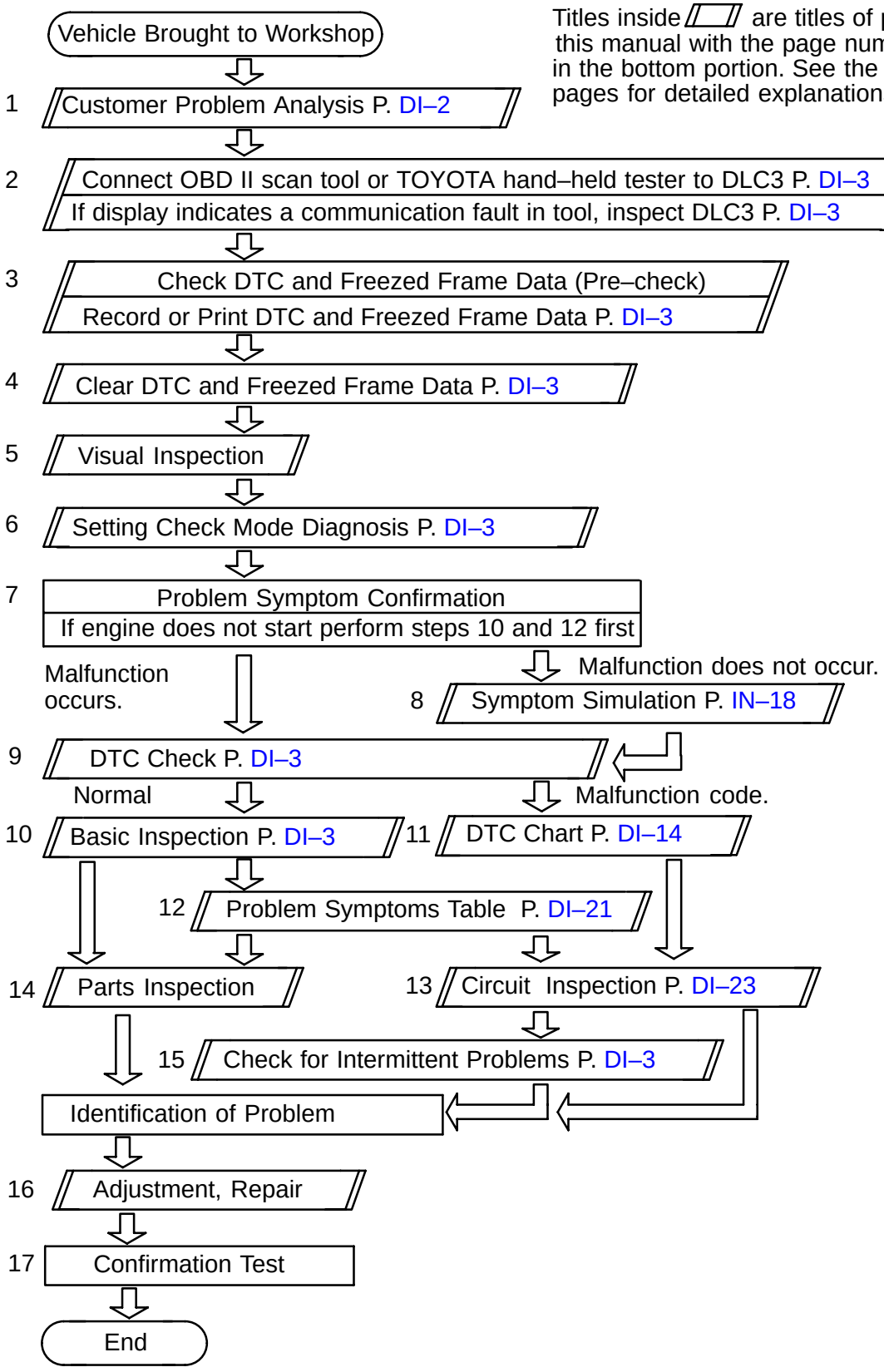
ENGINE

DI37Q–03

HOW TO PROCEED WITH TROUBLESHOOTING

Troubleshoot in accordance with the procedure on the following pages.

Titles inside ▱ are titles of pages in this manual with the page number indicated in the bottom portion. See the indicated pages for detailed explanations.



DI37R–03

CUSTOMER PROBLEM ANALYSIS CHECK

ENGINE CONTROL SYSTEM Check Sheet

Inspector's Name _____

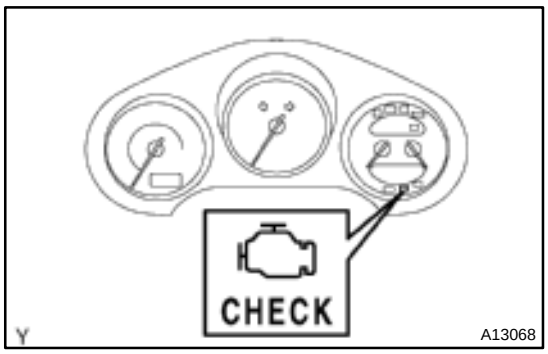
Customer's Name		Model and Model Year	
Driver's Name		Frame No.	
Data Vehicle Brought in		Engine Model	
License No.		Odometer Reading	miles km

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

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 Temperature	☐ Cold ☐ Warming up ☐ After warming up ☐ Any temperature ☐ Other _____
	Engine Operation	☐ Starting ☐ Just after starting (min.) ☐ Idling ☐ Racing ☐ Driving ☐ Constant speed ☐ Acceleration ☐ Deceleration ☐ A/C switch ON/OFF ☐ Other _____

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

DI37S–04



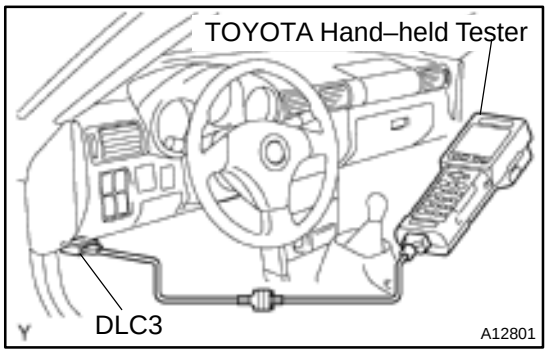
PRE–CHECK

1. DIAGNOSIS SYSTEM

(a) Description

- When troubleshooting OBD II vehicles, the only difference from the usual troubleshooting procedure is that you need to connect the vehicle to the OBD II scan tool complying with SAE J1978 or TOYOTA hand–held tester, and read off various data output from the vehicle's ECM.
- OBD II regulations require that the vehicle's on–board computer lights up the Malfunction Indicator Lamp (MIL) on the instrument panel when the computer detects a malfunction in the emission control system/components or in the powertrain control components which affect vehicle emissions, or a malfunction in the computer. In addition to the MIL lighting up when a malfunction is detected, the applicable Diagnostic Trouble Code (DTC) prescribed by SAE J2012 are recorded in the ECM memory (See page DI–14).

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



- To check the DTCs, connect the OBD II scan tool or TOYOTA hand–held tester to the Data Link Connector 3 (DLC3) on the vehicle. The OBD II scan tool or TOYOTA hand–held tester also enables you to erase the DTCs and check freezed frame data and various forms of engine data (For operating instructions, see the OBD II scan tool's instruction book.).

  DTCs include SAE controlled codes and manufacturer controlled codes. SAE controlled codes must be set as prescribed by the SAE, while manufacturer controlled codes can be set freely by the manufacturer within the prescribed limits (See DTC chart on page DI–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, and ensure thorough malfunction detection. By switching the ECM to the check mode when troubleshooting, the technician can cause the MIL to light up for a malfunction that is only detected once or momentarily (TOYOTA hand–held tester only)
(See page DI–3).
- *2 trip detection logic:
When a malfunction is first detected, the malfunction is temporarily stored in the ECM memory (1st trip).

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

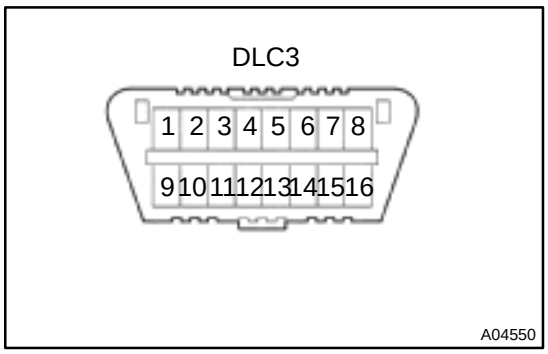
- Freeze frame data:
Freeze frame data records the engine condition when a misfire (DTC P0300 – P0304) or fuel trim malfunction (DTC P0171, P0172, P0174 and P0175) or other malfunction (first malfunction only), is detected.
Because freeze frame data records the engine conditions (fuel system, calculated load, engine coolant temperature, fuel trim, engine speed, vehicle speed, etc.) when the malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

Priorities for troubleshooting:

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

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

(1) DTCs other than fuel trim malfunction (DTCs P0171, P0172, P0174 and P0175) and misfire (DTCs P0300 – P0304).
(2) Fuel trim malfunction (DTCs P0171, P0172, P0174 and P0175).
(3) Misfire (DTCs P0300 – P0304).

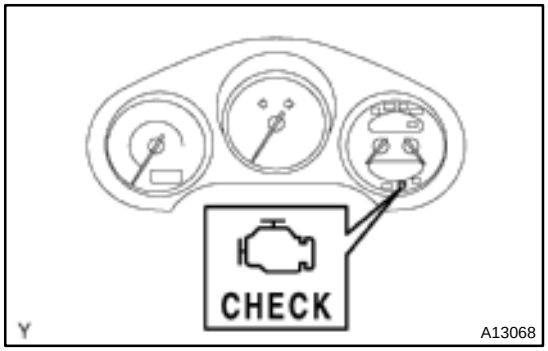


(b) Check the DLC3.
The vehicle's ECM uses ISO 9141–2 for communication. The terminal arrangement of DLC3 complies with SAE J1962 and matches the ISO 9141–2 format.

Terminal No.	Connection/Voltage or Resistance	Condition
7	Bus ⊕ Line/Pulse generation	During transmission
4	Chassis Ground ↔ Body Ground/1 Ω or less	Always
5	Signal Ground ↔ Body Ground/1 Ω or less	Always
16	Battery Positive ↔ Body Ground/9 – 14 V	Always

HINT:
If your display shows UNABLE TO CONNECT TO VEHICLE when you have connected the cable of the OBD II scan tool or TOYOTA hand–held tester to the DLC3, turned the ignition switch ON and operated the scan tool, there is a problem on the vehicle side or tool side.

- If communication is normal when the tool is connected to another vehicle, inspect the DLC3 on the original vehicle.
- If communication is still not possible when the tool is connected to another vehicle, the problem is probably in the tool itself, so consult the Service Department listed in the tool's instruction manual.



2. INSPECT DIAGNOSIS (Normal Mode)

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

HINT:
If the MIL does not light up, troubleshoot the combination meter (See page BE–2).

(2) When the engine started, the MIL should go off. If the lamp remains on, the diagnosis system has detected a malfunction or abnormality in the system.

(b) Check the DTC.

NOTICE:

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

- **TOYOTA hand–held tester only:**
  When the diagnosis system is switched from the normal mode to the check mode, it erases all DTCs and freezed frame data recorded in the normal mode. So before switching modes, always check the DTCs and freezed frame data, and note them down.
  (1) Prepare the OBD II scan tool (complying with SAE J1978) or TOYOTA hand–held tester.
  (2) Connect the OBD II scan tool or TOYOTA hand–held tester to DLC3.
  (3) Turn the ignition switch ON and push the OBD II scan tool or TOYOTA hand–held tester switch ON.
  (4) Use the OBD II scan tool or TOYOTA hand–held tester to check the DTCs and freezed frame data, note them down (For operating instructions, see the OBD II scan tool's instruction book).

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

(5) See page DI–3 to confirm the details of the DTCs.

NOTICE:

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

(c) Clear the DTC.
The DTC and freezed frame data will be erased by either action.
(1) Operating the OBD II scan tool (complying with SAE J1978) or TOYOTA hand–held tester to erase the codes (For operating instructions, see the OBD II scan tool's instruction book).
(2) Disconnecting the battery terminals or EFI1 fuse.

NOTICE:
If the TOYOTA hand–held tester switches the ECM from the normal mode to the check mode or vise–verse, or if the ignition switch is turned from ON to ACC or OFF during the check mode, the DTCs and freezed frame data will be erased.

3. INSPECT DIAGNOSIS (Check Mode)

HINT:

TOYOTA hand–held tester only:

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

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

(a) Check the DTC.

(1) Initial conditions

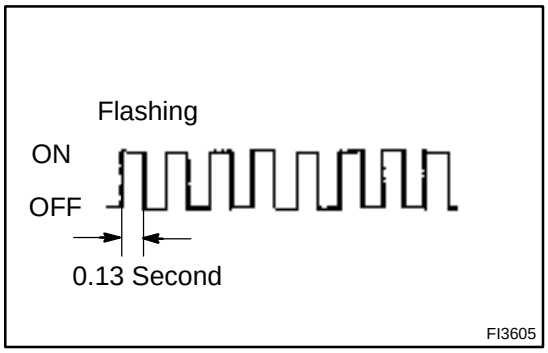
- Battery positive voltage 11V or more
- Throttle valve fully closed
- Transmission in neutral position
- A/C switched OFF

(2) Turn the ignition switch OFF.

(3) Prepare the TOYOTA hand–held tester.

(4) Connect the TOYOTA hand–held tester to the DLC3.

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



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

(7) Check if the MIL blinks.

NOTICE:

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

(8) Start the engine (The MIL goes out after the engine start).

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

NOTICE:

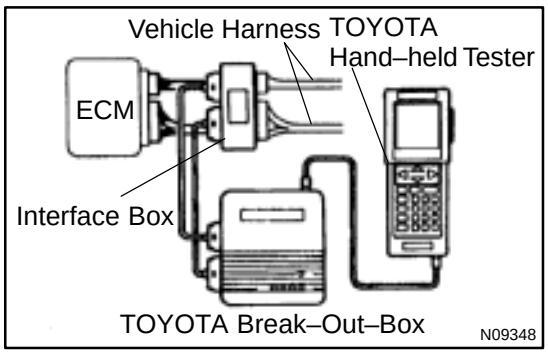
Leave the ignition switch ON until you have checked the DTC, etc.

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

HINT:

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

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



(b) The ECM terminal values measurement using TOYOTA break–out–box and TOYOTA hand–held tester
  (1) Hook up the TOYOTA break–out–box and TOYOTA hand–held tester to the vehicle.
  (2) Read the ECM input/output values by following the prompts on the tester screen.

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

4. FAIL–SAFE CHART

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

DTC No.	Fail–Safe Operation	Fail–Safe Deactivation Conditions
P0110	Intake air temperature is fixed at 20°C (68°F)	Returned to normal condition
P0115	Engine coolant temperature is fixed at 80°(176°F)	Returned to normal condition
P0120	VTA is fixed at 0°	The following condition must be repeated at least 2 times consecutively VTA ≧ ×0.1 V and ≦ 0.95 V
P0325	Max. timing retardation	Ignition switch OFF
P1300	Fuel cut	IGF signal is detected for 4 consecutive ignitions

5. CHECK FOR INTERMITTENT PROBLEMS

TOYOTA hand–held tester only:
By putting the vehicle’s ECM in the check mode, 1 trip detection logic is possible instead of 2 trip detection logic and sensitivity to detect open circuits is increased. This makes it easier to detect intermittent problems.

(1) Clear the DTC (See step 2).
(2) Set the check mode (See step 3).
(3) Perform a simulation test (See page IN–18).
(4) Check the connector and terminal (See page IN–28).
(5) Handle the connector (See page IN–28).

6. BASIC INSPECTION

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

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

NO → **Charge or replace battery.**

YES

2	**Is engine cranked?**

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

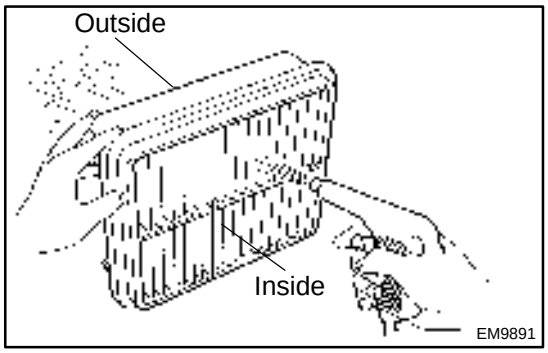
YES

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

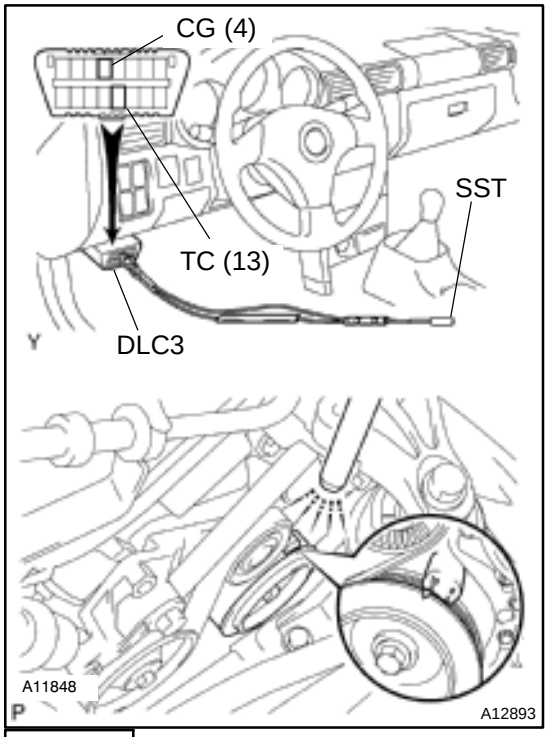
5	Check idle speed.

PREPARATION:
(a) Warm up the engine to normal operating temperature.
(b) Switch off all the accessories.
(c) Switch off the A/C.
(d) Shift the transmission into the neutral position.
(e) Connect the OBD II scan tool or TOYOTA hand–held tester to the DLC3 on the vehicle.
CHECK:
Use the CURRENT DATA to check the idle speed.
OK:
Idle speed: 800 ± 50 rpm

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

OK

6	**Check ignition timing.**



PREPARATION:

(a) Warm up the engine to normal operating temperature.
(b) Shift the transmission into the neutral position.
(c) Keep the engine speed at idle.
(d) Using SST, connect terminals 13 (TC) and 4 (CG) of the DLC3.
SST 09843–18040
(e) Connect the timing light (See page EM–9).

CHECK:

Check the ignition timing.

OK:

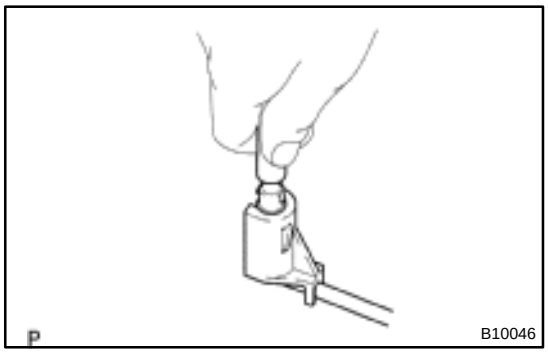
Ignition timing: 8 – 12˚ BTDC at idle

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

OK

Proceed to problem symptoms table on page DI–21.

7	**Check fuel pressure.**



PREPARATION:

(a) Be sure that enough fuel is in the tank.
(b) Connect the TOYOTA hand–held tester to the DLC3.
(c) Turn the ignition switch ON and push the TOYOTA hand–held tester main switch ON.
(d) Use the ACTIVE TEST mode to operate the fuel pump.
(e) Please refer to the TOYOTA hand–held tester operator's manual for further details.
(f) If you have no TOYOTA hand–held tester, connect the positive (+) and negative (–) leads from the battery to the fuel pump connector (See page SF–7).

CHECK:

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

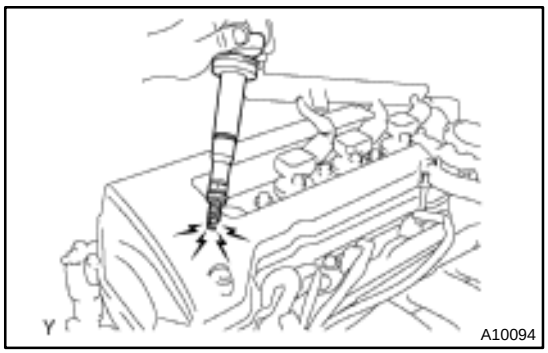
HINT:

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

NG	**Proceed to page SF–7, continue to trouble-shoot.**

OK

8	**Check for spark.**



PREPARATION:

(a) Remove the ignition coil with igniter.
(b) Remove the spark plug.
(c) Install the spark plug to the ignition coil with igniter.
(d) Disconnect the 4 injector connectors.
(e) Ground the spark plug.

CHECK:

Check if spark occurs while the 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.**
- **Do not crash the electrode gap.**

NG	**Proceed to page IG–1, 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 varies from those listed here. So do not decide whether a part is faulty or not solely according to the "Normal Condition" here.

(a) CARB mandated signals.

TOYOTA 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: 11.3 – 16.0 % Racing without load (2,500rpm): 12.3 – 17.9 %
COOLANT TEMP	Engine Coolant 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: 650 – 750 rpm
VEHICLE SPD	Vehicle Speed	Vehicle stopped: 0 km/h (0 mph)
IGN ADVANCE	Ignition Advance: Ignition Timing of Cylinder No. 1	Idling: BTDC 8 – 12°
INTAKE AIR	Intake Air Temp. Sensor Value	Equivalent to ambient temp.
MAF	Air Flow Rate Through Mass Air Flow Meter	Idling: 1.4 – 2.0 gm/sec. Racing without load (2,500 rpm): 5.4 – 7.9 gm/sec.
THROTTLE POS	Voltage Output of Throttle Position Sensor Calculated as a percentage: 0 V → 0 %, 5 V → 100 %	Throttle fully closed: 6 – 16 % Throttle fully open: 64 – 98 %
O2S B1 S1	Voltage Output of Heated Oxygen Sensor Bank 1 Sensor 1	Idling: 0.1 – 0.9 V
O2S B2 S1	Voltage Output of Heated Oxygen Sensor Bank 2 Sensor 1	Idling: 0.1 – 0.9 V
O2FT B1 S1	Heated Oxygen Sensor Fuel Trim Bank 1 Sensor 1 (Same as SHORT FT #1)	0 ± 20 %
O2FT B2 S1	Heated Oxygen Sensor Fuel Trim Bank 2 Sensor 1 (Same as SHORT FT #1)	0 ± 20 %
O2S B1 S2	Voltage Output of Heated Oxygen Sensor Bank 1 Sensor 2	Driving at 50 km/h (31 mph): 0.1 – 0.9 V

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

(b) TOYOTA Enhanced Signals.

TOYOTA hand–held tester display	Measurement Item	Normal Condition*
MISFIRE RPM	Engine RPM for first misfire range	Misfire 0: 0 rpm
MISFIRE LOAD	Engine load for first misfire range	Misfire 0: 9 g/r
INJECTOR	Fuel injection time for cylinder No. 1	Idling: 1.1 – 2.1 ms
IAC DUTY RATIO	Intake Air Control Valve Duty Ratio Opening ratio rotary solenoid type IAC valve	Idling: 25 – 35 %
STARTER SIG	Starter Signal	Cranking: ON
CTP SW	Closed Throttle Position Signal	Throttle fully closed: ON
A/C SIG	A/C Switch Signal	A/C ON: ON
ELECTCL LOAD SIG	Electrical Load Signal	Defogger S/W ON: ON
STOP LIGHT SW	Stop Light Switch Signal	Stop light switch ON: ON
PS OIL PRESS SW	Power Steering Oil Pressure Switch Signal	Turning 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#2, CYL#3, CYL#4	Abnormal revolution variation for each cylinder	0 %
IGNITION	Total number of ignition for every 1,000 revolutions	0 – 2,000
FUEL PUMP	Fuel Pump Signal	Idling: ON
A/C MAG CLUTCH	A/C switch signal	A/C ON: ON
EVAP (PURGE) VSV	EVAP VSV signal	VSV operating: ON
VVT CTRL	VVT control signal	VVT operating: ON
INTAKE CTRL VSV	Intake control VSV signal	VSV operating: ON
TOTAL FT B1	Total Fuel Trim Bank 1: Average value for fuel trim system of bank 1	Idling: 0.8 – 1.2 V
TOTAL FT B2	Total Fuel Trim Bank 2: Average value for fuel trim system of bank 2	Idling: 0.8 – 1.2 V
O2 LR B1 S1	Heated 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	Heated 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	Heated 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	Heated Oxygen Sensor Rich Lean Bank 2 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 neutral position, the A/C switch is OFF and all accessory switches are OFF.

DI37T–04

DIAGNOSTIC TROUBLE CODE CHART

HINT:

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

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

SAE CONTROLLED:

DTC No.	Detection Item	Trouble Area	MIL*	Memory
P0100 (DI–23)	Mass Air Flow Circuit Malfunction	• Open or short in mass air flow meter circuit • Mass air flow meter • ECM	○	○
P0101 (DI–27)	Mass Air Flow Circuit Range/Performance Problem	• Mass air flow meter	○	○
P0110 (DI–28)	Intake Air Temp. Circuit Malfunction	• Open or short in intake air temp. sensor circuit • Intake air temp. sensor (built into mass air flow meter) • ECM	○	○
P0115 (DI–32)	Engine Coolant Temp. Circuit Malfunction	• Open or short in engine coolant temp. sensor circuit • Engine coolant temp. sensor • ECM	○	○
P0116 (DI–36)	Engine Coolant Temp. Circuit Range/Performance Problem	• Cooling system • Engine coolant temp. sensor	○	○
P0120 (DI–37)	Throttle/Pedal Position Sensor/Switch ”A” Circuit Malfunction	• Open or short in throttle position sensor circuit • Throttle position sensor • ECM	○	○
P0121 (DI–41)	Throttle/Pedal Position Sensor/Switch ”A” Circuit Range/Performance Problem	• Throttle position sensor	○	○
P0125 (DI–42)	Insufficient Coolant Temp. for Closed Loop Fuel Control	• Open or short in heated oxygen sensor (bank 1, 2 sensor 1) circuit • Heated oxygen sensor (bank 1, 2 sensor 1) • Air induction system • Fuel pressure • Injector • Gas leakage on exhaust system • ECM	○	○
P0130 (DI–47)	Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 1)	• Open or short in heated oxygen sensor circuit • Heated oxygen sensor • Air induction system • Fuel pressure • Injector • ECM	○	○
P0133 (DI–51)	Oxygen Sensor Circuit Slow Response (Bank 1 Sensor 1)	• Open or short in heated oxygen sensor circuit • Heated oxygen sensor • Air induction system • Fuel pressure • Injector • ECM	○	○
P0135 (DI–54)	Oxygen Sensor Heater Circuit Malfunction (Bank 1 Sensor 1)	• Open or short in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • ECM	○	○
P0136 (DI–56)	Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 2)	• Open or short in heated oxygen sensor circuit • Heated oxygen sensor	○	○

P0141 (DI–54)	Oxygen Sensor Heater Circuit Malfunction (Bank 1 Sensor 2)	• Same as DTC No. P0135	○	○
P0150 (DI–47)	Oxygen Sensor Circuit Malfunction (Bank 2 Sensor 1)	• Same as DTC No. P0130	○	○
P0153 (DI–51)	Oxygen Sensor Circuit Slow Response (Bank 2 Sensor 1)	• Same as DTC No. P0133	○	○
P0155 (DI–54)	Oxygen Sensor Heater Circuit Malfunction (Bank 2 Sensor 1)	• Same as DTC No. P0135	○	○
P0171 (DI–58)	System too Lean (Fuel Trim) (Bank 1)	• Air induction system • Injector blockage • Mass air flow meter • Engine coolant temp. sensor • Fuel pressure • Gas leakage on exhaust system • Open or short in heated oxygen sensor (bank 1 sensor 1) circuit • Heated oxygen sensor (bank 1 sensor 1) • ECM	○	○
P0172 (DI–58)	System too Rich (Fuel Trim) (Bank 1)	• Injector leak, blockage • Mass air flow meter • Engine coolant temp. sensor • Ignition system • Fuel pressure • Gas leakage on exhaust system • Open or short in heated oxygen sensor (bank 1, sensor 1) circuit • Heated oxygen sensor (bank 1, sensor 1) • ECM	○	○
P0174 (DI–58)	System too Lean (Fuel Trim) (Bank 2)	• Same as the DTC No. P0171	○	○
P0175 (DI–58)	System too Rich (Fuel Trim) (Bank 2)	• Same as the DTC No. P0172	○	○
P0300 (DI–63)	Random/Multiple Cylinder Misfire Detected	• Open or short in engine wire • Connector connection • Vacuum hose connection • Ignition system • Injector • Fuel pressure • Mass air flow meter • Engine coolant temp. sensor • Compression pressure • Valve clearance • Valve timing • ECM	○	○
P0301 (DI–63)	Cylinder 1 Misfire Detected			
P0302 (DI–63)	Cylinder 2 Misfire Detected			
P0303 (DI–63)	Cylinder 3 Misfire Detected			
P0304 (DI–63)	Cylinder 4 Misfire Detected			
P0325 (DI–68)	Knock Sensor 1 Circuit Malfunction (Bank 1)	• Open or short in knock sensor circuit • Knock sensor (looseness) • ECM	○	○
P0335 (DI–71)	Crankshaft Position Sensor "A" Circuit Malfunction	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Crank angle sensor plate • ECM	○	○
P0340 (DI–73)	Camshaft Position Sensor Circuit Malfunction	• Open or short in camshaft position sensor circuit • Camshaft position sensor • Intake Camshaft • ECM	○	○

P0420 (DI–75)	Catalyst System Efficiency Below Threshold (Bank 1)	• Gas leakage on exhaust system • Heated oxygen sensor • Three–way catalytic converter	○	○
P0440 (DI–78)	Evaporative Emission Control System Malfunction	• Hose or tube cracked, holed, damaged or loose seal ((3) in Fig.1) • Fuel tank cap incorrectly installed • Fuel tank cap cracked or damaged • Vacuum hose cracked, holed, blocked, damaged or disconnected ((1) or (2) in Fig. 1) • Fuel tank cracked, holed or damaged • Charcoal canister cracked, holed or damaged • Open or short in vapor pressure sensor circuit • Vapor pressure sensor • Fuel tank over fill check valve cracked or damaged • ECM	○	○
P0441 (DI–84)	Evaporative Emission Control System Incorrect Purge Flow	• Vacuum hose cracked, holed, blocked damaged or disconnected((1), (2), (3),(4),(5), (6), (7), (8), (9), (10) and (11) in Fig.1) • Fuel tank cap incorrectly installed • Fuel tank cap cracked or damaged • Open or short in vapor pressure sensor circuit • Vapor pressure sensor • Open or short in VSV circuit for EVAP • VSV for EVAP • Open or short in VSV circuit for pressure switching valve • VSV for pressure switching valve • Fuel tank cracked, holed or damaged • Charcoal canister cracked, holed or damaged • Fuel tank over fill check valve cracked or damaged • ECM	○	○
P0446 (DI–84)	Evaporative Emission Control System Vent Control Malfunction	• Same as DTC No. P0441	○	○
P0450 (DI–101)	Evaporative Emission Control System Pressure Sensor Malfunction	• Open or short in vapor pressure sensor circuit • Vapor pressure sensor • ECM	○	○
P0451 (DI–101)	Evaporative Emission Control System Pressure Sensor Range/ Performance			
P0500 (DI–103)	Vehicle Speed Sensor Malfunction	• Combinationmeter • Open or short in vehicle speed sensor circuit • Vehicle speed sensor • ECM	○	○
P0505 (DI–106)	Idle Control System Malfunction	• Open or short in IAC valve circuit • IAC valve is stuck or closed • Open or short in A/C switch circuit • Air induction system • ECM	○	○

*: ○ · · · MIL lights up

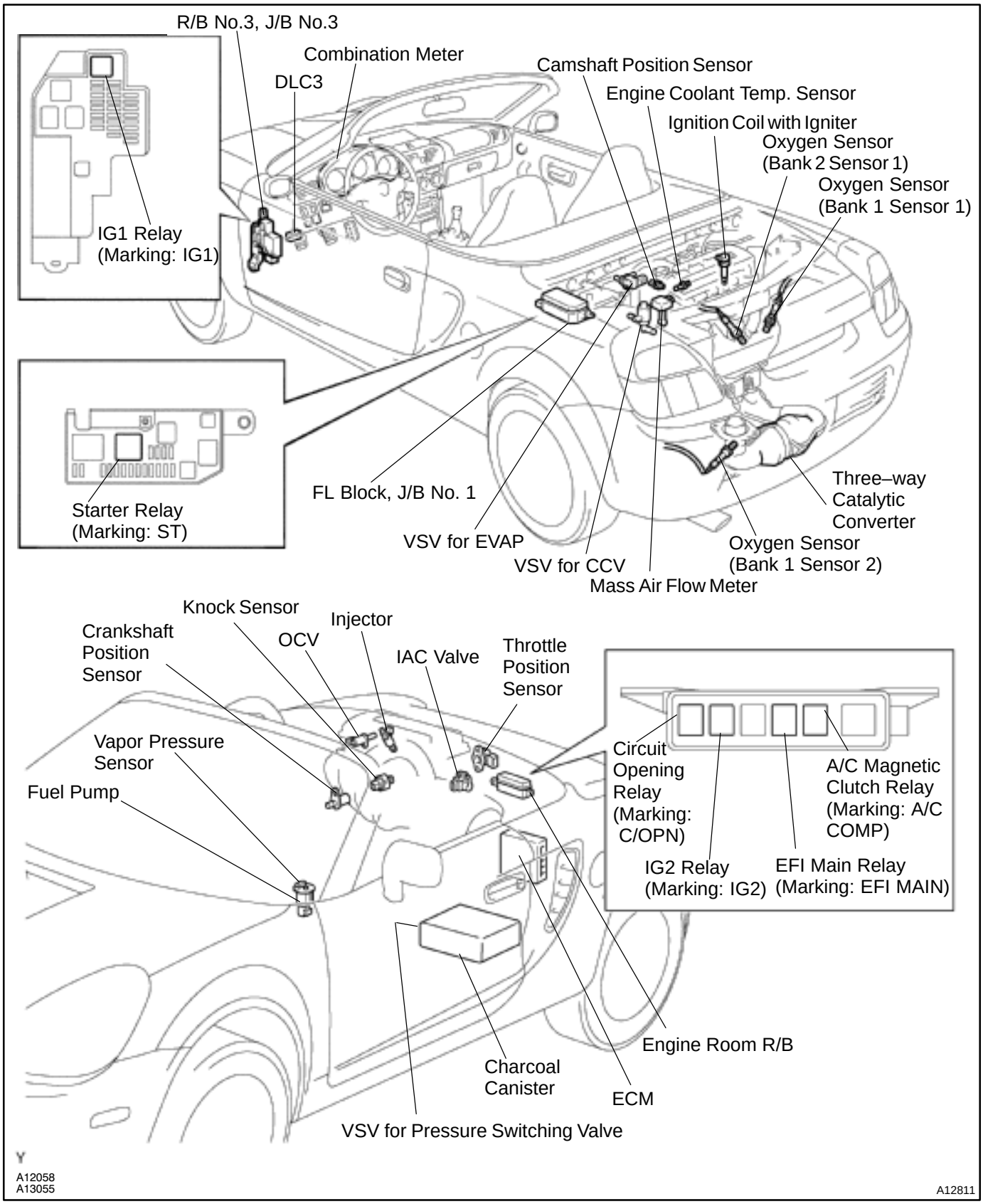
MANUFACTURER CONTROLLED:

DTC No. (See Page)	Detection Item	Trouble Area	MIL*	Memory
P1300 (DI–109)	Igniter Circuit Malfunction (No. 1)	• Ignition system • Open or short in IGF and IGT1 circuit from No. 1 ignition coil with igniter to ECM • No. 1 ignition coil with igniter • ECM	○	○
P1305 (DI–109)	Igniter Circuit Malfunction (No. 2)	• Ignition system • Open or short in IGF and IGT2 circuit from No. 2 ignition coil with igniter to ECM • No. 2 ignition coil with igniter • ECM	○	○
P1310 (DI–109)	Igniter Circuit Malfunction (No. 3)	• Ignition system • Open or short in IGF and IGT3 circuit from No. 3 ignition coil with igniter to ECM • No. 3 ignition coil with igniter • ECM	○	○
P1315 (DI–109)	Igniter Circuit Malfunction (No. 4)	• Ignition system • Open or short in IGF and IGT4 circuit from No. 4 ignition coil with igniter to ECM • No. 4 ignition coil with igniter • ECM	○	○
P1335 (DI–115)	Crankshaft Position Sensor Circuit Malfunction (During engine running)	• Same as DTC No. P0335	–	○
P1346 (DI–116)	VVT Sensor/Camshaft Position Sensor Circuit Range/Performance Problem (Bank 1)	• Mechanical system (Jumping teeth of timing chain, chain stretched) • ECM	○	○
P1349 (DI–117)	VVT System Malfunction (Bank 1)	• Valve timing • OCV • VVT controller assembly • ECM	○	○
P1600 (DI–123)	ECM BATT Malfunction	• Open in back up power source circuit • ECM	○	○
P1645 (DI–125)	Body ECU Malfunction	• Body ECU • A/C ECU • Vane pump assembly with motor • ABS ECU • Combination meter • Air bag sensor assembly • Communication bus	–	–
P1656 (DI–127)	OCV Circuit Malfunction (Bank 1)	• Open or short in OCV circuit • OCV • ECM	○	○

*: ○ · · · MIL lights up. – · · · MIL does not light up.

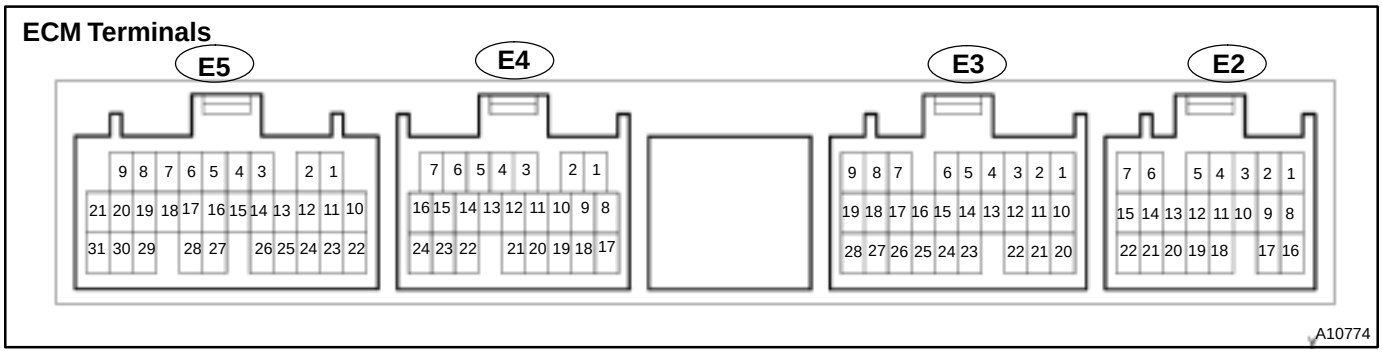
DI37U–03

PARTS LOCATION



DI37V–05

TERMINALS OF ECM



Symbols (Terminal No.)	Wiring Color	Condition	STD Voltage (V)
BATT (E2–1) – E1 (E4–17)	B–Y – BR	Always	9 – 14
IGSW (E2–8) – E1 (E4–17)	B–R – BR	IG switch ON	9 – 14
+B (E2–16) – E1 (E4–17)	B – BR		
VC (E4–2) – E2 (E4–18)	L–R – BR	IG switch ON	4.5 – 5.5
VTA (E4–23) – E2 (E4–18)	B–W – BR	IG switch ON, Accelerator pedal fully closed	0.3 – 1.0
		IG switch ON, Accelerator pedal fully open	3.2 – 4.8
THA (E4–22) – E2 (E4–18)	Y–B – BR	Idling, Intake air temp. 20˚C (68˚F)	0.5 – 3.4
THW (E4–14) – E2 (E4–18)	R–L – BR	Idling, Water temp. 80˚C (176˚F)	0.2 – 1.0
STA (E3–11) – E1 (E4–17)	B – BR	Shift position in neutral, Ignition SW START	6.0 or more
#10 (E5–1) – E01 (E5–21) #20 (E5–2) – E01 (E5–21) #30 (E5–3) – E01 (E5–21) #40 (E5–4) – E01 (E5–21)	B–W – W–R B – W–B L – W–B W – W–B	IG switch ON	9 – 14
		Idling	Pulse generation (See page DI–63)
IGT1 (E5–10) – E1 (E4–17) IGT2 (E5–11) – E1 (E4–17) IGT3 (E5–12) – E1 (E4–17) IGT4 (E5–13) – E1 (E4–17)	B – BR L – BR L–W – BR L – BR	Idling	Pulse generation (See page DI–109)
IGF (E5–25) – E1 (E4–17)	B–Y – BR	IG switch ON	4.5 – 5.5
		Idling	Pulse generation (See page DI–109)
G2 (E4–15) – NE– (E4–24)	W – B	Idling	Pulse generation (See page DI–71)
NE+ (E4–16) – NE– (E4–24)	W – B		
MREL (E3–21) – E1 (E4–17)	GR – BR	IG switch ON	9 – 14
FC (E2–3) – E1 (E4–17)	G–R – BR	IG switch ON	9 – 14
STP (E3–6) – E1 (E4–17)	G – BR	Brake pedal is depressed	9 – 14
		Brake pedal is released	Below 1.5
OX1A (E4–12) – E1 (E4–17)	B – BR	Maintain engine speed at 2,500 rpm for 90 sec. after warming up	Pulse generation (See page DI–42)
OX2A (E4–21) – E1 (E4–17)	B – BR	Maintain engine speed at 2,500 rpm for 90 sec. after warming up	Pulse generation (See page DI–42)
OX1B (E4–9) – E1 (E4–17)	B – BR	Maintain engine speed at 2,500 rpm for 3 min. after warming up	Pulse generation (See page DI–42)
HT1A (E4–3) – E01 (E4–6) HT1B (E4–8) – E01 (E4–6) HT2A (E4–5) – E01 (E4–6)	B–Y – BR L–B – BR B–W – BR	Idling	Below 3.0
		IG switch ON	9 – 14
KNK1 (E5–27) – E1 (E4–17)	W – BR	Maintain engine speed at 4,000 rpm after warming up	Pulse generation (See page DI–68)

TC (E3–5) – E1 (E4–17)	P–L – BR	IG switch ON	9 – 14
W (E2–15) – E01 (E4–6)	Y–R – BR	Idling	9 – 14
		IG switch ON	Below 3.0
OCV+ (E5–24) – OCV– (E5–23)	R – W	IG switch ON	Pulse generation (See page DI–117)
EVP1 (E4–4) – E01 (E4–6)	W – BR	IG switch ON	9 – 14
RSO (E5–18) – E1 (E4–17)	G – BR	IG switch ON	9 – 14
TBP (E3–23) – E01 (E4–6)	L–W – BR	IG switch ON	3.0 – 3.6
PTNK (E2–4) – E2 (E4–18)	G–B – BR	IG switch ON	3.0 – 3.6
SPD (E3–22) – E1 (E4–17)	V–W – BR	IG switch ON	9 – 14
PRE (E3–18) – E1 (E4–17)	W–L – BR	Refrigerant pressure is between 196 kPa and 1340 kPa	9 – 14
		Refrigerant pressure is less than 196 kPa, more than 1340 kPa	–
ACMG (E2–12) – E01 (E4–6)	L – BR	Idling, Magnetic clatch is ON	below 1.0
		Idling, Magnetic clatch is OFF	9 – 14
LCK1 (E3–28) – E1 (E4–17)	W–R – BR	Idling, A/C switch is ON	9 – 14
		Idling, A/C switch is OFF	–

