

SFI SYSTEM (1MZ-FE)

HOW TO PROCEED WITH TROUBLESHOOTING

051LP-07

1 VEHICLE BROUGHT TO WORKSHOP



2 CUSTOMER PROBLEM ANALYSIS (See page 05-4)



3 CONNECT THE HAND-HELD TESTER TO DLC3

HINT:

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



4 CHECK DTC AND FREEZED FRAME DATA (See page 05-5)

HINT:

Record or print DTC and Freezed Frame Data, if needed.



5 CLEAR DTC AND FREEZED FRAME DATA (See page 05-5)



6 VISUAL INSPECTION



7 SETTING THE CHECK (TEST) MODE DIAGNOSIS (See page 05-5)



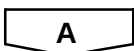
8 PROBLEM SYMPTOM CONFIRMATION

HINT:

If the engine does not start, perform step 10 and 12 first.

A	Malfunction does not occur
B	Malfunction occurs

B → **GO TO STEP 10**



A

9 SYMPTOM SIMULATION**10 DTC CHECK (See page 05-5)**

A	Malfunction code
B	No code

B → **GO TO STEP 12**

A

11 DTC CHART (See page 05-18)

GO TO STEP 14

12 BASIC INSPECTION (See page 05-5)

A	Not confirm wrong parts
B	Confirm wrong parts

B → **GO TO STEP 17**

A

13 PROBLEM SYMPTOMS TABLE (See page 05-30)

A	Confirm wrong circuit
B	Confirm wrong Parts

B → **GO TO STEP 17**

A

14 CHECK ECM POWER SOURCE CIRCUIT (See page 05-178)**15 CIRCUIT INSPECTION**

A	Not confirm malfunction
B	Confirm malfunction

B → **GO TO STEP 18**

A

16 CHECK FOR INTERMITTENT PROBLEMS (See page 05-5)



GO TO STEP 18

17 | PARTS INSPECTION



18 | IDENTIFICATION OF PROBLEM



19 | ADJUSTMENT, REPAIR



20 | CONFIRMATION TEST



END

CUSTOMER PROBLEM ANALYSIS CHECK

ENGINE CONTROL SYSTEM Check Sheet

Inspector's
Name _____

Customer's Name		Model and Model Year	
Driver's Name		Frame No.	
Data Vehicle Brought in		Engine Model	
License No.		Odometer Reading	km miles

Problem Symptoms	☐ Engine does not Start	☐ Engine does not crank	☐ No initial combustion	☐ No complete combustion
	☐ Difficult to Start	☐ Engine cranks slowly ☐ Other _____		
	☐ Poor Idling	☐ Incorrect first idle ☐ Idling rpm is abnormal ☐ High (rpm) ☐ Low (rpm) ☐ Rough idling ☐ Other _____		
	☐ Poor Drivability	☐ 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. ____ °F/ ____ °C)	
	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 (Precheck)	☐ Normal ☐ Malfunction code(s) (code) ☐ Freezed frame data ()	
	Check Mode	☐ Normal ☐ Malfunction code(s) (code) ☐ Freezed frame data ()	

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 the OBD II scan tool complying with SAE J1978 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 emission control system/components or in the powertrain control components which affect vehicle emissions, or a malfunction in the computer. In addition to the MIL lighting up when a malfunction is detected, the applicable Diagnostic Trouble Codes (DTCs) prescribed by SAE J2012 are recorded in the ECM memory (See page [05-18](#)).

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

- To check the DTC, connect the OBD II scan tool or hand-held tester to the Data Link Connector 3 (DLC3) on the vehicle. The OBD II scan tool or hand-held tester also enables you to erase the DTC and check frozen frame data and various forms of engine data (For operating instructions, see the OBD II scan tool's instruction book.). DTC 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 [05-18](#)).
- The diagnosis system operates in normal mode during normal vehicle use. It also has a check mode for technicians to simulate malfunction symptoms and troubleshoot. Most DTC use 2 trip detection logic* to prevent erroneous detection, and ensure thorough malfunction 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 only). (See step 2)

- *2 trip detection logic:
When a malfunction is first detected, the malfunction is temporarily stored in the ECM memory. (1st trip)

If the same malfunction is detected again during the second drive test, this second detection causes the MIL to light up. (2nd trip) the 2 trip repeats the same mode a 2nd time (However, the ignition switch must be turned OFF between the 1st trip and 2nd trip.).

- Freeze frame data:
Freeze frame data records the engine condition when a misfire (DTCs P0300 - P0306) or fuel trim malfunction (DTCs P0171 and P0172) or other malfunction (first malfunction only), is detected. Because freeze frame data records the engine conditions (fuel system, calculated load, engine coolant temperature, fuel trim, engine speed, vehicle speed, etc.) when the malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio was lean or rich, etc. at the time of the malfunction.

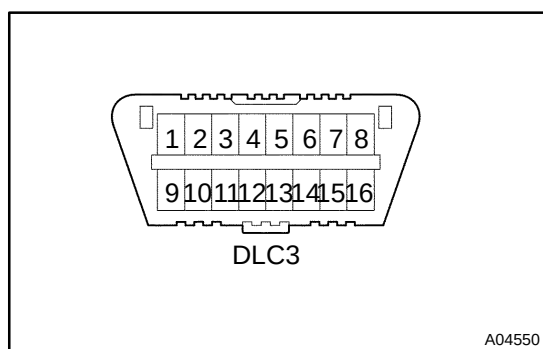
Priorities for troubleshooting:

If troubleshooting priorities for multiple DTCs are given in the applicable DTC chart, these should be followed.

If no instructions are given, troubleshoot DTCs according to the following priorities.

- (1) DTC other than fuel trim malfunction (DTCs P0171 and P0172), and misfire (DTCs P0300 - P0306).
 - (2) Fuel trim malfunction (DTCs P0171 and P0172).
 - (3) Misfire (DTCs P0300 - P0306).
- (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/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 TOYOTA 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. 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 [05-1040](#)).

- (2) When the engine 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:**

- **If there is no DTC in the normal mode, check the 1st trip DTC using Continuous Test Results function (Mode 7 for SAE J1979) or the OBD II scan tool or hand-held tester.**
- **Hand-held tester only:**

When the diagnosis system is switched from the normal mode to the check mode, it erases all DTC and freeze frame data recorded in the normal mode. So before switching modes, always check the DTC and freeze frame data, and note them down.

- (1) Prepare the OBD II scan tool (complying with SAE J 1978) or hand-held tester.
- (2) Connect the OBD II scan tool or hand-held tester to the DLC3 at the lower center of the instrument panel.
- (3) Turn the ignition switch ON and push 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 DTC and freeze frame data and note them down (For operating instructions, see the OBD II scan tool's instruction book.).

If there is no DTC in the normal mode, check the 1st trip DTC using Continuous Test Results function (Mode 7 for SAE J1979) on the OBD II scan tool or hand-held tester.

- (5) See page 05-18 to confirm the details of the DTC.

NOTICE:

- When simulating symptoms with an OBD II scan tool (excluding hand-held tester) to check the DTC, use the normal mode. For code on the DTC chart subject to "2 trip detection logic", perform the following either action.
- Turn the ignition switch OFF after the symptom is simulated the 1st time. Then repeat the simulation process again. When the problem has been simulated twice, the MIL lights up and the DTCs are recorded in the ECM.
- Check the 1st trip DTC using Mode 7 (Continuous Test Results) for SAE J1979.

- (c) Clear the DTC.

The DTCs and freezed frame data will be erased by either action.

- Operating the OBD II scan tool (complying with SAE J1978) or hand-held tester to erase the codes. (See the OBD II scan tool's instruction book for operating instructions.)
- Disconnecting the battery terminals or E.F.I. fuse and ETCS fuse more than 30 second.

NOTICE:

If the hand-held tester switches the ECM from the normal mode to the check mode or vice-versa, or if the ignition switch is turned from ON to ACC or OFF during the check mode, the DTCs and freezed frame data will be erased.

3. INSPECT DIAGNOSIS (Check Mode)**HINT:**

Hand-held tester only:

Compared to the normal mode, the check mode has an increased sensitivity to detect malfunctions.

Furthermore, the same diagnostic items which are detected in the normal mode can also be detected in the check mode.

- (a) Check the DTC.

- (1) Initial conditions.

- Battery positive voltage 11 V or more
- Throttle valve fully closed
- Transmission in P or N position
- A/C switched OFF

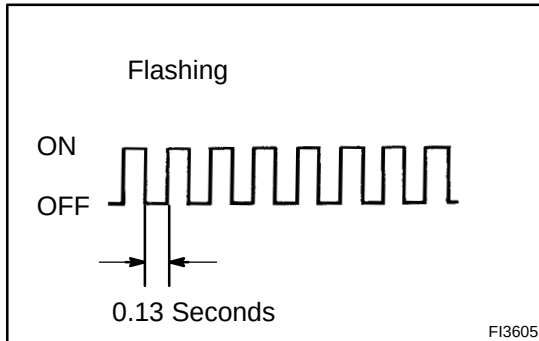
- (2) Turn the ignition switch OFF.

- (3) Prepare the hand-held tester.

- (4) Connect the hand-held tester to the DLC3 at the lower center of the instrument panel.

- (5) Turn the ignition switch ON and push the hand-held tester switch ON.

- (6) Switch the hand-held tester from the normal mode to the check mode (Check that the MIL flashes.).

**NOTICE:**

If the hand-held tester switches the ECM from the normal mode to the check mode or vice-versa, or if the ignition switch is turned from ON to ACC or OFF during the check mode, the DTC and freeze frame data will be erased.

- (7) Start the engine (The MIL goes out after the engine start.).
- (8) Simulate the conditions of the malfunction described by the customer.

NOTICE:

Leave the ignition switch ON until you have checked the DTC, etc.

- (9) After simulating the malfunction conditions, use the hand-held tester diagnosis selector to check the DTC and freeze frame data, etc.

HINT:

Take care not to turn the ignition switch OFF. Turning the ignition switch OFF switches the diagnosis system from the check mode to the normal mode, so all DTC, etc. are erased.

- (10) After checking the DTC, inspect the applicable circuit.
- (b) Clear the DTC.
- The following actions will erase the DTCs and freeze frame data.
- Operating the hand-held tester to erase the codes. (See the hand-held tester's instruction book for operating instructions.)
 - Disconnecting the battery terminals or E.F.I. fuse and ETCS fuse more than 30 second.

NOTICE:

If the hand-held tester switches the ECM from normal mode to check mode or vice-versa, or if the ignition switch is turned from ON to ACC or OFF during check mode, the DTCs and freeze frame data will be erased.

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 10° BTDC	Returned to normal condition
P0110	Intake air temp. is fixed at 20°C (68°F)	Returned to normal condition
P0115	Engine coolant temp. is fixed at 80°C (176°F)	Returned to normal condition
P0141 P1135 P1155	The heater circuit in which an abnormality is detected is turned off	Ignition switch OFF
P0325 P0330	Max. timing retardation	Ignition switch OFF
P1300 P1305 P1310 P1315 P1320 P1325	Fuel cut	Returned to normal condition

5. CHECK FOR INTERMITTENT PROBLEMS

Hand-held tester only:

By putting the vehicle's ECM in the check mode, 1 trip detection logic is possible instead of 2 trip detection logic and sensitivity to detect open circuits is increased. This makes it easier to detect intermittent problems.

- (1) Clear the DTC (See step 2.)
- (2) Set the check mode (See step 2.)
- (3) Perform a simulation test (See page [01-21](#)).
- (4) Check the connector and terminal (See page [01-31](#)).
- (5) Handle the connector (See page [01-31](#)).

6. DATA LIST

HINT:

According to the DATA LIST displayed by the OBD II scan tool or Hand-held tester, you can read the value of the switch, sensor, actuator and so on without parts removal. Reading the DATA LIST as a first step of troubleshooting is one of the method to shorten the labor time.

- Warm up the engine.
- Turn the ignition switch OFF.
- Connect the OBD II scan tool or Hand-held tester to the DLC3.
- Turn the ignition switch ON.
- According to the display on tester, read the "DATA LIST".

Item	Measurement Item/Range (Display)	Normal Condition	Diagnostic Note
INJECTOR	Injection period/ Min.: 0 ms, Max.: 32.64 ms	Idling: 1.6 - 2.9 ms	
IGN ADVANCE	Ignition timing advance/ Min.: -64 deg., Max.: 63.5 deg.	Idling: BTDC 10 - 25 deg.	
CALC LOAD	Calculated load by engine ECM/ Min.: 0 %, Max.: 100 %	- Idling: 13.1 - 18.7 % - Racing without load(2500 rpm): 11.7 - 17.3 %	
MAF	Air flow rate from MAF sensor/ Min.: 0 gm/s, Max.: 655 gm/s	- Idling: 3.3 - 4.7 gm/sec. - Racing without load (2,500 rpm): 10.4 - 15.4 gm/sec.	
ENGINE SPD	Engine Speed/ Min.: 0 rpm, Max.: 16383 rpm	Idling: 650 - 750 rpm	
COOLANT TEMP	Coolant temperature/ Min.: -40 °C, Max.: 140 °C	After warming up: 80 - 95°C (176 - 203°F)	If the value is "-40 °C" or "140 °C", sensor circuit is open or shorted.
INTAKE AIR	Intake air temperature/ Min.: -40 °C, Max.: 140 °C	Equivalent to Ambient Temp.	
THROTTLE POS	Absolute throttle position sensor/ Min.: 0 %, Max.: 100 %	- Throttle fully closed: 8 - 20 % - Throttle fully open: 64 - 96 %	
VEHICLE SPD	Vehicle speed/ Min.: 0 km/h, Max.: 255 km/h	Vehicle stopped: 0 km/h (0 mph)	
O2S B1 S2	Oxygen sensor output voltage of the bank 1 sensor 2/ Min.: 0 V, Max.: 1.275 V	Driving: 0.05 - 0.95 V	
O2S B2 S2	Oxygen sensor output voltage of the bank 2 sensor 2/ Min.: 0 V, Max.: 1.275 V		
AFS B1 S1	A/F sensor output voltage of the bank 1 sensor 1/ Min.: 0 V, Max.: 7.999 V	Idling: 2.8 - 3.8 V	
AFS B2 S1	A/F sensor output voltage of the bank 2 sensor 1/ Min.: 0 V, Max.: 7.999 V		
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 %	
TOTAL FT #1	Total fuel trim of bank 1/ Min.: 0.5, Max.: 1.496	Idling: 0.5 - 1.4	
SHORT FT #2	Short term fuel trim of bank 2/ Min.: -100 %, Max.: 100 %	0 ± 20 %	

LONG FT #2	Long term fuel trim of bank 2/ Min.: -100 %, Max.: 100 %	0 ± 20 %	
TOTAL FT #2	Total fuel trim of bank 2/ Min.: 0.5, Max.: 1.496	Idling: 0.5 - 1.4	
AF FT B1 S1	Short term fuel trim associated with the bank 1, sensor 1/ Min.: 0, Max.: 1.999	• Lean: 0 < 1 • Stoichiometric Air-Fuel Ratio = 1 • Rich: 1 < 1.999	
AF FT B2 S1	Short term fuel trim associated with the bank2, sensor 1/ Min.: 0, Max.: 1.999		
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 OLFAULT 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 enrichment) • 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.
FUEL SYS #2	Fuel system status (Bank2) / OL or CL or OL DRIVE or OL FAULT or CL FAULT		
FC IDL	Idle fuel cut / ON or OFF	Fuel cut operation: ON	
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]	Neutral position switch signal / ON or OFF	P or N position: ON	
ELECT LOAD SIG	Electrical load signal / ON or OFF	Defogger switch ON: ON	
STOP LIGHT SW	Stop 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	
INTAKE CTL VSV1	VSV status for intake control (Bank1) / ON or OFF	VSV operating: ON	
INTAKE CTL VSV2	VSV status for intake control (Bank1) / ON or OFF	VSV operating: ON	
FUEL PUMP / SPD	Fuel pump / speed status / ON/H or OFF/M,L	Idling: ON	

DIAGNOSTICS - SFI SYSTEM (1MZ-FE)

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	
VVT CTRL B2	VVT control status (Bank 2) / ON or OFF	VVT system operation: ON	
VVT CTRL B1	VVT control status (Bank 2) / ON or OFF	VVT system operation: ON	
SHIFT	Actual Gear Position/ 1st, 2nd, 3rd 4th	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	
LOCK UP SOL	Lock Up Solenoid Status/ ON or OFF	• Lock Up: ON • Except Lock Up: OFF	
OVERDRV CUT SW1	O/D SW Status/ ON or OFF	• O/D SW Push: ON • O/D SW Release: OFF	
REVERSE	PNP SW Status/ ON or OFF	Shift lever position is; R: ON Except R: OFF	The shift lever position and these values are different, there are failures of the PNP switch or shift cable adjustment.
4TH/DRIVE	PNP SW Status/ ON or OFF	Shift lever position is; D: ON Except D: 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	The shift lever position and these values are different, there are failures of the PNP switch or shift cable adjustment.
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.
SOLENOID (SLT)	Shift Solenoid SLT Status/ ON or OFF	IG SW ON: ON	
SPD (NC)	Counter Gear Speed display: 50 r/min	D Range is warmed up, 4th; Same as input shaft speed	
IGNITION	Ignition counter/ Min.: 0, Max.: 600	0 - 600	
CYL #1, #2, #3, #4, #5, #6	Misfire ratio of the cylinder 1/ Min.: 0 %, Max.: 50 %	0 %	
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.
MIL ON RUN DIST	This parameter indicates the distance travelled while MIL/ Min.: 0 km, Max.: 65535 km	When there is no DTC: 0 km/h (0 mph)	
THROTTLE POS #2	Throttle position sensor No.2 output voltage/ Min.: 0 V, Max.: 5 V	• Throttle fully closed: 2.0 - 2.9 V • Throttle fully open: 4.6 - 5.0 V	
ACCEL POS #1	Accelerator pedal position sensor No.1 output voltage/ Min.: 0 V, Max.: 5 V	• Accelerator released: 0.5 - 1.1 V • Accelerator depressed: 3.0 - 4.6 V	

ACCEL POS #2	Accelerator pedal position sensor No.2 output voltage/ Min.: 0 V, Max.: 5 V	• Accelerator released: 2.0 - 2.9 V • Accelerator depressed: 4.6 - 5.0 V	
THROTTLE TARGT	Target position of throttle valve/ Min.: 0 V, Max.: 5 V	Idling: 0.4 - 1.0 V	
THROTTLE OPN DUTY	Throttle motor opening duty ratio/ Min.: 0 %, Max.: 100 %	Throttle fully closed: 0 %	When accelerator pedal is depressed, duty ratio is increased.
THROTTLE CLS DUTY	Throttle motor closed duty ratio/ Min.: 0 %, Max.: 100 %	Throttle fully closed: 0 %	When accelerator pedal is quick released, duty ratio is increased.
THROTTLE MOT	Whether or not throttle motor control is permitted/ ON or OFF	Idling: ON	
+BM	Whether or not electric throttle control system power is inputted/ ON or OFF	Idling: ON	

7. ACTIVE TEST

HINT:

Performing the ACTIVE TEST using the OBD II scan tool or Hand-held tester allows the relay, VSV, actuator and so on to operate without parts removal. Performing the ACTIVE TEST as a first step of troubleshooting is one of the method to shorten the labor time.

It is possible to display the DATA LIST during the ACTIVE TEST.

- (a) Warm up the engine.
- (b) Turn the ignition switch OFF.
- (c) Connect the OBD II scan tool or Hand-held tester to the DLC3.
- (d) Turn the ignition switch ON.
- (e) 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: 3000rpm or less.	
IAC DUTY RATIO	[Test Details] Control the IAC duty ratio Min.: 0 %, Max.: 90 % [Vehicle Condition] Vehicle speed: 0 km/h. Engine speed: Idling Battery voltage: 8.5V or more.	When Engine speed does not change, IAC system has some failure.
INTAKE CTL VSV1	[Test Details] Activate the VSV for intake control. ON or OFF	
CAN CTRL VSV	[Test Details] Activate the VSV for canister control. ON or OFF	
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	
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 EGR system. ON or OFF	

BASIC INSPECTION

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

1 CHECK BATTERY VOLTAGE

NOTICE:

Carry out this check under the engine stoppage condition.

	OK	NG
Voltage	11V or more	Less than 11V

NG

CHARGE OR REPLACE BATTERY

OK

2 CHECK IF ENGINE IS CRANKED

NG

PROCEED TO PROBLEM SYMPTOMS TABLE ON PAGE 05-30

OK

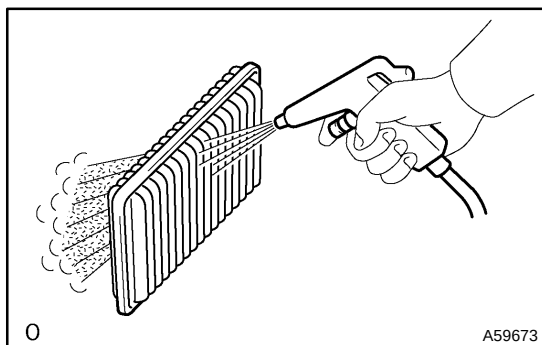
3 CHECK IF ENGINE STARTS

NG

GO TO STEP 7

OK

4 CHECK AIR FILTER



- (a) Visually check that the air filter is not excessively dirty or oily.

NOTICE:

If necessary, clean the filter with compressed air. First blow from inside thoroughly, then blow from outside of filter.

NG

REPAIR OR REPLACE

OK

5 CHECK IDLE SPEED (See page 14-1)**NG****PROCEED TO PROBLEM SYMPTOMS TABLE
ON PAGE 05-30****OK****6 CHECK IGNITION TIMING (See page 18-1)****NG****PROCEED TO PAGE 18-1 AND CONTINUE TO
TROUBLESHOOT****OK****PROCEED TO PROBLEM SYMPTOMS TABLE
ON PAGE 05-30****7 CHECK FUEL PRESSURE (See page 11-4)****NG****PROCEED TO PAGE 11-4 AND CONTINUE TO
TROUBLESHOOT****OK****8 CHECK FOR SPARK(See page 18-1)****NG****PROCEED TO PAGE 18-1 AND CONTINUE TO
TROUBLESHOOT****OK****PROCEED TO PROBLEM SYMPTOMS TABLE ON PAGE 05-30**

DIAGNOSTIC TROUBLE CODE CHART

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, turn to the page referred to under the "See page " for the respective "DTC No." in the DTC chart.

SAE CONTROLLED

DTC No. (See Page)	Detection Item	Trouble Area	MIL*1	Memory
P0100 (05-31)	Mass Air Flow Circuit Malfunction	• Open or short in intake air flow meter circuit • Intake air flow meter • ECM	○	○
P0101 (05-37)	Mass Air Flow Circuit Range/Performance Problem	• Intake air flow meter	○	○
P0110 (05-38)	Intake Air Temp. Circuit Malfunction	• Open or short in intake air temp. sensor circuit • Intake air temp. sensor (inside intake air flow meter) • ECM	○	○
P0115 (05-41)	Engine Coolant Temp. Circuit Malfunction	• Open or short in E.F.I. engine coolant temp. sensor circuit • E.F.I. engine coolant temp. sensor • ECM	○	○
P0116 (05-44)	Engine Coolant Temp. Circuit Range/Performance Problem	• Cooling system • E.F.I. engine coolant temp. sensor	○	○
P0120 (05-45)	Throttle/Pedal Position Sensor/Switch "A" Circuit Malfunction	• Open or short in throttle position sensor circuit • Throttle position sensor • ECM	○	○
P0121 (05-51)	Throttle/Pedal Position Sensor/Switch "A" Circuit Range/Performance Problem	• Throttle body assy (Throttle position sensor) • ECM	○	○
P0125 (05-52)	Insufficient Coolant Temp. for Closed Loop Fuel Control	• Open or short in A/F sensor (bank 1, 2 sensor 1) circuit • A/F sensor (bank 1, 2 sensor 1) • Air induction system • Fuel pressure • Injector • Gas leakage on exhaust system • PCV hose connection • ECM	○	○
P0128 (05-58)	Thermostat Malfunction	• Thermostat • Cooling system • E.F.I. engine coolant temp. sensor • ECM	○	○
P0136 (05-59)	Heated Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 2)	• Open or short in heated oxygen sensor circuit • Oxygen sensor	○	○
P0141 (05-63)	Heated Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 2)	• Open or short in heater circuit of heated oxygen sensor • Oxygen sensor heater • ECM	○	○
P0156 (05-59)	Heated Oxygen Sensor Circuit Malfunction (Bank 2 Sensor 2)	• Same as DTC No. P0136	○	○
P0161 (05-63)	Heated Oxygen Sensor Circuit Malfunction (Bank 2 Sensor 2)	• Same as DTC No. P0141	○	○

DIAGNOSTICS - SFI SYSTEM (1MZ-FE)

P0171 (05-66)	System too Lean (Fuel Trim) (Bank 1)	• Air induction system • Injector blockage • Intake air flow meter • E.F.I. engine coolant temp. sensor • Fuel pressure • Gas leakage on exhaust system • Open or short in A/F sensor (bank 1, sensor 1) circuit • A/F sensor (bank 1, sensor 1) • PCV hose connection • ECM	○	○
P0172 (05-66)	System too Rich (Fuel Trim) (Bank 1)	• Injector leak, blockage • Intake air flow meter • E.F.I. engine coolant temp. sensor • Ignition system • Fuel pressure • Gas leakage on exhaust system • Open or short in A/F sensor (bank 1, sensor 1) circuit • A/F sensor (bank 1, sensor 1) • PCV hose connection • ECM	○	○
P0174 (05-66)	System too Lean (Fuel Trim) (Bank2)	• Air induction system • Injector blockage • Intake air flow meter • E.F.I. engine coolant temp. sensor • Fuel pressure • Gas leakage on exhaust system • Open or short in A/F sensor (bank 2, sensor 1) circuit • A/F sensor (bank 2, sensor 1) • PCV hose connection • ECM	○	○
P0175 (05-66)	System too Rich (Fuel Trim) (Bank2)	• Injector leak, blockage • Intake air flow meter • E.F.I. engine coolant temp. sensor • Ignition system • Fuel pressure • Gas leakage on exhaust system • Open or short in A/F sensor (bank 2, sensor 1) circuit • A/F sensor (bank 2, sensor 1) • PCV hose connection • ECM	○	○
P0300 (05-71)	Random/Multiple Cylinder Misfire Detected	• Open or short in engine wire • Connector connection • Vacuum hose connection • Ignition system • Injector • Fuel pressure • Intake air flow meter • E.F.I. engine coolant temp. sensor • Compression pressure • Valve clearance • Valve timing • PCV hose connection • ECM	○*2	○

P0301 (05-71)	Cylinder 1 Misfire Detected	• Open or short in engine wire • Connector connection • Vacuum hose connection • Ignition system • Injector • Fuel pressure • Intake air flow meter • E.F.I. engine coolant temp. sensor • Compression pressure • Valve clearance • Valve timing • PCV hose connection • ECM	○*2	○
P0302 (05-71)	Cylinder 2 Misfire Detected	• Open or short in engine wire • Connector connection • Vacuum hose connection • Ignition system • Injector • Fuel pressure • Intake air flow meter • E.F.I. engine coolant temp. sensor • Compression pressure • Valve clearance • Valve timing • PCV hose connection • ECM	○*2	○
P0303 (05-71)	Cylinder 3 Misfire Detected	• Open or short in engine wire • Connector connection • Vacuum hose connection • Ignition system • Injector • Fuel pressure • Intake air flow meter • E.F.I. engine coolant temp. sensor • Compression pressure • Valve clearance • Valve timing • PCV hose connection • ECM	○*2	○
P0304 (05-71)	Cylinder 4 Misfire Detected	• Open or short in engine wire • Connector connection • Vacuum hose connection • Ignition system • Injector • Fuel pressure • Intake air flow meter • E.F.I. engine coolant temp. sensor • Compression pressure • Valve clearance • Valve timing • PCV hose connection • ECM	○*2	○

DIAGNOSTICS - SFI SYSTEM (1MZ-FE)

P0305 (05-71)	Cylinder 5 Misfire Detected	• Open or short in engine wire • Connector connection • Vacuum hose connection • Ignition system • Injector • Fuel pressure • Intake air flow meter • E.F.I. engine coolant temp. sensor • Compression pressure • Valve clearance • Valve timing • PCV hose connection • ECM	○*2	○
P0306 (05-71)	Cylinder 6 Misfire Detected	• Open or short in engine wire • Connector connection • Vacuum hose connection • Ignition system • Injector • Fuel pressure • Intake air flow meter • E.F.I. engine coolant temp. sensor • Compression pressure • Valve clearance • Valve timing • PCV hose connection • ECM	○*2	○
P0325 (05-77)	Knock Sensor 1 Circuit Malfunction (Bank 1)	• Open or short in knock sensor 1 circuit • Knock control sensor 1 (looseness) • ECM	○	○
P0330 (05-77)	Knock Sensor 2 Circuit Malfunction (Bank 2)	• Open or short in knock sensor 2 circuit • Knock control sensor 2 (looseness) • ECM	○	○
P0335 (05-80)	Crankshaft Position Sensor "A" Circuit Malfunction	• Open or short in crankshaft position sensor circuit • Crank position sensor • Crankshaft timing pulley • ECM	○	○
P0340 (05-83)	Camshaft Position Sensor Circuit Malfunction	• Open or short in camshaft position sensor circuit • Crank position sensor No.1 • Camshaft timing gear • ECM	○	○
P0420 (05-85)	Catalyst System Efficiency Below Threshold (Bank 1)	• Gas leakage on exhaust system • A/F sensor (bank 1, sensor 1) • Oxygen sensor (bank 1, sensor 2) • Exhaust manifold	○	○
P0430 (05-85)	Catalyst System Efficiency Below Threshold (Bank 2)	• Gas leakage on exhaust system • A/F sensor (bank 2, sensor 1) • Oxygen sensor (bank 2, sensor 2) • Exhaust manifold	○	○

P0440 (05-88)	Evaporative Emission Control System Malfunction	• Hose or tube cracked, holed, damaged or insufficient seal • Fuel tank cap incorrectly installed • Fuel tank cap cracked or damaged • Vacuum hose cracked, holed, blocked, damaged or disconnected • Fuel tank cracked, holed or damaged • Charcoal canister cracked, holed or damaged • Open or short in vapor pressure sensor circuit • VSV for CCV • VSV for EVAP • VSV for pressure switching valve • Vapor pressure sensor • Fuel tank over fill check valve cracked or damaged • ECM	○	○
P0441 (05-97)	Evaporative Emission Control System Incorrect Purge Flow	• Vacuum hose cracked, holed blocked, damaged or disconnected ((1), (2), (3), (4), (5), (6), (7), (8), (9), (10) and (11) in Fig. 1) • Fuel tank cap incorrectly installed • Open or short in vapor pressure sensor circuit • Vapor pressure sensor • Open or short in VSV circuit for EVAP • VSV for EVAP • Open or short in VSV circuit for CCV • VSV for CCV • Open or short in VSV circuit for pressure switching valve • VSV for pressure switching valve • Fuel tank cracked, holed or damaged • Charcoal canister cracked, holed or damaged • Fuel tank over fill check valve cracked or damaged • ECM	○	○
P0442 (05-88)	Evaporative Emission Control System Malfunction	• Same as DTC No. P0440	○	○
P0446 (05-97)	Evaporative Emission Control System Malfunction	• Same as DTC No. P0441	○	○
P0450 (05-112)	Evaporative Emission Control System Pressure Sensor Malfunction	• Open or short in vapor pressure sensor circuit • Vapor pressure sensor • ECM	○	○
P0451 (05-112)	Evaporative Emission Control System Pressure Sensor Range/Performance	• Open or short in vapor pressure sensor circuit • Vapor pressure sensor • ECM	○	○
P0500 (05-114)	Vehicle Speed Sensor Malfunction	• Combination meter • Vehicle speed sensor • Open or short in speed sensor circuit • ECM • Skid control computer assy	○	○
P0505 (05-117)	Idle Control System Malfunction	• Throttle body assy • Air induction system • PCV hose connection • ECM	○	○
P0605*3	Internal Control Module Read Only Memory Error	• ECM	—	○
P0710 (05-410)	Transmission Fluid Temp. Sensor Malfunction	• Electronic controlled automatic transmission (ECT)	○	○
P0711 (05-410)	Transmission Fluid Temp. Sensor Range/Performance Problem	• Electronic controlled automatic transmission (ECT)	○	○
P0750 (05-413)	Shift Solenoid A Malfunction	• Electronic controlled automatic transmission (ECT)	○	○

DIAGNOSTICS - SFI SYSTEM (1MZ-FE)

P0753 (05-420)	Shift Solenoid A Electrical Malfunction	• Electronic controlled automatic transmission (ECT)	☐	☐
P0755 (05-413)	Shift Solenoid B Malfunction	• Electronic controlled automatic transmission (ECT)	☐	☐
P0758 (05-420)	Shift Solenoid B Electrical Malfunction	• Electronic controlled automatic transmission (ECT)	☐	☐
P0760 (05-413)	Shift Solenoid C Malfunction	• Electronic controlled automatic transmission (ECT)	☐	☐
P0763 (05-420)	Shift Solenoid C Electrical Malfunction	• Electronic controlled automatic transmission (ECT)	☐	☐
P0765 (05-413)	Shift Solenoid D Malfunction	• Electronic controlled automatic transmission (ECT)	☐	☐
P0768 (05-420)	Shift Solenoid D Electrical Malfunction	• Electronic controlled automatic transmission (ECT)	☐	☐
P0770 (05-429)	Shift Solenoid E Malfunction	• Electronic controlled automatic transmission (ECT)	☐	☐
P0773 (05-433)	Shift Solenoid E Electrical Malfunction	• Electronic controlled automatic transmission (ECT)	☐	☐

*1: MIL lights up

*2: MIL light up or blinking

*3: Replace ECM

MANUFACTURER CONTROLLED

DTC No. (See Page)	Detection Item	Trouble Area	MIL*	Memory
P1120 (05-120)	Accelerator Pedal Position Sensor Circuit Malfunction	• Open or short in accelerator pedal position sensor circuit • Accelerator pedal position sensor • ECM	☐	☐
P1121 (05-125)	Accelerator Pedal Position Sensor Range/Performance Problem	• Accelerator pedal position sensor • ECM	☐	☐
P1125 (05-127)	Throttle Control Motor Circuit Malfunction	• Open or short in throttle control motor circuit • Throttle body assy (Throttle control motor) • ECM	☐	☐
P1127 (05-130)	ETCS Actuator Power Source Circuit Malfunction	• ETCS actuator power source circuit malfunction • ECM	☐	☐
P1128 (05-132)	Throttle Control Motor Lock Malfunction	• Throttle body assy (Throttle motor) • Throttle body assy (Throttle valve)	☐	☐
P1129 (05-133)	Electric Throttle Control System Malfunction	• Electric throttle control system malfunction • ECM	☐	☐
P1130 (05-134)	A/F Sensor Circuit Range/Performance Malfunction (Bank 1 Sensor 1)	• Open or short in A/F sensor circuit • A/F sensor • Air induction system • Fuel pressure • Injector • ECM	☐	☐
P1133 (05-138)	A/F Sensor Circuit Response Malfunction (Bank 1 Sensor 1)	• Open or short in A/F sensor circuit • A/F sensor • Air induction system • Fuel pressure • Injector • ECM	☐	☐

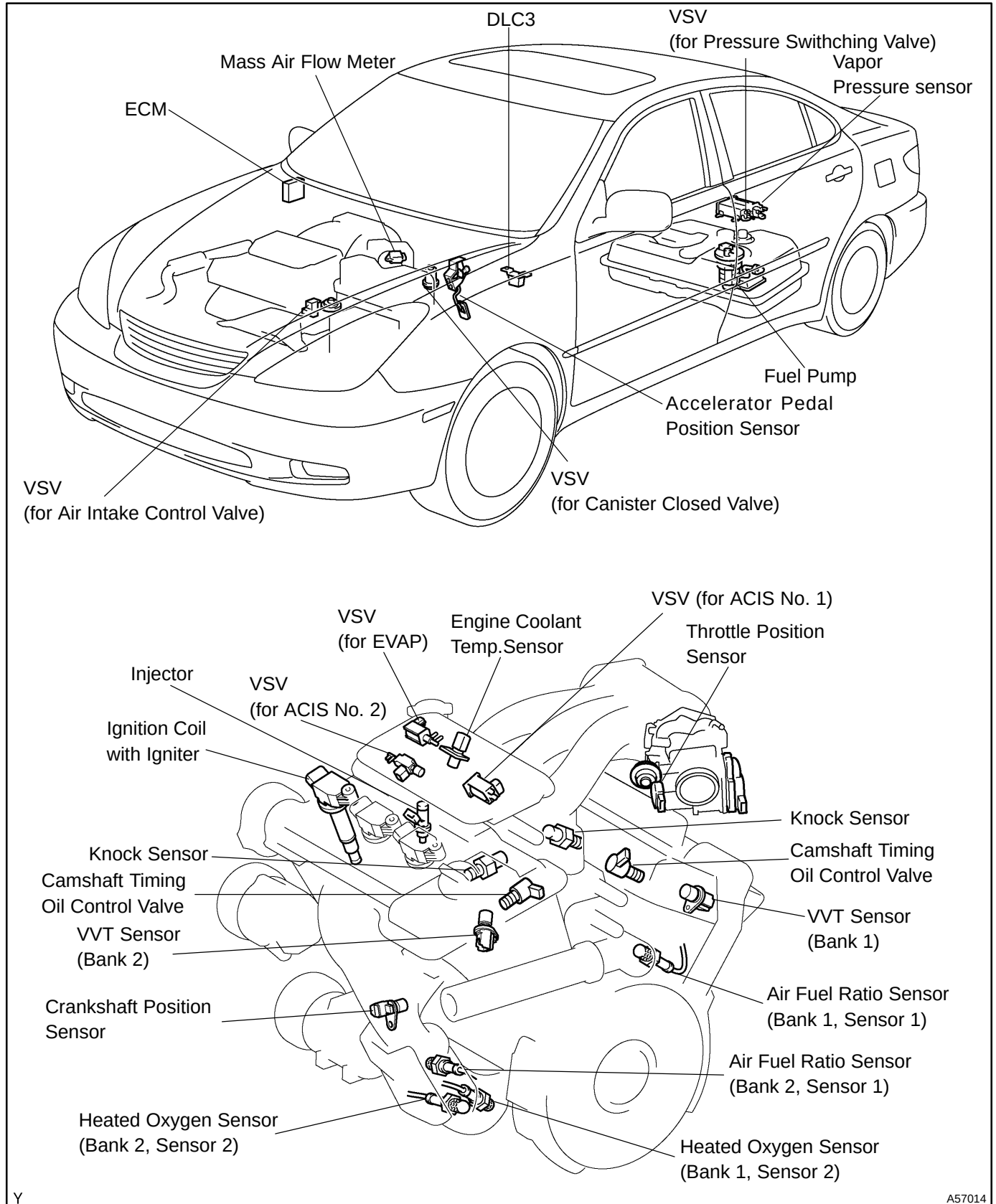
P1135 (05-141)	A/F Sensor Heater Circuit Malfunction (Bank 1 Sensor 1)	• Open or short in heater circuit of A/F sensor • A/F sensor heater • A/F ratio sensor heater relay • ECM	○	○
P1150 (05-134)	A/F Sensor Circuit Range/Performance Malfunction (Bank 2 Sensor 1)	• Same as DTC No. P1130	○	○
P1153 (05-138)	A/F Sensor Circuit Response Malfunction (Bank 2 Sensor 1)	• Same as DTC No. P1133	○	○
P1155 (05-141)	A/F Sensor Heater Circuit Malfunction (Bank 2 Sensor 1)	• Same as DTC No. P1135	○	○
P1300 (05-143)	Igniter Circuit Malfunction (No.1)	• Ignition system • Open or short in IGF1 or IGT1 circuit from No.1 ignition coil with igniter to ECM • No.1 ignition coil with igniter • ECM	○	○
P1305 (05-143)	Igniter Circuit Malfunction (No.2)	• Ignition system • Open or short in IGF2 or IGT2 circuit from No.2 ignition coil with igniter to ECM • No.2 ignition coil with igniter • ECM	○	○
P1310 (05-143)	Igniter Circuit Malfunction (No.3)	• Ignition system • Open or short in IGF2 or IGT3 circuit from No.3 ignition coil with igniter to ECM • No.3 ignition coil with igniter • ECM	○	○
P1315 (05-143)	Igniter Circuit Malfunction (No.4)	• Ignition system • Open or short in IGF1 or IGT4 circuit from No.4 ignition coil with igniter to ECM • No.4 ignition coil with igniter • ECM	○	○
P1320 (05-143)	Igniter Circuit Malfunction (No.5)	• Ignition system • Open or short in IGF2 or IGT5 circuit from No.5 ignition coil with igniter to ECM • No.5 ignition coil with igniter • ECM	○	○
P1325 (05-143)	Igniter Circuit Malfunction (No.6)	• Ignition system • Open or short in IGF1 or IGT6 circuit from No.6 ignition coil with igniter to ECM • No.6 ignition coil with igniter • ECM	○	○
P1335 (05-149)	Crankshaft Position Sensor Circuit Malfunction (During engine running)	• Open or short in crankshaft position sensor circuit • Crank position sensor • Camshaft timing gear • ECM	—	○
P1346 (05-151)	VVT Sensor/Camshaft position Sensor Circuit Range/Performance Problem (Bank 1)	• Mechanical system (Jumping teeth of timing belt, belt stretched) • ECM	○	○
P1349 (05-152)	VVT System Malfunction (Bank 1)	• Valve timing • OCV • VVT controller assembly • ECM	○	○
P1350 (05-157)	VVT Sensor/Camshaft position Sensor Circuit Malfunction (Bank 2)	• Open or short in VVT sensor (Crank position sensor No.1) circuit • VVT sensor (Crank position sensor No.1) • Camshaft timing gear • ECM	○	○

DIAGNOSTICS - SFI SYSTEM (1MZ-FE)

P1351 (05-151)	VVT Sensor/Camshaft position Sensor Circuit Range/Performance Problem (Bank 2)	• Same as DTC No. P1346	○	○
P1354 (05-152)	VVT System Malfunction (Bank 2)	• Same as DTC No. P1349	○	○
P1520 (05-159)	Stop Light Switch Signal Malfunction	• Short in stop light switch signal circuit • Stop light switch • ECM	○	○
P1566 (05-1262)	Input Signal Circuit Abnormal	• ECM	○	○
P1600 (05-161)	ECM BATT Malfunction	• Open in back up power source circuit • ECM	○	○
P1633 (05-163)	ECM Malfunction (ETCS Circuit)	• ECM	○	○
P1656 (05-164)	OCV Circuit Malfunction (Bank 1)	• Open or short in OCV Circuit • OCV • ECM	○	○
P1663 (05-164)	OCV Circuit Malfunction (Bank 2)	• Open or short in OCV Circuit • OCV • ECM	○	○
P1725 (05-438)	NT Revolution Sensor Malfunction	• Electronic controlled automatic transmission (ECT)	○	○
P1730 (05-440)	NT Revolution Sensor Malfunction	• Electronic controlled automatic transmission (ECT)	○	○
P1760 (05-443)	Linear Solenoid For Accumulator Pressure Control Malfunction	• Electronic controlled automatic transmission (ECT)	○	○
P1780 (05-447)	Park/Neutral Position Switch Malfunction	• Short in park/neutral position switch circuit • Park/neutral position switch • ECM	○	○
P1815 (05-413)	SR Solenoid Valve Malfunction	• Electronic controlled automatic transmission (ECT)	○	○
P1818 (05-420)	SR Solenoid Valve Malfunction	• Electronic controlled automatic transmission (ECT)	○	○
B2795 (05-1192)	Unmatched Key Code	• Immobilizer system	—	○
B2796 (05-1193)	No Communication in Immobilizer System	• Immobilizer system	—	○
B2797 (05-1196)	Communication Malfunction No.1	• Immobilizer system	—	○
B2798 (05-1193)	Communication Malfunction No.2	• Immobilizer system	—	○

*: ○ ~~0000~~ MIL lights up, - ~~0000~~ MIL dose not lights up.

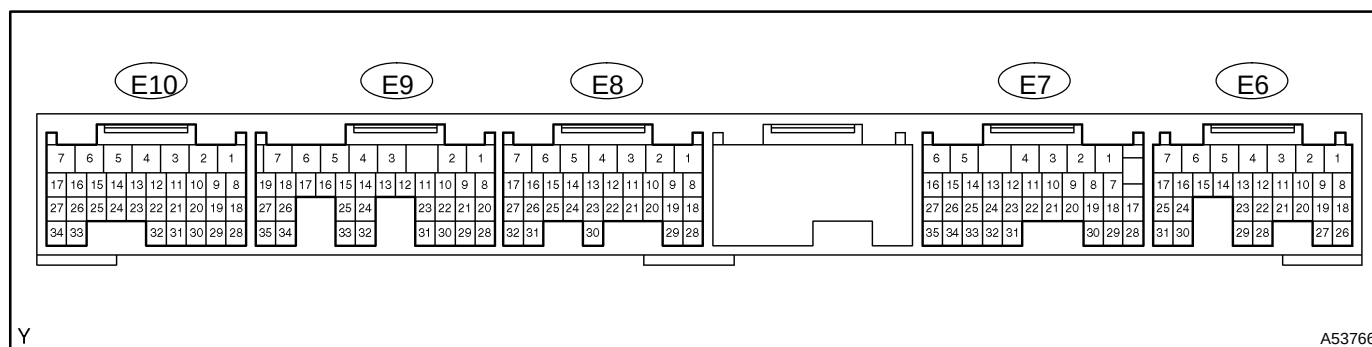
LOCATION



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A57014

TERMINALS OF ECM



Symbols (Terminal No.)	Wiring Color	Condition	STD Voltage (V)
BATT (E7-2) - E1 (E8-1)	B-Y - BR	Always	9 - 14
+BM (E7-6) - ME01 (E8-4)	L-R - W-B	Always	9 - 14
IGSW (E6-9) - E1(E8-1)	B-O - BR	Always	9 - 14
+B (E6-1) - E1 (E8-1)	B-R - BR	IG switch ON	9 - 14
VC (E10-18) - E2 (E10-28)	Y - BR	IG switch ON	4.5 - 5.5
VTA1 (E10-21) - E2 (E10-28)	LG - BR	IG switch ON, Throttle valve fully closed	0.4 - 1.0
VTA1 (E10-21) - E2 (E10-28)	LG - BR	IG switch ON, Throttle valve fully open	3.2 - 4.8
VTA2 (E10-31) - E2 (E10-28)	B-R - BR	IG switch ON, Accelerator pedal fully closed	2.0 - 2.9
VTA2 (E10-31) - E2 (E10-28)	B-R - BR	IG switch ON, Accelerator pedal fully open	4.6 - 5.0
M+ (E8-3) - E01 (E10-7) M- (E8-2) - E01 (E10-7)	B - W-B W - W-B	Idling	Pulse generation
VG (E9-24) - E2G (E9-32)	R - L-W	Idling, A/C switch OFF	1.1 - 1.5
VPA (E6-22) - EPA (E6-28)	L-Y - LG-B	IG switch ON, Accelerator pedal fully closed	0.5 - 1.1
VPA (E6-22) - EPA (E6-28)	L-Y - LG-B	IG switch ON, Accelerator pedal fully open	3.0 - 4.6
VPA2 (E6-23) - EPA2 (E6-29)	W-R - LG	IG switch ON, Accelerator pedal fully closed	0.9 - 2.3
VPA2 (E6-23) - EPA2 (E6-29)	W-R - LG	IG switch ON, Accelerator pedal fully open	3.4 - 5.0
VCPA (E6-26) - EPA (E6-28)	R - LG-B	IG switch ON	4.5 - 5.5
VCP2 (E6-27) - EPA2 (E6-29)	B-R - LG	IG switch ON	4.5 - 5.5
NE+ (E10-27) - NE- (E10-34)	R - G	Idling	Pulse generation (See page 05-80)
VV1+ (E8-27) - NE- (E10-34)	Y - G	Idling	Pulse generation (See page 05-83)
VV2+ (E8-26) - VV2- (E8-31)	L-Y - L-B	Idling	Pulse generation (See page 05-83)
OC1+ (E8-16) - OC1- (E8-15)	G-B - G-R	IG switch ON	Pulse generation (See page 05-164)
OC2+ (E8-14) - OC2- (E8-13)	L-R - L-W	IG switch ON	Pulse generation (See page 05-164)
THA (E10-20) - E2 (E10-28)	L-B - BR	Idling, Intake air temp. 20°C (68°F)	0.5 - 304
THW (E10-19) - E2 (E10-28)	G-B - BR	Idling, Engine coolant temp. 80°C (176°F)	0.2 - 1.0
STA (E9-9) - E1 (E8-1)	B-Y - BR	Cranking	6.0 or more
#10 (E10-1) - E01 (E10-7)	L - W-B	IG switch ON	9 - 14
#10 (E10-1) - E01 (E10-7)	L - W-B	Idling	Pulse generation
#20 (E10-2) - E01 (E10-7)	R - W-B	IG switch ON	9 - 14
#20 (E10-2) - E01 (E10-7)	R - W-B	Idling	Pulse generation
#30 (E10-3) - E01 (E10-7)	Y - W-B	IG switch ON	9 - 14
#30 (E10-3) - E01 (E10-7)	Y - W-B	Idling	Pulse generation
#40 (E10-4) - E01 (E10-7)	W - W-B	IG switch ON	9 - 14
#40 (E10-4) - E01 (E10-7)	W - W-B	Idling	Pulse generation
#50 (E10-5) - E01 (E10-7)	R-L - W-B	IG switch ON	9 - 14
#50 (E10-5) - E01 (E10-7)	R-L - W-B	Idling	Pulse generation

#60 (E9-5) - E01 (E10-7)	G - W-B	IG switch ON	9 - 14
#60 (E9-5) - E01 (E10-7)	G - W-B	Idling	Pulse generation
IGT1 (E10-8) - E1 (E8-1)	R-W - BR	Idling	Pulse generation (See page 05-143)
IGT2 (E10-9) - E1 (E8-1)	P - BR	Idling	Pulse generation (See page 05-143)
IGT3 (E10-10) - E1 (E8-1)	LG-B - BR	Idling	Pulse generation (See page 05-143)
IGT4 (E10-11) - E1 (E8-1)	L-Y - BR	Idling	Pulse generation (See page 05-143)
IGT5 (E10-12) - E1 (E8-1)	G-R - BR	Idling	Pulse generation (See page 05-143)
IGT6 (E10-13) - E1 (E8-1)	L - BR	Idling	Pulse generation (See page 05-143)
IGF (E10-23) - E1 (E8-1)	W-R - BR	IG switch ON	4.5 - 5.5
IGF (E10-23) - E1 (E8-1)	W-R - BR	Idling	Pulse generation (See page 05-143)
ACIS (E10-15) - E01 (E10-7)	R-Y - W-B	IG switch ON	9 - 14
ACI1 (E10-14) - E01 (E10-7)	Y-G - W-B	IG switch ON	9 - 14
AICV (E10-25) - E01 (E10-7)	W - W-B	IG switch ON	9 - 14
ACM1 (E10-24) - E01 (E10-7)	B-L - W-B	IG switch ON	9 - 14
FC (E6-10) - E01 (E10-7)	G-R - W-B	IG switch ON	9 - 14
FC (E6-10) - E01 (E10-7)	G-R - W-B	Idling	0 - 3
EVP1 (E8-11) - E01 (E10-7)	LG - W-B	IG switch ON	9 - 14
CCV (E8-12) - E01 (E10-7)	L - W-B	IG switch ON	9 - 14
KNKR (E9-1) - E1 (E8-1)	B - BR	Idling	Pulse generation (See page 05-77)
KNKL (E9-2) - E1 (E8-1)	W - BR	Idling	Pulse generation (See page 05-77)
NSW (E9-8) - E1 (E8-1)	G-Y - BR	IG switch ON, Other shift position in P, N	9 - 14
NSW (E9-8) - E1 (E8-1)	G-Y - BR	IG switch ON, Shift position in P, N	0 - 3
TACH (E6-5) - E1 (E8-1)	B-O - BR	Idling	Pulse generation
TBP (E6-4) - E01 (E10-7)	V - W-B	IG switch ON, Disconnect vacuum hose from vapor pressure sensor	9 - 14
PTNK (E6-21) - E2 (E10-28)	P - BR	IG switch ON	2.9 - 3.7
PTNK (E6-21) - E2 (E10-28)	P - BR	IG switch ON, Apply vacuum 4.0 kPa (30 mmHg, 1.18 in.Hg)	0.5 or less
SIL (E6-18) - E1 (E8-1)	W - BR	During transmission	Pulse generation
STP (E7-19) - E1 (E8-1)	G-W - BR	IG switch ON, Brake pedal depressed	7.5 - 14
STP (E7-19) - E1 (E8-1)	G-W - BR	IG switch ON, Brake pedal released	0 - 1.5
AFR+ (E9-22) - E1 (E8-1)	BR - BR	IG switch ON	3.0 - 3.6
AFL+ (E9-23) - E1 (E8-1)	O - BR	IG switch ON	2.7 - 3.3
AFR- (E9-30) - E1 (E8-1)	B-R - BR	IG switch ON	3.0 - 3.6
AFL- (E9-31) - E1 (E8-1)	W - BR	IG switch ON	2.7 - 3.3
OX1B (E9-21) - E1 (E8-1)	W - BR	Maintain engine speed at 2,500 rpm for 90 sec. after warming up	Pulse generation
OX2B (E9-29) - E1 (E8-1)	B - BR	Maintain engine speed at 2,500 rpm for 90 sec. after warming up	Pulse generation
HAFR (E9-4) - E04 (E9-7)	B-W - W-B	Idling	Below 3.0
HAFL (E9-3) - E05 (E9-6)	B-R - W-B	IG switch ON	9 - 14
KSW (E7-34) - E1 (E8-1)	L - BR	At time of inserting key	Below 1.5
KSW (E7-34) - E1 (E8-1)	L - BR	In condition without key inserted	4 - 5
RXCK (E7-27)*1 - E1 (E8-1)	R-L - BR	At time of inserting key	Pulse generation
CODE (E7-15)*1 - E1 (E8-1)	G-W - BR	At time of inserting key	Pulse generation
TXCT (E7-26)*1 - E1 (E8-1)	L-Y - BR	At time of inserting key	Pulse generation

DIAGNOSTICS - SFI SYSTEM (1MZ-FE)

IMLD (E7-16) - E1 (E8-1)	V - BR	In condition without key inserted	Pulse generation
MREL (E6-8) - E1 (E8-1)	B-W - BR	IG switch ON	9 - 14
SPD (E7-17) - E1 (E8-1)	V-W - BR	IG switch ON, Rotate driving sheel slowly	0 - 5
W (E6-12) - E01 (E10-7)	G-R - W-B	IG switch ON	Below 3.0
PS (E8-10) - E1 (E8-1)	R-W - BR	IG switch ON	9 - 14
HT1B (E8-6) - E03 (E8-7) HT2B (E8-5) - E03 (E8-7)	L - W-B Y - W-B	Idling	9 - 14
HT1B (E8-6) - E03 (E8-7) HT2B (E8-5) - E03 (E8-7)	L - W-B Y - W-B	IG switch ON	Below 3.0
TC (E6-11) - E1 (E8-1)	P-B - BR	IG switch ON	9 - 14
ACMG (E7-3) - E1 (E8-1)	L-W - BR	A/C switch ON (At Idling)	Below 3.0
ACMG (E7-3) - E1 (E8-1)	L-W - BR	A/C switch OFF	9 - 14
A/CS (E7-31) - E1 (E8-1)	P-L - BR	IG switch ON, A/C switch ON	9 - 14
A/CI (E7-33) - E01 (E10-7)	B - W-B	IG switch ON, A/C switch OFF	9 - 14
ENG+ (E6-24) - ENG- (E6-30) TRC+ (E6-25) - TRC- (E6-31)	W-B G-L	Idling	Pulse generation

*1: w/ Engine Immobiliser System.

