensor A)

CIRCUIT DESCRIPTION

Refer to P0335 on page DI–477.

DTC No.	DTC Detecting Condition	Trouble Area
P0016	Deviation in crankshaft position sensor signal and camshaft position sensor signal (2 trip detection logic)	• Mechanical system (Timing chain has a jumped tooth, chain is stretched) • ECM

MONITOR DESCRIPTION

The ECM optimizes the valve timing using the VVT (Variable Valve Timing) system to control the intake valve camshaft. The VVT system includes the ECM, the OCV (Oil Control Valve) and the VVT controller. The ECM sends a target duty–cycle control signal to the OCV. This control signal, sent to the OCV, regulates the oil pressure applied 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 is idling. The ECM closes the OCV to retard the cam. The ECM stores this value as VVT learning 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 learning 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 19°CA (crankshaft angle), or more than 41°CA.

(b) Above condition continues for more than 18 sec.

MONITOR STRATEGY

Related DTCs	P0016	Deviation in crankshaft position sensor signal and camshaft position sensor signal (Bank 1)
Required sensors/components	Crankshaft position sensor, Camshaft position sensor	
Frequency of operation	Once per driving cycle	
Duration	60 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–295	
Engine RPM	600 rpm	1,400 rpm

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Duration that either of the following conditions 1 or 2 is met:	18 sec. or more
1. VVT angle when camshaft is retarded maximum	Less than 19°CA
2. VVT angle when camshaft is retarded maximum	More than 41°CA

WIRING DIAGRAM

2005 CELICA (RM1131U)

Refer to DTC P0335 on page DI–477.

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, as well as other data from the time when a malfunction occurred.

1	**Check valve timing (Check for loosen and jumped tooth of timing chain).**

NG → **Adjust valve timing (Repair or replace timing chain).**

OK

Replace ECM (See page SF–78).

DIC77–02

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)

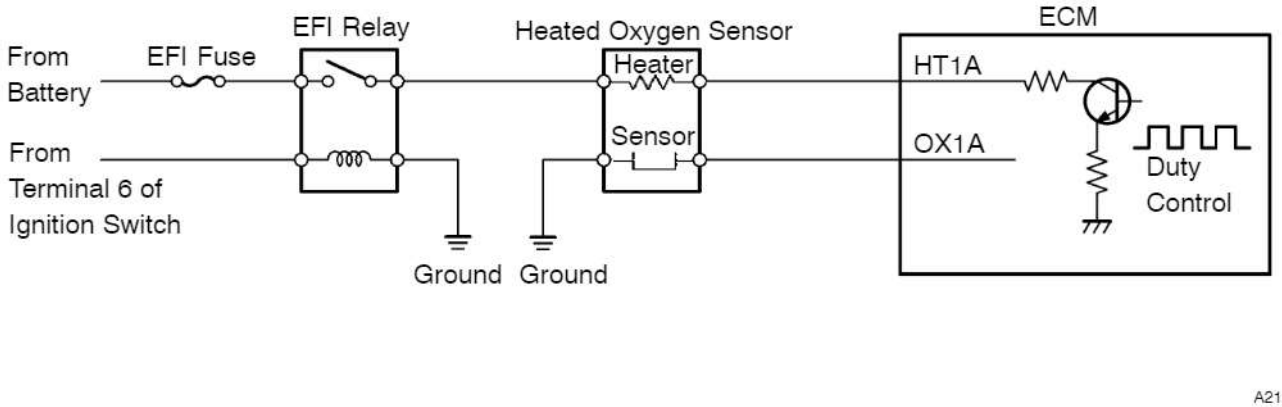
CIRCUIT DESCRIPTION

Refer to DTC P0130 on page DI–411.

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):



A21253

DTC No.	DTC Detection Condition	Trouble Area
P0031 P0037	Heater 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 • ECM
P0032 P0038	Heater current exceeds 3.5 A when heater operates (1 trip detection logic)	

HINT:

- Sensor 1 is to the sensor closer to the engine body.
- Sensor 2 is to the sensor farther away from the engine body.

MONITOR DESCRIPTION

The sending 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	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)
Required sensors/components	Main sensors/components	Heated oxygen sensor
	Related sensors/components	Vehicle speed sensor
Frequency of operation	Continuous	
Duration	0.2 sec.	
MIL operation	1 driving cycle	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–295	
P0031, P0037 (Low current):		
Either of the following conditions is met:	A or B	
A. Following conditions are met:	1, 2, 3, 4 and 5	
1. Time after engine start	250 sec.	500 sec.
2. Battery voltage	10.5 V	–
3. Vehicle speed	–	90 km/h (56 mph)
4. Misfire	Not detected	
5. Pass/Fail detection in this driving cycle	Not detected	
B. Following conditions are met:	1, 2, 3, 4 and 5	
1. Time after engine start	500 sec.	–
2. Battery voltage	10.5 V	–
3. Vehicle speed	64 km/h (40 mph)	–
4. Misfire	Not detected	
5. Pass/Fail detection in this driving cycle	Not detected	
P0032, P0038 (High current):		
Intrusive heating is OFF		

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P0031, P0037 (Low current):	
Heated oxygen sensor heater current	Less than 0.25 A (at 0.2 sec. after heater "ON")
P0032, P0038 (High current):	
Heated oxygen sensor heater current	More than 2 A (while intrusive heating is OFF)

COMPONENT OPERATING RANGE

Parameter	Standard Value
Heated oxygen sensor heater current under following conditions: • Engine is idling • Heated oxygen sensor is warmed up • Battery voltage is 11 to 14 V	0.4 to 1.0 A

MONITOR RESULT

Refer to page DI–295 for detailed information.

The test value and test limit information are described as shown in the following table. Check the monitor result and test values after performing the monitor drive pattern (see page DI–326).

- TID (Test Identification Data) is assigned to each emissions–related component.
- TLT (Test Limit Type):
  If TLT is 0, the component is malfunctioning when the test value is higher than the test limit.
  If TLT is 1, the component is malfunctioning when the test value is lower than the test limit.
- CID (Component Identification Data) is assigned to each test value.
- Unit Conversion is used to calculate the test value indicated on generic OBD II scan tools.

TID $04: HO2S heater

TLT	CID	Unit Conversion	Description of Test Data	Description of Test Limit
1	$01	Multiplied by 0.000076 (A)	Maximum HO2S heater current (Bank 1 Sensor 1)	Malfunction threshold for HO2S heater
1	$02	Multiplied by 0.000076 (A)	Maximum HO2S heater current (Bank 1 Sensor 2)	Malfunction threshold for HO2S heater

WIRING DIAGRAM

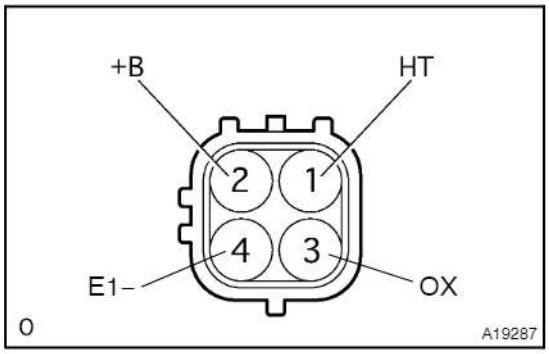
Refer to DTC P0130 on page DI–411.

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, as well as other data from the time when a malfunction occurred.

1	**Check resistance of heated oxygen sensor heater.**



PREPARATION:

Disconnect the heated oxygen sensor connector.

CHECK:

Measure resistance between the terminals HT and +B of the heated oxygen sensor.

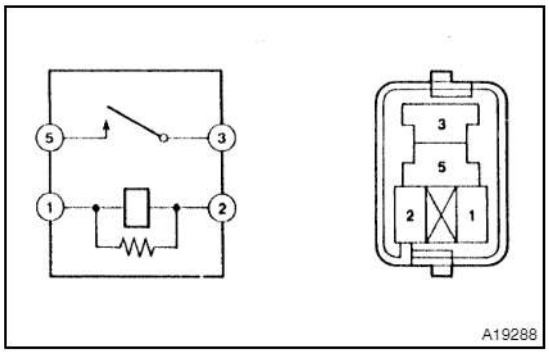
OK:

Resistance: 11 to 16 Ω (20°C)

NG	**Replace heated oxygen sensor.**

OK

2	Check EFI relay.



PREPARATION:

Remove the EFI relay from the engine room J/B.

CHECK:

Inspect the EFI relay.

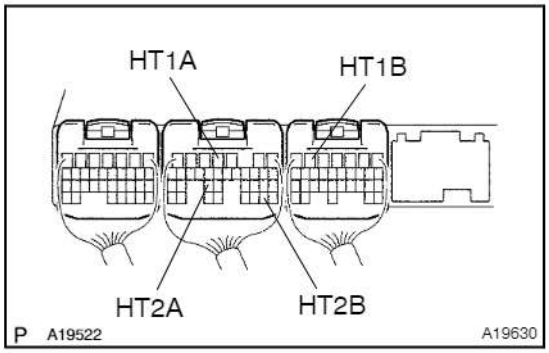
OK:

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

NG → **Replace EFI relay.**

OK

3	Check voltage between terminals HT1A, HT2A, HT1B, HT2B of ECM connectors and body ground.



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals HT1A, HT2A, HT1B, HT2B of the ECM connectors and body ground.

HINT:

- Connect terminal HT1A to bank 2 sensor 1.
- Connect terminal HT2A to bank 1 sensor 1.
- Connect terminal HT1B to bank 1 sensor 2.
- Connect terminal HT2B to bank 2 sensor 2.

OK:

Voltage: 9 to 14 V

OK → **Replace ECM (See page SF–78).**

NG

4	**Check for open and short in harness and connector between EFI main relay (Marking: EFI) and heated oxygen sensor, and heated oxygen sensor and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Replace ECM (See page SF–78).

D095-27

DTC	P0100	Mass or Volume Air Flow Circuit

DTC	P0102	Mass or Volume Air Flow Circuit Low Input

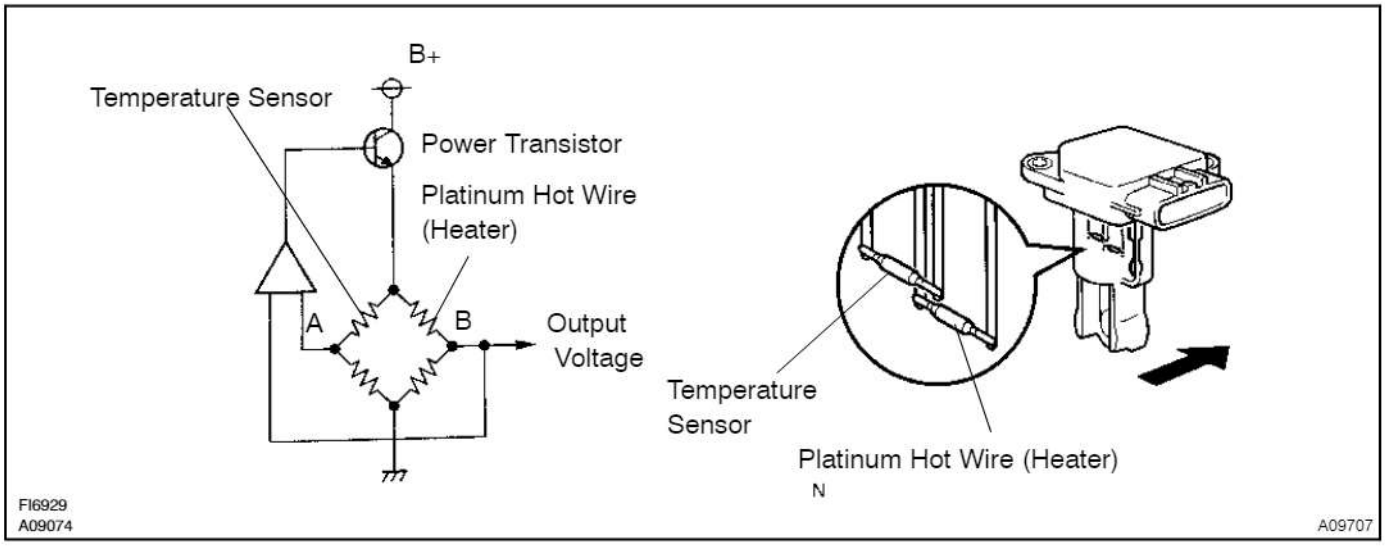
DTC	P0103	Mass or Volume Air Flow Circuit High Input

CIRCUIT DESCRIPTION

The MAF (Mass Air Flow) meter 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, 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 airflow through the sensor and the ECM interprets this voltage as the intake air amount.

The circuit is constructed so that the platinum hot wire and the 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 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	
P0103	When the mass air flow meter circuit has a short for more than 3 seconds under the 4,000 rpm engine speed	

HINT:

After confirming DTC P0100, P0102 or P0103, confirm the mass air flow ratio in the "DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL" using the hand–held tester or the OBD II scan tool.

Mass Air Flow Value (gm/sec.)	Malfunction
Approximately 0.0	• Mass air flow meter power source circuit open • VG circuit open or short
271.0 or more	• EVG circuit open

MONITOR DESCRIPTION

If there is a defect in the MAF (Mass Air Flow) meter 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:
The MAF meter voltage output is less than 0.2 V, or more than 4.9 V, and either the condition continues for more than 3 sec.

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	Mass air flow meter	
Frequency of operation	Continuous	
Duration	3 sec.	
MIL operation	Immediate (When engine speed is less than 4,000rpm) 2 driving cycles (When engine speed is 4,000 rpm or more)	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

The monitor will run whenever these DTCs are not present	See page DI–295
The typical enabling condition is not available	–

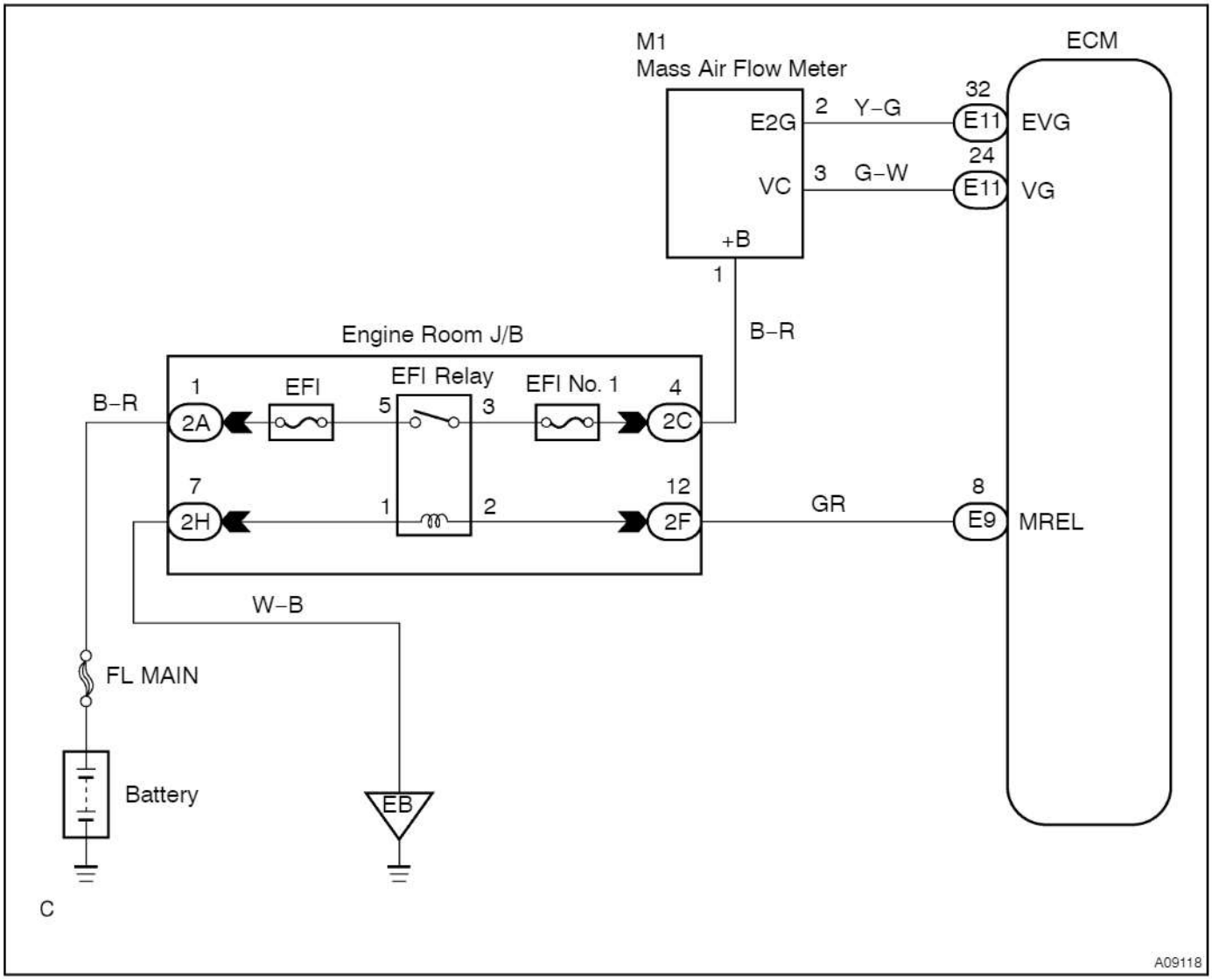
TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
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

Parameter	Standard Value
Mass air flow meter voltage	0.4 to 2.2 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, as well as other data from the time when a malfunction occurred.

1	**Connect OBD II scan tool or hand–held tester, and read value of mass air flow rate.**

PREPARATION:

(a) Connect the OBD II scan tool or hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the OBD II scan tool or hand–held tester main switch ON.
(c) Start the engine.
(d) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL/MAF.

CHECK:

Read the mass air flow rate on the OBD II scan tool or the hand–held tester.

RESULT:

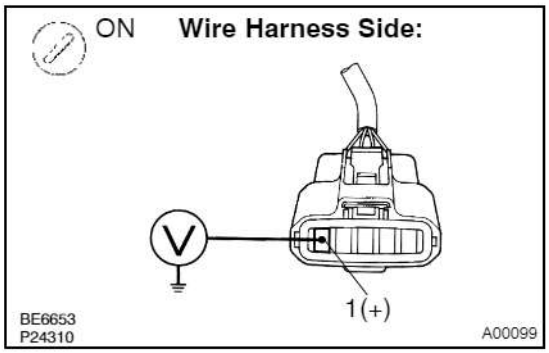
Air Flow Rate (gm/s)	Proceed to
0.0	A
271.0 or more	B
Between 1.0 and 270.0 (*1)	C

*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 DI–295).**

A

2	Check voltage of mass air flow meter power source.



PREPARATION:

(a) Disconnect the mass air flow meter connector.

(b) Turn ignition switch ON.

CHECK:

Measure voltage between terminal 1 of mass air flow meter connector and body ground.

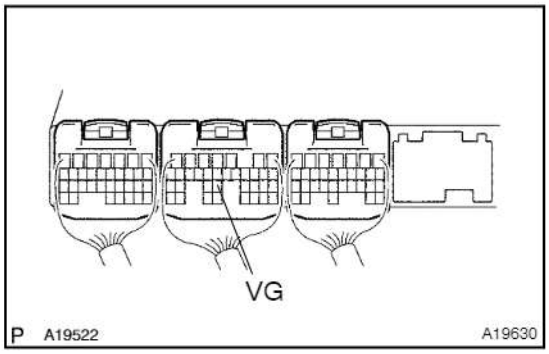
OK:

Voltage: 9 to 14 V

NG	Go to step 5.

OK

3	Check voltage between terminal VG of ECM connector and body ground.



PREPARATION:

(a) Remove the ECM cover.

(b) Start the engine.

CHECK:

Measure the voltage between terminal VG of the ECM connector and body ground while the engine is idling.

OK:

Voltage:

1.1 to 1.5 V (P or N position and A/C switch OFF)

OK	Replace ECM (See page SF–78).

NG

4	Check for open and short in harness and connector between mass air flow meter and ECM (See page IN–30).

NG	Repair or replace harness or connector.

OK

Replace mass air flow meter.

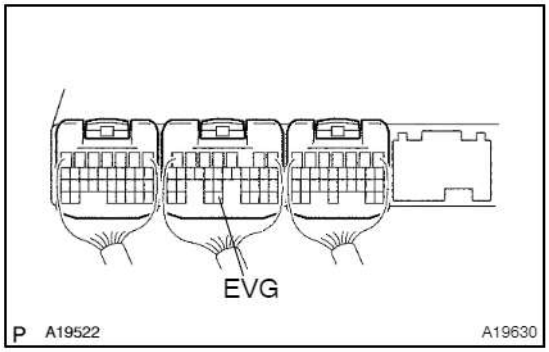
5	Check for open and short in harness and connector between EFI relay (Marking: EFI) and mass air flow meter.

NG → Repair or replace harness or connector.

OK →

Check ECM power source circuit (See page DI–652).

6	Check continuity between terminal EVG of ECM connector and body ground.



PREPARATION:
Remove the ECM cover.
CHECK:
Check the continuity between terminal EVG of the ECM connector and body ground.
OK:
Continuity (1 Ω or less)

NG → Replace ECM (See page SF–78).

OK →

7	Check for open in harness and connector between mass air flow meter and ECM (See page IN–30).

NG → Repair or replace harness or connector.

OK →

Replace mass air flow meter.

D09C–28

DTC	P0101	Mass or Volume Air Flow Circuit Range/ Performance Problem

CIRCUIT DESCRIPTION

Refer to DTC P0100 on page DI–372.

DTC No.	DTC Detecting Condition	Trouble Area
P0101	• High voltage: Conditions (a), (b) and (c) continue for more than 10 seconds (2 trip detection logic): (a) Engine speed less than 2,000 rpm (b) Engine coolant temperature 70°C (158°F) or higher (c) Voltage output of Mass Air Flow (MAF) meter more than 2.2 V (varies with Throttle Position [TP] sensor voltage) • Low voltage: Conditions (a) and (b) continue for more than 10 seconds (2 trip detection logic): (a) Engine speed more than 300 rpm (b) Voltage output of MAF meter less than 0.93 V (varies with TP sensor voltage)	• Mass air flow meter

MONITOR DESCRIPTION

The MAF (Mass Air Flow) meter 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 air flow through the MAF meter. The ECM interprets this voltage as the intake air amount. If there is a defect in the MAF meter 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 with idling or less than 0.4 V without idling, the ECM interprets this as a defect in the MAF meter and sets a DTC.

MONITOR STRATEGY

Related DTCs	P0101	Mass air flow meter rationality
Required sensors/components	Main sensors/components	Mass air flow meter
	Related sensors/components	Engine speed sensor, Engine coolant temperature sensor, Throttle position sensor
Frequency of operation	Continuous	
Duration	10 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–295	
High voltage:		
Engine RPM	–	2,000 rpm
MAF meter voltage	–	4.9 V
Engine coolant temperature	70°C (158°F)	–
Low voltage:		
Engine RPM	300 rpm	–
MAF meter voltage	0.2 V	–
Fuel cut	OFF	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
High voltage:	
Mass air flow meter voltage	More than 2.2 V (varies with throttle position sensor voltage)
Low voltage:	
Mass air flow meter voltage	Less than 0.65 V (varies with throttle position sensor voltage)

WIRING DIAGRAM

Refer to DTC P0100 on page DI–366.

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, as well as other data from the time when a malfunction occurred.

1	**Are there any other codes (besides DTC P0101) being output?**

PREPARATION:

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

CHECK:

Read the DTCs.

RESULT:

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

HINT:

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

B → **Replace mass air flow meter.**

A → **Go to relevant DTC chart (See page DI–335).**

DI37Z-18

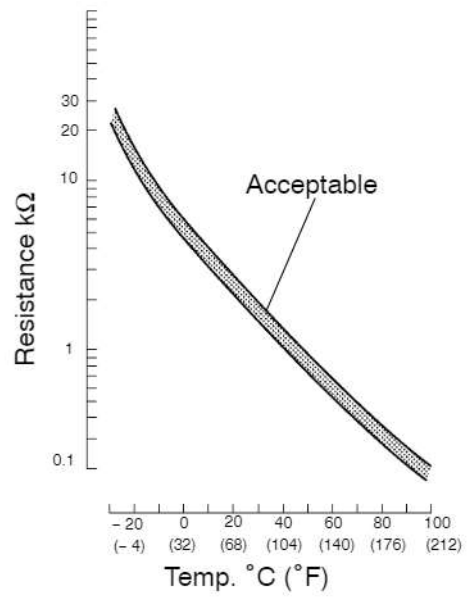
DTC	P0110	Intake Air Temperature Circuit

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 resistance varies 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 sec.	• 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 sec.	
P0113	Step 2	Open in intake air temperature sensor circuit for 0.5 sec.	

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

MONITOR DESCRIPTION

The ECM monitors the sensor voltage and uses this value to calculate the IAT (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:
The sensor voltage output is 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	Intake air temperature sensor	
Frequency of operation	Continuous	
Duration	0.5 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

The monitor will run whenever these DTCs are not present	See page DI–295
The typical enabling condition is not available	–

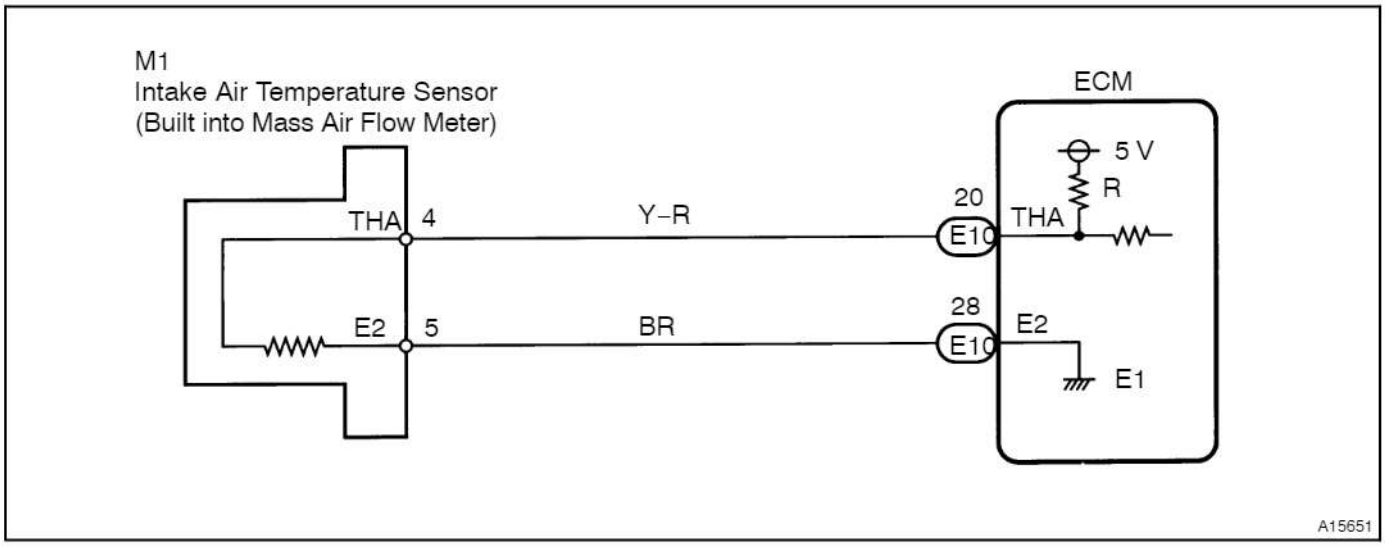
TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P0110:	
Intake air temperature sensor resistance (Intake air temperature)	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 (Intake air temperature)	Less than 98.5 Ω (More than 140°C (284°F))
P0113:	
Intake air temperature sensor resistance (Intake air temperature)	More than 156 kΩ (Less than –40°C (–40°F))

COMPONENT OPERATING RANGE

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

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, as well as other data from the time when a malfunction occurred.

1	**Connect OBD II scan tool or hand–held tester, and read value of intake air temperature.**

PREPARATION:

(a) Connect the OBD II scan tool or hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the OBD II scan tool or hand–held tester main switch ON.
(c) When using hand–held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL DADA / INTAKE AIR.

CHECK:

Read the temperature value on the OBD II scan tool or hand–held tester.

OK:

Same as actual intake air temperature and temperature displayed on the hand–held tester or OBD II scan tool.

RESULT:

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

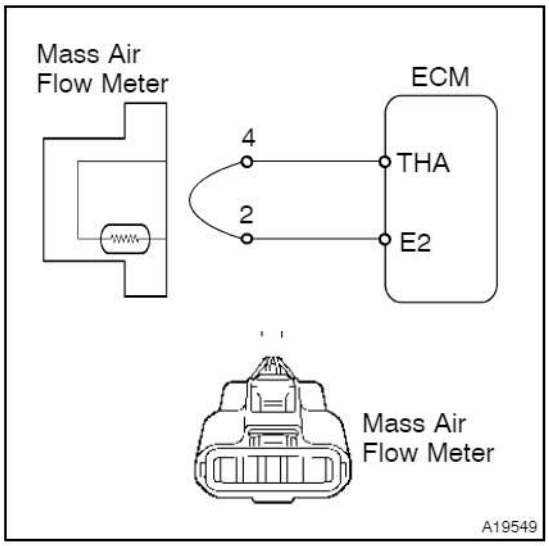
HINT:

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

B	**Go to step 4.**
C	**Check for intermittent problems (See page DI–295).**

A

2	Check for open in harness or ECM.



PREPARATION:

(a) Disconnect the mass air flow meter connector.
(b) Connect the sensor wire harness terminals together.
(c) Turn the ignition switch ON.
(d) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL DADA / INTAKE AIR.

CHECK:

Read the temperature value on the OBD II scan tool or hand–held tester.

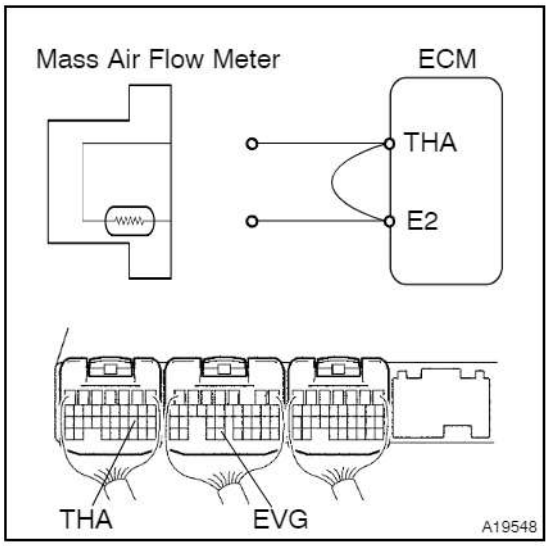
OK:

Temperature value: 140°C (284°F) or more

OK	**Confirm good connection at sensor. If OK, replace mass air flow meter.**

NG

3	Check for open in harness or ECM.



PREPARATION:

(a) Remove the ECM cover.
(b) Connect between terminals THA and EVG of the ECM connector.
(c) Turn the ignition switch ON.

HINT:

The mass air flow meter connector is disconnected. Before checking, do a visual and contact pressure checks for the ECM connector (See page IN–30).

(d) When using hand–held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL DADA / INTAKE AIR.

CHECK:

Read the temperature value on the OBD II scan tool or hand–held tester.

OK:

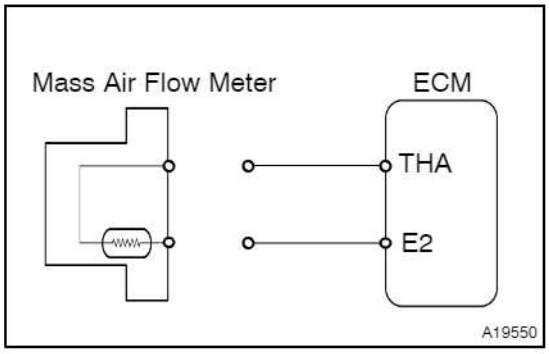
Temperature value: 140°C (284°F) or more

OK	Repair or replace harness or connector.

NG

Confirm good connection at ECM. If OK, replace ECM (See page SF–78).

4	Check for short in harness and ECM.



PREPARATION:

(a) Disconnect the mass air flow meter connector.
(b) Turn the ignition switch ON.
(c) When using hand–held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL DADA / INTAKE AIR.

CHECK:

Read the temperature value on the OBD II scan tool or hand–held tester.

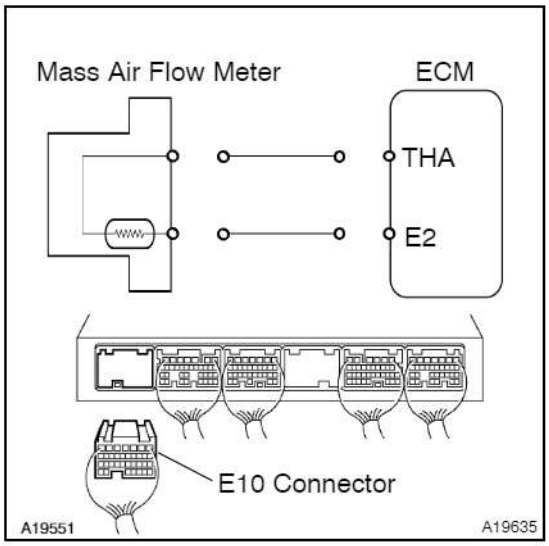
OK:

Temperature value: –40°C (–40°F)

OK	Replace mass air flow meter.

NG

5	Check for short in harness or ECM.



PREPARATION:

(a) Remove the ECM cover.

(b) Disconnect the E10 connector from the ECM.

HINT:

The mass air flow meter connector is disconnected.

(c) Turn the ignition switch ON.

(d) When using hand–held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL DADA / INTAKE AIR.

CHECK:

Read the temperature value on the OBD II scan tool or hand–held tester.

OK:

Temperature value: –40°C (–40°F)

OK	Repair or replace harness or connector.

NG

Replace ECM (See page SF–78).

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 into 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 are the same as the Intake Air Temperature (IAT) sensor.
HINT:
If the ECM detects the DTC P0115, it operates 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 sec.	• 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 sec.	
P0118	Step 2	Open in engine coolant temperature sensor circuit for 0.5 sec.	

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

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

MONITOR DESCRIPTION

The ECT (Engine Coolant Temperature) 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 resistance varies as output voltage from the sensor changes.
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:
The ECM calculates that the ECT is less than –40°C (–40°F), or more than 140°C (284°F), and either condition continues for 0.5 sec. or more, the ECM will set a DTC.

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	Engine coolant temperature sensor	
Frequency of operation	Continuous	
Duration	0.5 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

The monitor will run whenever these DTCs are not present	See page DI–295
The typical enabling condition is not available	–

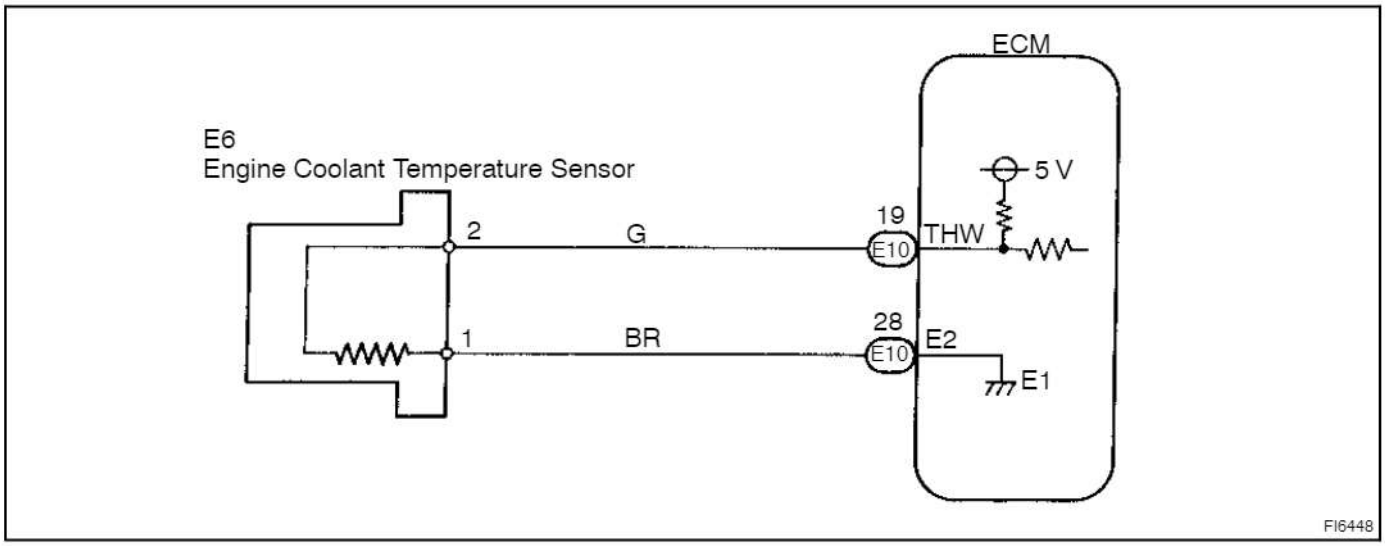
TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P0115:	
Engine coolant temperature sensor resistance (coolant temperature)	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 (coolant temperature)	Less than 79 Ω (More than 140°C (284°F))
P0118:	
Engine coolant temperature sensor resistance (coolant temperature)	More than 156 kΩ (Less than –40°C (–40°F))

COMPONENT OPERATING RANGE

Parameter	Standard Value
Engine coolant temperature sensor resistance	79 Ω (140°C (284°F)) to 156 kΩ (–40°C (–40°F))

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, as well as other data from the time when a malfunction occurred.

1	**Connect OBD II scan tool or hand–held tester, and read value of engine coolant temperature.**

PREPARATION:

(a) Connect the OBD II scan tool or hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the OBD II scan tool or hand–held tester main switch ON.
(c) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL DADA / COOLANT TEMP.

CHECK:

Read the temperature value on the OBD II scan tool or hand–held tester.

OK:

Same as actual engine coolant temperature and temperature displayed on the hand–held tester or the OBD II scan tool.

RESULT:

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

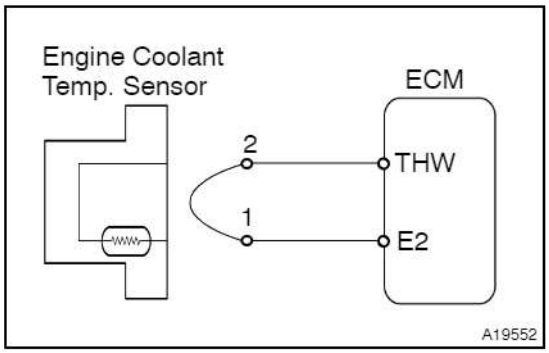
HINT:

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

B	**Go to step 4.**
C	**Check for intermittent problems (See page DI–295).**

A

2	Check for open in harness or ECM.



PREPARATION:

(a) Disconnect the engine coolant temp. sensor connector.
(b) Connect the sensor wire harness terminals together.
(c) Turn the ignition switch ON.
(d) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL DADA / COOLANT TEMP.

CHECK:

Read the temperature value on the OBD II scan tool or hand–held tester.

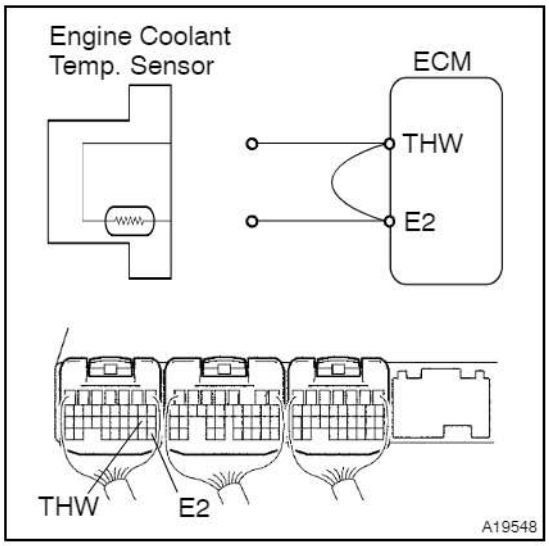
OK:

Temperature value: 140°C (284°F) or more

OK	Confirm good connection at sensor. If OK, replace engine coolant temperature sensor.

NG

3	Check for open in harness or ECM.



PREPARATION:

(a) Remove the ECM cover.

(b) Connect between terminals THW and E2 of the ECM connector.

HINT:

The engine coolant temperature sensor connector is disconnected. Before checking, do a visual and contact pressure checks for the ECM connector (See page IN–30).

(c) Turn the ignition switch ON.

(d) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL DADA / COOLANT TEMP.

CHECK:

Read the temperature value on the OBD II scan tool or hand–held tester.

OK:

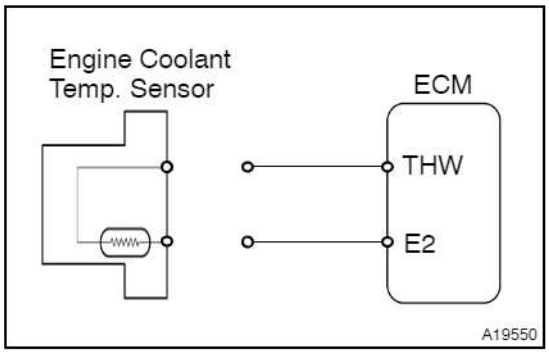
Temperature value: 140°C (284°F) or more

OK	Open in harness between terminals E2 and THW, repair or replace harness.

NG

Confirm good connection at ECM. If OK, replace ECM (See page SF–78).

4	Check for short in harness and ECM.



PREPARATION:

(a) Disconnect the engine coolant temperature sensor connector.
(b) Turn the ignition switch ON.
(c) When using hand–held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL DADA / COOLANT TEMP.

CHECK:

Read the temperature value on the OBD II scan tool or hand–held tester.

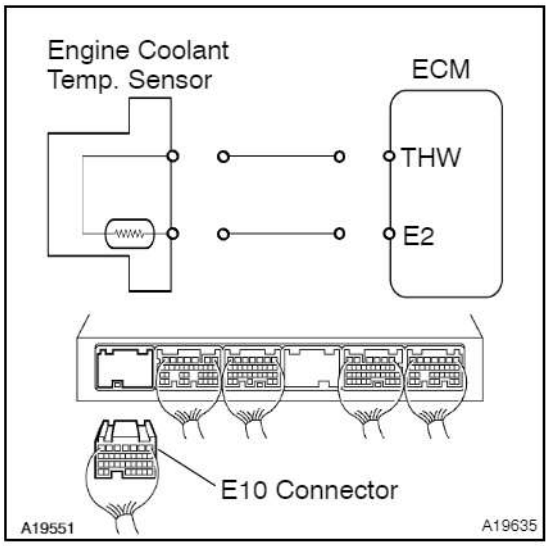
OK:

Temperature value: –40°C (–40°F)

OK	Replace engine coolant temperature sensor.

NG

5	Check for short in harness or ECM.



PREPARATION:

(a) Remove the ECM cover.
(b) Disconnect the E10 connector from the ECM.

HINT:

The engine coolant temperature sensor connector is disconnected.

(c) Turn the ignition switch ON.
(d) When using hand–held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL DADA / COOLANT TEMP.

CHECK:

Read the temperature value on the OBD II scan tool or hand–held tester.

OK:

Temperature value: –40°C (–40°F)

OK	Repair or replace harness or connector.

NG

Replace ECM (See page SF–78).

DTC	P0116	Engine Coolant Temperature Circuit Range/ Performance Problem

CIRCUIT DESCRIPTION

Refer to DTC P0115 on page DI–382.

DTC No.	DTC Detecting Condition	Trouble Area
P0116	The engine coolant temperature is 35°C (95°F) or more but less than 60°C (140°F) when the engine is started, and 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)	• Engine coolant temperature sensor
	• The engine coolant temperature is more than 60°C (140°F) when the engine is started and the vehicle has accelerated and decelerated • The engine coolant temperature sensor records a temperature variation of below 1°C (1.8°F) successively 6 times (6 trip detection logic)	

MONITOR DESCRIPTION

The ECT (Engine Coolant Temperature) 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 ECT is between 35°C (95°F) and 60°C (140°F). If, after driving for 250 sec., the ECT still remains within 3°C (5.4°F) of the starting temperature, a DTC will be set (2 trip detection logic).

(2) Upon starting the engine, the ECT is over 60°C (140°F). If, after driving for 250 sec., 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 range check (Stuck)
Required sensors/components	Main sensors/components	Engine coolant temperature sensor
Required sensors/components	Related sensors/components	Intake air temperature sensor, Crankshaft position sensor, Mass air flow meter
Frequency of operation	Continuous	
Duration	250 sec.	
MIL operation	2 driving cycles (When temperature is fixed between 35°C (95°F) and 60°C (140°F)) 6 driving cycles (When temperature is fixed at 60°C (140°F) or more)	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–295	
Case 1 (When temperature is fixed between 35°C (95°F) and 60°C (140°F)):		
Cumulative idle off period	250 sec.	–
Speed increased by 30 km/h (18.6 mph) or more	10 times	–
Engine coolant temperature	35°C (95°F)	60°C (140°F)
Intake air temperature after engine start	–6.7°C (20°F)	–
Case 2 (When temperature is fixed at 60°C (140°F) or more):		
Engine coolant temperature at engine start	60°C (140°F)	–
Intake air temperature	–6.7°C (20°F)	–
Stop and go	Once or more (Stop for 20 sec. or more and accelerate to more than 70 km/h (43.5 mph) within 40 sec.)	
Steady driving and stop *	Once or more	

*: Vehicle is driven at 65 km/h (40.4 mph) or more for 30 sec. or more and the vehicle speed reaches 70 km/h (43.5 mph). The vehicle is decelerated from 65 km/h (40.4 mph) to 3 km/h (1.86 mph) or less within 35 sec. and stopped for 10 sec.

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Case1 (When temperature is fixed between 35°C (95°F) and 60°C (140°F)):	
Change of engine coolant temperature value	Less than 3°C (5.4°F)
Case2 (When temperature is fixed at 60°C (140°F) or more):	
Change of engine coolant temperature value	1°C (1.8°F) or less

COMPONENT OPERATING RANGE

Standard Value
Engine coolant temperature changes with the 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 shorted. 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, as well as other data from the time when a malfunction occurred.

Replace engine coolant temperature sensor.

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 Correction

HINT:
This is repair procedure of ”throttle position sensor”.

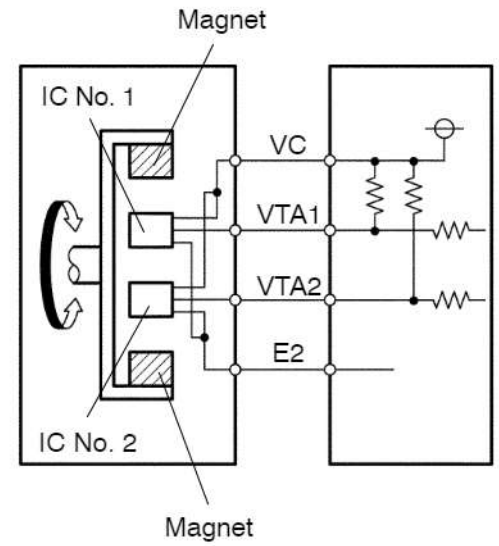
CIRCUIT DESCRIPTION

HINT:

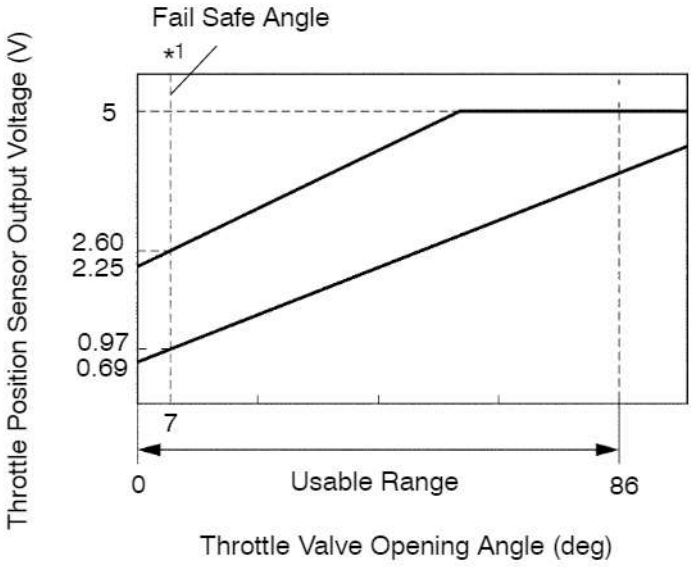
- This Electrical Throttle Control System (ETCS) does not use a throttle cable.
- This throttle position sensor is a non–contact type.

The throttle position sensor is mounted on the throttle body. 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 is used to detect the throttle opening angle and VTA2 is used to detect malfunctions in VTA1. Voltage applied to VTA1 and VTA2 changes between 0 V and 5 V depending on the opening angle of the throttle valve. This sensor includes 2 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 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



Throttle Valve Fully Closed
(Throttle opening position expressed as percentage
(VAT1) 0 to 20 %)

Throttle Valve Fully Opened
(Throttle opening position expressed as percentage
(VAT1) 64 to 96 %)

*1 : Fail Safe Angle 7°
(Throttle opening position expressed as percentage
(VAT1) 8 to 20 %)

A19802

DTC No.	DTC Detection Condition	Main trouble
Condition (a) of DTC P0120, P0122, P0123, P0220, P0222 or P0223 continues for 10 sec. with idling, but for 2 sec. without idling (Open or short in throttle position sensor circuit)		
P0122	(a) VTA1 ≦ 0.2 V	• Throttle position sensor • VTA1 circuit short • VC circuit open • ECM
P0123	(a) VTA1 ≧ 4.8 V	• Throttle position sensor • VTA1 circuit open • E2 circuit open • VC and VTA1 circuits are short–circuited • ECM
P0120	Detection conditions for DTCs P0122 and P0123 are not satisfied but condition (a) is satisfied (a) VTA1 ≦ 0.2 V or VTA1 ≧ 4.8 V	• Throttle position sensor • ECM
P0222	(a) VTA2 ≦ 0.5 V	• Throttle position sensor • VTA2 circuit short • VC circuit open • ECM
P0223	(a) VTA2 ≧ 4.8 V and 0.2 ≦ VTA1 ≦ 1.8 V	• Throttle position sensor • VTA2 circuit open • E2 circuit open • VC and VTA2 circuits are short–circuited • ECM
P0220	Detection conditions for DTCs P0222 and P0223 are not satisfied but condition (a) is satisfied (a) VTA2 ≦ 0.5 V or VTA2 ≧ 4.8 V and 0.2 ≦ VTA1 ≦ 1.8 V	• Throttle position sensor • ECM
P2135	Condition (a) continues for 0.5 sec. or more, or condition (b) continues for 0.4 sec. or more: (a) |VTA1 – VTA2| ≦ 0.02 V (b) VTA1 ≦ 0.2 V and VTA2 ≦ 0.5 V	• VTA1 and VTA2 circuits are short–circuited • Throttle position sensor • ECM

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 means the VTA2 signal.

Reference (Normal condition):

Tester display	Accelerator pedal released	Accelerator pedal fully depressed
THROTTLE POS	6 to 20 %	64 to 96 %
THROTTLE POS #2	2.15 to 3.05 V	4.5 to 5.5 V

MONITOR DESCRIPTION

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

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

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

(b) VTA1 and VTA2 have each 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 the difference between VTA1 and VTA2 is within 0.02 V, the ECM interprets this as a short circuit in the throttle position sensor system and will set a DTC.

FAIL SAFE

If the ETCS (Electronic Throttle Control System) 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 infection (intermittent fuel–cut) and ignition timing in accordance with the accelerator pedal opening angle to enable the vehicle to continue at a minimum 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 (sensor 1) range check (Fluttering)
	P0122	Throttle position sensor (sensor 1) range check (Low voltage)
	P0123	Throttle position sensor (sensor 1) range check (High voltage)
	P0220	Throttle position sensor (sensor 2) range check (Fluttering)
	P0222	Throttle position sensor (sensor 2) range check (Low voltage)
	P0223	Throttle position sensor (sensor 2) range check (High voltage)
	P2135	Throttle position sensor range check (Correlation)
Required sensors/components	Throttle position sensor	
Frequency of operation	Continuous	
Duration	2 sec.: Accelerator pedal ON 10 sec.: Accelerator pedal OFF	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

The monitor will run whenever these DTCs are not present	See page DI–295
Throttle control motor power	ON

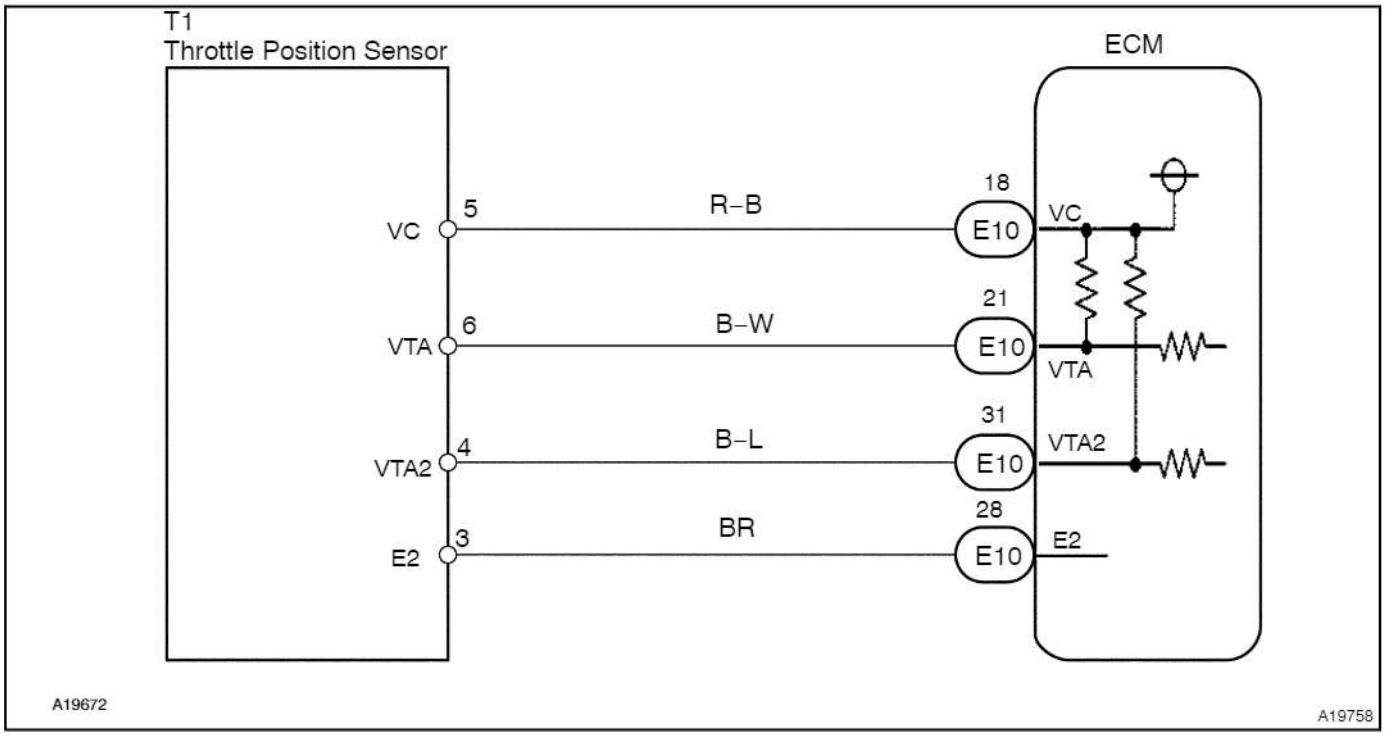
TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
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:	
VTA2 voltage	0.5 V or less, or 4.97 V or more
P0222:	
VTA2 voltage	0.5 V or less
P0223:	
Both of the following conditions are met:	A and B
A. VTA1 voltage	0.2 V or more and 1.8 V or less
B. VTA2 voltage	4.97 V or more
P2135:	
Difference between VTA1 and VTA2 voltages	0.02 V or less
Both of the following conditions are met:	A and B
A. VTA1 voltage	0.2 V or less
B. VTA2 voltage	0.5 V or less

COMPONENT OPERATING RANGE

Parameter	Standard Value
Throttle position sensor VTA1 voltage	0.6 to 3.96 V
Throttle position sensor VTA2 voltage	2.25 to 5.0 V

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, as well as other data from the time when a malfunction occurred.

Hand–held tester:

1	**Connect hand–held tester, and read the voltage for throttle position sensor data.**

PREPARATION:

(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) Enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / THROTTLE POS and THROTTLE POS#2.

CHECK:

Read the voltage for the accelerator pedal position sensor data.

OK:

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	
about 16 % (Fail safe)	0 to 0.2 or 4.5 to 5.5 V	about 16 % (Fail safe)	0 to 0.2 or 4.5 to 5.5 V	VTA2 circuit open or ground short	
6 to 20 %	2.15 to 3.05 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.**

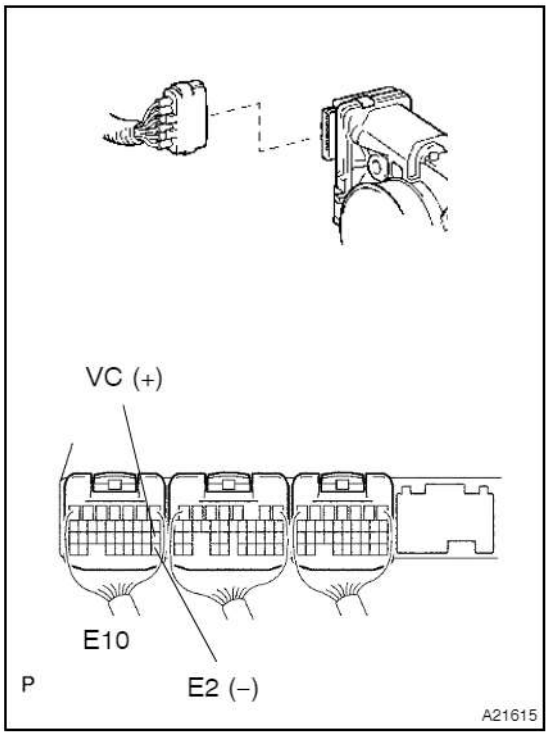
A

2	**Check for open and short in harness and connector in VC, VTA1, VTA2 and E2 circuits between ECM and throttle position sensor (See page IN–30).**

NG	**Repair or replace harness or connector.**

OK

3	Check voltage between terminals VC and E2 of ECM connector.



PREPARATION:

(a) Remove the ECM cover.
(b) Turn the ignition switch ON.
(c) Disconnect the throttle position sensor connector.

CHECK:

Measure the voltage between terminals VC and E2 of the ECM connector.

OK:

Voltage: 4.5 to 5.5 V

NG → **Replace ECM (See page SF–78).**

OK

4	Replace throttle body (See page SF–42).

Go

5	Check if DTC output recur.

PREPARATION:

(a) Clear the DTC (See page DI–295).
(b) Start the engine.
(c) Run the engine at idle for 15 seconds or more.

CHECK:

Read the DTC (See page DI–295).

RESULT:

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

OK → **System is OK.**

NG

Replace ECM (See page SF–78).

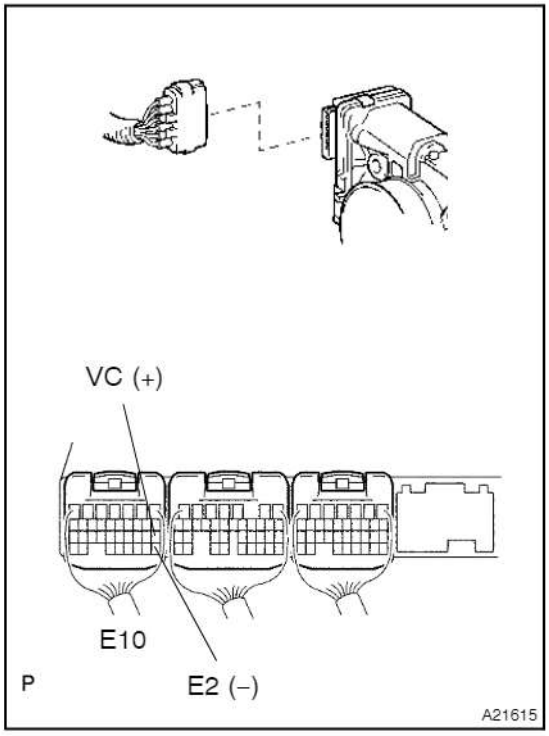
OBD II scan tool (excluding hand–held tester):

1	**Check for open and short in harness and connector in VC, VTA1, VTA2 and E2 circuits between ECM and throttle position sensor (See page IN–30)**

NG → **Repair or replace harness and connector.**

OK

2	**Check voltage between terminals VC and E2 of ECM connector.**



PREPARATION:

(a) Remove the ECM cover.
(b) Turn the ignition switch ON.
(c) Disconnect the throttle position sensor connector.

CHECK:

Measure the voltage between terminals VC and E2 of the ECM connector.

OK:

Voltage: 4.5 to 5.5 V

NG → **Replace ECM (See page SF–78).**

OK

3	**Replace throttle body (See page SF–42).**

Go

4	Check if DTC output recur.

PREPARATION:

(a) Clear the DTC (See page DI–295).
(b) Start the engine.
(c) Run the engine at idle for 15 seconds or more.

CHECK:

Read the DTC (See page DI–295).

RESULT:

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

B → **System is OK.**

A

Replace ECM (See page SF–78).

DI383–16

DTC	P0121	Throttle/Pedal Position Sensor/Switch "A" Circuit Range/Performance Problem

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

CIRCUIT DESCRIPTION

Refer to DTC P0120 on page DI–391.

DTC No.	DTC Detecting Condition	Trouble Area
P0121	Condition (a) continues for 10 sec. with idling, but for 2 sec. without idling : (a) Difference between VTA and VTA2 is out of threshold	Throttle body Assy (Throttle position sensor)

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.
There is a specific voltage difference between VTA1 and VTA2 for each throttle opening angle.
If the voltage output difference between the VTA1 and VTA2 deviates from the normal operating range, the ECM interprets this as a malfunction of the throttle position sensor. The ECM will turn on the MIL and a DTC is set.

FAIL SAFE

If the ETCS (Electronic Throttle Control System) 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 infection (intermittent fuel–cut) and ignition timing in accordance with the accelerator pedal opening angle to enable the vehicle to continue at a minimum 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 rationality
Required sensors/components	Main sensors/components	Throttle position sensor
	Related sensors/components	Vehicle speed sensor
Frequency of operation	Continuous	
Duration	2 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITION

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–295	
Either of the following conditions is met:	Condition 1 or 2	
1. Ignition switch	ON	
2. ETCS power	ON	
Throttle sensor open/short malfunction	Not detected	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
TP sensor 1 – [TP sensor 2 x 0.8 (corrected by learning value)]	Less than 0.8 V, or more than 1.6 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, as well as other data from the time when a malfunction occurred.

Replace throttle position sensor (See page SF–42).

DIC78–02

DTC	P0125	Insufficient coolant temperature for closed loop fuel control

CIRCUIT DESCRIPTION

Refer to DTC P0115 on page DI–382.

DTC No.	DTC Detection Condition	Trouble area
P0125	THW or THA is less than –7°C (19.4°F) at engine start, 20 minutes or more after starting engine, and ECT sensor value is 20°C (68°F) or less (2 trip detection logic)	• Cooling system • Engine coolant temperature sensor • Thermostat
	THW and THA is between –7°C (19.4°F) and 10°C (50°F) at engine start, 5 minutes or more after starting engine, and ECT sensor value is 20°C (68°F) or less (2 trip detection logic)	
	THW and THA greater than 10°C (50°F) at engine start, 2 minutes or more after starting engine, and ECT sensor value is 30°C (86°F) or less (2 trip detection logic)	

MONITOR DESCRIPTION

The ECT (Engine Coolant Temperature) 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 warmed up 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 is 0°C (32°F) at engine start. After 5 min. running time, the ECT sensor still indicates that the engine is not warmed up enough to begin air fuel ratio 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 coolant temperature for closed loop fuel control
Required sensors/components	Main sensors/components	Engine coolant temperature sensor, Cooling system, Thermostat
	Related sensors/components	Mass air flow meter
Frequency of operation	Continuous	
Duration	• 2 min. (at engine start, engine coolant or intake air temperature of 10°C (50°F) or more) • 5 min. (at engine start, engine coolant or intake air temperature of –6.6°C (20°F) to 10°C (50°F)) • 20 min. (at engine start, engine coolant or intake air temperature of less than –6.6°C (20°F))	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–295	
Fuel cut	OFF	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Time until "engine coolant temperature" detection temperature reaches feedback start temperature	
When the temperature at engine start is 10°C (50°F) or more	Engine coolant temperature is less than "closed–loop enable temperature" when 2 min. or more passed after engine start
When the temperature at engine start is "–6.6°C (20°F)" to "10°C (50°F)"	Engine coolant temperature is less than "closed–loop enable temperature" when 5 min. or more passed after engine start
When the temperature at engine start is –6.6°C (20°F) or less	Engine coolant temperature is less than "closed–loop enable temperature" when 20 min. or more passed after engine start

INSPECTION PROCEDURE

HINT:

- If DTCs P0115, P0116, P0117, P0118 and P0125 are output simultaneously, the engine coolant temperature sensor circuit may be open or shorted. 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, as well as other data from the time when a malfunction occurred.

1	**Are there any other codes (besides DTC P0125) being output?**

PREPARATION:

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

CHECK:

Read the DTCs.

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 codes first.

B → **Go to relevant DTC chart (See page DI–335).**

A

2	**Check thermostat (See page CO–10).**

NG → **Replace thermostat (See page CO–9).**

OK

3	**Check cooling system.**

CHECK:

Check that there is defect 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.

DIC79–02

DTC	P0128	Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature)

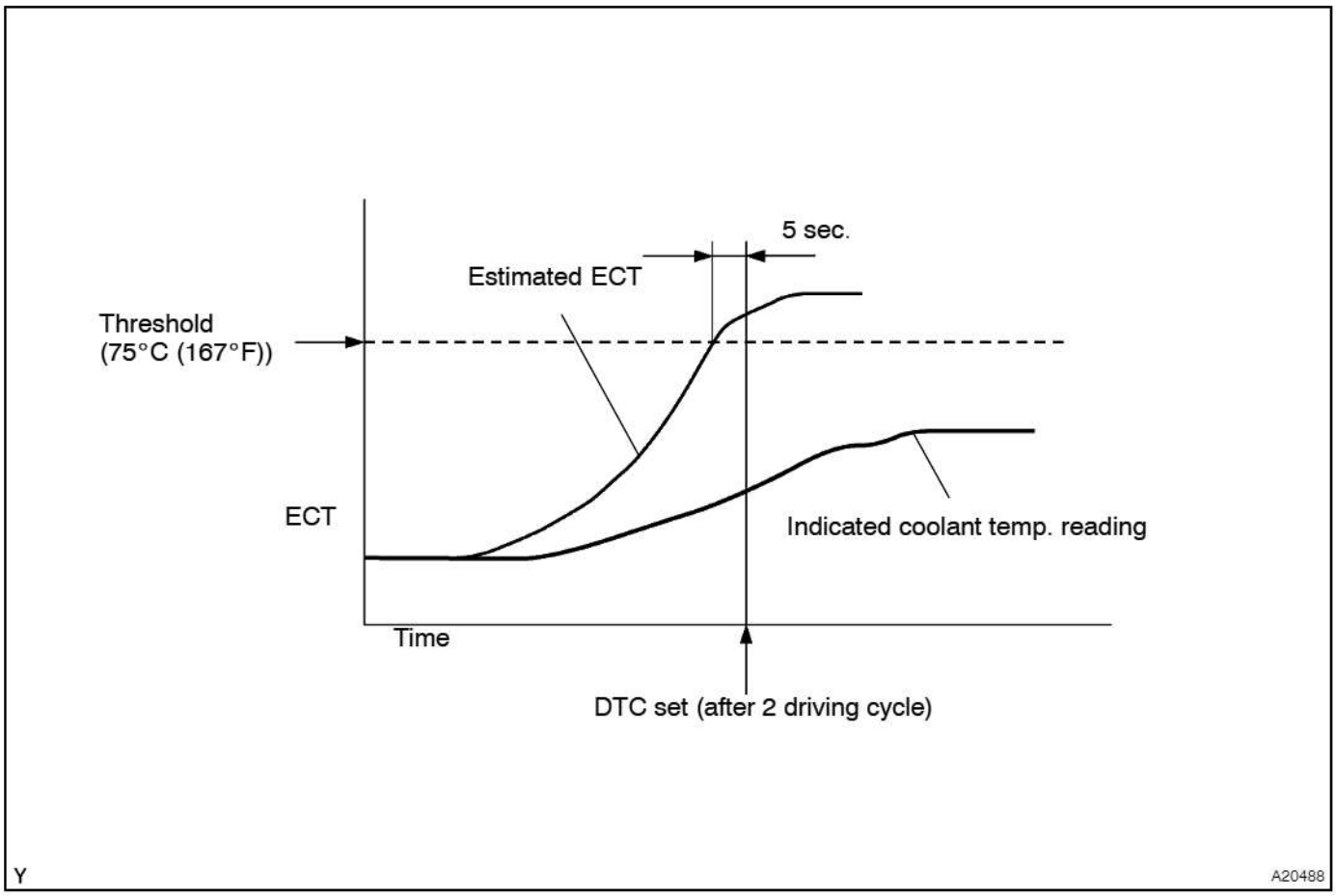
HINT:
This is the procedure of "thermostat" malfunction detection.

CIRCUIT DESCRIPTION

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

DTC No.	DTC Detecting Condition	Trouble Area
P0128	Conditions (a), (b) and (c) are met: (a) Cold start (b) Engine is warmed up (c) THW < 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 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 thermostat or engine cooling system and set a DTC.

MONITOR STRATEGY

Related DTCs	P0128	Thermostat
Required sensors/components	Main sensors/components	Engine coolant temperature sensor, Engine cooling system, Thermostat
	Related sensors/components	Intake air temperature sensor, Vehicle speed sensor
Frequency of operation	Once per driving cycle	
Duration	15 min.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–295	
Battery voltage	11.0 V	–
Throttle position learning	Completed	
Engine coolant temperature at engine start – Intake air temperature at engine start	–15°C (–27°F)	7°C (12.6°F)
Intake air temperature at engine start	–10°C (14°F)	35°C (95°F)
Engine coolant temperature at engine start	–10°C (14°F)	35°C (95°F)
Accumulated time that vehicle speed is 128 km/h (80 mph) or more	–	20 sec.

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Duration that both of following conditions 1 and 2 are met:	5 sec. or more
1. Estimated engine coolant temperature	75°C (167°F) or more
2. Engine coolant temperature sensor output value	Less than 75°C (167°F)

COMPONENT OPERATING RANGE

Parameter	Standard Value
Engine coolant temperature sensor output value after engine is warmed up	75°C (167°F) or more

MONITOR RESULT

Refer to page DI–295 for detailed information.

The test value and test limit information are described as shown in the following table. Check the monitor result and test values after performing the monitor drive pattern (see page DI–326).

- TID (Test Identification Data) is assigned to each emissions–related component.
- TLT (Test Limit Type):
  If TLT is 0, the component is malfunctioning when the test value is higher than the test limit.
  If TLT is 1, the component is malfunctioning when the test value is lower than the test limit.
- CID (Component Identification Data) is assigned to each test value.
- Unit Conversion is used to calculate the test value indicated on generic OBD II scan tools.

TID $08: Thermostat

TLT	CID	Unit Conversion	Description of Test Data	Description of Test Limit
1	$01	Multiply by 0.625 and subtract 40 (°C)	ECT sensor output when estimated ECT has reached to malfunction criterion	Malfunction criteria for thermostat

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, as well as other data from the time when a malfunction occurred.

1	**Check cooling system.**

CHECK:

Check that there is defective cooling system which causes overcool, such as abnormal radiator fan operation, modified cooling system and so on.

NG → **Repair or replace cooling system.**

OK

2	**Check thermostat (See page CO–10).**

NG → **Replace thermostat.**

YES

3	**Are there any other codes (besides DTC P0128) being output?**

PREPARATION:

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

CHECK:

Read the DTCs.

RESULT:

Display (DTC output)	Proceed to
P0128	A
"P0128" and other DTCs	B

HINT:

If any other codes besides P0128 is output, perform the troubleshooting for those DTCs first.

B → **Go to relevant DTC chart (See page DI–335).**

A → **Replace ECM (See page SF–78).**

DIC7A–02

DTC	P0130	Oxygen Sensor Circuit (Bank 1 Sensor 1)

DTC	P2195	Oxygen Sensor Signal Stuck Lean (Bank 1 Sensor 1)

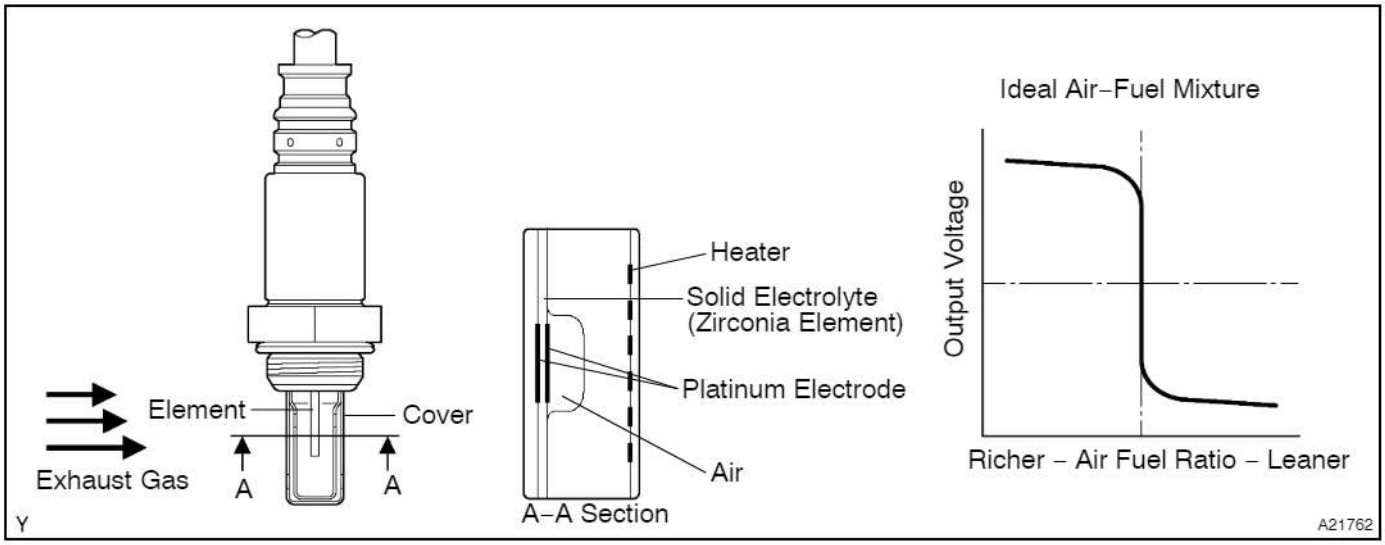
DTC	P2196	Oxygen Sensor Signal Stuck Rich (Bank 1 Sensor 1)

CIRCUIT DESCRIPTION

The heated oxygen sensor is used to monitor oxygen concentration in the exhaust gas. For optimum catalytic converter operation, the air fuel mixture must be maintained near the ideal stoichiometric ratio. The heated oxygen sensor output voltage changes suddenly in the vicinity of the stoichiometric ratio. The ECM adjusts the fuel injection time so that the air–fuel ratio is nearly stoichiometric.

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 will be vanished from the exhaust gas. And the heated oxygen sensor informs the ECM of the RICH condition (high voltage, i.e. more than 0.45 V).

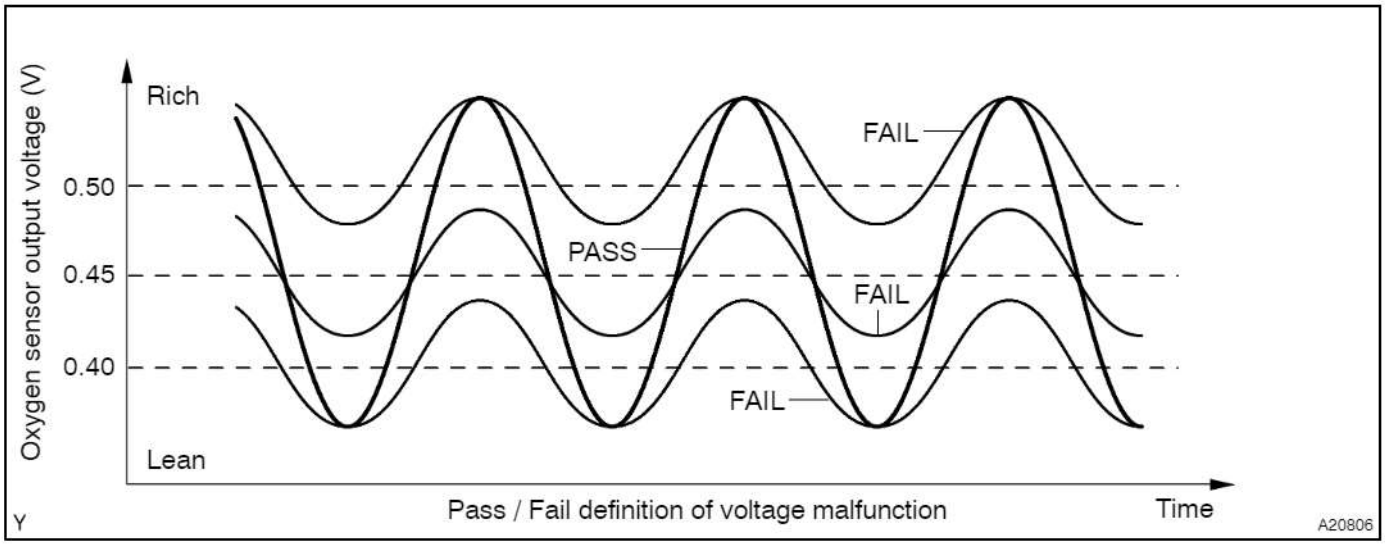


DTC No.	DTC Detection Condition	Trouble Area
P0130	Output voltage of heated oxygen sensor remains at 0.4 V or more, or 0.5 V or less, during idling after engine is warmed up (2 trip detection logic)	• Open or short in heated oxygen sensor (bank 1 sensor 1) circuit • Heated oxygen sensor (bank 1 sensor 1) • Heated oxygen sensor heater (bank 1 sensor 1) • EFI relay • Air induction system • Fuel pressure • Injector • ECM
P2195	Output voltage of heated oxygen sensor remains at 0.5 V or less, during idling after engine is warmed up (2 trip detection logic)	
P2196	Output voltage of heated oxygen sensor remains at 0.4 V or more, during idling after engine is warmed up (2 trip detection logic)	

HINT:

- Sensor 1 is the sensor closer to the engine body.
- The output voltage of the heated oxygen sensor and the short–term fuel trim value can be read using the OBD II scan tool or the hand–held tester.

MONITOR DESCRIPTION



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

The heated oxygen sensor element consists of the platinum coated zirconia and heating element. The inner surface of sensor element is exposed to the outside air, and the outer surface of sensor element is exposed to the exhaust gas. The sensor generates between 0 V and 1 V of the voltage output in response to the oxygen concentration in the exhaust gas. The sensor's output voltage varies suddenly in the vicinity of the stoichiometric air–fuel ratio.

Under a normal condition, the output voltage from the heated oxygen sensor alternates between RICH and LEAN sides periodically. When it is 0.4 V or less, the air–fuel ratio is judged as LEAN.

If the heated oxygen sensor outputs RICH signal (or LEAN signal) constantly, or if the heated oxygen sensor cannot output enough voltage to reach the minimum specification, the ECM interprets this as a malfunction in the heated oxygen sensor and sets a DTC.

MONITOR STRATEGY

Related DTCs	P0130	Front heated oxygen sensor voltage is constant
	P2195	Front heated oxygen sensor voltage is constant at lean side
	P2196	Front heated oxygen sensor voltage is constant at rich side
Required sensors/components	Main sensors/components	Front heated oxygen senor
	Related sensors/components	Crank position sensor, Vehicle speed sensor
Frequency of operation	Once per driving cycle	
Duration	20 to 36 sec. x (3 time)	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITION

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–295	
There is a history that the following conditions A and B were met:	30 sec. (Continuously)	–
A. Vehicle speed	40 km/h (25 mph)	–
B. Engine speed	900 rpm	–
Time after engine start	120 sec.	–
Idle	ON	
Fuel system status	Closed loop	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P0130:	
Front oxygen sensor voltage is 0.5 V or less for 28 sec. or more	1 time or more
Front oxygen sensor voltage is 0.4 V or more for 28 sec. or more	1 time or more
P2195:	
Front heated oxygen sensor voltage is 0.5 V or less for 28 sec.	1 time or more
P2196:	
Front heated oxygen sensor voltage is 0.4 V or more for 28 sec.	1 time or more

COMPONENT OPERATING RANGE

Parameter	Standard value
Heated oxygen sensor voltage	0 to 1 V

O2S TEST RESULT

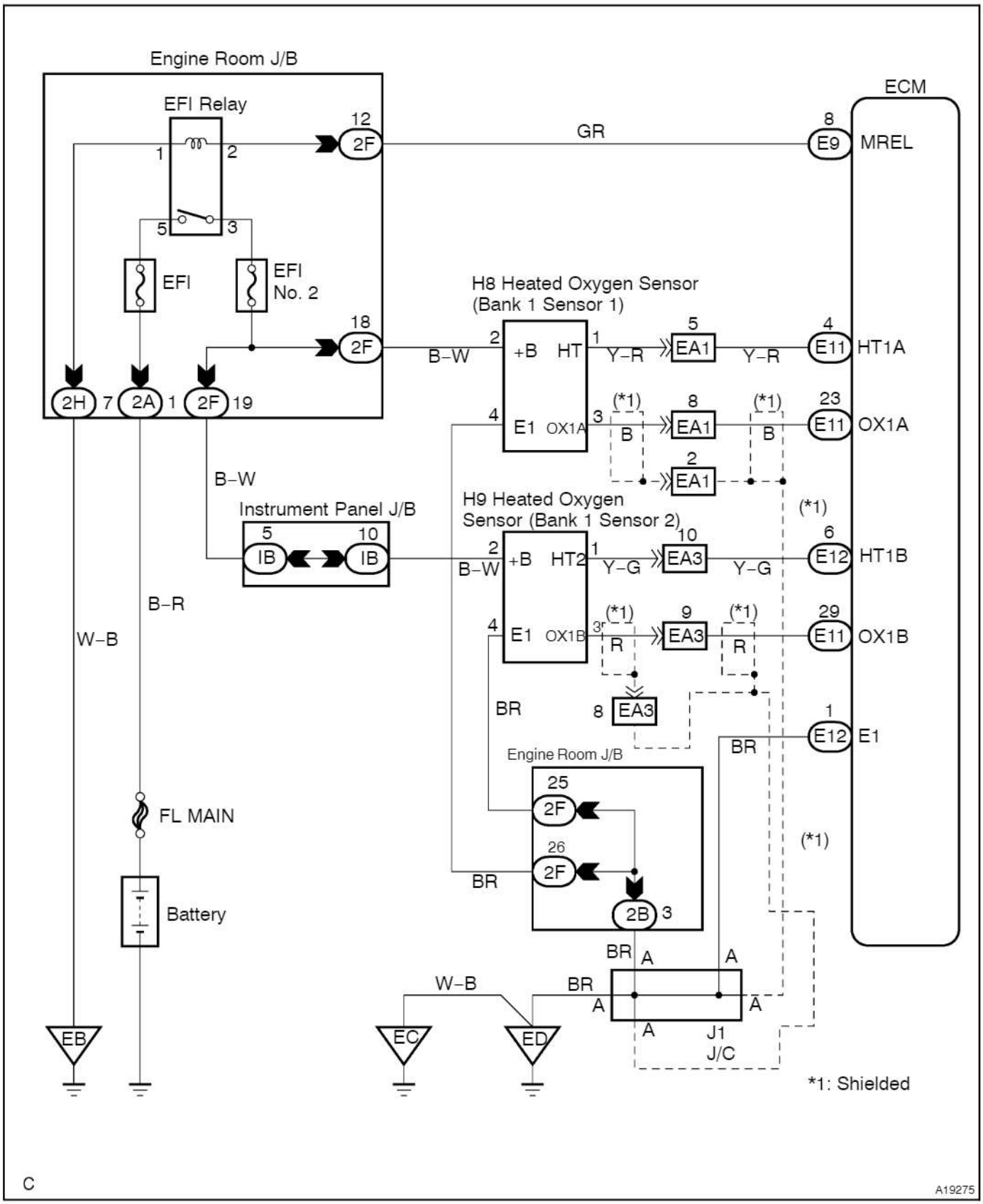
Refer to page DI–295 for detailed information.

Front HO2S voltage monitor

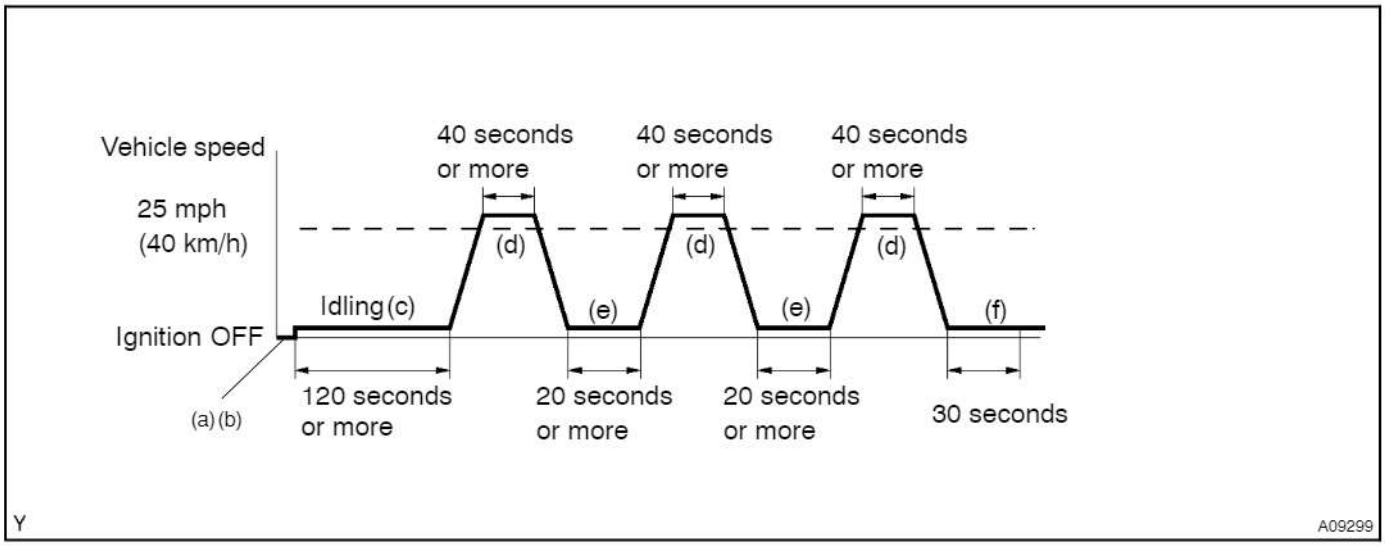
If the HO2S voltage is out of the standard value, the ECM interprets this as a malfunction.

TEST ID	Description of TEST DATA	Conversion Factor	Unit
$07	Minimum front HO2S voltage	Multiplied by 0.005	V
$08	Maximum front HO2S voltage	Multiplied by 0.005	V

WIRING DIAGRAM



CONFIRMATION DRIVING PATTERN



(a) Connect the hand–held tester to the DLC3.
(b) Switch the hand–held tester from the normal mode to the check mode (See page DI–295).
(c) Start the engine and let the engine idle for 120 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 20 seconds or more. Perform steps (d) and (e) at least 3 times.
(f) Let the engine idle for 30 seconds.

HINT:

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

NOTICE:

If the conditions in this test are not strictly followed, detection of a malfunction will not occur.
If you do not have the hand–held tester, turn the ignition switch OFF after performing steps from (c) to (f), then perform steps from (c) to (f) again.

INSPECTION PROCEDURE

HINT:

Hand–held tester only:

Narrowing down the trouble area is possible by performing "A/F CONTROL" ACTIVE TEST (heated oxygen sensor or other trouble areas can be distinguished).

Perform ACTIVE TEST using hand–held tester (A/F CONTROL).

HINT:

"A/F CONTROL" is the ACTIVE TEST which changes the injection volume to –12.5 % or +25 %.

(1) Connect the hand–held tester to the DLC3 on the vehicle.
(2) Turn the ignition switch ON.
(3) Warm up the engine by running the engine speed at 2,500 rpm for approximately 90 seconds.
(4) Select the item "DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL".
(5) Perform "A/F CONTROL" 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 approximately 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)	Mainly suspected trouble area
Case 1	Injection volume +25 % –12.5 % Output voltage More than 0.5 V Less than 0.4 V OK	Injection volume +25 % –12.5 % Output voltage More than 0.5 V Less than 0.4 V 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 0.4 V 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 0.4 V 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 of A/F CONTROL procedure enables the technician to check and graph the voltage outputs of both the heated oxygen sensors.

For displaying the graph indication, enter "ACTIVE TEST / A/F CONTROL / USER DATA", then select "O2S B1S1 and O2S B1S2" by pressing "YES" button and push "ENTER" button before pressing "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 comes on.

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, as well as other data from the time when a 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	**Are there any other codes (besides DTC P0130, P2195 or P2196) being output?**

PREPARATION:

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

CHECK:

Read the DTCs.

RESULT:

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

HINT:

If any other codes besides P0130, P2195 and/or P2196 are output, perform the troubleshooting for those DTCs first.

B → **Go to relevant DTC chart (See page DI–335).**

A

2	Check output voltage of heated oxygen sensor during idling.

PREPARATION:

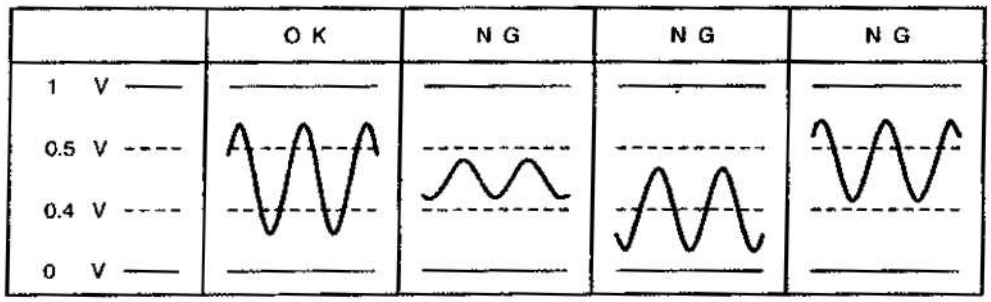
(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Start the engine and push the hand–held tester or the OBD II scan tool main switch ON.
(c) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / O2S B1S1."
(d) Warm up the heated oxygen sensor with the engine speed at 2,500 rpm for approximately 90 seconds.

CHECK:

Read the output voltage of the heated oxygen sensor while idling.

OK:

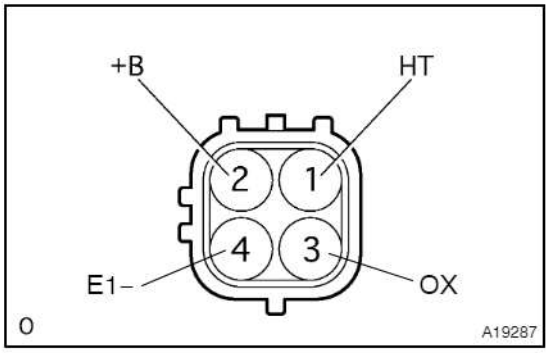
Heated oxygen sensor output voltage:
Alternates repeatedly between less than 0.4 V and more than 0.5 V (See the following table).



OK	Go to step 9.

NG

3	Check resistance of heated oxygen sensor heater.



PREPARATION:

Disconnect the heated oxygen sensor connector.

CHECK:

Measure resistance between the terminals HT and +B of the heated oxygen sensor.

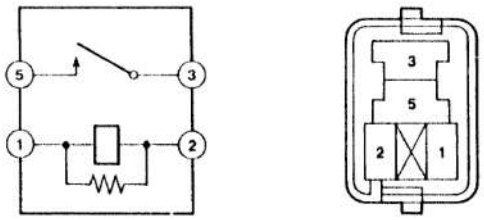
OK:

Resistance: 11 to 16 Ω (20°C)

NG	Replace heated oxygen sensor.

OK

4	Check EFI relay.



A19288

PREPARATION:

Remove the EFI relay from the engine room J/B.

CHECK:

Inspect the EFI relay.

OK:

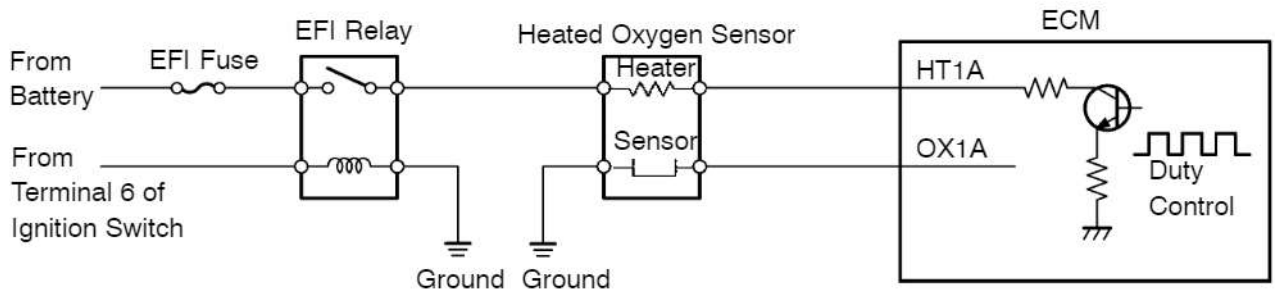
Tester Connection	Specified Condition
1 – 2	Continuity
3 – 5	No continuity
	Continuity (Apply battery voltage to terminals 1 and 2)

NG → **Replace EFI relay.**

OK

5	Check for open and short in harness and connector between ECM and heated oxygen sensor (See page IN–30).

Reference (Bank 1 Sensor 1 System Drawing):



A21253

NG → **Repair or replace harness or connector.**

OK

6	**Check air induction system.**

CHECK:

Check the air induction system for vacuum leaks.

NG → **Repair or replace induction system.**

OK ↓

7	**Check fuel pressure (See page SF–6).**

CHECK:

Check the fuel pressure (high or low pressure).

NG → **Check and repair fuel pump, pressure regulator, fuel pipe line and filter (See page SF–1).**

OK ↓

8	**Check injector injection (See page SF–22).**

NG → **Replace injector.**

OK ↓

Replace heated oxygen sensor (bank 1 sensor 1).

9	**Perform confirmation driving pattern.**

HINT:

Clear all DTCs prior to performing the confirmation driving pattern.

Go ↓

10	Is there DTC P0130, P2195 or P2196 being output again?

NO → Check for intermittent problems (See page DI–295).

YES →

Replace heated oxygen sensor (bank 1 sensor 1).

DI0TB–02

DTC	P0133	Oxygen Sensor Circuit Slow Response (Bank 1 Sensor 1)

CIRCUIT DESCRIPTION

Refer to DTC P0130 on page DI–411.

DTC No.	DTC Detecting Condition	Trouble Area
P0133	Response time of heated oxygen sensor's output voltage in one RICH–LEAN cycle is a specific time or more during vehicle running. (2 trip detection logic)	• Open or short in heated oxygen sensor circuit (bank 1 sensor 1) • Heated oxygen sensor (bank 1 sensor 1) • Heated oxygen sensor heater (bank 1 sensor 1) • EFI relay • Air induction system • Fuel pressure • Injector • ECM

HINT:

Sensor 1 is the sensor closest to the engine assembly.

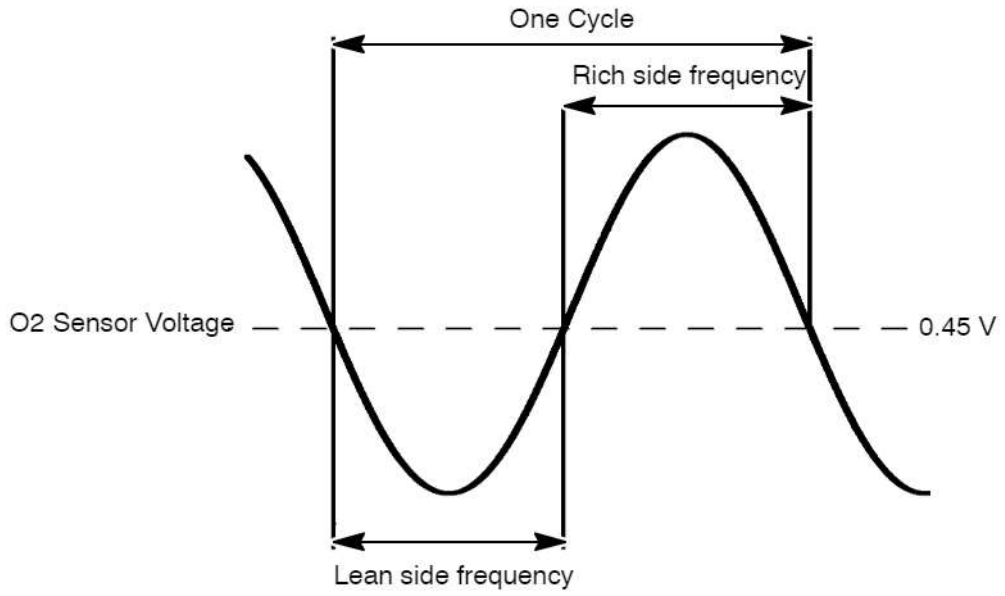
MONITOR DESCRIPTION

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 gas. 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 heated oxygen sensor has the characteristic, whereby its output voltage changes 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 exhaust gas. 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.

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 a malfunction in the heated oxygen sensor and sets a DTC.

Frequency condition:



MONITOR STRATEGY

Related DTCs	P0133	Front heated oxygen sensor response monitor
Required sensors/components	Main sensors/components	Front heated oxygen sensor
	Related sensors/components	Crankshaft position sensor, Vehicle speed sensor, Mass air flow meter
Frequency of operation	Once per driving cycle	
Duration	Within 60 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITION

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–295	
Slow slope condition:		
There is a history that the following conditions were met for 1 sec.:	Condition 1 and 2	
1. Vehicle speed	40 km/h (25 mph)	–
2. Engine RPM	900 rpm	–
Idle	ON	
Vehicle speed	–	5 km/h (3.1 mph)
Fuel system status	Closed–loop	
Time after engine start	120 sec.	–
Frequency cruise condition:		
Number of fail judgment is incremented when:	(1 and 2) or (3 and 4) is met	
1. Number of cycle time data summation	10 times	–

2. Sum of cycle time data	Sum of cycle threshold	
3. Number of cycle time data summation	1 time	10 times
4. Sum of cycle time data	Sum of cycle threshold x 1.2 x 10 / number of summation	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Slow slope condition:	
Time that output voltage of front heated oxygen sensor increase. from 0.35 V to 0.45 V and that it decreases from 0.45 V to 0.35 V	1 sec. or more
Frequency cruise condition:	
Oxygen sensor frequency is judged malfunction under the following conditions:	Both 1 and 2 are met
1. Number of fail judgement	1 time or more
2. Neither pass nor fail determined yet	

COMPONENT OPERATING RANGE

Parameter	Standard value
Voltage output of the front heated oxygen sensor rapidly fluctuates between 0.4 V and 0.5 V	

O2S TEST RESULT

Refer to page DI–295 for detailed information.

Front HO2S frequency monitor (cruse)

If the $90 is out of the standard value, the ECM interprets this as a malfunction.

TEST ID	Description of TEST DATA	Conversion Factor	Unit
$90	Remained value of that average of switching frequency is subtracted from average of switching frequency threshold	Multiply by 0.04096 plus 5.2	sec.

WIRING DIAGRAM

Refer to DTC P0130 on page DI–411.

INSPECTION PROCEDURE

HINT:

Hand–held tester only:

Narrowing down the trouble area is possible by performing "A/F CONTROL" ACTIVE TEST (heated oxygen sensor or other trouble areas can be distinguished). Perform ACTIVE TEST using hand–held tester (A/F CONTROL).

(a) Perform ACTIVE TEST using the hand–held tester (A/F CONTROL).

HINT:

"A/F CONTROL" is the ACTIVE TEST which changes the injection volume to –12.5 % or +25 %.

(1) Connect the hand–held tester to the DLC3 on the vehicle.
(2) Turn the ignition switch 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 "A/F CONTROL" 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)	Mainly suspected trouble area
Case 1	Injection volume +25 % –12.5 % Output voltage More than 0.5 V Less than 0.4 V OK	Injection volume +25 % –12.5 % Output voltage More than 0.5 V Less than 0.4 V 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 0.4 V 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 0.4 V 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 of the A/F CONTROL procedure enables the technician to check and graph the voltage outputs of both the heated oxygen sensors.

For displaying the graph indication, enter "ACTIVE TEST / A/F CONTROL / USER DATA," then select "O2S B1S1 and O2S B1S2" by pressing "YES" button and push "ENTER" button before pressing "F4" button.

NOTICE:

If the vehicle is short of fuel, the air–fuel ratio becomes LEAN and DTC P0133 will be recorded, and the MIL then comes on.

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, as well as other data from the time when a 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	**Are there any other codes (besides DTC P0133) being output?**

PREPARATION:

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester or the OBD II scan tool main switch ON.
(c) When using hand–held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES."

CHECK:

Read the DTCs.

RESULT:

Display (DTC output)	Proceed to
P0133	A
P0133 and other DTC	B

HINT:

If any other codes besides P0133 are output, perform the troubleshooting for those DTCs first.

B → **Go to relevant DTC chart (See page DI–335).**

A

2	**Check output voltage of heated oxygen sensor during idling.**

PREPARATION:

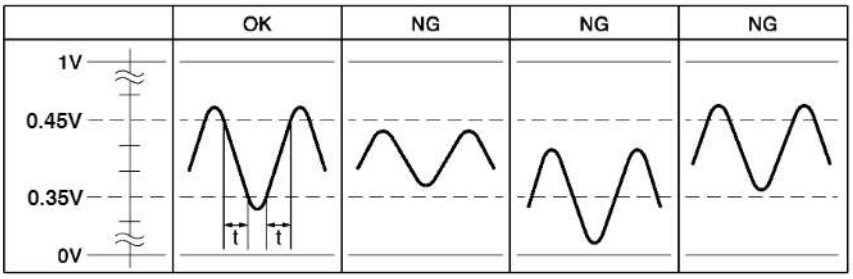
(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Start the engine and push the hand–held tester or the OBD II scan tool main switch ON.
(c) When using hand–held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / O2S B1S1."
(d) Warm up the heated oxygen sensor with the engine speed at 2,500 rpm for approximately 90 seconds.

CHECK:

Read the output voltage of the heated oxygen sensor during idling.

OK:

Heated oxygen sensor output voltage:
Alternates between less than 0.35 V and more than 0.45 V, and period of "t" must exist less than 0.6 second (See the following table).



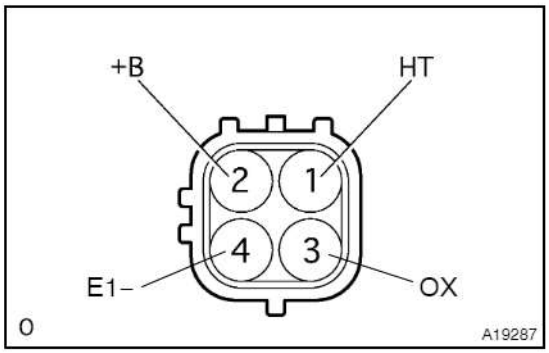
N

A21255

OK	**Go to step 9.**

NG

3	Check resistance of heated oxygen sensor heater.

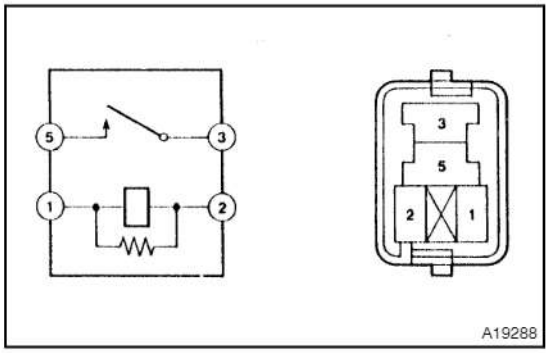


PREPARATION:
Disconnect the heated oxygen sensor connector.
CHECK:
Measure resistance between the terminals HT and +B of the heated oxygen sensor.
OK:
Resistance: 11 to 16 Ω (20°C)

NG	Replace heated oxygen sensor.

OK

4	Check EFI relay.



PREPARATION:
Remove the EFI relay from the engine room J/B.
CHECK:
Inspect the EFI relay.
OK:

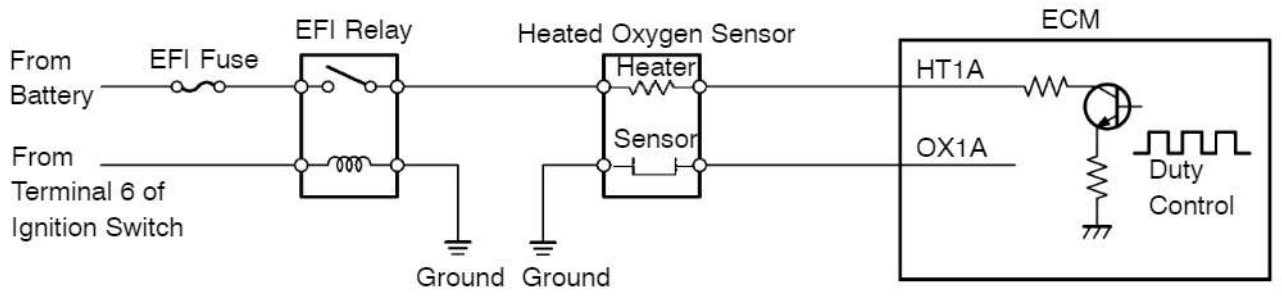
Tester Connection	Specified Condition
1 – 2	Continuity
3 – 5	No continuity
	Continuity (Apply battery voltage to terminals 1 and 2)

NG	Replace EFI relay.

OK

5	**Check for open and short in harness and connector between ECM and heated oxygen sensor (Bank 1 Sensor 1) (See page IN–30).**

Reference (Bank 1 Sensor 1 System Drawing):



NG → **Repair or replace harness or connector.**

OK ↓

6	**Check air induction system.**

CHECK:

Check the air induction system for vacuum leaks.

NG → **Repair or replace air induction system.**

OK ↓

7	**Check fuel pressure (See page SF–6).**

CHECK:

Check fuel pressure (high or low pressure).

NG → **Check and repair fuel pump, fuel pipe line and filter (See page SF–1).**

OK ↓

8	**Check injector injection (See page SF–22).**

NG → **Replace injector.**

OK

Replace heated oxygen sensor (bank 1 sensor 1).

9	**Perform confirmation driving pattern (See page DI–411).**

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

Go

10	**Is there DTC P0133 being output again?**

NO → **Check for intermittent problems (See page DI–295).**

YES

Replace heated oxygen sensor (bank 1 sensor 1).

DIC7C–02

DTC	P0134	Oxygen Sensor Circuit No Activity Detected (Bank 1 Sensor 1)

CIRCUIT DESCRIPTION

Refer to DTC P0130 on page DI–411.

DTC No.	DTC Detecting Condition	Trouble Area
P0134	After engine is warmed up, heated oxygen sensor (bank 1 sensor 1) output does not indicate RICH (greater than 0.45 V) even once when conditions (a), (b), (c), (d) and (e) continue for more than 65 seconds (1 trip detection logic) : (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)	• Open or short in heated oxygen sensor (bank 1 sensor 1) circuit • Heated oxygen sensor (bank 1 sensor 1) • Heated oxygen sensor heater (bank 1 sensor 1) • EFI relay • Air induction system • Fuel pressure • PCV hose connection • PCV valve and hose • Injector • Gas leakage in exhaust system • PCV piping • ECM

HINT:

- Sensor 1 is the sensor closer to the engine body.
- After confirming DTC P0134, check the output voltage of the heated oxygen sensor (bank 1 sensor 1) in the "DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL" using the hand–held tester or the OBD II scan tool. If the output voltage of the heated oxygen sensor is always less than 0.1 V, the sensor circuit may be open or shorted.

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 sensor does not indicate RICH even once despite the conditions for the closed–loop fuel control being met and a specified time period has passed, the ECM will conclude that the closed–loop fuel control is malfunctioning. The ECM will illuminate the MIL and a DTC is set.

MONITOR STRATEGY

Related DTCs	P0134	Excessive time to enter closed–loop
Required sensors/components	Main sensors/components	Front heated oxygen sensor
	Related sensors/components	Crankshaft position sensor, Engine coolant temperature sensor, Vehicle speed sensor
Frequency of operation	Once per driving cycle	
Duration	65 sec.	
MIL operation	1 driving cycle	
Sequence of operation	None	

TYPICAL ENABLING CONDITION

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–295	
Time after following conditions are met:	50 sec.	–
Engine coolant temperature	40°C (104°F)	–
Engine RPM	1,400 rpm	–
Vehicle speed	40 km/h (25 mph)	–
Idle	OFF	
Time after engine start	180 sec.	–

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Front heated oxygen sensor voltage	Less than 0.45 V

COMPONENT OPERATING RANGE

Parameter	Standard value
Front heated oxygen sensor voltage in the normal condition	0 to 1 V

WIRING DIAGRAM

Refer to DTC P0130 on page DI–411.

INSPECTION PROCEDURE

HINT:

Hand–held tester only:

To determine the trouble area is possible by performing "A/F CONTROL" ACTIVE TEST (heated oxygen sensor or other trouble areas can be distinguished).

(a) Perform ACTIVE TEST using the hand–held tester (A/F CONTROL).

HINT:

"A/F CONTROL" is the ACTIVE TEST which changes the injection volume to –12.5 % or +25 %.

(1) Connect the hand–held tester to the DLC3 on the vehicle.
(2) Turn the ignition switch 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 "A/F CONTROL" with the engine idling (press the right or left button).

RESULT:

Heated oxygen sensor reacts in accordance with increase and decrease of the 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)	Mainly suspected trouble area
Case 1	Injection volume +25 % –12.5 % Output voltage More than 0.5 V Less than 0.4 V OK	Injection volume +25 % –12.5 % Output voltage More than 0.5 V Less than 0.4 V 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 0.4 V 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 0.4 V 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 of the A/F CONTROL procedure enables the technician to check and graph the voltage outputs of both the heated oxygen sensors.
For displaying the graph indication, enter "ACTIVE TEST / A/F CONTROL / USER DATA," then select "O2S B1S1 and O2S B1S2" by pressing "YES" button and push "ENTER" button before pressing "F4" button.
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, as well as other data from the time when a 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	**Are there any other codes (besides DTCs P0134) being output?**

PREPARATION:

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

CHECK:

Read the DTCs.

RESULT:

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

HINT:

If any other codes besides P0134 are output, perform the troubleshooting for those DTCs first.

B → **Go to relevant DTC chart (See page DI–335).**

A

2	**Connect OBD II scan tool or hand–held tester, and read value for voltage output of heated oxygen sensor (bank 1 sensor 1).**

PREPARATION:

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester or the OBD II scan tool main switch ON.
(c) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / O2S B1S1."
(d) Warm up the engine to the normal operating engine coolant temperature above 75°C (169°F).

CHECK:

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.

OK:

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

OK → **Go to step 12.**

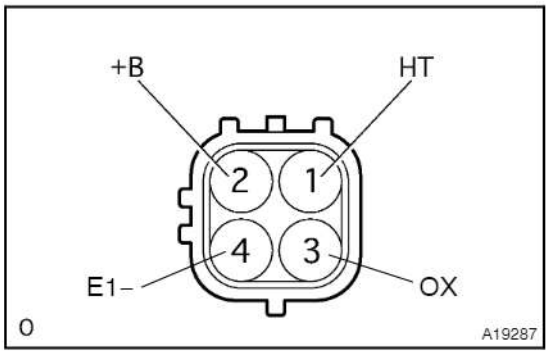
NG

3	Check connection of PCV piping.

NG → Repair or replace PCV piping.

OK

4	Check resistance of heated oxygen sensor heater.

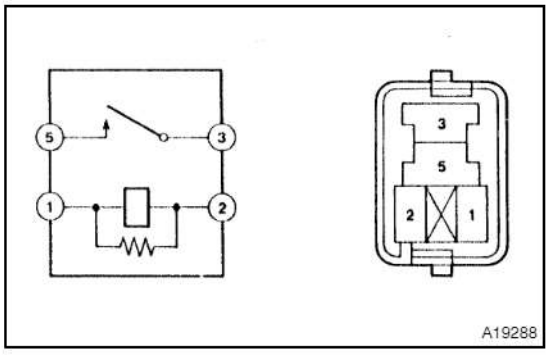


PREPARATION:
Disconnect the heated oxygen sensor connector.
CHECK:
Measure resistance between the terminals HT and +B of the heated oxygen sensor.
OK:
Resistance: 11 to 16 Ω (20°C)

NG → Replace heated oxygen sensor.

OK

5	Check EFI relay.



PREPARATION:
Remove the EFI relay from the engine room J/B.
CHECK:
Inspect the EFI relay.
OK:

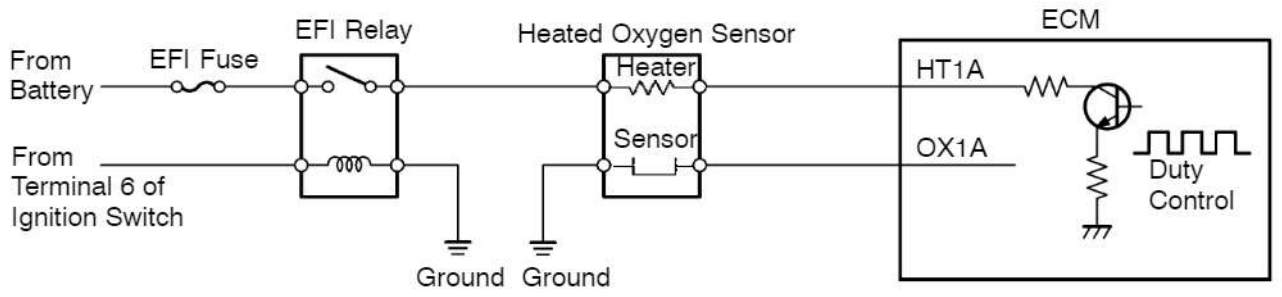
Tester Connection	Specified Condition
1 – 2	Continuity
3 – 5	No continuity
	Continuity (Apply battery voltage to terminals 1 and 2)

NG → Replace EFI relay.

OK

6	**Check for open and short in harness and connector between ECM and heated oxygen sensor (bank 1 sensor 1) (See page IN–30).**

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 DI–459).**

OK ↓

8	**Check air induction system (See page SF–1).**

CHECK:

Check the air induction system for vacuum leaks.

NG → **Repair or replace air induction system.**

OK ↓

9	**Check fuel pressure (See page SF–6).**

CHECK:

Check the fuel pressure (high or low pressure).

NG → **Check and repair fuel pump, fuel pipe line and filter (See page SF–1).**

OK ↓

10	**Check injector injection (See page SF–22)**

NG → **Replace injector.**

OK ↓

11	**Check gas leakage on exhaust system.**

NG → **Repair or replace exhaust gas leakage point.**

OK ↓

Replace heated oxygen sensor (bank 1, sensor 1).

12	**Perform confirmation of driving pattern (See page DI–411).**

HINT:

Clear all DTCs prior to performing the confirmation pattern.

Go ↓

13	Is there DTCs P0134 being output again?

YES → Replace ECM (See page SF–78).

NO

14	Did vehicle run out of fuel in past?

NO → Check for intermittent problems (See page DI–295).

YES

DTCs P0134 are caused by running out of fuel.

DTC	P0136	Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 2)

DTC	P0138	Heated Oxygen Sensor Circuit High Voltage (Bank 1 Sensor 2)

CIRCUIT DESCRIPTION

Refer to DTC P0130 on page DI–411.

DTC No.	DTC Detection Condition	Trouble Area
P0136	Either of the following conditions is met: • HO2 sensor (sensor 2) voltage remains LEAN (below 0.4 V) or RICH (above 0.5 V) while the vehicle is repeating acceleration and deceleration for 4 to 8 minutes • HO2 sensor (sensor 2) voltage remains extremely low for a long time	• Open or short in HO2 sensor (sensor 2) circuit • HO2 sensor (sensor 2) • HO2 sensor heater (sensor 2) • EFI relay
P0138	Either of the following conditions is met: • HO2 sensor (sensor 2) voltage does not drop below 0.2 V immediately when fuel–cut starts • HO2 sensor output voltage is 1.2 V or more for 10 seconds	• HO2 sensor (sensor 2) • Short in HO2 sensor (sensor 2) circuit

MONITOR DESCRIPTION

The ECM monitors the HO2 sensor (sensor 2) as follows:

- The HO2 sensor voltage does not remain RICH (above 0.5 V) or LEAN (below 0.4 V) while the vehicle is accelerated and decelerated for 4 to 8 minutes. If the voltage remains either RICH or LEAN, the ECM interprets this as a malfunction, illuminates the MIL and sets a DTC.
- The HO2 sensor voltage does not remain less than 0.05 V for a long time while the vehicle is running. If the voltage remains less than 0.05 V for a long time, the ECM interprets this as a malfunction, illuminates the MIL and sets a DTC.
- The sensor voltage drops below 0.2 V (extremely LEAN condition) immediately when the vehicle decelerates and fuel–cut operates. If the voltage does not drop below 0.2 V, the ECM determines that the response feature of the sensor has deteriorated, illuminates the MIL and sets a DTC.

MONITOR STRATEGY

Related DTCs	P0136	Heated rear oxygen sensor output voltage (Crack) (Bank 1)
		Heated rear oxygen sensor output voltage (Bank 1)
		Heated rear oxygen sensor slow response (Bank 1)
	P0138	Heated rear oxygen sensor output voltage (Bank 1)
Required sensors/components	Main sensors/components	Rear heated oxygen sensor
	Related sensors/components	Mass air flow meter, Vehicle speed sensor
Frequency of operation	Once per driving cycle	
Duration	P0136: Within 6 min. P0138: Within 10 sec.	
MIL operation	P0138 (Output voltage): Immediate Others: 2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–295	
P0136: Output voltage (crack)		
Vehicle speed	3 km/h (1.875 mph)	–
Idle	OFF	
Fuel cut	OFF	
Time after fuel cut ON to OFF	15 sec.	–
Intake air amount per revolution	0.24 g/rev	–
P0136: 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 sec.	–
D. Either of the following conditions is met:	(a) or (b)	
(a) Cumulative time while heated oxygen sensor heater is ON	22 sec.	–
(b) At once more heated oxygen sensor voltage	0.2 V	–
P0138: Slow response		
Rear oxygen sensor voltage before the fuel cut	0.2 V or more	–
Catalyst condition	Warmed up	
Engine coolant temperature	70°C (158°F)	–
Fuel cut	Operating	

P0138: Output voltage		
Engine	Running	
Battery voltage	11 V	–

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P0136: Output voltage (crack)	
Following conditions are met:	A, B and C
A. Cumulative heated oxygen sensor monitor time	200 sec. or more
B. Duration while heated oxygen sensor voltage is less than 0.05V	120 sec. or more
C. Maximum heated oxygen sensor rich time (0.45V or more)	Less than 20 sec.
P0136: Output voltage	
Number of heated oxygen sensor voltage "switching"	0 time or less
"Switching" is counted when the sensor signal crosses the minimum or maximum voltage	
Minimum voltage	0.4 V or less
Maximum voltage	0.5 V or more
P0138: Slow response	
Time until the rear oxygen sensor voltage drops to 0.2 V after fuel cut starts operating	7 sec. or more
P0138: Output voltage	
Duration while oxygen sensor output voltage is 1.2 V or more	10 sec. or more

COMPONENT OPERATING RANGE

Parameter	Standard Value
Heated oxygen sensor voltage	0 to 1 V

O2S TEST RESULT (MODE 05 DATA)

Refer to page DI–295 for detailed information.

Rear HO2S voltage monitor

If the HO2S 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	Minimum rear HO2S voltage	Multiplied by 0.005	V
$08	Maximum rear HO2S voltage	Multiplied by 0.005	V

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 (<0.4 V) to Rich (≧0.5 V)	Multiplied by 0.04	sec.
$32	Time to change from Rich (≧0.5 V) to Lean (<0.4 V)	Multiplied by 0.04	sec.

Rear HO2S slow response monitor

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

TEST ID	Description of TEST DATA	Conversion Factor	Unit
$37	Time until rear HO2S voltage drops to 0.2 V after fuel–cut starting	Multiplied by 0.04	sec.

Rear HO2S element monitor

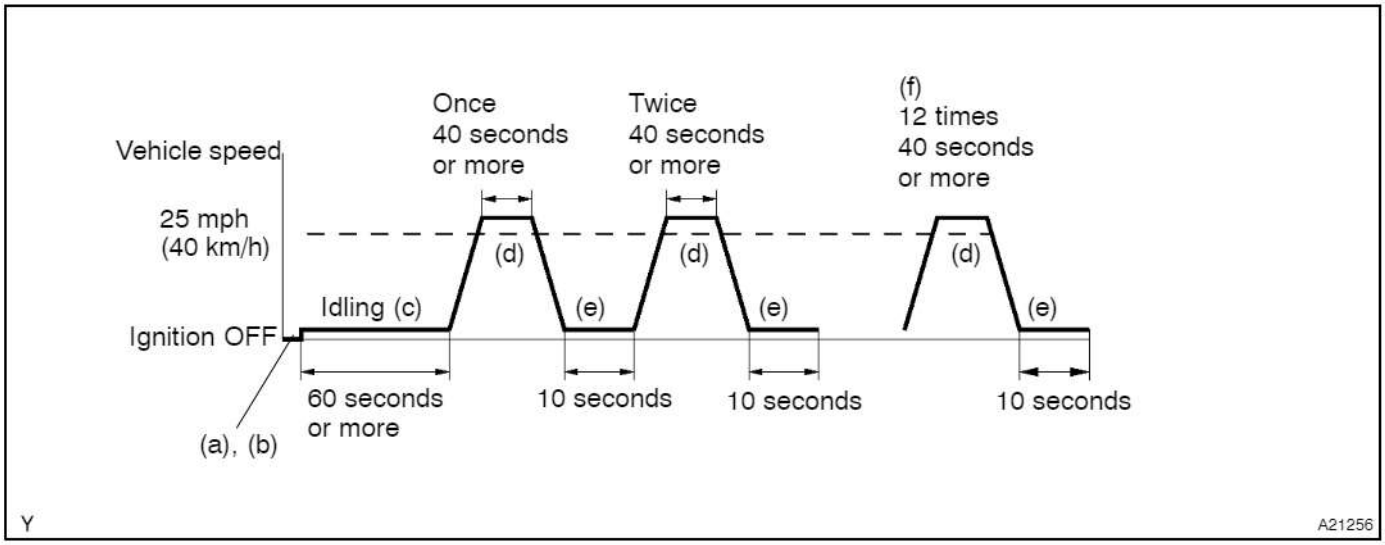
If all the values ($81, $84, $85 and $87) are out of the standard values, the ECM interprets this as a malfunction.

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

WIRING DIAGRAM

Refer to DTC P0130 on page DI–411.

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 DI–295).
(c) Start the engine and run at idle for 60 seconds or more.
(d) Drive the vehicle at 25 mph (40 km/h) or more for 40 seconds or more.
(e) Run the engine at idle for 10 seconds or more.
(f) Perform steps (d) and (e) 12 times.

HINT:

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

NOTICE:

If the conditions in this test are not strictly followed, a malfunction will not be detected. If you do not have a hand–held tester, turn the ignition switch OFF after performing steps from (c) to (f), then perform steps from (c) to (f) again.

INSPECTION PROCEDURE

HINT:

Hand–held tester only:

To determine the trouble area is possible by performing "A/F CONTROL" ACTIVE TEST (heated oxygen sensor or other trouble areas can be distinguished).

(a) Perform ACTIVE TEST using the hand–held tester (A/F CONTROL).

HINT:

"A/F CONTROL" is the ACTIVE TEST which changes the injection volume to –12.5 % or +25 %.

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

RESULT:

Heated oxygen sensor reacts in accordance with increase and decrease of the 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 approximately 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)	Mainly suspected trouble area
Case 1	Injection volume +25 % –12.5 % Output voltage More than 0.5 V Less than 0.4 V **OK**	Injection volume +25 % –12.5 % Output voltage More than 0.5 V Less than 0.4 V **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 0.4 V **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 0.4 V **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 the A/F CONTROL procedure enables the technician to check the graph of the voltage outputs of both the heated oxygen sensors.
To display the graph indication, enter "ACTIVE TEST / A/F CONTROL / USER DATA," then select "O2S B1S1 and O2S B1S2" by pressing "YES" and then "ENTER" button before pressing "F4" button.
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, as well as other data from the time when a malfunction occurred.

1	**Are there any other codes (besides DTC P0136 or P0138) being output?**

YES → **Go to relevant DTC chart (See page DI–335).**

NO

2	**Check output voltage of heated oxygen sensor.**

PREPARATION:
(a) Connect the OBD II scan tool or the hand–held tester to the DLC3.
(b) After warming up the engine, run the engine at 2,500 rpm for 3 minutes.
CHECK:
Read the voltage output of the heated oxygen sensor when the engine speed is suddenly increased.
HINT:
Quickly run the engine to 4,000 rpm for 3 minutes by using the accelerator pedal.
OK:

Heated oxygen sensor output voltage: Fluctuates repeatedly between less than 0.4 V and more than 0.5 V.

OK → **Go to step 6.**

NG

3	**Inspect heated oxygen sensor (heater resistance) (See page SF–75).**

NG → **Replace heated oxygen sensor.**

OK

4	Inspect EFI relay (See page SF–56).

NG → Replace EFI relay.

OK

5	Check for open and short in harness and connectors between ECM and heated oxygen sensor (See page IN–30).

NG → Repair or replace harness or connector.

OK

6	Perform confirmation of driving pattern.

GO

7	Is DTC P0136 or P0138 output again?

NO → Check for intermittent problems (See page DI–295).

YES

Replace heated oxygen sensor.

DIC7E–02

DTC	P0171	System too Lean (Bank 1)

DTC	P0172	System too Rich (Bank 1)

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 long–term fuel trim is the overall fuel compensation and carried out in long–term fueltrim to compensate a continual deviation from the theoretical central value by the short–term fuel trim, due to individual engine's specifications and engine deterioration with time.

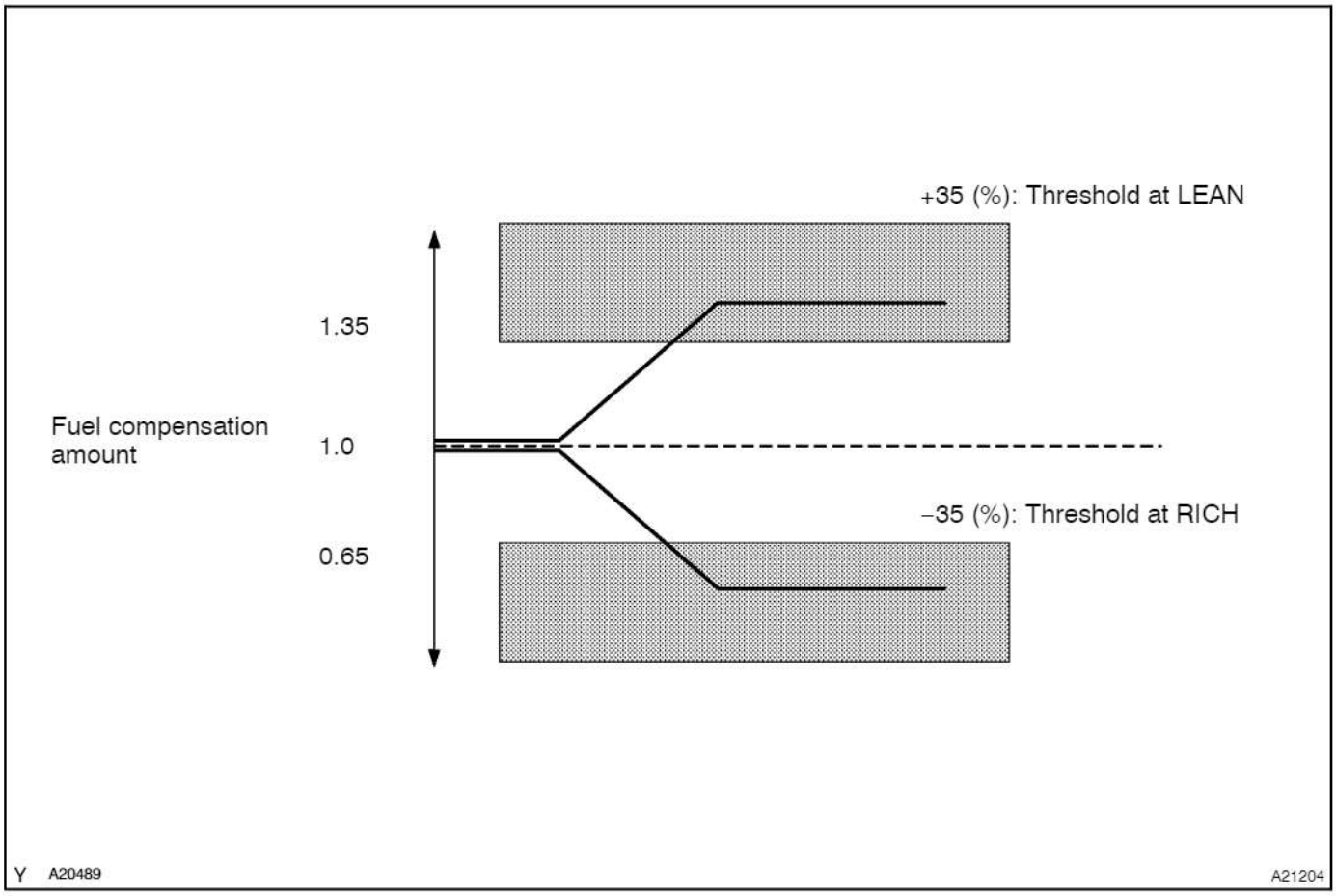
If both short–term and long–term fuel trims are LEAN or RICH beyond a certain value, it is detected as a malfunction and the MIL is illuminated.

DTC No.	DTC Detection Condition	Trouble Area
P0171	When air–fuel ratio feedback is stable after warming up the engine, fuel trim is considered to be 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 (bank 1, sensor 1) 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
P0172	When air–fuel ratio feedback is stable after warming up the engine, fuel trim is considered to be 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 heated oxygen sensor (bank 1, sensor 1) circuit • Heated oxygen sensor (bank 1, sensor 1) • Heated oxygen sensor heater (bank 1, sensor 1) • EFI relay • ECM

HINT:

- When DTC P0171 is recorded, the actual air–fuel ratio is on the LEAN side. When DTC P0172 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 may be recorded. The MIL then comes on.
- 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.

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 a 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:
If the smoothed fuel trim learning value is more than +35% or less than –35%, the ECM interprets this as a malfunction in the fuel system.

MONITOR STRATEGY

Related DTCs	P0171	Fuel system lean (Bank 1)
	P0172	Fuel system rich (Bank 1)
Required sensors/components	Main sensors/components	Front oxygen sensor
	Related sensors/components	Engine coolant temperature sensor, Mass air flow meter, Crankshaft position sensor
Frequency of operation	Continuous	
Duration	10 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–295	
Battery voltage	11 V	–
Fuel system status	Closed–loop	
Throttle position learning	Completed	
Either of the following conditions is met:	Condition 1 or 2	
1. Engine RPM	–	1,100 rpm
2. Intake air amount per revolution	0.15 g/sec. or more	–

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Purge–cut	Executing
Either of the following conditions is met:	Condition 1 or 2
1. Average between short–term fuel trim and long–term fuel trim	35% or more (varies with ECT)
2. Average between short–term fuel trim and long–term fuel trim	–35% or less (varies with ECT)

WIRING DIAGRAM

Refer to DTC P0130 on page DI–411.

INSPECTION PROCEDURE

HINT:

Hand–held tester only:

To determine the trouble area is possible by performing "A/F CONTROL" ACTIVE TEST (heated oxygen sensor or other trouble areas can be distinguished).

(a) Perform ACTIVE TEST using the hand–held tester (A/F CONTROL).

HINT:

"A/F CONTROL" is the ACTIVE TEST which changes the injection volume to –12.5 % or +25 %.

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

RESULT:

Heated oxygen sensor reacts in accordance with increase and decrease of the 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)	Mainly suspected trouble area
Case 1	Injection volume +25 % –12.5 % Output voltage More than 0.5 V Less than 0.4 V OK	Injection volume +25 % –12.5 % Output voltage More than 0.5 V Less than 0.4 V 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 0.4 V 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 0.4 V 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 of the A/F CONTROL procedure enables the technician to check and graph the voltage outputs of both the heated oxygen sensors.

For displaying the graph indication, enter "ACTIVE TEST / A/F CONTROL / USER DATA," then select "O2S B1S1 and O2S B1S2" by pressing "YES" button and push "ENTER" button before pressing "F4" button.

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, as well as other data from the time when a 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 (See page SF–1).**

CHECK:

Check the air induction system for vacuum leaks.

NG → **Repair or replace air induction system.**

OK

2	**Check connection of PCV piping.**

NG → **Repair or replace PCV piping.**

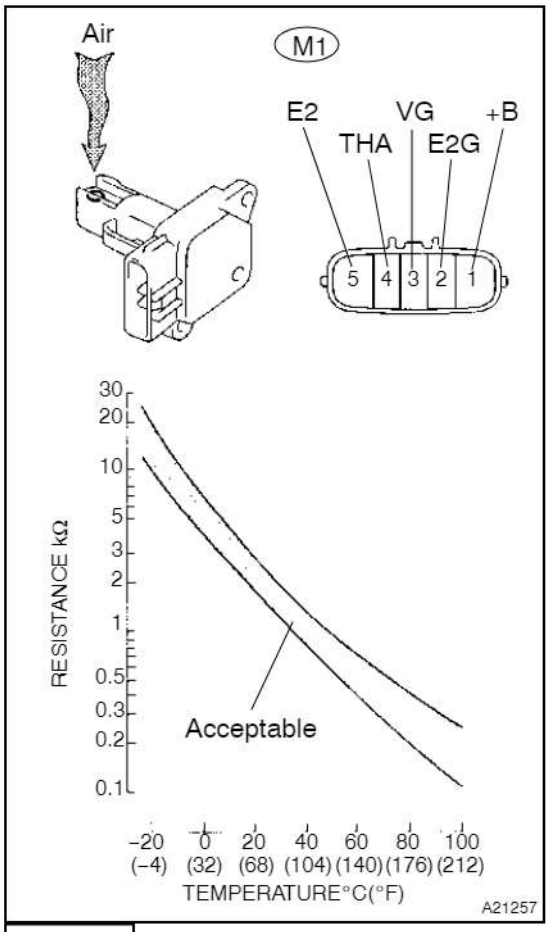
OK

3	**Check injector injection (See page SF–22).**

NG → **Replace injector.**

OK

4	Check mass air flow meter.



PREPARATION:

Remove the mass air flow meter.

CHECK:

(a) Check the output voltage.
  (1) Apply the battery voltage terminals +B and E2G.
  (2) Connect the positive (+) tester probe to terminal VG, and negative (–) tester probe to terminal E2G.
  (3) Blow air into the mass air flow meter, and check that the voltage fluctuates.

(b) Inspect the resistance
  (1) Measure the resistance between the terminals of the intake air temperature sensor.

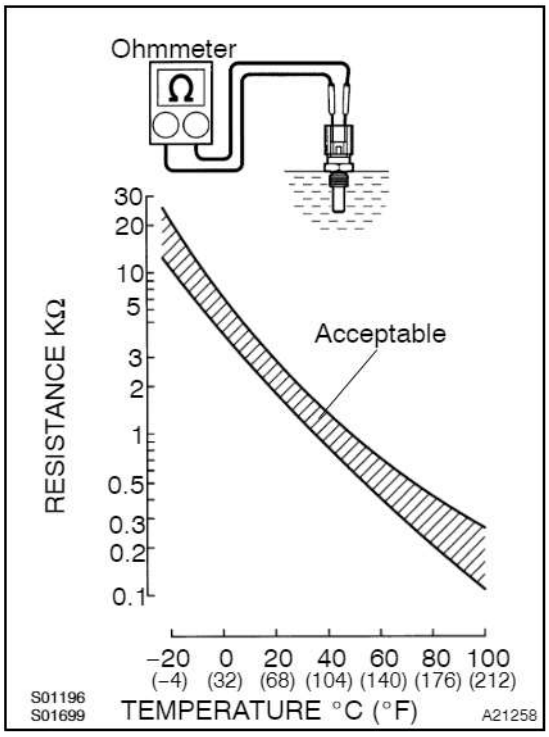
OK:

Tester Connection	Temperature	Specified Condition
THA (M1–4) – E2 (M1–5)	–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

NG → **Replace mass air flow meter.**

OK

5	Check engine coolant temperature sensor.



PREPARATION:

Remove the engine coolant temperature sensor.

CHECK:

Measure the resistance between the terminals of the engine coolant temperature sensor.

OK:

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

NOTICE:

If you check the engine coolant temperature sensor in water, be careful not to allow water to go into 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 (by warming up or cooling down) and repeat the test.

(a) Reinstall the engine coolant temperature sensor.

NG → **Replace engine coolant temperature sensor.**

OK

6	Check for spark and ignition (See page IG–1).

NG → **Repair or replace.**

OK

7	**Check fuel pressure (See page SF–6).**

CHECK:

Check the fuel pressure (high or low pressure).

NG → **Check and repair fuel pump, fuel pipe line and filter (See page SF–1).**

OK

8	**Check gas leakage on exhaust system.**

NG → **Repair or replace exhaust gas leakage point.**

OK

9	Check output voltage of heated oxygen sensor (bank 1 sensor 1) during idling.

PREPARATION:

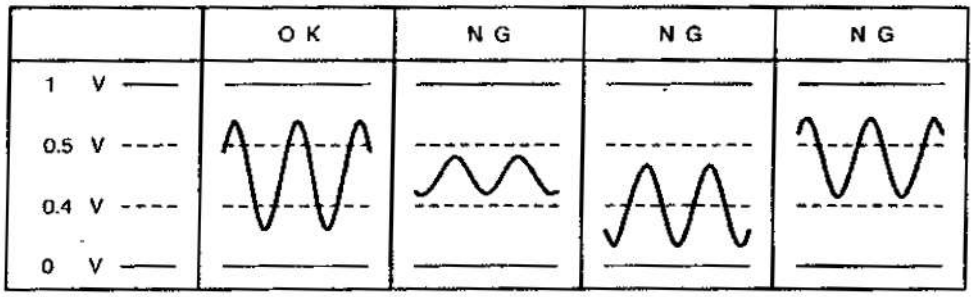
(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Start the engine and push the hand–held tester or the OBD II scan tool main switch ON.
(c) Whe using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / O2S B1S1."
(d) Warm up the heated oxygen sensor with the engine speed at 2,500 rpm for approximately 90 seconds.

CHECK:

Read the output voltage of the heated oxygen sensor during idling.

OK:

Heated oxygen sensor output voltage:
Alternates repeatedly between less than 0.4 V and more than 0.5 V (See the following table).

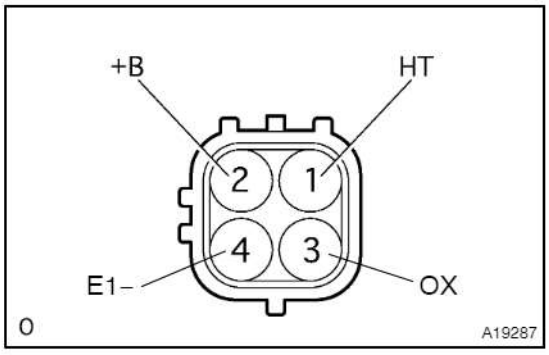


A21259

OK	Go to step 17.

NG

10	Check resistance of heated oxygen sensor heater.



A19287

PREPARATION:

Disconnect the heated oxygen sensor connector.

CHECK:

Measure resistance between the terminals HT and +B of the heated oxygen sensor.

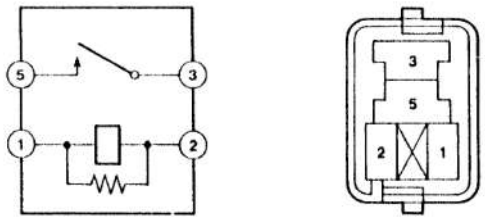
OK:

Resistance: 11 to 16 Ω (20°C)

NG	Replace heated oxygen sensor.

OK

11	Check EFI relay.



A19288

PREPARATION:

Remove the EFI relay from the engine room J/B.

CHECK:

Inspect the EFI relay.

OK:

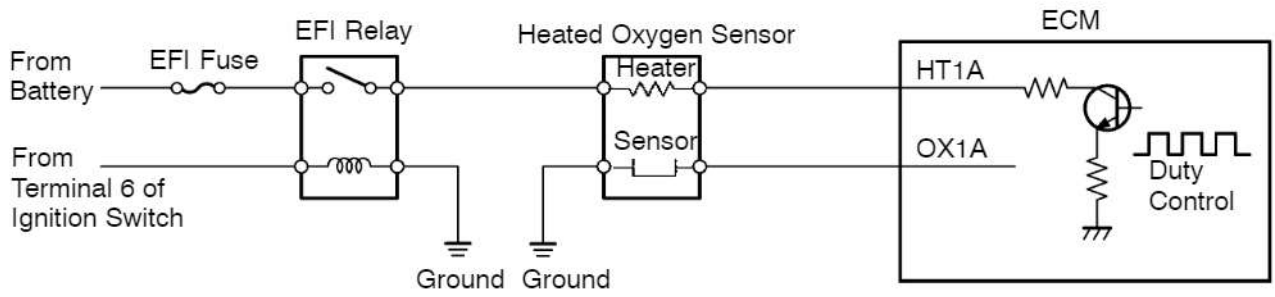
Tester Connection	Specified Condition
1 – 2	Continuity
3 – 5	No continuity
	Continuity (Apply battery voltage to terminals 1 and 2)

NG → **Replace EFI relay.**

OK

12	Check for open and short in harness and connector between ECM and heated oxygen sensor (bank 1 sensor 1) (See page IN–30).

Reference (Bank 1 Sensor 1 System Drawing):



A21253

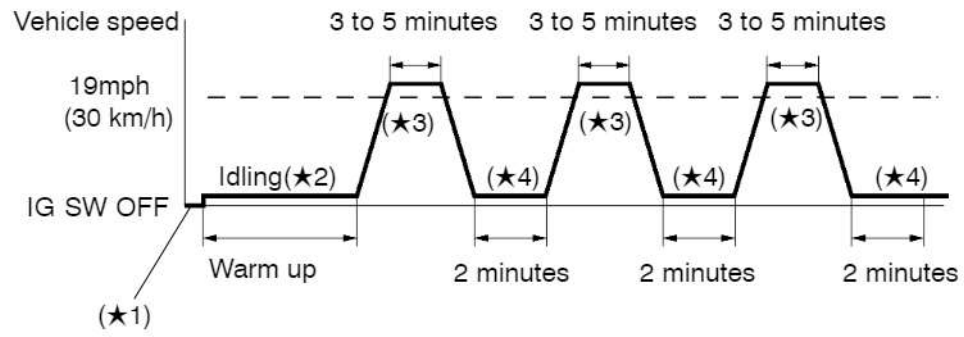
NG → **Repair or replace harness or connector.**

OK

13	**Replace heated oxygen sensor.**

Go

14	**Perform confirmation driving pattern.**



(a) Disconnect the battery terminal and wait for a 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 the normal mode to the check mode (See page DI–295). (★1)
(d) Start the engine and let it idle until engine coolant temperature is 75 °C (167 °F) or more. (★2)
(e) Drive the vehicle at 19 mph (30 km/h) or more for 3 minutes or more. (★3)
(f) Let the engine idle for approx. 2 minutes. (★4)
(g) Perform steps (e) and (g) at least 3 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, detecting a malfunction may be difficult. If you do not have a hand–held tester, turn the ignition switch OFF after performing steps (e) to (f), and then perform step (f) again.

Go

15	**Is there DTC P0171 or P0172 being output again?**

YES → **Replace ECM (See page SF–78) and perform confirmation driving pattern (Refer to step 14).**

NO

16	**Confirm if vehicle has run out of fuel in the past.**

NO → **Check for intermittent problems (See page DI–295).**

YES

DTC P0171 or P0172 is caused by fuel shortage.

17	**Perform confirmation driving pattern.**

HINT:
Clear all DTCs prior to performing the confirmation driving pattern (Refer to step 14).

Go

18	**Is there DTC P0171 or P0172 being output again?**

NO → **Go to step 22.**

YES

19	**Replace heated oxygen sensor.**

Go

20	**Perform confirmation driving pattern.**

HINT:
Clear all DTCs prior to performing the confirmation driving pattern (Refer to step 14).

Go

21	Is there DTC P0171 or P0172 being output again?

YES → Replace ECM (See page SF–78) and perform confirmation driving pattern (Refer to step 14).

NO

22	Confirm if vehicle has run out of fuel in the past.

NO → Check for intermittent problems (See page DI–295).

YES

DTC P0171 or P0172 is caused by fuel shortage.

DIC7F–02

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

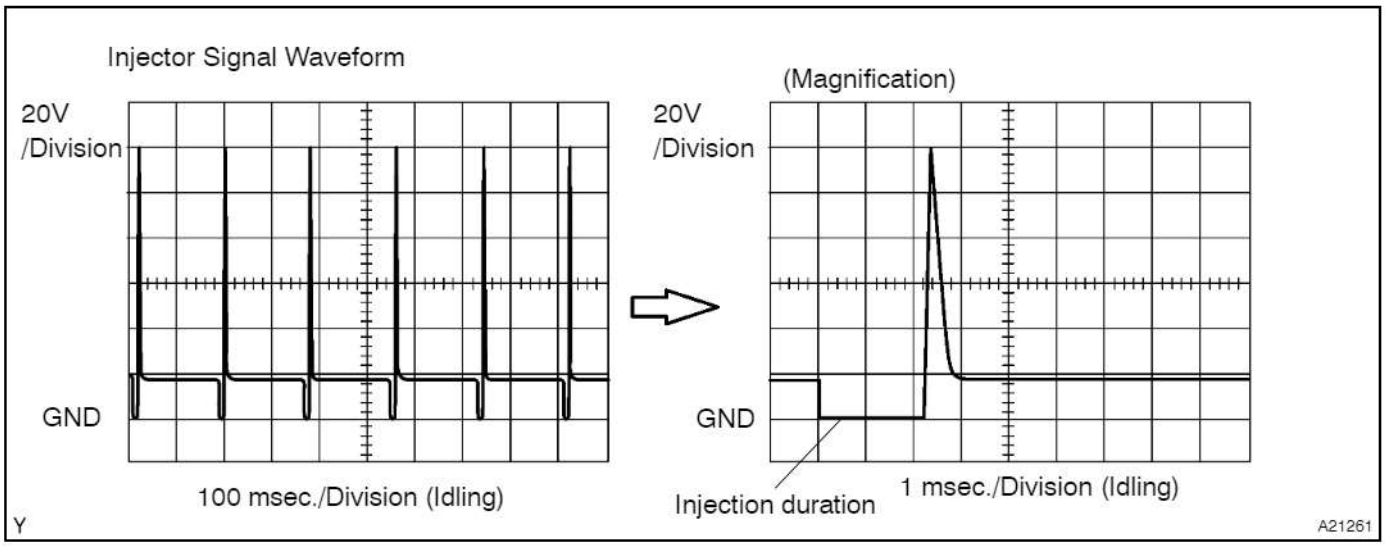
CIRCUIT DESCRIPTION

When a misfire occurs in the engine, hydrocarbons (HC) are output in high concentrations. If this HC concentration is high enough, there could be an increase in exhaust emission levels. High concentrations of HC passing through the catalyst also cause the temperature of the catalyst to increase, possibly damaging the catalyst. To prevent this increase in the 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 camshaft position sensor and the crankshaft position sensor. The camshaft position sensor is used to identify misfiring cylinders and crankshaft position sensor is used to measure variations in the crankshaft rotation speed. A misfire is counted when crankshaft rotation speed variations exceed threshold values.
The ECM illuminates the MIL if the misfiring rate exceeds a threshold value, which could cause emission deterioration.

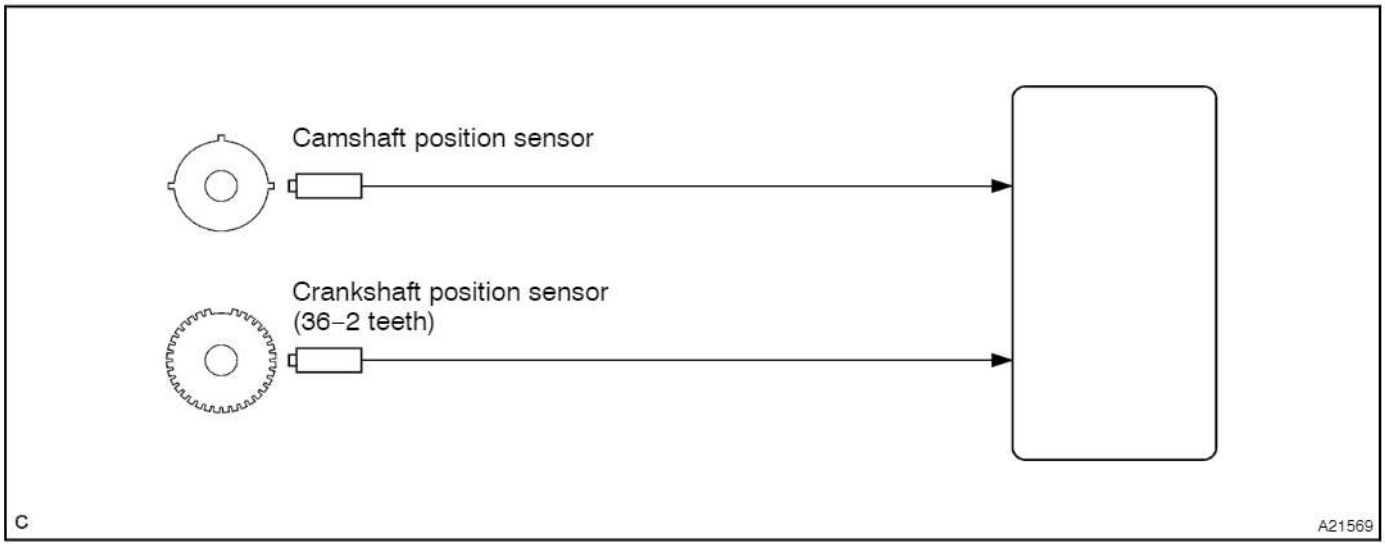
DTC No.	DTC Detection Condition	Trouble Area
P0300	Misfiring of random cylinder is detected	• Open or short in engine wire • Connector connection • Vacuum hose connection • Ignition system • Injector • Fuel pressure • Mass air flow meter • Engine coolant temperature sensor • Compression pressure • Valve clearance • Valve timing • VVTL–i system (rocker arm) • PCV hose connection • PCV hose • ECM
P0301 P0302 P0303 P0304	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 by using oscilloscope
With the engine idling, check the waveform between terminals #10 to #40 and E01 of the ECM connectors.
HINT:
The correct waveform is as shown in the illustration.



MONITOR DESCRIPTION



The ECM illuminates the MIL (2 trip detection logic) if:
The ECM will illuminate the MIL when the percentage of misfire exceeds the specified limit per 1,000 engine revolutions. One occurrence of excessive misfire during engine start will illuminate the MIL. Four occurrences are required to illuminate the MIL 1,000 revolutions after engine start.
The ECM blinks the MIL (the MIL blinks immediately) if:

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

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
Required sensors/components	Main sensors/components	Camshaft position sensor, Crankshaft position sensor
	Related sensors/components	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 of operation	None	

TYPICAL ENABLING CONDITIONS

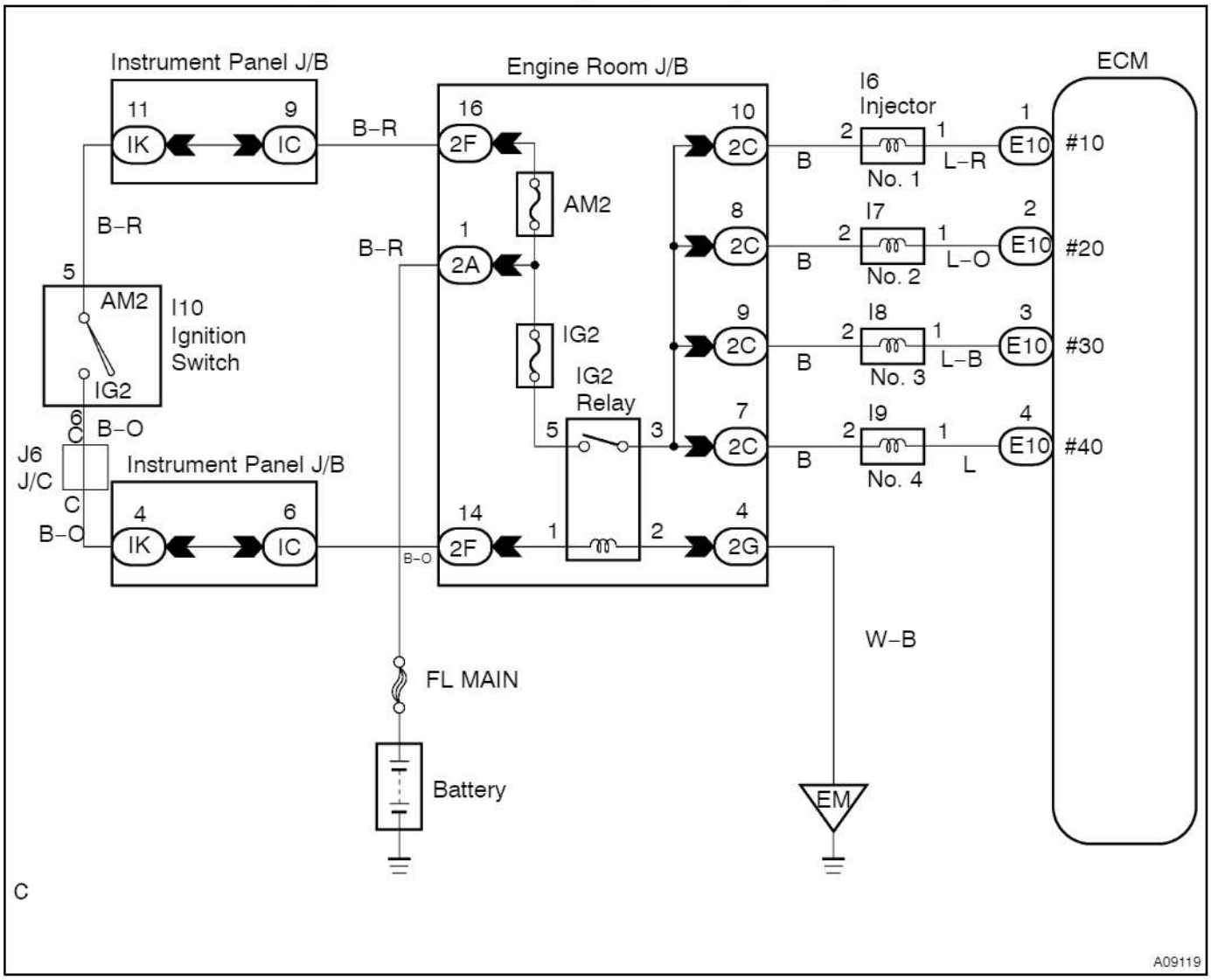
Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–295	
Battery voltage	8 V	–
Throttle position learning	Completed	
VVT sytem	Not operated by scan tool	
Engine RPM	400 rpm	7,800 rpm
All of the following conditions are met:	Condition 1 and 2	
1. Engine coolant temperature	–10°C (14°F)	–
2. Either of the following conditions is met:	Condition (a) or (b)	
(a) Engine coolant temperature at engine start	–7°C (19°F)	–
(b) Engine coolant temperature	20°C (68°F)	–
Fuel–cut	OFF	
Monitor period of emission – related – misfire:		
First 1,000 revolutions after engine start, or check mode	Crankshaft 1,000 revolutions	
Except above	Crankshaft 1,000 revolutions x 4	
Monitor period of catalyst – damage – misfire:		
All of the following conditions 1, 2 and 3 are met	Crankshaft 200 revolutions	
1. Driving cycle	1st	
2. Check mode	OFF	
3. Engine RPM	–	4,000 rpm

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Monitor period of emission – related – misfire:	
Misfire rate	1.3 % or more
Monitor period of catalyst – damage – misfire:	
Number of misfire per 200 revolutions	101 or more (varies with engine RPM and intake air amount)

WIRING DIAGRAM

Refer to DTC P0351 on page DI–486 for the wiring diagram of ignition system.



CONFIRMATION DRIVING PATTERN

(a) Connect the hand–held tester to the DLC3.
(b) Record DTCs and the freeze frame data.
(c) Select the check mode using the hand–held tester (See page DI–295).
(d) Read the value on the misfire counter for each cylinder with the engine idling. If the value is displayed on the misfire counter, skip the following procedure of the confirmation driving.
(e) Drive the vehicle several times with the engine speed, load and surrounding range shown as 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:

Do not turn the ignition switch OFF during the confirmation driving pattern. This switches the diagnosis system from the check mode to the normal mode, so all the DTCs and freeze flame data will be erased.

Engine Speed	Time
Idling	5 minutes and 45 seconds or more
1,000 rpm	4 minutes or more
2,000 rpm	2 minutes and 30 seconds or more
3,000 rpm	1 minute and 30 seconds or more

(f) Check whether there is misfire or not by monitoring the DTC and the freeze frame data. After that, record them.
(g) Turn the ignition switch OFF and wait 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, as well as other data from the time when a 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).
- For 6 or 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 code P0300 will be stored.

  When only a general misfire fault code like P0300 is stored:
- Erase the general misfire fault code using the hand–held tester or OBD II scan tool.
- Start the engine and drive the confirmation pattern.
- Read the value of the misfire ratio for each cylinder. Or read the DTC.
- Repair the cylinder that has a high misfire ratio. Or repair the cylinder indicated by the DTC.
- After finishing repairs, drive the confirmation pattern again and confirm that no misfire occurs.
- When either SHORT FT #1 or LONG FT #1 in the freeze frame data is over the range of ±20 %, there is a possibility that the air–fuel ratio is becoming to RICH (–20 % or less) or LEAN (+20 % or more).
- 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 is suspected: 1) the vehicle has low fuel, 2) improper fuel is being used, or 3) the ignition plug is contaminated.

- Be sure to check the value on the misfire counter after the repair.

1	**Are there any other codes (besides DTC P0300, P0301, P0302, P0303 or P0304) being output?**

PREPARATION:

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

CHECK:

Read the DTCs.

RESULT:

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

HINT:

If any other codes besides P0300, P0301, P0302, P0303 and/or P0304 are output, perform the trouble-shooting for those DTCs first.

B → **Go to relevant DTC chart (See page DI–335).**

A

2	**Check harness, connector and vacuum hose in engine room.**

CHECK:

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

NG → **Repair or replace, then confirm that there is no misfire (See confirmation driving pattern).**

OK

3	**Check connection of PCV piping.**

NG → **Repair or replace PCV piping.**

OK

4	**Connect hand–held tester, and read the number of misfire.**

PREPARATION:

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester or the OBD II scan tool main switch ON.
(c) Start the engine.
(d) When using hand–held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / CYL#1 to CYL#4.

CHECK:

Read the number of misfire cylinder 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.

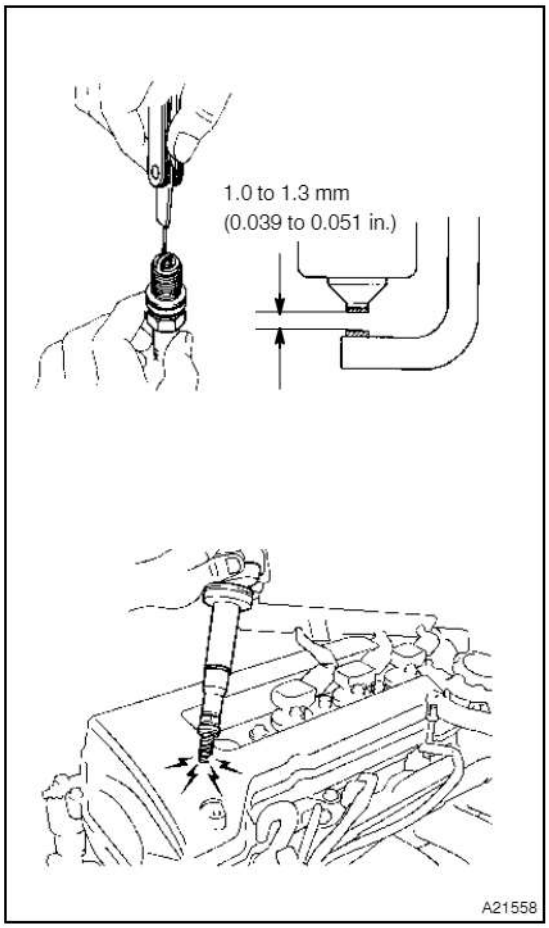
RESULT:

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.



PREPARATION:

(a) Disconnect the ignition coil assembly.
(b) Remove the spark plug.

CHECK:

(a) Check for carbon deposits on electrode.
(b) Check the spark plug type (See page IG–1).
(c) Check electrode gap.

OK:

(b) No large carbon deposit present.
Not wet with gasoline or oil.
(c) Electrode gap: 1.0 to 1.3 mm (0.039 to 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 of a used plug.

PREPARATION:

(a) Install the spark plug to the ignition coil assembly.
(b) Disconnect the injector connector.
(c) Ground spark plug.

CHECK:

Check if spark occurs while engine is being cracked.

CAUTION:

Always disconnect each injector connector.

NOTICE:

Do not crank the engine for more than 2 seconds.

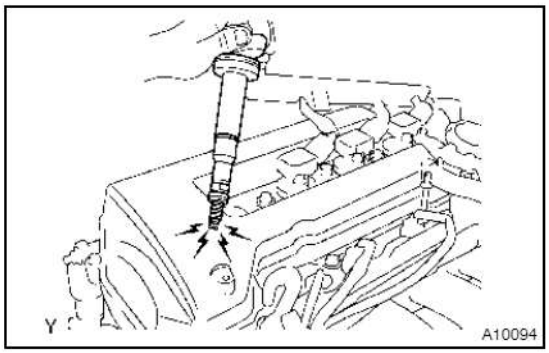
OK:

Spark jumps across electrode gap.

OK	Go to step 8.

NG

6	Change normal spark plug and check spark of misfiring cylinder.



PREPARATION:

(a) Change to the normal spark plug.
  (1) Remove the spark plug that may be faulty from the ignition coil assembly.
  (2) Install another spark plug to the ignition coil assembly.
(b) Disconnect the injector connector.
(c) Ground the spark plug.

CHECK:

Check if spark occurs while the engine is being cranked.

CAUTION:

Always disconnect each injector connector.

NOTICE:

Do not crank the engine for more than 2 seconds.

OK:

Spark jumps across electrode gap.

OK	Replace spark plug.

NG

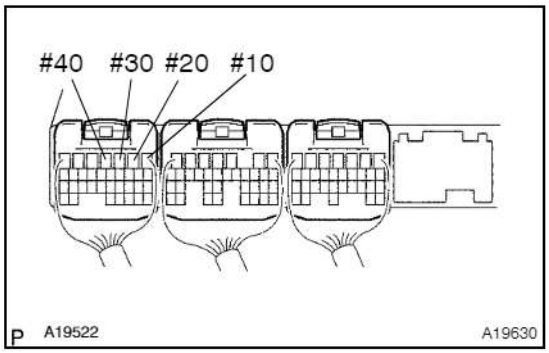
7	Check for open and short in harness and connector between ignition coil and ECM (See page IN–30).

OK	Replace ignition coil with igniter, then confirm that there is no misfire.

NG

Repair or replace harness or connector.

8	**Check voltage of ECM terminal for injector of failed cylinder.**



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure voltage between applicable terminal of the ECM connector and body ground.

OK:

Voltage: 9 to 14 V

OK	**Go to step 11.**

NG

9	**Check resistance of injector of misfiring cylinder (See page SF–18).**

NG	**Replace injector.**

OK

10	**Check for open and short in harness and connector between ignition switch and injector, injector and ECM of misfiring cylinder (See page IN–30).**

NG	**Repair or replace harness or connector.**

OK

11	**Check injector injection and volume of misfiring cylinder (See page SF–22).**

NG	**Replace injector.**

OK

12	**Check compression pressure of misfiring cylinder (See page EM–3).**

NG → **Repair or replace.**

OK

13	**Check valve clearance of misfiring cylinder (See page EM–4).**

NG → **Adjust valve clearance.**

OK

14	**Check result of step 4 switch step by number of misfire cylinder.**

High misfire rate cylinder	Proceed to
1 or 2 cylinders	A
more than 3 cylinders	B

B → **Check for intermittent problems (See page DI–295).**

A

15	**Check valve timing (Check for loose or a jumped tooth of the timing chain) (See page EM–26).**

NG → **Adjust valve timing.**

OK

16	**Check fuel pressure (See page SF–6).**

CHECK:

Check the fuel pressure (high or low pressure).

NG → **Check and repair fuel pump, fuel pipe line and filter (See page SF–1).**

OK ↓

17	**Check mass air flow meter.**

PREPARATION:

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

(b) Turn the ignition switch ON.

CHECK:

(a) Check the intake air temperature.

(1) When using hand–held tester, enter the following menu: "DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / INTAKE AIR".

(2) Read its value displayed on the hand–held tester or the OBD II scan tool.

OK:

Equivalent to ambient temperature

(b) Check the air flow rate.

(1) When using hand–held tester, enter the following menu: "DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / MAF".

(2) Read its value displayed on the hand–held tester or the OBD II scan tool.

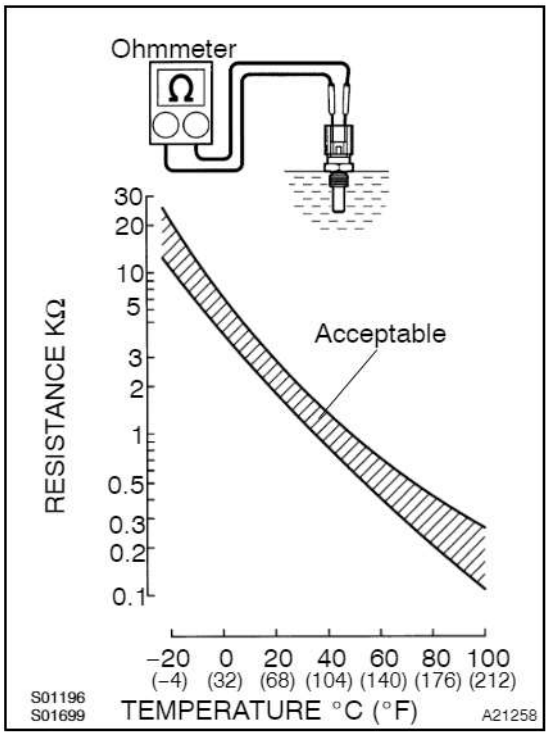
OK:

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
From idling to quickly accelerating	Air flow rate fluctuates

NG → **Replace mass air flow meter.**

OK ↓

18	Check engine coolant temperature sensor (See page SF–67).



PREPARATION:

Remove the engine coolant temperature sensor.

CHECK:

Measure the resistance between the terminals of the engine coolant temperature sensor.

OK:

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

NOTICE:

If you check the engine coolant temperature sensor in water, be careful not to allow water to go into 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 (by warming up or cooling down) and repeat the test.

(a) Reinstall the engine coolant temperature sensor.

NG	Replace engine coolant temperature sensor.

OK

19	Check result of step 4 switch step by number of misfire cylinder.

High misfire rate cylinder	Proceed to
1 or 2 cylinders	A
more than 3 cylinders	B

B	Go to step 5.

A

Check intermittent problems (See page DI–295).

DTC	P0327	Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)

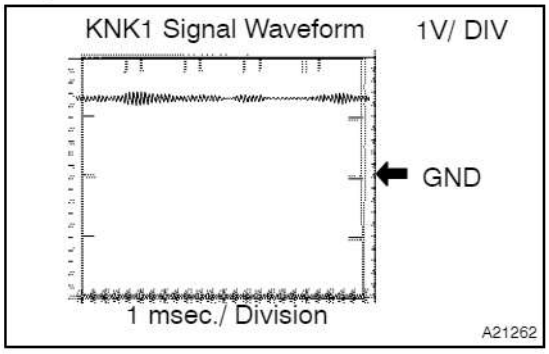
DTC	P0328	Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)

CIRCUIT DESCRIPTION

The flat type knock sensor (non–resonant type) has a structure that can detect vibrations in a wide frequency, from about 6 kHz to 15 kHz, and has the following features.
Knock sensors are fitted to the right bank and left bank of the cylinder block to detect the engine knocking. Each sensor contains a piezoelectric element which generates a voltage when it becomes deformed. This occurs when the cylinder block vibrates due to knocking. If engine knocking occurs, the ignition timing is retarded to suppress it.

DTC No.	DTC Detecting Condition	Trouble Area
P0327	Output voltage of the knock sensor is 0.5 V or less	• Short in knock sensor circuit • Knock sensor (under–torqued or loose) • ECM
P0328	Output voltage of the knock sensor is 4.5 V or more	• Open in knock sensor circuit • Knock sensor (under–torqued or loose) • ECM

HINT:
If the ECM detects the DTC P0327 and P0328, it enters the fail–safe mode in which the corrective retarded angle value is set to the maximum value.



Reference: Inspection by using the oscilloscope.
After warning up, run the engine at 4,000 rpm, and check the waveform between terminals KNK1 and EKNK of the ECM connector.

MONITOR DESCRIPTION

The knock sensor located on the cylinder block detects spark knock.
When spark knock occurs, the sensor pick–up vibrates in a specific frequency range. When the ECM detects the voltage in this frequency range, it retards the ignition timing to suppress the 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 sec. 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	P0327	Knock sensor (Bank 1) range check (Low voltage)
	P0328	Knock sensor (Bank 1) range check (High voltage)
Required sensors/components	Main sensors/components	Knock sensor
	Related sensors/components	Crankshaft position sensor, Camshaft position sensor, Engine coolant temperature sensor, Mass air flow meter
Frequency of operation	Continuous	
Duration	1 sec.	
MIL operation	Immediate	
Sequence of operation	None	

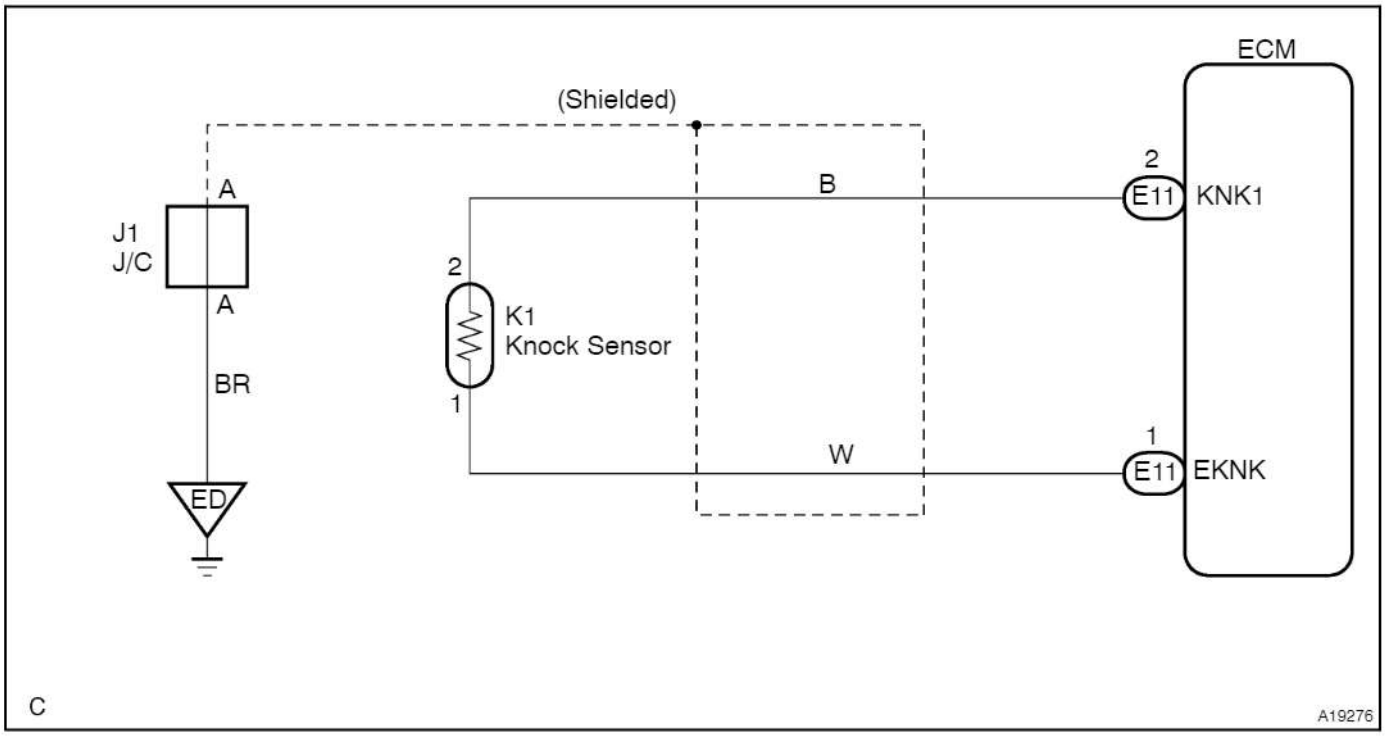
TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–295	
Battery voltage	10.5 V	–
Time after engine start	5 sec.	–
Ignition switch	ON	
Starter	OFF	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P0327:	
Knock sensor voltage	Less than 0.5 V
P0328:	
Knock sensor voltage	More than 4.5 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, as well as other data from the time when a malfunction occurred.

1	**Read output DTC.**

PREPARATION:

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester or the OBD II scan tool main switch ON.
(c) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(d) Clear the DTCs.
(e) Warm up the engine.
(f) Run the engine at 3,000 rpm for 10 seconds or more.

CHECK:

Read the DTCs.

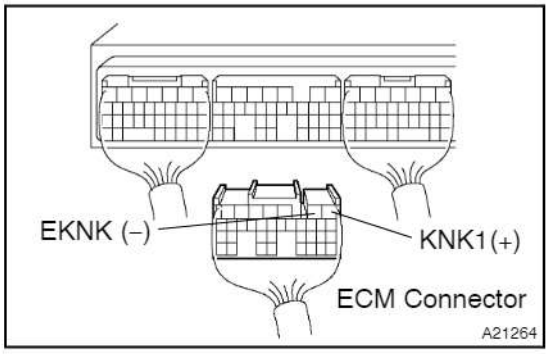
RESULT:

Display (DTC output)	Proceed to
P0327 and/or P0328	A
No output	B

B → **Check for intermittent problems (See page DI–295)**

A

2	**Check for open and short in harness and connector between ECM and knock sensor.**



PREPARATION:

Disconnect the E11 ECM connector.

CHECK:

Measure the resistance between the terminals of the ECM connector.

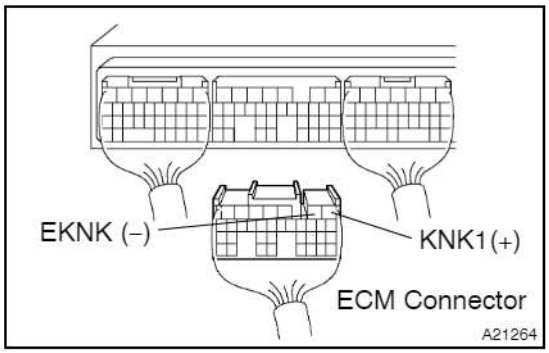
OK:

Resistance: 120 to 280 kΩ at 20 °C (68 °F)

NG → **Go to step 4.**

OK

3	Check voltage between terminals KNK1 and EKNK of ECM connector.



PREPARATION:

(a) Disconnect the E11 ECM connector.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between the terminals of the ECM connector.

OK:

Voltage: 4.5 to 5.5 V

NG	Replace ECM (See page SF–78).

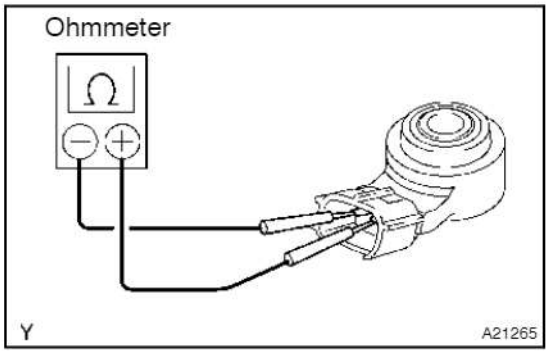
OK

Check for intermittent problems (See page DI–295).

NOTICE:

Fault may be intermittent. Check wire harness and connectors carefully.

4	Check knock sensor.



PREPARATION:

Remove the knock sensor.

CHECK:

Measure the resistance between the terminals.

OK:

Resistance: 120 to 280 kΩ at 20°C (68°F)

NG	Replace knock sensor.

OK

Repair or replace harness or connector.

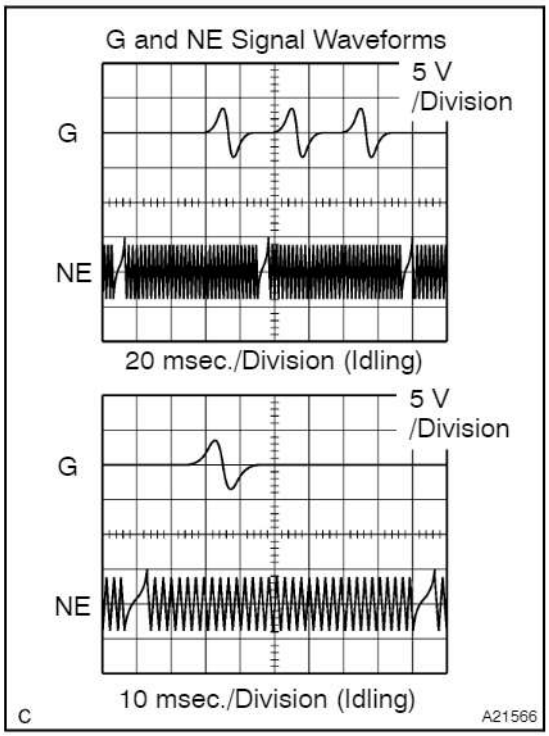
DTC	P0335	Crankshaft Position Sensor "A" Circuit Malfunction

DTC	P0339	Crankshaft Position Sensor "A" Circuit Intermittent

CIRCUIT DESCRIPTION

The crankshaft position sensor (NE signal) consists of a magnet, iron core and pickup coil.
The NE signal plate (crankshaft position sensor plate) has 34 teeth and is installed on the crankshaft. The NE signal sensor generates 34 signals for each engine revolution. This sensor monitors a plate (timing rotor) located on the crankshaft timing pulley and is used by the ECM to detect crankshaft angle and engine speed (RPM/NE). As the crankshaft timing pulley rotates through an engine revolution, this sensor communicates the rotation of the NE signal plate 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
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 with engine speed 600 rpm or more (2 trip detection logic)	
P0339	In conditions (a), (b) and (c), no crankshaft position sensor (NE+) signal is input for 0.05 second or more (a) Engine revolution is 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	



Reference: Inspection by using the oscilloscope.
HINT:
The correct waveform is as shown on the left.

Item	Contents
Terminal	CH1: G+ – NE– CH2: NE+ – NE–
Equipment Setting	5V/Division, 20ms/Division
Condition	During cranking or idling

MONITOR DESCRIPTION

If there are no signals from the crankshaft sensor even though the engine is cranking, 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 sensors/components	Crankshaft position sensor
	Related sensors/components	Engine speed sensor
Frequency of operation	Continuous	
Duration	Case 1: 4.7 sec. Case 2: 0.016 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

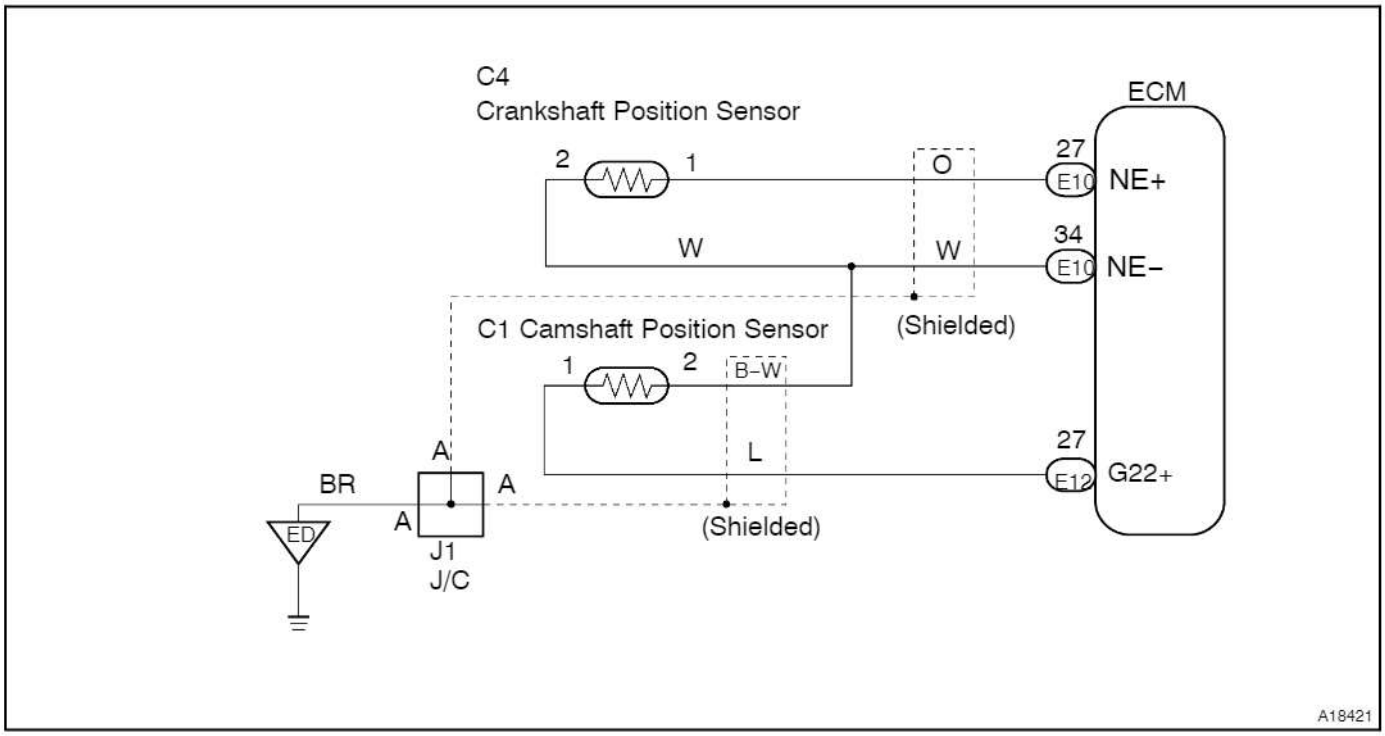
TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–295	
Case 1:		
Starter	ON	
Minimum battery voltage while starter is ON	–	11 V
Case 2:		
Engine speed	600 rpm	–
Starter	OFF	
Time after starter turns from ON to OFF	3 sec.	–

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Case 1:	
Engine speed signal	No signal for 4.7 sec.
Case 2:	
Engine speed signal	No signal for 0.016 sec.

WIRING DIAGRAM



INSPECTION PROCEDURE

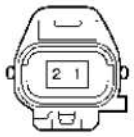
HINT:

- 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, as well as other data from the time when a 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 push the hand–held tester or the OBD II scan tool main switch ON.
  (c) Select the menu "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 are no NE signals from the crankshaft position sensor despite running the engine, the engine speed will be indicated as zero. If the voltage output of the crankshaft position sensor is insufficient, the engine speed will be indicated as lower RPM (than the actual RPM).

1	Check resistance of crankshaft position sensor.

Component Side:

Crankshaft Position Sensor



Front View

Y A21267

(a) Disconnect the crankshaft position sensor connector.
(b) Measure the resistance between the terminals of the crankshaft position sensor connector.

OK:

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).

NG → **Replace crankshaft position sensor.**

OK

2	Check for open and short in harness and connector between ECM and crankshaft position sensor (See page IN–30).

NG → **Repair or replace harness or connector.**

OK

3	Inspect sensor installation.

CHECK:

Check the crankshaft position sensor installation.

NG → **Tighten sensor.**

OK

4	**Check teeth of signal plate.**

PREPARATION:

Remove the crankshaft angle sensor plate (See page EM–19).

CHECK:

Check the teeth of sensor plate.

NG → **Replace signal plate.**

OK →

Replace ECM (See page SF–78).

DIC7I–02

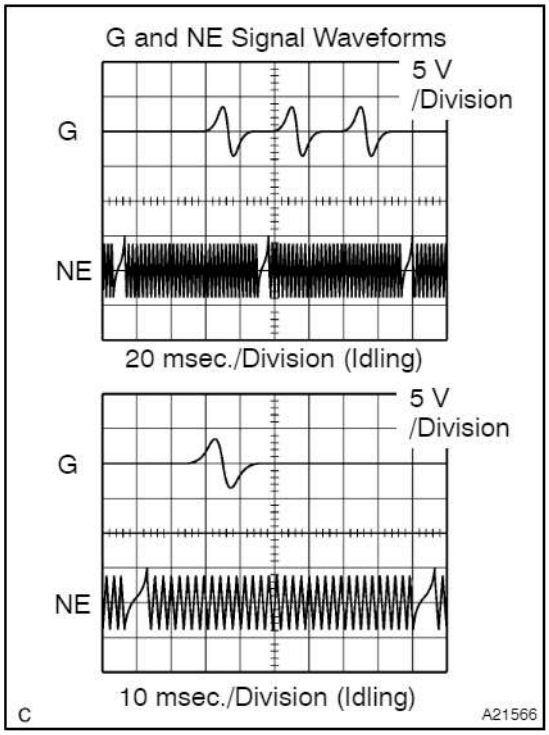
DTC	P0340	Camshaft Position Sensor "A" Circuit (Bank 1 or Single Sensor)

DTC	P0341	Camshaft Position Sensor "A" Circuit Range/Performance (Single Sensor)

CIRCUIT DESCRIPTION

The camshaft position sensor (G signal) consists of a magnet iron core and pickup coil.
The G signal plate has 3 teeth on its outer circumference and is installed on the camshaft timing pulley. When the camshafts rotate, 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 timing pulley) has 34 teeth and is installed to the crankshaft. The NE signal sensor generates 34 signals at every engine revolution. The ECM detects the crankshaft angle and the engine revolution based on the NE signal, and the cylinder and angle of VVT based on the combination of the G and NE signal.

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 600 rpm or more (1 trip detection logic)	• Open or short in camshaft position sensor circuit • Camshaft position sensor • Camshaft timing pulley • Timing chain has a jumped tooth • ECM
P0341	While crankshaft rotates twice, camshaft position sensor signal is input to ECM 12 times or more (1 trip detection logic) • Hint: Under normal condition, the signal from the sensor is regularly input into the ECM 3 times per 2 engine revolutions	



Reference: Inspection by using the oscilloscope.
HINT:
The correct waveform is as shown on the left.

Item	Contents
Terminal	CH1: G+ – NE– CH2: NE+ – NE–
Equipment Setting	5V/Division, 20ms/Division
Condition	During cranking or idling

MONITOR DESCRIPTION

If there is no signal from the camshaft position sensor even though the engine is cranking, 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 sensors/components	Camshaft position sensor
	Related sensors/components	Crankshaft position sensor, Engine speed sensor
Frequency of operation	Continuous	
Duration	5 sec.	
MIL operation	P0340 case 1 (no signal): 2 driving cycles P0340 case 2 (mis–aligned), P0341: Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–295	
P0340 Case 1 (No signal):		
Starter	ON	
Minimum battery voltage while starter is ON	–	11 V
P0340 Case 2 (Mis–aligned):		
Engine speed	600 rpm	–
Starter	OFF	
P0341:		
Starter	After OFF to ON timing	
Engine revolution angle	720°CA	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P0340 Case 1 (No signal):	
Camshaft position sensor signal	No signal
P0340 Case 2 (Mis–aligned):	
Crankshaft/camshaft (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

Parameter	Standard Value
Camshaft position sensor signal input during every 720°CA	3

WIRING DIAGRAM

Refer to DTC P0335 on page DI–477.

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, as well as other data from the time when a malfunction occurred.

1	**Check resistance of camshaft position sensor (See page IG–1).**

Component Side:



Camshaft Position Sensor

Y A21267

CHECK:

Measure the resistance between the terminals of camshaft position sensor connector.

OK:

Tester Connection	Specified Condition
1 – 2	835 to 1,400 Ω at cold
	1,060 to 1,645 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).

NG → **Replace camshaft position sensor.**

OK

2	**Check for open and short in harness and connector between ECM and camshaft position sensor (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

3	**Inspect sensor installation.**

CHECK:

Check the camshaft position sensor installation.

NG → **Tighten sensor.**

OK

4	**Check teeth of camshaft timing pulley.**

NG → **Replace camshaft timing pulley.**

OK

Replace ECM (See page SF–78).