DI37W–04

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	Suspected Area	See page
Engine does not crank (Does not start)	7. Starter 8. Starter relay 9. Body ECU	ST–7 ST–17 DI–357
No initial combustion (Does not start)	1. ECM power source circuit 2. Ignition coil with igniter 3. Fuel control circuit 4. Injector circuit	DI–132 DI–109 DI–140 DI–63
No complete combustion (Does not start)	1. Ignition coil with igniter 2. Fuel control circuit 3. Injector circuit	DI–109 DI–140 DI–63
Engine cranks normally (Difficult to start)	1. Starter signal circuit 2. Ignition coil with igniter 3. Spark plug 4. Compression 5. Injector circuit 6. Fuel control circuit 7. IAC valve circuit	DI–137 DI–109 IG–1 EM–3 DI–63 DI–140 DI–106
Cold engine (Difficult to start)	1. Starter signal circuit 2. Injector circuit 3. Ignition coil with igniter 4. Spark plug 5. Fuel control circuit 6. IAC valve circuit	DI–137 DI–63 DI–109 IG–1 DI–140 DI–106
Hot engine (Difficult to start)	1. Starter signal circuit 2. Injector circuit 3. Ignition coil 4. Spark plug 5. Fuel control circuit 6. IAC valve circuit	DI–137 DI–63 DI–109 IG–1 DI–140 DI–106
High engine idle speed (Poor idling)	1. ECM power source circuit 2. Back up power source circuit 3. IAC valve circuit	DI–132 DI–123 DI–106
Low engine idle speed (Poor idling)	1. Injector circuit 2. Back up power source circuit 3. Fuel control circuit 4. IAC valve circuit	DI–63 DI–123 DI–140 DI–106
Rough idling (Poor idling)	1. IAC valve circuit 2. Injector circuit 3. Fuel control circuit 4. Ignition coil with igniter 5. Compression	DI–106 DI–63 DI–140 DI–109 EM–3
Hunting (Poor idling)	1. ECM power source circuit 2. Fuel control circuit 3. IAC valve circuit	DI–132 DI–140 DI–106
Hesitation/Poor acceleration (Poor driveability)	1. Injector circuit 2. Ignition coil with igniter 3. Fuel control circuit	DI–63 DI–109 DI–140

Muffler explosion, after fire (Poor driveability)	1. Ignition coil 2. Spark plug 3. Injector circuit	IG–1 IG–1 DI–63
Surging (Poor driveability)	1. Spark plug 2. Injector circuit	IG–1 DI–63
Engine stall (Soon after starting)	1. Fuel control circuit 2. IAC valve circuit	DI–140 DI–106
Engine stall (After accelerator pedal depressed)	1. Injector circuit 2. IAC valve circuit 3. ECM	DI–63 DI–106 IN–28
Engine stall (After accelerator pedal released)	1. ECM 2. IAC valve circuit	IN–28 DI–106
Engine stall (During A/C operation)	1. A/C signal circuit (Compressor circuit) 2. ECM	DI–150 IN–28

CIRCUIT INSPECTION

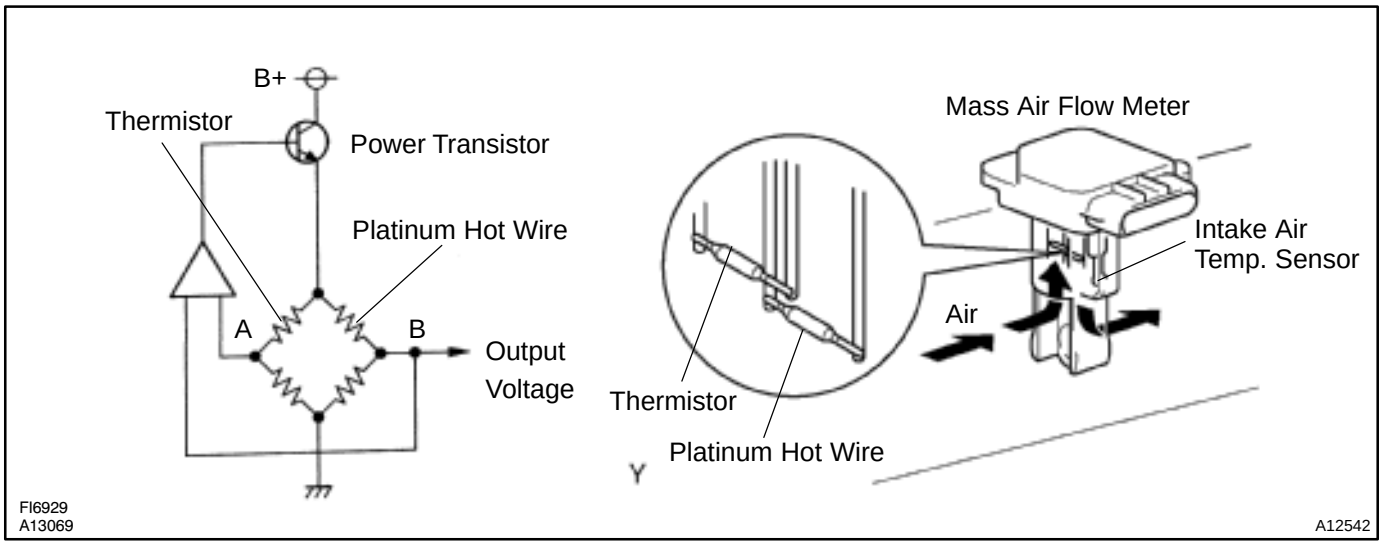
DTC	P0100	Mass Air Flow Circuit Malfunction

CIRCUIT DESCRIPTION

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

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

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



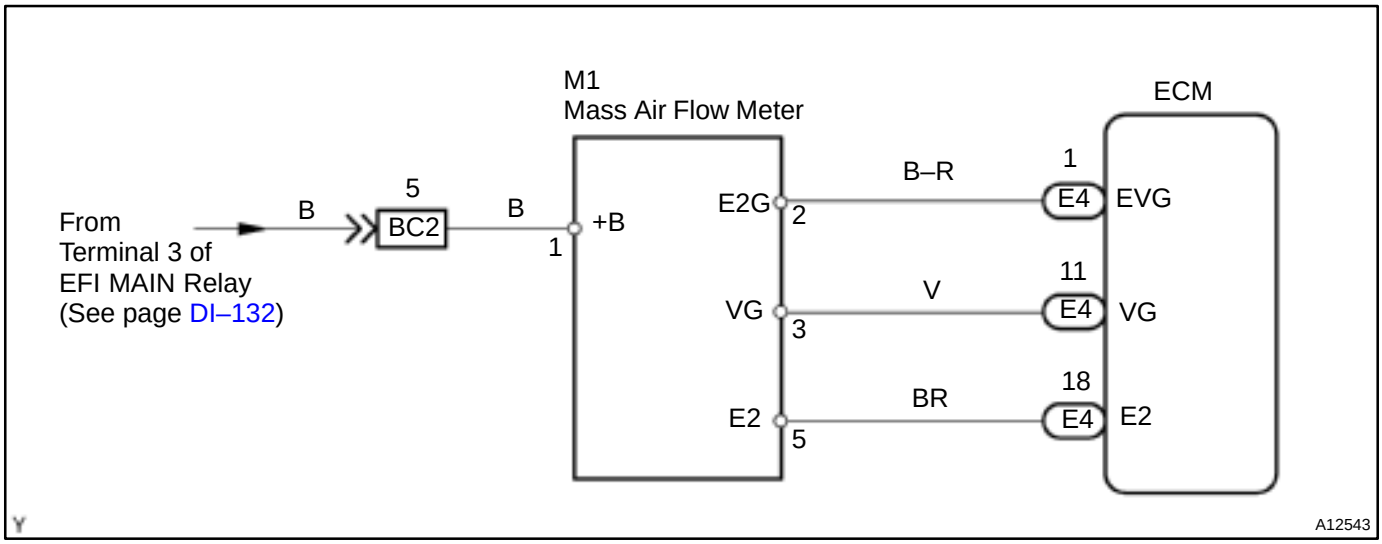
DTC No.	DTC Detection Condition	Trouble Area
P0100	Open or short in mass air flow meter circuit with more than 3 sec. engine speed 4,000 rpm or less	• Open or short in mass air flow meter circuit • Mass air flow meter • ECM

HINT:

After confirming DTC P0100, use the OBD II scan tool or TOYOTA hand–held tester to confirm the mass air flow ratio from the CURRENT DATA.

Mass Air Flow Value (gm/sec.)	Malfunction
0.0	• Mass air flow meter power source circuit open • VG circuit open or short
271.0 or more	• EVG circuit open

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

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

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

PREPARATION:

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

(b) Turn the ignition switch ON and push the OBD II scan tool or TOYOTA hand–held tester main switch ON.

(c) Start the engine.

CHECK:

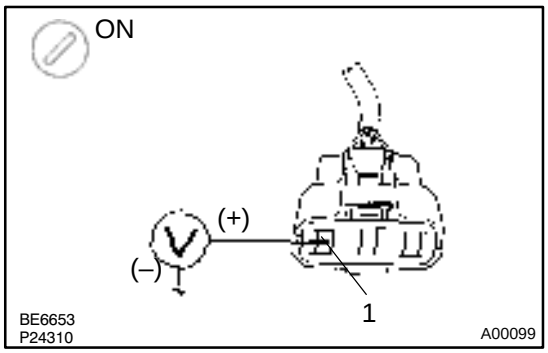
Read the mass air flow rate on the OBD II scan tool or TOYOTA hand–held tester.

RESULT:

	Type I	Type II
Mass Air Flow Rate (gm/sec.)	0.0	271.0 or more

Type I	**Go to step 2.**
Type II	**Go to step 5.**

2	Check voltage of mass air flow meter power source.



PREPARATION:

(a) Disconnect the mass air flow meter connector.

(b) Turn the ignition switch ON.

CHECK:

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

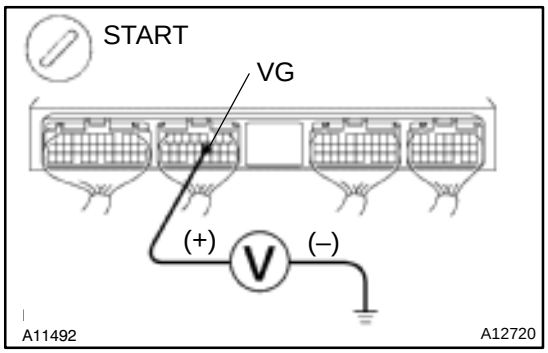
OK:

Voltage: 9 – 14 V

NG → **Check for open in harness and connector between EFI main relay (Marking: EFI MAIN) and mass air flow meter (See page IN–28).**

OK

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



PREPARATION:

(a) Disconnect the ECM with connector from body panel (See page SF–62).

(b) Start the engine.

CHECK:

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

OK:

Voltage:

1.1 – 1.5 V (Neutral position and A/C switch OFF)

OK → **Check and replace ECM (See page IN–28).**

NG

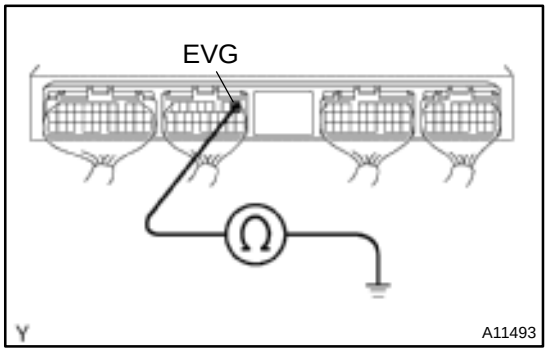
4	Check for open and short in harness and connector between mass air flow meter and ECM (See page IN–28).

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

OK

Replace mass air flow meter.

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



PREPARATION:

Disconnect the ECM with connector from body panel (See page SF–62).

CHECK:

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

OK:

Continuity (1 Ω or less)

NG → **Check and replace ECM (See page IN–28).**

OK

6	**Check for open in harness and connector between mass air flow meter and ECM (See page IN–28).**

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

OK

Replace mass air flow meter.

DI09C–08

DTC	P0101	Mass Air Flow Circuit Range/Performance Problem

CIRCUIT DESCRIPTION

Refer to DTC P0100 on page DI–23.

DTC No.	DTC Detection Condition	Trouble Area
P0101	Conditions (a) and (b) continue 10 sec. or more with engine speed 900 rpm or less: (2 trip detection logic) (a) Throttle valve fully closed (b) Mass air flow meter output > 2.2 V	• Mass air flow meter
	Conditions (a) and (b) continue 10 sec. or more with engine speed 1,500 rpm or more: (2 trip detection logic) (a) VTA ≧ 0.63 V (b) Mass air flow meter output < 1.06 V	

INSPECTION PROCEDURE

HINT:

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

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

NO → **Replace mass air flow meter.**

YES

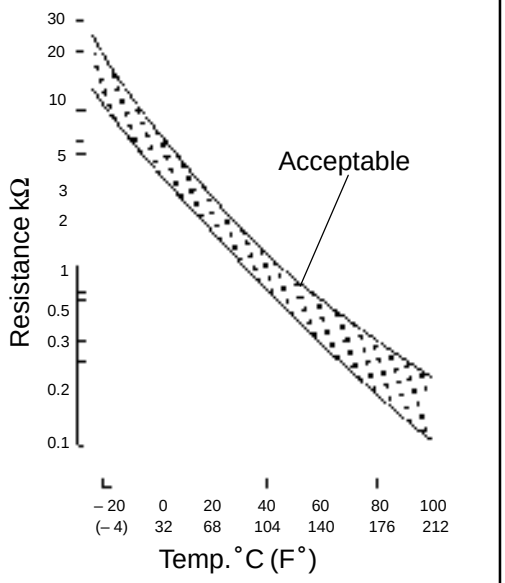
Go to relevant DTC chart (See page DI–14).

DI37Z–03

DTC	P0110	Intake Air Temp. Circuit Malfunction

CIRCUIT DESCRIPTION

Fig. 1



The intake air temperature sensor is built into the mass air flow meter (see page DI–23) 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 ECM (See below). The 5 V power source voltage in the ECM 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 temp. sensor are connected in series. When the resistance value of the intake air temp. sensor changes in accordance with changes in the intake air temperature, the potential at terminal THA also changes. Based on this signal, the ECM increases the fuel injection volume to improve driveability during cold engine operation.

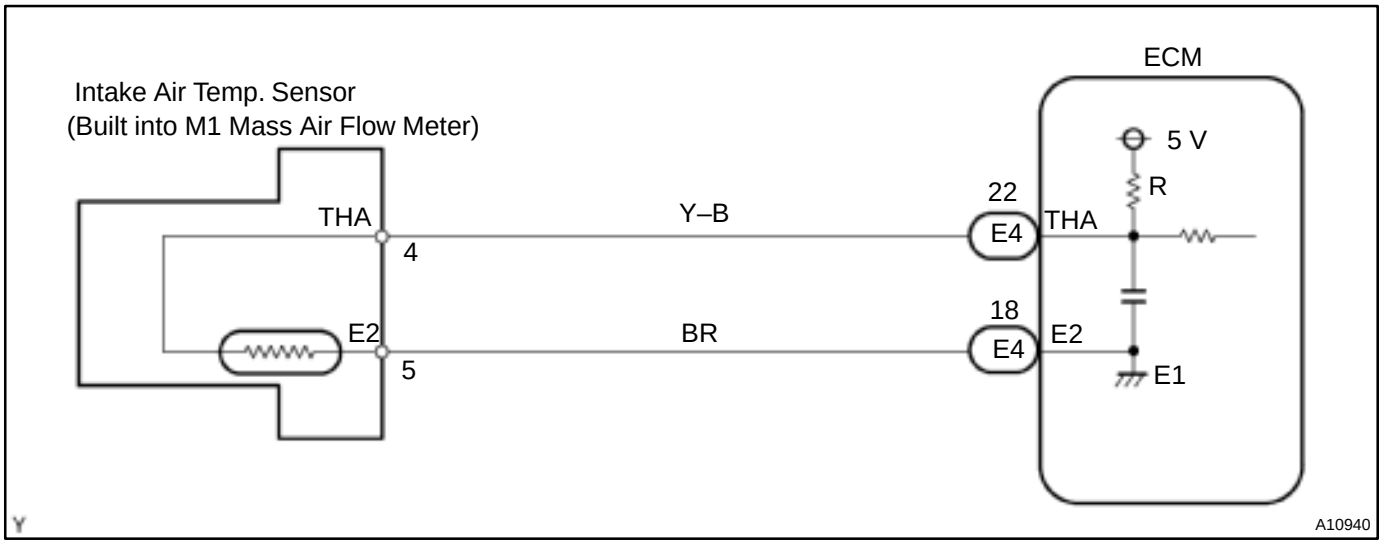
DTC No.	DTC Detection Condition	Trouble Area
P0110	Open or short in intake air temp. sensor circuit	• Open or short in intake air temp. sensor circuit • Intake air temp. sensor (built into mass air flow meter) • ECM

HINT:

After confirming DTC P0110, use the OBD II scan tool or TOYOTA 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 P100, P0101, P0110, P0115 and P0120 are output simultaneously, E2 (sensor ground) may be open.
- Read freeze frame data using TOYOTA hand–held tester or OBD II scan tool. Because freeze frame records the engine conditions when the malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

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

PREPARATION:

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

(b) Turn the ignition switch ON and push the OBD II scan tool or TOYOTA hand–held tester main switch ON.

CHECK:

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

OK:

Same as actual air intake temperature.

HINT:

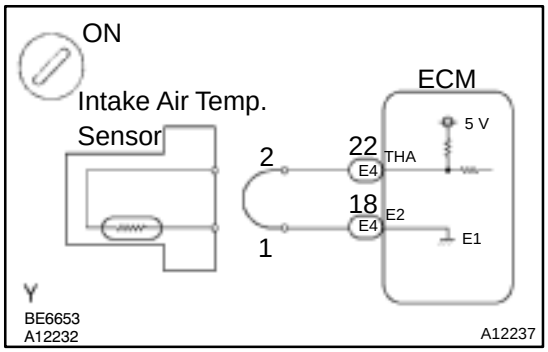
- If there is open circuit, OBD II scan tool or TOYOTA hand–held tester indicates –40˚C (–40˚F).
- If there is short circuit, OBD II scan tool or TOYOTA hand–held tester indicates 140˚C (284˚F) or more.

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 ECM.



PREPARATION:

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

CHECK:

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

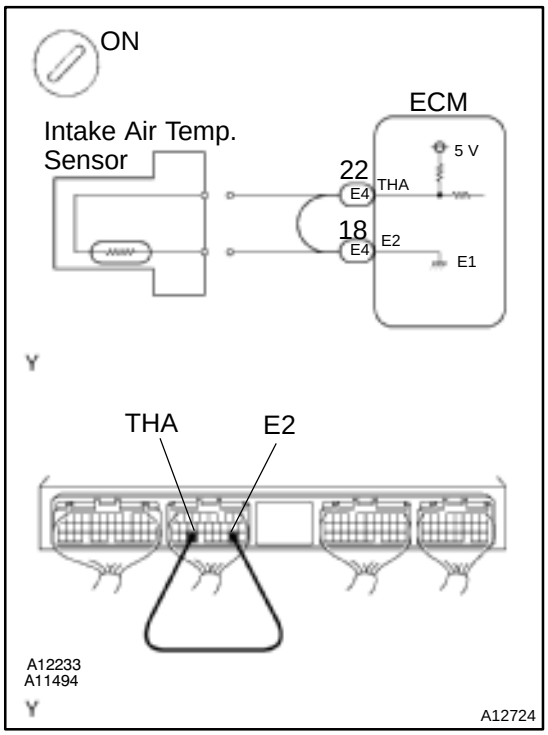
OK:

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

OK	Confirm good connection at sensor. If OK, replace mass air flow meter.

NG

3	Check for open in harness or ECM.



PREPARATION:

(a) Disconnect the ECM with connector from body panel (See page SF–62).
(b) Connect between terminals THA and E2 of the ECM connector.

HINT:

The mass air flow meter connector is disconnected. Before checking, do a visual and contact pressure check for the ECM connector (See page IN–28).

(c) Turn the ignition switch ON.

CHECK:

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

OK:

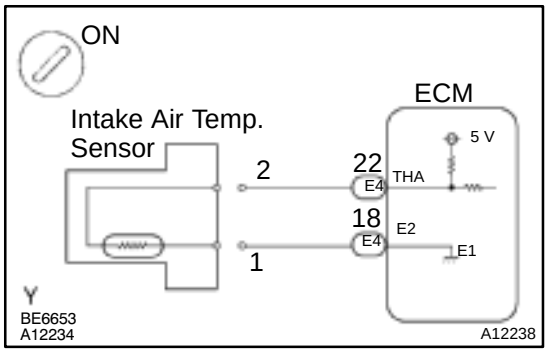
Temperature value: 140°C (284°F) or more

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

NG

Confirm good connection at ECM. If OK, check and replace ECM (See page IN–28).

4	Check for short in harness and ECM.



PREPARATION:

(a) Disconnect the mass air flow meter connector.

(b) Turn the ignition switch ON.

CHECK:

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

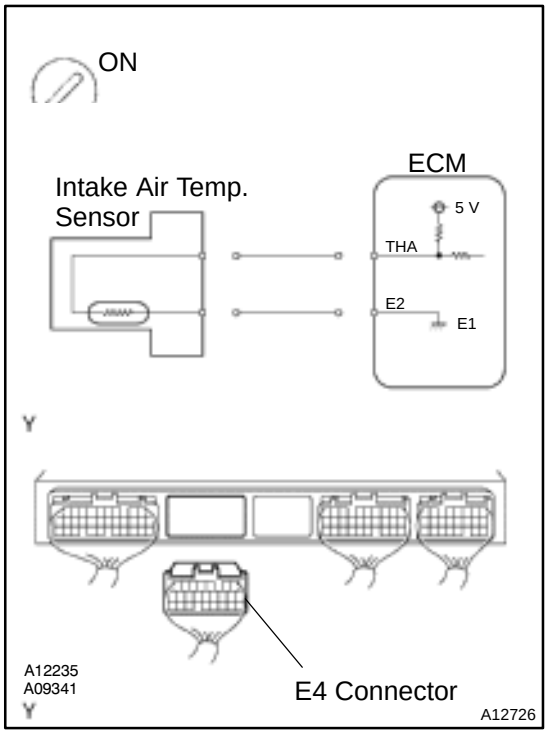
OK:

Temperature value: –40°C (–40°F)

OK	Replace mass air flow meter.

NG

5	Check for short in harness or ECM.



PREPARATION:

(a) Disconnect the ECM with connector from body panel (See page SF–62).

(b) Disconnect the E4 connector from the ECM.

HINT:

The mass air flow meter connector is disconnected.

(c) Turn the ignition switch ON.

CHECK:

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

OK:

Temperature value: –40°C (–40°F)

OK	Repair or replace harness or connector.

NG

Check and replace ECM (See page IN–28).

DI380–03

DTC	P0115	Engine Coolant Temp. Circuit Malfunction

CIRCUIT DESCRIPTION

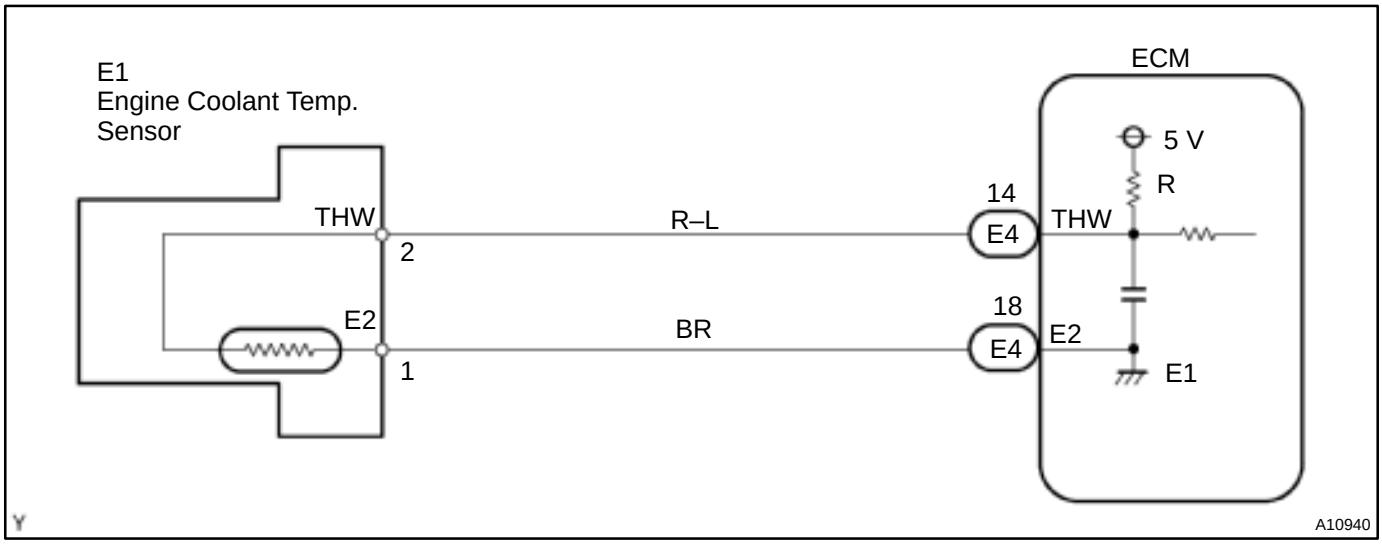
A thermistor built into the engine coolant temperature sensor changes the resistance value according to the engine coolant temperature.
The structure of the sensor and connection to the ECM is the same as in the intake air temperature circuit malfunction shown on page DI–28.

DTC No.	DTC Detection Condition	Trouble Area
P0115	Open or short in engine coolant temp. sensor circuit for 0.5 sec.	• Open or short in engine coolant temp. sensor circuit • Engine coolant temp. sensor • ECM

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

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

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If DTCs P0100, P0101, P0110, P0115 and P0120 are output simultaneously, E2 (sensor ground) may be open.
- Read freeze frame data using TOYOTA hand–held tester or OBD II scan tool. Because freeze frame records the engine conditions when the malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

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

PREPARATION:

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

(b) Turn the ignition switch ON and push the OBD II scan tool or TOYOTA hand–held tester main switch ON.

CHECK:

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

OK:

Same as actual engine coolant temperature.

HINT:

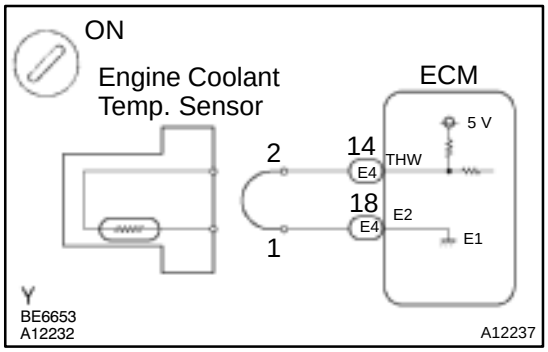
- If there is open circuit, OBD II scan tool or TOYOTA hand–held tester indicates –40˚C (–40˚F).
- If there is open circuit, OBD II scan tool or TOYOTA hand–held tester indicates 140˚C (284˚F) or more.

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 ECM.**



PREPARATION:

(a) Disconnect the engine coolant temperature sensor connector.

(b) Connect the sensor wire harness terminals together.

(c) Turn the ignition switch ON.

CHECK:

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

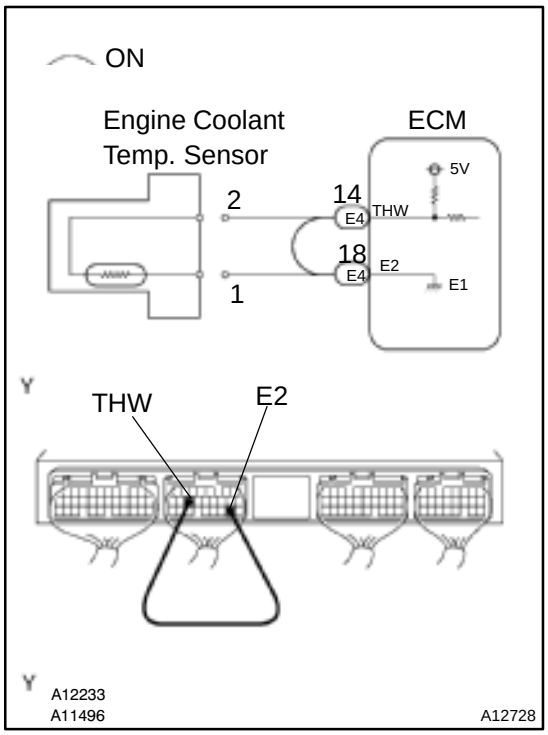
OK:

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

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

NG

3	Check for open in harness or ECM.



PREPARATION:

(a) Disconnect the ECM with connector from body panel (See page SF–62).

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

HINT:

The engine coolant temperature sensor connector is disconnected. Before checking, do a visual and contact pressure check for the ECM connector (See page IN–28).

(c) Turn the ignition switch ON.

CHECK:

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

OK:

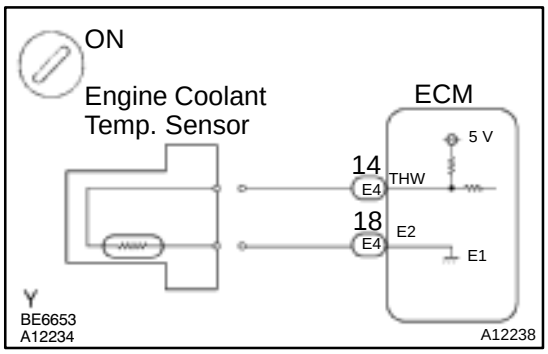
Temperature value: 140˚C (284˚F) or more

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

NG

Confirm good connection at ECM. If OK, check and replace ECM (See page IN–28).

4	Check for short in harness and ECM.



PREPARATION:

(a) Disconnect the engine coolant temperature sensor connector.

(b) Turn the ignition switch ON.

CHECK:

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

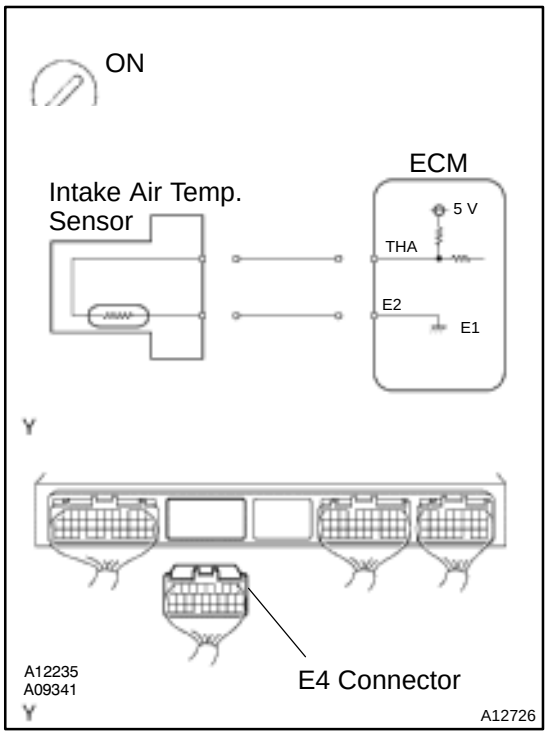
OK:

Temperature value: – 40˚C (– 40˚F)

OK	Replace engine coolant temperature sensor.

NG

5	Check for short in harness or ECM.



PREPARATION:

(a) Disconnect the ECM with connector from body panel (See page SF–62).

(b) Disconnect the E4 connector from the ECM.

HINT:

The engine coolant temperature sensor connector is disconnected.

(c) Turn the ignition switch ON.

CHECK:

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

OK:

Temperature value: –40˚C (–40˚F)

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

NG

Check and replace ECM (See page IN–28).

DI381–03

DTC	P0116	Engine Coolant Temp. Circuit Range/ Performance Problem

CIRCUIT DESCRIPTION

Refer to DTC P0115 on page DI–32.

DTC No.	DTC Detection Condition	Trouble Area
P0116	When engine starts, water temp. is –7˚C (20˚F) or less. And, 20 min. or more after engine starts, engine coolant temp. sensor value is 20˚C (68˚F) or less (2 trip detection logic)	• Cooling system • Engine coolant temp. sensor
	When engine starts, water temp. is between –7˚C (20˚F) and 10˚C (50˚F) And, 5 min. or more after engine starts, engine coolant temp. sensor value is 20˚C (68˚F) or less (2 trip detection logic)	

INSPECTION PROCEDURE

HINT:

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

1	Are there any other codes (besides DTC P0116) being output?

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

NO

2	Check thermostat (See page CO–10).

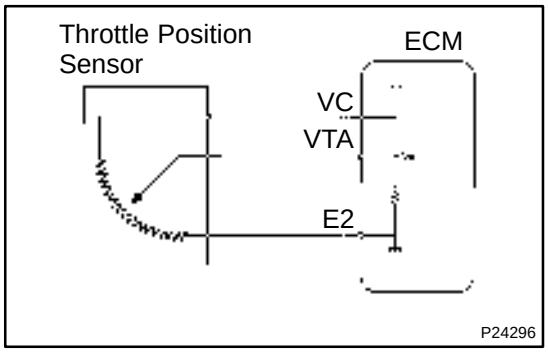
NG → Replace thermostat.

OK

Replace engine coolant temperature sensor.

DTC	P0120	Throttle/Pedal Position Sensor/Switch ”A” Circuit Malfunction

CIRCUIT DESCRIPTION



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

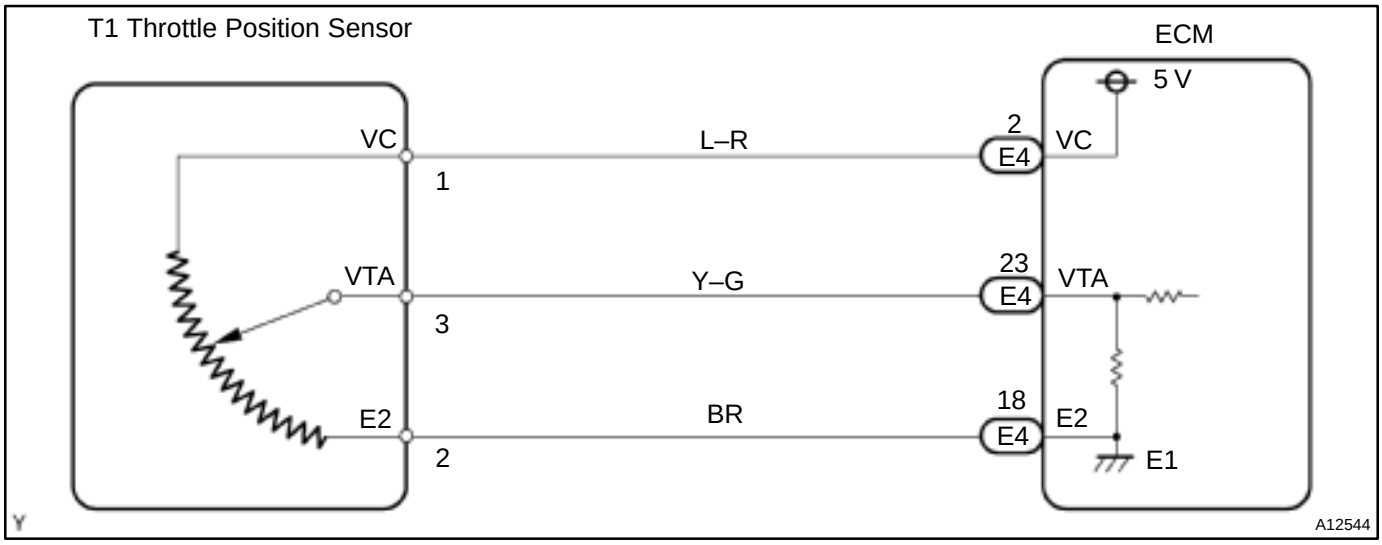
DTC No.	DTC Detection Condition	Trouble Area
P0120	Condition (a) or (b) continues with more than 5 sec.: (a) VTA < 0.1 V (b) VTA > 4.9 V	• Open or short in throttle position sensor circuit • Throttle position sensor • ECM

HINT:

After confirming DTC P0120, use the OBD II scan tool or TOYOTA hand–held tester to confirm the throttle valve opening percentage.

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

WIRING DIAGRAM

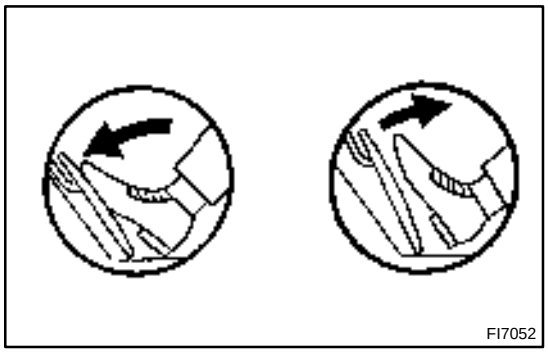


INSPECTION PROCEDURE

HINT:

- If DTCs P0100, P0106, P0110, P0115 and P0120 are output simultaneously, E2 (sensor ground) may be open.
- Read freeze frame data using TOYOTA hand–held tester or OBD II scan tool. Because freeze frame records the engine conditions when the malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

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



PREPARATION:

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

(b) Turn the ignition switch ON and push the OBD II scan tool or TOYOTA hand–held tester main switch ON.

CHECK:

Read the throttle valve opening percentage.

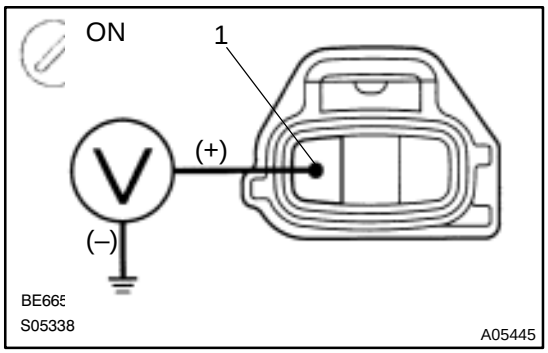
OK:

Throttle valve	Throttle valve opening position expressed as percentage
Fully open	Approx. 70 %
Fully closed	Approx. 10 %

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

NG

2	**Check voltage between terminal 1 of throttle position sensor connector and body ground.**



PREPARATION:

(a) Disconnect the throttle position sensor connector.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminal 1 of the throttle position connector and body ground.

OK:

Voltage: 4.5 – 5.5 V

NG → **Go to step 5.**

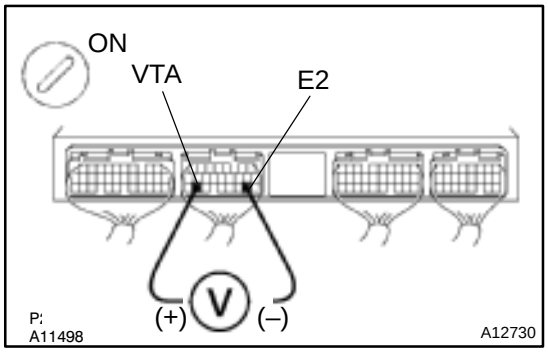
OK

3	**Check throttle position sensor (See page SF–33).**

NG → **Replace throttle position sensor.**

OK

4	**Check voltage between terminals VTA and E2 of ECM connector.**



PREPARATION:

(a) Disconnect the ECM with connector from body panel (See page SF–62).

(b) Turn the ignition switch ON.

CHECK:

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

OK:

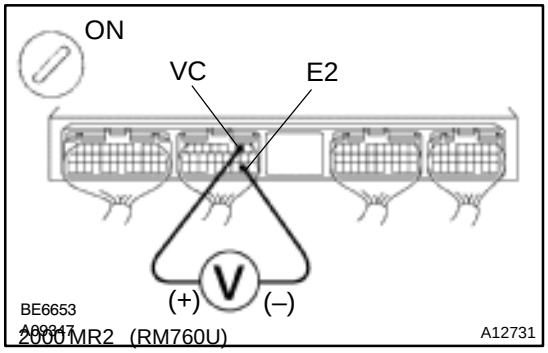
Throttle valve	Voltage
Fully closed	0.3 – 1.0 V
Fully open	3.2 – 4.9 V

OK → **Check and replace ECM (See page IN–28).**

NG

Check for open and short in harness and connector in VTA or E2 circuit between ECM and throttle position sensor (See page IN–28).

5	**Check voltage between terminals VC and E2 of ECM connector.**



PREPARATION:

(a) Disconnect the ECM with connector from body panel (See page SF–62).

(b) Turn the ignition switch ON.

CHECK:

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

OK:

Voltage: 4.5 – 5.5 V

NG	Check and replace ECM (See page IN–28).

OK

Check for open in harness and connector in VC circuit between ECM and sensor (See page IN–28).

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

CIRCUIT DESCRIPTION

Refer to DTC P0120 on page DI–37.

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 for vehicle speed is more than 0 km/h (0 mph). (2 trip detection logic)	• Throttle position sensor

INSPECTION PROCEDURE

HINT:

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

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

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

NO

Replace throttle position sensor.

DI384–04

DTC	P0125	Insufficient Coolant Temp. for Closed Loop Fuel Control

CIRCUIT DESCRIPTION

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

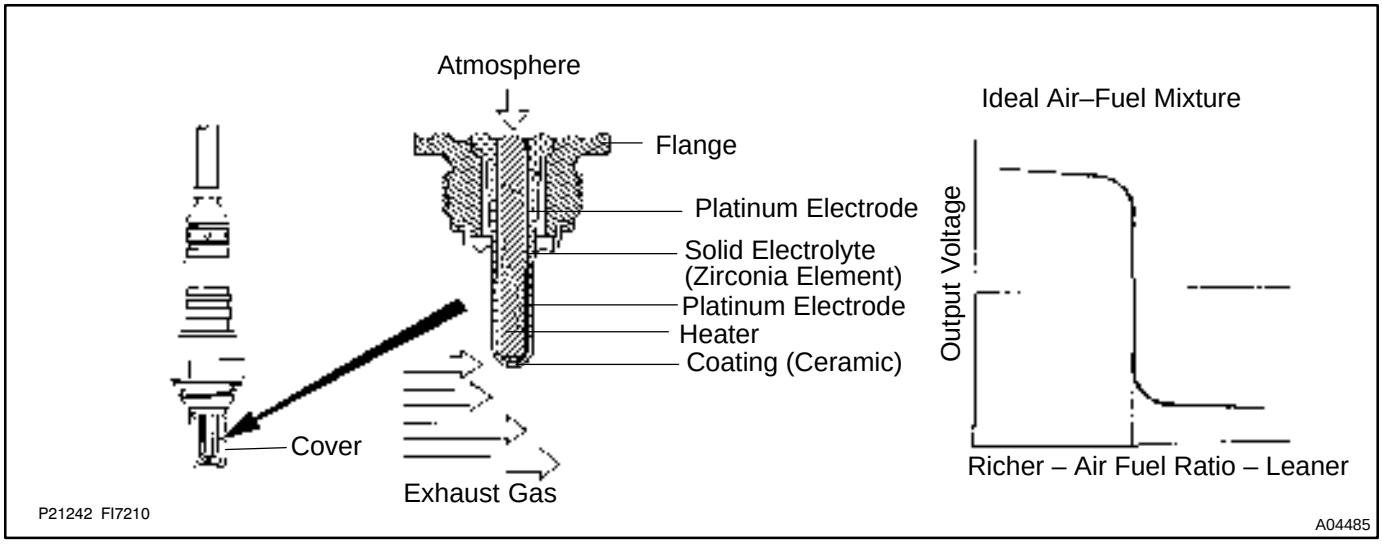
The heated oxygen sensor (bank 1, 2 sensor 1) has the characteristic and that output voltage, which changes suddenly in the vicinity of the stoichiometric air–fuel ratio. This is used to detect the oxygen concentration in the exhaust gas and provide the ECM with feedback to control the air–fuel ratio.

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

When the air–fuel ratio is RICHER than the stoichiometric air–fuel ratio the oxygen concentration in the exhaust gas in reduced and the heated oxygen sensor informs the ECM of the RICH condition (large electromotive force: > 0.45 V).

The ECM judges by the electromotive force from the heated oxygen sensor whether the air–fuel ratio is RICH or LEAN and controls the injection time accordingly. However, if malfunction of the heated oxygen sensor causes output of abnormal electromotive force, the ECM is unable to perform accurate air–fuel ratio control.