PROBLEM SYMPTOMS TABLE

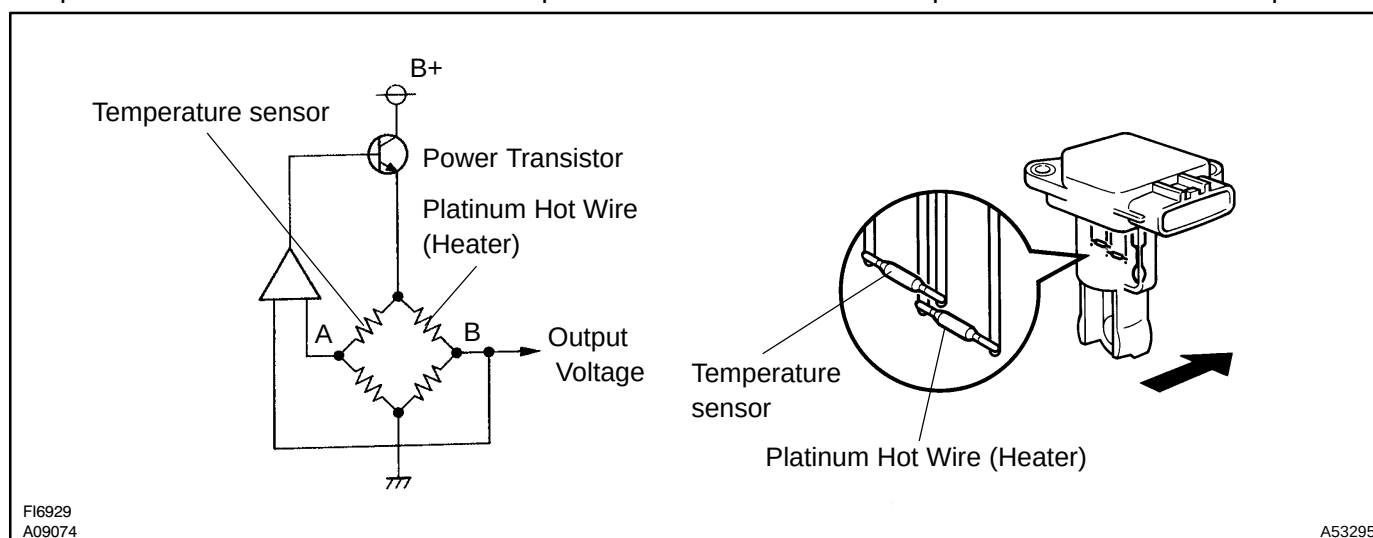
Symptom	Suspect Area	See page
Engine does not crank (Does not start)	24. Starter 25. Starter relay	19-1 19-1
No initial combustion (Does not start)	1. ECM power source circuit 2. Fuel pump control circuit 3. ECM	05-178 05-173 01-31
No complete combustion (Does not start)	1. Fuel pump control circuit	05-173
Engine cranks normally (Difficult to start)	1. Starter signal circuit 2. Fuel pump control circuit 3. Compression	05-167 05-173 14-1
Cold engine (Difficult to start)	1. Starter signal circuit 2. Fuel pump control circuit	05-167 05-173
Hot engine (Difficult to start)	1. Starter signal circuit 2. Fuel pump control circuit	05-167 05-173
High engine idle speed (Poor idling)	1. A/C signal circuit (Compressor circuit) 2. ECM power source circuit	05-536 05-178
Low engine idle speed (Poor idling)	1. A/C signal circuit (Compressor circuit) 2. Fuel pump control circuit	05-536 05-173
Rough idling (Poor idling)	1. Compression 2. Fuel pump control circuit 3. Electric throttle control system	14-1 05-173 05-117
Hunting (Poor idling)	1. ECM power source circuit 2. Fuel pump control circuit	05-178 05-173
Hesitation/Poor acceleration (Poor driveability)	1. Fuel pump control circuit 2. A/T faulty 3. Electric throttle control system	05-173 05-384 05-133
Surging (Poor driveability)	1. Fuel pump control circuit	05-173
Soon after starting (Engine stall)	1. Fuel pump control circuit	05-173
During A/C operation (Engine stall)	1. A/C signal circuit (Compressor circuit) 2. ECM	05-536 01-31
Unable to refuel/Difficult to refuel	1. ORVR system	

DTC**P0100****MASS AIR FLOW CIRCUIT MALFUNCTION****CIRCUIT DESCRIPTION**

The air flow meter uses a platinum hot wire. The hot wire air flow meter consists of a platinum hot wire, temperature sensor and a control circuit installed in a plastic housing. The hot wire air flow meter works on the principle that the hot wire and temperature sensor located in the intake air bypass of the housing detect any changes in the intake air temperature.

The hot wire is maintained at the set temperature by controlling the current flow through the hot wire. This current flow is then measured as the output voltage of the air flow meter.

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



DTC No.	DTC Detecting Condition	Trouble Area
P0100	Open or short in air flow meter circuit with more than 3 sec. engine speed less than 4,000 rpm	• Open or short in air flow meter circuit • Intake air flow meter • ECM

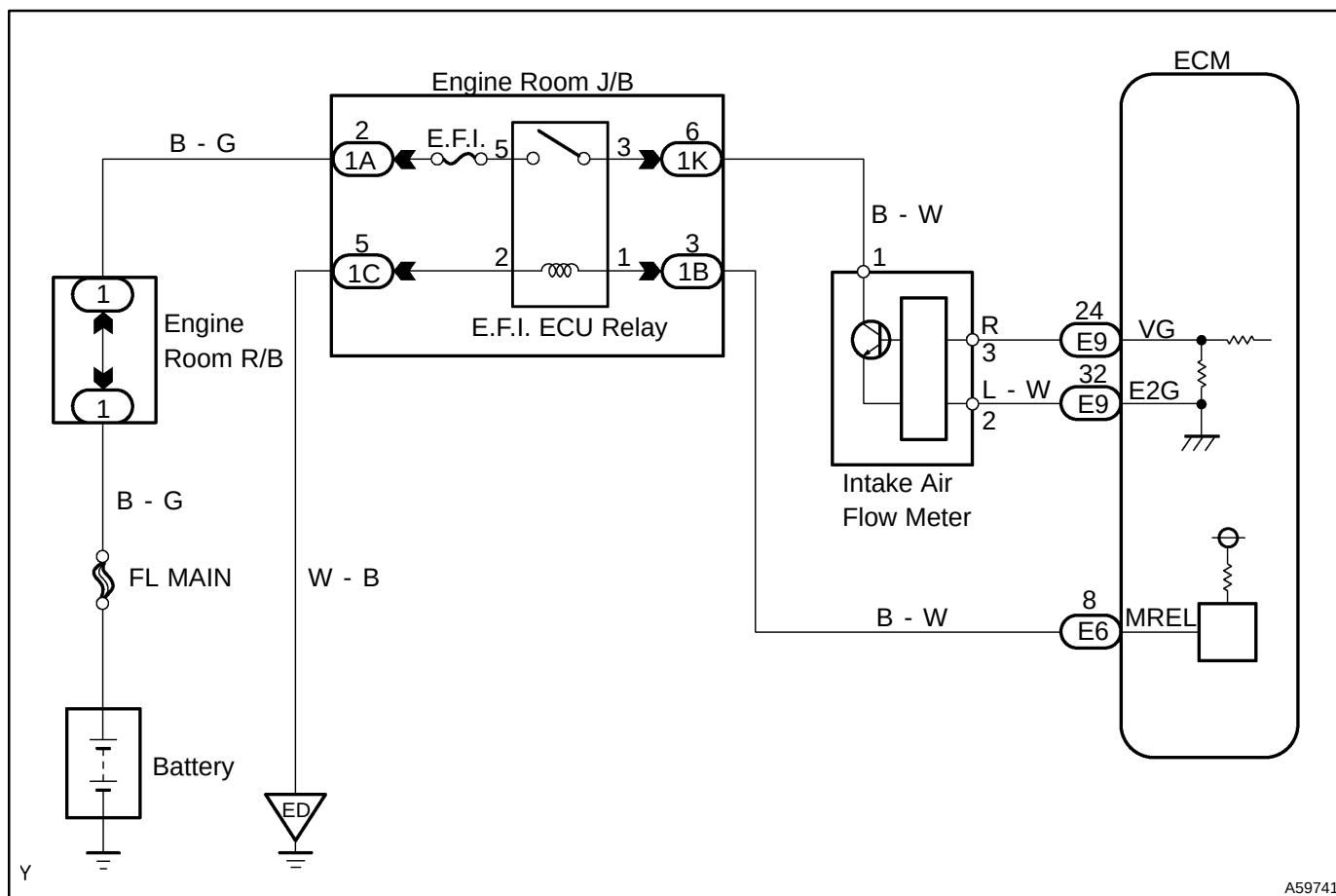
If the ECM detects DTC 0100, it operates the fail-safe function, keeping the ignition timing and injection volume constantly and making it possible to drive the vehicle.

HINT:

After confirming DTC P0100, use the hand-held tester to confirm the mass air flow ratio from the CURRENT DATA.

Air Flow Value (g/s)	Malfunction
Approx. 0.0	• Air flow meter power source circuit open • VG circuit open or short
160.0 or more	• EVG circuit open

WIRING DIAGRAM



A59741

INSPECTION PROCEDURE

HINT:

Read freeze frame data using hand-held tester. Because freeze frame records the engine conditions when the malfunction is detected, when troubleshooting it is useful for determining whether the vehicle was running or stopped, the engine warmed up or not, the air-fuel ratio lean or rich, etc. at the time of the malfunction.

1	READ VALUE OF OBD II SCAN TOOL OR HAND-HELD TESTER(MAF)
----------	--

(a) Read air flow rate on the hand-held tester.

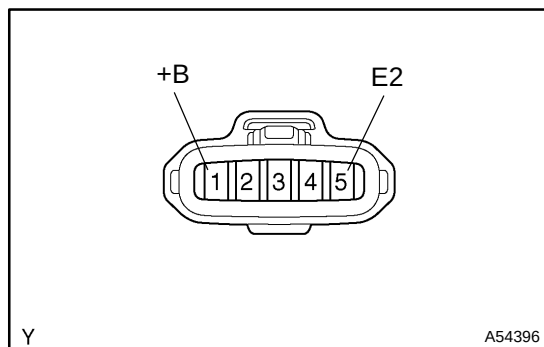
Result:

	A	B
Air flow rate (g/s)	0.0	160.0 or more

B

Go to step 5

A

2 INSPECT INTAKE AIR FLOW METER SUB-ASSY

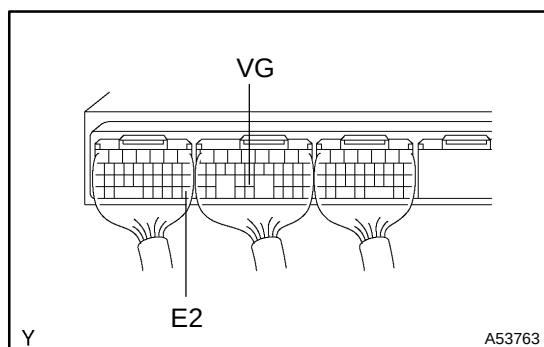
- (a) Disconnect the intake air flow meter connector.
- (b) Turn the ignition switch ON.
- (c) Measure voltage between the terminals +B and E2 of the air flow meter harness side connector.

Voltage: 9 - 14 V

NG

Go to step 7

OK

3 INSPECT ECM

- (a) Start the engine.
- (b) Measure voltage between the terminals VG and E2 of the ECM connector while the engine is idling.

Voltage: 0.5 - 3.0 V

HINT:

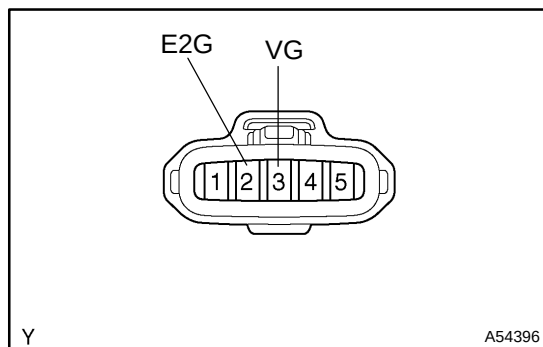
The shift position should be P or N and A/C switch should be turned OFF.

OK

CHECK AND REPLACE ECM

NG

4 CHECK HARNESS AND CONNECTOR(ECM - INTAKE AIR FLOW METER)



- (a) Disconnect the intake air flow meter connector.
- (b) Disconnect the ECM E9 connector.
- (c) Check for open between the terminals VG of the intake air flow meter harness side connector and VG of the ECM connector.

Resistance: 1 Ω or less

- (d) Check for open between the terminals E2G of the intake air flow meter harness side connector and E2G of the ECM connector.

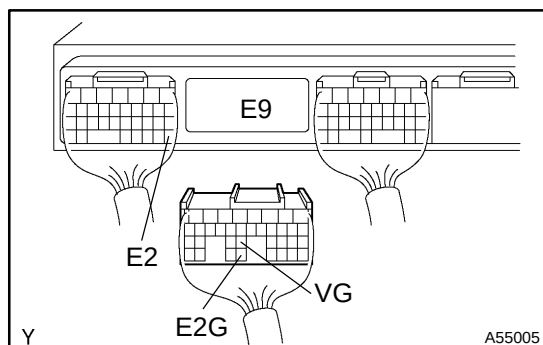
Resistance: 1 Ω or less

- (e) Check for short between the terminals VG and E2G of the ECM connector.

Resistance: 1 M Ω or more

- (f) Check for short between the terminals E2G and E2 of the ECM connector.

Resistance: 1 M Ω or more



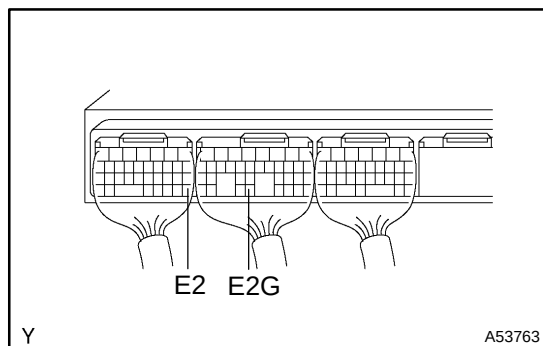
NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

REPLACE INTAKE AIR FLOW METER SUB-ASSY

5 INSPECT ECM



- (a) Check for open between the terminals E2G and E2 of the ECM connector.

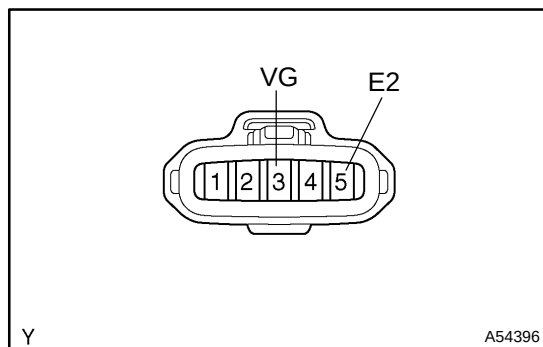
Resistance: 1 Ω or less

NG

CHECK AND REPLACE ECM

OK

6 CHECK HARNESS AND CONNECTOR(ECM - INTAKE AIR FLOW METER)

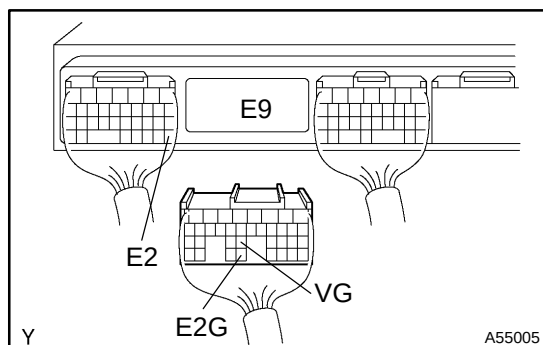


- (a) Disconnect the intake air flow meter connector.
- (b) Disconnect the ECM E9 connector.
- (c) Check for open between the terminals VG of the intake air flow meter harness side connector and VG of the ECM connector.

Resistance: 1 Ω or less

- (d) Check for open between the terminals E2 of the intake air flow meter harness side connector and E2 of the ECM connector.

Resistance: 1 Ω or less



- (e) Connect the ECM connector.
- (f) Check for short between the terminals VG and E2G of the ECM connector.

Resistance: 1 M Ω or more

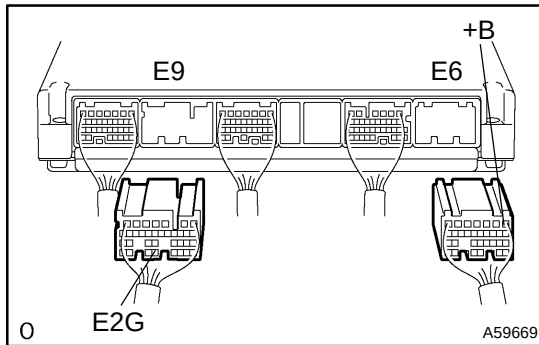
NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

REPLACE INTAKE AIR FLOW METER SUB-ASSY

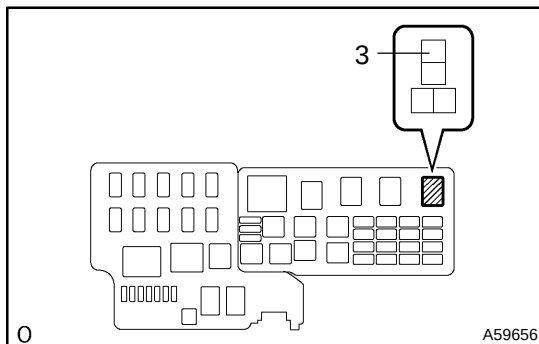
7

CHECK HARNESS AND CONNECTOR(E.F.I. ECU RELAY - INTAKE AIR FLOW METER)

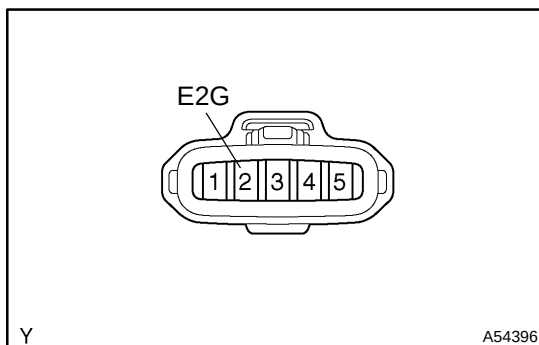
- (a) Disconnect the battery negative (-) terminal.
- (b) Disconnect the ECM E6 connector.
- (c) Check for open between the terminals +B of the ECM connector and 3 of the E.F.I. ECM relay installation relay block.

Resistance: 1 Ω or less**NOTICE:**

Do not insert the tester leads so hard in the procedure (c), or the holder may be damaged.



- (d) Disconnect the ECM E9 connector.
- (e) Check for open between the terminals E2G of the intake air flow meter harness side connector and E2G of the ECM connector.

Resistance: 1 Ω or less**NG****CHECK AND REPLACE HARNESS AND CONNECTOR****OK****CHECK FOR ECM POWER SOURCE CIRCUIT**

DTC	P0101	MASS AIR FLOW CIRCUIT RANGE/PERFORMANCE PROBLEM
------------	--------------	--

CIRCUIT DESCRIPTION

Refer to DTC P0100 on page [05-31](#) .

DTC No.	DTC Detecting Condition	Trouble Area
P0101	Conditions (a), (b) and (c) continue 10 sec. or more with engine speed NE < 900: (2 trip detection logic) (a) Throttle valve fully closed (b) Intake air flow meter output > 2.2 V (c) THW $\geq$ 70°C	• Intake air flow meter
	Conditions (a) and (b) continue 10 sec. or more with engine speed 1,500 rpm or more: (2 trip detection logic) (a) VTA $\geq$ 0.63 V (b) Intake air flow meter output < 1.06 V	

INSPECTION PROCEDURE

HINT:

Read freeze frame data using hand-held tester or OBD II scan tool. Because freeze frame records the engine conditions when the malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio was lean or rich, etc. at the time of the malfunction.

1	CHECK OTHER DTC OUTPUT(BESIDES DTC P0101)
----------	--

NO

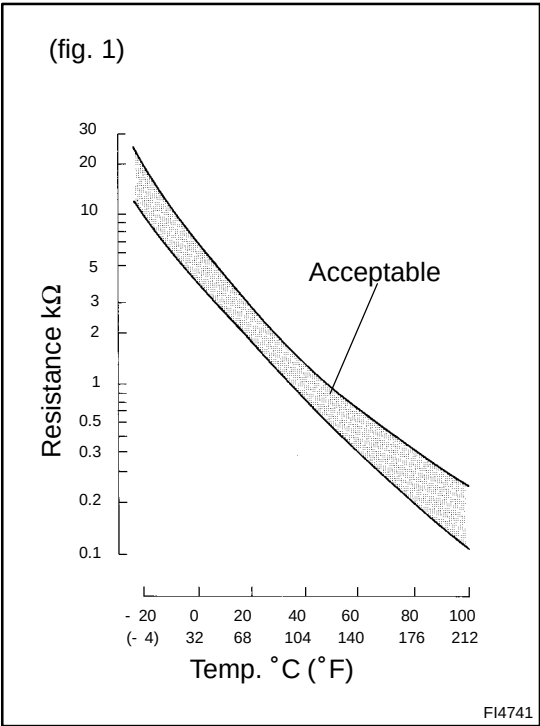
**REPLACE INTAKE AIR FLOW METER
SUB-ASSY**

YES

GO TO RELEVANT DTC CHART

DTC	P0110	INTAKE AIR TEMP. CIRCUIT MALFUNCTION
------------	--------------	---

CIRCUIT DESCRIPTION



The intake air temp. sensor is built into the air flow meter and senses the intake air temperature.

A thermistor built in the sensor changes the resistance value according to the intake air temperature.

The lower the intake air temperature, the greater the thermistor resistance value, and the higher the intake air temperature, the lower the thermistor resistance value (See fig. 1).

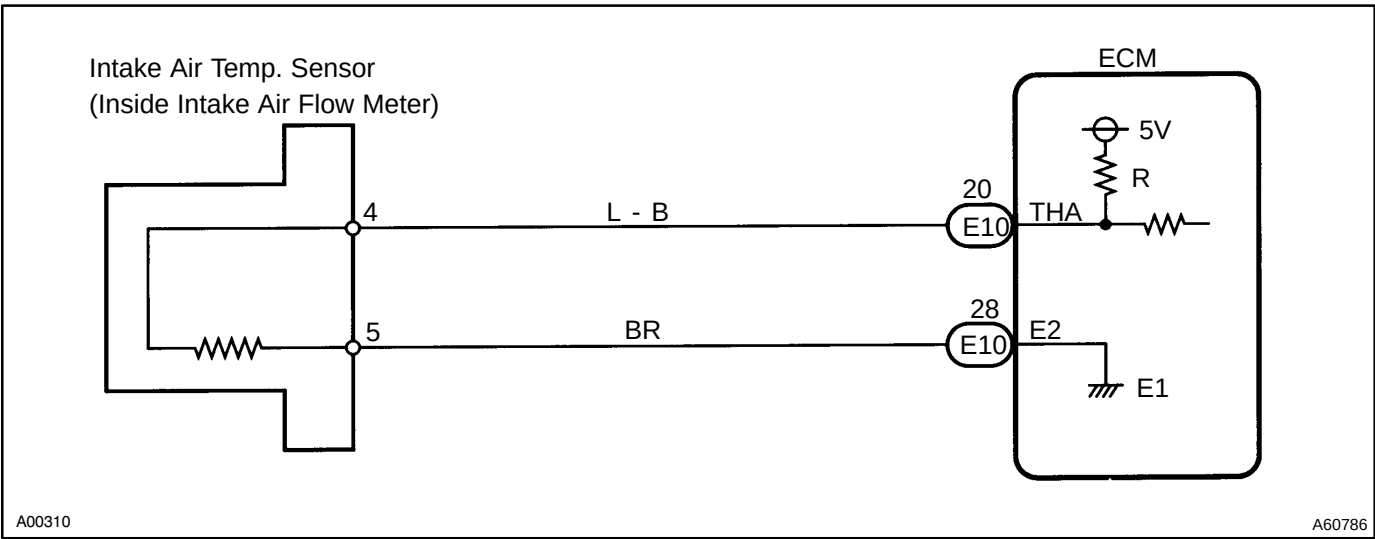
The intake air temp. sensor is connected to the engine ECM (See below). The 5 V power source voltage in the engine ECM is applied to the intake air temp. sensor from the terminal THA via resistor R.

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

If the ECM detects the DTC P0110, it operates the fail-safe function in which the intake air temperature is assumed to be 20°C (68°F).

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

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If DTC P0110 (Intake Air Temp. Circuit Malfunction), P0115 (Water Temp. Circuit Malfunction), P0120 (Throttle/Pedal Position Sensor/Switch "A" Malfunction) are output simultaneously, E2 (Sensor Ground) may be open.
- Read freeze frame data using hand-held tester. Because freeze frame records the engine conditions when the malfunction is detected, when troubleshooting it is useful for determining whether the vehicle was running or stopped, the engine warmed up or not, the air-fuel ratio lean or rich, etc. at the time of the malfunction.

1 READ VALUE OF OBD II SCAN TOOL OR HAND-HELD TESTER(INAKE AIR)

- (a) Read temperature value on the hand-held tester.

Temperature: The same as actual intake air temperature

Resistance:

A	B	C
-40 °C (-40 °F)	140 °C (284 °F) or more	OK

B

Go to step 4

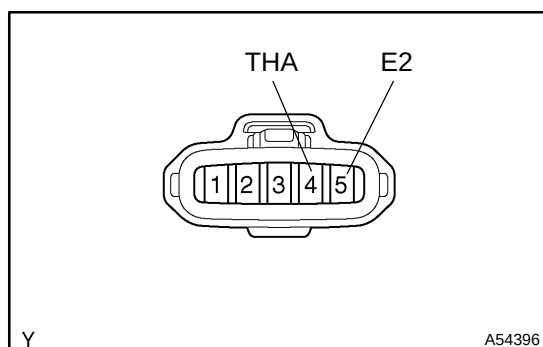
C

GO TO RELEVANT DTC CHART

A

2 READ VALUE OF OBD II SCAN TOOL OR HAND-HELD TESTER(CHECK FOR OPEN)

SST 09843-18040



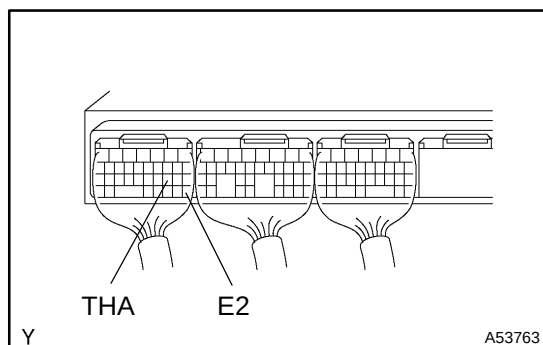
- Disconnect the intake air flow meter connector.
 - Connect the terminal THA with E2.
 - Turn the ignition switch ON.
 - Read temperature value on the hand-held tester.
- Temperature: 140°C (284°F) or more**

OK

REPLACE INTAKE AIR FLOW METER SUB-ASSY

NG

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



- (a) Connect the terminals THA with E2 of the ECM connector.
HINT:

Before checking, do a visual check and connector connection inspection of the ECM.

- (b) Read temperature value on the hand-held tester.

Temperature: 140°C (284°F) or more

OK

CHECK AND REPLACE HARNESS AND CONNECTOR

NG

CHECK AND REPLACE ECM

4 READ VALUE OF OBD II SCAN TOOL OR HAND-HELD TESTER(CHECK FOR SHORT)

- (a) Disconnect the intake air flow meter connector.
(b) Turn the ignition switch ON.
(c) Read temperature value on the hand-held tester.

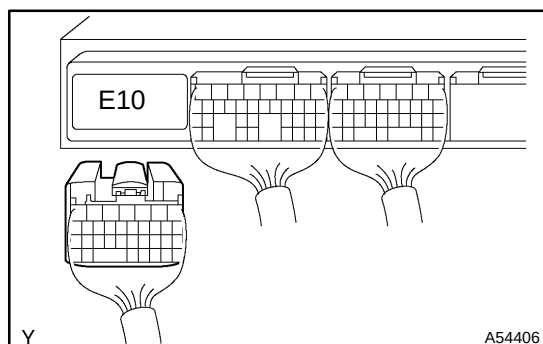
Temperature: -40°C (-40°F)

OK

REPLACE INTAKE AIR FLOW METER SUB-ASSY

NG

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



- (a) Disconnect the ECM E10 connector.
(b) Turn the ignition switch ON.
(c) Read temperature value on the hand-held tester.

Temperature: -40°C (-40°F)

OK

REPAIR OR REPLACE HARNESS AND CONNECTOR

NG

CHECK AND REPLACE ECM

DTC	P0115	ENGINE COOLANT TEMP. CIRCUIT MALFUNCTION
------------	--------------	---

CIRCUIT DESCRIPTION

A thermistor built into the water temp. sensor changes the resistance value according to the water temperature.

The structure of the sensor and connection to the ECM is the same as the ones of the air temperature sensor. If the ECM detects the DTC P0115, it operates the fail-safe functions in which the engine coolant temperature is assumed to be 80°C (176°F).

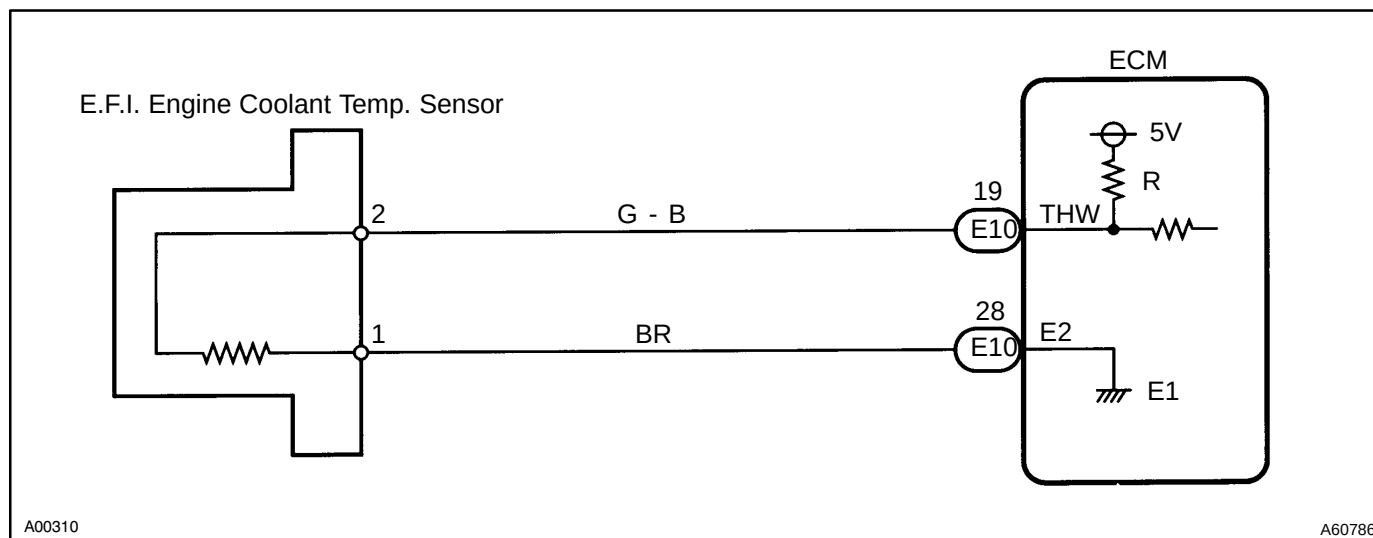
DTC No.	DTC Detecting Condition	Trouble Area
P0115	Open or short in water temp. sensor circuit	• Open or short in water temp. sensor circuit • E.F.I. engine coolant temperature sensor • ECM

HINT:

After confirming DTC P0115, use the OBD II scan tool or hand-held tester to confirm the engine coolant temperature from the CURRENT DATA.

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

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If DTC P0110 (Intake Air Temp. Circuit Malfunction), P0115 (Water Temp. Circuit Malfunction), P0120 (Throttle/Pedal Position Sensor/Switch "A" Malfunction) are output simultaneously, E1, E2 etc. (Sensor Ground system) may be open.
- Read freeze frame data using hand-held tester. Because freeze frame records the engine conditions when the malfunction is detected, when troubleshooting it is useful for determining whether the vehicle was running or stopped, the engine warmed up or not, the air-fuel ratio lean or rich, etc. at the time of the malfunction.

1 READ VALUE OF OBD II SCAN TOOL OR HAND-HELD TESTER(COOLANT TEMP/WATER TEMP)

- (a) Read temperature value on the hand-held tester.

Temperature: The same as actual water temperature

Result:

A	B	C
-40 °C (-40°F)	140°C (284°F)	OK

B

Go to step 4

C

CHECK FOR INTERMITTENT PROBLEMS

A

2 READ VALUE OF OBD II SCAN TOOL OR HAND-HELD TESTER(CHECK FOR OPEN)

SST 09843-18040



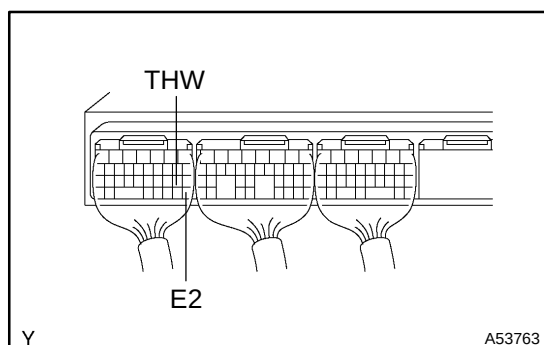
- (a) Disconnect the water temperature sensor connector.
 - (b) Connect the terminals 1 with 2 of the water temperature sensor connector.
 - (c) Turn the ignition switch ON.
 - (d) Read temperature value on the hand-held tester.
- Temperature: 140°C (284°F) or more**

OK

REPLACE E.F.I. ENGINE COOLANT TEMPERATURE SENSOR

NG

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



- (a) Connect the terminals THW with E2 of the ECM connector.
 - (b) Turn the ignition switch ON.
 - (c) Read temperature value on the hand-held tester.
- Temperature: 140°C (284°F) or more**

OK

REPAIR OR REPLACE HARNESS AND CONNECTOR

NG

CHECK AND REPLACE ECM

4	READ VALUE OF OBD II SCAN TOOL OR HAND-HELD TESTER(CHECK FOR SHORT)
----------	--

- (a) Disconnect the water temp. sensor connector.
- (b) Turn the ignition switch ON.
- (c) Read temperature value on the hand-held tester.

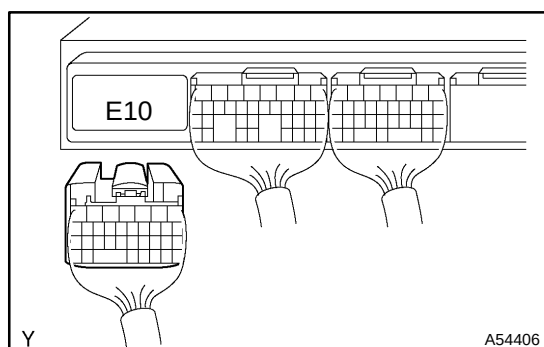
Temperature: -40°C (-40°F)

OK

REPLACE E.F.I. ENGINE COOLANT TEMPERATURE SENSOR

NG

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



- (a) Disconnect the ECM E10 connector.
- (b) Turn the ignition switch ON.
- (c) Read temperature value on the hand-held tester.

Temperature: -40°C (-40°F)

OK

REPAIR OR REPLACE HARNESS AND CONNECTOR

NG

CHECK AND REPLACE ECM

DTC	P0116	ENGINE COOLANT TEMP.CIRCUIT RANGE/PERFORMANCE PROBLEM
------------	--------------	--

CIRCUIT DESCRIPTION

Refer to DTC P0115 on page [05-41](#) .

DTC No.	DTC Detecting Condition	Trouble Area
P0116	If THW < -7°C (19.4°F), 20 min. or more after starting engine, E.F.I. engine coolant temp. sensor value is 20°C (68°F) or less (2 trip detection logic)	• Cooling system • E.F.I. engine coolant temperature sensor
	If THW ≥ -7°C (19.4°F), and < 10°C (50°F), 5 min. or more after starting engine, E.F.I. engine coolant temp. sensor value is 20°C (68°F) or less (2 trip detection logic)	
	If THW ≥ 10°C (50°F), 2 min. or more after starting engine, E.F.I. engine coolant temp. sensor value is 30°C (86°F) or less (2 trip detection logic)	
	When THW ≥ 35°C (95°F) or more and less than 60°C (140°F), and THA ≥ -6.7°C (19.9°F) or more, when starting engine, conditions (a) and (b) continue: (2 trip detection logic) (a) Vehicle speed is changing (Not stable) (b) THW change is lower than 3°C (37.4°F) from THW since when starting engine	
	In case that reading value of water temp. sensor will not change more than 1°C (33.8°F) even after repeating 6 trips (detection logic) of adjusting speed pattern with THW more than 60°C (140°F) when engine starts.	

INSPECTION PROCEDURE

HINT:

- If DTCs P0115 and P0116 are output simultaneously, E.F.I. engine coolant temperature sensor circuit may be open. Perform troubleshooting of DTC P0115 first.
- Read freeze frame data using hand-held tester or OBD II scan tool. Because freeze frame records the engine conditions when the malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio was lean or rich, etc. at the time of the malfunction.

1 CHECK OTHER DTC OUTPUT(BESIDES DTC P0116)

(a) Read the DTC using the hand-held tester or OBD II scan tool.

YES

GO TO RELEVANT DTC CHART

NO

2 INSPECT THERMOSTAT (See page [16-2](#))

NG

REPLACE THERMOSTAT

OK

REPLACE E.F.I. ENGINE COOLANT TEMPERATURE SENSOR

DTC	P0120	THROTTLE PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT MALFUNCTION
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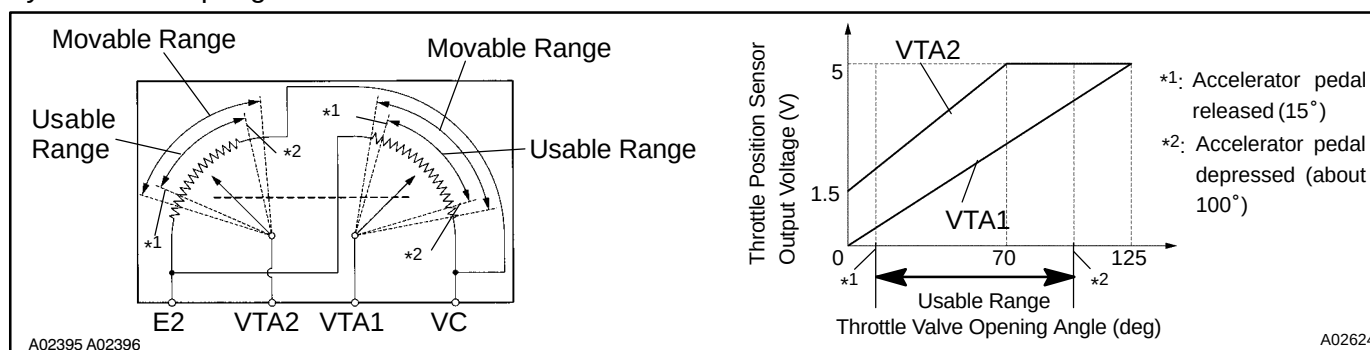
CIRCUIT DESCRIPTION

Throttle position sensor is mounted on the throttle body and it has 2 sensors to detect the throttle opening angle and the malfunction of the throttle position sensor's own.

The voltage applied to terminals VTA1 and VTA2 of the ECM changes between 0 V and 5 V in proportion to the opening angle of the throttle valve.

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 the driving condition.

If this DTC is stored, the ECM cuts the power down for the throttle motor, and the throttle valve is fully closed by the return spring.



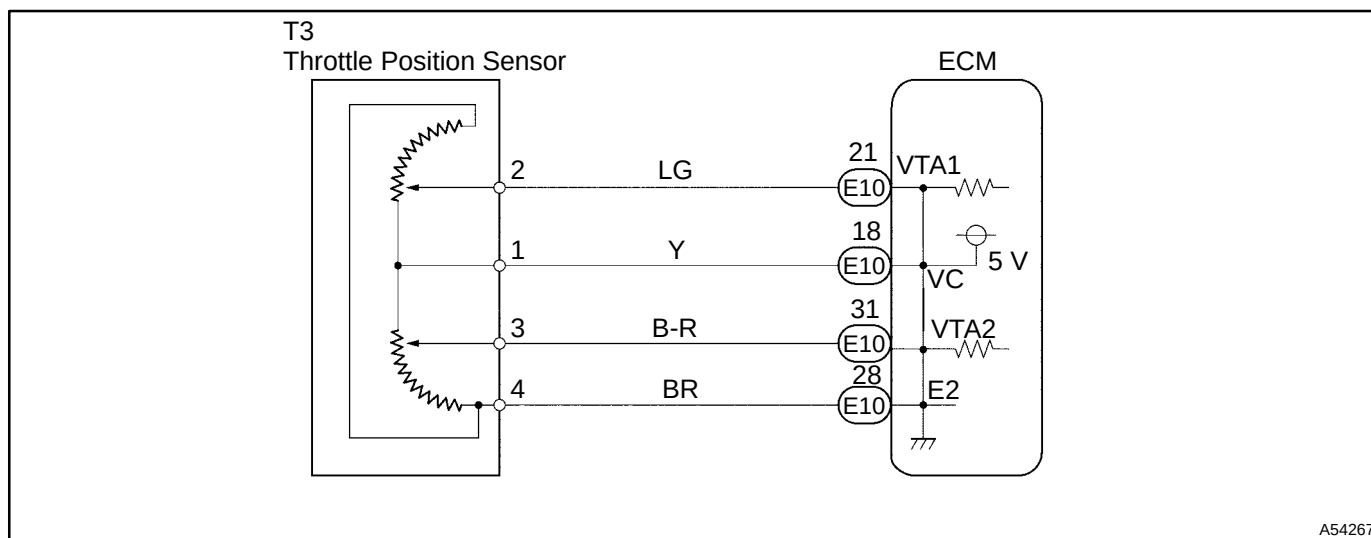
DTC No.	DTC Detection Condition	Trouble Area
P0120	Condition (a), (b), (c), (d) or (e) continues for 2.0 seconds: (IDL ON: 10 seconds) (a) $VTA1 \leq 0.2 \text{ V}$ (b) $VTA2 \leq 0.5 \text{ V}$ (c) $VTA1 \geq 4.8 \text{ V}$ (d) When $VTA \geq 0.2 \text{ V}$ and $\leq 1.8 \text{ V}$, and $VTA2 \geq 4.97 \text{ V}$ (e) $VTA1-VTA2 \leq 0.02 \text{ V}$ (f) IDL is OFF	• Open or short in throttle position sensor circuit • Throttle body assy (Throttle position sensor) • ECM
	Condition (a) continues for 0.4 seconds: (a) $VTA1 \leq 0.2 \text{ V}$ and $VTA2 \leq 0.5 \text{ V}$	

HINT:

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

Accelerator pedal position expressed as percentage and voltage				Trouble area
Accelerator pedal released		Accelerator pedal depressed		
THROTTLE POS	THROTTLE POS #2	THROTTLE POS	THROTTLE POS #2	
0 %	0 V	0 %	0 V	VC circuit open
0 %	2.0 - 2.9 V	0 %	4.6 - 5.0 V	VTA1 circuit open or ground short
8 - 20 %	0 V	64 - 96 %	0 V	VTA2 circuit open or ground short
100 %	5 V	100 %	5 V	E2 circuit open

WIRING DIAGRAM



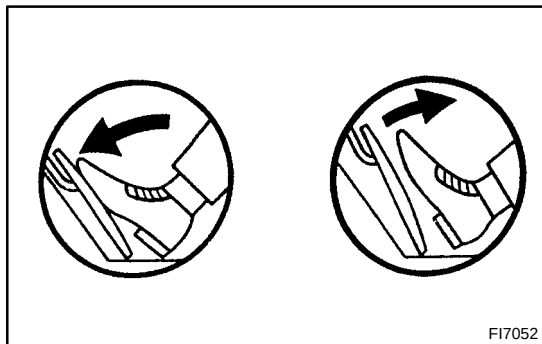
INSPECTION PROCEDURE

HINT:

Read freeze frame data using hand-held tester or OBD II scan tool, as freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio was lean or rich, etc. at the time of the malfunction.

Hand-held tester:

1	READ VALUE OF HAND-HELD TESTER(THROTTLE VALVE OPENING PERCENTAGE)
----------	--



- (a) Read the throttle valve opening percentage for the VTA circuit and read the voltage for the VTA2 circuit.

Accelerator pedal	Throttle valve opening position expressed as percentage (VTA1)	Voltage (VTA2)
Released	8 - 20 %	2.0 - 2.9 V
Depressed	64 - 96 %	4.6 - 5.0 V

HINT:

If the throttle position is 100 % when releasing throttle pedal, ETA1 circuit is open.

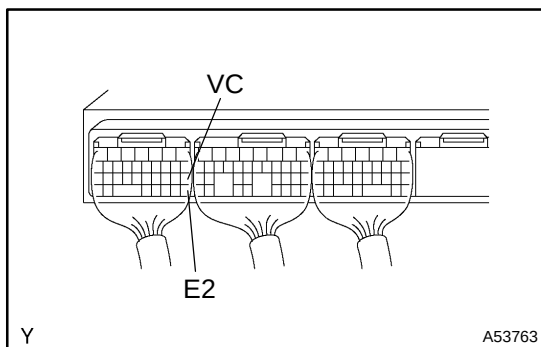
If the throttle position is 0 % when depressing accelerator pedal, VC or VTA1 circuit is open.

If the throttle position is not 0 % when releasing accelerator pedal or throttle position is not 100 % when depressing throttle pedal, VTA2 circuit is open or short.

OK

CHECK FOR INTERMITTENT PROBLEMS
(See page 01-31)

NG

2 INSPECT ECM(VC - E2)

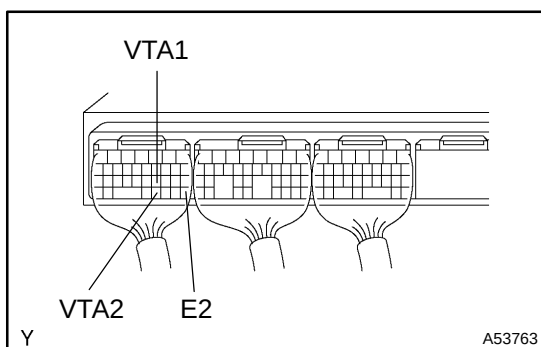
- (a) Measure the voltage between terminals VC and E2 of the ECM connector.

Voltage: 4.5 - 5.5 V

NG

CHECK AND REPLACE ECM

OK

3 INSPECT ECM(VTA1 - E2, VTA2 - E2)

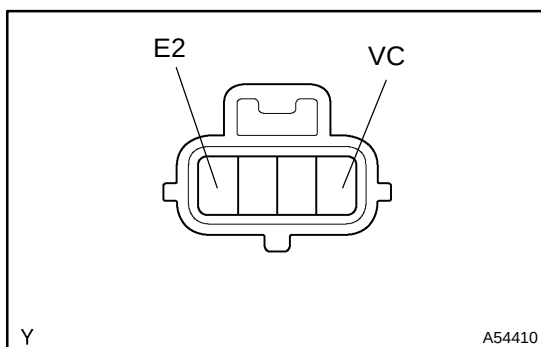
- (a) Measure the voltage between terminals VTA1 and E2, and VTA2 and E2 of the ECM connector.

Accelerator pedal	Voltage	
	VTA1 - E2	VTA2 - E2
Released	0.4 - 1.0 V	2.0 - 2.9 V
Depressed	3.2 - 4.8 V	4.6 - 5.0 V

NG

CHECK AND REPLACE ECM

NG

4 INSPECT E.F.I. THROTTLE POSITION SENSOR

- (a) Disconnect the throttle position sensor connector.
 (b) Using an ohmmeter, measure the resistance between terminals VC and E2.

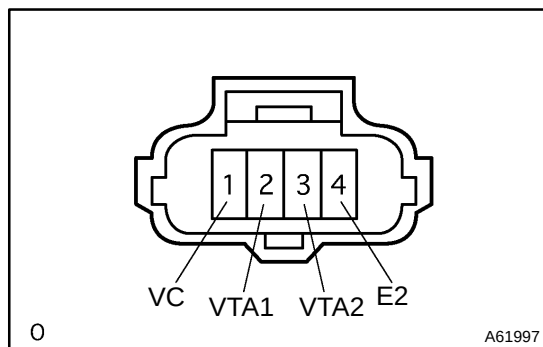
Resistance: 1.2 - 3.2 kΩ at 20°C (68°F)

NG

**REPLACE E.F.I. THROTTLE POSITION SENSOR
 (See page 10-6)**

OK

5 CHECK HARNESS AND CONNECTOR(ECM - THROTTLE BODY)



- (a) Disconnect the throttle position sensor connector and ECM E10 connector. Read throttle opening angle on the hand-held tester.

Throttle opening percentage:

Accelerator pedal released: 0 %

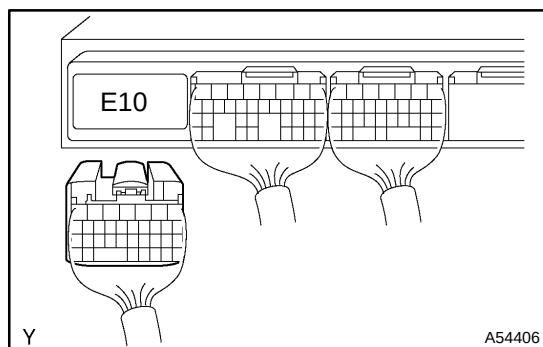
Accelerator pedal depressed: 64 - 96 %

HINT:

If the throttle position is 100 % when releasing throttle pedal, E2 circuit is open.

If the throttle position is 0 % when depressing accelerator pedal, VC or VTA1 circuit is open.

If the throttle position is not 0 % when releasing accelerator pedal or throttle position is not 100 % when depressing throttle pedal, VTA2 circuit is open or short.



NG

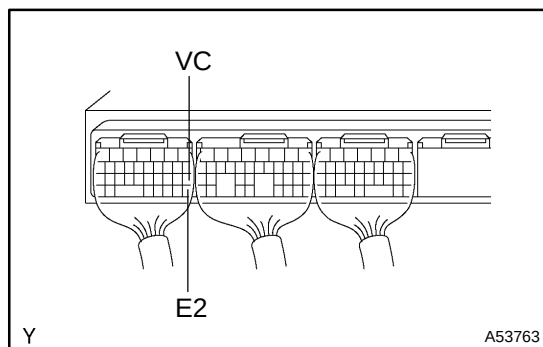
REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

CHECK AND REPLACE ECM

OBD II scan tool (excluding Hand-held Tester):

1 INSPECT ECM(VC - E2)



- (a) Measure the voltage between terminals VC and E2 of the ECM connector.

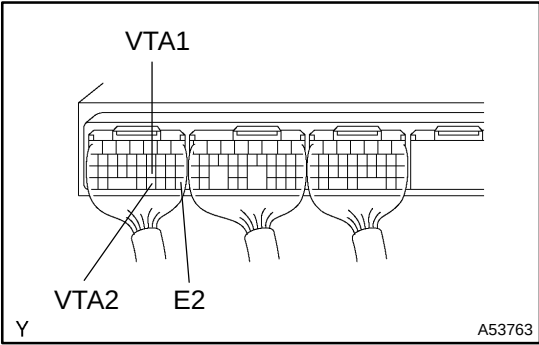
Voltage: 4.5 - 5.5 V

NG

CHECK AND REPLACE ECM

OK

2 INSPECT ECM(VTA1 - E2, VTA2 - E2)



- (a) Measure the voltage between terminals VTA1 and E2, and VTA2 and E2 of the ECM connector.