DIC7J–02

DTC	P0351	Igniter Coil "A" Primary/Secondary Circuit

DTC	P0352	Igniter Coil "B" Primary/Secondary Circuit

DTC	P0353	Igniter Coil "C" Primary/Secondary Circuit

DTC	P0354	Igniter Coil "D" Primary/Secondary Circuit

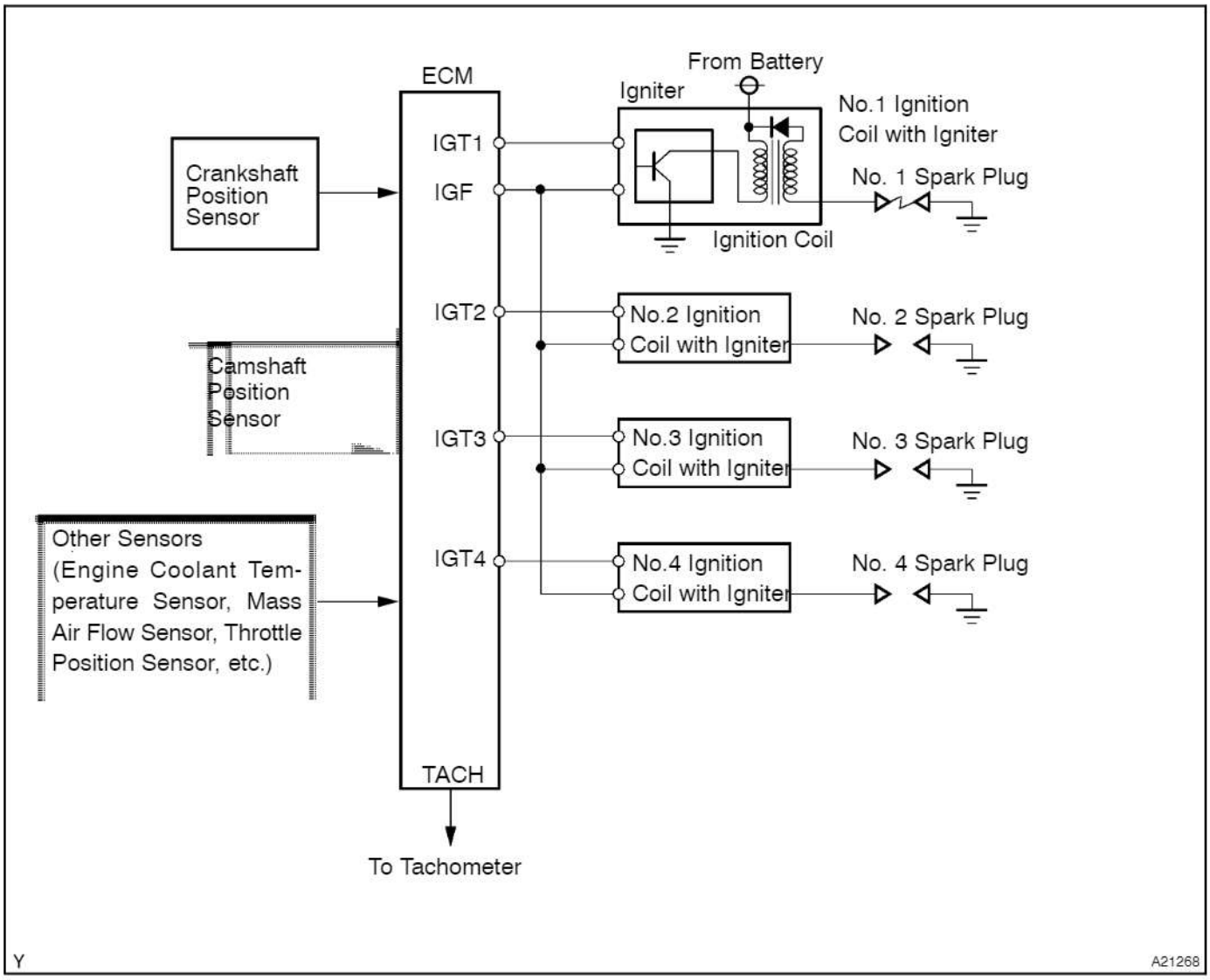
HINT:

- These DTCs indicate a malfunction related to the primary circuit.
- If DTC P0351 is present, check the No. 1 ignition coil with igniter circuit.
- If DTC P0352 is present, check the No. 2 ignition coil with igniter circuit.
- If DTC P0353 is present, check the No. 3 ignition coil with igniter circuit.
- If DTC P0354 is present, check the No. 4 ignition coil with igniter circuit.

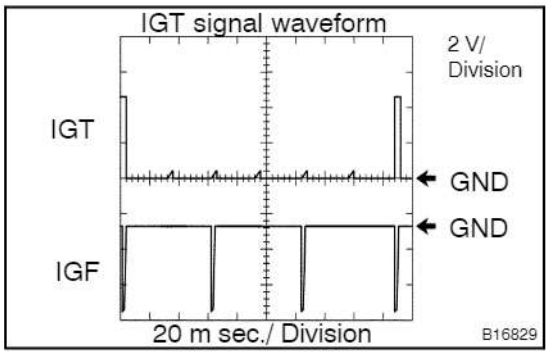
CIRCUIT DESCRIPTION

A Direct Ignition System (DIS) is used on this vehicle. 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. Using the IGT signal, the ECM turns on and off the power transistor inside the igniter and this switches on and off of 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 Detecting Condition	Trouble Area
P0351 P0352 P0353 P0354	No IGF signal to ECM while engine is running	• Open or short in IGF and IGT1 – IGT4 circuit from ignition coil with igniter to ECM • No. 1 to No. 4 ignition coil with igniter • Ignition system • ECM



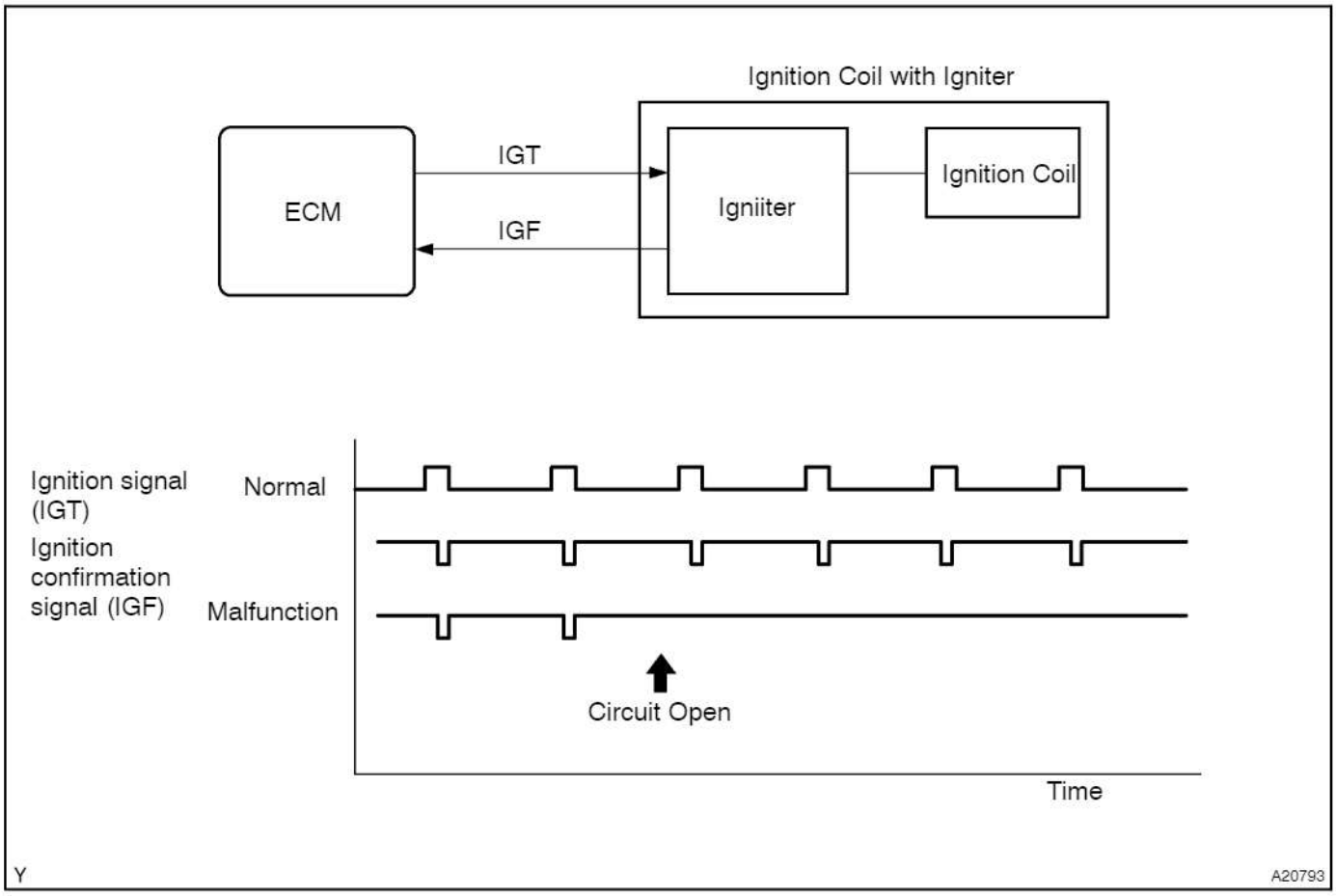
Reference: INSPECTION USING OSCILLOSCOPE

During cranking or idling, check waveform between terminals IGT1 – 4 and E1 of the ECM connector.

HINT:

The correct waveform appears as shown, with rectangle waves.

MONITOR DESCRIPTION



If the ECM does not receive the IGF after sending the IGT, it interprets this as a fault in the igniter and sets a DTC.

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
Required sensors/components	Igniter	
Frequency of operation	Continuous	
Duration	0.256 sec. + 4 sparks	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–295	
Either of the following conditions is met:	A or B	
A. Following conditions are met:	(a) and (b)	
(a) Engine speed	–	500 rpm
(b) Battery voltage	6 V	–
B. Following conditions are met:	(a) and (b)	
(a) Engine speed	500 rpm	–
(b) Battery voltage	10 V	–

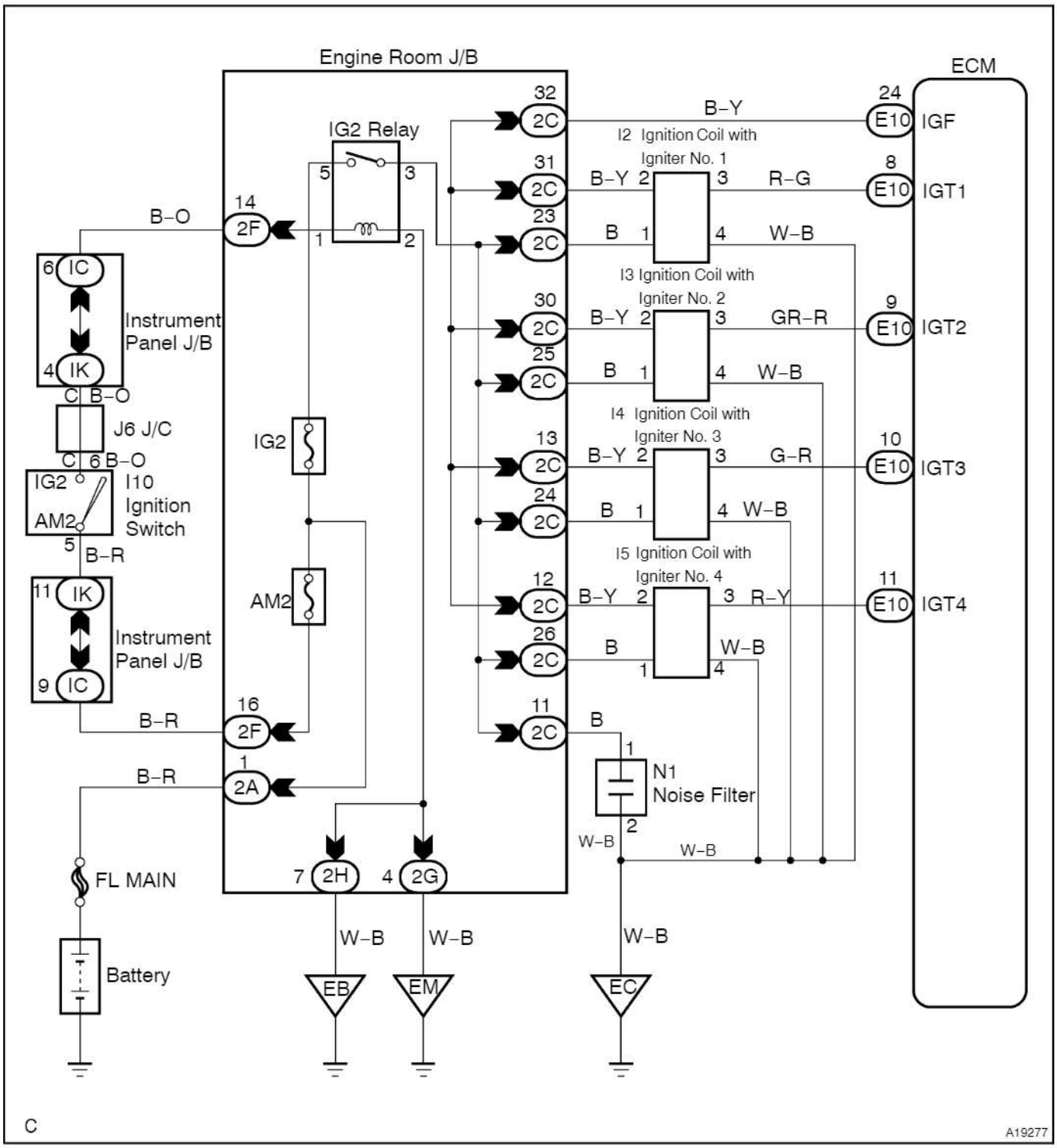
TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
"Ignition signal fail count"	More than 2 times
Condition when "ignition signal fail count" works:	IGF should have returned despite sending IGT.

COMPONENT OPERATING RANGE

Standard Value
Confirmed signal number equals to ignition signal number

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, as well as other data from the time when a malfunction occurred.

1	**Check spark plug and spark of misfiring cylinder (See page IG–1).**

NG → **Go to step 4.**

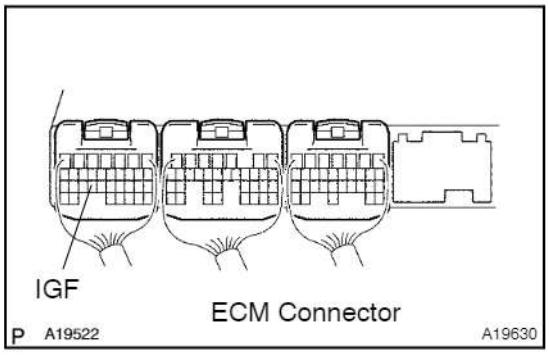
OK

2	**Check for open and short in harness and connector in IGF signal circuit between ECM and ignition coil with igniter (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

3	**Check voltage between terminals IGF of ECM connector and body ground.**



PREPARATION:

(a) Remove the ECM cover.
(b) Disconnect the ignition coil with igniter connector.
(c) Turn the ignition switch ON.

CHECK:

Measure voltage between terminals IGF of the ECM connector and body ground when engine is cranked.

OK:

Voltage: 4.5 to 5.5 V

NG → **Replace ECM (See page SF–78).**

OK

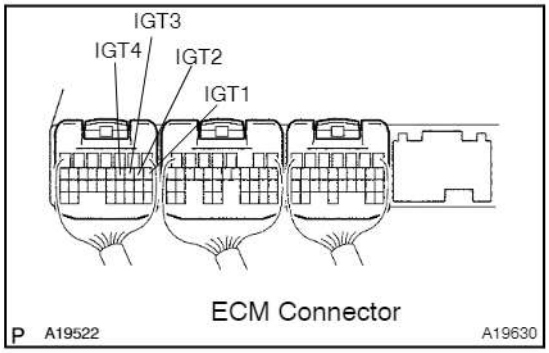
Replace ignition coil with igniter.

4	**Check for open and short in harness and connector in IGT signal circuit between ECM and ignition coil with igniter (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

5	**Check voltage between terminals IGT1 to 4 of ECM connector and body ground.**



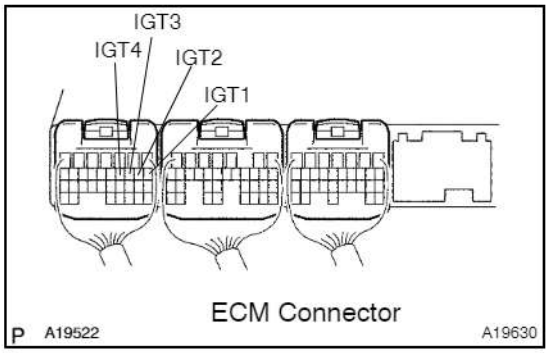
PREPARATION:
Remove the ECM cover.
CHECK:
Measure voltage between terminals IGT1 to 4 of the ECM connector and body ground when engine is cranked.
OK:

Voltage: More than 0.1 V and less than 4.5 V

NG → **Replace ECM (See page SF–78).**

OK

6	**Check voltage between terminals IGT1 to 4 of ECM connector and body ground.**



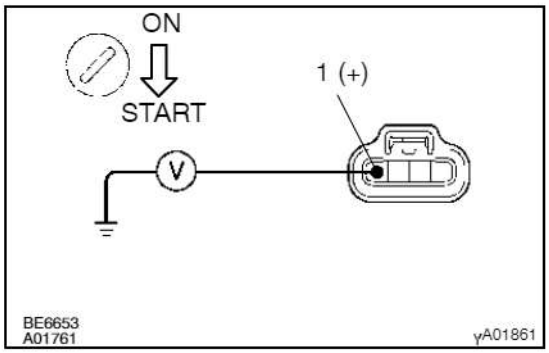
PREPARATION:
Disconnect the ignition coil with igniter connector.
CHECK:
Measure voltage between terminals IGT1 to 4 of the ECM connector and body ground when engine is cranked.
OK:

Voltage: 4.5 V or more

NG → **Replace ECM (See page SF–78).**

OK

7	Check ignition coil with igniter power source circuit.



PREPARATION:

Disconnect the ignition coil with igniter connector.

CHECK:

Measure the voltage between terminal 1 of the ignition coil with igniter connector and body ground when the ignition switch is turned to ON and START position.

OK:

Voltage: 9 to 14 V

NG → **Repair ignition coil with igniter power source circuit.**

OK ↓

8	Check for open and short in harness and connector between ignition switch and ignition coil with igniter (See page IN–30).

NG → **Repair or replace harness or connector.**

OK ↓

Replace ignition coil with igniter.

DIC7K–02

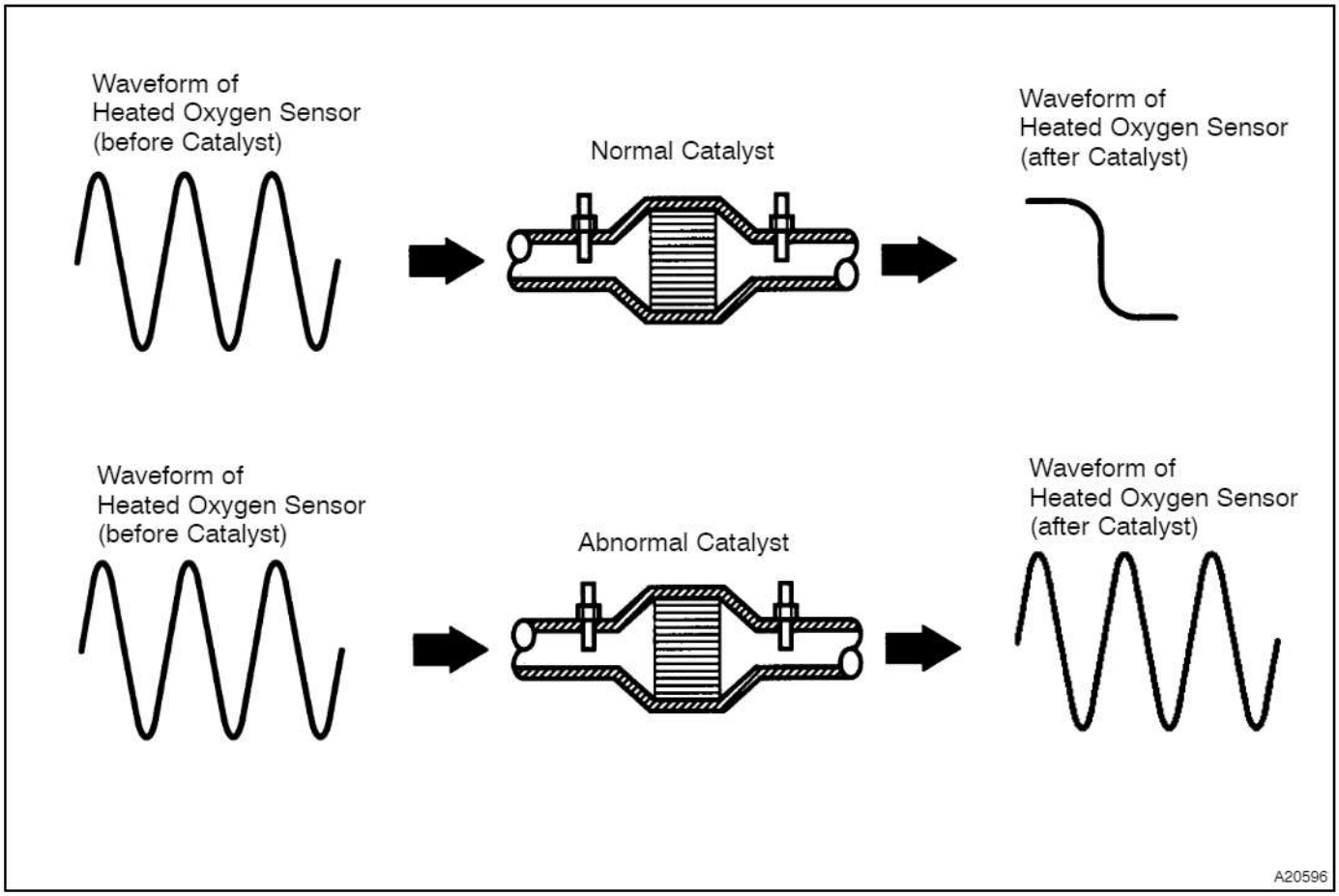
DTC	P0420	Catalyst System Efficiency Below Threshold (Bank 1)

MONITOR DESCRIPTION

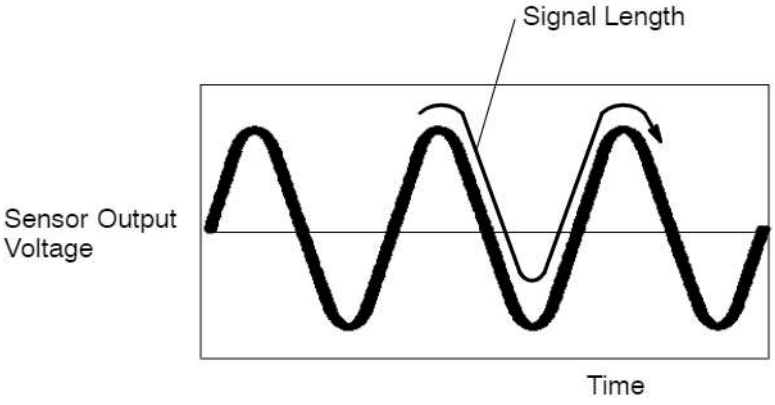
The vehicle is equipped with two heated oxygen sensors. One is mounted upstream from the TWC (Three–Way Catalytic) converter (Front Oxygen Sensor, "sensor 1"), the second is mounted downstream (Rear Oxygen Sensor "sensor 2"). The catalyst efficiency monitor compares the sensor 1 and sensor 2 signals in order to calculate TWC ability to store the 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 below.

DTC	Detecting Condition	Trouble Area
P0420	After engine and catalyst are warmed up, and while vehicle is driven within set vehicle and engine speed range, each waveform of heated oxygen sensors has the same amplitude (2 trip detection logic).	• Front exhaust pipe (catalyst) • Gas leakage in exhaust system • Heated oxygen sensor



Heated Oxygen Sensor Signal Length



MONITOR STRATEGY

Required sensors/components (main)	
Required sensors/components (related)	Front and rear heated oxygen sensors
Frequency of operation	Once per driving cycle
Duration	90 sec
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
These DTCs are not present	See page DI–295	
Accumulated time that all of the following conditions are met:	30 sec	
Battery voltage	11 V	–
Intake air temperature	–10°C (14°F)	–
Idle status	OFF	
Intake air amount	8 g/sec.	25 g/sec.
Engine RPM	–	4,500 rpm
Engine coolant temperature	75°C (167°F)	–
Catalyst temperature (M/T)	500°C (932°F)	900°C (1652°F)
Catalyst temperature (A/T)	480°C (896°F)	750°C (1382°F)
Fuel system status	Closed loop	

TYPICAL MALFUNCTION THRESHOLDS

Catalyst deterioration level	M/T: 0.5 or more A/T: 0.45 or more
Frequency of detection	3 times

MONITOR RESULT (MODE 6)

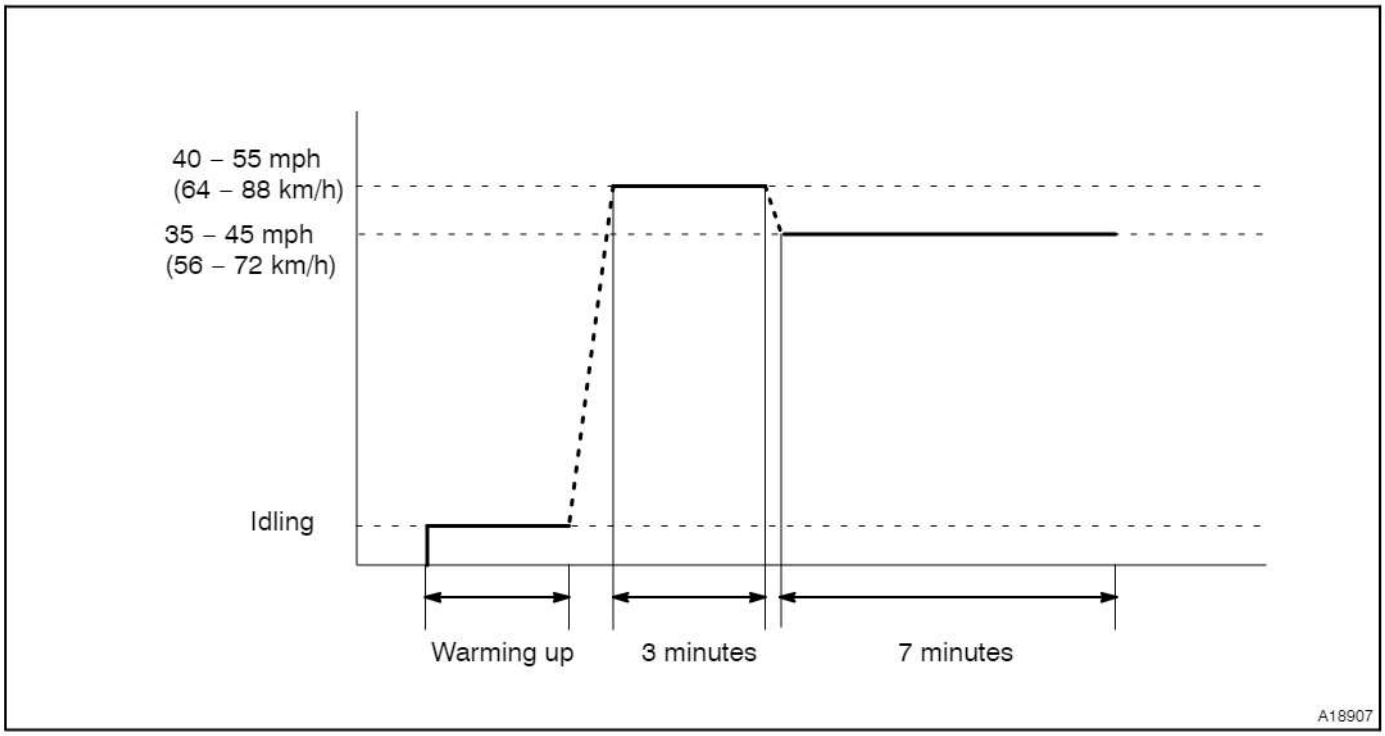
Refer to page DI–295 for detailed information.

Check the monitor result and test values after performing the drive pattern below.

TID $01: Catalyst monitor

TLT	CID	Unit Conversion	Description of Test Data	Description of Test Limit
0	$01	Multiplied by 0.0078 (no dimension)	Catalyst deterioration level	Malfunction criteria for catalyst deterioration

CONFIRMATION DRIVING PATTERN



(a) Clear the DTC.

(b) Warm up the engine until the engine coolant temperature reaches 75°C (167°F).

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

(d) Drive the vehicle at 35 to 45 mph (56 to 72 km/h) for at least 7 minutes.

NOTICE:

Drive with smooth throttle operation and avoid sudden acceleration.

INSPECTION PROCEDURE

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, as well as other data from the time when a malfunction occurred.

1	**Are there any other codes (besides DTC P0420) being output?**

If a DTC other than P0420 is set, troubleshoot for the DTC first.

RESULT:

DTC	Proceed to
P0420	A
P0420 and others	B

B → **Go to relevant DTC chart (See page DI–335).**

A

2	**Check gas leakage on exhaust system.**

NG → **Repair or replace exhaust gas leakage point.**

OK

3	**Perform A/F CONTROL active test.**

(a) Connect the hand–held tester to the DLC3.
(b) Run the engine at 2500 rpm for 90 seconds.
(c) Allow the engine to idle.
(d) Select from the tester menus: DIAGNOSIS / ENHANCED OBDII / ACTIVE TEST / A/F CONTROL.
(e) Switch the injection volume between +25% and –12.5%, and then check the oxygen sensor voltages.

Result

Go to	Heated oxygen sensor (Bank 1 Sensor 1)	Heated oxygen sensor (Bank 1 Sensor 2)	Suspected Trouble Area
A	Injection volume +25 % –12.5% Output voltage More than 0.55 V Less than 0.4 V	Injection volume +25 % –12.5% Output voltage More than 0.5 V Less than 0.4 V	Catalysts
B	Injection volume +25 % –12.5% Output voltage Almost no reaction	Injection volume +25 % –12.5% Output voltage More than 0.5 V Less than 0.4 V	Heated oxygen sensor (Bank 1 Sensor 1)
C	Injection volume +25 % –12.5% Output voltage More than 0.55 V Less than 0.4 V	Injection volume +25 % –12.5% Output voltage Almost no reaction	Heated oxygen sensor (Bank 1 Sensor 2)
D	Injection volume +25 % –12.5% Output voltage Almost no reaction	Injection volume +25 % –12.5% Output voltage Almost no reaction	Extremely rich or lean fuel–trim, etc.

NOTICE:
The front heated oxygen sensor has an output delay of a few seconds.
The rear heated oxygen sensor has a maximum output delay of approximately 20 seconds.

B → Replace heated oxygen sensor (bank 1 sensor 1) (See page EM–117).

C → Replace heated oxygen sensor (bank 1 sensor 2) (See page EM–117).

D → Check fuel trim (See page DI–445).

A

Replace front exhaust pipe (catalyst) (See page EM–117).

–MEMO–

DIC7L-02

DTC	P0441	Evaporative Emission Control System Incorrect Purge Flow

DTC	P0446	Evaporative Emission Control System Vent Control Circuit

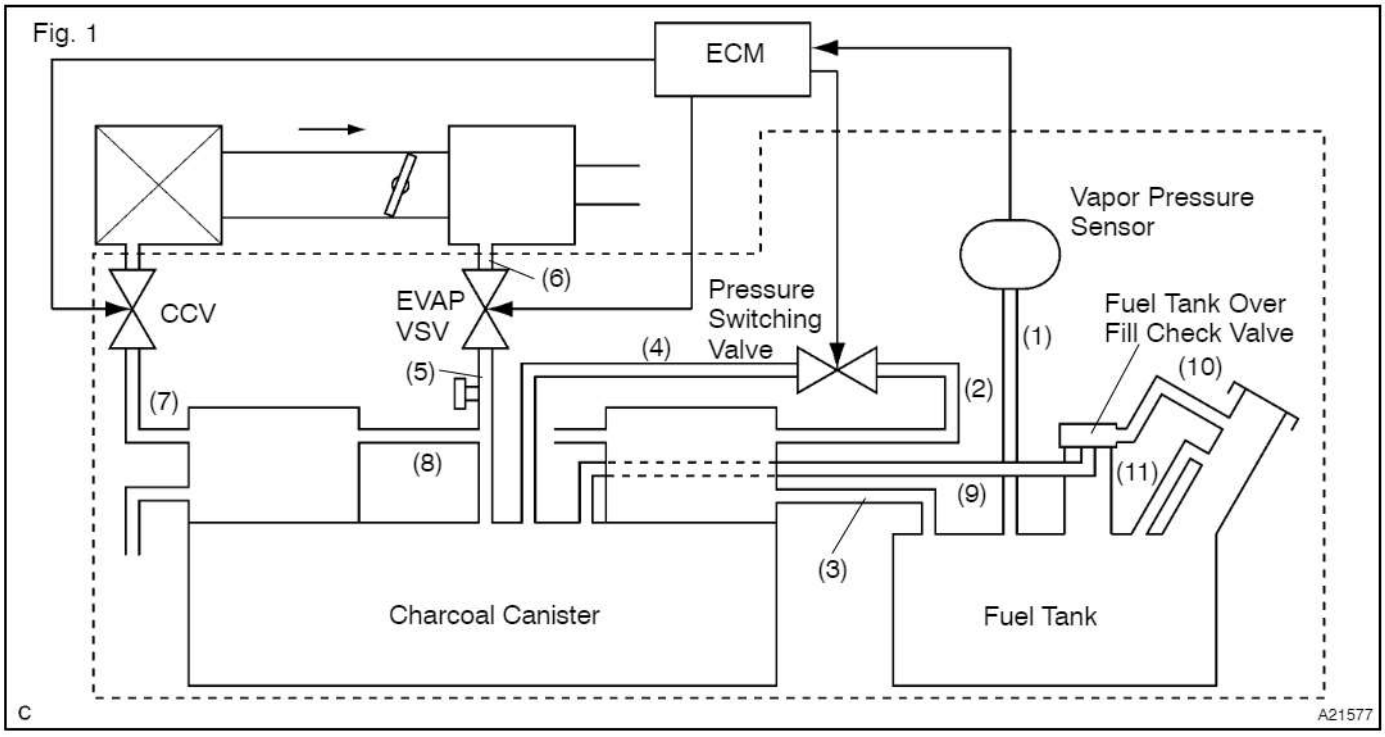
CIRCUIT DESCRIPTION

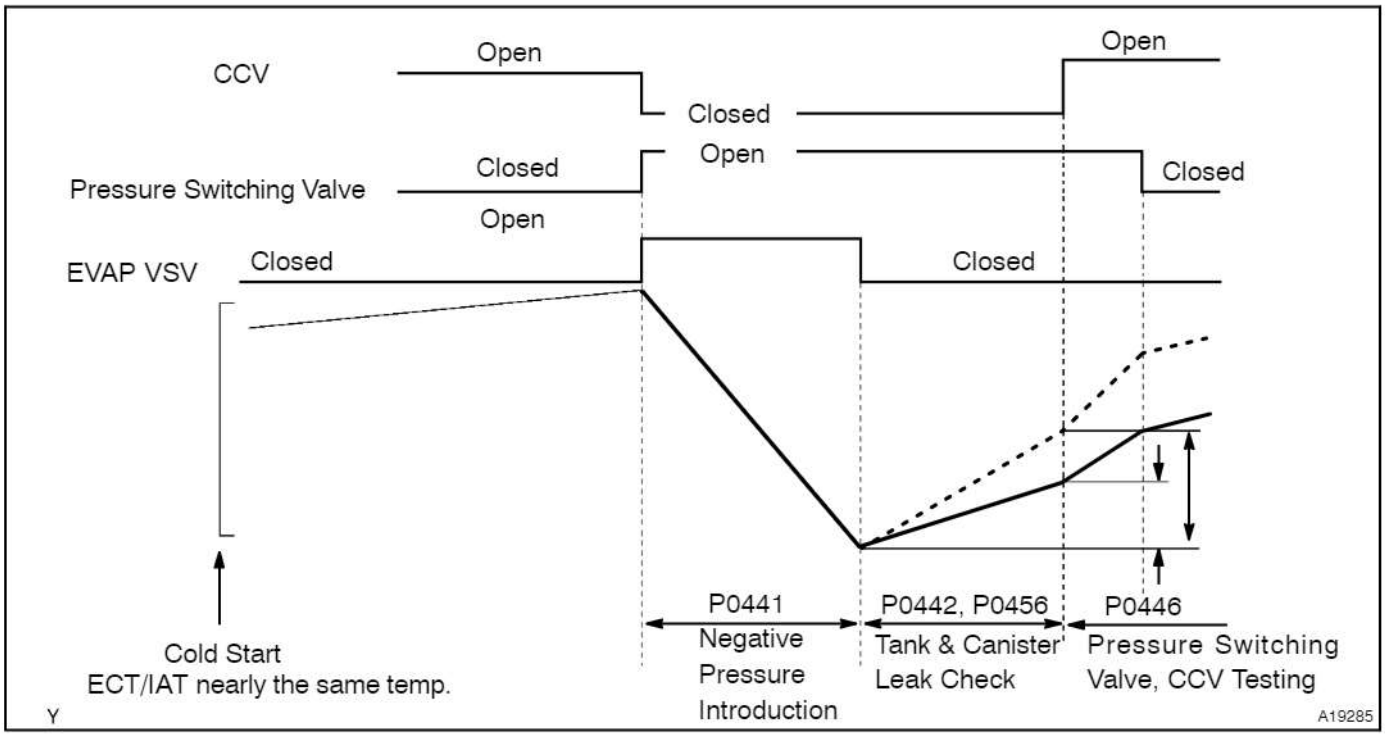
The vapor pressure sensor, canister closed valve (CCV), and pressure switching valve are used to detect abnormalities in the evaporative emission control system.

The ECM decides whether there is an abnormality in the evaporative emission control system based on the vapor pressure sensor signal.

DTCs P0441 and P0446 are recorded by the ECM when evaporative emissions leak from the components within the dotted line in Fig. 1 below, or when there is a malfunction in one of the EVAP VSV or the pressure switching valve, or in the vapor pressure sensor itself.

Fig. 1





MONITOR DESCRIPTION

P0441

The ECM checks for a stuck closed malfunction in the EVAP VSV by commanding it to open with the CCV closed. If a high negative pressure does not develop in the fuel tank, the ECM determines that the EVAP VSV remains closed. The ECM turns on the MIL and a DTC is set.

The ECM checks for EVAP VSV "stuck open" fault by commanding both valves (EVAP VSV and CCV) to close at a time when the fuel tank is at atmospheric pressure. If the fuel tank develops a high negative pressure at this early stage of the test, the ECM determines that the EVAP VSV is stuck open.

The ECM will turn on the MIL and a DTC will be set.

P0446

If there is a malfunction detected in the evaporative emission (EVAP) VSV, the canister closed valve (CCV) and the bypass valve, the ECM will illuminate the MIL and set a DTC.

This portion of the EVAP diagnosis checks the following EVAP system functions:

(a) CCV stuck closed.
The ECM checks for a CCV "stuck closed" malfunction by commanding the CCV to open after an EVAP leak test. If the fuel tank pressure does not rise (no vacuum generated), the ECM determines that the CCV is stuck closed. The ECM will turn on the MIL and a DTC will be set.

(b) Pressure switching valve stuck closed.
The ECM checks for a pressure switching valve "stuck closed" malfunction by commanding the pressure switching valve to close after an EVAP leak test. If the fuel tank pressure does not change, the ECM determines that the pressure switching valve is malfunctioning. The ECM will turn on the MIL and a DTC will be set.

(c) EVAP VSV (Purge line to intake manifold) stuck closed.
The ECM checks for a stuck closed malfunction in the EVAP VSV by commanding it to open with the CCV closed. If a high negative pressure does not develop in the fuel tank, the ECM determines that the EVAP VSV remains closed. The ECM turns on the MIL and a DTC is set.

DTC No.	DTC Detecting Condition	Trouble Area
P0441	Pressure in charcoal canister and fuel tank does not drop during purge control (2 trip detection logic)	• Vacuum hose is cracked, holed, blocked, damaged or disconnected ((1), (2), (3), (4), (5), (6), (7), (8), (9), (10) and (11) in Fig. 1) • Fuel tank cap is incorrectly installed • Fuel tank cap is cracked or damaged • Open or short in vapor pressure sensor circuit • Vapor pressure sensor • Open or short in circuit for EVAP VSV • EVAP VSV • Open or short in circuit for CCV • CCV • Open or short in circuit for pressure switching valve • Pressure switching valve • Fuel tank is cracked, holed or damaged • Charcoal canister is cracked, holed or damaged • Fuel tank over fill check valve is cracked damaged • ECM
	Negative pressure incoming in the charcoal canister and fuel tank does not stop during purge cut–off. (2 trip detection logic)	
P0446	No rising of the fuel tank pressure when commanding the CCV to open after the EVAP leak test	
	No changing of the fuel tank pressure when commanding the pressure switching valve to be checked after the EVAP leak test	
	A high negative pressure (vacuum) does not occur in the system when commanding the EVAP VSV to open with the CCV closed	

HINT:

Typical DTC output of each trouble part is shown in the table below.

Trouble part		Typical DTC output (*1)
Small Leak		"P0442" and/or "P0456" (*2)
Medium Leak (ex: Vacuum hose loose)		P0442
Large Leak (ex: Fuel tank cap loose)		P0442, P0441 and P0446
EVAP VSV	Open Malfunction	P0441
	Close Malfunction	P0442, P0441 and P0446
CCV	Open Malfunction	P0442, P0441 and P0446
	Close Malfunction	P0446
Pressure Switching Valve	Open Malfunction	P0446
	Close Malfunction	P0442, P0441 and P0446

*1: ECM may output some other DTC combination.

*2: Refer to P0442 and P0456 on page DI–524.

MONITOR STRATEGY

Related DTCs	P0441	EVAP VSV malfunction
	P0446	Canister close valve stuck closed Pressure switching valve malfunction EVAP VSV malfunction
Required sensors/components	Main sensors/components	Vapor pressure sensor
	Related sensors/components	Engine coolant temperature sensor, Intake air temperature sensor, Vehicle speed sensor
Frequency of operation	Once per driving cycle	
Duration	P0441 : 90 sec. P0446 : 10 sec.	
MIL operation	2 drive cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Criteria	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–295	
The same as that for DTC P0442		

TYPICAL MALFUNCTION THRESHOLDS

P0441

Detection Criteria	Threshold
Either the following conditions is met:	A or B
A. Following conditions are met:	(a) and (b)
(a) Fuel tank pressure at the vacuum introduction start	–1.6 kPa (–12 mmHg, –0.47 in.Hg) or more
(b) Difference between the fuel tank pressure at the vacuum introduction start and completion	Less than 0.9 kPa (7 mmHg, 0.27 in.Hg)
B. Following conditions are met for 14 sec.:	(a) and (b)
A. Difference between "minimum" fuel tank pressure before the leak check and fuel tank pressure at 14 sec. after the leak check	0.46 kPa or more (3.5 mmHg, 0.14 in.Hg)
(b) Fuel tank pressure 14 sec. after the leak check	Less than –3.7 kPa (–28 mmHg, –1.1 in.Hg)

P0446

Detection Criteria	Threshold
Case 1: CCV stuck closed	
Fuel tank pressure when the CCV is opened after an EVAP leak check	Not changing
Case 2: Pressure switching valve malfunction	
Fuel tank pressure when the pressure switching valve is closed after an EVAP leak check	Not changing
Case 3: EVAP VSV stuck closed	
Fuel tank pressure after the EVAP VSV is opened and manifold vacuum is introduced to the fuel tank	Not changing

MONITOR RESULT

Refer to page DI–295 for detailed information.

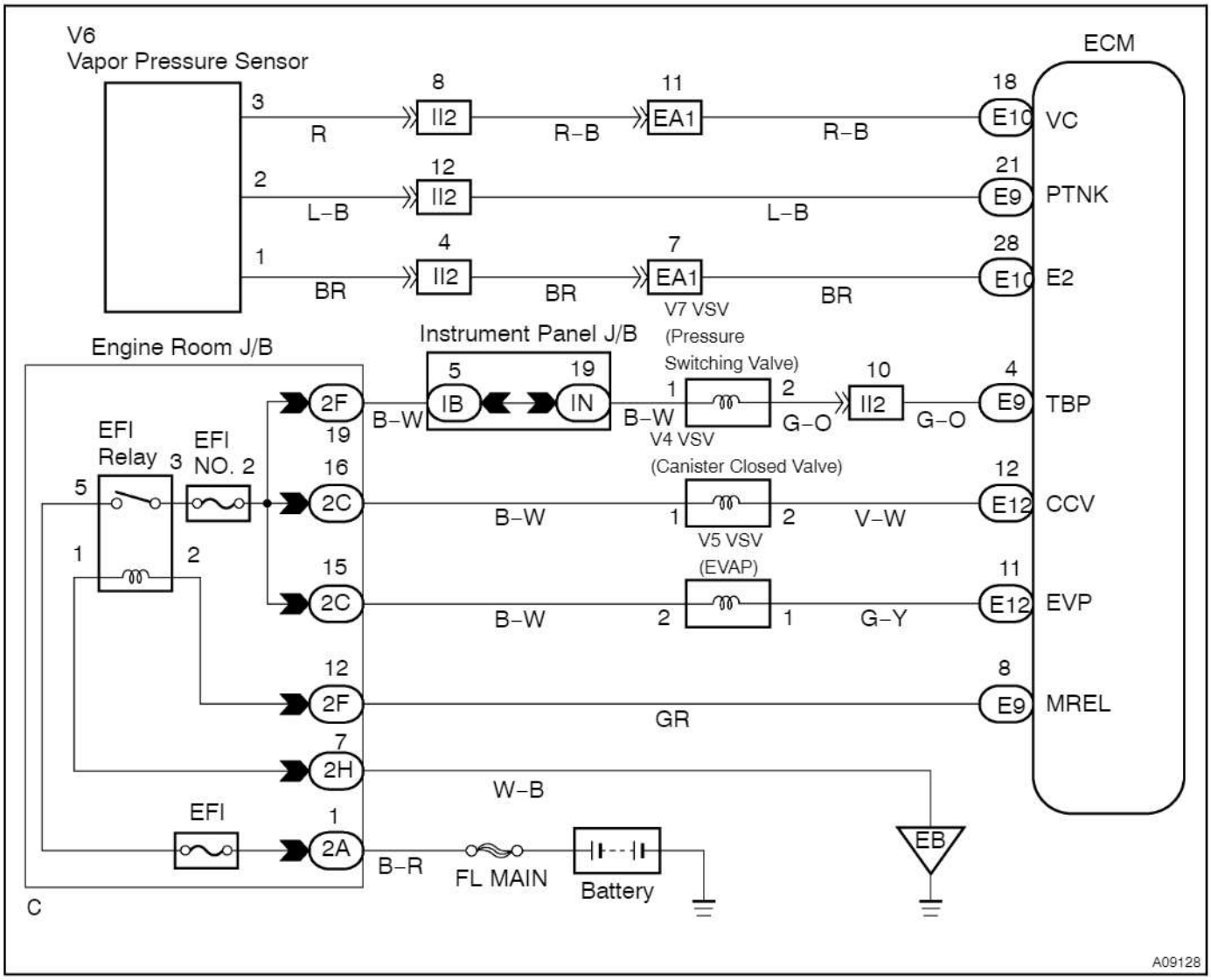
The test value and test limit information are described as shown in the following table. Check the monitor result and test values after performing the monitor drive pattern (see page DI–326).

- TID (Test Identification Data) is assigned to each emissions–related component.
- TLT (Test Limit Type):
  If TLT is 0, the component is malfunctioning when the test value is higher than the test limit.
  If TLT is 1, the component is malfunctioning when the test value is lower than the test limit.
- CID (Component Identification Data) is assigned to each test value.
- Unit Conversion is used to calculate the test value indicated on generic OBD II scan tools.

TID $02: EVAP system – Vacuum monitor

TLT	CID	Unit Conversion	Description of Test Data	Description of Test Limit
1	$01	Multiplied by 0.0916 (mmHg)	Test value of EVAP VSV: Determined by fuel tank pressure change during vacuum introduction	Malfunction criteria for EVAP VSV
1	$02	Multiplied by 0.0458 subtract 2.93 (mmHg)	Test value of canister closed valve (CCV) and bypass VSV: Determined by fuel tank pressure change at switching over CCV and bypass VSV	Malfunction criteria for CCV and bypass VSV
0	$03	Multiplyied by 0.0458 (mmHg)	Test value of 0.04 inch leak: Determined by fuel tank pressure change	Malfunction criteria for 0.04 inch leak
0	$04	Multiplied by 0.0458 (mmHg)	Test value of 0.02 inch leak: Determined by fuel tank pressure change	Malfunction criteria for 0.02 inch leak

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If DTC P0441 (Purge Flow), P0446 (CCV or pressure switching valve), P0451, P0452 or P0453 (See page DI–545) is output with DTC P0442 or P0456 (See page DI–524), 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, as well as other data from the time when a malfunction occurred.
- When the ENGINE RUN TIME in the freeze frame data is less than 200 seconds, carefully check the vapor pressure sensor.

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	Check fuel tank cap (See page EC–6).

NG → Replace fuel tank cap.

OK

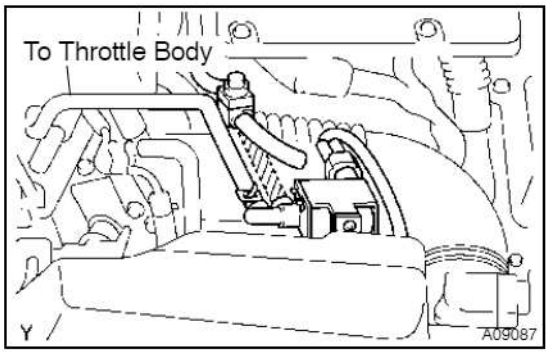
4	Check filler neck for damage.

PREPARATION:
Remove the fuel tank cap.
CHECK:
Visually inspect the filler neck for damage.

NG → Replace filler pipe.

OK

5	Check purge flow.



PREPARATION:

(a) Connect the hand–held tester to the DLC3.
(b) Select the "ENHANCED OBD II / ACTIVE TEST" mode on the hand–held tester.
(c) Disconnect the vacuum hose for the EVAP VSV from the charcoal canister.
(d) Start the engine.
(e) Select the menu "EVAP VSV (ALON) / ALL" in the ACTIVE TEST and operate EVAP VSV (Press the right or left button).

CHECK:

When the EVAP VSV is operated by the hand–held tester, check whether the disconnected hose applies suction to your finger.

OK:

VSV is ON:
Disconnected hose applies suction to your finger.
VSV is OFF:
Disconnected hose applies no suction to your finger.

OK	Go to step 9.

NG

6	Check vacuum hose between intake manifold and EVAP VSV, and EVAP VSV and charcoal canister.

CHECK:

(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, damages and blockage.

NG	Repair or replace vacuum hose.

OK

7	Check operation of EVAP VSV (See page SF–61).

NG → Replace EVAP VSV.

OK

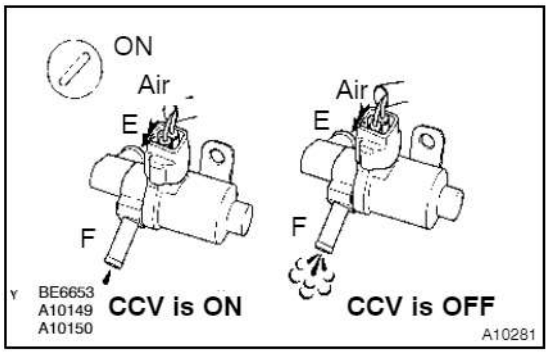
8	Check for open and short in harness and connector between EFI main relay (Marking: EFI) and EVAP VSV, and EVAP VSV and ECM (See page IN–30).

NG → Repair or replace harness or connector.

OK

Replace ECM (See page SF–78).

9	Check CCV.



PREPARATION:

(a) Disconnect the vacuum hose for the CCV from the charcoal canister.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the "ENHANCED OBD II / ACTIVE TEST" mode on the hand–held tester.
(d) Select the menu "CAN CTRL VSV / ALL" in the ACTIVE TEST and operate CAN CTRL VSV (Press the right or left button).

CHECK:

Check the CCV operation when it is operated by the hand–held tester.

OK:

CCV is ON:
Air does not flow from port E to port F.
CCV is OFF:
Air from port E flows out through port F.

OK	Go to step 13.

NG

10	Check vacuum hose between CCV and charcoal canister.

CHECK:

(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 damages, and blockage.

NG	Repair or replace vacuum hose.

OK

11	Check operation of CCV (See page SF–63).

NG	Replace CCV.

OK

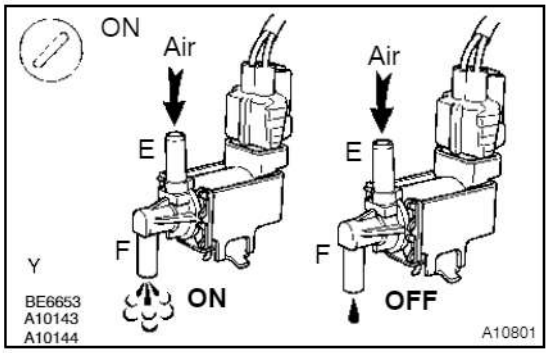
12	**Check for open and short in harness and connector between EFI main relay (Marking: EFI) and CCV, and CCV and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Replace ECM (See page SF–78).

13	**Check pressure switching valve.**



PREPARATION:

(a) Turn the ignition switch ON and push the hand–held tester main switch ON.

(b) Select the "ENHANCED OBD II / ACTIVE TEST" mode on the hand–held tester.

(c) Select the menu "TANK BYPASS VSV / ALL" in the ACTIVE TEST and operate TANK BYPASS VSV (Press the right or left button).

CHECK:

Check the pressure switching valve operation when it is operated by the hand–held tester.

OK:

Pressure switching valve is ON:
Air from port E flows out through port F.
Pressure switching valve is OFF:
Air does not flow from port E to port F.

OK → **Go to step 16.**

NG

14	**Check operation of pressure switching valve (See page SF–65).**

NG → **Replace pressure switching valve.**

OK

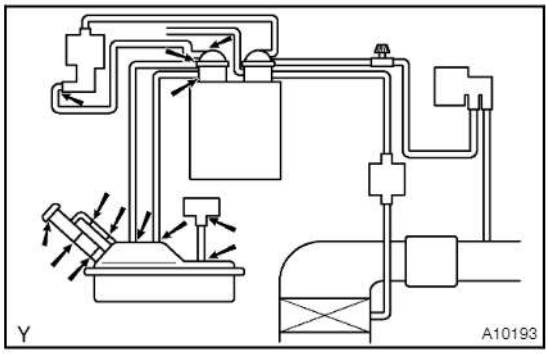
15	**Check for open and short in harness and connector between EFI main relay (Marking: EFI) and pressure switching valve, and pressure switching valve and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Replace ECM (See page SF–78).

16	**Check whether hose close to fuel tank has been modified, and check whether there are signs of any accident near fuel tank.**



CHECK:

Check for cracks, deformation and loose connection of the following parts:

- Fuel tank
- Fuel tank filler pipe
- Hoses and tubes around fuel tank

NG → **Repair or replace evaporative emission leak point.**

OK

17	**Check vacuum hoses between vapor pressure sensor and fuel tank, and charcoal canister and pressure switching valve.**

CHECK:

(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 damages.

NG → **Repair or replace vacuum hose.**

OK

18	Check hose and tube between fuel tank and charcoal canister.

CHECK:

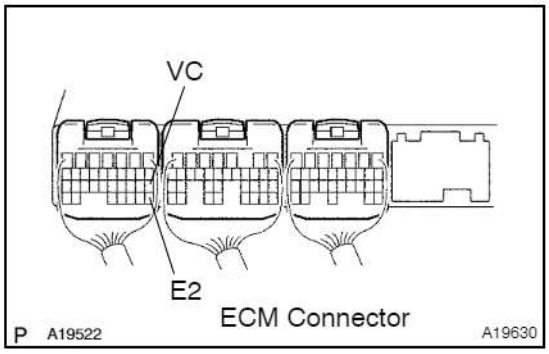
(a) Check for proper connection of the fuel tank and fuel evap pipe (See page EC–6), fuel evap pipe and fuel tube under the floor, fuel tube under the floor and charcoal canister.

(b) Check the hose and tube for cracks, holes and damages.

NG → **Repair or replace hose and tube.**

OK

19	Check voltage between terminals VC and E2 of ECM connector.



CHECK:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals VC and E2 of the ECM connector.

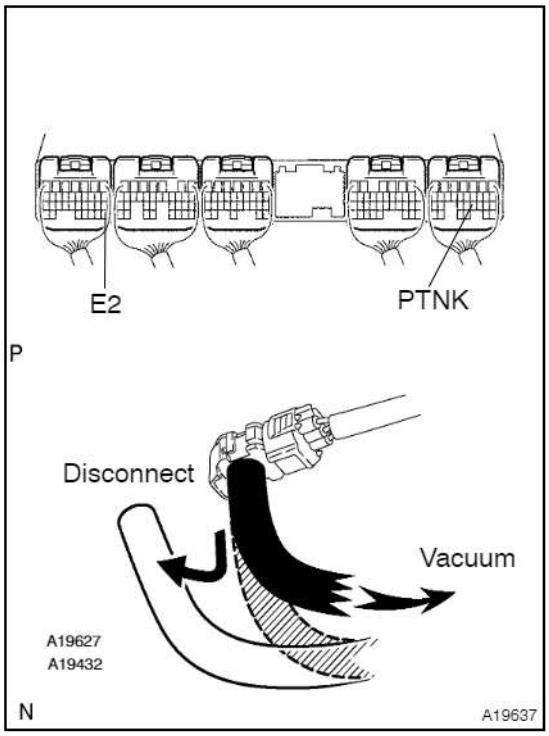
OK:

Voltage: 4.5 to 5.5 V

NG → **Replace ECM (See page SF–78).**

OK

20	Check voltage between terminals PTNK and E2 of ECM connectors.



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals PTNK and E2 of the ECM connector under following condition (1) and (2).

(1) Disconnect the vacuum hose from the vapor pressure sensor.

(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).

OK:

Condition (1) Voltage: 2.9 to 3.7 V

Condition (2) Voltage: 0.5 V or less

OK	Go to step 22.

NG

21	Check for open and short in harness and connector between vapor pressure sensor and ECM (See page IN–30).

NG	Repair or replace harness or connector.

OK

Replace ECM (See page SF–78).

22	Check fuel tank inlet valve.

NG	Replace fuel tank inlet valve.

OK

23	Check fuel tank.

NG → Replace fuel tank.

OK

24	Check charcoal canister for cracks, holes and damages.

NG → Repair or replace charcoal canister.

OK

Replace ECM (See page SF–78).

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	**Check fuel tank cap (See page EC–6).**

NG → **Replace fuel tank cap.**

OK

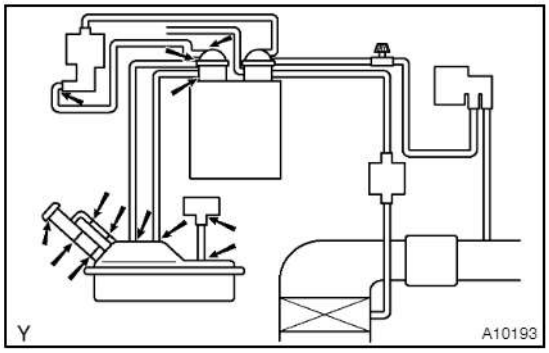
4	**Check filler neck for damage.**

PREPARATION:
Remove the fuel tank cap.
CHECK:
Visually inspect the filler neck for damage.

NG → **Replace filler pipe.**

OK

5	Check whether hose close to fuel tank has been modified, and check whether there are signs of any accident near fuel tank or charcoal canister.



CHECK:

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 evaporative emission leak part.**

OK

6	Check vacuum hoses between vapor pressure sensor and fuel tank, charcoal canister and pressure switching valve, and pressure switching valve and charcoal canister.

CHECK:

(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 damages.

NG → **Repair or connect VSV or sensor connector.**

OK

7	Check hose and tube between fuel tank and charcoal canister.

CHECK:

(a) Check for proper connection of the fuel tank and fuel evap pipe (See page EC–6), fuel evap pipe and fuel tube under the floor, fuel tube under the floor and charcoal canister.
(b) Check the hose and tube for cracks, holes and damages.

NG → **Repair or replace hose and tube.**

OK

8	**Check vacuum hoses ((8), (9), (10) and (11) in Fig. 1 in circuit description).**

CHECK:

(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, damages, and blockage.

NG → **Repair or replace vacuum hose.**

OK

9	**Check connector for EVAP VSV, connector for CCV, connector for pressure switching valve and vapor pressure sensor connector for looseness and disconnection.**

NG → **Repair or connect VSV or sensor connector.**

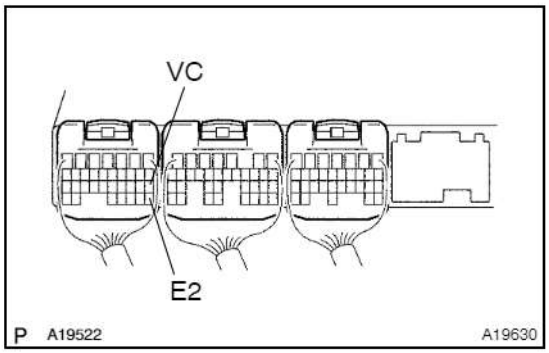
OK

10	**Check charcoal canister for cracks, holes and damages.**

NG → **Check and replace charcoal canister.**

OK

11	Check voltage between terminals VC and E2 of ECM connector.



CHECK:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals VC and E2 of the ECM connector.

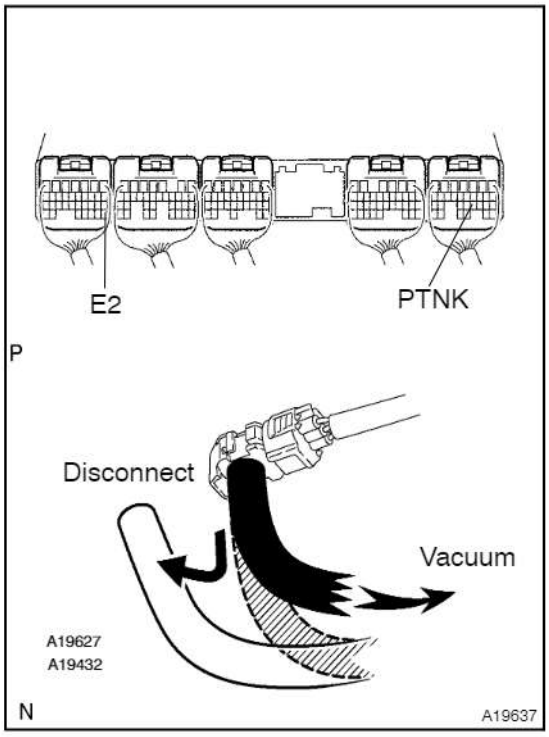
OK:

Voltage: 4.5 to 5.5 V

NG	Replace ECM (See page SF–78).

OK

12	Check voltage between terminals PTNK and E2 of ECM connectors.



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals PTNK and E2 of the ECM connector under following condition (1) and (2).

(1) Disconnect the vacuum hose from the vapor pressure sensor.

(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).

OK:

Condition (1) Voltage: 2.9 to 3.7 V

Condition (2) Voltage: 0.5 V or less

OK	Go to step 14.

NG

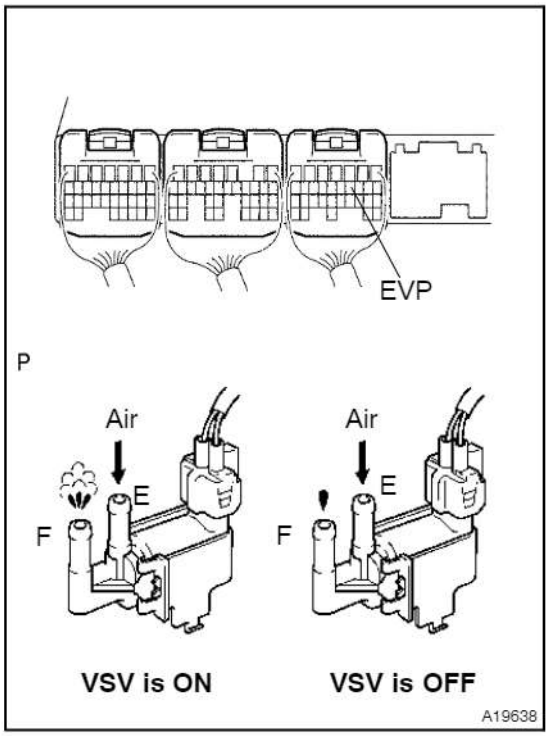
13	**Check for open and short in harness and connector between vapor pressure sensor and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Replace ECM (See page SF–78).

14	**Check EVAP VSV.**



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Check the VSV function.

(1) Connect the terminal EVP of the ECM connector and body ground (ON).

(2) Disconnect the terminal EVP of the ECM connector and body ground (OFF).

OK:

(1) VSV is ON:
Air from port E flows out through port F.
(2) VSV is OFF:
Air does not flow from port E to port F.

OK → **Go to step 17.**

NG

15	**Check operation of EVAP VSV (See page SF–61).**

NG → **Replace EVAP VSV.**

OK

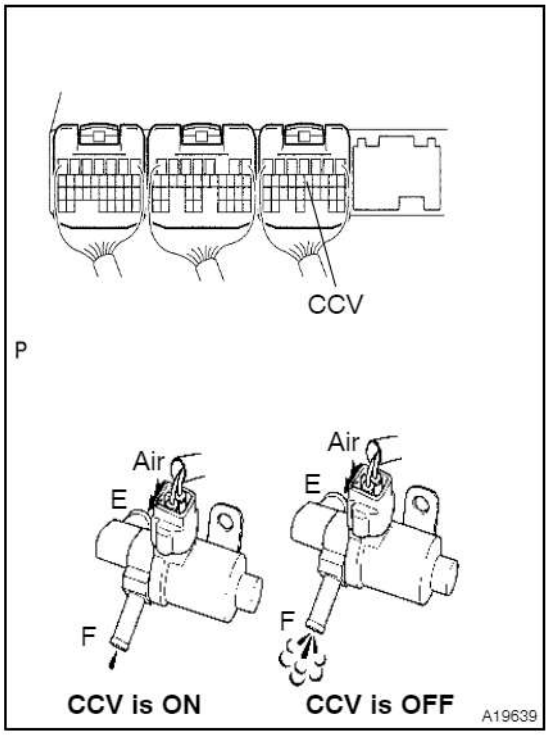
16	**Check for open and short in harness and connector between EFI main relay (Marking: EFI) and EVAP VSV, and EVAP VSV and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Replace ECM (See page SF–78).

17	**Check CCV.**



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Check the CCV function.

(1) Connect the terminal CCV of the ECM connector and body ground (ON).

(2) Disconnect the terminal CCV of the ECM connector and body ground (OFF).

OK:

(1) CCV is ON:
Air does not flow from port E to port F.
(2) CCV is OFF:
Air from port E flows out through port F.

OK → **Go to step 20.**

NG

18	**Check operation of CCV (See page SF–63).**

NG → **Replace CCV.**

OK

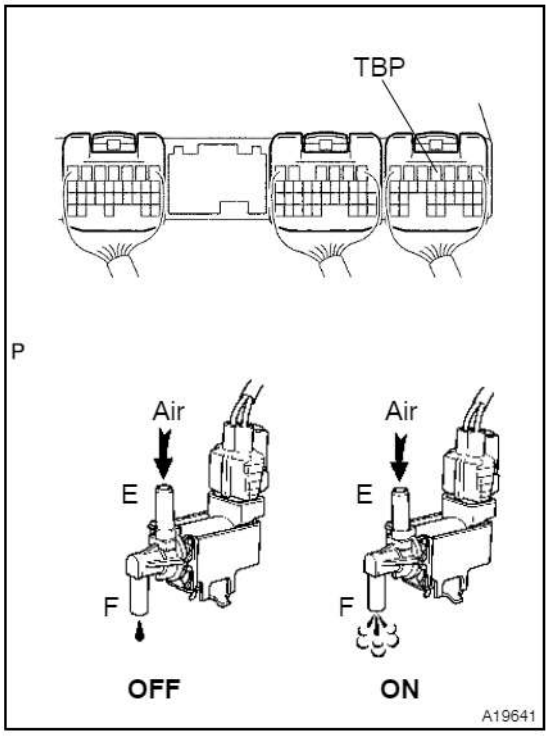
19	**Check for open and short in harness and connector between EFI main relay (Marking: EFI) and CCV, and CCV and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Replace ECM (See page SF–78).

20	**Check pressure switching valve.**



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Check the pressure switching valve function.

(1) Connect the terminal TBP of the ECM connector and body ground (ON).

(2) Disconnect the terminal TBP of the ECM connector and body ground (OFF).

OK:

(1) Pressure switching vavle is ON:
Air from port E flows out through port F.
(2) Pressure switching valve is OFF:
Air does not from flow port E to port F.

OK → **Go to step 23.**

NG

21	**Check operation of pressure switching valve (See page SF–65).**

NG → **Replace pressure switching valve.**

OK

22	Check for open and short in harness and connector between EFI main relay (Marking: EFI) and pressure switching valve, and pressure switching valve and ECM (See page IN–30).

NG → Repair or replace harness or connector.

OK →

Replace ECM (See page SF–78).

23	Check fuel tank inlet valve.

NG → Replace fuel tank inlet valve.

OK →

24	Check fuel tank.

NG → Replace fuel tank.

OK →

It is likely that vehicle user did not properly close fuel tank cap.

DTC	P0442	Evaporative Emission Control System Leak Detected (Small Leak)

DTC	P0456	Evaporative Emission Control System Leak Detected (Very Small Leak)

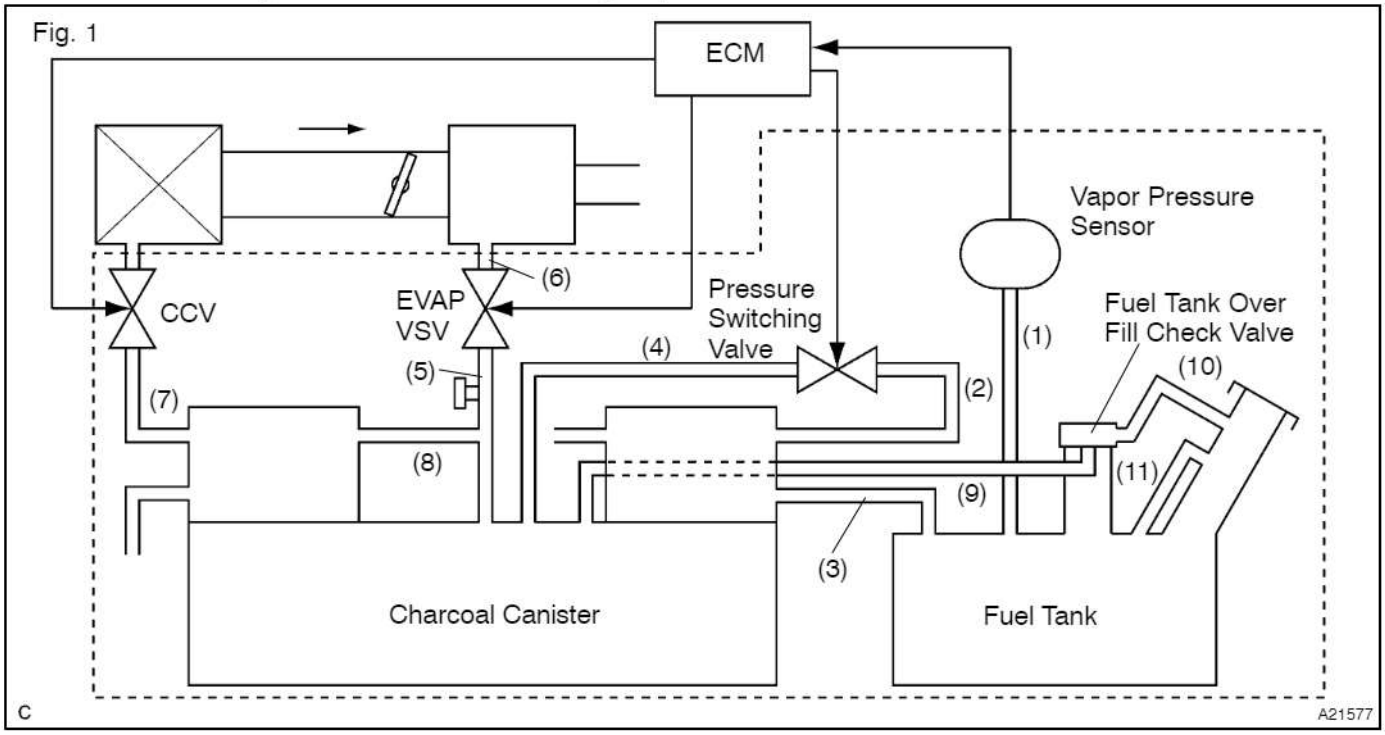
CIRCUIT DESCRIPTION

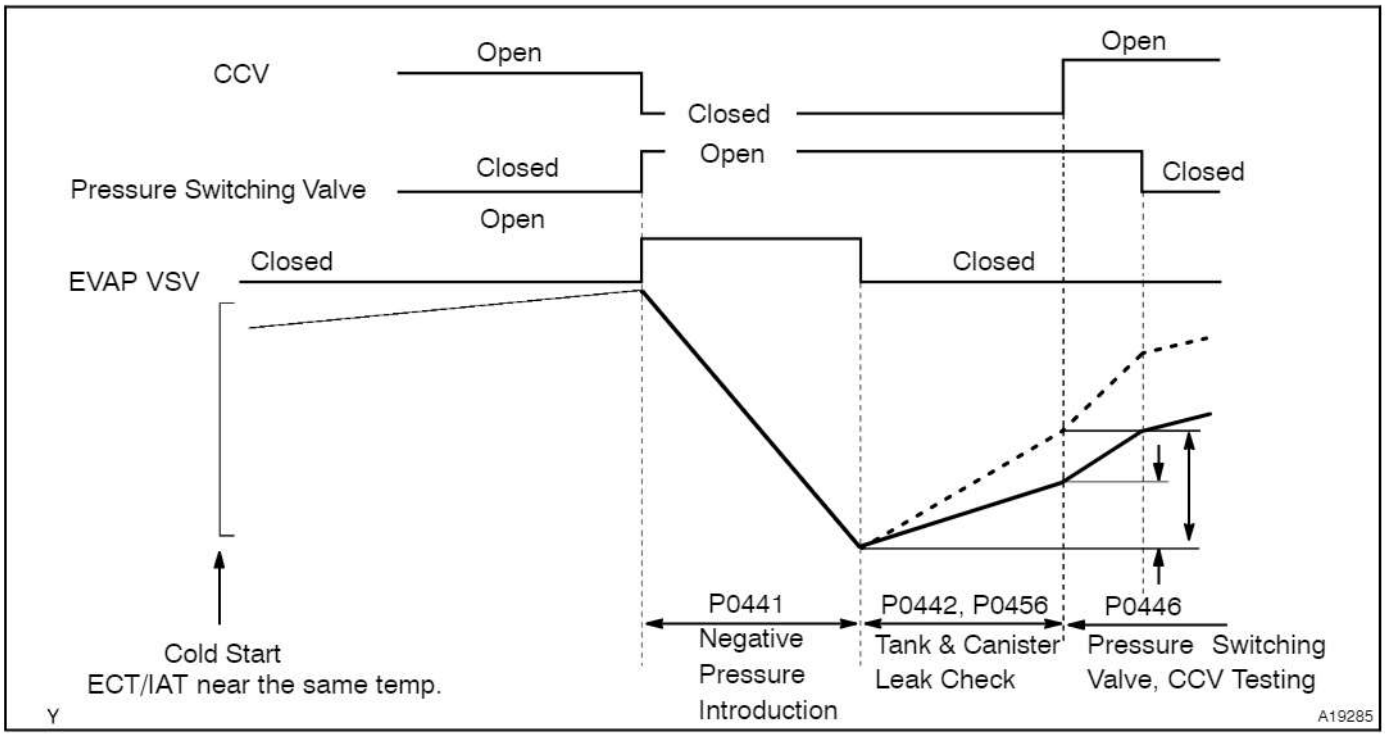
The vapor pressure sensor, canister closed valve (CCV) and pressure switching valve are used to detect abnormalities in the evaporative emission control system.

The ECM decides whether there is an abnormality in the evaporative emission control system based on the vapor pressure sensor signal.

DTC P0442 or P0456 is recorded by the ECM when evaporative emissions leak from the components within the dotted line in Fig. 1 below, or when the vapor pressure sensor malfunctions.

Fig. 1





DTC No.	DTC Detection Condition	Trouble Area
P0442	After negative pressure introduction is completed, the pressure in the EVAP system sharply increases (small leak) (2 trip detection logic)	• Fuel tank cap is incorrectly installed • Fuel tank cap is cracked or damaged • Vacuum hose is cracked, blocked, damaged or disconnected ((1), (2), (3), (4), (5), (6), (7), (8), (9), (10) and (11) in Fig. 1) • Open or short in vapor pressure sensor circuit • Vapor pressure sensor • Open or short in circuit for EVAP VSV • EVAP VSV • Open or short in circuit for CCV • CCV • Open or short in circuit for pressure switching valve • Pressure switching valve • Fuel tank is cracked, or damaged • Charcoal canister is cracked, or damaged • Fuel tank over fill check valve is cracked or damaged • ECM
P0456	The pressure in the EVAP system slightly increases while the ECM performs a leak check (very small leak) (2 trip detection logic)	

HINT:

Typical DTC output of each trouble part

Trouble part		Typical DTC output (*1)
Small Leak		"P0442" and/or "P0456"
Medium Leak (ex: Vacuum hose loose)		P0442
Large Leak (ex: Fuel tank cap loose)		P0442 and P0441 and P0446 (*2)
EVAP VSV	Open Malfunction	P0441
	Close Malfunction	P0442 and P0441 and P0446
CCV	Open Malfunction	P0442 and P0441 and P0446
	Close Malfunction	P0446
Pressure Switching Valve	Open Malfunction	P0446
	Close Malfunction	P0442 and P0441 and P0446

*1: ECM may output some other DTC combination.

*2: Refer to DTC P0441 and P0446 on page DI–501.

MONITOR DESCRIPTION

The evaporative emission system consists of the vapor pressure sensor, the CCV (Canister Closed Valve), the pressure switching valve and the EVAP VSV (Purge VSV), and those are used to detect malfunctions in the system by ECM.

This test will run once per driving cycle when the ECM detects stable vapor pressure in the fuel tank. While the vehicle is being driven on rough or winding roads, the movement of the fuel in the tank will cause unstable fuel tank vapor pressure and the diagnostic test will not executed.

The ECM performs the following steps:

(a) Closes the CCV. (shuts the system)

(b) Checks the stability of the fuel tank pressure. If the variation in the pressure is greater than the specified value, disables the diagnosis.

(c) Opens the EVAP VSV to introduce a negative pressure (vacuum) from the intake manifold into the fuel tank.

(d) Closes the EVAP VSV to seal the fuel tank for storing the negative pressure.

(e) Monitors the negative pressure in the fuel tank for:

(1) Rapid decrease, i.e. a large leak, 0.040 inch or more

(2) Decrease greater than the normal value

If the ECM detects either of the above conditions, the ECM interprets this as a leak in the EVAP system. The ECM will illuminate the MIL (2–trip detection logic) and set a DTC.

MONITOR STRATEGY

Related DTCs	P0442	Small leak (0.040 inch or more large hole) is detected
	P0456	Very small leak (0.020 inch hole) is detected
Required sensors/components	Main sensors/components	Vapor pressure sensor
	Related sensors/components	Mass air flow meter, Engine coolant temperature sensor EVAP VSV (purge VSV), CCV
Frequency of operation	Once per driving cycle	
Duration	60 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Criteria	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–295	
All:		
Altitude	–	2,400 m (7,872 ft.)
Battery voltage	11 V	–
Throttle position learning	Completed	
Fuel tank pressure sensor malfunction	Not detected	
Intake air temperature at engine start – Engine coolant temperature at engine start	–7°C (–13°F)	11.1°C (20°F)
EVAP VSV, CCV, bypass VSV	Not operated at scan tool	
P0456 (0.020 inch leak):		
Engine coolant temperature at engine start	10°C (50°F)	32°C (89.6°F)
Intake air temperature at engine start	10°C (50°F)	32°C (89.6°F)
Intake air temperature	10°C (50°F)	–
Vehicle speed change	Vehicle is driven at steady speed	
Either of the following conditions is met:	Condition 1 or 2	
1. Purge duty cycle	15% or more (when intake air amount is 8 g/sec. or more)	–
2. Purge concentration for 30 sec.	–5%/% or more (when vehicle speed is less than 10 km/h (6.2 mph))	–
Fuel slosh	No sloshing (i.e fairly smooth road)	
Time after engine start	–	50 min.
Fuel tank pressure change before vacuum introduction	Minimum change	
Fuel level	–	90%
0.040 inch leak	Not detected	
CCV malfunction, bypass VSV malfunction	Not detected	
Vehicle speed	–	130 km/h (80.6 mph)
Purge VSV malfunction	Not detected	
P0442 (0.040 inch leak):		
Engine coolant temperature at engine start	10°C (50°F)	35°C (95°F)
Intake air temperature at engine start	10°C (50°F)	35°C (95°F)
Intake air temperature	10°C (50°F)	–
Either of the following conditions is met:	Condition 1 or 2	
1. Purge duty cycle	15% or more (when intake air amount is 8 g/sec. or more)	–
2. Purge concentration for 30 sec.	–5%/% or more (when vehicle speed is less than 10 km/h (6.2 mph))	–
Fuel slosh	No sloshing (i.e fairly smooth road)	
Vehicle speed change	Vehicle is driven at steady speed	

Time after engine start	–	50 min.
Fuel tank pressure change before vacuum introduction	Minimum change	
Fuel level	–	90%
Purge VSV malfunction	Not detected	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P0456 (0.020 inch leak):	
Both of the following conditions are met:	Condition 1 and 2
1. Fuel tank pressure change for 5 sec. when fuel tank pressure is –2.0 kPa (–15 mmHg)	0.067 kPa (0.5 mmHg) or more
2. Fuel tank pressure change for 5 sec. when fuel tank pressure is –2.7 kPa (–20 mmHg)	0.067 kPa (0.5 mmHg) or more
P0442 (0.040 inch leak):	
Both of the following conditions are met:	Condition 1 and 2
1. Fuel tank pressure change for 5 sec. when fuel tank pressure is –2.0 kPa (–15 mmHg)	0.24 kPa (1.8 mmHg) or more
2. Fuel tank pressure change for 5 sec. when fuel tank pressure is –2.7 kPa (–20 mmHg)	0.24 kPa (1.8 mmHg) or more

Refer to page DI–295 for detailed information on Checking Monitor Status.

MONITOR RESULT

Refer to page DI–295 for detailed information.

The test value and test limit information are described as shown in the following table. Check the monitor result and test values after performing the monitor drive pattern (see page DI–326).

- TID (Test Identification Data) is assigned to each emissions–related component.
- TLT (Test Limit Type):
  If TLT is 0, the component is malfunctioning when the test value is higher than the test limit.
  If TLT is 1, the component is malfunctioning when the test value is lower than the test limit.
- CID (Component Identification Data) is assigned to each test value.
- Unit Conversion is used to calculate the test value indicated on generic OBD II scan tools.

TID $02: EVAP system – Vacuum monitor

TLT	CID	Unit Conversion	Description of Test Data	Description of Test Limit
1	$01	Multiplied by 0.0916 (mmHg)	Test value of EVAP VSV: Determined by fuel tank pressure change during vacuum introduction	Malfunction criteria for EVAP VSV
1	$02	Multiplied by 0.0458 subtract 2.93 (mmHg)	Test value of canister closed valve (CCV) and bypass VSV: Determined by fuel tank pressure change at switching over CCV and bypass VSV	Malfunction criteria for CCV and bypass VSV
0	$03	Multiplied by 0.0458 (mmHg)	Test value of 0.04 inch leak: Determined by fuel tank pressure change	Malfunction criteria for 0.04 inch leak
0	$04	Multiplied by 0.0458 (mmHg)	Test value of 0.02 inch leak: Determined by fuel tank pressure change	Malfunction criteria for 0.02 inch leak

INSPECTION PROCEDURE

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	Check fuel tank cap (See page EC–6).

NG → Replace fuel tank cap.

OK

4	Check filler neck for damage.

PREPARATION:

Remove the fuel tank cap.

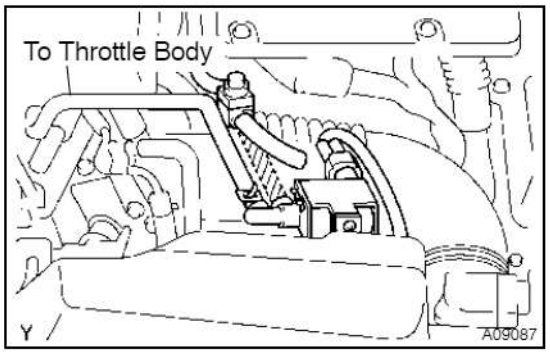
CHECK:

Visually inspect the filler neck for damage.

NG → Replace filler pipe.

OK

5	Check purge flow.



PREPARATION:

(a) Connect the hand–held tester to the DLC3.
(b) Select the "ENHANCED OBD II / ACTIVE TEST" mode on the hand–held tester.
(c) Disconnect the vacuum hose for the EVAP VSV from the charcoal canister.
(d) Start the engine.
(e) Select the menu "EVAP VSV (ALON) / ALL" in the ACTIVE TEST and operate EVAP VSV (Press the right or left button).

CHECK:

When the EVAP VSV is operated by the hand–held tester, check whether the disconnected hose applies suction to your finger.

OK:

VSV is ON:
Disconnected hose applies suction to your finger.
VSV is OFF:
Disconnected hose applies no suction to your finger.

OK	Go to step 9.

NG

6	Check vacuum hose between intake manifold and EVAP VSV, and EVAP VSV and charcoal canister.

CHECK:

(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, damages and blockage.

NG	Repair or replace vacuum hose.

OK

7	**Check operation of EVAP VSV (See page SF–61).**

NG → **Replace EVAP VSV.**

OK

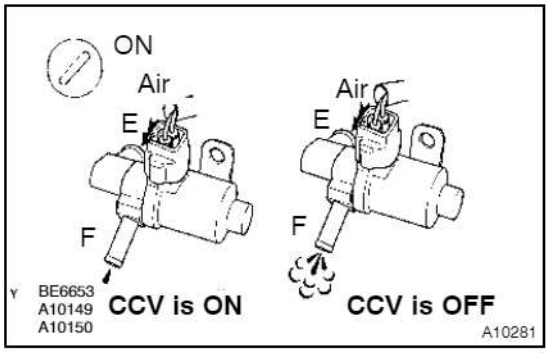
8	**Check for open and short in harness and connector between EFI main relay (Marking: EFI) and EVAP VSV, and EVAP VSV and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Replace ECM (See page SF–78).

9	**Check CCV.**



PREPARATION:

(a) Disconnect the vacuum hose for the CCV from the charcoal canister.

(b) Turn the ignition switch ON and push the hand–held tester main switch ON.

(c) Select the "ENHANCED OBD II / ACTIVE TEST" mode on the hand–held tester.

(d) Select the menu "CAN CTRL VSV / ALL" in the ACTIVE TEST and operate CAN CTRL VSV (Press the right or left button).

CHECK:

Check the CCV operation when it is operated by the hand–held tester.

OK:

CCV is ON:
Air does not flow from port E to port F.
CCV is OFF:
Air from port E flows out through port F.

OK → **Go to step 13.**

NG

10	**Check vacuum hose between CCV and charcoal canister.**

CHECK:

(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 damages, and blockage.

NG → **Repair or replace vacuum hose.**

OK

11	**Check operation of CCV (See page SF–63).**

NG → **Replace CCV.**

OK

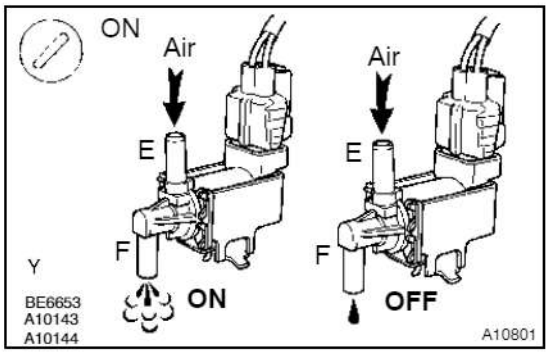
12	**Check for open and short in harness and connector between EFI main relay (Marking: EFI) and CCV, and CCV and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Replace ECM (See page SF–78).

13	Check pressure switching valve.



PREPARATION:

(a) Turn the ignition switch ON and push the hand–held tester main switch ON.

(b) Select the "ENHANCED OBD II / ACTIVE TEST" mode on the hand–held tester.

(c) Select the menu "TANK BYPASS VSV / ALL" in the ACTIVE TEST and operate TANK BYPASS VSV (Press the right or left button).

CHECK:

Check the pressure switching valve operation when it is operated by the hand–held tester.

OK:

Pressure switching valve is ON:
Air from port E flows out through port F.
Pressure switching valve is OFF:
Air does not flow from port E to port F.

OK	Go to step 16.

NG

14	Check operation of pressure switching valve (See page SF–65).

NG	Replace pressure switching valve.

OK

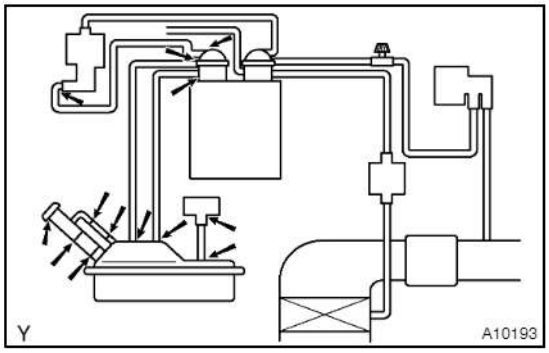
15	Check for open and short in harness and connector between EFI main relay (Marking: EFI) and pressure switching valve, and pressure switching valve and ECM (See page IN–30).

NG	Repair or replace harness or connector.

OK

Replace ECM (See page SF–78).

16	**Check whether hose close to fuel tank has been modified, and check whether there are signs of any accident near fuel tank or charcoal canister.**



CHECK:

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 evaporative emission leak part.**

OK

17	**Check vacuum hoses between vapor pressure sensor and fuel tank, and charcoal canister and pressure switching valve.**

CHECK:

(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 damages.

NG → **Repair or replace vacuum hose.**

OK

18	**Check hose and tube between fuel tank and charcoal canister.**

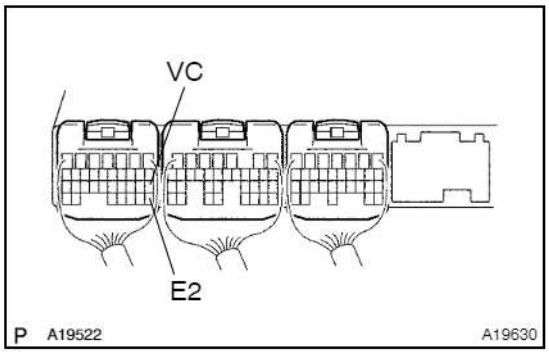
CHECK:

(a) Check for proper connection of the fuel tank and fuel evap pipe (See page EC–6), fuel evap pipe and fuel tube under the floor, fuel tube under the floor and charcoal canister.
(b) Check the hose and tube for cracks, holes and damages.

NG → **Repair or replace hose and tube.**

OK

19	Check voltage between terminals VC and E2 of ECM connector.



CHECK:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals VC and E2 of the ECM connector.

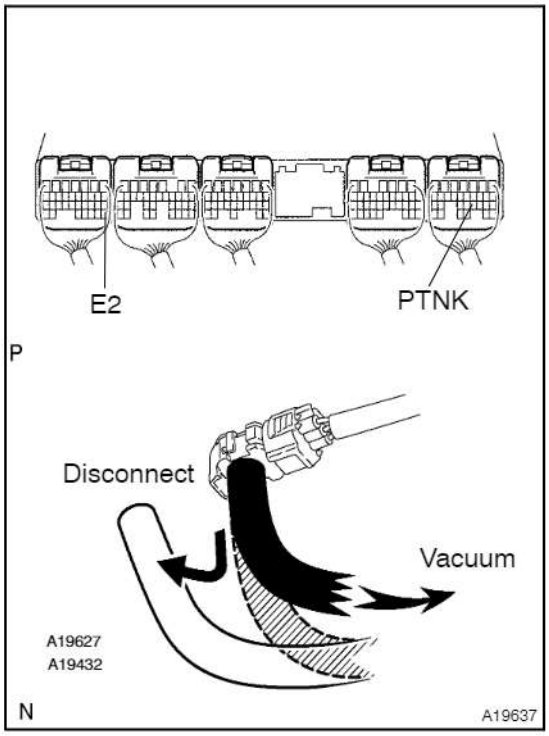
OK:

Voltage: 4.5 to 5.5 V

NG	Replace ECM (See page SF–78).

OK

20	Check voltage between terminals PTNK and E2 of ECM connectors.



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals PTNK and E2 of the ECM connector under following condition (1) and (2).

(1) Disconnect the vacuum hose from the vapor pressure sensor.

(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).

OK:

Condition (1) Voltage: 2.9 to 3.7 V

Condition (2) Voltage: 0.5 V or less

OK	Go to step 22.

NG

21	Check for open and short in harness and connector between vapor pressure sensor and ECM (See page IN–30).

NG → Repair or replace harness or connector.

OK →

Replace ECM (See page SF–78).

22	Check fuel tank inlet valve.

NG → Replace fuel tank inlet valve.

OK →

23	Check fuel tank.

NG → Replace fuel tank.

OK →

24	Check charcoal canister for cracks, holes and damages.

NG → Repair or replace charcoal canister.

OK →

Replace ECM (See page SF–78).

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	Check fuel tank cap (See page EC–6).

NG → Replace fuel tank cap.

OK

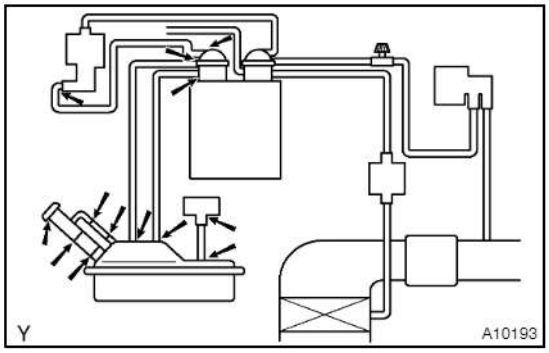
4	Check filler neck for damage.

PREPARATION:
Remove the fuel tank cap.
CHECK:
Visually inspect the filler neck for damage.

NG → Replace filler pipe.

OK

5	**Check whether hose close to fuel tank has been modified, and check whether there are signs of any accident near fuel tank or charcoal canister.**



CHECK:

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 evaporative emission leak part.**

OK →

6	**Check vacuum hoses between vapor pressure sensor and fuel tank, charcoal canister and pressure switching valve, and pressure switching valve and charcoal canister.**

CHECK:

(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 damages.

NG → **Repair or replace vacuum hose.**

OK →

7	**Check hose and tube between fuel tank and charcoal canister.**

CHECK:

(a) Check for proper connection of the fuel tank and fuel evap pipe (See page EC–6), fuel evap pipe and fuel tube under the floor, fuel tube under the floor and charcoal canister.
(b) Check the hose and tube for cracks, holes and damages.

NG → **Repair or replace hose and tube.**

OK →

8	**Check vacuum hoses ((8), (9), (10) and (11) in Fig. 1 in circuit description).**

CHECK:

(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 damage, and blockages.

NG → **Repair or replace vacuum hose.**

OK

9	**Check connector for EVAP VSV, connector for CCV, connector for pressure switching valve and vapor pressure sensor connector for looseness and disconnection.**

NG → **Repair or connect VSV or sensor connector.**

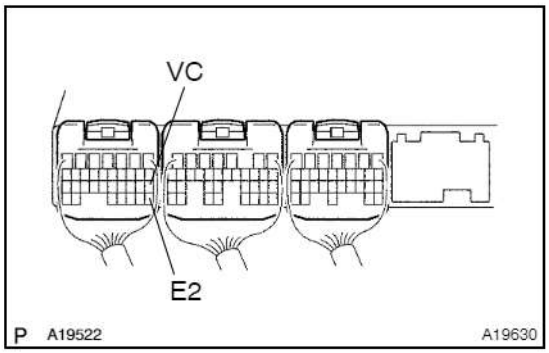
OK

10	**Check charcoal canister for cracks, holes and damages.**

NG → **Check and replace charcoal canister.**

OK

11	Check voltage between terminals VC and E2 of ECM connector.



CHECK:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals VC and E2 of the ECM connector.

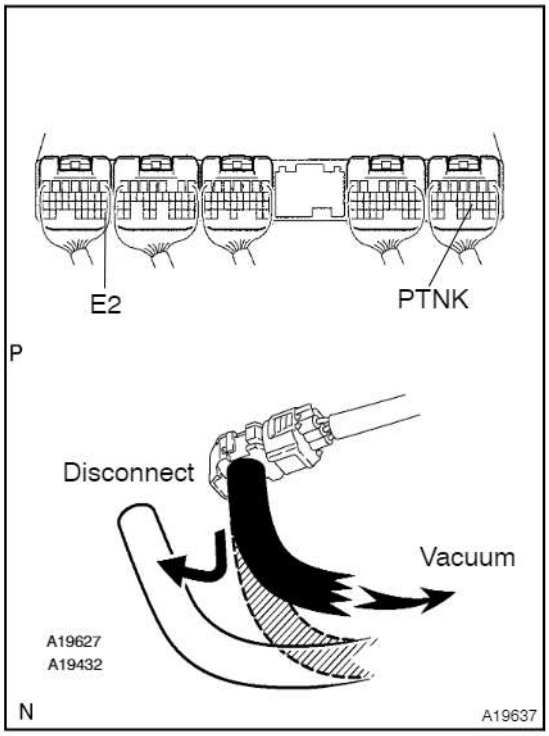
OK:

Voltage: 4.5 to 5.5 V

NG	Replace ECM (See page SF–78).

OK

12	Check voltage between terminals PTNK and E2 of ECM connectors.



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals PTNK and E2 of the ECM connector under following condition (1) and (2).

(1) Disconnect the vacuum hose from the vapor pressure sensor.

(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).

OK:

Condition (1) Voltage: 2.9 to 3.7 V

Condition (2) Voltage: 0.5 V or less

OK	Go to step 14.

NG

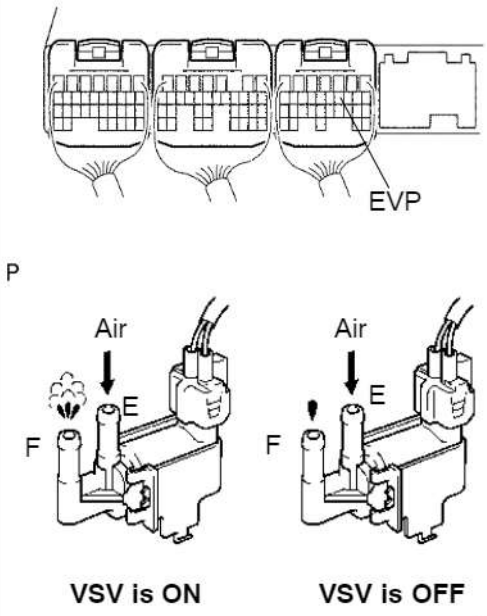
13	**Check for open and short in harness and connector between vapor pressure sensor and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Replace ECM (See page SF–78).

14	**Check EVAP VSV.**



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Check the VSV function.

(1) Connect the terminal EVP of the ECM connector and body ground (ON).

(2) Disconnect the terminal EVP of the ECM connector and body ground (OFF).

OK:

(1) VSV is ON:
Air from port E flows out through port F.
(2) VSV is OFF:
Air does not flow from port E to port F.

OK → **Go to step 17.**

NG

15	**Check operation of EVAP VSV (See page SF–61).**

NG → **Replace EVAP VSV.**

OK

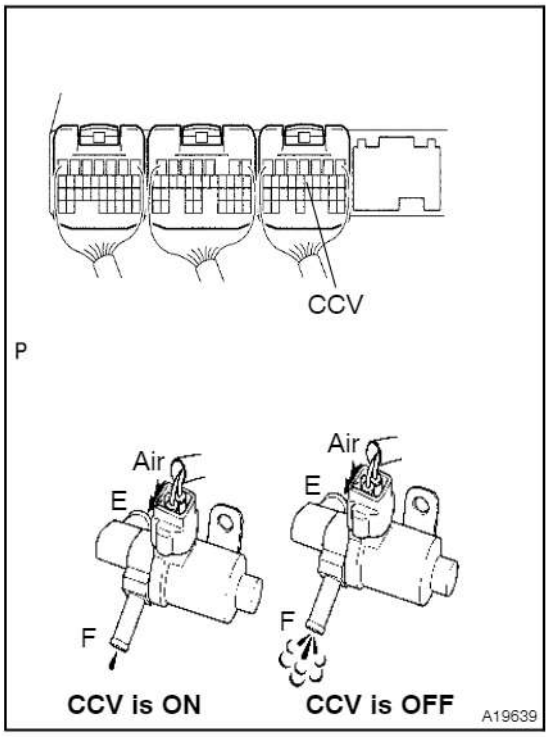
16	**Check for open and short in harness and connector between EFI main relay (Marking: EFI) and EVAP VSV, and EVAP VSV and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Replace ECM (See page SF–78).

17	**Check CCV.**



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Check the CCV function.

(1) Connect the terminal CCV of the ECM connector and body ground (ON).

(2) Disconnect the terminal CCV of the ECM connector and body ground (OFF).

OK:

(1) CCV is ON:
Air does not flow from port E to port F.
(2) CCV is OFF:
Air from port E flows out through port F.

OK → **Go to step 20.**

NG

18	**Check operation of CCV (See page SF–63).**

NG → **Replace CCV.**

OK

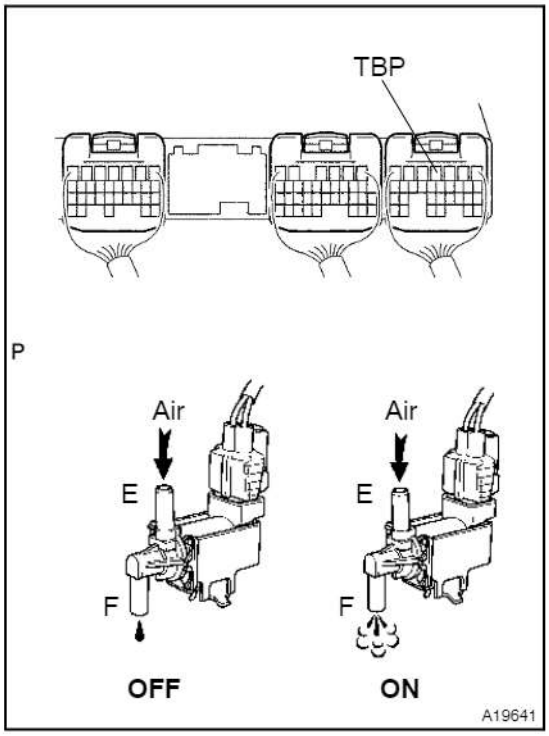
19	**Check for open and short in harness and connector between EFI main relay (Marking: EFI) and CCV, and CCV and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Replace ECM (See page SF–78).

20	**Check pressure switching valve.**



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Check the pressure switching valve function.

(1) Connect the terminal TBP of the ECM connector and body ground (ON).

(2) Disconnect the terminal TBP of the ECM connector and body ground (OFF).

OK:

(1) Pressure switching vavle is ON:
Air from port E flows out through port F.
(2) Pressure switching valve is OFF:
Air does not flow from port E to port F.

OK → **Go to step 23.**

NG

21	Check operation of pressure switching valve (See page SF–65).

NG → Replace pressure switching valve.

OK

22	Check for open and short in harness and connector between EFI main relay (Marking: EFI) and pressure switching valve, and pressure switching valve and ECM (See page IN–30).

NG → Repair or replace harness or connector.

OK

Replace ECM (See page SF–78).

23	Check fuel tank inlet valve.

NG → Replace fuel tank inlet valve.

OK

24	Check fuel tank.

NG → Replace fuel tank.

OK

It is likely that vehicle user did not properly close fuel tank cap.

DTC	P0451	Evaporative Emission Control System Pressure Sensor/Switch 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.

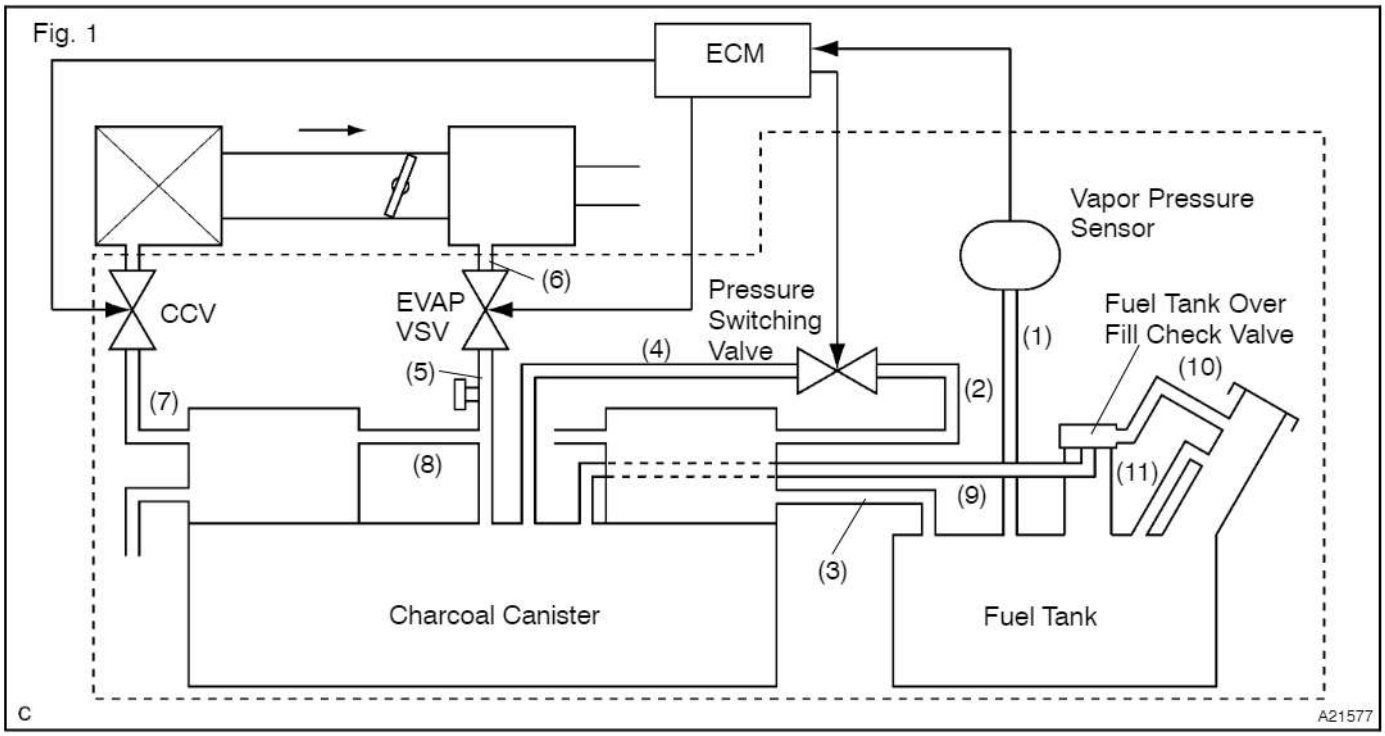
P0451

The ECM monitors pressure in the fuel tank using the vapor pressure sensor. The ECM supplies the sensor with a regulated 5 V reference voltage and the sensor returns a signal voltage between 0.5 V and 4.5 V according to the pressure level in the fuel tank.
When the pressure in the fuel tank is low, the output voltage of the vapor pressure sensor is low. When it is high, the output voltage is high.
For this DTC P0451, the ECM checks for a "noisy" sensor or a "stuck" sensor.
The ECM checks for a "noisy" sensor by monitoring the fuel tank pressures when the vehicle is stationary and there should be little variation in the tank pressure. If the indicated pressure value exceeds specified limits, the ECM will illuminate the MIL and a DTC will be set.
The ECM checks for a "stuck" sensor by monitoring the fuel tank pressure for an extended time period. If the indicated pressure value does not change over this period, the ECM will conclude that the fuel tank pressure sensor is malfunctioning. The ECM will illuminate the MIL and a DTC will be set.

P0452 and P0453

The ECM monitors pressure in the fuel tank using the vapor pressure sensor. The ECM supplies the sensor with a regulated 5 V reference voltage and the sensor returns a signal voltage between 0.5 V and 4.5 V according to the pressure level in the fuel tank.
If the output voltage of the vapor pressure sensor is out of normal range, the ECM will determine that there is a malfunction in the sensor or sensor circuit.
When pressure indicated by the vapor pressure sensor goes below –3.999 kPa (–30 mmHg, –1.18 in.Hg) or above 1.999 kPa (15 mmHg, 0.59 in.Hg), 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.

Fig. 1



DTC No.	DTC Detecting Condition	Trouble Area
P0451	Vapor pressure sensor output extremely changes under conditions of (a) and (b): (2 trip detection logic) (a) Vehicle speed: 0 km/h (0mph), Engine speed: Idling and pressure switching valve is OFF (b) Vapor pressure sensor value ≧ opening pressure valve of charcoal canister	• Open or short in vapor pressure sensor circuit • Vapor pressure sensor • ECM
P0452	Open in vapor pressure sensor circuit	
P0453	Short in vapor pressure sensor circuit	

MONITOR STRATEGY

P0451

Related DTCs	P0451	Evaporative emission control system pressure sensor range/performance
Required sensors/components	Main sensors/components	Vapor pressure sensor
	Related sensors/components	Mass air flow meter, Engine coolant temperature sensor
Frequency of operation	Once per driving cycle	
Duration	Fuel tank pressure sensor "Noise" monitor: 10sec. Fuel tank pressure sensor "Stuck" monitor: 20 min.	
MIL operation	2 driving cycles	
Sequence of 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 sensors/components	Vapor pressure sensor
	Related sensors/components	Mass air flow meter, Engine coolant temperature sensor
Frequency of operation	Once per driving cycle	
Duration	17 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

P0451

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–295	
Fuel tank pressure sensor "Noise" monitor:		
Altitude	–	2,400 m (7,872 ft)
Battery voltage	11 V	–
Throttle position learning	Completed	
Fuel tank pressure sensor malfunction (P0452, P0453)	Not detected	
EVAP VSV, CCV, bypass VSV	Not operated by scan tool	
Intake air temperature at engine start – Engine coolant temperature at engine start	–7°C (–13°F)	11.1°C (20°F)
Engine coolant temperature at engine start	4.4°C (40°F)	35°C (95°F)
Intake air temperature at engine start	4.4°C (40°F)	35°C (95°F)
Time after vehicle stop and idling	5 sec.	15 sec.
Bypass VSV	Closed	
Fuel tank pressure sensor "Stuck" monitor:		
Altitude	–	2,400 m (7,872 ft)
Battery voltage	11 V	–
Throttle position learning	Completed	
Vapor pressure sensor	No malfunction	
Fuel tank pressure sensor malfunction (P0452, P0453)	Not detected	
Intake air temperature at engine start – Engine coolant temperature at engine start	–7°C (–13°F)	11.1°C (20°F)
EVAP VSV, CCV, bypass VSV	Not operated by scan tool	
Engine coolant temperature at engine start	4.4°C (40°F)	35°C (95°F)
Intake air temperature at engine start	4.4°C (40°F)	35°C (95°F)
Time after engine start	6 sec.	–

P0452 and P0453

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–295	
Difference between intake air temperature and engine coolant temperature at engine start	–	12°C (22°F)
Engine coolant temperature at engine start	10°C (50°F)	35°C (95°F)
Intake air temperature at engine start	10°C (50°F)	35°C (95°F)
Engine	Running	

TYPICAL MALFUNCTION THRESHOLDS

P0451

Detection Criteria	Threshold
Fuel tank pressure sensor "Noise" monitor:	
Frequency that fuel tank pressure change is 0.667 kPa (5 mmHg) or more	7 times or more for 10 sec.
Fuel tank pressure sensor "Stuck" monitor:	
Fuel tank pressure change	No change for 20 min. or more

P0452 and P0453

Detection Criteria	Threshold
P0452:	
Fuel tank pressure	Less than –3.999 kPa (–30 mmHg)
P0453:	
Fuel tank pressure	1.999 kPa (15 mmHg) or more

WIRING DIAGRAM

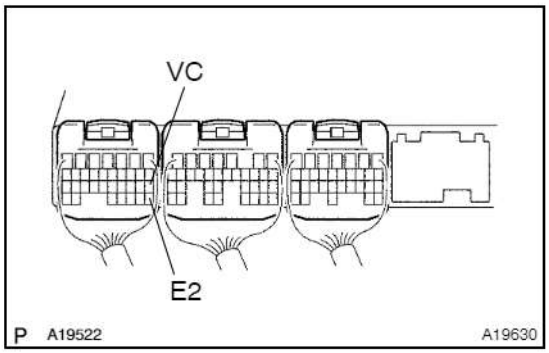
Refer to DTC P0441 on page DI–501.

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.
- If DTC P0441 (Purge Flow), P0446 (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, as well as other data from the time when a malfunction occurred.
- If the ENGINE RUN TIME in the freeze frame data is less than 200 seconds, carefully check the vapor pressure sensor.

1	Check voltage between terminals VC and E2 of ECM connector.



CHECK:

(a) Remove the ECM cover.
(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals VC and E2 of the ECM connector.

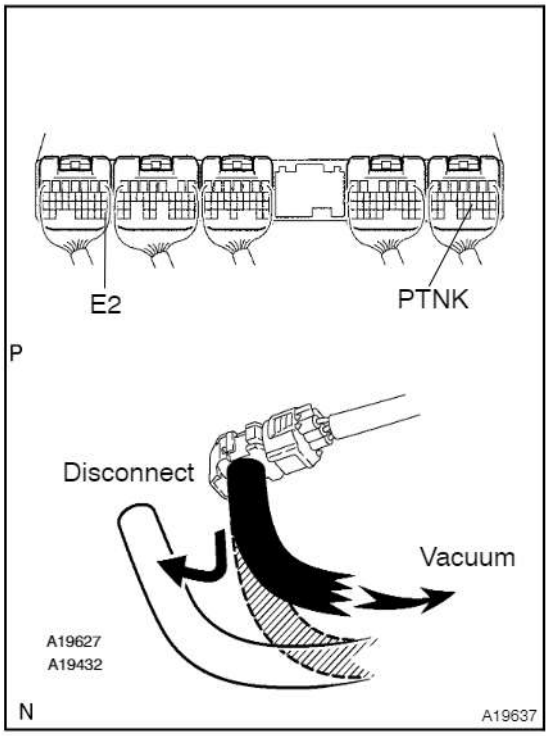
OK:

Voltage: 4.5 to 5.5 V

NG	Replace ECM (See page SF–78).

OK

2	Check voltage between terminals PTNK and E2 of ECM connectors.



PREPARATION:

(a) Remove the ECM cover.
(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals PTNK and E2 of the ECM connectors.

(1) Disconnect the vacuum hose from the vapor pressure sensor.
(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.
(3) Check the vapor pressure sensor output waveform using a hand–held tester.

NOTICE:

The vacuum applied to the vapor pressure sensor must be less than 66.7 kPa (500 mmHg, 19.7 in.Hg).

OK:

(1) Voltage: 2.9 to 3.7 V
(2) Voltage: 0.5 V or less
(3) A consecutive waveform presents.

OK	Replace ECM (See page SF–78).

NG

3	**Check for open and short in harness and connector between vapor pressure sensor and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Replace vapor pressure sensor.

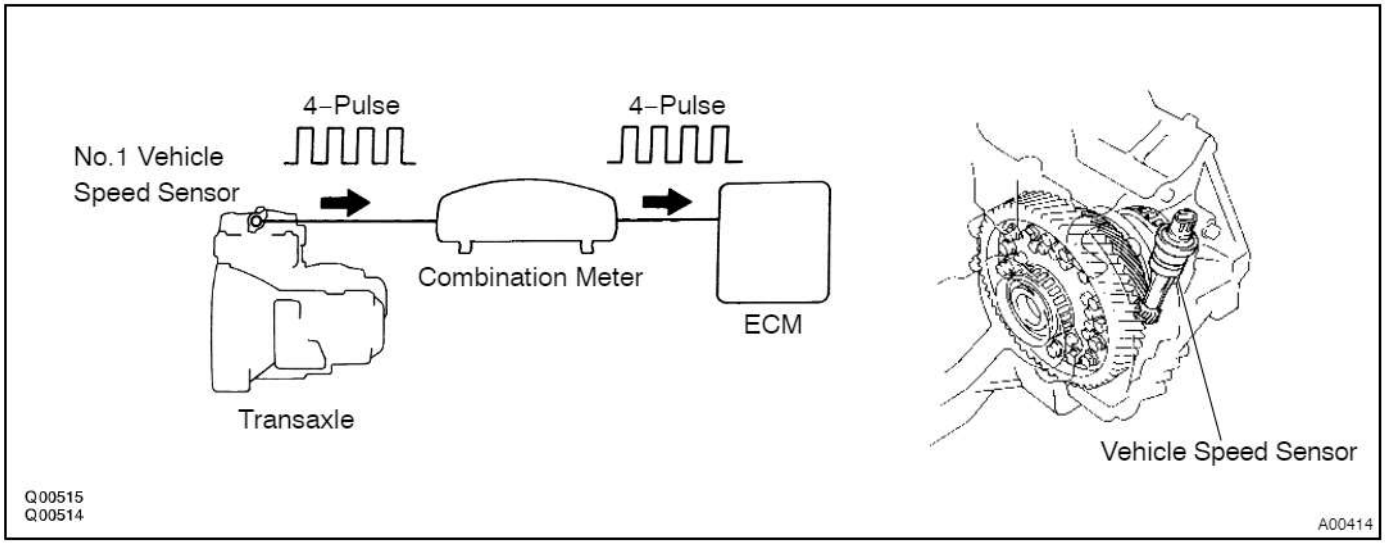
DI38H–13

DTC	P0500	Vehicle Speed Sensor ”A”

DTC	P0503	Vehicle Speed Sensor ”A” Intermittent/ Erratic/High

CIRCUIT DESCRIPTION

The No.1 vehicle speed sensor outputs a 4–pulse signal for every revolution of the rotor shaft, which is rotated by the transmission output shaft via the driven gear. After this signal is converted into a more precise rectangular waveform by the waveform shaping circuit inside the combination meter, it is then transmitted to the ECM. The ECM determines the vehicle speed based on the frequency of these pluse signals.



DTC No.	DTC Detecting Condition	Trouble Area
P0500 P0503	During vehicle is being driven, no vehicle speed sensor signal to ECM (2 trip detection logic)	• Combination meter • Open or short in vehicle speed sensor circuit • Vehicle speed sensor • ECM

MONITOR DESCRIPTION

The ECM assumes that the vehicle is being driven when over 30 sec. have passed since the park/neutral position switch was turned OFF. If there is no signal from the vehicle speed sensor when these conditions are satisfied, the ECM concludes that the vehicle speed sensor is malfunctioning. The ECM will turn on the MIL and a DTC will be set.

MONITOR STRATEGY

Related DTCs	P0500	Vehicle speed sensor "A" pulse input error
Required sensors/components	Main sensors/components	Vehicle speed sensor
	Related sensors/components	Engine coolant temperature sensor, Combination meter
Frequency of operation	Continuous	
Duration	Case 1: 8 sec. Case 2: 1 sec.	
MIL operation	Case 1: 2 driving cycles Case 2: Immediate	
Sequence of operation	None	

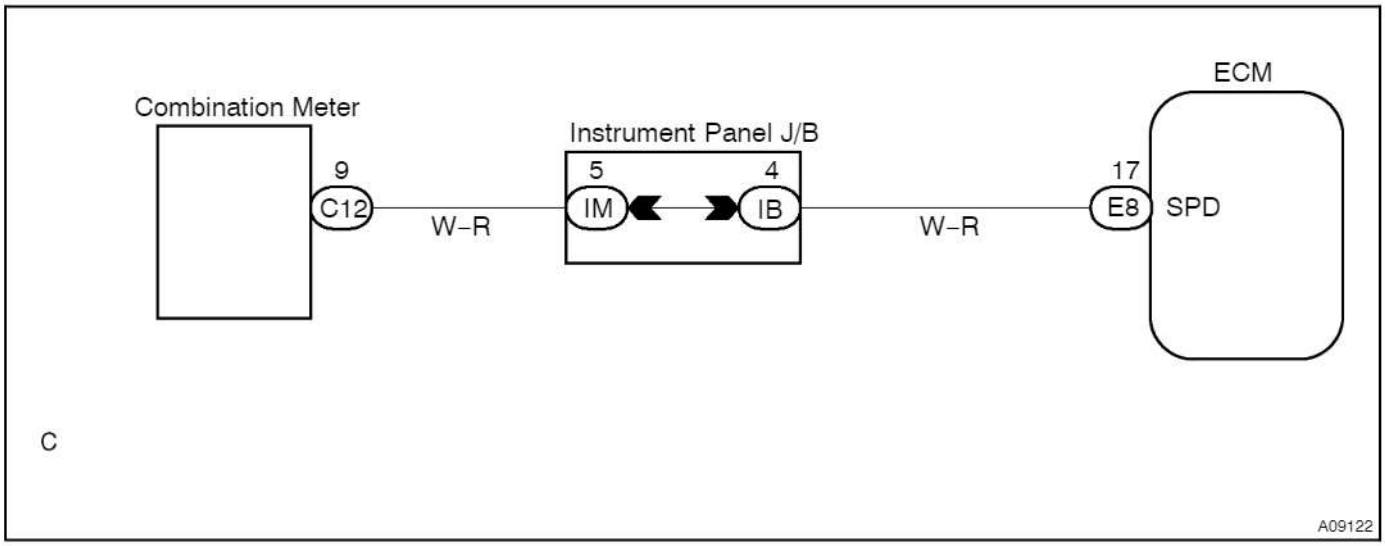
TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–295	
Case 1 (MT):		
Engine coolant temperature	70°C (158°F)	–
Engine speed	2,000 rpm	4,000 rpm
Intake air amount per engine revolution	0.34 g/rev	–
Fuel cut at high engine speed	Not executing	
Case 2 (AT):		
Engine	Running	
Either of the following conditions are met:	A or B	
A. All of the following conditions are met:	(a) and (b)	
(a) Time after park/neutral position switch turns from ON to OFF	2 sec.	–
(b) Engine coolant temperature	20°C (68°F)	–
B. One of the following conditions are met:	(a), (b) or (c)	
(a) Time after park/neutral position switch turns from ON to OFF	30 sec.	–
(b) Engine coolant temperature	–	20°C (68°F)
(c) Time after ignition switch is ON	2 sec.	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Sensor signal	No pulse input

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, as well as other data from the time when a malfunction occurred.

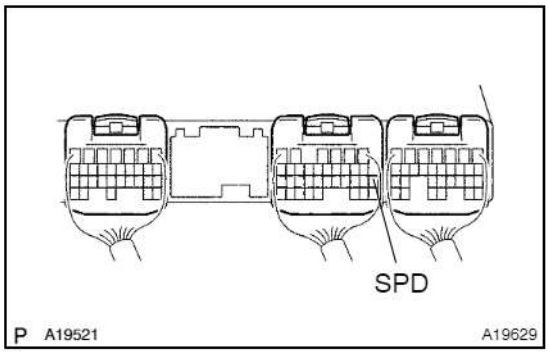
1	**Check operation of speedometer.**

CHECK:
Drive the vehicle and check if the operation of the speedmeter 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 combination meter troubleshooting (See page BE–2).**

OK

2	Check voltage between terminal SPD of ECM connector and body ground.



PREPARATION:

(a) Remove the ECM cover.
(b) Shift the shift lever to neutral.
(c) Jack up one of the front wheels.
(d) Turn the ignition switch ON.

CHECK:

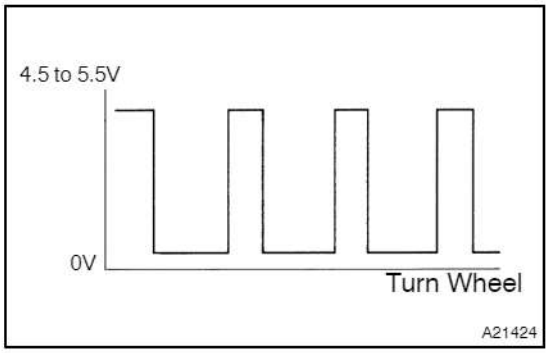
Measure voltage between terminal SPD of ECM connector and body ground when the wheel is turned slowly.

OK:

Voltage is 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 SF–78).

DIC7N–02

DTC	P0504	Brake Switch "A"/"B" Correlation

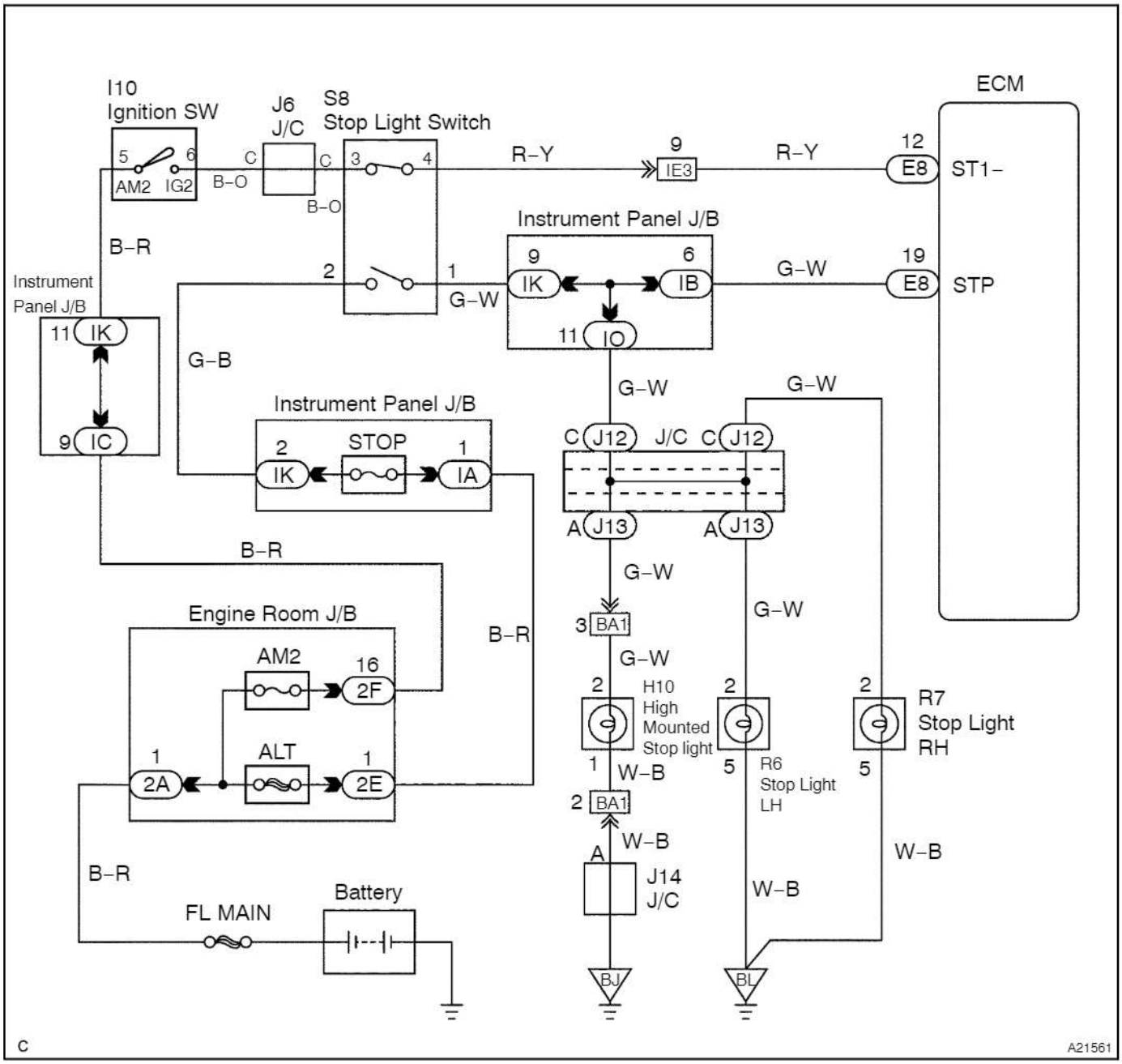
CIRCUIT DESCRIPTION

In addition to turning on the stop lamp, the stop light switch signals are used for a variety of engine and transmission functions as well as the stop lamp. This switch is designed with two complementary signal outputs: STP and ST1–. The ECM analyzes these signal outputs 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 seconds 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

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, as well as other data from the time when a malfunction occurred.

Hand–held tester:

1	**Check operation of stop light.**

PREPARATION:
Check if the stop lights come on and go off normally when the brake pedal is operated and released.

NG → **Check and repair stop light circuit (See page BE–37).**

OK ↓

2	**Check STOP fuse.**

PREPARATION:
Remove the STOP fuse from the instrument panel J/B.
CHECK:
Check the continuity of the STOP fuse.
OK:

Continuity

NG → **Check for short in all harness and components connected to STOP fuse.**

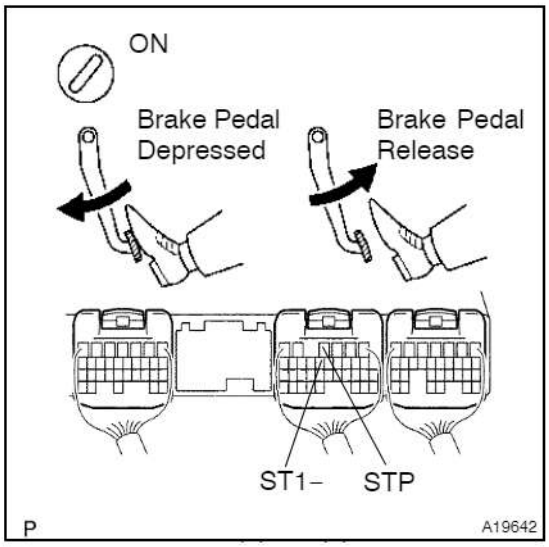
OK ↓

3	**Check stop light switch (See page BE–37).**

NG → **Replace stop light switch.**

OK ↓

4	Check STP signal and ST1– voltage.



PREPARATION:

(a) Connect the to the DLC3.
(b) Turn the ignition switch ON and hand–held tester main switch ON.
(c) Enter the following menu: "DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / STOP LIGHT SW".

CHECK:

(a) Read the STP signal on the hand–held tester.
(b) Measure the voltage between terminals ST1– and body ground.

OK:

Brake Pedal	STP Signal	ST1– Voltage
Depressed	ON	Below 1.5 V
Released	OFF	7.5 to 14 V

OK → **Check for intermittent problems (See page DI–295).**

NG

5	Check harness and connector between ECM and stop light switch (See page IN–30).

NG → **Repair or replace harness or connector.**

OK

Replace ECM (See page SF–78).

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

1	**Check operation of stop light.**

PREPARATION:
Check if the stop lights come on and go off normally when the brake pedal is operated and released.

NG → **Check and repair stop light circuit (See page BE–37).**

OK ↓

2	**Check STOP fuse.**

PREPARATION:
Remove the STOP fuse from the instrument panel J/B.
CHECK:
Check the continuity of the STOP fuse.
OK:
Continuity

NG → **Check for short in all harness and components connected to STOP fuse.**

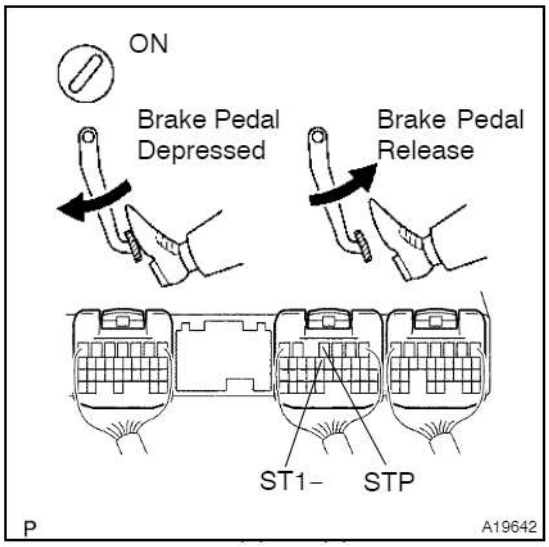
OK ↓

3	**Check stop light switch (See page BE–37).**

NG → **Replace stop light switch.**

OK ↓

4	Check voltage between terminal STP and ST1– of ECM and body ground.



PREPARATION:

Turn the ignition switch ON.

CHECK:

Check voltage between terminal STP and ST1– of ECM and body ground.

OK:

Brake Pedal	STP Voltage	ST1– Voltage
Depressed	7.5 to 14 V	Below 1.5 V
Released	Below 1.5 V	7.5 to 14 V

OK → **Check for intermittent problems (See page DI–295).**

NG

5	Check harness and connector between ECM and stop light switch (See page IN–30).

NG → **Repair or replace harness or connector.**

OK

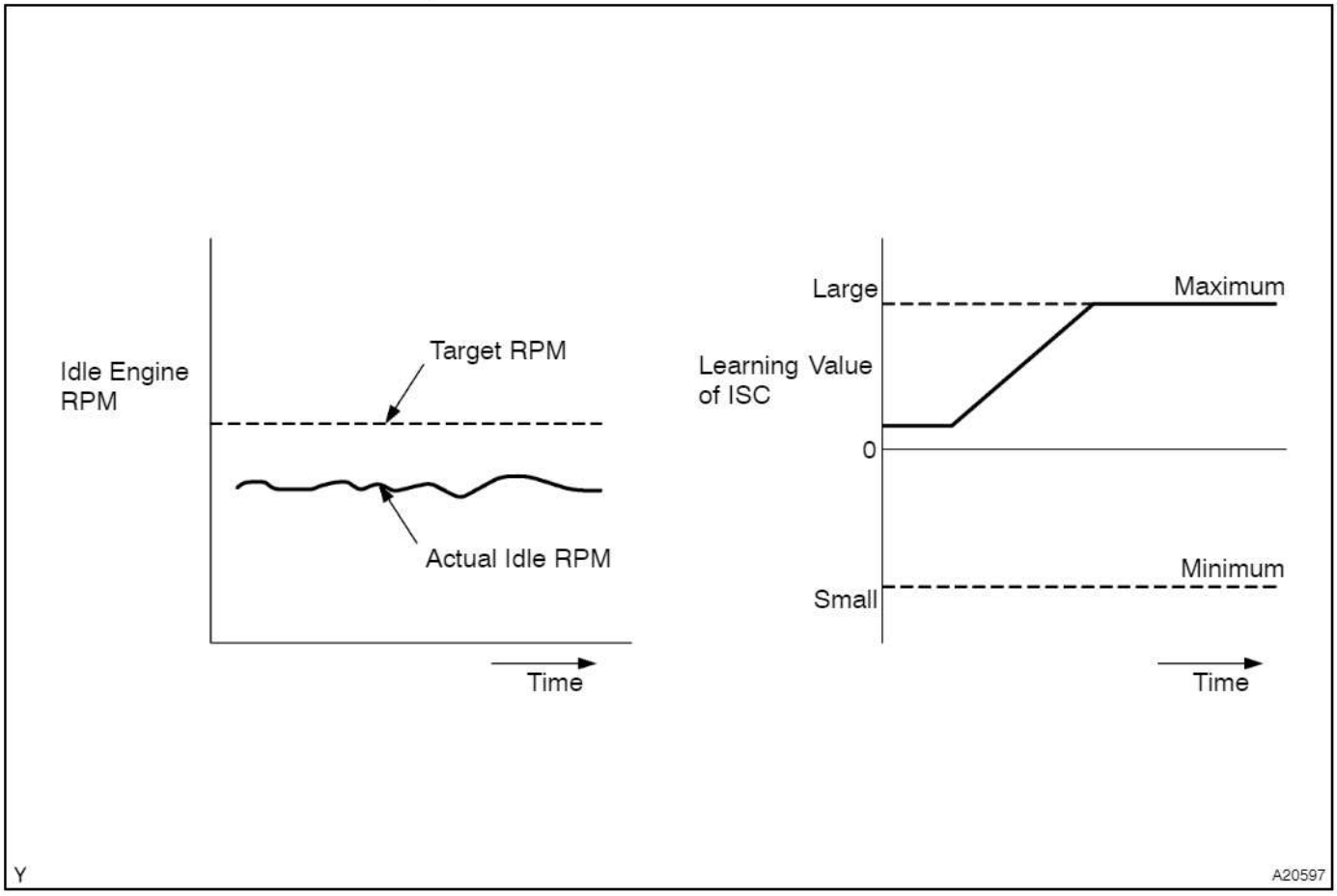
Replace ECM (See page SF–78).

DIC7O-02

DTC	P0505	Idle Air Control System

MONITOR DESCRIPTION

The idle speed is controlled by the ETCS (Electronic Throttle Control System).
The 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 TCM concludes that the idle speed control ECM function is malfunctioning if: 1) the actual idle RPM varies more than the specified amount, or 2) a learning value of the idle speed control remains at the maximum or minimum five times or more during a driving 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 will be set.
HINT:
*1: RPM threshold varies with engine load.



DTC No.	DTC Detecting Condition	Trouble Area
P0505	Idle speed continues to vary greatly from target speed (Function check 2 trip detection logic) (Range check 1 trip detection logic)	• Air induction system • Electric throttle control system • PCV piping

MONITOR STRATEGY

Related DTCs	P0505	Idle air control valve
Required sensors/components	Main sensors/components	Crankshaft position sensor
	Related sensors/components	Vehicle speed sensor, Engine coolant temperature sensor
Frequency of operation	Once per driving cycle	
Duration	10 min.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITION

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–295	
Engine	Running	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Either of the following conditions is met:	Condition 1 or 2
1. Frequency that both of the following conditions (a) and (b) are met:	5 times or more
(a). Engine RPM – target engine RPM	Less than –100 rpm, or more than 200 rpm (intake air temperature is 0°C (32°F) or more) Less than –100 rpm, or more than 300 rpm (intake air temperature is less than 0°C (32°F))
(b). Vehicle condition	Stop after vehicle was driven by 10 km/h (6.25 mph) or more
2. Frequency that both of the following conditions (a) and (b) are met:	Once
(a). Engine RPM – target engine RPM	Less than –100 rpm, or more than 200 rpm (intake air temperature is 0°C (32°F) or more) Less than –100 rpm, or more than 300 rpm (intake air temperature is less than 0°C (32°F))
(b). IAC flow rate learning value	0.43 or less, or more than 2.75

COMPONENT OPERATING RANGE

Parameter	Standard value
P0505:	
Time while no missing voltage change	0.5 sec. or more

INSPECTION PROCEDURE

HINT:

- When the throttle position is slightly opened (the accelerator pedal is slightly depressed) because a floor carpet is overlapped on the accelerator pedal, or if the accelerator pedal is not fully released, etc., DTC P505 may be detected.
- 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, as well as other data from the time when a malfunction occurred.

1	**Are there any other codes (besides P0505) being output?**

PREPARATION:

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

CHECK:

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 is output, perform the troubleshooting for those codes first.

B → **Go to relevant DTC chart (See page DI–335).**

A

2	**Check connection of PCV piping.**

NG → **Repair or replace PCV piping.**

OK

3	**Check air induction system.**

CHECK:

Check for vacuum leaks in air induction system.

NG → **Repair or replace air induction system.**

OK

Check electric throttle control system (See page SF–39).

DI38N–16

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 starts, the ECM will turn on the MIL and a DTC will be set.

DTC No.	DTC Detecting Condition	Trouble Area
P0560	Open in back up power source circuit	• Open in back up power source circuit • EFI fuse • ECM

HINT:
If DTC P0560 appears, the ECM does not store other DTC.

MONITOR STRATEGY

Related DTCs	P0560	System voltage malfunction
Required sensors/components	ECM	
Frequency of operation	Continuous	
Duration	3 sec.	
MIL operation	Immediate (*1)	
Sequence of operation	None	

*1: The DTC is set immediately. The MIL will be illuminated after the engine starts in the next time.

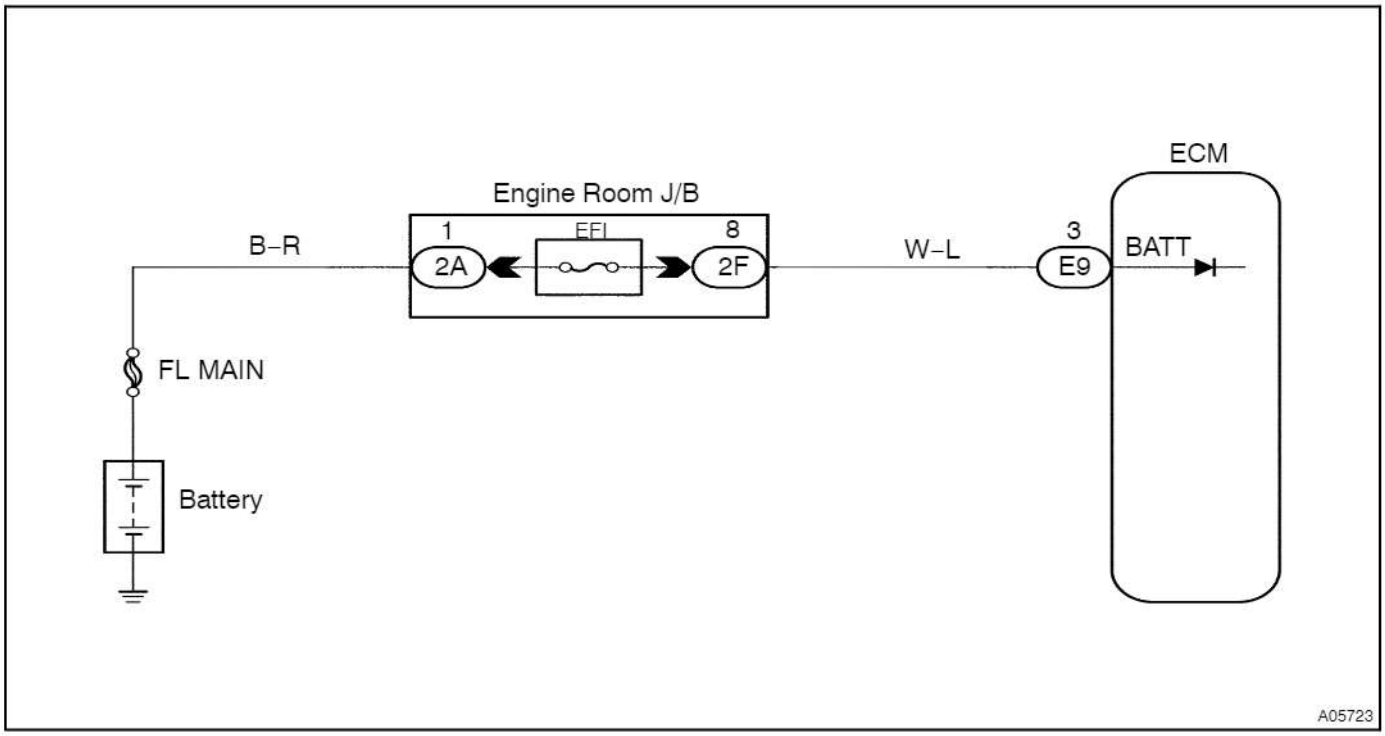
TYPICAL MALFUNCTION THRESHOLDS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–295	
Stand–by RAM	Initialized	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Battery voltage	Less than 3.5 V

WIRING DIAGRAM



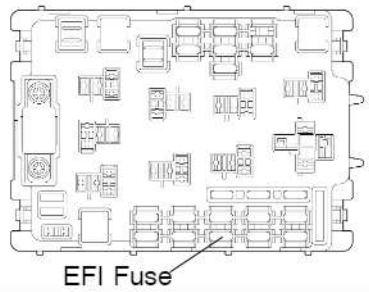
INSPECTION PROCEDURE

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, as well as other data from the time when a malfunction occurred.

1	**Check EFI fuse of engine room J/B.**

Engine Room J/B



PREPARATION:

Remove the EFI fuse from the engine room J/B.

CHECK:

Check the continuity of the EFI fuse.

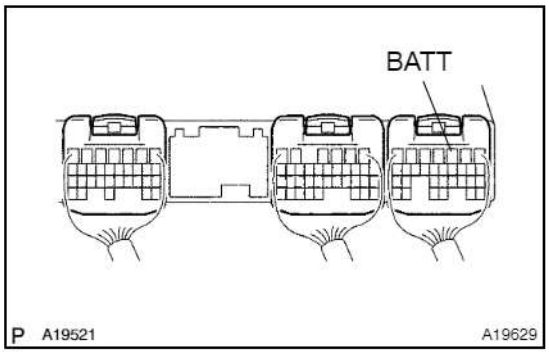
OK:

Continuity

NG	**Check for short in all harness and components connected to EFI fuse.**

OK

2	Check voltage between terminal BATT of ECM connector and body ground.



PREPARATION:
Remove the ECM cover.
CHECK:
Measure the voltage between terminal BATT of the ECM connector and body ground.
OK:
Voltage: 9 to 14 V

OK	Replace ECM (See page SF–78).

NG

3	Check for open or short in harness and connector between ECM and EFI No. 1 fuse, EFI fuse and battery (See page IN–30).

NG	Repair or replace harness or connector.

OK

Check and replace engine room J/B.

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 RAM (Random Access Memory) errors. The two CPUs also perform continuous mutual monitoring.

The ECM sets a DTC if: 1) outputs from the 2 CPUs are different and deviate 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 Detecting Condition	Trouble Area
P0604 P0606 P0607 P0657	ECM malfunction	• ECM

MONITOR STRATEGY

Related DTCs	P0604	RAM (Random Access Memory) error range check
	P0606	TP (Throttle position) and APP (Accel pedal position) sensor circuit in ECM
	P0607	ECM range check
	P0657	ETCS (Electrical throttle control) power supply circuit in ECM
Required sensors/components	ECM	
Frequency of operation	Continuous	
Duration	1 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

The monitor will run whenever these DTCs are not present	See page DI–295
The typical enabling condition is not available	–

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P0604:	
RAM	RAM check failure
P0606:	
Either of the following conditions is met:	Condition 1 or 2
1. Difference between TP of main CPU and TP of sub CPU	0.3 V or more
2. Difference between APP of main CPU and APP of sub CPU	0.3 V or more
P0607:	
Either of the following conditions is met:	Condition 1 or 2
1. All of the following conditions are met:	Condition (a), (b) and (c)
(a) CPU reset	1 time or more
(b) Difference between TP and APP learing values	0.4 V or more
(c) Electronic throttle actuator	OFF
2. CPU reset	2 times or more
P0657:	
ETCS 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, as well as other data from the time when a malfunction occurred.

Replace ECM (See page SF–78).

DIC7P–02

DTC	P0617	Starter Relay Circuit High

MONITOR DESCRIPTION

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 will be set.

DTC No.	DTC Detection Condition	Trouble Area
P0617	All conditions (a), (b) and (c) are satisfied for 20 seconds with battery (+B) voltage 10.5 V or more (a) Vehicle speed ≧ 20 km/h (12.4 mph) (b) Engine revolution ≧ 1,000 rpm (c) STA signal ON	• Park/neutral position switch (A/T) • Clutch start switch (M/T) • Starter relay circuit • Ignition switch • ECM

MONITOR STRATEGY

Related DTCs	P0617	Starter signal error
Required sensors/components	Main sensors/components	Starter signal
	Related sensors/components	Vehicle speed sensor, Engine speed sensor
Frequency of operation	Continuous	
Duration	20 sec.	
MIL operation	Immediate	
Sequence of operation	None	

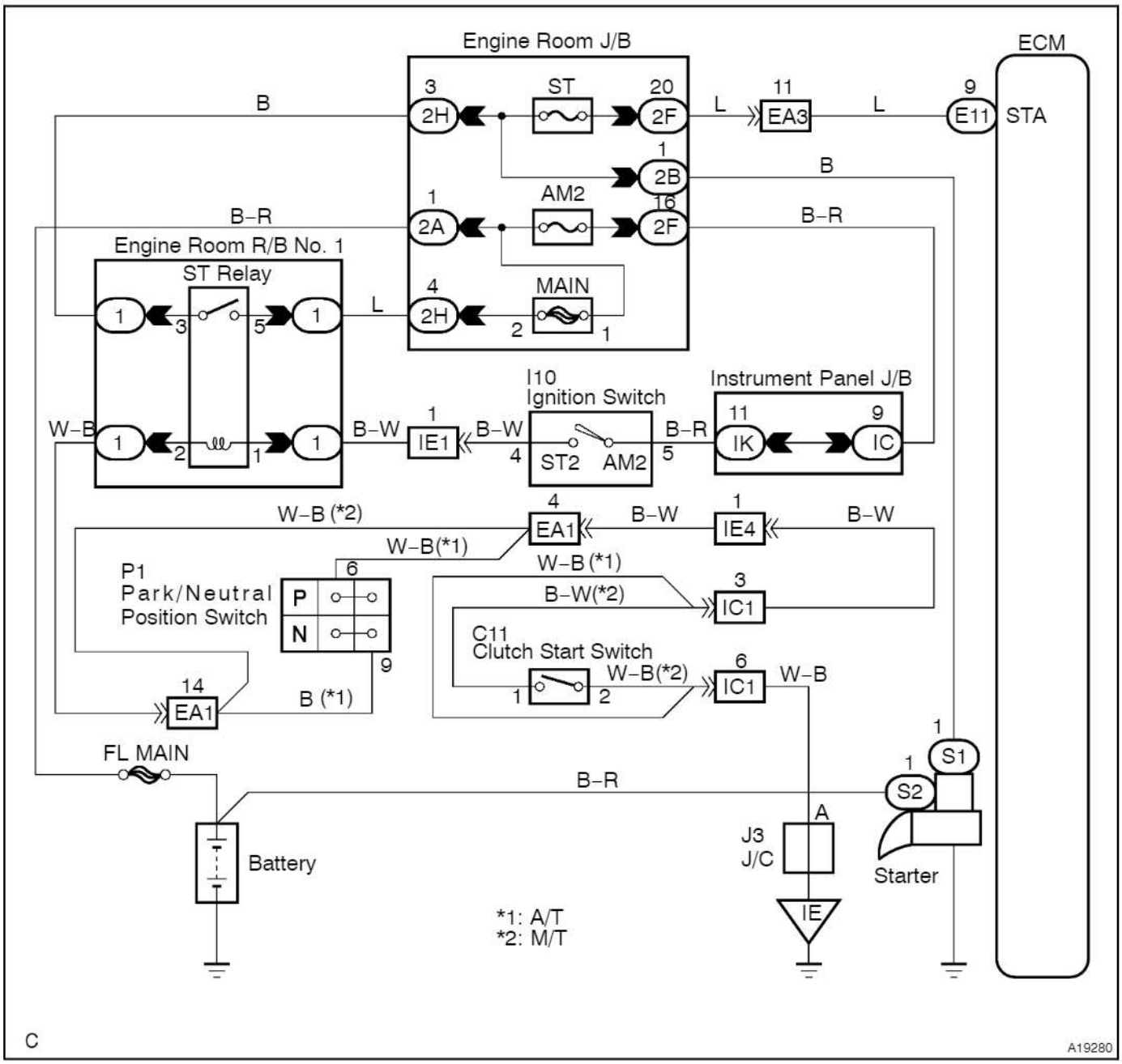
TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–295	
Battery voltage	10.5 V	–
Vehicle speed	20 km/h (12.4 mph)	–
Engine RPM	1,000 rpm	–

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Starter signal	ON (at "more than 20 km/h (12.4 mph) and more than 1,000 rpm")

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, as well as other data from the time when a malfunction occurred.

Hand–held tester:

1	**Check STA signal.**

PREPARATION:

(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) Enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / STARTER SIG.

CHECK:

Read the STA signal on the hand–held tester while the starter is operating.

OK:

Ignition Switch Position	ON	START
STA Signal	OFF	ON

OK → **Go to step 5.**

NG

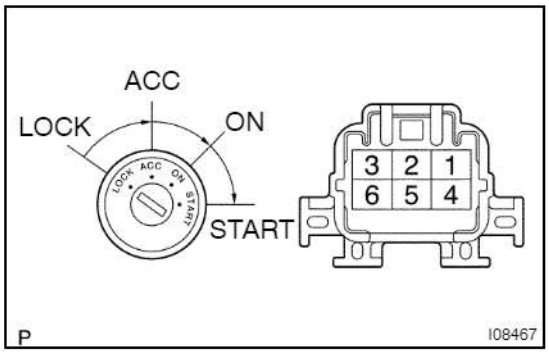
2	**Check park/neutral position switch or clutch start switch.**

(a) Inspect the park/neutral position switch (A/T)(See page DI–701).
(b) Inspect the clutch start switch (M/T)(See page CL–2).

NG → **Replace park/neutral position switch or clutch start switch. Go to next step 5 after the replacement.**

OK

3	Check ignition switch.



Check continuity between the connector terminals shown in the chart below.

Switch	Terminal No.	Resistance
LOCK	All Terminal to Terminal	1MΩ or more
ACC	2 – 3	1Ω or less
ON	2 – 3 – 4 6 – 7	1Ω or less
START	1 – 2 – 4 6 – 7 – 8	1Ω or less

NG → **Replace ignition switch.**
Go to next step 5 after the replacement.

OK

4	Check STA signal.

PREPARATION:

(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) Enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / STARTER SIG.

CHECK:

Read the STA signal on the hand–held tester while the starter is operating.

OK:

Ignition Switch Position	ON	START
STA Signal	OFF	ON

NG → **Repair or replace harness or connector.**

OK

5	Check DTC reoccur

PREPARATION:

(a) Connect the OBD II scan tool.
(b) Turn the ignition switch ON and OBD II scan tool main switch ON.
(c) Clear DTC (See page DI–295)
(d) Drive the vehicle more than 40 km/h (25 mph) for 20 seconds or more.

CHECK:

Check DTC reoccur.

RESULT:

Display (DTC Output)	Proceed to
P0617	A
No DTC output	B

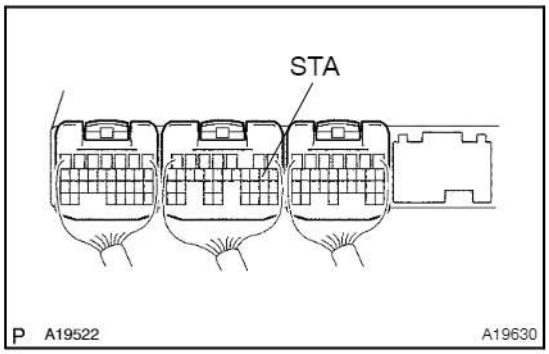
A → **Replace ECM (See page SF–78).**

B →

Check for intermittent problems (See page DI–295).

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

1	**Check voltage between terminal STA of ECM connector and body ground.**



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminal STA of the ECM connector and body ground during the engine cranking.

OK:

Voltage:

0 V (Ignition switch ON)

6 V or more (Engine cranking)

OK	**Go to step 5.**

NG

2	**Check park/neutral position switch or clutch start switch.**

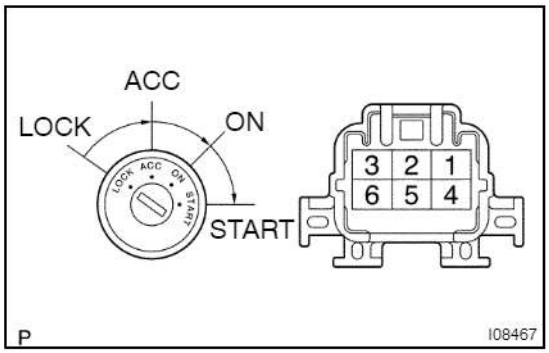
(a) Inspect the park/neutral position switch (A/T)(See page DI–701).

(b) Inspect the clutch start switch (M/T)(See page CL–2).

NG	**Replace park/neutral position switch or clutch start switch. Go to next step 5 after the replacement.**

OK

3	Check ignition switch.



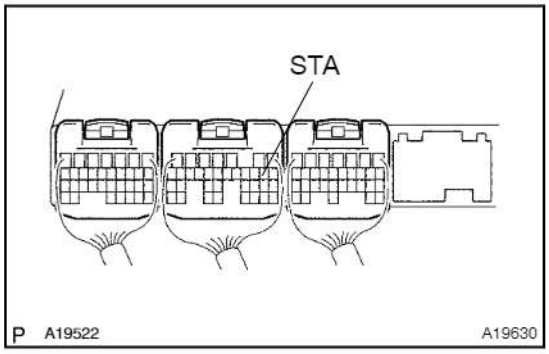
Check continuity between the connector terminals shown in the chart below.

Switch	Terminal No.	Resistance
LOCK	All Terminal to Terminal	10 kΩ or higher
ACC	2 – 3	Below 1Ω
ON	2 – 3 – 4 6 – 7	Below 1Ω
START	1 – 2 – 4 6 – 7 – 8	Below 1Ω

NG → **Replace ignition switch.**
Go to next step 5 after the replacement.

OK

4	Check voltage between terminal STA of ECM connector and body ground.



PREPARATION:
(a) Remove the ECM cover.
(b) Turn the ignition switch ON.

CHECK:
Measure the voltage between terminal STA of the ECM connector and body ground during the engine cranking.

OK:

Voltage:
0 V (Ignition switch ON)
6 V or more (Engine cranking)

NG → **Repair or replace harness or connector.**

OK

5	Check DTC reoccur

PREPARATION:

(a) Connect the OBD II scan tool.
(b) Turn the ignition switch ON and OBD II scan tool main switch ON.
(c) Clear DTC (See page DI–295).
(d) Drive the vehicle more than 40 km/h (25 mph) for 20 seconds or more.

CHECK:

Check DTC reoccur.

RESULT:

Display (DTC Output)	Proceed to
P0617	A
No DTC output	B

A → **Replace ECM (See page SF–78).**

B →

Check for intermittent problems (See page DI–295).

DTC	P0630	VIN not Programmed or Mismatch – ECM/ PCM

CIRCUIT DESCRIPTION

DTC P0630 is set when the Vehicle Identification Number (VIN) is not stored in the Engine Control Module (ECM) or the input VIN is not accurate. Input the VIN with the hand–held tester.

DTC No.	DTC Detecting Condition	Trouble Area
P0630	• VIN is not stored in ECM. • Input VIN to ECM is not accurate.	ECM

MONITOR STRATEGY

Related DTCs	P0630	VIN not programed
Required sensors/components	Main sensors/components	ECM
	Related sensors/components	–
Frequency of operation	Continuous	
Duration	0.5 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–295	
Battery voltage	8 V	–
Ignition switch	ON	
Starter	OFF	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
VIN code	Not programmed

COMPONENT OPERATING RANGE

Parameter	Standard value
VIN code	Programmed

INSPECTION PROCEDURE

1	Read current DTC.

NOTICE:
If P0630 is present, the VIN must be input to the ECM using the hand–held tester. However, all DTCs are cleared automatically by the tester when the VIN is input. If DTCs other than P0630 are present, check them first.

NEXT

2	Input VIN with hand–held tester (See page DI–322).

NEXT

END

DI1MG–13

DTC	P1645	Body ECU Malfunction

CIRCUIT DESCRIPTION

ECM receives the operating condition (ON/OFF) of A/C from A/C ECU and it also receives the electrical load information from the body ECU.
ECM uses the information to control the engine (idle up, etc.).

DTC No.	DTC Detecting Condition	Trouble Area
P1645	Condition (a) or (b) continues for 3.0 sec. (a) No communication from body ECU (b) No communication from A/C ECU	• Body ECU • A/C ECU • Communication bus

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, as well as other data from the time when a malfunction occurred.
Perform troubleshooting the Multiplex Communication System (See page DI–1184).

DIC7Q–02

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 inputs.
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 seconds) • Throttle control motor current 7 A or more (0.6 seconds)	• Short in throttle control motor circuit • Throttle control motor • Throttle valve • Throttle body assy • ECM

MONITOR DESCRIPTION

The ECM monitors the current through the electronic throttle motor and detects malfunctions or open circuit in the throttle motor based on the voltage of the current. When the current deviates from the standard, 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:
The current is more than 10 A. Or the current is less than 0.5 A when the motor driving duty ratio is exceeding 80%. The ECM concludes that the current is out of the specified range, turns on the MIL and a DTC is set.

FAIL SAFE

If the ETCS (Electronic Throttle Control System) 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 infection (Intermittent fuel–cut) and ignition timing in accordance with the accelerator pedal opening angle to enable the vehicle to continue at a minimum 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	P2102	Throttle actuator control motor current (Low current)
	P2103	Throttle actuator control motor current (High current)
Required sensors/components	Throttle actuator motor	
Frequency of operation	Continuous	
Duration	2 sec.	
MIL operation	Immediate	
Sequence of operation	None	

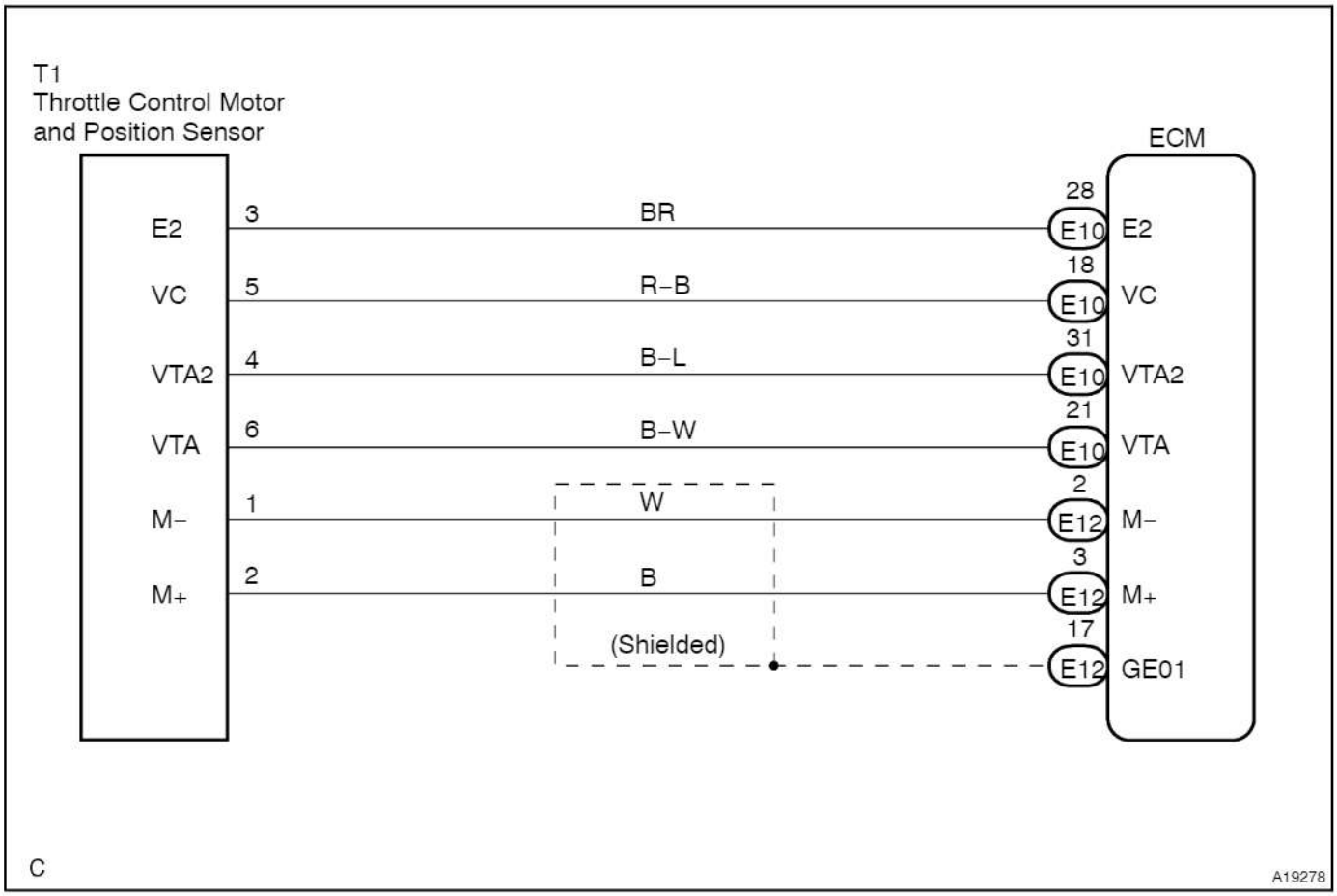
TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–295	
P2102:		
Throttle motor	ON	
Duty–cycle ratio to open throttle actuator	80%	–
Throttle actuator power supply	8 V	–
Motor current change during the last 0.016 sec.	–	0.2 A
P2103:		
Throttle motor	ON	
Either of the following conditions is met:	A or B	
A. Throttle actuator power supply	8 V	–
B. Throttle actuator power	ON	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
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 sec.) More than 7 A (0.6 sec.)

WIRING DIAGRAM

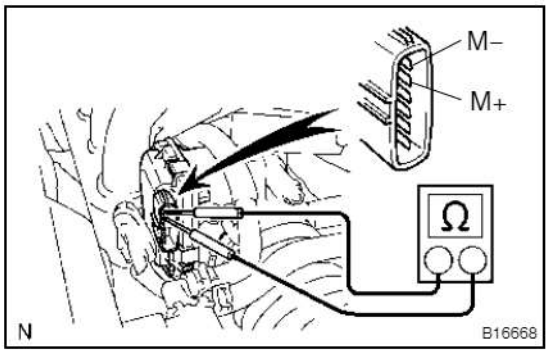


INSPECTION PROCEDURE

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, as well as other data from the time when a malfunction occurred.

1	**Check throttle control motor.**



PREPARATION:

Disconnect the throttle control motor connector.

CHECK:

Measure the resistance between terminals 1 and 2 of the throttle control motor.

OK:

Resistance: 0.3 to 100 Ω at 20°C (68°F)

NG	**Replace throttle control motor (See page SF–42).**

OK

2	**Check for open and short in harness and connector between throttle control motor and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

3	**Visually check throttle valve.**

PREPARATION:
Remove the intake air connector.
CHECK:
Check between the throttle valve and the housing for foreign objects. Also, check if the valve can open and close smoothly.

NG → **Remove foreign objects and clean throttle body.**

OK

Replace ECM (See page SF–78).

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. 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) is not used on the throttle cable.

DTC No.	DTC Detection Condition	Trouble Area
P2111	Throttle motor locked during ECM order to open	• Throttle control motor circuit • Throttle control motor • Throttle body • Throttle valve
P2112	Throttle motor locked during ECM order to close	• Same as DTC No. P2111

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 will be 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	P2111	Throttle motor actuator lock (Open)
	P2112	Throttle motor actuator lock (Closed)
Required sensors/components	Main sensors/components	Throttle actuator motor
	Related sensors/components	Throttle position sensor
Frequency of operation	Continuous	
Duration	0.5 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–295	
P2111:		
System guard*	ON	
Throttle motor current	2 A	–
Throttle motor duty to close side	80%	–
P2112:		
System guard*	ON	
Throttle motor current	2 A	–
Throttle motor duty to open side	80%	–
System guard*		
Throttle actuator	ON	
Throttle actuator duty calculation	Executing	
Throttle position sensor	Fail determined	
Throttle actuator current cut operation	Not executing	
Throttle actuator power supply	4 V	–
Throttle actuator	Fail determined	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P2111:	
Throttle position sensor voltage change for 0.016 sec.	Less than 0.1 V for 0.5 sec.
P2112:	
Throttle position sensor voltage change for 0.016 sec.	Less than 0.1 V for 0.5 sec.

WIRING DIAGRAM

Refer to DTC P2102 DI–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, as well as other data from the time when a malfunction occurred.

1	**Visually check throttle valve.**

PREPARATION:

Remove the intake air connector.

CHECK:

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

2	**Check if DTC outputs reoccur.**

PREPARATION:

(a) Clear the DTC (See page DI–295).
(b) Start and warm up the engine.
(c) Run the engine.
(d) Fully depress and release the accelerator pedal in a moment.

CHECK:

Read the DTC using the hand–held tester or the OBD II scan tool (See page DI–295).

RESULT:

Display (DTC Output)	Proceed to
No DTC output	A
DTC P2111 or P2112 output reoccur	B

B → **Replace ECM (See page SF–78).**

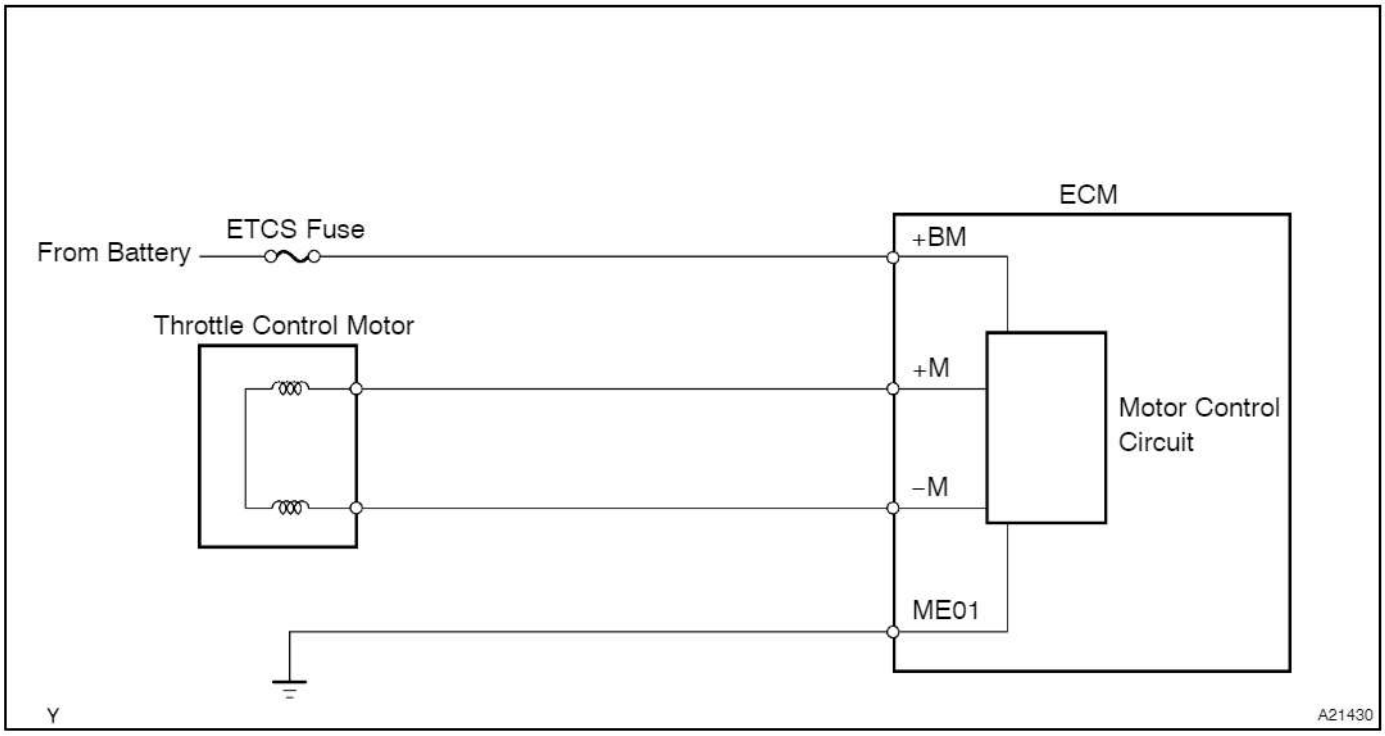
A

Check for intermittent problems (See page DI–295).

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 4 V), 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, current to the motor is cut. If repairs are made and the system has returned to normal, turn the ignition switch 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 +BM. When the power supply voltage drops below 0.4 V for 0.8 seconds, the ECM concludes that the power supply circuit has an open circuit. The MIL is turned on and a DTC is set.

FAIL SAFE

If the ETCS (Electronic Throttle Control System) 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 infection (intermittent fuel–cut) and ignition timing in accordance with the accelerator pedal opening angle to enable the vehicle to continue at a minimum 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	P2118	Throttle actuator motor power supply line range check (Low voltage)
Required sensors/components	Throttle actuator motor	
Frequency of operation	Continuous	
Duration	0.8 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–295	
Actuator power	ON	
Battery voltage	8 V	–

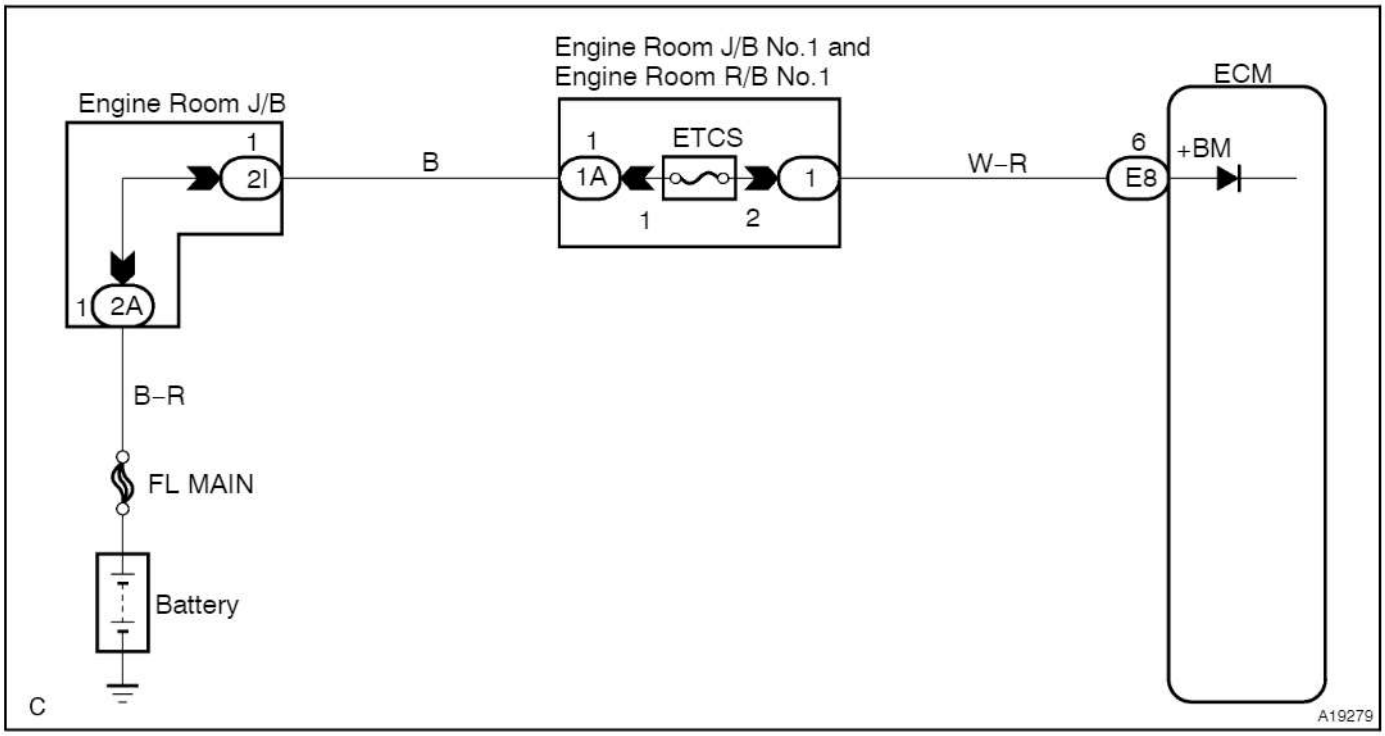
TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Throttle actuator motor power supply voltage	Less than 4 V

COMPONENT OPERATING RANGE

Parameter	Standard Value
Throttle actuator motor power supply voltage	9 to 14 V

WIRING DIAGRAM

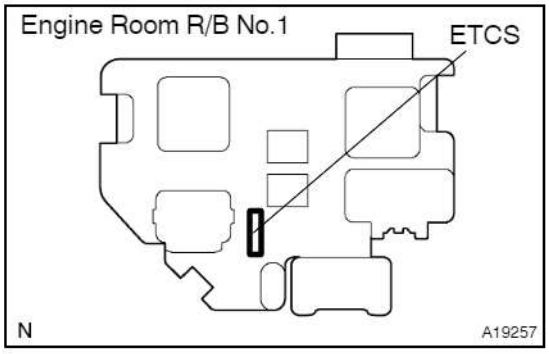


INSPECTION PROCEDURE

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, as well as other data from the time when a malfunction occurred.

1	**Check ETCS fuse.**



PREPARATION:

Remove the ETCS fuse from the engine room R/B No.1.

CHECK:

Check the continuity of the ETCS fuse.

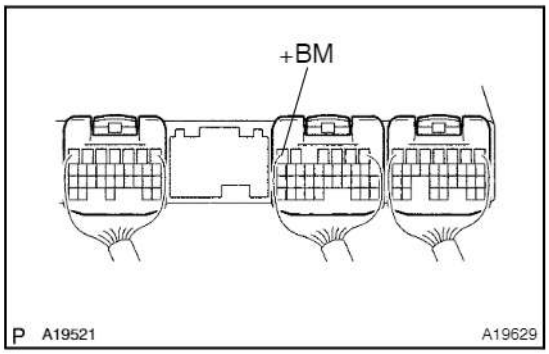
OK:

Continuity

NG	**Check for short in all harness and components connected to ETCS fuse.**

OK

2	**Check voltage between terminal +BM of ECM connector and body ground.**



PREPARATION:

Remove the glove compartment door (See page SF–78).

CHECK:

Measure the voltage between terminal +BM of the ECM connector and body ground.

OK:

Voltage: 9 to 14 V

OK	**Check for intermittent problems (See page DI–295).**

NG

3	**Check for open and short in harness and connector between ECM and ETCS fuse, ETCS fuse and battery (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Check engine room R/B No. 1.

DIAKC–03

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 inputs. The throttle position sensor, which is 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 Detecting 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 (Electronic Throttle Control System). The ECM turns on the MIL and a DTC is set.

FAIL SAFE

If the ETCS (Electronic Throttle Control System) 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 minimum 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	P2119	Electronic throttle control system failure
Required sensors/components	Main sensors/components	Throttle actuator motor
	Related sensors/components	Throttle position sensor
Frequency of operation	Continuous	
Duration	1 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

The monitor will run whenever this DTC is not present	See page DI–295	
System guard*	ON	
System guard*		
Throttle actuator	ON	
Throttle actuator duty calculation	Executing	
Throttle position sensor	Fail determined	
Throttle actuator current cut operation	Not executing	
Throttle actuator power supply	4 V	–
Throttle actuator	Fail determined	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Either of the following conditions is met:	Condition 1 or 2
1. Commanded closed TP – current closed TP	0.3 V or more for 1 sec.
2. Commanded open TP – current open TP	0.3 V or more for 0.6 sec.

COMPONENT OPERATING RANGE

Standard Value
Commanded throttle position and current throttle position are nearly the same

WIRING DIAGRAM

Refer to DTC P2102 on page DI–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, as well as other data from the time when a malfunction occurred.

1	**Are there any other codes (besides DTC P2119) being output?**

PREPARATION:

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester or the OBD II scan tool main switch ON.
(c) When using hand–held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES."

CHECK:

Read the DTC using the hand–held tester or the OBD II scan tool.

RESULT:

Display (DTC Output)	Proceed to
Only P2119 is output	A
P2119 and other DTC are output	B

HINT:

If any other codes besides P2119 are output, perform the troubleshooting for those codes first.

B → **Go to relevant DTC chart (See page DI–335).**

A

2	**Check if DTC outputs reoccur.**

PREPARATION:

(a) Clear the DTC (See page DI–295).
(b) Start and warm up the engine.
(c) Run the engine at idle for 15 seconds or more.
(d) Perform the stall test.
Move the shift lever to D Position and fully depress the accelerator pedal for 5 seconds. Then release the pedal for 5 seconds or more.

CHECK:

Read the DTC using the hand–held tester or the OBD II scan tool (See page DI–295).

OK:

No DTC output.

OK → **System is normal.**

NG

Replace throttle body.

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".

CIRCUIT DESCRIPTION

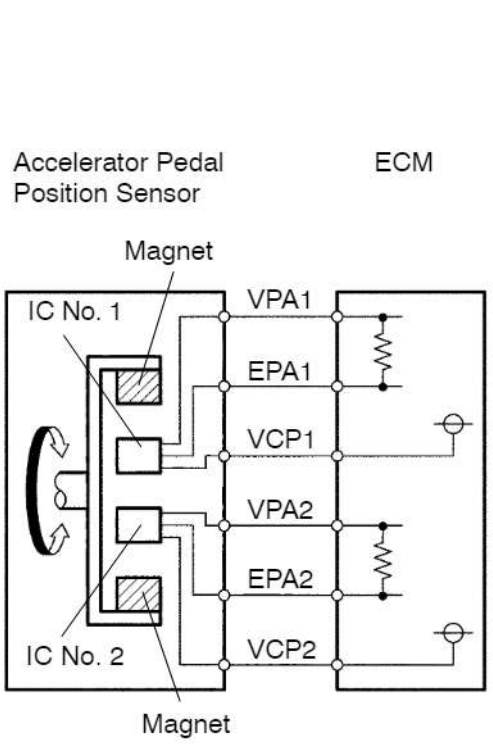
HINT:

- This electrical throttle system does not use a throttle cable.
- This accelerator pedal position sensor is a non–contact type.

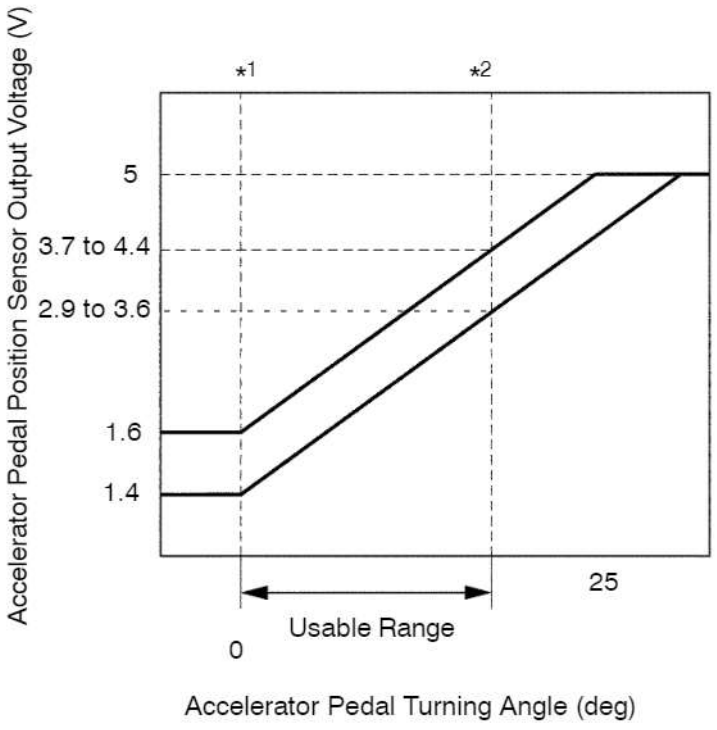
The accelerator pedal position sensor is mounted on the accelerator pedal to detect the angle of the accelerator pedal. This sensor is electronically controlled and uses Hall–effect elements.

In the accelerator pedal position sensor, the voltage applied to terminals VPA and VPA2 of the ECM changes between 0 V and 5 V in proportion to the angle of the accelerator pedal. The VPA is a signal to indicate the actual accelerator pedal angle and is used for the engine control. VPA2 is used to detect malfunctions of the sensor itself.

The ECM judges the current 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

DTC No.	DTC Detection Condition	Trouble Area
P2120	Condition (a) continues for 0.5 sec. or more: (a) VPA is 0.2 V or less and VPA2 is 0.97 deg or more, or VPA is 4.8 V or more	• Accelerator pedal position sensor • ECM
P2122	Conditions (a) and (b) continue for 0.5 sec. or more: (a) VPA is 0.2 V or less (b) VPA2 is 0.97 deg or more	• Accelerator pedal position sensor • Open in VCP1 circuit • VPA circuit open or ground short • ECM
P2123	Condition (a) continues for 2.0 sec. or more: (a) VPA is 4.8 V or more	• Accelerator pedal position sensor • Open in EPA circuit • ECM
P2125	Condition (a) continues for 0.5 sec. or more: (a) (VPA2 is 0.5 V or less and VPA is 0.97 deg or more) 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	Conditions (a) and (b) continue for 0.5 sec. or more: (a) VPA2 is 0.5 V or less (b) VPA is 0.97 deg or more	• Accelerator pedal position sensor • Open in VCP2 circuit • VPA2 circuit open or ground short • ECM
P2128	Conditions (a) and (b) continue for 2.0 sec. 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 sec. 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	• VPA and VPA2 circuits are short–circuited • Accelerator pedal position sensor • ECM

HINT:

After confirming DTCs "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 output			
	Accelerator pedal released		Accelerator pedal depressed	
	ACCEL POS #1	ACCEL POS #2	ACCEL POS #1	ACCEL POS #2
VCP 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
EPA 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 outputs 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:

The voltage output of the VPA is below 0.2 V or exceeds 4.8 V.

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 remaining circuit is used to calculate the accelerator pedal opening 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.
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	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	Accelerator position sensor	
Frequency of operation	Continuous	
Duration	2 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

The monitor will run whenever these DTCs are not present	See page DI–295
Throttle control motor power	ON

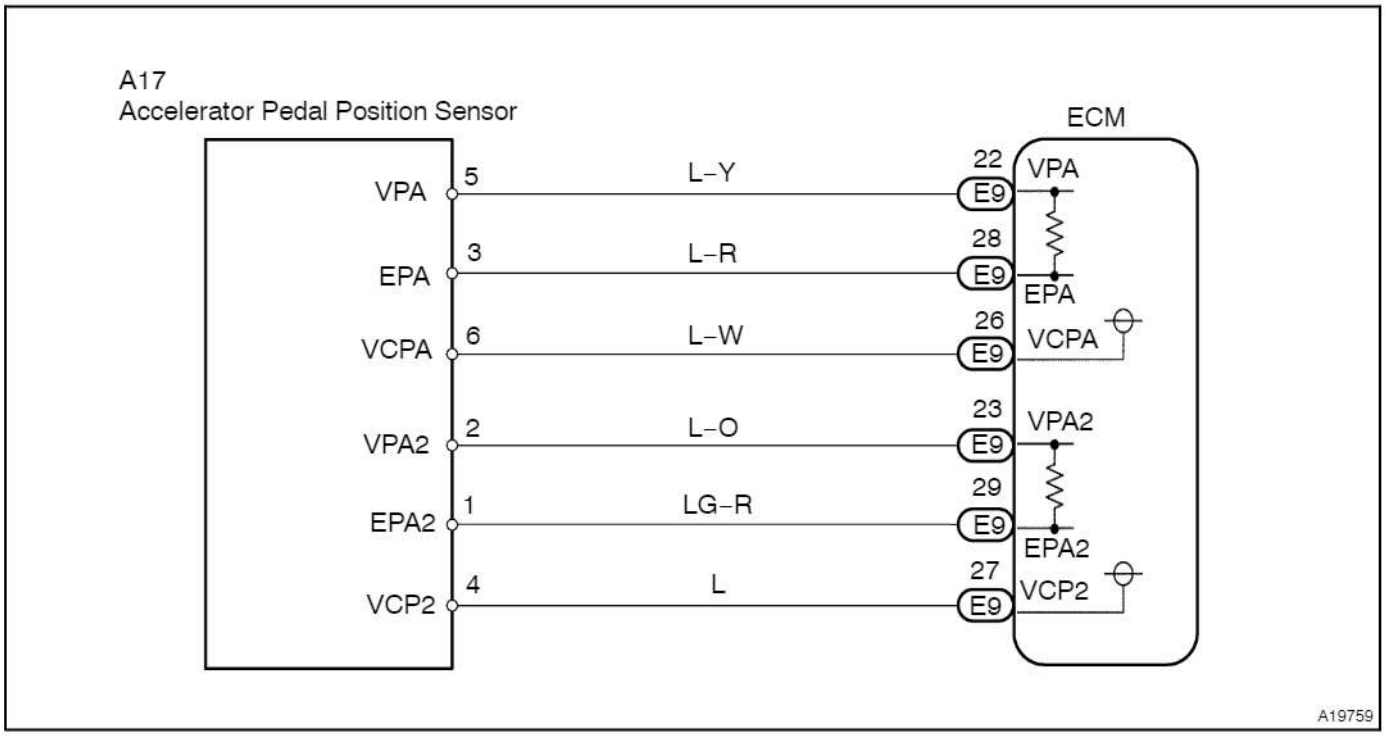
TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P2120:	
Either of the following conditions is met:	Condition 1 or 2
1. VPA1 voltage when VPA2 is 0.97° or more	0.2 V or less
2. VPA1 voltage	4.8 V or more
P2122:	
VPA1 voltage when VPA2 is 0.97° or more	0.2 V or less
P2123:	
VPA1 voltage	4.8 V or more
P2125:	
Either of the following conditions is met:	Condition 1 or 2
1. VPA2 voltage when VPA1 is 0.97° or more	0.5 V or less
2. VPA2 voltage when VPA1 is 0.2 to 3.45 V	4.8 V or more
P2127:	
VPA2 voltage when VPA1 is 0.97° 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:	
Either of the following conditions is met:	Condition 1 or 2
1. Difference between VPA1 and VPA2 voltages	0.02 V or less
2. Both of the following conditions are met:	(a) and (b)
(a) VPA1 voltage	0.2 V or less
(b) 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



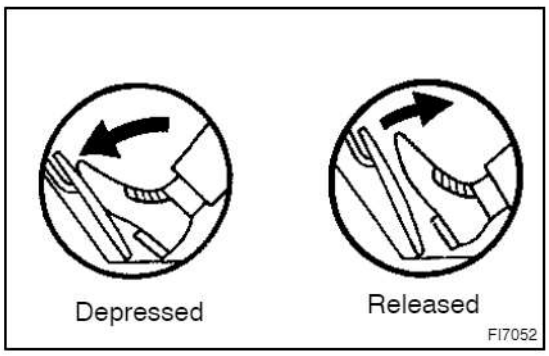
INSPECTION PROCEDURE

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, as well as other data from the time when a malfunction occurred.