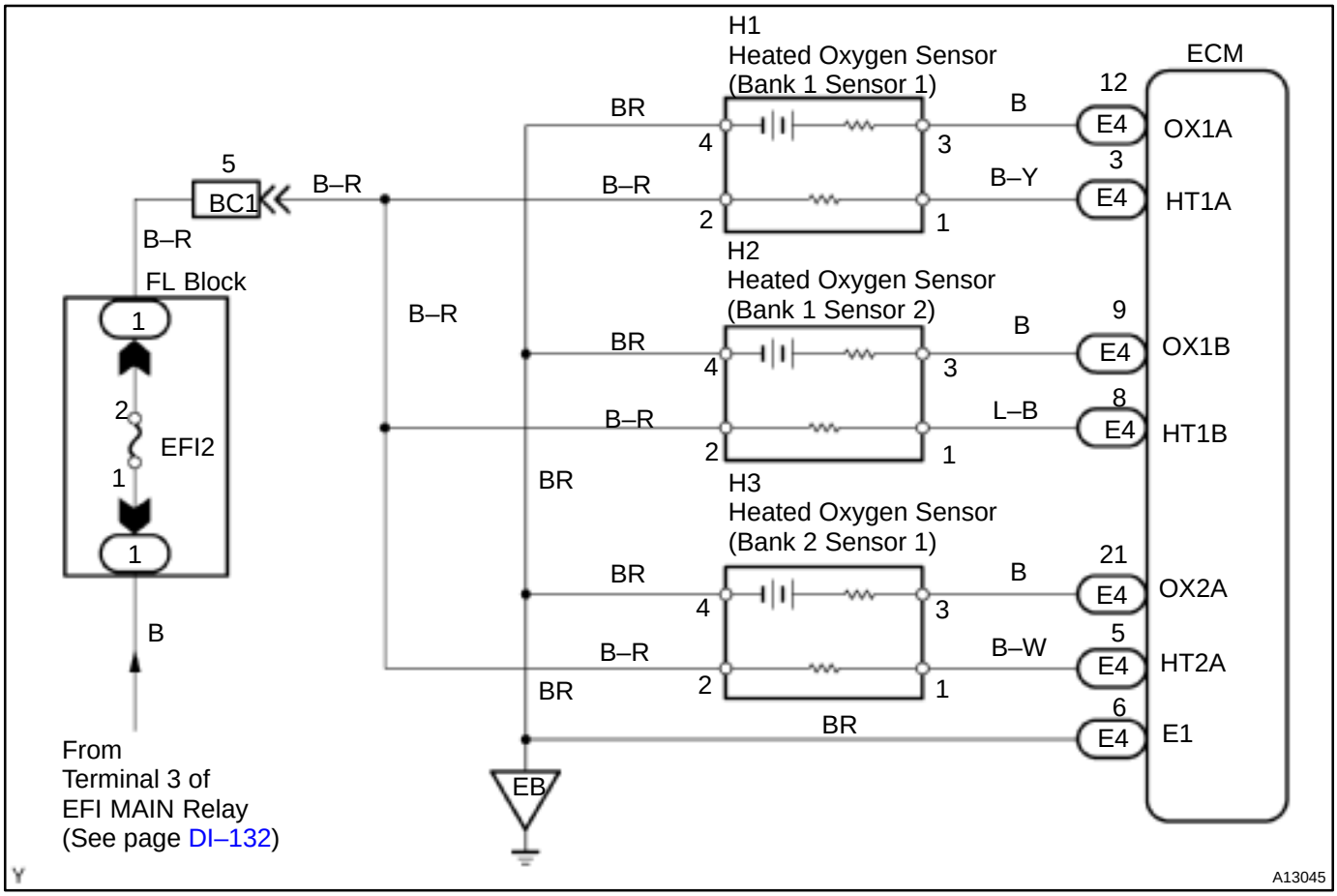
The heated oxygen sensors include a heater which heats the zirconia element. The heater is controlled by the ECM. When the intake air volume is low (the temp. of the exhaust gas is low) current flows to the heater to heat the sensor for accurate oxygen concentration detection.



DTC No.	DTC Detection Condition	Trouble Area
P0125	After engine is warmed up, oxygen sensor (bank 1, 2 sensor 1) output does not indicate RICH (≧ 0.45 V) even once when conditions (a), (b), and (c) continue for at least 1.5 min.: (a) Engine speed: 1,400 rpm or more (b) Vehicle speed: 40 – 100 km/h (25 – 62 mph) (c) Throttle valve does not fully closed	• Open or short in heated oxygen sensor (bank 1, 2 sensor 1) circuit • Heated oxygen sensor (bank 1, 2 sensor 1) • Air induction system • Fuel system • Injector • Gas leakage on exhaust system • ECM

HINT:
After confirming DTC P0125, use the OBD II scan tool or TOYOTA hand–held tester to confirm voltage output of the heated oxygen sensor (bank 1, 2 sensor 1) from the CURRENT DATA.
If the voltage output of the heated oxygen sensor (bank 1, 2 sensor 1) is less than 0.1 V, the heated oxygen sensor circuit may be open or short.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If the vehicle runs out of fuel, the air–fuel ratio is LEAN and DTC P0125 will be recorded. The MIL then comes on.
- Read freeze frame data using TOYOTA hand–held tester or OBD II scan tool. Because freeze frame records the engine conditions when the malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

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

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

NO

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

PREPARATION:

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

(b) Warm up the engine to normal operating temperature (above 75˚C).

CHECK:

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

HINT:

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

OK:

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

OK → **Go to step 9.**

NG

3	**Check for open and short in harness and connector between ECM and heated oxygen sensor (bank 1, 2 sensor 1) (See page IN–28).**

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

OK

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

NG → **Perform troubleshooting for misfire (See page DI–63).**

OK

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

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

OK

6	Check fuel pressure (See page SF–7).

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

OK ↓

7	Check injector injection (See page SF–24).

NG → Replace injector.

OK ↓

8	Check gas leakage on exhaust system.

NG → Repair or replace.

OK ↓

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

9	Perform confirmation driving pattern (See page DI–47).

Go ↓

10	Is there DTC P0125 being output again?

YES → Check and replace ECM (See page IN–18).

NO ↓

11	Did vehicle runs out of fuel in past?

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

YES →

DTC P0125 is caused by shortage of fuel.

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–42.

DTC No.	DTC Detection Condition	Trouble Area
P0130 P0150	Voltage output of heated 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 heated oxygen sensor circuit • Heated oxygen sensor • Air induction system • Fuel pressure • Injector • ECM

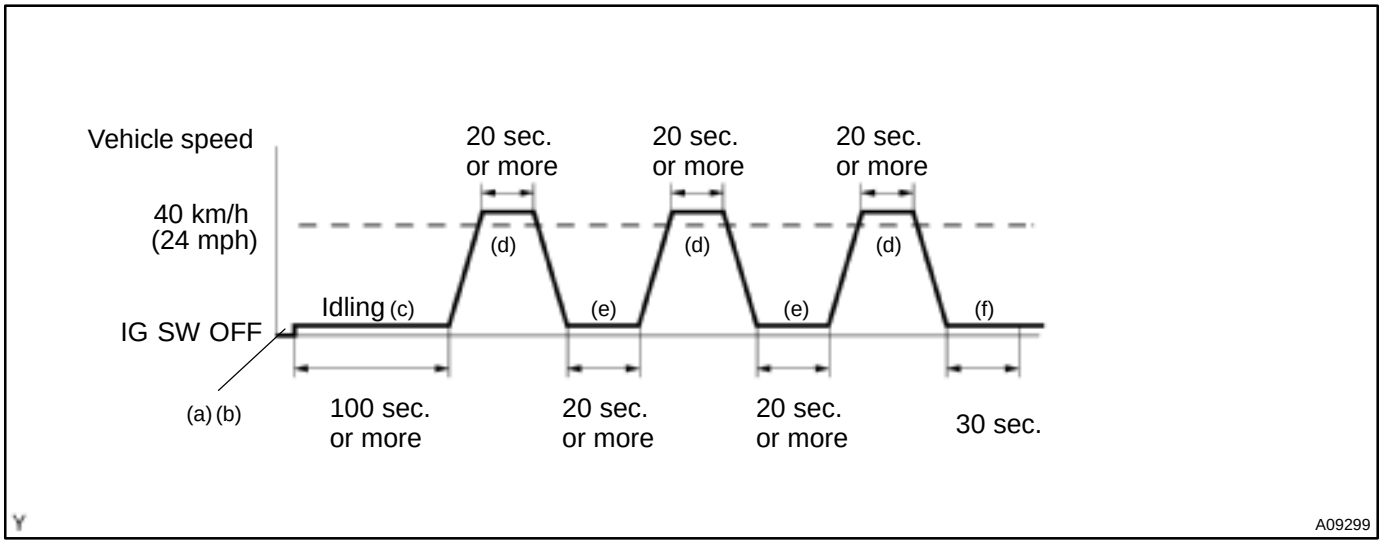
HINT:

- Bank 1 refers to the bank that includes the cylinder No. 1.
- Bank 2 refers to the bank that excludes the cylinder No. 1.
- Sensor 1 refers to the sensor closer to the engine body.
- The heated oxygen sensor's output voltage and the short−term fuel trim value can be read using the OBD II scan tool or TOYOTA hand−held tester.

WIRING DIAGRAM

Refer to DTC P0125 on page DI–42.

CONFIRMATION DRIVING PATTERN



(a) Connect the TOYOTA hand–held tester to the DLC3.
(b) Switch the TOYOTA hand–held tester from the normal mode to the check mode (See page DI–3).
(c) Start the engine and let the engine idle for 100 sec. or more.
(d) Drive the vehicle at 40 km/h (24 mph) or more for 20 sec. or more.
(e) Let the engine idle for 20 sec. or more.

(f) Let the engine idle for 30 sec.

HINT:

If a malfunction exists, the MIL will light up during step (f).

NOTICE:

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

INSPECTION PROCEDURE

HINT:

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

1	**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 heated oxygen sensor during idling.**

PREPARATION:

Keep the engine at 2,500 rpm for approx. 90 sec. to warm up the heated oxygen sensor.

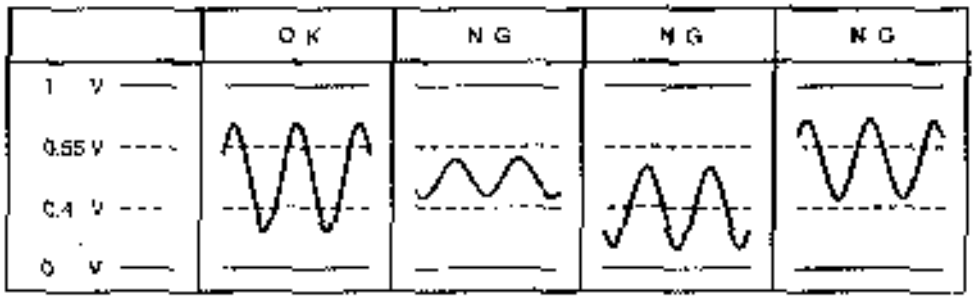
CHECK:

Use the OBD II scan tool or TOYOTA hand–held tester to read the output voltage of the heated oxygen sensor during idling.

OK:

Heated oxygen sensor output voltage:

Alternates repeatedly between less than 0.4 V and more than 0.55 V (See the following table).



P18349

OK → **Perform confirmation driving pattern (See page DI–47).**

NG

3	Check for open and short in harness and connector between ECM and heated oxygen sensor (See page IN–18).

NG → Repair or replace harness or connector.

OK

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

NG → Repair or replace induction system.

OK

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

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

OK

6	Check injector injection (See page SF–24).

NG → Replace injector.

OK

Replace heated oxygen sensor.

7	Perform confirmation driving pattern (See page DI–47).

Go

8	Is there DTC P0130 or P0150 being output again?

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

NO

Check and replace ECM (See page IN–28).

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–42.

DTC No.	DTC Detection Condition	Trouble Area
P0133 P0153	Response time for heated oxygen sensor's voltage output 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 heated oxygen sensor circuit • Heated oxygen sensor • Air induction system • Fuel pressure • Injector • ECM

HINT:

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

WIRING DIAGRAM

Refer to DTC P0125 on page DI–42.

INSPECTION PROCEDURE

HINT:

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

1	**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 heated oxygen sensor during idling.**

PREPARATION:

Keep the engine at 2,500 rpm for approx. 90 sec. to warm up the heated oxygen sensor.

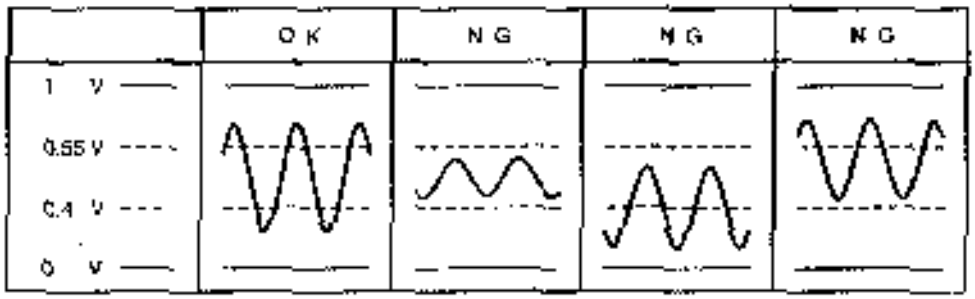
CHECK:

Use the OBD II scan tool or TOYOTA hand–held tester to read the output voltage of the heated oxygen sensor during idling.

OK:

Heated oxygen sensor output voltage:

Alternates repeatedly between less than 0.4 V and more than 0.55 V (See the following table).



P18349

OK → **Perform confirmation driving pattern (See page DI–47).**

NG

3	**Check for open and short in harness and connector between ECM and heated oxygen sensor (See page IN–18).**

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

OK

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

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

OK

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

NG → Check and repair fuel pump, fuel pipe line and filter (See page SF–1).

OK ↓

6	Check injector injection (See page SF–24).

NG → Replace injector.

OK ↓

Replace heated oxygen sensor.

7	Perform confirmation driving pattern (See page DI–47).

Go ↓

8	Is there DTC P0133 or P0153 being output again?

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

NO ↓

Check and replace ECM (See page IN–28).

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)

CIRCUIT DESCRIPTION

Refer to DTC P0125 on page DI–42.

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

HINT:

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

WIRING DIAGRAM

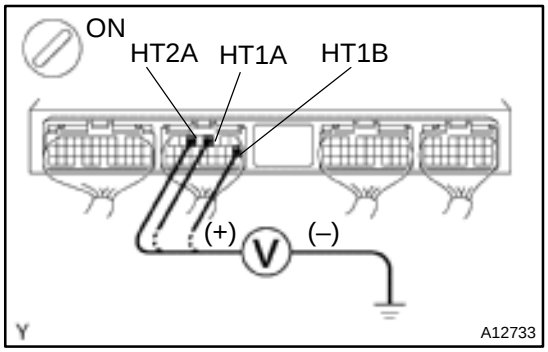
Refer to DTC P0125 on page DI–42.

INSPECTION PROCEDURE

HINT:

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

1	Check voltage between terminals HT1A, HT1B and HT2A of ECM connector and body ground.



PREPARATION:

(a) Disconnect the ECM with connector from body panel (See page SF–62).

(b) Turn the ignition switch ON.

CHECK:

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

HINT:

- Terminal HT1A connects to bank 1 sensor 1.
- Terminal HT1B connects to bank 2 sensor 1.
- Terminal HT2A connects to bank 1 sensor 2.

OK:

Voltage: 9 – 14 V

OK → **Check and replace ECM (See page IN–28).**

NG

2	Check resistance of heated oxygen sensor heater (See page SF–61).

NG → **Replace heated oxygen sensor.**

OK

Repair or replace harness or connector between EFI main relay (Marking: EFI MAIN) and heated oxygen sensor and heated oxygen sensor and ECM (See page IN–28).

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

CIRCUIT DESCRIPTION

Refer to DTC P0125 on page DI–42.

DTC No.	DTC Detection Condition	Trouble Area
P0136	Voltage output of heated oxygen sensor remains at 0.40 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 (2 trip detection logic)	• Open or short in heated oxygen sensor circuit • Heated oxygen sensor

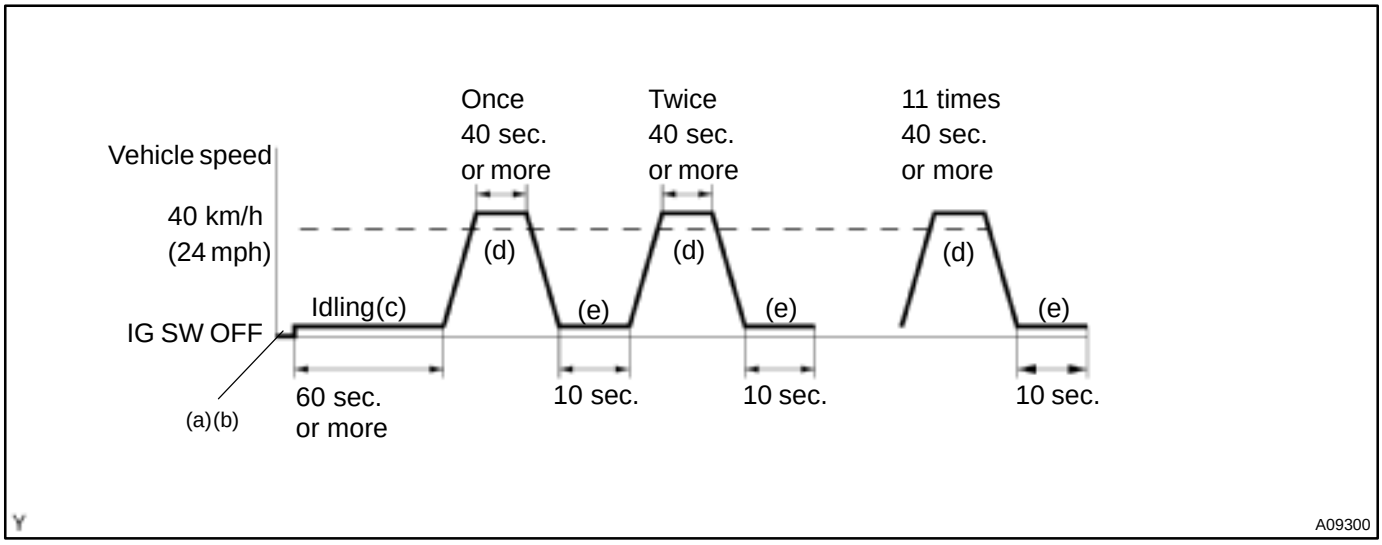
HINT:

- Bank 1 refers to the bank that includes the cylinder No. 1
- Sensor 2 refers to the sensor farther away from the engine body.

WIRING DIAGRAM

Refer to DTC P0125 on page DI–42.

CONFIRMATION DRIVING PATTERN



(a) Connect the hand–held tester to the DLC3.
(b) Switch the hand–held tester from the normal mode to the check (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 40 km/h (24 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.

HINT:

If a malfunction exists, the 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 will not be possible.
If you do not have a hand–held tester, turn the ignition switch OFF after performing steps from (c) to (f), then perform steps from (c) to (f) again.

INSPECTION PROCEDURE

HINT:

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

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

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

NO

2	**Check for open and short in harness and connector between ECM and heated oxygen sensor (See page IN–28).**

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

OK

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

PREPARATION:

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

(b) Warm up the engine to normal temperature of the operating.

CHECK:

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

HINT:

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

OK:

Heated oxygen sensor output voltage: Alternates from 0.40 V or less to 0.5 V or more.

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

NG

Replace heated oxygen sensor.

DI5CX–03

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 refers to the feedback compensation value compared 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 long–term to compensate for continual deviation of the short–term fuel trim from the central value due to individual engine differences, wear overtime and changes in the usage environment.

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

DTC No.	DTC Detection Condition	Trouble Area
P0171 P0174	When air–fuel ratio feedback is stable after warming up engine, fuel trim is considerably in error on RICH side (2 trip detection logic)	• Air induction system • Injector blockage • Mass air flow meter • Engine coolant temp. sensor • Fuel pressure • Gas leakage on exhaust system • Open or short in heated oxygen sensor (bank 1, 2 sensor 1) circuit • Heated oxygen sensor (bank 1, 2 sensor 1)
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)	• Injector leak, blockage • Mass air flow meter • Engine coolant temp. sensor • Ignition system • Fuel pressure • Gas leakage on exhaust system • Open or short in heated oxygen sensor (bank 1, 2 sensor 1) circuit • Heated oxygen sensor (bank 1, 2 sensor 1)

HINT:

- When the 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 the DTC P0171 is recorded. The MIL then comes on.
- If the total of the short–term fuel trim value and long–term fuel trim value is within ±38 %, the system is functioning normally.
- The heated oxygen sensor (Bank 1, 2 Sensor 1) output voltage and the short–term fuel trim value can be read using the OBD II scan tool or TOYOTA hand–held tester.

WIRING DIAGRAM

Refer to DTC P0125 on page DI–42.

INSPECTION PROCEDURE

HINT:

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

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

NG → **Repair or replace.**

OK

2	**Check injector injection (See page SF–24).**

NG → **Replace injector.**

OK

3	**Check engine coolant temperature sensor (See page SF–55) and mass air flow meter (See page SF–32).**

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 SF–7).**

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

OK

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

NG → **Repair or replace.**

OK

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

PREPARATION:

Keep the engine at 2,500 rpm for approx. 90 sec. to warm up the heated oxygen sensor.

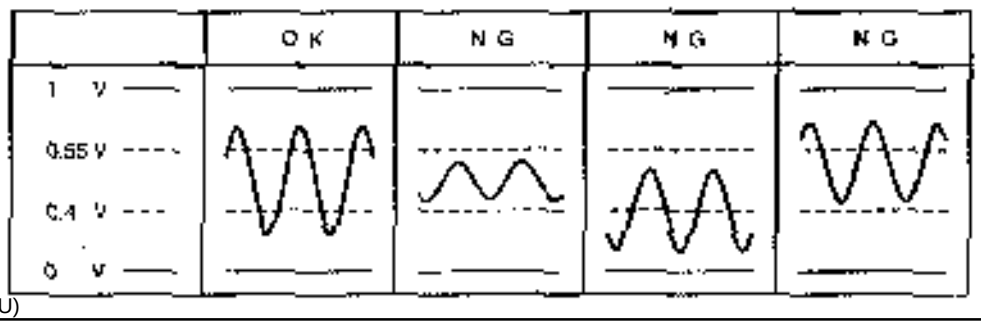
CHECK:

Use the OBD II scan tool or TOYOTA hand–held tester to read the output voltage of the heated oxygen sensor during idling.

OK:

Heated oxygen sensor output voltage:

Alternates repeatedly between less than 0.4 V and more than 0.55 V (See the following table).



2000 MR2 (RM760U) P18349

OK → Perform confirmation driving pattern (See page DI–47).

NG

8	Check for open and short in harness and connector between ECM and heated oxygen sensor (bank 1, 2 sensor 1) (See page IN–18).

NG → Repair or replace harness or connector.

OK

Replace heated oxygen sensor.

9	Perform confirmation driving pattern (See page DI–47).

GO

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

YES → Check and replace ECM (See page IN–28).

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.

DI7DE–01

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

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

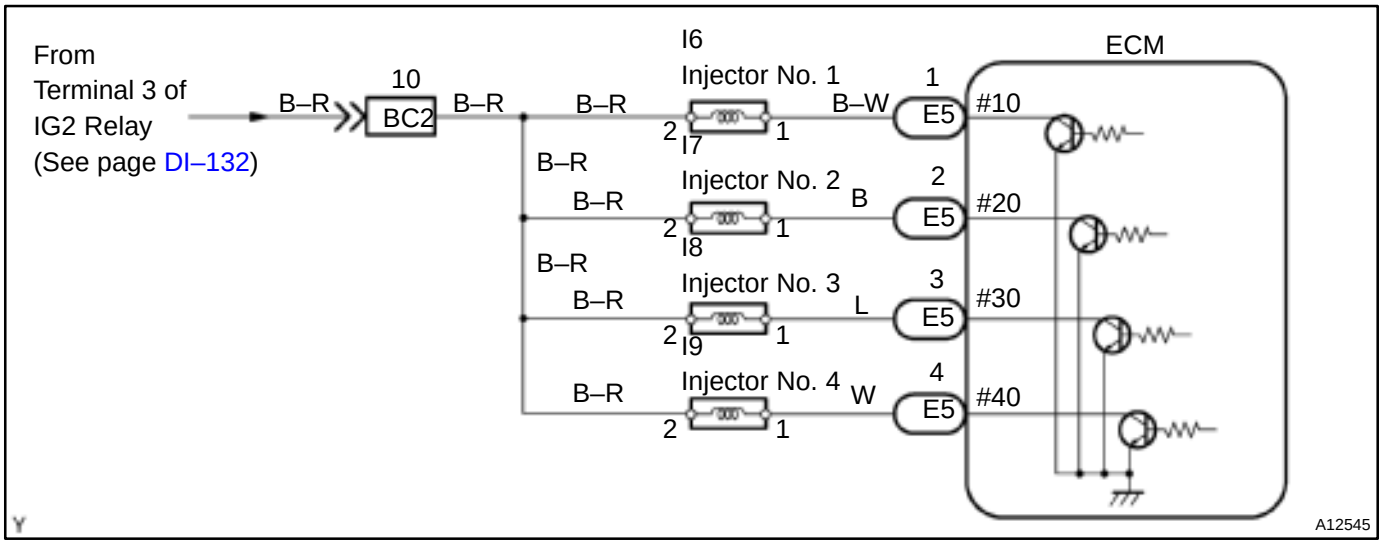
If the misfire rate is high enough and the driving conditions causes catalyst overheating, the MIL blinks when misfiring occurs.

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

HINT:

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

WIRING DIAGRAM



CONFIRMATION DRIVING PATTERN

(a) Connect the TOYOTA hand–held tester or OBD II scan tool to the DLC3.
(b) Record the DTC and the freeze frame data.
(c) Use the TOYOTA hand–held tester to set to the check 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 TOYOTA hand–held tester, turn the ignition switch OFF after the symptom is simulated the first time. Then repeat the simulation process again.

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

Engine Speed	Time
Idling	5 minutes and 45 seconds or more
1000 rpm	4 minutes or more
2000 rpm	2 minutes and 30 seconds or more
3000 rpm	1 minute and 30 seconds or more

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

INSPECTION PROCEDURE

HINT:
- If the DTC besides misfire is memorized simultaneously, first perform the troubleshooting for them.
- Read freeze frame data using TOYOTA hand–held tester or OBD II scan tool. Because freeze frame records the engine conditions when the malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.
- When the vehicle is brought to the workshop and the misfire is not occurred, misfire can be confirmed by reproducing the condition or freeze frame data. Also, after finishing the repair, confirm that there is no misfire. (See the confirmation driving pattern)

- When either of SHORT FT #1, LONG FT #1, SHORT FT #2 or LONG FT #2 in the freeze frame data is besides the range of ±20%, there is a possibility that the air–fuel ratio is inclining either to ”rich” (–20% or less) or ”lean” (+20% or more).
- When COOLANT TEMP in the freeze frame data is less than 80˚C (176˚F), there is a possibility or misfire only during warming up.
- In the case that misfire cannot be reproduced, this may be because of the driving with shortage of fuel, the use of improper fuel, a stain of 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 in the vacuum hose.

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

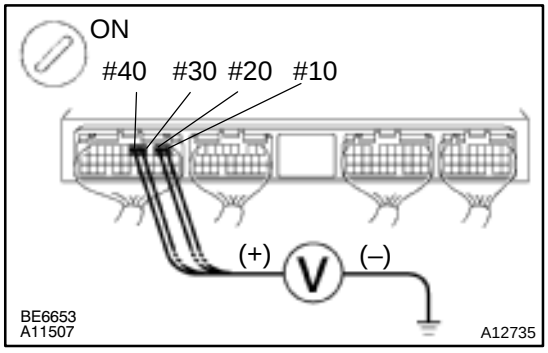
OK

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

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

OK

3	**Check voltage of ECM terminal for injector of faulty cylinder.**



PREPARATION:

(a) Disconnect the ECM with connector from body panel (See page SF–62).

(b) Turn the ignition switch ON.

CHECK:

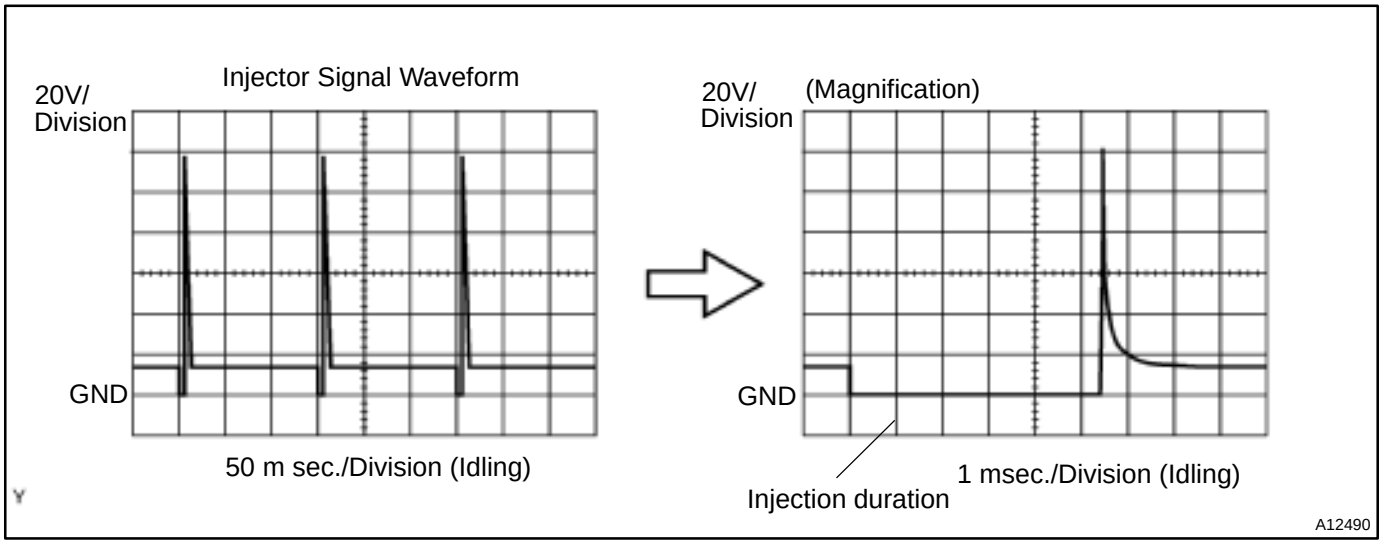
Measure the voltage between applicable terminal of the ECM connector and body ground.

OK:

Voltage: 9 – 14 V

Reference: INSPECTION USING OSCILLOSCOPE
INJECTOR SIGNAL WAVEFORM

With the engine idling, check the waveform between terminals #10 – #40 and E01 of the ECM connector.
HINT:
The correct waveforms are shown.



OK	**Go to step 5.**

NG

4	**Check resistance of injector of misfiring cylinder (See page SF–21).**

NG	**Replace injector.**

OK

Check for open and short in harness and connector between injector and ECM (See page IN–28).

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

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

OK

6	Check injector injection (See page SF–24).

NG → Replace injector.

OK

7	Check mass air flow meter (See page SF–31) and engine coolant temperature sensor (See page SF–55).

NG → Repair or replace.

OK

Check compression pressure (See page EM–3), valve clearance (See page EM–4), and valve timing (See page EM–17).

DI38A–04

DTC	P0325	Knock Sensor 1 Circuit Malfunction (Bank 1)

CIRCUIT DESCRIPTION

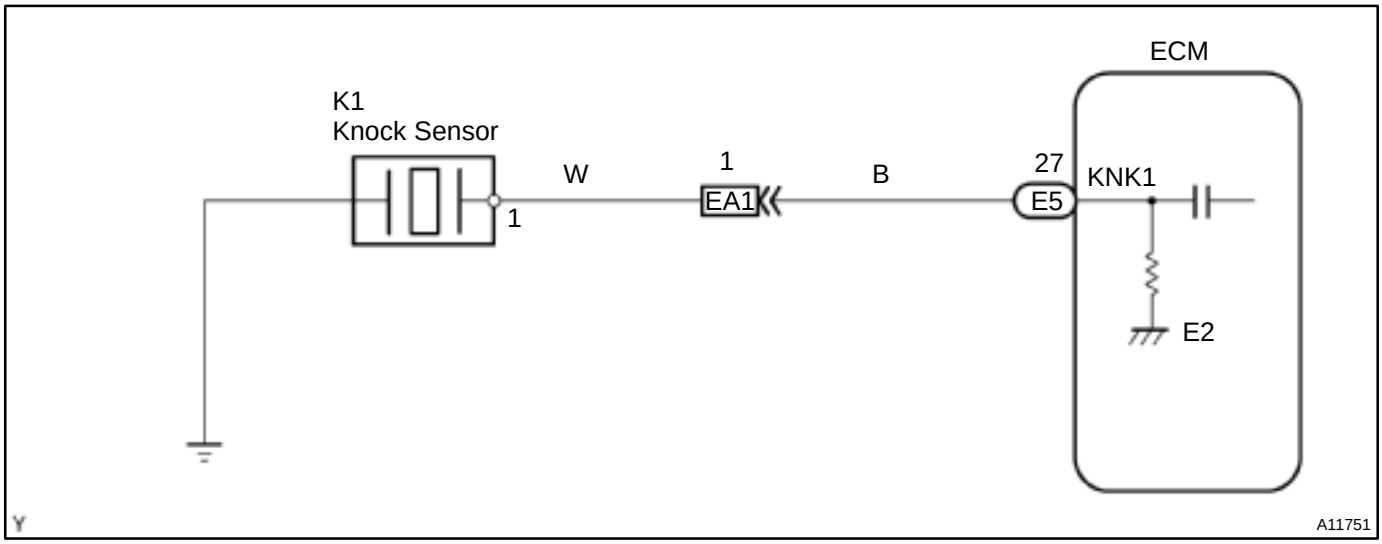
The knock sensor is fitted to the cylinder block to detect engine knocking. This sensor contains a piezoelectric element which generates a voltage when it becomes deformed. This occurs when the cylinder block vibrates due to knocking. If engine knocking occurs, ignition timing is retarded to suppress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

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

HINT:

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

WIRING DIAGRAM

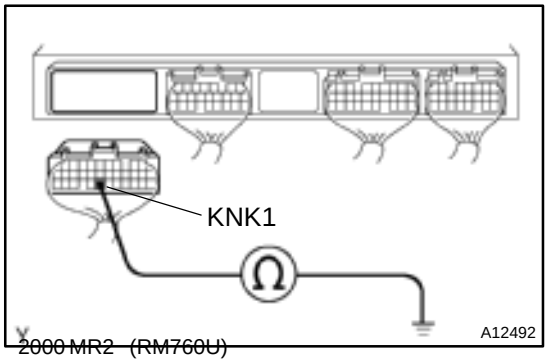


INSPECTION PROCEDURE

HINT:

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

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



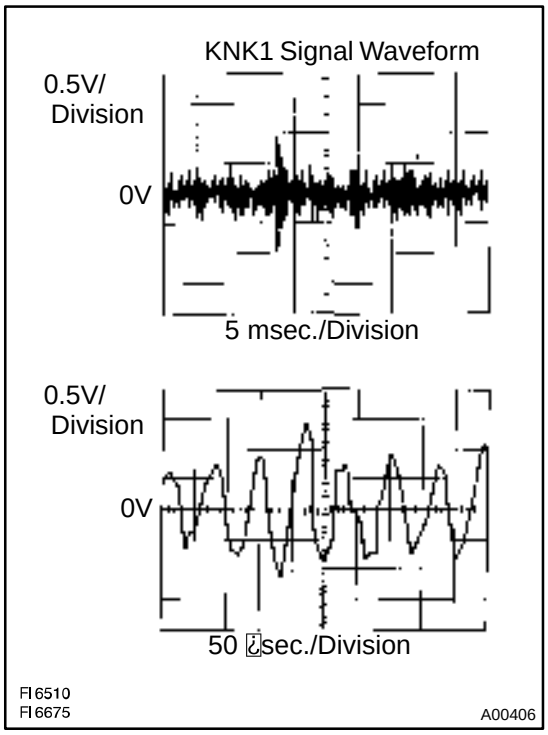
PREPARATION:

(a) Disconnect the ECM with connector from body panel (See page SF–62).

(b) Disconnect the E5 connector from the ECM.

CHECK:

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



OK:

Resistance: 1 MΩ or higher

Reference: INSPECTION USING OSCILLOSCOPE

- With the engine racing at 4,000 rpm, measure the waveform between terminal KNK1 of the ECM connector and body ground.

HINT:
The correct waveforms are as shown.

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

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

OK	**Go to step 3.**

NG

2	**Check knock sensor (See page SF–59).**

NG	**Replace knock sensor.**

OK

3	**Check for open and short in harness and connector between ECM and knock sensor (See page IN–28).**

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

OK

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

YES	**Replace knock sensor.**

NO

Check and replace ECM (See page IN–28).

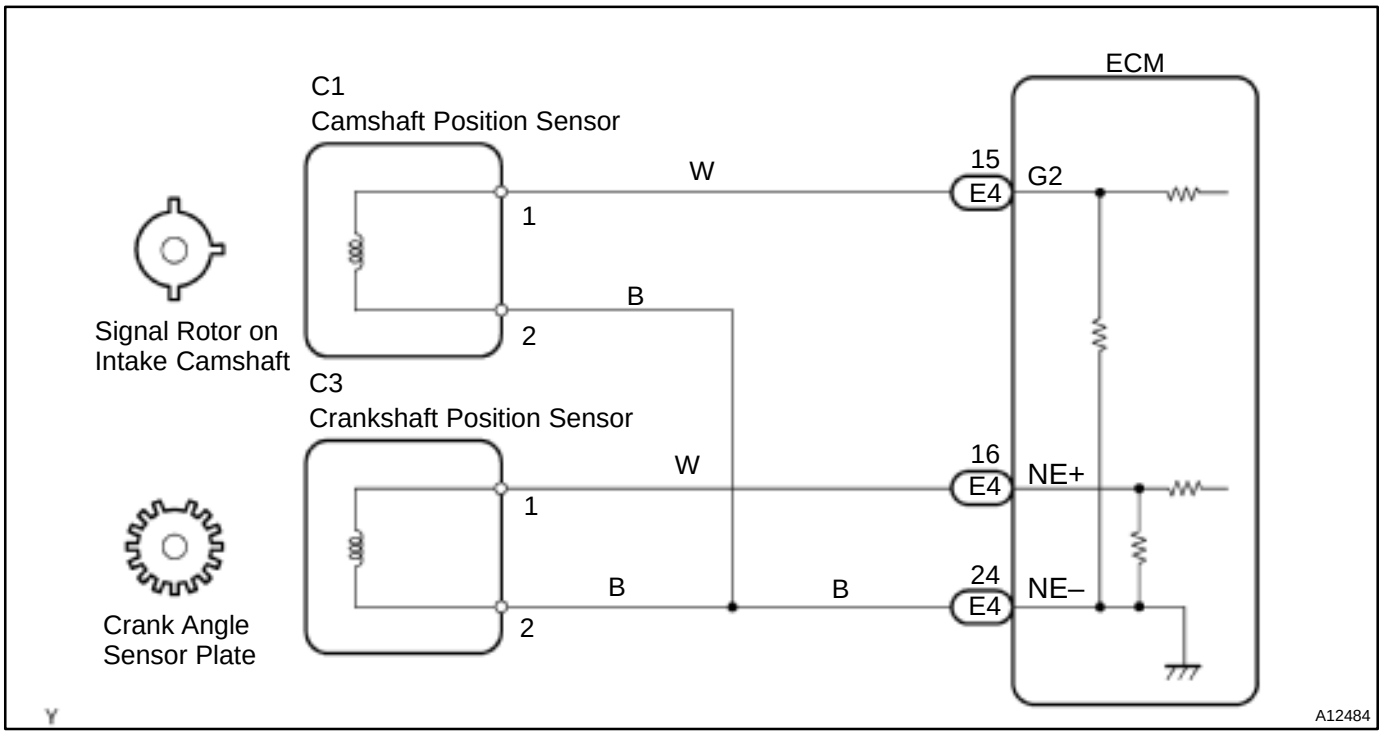
DTC	P0335	Crankshaft Position Sensor ”A” Circuit Malfunction

CIRCUIT DESCRIPTION

Crankshaft position sensor (NE signal) consists of a magnet, iron core and pick up coil.
The NE signal plate (crank angle sensor plate) has 34 teeth and is mounted on the crankshaft. The NE signal sensor generates 34 signals at every engine revolution. The ECM detects the standard crankshaft angle based on the G signal, 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 ECM during cranking (2 trip detection logic)	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Crank angle sensor plate • ECM
	No crankshaft position sensor signal to ECM with engine speed 600 rpm or more (2 trip detection logic)	

WIRING DIAGRAM

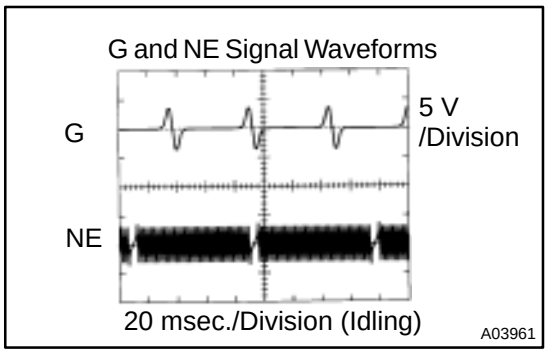


INSPECTION PROCEDURE

HINT:

- Perform troubleshooting of DTC P0335 1st. If no trouble is found, troubleshoot the following mechanical system.
- Read freeze frame data using TOYOTA hand–held tester or OBD II scan tool. Because freeze frame records the engine conditions when the malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

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



Reference: INSPECTION USING OSCILLOSCOPE
During cranking or idling, check the waveform between terminals G2 and NE– and NE+ and NE– of the ECM connector.
HINT:
The correct waveforms are as shown.

NG → **Replace crankshaft position sensor.**

OK

2	**Check for open and short in harness and connector between ECM and crankshaft position sensor (See page IN–28).**

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

OK

3	**Inspect sensor installation and teeth of crank angle sensor plate (See page EM–11).**

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

OK

Check and replace ECM (See page IN–28).

DTC	P0340	Camshaft Position Sensor Circuit Malfunction

CIRCUIT DESCRIPTION

Camshaft position sensor (G signal) consists of a magnet,iron core and pickup coil.
The G signal rotor has 3 teeth on its outer circumference and is mounted on the intake camshaft.
When the camshafts rotate, the protrusion on the signal plate and the air gap on the pickup coil change, causing fluctuations in the magnetic field and generating an electromotive force in the pickup coil.
The NE signal plate (crank angle sensor plate) has 34 teeth and is installed on the crankshaft. The NE signal sensor generates 34 signals at every engine revolution. The ECM detects the standard crankshaft angle based on the G signals, 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 ECM during cranking (2 trip detection logic)	• Open or short in camshaft position sensor circuit • Camshaft position sensor • Intake camshaft • ECM
	No camshaft position sensor signal to ECM with engine speed 600 rpm or more	

WIRING DIAGRAM

Refer to DTC P0335 on page DI–71.

INSPECTION PROCEDURE

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

1	**Check resistance of camshaft position sensor (See page IG–1).**

Reference: INSPECTION USING OSCILLOSCOPE
Refer to DTC P0335 on page DI–71.

NG → **Replace camshaft position sensor.**

OK

2	**Check for open and short in harness and connector between ECM and camshaft position sensor (See page IN–28).**

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

OK

3	**Inspect sensor installation and signal rotor teeth of intake camshaft (See page EM–11).**

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

OK

Check and replace ECM (See page IN–28).

