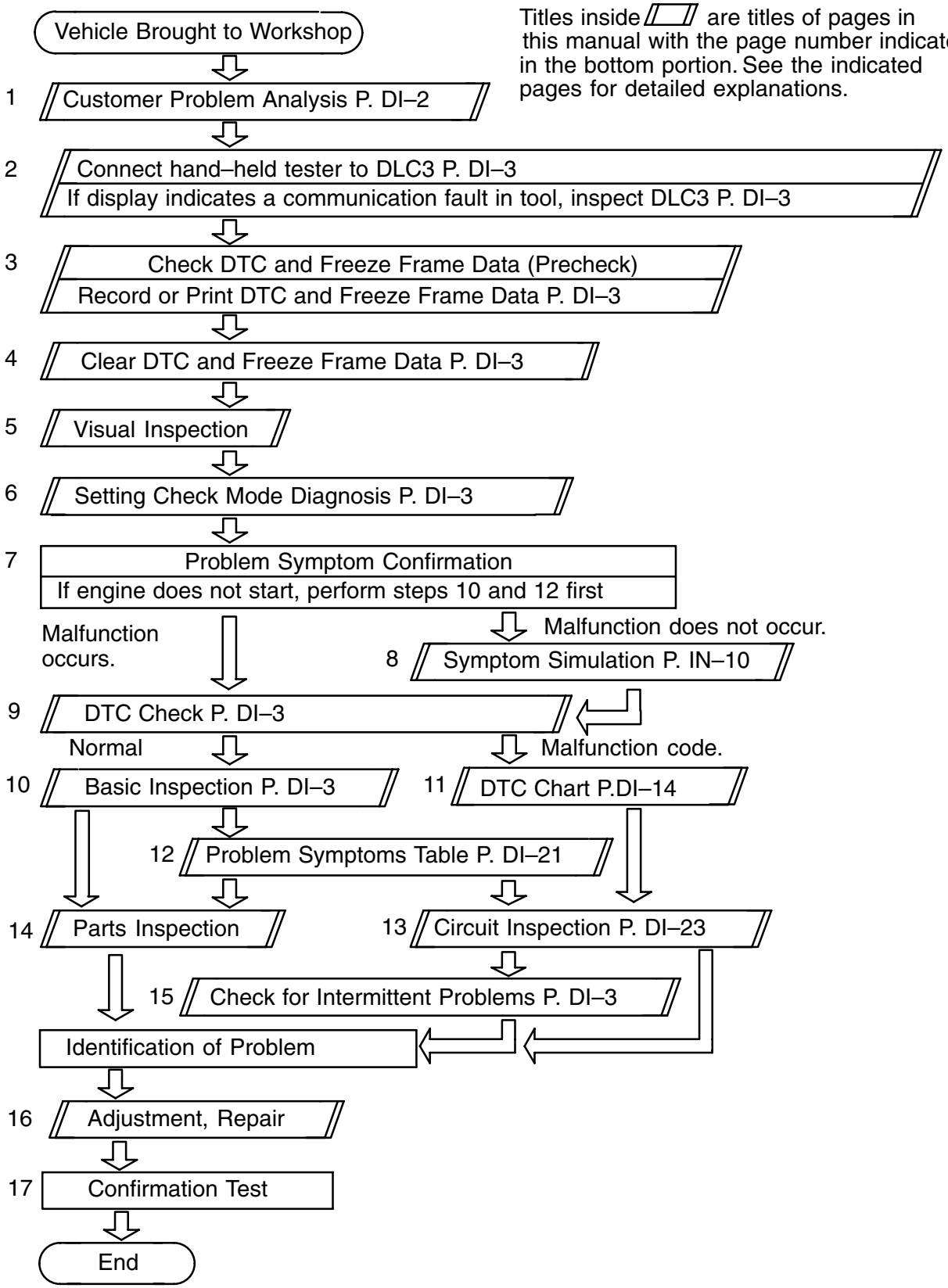
DIAGNOSTICS

ENGINE

HOW TO PROCEED WITH TROUBLESHOOTING

DI4DW–11



DI4DX–07

CUSTOMER PROBLEM ANALYSIS CHECK

ENGINE CONTROL SYSTEM Check Sheet

Inspector's Name _____

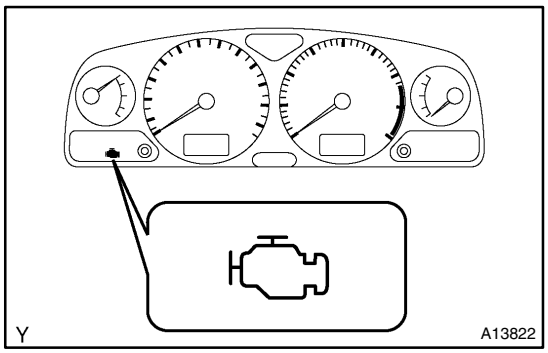
Customer's Name		Model and Model Year	
Driver's Name		Frame No.	
Date Vehicle Brought in		Engine Model	
License No.		Odometer Reading	km miles

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 Driveability	☐ Hesitation ☐ Back fire ☐ Muffler explosion (after–fire) ☐ Surging ☐ Knocking ☐ Other _____
	☐ Engine Stall	☐ Soon after starting ☐ After accelerator pedal depressed ☐ After accelerator pedal released ☐ During A/C operation ☐ Shifting from N to D ☐ Other _____
	☐ Others	

Data Problem Occurred		
Problem Frequency		☐ Constant ☐ Sometimes (times per day/month) ☐ Once only ☐ Other _____
Condition When Problem Occurs	Weather	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Various/Other _____
	Outdoor Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold (approx. ____ °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 check engine warning light (CHK ENG)		☐ Remains on ☐ Sometimes lights up ☐ Does not light up
DTC Inspection	Normal mode (Pre–check)	☐ Normal ☐ Malfunction code(s) (code) ☐ Freeze frame data ( )
	Check Mode	☐ Normal ☐ Malfunction code(s) (code) ☐ Freeze frame data ( )

DI80V–01

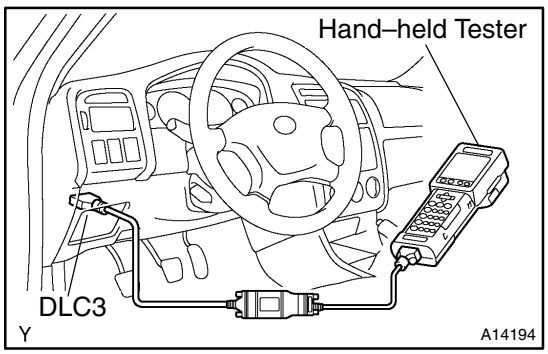


PRE–CHECK

1. DIAGNOSIS SYSTEM

(a) Description

- When troubleshooting Euro–OBD vehicles, the only difference from the usual troubleshooting procedure is that you need to connect the vehicle to the OBD scan tool complying with ISO 15031–4 or hand–held tester, and read off various data output from the vehicle's engine ECU.
- Euro–OBD regulations require that the vehicle's on–board computer lights up the Check Engine Warning Light (Malfunction Indicator Light)/CHK ENG (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 CHK ENG (MIL) lighting up when a malfunction is detected, the applicable Diagnostic Trouble Codes (DTCs) prescribed by ISO15031–6 are recorded in the engine ECU memory (See page DI–14). If the malfunction is not detected in 3 consecutive trips, the CHK ENG (MIL) goes off automatically but the DTCs remains in the engine ECU memory.



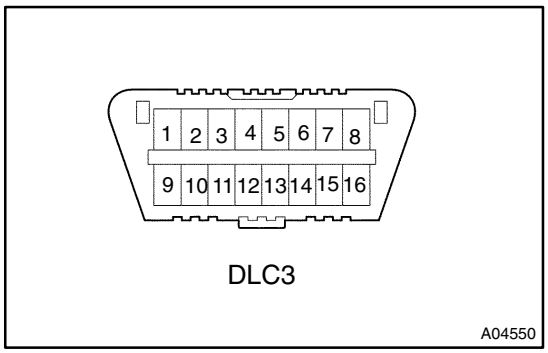
- To check the DTCs, connect the OBD scan tool or hand–held tester to the Data Link Connector 3 (DLC3) on the vehicle. The OBD scan tool or hand–held tester also enables you to erase the DTCs and check freeze frame data and various forms of engine data. (For operating instructions, see the OBD scan tool's instruction book.)
- The DTCs include ISO controlled codes and manufacturer controlled codes. ISO controlled codes must be set as prescribed by the ISO, while manufacturer controlled codes can be set freely by the manufacturer within the prescribed limits. (See the DTC chart on page DI–14)

- The diagnosis system operates in the normal mode during normal vehicle use. It also has a check mode for technicians to simulate malfunction symptoms and troubleshoot. Most DTCs use 2 trip detection logic* to prevent erroneous detection, which ensures the malfunction detection. By switching the engine ECU to the check mode when troubleshooting, the technician can cause the CHK ENG (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 engine ECU memory (1st trip). If the same malfunction is detected again during the second drive test, the CHK ENG (MIL) lights up in this second detection (2nd trip) (However, the ignition switch must be turned OFF between the 1st 2 and the 2nd 2 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. 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 to determine 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 the troubleshooting:

If troubleshooting priorities for multiple DTCs are given in the applicable DTC chart, these should be followed. If no instructions are given, troubleshoot the DTCs according to the following priorities.

(1) DTCs 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 engine ECU uses the ISO 9141–2 communication protocol. The terminal arrangement of the DLC3 complies with ISO 15031–3 and matches the ISO 9141–2/ISO 14230 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

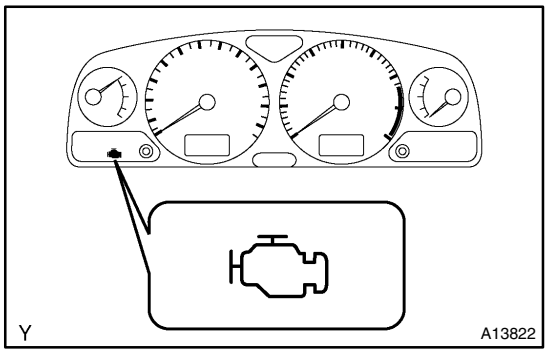
HINT:
If your display shows UNABLE TO CONNECT TO VEHICLE when you have connected the cable of the OBD scan tool or hand–held tester to the DLC3, turned the ignition switch ON and operated the scan tool, there is a problem on the vehicle side or tool side.
If the communication is normal when the tool is connected to another vehicle, inspect the DLC3 on the original vehicle.
If the communication is still 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. Normal Mode:
INSPECT DIAGNOSIS

(a) Check the DTC.

NOTICE:

When the diagnosis system is switched from the normal mode to the check mode, all the DTCs and freezed frame data recorded in the normal mode will be erased. So before switching the modes, always check the DTCs and freezed frame data and note them down.



(1) The CHK ENG (MIL) comes on when the ignition switch is turned ON and the engine is not running.
(2) Prepare the hand–held tester.
(3) Connect the hand–held tester to the DLC3.
(4) Turn the ignition switch ON and push the hand–held tester main switch ON.
(5) Use the hand–held tester to check the DTCs and freeze frame data, and note them down. (For operating instructions, see the hand–held tester instruction book.)

(6) See page DI–14 to confirm the details of the DTCs.

NOTICE:

- **When simulating symptoms with a hand–held tester to check the DTCs, use the normal mode. For code on the DTC chart subject to ”2 trip detection logic”, turn the ignition switch OFF after the symptom is simulated the first time. Then repeat the simulation process again. When the problem has been simulated twice, the CHK ENG (MIL) is indicated on the instrument panel and the DTCs are recorded in the engine ECU.**
- **Check the 1st trip DTC using Mode 7 for ISO 15031 (Continuous Test Results of Euro–OBD function in hand–held tester).**

(b) Clear the DTC.

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

(1) Operating the hand–held tester to erase the codes. (See the hand–held tester’s instruction book for operating instructions.)

(2) Disconnecting the battery terminals or EFI and TH/MTR fuses.

NOTICE:

If the hand–held tester switches the engine ECU 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 freeze frame data will be erased.

3. Check (Test) Mode:

INSPECT DIAGNOSIS

HINT:

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 (test) mode.

(a) Check the DTC.

(1) Initial conditions
- Battery 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.

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

(6) Switch the hand–held tester from the normal mode to the check (test) mode.

NOTICE:
If the hand–held tester switches the engine ECU 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.

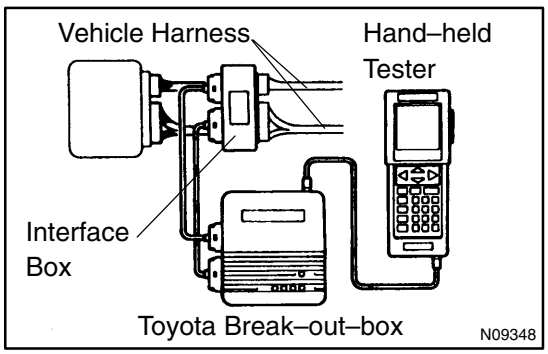
(7) Start the engine.
(8) Simulate the conditions of the malfunction described by the customer.

NOTICE:
Leave the ignition switch ON until you have finished checking the DTCs, etc.

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

HINT:
Take care not to turn the ignition switch OFF. Turning the ignition switch OFF switches the diagnosis system from the check (test) mode to the normal mode. so all the DTCs, etc. are erased.

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



(b) Using break–out–box and hand–held tester, measure the engine ECU terminal values.
(1) Hook up the break–out–box and hand–held tester to the vehicle.
(2) Read the engine ECU input/output values by following the prompts on the tester screen.

HINT:
- Hand–held tester has a ”snapshot” function. This records the measured values and is effective in the diagnosis of the intermittent problems.
- Please refer to the hand–held tester/break–out–box operator’s manual for further details.

4. FAIL–SAFE CHART

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

DTC No.	Fail–safe Operation	Fail–safe Deactivation Conditions
P0105	Ignition timing fixed at 5° BTDC	Returned to normal condition
P0110	Intake air temperature is fixed at 20°C (68°F)	Returned to normal condition
P0115	Water temperature is fixed at 80°C (176°F)	Returned to normal condition

P0120	VTA is fixed at 0°	The following condition must be repeated at least 2 times consecutively when closed throttle position switch is OFF: VTA ≧ 0.1 V and ≦ 0.95 V
P0135 P0141 P0155 P0161	The heater circuit in which an abnormality is detected is turned off	Ignition switch OFF
P0325	Max. timing retardation	Ignition switch OFF
P1300 P1305 P1310 P1315	Fuel cut	Returned to normal condition

5. CHECK FOR INTERMITTENT PROBLEMS

HINT:

By putting the vehicle's engine ECU in the check (test) 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.

(a) Clear the DTCs (See step 2).
(b) Set the check (Test) mode (See step 3).
(c) Perform a simulation test (See page IN–10).
(d) Check the connector and terminal (See page IN–20).
(e) Handle the connector (See page IN–20).

6. BASIC INSPECTION

When the malfunction code is not confirmed in the DTC check, troubleshooting should be performed in all the possible circuits 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, use of this check is essential in the engine troubleshooting.

1	**Is battery voltage 11 V or more when engine is stopped?**

NO → **Charge or replace battery.**

YES

2	**Is engine cranked?**

NO → **Proceed to problems table on page DI–21.**

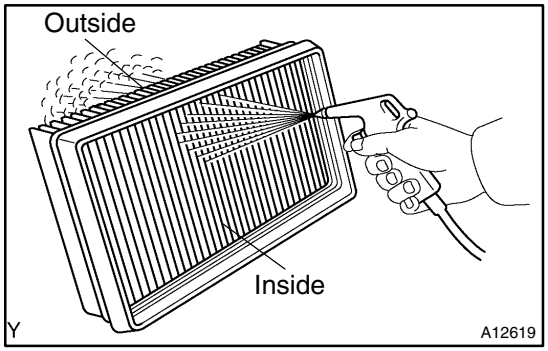
YES

3	Does engine start?

NO → Go to step 7.

YES

4	Check air filter.

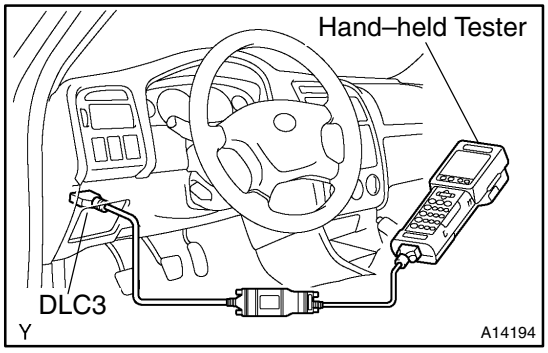


PREPARATION:
Remove the air filter.
CHECK:
Visually check that the air filter is not dirty or excessive oily.
HINT:
If necessary, clean the air filter with compressed air. First blow from inside thoroughly, then blow from outside of the air filter.

NG → **Repair or replace**

OK

5	Check idle speed.



PREPARATION:
(a) Warm up the engine to the normal operating temperature.
(b) Switch off all the accessories.
(c) Switch off the A/C.
(d) Shift the transmission into the N position.
(e) Connect the hand–held tester to the DLC3 on the vehicle.
SST 09843–18030

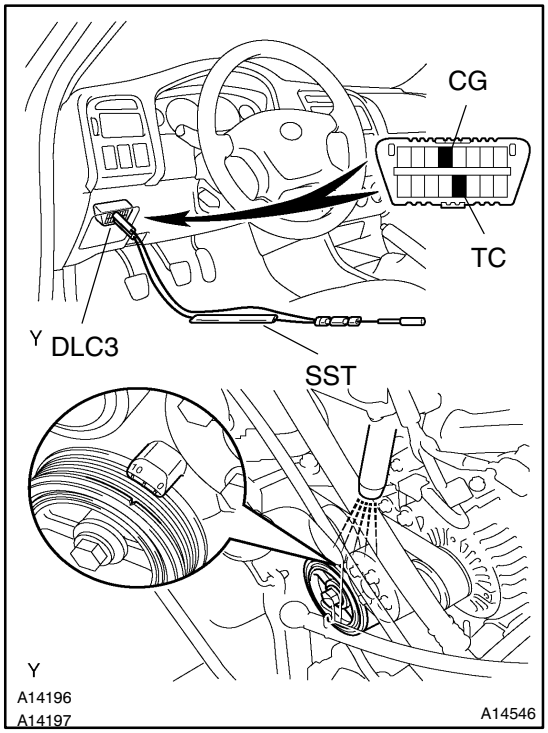
NOTICE:
As some tachometers are not compatible with this ignition system, it is recommend to confirm the compatibility of your unit before use.

CHECK:
Check the idle speed.
OK:
Idle speed: 625 – 725 rpm

NG → **Proceed to problem symptoms table on page DI–21.**

OK

6	Check ignition timing.



PREPARATION:

(a) Warm up the engine to the normal operating temperature.
(b) Shift the transmission into the N position.
(c) Keep the engine speed at idle.
(d) Using SST, connect terminals TC and CG of the DLC3.
SST 09843–18040

(e) Using a timing light, connect the tester to the ignition coil connector wire (See page EM–12).

CHECK:

Check the ignition timing.

OK:

Ignition timing: 8 – 12° BTDC at idle

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

OK

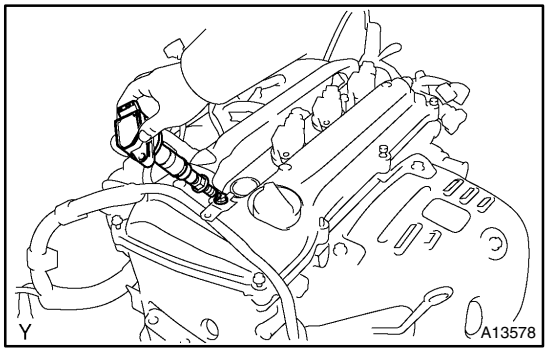
Proceed to problem symptoms table on page DI–21.

7	Check fuel pressure (See page FI–5).

NG → **Proceed to page FI–5 and continue to troubleshoot.**

OK

8	Check for spark.



PREPARATION:

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

CHECK:

Check if spark occurs while engine is being cranked.

NOTICE:

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

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

OK

Proceed to problem symptoms table on page DI–21.

7. ENGINE OPERATING CONDITION

NOTICE:

The values given below for "Normal Condition" are representative values, so a vehicle may still be normal even if its value differs from those listed here. So do not depend solely on the "Normal Condition" here when deciding whether the part is faulty or not.

Hand–held tester display	Measurement Item	Normal Condition*
FUEL SYS #1	Fuel System Bank 1 OPEN: Air–fuel ratio feedback stopped CLOSED: Air–fuel ratio feedback operating	Idling after warming up: CLOSED
FUEL SYS #2	Fuel System Bank 2 OPEN: Air–fuel ratio feedback stopped CLOSED: Air–fuel ratio feedback operating	Idling after warming up: CLOSED
CALC LOAD	Calculator Load: Current intake air volume as a proportion of max. intake air volume	Idling: 21.6 – 31.4 % Racing without load (2,500rpm): 19.6 – 29.4 %
COOLANT TEMP	Water Temp. Sensor Value	After warming up: 80 – 95°C (176 – 203°F)
SHORT FT #1	Short–term Fuel Trim Bank 1	0 ± 20 %
LONG FT #1	Long–term Fuel Trim Bank 1	0 ± 20 %
SHORT FT #2	Short–term Fuel Trim Bank 2	0 ± 20 %
LONG FT #2	Long–term Fuel Trim Bank 2	0 ± 20 %
ENGINE SPD	Engine Speed	Idling: 625 – 725 rpm
VEHICLE SPD	Vehicle Speed	Vehicle stopped: 0 km/h (0 mph)
IGN ADVANCE	Ignition Advance: Ignition Timing of Cylinder No.1	Idling: BTDC 5 – 23°

INTAKE AIR	Intake Air Temp. Sensor Value	Equivalent to ambient temp.
MAP	Absolute Pressure Inside Intake Manifold	Idling: 22 – 32 kPa. Racing without load (2,500 rpm): 20 – 30 kPa
THROTTLE POS	Voltage Output of Throttle Position Sensor Calculated as a percentage: 0 V → 0 %, 5 V → 100 %	Throttle fully closed: 8 – 20 % Throttle fully open: 64 – 96 %
O2S B1 S1	Voltage Output of Oxygen Sensor Bank 1 Sensor 1	Idling: 0.1 – 0.9 V
O2S B1 S2	Voltage Output of Oxygen Sensor Bank 1 Sensor 2	Driving (50 km/h, 31 mph): 0.1 – 0.9 V
O2S B2 S1	Voltage Output of Oxygen Sensor Bank 2 Sensor 1	Idling: 0.1 – 0.9 V
O2FT B1 S1	Oxygen Sensor Fuel Trim Bank 1 Sensor 1 (Same as SHORT FT #1)	0 ± 20 %
O2FT B2 S1	Oxygen Sensor Fuel Trim Bank 2 Sensor 1 (Same as SHORT FT #2)	0 ± 20 %
MIL ON RUN DIST	Distance since activation of check engine warning light	When there is no DTC: 0 km/h (0 mph)
INJECTOR	Fuel injection time for cylinder No.1	Idling: 0.40 – 0.78 ms
MISFIRE RPM	Engine RPM for first misfire range	Misfire 0: 0 rpm
MISFIRE LOAD	Engine load for first misfire range	Misfire 0: 0 g/r
STARTER SIG	Starter Signal	Cranking: ON
A/C SIG	A/C Switch Signal	A/C ON: ON
PNP SW	Park/Neutral Position Switch Signal	P or N position: ON
ELCTRCL LOAD SIG	Electrical Load Signal	Defogger switch ON: ON
CTP	Closed Throttle Position	Throttle fully closed: ON
STOP LIGHT SW	Stop Light Switch Signal	Stop light switch ON: ON
PS OIL PRESS SW	Power Steering Oil Pressure Switch Signal	Turn steering wheel: ON
FC IDL	Fuel Cut Idle: Fuel cut when throttle valve fully closed, during deceleration	Fuel cut operating: ON
FC TAU	Fuel Cut TAU: Fuel cut during very light load	Fuel cut operating: ON
CYL#1 – CYL#4	Abnormal revolution variation for each cylinder	0 %
IGNITION	Total number of ignition for every 1,000 revolutions	0 – 300
INTAKE CTRL VSV	Intake Air Control Valve VSV Signal	VSV operating: ON
A/C CUT SIG	A/C Cut Signal	A/C S/W OFF: ON
FUEL PUMP	Fuel Pump Signal	Idling: ON
EVAP (PURGE) VSV	EVAP VSV Signal	VSV operating: ON
THROTTLE POS #2	Throttle position sensor No.2 output voltage	Throttle fully closed: 2.0 – 2.9 V Throttle fully open: 4.6 – 5.1 V
ACCEL POS	Accelerator pedal position sensor No. 1 output voltage	Accelerator pedal released: 0.4 – 1.4 V Accelerator pedal depressed: 2.7 – 4.6 V
ACCEL POS #2	Accelerator pedal position sensor No. 2 output voltage	Accelerator pedal released: 1.2 – 2.2 V Accelerator pedal depressed: 3.5 – 5.0 V
THROTTLE TARGET POS	Target position of throttle valve	Idling: 0.4 – 1.1 V
THROTTLE OPEN DUTY	Throttle motor opening duty ratio	Throttle fully closed: 0 % When accelerator pedal is depressed, duty ratio is increased

THROTTLE CLOSE DUTY	Throttle motor closed duty ratio	Throttle fully closed: 0 % When accelerator pedal is quick released, duty ratio is increased
THROTTLE MOTOR CTL	Whether or not throttle motor control is permitted	Idling: ON
THROTTLE CLUTCH CTL	Whether or not magnetic clutch control is permitted	Idling: ON
+BM	Whether or not electric throttle control system power is inputted	Idling: ON
ACCEL IDL	Whether or not accelerator pedal position sensor is detecting idle	Idling: ON
THROTTLE IDL	Whether or not throttle position sensor is detecting idle	Idling: ON
FAIL #1	Whether or not fail safe function is executed	ETCS is failed: ON
FAIL #2	Whether or not fail safe function is executed	ETCS is failed: ON
THROTTLE LEARN VALUE	Throttle fully closed learning value	0.4 – 0.8 V
ACCEL LEARN VALUE	Accelerator fully closed learning value	0.4 – 1.4 V
THROTTLE MOTOR	Throttle motor control current	Idling: 0 – 3.0 A
TOTAL FT B1	Total Fuel Trim Bank 1: Average value for fuel trim system of bank 1	Idling: 0.5 – 1.4
TOTAL FT B2	Total Fuel Trim Bank 2: Average value for fuel trim system of bank 2	Idling: 0.5 – 1.4
O2 LR B1 S1	Oxygen Sensor Lean Rich Bank 1 Sensor 1: Response time for oxygen sensor output to switch from lean to rich	Idling after warming up: 0 – 1,000 msec.
O2 LR B2 S1	Oxygen Sensor Lean Rich Bank 2 Sensor 1: Response time for oxygen sensor output to switch from lean to rich	Idling after warming up: 0 – 1,000 msec.
O2 RL B1 S1	Oxygen Sensor Rich Lean Bank 1 Sensor 1: Response time for oxygen sensor output to switch from rich to lean	Idling after warming up: 0 – 1,000 msec.
O2 RL B2 S1	Oxygen Sensor Rich Lean Bank 1 Sensor 1: Response time for oxygen sensor output to switch from rich to lean	Idling after warming up: 0 – 1,000 msec.

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

DI12C–21

DIAGNOSTIC TROUBLE CODE CHART

HINT:

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

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

DTC No. (See page)	Detection Item	Trouble Area	* CHK ENG (MIL)	Memory
P0105 (DI–23)	Vacuum Sensor Circuit Malfunction	• Open or short in vacuum sensor circuit • Vacuum sensor • Engine ECU	○	○
P0110 (DI–26)	Intake Air Temp. Circuit Malfunction	• Open or short in intake air temp. sensor circuit • Intake air temp. sensor • Engine ECU	○	○
P0115 (DI–30)	Water Temp. Circuit Malfunction	• Open or short in water temp. sensor circuit • Water temp. sensor • Engine ECU	○	○
P0120 (DI–34)	Throttle Position Sensor Circuit Malfunction	• Open or short in throttle position sensor circuit • Throttle position sensor • Engine ECU	○	○
P0121 (DI–38)	Throttle Position Sensor Circuit Range/PerformanceProblem	• Throttle position sensor	○	○
P0125 (DI–39)	Insufficient Water Temp. for Closed Loop Fuel Control	• Open or short in oxygen sensor (bank 1, 2 sensor 1, 2) circuit • Open or short in oxygen sensor (bank 1, 2 sensor 1, 2) • Air induction system • Fuel system • Injector • Gas leak on exhaust system • Engine ECU	○	○
P0130 (DI–44)	Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 1)	• Open or short in oxygen sensor circuit • Oxygen sensor • Air induction system • Fuel pressure • Injector • Engine ECU	○	○
P0133 (DI–48)	Oxygen Sensor Circuit Slow Response (Bank 1 Sensor 1)	• Open or short in oxygen sensor circuit • Oxygen sensor • Air induction system • Fuel pressure • Injector • Engine ECU	○	○
P0135 (DI–51)	Oxygen Sensor Heater Circuit Malfunction (Bank 1 Sensor 1)	• Open or short in heater circuit of oxygen sensor • Oxygen sensor heater • Engine ECU	○	○
P0136 (DI–53)	Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 2)	• Open or short in oxygen sensor circuit • Oxygen sensor	○	○
P0141 (DI–51)	Oxygen Sensor Heater Circuit Malfunction (Bank 1 Sensor 2)	• Same as DTC No. P0135	○	○
P0150 (DI–44)	Oxygen Sensor Circuit Malfunction (Bank 2 Sensor 1)	• Same as DTC No. P0130	○	○

P0153 (DI–48)	Oxygen Sensor Circuit Slow Response (Bank 2 Sensor 1)	• Same as DTC No. P0133	○	○
P0155 (DI–51)	Oxygen Sensor Heater Circuit Malfunction (Bank 2 Sensor 1)	• Same as DTC No. P0135	○	○
P0156 (DI–53)	Oxygen Sensor Circuit Malfunction (Bank 2 Sensor 2)	• Same as DTC No. P0136	○	○
P0161 (DI–51)	Oxygen Sensor Heater Circuit Malfunction (Bank 2 Sensor 2)	• Same as DTC No. P0135	○	○
P0171 (DI–56)	System too Lean (Fuel Trim) (Bank 1)	• Air induction system • Injector leak, blockage • Vacuum sensor • Water temp. sensor • Ignition system • Gas leak on exhaust system • Fuel pressure • Oxygen sensor (bank 1 sensor 1, 2) • Engine ECU	○	○
P0172 (DI–56)	System too Rich (Fuel Trim) (Bank 1)	• Air induction system • Injector leak, blockage • Vacuum sensor • Water temp. sensor • Ignition system • Gas leak on exhaust system • Fuel pressure • Oxygen sensor (bank 2 sensor 1, 2) • Engine ECU	○	○
P0174 (DI–56)	System too Lean (Fuel Trim) (Bank 2)	• Same as DTC No. P0171	○	○
P0175 (DI–56)	System too Rich (Fuel Trim) (Bank 2)	• Same as DTC No. P0172	○	○
P0190 (DI–60)	Fuel Rail Pressure Sensor Circuit Malfunction	• Open or short in fuel pressure sensor circuit • Fuel pressure sensor • Engine ECU	○	○
P0191 (DI–63)	Fuel Rail Pressure Sensor Circuit Malfunction Range/Performance	• Open or short in fuel pressure sensor circuit • Fuel pressure sensor • Engine ECU	○	○
P0300 (DI–67)	Random/Multiple Cylinder Misfire Detected	• Open or short in engine wire • Connector connection • Vacuum hose connection • Ignition system • Injector • Fuel pressure • Vacuum sensor • Water temp. sensor • Compression pressure • Valve clearance • Valve timing • Engine ECU	○	○
P0301 (DI–67)	Cylinder 1 Misfire Detected			
P0302 (DI–67)	Cylinder 2 Misfire Detected			
P0303 (DI–67)	Cylinder 3 Misfire Detected			
P0304 (DI–67)	Cylinder 4 Misfire Detected			
P0325 (DI–72)	Knock Sensor 1 Circuit Malfunction (Bank 1)	• Open or short in knock sensor circuit • Knock sensor (looseness) • Engine ECU	○	○
P0335 (DI–75)	Crankshaft Position Sensor Circuit Malfunction (NE Signal)	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Crank angle sensor plate • Engine ECU	○	○

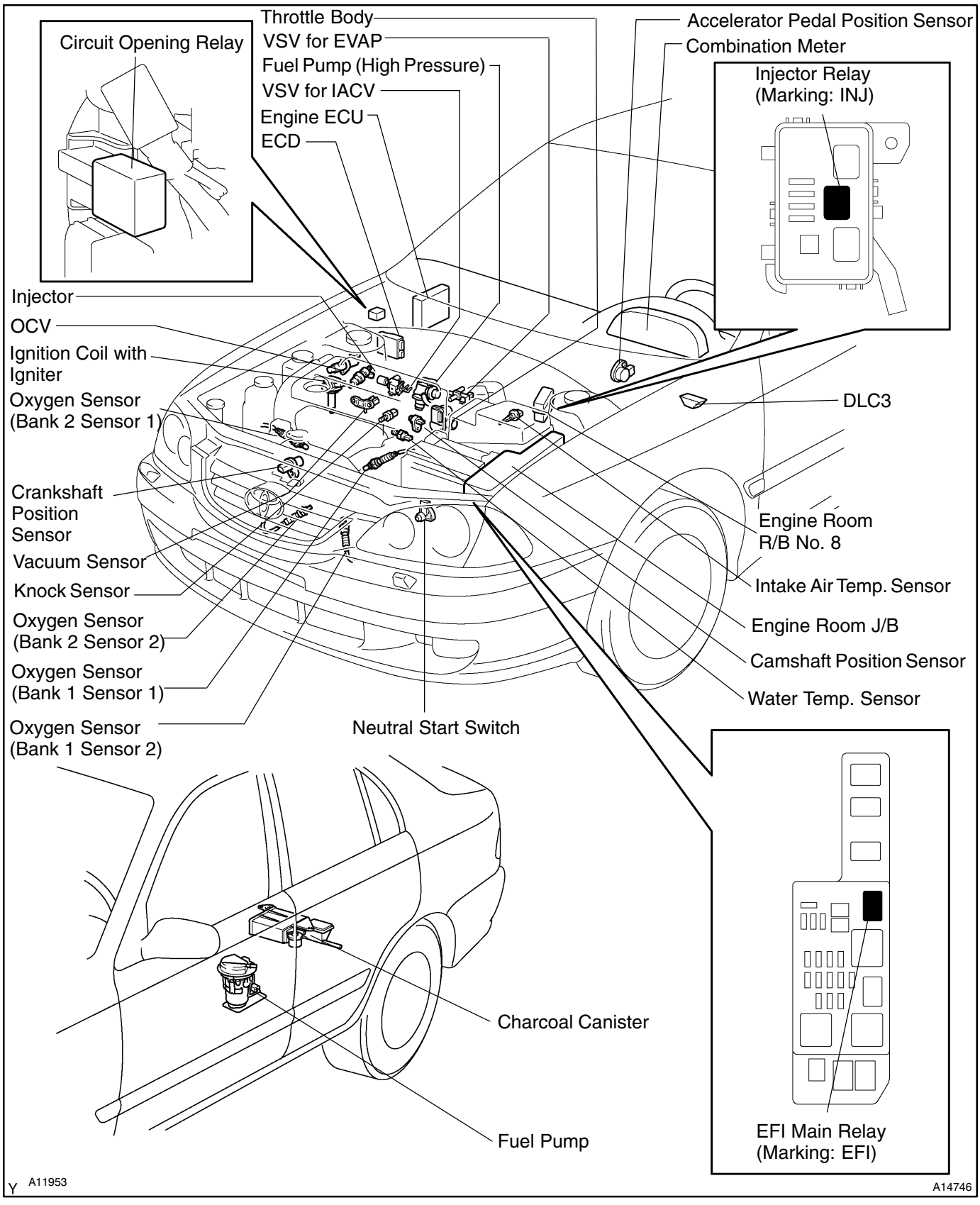
P0340 (DI–77)	Camshaft Position Sensor Circuit Malfunction (G Signal)	• Open or short in camshaft position sensor circuit • Camshaft position sensor • Intake camshaft • Engine ECU	○	○
P0420 (DI–79)	Catalyst System Efficiency Below Threshold (Bank 1)	• Gas leak on exhaust system • Oxygen sensor (bank 1 sensor 1, 2) • Three–way catalytic converter	○	○
P0430 (DI–79)	Catalyst System Efficiency Below Threshold (Bank 2)	• Gas leak on exhaust system • Oxygen sensor (bank 2 sensor 1, 2) • Three–way catalytic converter	○	○
P0443 (DI–82)	Evaporative Emission Control System Purge Control Vent Control Malfunction	• Open or short in VSV circuit for EVAP • VSV for EVAP • Engine ECU	○	○
P0500 (DI–84)	Vehicle Speed Sensor Malfunction	• Combination meter • Open or short in vehicle speed sensor circuit • Vehicle speed sensor • ABS ECU • Engine ECU	○	○
P1120 (DI–87)	Accelerator Pedal Position Sensor Circuit Malfunction	• Open or short in accelerator pedal position sensor circuit • Accelerator pedal position sensor • Engine ECU	○	○
P1121 (DI–91)	Accelerator Pedal Position Sensor Range/Performance Problem	• Accelerator pedal position sensor	○	○
P1125 (DI–92)	Throttle Control Motor Circuit Malfunction	• Open or short in throttle control motor circuit • Throttle control motor • Engine ECU	○	○
P1127 (DI–94)	ETCS (TH/MTR) Actuator Power Source Circuit Malfunction	• Open in TH/MTR power source circuit • Engine ECU	○	○
P1128 (DI–96)	Throttle Control Motor Lock Malfunction	• Throttle control motor • Throttle body	○	○
P1129 (DI–97)	Electric Throttle Control System Malfunction	• Electric throttle control system • Engine ECU	○	○
1215 (DI–98)	EDU Circuit Malfunction	• Open or short in EDU circuit • EDU • Injector • Engine ECU	○	○
1235 (DI–101)	Fuel Pump (High Pressure) Circuit Malfunction (Fuel leak)	• Open or short in fuel pump (high pressure) • Fuel pump (high pressure) • Engine ECU	○	○
P1300 (DI–104)	Igniter Circuit Malfunction (No. 1)	• Ignition system • Open or short in IGF or IGT1 circuit from No. 1 ignition coil with igniter to engine ECU • No. 1 ignition coil with igniter • Engine ECU	○	○
P1305 (DI–104)	Igniter Circuit Malfunction (No. 2)	• Ignition system • Open or short in IGF or IGT2 circuit from No. 2 ignition coil with igniter to engine ECU • No. 2 ignition coil with igniter • Engine ECU	○	○
P1310 (DI–104)	Igniter Circuit Malfunction (No. 3)	• Ignition system • Open or short in IGF or IGT3 circuit from No. 3 ignition coil with igniter to Engine ECU • No. 3 ignition coil with igniter • Engine ECU	○	○

P1315 (DI–104)	Igniter Circuit Malfunction (No. 4)	• Ignition system • Open or short in IGF or IGT4 circuit from No. 4 ignition coil with igniter to engine ECU • No. 4 ignition coil with igniter • Engine ECU	○	○
P1335 (DI–111)	Crankshaft Position Sensor Circuit Malfunction (During engine running)	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Crankshaft angle sensor plate • Engine ECU	–	–
P1349 (DI–112)	VVT System Malfunction (Bank 1)	• Valve timing • OCV for VVT • VVT controller assembly • Engine ECU	○	○
P1520 (DI–116)	Stop Light Switch Signal Malfunction (Only for A/T)	• Short in stop light switch signal circuit • Stop light switch • Engine ECU	○	○
P1600 (DI–120)	Engine ECU BATT Malfunction	• Open in back up power source circuit • Engine ECU	○	○
P1633 (DI–122)	Engine ECU Malfunction (ETCS (TH/MTR) Circuit)	• Engine ECU	○	○
P1653 (DI–123)	VSV for IACV Circuit Malfunction	• Open or short in VSV circuit for IACV • VSV for IACV • Engine ECU	○	○
P1656 (DI–126)	OCV Circuit Malfunction (Bank 1)	• Open or short in OCV circuit (bank 1) • OCV for VVT • Engine ECU	○	○
P1780 (DI–128)	Neutral Start Switch Malfunction (Only for A/T)	• Short in neutral start switch circuit • Neutral start switch • Engine ECU	○	○

*: ○ ... CHK ENG is indicated. – ... CHK ENG is not indicated.