Hand–held tester:

1	**Connect hand–held tester, and read the voltage for accelerator pedal position sensor data.**



PREPARATION:

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

(b) Turn the ignition switch ON and push the hand–held tester main switch ON.

CHECK:

Read the voltage for the accelerator pedal position sensor data.

OK:

Accelerator pedal	VPA1	VPA2
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.**

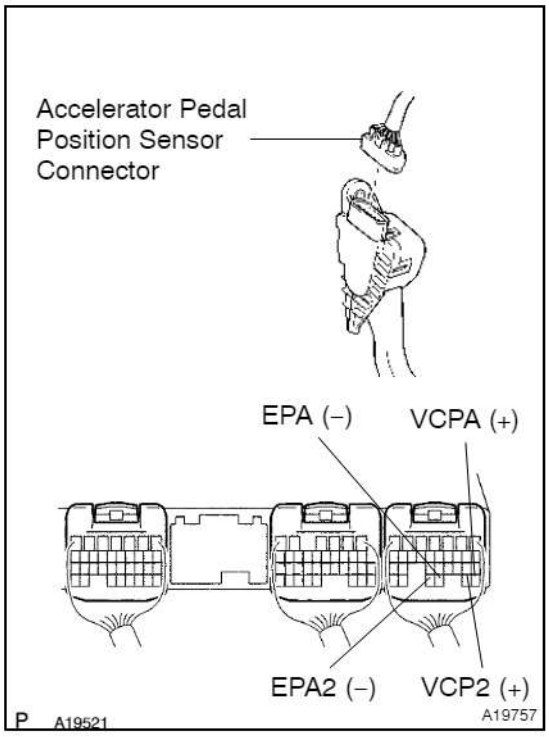
NG

2	**Check for open and short in harness and connector in VCPA, VCP2, VPA, VPA2 EPA and EPA2 circuit between ECM and accelerator pedal position sensor (See page IN–30)**

NG → **Repair or replace harness and connector.**

OK

3	**Check voltage between terminals VCPA and EPA, and VCP2 and EPA2 of ECM terminals.**



CHECK:

(a) Remove the ECM cover.
(b) Turn the ignition switch ON.
(c) Disconnect the accelerator pedal position sensor connector.

CHECK:

Measure the voltage between terminals VCPA and EPA, and VCP2 and EPA2 of the ECM connector.

OK:

Voltage: 4.5 to 5.5 V

NG → **Replace ECM (See page SF–78).**

OK

4	**Replace accelerator pedal assembly (See page SF–76).**

Go

5	**Check if DTC output recur?**

PREPARATION:

(a) Connect the hand–held tester to the DLC3.
(b) Clear the DTC by hand–held tester, or disconnect the battery terminals or remove the EFI fuses and ETCS fuses (Clear DTCs).
(c) Start the engine.
(d) Drive the engine at idle for 15 sec. or more.

CHECK:

Read the DTC output.

OK:

No DTC output.

OK → **System is OK.**

NG

Replace ECM (See page SF–78).

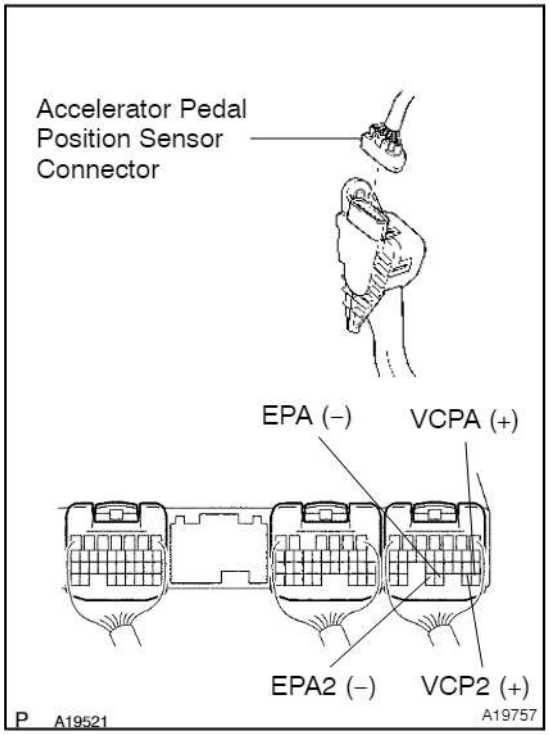
OBD II scan tool (excluding hand–held tester):

1	**Check for open and short in harness and connector in VCPA, VCP2, VPA, VPA2 EPA and EPA2 circuit between ECM and accelerator pedal position sensor (See page IN–30)**

NG → **Repair or replace harness or connector.**

OK

2	**Check voltage between terminals VCPA and EPA, and VCP2 and EPA2 of ECM terminals.**



CHECK:

(a) Remove the ECM cover.
(b) Turn the ignition switch ON.
(c) Disconnect the accelerator pedal position sensor connector.

CHECK:

Measure the voltage between terminals VCPA and EPA, and VCP2 and EPA2 of the ECM connector.

OK:

Voltage: 4.5 to 5.5 V

NG → **Replace ECM (See page SF–78).**

OK

3	**Replace accelerator pedal position sensor (See page SF–76).**

Go

4	**Check if DTC output recur?**

PREPARATION:

(a) Connect the OBD II scan tool to the DLC3.
(b) Disconnect the battery terminals or remove the EFI fuse and ETCS fuses (Clear DTCs).
(c) Start the engine.
(d) Drive the engine at idle for 15 sec. or more.

CHECK:

Read the DTC output.

OK:

No DTC output.

OK → **System is OK.**

NG →

Replace ECM (See page SF–78).

DIC7T–02

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 DI–597.

DTC No.	DTC Detecting Condition	Trouble Area
P2121	Condition (a) continues for 0.5 seconds: (a) Difference between VPA and VPA2 is out of threshold	• 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 outputs: 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 outputs 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 remaining circuit is used to calculate the accelerator pedal opening 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.
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	P2121	Accelerator position sensor (rationality)
Required sensors/components	Accelerator position sensor	
Frequency of operation	Continuous	
Duration	0.5 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–295	
Either of the following conditions is met	Condition 1 or 2	
1. Ignition switch	ON	
2. Throttle control motor power	ON	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Difference between VPA1 voltage (learned value) and VPA2 voltage (learned value)	Less than 0.4 V, or more than 1.2 V

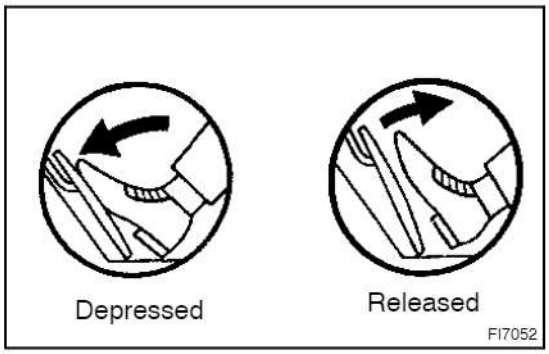
INSPECTION PROCEDURE

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, as well as other data from the time when a malfunction occurred.

Hand–held tester:

1	**Connect hand–held tester, and read the voltage for accelerator pedal position sensor data.**



PREPARATION:

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

(b) Turn the ignition switch ON and push the hand–held tester main switch ON.

CHECK:

Read the voltage for the accelerator pedal position sensor data.

OK:

Accelerator pedal	VPA1	VPA2
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	**Replace ECM (See page SF–78).**

NG

2	**Check for open and short in harness and connector between accelerator pedal position sensor and ECM (See page IN–30).**

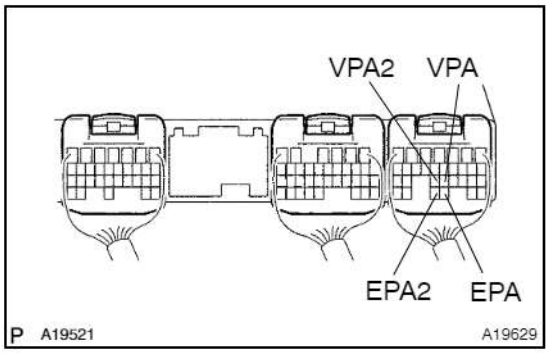
NG → **Repair or replace harness or connector.**

OK

Replace accelerator pedal position sensor.

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

1	**Check voltage between terminals VPA and EPA, VPA2 and EPA2 of ECM terminals.**



PREPARATION:

Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals VPA and EPA, VPA2 and EPA2 of the ECM connectors.

OK:

Accelerator Pedal Position	Tester Connection	Tester Connection
	VPA – EPA	VPA2 – EPA2
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 → **Replace ECM (See page SF–78).**

NG

2	**Check for open and short in harness and connector between accelerator pedal position sensor and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Replace accelerator pedal assembly (See page SF–76).

DTC	P2430	Secondary Air Injection System Air Flow/ Pressure Sensor Circuit Bank 1

DTC	P2431	Secondary Air Injection System Air Flow/Pressure Sensor Circuit Range/Performance Bank 1

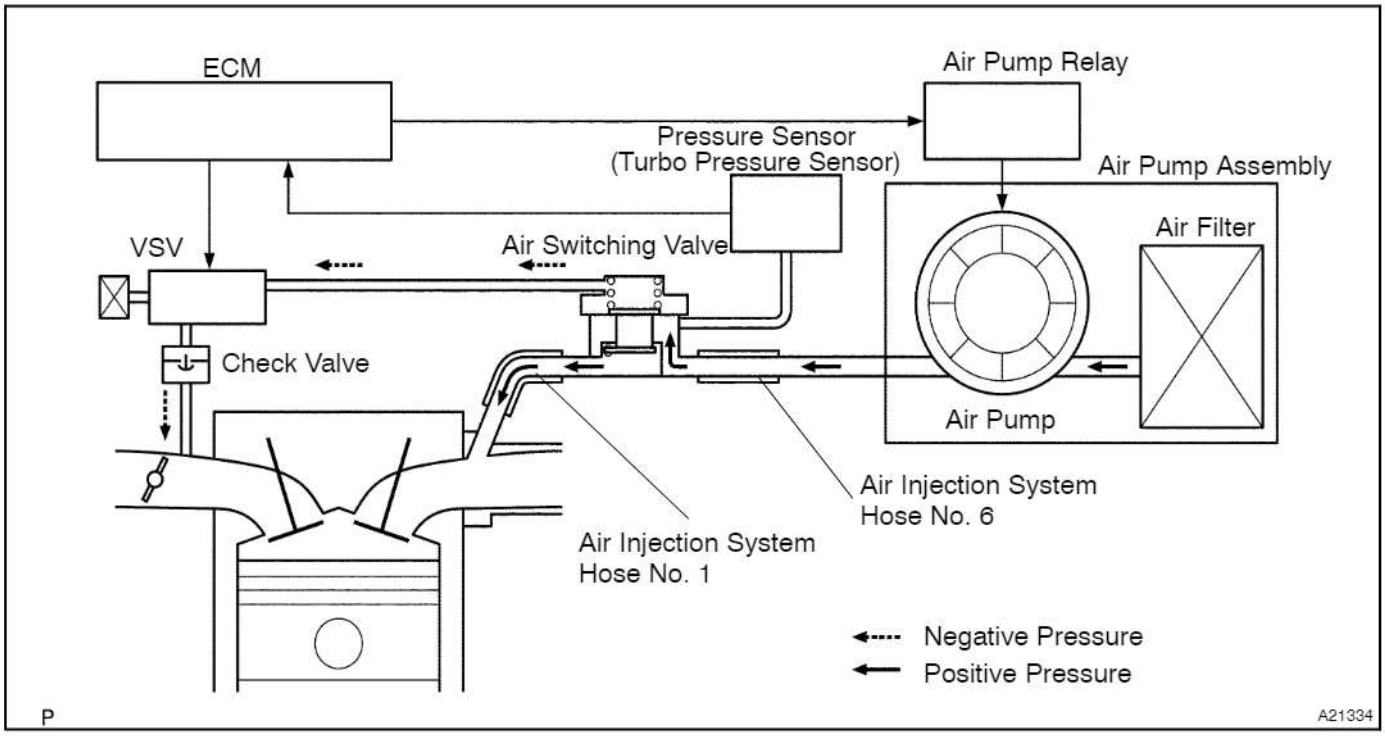
DTC	P2432	Secondary Air Injection System Air Flow/ Pressure Sensor Circuit Low Bank 1

DTC	P2433	Secondary Air Injection System Air Flow/ Pressure Sensor Circuit High Bank 1

CIRCUIT DESCRIPTION

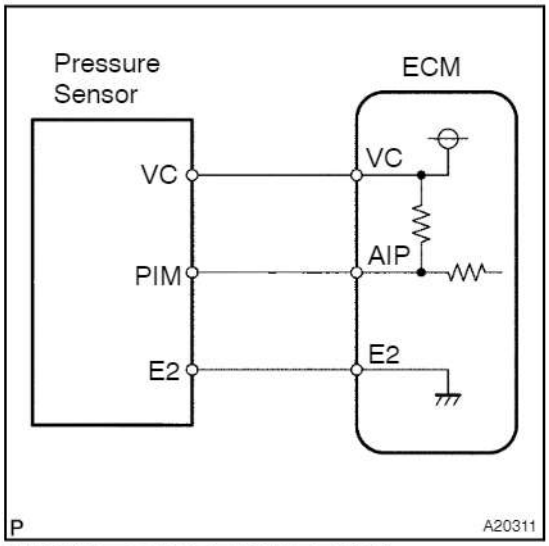
To accelerate the activation of catalyst when warming up the engine, the air injection system pumps the secondary air to the exhaust manifold. The secondary air is supplied by the air pump and is pumped to the exhaust manifold through the air switching valve. Open and close movement of the air switching valve is regulated by the vacuum switching valve (VSV).The air pump and the air switching valve are observed by the ECM and are used to detect a malfunction in this system.

The ECM monitors the secondary air injection system and detects a malfunction using a pressure sensor located on the air switching valve.



DTC No.	DTC Detecting Condition	Trouble Area
P2430	While the engine is running, voltage output of the pressure sensor indicates 0.1V or less, or indicates 4.8V or more	• Pressure sensor • Open or short in pressure sensor circuit • Vacuum hose • Check valve • ECM
P2431	The pressure sensor indicates less than 45 kPa (338 mHg), or more than 135 kPa (1013 mHg)	
P2432	While the engine is running, voltage output of pressure sensor remains below 0.1V	
P2433	While the engine is running, voltage output of the pressure sensor remains above 4.8V	

MONITOR DESCRIPTION



The ECM observes the pressure in the secondary air passage using the pressure sensor located on the air switching valve in the secondary air injection system.
If there is a defect in the sensor or the sensor circuit, the voltage level will deviate from the normal operating range, the ECM interprets this deviation as a defect in the pressure sensor circuit and sets a DTC.

MONITOR STRATEGY

Related DTCs	P2430	Air flow/Pressure sensor circuit range check (Fluttering)
	P2431	Air flow/Pressure sensor circuit rationality
	P2432	Air flow/Pressure sensor circuit range check (Low voltage)
	P2433	Air flow/Pressure sensor circuit range check (High voltage)
Required sensors/components	Pressure sensor	
Frequency of operation	Continuous	
Duration	P2430, P2432, P2433: 0.5 sec. P2431: 5 sec.	
MIL operation	P2430, P2432, P2433: Immediate P2431: 2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITION

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–295	
Battery voltage	8 V	–
Ignition switch	ON	
Starter	OFF	
Time after starter is turned from ON to OFF	2 sec.	–

TYPICAL MALFUNCTION THRESHOLD

Detection Criteria	Threshold
P2430:	
Air pressure sensor voltage	Less than 0.1 V, or more than 4.815 V
P2432:	
Air pressure sensor voltage	Less than 0.1V
P2433:	
Air pressure sensor voltage	More than 4.815 V
P2431:	
Air pressure	Less than 45 kPa (338 mmHg), or more than 135 kPa (1013 mmHg)

COMPONENT OPERATING RANGE

Parameter	Standard value
Air pressure sensor voltage	Between 0.1 V and 4.8 V

MONITOR RESULT

Refer to page DI–295 for detailed information.

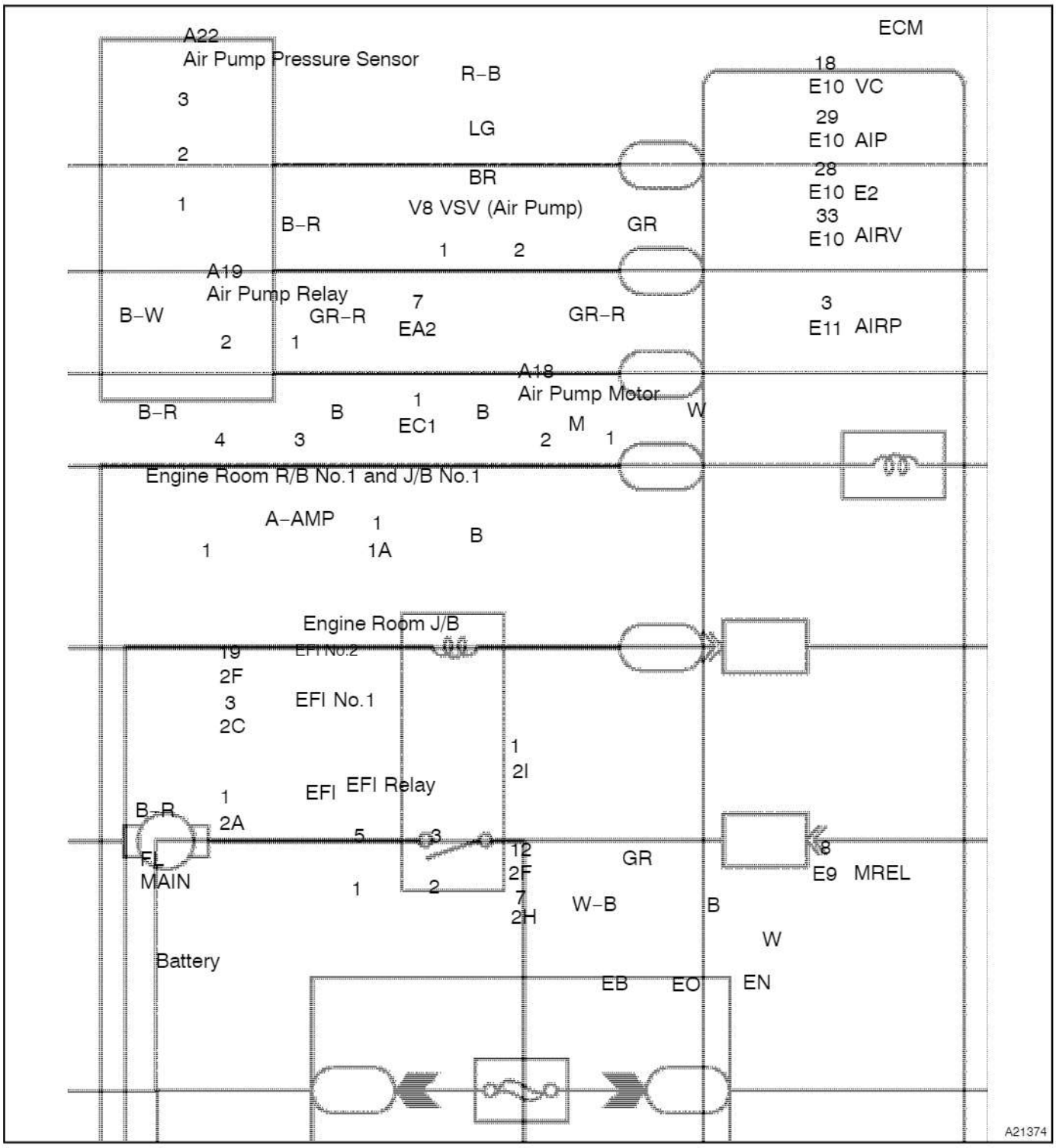
The test value and test limit information are described as shown in the following table. Check the monitor result and test values after performing the monitor drive pattern (see page DI–326).

- TID (Test Identification Data) is assigned to each emissions–related component.
- TLT (Test Limit Type):
  If TLT is 0, the component is malfunctioning when the test value is higher than the test limit.
  If TLT is 1, the component is malfunctioning when the test value is lower than the test limit.
- CID (Component Identification Data) is assigned to each test value.
- Unit Conversion is used to calculate the test value indicated on generic OBD II scan tools.

TID $0A: Secondary air injection (AIR) system

TLT	CID	Unit Conversion	Description of Test Data	Description of Test Limit
0	$01	Multiplied by 65.536 (no dimension)	Test value of AIR system malfunction	Malfunction criteria for AIR system malfunction
1	$02	Multiplied by 8.192 (no dimension)	Test value of AIR control valve stuck open	Malfunction criteria for AIR control valve stuck open
1	$03	Multiplied by 8.192 (no dimension)	Test value of AIR pump stuck ON	Malfunction criteria for AIR pump stuck ON

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

To check the pressure condition in the secondary air passage, the hand–held tester is available.

(a) Connect the hand–held tester to the DLC3 on the vehicle.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Start the engine.
(d) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / SECOND AIR VSV / ALL or USER DATA (press the right or left button).

NOTICE:

When selecting USER DATA, select "SECONDARY AIR" and "SECOND AIR VSV" on the screen by pressing the "YES" button on the tester.

HINT:

When operating the VSV in the secondary air system, the air pump is also operated at the same time.

(e) Check that the SECONDARY AIR, SECOND AIR VSV and 2ND AIR PRESS on the hand–held tester indicate the same conditions as the chart below.

NOTICE:

This test allows the technician to operate the VSV for only 5 seconds. If you perform the test again, more than 30 seconds interval must be required after the previous test is done.

Tester Operation	Specified Condition		2ND AIR PRESS (*3)
	SECONDARY AIR (*1)	SECOND AIR VSV (*2)	
VSV is ON	ON	ON	2.5 kPa or more
VSV is OFF	OFF	OFF	less than 2.5 kPa

HINT:

*1: Means the signal output from the ECM to operate the air pump.

*2: Means the signal output from the ECM to operate the VSV.

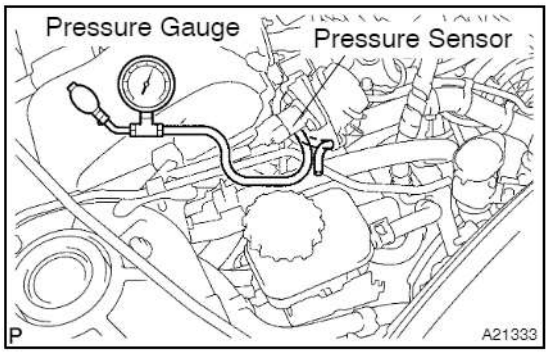
*3: Means the difference between the air pressure inside the air pressure sensor and the atmospheric pressure. When the pressure inside the secondary air injection system is equal to the atmospheric pressure, the hand–held tester displays "0 kPa".

1	**Check for open and short in harness and connector between pressure sensor and ECM (See page IN–30).**

NG → **Repair or replace harness and connector.**

OK

2	Inspect ECM (AIP voltage).



PREPARATION:

(a) Connect the pressure gauge to the pressure sensor as shown in the illustration.
(b) Connect the hand–held tester to the DLC3 on the vehicle.
(c) Turn the ignition switch ON and push the hand–held tester main switch ON (Do not start engine).
(d) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / 2ND AIR PRESS.

CHECK:

Check that the pressure displayed on the hand–held tester fluctuates when applying the pressure to the pressure sensor with the pressure gauge.

NG → **Replace pressure sensor (See page EC–14).**

OK →

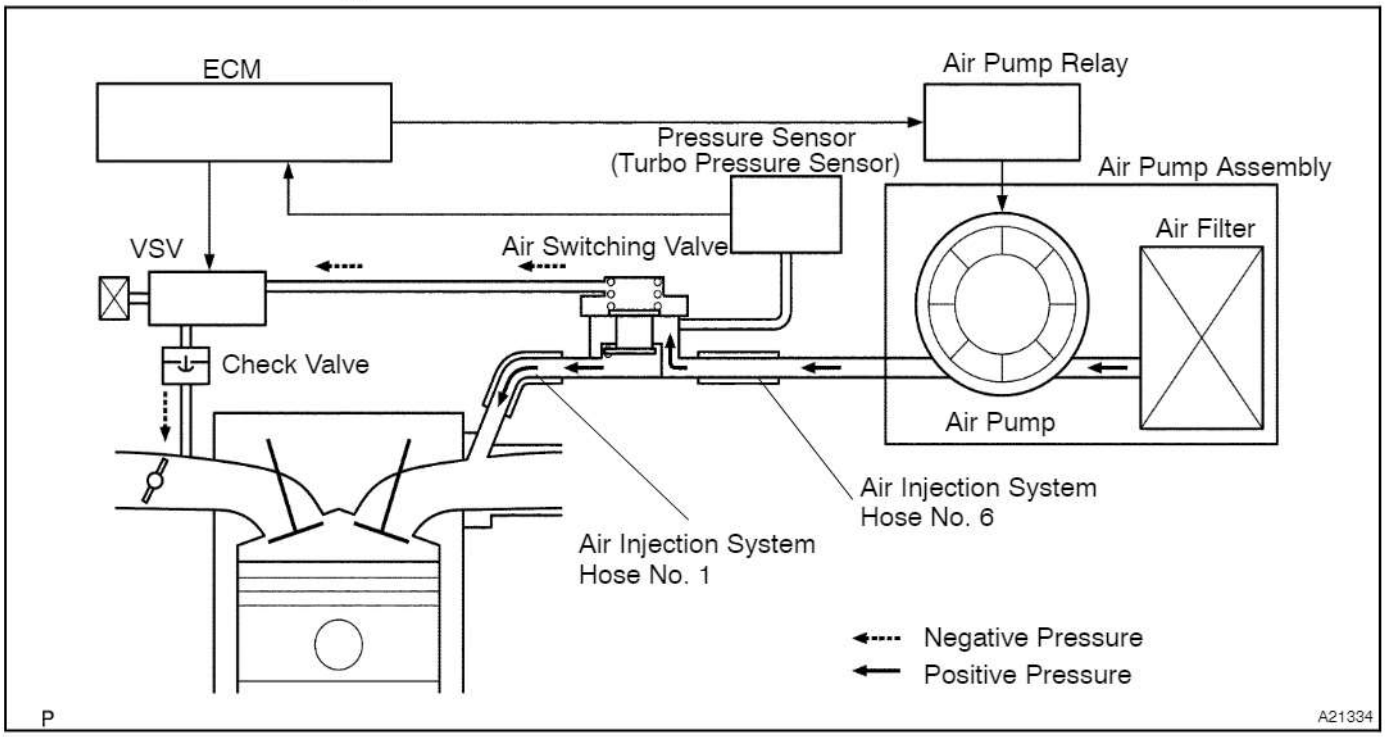
Replace ECM (See page SF–78).

DTC	P2440	Secondary Air Injection System Switching Valve Stuck Open Bank 1

DTC	P2441	Secondary Air Injection System Switching Valve Stuck Close Bank 1

CIRCUIT DESCRIPTION

To accelerate the activation of catalyst when warming up the engine, the air injection system pumps the secondary air to the exhaust manifold by pressure. The secondary air is supplied by the air pump and it is pumped to the exhaust manifold through the air switching valve. Open and close movement of the air switching valve is regulated by the vacuum switching valve (VSV).The air pump and the air switching valve are observed by the ECM and are used to detect a malfunction in this system.
The ECM monitors the secondary air injection system and detects a malfunction using a pressure sensor located on the air switching valve.



DTC No.	DTC Detection Condition	Trouble Area
P2440	Although the ECM has ordered the VSV to close the air switching valve while the engine is running but the pressure sensor detects pulsation of the exhaust gas	• VSV • Air switching valve • Open or short in VSV circuit • Pressure sensor • Open or short in pressure sensor circuit • ECM
P2441	Although the ECM has ordered the VSV to open the air switching valve while the engine is running but the pressure sensor is unable to detect pulsation of the exhaust gas	• VSV • Air switching valve • Open or short in VSV circuit • Vacuum hose and check valve • Air injection hose • Pressure sensor • Open or short in pressure sensor circuit • ECM

MONITOR DESCRIPTION

The ECM observes the pressure in the secondary air passage using the pressure sensor located on the air switching valve in the secondary air injection system. The sensor detects an exhaust pressure in the secondary air passage.

If the ECM receives the pulsation signal from the sensor despite the ECM ordering the VSV to close the air switching valve, or if the ECM has not received the signal from the sensor despite the ECM ordering the VSV to open the valve, the ECM interprets this as a fault in the secondary air injection system and sets a DTC.

MONITOR STRATEGY

Related DTCs	P2440	AIR control valve stuck open
	P2441	AIR control valve stuck closed
Required sensors/components	Pressure sensor	
Frequency of operation	Continuous	
Duration	2 min.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–295	
Battery voltage	11 V	–
Atmosphere pressure	45 kPa (0.46 kg/cm^2)	–
Engine	Running	
P2440:		
Air pump and air switching valve: OFF	10 sec.	–
P2441:		
Air pump and air switching valve: ON	6 sec.	–

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P2440:	
Number of times the following condition is met:	4 times or more
Cumulative pressure pulsation of secondary air injection	30 kPa (0.3 kg/cm^2) or more (Vary with smoothed pressure of secondary air injection)
P2441:	
Number of times the following condition is met:	4 times or more
Cumulative pressure pulsation of secondary air injection	20 kPa (0.2 kg/cm^2) or less (Vary with smoothed pressure of secondary air injection)

MONITOR RESULT

Refer to page DI–295 for detailed information.

The test value and test limit information are described as shown in the following table. Check the monitor result and test values after performing the monitor drive pattern (see page DI–326).

- TID (Test Identification Data) is assigned to each emissions–related component.
- TLT (Test Limit Type):
  If TLT is 0, the component is malfunctioning when the test value is higher than the test limit.
  If TLT is 1, the component is malfunctioning when the test value is lower than the test limit.
- CID (Component Identification Data) is assigned to each test value.
- Unit Conversion is used to calculate the test value indicated on generic OBD II scan tools.

TID $0A: Secondary air injection (AIR) system

TLT	CID	Unit Conversion	Description of Test Data	Description of Test Limit
0	$01	Multiplied by 65.536 (no dimension)	Test value of AIR system malfunction	Malfunction criteria for AIR system malfunction
1	$02	Multiplied by 8.192 (no dimension)	Test value of AIR control valve stuck open	Malfunction criteria for AIR control valve stuck open
1	$03	Multiplied by 8.192 (no dimension)	Test value of AIR pump stuck ON	Malfunction criteria for AIR pump stuck ON

WIRING DIAGRAM

Refer to DTC P2430 on page DI–611.

INSPECTION PROCEDURE

Hand–held tester:

HINT:

To check the pressure condition in the secondary air passage, the hand–held tester is available.

1	**Is the DTC P2440 or P2441 being output?**

PREPARATION:

(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) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.

CHECK:

Read the DTCs.

RESULT:

Display (DTC output)	Proceed to
P2440 or P2441	A
P2440, P2441 and other DTCs	B

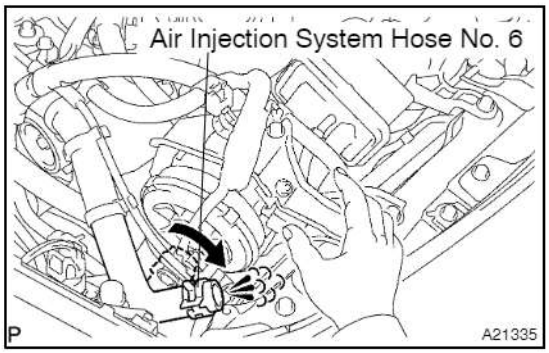
HINT:

If any other codes besides P2440 or P2441 are output, perform the troubleshooting for those DTCs first.

B → **Go to DTC chart (See page DI–335).**

A

2	Check VSV for secondary air injection system.



PREPARATION:

(a) Connect the hand–held tester to the DLC3 on the vehicle.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Disconnect the air injection system hose No. 6.
(d) Start the engine.
(e) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST/SECOND AIR VSV / ALL or USER DATA (press the right or left button).

NOTICE:

When selecting USER DATA, select SECONDARY AIR" and "SECOND AIR VSV" on the screen by pressing the "YES" button on the tester.

HINT:

When operating the VSV in the secondary air system, the air pump is also operated at the same time.

CHECK:

Put your hand at the disconnected hose end, and check that the exhaust gas pressure pulsation is applied to your hand when turning on the VSV for air switching valve with the ACTIVE TEST. And also check that the exhaust gas pressure pulsation is not applied to your hand when turning off the VSV for air switching valve.

NOTICE:

This test allows the technician to operate the VSV for only 5 seconds. If you perform the test again, more than 30 seconds interval must be required after the previous test is done.

HINT:

"SECONDARY AIR (air pump)" means the signal output from the ECM to operate the air pump.

OK	Go to step 9.

NG

3	**Check air injection system No. 1 hose.**

CHECK:

(a) Check that the air injection hose No. 1 is securely connected to both exhaust manifold and air switching valve.

(b) Inspect the air injection hose No. 1 for blockage or damage.

NG → **Repair or replace air injection system No. 1 hose.**

OK

4	**Check stored DTC.**

PREPARATION:

(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) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.

CHECK:

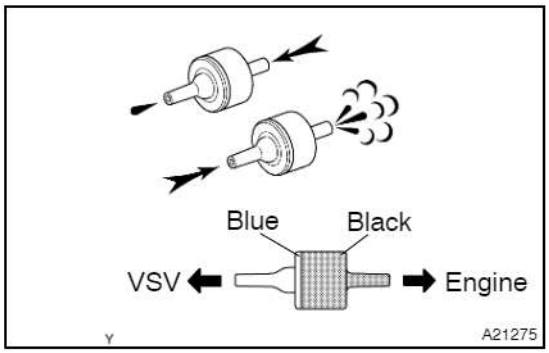
Read the DTC using the hand–held tester.

Display (DTC Output)	Proceed to
P2440	A
P2441	B

A → **Go to step 6.**

B

5	Check vacuum hose and check valve.



CHECK:

(a) Check each vacuum hose connection between the pressure sensor and air switching valve, the air switching valve and the VSV, and the VSV and intake manifold.
(b) Inspect the vacuum hose for blockage or damage.
(c) Check that check valve is correctly installed.
(d) Check that there is air–flow in the check valve from the VSV to the engine. Also, check that there is no air–flow in the opposite side.

NG → **Repair or replace vacuum hose and check valve.**

OK

6	Check air switching valve (See page EC–12).

NG → **Replace air switching valve.**

OK

7	Check vacuum switch valve (See page EC–12).

NG → **Replace vacuum switching valve.**

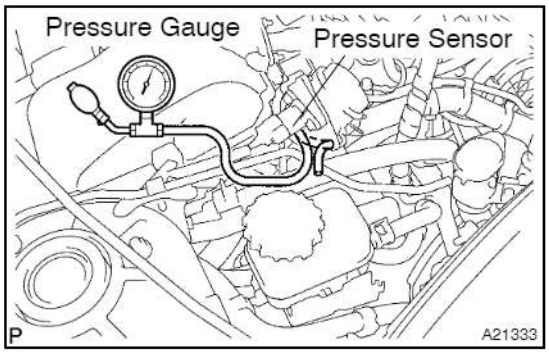
OK

8	Check for open and short in harness and connector between ECM and VSV for secondary air injection system.

NG → **Repair or replace harness or connector.**

OK

9	Inspect ECM (air voltage).



PREPARATION:

(a) Connect the pressure gauge to the pressure sensor as shown in the illustration.
(b) Connect the hand–held tester to the DLC3 on the vehicle.
(c) Turn the ignition switch ON and push the hand–held tester main switch ON (Do not start engine).
(d) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / 2ND AIR PRESS.

CHECK:

Check that the pressure displayed on the hand–held tester fluctuates when applying the pressure to the pressure sensor with the pressure gauge.

NG → **Replace pressure sensor.**

OK →

Replace ECM (See page SF–78).

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

1	**Is the DTC P2440 or P2441 being output.**

PREPARATION:

(a) Connect the OBD II scan tool to the DLC3.

(b) Turn the ignition switch ON and push the OBD II scan tool main switch ON.

CHECK:

Read the DTCs.

RESULT:

Display (DTC output)	Proceed to
P2440 or P2441	A
P2440, P2441 and other DTCs	B

HINT:

If any other codes besides P2440 or P2441 are output, perform the troubleshooting for those DTCs first.

B → **Go to DTC chart (See page DI–335).**

A

2	**Check stored DTC.**

CHECK:

Read the DTC using the OBD II scan tool.

Display (DTC Output)	Proceed to
P2440	A
P2441	B

A → **Go to step 4.**

B

3	Check air injection system No. 1 hose.

CHECK:

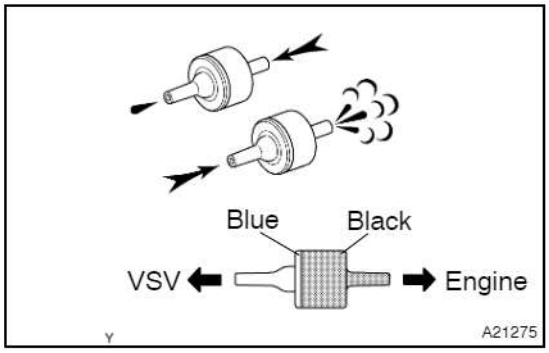
(a) Check that the air injection hose No. 1 is securely connected to both exhaust manifold and air switching valve.

(b) Inspect the air injection hose No. 1 for blockage or damage.

NG → **Repair or replace air injection system No. 1 hose.**

OK

4	Check vacuum hose and check valve.



CHECK:

(a) Check each vacuum hose connection between the pressure sensor and air switching valve, the air switching valve and the VSV, and the VSV and intake manifold.

(b) Inspect the vacuum hose for blockage or damage.

(c) Check that check valve is correctly installed.

(d) Check that there is air–flow in the check valve from the VSV to the engine. Also, check that there is no air–flow in the opposite side.

NG → **Repair or replace vacuum hose and check valve.**

OK

5	Check air switching valve (See page EC–12).

NG → **Replace air switching valve.**

OK

6	**Check vacuum switch valve (See page EC–12).**

NG → **Replace vacuum switching valve.**

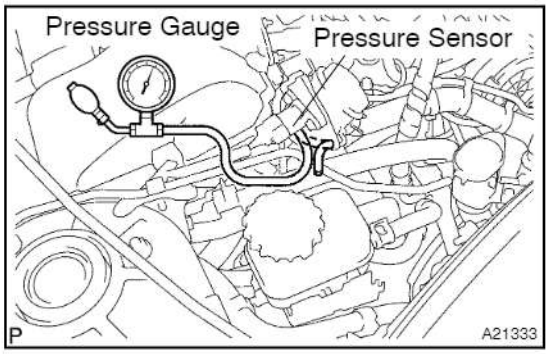
OK

7	**Check for open and short in harness and connector between ECM and VSV for secondary air injection system (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

8	**Inspect ECM (air voltage).**



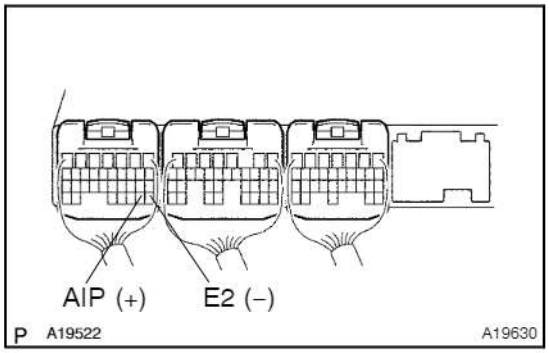
PREPARATION:

(a) Connect the pressure gauge to the air pressure sensor as shown in the illustration.

(b) Turn the ignition switch ON (Do not start engine).

CHECK:

Check for voltage change between terminals AIP and E2 of the ECM connector when applying the pressure to the pressure sensor with the pressure gauge.



NG → **Replace pressure sensor.**

OK

Replace ECM (See page SF–78).

DIC7W–02

DTC	P2444	Secondary Air Injection System Pump Stuck On Bank 1

DTC	P2445	Secondary Air Injection System Pump Stuck Off Bank 1

CIRCUIT DESCRIPTION

Refer to DTC P2430 on page DI–611.

DTC No.	DTC Detection Condition	Trouble Area
P2444	The secondary air pressure is more than 2.5 kPa (19 mmHg) despite the ECM ordering the air pump to turn off	• Short in air pump circuit • Pressure sensor • Air pump assembly • Open or short in pressure sensor circuit • ECM
P2445	The secondary air pressure is less than 2.5 kPa (19 mmHg) despite the ECM ordering the air pump to turn on	• Air pump fuse • Vacuum hose • Air pump assembly • Open in air pump circuit • Secondary air injection system piping • Pressure sensor • Open or short in pressure sensor circuit • ECM

MONITOR DESCRIPTION

The ECM observes the pressure in the secondary air passage using the pressure sensor located on the air switching valve in the secondary air injection system. The sensor measures the pressure in the secondary air passage and sends a signal to the ECM.

If the pressure level from the sensor has not reached a certain level despite the ECM turning on the air pump, or if the pressure level exceeds the threshold despite the ECM turning off the air pump, the ECM interprets this as a fault in the secondary air injection system and sets a DTC.

MONITOR STRATEGY

Related DTCs	P2444	Air pump stuck ON
	P2445	Air pump stuck OFF
Required sensors/components	Pressure sensor	
Frequency of operation	Continuous	
Duration	2 min.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–295	
Battery voltage	11 V	–
Atmosphere pressure	45 kPa (0.46 kg/cm^2)	–
Engine	Running	
P2444:		
Air pump and air switching valve: OFF	10 sec.	–
P2445:		
Air pump and air switching valve: ON	6 sec.	–

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P2444:	
Number of times the following conditions 1 and 2 are met:	4 times or more
1. Smoothed pressure of secondary air injection	2.5 kPa (0.025 kg/cm^2) or more
2. Cumulative pressure pulsation of secondary air injection	20 kPa (0.2 kg/cm^2) or less, or 30 kPa (0.3 kg/cm^2) or more (Vary with smoothed pressure of secondary air injection)
P2445:	
Number of times the following conditions 1 and 2 are met:	4 times or more
1. Smoothed pressure of secondary air injection	Less than 2.5 kPa (0.025 kg/cm^2)
2. Cumulative pressure pulsation of secondary air injection	20 kPa (0.2 kg/cm^2) or less, or 30 kPa (0.3 kg/cm^2) or more (Vary with smoothed pressure of secondary air injection)

MONITOR RESULT

Refer to page DI–295 for detailed information.

The test value and test limit information are described as shown in the following table. Check the monitor result and test values after performing the monitor drive pattern (see page DI–326).

- TID (Test Identification Data) is assigned to each emissions–related component.
- TLT (Test Limit Type):
  If TLT is 0, the component is malfunctioning when the test value is higher than the test limit.
  If TLT is 1, the component is malfunctioning when the test value is lower than the test limit.
- CID (Component Identification Data) is assigned to each test value.
- Unit Conversion is used to calculate the test value indicated on generic OBD II scan tools.

TID $0A: Secondary air injection (AIR) system

TLT	CID	Unit Conversion	Description of Test Data	Description of Test Limit
0	$01	Multiplied by 65.536 (no dimension)	Test value of AIR system malfunction	Malfunction criteria for AIR system malfunction
1	$02	Multiplied by 8.192 (no dimension)	Test value of AIR control valve stuck open	Malfunction criteria for AIR control valve stuck open
1	$03	Multiplied by 8.192 (no dimension)	Test value of AIR pump stuck ON	Malfunction criteria for AIR pump stuck ON

WIRING DIAGRAM

Refer to DTC P2430 on page DI–611.

INSPECTION PROCEDURE

Hand–held tester:

HINT:

To check the pressure condition in the secondary air passage, the hand–held tester is available.

1	**Is the DTC P2444 and P2445 being output.**

PREPARATION:

(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) Enter the following menu: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.

CHECK:

Read the DTCs.

RESULT:

Display (DTC output)	Proceed to
P2444 or P2445	A
"P2444, P2445" and other DTCs	B

HINT:

If any other codes besides P2444 or P2445 is output, perform the troubleshooting for those DTCs first.

B → **Go to DTC chart (See page DI–335).**

A

2	Perform active test by hand–held tester (VSV for secondary air injection system).

PREPARATION:

(a) Connect the hand–held tester to the DLC3 on the vehicle.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Start the engine.
(d) Enter the following menu: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / SECOND AIR VSV / ALL or USER DATA (press the right or left button).

NOTICE:

When selecting USER DATA, select SECONDARY AIR" and "SECOND AIR VSV" on the screen by pressing the "YES" button on the tester.

HINT:

When operating the VSV in the secondary air system, the air pump is also operated at the same time.

CHECK:

Check that the SECONDARY AIR, SECOND AIR VSV and 2ND AIR PRESS on the hand–held tester indicate the same conditions as the chart below.

NOTICE:

This test allows the technician to operate the VSV for only 5 seconds. If you perform the test again, more than 30 seconds interval must be required after the previous test is done.

Tester Operation	Specified Condition		
	SECONDARY AIR (*1)	SECOND AIR VSV (*2)	2ND AIR PRESS (*3)
VSV is ON	ON	ON	2.5 kPa (19 mmHg) or more
VSV is OFF	OFF	OFF	less than 2.5 kPa (19 mmHg)

HINT:

*1: Means the signal output from the ECM to operate the air pump.
*2: Means the signal output from the ECM to operate the VSV.
*3: Means the difference between the air pressure inside the air pressure sensor and the atmospheric pressure. When the pressure inside the secondary air injection system is equal to the atmospheric pressure, the hand–held tester displays "0 kPa."

NG → **Go to step 12.**

OK

3	Check stored DTC.

PREPARATION:

(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) Enter the following menu: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES."

CHECK:

Read the DTC using the hand–held tester.

Display (DTC Output)	Proceed to
P2444	A
P2445	B

A → **Go to step 10.**

B

4	Check vacuum hose.

CHECK:

(a) Check the vacuum hose connection between the pressure sensor and air switching valve.
(b) Inspect the vacuum hose for blockage or damage.

NG → **Repair or replace vacuum hose.**

OK

5	Check connection of secondary air injection system piping.

CHECK:

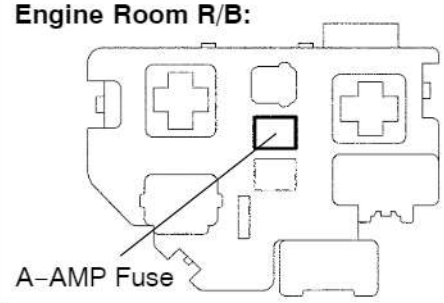
(a) Check that all the pipes and hoses between the air pump and air switching valve are securely connected.
(b) Inspect the pipe and hoses for blockage or damage.

NG → **Repair or replace secondary air injection system piping.**

OK

6	Check A–AMP fuse.

Engine Room R/B:



PREPARATION:

Remove the A–AMP fuse from the engine room R/B.

CHECK:

Check the resistance in the A–AMP fuse.

OK:

Below 1 Ω

NG → **Check for short in all harnesses and components connected fuse.**

OK

7	Check air pump relay (See page EC–17).

NG → **Replace air pump relay.**

OK

8	Check voltage of air pump motor power source.

Wire Harness Side:

Air Pump Assembly Connector



(a) Disconnect the air pump motor connector.

(b) Measure voltage between terminal 4 of the air pump assembly connector and body ground.

Standard: 9 to 14 V

NG → **Repair air pump power source circuit.**

OK

9	**Check for open in harness and connector between air pump motor and body ground.**

Wire Harness Side:

Air Pump Assembly Connector



Front View

A21278

(a) Disconnect the air pump assembly connector.

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

Standard (Check for open):

Tester Connection	Specified Condition
Air Pump Assembly (A22–2) – Body ground	Below 1 Ω

(c) Reconnect the air pump assembly connector.

NG → **Repair or replace harness or connector.**

OK

10	**Inspect air pump assy (See page EC–12).**

NG → **Replace air pump assy (See page EC–14).**

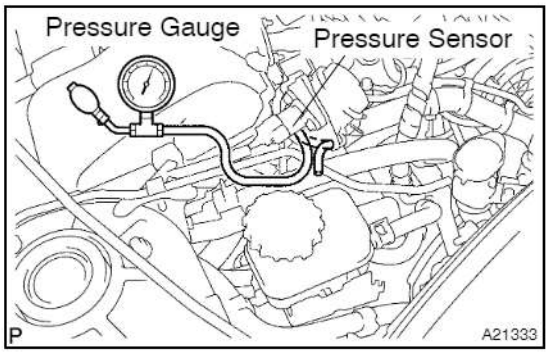
OK

11	**Check for open and short in harness and connector between ECM and air pump relay (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

12	Inspect ECM (air voltage).



(a) Connect the pressure gauge to the pressure sensor as shown in the illustration.
(b) Connect the hand–held tester to the DLC3 on the vehicle.
(c) Turn the ignition switch ON and push the hand–held tester main switch ON (Do not start engine).
(d) Enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / 2ND AIR PRESS.
(e) Check that the pressure displayed on the hand–held tester fluctuates when applying the pressure to the pressure sensor with the pressure gauge.

NG → **Replace pressure sensor.**

OK →

Replace ECM (See page SF–78).

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

1	**Is the DTC P2444 or P2445 being output.**

PREPARATION:

(a) Connect the OBD II scan tool to the DLC3.

(b) Turn the ignition switch ON and push the OBD II scan tool main switch ON.

CHECK:

Read the DTCs.

RESULT:

Display (DTC output)	Proceed to
P2444 or P2445	A
P2444, P2445 and other DTCs	B

HINT:

If any other codes besides P2444 or P2445 are output, perform the troubleshooting for those DTCs first.

B → **Go to DTC chart (See page DI–335).**

A

2	**Check stored DTC.**

Read the DTC using the OBD II scan tool.

Display (DTC Output)	Proceed to
P2444	A
P2445	B

A → **Go to step 9.**

B

3	**Check vacuum hose.**

NG → **Repair or replace vacuum hose.**

OK

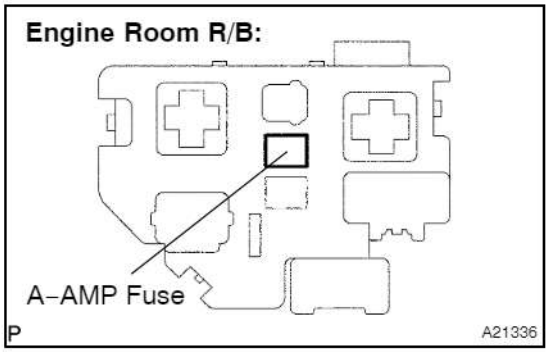
4	Check connection of secondary air injection system piping.

(a) Check that all the pipes and hoses between the air pump and the air switch are securely connected.
(b) Inspect the pipe and hoses for blockage or damage.

NG → **Repair or replace secondary air injection system piping.**

OK

5	Inspect A–AMP fuse.



PREPARATION:
Remove the A–AMP fuse from the engine room R/B.
CHECK:
Check the resistance in the A–AMP fuse.
OK:
Below 1 Ω

NG → **Check for short in all harnesses and components connected to fuse.**

OK

6	Check air pump relay (See page EC–17).

NG → **Replace air pump relay.**

OK

7	**Check voltage of air pump motor power source.**

Wire Harness Side:

Air Pump Assembly Connector



Front View

A21278

(a) Disconnect the air pump motor connector.
(b) Measure voltage between terminal 2 of the air pump assembly connector and body ground.
Standard: 9 to 14 V

NG → **Repair air pump power source circuit.**

OK

8	**Check for open in harness and connector between air pump motor and body ground.**

NG → **Repair or replace harness or connector.**

OK

9	**Check air pump assy (See page EC–12).**

NG → **Replace air pump assy (See page EC–14).**

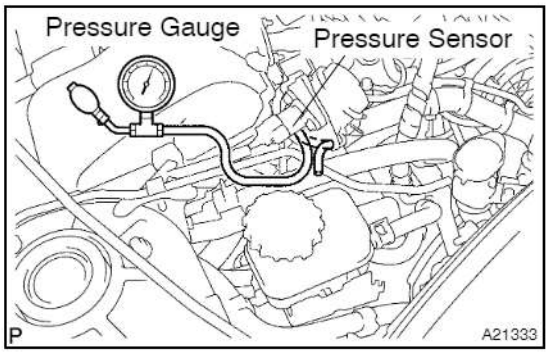
OK

10	**Check for open and short in harness and connector between ECM and air pump relay (See page IN–30).**

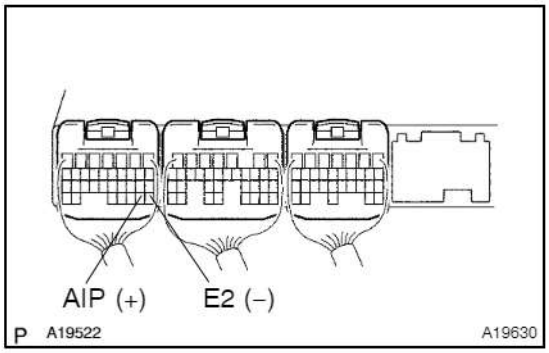
NG → **Repair or replace harness or connector.**

OK

11	Inspect ECM (air voltage).



(a) Connect the pressure gauge to the pressure sensor as shown in the illustration.
(b) Turn the ignition switch ON (Do not start engine).
(c) Check for voltage changes between terminals AIP and E2 of the ECM connector when applying the pressure to the pressure sensor with the pressure gauge.



NG → **Replace pressure sensor.**

OK →

Replace ECM (See page SF–78).

DIC7X–02

DTC	P2645	OCV for VVTL Circuit (Bank 1)

CIRCUIT DESCRIPTION

In order to improve the engine performance at both high and low engine speeds, the VVTL–i system varies valve lift using the standard cam and high lift cam. This provides the high power engine performance as well as an emission reduction and good fuel economy.
When the engine speed reaches 6,000 rpm, the ECM sends signals the OCV for VVTL–i to switch the effective cam from standard one to high lift one hydraulically.
The ECM controls the OCV to apply hydraulic pressure to the piston in the rocker arm and switches the rocker arm by locking the slipper for high speed.

DTC No.	DTC Detecting Condition	Trouble Area
P2645	Open or short in oil control valve for VVTL circuit	• Open or short in OCV circuit • OCV for VVTL–i • Oil pressure switch for VVTL–i • ECM

MONITOR DESCRIPTION

When the engine RPM is high, the VVTL–i actuator advances shims under the high–lift cam followers using engine oil pressure. Switching to the high–lift cam increases the valve lift as well as the intake air volume and exhaust capacity. These changes increase the engine's power output.
When the engine RPM is 6,000 rpm or more, the ECM increases the OCV control signal duty–ratio and it opens the oil passage to the VVTL–i actuator. The engine oil pressure powered actuator advances the cam follower shims and valves begin using the high–lift cam.
The ECM senses the current flow to the OCV to determine the "actual" duty–ratio of the control signal. If the duty–ratio is out of the normal range, the ECM interprets this as a malfunction in the OCV. The ECM will illuminate the MIL and a DTC will be set.

MONITOR STRATEGY

Related DTCs	P2645	OCV for VVTL–i circuit is open/shorted
Required sensors/components	OCV for VVTL–i	
Frequency of operation	Continuous	
Duration	1 sec.	
MIL operation	Immediate	
Sequence of operation	None	

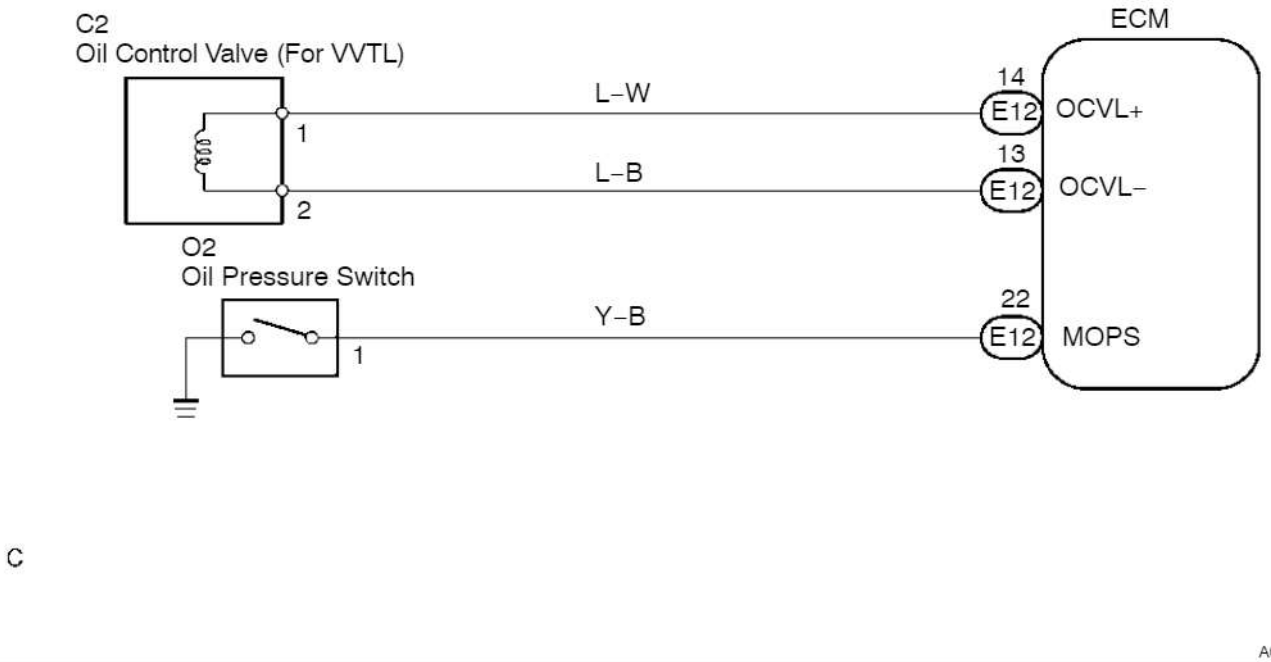
TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–295	
Battery Voltage	11 V	–
Starter	OFF	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Hybrid IC diagnosis signal	Fail

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, as well as other data from the time when a malfunction occurred.

Hand–held tester

1	**Check OCV for VVTL circuit.**

PREPARATION:

(a) Start the engine and warmed it up.
(b) Connect the hand–held tester to the DLC3.
(c) Turn the ignition switch ON and push the hand–held tester main switch ON.
(d) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / ALL/VVTL CTRL B1.
(e) Maintain engine speed at 1,500 to 2,500 rpm.

CHECK:

Check the engine speed when operate the OCV for VVTL by the hand–held tester.

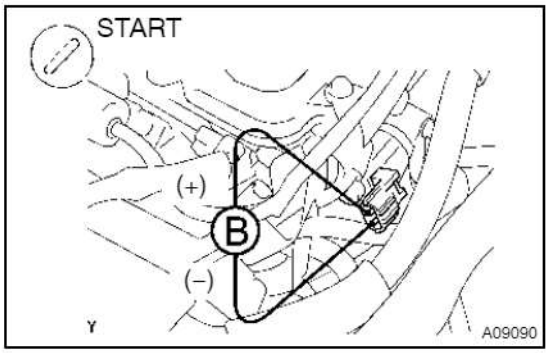
OK:

Tester Operation	Specified Condition
VVTL CTRL B1 is OFF (OCV is OFF)	Normal engine speed
VVTL CTRL B1 is ON (OCV is ON)	Rough engine speed or engine stalled

OK → **Check for intermitten problems (See page DI–295).**

NG

2	**Check operation of OCV for VVTL.**



PREPARATION:

Start the engine and warmed it up.

CHECK:

Check the engine speed at (1) and (2).

(1) Disconnect the C2 camshaft timing oil control valve connector.
(2) Apply the battery voltage between the terminals of the camshaft timing oil control valve.

RESULT:

Proceed to	Check (1)	Check (2)
A	Normal engine speed	Rough idle or engine stall
B	Conditions other than above	

OK:

Engine stalled.

B → **Replace OCV for VVTL.**

A

3	Check voltage between terminals OVL+ and OVL– of ECM connector (See page DI–333).

NG → Replace ECM (See page SF–78).

OK

4	Check for open and short in harness and connector between OCV for VVTL and ECM (See page IN–30).

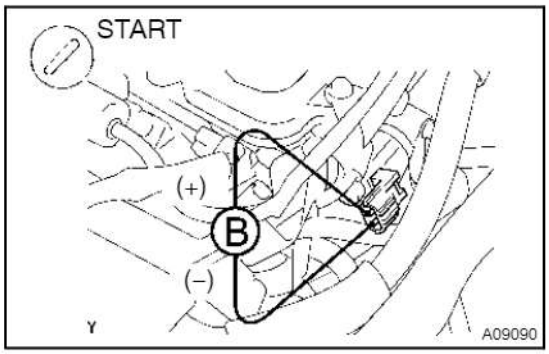
NG → Repair or replace harness or connector.

OK

Replace ECM (See page SF–78).

OBD II scan tool (excluding hand–held tester)

1	**Check operation of OCV for VVTL.**



PREPARATION:

Start the engine and warm it up.

CHECK:

Check the engine speed at (1) and (2).

(1) Disconnect the C2 camshaft timing oil control valve connector.

(2) Apply the battery voltage between the terminals of the camshaft timing oil control valve.

RESULT:

Proceed to	Check (1)	Check (2)
A	Normal engine speed	Rough idle or engine stall
B	Conditions other than above	

OK:

Engine stalled.

NG → **Replace OCV for VVTL.**

OK ↓

2	**Check voltage between terminals OVL+ and OVL– of ECM connector (See page DI–333).**

NG → **Replace ECM (See page SF–78).**

OK ↓

3	**Check for open and short in harness and connector between OCV for VVTL and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK ↓

Replace ECM (See page SF–78).

DIC7Y–02

DTC	P2646	OCV for VVTL Close Malfunction (Bank 1)

DTC	P2647	OCV for VVTL Open Malfunction (Bank 1)

CIRCUIT DESCRIPTION

Refer to DTC P2645 on page DI–640.

DTC No.	DTC Detecting Condition	Trouble Area
P2646	In the condition that the water temperature is 60 °C or more, the engine speed is 6,000 rpm or more, and the oil pressure switch is off for 1 sec. or more.	• Open or short in OCV circuit • OCV for VVT–L • Oil pressure switch for VVT–L • ECM
P2647	In the condition that the engine speed is 6,000 rpm or less and the oil pressure switch is on for 5 sec. or more.	

MONITOR DESCRIPTION

When the engine RPM is high, the VVTL–i actuator advances shims under the high–lift cam followers using engine oil pressure. Switching to the high–lift cam increases the valve lift as well as the intake air volume and exhaust capacity. These changes increase the engine's power output.

When the engine RPM is 6,500 rpm or more, the ECM increases the OCV control signal duty–ratio and it opens the oil passage to VVTL–i actuator. The engine oil pressure powered actuator advances the cam follower shims and valves begin using the high–lift cam.

The VVTL–i oil pressure switch senses the engine oil pressure applied to the VVTL–i system and the ECM judges which cam (standard cam or high–lift cam) is used based on the switch output. If the engine oil pressure applied to the VVTL–i system is high when the standard cam is required by the ECM or if the pressure is low when the high–lift cam is required, the ECM will determine that there is a malfunction in the OCV for VVTL and set a DTC.

MONITOR STRATEGY

Related DTCs	P2646	Cam does not change to high–lift cam
	P2647	Cam does not change to standard cam
Required sensors/components	Main sensors/components	Oil pressure switch for VVTL–i
	Related sensors/components	Vehicle speed sensor, ECT sensor, Crankshaft position sensor
Frequency of operation	Continuous	
Duration	Within 5 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–295	
High–lift cam condition:		
ECT	60°C (140°F)	–
Vehicle speed	10 km/h (6 mph)	–
Time after engine start	Within 5 sec.	–
Engine RPM	6,500 rpm	–
Standard cam condition:		
Except high–lift cam condition (Engine RPM is less than 6,500 rpm)		

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Case 1: Cam does not change to standard cam	
Oil pressure switch for VVTL under standard cam condition	ON (Oil pressure is applied to VVTL–i system) for 5 sec. or more
Case 2: Cam does not change to high–lift cam	
Oil pressure switch for VVTL under high–lift cam condition	OFF (Oil pressure is not applied to VVTL–i system) for 1 sec. or more

COMPONENT OPERATING RANGE

Parameter	Standard Value
Oil pressure switch for VVTL–i under standard cam condition	OFF
Oil pressure switch for VVTL–i under high–lift cam condition	ON

WIRING DIAGRAM

Refer to DTC P2645 on page DI–640.

INSPECTION PROCEDURE

Hand–held tester:

1	**Check OCV for VVTL circuit.**

PREPARATION:

(a) Start the engine and warm it up.
(b) Connect the hand–held tester to the DLC3.
(c) Turn the ignition switch ON and push the hand–held tester main switch ON.
(d) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / ALL/VVTL CTRL B1.
(e) Maintain engine speed at 1,500 to 2,500 rpm.

CHECK:

Check the engine speed when operate the OCV for VVTL by the hand–held tester.

OK:

Tester Operation	Specified Condition
VVTL CTRL B1 is OFF (OCV is OFF)	Normal engine speed
VVTL CTRL B1 is ON (OCV is ON)	Rough engine speed or engine stalled

OK → **Check for intermitten problems (See page DI–295).**

NG

2	**Check oil pressure switch for VVTL**

PREPARATION:

(a) Start the engine and warm it up.
(b) Connect the hand–held tester to the DLC3.
(c) Turn the ignition switch ON and push the hand–held tester main switch ON.
(d) Enter the following menu: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / ALL / VVTL CTRL B1.
(e) Disconnect the oil pressure switch for VVTL connector.
(f) Maintain the engine speed at 3,500 to 4,000 rpm.

CHECK:

Check for continuity between the oil pressure switch and body ground when operating the OCV by hand–held tester.

OK:

Tester Operation	Specified Condition
VVTL CTRL B1 is OFF (OCV is OFF)	No continuity
VVTL CTRL B1 is ON (OCV is ON)	Continuity

OK → **Replace oil pressure switch.**

NG

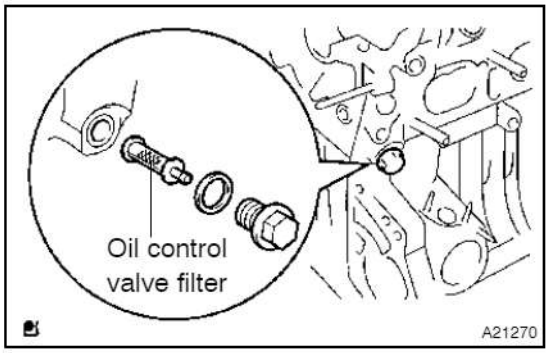
3	**Check for open and short in harness and connector between oil pressure switch for VVTL and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Replace ECM (See page SF–78).

4	**Check oil control valve filter.**



PREPARATION:

(a) Remove the generator. (See page CH–7)

(b) Remove the oil control valve filter.

CHECK:

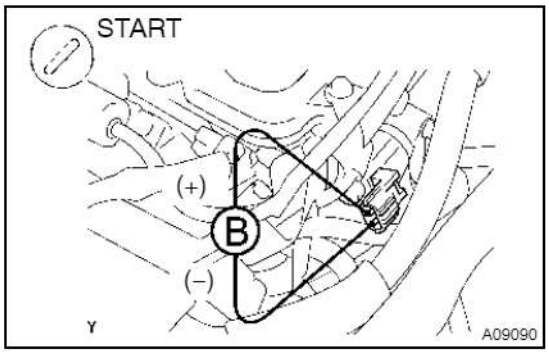
Check the oil control valve filter.

Confirm that the filter is clear.

NG → **Replace oil control valve filter.**

OK

5	Check operation of OCV for VVTL.



PREPARATION:

Start the engine and warmed it up.

CHECK:

Check the engine speed at (1) and (2).

(1) Disconnect the C2 camshaft timing oil control valve connector.

(2) Apply the battery voltage between the terminals of the camshaft timing oil control valve.

RESULT:

Proceed to	Check (1)	Check (2)
A	Normal engine speed	Rough idle or engine stall
B	Conditions other than above	

OK:

Engine stalled.

B → **Replace OCV for VVTL.**

A

Check for intermittent problems (See page DI–295).

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

1	**Check oil pressure switch for VVTL.**

PREPARATION:

(a) Disconnect the oil pressure switch for VVTL connector.
(b) Ignition switch OFF.

CHECK:

Measure continuity between the oil pressure switch and body ground.

OK:

No continuity

PREPARATION:

(a) Start the engine and warm it up.
(b) Disconnect the OCV for VVTL connector.
(c) Maintain engine speed at 6,500 rpm.

CHECK:

Measure continuity between the oil pressure switch and body ground when applying battery voltage between terminals of the OCV.

OK:

VVTL system is OFF (OCV is OFF): No continuity
VVTL system is ON (OCV is ON): Continuity

NG → **Replace oil pressure switch.**

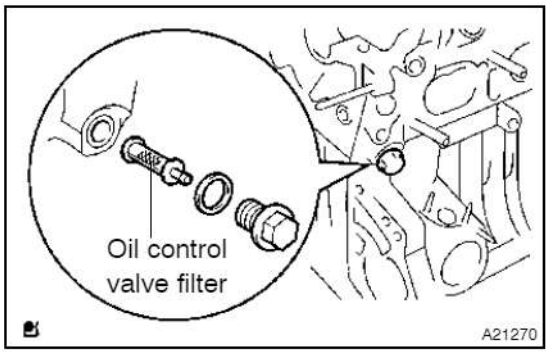
OK

2	**Check for open and short in harness and connector between oil pressure switch for VVTL and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

3	Check oil control valve filter.



PREPARATION:

(a) Remove the generator. (See page CH–7)

(b) Remove the oil control valve filter.

CHECK:

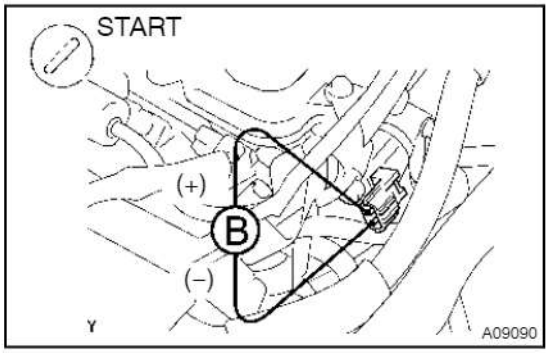
Check the oil control valve filter.

Confirm that the filter is clear.

NG	Replace oil control valve filter.

OK

4	Check operation of OCV for VVTL.



PREPARATION:

Start the engine and warm it up.

CHECK:

Check the engine speed at (1) and (2).

(1) Disconnect the C2 camshaft timing oil control valve connector.

(2) Apply 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	Conditions other than above	

OK:

Engine stalled.

B	Replace OCV for VVTL.

A

Check for intermittent problems (See page DI–295).

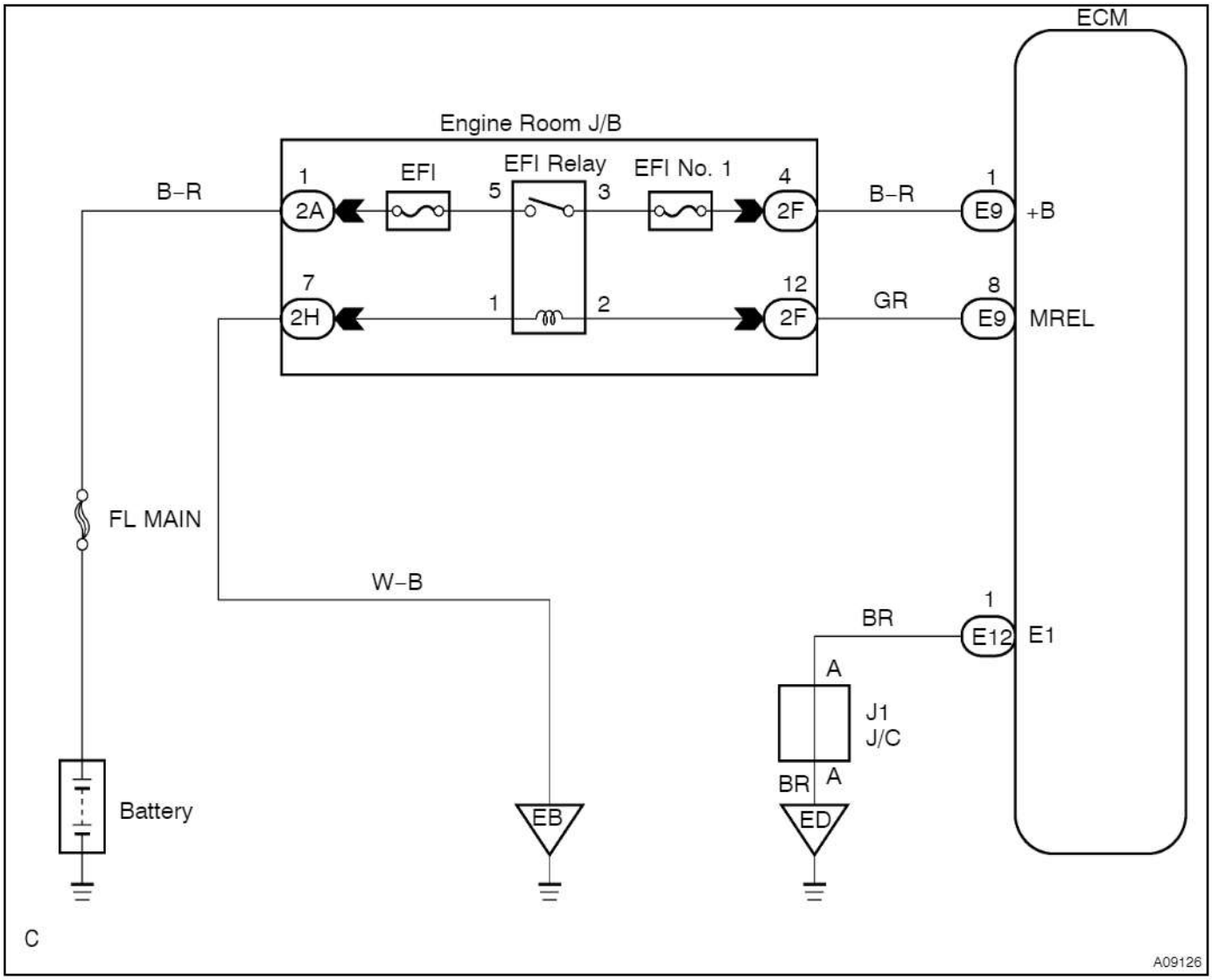
DIC7Z-02

ECM Power Source Circuit

CIRCUIT DESCRIPTION

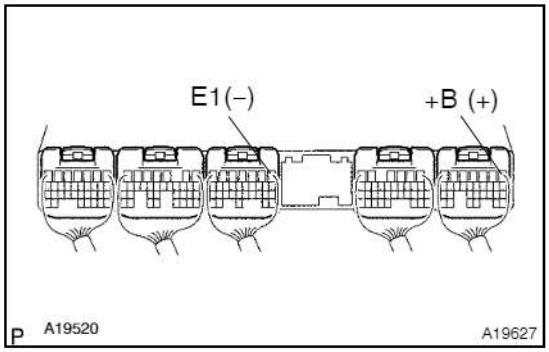
When the ignition switch is turned ON, battery voltage is applied to terminal IGSW of the ECM. The ECM "MREL" output signal causes current to flow to the coil, closing the contacts of the EFI relay and supplying power to terminal +B of the ECM.
If the ignition switch is turned OFF, the ECM holds the EFI relay ON for a maximum of 2 seconds to allow for the initial setting of the throttle valve.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check voltage between terminals +B and E1 of ECM connector.**



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure voltage between terminals +B and E1 of the ECM connector.

OK:

Voltage: 9 to 14 V

OK	**Replace ECM (See page SF–78).**

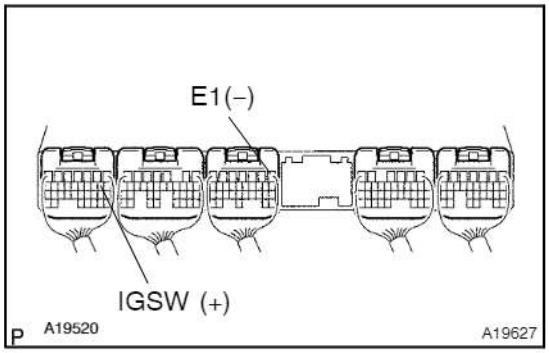
NG

2	**Check for open in harness and connector between terminal E1 of ECM and body ground (See page IN–30).**

NG	**Repair or replace harness or connector.**

OK

3	**Check voltage between terminals IGSW and E1 of ECM connector.**



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure voltage between terminals IGSW and E1 of the ECM connector.

OK:

Voltage: 9 to 14 V

OK	**Go to step 5.**

NG

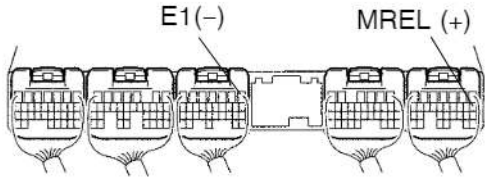
4	**Check ignition switch (See page BE–15).**

NG → **Replace ignition switch.**

OK

Check and repair harness and connector between battery and ignition switch, ignition switch and ECM (See page IN–30).

5	**Check voltage between terminals MREL and E1 of ECM connector.**



PREPARATION:
(a) Remove the ECM cover.
(b) Turn the ignition switch ON.

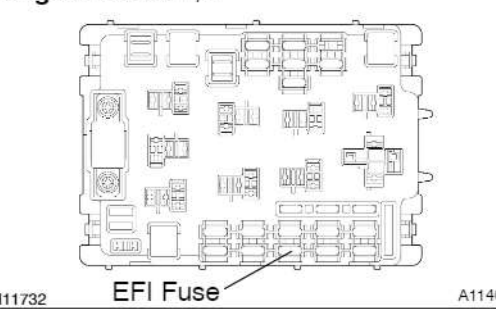
CHECK:
Measure voltage between terminals MREL and E1 of the ECM connector.

OK:
Voltage: 9 to 14 V

OK → **Repace ECM (See page SF–78).**

NG

6	**Check EFI fuse.**



PREPARATION:
Remove the EFI fuse from the engine room J/B.

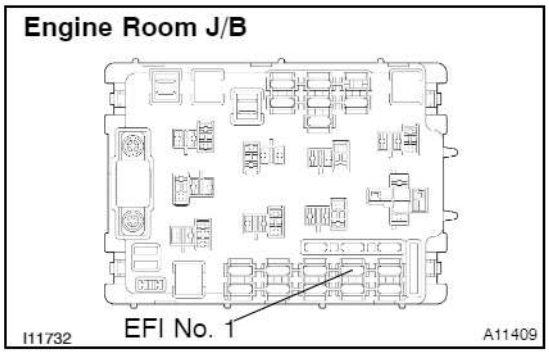
CHECK:
Check continuity of EFI fuse.

OK:
Continuity

NG → **Check for short in all the harness and components connected to EFI fuse.**

OK

7	**Check EFI No. 1 fuse.**



PREPARATION:

Remove IGN fuse from engine room J/B.

CHECK:

Check continuity of EFI No. 1 fuse.

OK:

Continuity

NG → **Check for short in all the harness and components connected to EFI No. 1 fuse.**

OK

8	**Check EFI main relay (Marking: EFI) (See page SF–56).**

NG → **Replace EFI main relay.**

OK

9	**Check for open and short in harness and connector between EFI relay and ECM, EFI relay and body ground (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

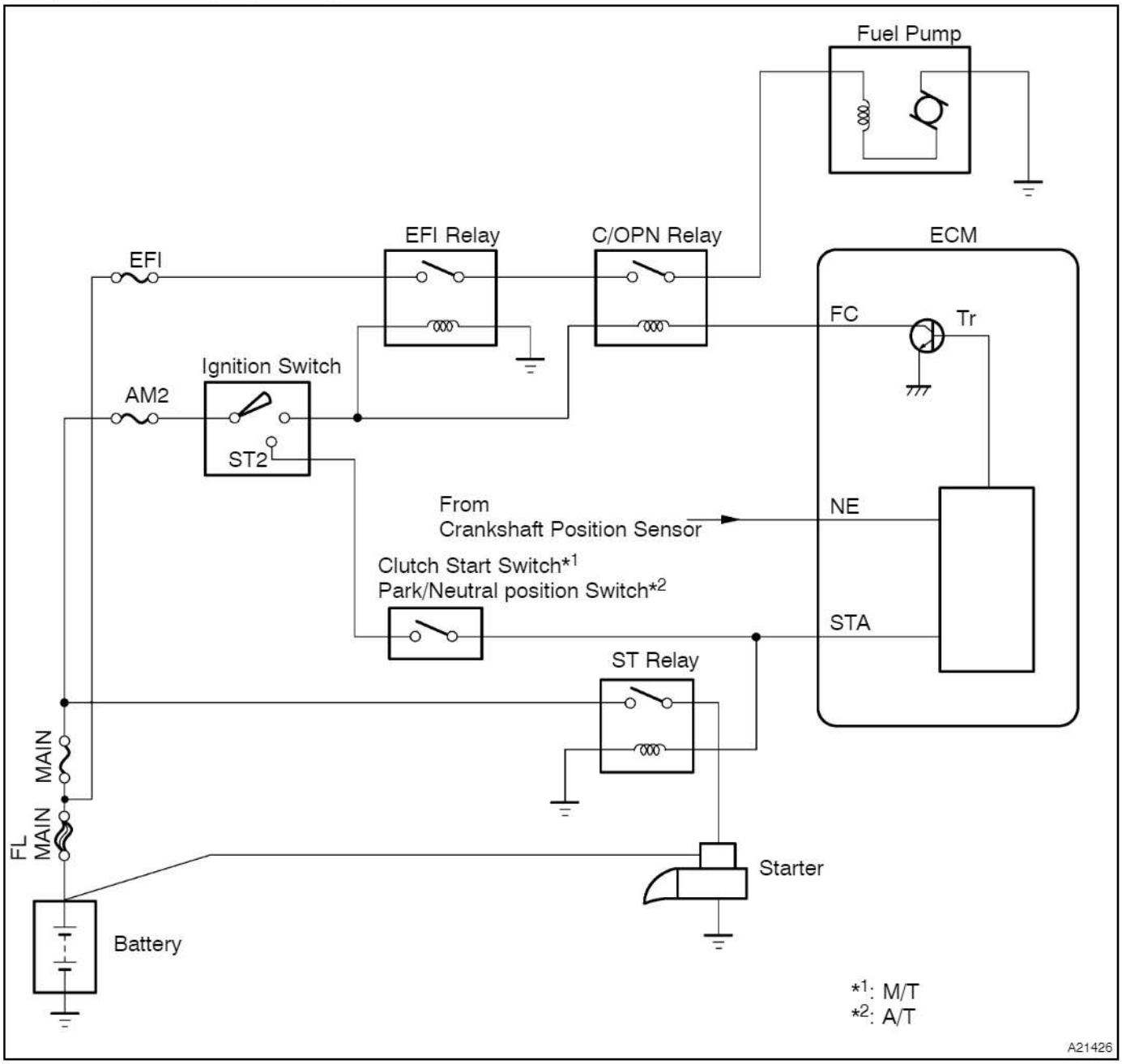
Check and replace harness and connector between terminal +B of ECM and battery positive terminal (See page IN–30).

DIC80–02

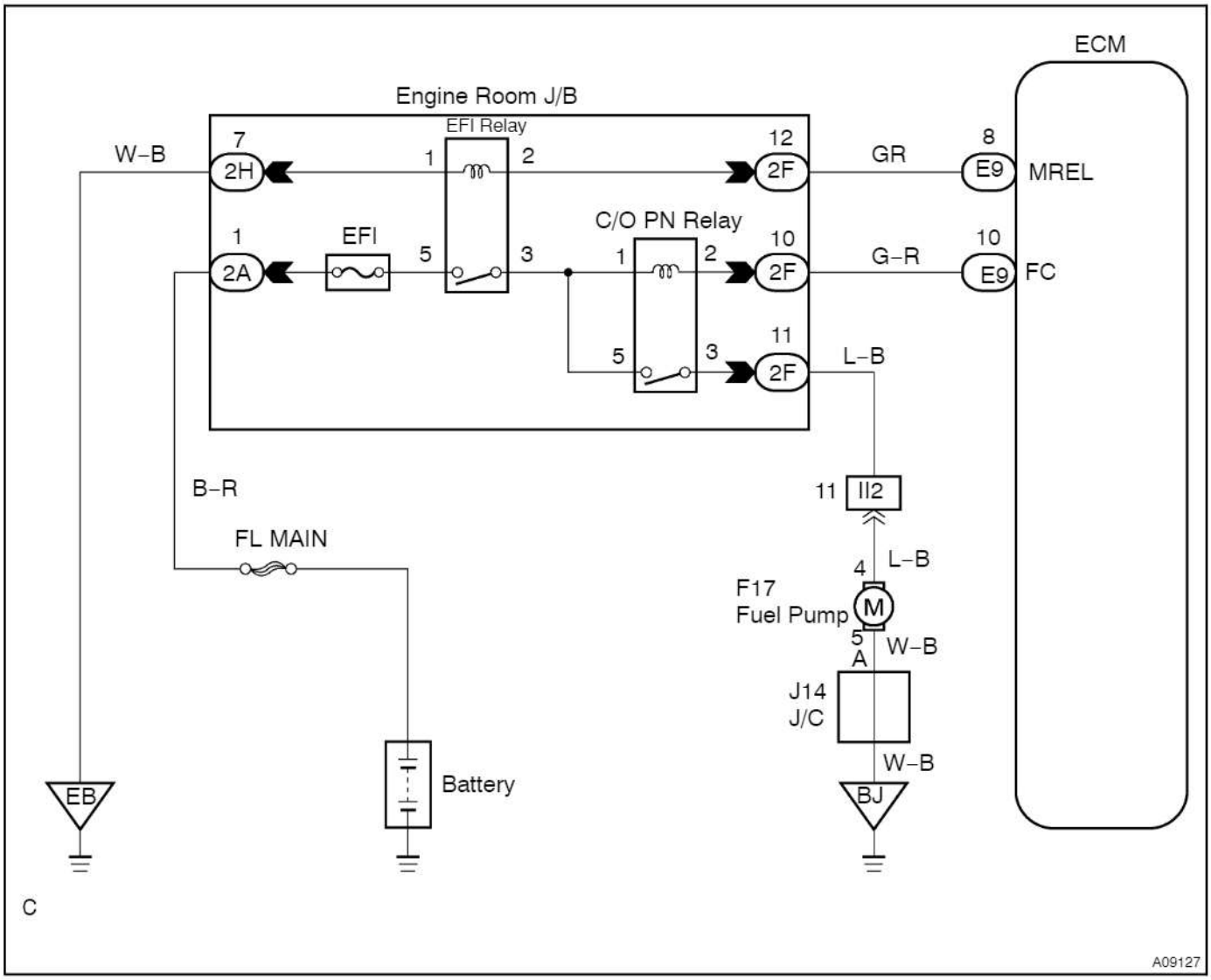
Fuel Pump Control Circuit

CIRCUIT DESCRIPTION

In the diagram below, when the engine is cranked, current flows from terminal ST2 of the ignition switch 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, Tr 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 Tr ON (circuit opening relay ON) and the fuel pump also keeps operating.



WIRING DIAGRAM



INSPECTION PROCEDURE

Hand–held tester:

1	**Connect the hand–held tester and check operation of fuel pump (See page DI–295).**

PREPARATION:

(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) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / FUEL PUMP / SPD.

CHECK:

Check if operating sounds can be heard while operating the relay with the hand–held tester.

OK:

Operating sounds can be heard from the relay.

OK → **Go to step 5.**

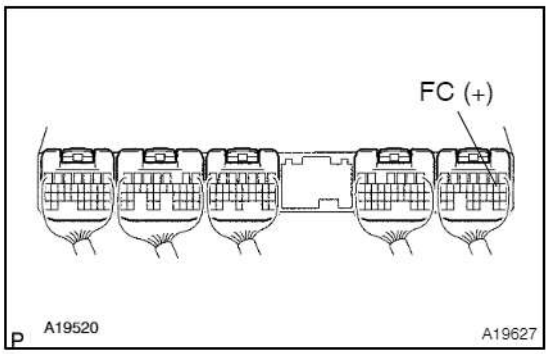
NG

2	**Check circuit opening relay (Marking: C/OPN) (See page SF–57).**

NG → **Replace circuit opening relay.**

OK

3	**Check voltage between terminal FC of ECM and body ground.**



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure voltage between terminal FC of the ECM and body ground.

OK:

Voltage 9 to 14 V

OK → **Replace ECM (See page SF–78).**

NG

4	Check for open and short in harness and connector between circuit opening relay (Marking: C/OPN) and ECM, circuit opening relay (Marking: C/OPN) and ignition switch (See page IN–30).

NG → Repair or replace harness or connector.

OK

5	Check fuel pump (See page SF–6).

NG → Repair or replace fuel pump.

OK

6	Check for open in harness and connector between circuit opening relay (Marking: C/OPN) and fuel pump, fuel pump and body ground (See page IN–30).

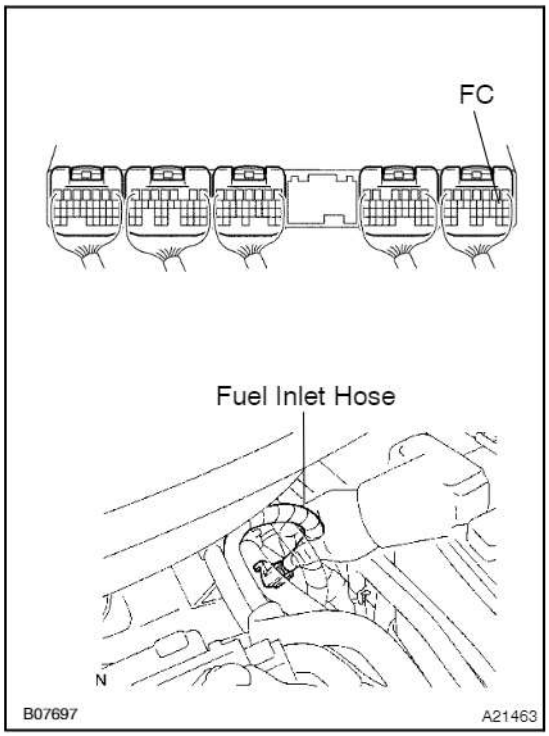
NG → Repair or replace harness or connector.

OK

Replace ECM (See page SF–78).

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

1	**Check operation of fuel pump.**



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

(a) Connect between terminal FC of the ECM connector and body ground.

(b) Check for fuel pressure in the fuel inlet hose when it is pinched off.

OK:

There is pressure in fuel inlet hose.

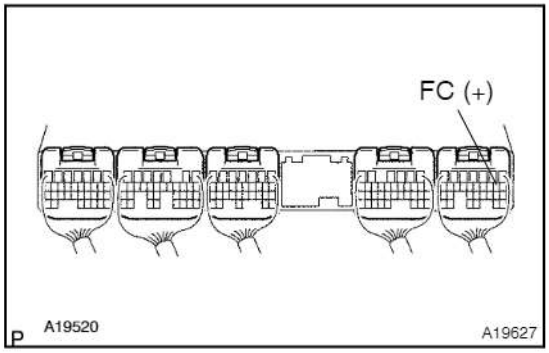
HINT:

At this time, you will hear a fuel return flowing noise.

OK	**Proceed to next circuit inspection shown on problem symptoms table (See page DI–332).**

NG

2	**Check operation of circuit opening relay (Marking: C/OPN).**



CHECK:

When connecting between terminal FC of the ECM connector and the body ground, check the relay operation.

OK:

Noise can be heard from the circuit opening relay.

OK	**Go to step 6.**

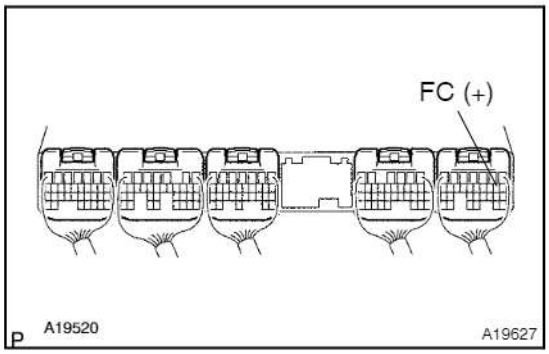
NG

3	**Check circuit opening relay (Marking: C/OPN) (See page SF–57).**

NG → **Replace circuit opening relay.**

OK

4	**Check voltage between terminal FC of ECM and body ground.**



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure voltage between terminal FC of the ECM and body ground.

OK:

Voltage 9 to 14 V

OK → **Replace ECM (See page SF–78).**

NG

5	**Check for open and short in harness and connector between circuit opening relay (Marking: C/OPN) and ECM, circuit opening relay (Marking: C/OPN) and ignition switch (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Replace ECM (See page SF–78).

6	Check fuel pump (See page SF–6).

NG → Repair or replace fuel pump.

OK

7	Check for open in harness and connector between circuit opening relay (Marking: C/OPN) and fuel pump, fuel pump and body ground (See page IN–30).

NG → Repair or replace harness or connector.

OK

Replace ECM (See page SF–78).

DIC81–02

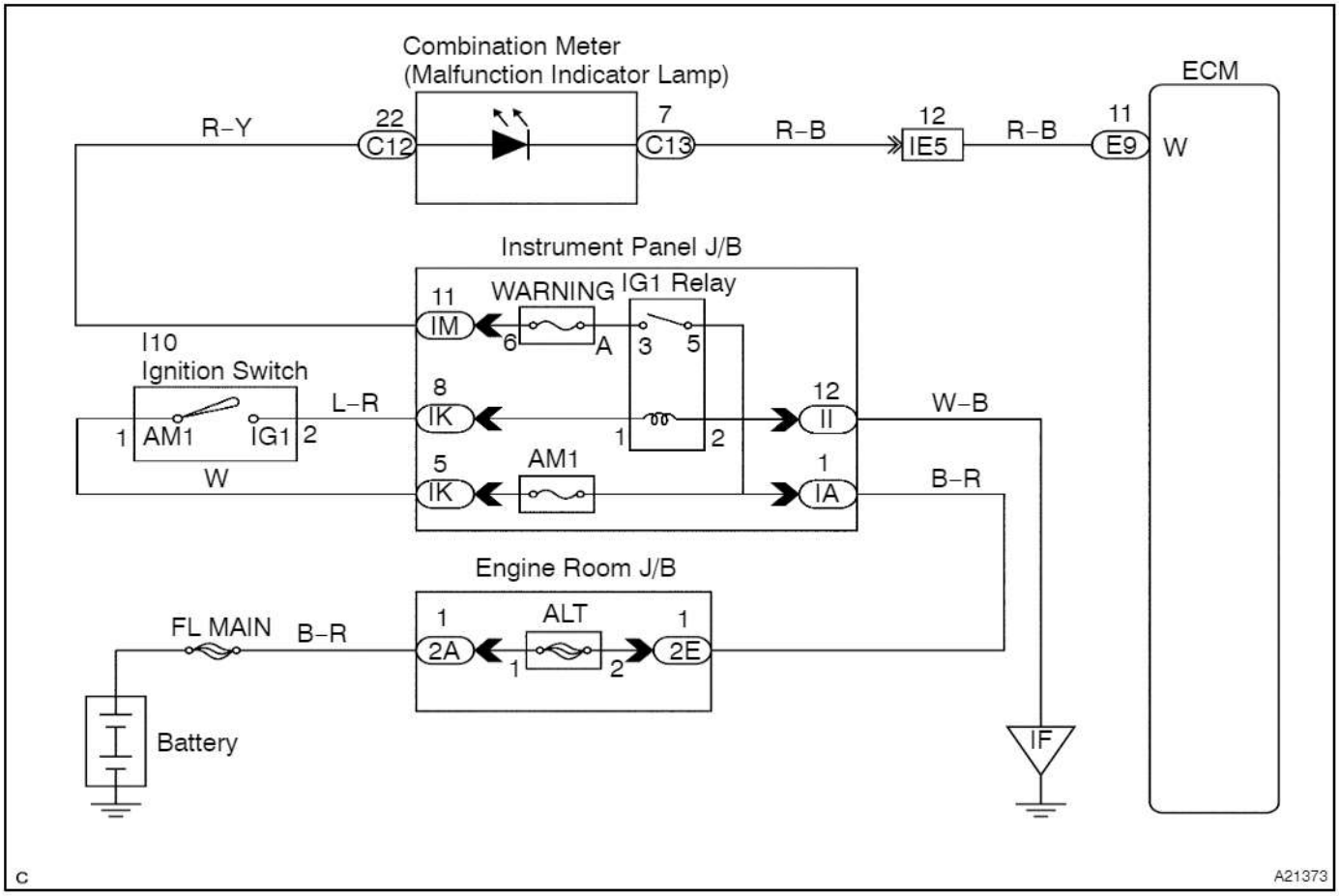
MIL Circuit

CIRCUIT DESCRIPTION

The ignition switch provides circuit power and the ECM provides the circuit ground that illuminates the MIL. MIL operation is checked visually:

It should be illuminated when the ignition is first turned on. If the MIL is off all of the time or on all of the time, use the procedure below to troubleshoot it. The MIL is used to indicate the ECM's detection of vehicle malfunction. Follow this procedure using the hand–held tester or an OBD II scan tool to determine the cause of the problem and to check the MIL.

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

1	**Clear DTC.**

PREPARATION:

(a) Connect the hand–held tester or the OBD II scan tool to the DLC 3.
(b) Turn the ignition switch ON and push the hand–held tester or the OBD II scan tool main switch ON.
(c) Read the DTCs (See page DI–295).
(d) Clear the DTCs (See page DI–295).

CHECK:

Check that MIL is not illuminated.

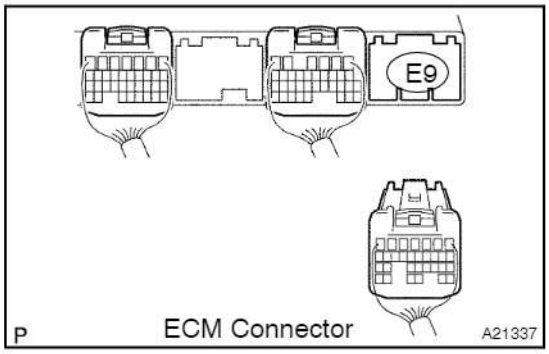
OK:

MIL is not illuminated

OK → **Repair circuit indicated by output DTC (See page DI–335).**

NG

2	**Check for short in wire harness.**



PREPARATION:

(a) Disconnect the E9 ECM connector.
(b) Turn the ignition switch ON.

CHECK:

Check that MIL is not illuminated.

OK:

MIL is not illuminated

OK → **Replace ECM (See page SF–78).**

NG

Check and repair harness and connector between combination meter and ECM (See page IN–30).

3	**Check that MIL is illuminated.**

CHECK:

Check that MIL is illuminated when turning the ignition switch ON.

OK:

MIL is illuminated

OK → **System OK.**

NG

4	**Check combination meter assy (MIL circuit).**

See the combination meter troubleshooting on page (See page BE–50).

NG → **Repair or replace bulb or combination meter assembly.**

OK

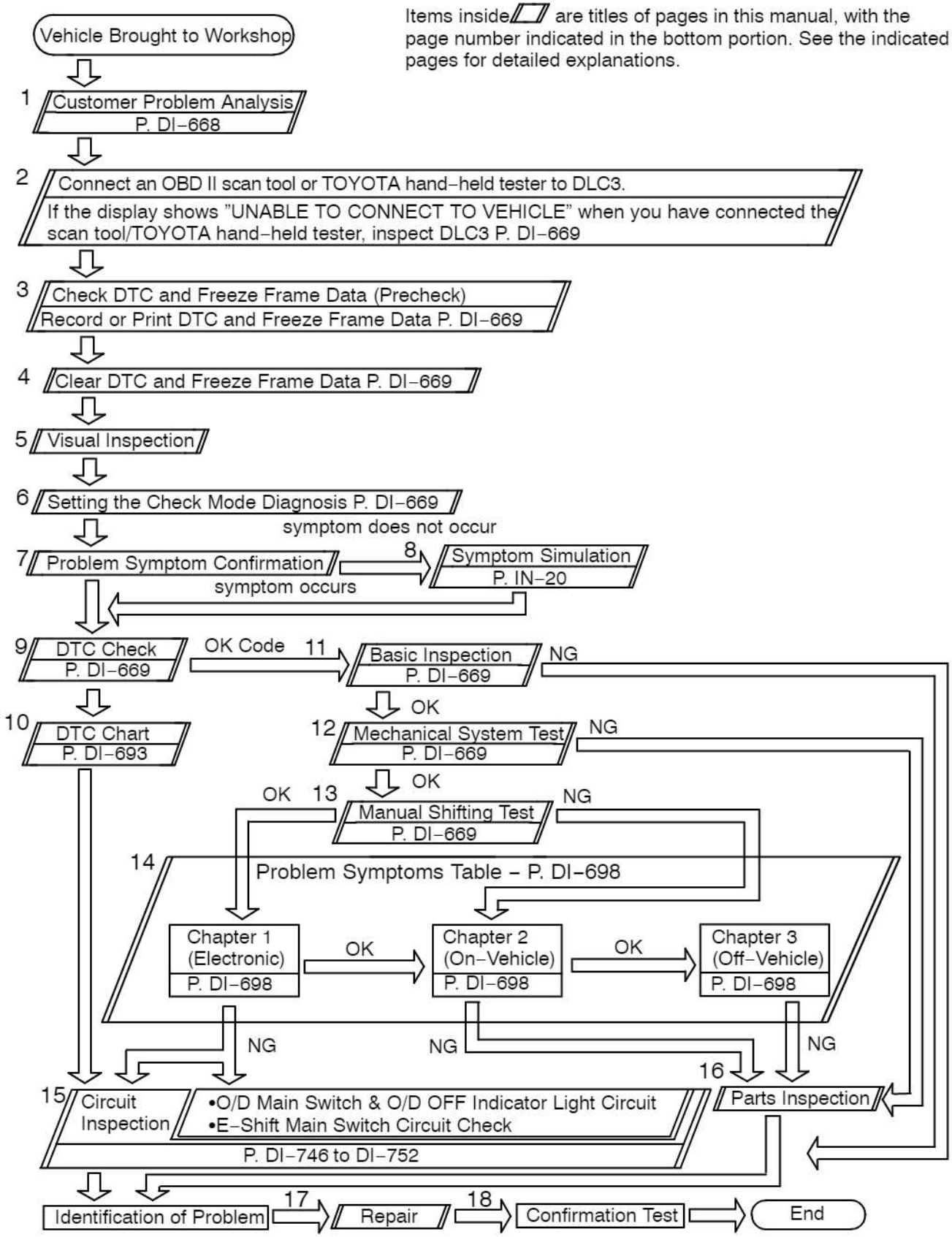
Check and repair harness and connector between combination meter and ECM (See page IN–30).

AUTOMATIC TRANSAXLE (U240E)

HOW TO PROCEED WITH TROUBLESHOOTING

DI4YY–09

Items inside ▱ are titles of pages in this manual, with the page number indicated in the bottom portion. See the indicated pages for detailed explanations.



DIBZW–10

PRECAUTION

NOTICE:

Perform the RESET MEMORY (AT initialization) when replacing the automatic transaxle assy, engine assy or the ECM (See page DI–669).

HINT:

Initialization can not be completed by only disconnecting the battery terminal.

DI4YZ-05

CUSTOMER PROBLEM ANALYSIS CHECK

Automatic Transaxle 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 → O/D)
	☐ No down–shift (☐ O/D → 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)

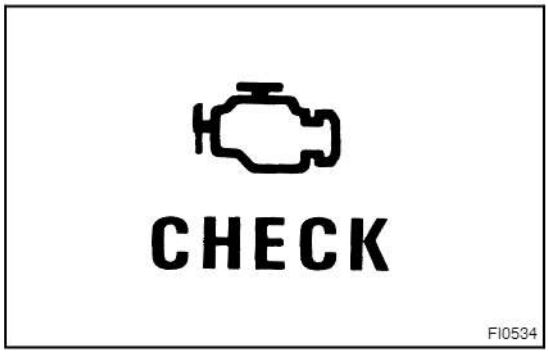
DIC8C–02

PRE–CHECK

1. DIAGNOSIS SYSTEM

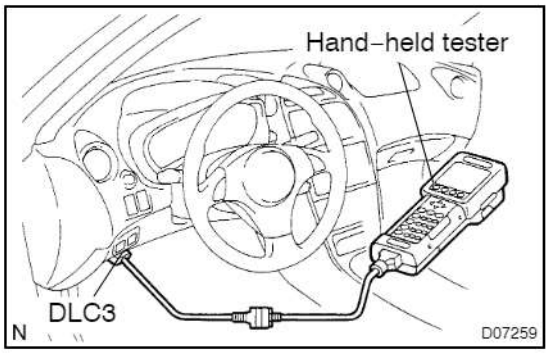
(a) Description

- When troubleshooting OBD II vehicles, the only difference from the usual troubleshooting procedure is that you connect an OBD II scan tool complying with SAE J1987 or hand–held tester, to the vehicle and read off various data output from the vehicle's ECM.



- OBD II regulations require that the vehicle's on–board computer lights up the Malfunction Indicator Lamp (MIL) on the instrument panel when the computer detects a malfunction in the computer itself or in drive system components which affect vehicle emissions. In addition to the MIL lighting up when a malfunction is detected, the applicable DTCs prescribed by SAE J2012 are recorded in the ECM memory (See page DI–335).

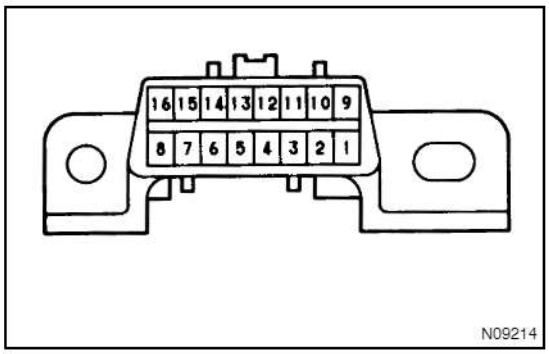
If the malfunction does not occur in 3 consecutive trips, the MIL goes off but the DTCs remain recorded in the ECM memory.



- To check the DTCs, connect an OBD II scan tool or hand–held tester to DLC3 on 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 operating instructions, see the instruction book).
- 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 the manufacturer within the prescribed limits (See DTC chart on page DI–693).

- The diagnosis system operates in normal mode during 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 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) (See page DI–669).
- *2–trip detection logic:
  When a logic malfunction is first detected, the malfunction is temporarily stored in the ECM memory.

If the same malfunction is detected again during the 2nd test drive, this 2nd detection causes the MIL to light up.

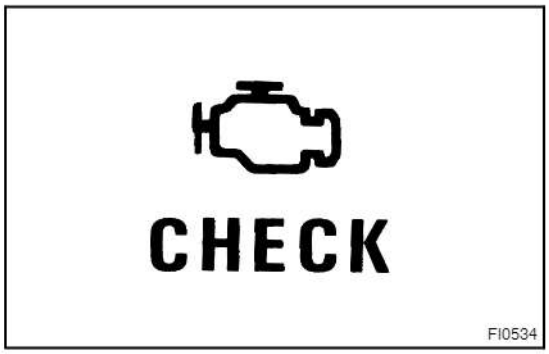


(b) Inspect the DLC3.
The vehicle's ECM uses ISO 9141–2 for communication. The terminal arrangement of DLC3 complies with SAE J1962 and matches the ISO 9141–2 format.

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 OBD II scan tool or hand–held tester to 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 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. INSPECT DIAGNOSIS (NORMAL MODE)

(a) 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 (See page BE–2).

(2) When the engine is started, the MIL should go off. If the lamp remains on, the diagnosis system has detected a malfunction or abnormality in the system.

(b) Check the DTC.

NOTICE:

Hand–held tester only: When the diagnostic system is switched from normal mode to check mode, it erases all DTCs and freeze frame data recorded in normal mode. So before switching modes, always check the DTCs and freeze frame data, and note them down.

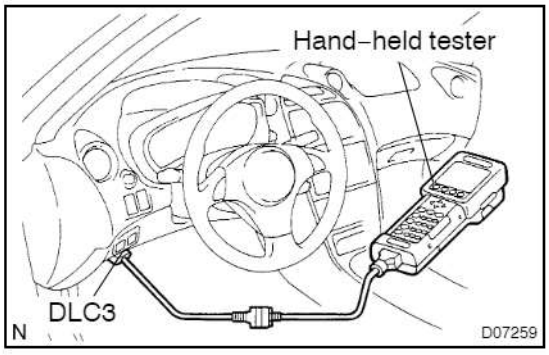
(1) Prepare an OBD II scan tool (complying with SAE J1978) or hand–held tester.

(2) Connect the OBD II scan tool or hand–held tester to DLC3 at the lower of the instrument panel.

(3) Turn the ignition switch ON and turn the OBD II scan tool or hand–held tester switch ON.

(4) 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).

(5) See page DI–693 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 normal mode. For codes on the DTCs chart subject to "2–trip detection logic", turn the ignition switch off after the symptoms have been simulated the 1st time. Then repeat the simulation process again. When the problem has been simulated twice, the MIL comes on on the instrument panel and DTCs are recorded in the ECM.

(c) 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.)

(d) When not using the OBD II scan tool or hand–held tester:
Clearing the DTCs.
Disconnect 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.

3. INSPECT DIAGNOSIS (CHECK MODE)

HINT:

Hand–held tester only: Compared to the normal mode, the check mode has high sensing ability to detect malfunctions. Furthermore, the same diagnostic items which are detected in Normal mode can also be detected in Check mode.

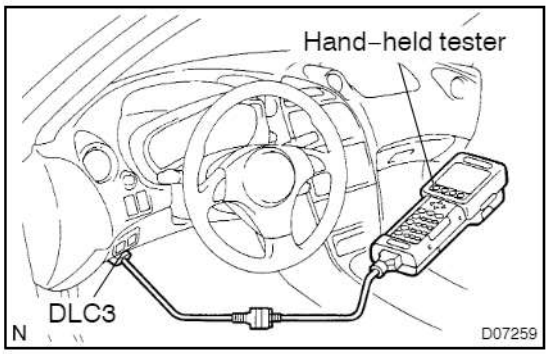
(a) Check the DTC.

(1) Check the initial conditions.

- Battery voltage 11 V or more.
- Throttle valve fully closed.
- Transaxle in P position.
- Air conditioning switched off.

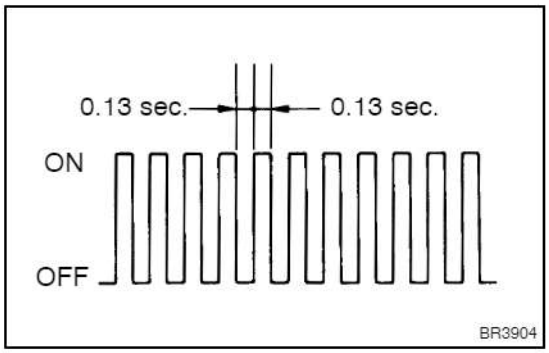
(2) Turn the ignition switch off.

(3) Prepare a hand–held tester.



(4) Connect the hand–held tester to DLC3 at the lower side of the instrument panel.

(5) Turn the ignition switch ON and switch the hand–held tester ON.



(6) Switch the hand–held tester from Normal mode to Check mode (Check that the MIL flashes).

(7) Start the engine (MIL goes out after the engine starts).

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

NOTICE:

Leave the ignition switch ON until you have checked the DTCs, etc.

(9) 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 Check mode to Normal mode, which erases all DTCs, etc.

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

(b) 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.)

(c) When not using the OBD II scan tool or hand–held tester:
Clearing the DTCs.
Disconnect 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.

4. 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 the first step of troubleshooting is one of the methods 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 to the ON position.
(e) Push the "ON" button of the OBD II scan tool or the hand–held tester.
(f) Select the item "DIAGNOSIS/ENHANCED OBD II/DATA LIST".
(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 • D(O/D OFF): 1st, 2nd or 3rd • D(O/D ON): 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	Ignition Key position is; START: ON Except START: OFF	←
LOW	PNP SW Status/ ON or OFF	Shift lever position is; L: ON Except L: OFF	The shift lever position and these values are different, there are failures of the PNP switch or shift cable adjustment.
2ND	PNP SW Status/ ON or OFF	Shift lever position is; 2: ON Except 2: OFF	
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: ON Except D: OFF	
OVERDRV CUT SW2	O/D SW Status/ ON or OFF	• IG SW ON: ON ↓ • O/D SW Push: OFF ↓ • O/D SW Push: ON	←
SOLENOID (SLT)	Shift Solenoid SLT Status/ ON or OFF	IG SW ON: ON	←
AT FLUID TEMP	ATF Temp. Sensor Value/ min.: –40 °C (–40 °F) max.: 225 °C (437 °F)	80 °C (176 °F) (After Stall Test)	If the value is "–40 °C (–40 °F)" or "225 °C (437 °F)", ATF temp. sensor circuit is opened or shorted.
SPD (NC)	Counter Gear Speed display: 50 r/min	D Position is warmed up,4th (O/D); Same as input shaft speed	←

5. 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 the first step of troubleshooting is one of the methods 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 hand–held tester to the DLC3.
(d) Turn the ignition switch to the ON position.
(e) Push the "ON" button of the the 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 values.
LOCK UP	[Test Details] Control the shift solenoid DSL to set the ATM to the lock–up condition. [Vehicle Condition] Vehicle Speed: 58 km/h (36 mph) or more	Possible to check the DSL operation.
LINE PRESS UP	[Test Details] Operate the shift solenoid SLT and raise the line pressure. [Vehicle Condition] • Vehicle Stopped. • IDL: ON [Others] ON: Line pressure up. OFF: No action (normal operation)	–

6. 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	A group of diagnostic trouble codes that are output by the ECM based on the same malfunction detection logic.
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. When a sensor is being monitored, the next sensor or component will not be monitored until the 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 the malfunction only one time during a single driving cycle. "Continuous" means that the ECM detects 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 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.

7. TOYOTA/LEXUS 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 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 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
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 immobiliser system, Immobiliser system	Vehicle anti–theft system

8. The monitor will run whenever the following DTCs are not present (Monitor Disablement List)

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.

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	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 Sensor 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 Sensor - Sensor3	Fuel system	Misfire			
	P0011	P0011				X		X														X									
	P0012	P0012				X		X														X									
	P0016,P0018	P0016,P0018																													
	P0021	P0021			X	X																X									
	P0022	P0022			X	X																X									
	P0030,50	P0031,32,51,52																				X	X	X	X	X	X				
	P0135,P0155	P0031,32,51,52																				X			X	X	X				
	P0036,56	P0037,38,57,58																							X	X					
	P0043,44,63,64	P0043,44,63,64																								X					
	P0100,P0101	P0100-P0103		X	X		X	X											X		X	X	X	X	X	X	X	X			
	P0105,P0106	P0105-P0108		X	X		X	X											X		X	X	X	X	X	X	X	X			
	P0110	P0110-P0113																			X	X	X	X	X	X		X			
	P0115,P0116	P0115-P0118		X	X	X	X	X						X		X					X	X	X	X	X	X	X	X			
	P0120,P0121	P0120-P0223,P2135												X		X							X	X	X	X	X	X			
	P0125	P0125		X	X		X	X						X		X						X	X	X	X	X	X	X			
	P0128	P0128																													
	P0130-P0153	P0130-P0153																				X		X	X	X					
	P0134,P0154	P0134,P0154								X												X	X		X	X	X				
	P0136,P0156	P0136,P0156																													
	P0142,P0162	P0142,P0162																													
	P0171,P0172	P0171,P0172																				X	X	X	X	X					
	P0300-P0308	P0300-P0308							X													X	X	X	X	X					
	P0325,P0330	P0325-P0333																										X			
	P0335	P0335		X	X		X	X						X		X						X	X	X	X	X	X	X			
	P0340, P0341	P0340, P0341		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					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																												
	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 Sensor 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 Sensor - 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 Adsorption 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		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			
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																														
P0450,P0451	P0450-P0453	EVAP press sensor												X																		

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Monitor detected malfunction				Monitor disablement (X - disabled)																													
	Fault code			P0325,P0330	P0335	P0340,P0341	P0340-P0346	P0351-P0358	P0385	P0401	P0402	P0405,P0406	P0409	P0420,P0430	P0440-P0446	P0450,P0451	P0500	P0500	P0500	P0511	P0510	P0560	P0617	P0705	P0710	P0720-P0793	P0715-P0717	P0724	P0741-P0796				
	Fault code			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				
		Component/ system		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						
	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 Adsorption 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	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 Adsorption 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						
	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	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 Adsorption 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
	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			X
	P2423,24	P2423,24	HC Adsorption 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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Note *1: Without input speed sensor

Note *2: With input speed sensor

9. PROBLEM SYMPTOM CONFIRMATION

Taking into consideration the results of the customer problem analysis, try to reproduce the symptoms of the trouble. If the problem is that the transaxle does not up–shift, down–shift, or the shift point is too high or too low, conduct the following road test to confirm the automatic shift schedule and simulate the problem symptoms.

10. 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 and 3 → O/D up–shifts take place, and that the shift points conform to the automatic shift schedule (See page SS–42).

HINT:

- O/D Gear Up–shift Prohibition Control (1. Coolant temp. is 60 °C (140 °F) or less. 2. If there is a 10 km/h (6 mph) difference between the set cruise control speed and vehicle speed.)
- O/D 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 and 3 → O/D up–shifts.

(3) Check for abnormal noises and vibration.

Drive in the 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 due to loss of balance in the differential, torque converter clutch, etc.

(4) Check kick–down operation.

While driving in the D position, 2nd, 3rd and O/D gears, check 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 SS–42).

(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 60 km/h (37 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) M position test

Shift to the M position, depress the accelerator pedal and check the following points.

Shift operations.

Pressing the transmission shift switch to "Up" or " Down" makes the transmission up–shifted or down–shifted respectively.

Without pressing the switch, it is not automatically shifted to either up or down.

When a vehicle is stopped, it is automatically down–shifted to 1st gear.

HINT:

Manual shift prohibition control (1. When the ATF temperature is low. 2. When down–shifting causes engine overrun. 3. When down–shifting is required continuously, down–shifting to 1st gear may not be performed. 4. When the ATF temp. is high, up–shifting to O/D is not performed.)

(c) 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 SS–42).

HINT:

There is no O/D up–shift and lock–up in the 2 position.

(2) Check engine braking.

While driving 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.

(d) 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 driving in the L position, check that there is no up–shift to 2nd gear.

(2) Check engine braking.

While driving in the L position, release the accelerator pedal and check the engine braking effect.

(3) Check for abnormal noises during acceleration and deceleration.

(e) 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.

(f) P position test

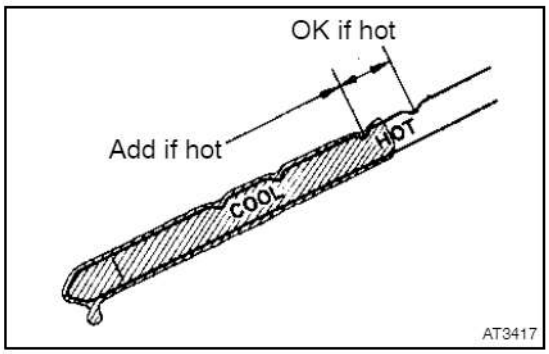
Stop the vehicle on a grade (more than 5°) and after shifting into the P position, release the parking brake. Then, check that the parking lock pawl holds the vehicle in place.

11. BASIC INSPECTION

(a) Check the fluid level.

HINT:

- Drive the vehicle so that the engine and transaxle are at normal operating temperature.
  Fluid temp.: 70 to 80 °C (158 to 176 °F)
- Only use the COOL range on the dipstick as a rough reference when the fluid is changed or the engine does not run.



(1) Park the vehicle on a level surface and set the parking brake.

(2) With the engine idling and the brake pedal depressed, shift the shift lever into all positions from P to L position and return to P position.

(3) Pull out the dipstick and wipe it clean.

(4) Push it back fully into the pipe.

(5) Pull it out and check that the fluid level is in the HOT range.

If the level is at the low side, add new fluid.

Fluid type: ATF Type T–IV

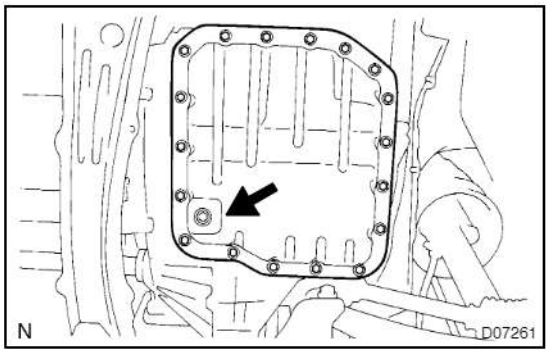
Capacity: 4.1 liters (4.3 US qts, 3.6 Imp. qts)

NOTICE:

Do not overfill.

(b) Check the fluid condition.

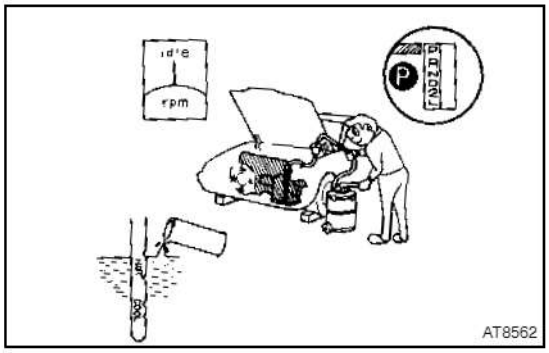
If the fluid smells burnt or is black, change it.



(c) Replace the ATF.

(1) Remove the drain plug and drain the fluid.

(2) Reinstall the drain plug securely.



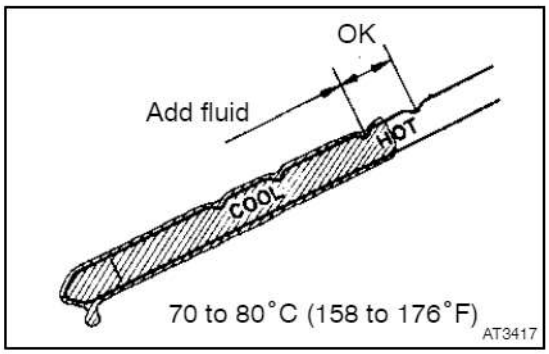
(3) With the engine OFF add new fluid through the oil filler pipe.

Fluid type: ATF Type T–IV

Capacity: 4.1 liters (4.3 US qts, 3.6 Imp. qts)

(4) Start the engine and shift the shift lever into all positions from P to L position and then shift into P position.

(5) With the engine idling, check the fluid level. Add fluid up to the COOL level on the dipstick.



(6) Check the fluid level at the normal operating temperature, 70 to 80 °C (158 to 176 °F), and add as necessary.

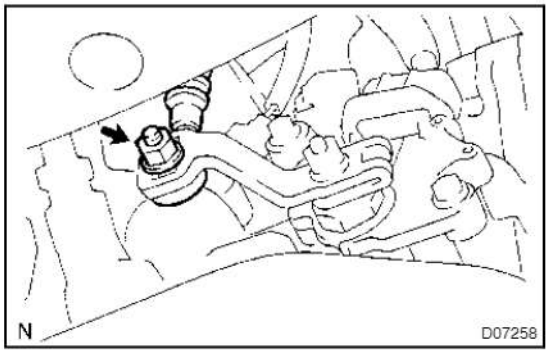
NOTICE:

Do not overfill.

(d) Check the fluid leaks.

Check for leaks in the transaxle.

If there are leaks, it is necessary to repair or replace O–rings, gaskets, oil seals, plugs or other parts.



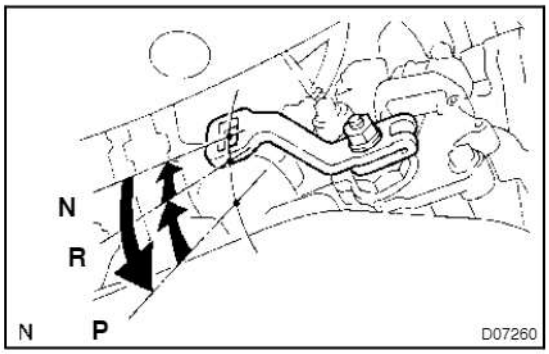
(e) Inspect and adjust the shift lever position.

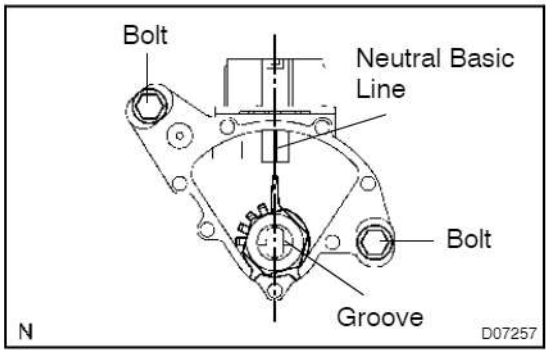
When shifting the shift lever from the N position to other positions, check that the lever can be shifted smoothly and accurately to each position and that the position indicator is aligned with the correct position.

If the indicator is not aligned with the correct position, carry out the following adjustment procedures.

(1) Loosen the nut on the shift lever.

(2) Push the control shaft fully downward.





(3) Return the control shaft lever 2 notches to N position.
(4) Set the shift lever to N position.
(5) While holding the shift lever lightly toward the R position side, tighten the shift lever nut.

Torque: 13 N·m (130 kgf·cm, 9 in.·lbf)

(6) Start the engine and make sure that the vehicle moves forward when shifting the lever from the N to D position and reverses when shifting it to the R position.

(f) Inspect and adjust the park/neutral position.

Check that the engine can be started with the shift lever only in the N or P position, but not in other positions.

If it is not as stated above, carry out the following adjustment procedures.

(1) Loosen the park/neutral position switch bolt and set the shift lever to the N position.
(2) Align the groove and neutral basic line.
(3) Hold in position and tighten the bolt.

Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

For continuity inspection of the park/neutral position switch, see page DI–701.

(g) Check the idle speed.

Idle speed: 650 ± 50 rpm
(In N position and air conditioner OFF)

12. MECHANICAL SYSTEM TESTS

(a) Measure the stall speed.

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 50 to 80 °C (122 to 176 °F).**
- **Do not continuously run this test for longer than 10 seconds.**
- **To ensure safety, conduct this test in a wide, clear level area which provides 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 4 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 pressed 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: 2,370 ± 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 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 • Forward clutch slipping • No.2 one–way clutch not operating properly • O/D clutch slipping
(c) Stall engine speed is high in R position	• Line pressure too low • Direct clutch slipping • 1st & reverse brake slipping • O/D clutch slipping
(d) Stall engine speed is high in D and R positions	• Line pressure too low • Improper fluid level • O/D one–way clutch not operating properly

(b) Measure the time lag.

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 fluid temperature 50 to 80 °C (122 to 176 °F).**
- **Be sure to allow 1 minute interval between tests.**
- **Take 3 measurements and take the average value.**

(1) Connect an OBD II scan tool or hand–held tester to DLC3.

(2) Fully apply the parking brake.

(3) Start the engine and check idle speed.

Idle speed: 650 ± 50 rpm (In N position and air conditioner OFF)

(4) 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

(5) 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 specified):

Problem	Possible cause
N → D time lag is longer	• Line pressure too low • Forward clutch worn • O/D one–way clutch not operating
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

13. HYDRAULIC TEST

Measure the line pressure.

NOTICE:

- **Do the test at normal operation fluid 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 stoppers outside the vehicle while the other is doing the test.**
- **Be careful to prevent SST's hose from interfering with the exhaust pipe.**

(1) Warm up the ATF.

(2) Remove the test plug on the transaxle case front left side and connect SST (See page AX–30 for the location to connect SST).

SST 09992–00095 (09992–00231, 09992–00271)

(3) Fully apply the parking brake and check the 4 wheels.

(4) Connect an OBD II scan tool or hand–held tester to DLC3.

(5) Start the engine and check idling speed.

(6) Keep your left foot pressed firmly on the brake pedal and shift into D position.

(7) Measure the line pressure when the engine is idling.

(8) Depress the accelerator pedal all the way down. Quickly read the highest line pressure when engine speed reaches stall speed.

(9) 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	372 to 412 (3.8 to 4.2, 54 to 59)	672 to 742 (6.9 to 7.6, 97 to 107)
Stall	931 to 1,031 (9.5 to 10.5, 134 to 149)	1,768 to 1,968 (18.0 to 20.1, 255 to 284)

Evaluation:

Problem	Possible cause
If the measured values at all position are higher	• Throttle valve defective • Regulator valve defective
If the measured values at all position are lower	• Throttle valve defective • Regulator valve defective • Oil pump defective • O/D direct clutch defective
If pressure is low in the D position only	• D position circuit fluid leakage • Forward clutch defective
If pressure is low in the R position only	• R position circuit fluid leakage • Direct clutch defective • 1st & reverse brake defective

14. MANUAL SHIFTING TEST

The purpose of this manual shifting test is to determine whether a problem is caused by either mechanical or electrical factors. Disconnecting the solenoid wire disables electrically-controlled automatic gear shifting. In this case, operating the shift level is the only way to shift the transaxle gear. If the gear is not changed by shift lever operation, it is assumed that there is a mechanical problem.

(a) Turn the ignition switch OFF.
(b) Disconnect the solenoid wire connector.
(c) Warm up the engine.
(d) Drive the vehicle.
(e) Check the transaxle operation when the shift lever is moved into L, 2 and D ranges.

Standard:

Shift Lever	Operation
L to 2	No shift (Not change)
2 to D	No shift (Not change)
D to 2	No shift (Not change)
2 to L	No shift (Not change)

(f) Turn the ignition switch OFF.
(g) Connect the solenoid wire connector.
(h) Clear DTCs.

HINT:

When the solenoid wire is disconnected, the transaxle gear will be set as listed below:

Shift Lever	Gear
P	Parking
R	Reverse
N	Neutral
D	3rd
2	3rd
L	3rd

15. RESET MEMORY

CAUTION:

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

NOTICE:

Hand–held tester only

HINT:

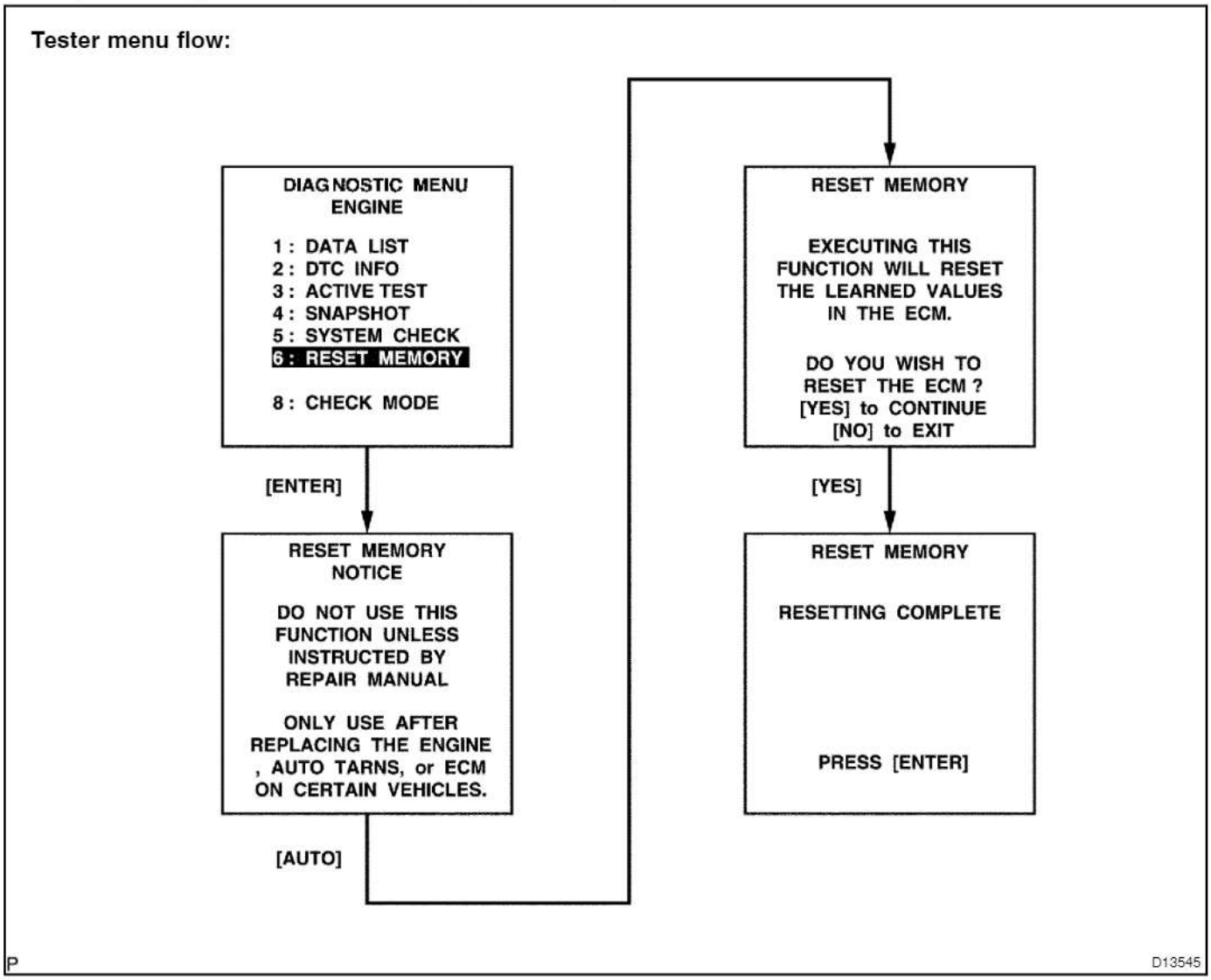
The ECM memorizes the condition that the ECT controls the automatic transaxle assy and engine assy according to those characteristics. Therefore, when the automatic transaxle assy, engine assy, or ECM has been replaced, it is necessary to reset the memory so that the ECM can memorize the new information. 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.

CAUTION:

After performing the RESET MEMORY, be sure to perform the ROAD TEST described earlier.

Tester menu flow:



DI4Z0-11

DIAGNOSTIC TROUBLE CODE CHART

If a DTC is displayed during the DTC check, check the circuit listed for that code in the table below and proceed to the page given.

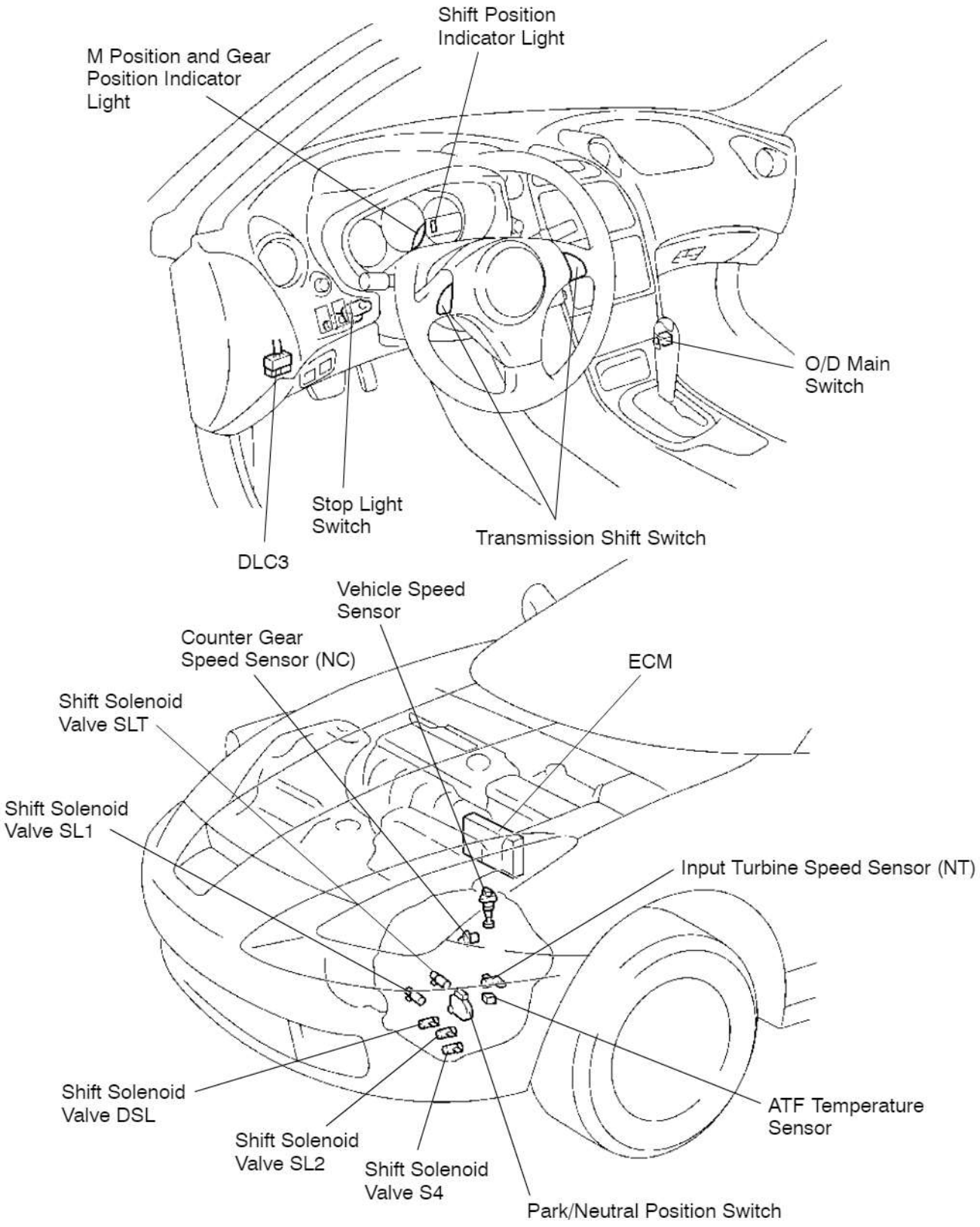
* : –...MIL does not light up /●...MIL lights up

DTC No. (See Page)	Detection Item	Trouble Area	MIL *	Memory
P0500 (DI–552)	Vehicle Speed Sensor "A"	• Combination meter • Open or short in vehicle speed sensor circuit • Vehicle speed sensor • ECM	●	○
P0705 (DI–701)	Transmission Range Sensor Circuit Malfunction (PRNDL Input)	• Open or short in park/neutral position switch circuit • Park/neutral position switch • E–shift main switch circuit • Multiplex communication circuit • ECM	●	○
P0710 (DI–706)	Transmission Fluid Temperature Sensor "A" Circuit	• Open or short in ATF temperature sensor circuit • ATF temperature sensor • ECM	●	○
P0711 (DI–710)	Transmission Fluid Temperature Sensor "A" Performance	• Transaxle fluid level • ATF temperature sensor • ECM	●	○
P0712 (DI–706)	Transmission Fluid Temperature Sensor "A" Circuit Low Input	• Open or short in ATF temperature sensor circuit • ATF temperature sensor • ECM	●	○
P0713 (DI–706)	Transmission Fluid Temperature Sensor "A" Circuit High Input		●	○
P0717 (DI–713)	Turbine Speed Sensor Circuit No Signal	• Open or short in speed sensor (NT) circuit • Speed sensor (NT) • ECM • Automatic transaxle assembly	●	○
P0724 (DI–716)	Brake Switch "B" Circuit High	• Short in stop light switch circuit • Stop light switch • ECM	●	○
P0741 (DI–718)	Torque Converter Clutch Solenoid Performance (Shift Solenoid Valve DSL)	• Shift solenoid valve DSL is stuck open or closed • Valve body blocked up or stuck • Lock–up clutch	●	○
P0746 (DI–722)	Pressure Control Solenoid "A" Performance (Shift Solenoid Valve SL1)	• Shift solenoid valve SL1 is stuck open or closed • Valve body is blocked up or stuck	●	○
P0748 (DI–728)	Pressure Control Solenoid "A" Electrical (Shift Solenoid Valve SL1)	• Open or short in shift solenoid valve SL1 circuit • Shift solenoid valve SL1 • ECM	●	○
P0766 (DI–722)	Shift Solenoid "D" Performance (Shift Solenoid Valve S4)	• Shift solenoid valve S4 is stuck open or closed • Valve body is blocked up or stuck	●	○
P0776 (DI–722)	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	●	○
P0778 (DI–728)	Pressure Control Solenoid "B" Electrical (Shift Solenoid Valve SL2)	• Open or short in shift solenoid valve SL2 circuit • Shift solenoid valve SL2 • ECM	●	○
P0793 (DI–735)	Intermediate Shaft Speed Sensor "A"	• Open or short in speed sensor (NC) circuit • Speed sensor (NC) • ECM	●	○

P0982 (DI–728)	Shift Solenoid "B" Control Circuit Low (Shift Solenoid Valve S4)	• Open or short in shift solenoid valve S4 circuit • Shift solenoid valve S4 • ECM	●	○
P0983 (DI–728)	Shift Solenoid "B" Control Circuit High (Shift Solenoid Valve S4)		●	○
P2716 (DI–738)	Pressure Control Solenoid "D" Electrical (Shift Solenoid Valve SLT)	• Open or short in shift solenoid valve SLT circuit • Shift solenoid valve SLT • ECM	●	○
P2769 (DI–742)	Torque Converter Clutch Solenoid Circuit Low (Shift Solenoid Valve DSL)	• Short in shift solenoid valve DSL circuit • Shift solenoid valve DSL • ECM	●	○
P2770 (DI–742)	Torque Converter Clutch Solenoid Circuit High (Shift Solenoid Valve DSL)	• Open in shift solenoid valve DSL circuit • Shift solenoid valve DSL • ECM	●	○

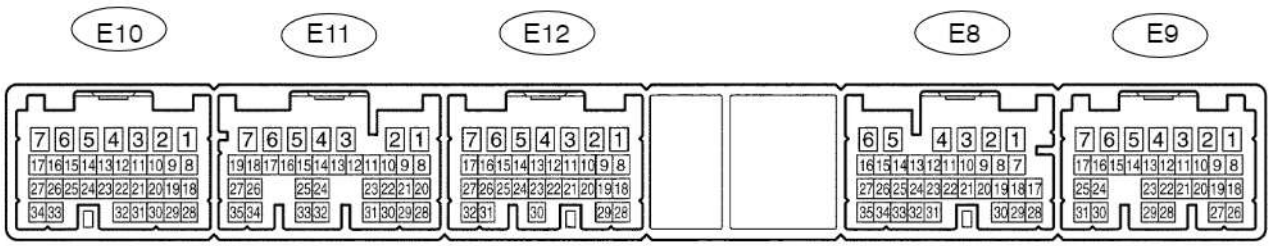
DI8KX-04

PARTS LOCATION



DI4ZQ–10

TERMINALS OF ECM



Each ECM terminals standard normal voltage is shown in the table below. In the table, first follow the information under "Condition".
Look under "Symbols (Terminals No.)" for the terminals to be inspected.
The standard normal voltage between the terminals is shown under "STD Voltage".
Use the illustration above as a reference for the ECM terminals.

Symbols (Terminal No.)	Wiring Color	Condition	STD Voltage
ODLP (E8–7) ⇔ E1 (E12–1)	BR–Y ⇔ BR	O/D main switch ON (O/D OFF)	Below 3 V
		O/D main switch OFF (O/D ON)	9 – 14 V
L (E8–8) ⇔ E1 (E12–1)	Y–B ⇔ BR	IG switch ON and Shift lever L position	10 – 14 V
		IG switch ON and Shift lever other than L position	Below 1 V
2 (E8–9) ⇔ E1 (E12–1)	L–O ⇔ BR	IG switch ON and Shift lever 2 position	10 – 14 V
		IG switch ON and Shift lever other than 2 position	Below 1 V
D (E8–10) ⇔ E1 (E12–1)	L–W ⇔ BR	IG switch ON and Shift lever D position	10 – 14 V
		IG switch ON and Shift lever other than D position	Below 1 V
R (E8–11) ⇔ E1 (E12–1)	R–B ⇔ BR	IG switch ON and Shift lever R position	10 – 14 V
		IG switch ON and Shift lever other than R position	Below 1 V
SPD (E8–17) ⇔ E1 (E12–1)	W–R ⇔ BR	IG switch ON and Turn one front wheel slowly	Pulse signal is output Below 1 ↔ 4–6 V
SFTD (E8–21) ⇔ E1 (E12–1)	P–L ⇔ BR	IG ON and "Down" transmission shift switch pressed	Below 1 V
		IG ON and "Down" transmission shift switch repressed	10 – 14 V
SFTU (E8–22) ⇔ E1 (E12–1)	L–R ⇔ BR	IG ON and "UP" transmission shift switch pressed	Below 1 V
		IG ON and "UP" transmission shift switch repressed	10 – 14 V
P (E9–6) ⇔ E1 (E12–1)	P ⇔ BR	IG switch ON and Shift lever P position	10 – 14 V
		IG switch ON and Shift lever other than P position	Below 1 V
N (E9–7) ⇔ E1 (E12–1)	P–L ⇔ BR	IG switch ON and Shift lever N position	10 – 14 V
		IG switch ON and Shift lever other than N position	Below 1 V
ODMS (E9–16) ⇔ E1 (E12–1)	BR–R ⇔ BR	IG switch ON	10 – 14 V
		IG switch ON and Press continuously O/D main switch	Below 1 V
SLT+ (E10–17) ⇔ SLT– (E10–16)	Y–L ⇔ Y–G	IG switch ON	10 – 14 V
THO (E10–30) ⇔ E2 (E10–28)	GR–L ⇔ BR	ATF temperature: 110 °C (230 °F) or more	Below 1.5 V
DSL (E11–11) ⇔ E1 (E12–1)	P–L ⇔ BR	IG switch ON	Below 1 V
		Vehicle driving under lock–up position	10 – 14 V
S4 (E11–13) ⇔ E1 (E12–1)	Y ⇔ BR	IG switch ON	Below 1 V
		O/D gear	10 – 14 V
		Except O/D gear	Below 1 V

SL2+ (E11–17) ⇔ SL2– (E11–16)	BR–Y ⇔ O	IG switch ON	Below 1 V
		1st or 2nd gear	10 – 14 V
		3rd or O/D gear	Below 1 V
SL1+ (E11–19) ⇔ SL1– (E11–18)	G–R ⇔ V	IG switch ON	10 – 14 V
		1st or 2nd gear	10 – 14 V
		3rd or O/D gear	Below 1 V
NC+ (E11–26) ⇔ NC– (E11–34)	P–B ⇔ G–O	Engine is running	Below 1 and 4 – 5 V
NT+ (E11–27) ⇔ NT– (E11–35)	W–L ⇔ B–R	Engine is running	Below 1 and 4 – 5 V

DI501–06

PROBLEM SYMPTOMS TABLE

If a normal code is displayed during the diagnostic trouble code 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 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 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, check and replace the ECM.

Chapter 1: Electronic circuit matrix chart

Symptom	Suspected Area	See page
No up–shift (A particular gear, from 1st to 3rd gear, is not up–shifted)	ECM	IN–30
No up–shift (3rd → O/D)	2. O/D main switch circuit 3. ECM	DI–746 IN–30
No down–shift (O/D → 3rd)	ECM	IN–30
No down–shift (A particular gear, from 3rd to 1st gear, is not down–shifted)	ECM	IN–30
No lock–up or No lock–up off	ECM	IN–30
Shift point too high or too low	ECM	IN–30
Up–shift to 2nd while in L position	ECM	IN–30
Up–shift to 3rd while in 2 position	ECM	IN–30
Up–shift to O/D from 3rd while O/D main switch is OFF	1. O/D main switch circuit 2. ECM	DI–746 IN–30
Up–shift to O/D from 3rd while engine is cold	ECM	IN–30
Harsh engagement (N → D)	ECM	IN–30
Harsh engagement (Lock–up)	ECM	IN–30
Harsh engagement (Any driving position)	ECM	IN–30
Poor acceleration	ECM	IN–30
Engine stalls when starting off or stopping	ECM	IN–30
No E–shift system	1. E–shift main switch circuit 2. Transmission shift switch circuit 3. ECM	DI–752 DI–749 IN–30

Chapter 2: On–vehicle repair
(★: U240E automatic transaxle repair manual Pub. No. RM740U)

Symptom	Suspected Area	See page
Vehicle does not move in any forward positions and reverse position	1. Manual valve 2. Primary regulator valve 3. Off–vehicle repair matrix chart	★ ★ –
Vehicle does not move in 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)	3–4 shift valve	★
No down–shift (3rd → 2nd)	2–3 shift valve	★
No down–shift (2nd → 1st)	1–2 shift valve	★
No lock–up or No lock–up off	1. Lock–up relay valve 2. Off–vehicle repair matrix chart	★ –
Harsh engagement (N → D)	1. C_1 accumulator 2. Off–vehicle repair matrix chart	★ –
Harsh engagement (N → R)	1. C_2 accumulator 2. Off–vehicle repair matrix chart	★
Harsh engagement (Lock–up)	1. Lock–up relay valve 2. Off–vehicle repair matrix chart	★ –
Harsh engagement (2nd → 3rd)	C_2 accumulator	★
Harsh engagement (3rd → O/D)	B_0 accumulator	★
Harsh engagement (O/D → 3rd)	1. C_0 accumulator 2. B_0 accumulator	★ ★
Slip or shudder (Forward and reverse)	1. Oil strainer 2. Off–vehicle repair matrix chart	★ –
No engine braking (1st: L position)	Off–vehicle repair matrix chart	–
No engine braking (2nd: 2 position)	Off–vehicle repair matrix chart	–
No kick–down	1. 1–2 shift valve 2. 2–3 shift valve 3. 3–4 shift valve	★ ★ ★

Chapter 3: Off–vehicle repair
(★: U240E automatic transaxle repair manual Pub. No. RM740U)

Symptom	Suspected Area	See page
Vehicle does not move in any forward positions and reverse position	1. Front and rear planetary gear 2. U/D planetary gear 3. U/D one–way clutch (F_2) 4. Forward clutch (C_1) 5. U/D brake (B_3)	★ ★ ★ ★ ★
Vehicle does not move in R position	1. Front and rear planetary gear unit 2. U/D planetary gear unit 3. Direct clutch (C_2) 4. U/D brake (C_3) 5. 1st & reverse brake (B_2)	★ ★ ★ ★ ★
No up–shift (1st → 2nd)	1. No. 1 one–way clutch (F_1) 2. 2nd brake (B_1)	★ ★
No up–shift (2nd → 3rd)	Direct clutch (C_2)	★
No up–shift (3rd → O/D)	U/D clutch (C_3)	★
No lock–up or No lock–up off	Torque converter clutch	AX–36
Harsh engagement (N → D)	1. Forward clutch (C_1) 2. U/D one–way clutch (F_2) 3. No. 1 one–way clutch (F_1)	★ ★ ★
Harsh engagement (N → R)	1. Direct clutch (C_2) 2. 1st & reverse brake (B_2)	★ ★
Harsh engagement (Lock–up)	Torque converter clutch	AX–36
Slip or shudder (Forward position: After warm–up)	1. Torque converter clutch 2. Forward clutch (C_1) 3. Direct clutch (C_2) 4. U/D brake (C_3) 5. No. 1 one–way clutch (F_1) 6. U/D one–way clutch (F_2)	AX–36 ★ ★ ★ ★ ★
Slip or shudder (R position)	1. Direct clutch (C_2) 2. 1st & reverse brake (B_2)	★ ★
Slip or shudder (1st)	No. 1 one–way clutch (F_1)	★
Slip or shudder (2nd)	1. U/D one–way clutch (F_2) 2. 2nd brake (B_1)	★ ★
Slip or shudder (3rd)	Direct clutch (C_2)	★
Slip or shudder (O/D)	U/D clutch (C_3)	★
No engine braking (1st – 3rd: D position)	U/D brake (B_3)	★
No engine braking (1st: L position)	1st & reverse brake (B_2)	★
No engine braking (2nd: 2 position)	2nd brake (B_1)	★
Poor acceleration (All position)	1. Torque converter clutch 2. U/D planetary gear	AX–36 ★
Poor acceleration (O/D)	1. U/D clutch (C_3) 2. U/D planetary gear	★ ★
Large shift shock or engine stalls when starting off or stopping	Torque converter clutch	AX–36

DI4ZS-10

CIRCUIT INSPECTION

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.
The ECM receives signals (P, R, N, D 2 and L) from the park/neutral position switch.

DTC No.	DTC Detection Condition	Trouble Area
P0705	Two or more of the following signals are detected at the same time for 0.5 seconds or more. (b) P range signal ON (c) R range signal ON (d) N range signal ON (e) D range signal ON (f) M range signal ON (g) 2 range signal ON (h) L range signal ON	• Short in park/neutral position switch circuit • Park/neutral position switch • E–shift main switch circuit • Multiplex communication circuit • 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	0.5 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever the following DTCs are not present.	See page DI–669	
The typical enabling condition is not available.	–	

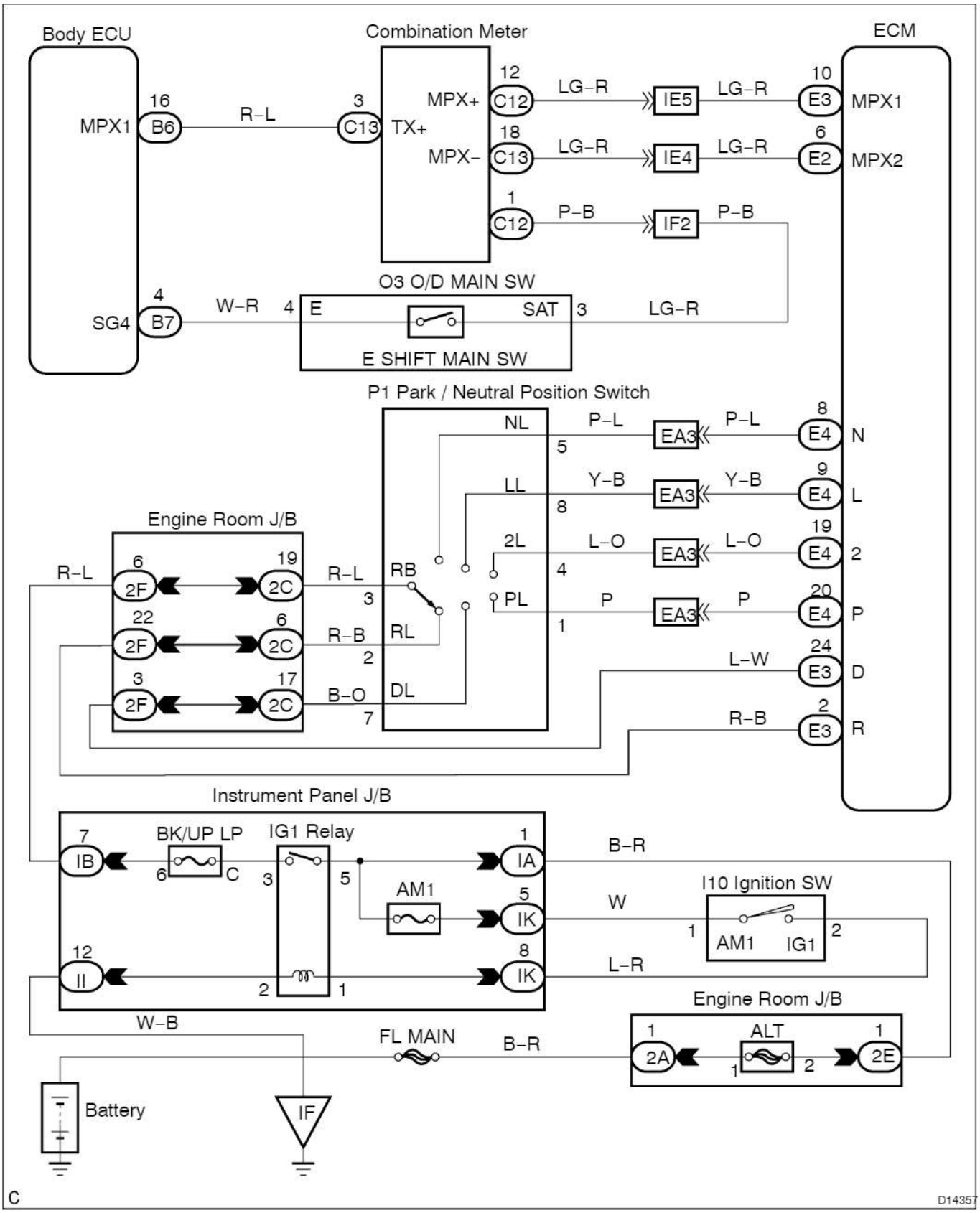
TYPICAL MALFUNCTION THRESHOLDS

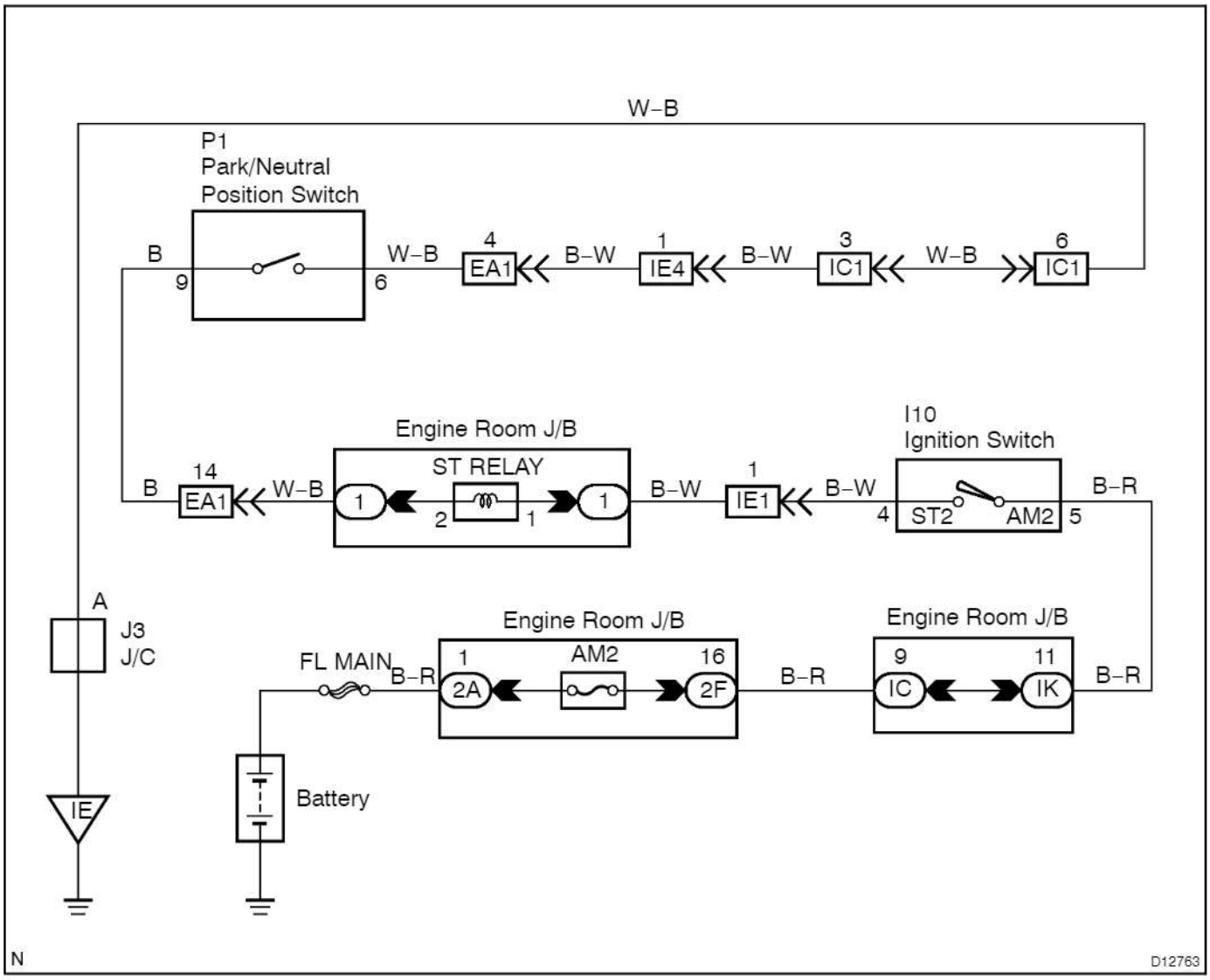
Detection criteria	Threshold
Either of the following conditions is met: Condition (A) or (B)	
Condition (A)	
Number of the following signal input at the same time	2 or more
P switch	ON
R switch	
N switch	
D switch	
2 switch	
L switch	
Condition (B)	
When shift lever is in M position, one of following conditions is met.	
P switch	ON
R switch	
N switch	
2 switch	
L switch	

COMPONENT OPERATING RANGE

Parameter	Standard value
Park/neutral position switch	The park/neutral position switch sends only one signal to the ECM

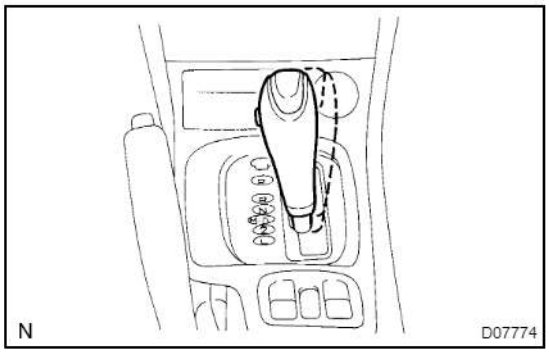
WIRING DIAGRAM




W–B
P1
Park/Neutral
Position Switch
B
9
W–B
6
4
EA1
B–W
1
IE4
B–W
3
IC1
W–B
6
IC1
Engine Room J/B
ST RELAY
B
14
EA1
W–B
1
2
1
1
B–W
1
IE1
B–W
I10
Ignition Switch
4
ST2
AM2
5
B–R
A
J3
J/C
IE
FL MAIN
B–R
Engine Room J/B
1
2A
AM2
16
2F
B–R
Engine Room J/B
9
IC
11
IK
B–R
Battery
N
D12763

INSPECTION PROCEDURE

1	**Check operation of M indicator light.**



PREPARATION:

Turn the ignition switch ON.

CHECK:

Check the M indicator light on the combination meter when shift lever is moved to D range and M range.

OK:

Shift Lever Position	Specified Condition
M	"M" indicator light comes on
Except M	"M" indicator light goes off

NG → **Go to step 2**

OK →

Go to step 4

2	**Check the E–shift main switch circuit (See page DI–752).**

NG → **Repair E–shift main switch circuit.**

OK →

3	**Check multiplex communication circuit (See page DI–1184).**

NG → **Repair multiplex communication circuit.**

OK →

4	Read PNP, REVERSE, 2ND and LOW signals.

When using TOYOTA hand–held tester:

PREPARATION:

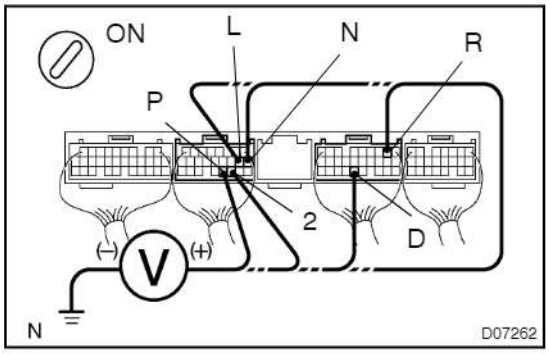
(a) Remove the DLC3 cover.
(b) Connect a TOYOTA hand–held tester to the DLC3.
(c) Turn the ignition switch ON and TOYOTA hand–held tester main switch ON.

CHECK:

Shift lever into the P, R, N, D, 2 and L positions, and read the NSW, REVERSE, 2ND DRIVE and LOW signals on the TOYOTA hand–held tester.

OK:

Shift position	Signal
2	2ND OFF → ON
L	LOW OFF → ON
D	DRIVE OFF → ON
R	REVERSE OFF → ON
P, N	NSW OFF → ON



When not using TOYOTA hand–held tester:

PREPARATION:

Turn the ignition switch ON.

CHECK:

Measure voltage between terminals P, R, N, D, 2 and L of ECM and body ground when the shift lever is shifted to the following positions.

OK:

Position	P–Body ground	R–Body ground	N–Body ground	D–Body ground	2–Body ground	L–Body ground
P	9 – 14 V	0 V	0 V	0 V	0 V	0 V
R	0 V	9 – 14 V	0 V	0 V	0 V	0 V
N	0 V	0 V	9 – 14 V	0 V	0 V	0 V
D	0 V	0 V	0 V	9 – 14 V	0 V	0 V
2	0 V	0 V	0 V	0 V	9 – 14 V	0 V
L	0 V	0 V	0 V	0 V	0 V	9 – 14 V

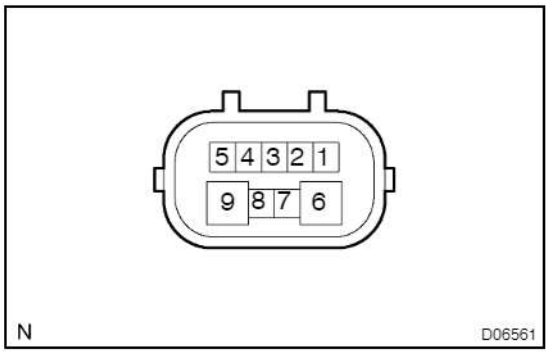
HINT:

*: The voltage will drop slightly due to lighting up of the back up light.

OK → **Check and replace the ECM (See page IN–30).**

NG

5	Check park/neutral position switch.



PREPARATION:

Remove the park/neutral position switch.

CHECK:

Check continuity between each terminal shown below when the shift lever is moved to each position.

Shift position	Terminal No. to continuity	
P	6 – 9	1 – 3
R	2 – 3	–
N	6 – 9	3 – 5
D	3 – 7	–
2	3 – 4	–
L	3 – 8	–

OK:

There is continuity.

NG → **Replace the park/neutral position switch.**

OK

Repair or replace harness or connector between battery and park/neutral position switch, park/neutral position switch and ECM (See page IN–30).

DI500-09

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 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 momentarily 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 detects an open or short 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 (TFT sensor)	
Frequency of operation	Continuous	
Duration	0.5 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present.	See page DI–669	
Range check (Fluttering, Low resistance)		
The typical enabling condition is not available.	–	–
Range check (High resistance)		
Time after engine start	15 min. or more	–

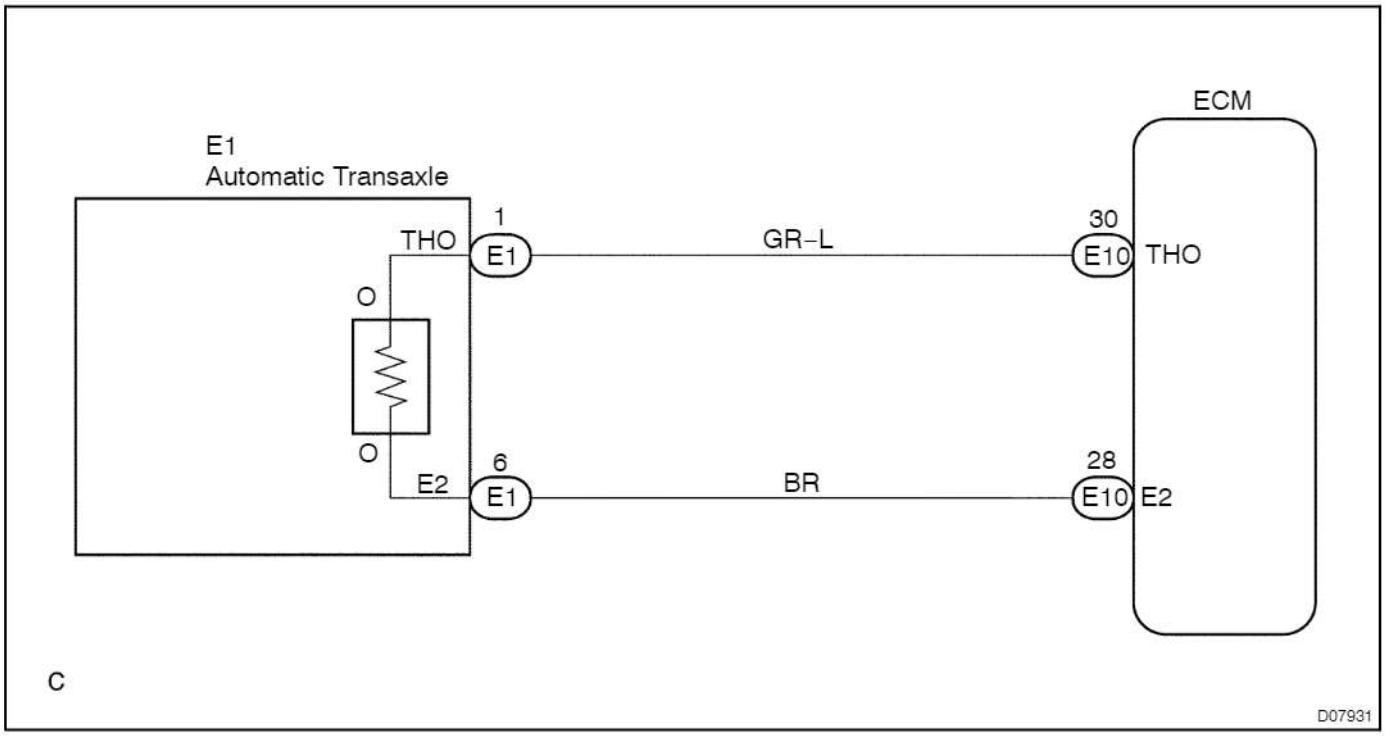
TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
Range check (Fluttering)	
TFT (transmission fluid temperature) sensor resistance	Less than 79 Ω or More than 156 kΩ
Range check (Low resistance)	
TFT sensor resistance	Less than 79 Ω
Range check (High resistance)	
TFT sensor resistance	More than 156 kΩ

COMPONENT OPERATING RANGE

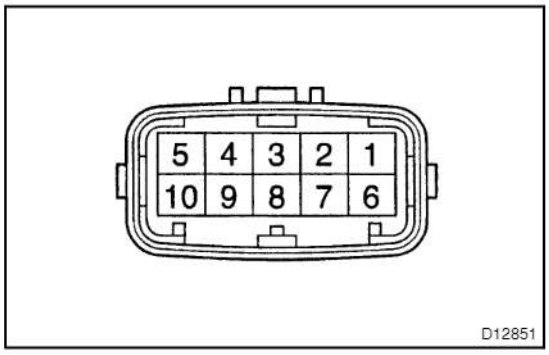
Parameter	Standard value
TFT sensor	Atmospheric temperature to approx. 130°C (266°F)

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check ATF temperature sensor.**



PREPARATION:

Disconnect the transmission wire connector.

CHECK:

Measure resistance between terminals 1 and 6 of transmission wire connector.

OK:

90 Ω to 156 kΩ

HINT:

Refer to the table below for resistance values according to ATF temperature.

ATF temperature	Specified condition
10°C (50°F)	6.4 kΩ
25°C (77°F)	3.5 kΩ
110°C (230°F)	0.2 kΩ

Measure resistance between terminals 1 and 6 of the transmission wire connector and body ground.

OK:

Resistance: 1 MΩ or higher

NG	**Replace the ATF temperature sensor (transmission wire).**

OK

2	**Check harness and connector between ATF temperature sensor and ECM (See page IN–30).**

NG → **Repair or replace the harness or connector.**

OK

Check and replace the ECM (See page IN–30).

DIC6D-02

DTC	P0711	Transmission Fluid Temperature Sensor "A" Performance

CIRCUIT DESCRIPTION

The ATF temperature sensor converts 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 (b) After normal driving for over 17 min. and 9 km (6 miles), ATF temp. is less than 10°C	• Open or short in ATF temperature sensor circuit • ATF temperature sensor • 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 open or short 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.

When the ATF temperature is 110°C (230°F) or more after 17 minutes of engine cold start, the ECM also determines this as a fault, turns on the MIL, and stores the DTC.

MONITOR STRATEGY

Related DTCs	P0711	ATF temperature sensor "A"/Rationality check
Required sensors/Components	Main	ATF temperature sensor (TFT sensor)
Required sensors/Components	Sub	ECT sensor, IAT sensor
Frequency of operation	Continuous	
Duration	3 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present.	See page DI–669	
ECT (Engine coolant temperature)	–15°C (5°F) or more	–
Time after engine start	16 min. and 40 sec. or more	–
TFT (transmission fluid temperature) sensor circuit	Not circuit malfunction	
ECT sensor circuit	Not circuit malfunction	
IAT (Intake air temperature) sensor circuit	Not circuit malfunction	
Time after engine start	18 min. and 20 sec.	
Driving distance after engine start	9 km (5.6 mile) or more	–

IAT (12 sec. after engine start)	–10°C (14°F) or more	–
ECT (12 sec. after engine start)	–10°C (14°F) or more	–

TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
TFT (transmission fluid temperature)	Less than 10°C (50°F)

COMPONENT OPERATING RANGE

Parameter	Standard value
TFT (transmission fluid temperature)	Atmospheric temperature to approx. 130°C (266°F)

WIRING DIAGRAM

See page DI–706.

INSPECTION PROCEDURE

1	**Check other DTCs output (in addition to DTC P0711)**

PREPARATION:

(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 to the ON position.
(e) Push the "ON" button of the OBD II scan tool or the hand–held tester.
(f) Select the item "DIAGNOSIS/ENHANCED OBD II/DTC INFO/CURRENT CODES".

CHECK:

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 DI–693).**

A

2	**Check transaxle fluid level (See page DI–669).**

NG → **Add fluid (See page DI–669).**

OK

Replace the transmission wire (ATF temperature sensor) (See page AX–6).

DIC6E-02

DTC	P0717	Turbine Speed Sensor Circuit No Signal

CIRCUIT DESCRIPTION

This sensor detects the rotation speed of the input turbine. By comparing the input turbine speed signal (NT) with the counter gear speed sensor signal (NC), the ECM detects the shift timing of the gears and appropriately controls the engine torque and hydraulic pressure in response to various conditions, thus performing smooth gear shifting.

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: 2nd, 3rd, 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 input turbine (NT) speed sensor circuit • Input turbine (NT) speed sensor • ECM • Automatic transaxle assembly

MONITOR DESCRIPTION

The NT terminal of the ECM detects the revolving signal from speed sensor (NT) (input RPM). The ECM outputs a gearshift signal comparing the speed sensor (NT) with the speed sensor (NC).
While the vehicle is operating in the 2nd, 3rd or O/D gear position in the shift position of D, if the input shaft revolution is less than 300 rpm*1 although the output shaft revolution is more than 1,000 rpm*2, the ECM detects the trouble, illuminates the MIL and stores the DTC.
*1: Pulse is not output or is irregularly output.
*2: The vehicle speed is 50 km/h (31 mph) or more.

MONITOR STRATEGY

Related DTCs	P0717	Input/Turbine speed sensor/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	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present.	See page DI–669	
Shift change	Shift change is completed before starting next shift change operation	
ECM selected gear	2nd, 3rd, 4th or 5th	
Output shaft rpm	1,000 rpm or more	–
NSW switch	OFF	
R switch	OFF	
L switch	OFF	
Engine	Running	

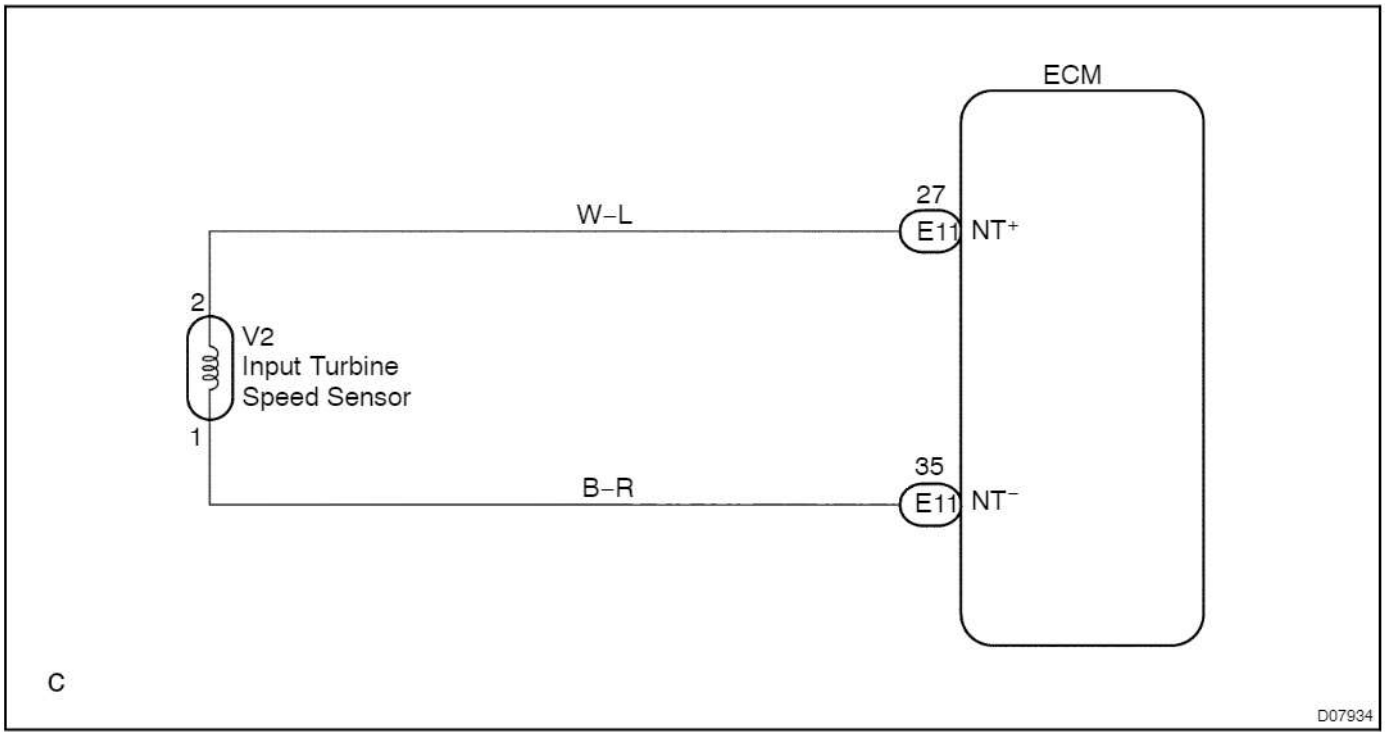
TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
Sensor signal rpm	Less than 300 rpm

COMPONENT OPERATING RANGE

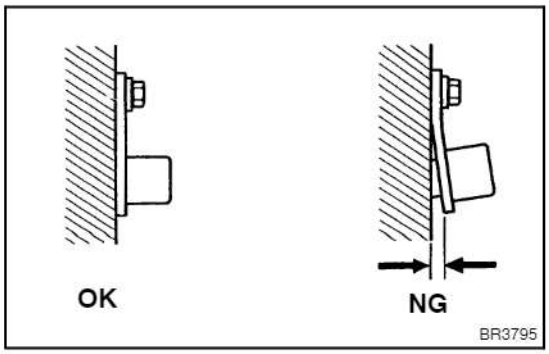
Parameter	Standard value
Speed sensor (NT)	Turbine speed is equal to engine speed when lock–up ON.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check speed sensor (NT) installation.**

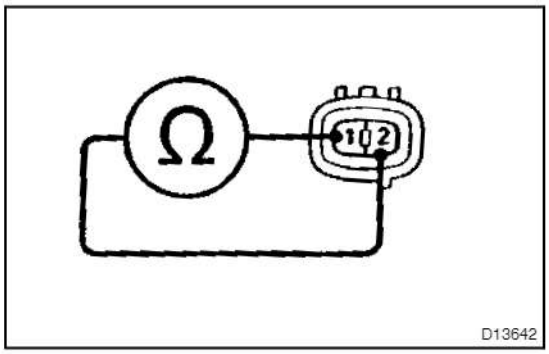


CHECK:
Check the speed sensor installation.
OK:
The installation bolt is tightened properly and there is no clearance between the sensor and transaxle case.

NG → **Tighten the speed sensor (NT) properly.**

OK

2	**Check speed sensor (NT) .**



PREPARATION:
Remove the NT speed sensor from transaxle.
CHECK:
Measure resistance between terminals 1 and 2 of speed sensor.
OK:
Resistance: 620 ± 60 Ω at 20 °C (68 °F)

NG → **Replace the speed sensor NT.**

OK

3	**Check harness and connector between ECM and speed sensor NT (See page IN–30).**

NG → **Repair or replace harness and connector.**

OK

Check and replace the ECM (See page IN–30).

DI4Z1-07

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 operated, this switch sends a signals to ECM. Then the ECM cancels 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)) 5 times for two driving cycles in order to detect malfunction.

MONITOR STRATEGY

Related DTCs	P0724	Stop light switch/Range check/Rationality
Required sensors/Components	Main	Stop light switch
Required sensors/Components	Sub	Vehicle speed sensor
Frequency of operation	Continuous	
Duration	GO and STOP 5 times	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present.	See pageDI–669	
GO (Vehicle speed is 30 km/h (18.63 mph) or more)	Once	
STOP (Vehicle speed is less than 3 km/h (1.86 mph))	Once	
Battery voltage	8 V or more	–
Starter	OFF	
Ignition switch	ON	

TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
Brake switch	Remain ON during GO and STOP 5 times

WIRING DIAGRAM

See page DI–556.

INSPECTION PROCEDURE

1	**Check stop light switch (See page BE–37).**

NG → **Replace stop light switch.**

OK

2	**Check harness and connector between ECM and stop light switch (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Check and replace the ECM (See page IN–30).

DI4ZX-09

DTC	P0741	Torque Converter Clutch Solenoid Performance (Shift Solenoid Valve DSL)

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 DSL, valve body and torque converter clutch.

DTC No.	DTC Detecting 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 DSL 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 speed sensor (NT), speed sensor (NC), engine rpm, engine load, engine temperature, vehicle speed, 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 turbine rpm (NT). The ECM calculates the actual transmission gear by comparing input turbine rpm (NT) to counter gear rpm (NC). When conditions are appropriate, the ECM requests "lock–up" by applying control voltage to shift solenoid DSL. When the DSL is turned on, solenoid DSL 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 torque converter clutch 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 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 speed is less than 35 rpm.)

MONITOR STRATEGY

Related DTCs	P0741	Shift solenoid valve DSL/OFF malfunction
		Shift solenoid valve DSL/ON malfunction
Required sensors/Components	Main	Shift solenoid valve DSL, Speed sensor (NT), Speed sensor (NC), Crankshaft position sensor (NE)
Required sensors/Components	Sub	Throttle position sensor (VPA1), Mass air flow meter (MAF), ATF temperature sensor (THO1), Engine coolant temperature sensor (ECT)
Frequency of operation	Continuous	
Duration	OFF malfunction	3.5 sec.
	ON malfunction (A)	1.8 sec.
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

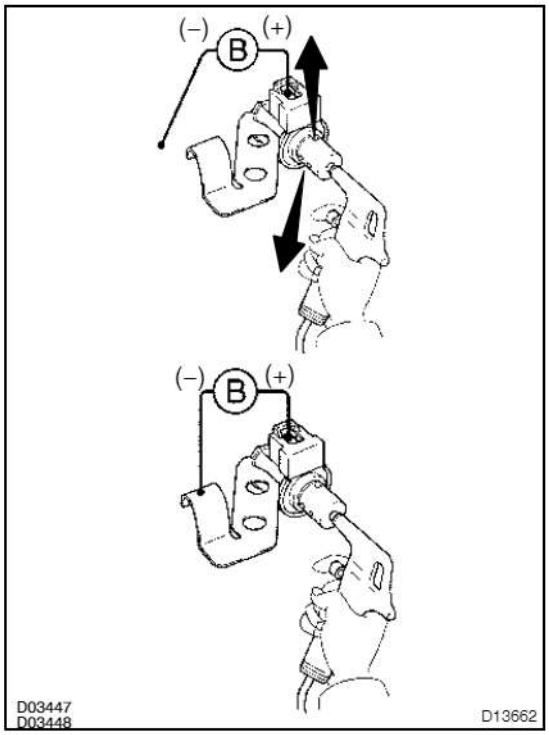
Item	Specification	
	Minimum	Maximum
ALL		
ECT (Engine Coolant Temperature)	60°C (140°F) or more	–
Transmission range	"D"	
TFT (transmission fluid temperature)	–20°C (–4°F) or more	–
TFT sensor circuit	Not circuit malfunction	
ECT sensor circuit	Not circuit malfunction	
Turbine speed sensor circuit	Not circuit malfunction	
Intermediate shaft speed sensor circuit	Not circuit malfunction	
Output speed sensor circuit	Not circuit malfunction	
Shift solenoid valve SL1 circuit	Not circuit malfunction	
Shift solenoid valve SL2 circuit	Not circuit malfunction	
Shift solenoid valve S4 circuit	Not circuit malfunction	
Shift solenoid valve DSL circuit	Not circuit malfunction	
Electronic throttle system	Not circuit malfunction	
OFF malfunction		
ECM lock–up command	ON	
ECM selected gear	3rd or 4th	
Vehicle speed	25 km/h (15.5 mph) or more	–
ON malfunction		
ECM lock–up command	OFF	
ECM selected gear	3rd or 4th	
Throttle valve opening angle	8% or more	–
Vehicle speed	25 to 60 km/h (15.5 to 37.2 mph)	

TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
Either of the following conditions is met: OFF malfunction or ON malfunction	
OFF malfunction	
Engine speed – Input (turbine) speed	100 rpm or more
ON malfunction	
Difference between engine speed and input (turbine) speed	Less than 35 rpm
2 detections are necessary per driving cycle: 1st detection; temporary flag ON 2nd detection; pending fault code ON Vehicle speed must be under 10 km/h (6.2 mph) once before 2nd detection	

INSPECTION PROCEDURE

1	**Check solenoid valve DSL operation.**



PREPARATION:

(a) Remove the oil pan.

(b) Remove the shift solenoid valve DSL.

CHECK:

(a) Applying 490 kPa (5 kgf/cm^2, 71 psi) of compressed air, check that the solenoid valve does leak air.

(b) When battery voltage is supplied to the shift solenoid valve, check that the solenoid valve closes.

OK:

(a) Solenoid valve does leak air.

(b) Solenoid valve closes.

NG → **Replace the solenoid valve DSL.**

OK

2	Check valve body (See page DI–698).

NG → Repair or replace the valve body.

OK →

Replace the torque converter clutch (See page AX–30).

DTC	P0746	Pressure Control Solenoid "A" Performance (Shift Solenoid Valve SL1)

DTC	P0766	Shift Solenoid "D" Performance (Shift Solenoid Valve S4)

DTC	P0776	Pressure Control Solenoid "B" Performance (Shift Solenoid Valve SL2)

SYSTEM DESCRIPTION

The ECM uses signals from the vehicle 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 trouble of the shift solenoid valves and valve body.

DTC No.	DTC Detecting Condition	Trouble Area
P0746 P0766 P0776	During normal driving, the gear required by the ECM does not match the actual gear (2–trip detection logic)	• Shift solenoid valve SL1/SL2/S4 is stuck open or closed • Valve body is blocked up or stuck

HINT:
Check the shift solenoid valve SL1 when DTC P0746 is output, check the shift solenoid valve SL2 when DTC P0776 is output and check shift solenoid S4 when DTC P0766 is output.

MONITOR DESCRIPTION

P0746

The ECM commands gear shifts by turning the shift solenoid valves "ON/OFF". According to the input shaft revolution, intermediate (counter) 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 the same, the ECM illuminates the MIL.
Example:
When either condition (a) or (b) is met, the ECM detects a malfunction.
(a) The ECM commands the 1st gear, but the actual gear is 2nd.
(b) The ECM commands the 2nd gear, but the actual gear is 1st.

P0766, P0776

The ECM commands gear shifts by turning the shift solenoid valves "ON/OFF". According to the input shaft revolution, intermediate (counter) 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 the same, the ECM illuminates the MIL and stores the DTC.