DTC	P0420	Catalyst System Efficiency Below Threshold (Bank 1)

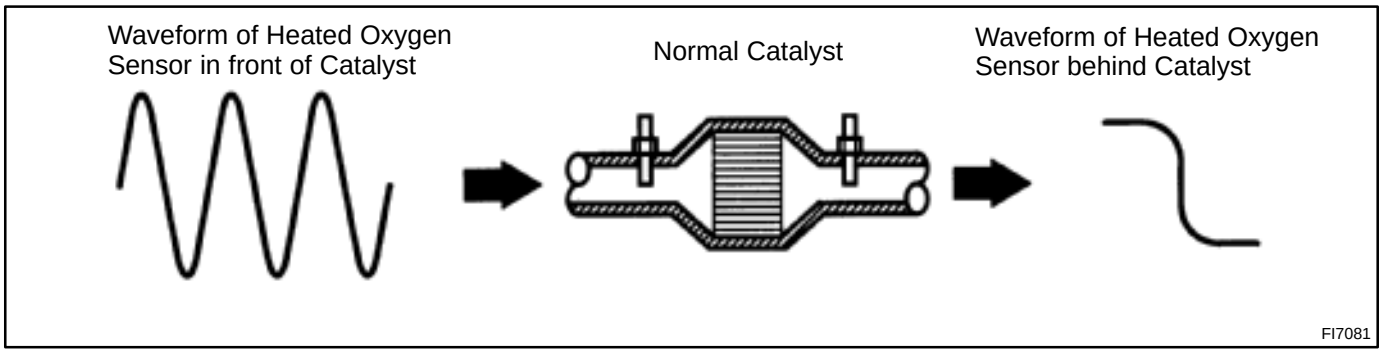
CIRCUIT DESCRIPTION

The ECM compares the waveform of the heated oxygen sensor located in front of the catalyst with the waveform of the heated oxygen sensor located behind the catalyst to determine whether or not catalyst performance has deteriorated.

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

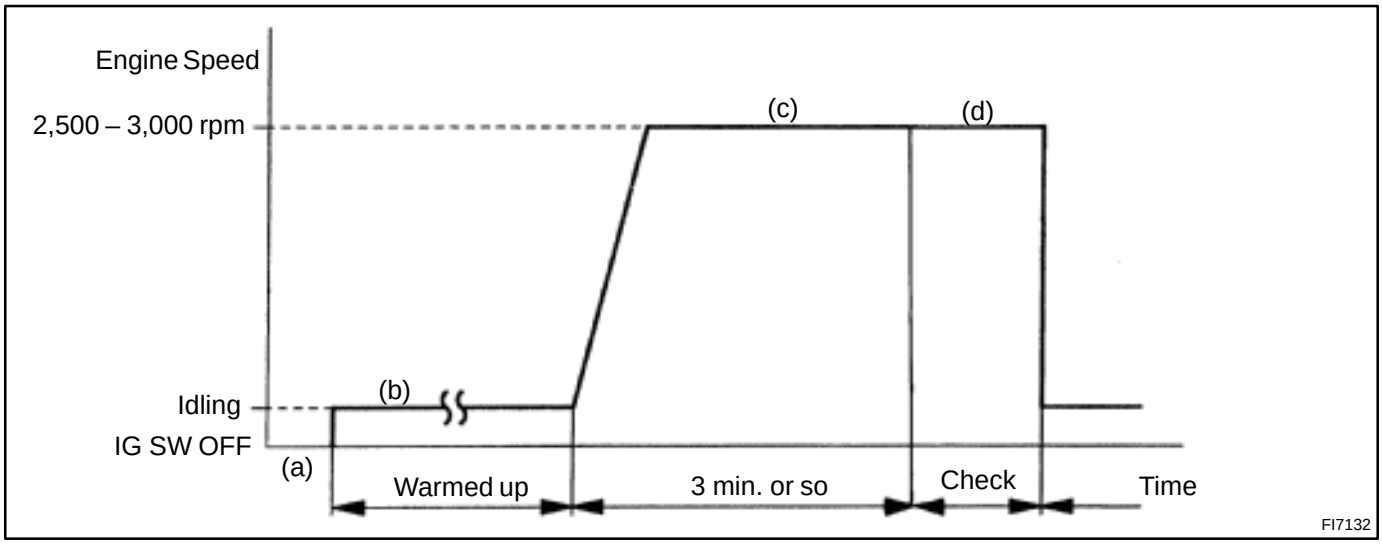
If the catalyst is functioning normally, the waveform of the heated oxygen sensor behind the catalyst switches back and forth between rich and lean much more slowly than the waveform of the heated oxygen sensor in front of the catalyst.

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

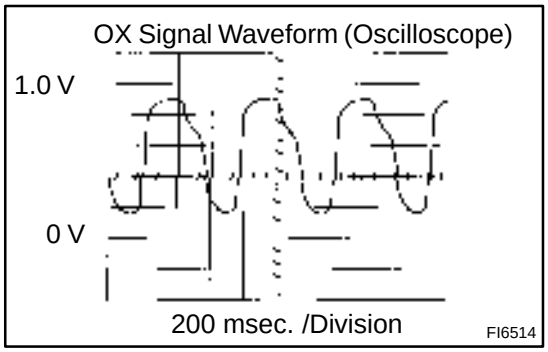


DTC No.	DTC Detection Condition	Trouble Area
P0420	After engine and catalyst are warmed up, and while vehicle is driven within set vehicle and engine speed range, waveforms of oxygen sensors (bank 1 sensor 1 and bank 1 sensor 2) have same amplitude (2 trip detection logic)	• Gas leakage on exhaust system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

CONFIRMATION ENGINE RACING PATTERN



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



HINT:
- If there is a malfunction in the system, the waveform of the heated oxygen sensor (bank 1 sensor 2 (OX1B)), is almost the same as that of the heated oxygen sensor (bank 1, 2 sensor 1 (OX1A, OX2A)), on the left.
- There are some cases where, even though a malfunction exists, the MIL may either light up or not light up.

INSPECTION PROCEDURE

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

1	**Are there any other codes (besides DTC P0420) being output?**

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

NO

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

NG → **Repair or replace.**

OK

3	**Check heated oxygen sensor (bank 1, 2 sensor 1) (See page DI–47).**

NG → **Repair or replace.**

OK

4	Check heated oxygen sensor (bank 1 sensor 2) (See page DI–56).

NG → Repair or replace.

OK

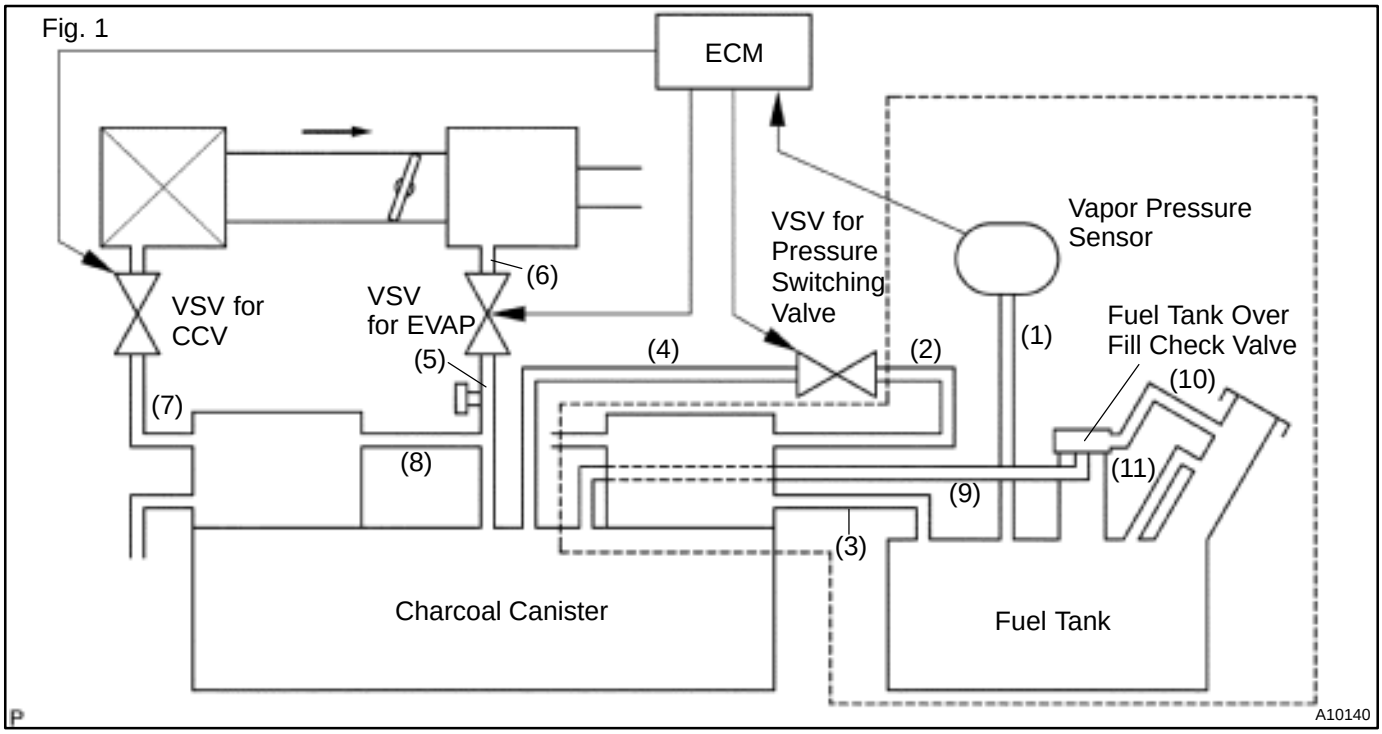
Replace three–way catalytic converter.

DTC	P0440	Evaporative Emission Control System Malfunction

CIRCUIT DESCRIPTION

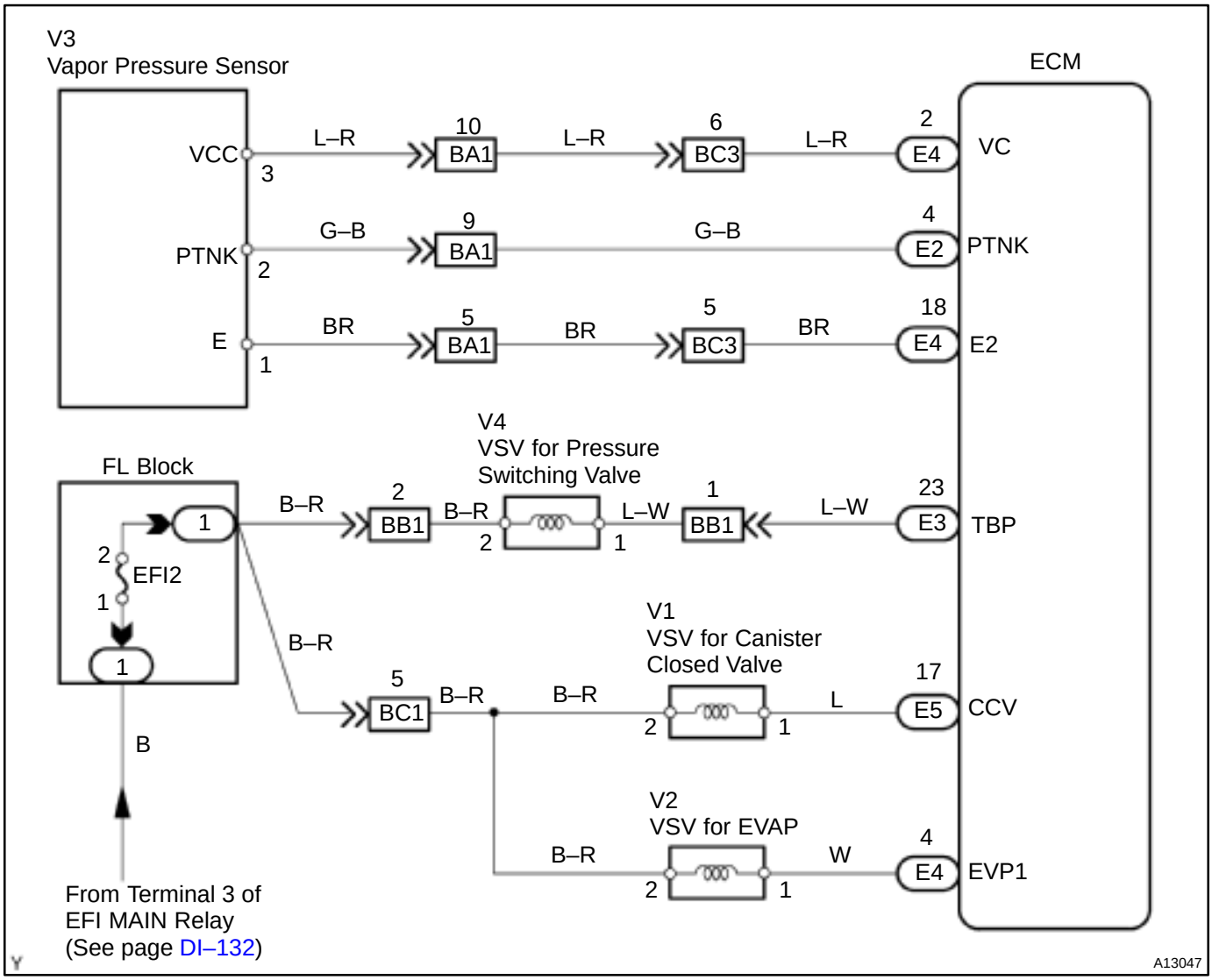
The vapor pressure sensor, VSV for canister closed valve (CCV) and VSV for pressure switching valve are used to detect abnormalities in the evaporative emission control system.
The ECM decides whether there is an abnormality in the evaporative emission control system based on the vapor pressure sensor signal.
DTC P0440 is recorded by the ECM when evaporative emissions leak from the components within the dotted line in Fig. 1 below, or when the vapor pressure sensor malfunctions.

Fig. 1



DTC No.	DTC Detection Condition	Trouble Area
P0440	Fuel tank pressure is atmospheric pressure after vehicle is driven for 20 min. (2 trip detection logic)	• Hose or tube cracked, holed, damaged or loose seal ((3) in Fig. 1) • Fuel tank cap incorrectly installed • Fuel tank cap cracked or damaged • Vacuum hose cracked, holed, blocked, damaged or disconnected ((1) or (2) in Fig. 1) • Fuel tank cracked, holed or damaged • Charcoal canister cracked, holed or damaged • Open or short in vapor pressure sensor circuit • Vapor pressure sensor • Fuel tank over fill check valve cracked or damaged • ECM

WIRING DIAGRAM

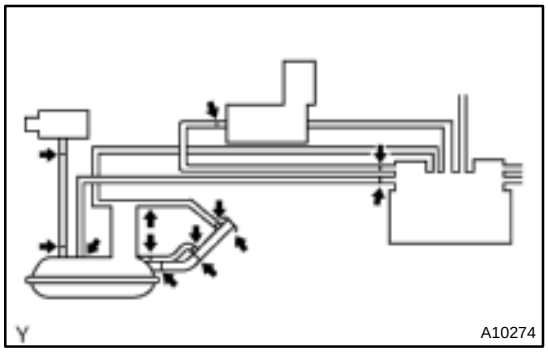


INSPECTION PROCEDURE

HINT:

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

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



CHECK:

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

- Fuel tank
- Charcoal canister
- Fuel tank filler pipe
- Hoses and tubes around fuel tank and charcoal canister

NG → **Repair or replace.**

OK

2	**Check that fuel tank cap is TOYOTA genuine parts.**

NG → **Replace with TOYOTA genuine parts.**

OK

3	**Check that fuel tank cap is correctly installed.**

NG → **Correctly install fuel tank cap.**

OK

4	**Check fuel tank cap (See page EC–6).**

NG → **Replace fuel tank cap.**

OK

5	**Check fuel inlet pipe for damage.**

PREPARATION:
Remove the fuel tank cap.
CHECK:
Visually inspect the fuel inlet pipe for damage.

NG → **Replace fuel inlet pipe.**

OK ↓

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

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

NG → **Repair or replace.**

OK ↓

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

CHECK:
(a) Check for proper connection of the fuel tank and fuel evap pipe (See page EC–6), fuel evap pipe and fuel tube under the floor, fuel tube under the floor and charcoal canister.
(b) Check the hose and tube for cracks, hole and damage.

NG → **Repair or replace.**

OK ↓

8	**Check charcoal canister for cracks, hole and damage (See page EC–6).**

NG → **Replace charcoal canister.**

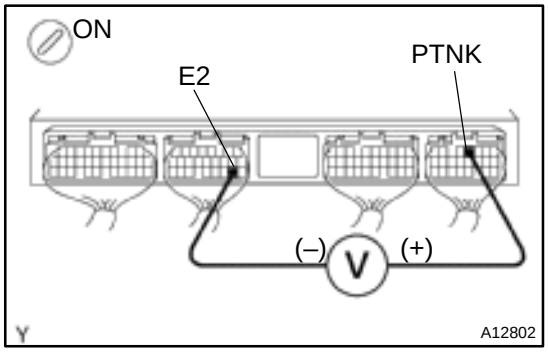
OK ↓

9	**Check voltage between terminals VC and E2 of ECM connector (See page DI–37, step 5).**

NG → **Check and replace ECM (See page IN–28).**

OK

10	**Check voltage between terminals PTNK and E2 of ECM connectors.**



PREPARATION:

(a) Disconnect the ECM with connector from body panel (See page SF–62).

(b) Remove the fuel tank cap.

(c) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals PTNK and E2 of the ECM connectors.

OK:

Voltage: 3.0 – 3.6 V

OK → **Go to step 12.**

NG

11	**Check for open and short in harness and connector between vapor pressure sensor and ECM (See page IN–28).**

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

OK

Replace vapor pressure sensor.

12	**Check fuel tank and fuel tank over fill check valve for cracks and damage.**

NG → **Replace fuel tank or fuel tank over fill check valve.**

OK

It is likely that vehicle user did not properly close fuel tank cap. Please explain to customer how to properly install fuel tank cap.

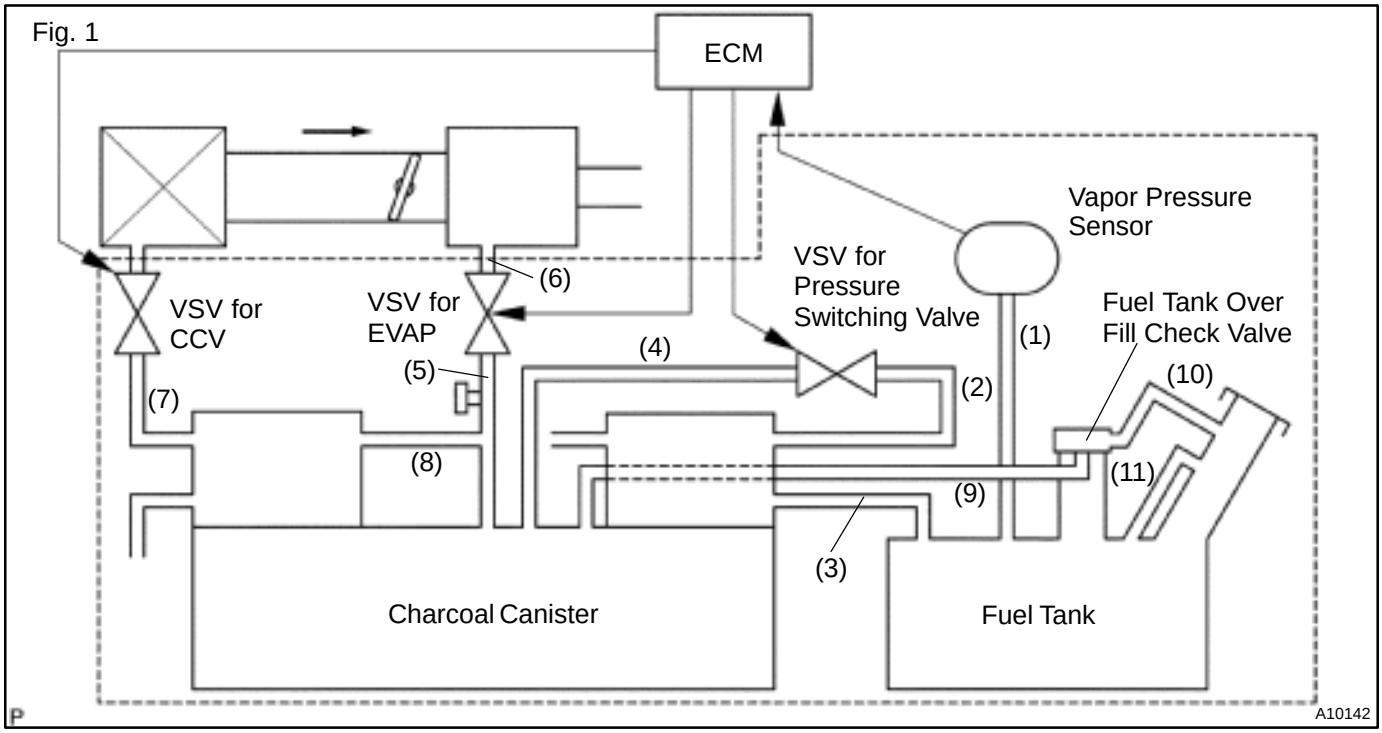
DTC	P0441	Evaporative Emission Control System Incorrect Purge Flow

DTC	P0446	Evaporative Emission Control System Vent Control Malfunction

CIRCUIT DESCRIPTION

The vapor pressure sensor, VSV for canister closed valve (CCV), VSV for pressure switching valve are used to detect abnormalities in the evaporative emission control system.
The ECM decides whether there is an abnormality in the evaporative emission control system based on the vapor pressure sensor signal.
DTCs P0441 and P0446 are recorded by the ECM when evaporative emissions leak from the components within the dotted line in Fig. 1 below, or when there is a malfunction in the VSV for EVAP, the VSV for pressure switching valve, or in the vapor pressure sensor itself.

Fig. 1



DTC No.	DTC Detection Condition	Trouble Area
P0441	Pressure in charcoal canister does not drop during purge control (2 trip detection logic)	• Vacuum hose cracks, holed, blocked, damaged or disconnected ((1), (2), (3), (4), (5), (6), (7), (8), (9), (10) and(11) in Fig. 1) • Fuel tank cap incorrectly installed • Open or short in vapor pressure sensor circuit • Vapor pressure sensor • Open or short in VSV circuit for EVAP • VSV for EVAP • Open or short in VSV circuit for CCV • VSV for CCV • Open or short in VSV circuit for pressure switching valve • VSV for pressure switching valve • Fuel tank cracked, holed ordamaged • Charcoal canister cracked, holed or damaged • Fuel tank over fill check valve cracked or damaged • ECM
	During purge cut–off, pressure in charcoal canister is very low compared with atmospheric pressure (2 trip detection logic)	
P0446	When VSV for pressure switching valve is turned OFF, pressure in fuel tank is maintained at atmospheric pressure (2 trip detection logic)	
	When VSV for pressure switching valve is OFF, ECM judges that there is no continuity between vapor pressure sensor and fuel tank (2 trip detection logic)	
	When VSV for CCV is ON, pressure in charcoal canister and fuel tank is maintained at atmospheric pressure (2 trip detection logic)	

WIRING DIAGRAM

Refer to DTC P0440 on page DI–78.

INSPECTION PROCEDURE

HINT:

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

TOYOTA hand–held tester:

1	**Check whether hose close to fuel tank have been modified, and check whether there are signs of any accident near fuel tank or charcoal canister (See page DI–78, step 1).**

NG → **Repair or replace.**

OK

2	**Check that fuel tank cap is TOYOTA genuine parts.**

NG → **Replace with TOYOTA genuine parts.**

OK

3	Check that fuel tank cap is correctly installed.

NG → Correctly install fuel tank cap.

OK

4	Check fuel tank cap (See page EC–6).

NG → Replace fuel tank cap.

OK

5	Check fuel inlet pipe for damage (See page DI–78, step 5).

NG → Replace fuel inlet pipe.

OK

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

NG → Repair or connect VSV or sensor connector.

OK

7	Check hose and tube between fuel tank and charcoal canister (See page DI–78 step 7).

NG → Repair or replace.

OK

8	**Check VSV connector for EVAP, VSV connector for CCV, VSV connector for pressure switching valve and vapor pressure sensor connector for looseness and disconnection.**

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

OK

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

CHECK:

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

NG → **Repair or replace.**

OK

10	**Check voltage between terminals VC and E2 of ECM connector (See page DI–78 step 9).**

NG → **Check and replace ECM (See page IN–28).**

OK

11	**Check voltage between terminals PTNK and E2 of ECM connectors (See page DI–78, step 10).**

OK → **Go to step 13.**

NG

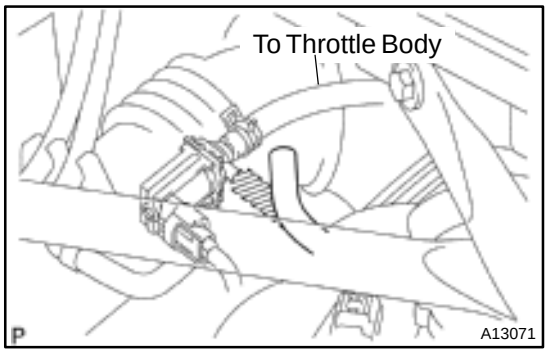
12	**Check for open and short in harness and connector between vapor pressure sensor and ECM (See page IN–28).**

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

OK

Replace vapor pressure sensor.

13	**Check purge flow.**



PREPARATION:

(a) Connect the TOYOTA hand–held tester to the DLC3.
(b) Select the ACTIVE TEST mode on the TOYOTA hand–held tester.
(c) Disconnect the vacuum hose from the VSV for the EVAP from the charcoal canister.
(d) Start the engine.

CHECK:

When the VSV for the EVAP is operated by the TOYOTA hand–held tester, apply the disconected hose to your finger to check the suction.

OK:

VSV is ON: Disconnected hose sucks.
VSV is OFF: Disconnected hose does not suck.

OK → **Go to step 17.**

NG

14	**Check vacuum hose between intake manifold and VSV for EVAP, and VSV for EVAP and charcoal canister.**

CHECK:

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

NG → **Repair or replace.**

OK

15	**Check operation of VSV for EVAP (See page SF–49).**

OK → **Go to step 16.**

NG

Replace VSV and charcoal canister, and then clean vacuum hoses between throttle body and VSV for EVAP, and VSV for EVAP and charcoal canister.

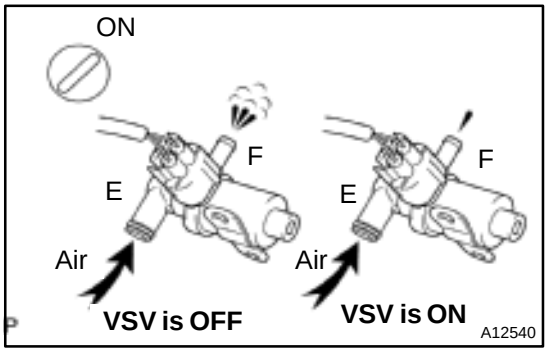
16	**Check for open and short in harness and connector between EFI main relay (Marking: EFI MAIN) and VSV for EVAP, and VSV for EVAP and ECM (See page IN–28).**

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

OK

Check and replace ECM (See page IN–28).

17	**Check VSV for CCV.**



PREPARATION:

(a) Connect the TOYOTA hand–held tester to the DLC3.
(b) Disconnect the vacuum hose for the VSV for the CCV from the charcoal canister.
(c) Turn the ignition switch ON and push the TOYOTA hand–held tester main switch ON.
(d) Select the ACTIVE TEST mode on the TOYOTA hand–held tester.

CHECK:

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

OK:

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

OK → **Go to step 21.**

NG

18	**Check vacuum hose between VSV for CCV and charcoal canister.**

CHECK:

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

NG → **Repair or replace.**

OK

19	**Check operation of VSV for CCV (See page SF–50).**

OK → **Go to step 20.**

NG

Replace VSV and charcoal canister, and then clean vacuum hose between charcoal canister and VSV for CCV.

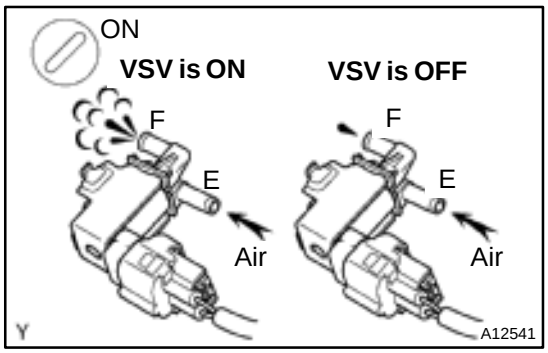
20	**Check for open and short in harness and connector between EFI main relay and VSV for CCV, and VSV for CCV and ECM (See page IN–28).**

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

OK

Check and replace ECM (See page IN–28).

21	Check VSV for pressure switching valve.



PREPARATION:

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

CHECK:

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

OK:

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

OK	Go to step 24.

NG

22	Check operation of VSV for pressure switching valve (See page SF–53).

OK	Go to step 23.

NG

Replace VSV and charcoal canister, and then clean vacuum hose between charcoal canister and VSV for pressure switching valve, and VSV for pressure switching valve and fuel tank.

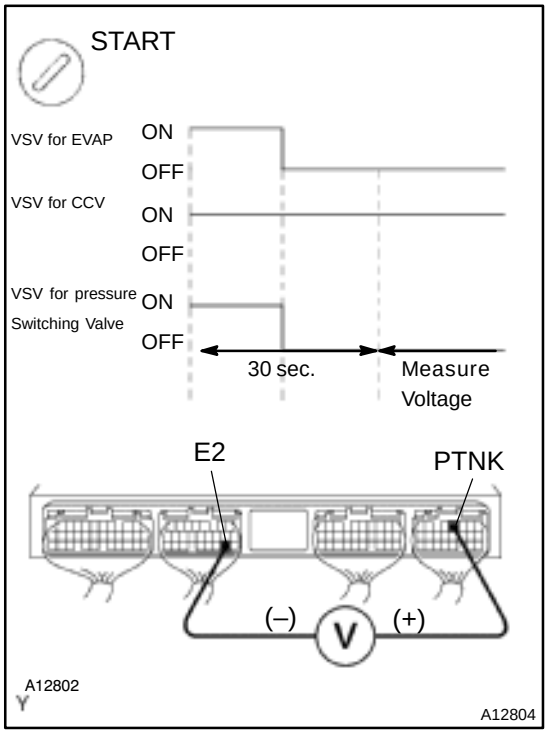
23	Check for open and short in harness and connector between EFI main relay and VSV for pressure switching valve, and VSV for pressure switching valve and ECM (See page IN–28).

NG	Repair or replace harness or connector.

OK

Check and replace ECM (See page IN–28).

24	Check fuel tank.



PREPARATION:

(a) Disconnect the ECM with connector from body panel (See page SF–62).
(b) Connect the TOYOTA hand–held tester to the DLC3.
(c) Select the ACTIVE TEST mode on the TOYOTA hand–held tester.
(d) Start the engine.
(e) The VSV for the CCV is ON by the TOYOTA hand–held tester.
(f) The VSV for the EVAP is OFF, and the VSV for the pressure switching valve is ON by the TOYOTA hand–held tester and remains on for 30 sec.

CHECK:

Measure the voltage between terminals PTNK and E2 of the ECM connectors after switching the VSV for the EVAP from OFF to ON, and the VSV for the pressure switching valve from ON to OFF.

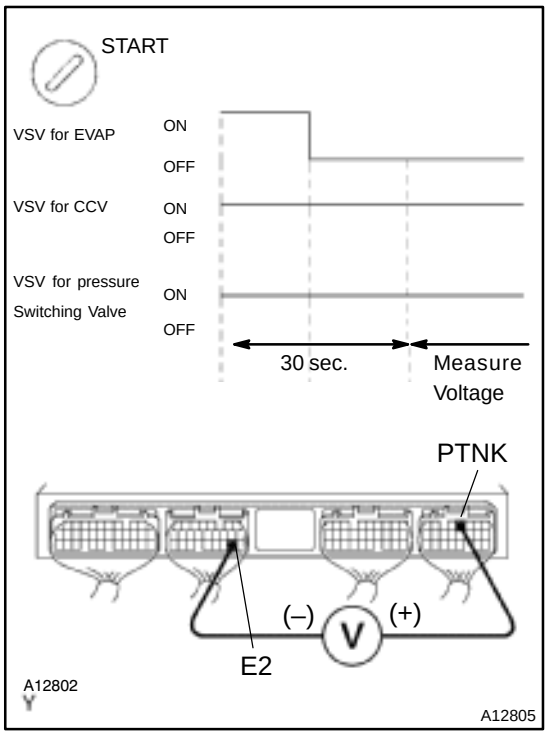
OK:

Voltage: 2.5 V or less

NG → **Replace fuel tank.**

OK

25	Check charcoal canister.



PREPARATION:

(a) Disconnect the ECM with connector from body panel (See page SF–62).
(b) Connect the TOYOTA hand–held tester to the DLC3.
(c) Select the ACTIVE TEST mode on the TOYOTA hand–held tester.
(d) Start the engine.
(e) The VSV for the CCV and the VSV for the pressure switching valve are ON by the TOYOTA hand–held tester.
(f) The VSV for the EVAP is OFF by the TOYOTA hand–held tester and remains on for 30 sec.

CHECK:

Measure the voltage between terminals PTNK and E2 of the ECM connectors after switching the VSV for the EVAP from OFF to ON.

OK:

Voltage: 2.5 V or less

NG	Replace charcoal canister.

OK

26	Remove charcoal canister and check it (See page EC–6).

NG	Replace charcoal canister.

OK

27	Check fuel tank over fill check valve (See page EC–6).

NG	Replace fuel tank over fill check valve or fuel tank.

OK

Check and replace charcoal canister (See page EC–5).

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

1	Check whether hose close to fuel tank have been modified, and check whether there are signs of any accident near fuel tank or charcoal canister (See page DI–78, step 1).

NG → Repair or replace.

OK

2	Check that fuel tank cap is TOYOTA genuine parts.

NG → Replace with TOYOTA genuine parts.

OK

3	Check that fuel tank cap is correctly installed.

NG → Correctly install fuel tank cap.

OK

4	Check fuel tank cap (See page EC–6).

NG → Replace fuel tank cap.

OK

5	Check fuel inlet pipe neck for damage.

NG → Replace fuel inlet pipe.

OK

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

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

OK

7	**Check hose and tube between fuel tank and charcoal canister (See page DI–78 step 7).**

NG → **Repair or replace.**

OK

8	**Check VSV connector for EVAP, VSV connector for CCV, VSV connector for pressure switching valve and vapor pressure sensor connector for looseness and disconnection.**

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

OK

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

CHECK:

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

NG → **Repair or replace.**

OK

10	Check voltage between terminals VC and E2 of ECM connector (See page DI–78 step 9).

NG → Check and replace ECM (See page IN–28).

OK

11	Check voltage between terminals PTNK and E2 of ECM connectors (See page DI–78, step 10).

OK → Go to step 13.

NG

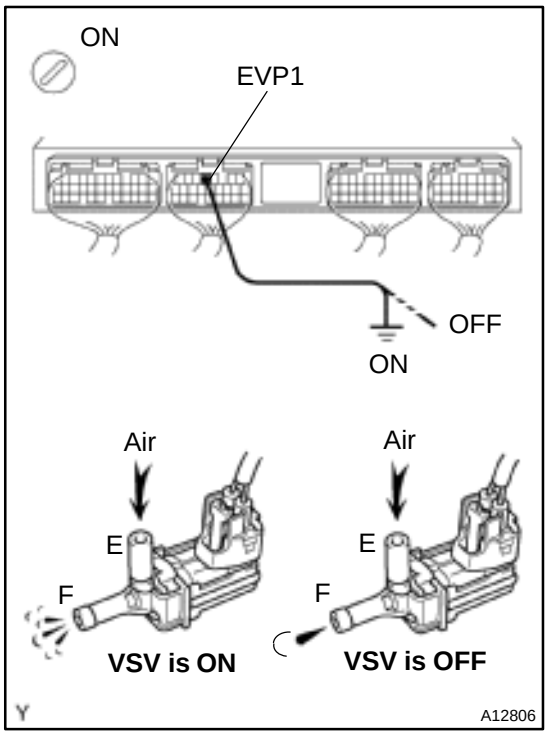
12	Check for open and short in harness and connector between vapor pressure sensor and ECM (See page IN–28).

NG → Repair or replace harness or connector.

OK

Replace vapor pressure sensor.

13	Check VSV for EVAP.



PREPARATION:

(a) Disconnect the ECM with connector from body panel (See page SF–62).

(b) Turn the ignition switch ON.

CHECK:

Check the VSV function.

(1) Connect between terminal EVP1 of the ECM connector and body ground (VSV ON).

(2) Disconnect between terminal EVP1 of the ECM connector and body ground (VSV OFF).

OK:

(1) VSV is ON:
Air from port E flows out through port F.
(2) VSV is OFF:
Air from port E flows out through port F with a little difficultly.

OK	Go to step 16.

NG

14	Check operation of VSV for EVAP (See page SF–49).

NG	Go to step 15.

NG

Replace VSV and clean vacuum hoses between throttle body and VSV for EVAP, and VSV for EVAP and charcoal canister, and then check charcoal canister.

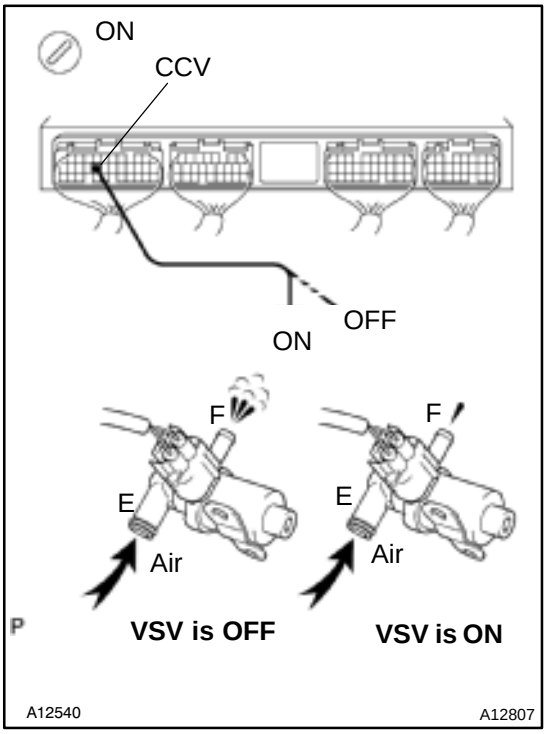
15	Check for open and short in harness and connector between EFI main relay (Marking: EFI MAIN) and VSV for EVAP, and VSV for EVAP and ECM (See page IN–28)

NG	Repair or replace harness or connector.

OK

Check and replace ECM (See page IN–28).

16	Check VSV for CCV.



PREPARATION:

(a) Disconnect the ECM with connector from body panel (See page SF–62).

(b) Turn the ignition switch ON.

CHECK:

Check the VSV function.

(1) Connect between terminal CCV of the ECM connector and body ground (VSV ON).

(2) Disconnect between terminal CCV of the ECM connector and body ground (VSV OFF).

OK:

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

OK	Go to step 19.

NG

17	Check operation of VSV for CCV (See page SF–51).

OK	Go to step 18.

NG

Replace VSV and charcoal canister, and then clean vacuum hoses between charcoal canister and VSV for CCV.

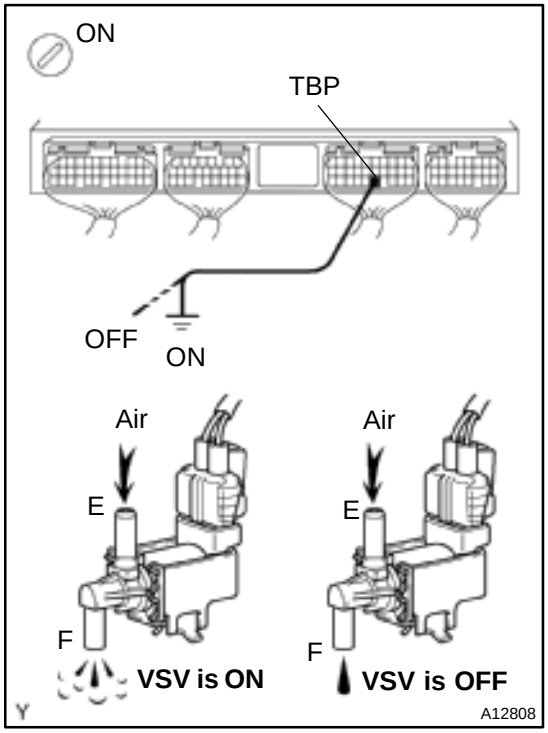
18	Check for open and short in harness and connector between EFI main relay (Marking: EFI MAIN) and VSV for CCV, and VSV for CCV and ECM (See page IN–28).

NG	Repair or replace harness or connector.

OK

Check and replace ECM (See page IN–28).

19	Check VSV for pressure switching valve.



PREPARATION:

(a) Disconnect the ECM with connector from body panel (See page SF–62).

(b) Turn the ignition switch ON.

CHECK:

Check the VSV function.

(1) Connect between terminal TBP of the ECM connector and body ground (VSV ON).

(2) Disconnect between terminal TBP of the ECM connector and body ground (VSV OFF).

OK:

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

OK	Go to step 22.

NG

20	Check operation of VSV for pressure switching valve (See page SF–53).

OK	Go to step 21.

NG

Replace VSV and charcoal canister, and then clean vacuum hoses between charcoal canister and VSV for pressure switching valve, and VSV for pressure switching valve and fuel tank.

21	Check for open and short in harness and connector between EFI main relay and VSV for pressure switching valve, and VSV for pressure switching valve and ECM (See page IN–28).

NG	Repair or replace harness or connector.

OK

Check and replace ECM (See page IN–28).

22	Check fuel tank over fill check valve (See page EC–6).

NG	Replace fuel tank over fill check valve or fuel tank.

OK

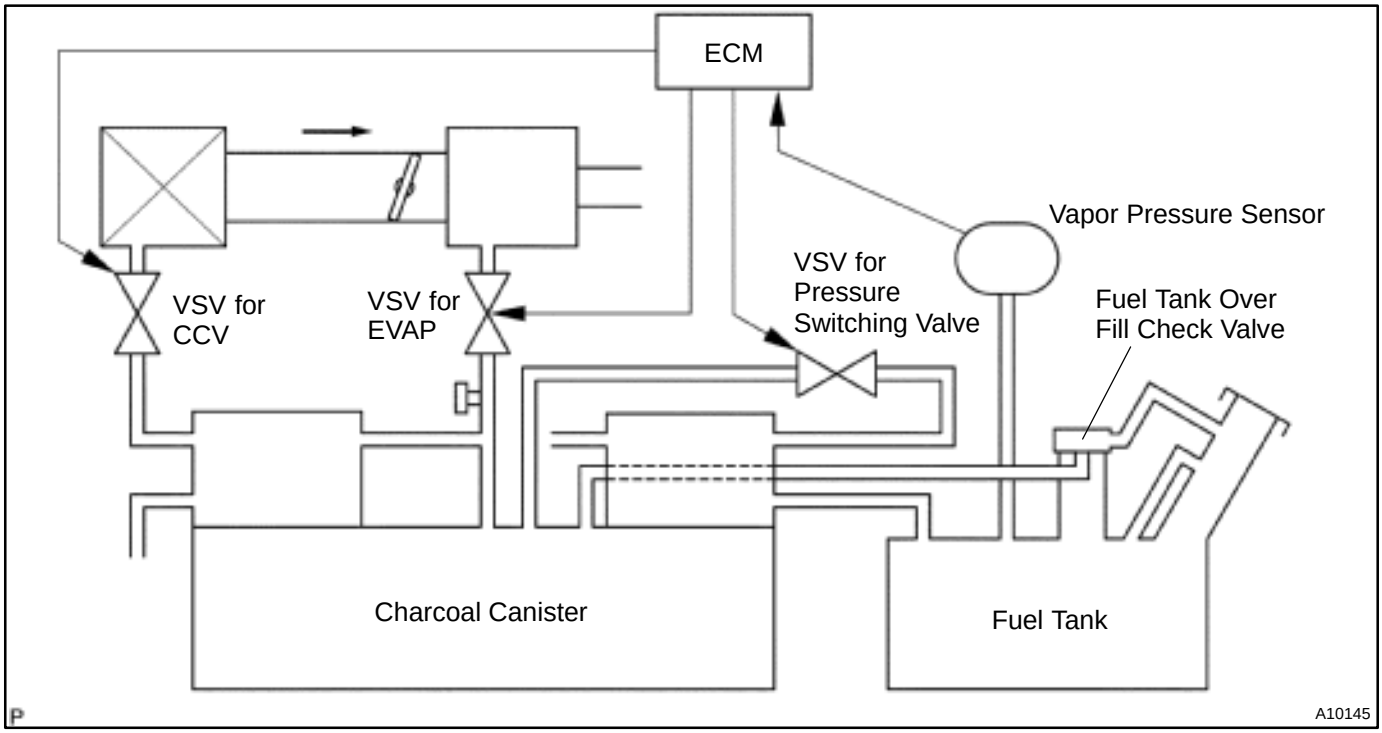
Check and replace charcoal canister (See page EC–5).