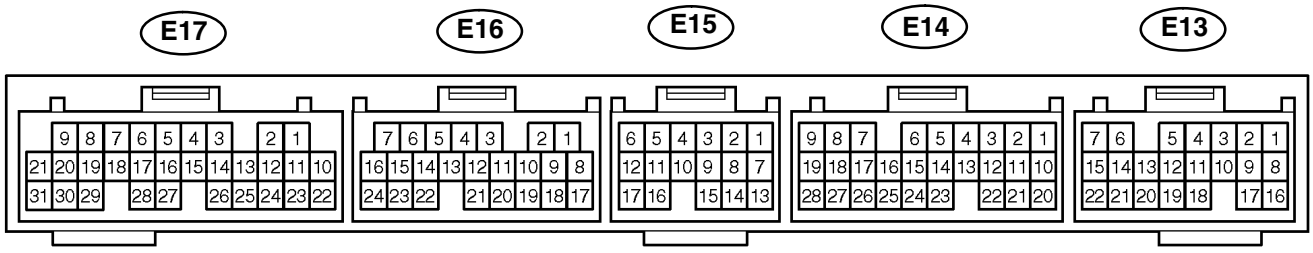
DI68L–12

PARTS LOCATION



DI68M–09

TERMINALS OF ECU



D01054 D03442

Symbols (Terminal No.)	Wiring Color	Condition	STD Voltage (V)
BATT (E13–16) – E1 (E16–3)	B–Y – BR	Always	9 – 14
IGSW (E13–9) – E1 (E16–3)	B–R – BR	IG switch ON	9 – 14
+B (E13–1) – E1 (E16–3)	B–R – BR		
PIM (E16–15) – E2 (E16–19)	P – BR	IG switch ON	3.3 – 3.9
		Apply vacuum 26.7 kPa (200 mmHg, 7.9 in.Hg)	2.6 – 3.0
VC (E16–20) – E2 (E16–19)	Y – BR	IG switch ON	4.5 – 5.5
VTA (E17–26) – E2 (E16–19)	LG – BR	IG switch ON, Accelerator pedal fully closed	0.3 – 1.0
		IG switch ON, Accelerator pedal fully open	3.2 – 4.8
VTA2 (E17–25) – E2 (E16–19)	Y–G – BR	IG switch ON, Accelerator pedal fully closed	2.0 – 2.9
		IG switch ON, Accelerator pedal fully open	4.6 – 5.1
VPA (E17–24) – E2 (E16–19)	LG–R – BR	IG switch ON, Accelerator pedal fully closed	0.3 – 0.9
		IG switch ON, Accelerator pedal fully open	3.2 – 4.8
VPA2 (E17–23) – E2 (E16–19)	L–R – BR	IG switch ON, Accelerator pedal fully closed	1.8 – 2.7
		IG switch ON, Accelerator pedal fully open	4.7 – 5.1
THA (E16–22) – E2 (E16–19)	Y–B – BR	Idling, Intake air temp. 20°C (68°F)	0.5 – 3.4
THW (E16–14) – E2 (E16–19)	L – BR	Idling, Water temp. 80°C (176°F)	0.2 – 1.0
STA (E14–18) – E1 (E16–3)	R–G – BR	Shift position in neutral, IG SW START	6.0 or more
#1 (E15–3) – E01 (E17–6) #2 (E15–2) – E01 (E17–6) #3 (E15–1) – E01 (E17–6) #4 (E15–9) – E01 (E17–6)	L–B – BR R–W – BR L–W – BR G–W – BR	IG switch ON	9 – 14
		Idling	Pulse generation (See page DI–67)
INJF (E17–17) – E01 (E17–6)	L – BR	Idling	Pulse generation (See page DI–75)
IGT1 (E17–18) – E1 (E16–3)	B – BR	Idling	Pulse generation (See page DI–104)
IGT2 (E17–17) – E1 (E16–3)	B–R – BR		
IGT3 (E17–16) – E1 (E16–3)	P – BR		
IGT4 (E17–15) – E1 (E16–3)	R – BR		
IGF (E17–14) – E1 (E16–3)	B–Y – BR	IG switch ON	4.5 – 5.5
		Idling	Pulse generation (See page DI–104)
G22+ (E16–10) – NE– (E16–18)	B – R	Idling	Pulse generation (See page DI–75)
NE+ (E16–9) – NE– (E16–18)	G – R		
IREL (E14–28) – E1 (E16–3)	Y–B – BR	IG switch ON	9 – 14
FC (E13–2) – E1 (E16–3)	G–R – BR	IG switch ON	9 – 14

STP (E13–22) – E1 (E16–3)	G–W – BR	Brake pedal is depressed	9 – 14
		Brake pedal is released	Below 1.5
OX1A (E16–11) – E1 (E16–3)	W – BR	Maintain engine speed at 2,500 rpm for 90 sec. after warming up	Pulse generation (See page DI–39)
OX2A (E16–16) – E1 (E16–3)	B – BR		
OX1B (E16–21) – E1 (E16–3)	W – BR	Maintain engine speed at 2,500 rpm for 3 min. after warming up	Pulse generation (See page DI–39)
OX2B (E16–24) – E1 (E16–3)	R – BR		
HT1A (E16–5) – E03 (E16–1) HT1B (E16–6) – E03 (E16–1) HT2A (E16–4) – E03 (E16–1) HT2B (E17–1) – E03 (E16–1)	B–W – BR W–B – BR G–W – BR L–R – BR	Idling	Below 3.0
		IG switch ON	9 – 14
KNK1 (E16–23) – E1 (E16–3)	W – BR	Maintain engine speed at 4,000 rpm after warming up	Pulse generation (See page DI–72)
TC (E13–18) – E1 (E16–3)	LG–R – BR	IG switch ON	9 – 14
W (E13–12) – E01 (E17–6)	Y–B – BR	Idling	9 – 14
		IG switch ON	Below 3.0
OCV+ (E17–19) – OCV– (E17–29)	B–O – L–O	IG switch ON	Pulse generation (See page DI–112)
EVP1 (E15–16) – E1 (E16–3)	R–Y – BR	IG switch ON	9 – 14
SPD (E13–6) – E01 (E17–6)	G – BR	IG switch ON	9 – 14
M+ (E17–8) – E1 (E16–3)	B–W – BR	Idling	Pulse generation (See page DI–92)
M– (E17–7) – E1 (E16–3)	L – BR		
FP+ (E17–4) – FP– (E17–3)	W – O	Idling	Pulse generation (See page DI–101)
SCV (E17–20) – E1 (E16–13)	G – BR	IG switch ON	9 – 14

DI1IA–23

PROBLEM SYMPTOMS TABLE

When the malfunction is not confirmed in the diagnostic trouble code check and the problem still can not be confirmed in the basic inspection, proceed to this problem symptoms table and troubleshoot according to the numbered order given below.

Symptom	Suspect Area	See page
Engine does not crank (Does not start)	1. Starter and starter relay 2. Neutral start switch circuit	ST–7 ST–19 DI–128
No initial combustion (Does not start)	1. Engine ECU power source circuit 2. Ignition coil with igniter 3. Injector circuit	DI–132 DI–104 DI–67
No complete combustion (Does not start)	1. Ignition coil with igniter 2. Injector circuit	DI–104 DI–67
Engine cranks normally (Difficult to start)	1. Starter signal circuit 2. Ignition coil with igniter 3. Spark plug 4. Compression 5. Injector circuit	DI–141 DI–104 IG–1 EM–4 DI–67
Cold engine (Difficult to start)	1. Starter signal circuit 2. Injector circuit 3. Ignition coil with igniter 4. Spark plug	DI–141 DI–67 DI–104 IG–1
Hot engine (Difficult to start)	1. Starter signal circuit 2. Injector circuit 3. Ignition coil with igniter 4. Spark plug	DI–141 DI–67 IG–1 IG–1
High engine idle speed (Poor idling)	1. Engine ECU power source circuit 2. Neutral start switch circuit 3. Back up power source circuit	DI–132 DI–128 DI–120
Low engine idle speed (Poor idling)	1. Neutral start switch circuit 2. Injector circuit 3. Back up power source circuit	DI–128 DI–67 DI–120
Rough idling (Poor idling)	1. Vacuum sensor circuit 2. Injector circuit 3. Ignition coil with igniter 4. Compression 5. Back up power source circuit	DI–23 DI–67 DI–104 EM–4 DI–120
Hunting (Poor idling)	1. Vacuum sensor circuit 2. Engine ECU power source circuit	DI–23 DI–132
Hesitation/Poor acceleration (Poor driveability)	1. Vacuum sensor circuit 2. Injector circuit 3. Ignition coil with igniter	DI–23 DI–67 DI–104
Muffler explosion, after fire (Poor driveability)	1. Ignition coil with igniter 2. Spark plug 3. Injector circuit	IG–1 IG–1 DI–67
Surging (Poor driveability)	1. Spark plug 2. Injector circuit	IG–1 DI–67
Engine stall (Soon after starting)	1. Vacuum sensor circuit	DI–23
Engine stall (After accelerator pedal depressed)	1. Vacuum sensor circuit	DI–23
Engine stall (After accelerator pedal released)	1. Vacuum sensor circuit 2. Engine ECU	DI–23 IN–20

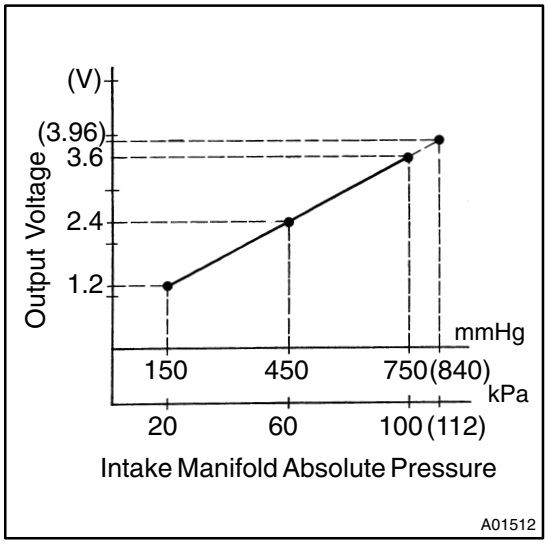
Engine stall (During A/C operation)	1. A/C signal circuit (Compressor circuit) 2. Engine ECU	DI–145 IN–20
Engine stall (When shifting N to D)	1. Neutral start switch circuit	DI–128

DI80W–01

CIRCUIT INSPECTION

DTC	P0105	Vacuum Sensor Circuit Malfunction

CIRCUIT DESCRIPTION



The vacuum sensor detects the intake manifold pressure and indicates it in volt. The engine ECU then determines the basic injection duration and basic ignition advance angle according to this voltage.

Since the vacuum sensor does not use the atmospheric pressure as a criterion but senses the absolute pressure inside the intake manifold (the pressure in proportion to the preset absolute vacuum 0), it is not influenced by fluctuations in the atmospheric pressure due to high altitude and other factors. This enables it to control the air fuel ratio at the proper level under all conditions.

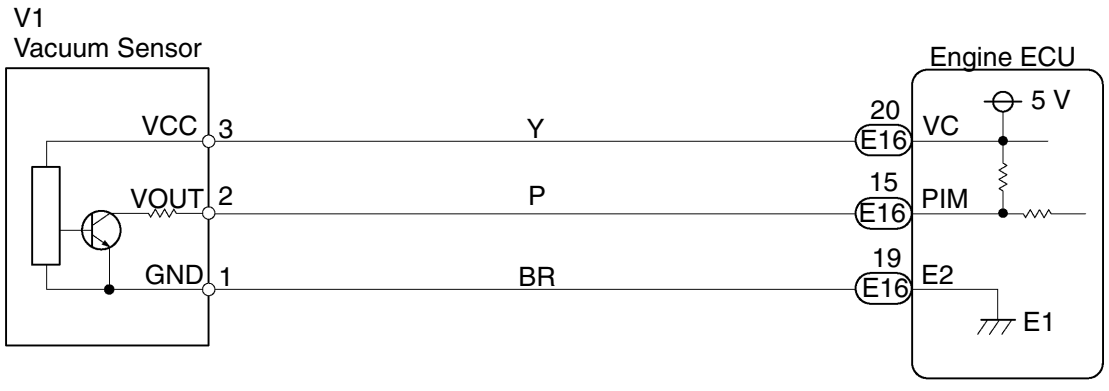
DTC No.	DTC Detection Condition	Trouble Area
P0105	Open or short in vacuum sensor circuit	• Open or short in vacuum sensor circuit • Vacuum sensor • Engine ECU

HINT:

After confirming DTC P0105, use the hand–held tester to confirm the manifold absolute pressure from the CURRENT DATA.

Manifold Absolute Pressure (kPa)	Malfunction
Approx. 0	• PIM circuit short
142 or more	• VC circuit open or short • PIM circuit open • E2 circuit open

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If DTCs P0105, P0110, P0115, P0120, P0121, P0190, P0191, P1120, P1121, P1125 and P1129 are output simultaneously, E2 (sensor ground) may be open.
- Read freeze frame data using hand–held tester, 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	**Connect hand–held tester, and read value of manifold absolute pressure.**

PREPARATION:

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

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

CHECK:

Read the value of the manifold absolute pressure on the hand–held tester.

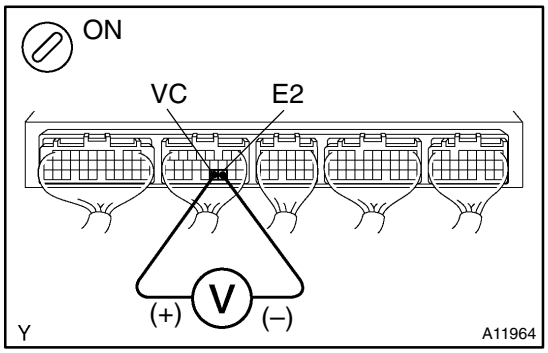
OK:

Same value as the atmospheric pressure.

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

NG

2	**Check voltage between terminals VC and E2 of engine ECU Connector.**



PREPARATION:

(a) Remove the glove compartment (See page FI–56).

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals VC and E2 of the engine ECU connector.

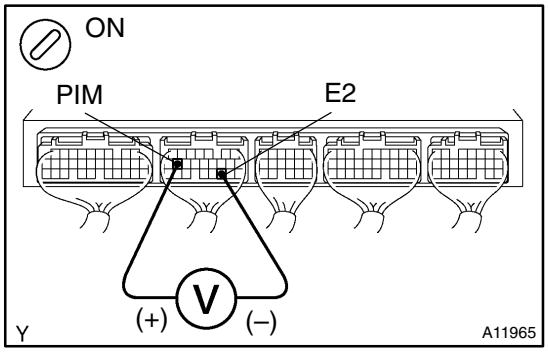
OK:

Voltage: 4.5 – 5.5 V

NG → **Check and replace engine ECU (See page IN–20).**

OK

3	Check voltage between terminals PIM and E2 of engine ECU connector.



PREPARATION:

(a) Remove the glove compartment (See page FI–56).

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals PIM and E2 of the engine ECU connector.

OK:

Voltage: 3.3 – 3.9 V

OK → **Check and replace engine ECU (See page IN–20).**

NG

4	Check for open and short in harness and connector between vacuum sensor and engine ECU (See page IN–20).

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

OK

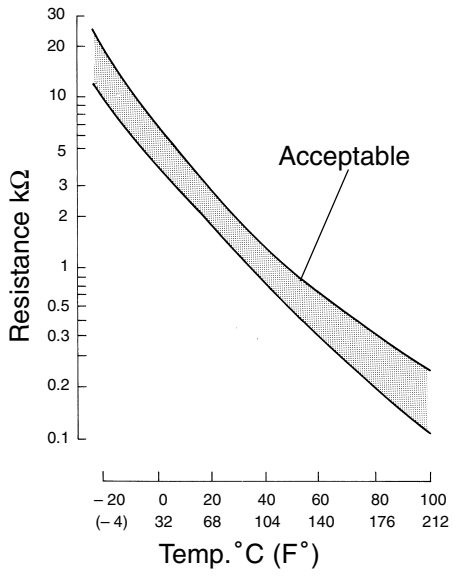
Replace vacuum sensor (See page FI–44).

DI7GU–05

DTC	P0110	Intake Air Temp. Circuit Malfunction

CIRCUIT DESCRIPTION

Fig.1



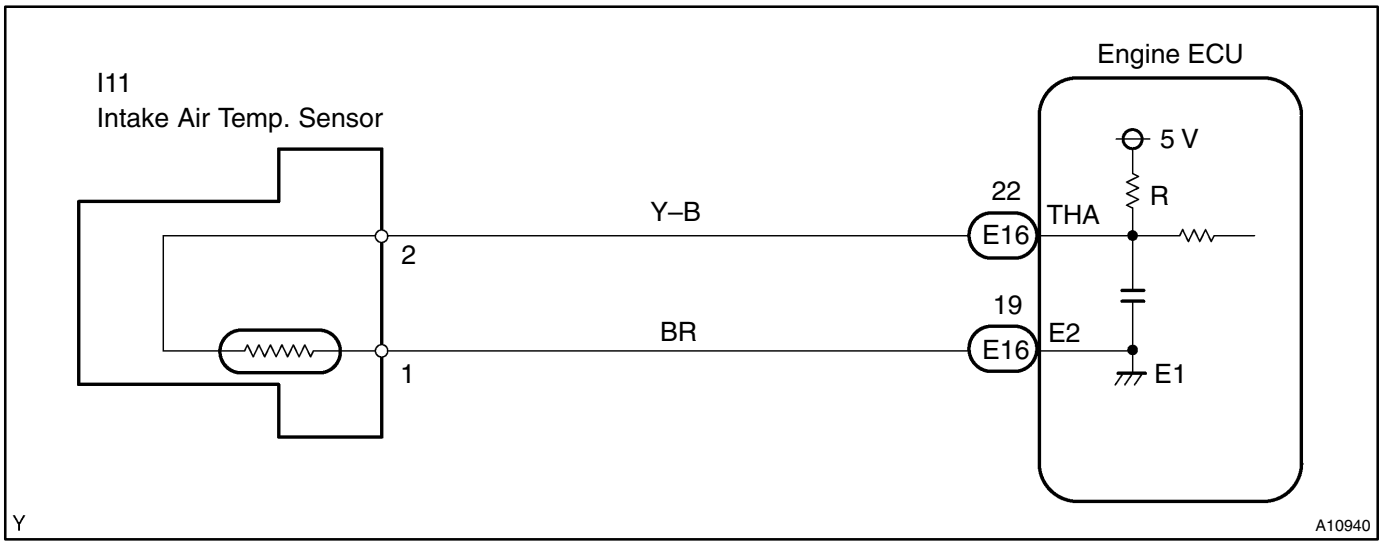
The intake air temperature sensor is mounted on the air cleaner cap and senses the intake air temperature. A thermistor built in the sensor changes the resistance value according to the intake air temperature. The lower the intake air temperature the greater the thermistor resistance value, and the higher the intake air temperature the lower the thermistor resistance value (See Fig.1). The air intake temperature sensor is connected to the engine ECU (See below). The 5V power source voltage in the engine ECU is applied to the intake air temperature sensor from the terminal THA via a resistor R. That is, the resistor R and the intake air temperature sensor are connected in series. When the resistance value of the intake air temperature sensor changes in accordance with changes in the intake air temperature, the potential at terminal THA also changes. Based on this signal, the engine ECU increases the fuel injection volume and improves driveability during cold engine operation.

DTC No.	DTC Detection Condition	Trouble Area
P0110	Open or short in intake air temp. sensor circuit for 0.5 sec. or more	• Open or short in intake air temp. sensor circuit • Intake air temp. sensor • Engine ECU

HINT:
After confirming DTC P0110, use the hand–held tester to confirm the intake air temperature from the CURRENT DATA.

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

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If DTCs P0105, P0110, P0115, P0120, P0121, P0190, P0191, P1120, P1121, P1125 and P1129 are output simultaneously, E2 (sensor ground) may be open.
- Read freeze frame data using hand–held tester, 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	**Connect hand–held tester, and read value of intake air temperature.**

PREPARATION:

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

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

CHECK:

Read the temperature value on the hand–held tester.

OK:

Same value as the actual intake air temperature.

HINT:

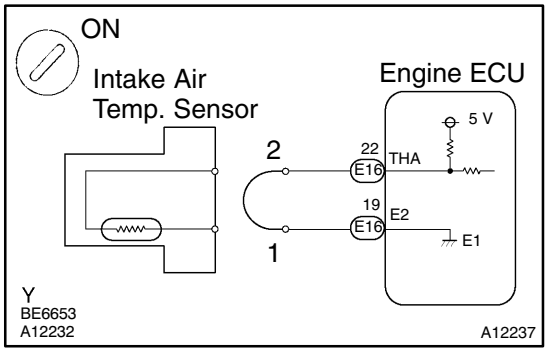
- If there is open circuit, hand–held tester indicates –40˚C (–40˚F).
- If there is short circuit, hand–held tester indicates 140˚C (284˚F) or more.

NG → **–40˚C (–40˚F) ... Go to step 2**
140˚C (284˚F) or more ... Go to step 4.

OK

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

2	Check for open in harness or engine ECU.



PREPARATION:

(a) Disconnect the intake air temperature sensor connector.
(b) Connect the sensor wire harness terminals together.
(c) Turn the ignition switch ON.

CHECK:

Read the temperature value on the hand–held tester.

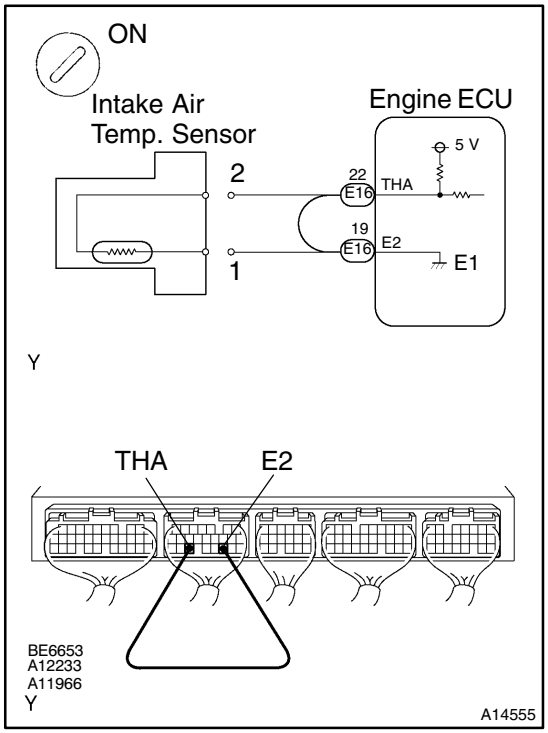
OK:

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

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

NG

3	Check for open in harness or engine ECU connector.



PREPARATION:

(a) Remove the glove compartment (See page FI–56).
(b) Connect between terminals THA and E2 of the engine ECU connector.

HINT:

The intake air temperature sensor connector is disconnected. Before checking, do a visual and contact pressure check for the engine ECU connector (See page IN–20).

CHECK:

Read the temperature value on the hand–held tester.

OK:

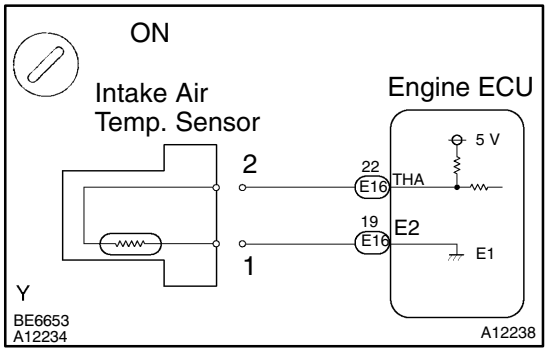
Temperature value: 140°C (284°F) or more

OK	Open in harness between terminals E2 or THA, repair or replace harness.

NG

Confirm good connection at engine ECU. If OK, check and replace engine ECU (See page IN–20).

4	Check for short in harness and engine ECU.



PREPARATION:

(a) Disconnect the intake air temperature sensor connector.

(b) Turn the ignition switch ON.

CHECK:

Read the temperature value on the hand–held tester.

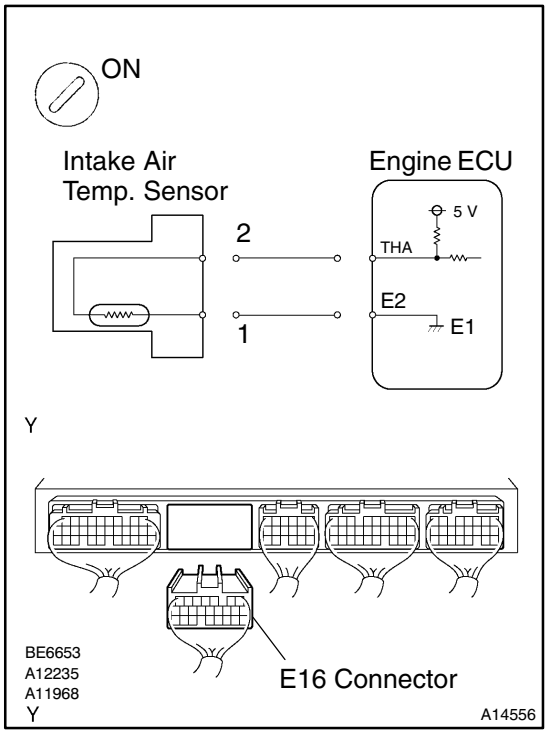
OK:

Temperature value: –40°C (–40°F)

OK	Replace intake air temperature sensor.

NG

5	Check for short in harness or engine ECU.



PREPARATION:

(a) Remove the glove compartment (See page FI–56).

(b) Disconnect the E16 connector of engine ECU (See page FI–56).

HINT:

The intake air temperature sensor connector is disconnected.

(c) Turn the ignition switch ON.

CHECK:

Read the temperature value on the hand–held tester.

OK:

Temperature value: –40°C (–40°F)

OK	Repair or replace harness or connector.

NG

Check and replace engine ECU (See page IN–20).

DI7GV–05

DTC	P0115	Water Temp. Circuit Malfunction

CIRCUIT DESCRIPTION

A thermistor built in the water temperature sensor changes the resistance value according to the water temperature. The structure of the sensor and connection to the engine ECU is the same as in the DTC P0110 shown in page DI–26.

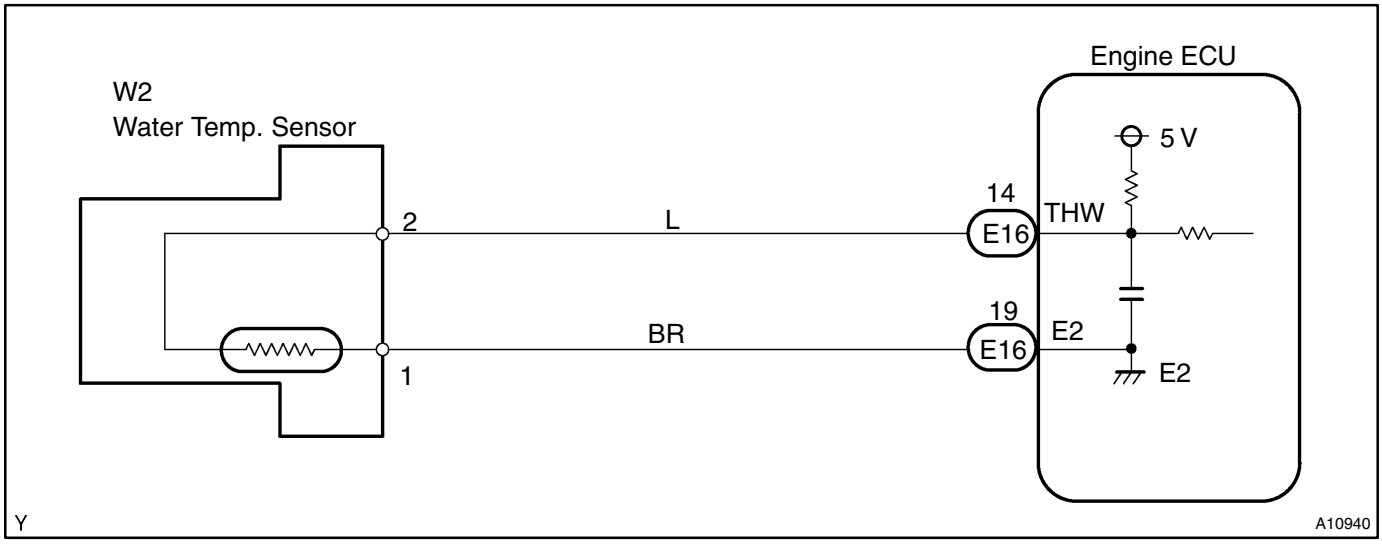
DTC No.	DTC Detection Condition	Trouble Area
P0115	Open or short in water temp. sensor circuit for 0.5 sec. or condition below continues for 0.5 sec. or more: • THW out put ≦0.1 (V) or 4.9 (V) ≧THW out put	• Open or short in water temp. sensor circuit • Water temp. sensor • Engine ECU

HINT:

After confirming DTC P0115, use the hand–held tester to confirm the water temperature from the CURRENT DATA.

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

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If DTCs P0105, P0110, P0115, P0120, P0121, P0190, P0191, P1120, P1121, P1125 and P1129 are output simultaneously, E2 (sensor ground) may be open.
- Read freeze frame data using hand–held tester, 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	Connect hand–held tester, and read value of water temp.

PREPARATION:

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

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

CHECK:

Read the temperature value on the hand–held tester.

OK:

Same value as the actual water temperature.

HINT:

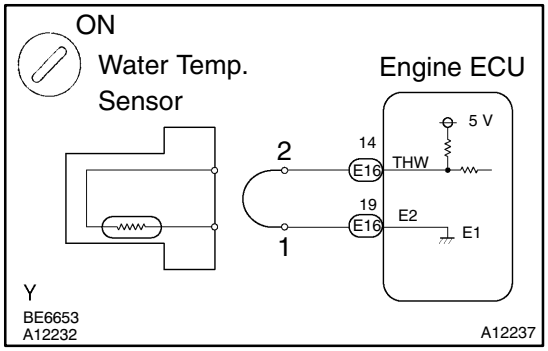
- If there is open circuit, hand–held tester indicates –40˚C (–40˚F).
- If there is short circuit, hand–held tester indicates 140˚C (284˚F) or more.

NG → **–40˚C (–40˚F) ... Go to step 2.**
140˚C (284˚F) or more ... Go to step 4.

OK

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

2	Check for open in harness or engine ECU.



PREPARATION:

(a) Disconnect the water temperature sensor connector.

(b) Connect the sensor wire harness terminals together.

(c) Turn the ignition switch ON.

CHECK:

Read the temperature value on the hand–held tester.

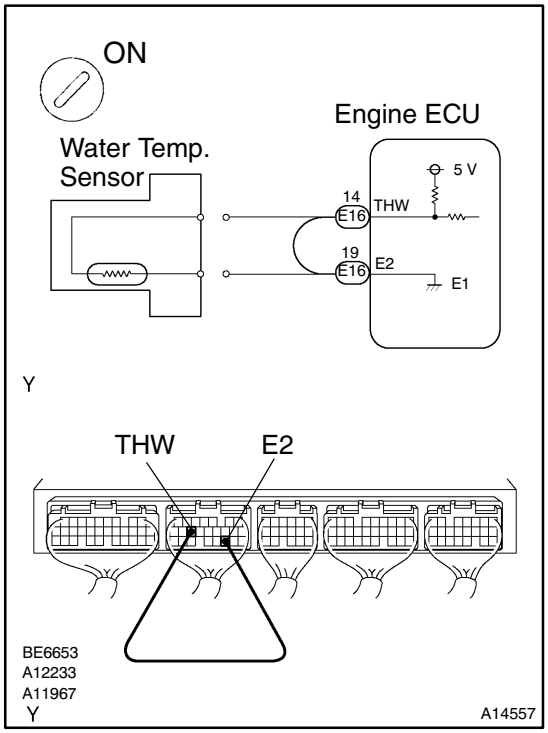
OK:

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

OK → **Confirm good connection at sensor. If OK, replace water temp. sensor.**

NG

3	Check for open in harness or engine ECU.



PREPARATION:

(a) Remove the glove compartment (See page FI–56).