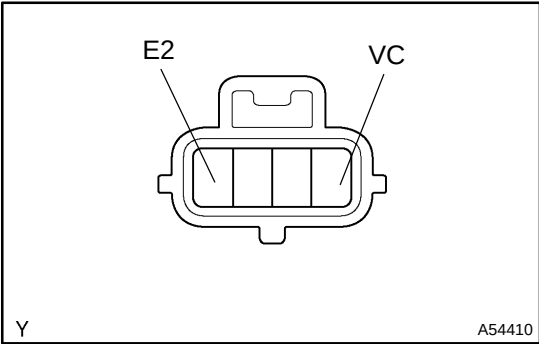
Accelerator pedal	Voltage	
	VTA1 - E	VTA2 - E2
Released	0.4 - 1.0 V	2.0 - 2.9 V
Depressed	3.2 - 4.8 V	4.6 - 5.0 V

OK

CHECK AND REPLACE ECM

NG

3 INSPECT E.F.I. THROTTLE POSITION SENSOR



- (a) Disconnect the throttle position sensor connector.
(b) Using an ohmmeter, measure the resistance between terminals VC and E2.

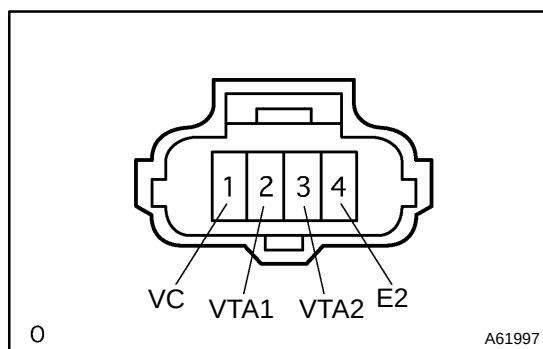
Resistance: 1.2 - 3.2 kΩ at 20°C (68°F)

NG

REPLACE E.F.I. THROTTLE POSITION SENSOR

OK

4 CHECK HARNESS AND CONNECTOR(ECM - THROTTLE BODY)

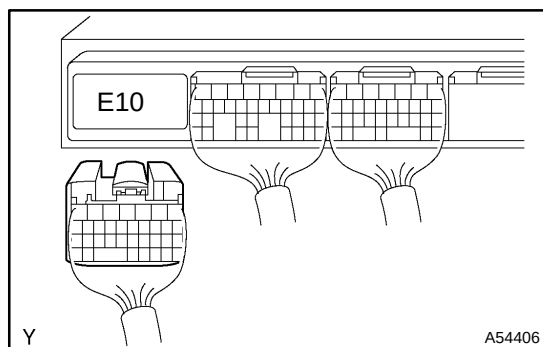


- (a) Disconnect the throttle position sensor connector and E10 connector. Read throttle opening angle on the OBD II scan tool.

Throttle opening percentage:

Accelerator pedal released: 0 %

Accelerator pedal depressed: 64 - 96 %



NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

CHECK AND REPLACE ECM

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

CIRCUIT DESCRIPTION

Refer to DTC P0120 on page [05-45](#) .

DTC No.	DTC Detecting Condition	Trouble Area
P0121	Condition (a) continues for 2.0 seconds: (IDL ON: 10 seconds) (a) Difference between VTA1 and VTA2 is out of threshold (b) IDL is OFF	• Throttle position sensor • ECM

INSPECTION PROCEDURE

HINT:

Read freeze frame data using hand-held tester or OBD II scan tool. Because freeze frame records the engine conditions when the malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio was lean or rich, etc. at the time of the malfunction.

REPLACE E.F.I. THROTTLE POSITION SENSOR

DTC	P0125	INSUFFICIENT COOLANT TEMP. FOR CLOSE LOOP FUEL CONTROL
------------	--------------	---

CIRCUIT DESCRIPTION

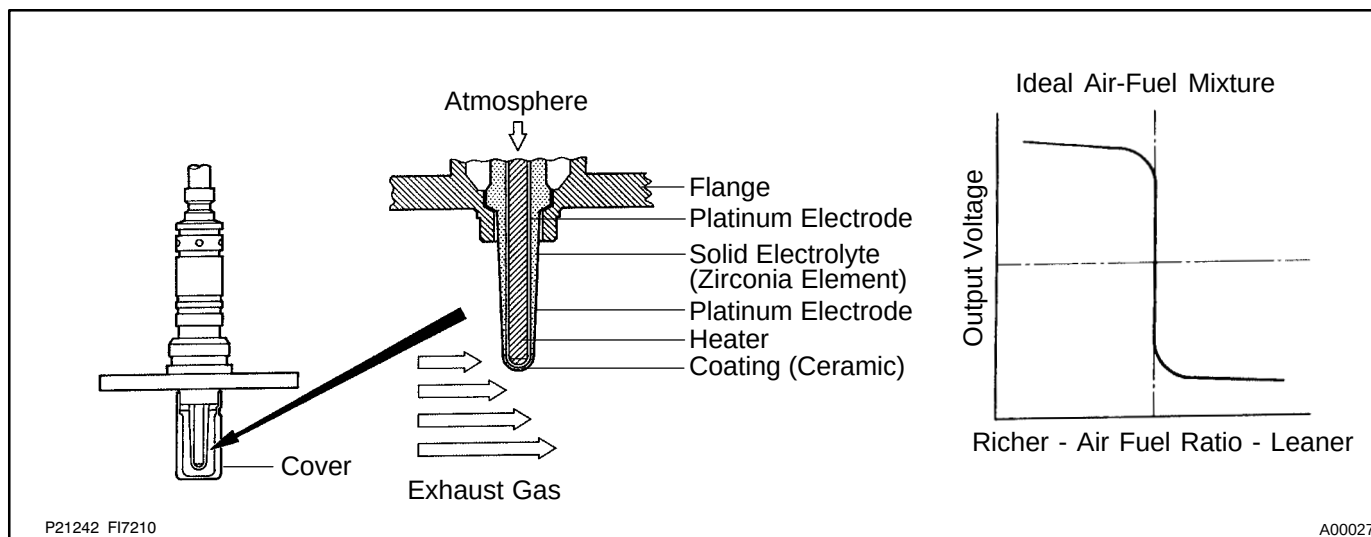
To obtain a high purification rate for the CO, HC and NO_x components of the exhaust gas, a three-way catalytic converter is used, but for the most efficient use of the three-way catalytic converter, the air-fuel ratio must be precisely controlled so that it is always close to the stoichiometric air-fuel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

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

When the air-fuel ratio becomes LEAN, the oxygen concentration in the exhaust increases and the oxygen sensor informs the ECM of the LEAN condition (small electromotive force: < 0.45 V).

When the air-fuel ratio is RICHER than the stoichiometric air-fuel ratio the oxygen concentration in the exhaust gas is reduced and the oxygen sensor informs the ECM of the RICH condition (large electromotive force: > 0.45 V). The ECM judges by the electromotive force from the oxygen sensor whether the air-fuel ratio is RICH or LEAN and controls the injection time accordingly. However, if malfunction of the oxygen sensor causes output of abnormal electromotive force, the ECM is unable to perform accurate air-fuel ratio control.

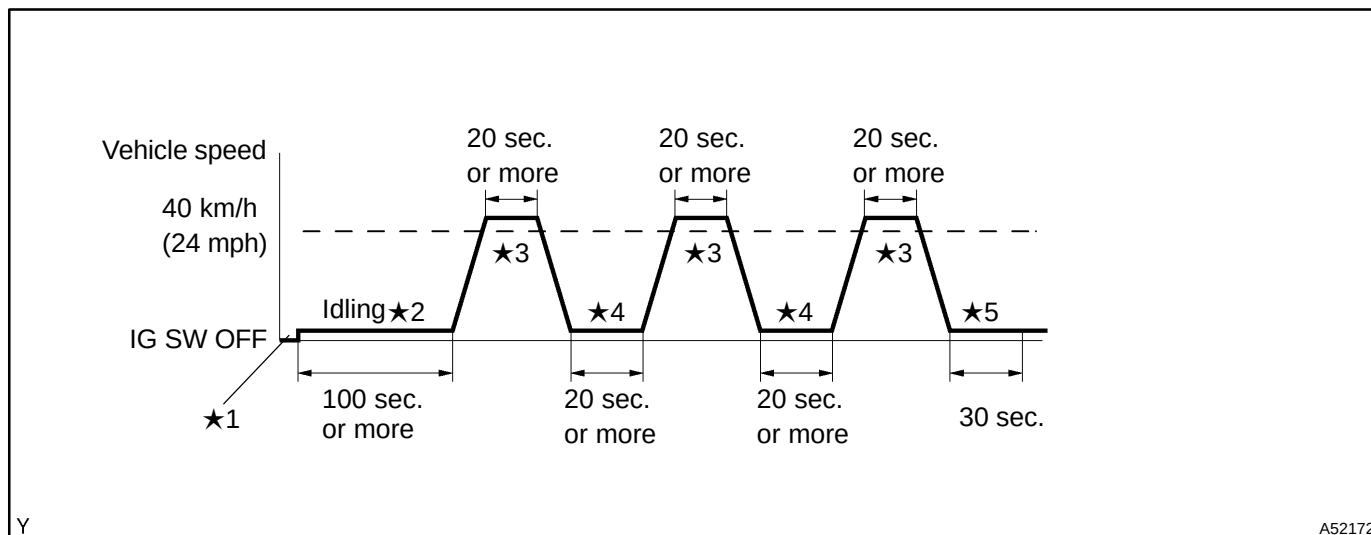
The main heated oxygen sensors include a heater which heats the zirconia element. The heater is controlled by the ECM. When the intake air volume is low (the temperature of the exhaust gas is low) current flows to the heater to heat the sensor for accurate oxygen concentration detection.



DTC No.	DTC Detecting Condition	Trouble Area
P0125	After engine is warmed up, A/F sensor output* does not change when conditions (a), (b), (c) and (d) continue for at least 1.5 min: *: Output value changes at inside of the ECM only (a) Engine speed: 1,500 rpm or more (b) Vehicle speed: 40 - 100 km/h (25 - 62 mph) (c) Throttle valve is not fully closed (d) 140 sec. or more after starting engine	• Open or short in A/F sensor (bank 1, 2 sensor 1) circuit • A/F sensor (bank 1, 2 sensor 1) • Air induction system • Fuel pressure • Injector • Gas leakage on exhaust system • PCV hose connection • ECM

HINT:

- After confirming DTC P0125, use the OBD II scan tool or hand-held tester to confirm voltage output of the A/F sensor (bank 1, 2 sensor 1) from the CURRENT DATA.
- The ECM controls the voltage of the AFR+, AFL+, AFR- and AFL- terminals of the ECM to the fixed voltage. Therefore, it is impossible to confirm the A/F sensor output voltage without the OBD II scan tool or hand-held tester.
- OBD II scan tool (excluding hand-held tester) displays the one fifth of the A/F sensor output voltage which is displayed on the hand-held tester.

CONFIRMATION DRIVING PATTERN

- Switch the hand-held tester from the normal mode to the check mode. (See page 05-5)★1
- Start the engine and let the engine idle for 100 seconds or more.★2
- Drive the vehicle at 40 km/h (24 mph) or more for 20 seconds or more.★3
- Let the engine idle for 20 seconds or more.★4
- Repeat the procedure ★3 and ★4 three times.
- Let the engine idle for 30 seconds.★5
- Check the O2 sensor output voltage.

HINT:

If a malfunction exists, the check engine warning light comes on.

NOTICE:

If the conditions on this test are not strictly followed, the malfunction will not be detected.

0

*1: Shielded

A6156

INSPECTION PROCEDURE

HINT:

Read freeze frame data using hand-held tester or OBD II scan tool. Because freeze frame records the engine conditions when the malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio was lean or rich, etc. at the time of the malfunction.

1 CHECK OTHER DTC OUTPUT(BESIDES DTC P0125)

YES

GO TO RELEVANT DTC CHART

NO

2 READ VALUE OF A/FS(B1S1, B2S1)

- Warm up the A/F sensor with the engine speed at 2,500 rpm for approx. 90 sec.
- Read the voltage value of the A/F sensor on the screen of OBD II scan tool or hand-held tester when you perform all the following conditions.

HINT:

The voltage of the AFR+ or AFL+ terminal of the ECM is fixed at 3.3 V and the voltage of the AFR- or AFL- terminal is fixed at 3.0 V. Therefore, it is impossible to check the A/F sensor output voltage at the terminals (AFR+, AFL+/AFR-, AFL-) of the ECM.

Result:

Condition	A/F Sensor Voltage Value
Engine idling	- Not remains at 3.30 V (0.660 V*) - Not remains at 3.8 V (0.76 V*) or more - Not remains at 2.8 V (0.56 V*) or less *: When you use OBD II scan tool (excluding TOYOTA hand-held tester)
Engine racing	
Driving at engine speed 1,500 rpm or more and vehicle speed 40 km/h (25 mph) or more, and operate throttle valve open and close	

HINT:

- During fuel enrichment, there is a case that the output voltage of the A/F sensor is below 2.8 V (0.56 V*), it is normal.
- During fuel cut, there is a case that the output voltage of the A/F sensor is above 3.8 V (0.76 V*), it is normal.
- If the output voltage of the A/F sensor remains at 3.30 V (0.660 V*) even after performing all the above conditions, the A/F sensor circuit may be open.
- If the output voltage of the A/F sensor remains at 3.8 V (0.76 V*) or more, or 2.8 V (0.56 V*) or less even after performing all the above conditions, the A/F sensor circuit may be short.

*: When you use the OBD II scan tool (excluding hand-held tester).

OK

Go to step 10

NG

3 CHECK CONNECTION OF PCV HOSE

NG

REPAIR OR REPLACE PCV HOSE

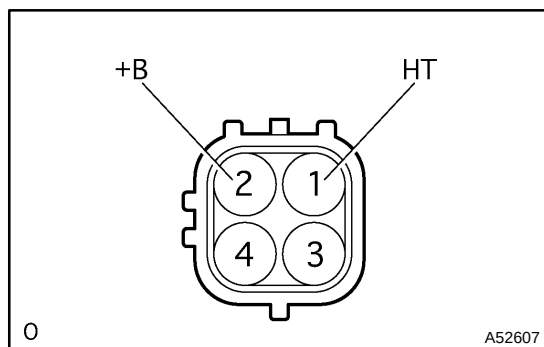
OK

4 CHECK HARNESS AND CONNECTOR(ECM - A/F SENSOR)

NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

5 INSPECT AIR FUEL RATIO SENSOR(CHECK HEATER RESISTANCE)

- (a) Disconnect the air fuel ratio sensor.
(b) Measure resistance between the terminals HT and +B of the air fuel ratio sensor.

Resistance: 2.16 - 2.88 Ω (20°C)

NG

REPLACE AIR FUEL RATIO SENSOR

OK

6 CHECK AIR INDUCTION SYSTEM (See page 11-1)

NG

REPAIR OR REPLACE AIR INDUCTION SYSTEM

OK

7 CHECK FUEL PRESSURE (See page 11-4)

NG

REPAIR OR REPLACE FUEL SYSTEM

OK

8 INSPECT FUEL INJECTOR ASSY (See page 11-7)

NG

REPLACE FUEL INJECTOR ASSY

OK

9 CHECK EXHAUST GAS LEAK

NG

REPAIR OR REPLACE EXHAUST GAS LEAKAGE POINT

OK

REPLACE AIR FUEL RATIO SENSOR

10	PERFORM CONFIRMATION DRIVING PATTERN (See page 05-52)
----	--

GO

11	READ OUTPUT DTC(DTC P0125 OUTPUT AGAIN)
----	---

YES	CHECK AND REPLACE ECM
-----	-----------------------

NO

12	CONFIRM VEHICLE RUNS OUT OF FUEL IN THE PAST
----	--

NO	CHECK FOR INTERMITTENT PROBLEMS
----	---------------------------------

YES

DTC P0125 IS CAUSED BY RUNNING OUT OF FUEL	
--	--

DTC	P0128	THERMOSTAT MALFUNCTION
------------	--------------	-------------------------------

CIRCUIT DESCRIPTION

If the water temperature becomes 75°C (167°F) or more, it is abnormal.

If not due to the thermostat malfunction, it is abnormal.

DTC No.	DTC Detecting Condition	Trouble Area
P0128	Condition (a), (b) or (c): (a) After starting engine at 20°C (68°F) (b) After engine is warmed up (c) THW < 75°C (167°F)	• Thermostat • Cooling system • E.F.I. engine coolant temp. sensor • ECM

INSPECTION PROCEDURE

HINT:

Read freeze frame data using hand-held tester or OBD II scan tool. Because freeze frame records the engine conditions when the malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio was lean or rich, etc. at the time of the malfunction.

1	INSPECT THERMOSTAT (See page 16-12)
----------	---

NG

REPLACE THERMOSTAT

OK

2	CHECK OTHER DTC OUTPUT(BESIDES DTC P0128)
----------	--

YES

GO TO RELEVANT DTC CHART

NO

CHECK AND REPLACE ECM

DTC	P0136	HEATED OXYGEN SENSOR CIRCUIT MALFUNCTION(BANK1 SENSOR2)
------------	--------------	--

DTC	P0156	HEATED OXYGEN SENSOR CIRCUIT MALFUNCTION (BANK2 SENSOR2)
------------	--------------	---

CIRCUIT DESCRIPTION

Refer to DTC P0125 on page [05-52](#) .

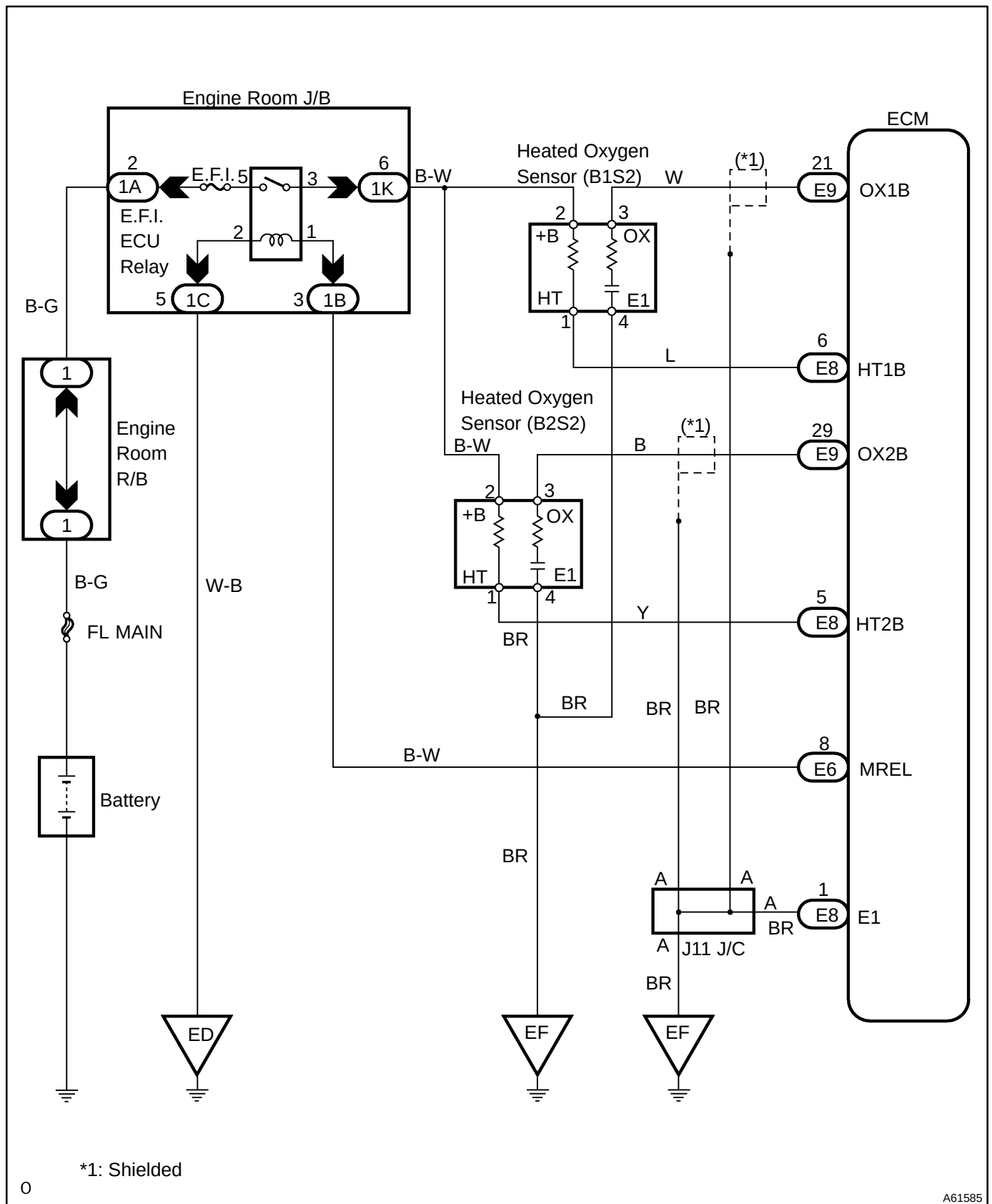
DTC No	DTC Detecting Condition	Trouble Area
P0136 P0156	Condition (a) and (b) continues for 60 secs. or more: (a) Voltage output of oxygen sensor remains at 0.35 V or more, or 0.55 V or less, during idling after engine is warmed up (b) Oxygen sensor output voltage amplitude is less than 0.3 V.	• Oxygen sensor • Fuel trim malfunction

HINT:

After confirming DTC P0125, use the hand-held tester to confirm voltage output of the oxygen sensor (bank 1 sensor 2) from the CURRENT DATA.

If voltage output of the oxygen sensor (bank 1 sensor 2) is less than 0.1 V, oxygen sensor (bank 1 sensor 2) circuit may be open or short.

WIRING DIAGRAM



A61585

INSPECTION PROCEDURE

NOTICE:

If the vehicle run out of fuel, the air-fuel ratio becomes LEAN and DTC P0125 will be recorded. and the check engine warning light then comes on.

HINT:

Read freeze frame data using hand-held tester. Because freeze frame records the engine conditions when the malfunction is detected, when troubleshooting it is useful for determining whether the vehicle was running or stopped, the engine warmed up or not, the air-fuel ratio lean or rich, etc. at the time of the malfunction.

1 CHECK OTHER DTC OUTPUT(BESIDES DTC P0136, P0156)

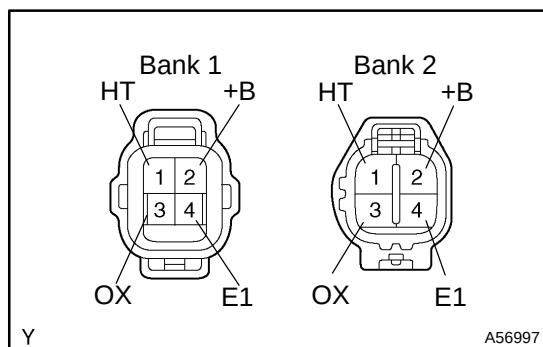
- (a) Read the DTC using the hand-held tester or OBDII scan tool.

YES

GO TO RELEVANT DTC CHART

NO

2 CHECK HARNESS AND CONNECTOR(ECM - OXYGEN SENSOR)

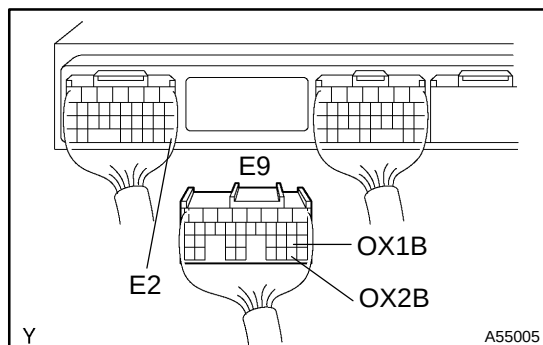


- (a) Disconnect the oxygen sensor connector.
 (b) Disconnect the ECM E9 connector.
 (c) Check continuity between the terminals OX1B and OX2B of the ECM connector and OX of the oxygen sensor connector.

Resistance: 1 Ω or less

- (d) Check for short between the terminals OX1B, OX2B and E2 of the ECM connector.

Resistance: 1 M Ω or more



NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

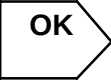
3 READ VALUE OF OBD II SCAN TOOL OR HAND-HELD TESTER(OXIGEN SENSOR)

- (a) Connect the OBD II scan tool or hand-held tester to the DLC3.
 (b) Warm up the engine to normal operating temperature.
 (c) Read the voltage output of the heated oxygen sensor when the engine is suddenly raced.

HINT:

Perform quick racing to 4,000 rpm 3 min. using the accelerator pedal.

Heated oxygen sensor output voltage: Alternates from 0.4 V or less to 0.6 V or more.

OK

CHECK THAT EACH CONNECTOR IS
PROPERLY CONNECTED

NG

REPLACE OXYGEN NO.2 SENSOR

DTC	P0141	OXYGEN SENSOR HEATER CIRCUIT MALFUNCTION (BANK 1 SENSOR 2)
------------	--------------	---

DTC	P0161	OXYGEN SENSOR HEATER CIRCUIT MALFUNCTION (BANK 2 SENSOR 2)
------------	--------------	---

CIRCUIT DESCRIPTION

Refer to DTC P0125 on page 05-52 .

DTC No.	DTC Detecting Condition	Trouble Area
P0141 P0161	- When the heater operates, heater current exceeds 2.35 A (2 trip detection logic) - Heater current of 0.2 A or less when the heater operates (2 trip detection logic)	- Open or short in heater circuit of oxygen sensor - Oxygen sensor heater - ECM

HINT:

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

WIRING DIAGRAM

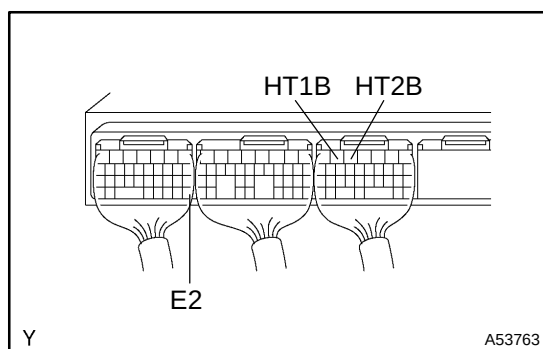
Refer to DTC P0136 on page 05-59 .

INSPECTION PROCEDURE

HINT:

Read freeze frame data using hand-held tester. Because freeze frame records the engine conditions when the malfunction is detected, when troubleshooting it is useful for determining whether the vehicle was running or stopped, the engine warmed up or not, the air-fuel ratio lean or rich, etc. at the time of the malfunction.

1	INSPECT ECM
----------	--------------------



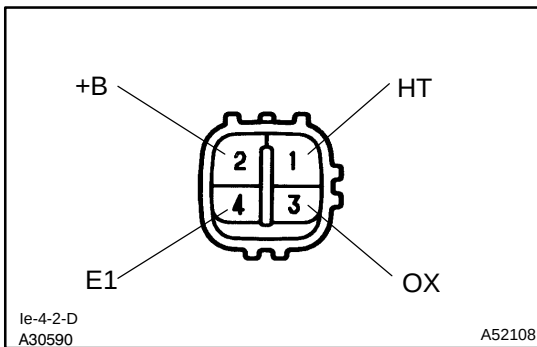
- Turn the ignition switch ON.
- Measure voltage between the terminals HT1B, HT2B and E2 of the ECM connector.
Voltage: 9 - 14 V

OK

CHECK AND REPLACE ECM

NG

2 INSPECT OXYGEN NO.2 SENSOR



- Disconnect the oxygen sensor connector.
- Measure resistance between the terminals HT and +B of the oxygen sensor.

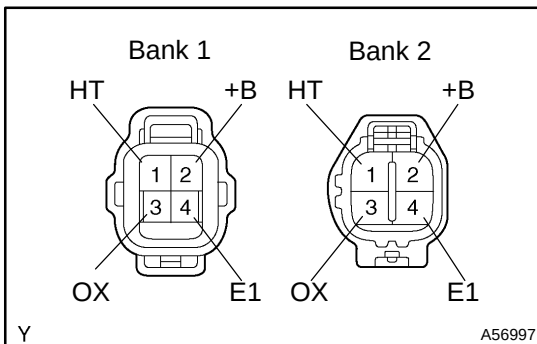
Resistance: 11 - 16 Ω (20°C)

NG

REPLACE OXYGEN NO.2 SENSOR

OK

3 CHECK HARNESS AND CONNECTOR(ECM - OXYGEN SENSOR)

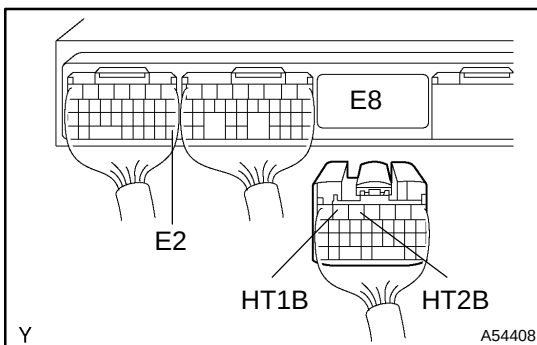


- Disconnect the oxygen sensor connector.
- Disconnect the ECM E8 connector.
- Check for open between the terminals HT of the oxygen sensor connector and HT1B, HT2B of the ECM connector.

Resistance: 1 Ω or less

- Check for short between the terminals HT1B, HT2B and E2 of the ECM connector.

Resistance: 1 M Ω or more

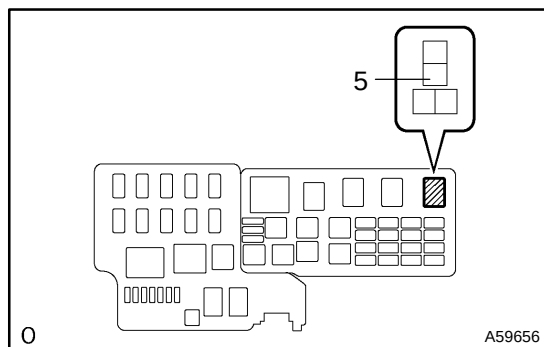


NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

4 CHECK HARNESS AND CONNECTOR(OXYGEN SENSOR - E.F.I. ECU RELAY)

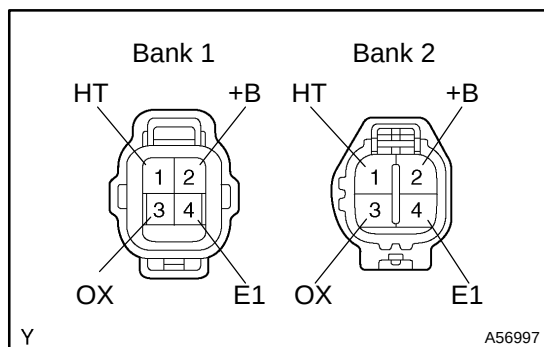


- (a) Disconnect the battery negative (-) terminal.
- (b) Disconnect the oxygen sensor connector.
- (c) Check for open between the terminals 5 of the E.F.I. ECU relay side connector and +B of the oxygen sensor connector.

Resistance: 1 Ω or less

NOTICE:

Do not insert the tester leads hard in the procedure (c), or the holder may be damaged.



NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

CHECK CHECK FOR ECM POWER SOURCE CIRCUIT

DTC	P0171	SYSTEM TOO LEAN(FUEL TRIM)(BANK1)
DTC	P0172	SYSTEM TOO RICH(FUEL TRIM)(BANK1)
DTC	P0174	SYSTEM TOO LEAN (FUEL TRIM)(BANK2)
DTC	P0175	SYSTEM TOO RICH (FUEL TRIM)(BANK2)

CIRCUIT DESCRIPTION

Fuel trim refers to the feedback compensation value compared against the basic injection time. Fuel trim includes short-term fuel trim and long-term fuel trim.

Short-term fuel trim is the short-term fuel compensation used to maintain the air-fuel ratio at its ideal theoretical value. The signal from the heated oxygen sensor indicates whether the air-fuel ratio is RICH or LEAN compared to the ideal theoretical value, triggering a reduction in fuel volume if the air-fuel ratio is rich, and an increase in fuel volume if it is lean.

Long-term fuel trim is overall fuel compensation carried out long-term to compensate for continual deviation of the short-term fuel trim from the central value due to individual engine differences, wear over time and changes in the usage environment.

If both the short-term fuel trim and long-term fuel trim are LEAN or RICH beyond a certain value, it is detected as a malfunction and the check engine warning (MIL) lights up.

DTC No.	DTC Detecting Condition	Trouble Area
P0171 P0174	When air fuel ratio feedback is stable after warming up engine, fuel trim is considerably in error on RICH side (2 trip detection logic)	• Air intake (hose loose) • Fuel line pressure • Injector blockage • Open or short in A/F sensor circuit • A/F sensor malfunction • Intake air flow meter • E.F.I. engine coolant temperature sensor • Gas leakage on exhaust system • PCV hose connection
P0172 P0175	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 • Fuel line pressure • Injector blockage • Open or short in A/F sensor circuit • A/F sensor malfunction • Intake air flow meter • E.F.I. engine coolant temperature sensor • Gas leakage on exhaust system • PCV hose connection

HINT:

If the total of the short-term fuel trim value and long-term fuel trim value is within $\pm 25\%$, the system is functioning normally.

WIRING DIAGRAM

Refer to DTC P0125 on page [05-52](#) .

INSPECTION PROCEDURE

HINT:

Read freeze frame data using hand-held tester. Because freeze frame records the engine conditions when the malfunction is detected, when troubleshooting it is useful for determining whether the vehicle was running or stopped, the engine warmed up or not, the air-fuel ratio lean or rich, etc. at the time of the malfunction.

1 CHECK AIR INDUCTION SYSTEM (See page 11-1)

NG

REPAIR OR REPLACE AIR INDUCTION SYSTEM

OK

2 CHECK CONNECTION OF PCV HOSE

NG

REPAIR OR REPLACE PCV HOSE

OK

3 INSPECT FUEL INJECTOR ASSY (See page 11-7)

NG

REPLACE FUEL INJECTOR ASSY

OK

4 INSPECT INTAKE AIR FLOW METER SUB-ASSY (See page 10-2)

NG

REPLACE INTAKE AIR FLOW METER SUB-ASSY

OK

5 INSPECT E.F.I. ENGINE COOLANT TEMPERATURE SENSOR (See page 10-2)

NG

REPLACE E.F.I. ENGINE COOLANT TEMPERATURE SENSOR

OK

6 CHECK FOR SPARK AND IGNITION (See page 18-1)

NG

GO TO IGNITION SYSTEM

OK

7 CHECK FUEL PRESSURE (See page 11-4)

NG **GO TO FUEL SYSTEM**

OK

8 CHECK EXHAUST GAS LEAK

NG **REPAIR OR REPLACE EXHAUST GAS LEAKAGE POINT**

OK

9 READ VALUE OF OBD II SCAN TOOL OR HAND-HELD TESTER(AIR FUEL RATIO SENSOR)

- Connect the OBD II scan tool or hand-held tester to the DLC3.
- Warm up the A/F sensor with the engine speed at 2,500 rpm for approx. 90 sec.
- Read the voltage value of the A/F sensor on the screen of OBD II scan tool or hand-held tester when you perform all the following conditions.

HINT:

The voltage of the AFR+ or AFL+ terminal of the ECM is 3.3 fixed the AFR- or AFL- terminal is 3.0 V fixed. Therefore, it is impossible to check the A/F sensor output voltage at the terminals (AFR+, AFL+/AFR-, AFL-) of the ECM.

Air fuel ration sensor output voltage:

Condition	A/F Sensor Voltage value
Engine idling	• Not remains at 3.30 V (0.660 V*) • Not remains at 3.8 V (0.76 V*) or more • Not remains at 2.8 V (0.56 V*) or less *: When you use OBD II scan tool (excluding hand-held tester)
Engine racing	
Driving at engine speed 1,500 rpm or more and vehicle speed 40 km/h (25 mph) or more, and operate throttle valve open and close	

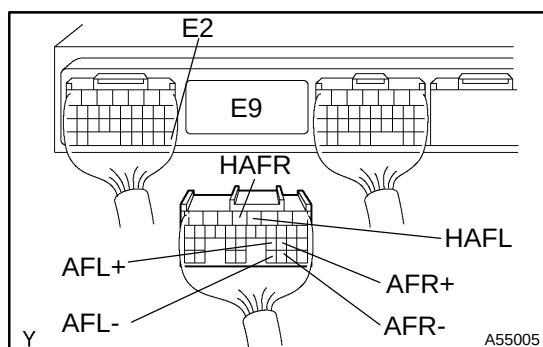
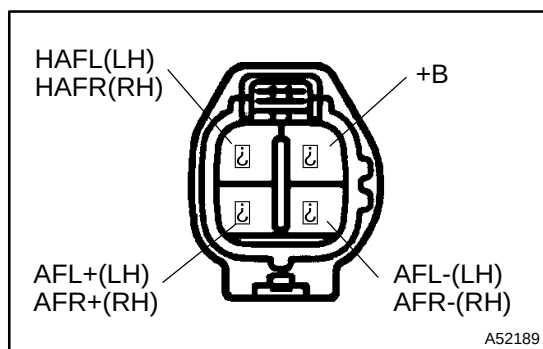
HINT:

- During fuel enrichment, there is a case that the output voltage of the A/F sensor is below 2.8 V (0.56 V*), it is normal.
- During fuel cut, there is a case that the output voltage of the A/F sensor is above 3.8 V (0.76 V*), it is normal.
- If the output voltage of the A/F sensor remains at 3.30 V (0.660 V*) even after performing all the above conditions, the A/F sensor circuit may be open.
- If the output voltage of the A/F sensor remains at 3.8 V (0.76 V*) or more, or 2.8 V (0.56 V*) or less even after performing all the above conditions, the A/F sensor circuit may be short.

*: When you use the OBD II scan tool (excluding hand-held tester).

OK **Go to step 11**

NG

10 CHECK HARNESS AND CONNECTOR(ECM - A/F SENSOR)

- (a) Disconnect the air fuel ratio sensor connector.
- (b) Disconnect the ECM E9 connector.
- (c) Check for open between the terminals HAFL of the ECM connector and HAFL of the air fuel ratio sensor connector.
Resistance: 1 Ω or less
- (d) Check for open between the terminals AFL+ of the ECM connector and AFL+ of the air fuel ratio sensor connector.
Resistance: 1 Ω or less
- (e) Check for open between the terminals AFL- of the ECM connector and AFL- of the air fuel ratio sensor connector.
Resistance: 1 Ω or less
- (f) Check for open between the terminals HAFR of the ECM connector and HAFR of the air fuel ratio sensor connector.
Resistance: 1 Ω or less
- (g) Check for open between the terminals AFR+ of the ECM connector and AFR+ of the air fuel ratio sensor connector.
Resistance: 1 Ω or less
- (h) Check for open between the terminals AFR- of the ECM connector and AFR- of the air fuel ratio sensor connector.
Resistance: 1 Ω or less
- (i) Check for short between the terminals HAFL, HAFR, AFL+, AFR+, AFL-, AFR- and E2 of the ECM connector.
Resistance: 1 M Ω or more

NG**REPAIR OR REPLACE HARNESS AND CONNECTOR****OK****REPLACE AIR FUEL RATIO SENSOR****11 PERFORM CONFIRMATION DRIVING PATTERN (See page 05-52)****GO****12 READ OUTPUT DTC(DTC P0171,P0172,P0174 AND P0175 OUTPUT AGAIN)****YES****CHECK AND REPLACE ECM****NO****13 CONFIRM VEHICLE RUNS OUT OF FUEL IN THE PAST****NO****CHECK FOR INTERMITTENT PROBLEMS****YES**

DTC P0171, P0172, P0174 or P0175 IS CAUSED BY RUNNING OUT OF FUEL
--

DTC	P0300	RANDOM/MULTIPLE CYLINDER MISFIRE DETECTED
DTC	P0301	CYLINDER 1 MISFIRE DETECTED
DTC	P0302	CYLINDER 2 MISFIRE DETECTED
DTC	P0303	CYLINDER 3 MISFIRE DETECTED
DTC	P0304	CYLINDER 4 MISFIRE DETECTED
DTC	P0305	CYLINDER 5 MISFIRE DETECTED
DTC	P0306	CYLINDER 6 MISFIRE DETECTED

CIRCUIT DESCRIPTION

Misfire: The ECM uses the crank position sensor and camshaft position sensor to monitor changes in the crankshaft rotation for each cylinder.

The ECM counts the number of times the engine speed change rate indicates that misfire has occurred. When the misfire rate equals or exceeds the count indicating that the engine condition has deteriorated, the MIL lights up.

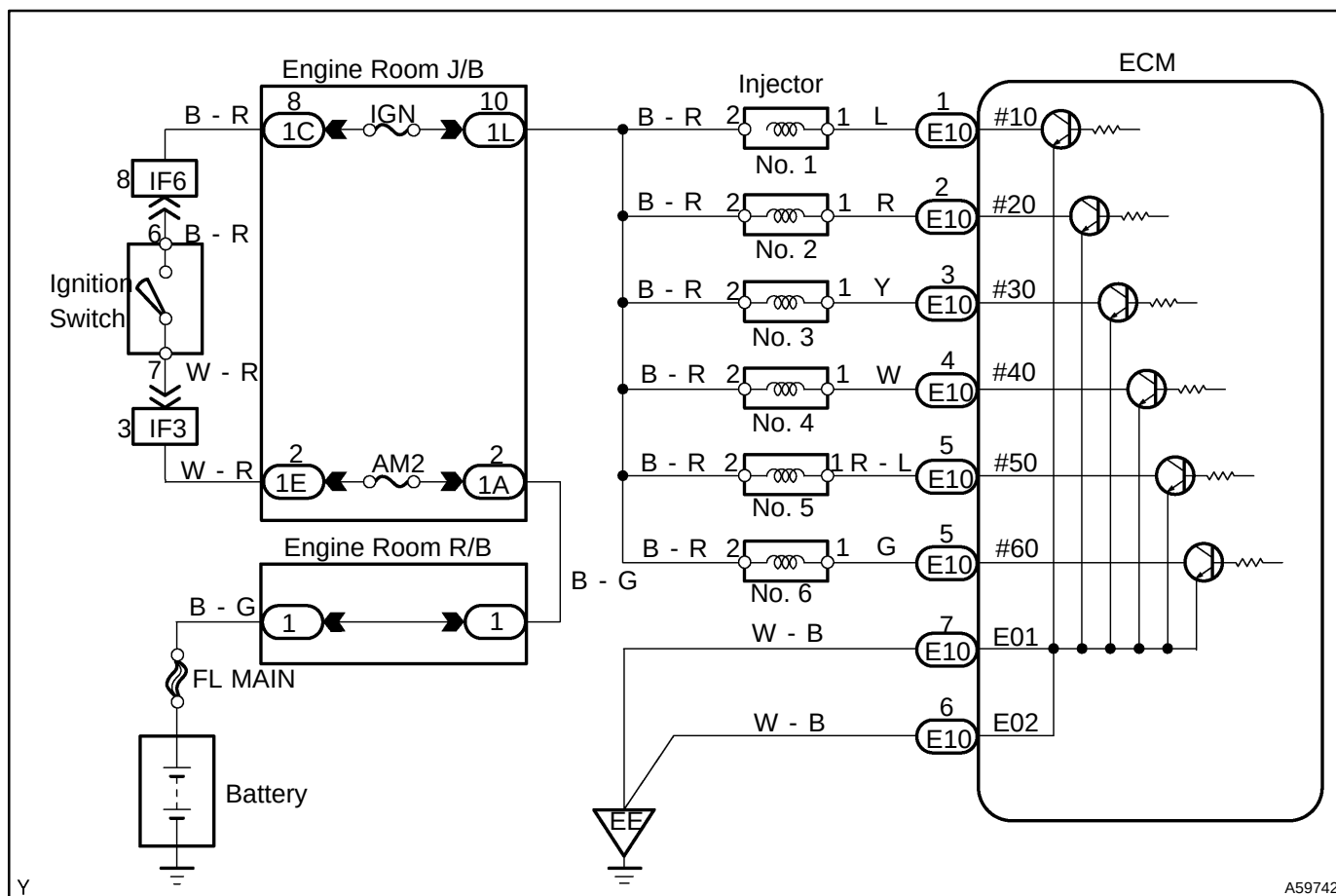
If the misfire rate is high enough and the driving conditions will cause catalyst overheating, the MIL blinks when misfiring occurs.

DTC No.	DTC Detecting Condition	Trouble Area
P0300	Misfiring of random cylinders is detected during any particular 200 or 1,000 revolutions	• Open or short in engine wire • Connector connection • Vacuum hose connection • Ignition system • Injector • Fuel pressure • Intake air flow meter • E.F.I. engine coolant temperature sensor • Compression pressure • Valve clearance • Valve timing • PCV hose connection • ECM
P0301 P0302 P0303 P0304 P0305 P0306	For any particular 200 revolutions for engine, misfiring is detected which can cause catalyst overheating (This causes MIL to blink)	
	For any particular 1,000 revolutions of engine, misfiring is detected which causes a deterioration in emission (2 trip detection logic)	

HINT:

When the 2 or more codes for a misfiring cylinder are recorded repeatedly but no Random Misfire code is recorded, it indicates that the misfires were detected and recorded at different times.

WIRING DIAGRAM



CONFIRMATION DRIVING PATTERN

- Connect the hand-held tester or OBD II scan tool.
- Record the DTC and the freeze frame data.
- Use the hand-held tester to set to the check mode (See page 05-5).
- Drive the vehicle several times with the engine speed, load and its surrounding range shown with the ENGINE SPD, CALC LOAD in the freeze frame data or the 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 the first time. Then repeat the simulation process again.

HINT:

In order to memorize DTC of misfire, it is necessary to drive around MISFIRE RPM, MISFIRE LOAD in the data list for the following period of time.

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

- Check whether there is misfire or not by monitoring DTC and the freeze frame data. After that, record them.
- Turn the ignition switch OFF and wait at least 5 seconds.

INSPECTION PROCEDURE

HINT:

- If is case that DTC besides misfire is memorized simultaneously, first perform the troubleshooting for them.
- Read freeze frame data using hand-held tester or OBD II scan tool. Because freeze frame data records the engine conditions when the malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio was lean or rich, etc. at the time of the malfunction.
- When the vehicle is brought to the workshop and the misfire is not occurred, misfire can be confirmed by reproducing the condition or freeze frame data. Also, after finishing the repair, confirm that there is no misfire. (See the confirmation driving pattern)
- When either of SHORT FT #1, LONG FT #1, SHORT FT #2 or LONG FT #2 in the freeze frame data is besides the range of $\pm 20\%$, there is a possibility that the air-fuel ratio is inclining either 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 or misfire only during warming up.
- In the case that misfire cannot be reproduced, the reason may be because of the driving with lack or fuel, the use of improper fuel, a stain of ignition plug, and etc.

1 CHECK WIRE HERNESS, CONNECTOR AND VACUUM HOSE IN ENGINE ROOM

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

NG

REPAIR OR REPLACE, THEM CONFIRM THAT THERE IS NO MISFIRE

OK

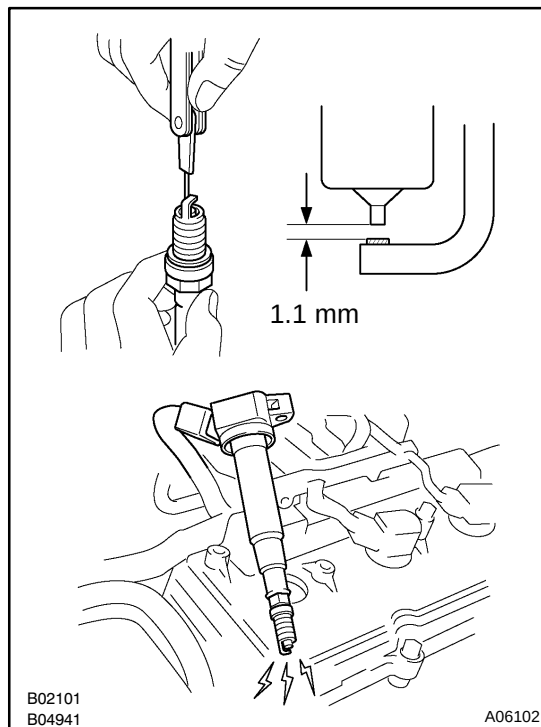
2 CHECK CONNECTION OF PCV HOSE

NG

REPAIR OR REPLACE PCV HOSE

OK

3 INSPECT SPARK PLUG

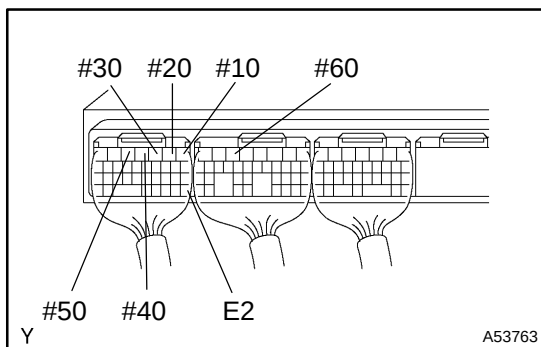


- (a) Check electrode gap.
OK: 1.1 mm (0.043 in.)
- (b) Install the spark plug to the ignition coil, and connect the ignition coil connector.
- (c) Disconnect the injector connector.
- (d) Ground the spark plug.
- (e) Check if spark occurs while engine is being cranked.
OK: Spark jumps across electrode gap.

NG

REPLACE SPARK PLUG

OK

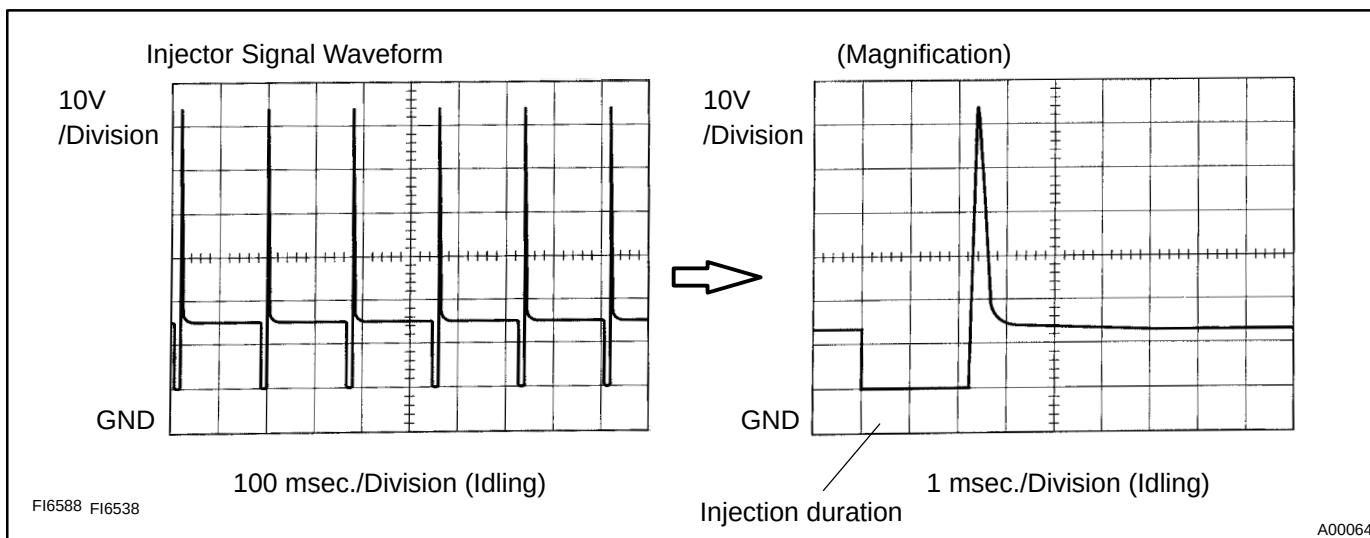
4 INSPECT ECM

- (a) Turn the ignition switch ON.
- (b) Measure the voltage between #10-#60 and E2 terminal of the ECM connector.

Voltage: 9 - 14 V

HINT:

With the engine idling, check the waveform between terminals #10 - #60 and E01 of the ECM connector.