DTC	P0450	Evaporative Emission Control System Pressure Sensor Malfunction

DTC	P0451	Evaporative Emission Control System Pressure Sensor Range/Performance

CIRCUIT DESCRIPTION

The vapor pressure sensor, VSV for canister closed valve (CCV) and VSV for pressure switching valve are used to detect abnormalities in the evaporative emission control system.
The ECM decides whether there is an abnormality in the evaporative emission control system based on the vapor pressure sensor signal.
DTC P0450 or P0451 is recorded by the ECM when the vapor pressure sensor malfunctions.



DTC No.	DTC Detection Condition	Trouble Area
P0450	10 seconds or less after engine starting condition (a) or (b) continues for 7 seconds or more: (2 trip detection logic) (a) Vapor pressure sensor value < –4.0 kPa (–30 mmHg, –1.2 in.Hg) (b) Vapor pressure sensor value ≧ 2.0 kPa (15 mmHg, 0.6 in.Hg)	• Open or short in vapor pressure sensor circuit • Vapor pressure sensor • ECM
P0451	Vapor pressure sensor output extremely changes under conditions of (a) or (b): (2 trip detection logic) (a) Vehicle speed: 0 km/h (0mph), Engine speed: Idling and VSV for pressure switching valve is OFF (b) High vapor pressure sensor	

WIRING DIAGRAM

Refer to DTC P0440 on page DI–78.

INSPECTION PROCEDURE

HINT:

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

1	**Check voltage between terminals VC and E2 of ECM connector (See page DI–78).**

NG → **Check and replace ECM (See page IN–28).**

OK

2	**Check voltage between terminals PTNK and E2 of ECM connectors (See page DI–78).**

OK → **Check and replace ECM (See page IN–28).**

NG

3	**Check for open and short in harness and connector between vapor pressure sensor and ECM (See page IN–28).**

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

OK

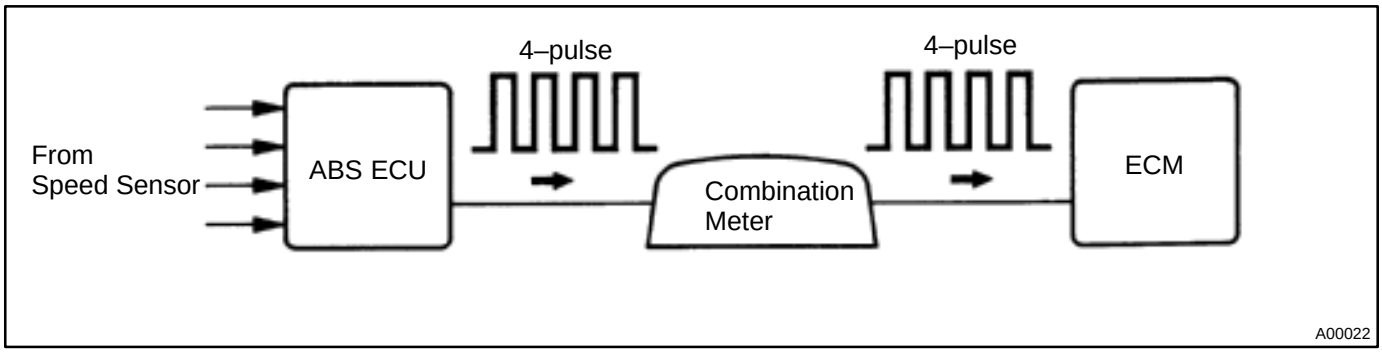
Replace vapor pressure sensor.

DI38H–03

DTC	P0500	Vehicle Speed Sensor Malfunction

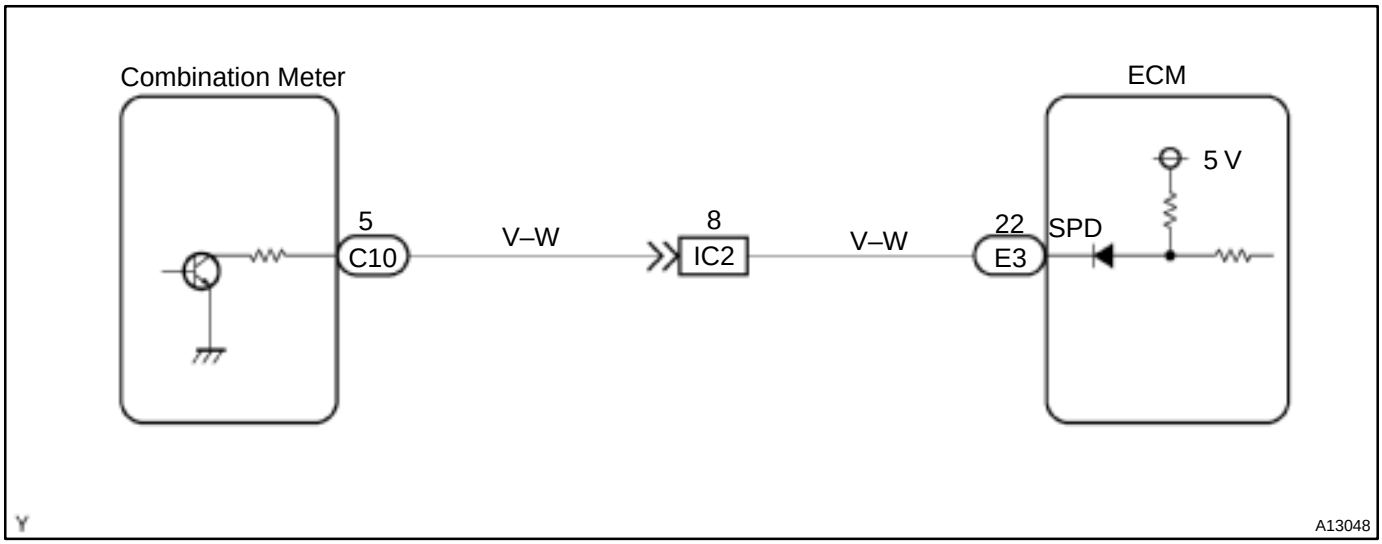
CIRCUIT DESCRIPTION

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 ECM. The ECM determines the vehicle speed based on the frequency of these pulse signals.



DTC No.	DTC Detection Condition	Trouble Area
P0500	No vehicle speed sensor signal to ECM under following condition: (2 trip detection logic) (a) Vehicle is being driven (b) Clutch or brake slips or gear is broken (2–trip detection logic)	• Combination meter • Open or short in vehicle speed sensor circuit • Vehicle speed sensor • ABS ECU • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

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

1	**Check operation of speedometer.**

CHECK:

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

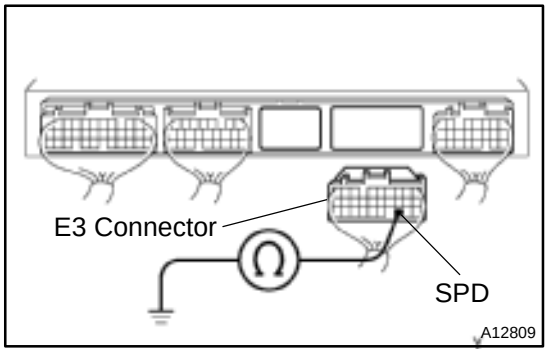
HINT:

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

NG → **Check speedometer circuit (See page BE–38).**

OK

2	**Check for short in harness and connector between terminal SPD of ECM connector and body ground.**



PREPARATION:

(a) Disconnect the ECM with connector from body panel (See page SF–62).

(b) Disconnect the E3 connector from the ECM.

CHECK:

Check the continuity between terminal SPD of the ECM connector and body ground.

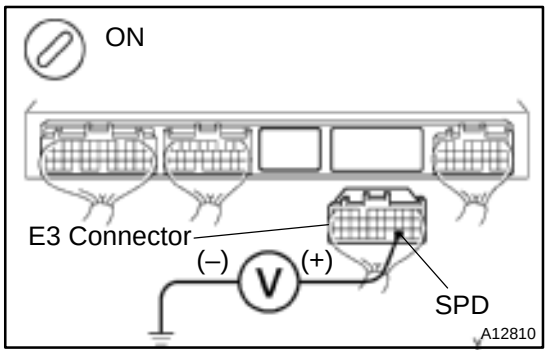
OK:

No continuity (1 MΩ or higher)

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

OK

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



PREPARATION:

(a) Disconnect the ECM with connector from body panel (See page SF–62).

(b) Disconnect the E3 connector from the ECM.

(c) Turn the ignition switch ON.

CHECK:

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

OK:

Voltage: 9 – 14 V

NG → **Repair or replace harness and connector between combination meter and ECM (See page IN–28).**

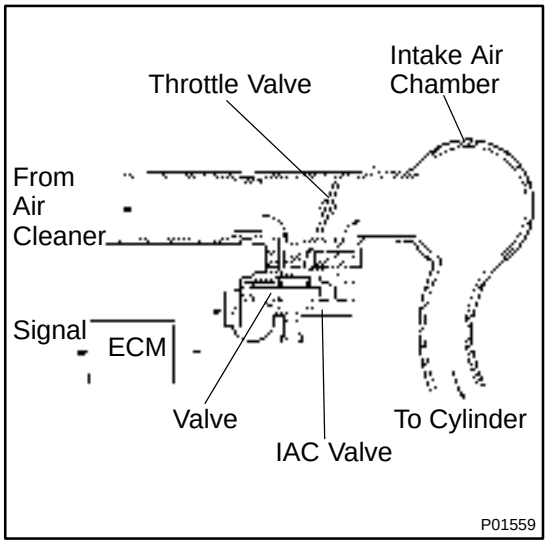
OK

Check and replace ECM (See page IN–28).

DI38I–05

DTC	P0505	Idle Control System Malfunction

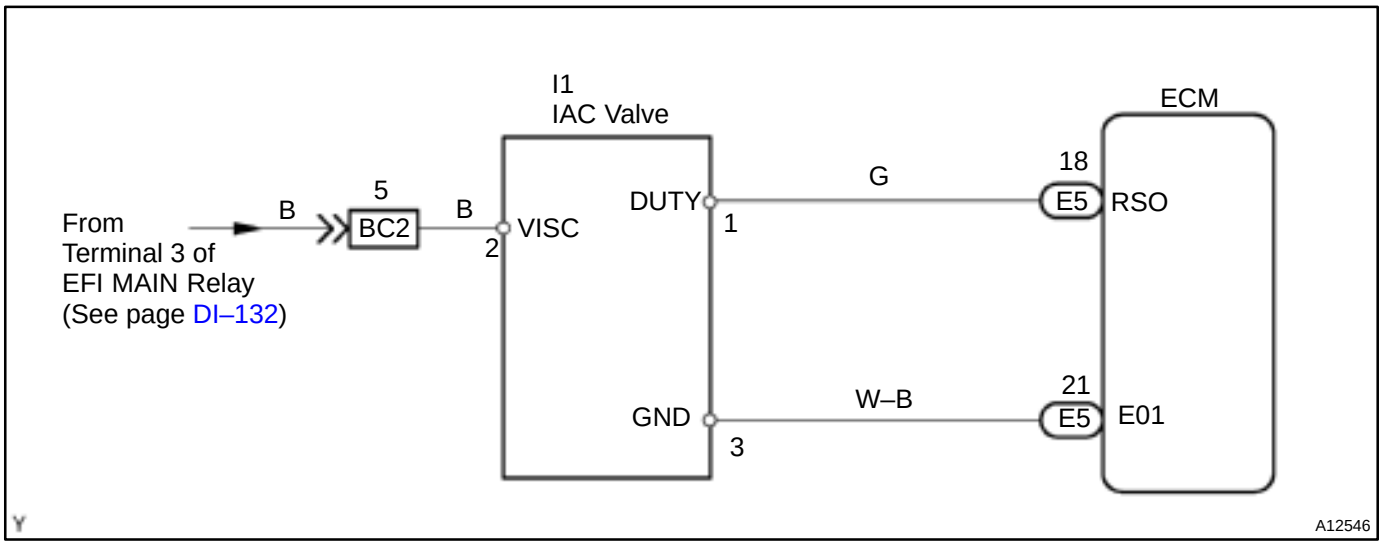
CIRCUIT DESCRIPTION



The rotary solenoid type IAC valve is located on the throttle body and intake air bypassing the throttle valve is directed to the IAC valve through a passage.
In this way the intake air volume bypassing the throttle valve is regulated, controlling the engine speed.
The ECM operates only the IAC valve to perform idle–up and provide feedback for the target idling speed.

DTC No.	DTC Detection Condition	Trouble Area
P0505	Idle speed continues to vary greatly from target speed (2 trip detection logic)	• Open or short in IAC valve circuit • IAC valve is stuck or closed • Open or short in A/C switch circuit • Air induction system • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

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

1	**Check engine idle speed.**

PREPARATION:
(a) Warm up the engine to normal operating temperature.
(b) Switch off all the accessories.
(c) Switch off the A/C.
(d) Shift the transmission into neutral position.
(e) Connect the OBD II scan tool or TOYOTA hand–held tester to the DLC3 on the vehicle.

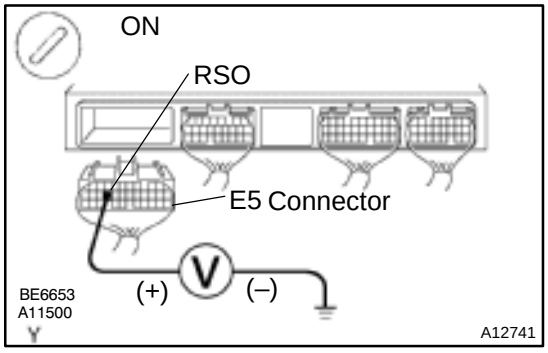
CHECK:
Check the difference of engine speed in less than 5 sec. and more than 5 sec.

OK:
Difference of engine speed: More than 100 rpm.

OK → **Go to step 6.**

NG

2	**Check voltage between terminals RSO of ECM connector and body ground.**



PREPARATION:
(a) Disconnect the ECM with connector from body panel (See page SF–62).
(b) Disconnect the E5 connector from ECM.
(c) Turn the ignition switch ON.

CHECK:
Measure the voltage between terminals RSO of the ECM connector and body ground,

OK:
Voltage: 9 – 14 V

OK → **Go to step 4.**

NG

3	**Check IAC valve (See page SF–38).**

NG → **Replace IAC valve.**

OK

Check for open and short in harness and connector between IAC valve and ECM (See page IN–28).

4	Check operation of IAC valve (See page SF–38).

NG → Replace IAC valve.

OK

5	Check blockage of IAC valve and passage to bypass throttle valve.

NG → Replace IAC valve.

OK

Check and replace ECM (See page IN–28).

6	Check for A/C signal circuit (See page AC–84).

NG → Repair or replace.

OK

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

DTC	P1300	Igniter Circuit Malfunction (No. 1)

DTC	P1305	Igniter Circuit Malfunction (No. 2)

DTC	P1310	Igniter Circuit Malfunction (No. 3)

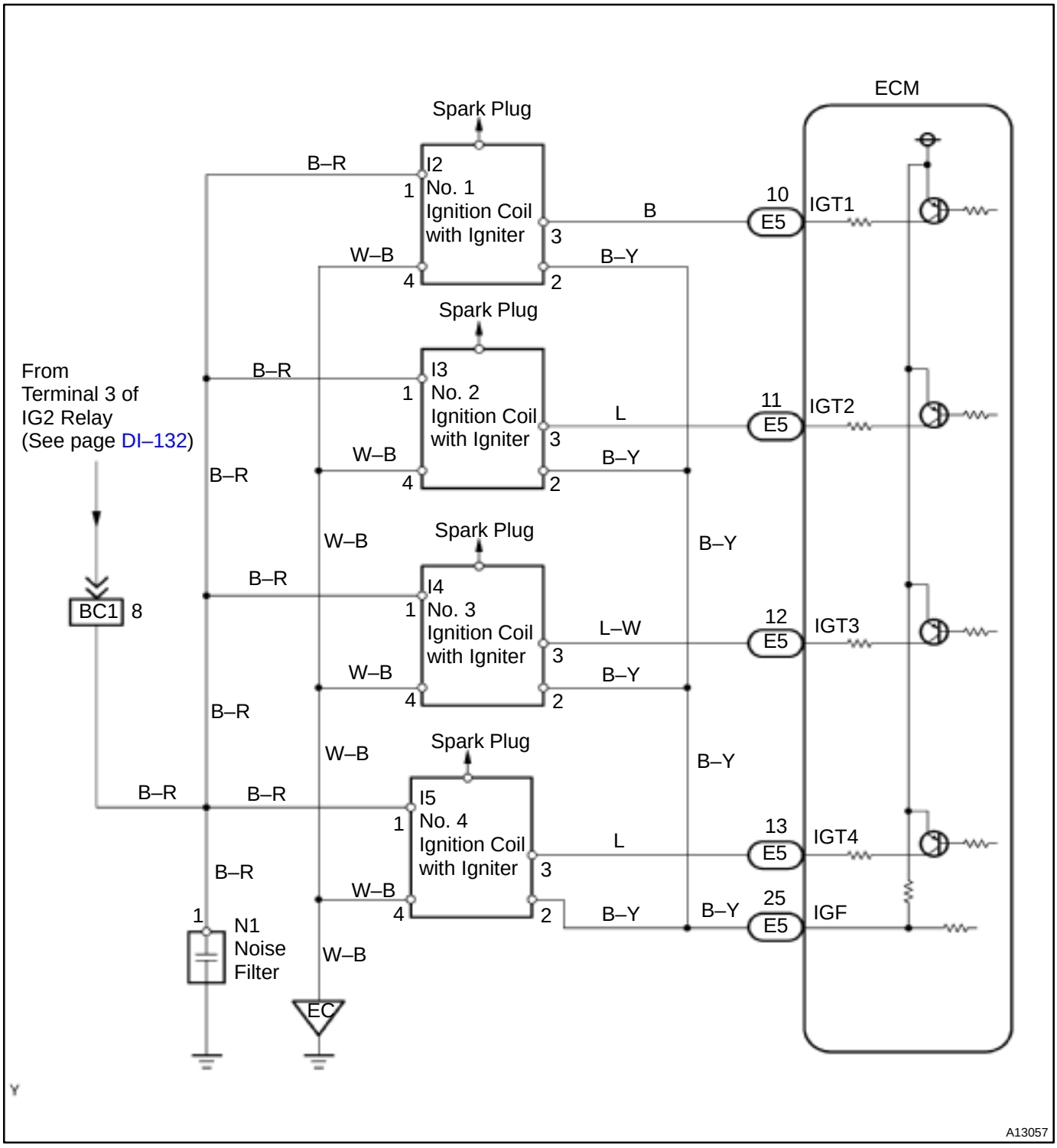
DTC	P1315	Igniter Circuit Malfunction (No. 4)

CIRCUIT DESCRIPTION

A Direct Ignition System (DIS) has been adopted. The DIS improves the ignition timing accuracy, reduces high–voltage loss, and enhances 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 spark plug is connected to the end of the secondary winding. High voltage generated in the secondary winding is applied directly to the spark plug. The spark of the spark plug passes, from the center electrode to the ground electrode.
The ECM determines ignition timing and outputs the ignition signals (IGT) for each cylinder. Based on IGT signals, the power transistors in the igniter cuts off the current to the primary coil in the ignition coil supplied to the spark plug connected to the end of the secondary coil. At the same time, the igniter also sends an ignition confirmation signal (IGF) as a fail–safe measure to the ECM.

DTC No.	DTC Detection Condition	Trouble Area
P1300 P1305 P1310 P1315	No IGF signal to ECM while engine is running	• Ignition system • Open or short in IGF and IGT circuit from ignition coil with igniter • ignition coil with igniter • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

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

1	**Check spark plug and spark (See page DI–63).**

NG → **Go to step 4.**

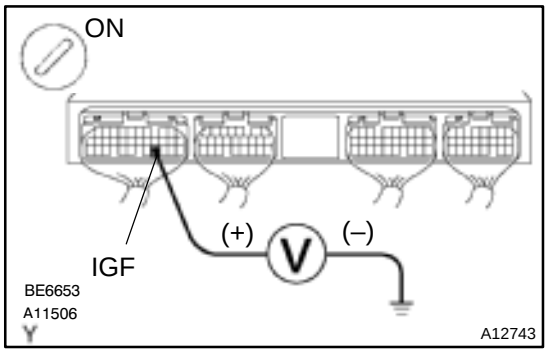
OK

2	**Check for open and short in harness and connector in IGF and IGT signal circuit between ECM and ignition coil with igniter (See page IN–28).**

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

OK

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



PREPARATION:

(a) Disconnect the ECM with connector from body panel (See page SF–62).
(b) Disconnect the ignition coil with igniter connector.
(c) Turn the ignition switch ON.

CHECK:

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

OK:

Voltage: 4.5 – 5.5 V

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

NG

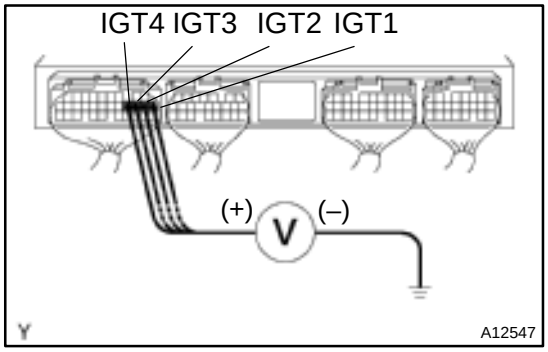
Check and replace ECM (See page IN–28).

4	**Check for open and short in harness and connector in IGT signal circuit between ECM and ignition coil with igniter (See page IN–28).**

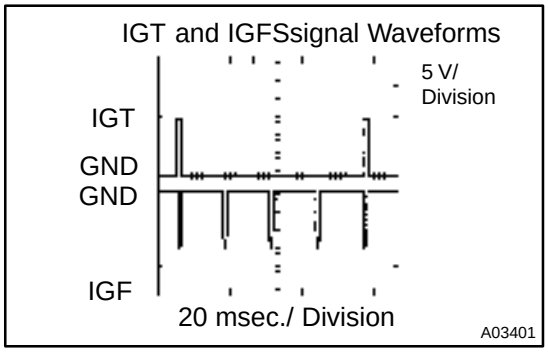
NG → **Repair or replace harness or connector.**

OK

5	**Check voltage between terminals IGT1 – IGT4 of ECM connector and body ground.**



PREPARATION:
Disconnect the ECM with connector from body panel (See page SF–62).
CHECK:
Measure the voltage between terminals IGT1 – IGT4 of the ECM connector and body ground when the engine is cranked.
OK:
Voltage: More than 0.1 V and less than 4.5 V

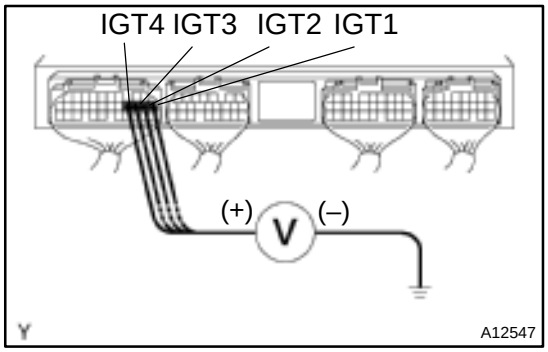


Reference: INSPECTION USING OSCILLOSCOPE
During cranking or idling, check the waveform between terminals IGT1 – IGT4 and E1, IGF and E1 of the ECM connector.
HINT:
Correct waveform appears as shown, with rectangle waves.

NG → **Check and replace ECM (See page IN–28).**

OK

6	Disconnect ignition coil with igniter connector and check voltage between terminals IGT1 – IGT4 of ECM connector and body ground.



PREPARATION:

(a) Disconnect the ECM with connector from body panel (See page SF–62).

(b) Disconnect the ignition coil with igniter connector.

CHECK:

Measure the voltage between terminals IGT1 – IGT4 of the ECM connector and body ground when the engine is cranked.

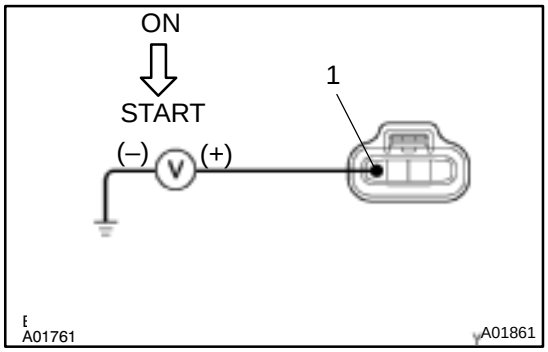
OK:

Voltage: More than 0.1 V and less than 4.5 V

NG → **Check and replace ECM (See page IN–28).**

OK

7	Check ignition coil with igniter power source circuit.



PREPARATION:

Disconnect the ignition coil with igniter connector.

CHECK:

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

OK:

Voltage: 9 – 14 V

NG → **Repair ignition coil with igniter power source circuit.**

OK

8	Check for open and short in harness and connector between ignition switch and ignition coil with igniter (See page IN–28).

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

OK

9	Check IG2 relay (Marking: IG2) (See page IG–7).

NG → Replace IG2 relay.

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–71.

DTC No.	DTC Detection Condition	Trouble Area
P1335	If conditions (a) through (c) are met: (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 • ECM

WIRING DIAGRAM

Refer to DTC P0335 on page DI–71.

INSPECTION PROCEDURE

Refer to DTC P0335 on page DI–71.

DTC	P1346	VVT Sensor/Camshaft Position Sensor Circuit Range/Performance Problem (Bank 1)

CIRCUIT DESCRIPTION

Refer to DTC P0335 on page DI–71.

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

WIRING DIAGRAM

Refer to DTC P0335 on page DI–71.

INSPECTION PROCEDURE

HINT:

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

1	**Check valve timing (Check for loose and jumping teeth of timing chain) (See page EM–13).**

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

OK

Check and replace ECM (See page IN–28).

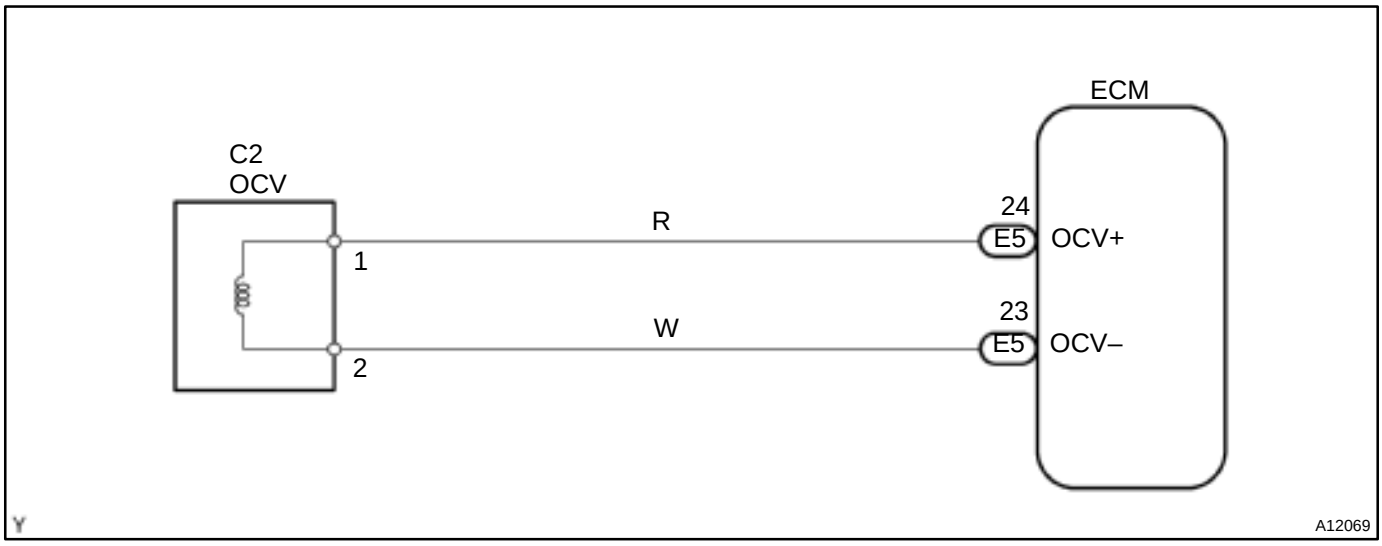
DTC	P1349	VVT System Malfunction (Bank 1)

CIRCUIT DESCRIPTION

VVT system controls the intake valve timing properly in response to driving condition.
ECM controls OCV (Oil Control Valve) to make the intake valve timing properly, and, oil pressure controlled with OCV is supplied to the VVT controller, and then, VVT controller changes relative position between the camshaft and the crankshaft.

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

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

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

TOYOTA hand–held tester:

1	**Check valve timing (See page EM–13).**

NG → **Adjust valve timing.**

OK

2	Check operation of OCV.

PREPARATION:

(a) Start the engine and warm it up.

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

CHECK:

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

OK:

OCV is OFF: Normal engine speed

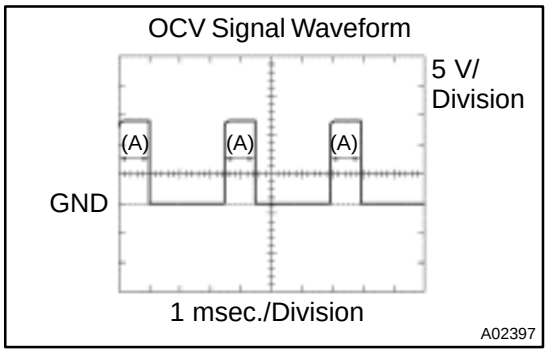
OCV is ON: Rough idle or engine stall

OK → **VVT system is OK.***

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

NG

3	Check voltage between terminals OCV+ and OCV– of ECM connector.



Reference: INSPECTION USING OSCILLOSCOPE

Turn the ignition switch ON, check waveform between terminals OCV+ and OCV– of the ECM connector.

HINT:

- The correct waveform is as shown.
- The waveform frequency (A) is lengthened as the engine speed becomes higher.

NG → **Check and replace ECM (See page IN–28).**

OK

4	Check VVT controller assembly (See page EM–33).

NG → **Replace VVT controller assembly, and then go to step NO TAG.**

OK

5	**Check OCV (See page SF–43).**

NG → **Replace OCV, and then go to step NO TAG.**

OK

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

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 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.***

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

NG

Check and replace ECM (See page IN–28).

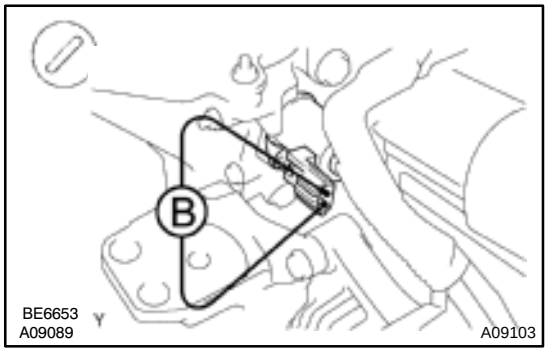
OBD II scan tool (excluding TOYOTA hand–held tester):

1	**Check valve timing (See page EM–13).**

NG → **Repair valve timing.**

OK

2	**Check operation of OCV.**



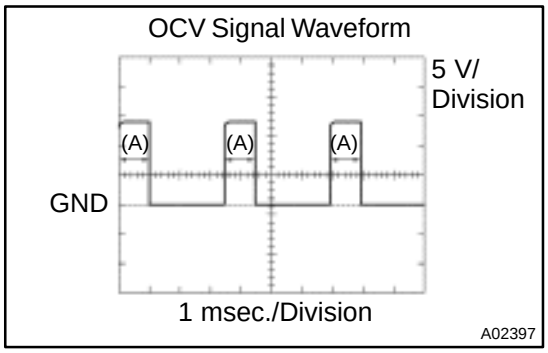
PREPARATION:
Start the engine.
CHECK:
(a) Check the engine speed when disconnecting the OCV connector.
(b) Check the engine speed when applying battery positive voltage between terminals of OCV.
RESULT:

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

2 → **Go to step NO TAG.**

1

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



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

OK → **VVT system is OK.***

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

NG

Check and replace ECM (See page IN–28).

4	**Check VVT controller assembly (See page EM–33).**

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

OK

5	**Check OCV (See page SF–43).**

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

OK

6	**Check blockage of OCV, OCV and oil pipe No. 1.**

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 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.***

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

NG

Check and replace ECM (See page IN–28).

DI38N–04

DTC	P1600	ECM BATT Malfunction

CIRCUIT DESCRIPTION

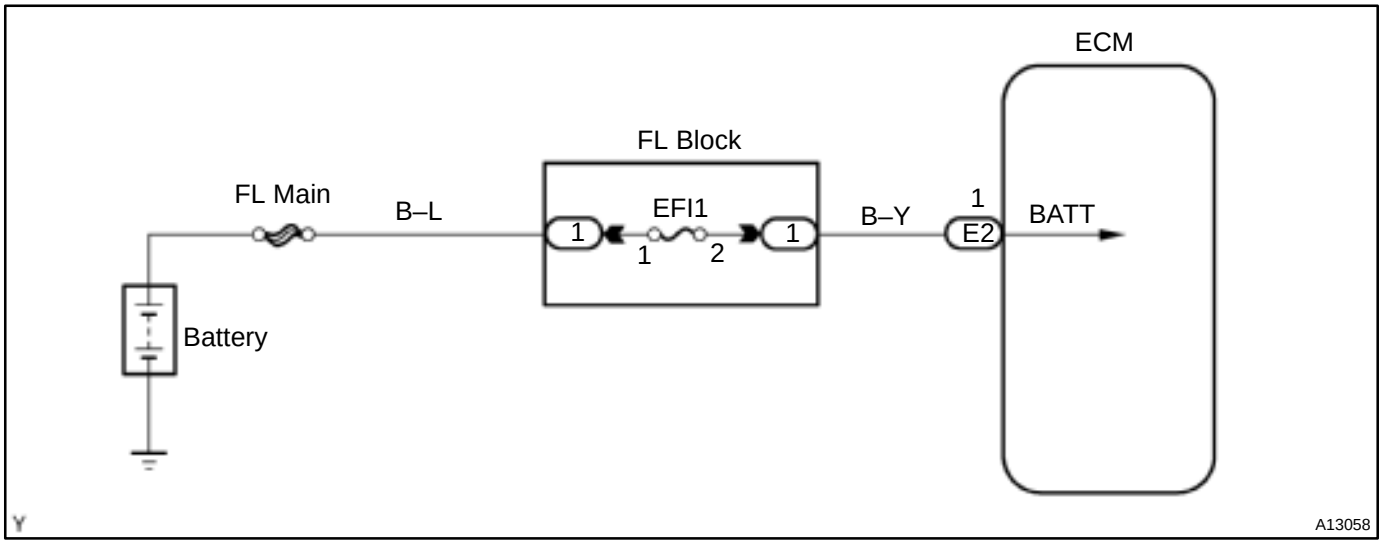
Battery positive voltage is supplied to terminal BATT of the ECM even when the ignition switch is OFF for use by the DTC memory and air–fuel ratio adaptive control value memory, etc.

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

HINT:

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

WIRING DIAGRAM

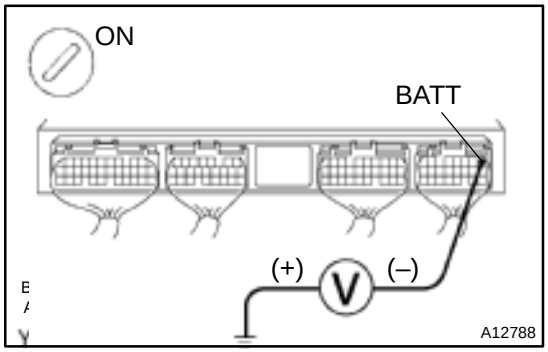


INSPECTION PROCEDURE

HINT:

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

1	**Check voltage between terminal BATT of ECM connector and body ground.**



PREPARATION:

(a) Disconnect the ECM with connector from body panel (See page SF–62).

(b) Turn the ignition switch ON.

CHECK:

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

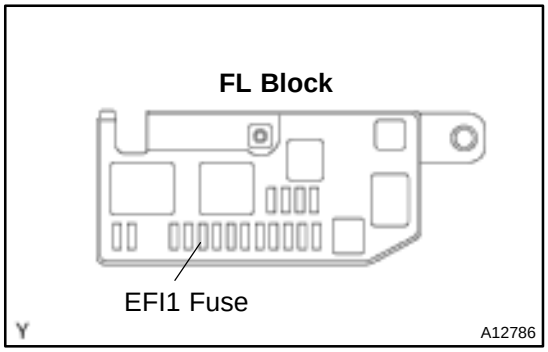
OK:

Voltage 9 – 14 V

OK	Check and replace ECM (See page IN–28).

NG

2	Check EFI1 fuse.



PREPARATION:
Remove the EFI1 fuse from the fusible link block.
CHECK:
Check the continuity of the EFI1 fuse.
OK:

Continuity

NG	Check for short in all the harness and components connected to EFI1 fuse.

OK

Check and repair harness or connector between battery and EFI1 fuse, EFI1 fuse and ECM (See page IN–28).

DI7DH–01

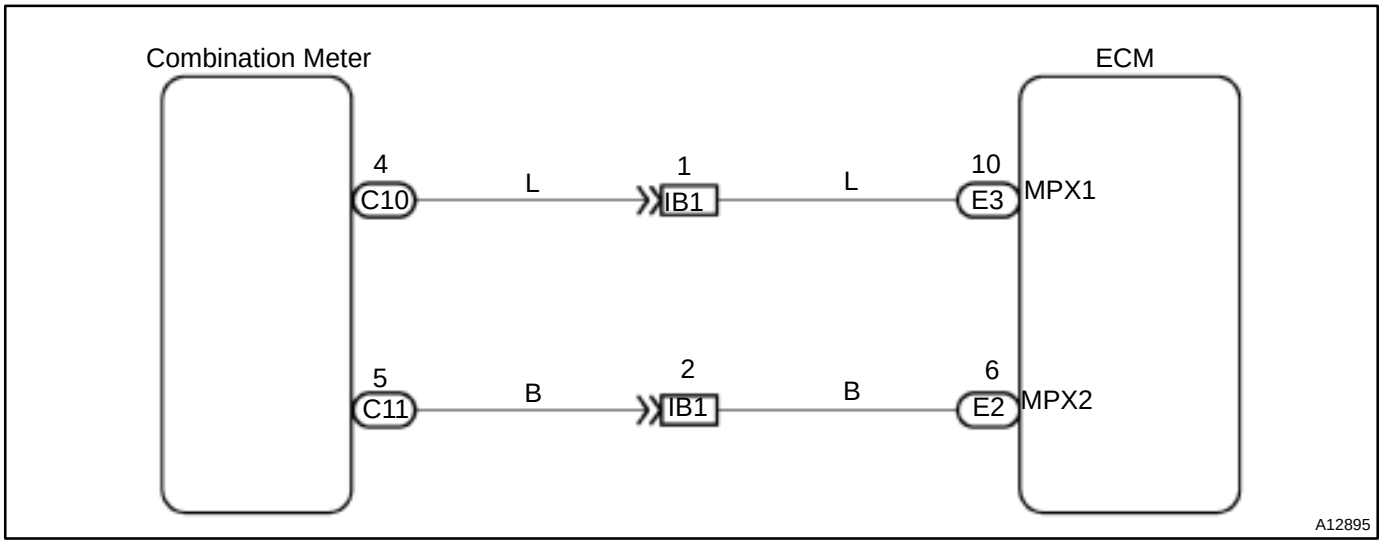
DTC	P1645	Body ECU Malfunction

CIRCUIT DESCRIPTION

The ECM receives the operating condition (ON/OFF) of the A/C from the combination meter and it also receives the electrical load information from the body ECU.
The ECM uses the information to control the engine (idle up, etc.).

DTC No.	DTC Detection Condition	Trouble Area
P1645	Condition below continues for 3.0 sec. No communication from body ECU	• Body ECU • A/C ECU • Vane pump assembly with motor • Air bag sensor assembly • ABS ECU • Communication bus • Combination meter

WIRING DIAGRAM



INSPECTION PROCEDURE

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

1	**Check body ECU (See page DI–1).**

NG → **Replace body ECU.**

OK

2	Check combination meter (See page BE–40).

NG → Replace combination meter.

OK

3	Check harness and connector between combination meter and body ECU, ECM and combination meter (See page IN–28).

NG → Repair or replace harness or connector.

OK

Check and replace ECM (See page IN–28).

DTC	P1656	OCV Circuit Malfunction (Bank 1)

CIRCUIT DESCRIPTION

Refer to DTC P1349 on page DI–117.

DTC No.	DTC Detection Condition	Trouble Area
P1656	Open or short in OCV circuit	• Open or short in OCV circuit • OCV valve • ECM

WIRING DIAGRAM

Refer to DTC P1349 on page DI–117.

INSPECTION PROCEDURE

HINT:

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

TOYOTA hand–held tester:

1	**Check OCV circuit.**

PREPARATION:

(a) Start the engine and warm it up.

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

CHECK:

Check the engine speed when operating the OCV by the TOYOTA 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 (See page DI–3).**

NG

2	**Check operation of OCV (See page DI–117).**

NG → **Replace OCV.**

OK

3	**Check voltage between terminals OCV+ and OCV– of ECM connector (See page DI–117, step 3).**

NG → **Check and replace ECM (See page IN–28).**

OK

4	**Check for open and short in harness and connector between OCV and ECM (See page IN–28).**

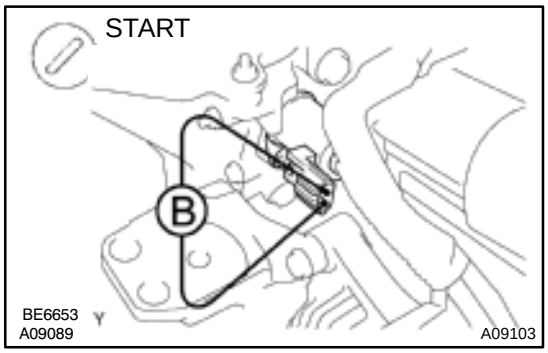
NG → **Repair or replace.**

OK

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

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

1	**Check operation of OCV.**



PREPARATION:

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

CHECK:

Check the engine speed.

OK:

Rough idle or engine stalled

NG → **Replace OCV.**

OK

2	**Check voltage between terminals OCV+ and OCV– of ECM connector (See page DI–117, step 3).**

NG → Check and replace ECM (See page IN–28).

OK

3	Check for open and short in harness and connector between OCV and ECM (See page IN–28).

NG → Repair or replace.