MONITOR STRATEGY

P0746

Related DTCs	P0746	Shift solenoid valve SL1/OFF malfunction
		Shift solenoid valve SL1/ON malfunction
Required sensors/Components	Main	Shift solenoid valve SL1, Speed sensor (NT), Speed sensor (NC), Crankshaft position sensor (NE)
Required sensors/Components	Sub	ECT sensor, ATF temperature sensor, Throttle position sensor, Vehicle speed sensor
Frequency of operation	Continuous	
Duration	OFF malfunction, ON malfunction (A)	0.8 sec.
	ON malfunction (B)	1 sec.
MIL operation	2 driving cycles	
Sequence of operation	None	

P0766

Related DTCs	P0766	Shift solenoid valve S4/ON malfunction
		Shift solenoid valve S4/OFF malfunction
Required sensors/Components	Main	Shift solenoid valve S4, Speed sensor (NT), Speed sensor (NC), Crankshaft position sensor (NE)
Required sensors/Components	Sub	ECT sensor, ATF temperature sensor, Throttle position sensor, Vehicle speed sensor
Frequency of operation	Continuous	
Duration	1 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

P0776

Related DTCs	P0776	Shift solenoid valve SL2/OFF malfunction
		Shift solenoid valve SL2/ON malfunction
Required sensors/Components	Main	Shift solenoid valve SL2
Required sensors/Components	Sub	ECT sensor, ATF temperature sensor, Throttle position sensor, Vehicle speed sensor
Frequency of operation	Continuous	
Duration	0.8 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

P0746

Item	Specification	
	Minimum	Maximum
ALL		
ECT (Engine Coolant Temperature)	60°C (140°F) or more	–
Transmission range	"D"	
TFT (transmission fluid temperature)	–20°C (–4°F) or more	–
TFT sensor circuit	Not circuit malfunction	
ECT sensor circuit	Not circuit malfunction	
Turbine speed sensor circuit	Not circuit malfunction	
Intermediate shaft speed sensor circuit	Not circuit malfunction	
Output speed sensor circuit	Not circuit malfunction	
Shift solenoid valve SL1 circuit	Not circuit malfunction	
Shift solenoid valve SL2 circuit	Not circuit malfunction	
Shift solenoid valve S4 circuit	Not circuit malfunction	
Electronic throttle system	Not circuit malfunction	
OFF malfunction		
ECM selected gear	1st	
Vehicle speed	10 to 40 km/h (6.2 to 24.9 mph)	
Throttle valve opening angle	4.5% or more at engine speed 1,900 rpm (varies with engine speed)	–
ON malfunction (A)		
ECM selected gear	2nd	
Vehicle speed	10 km/h (6.2 mph) or more	–
Throttle valve opening angle	4.5% or more at engine speed 1,900 rpm (varies with engine speed)	–
ON malfunction (B)		
ECM lock–up command	OFF	
ECM selected gear	3rd or 4th	

P0766

Item	Specification	
	Minimum	Maximum
All		
ECT (Engine Coolant Temperature)	60°C (140°F) or more	–
Transmission range	"D"	
TFT (transmission fluid temperature)	–20°C (–4°F) or more	–
TFT sensor circuit	Not circuit malfunction	
ECT sensor circuit	Not circuit malfunction	
Turbine speed sensor circuit	Not circuit malfunction	
Intermediate shaft speed sensor circuit	Not circuit malfunction	
Output speed sensor circuit	Not circuit malfunction	
Shift solenoid valve SL1 circuit	Not circuit malfunction	
Shift solenoid valve SL2 circuit	Not circuit malfunction	

Shift solenoid valve S4 circuit	Not circuit malfunction	
Electronic throttle system	Not circuit malfunction	
OFF malfunction		
ECM selected gear	4th	
Throttle valve opening angle	7% or more	–
Vehicle speed	10 km/h (6.2 mph) or more	–
ON malfunction		
ECM selected gear	3rd	
Throttle valve opening angle	7% or more	–
Vehicle speed	10 km/h (6.2 mph) or more	–

P0776

Item	Specification	
	Minimum	Maximum
ALL		
ECT (Engine Coolant Temperature)	60°C (140°F) or more	–
Transmission range	"D"	
TFT (transmission fluid temperature)	–20°C (4°F) or more	–
TFT sensor circuit	Not circuit malfunction	
ECT sensor circuit	Not circuit malfunction	
Turbine speed sensor circuit	Not circuit malfunction	
Intermediate shaft speed sensor circuit	Not circuit malfunction	
Output speed sensor circuit	Not circuit malfunction	
Shift solenoid valve SL1 circuit	Not circuit malfunction	
Shift solenoid valve SL2 circuit	Not circuit malfunction	
Shift solenoid valve S4 circuit	Not circuit malfunction	
Electronic throttle system	Not circuit malfunction	
OFF malfunction		
ECM selected gear	1st	
Vehicle speed	10 to 40 km/h (6.2 to 24.9 mph)	
Throttle valve opening angle	4.5% or more at engine speed 1,900 rpm (varies with engine speed)	–
Throttle valve opening angle	15 % or more	–
ON malfunction		
ECM selected gear	3rd or 4th	
Vehicle speed	10 km/h (6.2 mph) or more	–
Throttle valve opening angle	4.5% or more at engine speed 1,900 rpm (vary with engine speed)	–

TYPICAL MALFUNCTION THRESHOLDS

P0746

Detection criteria	Threshold
Either of the following conditions is met: OFF malfunction, or ON malfunction (A) and (B)	
2 detections are necessary per driving cycle: 1st detection; temporary flag ON 2nd detection; pending fault code ON	
OFF malfunction	
Input (turbine) speed/Intermediate shaft speed	1.49 to 1.63
ON malfunction (A)	
Input (turbine) speed/Intermediate shaft speed	2.72 to 2.86
ON malfunction (B)	
Engine speed – Input (turbine) speed	250 rpm or more

P0766

Detection criteria	Threshold
Either of the following conditions is met: OFF malfunction or ON malfunction	
2 detections are necessary per driving cycle: 1st detection; temporary flag ON 2nd detection; pending fault code ON	
OFF malfunction	
Intermediate shaft speed/Output speed	1.34 to 1.48
ON malfunction	
Intermediate shaft speed/Output speed	0.95 to 1.09

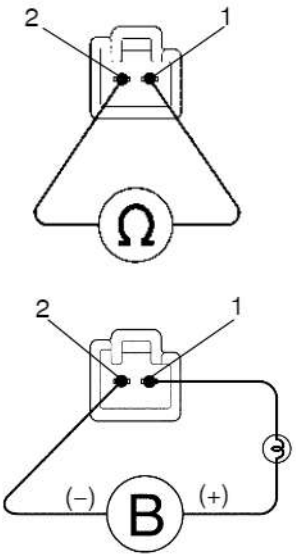
P0776

Detection criteria	Threshold
Either of the conditions is met: OFF malfunction or ON malfunction	
2 detections are necessary per driving cycle: 1st detection; temporary flag ON 2nd detection; pending fault code ON	
OFF malfunction	
Input (turbine) speed/Intermediate shaft speed	0.93 to 1.07
ON malfunction	
Input (turbine) speed/Intermediate shaft speed	1.49 to 1.63

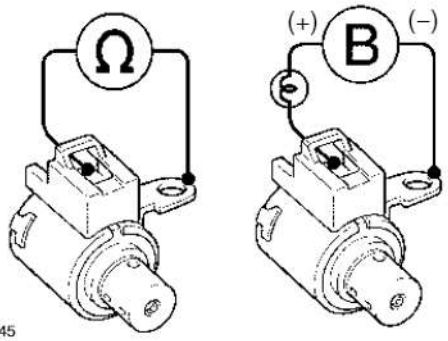
INSPECTION PROCEDURE

1	**Check shift solenoid valve SL1, SL2 or S4 operation.**

Shift solenoid valve SL1 and SL2



Shift solenoid valve S4



D03445
D03446
D03424 D03423
D03724

PREPARATION:

(a) Jack up the vehicle.
(b) Remove the oil pan.
(c) Remove the shift solenoid valve SL1, SL2 or S4.

CHECK:

Check Solenoid Resistance:

(a) Shift solenoid valve SL1 or SL2:
Measure resistance between terminals 1 and 2 of solenoid connector.
(b) Shift solenoid valve S4:
Measure resistance between terminal 1 of solenoid connector and solenoid body.

Check Solenoid Operation:

(a) Shift solenoid valve SL1 or SL2:
Connect the positive (+) lead with an 23W bulb to terminal 1 and the negative (–) lead to terminal 2 of solenoid connector, then check the movement of the valve.
(b) Shift solenoid valve S4:
Connect the positive (+) lead with an 23W bulb to terminal 1 of solenoid connector and the negative (–) lead to the solenoid valve body, then check the movement of the valve.

OK:

Resistance: 5.1 – 5.5 Ω
The shift solenoid valve makes operation noise.

NG → **Replace the shift solenoid valve SL1, SL2 or S4.**

OK

Check the valve body (See page DI–698).

DTC	P0748	Presser Control Solenoid "A" Electrical (Shift Solenoid Valve SL1)

DTC	P0778	Presser Control Solenoid "B" Electrical (Shift Solenoid Valve SL2)

DTC	P0982	Shift Solenoid "D" Control Circuit Low (Shift Solenoid Valve S4)

DTC	P0983	Shift Solenoid "D" Control Circuit High (Shift Solenoid Valve S4)

CIRCUIT DESCRIPTION

Shifting from 1st to O/D is performed in combination with ON and OFF of the shift solenoid valves 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).

DTC No.	DTC Detecting Condition	Trouble Area
P0748 P0778	The ECM checks for an open or short circuit in the shift solenoid valves SL1 and SL2. (a) When the solenoid is energized, the duty ratio exceed 75 %. (b) When the solenoid is not energized, the duty ratio is less than 3 %.	• Open or short in shift solenoid valve SL1/SL2 circuit • Shift solenoid valve SL1/SL2 • ECM
P0982	ECM detects short in solenoid valve No. 2 circuit 2 times when solenoid valve No. 2 is operated (2–trip detection logic).	• Short in shift solenoid valve No. 4 circuit • Shift solenoid valve No. 4 • ECM
P0983	ECM detects open in solenoid valve No. 2 circuit 2 times when solenoid valve No. 2 is not operated (2–trip detection logic).	• Open in shift solenoid valve No. 4 circuit • Shift solenoid valve No. 4 • ECM

HINT:

Check the shift solenoid valve SL1 when DTC P0748 is output, check the shift solenoid valve SL2 when DTC P0778 is output and check the shift solenoid valve S4 when DTCs P0982 and P0983 are output.

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. The ECM also turns the shift solenoid valve DSL OFF at the same time. If both solenoids are malfunction, hydraulic control cannot be performed electronically and 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).

NORMAL				SHIFT SOLENOID SL1 MALFUNCTIONING								SHIFT SOLENOID SL2 MALFUNCTIONING			
				Driving at 3rd or O/D				Driving at 1st or 2nd							
Solenoid Valve			Gear	Solenoid Valve			Gear	Solenoid Valve			Gear	Solenoid Valve			Gear
SL1	SL2	S4		SL1	SL2	S4		SL1	SL2	S4		SL1	SL2	S4	
ON	ON	OFF	1st	X	ON → OFF	OFF	3rd	X	ON	OFF	2nd	ON → OFF	X	OFF	3rd
OFF	ON	OFF	2nd	X	ON → OFF	OFF	3rd	X	ON	OFF	2nd	OFF	X	OFF	3rd
	OFF	OFF	3rd	X	OFF	OFF	3rd	X	OFF → ON	OFF → ON	3rd		X	OFF	3rd
	OFF	ON	O/D	X	OFF	ON	O/D	X	OFF → ON	ON	3rd		X	ON	O/D

SHIFT SOLENOID S4 MALFUNCTIONING				SHIFT SOLENOID SL1 AND SL2 MALFUNCTIONING				SHIFT SOLENOID SL1 AND S4 MALFUNCTIONING							
								Driving at 3rd or O/D				Driving at 1st or 2nd			
Solenoid Valve			Gear	Solenoid Valve			Gear	Solenoid Valve			Gear	Solenoid Valve			Gear
SL1	SL2	S4		SL1	SL2	S4		SL1	SL2	S4		SL1	SL2	S4	
ON	ON	X	1st	X	X	OFF	3rd	X	ON → OFF	X	3rd	X	ON	X	2nd
OFF	ON	X	2nd	X	X	OFF	3rd	X	ON → OFF	X	3rd	X	ON	X	2nd
	OFF	X	3rd	X	X	OFF	3rd	X	OFF	X	3rd	X	OFF → ON	X	2nd
	OFF	X	3rd	X	X	ON	O/D	X	OFF	X	3rd	X	OFF → ON	X	2nd

SHIFT SOLENOID SL2 AND S4 MALFUNCTIONING				SHIFT SOLENOID SL1, SL2 AND S4 MALFUNCTIONING			
Solenoid Valve			Gear	Solenoid Valve			Gear
SL1	SL2	S4		SL1	SL2	S4	
ON → OFF	X	X	3rd	X	X	X	3rd
OFF	X	X	3rd	X	X	X	3rd
	X	X	3rd	X	X	X	3rd
	X	X	3rd	X	X	X	3rd

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

P0748, P0778

Related DTCs	P0748	Shift solenoid valve SL1/Range check
	P0778	Shift solenoid valve SL2/Range check
Required sensors/Components	P0748: Shift solenoid valve SL1	
	P0778: Shift solenoid valve SL2	
Frequency of operation	Continuous	
Duration	1 sec.	
MIL operation	Immediate	
Sequence of operation	None	

P0982, P0983

Related DTCs	P0982	Shift solenoid valve S4/Range check (Low resistance)
	P0983	Shift solenoid valve S4/Range check (High resistance)
Required sensors/Components	Shift solenoid valve S4	
Frequency of operation	Continuous	
Duration	0.064 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

P0748, P0778

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present.	See page DI–669	
Solenoid current cut status	Not cut	
Battery voltage	11 V or more	–
CPU commanded duty	19 % or more	–
Ignition switch	ON	
Starter	OFF	

P0982, P0983

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present.	See page DI–669	
Range check (Low resistance)		
Shift solenoid valve	ON	
Battery voltage	8 V or more	–
Ignition switch	ON	
Starter	OFF	
Range check (High resistance)		
Shift solenoid valve	OFF	
Battery voltage	8 V or more	–
Ignition switch	ON	
Starter	OFF	

TYPICAL MALFUNCTION THRESHOLDS

P0748, P0778

Detection criteria	Threshold
Solenoid status from IC	Fail (Open or short)

P0982, P0983

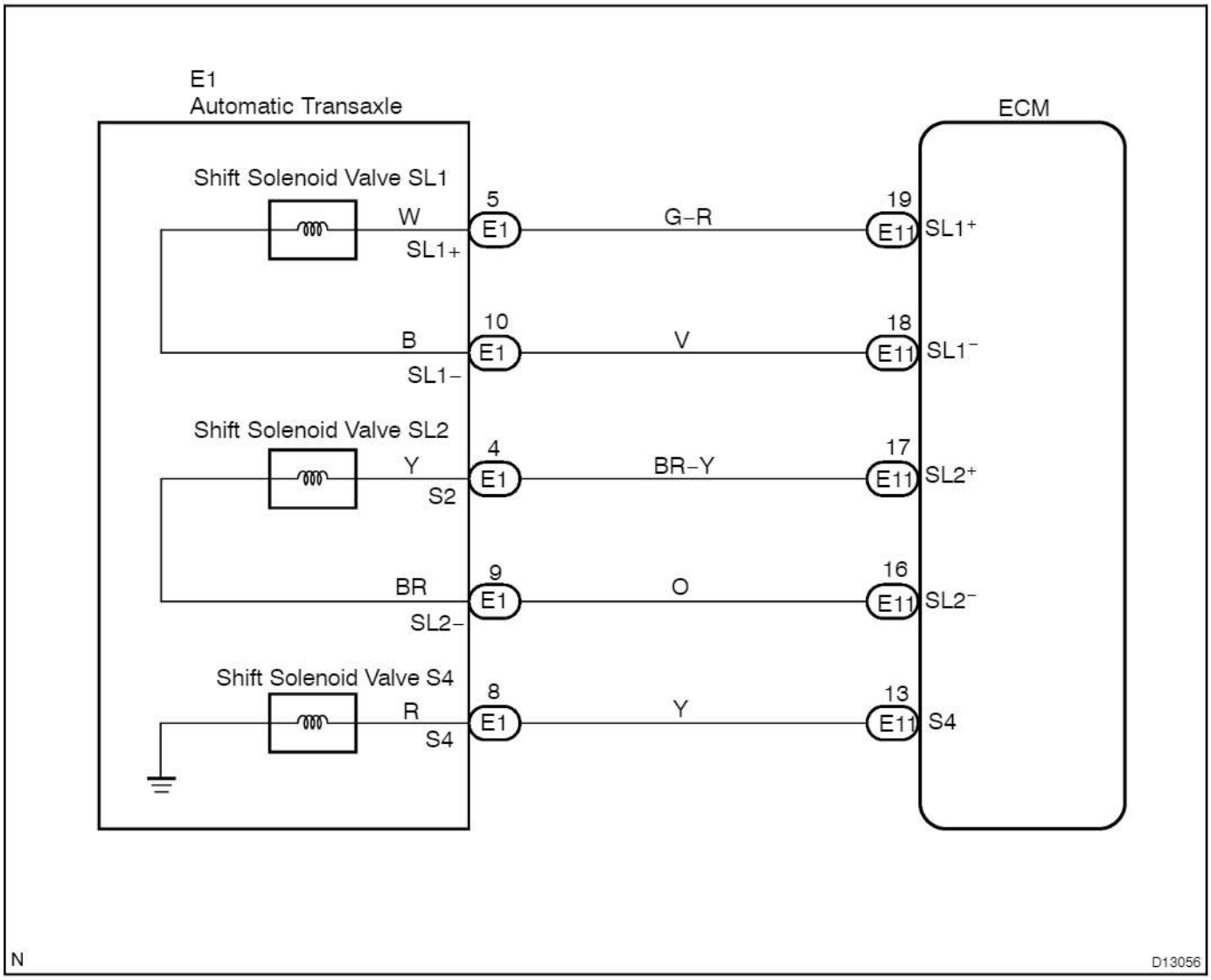
Detection criteria	Threshold
Range check (Low resistance)	
Shift solenoid valve resistance	8 Ω or less
Range check (High resistance)	
Shift solenoid valve resistance	100 kΩ or more

COMPONENT OPERATING RANGE

P0748, P0778

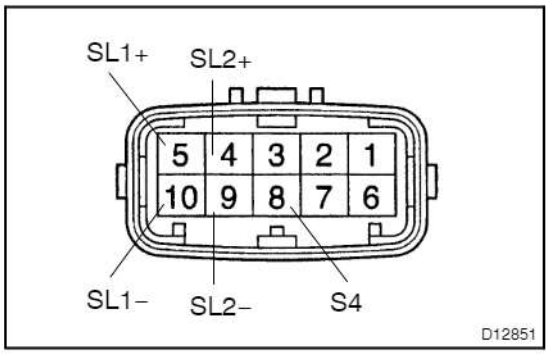
Parameter	Standard value
Output signal duty	Less than 100%

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check transmission wire.**



PREPARATION:

Disconnect the transmission wire connector.

CHECK:

(a) Measure resistance between terminal SL1+ and SL2– of transmission wire connector.

(b) Measure resistance between terminal SL2+ and SL2– of transmission wire connector.

(c) Measure resistance between terminal S4 of transmission wire connector and body ground.

OK:

Resistance: 5.0 to 5.6 Ω at 20 °C (68°F)

CHECK:

Measure resistance between terminals SL1+, SL1–, SL2+ and SL2– of the transmission wire connector and body ground.

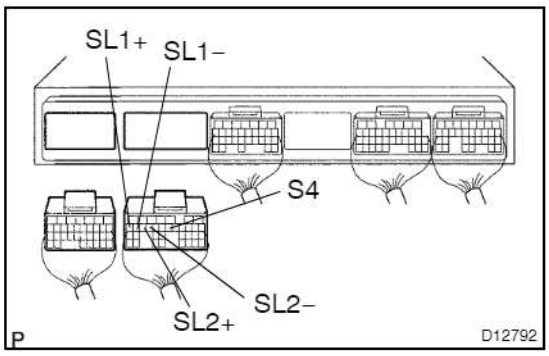
OK:

Resistance: 1 MΩ or higher

NG	**Go to step 3.**

OK

2	**Measure resistance between terminals SL1+, SL1–, SL2+, SL2– and S4 of ECM connector.**



PREPARATION:

(a) Connect the transmission wire connector.
(b) Remove the ECM hood.
(c) Disconnect the connector of the ECM.

CHECK:

Measure resistance between SL1+, SL1–, SL2+, SL2–, and S4 of ECM connector.

OK:

Resistance: 5.0 to 5.6 Ω at 20 °C (68°F)

CHECK:

Measure resistance between terminals SL1+, SL1–, SL2+ and SL2– of the transmission wire connector and body ground.

OK:

Resistance: 1 MΩ or higher

NG → **Repair or replace the harness or connector (See page IN–30).**

OK

Check and replace the ECM (See page IN–30).

3	**Check shift solenoid valve SL1, SL2 or S4 (See page DI–722).**

NG → **Replace the shift solenoid valve SL1, SL2 or S4.**

OK

Repair or replace the transmission wire (See page AX–6).

DIC8F-02

DTC	P0793	Intermediate Shaft Speed Sensor "A"

CIRCUIT DESCRIPTION

This sensor detects the rotation speed of the counter gear. By comparing the counter gear speed signal (NC) with the input turbine speed sensor signal (NT), the ECM detects the shift timing of the gears and appropriately controls the engine torque and hydraulic pressure in response to various conditions, thus performing smooth gear shifting.

DTC No.	DTC Detecting Condition	Trouble Area
P0793	All conditions below are detected for 5 secs. or more (1–trip detection logic) (a) Gear change not being performed (b) Counter gear rpm: Less than 300 rpm (c) T/M output shaft rpm: 1,000 rpm or more (d) Park/neutral position switch: OFF (e) Shift solenoid valves, park/neutral position switch and vehicle speed sensor are in normal operation	• Open or short in speed sensor (NC) circuit • Speed sensor (NC) • ECM

MONITOR DESCRIPTION

The NC terminal of ECM detects the revolving signal from speed sensor (NC) (output rpm). The ECM outputs a gearshift signal comparing the speed sensor (NT) with the speed sensor (NC).
While the vehicle is operating in the 2nd, 3rd or O/D gear position in the shift position of D, if the counter gear revolution is less than 300 rpm*1 although the output shaft revolution is more than 1,000 rpm*2, the ECM detects the trouble, illuminates the MIL and stores the DTC.
When the ECM detects this malfunction, the ECM performs the fail–safe function and outputs a gearshift signal based on the signal from the speed sensor (NT).
*1: Pulse is not output or is irregularly output.
*2: The vehicle speed is 50 km/h (31 mph) or more.

MONITOR STRATEGY

Related DTCs	P0793	Direct clutch speed sensor/Verify pulse input
Required sensors/Components	Speed sensor (NC), Speed sensor (NT), Park/neutral position switch	
Frequency of operation	Continuous	
Duration	5 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITION

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present.	See page DI–669	
Engine	Running	
NSW switch	OFF	
Output shaft rpm	1,000 rpm or more	–

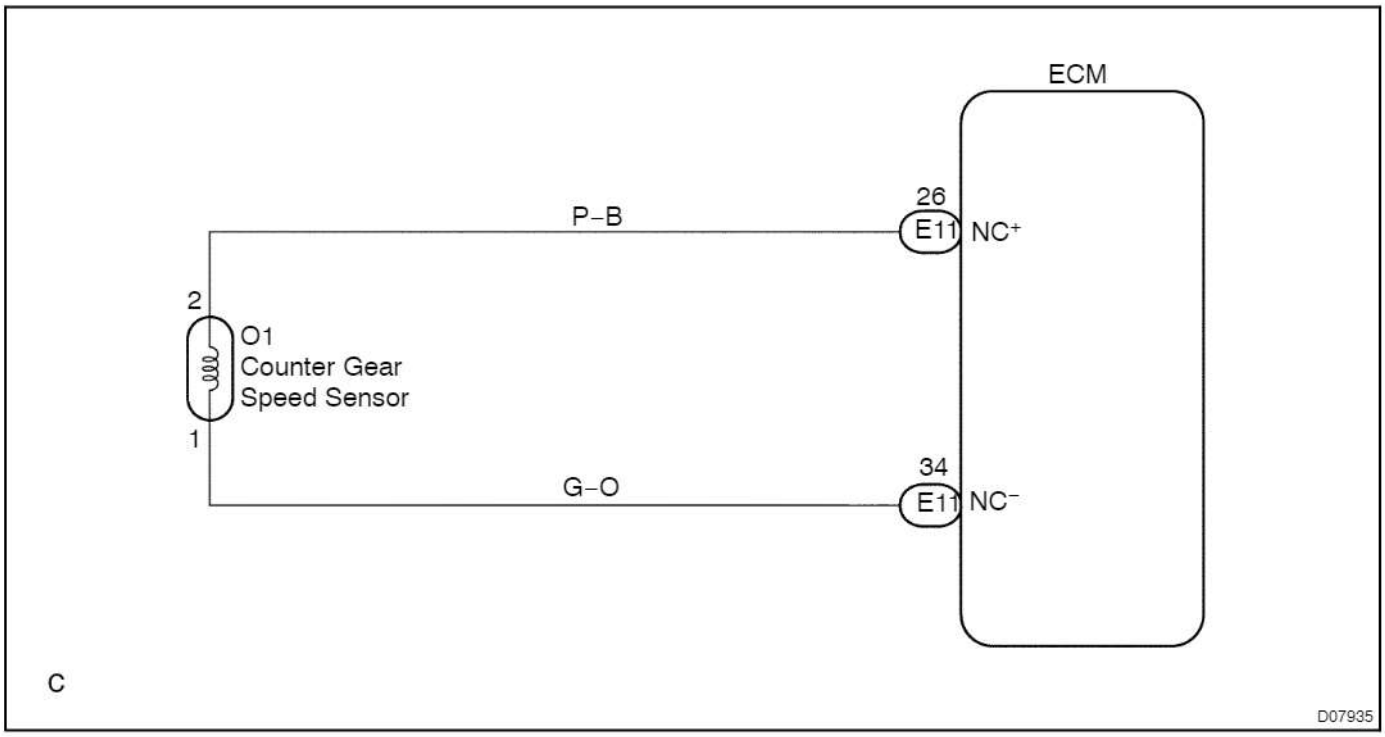
TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
Sensor signal rpm	Less than 300 rpm

COMPONENT OPERATING RANGE

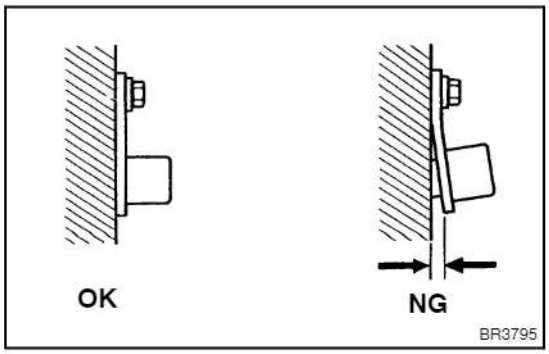
Parameter	Standard value
Counter gear speed sensor	When shift position is D: 3rd (After warming up the engine) • Output shaft speed becomes close to the input shaft speed.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check speed sensor (NC) installation.

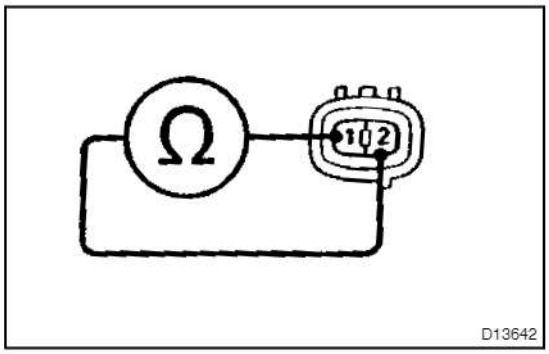


CHECK:
Check the speed sensor installation.
OK:
The installation bolt is tightened properly and there is no clearance between the sensor and transaxle case.

NG → **Tighten the speed sensor (NC) properly.**

OK

2	Check speed sensor (NC) .



PREPARATION:
Remove the NC speed sensor from transaxle.
CHECK:
Measure resistance between terminals 1 and 2 of speed sensor.
OK:
Resistance: 620 ± 60 Ω at 20 °C (68 °F)

NG → **Replace the speed sensor (NC).**

OK

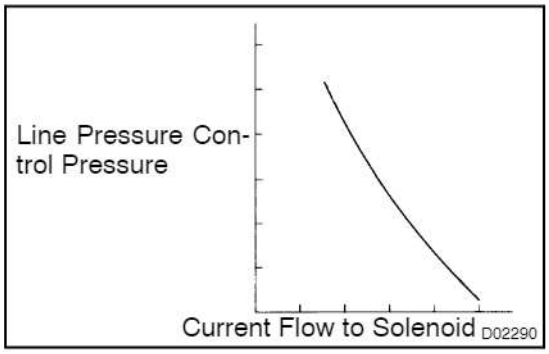
3	Check harness and connector between ECM and speed sensor (NC) (See page IN–30).

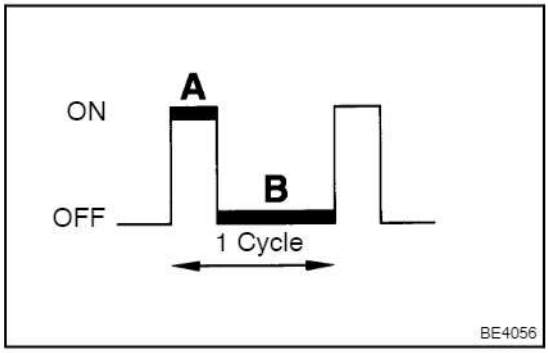
NG → **Repair or replace harness and connector.**

OK

Check and replace the ECM (See page IN–30)

DTC	P2716	Pressure Control Solenoid "D" Electrical (Shift Solenoid Valve SLT)





CIRCUIT DESCRIPTION

The throttle pressure that is applied to the primary regulator valve (which modulates line pressure) causes the solenoid valve SLT, under electronic control, to precisely and minutely modulate and generate line pressure according to the accelerator pedal effort, or engine power output detected.

This controls the line pressure and provides smooth shifting characteristics.

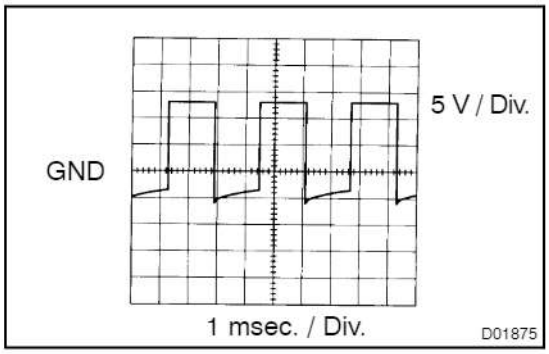
Upon receiving the throttle valve opening angle signal, ECM controls the line pressure by sending a predetermined (*) duty ratio to the solenoid valve, modulating the line pressure, generating throttle pressure.

(*) 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

$$\text{Duty Ratio} = \frac{A}{A + B} \times 100\ (\%)$$

DTC No.	DTC Detecting Condition	Trouble Area
P2716	(a) or (b) condition below is detected 1 second or more. (1–trip detection logic) (a) SLT^- terminal: 0V (b) SLT^- terminal: 12V	• Open or short in shift solenoid valve SLT circuit • Shift solenoid valve SLT • ECM



Reference:

Waveform between terminals SLT^+ and SLT^- during engine idling.

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	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present.	See page DI–669	
Solenoid current cut status	Not cut	
Battery voltage	11 V or more	–
CPU command duty to SLT	19% or more	–
Ignition switch	ON	
Starter	OFF	

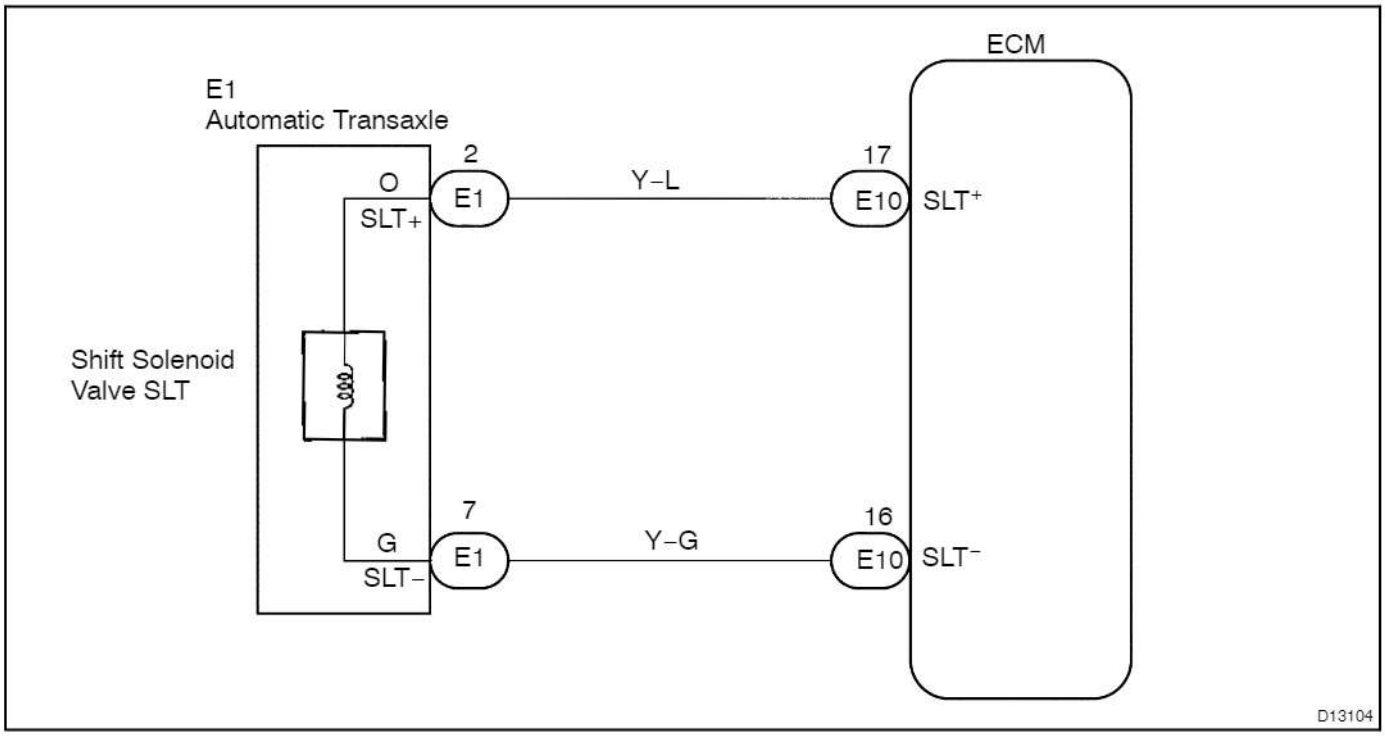
TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
Solenoid status from IC	Fail (Open or short)

COMPONENT OPERATING RANGE

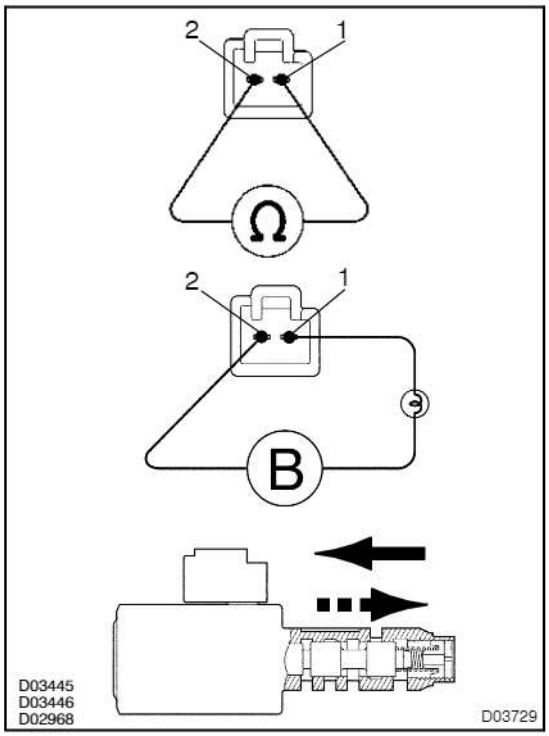
Parameter	Standard value
Output signal duty	Less than 100%

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check shift solenoid valve SLT.**



PREPARATION:

(a) Jack up the vehicle.
(b) Remove the oil pan.
(c) Disconnect the solenoid connector.

Check solenoid resistance:

CHECK:

Measure resistance between terminals 1 and 2 of solenoid connector.

OK:

Resistance: 5.0 to 5.6 Ω

Check solenoid operation:

CHECK:

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 at right.
When battery positive voltage is cut off.	Valve moves in ⬅ direction in illustration at left.

NG → **Replace shift solenoid valve SLT.**

OK ↓

2	**Check harness and connector between shift solenoid valve SLT and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK ↓

Check and replace the ECM (See page IN–30).

DIC8G–02

DTC	P2769	Torque Converter Clutch Solenoid Circuit Low (Shift Solenoid Valve DSL)

DTC	P2770	Torque Converter Clutch Solenoid Circuit High (Shift Solenoid Valve DSL)

CIRCUIT DESCRIPTION

The shift solenoid valve DSL 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 Detecting Condition	Trouble Area
P2769 P2770	Either (a) or (b) are detected for 1 time. (2–trip detection logic) (a) Solenoid resistance is 8 Ω or less short circuit when solenoid is energized. (b) Solenoid resistance is 100 kΩ or more open circuit when solenoid is not energized.	• Open or short in shift solenoid valve DSL circuit • Shift solenoid valve DSL • ECM

Fail safe function:
If the ECM detects a malfunction, it turns the shift solenoid valve DSL OFF.

MONITOR DESCRIPTION

Based on the signals from the Throttle Position Sensor, the Airflow Meter and the Crankshaft Position Sensor, the ECM sends a signal to the DSL Solenoid Valve to regulate the hydraulic pressure and provide smoother gearshifts. The shift–solenoid valve DSL responds to commands from the ECM. The valve controls the look–up relay valve to perform the torque–converter lock–up function. If the ECM detects an open or short circuit for shift–solenoid DSL, it will illuminate the MIL and store the DTC.

MONITOR STRATEGY

Related DTCs	P2669	Shift solenoid valve DSL/Range check (Low resistance)
	P2770	Shift solenoid valve DSL/Range check (High resistance)
Required sensors/Components	Shift solenoid valve DSL	
Frequency of operation	Continuous	
Duration	0.064 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

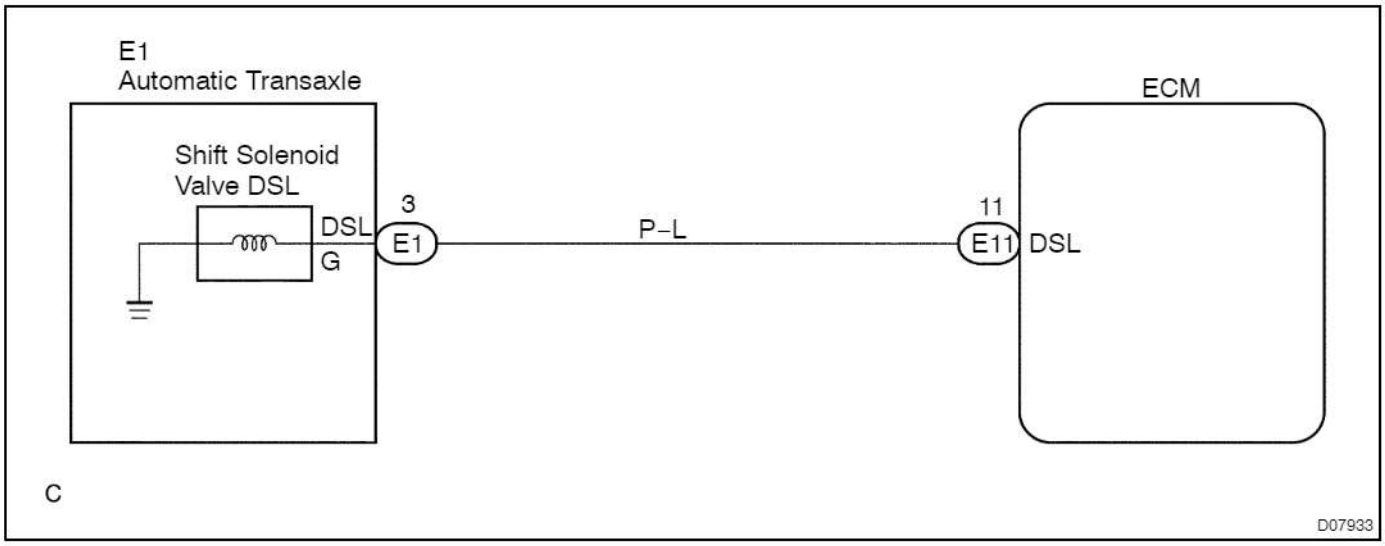
TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present.	See page DI–669	
Range check (Low resistance)		
Solenoid current cut status	Not cut	
Shift solenoid valve	ON	
Battery voltage	8 V or more	–
Ignition	ON	
Starter	OFF	
Range check (High resistance)		
Shift solenoid valve	ON	
Battery voltage	8 V or more	–
Ignition	ON	
Starter	OFF	

TYPICAL MALFUNCTION THRESHOLDS

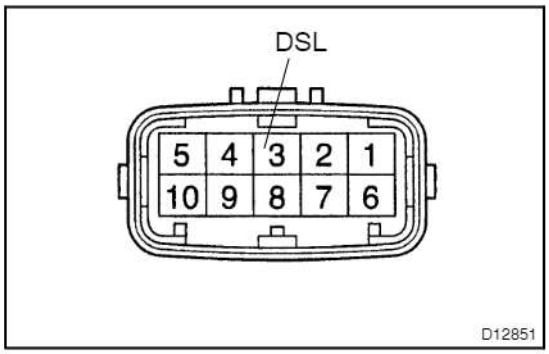
Detection criteria	Threshold
Range check (Low resistance)	
Shift solenoid valve resistance	8 Ω or less
Range check (High resistance)	
Shift solenoid valve resistance	100 kΩ or more

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check transmission wire.

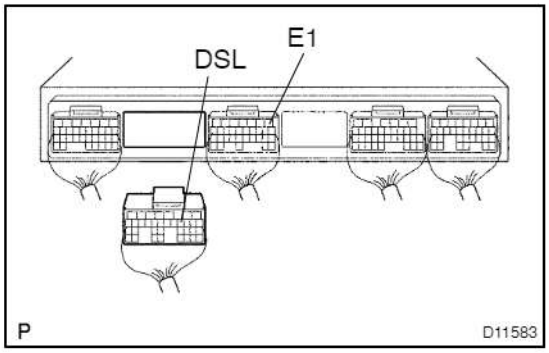


PREPARATION:
Disconnect the transmission wire connector.
CHECK:
Measure resistance between DSL of transmission wire and body ground.
OK:
Resistance: 11 to 15 Ω at 20 °C (68 °F)

NG → **Go to step 3.**

OK

2	Measure resistance between terminals DSL of ECM and body ground.



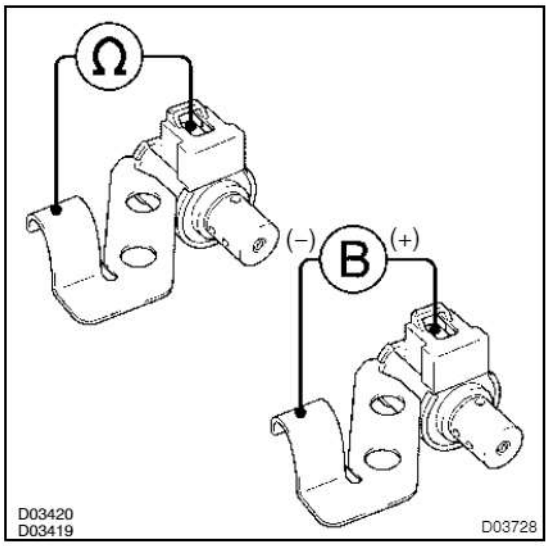
PREPARATION:
(a) Connect the transmission wire connector.
(b) Remove the ECM hood.
(c) Disconnect the connector from ECM.
CHECK:
Measure resistance between terminals DSL and E1 of ECM.
OK:
Resistance: 11 to 15 Ω at 20 °C (68 °F)

NG → **Repair or replace the harness or connector (See page IN–30).**

OK

Check and replace the ECM (See page IN–30).

3	Check shift solenoid valve DSL.



PREPARATION:

(a) Jack up the vehicle.
(b) Remove the oil pan.
(c) Disconnect the shift solenoid valve DSL connector.
(d) Remove the shift solenoid valve DSL.

CHECK:

(a) Measure resistance between terminal DSL of shift solenoid valve and solenoid body.
(b) Connect positive (+) lead to terminal of solenoid connector, negative (–) lead to solenoid body.

OK:

(a) Resistance: 11 to 15 Ω
(b) The shift solenoid valve DSL makes operation noise.

NG	Replace the shift solenoid valve DSL.

OK

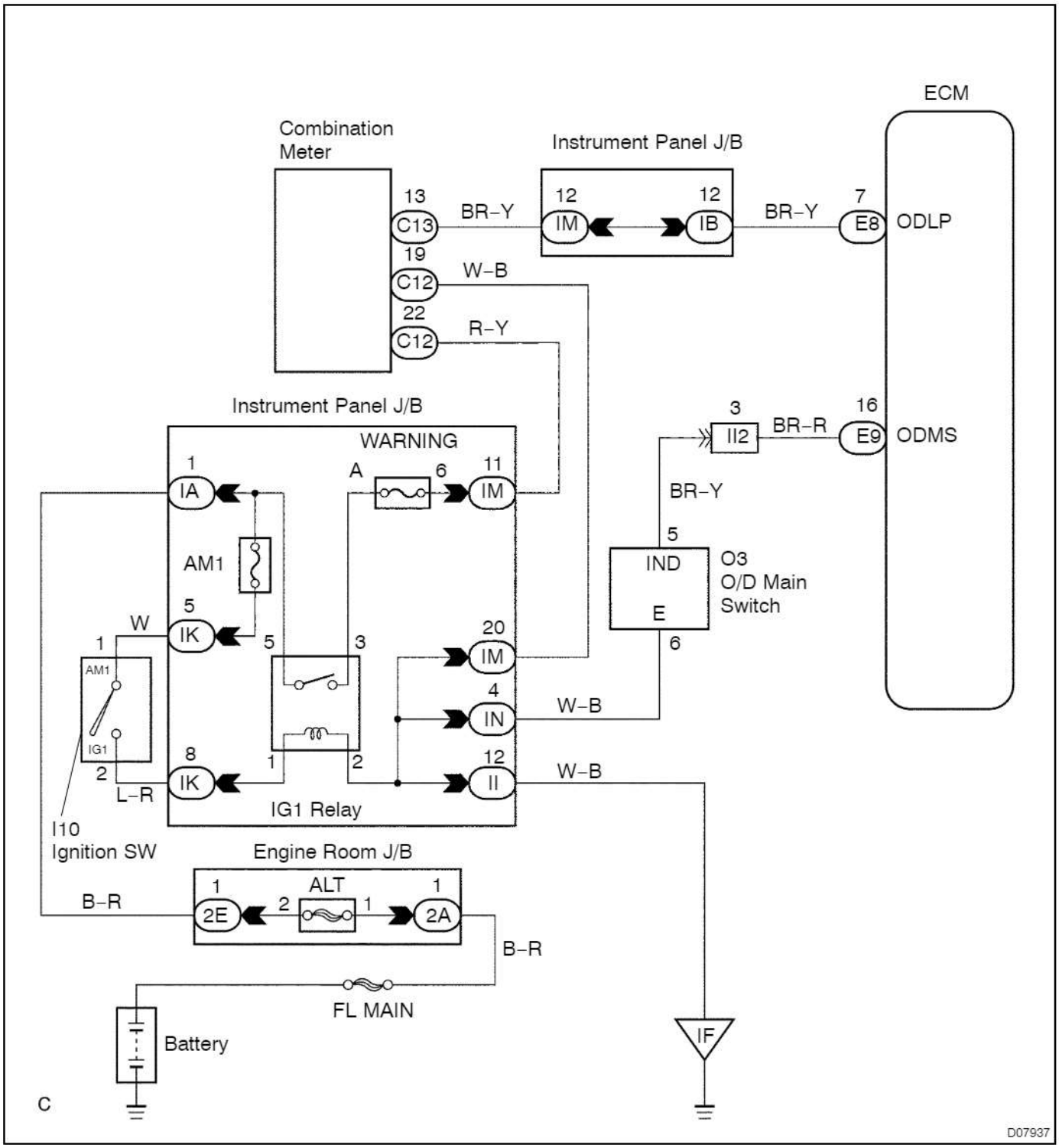
Repair or replace the transmission wire (See page AX–6).

O/D Main Switch & O/D OFF Indicator Light Circuit

CIRCUIT DESCRIPTION

The O/D main switch is a momentary type switch. When pressing the O/D main switch, the O/D OFF indicator light lights up and ECM prohibits shifting to O/D, and when pressing it again, the O/D OFF indicator light goes off and ECM allows shifting to O/D. Turning the ignition switch off will reset the O/D OFF indicator light.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check operation of O/D main switch**

PREPARATION:
Turn the ignition switch ON.
CHECK:
(a) Check O/D OFF indicator light when O/D main switch is pushed in to ON.
(b) Check O/D OFF indicator light when O/D main switch is pushed again.
OK:
(a) O/D OFF indicator light lights up.
(b) O/D OFF indicator light goes off.

OK	**Proceed to next inspection shown on problem symptoms tables (See page DI–698).**

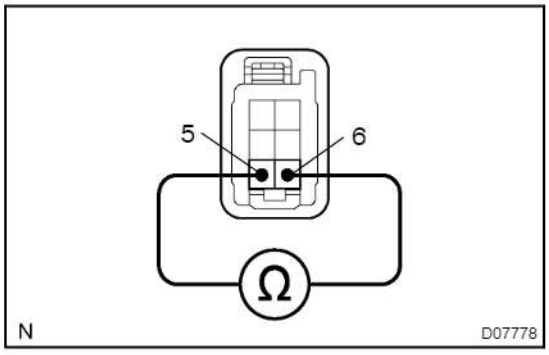
NG

2	**Check and replace the combination meter (See page BE–2).**

NG	**Replace the combination meter.**

OK

3	**Check O/D main switch.**



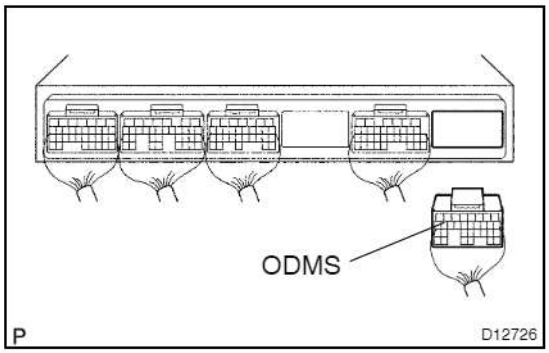
PREPARATION:
Disconnect the O/D main switch connector.
CHECK:
Check continuity between terminals 5 and 6 of O/D main switch connector.
OK:

O/D main switch condition	Specified condition
Press continuously O/D main switch	Continuity
Release O/D main switch	No continuity

NG	**Replace and repair O/D main switch.**

OK

4	Check harness and connector between terminal ODMS of ECM and body ground.



PREPARATION:

Disconnect the connector of ECM.

CHECK:

Check continuity between terminal ODMS of ECM and body ground when O/D main switch is ON and OFF.

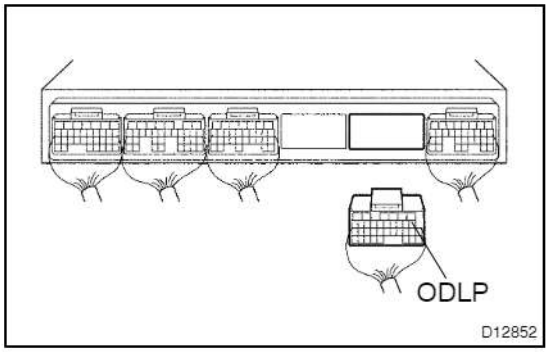
OK:

O/D main switch	Specified voltage
Press continuously O/D main switch	Continuity
Release O/D main switch	No Continuity

NG → **Repair or replace harness or connector (See page IN–30).**

OK

5	Check voltage between terminal ODLP of ECM and body ground.



PREPARATION:

(a) Disconnect the connector of ECM.

(b) Turn the ignition switch ON.

CHECK:

Check voltage between terminal ODLP of ECM and body ground.

OK:

Voltage: 9 to 14 V

NG → **Repair or replace harness or connector (See page IN–30).**

OK

Check and replace the ECM (See page IN–30).

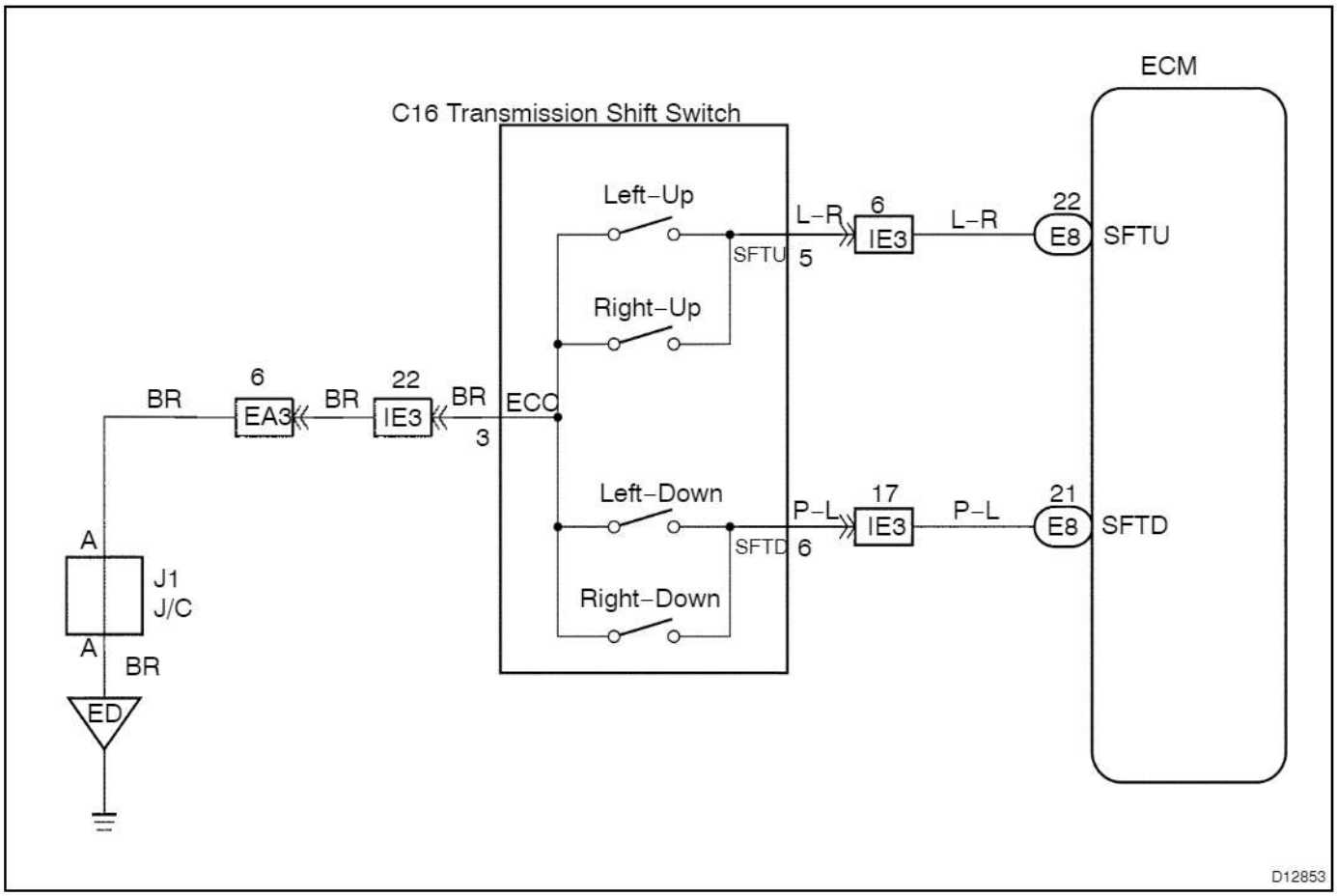
DI25Z-13

Transmission Shift Switch Circuit

CIRCUIT DESCRIPTION

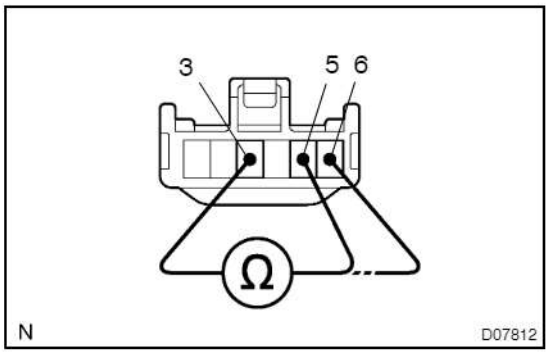
When shifting the shift lever to the M position, using the transmission shift switch, it is possible to shift to the 2 to 4 positions.
Pressing "Up switch" once shifts up 1 position, and pressing "Down switch" once shifts down 1 position respectively.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check transmission shift switch.



PREPARATION:

(a) Remove the steering wheel pad.

(b) Disconnect the transmission shift switch connector.

CHECK:

Check continuity between each terminal of transmission shift switch connector.

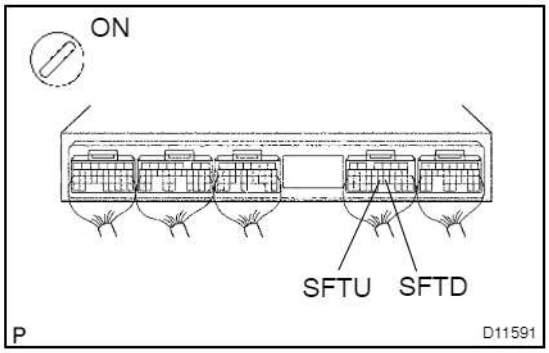
OK:

Switch condition	Tester connection	Specified value
"Up" switch pressed	3 – 5	No continuity
"Up" switch released		Continuity
"Down" switch pressed	3 – 6	No continuity
"Down" switch released		Continuity

NG → **Replace the steering wheel.**

OK

2	Check voltage between each of terminals SFTU and SFTD of ECM and body ground.



PREPARATION:

(a) Turn ignition switch ON.

(b) Remove the ECM with connectors still connected.

CHECK:

Check voltage between each terminal of SFTU and SFTD of ECM and body ground.

OK:

Switch condition	Tester connection	Specified condition
"Up" switch held pressed	SFTU – Body ground	Below 1.5 V
"Up" switch released		10 to 14 V
"Down" switch held pressed	SFTD – Body ground	Below 1.5 V
"Down" switch released		10 to 14 V

OK → **Proceed to next circuit inspection shown in problem symptoms table (See page DI–698).**

NG

3	**Check harness and connector between ECM and transmission shift switch, transmission shift switch and body ground (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Check and replace ECM (See page IN–30).

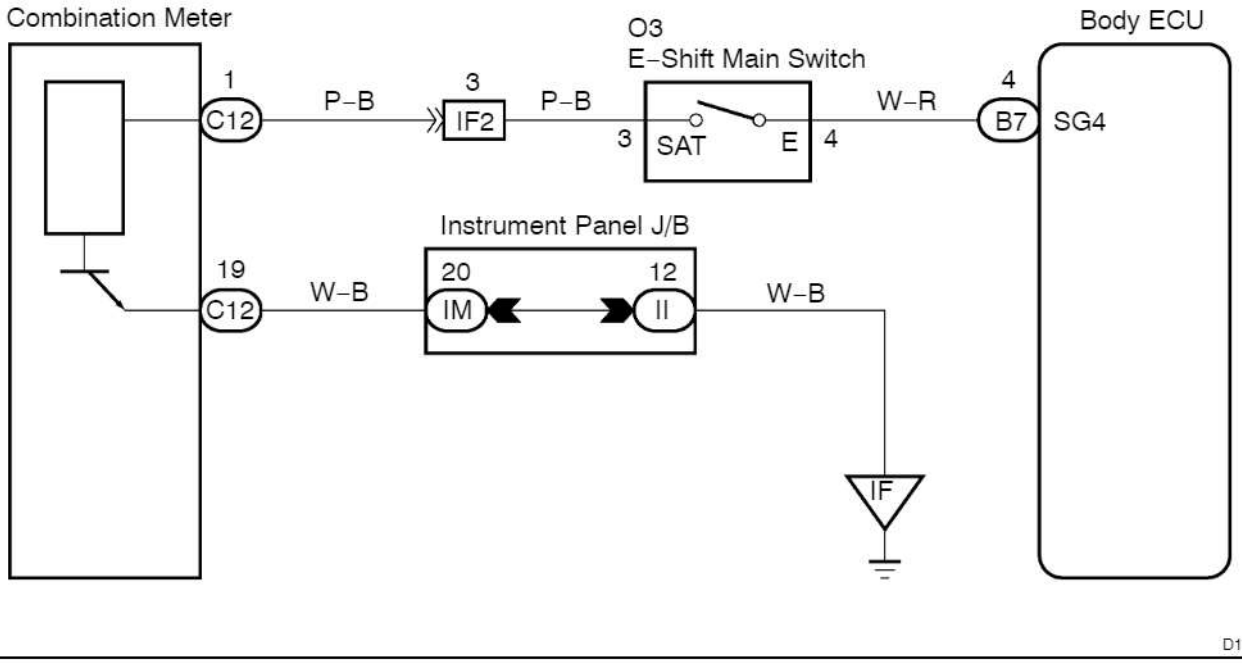
DIAJ6–03

E–Shift Main Switch Circuit

CIRCUIT DESCRIPTION

When the shift lever is shifted from the D to M position (the E–shift main switch is pressed), "M" on the combination meter lights up. When the "M" on the combination meter turns off, or when the "M" on the combination meter is flashing, the system may be defective or the ATF temperature may be excessively high or low.

WIRING DIAGRAM



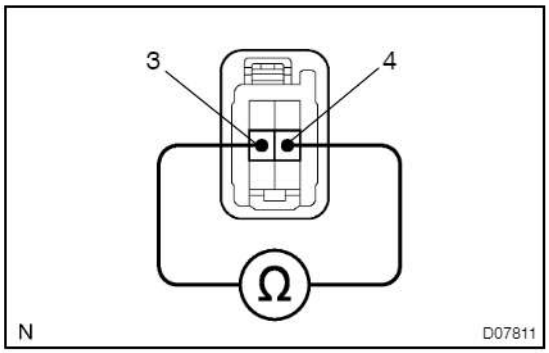
INSPECTION PROCEDURE

"M" position indicator light flashes.

When the ATF temperature is too high or low, the M position indicator light flashes. If this happens, shift the shift lever to the D position and shift it back to the M position after the ATF temperature increase or decrease. If the M position indicator light is still flashing, check if DTC P0710, P0712, or P0713 is displayed or not and inspect the transmission shift main switch circuit.

"M" position indicator light does not light up.

1	**Check E–shift main switch.**



PREPARATION:

Remove the E–shift main switch.

CHECK:

Check continuity between each terminal of the E–shift main switch.

OK:

Shift Lever Position	Tester connection	Specified value
M	3 – 4	Continuity
Except M	3 – 4	No continuity

NG → **Replace the E–shift main switch (See page AX–17).**

OK

2	**Check and replace the combination meter (See page BE–50).**

NG → **Replace the combination meter.**

OK

3	**Check harness and connector between body ECU and E–shift main switch, E–shift main switch and combination meter (See page IN–30).**

NG → **Repair or replace the harness or connector.**

OK

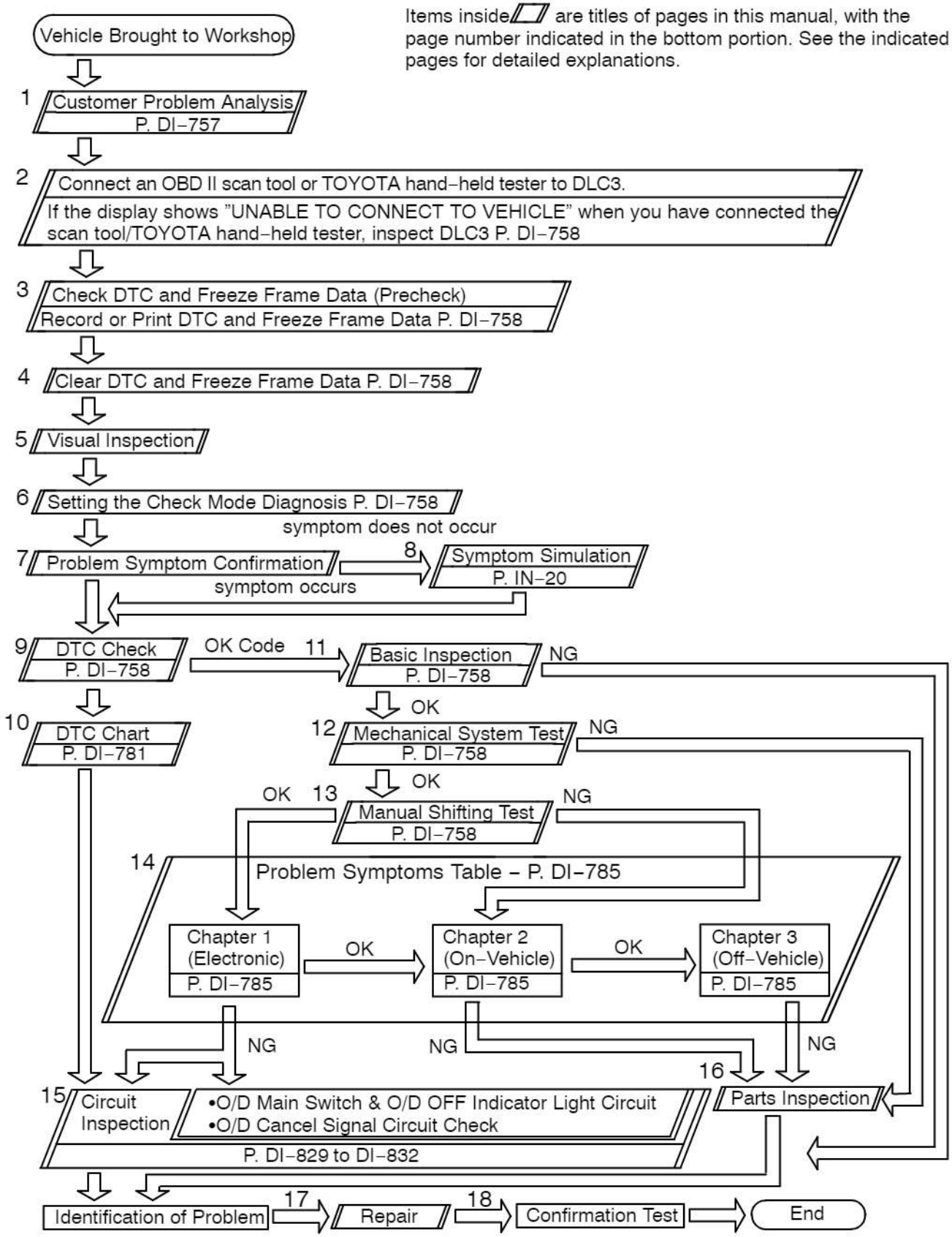
Proceed to next circuit inspection shown in problem symptoms table (See page DI–698).

AUTOMATIC TRANSAXLE (U341E)

HOW TO PROCEED WITH TROUBLESHOOTING

DI4YY–10

Items inside ▱ are titles of pages in this manual, with the page number indicated in the bottom portion. See the indicated pages for detailed explanations.



DIBZW–11

PRECAUTION

NOTICE:

Perform the RESET MEMORY (AT initialization) when replacing the automatic transaxle assy, engine assy or the ECM (See page DI–758).

HINT:

Initialization can not be completed by only disconnecting the battery terminal.

DI4YZ-06

CUSTOMER PROBLEM ANALYSIS CHECK

Automatic Transaxle 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 → O/D)
	☐ No down–shift (☐ O/D → 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)

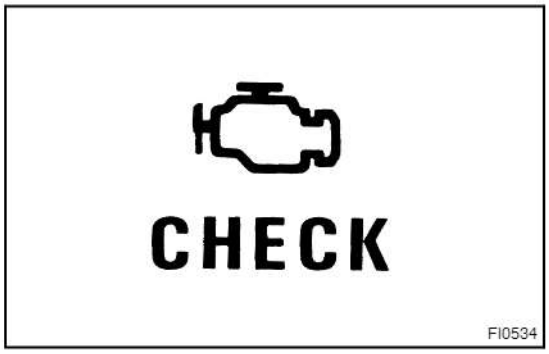
DIC89–02

PRE–CHECK

1. DIAGNOSIS SYSTEM

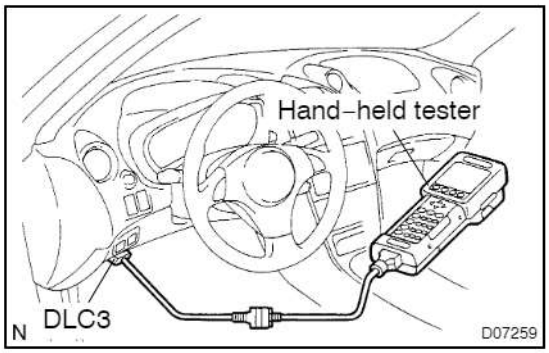
(a) Description

- When troubleshooting OBD II vehicles, the only difference from the usual troubleshooting procedure is that you connect the vehicle to an OBD II scan tool complying with SAE J1987 or hand–held tester, and read off various data output from the vehicle's ECM.



- OBD II regulations require that the vehicle's on–board computer lights up the Malfunction Indicator Lamp (MIL) on the instrument panel when the computer detects a malfunction in the computer itself or in drive system components which affect vehicle emissions. In addition to the MIL lighting up when a malfunction is detected, the applicable DTCs prescribed by SAE J2012 are recorded in the ECM memory (See page DI–42).

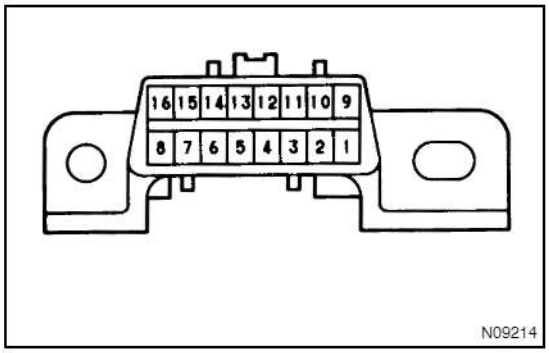
If the malfunction does not occur in 3 consecutive trips, the MIL goes off but the DTCs remain recorded in the ECM memory.



- To check the DTCs, connect an OBD II scan tool or hand–held tester to DLC3 on 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 operating instructions, see the instruction book).
- 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 the manufacturer within the prescribed limits (See DTC chart on page DI–781).

- The diagnosis system operates in normal mode during 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 check mode when troubleshooting, the technician can cause the MIL to light up and for a malfunction that is only detected once or momentarily (Hand–held tester) (See page DI–758).
- *2–trip detection logic:
  When a logic malfunction is first detected, the malfunction is temporarily stored in the ECM memory.

If the same malfunction is detected again during the 2nd test drive, this 2nd detection causes the MIL to light up .

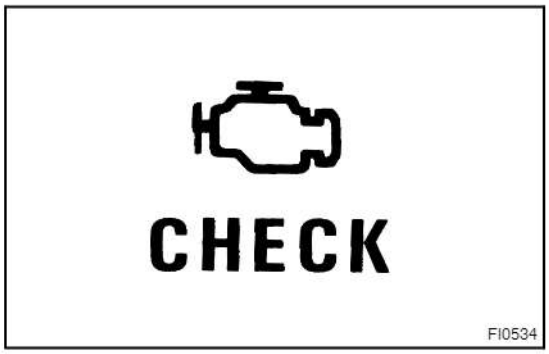


(b) Inspect the DLC3.
The vehicle's ECM uses ISO 9141–2 for communication. The terminal arrangement of DLC3 complies with SAE J1962 and matches the ISO 9141–2 format.

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 OBD II scan tool or hand–held tester to 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 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. INSPECT DIAGNOSIS (NORMAL MODE)

(a) 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 (See page BE–2).

(2) When the engine is started, the MIL should go off. If the lamp remains on, the diagnosis system has detected a malfunction or abnormality in the system.

(b) Check the DTC.

NOTICE:

Hand–held tester only: When the diagnostic system is switched from normal mode to check mode, it erases all DTCs and freeze frame data recorded in normal mode. So before switching modes, always check the DTCs and freeze frame data, and note them down.

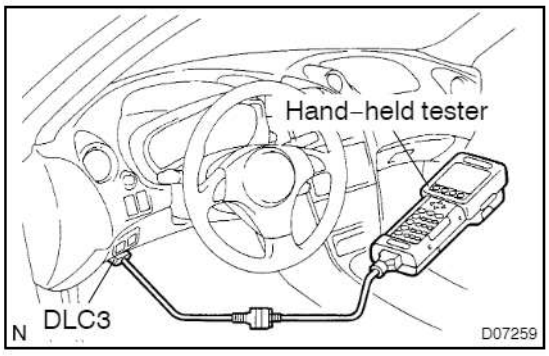
(1) Prepare an OBD II scan tool (complying with SAE J1978) or hand–held tester.

(2) Connect the OBD II scan tool or hand–held tester to DLC3 at the lower of the instrument panel.

(3) Turn the ignition switch ON and turn the OBD II scan tool or hand–held tester switch ON.

(4) 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).

(5) See page DI–781 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 normal mode. For codes on the DTCs chart subject to "2–trip detection logic", turn the ignition switch off after the symptoms have been simulated the 1st time. Then repeat the simulation process again. When the problem has been simulated twice, the MIL comes on on the instrument panel and DTCs are recorded in the ECM.

(c) 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.)

(d) When not using the OBD II scan tool or hand–held tester:
Clearing the DTCs.
Disconnect 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.

3. INSPECT DIAGNOSIS (CHECK MODE)

HINT:

Hand–held tester only: Compared to the normal mode, the check mode has high sensing ability to detect malfunctions. Furthermore, the same diagnostic items which are detected in Normal mode can also be detected in Check mode.

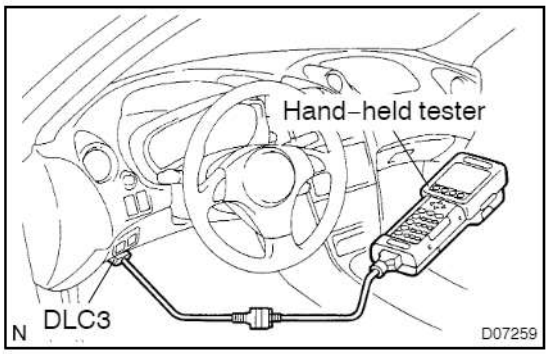
(a) Check the DTC.

(1) Check the initial conditions.

- Battery voltage 11 V or more.
- Throttle valve fully closed.
- Transaxle in P position.
- Air conditioning switched off.

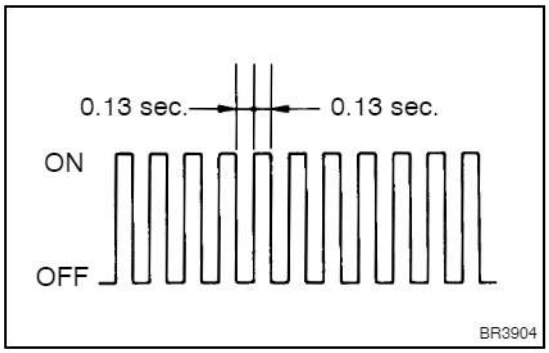
(2) Turn the ignition switch off.

(3) Prepare a hand–held tester.



(4) Connect the hand–held tester to DLC3 at the lower side of the instrument panel.

(5) Turn the ignition switch ON and switch the hand–held tester ON.



(6) Switch the hand–held tester from Normal mode to Check mode (Check that the MIL flashes).

(7) Start the engine (MIL goes out after the engine starts).

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

NOTICE:

Leave the ignition switch ON until you have checked the DTCs, etc.

(9) 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 Check mode to Normal mode, which erases all DTCs, etc.

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

(b) 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.)

(c) When not using the OBD II scan tool or hand–held tester:
Clearing the DTCs.
Disconnect 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.

4. 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 the first step of troubleshooting is one of the methods 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 to the ON position.
(e) Push the "ON" button of the OBD II scan tool or the hand–held tester.
(f) Select the item "DIAGNOSIS/ENHANCED OBD II/DATA LIST".
(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 • D(O/D OFF): 1st, 2nd or 3rd • D(O/D ON): 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	Ignition Key position is; START: ON Except START: OFF	←
LOW	PNP SW Status/ ON or OFF	Shift lever position is; L: ON Except L: OFF	The shift lever position and these values are different, there are failures of the PNP switch or shift cable adjustment.
2ND	PNP SW Status/ ON or OFF	Shift lever position is; 2: ON Except 2: OFF	
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: ON Except D: OFF	
OVERDRV CUT SW1	CCS O/D Cancel Signal/ ON or OFF	• O/D Cancel Signal input: ON • O/D Cancel Signal not input: OFF	←
OVERDRV CUT SW2	O/D SW Status/ ON or OFF	• IG SW ON: ON ↓ • O/D SW Push: OFF ↓ • O/D SW Push: ON	←
SOLENOID (SLT)	Shift Solenoid SLT Status/ ON or OFF	IG SW ON: ON	←
AT FLUID TEMP	ATF Temp. Sensor Value/ min.: –40 °C (–40 °F) max.: 225 °C (437 °F)	80 °C (176 °F) (After Stall Test)	If the value is "–40 °C (–40 °F)" or "225 °C (437 °F)", ATF temp. sensor circuit is opened or shorted.

5. 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 the first step of troubleshooting is one of the methods 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 hand–held tester to the DLC3.
(d) Turn the ignition switch to the ON position.
(e) Push the "ON" button of the the 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 values.
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 [Others] ON: Line pressure up. OFF: No action (normal operation)	–

6. DEFINITION OF TERMS

Monitor description	Description of what the ECM monitors and how it detects malfunctions (monitoring purpose and its details).
Related DTCs	A group of diagnostic trouble codes that are output by the ECM based on the same malfunction detection logic.
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. When a sensor is being monitored, the next sensor or component will not be monitored until the 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 the malfunction only one time during a single driving cycle. "Continuous" means that the ECM detects 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 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.

7. TOYOTA/LEXUS 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 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 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
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 immobiliser system, Immobiliser system	Vehicle anti–theft system

8. The monitor will run whenever the following DTCs are not present (Monitor Disablement List)

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.

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	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 Sensor 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 Sensor - Sensor3	Fuel system	Misfire			
	P0011	P0011				X		X														X									
	P0012	P0012				X		X														X									
	P0016,P0018	P0016,P0018																													
	P0021	P0021			X	X																X									
	P0022	P0022			X	X																X									
	P0030,50	P0031,32,51,52																				X	X	X	X	X	X				
	P0135,P0155	P0031,32,51,52																				X			X	X	X				
	P0036,56	P0037,38,57,58																							X	X					
	P0043,44,63,64	P0043,44,63,64																									X				
	P0100,P0101	P0100-P0103		X	X		X	X											X		X	X	X	X	X	X	X	X			
	P0105,P0106	P0105-P0108		X	X		X	X											X		X	X	X	X	X	X	X	X			
	P0110	P0110-P0113																			X	X	X	X	X	X		X			
	P0115,P0116	P0115-P0118		X	X	X	X	X						X		X					X	X	X	X	X	X	X	X			
	P0120,P0121	P0120-P0223,P2135												X		X							X	X	X	X	X	X			
	P0125	P0125		X	X		X	X						X		X						X	X	X	X	X	X	X			
	P0128	P0128																													
	P0130-P0153	P0130-P0153																				X		X	X	X					
	P0134,P0154	P0134,P0154								X												X	X		X	X	X				
	P0136,P0156	P0136,P0156																													
	P0142,P0162	P0142,P0162																													
	P0171,P0172	P0171,P0172																				X	X	X	X	X					
	P0300-P0308	P0300-P0308							X													X	X	X	X	X					
	P0325,P0330	P0325-P0333																										X			
	P0335	P0335		X	X		X	X						X		X						X	X	X	X	X	X	X			
	P0340, P0341	P0340, P0341		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					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																												
	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 Sensor 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 Sensor - 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 Adsorption 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				Monitor disablement (X - disabled)																														
	Fault code	Fault code	Component/ system	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
	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									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				Monitor disablement (X - disabled)																													
	Fault code			P0325,P0330	P0335	P0340,P0341	P0340-P0346	P0351-P0358	P0385	P0401	P0402	P0405,P0406	P0409	P0420,P0430	P0440-P0446	P0450,P0451	P0500	P0500	P0500	P0511	P0510	P0560	P0617	P0705	P0710	P0720-P0793	P0715-P0717	P0724	P0741-P0796				
	Fault code			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				
		Component/ system		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 Adsorption 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	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 Adsorption 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	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 Adsorption 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
	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 Adsorption 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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Note *1: Without input speed sensor
Note *2: With input speed sensor

9. PROBLEM SYMPTOM CONFIRMATION

Taking into consideration the results of the customer problem analysis, try to reproduce the symptoms of the trouble. If the problem is that the transaxle does not up–shift, down–shift, or the shift point is too high or too low, conduct the following road test to confirm the automatic shift schedule and simulate the problem symptoms.

10. 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 and 3 → O/D up–shifts take place, and that the shift points conform to the automatic shift schedule (See page SS–44).

HINT:

- O/D Gear Up–shift Prohibition Control (1. Coolant temp. is 60 °C (140 °F) or less. 2. If there is a 10 km/h (6 mph) difference between the set cruise control speed and vehicle speed.)
- O/D 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 and 3 → O/D up–shifts.

(3) Check for abnormal noises and vibration.

Drive in the 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 due to loss of balance in the differential, torque converter clutch, etc.

(4) Check kick–down operation.

While driving in the D position, 2nd, 3rd and O/D gears, check 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 SS–44).

(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 60 km/h (37 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 SS–44).

HINT:

There is no O/D up–shift and lock–up in the 2 position.

(2) Check engine braking.

While driving 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.

(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 driving in the L position, check that there is no up–shift to 2nd gear.

(2) Check engine braking.

While driving 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 that the parking lock pawl holds the vehicle in place.

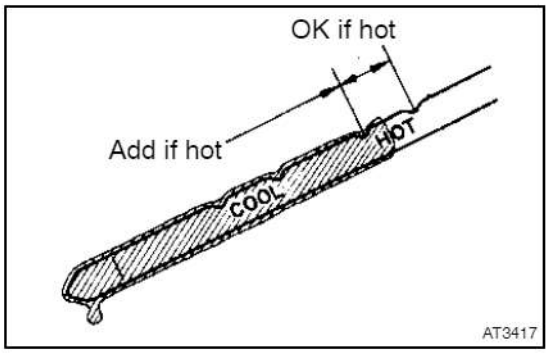
11. BASIC INSPECTION

(a) Check the fluid level.

HINT:

- Drive the vehicle so that the engine and transaxle are at normal operating temperature.

  Fluid temp.: 70 to 80 °C (158 to 176 °F)
- Only use the COOL range on the dipstick as a rough reference when the fluid is changed or the engine does not run.



(1) Park the vehicle on a level surface and set the parking brake.

(2) With the engine idling and the brake pedal depressed, shift the shift lever into all positions from P to L position and return to P position.

(3) Pull out the dipstick and wipe it clean.

(4) Push it back fully into the pipe.

(5) Pull it out and check that the fluid level is in the HOT range.

If the level is at the low side, add new fluid.

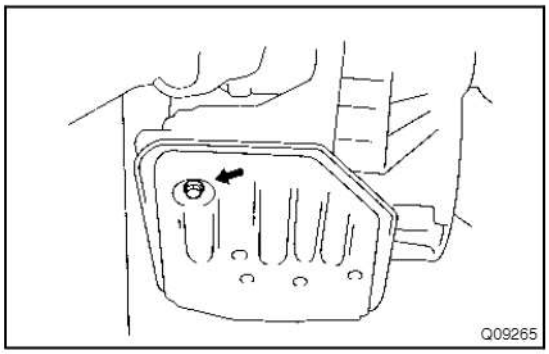
Capacity: 2.9 liters (3.1 US qts, 2.6 Imp. qts)

NOTICE:

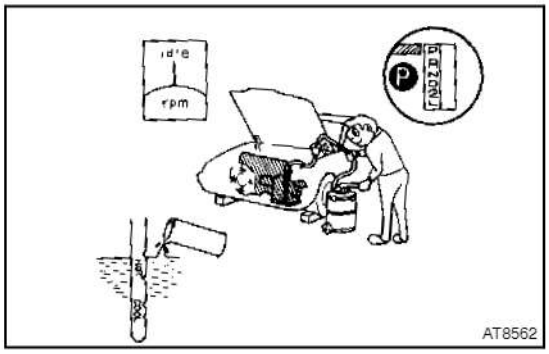
Do not overfill.

(b) Check the fluid condition.

If the fluid smells burnt or is black, change it.


Q09265

(c) Replace the ATF.
(1) Remove the drain plug and drain the fluid.
(2) Reinstall the drain plug securely.



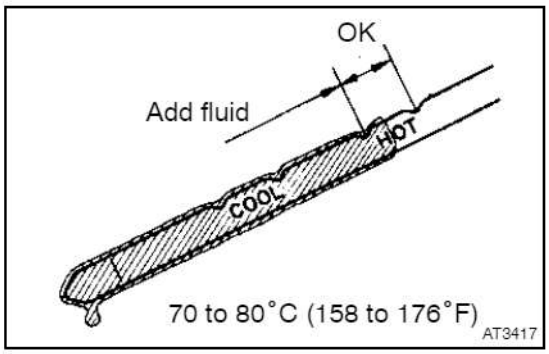
AT8562

(3) With the engine OFF add new fluid through the oil filler pipe.

Fluid type: ATF Type T–IV

Capacity: 2.9 liters (3.1 US qts, 2.6 Imp. qts)

(4) Start the engine and shift the shift lever into all positions from P to L position and then shift into P position.
(5) With the engine idling, check the fluid level. Add fluid up to the COOL level on the dipstick.



AT3417

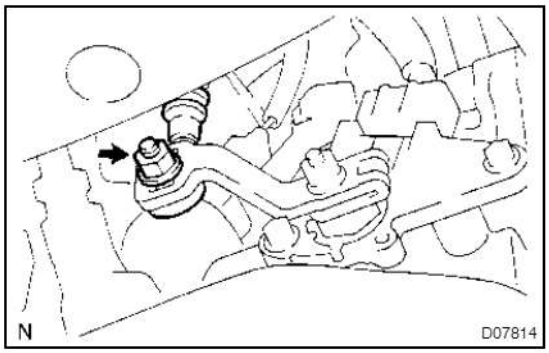
(6) Check the fluid level at the normal operating temperature, 70 to 80 °C (158 to 176 °F), and add as necessary.

NOTICE:

Do not overfill.

(d) Check the fluid leaks.
Check for leaks in the transaxle.

If there are leaks, it is necessary to repair or replace O–rings, gaskets, oil seals, plugs or other parts.

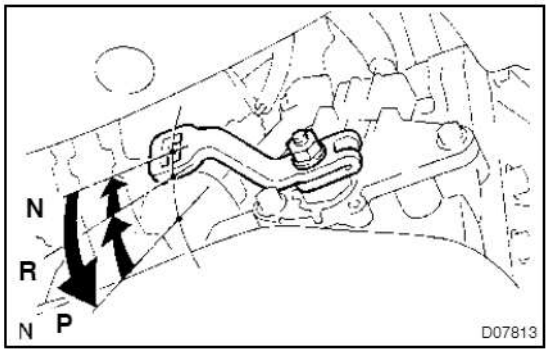


D07814

(e) Inspect and adjust the shift lever position.
When shifting the shift lever from the N position to other positions, check that the lever can be shifted smoothly and accurately to each position and that the position indicator is aligned with the correct position.

If the indicator is not aligned with the correct position, carry out the following adjustment procedures.

(1) Loosen the nut on the shift lever.
(2) Push the control shaft fully downward.

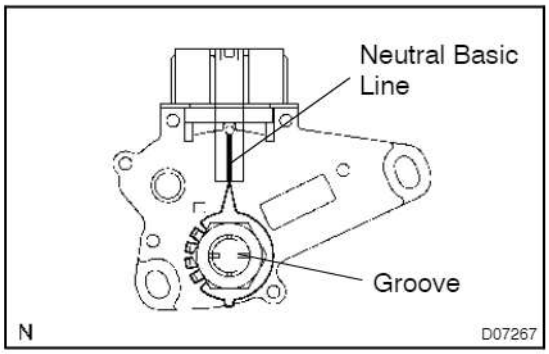


D07813

(3) Return the control shaft lever 2 notches to N position.
(4) Set the shift lever to N position.
(5) While holding the shift lever lightly toward the R position side, tighten the shift lever nut.

Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

(6) Start the engine and make sure that the vehicle moves forward when shifting the lever from the N to D position and reverses when shifting it to the R position.



(f) Inspect and adjust the park/neutral position.
Check that the engine can be started with the shift lever only in the N or P position, but not in other positions.

If it is not as stated above, carry out the following adjustment procedures.

(1) Loosen the park/neutral position switch bolt and set the shift lever to the N position.
(2) Align the groove and neutral basic line.
(3) Hold in position and tighten the bolt.

Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

For continuity inspection of the park/neutral position switch, see page DI–789.

(g) Check the idle speed.
Idle speed: 750 ± 50 rpm
(In N position and air conditioner OFF)

12. MECHANICAL SYSTEM TESTS

(a) Measure the stall speed.
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 50 to 80 °C (122 to 176 °F).**
- **Do not continuously run this test for longer than 10 seconds.**
- **To ensure safety, conduct this test in a wide, clear level area which provides 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 4 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 pressed 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: 2,220 to 2,520 rpm

(7) Do the same test in R position.

Stall speed: 2,220 to 2,520 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 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 • Forward clutch slipping • No.2 one–way clutch not operating properly
(c) Stall engine speed is high in R position	• Line pressure too low • Reverse clutch slipping • 1st & reverse brake slipping
(d) Stall engine speed is high in D and R positions	• Line pressure too low • Improper fluid level

(b) Measure the time lag.
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 No. 2 one–way clutch, reverse clutch, forward clutch, and 1st & reverse brake.

NOTICE:

- **Do the test at normal operating fluid temperature 50 to 80 °C (122 to 176 °F).**
- **Be sure to allow 1 minute interval between tests.**
- **Take 3 measurements and take the average value.**

(1) Connect an OBD II scan tool or hand–held tester to DLC3.
(2) Fully apply the parking brake.
(3) Start the engine and check idle speed.
Idle speed: 750 ± 50 rpm (In N position and air conditioner OFF)
(4) 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
(5) 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 specified):

Problem	Possible cause
N → D time lag is longer	• Line pressure too low • Forward clutch worn • No. 2 one–way clutch not operating
N → R time lag is longer	• Line pressure too low • Reverse clutch worn • 1st & reverse brake worn

13. HYDRAULIC TEST

Measure the line pressure.

NOTICE:

- **Do the test at normal operation fluid 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 stoppers outside the vehicle while the other is doing the test.**
- **Be careful to prevent SST's hose from interfering with the exhaust pipe.**

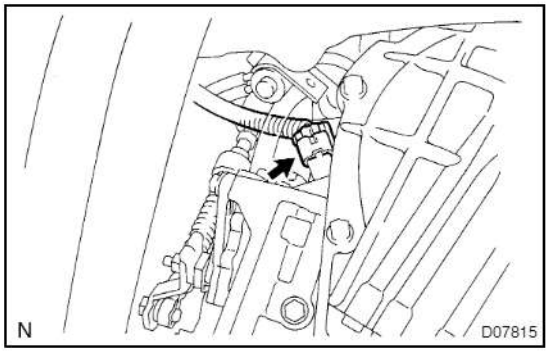
(1) Warm up the ATF.
(2) Remove the test plug on the transaxle case front left side and connect SST (See page AX–30 for the location to connect SST).
SST 09992–00095 (09992–00231, 09992–00271)
(3) Fully apply the parking brake and check the 4 wheels.
(4) Connect an OBD II scan tool or hand–held tester to DLC3.
(5) Start the engine and check idling speed.
(6) Keep your left foot pressed firmly on the brake pedal and shift into D position.
(7) Measure the line pressure when the engine is idling.
(8) Depress the accelerator pedal all the way down. Quickly read the highest line pressure when engine speed reaches stall speed.
(9) 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	372 to 412 (3.8 to 4.2, 54 to 60)	553 to 623 (5.6 to 6.4, 80 to 90)
Stall	1,126 to 1,226 (11.5 to 12.5, 164 to 178)	1,764 to 1,964 (18.0 to 20.0, 256 to 284)

If the measured pressure is not within specification, recheck the throttle cable adjustment and retest.

Evaluation:

Problem	Possible cause
If the measured values at all position are higher	• Shift solenoid valve SLT • Regulator valve defective
If the measured values at all position are lower	• Shift solenoid valve SLT • Regulator valve defective • Oil pump defective
If pressure is low in the D position only	• D position circuit fluid leakage • Forward clutch defective
If pressure is low in the R position only	• R position circuit fluid leakage • Reverse clutch defective • 1st & reverse brake defective



14. MANUAL SHIFTING TEST

The purpose of this manual shifting test is to determine whether a problem is caused by either mechanical or electrical factors. Disconnecting the solenoid wire disables electrically-controlled automatic gear shifting. In this case, operating the shift level is the only way to shift the transaxle gear. If the gear is not changed by shift lever operation, it is assumed that there is a mechanical problem.

(a) Turn the ignition switch OFF.
(b) Disconnect the solenoid wire connector.
(c) Warm up the engine.
(d) Drive the vehicle.
(e) Check the transaxle operation when the shift lever is moved into L, 2 and D ranges.

Standard:

Shift Lever	Operation
L to 2	No shift (Not change)
2 to D	No shift (Not change)
D to 2	No shift (Not change)
2 to L	No shift (Not change)

(f) Turn the ignition switch OFF.
(g) Connect the solenoid wire connector.
(h) Clear DTCs.

HINT:

When the solenoid wire is disconnected, the transaxle gear will be set as listed below:

Shift Lever	Gear
P	Parking
R	Reverse
N	Neutral
D	3rd
2	3rd
L	3rd

15. RESET MEMORY

CAUTION:

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

NOTICE:

Hand–held tester only

HINT:

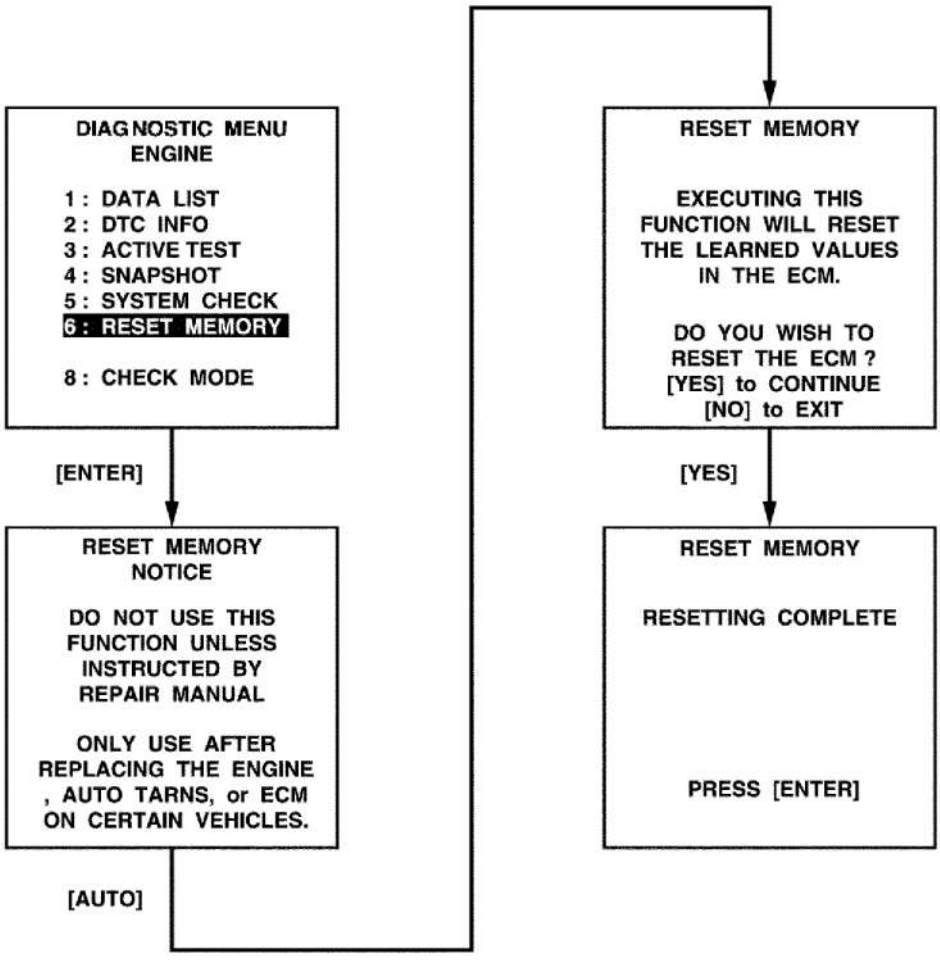
The ECM memorizes the condition that the ECT controls the automatic transaxle assy and engine assy according to those characteristics. Therefore, when the automatic transaxle assy, engine assy, or ECM has been replaced, it is necessary to reset the memory so that the ECM can memorize the new information. 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.

CAUTION:

After performing the RESET MEMORY, be sure to perform the ROAD TEST described earlier.

Tester menu flow:



P D13545

DI4Z0-12

DIAGNOSTIC TROUBLE CODE CHART

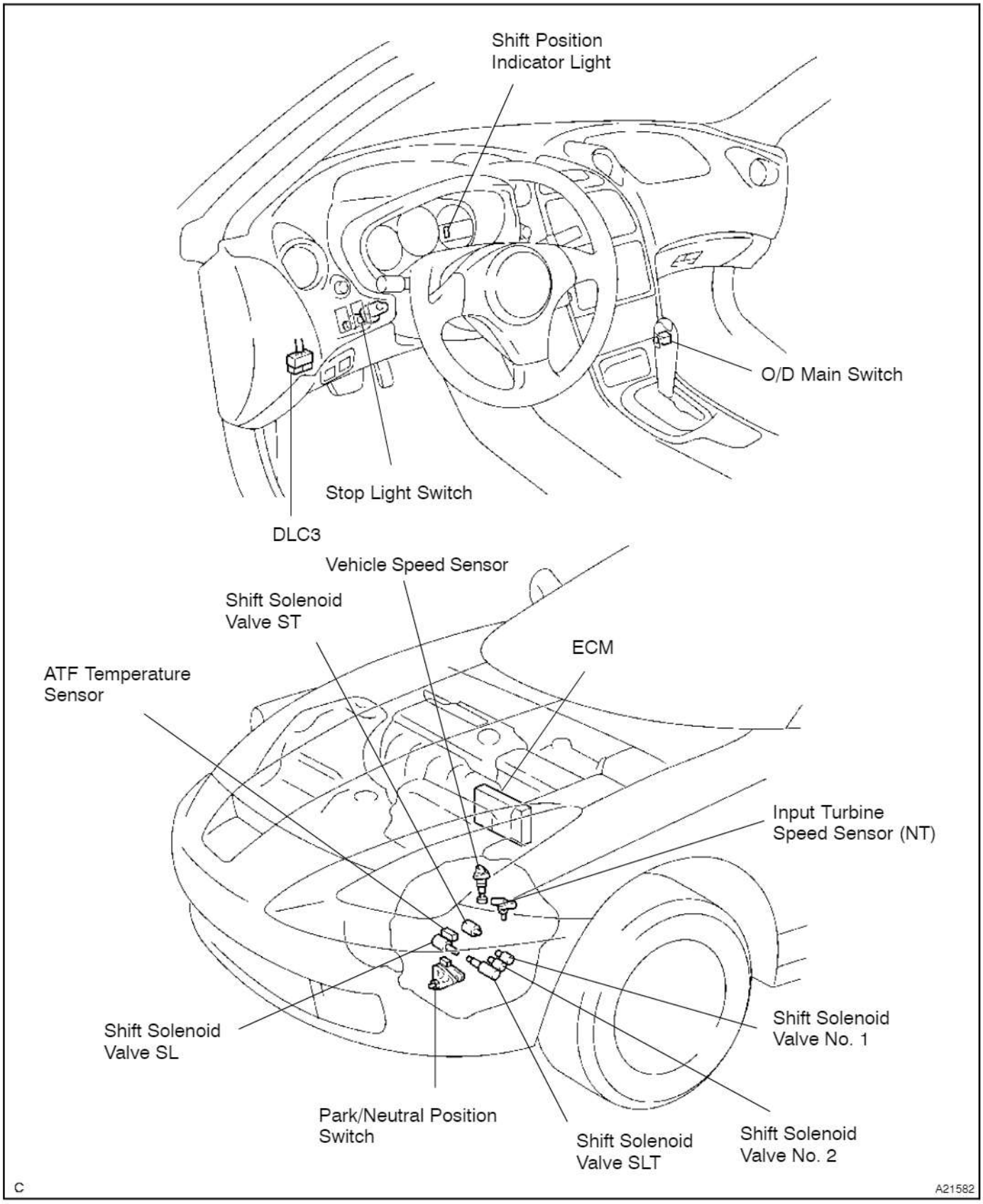
If a DTC is displayed during the DTC check, check the circuit listed for that code in the table below and proceed to the page given.

* : –...MIL does not light up /●...MIL lights up

DTC No. (See Page)	Detection Item	Trouble Area	MIL *	Memory
P0500 (DI–253)	Vehicle Speed Sensor "A"	• Combination meter • Open or short in vehicle speed sensor circuit • Vehicle speed sensor • ECM	●	○
P0705 (DI–789)	Transmission Range Sensor Circuit Malfunction (PRNDL Input)	• Open or short in park/neutral position switch circuit • Park/neutral position switch • ECM	●	○
P0710 (DI–794)	Transmission Fluid Temperature Sensor "A" Circuit	• Open or short in ATF temperature sensor circuit • ATF temperature sensor • ECM	●	○
P0711 (DI–797)	Transmission Fluid Temperature Sensor "A" Performance	• Transaxle fluid level • ATF temperature sensor	●	○
P0717 (DI–800)	Turbine Speed Sensor Circuit No Signal	• Open or short in input turbine speed sensor (NT) circuit • Input turbine speed sensor (NT) • ECM	●	○
P0724 (DI–803)	Brake Switch "B" Circuit High	• Short in stop light switch circuit • Stop light switch • ECM	●	○
P0741 (DI–805)	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 • Automatic transaxle (clutch, brake or gear etc.)	●	○
P0743 (DI–809)	Torque Converter Clutch Circuit Electrical (Shift Solenoid Valve SL)	• Open or short in shift solenoid valve SL circuit • Shift solenoid valve SL • ECM	●	○
P0751 (DI–812)	Shift Solenoid "A" Performance (Shift Solenoid Valve S1)	• Shift solenoid valve No. 1 is stuck open or closed • Valve body is blocked up or stuck • ECM	●	○
P0753 (DI–817)	Shift Solenoid A Electrical Malfunction (Shift Solenoid Valve S1)	• Open or short in shift solenoid valve No. 1 circuit • Shift solenoid valve No. 1 • ECM	●	○
P0756 (DI–812)	Shift Solenoid "B" Performance (Shift Solenoid Valve S2)	• Shift solenoid valve No. 2 is stuck open or closed • Valve body is blocked up or stuck • ECM	●	○
P0758 (DI–817)	Shift Solenoid B Electrical Malfunction (Shift Solenoid Valve S2)	• Open or short in shift solenoid valve No. 2 circuit • Shift solenoid valve No. 2 • ECM	●	○
P0785 (DI–821)	Shift/Timing Solenoid (Sift Solenoid Valve ST)	• Open or short in shift solenoid valve ST circuit • Shift solenoid valve ST • ECM	●	○
P2716 (DI–825)	Pressure Control Solenoid "D" Electrical (Sift Solenoid Valve SLT)	• Open or short in shift solenoid valve SLT circuit • Shift solenoid valve SLT • ECM	●	○

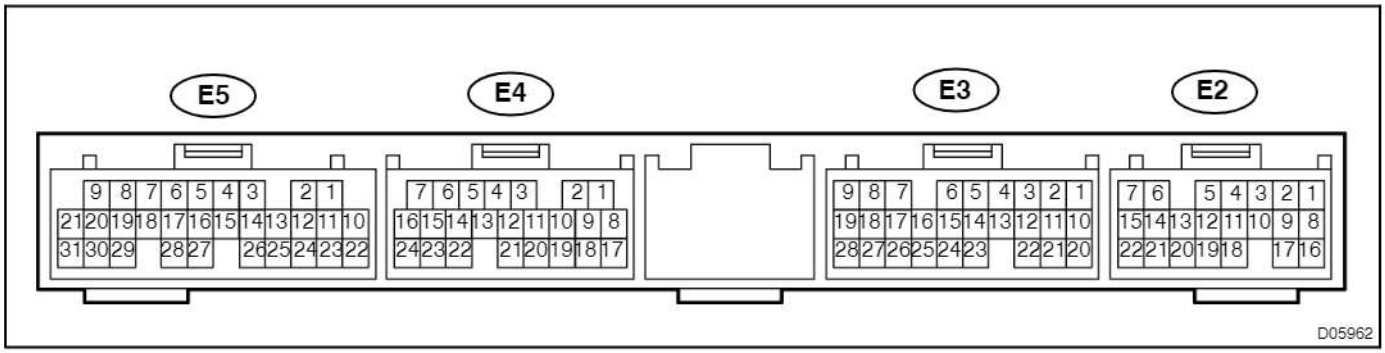
DI6N4–04

PARTS LOCATION



DI4ZQ–11

TERMINALS OF ECM



Each ECM terminals standard normal voltage is shown in the table below. In the table, first follow the information under "Condition".
Look under "Symbols (Terminals No.)" for the terminals to be inspected.
The standard normal 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
S1 (E5–8) ↔ E1 (E4–17)	BR–Y ↔ BR	IG switch ON	10 – 14 V
		1st or 2nd gear	10 – 14 V
		3rd or O/D gear	Below 1 V
S2 (E5–20) ↔ E1 (E4–17)	Y ↔ BR	IG switch ON	10 – 14 V
		1st or O/D gear	10 – 14 V
		2nd or 3rd gear	Below 1 V
SL (E5–19) ↔ E1 (E4 – 17)	G–W ↔ BR	IG switch ON	Below 1 V
		Vehicle driving under lock–up position	10 – 14 V
SLT^+ (E5–6) ↔ SLT^- (E5–5)	Y–R ↔ Y–G	IG switch ON	10 – 14 V
OD1 (E3–1) ↔ E1 (E4–17)	B ↔ BR	IG switch ON	5 – 6 V
ODLP (E3–19) ↔ E1 (E4–17)	BR–Y ↔ BR	O/D main switch ON (O/D OFF)	Below 1 V
		O/D main switch OFF (O/D ON)	10 – 14 V
L (E4–9) ↔ E1 (E4–17)	Y–B ↔ BR	IG switch ON and Shift lever L position	10 – 14 V
		IG switch ON and Shift lever other than L position	Below 1 V
2 (E4–19) ↔ E1 (E4–17)	L–Y ↔ BR	IG switch ON and Shift lever 2 position	10 – 14 V
		IG switch ON and Shift lever other than 2 position	Below 1 V
R (E3–2) ↔ E1 (E4–17)	R–B ↔ BR	IG switch ON and Shift lever R position	10 – 14 V
		IG switch ON and Shift lever other than R position	Below 1 V
D (E3–24) ↔ E1 (E4–17)	B–O ↔ BR	IG switch ON and Shift lever D position	10 – 14 V
		IG switch ON and Shift lever other than D position	Below 1 V
N (E4–8) ↔ E1 (E4–17)	P–L ↔ BR	IG switch ON and Shift lever N position	10 – 14 V
		IG switch ON and Shift lever other than N position	Below 1 V
THO (E4–13) ↔ E2 (E4–18)	GR–L ↔ BR	IG switch ON and ATF temperature 110 °C (230 °F)	Below 1 V
ST (E5–29) ↔ E1 (E4–17)	BR–W ↔ BR	IG switch ON	Below 1 V
		IG switch ON and R gear	10 – 14 V
P (E4–20) ↔ E1 (E4–17)	P ↔ BR	IG switch ON and Shift lever P position	10 – 14 V
		IG switch ON and Shift lever other than P position	Below 1 V
SPD (E3–22) ↔ E1 (E4–17)	W–R ↔ BR	IG switch ON and rotate driving wheel slowly	Pulse generation

ODMS (E2–5) ↔ E1 (E4–17)	BR–Y ↔ BR	IG switch ON	10 – 14 V
		IG switch ON and Press continuously O/D main switch	Below 1 V
NT^+ (E5–16) ↔ NT^- (E5–15)	W–L ↔ B	Engine is running	Pulse signal is output below 1 ↔ 4 to 5 V

DI677-08

PROBLEM SYMPTOMS TABLE

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.

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 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, check and replace the ECM.

Chapter 1: Electronic Circuit Matrix Chart

Symptom	Suspected Area	See page
No up–shift (A particular gear, from 1st to 3rd gear, is not up–shifted)	ECM	–
No up–shift (3rd → O/D)	1. O/D main switch and O/D OFF indicator light circuit 2. O/D cancel signal circuit 3. ECM	DI–829 DI–832 –
No down–shift (A particular gear, from 1st to 3rd gear, is not down–shifted)	ECM	–
No down–shift (O/D → 3rd)	1. O/D main switch and O/D OFF indicator light circuit 2. ECM	DI–829 –
No lock–up	ECM	–
No lock–up OFF	ECM	–
Shift point too high or too low	ECM	–
Up–shift to O/D from 3rd while O/D main switch is OFF	ECM	–
Up–shift to O/D from 3rd while engine is cold	ECM	–
No kick–down	ECM	–
Engine stalls when starting off or stopping	ECM	–

Chapter 2: On–vehicle Repair
(★: U341E AUTOMATIC TRANSAXLE Repair Manual Pub. No. RM735U)

Symptom	Suspected Area	See page
Vehicle does not move in any forward positions and reverse position	1. Manual valve 2. Primary regulator valve 3. Secondary regulator valve 4. Off–vehicle repair matrix chart	★ ★ ★ –
Vehicle does not move in R position	1. Manual valve 2. 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)	3–4 shift valve	★
No down–shift (3rd → 2nd)	2–3 shift valve	★
No down–shift (2nd → 1st)	1–2 shift valve	★
No lock–up or No lock–up off	1. Lock–up relay valve 2. Lock–up control valve 3. Solenoid relay valve 4. Solenoid modulator valve 5. Off–vehicle repair matrix chart	★ ★ ★ ★ –
Harsh engagement (N → D)	1. C_1 accumulator 2. Accumulator control valve 3. Off–vehicle repair matrix chart	★ ★ –
Harsh engagement (N → R)	1. C_3 accumulator 2. Accumulator control valve 3. Reverse control valve 4. Off–vehicle repair matrix chart	★ ★ ★ –
Harsh engagement (Lock–up)	1. Lock–up relay valve 2. Accumulator control valve 3. Lock–up control valve 4. Off–vehicle repair matrix chart	★ ★ ★ –
Harsh engagement (1st → 2nd)	1. B_2 accumulator 2. Accumulator control valve	★ ★
Harsh engagement (2nd → 3rd)	1. C_2 accumulator 2. Accumulator control valve	★ ★
Harsh engagement (3rd → O/D)	1. B_1 accumulator 2. Accumulator control valve 3. 3–4 shift timing valve	★ ★ ★
Harsh engagement (O/D → 3)	1. 3–4 shift timing valve 2. 4–3 shift timing valve	★ ★
Harsh engagement (D, 2, L position)	Coat relay valve	★
Slip or shudder (Forward and reverse)	1. Oil strainer 2. Off–vehicle repair matrix chart	AX–9 –
No engine braking (1st: L position)	1. Reverse control valve 2. Off–vehicle repair matrix chart	★ –
No engine braking (2nd: 2 position)	3–4 shift valve	★

No kick–down	1. 1–2 shift valve 2. 2–3 shift valve 3. 3–4 shift valve	★ ★ ★
Poor acceleration	SLT damper	★

Chapter 3: Off–vehicle Repair
(★: U341E AUTOMATIC TRANSAXLE Repair Manual Pub. No. RM735U)

Symptom	Suspected Area	See page
Vehicle does not move in any forward positions and reverse position	1. Planetary gear unit 2. Forward clutch 3. One–way clutch No. 2 4. Reverse Clutch 5. 1st and reverse brake	★ ★ ★ ★ ★
Vehicle does not move in R position	1. Planetary gear unit 2. Reverse Clutch 3. 1st and reverse brake	★ ★ ★
No up–shift (1st → 2nd)	1. 2nd brake 2. One–way clutch No. 1	★ ★
No up–shift (2nd → 3rd)	Direct clutch	★
No up–shift (3rd → O/D)	O/D and 2nd brake	★
No lock–up or No lock–up off	Torque converter clutch	AX–36
Harsh engagement (N → D)	1. Forward clutch 2. One–way clutch No. 2	★ ★
Harsh engagement (N → R)	1. Reverse clutch 2. 1st and reverse brake	★ ★
Harsh engagement (Lock–up)	Torque converter clutch	AX–36
Harsh engagement (1st → 2nd)	1. 2nd brake 2. One–way clutch No. 1	★ ★
Harsh engagement (2nd → 3rd)	Direct clutch	★
Harsh engagement (3rd → O/D)	O/D and 2nd brake	★
Slip or shudder (Forward position)	1. Torque converter clutch 2. Forward clutch 3. Direct clutch 4. O/D and 2nd brake 5. 2nd brake 6. One–way clutch No. 1 7. One–way clutch No. 2	AX–36 ★ ★ ★ ★ ★ ★
Slip or shudder (Reverse position)	1. Reverse clutch 2. 1st and reverse brake	★ ★
Slip or shudder (1st)	One–way clutch No. 2	★
Slip or shudder (2nd)	1. 2nd brake 2. One–way clutch No. 1	★ ★
Slip or shudder (3rd)	Direct clutch	★
Slip or shudder (O/D)	O/D and 2nd brake	★
No engine braking (1st: L position)	1st and reverse brake	★
No engine braking (2nd: 2 position)	O/D and 2nd brake	★
Poor acceleration (All position)	Torque converter clutch	AX–36
Large shift shock or engine stalls when starting off or stopping	Torque converter clutch	AX–36

DIAJ8-03

CIRCUIT INSPECTION

DTC	P0705	Transmission Range Sensor Circuit Malfunction (PRNDL Input)

CIRCUIT DESCRIPTION

The neutral start switch detects the shift lever position and sends signals to the ECM.
The ECM receives signals (P, R, N, D, 2 and L) from the park/neutral position switch.

DTC No.	DTC Detecting Condition	Trouble Area
P0705	(2–trip detection logic) • 2 or more switches are ON simultaneously for P, R, N, D, 2 and L positions.	• Open or 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	0.5 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present.	See page DI–758	
The typical enabling condition is not available.	–	

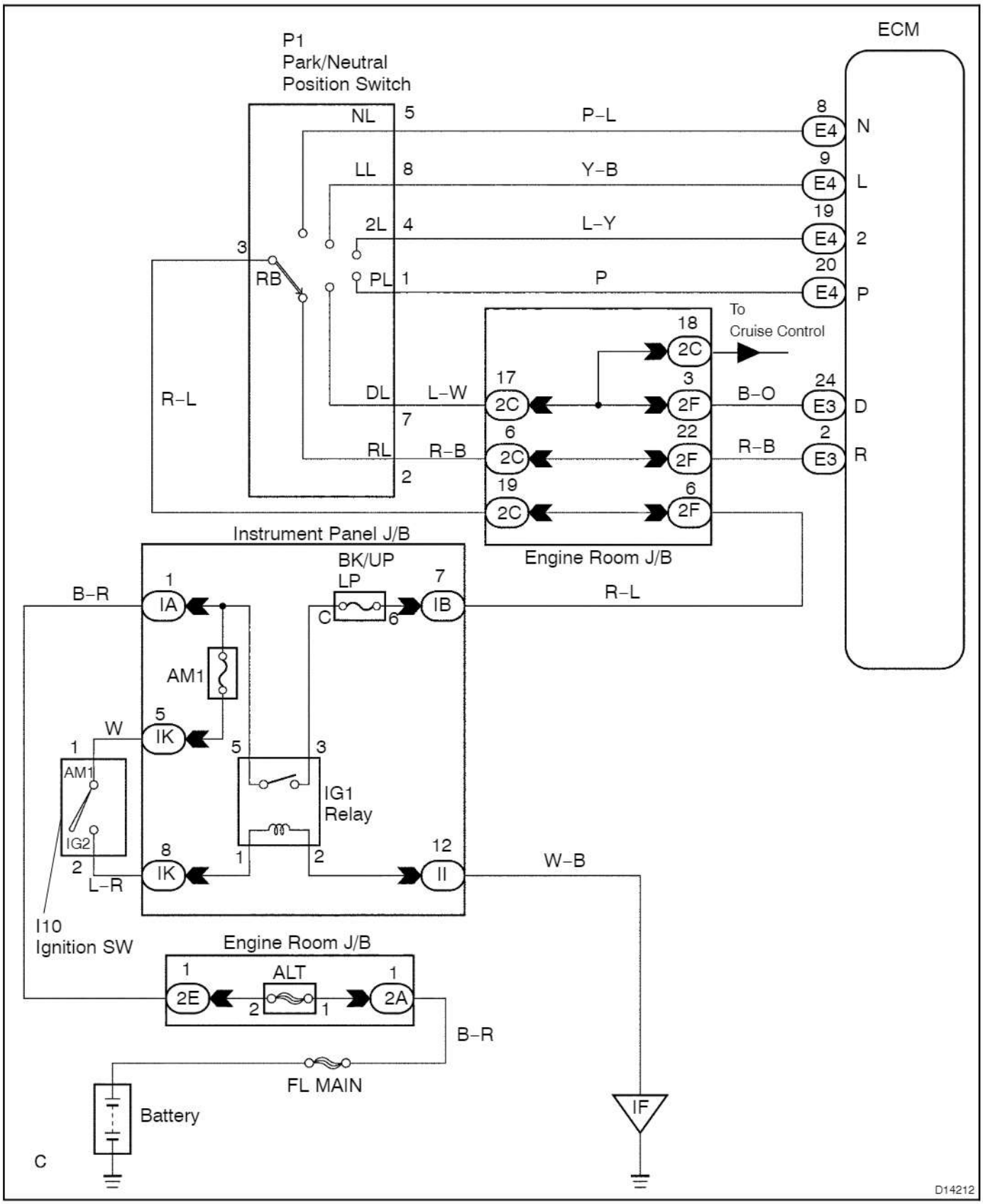
TYPICAL MALFUNCTION THRESHOLDS

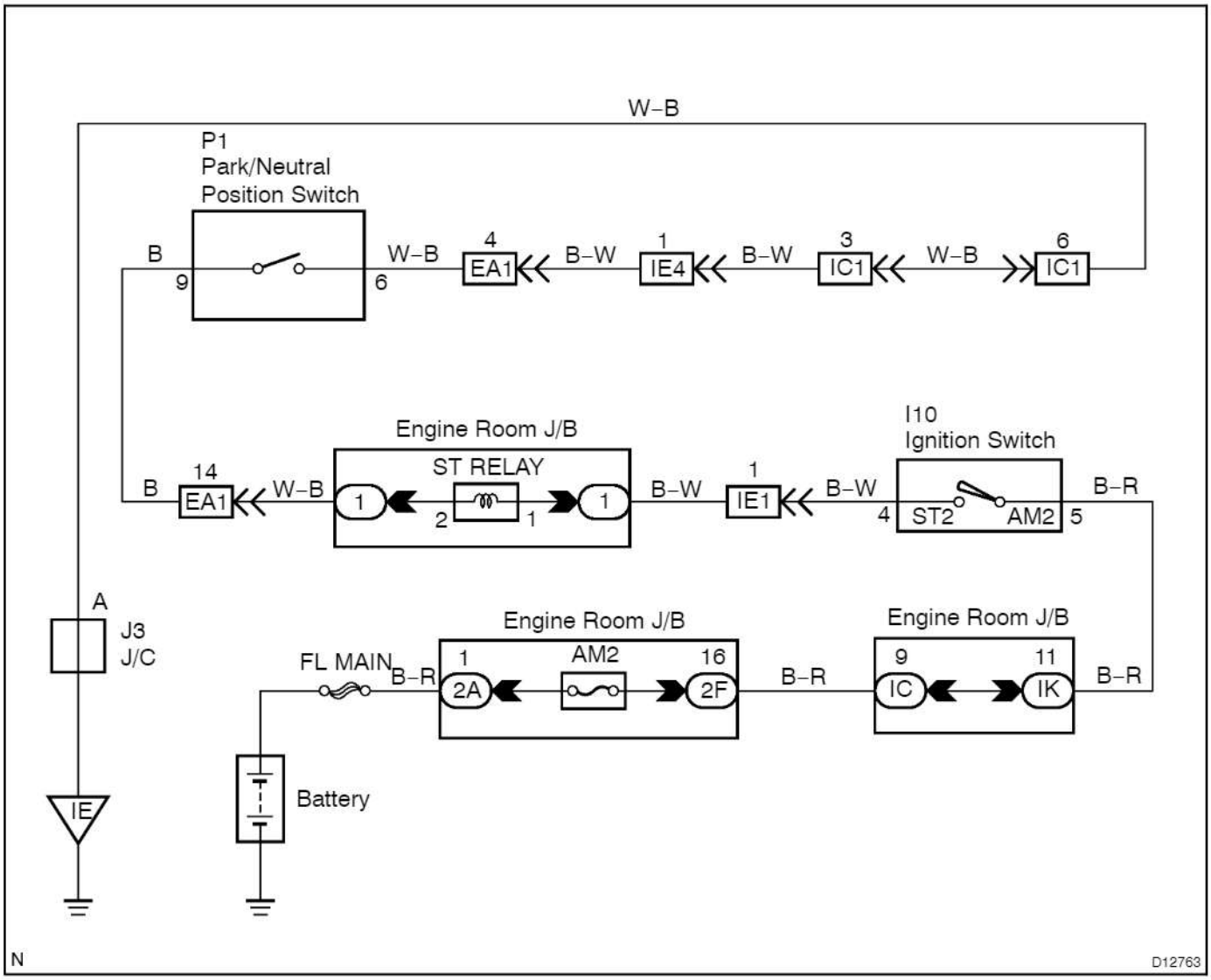
Detection criteria	Threshold
Number of the following signal input at the same time	2 or more
P switch	ON
R switch	
N switch	
D switch	
2 switch	
L switch	

COMPONENT OPERATING RANGE

Parameter	Standard value
Park/neutral position switch	The park/neutral switch sends only one signal to the ECM

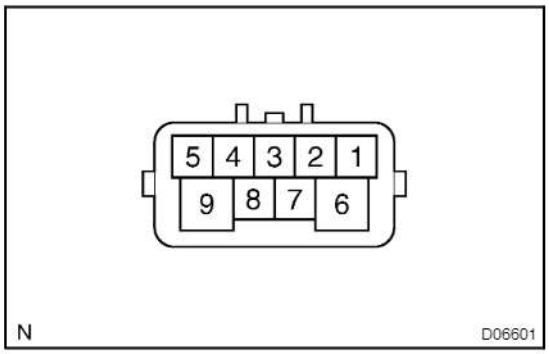
WIRING DIAGRAM




W–B
P1
Park/Neutral
Position Switch
B
9
W–B
6
4
EA1
B–W
1
IE4
B–W
3
IC1
W–B
6
IC1
Engine Room J/B
ST RELAY
B
14
EA1
W–B
1
2
1
1
B–W
1
IE1
I10
Ignition Switch
B–W
4
ST2
AM2
5
B–R
A
J3
J/C
IE
FL MAIN
B–R
Engine Room J/B
1
2A
AM2
16
2F
B–R
Engine Room J/B
9
IC
11
IK
B–R
Battery
N
D12763

INSPECTION PROCEDURE

1	**Check park/neutral position switch.**



PREPARATION:

Remove the park/neutral position switch.

CHECK:

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 – 7	–
2	3 – 4	–
L	3 – 8	–

OK:

There is continuity.

NG	**Replace the park/neutral position switch.**

OK

2	**Check harness and connector between ECM and park/neutral position switch (See page IN–30).**

NG	**Repair or replace the harness and connector.**

OK

Check and replace the ECM (See page IN–30).

DTC	P0710	Transmission Fluid Temperature Sensor "A" Circuit

CIRCUIT DESCRIPTION

The ATF temperature sensor converts fluid temperature into a resistance value which is input into the ECM.

DTC No.	DTC Detecting Condition	Trouble Area
P0710	Either (a) or (b) is detected for 0.5 sec. or more. (1–trip detection logic) (a) Temperature sensor resistance is less than 79 Ω (b) After the engine has been operating for 15 minutes or more, the resistance at the temp. sensor is more than 156 kΩ	• Open or short in ATF temp. sensor circuit • ATF temp. sensor • ECM

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 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)
		ATF temperature sensor/Range check (Low resistance)
		ATF temperature sensor/Range check (High resistance)
Required sensors/Components	ATF temperature sensor (TFT sensor)	
Frequency of operation	Continuous	
Duration	0.5 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present.	See page DI–758	
Range check (Chattering, Low resistance)		
The typical enabling condition is not available.	–	–
Range check (High resistance)		
Time after engine start	15 min. or more	–

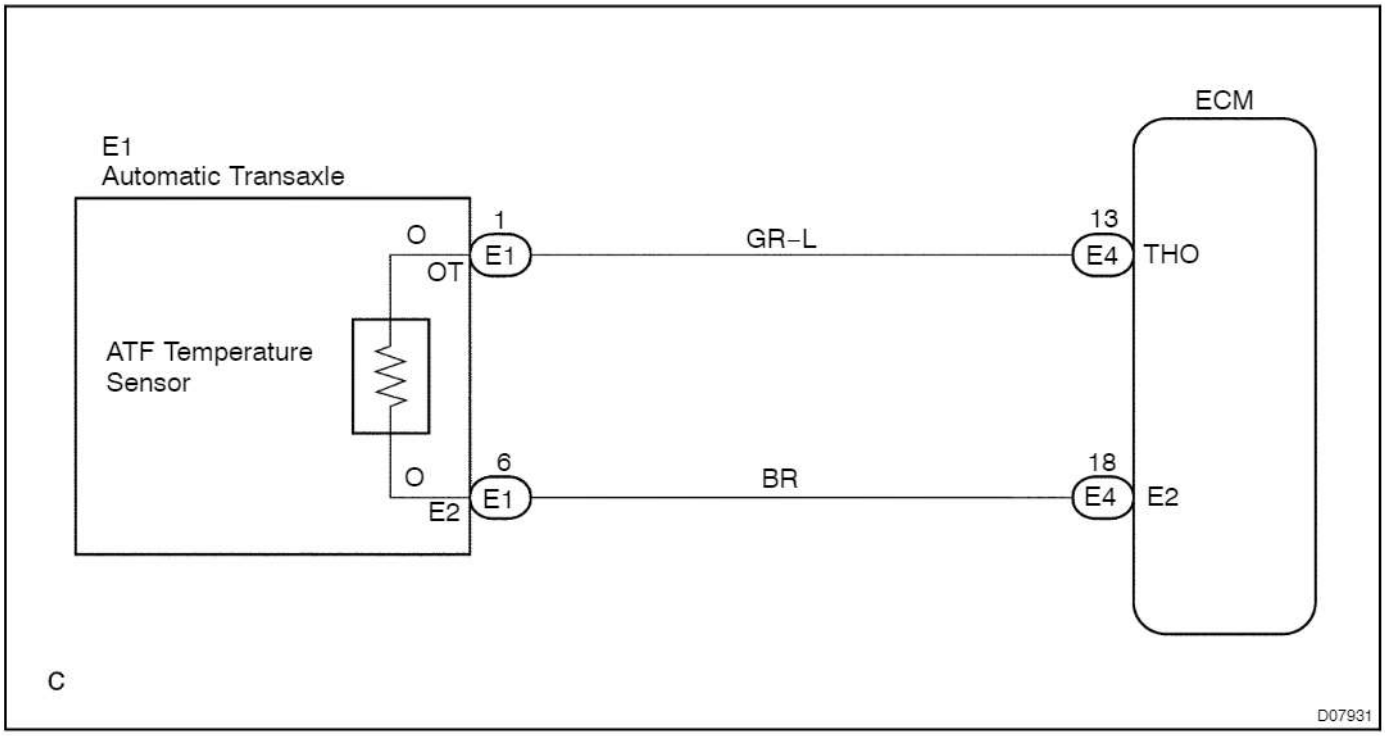
TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
Range check (Chattering)	
TFT (transmission fluid temperature) sensor resistance	Less than 79 Ω, more than 156 kΩ
Range check (Low resistance)	
TFT sensor resistance	Less than 79 Ω
Range check (High resistance)	
TFT sensor resistance	More than 156 kΩ

COMPONENT OPERATING RANGE

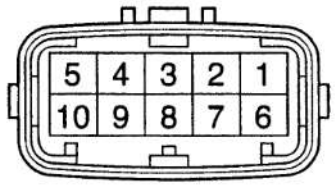
Parameter	Standard value
TFT sensor	Atmospheric temperature to approx. 130°C (266°F)

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check ATF temperature sensor.



D12851

PREPARATION:
Disconnect the transmission wire connector.
CHECK:
Measure resistance between terminals 1 and 6 of transmission wire connector.
OK:
90 Ω to 156 kΩ
HINT:
Refer to the table below for resistance values according to ATF temperature.

ATF temperature	Specified condition
10°C (50°F)	6.4 kΩ
25°C (77°F)	3.5 kΩ
110°C (230°F)	0.2 kΩ

Measure resistance between terminals 1 and 6 of the transmission wire connector and body ground.
OK:
Resistance: 1 MΩ or higher

NG → **Replace the ATF temperature sensor (transmission wire).**

OK

2	Check harness and connector between ATF temperature sensor and ECM (See page IN–30).

NG → **Repair or replace the harness or connector.**

OK

Check and replace the ECM (See page IN–30).

DIC6A–02

DTC	P0711	Transmission Fluid Temperature Sensor "A" Performance

CIRCUIT DESCRIPTION

The ATF temperature sensor converts fluid temperature into a resistance value which is input into the ECM.

DTC No.	DTC Detecting Condition	Trouble Area
P0711	Both (a) and (b) is detected. (2–trip detection logic) (a) After 12 seconds of the engine start, the temp. of the atmosphere and that of the engine coolant is more than –10°C. (b) After a normal driving for over 18 minutes and 20 seconds and 9 km (6 miles), the ATF temp. is less than 20°C.	• Transaxle fluid level • ATF temperature sensor

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 open or short 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 20°C (68°F) after running the vehicle for a certain period, the ECM interprets this as a fault, and turns on the MIL.
When the ATF temperature is 110°C (230°F) or more after 18 minutes of engine cold start, the ECM also determines this as a fault, turns on the MIL, and stores the DTC.

MONITOR STRATEGY

Related DTCs	P0711	ATF temperature sensor /Rationality check
Required sensors/Components	Main	ATF temperature sensor (TFT sensor)
Required sensors/Components	Sub	IAT sensor, ECT sensor
Frequency of operation	Continuous	
Duration	3 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present.	See page DI–758	
TFT (transmission fluid temperature) sensor circuit	Not circuit malfunction	
ECT (Engine coolant temperature) sensor circuit	Not circuit malfunction	
IAT (Intake air temperature) sensor circuit	Not circuit malfunction	
Throttle sensor circuit	Not circuit malfunction	
Time after engine start	16 min. and 40 sec. or more	–
Duration time from TFT (transmission fluid temperature): Less than 20°C (68°F)	3 sec. or more	–
ECT	–15°C (5°F) or more	–
Time after engine start	18 min. and 20 sec.	
Driving distance after engine start	9 km (5.6 mile) or more	–
IAT (12 sec. after engine start)	–10°C (14°F) or more	–
ECT (12 sec. after engine start)	–10°C (14°F) or more	–

TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
TFT (transmission fluid temperature)	Less than 20°C (68°F)

COMPONENT OPERATING RANGE

Parameter	Standard value
TFT (transmission fluid temperature)	Atmospheric temperature to approx. 130°C (266°F)

WIRING DIAGRAM

See page DI–794.

INSPECTION PROCEDURE

1	**Check other DTCs output (in addition to DTC P0711)**

PREPARATION:

(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 to the ON position.
(e) Push the "ON" button of the OBD II scan tool or the hand–held tester.
(f) Select the item "DIAGNOSIS/ENHANCED OBD II/DTC INFO/CURRENT CODES".

CHECK:

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 DI–781).**

A

2	**Check transaxle fluid level (See page DI–758).**

NG → **Add fluid (See page DI–758).**

OK

Replace the transmission wire (ATF temperature sensor) (See page AX–5).

D/C6B–02

DTC	P0717	Turbine Speed Sensor Circuit No Signal

CIRCUIT DESCRIPTION

This sensor detects the rotation speed of the input turbine. By comparing the input turbine speed signal (NT) with the counter gear speed sensor signal (NC), the ECM detects the shift timing of the gears and appropriately controls the engine torque and hydraulic pressure in response to various conditions, thus performing smooth gear shifting.

DTC No.	DTC Detecting Condition	Trouble Area
P0717	The ECM detects conditions (a), (b), (c), (d) and (e) continuity for 5 secs. or more. (1–trip detection logic) (a) Gear change not being performed (b) Gear position: 2nd, 3rd or 4th gear (c) Solenoid valves and park/neutral position switch are normal (d) T/M input shaft rpm: 300 rpm or less (e) T/M output shaft rpm: 1,000 rpm or more	• Open or short in input turbine speed sensor (NT) circuit • Input turbine speed sensor (NT) • ECM

MONITOR DESCRIPTION

The NT terminal of the ECM detects the revolving signal from speed sensor (NT) (input RPM). The ECM outputs a gearshift signal comparing the speed sensor (NT) with the speed sensor (NC).
While the vehicle is operating in the 2nd, 3rd, 4th or 5th gear position in the shift position of D, if the input shaft revolution is less than 300 rpm*1 although the output shaft revolution is more than 1,000 rpm*2, the ECM detects the trouble, illuminates the MIL and stores the DTC.
*1: Pulse is not output or is irregularly output.
*2: The vehicle speed is 50 km/h (31 mph) or more.

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	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present.	See page DI–758	
Shift change	Shift change is completed and before starting next shift change operation	
ECM selected gear	2nd, 3rd or 4th	
Output shaft rpm	1,000 rpm or more	–
NSW switch	OFF	
R switch	OFF	
L switch	OFF	
Engine	Running	

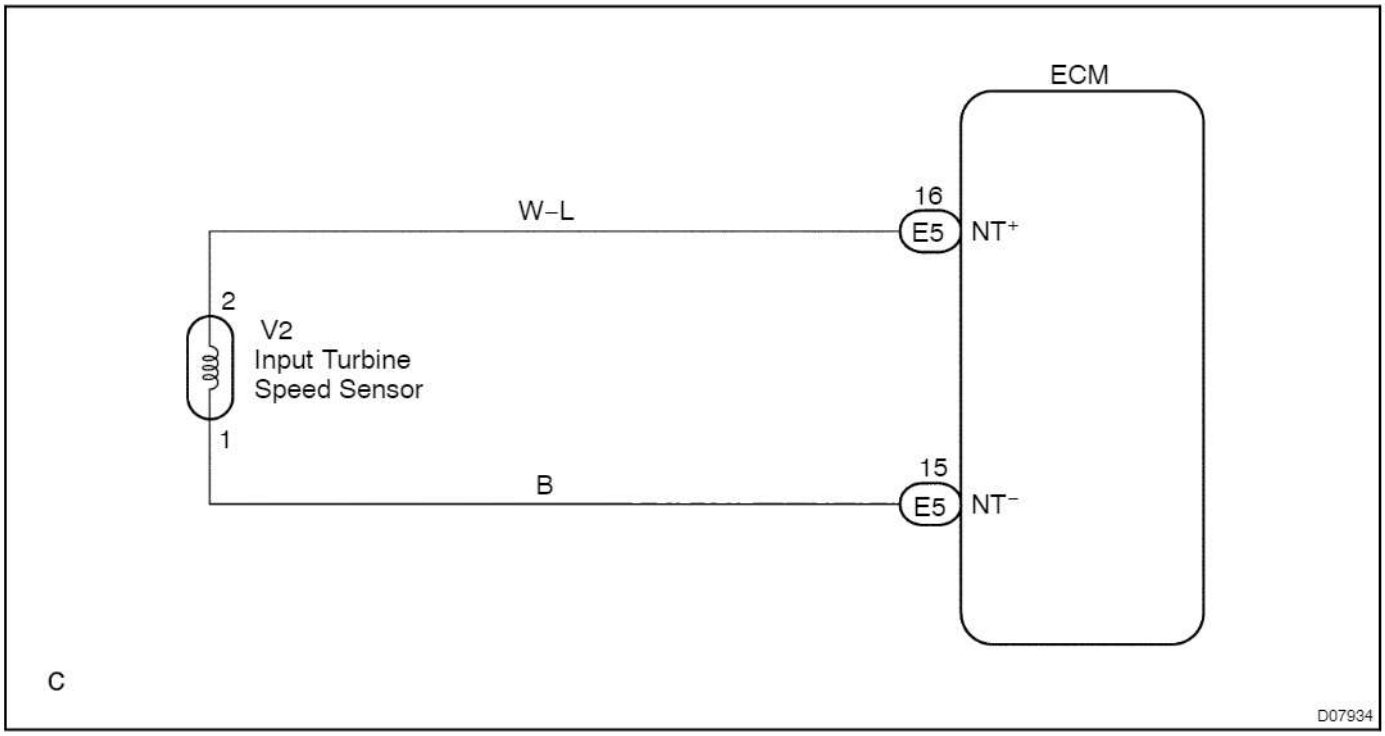
TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
Sensor signal rpm	Less than 300 rpm

COMPONENT OPERATING RANGE

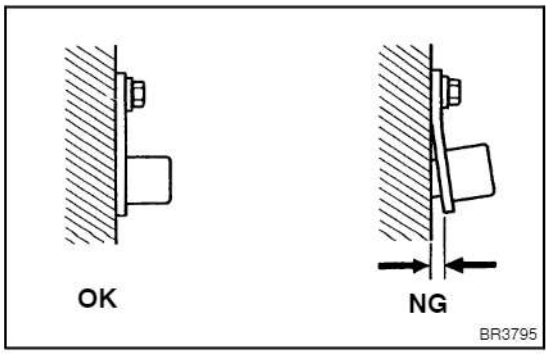
Parameter	Standard value
Speed sensor (NT)	Turbine speed is equal to engine speed when lock–up ON.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check speed sensor (NT) installation.**

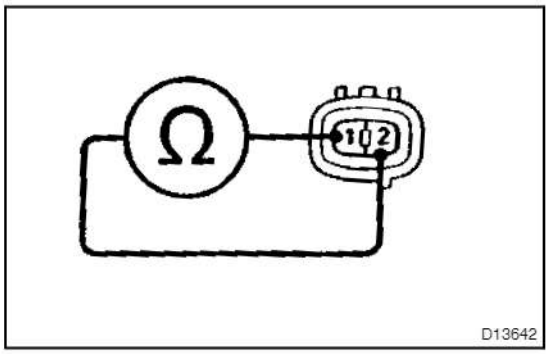


CHECK:
Check the speed sensor installation.
OK:
The installation bolt is tightened properly and there is no clearance between the sensor and transaxle case.

NG → **Tighten the speed sensor (NT) properly.**

OK

2	**Check speed sensor (NT) .**



PREPARATION:
Remove the NT speed sensor from transaxle.
CHECK:
Measure resistance between terminals 1 and 2 of speed sensor.
OK:
Resistance: 620 ± 60 Ω at 20 °C (68 °F)

NG → **Replace the speed sensor (NT).**

OK

3	**Check harness and connector between ECM and speed sensor (NT) (See page IN–30).**

NG → **Repair or replace harness and connector.**

OK

Check and replace the ECM (See page IN–30).

DIAJB-03

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 operated, this switch sends a signals to ECM. Then the ECM cancels 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)) 5 times for two driving cycles in order to detect malfunction.

MONITOR STRATEGY

Related DTCs	P0724	Stop light switch/Range check/Rationality
Required sensors/Components	Main	Stop light switch
Required sensors/Components	Sub	Vehicle speed sensor
Frequency of operation	Continuous	
Duration	GO and STOP 5 times	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present.	See page DI–758	
GO (Vehicle speed is 30 km/h (18.63 mph) or more)	Once	
STOP (Vehicle speed is less than 3 km/h (1.86 mph))	Once	

TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
Brake switch	Remain ON during GO and STOP 5 times

WIRING DIAGRAM

See page DI–1068.

INSPECTION PROCEDURE

1	Check stop light switch (See page BE–37).

NG → Replace stop light switch.

OK ↓

2	Check harness and connector between ECM and stop light switch (See page IN–30).

NG → Repair or replace harness or connector.

OK ↓

Check and replace the ECM (See page IN–30).

DIAJC-03

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 or automatic transaxle (clutch, brake or gear etc.).

DTC No.	DTC Detecting 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) • When lock–up is ON, clutch or brake slips or gear is broken. (2–trip detection logic)	• Shift solenoid valve SL is stuck open or closed • Valve body blocked up or stuck • Lock–up clutch • Automatic transaxle (clutch, brake or gear etc.)

MONITOR DESCRIPTION

Torque converter lock–up is controlled by the ECM based on speed sensor (NT), speed sensor (NC), engine rpm, engine load, engine temperature, vehicle speed, 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 turbine rpm (NT). The ECM calculates the actual transmission gear by comparing input turbine rpm (NT) to counter gear rpm (NC). 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 torque converter clutch 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 100 rpm greater than input 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 speed is less than 35 rpm.)

MONITOR STRATEGY

Related DTCs	P0741	Shift solenoid valve SL/OFF malfunction
		Shift solenoid valve SL/ON malfunction
Required sensors/Components	Main	Shift solenoid valve SL, Speed sensor (NT), Speed sensor (NC), Crankshaft position sensor (NE)
Required sensors/Components	Sub	Throttle position sensor (VPA1), Mass air flow meter (MAF), ATF temperature sensor (THO1), Engine coolant temperature sensor (ECT)
Frequency of operation	Continuous	
Duration	OFF malfunction	3.5 sec.
	ON malfunction	1.8 sec.
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

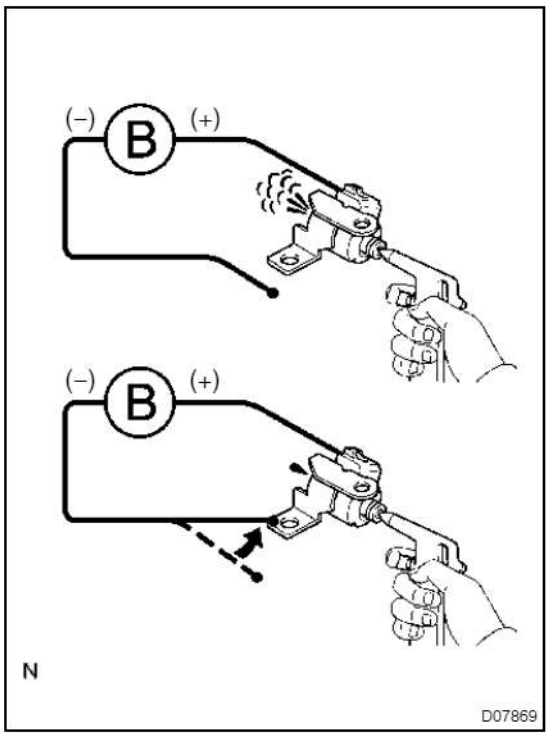
Item	Specification	
	Minimum	Maximum
All		
ECT (Engine Coolant Temperature)	60°C (140°F) or more	–
Vehicle speed	25 km/h (15.5 mph) or more	–
Transmission range	"D"	
ECM selected gear	3rd or 4th	
ECT sensor circuit	Not circuit malfunction	
Shift solenoid valve S1 circuit	Not circuit malfunction	
Shift solenoid valve S2 circuit	Not circuit malfunction	
Shift solenoid valve SL circuit	Not circuit malfunction	
Input (turbine) speed sensor circuit	Not circuit malfunction	
Internal counter shaft speed sensor circuit	Not circuit malfunction	
Throttle sensor circuit	Not circuit malfunction	
OFF malfunction		
ECM lock–up command	ON	
ON malfunction		
ECM lock–up command	OFF	
Throttle valve opening angle	8% or more	–
Vehicle speed	–	Less than 60 km/h (37.3 mph)

TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
OFF malfunction	
Engine speed – Input (turbine) speed	100 rpm or more
ON malfunction	
2 detections are necessary per driving cycle: 1st detection; temporary flag ON 2nd detection; pending fault code ON Vehicle speed must be under 10 km/h (6.2 mph) once before 2nd detection	
Difference between egine speed and Input (turbine) speed	Less than 35 rpm

INSPECTION PROCEDURE

1	**Check solenoid valve SL operation**



PREPARATION:

(a) Remove the oil pan.

(b) Remove the solenoid valve SL.

CHECK:

(a) Applying 490 kPa (5 kgf/cm^2, 71 psi) of compressed air, check that the solenoid valve does leak air.

(b) When battery voltage is supplied to the shift solenoid valve, check that the solenoid valve closes.

OK:

(a) Solenoid valve does leak air.

(b) Solenoid valve closes.

NG	**Replace the solenoid valve SL.**

OK

2	Check valve body (See page DI–785).

NG → Repair or replace the valve body.

OK

3	Check the torque converter clutch (See page AX–36).

NG → Repair the torque converter clutch.

OK

Repair the transaxle (See page AX–30).

DIAJD-03

DTC	P0743	Torque Converter Clutch Circuit Electrical (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.
Fail safe function:
If the ECM detects a malfunction, it turns the shift solenoid valve SL OFF.

DTC No.	DTC Detecting Condition	Trouble Area
P0743	Either (a) or (b) is detected for 1 time. (2–trip detection logic) (a) Solenoid resistance is 8 Ω or less when solenoid is energized. (b) Solenoid resistance is 100 kΩ or more when solenoid is not energized.	• Open or short in shift solenoid valve SL circuit • Shift solenoid valve SL • ECM

MONITOR DESCRIPTION

Based on the signals from the Throttle Position Sensor, the Airflow Meter and the Crankshaft Position Sensor, the ECM sends a signal to the SL Solenoid Valve to regulate the hydraulic pressure and provide smoother gearshifts. The shift–solenoid valve SL responds to commands from the ECM. The valve controls the look–up relay valve to perform the torque–converter lock–up function. If the ECM detects an open or short circuit for shift–solenoid SL, it will illuminate the MIL and store the DTC.

MONITOR STRATEGY

Related DTCs	P0743	Shift solenoid valve SL/Range check (Low resistance)
		Shift solenoid valve SL/Range check (High resistance)
Required sensors/Components	Shift solenoid valve SL	
Frequency of operation	Continuous	
Duration	0.032 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

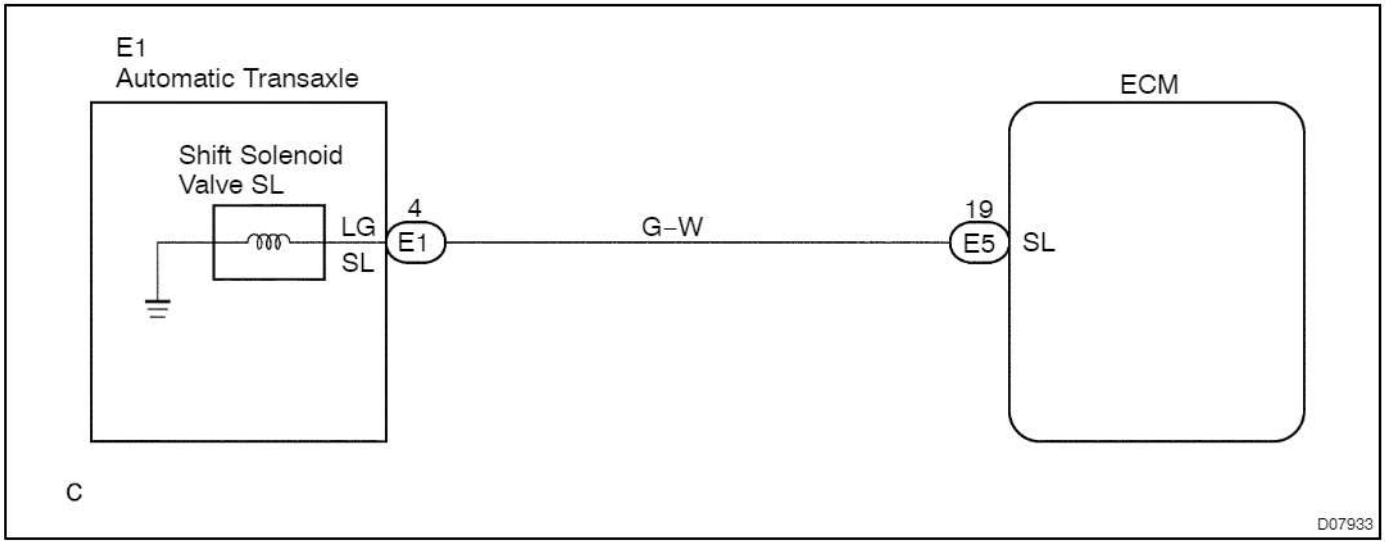
TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present.	See page DI–758	
The typical enabling condition is not available.	–	

TYPICAL MALFUNCTION THRESHOLDS

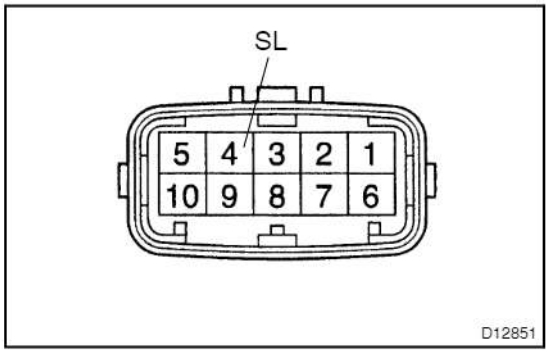
Detection criteria	Threshold
Either of the following conditions is met: Range check (Low resistance) or (high resistance)	
Low resistance	
Shift solenoid vavle SL resistance	8 Ω or less
High resistance	
Shift solenoid vavle SL resistance	100 kΩ or more

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check transmission wire.**

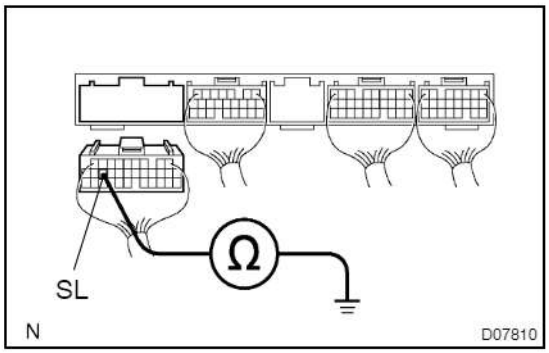


PREPARATION:
Disconnect the transmission wire connector.
CHECK:
Measure resistance between SL of transmission wire and body ground.
OK:
Resistance: 11 to 15 Ω at 20 °C (68 °F)

NG → **Go to step 3.**

OK

2	Measure resistance between terminal SL of ECM and body ground.



PREPARATION:

(a) Connect the transmission wire connector.
(b) Remove the ECM hood.
(c) Disconnect the connector from ECM.

CHECK:

Measure resistance between terminal SL of ECM and body ground.

OK:

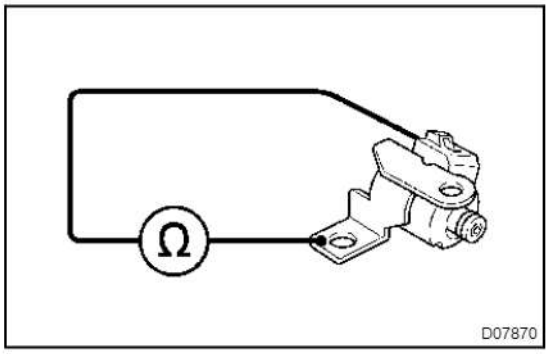
Resistance: 11 to 15 Ω at 20 °C (68 °F)

NG	Repair or replace the harness or connector (See page IN–30).

OK

Check and replace the ECM (See page IN–30).

3	Check shift solenoid valve SL.



PREPARATION:

(a) Jack up the vehicle.
(b) Remove the oil pan.
(c) Disconnect the shift solenoid valve SL connector.
(d) Remove the shift solenoid valve SL.

CHECK:

Measure resistance between terminal SL of shift solenoid valve and solenoid body.

OK:

Resistance: 11 to 15 Ω at 20 °C (68 °F)

NG	Replace the shift solenoid valve SL.

OK

Repair or replace the transmission wire (See page AX–5).

DIAJE-03

DTC	P0751	Shift Solenoid "A" Performance (Shift Solenoid Valve S1)

DTC	P0756	Shift Solenoid "B" Performance (Shift Solenoid Valve S2)

SYSTEM DESCRIPTION

The ECM uses signals from the vehicle 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 trouble of the shift solenoid valves and valve body.

DTC No.	DTC Detecting Condition	Trouble Area
P0751 P0756	During normal driving, the gear required by the ECM does not match the actual gear (2–trip detection logic)	• Shift solenoid valve No. 1/No. 2 is stuck open or closed • Valve body is blocked up or stuck • ECM

HINT:
Check the shift solenoid valve No. 1 when DTC P0751 is output and check the shift solenoid valve No. 2 when DTC P0756 is output.

MONITOR DESCRIPTION

The ECM commands gear shifts by turning the shift solenoid valves "ON/OFF". According to the input shaft revolution, intermediate (counter) 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 the same, the ECM illuminates the MIL and stores the DTC.

MONITOR STRATEGY

P0751

Related DTCs	P0751	Shift solenoid valve S1/OFF malfunction
		Shift solenoid valve S1/ON malfunction
Required sensors/Components	Main	Shift solenoid valve S1, Speed sensor (NT), Speed sensor (NC), Crankshaft position sensor (NE)
Required sensors/Components	Sub	Throttle position sensor, Vehicle speed sensor
Frequency of operation	Continuous	
Duration	OFF malfunction (A)	0.85 sec.
	OFF malfunction (B), ON malfunction (A) & (B)	0.8 sec.
MIL operation	2 driving cycles	
Sequence of operation	None	

P0756

Related DTCs	P0756	Shift solenoid valve S2/OFF malfunction
		Shift solenoid valve S2/ON malfunction
Required sensors/Components	Main	Shift solenoid valve S2, Speed sensor (NT), Speed sensor (NC), Crankshaft position sensor (NE)
Required sensors/Components	Sub	Throttle position sensor, Vehicle speed sensor
Frequency of operation	Continuous	
Duration	0.85 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

P0751

Item	Specification	
	Minimum	Maximum
All		
ECT (Engine Coolant Temperature)	60°C (140°F) or more	–
Transmission range	"D"	
ECT sensor circuit	Not circuit malfunction	
Shift solenoid valve S1 circuit	Not circuit malfunction	
Shift solenoid valve S2 circuit	Not circuit malfunction	
Input (turbine) speed sensor circuit	Not circuit malfunction	
Internal counter shaft speed sensor circuit	Not circuit malfunction	
Throttle sensor circuit	Not circuit malfunction	
OFF malfunction (A)		
ECM selected gear	1st	
Vehicle speed	10 to 40 km/h (6.2 to 24.9 mph)	
Throttle valve opening angle	15% or more and 7.0% at engine speed 1,900 rpm (varies with engine speed)	–
OFF malfunction (B)		
Current ECM selected gear	4th	
Last ECM selected gear	3rd	
ON malfunction (A)		
Current ECM selected gear	4th	
Last ECM selected gear	3rd	
ON malfunction (B)		
ECM selected gear	4th	
"Throttle valve opening angle at current ECM selected gear" – "Throttle valve opening angle at last ECM selected gear"	–	Less than 20%
"Vehicle speed at current ECM" – "Vehicle speed at last ECM selected gear"	–	Less than 15 km/h (9.3 mph)
Vehicle speed (current)	–	Less than 85 km/h (52.8 mph)
Throttle valve opening angle (current)	–	Less than 35%
Engine speed (current)	3,200 rpm or more	–

P0756

Item	Specification	
	Minimum	Maximum
All		
ECT (Engine Coolant Temperature)	60°C (140°F) or more	–
Transmission range	"D"	
ECT sensor circuit	Not circuit malfunction	
Shift solenoid valve S1 circuit	Not circuit malfunction	
Shift solenoid valve S2 circuit	Not circuit malfunction	
Input (turbine) speed sensor circuit	Not circuit malfunction	
Internal counter shaft speed sensor circuit	Not circuit malfunction	
Throttle sensor circuit	Not circuit malfunction	
OFF malfunction (A)		
ECM selected gear	1st	
Vehicle speed	10 to 40 km/h (6.2 to 24.9 mph)	
Throttle valve opening angle	7.0% or more at engine speed 1,900rpm (varies with engine speed)	–
OFF malfunction (B)		
ECM selected gear	3rd	
Vehicle speed	10 km/h (6.2 mph) or more	–
Throttle valve opening angle	7.0% or more at engine speed 1,900rpm (varies with engine speed)	–
OFF malfunction (C)		
ECM selected gear	4th	
Vehicle speed	10 km/h (6.2 mph) or more	–
Throttle valve opening angle	7.0% or more at engine speed 1,900rpm (varies with engine speed)	–
ON malfunction (A)		
ECM selected gear	2nd	
Vehicle speed	10 km/h (6.2 mph) or more	–
Throttle valve opening angle	7.0% or more at engine speed 1,900rpm (varies with engine speed)	–
ON malfunction (B)		
ECM selected gear	3rd	
Vehicle speed	10 km/h (6.2 mph) or more	–
Throttle valve opening angle	7.0% or more at engine speed 1,900rpm (varies with engine speed)	–
ON malfunction (C)		
ECM selected gear	4th	
Vehicle speed	10 km/h (6.2 mph) or more	–
Throttle valve opening angle	7.0% or more at engine speed 1,900rpm (varies with engine speed)	–

TYPICAL MALFUNCTION THRESHOLDS

P0751

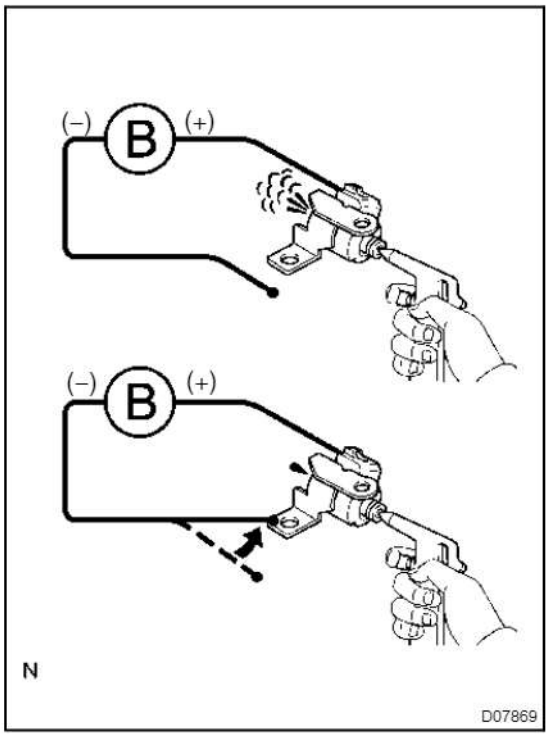
Detection criteria	Threshold
[OFF malfunction]	
Both of the following conditions are met: OFF malfunction (A) and (B)	
2 detections are necessary per driving cycle: 1st detection; temporary flag ON 2nd detection; pending fault code ON	
OFF malfunction (A)	
Input speed/Output speed	0.64 to 0.78
OFF malfunction (B)	
Input speed/Output speed	Change as follows 0.95 to 1.09 (Last) ↓ 0.64 to 0.78 (Current)
[ON malfunction]	
Both of the following conditions are met: ON malfunction (A) and (B)	
ON malfunction (A)	
Input speed/Output speed	Not changed as follows 0.95 to 1.09 (Last) ↓ 0.64 to 0.78 (Current)
ON malfunction (B)	
NE current – NE last	1,100 rpm or more

P0756

Detection criteria	Threshold
[OFF malfunction]	
All of the following conditions are met: OFF malfunction (A), (B) and (C)	
2 detections are necessary per driving cycle: 1st detection; temporary flag ON 2nd detection; pending fault code ON	
OFF malfunction (A)	
Input speed/Output speed	1.50 to 1.80
OFF malfunction (B)	
Input speed/Output speed	0.95 to 1.09
OFF malfunction (C)	
Input speed/Output speed	0.95 to 1.09
[ON malfunction]	
All of the following conditions are met: ON malfunction (A), (B) and (C)	
ON malfunction (A)	
Input speed/Output speed	2.75 to 3.35
ON malfunction (B)	
Input speed/Output speed	0.64 to 0.78
ON malfunction (C)	
Input speed/Output speed	0.64 to 0.78

INSPECTION PROCEDURE

1	Check shift solenoid valve No. 1 or No. 2 operation.



PREPARATION:

(a) Remove the oil pan.

(b) Remove the shift solenoid valve No. 1 or No. 2.

CHECK:

(a) By applying 490 kPa (5 kgf/cm^2, 71 psi) of compressed air, check that the solenoid valve does leak air.

(b) When battery voltage is supplied to the shift solenoid valve, check that the valve closes.

OK:

(a) Solenoid valve does leak air.

(b) Solenoid valve closes.

NG → **Replace the shift solenoid valve No. 1 or No. 2.**

OK ↓

2	Check the valve body (See page DI–785).

NG → **Repair or replace the valve body.**

OK ↓

Repair or replace the transaxle.

DI32W-11

DTC	P0753	Shift Solenoid A Electrical Malfunction (Shift Solenoid Valve S1)

DTC	P0758	Shift Solenoid B Electrical Malfunction (Shift Solenoid Valve S2)

CIRCUIT DESCRIPTION

Shifting from 1st to O/D is performed in combination with ON and OFF of the shift solenoid valve No. 1 and No. 2 controlled by ECM. If an open or short circuit occurs in either of the solenoid valves, the ECM controls the remaining normal solenoid valve to allow the vehicle to be operated smoothly (Fail safe function).

Range	NORMAL			SHIFT SOLENOID VALVE NO. 1 MALFUNCTIONING			SHIFT SOLENOID VALVE NO. 2 MALFUNCTIONING			BOTH SHIFT SOLENOID VALVES MALFUNCTIONING
	Solenoid valve		Gear	Solenoid valve		Gear	Solenoid valve		Gear	Gear when shift selector is manually operated
	No. 1	No. 2		No. 1	No. 2		No. 1	No. 2		
D	ON	ON	1st	X	OFF	3rd	ON	X	2nd	3rd
	ON	OFF	2nd	X	OFF	3rd	ON	X	2nd	3rd
	OFF	OFF	3rd	X	OFF	3rd	OFF	X	3rd	3rd
	OFF	ON	O/D	X	ON	O/D	OFF	X	3rd	3rd
2	ON	ON	1st	X	OFF	3rd	ON	X	2nd	3rd
	ON	OFF	2nd	X	OFF	3rd	ON	X	2nd	3rd
	OFF	OFF	3rd	X	OFF	3rd	OFF	X	3rd	3rd
L	ON	ON	1st	X	OFF	1st	ON	X	2nd	3rd
	ON	OFF	2nd	X	OFF	3rd	ON	X	2nd	3rd

X: Malfunctions

HINT:

Check the sift solenoid valve No. 1 when DTC P0753 is output and check the shift solenoid valve No. 2 when DTC P0758 is output.

DTC No.	DTC Detecting Condition	Trouble Area
P0753 P0758	The ECM checks for an open or short circuit in the shift solenoid valve No. 1/No. 2 circuit when it changes. The ECM records DTC P0753 or P0758 if condition (a) or (b) is detected once, but it does not blink the MIL. After ECM detects condition (a) or (b) continuously 2 times or more in 1–trip, it causes the MIL to light up until condition (a) or (b) disappears. After that, if the ECM detects condition (a) or (b) once, it starts lighting up MIL again. (a) Solenoid resistance is 8 Ω or less (short circuit) when the solenoid is energized. (b) Solenoid resistance is 100 kΩ or more (open circuit) when the solenoid is not energized.	• Open or short in shift solenoid valve No. 1/No. 2 circuit • Shift solenoid valve No. 1/No. 2 • ECM

Fail safe function:
If either of the solenoid valve circuits develops an open or short, the ECM turns the other solenoid valve ON and OFF to shift to the gear positions shown in the table on the previous page. The ECM also turns the shift solenoid valve ST OFF at the same time. If both solenoids malfunction, hydraulic control cannot be performed electronically and must be done manually.
Manual shifting as shown in the table on the previous page must be done (In the case of a short circuit, the ECM stops sending current to the short circuited solenoid).

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	P0753	Shift solenoid valve S1/Range check (Low resistance)
		Shift solenoid valve S1/Range check (High resistance)
	P0758	Shift solenoid valve S2/Range check (Low resistance)
		Shift solenoid valve S2/Range check (High resistance)
Required sensors/Components	P0753: Shift solenoid valve S1	
	P0758: Shift solenoid valve S2	
Frequency of operation	Continuous	
Duration	0.032 sec.	
MIL operation	Immediate	
Sequence of operation	None	

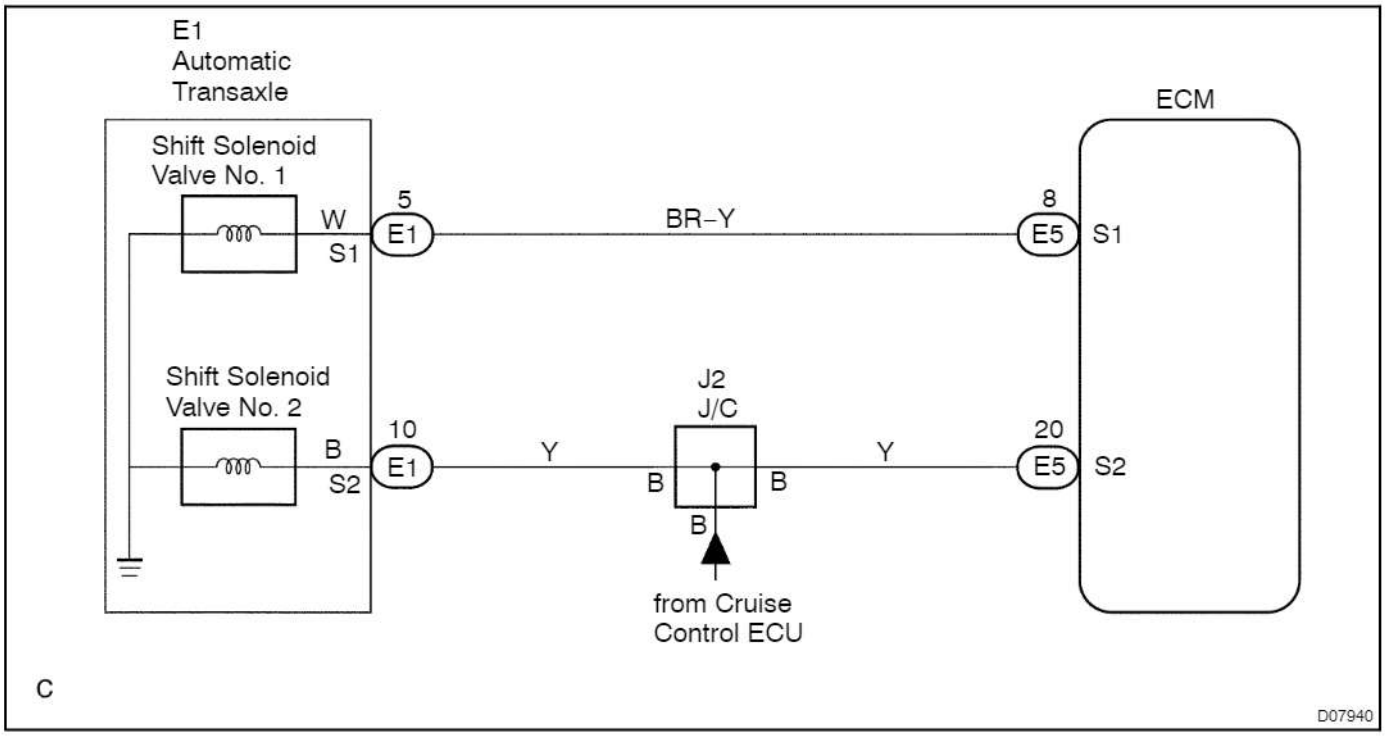
TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present.	See page DI–758	
Range check (Low resistance)		
Shift solenoid valve	ON	
Range check (High resistance)		
Shift solenoid valve	OFF	

TYPICAL MALFUNCTION THRESHOLDS

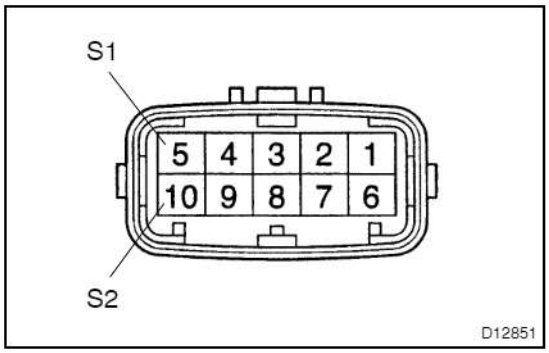
Detection criteria	Threshold
Either of the following conditions is met: Range check (Low resistance) or (High resistance)	
Range check (Low resistance)	
Shift solenoid valve resistance	8 Ω or less
Range check (High resistance)	
Shift solenoid valve resistance	100 kΩ or more

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check transmission wire.**



PREPARATION:
Disconnect the transmission wire connector.

CHECK:
Measure resistance between S1 and S2 of transmission wire connector and body ground.

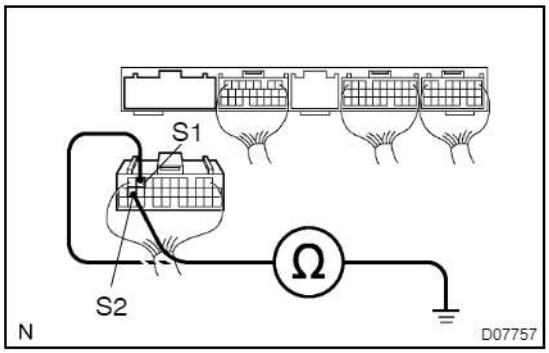
OK:

Resistance: 11 to 15 Ω at 20 °C (68°F)

NG	**Go to step 3.**

OK

2	Measure resistance between terminal S1 or S2 of ECM and body ground.



PREPARATION:

(a) Connect the transmission wire connector.
(b) Remove the ECM hood.
(c) Disconnect the connector of the ECM.

CHECK:

Measure resistance between terminal S1 or S2 of ECM and body ground.

OK:

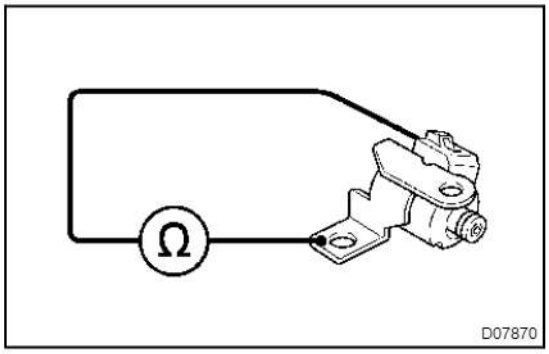
Resistance: 11 to 15 Ω at 20 °C (68 °F)

NG	Repair or replace the harness or connector (See page IN–30).

OK

Check and replace the ECM (See page IN–30).

3	Check shift solenoid valve No. 1 or No. 2.



PREPARATION:

(a) Jack up the vehicle.
(b) Remove the oil pan.
(c) Disconnect the solenoid connector.
(d) Remove the shift solenoid valve No. 1 or No. 2.

CHECK:

Measure resistance between solenoid connector and body ground.

OK:

Resistance: 11 to 15 Ω at 20 °C (68 °F)

NG	Replace the solenoid valve.

OK

Repair or replace transmission wire (See page IN–30).

DIAJF-03

DTC	P0785	Shift/Timing Solenoid (Shift Solenoid Valve ST)

CIRCUIT DESCRIPTION

Shift solenoid valve ST is switched ON–OFF by a signal from ECM so that let in or out timing of 2nd brake is adjusted by operating orifice control valve. Therefore, ST solenoid operates when letting in or out reverse clutch.
If it is broken, the shift shock becomes big.

DTC No.	DTC Detecting Condition	Trouble Area
P0785	ECM memorizes DTC P0785 if (a) or (b) condition below is detected once or more. (1–trip detection logic) (a) Solenoid resistance is 8 Ω or lower (short circuit) when solenoid energized. (b) Solenoid resistance is 100 kΩ or higher (open circuit) when solenoid is not energized.	• Open or short in shift solenoid valve ST circuit • Shift solenoid valve ST • ECM

MONITOR DESCRIPTION

The ECM reduces the gear shift shock when shifting from the N position to the D position and from 3rd gear to 4th gear by regulating the hydraulic line pressure. To regulate the pressure, the ECM controls shift–solenoid ST with a duty–cycle signal that adjusts the line–pressure.
If the ECM detects an open or short in the shift–solenoid ST circuit, it will illuminate the MIL and store the DTC.

MONITOR STRATEGY

Related DTCs	P0785	Shift solenoid valve ST/Range check (Low resistance)
		Shift solenoid valve ST/Range check (High resistance)
Required sensors/Components	Shift solenoid valve ST	
Frequency of operation	Continuous	
Duration	0.032 sec.	
MIL operation	Immediate	
Sequence of operation	None	

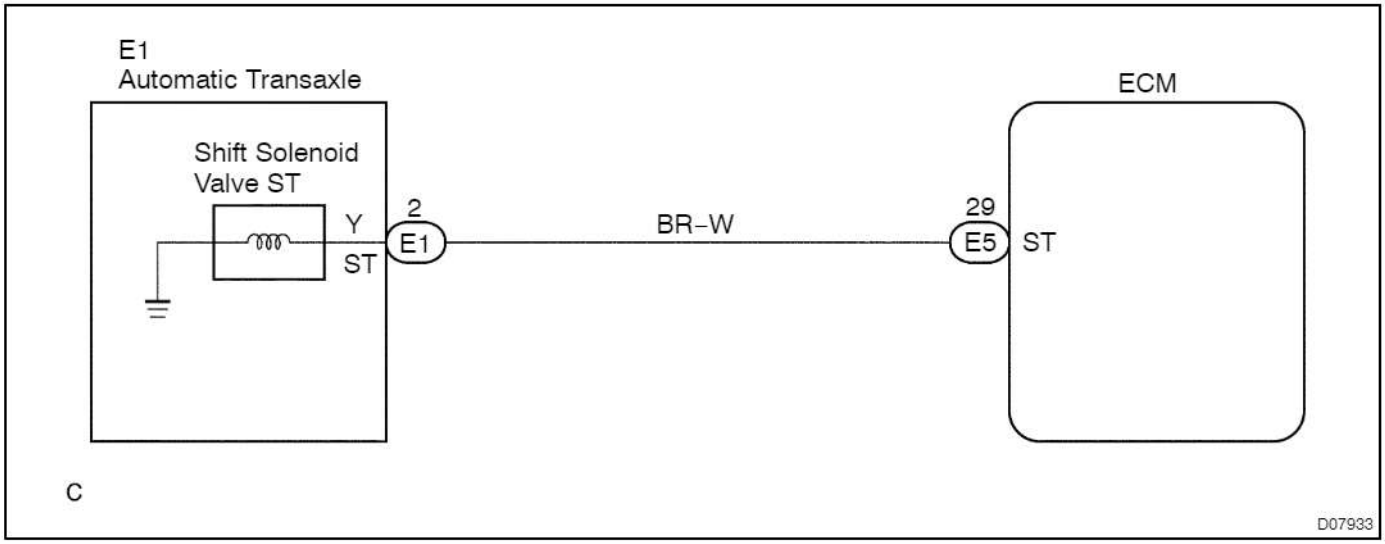
TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present.	See page DI–758	
Range check (Low resistance)		
Shift solenoid valve	ON	
Range check (High resistance)		
Shift solenoid valve	OFF	

TYPICAL MALFUNCTION THRESHOLDS

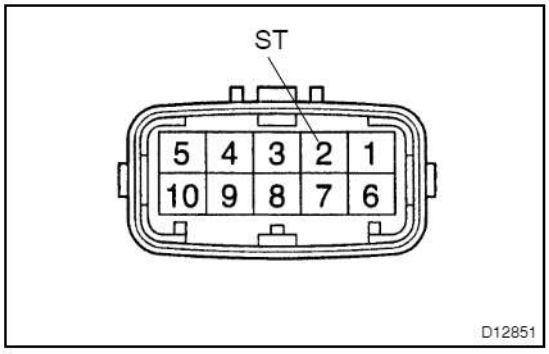
Detection criteria	Threshold
Either of the following conditions is met: Range check (Low resistance) or (High resistance)	
Range check (Low resistance)	
Shift solenoid valve resistance	8 Ω or less
Range check (High resistance)	
Shift solenoid valve resistance	100 kΩ or less

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check transmission wire.

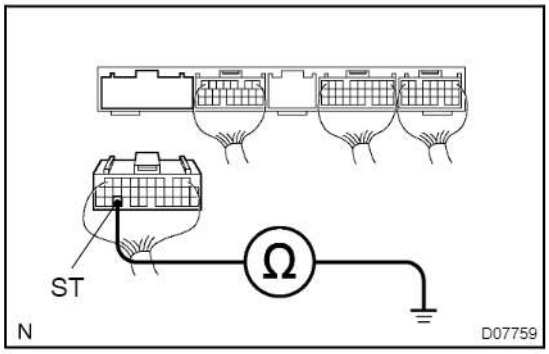


PREPARATION:
Disconnect the transmission wire connector.
CHECK:
Measure resistance between ST of transmission wire and body ground.
OK:
Resistance: 11 to 15 Ω at 20 °C (68 °F)

NG	Go to step 3.

OK

2	Measure resistance between terminal ST of ECM and body ground.



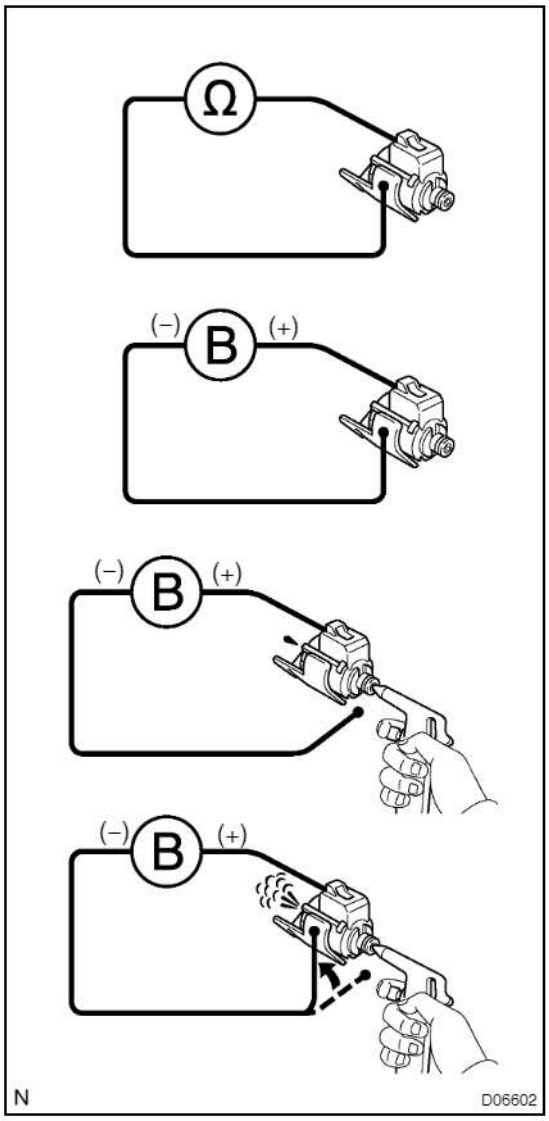
PREPARATION:
(a) Connect the transmission wire connector.
(b) Remove the ECM hood.
(c) Disconnect the connector from ECM.
CHECK:
Measure resistance between terminal ST of ECM and body ground.
OK:
Resistance: 11 to 15 Ω at 20 °C (68 °F)

NG	Repair or replace the harness or connector (See page IN–30).

OK

Check and replace the ECM (See page IN–30).

3	Check shift solenoid valve ST.



Electrical check:

PREPARATION:

(a) Jack up the vehicle.
(b) Remove the oil pan.
(c) Remove the shift solenoid valve ST.

CHECK:

(a) Measure resistance between solenoid connector and body ground.
(b) Connect positive ⊕ lead to terminal of solenoid connector, negative ⊖ lead to solenoid body.

OK:

(a) Resistance: 11 to 15 Ω at 20 °C (68 °F)
(b) The solenoid makes an operating noise.

Mechanical check:

PREPARATION:

(a) Jack up the vehicle.
(b) Remove the oil pan.
(c) Disconnect the solenoid connector.
(d) Remove the shift solenoid valve ST.

CHECK:

(a) Applying 490 kPa (5 kgf/cm^2, 71 psi) of compressed air, check that the solenoid valves do not leak air.
(b) When battery voltage is supplied to the shift solenoid valves, check that the solenoid valve opens.

OK:

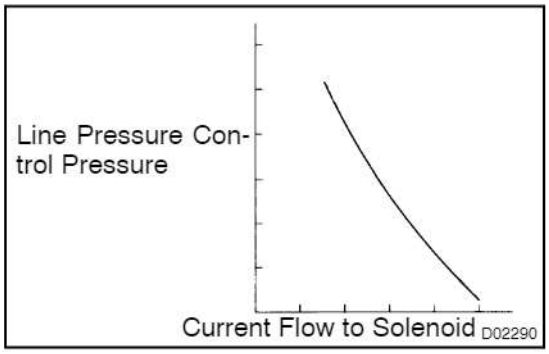
(a) Solenoid valve does not leak air.
(b) Solenoid valve opens.

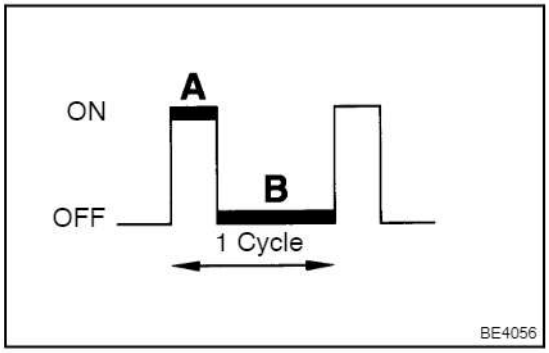
NG → **Replace the shift solenoid valve ST.**

OK

Repair or replace the transmission wire (See page AX–5).

DTC	P2716	Pressure Control Solenoid "D" Electrical (Shift Solenoid Valve SLT)





CIRCUIT DESCRIPTION

The throttle pressure that is applied to the primary regulator valve (which modulates line pressure) causes the shift solenoid valve SLT, under electronic control, to precisely and minutely modulate and generate line pressure according to the accelerator pedal effort, or engine power output detected.

This controls the line pressure and provides smooth shifting characteristics.

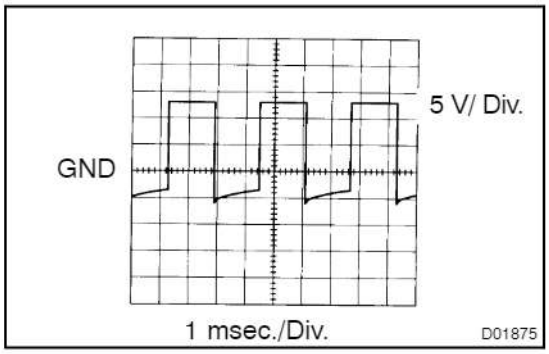
Upon receiving the throttle valve opening angle signal, ECM controls the line pressure by sending a predetermined (*) duty ratio to the solenoid valve, modulating the line pressure, generating throttle pressure.

(*) 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

$$\text{Duty Ratio} = \frac{A}{A + B} \times 100\ (\%)$$

DTC No.	DTC Detecting Condition	Trouble Area
P2716	(a) or (b) condition below is detected 1 second or more. (1–trip detection logic) (a) SLT^- terminal: 0V (b) SLT^- terminal: 12V	• Open or short in shift solenoid valve SLT circuit • Shift solenoid valve SLT • ECM



HINT:

Refer to the chart for the waveform between terminals SLT^+ and SLT^- during engine idling.

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	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present.	See page DI–758	
Solenoid current shout OFF	Not cut	
Battery voltage	11 V or more	–
CPU command duty ratio to SLT	19% or more	–
Starter	OFF	

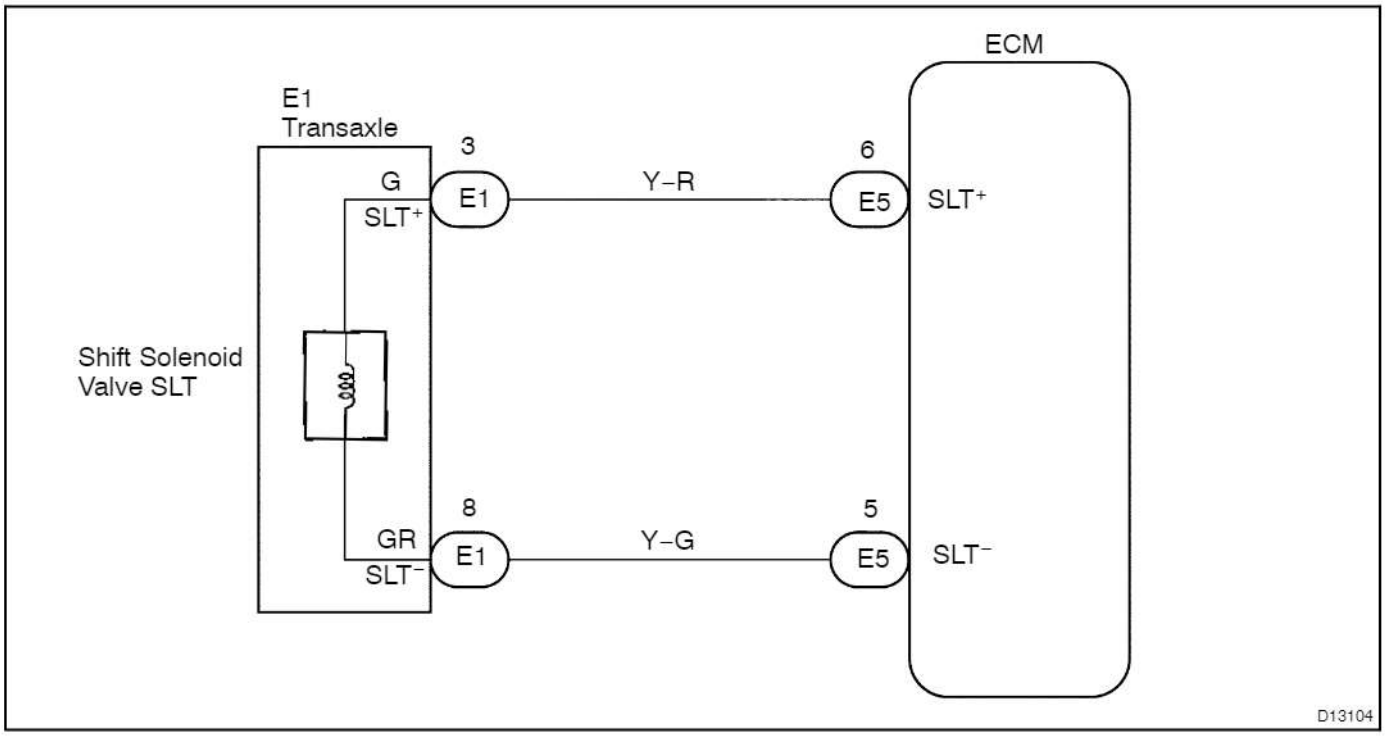
TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
Diagnostic signal from IC	Fail (Open or short)

COMPONENT OPERATING RANGE

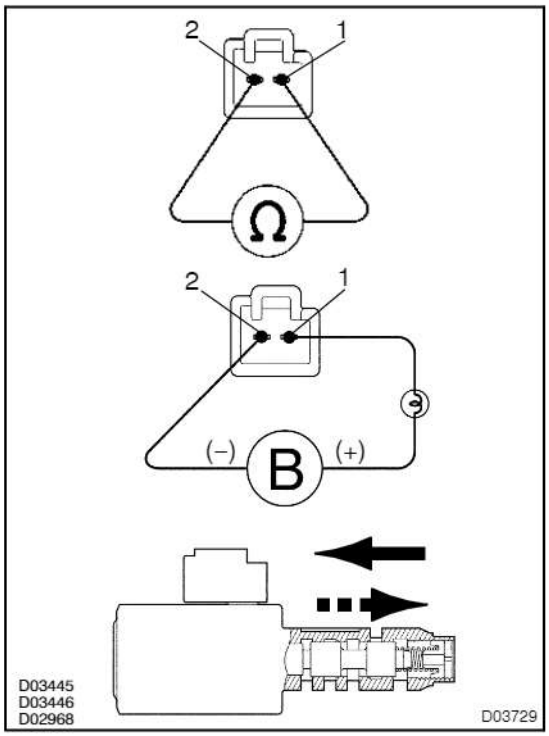
Parameter	Standard value
Output signal duty	Less than 100%

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check shift solenoid valve SLT.



PREPARATION:

(a) Jack up the vehicle.
(b) Remove the oil pan.
(c) Disconnect the solenoid connector.

Check solenoid resistance:

CHECK:

Measure resistance between terminals 1 and 2 of solenoid connector.

OK:

Resistance: 5.0 to 5.6 Ω at 20 °C (68 °F)

Check solenoid operation:

CHECK:

Connect positive (+) lead with an 5 to 6 W bulb to terminal 1 of solenoid connector and negative (–) lead to terminal 2, then check the movement of the valve.