OK

Go to step 7

NG

5 INSPECT FUEL INJECTOR ASSY(RESISTANCE) (See page 11-7)

NG

REPLACE FUEL INJECTOR ASSY

OK

6 CHECK FUEL PRESSURE (See page 11-4)

NG

REPAIR OR REPLACE FUEL SYSTEM

OK

CHECK HARNESS AND CONNECTOR

7	INSPECT FUEL INJECTOR ASSY(INJECTION) (See page 11-7)
---	--

NG

REPLACE FUEL INJECTOR ASSY

OK

8	INSPECT INTAKE AIR FLOW METER SUB-ASSY (See page 10-2)
---	---

NG

REPAIR OR REPLACE INTAKE AIR FLOW
METER SUB-ASSY

OK

9	INSPECT E.F.I. ENGINE COOLANT TEMPERATURE SENSOR (See page 10-2)
---	---

NG

REPAIR OR REPLACE E.F.I. ENGINE COOLANT
TEMPERATURE SENSOR

OK

CHECK COMPRESSION PRESSURE, VALVE CLEARANCE AND VALVE TIMING

DTC	P0325	KNOCK SENSOR1 CIRCUIT MALFANCTION (BANK1)
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DTC	P0330	KNOCK SENSOR2 CIRCUIT MALFANCTION (BANK2)
------------	--------------	--

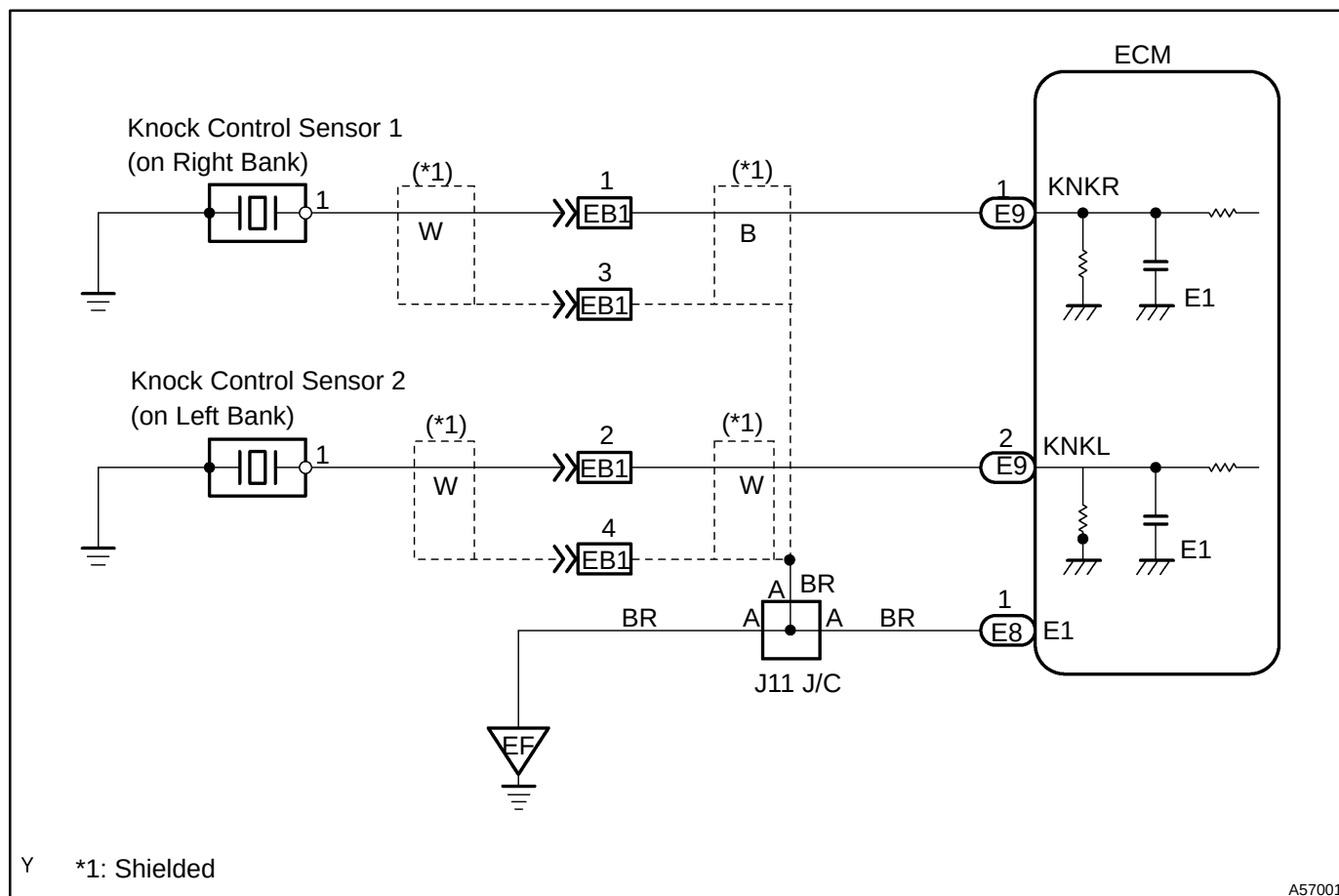
CIRCUIT DESCRIPTION

Each of knock sensor is fitted to the right bank and left bank of 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 between 2,000 rpm and 5,600 rpm	• Open or short in knock sensor 1 circuit • Knock control sensor 1 (looseness) • ECM
P0330	No knock sensor 2 signal to ECM with engine speed between 2,000 rpm and 5,600 rpm	• Open or short in knock sensor 2 circuit • Knock control sensor 2 (looseness) • ECM

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

WIRING DIAGRAM

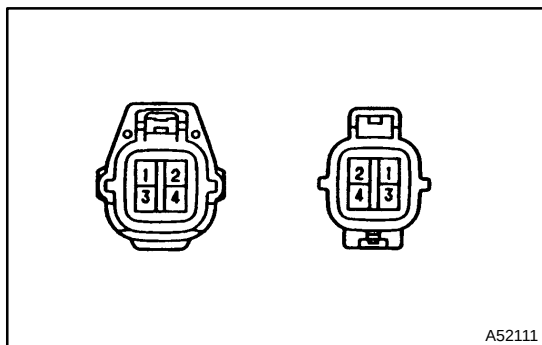


INSPECTION PROCEDURE

HINT:

- DTC P0325 is for the right bank knock sensor circuit.
- DTC P0330 is for the left bank knock sensor circuit.
- Read freeze frame data using hand-held tester or OBD II scan tool. Because freeze frame records the engine conditions when the malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio was lean or rich, etc. at the time of the malfunction.

1 CHECK KNOCK SENSOR CIRCUIT



- (a) Disconnect the wire from wire connector .
- (b) Connect the terminals of the disconnected EB1 male connector and EB1 female as follows.

Male connector ↔ Female connector
Terminal 1 ↔ Terminal 2
Terminal 2 ↔ Terminal 1

- (c) Turn the ignition switch ON and push the OBD II scan tool or hand-held tester main switch ON.
- (d) After the engine is warmed up, perform quick racing to 4,000 rpm 3 times.

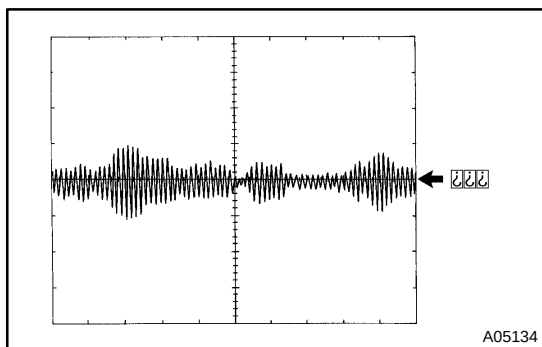
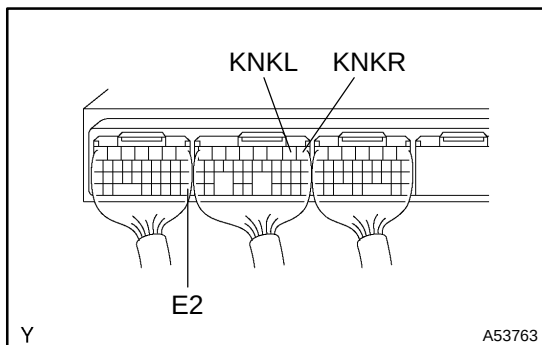
Result:

A	DTC same as when vehicle brought in P0325 → P0325 or P0330 → P0330
B	DTC different to when vehicle brought in P0325 → P0330 or P0330 → P0325

- (e) Check the output waveform.

HINT:

Item	Contents
Terminal	KNKL, KNKR ↔ E2
Equipment Set	0.5V/DIV, 1ms/DIV
Condition	After warming up the engine, keep the engine speed 4,000 rpm.



B

Go to step 3

A

2 CHECK HARNESS AND CONNECTOR(EB1 CONNECTER - ECM)**NG****REPAIR OR REPLACE HARNESS AND CONNECTOR****OK****CHECK AND REPLACE ECM****3 CHECK HARNESS AND CONNECTOR(EB1 CONNECTER - KNOCK SENSOR)**

HINT:

- If DTC P0325 has changed to P0330, check the knock sensor circuit on the right bank side.
- If DTC P0330 has changed to P0325, check the knock sensor circuit on the left bank side.

NG**REPAIR OR REPLACE HARNESS AND CONNECTOR****OK****REPLACE KNOCK CONTROL SENSOR**

DTC	P0335	CRANKSHAFT POSITION SENSOR CIRCUIT MALFUNCTION
------------	--------------	---

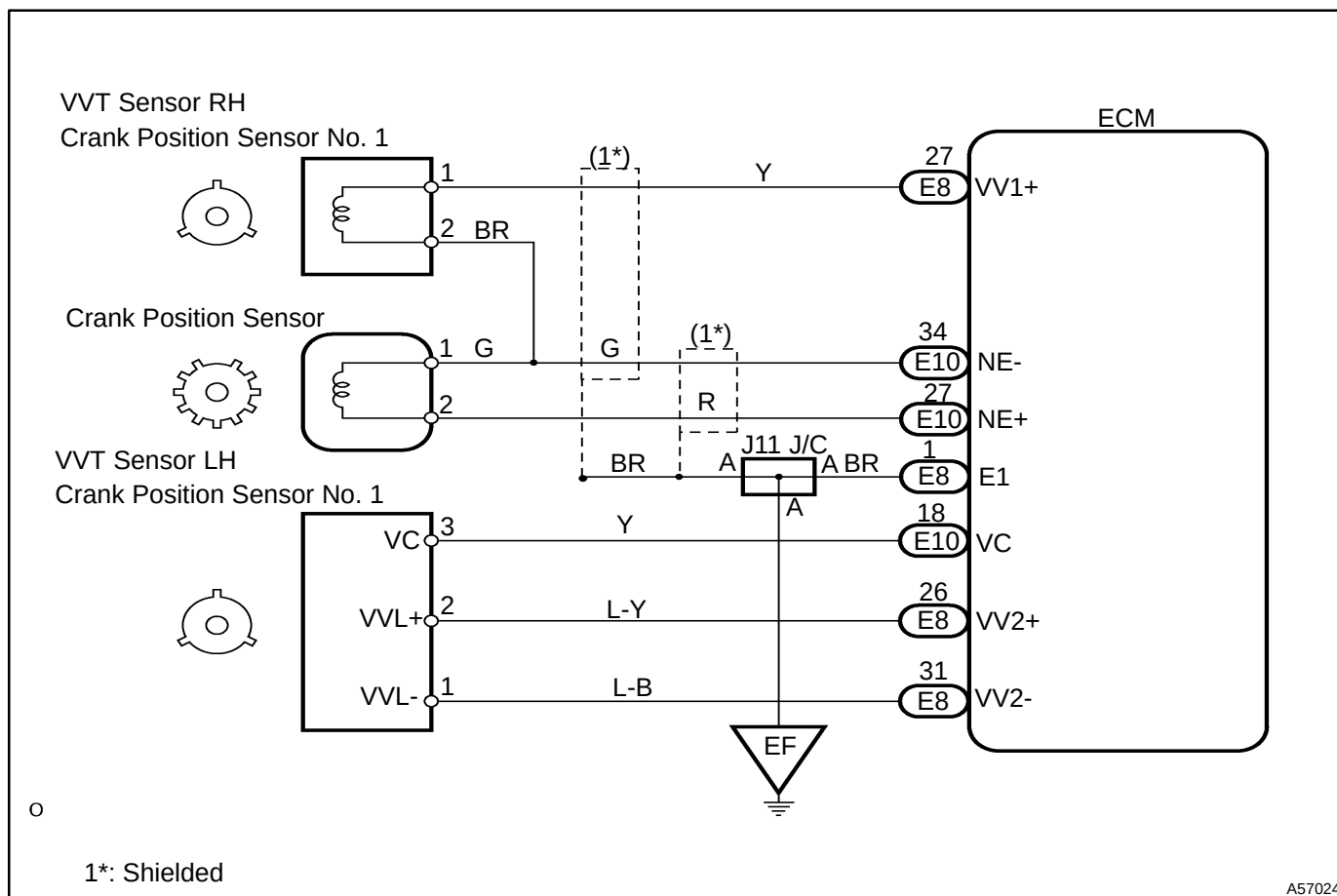
CIRCUIT DESCRIPTION

The crank position sensor (NE signal) consists of a magnet, iron core and pickup coil.

The NE signal plate has 34 teeth and is installed the crankshaft timing pulley. The NE signal sensor generates 34 signals at every engine revolution. The engine ECM detects the crankshaft angle and the engine speed based on the NE signals, and the cylinder detection based on the combination of the G2 and NE signals.

DTC No.	DTC Detecting Condition	Trouble Area
P0335	No crank position sensor signal to ECM during cranking (2 trip detection logic)	• Open or short in crank position sensor circuit • Crank position sensor • Crankshaft timing pulley • ECM
	No crank position sensor signal to ECM with engine speed 600 rpm or more (2 trip detection logic)	

WIRING DIAGRAM



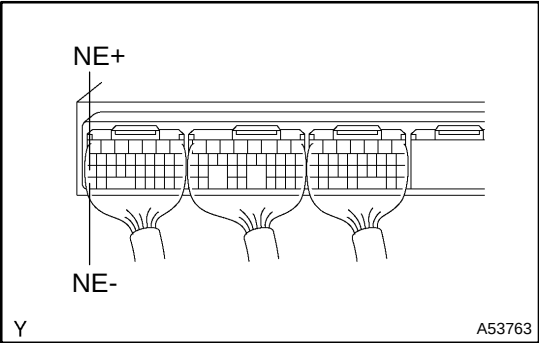
A57024

INSPECTION PROCEDURE

HINT:

- Perform troubleshooting of DTC P0335 first. If no trouble is found, troubleshoot the following mechanical systems.
- Read freeze frame data using hand-held tester or OBD II scan tool. Because freeze frame records the engine conditions when the malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio was lean or rich, etc. at the time of the malfunction.

1 INSPECT CRANK POSITION SENSOR (See page 18-2)

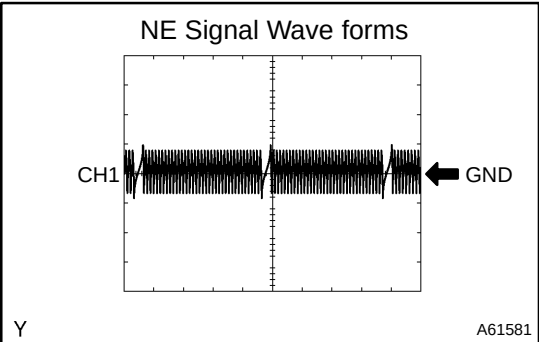


(a) Check the output waveform.

Item	Contents
Terminal	CH1: NE+↔NE-
Equipment Set	5V/DIV, 20ms/DIV
Condition	During Cranking or idling

HINT:

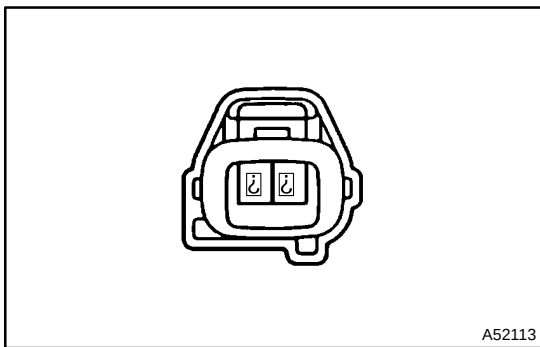
The correct waveforms are as shown.



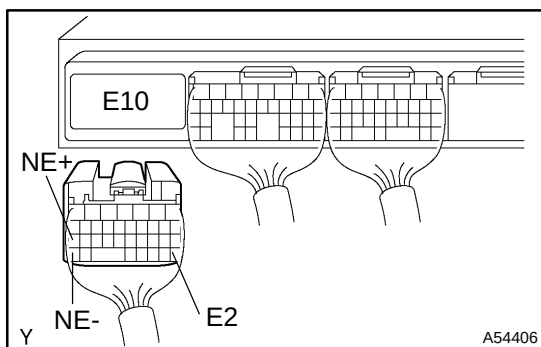
NG REPLACE CRANK POSITION SENSOR

OK

2 CHECK HARNESS AND CONNECTOR(ECM - CRANK POSITION SENSOR)



- (a) Disconnect the ECM E10 connector.
- (b) Disconnect the crank position sensor connector.
- (c) Check for open between the terminals NE+ of the ECM connector and 1 of the crank position sensor connector.
Resistance: 1 Ω or less
- (d) Check for short between the terminals NE+ and E2 of the ECM connector.
Resistance: 1 M Ω or more
- (e) Check for open between the terminals NE- of the ECM connector and 2 of the crank position sensor connector.
Resistance: 1 Ω or less
- (f) Check for short between the terminals NE- and E2 of the ECM connector.
Resistance: 1 M Ω or more



NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

3 CHECK SENSOR INSTLLATION(CRANK POSITION SENSOR)

NG

TIGHTEN SENSOR

OK

4 CHECK CRANKSHAFT TIMING PULLEY

NG

REPLACE CRANKSHAFT TIMING PULLEY

OK

CHECK AND REPLACE ECM

DTC	P0340	CAMSHAFT POSITON SENSOR CIRCUIT MALFUNCTION
------------	--------------	--

CIRCUIT DESCRIPTION

The camshaft position sensor (VV1 signal) consists of a signal plate and a pick up coil. On the signal plate for a cam position sensor, there are three convex on its outer circumference and it is fixed to the camshaft timing gear.

When the camshaft turns, the convex of the signal plate and the air-gap over the pick up coil will switch, and with this the magnetic field will change and generate electricity inside the pick up coil. In addition, VV2 signal adopts a sensor using a signal plate and a magnetic resistance element. By switching the air-gap of the signal plate and the sensor, ECM voltage will be converted to a rectangular wave and output as a signal. The NE signal plate has 34 teeth and is mounted on the crankshaft. The NE signal sensor generates 34 signals at every engine revolution. The ECM detects the crankshaft angle based on the G signal and the actual crankshaft angle and the engine speed by the NE signal.

DTC No.	DTC Detecting Condition	Trouble Area
P0340	No crank position sensor No.1 signal to ECM during cranking (2 trip detection logic)	• Open or short in camshaft position sensor circuit • Crank position sensor No.1 • Camshaft timing gear • ECM
	No crank position sensor No.1 signal to ECM with engine speed 600 rpm or more	

WIRING DIAGRAM

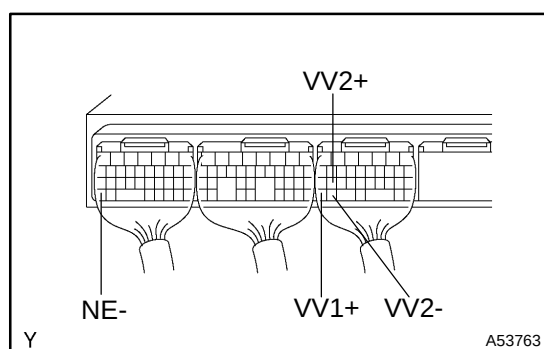
Refer to DTC P0335 on page 05-80 .

INSPECTION PROCEDURE

HINT:

Read freeze frame data using hand-held tester or OBD II scan tool. Because freeze frame records the engine conditions when the malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio was lean or rich, etc. at the time of the malfunction.

1 INSPECT CRANK POSITION SENSOR (See page 18-2)

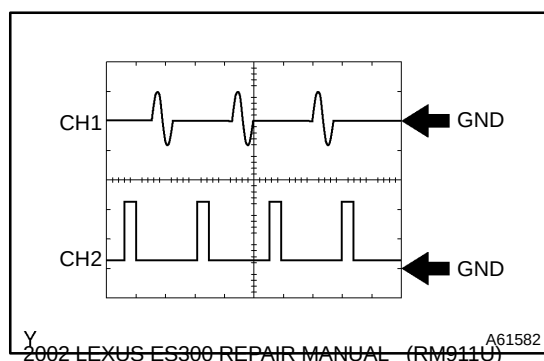


(a) Check the output waveform.

Item	Contents
Terminal	CH1: VV1+↔NE- CH2: VV2+↔VV2-
Equipment Set	5V/DIV, 20MS/DIV
Condition	During Cranking or idling

HINT:

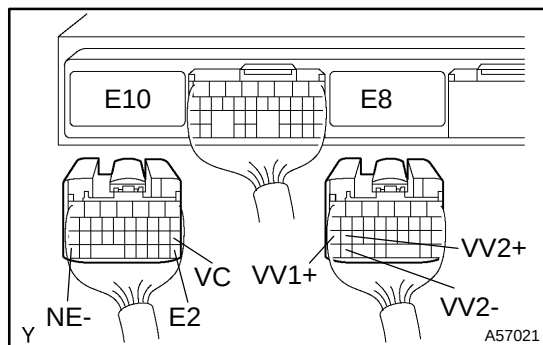
The correct waveforms are as shown.



NG

REPLACE CRANK POSITION SENSOR

OK

2 CHECK HARNESS AND CONNECTOR(ECM - CRANK POSITION SENSOR NO.1)

- (a) Disconnect the ECM E8 and E10 connector.
 (b) Disconnect the crank position sensor No.1 connector.
 (c) Check for continuity between terminals shown in the illustration and table.

Standard (check for open) :

Sensor position	Crank position sensor No.1 Connector terminal	ECM Connector terminal	Continuity
Bank 1	VV1+	VV1+	Continuity
Bank 1	NE-	NE-	Continuity
Bank 2	VC	VC	Continuity
Bank 2	VVL+	VV2+	Continuity
Bank 2	VVL-	VV2-	Continuity

(Check for short)

Sensor position	Crank position sensor No.1 Connector terminal	ECM Connector terminal	Continuity
Bank 1	VV1+	E2	No Continuity
Bank 1	NE-	E2	No Continuity
Bank 2	VC	E2	No Continuity
Bank 2	VVL+	E2	No Continuity
Bank 2	VVL-	E2	No Continuity

NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

3 CHECK SENSOR INSTALLATION(CRANK POSITION SENSOR NO.1)

NG

TIGHTEN SENSOR. REPLACE CAMSHAFT TIMING GEAR

OK

4 CHECK CAMSHAFT TIMING PULLEY

NG

REPLACE CAMSHAFT TIMING PULLEY

OK

CHECK AND REPLACE ECM

DTC	P0420	CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK1)
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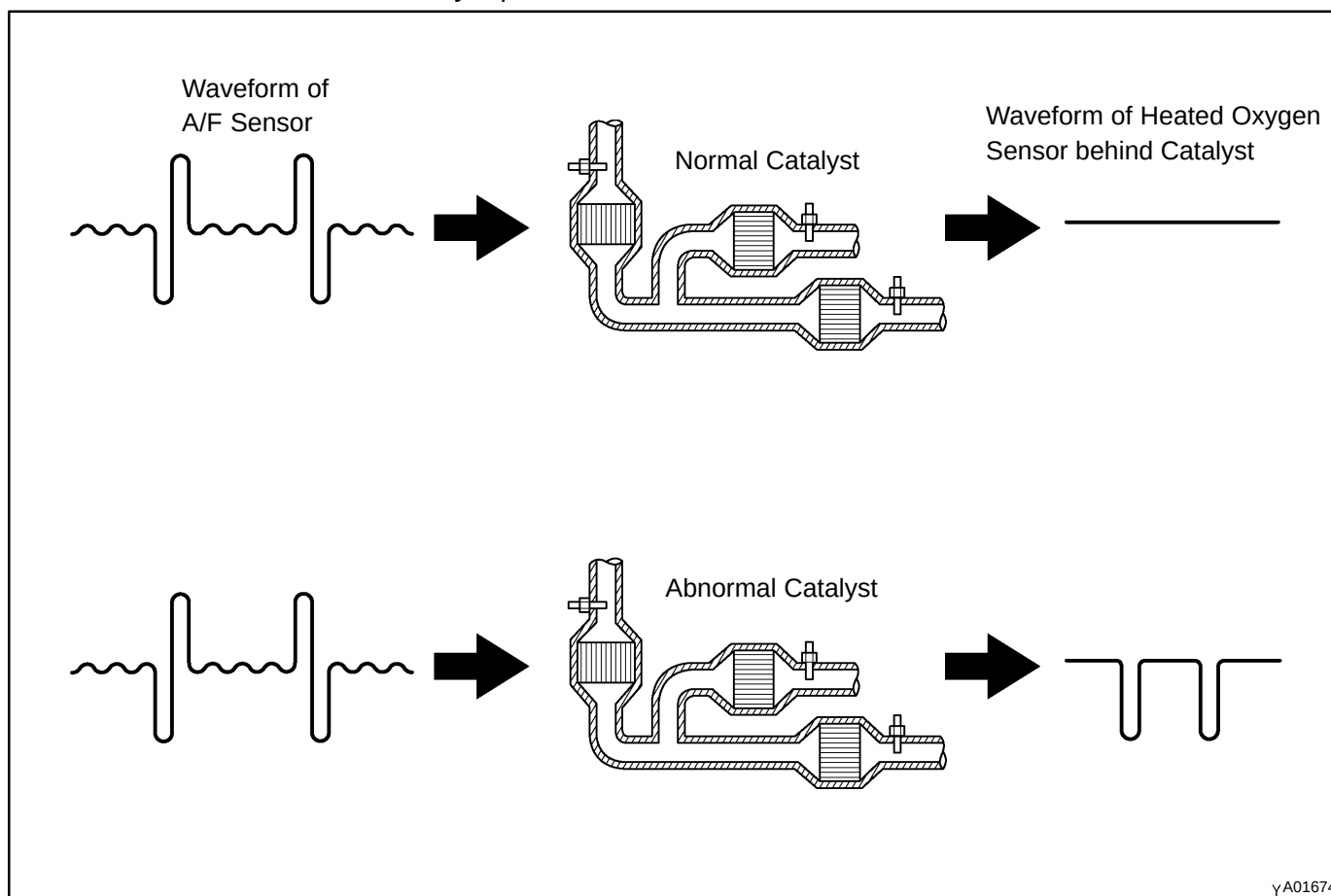
DTC	P0430	CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK2)
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CIRCUIT DESCRIPTION

The ECM observes the waveform of the heated oxygen sensor located behind the catalyst to determine whether the catalyst performance has deteriorated.

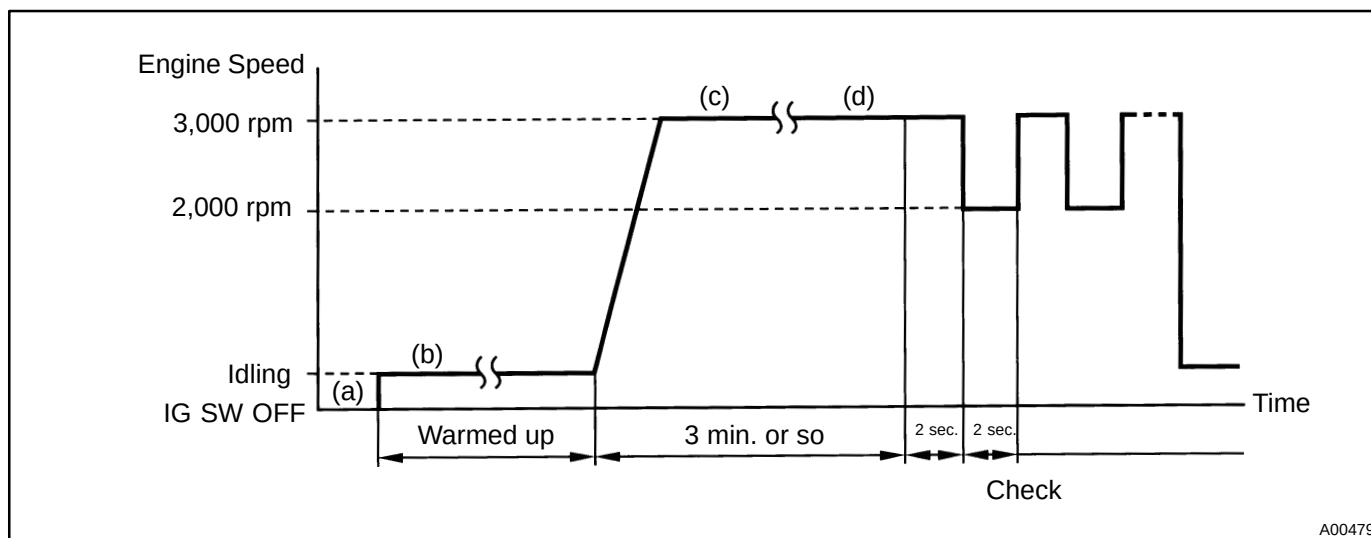
If the catalyst is functioning normally, the waveform of the heated oxygen sensor located behind the catalyst switches back and forth between rich and lean much more slowly.

When the waveform of the heated oxygen sensor located behind the catalyst alternates flutteringly between rich and lean, it indicates that catalyst performance has deteriorated.



DTC No.	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, waveform of heated oxygen sensor (bank 1 sensor 2) alternates flutteringly between rich and lean (2 trip detection logic)	• Gas leakage on exhaust system • A/F sensor (bank 1 sensor 1) • Heated oxygen sensor (bank 1 sensor 2) • Exhaust manifold
P0430	After engine and catalyst are warmed up, and while vehicle is driven within set vehicle and engine speed range, waveform of heated oxygen sensor (bank 2 sensor 2) alternates flutteringly between rich and lean (2 trip detection logic)	• Gas leakage on exhaust system • A/F sensor (bank 2 sensor 1) • Heated oxygen sensor (bank 2 sensor 2) • Exhaust manifold

CONFIRMATION ENGINE RACING PATTERN



- (a) Connect the OBD II scan tool or hand-held tester to the DLC3.
- (b) Start engine and warm it up with all the accessories switched OFF until the water temperature is stable.
- (c) Race the engine at 2,500 - 3,000 rpm for about 3 min.
- (d) When racing the engine at 3,000 rpm for 2 sec. and 2,000 rpm for 2 sec. alternately, check the waveform of the heated oxygen sensor (bank 1 sensor 2).

INSPECTION PROCEDURE

HINT:

Read freeze frame data using hand-held tester or OBD II scan tool. Because freeze frame records the engine conditions when the malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio was lean or rich, etc. at the time of the malfunction.

1 CHECK OTHER DTC OUTPUT (BESIDES DTC P0420, P0430)

- (a) Read the DTC using the hand-held tester or OBD II scan tool.

YES

GO TO RELEVANT DTC CHART

NO

2 CHECK EXHAUST GAS LEAK

NG

REPAIR OR REPLACE

OK

3 CHECK AIR FUEL RATIO SENSOR (BANK1, 2 SENSOR1) (See page 12-1)

NG

REPAIR OR REPLACE AIR FUEL RATIO SENSOR

OK

4	CHECK OXYGEN NO.2 SENSOR (BANK1, 2 SENSOR2) (See page 12-6)
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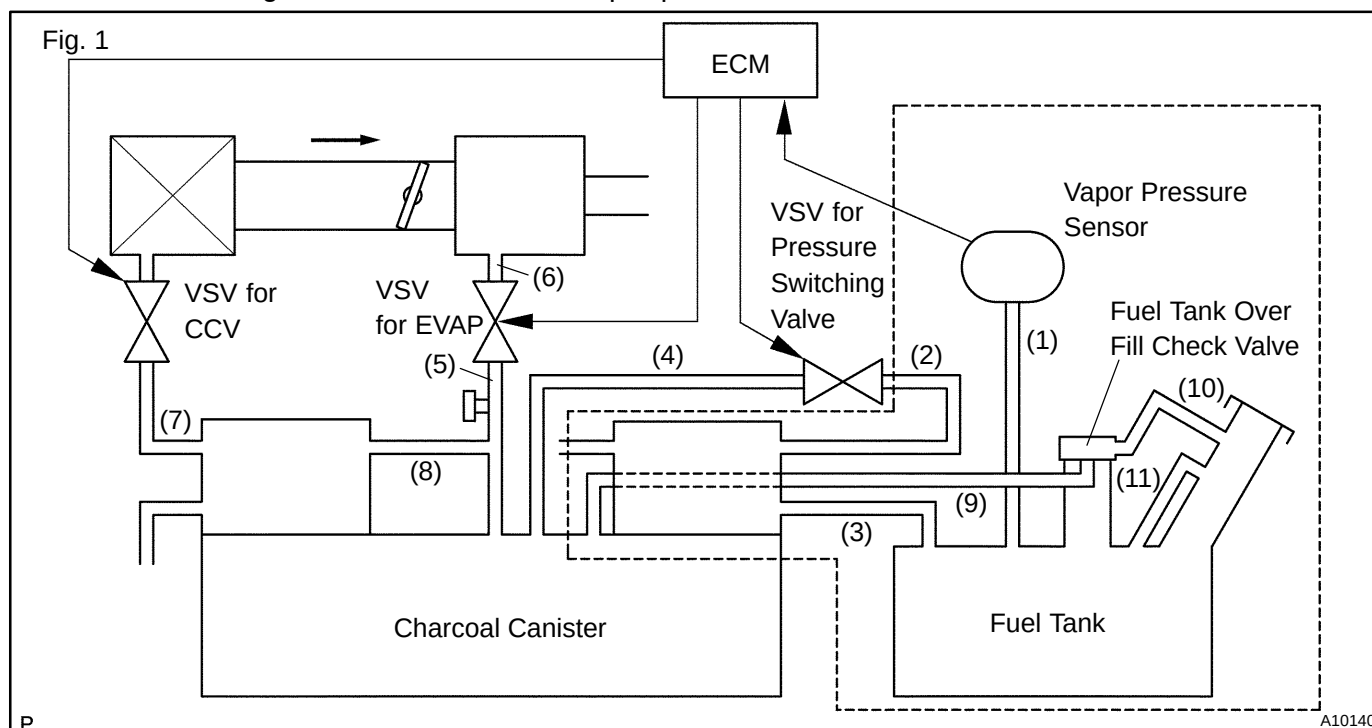
NG	REPAIR OR REPLACE OXYGEN NO.2 SENSOR
----	--------------------------------------

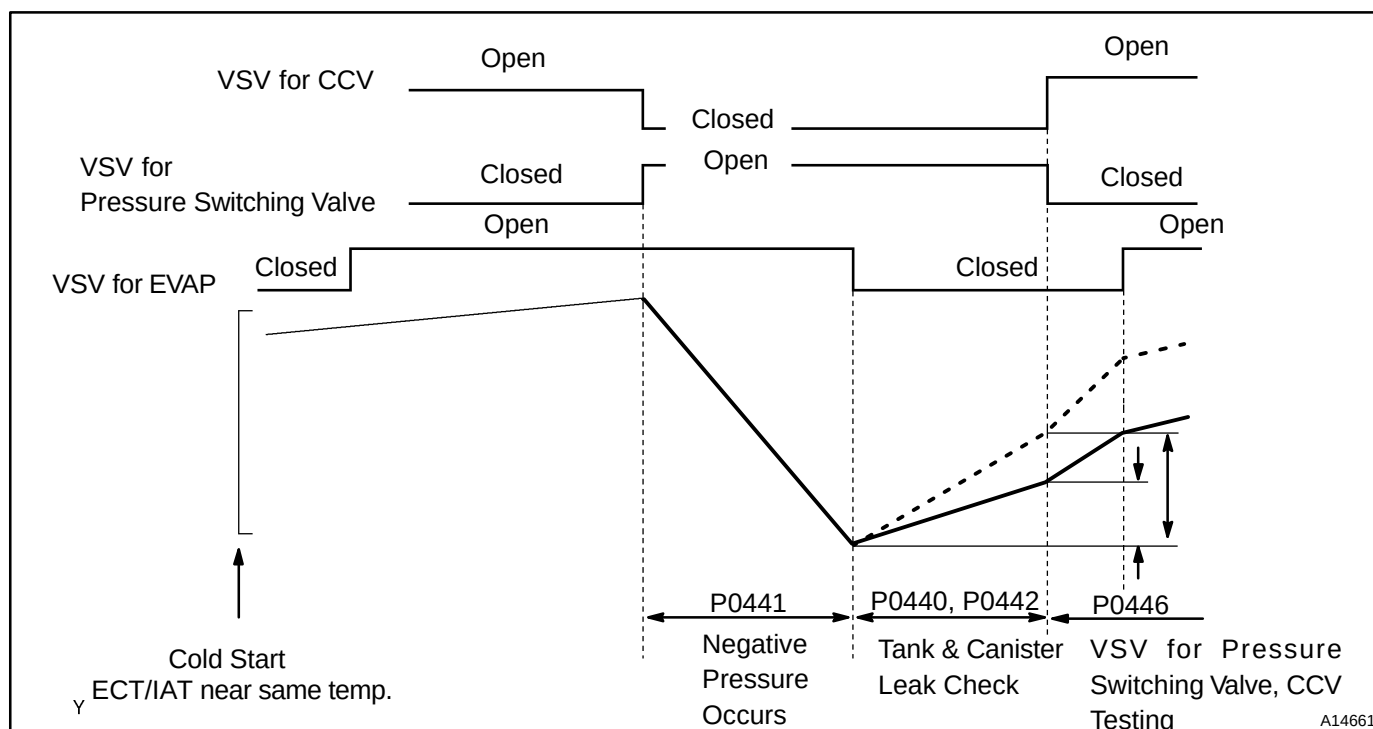
OK

REPLACE EXHAUST PIPE ASSY CENTER

DTC	P0442	EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK)
-----	-------	---

DTC P0440 or P0442 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.



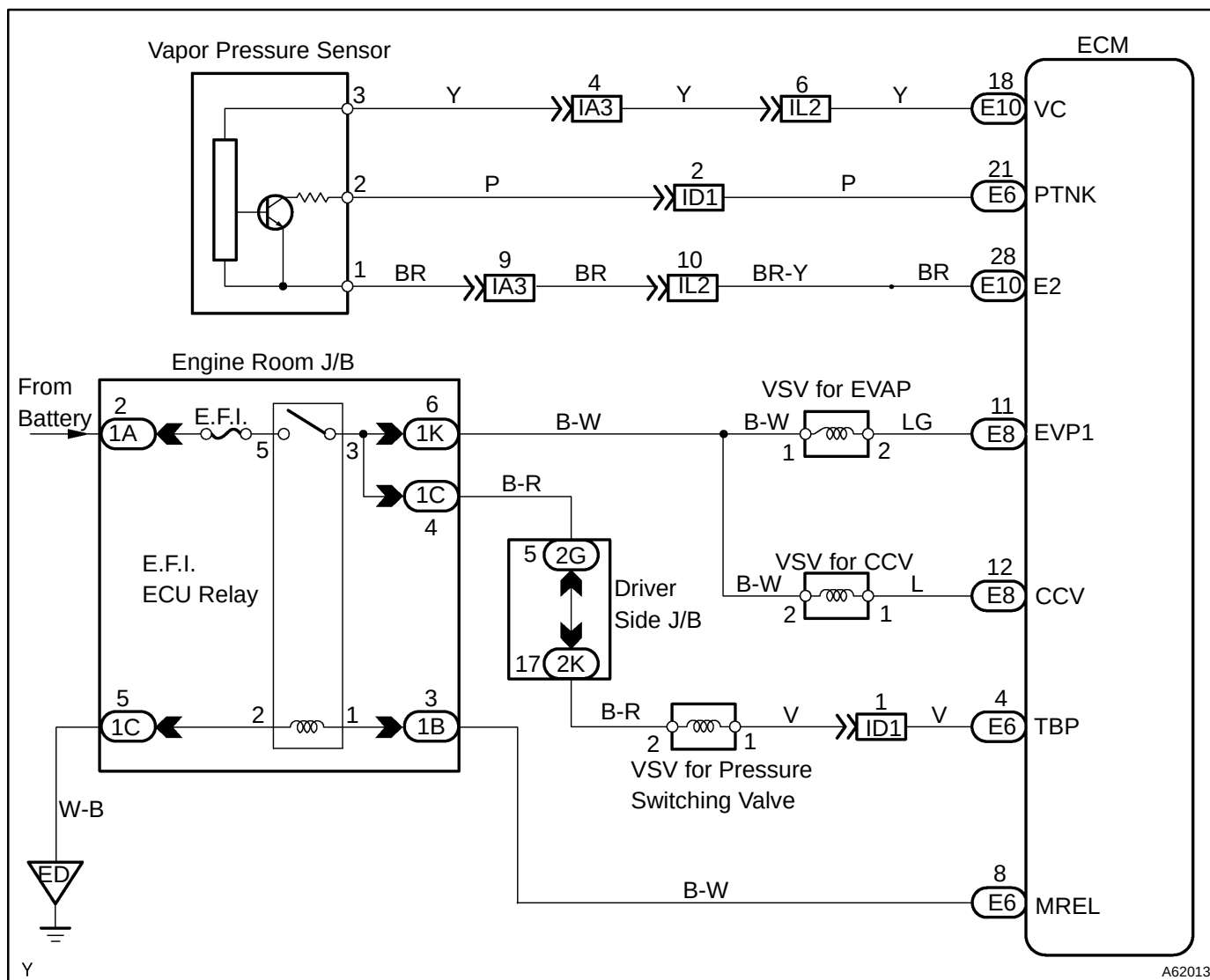


After purge operation, the VSV for EVAP is turned off sealing the vacuum in the system and the ECM begins to monitor the pressure increase. Some increase is normal. A very rapid, sharp increase in pressure indicates a leak in the EVAP system and sets the DTC P0440.

A pressure rise just above normal indicates a very small hole and will set the DTC P0442.

DTC No.	DTC Detecting Condition	Trouble Area
P0440 P0442	After cold starting and when generating certain swift pressure value in fuel tank enabling not to hold that value (2 trip detection logic)	• Hose or tube cracked, hole, damaged or loose seal ((3) in Fig. 1) • Fuel tank cap incorrectly installed • Fuel tank cap cracked or damaged • Vacuum hose cracked, holed, blocked, damaged or disconnected ((1) or (2) in Fig. 1) • Fuel tank cracked, holed or damaged • Charcoal canister cracked, holed or damaged • Open or short in vapor pressure sensor circuit • VSV for CCV • VSV for EVAP • VSV for pressure switching valve • Vapor pressure sensor • Fuel tank over fill check valve cracked or damaged • ECM

WIRING DIAGRAM



A62013

CONFIRMATION READINESS TEST

1. First Trip Procedure

- Vehicle must be cold, ambient temperature approximately between 50°F - 95°F.
- Intake Air Temp. (IAT) and Engine Coolant Temp. (ECT) sensor almost same value.
- Clear DTC's.
 - Disconnecting the battery terminals or EFI fuse.
 - Readiness tests will show INCMPL (incomplete).
- Drive the vehicle according to LA#4 drive cycle. Note the state of Readiness Tests. They will change to COMPL as the evaluation monitors operate and if the system passes. This procedure may take approximately 20 minutes or more.

READINESS TESTS

MISFIRE MON.....	AVAIL
FUEL SYS MON.....	AVAIL
COMP MON.....	AVAIL
CAT EVAL.....	INCMPL
HTD CAT EVAL.....	N/A
EVAP EVAL.....	INCMPL
2nd AIR EVAL.....	N/A
A/C EVAL.....	N/A
O2S EVAL.....	INCMPL
O2S HTR EVAL.....	INCMPL
EGR EVAL.....	INCMPL

A53796

NOTICE:

Do not shut off the engine - the results will be invalid.

READINESS TESTS

```

MISFIRE MON..... AVAIL
FUEL SYS MON..... AVAIL
COMP MON..... AVAIL
CAT EVAL..... COMPL
HTD CAT EVAL..... N/A
EVAP EVAL..... COMPL
2nd AIR EVAL..... N/A
A/C EVAL..... N/A
O2S EVAL..... COMPL
O2S HTR EVAL..... COMPL
EGR EVAL..... COMPL

```

A53797

2. Pass Condition - No Problem Found by the ECM

If the EVAP evaluation monitor shows COMPL, go to the Non-Continuous Test screen.

NOTICE:

Do not shut off the engine - the results will be invalid.

NON-CONTINUOUS TESTS

```

Time$01 CID$01..... Pass
Time$02 CID$01..... Pass
Time$02 CID$02..... Pass
Time$02 CID$03..... Pass
Time$02 CID$04..... Pass
Time$04 CID$00..... Pass
Time$04 CID$02..... Pass
Time$05 CID$01..... Pass
Time$06 CID$01..... Pass
Time$07 CID$01..... Pass

```

A53798

- (1) To get there, go to Advanced OBD II, Onboard Tests, Non-continuous Tests.
- (2) If all of the tests in the time \$02 category Tests show Pass, the evaluation monitor has operated and no problem was detected.

READINESS TESTS

```

MISFIRE MON..... AVAIL
FUEL SYS MON..... AVAIL
COMP MON..... AVAIL
CAT EVAL..... COMPL
HTD CAT EVAL..... N/A
EVAP EVAL..... INCMPL
2nd AIR EVAL..... N/A
A/C EVAL..... N/A
O2S EVAL..... COMPL
O2S HTR EVAL..... COMPL
EGR EVAL..... N/A

```

A53799

3. Fail Condition - Problem Detected by the ECM

If the EVAP evaluation monitor shows INCMPL, go to the Non-Continuous Test screen.

NON-CONTINUOUS TESTS

```

Time$01 CID$01..... Pass
Time$02 CID$01..... Fail
Time$02 CID$02..... Fail
Time$02 CID$03..... Fail
Time$02 CID$04..... Fail
Time$04 CID$00..... Pass
Time$04 CID$02..... Pass
Time$05 CID$01..... Pass
Time$06 CID$01..... Pass
Time$07 CID$01..... Pass

```

A53800

- (1) If all Tests show Pass, the following may have occurred.
 - The EVAP evaluation monitor did not operate.
 - The EVAP evaluation monitor did not finish.
 - The ECM withheld judgement.
- (2) If one or more of the tests in the time \$02 category show Fail, the EVAP evaluation monitor did operate and the ECM detected a problem.

```

CONTINUOUS TESTS
ECU: $10 (Engine)
Number of Tests: 3

P0440
EVAP Control System Malfunction

P0441
EVAP Control System Incorrect
Purge Flow

P0446
EVAP Control System Vent Control
Circuit Malfunction

```

A53801

- (3) Go to Continuous Tests screen. This is the only place DTC's are listed for the first trip.

NOTICE:

The DTC listed may not be valid. A second trip is needed to confirm the DTC.

READINESS TESTS

```

MISFIRE MON..... AVAIL
FUEL SYS MON..... AVAIL
COMP MON..... AVAIL
CAT EVAL..... COMPL
HTD CAT EVAL..... N/A
EVAP EVAL..... COMPL
2nd AIR EVAL..... N/A
A/C EVAL..... N/A
O2S EVAL..... COMPL
O2S HTR EVAL..... COMPL
EGR EVAL..... COMPL

```

A53797

4. Second Trip Procedure

- Vehicle must be cold, ambient temperature approximately between 50°F - 95°F.
- Go to Readiness Tests screen.
- Drive the vehicle according to LA#4 drive cycle. Note the state of EVAP evaluation monitor. This procedure may take approximately 20 minutes or more.

NOTICE:

Do not shut off the engine - the results will be invalid.

```

CONTINUOUS TESTS
ECU: $10 (Engine)
Number of Tests: 3

P0440
EVAP Control System Malfunction

P0441
EVAP Control System Incorrect
Purge Flow

P0446
EVAP Control System Vent Control
Circuit Malfunction

```

A53801

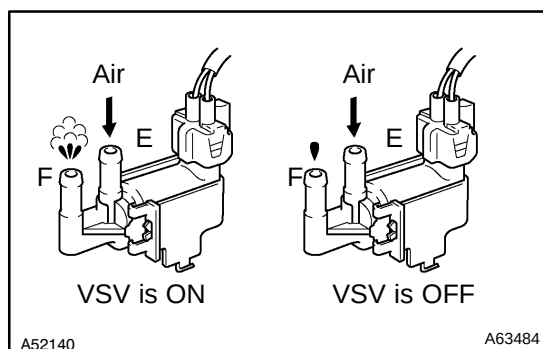
- If Readiness Tests changes to COMPL, the EVAP evaluation monitor has operated. Check for any stored DTC's.
 - If a DTC has stored, the problem has been detected and confirmed by the ECM.
 - If no DTC was found, the EVAP monitor operated but no problem was detected.

INSPECTION PROCEDURE

HINT:

- If DTC P0441, P0446, P0450 or P0451 is output after DTC P0440 or P0442, first troubleshoot DTC P0441, P0446, P0450 or P0451. If no malfunction is detected, troubleshoot DTC P0440 or P0442 next.
- Ask the customer whether, after the MIL came on, the customer found the fuel tank cap loose and tightened it. Also ask the customer whether the fuel tank cap was loose when refuelling. If the fuel tank cap was loose, it was the cause of the DTC. If the fuel tank cap was not loose or if the customer was not sure if it was loose, troubleshoot according to the following procedure.
- Read freeze frame data using hand-held tester or OBD II scan tool. Because freeze frame records the engine conditions when the malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio was lean or rich, etc. at the time of the malfunction.
- When the ENGINE RUN TIME in the freeze frame data is less than 200 seconds, carefully check the vapor pressure sensor.

1 PERFORM ACTIVE TEST BY HAND-HELD TESTER

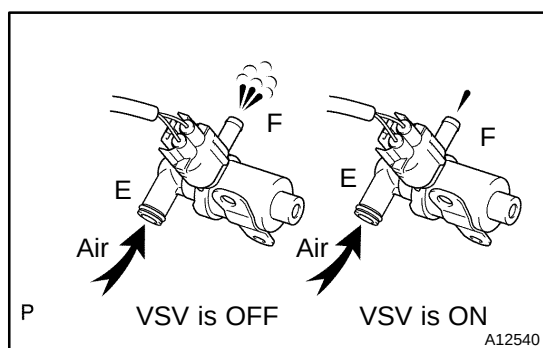


- (a) Select the ACTIVE TEST mode on the hand-held tester.
- (b) Disconnect the vacuum hose from the VSV for the EVAP.
- (c) Start the engine.
- (d) Select the item "EVAP VSV(ALONE)" in the ACTIVE TEST and operate the VSV for EVAP.
- (e) When the VSV for the EVAP is operated by the hand-held tester, apply the disconnected hose to your finger to check the suction.

Result:

VSV is ON: Disconnected hose sucks.

VSV is OFF: Disconnected hose does not suck.

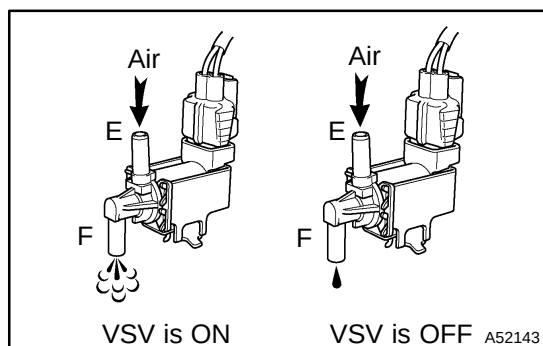


- (f) Select the item "CAN CTRL VSV" in the ACTIVE TEST and operate the VSV for CCV.
- (g) Check the VSV for CCV operation when it is operated by the hand-held tester.

Result:

VSV is ON: Disconnected hose sucks.

VSV is OFF: Disconnected hose does not suck.



- (h) Select the item "TANK BYPASS VSV" in the ACTIVE TEST and operate the VSV for pressure switching valve.
- (i) Check the VSV for pressure switching valve operation when it is operated by the hand-held tester.

Result:

VSV is ON: Disconnected hose sucks.

VSV is OFF: Disconnected hose does not suck.

NG

REPAIR OR REPLACE

OK

2 PERFORM ACTIVE TEST BY FOR EVAPORATIVE EMISSIONS LEAK(EVEP SYS CHECK)

- (a) Connect the hand-held tester to the DLC3.
- (b) Select the "EVAP SYS CHECK" mode on the hand-held tester.
- (c) Perform "EVAP SYS CHECK".

DISPLAY:

A	B	C
Scantool detects a leak on the fuel tank side.	Scantool detects a leak on the canister side.	Scantool does not detect a leak in the EVAP system.

B

Go to step 7

C

CHECK VACUUM HOSES

A

3 INSPECT FUEL TANK CAP ASSY(TOYOTA GENUINE PARTS) (See page 12-6)

- (a) Replace to toyota genuine parts.
- (b) After replace, perform "EVAP SYS CHECK" by hand-held tester. (Go to step 2.)

OK

Go to step 4

NG

REPLACE TO TOYOTA GENUINE PARTS

4 CHECK THAT FUEL TANK CAP IS CORRECTLY INSTALLED

- (a) Correctly install fuel tank cap.
- (b) After install, perform "EVAP SYS CHECK" by hand-held tester. (Go to step 2)

OK

Go to step 5

NG

CORRECTLY INSTALL FUEL TANK CAP

5 INSPECT FUEL TANK CAP ASSY (See page 12-6)

- (a) Replace to fuel tank cap assy.
- (b) After replace, perform "EVAP SYS CHECK" by hand-held tester. (Go to step 2)

OK

Go to step 6

NG

REPLACE FUEL TANK CAP ASSY**6 INSPECT FUEL TANK INLET PIPE SUB-ASSY**

- (a) Remove the fuel tank cap.
- (b) Visually inspect the fuel inlet pipe for damage.

NG**REPLACE FUEL TANK INLET PIPE SUB-ASSY**

- (1) Replace to fuel tank inlet pipe sub-assy.
- (2) After replace, perform "EVAP SYS CHECK" by hand-held tester. (Go to step 2.)

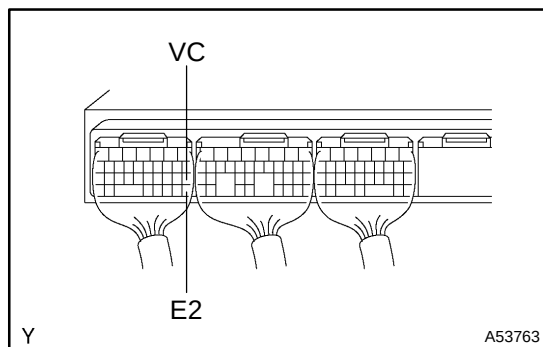
OK**REPAIR OR REPLACE VACUUM HOSES(VAPOR PRESSURE SENSOR - FUEL TANK, FUEL TANK - VSV FOR PRESSURE SWITCHING VALVE)**

- (c) Repair or replace to fuel tank cap assy.
- (d) After repair or replace, perform "EVAP SYS CHECK" by hand-held tester. (Go to step 2)

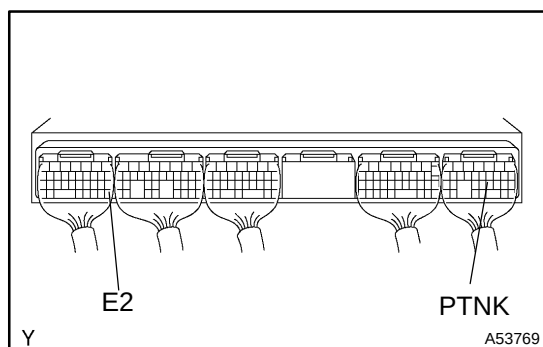
7 CHECK FUEL HOSE(VSV FOR PRESSURE SWITCHING VALVE - CHARCOAL CANISTER)

- (a) Check for proper connection of the fuel tank and fuel EVAP pipe (See page [12-1](#)), 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****OK****8 CHECK CHARCOAL CANISTER ASSY (See page [12-6](#))****NG****REPLACE CHARCOAL CANISTER ASSY****OK**

9 INSPECT ECM(CHECK VOLTAGE)

- (a) Turn the ignition switch ON.
- (b) Measure the voltage between terminals VC and E2 of the ECM connector.