OK

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

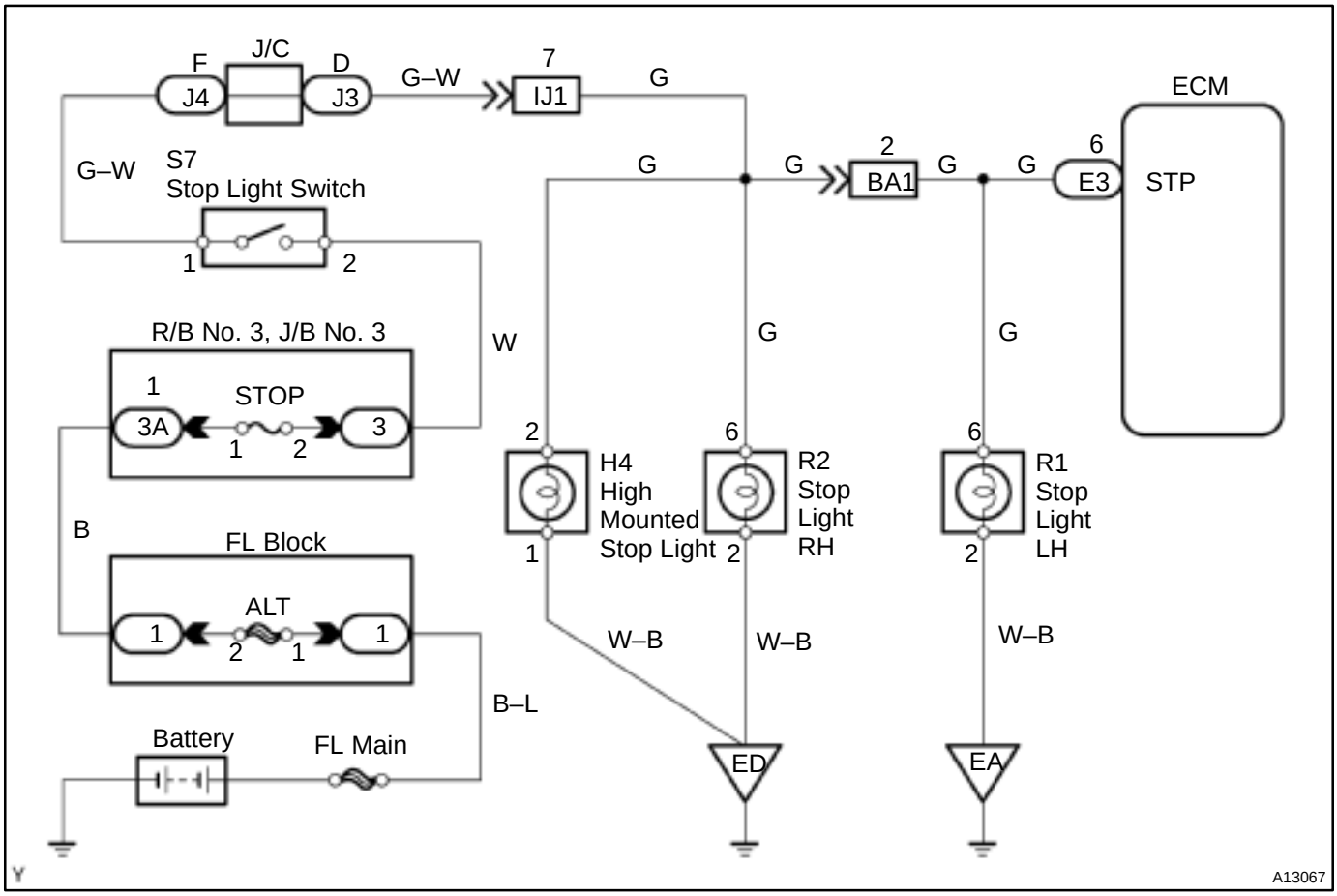
DI7DJ–01

Stop Light Switch Signal Circuit

CIRCUIT DESCRIPTION

The purpose of this circuit is to prevent the engine from stalling, when brakes are suddenly applied. When the brake pedal is depressed, this switch sends a signal to the ECM.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check operation of stop light.**

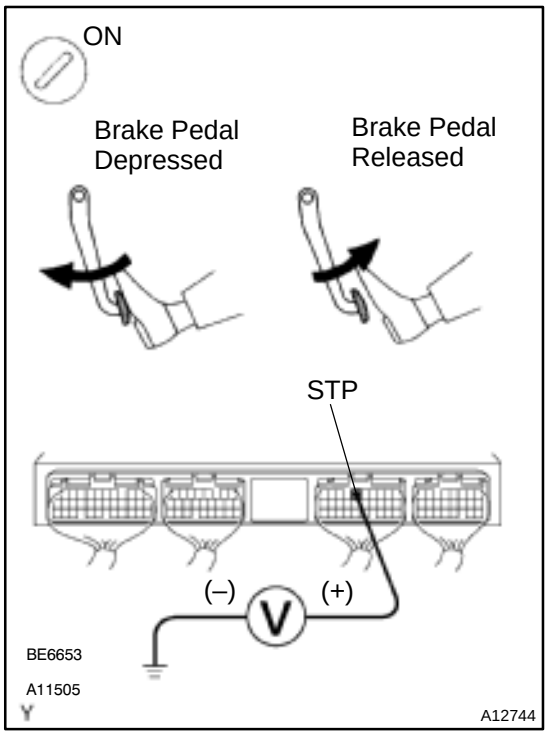
CHECK:

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.



When using TOYOTA hand–held tester:

PREPARATION:

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

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

CHECK:

Read the STP signal on the TOYOTA hand–held tester.

OK:

Brake Pedal	STP Signal
Depressed	ON
Released	OFF

When not using TOYOTA hand–held tester:

PREPARATION:

(a) Disconnect the ECM with connector from body panel (See page SF–62).

(b) Turn the ignition switch ON.

CHECK:

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

OK:

Brake Pedal	Voltage
Depressed	9.0 – 14 V
Released	Below 1.5 V

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

NG

3	Check harness and connector between ECM and stop light switch (See page IN–18).

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

OK

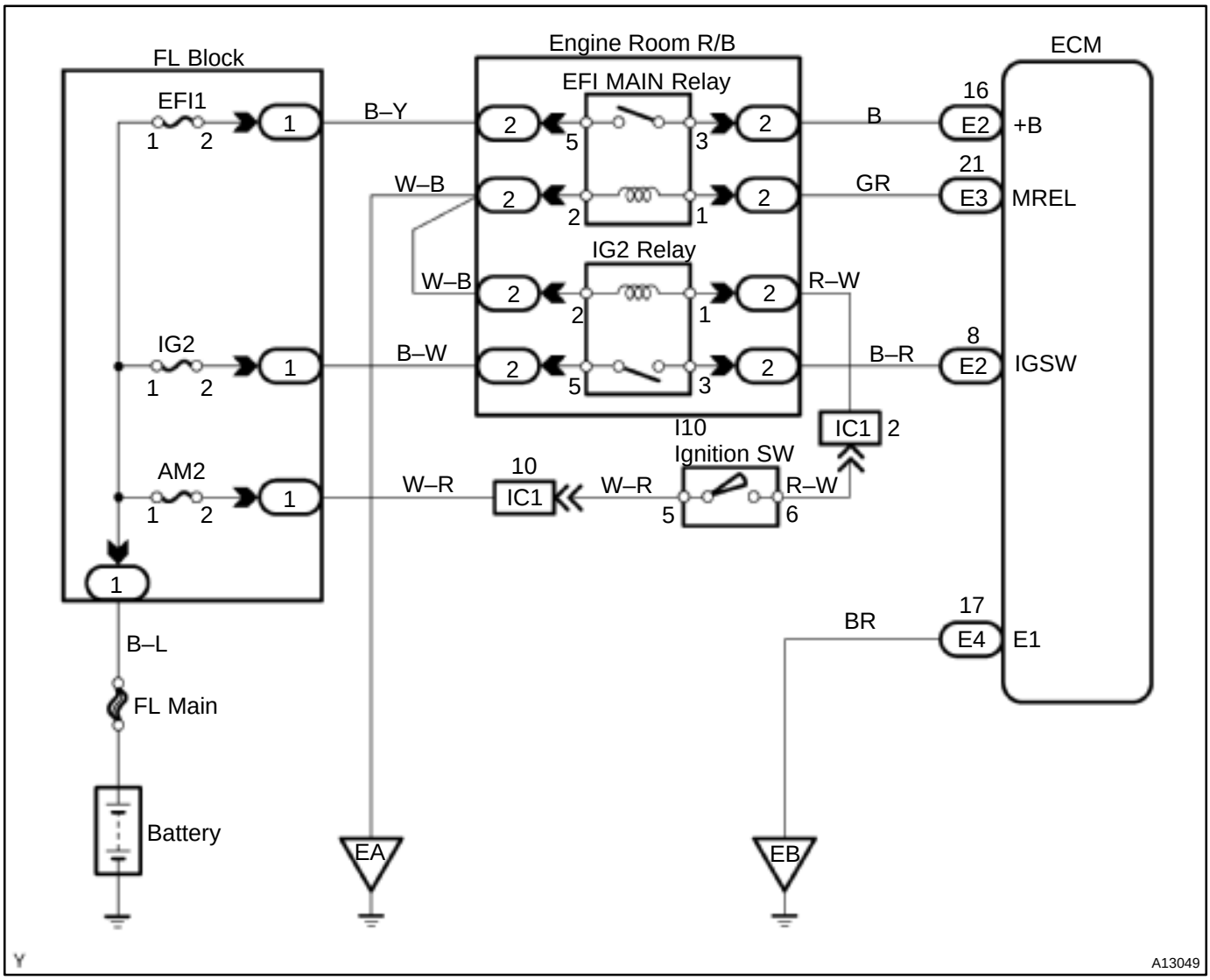
Check and replace ECM (See page IN–18).

ECM Power Source Circuit

CIRCUIT INSPECTION

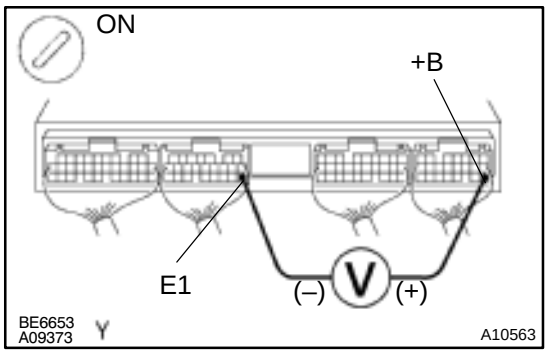
When the ignition switch is turned on, battery positive voltage is applied to IG2 Relay, terminal IGSW of the ECM and the EFI main relay (Marking: EFI MAIN) control circuit in the ECM sends a signal to terminal MREL of the ECM switching on the EFI main relay.
This signal causes current to flow to the coil, closing the contacts of the EFI main relay and supplying power to terminals +B of the ECM.
If the ignition switch is turned off, the ECM continues to switch on the EFI main relay for a maximum of 2 seconds for the initial setting of the IAC valve.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check voltage between terminals +B and E1 or ECM connectors.**



PREPARATION:

(a) Disconnect the ECM with connector from body panel (See page SF–62).

(b) Turn the ignition switch ON.

CHECK:

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

OK:

Voltage: 9 – 14 V

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

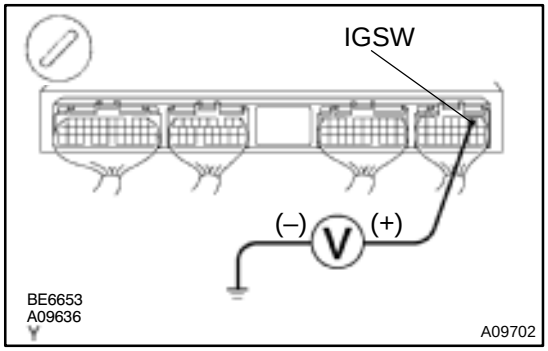
NG

2	**Check for open in harness and connector between terminal E1 of ECM connector and body ground (See page IN–28).**

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

OK

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



PREPARATION:

(a) Disconnect the ECM with connector from body panel (See page SF–62).

(b) Turn the ignition switch ON.

CHECK:

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

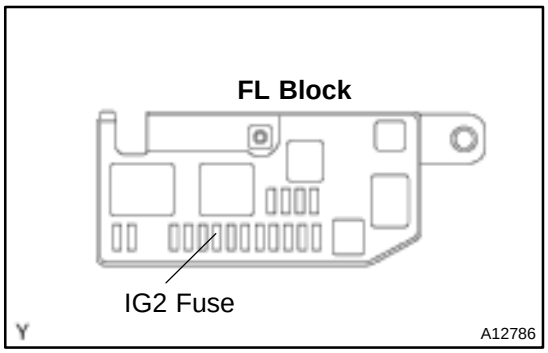
OK:

Voltage: 9 – 14 V

OK	**Go to step 6.**

NG

4	**Check IG2 fuse.**



PREPARATION:
Remove the IG2 fuse from the FL block.
CHECK:
Check the continuity of the IG2 fuse.
OK:

Continuity

NG	**Check for short in all harness and components connected to IG2 fuse (See attached wiring diagram).**

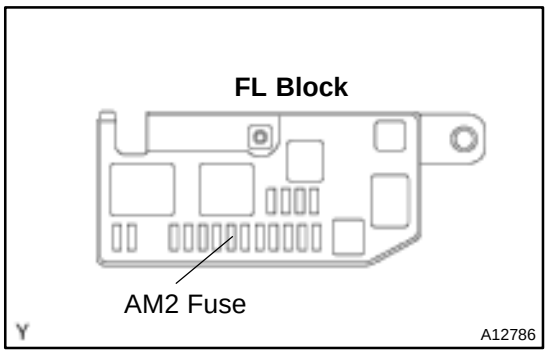
OK

5	**Check IG2 relay (See page IG–7).**

NG	**Replace IG2 relay.**

OK

6	**Check AM2 fuse.**



PREPARATION:
Remove the AM2 fuse from the FL block.
CHECK:
Check the continuity of the AM2 fuse.
OK:

Continuity

NG	**Check for short in all harness and components connected to AM2 fuse (See attached wiring diagram).**

OK

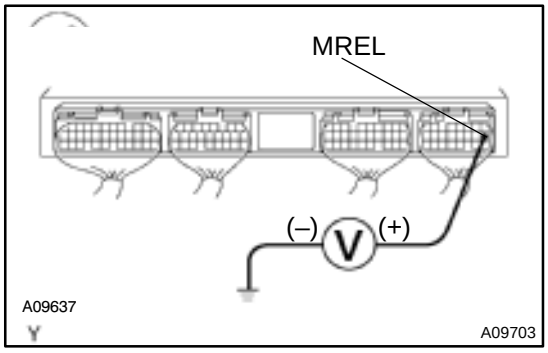
7	**Check ignition switch (See page BE–15).**

NG → **Replace ignition switch.**

OK

Check and repair harness and connector between battery and ignition switch, and ignition switch and ECM.

8	**Check voltage between terminal MREL of ECM connector and body ground.**



PREPARATION:

(a) Disconnect the ECM with connector from body panel (See page SF–62).

(b) Turn the ignition switch ON.

CHECK:

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

OK:

Voltage: 9 – 14 V

NG → **Check and replace ECM (See page IN–28).**

OK

9	**Check EFI1 fuse (See page DI–123, step 2).**

NG → **Check for short in all harness and components connected to EFI1 fuse (See attached wiring diagram).**

OK

10	**Check EFI main relay (Marking: EFI MAIN) (See page SF–44).**

NG → **Replace EFI main relay.**

OK

11	Check for open and short in harness and connector between terminal MREL of ECM and body ground (See page IN–28).

NG → Repair or replace harness or connector.

OK

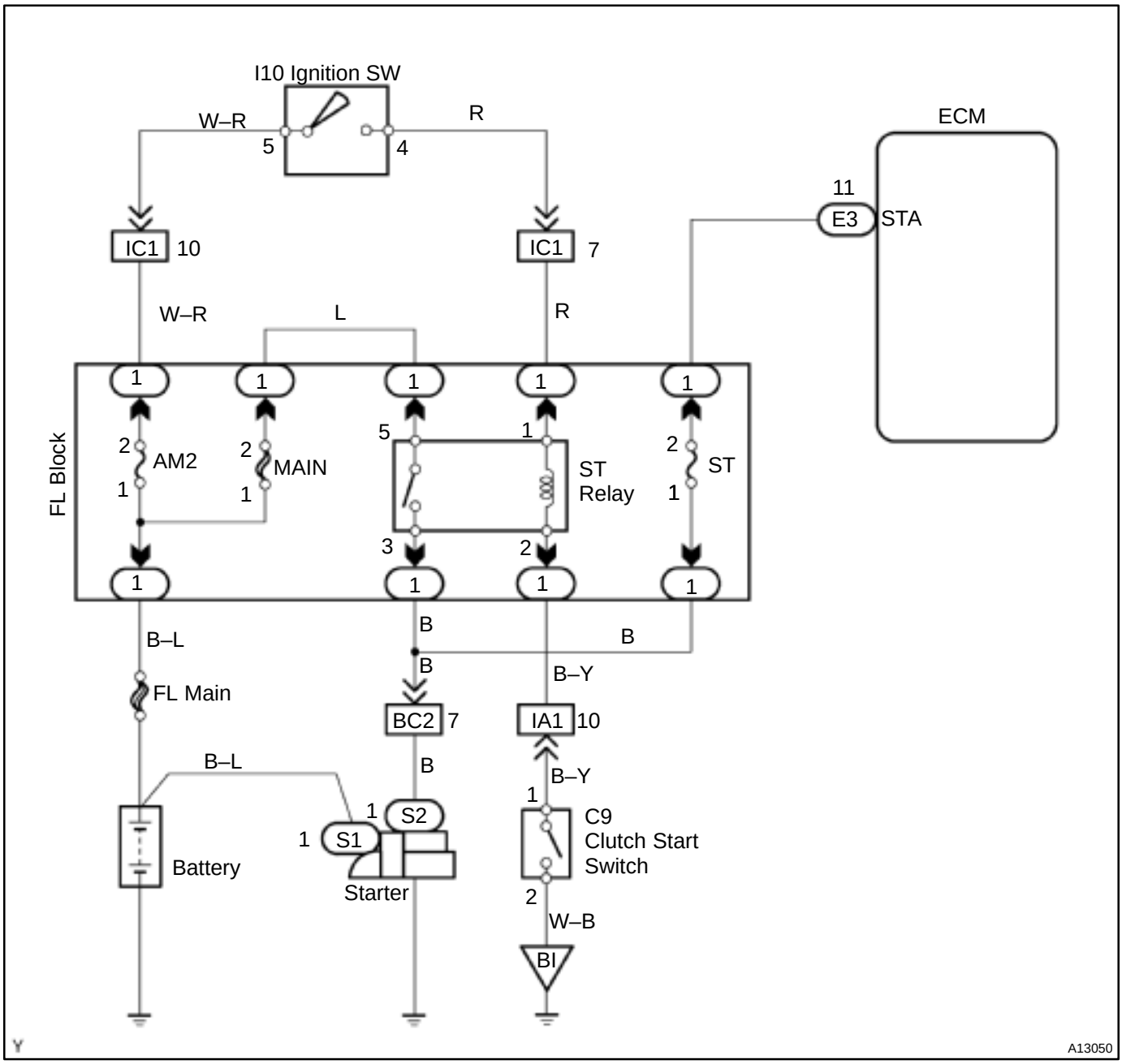
Check and repair harness or connector between EFI1 fuse and battery.

Starter Signal Circuit

CIRCUIT DESCRIPTION

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

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

This diagnostic chart is based on the premise that the engine is cranked normally. If the engine is not cranked, proceed to the problem symptoms table on page DI–21.

TOYOTA hand–held tester:

1	**Check STA signal.**

PREPARATION:

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

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

CHECK:

Read the STA signal on the TOYOTA 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 on problem symptoms table (See page DI–21).**

NG

2	**Check for open in harness and connector between ECM and starter relay (Marking: ST) (See page IN–28).**

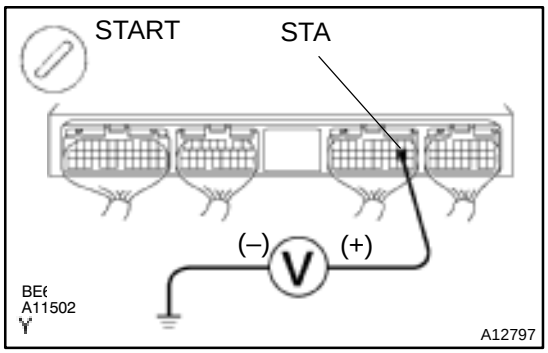
NG → **Repair or replace harness or connector.**

OK

Check and replace ECM (See page IN–28).

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

1	**Check voltage between terminal STA of ECM connector and body ground.**



PREPARATION:

(a) Disconnect the ECM with connector from body panel (See page SF–62).

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminal STA of the ECM connector and body ground during the engine cranking.

OK:

Voltage: 6 V or more

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 ECM and starter relay (Marking: ST) (See page IN–28).**

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

OK

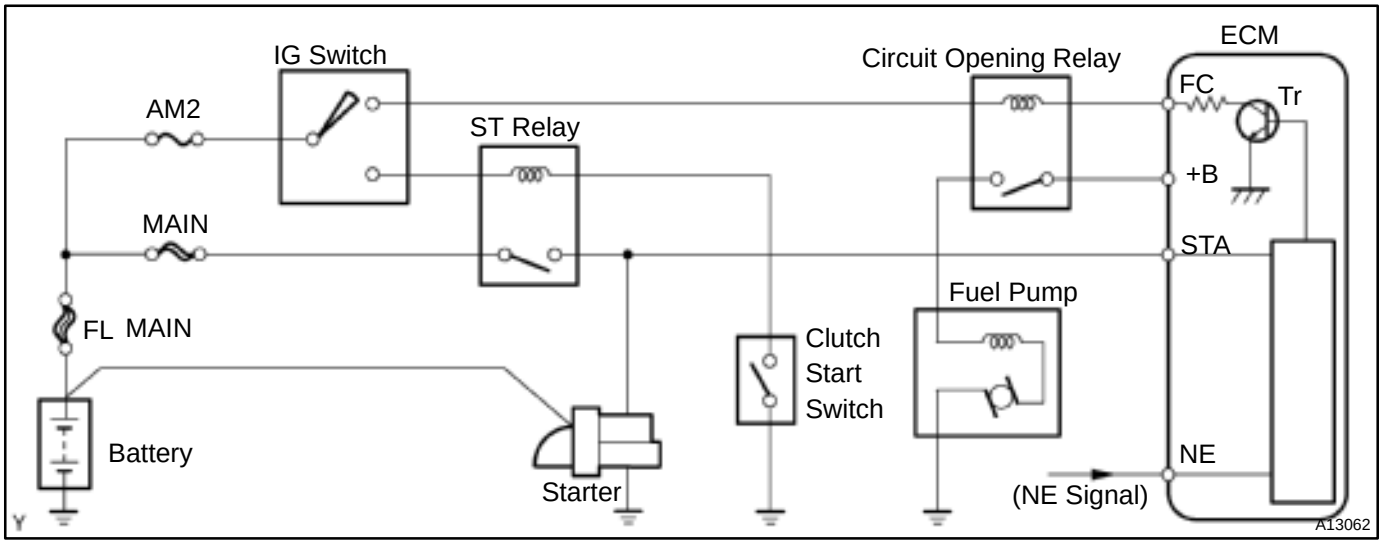
Check and replace ECM (See page IN–28).

DI38Q–05

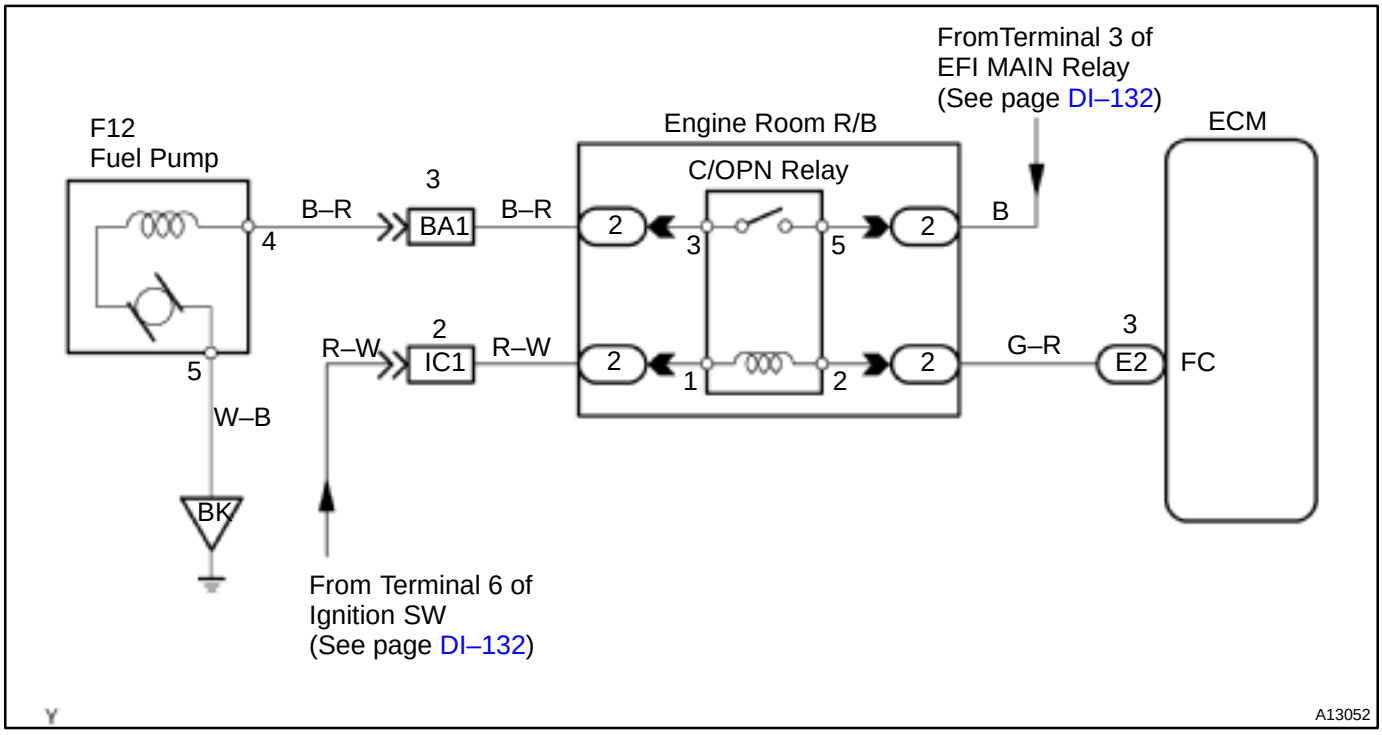
Fuel Pump Control Circuit

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



WIRING DIAGRAM



INSPECTION PROCEDURE
TOYOTA hand–held tester:

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

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

NG

2	Check for ECM power source circuit (See page DI–132).

NG → Repair or replace.

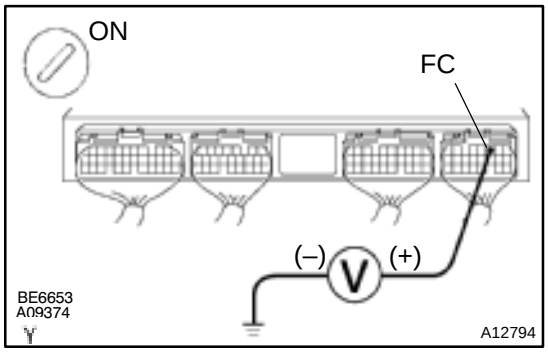
OK

3	Check circuit opening relay (Marking: C/OPN) (See page SF–47).

NG → Replace circuit opening relay.

OK

4	Check voltage between terminal FC of ECM and body ground.



PREPARATION:

(a) Disconnect the ECM with connector from body panel (See page SF–62).

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminal FC of the ECM and body ground.

OK:

Voltage: 9 – 14 V

OK → Go to step 5.

NG

Check for open in harness and connector between EFI main relay and circuit opening relay (Marking: C/OPN), circuit opening relay and ECM (See page IN–28).

5	Check fuel pump (See page SF–7).

NG → Repair or replace fuel pump.

OK

6	Check for open in harness and connector between circuit opening relay and fuel pump and body ground (See page IN–28).

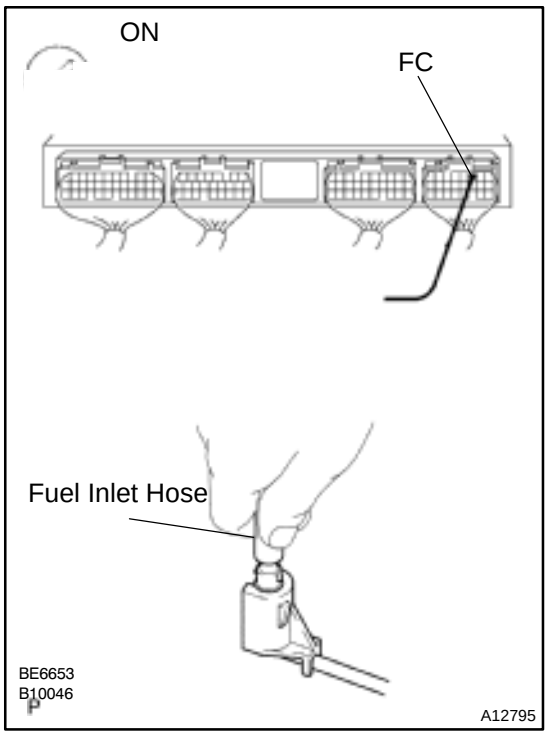
NG → Repair or replace harness or connector.

OK

Check and replace ECM (See page IN–28).

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

1	**Check operation of fuel pump.**



PREPARATION:

(a) Disconnect the ECM with connector from body panel (See page SF–62).

(b) Turn the ignition switch ON.

CHECK:

(a) Connect between terminal FC of the ECM connector and body ground.

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

OK:

There is pressure in fuel inlet hose.

HINT:

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

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

NG

2	**Check for ECM power source circuit (See page DI–132).**

NG	**Repair or replace.**

OK

3	**Check circuit opening relay (Marking: C/OPN) (See page SF–47).**

NG	**Replace circuit opening relay.**

OK

4	Check voltage between terminal FC of ECM and body ground (See page DI–140, step 4).

OK → Go to step 5.

NG

Check for open in harness and connector between EFI main relay and circuit opening relay (Marking: C/OPN), circuit opening relay and ECM (See page IN–28).

5	Check fuel pump (See page SF–7).

NG → Repair or replace fuel pump.

OK

6	Check for open in harness and connector between circuit opening relay and fuel pump and body ground (See page IN–28).

NG → Repair or replace harness or connector.

OK

Check and replace ECM (See page IN–28).

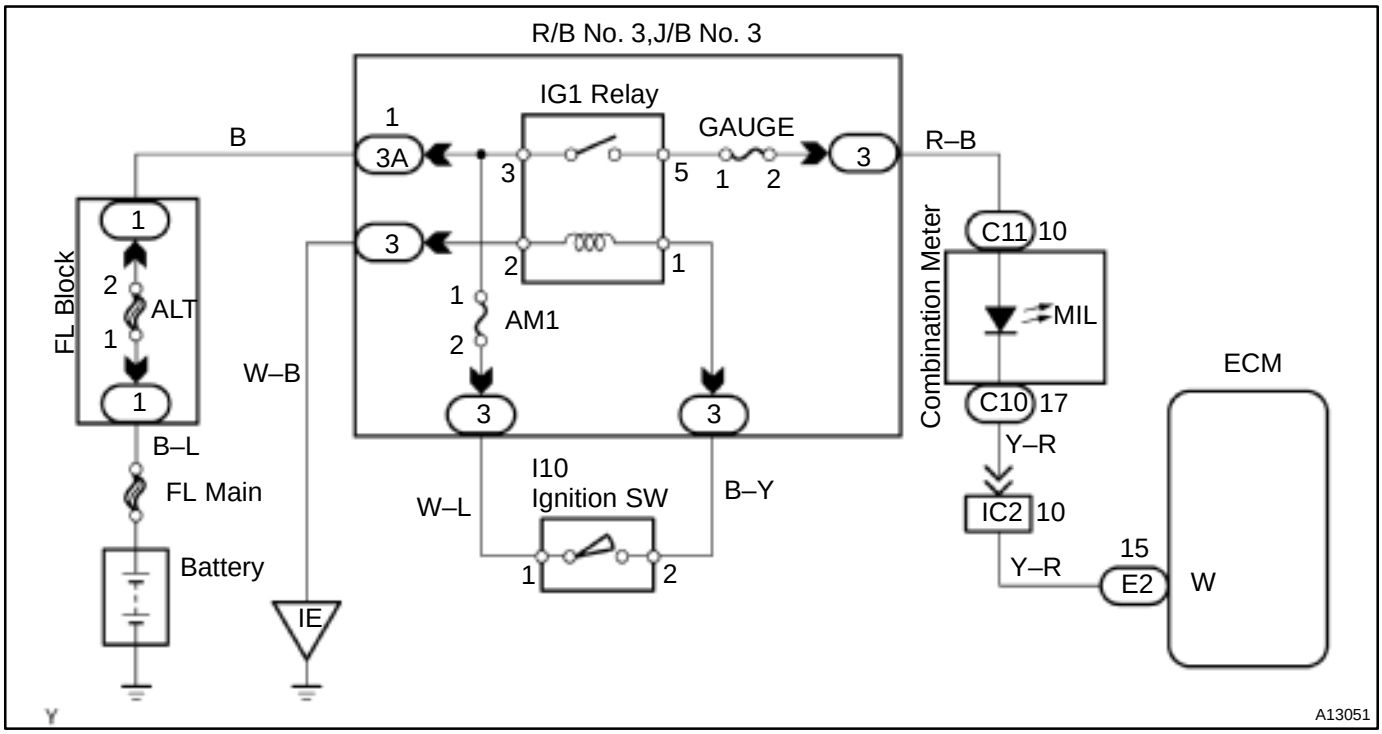
DI6MN–02

MIL Circuit Malfunction

CIRCUIT DESCRIPTION

If the ECM detects trouble, the MIL lights up. At this time, the ECM records a DTC in memory.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Troubleshoot in accordance with the chart below for each trouble symptom.

MIL does not light up	Start inspection from step 1 in case of using TOYOTA hand–held tester and start from step 2 in case of not using TOYOTA hand–held tester
MIL remains on	After inspection of step 3, start inspection from step 4 in case of using TOYOTA hand–held tester and start from step 5 in case of not using TOYOTA hand–held tester

1	**Inspect diagnosis (normal mode, check mode) (See page DI–3).**

OK → **Check and replace ECM (See page IN–28).**

NG

2	**Check MIL.**

See combination meter troubleshooting on page BE–2.

NG → **Repair or replace bulb or combination meter assembly.**

OK

3	**Check that ECM connectors are securely connected to ECM.**

NO → **Connect connector to ECM.**

YES

Check for open circuit in harness and connector between combination meter and ECM (See page IN–28).

4	**Check operation of MIL (See step 1).**

OK → **Check and replace ECM (See page IN–28).**

NG

5	**Is any DTC output?**

Check DTC on page DI–14.

YES → **Repair circuit indicated by output code.**

NO

6	Check IG1 relay (Marking: IG1) (See page BE–15).

NG → Replace IG1 relay.

OK →

Check for short circuit in harness and connector between DLC3 and ECM (See page IN–28).

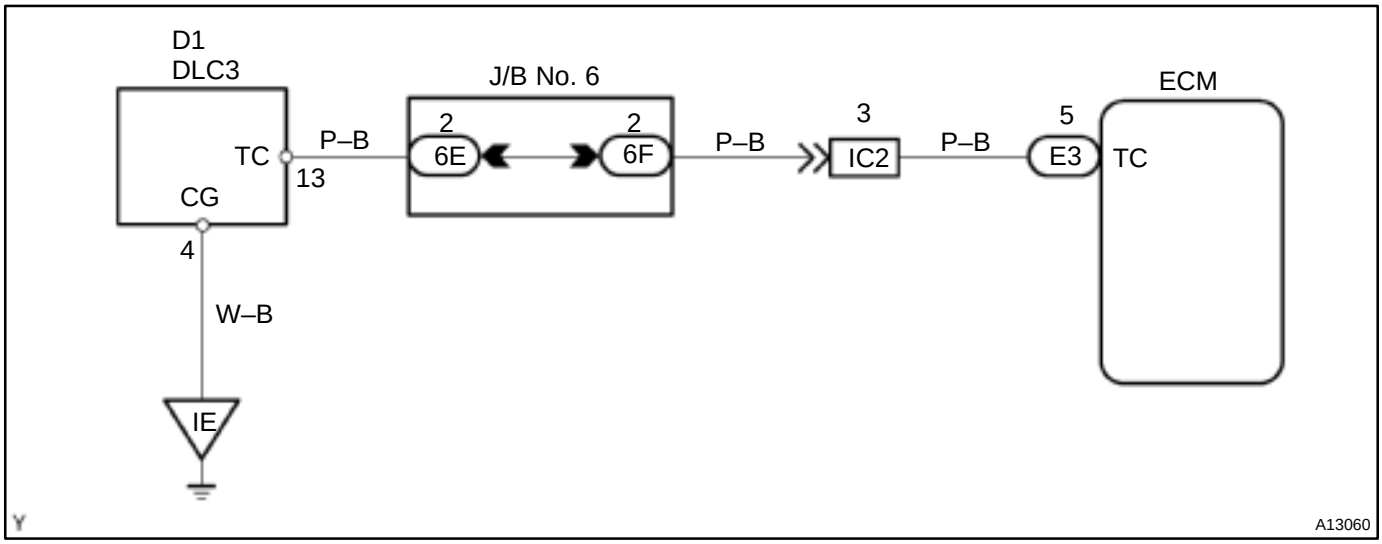
DI7DL–01

TC Terminal Circuit

CIRCUIT DESCRIPTION

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

WIRING DIAGRAM

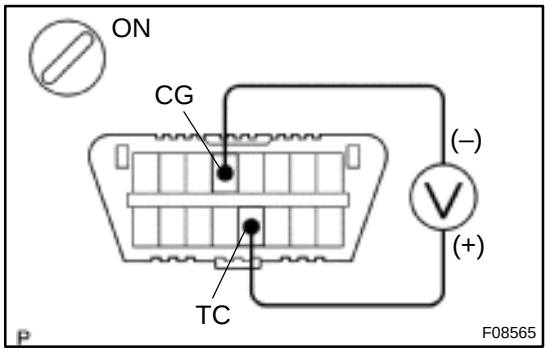


INSPECTION PROCEDURE

HINT:

- Even though terminal TC is not connected with terminal CG, the MIL blinks.
- For the above phenomenon,an open or short in the wire harness, or malfunction inside the ECM is the likely cause.

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



PREPARATION:

Turn the ignition switch ON.

CHECK:

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

OK:

Voltage: 9 – 14 V

OK	**Check and replace ECM (See page IN–28).**

NG

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

NG → Repair or replace harness or connector.

OK

3	Check for open and short circuit in harness and connector between ECM and DLC3, and DLC3 and body ground (See page IN–28).

NG → Repair or replace harness or connector.

OK

Check and replace ECM (See page IN–28).

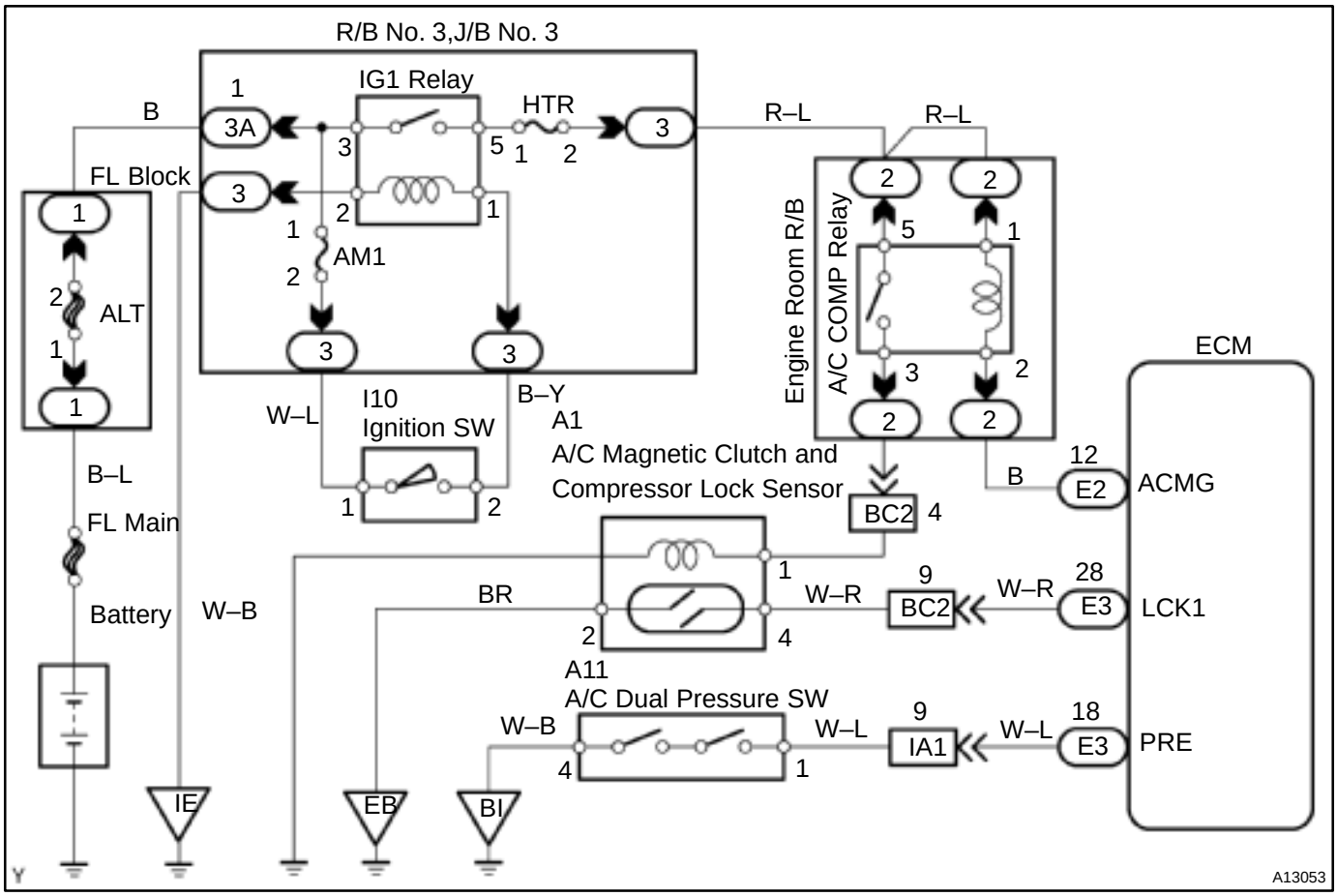
DI7DM–01

A/C Compressor Circuit

CIRCUIT DESCRIPTION

This sensor sends 1 pulse par engine revolution to the ECM. If the number ratio of the compressor speed divided by the engine speed is smaller than a predetermined value, the ECM turns the compressor off. And, the indicator flashes at about 1 second interval.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check A/C compressor.**

PREPARATION:

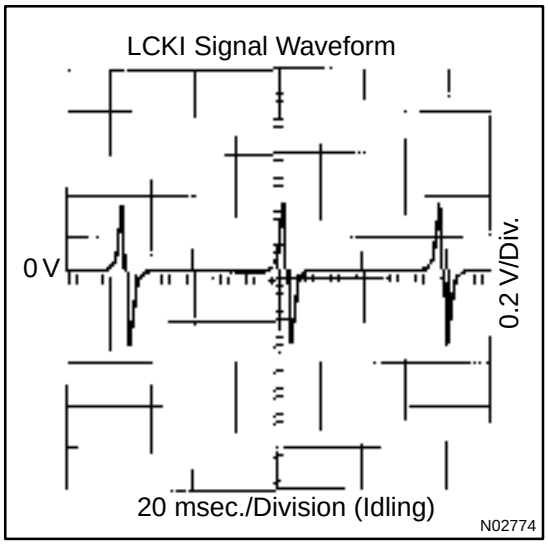
(a) Check the tension of the compressor drive belt (See page AC–16).

(b) Check if the compressor does not lock during operation with the engine started, and the blower switch and A/C switch ON.

NG	**Adjust drive belt tension or repair compressor (See page AC–16).**

OK

2	**Check A/C compressor lock sensor (See page AC–46).**



Reference: INSPECTION USING OSCILLOSCOPE
During cranking or idling, check the waveform between terminals LCKI and E1 of the ECM connector.
HINT:
The correct waveform appears as shown.