(b) Connect terminals THW and E2 of the engine ECU connector together.

HINT:

The water temperature sensor connector is disconnected. Before checking, do a visual and contact pressure check for the engine ECU connector (See page IN–20).

(c) Turn the ignition switch ON.

CHECK:

Read the temperature value on the hand–held tester.

OK:

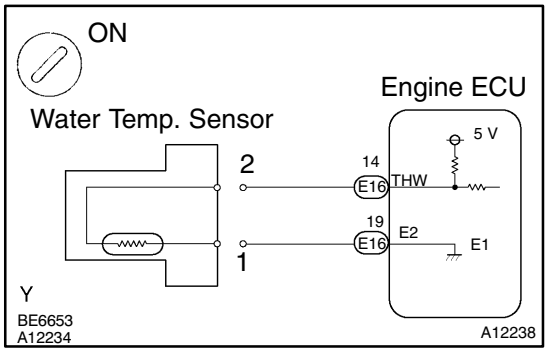
Temperature value: 140°C (284°F) or more

OK	Open in harness between terminals E2 or THW, repair or replace harness.

NG

Confirm good connection at engine ECU. If OK, check and replace engine ECU (See page IN–20).

4	Check for short in harness and engine ECU.



PREPARATION:

(a) Disconnect the water temperature sensor connector.

(b) Turn the ignition switch ON.

CHECK:

Read the temperature value on the hand–held tester.

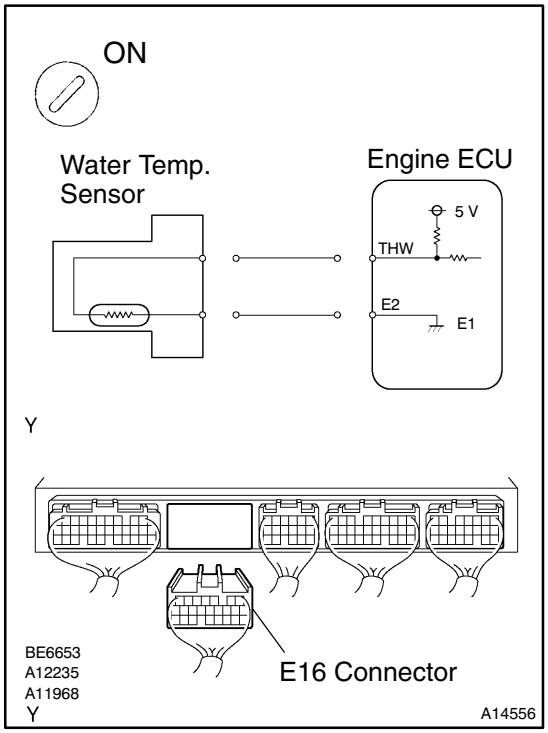
OK:

Temperature value: –40°C (–40°F)

OK	Replace water temp. sensor.

NG

5	Check for short in harness or engine ECU.



PREPARATION:

(a) Remove the glove compartment (See page FI–56).

(b) Disconnect the E16 connector from the engine ECU (See page FI–56).

HINT:

The water temperature sensor connector is disconnected.

(c) Turn the ignition switch ON.

CHECK:

Read the temperature value on the hand–held tester.

OK:

Temperature value: –40°C (–40°F)

NG

Check and replace engine ECU (See page IN–20).

OK

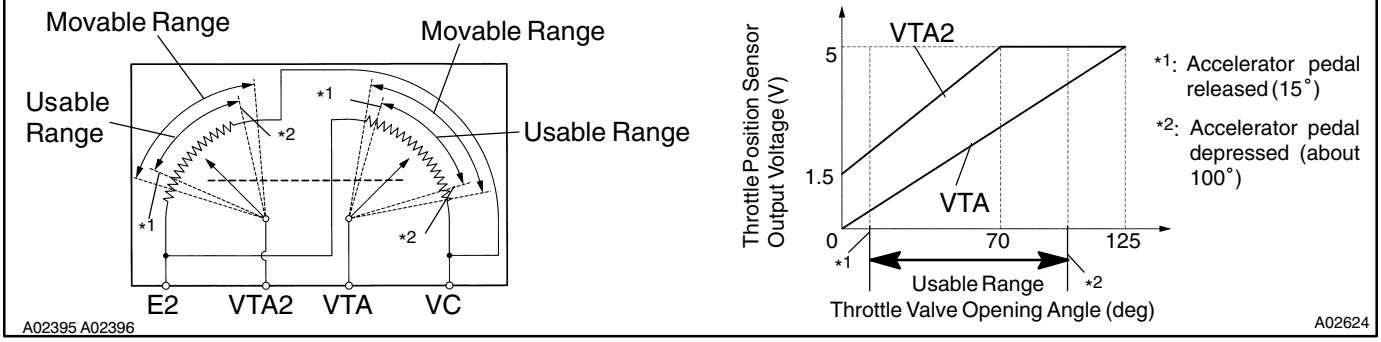
Repair or replace harness or connector.

DI80X–01

DTC	P0120	Throttle Position Sensor Circuit Malfunction

CIRCUIT DESCRIPTION

Throttle position sensor is mounted on the throttle body and it has the 2 sensors to detect the throttle opening angle and the malfunction of the throttle position sensor's own. The voltage applied to the terminals VTA and VTA2 of the engine ECU changes between 0 V and 5 V in proportion to the opening angle of the throttle valve. The engine ECU judges the current opening angle of the throttle valve by these signals output from terminals VTA and VTA2, and the engine ECU controls the throttle motor to make the throttle valve angle properly according to the driving condition. If the DTC is stored, the engine ECU cut the power for the throttle motor and the electromagnetic clutch, and the throttle valve is fully closed by the return spring. However, the opening angle of the throttle valve can be controlled by the accelerator pedal through the throttle cable.



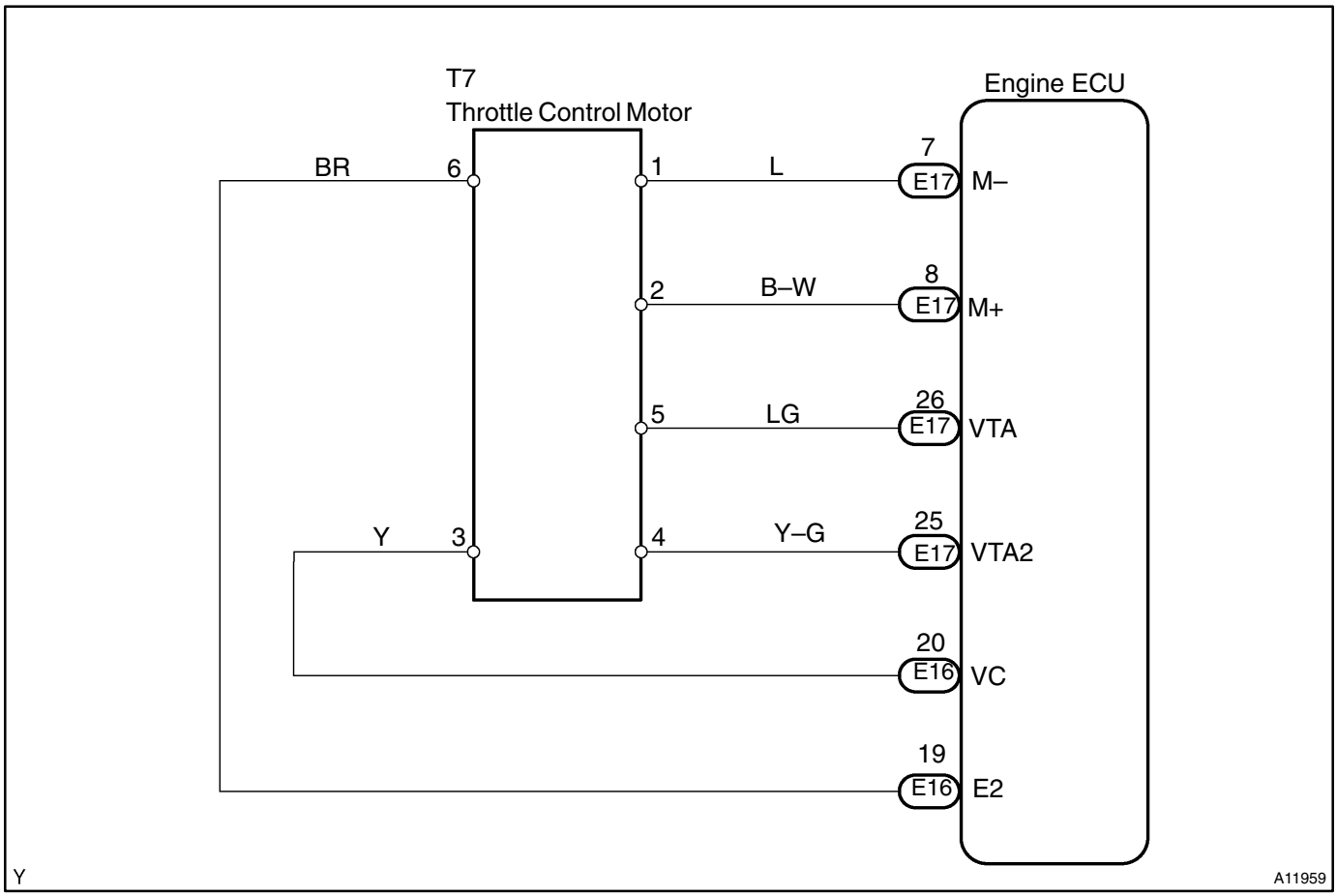
DTC No.	DTC Detection Condition	Trouble Area
P0120	Condition (a), (b), (c), (d) or (e) continues for 2.0 sec.: (a) VTA ≦ 0.2 V (b) VTA2 ≦ 0.5 V (c) VTA ≧ 4.8 V (d) When VTA ≧ 0.2 V and ≦ 2.0 V, and VTA2 ≧ 4.97 V (e) VTA–VTA2 ≦ 0.02 V	• Open or short in throttle position sensor circuit • Throttle position sensor • Engine ECU
	Condition below continues for 0.4 sec.: • VTA ≦ 0.2 V and VTA2 ≦ 0.5 V	

HINT:

After confirming DTC P0120, use the 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 – 5.1 V	VTA 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

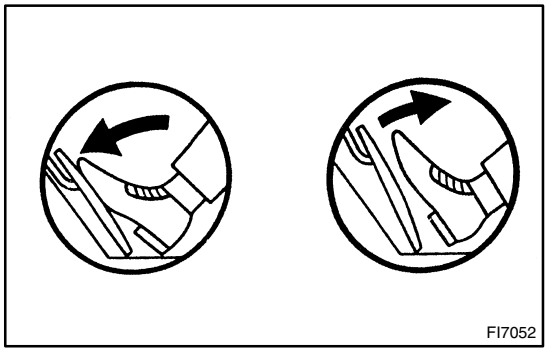


INSPECTION PROCEDURE

HINT:

- If DTCs P0105, P0110, P0115, P0120, P0121, P0190, P0191, P1120, P1121, P1125 and P1129 are output simultaneously, E2 (sensor ground) may be open.
- Read freeze frame data using hand–held tester, 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	Connect hand–held tester and read throttle valve opening percentage.



PREPARATION:

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

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

CHECK:

Read the throttle valve opening percentage for the VTA circuit and read the voltage for the VTA2 circuit.

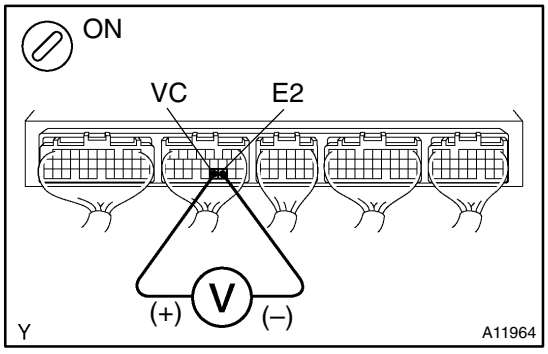
OK:

Accelerator pedal	Throttle valve opening position expressed as percentage (VTA)	Voltage (VTA2)
Released	8 – 20 %	2.0 – 2.9 V
Depressed	64 – 96 %	4.6 – 5.1 V

OK → **Check and replace engine ECU (See page IN–20).**

NG

2	Check voltage between terminals VC and E2 of engine ECU connector.



PREPARATION:

(a) Remove the glove compartment (See page FI–56).

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals VC and E2 of the engine ECU connector.

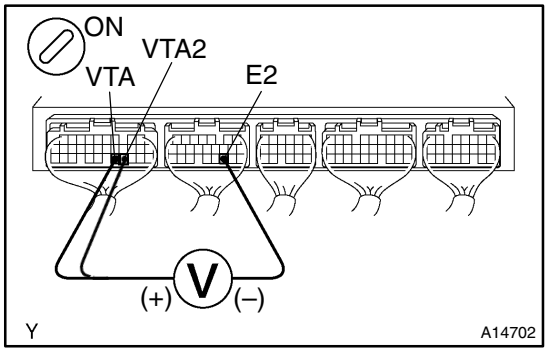
OK:

Voltage: 4.5 – 5.5 V

NG → **Check and replace engine ECU (See page IN–20).**

OK

3	Check voltage between terminals VTA and E2, and VTA2 and E2 of engine ECU connector.



PREPARATION:

(a) Remove the glove compartment (See page FI–56).

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals VTA and E2, and VTA2 and E2 of the engine ECU connector.

OK:

Accelerator Pedal	Voltage	
	VTA – E2	VTA2 – E2
Released	0.4 – 1.0 V	2.0 – 2.9 V
Depressed	3.2 – 4.8 V	4.6 – 5.1 V

OK → **Check and replace engine ECU (See page IN–20).**

NG

4	Check throttle position sensor (See page FI–24).

NG → **Replace throttle body.**

OK

Check for open and short in harness and connector in VC, VTA, VTA2 or E2 circuit between engine ECU and throttle position sensor (See page IN–20).

DI1LI–13

DTC	P0121	Throttle Pedal Position Sensor Circuit Range/Performance Problem

CIRCUIT DESCRIPTION

Refer to DTC P0120 on page DI–34.

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

INSPECTION PROCEDURE

HINT:

- If DTCs P0105, P0110, P0115, P0120, P0121, P0190, P0191, P1120, P1121, P1125 and P1129 are output simultaneously, E2 (sensor ground) may be open.
- Read freeze frame data using hand–held tester, 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	Are there any other codes (besides DTC P0121) being output?

YES → Go to relevant DTC chart (See page DI–14).

NO →

Replace throttle body (See page FI–25).

DTC	P0125	Insufficient Water Temp. for Closed Loop Fuel Control

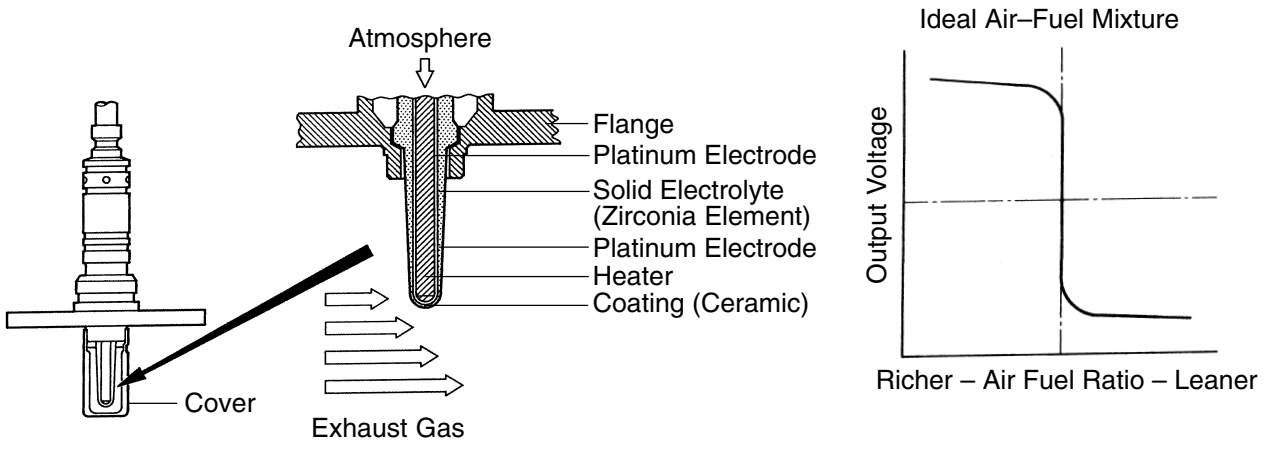
CIRCUIT DESCRIPTION

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

The oxygen sensor is characterized that 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 the engine ECU with feedback to control the air–fuel ratio. When the air–fuel ratio becomes LEAN, the oxygen concentration in the exhaust gas increases and the oxygen sensor informs the engine ECU of the LEAN condition (small electromotive force: 0 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 engine ECU of the RICH condition (large electromotive force: 1 V).

The engine ECU 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 engine ECU is unable to perform accurate air–fuel ratio control.

The oxygen sensors include a heater which heats the zirconia element. The heater is controlled by the engine ECU. 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.

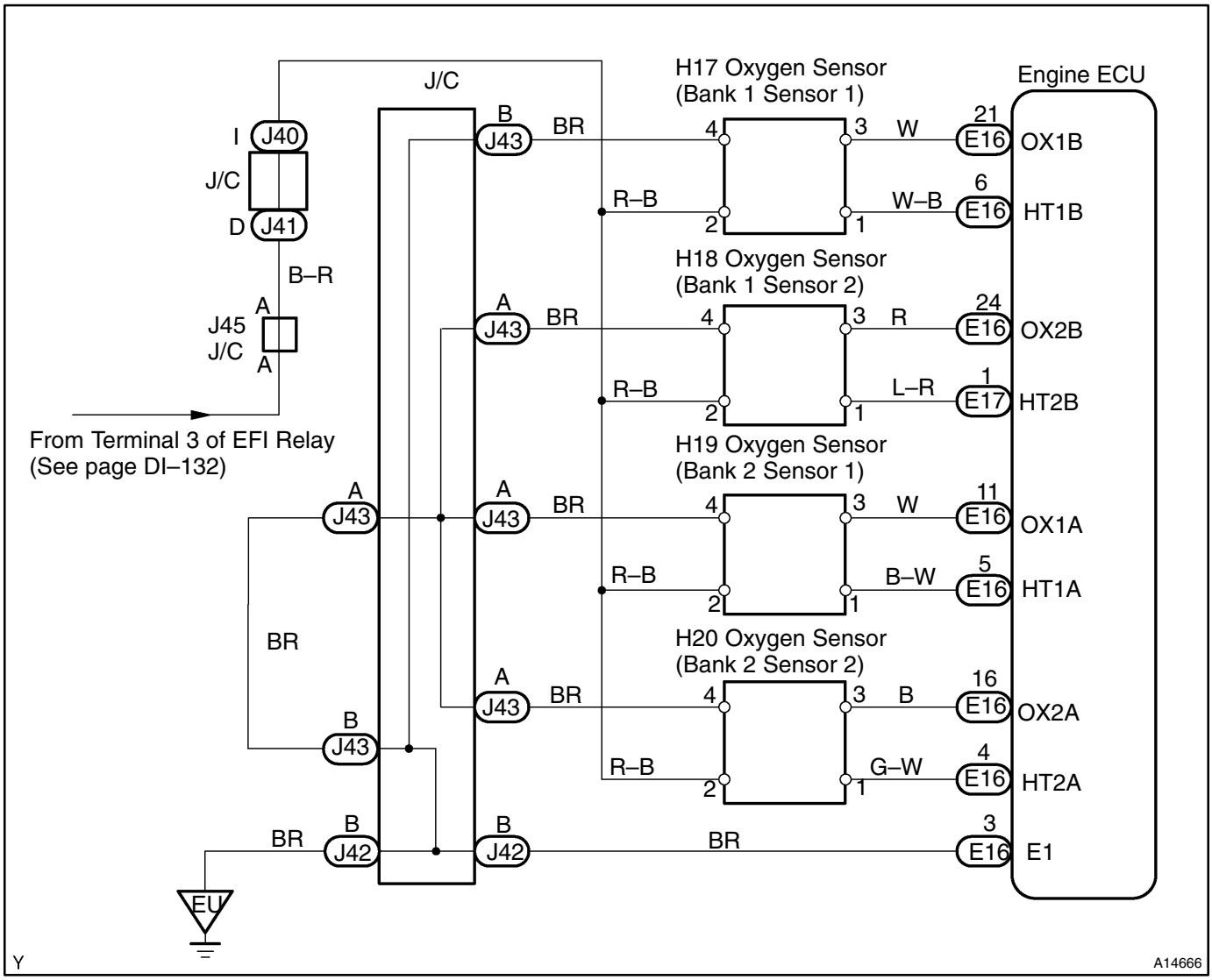


DTC No.	DTC Detection Condition	Trouble Area
P0125	After engine is warmed up, oxygen sensor (bank 1, 2 sensor 1, 2) does not output RICH even once when conditions (a), (b) and (c) continue for at least 1.5 min.: (a) Engine speed: 1,500 rpm or more (b) Vehicle speed: 40 – 100 km/h (25 – 62 mph) (c) After starting engine ≧ 180 sec.	• Open or short in oxygen sensor (bank 1, 2 sensor 1, 2) circuit • Oxygen sensor (bank 1, 2 sensor 1, 2) • Air induction system • Fuel system • Injector • Gas leak on exhaust system • Engine ECU

HINT:

- After confirming DTC P0125, use a hand–held tester to confirm the output voltage of the oxygen sensors (bank 1, 2 sensor 1) from the CURRENT DATA.
- The engine ECU controls the voltage of terminals OX1A, OX1B, OX2A, OX2B and E1 of the engine ECU to the fixed voltage. Therefore, it is impossible to confirm the oxygen sensor output voltage without a hand–held tester.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using a hand–held tester, 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	**Are there any other codes (besides DTC P0125) being output ?**

YES → **Go to relevant DTC chart (See page DI–14).**

NO

2	**Connect hand–held tester and read value for voltage output of oxygen sensor (bank 1, 2 sensor 1, 2).**

PREPARATION:

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

(b) Warm up the engine to the normal operating temperature (above 75°C (169°F)).

CHECK:

Read the output voltage of the oxygen sensor when the engine is suddenly raced.

HINT:

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

OK:

Oxygen sensor output a RICH signal (0.45 V or more) at least once.

OK → **Go to step 10.**

NG

3	**Check for open and short in harness and connector between engine ECU and oxygen sensor (bank 1, 2 sensor 1, 2) (See page IN–20).**

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

OK

4	**Check whether misfire is occurred or not by monitoring DTC and data list.**

NG → Perform troubleshooting for misfire (See page DI–104).

OK

5	Check air induction system (See page FI–1).

NG → Repair or replace.

OK

6	Check fuel pressure (See page FI–5).

NG → Check and repair fuel pump, fuel pipe line and filter.

OK

7	Check injector injection (See page FI–18)

NG → Replace injector.

OK

8	Check gas leak on exhaust system.

NG → Repair or replace.

OK

Replace oxygen sensor (bank 1, 2 sensor 1, 2).

9	Perform confirmation driving pattern (See page DI–44).

Go

10	Is there DTC P0125 being output again?

YES → Check and replace engine ECU (See page IN–20).

NO

11	Did vehicle run out of fuel in past?

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

YES

DTC P0125 is caused by running out of fuel.

DI63V–06

DTC	P0130	Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 1)

DTC	P0150	Oxygen Sensor Circuit Malfunction (Bank 2 Sensor 1)

CIRCUIT DESCRIPTION

Refer to DTC P0125 on page DI–39.

DTC No.	DTC Detection Condition	Trouble Area
P0130 P0150 P0156	Output voltage of oxygen sensor remains at 0.4 V or more, or 0.55 V or less, during idling after engine is warmed up (2 trip detection logic)	• Open or short in oxygen sensor circuit • Oxygen sensor • Air induction system • Fuel pressure • Injector • Engine ECU

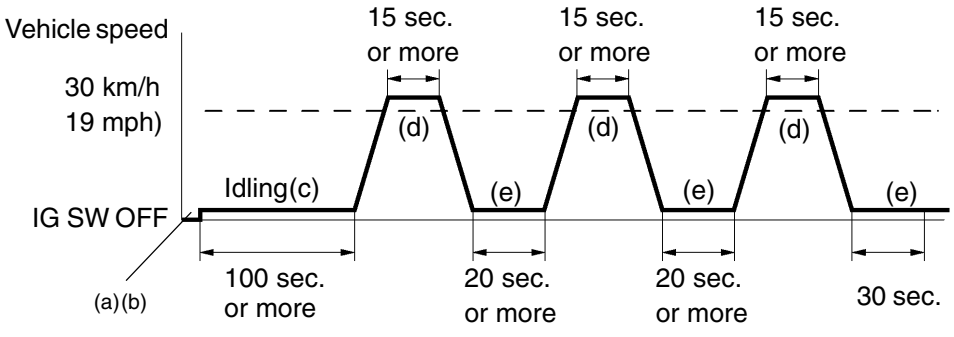
HINT:

- Bank 1 refers to bank that includes cylinder No. 1.
- Bank 2 refers to bank that does not include cylinder No. 1.
- Sensor 1 refers to the sensor being closer to the engine body.
- The oxygen sensor's output voltage and the short–term fuel trim value can be read by using the hand–held tester.

WIRING DIAGRAM

Refer to DTC P0125 on page DI–39.

CONFIRMATION DRIVING PATTERN



Y

A09299

(a) Connect the hand–held tester to the DLC3.
(b) Switch the hand–held tester from the normal mode to the check (test) mode (See page DI–3).
(c) Start the engine and let the engine idle for 100 seconds or more.
(d) Drive the vehicle at 30 km/h (19 mph) or more for 15 seconds or more.
(e) Let the engine idle for 20 seconds or more.
(f) Let the engine idle for 30 seconds.

HINT:
If a malfunction exists, the CHK ENG (MIL) will be indicated on the multi–information display during step (f).
NOTICE:
If the conditions in this test are not strictly followed, detection of the malfunction is impossible. If you do not have a hand–held tester, turn the ignition switch OFF after performing steps (c) to (f) once, then perform steps (c) to (f) again.

INSPECTION PROCEDURE

HINT:
Read freeze frame data using hand–held tester, 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.

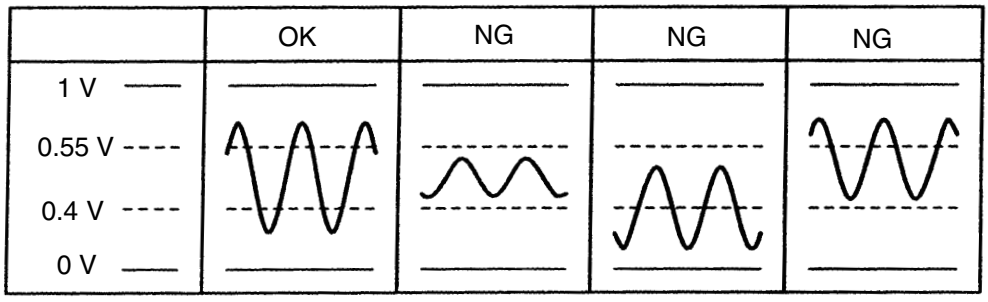
1	**Are there any other codes (besides DTC P0130 or P0150) being output?**

YES → **Go to relevant DTC chart (See page DI–14).**

NO

2	**Check output voltage of oxygen sensor during idling.**

PREPARATION:
Warm up the oxygen sensor with the engine speed at 2,500 rpm for approx. 90 sec.
CHECK:
Use the hand–held tester to read the output voltage of the oxygen sensor during idling.
OK:
Oxygen sensor output voltage:
Alternates repeatedly between less than 0.4 V and more than 0.55 V (See the following table).



OK → **Go to step 7.**

NG

3	Check for open and short in harness, and connector between engine ECU and oxygen sensor (See page IN–20).

NG → Repair or replace harness or connector.

OK

4	Check air induction system (See page FI–1).

NG → Repair or replace.

OK

5	Check fuel pressure (See page FI–5).

NG → Check and repair fuel pump, pressure regulator, fuel pipe line and filter.

OK

6	Check injector injection (See page FI–18).

NG → Replace injector.

OK

Replace oxygen sensor.

7	**Perform confirmation driving pattern.**

Go

8	**Is there DTC P0130 or P0150 being output again?**

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

YES

Check and replace engine ECU (See page IN–20).

DI563–08

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

DTC	P0153	Oxygen Sensor Circuit Slow Response (Bank 2 Sensor 1)

CIRCUIT DESCRIPTION

Refer to DTC P0125 on page DI–39.

DTC No.	DTC Detection Condition	Trouble Area
P0133 P0153	Response time for oxygen sensor's output voltage to change from rich to lean, or from lean to rich, is 1 sec. or more during idling after engine is warmed up (2 trip detection logic)	• Open or short in oxygen sensor circuit • Oxygen sensor • Air induction system • Fuel pressure • Injector • Engine ECU

HINT:

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

WIRING DIAGRAM

Refer to DTC P0125 on page DI–39.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using hand–held tester, 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	**Are there any other codes (besides DTC P0133 or P0153) being output?**

YES → **Go to relevant DTC chart (See page DI–14).**

NO

2	**Check output voltage of oxygen sensor during idling.**

PREPARATION:

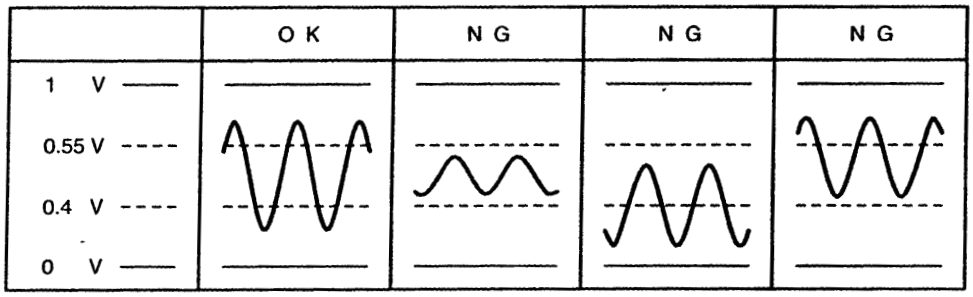
Warm up the oxygen sensor with the engine speed at 2,500 rpm for approx. 90 sec.

CHECK:

Use the hand–held tester to read the output voltage of the oxygen sensor during idling.

OK:

Oxygen sensor output voltage:
Alternates repeatedly between less than 0.4 V and more than 0.55 V (See the following table).



P18349

OK	Go to step 7.

NG

3	Check for open and short in harness and connector between engine ECU and oxygen sensor (See page IN–20).

NG	Repair or replace harness or connector.

OK

4	Check air induction system (See page FI–1).

NG	Repair or replace.

OK

5	Check fuel pressure (See page FI–5).

NG	Check and repair fuel pump, pressure regulator, fuel pipe line and filter.

OK

6	Check injector injection (See page FI–18).

NG → Replace injector.

OK →

Replace oxygen sensor.

7	Perform confirmation driving pattern (See page DI–44).

GO →

8	Is there DTC P0133 or P0153 being output again?

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

YES →

Check and replace engine ECU (See page IN–20).

DTC	P0135	Oxygen Sensor Heater Circuit Malfunction (Bank 1 Sensor 1)

DTC	P0141	Oxygen Sensor Heater Circuit Malfunction (Bank 1 Sensor 2)

DTC	P0155	Oxygen Sensor Heater Circuit Malfunction (Bank 2 Sensor 1)

DTC	P0161	Oxygen Sensor Heater Circuit Malfunction (Bank 2 Sensor 2)

CIRCUIT DESCRIPTION

Refer to DTC P0125 on page DI–39.

DTC No.	DTC Detection Condition	Trouble Area
P0135 P0141 P0155 P0161	When heater operates, heater current exceeds 2 A (2 trip detection logic)	• Open or short in heater circuit of oxygen sensor • Oxygen sensor heater • Engine ECU
	Heater current of 0.2 A or less when heater operates (2 trip detection logic)	

HINT:

- Bank 1 refers to bank that includes cylinder No. 1.
- Bank 2 refers to bank that excludes cylinder No. 1.
- Sensor 1 refers to the sensor being closer to the engine body.

WIRING DIAGRAM

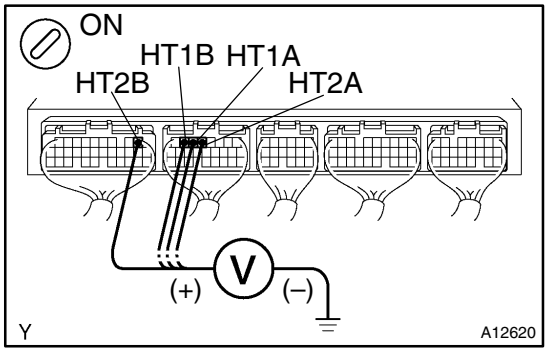
Refer to DTC P0125 on page DI–39.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using hand–held tester, 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	Check voltage between terminals HT1A, HT1B, HT2A, HT2B of engine ECU connector and body ground.



PREPARATION:

(a) Remove the glove compartment (See page FI–56).

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals HT1A, HT1B, HT2A, HT2B of the engine ECU connector and the body ground.

HINT:

- Connect terminal HT1A to bank 1 sensor 1.
- Connect terminal HT2A to bank 2 sensor 1.
- Connect terminal HT1B to bank 1 sensor 2.
- Connect terminal HT2B to bank 2 sensor 2.

OK:

Voltage: 9 – 14 V

OK	Check and replace engine ECU (See page IN–20).

NG

2	Check resistance of oxygen sensor heater (See page FI–51).

NG	Replace oxygen sensor.

OK

Check and repair harness or connector between EFI main relay (Marking: EFI) and oxygen sensor, and oxygen sensor and engine ECU (See page IN–20).

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

DTC	P0156	Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 2)

CIRCUIT DESCRIPTION

Refer to DTC P0125 on page DI–39.

DTC No.	DTC Detection Condition	Trouble Area
P0136	Output voltage of oxygen sensor remains at 0.4 V or more or 0.5 V or less when vehicle is driven at 40 km/h (25 mph) or more after engine is warmed up and water temperature is 40°C (96 °F) or more and engine speed is 1,400 rpm or more (2 trip detection logic)	• Open or short in oxygen sensor circuit • Oxygen sensor

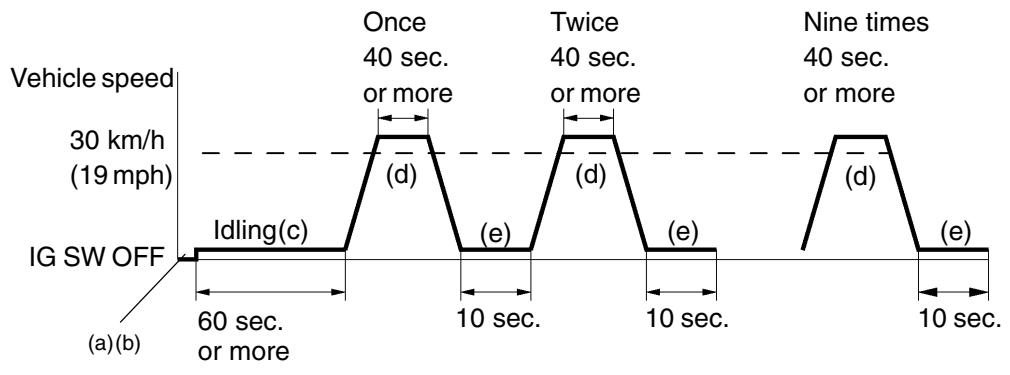
HINT:

- Bank 1 refers to bank that includes cylinder No. 1.
- Bank 2 refers to bank that does not includes cylinder No. 1.
- Sensor 2 refers to the sensor being farther from the engine body.
- The oxygen sensor's output voltage and the short–term fuel trim value can be read by using the hand–held tester.