HINT:

The solenoid valve operates with the current of 0.9 – 1.0 A.

OK:

When battery positive voltage is applied.	Valve moves in ■■➡ direction in illustration.
When battery positive voltage is cut off.	Valve moves in ⬅ direction in illustration.

NG → **Replace SLT solenoid valve.**

OK ↓

2	Check harness and connector between shift solenoid valve SLT and ECM (See page IN–30).

NG → **Repair or replace harness or connector.**

OK ↓

Check and replace the ECM (See page IN–30).

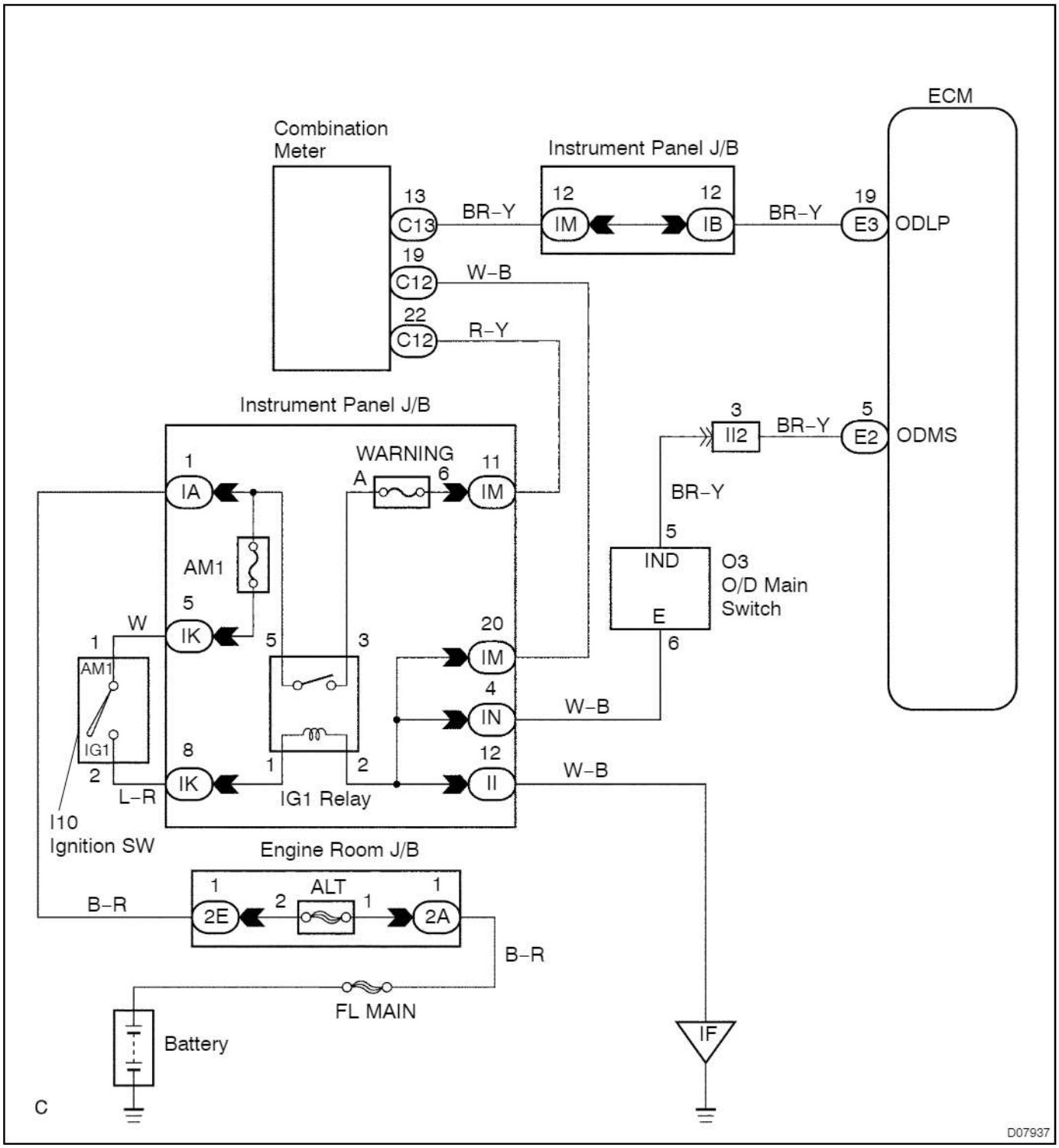
DI690-14

O/D Main Switch & O/D OFF Indictor Light Circuit

CIRCUIT DESCRIPTION

The O/D main switch is a momentary type switch. When pressing the O/D main switch, the O/D OFF indicator light lights up and ECM prohibits shifting to O/D, and when pressing it again, the O/D OFF indicator light goes off and ECM allows shifting to O/D. Turning the ignition switch off will reset the O/D OFF indicator light.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check operation of O/D main switch.**

PREPARATION:
Turn the ignition switch ON.
CHECK:
(a) Check O/D OFF indicator light when O/D main switch is pushed in to ON.
(b) Check O/D OFF indicator light when O/D main switch is pushed again.
OK:
(a) O/D OFF indicator light lights up.
(b) O/D OFF indicator light goes off.

OK → **Proceed to next inspection shown on problem symptoms tables (See page DI–785).**

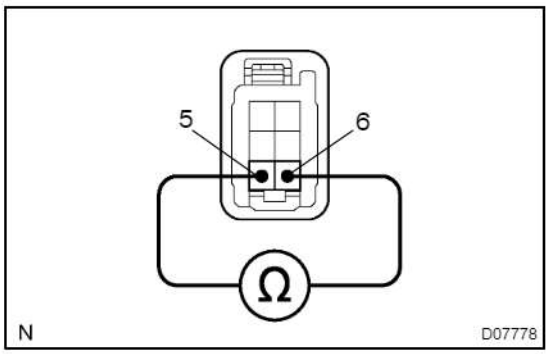
NG

2	**Check and replace the combination meter (See page BE–2).**

NG → **Replace the combination meter.**

OK

3	**Check O/D main switch.**



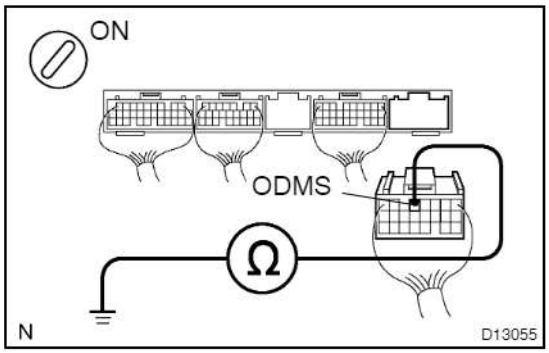
PREPARATION:
Disconnect the O/D main switch connector.
CHECK:
Check continuity between terminals 5 and 6 of O/D main switch connector.
OK:

O/D main switch condition	Specified condition
Press continuously O/D main switch	Continuity
Release O/D main switch	No continuity

NG → **Replace and repair O/D main switch.**

OK

4	Check harness and connector between terminal ODMS of ECM and body ground.



PREPARATION:

Disconnect the connector of ECM.

CHECK:

Check continuity between terminal ODMS of ECM and body ground when O/D main switch is ON and OFF.

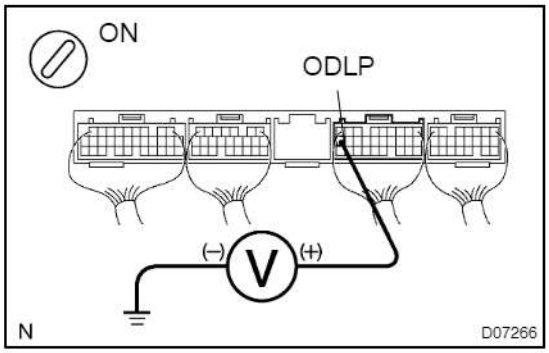
OK:

O/D main switch	Specified voltage
Press continuously O/D main switch	Continuity
Release O/D main switch	No Continuity

NG → **Repair or replace harness or connector (See page IN–30).**

OK

5	Check voltage between terminal ODLP of ECM and body ground.



PREPARATION:

(a) Disconnect the connector of ECM.

(b) Turn the ignition switch ON.

CHECK:

Check voltage between terminal ODLP of ECM and body ground.

OK:

Voltage: 7.5 to 14 V

NG → **Repair or replace harness or connector (See page IN–30).**

OK

Check and replace the ECM (See page IN–30).

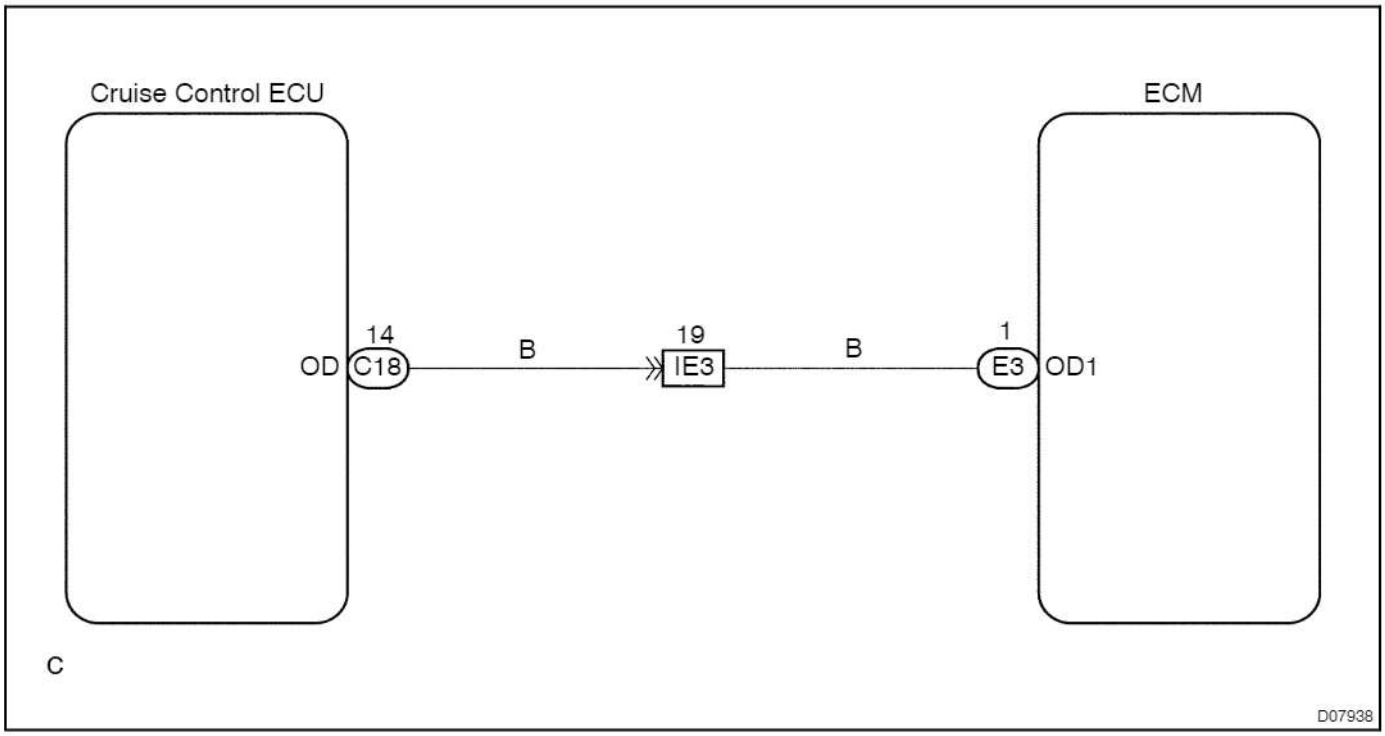
DI4ZR-07

O/D Cancel Signal Circuit

CIRCUIT DESCRIPTION

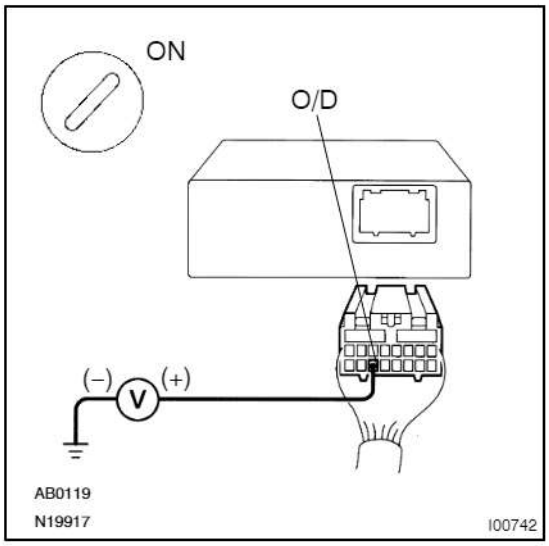
While driving uphill with cruise control activated, in order to minimize gear shifting and provide smooth cruising overdrive may be prohibited temporarily under some condition.
The cruise control ECU sends O/D cut signals to the ECM as necessary and the ECM cancels overdrive shifting until these signals are discontinued.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check voltage between terminal OD of cruise control ECU harness side connector and body ground.**



PREPARATION:

(a) Disconnect the cruise control ECU connector.

(b) Turn the ignition switch ON.

CHECK:

Measure voltage between terminal OD of cruise control ECU harness side connector and body ground.

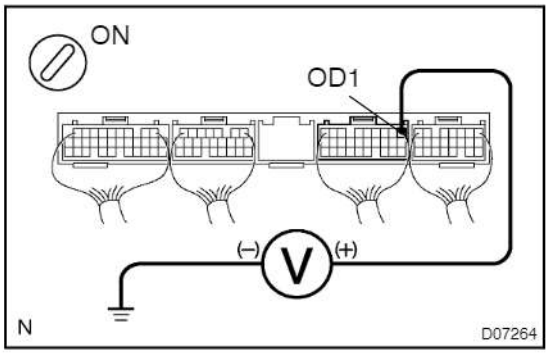
OK:

Voltage: 10 to 14 V

OK	**Check and replace the cruise control ECU.**

NG

2	**Check voltage between terminal OD1 of ECM and body ground.**



PREPARATION:

Turn the ignition switch ON.

CHECK:

Measure voltage between terminal OD1 of ECM and body ground.

OK:

Voltage: 10 to 14 V

OK	**Repair or replace the harness or connector (See page IN–30).**

NG

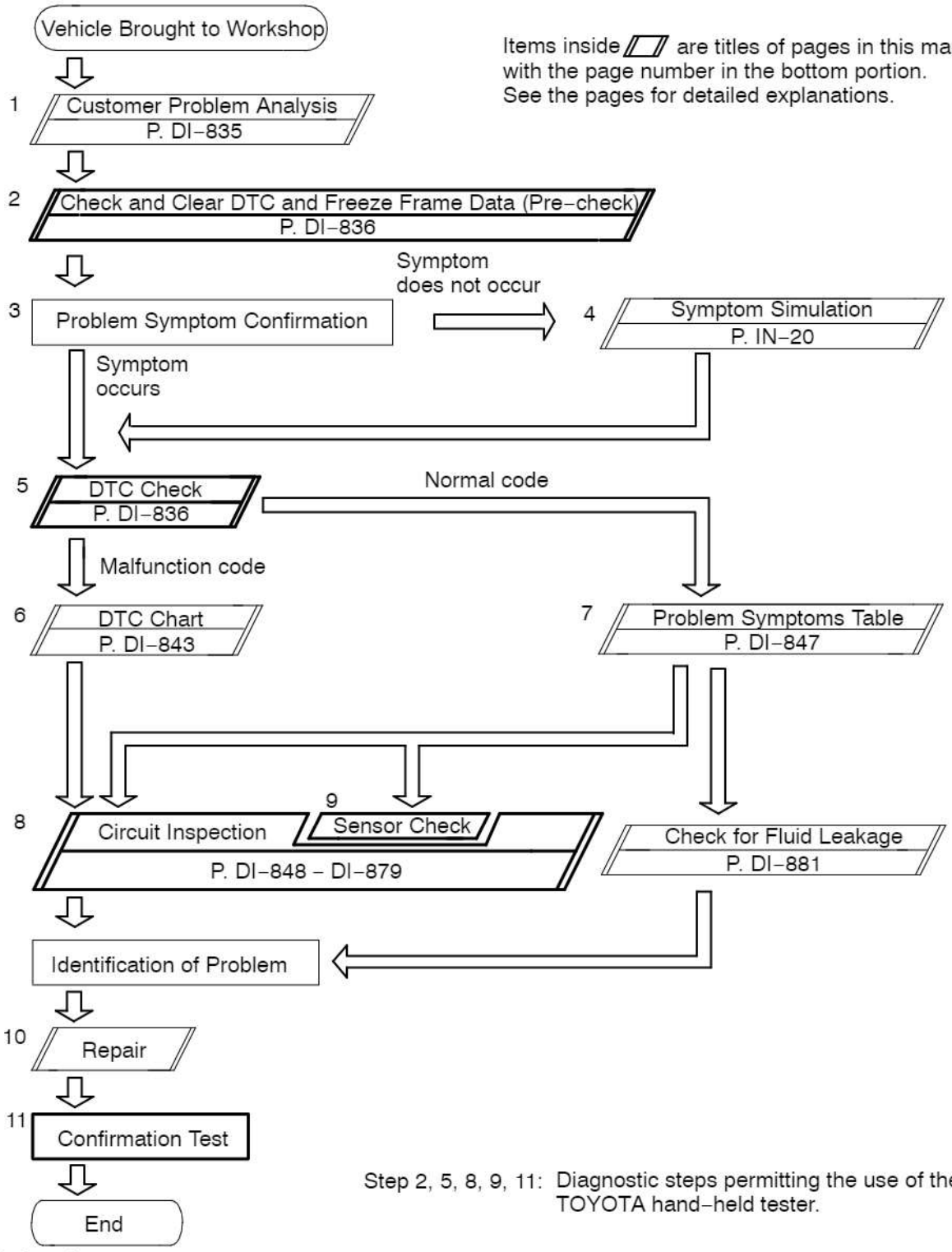
Check and replace the ECM (See page IN–30).

ANTI–LOCK BRAKE SYSTEM WITH ELECTRONIC BRAKE FORCE DISTRIBUTION (EBD)

DI6M7–08

HOW TO PROCEED WITH TROUBLESHOOTING

Troubleshoot in accordance with the procedure on the following pages.



Step 2, 5, 8, 9, 11: Diagnostic steps permitting the use of the TOYOTA hand–held tester.

Fail safe function:
When a failure occurs in the ABS system, the ABS warning light comes on and the ABS operation is prohibited. In addition to this, when the failure which disables the EBD operation occurs, the brake warning light comes on as well and the EBD operation is prohibited.

DI6M8-03

CUSTOMER PROBLEM ANALYSIS CHECK

ABS Check Sheet

Inspector's Name :

Customer's Name		**Registration No.**	
		Registration Date	/ /
		Frame No.	
Date Vehicle Brought In	/ /	**Odometer Reading**	km miles

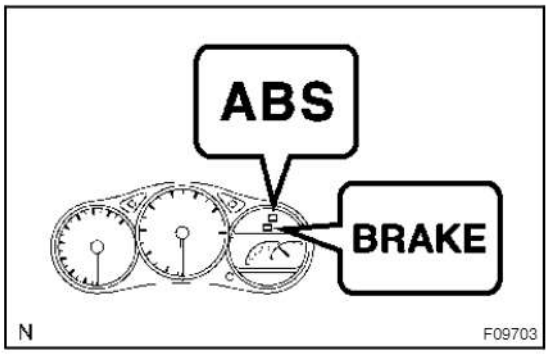
Date Problem First Occurred	/ /
Frequency Problem Occurs	☐ Continuous ☐ Intermittent (times a day)

Symptoms	☐ ABS does not operate.	
	☐ ABS does not operate efficiently.	
	ABS Warning Light Abnormal	☐ Remains ON ☐ Does not comes on
	BRAKE Warning Light Abnormal	☐ Remains ON ☐ Does not come on

DTC Check	**1st Time**	☐ Normal Code ☐ Malfunction Code (Code)
	2nd Time	☐ Normal Code ☐ Malfunction Code (Code)

DIAIJ–04

PRE–CHECK



1. DIAGNOSIS SYSTEM

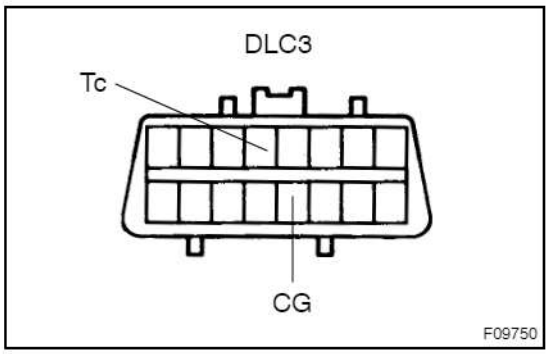
(a) Release the parking brake lever.

(b) Check the indicator.

When the ignition switch is turned ON, check that the ABS warning light and the BRAKE warning light come on for approx. 3 seconds.

HINT:

- When the parking brake is applied or the level of the brake fluid is low, the BRAKE warning light come on.
- If the indicator check result is not normal, proceed to troubleshooting for the ABS warning light circuit or BRAKE warning light circuit (See page DI–872 or DI–875).



(c) In the case of not using TOYOTA hand –held tester: Check DTC.

(1) Using SST, connect terminal Tc and CG of DLC3.

SST 09843–18040

(2) Turn the ignition switch to ON.

(3) Read DTC from the ABS warning light on the combination meter.

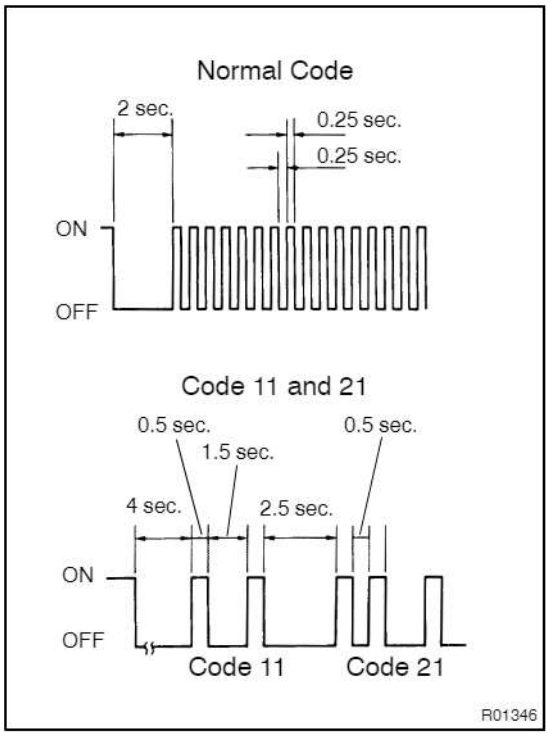
HINT:

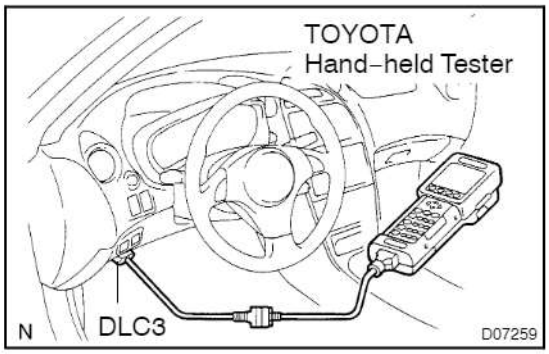
- If no code appears, inspect the diagnostic circuit or ABS warning light circuit (See page DI–877 or DI–872).
- As an example, the blinking patterns for normal code and codes 11 and 21 are shown on the left.

(4) Codes are explained in the code table on page DI–843.

(5) After completing the check, disconnect terminal Tc and CG, and turn off the display.

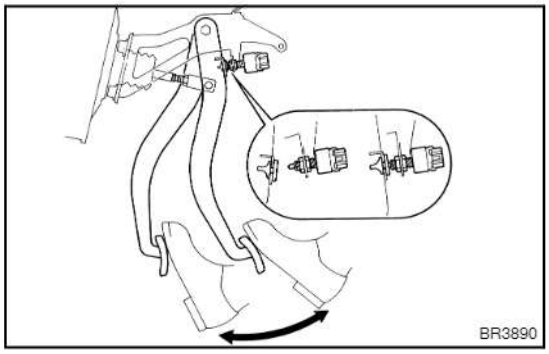
If 2 or more malfunctions are indicated at the same time, the lowest numbered DTC will be displayed first.



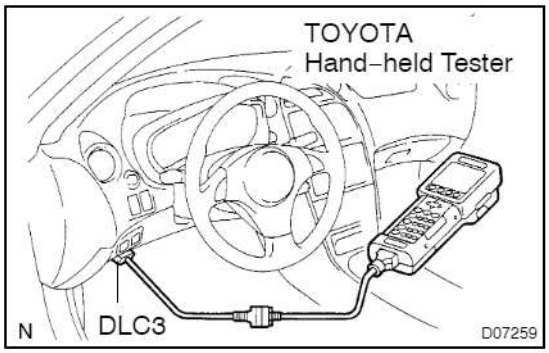


(d) In the case of using TOYOTA hand–held tester:
Check the DTC.
(1) Hook up the TOYOTA hand–held tester to the DLC3.
(2) Turn the ignition switch to ON.
(3) Read DTC by following the prompts on the tester screen.

HINT:
Please refer to the TOYOTA hand–held tester operator's manual for further details.



(e) In case of not using TOYOTA hand–held tester:
Clear the DTC.
(1) Using SST, connect terminals Tc and CG of DLC3.
SST 09843–18040
(2) Turn the ignition switch to ON.
(3) Clear the DTC stored in ECU by depressing the brake pedal 8 times or more within 5 seconds.
(4) Check that the warning light shows the normal code.
(5) Remove the SST from the terminals of DLC3.
SST 09843–18040



(f) In the case of using TOYOTA hand–held tester:
Clear the DTC.
(1) Hook up the TOYOTA hand–held tester to the DLC3.
(2) Turn the ignition switch to ON.
(3) Operate the TOYOTA hand–held tester to erase the codes.

HINT:
Please refer to the TOYOTA hand–held tester operator's manual for further details.

2. DATA LIST

HINT:

By the DATA LIST displayed by the TOYOTA 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 TOYOTA 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 / Range (Display)	Normal Condition	Diagnostic Note
ABS MOT RELAY	ABS motor relay / ON or OFF		
SOL RELAY	Solenoid relay / ON or OFF		
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
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
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 / OFF		

SFRH	ABS solenoid (SFRH) ON / OFF		
SFLR	ABS solenoid (SFLR) ON / OFF		
SFLH	ABS solenoid (SFLH) ON / OFF		
SRRR (SRR)	ABS solenoid (SRRR (SRR)) ON / OFF		
SRRH (SRH)	ABS solenoid (SRRH (SRH)) ON / OFF		
SRLR	ABS solenoid (SRLR) ON / OFF		
SRLH	ABS solenoid (SRLH) ON / OFF		
AIR BLD SUPPORT	Air bleed support / SUPPORT or NOT SUP	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.: 20	

3. ACTIVE TEST

HINT:

Performing the ACTIVE TEST using the TOYOTA hand–held tester allows the relay, the 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 TOYOTA hand–held tester to the DLC3.

(b) Turn the ignition switch ON.

(c) According to the display on tester, perform the "ACTIVE TEST".

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

SFRR & SFRH	Turns ABS solenoid SFRR & SFRH 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
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
ABS WARN LIGHT	Turns ABS warning light ON / OFF	Observe combination meter
BRAKE WRN LIGHT	Turns BRAKE warning light ON / OFF	Observe combination meter

4. FREEZE FRAME DATA

(a) The vehicle (sensor) status at the occurrence of abnormality of the diagnosis code and during the ABS operation can be memorized and displayed using the TOYOTA hand–held tester.

(b) Only one record of the freeze frame data is stored, however, the freeze frame data during the ABS operating is always up–dated. After the storage of the freeze frame data, up to 31 ignition "ON" operations are stored and 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.

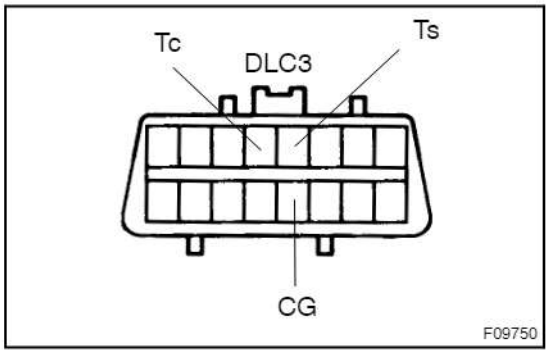
Hand–held Tester Display	Measurement Item	Reference Value*
VEHICLE SPD	Wheel speed reading	Speed indication of a meter
STOP LIGHT SW	Stop light switch signal	Stop light switch ON: ON, OFF: OFF
# IG ON	Number of operations of ignition switch ON after memorizing freeze frame data	0 – 31
SYSTEM	System status	ABS activated: ABS Fail safe mode activated: FAIL SF No system activated: NO SYS

*: 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.

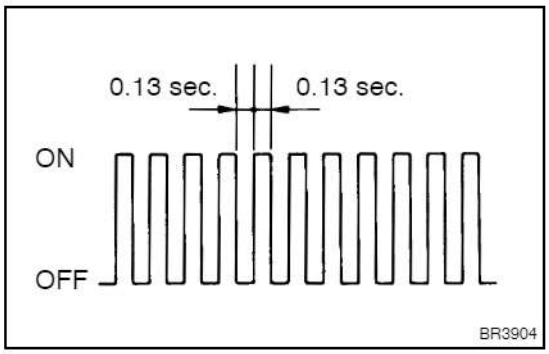
5. SPEED SENSOR SIGNAL

HINT:

- If the ignition switch is turned from ON to ACC or LOCK during test mode, DTC of sensor check function will be erased.
- During test mode, ECU records all DTC of sensor check function. By preforming sensor signal check, the codes are erased if normality is confirmed. The codes remain if abnormality is found.



(a) In case of not using TOYOTA hand-held tester:
Check the speed sensor signal.
(1) Turn the ignition switch to OFF.
(2) Using SST, connect terminal Ts and CG of DLC3.
SST 09843–18040
(3) Start the engine.



(4) Check that the ABS warning light blinks.

HINT:

If the ABS warning light does not blink, inspect the ABS warning light circuit and the Ts circuit (See page DI–872 and DI–879).

(5) Drive vehicle straight forward.

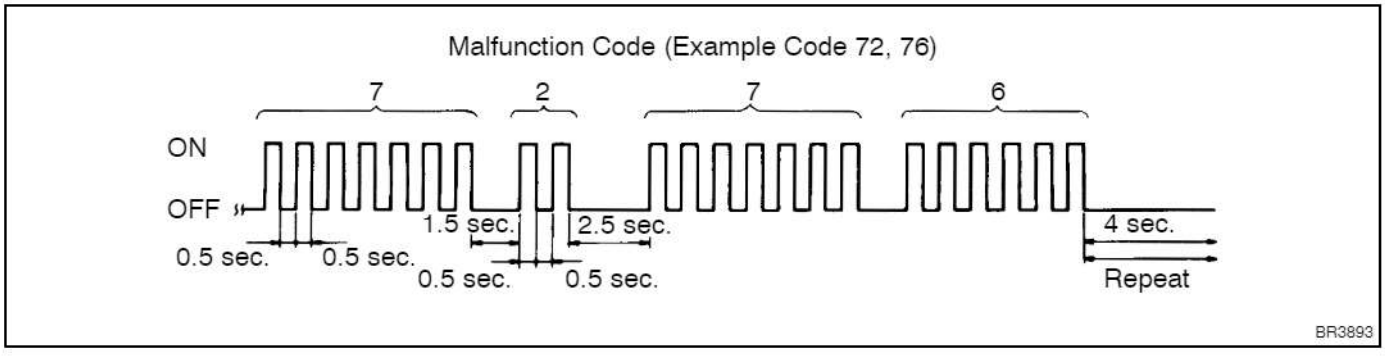
HINT:

Drive vehicle faster than 45 km/h (28 mph) for several seconds.

(6) Stop the vehicle.
(7) Using SST, connect terminal Tc and CG of DLC3.
SST 09843–18040
(8) Read the number of times of the ABS warning light blinks.

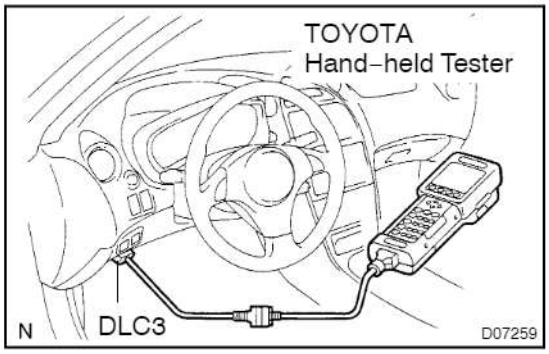
HINT:

- See the list of DTC shown on the DTC chart (See page DI–843).
- If every sensor is normal, a normal code is output (A cycle of 0.25 sec. ON and 0.25 sec. OFF is repeated).
- If 2 or more malfunctions are indicated at the same time, the lowest numbered code will be displayed first.



(9) After doing the check, disconnect the SST from terminal Ts and CG, Tc and CG of DLC3, and turn the ignition switch to OFF.

SST 09843–18040



(b) In case of using TOYOTA hand–held tester:
Check DTC.

(1) Hook up the TOYOTA hand–held tester to the DLC3.

(2) Do step (3) to (6) on the previous page.

(3) Read DTC by following the prompts on the tester screen.

HINT:

Please refer to the TOYOTA hand–held tester operator's manual for further details.

DI6MA-03

DIAGNOSTIC TROUBLE CODE CHART

HINT:

- Using SST 09843-18040, connect the terminals Tc and CG of the DLC3.
- If any abnormality is not found as inspecting parts, inspect ECU.
- If a malfunction code is displayed during the DTC check, check the circuit listed for the 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 No. (See Page)	Detection Item	Trouble Area
C0278/11 (DI-860)	Open circuit in ABS solenoid relay circuit	• ABS solenoid relay • ABS solenoid relay circuit • ABS actuator
C0279/12 (DI-860)	Short circuit in ABS solenoid relay circuit	
C0273/13 (DI-857)	Open circuit in ABS motor relay circuit	• ABS motor relay • ABS motor relay circuit • ABS actuator
C0274/14 (DI-857)	Short circuit in ABS motor relay circuit	
C0226/21 (DI-855)	Open or short circuit in 2-position solenoid circuit for right front wheel	• ABS actuator • SFRR or SFRH circuit
C0236/22 (DI-855)	Open or short circuit in 2-position solenoid circuit for left front wheel	• ABS actuator • SFLR or SFLH circuit
C0246/23 (DI-855)	Open or short circuit in 2-position solenoid circuit for right rear wheel	• ABS actuator • SRRR or SRRH circuit
C0256/24 (DI-855)	Open or short circuit in 2-position solenoid circuit for left rear wheel	• ABS actuator • SRLR or SRLH circuit
C0200/31 (DI-848)	Right front wheel speed sensor signal malfunction	• Right front or left front speed sensor • Each speed sensor circuit • Speed sensor rotor
C0205/32 (DI-848)	Left front wheel speed sensor signal malfunction	
C0210/33 (DI-848)	Right rear wheel speed sensor signal malfunction	• Right rear or left rear speed sensor • Each speed sensor circuit • Speed sensor rotor • Rear axle hub
C0215/34 (DI-848)	Left rear wheel speed sensor signal malfunction	
C1235/35 (DI-848)	Foreign matter is stuck on the tip of the right front sensor	• Right front, left front, right rear or left rear speed sensor • Each speed sensor circuit • Speed sensor rotor
C1236/36 (DI-848)	Foreign matter is stuck on the tip of the left front sensor	
C1238/38 (DI-848)	Foreign matter is stuck on the tip of the right rear sensor	
C1239/39 (DI-848)	Foreign matter is stuck on the tip of the left rear sensor	
C1241/41 (DI-863)	Power source voltage down	• Battery • Charging system • Power source circuit
C1249/49 (DI-866)	Open circuit in stop light switch circuit	• Stop light switch • Stop light switch circuit • Stop light bulb

C1251/51 (DI–868)	Pump motor is locked	• ABS pump motor
Always ON (DI–870)	Malfunction in ECU	• Battery • Charging system • Skid control ECU

HINT:

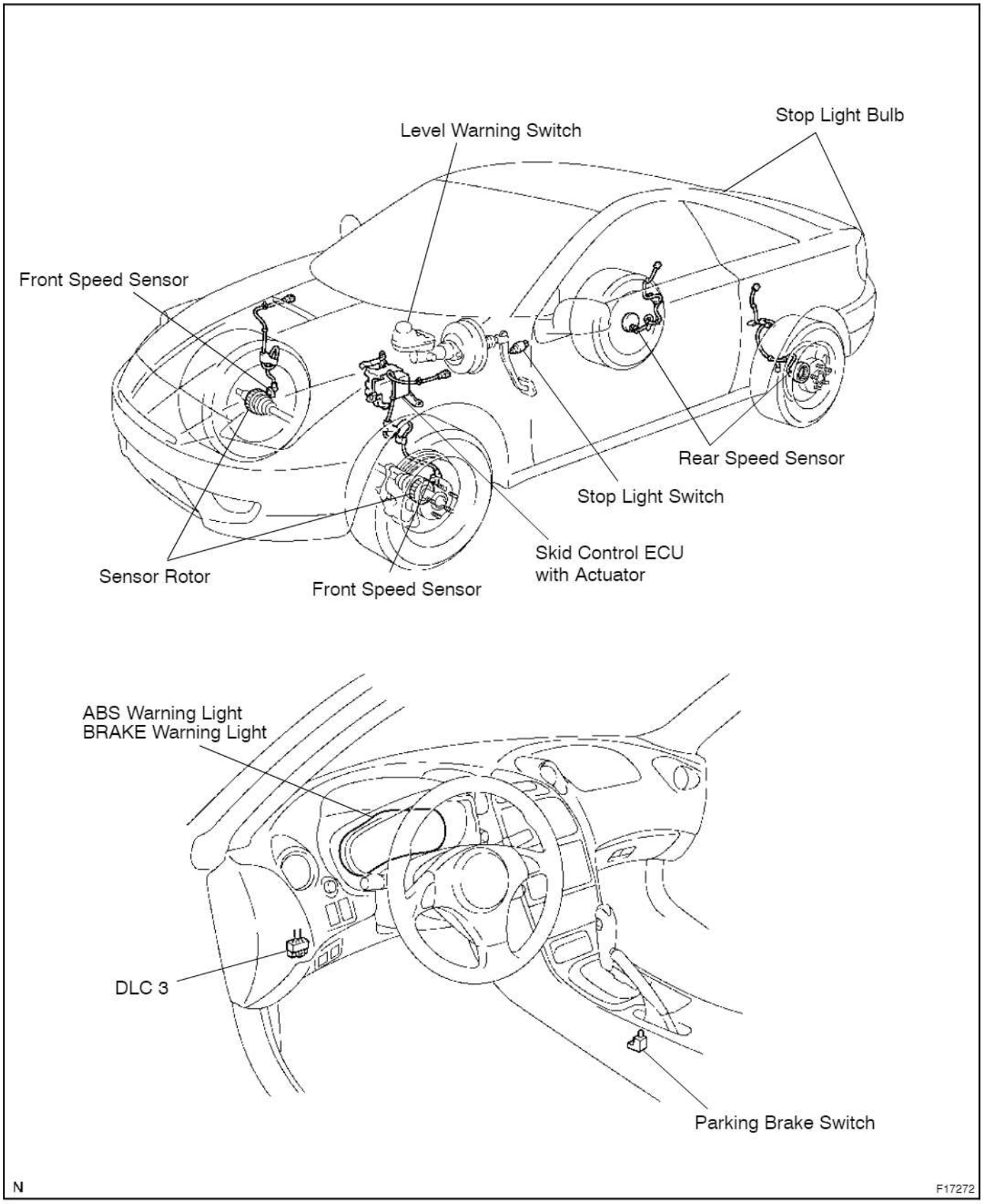
There is a case that hand–held tester cannot be used when the ABS warning light remains ON.

DTC of speed sensor check function:

Code No.	Diagnosis	Trouble Area
C1271/71	Low output voltage of right front speed sensor	• Right front speed sensor • Sensor installation • Right front speed sensor rotor
C1272/72	Low output voltage of left front speed sensor	• Left front speed sensor • Sensor installation • Left front speed sensor rotor
C1273/73	Low output voltage of right rear speed sensor	• Right rear speed sensor • Sensor installation • Right rear speed sensor rotor
C1274/74	Low output voltage of left rear speed sensor	• Left rear speed sensor • Sensor installation • Left rear speed sensor rotor
C1275/75	Abnormal change in output voltage of right front speed sensor	Right front speed 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 speed sensor rotor
C1278/78	Abnormal change in output voltage of left rear speed sensor	Left rear speed sensor rotor

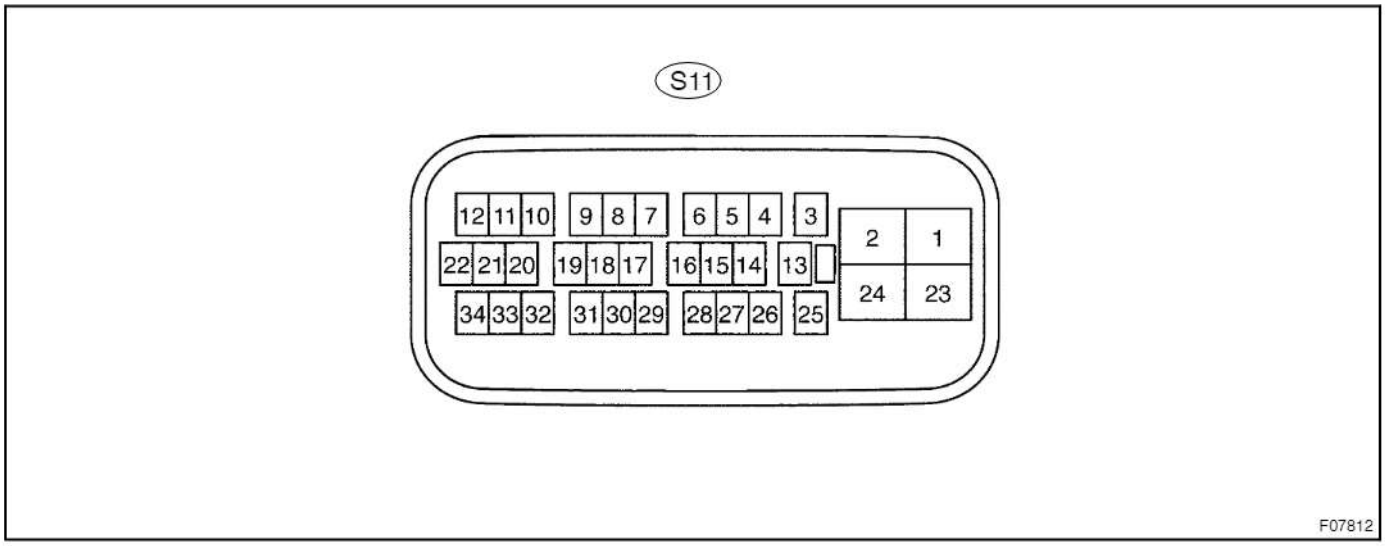
DI6MB–05

PARTS LOCATION



DI6SJ–12

TERMINALS OF ECU



Symbols (Terminal No.)	Wiring Color	Condition	STD Voltage (V)
+BS (S11–1) – GND1, 2 (S11–2, 24)	B–W ↔ W–B	Always	11 – 14
PN (S11–5) – GND1, 2 (S11–2, 24)	G–W ↔ W–B	IG switch ON, shift lever is in P position	10 – 14
		IG switch ON, shift lever is in N position	
FL+ (S11–9) – FL– (S11–8)	Y – BR	IG switch ON, slowly turn left front wheel	AC generation
STP (S11–10) – GND1, 2 (S11–2, 24)	G–W ↔ W–B	Stop light switch ON	10 – 14
		Stop light switch OFF	Below 1.0
RL+ (S11–11) – RL– (S11–12)	R ↔ G	IG switch ON, slowly turn left rear wheel	AC generation
WA (S11–13) – GND1, 2 (S11–2, 24)	V ↔ W–B	IG switch ON, ABS warning light ON	10 – 14
		IG switch ON, ABS warning light OFF	Below 2.0
D/G (S11–14) – GND1, 2 (S11–2, 24)	W ↔ W–B	IG switch ON	10 – 14
TS (S11–15) – GND1, 2 (S11–2, 24)	W–R ↔ W–B	IG switch ON	10 – 14
TC (S11–16) – GND1, 2 (S11–2, 24)	P–B ↔ W–B	IG switch ON	10 – 14
PKB (S11–18) – GND1, 2 (S11–2, 24)	R–B ↔ W–B	IG switch ON, parking switch ON	Below 1.0
		IG switch ON, parking switch OFF	10 – 14
+BM (S11–23) – GND1, 2 (S11–2, 24)	B–R ↔ W–B	Always	11 – 14
IG1 (S11–25) – GND1, 2 (S11–2, 24)	B–O ↔ W–B	IG switch ON	10 – 14
SP1 (S11 – 26) – GND1, 2 (S11–2, 24)	L–B ↔ W–B	Vehicle drives at about 20 km/h (12 mph)	Pulse generation
FR+ (S11–31) – FR– (S11–30)	P ↔ L	IG switch ON, slowly turn right front wheel	AC generation
BRL (S11–32) – GND1, 2 (S11–2, 24)	GR ↔ W–B	IG switch ON, brake warning light ON	10 – 14
		IG switch ON, brake warning light OFF	Below 2.0
RR+ (S11–33) – RR– (S11–34)	W ↔ B	IG switch ON, slowly turn right rear wheel	AC generation

DI6MD-05

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 IG switch OFF.

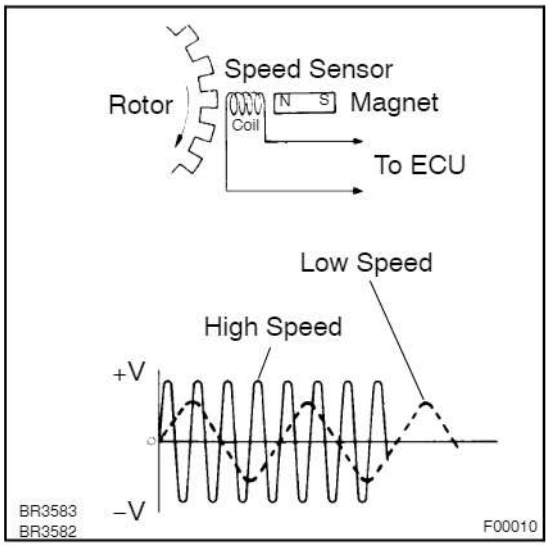
Symptom	Suspect Area	See page
ABS does not operate	Only when 1. to 4. are all normal and the problem is still occurring, replace the Skid Control ECU. 3. Check the DTC reconfirming that the normal code is output. 4. IG power source circuit 5. Speed sensor circuit 6. Check the ABS actuator with a TOYOTA hand-held tester. If abnormal, check the hydraulic circuit for leakage (See page DI-881).	 DI-836 DI-863 DI-848 BR-48
ABS does not operate efficiently	Only when 1. to 4. are all normal and the problem is still occurring, replace the Skid Control ECU. 1. Check the DTC reconfirming that the normal code is output. 2. Speed sensor circuit 3. Stop light switch circuit 4. Check the ABS actuator with a TOYOTA hand-held tester. If abnormal, check the hydraulic circuit for leakage (See page DI-881).	 DI-836 DI-848 DI-866 BR-48
ABS warning light abnormal	1. ABS warning light circuit 2. Skid Control ECU	DI-872
BRAKE warning light abnormal	1. BRAKE warning light circuit 2. Skid Control ECU	DI-875
DTC check cannot be done	Only when 1. and 2. are all normal and the problem is still occurring, replace the Skid Control ECU. 1. ABS warning light circuit 2. Tc terminal circuit	 DI-872 DI-877
Speed sensor signal check cannot be done	1. Ts terminal circuit 2. Skid Control ECU	DI-879

DI6SL-09

CIRCUIT INSPECTION

DTC	C0200/31 to C1239/39	Speed Sensor Circuit

CIRCUIT DESCRIPTION



The speed sensor detects wheel speed and sends the appropriate signals to the ECU. These signals are used to control the ABS system. The front and the rear rotors each have 48 serrations.

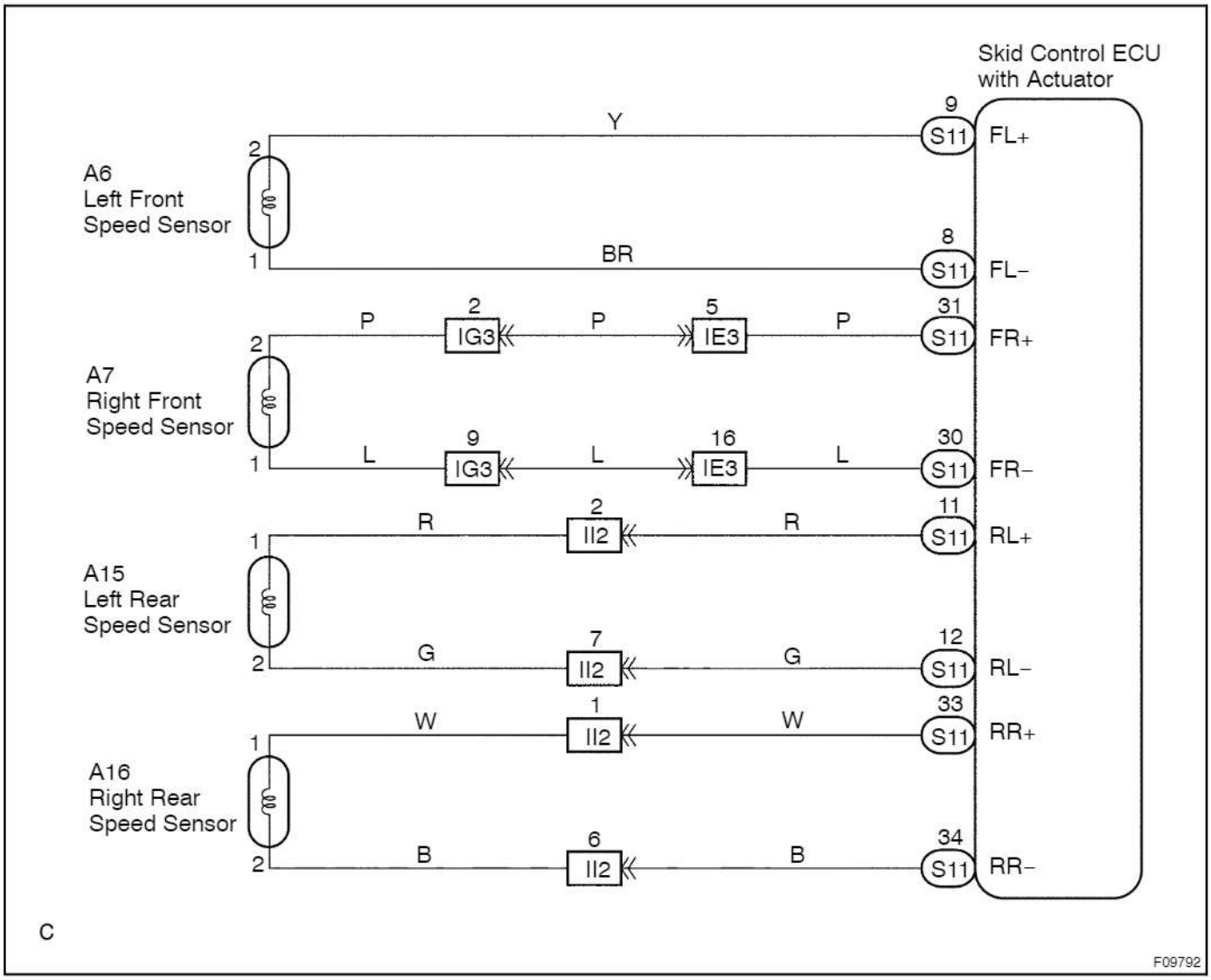
When the rotors rotate, the magnetic field emitted by the permanent magnet in the speed sensor generates an AC voltage. Since the frequency of this AC voltage changes in direct proportion to the speed of the rotor, the frequency is used by the ECU to detect the speed of each wheel.

DTC No.	DTC Detecting Condition	Trouble Area
C0200/31 C0205/32	Detection of any of conditions from 1. through 3.: 1. Vehicle speed is at 10 km/h (6 mph) or more and the speed sensor signal circuit is open or short circuit continues for 15 sec. or more. 2. Momentary interruption of the speed sensor signal occurs 7 times or more. 3. Open circuit condition of the speed sensor signal circuit continues for 0.5 sec. or more.	• Right front or left front speed sensor • Each speed sensor circuit • Speed sensor rotor
C0210/33 C0215/34		• Right rear and left rear speed sensor • Each speed sensor circuit • Speed sensor rotor • Rear axle hub
C1235/35 C1236/36 C1238/38 C1239/39	Vehicle speed is at 20 km/h (12mph) or more and interference on the speed sensor signal continues for 5 sec. or more.	• Right front, left front, right rear or left rear speed sensor • Each speed sensor circuit • Speed sensor rotor

HINT:

- DTC No. C0200/31 and C1235/35 is for the right front speed sensor.
- DTC No. C0205/32 and C1236/36 is for the left front speed sensor.
- DTC No. C0210/33 and C1238/38 is for the right rear speed sensor.
- DTC No. C0215/34 and C1239/39 is for the left rear speed sensor.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Start the inspection from step 1 in the case of using the TOYOTA hand–held tester and start from step 2 in the case of not using the TOYOTA hand–held tester.

1	**Check output value of speed sensor.**

PREPARATION:

(a) Connect the TOYOTA hand–held tester to the DLC3.
(b) Turn the ignition switch to ON and push the TOYOTA hand–held tester main switch ON.
(c) Select the DATA LIST mode on the TOYOTA hand–held tester.

CHECK:

Check that there is no difference between the speed value output from the speed sensor displayed on the TOYOTA hand–held tester and the speed value displayed on the speedometer when driving the vehicle.

OK:

There is almost no difference between the two displayed speed values.

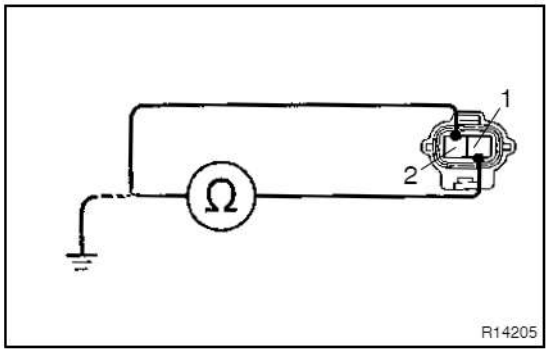
HINT:

There is tolerance of ± 10 % in the speedometer indication.

OK → **Check and replace Skid Control ECU (ABS Actuator Assembly). (See page IN–30)**

NG

2	**Check speed sensor.**



Front:

PREPARATION:

(a) Remove the front fender liner.
(b) Make sure that there is no looseness at the connector lock part and the connecting part of the connector.
(c) Disconnect the speed sensor connector.

CHECK:

Measure the resistance between terminal 1 and 2 of speed sensor connector.

OK:

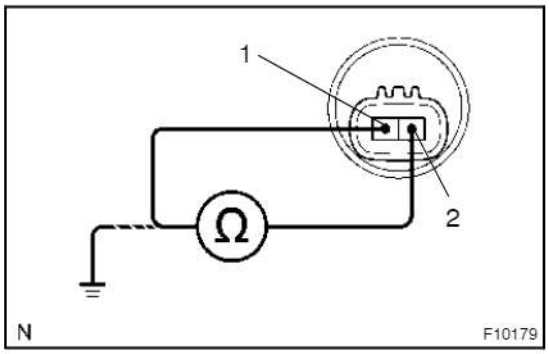
Resistance: 1.4 – 1.8 kΩ at 20 °C

CHECK:

Measure the resistance between terminal 1 and 2 of speed sensor connector and body ground.

OK:

Resistance: 10 MΩ or higher



Rear speed sensor:

PREPARATION:

(a) Make sure that there is no looseness at the connector lock part and the connecting part of the connector.

(b) Disconnect the speed sensor connector at hub bearing .

CHECK:

Measure the resistance between terminal 1 and 2 of speed sensor connector.

OK:

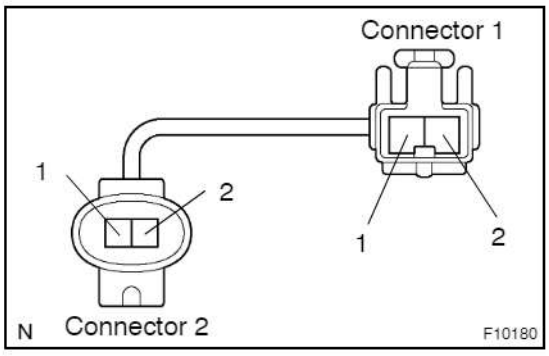
Resistance: 2.2 kΩ or less

CHECK:

Measure the resistance between terminal 1 and 2 of speed sensor connector and body ground.

OK:

Resistance: 1 MΩ or higher



Rear speed sensor sub–wire harness:

PREPARATION:

(a) Remove the seat cushion and the seatback.

(b) Make sure that there is no looseness at the connector lock part and connecting part of the connector.

(c) Disconnect the speed sensor sub–wire harness connector inside vehicle.

CHECK:

(a) Measure the resistance between terminal 1 of connector 1 and terminal 2 of connector 2.

(b) Measure the resistance between terminal 2 of connector 1 and terminal 1 of connector 2.

OK:

Resistance: below 1 Ω

CHECK:

Measure the resistance between terminal 1 and 2 of speed sensor connector 1 and body ground.

OK:

Resistance: 10 MΩ or higher

NG	**Replace speed sensor or sub–wire harness.**

NOTICE:

Check the speed sensor signal last (See page DI–836).

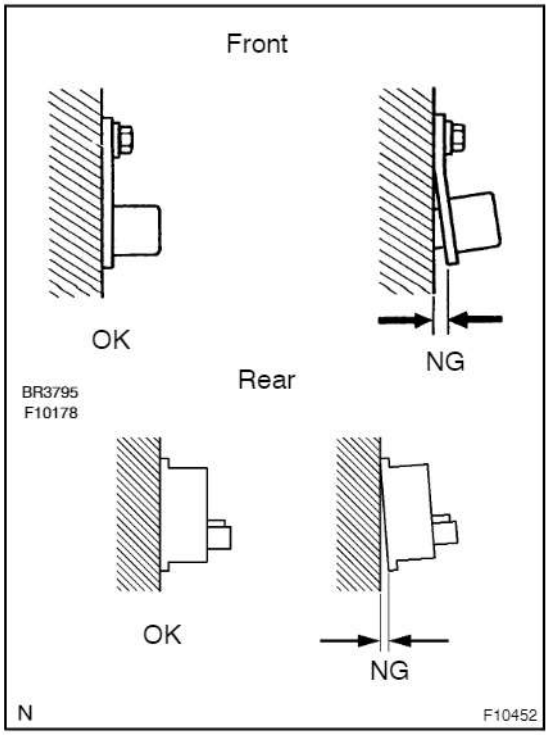
OK

3	**Check for open and short circuit in harness and connector between each speed sensor and Skid Control ECU (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

4	**Check speed sensor installation.**



CHECK:

Check the speed sensor installation.

OK:

Front:

The installation bolt is tightened properly and there is no clearance between the sensor and the steering knuckle.

Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)

Rear:

There is no clearance between the sensor and the rear axle carrier.

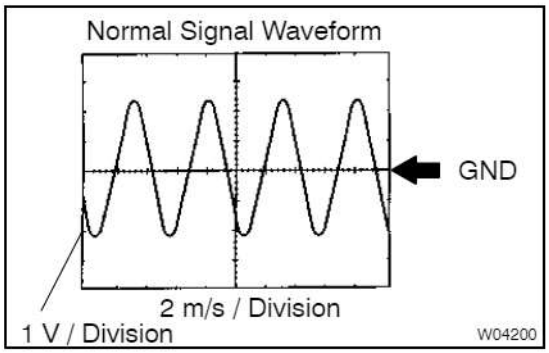
NG → **Replace speed sensor.**

NOTICE:

Check the speed sensor signal again at the end of the procedure (See page DI–836).

OK

5	Check speed sensor and sensor rotor serrations.



REFERENCE: INSPECTION USING OSCILLOSCOPE

PREPARATION:

(a) Disconnect the Skid Control ECU connector.

(b) Connect the oscilloscope to the terminal FR+ – FR–, FL+ – FL–, RR+ – RR– and RL+ – RL– of the Skid Control ECU harness side connector.

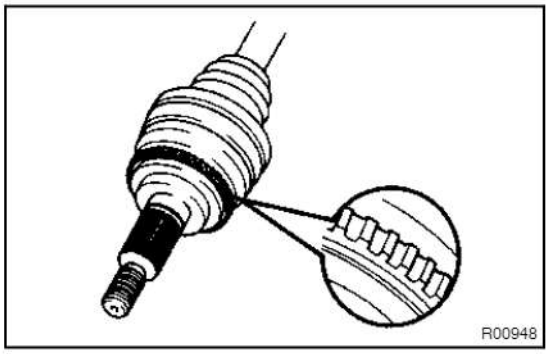
CHECK:

Drive the vehicle with about 30 km/h (19 mph), and check the signal waveform.

OK	Check and replace Skid Control ECU (ABS Actuator Assembly). (See page IN–30)

NG

6	Check sensor rotor and sensor tip.



Front:

PREPARATION:

Remove the front drive shaft (See page SA–21).

CHECK:

Check the sensor rotor serrations.

OK:

No scratches or missing teeth or foreign objects.

PREPARATION:

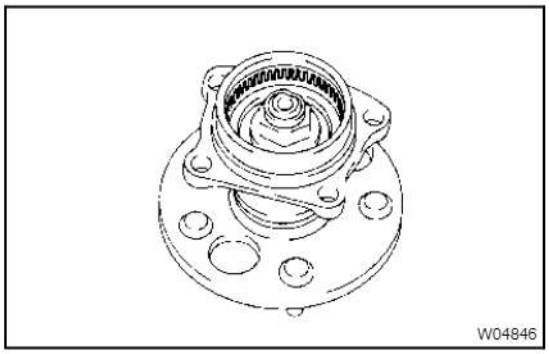
Remove the front speed sensor (See page BR–54).

CHECK:

Check the sensor tip.

OK:

No scratches or foreign objects on the sensor tip.



Rear:

PREPARATION:

Remove the rear speed sensor (See page BR–57).

CHECK:

Check the sensor rotor serrations.

OK:

No scratches or missing teeth or foreign objects.

CHECK:

Check the sensor tip.

OK:

No scratches or foreign objects on the sensor tip.

NG → **Replace sensor rotor or speed sensor.**

NOTICE:

Check the speed sensor signal again at the end of the procedure (See page DI–836).

OK

Check and replace Skid Control ECU (ABS Actuator Assembly). (See page IN–30)

DI6SM-11

DTC	C0226/21 to C0256/24	ABS Solenoid Valve Circuit

CIRCUIT DESCRIPTION

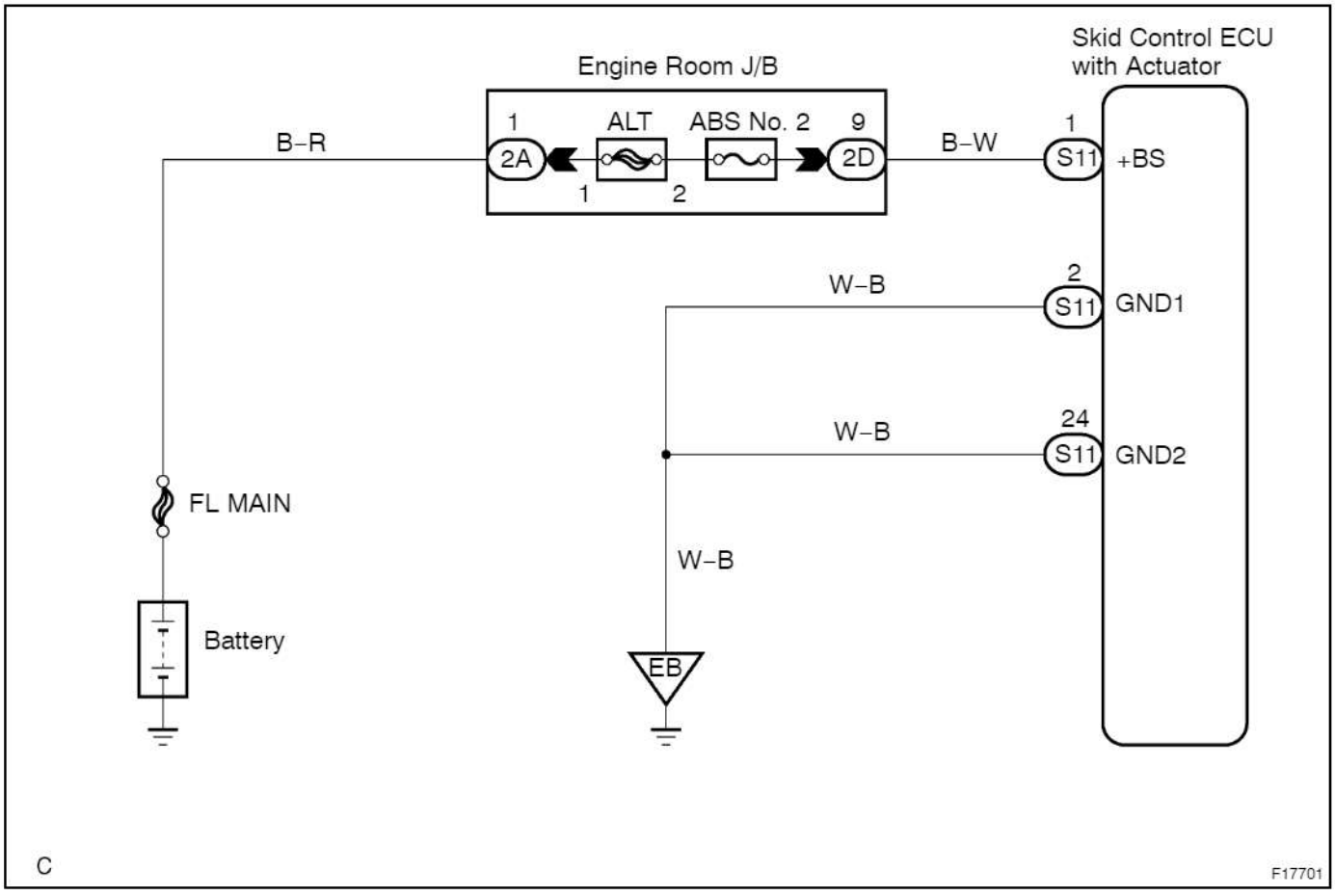
The ABS solenoid valve turns on when signals are sent from the ECU and controls the pressure operating the wheel cylinders, thus the braking force is controlled.

DTC No.	DTC Detection Condition	Trouble Area
C0226/21 C0236/22	1. When solenoid relay is ON and IG1 terminal voltage is 9.5 – 18.5 V, solenoid circuit is open or short for 0.05 sec. or longer 2. IG1 terminal voltage of skid control ECU is 9.5 – 18.5 V, and while ABS is control in operation, there is solenoid relay contact OFF for 0.05 sec. or longer.	• ABS actuator • SFRR, SFRH, SFLR or SFLH circuit
C0246/23 C0256/24		• ABS actuator • SRRR, SRRH, SRLR or SRLH circuit

HINT:

- DTC No. C0226/21 is for right front solenoid valve.
- DTC No. C0236/22 is for left front solenoid valve.
- DTC No. C0246/23 is for right rear solenoid valve.
- DTC No. C0256/24 is for left rear solenoid valve.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check the DTC once more.**

PREPARATION:

(a) Clear DTC (See page DI–836).

(b) Turn the ignition switch to OFF.

CHECK:

Turn the ignition switch to ON, and check that the same DTC is stored in the memory.

YES → **Replace ABS Actuator Assembly.**

NO

2	**Perform ACTIVE TEST by TOYOTA hand–held tester.**

(a) Select the item "ABS SOLENOID RELAY" in the ACTIVE TEST and operate the ABS solenoid relay on the TOYOTA hand–held tester.

(b) Operat the ABS solenoid relay by the TOYOTA hand–held tester.

CHECK:

Check that the same DTC is stored in the memeoty.

NO → **No problem.**

YES

Replace ABS Actuator Assembly.

DIAIK-04

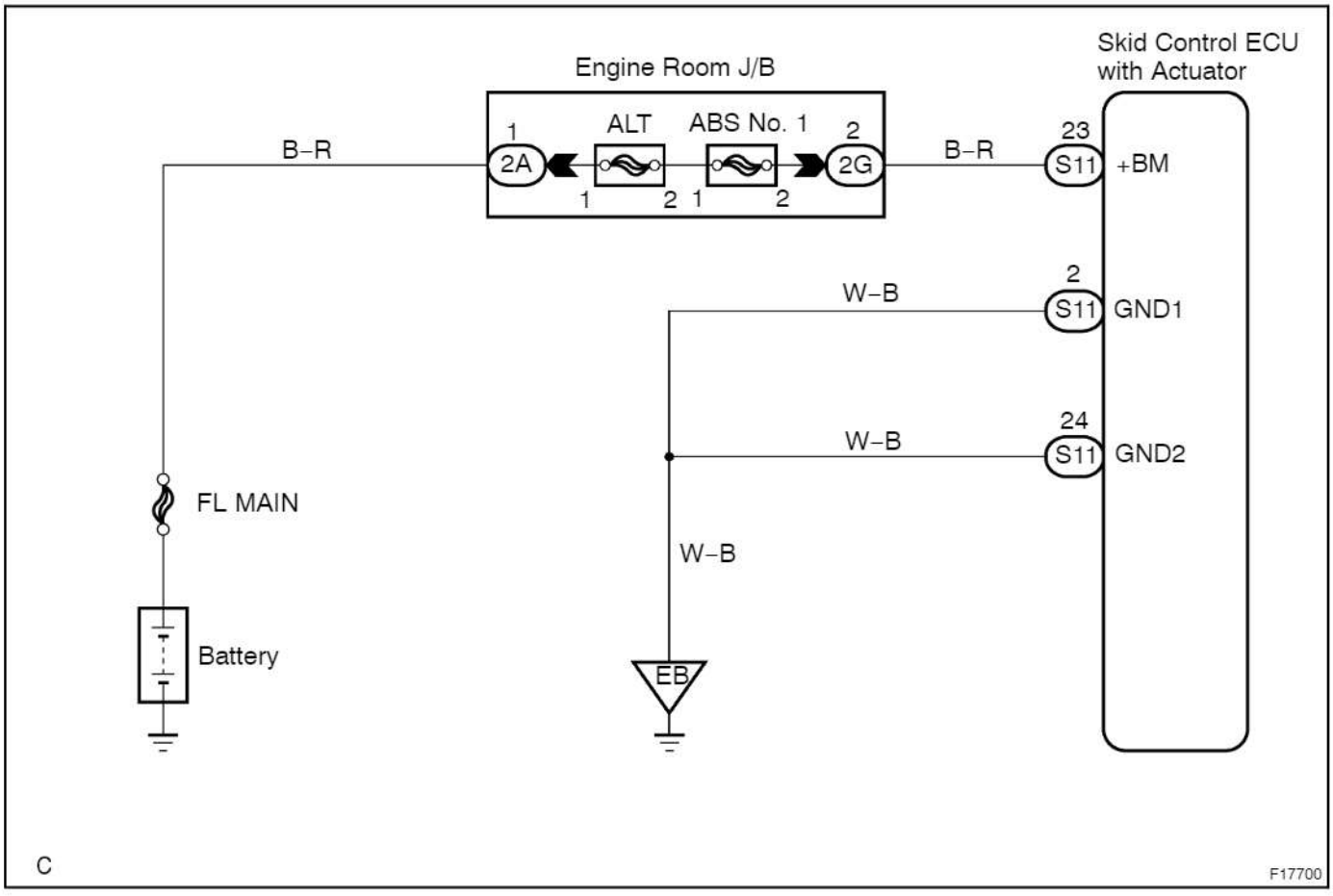
DTC	C0273/13, C0274/14	ABS Motor Relay Circuit

CIRCUIT DESCRIPTION

The ABS motor relay supplies power to the ABS pump motor. While the ABS is activated, ECU switches the ABS motor relay ON and operates the ABS pump motor.

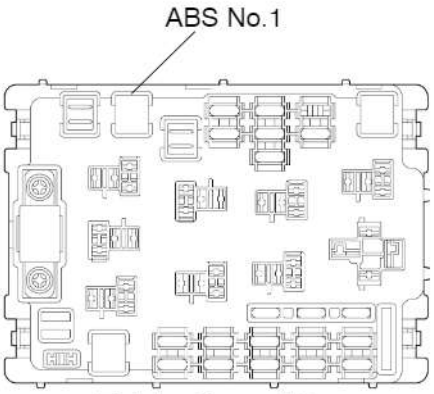
DTC No.	DTC Detection Condition	Trouble Area
C0273/13	• IG1 terminal voltage is from 9.5 V to 18.5 V and the relay contact OFF condition remains for 0.2 sec. or more, despite turning the relay ON during the initial check or while ABS is in operation. • IG1 terminal voltage decreases in 9.5 V or less and the relay contact OFF condition remains for 0.2 sec. or more, despite turning the relay ON during the initial check or while ABS is in operation.	• ABS actuator • ABS motor relay • ABS motor relay circuit
C0274/14	The relay contact ON condition continues for 4 sec. when the relay is OFF.	

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check ABS No.1 fuse.



PREPARATION:

Remove the ABS No.1 fuse from Engine Room J/B.

CHECK:

Check continuity of the ABS No.1 fuse.

OK:

Continuity

NG → **Check for short circuit in all the harness and components connected to ABS No.1 fuse (See attached wiring diagram).**

OK ↓

2	Check the DTC once more.

PREPARATION:

(a) Clear the DTC (See page DI–836).

(b) Turn the ignition switch to OFF.

CHECK:

Turn the ignition switch to ON, and check that the same DTC is stored in the memory.

YES → **Replace ABS Actuator Assembly.**

NO ↓

3	Check ABS motor relay operation.

PREPARATION:

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

(b) Turn the ignition switch to ON and push the TOYOTA hand–held tester main switch ON.

(c) Select the ACTIVE TEST mode on the TOYOTA hand–held tester.

CHECK:

Check the operation sound of the ABS motor individually when operating it with the TOYOTA hand–held tester.

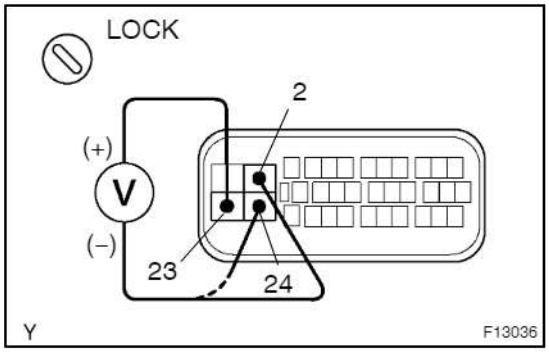
OK:

The operation sound of the ABS motor should be heard.

NG → **Check and replace Skid Control ECU (ABS Actuator Assembly). (See page IN–30)**

OK

4	Check voltage between terminals +BM (23) and GND (2, 24) of Skid Control ECU connector.



PREPARATION:

Disconnect the Skid Control ECU connector.

CHECK:

Measure the voltage between terminal 23 and 2, 24 of the Skid Control ECU harness side connector.

OK:

Voltage: 10 – 14 V

NG → **Check and repair harness or connector.**

OK

If the same code is still output after the DTC is deleted, check the contact condition of each connection. If the connection is normal, the ECU may be defective.

DIAIL-04

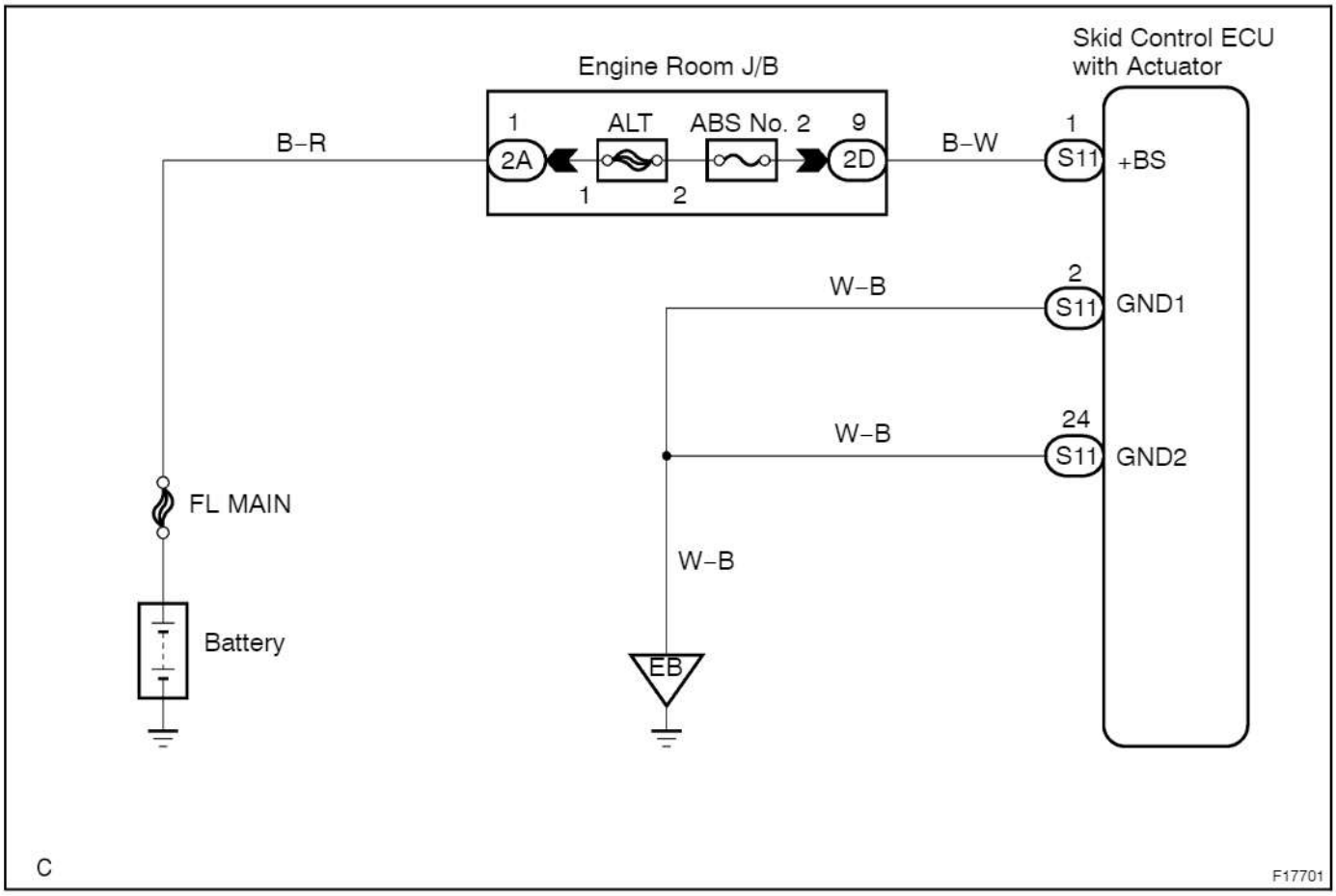
DTC	C0278/11, C0279/12	ABS Solenoid Relay Circuit

CIRCUIT DESCRIPTION

This relay supplies power to each ABS solenoid. After the ignition switch is turned ON, and if the initial check is OK, the relay turns on.

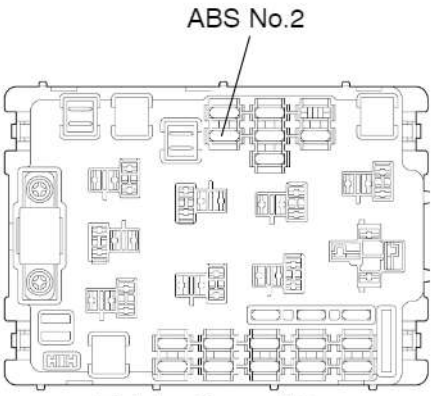
DTC No.	DTC Detection Condition	Trouble Area
C0278/11	• IG1 terminal voltage is from 9.5 V to 18.5 V and the relay contact OFF condition continues for 0.2 sec. or more. • IG1 terminal voltage decreases in 9.5 V or less because of the relay ON driving, and the relay contact OFF condition elapses for 0.2 sec. or more.	• ABS solenoid relay • ABS solenoid relay circuit • ABS actuator
C0279/12	Immediately after IG switch has been turned ON, when the solenoid relay is OFF.	

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check ABS No.2 fuse.



PREPARATION:

Remove the ABS No.2 fuse from the Engine Room J/B.

CHECK:

Check continuity of ABS No.2 fuse.

OK:

Continuity

NG → **Check for short circuit in all the harness and components connected to ABS No.2 fuse (See attached wiring diagram).**

OK

2	Check the DTC once more.

PREPARATION:

(a) Clear DTC (See page DI–836).

(b) Turn the ignition switch to OFF.

CHECK:

Turn the ignition switch to ON, and check that the same DTC is stored in the memory.

YES → **Replace ABS Actuator Assembly.**

NO

3	Check ABS solenoid relay operation.

PREPARATION:

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

(b) Turn the ignition switch ON and push the TOYOTA hand–held tester main switch ON.

(c) Select the ACTIVE TEST mode on the TOYOTA hand–held tester.

CHECK:

Check the operation sound of the ABS solenoid relay when operating it with the TOYOTA hand–held tester.

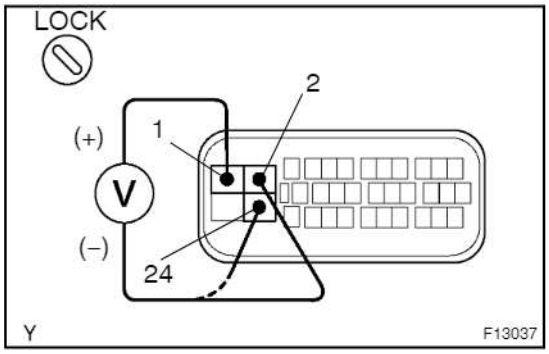
OK:

The operation sound of the ABS solenoid relay should be heard.

NG → **Check and replace ABS Actuator Assembly.**

OK

4	Check voltage between terminals +BS (1) and GND (2, 24) of skid control ECU.



PREPARATION:

Disconnect the Skid Control ECU connector.

CHECK:

Measure the voltage between terminal 1 and 2, 24 of the Skid Control ECU harness side connector.

OK:

Voltage: 10 – 14 V

NG → **Check and repair harness or connector.**

OK

If the same code is still output after the DTC is deleted, check the contact condition of each connection. If the connection is normal, the ECU may be defective.

D6SP-12

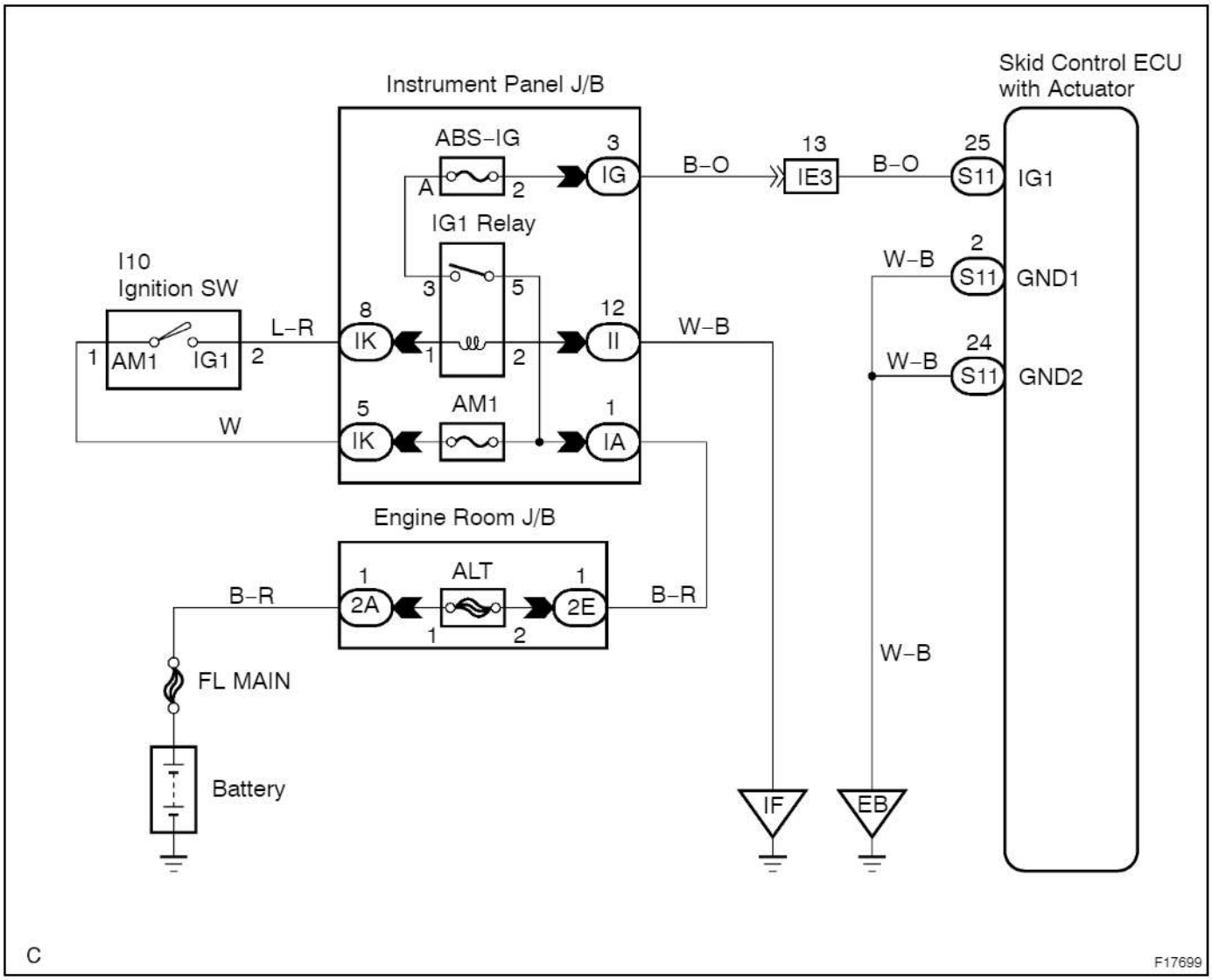
DTC	C1241/41	IG Power Source Circuit

CIRCUIT DESCRIPTION

This is the power source of ECU, hence of CPU, and of the ABS actuator.

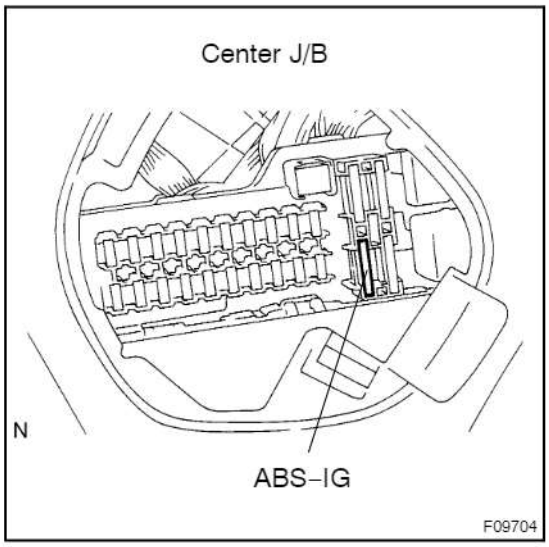
DTC No.	DTC Detection Condition	Trouble Area
C1241/41	Condition 1. or 2. is detected: 1. Vehicle speed is at 3 km/h (1.9 mph) or more and ECU terminal IG1 voltage is 9.5 V or less, which continues for 10 sec. or more 2. When IG terminal voltage is less than 9.5 V, there is open circuit in the motor relay or in the solenoid relay, or the solenoid circuit malfunction.	• Battery • Charging system • Power source circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check ABS–IG fuse.**



PREPARATION:

Remove the ABS–IG fuse from Center J/B.

CHECK:

Check continuity of the ABS–IG fuse.

OK:

Continuity

NG → **Check for short circuit in all the harness and components connected to ABS–IG fuse (See attached wiring diagram).**

OK

2	**Check battery positive voltage.**

OK:

Voltage: 10 – 14 V

NG → **Check and repair the charging system (See page IN–30).**

OK

3	Check voltage of the ECU IG power source.

PREPARATION:

In the case of using the hand–held tester:

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

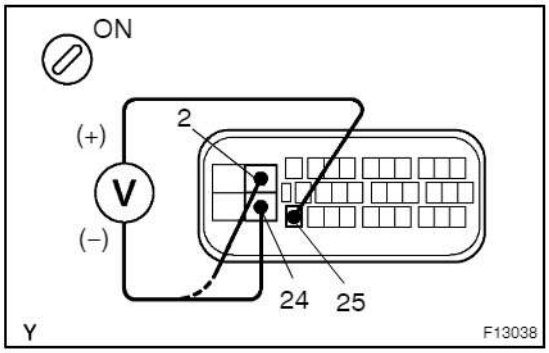
(b) Turn the ignition switch to ON and push the TOYOTA hand–held tester main switch ON.

(c) Select the item "IG VOLTAGE" in the DATA LIST and read its value displayed on the TOYOTA hand–held tester.

(d) Check the voltage condition output from the ECU and displayed on theTOYOTA hand–held tester.

CHECK:

OK: "Normal" is displayed. (Voltage: 10 – 14 V)



PREPARATION:

In the case of not using the hand–held tester:

(a) Disconnect the Skid Control ECU connector.

(b) Turn the ignition switch to ON.

PREPARATION:

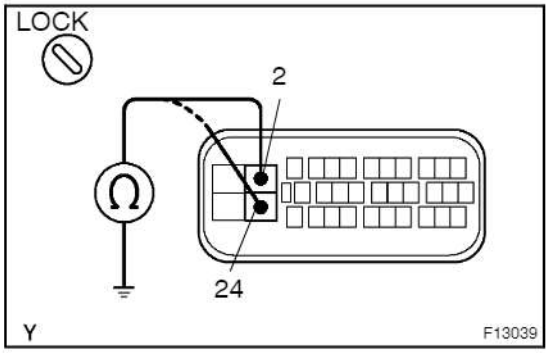
Measure the voltage between terminal 25 and 2 or 24 of the skid control ECU connector.

OK: 10 – 14 V

OK	Check or replace Skid Control ECU (ABS Actuator Assembly). (See page IN–30)

NG

4	Check continuity between terminals GND (2, 24) of Skid Control ECU connector and body ground.



CHECK:

Measure the resistance between terminal 2 and 24 of Skid Control ECU harness side connector and body ground.

OK:

Resistance: 1 Ω or less

NG	Repair or replace harness or connector.

OK

Check for open circuit in harness and connector between Skid Control ECU and ABS–IG fuse (See page IN–30).

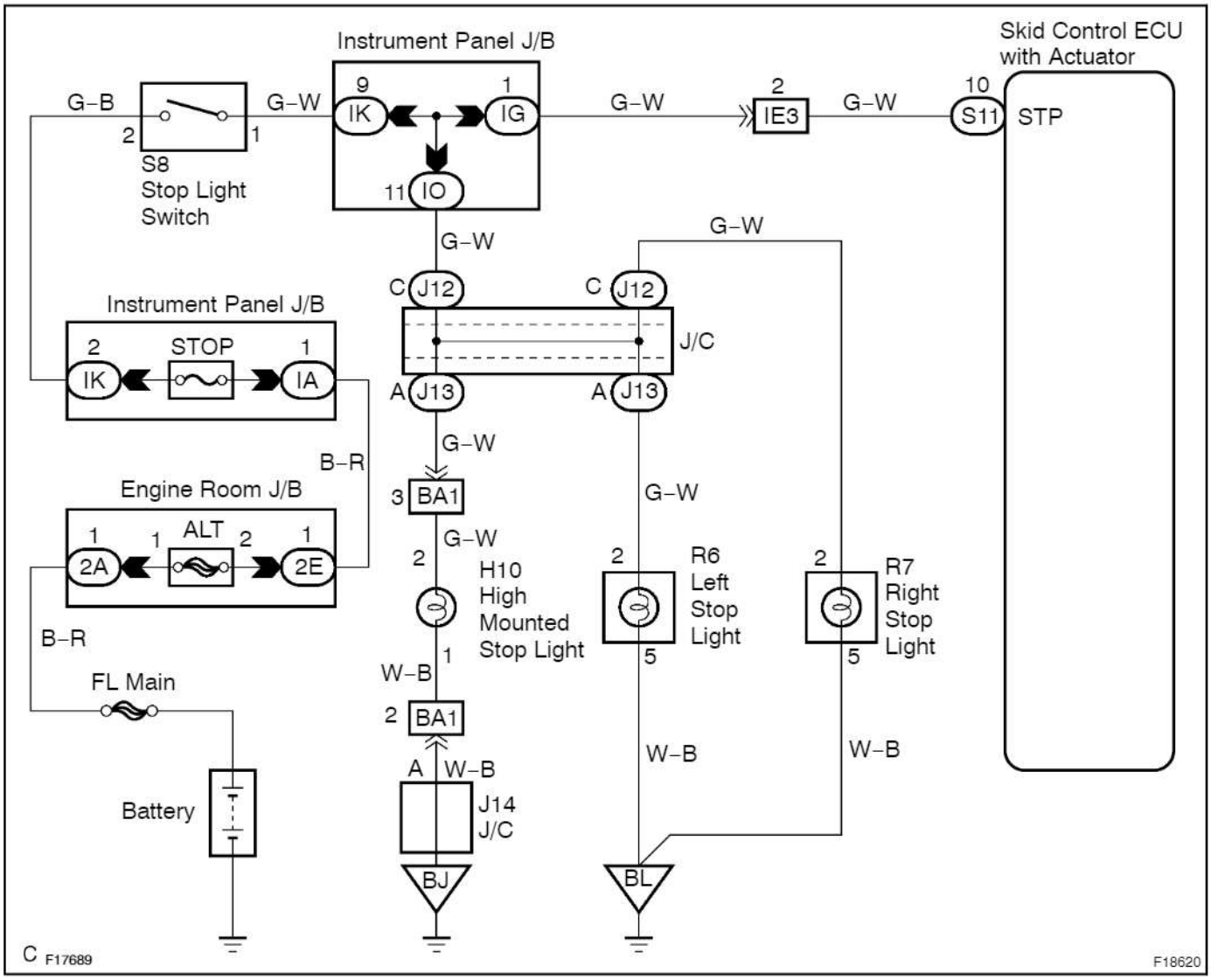
D6SQ-09

DTC	C1249/49	Stop Light Switch Circuit

CIRCUIT DESCRIPTION

DTC No.	DTC Detection Condition	Trouble Area
C1249/49	When IG1 terminal voltage is from 9.5 V to 18.5 V and ABS is not in operation, the open circuit of the stop light switch circuit continues for 0.3 sec. or more.	• Stop lamp switch • Stop light switch circuit • Stop light bulb

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check operation of stop light.**

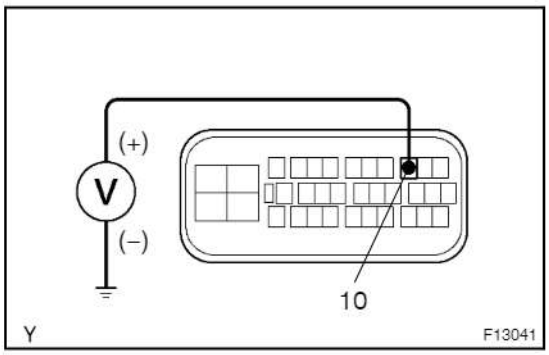
CHECK:

Check that stop light comes on when brake pedal is depressed and goes off when brake pedal is released.

NG → **Repair stop light circuit (See page BE-37).**

OK

2	**Check voltage between terminal STP (10) of Skid Control ECU and body ground.**



PREPARATION:

Disconnect Skid Control ECU connector.

CHECK:

Measure the voltage between terminal 10 of Skid Contorl ECU harness side connector and body ground when brake pedal is depressed.

OK:

Voltage: 10 – 14 V

OK → **Check and replace Skid Control ECU (ABS Actuator Assembly). (See page IN-30)**

NG

3	**Check for open circuit in harness and connector between Skid Control ECU and stop light switch (See page IN-30).**

NG → **Repair or replace harness or connector.**

OK

Check and replace Skid Contorl ECU (ABS Actuator Assembly). (See page IN-30)

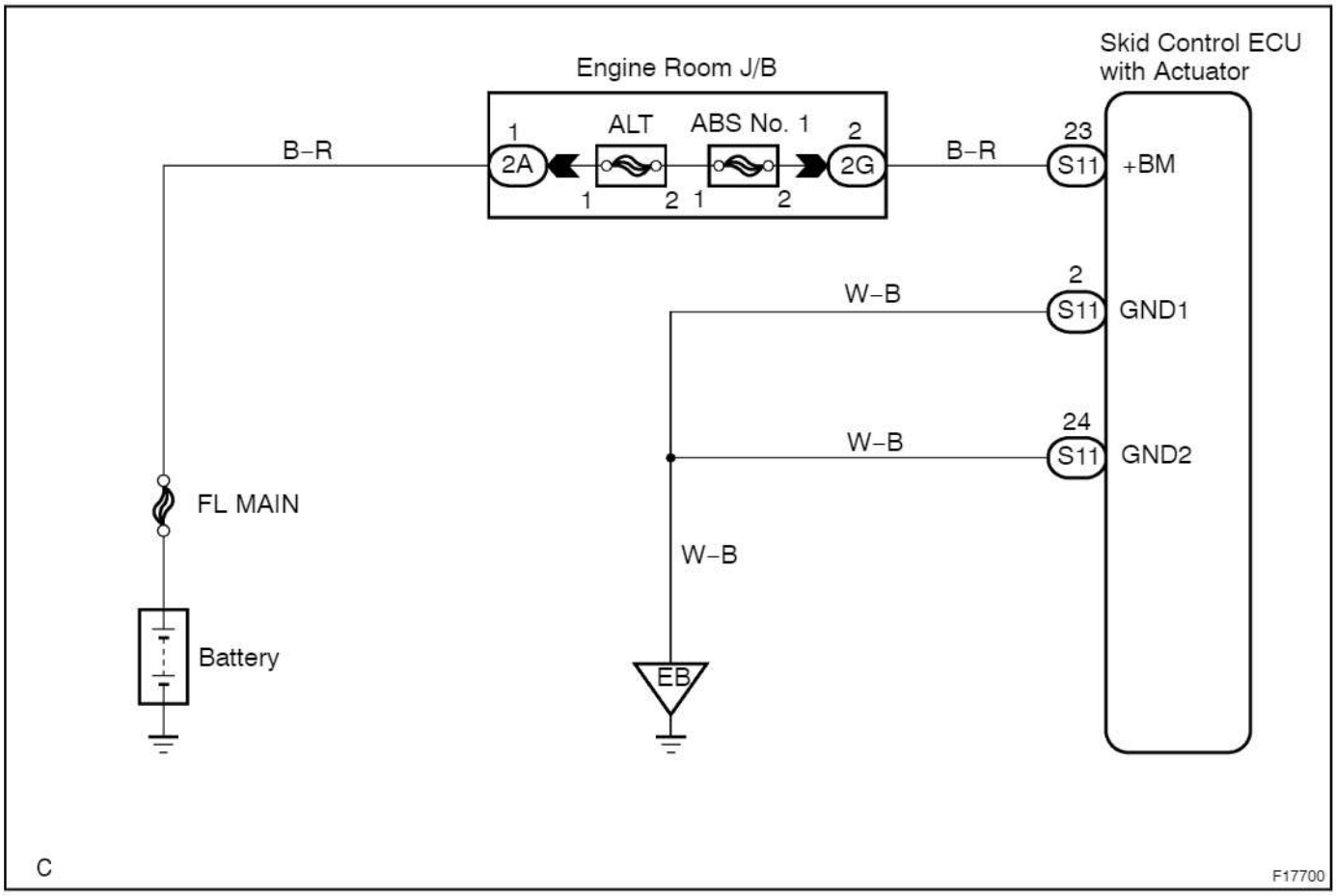
DIAM–04

DTC	C1251/51	ABS Pump Motor Lock

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
C1251/51	When the actuator pump drive motor does not rotate correctly.	ABS pump motor

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check ABS pump motor operation.**

PREPARATION:

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

(b) Turn the ignition switch to ON and push the TOYOTA hand–held tester main switch ON.

(c) Select the ACTIVE TEST mode on the TOYOTA hand–held tester.

CHECK:

Check the operation sound of the ABS pump motor when operating it with the TOYOTA hand–held tester.

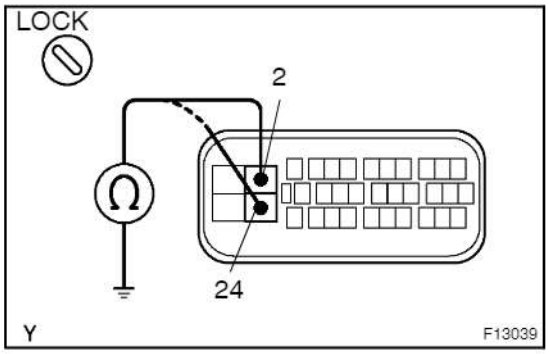
OK:

The operation sound of the ABS pump motor should be heard.

OK → **Proceed to next circuit inspection shown in problem symptoms chart (See page DI–847).**

NG

2	**Check continuity between terminals GND (2, 24) of Skid Control ECU connector and body ground.**



CHECK:

Measure the resistance between terminals 2 and 24 of Skid Control ECU harness side connector and body ground.

OK:

Resistance: 1 Ω or less

NG → **Repair or replace harness or connector.**

OK

Check and replace Skid Control ECU (ABS Actuator Assembly). (See page IN–30)

DI6MM–04

DTC	Always ON	Skid Control ECU Malfunction

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
Always ON	Detection of any conditions in 1. and 2.: 1. Skid control ECU internal malfunction is detected 2. There is a malfunction in the ECU internal circuit	• Battery • Charging system • Skid control ECU

INSPECTION PROCEDURE

1	Is DTC output?

Check DTC on page DI–836.

YES → **Repair circuit indicated by the code output.**

NO

2	Is normal code displayed?

YES → **Check and replace Skid Control ECU (ABS Actuator Assembly). (See page IN–30)**

NO

3	Does ABS warning light go off?

YES → **Check and replace Skid Control ECU (ABS Actuator Assembly). (See page IN–30)**

NO

4	Check battery positive voltage.

CHECK:

Check the battery positive voltage.

OK:

10 – 14 V

NG → **Check and repair the charging system. (See page CH–2)**

OK

5	Check ABS warning light.

PREPARATION:

(a) Disconnect the connector from the Skid Comtrol ECU.

(b) Connect the terminal WA (S11 – 13) of the wire harness and the terminal GND (S11 – 2, 24) of the wire harness.

(c) Turn the ignition switch to ON.

CHECK:

Check the ABS warning light goes off.

OK → **Check and replace Skid Control ECU (ABS Actuator Assembly). (See page IN–30)**

NG

Check for short circuit in harness and connector between ABS warning light, combination meter and Skid Control ECU (See page IN–30).

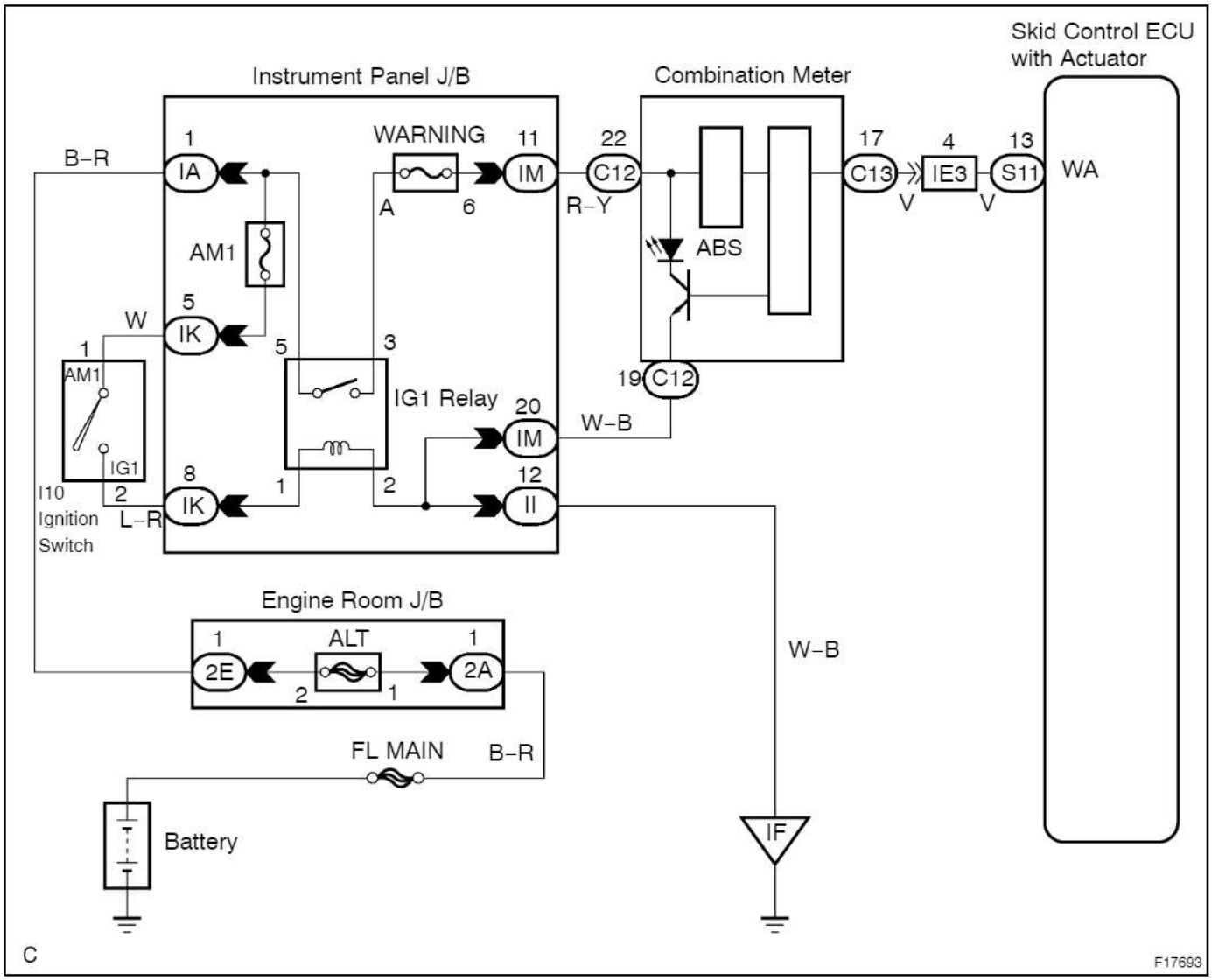
DI6MN–26

ABS Warning Light Circuit

CIRCUIT DESCRIPTION

If ECU detects trouble, it turns on the ABS warning light, and prohibit the ABS control at the same time. At this time, the ECU records a DTC in memory.
Connect terminal TC and CG of the DLC3 to make the ABS warning light blink and output DTC.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Troubleshoot in accordance with the chart below for each trouble symptom.

ABS warning light does not come on	*1
ABS warning light remains on	*2

*1: Start the inspection from step 1 in the case of using the TOYOTA hand–held tester and start from step 2 in the case of not using TOYOTA hand–held tester.

*2: After inspection of step 3, start the inspection from step 4 in the case of using the TOYOTA hand–held tester and start from step 5 in the case of not using TOYOTA hand–held tester.

1	**Check operation of the ABS warning light.**

PREPARATION:

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

(b) Turn the ignition switch ON and push the TOYOTA hand–held tester main switch ON.

(c) Select the ACTIVE TEST mode on the TOYOTA hand–held tester.

CHECK:

Check that "ON" of the ABS warning light can be shown on the combination meter using the TOYOTA hand–held tester.

HINT:

ABS warning light turns "OFF" automatically 2 seconds after it is turnd "ON".

OK → **Check and replace Skid Control ECU (ABS Actuator Assembly). (See page IN–30)**

NG

2	**Check ABS warning light.**

See combination meter troubleshooting on page BE–2.

NG → **Repair bulb or combination meter assembly.**

OK

3	**Check that the ECU connector is securely connected to the ECU.**

NO → **Connect the connector to the ECU.**

YES

Check for open circuit in harness and connector between combination meter and ABS ECU (See page IN–30).

4	**Check operation of the ABS warning light (See step 1).**

OK → **Check and replace Skid Control ECU (ABS Actuator Assembly). (See page IN–30)**

NG

5	**Is DTC output?**

Check DTC on page DI–836.

YES → **Repair circuit indicated by the output code.**

NO

Check for short circuit in harness and connector between DLC3 and Skid Control ECU (See page IN–30).

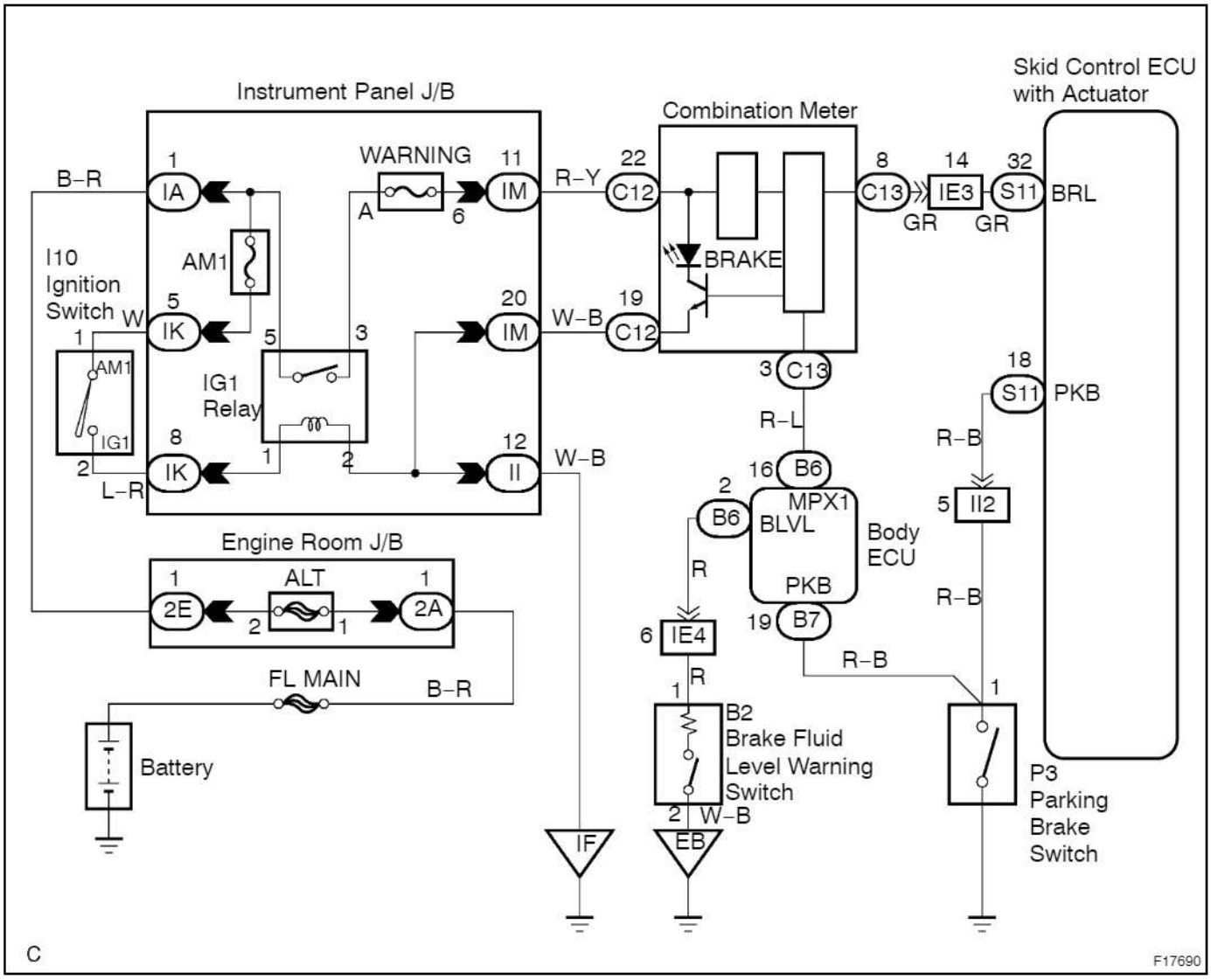
DI6MO-05

BRAKE Warning Light Circuit

CIRCUIT DESCRIPTION

The BRAKE warning light comes on when the brake fluid is insufficient, the parking brake is applied or the EBD is defective.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check parking brake switch circuit (See page BE–2).**

NG → **Repair or replace parking brake switch circuit.**

OK

2	**Check brake fluid level warning switch circuit (See page BE–2).**

NG → **Repair or replace brake fluid level warning switch circuit.**

OK

3	**Is DTC output for ABS?**

Check DTC on page DI–836.

Yes → **Repair circuit indicated by the output code.**

No

4	**Check BRAKE warning light.**

See combination meter troubleshooting on page BE–2.

NG → **Repair or replace combination meter.**

OK

Check and replace Skid Control ECU (ABS Actuator Assembly). (See page IN–30)

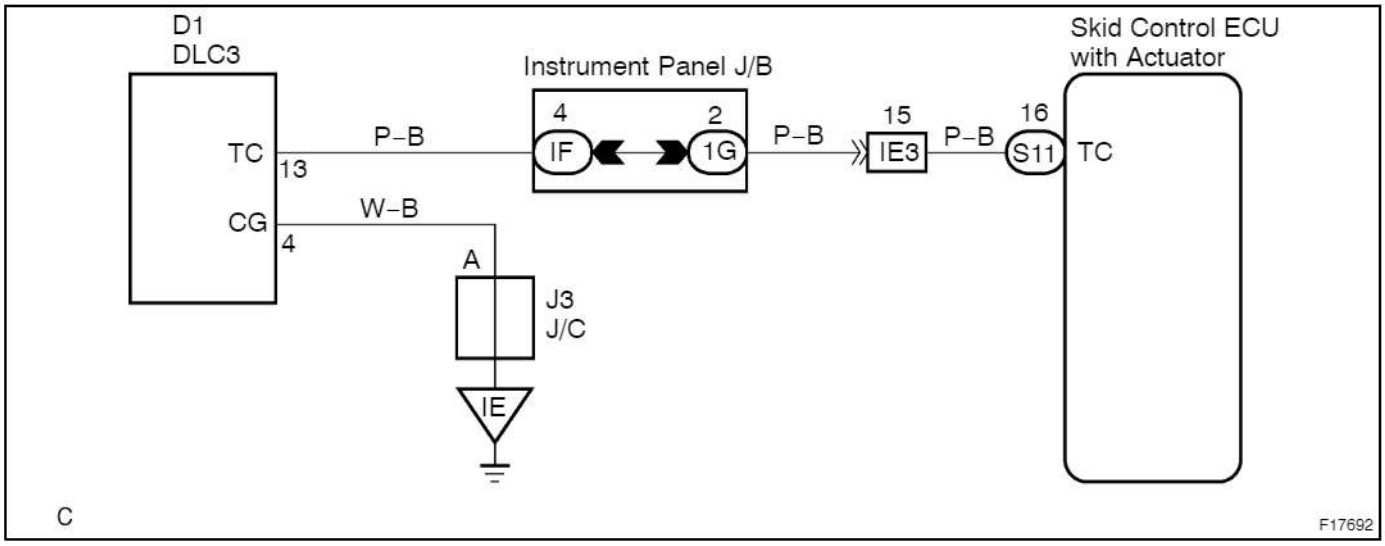
DIAIN-04

TC Terminal Circuit

CIRCUIT DESCRIPTION

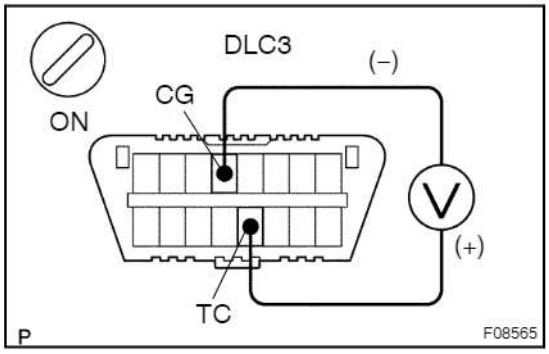
Connecting between terminal TC and CG of the DLC3 causes the ECU to display DTC by flashing the ABS warning light.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check voltage between terminals TC and CG of DLC3.**



CHECK:

(a) Turn the ignition switch to ON.

(b) Measure the voltage between terminal TC and CG of DLC3.

OK:

Voltage: 10 – 14 V

NG → **Go to step 3.**

OK

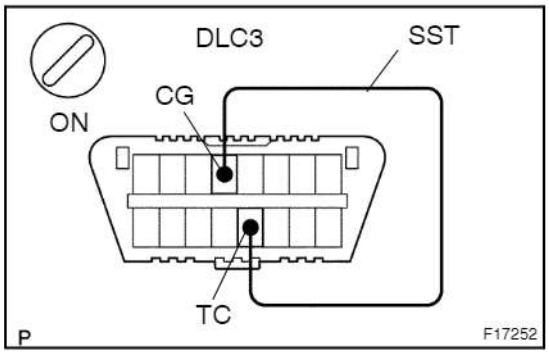
2	**Check for open and short circuit in harness and connector between Skid Control ECU and DLC3, DLC3 and body ground (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Check and replace Skid Control ECU (ABS Actuator Assembly). (See page IN–30)

3	**Check ABS warning light.**



(a) Using SST, connect the terminal TC and CG of the DLC3.
SST 09843–18040

(b) Turn the ignition switch to ON.

(c) Check the ABS warning light.

OK:

ABS warning light blinks

OK → **END**

NG

Check and replace Skid Control ECU (ABS Actuato Assembly). (See page IN–30)

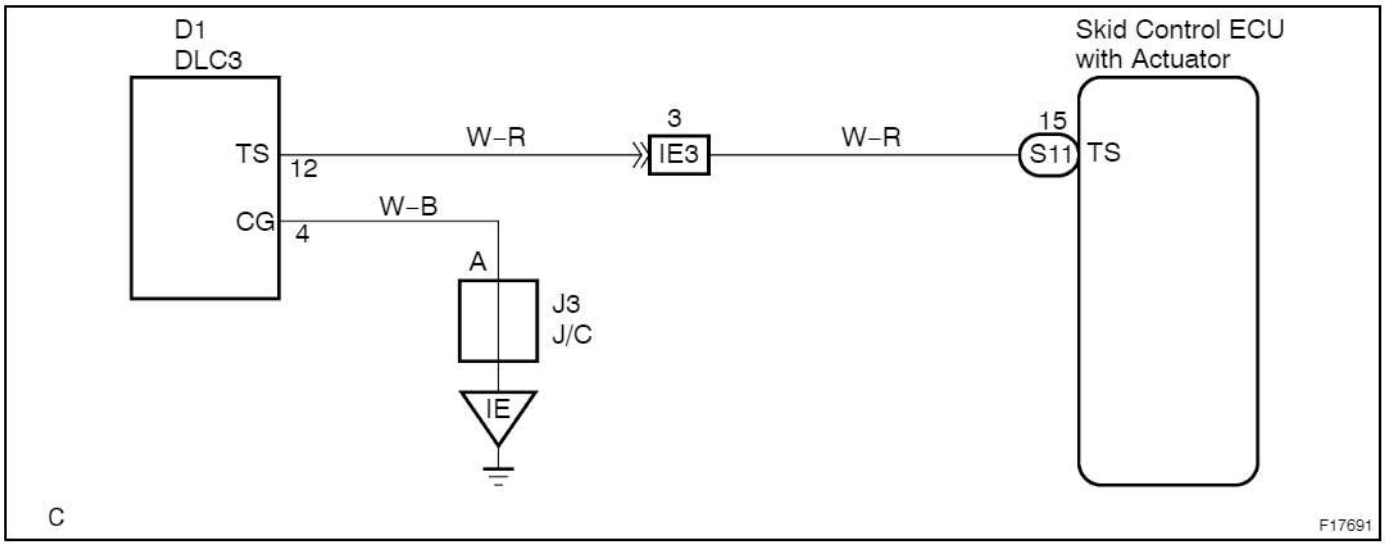
DIAG-04

TS Terminal Circuit

CIRCUIT DESCRIPTION

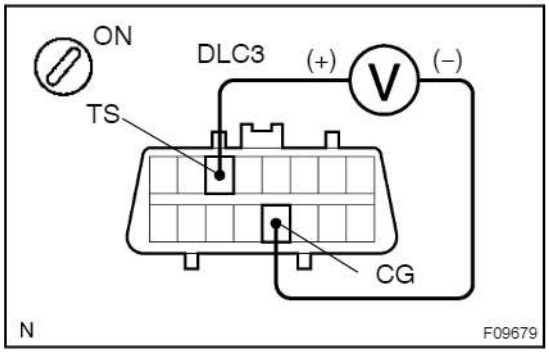
The sensor check circuit detects abnormalities in the speed sensor signal which cannot be detected with the DTC check.
Connecting terminal TS and CG of the DLC3 starts the check.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check voltage between terminals TS and CG of DLC3.**



CHECK:

(a) Turn the ignition switch to ON.
(b) Measure the voltage between terminal TS and CG of DLC3.

OK:

Voltage: 10 – 14 V

NG	**Go to step 3.**

OK

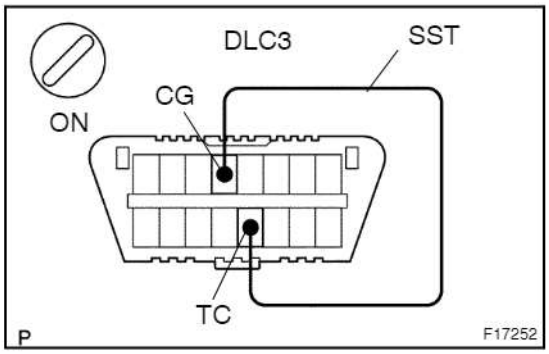
2	**Check for open and short circuit in harness and connector between Skid Control ECU and DLC3, DLC3 and body ground (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Check and replace Skid Control ECU (ABS Actuator Assembly). (See page IN–30)

3	**Check ABS warning light.**



(a) Using SST, connect the terminal TC and CG of the DLC3.
SST 09843–18040
(b) Turn the ignition switch to ON.
(c) Check the ABS warning light.

OK:

ABS warning light blinks

OK → **END**

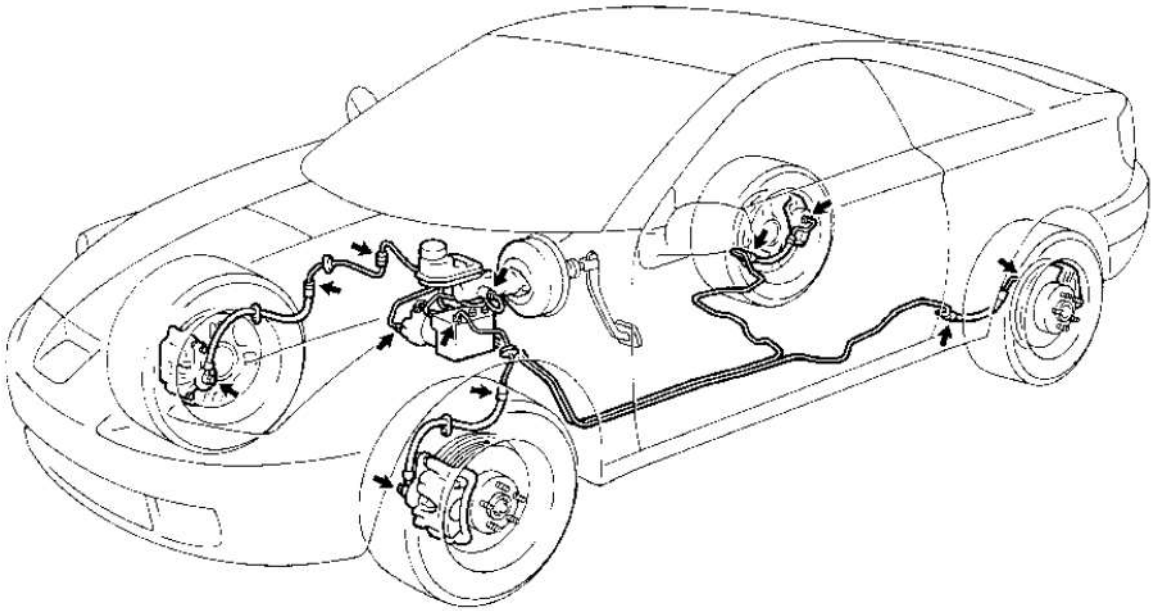
NG

Check and replace Skid Control ECU (ABS Actuato Assembly). (See page IN–30)

DI6MR-05

Check for Fluid Leakage

Check for fluid leakage from the actuator or the hydraulic lines.



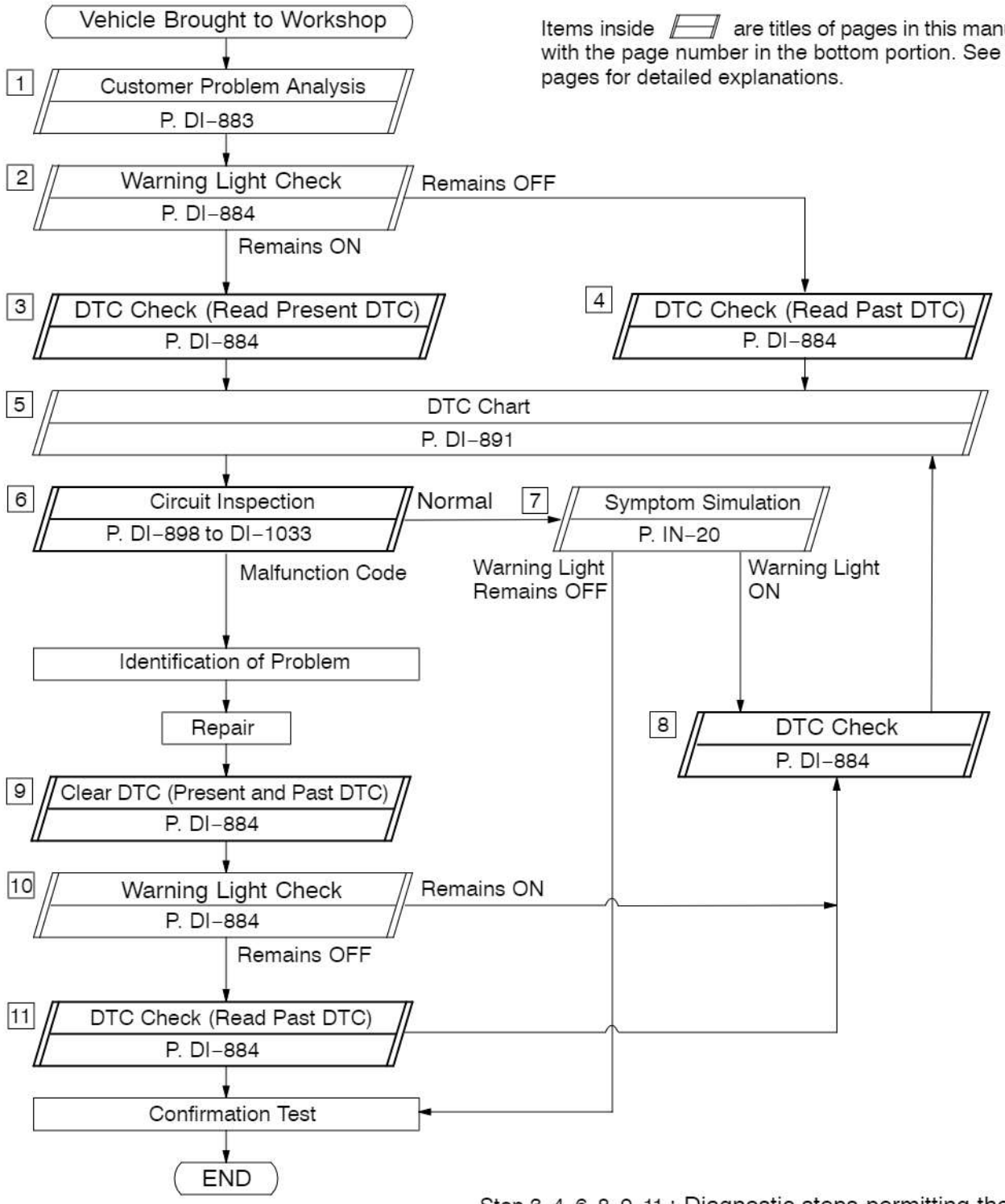
N

F09765

SUPPLEMENTAL RESTRAINT SYSTEM

HOW TO PROCEED WITH TROUBLESHOOTING

DI6OW–26



Step 3, 4, 6, 8, 9, 11 : Diagnostic steps permitting the use of the TOYOTA hand–held tester.

DI6OX-16

CUSTOMER PROBLEM ANALYSIS CHECK

Supplemental Restraint 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 Occurred	/ /
Weather	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Other
Temperature	Approx.

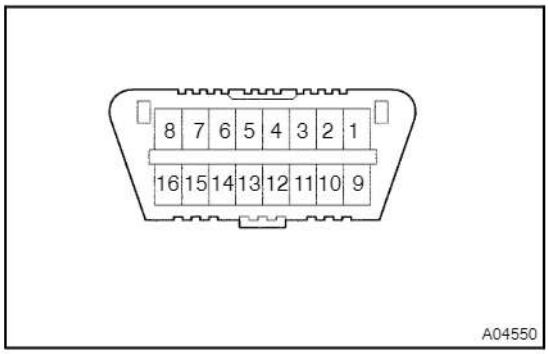
Vehicle Operation	☐ Starting ☐ Idling ☐ Driving [☐ Constant speed ☐ Acceleration ☐ Deceleration ☐ Other]
Road Conditions	
Details of Problem	

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.]

DIAIF-03



PRE–CHECK

1. DIAGNOSIS SYSTEM

(a) Check the DLC3.

HINT:

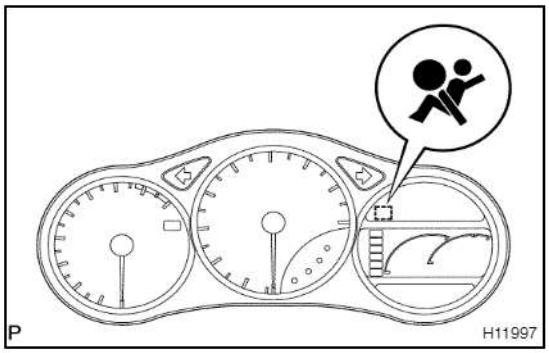
The vehicle's ECM uses ISO 9141–2 for communication. The terminal arrangement of the DLC3 complies wire SAE J1962 and matches the ISO 9141–2 format.

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 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 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.



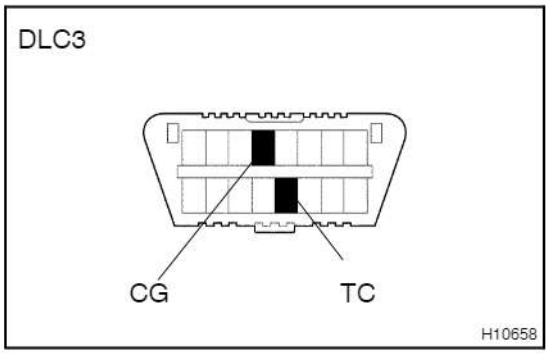
2. SRS WARNING LIGHT CHECK

(a) Turn the ignition switch to ON, 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 at ON and the SRS warning light remains on or flashes, the airbag sensor assembly has detected a malfunction code.
- If, after approx. 6 seconds have elapsed, the SRS warning light sometimes comes on even when the ignition switch is OFF. In this case, a short in the SRS warning light circuit is possible. Proceed to "SRS warning light circuit malfunction" on page DI–1028.



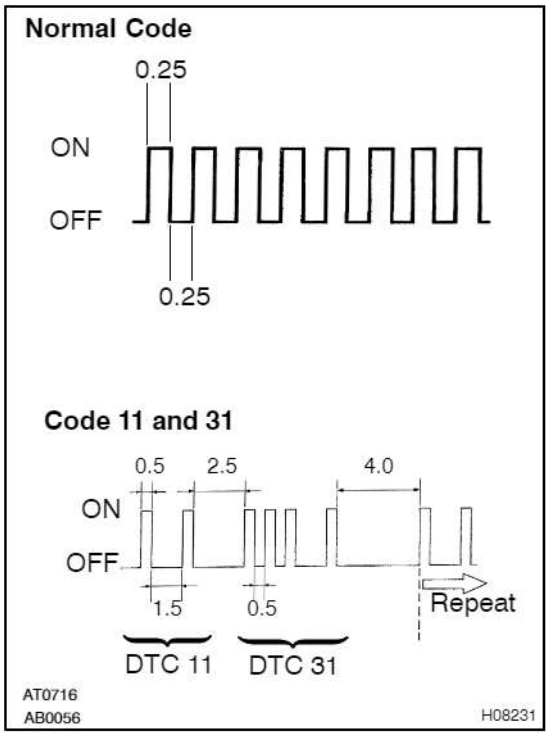
3. DTC CHECK (Using diagnosis check wire)

(a) Present troubles codes:
Output the DTC.
(1) Turn the ignition switch to ON, and wait for approx. 60 seconds.
(2) Using SST, connect terminal TC and CG of the DLC3.
SST 09843–18040

NOTICE:
Pay attention to the terminal connecting position to avoid a malfunction.

(b) Past troubles codes:
Output the DTC.
(1) Using SST, connect terminal TC and CG of the DLC3.
SST 09843–18040
(2) Turn the ignition switch to ON, and wait for approx. 60 seconds.

NOTICE:
Pay attention to the terminal connecting position to avoid a malfunction.



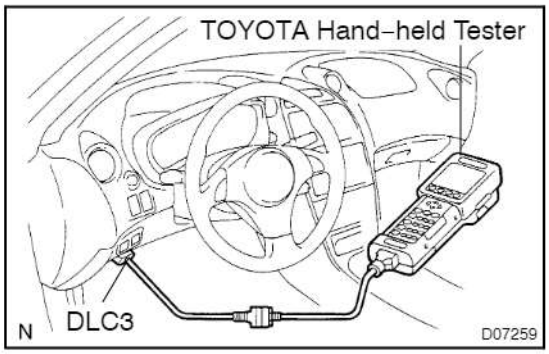
(c) Read the DTC.
Read the DTC by connecting the blinking times. As an example, the blinking patterns of normal, 11 and 31 are shown in the illustration.

- Normal code indication
  The light blinks 2 times per 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 comes out at all, or if DTCs are indicated without a connection of the terminals, proceed to the "TC terminal circuit inspection" on page DI–1033.



4. DTC CHECK (Using TOYOTA hand–held tester)

(a) Hook up the TOYOTA hand–held tester to the DLC3.

(b) Read the DTCs by following the prompts on the tester screen.

HINT:

Please refer to the TOYOTA hand–held tester operator's manual for further details.

5. DTC CLEARANCE (Not using service wire)

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 service wire)

(a) Connect the 2 service wires to terminal TC and AB of DLC3.

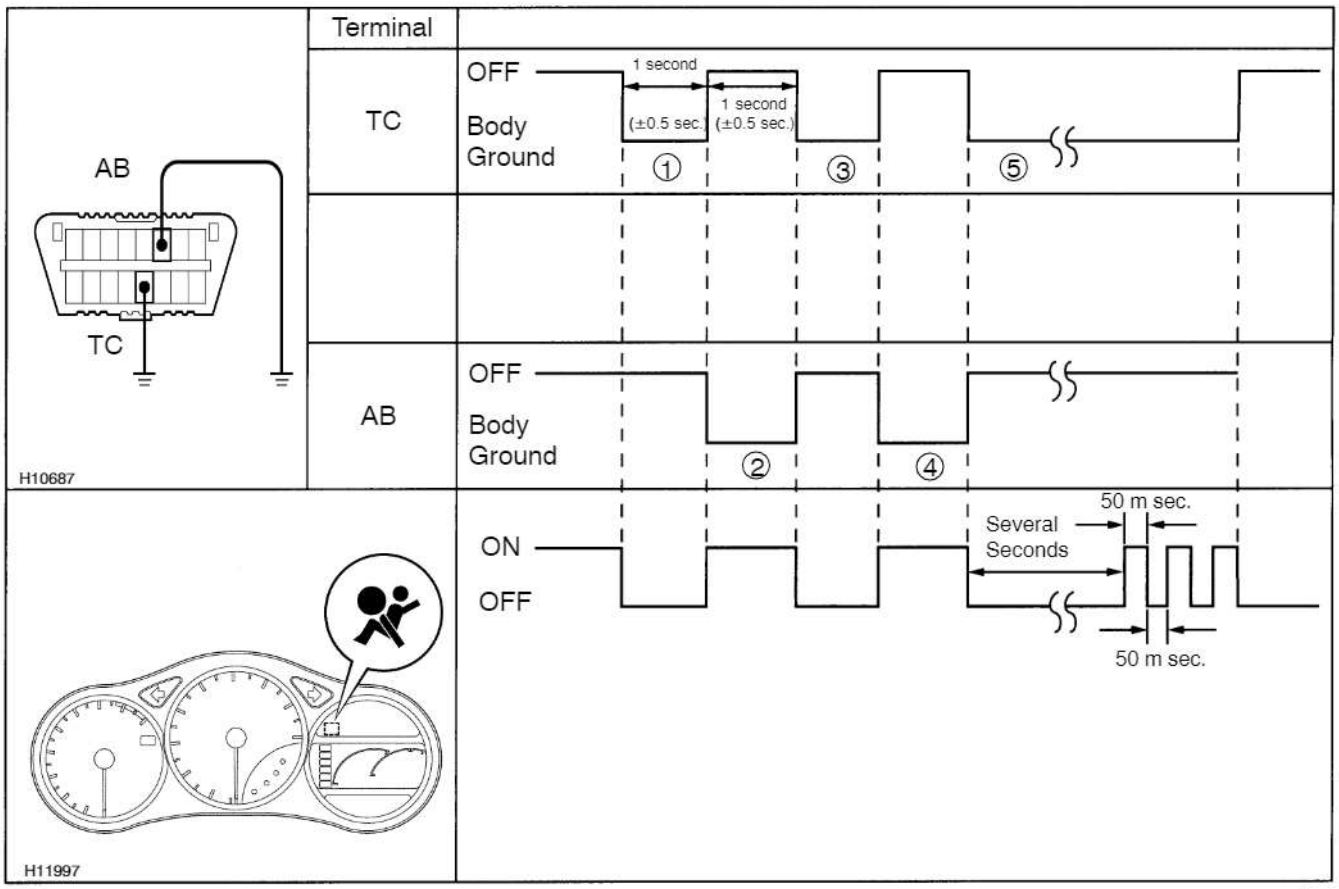
(b) Turn the ignition switch to ON, and wait for approx. 6 seconds.

(c) Starting with the TC terminal, ground alternately terminal TC and terminal AB twice each in cycles of 1.0 second. Make sure that the terminals are grounded. Ensure the terminal Tc remain grounded.

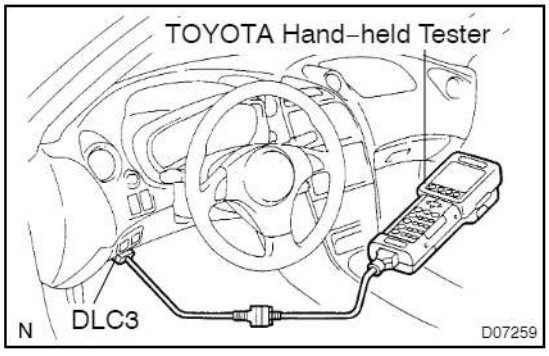
HINT:

When alternately grounding terminal TC and AB, release ground from one terminal and immediately ground the other terminal within an interval of 0.2 seconds.

If DTCs are not cleared, repeat the above procedure until the codes are cleared.



(d) Several seconds after doing the clearing procedure, the SRS warning light will blink in a 50 – m sec. cycle to indicate the codes which have been cleared.



7. DTC CLEARANCE (Using TOYOTA hand–held tester)

(a) Hook up the TOYOTA hand–held tester to the DLC3.

(b) Clear the DTCs by following the prompts on the tester screen.

HINT:

Please refer to the TOYOTA hand–held tester operation's manual for further details.

8. RELEASE METHOD OF AIRBAG ACTIVATION PREVENTION MECHANISM

An airbag activation prevention mechanism is built into the connector for the squib circuit of the SRS.

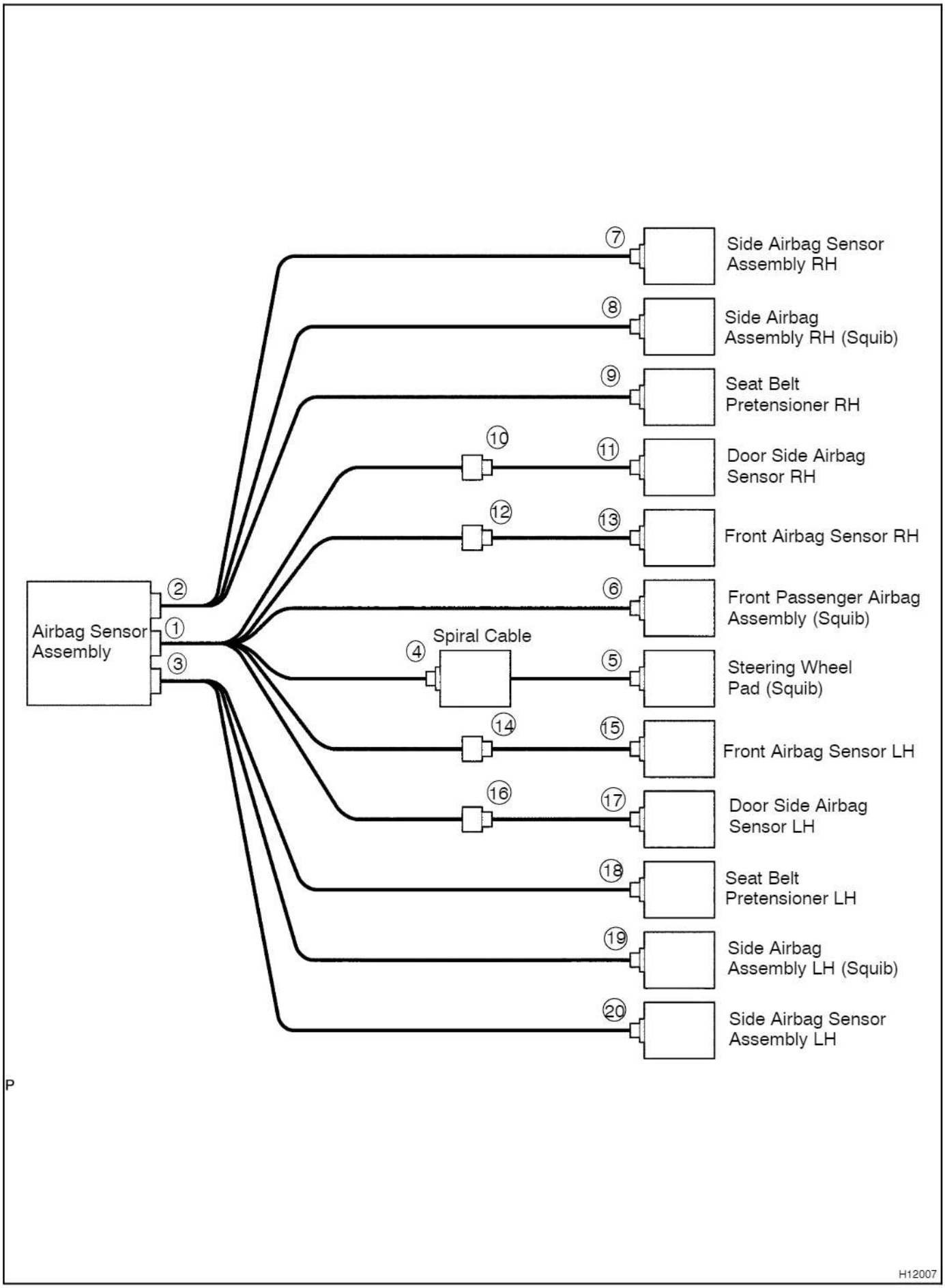
As explained in the troubleshooting later, insert a paper with the same thickness as the male terminal between the terminal and the short spring to release it (Refer to illustrations on next 2 pages).

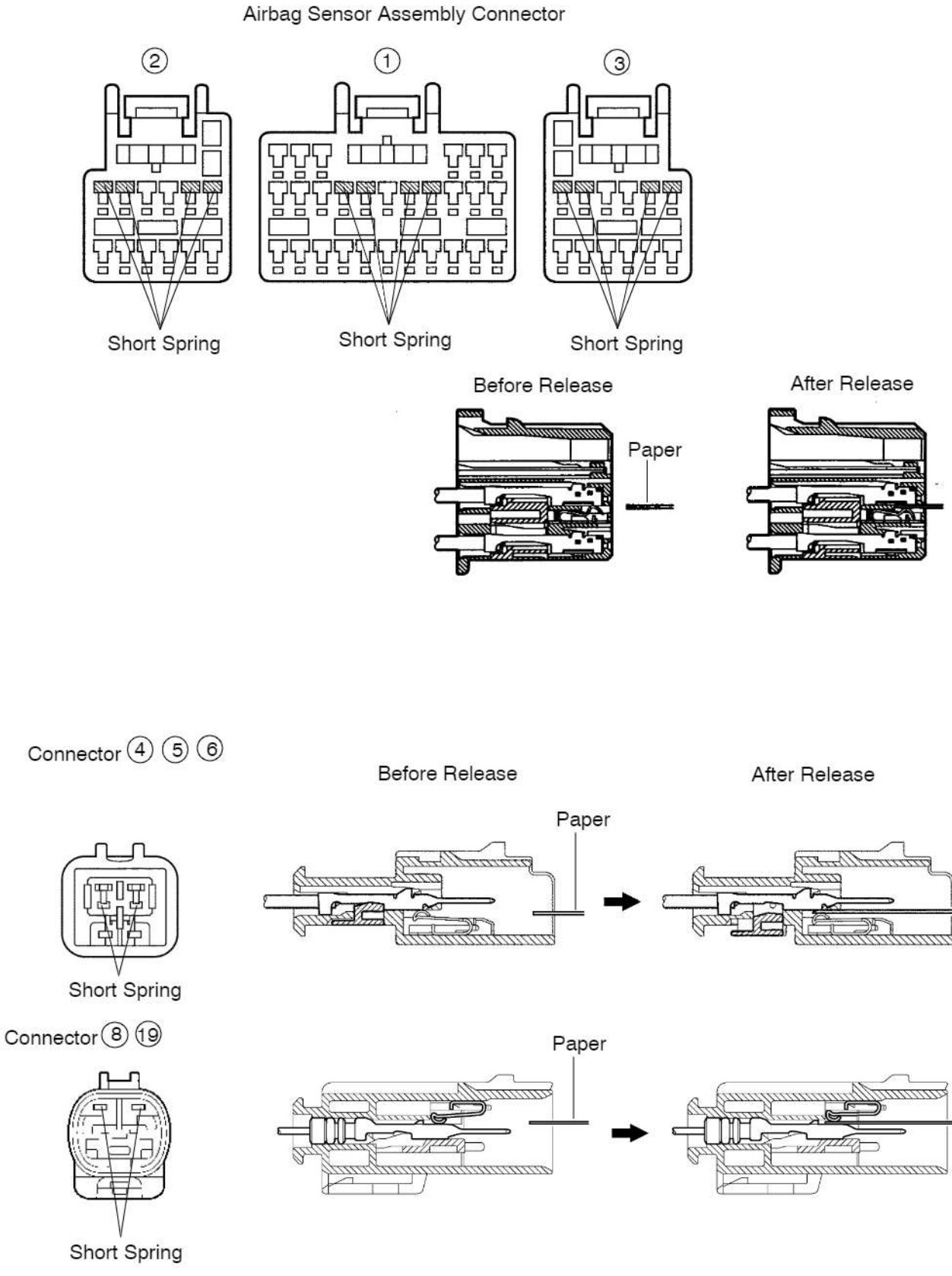
CAUTION:

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.**


Airbag Sensor Assembly
2
1
3
Spiral Cable
4
7
Side Airbag Sensor Assembly RH
8
Side Airbag Assembly RH (Squib)
9
Seat Belt Pretensioner RH
10
11
Door Side Airbag Sensor RH
12
13
Front Airbag Sensor RH
6
Front Passenger Airbag Assembly (Squib)
5
Steering Wheel Pad (Squib)
14
15
Front Airbag Sensor LH
16
17
Door Side Airbag Sensor LH
18
Seat Belt Pretensioner LH
19
Side Airbag Assembly LH (Squib)
20
Side Airbag Sensor Assembly LH
P
H12007



H01356
H01233
H02248 H02249
H09672 H09658

H10693

DI6OZ–31

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	SRS Warning Light
B0100/13 (DI–898)	• Short in D squib circuit	• Steering wheel pad (squib) • Spiral cable • Airbag sensor assembly • Instrument panel wire	ON
B0101/14 (DI–903)	• Open in D squib circuit	• Steering wheel pad (squib) • Spiral cable • Airbag sensor assembly • Instrument panel wire	ON
B0102/11 (DI–907)	• Short in D squib circuit (to ground)	• Steering wheel pad (squib) • Spiral cable • Airbag sensor assembly • Instrument panel wire	ON
B0103/12 (DI–911)	• Short in D squib circuit (to B+)	• Steering wheel pad (squib) • Spiral cable • Airbag sensor assembly • Instrument panel wire	ON
B0105/53 (DI–915)	• Short in P squib circuit	• Front passenger airbag assembly (squib) • Airbag sensor assembly • Instrument panel wire	ON
B0106/54 (DI–919)	• Open in P squib circuit	• Front passenger airbag assembly (squib) • Airbag sensor assembly • Instrument panel wire	ON
B0107/51 (DI–922)	• Short in P squib circuit (to ground)	• Front passenger airbag assembly (squib) • Airbag sensor assembly • Instrument panel wire	ON
B0108/52 (DI–925)	• Short in P squib circuit (to B+)	• Front passenger airbag assembly (squib) • Airbag sensor assembly • Instrument panel wire	ON
B0110/43 (DI–928)	• Short in side squib RH circuit	• Side airbag assembly RH (squib) • Airbag sensor assembly • Floor wire	Blink
B0111/44 (DI–932)	• Open in side squib RH circuit	• Side airbag assembly RH (squib) • Airbag sensor assembly • Floor wire	Blink
B0112/41 (DI–938)	• Short in side squib RH circuit (to ground)	• Side airbag assembly RH (squib) • Airbag sensor assembly • Floor wire	Blink
B0113/42 (DI–938)	• Short in side squib RH circuit (to B+)	• Side airbag assembly RH (squib) • Airbag sensor assembly • Floor wire	Blink
B0115/47 (DI–941)	• Short in side squib LH circuit	• Side airbag assembly LH (squib) • Airbag sensor assembly • Floor wire	Blink
B0116/48 (DI–945)	• Open in side squib LH circuit	• Side airbag assembly LH (squib) • Airbag sensor assembly • Floor wire	Blink

DTC No. (See Page)	Detection Item	Trouble Area	SRS Warning Light
B0117/45 (DI–948)	• Short in side squib LH circuit (to ground)	• Side airbag assembly LH (squib) • Airbag sensor assembly • Floor wire	Blink
B0118/46 (DI–951)	• Short in side squib LH circuit (to B+)	• Side airbag assembly LH (squib) • Airbag sensor assembly • Floor wire	Blink
B0130/63 (DI–954)	• Short in P/T squib RH circuit	• Seat belt pretensioner RH (squib) • Airbag sensor assembly • Floor wire	Blink
B0131/64 (DI–958)	• Open in P/T squib RH circuit	• Seat belt pretensioner RH (squib) • Airbag sensor assembly • Floor wire	Blink
B0132/61 (DI–961)	• Short in P/T squib RH circuit (to ground)	• Seat belt pretensioner RH (squib) • Airbag sensor assembly • Floor wire	Blink
B0133/62 (DI–964)	• Short in P/T squib RH circuit (to B+)	• Seat belt pretensioner RH (squib) • Airbag sensor assembly • Floor wire	Blink
B0135/73 (DI–967)	• Short in P/T squib LH circuit	• Seat belt pretensioner LH (squib) • Airbag sensor assembly • Floor wire	Blink
B0136/74 (DI–971)	• Open in P/T squib LH circuit	• Seat belt pretensioner LH (squib) • Airbag sensor assembly • Floor wire	Blink
B0137/71 (DI–974)	• Short in P/T squib LH circuit (to ground)	• Seat belt pretensioner LH (squib) • Airbag sensor assembly • Floor wire	Blink
B0138/72 (DI–977)	• Short in P/T squib LH circuit (to B+)	• Seat belt pretensioner LH (squib) • Airbag sensor assembly • Floor wire	Blink
B1100/31 (DI–980)	• Airbag sensor assembly malfunction	• Airbag sensor assembly	ON
B1140/32 (DI–982)	• Side airbag sensor assembly RH malfunction	• Side airbag sensor assembly RH • Airbag sensor assembly • Floor wire	Blink
B1141/33 (DI–988)	• Side airbag sensor assembly LH malfunction	• Side airbag sensor assembly LH • Airbag sensor assembly • Floor wire	Blink
B1142/B1143/34 (DI–994)	• Door side airbag sensor RH malfunction	• Door side airbag sensor RH • Airbag sensor assembly • Instrument panel wire • Front door RH wire	ON
B1144/B1145/35 (DI–1002)	• Door side airbag sensor LH malfunction	• Door side airbag sensor LH • Airbag sensor assembly • Instrument panel wire • Front door LH wire	ON
B1156/B1157/15 (DI–1010)	• Front airbag sensor RH malfunction	• Front airbag sensor RH • Airbag sensor assembly • Instrument panel wire • Engine room No. 2 wire	ON

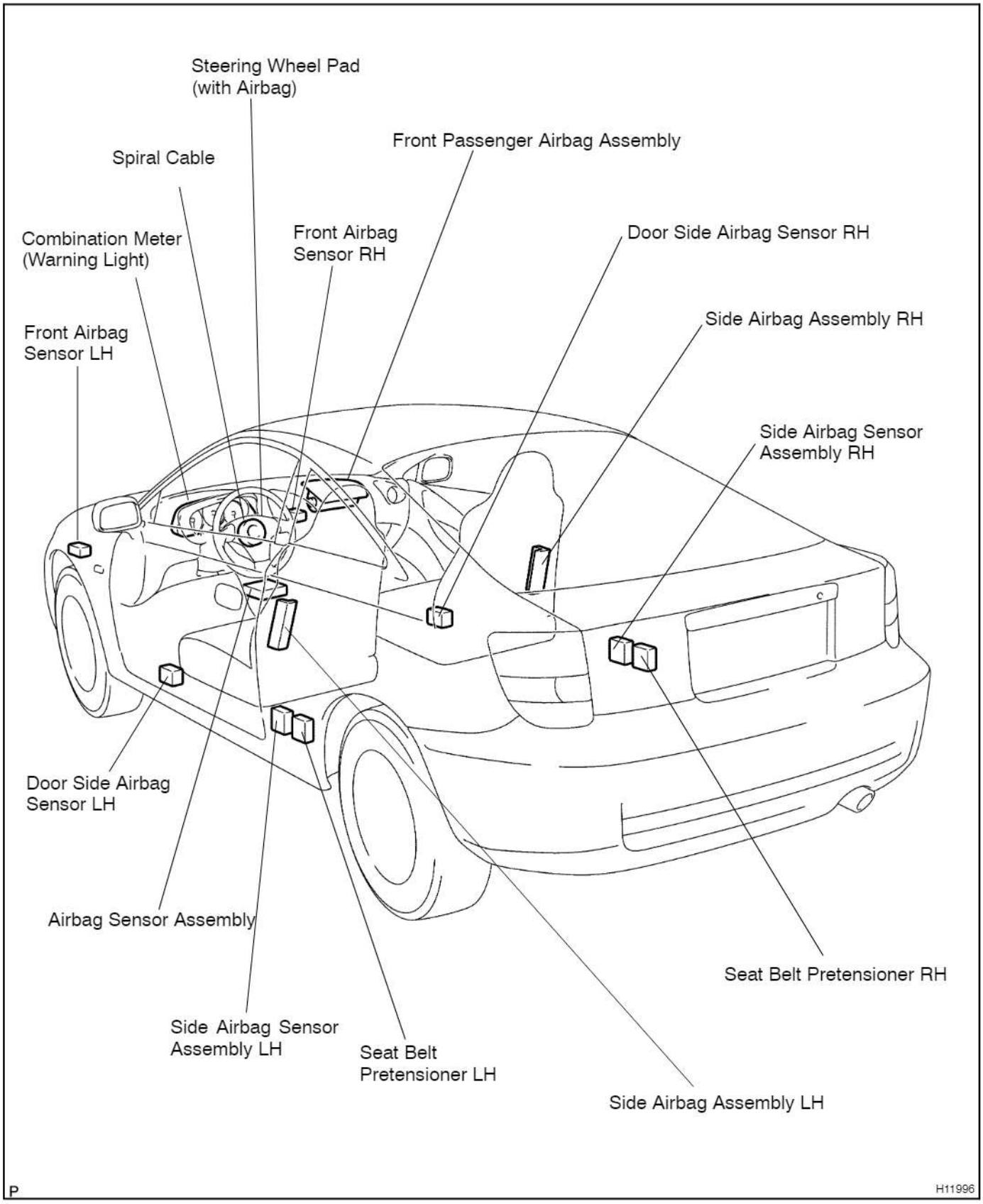
DTC No. (See Page)	Detection Item	Trouble Area	SRS Warning Light
B1158/B1159/16 (DI–1018)	• Front airbag sensor LH malfunction	• Front airbag sensor LH • Airbag sensor assembly • Instrument panel wire • Engine room main wire	ON
Normal (DI–1025)	• System normal	–	OFF
	• Voltage source drop	• Battery • Airbag sensor assembly	ON

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 assembly 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 assembly is at fault.
- In the case of any malfunction concerning any open circuit, ground short, or B+ short due to any 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.

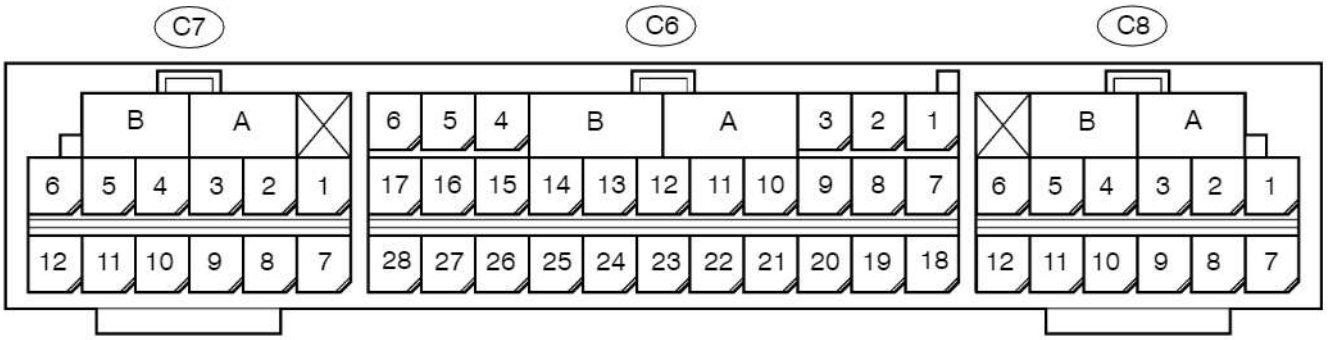
DI6P0-25

PARTS LOCATION



DI6P1-33

TERMINALS OF ECU



H01357

No.	Symbol	Terminal Name
A	–	Electrical Connector Check Mechanism
B	–	Electrical Connector Check Mechanism
C6 – 3	LA	SRS Warning Light
C6 – 5	IG2	Power Source
C6 – 6	IG1	Power Source
C6 – 7	DMR+	Door Side Airbag Sensor RH
C6 – 8	DMR–	Door Side Airbag Sensor RH
C6 – 9	+SR	Front Airbag Sensor RH
C6 – 10	P+	Squib (Passenger)
C6 – 11	P–	Squib (Passenger)
C6 – 12	SIL	Diagnosis
C6 – 13	D–	Squib (Driver)
C6 – 14	D+	Squib (Driver)
C6 – 15	+SL	Front Airbag Sensor LH
C6 – 16	DML–	Door Side Airbag Sensor LH
C6 – 17	DML+	Door Side Airbag Sensor LH
C6 – 19	TC	Diagnosis
C6 – 20	–SR	Front Airbag Sensor RH
C6 – 23	GSW2	ECM
C6 – 26	–SL	Front Airbag Sensor LH
C6 – 27	E1	Ground
C6 – 28	E2	Ground
C7 – 1	PL–	Squib (Seat Belt Pretensioner, LH)
C7 – 2	PL+	Squib (Seat Belt Pretensioner, LH)
C7 – 5	SFL+	Squib (Side, LH)

No.	Symbol	Terminal Name
C7 – 6	SFL–	Squib (Side, LH)
C7 – 7	VUPL	Side Airbag Sensor Assembly LH
C7 – 9	SSL+	Side Airbag Sensor Assembly LH
C7 – 10	FSL	Side Airbag Sensor Assembly LH
C7 – 11	LBE+	Body ECU
C7 – 12	ESL	Side Airbag Sensor Assembly LH
C8 – 1	SFR–	Squib (Side, RH)
C8 – 2	SFR+	Squib (Side, RH)
C8 – 5	PR+	Squib (Pretensioner, RH)
C8 – 6	PR–	Squib (Pretensioner, RH)
C8 – 7	ESR	Side Airbag Sensor Assembly RH
C8 – 9	FSR	Side Airbag Sensor Assembly RH
C8 – 10	SSR+	Side Airbag Sensor Assembly RH
C8 – 12	VUPR	Side Airbag Sensor Assembly RH

DI6P2-14

PROBLEM SYMPTOMS TABLE

Proceed with troubleshooting of each circuit in the table below.

Symptom	Suspect Area	See page
• With the ignition switch in ON position, the SRS warning light sometimes lights up after approx. 6 seconds have elapsed.	• SRS warning light circuit	DI–1028
• SRS warning light is always lit up even when ignition switch is in the LOCK position.		
• With the ignition switch in ON position, the SRS warning light does not light up.		
• DTC is not displayed.	• TC terminal circuit	DI–1033
• SRS warning light is always lit up at the time of DTC check procedure.		
• DTC is displayed without TC and CG terminal connection.		

DI6P3-31

CIRCUIT INSPECTION

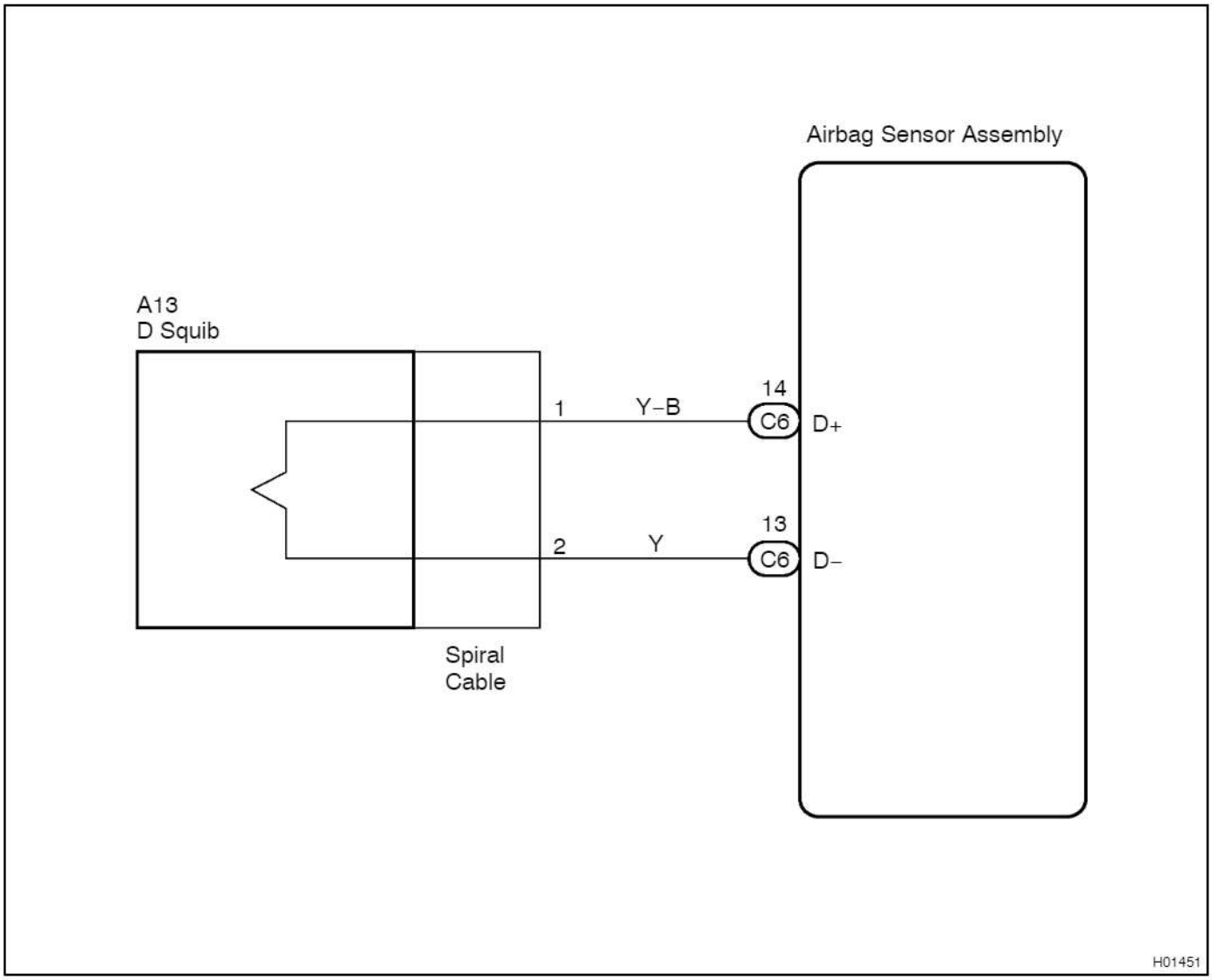
DTC	B0100/13	Short in D Squib Circuit

CIRCUIT DESCRIPTION

The D squib circuit consists of the airbag sensor assembly, the spiral cable and the steering wheel pad. It causes the airbag to deploy when the airbag deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
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 wire harness • D squib malfunction • Spiral cable malfunction • Airbag sensor assembly malfunction	• Steering wheel pad (D squib) • Spiral cable • Airbag sensor assembly • Instrument panel wire

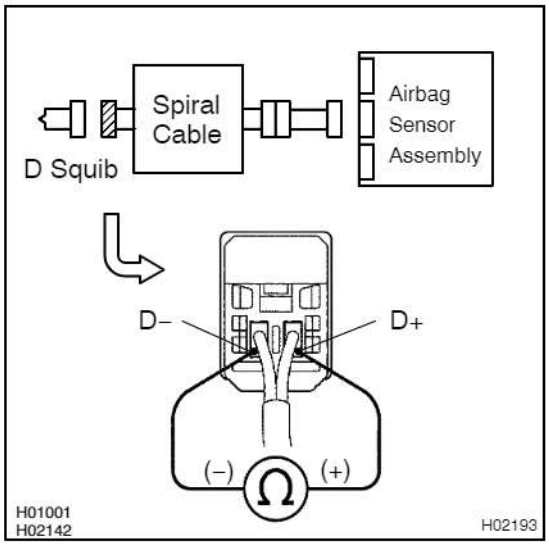
WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Prepare for inspection (See step 1 on page DI–1025).**

2	**Check D squib wire harness.**



PREPARATION:

Release the airbag activation prevention mechanism built in the connector on the airbag sensor assembly side between the steering wheel pad (D squib) and the airbag sensor assembly (See page DI–884).

CHECK:

Measure the resistance between D+ and D– on the steering wheel pad (D squib) side between the airbag sensor assembly and the steering wheel pad (D squib).

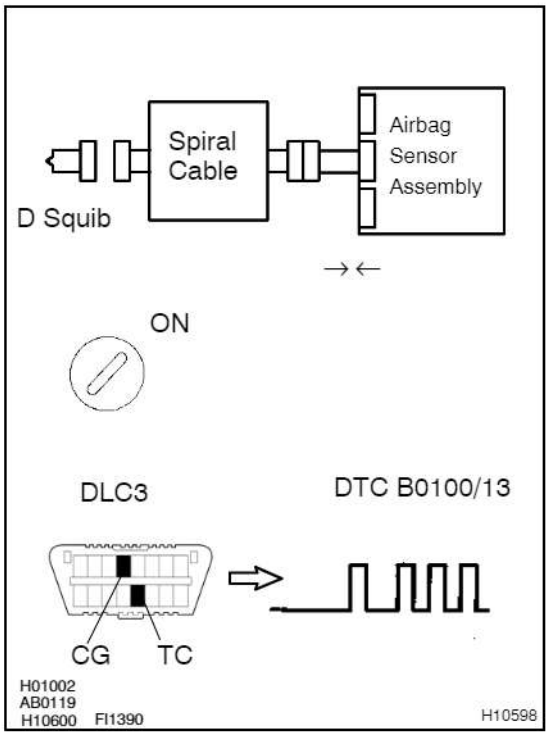
OK:

Resistance: 1 MΩ or Higher

NG	**Go to step 5.**

OK

3	Check airbag sensor assembly.



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.
(b) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(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 DI–884).

OK:

DTC B0100/13 is not output.

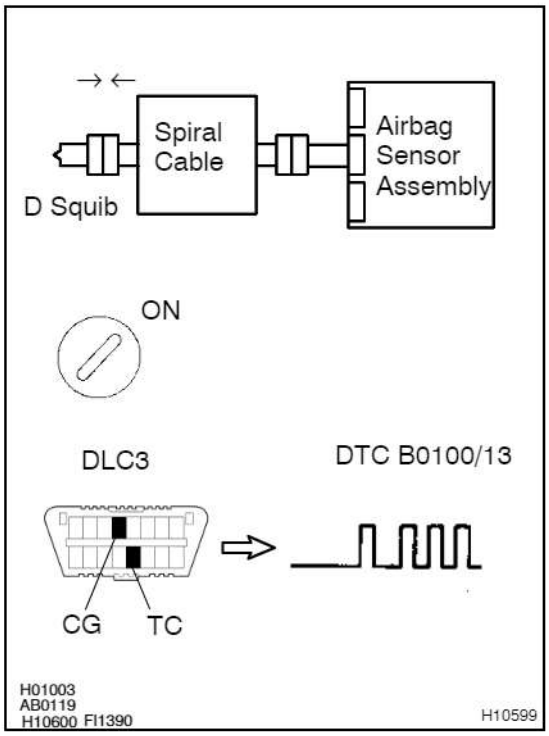
HINT:

Codes other than code B0100/13 may be output at this time, but they are not relevant to this check.

NG → **Replace airbag sensor assembly.**

OK

4	Check D squib.



PREPARATION:

(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 steering wheel pad (D squib) to the spiral cable.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(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 DI–884).

OK:

DTC B0100/13 is not output.

HINT:

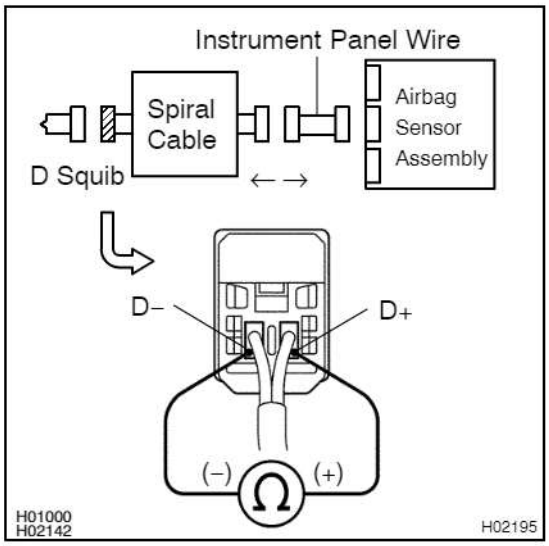
Codes other than code B0100/13 may be output at this time, but they are not relevant to this check.

NG → **Replace steering wheel pad (D squib).**

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

5	Check spiral cable.



PREPARATION:

(a) Disconnect the spiral cable connector from the instrument panel wire.

(b) Release the airbag activation prevention mechanism built in the spiral cable connector on the airbag sensor assembly side (See page DI–884).

CHECK:

Measure the resistance between D+ and D– of the spiral cable connector on the steering wheel pad (D squib) side.

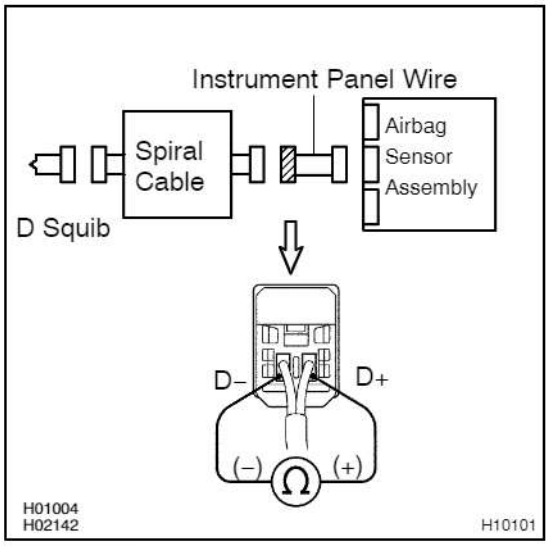
OK:

Resistance: 1 MΩ or Higher

NG	Replace spiral cable.

OK

6	Check instrument panel wire.



PREPARATION:

Release the airbag activation prevention mechanism built in the instrument panel wire connector on the airbag sensor assembly side (See page DI–884).

CHECK:

Measure the resistance between D+ and D– of the instrument panel wire connector on the spiral cable side.

OK:

Resistance: 1 MΩ or Higher

NG	Repair or replace instrument panel wire.

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

D6P4–21

DTC	B0101/14	Open in D Squib Circuit

CIRCUIT DESCRIPTION

The D squib circuit consists of the airbag sensor assembly, the spiral cable and the steering wheel pad. It causes the airbag to deploy when the airbag deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
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 wire harness • D squib malfunction • Spiral cable malfunction • Airbag sensor assembly malfunction	• Steering wheel pad (D squib) • Spiral cable • Airbag sensor assembly • Instrument panel wire

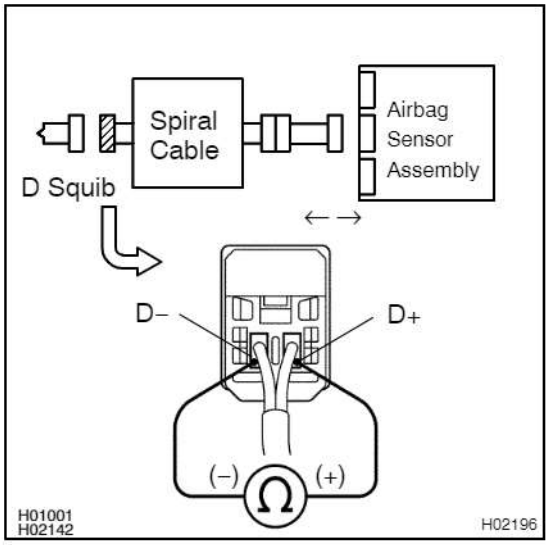
WIRING DIAGRAM

See page DI–898.

INSPECTION PROCEDURE

1	Prepare for inspection (See step 1 on page DI–1025).

2	Check D squib wire harness.

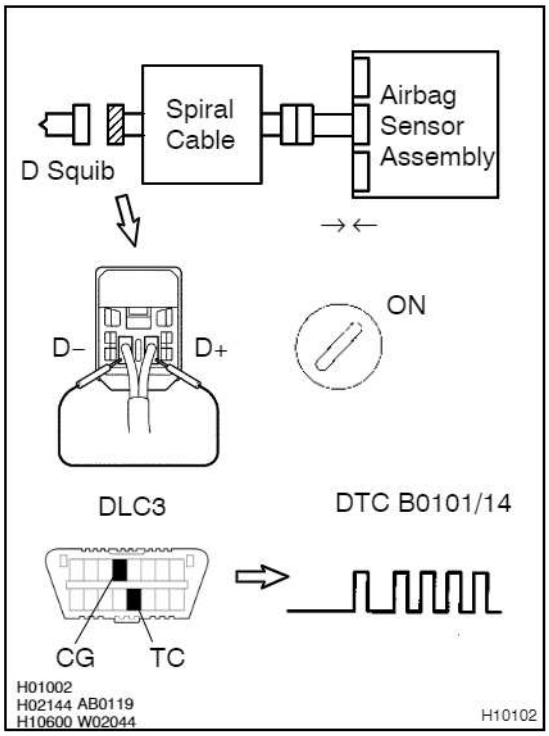


CHECK:
Measure the resistance between D+ and D– on the steering wheel pad (D squib) side between the airbag sensor assembly and the steering wheel pad (D squib).
OK:
Resistance: Below 1 Ω

NG → **Go to step 5.**

OK

3	Check airbag sensor assembly.



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.
(b) Using a service wire, connect D+ and D– of the connector on the spiral cable side between the airbag sensor assembly and the steering wheel pad (D squib).
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(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 DI–884).

OK:

DTC B0101/14 is not output.

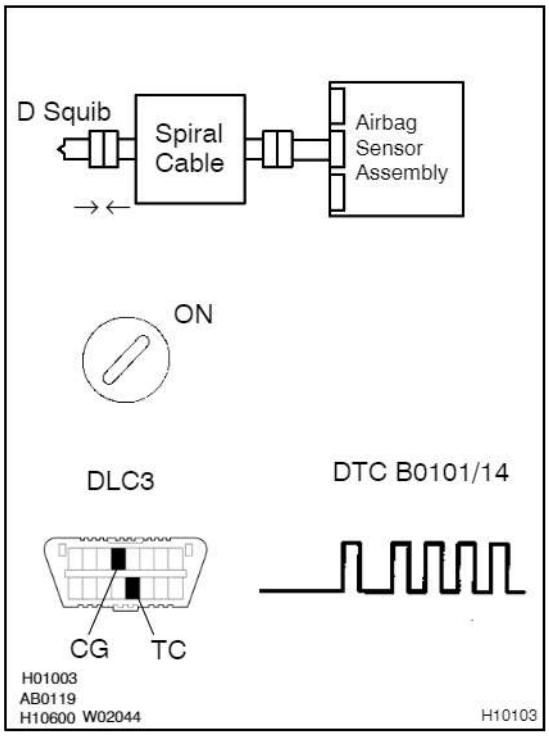
HINT:

Codes other than code B0101/14 may be output at this time, but they are not relevant to this check.

NG	Replace airbag sensor assembly.

OK

4	Check D squib.



PREPARATION:

(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 steering wheel pad (D squib) to the spiral cable.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(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 DI–884).

OK:

DTC B0101/14 is not output.

HINT:

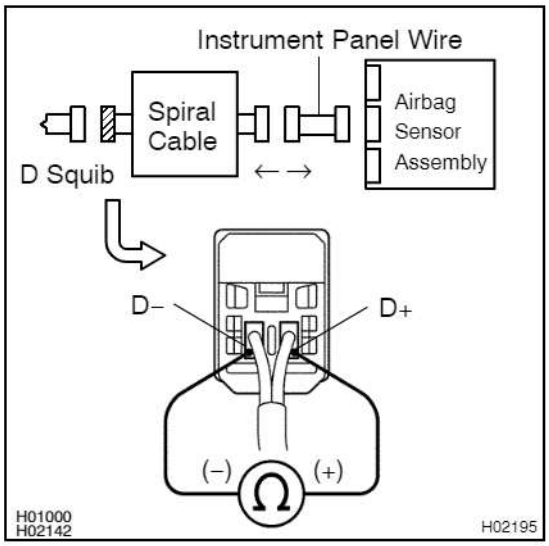
Codes other than code B0101/14 may be output at this time, but they are not relevant to this check.

NG → **Replace steering wheel pad (D squib).**

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

5	Check spiral cable.



PREPARATION:
Disconnect the spiral cable connector from the instrument panel wire.

CHECK:
Measure the resistance between D+ and D– of the spiral cable connector on the steering wheel pad (D squib) side.

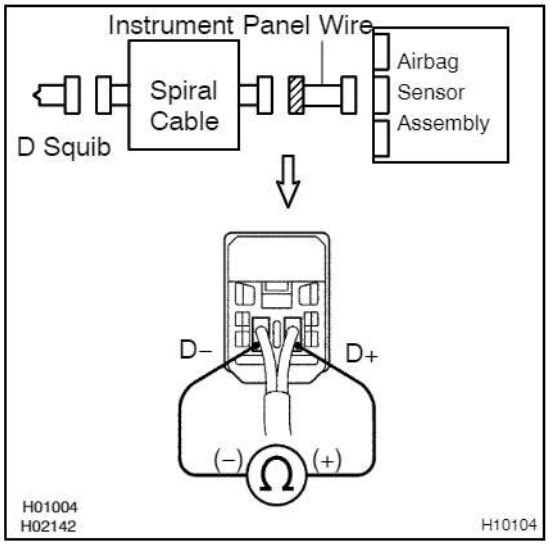
OK:

Resistance: Below 1 Ω

NG	Replace spiral cable.

OK

6	Check instrument panel wire.



CHECK:
Measure the resistance between D+ and D– of the instrument panel wire connector on the spiral cable side.

OK:

Resistance: Below 1 Ω

NG	Repair or replace instrument panel wire.

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

DI6P5-21

DTC	B0102/11	Short in D Squib Circuit (to Ground)

CIRCUIT DESCRIPTION

The D squib circuit consists of the airbag sensor assembly, the spiral cable and the steering wheel pad. It causes the SRS to deploy when the SRS deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
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 wire harness (to ground) • D squib malfunction • Spiral cable malfunction • Airbag sensor assembly malfunction	• Steering wheel pad (D squib) • Spiral cable • Airbag sensor assembly • Instrument panel wire

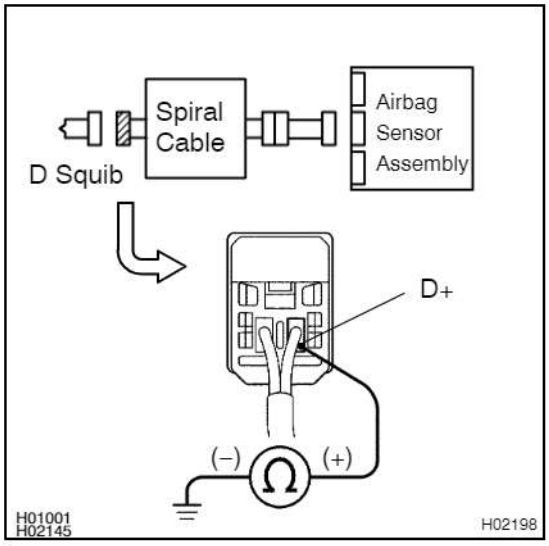
WIRING DIAGRAM

See page DI–898.

INSPECTION PROCEDURE

1	Prepare for inspection (See step 1 on page DI–1025).

2	Check D squib wire harness.



CHECK:

Measure the resistance between the body ground and D+ on the steering wheel pad (D squib) side between the airbag sensor assembly and the steering wheel pad (D squib).

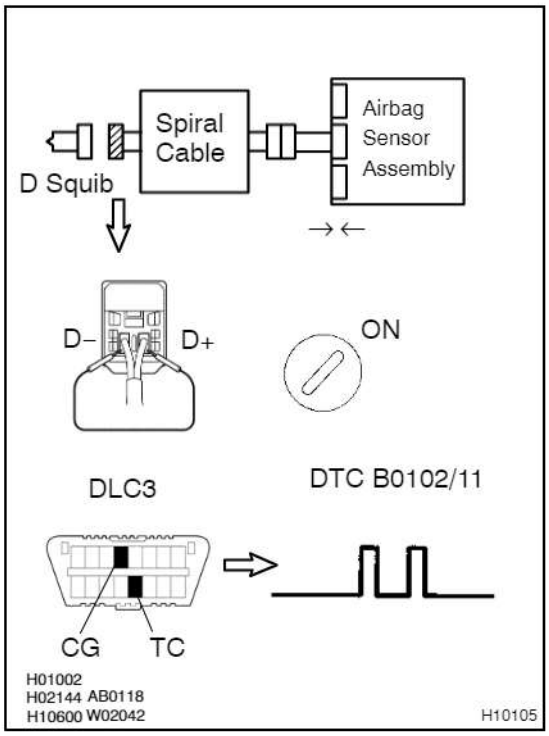
OK:

Resistance: 1 MΩ or Higher

NG	Go to step 5.

OK

3	Check airbag sensor assembly.



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.
(b) Using a service wire, connect D+ and D– of the connector on the spiral cable side between the airbag sensor assembly and the steering wheel pad (D squib).
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(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 DI–884).

OK:

DTC B0102/11 is not output.

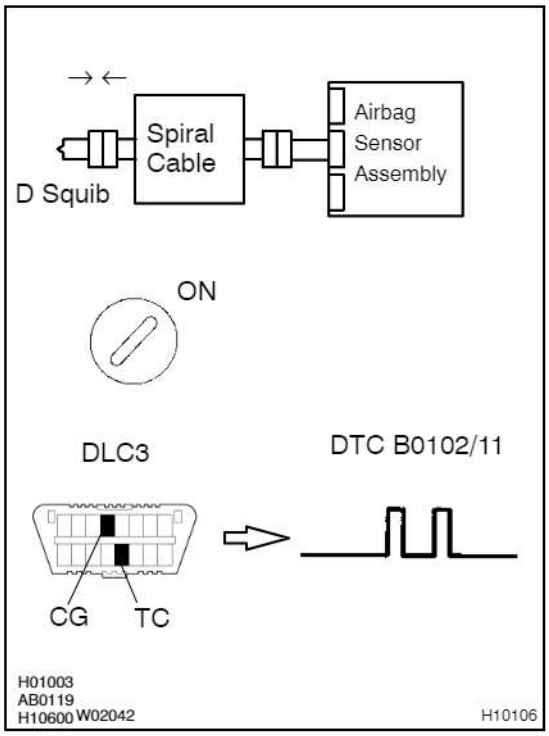
HINT:

Codes other than code B0102/11 may be output at this time, but they are not relevant to this check.

NG → **Replace airbag sensor assembly.**

OK

4	Check D squib.



PREPARATION:

(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 steering wheel pad (D squib) to the spiral cable.
(d) Connect negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(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 DI–884).

OK:

DTC B0102/11 is not output.

HINT:

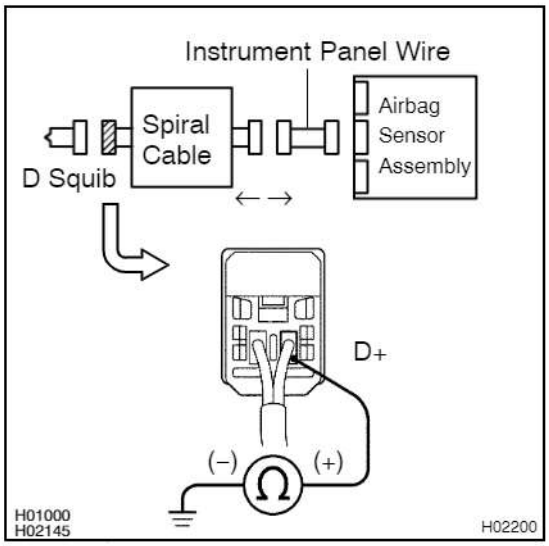
Codes other than code B0102/11 may be output at this time, but they are not relevant to this check.

NG	Replace steering wheel pad (D squib).

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check. If the malfunctioning part can not be detected by the simulation method, replace all SRS components including the wire harness.

5	Check spiral cable.



PREPARATION:

Disconnect the spiral cable connector from the instrument panel wire.

CHECK:

Measure the resistance between the body ground and D+ of the spiral cable connector on the steering wheel pad (D squib) side.

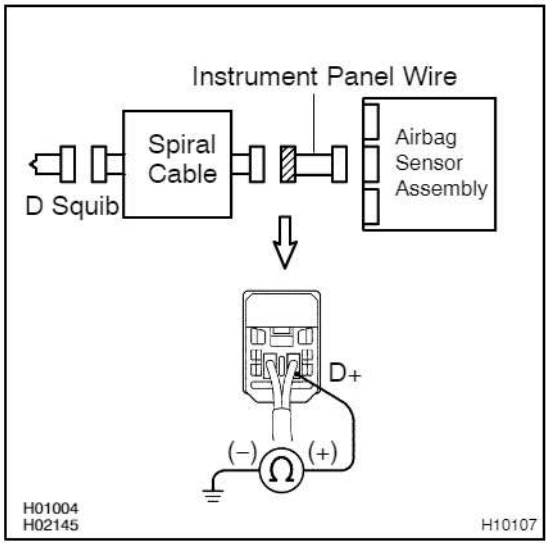
OK:

Resistance: 1 MΩ or Higher

NG → **Replace spiral cable.**

OK

6	Check instrument panel wire.



CHECK:

Measure the resistance between the body ground and D+ of the instrument panel wire connector on the spiral cable side.

OK:

Resistance: 1 MΩ or Higher

NG → **Repair or replace instrument panel wire.**

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check. If the malfunctioning part can not be detected by the simulation method, replace all SRS components including the wire harness.