NG → **Replace compressor lock sensor (See page AC–47).**

OK

3	**Check magnetic clutch relay (Marking: A/C COMP) (See page AC–71).**

NG → **Replace magnetic clutch relay (See page AC–47).**

OK

4	**Check harness and connector between A/C compressor lock sensor and ECM (See page IN–28).**

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

OK

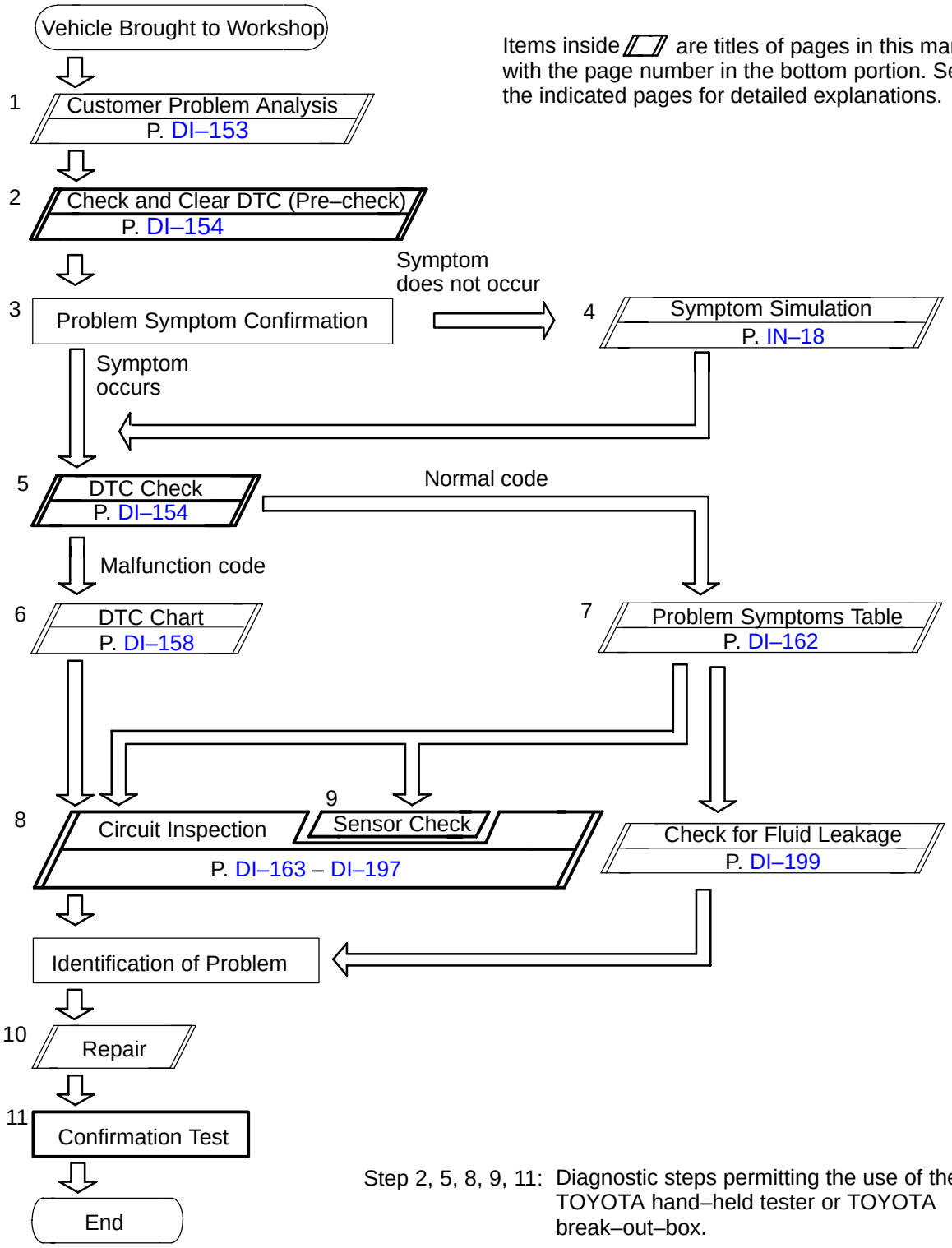
Check and replace ECM (See page IN–28).

ANTI–LOCK BRAKE SYSTEM

DI7CJ–01

HOW TO PROCEED WITH TROUBLESHOOTING

Troubleshoot in accordance with the procedure on the following pages.



Items inside ▱ are titles of pages in this manual, with the page number in the bottom portion. See the indicated pages for detailed explanations.

Step 2, 5, 8, 9, 11: Diagnostic steps permitting the use of the TOYOTA hand–held tester or TOYOTA break–out–box.

Fail safe function:
When a failure occurs in the ABS system, the ABS warning light is lit and the ABS operation is prohibited.

DI7CK–01

CUSTOMER PROBLEM ANALYSIS CHECK

ABS Check Sheet

Inspector's Name :

Customer's Name		**Registration No.**	
		Registration Year	/ /
		Frame No.	
Date Vehicle Brought In	/ /	**Odometer Reading**	km miles

Date Problem First Occurred	/ /
Frequency Problem Occurs	☐ Continuous ☐ Intermittent (times a day)

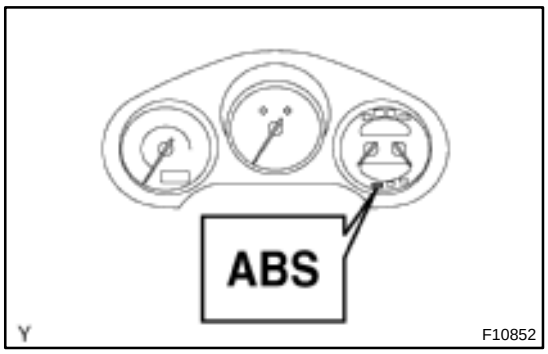
Symptoms	☐ ABS does not operate.	
	☐ ABS does not operate efficiently.	
	ABS Warning Light Abnormal	☐ Remains ON ☐ Does not Light Up

DTC Check	**1st Time**	☐ Normal Code ☐ Malfunction Code (Code)
	2nd Time	☐ Normal Code ☐ Malfunction Code (Code)

DI7CL–01

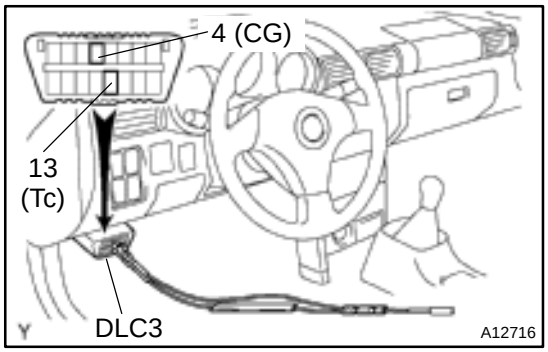
PRE–CHECK

1. DIAGNOSIS SYSTEM

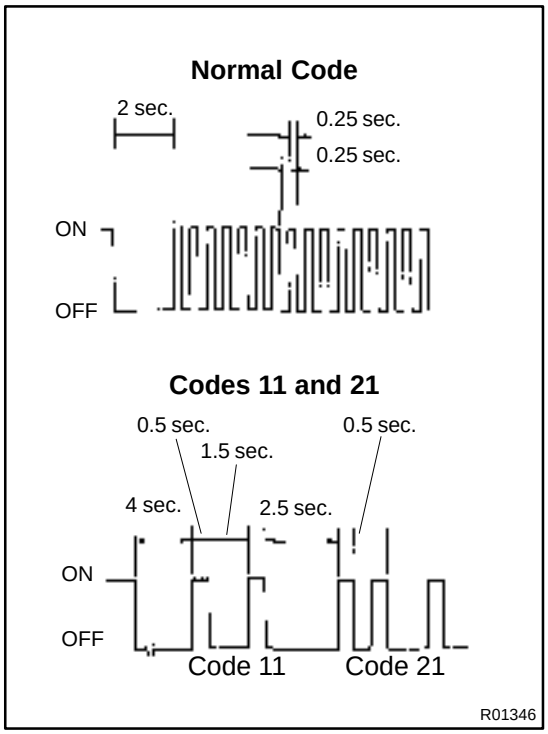


(a) Check the warning light.
When the ignition switch is turned ON, check that the ABS warning light go on for approx. 3 seconds.

HINT:
If the indicator is not normal, proceed to troubleshooting for the ABS warning light circuit (See page DI–192).

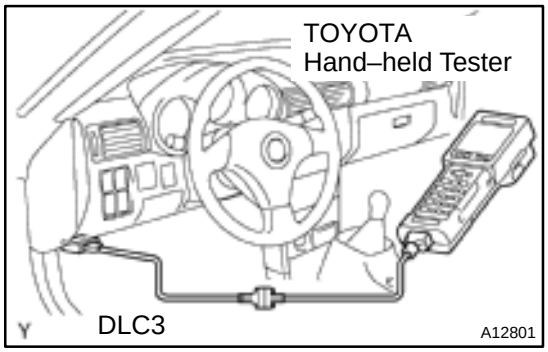


(b) In case of not using TOYOTA hand–held tester:
Check the DTC.
(1) Using SST, connect terminals Tc and CG of the DLC3.
SST 09843–18040
(2) Turn the ignition switch ON.
(3) Read the DTC from the ABS warning light on the combination meter.

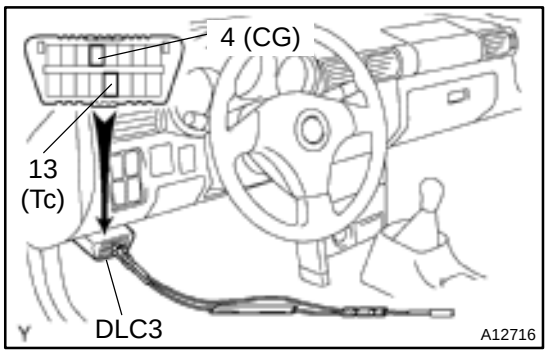


HINT:
- If no code appears, inspect the diagnostic circuit or ABS warning light circuit (See page DI–195).
- As an example, the blinking patterns for normal code and codes 11 and 21 are shown on the left.
(4) Codes are explained in the code table on page DI–158.
(5) After completing the check, disconnect terminals Tc and CG of the DLC3, and turn off the display.

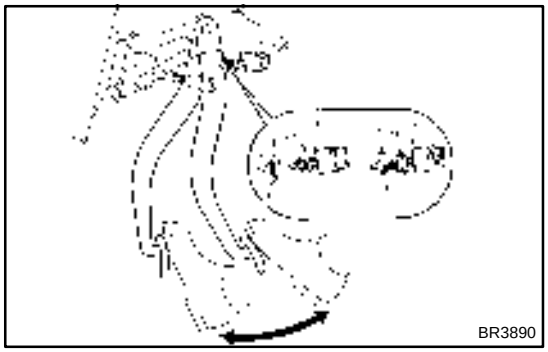
If 2 or more malfunctions are indicated at the same time, the lowest numbered DTC will be displayed first.



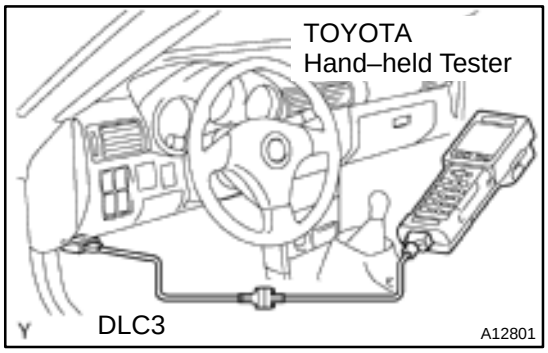
(c) In case of using TOYOTA hand–held tester:
Check the DTC.
(1) Hook up the TOYOTA hand–held tester to the DLC3.
(2) Turn the ignition switch ON.
(3) Read the DTC by following the prompts on the tester screen.
Please refer to the TOYOTA hand–held tester operator's manual for further details.



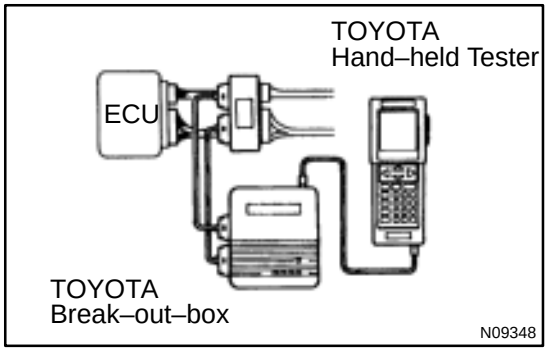
(d) In case of not using TOYOTA hand–held tester:
Clear the DTC.
(1) Using SST, connect terminals Tc and CG of the DLC3.
SST 09843–18040
(2) Turn the ignition switch ON.



(3) Clear the DTC stored in ECU by depressing the brake pedal 8 or more times within 5 seconds.
(4) Check that the warning light shows the normal code.
(5) Remove the SST from the terminals of the DLC3.
SST 09843–18040

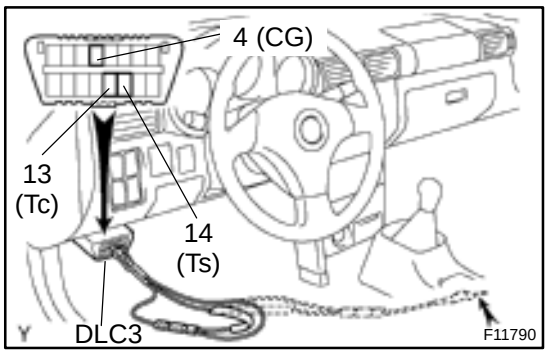


(e) In case of using TOYOTA hand–held tester:
Clear the DTC.
(1) Hook up the TOYOTA hand–held tester to the DLC3.
(2) Turn the ignition switch ON.
(3) Operate the TOYOTA hand–held tester to erase the codes. (See hand–held tester oprater's manual.)



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

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



2. SPEED SENSOR SIGNAL (TEST MODE)

(a) In case of not using TOYOTA hand–held tester:
Check the speed sensor signal.

(1) Turn the ignition switch OFF.

(2) Using SST, connect terminals Ts and CG of the DLC3.

SST 09843–18040

(3) Start the engine.

(4) Check that the ABS warning light blinks.

HINT:

If the ABS warning light does not blink, inspect the ABS warning light circuit (See page DI–192).

(5) Drive vehicle straight forward.

HINT:

Drive vehicle at faster than 45 km/h (28 mph) for several seconds.

(6) Stop the vehicle.

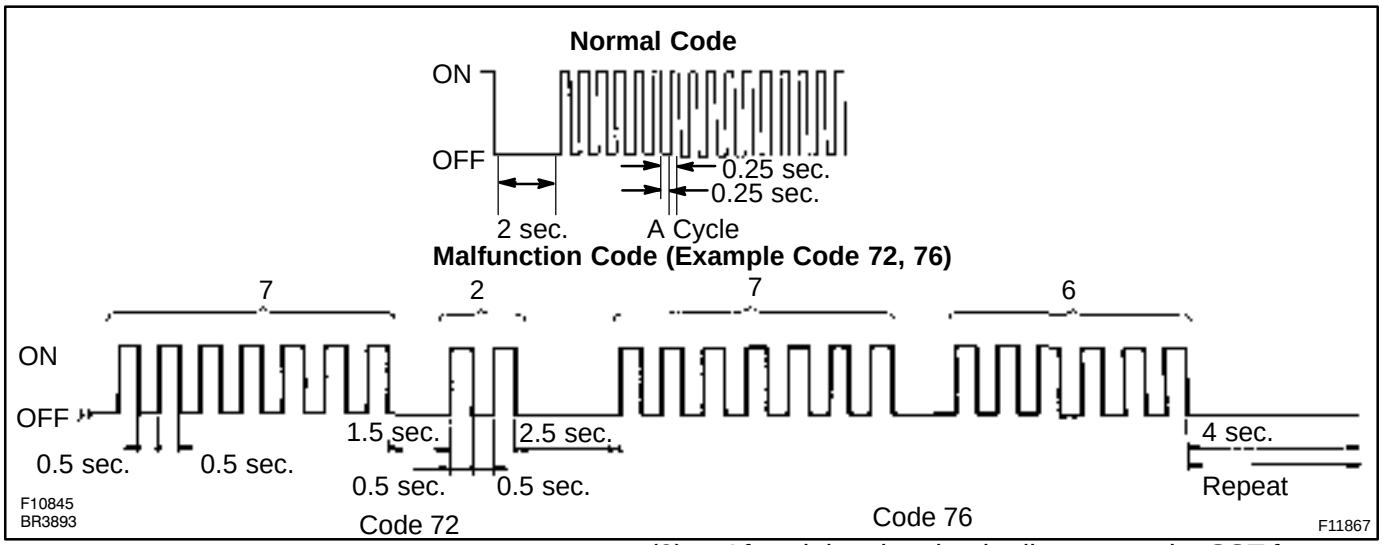
(7) Using SST, connect terminals Tc and CG of the DLC3.

SST 09843–18040

(8) Read the number of blinks of the ABS warning light.

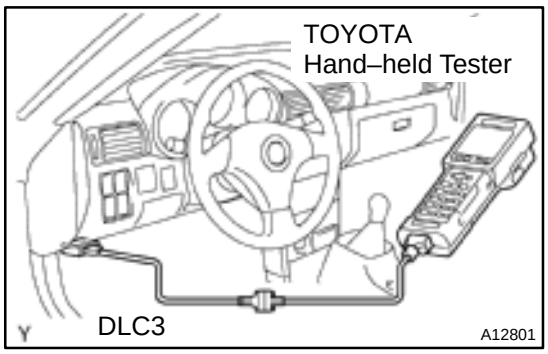
HINT:

- See the list of DTC shown on the next page.
- If each sensor is normal, a normal code is output (A cycle of 0.25 sec. ON and 0.25 sec. OFF is repeated).
- If 2 or more malfunctions are indicated at the same time, the lowest numbered code will be displayed first.



(9) After doing the check, disconnect the SST from terminals Ts, Tc and CG of the DLC3, and turn ignition switch OFF.

SST 09843–18040



(b) Using TOYOTA hand–held tester:
Check the DTC.
(1) Hook up the TOYOTA hand–held tester to the DLC3.
(2) Do steps (3) to (6) on the previous page and this page.
(3) Read the DTC by following the prompts on the tester screen.
Please refer to the TOYOTA hand–held tester operator's manual for further details.

DTC of speed sensor check function:

Code No.	Diagnosis	Trouble Area
C1271/71	Low output voltage of right front speed sensor	• Right front speed sensor • Sensor installation • Right front speed sensor rotor
C1272/72	Low output voltage of left front speed sensor	• Left front speed sensor • Sensor installation • Left front speed sensor rotor
C1273/73	Low output voltage of right rear speed sensor	• Right rear speed sensor • Sensor installation • Right rear speed sensor rotor
C1274/74	Low output voltage of left rear speed sensor	• Left rear speed sensor • Sensor installation • Left rear speed sensor rotor
C1275/75	Abnormal change in output voltage of right front speed sensor	Right front speed sensor rotor
C1276/76	Abnormal change in output voltage of left front speed sensor	Left front speed sensor rotor
C1277/77	Abnormal change in output voltage of right rear speed sensor	Right rear speed sensor rotor
C1278/78	Abnormal change in output voltage of left rear speed sensor	Left rear speed sensor rotor

DI7CM–01

DIAGNOSTIC TROUBLE CODE CHART

HINT:

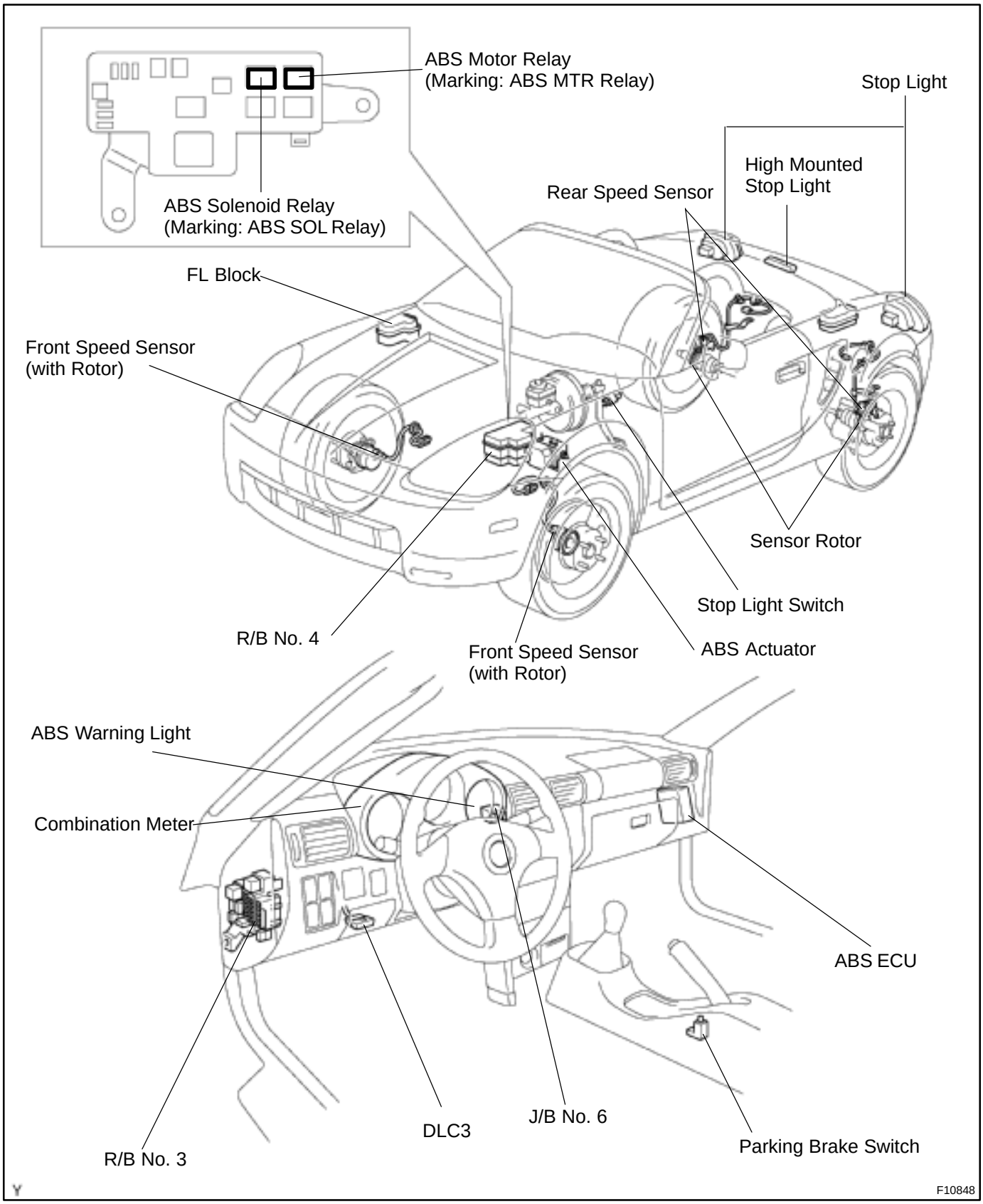
- Using SST 09843–18040, connect terminals Tc and CG of the DLC3.
- If any abnormality is not found in inspection parts, inspect the ECU.
- If a malfunction code is displayed during the DTC check, check the circuit listed for the code. For details of each code, turn to the page referred to under the "See page" for respective "DTC No." in the DTC chart.

DTC No. (See page)	Detection Item	Trouble Area
C0278/11 (DI–178)	Open circuit in ABS solenoid relay circuit	• ABS solenoid relay • ABS solenoid relay circuit
C0279/12 (DI–178)	Short circuit in ABS solenoid relay circuit	
C0273/13 (DI–173)	Open circuit in ABS motor relay circuit	• ABS motor relay • ABS motor relay circuit
C0274/14 (DI–173)	Short circuit in ABS motor relay circuit	
C0226/21 (DI–170)	Open or short circuit in 2–position solenoid circuit for right front wheel	• ABS actuator • SFRR or SFRH circuit
C0236/22 (DI–170)	Open or short circuit in 2–position solenoid circuit for left front wheel	• ABS actuator • SFLR or SFLH circuit
C0246/23 (DI–170)	Open or short circuit in 2–position solenoid circuit for right rear wheel	• ABS actuator • SRRR or SRRH circuit
C0256/24 (DI–170)	Open or short circuit in 2–position solenoid circuit for left rear wheel	• ABS actuator • SRLR or SRLH circuit
C0200/31 (DI–163)	Right front wheel speed sensor signal malfunction	• Right front, left front, right rear or left rear speed sensor • Each speed sensor circuit • Speed sensor rotor
C0205/32 (DI–163)	Left front wheel speed sensor signal malfunction	
C0210/33 (DI–163)	Right rear wheel speed sensor signal malfunction	• Rear axle hub • Right rear or left rear speed sensor • Each speed sensor circuit • Speed sensor rotor
C0215/34 (DI–163)	Left rear wheel speed sensor signal malfunction	
C1235/35 (DI–163)	Foreign matter is attached on the tip of the right front sensor	• Right front, left front, right rear or left rear speed sensor • Each speed sensor circuit • Speed sensor rotor
C1236/36 (DI–163)	Foreign matter is attached on the tip of the left front sensor	
C1238/38 (DI–163)	Foreign matter is attached on the tip of the right rear sensor	
C1239/39 (DI–163)	Foreign matter is attached on the tip of the left rear sensor	
C1241/41 (DI–183)	Power source voltage down	• Battery • Charging system • Power source circuit
C1249/49 (DI–186)	Open circuit in stop light switch circuit	• Stop light switch • Stop light switch circuit

C1251/51 (DI–188)	Pump motor is locked	• ABS pump motor
Always ON (DI–190)	Malfunction in ECU	• Charging system • ABS warning light circuit • Battery • ABS ECU

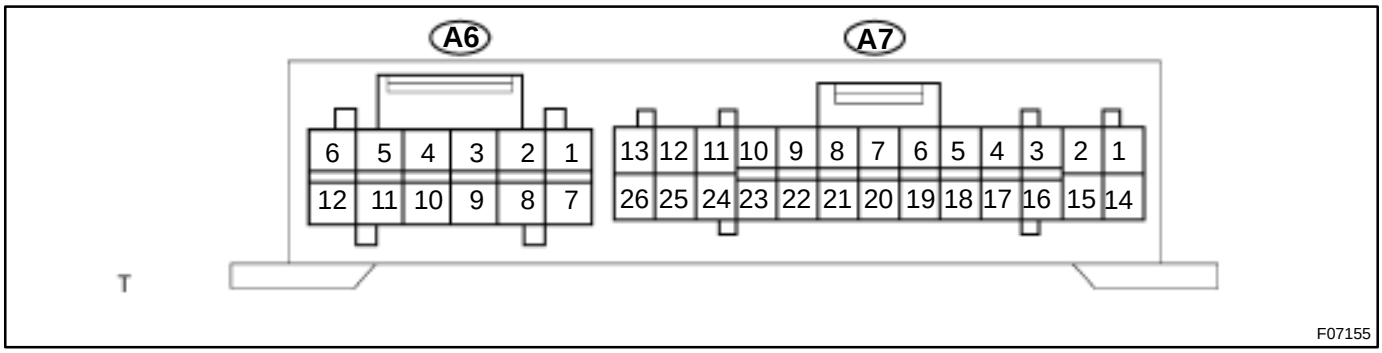
DI7CN–01

PARTS LOCATION



DI7CO–01

TERMINALS OF ECU



Symbols (Terminal No.)	Wiring Color	Condition	STD Voltage (V)
IG1 (A7–13) – GND (A7–12, 25)	B–R ↔ W–B	IG switch ON	10 – 14
R+ (A7–26) – SR (A6–7)	L ↔ R–B	IG switch ON, ABS warning light OFF	9 – 14
R+ (A7–26) – MR (A6–1)	L ↔ R–Y	IG switch ON	Below 1.0
SFRR (A7–1) – GND (A7–12, 25)	W–L ↔ W–B	IG switch ON, ABS warning light OFF	10 – 14
SFRH (A7–2) – GND (A7–12, 25)	W–G ↔ W–B	IG switch ON, ABS warning light OFF	10 – 14
SFLR (A6–6) – GND (A7–12, 25)	W ↔ W–B	IG switch ON, ABS warning light OFF	10 – 14
SFLH (A6–5) – GND (A7–12, 25)	W–R ↔ W–B	IG switch ON, ABS warning light OFF	10 – 14
SRRR (A7–12) – GND (A7–12, 25)	R–G ↔ W–B	IG switch ON, ABS warning light OFF	10 – 14
SRRH (A6–11) – GND (A7–12, 25)	R–B ↔ W–B	IG switch ON, ABS warning light OFF	10 – 14
SRLR (A7–14) – GND (A7–12, 25)	R–W ↔ W–B	IG switch ON, ABS warning light OFF	10 – 14
SRLH (A7–15) – GND (A7–12, 25)	R–L ↔ W–B	IG switch ON, ABS warning light OFF	10 – 14
WA (A7–11) – GND (A7–12, 25)	R–G ↔ W–B	IG switch ON, ABS warning light ON	10 – 14
		IG switch ON, ABS warning light OFF	Below 2.0
STP (A7–5) – GND (A7–12, 25)	G–W ↔ W–B	Stop light switch OFF	Below 1.5
		Stop light switch ON	8 – 14
D/G (A7–24) – GND (A7–12, 25)	W–G ↔ W–B	IG switch ON, ABS warning light OFF	10 – 14
Tc (A7–8) – GND (A7–12, 25)	P–B ↔ W–B	IG switch ON	8 – 14
Ts (A7–21) – GND (A7–12, 25)	G–R ↔ W–B	IG switch ON	8 – 14
FR+ (A6–3) – FR– (A6–9)	R ↔ G	IG switch ON, Slowly turning right front wheel	AC generation
FL+ (A6–8) – FL– (A6–2)	L ↔ P	IG switch ON, Slowly turning left front wheel	AC generation
RR+ (A7–10) – RR– (A7–23)	B ↔ W	IG switch ON, Slowly turning right rear wheel	AC generation
RL+ (A7–22) – RL– (A7–9)	Y ↔ BR	IG switch ON, Slowly turning left rear wheel	AC generation
MT (A6–10) – GND (A7–12, 25)	L–W ↔ W–B	IG switch ON	Below 1.5

DI7CP–01

PROBLEM SYMPTOMS TABLE

If a normal code is displayed during the DTC check but the problem still occurs, check the circuits for each problem symptom in the order given in the table below and proceed to the relevant troubleshooting page.

NOTICE:

When replacing ABS ECU, sensor or etc., turn the IG switch OFF.

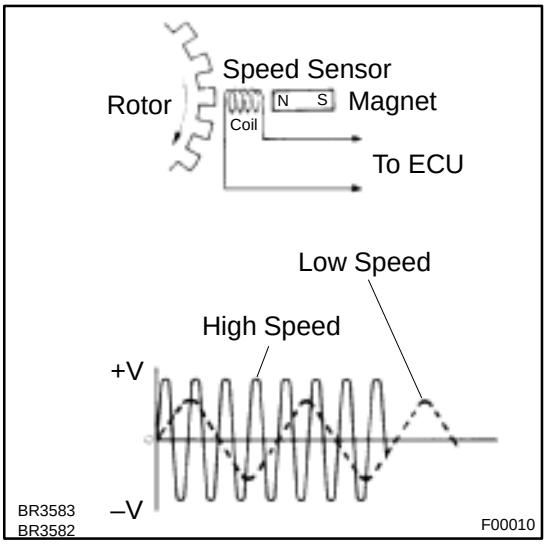
Symptom	Suspected Area	See page
ABS does not operate	Only when 1. to 4. are all normal and the problem is still occurring, replace the ABS ECU. 3. Check the DTC reconfirming that the normal code is output. 4. IG power source circuit 5. Speed sensor circuit 6. Check the ABS actuator with a checker or TOYOTA hand–held tester. If abnormal, check the hydraulic circuit for leakage (See page DI–199).	 DI–154 DI–183 DI–163 BR–42
ABS does not operate efficiently	Only when 1. to 4. are all normal and the problem is still occurring, replace the ABS ECU. 1. Check the DTC reconfirming that the normal code is output. 2. Speed sensor circuit 3. Stop light switch circuit 4. Check the ABS actuator with a checker or TOYOTA hand–held tester. If abnormal, check the hydraulic circuit for leakage (See page DI–199).	 DI–154 DI–163 DI–186 BR–42
ABS warning light abnormal	1. ABS warning light circuit 2. ABS ECU	DI–192
DTC check cannot be done	Only when 1. and 2. are all normal and the problem is still occurring, replace the ABS ECU. 1. ABS warning light circuit 2. Tc terminal circuit	 DI–192 DI–195
Speed sensor signal check cannot be done	1. Ts terminal circuit 2. ABS ECU	DI–197

DI7CQ–01

CIRCUIT INSPECTION

DTC	C0200/31 – C1239/39	Speed Sensor Circuit

CIRCUIT DESCRIPTION



The speed sensor detects wheel speed and sends the appropriate signals to the ECU. These signals are used to control the ABS system. The front and rear rotors each have 48 serrations.

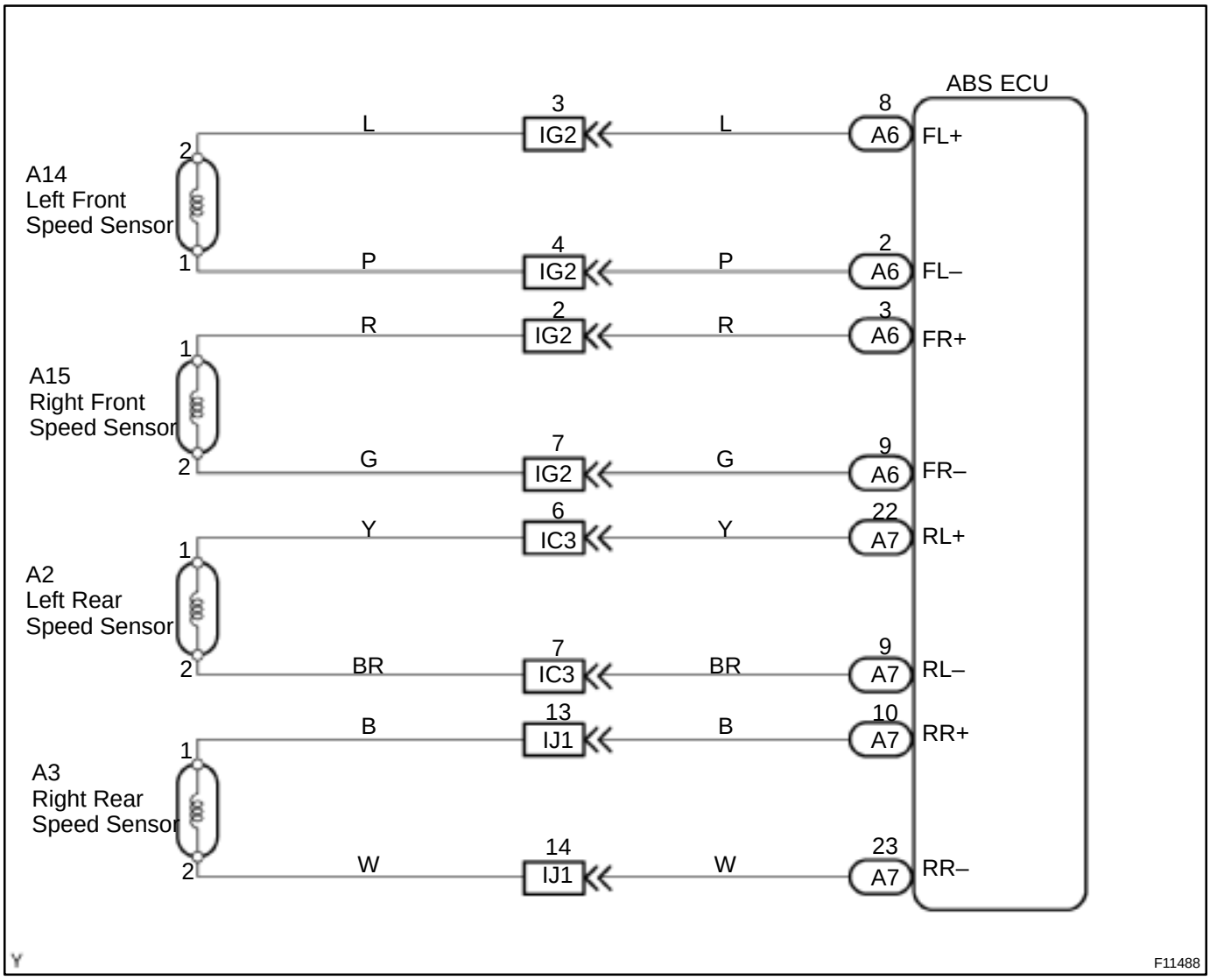
When the rotors rotate, the magnetic field emitted by the permanent magnet in the speed sensor generates an AC voltage. Since the frequency of this AC voltage changes in direct proportion to the speed of the rotor, the frequency is used by the ECU to detect the speed of each wheel.

DTC No.	DTC Detection Condition	Trouble Area
C0200/31 C0205/32 C0210/33 C0215/34	Detection of any of conditions from 1. through 3.: 1. Vehicle speed is at 10 km/h (6 mph) or more and open or short of the speed sensor signal circuit continues 15 sec. or more. 2. Momentary interruption of the speed sensor signal occurs 7 times or more. 3. Open circuit condition of the speed sensor signal circuit continues for 0.5 sec. or more.	• Right front, left front, right rear or left rear speed sensor • Each speed sensor circuit • Speed sensor rotor
C1235/35 C1236/36 C1238/38 C1239/39	Vehicle speed is at 20 km/h (12mph) or more and interference on the speed sensor signal continues for 5 sec. or more.	• Right front, left front, right rear or left rear speed sensor • Each speed sensor circuit • Speed sensor rotor
C0210/33 C0215/34	The condition that the both rear side wheels' speed is lower than the front wheels' speed at 20 km/h (12 mph) or more for 20 sec. or more when the IG switch turns ON and OFF, which is repeated in a sequence more than 8 times.	• Rear axle hub • Right rear or left rear speed sensor • Rear speed sensor circuit

HINT:

- DTC Nos. C0200/31 and C1235/35 are for the right front speed sensor.
- DTC Nos. C0205/32 and C1236/36 are for the left front speed sensor.
- DTC Nos. C0210/33 and C1238/38 are for the right rear speed sensor.
- DTC Nos. C0215/34 and C1239/39 are for the left rear speed sensor.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Start the inspection from step 1 in case of using the TOYOTA hand–held tester and start from step 2 in case of not using the TOYOTA hand–held tester.

1	**Check output value of speed sensor.**

PREPARATION:

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

CHECK:

Check that there is no difference between the speed value output from the speed sensor displayed on the TOYOTA hand–held tester and the speed value displayed on the speedometer when driving the vehicle.

OK:

There is almost no difference from the displayed speed value.

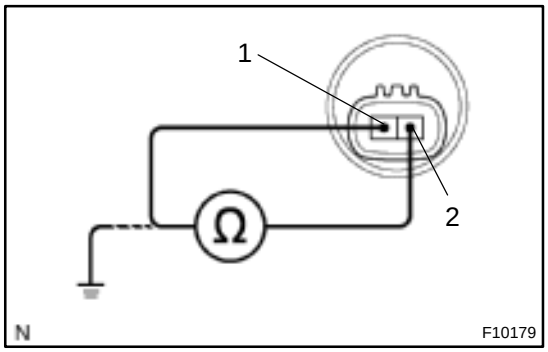
HINT:

There is tolerance of ± 10 % in the speedometer indication.

OK → **Check and replace ABS ECU.**

NG

2	**Check speed sensor.**



Front speed sensor:

PREPARATION:

(a) Make sure that there is no looseness at the connector lock part and connecting part of the connector.
(b) Disconnect the speed sensor connector at hub bearing.

CHECK:

Measure the resistance between terminals 1 and 2 of the speed sensor connector.

OK:

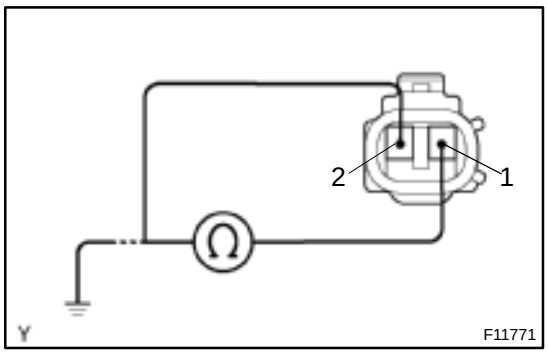
Resistance: 1.1 – 1.3 kΩ at 25˚C

CHECK:

Measure the resistance between terminals 1 and 2 of the speed sensor connector and body ground.

OK:

Resistance: 1 MΩ or higher



Rear speed sesor:

PREPARATION:

(a) Make sure the that there is no looseness at the connector lock part and connecting part of the connector.

(b) Disconnect the speed sensor connector.

CHECK:

Measure the resistance between terminals 1 and 2 of the speed sensor connector.

OK:

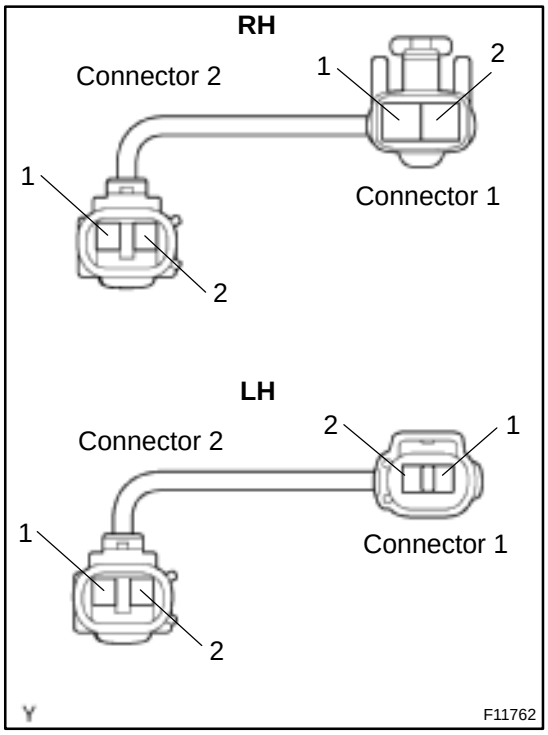
Resistance: 0.9 – 1.3 kΩ at 25 ± 5 ˚C

CHECK:

Measure the resistance between terminals 1 and 2 of the speed sensor connector and body ground.

OK:

Resistance: 10 MΩ or higher



Front speed sensor sub–wire:

PREPARATION:

(a) Remove the fender liner.

(b) Make sure that there is no looseness at the connector lock part and connecting part of the connector.

(c) Disconnect the speed sensor connector inside vehicle.

CHECK:

(a) Measure the resistance between terminal 1 of connector 1 and terninal 2 of connector 2.

(b) Measure the resistance between terminal 2 of connector 1 and terninal 1 of connector 2.

OK:

Resistance: below 1 Ω

CHECK:

Measure the resistance between terminals 1 and 2 of connector 1 and body ground.

OK:

Resistance: 10 MΩ or higher

NG → **Replace speed sensor or sub–wire harness.**

NOTICE:

Check the speed sensor signal last (See page DI–154).

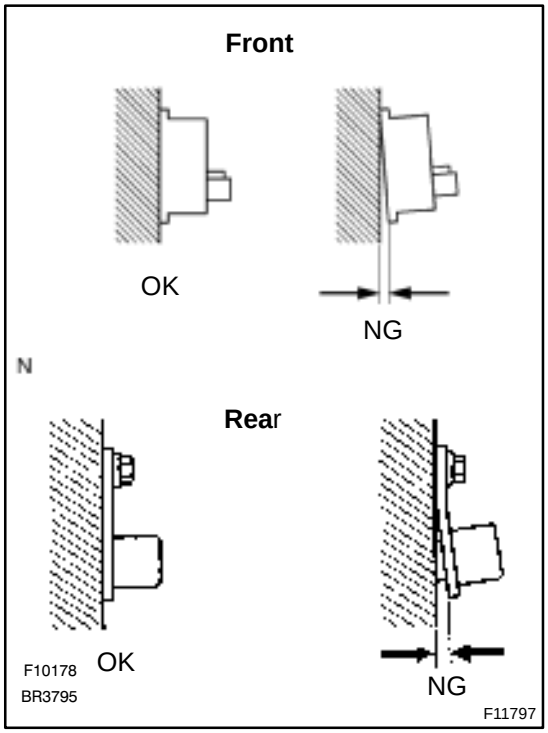
OK

3	**Check for open and short circuit in harness and connector between each speed sensor and ABS ECU (See page IN–28).**

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

OK

4	**Check speed sensor installation.**



CHECK:
Check the speed sensor installation.
OK:

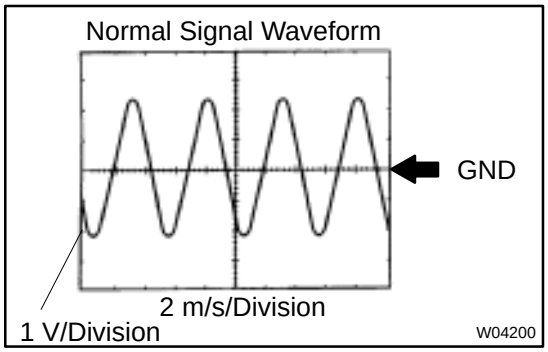
The installation bolt is tightened properly and there is no clearance between the sensor and steering knuckle or rear axle carrier.

NG → **Replace speed sensor.**

NOTICE:
Check the speed sensor signal last (See page DI–154).