WIRING DIAGRAM

Refer to DTC P0125 on page DI–39.

CONFIRMATION DRIVING PATTERN



Y A09300

(a) Connect the hand–held tester to the DLC3.
(b) Switch the hand–held tester from the normal mode to the check (test) mode (See page DI–3).
(c) Start the engine and let the engine idle for 60 seconds or more.
(d) Drive the vehicle at 30 km/h (19 mph) or more for 40 seconds or more.
(e) Let the engine idle for 10 seconds or more.
(f) Preform steps (d) to (e) 9 times.

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

INSPECTION PROCEDURE

HINT:
Read freeze frame data using hand–held tester, 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	**Are there any other codes (besides DTC P0136 or P0156) being output?**

YES → **Go to relevant DTC chart (See page DI–14).**

NO

2	**Check for open and short in harness and connector between engine ECU and oxygen sensor (See page IN–20).**

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

OK

3	**Check output voltage of oxygen sensor.**

PREPARATION:
(a) Connect the hand–held tester to the DLC3.
(b) After warming up the engine, race the engine at 2,500 rpm for 3 min.

CHECK:
Read the output voltage of the oxygen sensor when the engine is suddenly raced.
HINT:
Perform quick racing at 4,000 rpm for 3 min. by using the accelerator pedal.

OK:
Oxygen sensor output voltage: Alternates from 0.4 V or less to 0.5 V or more.

OK → **Check that each connector is properly connected.**

NG

Replace oxygen sensor.

DTC	P0171	System too Lean (Fuel Trim) (Bank 1)

DTC	P0172	System too Rich (Fuel Trim) (Bank 1)

DTC	P0174	System too Lean (Fuel Trim) (Bank 2)

DTC	P0175	System too Rich (Fuel Trim) (Bank 2)

CIRCUIT DESCRIPTION

Fuel trim is related to the feedback compensation value, not to 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 in long–term to compensate for continual deviation of the short–term fuel trim. It forms the central value by the individual engine differences, and is warn out by overtime and changes in the using 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 CHK ENG (MIL) lights up.

DTC No.	DTC Detection Condition	Trouble Area
P0171 P0174	When air–fuel ratio feedback is stable after warming up engine, the fuel trim is considerably in error on RICH side (2 trip detection logic)	• Air induction system • Injector leak, blockage • Vacuum sensor • Water temp. sensor • Ignition system • Gas leak on exhaust system • Fuel pressure • Oxygen sensor (bank 1, 2 sensor 1, 2) malfunction • Oxygen sensor (bank 1, 2 sensor 1, 2) • Engine ECU
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)	

HINT:

- When DTC P0171 or P0174 is recorded, the actual air–fuel ratio is on the LEAN side. When DTC P0172 or P0175 is recorded, the actual air–fuel ratio is on the RICH side.
- If the vehicle runs out of fuel, the air–fuel ratio is LEAN and DTC P0171 or P0174 is recorded. The CHK ENG (MIL) then comes on.
- If the total of the short–term fuel trim value and long–term fuel trim value is within ± 35 % (80°C (176°F) or more), the system is functioning normally.
- The oxygen sensors (bank 1, 2 sensor 1, 2) output voltage and the short–term fuel trim value can be read by using the hand–held tester.

INSPECTION PROCEDURE

HINT:

Read freed frame data using hand–held tester, 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	**Check air induction system (See page FI–1).**

NG → **Repair or replace.**

OK

2	**Check injector injection (See page FI–18).**

NG → **Replace injector.**

OK

3	**Check vacuum sensor (See page FI–45) and water temperature sensor (See page FI–41).**

NG → **Repair or replace.**

OK

4	**Check for spark and ignition (See page IG–1).**

NG → **Repair or replace.**

OK

5	**Check fuel pressure (See page FI–5).**

NG → **Check and repair fuel pump, pressure regulator, fuel pipe line and filter.**

OK

6	**Check gas leak on exhaust system.**

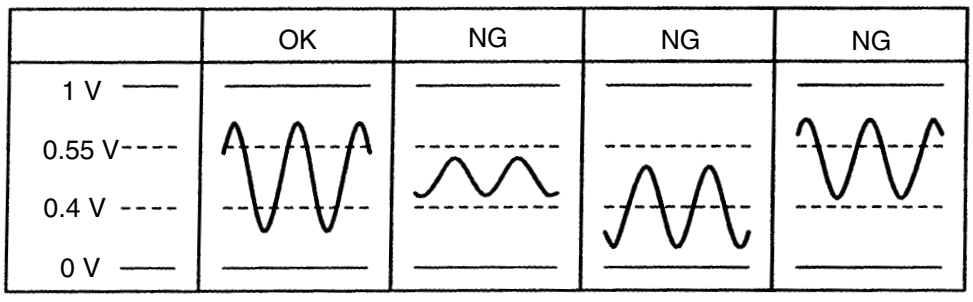
NG → **Repair or replace.**

OK

7	**Check output voltage of oxygen sensor (bank 1, 2 sensor 1, 2) during idling.**

PREPARATION:
Warm up the oxygen sensor with the engine speed at 2,500 rpm for approx. 90 sec.
CHECK:
Use the hand–held tester to read the output voltage of the oxygen sensor during idling.
OK:

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



OK → **Go to step 9.**

NG

8	Check for open and short in harness and connector between engine ECU and oxygen sensor (bank 1, 2 sensor 1, 2) (See page IN–20).

NG → Repair or replace harness or connector.

OK →

Replace oxygen sensor.

9	Perform confirmation driving pattern (See page DI–44).

Go →

10	Is there DTC P0171, P0172, P0174 or P0175 being output again?

YES → Check and replace engine ECU (See page IN–20).

NO →

11	Did vehicle run out of fuel in past?

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

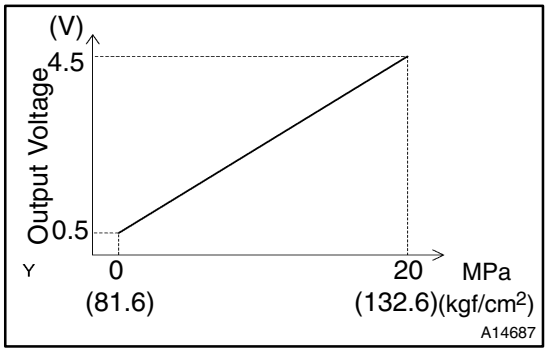
YES →

DTC P0171, P0172, P0174 or P0175 is caused by shortage of fuel.

DI80Z–01

DTC	P0190	Fuel Rail Pressure Sensor Circuit Malfunction

CIRCUIT DESCRIPTION

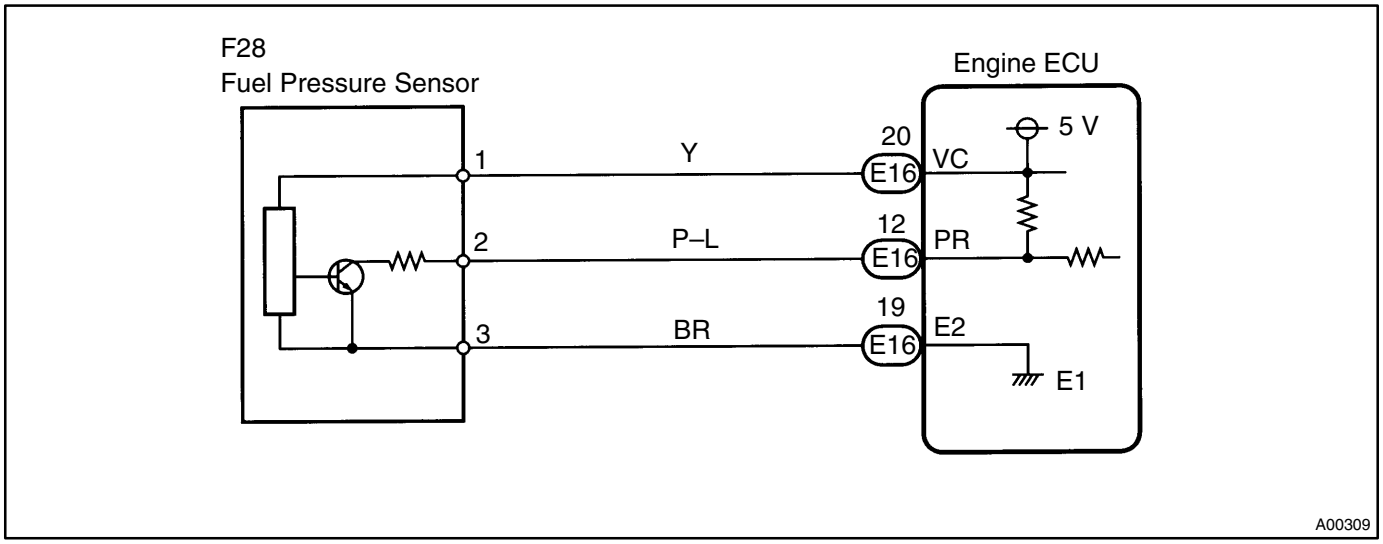


The fuel pressure sensor installed on a fuel delivery pipe and detects the fuel pressure. It controls to feedback the pump discharge in order to keep the fuel at target pressure 8 – 13 MPa (81.6 – 132.6 kgf/cm^2, 1,160 – 1,885 psi) by means of the engine control computer.

DTC No.	DTC Detection Condition	Trouble Area
P0190	Open or short in fuel pressure sensor circuit for delivery pipe	• Open or short in fuel pressure sensor circuit • Fuel pressure sensor • Engine ECU

HINT:
After confirming DTC P0190, use the hand–held tester to confirm the delivery pipe pressure from the CURRENT DATA.

WIRING DIAGRAM

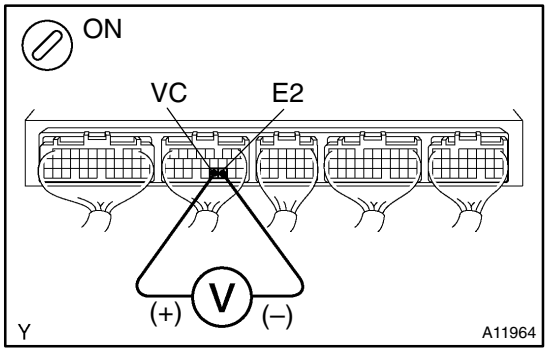


INSPECTION PROCEDURE

HINT:

- If DTCs P0105, P0110, P0115, P0120, P0121, P0190, P0191, P1120, P1121, P1125 and P1129 are output simultaneously, E2 (sensor ground) may be open.
- Read freeze frame data using hand–held tester, 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	Check voltage between terminals VC and E2 of engine ECU connector.



PREPARATION:
(a) Remove the glove compartment (See page FI–56).
(b) Turn the ignition switch ON.

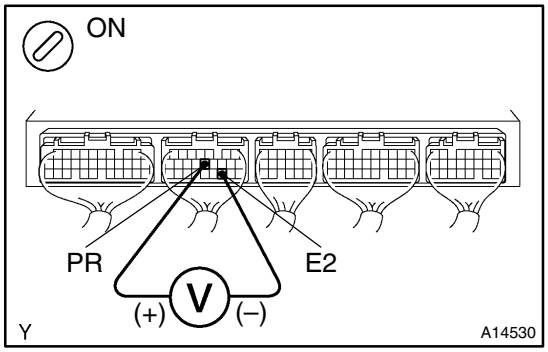
CHECK:
Measure the voltage between terminals VC and E2 of the engine ECU connector.

OK:
Voltage: 4.5 – 5.5 V

NG	Check and replace engine ECU (See page IN–20).

OK

2	Check voltage between terminals PR and E2 of engine ECU connector.



PREPARATION:
(a) Remove the glove compartment (See page FI–56).
(b) Start the engine.

CHECK:
Measure the voltage between terminals PR and E2 of the engine ECU connector.

OK:
Voltage: 3.1 – 3.6 V at 20°C (68°F)

HINT:
The fuel pressure in the delivery pipe is 8 – 13 MPa (81.6 – 132.6 kgf/cm^2, 1,160 – 1,885 psi).

OK	Check and replace engine ECU (See page IN–20).

NG

3	Check for open and short in harness and connector between fuel pressure sensor and engine ECU (See page IN–20).

NG	Repair or replace harness or connector.

OK

Replace fuel pressure sensor (See page FI–47).

DI810-01

DTC	P0191	Fuel Rail Pressure Sensor Circuit Malfunction Range/Performance

CIRCUIT DESCRIPTION

Refer to DTC P0190 on page DI–60.

DTC No.	DTC Detection Condition	Trouble Area
P0191	After combustion pressure keeps ±2 MPa (20.4 kgf/cm^2, 290 psi) for 3 sec. stably, it keeps value which deviates in +3 MPa (30.6 kgf/cm^2, 435 psi) or –5 MPa (51 kgf/cm^2, 725 psi) from standard value for 10 sec.	• Open or short in fuel pressure sensor circuit • Fuel pressure sensor • Engine ECU

INSPECTION PROCEDURE

HINT:

- If DTCs P0105, P0110, P0115, P0120, P0121, P0190, P0191, P1120, P1121, P1125 and P1129 are output simultaneously, E2 (sensor ground) may be open.
- Read freeze frame data using hand–held tester, 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	**Does engine start ?**

OK → **Go to step 8.**

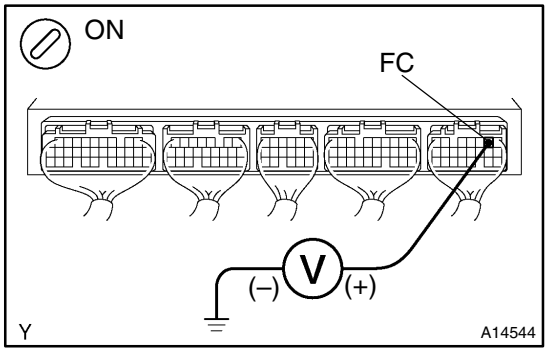
NG

2	**Check operation of fuel pump (See page FI–5).**

OK → **Go to step 7.**

NG

3	Check voltage between terminal FC of engine ECU connector and body ground.



PREPARATION:

(a) Remove the glove compartment (See page FI–56).

(b) Turn ignition switch ON.

CHECK:

Measure the voltage between terminal FC of the engine ECU connector and the body ground.

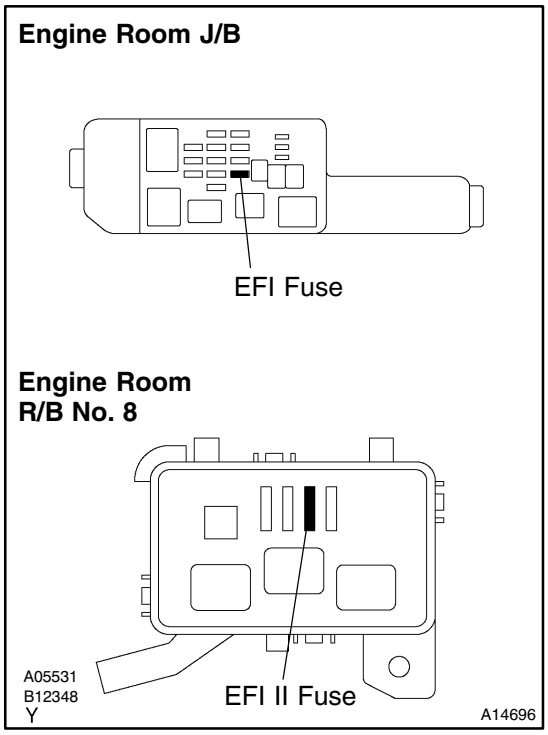
OK:

Voltage: 9 – 14 V

OK	Go to step 8.

NG

4	Check EFI and EFI II fuses.



PREPARATION:

Remove the EFI and EFI II fuses from the engine room J/B and engine room R/B No. 8.

CHECK:

Check the continuity of the EFI and EFI II fuses.

OK:

Continuity

OK	Check for sort in all harness and components connect to EFI or EFI II fuses.

NG

5	Check injector relay (Marking: INJ) (See page FI–35) and circuit opening relay (See page FI–35).

OK → Replace injector relay or circuit opening relay.

NG

6	Check for open in harness and connector between injector relay (Marking: INJ) and circuit opening relay, and opening relay and engine ECU (See page IN–20).

OK → Replace or repair.

NG

7	Check fuel pump (See page FI–5).

NG → Replace or repair fuel pump.

OK

8	Check fuel pressure (See page FI–5).

OK → Go to step 10.

NG

9	Check fuel pipe (See page FI–1).

NG → Replace fuel pipe.

OK

10	Check fuel pump (high pressure) fuel leak (See page FI–1).

NG → Check and replace leak parts.

OK

11	Check fuel pressure sensor (See page FI–47).

NG → Replace fuel pressure sensor.

OK

12	Check operation of fuel pump (high pressure) (See page FI–11).

NG → Replace fuel pump (high pressure).

OK

13	Is there DTC P0191 being output again?

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

OK

Check and replace engine ECU (See page IN–20).

DI7H0-06

DTC	P0300	Random/Multiple Cylinder Misfire Detected

DTC	P0301	Cylinder 1 Misfire Detected

DTC	P0302	Cylinder 2 Misfire Detected

DTC	P0303	Cylinder 3 Misfire Detected

DTC	P0304	Cylinder 4 Misfire Detected

CIRCUIT DESCRIPTION

Misfire: The engine ECU uses the crankshaft position sensor and camshaft position sensor to monitor changes in the crankshaft rotation of each cylinder.

The engine ECU counts the number of times the engine speed changes rate, indicating that misfire has occurred. And when the misfire rate equals to or exceeds the count indicating that the engine condition has deteriorated, the CHK ENG (MIL) lights up.

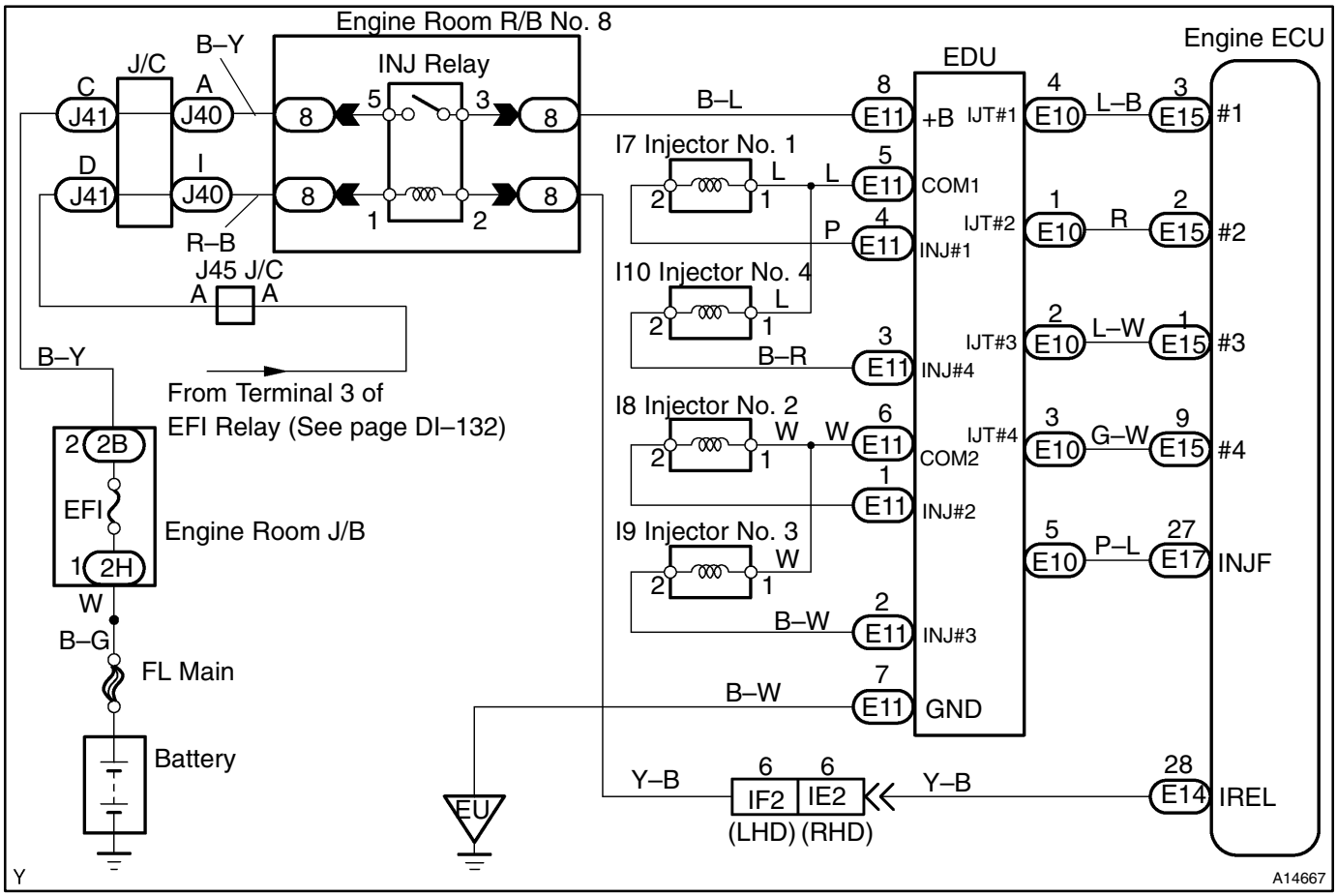
If the misfire rate is high enough and the driving conditions cause the catalyst to overheat, the CHK ENG (MIL) blinks when the misfire occurs.

DTC No.	DTC Detection Condition	Trouble Area
P0300	Misfiring of random cylinders is detected during any particular 200 or 1,000 revolutions 1 trip detection logic: CHK ENG to brink 2 trip detection logic: CHK ENG to light up	• Open or short in engine wire • Connector connection • Vaccum hose connection • Ignition system • Injector • Fuel pressure • Vacuum sensor • Water temp. sensor • Compression pressure • Valve clearance • Valve timing • Engine ECU
P0301 P0302 P0303 P0304	For any particular 200 revolutions of engine, misfire is detected which can cause catalyst to overheat (This causes CHK ENG to blink)	
	For any particular 1,000 revolutions of engine, misfire is detected which causes a deterioration in emissions (2 trip detection logic)	

HINT:

When codes of a misfire cylinder is 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

(a) Connect the hand–held tester to the DLC3.
(b) Record the DTC and the freeze frame data.
(c) Use the hand–held tester to set to the check (test) mode (See page DI–3).
(d) Drive the vehicle several times with the engine speed, load and its surrounding range shown with ENGINE SPD, CALC LOAD in the freeze frame data or MISFIRE RPM, MISFIRE LOAD in the data list.

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

HINT:

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

Engine Speed	Time
Idling	6 minutes or more
1,000 rpm	4 minutes or more
2,000 rpm	2 minutes or more
3,000 rpm	1 minute and 20 seconds or more

(e) Check whether there is misfire or not by monitoring DTC and the freeze frame data, and then, record them.
(f) Turn the ignition switch OFF and wait at least 5 seconds.

INSPECTION PROCEDURE

HINT:

- If the other DTCs besides misfire is memorized simultaneously, first perform the troubleshooting for them.
- Read freeze frame data using hand–held tester, 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.
- If the misfire is not occurred when the vehicle is brought to the workshop, it can be confirmed by reproducing the condition of the freeze frame data. Also, after finishing the repair, confirm that there is no misfire (See confirmation driving pattern).
- When either of SHORT FT #1, LONG FT #1, SHORT FT #2 or LONG FT #2 in the freeze frame data is over the range of ± 20 %, there is a possibility that the air–fuel ratio is inclining either to RICH (–20 % or less) or LEAN (+20 % or more).
- When WATER TEMP in the freeze frame data is less than 80°C (176°F), there is a possibility of misfire only during warming up.
- In case that the misfire cannot be reproduced, this may be because of the driving with the shortage of fuel, the use of improper fuel, a stain of the ignition plug and etc.

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

CHECK:

(a) Check the connection conditions of the wire harness and connector.

(b) Check the disconnection, piping and break of the vacuum hose.

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

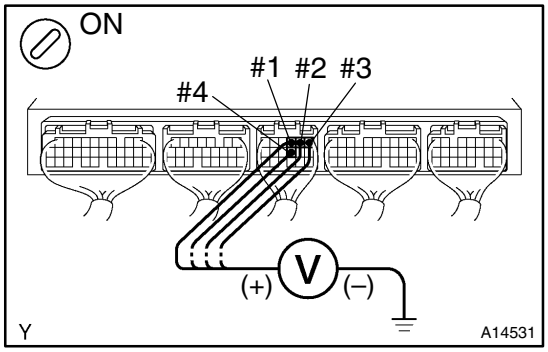
OK

2	**Check spark plug and spark of misfire cylinder (See page FI–18).**

NG → **Replace or check ignition system (See page IG–1).**

OK

3	Check voltage of engine ECU terminals for injector of faulty cylinder.



PREPARATION:

(a) Remove the glove compartment (See page FI–56).

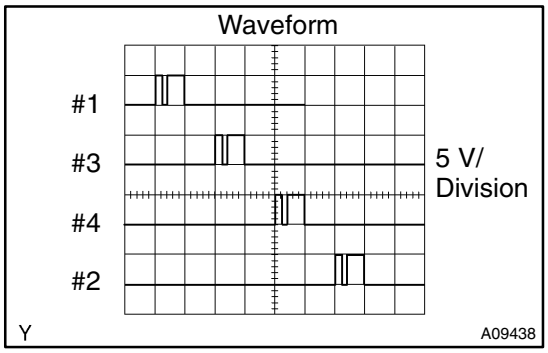
(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between applicable terminals #10 – #40 of the engine ECU connector and body ground.

OK:

Voltage: 9 – 14 V



Reference: INSPECTION USING OSCILLOSCOPE

With the engine idling, check the waveform between terminals #1 – #4 and E01 of the engine ECU connector.

HINT:

The correct waveform is as shown in the illustration.

OK	Go to step 5.

NG

4	Check resistance of injector of misfire cylinder (See page FI–18).

NG	Replace injector.

OK

Check for open and short in harness and connector between injector and engine ECU (See page IN–20).

5	Check fuel pressure (See page FI–5).

NG → Check and repair fuel pump, pressure regulator, fuel pipe line and filter.

OK

6	Check injector injection (See page FI–18).

NG → Replace injector.

OK

7	Check vacuum sensor (See page FI–45) and water temperature sensor (See page FI–41).

NG → Repair or replace.

OK

Check compression pressure (See page EM–4) and valve clearance (See page EM–5).

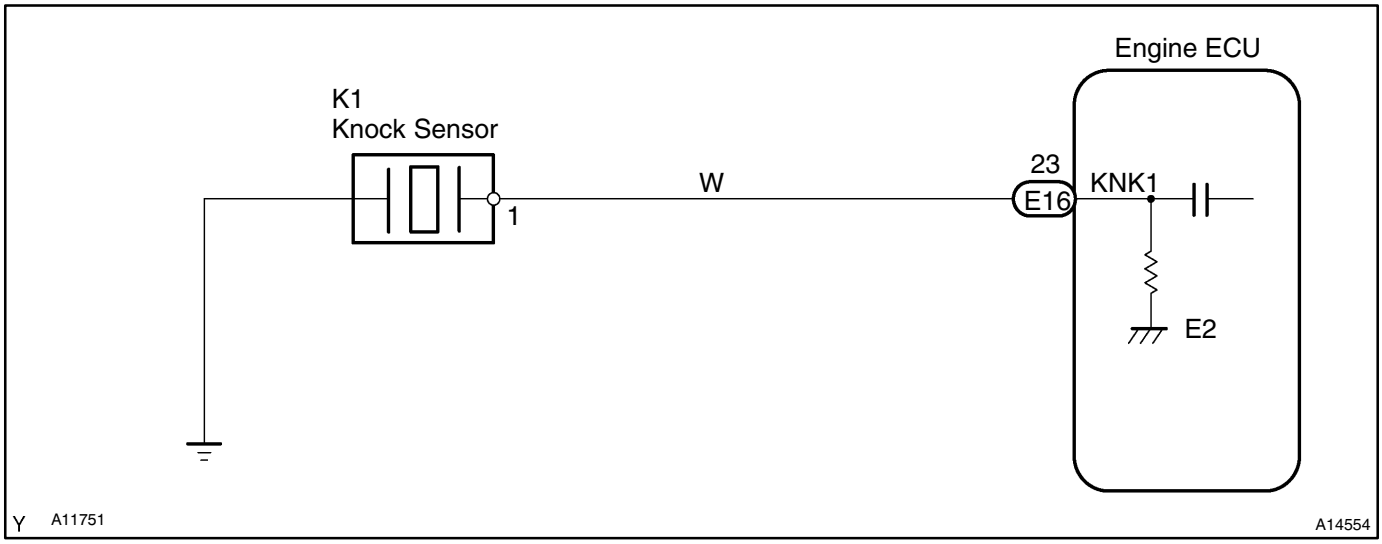
DTC	P0325	Knock Sensor 1 Circuit Malfunction (Bank 1)

CIRCUIT DESCRIPTION

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

DTC No.	DTC Detection Condition	Trouble Area
P0325	No knock sensor 1 signal to engine ECU with engine speed between 1,800 rpm and 5,000 rpm for 5 sec. or more	• Open or short in knock sensor circuit • Knock sensor (looseness) • Engine ECU

WIRING DIAGRAM

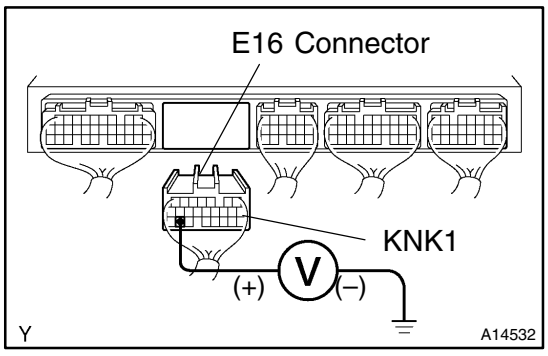


INSPECTION PROCEDURE

HINT:

Read freeze frame data using hand–held tester, 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	**Check continuity between terminal KNK1 of engine ECU connector and body ground.**



PREPARATION:

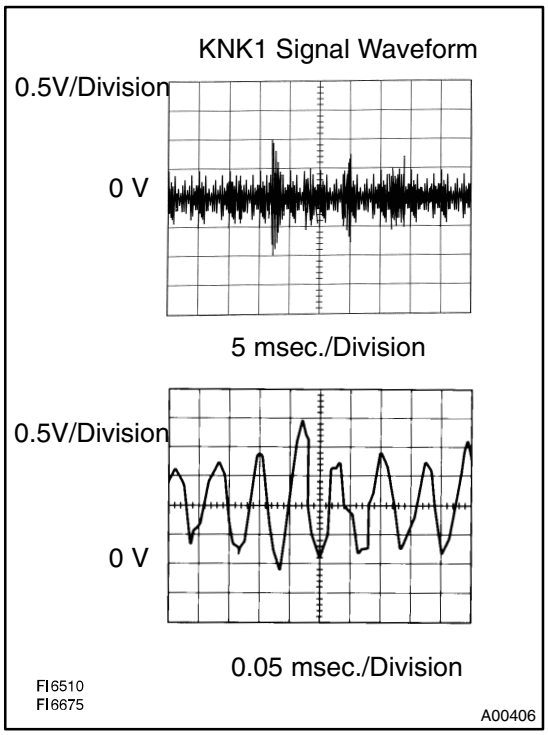
Disconnect the E16 connector from the engine ECU (See page FI–56).

CHECK:

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

OK:

Resistance: 1 MΩ or higher



Reference: INSPECTION USING OSCILLOSCOPE

- With the engine racing at 4,000 rpm, check the waveform between terminals KNK1 of the engine ECU connector and the body ground.

HINT:

The correct waveform is as shown in the illustration.

- Spread the time on the horizontal axis, and confirm that the period of the wave is 0.08 msec. (Normal mode vibration frequency of knock sensor: 6.7 kHz)

HINT:

If the vibration frequency in the normal mode is not 6.7 kHz, the sensor is out of order.

OK	**Go to step 3.**

NG

2	**Check knock sensor (See page FI–49).**

NG	**Replace knock sensor.**

OK

3	**Check for open and short in harness and connector between engine ECU and knock sensor (See page IN–20).**

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

OK

4	**Is malfunction detected again when a good knock sensor is installed?**

YES	**Replace knock sensor.**

NO

Check and replace engine ECU (See page IN–20).

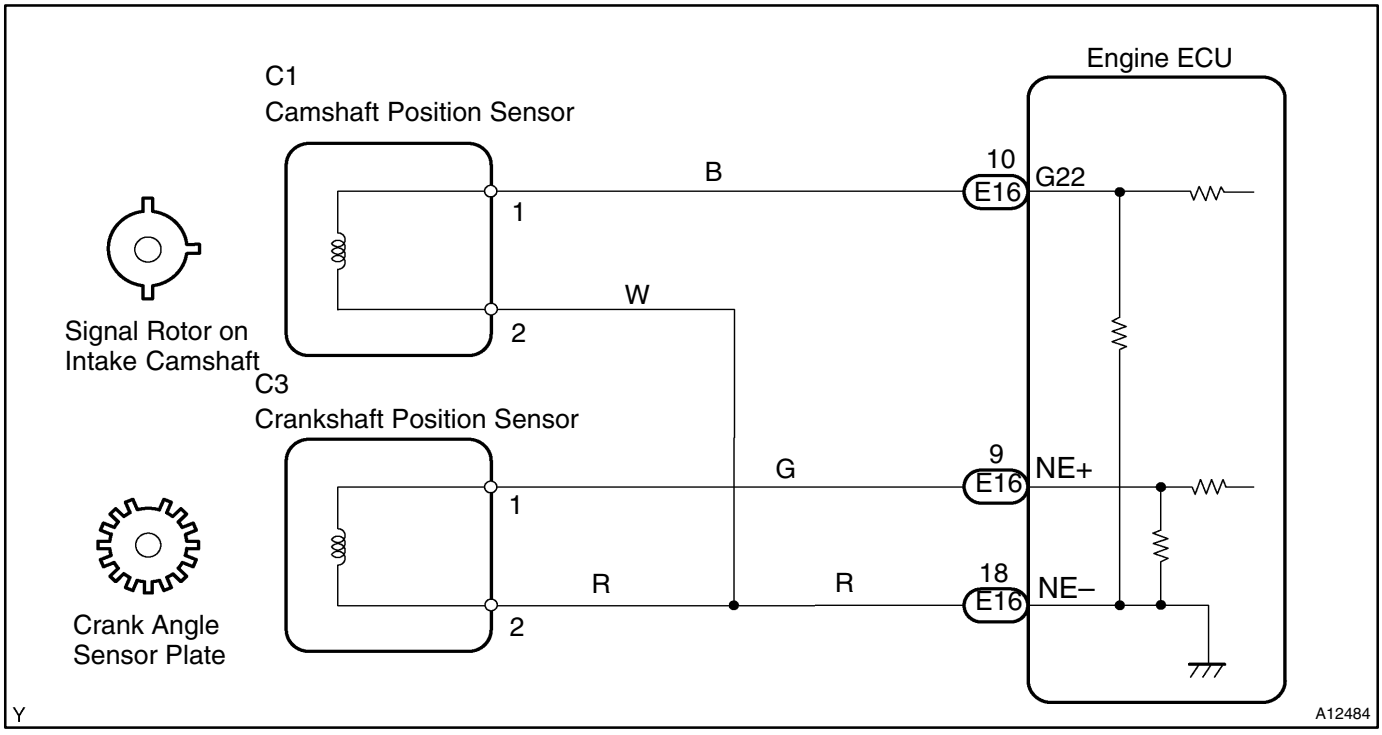
DTC	P0335	Crankshaft Position Sensor Circuit Malfunction (NE Signal)

CIRCUIT DESCRIPTION

The crankshaft position sensor, which detects the engine speed and crankshaft angle signal (NE signal), has been installed on the oil pump body.
The NE signal plate (crank angle sensor plate) has 34 teeth. The NE signal sensor generates 34 signals of every engine revolution. The engine ECU detects the standard crankshaft angle based on the G signal, and the actual crankshaft angle and the engine speed by the NE signal.