Voltage: 4.5 - 5.5 V**NG****CHECK AND REPLACE ECM****OK****10 INSPECT ECM(CHECK VOLTAGE)**

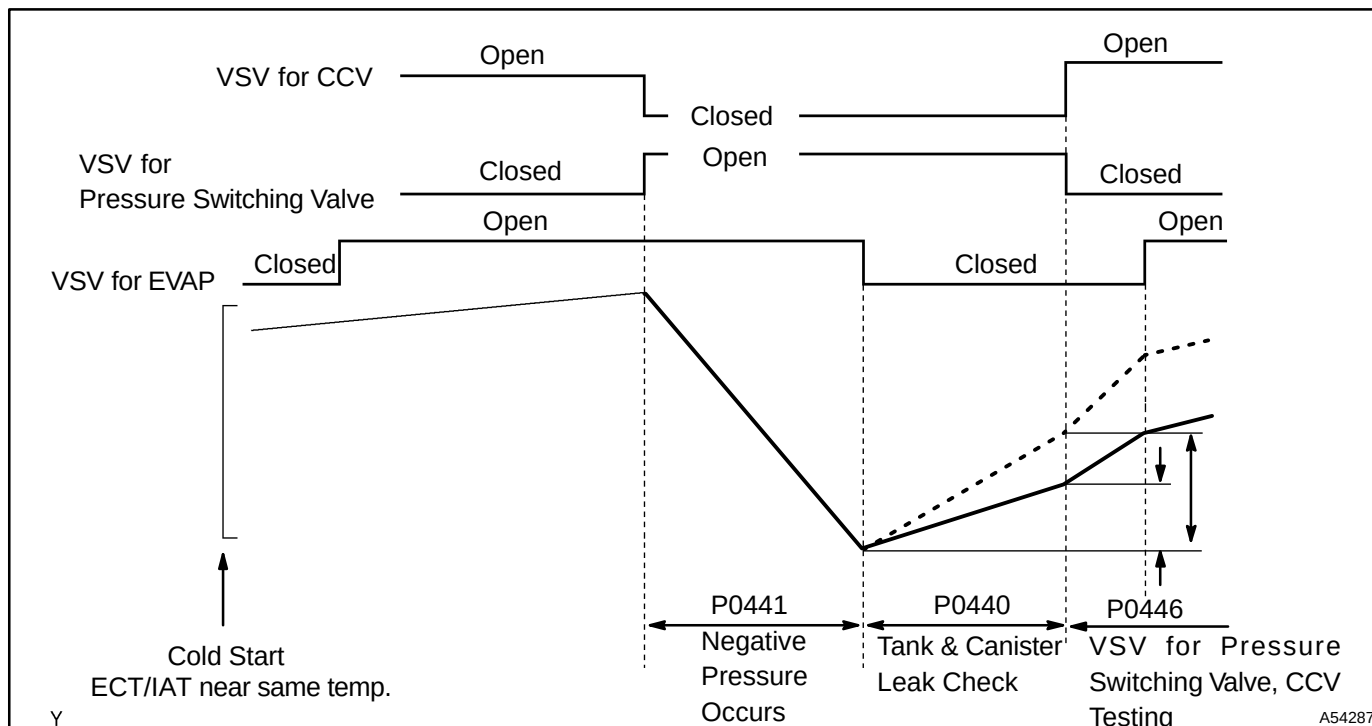
- (a) Remove the fuel tank cap.
- (b) Turn the ignition switch ON.
- (c) Measure the voltage between terminals PTNK of the ECM E6 connector and E2 of the ECM E10 connector.

Voltage: 3.0 - 3.6 V**OK****Go to step 12****NG****11 CHECK HARNESS AND CONNECTOR(VAPOR PRESSURE SENSOR - ECM)****NG****REPAIR OR REPLACE HARNESS AND CONNECTOR****OK****REPLACE VAPOR PRESSURE SENSOR ASSY****12 CHECK FUEL TANK AND FUEL TANK OVER FILL CHECK VALVE FOR CRACKS AND DAMAGE****NG****REPLACE FUEL TANK ASSY****OK****IT IS LIKELY THAT VEHICLE USER DID NOT PROPERLY CLOSE FUEL TANK CAP**

DTC	P0446	EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL MALFUNCTION
------------	--------------	---

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 VSV for EVAP, the VSV for pressure switching valve, or in the vapor pressure sensor itself.





A54287

P0441:

The ECM closes the CCV and opens the VSV for pressure switching valve causing vacuum to increase in the entire EVAP system.

The ECM continues to operate the VSV for EVAP until the vacuum is increased to a specified point at which time the ECM closes the VSV for EVAP.

If the vacuum did not increase, or if the vacuum increased beyond the specified limit, the ECM judges the VSV for EVAP and related components to be faulty.

P0446:

When the vapor pressure rises to a specified point, the ECM opens the VSV for CCV. Pressure will increase rapidly because of the air allowed into the system. No increase or an increase below specified rate of pressure increase indicates a restriction on the air inlet side.

The ECM closes the VSV for pressure switching valve. This action blocks air entering the fuel tank side of system. The pressure rise on the fuel tank side is no longer as great.

If there was no change in pressure, the ECM will conclude the VSV for pressure switching valve did not close.

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 cracks, holed blocked, damaged or disconnected ((1), (2), (3), (4), (5), (6), (7), (8), (9), (10) and (11) in Fig. 1) • Fuel tank cap incorrectly installed • Open or short in vapor pressure sensor circuit • Vapor pressure sensor
	During purge cut-off, negative pressure incoming in the charcoal canister and fuel tank will not stop. (2 trip detection logic)	
P0446	When VSV for pressure switching valve is ON, ECM judges that there is no continuity between vapor pressure sensor, fuel tank and charcoal canister (2 trip detection logic)	• Open or short in VSV circuit for EVAP • VSV for EVAP • Open or short in VSV circuit for CCV • VSV for CCV • Open or short in VSV circuit for pressure switching valve • VSV for pressure switching valve • Fuel tank cracked, holed or damaged • Charcoal canister cracked, holed or damaged • Fuel tank over fill check valve cracked damaged • ECM
	When VSV for pressure switching valve is turned OFF, pressure in fuel tank is maintained at atmospheric pressure (2 trip detection logic)	
	When VSV for CCV is ON, pressure in charcoal canister and fuel tank is maintained at atmospheric pressure (2 trip detection logic)	

WIRING DIAGRAM

Refer to DTC P0440 on page 05-88 .

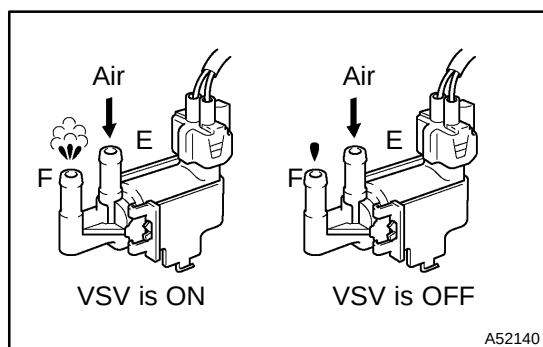
INSPECTION PROCEDURE

HINT:

- If DTC P0441, P0446, P0450 or P0451 is output after DTC P0440 or P0442, first troubleshoot DTC P0441, P0446, P0450 or P0451. If no malfunction is detected, troubleshoot DTC P0440 or P0442 next.
- Read freeze frame data using hand-held tester or OBD II scan tool. Because freeze frame records the engine conditions when the malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio was lean or rich, etc. at the time of the malfunction.
- 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 PERFORM ACTIVE TEST BY HAND-HELD TESTER

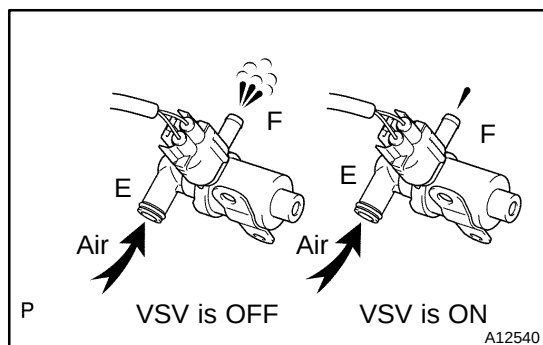


- Select the ACTIVE TEST mode on the hand-held tester.
- Disconnect the vacuum hose from the VSV for the EVAP.
- Start the engine.
- Select the item "EVAP VSV(ALONE)" in the ACTIVE TEST and operate the VSV for EVAP.
- When the VSV for the EVAP is operated by the hand-held tester, apply the disconnected hose to your finger to check the suction.

Result:

VSV is ON: Disconnected hose sucks.

VSV is OFF: Disconnected hose does not suck.

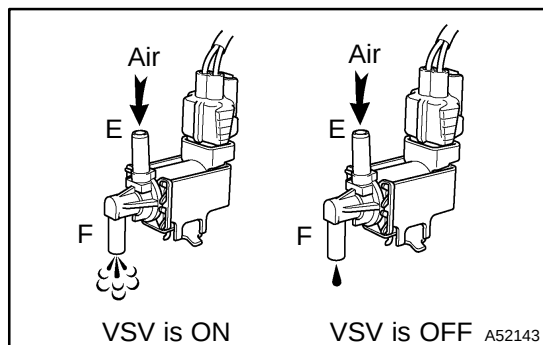


- Select the item "CAN CTRL VSV" in the ACTIVE TEST and operate the VSV for CCV.
- Check the VSV for CCV operation when it is operated by the hand-held tester.

Result:

VSV is ON: Disconnected hose sucks.

VSV is OFF: Disconnected hose does not suck.



- Select the item "TANK BYPASS VSV" in the ACTIVE TEST and operate the VSV for pressure switching valve.
- Check the VSV for pressure switching valve operation when it is operated by the hand-held tester.

Result:

VSV is ON: Disconnected hose sucks.

VSV is OFF: Disconnected hose does not suck.

NG

REPAIR OR REPLACE

OK

2 PERFORM ACTIVE TEST BY FOR EVAPORATIVE EMISSIONS LEAK

- (a) Connect the hand-held tester to the DLC3.
- (b) Select the "EVAP SYS CHECK" mode on the hand-held tester.
- (c) Perform "EVAP SYS CHECK".

DISPLAY:

A	B	C
Scan tool detects a leak on the fuel tank side.	Scan tool detects a leak on the canister side.	Scan tool does not detect a leak in the EVAP system.

B

Go to step 7

C

CHECK VACUUM HOSES

A

3 CHECK FUEL TANK CAP ASSY(TOYOTA GENUINE PARTS)

- (a) Replace to Toyota genuine parts.
- (b) After replace, perform "EVAP SYS CHECK" by hand-held tester. (Go to step 2.)

OK

Go to step 4

NG

REPLACE TO TOYOTA GENUINE PARTS

4 CHECK THAT FUEL TANK CAP IS CORRECTLY INSTALLED

- (a) Correctly install fuel tank cap.
- (b) After install, perform "EVAP SYS CHECK" by hand-held tester. (Go to step 2.)

OK

Go to step 5

NG

CORRECTLY INSTALL FUEL TANK CAP

5 INSPECT FUEL TANK CAP ASSY (See page 12-6)

- (a) Replace to fuel tank cap assy.
- (b) After replace, perform "EVAP SYS CHECK" by hand-held tester. (Go to step 2.)

OK

Go to step 6

NG

REPLACE FUEL TANK CAP ASSY

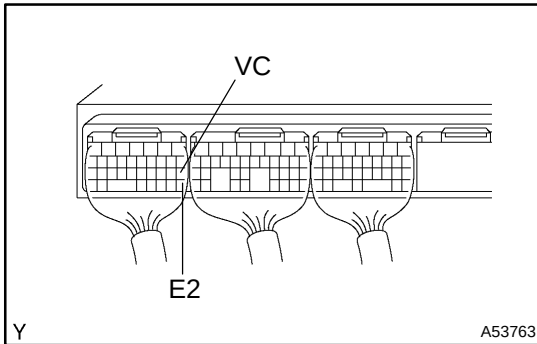
6 CHECK FUEL TANK INLET PIPE SUB-ASSY (FOR DAMAGE)

- (a) Remove the fuel tank cap.
- (b) Visually inspect the fuel inlet pipe for damage.
 - (1) Replace to fuel tank inlet pipe sub-assy.
 - (2) After replace, perform "EVAP SYS CHECK" by hand-held tester. (Go to step 2)
- (c) Repair or replace to fuel tank cap assy.
- (d) After repair or replace, perform "EVAP SYS CHECK" by hand-held tester. (Go to step 2)

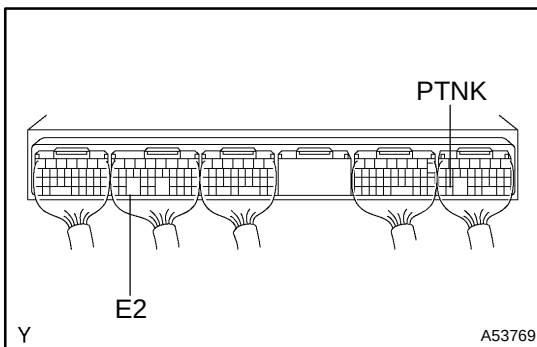
NG**REPLACE FUEL TANK INLET PIPE SUB-ASSY****OK****REPLACE VACUUM HOSES (VAPOR PRESSURE SENSOR - FUEL TANK, FUEL TANK - VSV FOR PRESSURE SWITCHING VALVE)****7 CHECK FUEL HOSE (VSV FOR PRESSURE SWITCHING VALVE - CHARCOAL CANISTER)****NG****REPAIR OR REPLACE****OK****8 CHECK EACH VSV CONNECTOR FOR LOOSENESS AND DISCONNECTION****NG****REPAIR OR CONNECT VSV AND SENSOR CONNECTOR****OK****9 CHECK VACUUM HOSES(8,9,10 AND 11 IN CIRCUIT DESCRIPTION)**

- (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****OK**

10 INSPECT ECM(CHECK VOLTAGE)

- (a) Turn the ignition switch ON.
- (b) Measure voltage between terminals VC and E2 of the ECM connector.

Voltage: 4.5 - 5.5 V**NG****CHECK AND REPLACE ECM****OK****11 INSPECT ECM(CHECK VOLTAGE)**

- (a) Remove the fuel tank cap.
- (b) Turn the ignition switch ON.
- (c) Measure the voltage between terminals PTNK and E2 of the ECM connector.

Voltage: 3.0 - 3.6 V**OK****Go to step 13****NG****12 CHECK HARNESS AND CONNECTOR(VAPOR PRESSURE SENSOR - ECM)****NG****REPAIR OR REPLACE HARNESS AND CONNECTOR****OK****REPLACE VAPOR PRESSURE SENSOR ASSY**

13	CHECK VACUUM HOSES (INTAKE MANIFOLD - VSV FOR EVAP, VSV FOR EVAP - CHARCOAL CANISTER)
-----------	--

- (a) Check that the vacuum hose is connected correctly.
- (b) Check the vacuum hose for looseness and disconnection.
- (c) Check the vacuum hose for cracks, hole, damage and blockage.

NG	REPAIR OR REPLACE
-----------	--------------------------

OK

14	CHECK OPERATION OF VSV(FOR EVAP) (See Step 1)
-----------	--

OK	Go to step 15
-----------	----------------------

NG

CHECK VACUUM HOSES (8,9,10 AND 11 IN CIRCUIT DESCRIPTION)
--

15	CHECK HARNESS AND CONNECTOR (E.F.I. ECU RELAY - VSV FOR EVAP, VSV FOR EVPA - ECM)
-----------	--

NG	REPAIR OR REPLACE HARNESS AND CONNECTOR
-----------	--

OK

16	CHECK VACUUM HOSES(VSV FOR CCV - CHARCOAL CANISTER)
-----------	--

- (a) Check that the vacuum hose is connected correctly.
- (b) Check the vacuum hose for looseness and disconnection.
- (c) Check the vacuum hose for cracks, hole damage, and blockage.

NG	CORRECTLY INSTALL FUEL TANK CAP
-----------	--

OK

17	CHECK OPERATION OF VSV(FOR CCV) (See Step 1)
-----------	---

OK	Go to step 18
-----------	----------------------

NG

REPLACE VSV AND CHARCOAL CANISTER, AND THEN CLEAN VACUUM HOSE
--

18 CHECK HARNESS AND CONNECTOR(E.F.I. ECU RELAY - VSV FOR OCV, VSV FOR CCV - ECM)

NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

**19 CHECK OPERATION OF VSV(FOR PRESSURE SWITCHING VALVE)
(See Step 1)**

OK

Go to step 20

NG

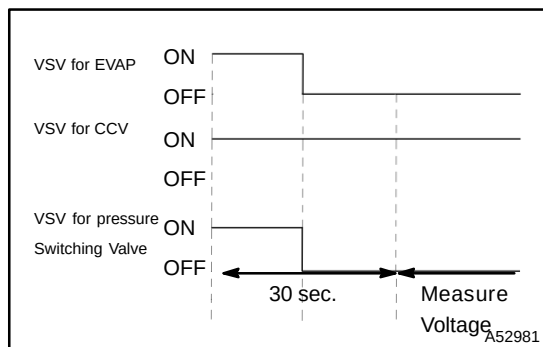
REPLACE VSV AND CHARCOAL CANISTER, AND THEN CLEAN VACUUM HOSE

20 CHECK HARNESS AND CONNECTOR(E.F.I. ECU RELAY - VSV FOR PRESSURE SWITCHING VALVE,VSV FOR PRESSURE SWITCHING VALVE - ECM)

NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

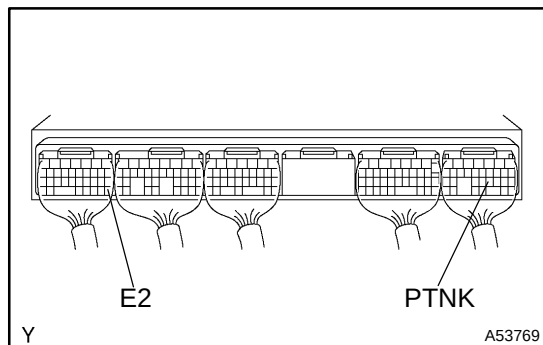
OK

21 PERFORM ACTIVE TEST BY OBD II SCAN TOOL OR HAND-HELD TESTER(FUEL TANK ASSY)


- Connect the hand-held tester to the DLC3.
- Select the ACTIVE TEST mode on the hand-held tester.
- Start the engine.
- The VSV for the CCV is ON by the hand-held tester.
- The VSV for the EVAP and the VSV for the pressure switching valve are ON by the hand-held tester and hold the VSV for the EVAP until voltage between terminals PTNK and E2 becomes 1.2 V.
- Measure the voltage between terminals PTNK and E2 of the ECM connectors 30 sec. after switching the VSV for the EVAP and the VSV for the pressure switching valve from ON to OFF.

Voltage:

When there is no sharp change of the voltage with the voltage of more or less 1.2 V

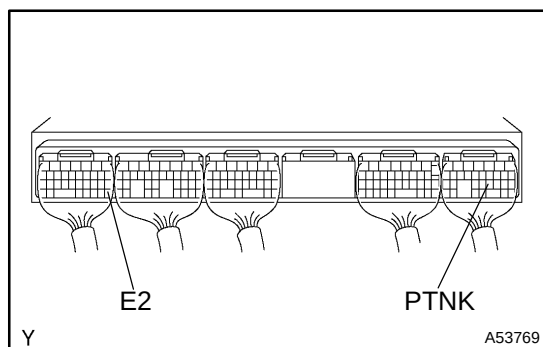
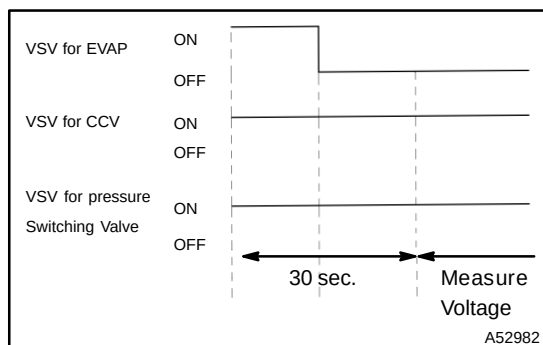


NG

REPLACE FUEL TANK ASSY

OK

22 PERFORM ACTIVE TEST BY OBD II SCAN TOOL OR HAND-HELD TESTER(CHARCOAL CANISTER ASSY)



- Connect the hand-held tester to the DLC3.
- Select the ACTIVE TEST mode on the hand-held tester.
- Start the engine.
- The VSV for the CCV and the VSV for the pressure switching valve are ON by the hand-held tester.
- The VSV for the EVAP is ON by the hand-held tester and hold the VSV for the EVAP until voltage between terminals PTNK and E2 becomes 1.2 V.
- Measure the voltage between terminals PTNK and E2 of the ECM connectors 30 sec. after switching the VSV for the EVAP from ON to OFF.

Voltage:

When there is no sharp change of the voltage with the voltage of more or less 1.2 V

NG

REPLACE CHARCOAL CANISTER ASSY

OK

23 CHECK CHARCOAL CANISTER ASSY (See page 12-6)

NG

REPLACE CHARCOAL CANISTER ASSY

OK

24 CHECK FUEL TANK OVER FILL CHECK VALVE

NG

REPLACE VSV AND CHARCOAL CANISTER, AND THEN CLEAN VACUUM HOSE

OK

REPLACE CHARCOAL CANISTER ASSY

OBDII scan tool (excluding Hand-held Tester):

1 CHECK FOR EVAPORATIVE EMISSIONS LEAK

NG

REPAIR OR REPLACE

OK

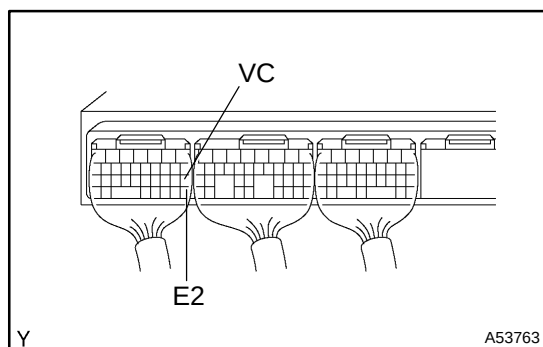
2 INSPECT FUEL TANK CAP ASSY(TOYOTA GENUINE PARTS)**NG** REPLACE TO TOYOTA GENUINE PARTS**OK****3 CHECK THAT FUEL TANK CAP IS CORRECTLY INSTALLED****NG** CORRECTLY INSTALL FUEL TANK CAP**OK****4 INSPECT FUEL TANK CAP ASSY (See page 12-6)****NG** REPLACE FUEL TANK CAP ASSY**OK****5 INSPECT FUEL TANK INLET PIPE SUB-ASSY(FOR DAMAGE)**

- (a) Remove the fuel tank cap.
(b) Visually inspect the fuel inlet pipe for damage.

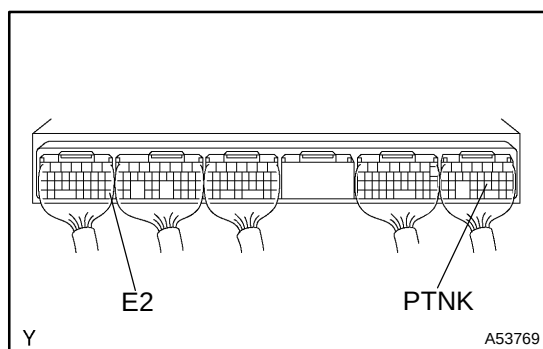
NG REPLACE FUEL TANK INLET PIPE SUB-ASSY**OK****6 CHECK VACUUM HOSES(VAPOR PRESSURE SENSOR - FUEL TANK,CHARCOAL CANISTER - VSV FOR PRESSURE SWITCHING VALVE)****NG** REPAIR OR CONNECT VSV AND SENSOR CONNECTOR**OK****7 CHECK FUEL HOSE(FUEL TANK - CHARCOAL CANISTER)****NG** REPAIR OR REPLACE**OK****8 CHECK EACH VSV CONNECTOR FOR LOOSENESS AND DISCONNECTION****NG** REPAIR OR CONNECT VSV AND SENSOR CONNECTOR**OK**

9 CHECK VACUUM HOSES(8,9,10 AND 11 IN CIRCUIT DESCRIPTION)

- (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.

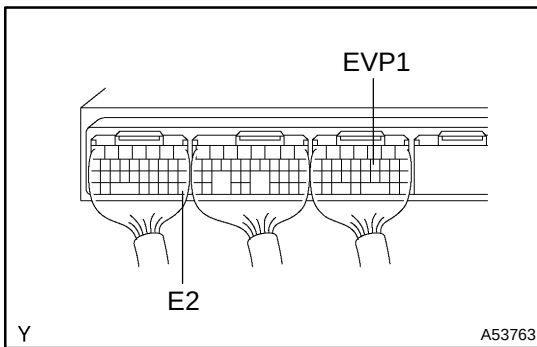
NG**CHECK FUEL TANK OVER FILL CHECK VALVE****OK****10 INSPECT ECM(VC - E2)**

- (a) Turn the ignition switch ON.
- (b) Measure voltage between terminals VC and E2 of the ECM connector.
Voltage: 4.5 - 5.5 V

NG**CHECK AND REPLACE ECM****OK****11 INSPECT ECM(PTNK - E2)**

- (a) Remove the fuel tank cap.
- (b) Turn the ignition switch ON.
- (c) Measure the voltage between terminals PTNK and E2 of the ECM connector.
Voltage: 3.0 - 3.6 V

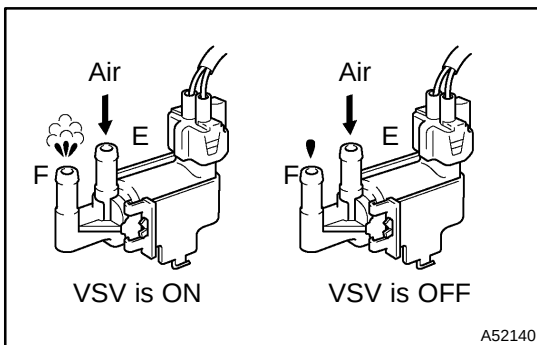
OK**Go to step 13****NG****12 CHECK HARNESS AND CONNECTOR(VAPOR PRESSURE SENSOR - ECM)****NG****REPAIR OR REPLACE HARNESS AND CONNECTOR****OK****REPLACE VAPOR PRESSURE SENSOR ASSY**

13 CHECK VSV (FOR EVAP)

- (a) Turn the ignition switch ON.
 (b) Check the VSV function.
 (1) Connect between terminal EVP1 and E2 of the ECM connector (VSV ON).

VSV is ON:**Air from port E flows out through port F**

- (2) Disconnect between terminal EVP1 and E2 of the ECM connector (VSV OFF).

VSV is OFF:**Air does not flow port E to port F**

OK → Go to step 16

NG

14 CHECK OPERATION OF VSV(FOR EVAP) (See page 12-6)

OK → Go to step 15

NG

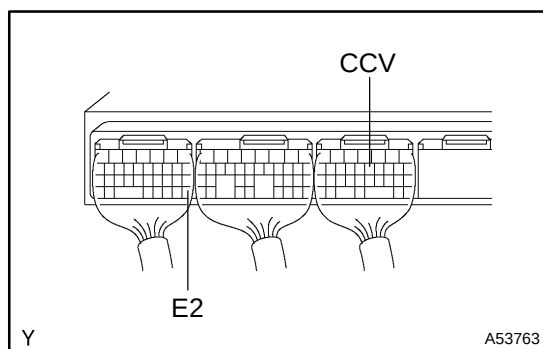
REPLACE VSV AND CHARCOAL CANISTER, AND THEN CLEAN VACUUM HOSE

15 CHECK HARNESS AND CONNECTOR(E.F.I.ECU RELAY - VSV FOR EVAP, VSV FOR EVAP - ECM)

NG → REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

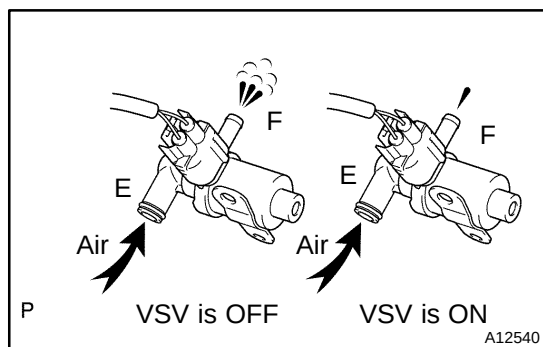
CHECK AND REPLACE ECM

16 CHECK VSV (FOR CCV)

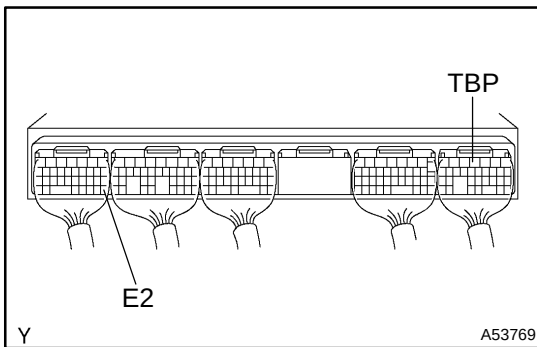
- (a) Turn the ignition switch ON.
- (b) Check the VSV function.
 - (1) Connect between terminal CCV and E2 of the ECM connector (VSV ON).

VSV is ON:**Air does not flow from port E to port F**

- (2) Disconnect between terminal CCV and E2 of the ECM connector (VSV OFF).

VSV is OFF:**Air from port E flows out through port F****OK****Go to step 19****NG****17 CHECK OPERATION OF VSV(FOR CCV) (See page 12-6)****OK****Go to step 18****NG****REPLACE VSV AND CHARCOAL CANISTER, AND THEN CLEAN VACUUM HOSE****18 CHECK HARNESS AND CONNECTOR(E.F.I. ECU RELAY - VSV FOR CCV, VSV FOR CCV - ECM)****NG****REPAIR OR REPLACE HARNESS AND CONNECTOR****OK****CHECK AND REPLACE ECM**

19 CHECK VSV (FOR PRESSURE SWITCHING VALVE)

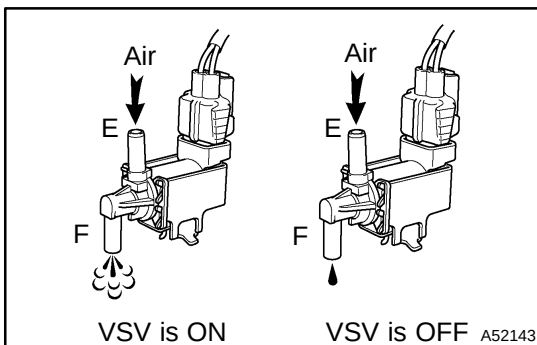


- (a) Turn the ignition switch ON.
- (b) Check the VSV function.
 - (1) Connect between terminal TBP and E2 of the ECM connector (VSV ON).

VSV is ON: Air from port E flows out through port F

- (2) Disconnect between terminal TBP and E2 of the ECM connector (VSV OFF).

VSV is OFF: Air does not flow from port E to port F



OK Go to step 22

NG

20 CHECK OPERATION OF VSV(FOR PRESSURE SWITCHING VALVE) (See page 12-6)

OK Go to step 21

NG

REPLACE VSV AND CHARCOAL CANISTER, AND THEN CLEAN VACUUM HOSE

21 CHECK HARNESS AND CONNECTOR(E.F.I. ECU RELAY - VSV FOR PRESSURE SWITCHING VALVE, VSV FOR PRESSURE SWITCHING VALVE - ECM)

NG REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

CHECK AND REPLACE ECM

22 CHECK FUEL TANK OVER FILL CHECK VALVE**NG****REPLACE FUEL TANK OVER FILL CHECK VALVE OR FUEL TANK****OK****REPAIR OR REPLACE CHARCOAL CANISTER ASSY**

DTC	P0450	EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR MALFUNCTION
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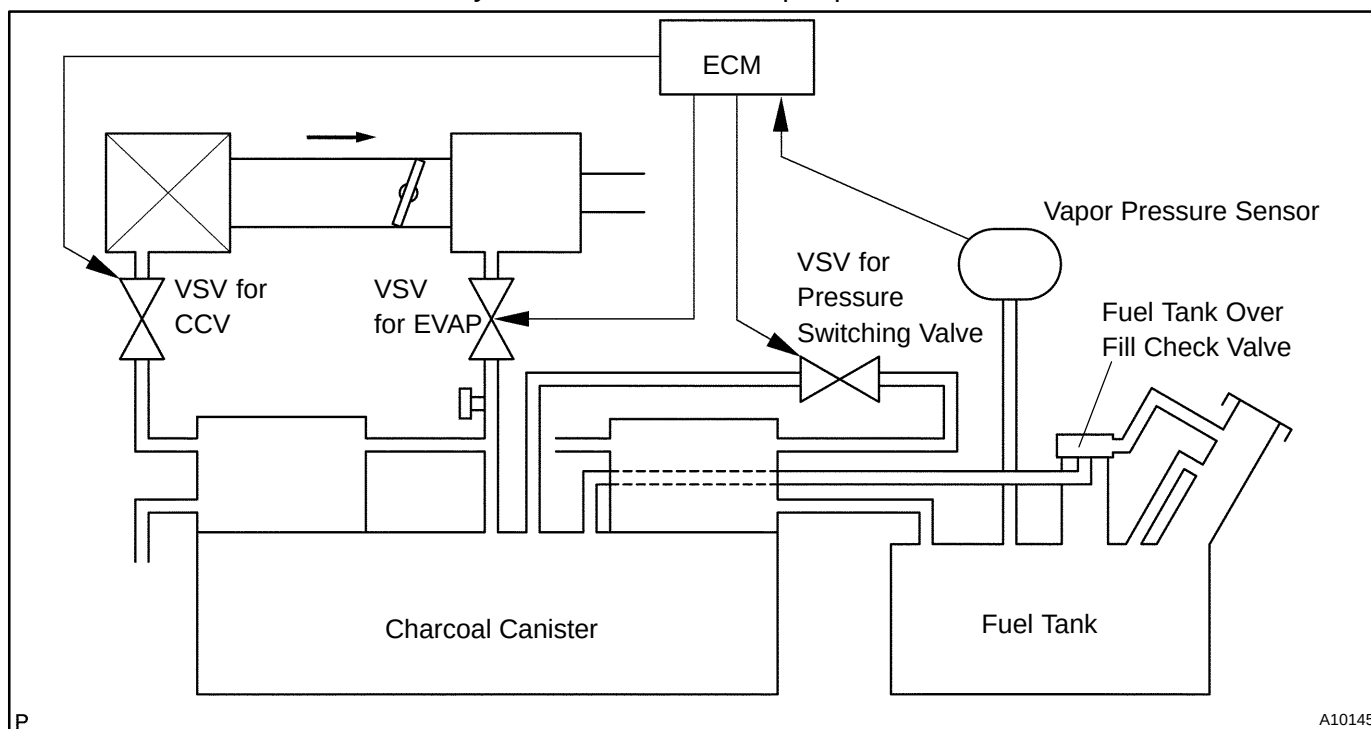
DTC	P0451	EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE
------------	--------------	--

CIRCUIT DESCRIPTION

The vapor pressure sensor, VSV for canister closed valve (CCV) and VSV for 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 P0450 or P0451 is recorded by the ECM when the vapor pressure sensor malfunction.



DTC No.	DTC Detecting Condition	Trouble Area
P0450	10 seconds or less after engine starting condition vapor pressure sensor fixed value continues for fixed value or more: (2 trip detection logic)	
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 VSV for pressure switching valve is OFF (b) vapor pressure sensor value $\geq$ opening pressure valve of charcoal canister	• Open or short in vapor pressure sensor circuit • Vapor pressure sensor • ECM

WIRING DIAGRAM

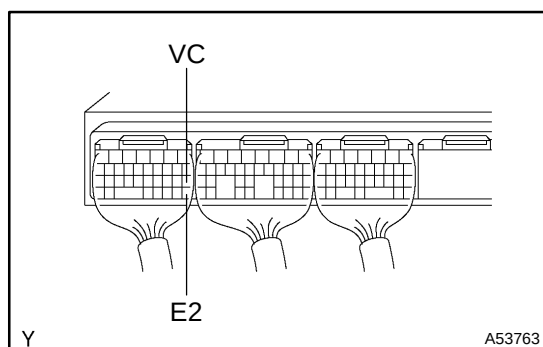
Refer to DTC P0440 on page [05-88](#) .

INSPECTION PROCEDURE

HINT:

- If DTC P0441, P0446, P0450 or P0451 is output after DTC P0440 or P0442, first trouble shoot DTC P0441, P0446 P0450 or P0451. If no malfunction is detected, troubleshoot DTC P0440 or P0442 next.
- Read freeze frame data using hand-held tester or OBD II scan tool. Because freeze frame records the engine conditions when the malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio was lean or rich, etc. at the time of the malfunction.
- When the ENGINE RUN TIME in the freeze frame data is less than 200 seconds, carefully check the VSV for EVAP, charcoal canister and vapor pressure sensor.

1 INSPECT ECM



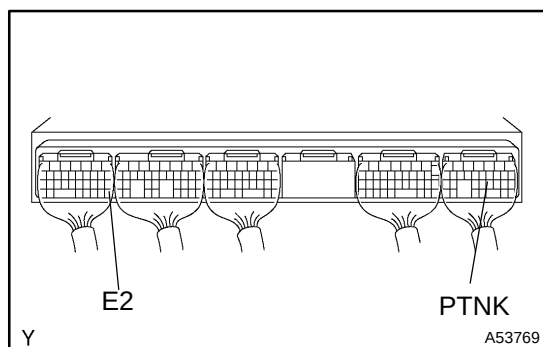
- Turn the ignition switch ON.
- Measure the voltage between terminals VC and E2 of the ECM connector.
Voltage: 4.5 - 5.5 V

NG

CHECK AND REPLACE ECM

OK

2 INSPECT ECM



- Remove the fuel tank cap.
- Turn the ignition switch ON.
- Measure the voltage between terminals PTNK of the ECM E6 connector and E2 of the ECM E10 connector.
Voltage: 3.0 - 3.6 V

OK

CHECK AND REPLACE ECM

NG

3 CHECK HARNESS AND CONNECTOR(VAPOR PRESSURE SENSOR - ECM)

NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

REPLACE VAPOR PRESSURE SENSOR ASSY

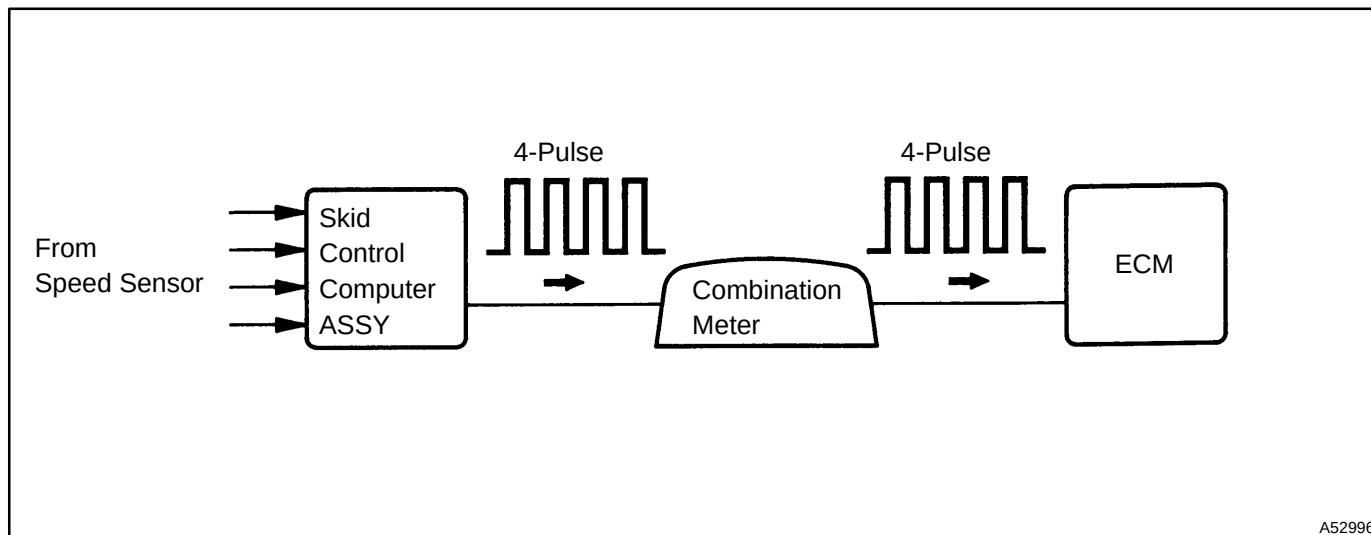
DTC	P0500	VEHICLE SPEED SENSOR MALFUNCTION
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CIRCUIT DESCRIPTION

The speed sensor for skid control computer assy detects the wheel speed and sends the appropriate signals to the skid control computer assy.

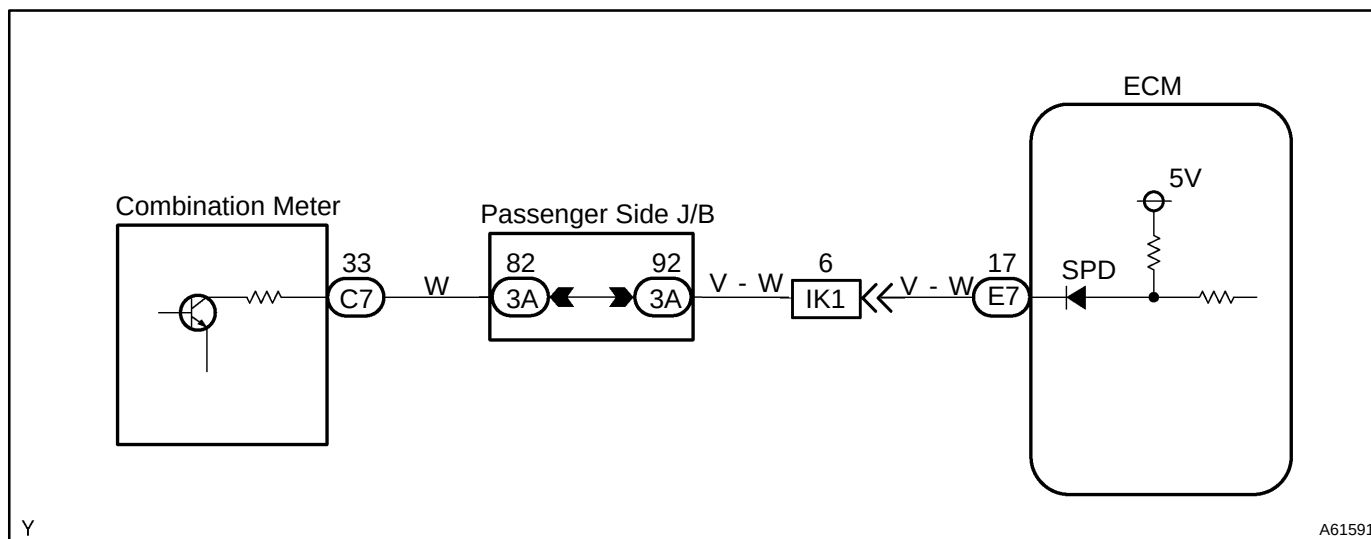
The ECM converts these signals into a 4-pulse signal and outputs it to the combination meter.

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 pulse signals.



DTC No.	DTC Detecting Condition	Trouble Area
P0500	No vehicle speed sensor signal to Engine & ECT ECU under the following conditions: (2 trip detection logic) • Vehicle is being driven • Clutch or brake slips or gear is broken (2-trip detection logic)	• Combination meter • Open or short in speed sensor circuit • Vehicle speed sensor • ECM • Skid control computer assy

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand-held tester or OBD II scan tool, as freeze frame data records the engine conditions when the malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio was lean or rich, etc. at the time of the malfunction.

1 READ VALUE OF VEHICLE SPEED VALUE(SPEED METER)

(a) Drive the vehicle and check if the operation of the speedometer in the combination meter is normal.

HINT:

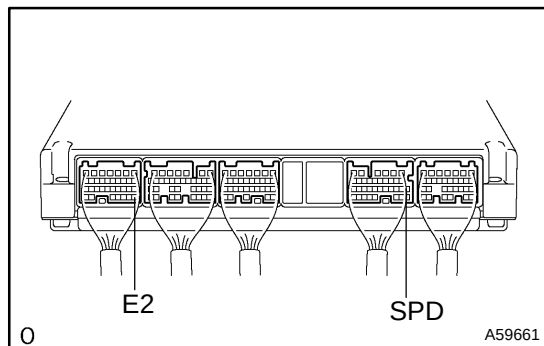
The vehicle speed sensor is operating normally if the speedometer display is normal.

NG

CHECK SPEED METER CIRCUIT
(See page 05-1052)

OK

2 CHECK HARNESS AND CONNECTOR(SPD - E2)



(a) Check continuity between the terminals SPD and E2 of the ECM connector.

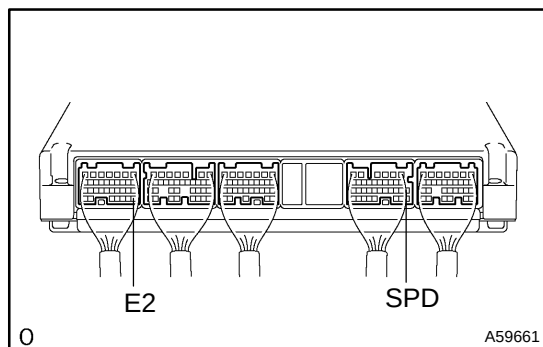
Resistance: 1 MΩ or more

NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

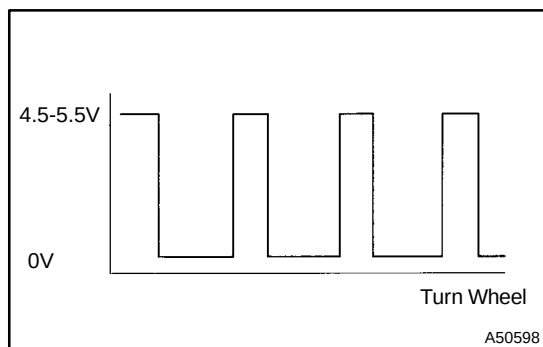
OK

3 INSPECT ECM(SPD - E2)



- Shift the lever to the neutral position.
- Jack up the vehicle.
- Turn the ignition switch ON.
- Measure the voltage between terminal SPD and E2 of the ECM connector with turning the wheel slowly.

Voltage: Generated intermittently



NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

CHECK AND REPLACE ECM

DTC	P0505	IDLE CONTROL SYSTEM MALFUNCTION
------------	--------------	--

CIRCUIT DESCRIPTION

The idle speed is controlled by the Electric Throttle Control System (ETCS).

ETCS is composed of the throttle motor to operate the throttle valve to connect the throttle motor with the throttle valve, the throttle position sensor to detect the opening angle of the throttle valve, the accelerator pedal position sensor to detect the accelerator pedal position, the ECM to control the ETCS and the one valve type throttle body.

The ECM controls the throttle motor to make the throttle valve opening angle properly for the target idle speed.

DTC No.	DTC Detection Condition	Trouble Area
P0505	Idle speed continues to vary greatly from target speed (2 trip detection logic)	• Throttle body assy • Air induction system • PCV hose connection • ECM

INSPECTION PROCEDURE

HINT:

Read freed frame data using hand-held tester. Because freeze frame records the engine conditions when the malfunction is detected, when troubleshooting it is useful for determining whether the vehicle was running or stopped, the engine warmed up or not, the air-fuel ratio lean or rich, etc. at the time of the malfunction.

1	CHECK OTHER DTC OUTPUT(BESIDES DTC P0505)
----------	--

(a) Read the DTC using the hand-held tester or OBD II scan tool.

YES

GO TO RELEVANT DTC CHART

NO

2	CHECK AIR INDUCTION SYSTEM
----------	-----------------------------------

NG

REPAIR OR REPLACE AIR INDUCTION SYSTEM

OK

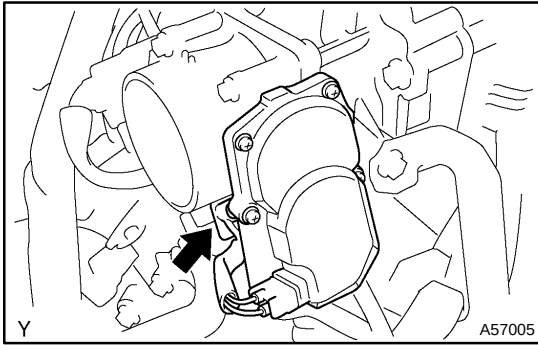
3	CHECK CONNECTION OF PCV HOSE
----------	-------------------------------------

NG

REPAIR OR REPLACE PCV HOSE

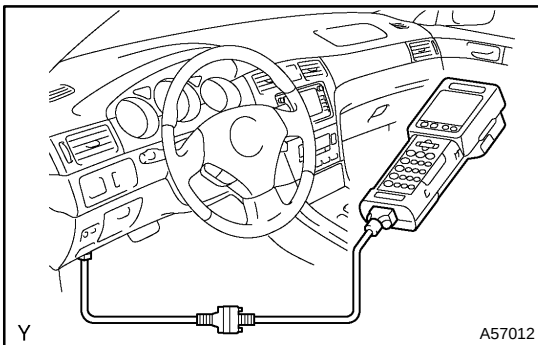
OK

4 INSPECT THROTTLE BODY ASSY



- (a) Inspect the throttle control motor for operating sound.
- (1) When turning the accelerator pedal position sensor lever, check the running sound of the motor. Also, check that there is no friction sound.

If operation is not as specified, check the throttle control motor, wiring and ECM.

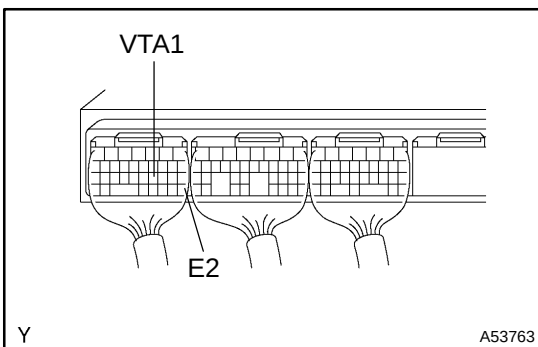


- (b) Inspect the accelerator pedal position sensor.
- (1) Connect the hand-held tester or OBDII scan tool to the DLC3.
 - (2) Check that the check engine warning light does not light up.
 - (3) When turning the accelerator pedal position sensor lever to the full-open position, check that the throttle valve opening percentage (THROTTLE POS) of the CURRENT DATA shows the standard value.

**Standard throttle valve opening percentage:
60 % or more**

If operation is not as specified, check that the accelerator pedal position sensor, wiring and ECM.

If you have no hand-held tester, measure voltage between terminals VTA1 and E2 of the ECM connector (See page 05-27).



- (c) Inspect the idle speed.
- (1) Start the engine and check that the MIL does not light up.
 - (2) Allow the engine to warm up to normal operating temperature.
 - (3) Turn the A/C conditioning ON to OFF, and check the idle speed.

Idle speed (Transmission in neutral): 600 ± 50 rpm

NOTICE:

Perform inspection under condition without electrical load.

- (d) After checking the above (b) to (d), perform the driving test and check that there is no sense of incongruity.

NG

REPLACE THROTTLE BODY ASSY

OK

5	CHECK HARNESS AND CONNECTOR(ECM - THROTTLE BODY ASSY)
---	---

NG	REPAIR OR REPLACE HARNESS AND CONNECTOR
----	---

OK

6	INSPECT E.F.I. THROTTLE POSITION SENSOR (See Page 10-2)
---	--

NG	REPLACE E.F.I. THROTTLE POSITION SENSOR
----	---

OK

7	CHECK HARNESS AND CONNECTOR(ECM - THROTTLE POSITION SESOR)
---	--

NG	REPAIR OR REPLACE HARNESS AND CONNECTOR
----	---

OK

CHECK AND REPLACE ECM	
-----------------------	--

DTC	P1120	ACCELERATOR PEDAL POSITION SENSOR CIRCUIT MALFUNCTION
------------	--------------	--

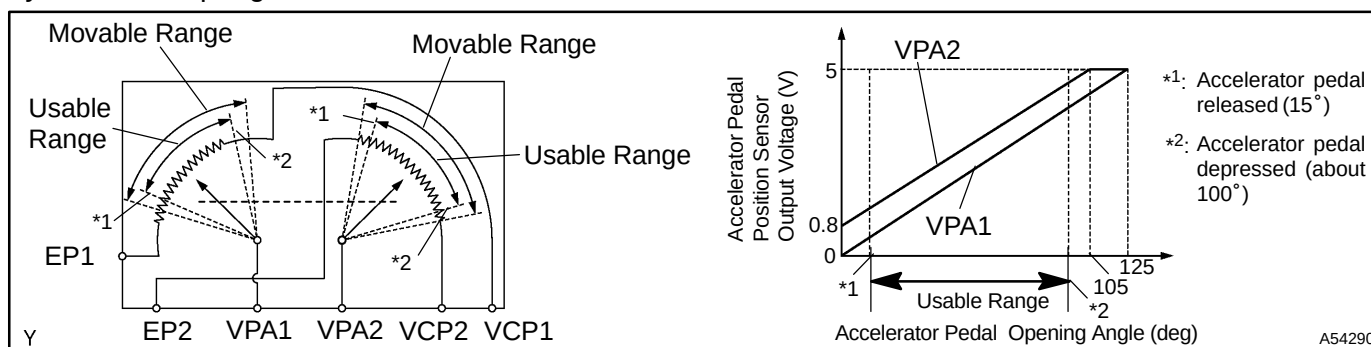
CIRCUIT DESCRIPTION

Accelerator pedal position sensor is mounted on the accelerator pedal bracket and it has 2 sensors to detect the accelerator position and a malfunction of the accelerator position's own.