DI6P6-23

DTC	B0103/12	Short in D Squib Circuit (to B+)

CIRCUIT DESCRIPTION

The D squib circuit consists of the airbag sensor assembly, the spiral cable and the steering wheel pad. It causes the SRS to deploy when the SRS deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
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 wire harness (to B+) • D squib malfunction • Spiral cable malfunction • Airbag sensor assembly malfunction	• Steering wheel pad (D squib) • Spiral cable • Airbag sensor assembly • Instrument panel wire

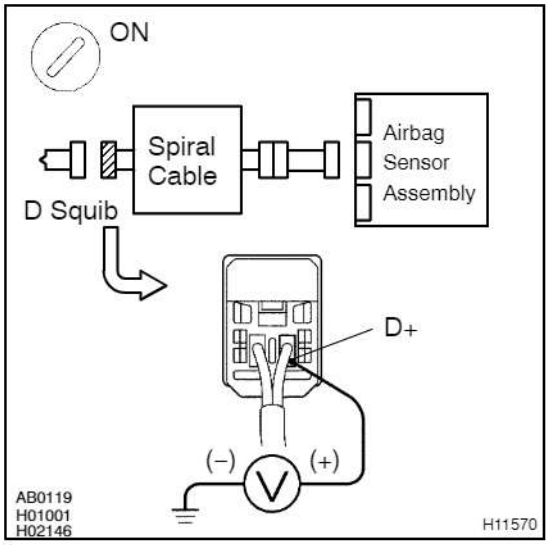
WIRING DIAGRAM

See page DI–898.

INSPECTION PROCEDURE

1	Prepare for inspection (See step 1 on page DI–1025).

2	Check D squib wire harness.



CHECK:

(a) Turn the ignition switch to ON.

(b) Measure the voltage between the body ground and D+ on the steering wheel pad (D squib) side between the airbag sensor assembly and the steering wheel pad (D squib).

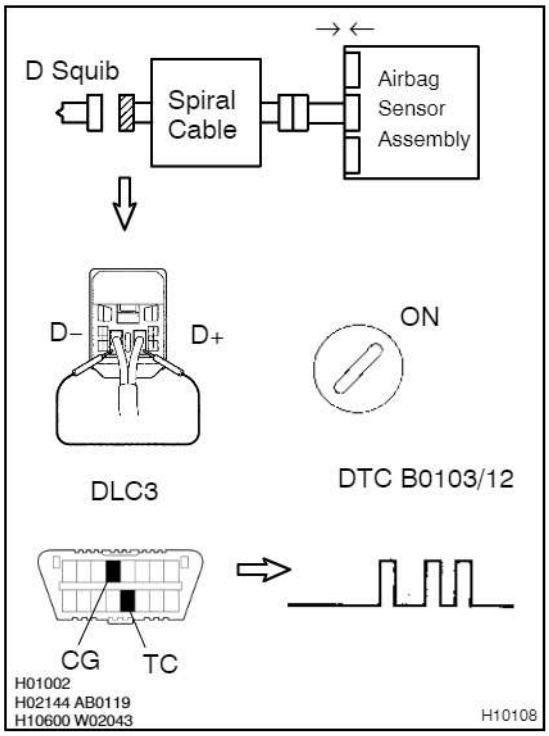
OK:

Voltage: Below 1 V

NG	Go to step 5.

OK

3	Check airbag sensor assembly.



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.
(b) Using a service wire, connect D+ and D– of the connector on the spiral cable side between the airbag sensor assembly and the steering wheel pad (D squib).
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(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 DI–884).

OK:

DTC B0103/12 is not output.

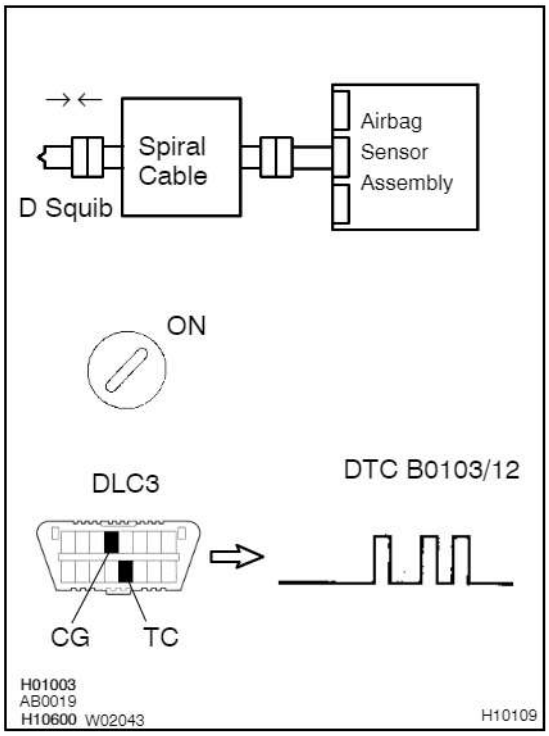
HINT:

Codes other than code B0103/12 may be output at this time, but they are not relevant to this check.

NG	Replace airbag sensor assembly.

OK

4	Check D squib.



PREPARATION:

(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 steering wheel pad (D squib) to the spiral cable.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(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 DI–884).

OK:

DTC B0103/12 is not output.

HINT:

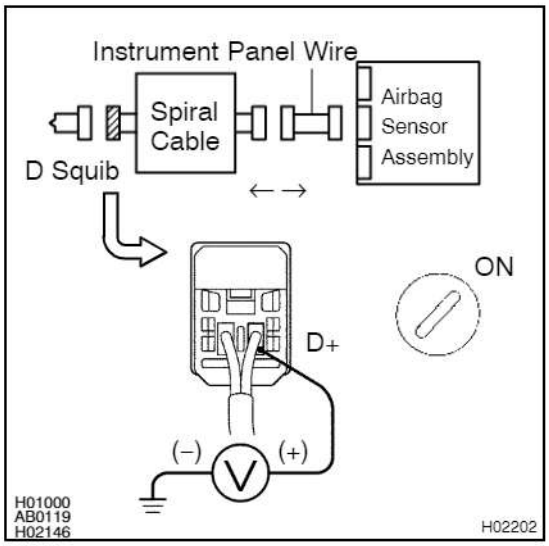
Codes other than code B0103/12 may be output at this time, but they are not relevant to this check.

NG	Replace steering wheel pad (D squib).

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check. If the malfunctioning part can not be detected by the simulation method, replace all SRS components including the wire harness.

5	Check spiral cable.



PREPARATION:

(a) Turn the ignition switch to LOCK.

(b) Disconnect the spiral cable connector from the instrument panel wire.

CHECK:

(a) Turn the ignition switch to ON.

(b) Measure the voltage between the body ground and D+ of the spiral cable connector on the steering wheel pad (D squib) side.

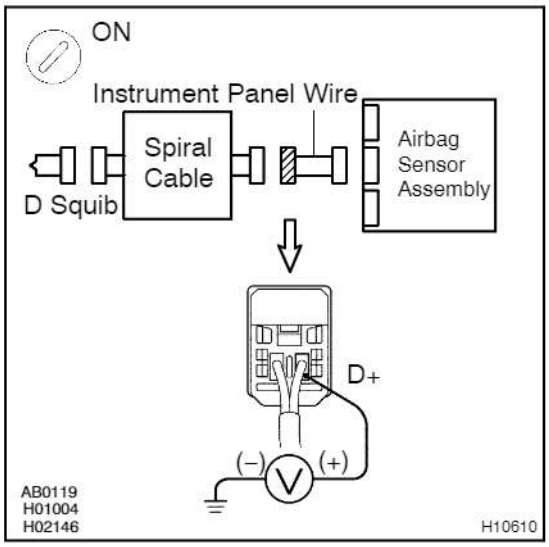
OK:

Voltage: Below 1 V

NG	Replace spiral cable.

OK

6	Check instrument panel wire.



CHECK:

(a) Turn the ignition switch to ON.

(b) Measure the voltage between the body ground and D+ of the instrument panel wire connector on the spiral cable side.

OK:

Voltage: Below 1 V

NG	Repair or replace instrument panel wire.

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check. If the malfunctioning part can not be detected by the simulation method, replace all SRS components including the wire harness.

D6P7-34

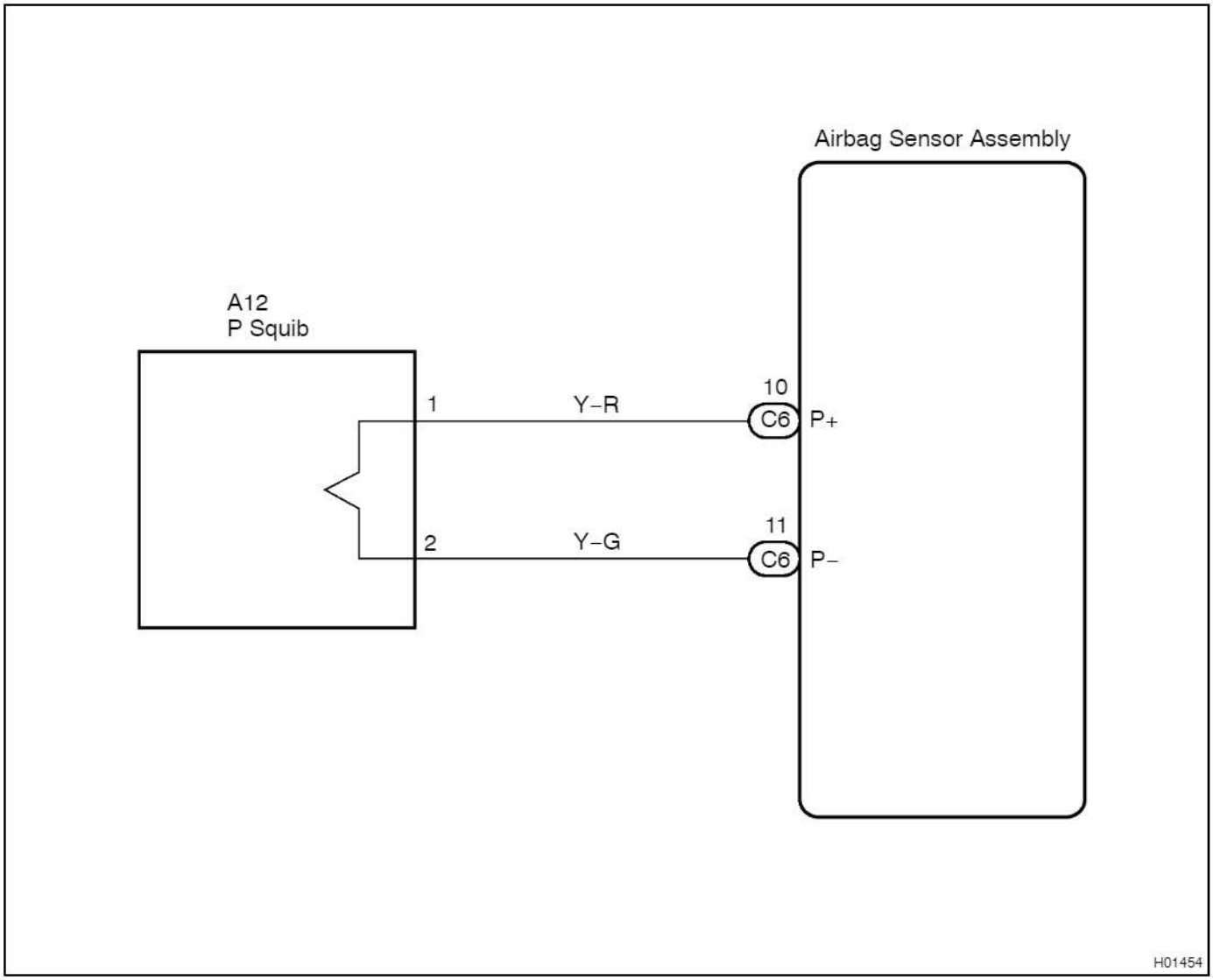
DTC	B0105/53	Short in P Squib Circuit

CIRCUIT DESCRIPTION

The P squib circuit consists of the airbag sensor assembly and the front passenger airbag assembly.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
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 wire harness • P squib malfunction • Airbag sensor assembly malfunction	• Front passenger airbag assembly (P squib) • Airbag sensor assembly • Instrument panel wire

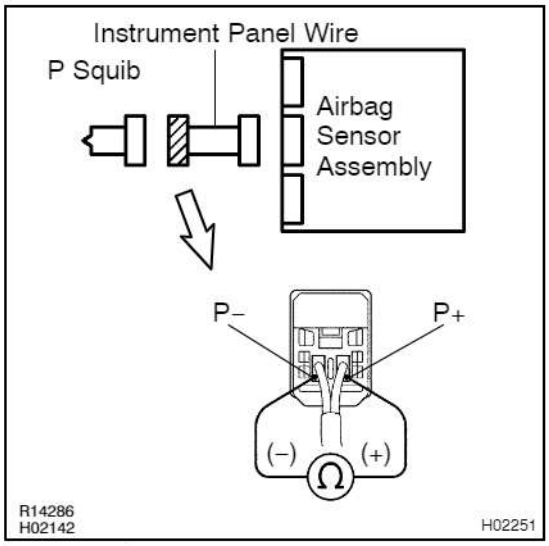
WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Prepare for inspection (See step 1 on page DI–1025).**

2	**Check instrument panel wire.**



PREPARATION:

Release the airbag activation prevention mechanism built in the instrument panel wire connector on the airbag sensor assembly side (See page DI–884).

CHECK:

Measure the resistance between P+ and P– of the instrument panel wire connector on the front passenger airbag assembly (P squib) side.

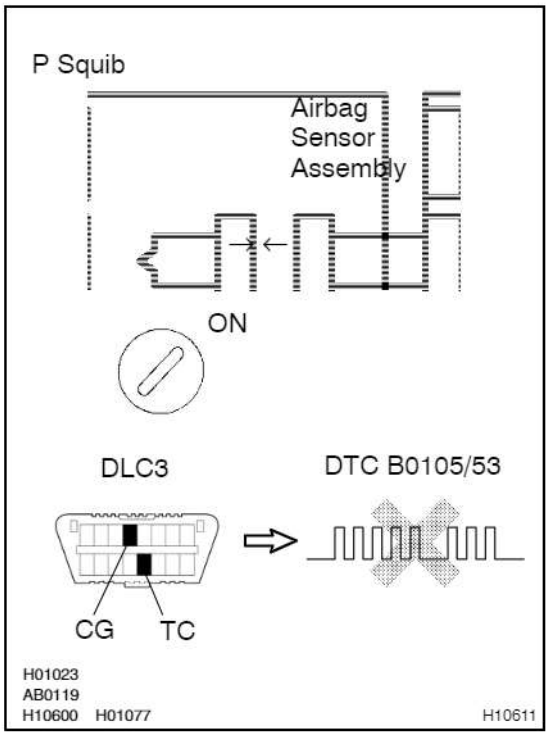
OK:

Resistance: 1 MΩ or Higher

NG	**Repair or replace instrument panel wire.**

OK

3	Check airbag sensor assembly.



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.
(b) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(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 DI–884).

OK:

DTC B0105/53 is not output.

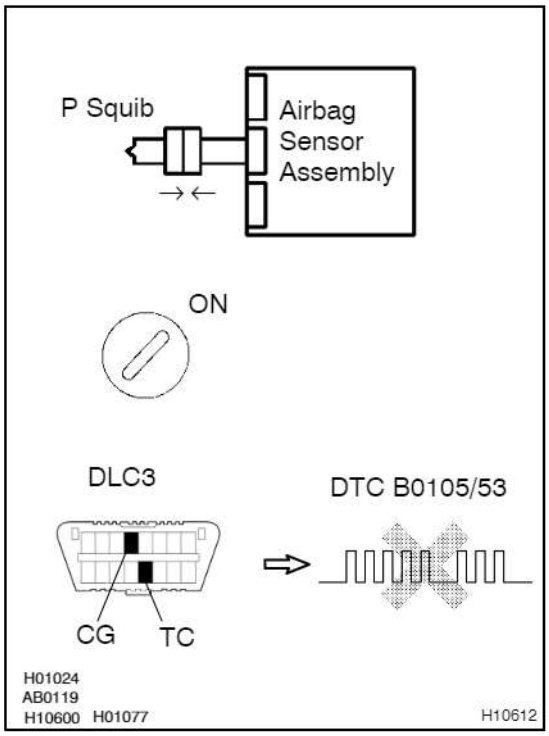
HINT:

Codes other than code B0105/53 may be output at this time, but they are not relevant to this check.

NG → **Replace airbag sensor assembly.**

OK

4	Check P squib.



PREPARATION:

(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 passenger airbag assembly (P squib) connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(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 DI–884).

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 front passenger airbag assembly (P squib).**

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

DI6P8-20

DTC	B0106/54	Open in P Squib Circuit

CIRCUIT DESCRIPTION

The P squib circuit consists of the airbag sensor assembly and the front passenger airbag assembly.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
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 wire harness • P squib malfunction • Airbag sensor assembly malfunction	• Front passenger airbag assembly (P squib) • Airbag sensor assembly • Instrument panel wire

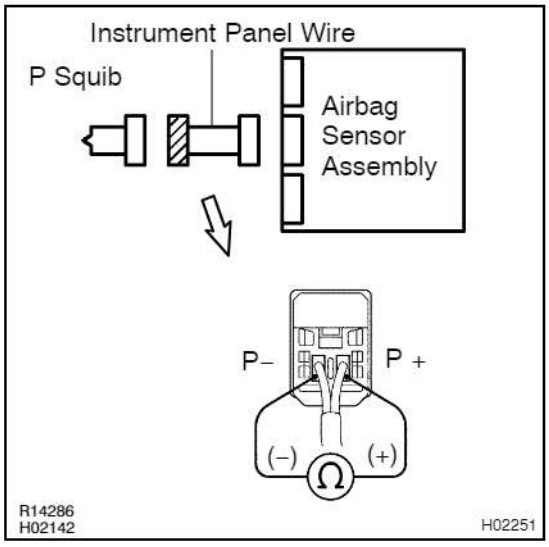
WIRING DIAGRAM

See page DI–915.

INSPECTION PROCEDURE

1	**Prepare for inspection (See step 1 on page DI–1025).**

2	**Check instrument panel wire.**



CHECK:

Measure the resistance between P+ and P– of the instrument panel wire connector on the front passenger airbag assembly (P squib) side.

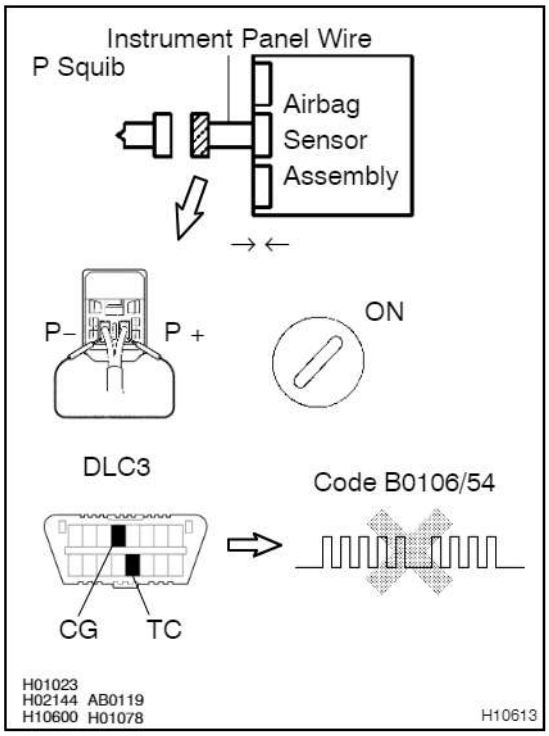
OK:

Resistance: Below 1 Ω

NG → **Repair or replace instrument panel wire.**

OK

3	Check airbag sensor assembly.



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.
(b) Using a service wire, connect P+ and P– of the instrument panel wire connector on the front passenger airbag assembly (P squib) side.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(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 DI–884).

OK:

DTC B0106/54 is not output.

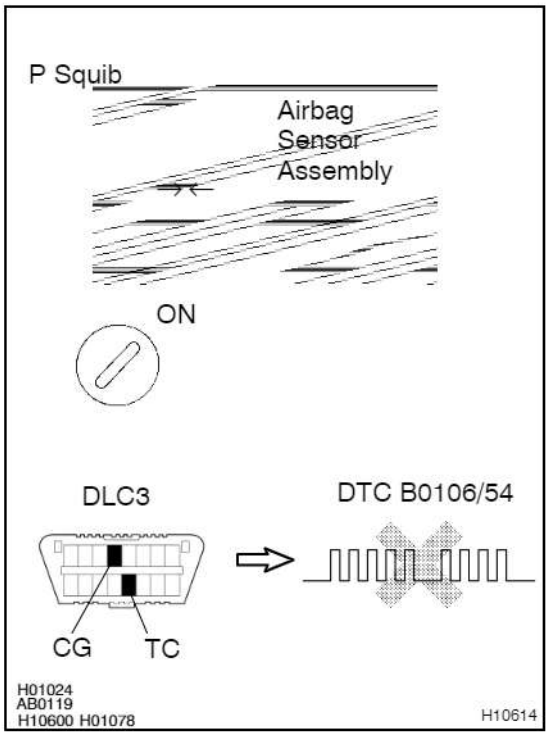
HINT:

Codes other than code B0106/54 may be output at this time, but they are not relevant to this check.

NG	Replace airbag sensor assembly.

OK

4	Check P squib.



PREPARATION:

(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 passenger airbag assembly (P squib) connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(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 DI–884).

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 front passenger airbag assembly (P squib).**

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

DI6P9-20

DTC	B0107/51	Short in P Squib Circuit (to Ground)

CIRCUIT DESCRIPTION

The P squib circuit consists of the airbag sensor assembly and the front passenger airbag assembly.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
DTC B0107/51 is recorded when ground short is detected in the P squib circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B0107/51	• Short in P squib wire harness (to ground) • P squib malfunction • Airbag sensor assembly malfunction	• Front passenger airbag assembly (P squib) • Airbag sensor assembly • Instrument panel wire

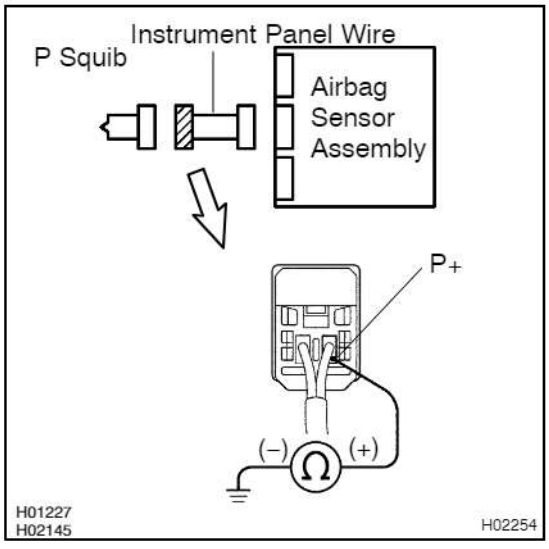
WIRING DIAGRAM

See page DI–915.

INSPECTION PROCEDURE

1	Prepare for inspection (See step 1 on page DI–1025).

2	Check instrument panel wire.



CHECK:

Measure the resistance between the body ground and P+ of the instrument panel wire connector on the front passenger airbag assembly (P squib) side.

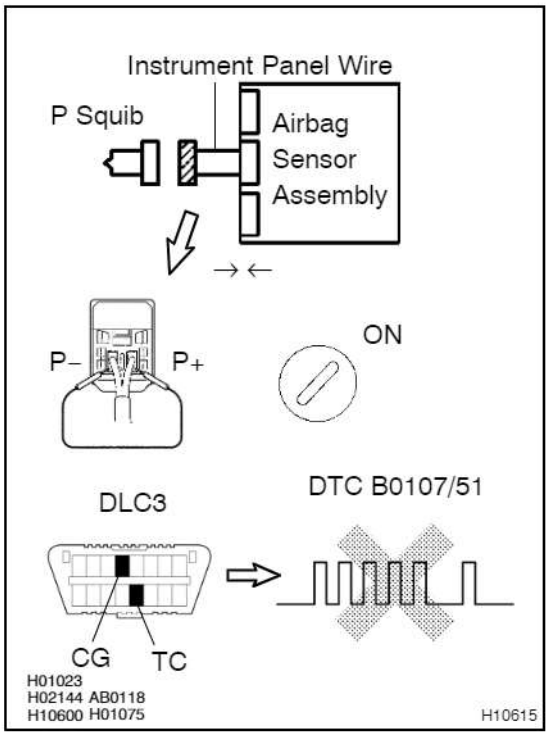
OK:

Resistance: 1 MΩ or Higher

NG → **Repair or replace instrument panel wire.**

OK

3	Check airbag sensor assembly.



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.
(b) Using a service wire, connect P+ and P– of the instrument panel wire connector on the front passenger airbag assembly (P squib) side.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(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 DI–884).

OK:

DTC B0107/51 is not output.

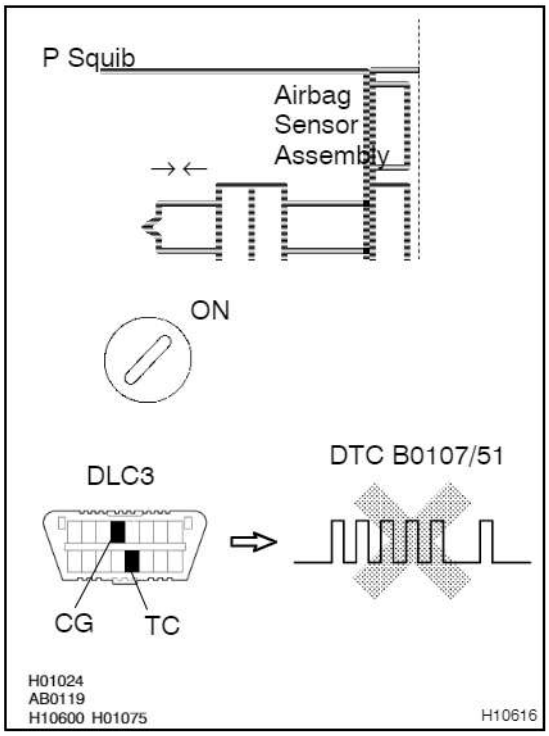
HINT:

Codes other than code B0107/51 may be output at this time, but they are not relevant to this check.

NG	Replace airbag sensor assembly.

OK

4	Check P squib.



PREPARATION:

(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 passenger airbag assembly (P squib) connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(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 DI–884).

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 front passenger airbag assembly (P squib).

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check. If the malfunctioning part can not be detected by the simulation method, replace all SRS components including the wire harness.

D6PA–19

DTC	B0108/52	Short in P Squib Circuit (to B+)

CIRCUIT DESCRIPTION

The P squib circuit consists of the airbag sensor assembly and the front passenger airbag assembly. It causes the SRS to deploy when the SRS deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
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 wire harness (to B+) • P squib malfunction • Airbag sensor assembly malfunction	• Front passenger airbag assembly (P squib) • Airbag sensor assembly • Instrument panel wire

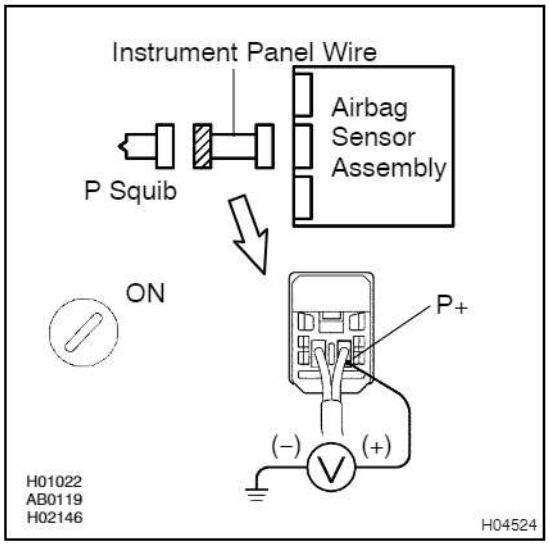
WIRING DIAGRAM

See page DI–915.

INSPECTION PROCEDURE

1	**Prepare for inspection (See step 1 on page DI–1025).**

2	**Check instrument panel wire.**



CHECK:

(a) Turn the ignition switch to ON.
(b) Measure the voltage between the body ground and P+ of the instrument panel wire connector on the front passenger airbag assembly (P squib) side.

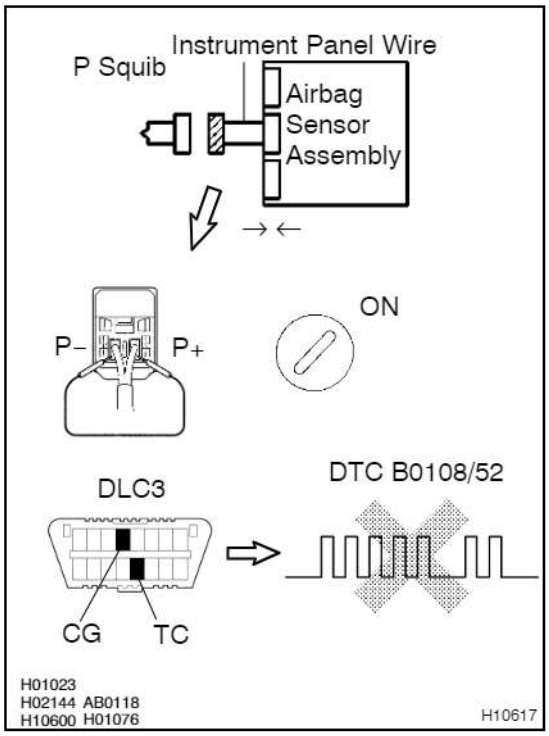
OK:

Voltage: Below 1 V

NG → **Repair or replace instrument panel wire.**

OK

3	Check airbag sensor assembly.



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.
(b) Using a service wire, connect P+ and P– of the instrument panel wire connector on the front passenger airbag assembly (P squib) side.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(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 DI–884).

OK:

DTC B0108/52 is not output.

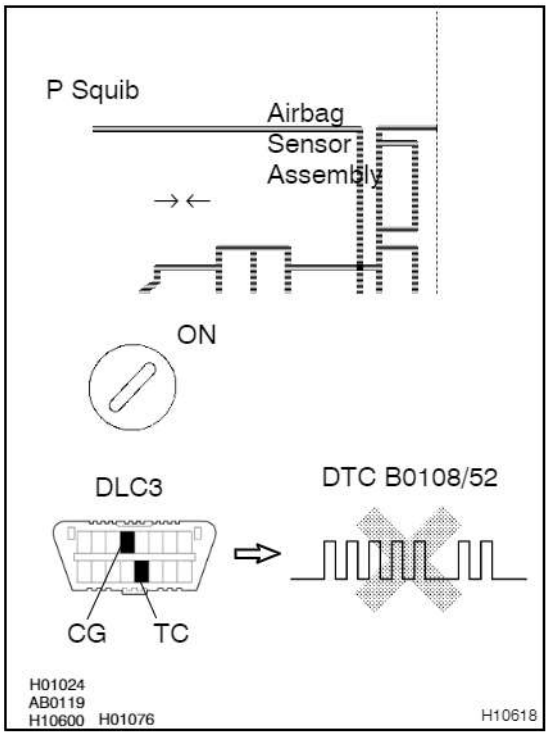
HINT:

Codes other than code B0108/52 may be output at this time, but they are not relevant to this check.

NG	Replace airbag sensor assembly.

OK

4	Check P squib.



PREPARATION:

(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 passenger airbag assembly (P squib) connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(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 DI–884).

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 front passenger airbag assembly (P squib).**

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check. If the malfunctioning part can not be detected by the simulation method, replace all SRS components including the wire harness.

D6PB–44

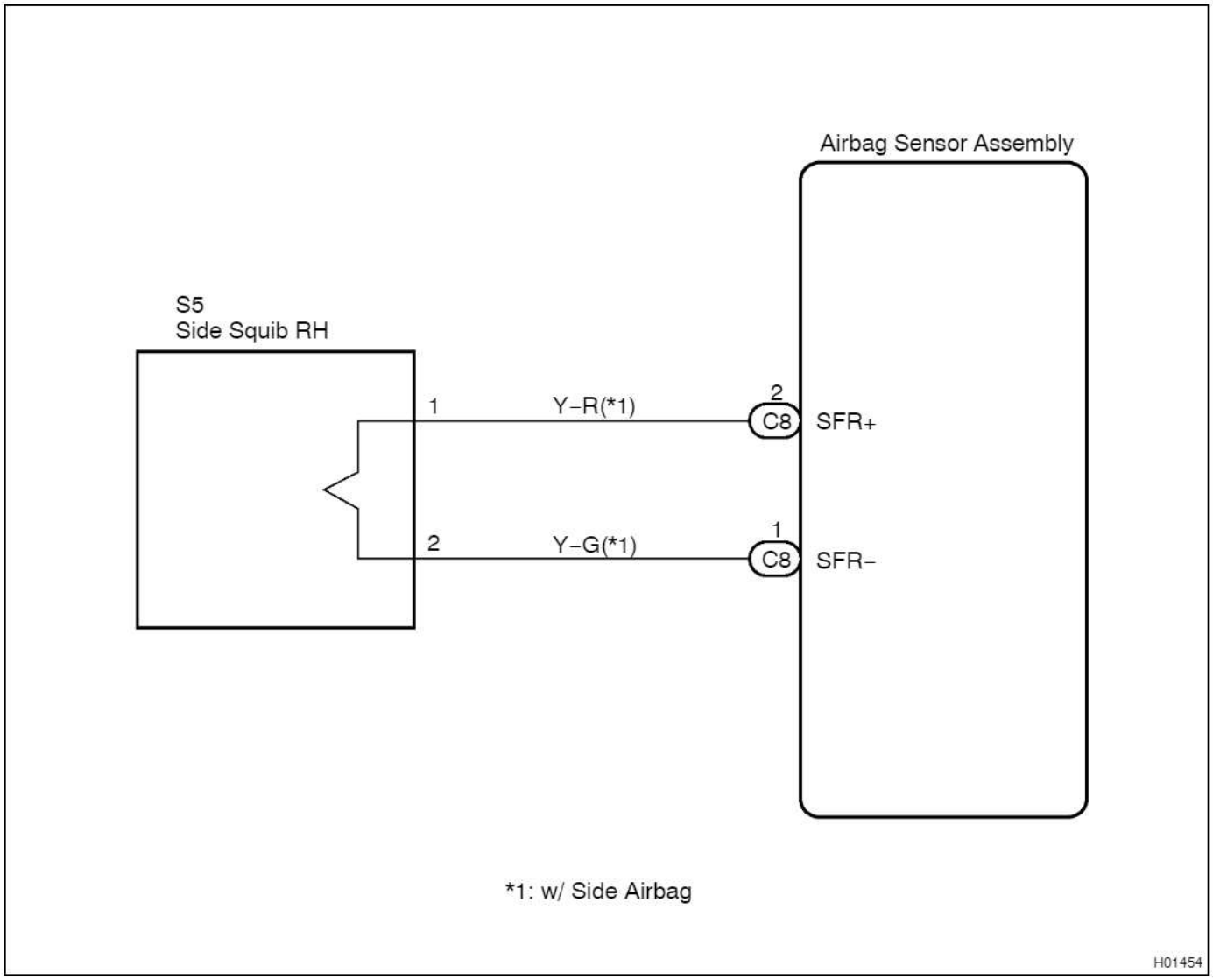
DTC	B0110/43	Short in Side Squib RH Circuit

CIRCUIT DESCRIPTION

The side squib RH circuit consists of the airbag sensor assembly and the side airbag assembly RH.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
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 wire harness • Side squib RH malfunction • Airbag sensor assembly malfunction	• Side airbag assembly RH (Side squib RH) • Airbag sensor assembly • Floor wire

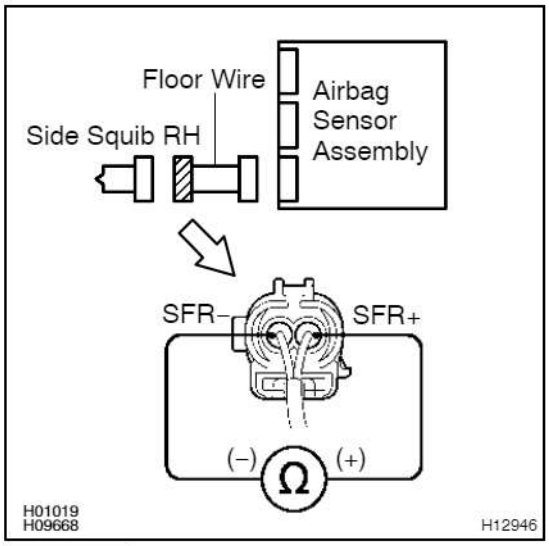
WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Prepare for inspection (See step 1 on page DI–1025).**

2	**Check floor wire.**



PREPARATION:

Release the airbag activation prevention mechanism built in the connector of the floor wire on the airbag sensor assembly side (See page DI–884).

CHECK:

Measure the resistance between SFR+ and SFR– of the floor wire connector on the side airbag assembly RH (side squib RH) side.

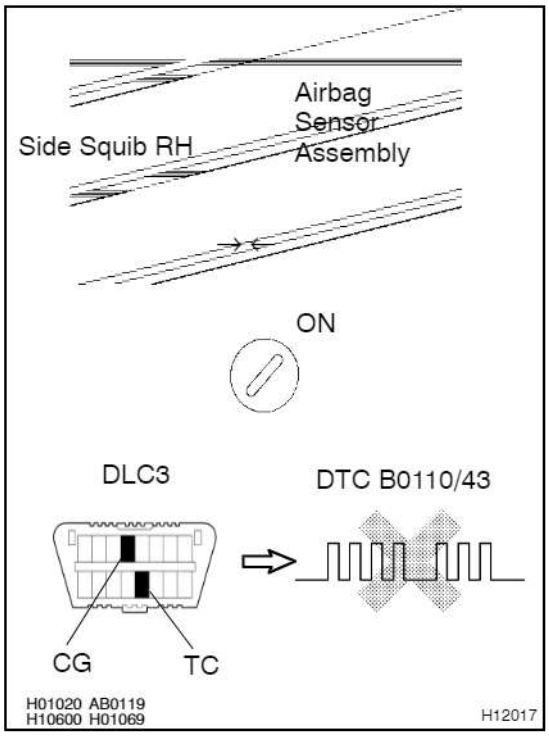
OK:

Resistance: 1 MΩ or Higher

NG	**Repair or replace floor wire.**

OK

3	Check airbag sensor assembly.



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.
(b) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch or ON, and wait at least for 10 seconds.
(e) Check the DTC (See page DI–884).

OK:

DTC B0110/43 is not output.

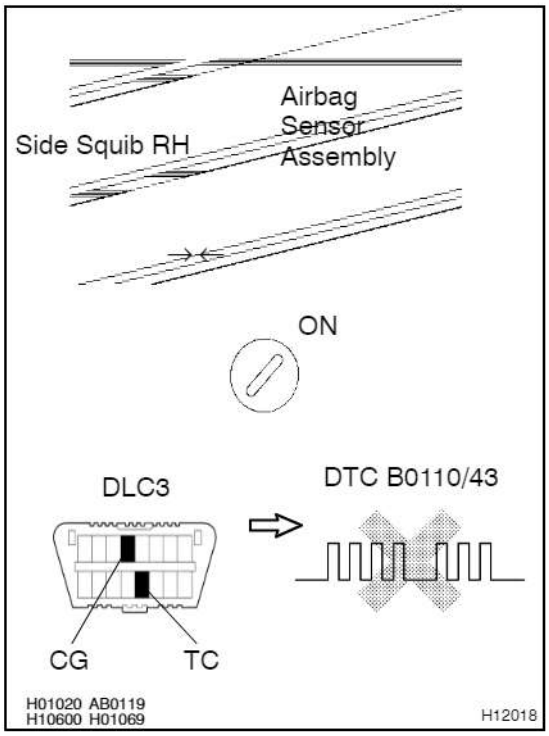
HINT:

Codes other than code B0110/43 may be output at this time, but they are not relevant to this check.

NG → **Replace airbag sensor assembly.**

OK

4	Check side squib RH.



PREPARATION:

(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 side airbag assembly RH (side squib RH) connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(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 DI–884).

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 side airbag assembly RH (side squib RH).

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

DI6PC-27

DTC	B0111/44	Open in Side Squib RH Circuit

CIRCUIT DESCRIPTION

The side squib RH circuit consists of the airbag sensor assembly and the side airbag assembly RH.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
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 wire harness • Side squib RH malfunction • Airbag sensor assembly malfunction	• Side airbag assembly RH (Side squib RH) • Airbag sensor assembly • Floor wire

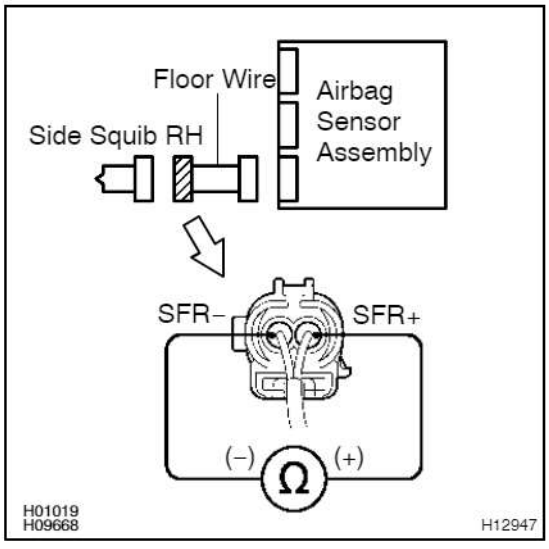
WIRING DIAGRAM

See page DI–928.

INSPECTION PROCEDURE

1	**Prepare for inspection (See step 1 on page DI–1025).**

2	**Check floor wire.**



CHECK:

Measure the resistance between SFR+ and SFR– of the floor wire connector on the side airbag assembly RH (side squib RH) side.

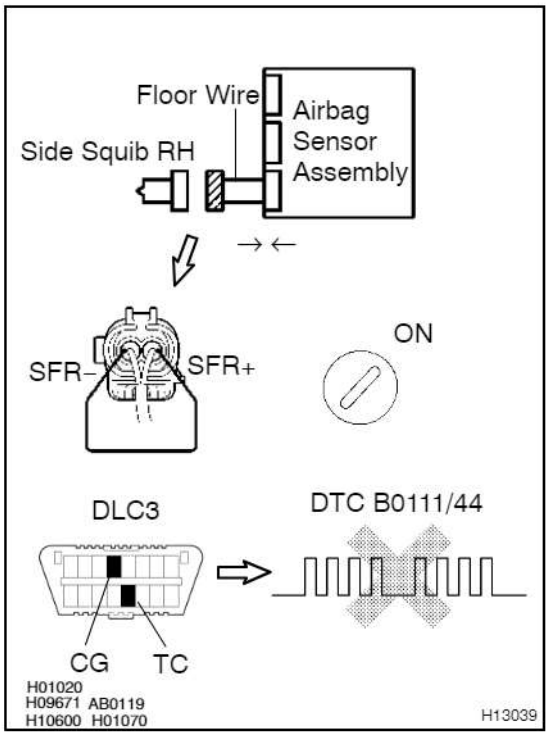
OK:

Resistance: Below 1 Ω

NG → **Repair or replace floor wire.**

OK

3	Check airbag sensor assembly.



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.
(b) Using a service wire, connect SFR+ and SFR– of the floor wire connector on the side airbag assembly RH (side squib RH) side.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(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 DI–884).

OK:

DTC B0111/44 is not output.

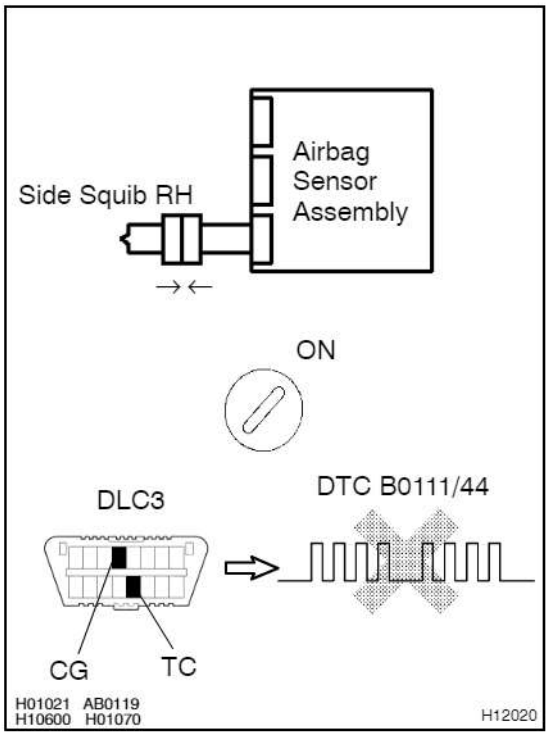
HINT:

Codes other than code B0111/44 may be output at this time, but they are not relevant to this check.

NG → **Replace airbag sensor assembly.**

OK

4	Check side squib RH.



PREPARATION:

(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 side airbag assembly RH (side squib RH) connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(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 DI–884).

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 side airbag assembly RH (side squib RH).**

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

DTC	B0112/41	Short in Side Squib RH Circuit (to Ground)

CIRCUIT DESCRIPTION

The side squib RH circuit consists of the airbag sensor assembly and the side airbag assembly RH.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
DTC B0112/41 is recorded when ground short is detected in the side squib RH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B0112/41	• Short in side squib RH wire harness (to ground) • Side squib RH malfunction • Airbag sensor assembly malfunction	• Side airbag assembly RH (Side squib RH) • Airbag sensor assembly • Floor wire

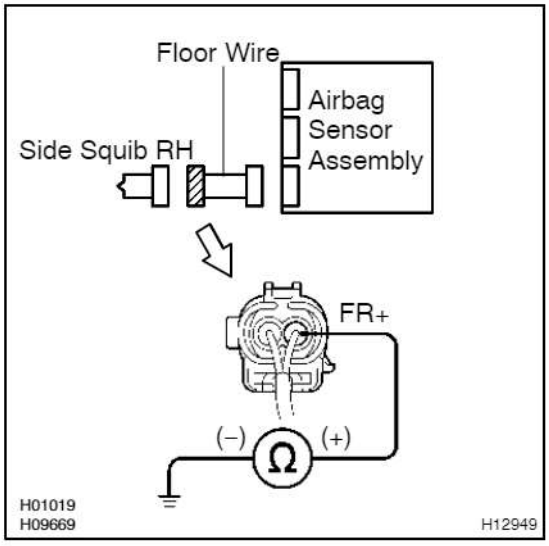
WIRING DIAGRAM

See page DI–928.

INSPECTION PROCEDURE

1	Prepare for inspection (See step 1 on page DI–1025).

2	Check floor wire.



CHECK:

Measure the resistance between the body ground and SFR+ of the floor wire connector on the side airbag assembly RH (side squib RH) side.

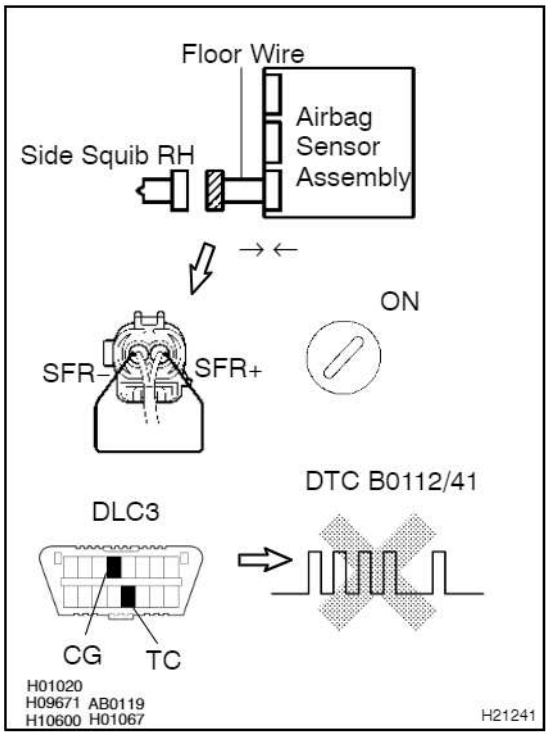
OK:

Resistance: 1 MΩ or Higher

NG	Repair or replace floor wire.

OK

3	Check airbag sensor assembly.



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.
(b) Using a service wire, connect SFR+ and SFR– of the floor wire connector on the side airbag assembly RH (side squib RH) side.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(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 DI–884).

OK:

DTC B0112/41 is not output.

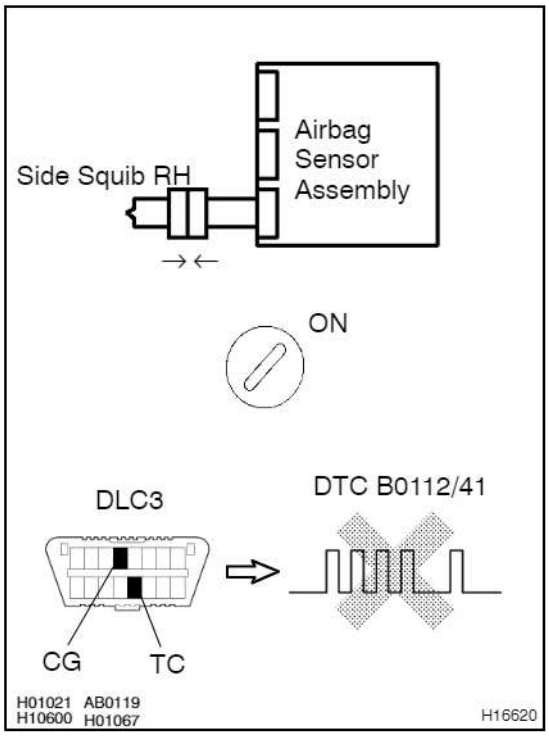
HINT:

Codes other than code B0112/41 may be output at this time, but they are not relevant to this check.

NG	Replace airbag sensor assembly.

OK

4	Check side squib RH.



PREPARATION:

(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 side airbag assembly RH (side squib RH) connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(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 DI–884).

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 side airbag assembly RH (side squib RH).**

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check. If the malfunctioning part can not be detected by the simulation method, replace all SRS components including the wire harness.

D6PE-29

DTC	B0113/42	Short in Side Squib RH Circuit (to B+)

CIRCUIT DESCRIPTION

The side squib RH circuit consists of the airbag sensor assembly and the side airbag assembly RH.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
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 wire harness (to B+) • Side squib RH malfunction • Airbag sensor assembly malfunction	• Side airbag assembly RH (Side squib RH) • Airbag sensor assembly • Floor wire

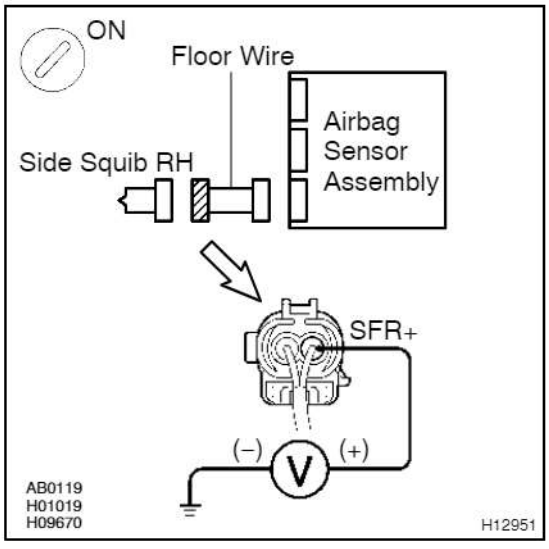
WIRING DIAGRAM

See page DI–928.

INSPECTION PROCEDURE

1	Prepare for inspection (See step 1 on page DI–884).

2	Check floor wire.



CHECK:

(a) Turn the ignition switch to ON.

(b) Measure the voltage between the body ground and SFR+ of the floor wire connector on the side airbag assembly RH (side squib RH) side.

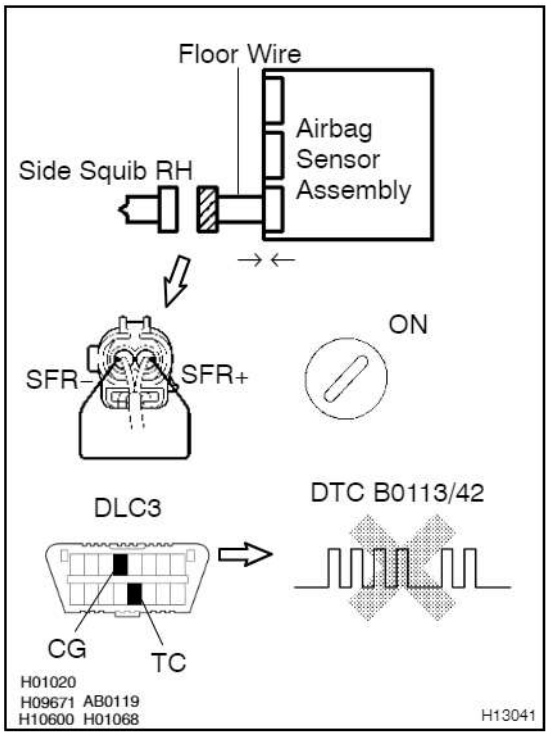
OK:

Voltage: Below 1 V

NG → **Repair or replace floor wire.**

OK

3	Check airbag sensor assembly.



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.
(b) Using a service wire, connect SFR+ and SFR– of the floor wire connector on the side airbag assembly RH (side squib RH) side.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(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 DI–884).

OK:

DTC B0113/42 is not output.

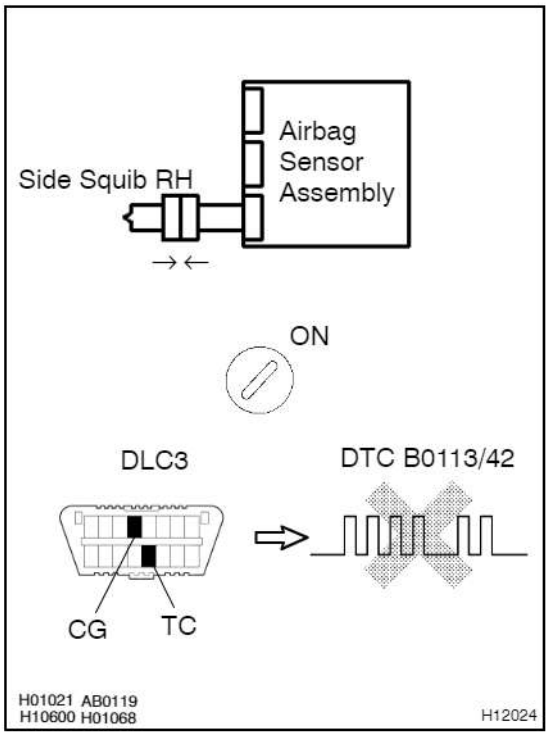
HINT:

Codes other than code B0113/42 may be output at this time, but they are not relevant to this check.

NG	Replace airbag sensor assembly.

OK

4	Check side squib RH.



PREPARATION:

(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 side airbag assembly RH (side squib RH) connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(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 DI–884).

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 side airbag assembly RH (side squib RH).**

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check. If the malfunctioning part can not be detected by the simulation method, replace all SRS components including the wire harness.

D6PF-46

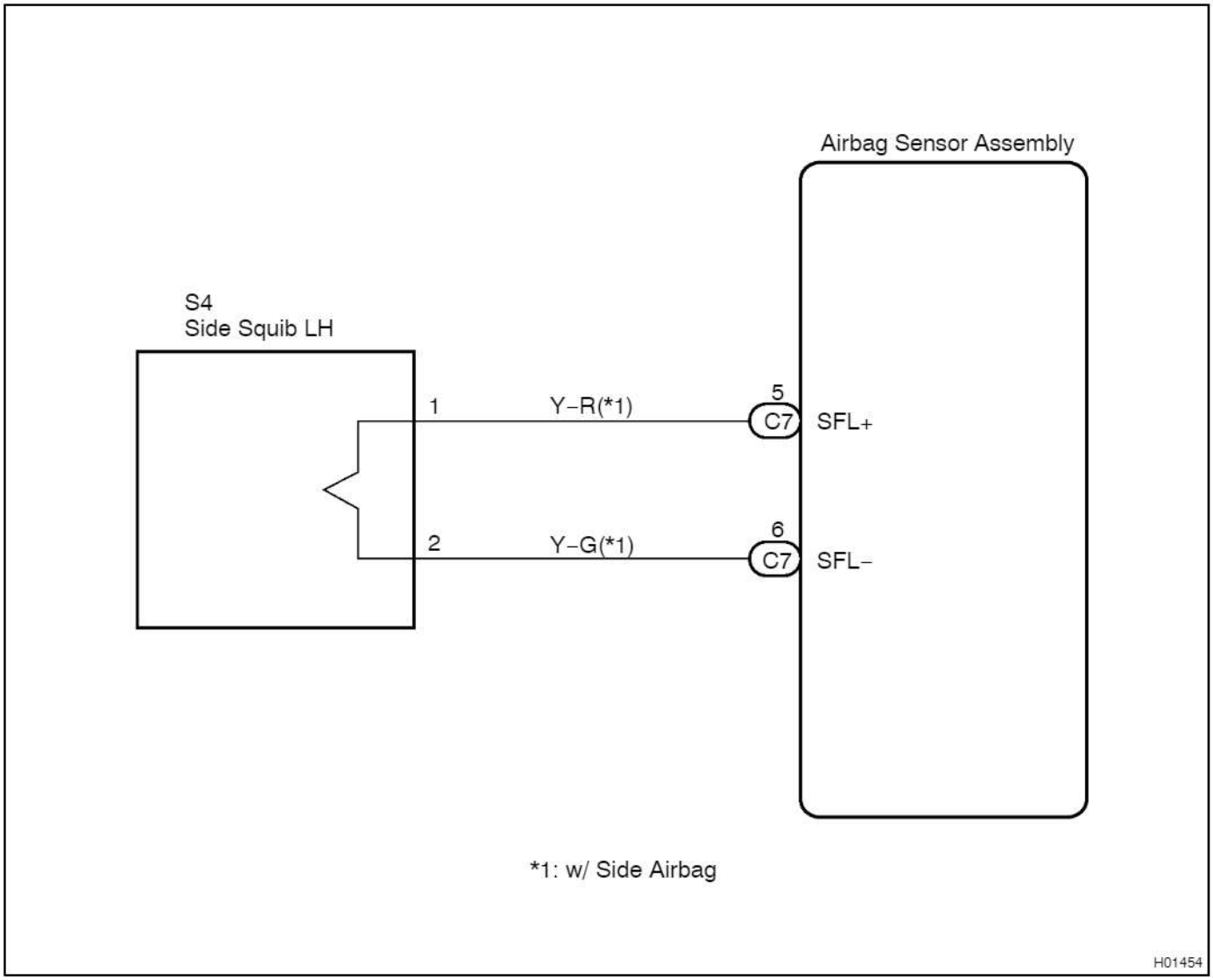
DTC	B0115/47	Short in Side Squib LH Circuit

CIRCUIT DESCRIPTION

The side squib LH circuit consists of the airbag sensor assembly and the side airbag assembly LH.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
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 wire harness • Side squib LH malfunction • Airbag sensor assembly malfunction	• Side airbag assembly LH (Side squib LH) • Airbag sensor assembly • Floor wire

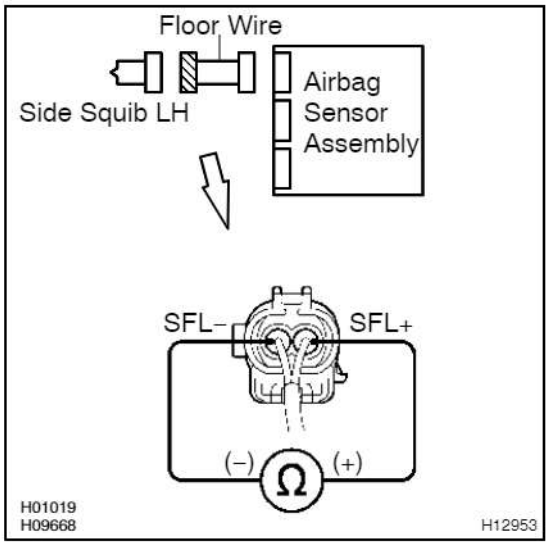
WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Prepare for inspection (See step 1 on page DI–1025).**

2	**Check floor wire.**



PREPARATION:
Release the airbag activation prevention mechanism built in the connector of the floor wire on the airbag sensor assembly side (See page DI–884).

CHECK:
Measure the resistance between SFL+ and SFL– of the floor wire connector on the side airbag assembly LH (side squib LH) side.

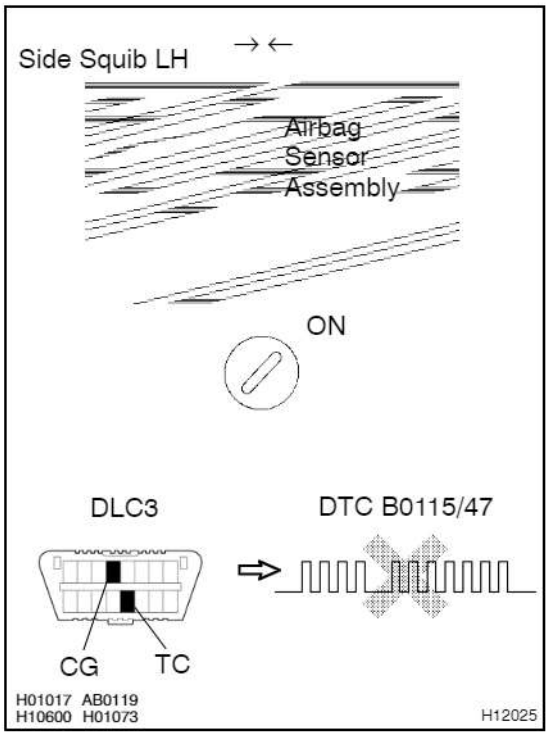
OK:

Resistance: 1 MΩ or Higher

NG	**Repair or replace floor wire.**

OK

3	Check airbag sensor assembly.



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.
(b) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(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 DI–884).

OK:

DTC B0115/47 is not output.

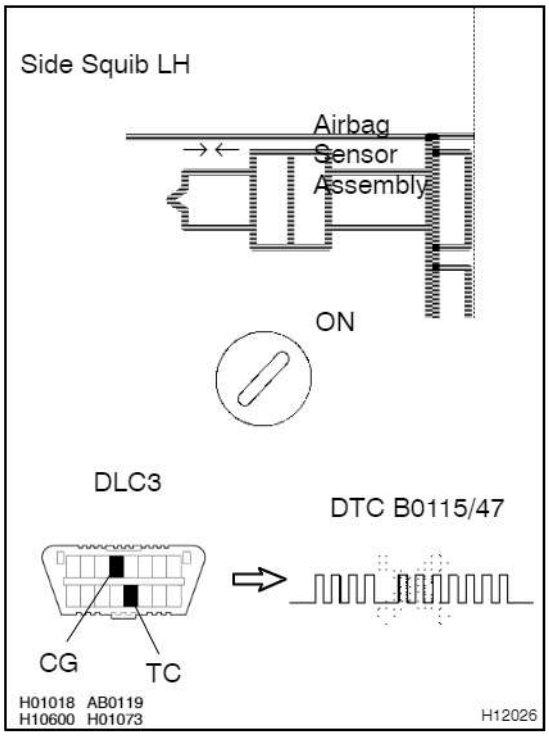
HINT:

Codes other than code B0115/47 may be output at this time, but they are not relevant to this check.

NG → **Replace airbag sensor assembly.**

OK

4	Check side squib LH.



PREPARATION:

(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 side airbag assembly LH connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(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 DI–884).

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 side airbag assembly LH (side squib LH).

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

D6PG-28

DTC	B0116/48	Open in Side Squib LH Circuit

CIRCUIT DESCRIPTION

The side squib LH circuit consists of the airbag sensor assembly and the side airbag assembly LH.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
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 wire harness • Side squib LH malfunction • Airbag sensor assembly malfunction	• Side airbag assembly LH (Side squib LH) • Airbag sensor assembly • Floor wire

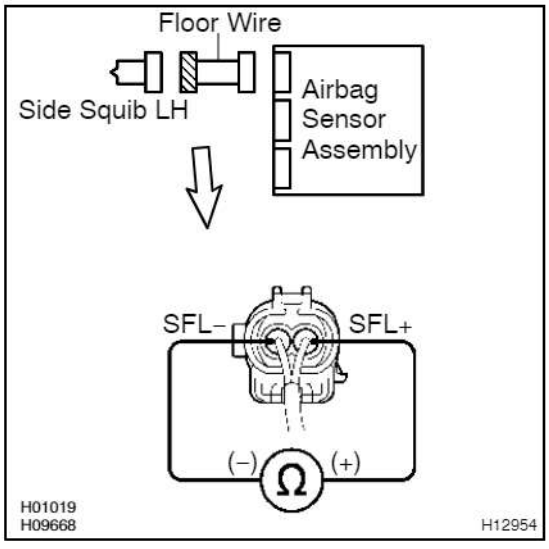
WIRING DIAGRAM

See page DI–941.

INSPECTION PROCEDURE

1	**Prepare for inspection. (See step 1 on page DI–1025)**

2	**Check floor wire.**



CHECK:

Measure the resistance between SFL+ and SFL– of the floor wire connector on the side airbag assembly LH (side squib LH) side.

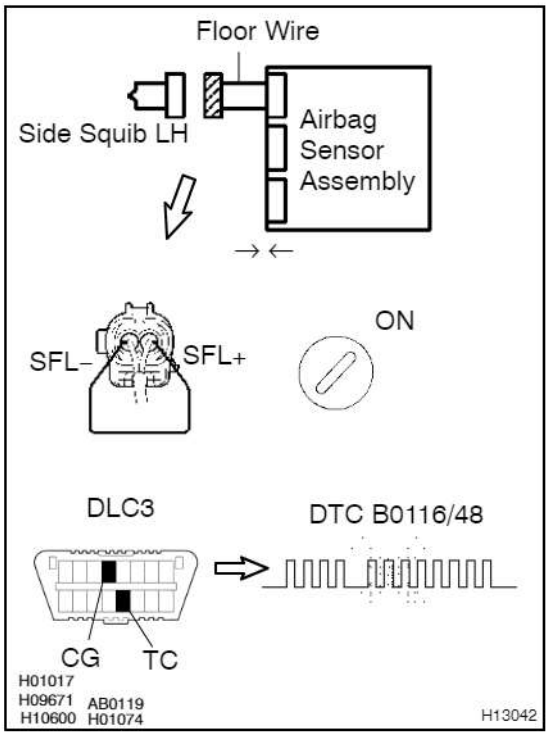
OK:

Resistance: Below 1 Ω

NG → **Repair or replace floor wire.**

OK

3	Check airbag sensor assembly.



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.
(b) Using a service wire, connect SFL+ and SFL– of the floor wire connector on the side airbag assembly LH (side squib LH) side.
(c) Connect the negative (–) terminal cable to the battery, and wait at least 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(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 DI–884).

OK:

DTC B0116/48 is not output.

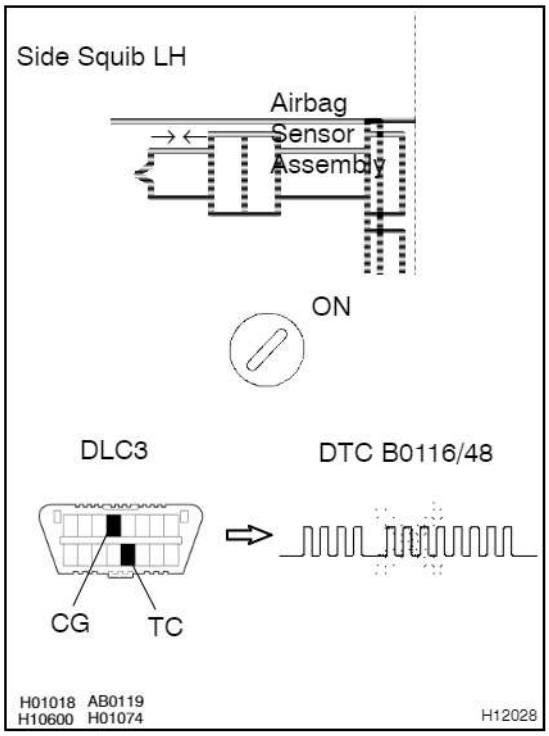
HINT:

Codes other than code B0116/48 may be output at this time, but they are not relevant to this check.

NG	Replace airbag sensor assembly.

OK

4	Check side squib LH.



PREPARATION:

(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 side airbag assembly LH (side squib LH) connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(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 DI–884).

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 side airbag assembly LH (side squib LH).**

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

DTC	B0117/45	Short in Side Squib LH Circuit (to Ground)

CIRCUIT DESCRIPTION

The side squib LH circuit consists of the airbag sensor assembly and the side airbag assembly LH.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
DTC B0117/45 is recorded when ground short is detected in the side squib LH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B0117/45	• Short in side squib LH wire harness (to ground) • Side squib LH malfunction • Airbag sensor assembly malfunction	• Side airbag assembly LH (Side squib LH) • Airbag sensor assembly • Floor wire

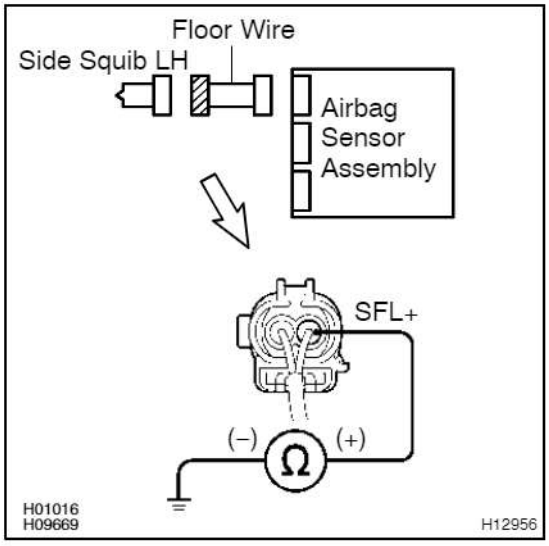
WIRING DIAGRAM

See page DI–941.

INSPECTION PROCEDURE

1	**Prepare for inspection (See step 1 on page DI–1025).**

2	**Check floor wire.**



CHECK:

Measure the resistance between the body ground and SFL+ of the floor wire connector on the side airbag assembly LH (side squib LH) side.

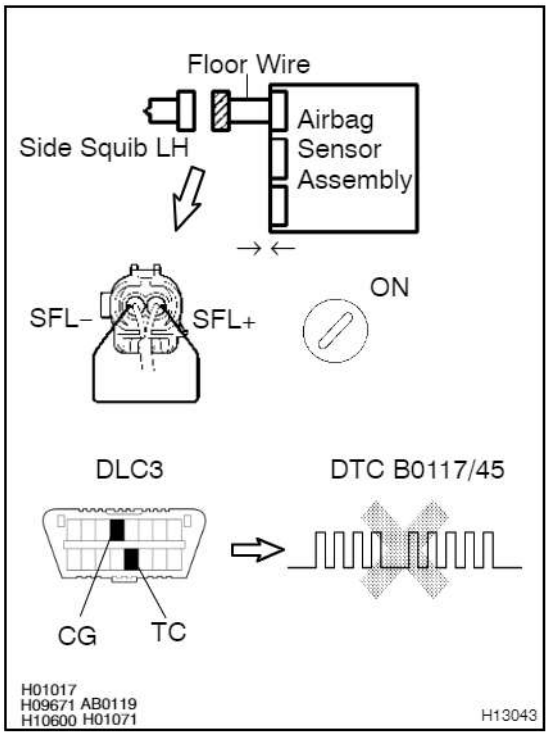
OK:

Resistance: 1 MΩ or Higher

NG	**Repair or replace floor wire.**

OK

3	Check airbag sensor assembly.



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.
(b) Using a service wire, connect SFL+ and SFL– of the floor wire connector on the side airbag assembly LH (side squib LH) side.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(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 DI–884).

OK:

DTC B0117/45 is not output.

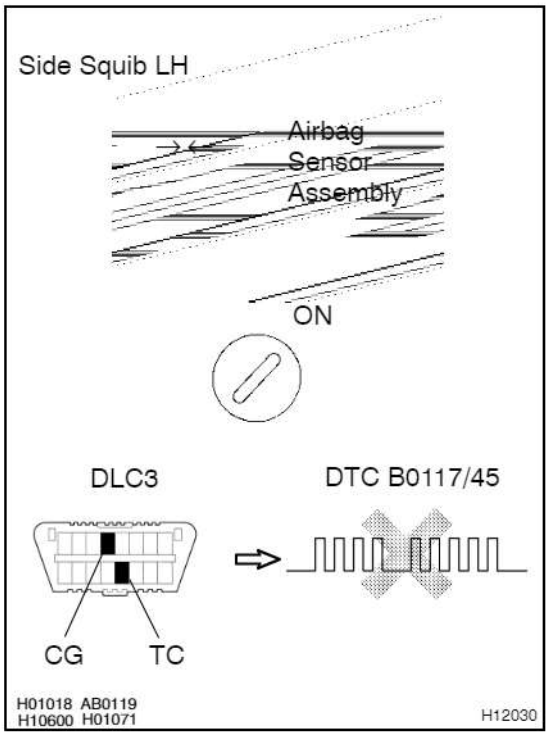
HINT:

Codes other than code B0117/45 may be output at this time, but they are not relevant to this check.

NG	Replace airbag sensor assembly.

OK

4	Check side squib LH.



PREPARATION:

(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 side airbag assembly LH (side squib LH) connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(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 DI–884).

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 side airbag assembly LH (side squib LH).**

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check. If the malfunctioning part can not be detected by the simulation method, replace all SRS components including the wire harness.

D6PI-28

DTC	B0118/46	Short in Side Squib LH Circuit (to B+)

CIRCUIT DESCRIPTION

The side squib LH circuit consists of the airbag sensor assembly and the side airbag assembly LH.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
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 wire harness (to B+) • Side squib LH malfunction • Airbag sensor assembly malfunction	• Side airbag assembly LH (Side squib LH) • Airbag sensor assembly • Floor wire

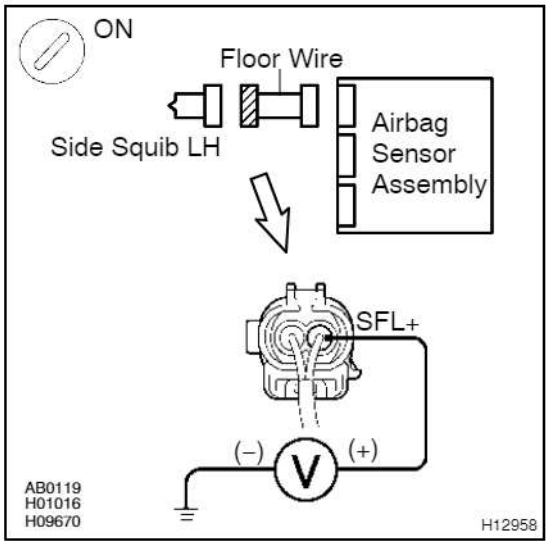
WIRING DIAGRAM

See page DI–941.

INSPECTION PROCEDURE

1	**Prepare for inspection (See step 1 on page DI–1025).**

2	**Check floor wire.**



CHECK:

(a) Turn the ignition switch to ON.

(b) Measure the voltage between the body ground and SFL+ of the floor wire connector on the side airbag assembly LH (side squib LH) side.

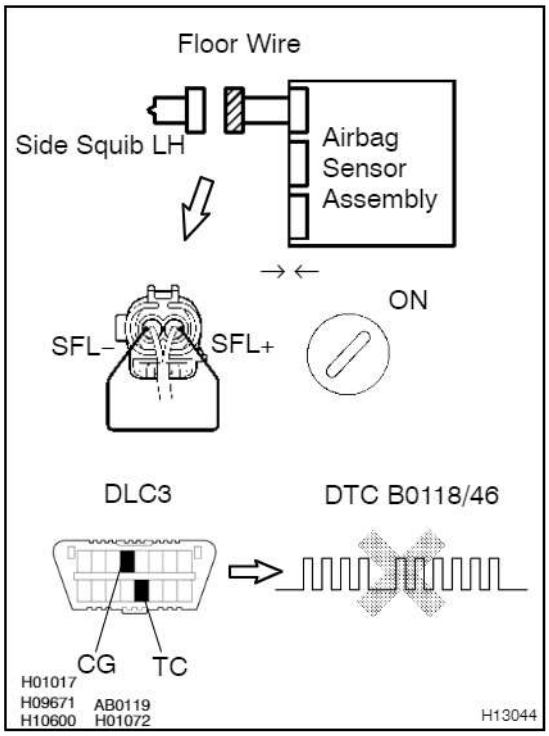
OK:

Voltage: Below 1 V

NG → **Repair or replace floor wire.**

OK

3	Check airbag sensor assembly.



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.
(b) Using a service wire, connect SFL+ and SFL– of the floor wire connector on the side airbag assembly LH (side squib LH) side.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(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 DI–884).

OK:

DTC B0118/46 is not output.

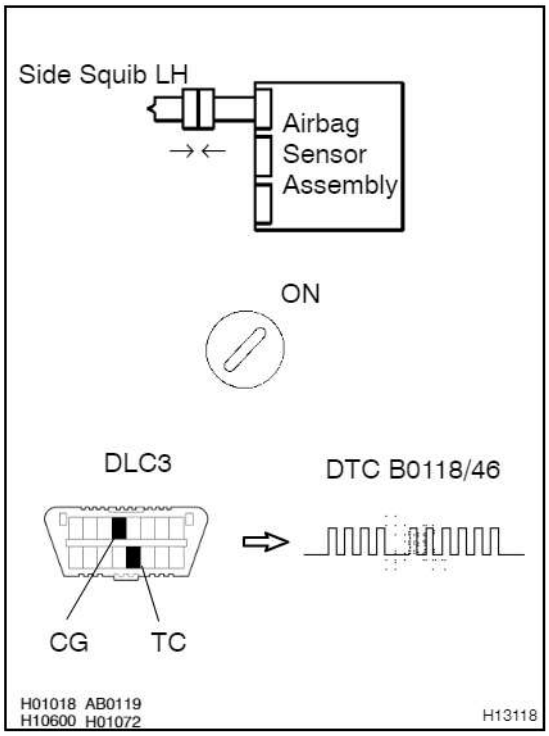
HINT:

Codes other than code B0118/46 may be output at this time, but they are not relevant to this check.

NG → **Replace airbag sensor assembly.**

OK

4	Check side squib LH.



PREPARATION:

(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 side airbag assembly LH (side squib LH) connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(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 DI–884).

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 side airbag assembly LH (side squib LH).**

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check. If the malfunctioning part can not be detected by the simulation method, replace all SRS components including the wire harness.

D6PJ–34

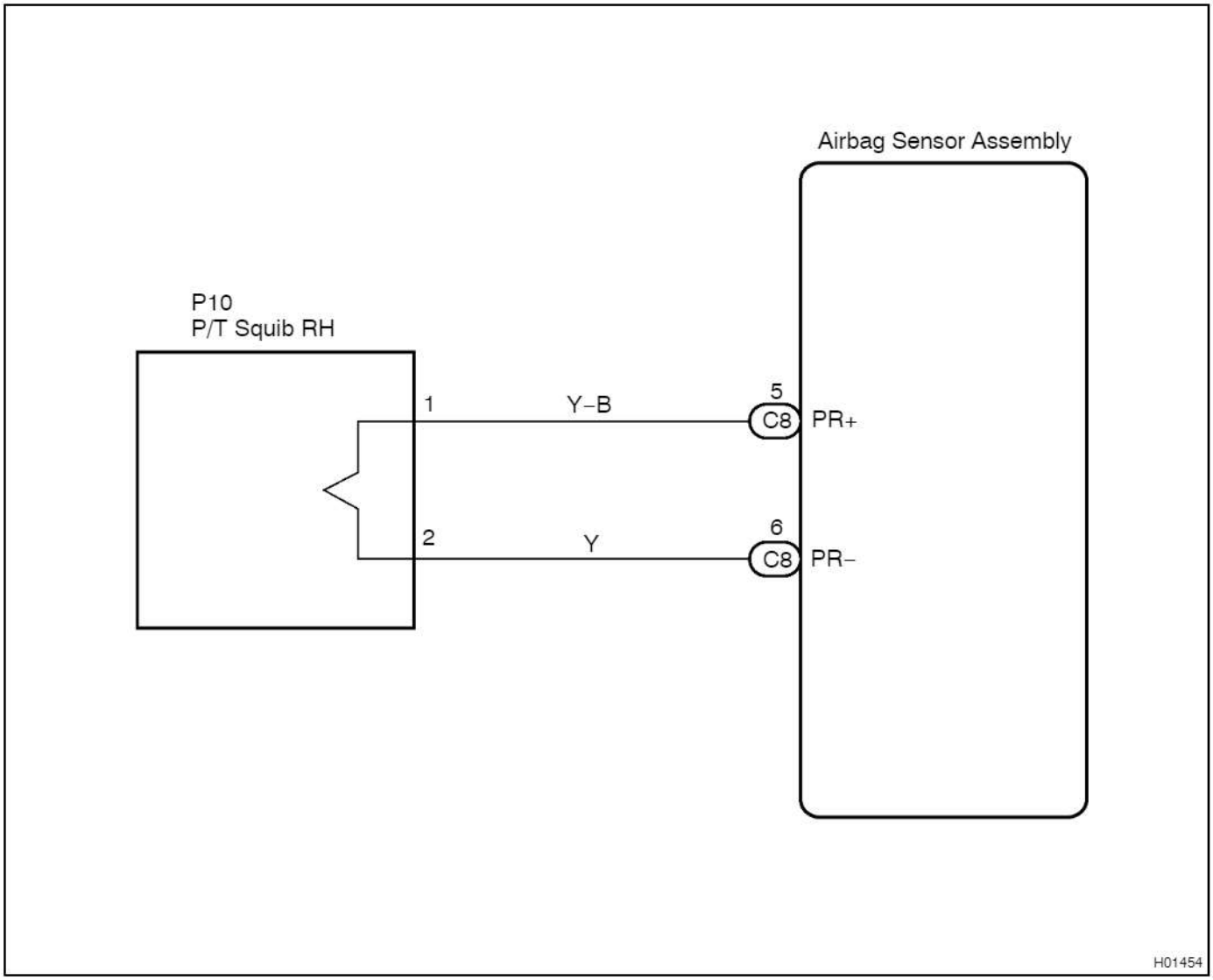
DTC	B0130/63	Short in P/T Squib RH Circuit

CIRCUIT DESCRIPTION

The P/T squib RH circuit consists of the airbag sensor assembly and the seat belt pretensioner RH.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
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 wire harness • P/T squib RH malfunction • Airbag sensor assembly malfunction	• Seat belt pretensioner RH (P/T squib RH) • Airbag sensor assembly • Floor wire

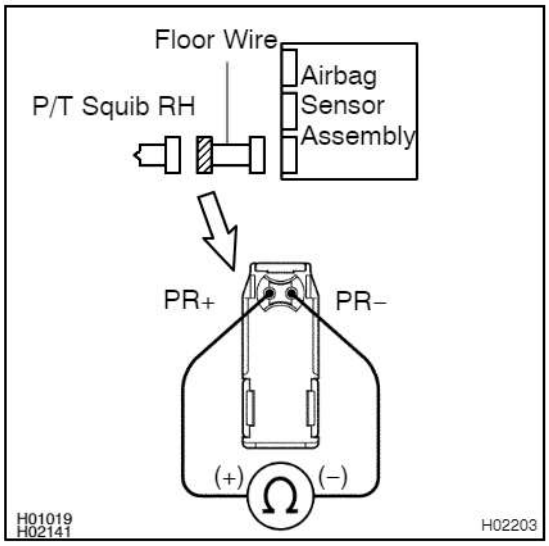
WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Prepare for inspection (See step 1 on page DI–1025).**

2	**Check floor wire.**



PREPARATION:
Release the airbag activation prevention mechanism built in the connector of the floor wire on the airbag sensor assembly side (See page DI–884).

CHECK:
Measure the resistance between PR+ and PR– of the floor wire connector on the seat belt pretensioner RH (P/T squib RH) side.

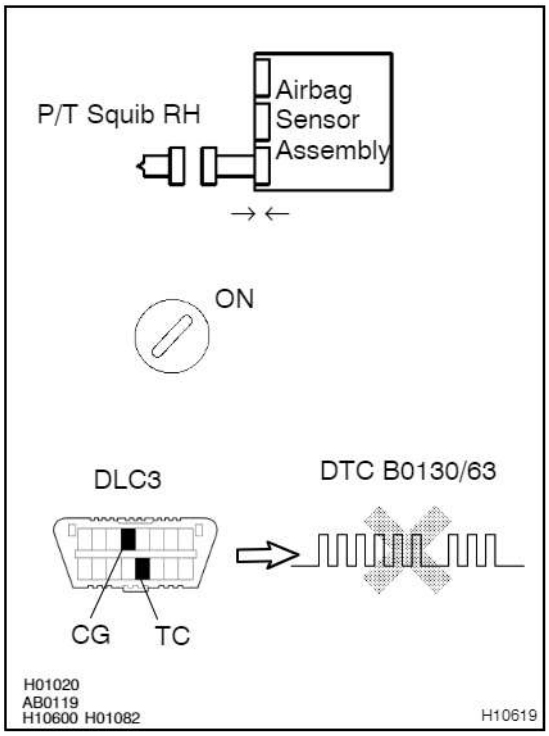
OK:

Resistance: 1 MΩ or Higher

NG	**Repair or replace floor wire.**

OK

3	Check airbag sensor assembly.



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.
(b) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(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 DI–884).

OK:

DTC B0130/63 is not output.

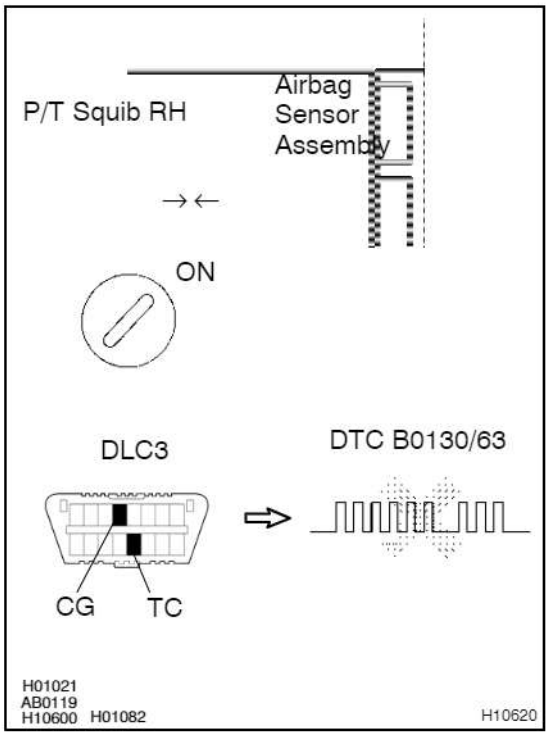
HINT:

Codes other than code B0130/63 may be output at this time, but they are not relevant to this check.

NG	Replace airbag sensor assembly.

OK

4	Check P/T squib RH.



PREPARATION:

(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 (P/T squib RH) connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(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 DI–884).

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 seat belt pretensioner RH (P/T squib RH).**

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

D6PK–23

DTC	B0131/64	Open in P/T Squib RH Circuit

CIRCUIT DESCRIPTION

The P/T squib RH circuit consists of the airbag sensor assembly and the seat belt pretensioner RH.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
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 wire harness • P/T squib RH malfunction • Airbag sensor assembly malfunction	• Seat belt pretensioner RH (P/T squib RH) • Airbag sensor assembly • Floor wire

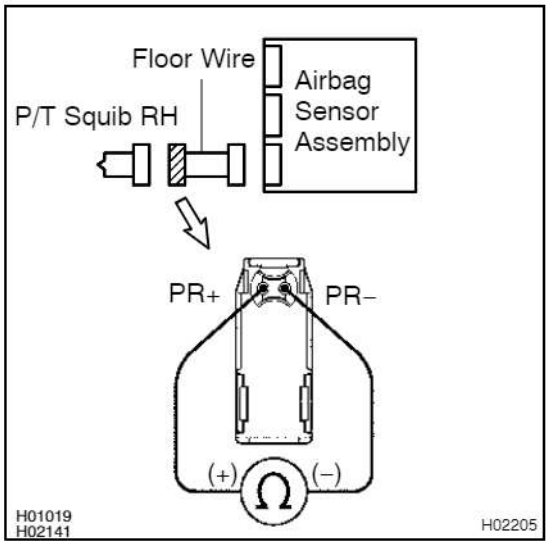
WIRING DIAGRAM

See page DI–954.

INSPECTION PROCEDURE

1	**Prepare for inspection (See step 1 on page DI–1025).**

2	**Check floor wire.**



CHECK:

Measure the resistance between PR+ and PR– of the floor wire connector on the seat belt pretensioner RH (P/T squib RH) side.

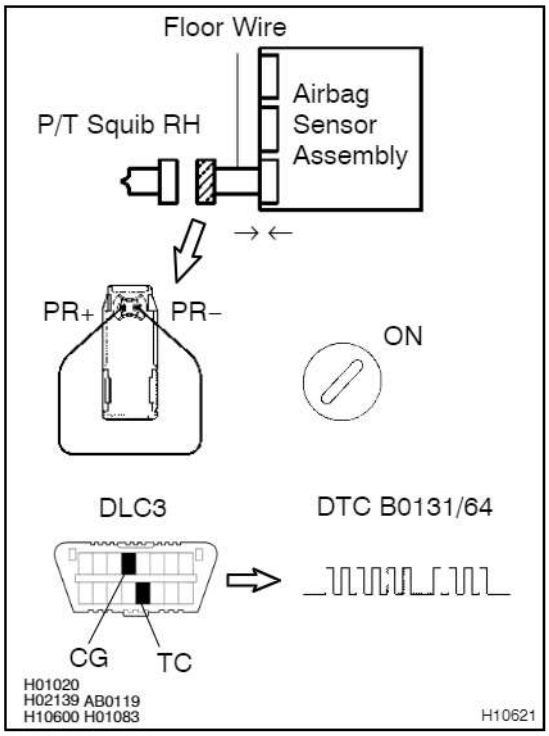
OK:

Resistance: Below 1 Ω

NG → **Repair or replace floor wire.**

OK

3	Check airbag sensor assembly.



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.
(b) Using a service wire, connect PR+ and PR– of the floor wire connector on the seat belt pretensioner RH (P/T squib RH) side.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(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 DI–884).

OK:

DTC B0131/64 is not output.

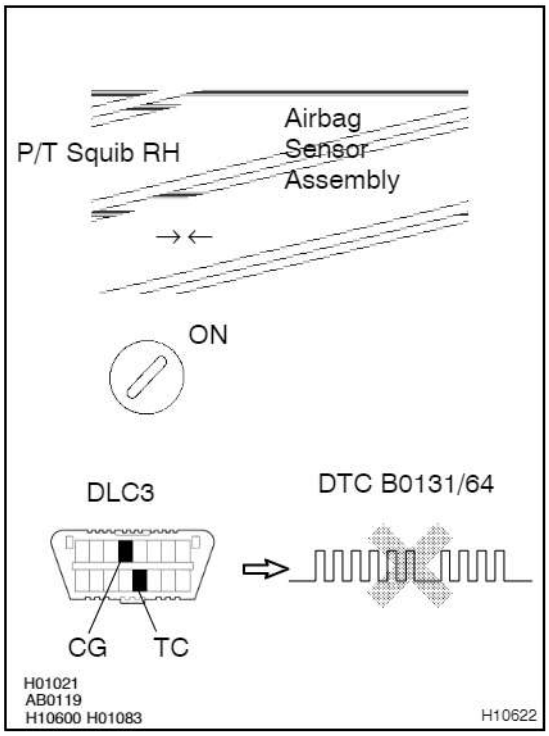
HINT:

Codes other than code B0131/64 may be output at this time, but they are not relevant to this check.

NG	Replace airbag sensor assembly.

OK

4	Check P/T squib RH.



PREPARATION:

(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 (P/T squib RH) connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(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 DI–884).

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 seat belt pretensioner RH (P/T squib RH).**

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

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 assembly and the seat belt pretensioner RH.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
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 wire harness (to ground) • P/T squib RH malfunction • Airbag sensor assembly malfunction	• Seat belt pretensioner RH (P/T squib RH) • Airbag sensor assembly • Floor wire

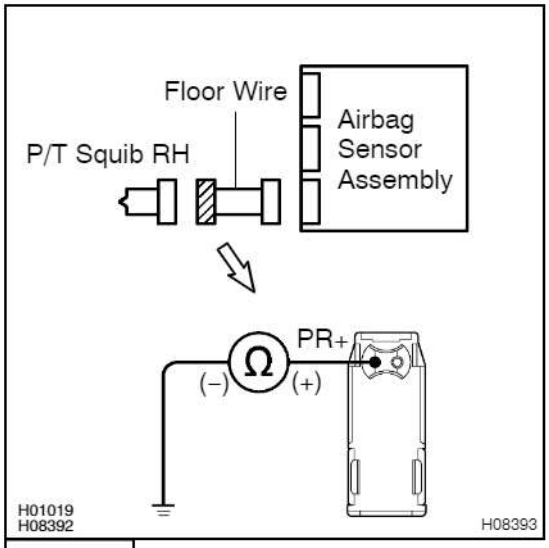
WIRING DIAGRAM

See page DI–954.

INSPECTION PROCEDURE

1	**Prepare for inspection (See step 1 on page DI–1025).**

2	**Check floor wire.**



CHECK:

Measure the resistance between the body ground and PR+ of the floor wire connector on the seat belt pretensioner RH (P/T squib RH) side.

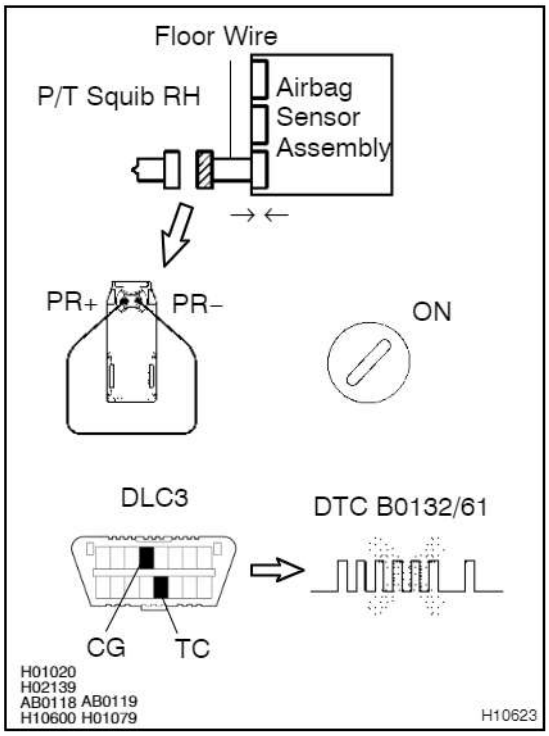
OK:

Resistance: 1 MΩ or Higher

NG → **Repair or replace floor wire.**

OK

3	Check airbag sensor assembly.



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.
(b) Using a service wire, connect PR+ and PR– of the floor wire connector on the seat belt pretensioner RH (P/T squib RH) side.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(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 DI–884).

OK:

DTC B0132/61 is not output.

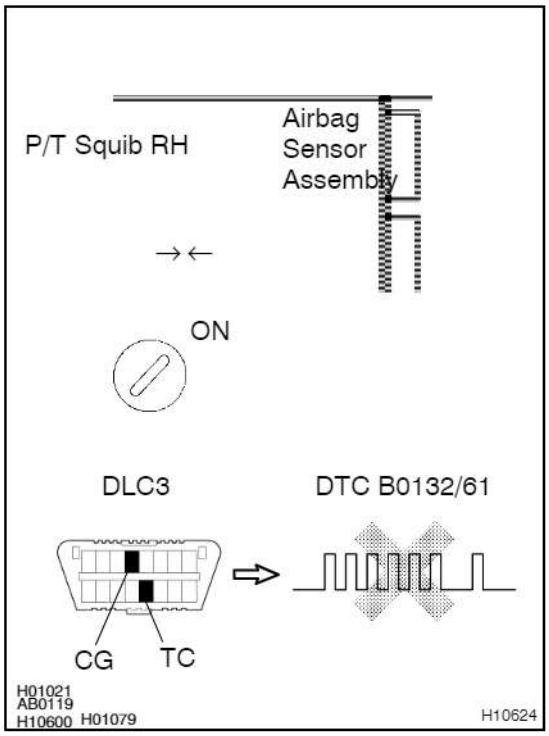
HINT:

Codes other than code B0132/61 may be output at this time, but they are not relevant to this check.

NG	Replace airbag sensor assembly.

OK

4	Check P/T squib RH.



PREPARATION:

(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 (P/T squib RH) connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(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 DI–884).

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 seat belt pretensioner RH (P/T squib RH).**

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check. If the malfunctioning part can not be detected by the simulation method, replace all SRS components including the wire harness.

D6FM-23

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 assembly and the seat belt pretensioner RH.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS-2.
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 wire harness (to B+) • P/T squib RH malfunction • Airbag sensor assembly malfunction	• Seat belt pretensioner RH (P/T squib RH) • Airbag sensor assembly • Floor wire

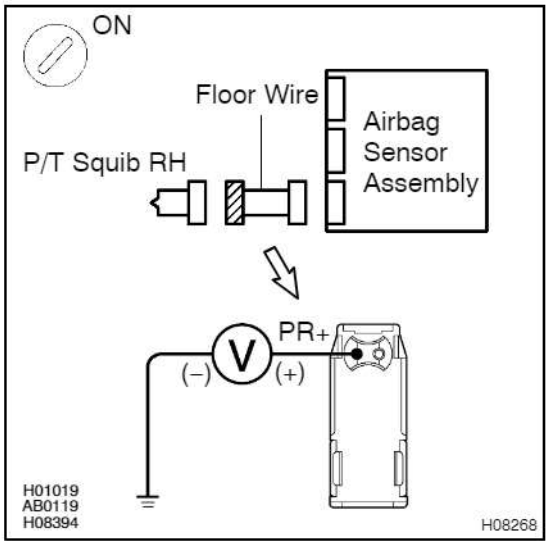
WIRING DIAGRAM

See page DI-954.

INSPECTION PROCEDURE

1	**Prepare for inspection (See step 1 on page DI-1025).**

2	**Check floor wire.**



CHECK:

(a) Turn the ignition switch to ON.

(b) Measure the voltage between the body ground and PR+ of the floor wire connector on the seat belt pretensioner RH (P/T squib RH) side.

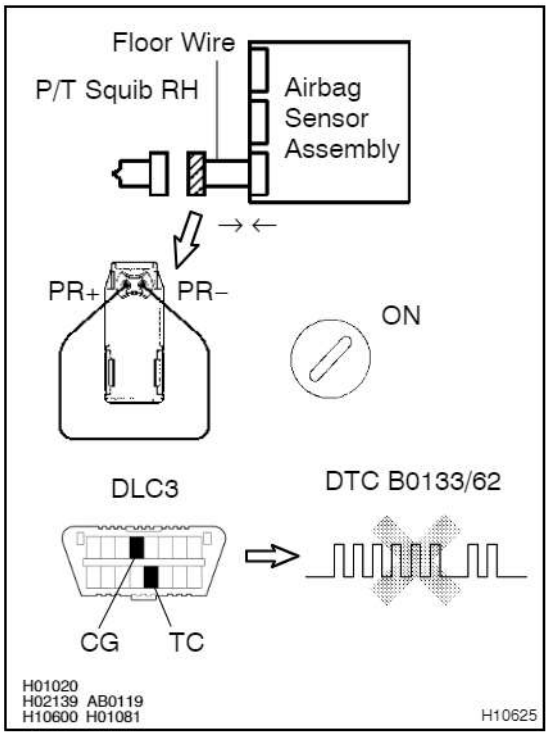
OK:

Voltage: Below 1 V

NG → **Repair or replace floor wire.**

OK

3	Check airbag sensor assembly.



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.
(b) Using a service wire, connect PR+ and PR– of the floor wire connector on the seat belt pretensioner RH (P/T squib RH) side.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(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 DI–884).

OK:

DTC B0133/62 is not output.

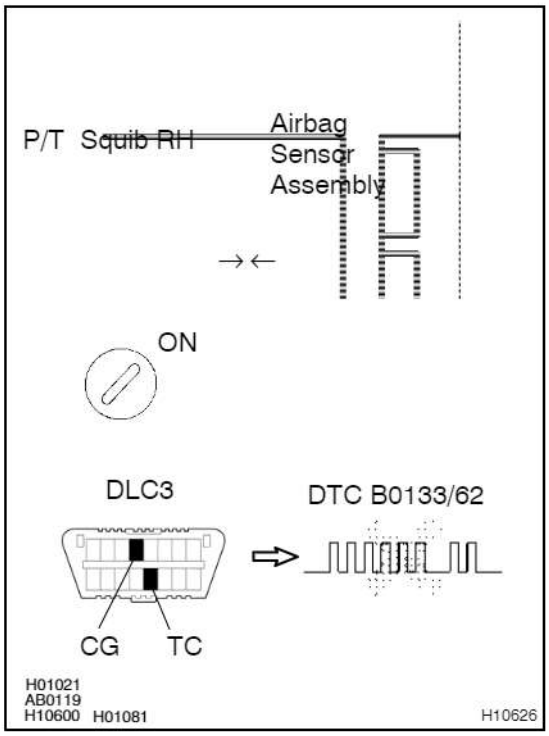
HINT:

Codes other than code B0133/62 may be output at this time, but they are not relevant to this check.

NG	Replace airbag sensor assembly.

OK

4	Check P/T squib RH.



PREPARATION:

(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 (P/T squib RH) connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(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 DI–884).

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 seat belt pretensioner RH (P/T squib RH).**

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check. If the malfunctioning part can not be detected by the simulation method, replace all SRS components including the wire harness.

DI6PN–34

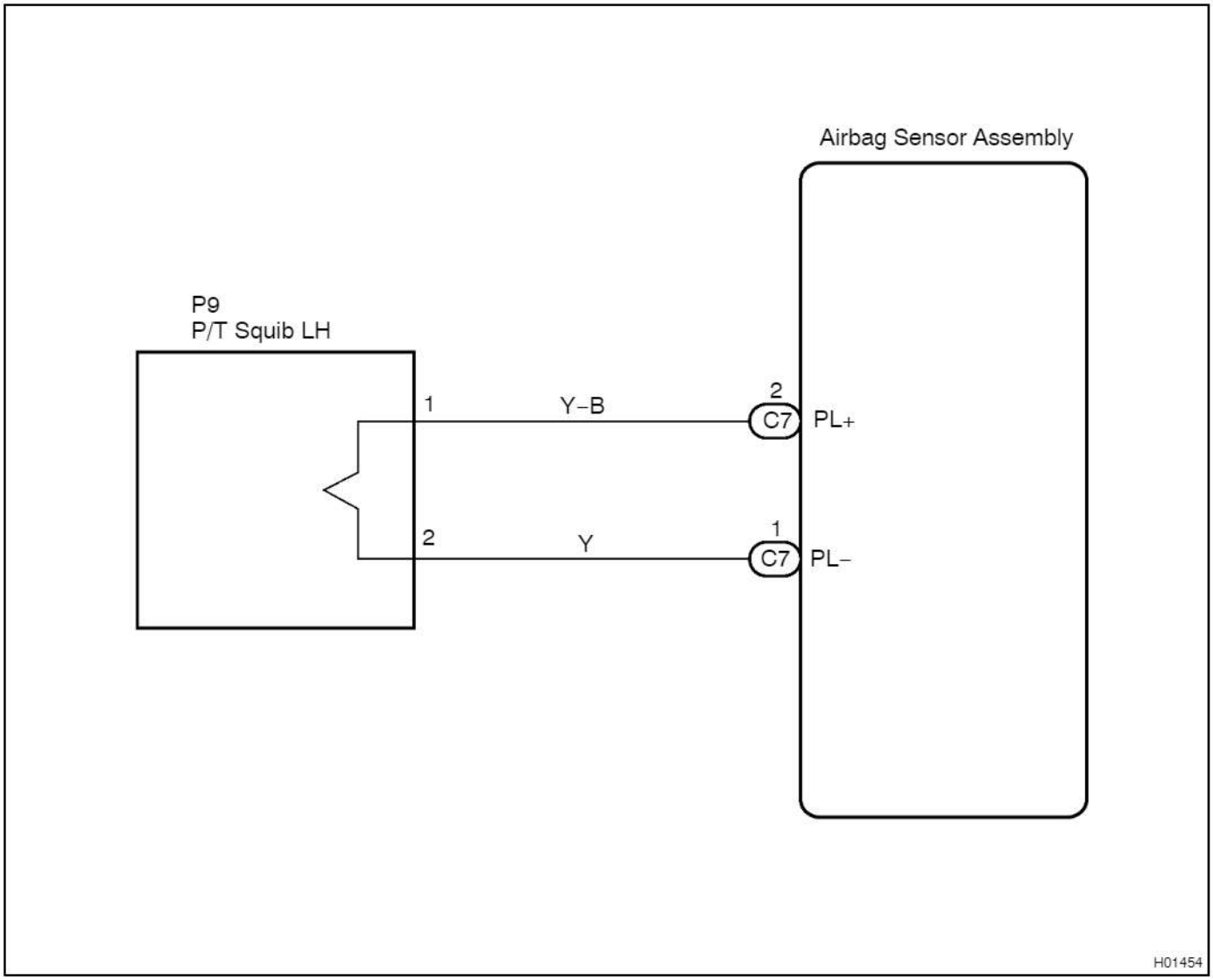
DTC	B0135/73	Short in P/T Squib LH Circuit

CIRCUIT DESCRIPTION

The P/T squib LH circuit consists of the airbag sensor assembly and the seat belt pretensioner LH.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
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 wire harness • P/T squib LH malfunction • Airbag sensor assembly malfunction	• Seat belt pretensioner LH (P/T squib LH) • Airbag sensor assembly • Floor wire

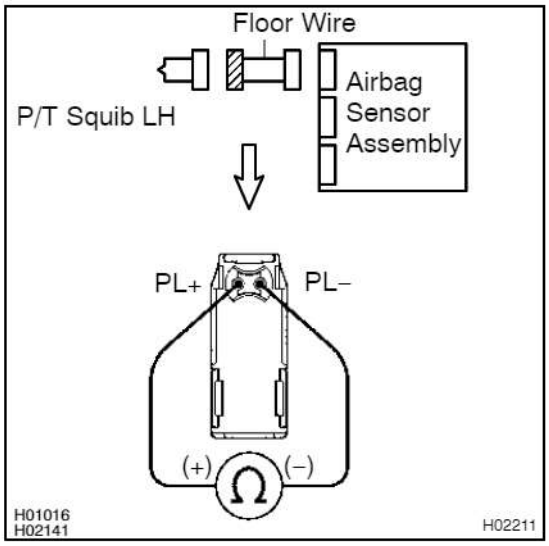
WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Prepare for inspection (See step 1 on page DI–1025).**

2	**Check floor wire.**



PREPARATION:

Release the airbag activation prevention mechanism built in the connector of the floor wire on the airbag sensor assembly side.(See page DI–884).

CHECK:

Measure the resistance between PL+ and PL– of the floor wire connector on the seat belt pretensioner LH (P/T squib LH) side.

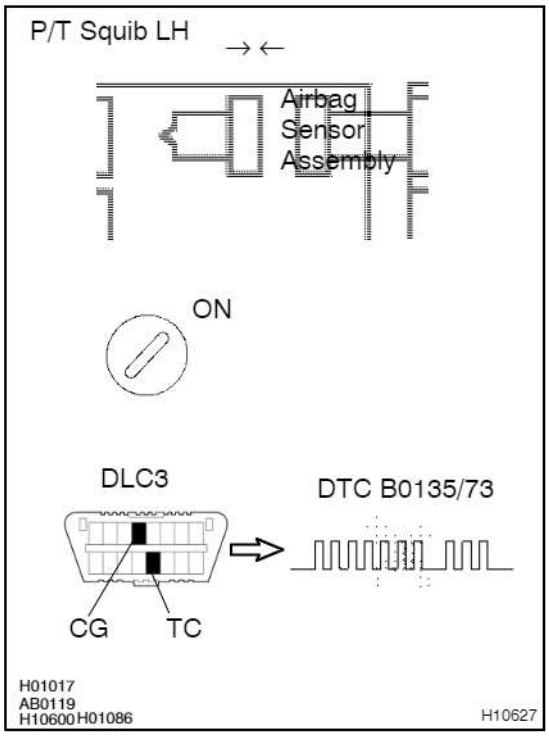
OK:

Resistance: 1 MΩ or Higher

NG	**Repair or replace floor wire.**

OK

3	Check airbag sensor assembly.



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.
(b) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(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 DI–884).

OK:

DTC B0135/73 is not output.

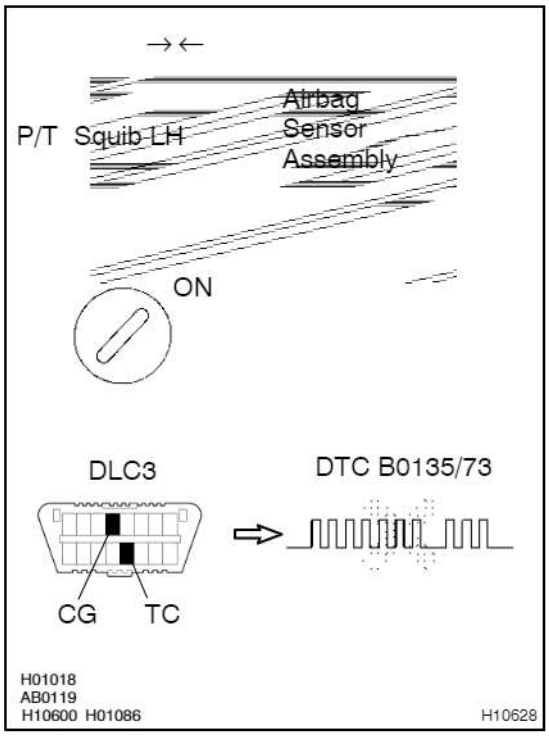
HINT:

Codes other than code B0135/73 may be output at this time, but they are not relevant to this check.

NG → **Replace airbag sensor assembly.**

OK

4	Check P/T squib LH.



PREPARATION:

(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 (P/T squib LH) connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(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 DI–884).

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 seat belt pretensioner LH (P/T squib LH).**

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

D6PO-23

DTC	B0136/74	Open in P/T Squib LH Circuit

CIRCUIT DESCRIPTION

The P/T squib LH circuit consists of the airbag sensor assembly and the seat belt pretensioner LH.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
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 wire harness • P/T squib LH malfunction • Airbag sensor assembly malfunction	• Seat belt pretensioner LH (P/T squib LH) • Airbag sensor assembly • Floor wire

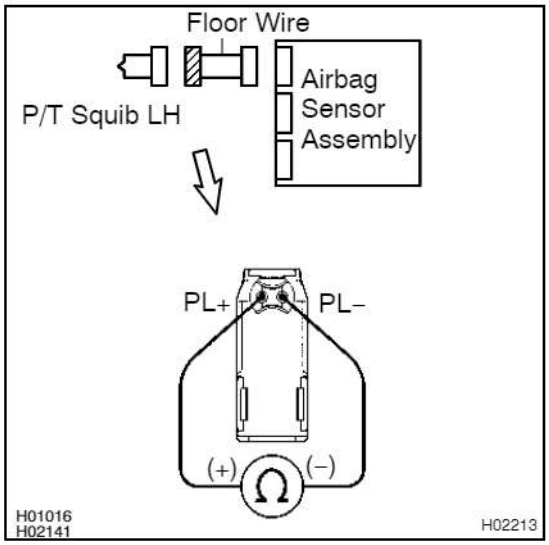
WIRING DIAGRAM

See page DI–967.

INSPECTION PROCEDURE

1	**Prepare for inspection (See step 1 on page DI–1025).**

2	**Check floor wire.**



CHECK:

Measure the resistance between PL+ and PL– of the floor wire connector on the seat belt pretensioner LH (P/T squib LH) side.

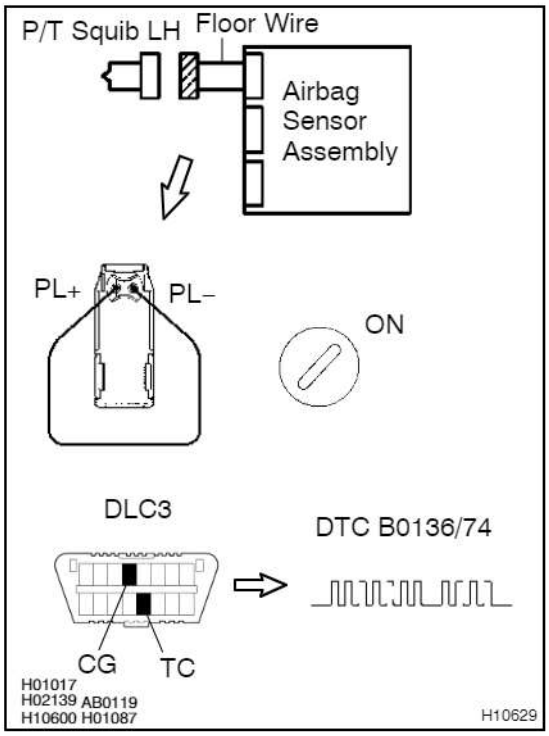
OK:

Resistance: Below 1 Ω

NG → **Repair or replace floor wire.**

OK

3	Check airbag sensor assembly.



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.
(b) Using a service wire, connect PL+ and PL– of the floor wire connector on the seat belt pretensioner LH (P/T squib LH) side.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(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 DI–884).

OK:

DTC B0136/74 is not output.

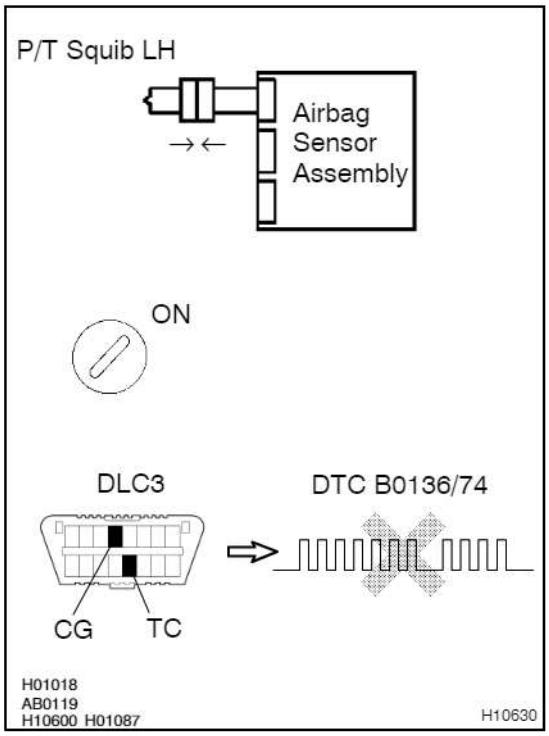
HINT:

Codes other than code B0136/74 may be output at this time, but they are not relevant to this check.

NG	Replace airbag sensor assembly.

OK

4	Check P/T squib LH.



PREPARATION:

(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 (P/T squib LH) connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(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 DI–884).

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 seat belt pretensioner LH (P/T squib LH).**

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

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 assembly and the seat belt pretensioner LH.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
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 wire harness (to ground) • P/T squib LH malfunction • Airbag sensor assembly malfunction	• Seat belt pretensioner LH (P/T squib LH) • Airbag sensor assembly • Floor wire

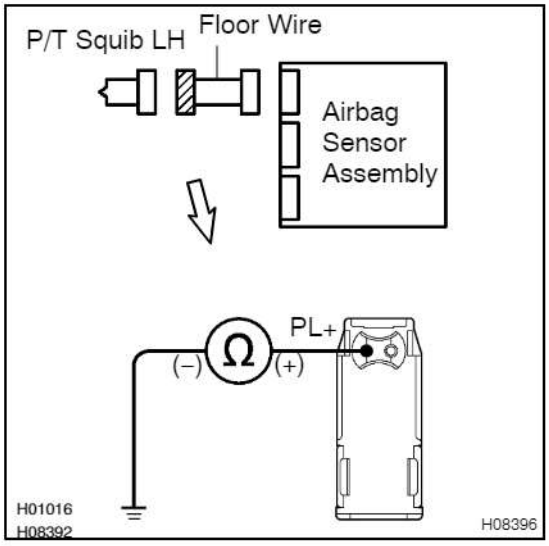
WIRING DIAGRAM

See page DI–967.

INSPECTION PROCEDURE

1	**Prepare for inspection (See step 1 on page DI–1025).**

2	**Check floor wire.**



CHECK:

Measure the resistance between the body ground and PL+ of the floor wire connector on the seat belt pretensioner LH (P/T squib LH) side.

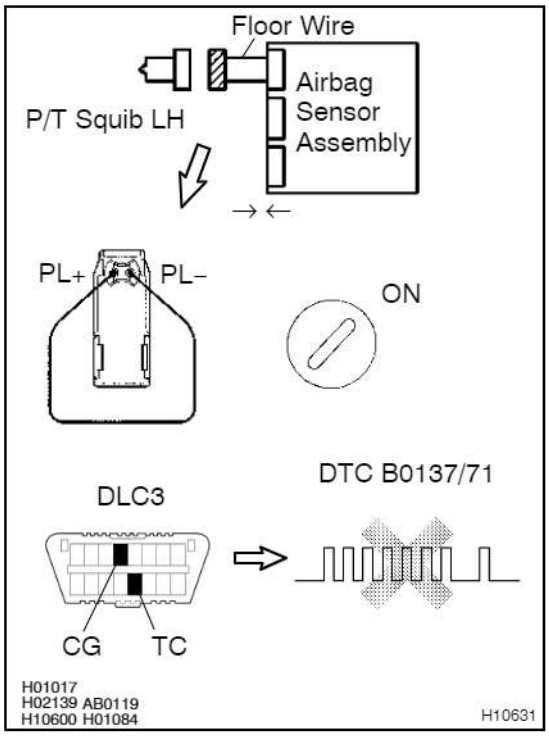
OK:

Resistance: 1 MΩ or Higher

NG → **Repair or replace floor wire.**

OK

3	Check airbag sensor assembly.



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.
(b) Using a service wire, connect PL+ and PL– of the floor wire connector on the seat belt pretensioner LH (P/T squib LH) side.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(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 DI–884).

OK:

DTC B0137/71 is not output.

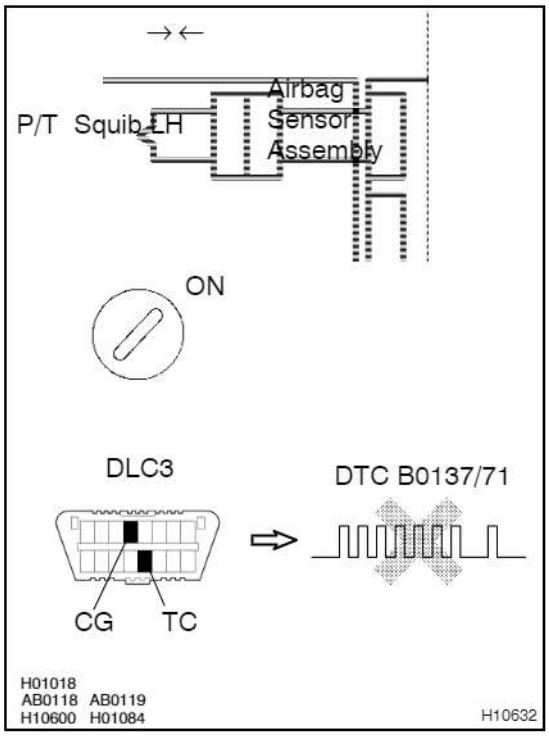
HINT:

Codes other than code B0137/71 may be output at this time, but they are not relevant to this check.

NG	Replace airbag sensor assembly.

OK

4	Check P/T squib LH.



PREPARATION:

(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 (P/T squib LH) connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(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 DI–884).

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 seat belt pretensioner LH (P/T squib LH).**

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check. If the malfunctioning part can not be detected by the simulation method, replace all SRS components including the wire harness.

D6PQ-23

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 assembly and the seat belt pretensioner LH.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
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 wire harness (to B+) • P/T squib LH malfunction • Airbag sensor assembly malfunction	• Seat belt pretensioner LH (P/T squib LH) • Airbag sensor assembly • Floor wire

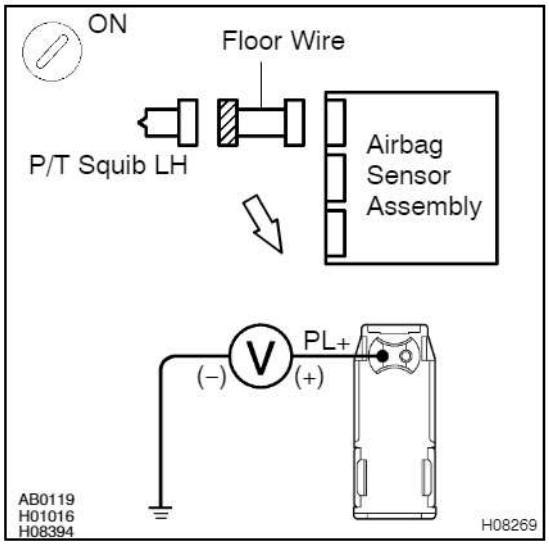
WIRING DIAGRAM

See page DI–967.

INSPECTION PROCEDURE

1	**Prepare for inspection (See step 1 on page DI–1025).**

2	**Check floor wire.**



CHECK:

(a) Turn the ignition switch to ON.

(b) Measure the voltage between the body ground and PL+ of the floor wire connector on the seat belt pretensioner LH (P/T squib LH) side.

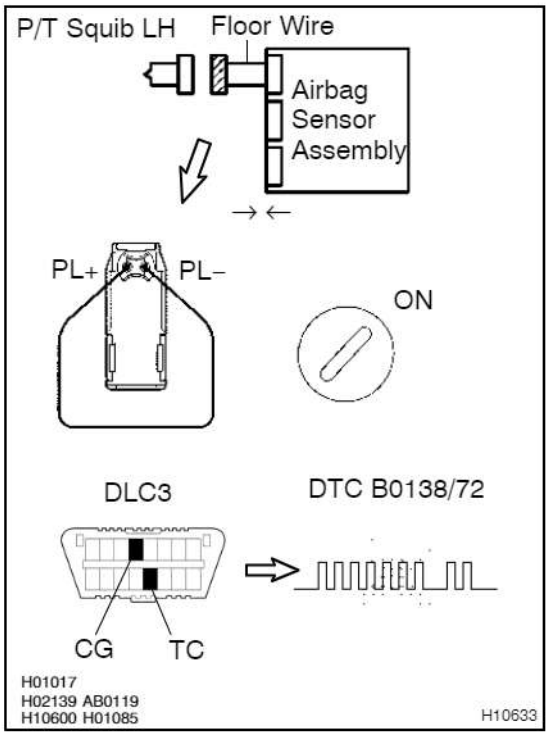
OK:

Voltage: Below 1 V

NG	**Repair or replace floor wire.**

OK

3	Check airbag sensor assembly.



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.
(b) Using a service wire, connect PL+ and PL– of the floor wire connector on the seat belt pretensioner LH (P/T squib LH) side.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(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 DI–884).

OK:

DTC B0138/72 is not output.

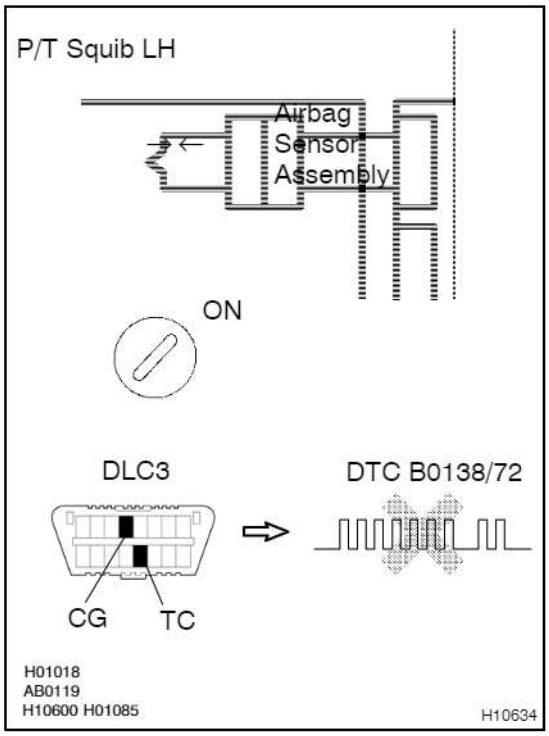
HINT:

Codes other than code B0138/72 may be output at this time, but they are not relevant to this check.

NG	Replace airbag sensor assembly.

OK

4	Check P/T squib LH.



PREPARATION:

(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 (P/T squib LH) connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(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 DI–884).

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 seat belt pretensioner LH (P/T squib LH).**

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check. If the malfunctioning part can not be detected by the simulation method, replace all SRS components including the wire harness.

D6PR-21

DTC	B1100/31	Airbag Sensor Assembly Malfunction

CIRCUIT DESCRIPTION

The airbag sensor assembly consists of the airbag sensor, safing sensor, drive circuit, diagnosis circuit and ignition control, etc.
It receives signals from the airbag sensor, judges whether or not the SRS must be activated, and detects diagnosis system malfunction.
DTC B1100/31 is recorded when occurrence of a malfunction in the airbag sensor assembly is detected.

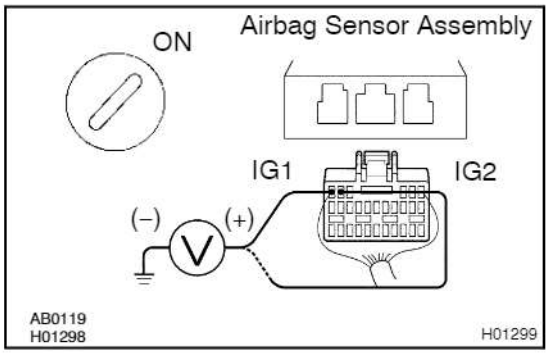
DTC No.	DTC Detecting Condition	Trouble Area
B1100/31	• Airbag sensor assembly malfunction	• Airbag sensor assembly

INSPECTION PROCEDURE

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.

1	**Prepare for inspection (See step 1 on page DI–1025).**

2	**Check voltage at IG1 and IG2 of airbag sensor assembly.**



CHECK:

(a) Turn the ignition switch to ON.
(b) Measure the voltage between the body ground and each of terminals IG1 and IG2 of the airbag sensor assembly connector.

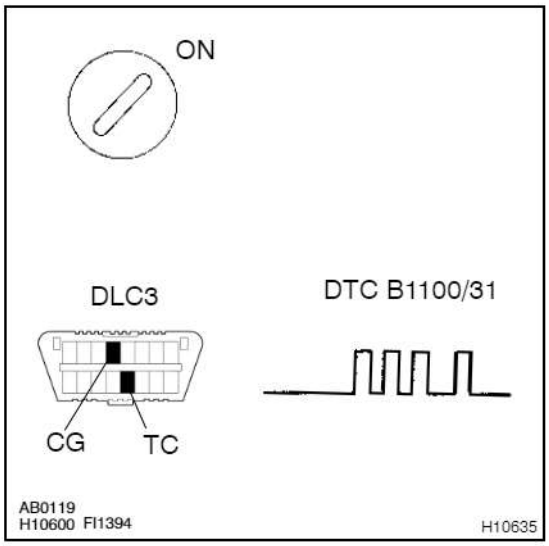
OK:

Voltage: 10 – 14 V

NG	**Check that an abnormality occurs on the battery and charging system.**

OK

3	Is DTC B1100/31 output again?



PREPARATION:

Clear the DTC (See page DI–884).

CHECK:

(a) Turn the ignition switch to LOCK, and wait at least for 10 seconds.

(b) Turn the ignition switch to ON, and wait at least for 10 seconds.

(c) Repeat operation in step (a) and (b) at least 5 times.

(d) Check the DTC (See page DI–884).

OK:

DTC B1100/31 is output.

HINT:

Codes other than code B1100/31 may be output at this time, but they are not relevant to this check.

NO → **Using simulation method, reproduce malfunction symptoms (See page IN–20).**

YES

Replace airbag sensor assembly.

DIAIQ-03

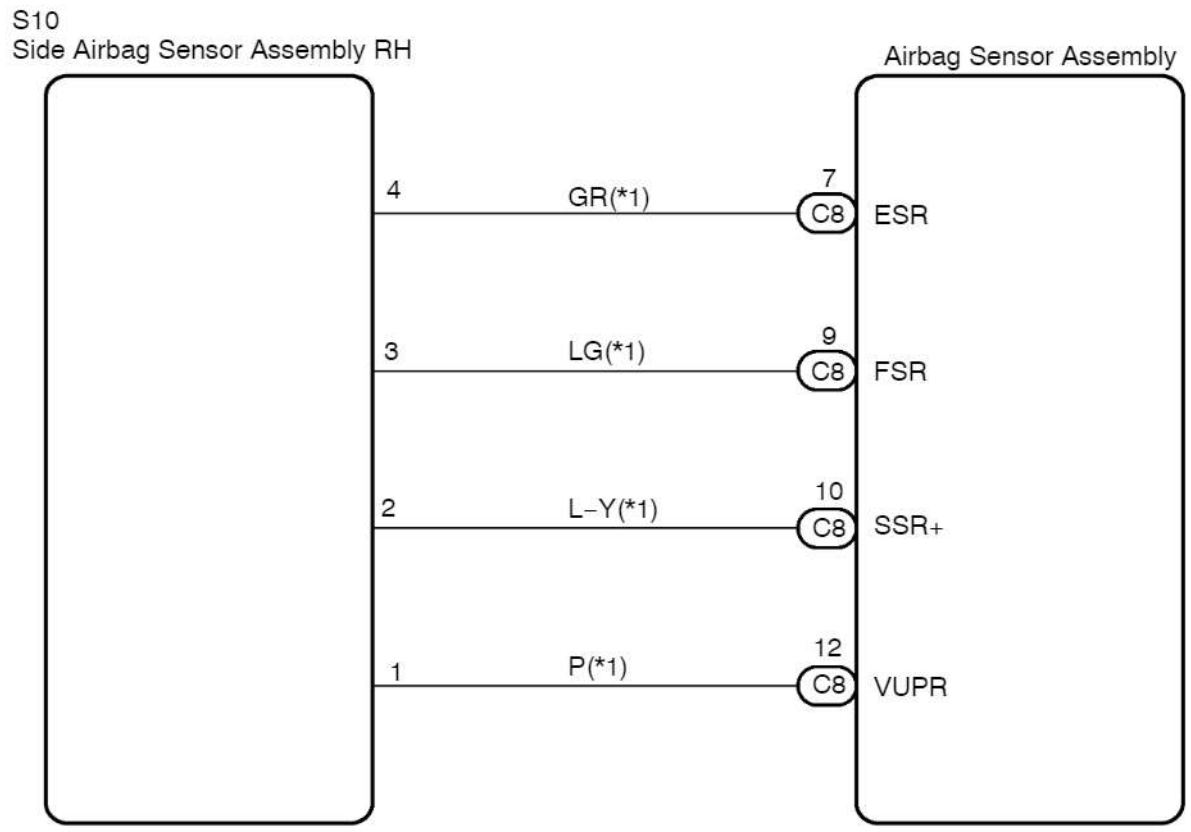
DTC	B1140/32	Side Airbag Sensor Assembly RH Malfunction

CIRCUIT DESCRIPTION

The side airbag sensor assembly 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 B1140/32 is recorded when occurrence of a malfunction in the side airbag sensor assembly RH is detected.

DTC No.	DTC Detecting Condition	Trouble Area
B1140/32	• Side airbag sensor assembly RH malfunction	• Side airbag sensor assembly RH • Floor wire • Airbag sensor assembly

WIRING DIAGRAM

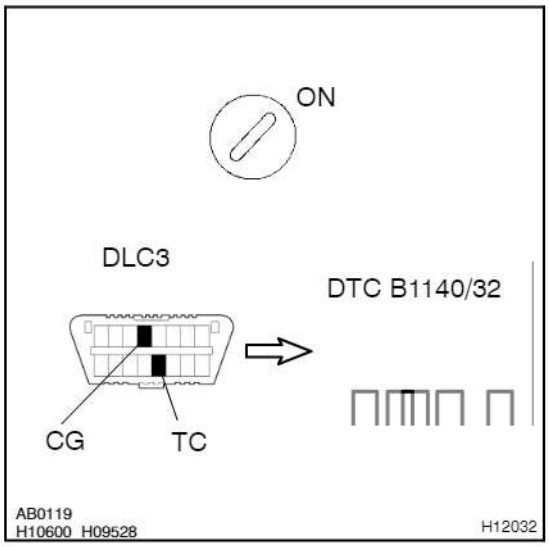


*1: w/ Side Airbag

H01450

INSPECTION PROCEDURE

1	Is DTC B1140/32 output?



CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(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 DI–884).

OK:

DTC B1140/32 is output.

HINT:

Codes other than code B1140/32 may be output at this time, but they are not relevant to this check.

NO → **The malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.**

YES

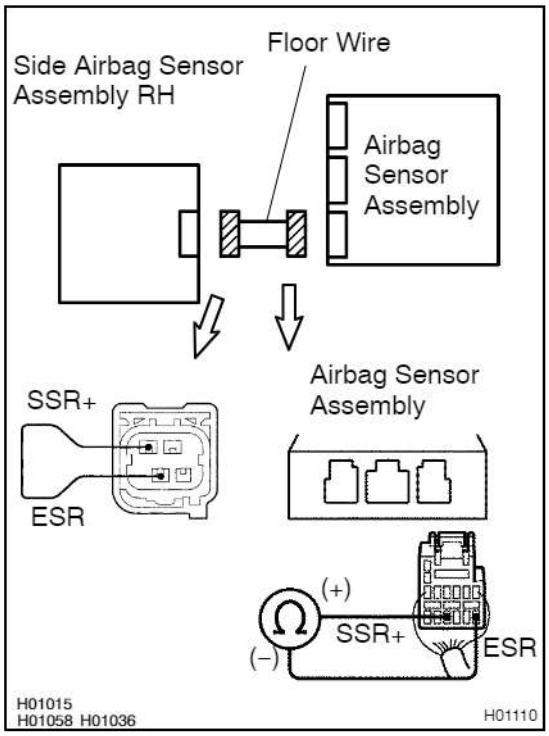
2	Is connector of side airbag sensor assembly RH properly connected?

NO → **Connect connector.**

YES

3	Prepare for inspection (See step 1 on DI–1025).

4	Check floor wire.



PREPARATION:

Using a service wire, connect SSR+ and ESR of the floor wire connector on the side airbag sensor assembly RH side.

CHECK:

Measure the resistance between SSR+ and ESR of the floor wire connector on the airbag sensor assembly side.

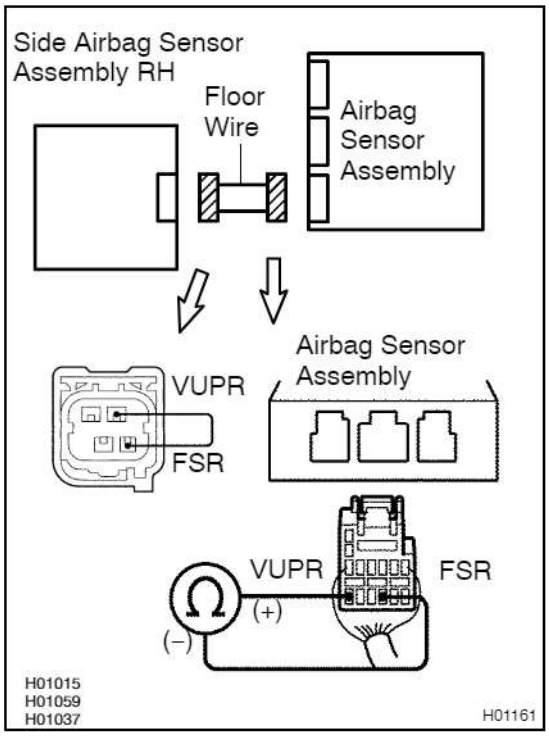
OK:

Resistance: Below 1 Ω

NG → **Repair or replace floor wire.**

OK

5	Check floor wire.



PREPARATION:

Measure the resistance between VUPR and FSR of the floor wire connector on the airbag sensor assembly side.

CHECK:

Measure the resistance between the body ground and each of SSR+, VUPR and FSR of the floor wire connector on the airbag sensor assembly side.

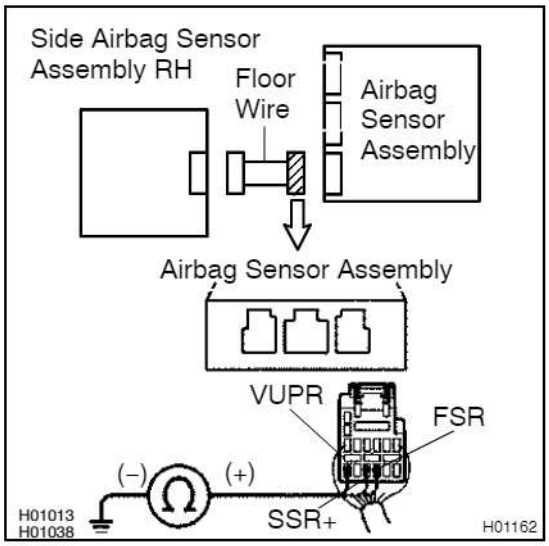
OK:

Resistance: Below 1 Ω

NG → **Repair or replace floor wire.**

OK

6	Check floor wire (to ground).



CHECK:

Measure the resistance between the body ground and each of SSR+, VUPR and FSR of the floor wire connector on the airbag sensor assembly side.

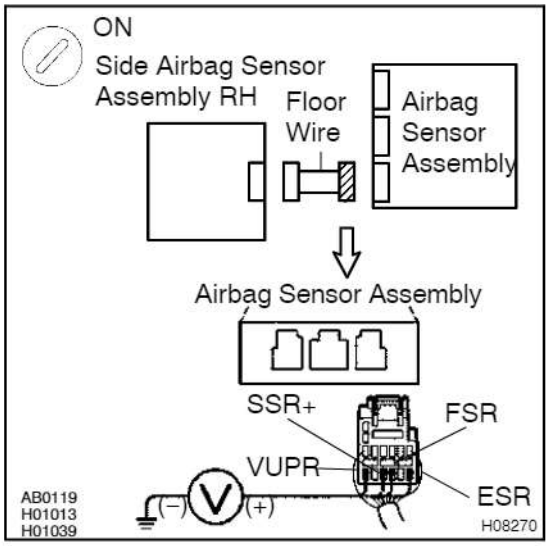
OK:

Resistance: 1M Ω or Higher

NG → **Repair or replace floor wire.**

OK

7	Check floor wire (to B+).



CHECK:

(a) Turn the ignition switch to ON.

(b) Measure the voltage between the body ground and each of VUPR, SSR+, FSR and ESR of the floor wire connector on the airbag sensor assembly side.

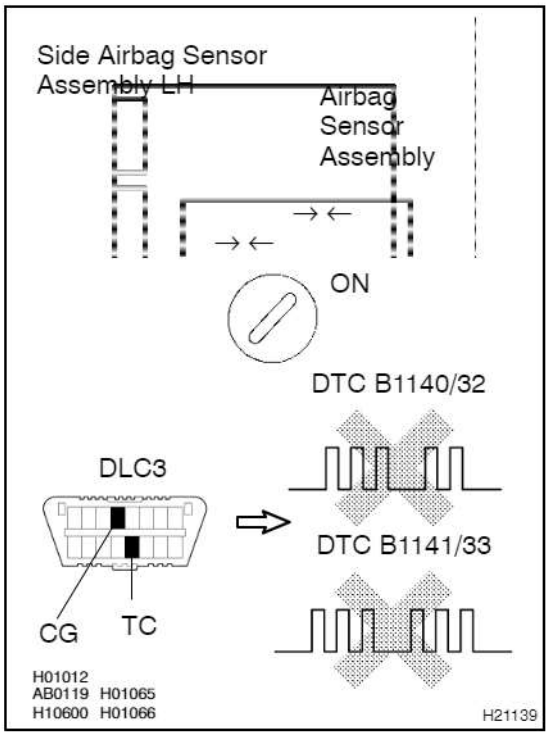
OK:

Voltage: Below 1 V

NG → **Repair or replace floor wire.**

OK

8	Check airbag sensor assembly.



PREPARATION:

(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 airbag sensor assembly.
(d) Change the side airbag sensor assembly LH position with RH position.
(e) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(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 DI–884).

OK:

Neither DTC B1140/32 nor B1141/33 are not output.

HINT:

Codes other than code B1140/32 or B1141/33 may be output at this time, but they are not relevant to this check.

NG → **Replace airbag sensor assembly (DTC B1140/32 is output).**

NG → **Replace side airbag sensor assembly RH (DTC B1141/33 is output).**

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

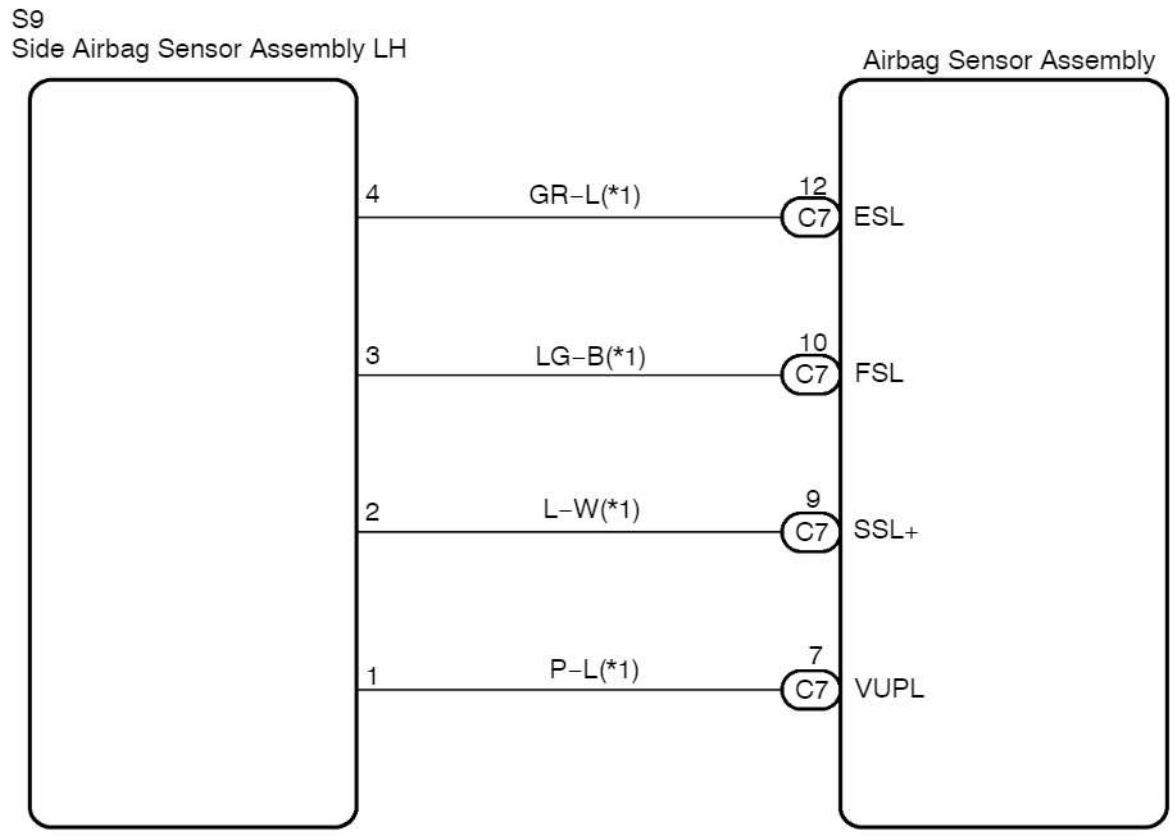
DTC	B1141/33	Side Airbag Sensor Assembly LH Malfunction

CIRCUIT DESCRIPTION

The side airbag sensor assembly LH 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 B1141/33 is recorded when occurrence of a malfunction in the side airbag sensor assembly LH is detected.

DTC No.	DTC Detecting Condition	Trouble Area
B1141/33	• Side airbag sensor assembly LH malfunction	• Side airbag sensor assembly LH • Floor wire • Airbag sensor assembly

WIRING DIAGRAM

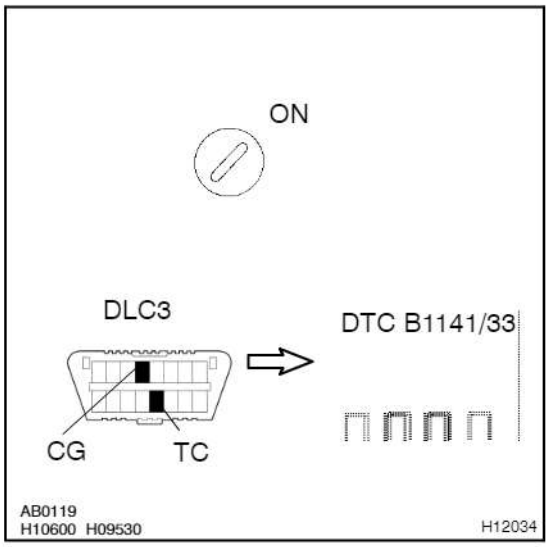


*1: w/ Side Airbag

H01450

INSPECTION PROCEDURE

1	Is DTC B1141/33 output?



CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(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 DI–884).

OK:

DTC B1141/33 is output.

HINT:

Codes other than code B1141/33 may be output at this time, but they are not relevant to this check.

NO → **The malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.**

YES

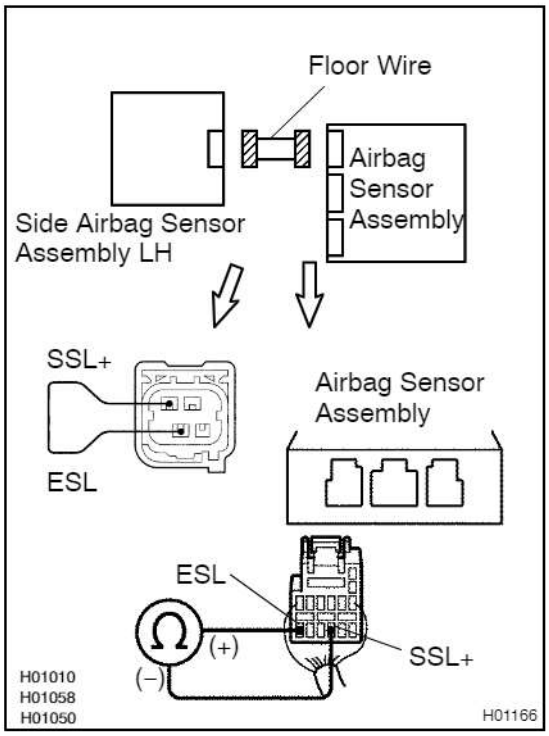
2	Is connector of side airbag sensor assembly LH properly connected?

NO → **Connect connector.**

YES

3	Prepare for inspection (See step 1 on page DI–1025).

4	Check floor wire.



PREPARATION:

Using a service wire, connect SSL+ and ESL of the floor wire connector on the side airbag sensor assembly LH side.

CHECK:

Measure the resistance between SSL+ and ESL of the floor wire connector on the airbag sensor assembly side.

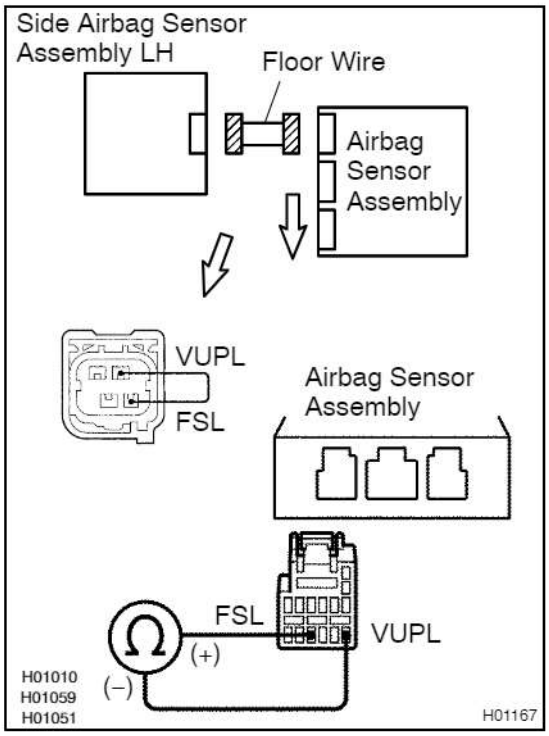
OK:

Resistance: Below 1 Ω

NG → **Repair or replace floor wire.**

OK

5	Check floor wire.



PREPARATION:

Using a service wire, connect VUPL and FSL of the floor wire connector on the side airbag sensor assembly LH side.

CHECK:

Measure the resistance between VUPL and FSL of the floor wire connector on the airbag sensor assembly side.

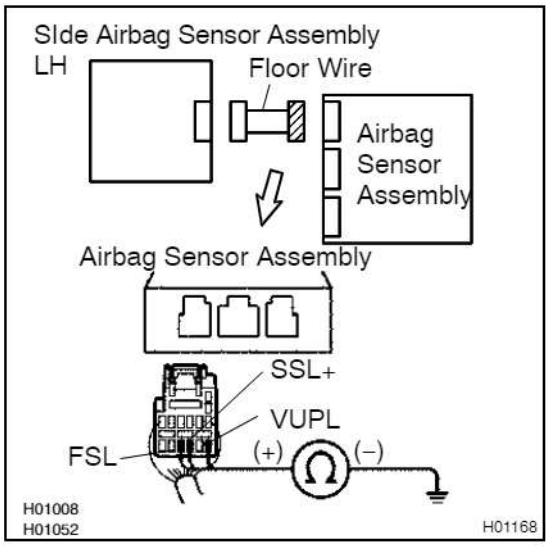
OK:

Resistance: Below 1 Ω

NG → **Repair or replace floor wire.**

OK

6	Check floor wire (to ground).



CHECK:

Measure the resistance between the body ground and each of VUPL, SSL+ and FSL of the floor wire connector on the airbag sensor assembly side.

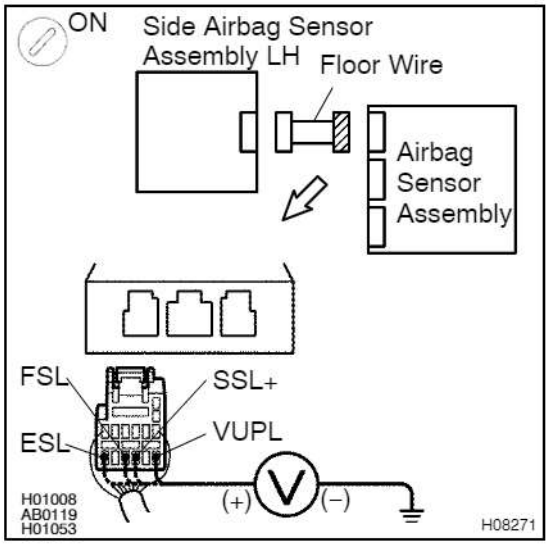
OK:

Resistance: 1 MΩ or Higher

NG → **Repair or replace floor wire.**

OK

7	Check floor wire (to B+).



CHECK:

(a) Turn the ignition switch to ON.

(b) Measure the voltage between the body ground and each of VUPL, SSL+, FSL and ESL of the floor wire connector on the airbag sensor assembly side.

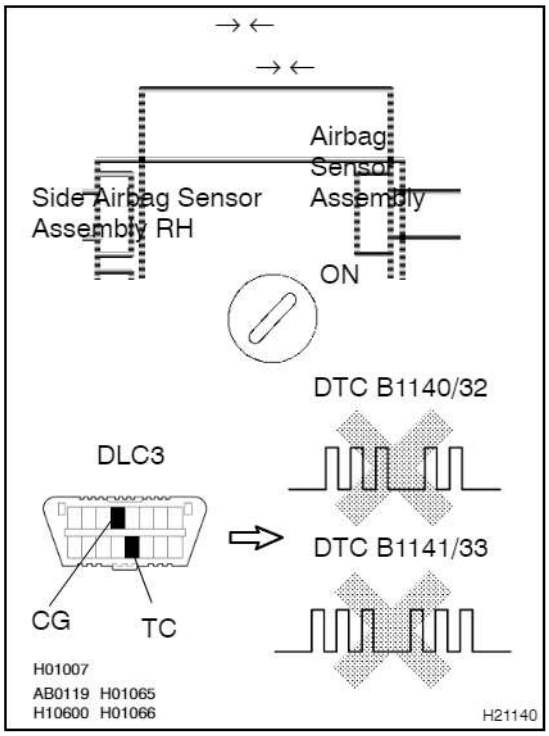
OK:

Voltage: Below 1 V

NG → **Repair or replace floor wire.**

OK

8	Check airbag sensor assembly.



PREPARATION:

(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 assembly.
(d) Change the side airbag sensor assembly RH position with LH position.
(e) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(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 DI–884).

OK:

Neither DTC B1141/33 nor B1140/32 are not output.

HINT:

Codes other than code B1141/33 or B1141/32 may be output at this time, but they are not relevant to this check.

NG	**Replace airbag sensor assembly (DTC B1141/33 is output).**

NG	**Replace side airbag sensor assembly LH (DTC B1140/32 is output).**

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

D6FU–09

DTC	B1142/B1143/34	Door Side Airbag Sensor RH Malfunction

CIRCUIT DESCRIPTION

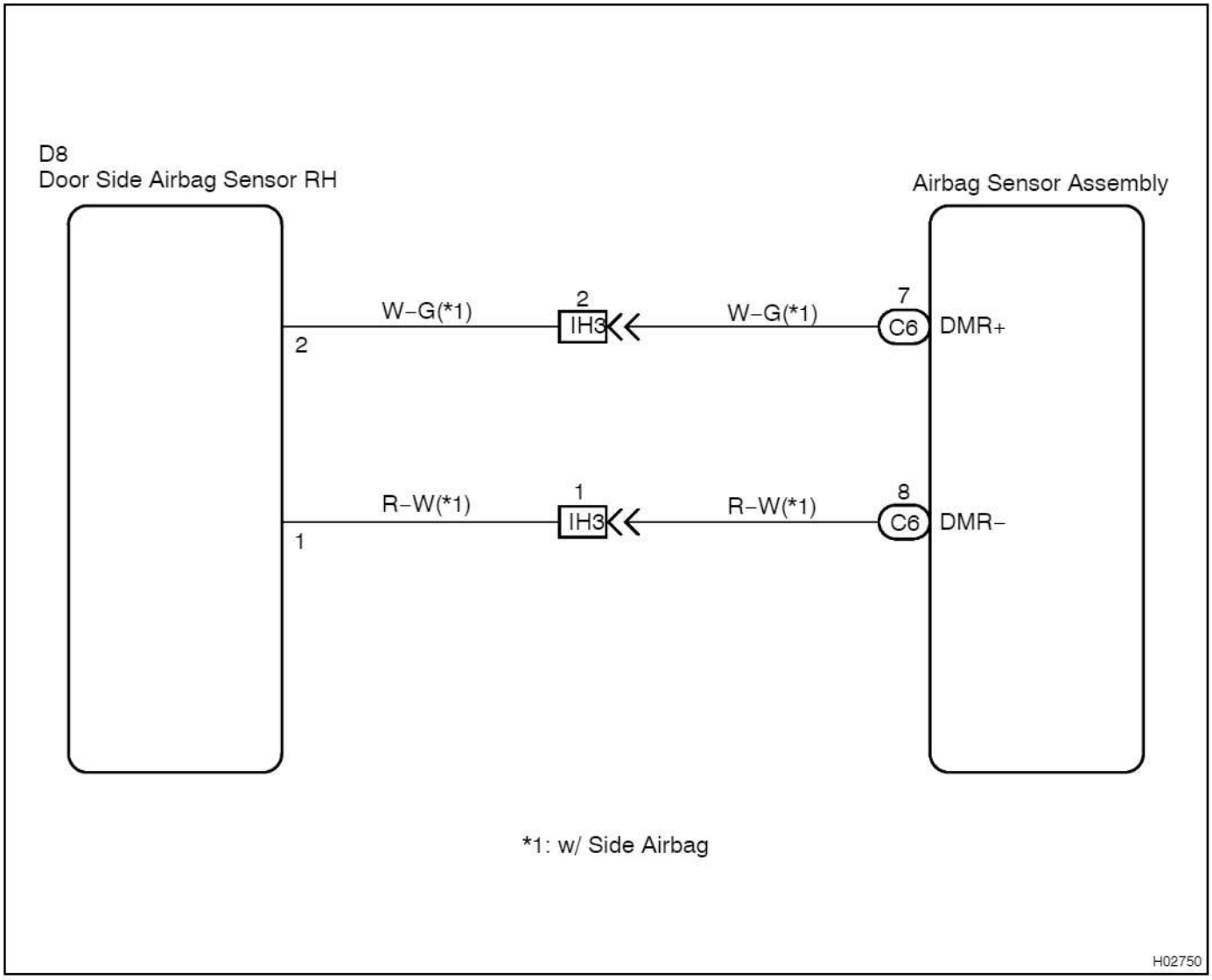
The door side airbag sensor RH circuit consists of the airbag sensor assembly and the door side airbag sensor RH.

For details of the function of each component, see OPERATION on page RS–2.

DTC B1142/B1143/34 is recorded when a malfunction is detected in the door side airbag sensor RH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B1142/B1143/34	• Short in door side airbag sensor RH wire harness (to B+) • Short in door side airbag sensor RH wire harness (to Ground) • Door side airbag sensor RH malfunction	• Door side airbag sensor RH • Airbag sensor assembly • Instrument panel wire • Front door RH wire

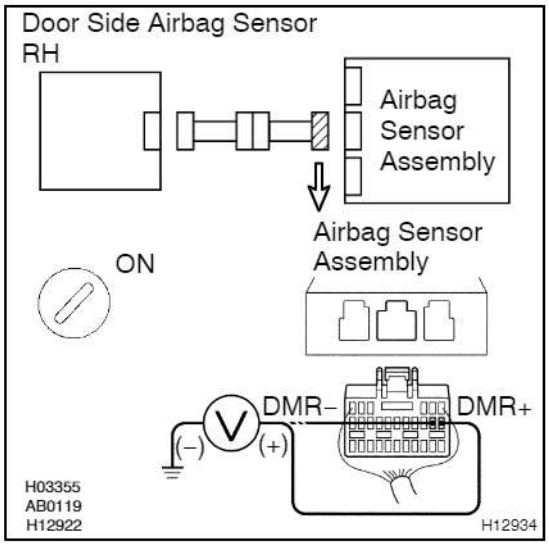
WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Prepare for inspection (See step 1 on page DI–1025).**

2	**Check wire harness (to B+).**



CHECK:

(a) Turn the ignition switch to ON.

(b) Measure the voltage between the body ground and each of DMR+ and DMR– on the airbag sensor assembly side between the door side airbag sensor RH and the airbag sensor assembly.

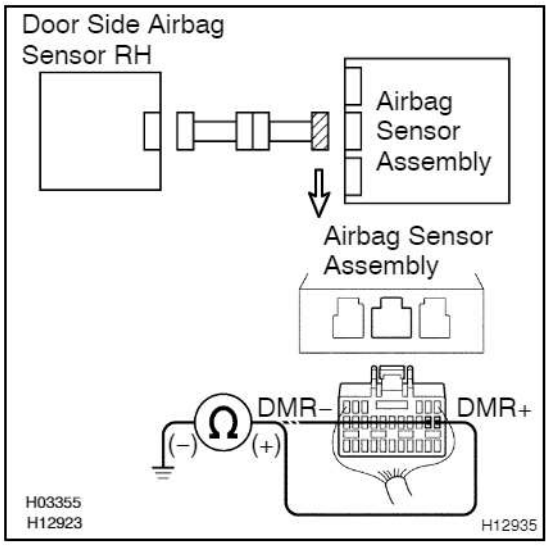
OK:

Voltage: Below 1 V

NG	**Go to step 8.**

OK

3	**Check wire harness (to ground).**



CHECK:

Measure the resistance between the body ground and each of DMR+ and DMR– on the airbag sensor assembly side between the door side airbag sensor RH and the airbag sensor assembly.

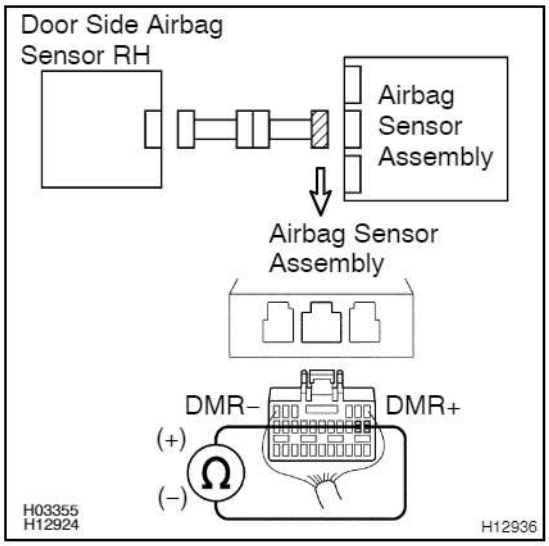
OK:

Resistance: 1 MΩ or Higher

NG	**Go to step 9.**

OK

4	Check wire harness.



CHECK:

Measure the resistance between DMR+ and DMR– on the airbag sensor assembly side between the airbag sensor assembly and the door side airbag sensor RH.

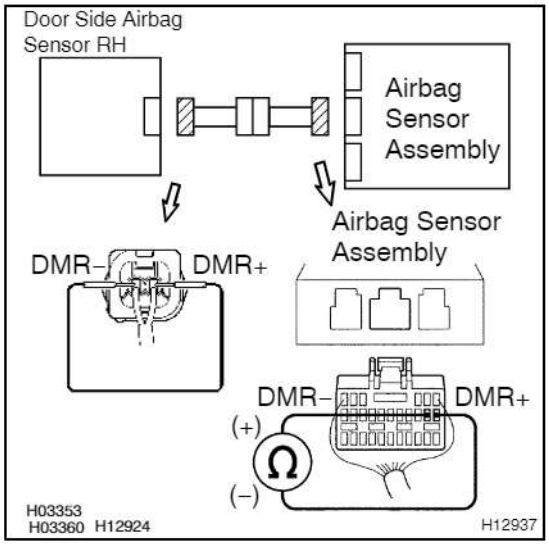
OK:

Resistance: 1 MΩ or Higher

NG → **Go to step 10.**

OK

5	Check wire harness.



PREPARATION:

Using a service wire, connect DMR+ and DMR– on the door side airbag sensor RH side between the airbag sensor assembly and the door side airbag sensor RH.

CHECK:

Measure the resistance between DMR+ and DMR– on the airbag sensor assembly side between the airbag sensor assembly and the door side airbag sensor RH.

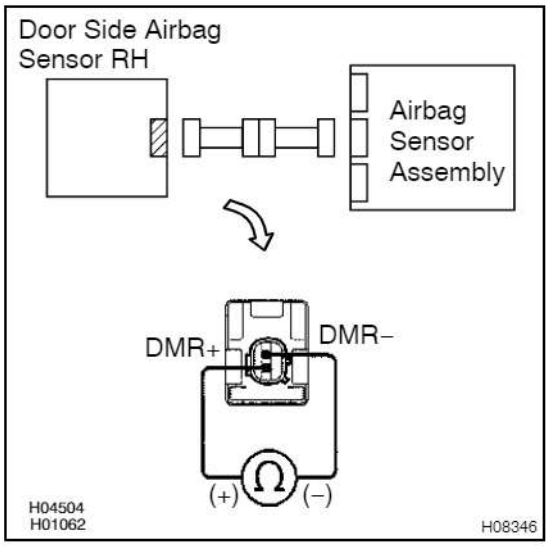
OK:

Resistance: Below 1 Ω

NG → **Go to step 11.**

OK

6	Check door side airbag sensor RH.



CHECK:

Measure the resistance between DMR+ and DMR– of the door side airbag sensor RH.

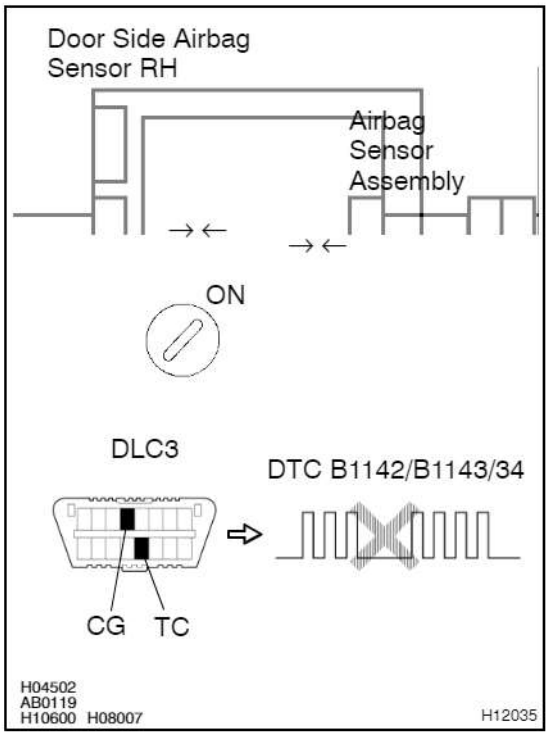
OK:

Resistance: 300 – 1500 Ω

NG → **Replace door side airbag sensor RH.**

OK

7	Check airbag sensor assembly.



PREPARATION:

(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 door side airbag sensor RH connector and airbag sensor assembly connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(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 DI–884).

OK:

DTC B1142/B1143/34 is not output.

HINT:

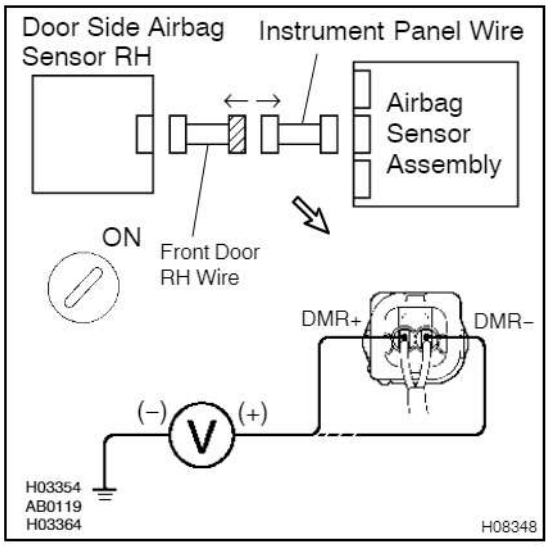
Codes other than code B1142/B1143/34 may be output at this time, but they are not relevant to this check.

NG → **Replace airbag sensor assembly.**

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

8	Check front door RH wire (to B+).



PREPARATION:

Disconnect the front door RH wire from the instrument panel wire.

CHECK:

(a) Turn the ignition switch to ON.

(b) Measure the voltage between the body ground and each of DMR+ and DMR– of the front door RH wire connector on the instrument panel wire side.

OK:

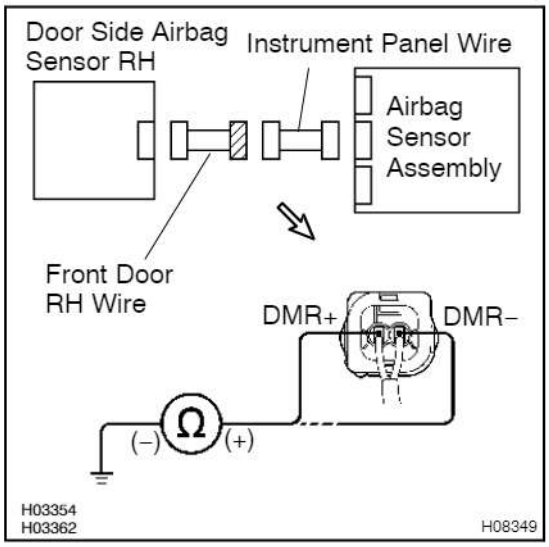
Voltage: Below 1 V

NG → **Repair or replace front door RH wire.**

OK

Repair or replace instrument panel wire.

9	Check front door RH wire (to ground).



PREPARATION:

Disconnect the front door RH wire from the instrument panel wire.

CHECK:

Measure the resistance between the body ground and each of DMR+ and DMR– of the front door RH wire connector on the instrument panel wire side.

OK:

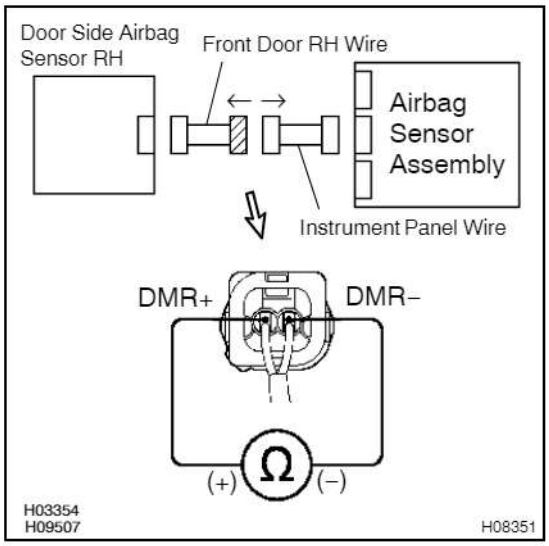
Resistance: 1 MΩ or Higher

NG → **Repair or replace front door RH wire.**

OK

Repair or replace instrument panel wire.

10	Check front door RH wire.



PREPARATION:

Disconnect the front door RH wire from the instrument panel wire.

CHECK:

Measure the resistance between DMR+ and DMR– of the front door RH wire connector on the instrument panel wire side.

OK:

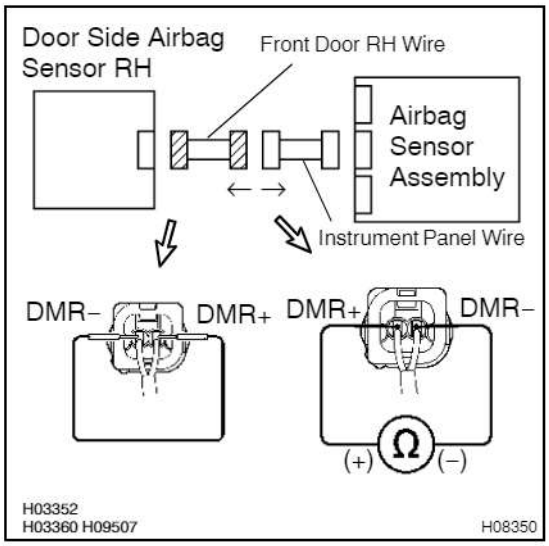
Resistance: 1 MΩ or Higher

NG → **Repair or replace front door RH wire.**

OK

Repair or replace instrument panel wire.

11	Check front door RH wire.



PREPARATION:

(a) Disconnect the front door RH wire from the instrument panel wire.

(b) Using a service wire, connect DMR+ and DMR– of the front door RH wire connector on the door side airbag sensor RH side.

CHECK:

Measure the resistance between DMR+ and DMR– of the front door RH wire connector on the instrument panel wire side.

OK:

Resistance: Below 1 Ω

NG → **Repair or replace front door RH wire.**

OK →

Repair or replace instrument panel wire.

D6FV–09

DTC	B1144/B1145/35	Door Side Airbag Sensor LH Malfunction

CIRCUIT DESCRIPTION

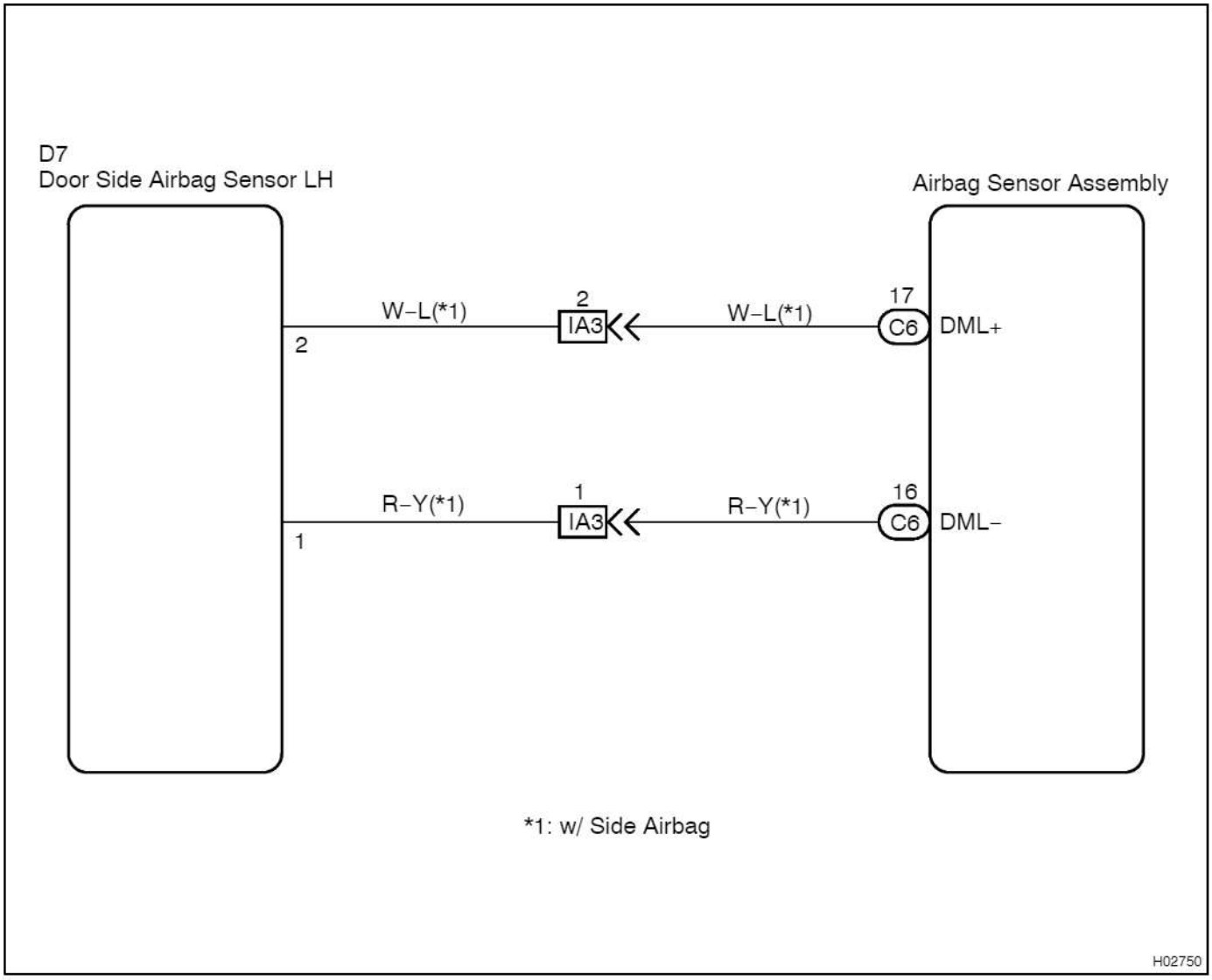
The door side airbag sensor LH circuit consists of the airbag sensor assembly and the door side airbag sensor LH.

For details of the function of each component, see OPERATION on page RS–2.

DTC B1144/B1145/35 is recorded when malfunction is detected in the door side airbag sensor LH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B1144/B1145/35	• Short in door side airbag sensor LH wire harness (to B+) • Short in door side airbag sensor LH wire harness (to Ground) • Door side airbag sensor LH malfunction	• Door side airbag sensor LH • Airbag sensor assembly • Instrument panel wire • Front door LH wire

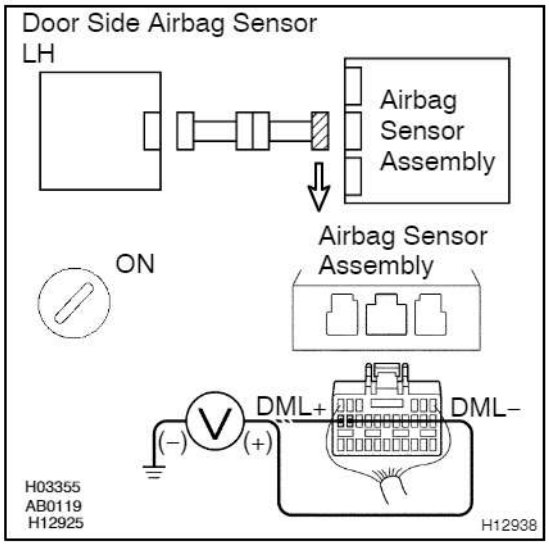
WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Prepare for inspection (See step 1 on page DI–1025).**

2	**Check wire harness (to B+).**



CHECK:

(a) Turn the ignition switch to ON.

(b) Measure the voltage between the body ground and each of DML+ and DML– on the airbag sensor assembly side between the door side airbag sensor LH and the airbag sensor assembly.

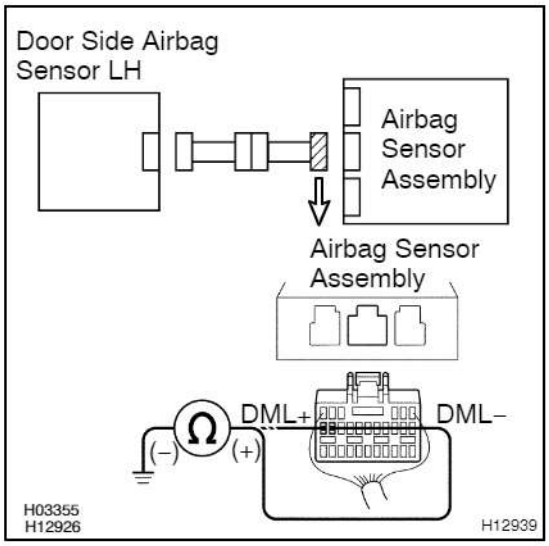
OK:

Voltage: Below 1 V

NG	**Go to step 8.**

OK

3	**Check wire harness (to ground).**



CHECK:

Measure the resistance between the body ground and each of DML+ and DML– on the airbag sensor assembly side between the door side airbag sensor LH and the airbag sensor assembly.

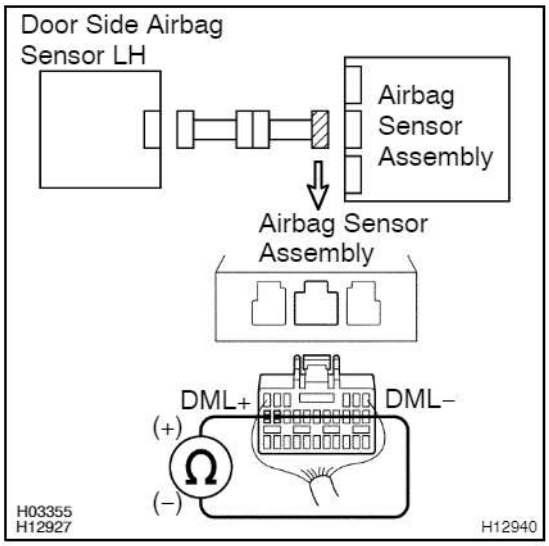
OK:

Resistance: 1 MΩ or Higher

NG	**Go to step 9.**

OK

4	Check wire harness.



CHECK:

Measure the resistance between DML+ and DML– on the airbag sensor assembly side between the door side airbag sensor LH and the airbag sensor assembly side.

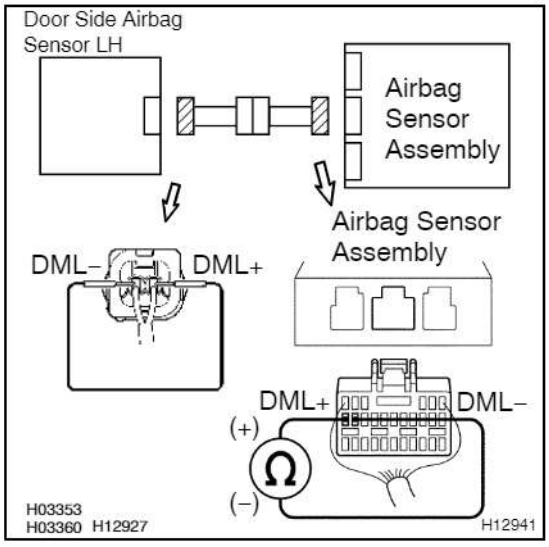
OK:

Resistance: 1 MΩ or Higher

NG	Go to step 10.

OK

5	Check wire harness.



PREPARATION:

Using a service wire, connect DML+ and DML– on the door side airbag sensor LH side between the airbag sensor assembly and the door side airbag sensor LH.

CHECK:

Measure the resistance between DML+ and DML– on the airbag sensor assembly side between the door side airbag sensor LH and the airbag sensor assembly side.

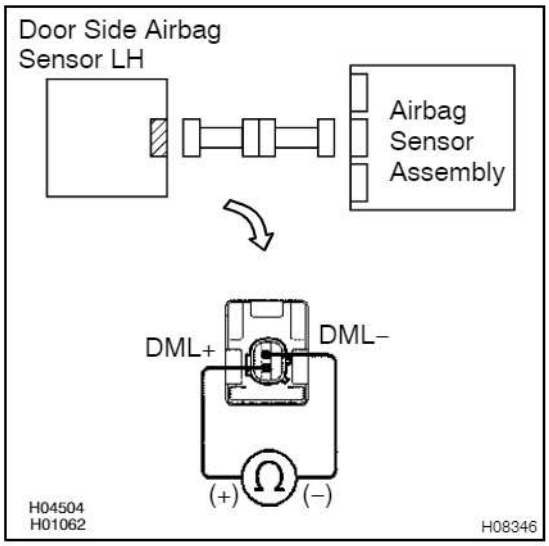
OK:

Resistance: Below 1 Ω

NG	Go to step 11.

OK

6	Check door side airbag sensor LH.



CHECK:

Measure the resistance between DML+ and DML– of the door side airbag sensor LH.

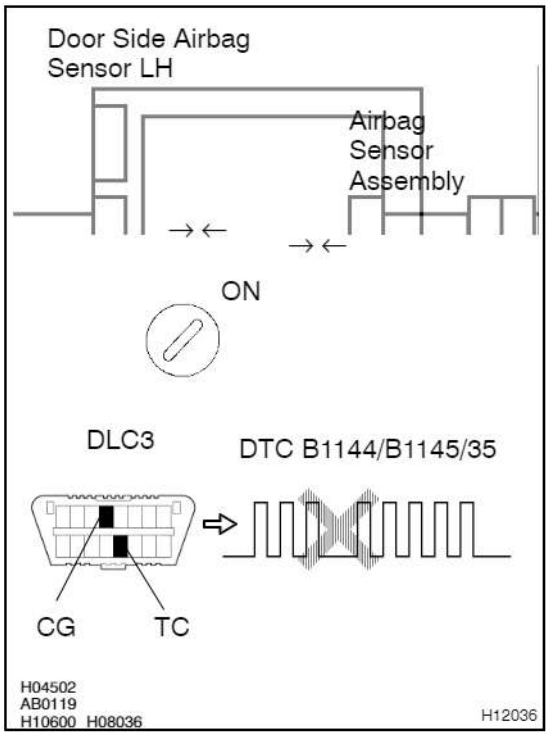
OK:

Resistance: 300 – 1500 Ω

NG → **Replace door side airbag sensor LH.**

OK

7	Check airbag sensor assembly.



PREPARATION:

(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 door side airbag sensor LH connector and airbag sensor assembly connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(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 DI–884).

OK:

DTC B1144/B1145/35 is not output.

HINT:

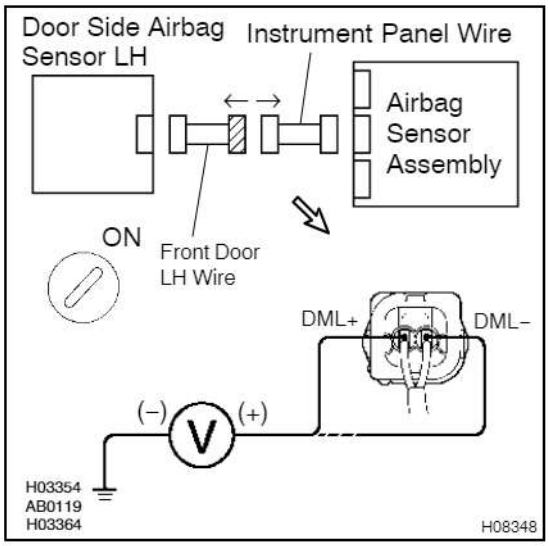
Codes other than code B1144/B1145/35 may be output at this time, but they are not relevant to this check.

NG → **Replace airbag sensor assembly.**

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

8	Check front door LH wire (to B+).



PREPARATION:

Disconnect the front door LH wire from the instrument panel wire.

CHECK:

(a) Turn the ignition switch to ON.

(b) Measure the voltage between the body ground and each of DML+ and DML– of the front door LH wire connector on the instrument panel wire side.

OK:

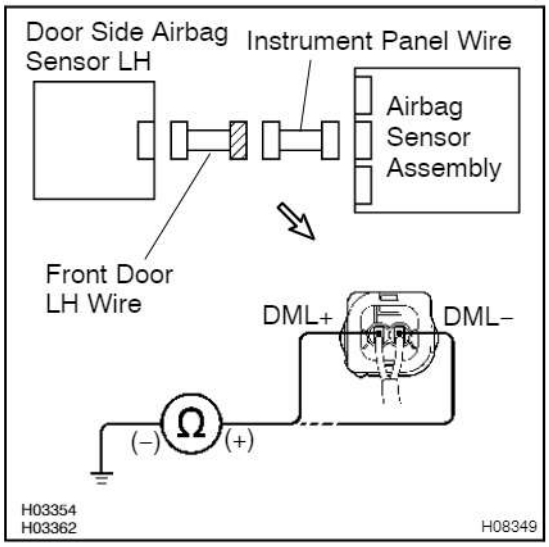
Voltage: Below 1 V

NG	Repair or replace front door LH wire.

OK

Repair or replace instrument panel wire.

9	Check front door LH wire (to ground).



PREPARATION:

Disconnect the front door LH wire from the instrument panel wire.

CHECK:

Measure the resistance between the body ground and each of DML+ and DML– of the front door LH wire connector on the instrument panel wire side.

OK:

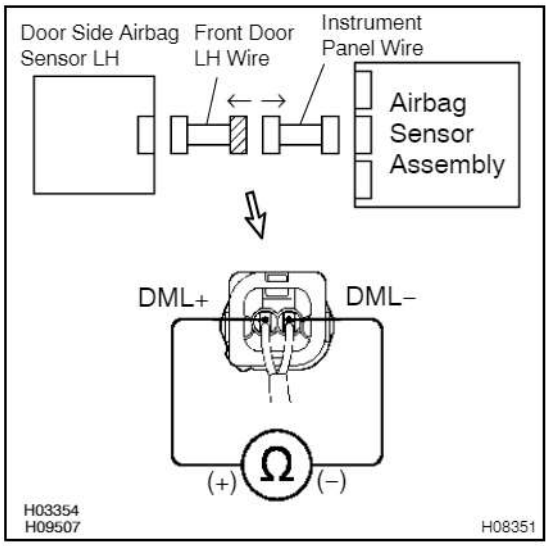
Resistance: 1 MΩ or Higher

NG	Repair or replace front door LH wire.

OK

Repair or replace instrument panel wire.

10	Check front door LH wire.



PREPARATION:

Disconnect the front door LH wire from the instrument panel wire.

CHECK:

Measure the resistance between DML+ and DML– of the front door LH wire connector on the instrument panel wire side.

OK:

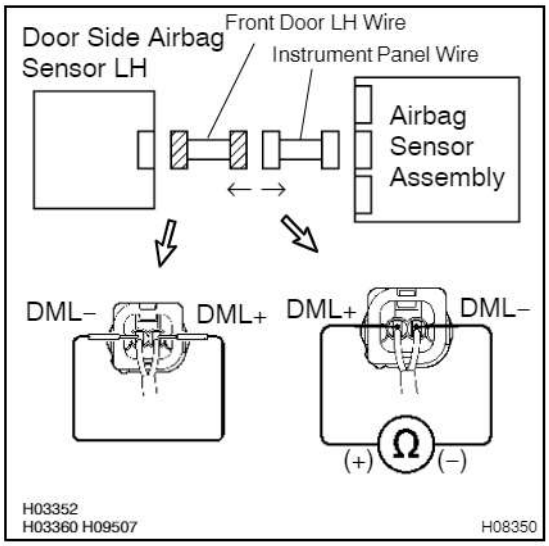
Resistance: 1 MΩ or Higher

NG → **Repair or replace front door LH wire.**

OK

Repair or replace instrument panel wire.

11	Check front door LH wire.



PREPARATION:

(a) Disconnect the front door LH wire from the instrument panel wire.

(b) Using a service wire, connect DML+ and DML– of the front door LH wire connector on the door side airbag sensor LH side.

CHECK:

Measure the resistance between DML+ and DML– of the front door LH wire connector on the instrument panel wire side.

OK:

Resistance: Below 1 Ω

NG → **Repair or replace front door LH wire.**

OK →

Repair or replace instrument panel wire.