DTC No.	DTC Detection Condition	Trouble Area
P0335	No crankshaft position sensor signal to engine ECU during cranking for 4.7 sec. or more (2 trip detection logic)	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Crank angle sensor plate • Engine ECU
	No crankshaft position sensor signal to engine ECU with engine speed 600 rpm or more (2 trip detection logic)	

WIRING DIAGRAM

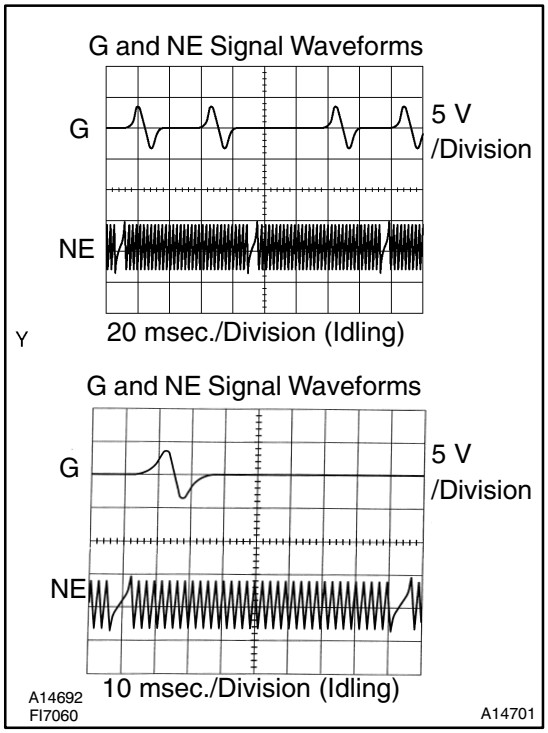


INSPECTION PROCEDURE

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, 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	Check resistance of crankshaft position sensor (See page IG–1).



Reference: INSPECTION USING OSCILLOSCOPE

During cranking or idling, check the waveforms between terminals G22 and NE–, and NE+ and NE– of the engine ECU connector.

HINT:

The correct waveforms are as shown in the illustration.

NG → **Replace crankshaft position sensor.**

OK

2	Check for open and short in harness and connector between engine ECU and crankshaft position sensor (See page IN–20).

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

OK

3	Inspect sensor installation and signal plate teeth of crank angle sensor plate.

NG → **Tighten sensor securely. Replace crank angle sensor plate.**

OK

Check and replace engine ECU (See page IN–20).

DTC	P0340	Camshaft Position Sensor Circuit Malfunction (G Signal)

CIRCUIT DESCRIPTION

Camshaft position sensor (G signal) consists of a magnet, an iron core and pickup coil.
The G signal rotor has 3 teeth. It is installed in the intake camshaft.
When the camshafts rotates, the protrusion on the signal rotor and the air gap on the pickup coil change. It causes fluctuations in the magnetic field and generates an electromotive force in the pickup coil.
The NE signal plate (crank angle sensor plate) has 34 teeth. It is installed in the crankshaft timing pulley. The NE signal sensor generates 34 signals at every engine revolution. The engine ECU detects the standard crankshaft angle based on the G signal, the actual crankshaft angle and the engine speed by the NE signals.

DTC No.	DTC Detection Condition	Trouble Area
P0340	No camshaft position sensor signal to engine ECU during cranking for 5 sec. or more (2 trip detection logic)	• Open or short in camshaft position sensor circuit • Camshaft position sensor • Intake camshaft • Engine ECU
	No camshaft position sensor signal to engine ECU with engine speed 600 rpm or more	

WIRING DIAGRAM

Refer to DTC P0335 on page DI–75.

INSPECTION PROCEDURE

HINT:
Read freeze frame data using hand–held tester, 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	**Check resistance of camshaft position sensor (See page IG–1).**

Reference: INSPECTION USING OSCILLOSCOPE
Refer to DTC P0335 on page DI–75.

NG → **Replace camshaft position sensor.**

OK

2	**Check for open and short in harness and connector between engine ECU and camshaft position sensor (See page IN–20).**

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

OK

3	**Inspect sensor installation and signal rotor teeth of intake camshaft.**

NG → **Tighten sensor securely. Replace intake camshaft.**

OK

Check and replace engine ECU (See page IN–20).

DTC	P0420	Catalyst System Efficiency Below Threshold (Bank 1)

DTC	P0430	Catalyst System Efficiency Below Threshold (Bank 2)

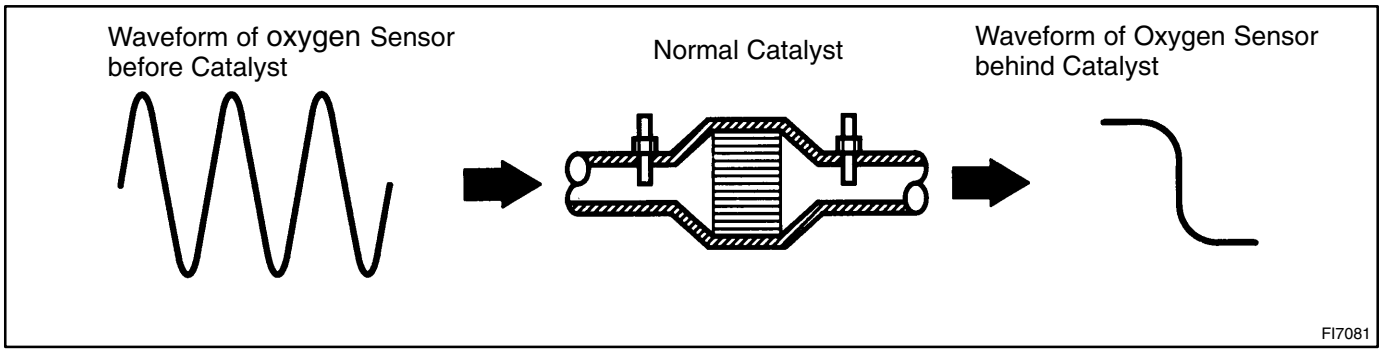
CIRCUIT DESCRIPTION

The engine ECU compares the waveform of the oxygen sensor located behind the catalyst to determine whether or not the catalyst performance has deteriorated.

Air–fuel ratio feedback compensation keeps the waveform of the oxygen sensor before the catalyst repeatedly changing back and forth from rich to lean.

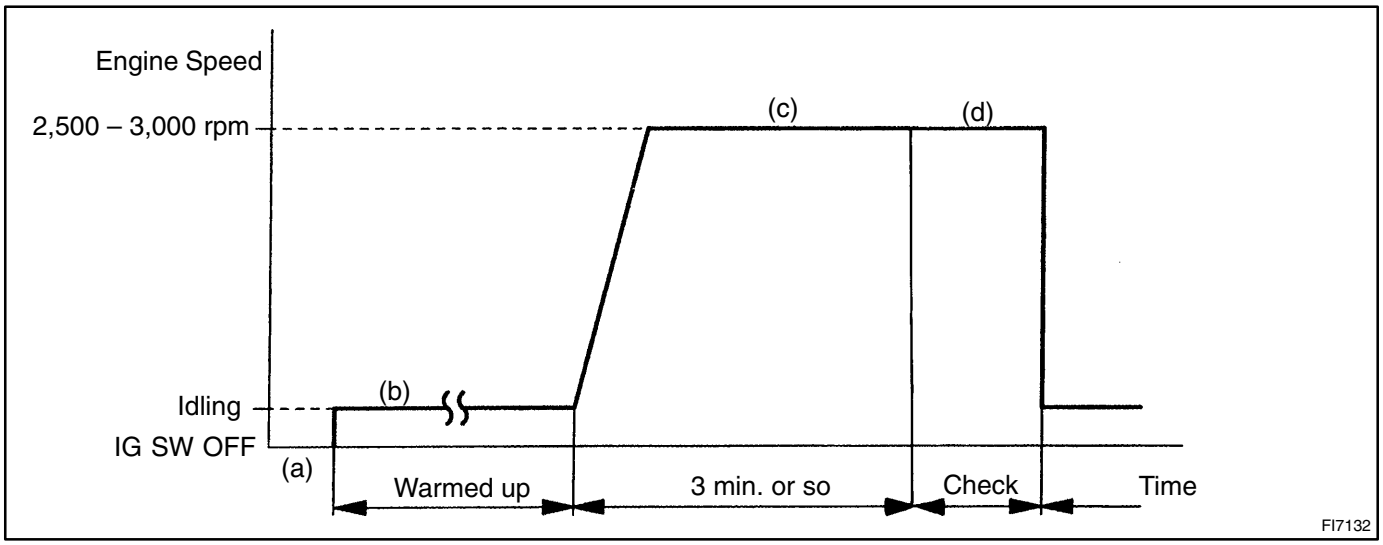
If the catalyst is functioning normally, the waveform of the oxygen sensor behind the catalyst switches back and forth between rich and lean much more slowly than the waveform of the oxygen sensor before the catalyst.

But when both waveforms change at a similar rate, it indicates that the catalyst performance has deteriorated.

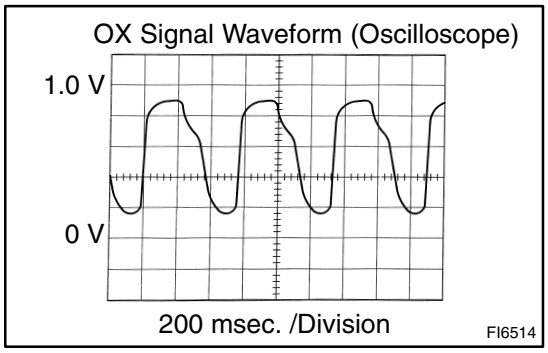


DTC No.	DTC Detection Condition	Trouble Area
P0420	After engine and catalyst are warmed up, and while vehicle is driven within set vehicle and engine speed range, the waveforms of the oxygen sensors (bank 1, 2 sensor 1, 2) have same amplitude (2 trip detection logic)	• Gas leak on exhaust system • Oxygen sensor (bank 1 sensor 1, 2) • Three–way catalytic converter
P0430		• Gas leak on exhaust system • Oxygen sensor (bank 2 sensor 1, 2) • Three–way catalytic converter

CONFIRMATION ENGINE RACING PATTERN



(a) Connect the hand–held tester to the DLC3, or connect the probe of the oscilloscope between terminals OX1A, OX2A, OX1B, OX2B and E1 of the engine ECU.
(b) Start the engine and warm it up with all accessories switched OFF until the water temperature is stable.
(c) Race the engine at 2,500 – 3,000 rpm for about 3 min.
(d) After confirming that the waveform of the oxygen sensor (bank 1, 2 sensor 1, 2) which oscillates around 0.5 V during feedback to the engine ECU, check the waveform of the oxygen sensor, bank 1, 2 sensor 1, 2 (OX1A, OX2A, OX1B, OX2B).



HINT:
If there is a malfunction in the system, the waveform of the oxygen sensor (bank 1, 2 sensor 1, 2) (OX1A, OX2A, OX1B, OX2B) becomes as shown in the left.
There are some cases when the CHEK ENG (MIL) may either light up or not, even though a malfunction exists.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using a hand–held tester, 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	**Are there any other codes (besides DTC P0420, P0430) being output?**

YES → **Go to relevant DTC chart (See page DI–14).**

NO

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

NG → **Repair or replace.**

OK

3	**Check oxygen sensor (bank 1, 2 sensor 1, 2) (See page FI–51).**

NG → **Repair or replace.**

OK

Replace three–way catalytic converter.

DI7H1–04

DTC	P0443	Evaporative Emission Control System Purge Control Vent Control Malfunction

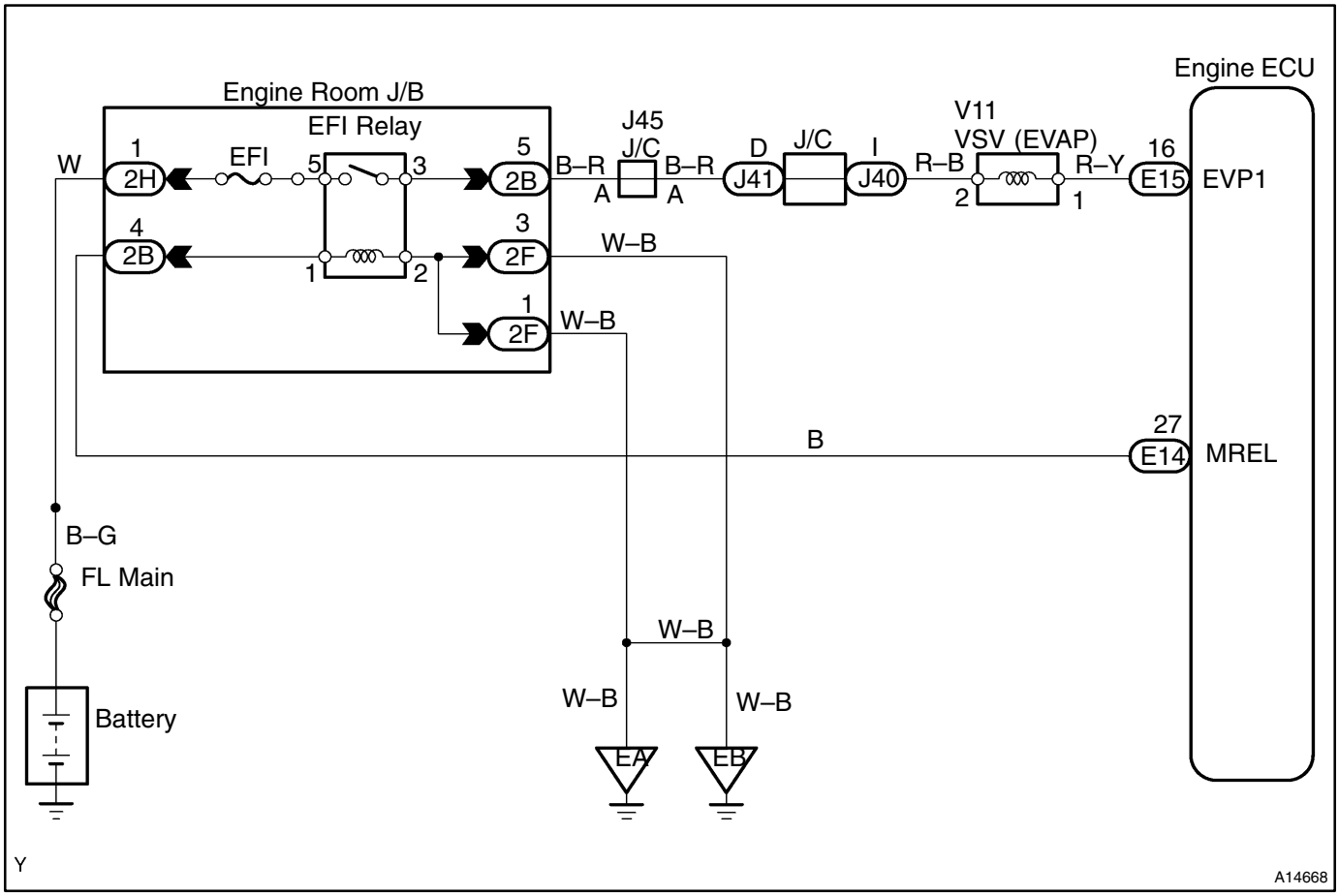
CIRCUIT DESCRIPTION

To reduce HC emissions, evaporated fuel from the fuel tank goes through the charcoal canister to the intake manifold for combustion in the cylinders.

The engine ECU changes the duty signal to the VSV for the EVAP so that the intake quantity of HC emissions becomes appropriate for the driving conditions (engine load, engine speed, vehicle speed, etc.) after the engine is wamed up.

DTC No.	DTC Detection Condition	Trouble Area
P0443	Proper response to engine ECU command does not occur	• Open or short in VSV circuit for EVAP • VSV for EVAP • Engine ECU

WIRING DIAGRAM

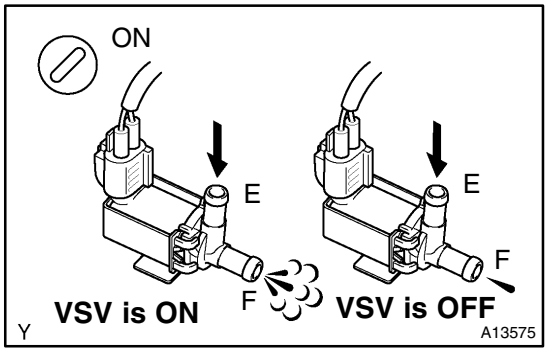


INSPECTION PROCEDURE

HINT:

Read freeze frame data using a hand–held tester, 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	Connect hand–held tester and check operation of VSV for EVAP.



PREPARATION:

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the ACTIVE TEST mode on the hand–held tester.

CHECK:

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

OK:

VSV is ON:
Air from port E flows out through port F.
VSV is OFF:
Air from port E flows out through port F with a little difficulty.

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

NG

2	Check VSV for EVAP (See page FI–38).

NG → **Replace VSV for EVAP.**

OK

3	Check for open and short in harness and connector between EFI main relay (Marking: EFI) and engine ECU (See page IN–20).

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

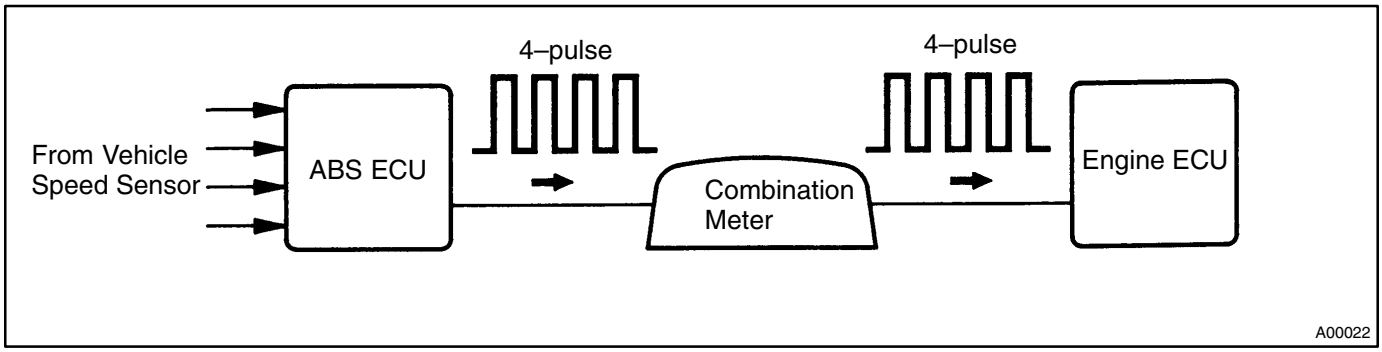
OK

Check and replace engine ECU.

DTC	P0500	Vehicle Speed Sensor Malfunction

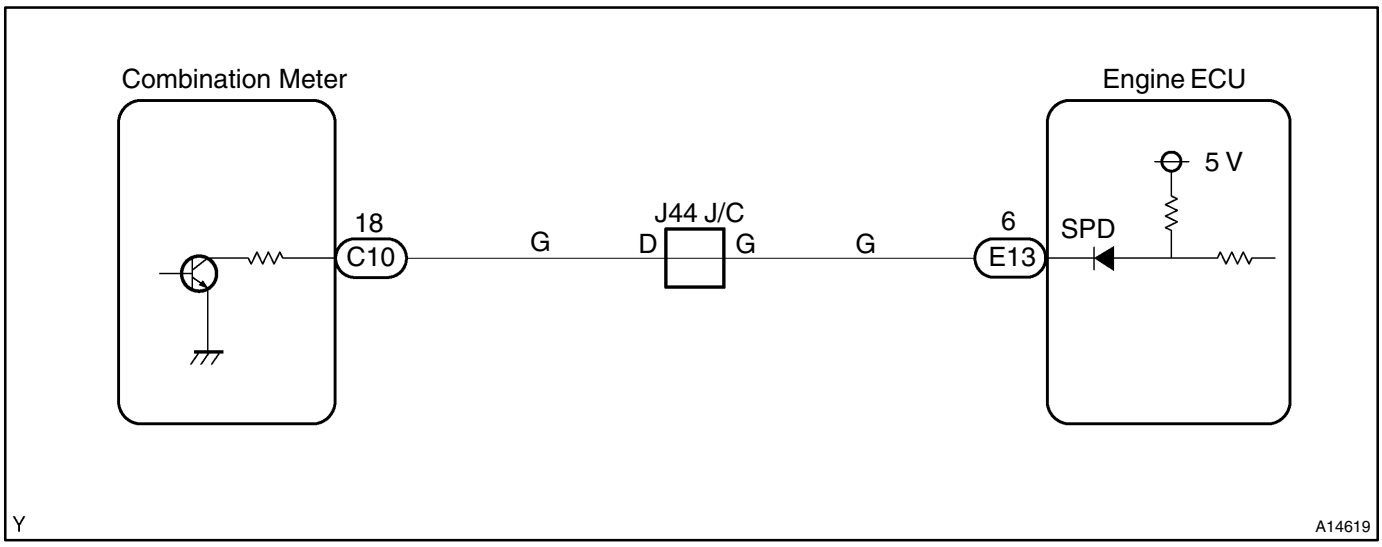
CIRCUIT DESCRIPTION

The speed sensor for ABS detects the wheel speed and sends the appropriate signals to the ABS ECU. The ECU 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 engine ECU. The engine ECU determines the vehicle speed according to the frequency of these pulse signals.



DTC No.	DTC Detection Condition	Trouble Area
P0500	No vehicle speed sensor signal to engine ECU under condition for 8 sec. or more: (2 trip detection logic) • Vehicle is being driven	• Combination meter • Open or short in vehicle speed sensor circuit • Vehicle speed sensor • ABS ECU • Engine ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:
Read freeze frame data using hand–held tester, 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	Check operation of speedometer.

CHECK:

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

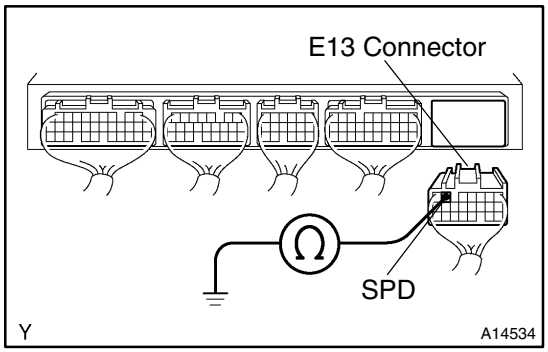
HINT:

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

NG → **Check speedometer circuit.**

OK

2	Check for short in harness and connector between terminal SPD of engine ECU connector and body ground.



PREPARATION:

(a) Remove the glove compartment (See page FI–56).

(b) Disconnect the E13 connector of the engine ECU (See page FI–56).

CHECK:

Check the continuity between terminal SPD of the engine ECU and the body ground.

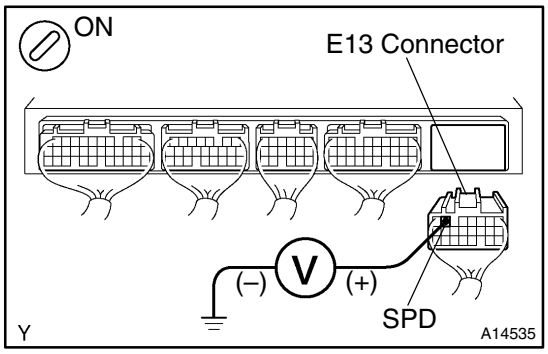
OK:

No continuity (1 MΩ or higher)

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

OK

3	Check voltage between terminal SPD of engine ECU connector and body ground.



PREPARATION:

(a) Remove the glove compartment (See page FI–56).

(b) Disconnect the E13 connector of the engine ECU (See page FI–56).

(c) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminal SPD of the engine ECU connector and the body ground.

OK:

Voltage: 9 – 14 V

NG → **Check for open in harness and connector between combination meter and engine ECU (See page IN–20).**

OK

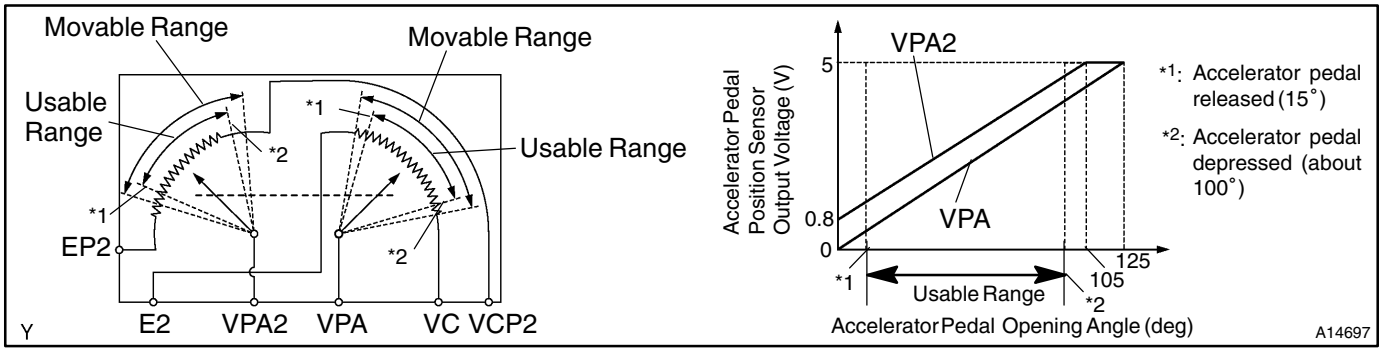
Check and replace engine ECU (See page IN–20).

DI811–01

DTC	P1120	Accelerator Pedal Position Sensor Circuit Malfunction

CIRCUIT DESCRIPTION

Accelerator pedal position sensor is mounted on the accelerator pedal braket and it has the 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 VPA and VPA2 of the ECU changes between 0 V and 5 V in proportion to the opening angle of the accelerator pedal.
The engine ECU judges the current opening angle of the accelerator pedal from by these signals output from terminals VPA and VPA2, and the engine ECU controls the throttle motor based on these signals.
If this DTC is stored, the engine ECU cuts down the power for the throttle motor and the magnetic clutch, and the throttle valve is fully closed by the return spring.

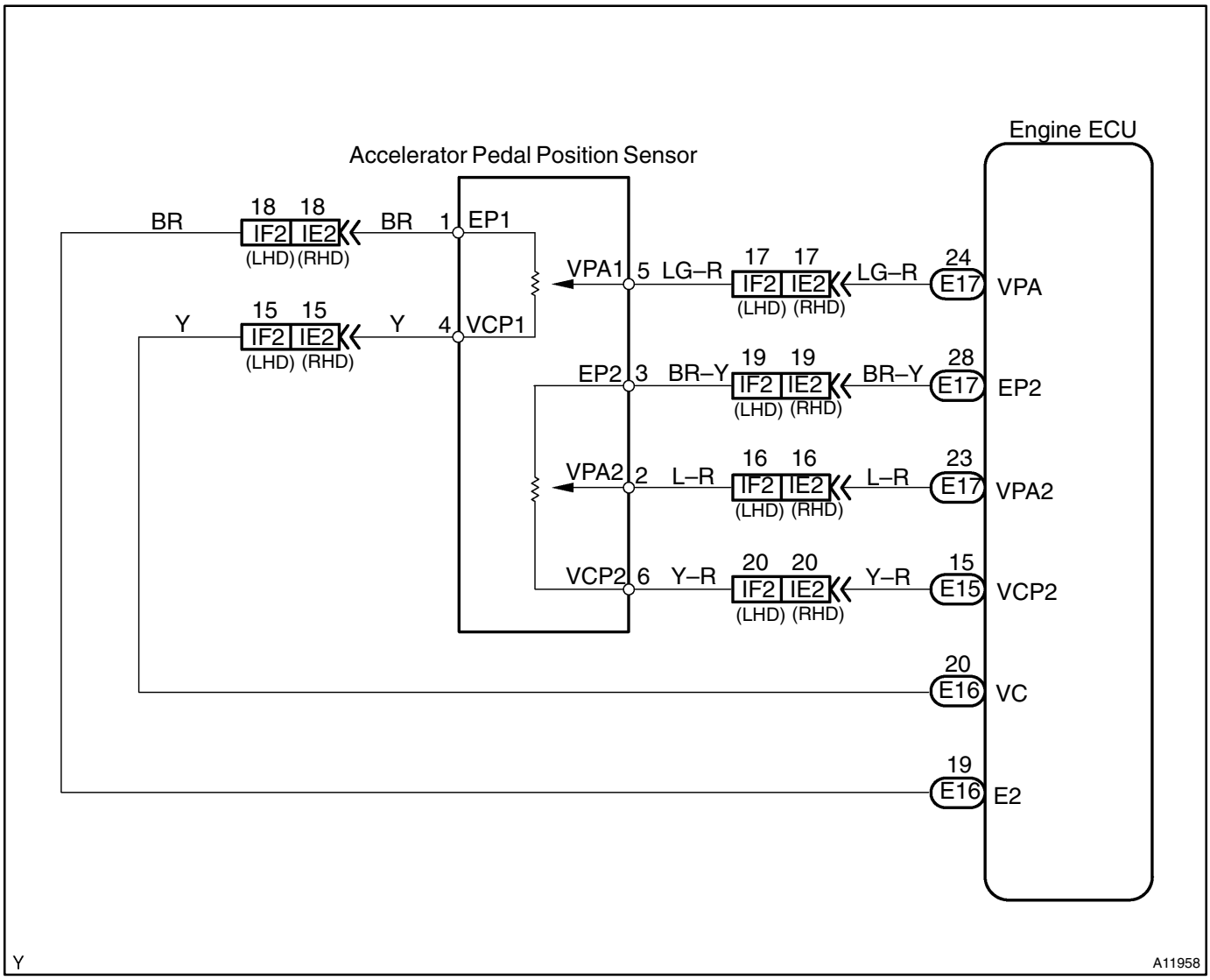


DTC No.	DTC Detection Condition	Trouble Area
P1120	Condition (a), (b), (c) or (d) continues for 2.0 sec.: (a) VPA ≦ 0.2 V (b) VPA2 ≦ 0.5 V (c) VPA ≧ 4.8 V (d) When VPA ≧ 0.2 V and ≦ 1.8 V, and VPA2 ≧ 4.97 V (e) VPA–VPA2 ≦ 0.02 V	• Open or short in accelerator pedal position sensor circuit • Accelerator pedal position sensor • Engine ECU
	Condition below continues for 0.4 sec.: • VPA ≦ 0.2 V and VPA2 ≦ 1.5 V	

HINT:
After confirming DTC P1120, use the hand–held tester to confirm the accelerator pedal opening percentage.

Throttle valve position expressed as volt				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	VC line open
0 V	1.8 – 2.7 V	0 V	4.7 – 5.1 V	VPA line open or grand short
0.3 – 0.9 V	0 V	3.2 – 4.8 V	0 V	VPA2 line open or grand short
5 V	5 V	5 V	5 V	E2 line open

WIRING DIAGRAM

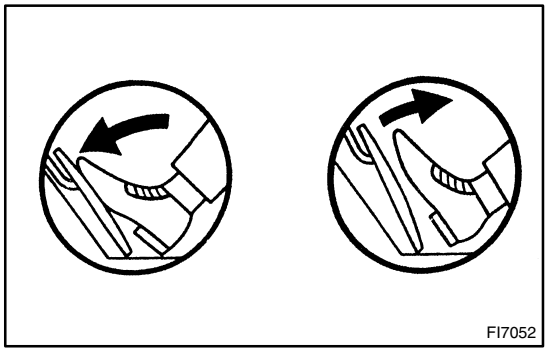


INSPECTION PROCEDURE

HINT:

- If DTCs P0105, P0110, P0115, P0120, P0121, P0190, P0191, P1120, P1121, P1125 and P1129 are output simultaneously, E2 (sensor ground) may be open.
- Read freeze frame data using hand–held tester, 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	Connect hand–held tester, read voltage for accelerator pedal position sensor data.



PREPARATION:

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

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

CHECK:

Read the voltage in the accelerator pedal position sensor data.

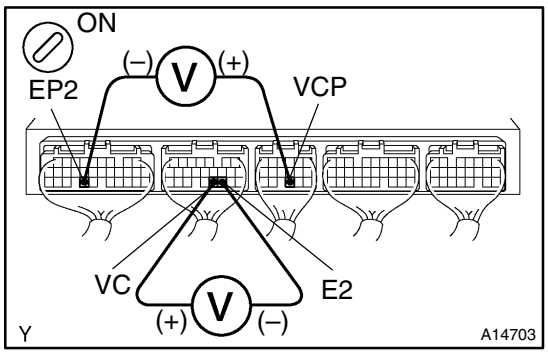
OK:

Accelerator Pedal	VPA	VPA2
Released	0.3 – 0.9 V	1.8 – 2.7 V
Depressed	3.2 – 4.8 V	4.7 – 5.1 V

OK	Check and replace engine ECU (See page IN–20).

NG

2	Check voltage between terminals VC and E2, and VCP and EP2 of engine ECU connector.



PREPARATION:

(a) Remove the glove compartment (See page FI–56).

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals VC and E2, and VCP and EP2 of the engine ECU connector.

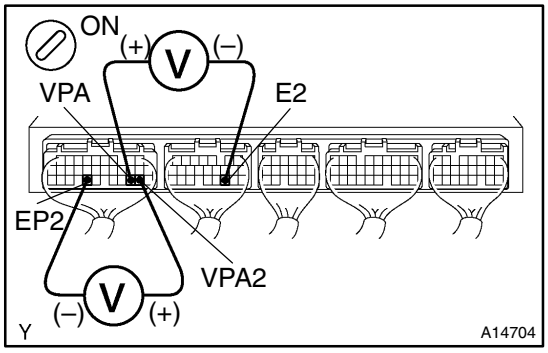
OK:

Voltage: 4.5 – 5.5 V

NG	Check and replace engine ECU (See page IN–20).

OK

3	Check voltage between terminals VPA and E2, and VPA2 and EP2 of engine ECU connector.



PREPARATION:

(a) Remove the glove compartment (See page FI–56).

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals VPA and E2, and VPA2 and EP2 of the engine ECU connector.

OK:

Accelerator pedal	Volt	
	VPA – E2	VPA2 – E2
Released	0.3 – 0.9 V	1.8 – 2.7 V
Depressed	3.2 – 4.8 V	4.7 – 5.1 V

OK → **Check and replace engine ECU (See page IN–20).**

NG

4	Check accelerator pedal position sensor (See page FI–24).

NG → **Replace accelerator pedal position sensor (See page FI–52).**

OK

Check for open and short in harness and connector in VC, VPA, VPA2 or E2 circuit between engine ECU and accelerator pedal position sensor (See page IN–20).

DI812-01

DTC	P1121	Accelerator Pedal Position Sensor Range/ Performance Problem

CIRCUIT DESCRIPTION

Refer to DTC P1120 on page DI–87.

DTC No.	DTC Detection Condition	Trouble Area
P1121	Condition below continues for 2.0 sec.: • Difference between VPA and VPA2 is out of threshold	• Accelerator pedal position sensor

INSPECTION PROCEDURE

HINT:

Read freeze frame data using hand–held tester, 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.

Replace accelerator pedal position sensor (See page FI–52).