The accelerator pedal position sensor is the voltage applied to the terminals VPA1 and VPA2 of the ECM changes between 0 V and 5 V in proportion to the opening angle of the accelerator pedal.

The ECM judges the current opening angle of the accelerator pedal from these signals input from terminals VPA1 and VPA2 and the ECM controls the throttle motor based on these signals.

If this DTC is stored, the ECM shuts down the power for the throttle motor, and the throttle valve is fully closed by the return spring.

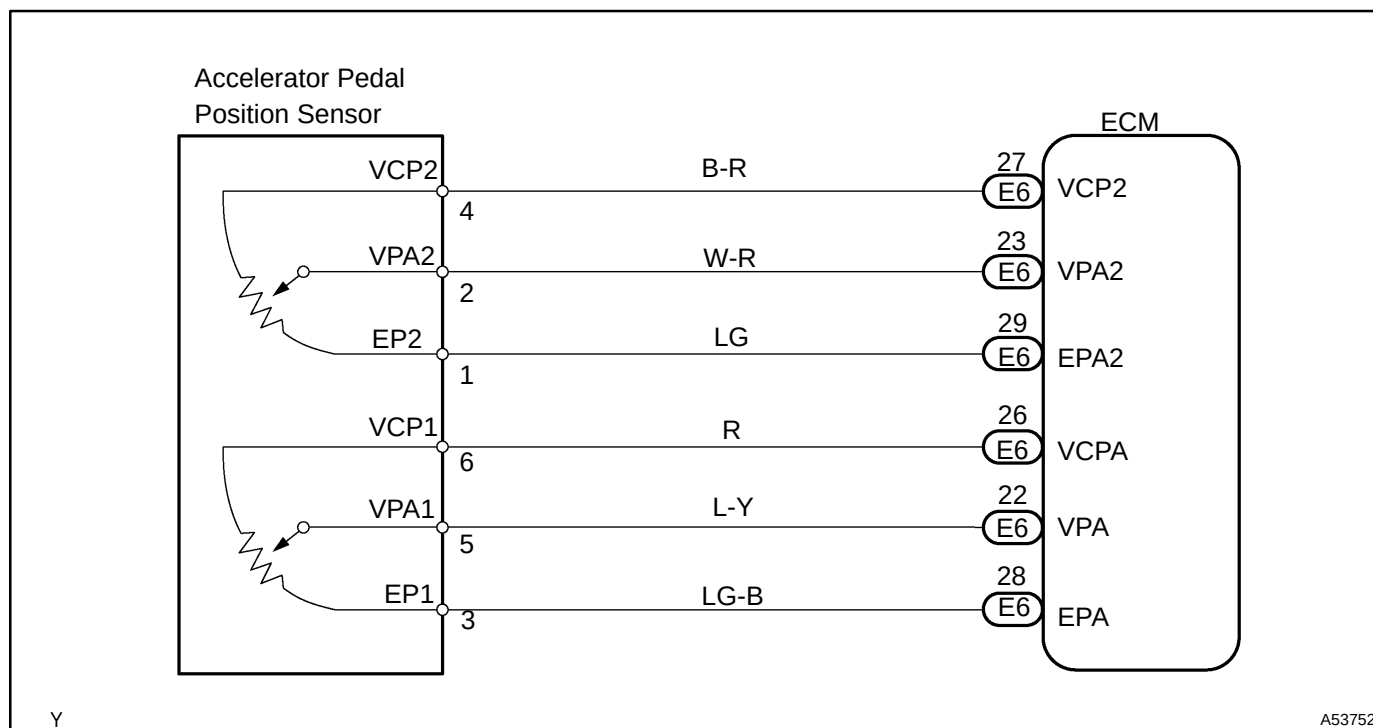


DTC No.	DTC Detecting Condition	Trouble Area
P1120	Condition (a), (b), (c), (d) or (e) continues for 0.5 seconds: (IDL ON: 10 seconds) (a) $VPA1 \leq 0.2 \text{ V}$ (b) $VPA2 \leq 0.5 \text{ V}$ (c) $VPA1 \geq 4.8 \text{ V}$ (d) When $VPA1 \geq 0.2 \text{ V}$ and $\leq 3.45 \text{ V}$, and $VPA2 \geq 4.8 \text{ V}$ (e) $VPA1 - VPA2 \leq 0.02 \text{ V}$ (f) IDL is OFF	• Open or short in accelerator pedal position sensor circuit • Accelerator pedal position sensor • ECM
	Condition (a) or (b) continues for 2.0 seconds: (a) $VPA1 \leq 0.2 \text{ V}$ and $VPA2 \leq 0.5 \text{ V}$	

After confirming DTC P1120, use the OBD II scan tool or hand-held tester to confirm the throttle valve opening percentage.

Accelerator pedal position expressed as voltage				Trouble area
Accelerator pedal released		Accelerator pedal depressed		
ACCEL POS #1	ACCEL POS #2	ACCEL POS #1	ACCEL POS #2	
0 V	0 V	0 V	0 V	VCcircuit open
0 V	0.9 - 2.3 V	0 V	3.4 - 5.0 V	VPA1 circuit open or ground short
0.5 - 1.1 V	0 V	3.0 - 4.6 V	0 V	VPA2 circuit open or ground short
5 V	5 V	5 V	5 V	E2 circuit open

WIRING DIAGRAM



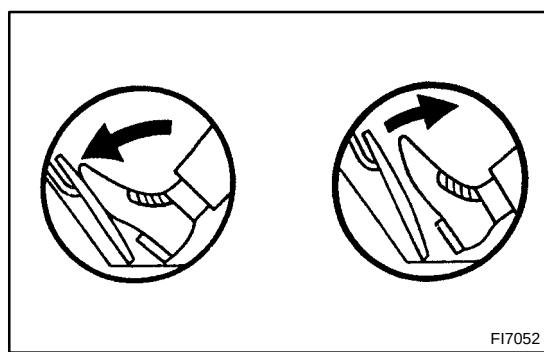
INSPECTION PROCEDURE

HINT:

Read freeze frame data using hand-held tester or OBD II scan tool, as freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio was lean or rich, etc. at the time of the malfunction.

Hand-held tester:

1 READ VALUE OF HAND-HELD TESTER



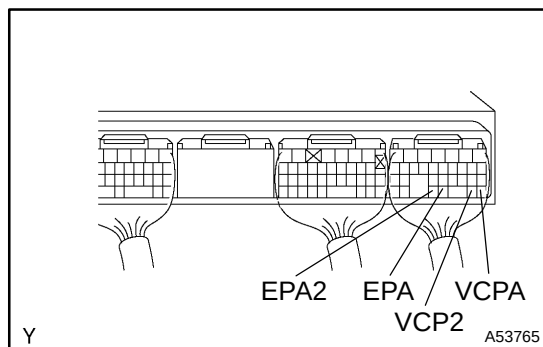
- (a) Select the item "ACCEL POS #1" and "ACCEL POS #2" in the DATA LIST and read its value displayed on the hand-held tester.

Accelerator pedal	VPA	VPA2
Released	0.5 - 1.1 V	0.9 - 2.3 V
Depressed	3.0 - 4.6 V	3.4 - 5.0 V

OK

CHECK AND REPLACE ECM

NG

2 INSPECT ECM(VCPA - EPA, VCP2 - EPA2)

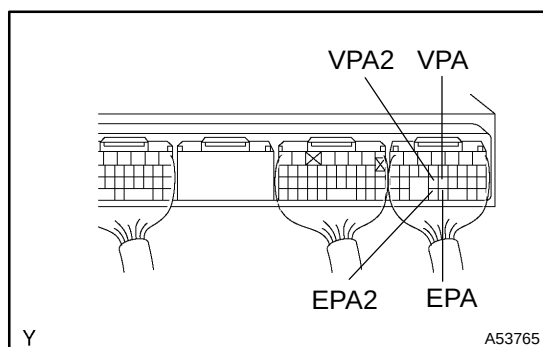
- (a) Measure the voltage between terminals VCPA and EPA, VCP2 and EPA2 of the ECM connector.

Voltage: 4.5 - 5.5 V

NG

CHECK AND REPLACE ECM

OK

3 INSPECT ECM(VPA - EPA, VPA2 - EPA2)

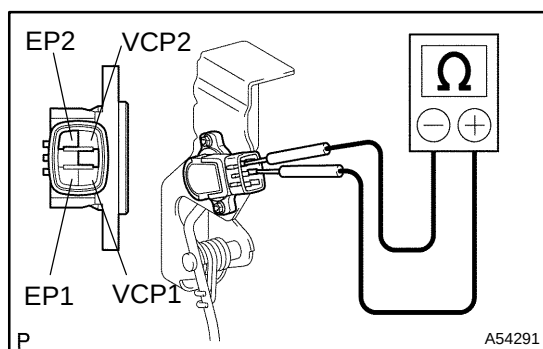
- (a) Measure the voltage between terminals VPA and EPA, and VPA2 and EPA2 of the ECM connector.

Accelerator pedal	Voltage	
	VPA - EPA	VPA2 - EPA2
Released	0.5 - 1.1 V	0.9 - 2.3 V
Depressed	3.0 - 4.6 V	3.4 - 5.0 V

OK

CHECK AND REPLACE ECM

NG

4 INSPECT ACCELERATOR PEDAL ASSY(POSITION SENSOR)

- (a) Disconnect the accelerator pedal position sensor connector.
 (b) Using an ohmmeter, measure the resistance between each terminals.

Resistance: at 20°C (68°F)

Terminals	Resistance
VCP1 - EP1 VCP2 - EP2	2.25 - 4.75 kΩ

NG

REPLACE ACCELERATOR PEDAL ASSY

OK

5 CHECK AND REPLACE HARNESS AND CONNECTOR(ECM - ACCELERATOR POSITION SENSOR)

NG

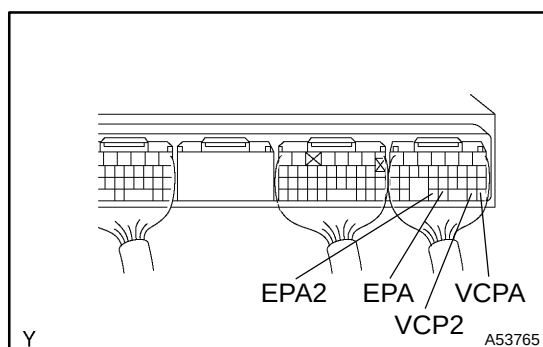
REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

CHECK AND REPLACE ECM

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

1 INSPECT ECM(VCPA - EPA, VCP2 - EPA2)



- (a) Measure the voltage between terminals VCPA and EPA, VCP2 and EPA2 of the ECM connector.

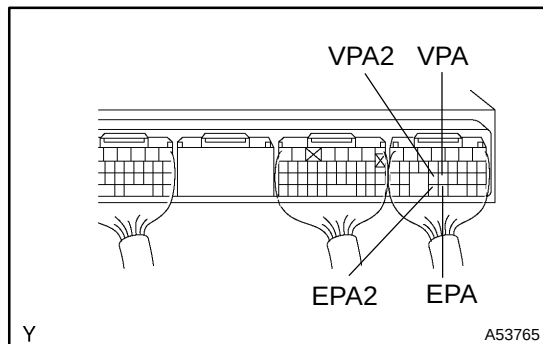
Voltage: 4.5 - 5.5 V

NG

CHECK AND REPLACE ECM

OK

2 INSPECT ECM(VPA - EPA, VPA2 - EPA2)



- (a) Measure the voltage between terminals VPA and EPA, and VPA2 and EPA2 of the ECM connector.

Accelerator pedal	Voltage	
	VPA - EPA	VPA2 - EPA2
Released	0.5 - 1.1 V	0.9 - 2.3 V
Depressed	3.0 - 4.6 V	3.4 - 5.0 V

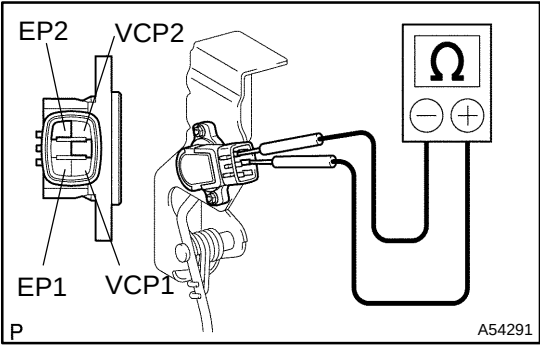
OK

CHECK AND REPLACE ECM

NG

3

INSPECT ACCELERATOR PEDAL ASSY(POSITION SENSOR)



- (a) Disconnect the accelerator pedal position sensor connector.
- (b) Using an ohmmeter, measure the resistance between each terminals.

Resistance: at 20°C (68°F)

Terminals	Resistance
VCP1 - EP1	2.25 - 4.75 kΩ
VCP2 - EP2	

NG

REPLACE ACCELERATOR PEDAL ASSY

OK

4

CHECK HARNESS AND CONNECTOR(VCPA,VPA - EPA VCP2,VPA2 - EPA2)

NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

CHECK AND REPLACE ECM

DTC	P1121	ACCELERATOR PEDAL POSITION SENSOR RANGE/PERFORMANCE PROBLEM
------------	--------------	--

CIRCUIT DESCRIPTION

Refer to DTC P1120 on page [05-120](#) .

DTC No.	DTC Detection Condition	Trouble Area
P1121	Condition (a) continues for 2.0 seconds: (IDL ON: 10 seconds) (a) Difference between VPA and VPA2 is out of threshold (b) IDL is OFF	- Accelerator pedal position sensor - ECM

WIRING DIAGRAM

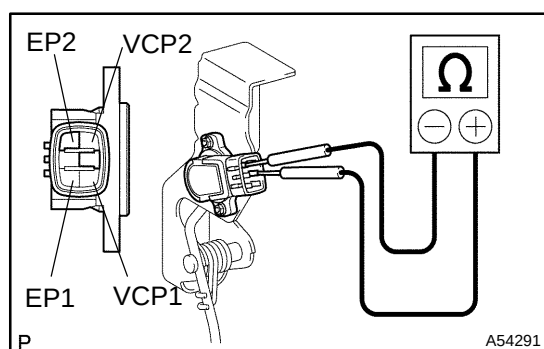
Refer to DTC P1120 on page [05-120](#) .

INSPECTION PROCEDURE

HINT:

Read freeze frame data using hand-held tester or OBD II scan tool, as freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio was lean or rich, etc. at the time of the malfunction.

1 INSPECT ACCELERATOR PEDAL ASSY(POSITION SENSOR)



- Disconnect the accelerator pedal position sensor connector.
- Using an ohmmeter, measure the resistance between each terminals.

Resistance: at 20°C (68°F)

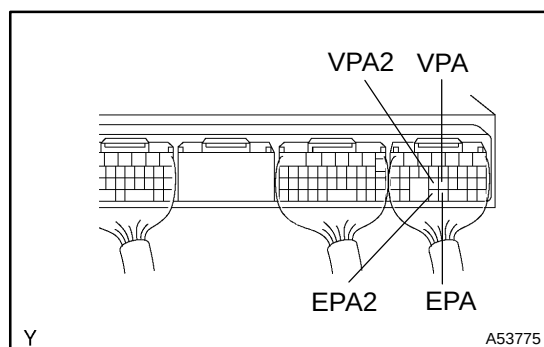
Terminals	Resistance
VCP1 - EP1 VCP2 - EP2	2.25 - 4.75 kΩ

NG

Go to step 3

OK

2 INSPECT ECM(VPA - EPA, VPA2 - EPA2)



- Measure the voltage between terminals VPA and EPA, and VPA2 and EPA2 of the ECM connector.

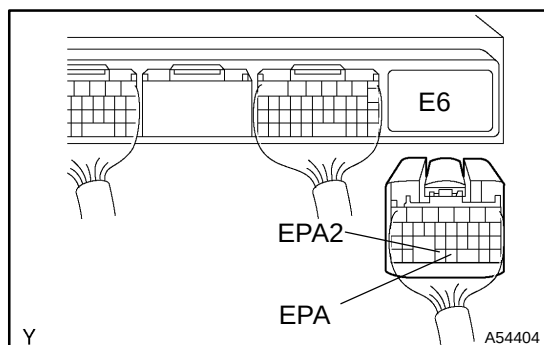
Accelerator pedal	Voltage	
	VPA - EPA	VPA2 - EPA2
Released	0.5 - 1.1 V	0.9 - 2.3 V
Depressed	3.0 - 4.6 V	3.4 - 5.0 V

OK

CHECK AND REPLACE ECM

NG

3 CHECK HARNESS AND CONNECTOR(ECM - ACCELERATOR POSITION SENSOR)

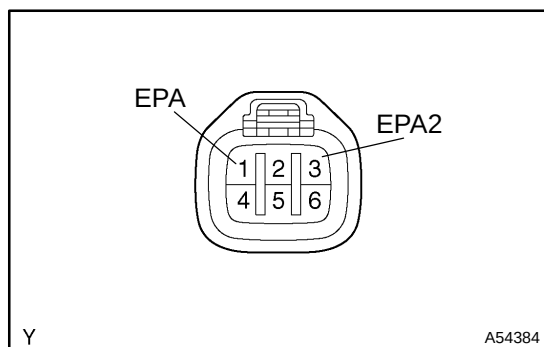


- (a) Disconnect the ECM E6 connector.
- (b) Check the continuity of the accelerator position sensor and ECM.

Standard: Continuity

- (c) Check the continuity of the EPA, EPA2 of the accelerator position sensor and the body ground.

Standard: No continuity



NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

REPLACE ACCELERATOR PEDAL ASSY

DTC	P1125	THROTTLE CONTROL MOTOR CIRCUIT MALFUNCTION
------------	--------------	---

CIRCUIT DESCRIPTION

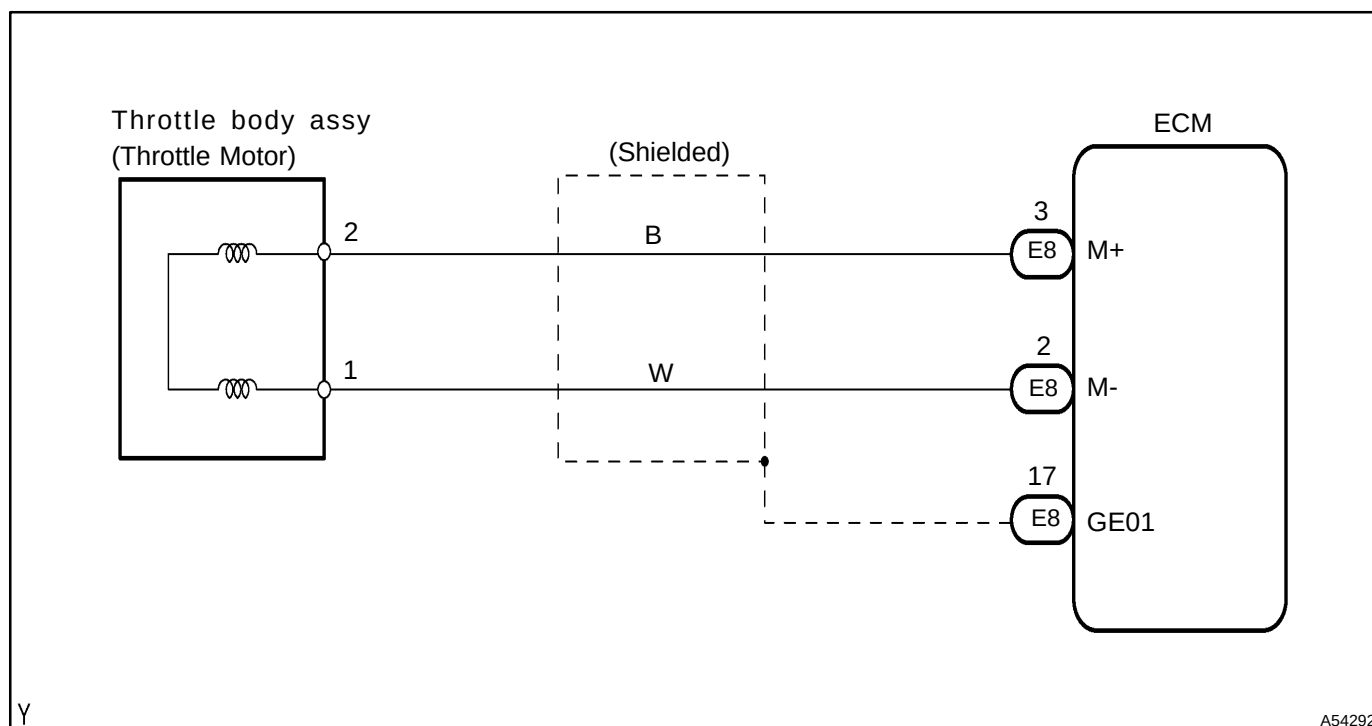
Throttle motor is operated by the ECM and it opens and closes the throttle valve.

The opening angle of the throttle valve is detected by the throttle position sensor which is mounted on the throttle body and it provides feedback to the ECM to control the throttle motor in order to control the throttle valve opening angle properly in response to driving condition.

If this DTC is stored, the ECM shuts down the power for the throttle motor, and the throttle valve is fully closed by the return spring.

DTC No.	DTC Detection Condition	Trouble Area
P1125	Conditions (a) and (b) continue for 2.0 seconds: (a) Throttle control motor output duty $\geq 80\%$ (b) Throttle control motor current $< 0.5\text{ A}$	• Open or short in throttle control motor circuit • Throttle body assy (Throttle motor) • ECM
	Throttle control motor current $\geq 16\text{ A}$	
	Condition (a) continues for 0.6 seconds: (a) Throttle control motor current $\geq \text{high}$	

WIRING DIAGRAM

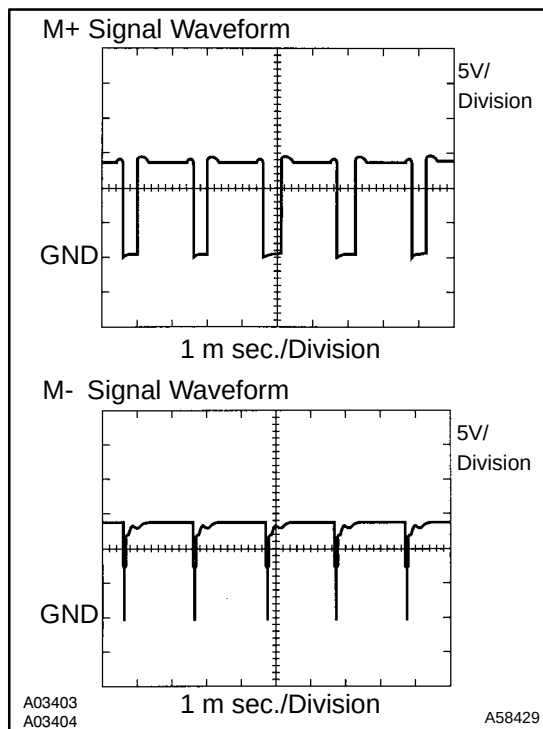


INSPECTION PROCEDURE

HINT:

Read freeze frame data using hand-held tester or OBD II scan tool, as freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio was lean or rich, etc. at the time of the malfunction.

1 INSPECT THROTTLE BODY ASSY(THROTTLE CONTROL MOTOR CIRCUIT)



- (a) Check the waveform between E8 ECM terminals M+ or M- and E1 when the engine is idling.

HINT:

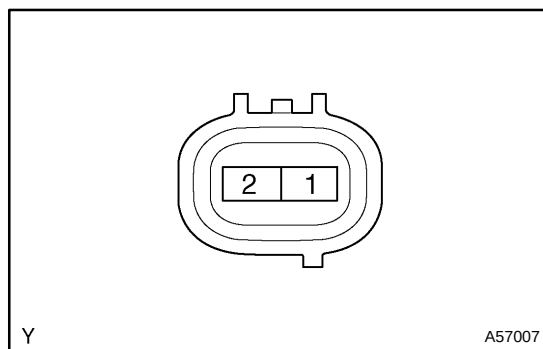
The waveform frequency changes depending on the throttle opening.

OK

CHECK AND REPLACE ECM

NG

2 INSPECT THROTTLE BODY ASSY(THROTTLE CONTROL MOTOR)



- (a) Disconnect the throttle control motor connector.
- (b) Using an ohmmeter, measure the motor resistance between terminals 1 (M-) and 2 (M+).

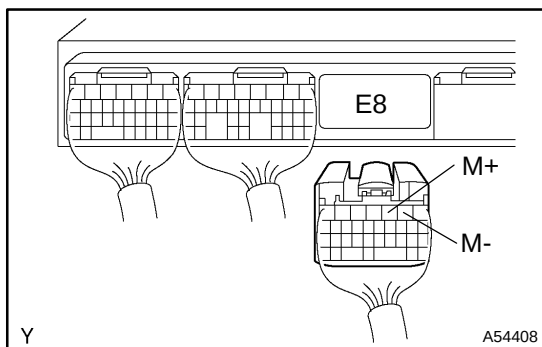
Motor resistance: 0.3 - 100 Ω at 20°C (68°F)

NG

REPLACE THROTTLE BODY ASSY

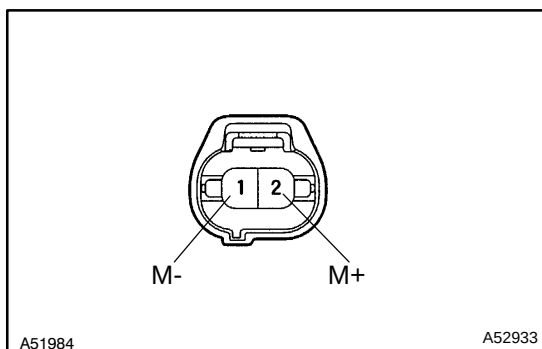
OK

3 CHECK HARNESS AND CONNECTOR(ECM - THROTTLE CONTROL MOTOR)



- (a) Disconnect the ECM E8 connector.
- (b) Check the continuity of the throttle control motor and ECM.

Standard: Continuity



NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

CHECK AND REPLACE ECM

DTC	P1127	ETCS ACTUATOR POWER SOURCE CIRCUIT MALFUNCTION
-----	-------	--

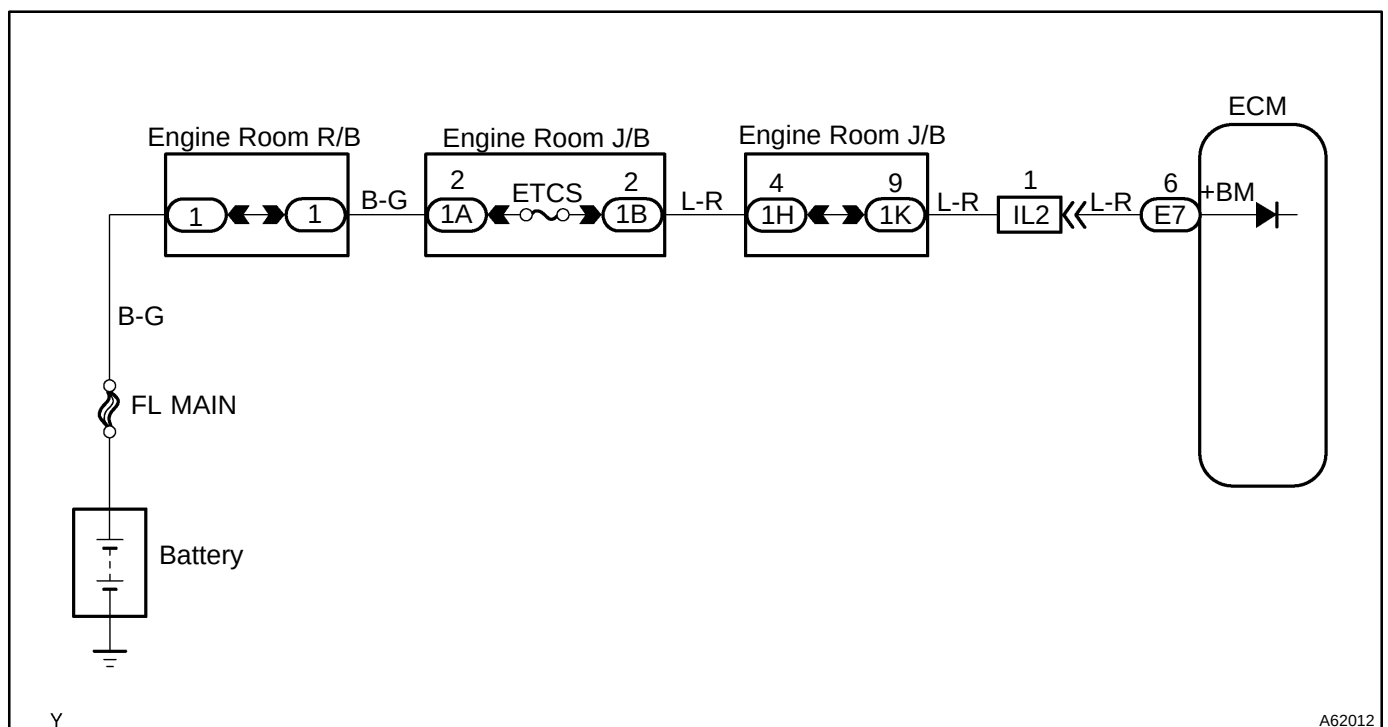
CIRCUIT DESCRIPTION

Battery positive voltage is supplied to terminal +BM of the ECM even once when the ignition switch is OFF for the electric throttle control system.

If this DTC is stored, the ECM shuts down the power for the throttle motor, and the throttle valve is fully closed by the return spring.

DTC No.	DTC Detection Condition	Trouble Area
P1127	Open in ETCS power source circuit	• Open in ETCS power source circuit • ECM

WIRING DIAGRAM

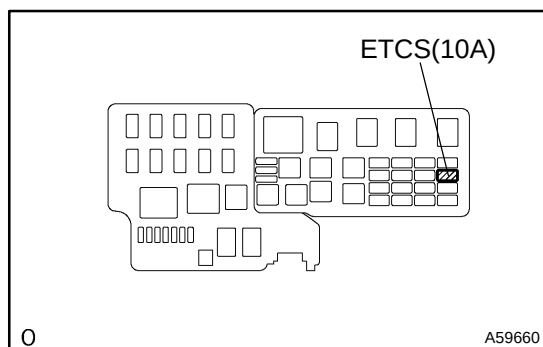


INSPECTION PROCEDURE

HINT:

Read freeze frame data using hand-held tester or OBD II scan tool. Because freeze frame records the engine conditions when the malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio was lean or rich, etc. at the time of the malfunction.

1 INSPECT ETCS FUSE



- (a) Check the continuity of the ETCS fuse.

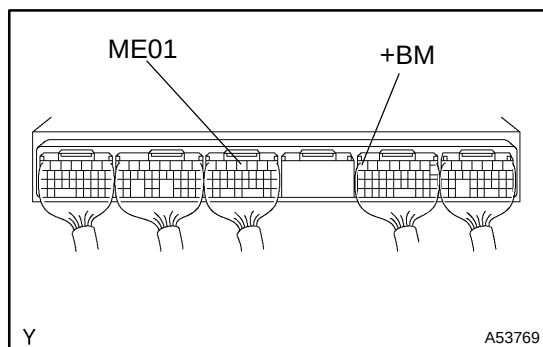
Standard: Continuity

NG

CHECK FOR SHORT IN ALL THE HARNESS TO ETCS FUSE

OK

2 INSPECT ECM(+BM - ME01)



- (a) Measure the voltage between terminals +BM and ME01 of the ECM connectors.

Voltage: 9 - 14 V

NG

CHECK AND REPLACE ECM

OK

3 CHECK HARNESS AND CONNECTOR(BATTERY - ETCS FUSE, ETCS FUSE - ECM)

NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

CHECK AND REPLACE ECM

DTC	P1128	THROTTLE CONTROL MOTOR LOCK MALFUNCTION
------------	--------------	--

CIRCUIT DESCRIPTION

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 and it provides feedback to the ECM to control the throttle motor in order the throttle valve opening angle properly in response to driving condition. If this DTC is stored, the ECM shuts down the power for the throttle motor, and the throttle valve is fully closed by the return spring.

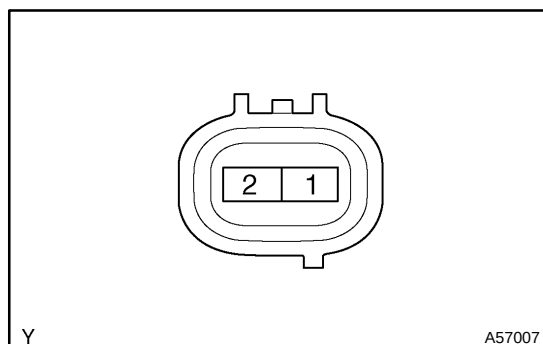
DTC No.	DTC Detection Condition	Trouble Area
P1128	Lock throttle control motor during control throttle control motor	• Throttle body assy (Throttle motor) • Throttle body assy (Throttle valve)

INSPECTION PROCEDURE

HINT:

Read freeze frame data using hand-held tester or OBD II scan tool, as freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio was lean or rich, etc. at the time of the malfunction.

1 INSPECT THROTTLE BODY ASSY(THROTTLE CONTROL MOTOR)



- Disconnect the throttle control motor connector.
- Using an ohmmeter, measure the motor resistance between terminals 1 (M-) and 2 (M+).

Motor resistance: 0.3 - 100 Ω at 20°C (68°F)

NG

REPLACE THROTTLE BODY ASSY

OK

2 INSPECT THROTTLE BODY ASSY(THROTTLE VALVE)

Check whether or not a foreign body is caught between the throttle valve and housing.

NG

REMOVE FOREIGN BODY AND CLEAN THROTTLE BODY

OK

REPLACE THROTTLE BODY ASSY (See page 10-6)

DTC	P1129	ELECTRIC THROTTLE CONTROL SYSTEM MALFUNCTION
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CIRCUIT DESCRIPTION

Electric Throttle Control System (ETCS) is composed of the throttle motor to operate the throttle valve, the throttle position sensor to detect the opening angle of the throttle valve, the accelerator pedal position sensor to detect the accelerator pedal position, the ECM to control the ETCS and the one valve type throttle body. The ECM controls the throttle motor to make the throttle valve opening angle properly in response driving condition.

The throttle position sensor which is mounted on the throttle body detects the opening angle of the throttle valve, and it provides feedback to the ECM to control the throttle motor.

If the ETCS has a malfunction, the ECM shuts down the power for the throttle motor, and the throttle valve is fully closed by the return spring.

DTC No.	DTC Detection Condition	Trouble Area
P1129	Throttle opening angle continues to vary greatly from target throttle opening angle	• Electric throttle control system • ECM

WIRING DIAGRAM

Refer to DTC P1125 on page [05-127](#) .

INSPECTION PROCEDURE

HINT:

Read freeze frame data using hand-held tester or OBD II scan tool. Because freeze frame records the engine conditions when the malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio was lean or rich, etc. at the time of the malfunction.

1	CHECK OTHER DTC OUTPUT(BESIDES DTC P1129)
----------	--

(a) Read the DTC using hand-held tester or OBD II scan tool.

YES

GO TO RELEVANT DTC CHART

NO

2	INSPECT THROTTLE BODY ASSY (See Page 10-1)
----------	--

NG

REPLACE THROTTLE BODY ASSY

OK

INSPECT ECM

DTC	P1130	A/F SENSOR CIRCUIT RANGE/PERFORMANCE MALFUNCTION(BANK1 SENSOR1)
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DTC	P1150	A/F SENSOR CIRCUIT RANGE/PERFORMANCE MALFUNCTION(BANK2 SENSOR1)
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CIRCUIT DESCRIPTION

Refer to DTC P0125 on page [05-52](#) .

DTC No.	DTC Detecting Condition	Trouble Area
P1130 P1150	Voltage output* of A/F sensor remains at 3.8 V or more, or 2.8 V or less, during engine running after the engine is warmed up (2 trip detection logic) *: Output value changes at inside of ECM only	• Open or short in A/F sensor circuit • A/F sensor • Air induction system • Fuel pressure • Injector • ECM
	Voltage output* of A/F sensor does not change from 3.30 V, during engine running after the engine is warmed up (2 trip detection logic) *: Output value changes at the inside of ECM only	
	Open or short in A/F sensor circuit (2 trip detection logic)	

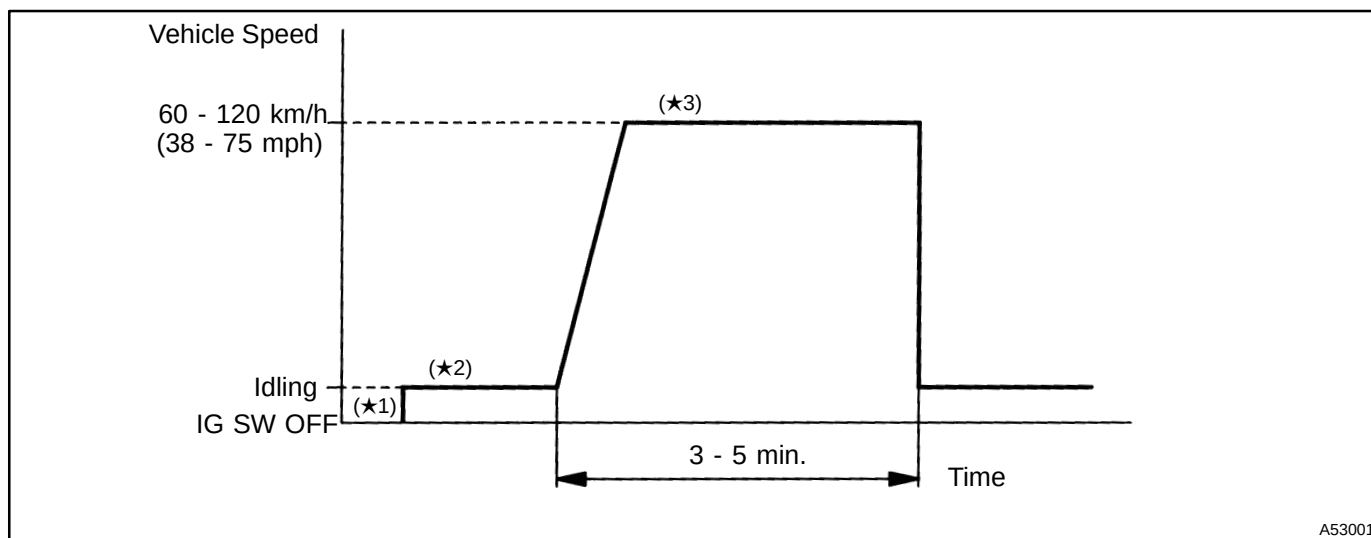
HINT:

- After confirming DTC P1130, use the OBD II scan tool or hand–held tester to confirm voltage output of A/F sensor (AFS B1 S1/O2S B1 S1) from the CURRENT DATA.
- The A/F sensor's output voltage and the short–term fuel trim value can be read using the OBD II scan tool or hand–held tester.
- The ECM controls the voltage of the AFR+, AFL+, AFR– and AFL– terminals of the ECM to the fixed voltage. Therefore, it is impossible to confirm the A/F sensor output voltage without the OBDII scan tool or hand-held tester.
- OBD II scan tool (excluding hand–held tester) displays the one fifth of the A/F sensor output voltage which is displayed on the hand–held tester.

WIRING DIAGRAM

Refer to DTC P0125 on page [05-52](#) .

CONFIRMATION DRIVING PATTERN



A53001

1. Connect the hand-held tester to the DLC3. (★1)
2. Switch the hand-held tester from the normal mode to the check mode (See page 05-5).(★1)
3. Start the engine and warm it up with all the accessory switches OFF.(★2)
4. Drive the vehicle at 60 - 120 km/h (38 - 75 mph) and engine speed at 1,400 - 3,200 rpm for 3 - 5 min.(★3)

HINT:

If a malfunction exists, the MIL will light up during step (★3)

NOTICE:

If the conditions in this test are not strictly followed, detection of the malfunction will not be possible. If you do not have a hand-held tester, turn the ignition switch OFF after performing steps (★2) and (★3), then perform steps (★2) and (★3) again.

INSPECTION PROCEDURE

HINT:

- If DTC P1130 is displayed, check Bank 1 Sensor 1 circuit.
- If DTC P1150 is displayed, check Bank 2 Sensor 1 circuit.
- Read freeze frame data using hand-held tester or OBD II scan tool. Because freeze frame records the engine conditions when the malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio was lean or rich, etc. at the time of the malfunction.

1 CHECK OTHER DTC OUTPUT(BESIDES DTC P1130, P1150)

- (a) Read the DTC using the hand-held tester or OBD II scan tool.

YES

GO TO RELEVANT DTC CHART

NO

2 CHECK AIR FUEL RATIO SENSOR(OUTPUT VOLTAGE)

- (a) Warm up the A/F sensor with the engine speed at 2,500 rpm for approx. 90 sec.
 (b) Read the voltage value of the A/F sensor on the screen of OBDII scan tool or hand-held tester when you perform all the following conditions.

HINT:

The voltage of the AFR+ or AFL+ terminal of the ECM is fixed at 3.3 V and the voltage of the AFR- or AFL- terminal is fixed at 3.0 V. Therefore, it is impossible to check the A/F sensor output voltage at the terminals (AFR+, AFL+/AFR-, AFL-) of the ECM.

Result:

Condition	A/F Sensor Voltage Value
Engine idling	• Not remains at 3.30 V (0.660 V*) • Not remains at 3.8 V (0.76 V*) or more • Not remains at 2.8 V (0.56 V*) or less *: When you use OBD II scan tool (excluding hand-held tester)
Engine racing	
Driving at engine speed 1,500 rpm or more and vehicle speed 40 km/h (25 mph) or more, and operate throttle valve open and close	

HINT:

- During fuel enrichment, there is a case that the output voltage of the A/F sensor is below 2.8 V (0.56 V*), it is normal.
- During fuel cut, there is a case that the output voltage of the A/F sensor is above 3.8 V (0.76 V*), it is normally.
- If the output voltage of the A/F sensor remains at 3.30 V (0.660 V*) even after performing all the above conditions, the A/F sensor circuit may be open.
- If the output voltage of the A/F sensor remains at 3.8 V (0.76 V*) or more, or 2.8 V (0.56 V*) or less even after performing all the above conditions, the A/F sensor circuit may be short.

*: When you use the OBD II scan tool (excluding hand-held tester).

OK

Go to step 8

NG

3 CHECK HARNESS AND CONNECTOR(ECM - A/F SENSOR)

NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

4 CHECK AIR FUEL RATIO SENSOR(RESISTANCE) (See page 12-6)

NG

REPLACE AIR FUEL RATIO SENSOR

OK

5 CHECK AIR INDUCTION SYSTEM (See page 11-1)

NG

REPAIR OR REPLACE

OK

6 CHECK FUEL PRESSURE (See page [11-1](#))**NG****REPAIR OR REPLACE FUEL SYSTEM****OK****7 INSPECT FUEL INJECTOR ASSY (See page [11-7](#))****NG****REPLACE FUEL INJECTOR ASSY****OK****REPLACE AIR FUEL RATIO SENSOR****8 PERFORM CONFIRMATION DRIVING PATTERN (See page [05-52](#))****GO****9 READ OUTPUT DTC(DTC P1130 OR P1150 OUTPUT AGAIN)****YES****CHECK AND REPLACE ECM****NO****10 CONFIRM VEHICLE RUNS OUT OF FUEL IN THE PAST****NO****CHECK FOR INTERMITTENT PROBLEMS****YES****DTC P1130 OR P1150 IS CAUSED BY RUNNING OUT OF FUEL**

DTC	P1133	A/F SENSOR CIRCUIT RESPONSE MALFUNCTION(BANK1 SENSOR1)
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DTC	P1153	A/F SENSOR CIRCUIT RESPONSE MALFUNCTION(BANK2 SENSOR1)
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CIRCUIT DESCRIPTION

Refer to DTC P0125 on page [05-52](#) .

DTC No.	DTC Detecting Condition	Trouble Area
P1133 P1153	After engine is warmed up, and during vehicle driving at engine speed 1,400 rpm or more and vehicle speed 60 km/h (38 mph) or more, if the response characteristic of A/F sensor becomes deteriorated (2 trip detection logic)	• Open or short in A/F sensor circuit • A/F sensor • Air induction system • Fuel pressure • Injector • ECM

WIRING DIAGRAM

Refer to DTC P0125 on page [05-52](#) .

INSPECTION PROCEDURE

HINT:

Read freeze frame data using hand-held tester or OBD II scan tool. Because freeze frame records the engine conditions when the malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio was lean or rich, etc. at the time of the malfunction.

1	CHECK OTHER DTC OUTPUT(BESIDES DTC P1133, P1153)
----------	---

(a) Read the DTC using the hand-held tester or OBD II scan tool.

YES

GO TO RELEVANT DTC CHART

NO

2 READ VALUE OF OBD II SCAN TOOL OR HAND-HELD TESTER(AIR FUEL RATIO SENSOR)

- (a) Warm up the A/F sensor with the engine speed at 2,500 rpm for approx. 90 sec.
 (b) Read the voltage of the A/F sensor on the screen of the OBD II scan tool or hand-held tester when you perform all the following conditions.

HINT:

The voltage of the AFR+ or AFL+ terminal of the ECM is fixed at 3.3 V and the voltage of the AFR- or AFL- terminal is fixed at 3.0 V. Therefore, it is impossible to check the A/F sensor output voltage at the terminals (AFR+, AFL+/AFR-, AFL-) of the ECM.

Result:

Condition	A/F Sensor Voltage value
Engine idling	• Not remains at 3.30 V (0.660 V*) • Not remains at 3.8 V (0.76 V*) or more • Not remains at 2.8 V (0.56 V*) or less *: When you use the OBD II scan tool (excluding hand-held tester)
Engine racing	
Driving at engine speed 1,500 rpm or more and vehicle speed 40 km/h (25 mph) or more, and operate throttle valve open and close	

HINT:

- During fuel enrichment, there is a case that the output voltage of the A/F sensor is below 2.8 V (0.56 V*), it is normal.
- During fuel cut, there is a case that the output voltage of the A/F sensor is above 3.8 V (0.76 V*), it is normal.
- If the output voltage of the A/F sensor remains at 3.30 V (0.660 V*) even after performing all the above conditions, the A/F sensor circuit may be open.
- If the output voltage of the A/F sensor remains at 3.8 V (0.76V*) or more, or 2.8 V (0.56 V*) or less even after performing all the above conditions, the A/F sensor circuit may be short.

*: When you use the OBD II scan tool (excluding hand-held tester).

OK

Go to step 8

NG

3 CHECK HARNESS AND CONNECTOR(ECM - A/F SENSOR)

NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

4 CHECK AIR FUEL RATIO SENSOR(RESISTANCE) (See page 12-6)

NG

REPLACE AIR FUEL RATIO SENSOR

OK

5 CHECK AIR INDUCTION SYSTEM (See page 11-1)

NG

REPAIR OR REPLACE AIR INDUCTION SYSTEM

OK

6 CHECK FUEL PRESSURE (See page [11-1](#))**NG****REPAIR OR REPLACE FUEL SYSTEM****OK****7 INSPECT FUEL INJECTOR ASSY (See page [11-7](#))****NG****REPLACE FUEL INJECTOR ASSY****OK****REPLACE AIR FUEL RATIO SENSOR****8 PERFORM CONFIRMATION DRIVING PATTERN (See page [05-52](#))****GO****9 READ OUTPUT DTC(DTC P1133 OR P1153 OUTPUT AGAIN)****YES****CHECK AND REPLACE ECM****NO****10 CONFIRM VEHICLE RUNS OUT OF FUEL IN THE PAST****NO****CHECK FOR INTERMITTENT PROBLEMS****YES****DTC P1133 OR P1153 IS CAUSED BY RUNNING OUT OF FUEL**

DTC	P1135	A/F SENSOR HEATER CIRCUIT MALFUNCTION(BANK1 SENSOR1)
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DTC	P1155	A/F SENSOR HEATER CIRCUIT MALFUNCTION(BANK2 SENSOR1)
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CIRCUIT DESCRIPTION

Refer to DTC P0125 on page 05-52 .

DTC No.	DTC Detecting Condition	Trouble Area
P1135	When the heater operates, heater current exceeds 8 A (2 trip detection logic)	• Open or short in heater circuit of A/F sensor • A/F sensor heater • A/F HTR relay • ECM
P1155	Heater current of 0.25 A or less when the heater operates (2 trip detection logic)	

WIRING DIAGRAM

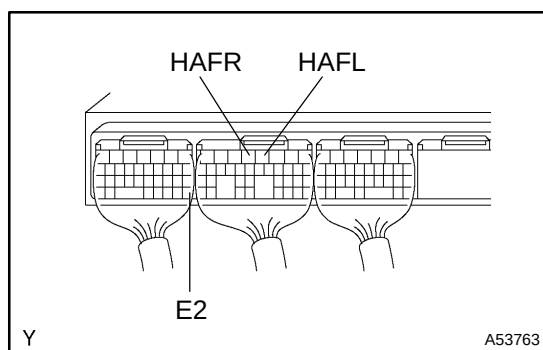
Refer to DTC P0125 on page 05-52 .

INSPECTION PROCEDURE

HINT:

Read freeze frame data using hand-held tester or OBD II scan tool. Because freeze frame records the engine conditions when the malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio was lean or rich, etc. at the time of the malfunction.

1	INSPECT ECM
----------	--------------------



- Turn the ignition switch ON.
- Measure the voltage between terminals HAFL, HAFL and E2 of the ECM connector.
Voltage: 9 - 14 V

OK

CHECK AND REPLACE ECM

NG

2	CHECK AIR FUEL RATIO SENSOR(RESISTANCE) (See page 12-6)
----------	---

NG

REPLACE AIR FUEL RATIO SENSOR

OK

3	CHECK E.F.I ECU RELAY (See page 10-2)
---	--

NG

REPLACE E.F.I ECU RELAY

OK

REPAIR OR REPLACE HARNESS AND CONNECTOR

DTC	P1300	IGNITER CIRCUIT MALFUNCTION(NO.1)
DTC	P1305	IGNITER CIRCUIT MALFUNCTION(NO.2)
DTC	P1310	IGNITER CIRCUIT MALFUNCTION(NO.3)
DTC	P1315	IGNITER CIRCUIT MALFUNCTION(No.4)
DTC	P1320	IGNITER CIRCUIT MALFUNCTION(NO.5)
DTC	P1325	IGNITER CIRCUIT MALFUNCTION(NO.6)

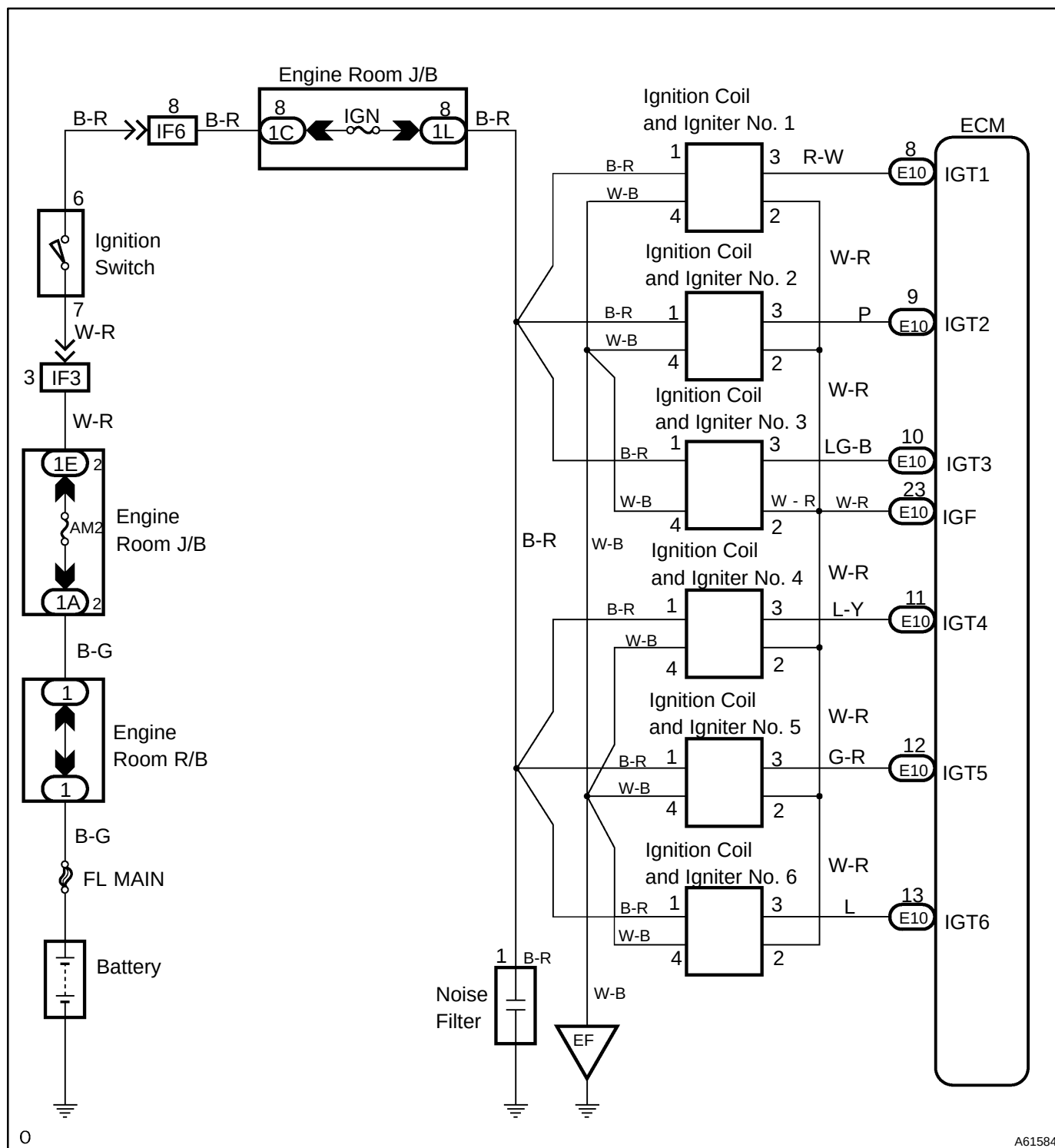
CIRCUIT DESCRIPTION

A Direct Ignition System (DIS) has been adopted. The DIS improves the ignition timing accuracy, reduces high-voltage loss, and enhances the 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 pass from the center electrode to the ground electrode.