D6FW-24

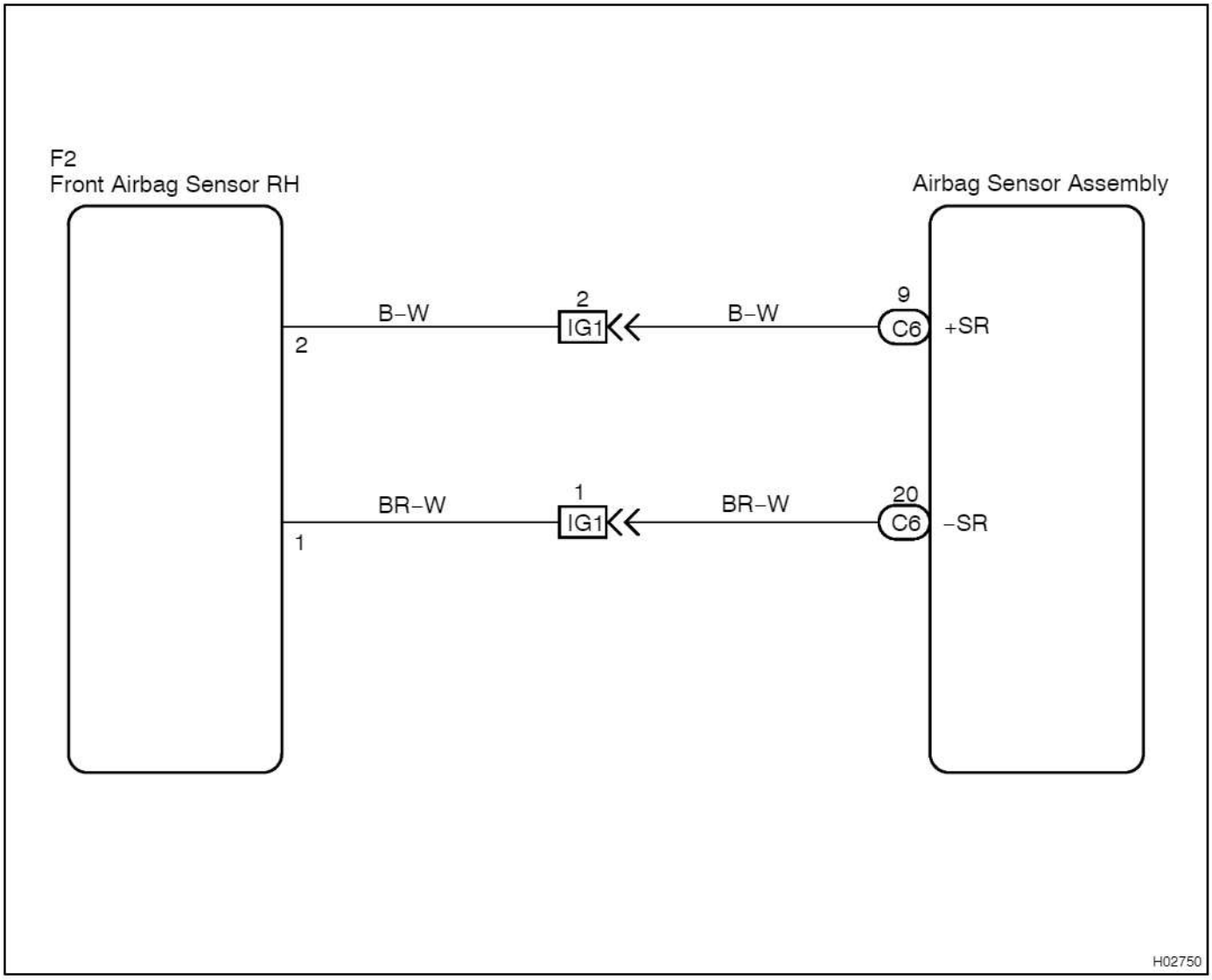
DTC	B1156/B1157/15	Front Airbag Sensor RH Malfunction

CIRCUIT DESCRIPTION

The front airbag sensor RH circuit consists of the airbag sensor assembly and the front airbag sensor RH. For details of the function of each component, see OPERATION on page RS–2.
DTC B1156/B1157/15 is recorded when a malfunction is detected in the front airbag sensor RH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B1156/B1157/15	• Front airbag sensor RH malfunction	• Front airbag sensor RH • Airbag sensor assembly • Instrument panel wire • Engine room No. 2 wire

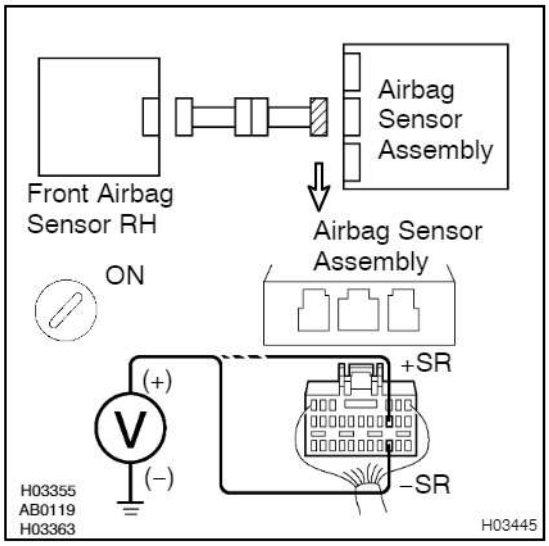
WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Prepare for inspection (See step 1 on page DI–1025).**

2	**Check wire harness (to B+).**



CHECK:

(a) Turn the ignition switch to ON.

(b) Measure the voltage between the body ground and each of +SR and –SR on the airbag sensor assembly side between the front airbag sensor RH and the airbag sensor assembly.

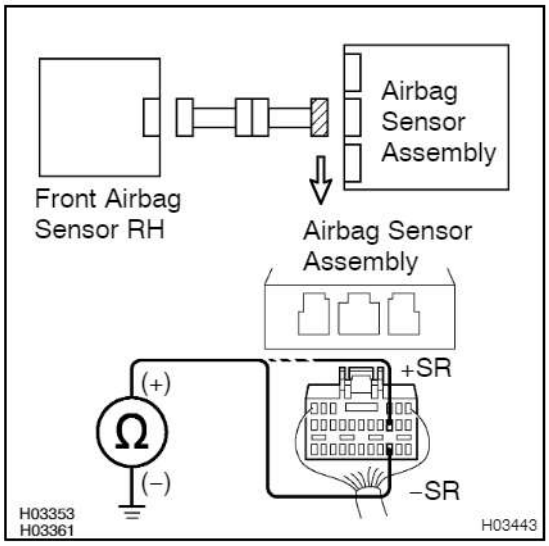
OK:

Voltage: Below 1 V

NG	**Go to step 8.**

OK

3	**Check wire harness (to ground).**



CHECK:

Measure the resistance between the body ground and each of +SR and –SR on the airbag sensor assembly side between the front airbag sensor RH and the airbag sensor assembly.

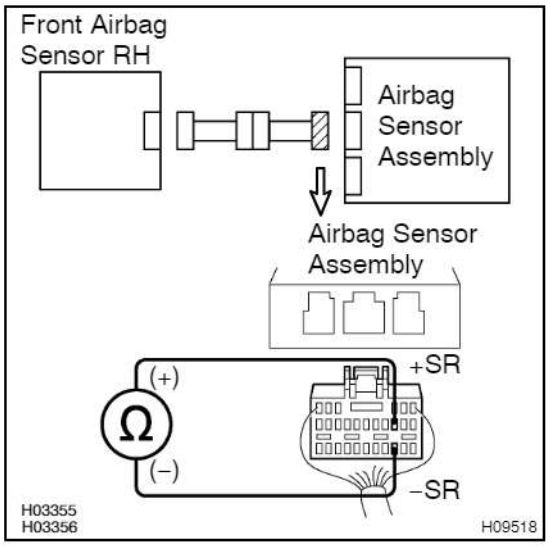
OK:

Resistance: 1 MΩ or Higher

NG	**Go to step 9.**

OK

4	Check wire harness.



CHECK:

Measure the resistance between +SR and –SR on the airbag sensor assembly side between the front airbag sensor RH and the airbag sensor assembly.

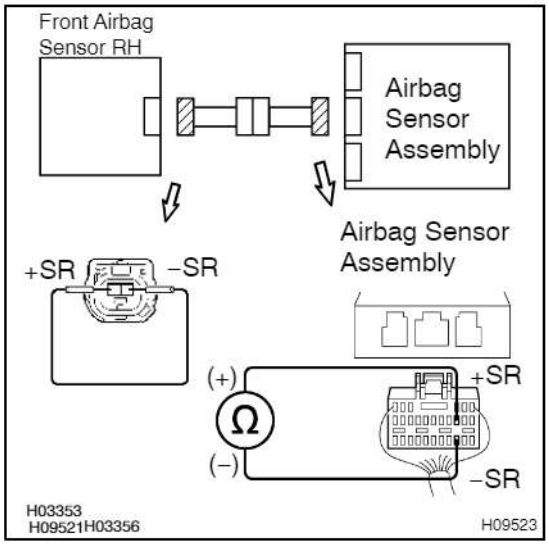
OK:

Resistance: 1 MΩ or Higher

NG	Go to step 10.

OK

5	Check wire harness.



PREPARATION:

Using a service wire, connect +SR and –SR on the front airbag sensor RH side between the airbag sensor assembly and the front airbag sensor RH.

CHECK:

Measure the resistance between +SR and –SR on the airbag sensor assembly side between the front airbag sensor RH and the airbag sensor assembly.

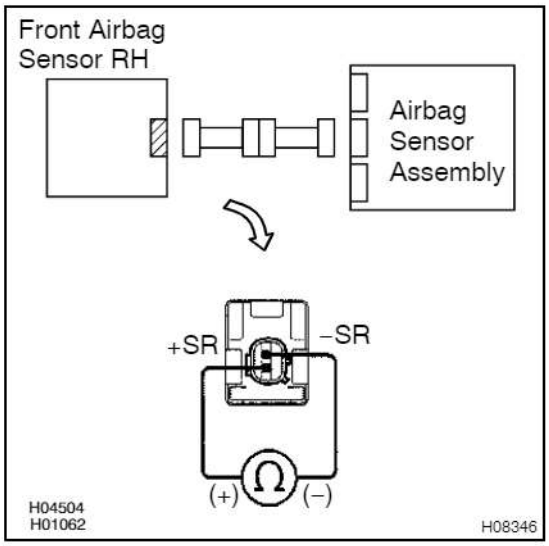
OK:

Resistance: Below 1 Ω

NG	Go to step 11.

OK

6	Check front airbag sensor RH.



CHECK:

Measure the resistance between +SR and –SR of the front airbag sensor RH.

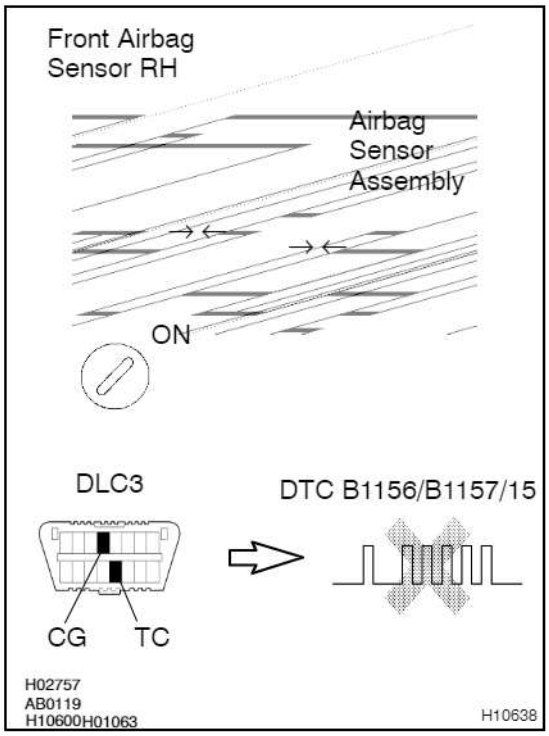
OK:

Resistance: 300 – 1500 Ω

NG → **Replace front airbag sensor RH.**

OK

7	Check airbag sensor assembly.



PREPARATION:

(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 airbag sensor RH connector and airbag sensor assembly connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(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 DI–884).

OK:

DTC B1156/B1157/15 is not output.

HINT:

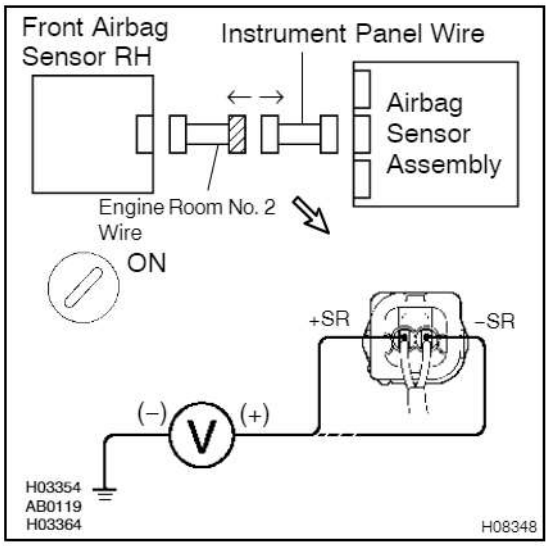
Codes other than code B1156/B1157/15 may be output at this time, but they are not relevant to this check.

NG	Replace airbag sensor assembly.

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

8	Check engine room No. 2 wire (to B+).



PREPARATION:

Disconnect the engine room No. 2 wire from the instrument panel wire.

CHECK:

(a) Turn the ignition switch to ON.

(b) Measure the voltage between the body ground and each of +SR and –SR of the engine room No. 2 wire connector on the instrument panel wire side.

OK:

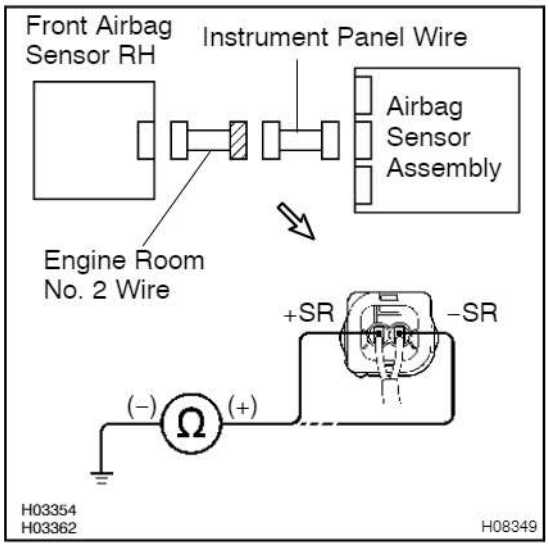
Voltage: Below 1 V

NG → **Repair or replace engine room No. 2 wire.**

OK

Repair or replace instrument panel wire.

9	Check engine room No. 2 wire (to ground).



PREPARATION:

Disconnect the engine room No. 2 wire from the instrument panel wire.

CHECK:

Measure the resistance between the body ground an each of +SR and –SR of the engine room No. 2 wire connector on the instrument panel wire side.

OK:

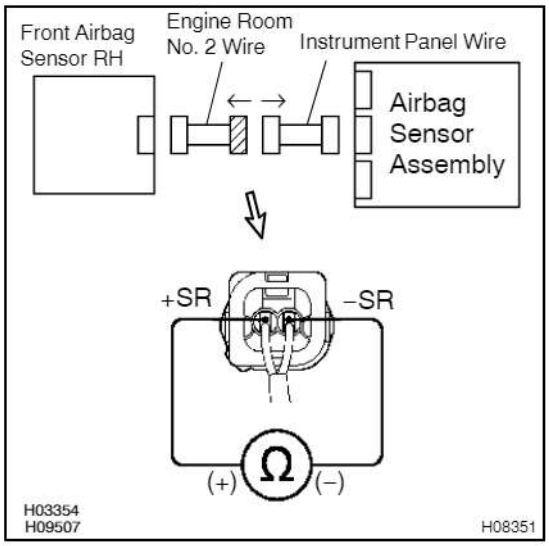
Resistance: 1 MΩ or Higher

NG → **Repair or replace engine room No. 2 wire.**

OK

Repair or replace instrument panel wire.

10	Check engine room No. 2 wire.



PREPARATION:

Disconnect the engine room No. 2 wire from the instrument panel wire.

CHECK:

Measure the resistance between +SR and –SR of the engine room No. 2 wire connector on the instrument panel wire side.

OK:

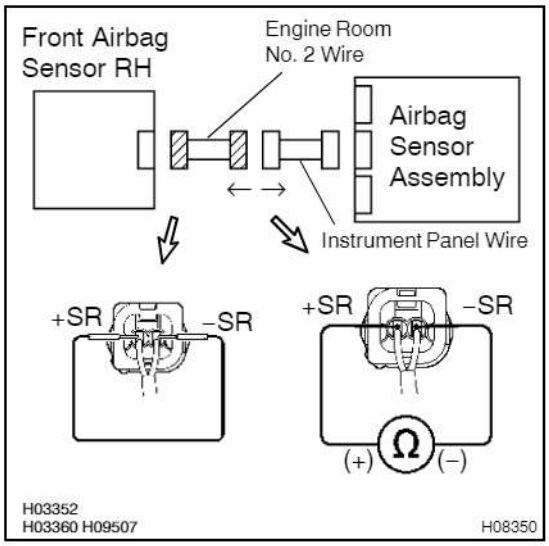
Resistance: 1 MΩ or Higher

NG → **Repair or replace engine room No. 2 wire.**

OK

Repair or replace instrument panel wire.

11	Check engine room No. 2 wire.



PREPARATION:

(a) Disconnect the engine room No. 2 wire from the instrument panel wire.

(b) Using a service wire, connect +SR and –SR of the engine room No. 2 wire connector on the front airbag sensor RH side.

CHECK:

Measure the resistance between +SR and –SR of the engine room No. 2 wire connector on the instrument panel wire side.

OK:

Resistance: Below 1 Ω

NG → **Repair or replace engine room No. 2 wire.**

OK

Repair or replace instrument panel wire.

D6PX-23

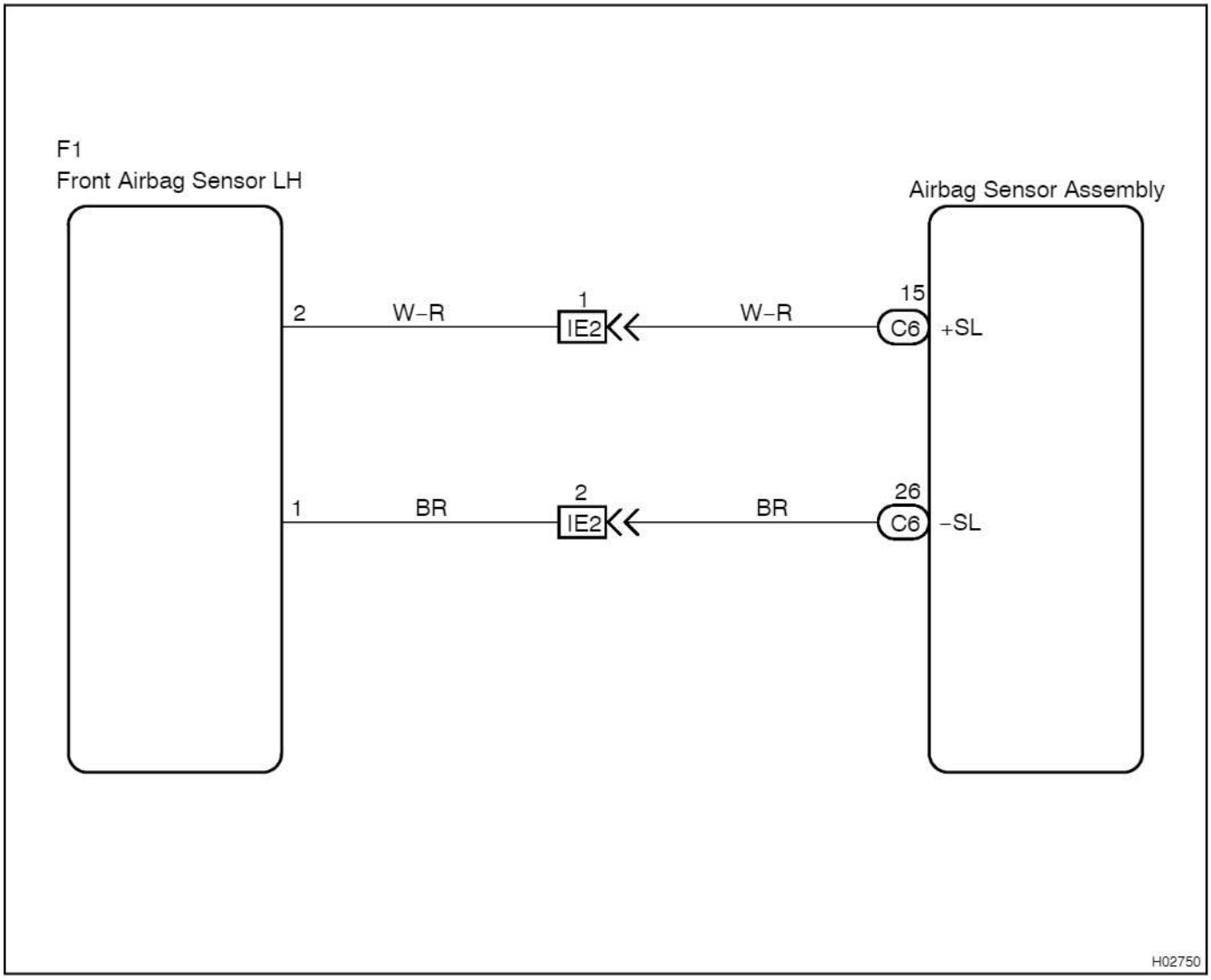
DTC	B1158/B1159/16	Front Airbag Sensor LH Malfunction

CIRCUIT DESCRIPTION

The front airbag sensor LH circuit consists of the airbag sensor assembly and the front airbag sensor LH.
For details of the function of each component, see OPERATION on page RS–2.
DTC B1158/B1159/16 is recorded when malfunction is detected in the front airbag sensor LH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B1158/B1159/16	• Front airbag sensor LH malfunction	• Front airbag sensor LH • Airbag sensor assembly • Wire harness • Engine room main wire

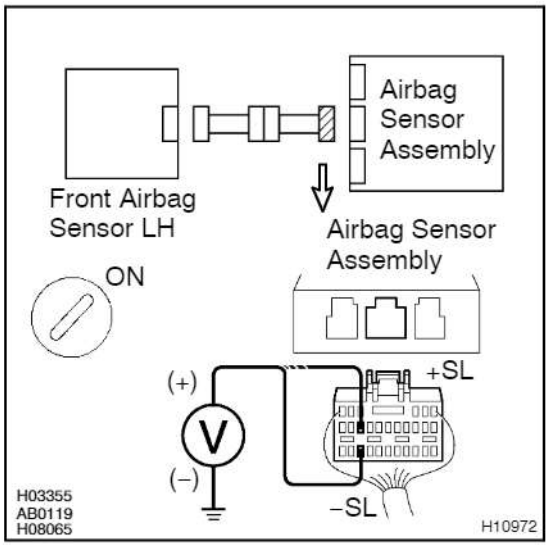
WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Prepare for inspection (See step 1 on page DI–1025).**

2	**Check wire harness (to B+).**



CHECK:

(a) Turn the ignition switch to ON.

(b) Measure the voltage between the body ground and +SL and –SL on the airbag sensor assembly side between the front airbag sensor LH and the airbag sensor assembly.

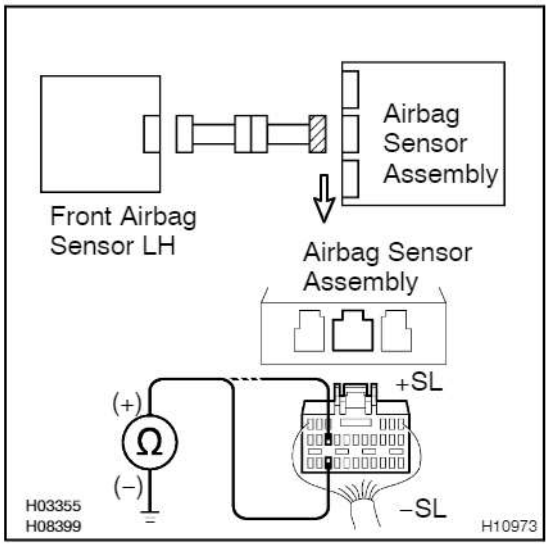
OK:

Voltage: Below 1 V

NG	**Go to step 8.**

OK

3	**Check wire harness (to ground).**



CHECK:

Measure the resistance between the body ground and +SL and –SL on the airbag sensor assembly side between the front airbag sensor LH and the airbag sensor assembly.

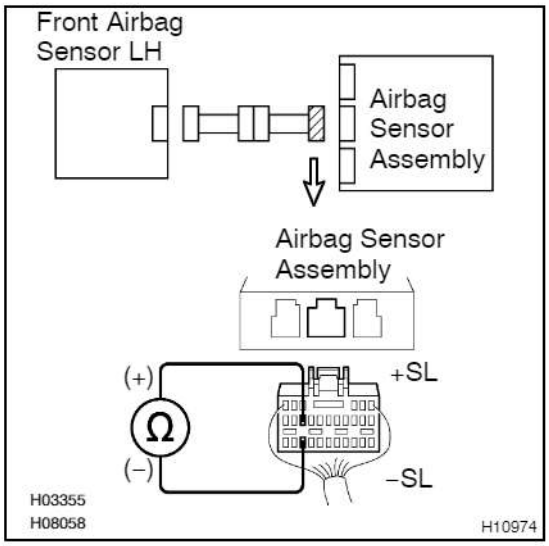
OK:

Resistance: 1 MΩ or Higher

NG	**Go to step 9.**

OK

4	Check wire harness.



CHECK:

Measure the resistance between +SL and –SL on the airbag sensor assembly side between the front airbag sensor LH and the airbag sensor assembly.

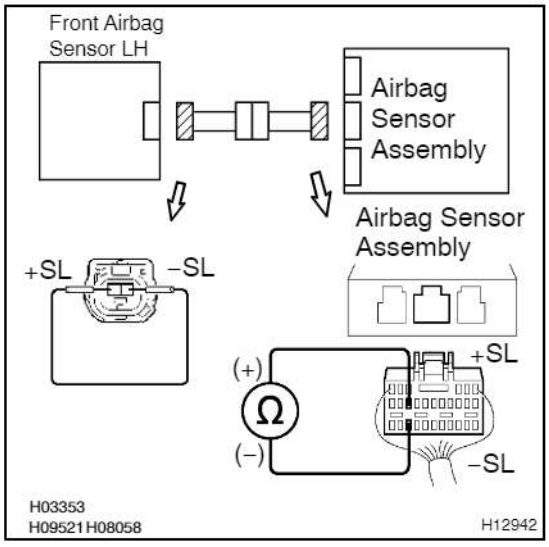
OK:

Resistance: 1 MΩ or Higher

NG	Go to step 10.

OK

5	Check wire harness.



PREPARATION:

Using a service wire, connect +SL and –SL on the front airbag sensor LH side between the airbag sensor assembly and the front airbag sensor LH.

CHECK:

Measure the resistance between +SL and –SL on the airbag sensor assembly side between the front airbag sensor LH and the airbag sensor assembly.

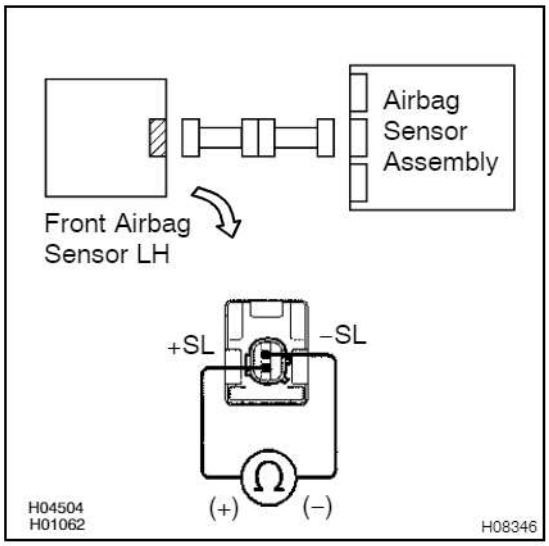
OK:

Resistance: Below 1 Ω

NG	Go to step 11.

OK

6	Check front airbag sensor LH.



CHECK:

Measure the resistance between +SL and –SL of the front airbag sensor LH.

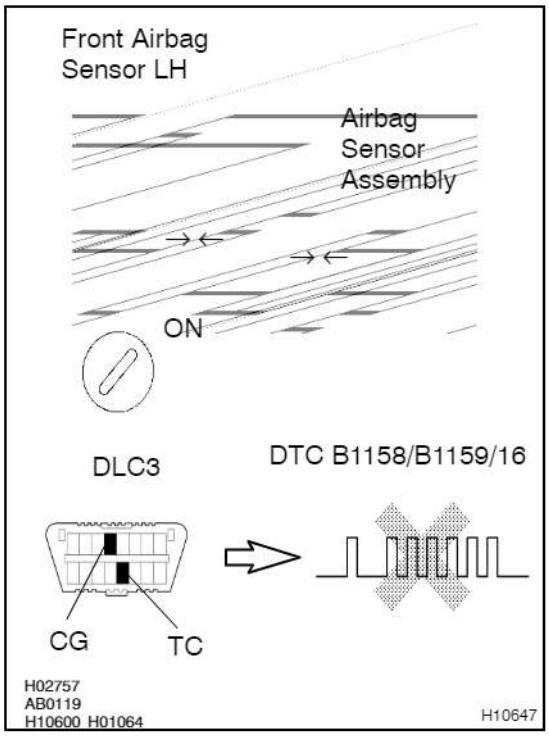
OK:

Resistance: 300 – 1500 Ω

NG → **Replace front airbag sensor LH.**

OK

7	Check airbag sensor assembly.



PREPARATION:

(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 airbag sensor LH connector and airbag sensor assembly connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(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 DI–884).

OK:

DTC B1158/B1159/16 is not output.

HINT:

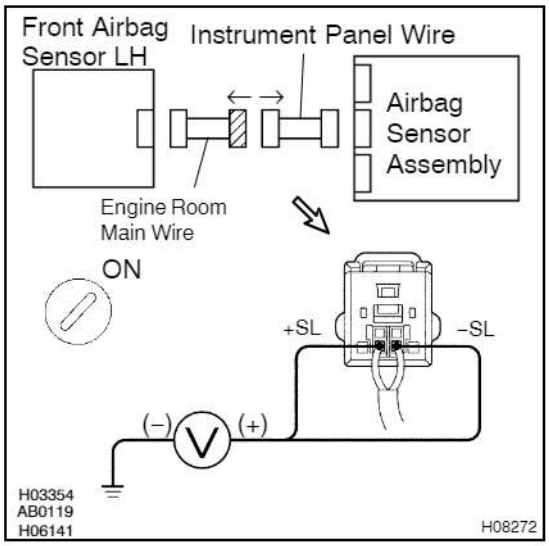
Codes other than code B1158/B1159/16 may be output at this time, but they are not relevant to this check.

NG	Replace airbag sensor assembly.

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

8	Check engine room main wire (to B+).



PREPARATION:

Disconnect the engine room main wire from the instrument panel wire.

CHECK:

(a) Turn the ignition switch to ON.

(b) Measure the voltage between the body ground and +SL and –SL of the engine room main wire connector on the instrument panel wire side.

OK:

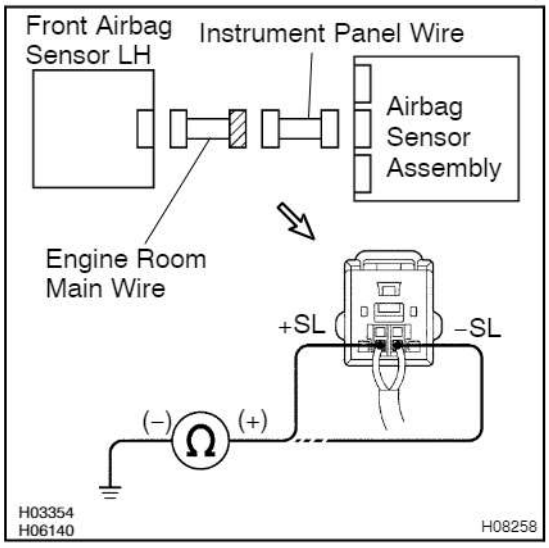
Voltage: Below 1 V

NG	Repair or replace engine room main wire.

OK

Repair or replace instrument panel wire.

9	Check engine room main wire (to ground).



PREPARATION:

Disconnect the engine room main wire from the instrument panel wire.

CHECK:

Measure the resistance between the body ground and +SL and –SL of the engine room main wire connector on the instrument panel wire side.

OK:

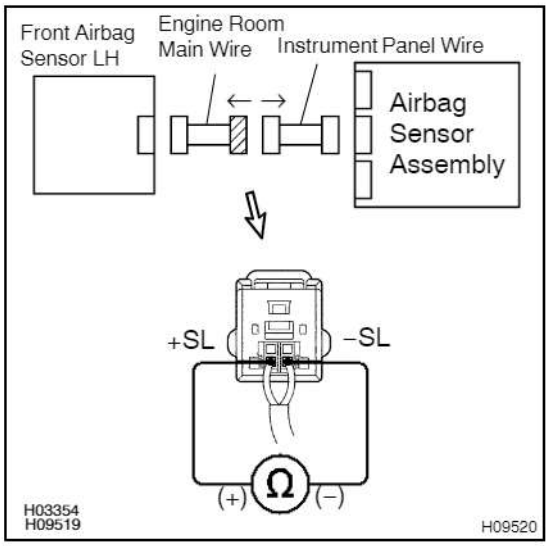
Resistance: 1 MΩ or Higher

NG	Repair or replace engine room main wire.

OK

Repair or replace instrument panel wire.

10	Check engine room main wire.



PREPARATION:

Disconnect the engine room main wire from the instrument panel wire.

CHECK:

Measure the resistance between +SL and –SL of the engine room main wire connector on the instrument panel wire side.

OK:

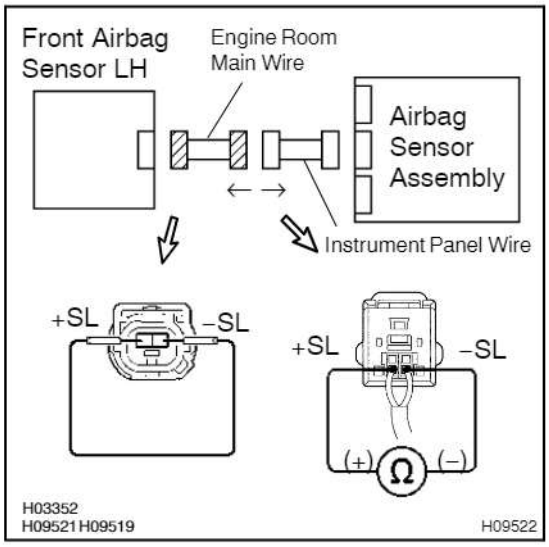
Resistance: 1 MΩ or Higher

NG	Repair or replace engine room main wire.

OK

Repair or replace instrument panel wire.

11	Check engine room main wire.



PREPARATION:

(a) Disconnect the engine room main wire from the instrument panel wire.

(b) Using a service wire, connect +SL and –SL of the engine room main wire connector on the front airbag sensor assembly side.

CHECK:

Measure the resistance between +SL and –SL of the engine room main wire connector on the instrument panel wire side.

OK:

Resistance: Below 1 Ω

NG	Repair or replace engine room main wire.

OK

Repair or replace instrument panel wire.

D6FY-25

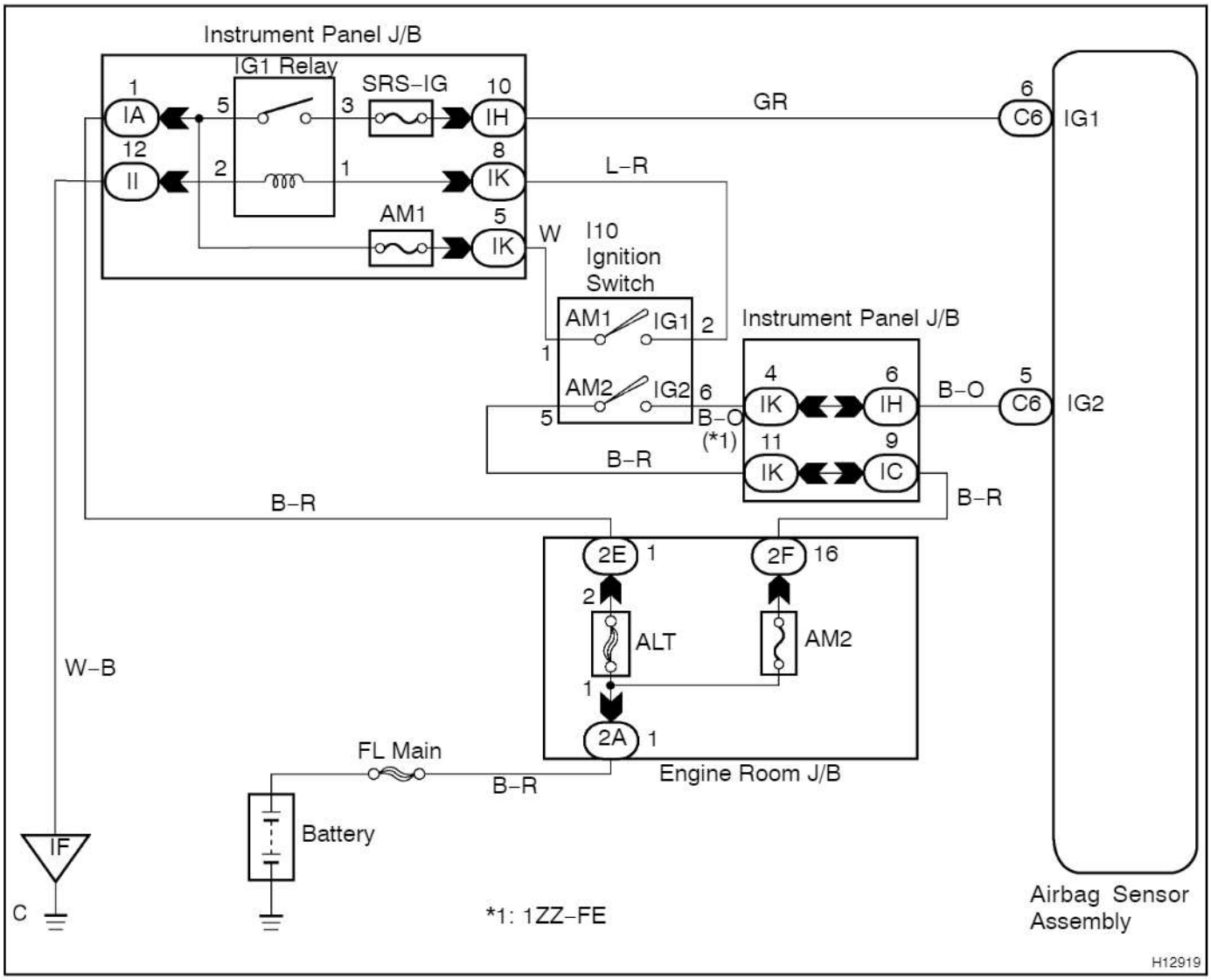
DTC	Normal	Source Voltage Drop

CIRCUIT DESCRIPTION

The SRS is equipped with a voltage–increase circuit (DC–DC converter) in the airbag sensor assembly 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 differ from the other circuits in that when the SRS warning light remains on and the DTC shows a normal code, source voltage drop is indicated.
Malfunction in this circuit is not recorded in the airbag sensor assembly, and when the source voltage returns to normal, the SRS warning light automatically goes off.

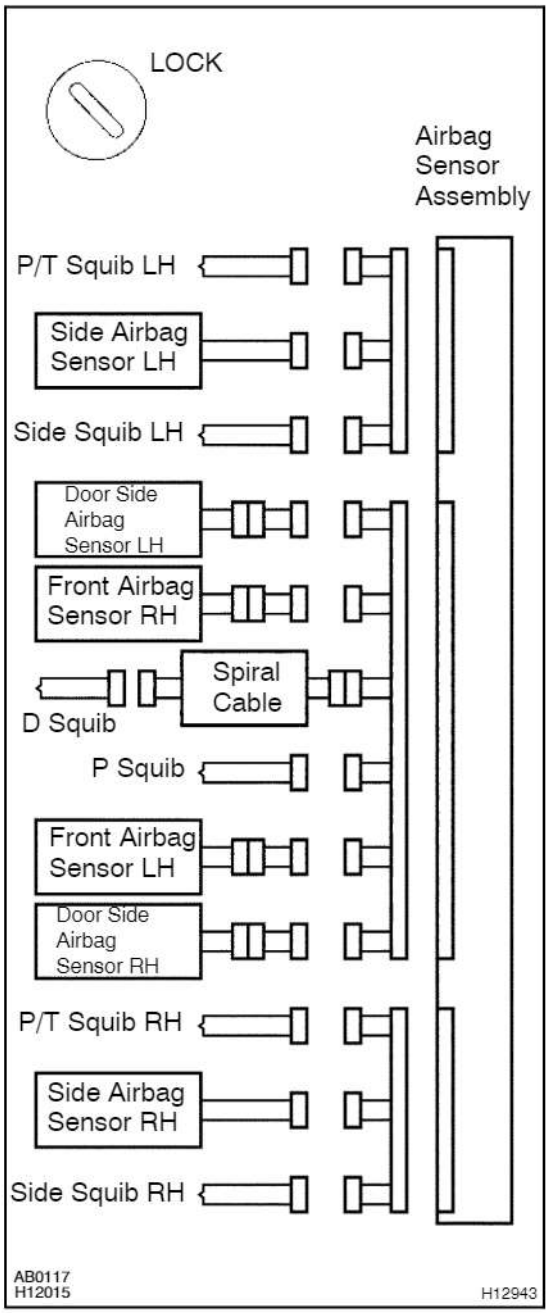
DTC No.	Diagnosis
(Normal)	Source voltage drop

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Prepare for inspection.**



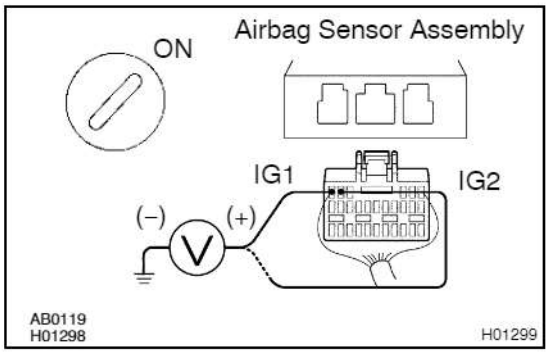
PREPARATION:

(a) Disconnect negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(b) Remove the steering wheel pad (See page SR–13).
(c) Disconnect the connector of the front passenger airbag assembly (See page RS–27).
(d) Disconnect the connector of the side airbag assembly RH and LH (See page RS–40).
(e) Disconnect the connector of the seat belt pretensioner RH and LH (See page BO–109).
(f) Disconnect the connectors of the airbag sensor assembly (See page RS–53).
(g) Disconnect the connector of the front airbag sensor RH and LH (See page RS–58).
(h) Disconnect the connector of the side airbag sensor assembly RH and LH (See page RS–63).
(i) Disconnect the connector of the door side airbag sensor RH and LH (See page RS–68).

CAUTION:

Store the steering wheel pad, front passenger airbag assembly and side airbag assembly with the front surface facing upward.

2	Check source voltage.



PREPARATION:

Connect the negative (–) terminal cable to the battery.

CHECK:

(a) Turn the ignition switch to ON.

(b) Measure the voltage between the body ground and each of IG1 and IG2 on the airbag sensor assembly and operate electric system (defogger, wiper, headlight, heater blower, etc.).

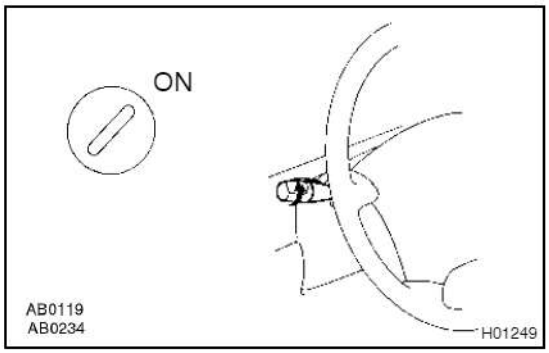
OK:

Voltage: 10 – 14 V

NG	Check harness between battery and airbag sensor assembly, and check battery and charging system.

OK

3	Does SRS warning light turn off?



PREPARATION:

(a) Turn the ignition switch to LOCK.

(b) Connect the steering wheel pad connector.

(c) Connect the front passenger airbag assembly connector.

(d) Connect the side airbag assembly connectors.

(e) Connect the seat belt pretensioner connectors.

(f) Connect the airbag sensor assembly connectors.

(g) Connect the front airbag sensor connectors.

(h) Connect the side airbag sensor assembly connectors.

(i) Connect the door side airbag sensor connectors.

(j) Turn the ignition switch to ON.

CHECK:

Operate electric system (defogger, wiper, headlight, heater blower, etc.) and check that SRS warning light goes off.

NO	Check for DTCs. If a DTC is output, perform troubleshooting for the DTC. If a normal code is output, replace airbag sensor assembly.

YES

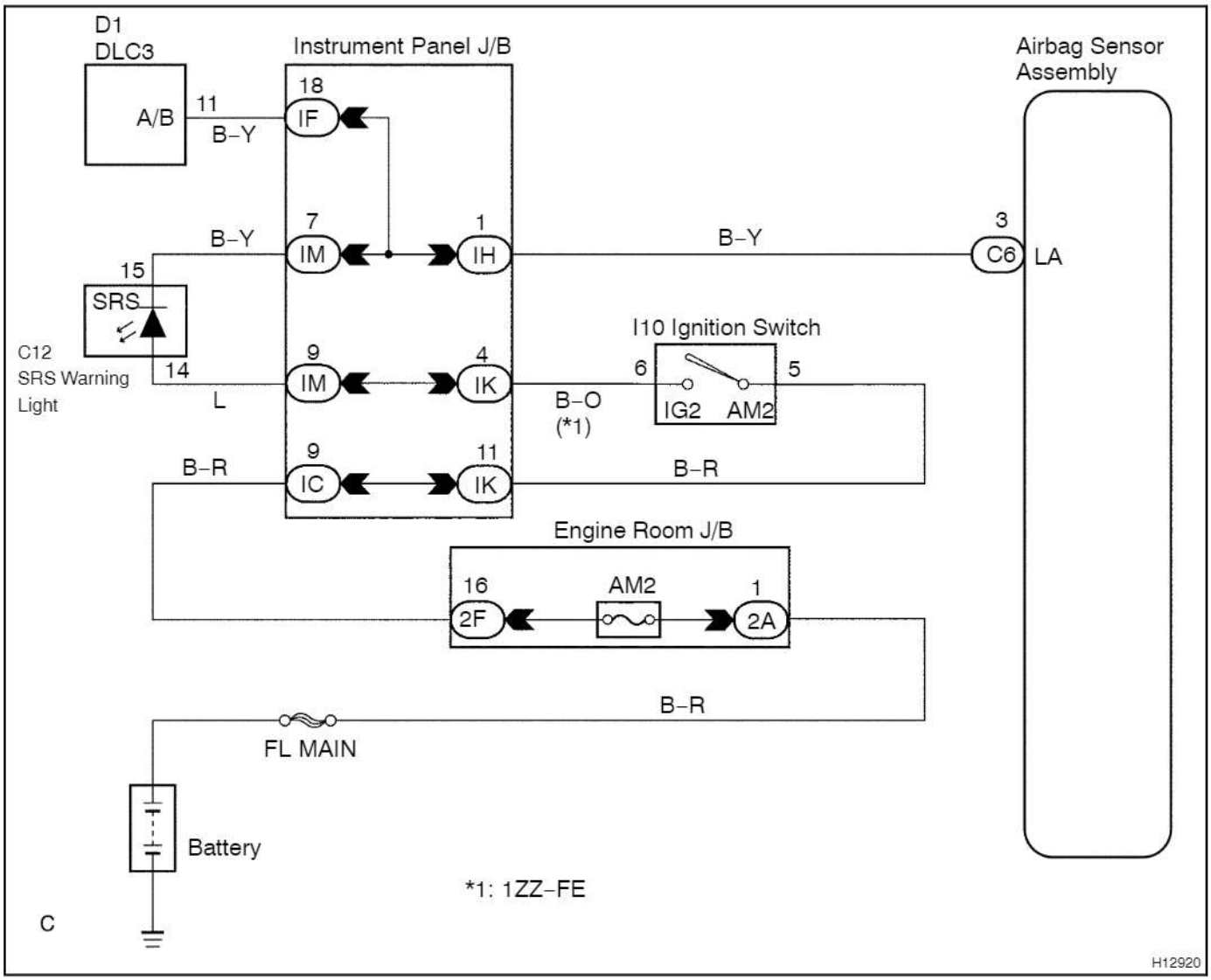
From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

SRS Warning Light Circuit Malfunction

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 terminals TC and CG of the DLC3 are connected, the DTC is displayed by blinking the SRS warning light.

WIRING DIAGRAM

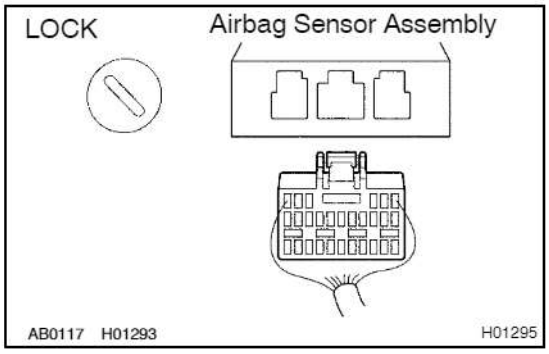


INSPECTION PROCEDURE

Always lights up, when ignition switch is in LOCK position

1	**Prepare for inspection (See step 1 on page DI–1025).**

2	**Does SRS warning light turn off?**



PREPARATION:

(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 airbag sensor assembly connector.
(d) Connect the negative (–) terminal cable to the battery.

CHECK:

Check operation of SRS warning light.

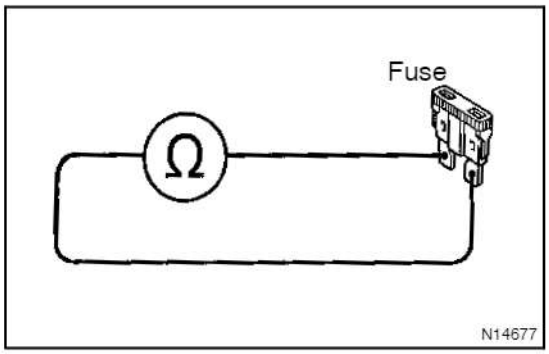
NO → **Check SRS warning light circuit or terminal AB circuit of DLC3.**

YES

Replace airbag sensor assembly.

Does not light up, when ignition switch is turned to ON

1	**Check AM2 Fuse.**



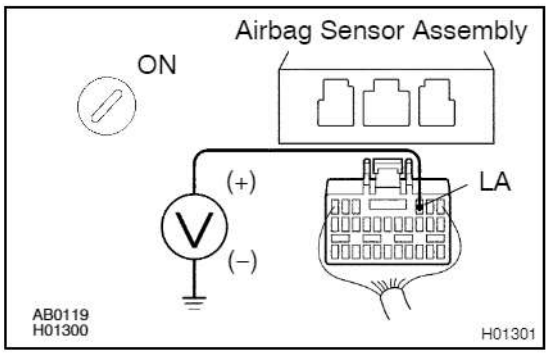
PREPARATION:
Remove the AM2 fuse.
CHECK:
Check continuity of the AM2 fuse.
OK:
Continuity
HINT:
- Fuse may be burnt out even if it appears to be OK during visual inspection.
- If fuse is OK, install it.

NG	**Go to step 5.**

OK

2	**Prepare for inspection (See step 1 on page DI–1025).**

3	**Check SRS warning light circuit.**

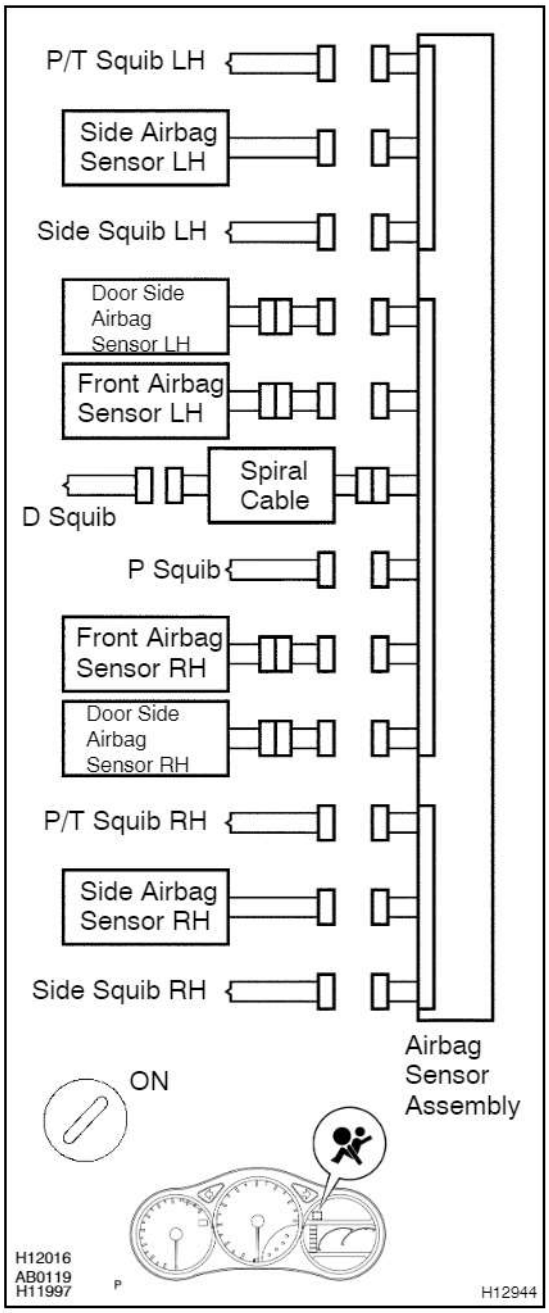


PREPARATION:
(a) Connect the negative (–) terminal cable to the battery.
(b) Turn the ignition switch to ON.
CHECK:
Measure the voltage between the body ground and LA terminal of the harness side connector of the airbag sensor assembly.
OK:
Voltage: 10 – 14 V

NG	**Check combination meter or repair SRS warning light circuit.**

OK

4	Does SRS warning light come on?



PREPARATION:

(a) Disconnect the negative (–) terminal cable from the battery.
(b) Connect the airbag sensor assembly connectors.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(d) Turn the ignition switch to ON.

CHECK:

Check operation of the SRS warning light.

NO → **Check terminal LA of airbag sensor assembly. If normal, replace airbag sensor assembly.**

YES

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use simulation method to check.

5	Is new AM2 fuse burnt out again?

NO → Using simulation method, reproduce malfunction symptoms (See page IN–20).

YES →

Check harness between AM2 fuse and SRS warning light.

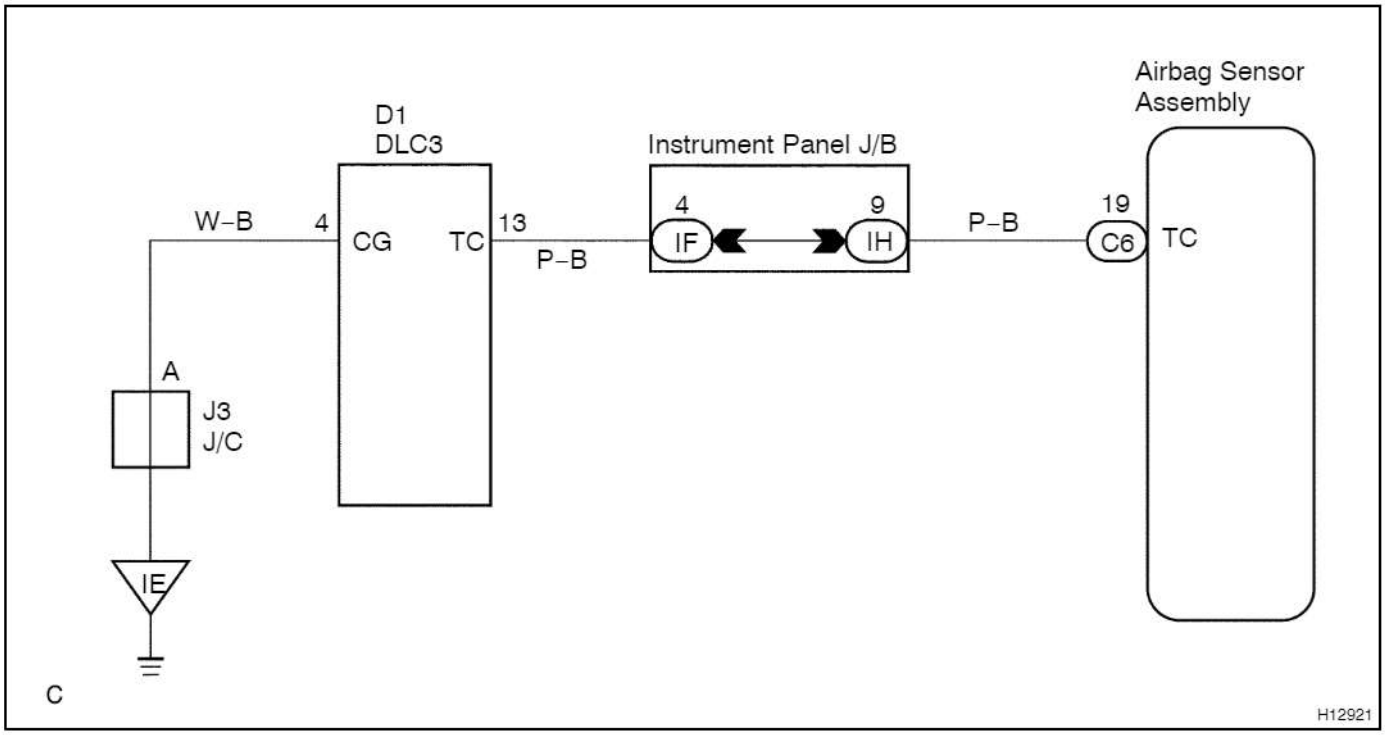
DI6Q0-19

TC Terminal Circuit

CIRCUIT DESCRIPTION

DTC output mode is set by connecting terminal TC and CG of the DLC3 the airbag sensor assembly. The DTCs are displayed by blinking the SRS warning light.

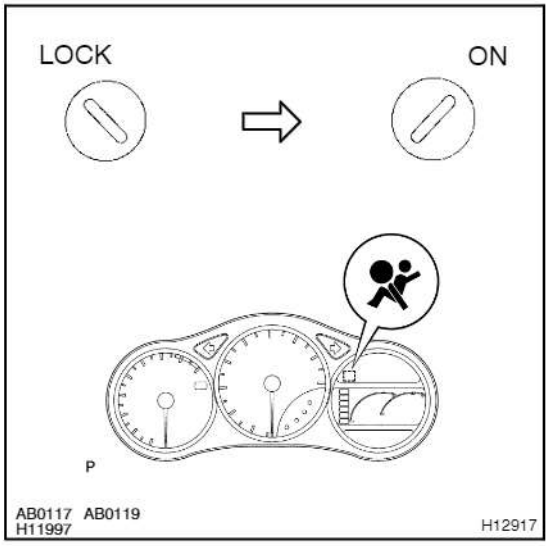
WIRING DIAGRAM



INSPECTION PROCEDURE

If the DTC is not displayed, do the following troubleshooting.

1	**Does SRS warning light light up for approx. 6 seconds?**



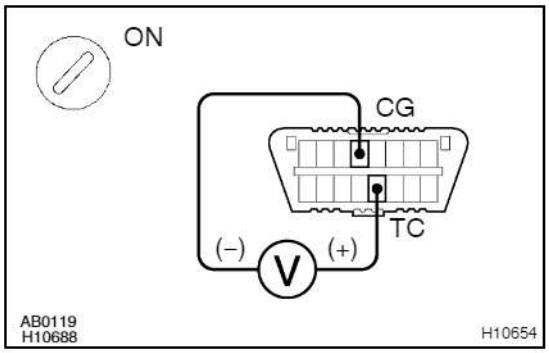
CHECK:

Check operation of the SRS warning light after ignition switch is turned from LOCK position to ON position.

NO → **Check SRS warning light system (See page DI–1028).**

YES

2	**Check voltage between terminal TC and CG of DLC3.**



PREPARATION:

Turn the ignition switch to ON.

CHECK:

Measure the voltage between terminal TC and CG of DLC3.

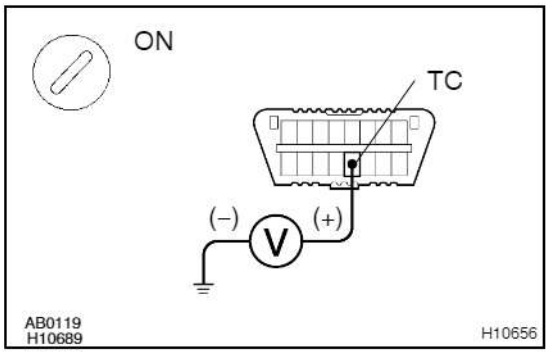
OK:

Voltage: 10 – 14 V

OK → **Go to step 4.**

NG

3	Check voltage between terminal TC of DLC3 and body ground.



CHECK:

Measure the voltage between terminal TC of DLC3 and body ground.

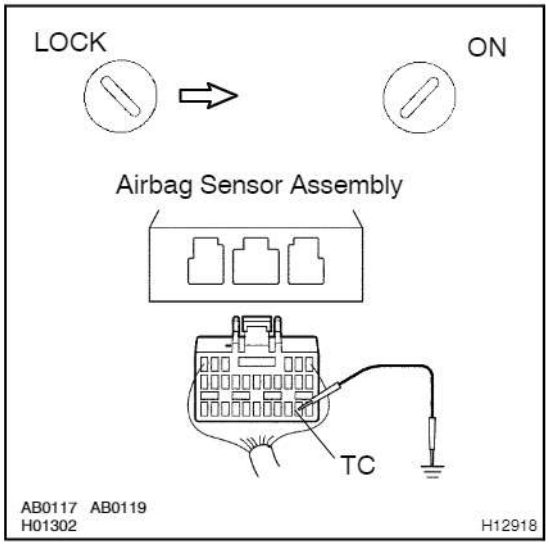
OK:

Voltage: 10 – 14 V

OK	Check harness between terminal CG of DLC3 and body ground.

NG

4	Check airbag sensor assembly.



PREPARATION:

(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 airbag sensor assembly connector.
(d) Insert service wire into terminal TC from back side as shown in the illustration.
(e) Connect the airbag sensor assembly connector with service wire.
(f) Connect the negative (–) terminal cable to the battery.
(g) Turn the ignition switch to ON, and wait at least for 60 seconds.
(h) Connect service wire of terminal TC to body ground.

CHECK:

Check operation of the SRS warning light.

OK:

SRS waning light comes on.

NOTICE:

Pay due attention to the terminal connecting position to avoid a malfunction.

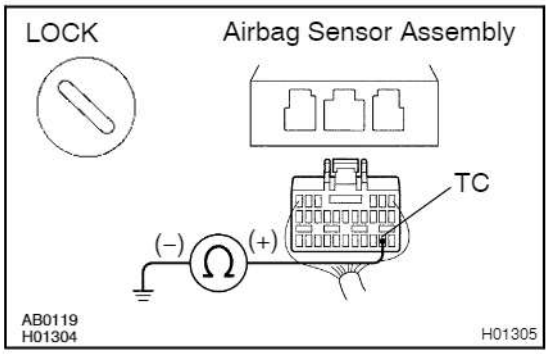
OK	Check harness between the airbag sensor assembly and DLC3.

NG

Replace airbag sensor assembly.

If the DTC is displayed without a DTC check procedure, perform the following troubleshooting.

1	**Check resistance between terminal Tc of airbag sensor assembly and body ground.**



PREPARATION:

(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 airbag sensor assembly connector.

CHECK:

Check resistance between terminal TC of the airbag sensor assembly connector and the body ground.

OK:

Resistance: 1 MΩ or Higher

NG → **Repair or replace harness or connector.**

OK

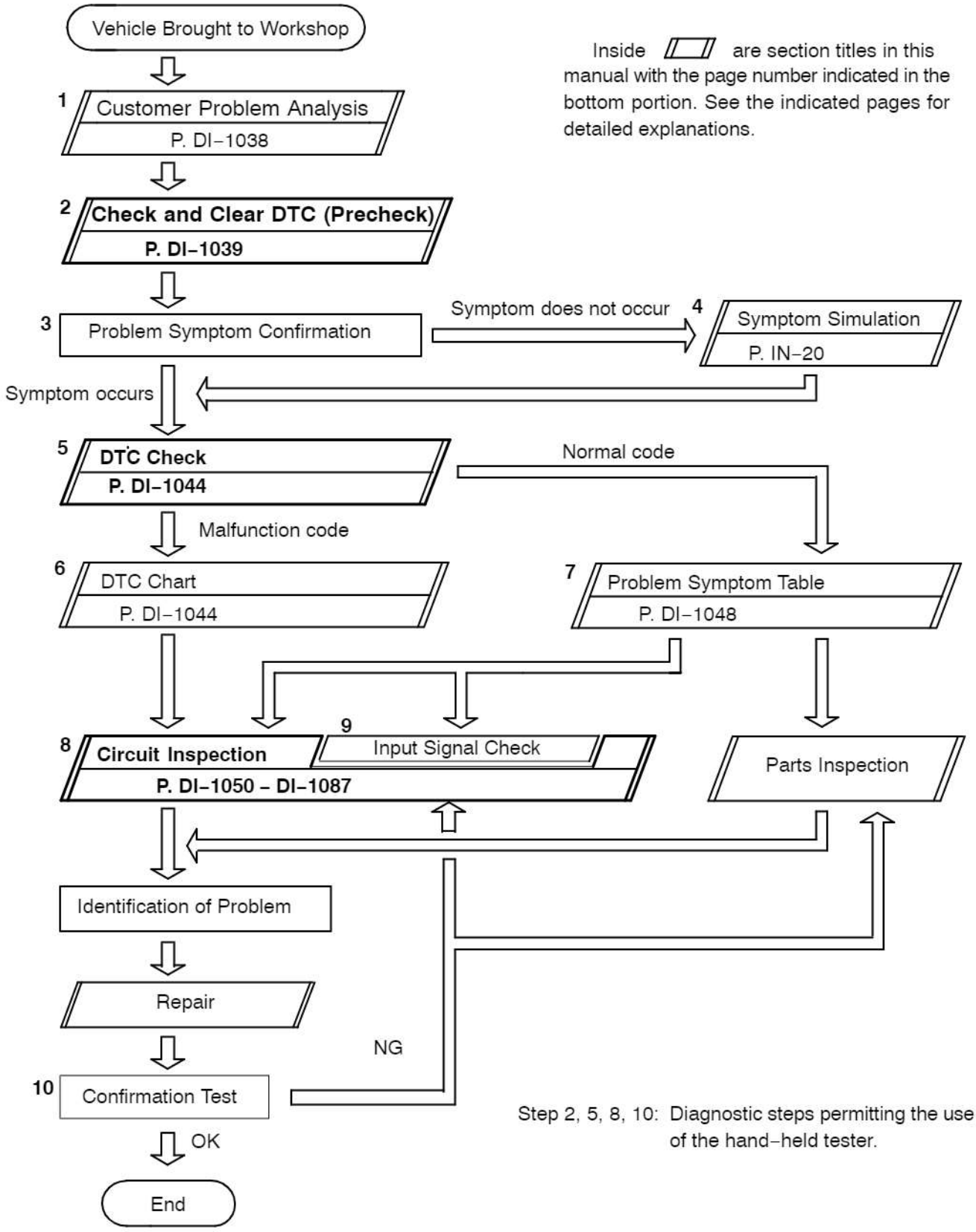
Replace airbag sensor assembly.

CRUISE CONTROL SYSTEM (1ZZ–FE)

DI08F–29

HOW TO PROCEED WITH TROUBLESHOOTING

Troubleshoot in accordance with the procedure on the following page.



Inside ▱ are section titles in this manual with the page number indicated in the bottom portion. See the indicated pages for detailed explanations.

Step 2, 5, 8, 10: Diagnostic steps permitting the use of the hand–held tester.

DI08G–15

CUSTOMER PROBLEM ANALYSIS CHECK

CRUISE CONTROL SYSTEM Check Sheet

Inspector's name: _____

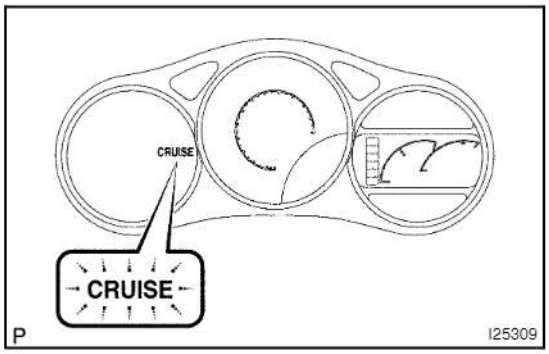
Customer's Name		**VIN**	
		Production Date	
		Licence No.	
Date Vehicle Brought in	/ /	**Odometer Reading**	**km Mile**

Condition of Problem Occurrence	**Date of Problem Occurrence**	/ /
	How Often does Problem Occurs	☑ Continuous ☑ Intermittent (Times a day)
	Vehicle Speed when Problem Occurred	**km Mile**

Symptoms	☑ Auto cancel occurs	● Driving condition ☐ City driving ☐ Freeway ☐ Uphill ☐ Downhill ● After cancel occurred, did the driver activate cruise control again? ☐ Yes ☐ No
	☐ Cancel does not occur	☐ With brake ON ☐ Except D position shift ☐ At 40 km/h (25 mph) or less ☐ 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 ☐ ACCEL ☐ COAST ☐ RESUME ☐ CANCEL
	☐ Cruise MAIN indicator light	☐ Remains ON ☐ Does not come on ☐ Blinking

DTC Check	**1st Time**	☐ Normal Code ☐ Malfunction Code (Code)
	2nd Time	☐ Normal Code ☐ Malfunction Code (Code)

DI1KS–20



PRE–CHECK

1. DIAGNOSIS SYSTEM

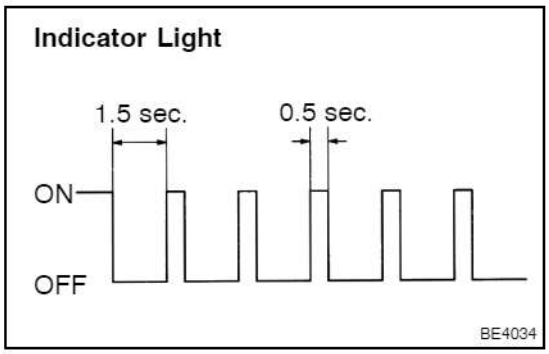
(a) Check the indicator.

(1) Turn the ignition switch ON.

(2) Check that the CRUISE MAIN indicator light comes ON when the cruise control main switch is turned ON, and that the indicator light goes OFF when the main switch is turned OFF.

HINT:

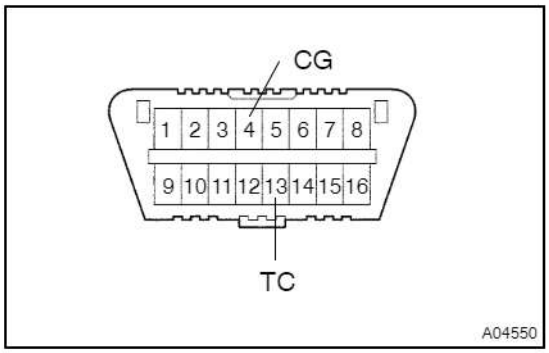
If the indicator check failed, proceed to troubleshooting (See page BE–46) for the combination meter section.



(b) Check the DTC.

HINT:

If a malfunction occurs in the No. 1 vehicle speed sensor or actuator, 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 the memory as DTC.



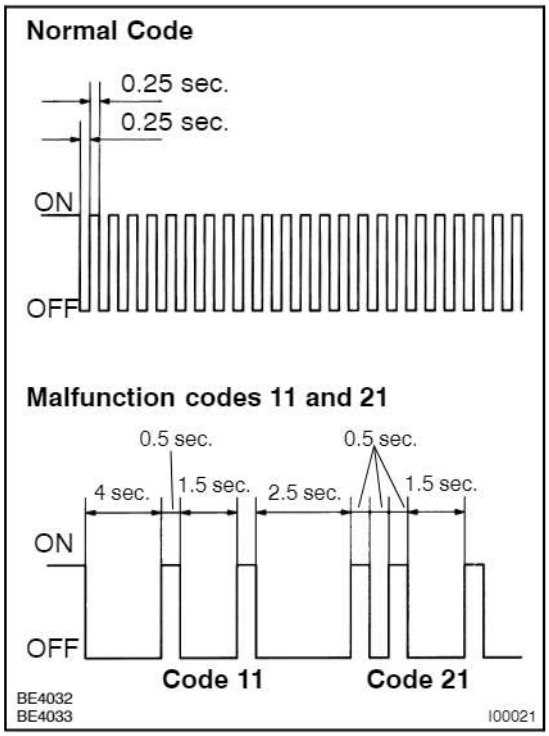
(c) Output of DTC using diagnosis check wire.

(1) Turn the ignition switch ON.

(2) Using SST, connect terminal Tc and CG of DLC3.

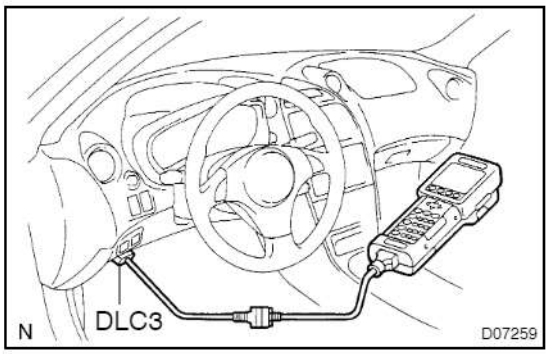
SST 09843–18040

(3) Read the DTC on the CRUISE MAIN indicator light.



HINT:

- If the DTC is not output, inspect the diagnosis circuit (See page DI–1085).
- As an example, the blinking patterns of normal code, code 11 and code 21 are shown in the illustration.



2. USING HAND–HELD TESTER

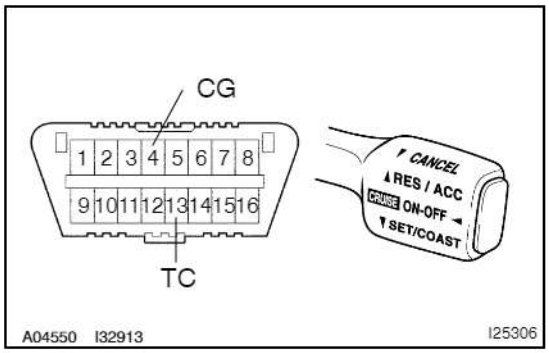
(a) Hook up the hand–held tester to the DLC3.

(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. DTC CLEARANCE (ERASE MODE)

HINT:

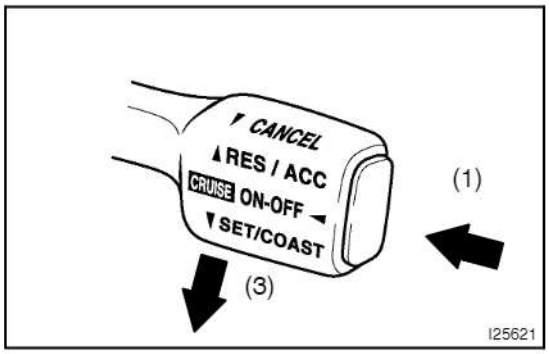
When operating the erase mode, diagnosis detection does not work.

(a) Drive at about 15 km/h or below.

(b) Using SST, connect terminal Tc and CG of DLC3.
SST 09843–18040

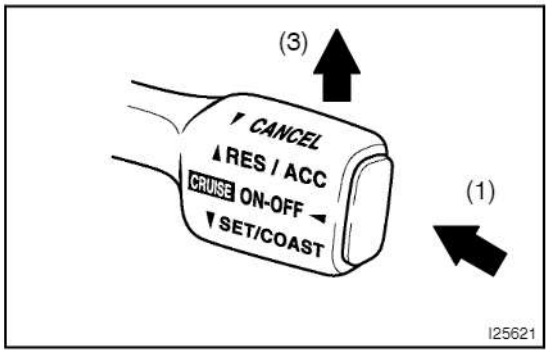
(c) Pull the cruise control switch to CANCEL.

(d) Under the condition mentioned above, turn on the cruise control main switch 5 times within 3 seconds.

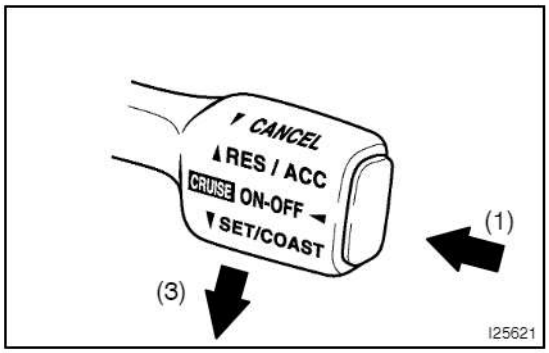


4. PROBLEM SYMPTOM CONFIRMATION (ROAD TEST)

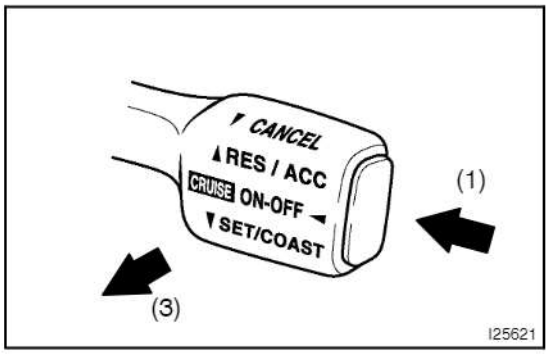
(a) Inspect the SET switch.
- (1) Press the main switch button to ON.
- (2) Drive at a desired speed [40 km/h (25 mph) or higher].
- (3) Push down the control switch to the SET/COAST.
- (4) After releasing the switch, check that the vehicle cruises at the desired speed.



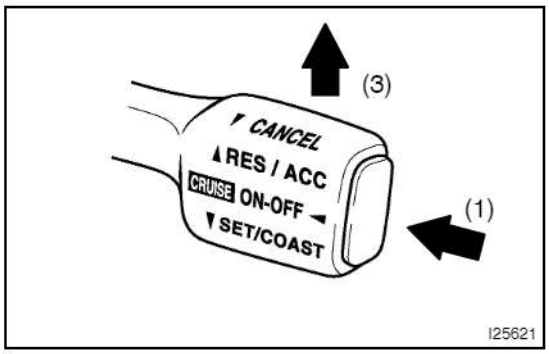
(b) Inspect the ACCEL switch.
- (1) Press the main switch button to ON.
- (2) Drive at a desired speed [40 km/h (25 mph) or higher].
- (3) Check that the vehicle speed increases while the control switch is pushed up to RES/ACC, and that the vehicle cruises at the set speed when the switch is released.
- (4) Momentarily push up the control switch to the RES/ACC position, and then immediately release it. Check that the vehicle speed increases by about 1.5 km/h (Tap–up function).



(c) Inspect the COAST switch.
- (1) Press 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 pushed down to SET/COAST, and the vehicle cruises at the set speed when the switch is released.
- (4) Momentarily push down the control switch to SET/COAST, and then immediately release it. Check that the vehicle speed decreases by about 1.5 km/h (Tap–down function).

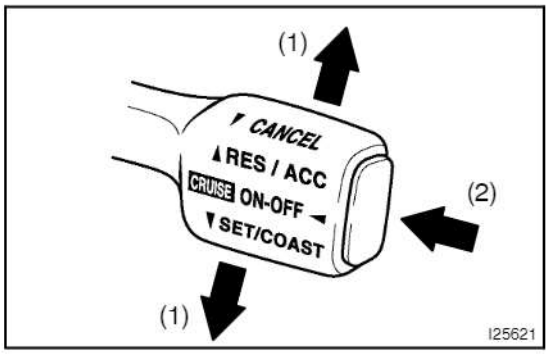


(d) Inspect the CANCEL switch.
(1) Press the main switch button to ON.
(2) Drive at a desired speed [40 km/h (25 mph) or higher].
(3) When performing one of the following actions, check that the cruise control system is cancelled and that the normal driving mode is reset.
- Depress the brake pedal.
- Depress the clutch pedal. (M/T)
- Shift to except D position. (A/T)
- Push the main switch button to OFF.
- Pull the cruise control switch to CANCEL.



(e) Inspect the RESUME switch.
(1) Press the main switch button to ON.
(2) Drive at a desired speed [40 km/h (25 mph) or higher].
(3) When performing one of the followings action, check that the cruise control system is cancelled and that the normal driving mode is reset.
- Depress the brake pedal.
- Depress the clutch pedal. (M/T)
- Shift to except D position. (A/T)
- Push the main switch button to OFF.

(4) When the control switch is pushed up to RES/ACC at the driving speed of more than 40 km/h (25 mph), check that the vehicle restores the speed before the cancellation.



5. INPUT SIGNAL CHECK

HINT:

(1) For check No.1 to No.3:

Turn ignition switch ON.

(2) For check No.4:

- Jack up the vehicle.
- Start the engine.
- Shift to D position.

(a) Push down the control switch to push up the SET/COAST or push up the RES/ACC position and hold it down or up (1).

(b) Push the main switch ON (2).

(c) Check that the CRUISE MAIN indicator light blinks twice or 3 times repeatedly after 3 seconds.

(d) Turn the SET/COAST or RES/ACC switch OFF.

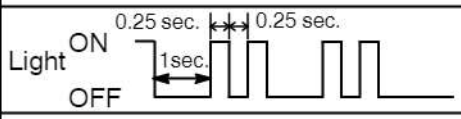
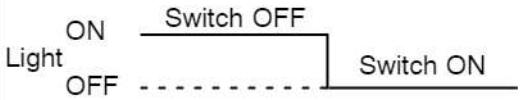
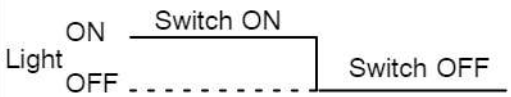
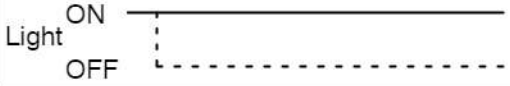
(e) Operate each switch as listed in the table below.

(f) Read the blinking pattern of the CRUISE MAIN indicator light.

(g) After performing the check, turn the main switch OFF.

HINT:

When 2 or more signals are input to the ECU, the lower numbered code will be displayed first.

No.	Operation Method	CRUISE MAIN Indicator Light Blinking Pattern	Diagnosis
1	Turn SET/COAST switch ON		SET/COAST switch circuit is normal
2	Turn RES/ACC switch ON		RES/ACC switch circuit is normal
3	Turn CANCEL switch ON		CANCEL switch circuit is normal
	Turn stop light switch ON Depress brake pedal		Stop light switch circuit is normal
	Turn PNP switch OFF (Shift to except D position)		PNP switch circuit is normal
	Turn clutch switch OFF (Depress clutch pedal)		Clutch switch circuit is normal
4	Drive at about 40 km/h (25 mph)or higher		Vehicle Speed Sensor is normal
	Drive at about 40 km/h (25 mph) or below		

DI08I–19

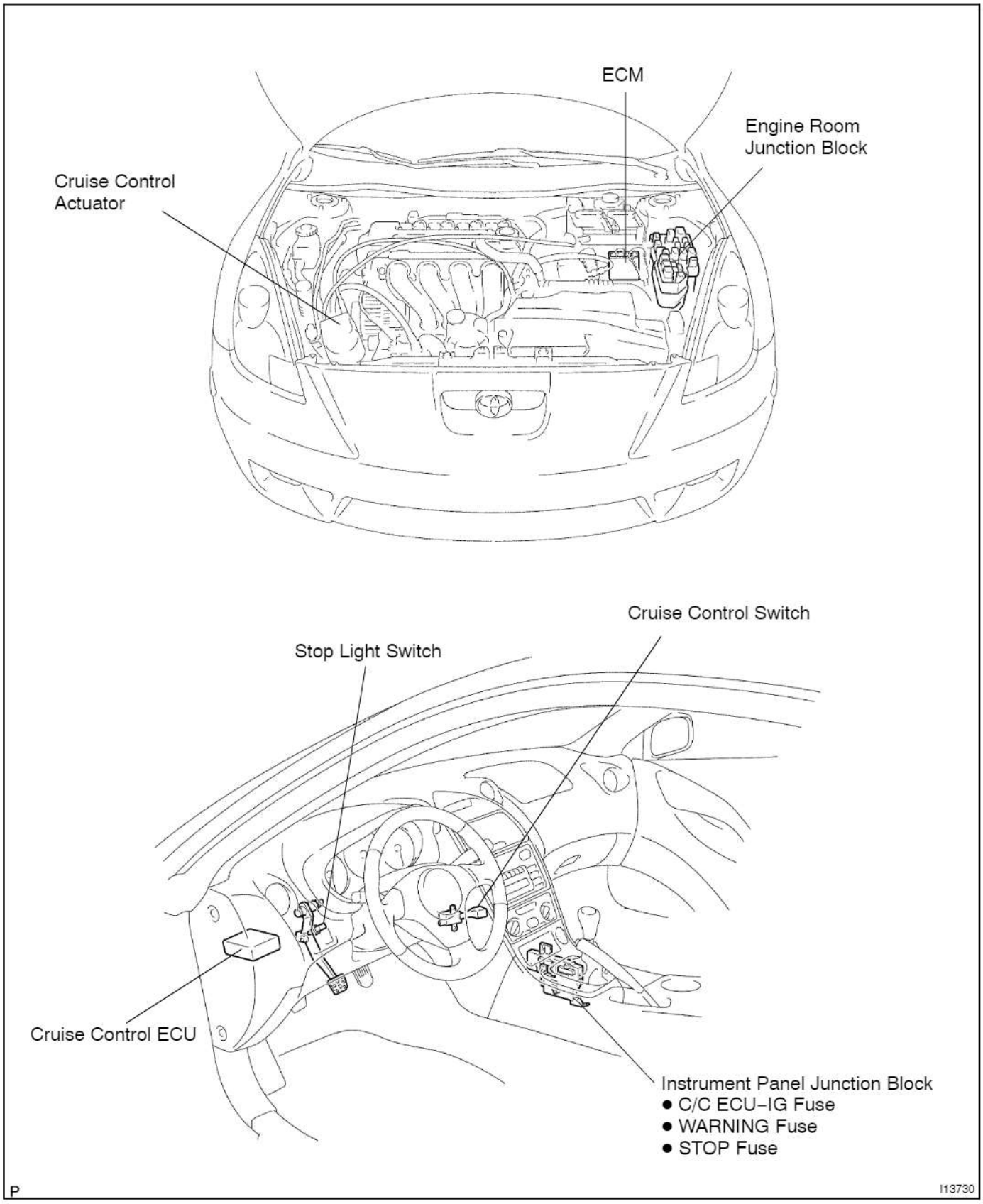
DIAGNOSTIC TROUBLE CODE CHART

If a malfunction code is displayed during the DTC check, check the circuit listed for that code in the table below and proceed to the appropriate page.

DTC No. (See Page)	Circuit Inspection	Trouble Area
11, 15 (DI–1050)	Actuator Motor Circuit	• Actuator motor • Harness or connector between cruise control ECU and actuator motor • Cruise control ECU
12, 43 (DI–1052)	Actuator Magnetic Clutch Circuit	• STOP Fuse • Stop light switch • Actuator magnetic clutch • Harness or connector between cruise control ECU and actuator magnetic clutch, actuator magnetic clutch and body ground • Cruise control ECU
14 (DI–1056)	Actuator Mechanical Malfunction	• Actuator motor (actuator lock: motor, arm) • Cruise control ECU
21 (DI–1058)	Open in Vehicle Speed Sensor Circuit	• Combination meter • Harness or connector between cruise control ECU and combination meter, combination meter and vehicle speed sensor • Vehicle speed sensor • Cruise control ECU
23 (DI–1062)	Vehicle Speed Signal Abnormal	• Vehicle speed sensor • Cruise control ECU
41	Cruise control ECU	• Cruise control ECU
42	Source voltage drop	• Power source

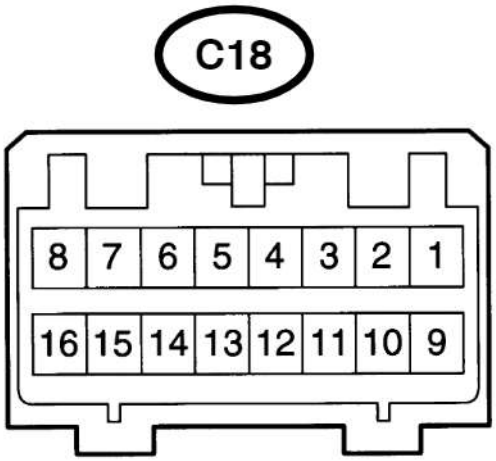
DI6QT–06

PARTS LOCATION



DI1KT–23

TERMINALS OF ECU



I00293

Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage
STP– ↔ GND (C18–2 ↔ C18–16)	G–W ↔ W–B	Depress brake pedal	10 – 16 V
		Release brake pedal	Below 1 V
D ↔ GND (C18–3 ↔ C18–16)	B–Y ↔ W–B	Shift to positions except D	Below 1 V
		Shift to D position	10 – 16 V
D ↔ GND (C18–3 ↔ C18–16)	B–Y ↔ W–B	Clutch pedal is depressed	10 – 16 V
		Clutch pedal is released	Below 1 V
PI ↔ GND (C18–4 ↔ C18–16)	Y–B ↔ W–B	Ignition switch ON Cruise control main switch OFF	10 – 16 V
TC ↔ GND (C18–5 ↔ C18–16)	P–B ↔ W–B	Ignition switch ON	10 – 16 V
		Ignition switch ON Connect terminals Tc and E1 of diagnostic check connector	Below 1 V
ECT ↔ GND (C18–6 ↔ C18–16)	Y ↔ W–B	During driving Gear position 3rd	10 – 16 V
		During driving Gear position O/D	Below 1 V
MC ↔ GND (C18–7 ↔ C18–16)	R–W ↔ W–B	During cruise control driving COAST switch held ON	9 – 15 V
		During cruise control driving ACC switch held ON	Below 1 V
L ↔ GND (C18–8 ↔ C18–16)	G–B ↔ W–B	During cruise control driving	9 – 15 V
		Except during cruise control driving	Below 1 V
B ↔ GND (C18–9 ↔ C18–16)	B–O ↔ W–B	Ignition switch ON	10 – 16 V
CCS ↔ GND (C18–10 ↔ C18–16)	W ↔ W–B	Ignition switch ON	10 – 16 V
		Ignition switch ON MAIN switch held ON	4.2 – 8.8 V
		Ignition switch ON SET/COAST switch held ON	2.5 – 6.3 V
		Ignition switch ON RES/ACC switch held ON	0.8 – 3.7 V

SPD ↔ GND (C18–12 ↔ C18–16)	W–R ↔ W–B	Engine start Car stoppage.	Below 1.5 V or 4.7 – 16 V
		During driving (Pulse generated).	3 – 7 V
IDL ↔ GND (C18–13 ↔ C18–16)	L–W ↔ W–B	Ignition switch ON Throttle valve fully opened.	10 – 16 V
		Ignition switch ON Throttle valve fully closed.	Below 1.5 V
OD ↔ GND (C18–14 ↔ C18–16)	B ↔ W–B	During cruise control driving O/D switch ON.	10 – 16 V
		During cruise control driving O/D switch OFF (3rd driving)	Below 1 V
MO ↔ GND (C18–15 ↔ C18–16)	P–L ↔ W–B	During cruise control driving ACC switch hold ON	9 – 15 V
		During cruise control driving COAST switch hold ON	Below 1 V
GND ↔ Body Ground (C18–16 ↔ Body Ground)	W–B ↔ Body Ground	Always	Below 1 V

DI08L–31

PROBLEM SYMPTOMS TABLE

Symptom	Suspect Area	See page
SET not occurring or CANCEL occurring (DTC is normal).	1. Main Switch Circuit (Cruise control switch) 2. Vehicle Speed Sensor 3. Control Switch Circuit (Cruise control switch) 4. Stop Light Switch Circuit 5. Park/Neutral Position Switch Circuit (A/T) 6. Clutch Switch Circuit (M/T) 7. Actuator Motor Circuit 8. Cruise Control Cable 9. Cruise Control ECU	DI–1063 DI–1058 DI–1063 DI–1068 DI–1075 DI–1078 DI–1078 DI–1050 DI–1078
SET not occurring or CANCEL occurring (DTC does not output).	1. ECU Power Source Circuit 2. Cruise Control ECU	DI–1080 DI–1078
Actual vehicle speed deviates above or below the set speed.	1. Cruise Control Cable 2. Vehicle Speed Signal Abnormal 3. Electronically Controlled Transmission Communication Circuit 4. Actuator Motor Circuit 5. Idle Signal Circuit (Main throttle position sensor) 6. Cruise Control ECU	DI–1050 DI–1058 DI–1072 DI–1078 DI–1066 DI–1078
Gear shifting frequently between 3rd and O/D when driving on uphill road (Hurting).	1. Electronically Controlled Transmission Communication Circuit 2. Cruise Control ECU	DI–1072 DI–1078
Cruise control cannot be cancelled even when brake pedal is depressed.	1. Cruise Control Cable 2. Stop Light Switch Circuit 3. Actuator Motor Circuit 4. Cruise Control ECU	DI–1050 DI–1068 DI–1078 DI–1078
Cruise control cannot be cancelled even when transmission is shifted to "N" position.	1. Cruise Control Cable 2. Park/Neutral Position Switch Circuit (A/T) 3. Actuator Motor Circuit 4. Cruise Control ECU	DI–1050 DI–1075 DI–1078 DI–1078
Cruise control cannot be cancelled even when clutch pedal is depressed.	1. Cruise Control Cable 2. Clutch Switch Circuit (M/T) 3. Actuator Motor Circuit 4. Cruise Control ECU	DI–1050 DI–1078 DI–1078 DI–1078
Control switch does not operate (SET/COAST, ACC/RES, CANCEL not possible).	1. Cruise Control Cable 2. Control Switch Circuit 3. Actuator Motor Circuit 4. Cruise Control ECU	DI–1050 DI–1078 DI–1078 DI–1078
SET is possible at 40 km/h (25 mph) or less, or CANCEL does not operate at 40 km/h (25 mph) or less.	1. Cruise Control Cable 2. Vehicle Speed Signal Abnormal 3. Actuator Motor Circuit 4. Cruise Control ECU	DI–1050 DI–1058 DI–1078 DI–1078
Poor response is in ACCEL and RESUME modes.	1. Cruise Control Cable 2. Electronically Controlled Transmission Communication Circuit 3. Actuator Motor Circuit 4. Cruise Control ECU	DI–1050 DI–1072 DI–1078 DI–1078
O/D does not resume even though the road is not uphill.	1. Electronically Controlled Transmission Communication Circuit 2. Cruise Control ECU	DI–1072 DI–1078
DTC memory is erased.	1. Cruise Control ECU	DI–1078

DTC is not output, or is output when should not be.	1. Diagnosis Circuit 2. Cruise Control ECU	DI–1085 DI–1078
Cruise MAIN indicator light remains ON or fails to come on.	1. Cruise MAIN Indicator Light Switch Circuit	DI–1083

DI08M–34

CIRCUIT INSPECTION

DTC	11, 15	Actuator Motor Circuit

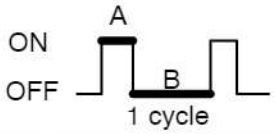
CIRCUIT DESCRIPTION

The actuator motor is operated by signals from the ECU. Acceleration and deceleration signals are transmitted according to the changes in the Duty Ratio (See below).

Duty Ratio

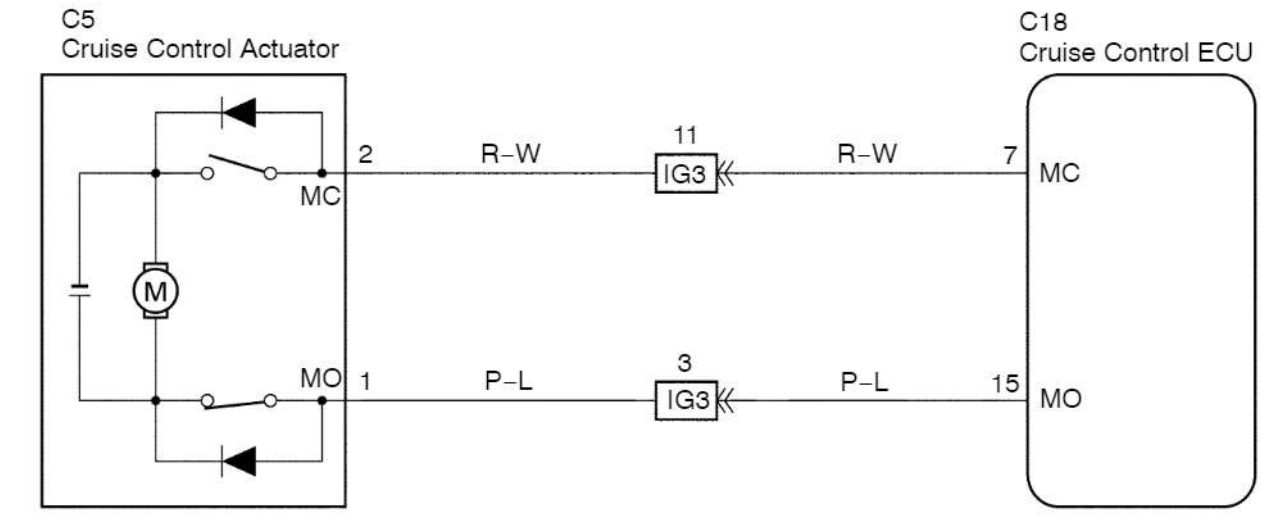
The duty ratio is the ratio of the period of continuity in one cycle. For example, if A is the period of continuity in one cycle, B is the period of non–continuity.

$$\text{Duty Ratio} = \frac{A}{A + B} \times 100\ (\%)$$



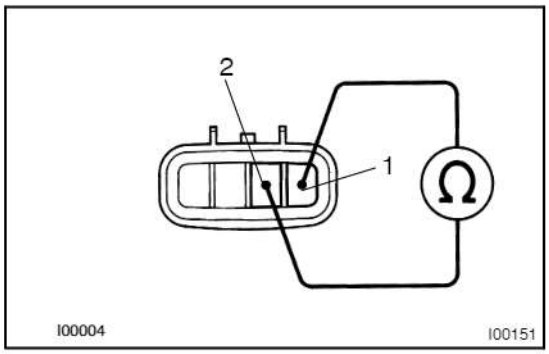
DTC No.	Detection Item	Trouble Area
11	Short in actuator motor circuit.	• Actuator motor • Harness or connector between cruise control ECU and actuator motor • Cruise control ECU
15	Open in actuator motor circuit.	• Actuator motor

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check resistance between terminals MO and MC of actuator motor.**



PREPARATION:

(a) Turn ignition switch OFF.

(b) Disconnect the actuator connector.

CHECK:

Measure the resistance between terminal 1 and 2.

HINT:

If the control plate is in fully opened or fully closed positions, the resistance cannot be measured.

OK:

Resistance: more than 4.2 Ω

NG → **Replace cruise control actuator.**

OK

2	**Check for open and short in harness and connectors between cruise control ECU and actuator motor (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Check and replace cruise control ECU (See page IN–30).

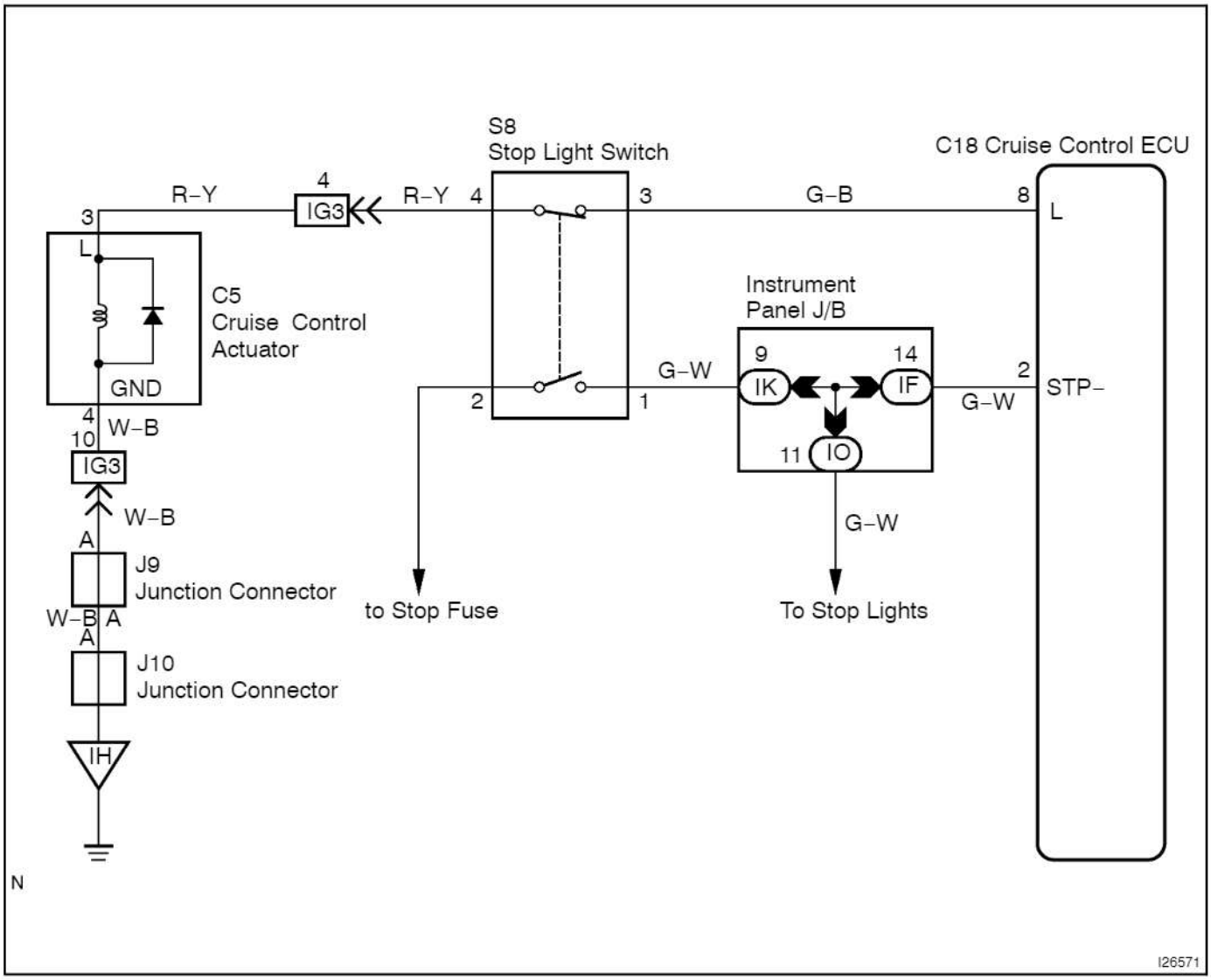
DTC	12, 43	Actuator Magnetic Clutch Circuit

CIRCUIT DESCRIPTION

This circuit turns on the magnetic clutch inside the actuator during the cruise control operation according to the signal from the ECU. If a malfunction occurs in the actuator or speed sensor, etc. during the cruise control operation, the rotor shaft between the motor and control plate is released.
When the brake pedal is depressed, the stop light switch is turned on and the power supply to the magnetic clutch is mechanically cut, and therefore the magnetic clutch is turned OFF.
When driving downhill, if the vehicle speed exceeds the set speed by 15 km/h (9 mph), the ECU turns the safety magnet clutch OFF. If the vehicle speed later drops by 10 km/h (6 mph) from that speed, cruise control at the set speed is resumed.

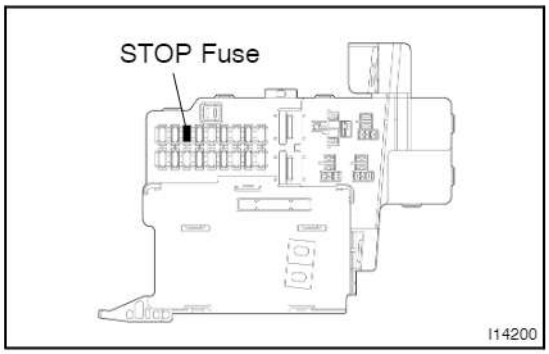
DTC No.	Detection Item	Trouble Area
12, 43	Short in actuator magnetic clutch circuit. Open (0.8 sec.) in actuator magnetic clutch circuit.	• STOP Fuse • Stop light switch • Actuator magnetic clutch • Harness or connector between cruise control ECU and actuator magnetic clutch, actuator magnetic clutch and body ground • Cruise control ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check STOP fuse.



PREPARATION:

(a) Turn ignition switch OFF.

(b) Remove the STOP fuse from the instrument panel junction block.

CHECK:

Check fuse continuity.

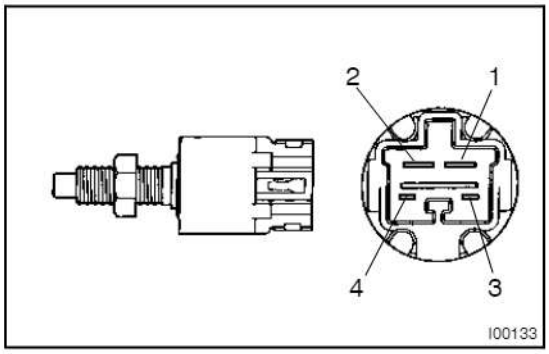
OK:

There is continuity.

NG	Replace STOP fuse.

OK

2	Check stop light switch.



PREPARATION:

Disconnect the stop light switch connector.

CHECK:

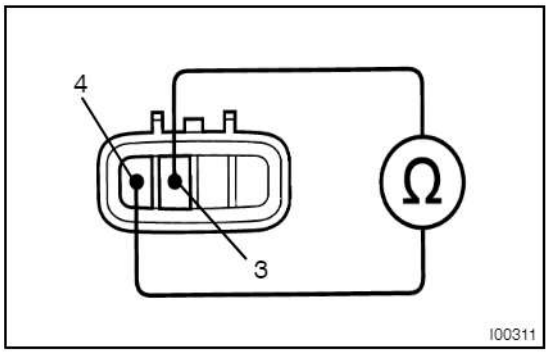
Check continuity between terminals.

Switch position	Continuity
Switch pin free (Brake pedal depressed)	1 – 2
Switch pin pushed in (Brake pedal released)	3 – 4

NG	Replace stop light switch.

OK

3	**Check resistance between terminals L and GND of actuator magnetic clutch.**



PREPARATION:

(a) Turn ignition switch OFF.

(b) Disconnect the actuator connector.

CHECK:

Measure the resistance between terminal 3 and 4.

OK:

Resistance: 34.65 – 42.35 Ω.

NG → **Replace cruise control actuator.**

OK

4	**Check for open and short in harness and connectors between cruise control ECU and actuator magnetic clutch, actuator magnetic clutch and body ground (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Check and replace cruise control ECU (See page IN–30).

DTC	14	Actuator Mechanical Malfunction

CIRCUIT DESCRIPTION

The circuit detects the rotation position of the actuator control plate and sends a signal to the ECU.

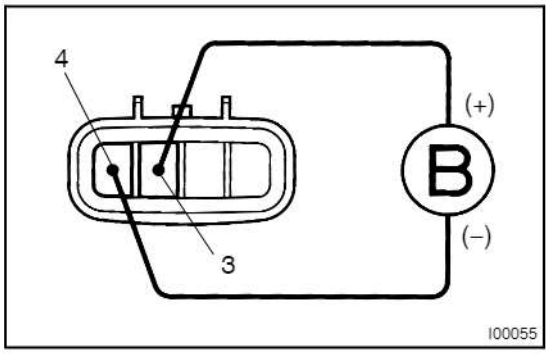
DTC No.	Detection Item	Trouble Area
14	Cruise control actuator mechanical malfunction.	• Actuator lock: (motor, arm) • Actuator motor • Cruise control ECU

WIRING DIAGRAM

See page DI–1052.

INSPECTION PROCEDURE

1	Check cruise control actuator arm locking operation



PREPARATION:

(a) Turn ignition switch OFF.

(b) Disconnect the actuator connector.

CHECK:

(a) Connect the battery positive (+) lead to terminal 3, and the battery negative (–) lead to terminal 4 of the actuator.

NOTICE:

Do not connect the high tension cables to the wrong battery terminal. The cruise control actuator will be damaged.

(b) Move the control plate by hand.

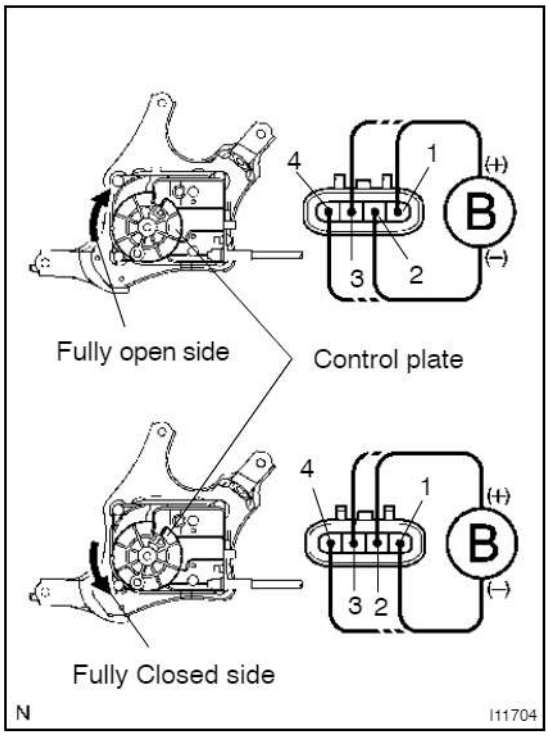
OK:

Control plate does not move.

NG	Replace cruise control actuator.

OK

2	Check cruise control actuator operation.



PREPARATION:

(a) Turn ignition switch OFF.

(b) Disconnect the actuator connector.

CHECK:

Connect the battery positive (+) lead to terminal 1 and 3 of the actuator, and connect the battery negative (–) lead to terminal 2 and 4 of the actuator.

OK:

Control arm moves to fully open side

CHECK:

Connect the battery positive (+) lead to terminal 2 and 3 of the actuator, and connect the battery negative (–) lead to terminal 1 and 4 of the actuator.

OK:

Control arm moves to fully closed side

NG → **Replace cruise control actuator.**

OK

3	Check harness and connector between cruise control ECU and cruise control actuator (See page IN–30).

NG → **Repair or replace harness or connector.**

OK

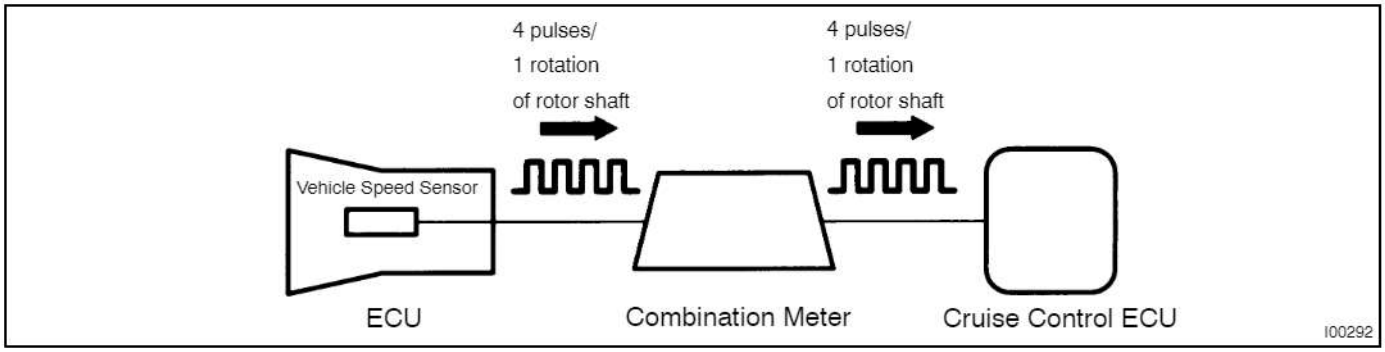
Check and replace cruise control ECU (See page IN–30).

D08P–41

DTC	21	Open in Vehicle Speed Sensor Circuit

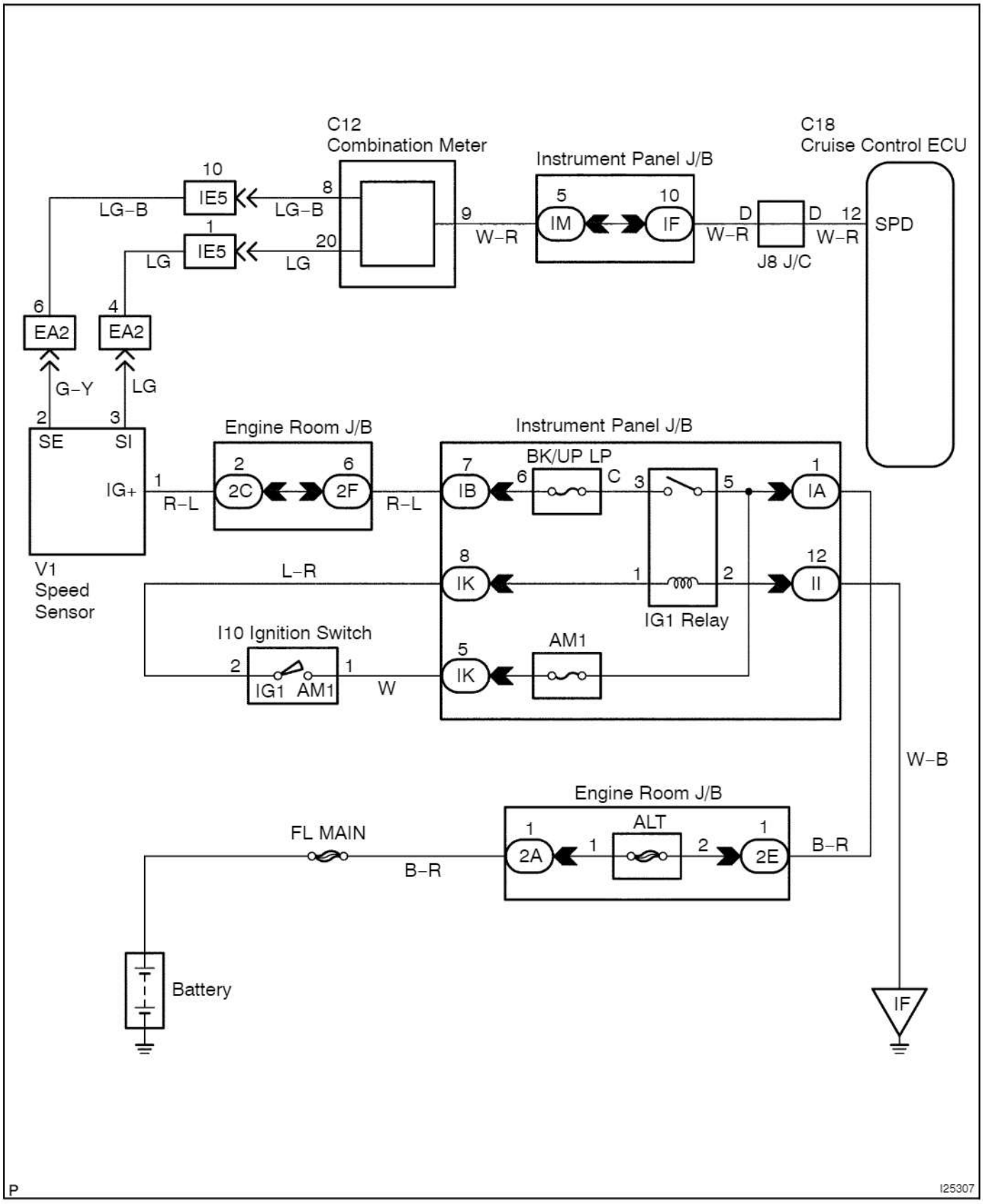
CIRCUIT DESCRIPTION

The signal from the vehicle speed sensor circuit is sent to the cruise control ECU as a vehicle speed signal. The rotor shaft is driven by the gear of the transmission.
For each rotation of the shaft, the vehicle speed sensor sends a 4–pulse signal through the combination meter to the cruise control ECU (See the following installation).
ECU calculates the vehicle speed from this pulse frequency.



DTC No.	Detection Item	Trouble Area
21	Speed signal is not input to the cruise control ECU while cruise control is set.	• Combination meter • Harness or connector between cruise control ECU and combination meter, combination meter and vehicle speed sensor • Vehicle speed sensor • Cruise control ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Input signal check.**

Input Signal	Indicator Light Blinking Pattern
Drive at about 40 km/h (25 mph) or below	Light: ON — OFF
Drive at about 40 km/h (25 mph) or higher	Light: ON / OFF (blinking)

CHECK:

(a) See input signal check on page DI–1058.

(b) Check indicator light operation when driving a vehicle above 40 km/h (25 mph) and below 40 km/h (25 mph).

OK:

Vehicle speed below 40 km/h (25 mph):
Indicator light remains on

Vehicle speed above 40 km/h (25 mph):
Indicator light blinks

OK → **Check and replace cruise control ECU (See page IN–30).**

NG

2	**Check speedometer circuit (See Combination meter troubleshooting on page BE–46).**

NG → **Repair or replace harness, connector or combination meter assembly.**

OK

3	**Check harness and connector between cruise control ECU and combination meter, combination meter and vehicle speed sensor (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

4	Check vehicle speed sensor (See page BE–50).

NG → Replace vehicle speed sensor.

OK →

Check and replace cruise control ECU (See page IN–30).

D08Q-23

DTC	23	Vehicle Speed Signal Abnormal

CIRCUIT DESCRIPTION

See page DI-1058.

DTC No.	Detection Item	Trouble Area
23	Vehicle speed sensor pulse is abnormal.	• Vehicle speed sensor • Cruise control ECU

WIRING DIAGRAM

See page DI-1058.

INSPECTION PROCEDURE

1	**Check vehicle speed sensor (See page BE-50).**

NG → **Replace vehicle speed sensor.**

OK

Check and replace cruise control ECU (See page IN-30).

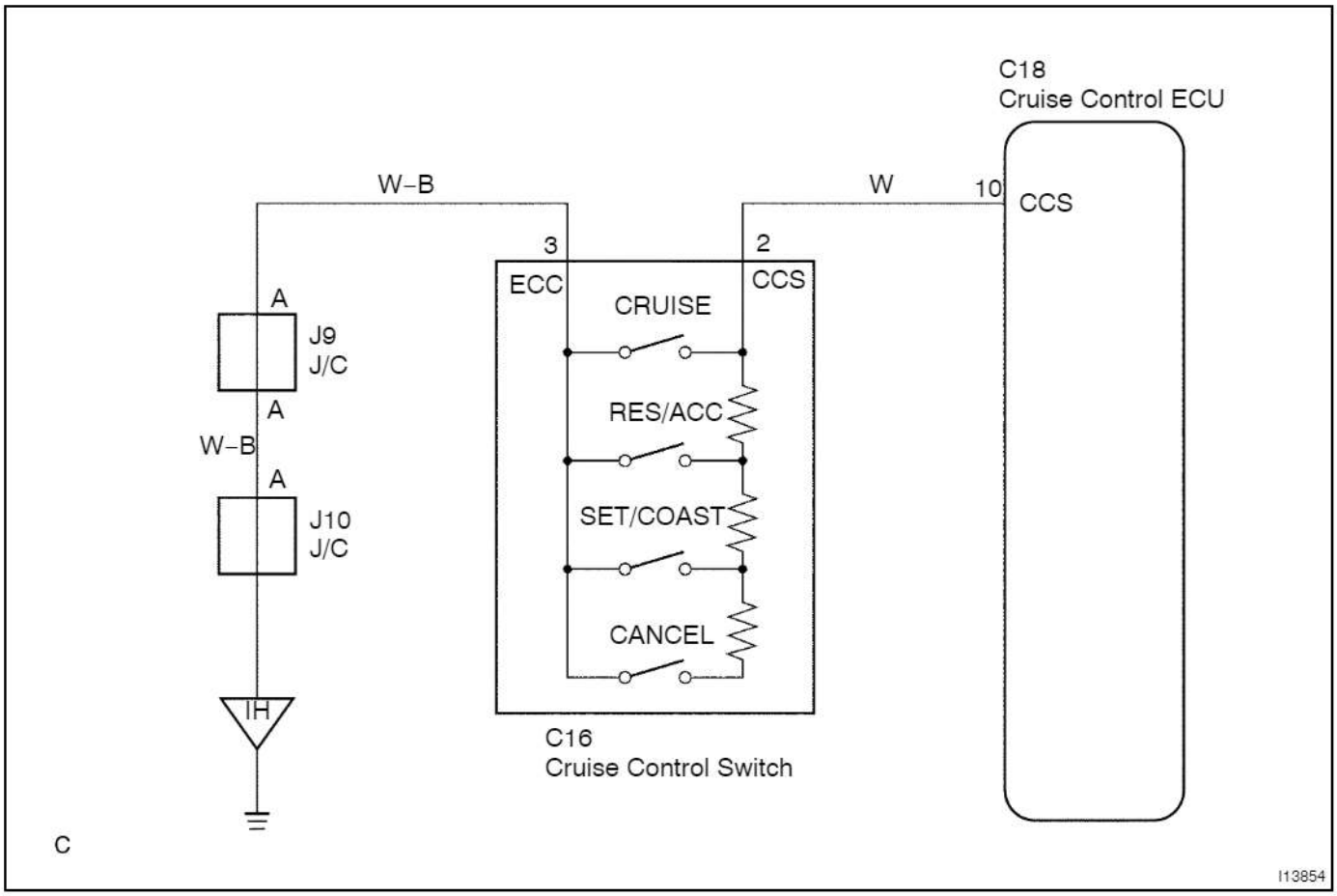
DI08R–37

Control Switch Circuit (Cruise Control Switch)

CIRCUIT DESCRIPTION

This circuit carries the SET/COAST, RESUME/ACCEL and CANCEL signals (each voltage) to the ECU.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Input signal check.

Input Signal	Indicator Light Blinking Pattern
SET/COAST switch	ON / OFF — 2 Pulses
RESUME/ACCEL switch	ON / OFF — 3 Pulses
CANCEL switch	ON / OFF — SW OFF, SW ON

PREPARATION:

See input signal check on page DI–1039.

CHECK:

Check the indicator light operation when each of the SET/COAST, RESUME/ACCEL and CANCEL is turned on.

OK:

SET/COAST, RESUME/ACCEL switch

The signals shown in the table on the left should be output when each switch is ON. The signal should disappear when the switch is turned OFF.

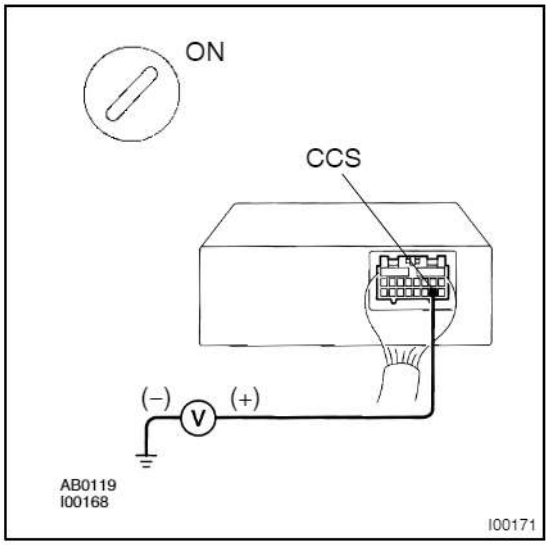
CANCEL switch

The indicator light should go off when the cancel switch is turned ON.

OK	Wait and see.

NG

2	Check voltage between terminals CCS of cruise control ECU connector and body ground.



PREPARATION:

(a) Remove ECU with connector being connected.

(b) Turn ignition switch ON.

CHECK:

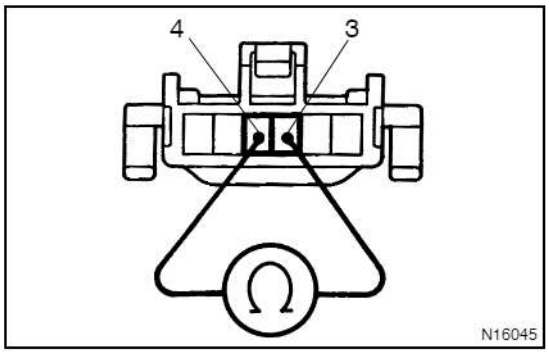
Measure the voltage between terminal 10 of ECU connector and body ground when each of the SET/COAST, RESUME/ACCEL and CANCEL is turned ON.

Switch position	Voltage
Neutral	10 – 16
RES/ACC	2.3 – 4.5
SET/COAST	4.5 – 8.1
CANCEL	6.6 – 11.4

OK	Proceed to next circuit inspection shown in problem symptom table (See page DI–1048).

NG

3	Check control switch.



PREPARATION:

(a) Remove the steering wheel center pad.

(b) Disconnect the control switch connector.

CHECK:

Measure the resistance between terminal 3 and 4 of the control switch connector when control switch is operated.

Switch position	Resistance (Ω)
Neutral	∞ (No continuity)
RES/ACC	210 – 270
SET/COAST	570 – 690
CANCEL	1390 – 1690

NG → **Replace control switch.**

OK

4	Check harness and connector between cruise control ECU and cruise control switch, cruise control switch and body ground (See page IN–30).

NG → **Repair or replace harness or connector.**

OK

5	Input signal check (See step 1).

OK → **Wait and see.**

NG

Check and replace cruise control ECU (See page IN–30).

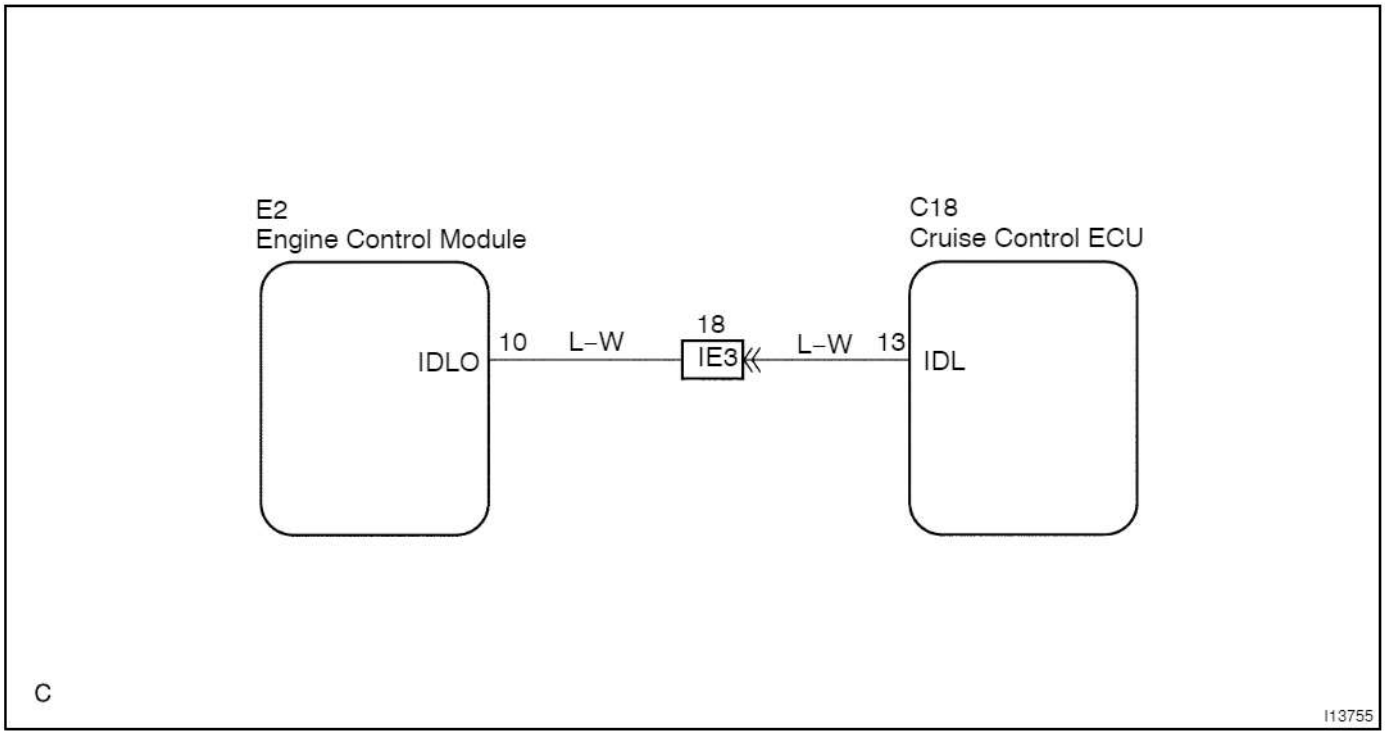
DI3VK–14

Idle Signal Circuit

CIRCUIT DESCRIPTION

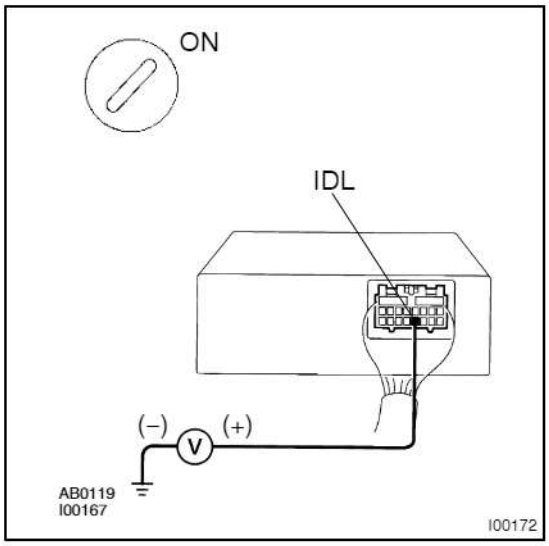
When the idle switch is turned ON, a signal is sent to the ECU. The ECU uses this signal to correct the discrepancy between the throttle valve position and the actuator position sensor value to enable accurate cruise control at the set speed. Since there will also be a problem when the idle switch malfunctions, inspect both the switch and the engine if the idle switch is faulty.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check voltage between terminal IDL of cruise control ECU connector and body ground.**



PREPARATION:

(a) Remove ECU with connector being connected.
(b) Disconnect the cruise control ECU connector.
(c) Turn ignition switch ON.

CHECK:

Measure the voltage between terminal IDL of the ECU connector and body ground when the throttle valve is fully opened and fully closed.

OK:

Throttle valve position	Voltage
Fully opened	10 – 14 V
Fully closed	Below 2 V

OK → **Proceed to next circuit inspection shown in problem symptom table (See page DI–1048).**

NG

2	**Check for open and short in harness and connector between cruise control ECU and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Check and replace cruise control ECU (See page IN–30).

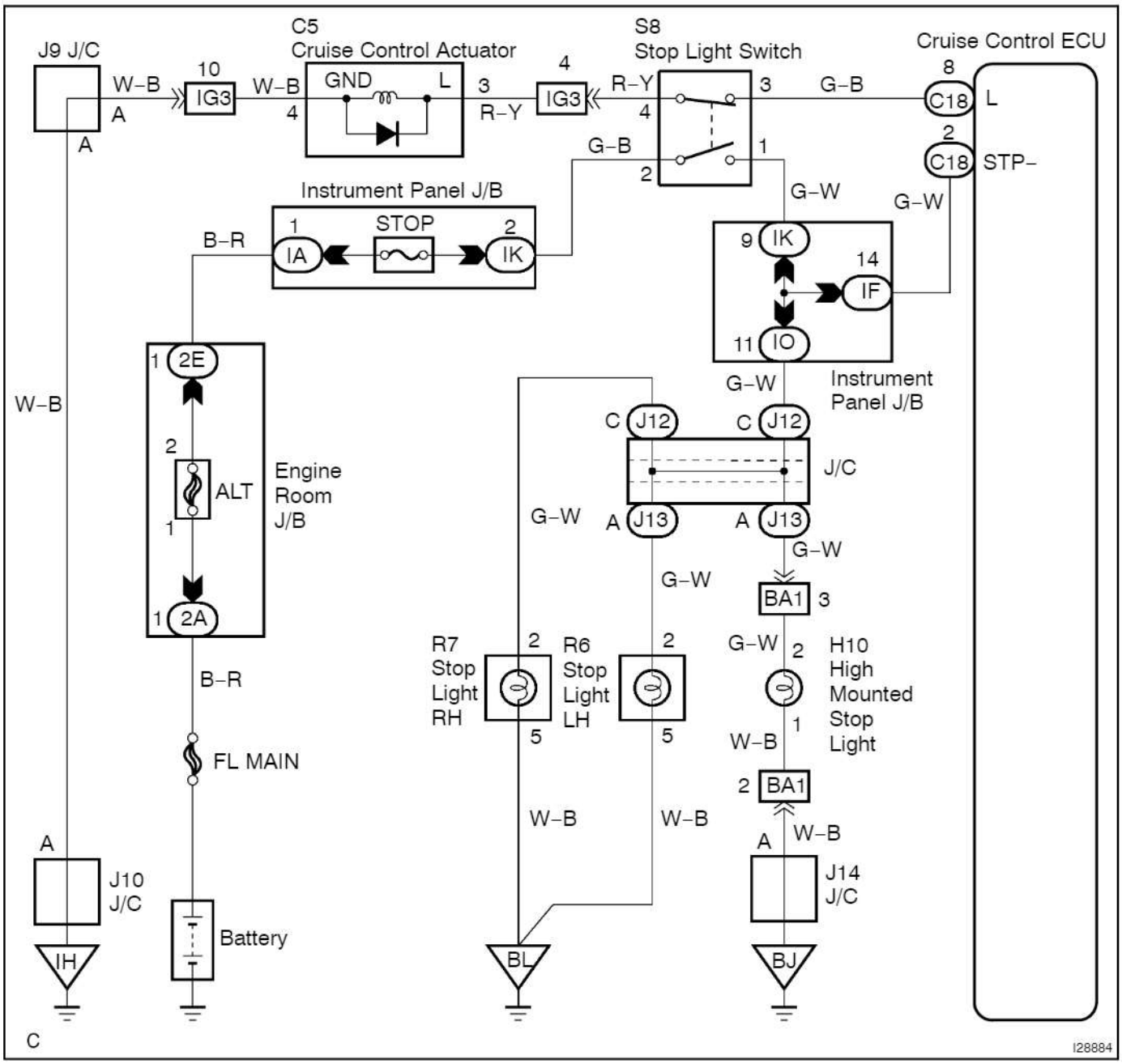
DI08T–36

Stop Light Switch Circuit

CIRCUIT DESCRIPTION

When the brake pedal is depressed, the stop light switch sends a signal to ECU. When ECU receives this signal, it cancels the cruise control.
A fail–safe function is provided so that the cruise control is canceled normally when there is a malfunction in the stop light signal circuit.
The cancellation occurs when the battery positive voltage is applied to terminal STP–.
When the brake is ON, battery positive voltage is applied to terminal STP– of the ECU via the stop fuse and the stop light switch, and then the ECU turns the cruise control OFF.
Even if the harness connected to terminal STP– has an open circuit, the cruise control will be turned OFF.
Also, when the brake is ON, the magnetic clutch circuit is cut mechanically by the stop light switch, turning the cruise control OFF (See page DI–1052 for operation of the magnetic clutch).

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check operation of stop light.**

CHECK:

Check that stop light comes on when the brake pedal is depressed, and turns off when the brake pedal is released.

NG → **Check stop light system (See page BE–2).**

OK

2	**Input signal check.**

Input Signal	Indicator Light Blinking Pattern
Stop Light switch ON	

CHECK:

(a) See input signal check on DI–1039.

(b) Check the indicator light when the brake pedal is depressed.

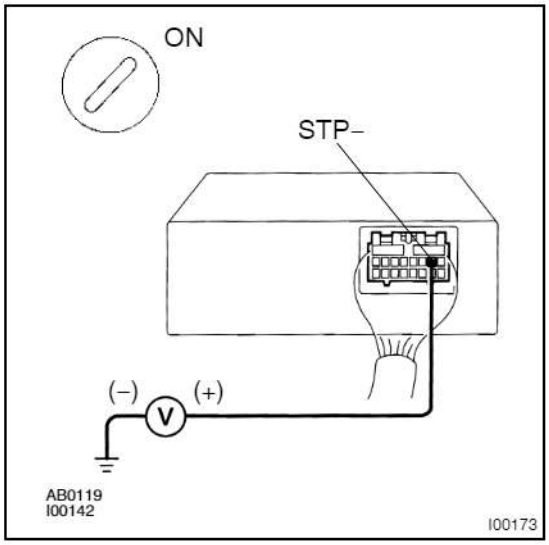
OK:

The indicator light goes OFF when the brake pedal is depressed.

OK → **Proceed to next circuit inspection shown in problem symptom table (See page DI–1048).**

NG

3	Check voltage between terminal STP– of cruise control ECU connector and body ground.



PREPARATION:

(a) Remove ECU with connectors being connected.

(b) Turn ignition switch ON.

CHECK:

Measure the voltage between terminal STP– of the cruise control ECU connector and body ground when the brake pedal is depressed and released.

OK:

Depressed	10 – 14 V
Released	Below 1 V

OK → **Proceed to next circuit inspection shown in problem symptom table (See page DI–1048).**

NG

4	Check for open in harness and connectors between terminal STP– of cruise control ECU and stop light switch (See page IN–30).

NG → **Repair or replace harness or connector.**

OK

Check and replace cruise control ECU (See page IN–30).

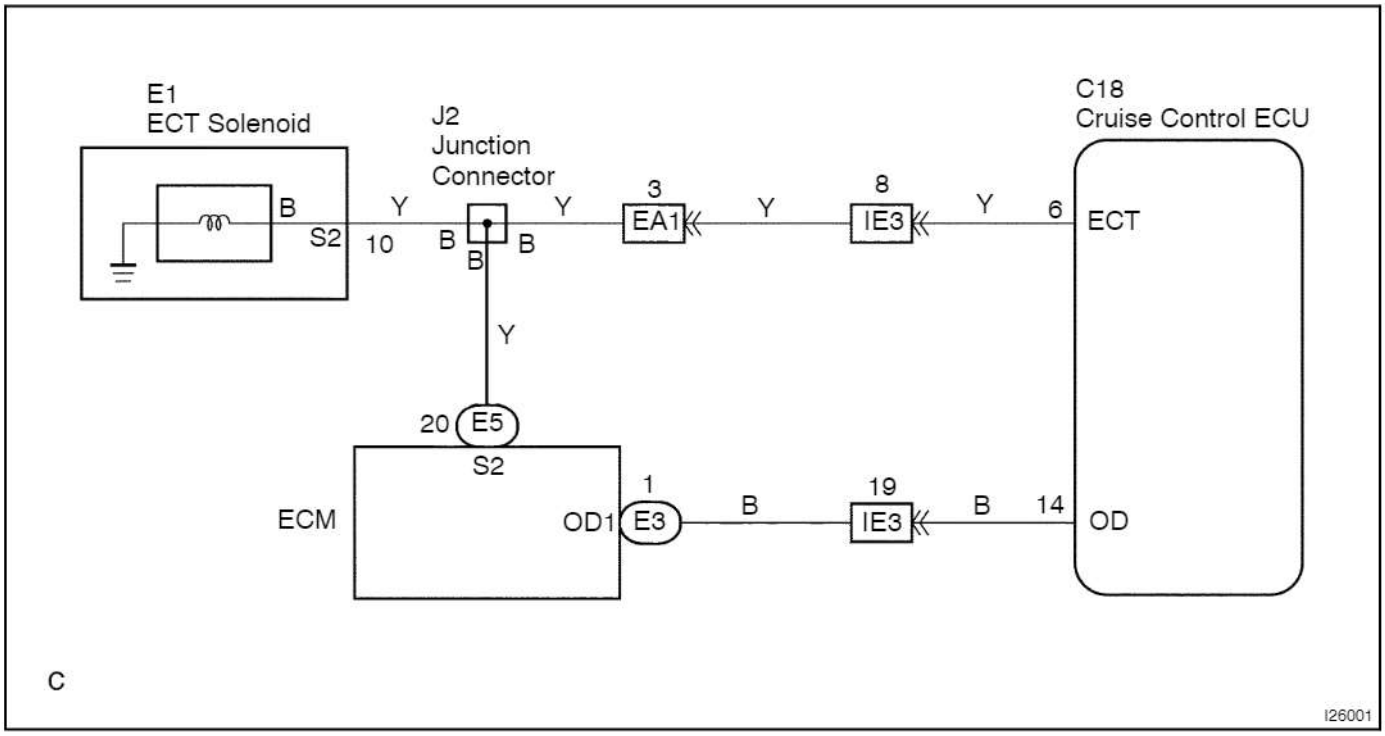
Electronically Controlled Transmission Communication Circuit

CIRCUIT DESCRIPTION

When driving uphill under the cruise control and the shift–down occurred in the electronically controlled transmission, the cruise control ECU sends a signal there to suspend the shift–up until the vehicle reaches the top of the hill. This will provide smooth driving, and there is no need for ON–OFF overdrive operation. Terminal ECT of the cruise control ECU detects the shift change signal (output to electronically controlled transmission No. 2 solenoid) from ECM.

If the vehicle speeds down and when terminal ECT receives the shift–down signal, ECU sends a signal from terminal OD to ECM to stop the overdrive until the end of the uphill slope, and the gear shift points in the electronically controlled transmission are changed.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check operation of overdrive.**

PREPARATION:

Test drive after engine warms up.

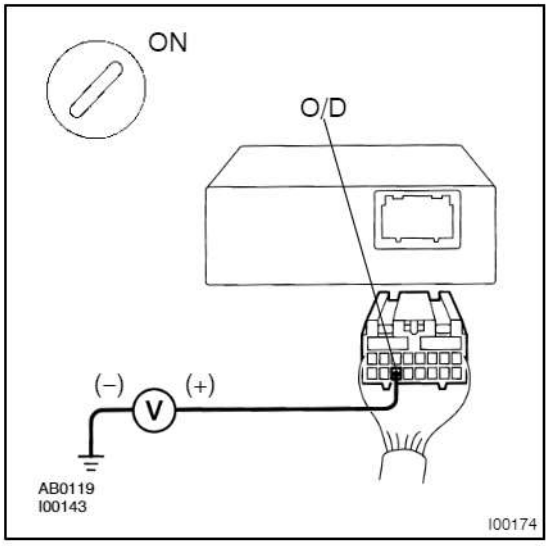
CHECK:

Check that the overdrive ON ↔ OFF occurs by operating the O/D switch ON–OFF.

NG → **Check and repair electronically controlled transmission (See page DI–666 or DI–755).**

OK

2	**Check voltage between terminal OD of harness side connector of cruise control ECU and body ground.**



PREPARATION:

(a) Remove ECU with connector being connected.
(b) Turn the ignition switch ON.
(c) Disconnect the ECU connector.

CHECK:

Measure the voltage between terminal OD of the harness side connector of ECU and body ground.

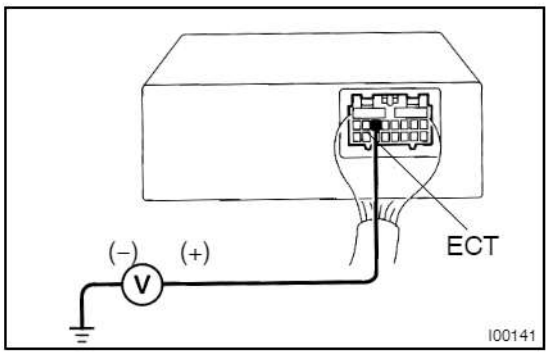
OK:

Voltage: 10 – 14 V

NG → **Go to step 5.**

OK

3	Check voltage between terminal ECT of cruise control ECU connector and body ground (On test drive).



PREPARATION:

(a) Connect the ECU connector.

(b) Test drive after engine warms up.

CHECK:

Check the voltage between terminal ECT of ECU connector and body ground when O/D switch is ON and OFF.

OK:

OD switch position	Voltage
ON	8 – 14 V
OFF	Below 0.5 V

OK → **Proceed to next circuit inspection shown in problem symptom table (See page DI–1048).**

NG

4	Check harness and connector between terminal ECT of cruise control ECU and electronically controlled transmission solenoid (See page IN–30).

NG → **Repair or replace harness or connector.**

OK

Check and replace cruise control ECU.

5	Check harness and connector between terminal OD of cruise control ECU and terminal OD1 of ECM (See page IN–30).

NG → **Repair or replace harness or connector.**

OK

Check and replace cruise control ECU (See page IN–30).

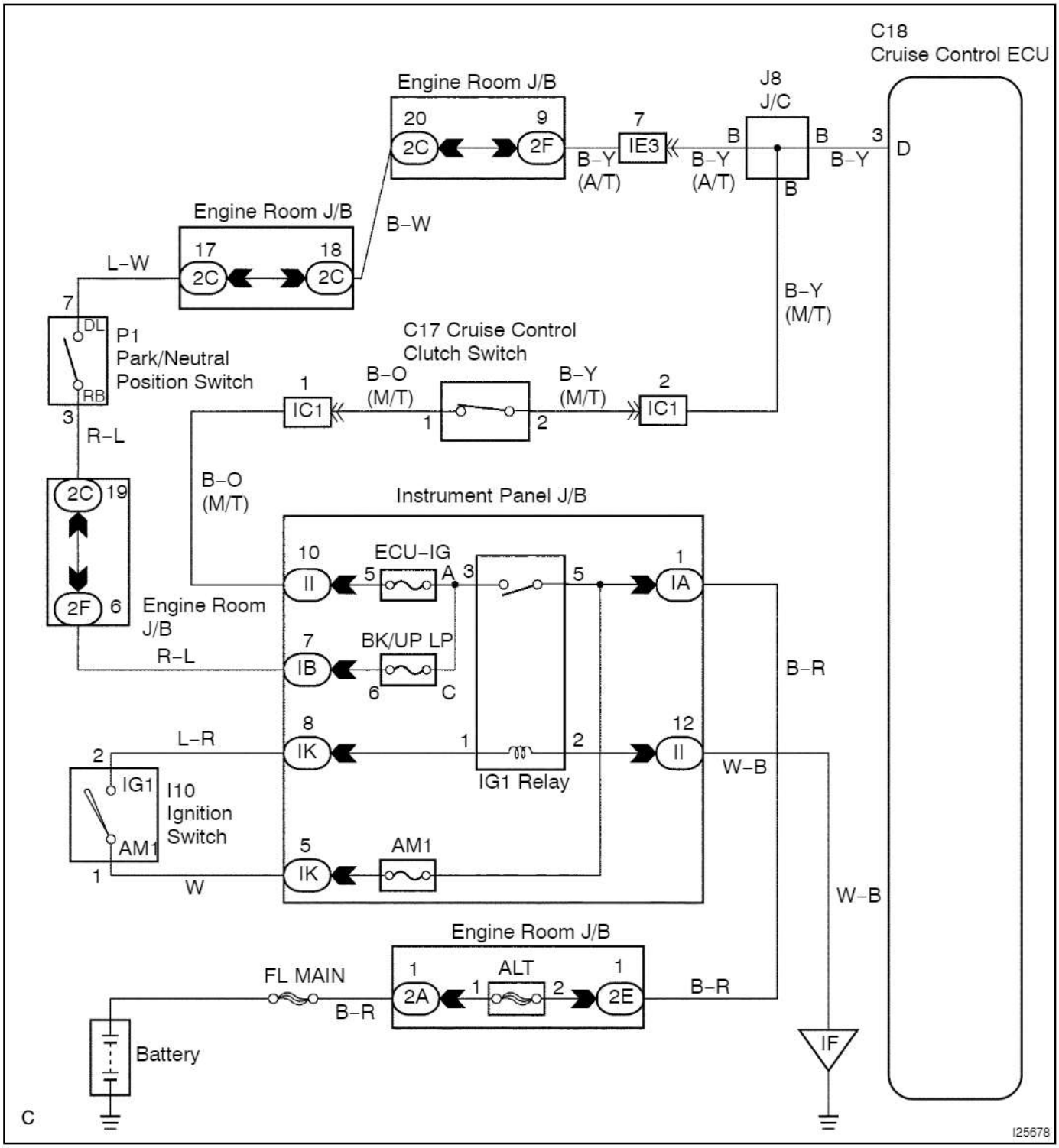
DI08V–38

Park/Neutral Position Switch Circuit

CIRCUIT DESCRIPTION

When the shift position is except D, a signal is sent from the park/neutral position switch to ECU. When this signal is input during cruise control driving, ECU cancels the cruise control.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check starter operation.**

CHECK:

Check that the starter operates normally and the engine starts.

NG → **Proceed to engine troubleshooting (See page DI–1).**

OK

2	**Input signal check.**

Input Signal	Indicator Light Blinking Pattern
Turn PNP switch OFF (Shift to positions except D)	Light: ON — SW ON; OFF — SW OFF

PREPARATION:

See input signal check on page DI–1039.

CHECK:

Check the indicator light when shifting into positions except D.

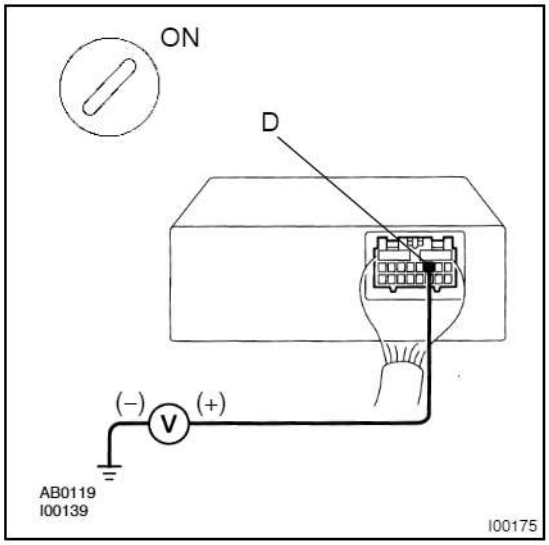
OK:

The indicator light goes off when shifting into positions except D.

OK → **Proceed to next circuit inspection shown in problem symptom table (See page DI–1048).**

NG

3	Check voltage between terminal D of cruise control ECU connector and body ground.



PREPARATION:

Turn the ignition switch ON.

CHECK:

Measure the voltage between terminal D of ECU connector and body ground when shifting into D position and the other positions.

OK:

Shift Position	Voltage
D position	10 – 14 V
Other positions	Below 1 V

OK → **Proceed to next circuit inspection shown in problem symptom table (See page DI–1048).**

NG

4	Check harness and connector between cruise control ECU and park/neutral position switch (See page IN–30).

NG → **Repair or replace harness or connector.**

OK

Check and replace cruise control ECU (See page IN–30).

Clutch Switch Circuit

CIRCUIT DESCRIPTION

When the clutch pedal is depressed, the clutch switch sends a signal to the cruise control ECU. When the signal is input to the cruise control ECU during cruise control driving, the cruise control ECU cancels cruise control.

WIRING DIAGRAM

Refer to PNP switch circuit on page DI–1075.

INSPECTION PROCEDURE

1	**Check starter operation.**

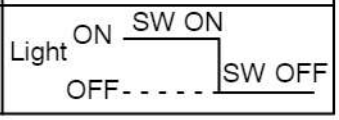
CHECK:

Check that the starter operates normally and the engine starts.

NG → **Proceed to engine troubleshooting.**

OK ↓

2	**Input signal check.**

Input Signal	Indicator Light Blinking Pattern
Clutch switch OFF (Depress clutch pedal)	

PREPARATION:

See input signal check on page DI–1039.

CHECK:

Check the indicator lights when clutch pedal is depressed.

OK:

The indicator light goes off when shifting into clutch pedal is depressed.

OK → **Proceed to next circuit inspection shown in problem symptom table (See page DI–1048).**

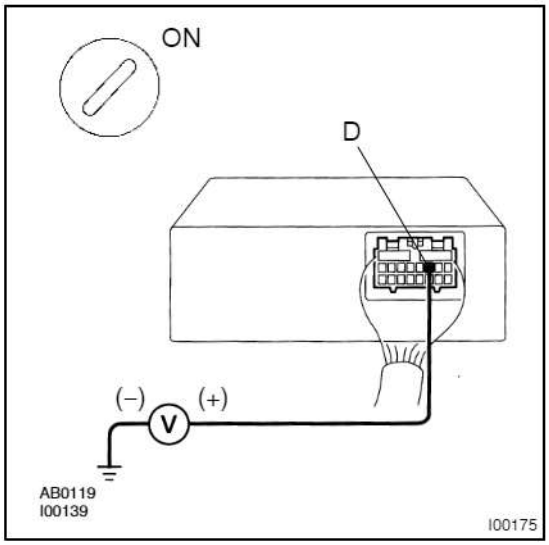
NG ↓

3	**Inspect clutch switch.**

NG → **Replace clutch switch**

OK

4	**Check voltage between terminal D of cruise control ECU and body ground.**



PREPARATION:
Turn the ignition switch ON.
CHECK:
Measure the voltage between terminal D of the cruise control ECU connector and body ground when clutch pedal is depressed and pushed in.
OK:

Condition	Voltage
Clutch pedal depressed	10 – 14 V
Clutch pedal pushed in	Below 1 V

OK → **Proceed to next circuit inspection shown in problem symptom table (See page DI–1048).**

NG

5	**Check for open in harness and connector between ECU and C/C ECU–IG fuse (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

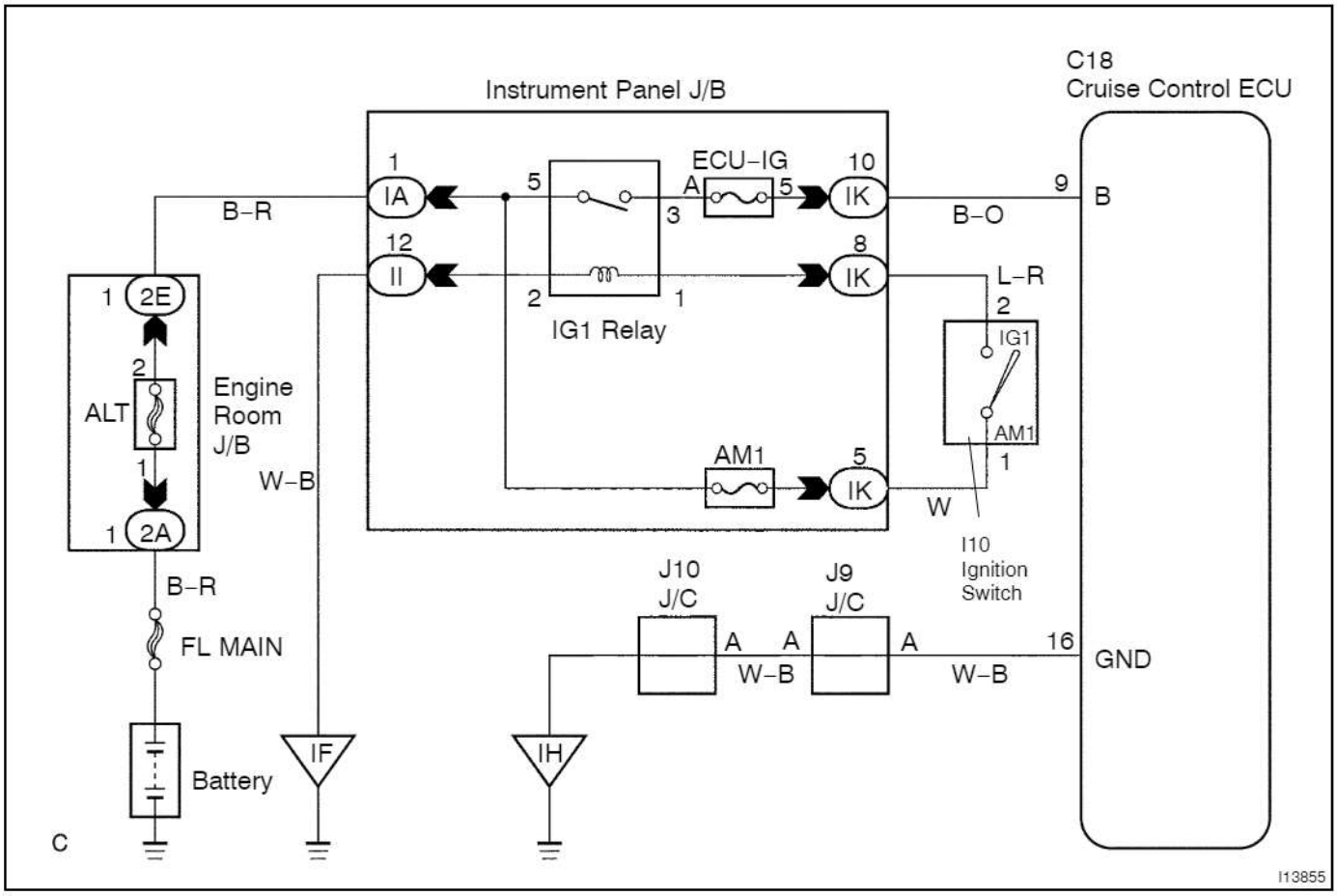
Check and replace cruise control ECU (See page IN–30).

ECU Power Source Circuit

CIRCUIT DESCRIPTION

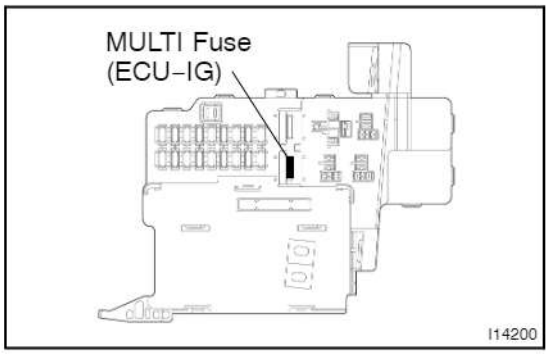
The ECU power source supplies a power to the actuator and sensors, etc. when terminal GND and the cruise control ECU case are grounded.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check ECU–IG fuse.

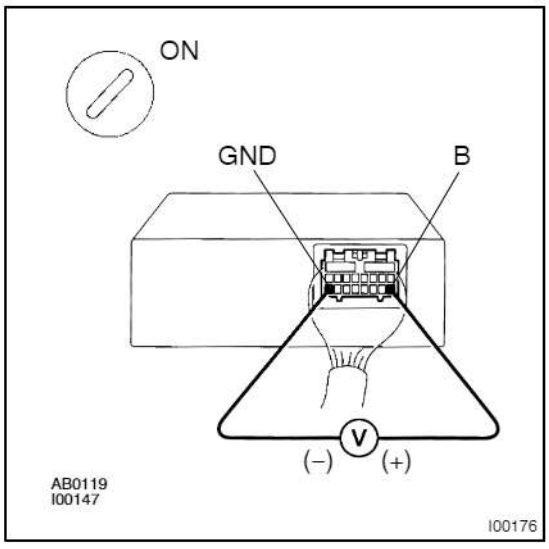


PREPARATION:
Remove the ECU–IG fuse from the instrument panel junction block.
CHECK:
Check the continuity of ECU–IG fuse.
OK:
Continuity

NG → **Check for short in all the harness and components connected to ECU–IG fuse.**

OK

2	Check voltage between terminals B and GND of cruise control ECU connector.

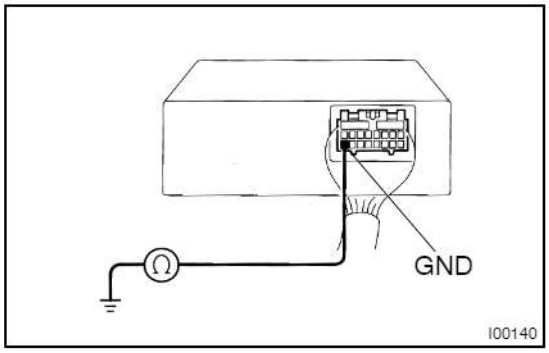


PREPARATION:
(a) Remove ECU with connector being connected.
(b) Turn ignition switch ON.
CHECK:
Measure the voltage between terminal B and GND of the ECU connector.
OK:
Voltage: 10 – 14 V

OK → **Proceed to next circuit inspection shown in problem symptom table (See page DI–1048).**

NG

3	**Check resistance between terminal GND of cruise control ECU connector and body ground.**



CHECK:

Measure the resistance between terminal GND of the ECU connector and body ground.

OK:

Resistance: Below 1 Ω

NG → **Repair or replace harness or connector.**

OK

Check and repair harness and connector between cruise control ECU and battery (See page IN–30).

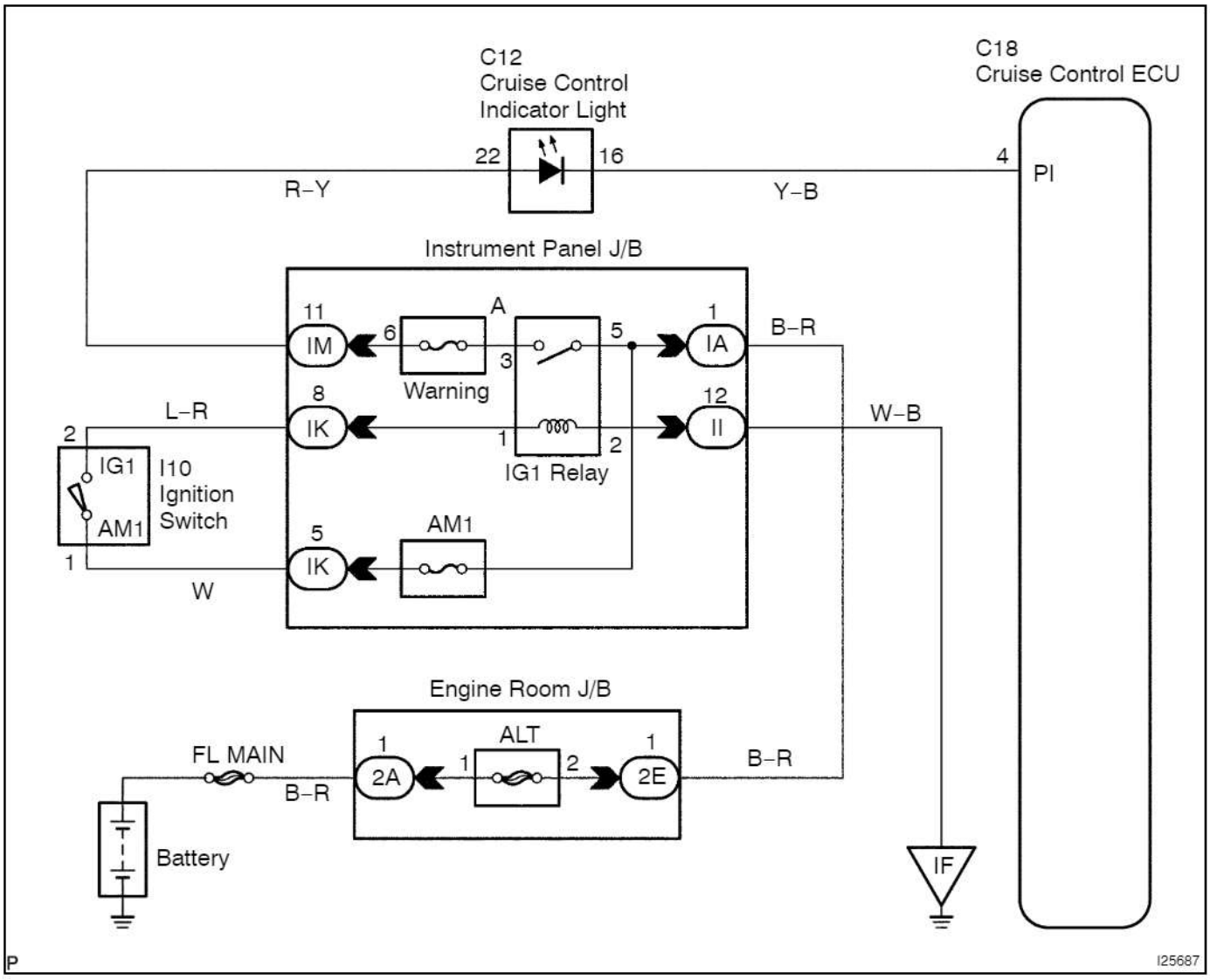
D090-59

CRUISE MAIN Indicator Light Circuit

CIRCUIT DESCRIPTION

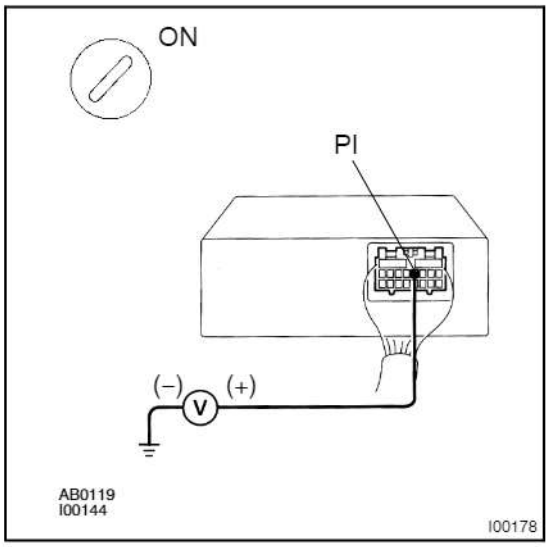
When the cruise control main switch is turned ON, CRUISE MAIN indicator light comes on.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check voltage between terminals PI and GND of cruise control ECU connector.**



PREPARATION:
Turn the ignition switch ON.
CHECK:
Measure the voltage between terminal PI and GND of the cruise control ECU connector when main switch is ON and OFF.
OK:

Switch position	Voltage
OFF	10 – 16 V
ON	Below 1.2 V

OK → **Proceed to next circuit inspection shown in problem symptom table (See page DI–1048).**

NG

2	**Check combination meter (See page BE–46).**

NG → **Replace combination meter.**

OK

Check and replace cruise control ECU (See page IN–30).

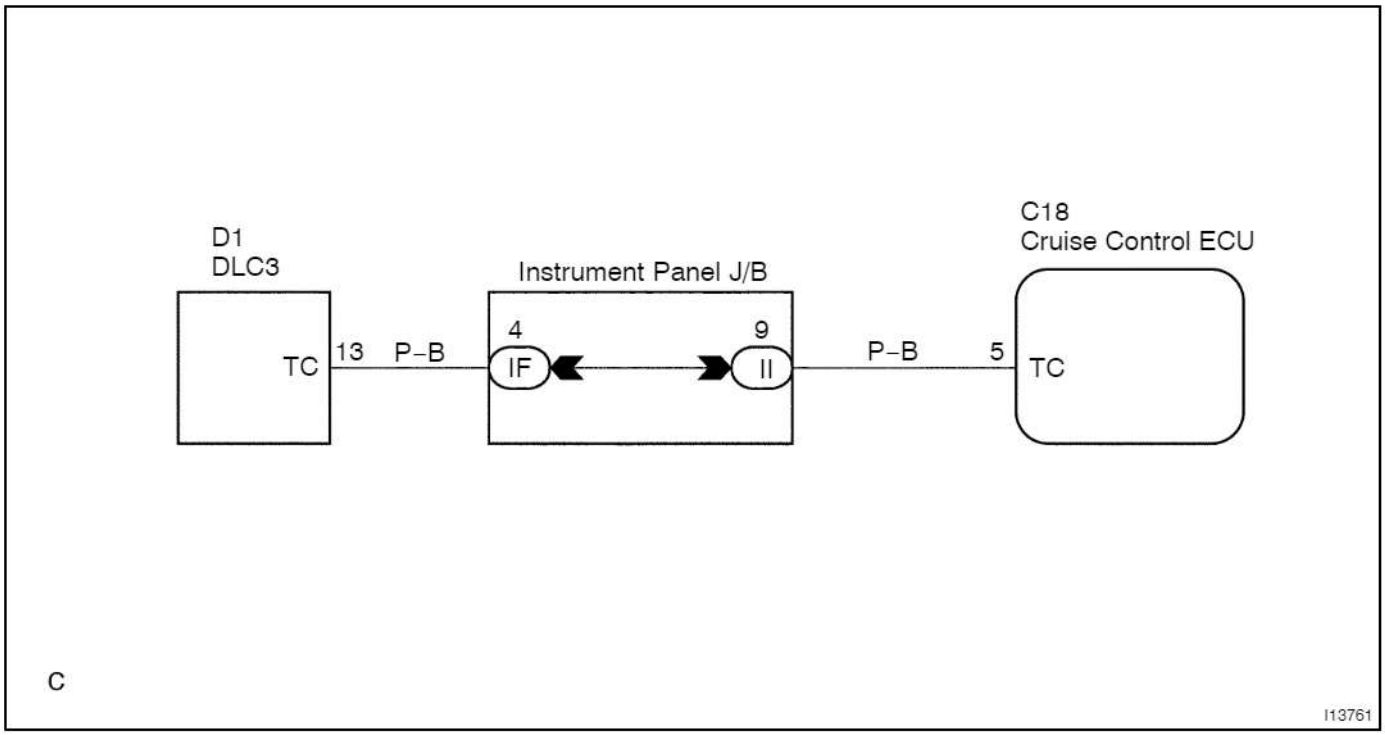
D091-36

Diagnosis Circuit

CIRCUIT DESCRIPTION

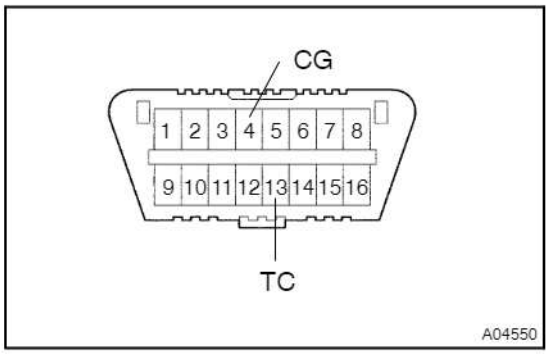
This circuit sends a signal to ECU which outputs DTC.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check voltage between terminals Tc and CG of DLC3.**



PREPARATION:
Turn the ignition switch ON.
CHECK:
Measure the voltage between terminal Tc and CG of DLC3.
OK:
Voltage: 10 – 14 V

OK → **Proceed to next circuit inspection shown in problem symptom table (See page DI–1048).**

NG

2	**Check harness and connector between cruise control ECU and DLC3, DLC3 and body ground (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Check and replace cruise control ECU (See page IN–30).

DI092-15

Actuator Control Cable

INSPECTION PROCEDURE

1	**Actuator control cable inspection**

CHECK:

(a) Check that the actuator and the control cable throttle link are properly installed and that the cable and link are connected correctly.

(b) Check that the actuator and the bell crank operate smoothly.

(c) Check that the cable is not too loose or too tight.

OK:

Freeplay: less than 10 mm

HINT:

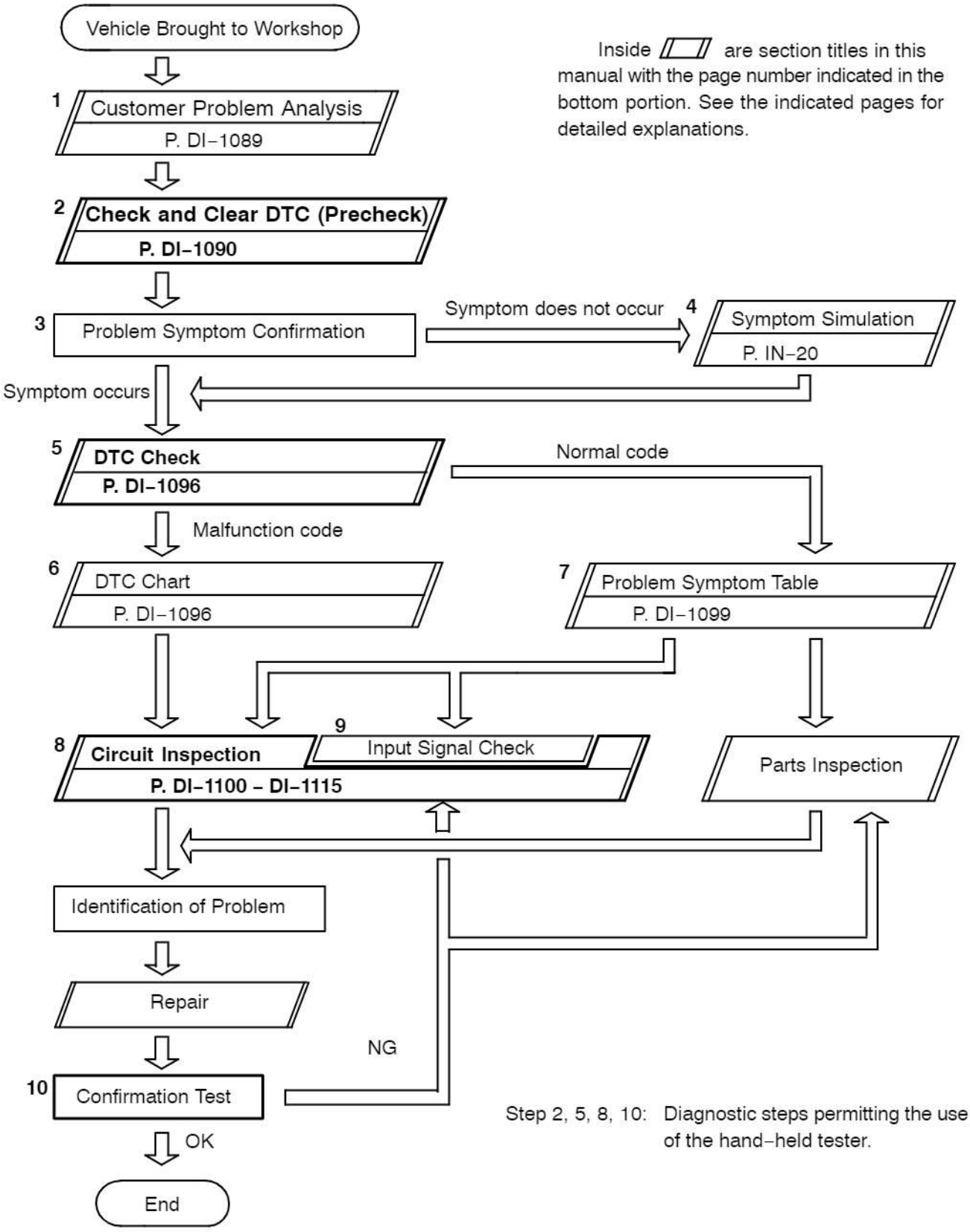
- If the control cable is too loose, the vehicle's loss of speed going uphill will be large.
- If the control cable is too tight, the idle RPM will become high.

CRUISE CONTROL SYSTEM (2ZZ–GE)

DIAJJ–02

HOW TO PROCEED WITH TROUBLESHOOTING

Troubleshoot in accordance with the procedure on the following page.



Inside ▱ are section titles in this manual with the page number indicated in the bottom portion. See the indicated pages for detailed explanations.

Step 2, 5, 8, 10: Diagnostic steps permitting the use of the hand–held tester.

DIAJK-03

CUSTOMER PROBLEM ANALYSIS CHECK

CRUISE CONTROL SYSTEM Check Sheet

Inspector's name: _____

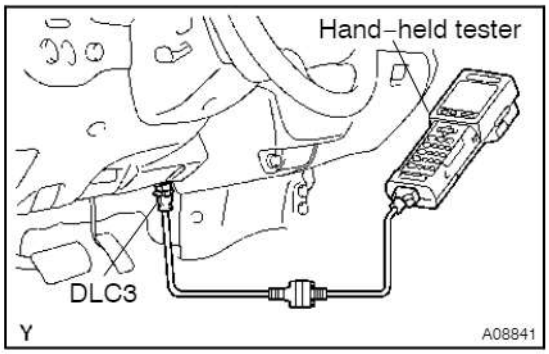
Customer's Name		**VIN**	
		Production Date	
		Licence No.	
Date of Vehicle Brought in	/ /	**Odometer Reading**	**km Mile**

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 ☐ With clutch switch 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 ☐ ACCEL ☐ COAST ☐ RESUME ☐ CANCEL
	☐ Cruise main indicator light	☐ Remains ON ☐ Does not come on ☐ Blinks

DTC Check	**1st Time**	☐ Normal Code ☐ Malfunction Code (Code)
	2nd Time	☐ Normal Code ☐ Malfunction Code (Code)

DIAJL–04



PRE–CHECK

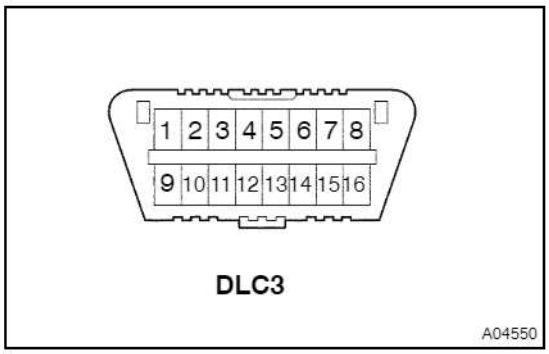
1. DIAGNOSIS SYSTEM

(a) Description

ECM controls the function of the cruise control on a vehicle.

Data on the cruise control and on DTC can be read from the DLC3 on the vehicle. If CRUISE MAIN indicator does not come 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.



(b) Check the DLC3.

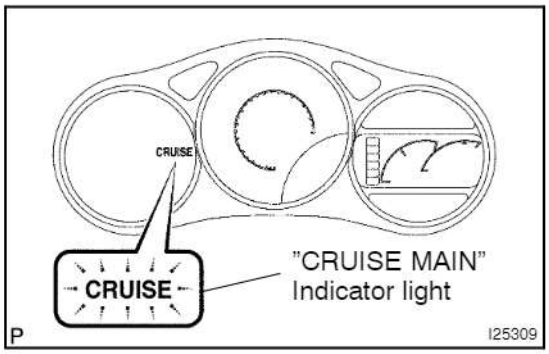
The vehicle's ECM uses ISO 9141–2 for communication. The terminal arrangement of DLC3 complies with SAE J1962 and matches the ISO 9141–2 format.

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:

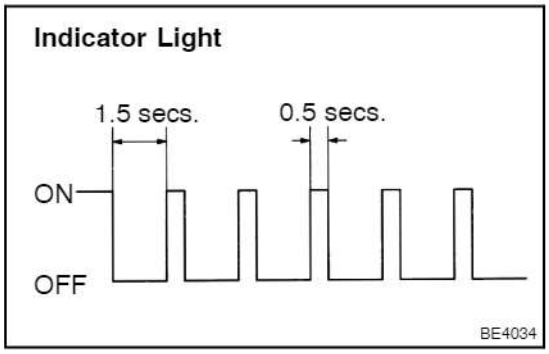
If the display shows "UNABLE TO CONNECT TO VEHICLE" as connecting the hand–held tester to the DLC3 and turning the ignition ON, there is a problem either on the vehicle or on the tool.

- 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.



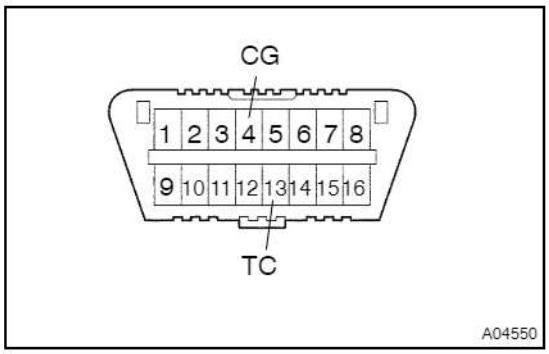
(c) Check the indicator.
(1) Turn the ignition switch to ON.
(2) Check that the CRUISE MAIN indicator light comes ON when the cruise control main switch is turned ON, and that the indicator light goes off when the main switch is turned OFF.

HINT:
If the indicator check failed, proceed to troubleshooting for the combination meter section. (See page BE–50)

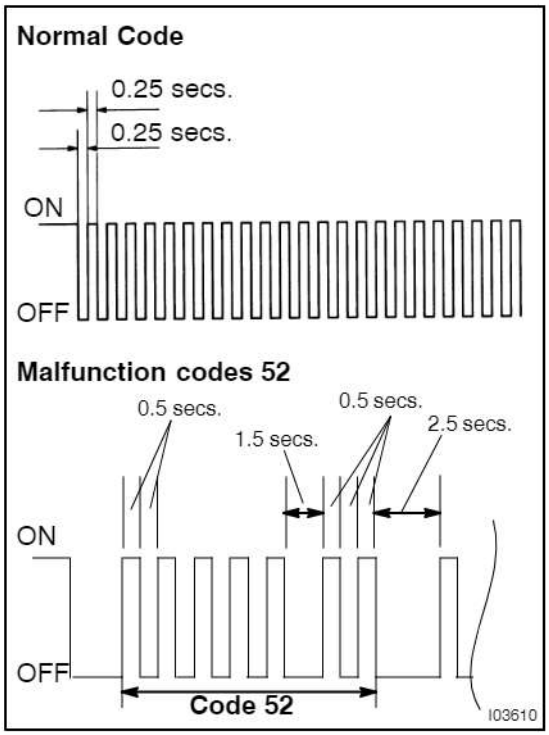


(d) Check the DTC.

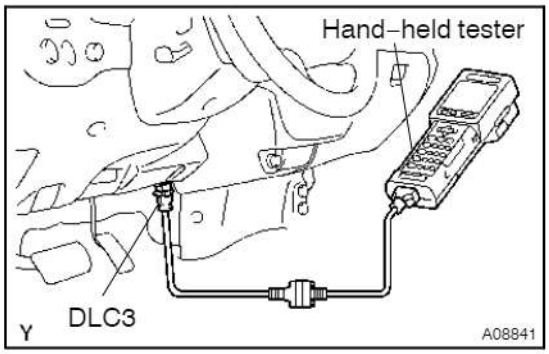
HINT:
If a malfunction occurs on the speed sensor or on the stop light switch, etc. during cruise control driving, ECU actuates AUTO CANCEL of the cruise control and turns ON and OFF the CRUISE MAIN indicator light to inform the driver of a malfunction. At the same time, the malfunction is stored in the memory as a diagnostic trouble code.



(e) Output DTC using diagnosis check wire.
(1) Turn the ignition switch ON.
(2) Using SST, connect terminal TC and CG of DLC3.
SST 09843–18040
(3) Read DTC on the CRUISE MAIN indicator light.



HINT:
- If the DTC is not indicated, inspect the cruise main indicator light circuit and the diagnosis circuit (See page DI–1109, DI–1115).
- As an example, the blinking pattern of normal code and code 52 are shown on the illustration.



2. USING HAND–HELD TESTER

(a) Hook up the hand–held tester to the DLC3.
(b) Monitor the ECU data by following the prompt 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:
By using the DATA LIST displayed by the hand–held tester, you can read the value of the switch, the sensor 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 / Display (Range)	Normal Condition	Diagnostic Note
VEHICLE SPD	Vehicle speed / min.: 0km/h (0mph), max.: 255km/h (158mph)	Actual vehicle speed	–
MEMORY SPD	Cruise control memorized speed / min.: 0km/h (0mph), max.: 255km/h (158mph)	Memorized speed : Cruise control activated	–
THROTTLE	Required throttle opening angle / min.: 0°, max.: 125°	Required throttle opening angle (0° – 84°) : Cruise control activated	–
CCS READY S	Cruise control system standby condition (Sub CPU) / ON or OFF	ON ⇔ OFF : Change ON/OFF each time Main SW is pressed in.	"1"
CCS READY M	Cruise control system standby condition (Main CPU) / ON or OFF	ON ⇔ OFF : Change ON/OFF each time Main SW is pressed in.	"1"
CANCEL SW	CANCEL SW signal / ON or OFF	ON : CANCEL SW ON OFF : CANCEL SW OFF	–
SET/COAST SW	SET/COAST SW signal / ON or OFF	ON : SET/COAST SW ON OFF : SET/COAST SW OFF	–
RES/ACC SW	RES/ACC SW signal / ON or OFF	ON : RES/ ACC SW ON OFF : RES/ACC SW OFF	–
STP LIGHT SW2 M	Stop light SW signal (Main CPU) / ON or OFF	ON : Brake pedal depressed OFF : Brake pedal released	–
STP LIGHT SW2 S	Stop light SW signal (Sub CPU) / ON or OFF	ON : Brake pedal depressed OFF : Brake pedal released	–
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	–
CRUISE CTRL	Cruise control system active condition / ON or OFF	ON : Cruise control activated OFF : Cruise control inactivated	–
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"

MAIN SW (SUB)	Main SW signal (Sub CPU) / ON or OFF	ON : Main SW ON (Pressed in) OFF Main SW OFF (Pressed out)	"3"
MAIN SW (MAIN)	Main SW signal (Main CPU) / ON or OFF	ON : Main SW ON (Pressed in) OFF Main SW OFF (Pressed out)	"3"

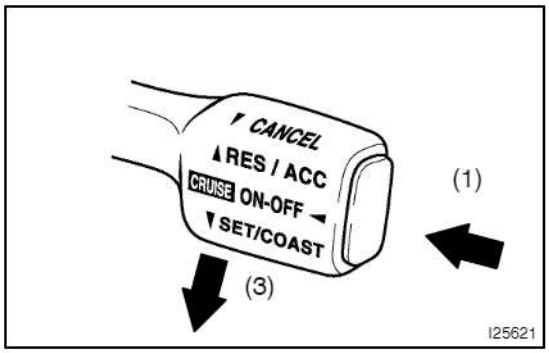
HINT:
"3" is OK but "1" is NG → ECM failure
"1" is OK but "2" is NG → DTC output or ECM failure
"3" is OK but the cruise indicator does not turn on → Indicator or W/H or ECM failure

4. DTC CLEARANCE

(a) Following actions will erase the DTC and the freeze frame data.
  (1) Hand–Held Tester:
  Operating the hand–held tester to erase the codes.
  (2) EXCEPT Hand–Held Tester:
  Disconnect the battery terminals or EFI NO.1 fuse.

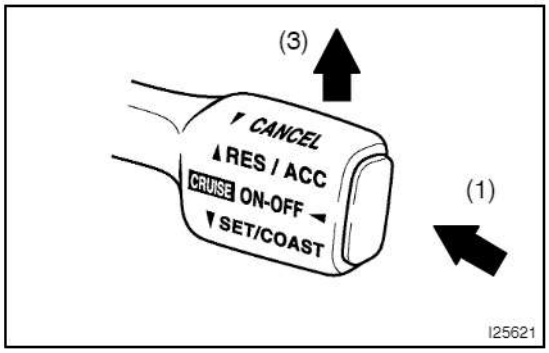
(b) After completing repairs, DTC retained in the memory can be cleared by removing the EFI NO.1 fuse more than 1 minutes with the ignition switch OFF.

(c) Check that the normal code is displayed after connecting the fuse.



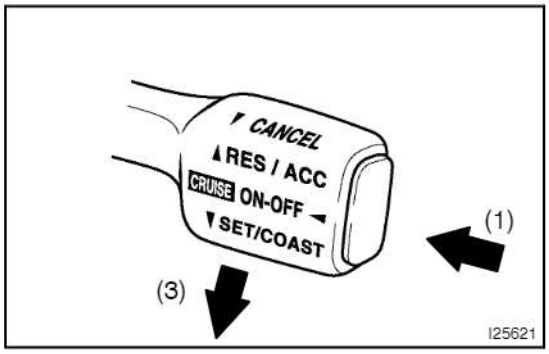
5. PROBLEM SYMPTOM CONFIRMATION (ROAD TEST)

(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/COAST.
  (4) After releasing the switch, check that the vehicle cruises at the desired speed.

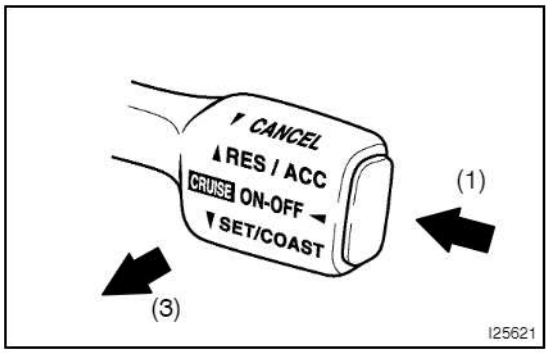


(b) Inspect the ACCEL switch.
  (1) Push the main switch button to ON.
  (2) Drive at a desired speed [40 km/h (25 mph) or higher].
  (3) Check that the vehicle speed increases while the control switch is pulled up to RES/ACC, and that the vehicle cruises at the set speed when the switch is released.

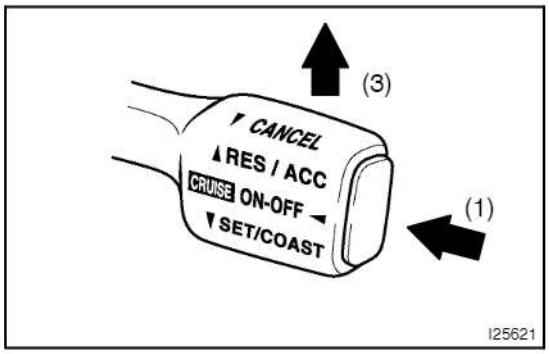
(4) Momentarily push the control switch upward to the RES/ACC, and then immediately release it. Check that the vehicle speed increases by about 1.5 km/h (Tap–up function).



(c) Inspect the COAST 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 pushed down to SET/COAST, and the vehicle cruises at the set speed when the switch is released.
(4) Momentarily push the control switch downward to SET/COAST, and then immediately release it. Check that the vehicle speed decreases by about 1.5 km/h (Tap–down function).