DI813–01

DTC	P1125	Throttle Control Motor Circuit Malfunction

CIRCUIT DESCRIPTION

Throttle motor is operated by the engine ECU. 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. It provides feedback to the engine ECU to control the throttle motor in order to make the throttle valve opening angle properly according to the driving condition.
If this DTC is stored, the engine ECU cuts 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 0.5 sec.: (a) Throttle control motor output duty ≧ 80 % (b) Throttle control motor current < 0.5 A	• Open or short in throttle control motor circuit • Throttle control motor • Engine ECU
	Throttle control motor current ≧ 16 A	
	Under condition continues for 0.6 sec.: Throttle control motor current ≧ 7 A	

WIRING DIAGRAM

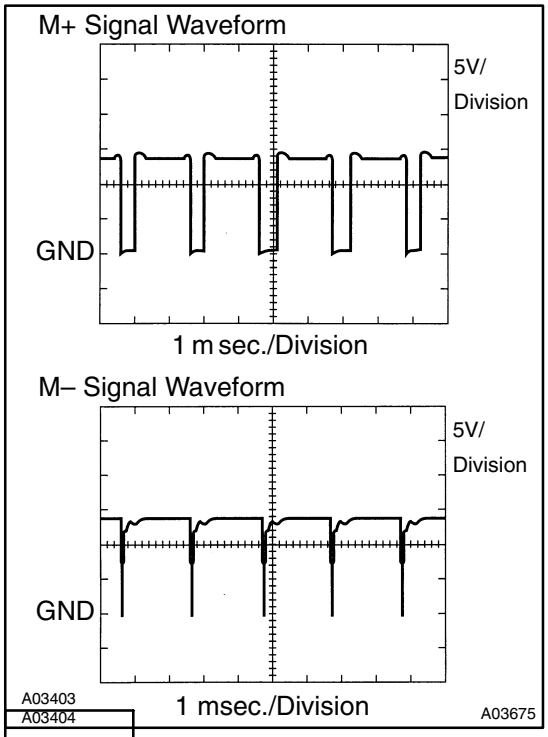
Refer to DTC P0120 on page DI–34.

INSPECTION PROCEDURE

HINT:

- If DTCs P0105, P0110, P0115, P0120, P0121, P0190, P0191, P1120, P1121, P1125 and P1129 are output simultaneously, E2 (sensor ground) may be open.
- Read freeze frame data using hand–held tester, 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	Check throttle control motor circuit.



PREPARATION:

(a) Connect the oscilloscope between terminals M+ or M– and E1 of the engine ECU connector.

(b) Start the engine.

CHECK:

Check the waveform between terminals M+ or M– and E1 of the engine ECU when the engine is idling.

OK:

The correct waveforms are as shown.

HINT:

The waveform frequency varies with the throttle opening.

OK → **Check and replace engine ECU (See page IN–20).**

NG

2	Check throttle control motor (See page FI–24).

NG → **Replace throttle control motor.**

OK

3	Check for open and short in harness and connector between throttle control motor and engine ECU (See page IN–20).

NG → **Repair or replace.**

OK

Check and replace engine ECU.

DI64A–03

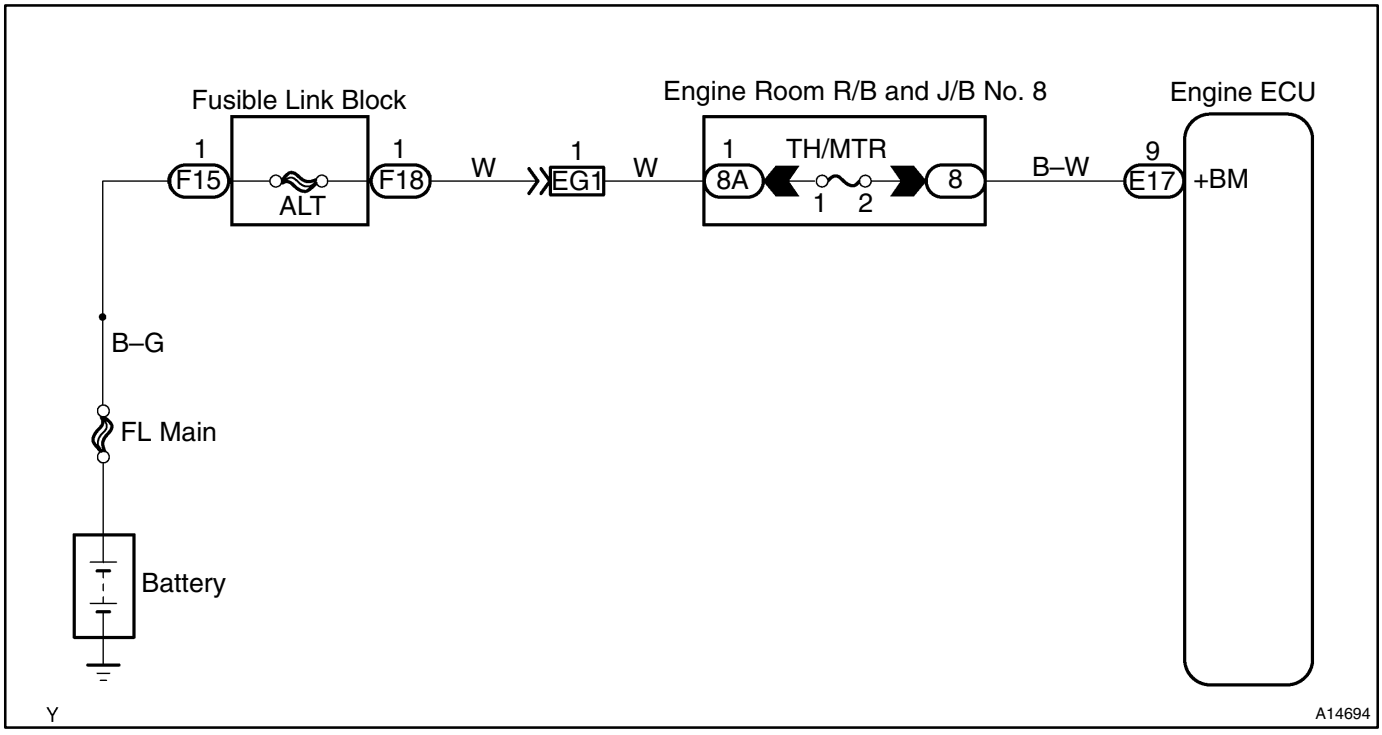
DTC	P1127	ETCS (TH/MTR) Actuator Power Source Circuit Malfunction

CIRCUIT DESCRIPTION

Battery positive voltage is supplied to terminal +BM of the engine ECU even once when the ignition switch is OFF for the electric throttle control system.
If this DTC is stored, the engine ECU cuts 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 TH/MTR power source circuit • Engine ECU

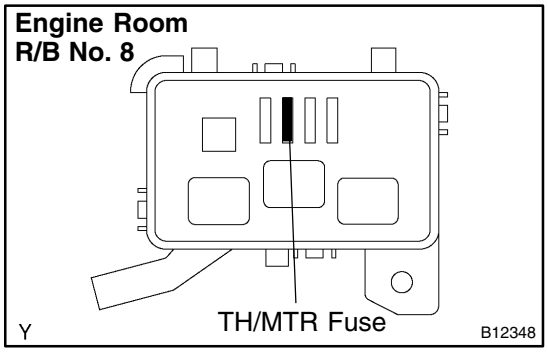
WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:
Read freeze frame data using hand–held tester, 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	Check TH/MTR fuse.

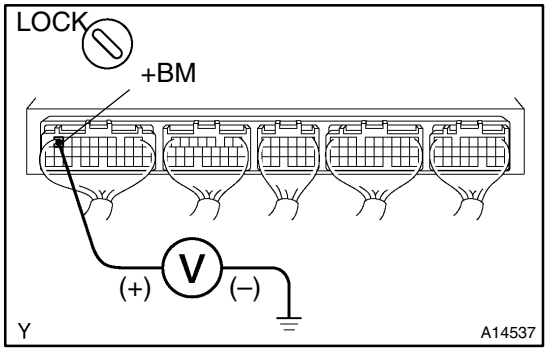


PREPARATION:
Remove the TH/MTR fuse from the engine room R/B No. 8.
CHECK:
Check the continuity of the TH/MTR fuse.
OK:
Continuity

NG → **Check for short in all harness and components connected to TH/MTR fuse.**

OK

2	Check voltage between terminal +BM of engine ECU connector and body ground.



PREPARATION:
Remove the glove compartment (See page FI–56).
CHECK:
Measure the voltage between terminal +BM of the engine ECU connector and the body ground.
OK:
Voltage: 9 – 14 V

OK → **Check and replace engine ECU (See page IN–20).**

NG

Check and repair harness or connector between battery and TH/MTR fuse, and TH/MTR fuse and engine ECU (See page IN–20).

DI814–01

DTC	P1128	Throttle Control Motor Lock Malfunction

CIRCUIT DESCRIPTION

Throttle motor is operated by the ECU. 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. It provides feedback to the engine ECU to control the throttle motor in order to make the throttle valve opening angle properly according to the driving condition.
If this DTC is stored, the engine ECU cuts 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	Throttle control motor is locked during controlling throttle control motor	• Throttle control motor • Throttle body

INSPECTION PROCEDURE

HINT:
Read freeze frame data using hand–held tester, 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	**Check throttle control motor (See page DI–92, step 2).**

NG → **Replace throttle body (See page FI–25).**

OK

2	**Visually check throttle valve.**

PREPARATION:
Remove the air cleaner.
CHECK:
Check whether or not a foreign object is caught between the throttle valve and the housing.

NG → **Remove a foreign object and clean throttle body.**

OK

Replace throttle body (See page FI–25).

DI64C–03

DTC	P1129	Electric Throttle Control System Malfunction

CIRCUIT DESCRIPTION

Electric Throttle Control System (ETCS) is composed of the throttle motor to operate the throttle valve, the electromagnetic clutch to connect the throttle motor with the throttle valve, the accelerator pedal position sensor to detect the accelerator pedal position, the engIne ECU to control the ETCS and the one valve type throttle body.

The engine ECU controls the throttle motor to make the throttle valve opening angle properly according to the 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 engIne ECU to control the throttle motor.

If the ETCS has a malfunction, the engine ECU cuts the power for the throttle motor and the magnetic clutch, 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 great from target throttle opening angle	• Electric throttle control system • Engine ECU

WIRING DIAGRAM

Refer to DTC P1125 on page DI–92.

INSPECTION PROCEDURE

HINT:

- If DTCs P0105, P0110, P0115, P0120, P0121, P0190, P0191, P1120, P1121, P1125 and P1129 are output simultaneously, E2 (sensor ground) may be open.
- Read freeze frame data using hand–held tester, 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	**Are there any other codes (besides DTC P1129) being output?**

YES → **Go to relevant DTC chart (See page DI–14).**

NO

Replace engIne ECU, and clear DTC. If DTC P1129 is memorized again, and then replace throttle body.

DI815-01

DTC	P1215	EDU Circuit Malfunction

CIRCUIT DESCRIPTION

The ECU is adopted to drive the injector at high speed. The EDU realizes high–speed driving under high fuel pressure conditions by using a DC/DC converter that provides a high–voltage and quick–charging system.

The engine ECU constantly monitors the EDU and stops the engine in case an abnormal condition is detected.

DTC No.	DTC Detection condition	Trouble Area
1215	Open or short in EDU circuit	• Open or short in EDU circuit • EDU • Injector • Engine ECU

WIRING DIAGRAM

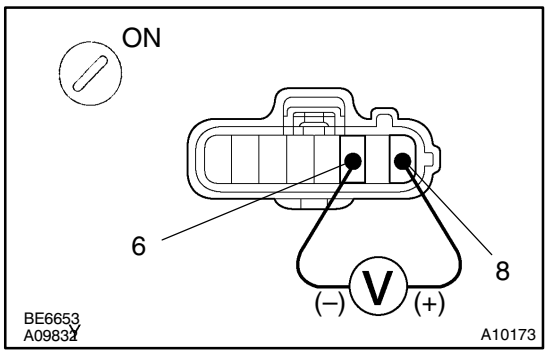
Refer to DTC P0300 – P0304 on page DI–67.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using hand–held tester, 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 ration was lean or rich, etc. at the time of the malfunction.

1	Check voltage of EDU power source.



PREPARATION:

(a) Disconnect the EDU connector.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals 6 and 8 of the wire harness side connector.

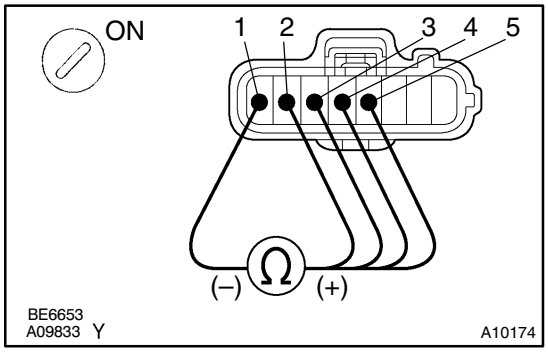
OK:

Voltage: 9 – 14 V

NG	Check EDU power source circuit (See page DI–132).

OK

2	Check resistance between terminals 1 and 2 – 5 of wire harness side connector.



PREPARATION:

(a) Disconnect the EDU connector.

(b) Turn the ignition switch ON.

CHECK:

Measure the resistance between terminals 1 and 2 – 5 of the wire harness side connector.

OK:

Resistance: 2.5 – 3.1 Ω at 20°C (68°F)

OK	Go to step 4.

NG

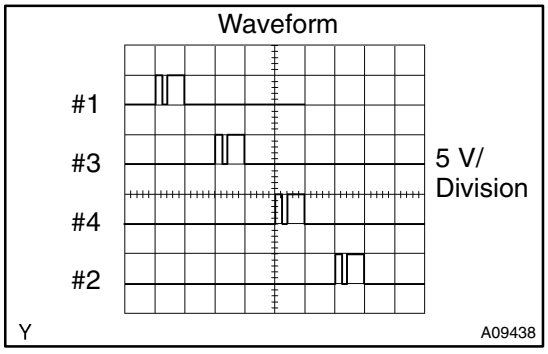
3	Check injector (See page FI–18).

NG	Replace injector.

OK

Repair or replace harness or connector.

4	Check voltage between terminals #1 – #4 and E01 of engine ECU connector.



PREPARATION:

Remove the glove compartment.

CHECK:

During cranking or idling, check the waveform between terminals #1 – #4 and E01 of the engine ECU connector with the oscilloscope.

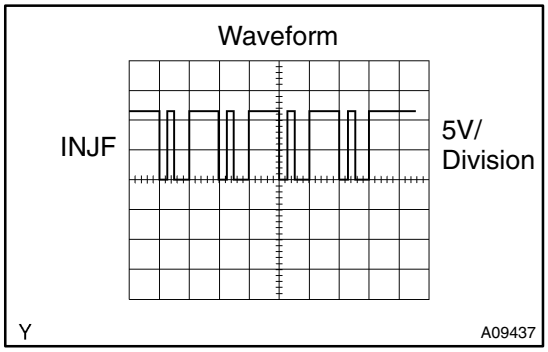
OK:

Voltage: The correct waveform are as shown in the illustration.

NG	Check and replace ECU (See page IN–20).

OK

5	Check voltage between terminals INJF and E01 of engine ECU connector.



PREPARATION:
Remove the glove compartment (See page FI–56).
CHECK:
During cranking or idling, check the waveform between terminals INJF and E01 of the engine ECU connector with the oscilloscope.
OK:

Voltage: The correct waveform are as shown in the illustration.

NG → **Check and replace ECU (See page IN–20).**

NG

6	Check for open and short in harness and connector between EDU and engine ECU (See page IN–20).

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

OK

Replace EDU.

DI816-01

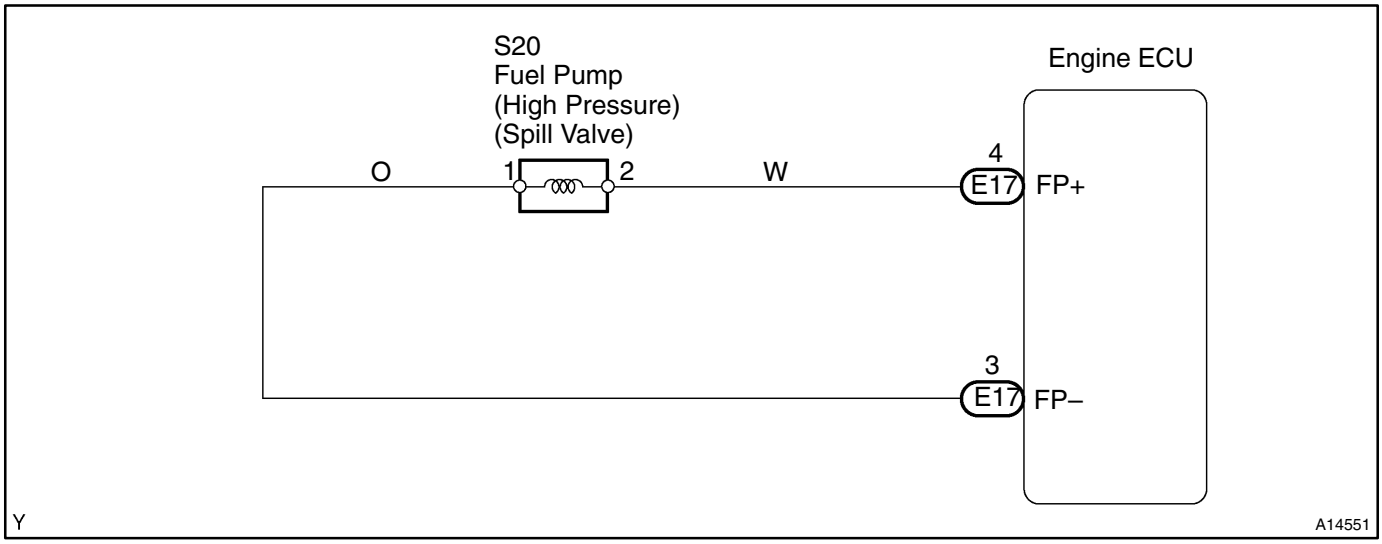
DTC	P1235	Fuel Pump (high Pressure) Circuit Malfunction

CIRCUIT DESCRIPTION

The fuel pump (high pressure) is an electronically controlled plunger type fuel pump (high pressure) which is driven by the cam provided on the exhaust cam shaft rear end on the cylinder head.
The fuel pump (high pressure) increases the pressure of the fuel fed from the fuel pump in the fuel tank at 8 – 13 MPa (81.6 – 132.6 kgf/cm^2, 1,160 – 1,885 psi) according to the operating condition, and it feeds the fuel to the fuel delivery pipe.

DTC No.	DTC Detection condition	Trouble Area
P1235	Open or short in fuel pump (high pressure) circuit for 1sec. or more	• Open or short in fuel pump (high pressure) • Fuel pump (high pressure) • Engine ECU

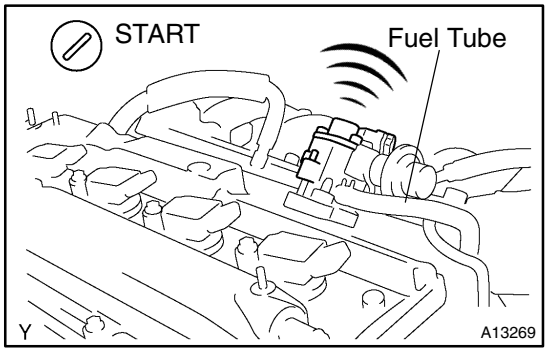
WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:
Read freeze frame data using hand–held tester, 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	Check operation of fuel pump (high pressure).

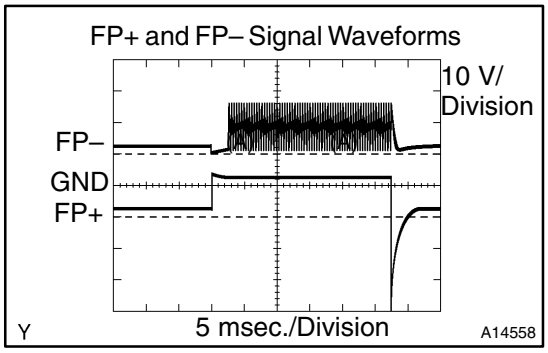


CHECK:
With the engine running or cranking, use a sound scope to check that there is the normal operating sound of the fuel pump (high pressure) when it is operated.
OK:
There is the operating sound of the fuel pump (high pressure).

NG → **Replace fuel pump (high pressure).**

OK

2	Check voltage between terminals FP+ and FP– of engine ECU connector.



Reference: INSPECTION USING OSCILLOSCOPE
Turn the ignition switch ON, and check the waveforms between terminals FP+ and FP– of the engine ECU connector.
HINT:
The correct waveform is as shown in the illustration.

NG → **Check and replace engine ECU (See page IN–20).**

OK

3	Check fuel pump (high pressure) (See page FI–11).

NG → **Repair fuel pump (high pressure).**

OK

4	**Check for open and short in harness and connector between fuel pump (high pressure) and engine ECU (See page IN–20).**

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

OK

Check for problem symptoms table (See page DI–21).

DI7J7–02

DTC	P1300	Igniter Circuit Malfunction (No. 1)

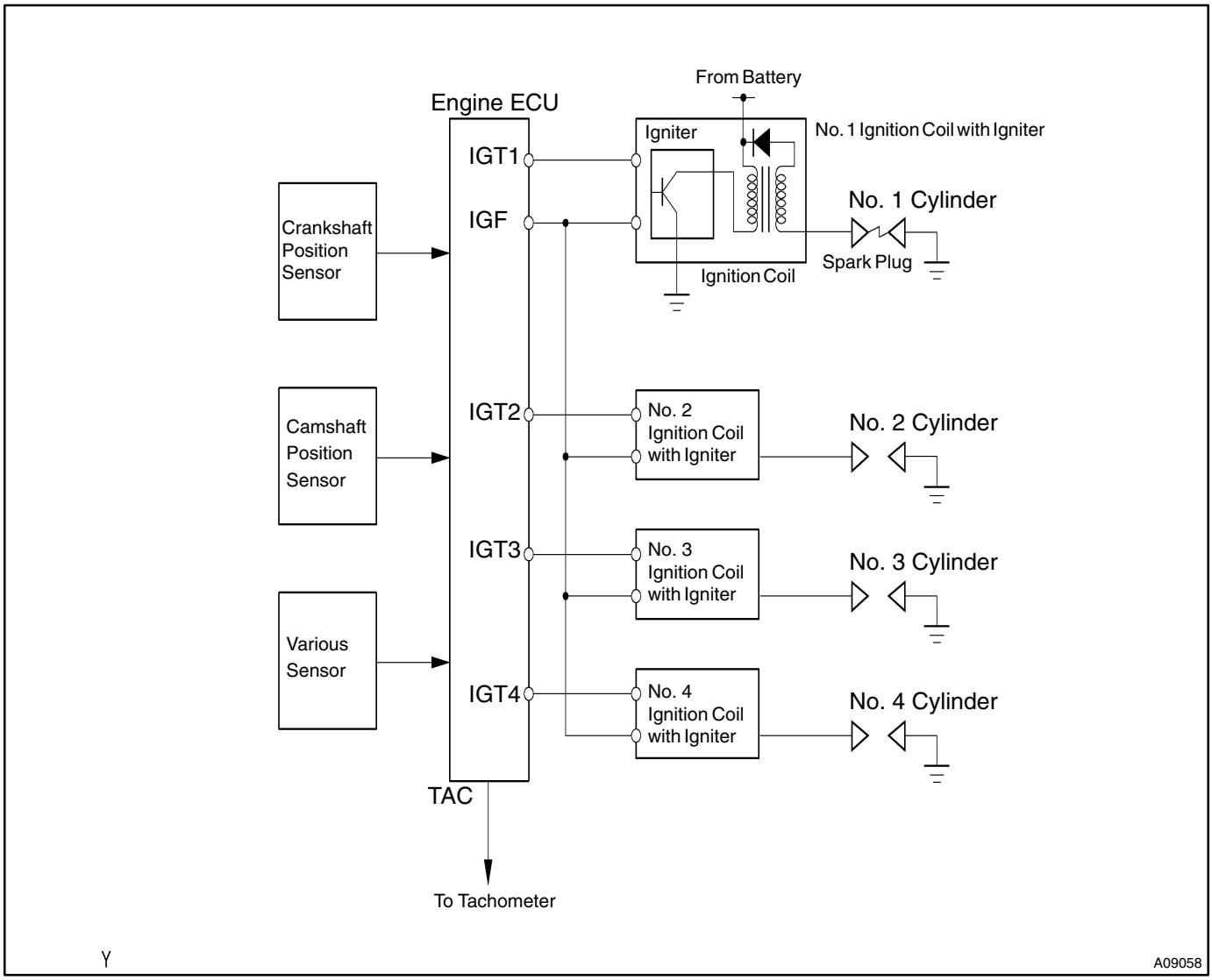
DTC	P1305	Igniter Circuit Malfunction (No. 2)

DTC	P1310	Igniter Circuit Malfunction (No. 3)

DTC	P1315	Igniter Circuit Malfunction (No. 4)

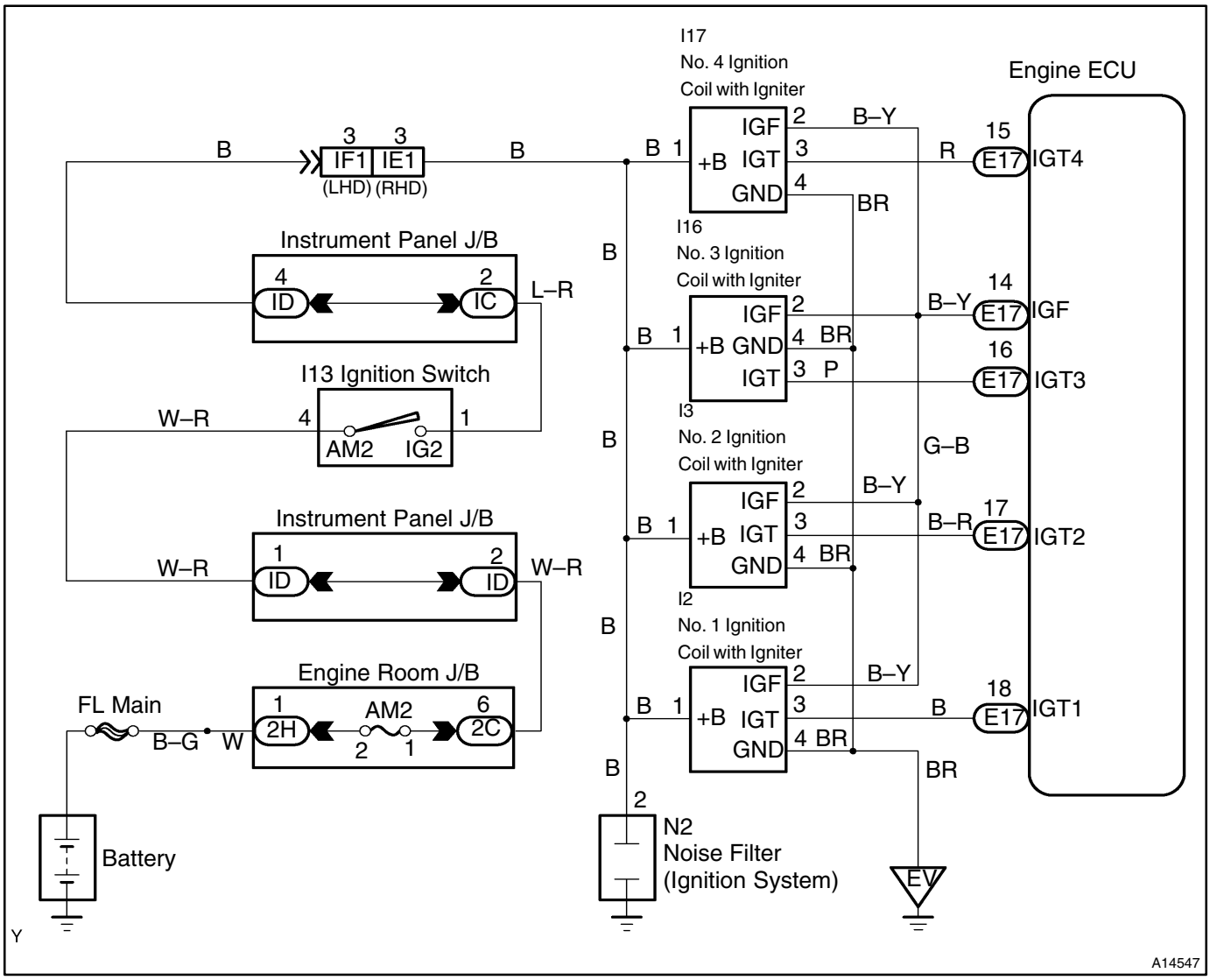
CIRCUIT DESCRIPTION

A Direct Ignition System (DIS) has been adopted. The DIS improves the ignition timing accuracy, reduces high–voltage loss and enhances the overall reliability of the ignition system by eliminating the distributor.
The DIS is a 1–cylinder ignition system which ignites one cylinder with one ignition coil. In the 1–cylinder ignition system, the one spark plug is connected to the end of the secondary winding. High voltage generated in the secondary winding is applied directly to the spark plug. The spark of the spark plug passes from the center electrode to the ground electrode.
The engine ECU determines ignition timing and outputs the ignition signals (IGT) of each cylinder. Based on the IGT signals, the power transistors in the igniter cut the current off 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 measurement to the engine ECU.



DTC No.	DTC Detection Condition	Trouble Area
P1300 P1305 P1310 P1315	No IGF signal to engine ECU while engine is running	• Ignition system • Open or short in IGF or IGT1 – 4 circuit from ignition coil with igniter • No. 1 – No. 4 ignition coil with igniter • Engine ECU

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.
- Read freeze frame data using hand–held tester, 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	**Check spark plug and spark (See page IG–1).**

NG → **Go to step 4.**

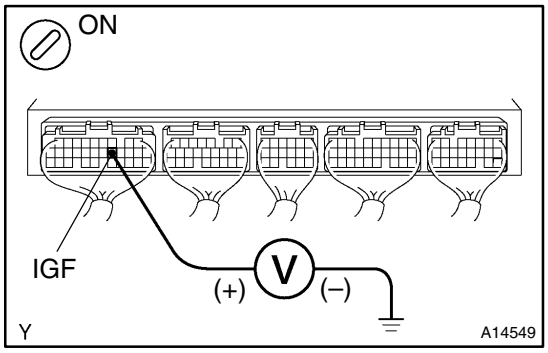
OK

2	**Check for open and short in harness and connector in IGF and IGT signal circuits between engine ECU and ignition coil with igniter (See page IN–20).**

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

OK

3	**Disconnect ignition coil with igniter connector, and check voltage between terminals IGF of engine ECU connector and body ground.**



PREPARATION:

(a) Remove the glove compartment (See page FI–56).
(b) Disconnect the ignition coil with igniter connector.
(c) Turn the ignition switch ON.

CHECK:

Measure the voltage between the terminals IGF of the engine ECU connector and body ground.

OK:

Voltage: 4.5 – 5.5 V

OK → **Replace ignition coil with igniter.**

NG

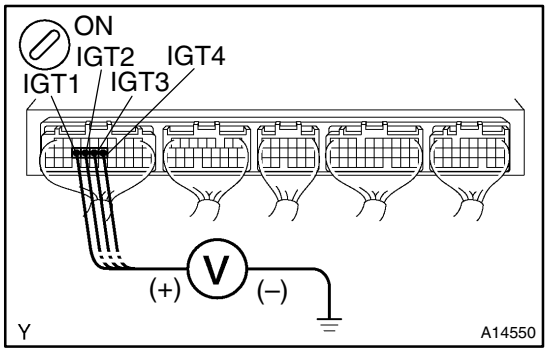
Check and replace engine ECU (See page IN–20).

4	Check for open and short in harness and connector in IGT signal circuit between engine ECU and ignition coil with igniter (See page IN–20).

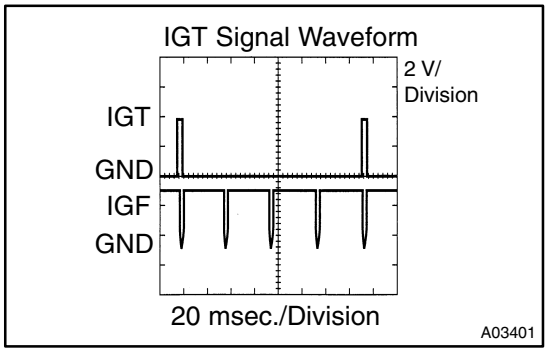
NG → **Repair or replace harness or connector.**

OK

5	Check voltage between terminals IGT1 – 4 of engine ECU connector and body ground.



PREPARATION:
Remove the glove compartment (See page FI–56).
CHECK:
Measure the voltage between terminals IGT1 – 4 of the engine ECU connector and body ground when the engine is cranked.
OK:
Voltage: More than 0.1 V and less than 4.5 V

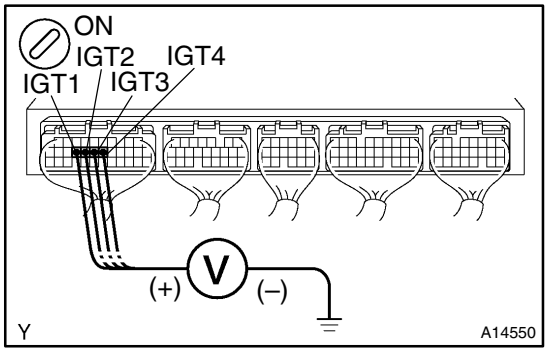


Reference: INSPECTION USING OSCILLOSCOPE
During cranking or idling, check the waveform between terminals IGT1 – 4 and E1 of the engine ECU connector.
HINT:
Correct waveform appears as shown, with rectangle waves.

NG → **Check and replace engine ECU (See page IN–20).**

OK

6	Disconnect ignition coil with igniter connector and check voltage between terminals IGT1 – 4 of engine ECU connector and body ground.



PREPARATION:

(a) Remove the glove compartment (See page FI–56).

(b) Disconnect the ignition coil with igniter connector.

CHECK:

Measure the voltage between the terminals IGT1 – 4 of the engine ECU connector and the body ground when the engine is cranked.

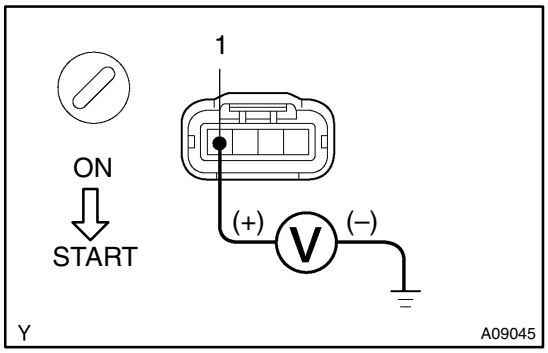
OK:

Voltage: More than 0.1 V and less than 4.5 V

NG	Check and replace engine ECU (See page IN–20).

OK

7	Check ignition coil with igniter power source circuit.



PREPARATION:

Disconnect the ignition coil with igniter connector.

CHECK:

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

OK:

Voltage: 9 – 14 V

OK	Repair ignition coil with igniter power source circuit.

NG

8	Check for open and short in harness and connector between ignition switch and ignition coil with igniter (See page IN–20).

NG	Repair or replace harness or connector.

OK

Replace ignition coil with igniter.

DTC	P1335	Crankshaft Position Sensor Circuit Malfunction (During engine running)

CIRCUIT DESCRIPTION

Refer to DTC P0335 on page DI–75.

DTC No.	DTC Detection Condition	Trouble Area
P1335	If conditions (a) through (c) are found: (a) NE ≧ 1,000 rpm (b) NE signal is not detected for over 50 msec. (c) Not during cranking	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Crank angle sensor plate • Engine ECU

WIRING DIAGRAM

Refer to DTC P0335 on page DI–75.

INSPECTION PROCEDURE

Refer to DTC P0335 on page DI–75.