The ECM determines ignition timing and outputs the ignition signals (IGT) for each cylinder. Based on IGT signals, the power transistors in the igniter cuts off the current to the primary coil in the ignition coil is supplied to the spark plug that are connected to the end of the secondary coil. At the same time, the igniter also sends an ignition confirmation signal (IGF) as a fail-safe measure to the ECM.

DTC No.	DTC Detecting Condition	Trouble Area
P1300 P1305 P1310 P1315 P1320 P1325	No IGF signal to engine ECU while engine is running	• Ignition system • Open or short in IGF and IGT1 - 6 circuit from ignition coil with ignite • No.1 - No.6 ignition coil with igniter • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If DTC P1300 is displayed, check No.1 ignition coil with igniter circuit.
- If DTC P1305 is displayed, check No.2 ignition coil with igniter circuit.
- If DTC P1310 is displayed, check No.3 ignition coil with igniter circuit.
- If DTC P1315 is displayed, check No.4 ignition coil with igniter circuit.
- If DTC P1320 is displayed, check No.5 ignition coil with igniter circuit.
- If DTC P1325 is displayed, check No.6 ignition coil with igniter circuit.
- Read freeze frame data using hand-held tester. Because freeze frame records the engine conditions when the malfunction is detected, when troubleshooting it is useful for determining whether the vehicle was running or stopped, the engine warmed up or not, the air-fuel ratio lean or rich, etc. at the time of the malfunction.

1 CHECK SPARK PLUG (See page 18-1)

NG

Go to step 4

OK

2 CHECK HARNESS AND CONNECTOR(ECM - IGNITION COIL)

HINT:

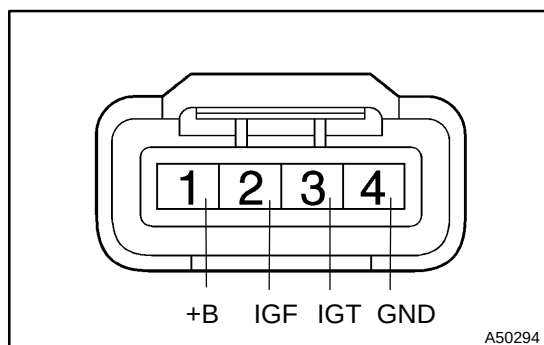
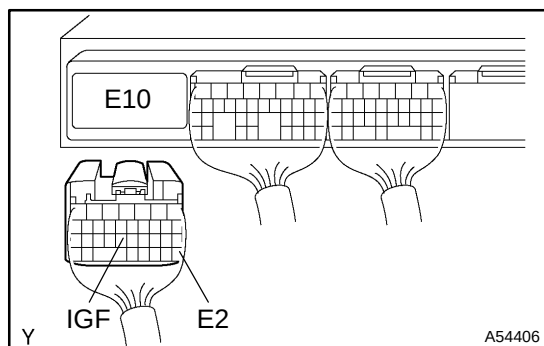
The procedure below is for No.1 cylinder. If a malfunction is found on the other cylinders, check the circuit for the cylinder with referring to this procedure.

- Disconnect the ignition coil connector.
- Disconnect the ECM E10 connector.
- Check for open between the terminals IGF of the ECM connector and IGF of the ignition coil connector.

Resistance: 1 Ω or less

- Check for short between the terminals IGF and E2 of the ECM connector.

Resistance: 1 M Ω or less

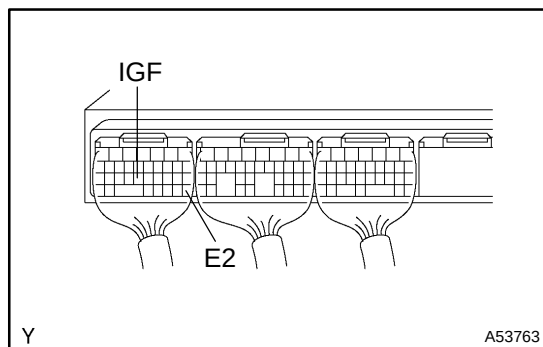


NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

3 INSPECT ECM



- (a) Disconnect the ignition coil connector.
- (b) Turn the ignition switch ON
- (c) Measure voltage between the terminals IGF and E2 of the ECM connector.

Voltage: 4.5 - 5.5 V

OK

CHECK AND REPLACE ECM

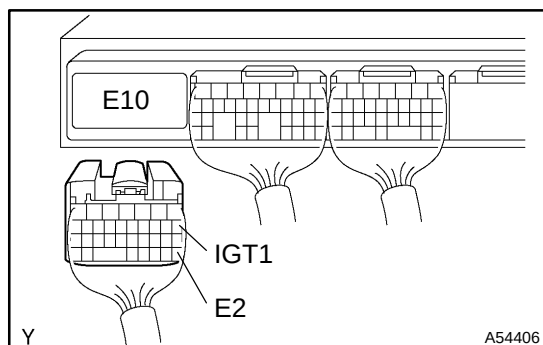
NG

CHECK AND REPLACE ECM

4 CHECK HARNESS AND CONNECTOR(ECM - IGNITION COIL)

HINT:

The procedure below is for No.1 cylinder. If a malfunction is found on the other cylinders, check the circuit for the cylinder with referring to this procedure.

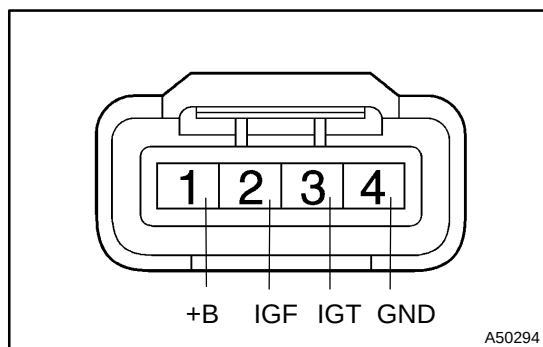


- (a) Disconnect the ignition coil connector.
- (b) Disconnect the ECM E10 connector.
- (c) Check for open between the terminals IGT1 of the ECM connector and IGT of the ignition coil connector.

Resistance: 1 Ω or less

- (d) Check for short between the terminals IGT1 and E2 of the ECM connector.

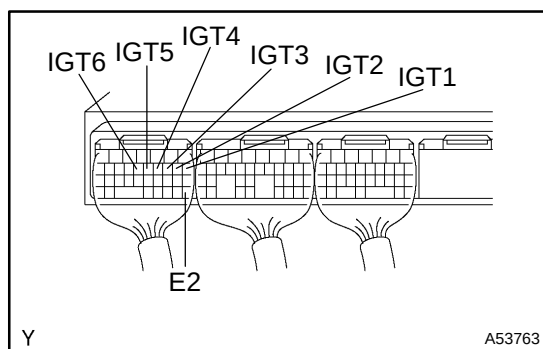
Resistance: 1 M Ω or less



NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

5 INSPECT ECM

- Turn the ignition switch ON.
- Measure the voltage between terminals IGT1 - IGT6 and E2 of the ECM connector when the engine is cranked.

Voltage: More than 0.1 V and less than 4.5 V

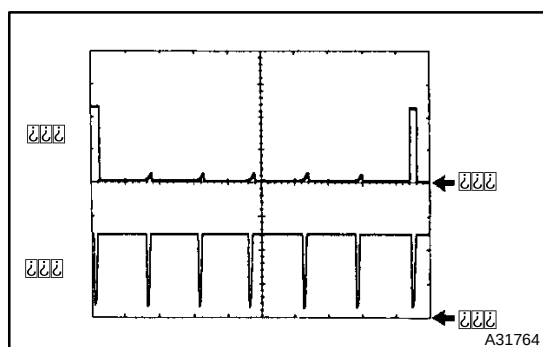
HINT:

During cranking or idling, check the waveform between terminals IGT1 - IGT6 and E2 of the ECM connector.

Item	Contents
Terminal	CH1: IGT1, IGT2, IGT3, IGT4, IGT5, IGT6 - E2 CH2: IGF - E2
Equipment Set	2V/DIV, 20ms/DIV
Condition	While the engine is cranking or idling

HINT:

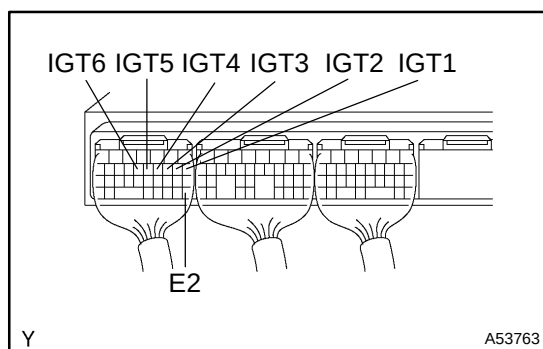
Correct waveform appears as shown, with rectangle waves.



NG

CHECK AND REPLACE ECM

OK

6 INSPECT ECM

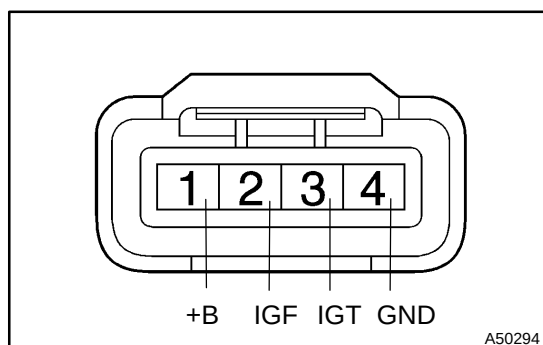
- Disconnect the ignition coil with the igniter connector.
- Turn the ignition switch ON.
- Measure the voltage between terminals IGT1 - IGT6 and E2 of the ECM connector when the engine is cranked.

Voltage: More than 0.1 V and less than 4.5 V

NG

CHECK AND REPLACE ECM

OK

7 CHECK IGNITION COIL ASSY(POWER SOUSE CIRCUIT)

- Disconnect the ignition coil with the igniter connector.
- Turn the ignition switch ON.
- Measure voltage between terminals +B and GND of the ignition coil with the igniter connector.

Voltage: 9 - 14 V

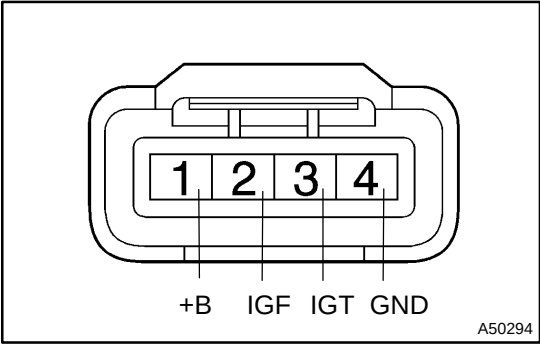
NG

REPAIR OR REPLACE POWER SOURCE

OK

8

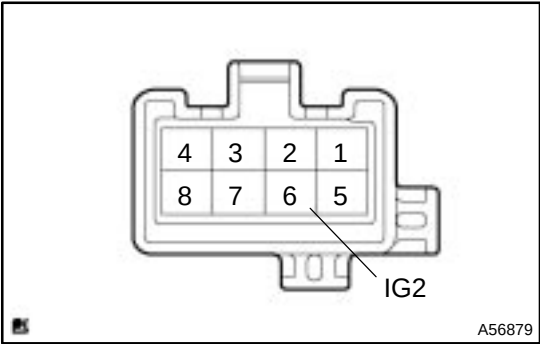
CHECK HARNESS AND CONNECTOR(IGNITION SWITCH - IGNITION COIL)



- (a) Disconnect the ignition coil with the igniter connector.
 - (b) Disconnect the ignition switch connector.
 - (c) Check open between the terminals +B of the ignition coil with igniter connector and IG2 of the ignition switch.
- Resistance: 1 Ω or less**

NG

REPAIR OR REPLACE HARNESS AND CONNECTOR



OK

REPLACE IGNITION COIL ASSY

DTC	P1335	CRANKSHAFT POSITION SENSOR CIRCUIT MALFUNCTION(DURING ENGINE RUNNING)
------------	--------------	--

CIRCUIT DESCRIPTION

Refer to DTC P0335 on page [05-80](#) .

DTC No.	DTC Detecting Condition	Trouble Area
P1335	No crank position sensor signal to ECM with engine speed 1,000 rpm or more	• Open or short in crankshaft position sensor circuit • Crank position sensor • Crankshaft timing pulley • ECM

WIRING DIAGRAM

Refer to DTC P0335 on page [05-80](#) .

INSPECTION PROCEDURE

HINT:

Read freeze frame data using hand-held tester or OBD II scan tool. Because freeze frame records the engine conditions when the malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio was lean or rich, etc. at the time of the malfunction.

1	INSPECT CRANK POSITION SENSOR (See page 18-2)
----------	---

Refer to DTC P0335 on page [05-80](#) .

NG	REPLACE CRANK POSITION SENSOR
-----------	--------------------------------------

OK

2	CHECK HARNESS AND CONNECTOR(ECM - CRANK POSITION SENSOR) (See page 05-80)
----------	---

NG	REPAIR OR REPLACE HARNESS AND CONNECTOR
-----------	--

OK

3	CHECK SENSOR INSTLLATION(CRANK POSITION SENSOR)
----------	--

NG	TIGHTEN SENSOR
-----------	-----------------------

OK

4	CHECK CRANKSHAFT TIMING PULLEY
---	--------------------------------

NG	REPLACE CRANKSHAFT TIMING PULLEY
----	----------------------------------

OK

CHECK AND REPLACE ECM

DTC	P1346	VVT SENSOR/CAMSHAFT POSITION SENSOR CIRCUIT RANGE/PERFORMANCE PLOBLEM(BANK1)
------------	--------------	---

DTC	P1351	VVT SENSOR/CAMSHAFT POSITION SENSOR CIRCUIT RANGE/PERFORMANCE PLOBLEM(BANK2)
------------	--------------	---

CIRCUIT DESCRIPTION

Refer to DTC P0340 on page [05-83](#) .

DTC No.	DTC Detection Condition	Trouble Area
P1346	Deviation in crankshaft position sensor signal and VVT sensor (bank 1) signal (2 trip detection logic)	• Mechanical system malfunction (Jumping teeth of timing belt, belt stretched) • ECM
P1351	Deviation in crankshaft position sensor signal and VVT sensor (bank 2) signal (2 trip detection logic)	

WIRING DIAGRAM

Refer to DTC P0340 on page [05-83](#) .

INSPECTION PROCEDURE

HINT:

Read freeze frame data using hand-held tester or OBD II scan tool. Because freeze frame records the engine conditions when the malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio was lean or rich, etc. at the time of the malfunction.

1	CHECK VALVE TIMING(CHECK FOR LOOSE AND JUMPING TEETH OF TIMING BELT) (See page 14-75)
----------	---

NG

ADJUST VALVE TIMING

OK

CHECK AND REPLACE ECM

DTC	P1349	VVT SYSTEM MALFUNCTION (BANK 1)
------------	--------------	--

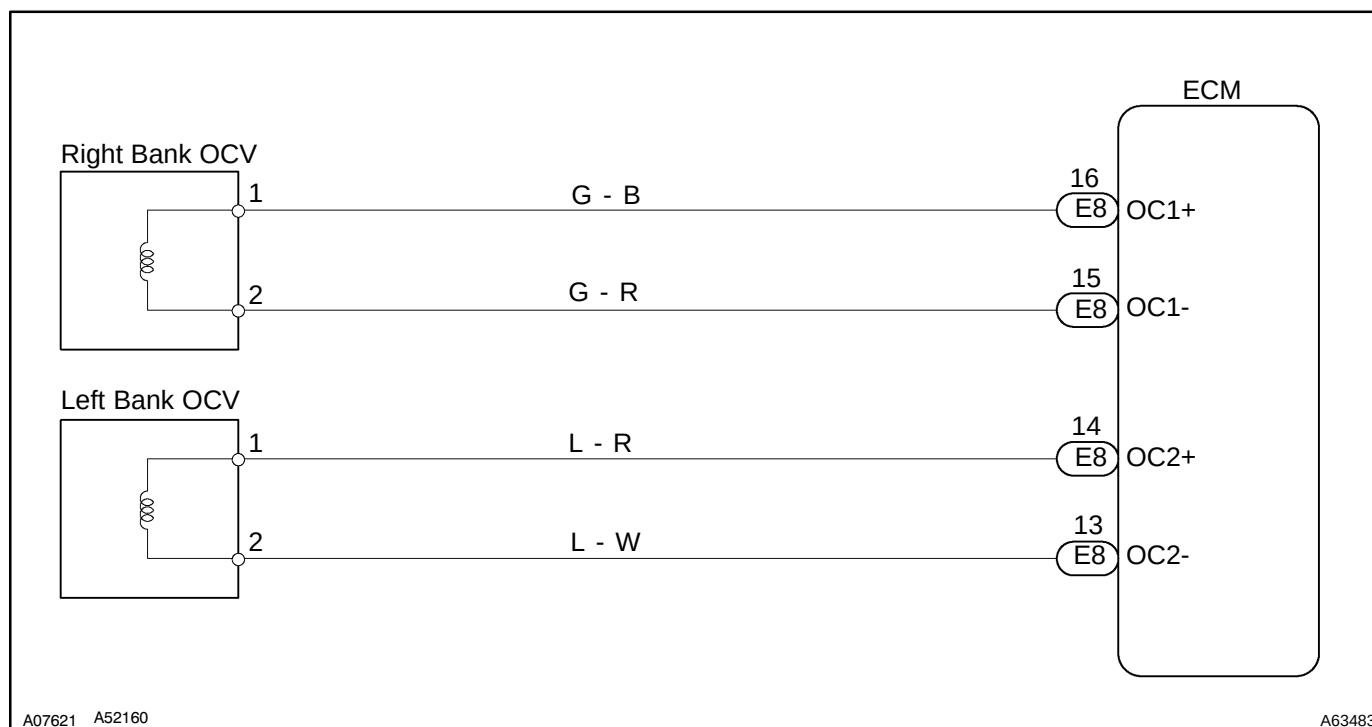
DTC	P1354	VVT SYSTEM MALFUNCTION (BANK 2)
------------	--------------	--

CIRCUIT DESCRIPTION

The VVT system constantly adjusts intake valve timing based upon operating conditions. The ECM controls the Oil Control Valve (OCV) with a variable duty cycle. The Oil Control Valve then supplies oil to the advance or retard side of the VVT controller. The oil applied to the VVT controller will cause the intake cam to advance or retard depending on the position of the Oil Control Valve. The ECM verifies that the desired camshaft angle has been achieved by monitoring the camshaft position sensor.

DTC No.	DTC Detecting Condition	Trouble Area
P1349 P1354	Condition (a) or (b) continues for after the engine is warmed up and engine speed at 400 - 4,000 rpm: (a) Valve timing does not change from of current valve timing (b) Current valve timing is fixed	• Valve timing • OCV • VVT controller assy • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

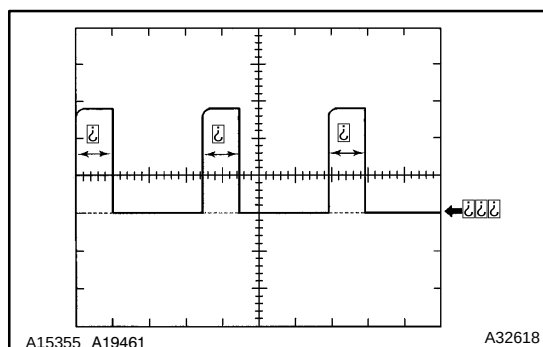
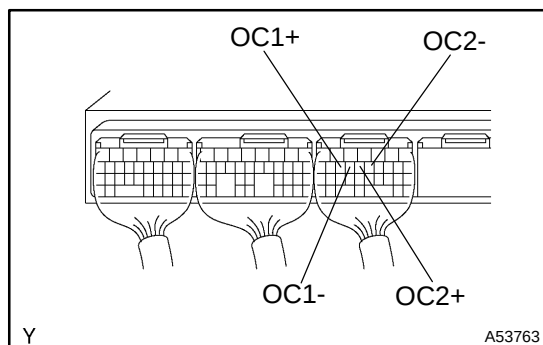
- If DTC P1349 is displayed, check right bank VVT system circuit.
- If DTC P1354 is displayed, check left bank VVT system circuit.
- Read freeze frame data using hand-held tester or OBD II scan tool. Because freeze frame records the engine conditions when the malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio was lean or rich, etc. at the time of the malfunction.

Hand-held Tester:**1 CHECK VALVE TIMING****NG****REPAIR VALVE TIMING****OK****2 PERFORM ACTIVE TEST BY OBD II SCAN TOOL OR HAND-HELD TESTER (OCV)**

- (a) Warm up the engine.
- (b) Select ACTIVE TEST on the hand-held tester.
- (c) Check the engine speed when the OCV is made to operate by the hand-held tester.

Engine speed:**OCV is OFF: Normal engine speed****OCV is ON: Rough idle or engine stall****HINT:**

DTCs 1349 and P1354 are also output after the foreign object is caught in some part of the system in the engine oil and the system returns to normal in a short time. As ECM operates so that foreign objects are ejected, there is no problem about VVT. There is also no problem since the oil filter should get the foreign object in the engine oil.

OK**VVT SYSTEM OK****NG****3 INSPECT ECM**

- (a) Check the output waveform.

HINT:

Using the oscilloscope function of hand-held tester, it is possible to check the function between the ECM and the knock control sensor.

- (1) Connect hand-held tester between the terminals OC1+ and OC1- of the ECM.
- (2) Connect hand-held tester between the terminals OC2+ and OC2- of the ECM.
- (3) Select oscilloscope function.
- (4) Turn the ignition switch ON and check the waveform at the engine stop.

Item	Contents
Terminal	OC1+ ↔ OC1-, OC2+ ↔ OC2-
Equipment Set	5V/DIV, 1ms/DIV
Condition	The engine stops, IG switch ON

HINT:

The waveform shown in the illustration is an example without noise and chattering.

NG**CHECK AND REPLACE ECM****OK**

4 INSPECT CAMSHAFT TIMING GEAR ASSY

- (a) Remove the timing belt.
- (b) Remove the cylinder head cover.
- (c) Remove the OCV.
- (d) Drain oil into the VVT controller assembly.
- (e) Check whether the oil into VVT controller assembly is drained or not.

Result: The oil into VVT controller assembly is drained.

NG

REPLACE VVT CONTROLLER ASSEMBLY, AND THEN GO TO NEXT STEP

OK

5 INSPECT OCV (See page 10-2)

NG

REPLACE OCV, AND THEN GO TO NEXT STEP

OK

6 CHECK BLOCKAGE OF OCV, OIL CHECK VALVE AND OIL PIPE NO.1

NG

REPAIR OR REPLACE

OK

7 CHECK WHETHER OR NOT DTC P1349/P1354 IS STORED

- (a) Clear the DTC (See page 05-5).
- (b) Perform simulation test.
- (c) Check whether or not DTC P1349/P1354 is stored.

Result: DTC P1349/P1354 is not stored.

HINT:

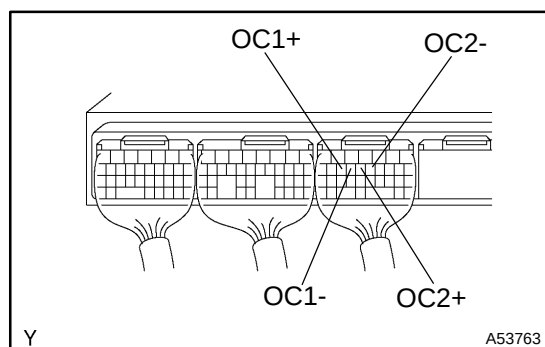
DTCs P1349 and P1354 are also output after the foreign object is caught in some part of the system in the engine oil and the system returns to normal in a short time. As ECM controls so that foreign objects are ejected, there is no problem about VVT. There is also no problem since the oil filter should get the foreign object in the engine oil.

OBDII scan tool (excluding Hand-held Tester):**1 CHECK VALVE TIMING (See page 14-75)****NG****REPAIR VALVE TIMING****OK****2 CHECK OPERATION OF OCV**

- (a) Check the engine speed when disconnecting the OCV connector.
 (b) Check the engine speed when applying battery positive voltage between the terminals of the OCV.

Result:

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

B**Go to step 4****A****3 INSPECT ECM**

- (a) Check the output waveform.
- (1) Turn the ignition switch ON.
 - (2) Check the waveform between terminals OC1+ and OC1- of the ECM connector.
 - (3) Check the waveform between terminals OC2+ and OC2- of the ECM connector.

Item	Contents
Terminal	OC1+ ↔ OC1-, OC2+ ↔ OC2-
Equipment Set	5V/DIV, 1ms/DIV
Condition	The engine stops, IG switch ON

HINT:

- The correct waveform is as shown.
- DTCs P1349 and P1354 are also output after the foreign object is caught in some part of the system in the engine oil and the system returns to normal in a short time. As ECM controls so that foreign objects are ejected, there is no problem about VVT. There is also no problem since the oil filter should get the foreign object in the engine oil.

OK**VVT SYSTEM OK****NG****CHECK AND REPLACE ECM**

4	INSPECT CAMSHAFT TIMING GEAR ASSY (See step 4 Hand-held Tester)
---	---

NG

REPLACE VVT CONTROLLER ASSEMBLY, AND THEN GO TO NEXT STEP

OK

5	INSPECT OCV (See page 10-2)
---	--

NG

REPLACE OCV, AND THEN GO TO NEXT STEP

OK

6	CHECK BLOCKAGE OF OCV, OIL CHECK VALVE AND OIL PIPE NO.1
---	--

NG

REPAIR OR REPLACE

OK

7	CHECK WHETHER OR NOT DTC P1349/P1354 IS STORED (See step 7 Hand-held Tester)
---	---

OK

VVT SYSTEM OK

NG

CHECK AND REPLACE ECM

DTC	P1350	VVT SENSOR/CAMSHAFT POSITION SENSOR CIRCUIT MALFUNCTION(BANK2)
------------	--------------	---

CIRCUIT DESCRIPTION

VVT sensor RH consists of a core and a pick up coil.

On the signal plate for VVT signal, there are three convex on its outer circumference and it is fixed to the camshaft timing gear.

When the camshaft turns, the convex of the signal plate and the air-gap over the pick up coil will switch, and with this the magnetic field will change and generate electricity inside the pick up coil. In addition, VVT sensor LH adopts a sensor using a signal plate and a magnetic resistance element. By switching the air-gap of the signal plate and the sensor, ECM voltage will be converted to a rectangular wave and output as a signal.

DTC No.	DTC Detecting Condition	Trouble Area
P1350	No VVT sensor (Crank position sensor NO.1) signal to ECM during cranking at 4 sec. or more	• Open or short in VVT sensor (Crank position sensor No.1) circuit • VVT sensor (Crank position sensor No.1) • Camshaft timing gear • ECM
	No VVT sensor (Crank position sensor NO.1) signal to ECM with 5 sec. or more engine speed 600 rpm or more	
	While crankshaft rotates twice, VVT sensor (Crank position sensor NO.1) signal will be input to ECM 5 times.	

WIRING DIAGRAM

Refer to DTC P0335 on page 05-80 .

INSPECTION PROCEDURE

HINT:

- If DTC P1350 is displayed, check right bank VVT sensor (Crank position sensor No.1).
- Read freeze frame data using hand-held tester or OBD II scan tool. Because freeze frame records the engine conditions when the malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio was lean or rich, etc. at the time of the malfunction.

1	INSPECT CRANK POSITION SENSOR NO.1 (See page 18-2)
----------	--

(a) Check waveform. (See page 05-83)

NG

REPLACE CRANK POSITION SENSOR NO.1

OK

2	CHECK HARNESS AND CONNECTOR(ECM - VVT SENSOR) (See page 05-83)
----------	--

NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

3	CHECK SENSOR INSTALLATION(CRANK POSITION SENSOR NO.1)
----------	--

NG

TIGHTEN SENSOR

OK

4	INSPECT CAMSHAFT TIMING PULLEY
---	--------------------------------

NG	REPLACE CAMSHAFT TIMING PULLEY
----	--------------------------------

OK

CHECK AND REPLACE ECM

DTC	P1520	STOP LIGHT SWITCH MALFUNCTION
-----	-------	-------------------------------

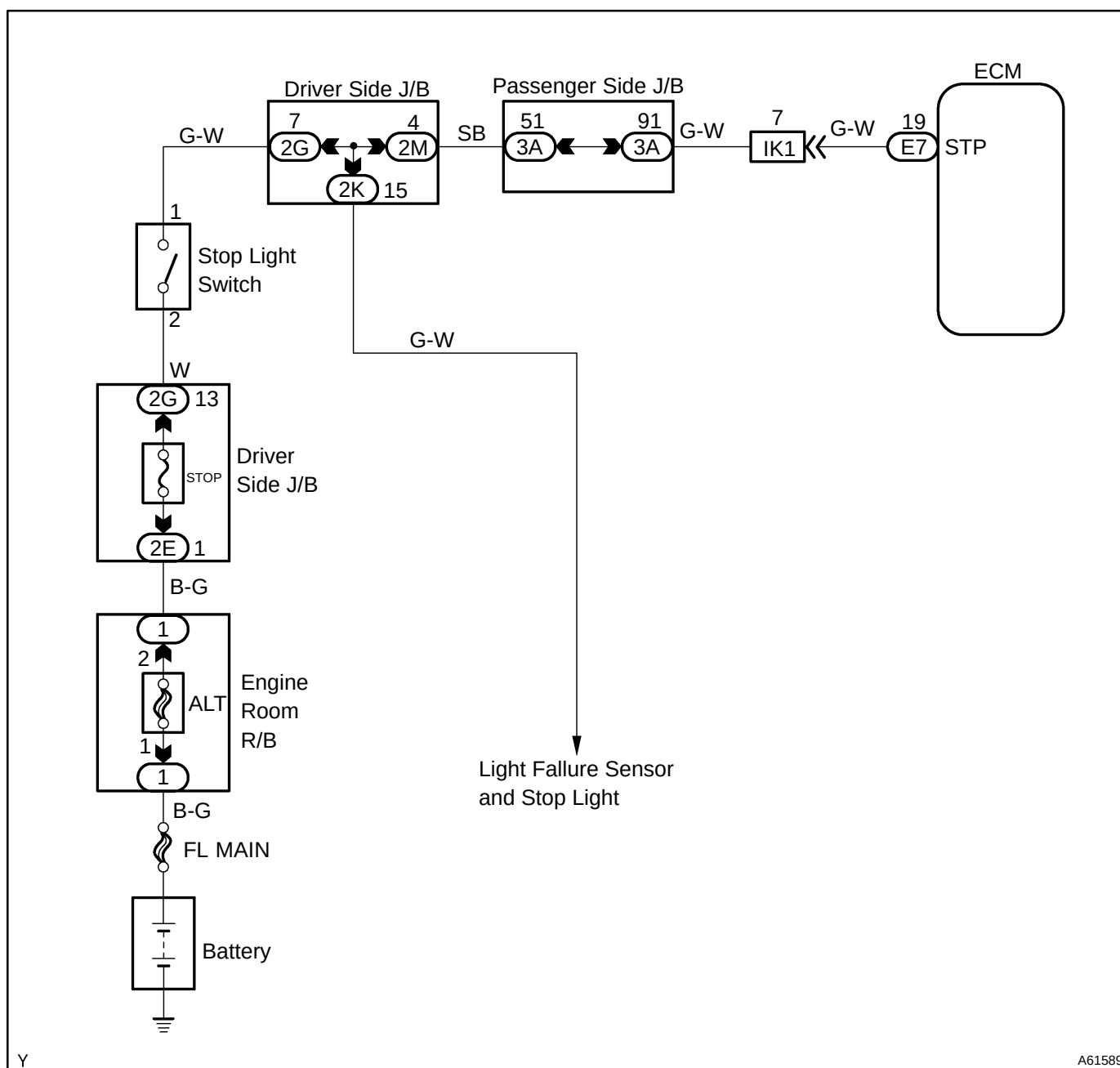
CIRCUIT DESCRIPTION

This signal is used to detect when the brakes have been applied. The STP signal voltage is the same as the voltage supplied to the stop lights.

The STP signal is used mainly to control the fuel cut-off engine speed (The fuel cut-off engine speed is reduced slightly when the vehicle is braking.).

DTC No.	DTC Detecting Condition	Trouble Area
P1520	Stop light switch does not turn off when repeating driving at 30 km or more 10 time or more after depressing brake (2 trip detection logic)	• Short in stop light switch signal circuit • Stop light switch • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using hand-held tester or OBD II scan tool. Because freeze frame records the engine conditions when the malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio was lean or rich, etc. at the time of the malfunction.

1 CHECK OPERATION OF STOP LIGHT

NG

REPAIR OR REPLACE STOP LIGHT SWITCH CIRCUIT

OK

2 CHECK STP SIGNAL

- (a) Turn the ignition switch ON and push the hand-held tester main switch ON.
- (b) Read the STP signal on the hand-held tester.

Result:

Brake Pedal	STP Signal
Depressed	ON
Released	OFF

OK

CHECK FOR INTERMITTENT PROBLEMS

NG

3 CHECK HARNESS AND CONNECTOR(ECM - STOP LIGHT SWITCH)

NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

CHECK AND REPLACE ECM

DTC	P1600	ECM BATT MALFUNCTION
-----	-------	----------------------

CIRCUIT DESCRIPTION

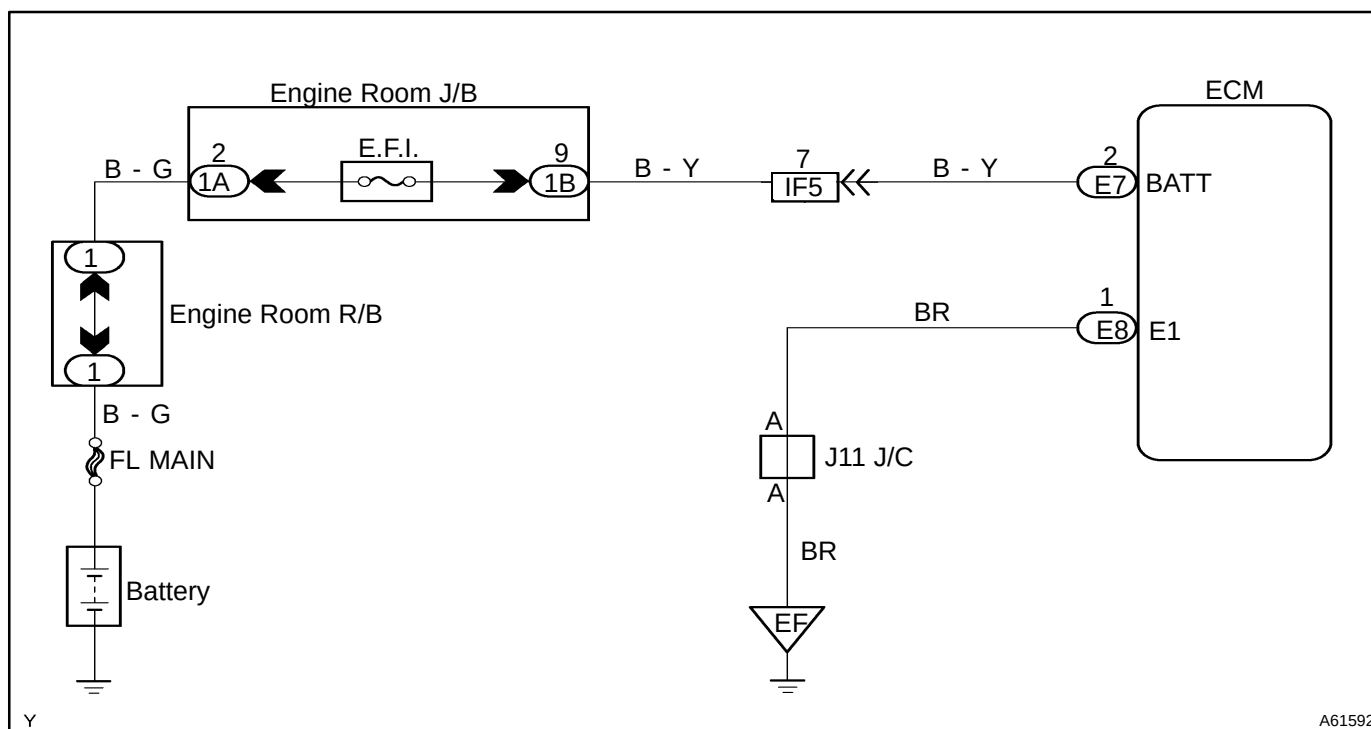
Battery positive voltage is supplied to terminal BATT of the ECM even when the ignition switch is OFF for use by the DTC memory and air-fuel ratio adaptive control value memory, etc.

DTC No.	DTC Detecting Condition	Trouble Area
P1600	Open in back up power source circuit	• Open in back up power source circuit • ECM

HINT:

If DTC P1600 appear, the ECM does not store another DTC.

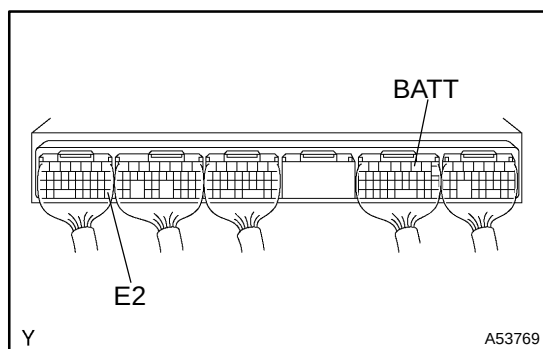
WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using hand-held tester or OBD II scan tool. Because freeze frame records the engine conditions when the malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio was lean or rich, etc. at the time of the malfunction.

1 INSPECT ECM

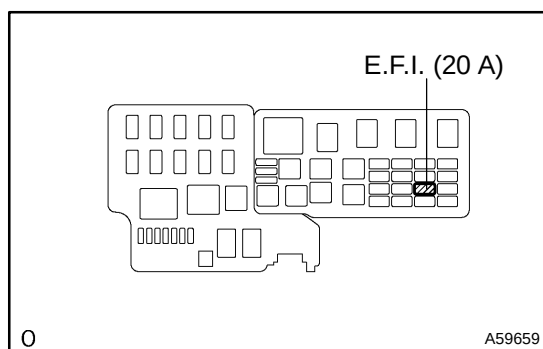
- (a) Measure the voltage between terminal BATT and E2 of the ECM connector.

Voltage: 9 - 14 V

OK

CHECK AND REPLACE ECM

NG

2 CHECK FUSE(FOR E.F.I.)

- (a) Check the continuity of the E.F.I. fuse.

Result: Continuity

NG

CHECK FOR SHORT IN ALL HARNESS AND COMPONENTS CONNECTED EFI FUSE

OK

REPAIR OR REPLACE HARNESS AND CONNECTOR

DTC	P1633	ECM MALFUNCTION (ETCS CIRCUIT)
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CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
P1633	ECM malfunction	• ECM

INSPECTION PROCEDURE

HINT:

Read freeze frame data using hand-held tester. Because freeze frame records the engine conditions when the malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio was lean or rich, etc. at the time of the malfunction.

1	REPAIR OR REPLACE ECM
----------	------------------------------

DTC	P1656	OCV CIRCUIT MALFUNCTION
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DTC	P1663	OCV CIRCUIT MALFUNCTION(BANK2)
------------	--------------	---------------------------------------

CIRCUIT DESCRIPTION

Refer to DTC P1349 on page [05-152](#) ..

DTC No.	DTC Detecting Condition	Trouble Area
P1656 P1663	Open or short in oil control valve circuit	• Open or short in oil control valve circuit • Oil control valve • ECM

WIRING DIAGRAM

Refer to DTC P1349 on page [05-152](#) .

INSPECTION PROCEDURE

HINT:

Read freeze frame data using hand-held tester. Because freeze frame records the engine conditions when the malfunction is detected, when troubleshooting it is useful for determining whether the vehicle was running or stopped, the engine warmed up or not, the air-fuel ratio lean or rich, etc. at the time of the malfunction.

Hand-held Tester:

1	PERFORM ACTIVE TEST BY CHECK OCV CIRCUIT
----------	---

- Warmed up the engine.
- Select ACTIVE TEST on the hand-held tester.
- Check the engine speed when the OCV is made to operate by the hand-held tester.

Engine speed:

OCV is OFF: Normal engine speed

OCV is ON: Rough idle or engine stall

HINT:

DTCs P1656 and P1663 also output after the foreign object is caught in some part of the system in the engine oil and the system returns to normal in a short time. As engine ECM operates so that foreign objects are ejected, there is no problem about VVT. There is also no problem since the oil filter should get the foreign object in the engine oil.

OK

CHECK FOR INTERMITTENT PROBLEMS

NG

2	CHECK OPERATION OF OCV
----------	-------------------------------

- Start the engine and warmed it up.
- Apply battery positive voltage between terminals of the OCV.
- Check the engine speed.

Result: Rough idle or engine stalled.

NG

REPLACE OCV

OK

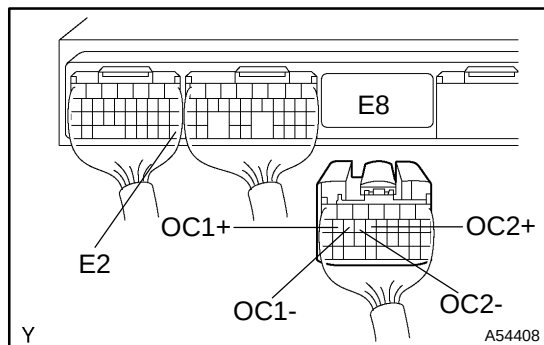
3 INSPECT ECM (See page 05-152)

NG

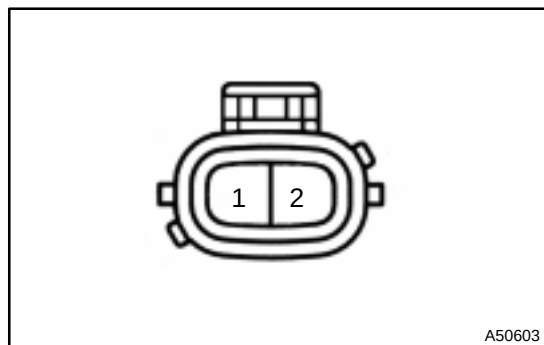
CHECK AND REPLACE ECM

OK

4 CHECK HARNESS AND CONNECTOR(OCV - ECM)



- (a) Disconnect the engine ECM E8 connector.
- (b) Disconnect the OCV connector.
- (c) Check for open between the terminals OC1+ of the ECM connector and 1 of the OCV(RH) connector.
Resistance: 1 Ω or less
- (d) Check for open between the terminals OC1- of the ECM connector and 2 of the OCV(RH) connector.
Resistance: 1 Ω or less
- (e) Check for open between the terminals OC2+ of the ECM connector and 1 of the OCV(LH) connector.
Resistance: 1 Ω or less
- (f) Check for open between the terminals OC2- of the ECM connector and 2 of the OCV(LH) connector.
Resistance: 1 Ω or less
- (g) Check for short between the terminals OC1+, OC1-, OC2+, OC2- and E2 of the ECM connector.
Resistance: 1 M Ω or more



NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

CHECK FOR INTERMITTENT PROBLEMS

OBDII scan tool (excluding Hand-held Tester):

1	CHECK OPERATION OF OCV (See page 10-2)
----------	--

NG**REPLACE OCV****OK**

2	INSPECT ECM (See page 05-152)
----------	---

NG**CHECK AND REPLACE ECM****OK**

3	CHECK HARNESS AND CONNECTOR(OCV - ECM)
----------	---

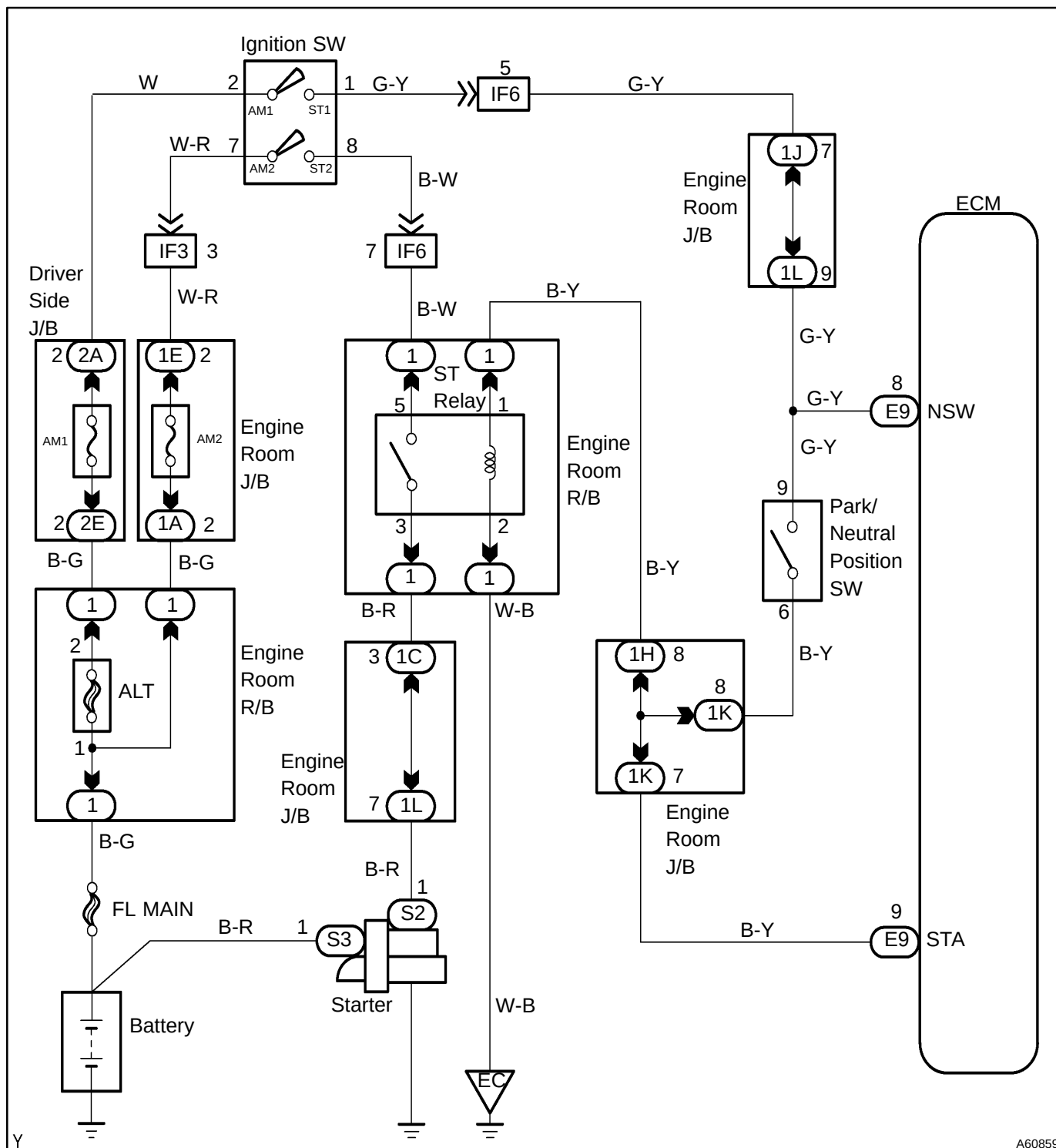
NG**REPAIR OR REPLACE HARNESS AND CONNECTOR****OK****CHECK FOR INTERMITTENT PROBLEMS**

STARTER SIGNAL CIRCUIT

CIRCUIT DESCRIPTION

When the engine is cranked, the intake air flow is slow, so fuel vaporization is poor. A rich mixture is therefore necessary in order to achieve good startability. While the engine is being cranked, the battery positive voltage is applied to terminal STA of the ECM. The starter signal is mainly used to increase the fuel injection volume for the starting injection control and after-start injection control.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

This diagnostic chart is based on the premise that the engine is cranked normally. If the engine is not cranked, proceed to the problem symptoms table on page 05-30 .

Hand-held Tester:

1	READ VALUE OF HAND-HELD TESTER(STARTER SIGNAL)
----------	---

- (a) Turn the ignition switch ON and push the hand-held tester main switch ON.
 (b) Read the STA signal on the hand-held tester while the starter operates.

Result:

Ignition Switch Position	ON	START
STA Signal	OFF	ON

OK

PROCEED TO NEXT CIRCUIT INSPECTION
SHOWN ON PROBLEM SYMPTOMS TABLE

NG

2	CHECK HARNESS AND CONNECTOR(ECM - STARTER RELAY)
----------	---

NG

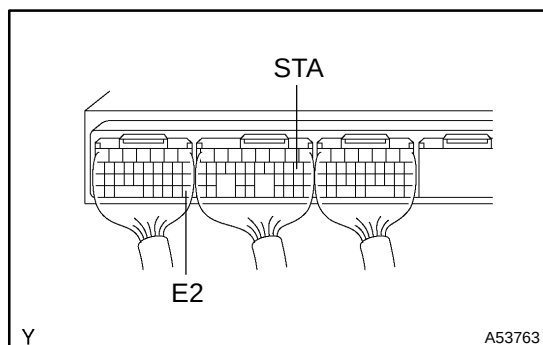
REPAIR OR REPLACE HARNESS AND
CONNECTOR

OK

CHECK AND REPLACE ECM

OBDII scan tool (excluding Hand-held Tester):

1	INSPECT ECM
----------	--------------------



- (a) Measure the voltage between terminal STA and E2 of the ECM connector during the engine cranking.

Voltage: 6 V or more

OK

PROCEED TO NEXT CIRCUIT INSPECTION
SHOWN ON PROBLEM SYMPTOMS TABLE

NG

NG

OK

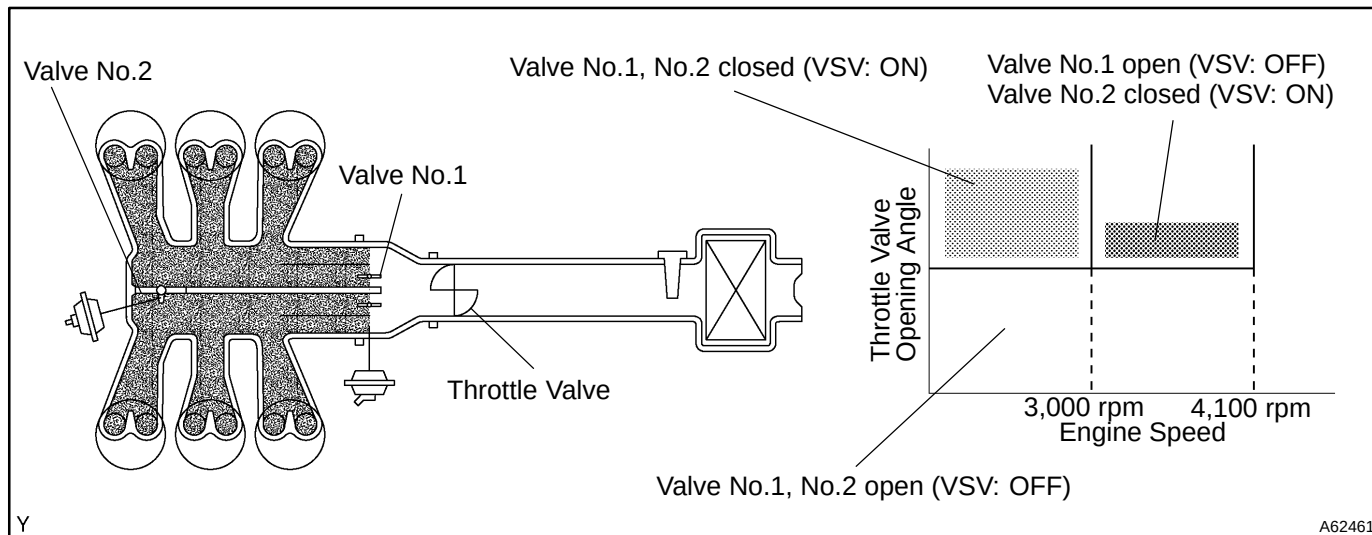
322

ACIS CONTROL CIRCUIT

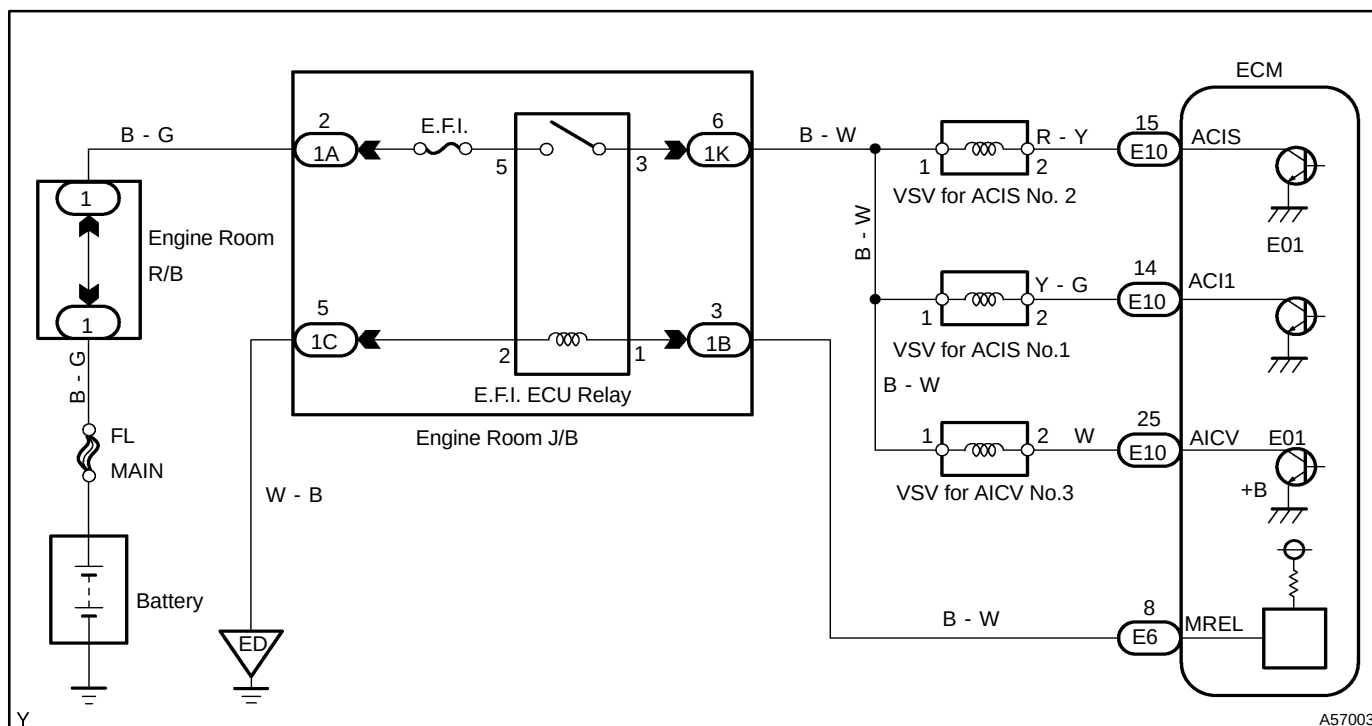
CIRCUIT DESCRIPTION

This circuit opens and closes the Intake Air Control Valve in response to the engine load in order to increase the intake efficiency (ACIS: Acoustic Control Induction System).