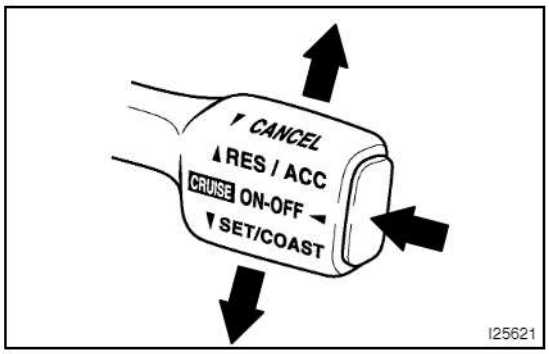


(d) Inspect the CANCEL switch.
(1) Push the main switch button to ON.
(2) Drive at a desired speed [40 km/h (25 mph) or higher].
(3) When operating one of the followings, check that the cruise control system is cancelled and that the normal driving mode is reset.
- Depress the brake pedal.
- Depress the clutch pedal. (M/T)
- Shift to except D position. (A/T)
- Push the main switch button to OFF.
- Pull the cruise control switch to CANCEL.



(e) Inspect the RESUME 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.
- Depress the clutch pedal. (M/T)
- Shift to except D position. (A/T)
- Pull the cruise control switch to CANCEL.

(4) After the control switch is pulled up to RES/ACC at the driving speed of more than 40 km/h (25 mph), check that the vehicle restores the speed prior to the cancellation.



6. INPUT SIGNAL CHECK (Using hand–held tester)

(a) Connect the hand–held tester to DLC3.
(b) Check the control switch (ON–OFF, CANCEL, SET/COAST, RES/ACC).

DIAJM–02

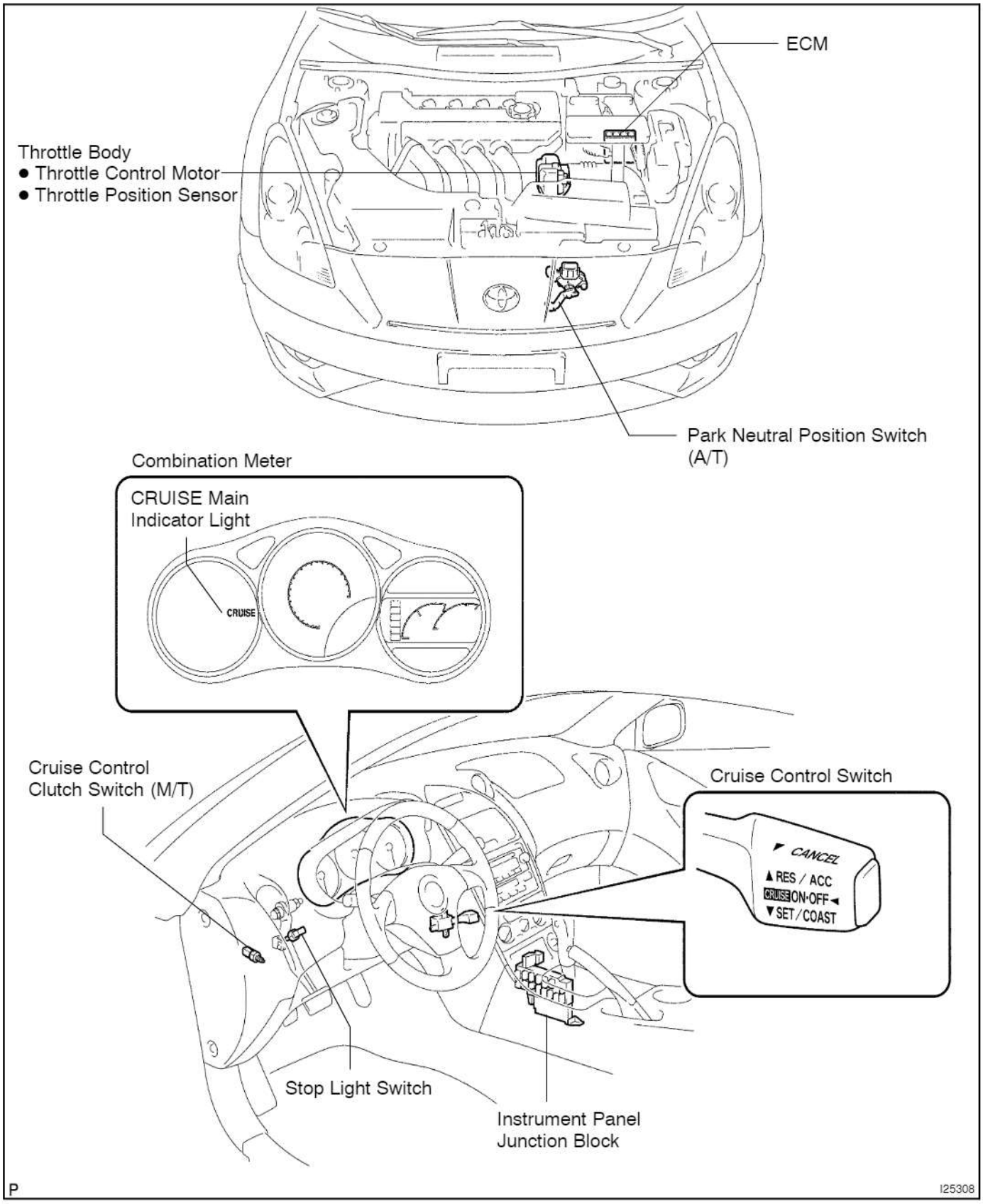
DIAGNOSTIC TROUBLE CODE CHART

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 (DI–1100)	Vehicle Speed Sensor "A"	• Combination meter • Vehicle speed sensor • Wire harness or connector • ECM
P0503/23 (DI–1100)	Vehicle speed sensor "A" Intermittent/Erratic/High	
P0571/52 (DI–1101)	Brake switch "A" Circuit	• Stop light switch • Wire harness or connector • ECM
P0607/54 (DI–1105)	Control module performance	• ECM

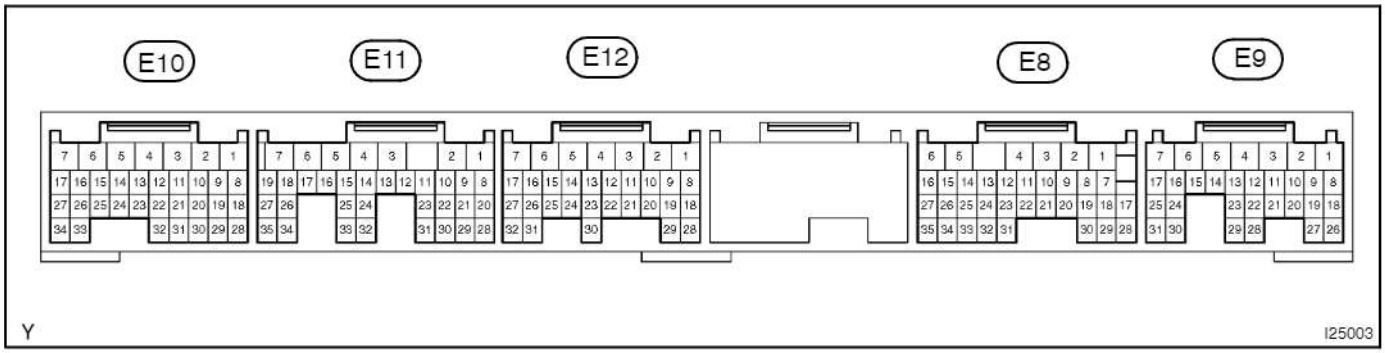
DIAJN–03

PARTS LOCATION



DIAJO–03

TERMINALS OF ECM



Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage
STP ↔ E1 (E8–19 ↔ E12–1)	G–W ↔ BR	Depress brake pedal	7.5 – 14 V
		Release brake pedal	Below 1 V
CCS ↔ E1 (E8–24 ↔ E12–1)	W–G ↔ BR	Ignition switch ON	9 – 14 V
		Ignition switch ON CANCEL switch hold ON	6 – 10.1 V
		Ignition switch ON SET/COAST switch hold ON	4 – 7.1 V
		Ignition switch ON RES/ACC switch hold ON	2.1 – 4 V
		Ignition switch ON MAIN switch hold ON	Below 1 V
PI ↔ E1 (E8–13 ↔ E12–1)	Y–G ↔ BR	Ignition switch ON Cruise control main switch ON	0 – 3 V
		Ignition switch ON Cruise control main switch OFF	9 – 14 V
ST1– ↔ E1 (E8–12 ↔ E12–1)	R–Y ↔ BR	Depress brake pedal	Below 1 V
		Release brake pedal	7.5 – 14 V

DIAJP–03

PROBLEM SYMPTOMS TABLE

Symptom	Suspect Area	See page
SET not occurring or CANCEL occurring. (DTC is Normal)	1. Input Signal Circuit 2. Vehicle Speed Sensor Circuit 3. Stop Light Switch Circuit 4. Park/Neutral Position Switch Circuit (A/T) 5. Clutch Switch Circuit (M/T) 6. ECM	DI–1105 DI–1100 DI–1101 DI–738 or DI–825 DI–1106 DI–293
SET not occurring or CANCEL occurring. (DTC is not output)	ECM	DI–293
Actual vehicle speed deviates above or below the set speed.	1. Input Signal Circuit 2. ECM	DI–1105 DI–293
Gear shifting occurs frequently between 3rd and O/D when driving on uphill road. (Hurting)	ECM	DI–293
Cruise control cannot be cancelled, even when the brake pedal is depressed.	1. Stop Light Switch Circuit 2. ECM	DI–1101 DI–293
Cruise control cannot be cancelled, even when the transmission is shifted to "N" position.	1. Park/Neutral Position Switch Circuit (A/T) 2. Clutch Switch Circuit (M/T) 3. ECM	DI–738 or DI–825 DI–1106 DI–293
Control switch does not operate. (SET/COAST, ACC/RES, CANCEL not possible)	1. Cruise Control Switch Circuit 2. ECM	DI–1063 DI–293
SET possible at 40 km/h (25 mph) or less, or CANCEL does not operate at 40 km/h (25 mph) or less.	1. Input Signal Circuit 2. ECM	DI–1105 DI–293
Poor response in ACCEL and RESUME modes.	ECM	DI–293
O/D does not resume, even though the road is not uphill.	ECM	DI–293
DTC memory is erased.	ECM	DI–293
DTC is not output, or is output when it should not be.	1. Diagnosis Circuit 2. ECM	– DI–293
Cruise MAIN indicator light remains ON or fails to come on.	1. Input Signal Circuit 2. ECM	DI–1105 DI–293
Cruise MAIN indicator light does not come on.	Cruise MAIN Indicator Light Circuit	DI–1109

DIAJQ-02

CIRCUIT INSPECTION

DTC	P0500/21	Vehicle Speed Sensor "A"

DTC	P0503/23	Vehicle Speed Sensor "A" Intermittent/Erratic/High

CIRCUIT DESCRIPTION

See page DI-552.

DTC No.	DTC Detecting Condition	Trouble Area
P0500/21 P0503/23	No vehicle speed sensor signal to ECM under following conditions (a) and (b): (2 trip detection logic) (f) Park/Neutral position switch is OFF (g) Vehicle is being driven	• Combination meter • Harness or connector between ECM and vehicle speed sensor • Vehicle speed sensor • ECM

WIRING DIAGRAM

See page DI-552.

INSPECTION PROCEDURE

See page DI-552.

DIAJR–03

DTC	P0571/52	Brake Switch "A" Circuit

CIRCUIT DESCRIPTION

When the brake pedal is depressed, the stop light switch sends a signal to ECM. When ECM receives this signal, it cancels the cruise control.

A fail–safe function is provided to maintain normal driving, even if there is a malfunction in the stop light signal circuit.

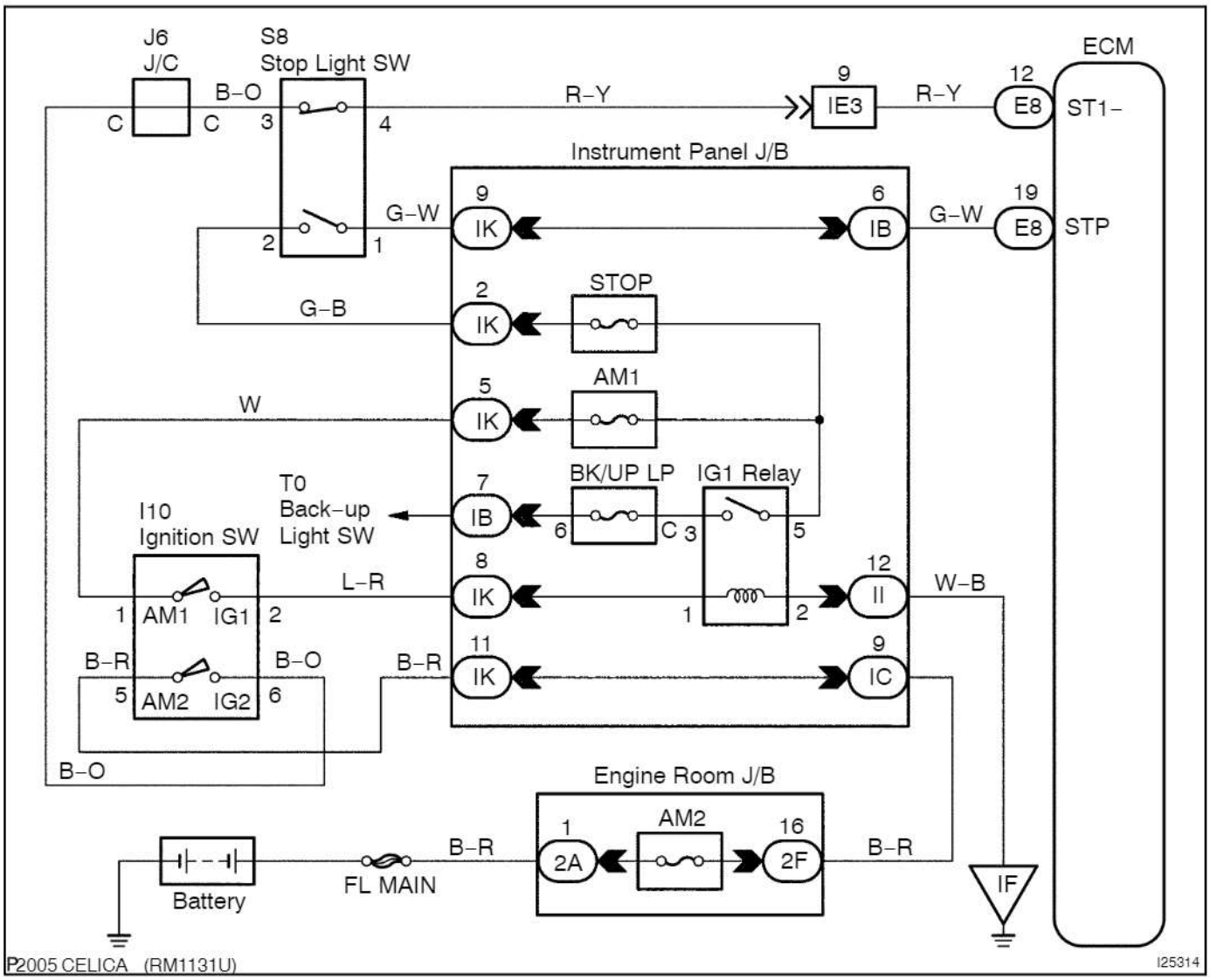
The cancel condition occurs when the battery positive voltage is supplied to terminal STP.

When the stop light switch is on, battery positive voltage is applied through the STOP fuse and the stop light switch 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 Detecting Condition	Trouble Area
P0571/52	Stop Light switch does not turn off even once the vehicle is driven	• Stop light switch • Harness or connector between ECM and stop light switch circuit • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

When using the hand–held tester, start the inspection from step 1. Otherwise, start from step 2.

1	**Check stop light switch using hand–held tester.**

PREPARATION:

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

(b) Turn the ignition switch ON and push the hand–held tester main switch ON.

CHECK:

Select the item "STOP LIGHT SW" in the DATA LIST and read the displayed value.

OK:

Brake pedal depressed: ON
Brake pedal released: OFF

OK → **Proceed to next circuit inspection shown in problem symptoms table (See page DI–1099).**

NG

2	**Check operation of stop light.**

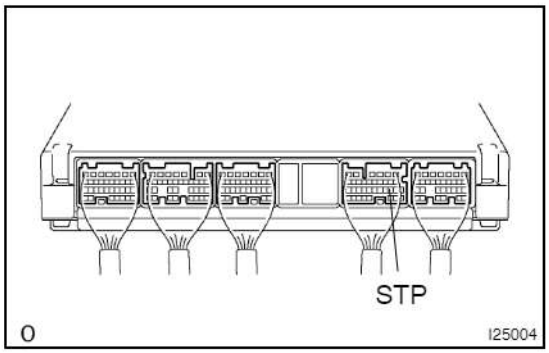
CHECK:

Check that the stop light comes on when the brake pedal is depressed, and turns off when the brake pedal is released.

NG → **Check stop light system (See page BE–37).**

OK

3	Check voltage between terminal STP of ECM connector and body ground.



PREPARATION:

(a) Remove ECM with connectors being connected.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminal STP of ECM connector and body ground when the brake pedal is depressed and released.

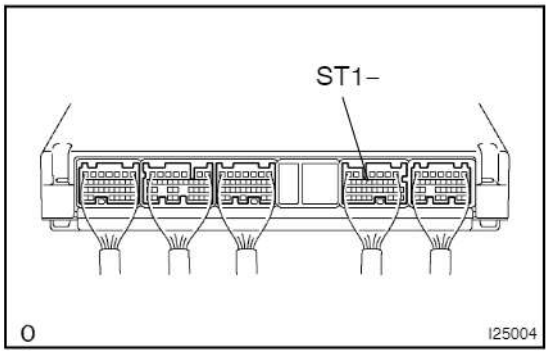
OK:

Depressed	10 – 14 V
Released	Below 1 V

OK → **Proceed to next circuit inspection shown in problem symptoms table (See page DI–1099).**

NG

4	Check voltage between terminal ST1– of ECM connector and body ground.



PREPARATION:

(a) Remove ECM with connectors being connected.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminal ST1– of ECM connector and body ground when the brake pedal is depressed and released.

OK:

Depressed	Below 1 V
Released	10 – 14 V

OK → **Proceed to next circuit inspection shown in problem symptoms table (See page DI–1099).**

NG

5	**Check wire harness and connector between terminal STP of ECM and stop light switch, and terminal ST1– of ECM and stop light switch (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Check and replace ECM (See page IN–30).

DIAJS–02

DTC	P0607/54	Input Signal Control Module Performance Abnormal

CIRCUIT DESCRIPTION

This DTC indicates the internal abnormalities of ECM.

DTC No.	DTC Detecting Condition	Trouble Area
P0607/54	• Cruise control input signal abnormal. • Stop light switch input signal abnormal.	• ECM

INSPECTION PROCEDURE

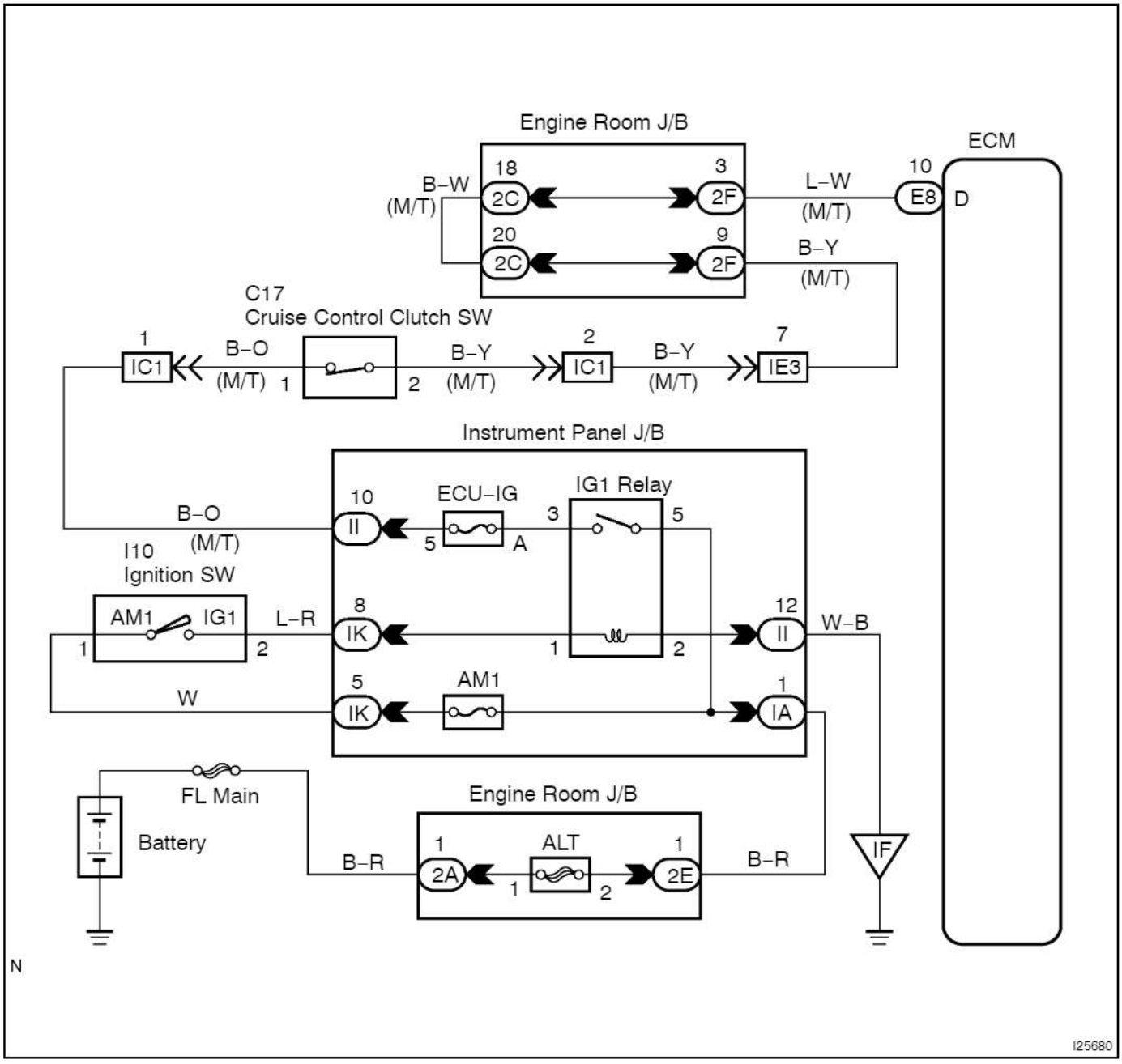
Check and replace ECM (See page IN–30).

Clutch Switch Circuit

CIRCUIT DESCRIPTION

When the clutch pedal is depressed, the clutch switch sends a signal to the ECM. When the signal is input to the ECM during the cruise control driving, the cruise control ECU cancels the cruise control.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Input signal check.

Input Signal	Indicator Light Blinking Pattern
Clutch switch OFF (Depress clutch pedal)	Light: ON → SW ON; OFF - - - - - SW OFF

PREPARATION:

See input signal check on page DI–1090.

CHECK:

Check the indicator lights when clutch pedal is depressed.

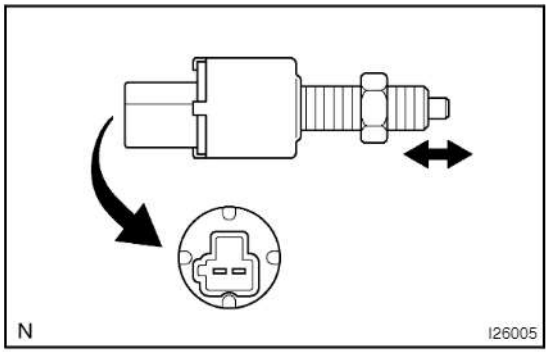
OK:

The indicator light goes off when the clutch pedal is depressed.

OK	Proceed to next circuit inspection shown in problem symptom table (See page DI–1099).

NG

2	Inspect clutch switch assy.



(a) Disconnect the clutch switch connector.

(b) Check that the continuity exists when the clutch switch assy is operated.

OK:

Switch Position	Specified condition
Switch pin free	No continuity
Switch pin pushed in	Continuity

NG	Replace clutch switch assy.

OK

3	**Check for open in harness and connector between ECU and GAUGE fuse (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Check and replace ECM (See page IN–30).

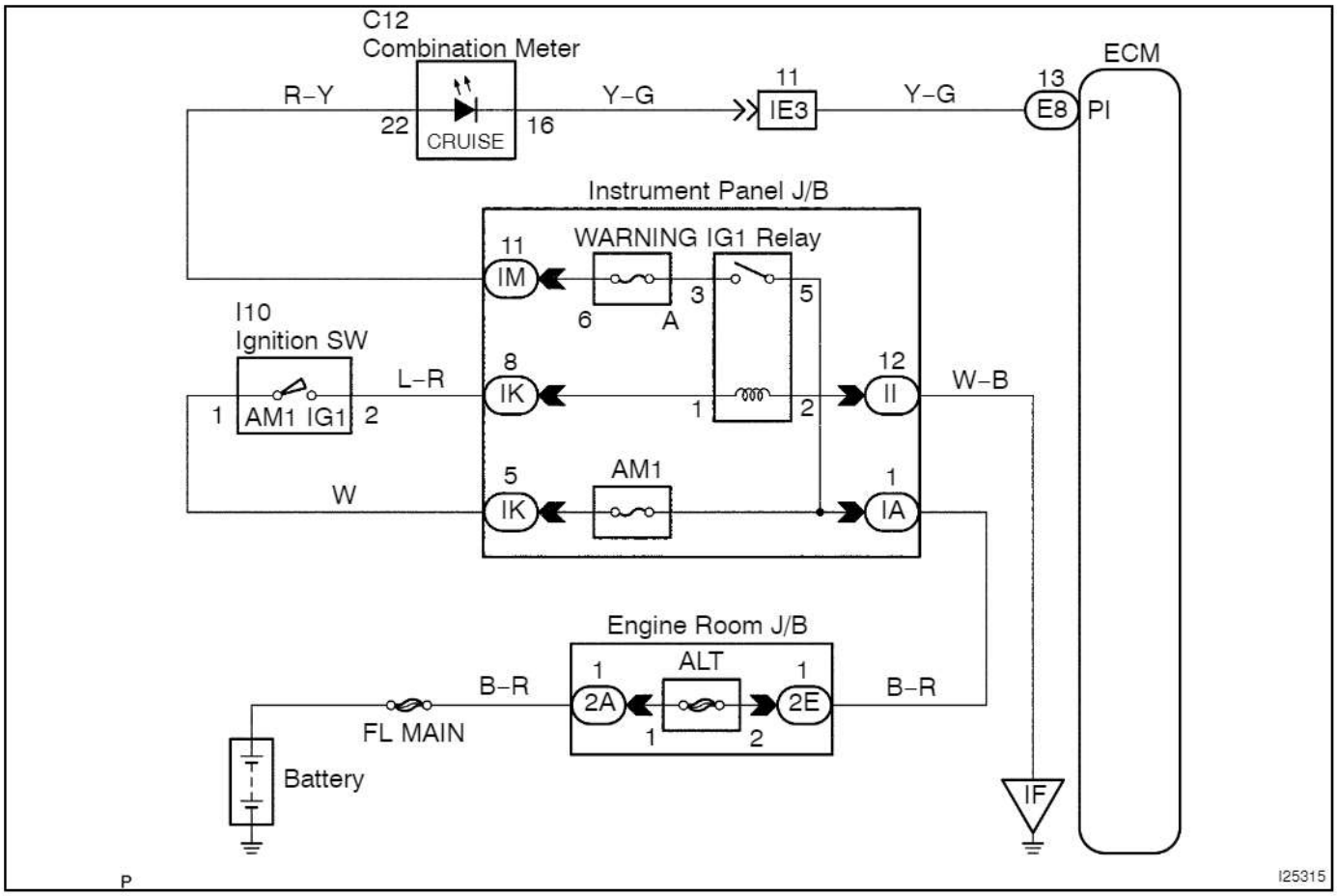
DIAJU–03

CRUISE MAIN Indicator Light Circuit

CIRCUIT DESCRIPTION

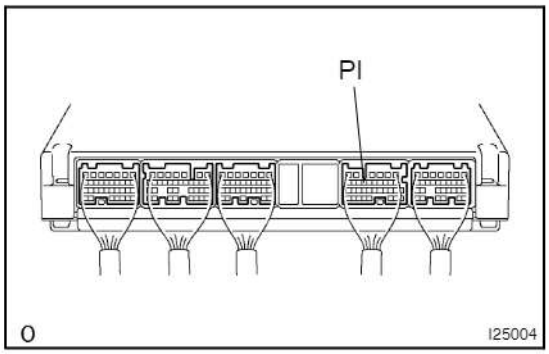
When the cruise control main switch is turned off, the cruise control does not operate.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check voltage between terminal PI and GND of ECM connector.**



PREPARATION:
Turn ignition switch ON.
CHECK:
Measure the voltage between terminal PI and GND of ECM connector when main switch is turned on and off.
OK:

Switch position	Voltage
OFF	9 – 14 V
ON	0 – 3 V

OK → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–1099).**

NG

2	**Check combination meter (See page BE–50).**

NG → **Replace combination meter.**

OK

Check and replace ECM (See page IN–30).

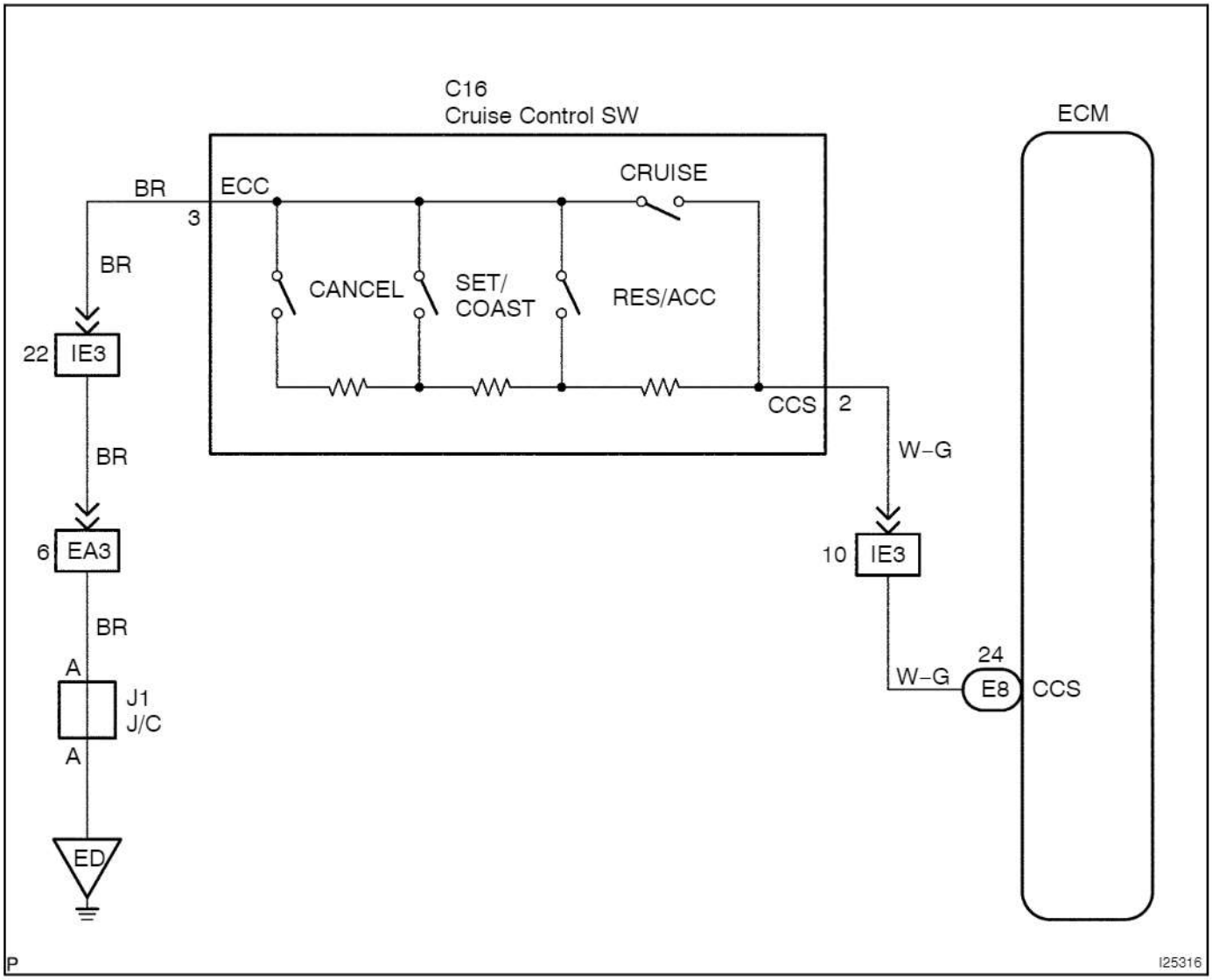
DIAJV–03

Control Switch Circuit (Cruise Control Switch)

CIRCUIT DESCRIPTION

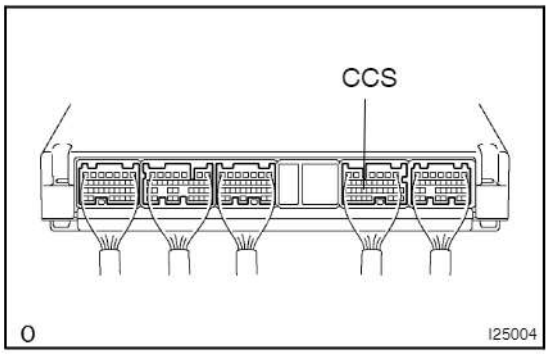
This circuit carries the SET/COAST, RESUME/ACCEL and CANCEL signals (each voltage) to ECM.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check voltage between terminals CCS of ECM connector and body ground.**



PREPARATION:

(a) Remove ECM with connectors being connected.

(b) Turn the ignition switch ON.

CHECK:

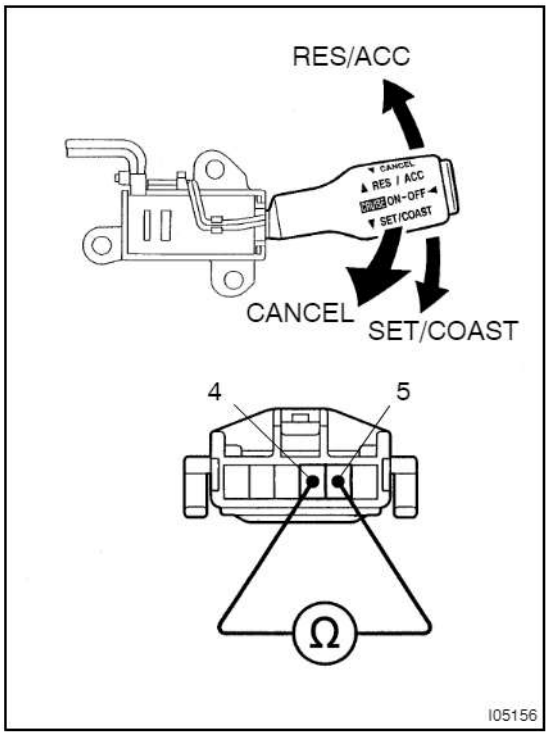
Measure the voltage between terminal CCS of ECM connector and body ground when each of the SET/COAST, RES/ACC and CANCEL is turned ON.

Switch position	Voltage (V)
Neutral	9 – 14 V
RES/ACC	2.1 – 4 V
SET/COAST	4 – 7.1 V
CANCEL	6 – 10.1 V

NG → **Proceed to next circuit inspection shown in problem symptoms table (See page DI–1099).**

OK

2	Check cruise control switch continuity.



PREPARATION:

(a) Remove the steering wheel center pad.

(b) Disconnect the cruise control switch connector.

CHECK:

(a) Measure the resistance between terminal 4 and 5 of the cruise control switch connector when the control switch is operated.

OK:

Switch position	Resistance (Ω)
Neutral	∞ (No continuity)
RES/ACC	210 – 270
SET/COAST	560 – 700
CANCEL	1380 – 1700

(b) Check the continuity between terminal 4 and 5 of the control switch connector when main switch is held on and off.

OK:

Switch position	Tester connection	Specified condition
OFF	4 – 5	No continuity
ON	4 – 5	Continuity

NG → **Replace control switch.**

OK

3	Check harness and connector between ECM and cruise control switch, cruise control switch and body ground (See page IN–30).

NG → **Repair or replace harness or connector.**

OK

4	Check cruise control indicator light (See combination meter).

NG → Replace combination meter.

OK →

Check and replace ECM (See page IN–30).

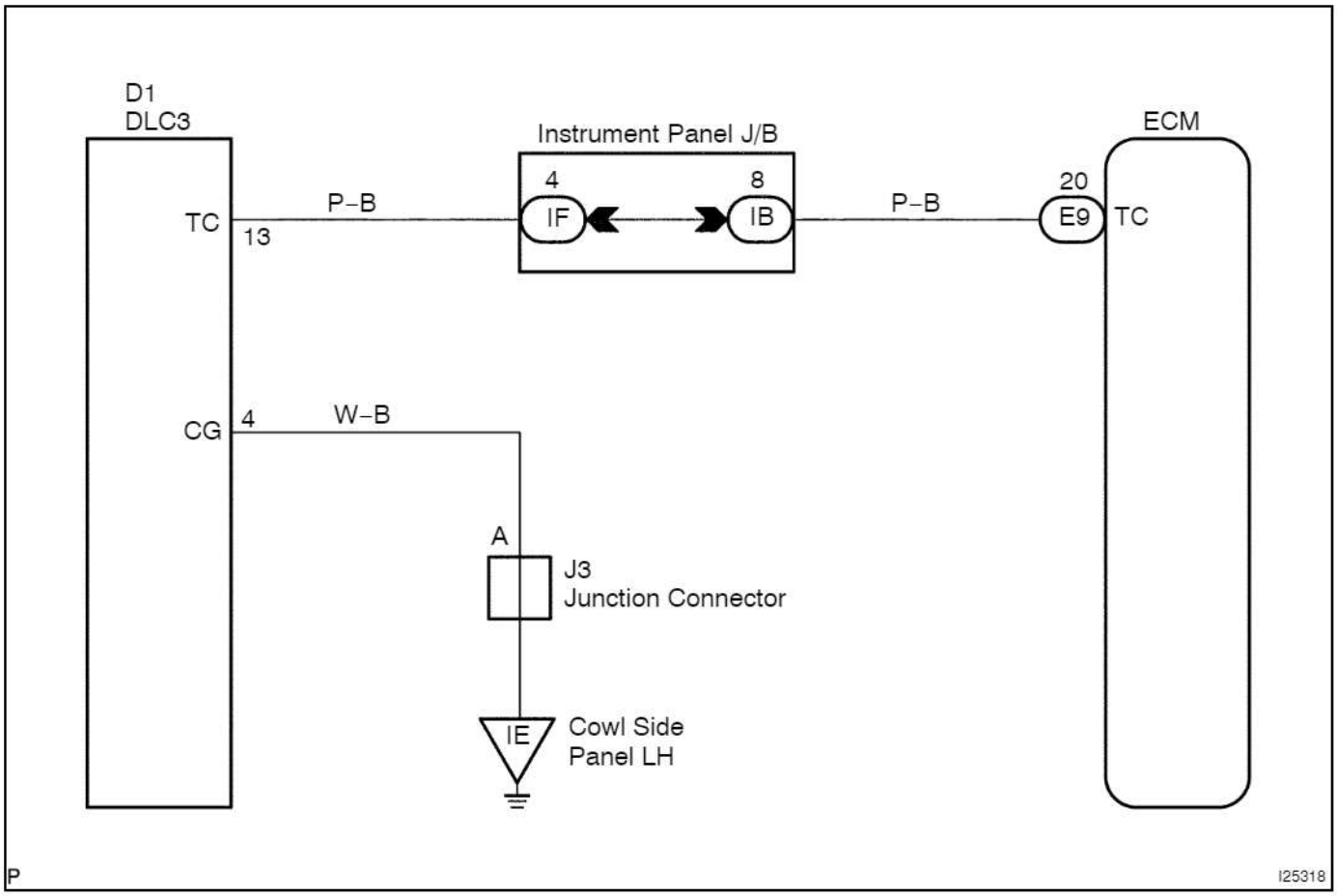
DIAJW–03

DIAGNOSIS CIRCUIT

CIRCUIT DESCRIPTION

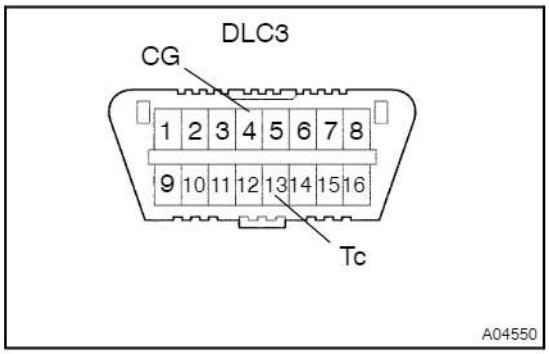
This circuit operates when conducting the DTC check.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Inspect DLC3 terminal voltage.



(a) Turn the ignition switch to ON.
(b) Measure the voltage between terminal 13 (Tc) and 4 (CG) of DLC3.

OK:

Voltage: 10 – 16 V

OK	Proceed to next circuit inspection shown in problem symptoms table (See page DI–1099).

NG

2	Check harness and connector.

(a) Check for open and short circuit in the harness and the connector between ECM and DLC3 (See page IN–30).
(b) Check for open and short circuit in the harness and the connector between DLC3 and body ground (See page IN–30).

NG	Repair or replace harness or connector.

OK

Proceed to next circuit inspection shown in problem symptoms table (See page DI–1099)

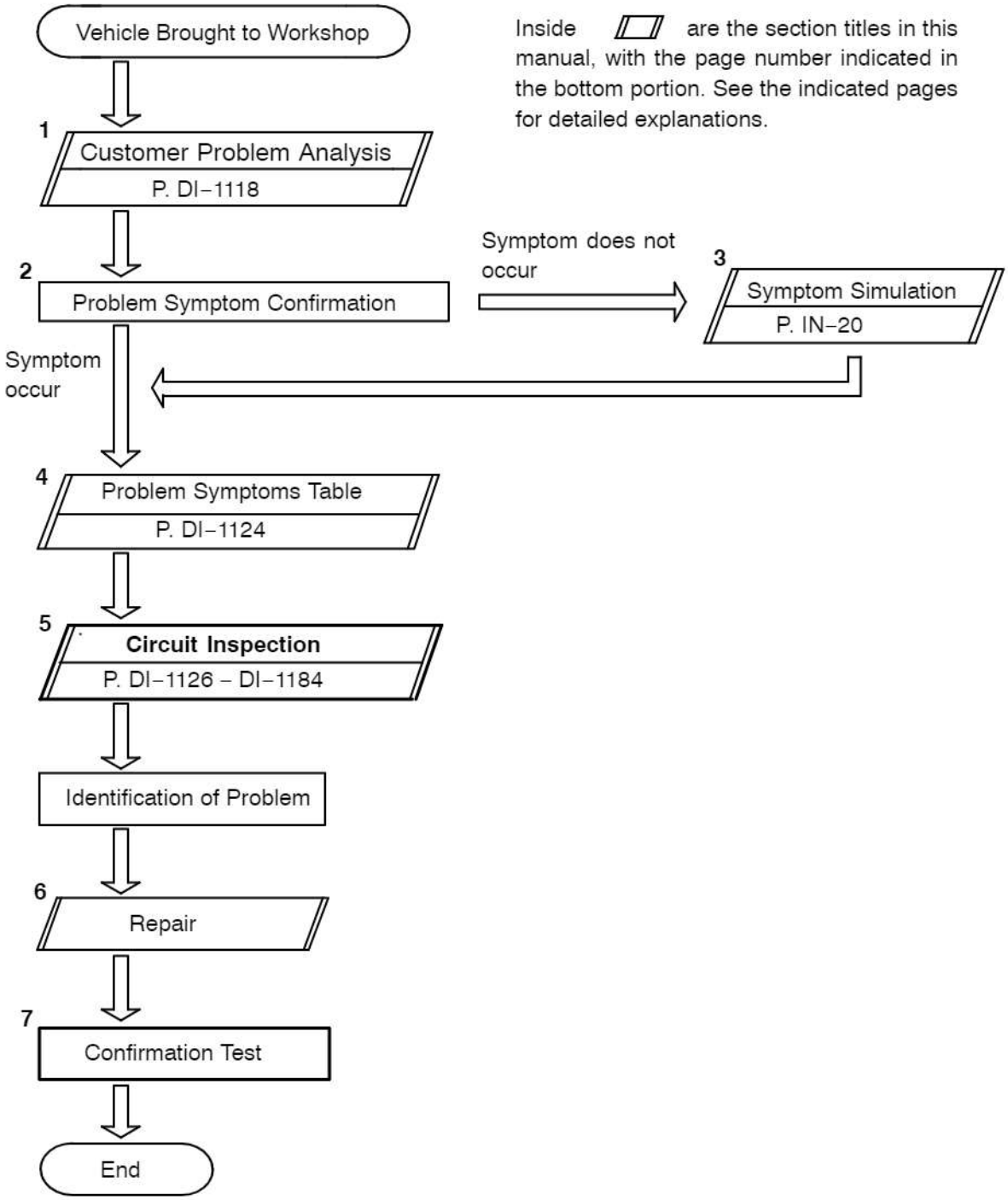
BODY CONTROL SYSTEM

HOW TO PROCEED WITH TROUBLESHOOTING

DI62C–13

HINT:

This ECU is connected to the multiplex communication system. Therefore, be sure to check that there is no troubles in the multiplex communication system before performing the troubleshooting.



Step 6, 8 : Diagnostic steps permitting the use of the hand–held tester.

DI62D-08

CUSTOMER PROBLEM ANALYSIS CHECK

BODY CONTROL SYSTEM Check Sheet

Inspector's name: _____

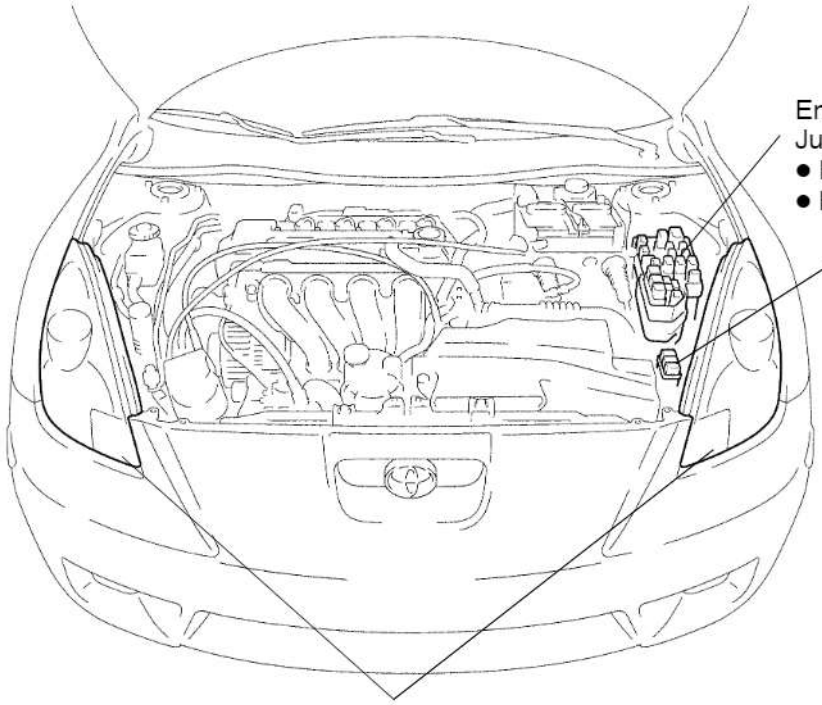
Customer's Name		**VIN**	
		Production Date	
		Licence No.	
Date Vehicle Brought in	/ /	**Odometer Reading**	**km Mile**

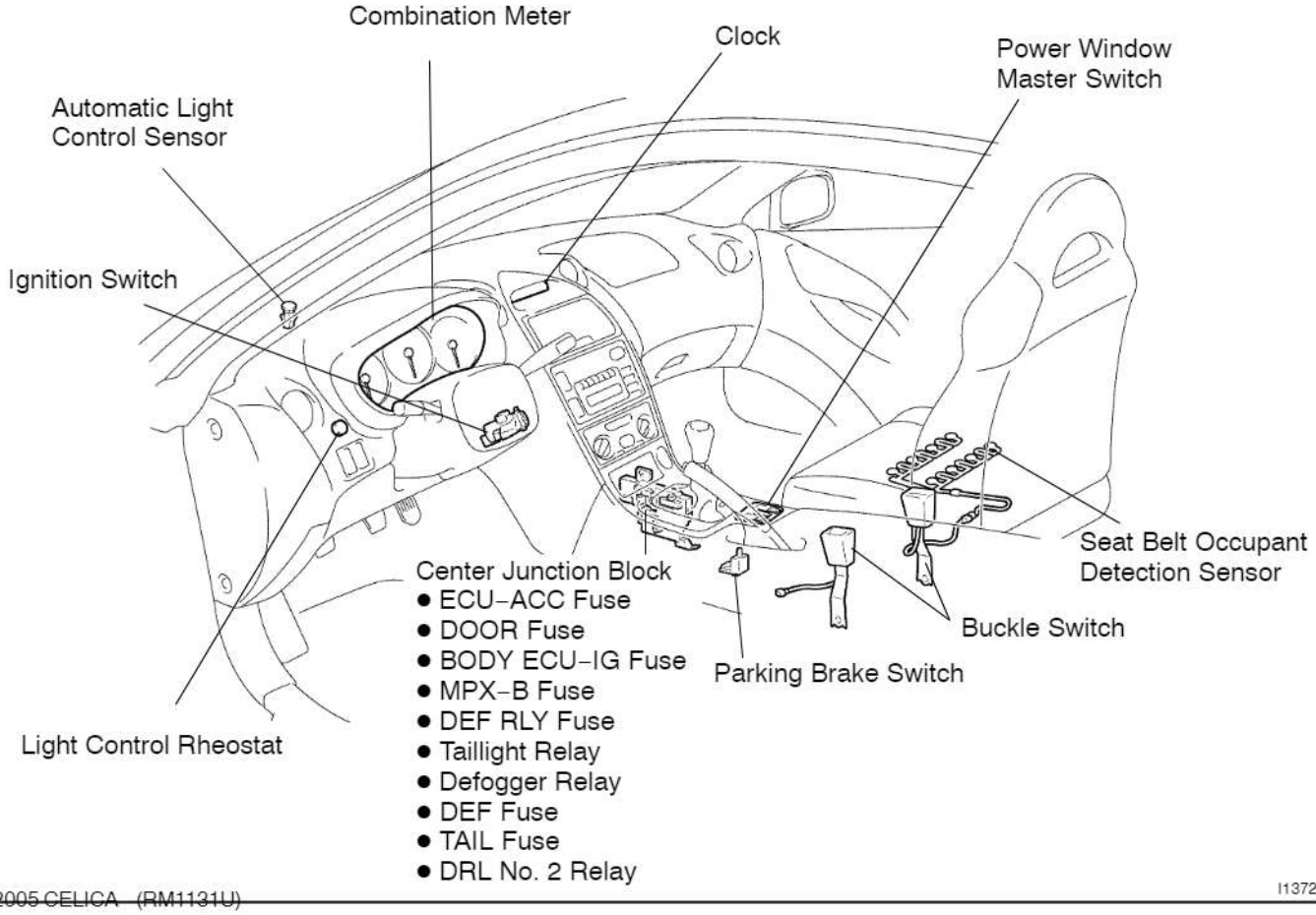
Date Problem First Occurred		/ /
Frequency Problem Occurs		☐ Constant ☐ Sometimes (times per day, month) ☐ Once only
Weather Conditions When Problem Occurred	**Weather**	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Various/ Others
	Outdoor Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold (Approx. °F (°C))

Malfunction System	☐ Key Reminder System
	☐ Light Control System
	☐ Daytime Running Light System
	☐ Combination Meter (Open door warning light)
	☐ Light Auto Turn Off System
	☐ Illuminated Entry System
	☐ Seat Belt Warning
	☐ Power Window Control System
	☐ Power Door Lock Control System
	☐ Wireless Door Lock Control System
	☐ Others

DI6QU–03

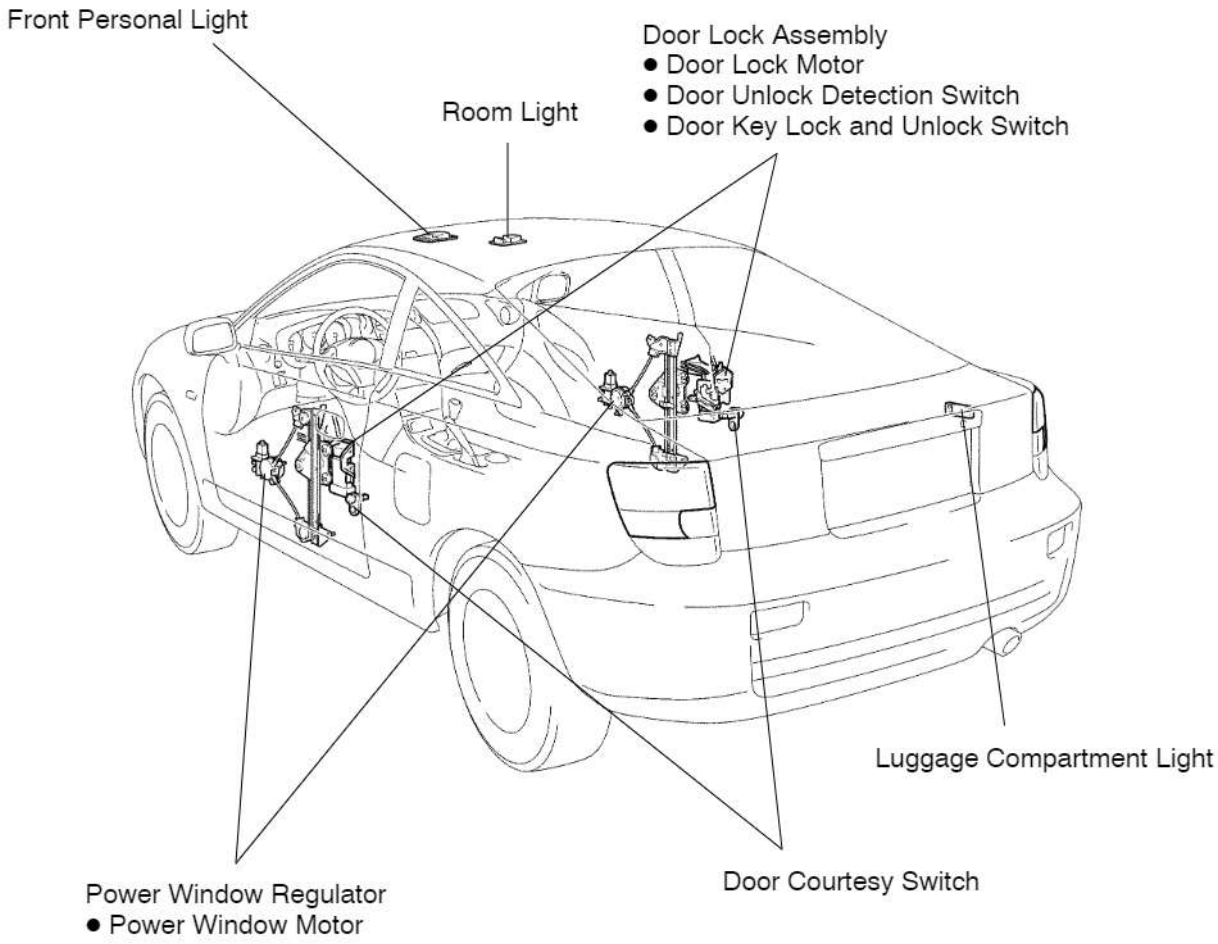
PARTS LOCATION





P

I13725


Front Personal Light
Room Light
Door Lock Assembly
● Door Lock Motor
● Door Unlock Detection Switch
● Door Key Lock and Unlock Switch
Luggage Compartment Light
Power Window Regulator
● Power Window Motor
Door Courtesy Switch

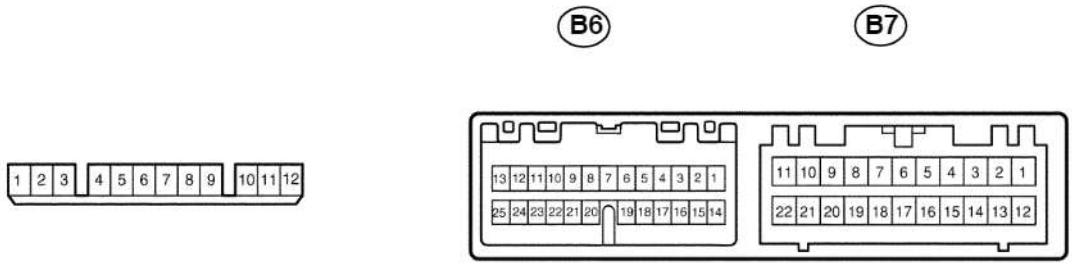
P

I13726

DI6QV–06

TERMINALS OF ECU

Body ECU:



P

I25679

Terminals No. (Symbols)	Wiring Color	Condition	STD Voltage
1 – 11 (TRLY – E)	–	Light control switch OFF	10 – 14 V
		Light control switch TAIL or HEAD	Below 1 V
2 – 11 (DEFB – E)	–	Always	10 – 14 V
3 – 11 (IG – E)	–	Ignition switch OFF or ACC	Below 1 V
		Ignition switch ON	10 – 14 V
4 – 11 (DEF – E)	–	Defogger switch OFF	10 – 14 V
		Defogger switch ON	Below 1 V
5 – 11 (B – E)	–	Always	10 – 14 V
6 – 11 (L2 – E)	–	Door key lock and unlock switch OFF	Approx. 5 V
		Door key lock and unlock switch ON	Below 1 V
7 – 9 (ACT– – ACT+)	–	Door lock operating	10 – 14 V
8 – 11 (B – E)	–	Always	10 – 14 V
10 – 11 (HRLY – E)	–	Light control switch OFF or TAIL	10 – 14 V
		Light control switch HEAD	Below 1 V
11 – Body ground (E – Body ground)	–	Always	Below 1 V
12 – 11 (ACC – E)	–	Ignition switch OFF	Below 1 V
		Ignition switch ACC or ON	10 – 14 V
B6–1 – 11 (PWS – E)	GR	Sliding roof ECU communication circuit	–
B6–2 – 11 (BLVL – E)	R	Parking brake switch ON (parking brake is used)	Below 1 V
		Parking brake switch OFF (parking brake is not used)	Approx. 5V
B6–3 – 11 (CLTS – E)	LG – B	Automatic light control sensor communication circuit	–
B6–4 – 11 (CLTB – E)	G – W	Automatic light control sensor communication circuit	–

Terminals No. (Symbols)	Wiring Color	Condition	STD Voltage
B6–5 – 11 (T – E)	LG	Light control switch OFF	10 – 14 V
		Light control switch TAIL or HEAD	Below 1 V
B6–9 – 11 (KSW – E)	Y	Key is inserted	Below 1 V
		Key is not inserted	10 – 14 V
B6–10 – 11 (LP – E)	R – W	Each door is opened	Below 2 V
		All doors are closed	10 – 14 V
B6–11 – 11 (SG1 – E)	W – L	Key is inserted	Below 1 V
		Key is not inserted	10 – 14 V
B6–12 – 11 (HF – E)	P – B	Light control switch HIGH beam or FLASH	Below 1 V
		Light control switch OFF or LOW beam	Approx. 5.7 V
B6–13 – 9 (ACTD – ACT+)	L – R	Driver door (operates)	10 – 14 V
B6–14 – 11 (HORN – E)	L – B	Horn sound	Below 1 V
		Horn does not sound	10 – 14 V
B6–16 – 11 (MPX1 – E)	R – L	Multiplex communication circuit	–
B6–17 – 11 (L – E)	Y – G	Engine running	Below 1 V
B6–18 – 11 (H – E)	R – L	Light control switch OFF or TAIL	Approx. 5.7 V
		Light control switch HEAD	Below 1 V
B6–19 – 11 (HU – E)	P – L	Headlight dimmer switch LOW	Approx. 5.7 V
		Headlight dimmer switch HIGH or FLASH	Below 1 V
B6–20 – 11 (LSWP – E)	G	Except driver's door is unlocked	Below 1 V
		Except driver's door is locked	Approx. 5.7 V
B6–21 – 11 (LSWD – E)	B	Driver door is unlocked	Below 1 V
		Driver door is locked	Approx. 5.7 V
B6–22 – 11 (UL2 – E)	Y – B	Passenger door key lock and unlock switch OFF	Approx. 5.0 V
		Passenger door key lock and unlock switch ON	Below 1 V
B6–24 – 11 (CLTE – E)	LG – R	Automatic light control sensor communication circuit	–
B6–25 – 11 (UL3 – E)	Y – B	Driver door key lock and unlock switch OFF	Approx. 5.0 V
		Driver door key lock and unlock switch ON	Below 1 V
B7–1 – 11 (SG2 – E)	W – L	Always	Below 1 V
B7–2 – 11 (SG3 – E)	W	Always	Below 1 V
B7–3 – 11 (FU– – E)	BR – W	Always	Below 1 V
B7–7 – 11 (DBKL – E)	L	Driver seat belt buckle switch ON (belt fastened)	Below 1 V
		Driver seat belt buckle switch OFF (belt unfastened)	10 – 14 V
B7–18 – 11 (BLTW – E)	P	Driver seat belt buckle switch ON (belt fastened)	Below 1 V
		Driver seat belt buckle switch OFF (belt unfastened)	10 – 14 V
B7–9 – 11 (PRG – E)	R – B	Wireless door lock control receiver communication circuit	–

Terminals No. (Symbols)	Wiring Color	Condition	STD Voltage
B7–10 – 11 (RDA – E)	V	Wireless door lock control receiver communication circuit	–
B7–11 – 11 (P/W – E)	Y – B	Key–off power window operation	10 – 14 V
B7–12 – 11 (FUA – E)	Y – R	Ignition switch ON and fuel sender gauge float down	Approx. 0.3 V
		Ignition switch ON and fuel sender gauge float up	Approx. 4.6 V
B7–13 – 11 (FU+ – E)	Y – G	Ignition switch ON	Approx. 5.0 V
B7–14 – 11 (PBKL – E)	L – Y	Passenger seat belt buckle switch ON (belt fastened)	Below 1 V
		Passenger seat belt buckle switch OFF (belt unfastened)	Approx. 5.0 V
B7–15 – 11 (L1 – E)	V – W	Door lock manual switch OFF or UNLOCK	Below 1 V
		Door lock manual switch LOCK	Approx. 5.0 V
B7–16 – 11 (UL1 – E)	P – B	Door lock manual switch OFF or LOCK	Below 1 V
		Door lock manual switch UNLOCK	Approx. 5.0 V
B7–17 – 11 (DRL – E)	L – W	Daytime running light system operates when DRL ON	Below 1 V
B7–4 – 11 (SG4 – E)	W – R	Sport mode switch OFF	10 – 14 V
		Sport mode switch ON	Below 1 V
B7–19 – 11 (PKB – E)	R – B	Parking brake is used	Below 1 V
		Parking brake is not used	10 – 14 V
B7–20 – 11 (DCTY – E)	R – Y	Driver door opened	Below 1 V
		Driver door closed	10 – 14 V
B7–21 – 11 (PCTY – E)	R	Passenger door opened	Below 1 V
		Passenger door closed	10 – 14 V
B7–22 – 11 (LGCY – E)	LG	Luggage door opened	Below 1 V
		Luggage door closed	10 – 14 V

DI62G-13

PROBLEM SYMPTOMS TABLE

DOOR LOCK CONTROL

Symptom	Suspect Area	See page
Lock or unlock cannot be operated with door lock control S/W.	1. Door lock control switch circuit (Master switch) 2. Body ECU	DI–1155 IN–30
Door key linked function does not operate.	1. Door key lock and unlock switch circuit 2. Body ECU	DI–1162 IN–30
Key confinement prevention function does not operate.	1. Key unlock switch circuit 2. Body ECU	DI–1147 IN–30
Only one of the door does not lock and unlock.	1. Door lock motor circuit 2. Body ECU	DI–1158 IN–30
Luggage compartment door opener function does not operate.	1. Luggage component door courtesy switch circuit 2. Body ECU	DI–1166 IN–30

WIRELESS DOOR LOCK CONTROL

Symptom	Suspect Area	See page
All functions of wireless door lock control system do not operate.	1. Transmitter 2. Wireless tuner circuit 3. Key unlock warning switch circuit 4. Body ECU	BE–76 DI–1168 DI–1147 IN–30
Lock (or unlock) function does not operate.	1. Door key lock and unlock switch circuit 2. Door unlock detection switch circuit 3. Body ECU	DI–1162 DI–1160 IN–30
Automatic lock function operates even if any door is opened within 30 seconds after all doors are unlocked by wireless door lock control system .	1. Door courtesy switch circuit 2. Body ECU	DI–1164 IN–30

ILLUMINATED ENTRY

Symptom	Suspect Area	See page
Illuminated entry does not operate.	1. Illumination circuit 2. Body ECU	DI–1144 IN–30

HEADLIGHT AND TAILLIGHT SYSTEM:

Symptom	Suspect Area	See page
Headlight does not come on.	1. Light control switch circuit 2. Headlight control relay circuit 3. Body ECU	DI–1140 DI–1132 IN–30
Taillight does not come on.	1. Light control switch circuit 2. Taillight relay circuit 3. Body ECU	DI–1140 DI–1130 IN–30
Automatic light control system does not operate.	1. Automatic light control sensor circuit 2. Light switch circuit 3. Body ECU	DI–1182 DI–1140 IN–30
Auto turn–off system does not operate.	1. Driver door courtesy switch circuit 2. Body ECU	DI–1164 IN–30

OTHERS

Symptom	Suspect Area	See page
Driver seat belt warning light does not go off.	1. Driver buckle switch circuit 2. Combination meter 3. Body ECU	DI–1149 IN–30
Passenger seat belt warning light does not go off.	1. Passenger buckle switch circuit 2. Clock 3. Body ECU	DI–1149 IN–30
Rear window defogger does not operate.	1. Defogger relay circuit 2. Defogger switch 3. Body ECU	DI–1170 BE–58 IN–30
Body ECU does not operate.	1. Power source circuit 2. Body ECU	DI–1126 IN–30
Fuel sender gauge does not operate.	1. Fuel sender gauge circuit 2. Combination meter system 3. Body ECU	DI–1172 BE–50 IN–30

DI6QW–07

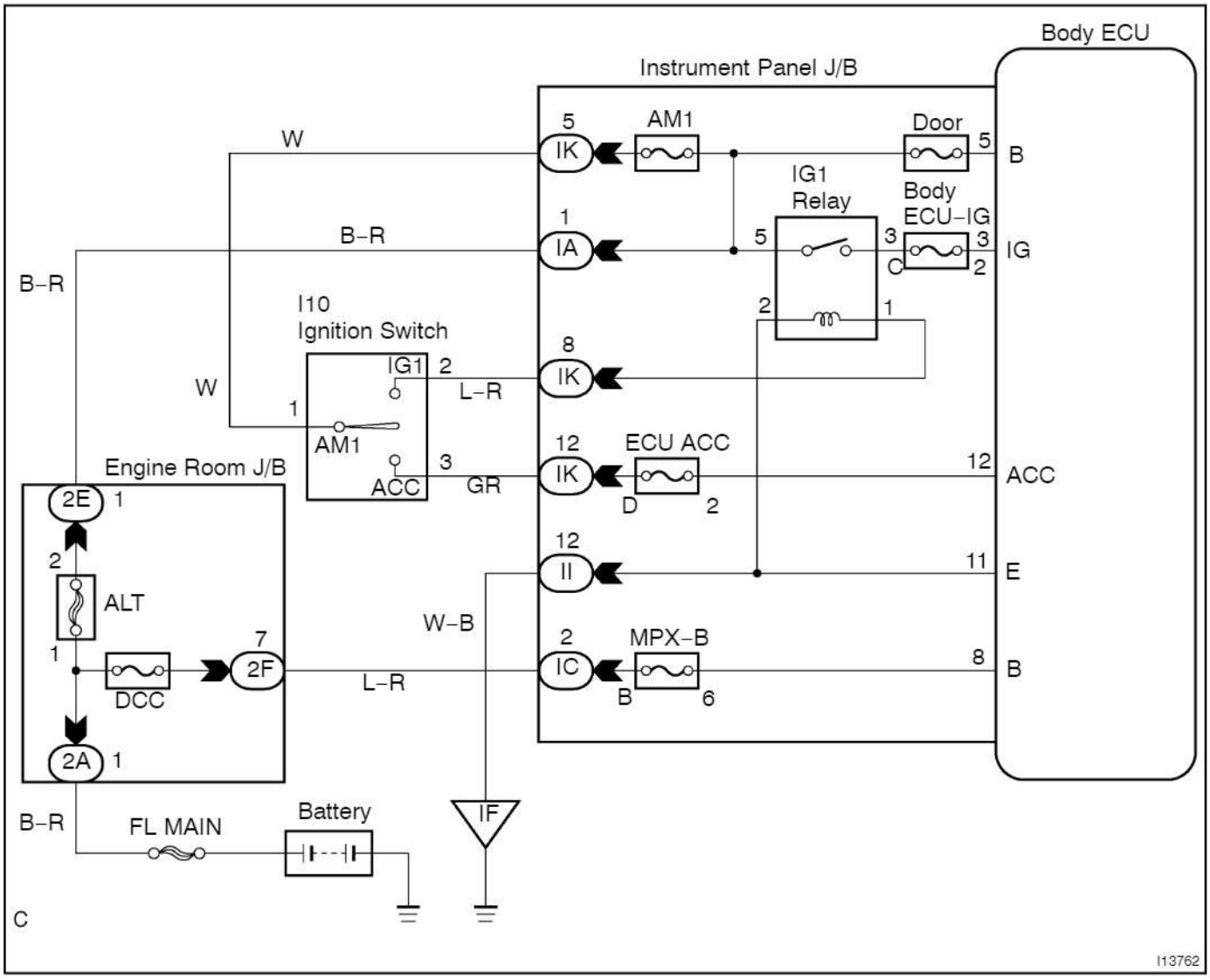
CIRCUIT INSPECTION

Power Source Circuit

CIRCUIT DESCRIPTION

This circuit provides power to operate the Body ECU.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check MPX–B, ACC, AM1 and DOOR fuse.**

CHECK:

Check continuity of MPX–B, ACC, AM1 and DOOR fuse.

OK:

Continuity

NG → **Replace the failure fuse.**

OK

2	**Check voltage between terminals B, B and E of Body ECU connector.**

PREPARATION:

(a) Turn ignition switch OFF.

(b) Disconnect the Body ECU connector.

CHECK:

Measure the voltage between terminal B, B and E.

OK:

Voltage: 10 – 14V

OK → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–1124).**

NG

3	**Check wireharness and connector between Body ECU and body ground (See page IN–30).**

NG → **Repair or replace wire harness or connector.**

OK

Check and repair wire harness and connector between Body ECU and battery.

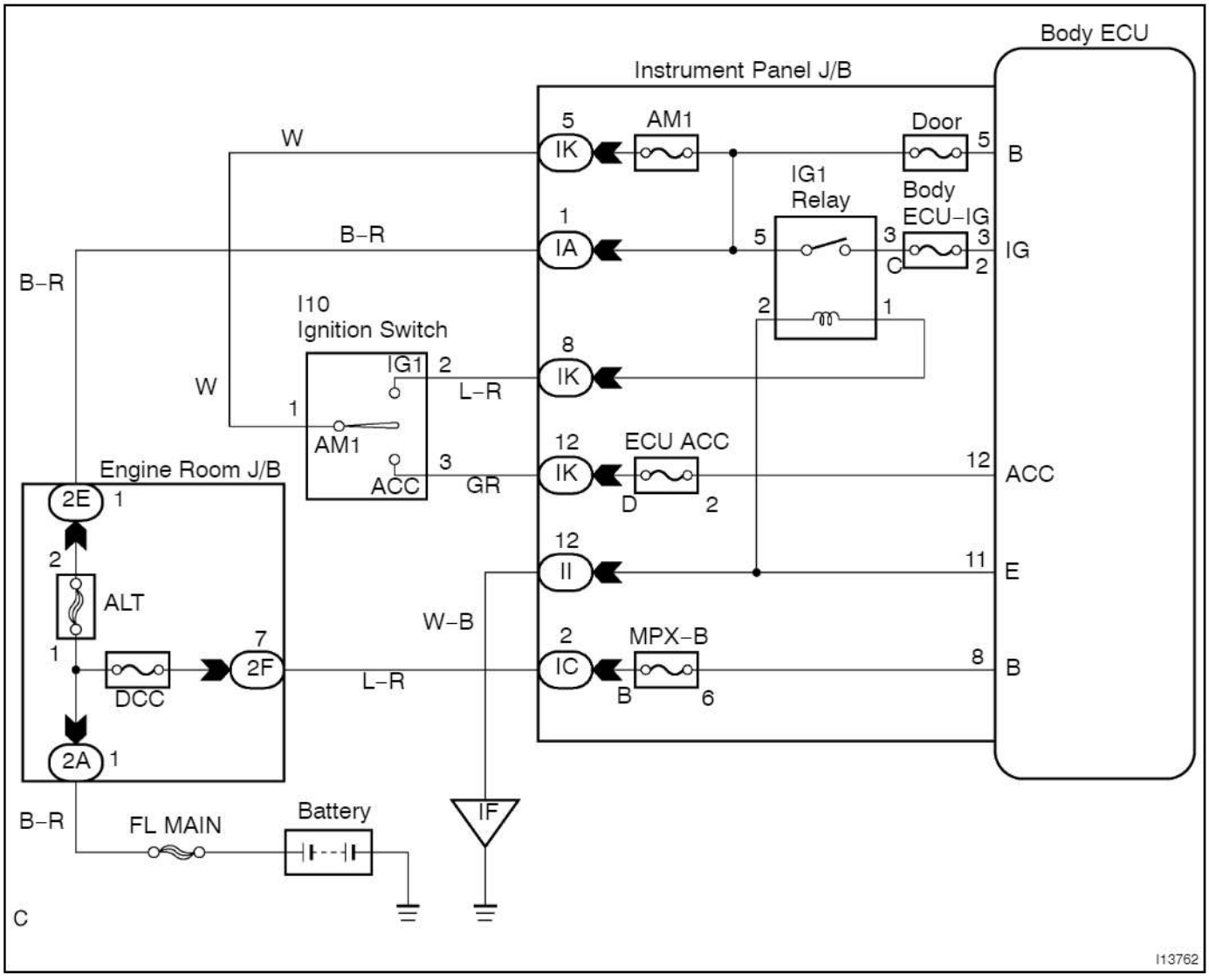
DI6QX-05

Ignition Switch Power Source Circuit

CIRCUIT DESCRIPTION

When the ignition switch is turned to the ACC position, battery voltage is applied to terminal ACC of ECU, and when the ignition switch is turned to the ON position, battery voltage is applied to terminal IG of ECU.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check BODY ECU–IG and ECU–ACC fuse.**

CHECK:

Check continuity of BODY ECU–IG and ECU–ACC fuse.

OK:

Continuity

NG → **Replace the failure fuse.**

OK

2	**Check voltage between terminals ACC, IG and E of Body ECU connector.**

PREPARATION:

Turn ignition switch ON.

CHECK:

Measure the voltage between terminal ACC, IG, and E.

OK:

Voltage: 10 – 14V

OK → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–1124).**

NG

3	**Check wire harness and connector between Body ECU and body ground (See page IN–30).**

NG → **Repair or replace wire harness or connector.**

OK

Check and repair wire harness and connector between Body ECU and battery.

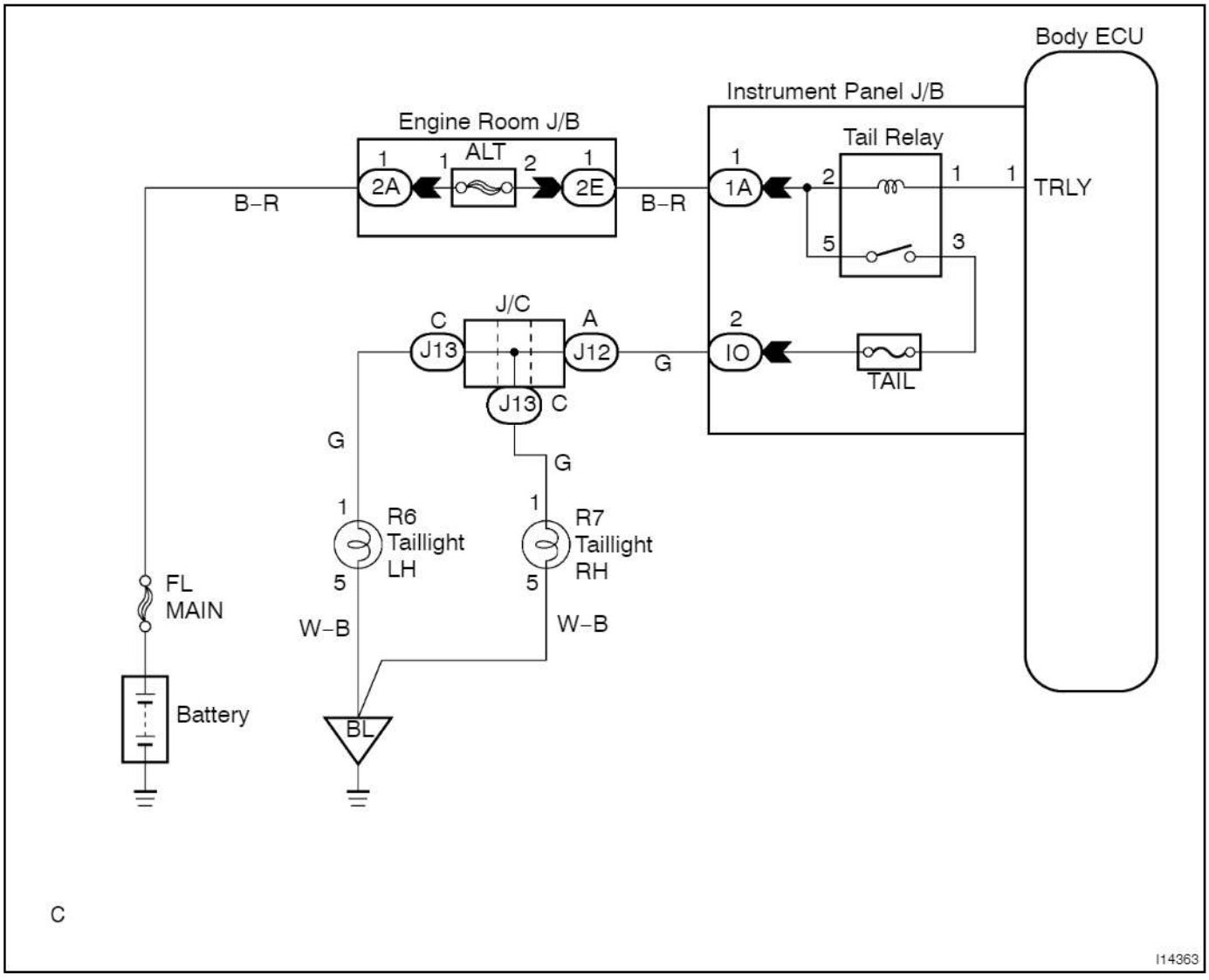
D6QY-10

Taillight Relay Circuit

CIRCUIT DESCRIPTION

Taillight relay will be "ON" by operating the taillight switch. The transistor which activates the taillight relay has two sorts: one is activated by the taillight switch for fail–safe and the other is activated by CPU.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check taillight relay (See page BE–18).

NG → Replace the taillight relay.

OK

2	Check wire harness and connector between taillight relay and Body ECU, battery and taillight relay (See page IN–30).

NG → Repair or replace wire harness or connector.

OK

Proceed to next circuit inspection shown on problem symptoms table (See page DI–1124).

DIAJH–03

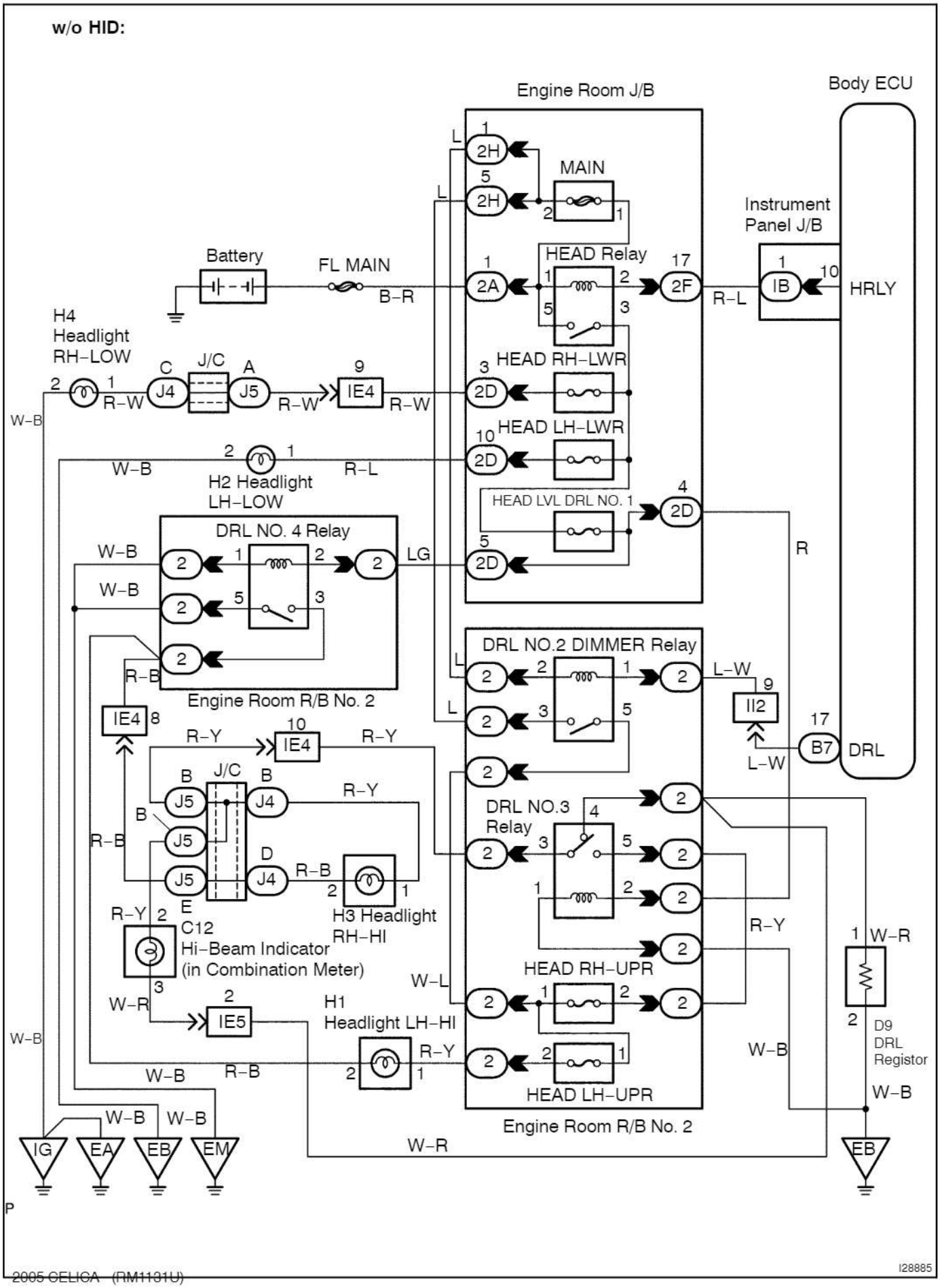
Headlight Relay Circuit

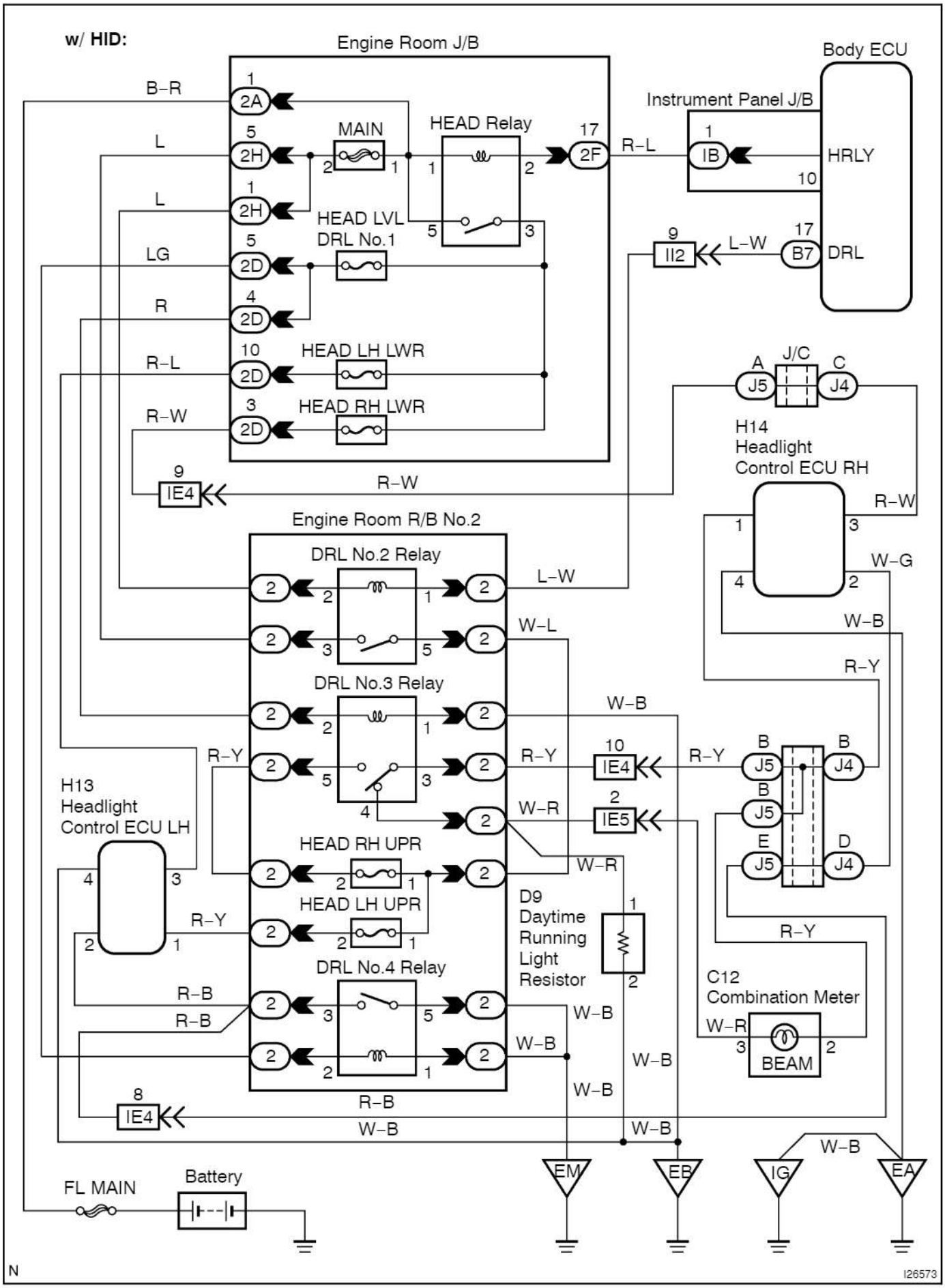
CIRCUIT DESCRIPTION

Headlight relay will be "ON" by operating the headlight switch. The transistor which activates the headlight relay has two sorts: one is activated directly by the headlight switch for fail–safe and the other is activated by CPU. The one activated by CPU has two systems and prevents the headlight to be turned off at the time of trouble with one system in the automatic operation circuit.

WIRING DIAGRAM

w/o HID:




w/ HID:
Engine Room J/B
Body ECU
Instrument Panel J/B
B–R
L
L
LG
R
R–L
R–W
MAIN
HEAD Relay
HEAD LVL
DRL No.1
HEAD LH LWR
HEAD RH LWR
2A
2H
2H
2D
2D
2D
2D
2F
1B
HRLY
DRL
II2
L–W
B7
IE4
R–W
J/C
A
J5
C
J4
H14
Headlight
Control ECU RH
W–G
W–B
R–Y
Engine Room R/B No.2
DRL No.2 Relay
DRL No.3 Relay
DRL No.4 Relay
L–W
W–L
W–B
R–Y
W–R
HEAD RH UPR
HEAD LH UPR
H13
Headlight
Control ECU LH
D9
Daytime
Running
Light
Resistor
IE4
IE5
B
J5
J4
E
D
C12
Combination Meter
BEAM
R–B
W–B
FL MAIN
Battery
EM
EB
IG
EA
N
I26573

INSPECTION PROCEDURE

1	Check headlight relay (See page BE–18).

NG → Replace the headlight relay.

OK

2	Check wire harness and connector between headlight relay and Body ECU, battery and headlight relay (See page IN–30).

NG → Repair or replace wire harness or connector.

OK

Proceed to next circuit inspection shown on problem symptoms table (See page DI–1124).

DIAJI-03

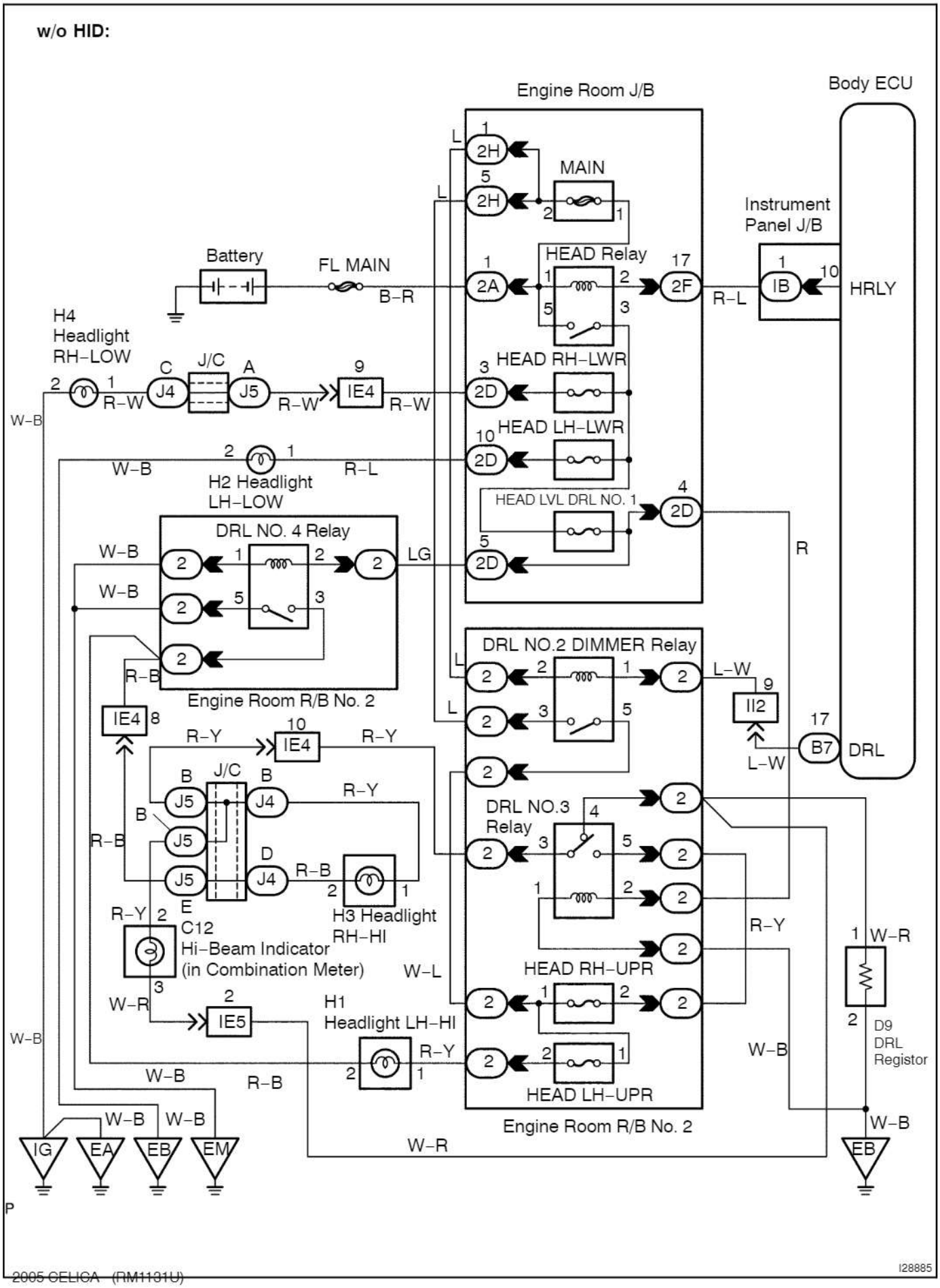
Daytime Running Light No. 2, No. 3, No. 4 Relay Circuit

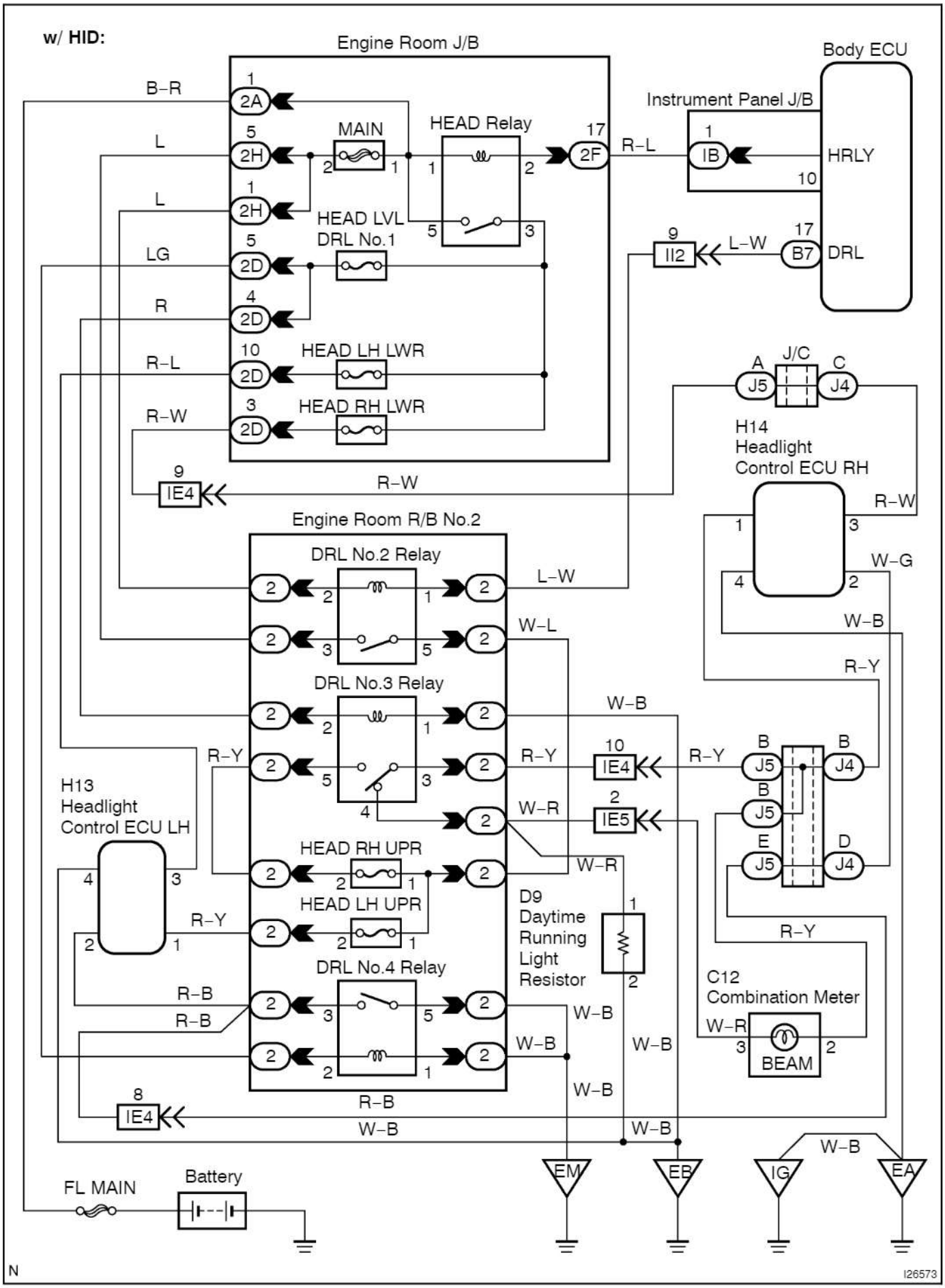
CIRCUIT DESCRIPTION

When the light control switch is set to OFF or TAIL after the following conditions are satisfied simultaneously with the ignition switch ON, the headlight comes on by control of the body ECU.

- The parking brake switch is OFF.
- The generator is ON (Engine running)

WIRING DIAGRAM




w/ HID:
Engine Room J/B
Body ECU
Instrument Panel J/B
B–R
L
L
LG
R
R–L
R–W
MAIN
HEAD Relay
HEAD LVL
DRL No.1
HEAD LH LWR
HEAD RH LWR
2A
2H
2H
2D
2D
2D
2D
2F
1B
HRLY
DRL
II2
B7
L–W
R–W
IE4
J/C
J5
J4
H14
Headlight
Control ECU RH
W–G
W–B
R–Y
Engine Room R/B No.2
DRL No.2 Relay
DRL No.3 Relay
DRL No.4 Relay
HEAD RH UPR
HEAD LH UPR
L–W
W–L
W–B
W–R
R–Y
R–B
H13
Headlight
Control ECU LH
D9
Daytime
Running
Light
Resistor
IE5
C12
Combination Meter
BEAM
FL MAIN
Battery
EM
EB
IG
EA
N
I26573

INSPECTION PROCEDURE

1	Check D.R.L. No. 2, No. 3, No. 4 relay (See page BE–18).

NG → Replace the D.R.L. No. 2 relay.

OK

2	Check wire harness and connector between D.R.L. No. 2 relay and Body ECU, battery and D.R.L. No. 2 relay (See page IN–30).

NG → Repair or replace wire harness or connector.

OK

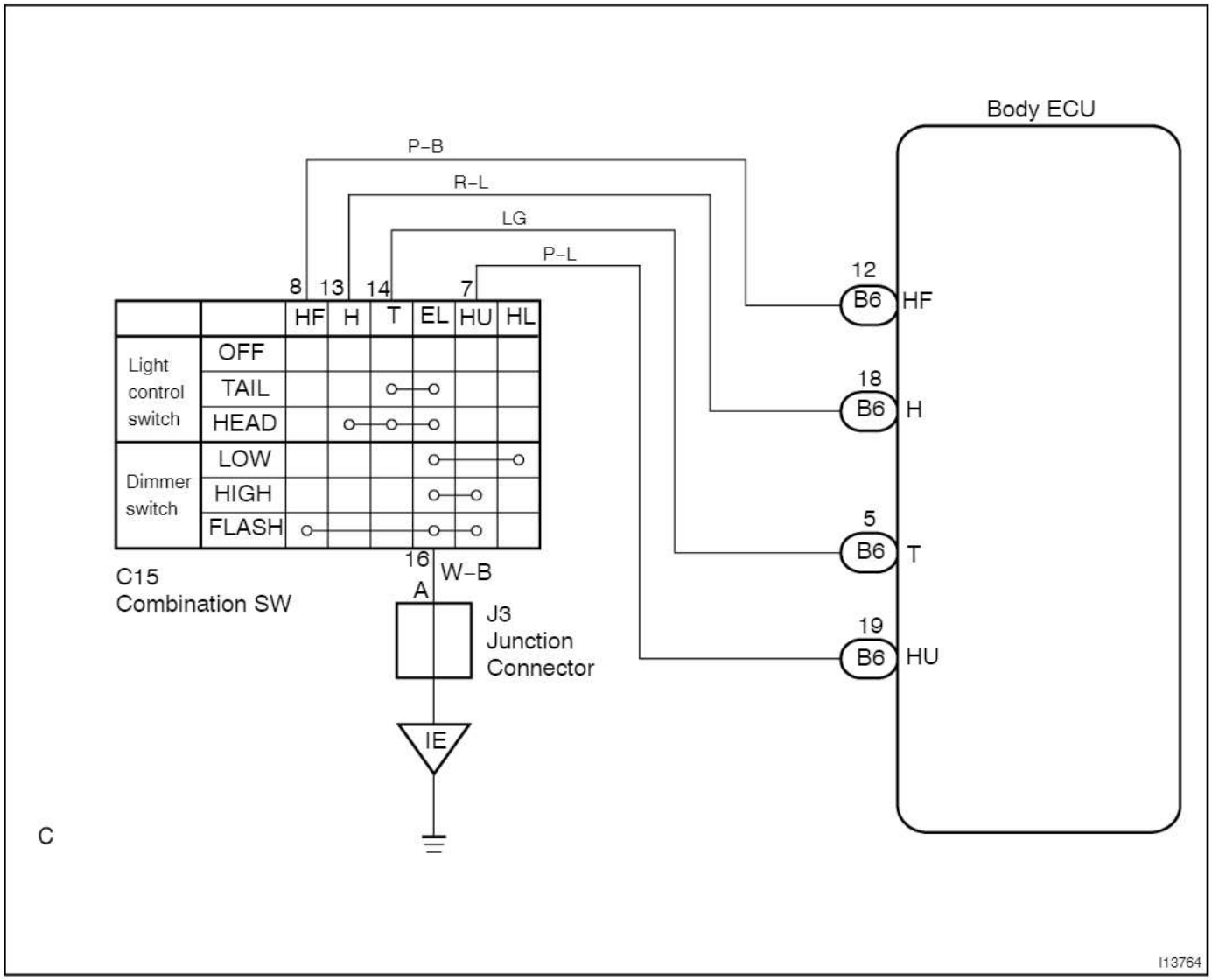
Proceed to next circuit inspection shown on problem symptoms table (See page DI–1124).

Light Control Switch Circuit

CIRCUIT DESCRIPTION

This circuit detects the state of the light control switch.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check light control switch (See page BE–18).

NG → Replace the headlight control switch.

OK

2	Check wire harness and connector between headlight control switch and Body ECU (See page IN–30).

NG → Repair or replace wire harness or connector.

OK

Proceed to next circuit inspection shown on problem symptoms table (See page DI–1124).

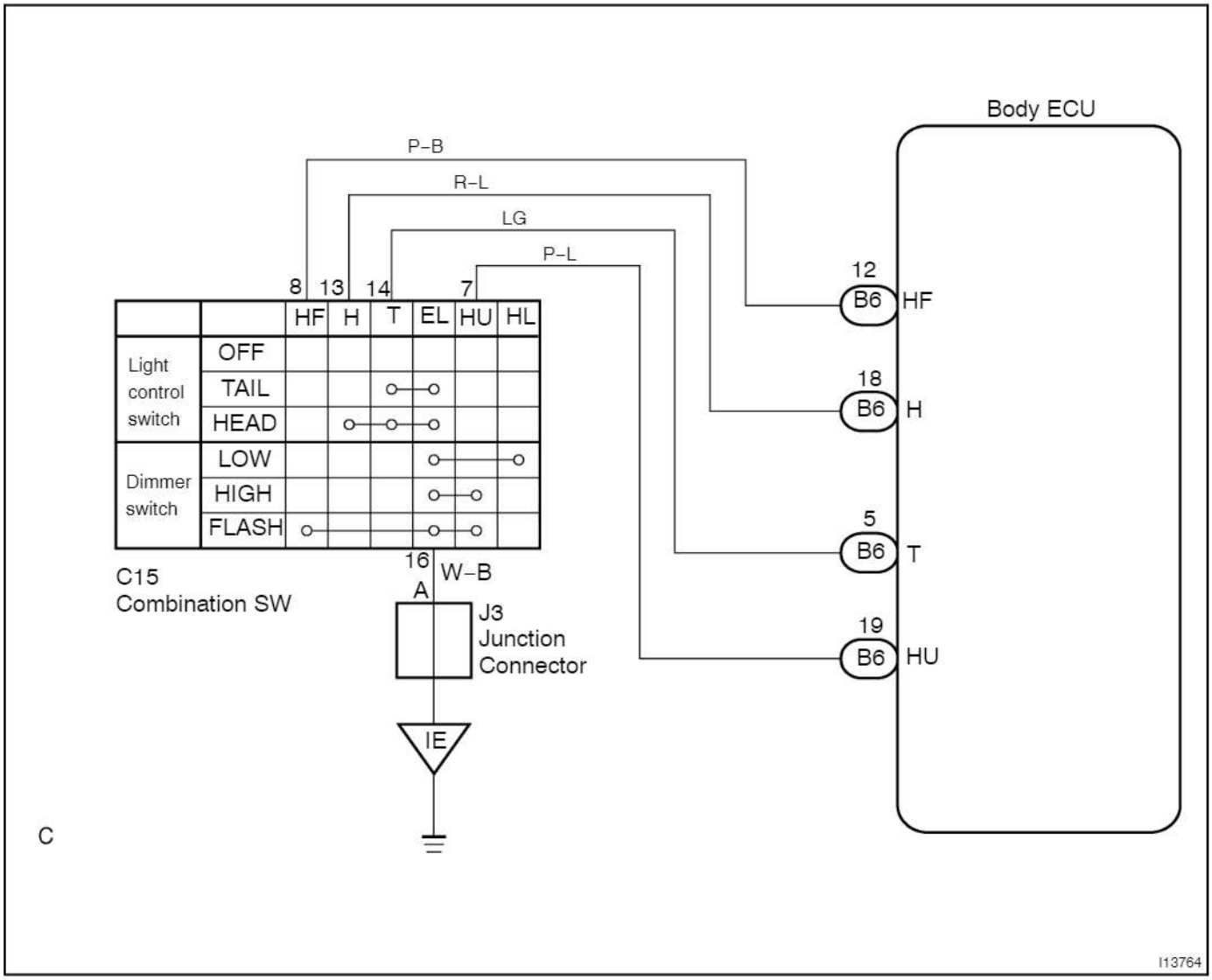
DI5VO-15

Headlight Dimmer Switch Circuit

CIRCUIT DESCRIPTION

This circuit detects the state of the headlight dimmer switch.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check headlight dimmer switch (See page BE–18).

NG → Replace the headlight dimmer switch.

OK

2	Check wire harness and connector between headlight dimmer switch and Body ECU (See page IN–30).

NG → Repair or replace wire harness or connector.

OK

Proceed to next circuit inspection shown on problem symptoms table (See page DI–1124).

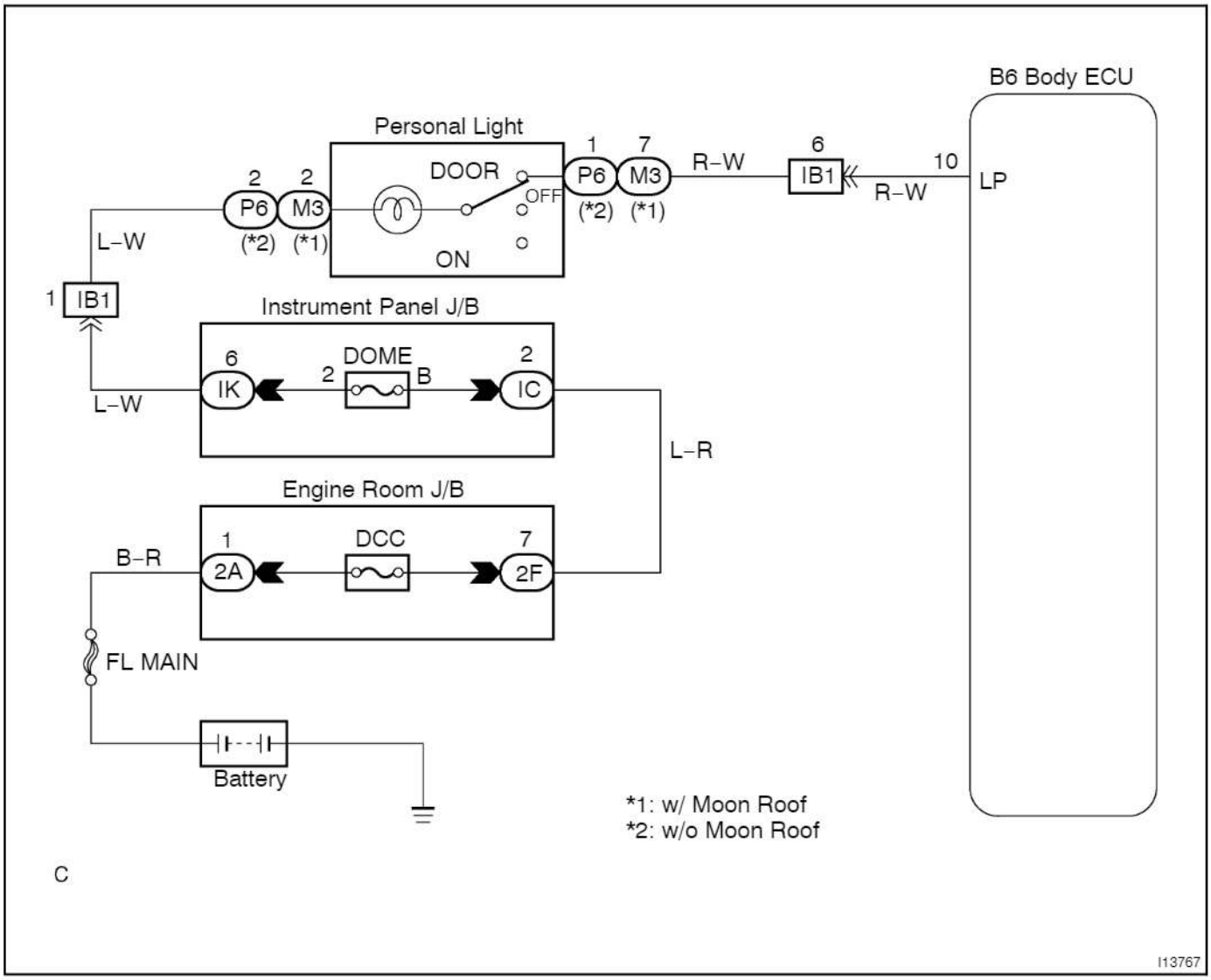
DI6R0-04

Illumination Circuit

CIRCUIT DESCRIPTION

Receiving the courtesy signal from the Body ECU will make the interior light, the ignition light and the courtesy light to come on.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check DOME fuse.

NG → Replace the fuse.

OK ↓

2	Check illumination light (See page BE–32).

NG → Replace the failure light.

OK ↓

3	Check wire harness and connector between each illumination light and Body ECU, battery and each illumination light (See page IN–30).

NG → Repair or replace wire harness or connector.

OK ↓

Proceed to next circuit inspection shown on problem symptoms table (See page DI–1124).

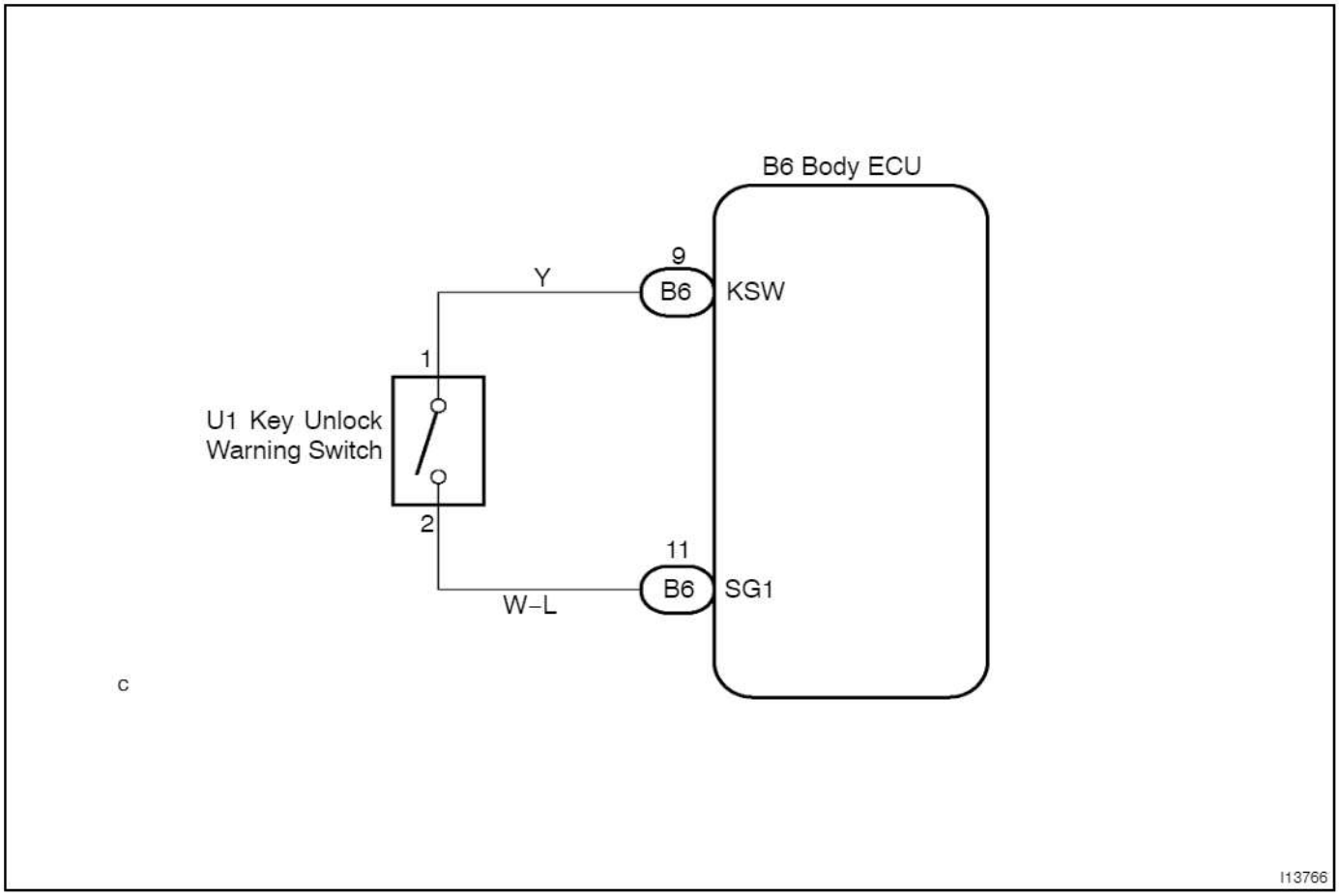
DI6R1-06

Key Unlock Warning Switch Circuit

CIRCUIT DESCRIPTION

The key unlock warning switch comes on when the ignition key is inserted in the key cylinder and goes off when the ignition key is removed.
ECU operates the key confinement prevention function while the key unlock warning switch is on.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check key unlock warning switch (See page BE–15).

NG → Replace the key unlock warning switch.

OK

2	Check wire harness and connector between key unlock warning switch and Body ECU (See page IN–30).

NG → Repair or replace wire harness or connector.

OK

Proceed to next circuit inspection shown on problem symptoms table (See page DI–1124).

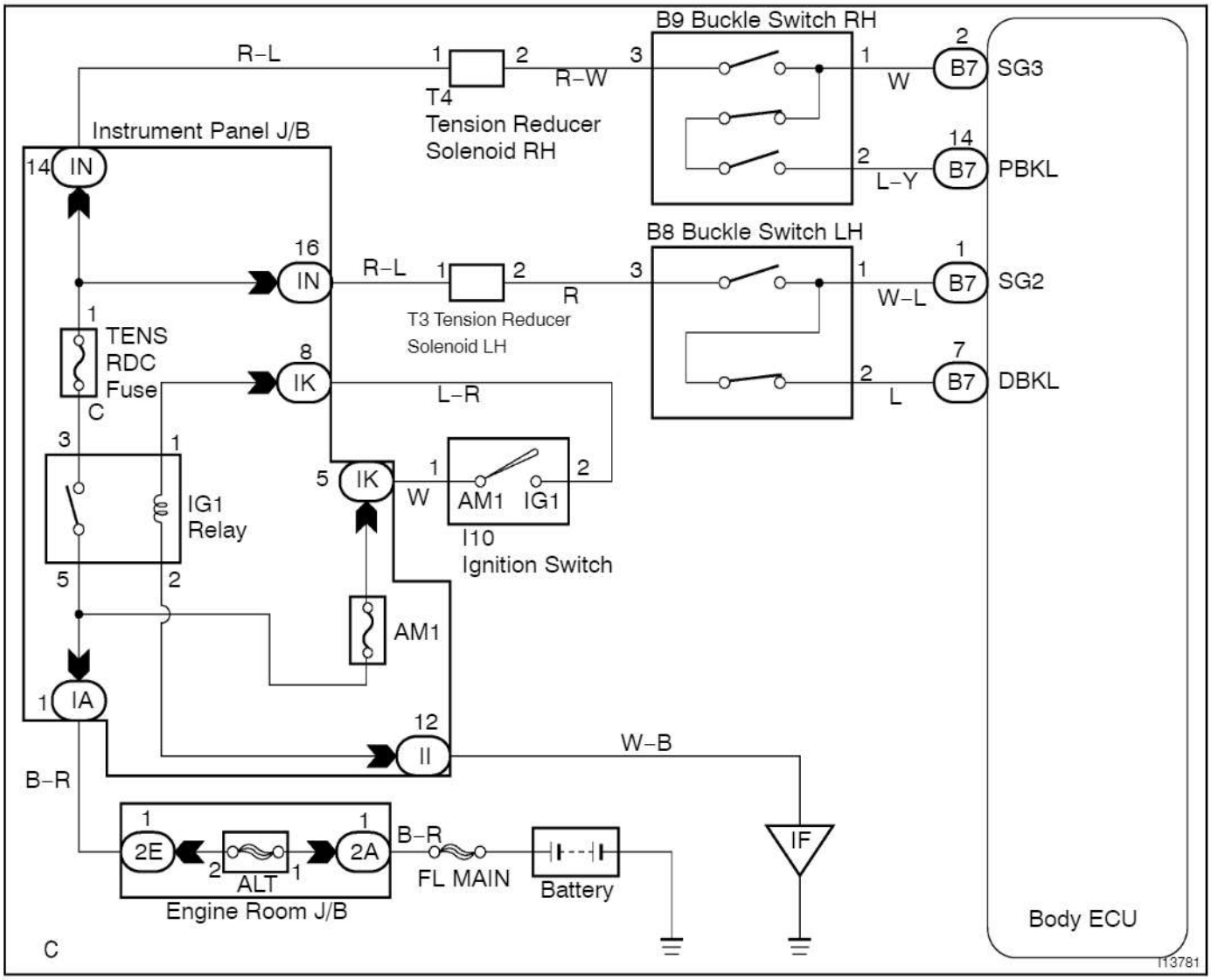
DI6R2-07

Driver Buckle Switch Circuit

CIRCUIT DESCRIPTION

When the buckle switch of the driver's seat is ON with the ignition switch ON, the body ECU sends a signal to turn on the seat belt warning light for the driver's seat and to sound a buzzer.
When the buckle switch of the passenger seat is ON and the passenger seat belt occupant detecting sensor is ON with the ignition switch ON, the body ECU sends a signal to turn on the seat belt warning light for the passenger seat.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check buckle switch (See page BE–50).

NG → Replace the buckle switch.

OK ↓

2	Check wire harness and connector between buckle switch and body ground (See page IN–30).

NG → Repair or replace wire harness or connector.

OK ↓

Proceed to next circuit inspection shown on problem symptoms table (See page DI–1124).

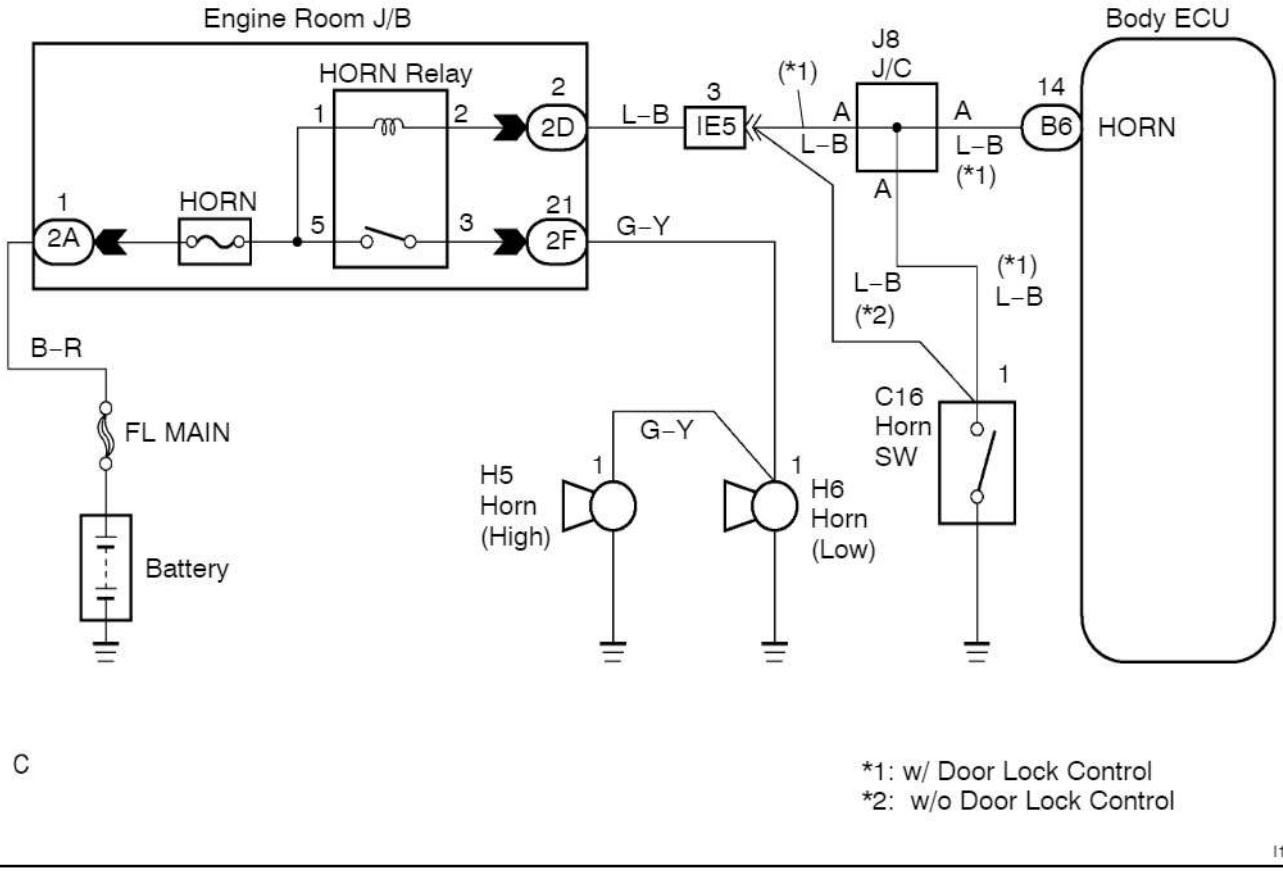
DI2A3-11

Horn Circuit

CIRCUIT DESCRIPTION

The horn is connected to and activated by the body ECU.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check horn (See page BE–131).

NG → Replace the horn.

OK ↓

2	Check wire harness and connector between horn relay and body ECU, battery and horn relay (See page IN–30).

NG → Repair or replace wire harness or connector.

OK ↓

Proceed to next circuit inspection shown on problem symptoms table (See page DI–1124).

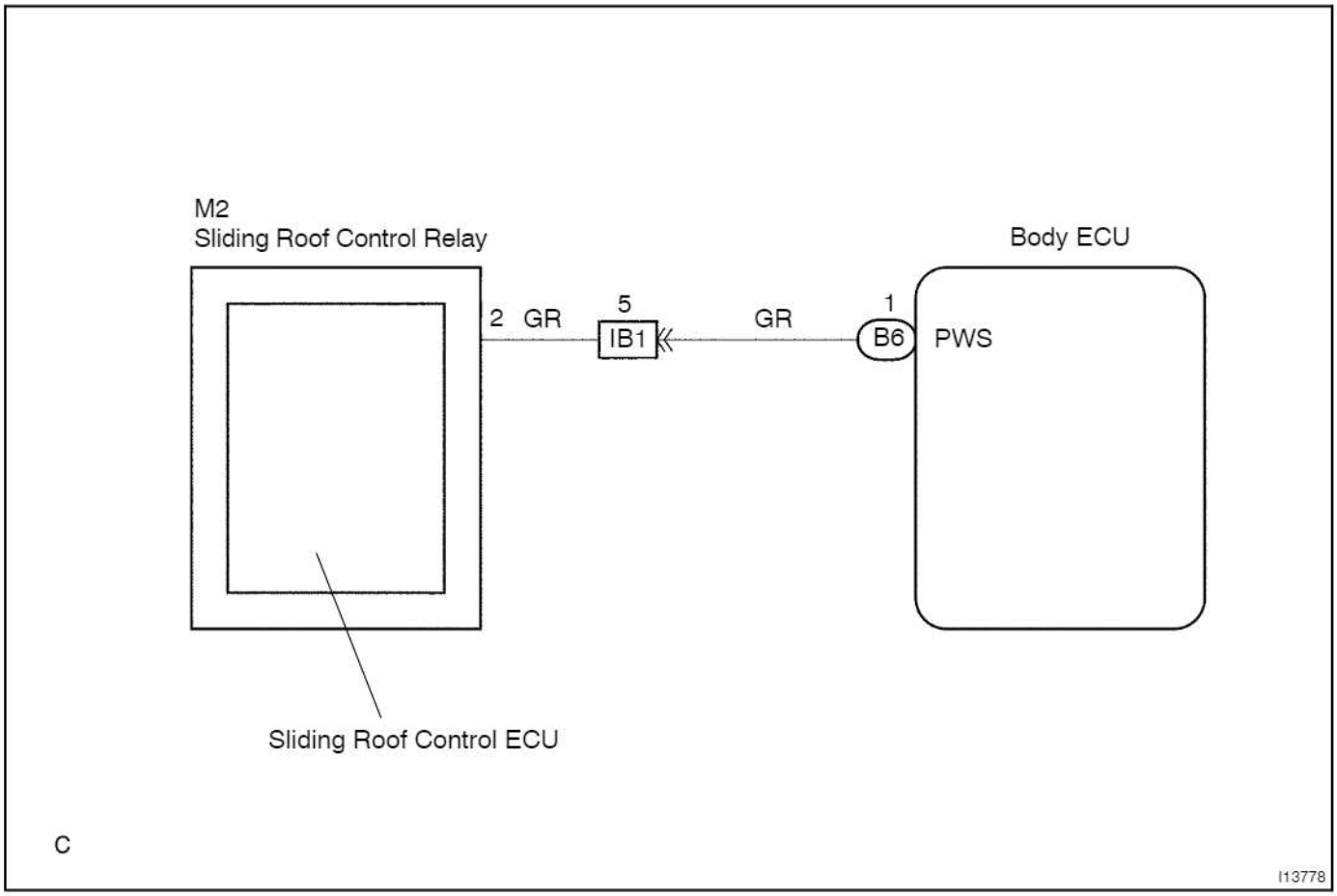
DI5W4-06

PWS Circuit

CIRCUIT DESCRIPTION

The body ECU operates the power window and the sliding roof when the ignition switch is ON or within 43 sec. after the ignition switch is turned OFF or until the driver's side door is opened in that period.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check wire harness and connector between sliding roof control assembly and Body ECU (See page IN–30).

NG → Repair or replace wire harness or connector.

OK →

Proceed to next circuit inspection shown on problem symptoms table (See page DI–1124).

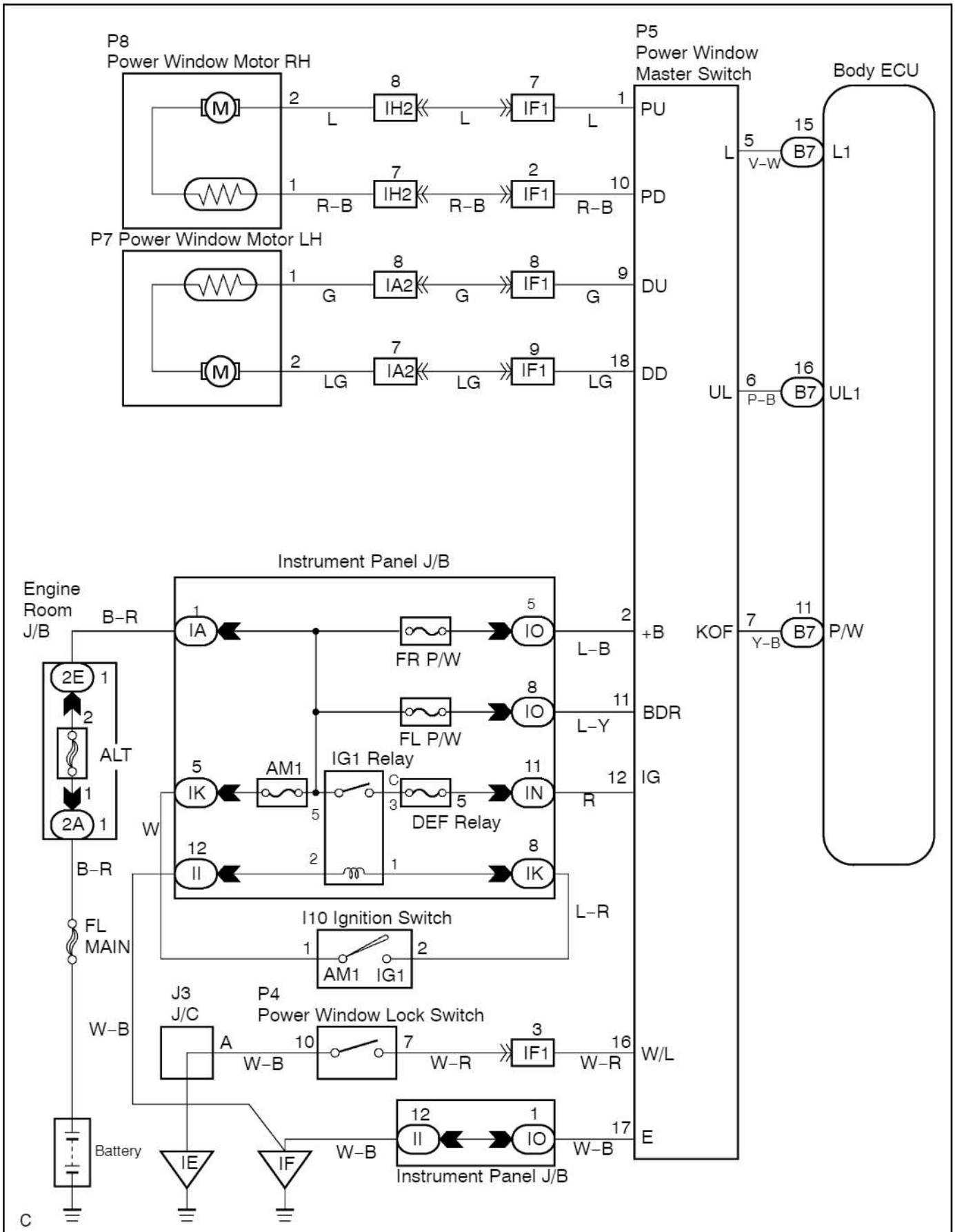
DI6R3-04

Power Window Master Switch Circuit

CIRCUIT DESCRIPTION

This circuit detects the state of the power window master switch.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check the power window master switch (See page BE–62).

NG → Replace the power window master switch.

OK

2	Check wire harness and connector between power window master switch and body ECU (See page IN–30).

NG → Repair or replace wire harness or connector.

OK

Proceed to next circuit inspection shown on problem symptoms table (See page DI–1124).

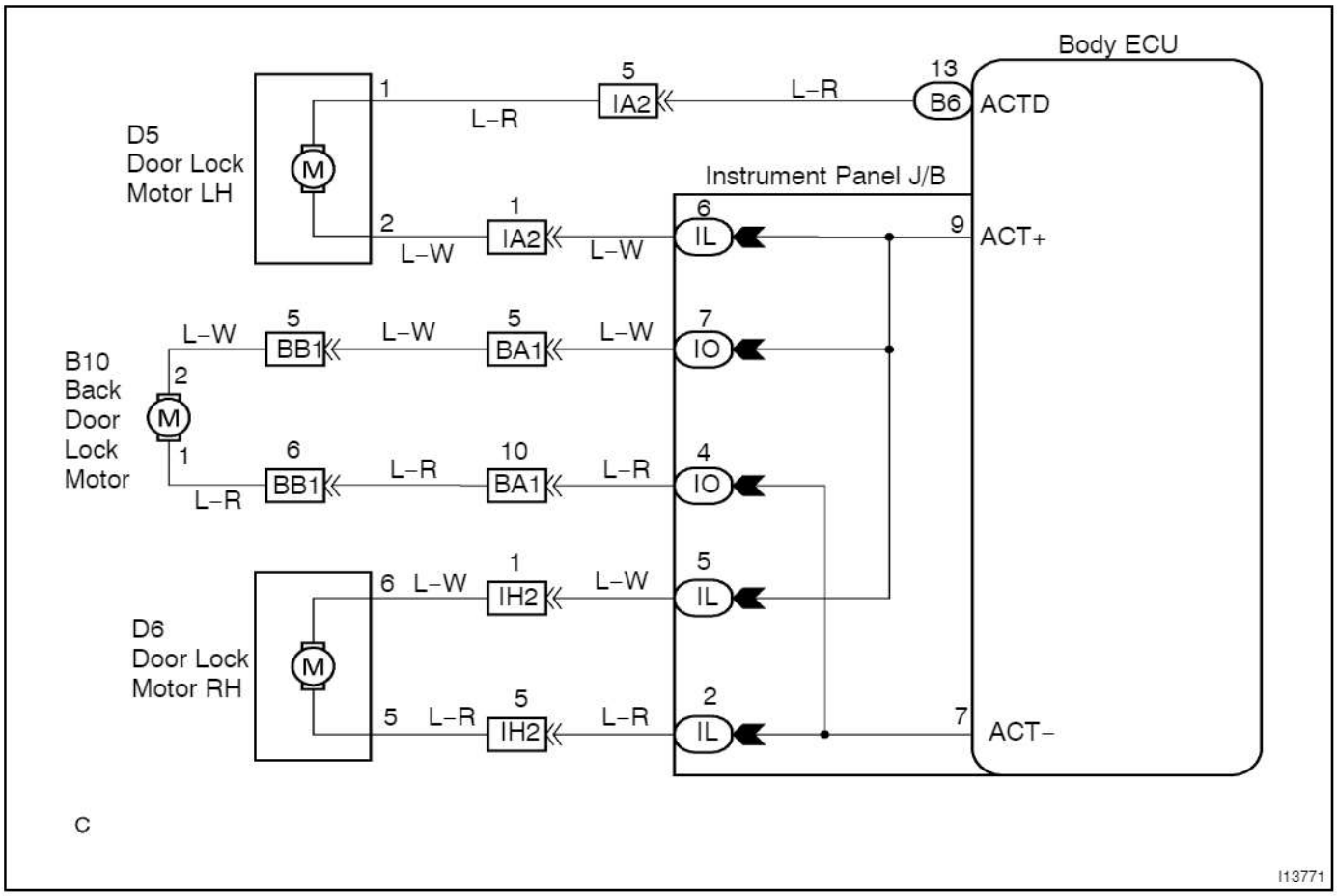
D6R4–07

Door Lock Motor Circuit

CIRCUIT DESCRIPTION

When the door switch is set to LOCK, the body ECU outputs a signal to lock all of the doors.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check door lock motor (See page BE–66).

NG → Replace the door lock motor.

OK

2	Check wire harness and connector between door lock motor and body ECU (See page IN–30).

NG → Repair or replace wire harness or connector.

OK

Proceed to next circuit inspection shown on problem symptoms table (See page DI–1124).

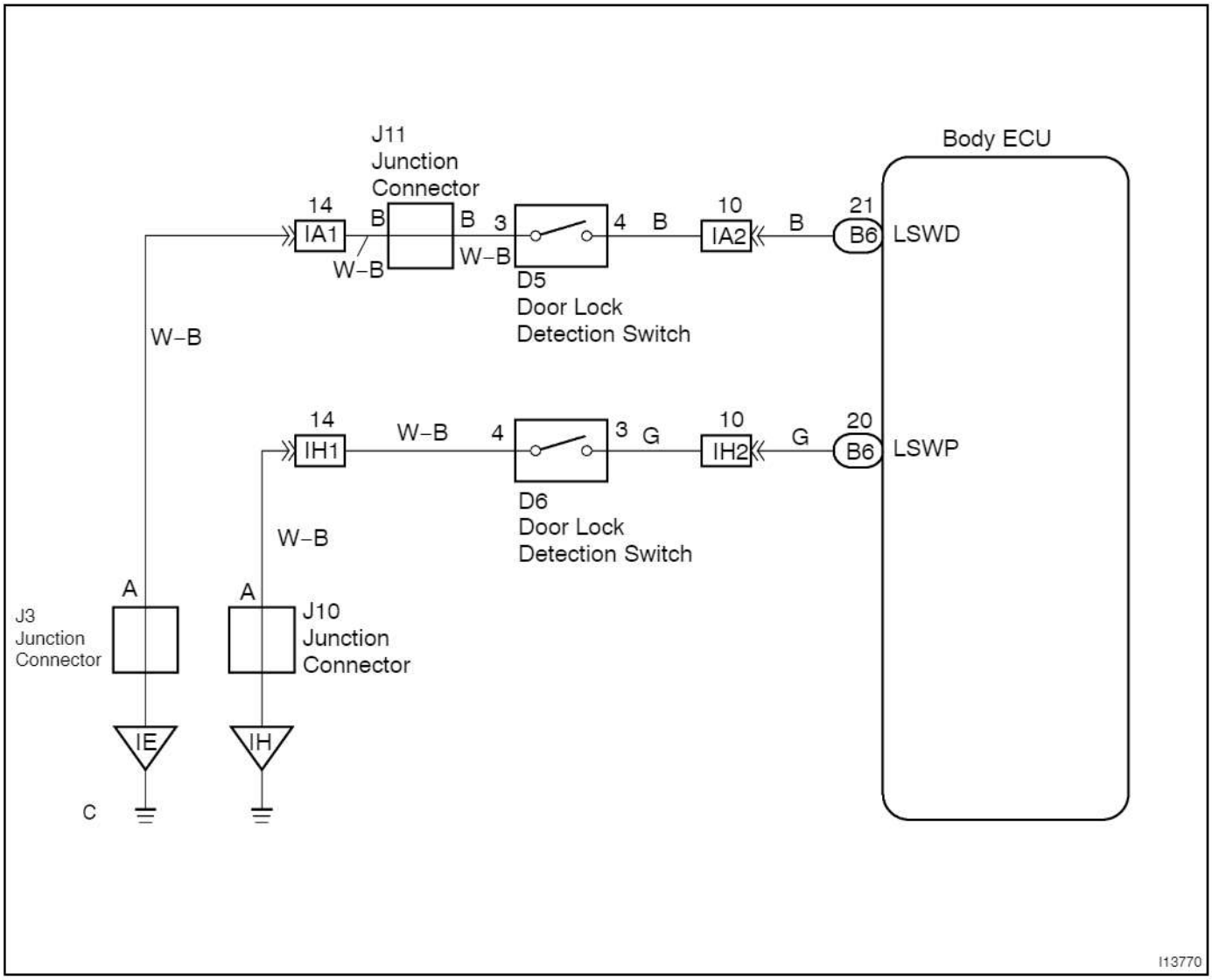
DI6R5-09

Door Unlock Detection Switch Circuit

CIRCUIT DESCRIPTION

The door unlock detection switch is built in the door lock motor assembly. This switch is ON when the door lock knob is in the unlock position and OFF when the lock knob is in the lock position. The ECU detects the door lock knob conditions in this circuit. This system is used as one of the operating conditions for the key confinement prevention function.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check door unlock detection switch (See page BE–66).

NG → Replace the door unlock detection switch.

OK

2	Check wire harness and connector between door unlock detection switch and body ECU (See page IN–30).

NG → Repair or replace wire harness or connector.

OK

Proceed to next circuit inspection shown on problem symptoms table (See page DI–1124).

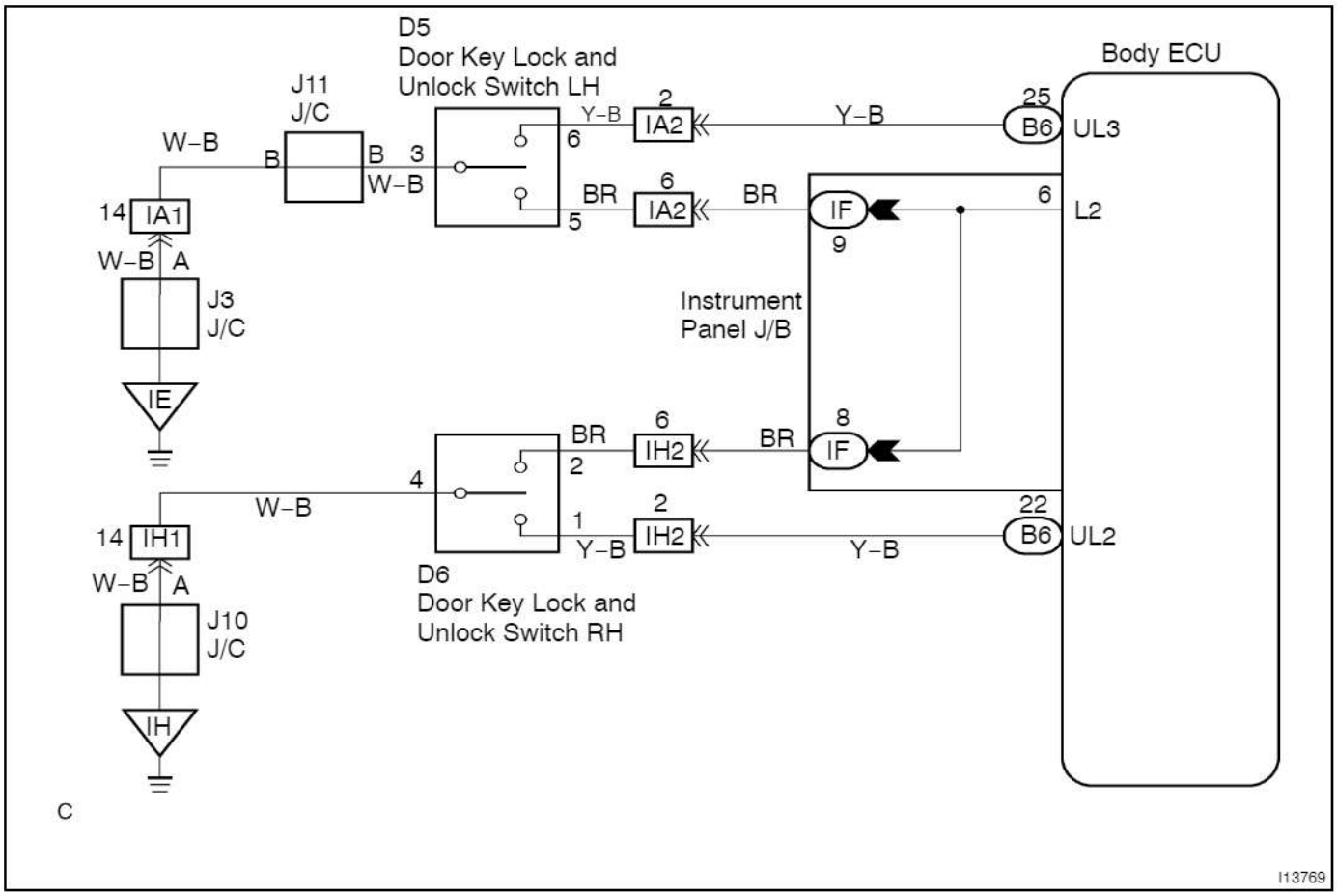
DI6R6-09

Door Key Lock and Unlock Switch Circuit

CIRCUIT DESCRIPTION

The door key lock and unlock switch are built in the door key cylinder. When the key is turned to the lock side, terminal 3 of the switch is grounded and when the key is turned to the unlock side, terminal 2 of the switch is grounded.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check the door key lock and unlock switch (See page BE–66).

NG → Replace the door key lock and unlock switch.

NG

2	Check wire harness and connector between door key lock and unlock switch and body ECU (See page IN–30).

NG → Repair or replace wire harness or connector.

OK

Proceed to next circuit inspection shown on problem symptoms table (See page DI–1124).

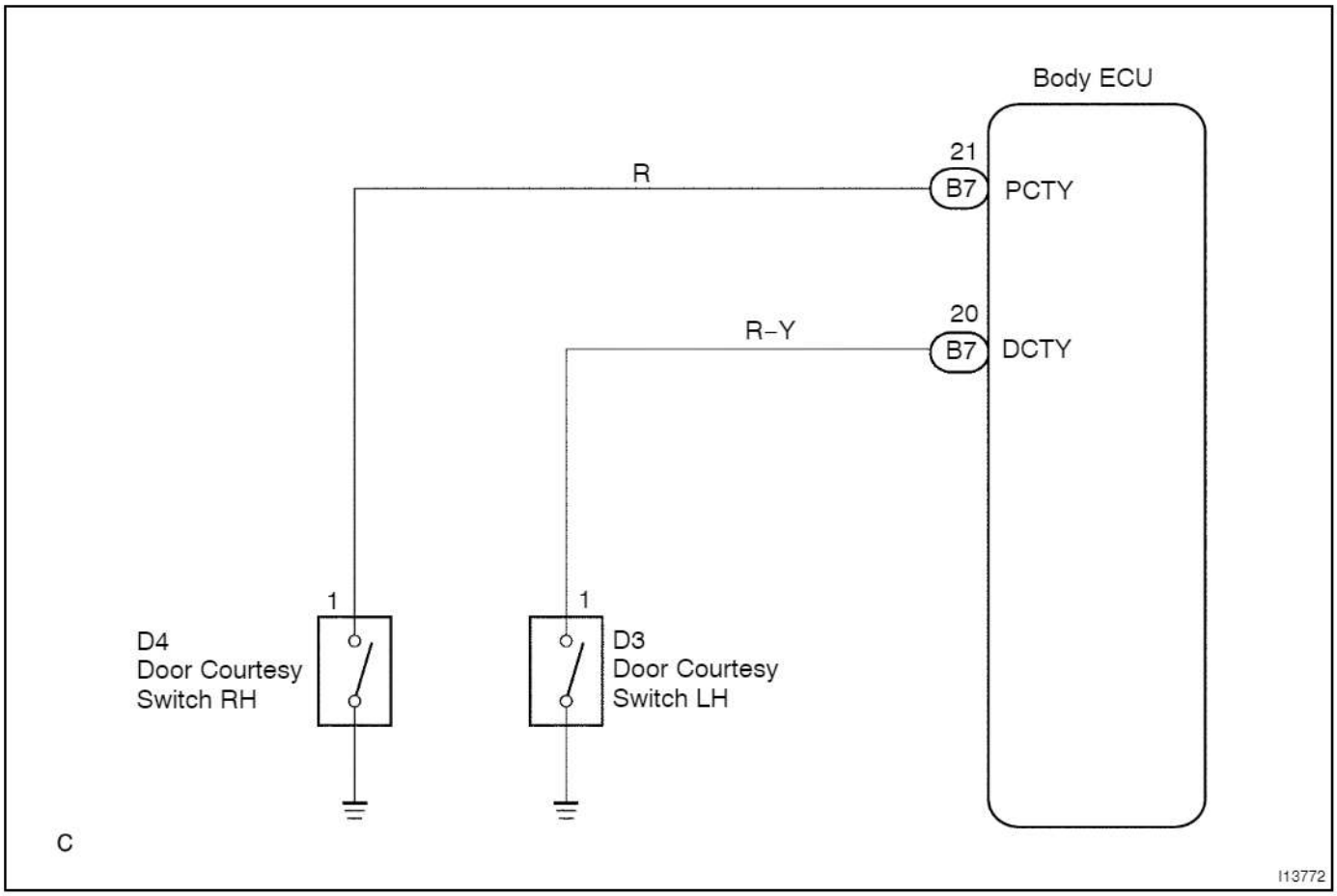
D6R7-07

Door Courtesy Switch Circuit

CIRCUIT DESCRIPTION

The door courtesy switch comes on when the door is opened and goes off when door is closed.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check courtesy switch (See page BE–32).

NG → Replace the courtesy switch.

OK

2	Check that there is a grounding malfunction caused by looseness of the tighten screw.

NG → Install screw.

OK

3	Check wire harness and connector between courtesy light and body ECU, courtesy switch and body ECU (See page IN–30).

NG → Repair or replace wire harness or connector.

OK

Proceed to next circuit inspection shown on problem symptoms table (See page DI–1124).

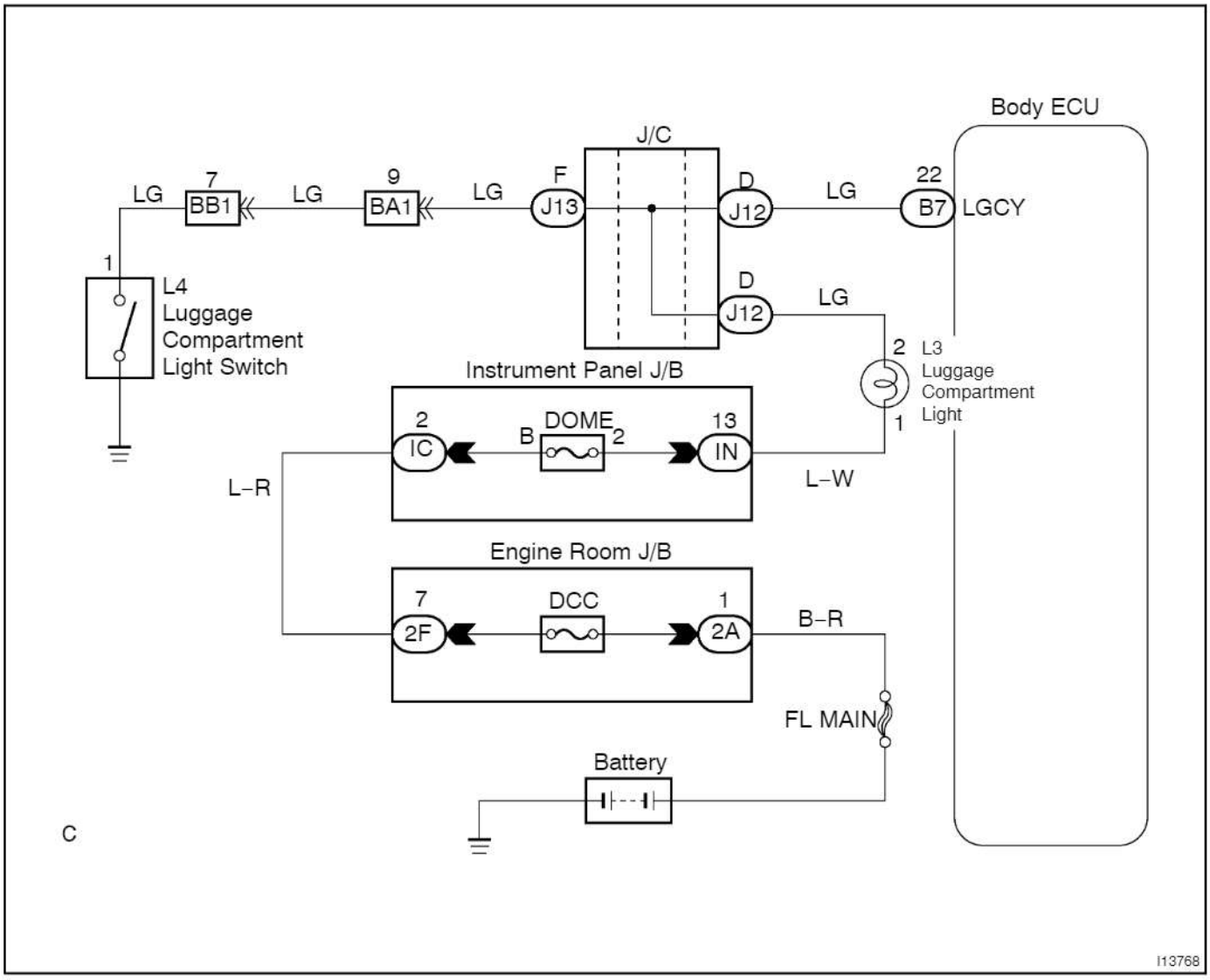
DI6R8-05

Luggage Courtesy Switch Circuit

CIRCUIT DESCRIPTION

The luggage courtesy switch comes on when luggage compartment door is opened and goes off when luggage compartment door is closed.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check luggage courtesy switch (See page BE–32).

NG → Replace the luggage courtesy switch.

OK

2	Check wire harness and connector between luggage courtesy switch and Body ECU (See page IN–30).

NG → Repair or replace wire harness or connector.

OK

Proceed to next circuit inspection shown on problem symptoms table (See page DI–1124).

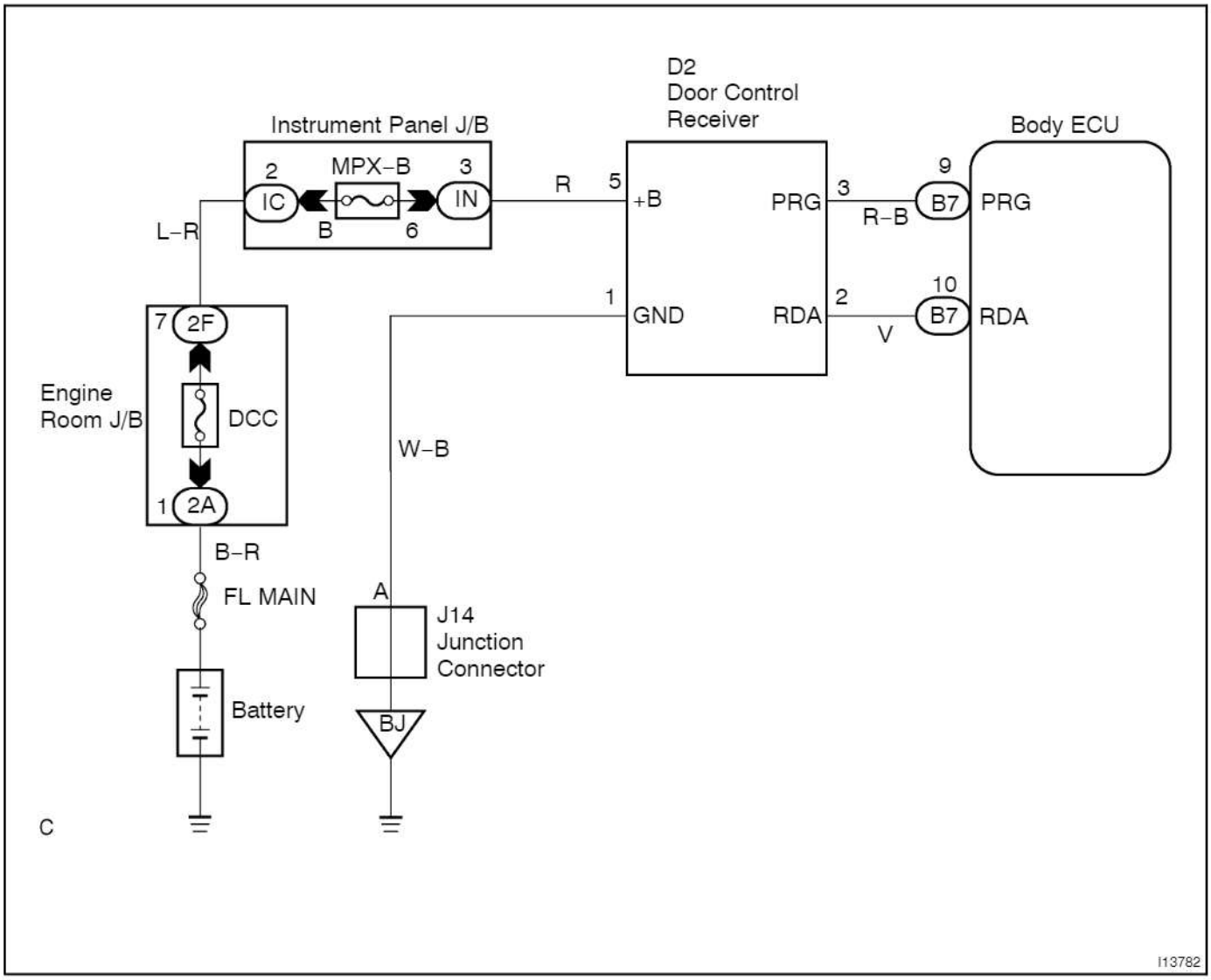
D6R9-06

Wireless Door Lock Tuner Circuit

CIRCUIT DESCRIPTION

The signal from the transmitter will be input to the body ECU through RDA line. RDA line is diagnosed by the Body ECU, so check DTC also in case of the failure of the wireless function.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check wire harness.**

PREPARATION:

Disconnect connectors of the wireless door lock tuner and the Body ECU.

CHECK:

Check continuity between terminal PRG of the wireless door lock tuner and PRG of Body ECU.

OK:

Continuity

NG → **Repair or replace wire harness.**

OK ↓

2	**Check the wireless door lock tuner.**

CHECK:

Replace the wireless door lock tuner and check if it recovers normally.

OK:

Must be recovered normally.

NG → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–1124).**

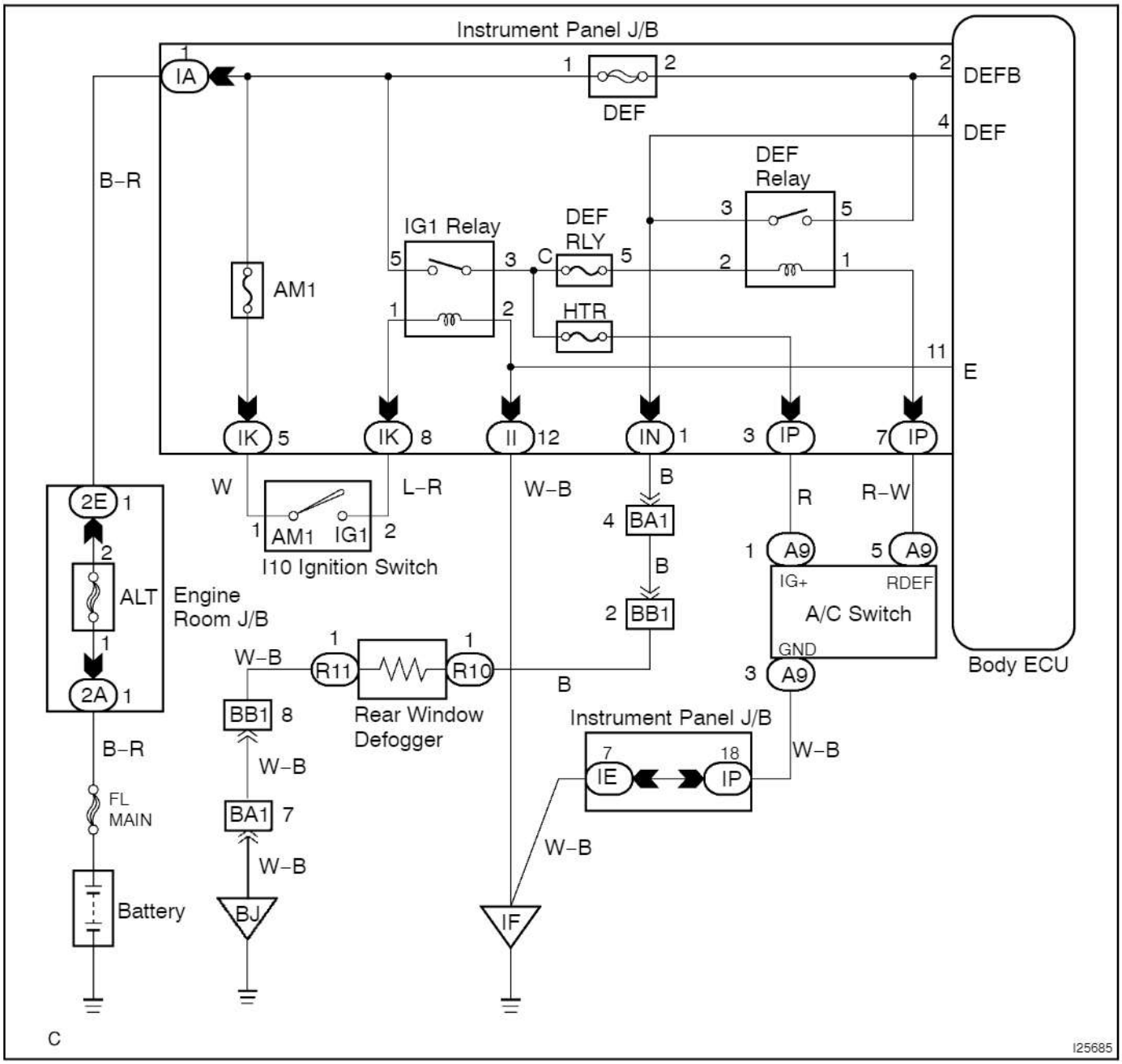
OK ↓

Failure of the original wireless door lock tuner.

D6RA–05

Rear Defogger Relay Circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check rear defogger relay (See page BE–58).

NG → Replace the rear defogger relay.

OK

2	Check wire harness and connector between rear defogger relay and body ECU, front defogger relay and body ECU (See page IN–30).

NG → Repair or replace wire harness or connector.

OK

Proceed to next circuit inspection shown on problem symptoms table (See page DI–1124).

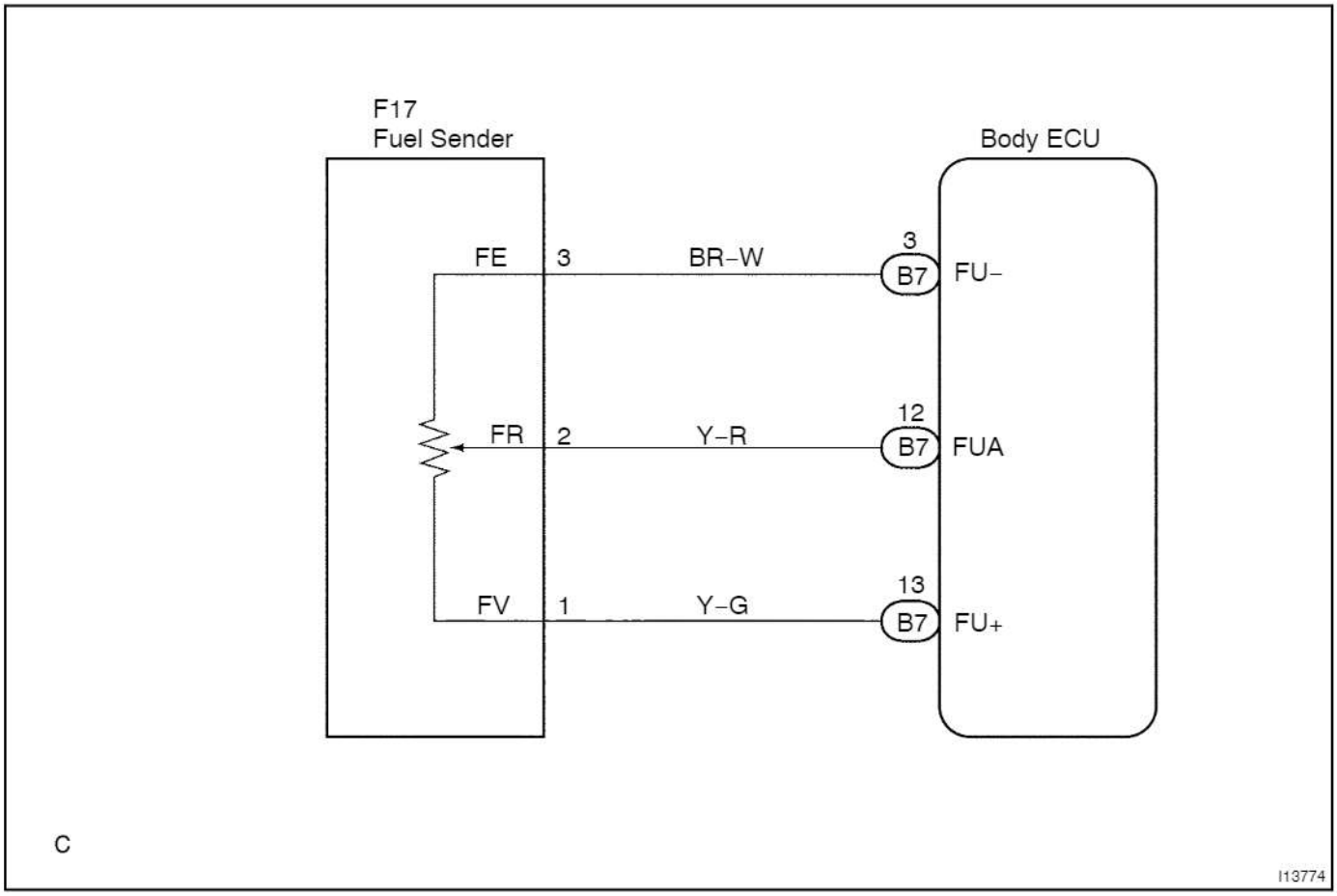
D6RB-04

Fuel Sender Gauge Circuit

CIRCUIT DESCRIPTION

This circuit detects sensor signals from the fuel sender gauge.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check fuel sender gauge (See page BE–50).

NG → Replace the fuel sender gauge.

OK

2	Check wire harness and connector between fuel sender gauge and Body ECU (See page IN–30).

NG → Repair or replace wire harness or connector.

OK

Proceed to next circuit inspection shown on problem symptoms table (See page DI–1124).

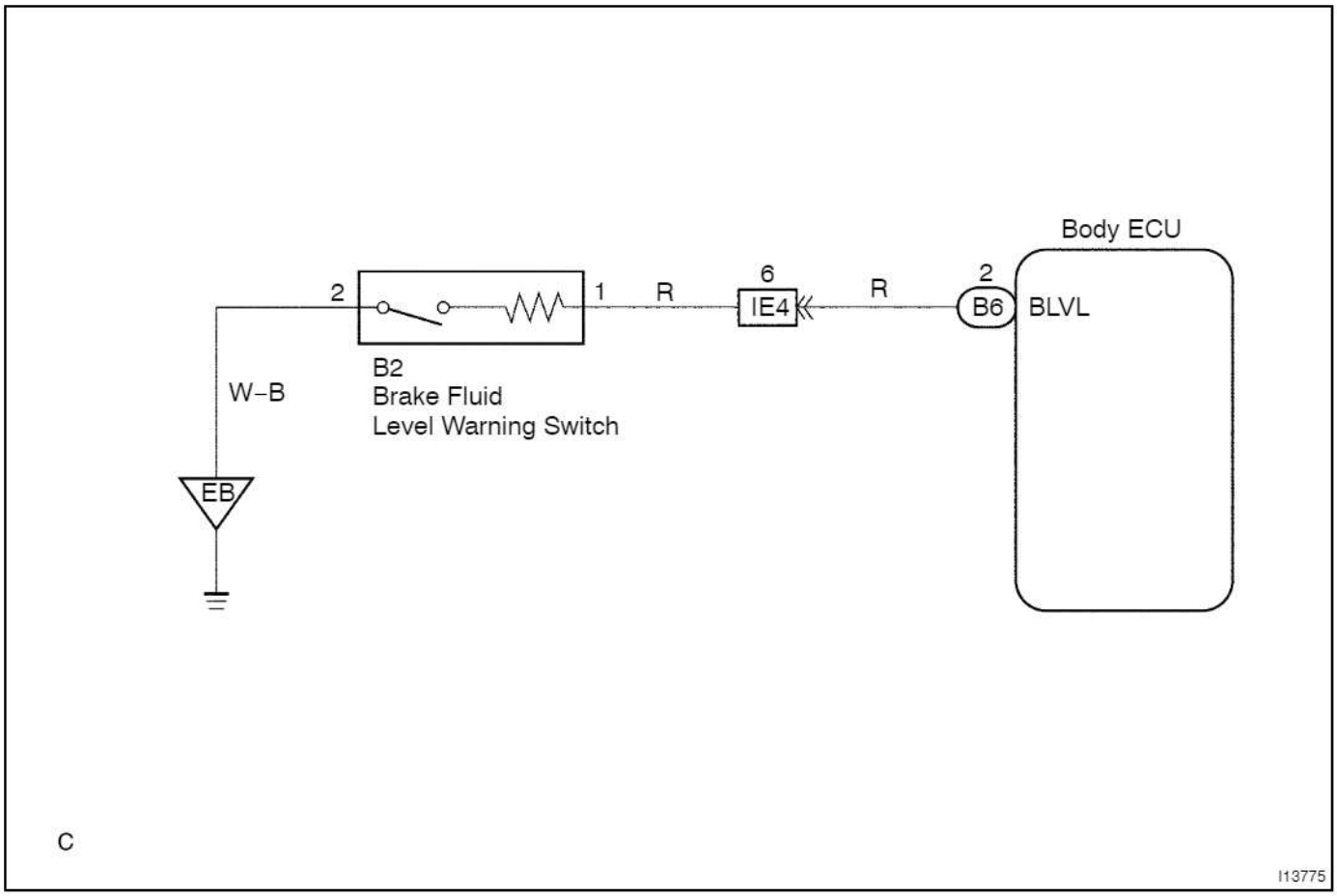
D2AJ-11

Brake Fluid Level Warning Switch Circuit

CIRCUIT DESCRIPTION

This circuit detects abnormality of the brake fluid level.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check brake fluid level warning switch (See page BE–50).

NG → Replace the brake fluid level warning switch.

OK

2	Check wire harness and connector between brake fluid level warning switch and body ECU (See page IN–30).

NG → Repair or replace wire harness or connector.

OK

Proceed to next circuit inspection shown on problem symptoms table (See page DI–1124).

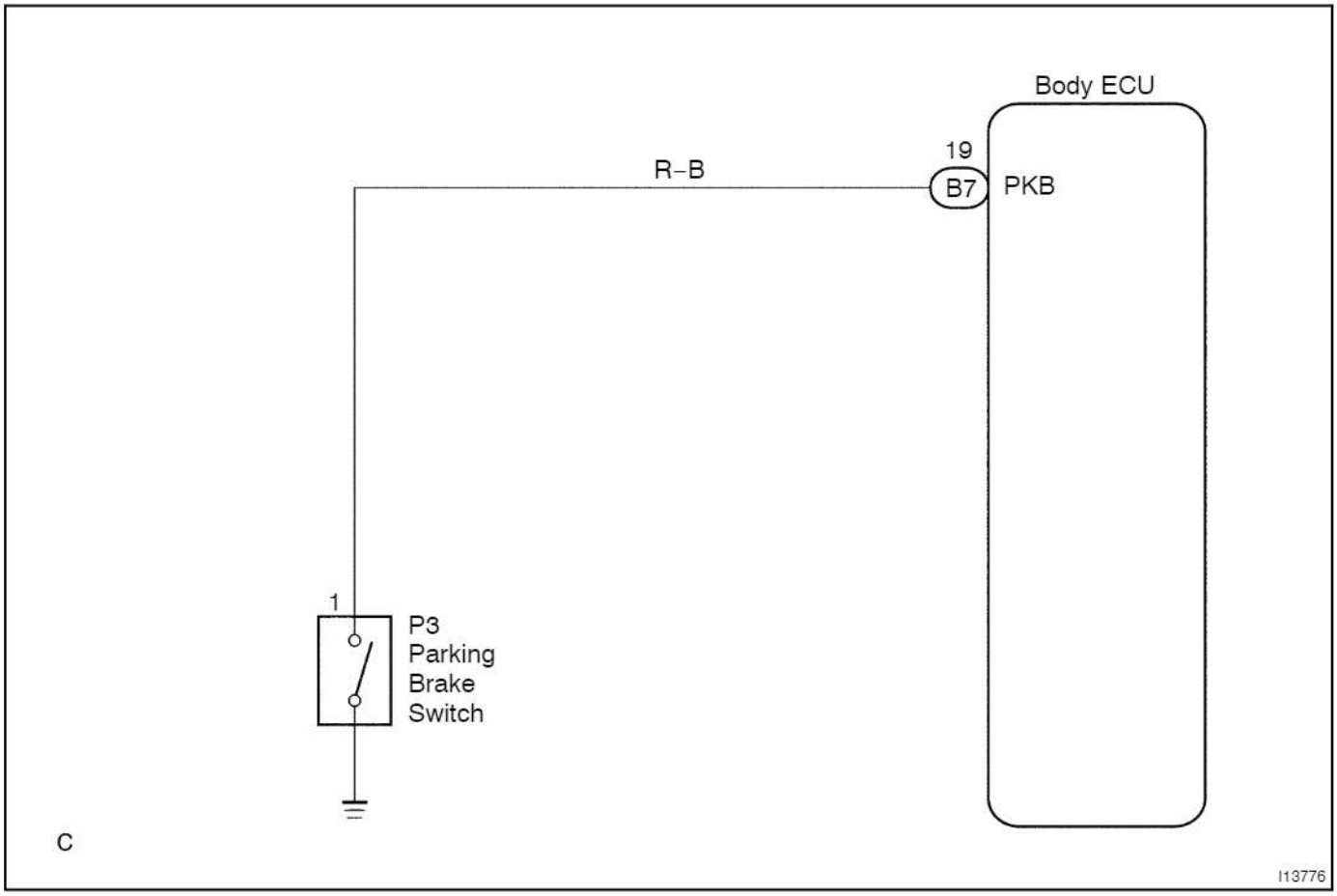
DISW2-06

Parking Brake Switch Circuit

CIRCUIT DESCRIPTION

This circuit detects the state of the parking brake switch.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check parking brake switch (See page BE–50).

NG → Replace the parking brake switch.

OK

2	Check wire harness and connector between parking brake switch and Body ECU (See page IN–30).

NG → Repair or replace wire harness or connector.

OK

Proceed to next circuit inspection shown on problem symptoms table (See page DI–1124).

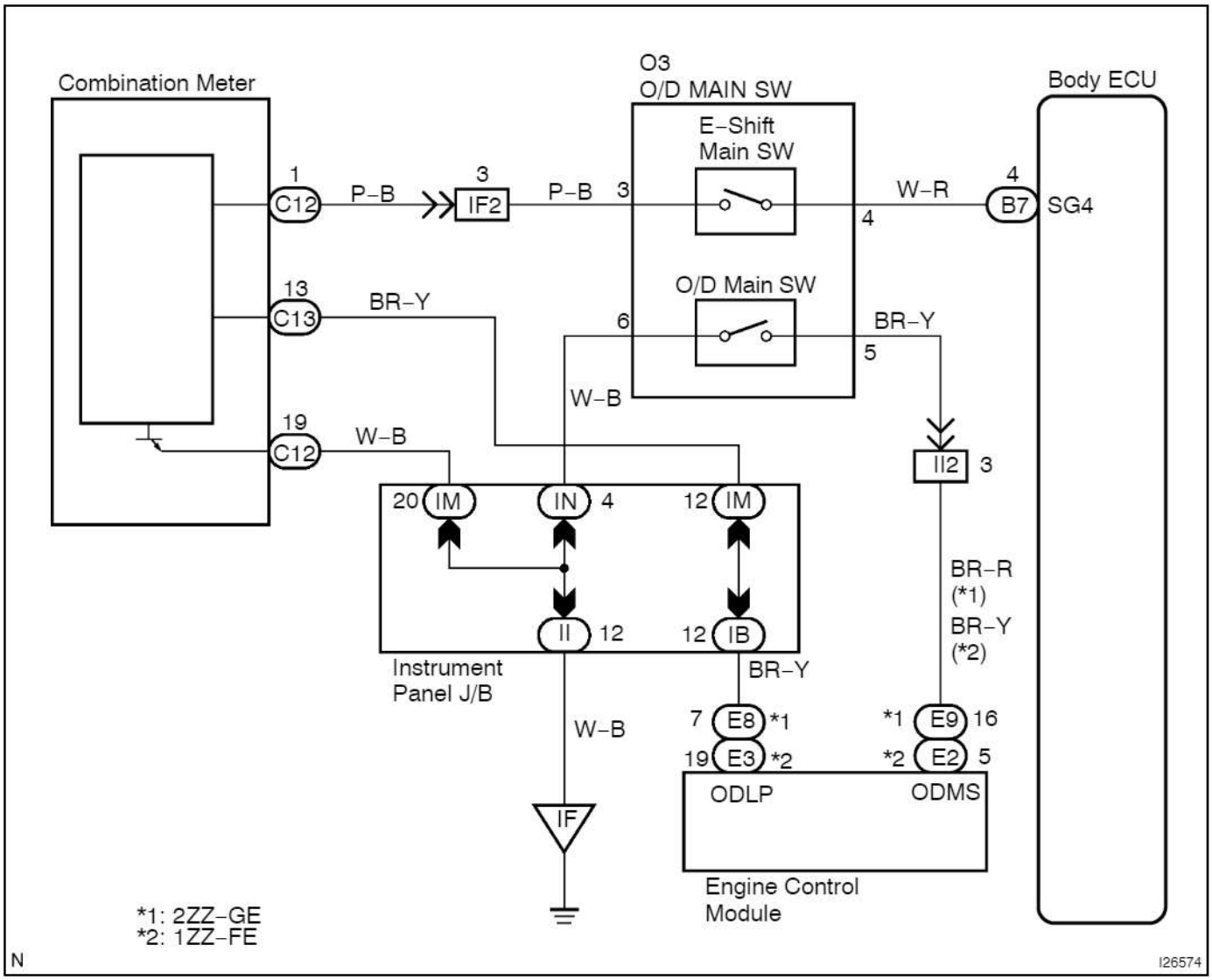
D29Z–11

O/D Main Switch Circuit

CIRCUIT DESCRIPTION

The body ECU detects the state of O/D main switch.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check O/D main switch (See page DI–746, DI–829).

NG → Replace the O/D main switch.

OK

2	Check wire harness and connector between O/D main switch and body ECU (See page IN–30).

NG → Repair or replace wire harness or connector.

OK

Proceed to next circuit inspection shown on problem symptoms table (See page DI–1124).

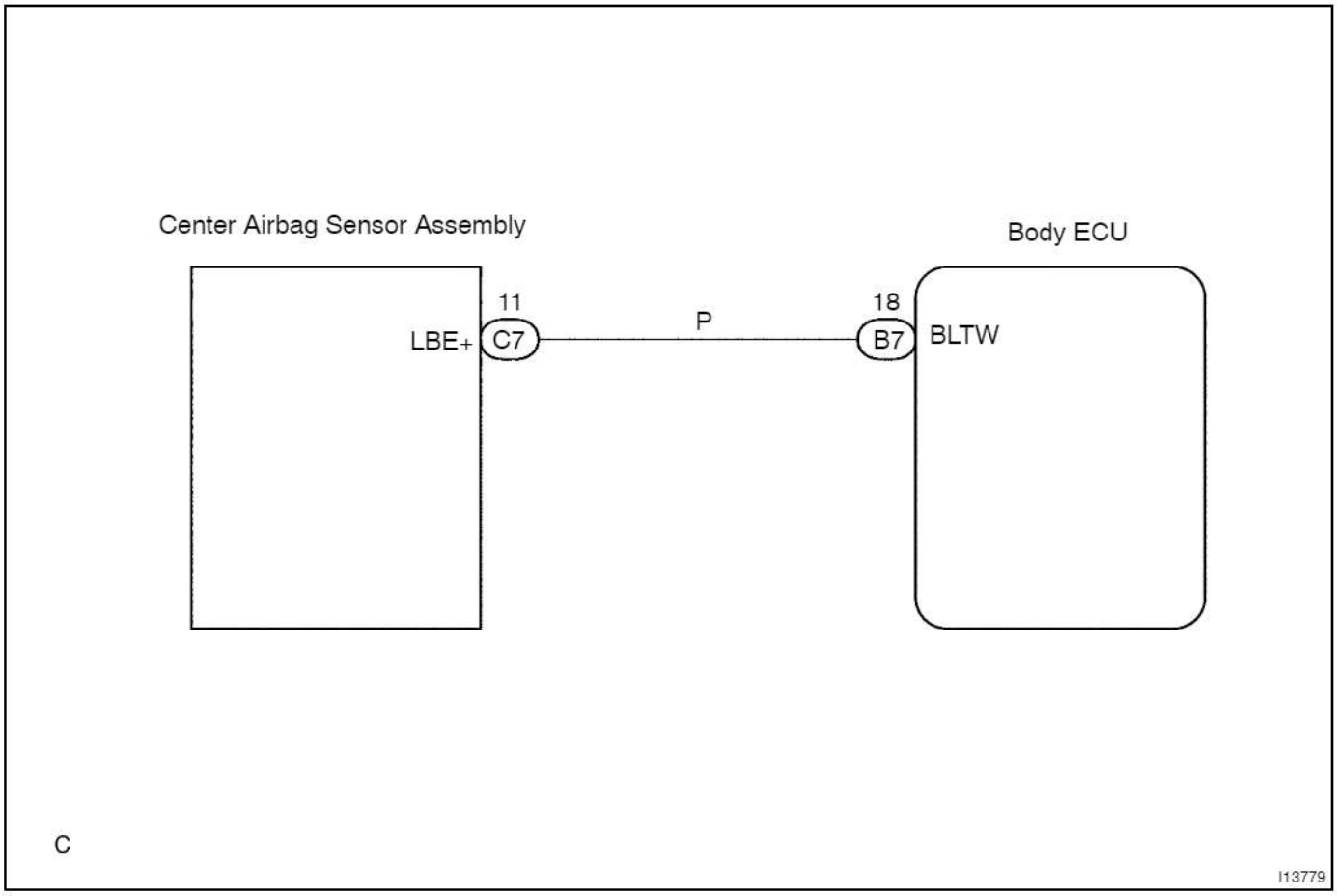
DI1T3-07

Airbag Sensor Assembly Communication Circuit

CIRCUIT DESCRIPTION

Signals received at the body ECU, such as the passenger seat occupant detection sensor signal, are transmitted to the airbag sensor assembly.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check for open and short in wire harness and connector between body ECU and airbag sensor assembly (See page IN–30).

NG → Repair or replace wire harness and connector.

OK

2	Check the airbag sensor assembly (See page DI–882).

NG → Replace the airbag sensor assembly.

OK

Replace the body ECU.

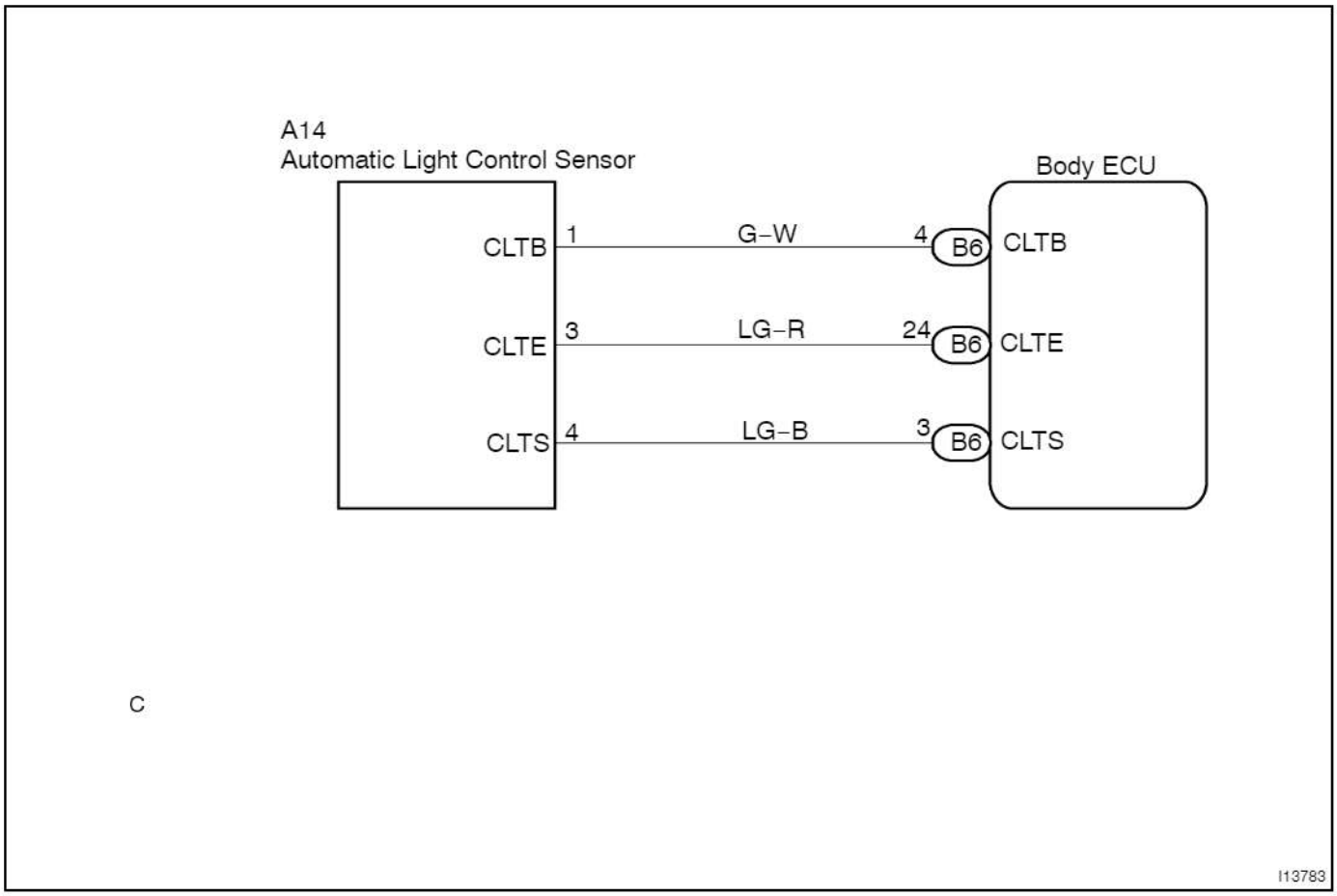
DI1SU–06

Light Sensor Circuit

CIRCUIT DESCRIPTION

This circuit detects signals output from the light control sensor.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check light sensor (See page BE–18).

NG → Replace the light sensor.

OK

2	Check wire harness and connector between light sensor and body ECU (See page IN–30).

NG → Repair or replace wire harness or connector.

OK

Replace the body ECU.

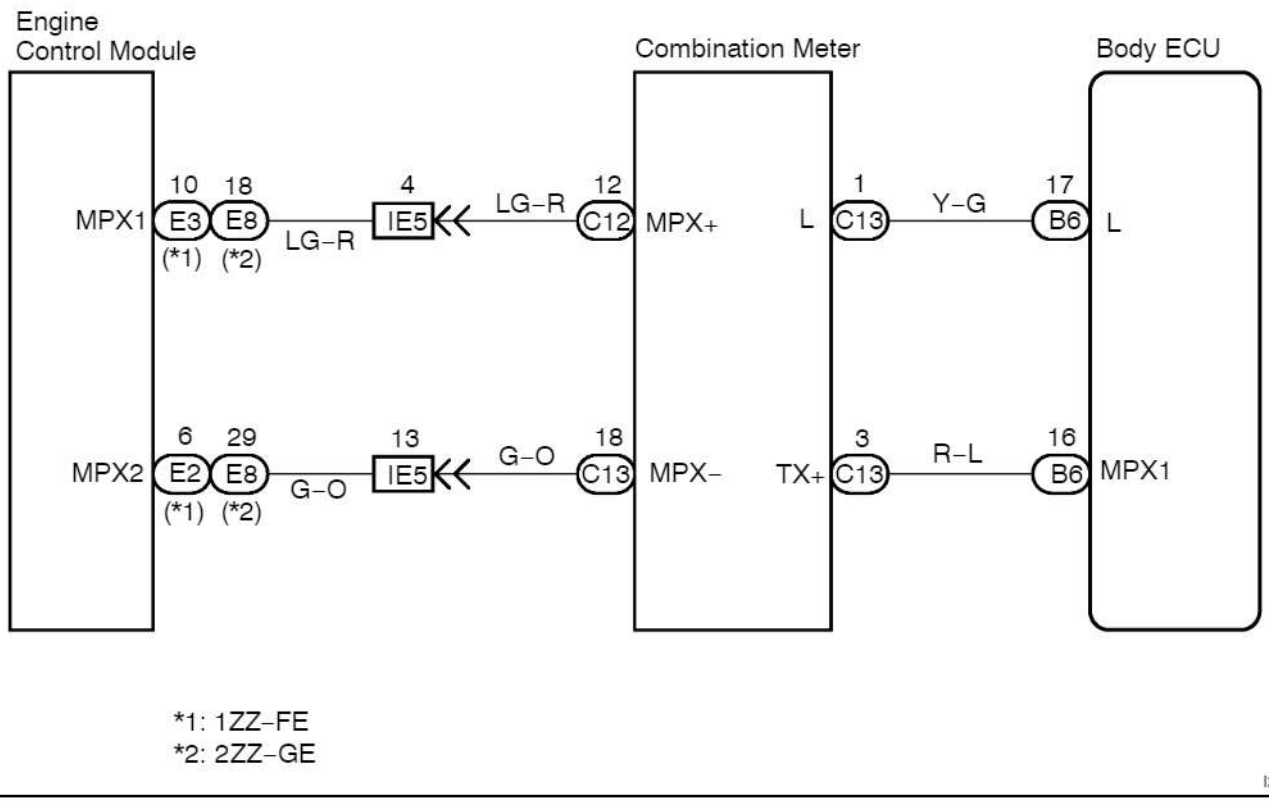
D6RC-04

Multiplex Communication Circuit

CIRCUIT DESCRIPTION

Signals are transmitted between ECM and the combination meter through the communication circuit.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check ECM (See page DI–1).

NG → Replace the ECM.

OK ↓

2	Check combination meter (See page BE–50).

NG → Replace the combination meter.

OK ↓

3	Check wire harness and connector between combination meter and body ECU, ECM and combination meter (See page IN–30).

NG → Repair or replace wire harness or connector.

OK ↓

Replace the body ECU.