DI817–01

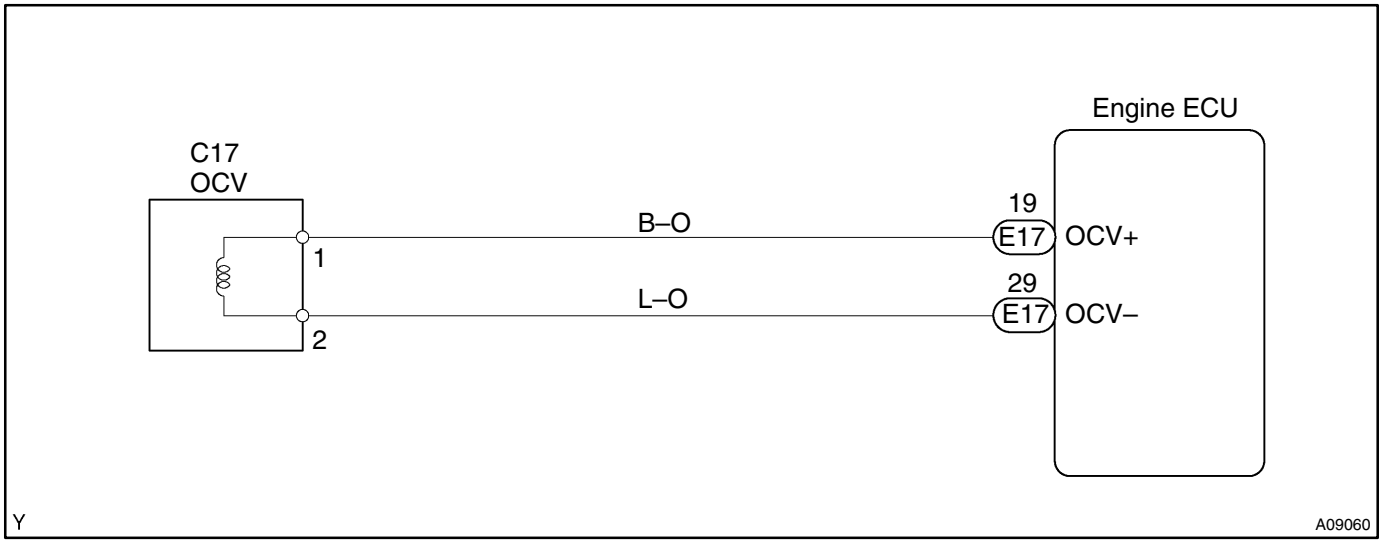
DTC	P1349	VVT System Malfunction (Bank 1)

CIRCUIT DESCRIPTION

VVT system controls the intake valve timing properly according to the driving condition.
The engine ECU controls Oil Control Valve (OCV) for VVT to make the intake valve timing properly. The oil pressure controlled by the OCV for VVT is supplied to the VVT controller which changes the relative position between the camshaft and the crankshaft.

DTC No.	DTC Detection Condition	Trouble Area
P1349	Condition (a) or (b) continues 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 for VVT • VVT controller assembly • Engine ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using a hand–held tester, 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	**Check valve timing (See page EM–20).**

NG → **Repair valve timing.**

OK

2	**Check operation of OCV.**

PREPARATION:

(a) Start the engine and warmed it up.

(b) Connect the hand–held tester and select VVT on the ACTIVE TEST menu.

CHECK:

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

OK:

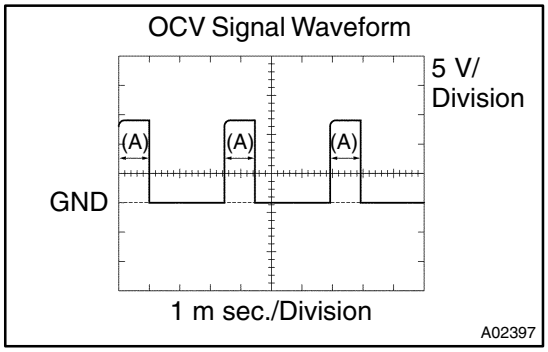
OCV is OFF: Normal engine speed
OCV is ON: Rough idle or engine stall

OK → **VVT system is OK.***

*: DTCs P1349 are also output when a foreign object is detected in some parts of the system in the engine oil, and then the system returns to normal in a short time. As the engine ECU is controlled to eject a foreign object, there is no problem on the VVT. There is also no problem on the VVT as the oil filter should catch the foreign object in the engine oil.

NG

3	**Check voltage between terminals OCV+ and OCV– of engine ECU connector.**



Reference: INSPECTION USING OSCILLOSCOPE
Turn the ignition switch ON, and check the waveform between terminals OCV+ and OCV– of the engine ECU connector.
HINT:
- The correct waveform is as shown in the illustration.
- The waveform frequency (A) becomes longer as the engine speed becomes higher.

NG → **Check and replace engine ECU (See page IN–20).**

OK

4	**Check valve timing controller assembly (See page EM–34).**

NG → **Replace VVT controller assembly, and then go to step 5.**

OK

5	**Check OCV (See page FI–29).**

NG → **Replace OCV and then go to step 6.**

OK

6	**Check OCV and oil filter for blockage.**

NG → **Repair or replace.**

OK

7	Check whether or not DTC P1349 is stored.

PREPARATION:

(a) Clear the DTC (See page DI–3).

(b) Perform a simulation test.

CHECK:

Check whether or not DTC P1349 is stored (See page DI–3).

OK:

DTC P1349 is not stored

OK → **VVT system is OK.***

*: DTCs P1349 are also output when a foreign object is detected in some parts of the system in the engine oil, and then the system returns to normal in a short time. As the engine ECU is controlled to eject a foreign object, there is no problem on the VVT. There is also no problem on the VVT as the oil filter should catch the foreign object in the engine oil.

NG

Replace engine ECU

DI818–01

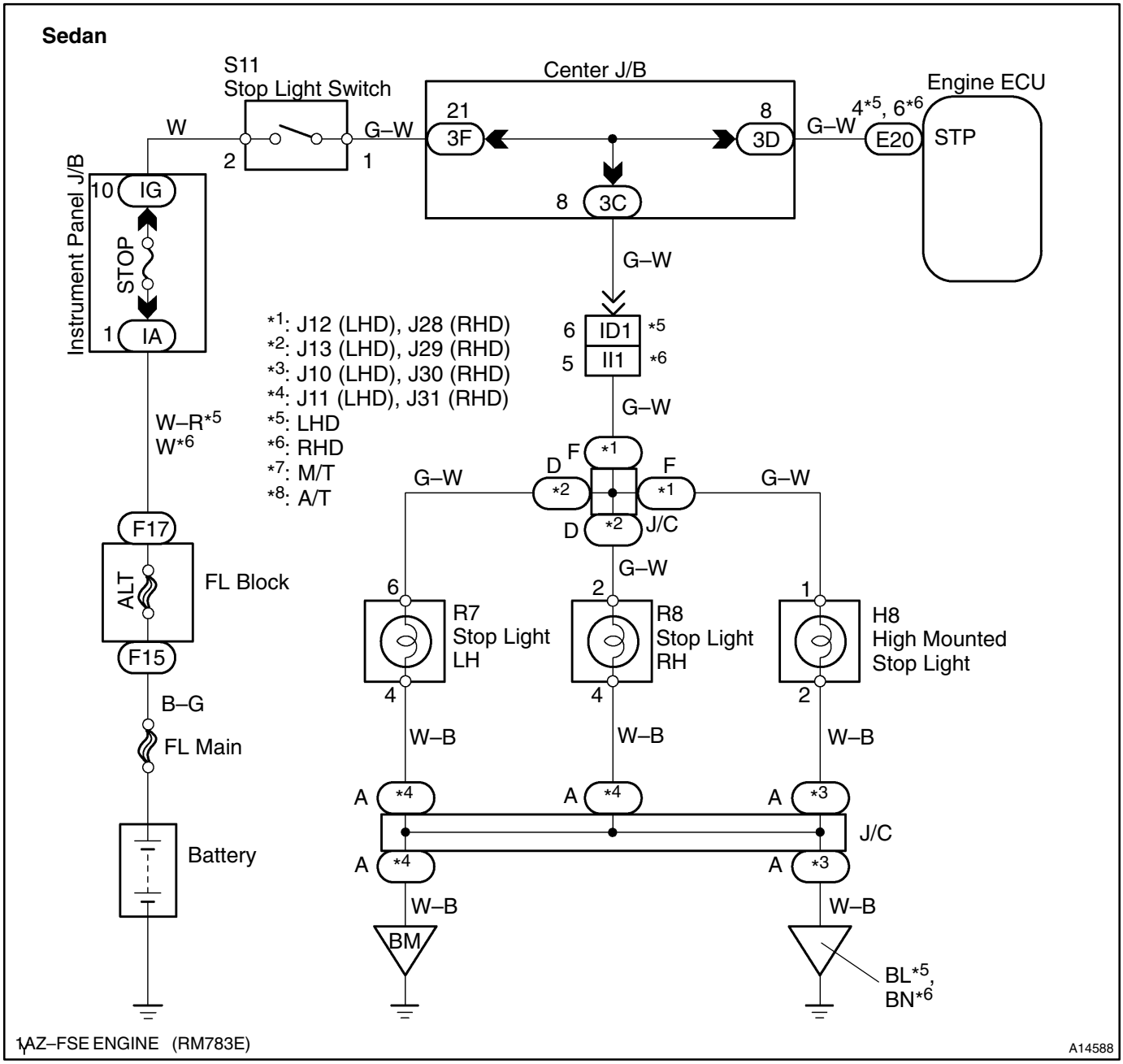
DTC	P1520	Stop Light Switch Signal Malfunction (Only for A/T)

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 Detection Condition	Trouble Area
P1520	Stop light switch does not turn off even once vehicle is driven (2 trip detection logic)	• Short in stop light switch signal circuit • Stop light switch • Engine ECU

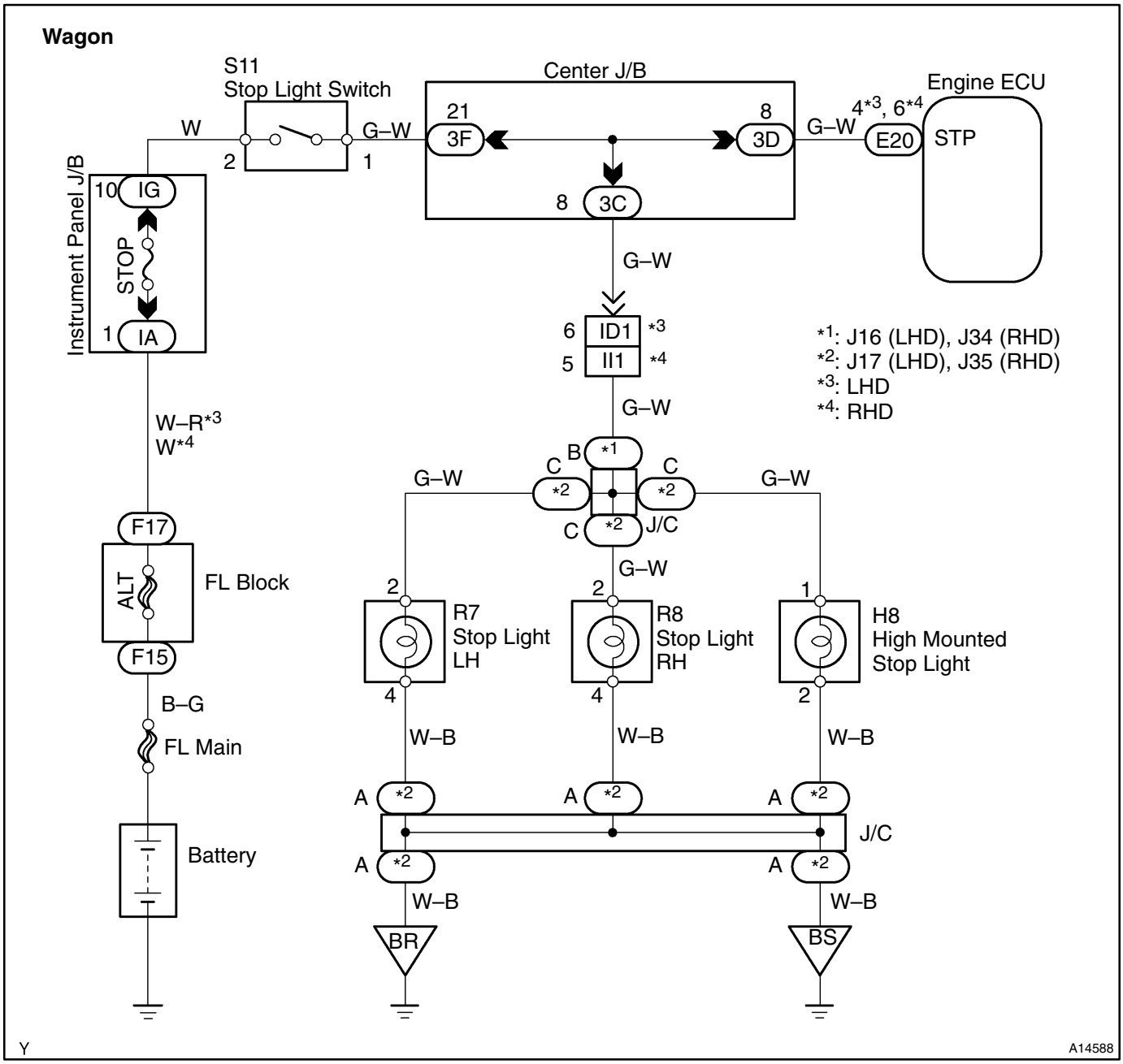
WIRING DIAGRAM

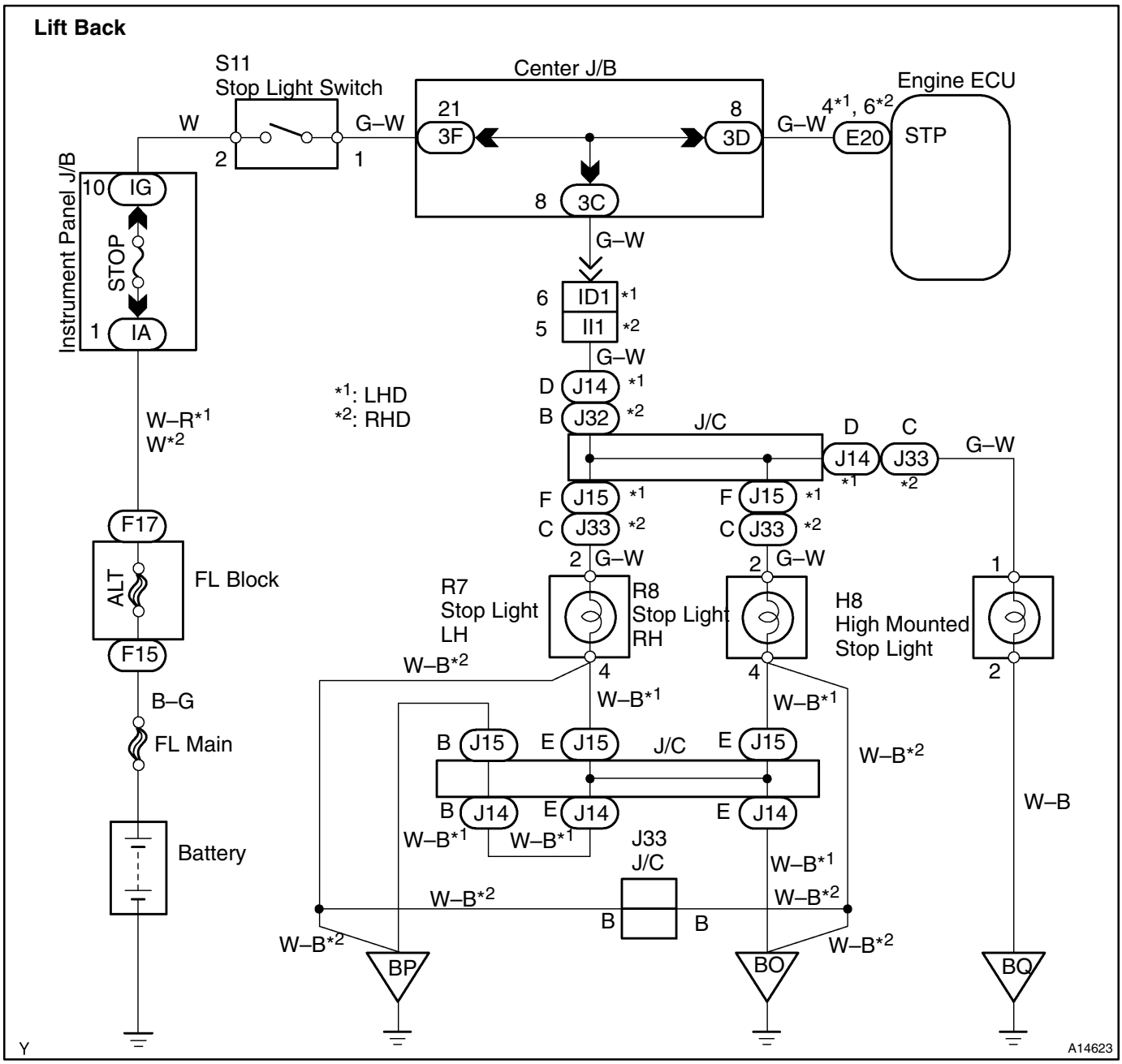


1AZ–FSE ENGINE (RM783E)

A14588

Wagon


S11
Stop Light Switch
W
G–W
2
1
Center J/B
21
3F
8
3D
8
3C
G–W
4*3, 6*4
E20
Engine ECU
STP
Instrument Panel J/B
10
IG
STOP
1
IA
G–W
6
ID1
*3
5
II1
*4
*1: J16 (LHD), J34 (RHD)
*2: J17 (LHD), J35 (RHD)
*3: LHD
*4: RHD
W–R*3
W*4
G–W
B
*1
C
*2
C
*2
G–W
G–W
C
*2
J/C
F17
ALT
F15
FL Block
G–W
2
2
1
R7
Stop Light
LH
R8
Stop Light
RH
H8
High Mounted
Stop Light
4
4
2
B–G
FL Main
W–B
W–B
W–B
A
*2
A
*2
A
*2
J/C
A
*2
A
*2
Battery
W–B
W–B
BR
BS
Y
A14588



INSPECTION PROCEDURE

HINT:

Read freeze frame data using hand–held tester, 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	**Check operation of stop light.**

CHECK:

Check if the stop lights go on and off normally when the brake pedal is depressed and released.

NG	**Check and repair stop light circuit.**

OK

2	**Check STP signal.**

PREPARATION:

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

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

CHECK:

Read the STP signal on the hand–held tester.

OK:

Brake Pedal	STP Signal
Depressed	ON
Released	OFF

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

NG

3	**Check harness and connector between engine ECU and stop light switch (See page IN–20).**

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

OK

Check and replace engine ECU.

DI7JD–02

DTC	P1600	Engine ECU BATT Malfunction

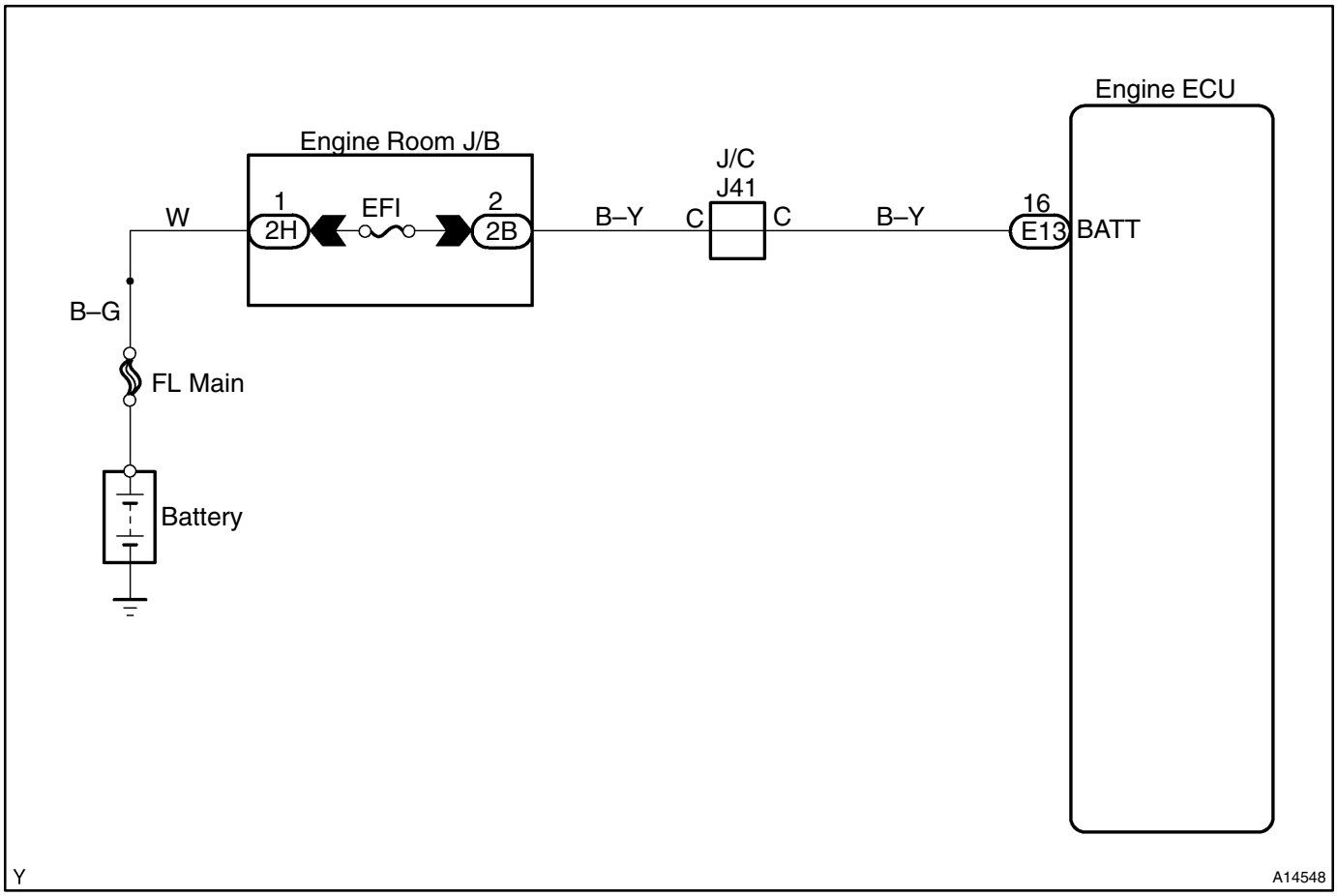
CIRCUIT DESCRIPTION

Battery positive voltage is supplied to terminal BATT of the engine ECU 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 Detection Condition	Trouble Area
P1600	Open in back up power source circuit	• Open in back up power source circuit • Engine ECU

HINT:
If DTC P1600 is displayed, the engine ECU does not store another DTC.

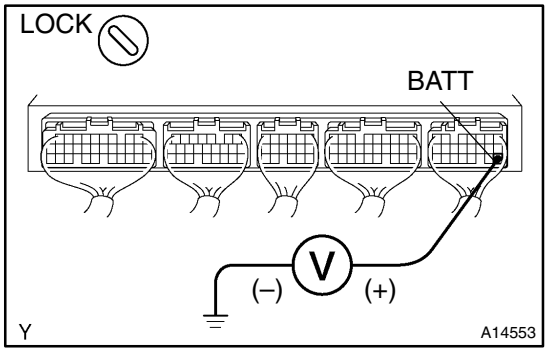
WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:
Read freeze frame data using hand–held tester, as free 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	Check voltage between terminal BATT of engine ECU connector and body ground.

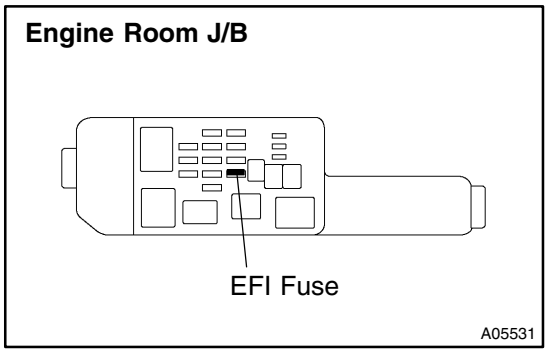


PREPARATION:
Remove the glove compartment (See page FI–56).
CHECK:
Measure the voltage between terminal BATT of the engine ECU connector and body ground.
OK:
Voltage: 9 – 14 V

OK	Check and replace engine ECU (See page IN–20).

NG

2	Check EFI fuse.



PREPARATION:
Remove the EFI fuse from the engine room J/B.
CHECK:
Check the continuity of the EFI fuse.
OK:
Continuity

NG	Check for short in all harness and components connected to EFI fuse.

OK

Check and repair harness or connector between battery and EFI fuse, and EFI fuse and engine ECU (See page IN–20).

DI64I–02

DTC	P1633	Engine ECU Malfunction (ETCS (TH/MTR) Circuit)

CIRCUIT DESCRIPTION

Refer to DTC P1129 on page DI–38.

DTC No.	DTC Detection Condition	Trouble Area
P1633	Engine ECU malfunction	• Engine ECU

INSPECTION PROCEDURE

HINT:

Read freeze frame data using hand–held tester, 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.

Replace engine ECU.

DI819-01

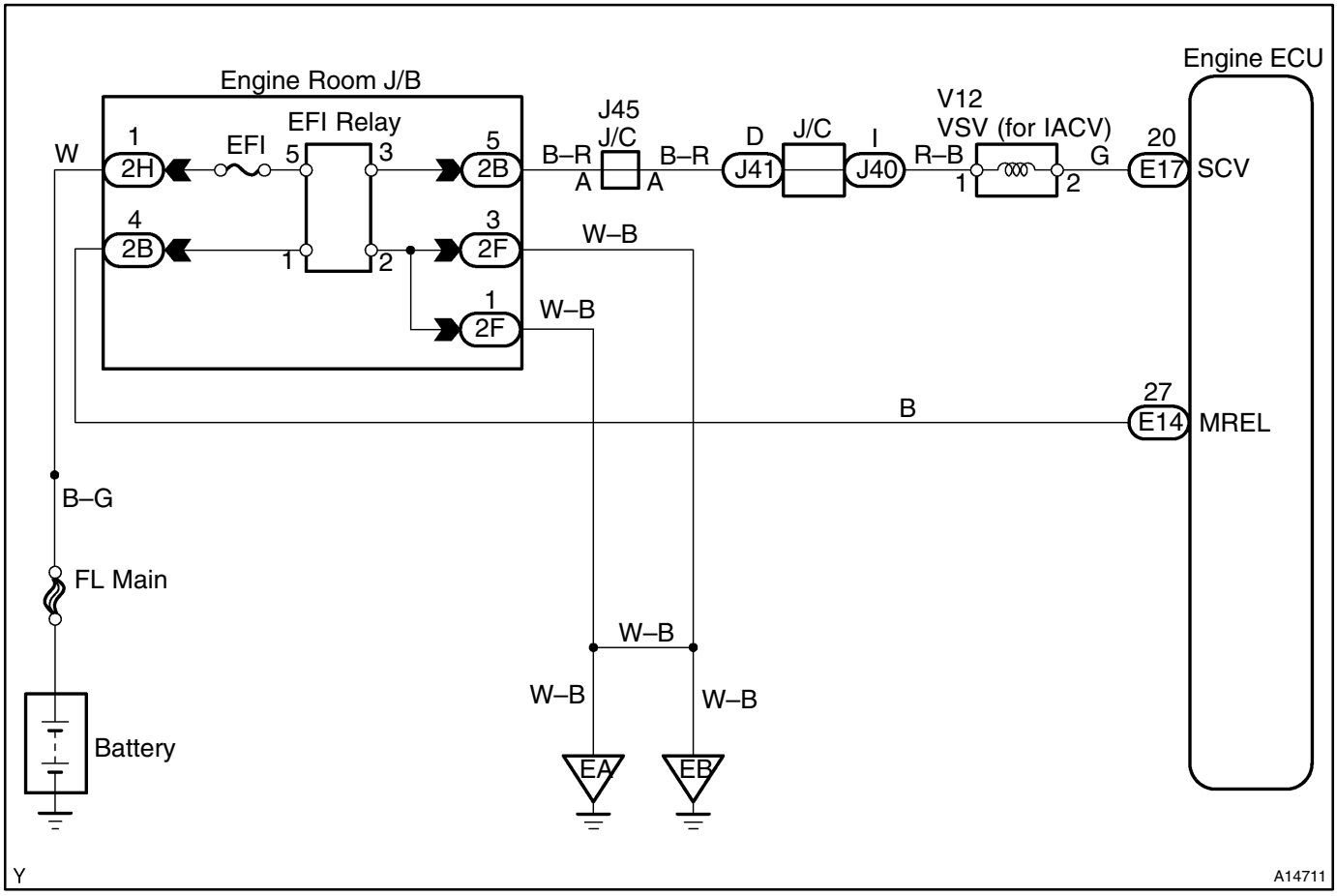
DTC	P1653	VSV for IACV Circuit Malfunction

CIRCUIT DESCRIPTION

The Intake Air Control valve (IACV) is opened and shut by the actuator with intake manifold vacuum. It stabilizes the engine combustion. the IACV operation causes swirl of induction air.

DTC No.	DTC Detection Condition	Trouble Area
P1653	Open or short in VSV for IACV circuit 0.5 sec. or more	• Open or short in VSV circuit for IACV • VSV for IACV • Engine ECU

WIRING DIAGRAM

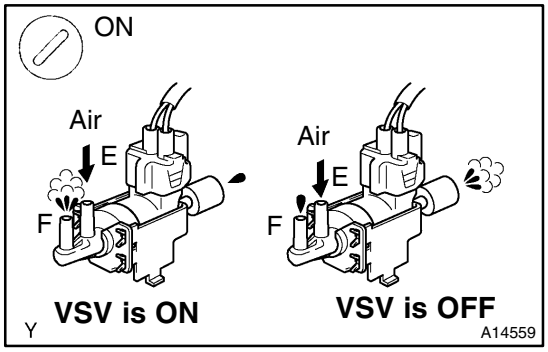


INSPECTION PROCEDURE

HINT:

Read freeze frame data using a hand–held tester, 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	Connect hand–held tester and check operation of VSV for IACV.



PREPARATION:

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the ACTIVE TEST mode on the hand–held tester.

CHECK:

Check the operation of the VSV when the VSV is operated with the hand–held tester.

OK:

VSV is ON:
Air from port E flows out through port F.
VSV is OFF:
Air from port E flows out through port F with a little difficulty.

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

NG

2	Check VSV for IACV (See page FI–38).

NG → **Replace VSV for IACV.**

OK

3	Check for open and short in harness and connector between EFI main relay (Marking: EFI) and engine ECU (See page IN–20).

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

OK

Check and replace engine ECU.

DI81A–01

DTC	P1656	OCV Circuit Malfunction (Bank 1)

CIRCUIT DESCRIPTION

Refer to DTC P1349 on page DI–112.

DTC No.	DTC Detection Condition	Trouble Area
P1656	Open or short in OCV circuit	• Open or short in OCV circuit • OCV for VVT • Engine ECU

WIRING DIAGRAM

Refer to DTC P1349 on page DI–112.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using hand–held tester, 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	**Check OCV circuit.**

PREPARATION:

(a) Start the engine and warme it up.

(b) Connect the hand–held tester and select VVT on the ACTIVE TEST menu.

CHECK:

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

OK:

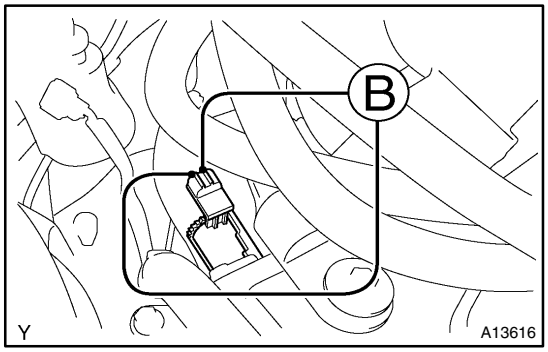
VVT system is OFF (OCV is OFF): Normal engine speed

VVT system is ON (OCV is ON): Rough idle or engine stalled

OK → **Check for intermittent problems.**

NG

2	Check operation of OCV.



PREPARATION:

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

CHECK:

Check the engine speed.

OK:

Rough idle or engine stalled.

NG → **Replace OCV.**

OK

3	Check voltage between terminals OCV+ and OCV– of engine ECU connector (See page DI–112).

NG → **Check and replace engine ECU (See page IN–20).**

OK

4	Check for open and short in harness and connector between OCV and engine ECU (See page IN–20).

NG → **Repair or replace.**

OK

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

DTC	P1780	Neutral Start Switch Malfunction (Only for A/T)

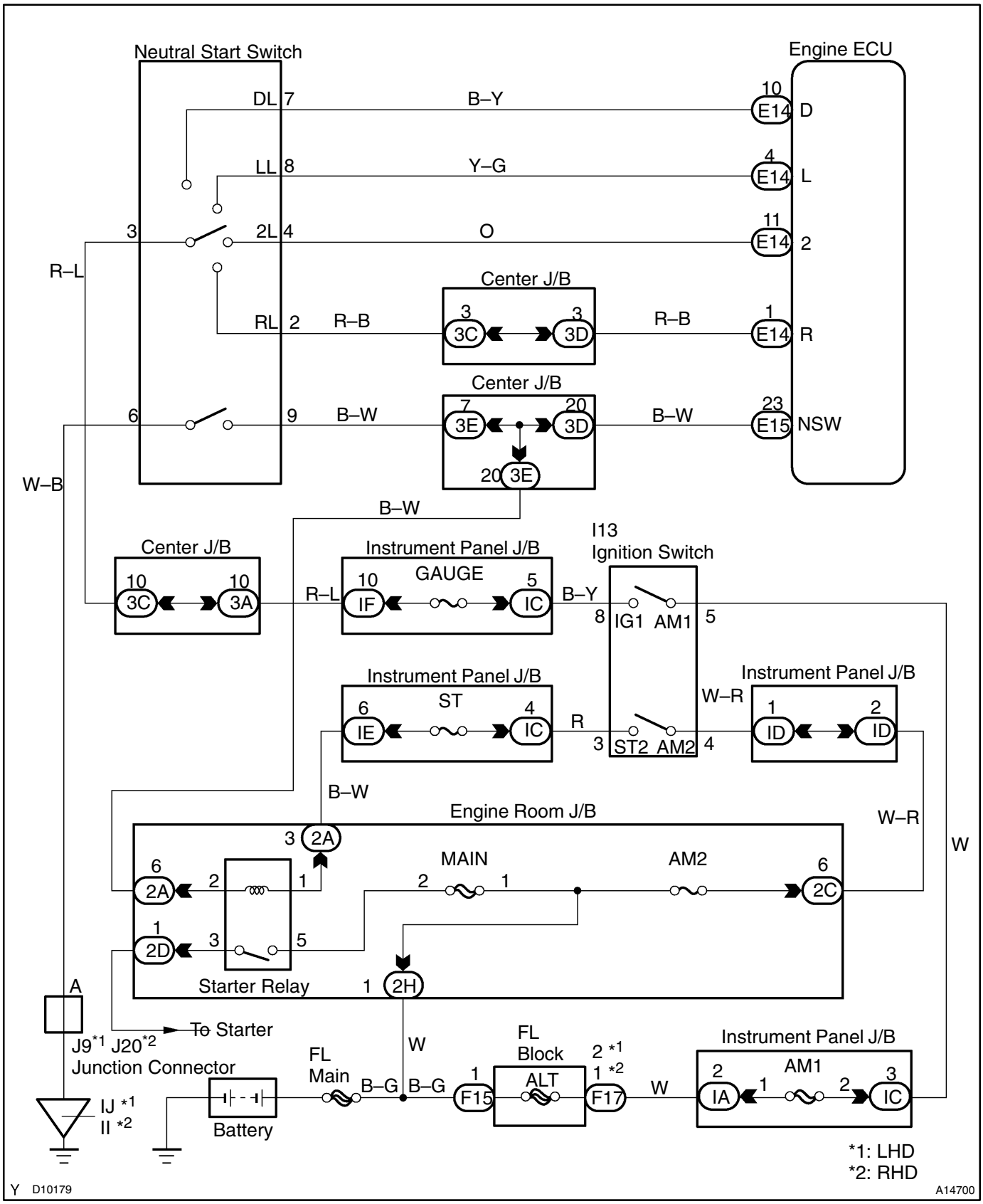
CIRCUIT DESCRIPTION

The neutral start switch goes on when the shift lever is in the N or P position. When it goes on, terminal NSW of the engine ECU is grounded to body ground via the starter relay, thus the terminal NSW voltage becomes 0V. When the shift lever is in the D, 2, L or R position, the neutral start switch goes off, so the voltage of the terminal NSW becomes battery voltage and the voltage of the engine ECU internal power source. If the shift lever is shifted from the N position to the D position, this signal is used for air–fuel ratio correction and for idle speed control (estimated control), etc.