When the engine speed is 4,100 rpm or less and the throttle valve opening angle is 30° or more, the ECM turns the two VSV ON or OFF and operates the Intake Air Control Valve.



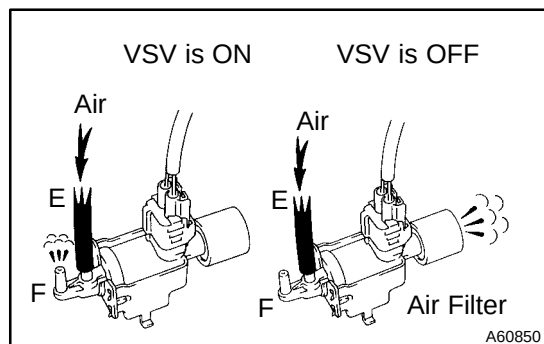
WIRING DIAGRAM



INSPECTION PROCEDURE

Hand-held Tester:

1 PERFORM ACTIVE TEST BY HAND-HELD TESTER(VSV FOR ACIS)



- Turn the ignition switch ON and hand-held tester main switch ON.
- Select the INTAKE CTRL VSV from the ACTIVE TEST menu on the hand-held tester.
- Check the operation of the VSV when the VSV is operated by the hand-held tester.

VSV is ON:

Air from port E flows out through port F.

VSV is OFF:

Air from port E flows out through the air filter.

OK

INSPECT VACUUM TANK

NG

2 CHECK VSV(FOR ACIS) (See page 13-2)

NG

REPLACE VACUUM SWITCHING VALVE ASSY NO.1

OK

3 CHECK HARNESS AND CONNECTOR(E.F.I. ECU RELAY - ECM)

NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

CHECK AND REPLACE ECM

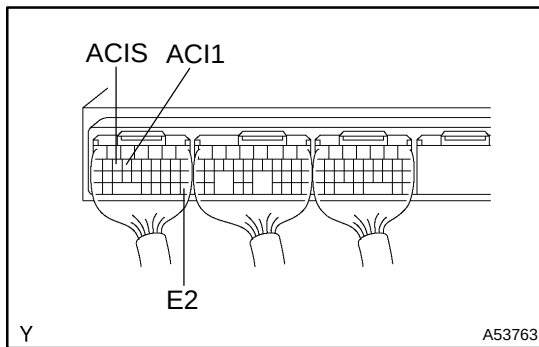
OBDII scan tool (excluding Hand-held Tester):

1 CHECK VSV(FOR ACIS) (See page 13-2)

NG

REPLACE VACUUM SWITCHING VALVE ASSY NO.1

OK

2 INSPECT ECM

- (a) Turn the ignition switch ON.
- (b) Measure the voltage between terminals ACI1, ACIS and E2 of the ECM connector.

Voltage: 9 - 14 V**NG****CHECK HARNESS AND CONNECTOR****OK****3 INSPECT VACUUM TANK (See page 13-2)****NG****REPAIR OR REPLACE****OK****CHECK AND REPLACE ECM**

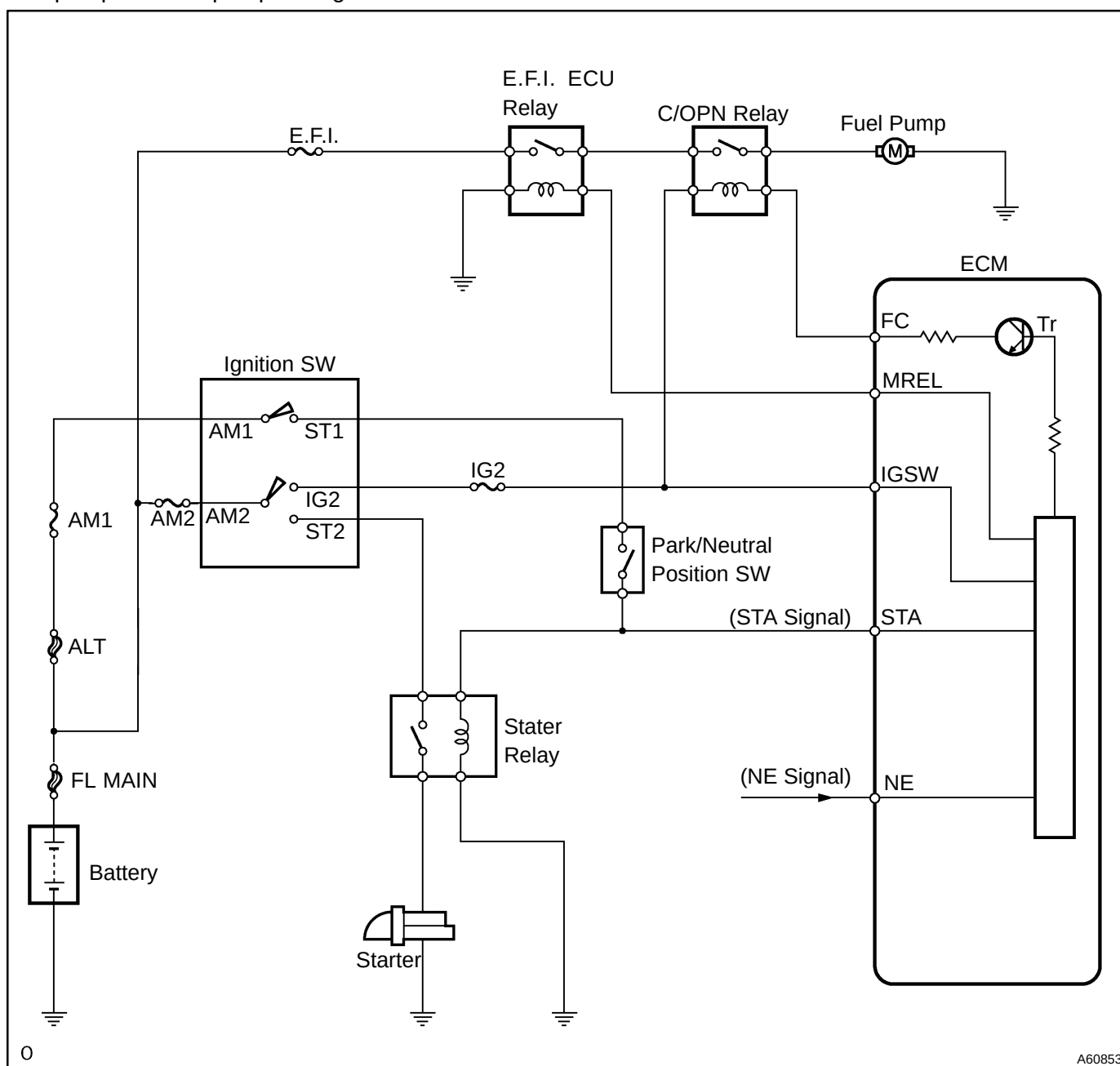
FUEL PUMP CONTROL CIRCUIT

CIRCUIT DESCRIPTION

In the diagram below, when the engine is cranked, current flows from terminal ST of the ignition switch to the starter relay (Marking: ST) coil and also current flows to terminal STA of ECM (STA signal).

When the STA signal and NE signal are input to the ECM, Tr is turned ON, current flows to coil of the circuit opening relay (Marking: C/OPN), the relay switches on, power is supplied to the fuel pump and the fuel pump operates.

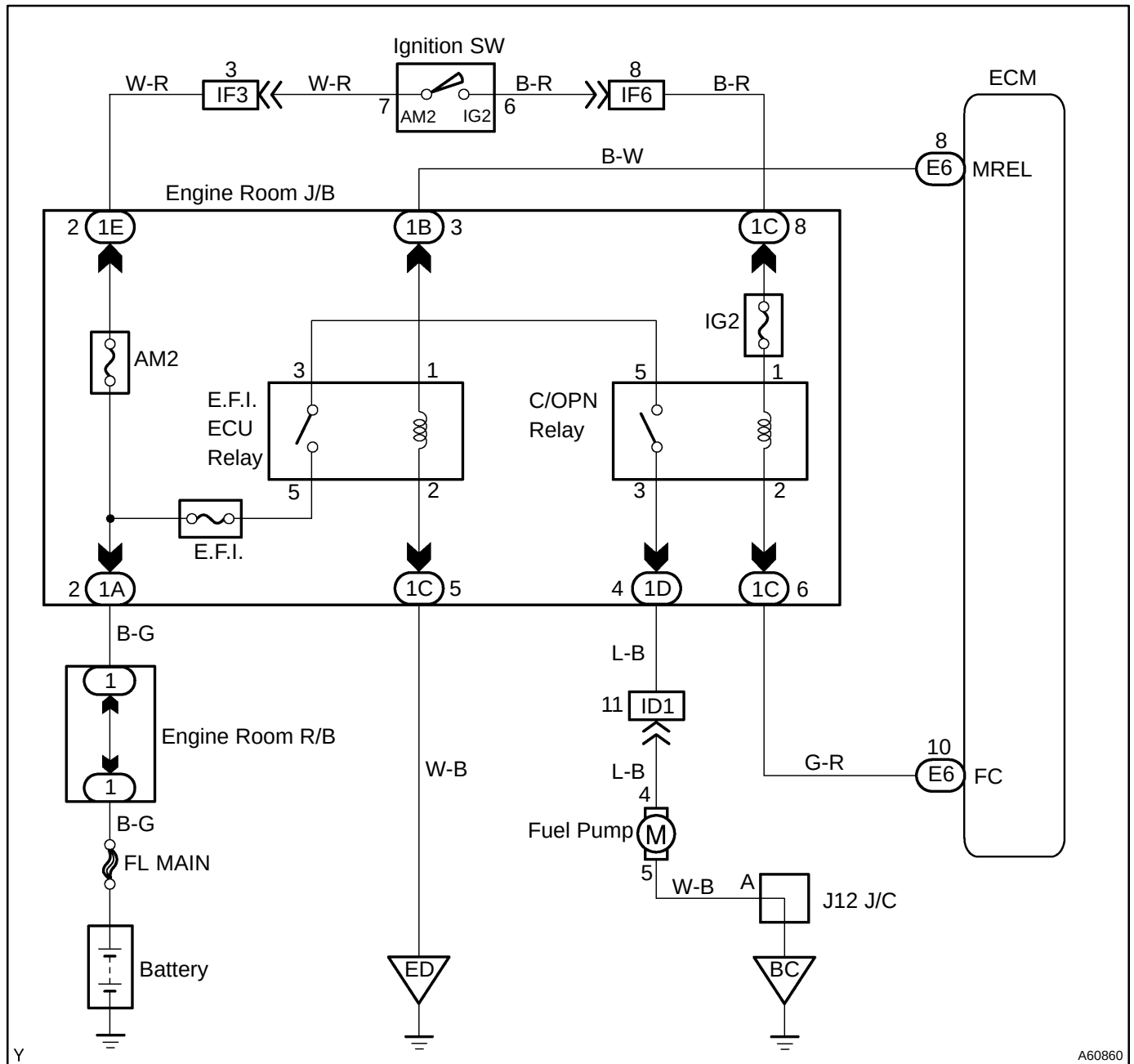
While the NE signal is generated (engine running), the ECM keeps Tr ON (circuit opening relay ON) and the fuel pump also keeps operating.



0

A60853

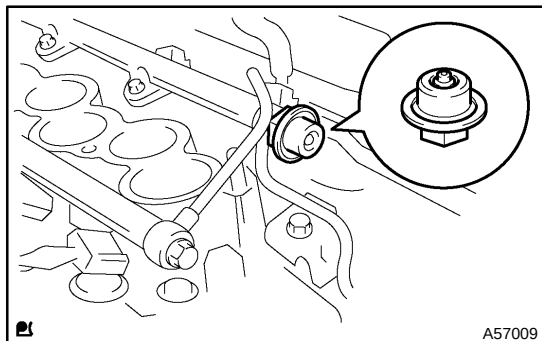
WIRING DIAGRAM



INSPECTION PROCEDURE

When using Hand-held Tester:

1 PERFORM ACTIVE TEST BY CHECK OPERATION OF FUEL PUMP



- Turn the ignition switch ON and push the hand-held tester main switch ON.
- Use the ACTIVE TEST mode to operate the fuel pump.
- Check that the pulsation damper screw rises up when the fuel pump is operated by the hand-held tester.

Result: The pulsation damper screw rises up.

OK

CHECK FOR STARTER SIGNAL CIRCUIT

NG

2 CHECK FOR ECM POWER SOURCE CIRCUIT (See page 05-178)

NG

REPAIR OR REPLACE

OK

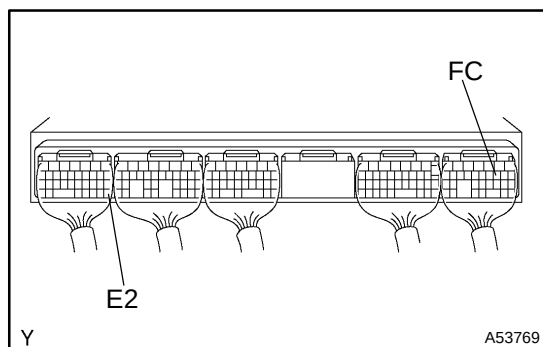
3 CHECK E.F.I. CIRCUIT OPENING RELAY ASSY (See page 10-2)

NG

REPLACE E.F.I. CIRCUIT OPENING RELAY ASSY

OK

4 INSPECT ECM



- Turn the ignition switch ON.
- Measure the voltage between terminal FC and E2 of the ECM connector.

Voltage: 9 - 14 V

NG

CHECK HARNESS AND CONNECTOR

OK

5 INSPECT FUEL PUMP (See page 11-4)

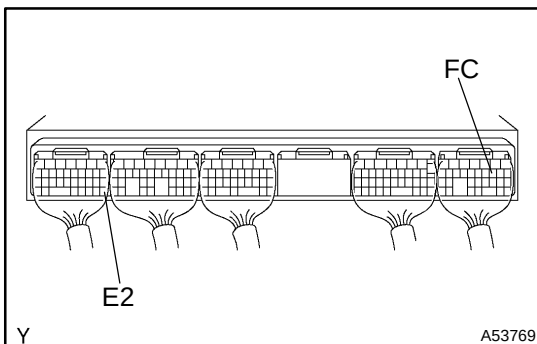
NG → REPLACE FUEL PUMP

OK

6 CHECK HARNESS AND CONNECTOR(CIRCUIT OPENING RELAY - FUEL PUMP,FUEL PUMP - E2)

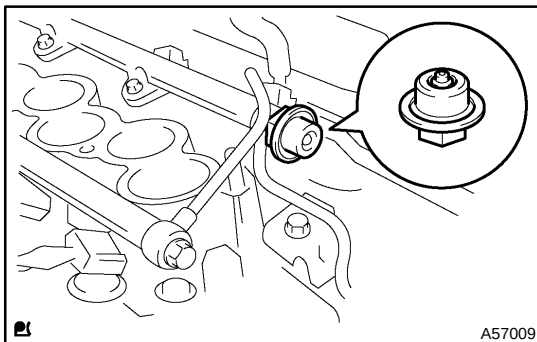
NG → REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

CHECK AND REPLACE ECM**OBDII scan tool (excluding Hand-held Tester):****1 CHECK OPERATION OF FUEL PUMP**

- (a) Turn the ignition switch ON.
- (b) Connect between terminal FC and E2 of the ECM connector.
- (c) Check that the pulsation damper screw rises up when connecting between terminal FC and E2 of the ECM and E8 connector.

Result: The pulsation damper screw rises up.



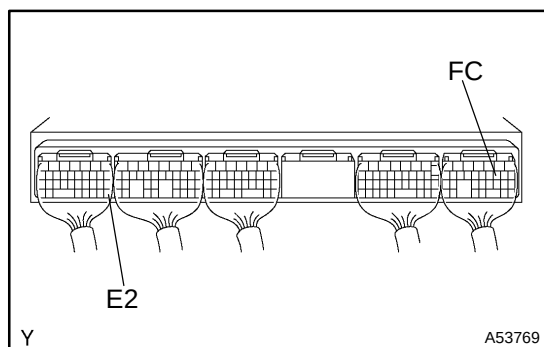
OK → CHECK FOR STARTER SIGNAL CIRCUIT

NG

2 CHECK FOR ECM POWER SOURCE CIRCUIT (See page 05-178)

NG → REPAIR OR REPLACE

OK

3 CHECK E.F.I. CIRCUIT OPENING RELAY ASSY (See page 10-2)**NG****REPLACE E.F.I. CIRCUIT OPENING RELAY ASSY****OK****4 INSPECT ECM**

- (a) Turn the ignition switch ON.
 (b) Measure the voltage between terminal FC and E2 of the ECM connector.

Voltage: 9 - 14 V**NG****CHECK HARNESS AND CONNECTOR****OK****5 CHECK FUEL PUMP (See page 11-4)****NG****REPLACE FUEL PUMP****OK****6 CHECK HARNESS AND CONNECTOR(CIRCUIT OPENING RELAY - FUEL PUMP, FUEL PUMP - E2)****NG****REPAIR OR REPLACE HARNESS AND CONNECTOR****OK****CHECK AND REPLACE ECM**

ECM POWER SOURCE CIRCUIT

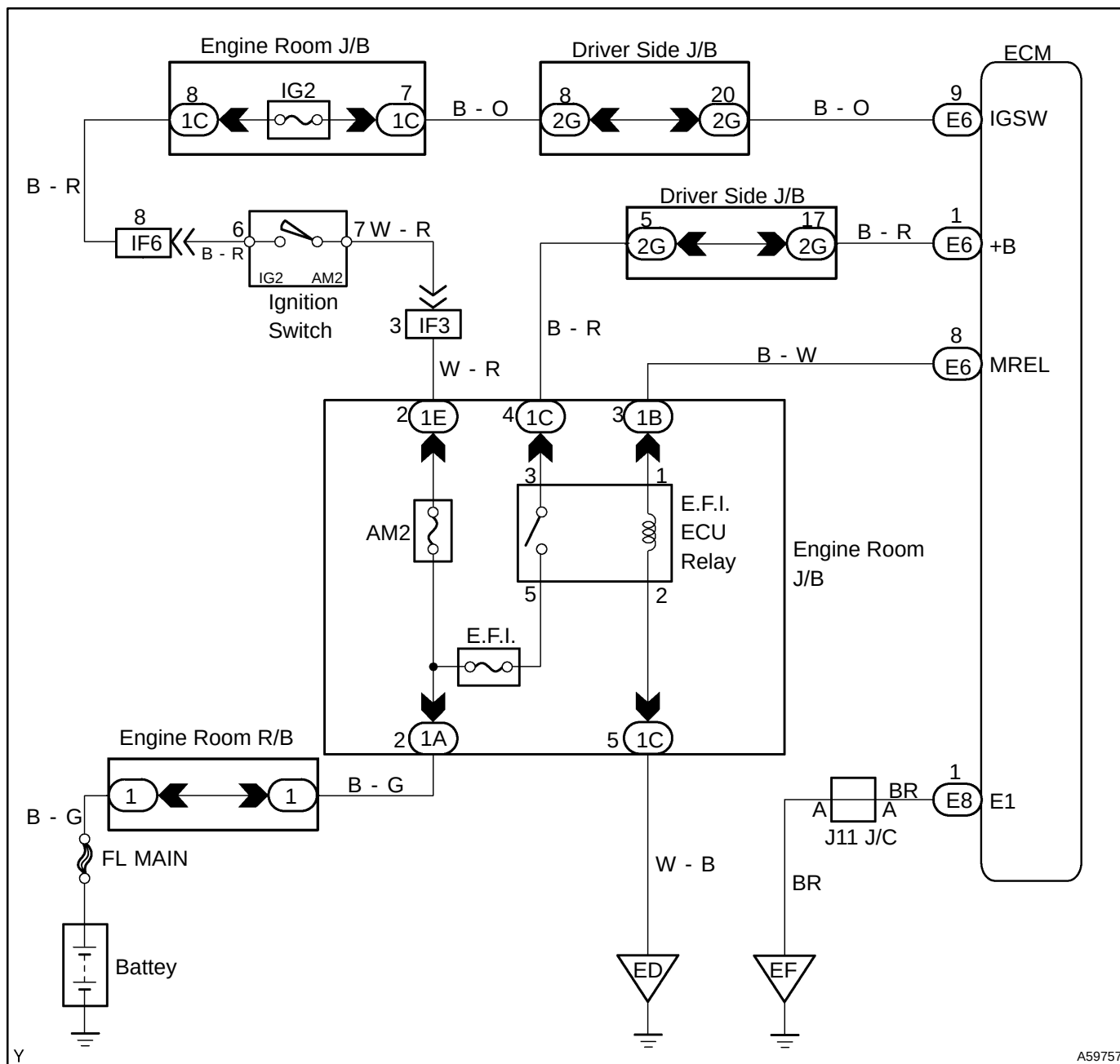
CIRCUIT DESCRIPTION

When the ignition switch is turned ON, battery positive voltage is applied to terminal IGSW of the ECM and the E.F.I. ECU relay (Marking: E.F.I.) control circuit in the ECM sends a signal to terminal MREL of the ECM switching on the E.F.I. ECU relay.

This signal causes current to flow to the coil, closing the contacts of the E.F.I. ECU relay and supplying power to terminal +B of the ECM.

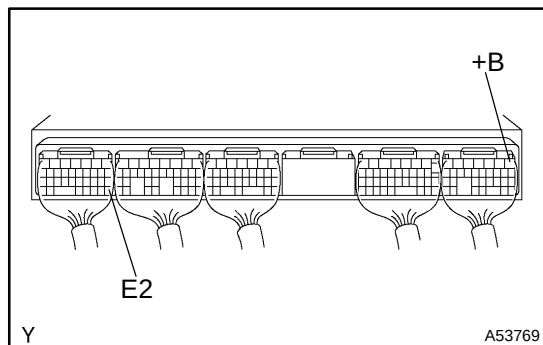
If the ignition switch is turned off, the ECM continues to switch on the E.F.I. ECU relay for a maximum of 2 seconds for the initial setting of the IAC valve.

WIRING DIAGRAM



INSPECTION PROCEDURE

1 INSPECT ECM



- (a) Turn the ignition switch ON.
- (b) Measure the voltage between terminals +B and E2 of the ECM connectors.

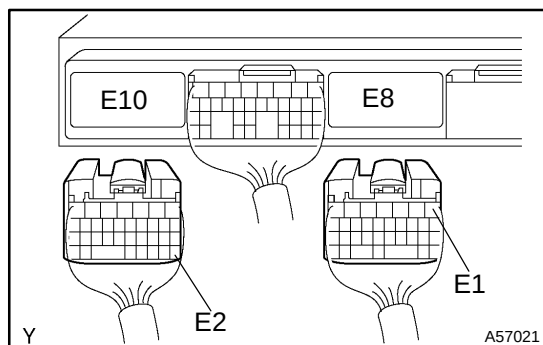
Voltage: 9 - 14 V

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE

NG

2 CHECK HARNESS AND CONNECTOR(E1,E2 - BODY EARTH)



- (a) Disconnect the ECM E10 and E8 connector.
- (b) Check for open between the terminals E1 and E2 of the ECM connector and Body ground.

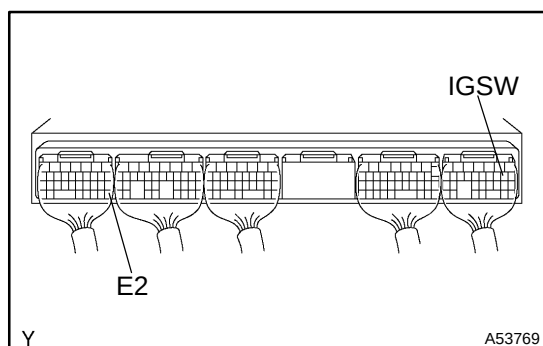
Resistance: 1 Ω or less

NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

3 INSPECT ECM



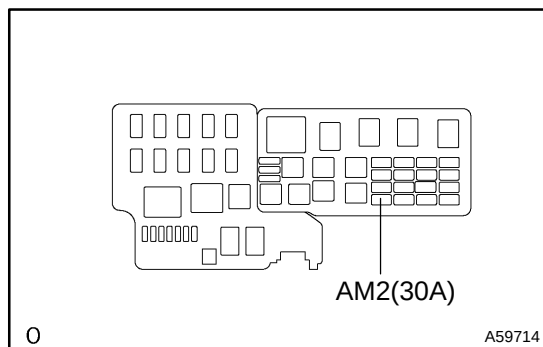
- (a) Turn the ignition switch ON.
- (b) Measure the voltage between terminal IGSW and E2 of the ECM connector.

Voltage: 9 - 14 V

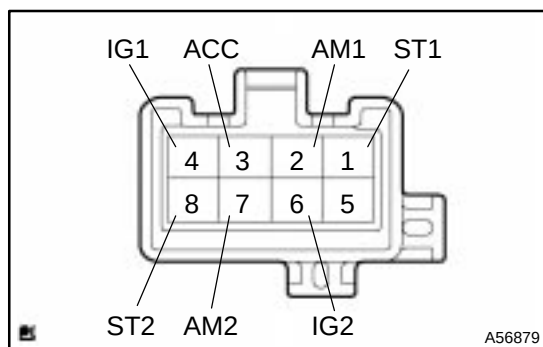
OK

Go to step 6

NG

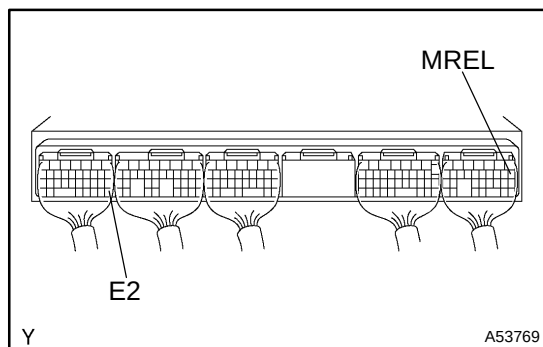
4 CHECK FUSE(AM2)

- (a) Remove the AM2 fuse from the engine room J/B.
- (b) Check the continuity of the AM2 fuse.

NG**CHECK FOR SHORT IN ALL HARNESS AND COMPONENTS CONNECTED AM2 FUSE****OK****5 CHECK IGNITION OR STARTER SWITCH ASSY**

- (a) 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 OR STARTER SWITCH ASSY****OK****REPAIR OR REPLACE HARNESS AND CONNECTOR****6 INSPECT ECM**

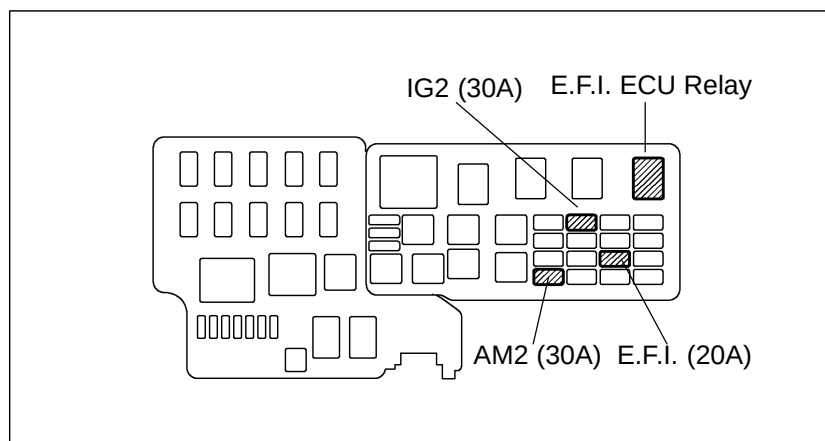
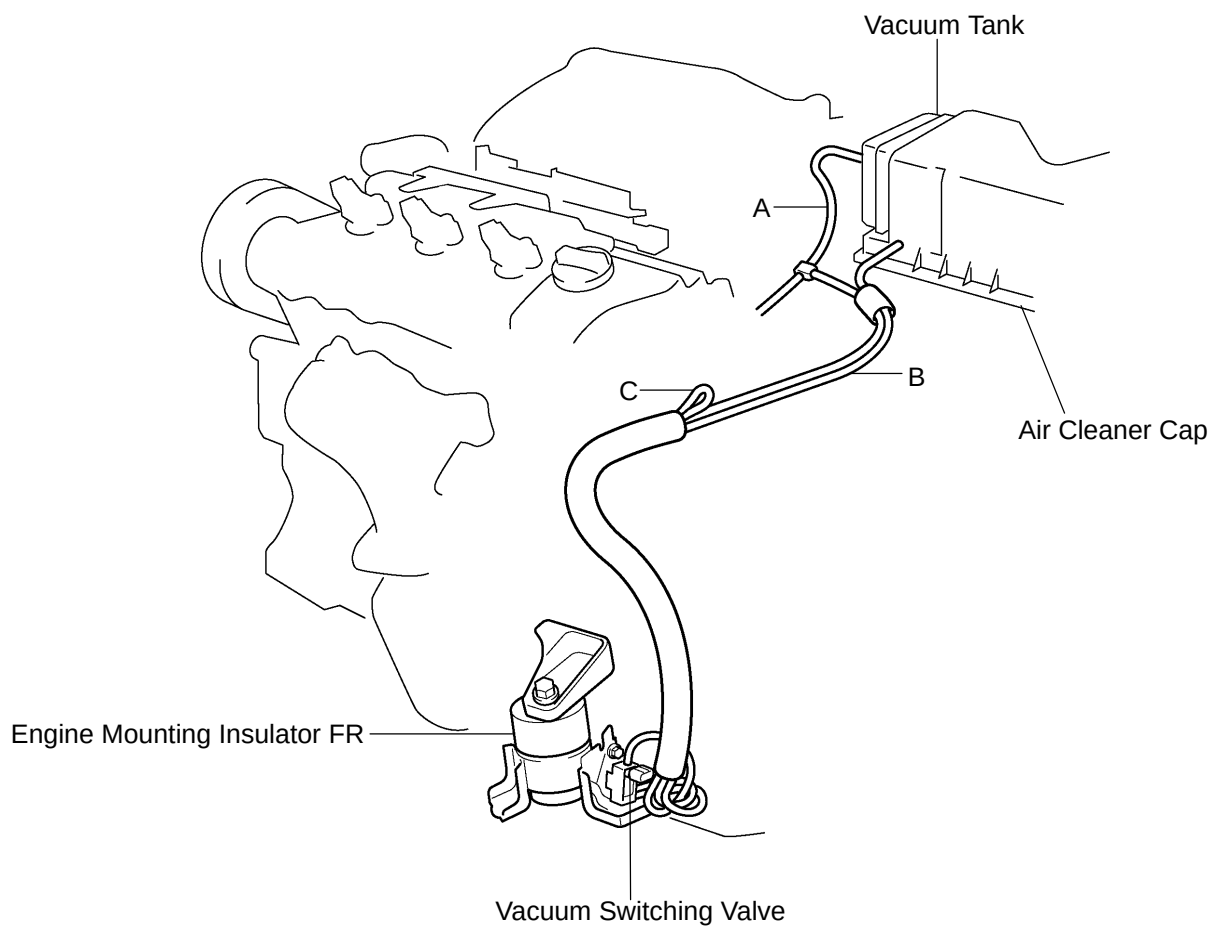
- (a) Turn the ignition switch ON.
- (b) Measure the voltage between terminal MREL and E2 of the ECM connector.

Voltage: 9 - 14 V**NG****CHECK AND REPLACE ECM****OK**

7 CHECK FUSE(E.F.I.)**NG****CHECK FOR SHORT IN ALL HARNESS AND COMPONENTS CONNECTED EFI FUSE****OK****8 CHECK E.F.I ECU RELAY (See page [10-2](#))****NG****REPLACE E.F.I ECU RELAY****OK****9 CHECK HARNESS AND CONNECTOR(MREL - E2)****NG****REPAIR OR REPLACE HARNESS AND CONNECTOR****OK****REPAIR OR REPLACE HARNESS AND CONNECTOR**

ACTIVE CONTROL ENGINE MOUNT

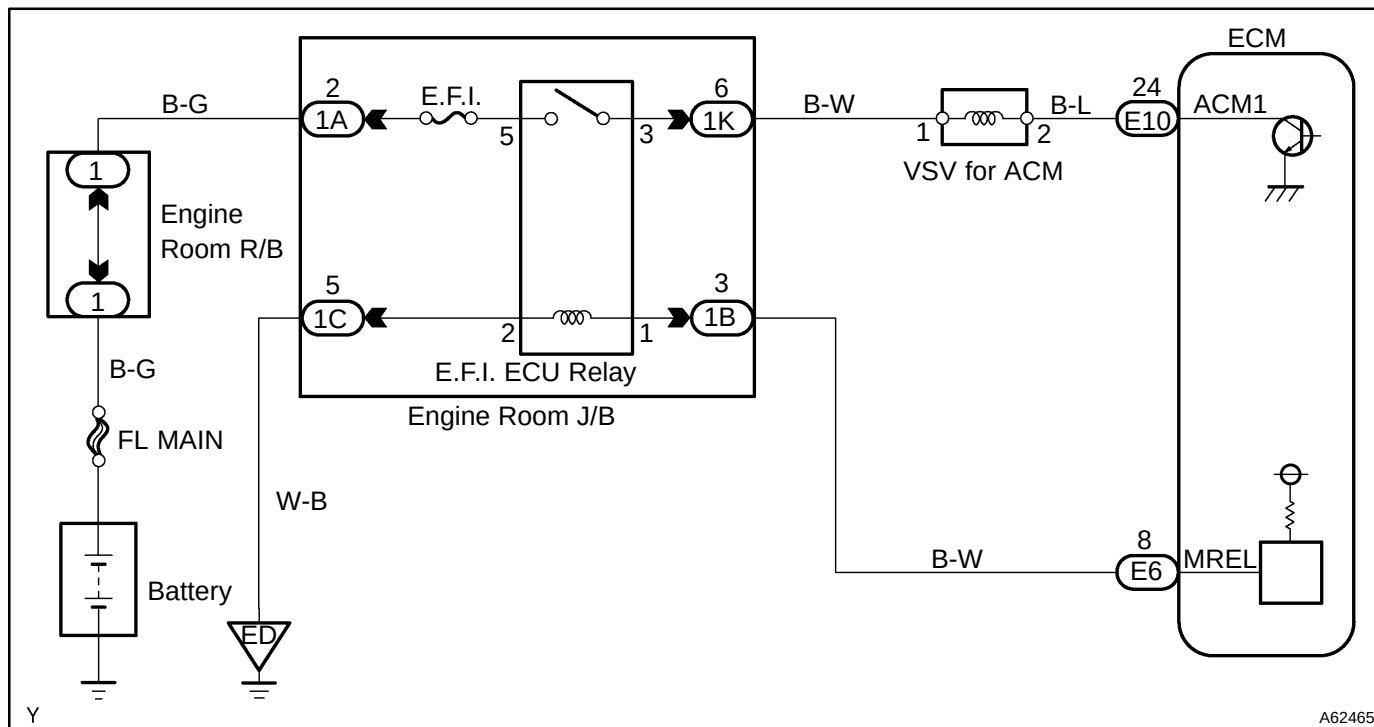
LOCATION



CIRCUIT DESCRIPTION

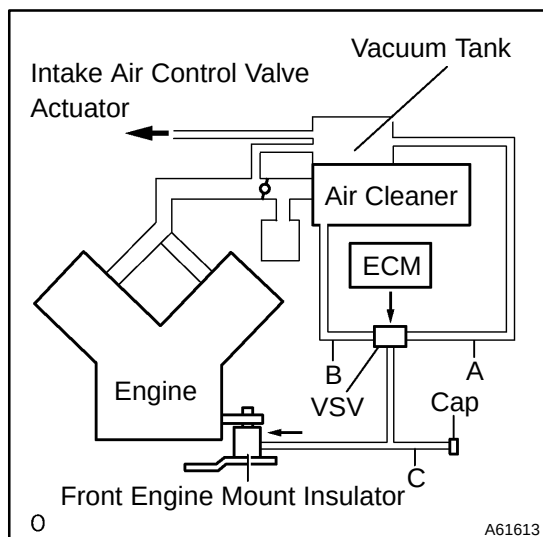
Active control engine mount (ACM) system dampens engine vibration at low engine speed using ACM VSV. The VSV is controlled by a pulse signal transmitted to the VSV from the engine control module (ECM). In normal operation, the frequency of this pulse signal is correctly matched to engine speed to effectively dampen engine vibration.

WIRING DIAGRAM



INSPECTION PROCEDURE

1 CHECK VACUUM HOSE



- Check whether the cap of vacuum hose is missing or not.
- Do not repair the hose with a cap by cutting it. If the hose is damaged, be sure to replace whole vacuum hose assembly.
- Check the air/vacuum hose for looseness, disconnection and blockage.

NG

REPAIR OR REPLACE VACUUM HOSE

OK

2 PERFORM ACTIVE TEST BY OBD II SCAN TOOL OR HAND-HELD TESTER(ACTIVE CONTROL ENGINE MOUNT)

- (a) Warm up engine to normal operating temperature.
- (b) Connect the hand-held tester to the DLC3.
- (c) Select the ACM inhibit active test on the hand-held tester.
- (d) Shift transmission into "N" or "P" range.
- (e) Check whether or not engine vibration is increased while the ACM inhibit active test is in the "ON" state.

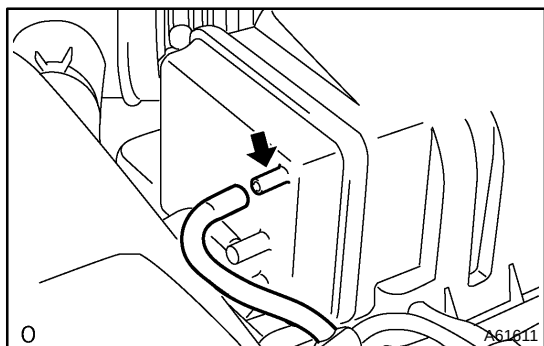
Result: Engine vibration is increased.

NG

Go to step 4

OK

3 CHECK INTAKE MANIFOLD VACUUM PRESSURE



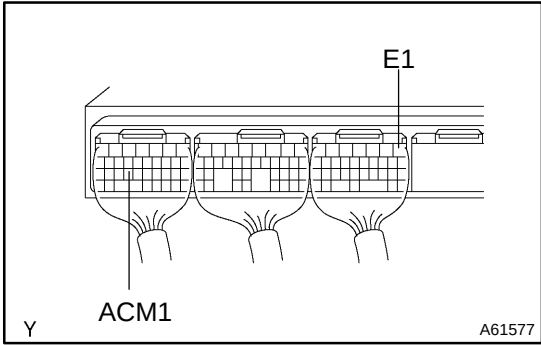
- (a) Warm up engine to normal operating temperature.
- (b) Chock the 4 wheels.
- (c) Fully apply the parking brake.
- (d) Keep your foot pressing firmly on the brake pedal.
- (e) Shift transmission into "D" position.
- (f) Disconnect the vacuum hose.
- (g) Check that disconnected hose applies suction to your finger intermittently.

OK

SYSTEM OK

NG

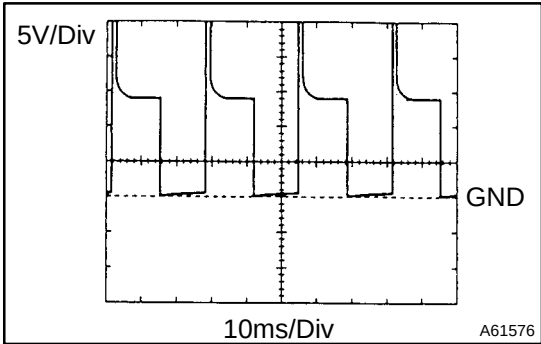
4 INSPECT ECM



- (a) Connect the oscilloscope between terminals ACM1 and E1 of ECM connector.
- (b) Warm up engine to normal operating temperature.
- (c) Measure voltage between terminals ACM1 of and E1 of ECM connector.

Result:

Condition	Voltage
Shift position is D range, and engine speed is 900 rpm or less.	Pulse generation
Shift position is D range, and engine speed is 900 rpm or more.	9 - 14 V
Shift position is P range.	9 - 14 V

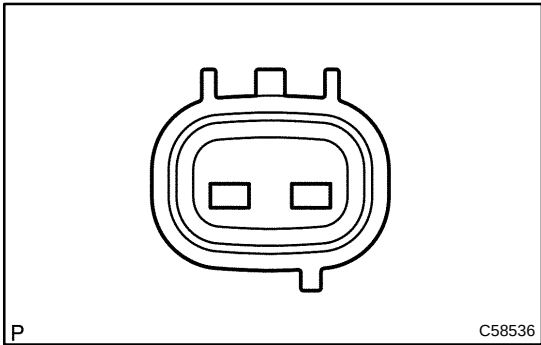


OK

Go to step 7

NG

5 INSPECT DUTY VACUUM SWITCHING VALVE(RESISTANCE)



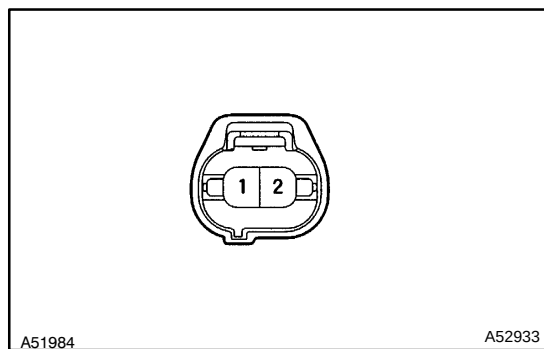
- (a) Disconnect the VSV connector for ACM.
- (b) Measure resistance between the terminals.
Resistance: 19 - 21 Ω at 20°C (68°F)

NG

REPLACE DUTY VACUUM SWITCHING VALVE

OK

6 CHECK HARNESS AND CONNECTOR



- (a) Disconnect the connector from the VSV of ACM.
- (b) Remove the E.F.I. ECU Relay.
- (c) Check for open between the terminals 3 of the E.F.I. ECU Relay in the holder and 1 of the VSV connector for ACM.

NOTICE:

Do not insert the tester leads too hard in the procedure above, or the holder may be damaged.

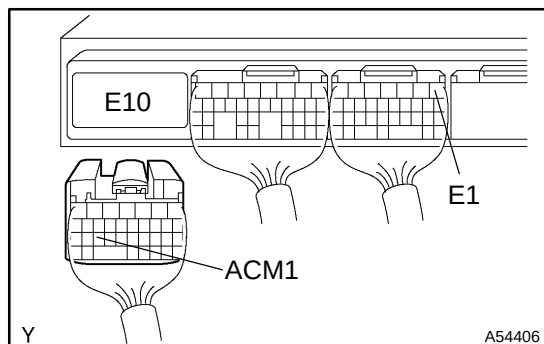
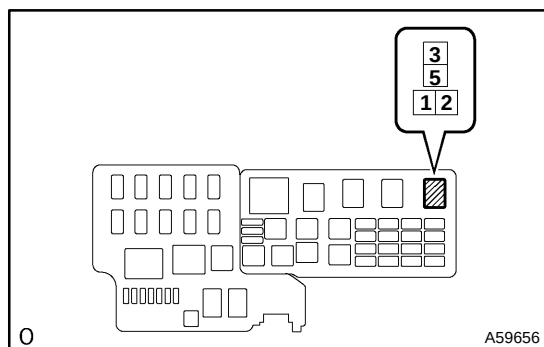
Resistance: 1 Ω or less

- (d) Check for short between the terminals 3 and 2 of the E.F.I. ECU Relay in the holder.

NOTICE:

Do not insert the tester leads too hard in the procedure above, or the holder may be damaged.

Resistance: 1 M Ω or more

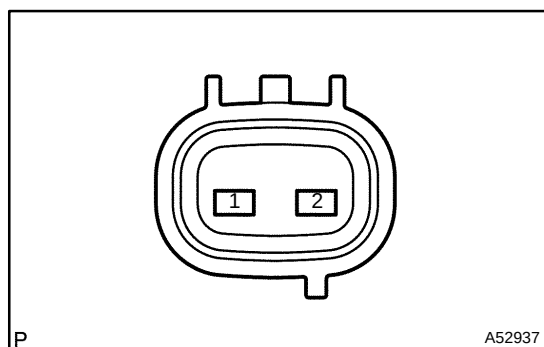


- (e) Disconnect the ECM E10 connector.
- (f) Check for open between the terminals ACM1 of the ECM connector and 2 of the VSV connector for ACM.

Resistance: 1 Ω or less

- (g) Check for short between the the terminals ACM1 and E1 of the ECM connector.

Resistance: 1 M Ω or more



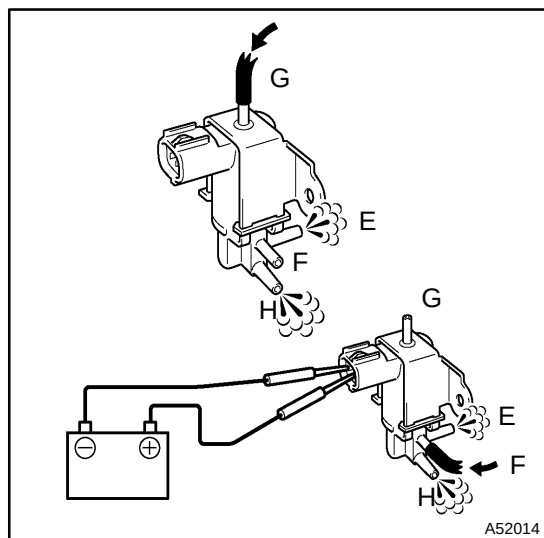
NG

CHECK AND REPLACE WIRE HARNESS

OK

CHECK AND REPLACE ECM

7 INSPECT DUTY VACUUM SWITCHING VALVE(OPERATION)



- Disconnect the VSV connector for ACM.
- Check operation of VSV for ACM when battery positive voltage is applied to the terminals of VSV connector for ACM or not.

Battery positive voltage is not applied:

The air from pipe G is flowing out through pipe E and H.

Battery positive voltage is applied:

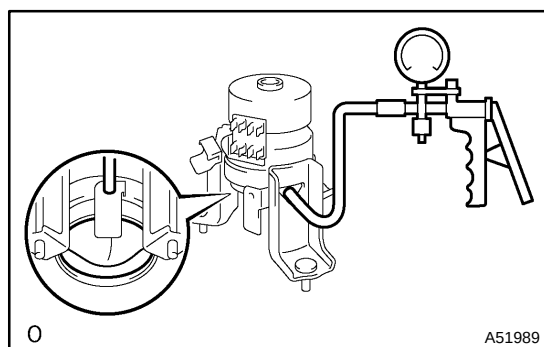
The air from pipe F is flowing out through pipe E and H.

NG

REPLACE DUTY VACUUM SWITCHING VALVE

OK

8 INSPECT ENGINE MOUNTING INSULATOR ASSY FRONT



- Disconnect the vacuum hose from front engine mount insulator.
- Using MITYBAC (Hand-Held Vacuum Pump), apply vacuum of 80 kPa (600 mmHg, 25 in.Hg) and allow it to stand for 1 minutes.
- Check that there is no change in the needle movement.
- Check that there is no fluid leakage caused by a brake of a lower diaphragm.

NG

REPLACE ENGINE MOUNTING INSULATOR ASSY FRONT

OK

SYSTEM OK

AIR INTAKE CONTROL CIRCUIT

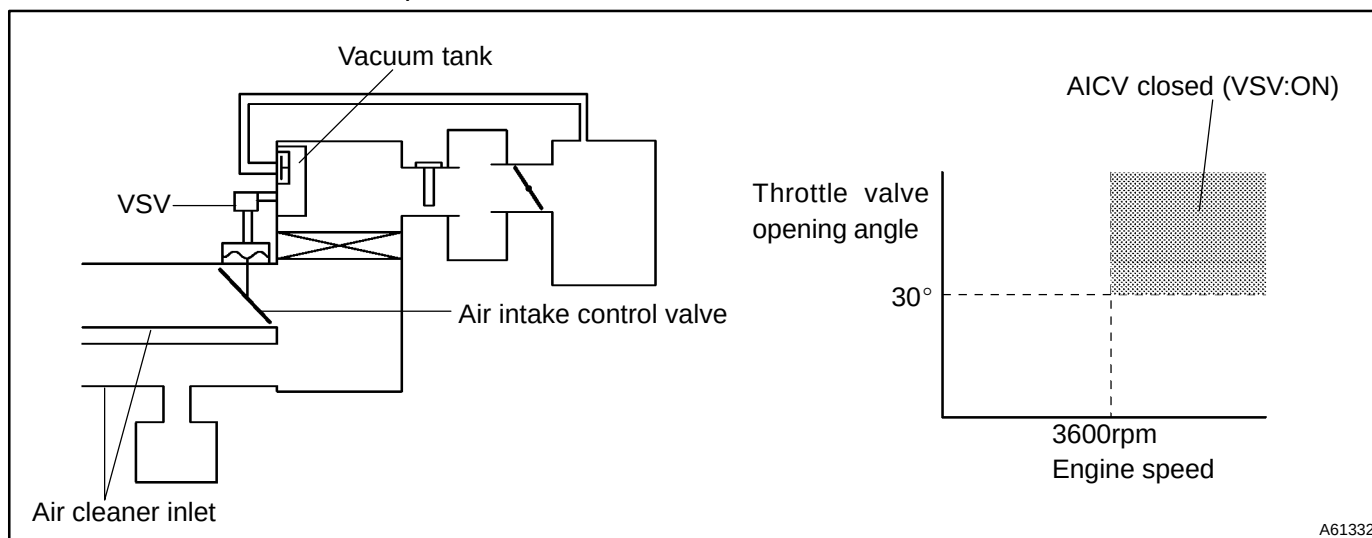
CIRCUIT DESCRIPTION

The air cleaner inlet is divided into two areas, and a air intake control valve and an actuator have been provided in one of the areas.

As a result, a reduction in intake noise and an increase in the power output have been realized in the low to the high-speed range of the engine.

When the engine is operating in the low-to mid-speed range, this control operates the air intake control valve to close one side of the air cleaner inlet.

When the engine speed is more than 3600 rpm. and the opening of the throttle valve is more than 30°, the ECM activates VSV ON and operates AICV.



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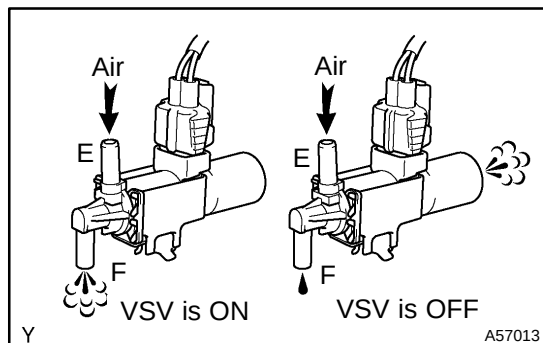
WIRING DIAGRAM

Refer to ACIS CONTROL CIRCUIT on page 05-170 .

INSPECTION PROCEDURE

Hand-held Tester:

1 READ VALUE OF HAND-HELD TESTER(VSV FOR AICV)



- Turn the ignition switch ON and hand-held tester main switch ON.
- Select the INTAKE CTRL VSV from the ACTIVE TEST menu on the hand-held tester.
- Check the operation of the VSV when the VSV is operated by the hand-held tester.

VSV is ON:

Air from port E flows out through port F.

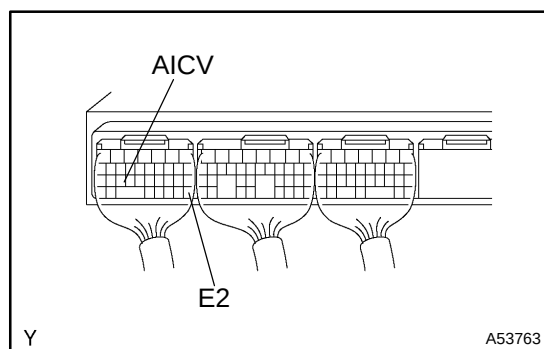
VSV is OFF:

Air from port E flows out through the air filter.

OK

INSPECT VACUUM TANK

NG

2 CHECK CHECK VSV(FOR AICV) (See page 13-2)**NG****REPLACE INTAKE AIR CONTROL VALVE ASSY NO.3****OK****3 CHECK HARNESS AND CONNECTOR(COMPUTRE RELAY - ECM)****NG****REPAIR OR REPLACE HARNESS AND CONNECTOR****OK****CHECK AND REPLACE ECM****OBDII scan tool (excluding Hand-held Tester):****1 CHECK VSV(FOR - AICV) (See page 13-2)****NG****REPLACE INTAKE AIR CONTROL VALVE ASSY NO.3****OK****2 INSPECT ECM**

- (a) Turn the ignition switch ON.
- (b) Measure the voltage between terminals AICV and E2 of the ECM E8 and E9 connector.

Voltage: 9 - 14 V**NG****CHECK HARNESS AND CONNECTOR****OK****3 INSPECT VACUUM TANK****NG****REPAIR OR REPLACE****OK****CHECK AND REPLACE ECM**