DTC No.	DTC Detection Condition	Trouble Area
P1780	When driving under conditions (a) and (b) for 30 sec. or more neutral start switch is ON (N position): (2 trip detection logic) (a) Vehicle speed: 40 km/h (25 mph) or more (b) Engine speed: 1,500 – 4,000 rpm	• Short in neutral start switch circuit • Neutral start switch • Engine ECU

HINT:
After confirming DTC P1780, use the hand–held tester to confirm the PNP switch signal from the CURRENT DATA.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using hand–held tester, 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 REVERSE, 2ND, DRIVE and LOW signals.**

PREPARATION:

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

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

CHECK:

Shift the lever into the R, D, 2 and L positions, and read the REVERSE, 2ND, DRIVE and LOW signals on the hand–held tester.

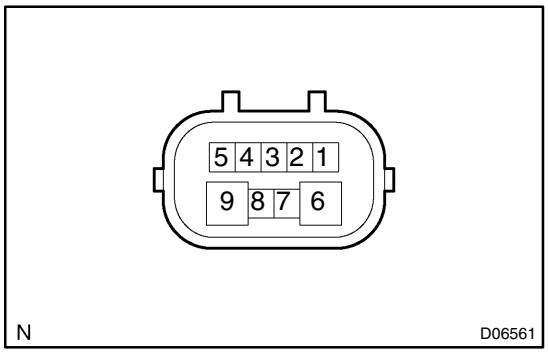
OK:

Shift Range	Signal
2	2ND OFF → ON
L	LOW OFF → ON
D	DRIVE OFF → ON
R	REVERSE OFF → ON
P, N	PNP OFF → ON

OK → **Check and replace engine ECU (See page IN–20).**

NG

2	**Check neutral start switch.**



PREPARATION:

(a) Jack up the vehicle.

(b) Remove the neutral start switch.

CHECK:

Check the continuity between the terminals shown below when the shift lever is shifted to each position.

Shift Range	Terminal No. to continuity	
P	6 – 9	1 – 3
R	2 – 3	–
N	6 – 9	3 – 5
D	3 – 7	–
2	3 – 4	–
L	3 – 8	–

OK:

There is continuity.

NG → **Replace neutral start switch.**

OK

Repair or replace harness and connector between battery and neutral start switch, and neutral start switch and engine ECU (See page IN–20).

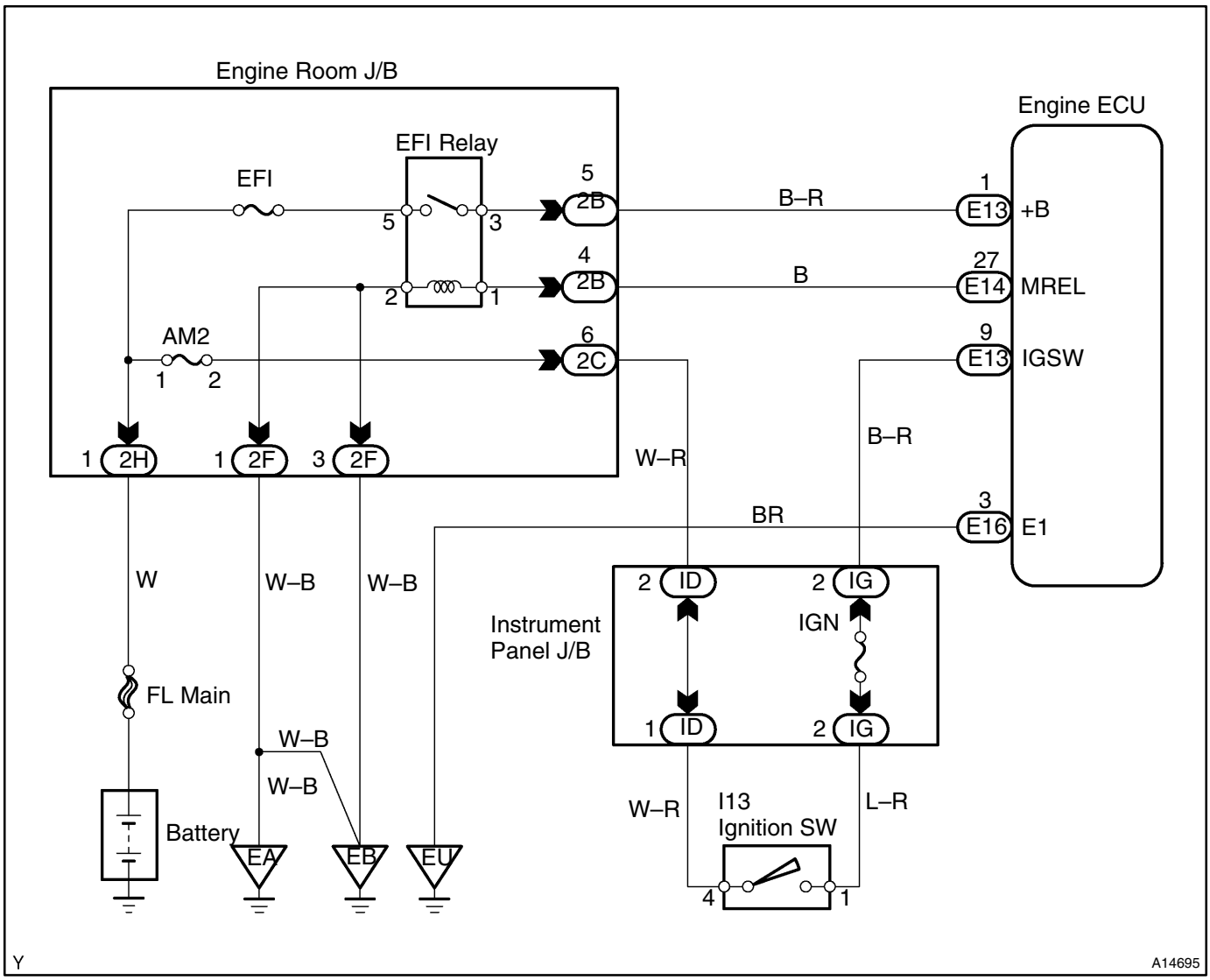
DI7HA–06

Engine ECU Power Source Circuit

CIRCUIT DESCRIPTION

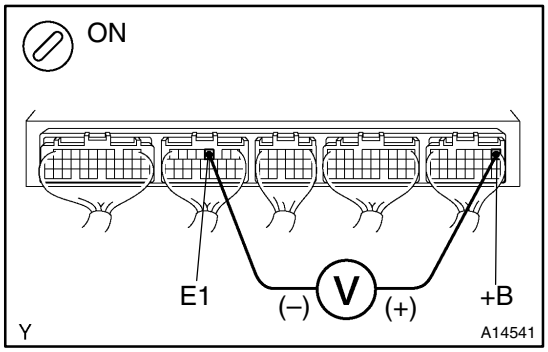
When the ignition switch is turned ON, battery voltage is applied to terminal IGSW of the engine ECU. And the EFI main relay (Marking: EFI) control circuit in the engine ECU sends a signal to the terminal MREL of the engine ECU switching on the EFI main relay.
This signal causes current to flow to the coil, and it closes the contacts of the EFI main relay and supplys power to terminals +B of the engine ECU.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check voltage between terminals +B and E1 of engine ECU connectors.**



PREPARATION:

(a) Remove the glove compartment (See page FI–56).

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals +B and E1 of the engine ECU connectors.

OK:

Voltage: 9 – 14 V

OK → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–21).**

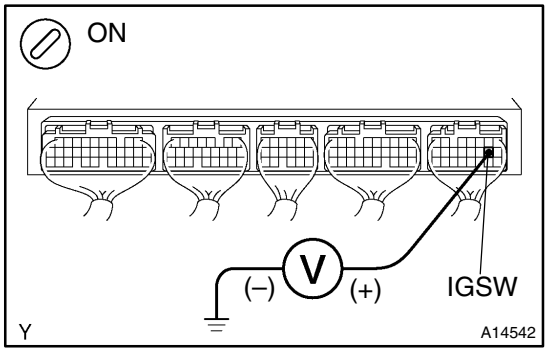
NG

2	**Check for open in harness and connector between terminal E1 of engine ECU and body ground (See page IN–20).**

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

OK

3	Check voltage between terminal IGSW of engine ECU connector and body ground.



PREPARATION:
(a) Remove the glove compartment (See page FI–56).
(b) Turn the ignition switch ON.

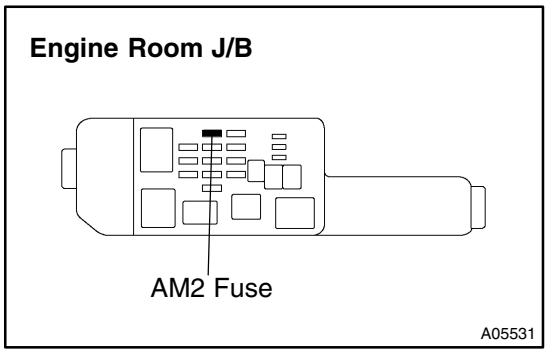
CHECK:
Measure the voltage between terminal IGSW of the engine ECU connector and the body ground.

OK:
Voltage: 9 – 14 V

OK	Go to step 7.

NG

4	Check AM2 fuse.



PREPARATION:
Remove the AM2 fuse from the engine room J/B.

CHECK:
Check the continuity of the AM2 fuse.

OK:
Continuity

NG	Replace AM2 fuse.

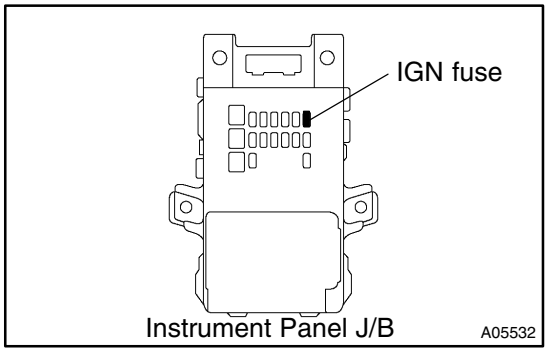
OK

5	Check ignition switch (See Pub. No. RM599E, BE section).

NG	Replace ignition switch.

OK

6	Check IGN fuse.



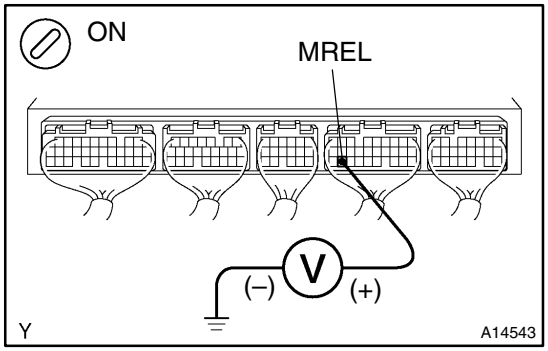
PREPARATION:
Remove IGN fuse from the instrument panel J/B.
CHECK:
Check the continuity of the IGN fuse.
OK:
Continuity

NG → **Replace IGN fuse.**

OK

Check and repair harness and connector between battery and ignition switch, and ignition switch and engine ECU.

7	Check voltage between terminal MREL of engine ECU connector and body ground.



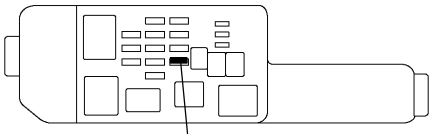
PREPARATION:
(a) Remove the glove compartment (See page FI–56).
(b) Turn the ignition switch ON.
CHECK:
Measure the voltage between terminal MREL of the engine ECU connector and the body ground.
OK:
Voltage: 9 – 14 V

NG → **Check and replace engine ECU (See page IN–20).**

OK

8	Check EFI fuse.

Engine Room J/B



EFI Fuse

A05531

PREPARATION:

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

CHECK:

Check the continuity of the EFI fuse.

OK:

Continuity

NG → **Check for short in all harness and components connected to EFI fuse.**

OK

9	Check EFI main relay (Marking: EFI MAIN) (See page FI–32).

NG → **Replace EFI main relay.**

OK

10	Check for open and short in harness and connector between terminal MREL of engine ECU and body ground (See page IN–20).

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

OK

Check and repair harness or connector between EFI fuse and battery.

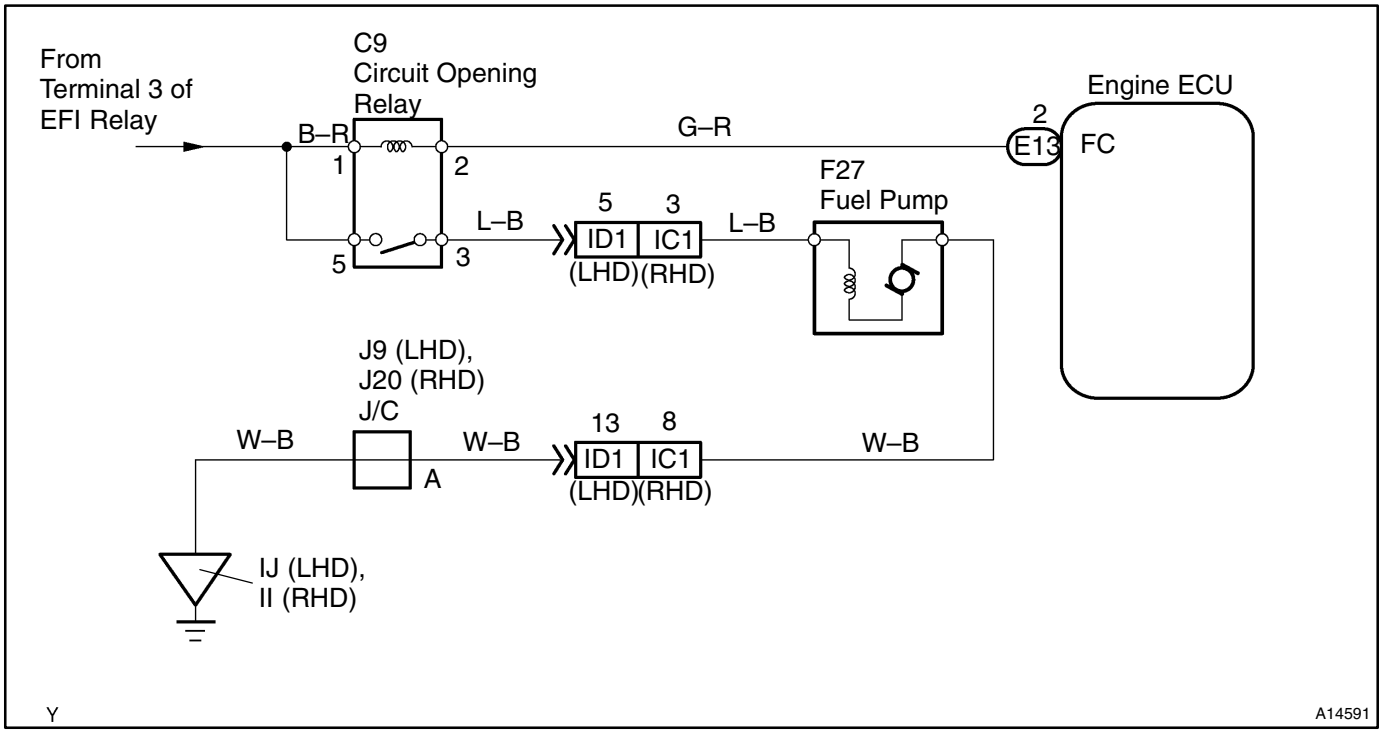
DI81C–01

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 coil and also current flows to terminal STA of engine ECU (STA signal).
When the STA signal and NE signal are input to the engine ECU, Tr is turned ON, current flows to coil of the circuit opening relay, the relay switches on, power is supplied to the fuel pump and then the fuel pump operates. While the NE signal is generated (engine running), the engine ECU keeps Tr ON (circuit opening relay ON) and the fuel pump also keeps operating.

WIRING DIAGRAM



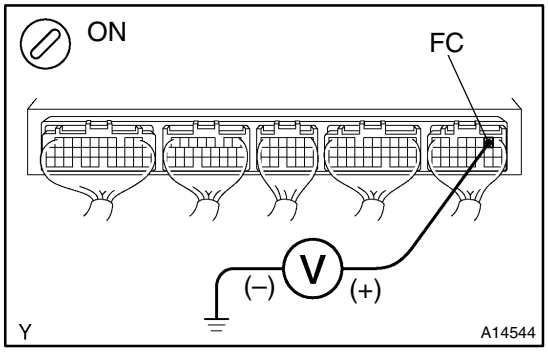
INSPECTION PROCEDURE

1	**Connect hand–held tester and check operation of fuel pump (See page DI–3).**

NG → **Proceed to next circuit inspection shown in problem symptoms table (See page DI–21).**

OK

2	**Check voltage between terminal FC of engine ECU connector and body ground.**



PREPARATION:

(a) Remove the glove compartment (See page FI–56).

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminal FC of the engine ECU connector and the body ground.

OK:

Voltage: 9 – 14 V

OK → **Go to step 2**

NG

Check for open in harness and connector between EFI main relay (Marking: EFI) and circuit opening relay, and circuit opening relay and engine ECU.

3	**Check for engine ECU power source circuit (See page DI–132).**

NG → **Repair or replace.**

OK

4	**Check circuit opening relay (See page FI–33).**

NG → **Replace circuit opening relay.**

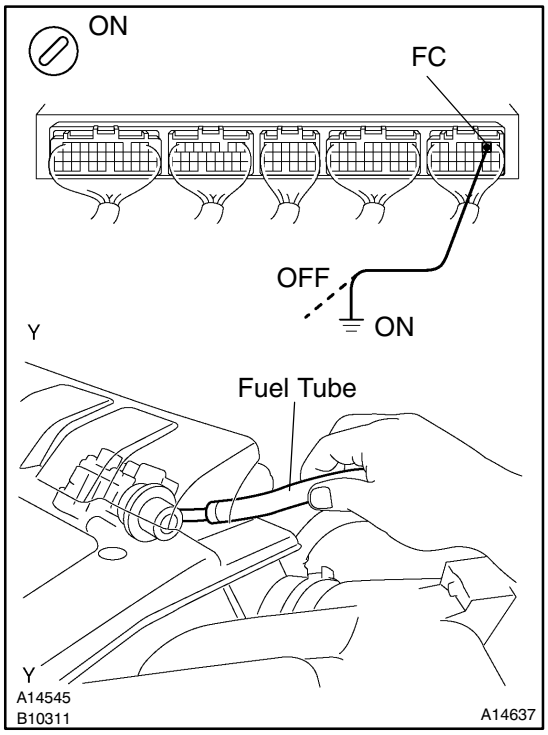
OK

5	Check fuel pump (See page FI–5).

NG → Repair or replace fuel pump.

OK

6	Check fuel pump operation.



PREPARATION:

(a) Remove the glove compartment (See page FI–56).
(b) Connect the hand held tester to the DLC3.
(c) Turn the ignition switch ON and push the hand–held tester main switch ON.
(d) Select the ACTIVE TEST mode on the hand–held tester.
(e) If you have no hand–held tester, connect the (+) and (–) leads from the battery to the fuel pump connector (See page FI–5).

CHECK:

Check that the pulsation damper screw rises up when the fuel pump operates.

OK:

The pulsation damper screw rises up.

OK → **Proceed to next circuit inspection shown in problem symptoms table (See page DI–21).**

NG

7	Check for open in harness and connector between circuit opening relay and fuel pump, and fuel pump and body ground (See page IN–20).

NG → Repair or replace harness or connector.

OK

Check and replace engine ECU.

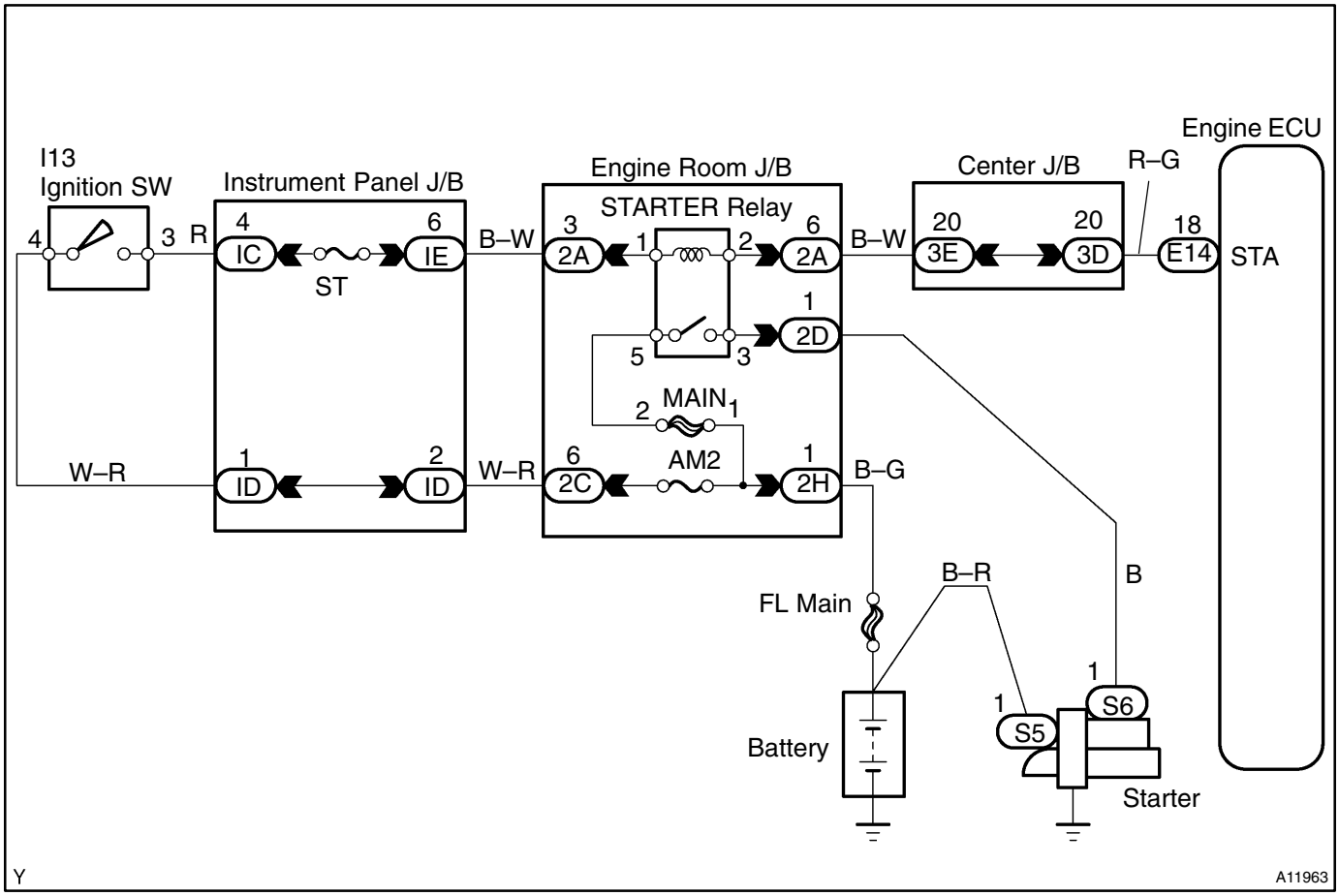
DI7H9–04

Starter Signal Circuit (Only for M/T)

CIRCUIT DESCRIPTION

When the engine is cranked, the intake air flow becomes 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 voltage is applied to terminal STA of the engine ECU. 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 in page DI–21.

1	**Check STA signal.**

PREPARATION:

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

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

CHECK:

Read the STA signal on the hand–held tester while the starter is operating.

OK:

Ignition Switch Position	ON	START
STA Signal	OFF	ON

OK → **Proceed to next circuit inspection shown in problem symptoms table (See page DI–21).**

NG

2	**Check for open in harness and connector between engine ECU and starter relay (See page IN–20).**

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

OK

Check and replace engine ECU.

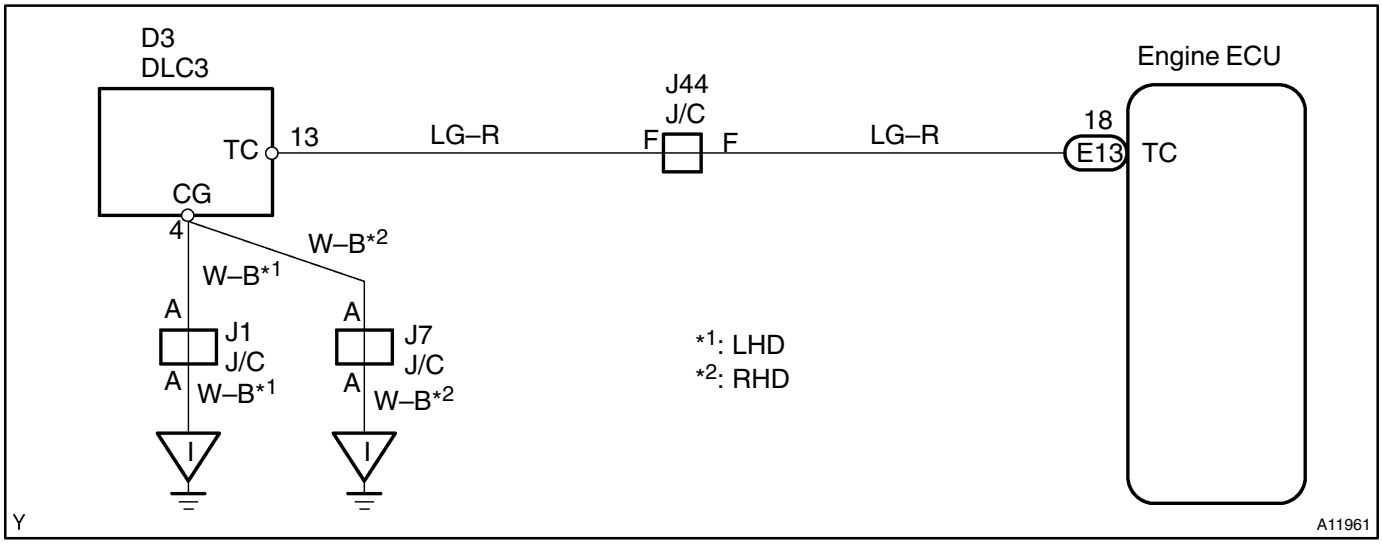
DI6SV–08

TC Terminal Circuit

CIRCUIT DESCRIPTION

Terminal TC and CG are located in the DLC3. When connecting these terminals, DTCs in the normal mode or the test mode can be read through the CHK ENG (MIL) flashing in combination meter.

WIRING DIAGRAM

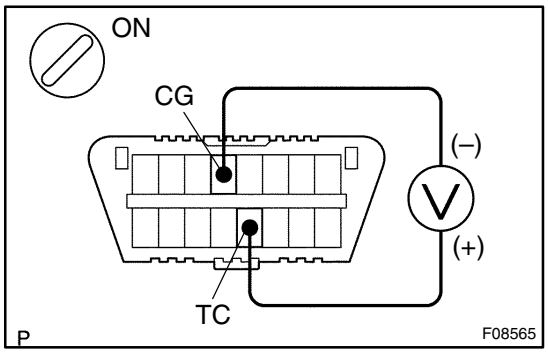


INSPECTION PROCEDURE

HINT:

- Even though terminal TC is not connected with terminal CG, the CHK ENG (MIL) blinks.
- For the above phenomenon, an open or a short in the wire harness, or malfunction inside the engine ECU is the likely cause.

1	**Check voltage between terminals TC and CG of DLC3.**



PREPARATION:

Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals TC and CG of the DLC3.

OK:

Voltage: 9 – 14 V

OK	**Check and replace engine ECU (See page IN–20).**

NG

2	Check continuity between terminal CG of DLC3 and body ground.

NG → Repair or replace harness or connector.

OK

3	Check for open and short circuit in harness and connector between engine ECU and DLC3, and DLC3 and body ground (See page IN–20).

NG → Repair or replace harness or connector.

OK

Check and replace engine ECU.

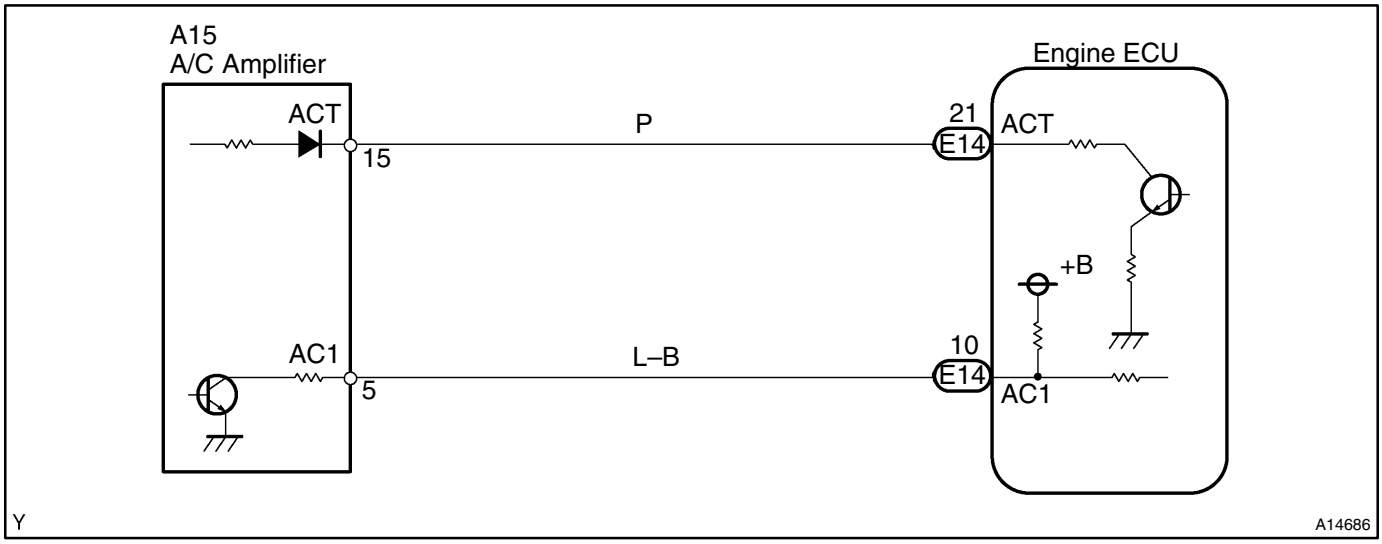
DI81D–01

A/C Cut Control Circuit

CIRCUIT DESCRIPTION

This circuit cuts A/C operation during the vehicle acceleration in order to increase acceleration performance. During acceleration with the vehicle speed at 25 km/h (16 mph) (A/T model), at 40 km/h (25 mph) (M/T model) or less, engine speed at 1,200 rpm (A/T model),at 1,600 rpm (M/T model) or less and throttle valve opening angle at 60 ° or more, the A/C magnet switch is turned OFF for several seconds.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Connect hand–held tester and check operation of A/C cut control.**

PREPARATION:

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Start the engine and switch the A/C switch ON.

HINT:

The A/C magnet clutch is turned ON.

(d) Select the ACTIVE TEST mode on the hand–held tester.

CHECK:

Check the operation of the A/C magnet clutch cut when the A/C cut control is operated with the hand–held tester.

OK:

A/C magnet clutch is turned OFF.

OK → **Proceed to next circuit inspection shown in problem symptoms table (See page DI–21).**

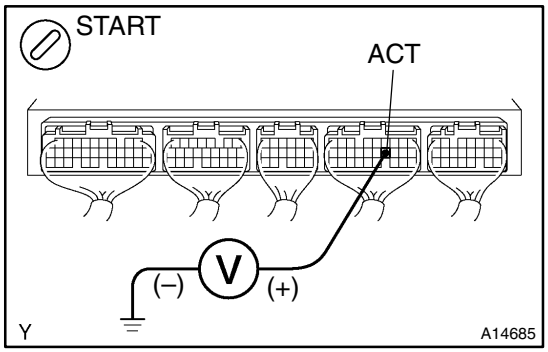
NG

2	**Check for open and short in harness and connector between engine ECU and A/C amplifier (See page IN–20).**

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

OK

3	**Check voltage between terminal ACT of engine engine ECU and body ground.**



PREPARATION:

(a) Remove the glove compartment (See page FI–56).

(b) Start the engine.

CHECK:

Measure the voltage between terminal ACT of the engine ECU connector and the body ground when the A/C switch is turned to ON and OFF.

OK:

A/C Switch Condition	Voltage
ON	9 – 14 V
OFF	Below 2.0 V

NG → **Check and replace A/C amplifier (See page IN–20).**

OK

Check and replace engine ECU (See page IN–20).

DI81F–01

Stop Light Switch Circuit (Only for M/T)

CIRCUIT DESCRIPTION

Refer to DTC P1520 on page DI–116.

WIRING DIAGRAM

Refer to DTC P1520 on page DI–116.

INSPECTION PROCEDURE

1	**Check operation of stop light.**

CHECK:

Check if the stop lights go on and off normally when the brake pedal is operated and released.

NG → **Check and repair stop light circuit.**

OK

2	**Check STP signal.**

PREPARATION:

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

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

CHECK:

Read the STP signal on the hand–held tester.

OK:

Brake Pedal	STP Signal
Depressed	ON
Released	OFF

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

NG

3	**Check harness and connector between engine ECU and stop light switch (See page IN–20).**

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

OK

Check and replace engine ECU.

DI81E–01

Injector Circuit

CIRCUIT DESCRIPTION

Refer to DTC P0300 – P0304 on page DI–67.

WIRING DIAGRAM

Refer to DTC P0300 – P0304 on page DI–67.

INSPECTION PROCEDURE

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

CHECK:

(a) Check the connection conditions of the wire harness and connector.

(b) Check the disconnection, piping and break of the vacuum hose.

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

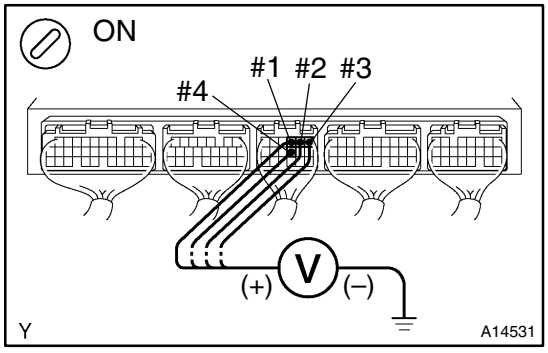
OK

2	**Check spark plug and spark of misfire cylinder (See page FI–18).**

NG → **Replace or check ignition system (See page IG–1).**

OK

3	**Check voltage of engine ECU terminals for injector of faulty cylinder.**



PREPARATION:

(a) Remove the glove compartment (See page FI–56).

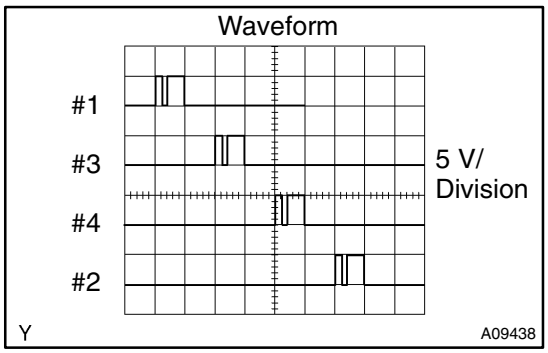
(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between applicable terminals #10 – #40 of the engine ECU connector and the body ground.

OK:

Voltage: 9 – 14 V



Reference: INSPECTION USING OSCILLOSCOPE
With the engine idling, check the waveform between terminals #1 – #4 and E01 of the engine ECU connector.
HINT:
The correct waveform is as shown in the illustration.

OK	**Go to step 5.**

NG

4	**Check resistance of injector of misfire cylinder (See page FI–18).**

NG	**Replace injector.**

OK

Check for open and short in harness and connector between injector and engine ECU (See page IN–20).

5	**Check fuel pressure (See page FI–5).**

NG	**Check and repair fuel pump, pressure regulator, fuel pipe line and filter (See page FI–1).**

OK

6	**Check injector injection (See page FI–18).**

NG	**Replace injector.**

OK

7	**Check vacuum sensor (See page FI–45) and water temperature sensor (See page FI–41).**

NG → **Repair or replace.**

OK

Check compression pressure (See page EM–4) and valve clearance (See page EM–5).