OK

5	Check speed sensor and sensor rotor serrations.



REFERENCE: INSPECTION USING OSCILLOSCOPE

PREPARATION:

(a) Remove the ABS ECU with the connectors still connected.

(b) Connect the oscilloscope to terminals FR+, FL+, RR+ or RL+ and GND of the ABS ECU.

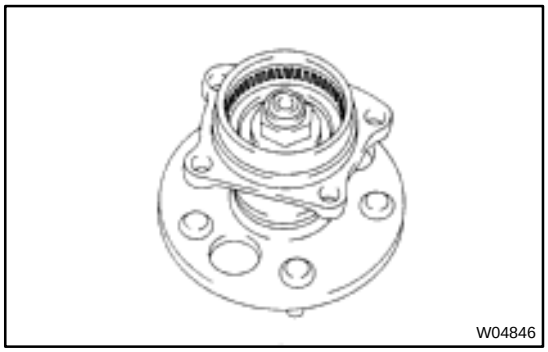
CHECK:

Drive the vehicle at about 30 km/h (19 mph), and check the signal waveform.

OK	Check and replace ABS ECU.

NG

6	Check sensor rotor and sensor tip.



Front:

PREPARATION:

Remove the front speed sensor (See page BR–51).

CHECK:

Check the sensor rotor serrations.

OK:

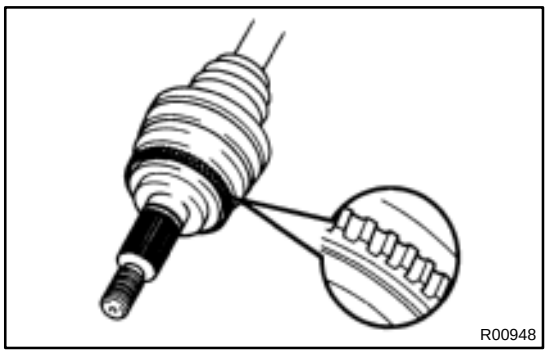
No scratches or missing teeth or foreign objects.

CHECK:

Check the sensor tip.

OK:

No scratches or foreign objects on the sensor tip.



Rear:

PREPARATION:

Remove the rear drive shaft (See page SA–41).

CHECK:

Check the sensor rotor serrations.

OK:

No scratches or missing teeth or foreign objects.

PREPARATION:

Remove the rear speed sensor (See page BR–56).

CHECK:

Check the sensor tip.

OK:

No scratches or foreign objects on the sensor tip.

NG → **Replace sensor rotor or speed sensor.**

NOTICE:

Check the speed sensor signal last (See page DI–154).

OK

Check and replace ABS ECU.

DI7CR–01

DTC	C0226/21 – C0256/24	ABS Actuator Solenoid Circuit

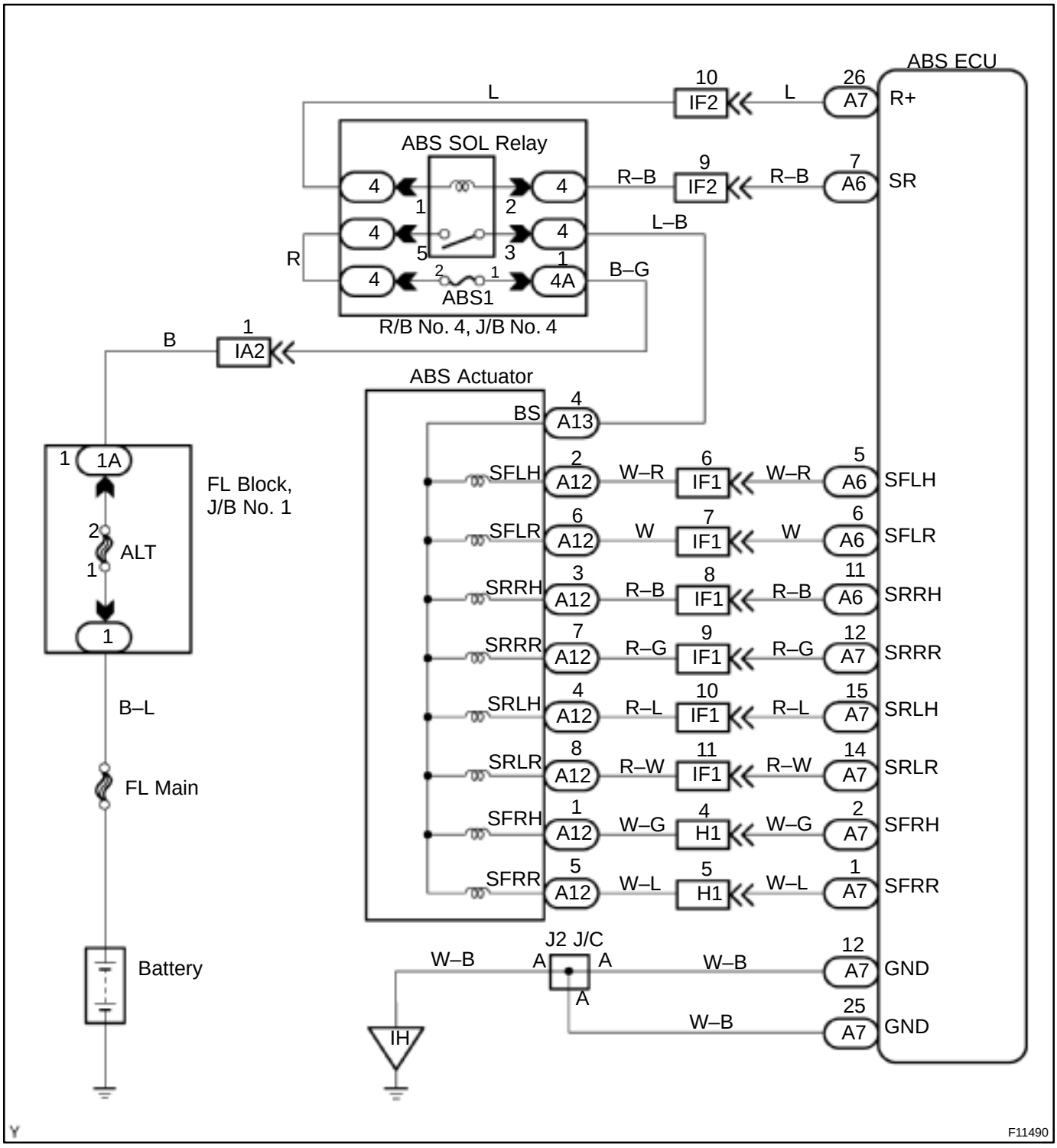
CIRCUIT DESCRIPTION

This solenoid goes on when signals are received from the ECU and controls the pressure acting on the wheel cylinders thus controlling the braking force.

DTC No.	DTC Detection Condition	Trouble Area
C0226/21	Condition 1. or 2. continues for 0.05 sec. or more: 1. IG1 terminal voltage of ABS ECU is 9.5 – 18.5 V, there is open or short circuit in actuator solenoid SFRR or SFRH. 2. IG1 terminal voltage of ABS ECU is 9.5 – 18.5 V, and while ABS control is in operation.*	• ABS actuator • SFRR or SFRH circuit
C0236/22	Condition 1. or 2. continues for 0.05 sec. or more: 1. IG1 terminal voltage of ABS ECU is 9.5 – 18.5 V, there is open or short circuit in actuator solenoid SFLR or SFLH. 2. IG1 terminal voltage of ABS ECU is 9.5 – 18.5 V, and while ABS control is in operation.*	• ABS actuator • SFLR or SFLH circuit
C0246/23	Condition 1. or 2. continues for 0.05 sec. or more: 1. IG1 terminal voltage of ABS ECU is 9.5 – 18.5 V, there is open or short circuit in actuator solenoid SRRR or SRRH. 2. IG1 terminal voltage of ABS ECU is 9.5 – 18.5 V, and while ABS control is in operation.*	• ABS actuator • SRRR or SRRH circuit
C0256/24	Condition 1. or 2. continues for 0.05 sec. or more: 1. IG1 terminal voltage of ABS ECU is 9.5 – 18.5 V, there is open or short circuit in actuator solenoid SRLR or SRLH. 2. IG1 terminal voltage of ABS ECU is 9.5 – 18.5 V, and while ABS control is in operation.*	• ABS actuator • SRLR or SRLH circuit

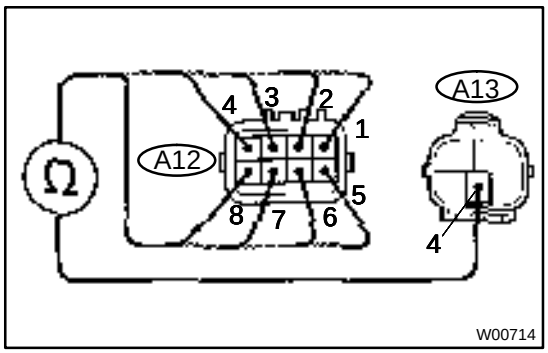
*: Solenoid relay contact ON condition:
All of solenoid terminal voltage is half or less than IG1 terminal voltage .

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check ABS actuator solenoid.**



PREPARATION:
Disconnect the 2 connectors from the ABS actuator.
CHECK:
Check the continuity between terminals A13–4 and A12–1, 2, 3, 4, 5, 6, 7, 8 of the ABS actuator connector.
OK:

Continuity

HINT:
Resistance of each solenoid coil
SRLR, SRRR, SFLR, SFRR: 4.3 Ω
SRLH, SRRH, SFLH, SFRH: 8.8 Ω

NG → **Replace ABS actuator.**

OK

2	**Check for open and short circuit in harness and connector between ABS ECU and actuator (See page IN–28).**

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

OK

If same code is still output after DTC is deleted, check connections. If connections are normal, ECU may be defective.

DI7CS–01

DTC	C0273/13, C0274/14	ABS Motor Relay Circuit

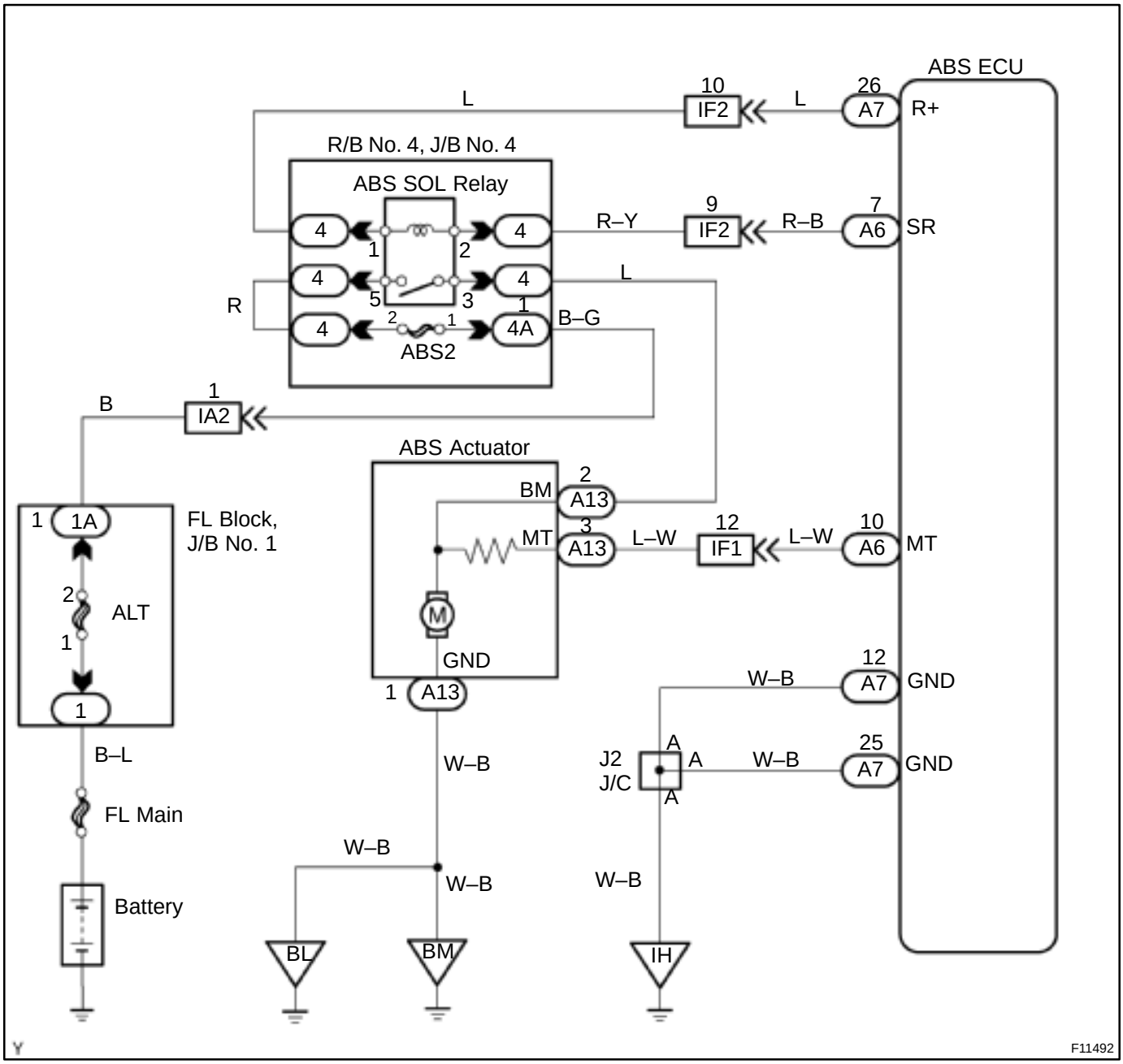
CIRCUIT DESCRIPTION

The ABS motor relay (Marking: ABS MTR) supplies power to the ABS pump motor. While the ABS is activated, the ECU switches the ABS motor relay ON and operates the ABS pump motor.

DTC No.	DTC Detection Condition	Trouble Area
C0273/13	Condition 1. or 2. continues for 0.2 sec. or more: 1. ABS ECU terminal IG1 voltage is 9.5 V to 18.5 V, and when motor relay is ON in the midst of initial check or when ABS control is in operation.*1 2. Motor relay is ON driving in the midst of initial check or when ABS control is in operation, ABS ECU terminal IG1 voltage becomes 9.5 V or less.*2	• ABS motor relay • ABS motor relay circuit
C0274/14	Condition below continues for 4 sec. or more: When the motor relay is OFF, there is open circuit in MT terminal of ABS ECU.	

*1: Relay contact OFF condition: MT terminal voltage is below 3.6 V.
*2: Relay contact ON condition: MT terminal voltage is 3.6 V or above.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Start the inspection from step 1 in case of using the TOYOTA hand–held tester and start from step 2 in case of not using TOYOTA hand–held tester.

1	**Check ABS motor relay (Marking: ABS MTR) operation.**

PREPARATION:

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

CHECK:

Check the operation sound of the ABS motor relay when operating it with the TOYOTA hand–held tester.

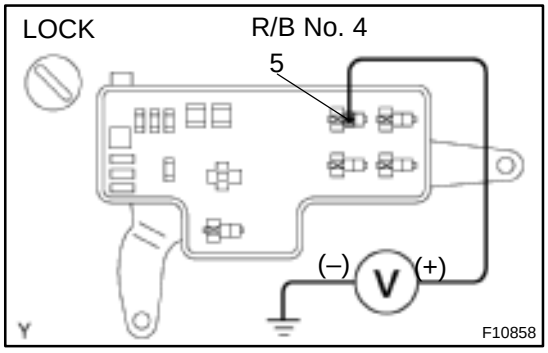
OK:

The operation sound of the ABS motor relay should be heard.

OK → **Go to step 5.**

NG

2	**Check voltage between terminal 5 of R/B No. 4 (for ABS motor relay (Marking: ABS MTR)) and body ground.**



PREPARATION:

Remove the ABS motor relay from the R/B No. 4.

CHECK:

Measure the voltage between terminal 5 of the R/B No. 4 (for ABS motor relay) and body ground.

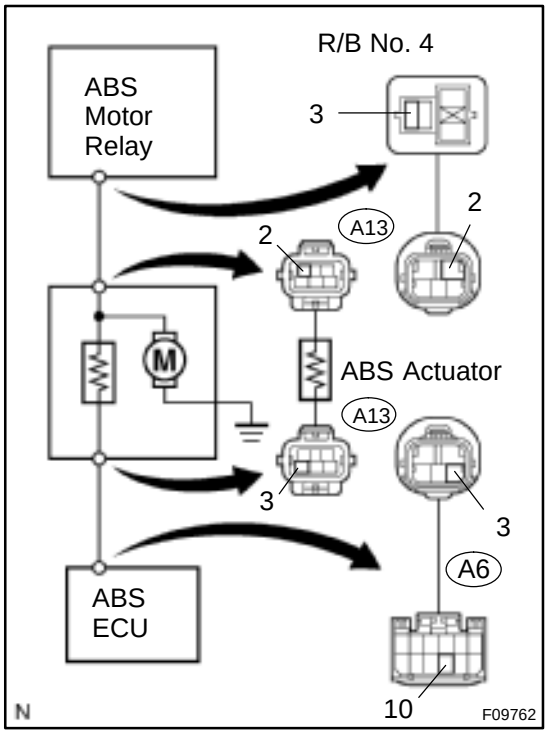
OK:

Voltage: 10 – 14 V

NG → **Check and repair harness or connector between R/B No. 4 and battery.**

OK

3	**Check continuity between terminal 3 of R/B No. 4 (for ABS motor relay (Marking: ABS MTR)) and terminal MT (A6–10) of ABS ECU.**



CHECK:

Check the continuity between terminal 3 of the R/B No. 4 (for ABS motor relay) and terminal MT (A6–10) of the ABS ECU.

OK:

Continuity

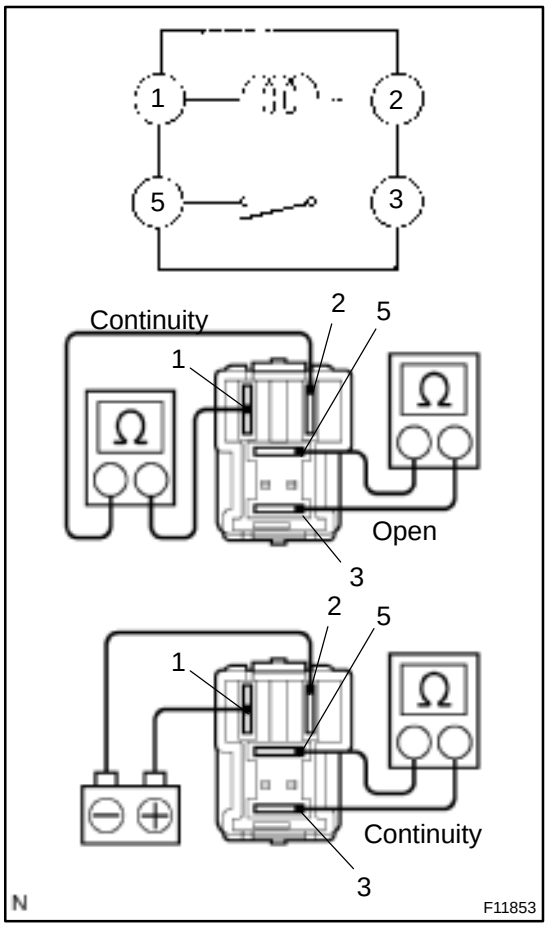
HINT:

There is a resistance of 4 – 6 Ω between terminals A13–2 and A12–3 of the ABS actuator.

OK

NG → **Repair or replace harness or ABS actuator.**

4	Check ABS motor relay (Marking: ABS MTR).



PREPARATION:

Remove the ABS motor relay from the R/B No. 4.

CHECK:

Check the continuity between each terminal of the ABS motor relay.

OK:

Terminals 1 and 2	Continuity (Reference value 62 Ω)
Terminals 3 and 5	Open

CHECK:

(a) Apply battery positive voltage between terminals 1 and 2.

(b) Check the continuity between terminals of the ABS motor relay.

OK:

Terminals 3 and 5	Continuity

NG → **Replace ABS motor relay.**

OK

5	Check for open and short circuit in harness and connector between ABS motor relay (Marking: ABS MTR) and ABS ECU (See page IN–28).

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

OK

If same code is still output after the DTC is deleted, check connections. If connections are normal, ECU may be defective.

DI7CT–01

DTC	C0278/11, C0279/12	ABS Solenoid Relay Circuit

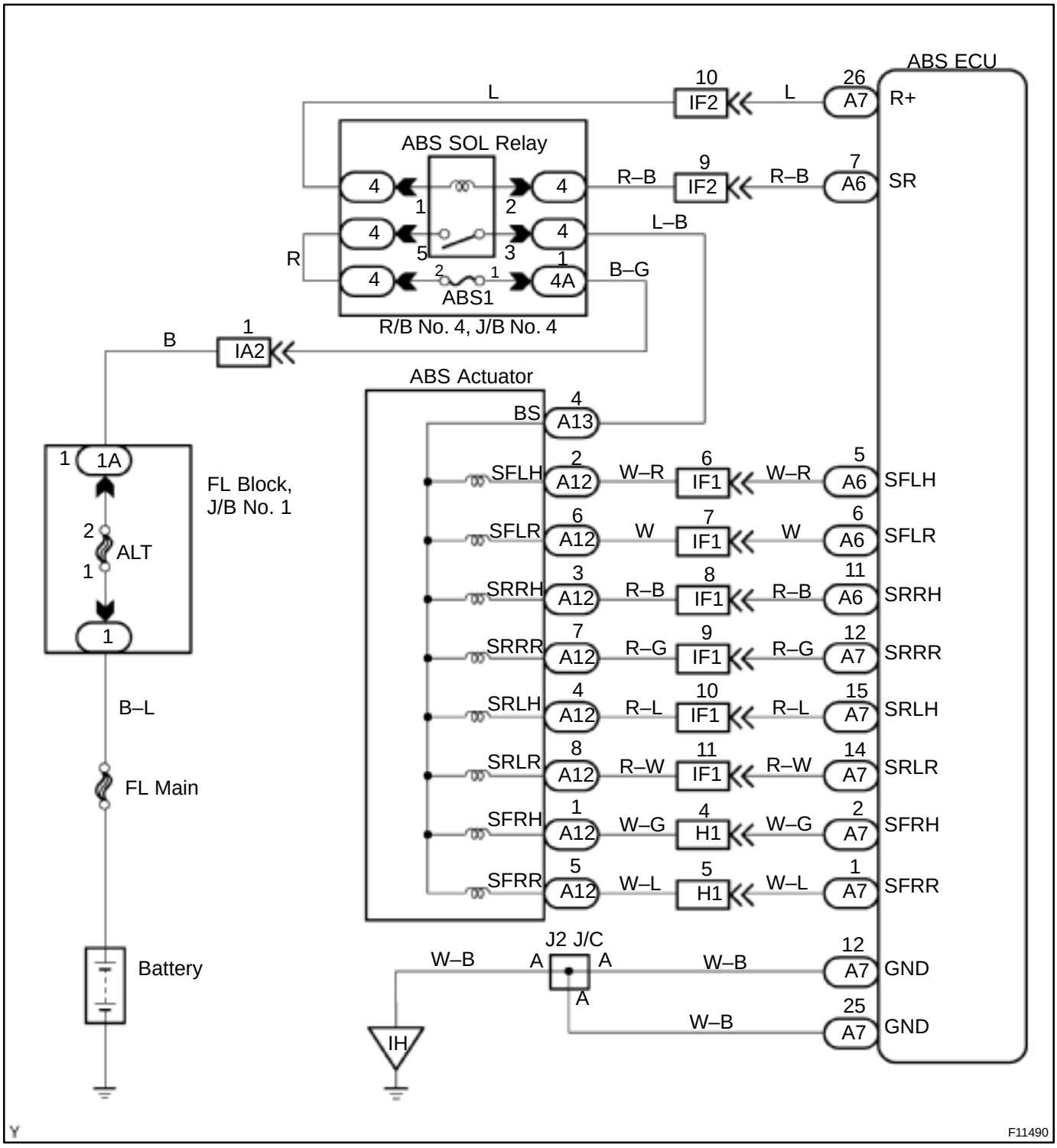
CIRCUIT DESCRIPTION

This ABS solenoid relay (Marking: ABS SOL) supplies power to each ABS solenoid. After the ignition switch is turned ON, if the initial check is OK, the relay goes on.

DTC No.	DTC Detection Condition	Trouble Area
C0278/11	Condition 1. or 2. continues for 0.2 sec. or more: 1. IG1 terminal voltage of ABS ECU is 9.5 – 18.5 V, and when the solenoid relay is ON.*1 2. With solenoid relay ON, when IG1 terminal of ABS ECU is less than 9.5 V.*1	• ABS solenoid relay • ABS solenoid relay circuit
C0279/12	Immediately after IG switch has been turned ON, when the solenoid relay is OFF.*2	

*1: Solenoid relay contact OFF condition:
All of solenoid terminal voltage is half or less than IG1 terminal voltage.
*2: Solenoid relay contact ON condition:
All of solenoid terminal voltage is half of IG1 terminal voltage or more.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Start the inspection from step 1 in case of using the TOYOTA hand–held tester and start from step 2 in case of not using the TOYOTA hand–held tester.

1	**Check ABS solenoid relay (Marking: ABS SOL) operation.**

PREPARATION:

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

CHECK:

Check the operation sound of the ABS solenoid relay when operating it with the TOYOTA hand–held tester.

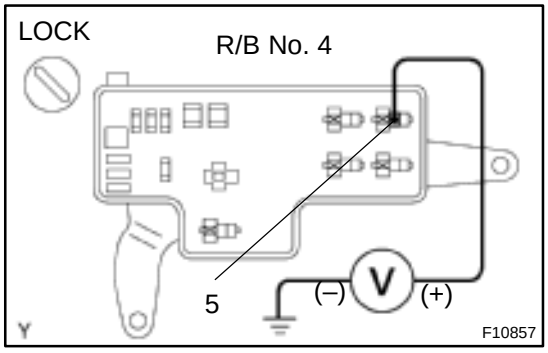
OK:

The operation sound of the ABS solenoid relay should be heard.

OK → **Go to step 5.**

NG

2	**Check voltage between terminal 5 of R/B No. 4 (for ABS solenoid relay (Marking: ABS SOL)) and body groud.**



PREPARATION:

Remove the ABS solenoid relay from the R/B No. 4.

CHECK:

Measure the voltage between terminal 5 of the R/B No. 4 (for ABS solenoid relay) and body ground.

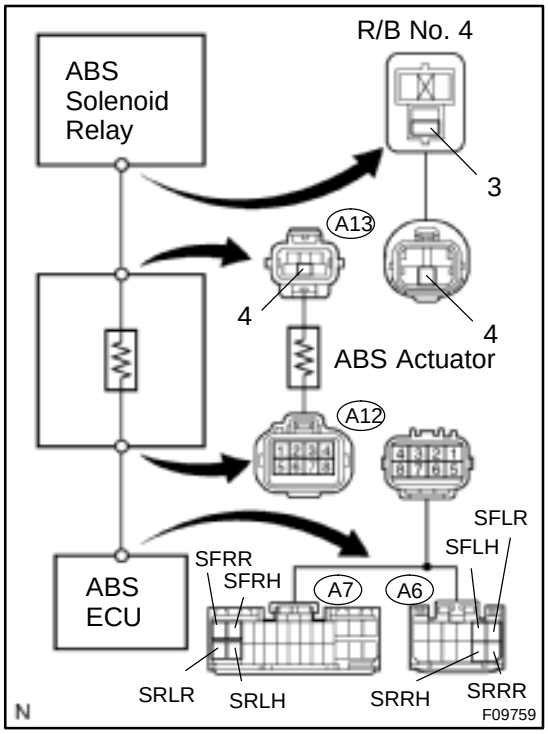
OK:

Voltage: 10 – 14 V

NG → **Check and repair harness or connector between R/B No. 4 and battery.**

OK

3	**Check continuity between terminal 3 of R/B No. 4 (for ABS solenoid relay (Marking: ABS SOL)) and each solenoid terminal of ABS ECU.**



CHECK:

Check the continuity between terminal 3 of the R/B No. 4 (for ABS solenoid relay) and terminal SRLR, SRLH, SRRR, SRRH, SFLR, SRLH, SFRR or SFRH of the ABS ECU.

OK:

Continuity

HINT:

Resistance of each solenoid coil

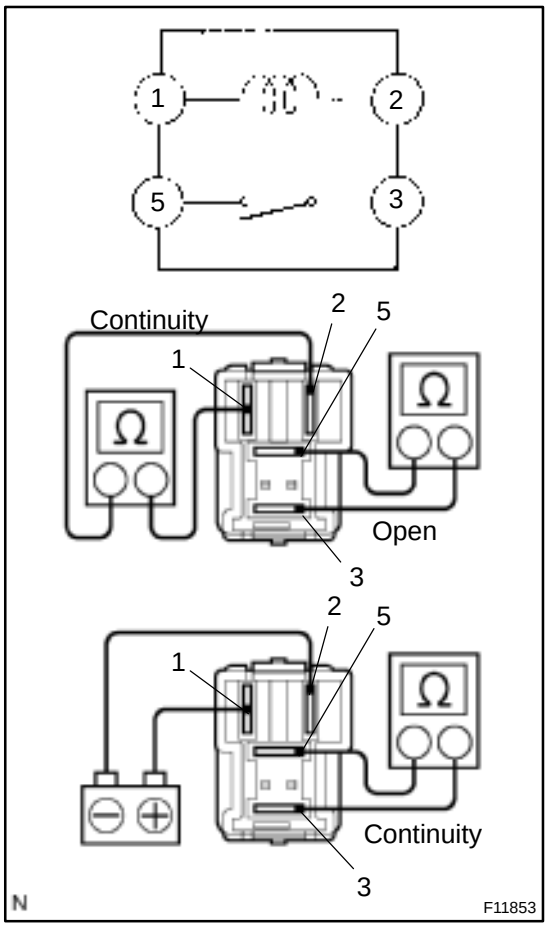
SRLR, SRRR, SFLR, SFRR: 4.3 Ω

SRLH, SRRH, SFLH, SFRH: 8.8 Ω

NG → **Repair or replace harness or ABS actuator.**

OK

4	Check ABS solenoid relay (Marking: ABS SOL).



PREPARATION:

Remove the ABS motor relay from the R/B No. 4.

CHECK:

Check the continuity between each terminal of ABS solenoid relay.

OK:

Terminals 1 and 2	Continuity (Reference value 100 Ω)
Terminals 3 and 5	Open

CHECK:

(a) Apply battery positive voltage between terminals 1 and 2.

(b) Check continuity between each terminal of the ABS solenoid relay.

OK:

Terminals 3 and 5	Continuity

NG → **Replace ABS solenoid relay.**

OK

5	Check for open and short circuit in harness and connector between ABS solenoid relay (Marking: ABS SOL) and ABS ECU (See page IN–28).

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

OK

If same code is still output after DTC is deleted, check connections. If connections are normal, ECU may be defective.

DI7CU–01

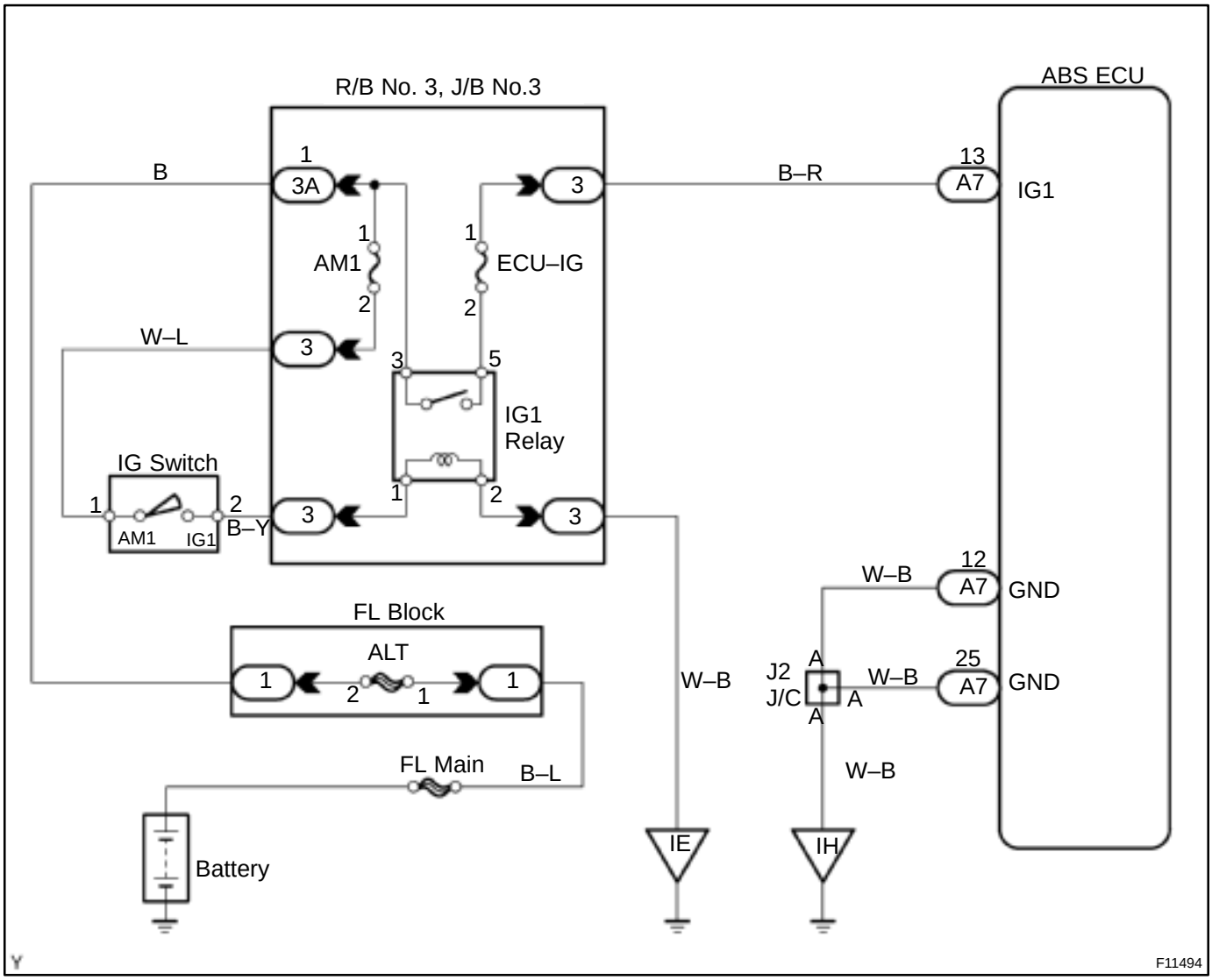
DTC	C1241/41	IG Power Source Circuit

CIRCUIT DESCRIPTION

This is the power source for the ECU, hence the actuators.

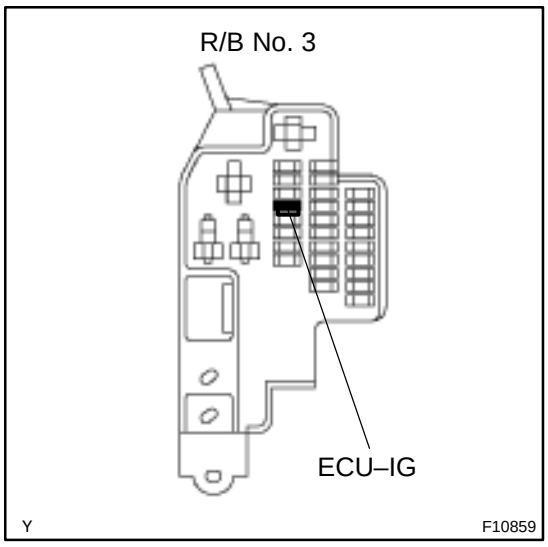
DTC No.	DTC Detection Condition	Trouble Area
C1241/41	Condition 1. or 2. is detected: 1. Vehicle speed is at 3 km/h (1.9 mph) or more and ECU terminal IG1 voltage is 9.5 V or less, which continues for 10 sec. or more. 2. When IG1 terminal voltage is less than 9.5 V, there is open circuit in the motor relay or in the solenoid relay, or the solenoid circuit malfunction.	• Battery • Charging system • Power source circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check ECU–IG fuse.



PREPARATION:
Remove the ECU–IG fuse from the R/B No. 3.
CHECK:
Check the continuity of the ECU–IG fuse.
OK:
Continuity

NG → **Check for short circuit in all harness and components connected to ECU–IG fuse (See attached wiring diagram).**

OK

2	Check battery positive voltage.

OK:
Voltage: 10 – 14 V

NG → **Check and repair charging system (See page CH–2).**

OK

3	**Check voltage of IG1 power source.**

In case of using TOYOTA hand–held tester:

PREPARATION:

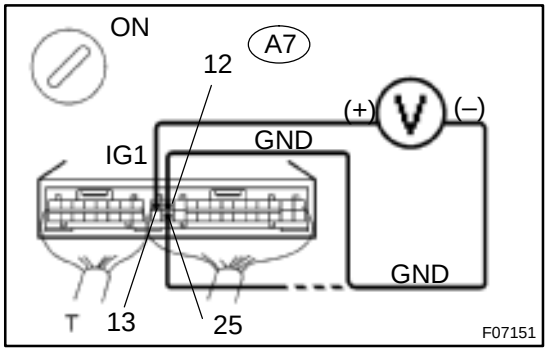
(a) Connect the TOYOTA hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the TOYOTA hand–held tester main switch ON.
(c) Select the DATALIST mode on the TOYOTA hand–held tester.

CHECK:

Check the voltage condition output from the ECU displayed on the TOYOTA hand–held tester.

OK:

"Normal" is displayed.



In case of not using TOYOTA hand–held tester:

PREPARATION:

Remove the ABS ECU with the connectors still connected.

CHECK:

(a) Turn the ignition switch ON.
(b) Measure the voltage between terminals A7–13 and A7–12, 25 of the ABS ECU connector.

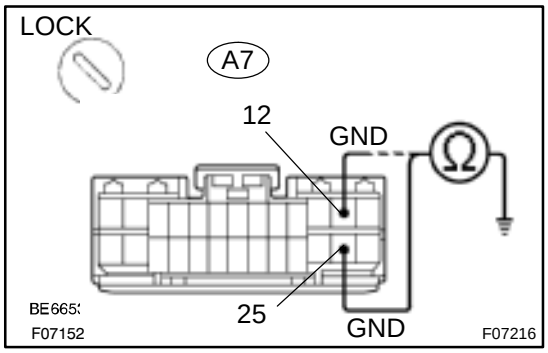
OK:

Voltage: 10 – 14 V

OK	**Check and replace ABS ECU.**

NG

4	**Check continuity between terminals GND (A7–12, 25) of ABS ECU connector and body ground.**



PREPARATION:

Disconnect the connector from the ABS ECU.

CHECK:

Measure the resistance between terminal A7–12, 25 of the ABS ECU harness side connector and body ground.

OK:

Resistance: 1 Ω or less

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

OK

Check for open circuit in harness and connector between ABS ECU and ECU–IG fuse (See page IN–28).

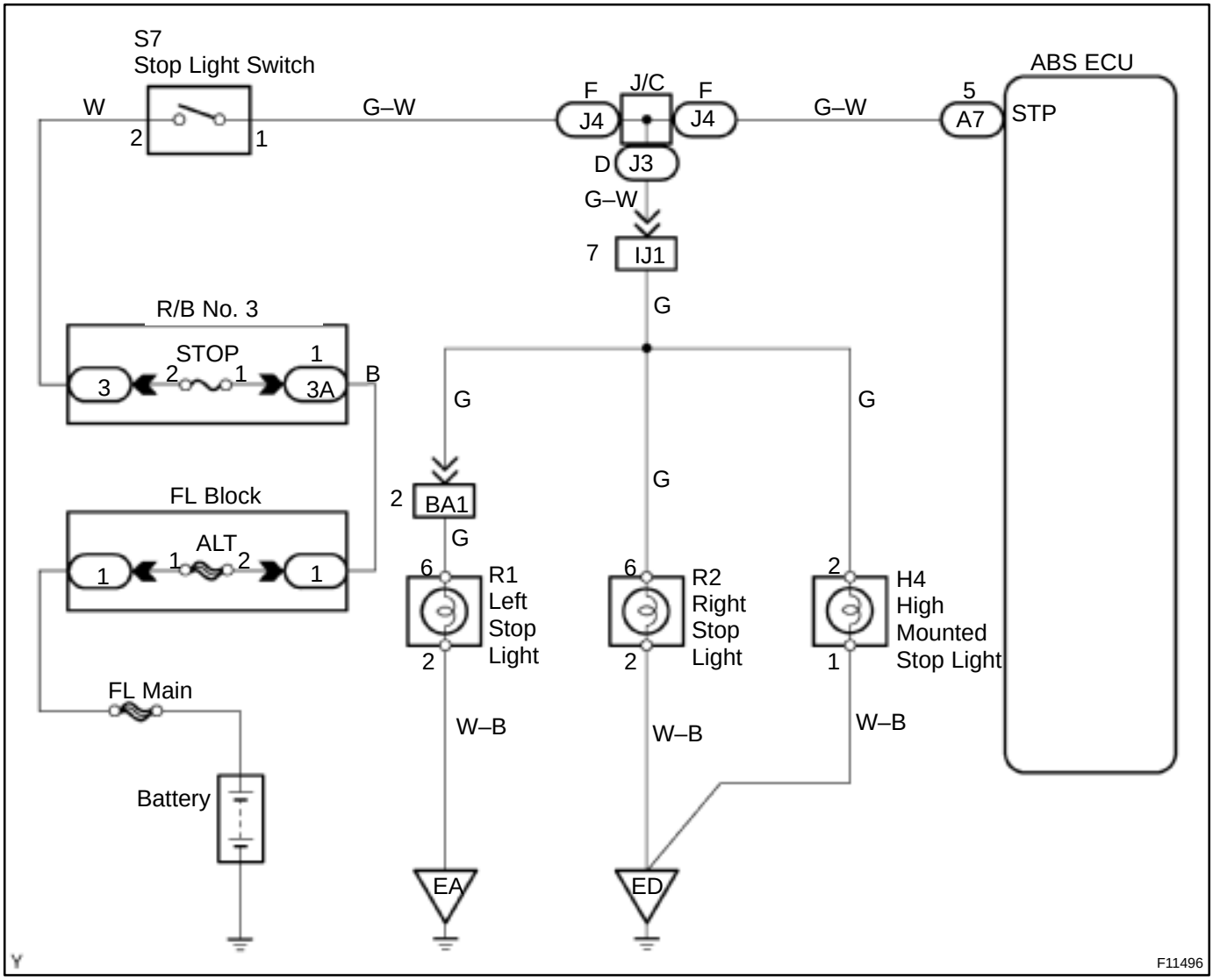
DI7CV–01

DTC	C1249/49	Stop Light Switch Circuit

CIRCUIT DESCRIPTION

DTC No.	DTC Detection Condition	Trouble Area
C1249/49	ABS ECU terminal IG1 voltage is 9.5 V to 18.5 V and ABS is not operated, the open circuit of the stop light switch continues for 0.3 sec. or more.	• Stop light switch • Stop light switch circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

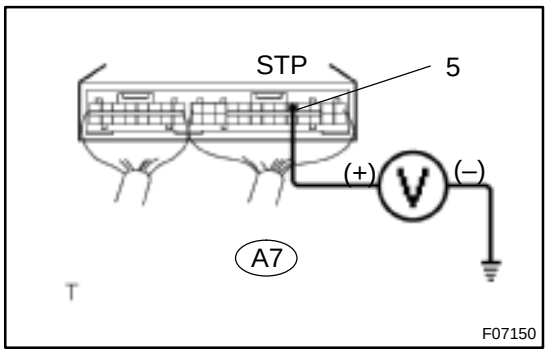
1	**Check operation of stop light.**

CHECK:
Check that stop light lights up when brake pedal is depressed and turns off when brake pedal is released.

NG → **Repair stop light circuit (See page BE–30).**

OK

2	**Check voltage between terminal STP (A7–5) of ABS ECU and body ground.**



PREPARATION:
Remove the ABS ECU with the connectors still connected.
CHECK:
Measure the voltage between terminal A7–5 of the ABS ECU and body ground when the brake pedal is depressed.
OK:

Voltage: 8 – 14 V

OK → **Check and replace ABS ECU.**

NG

3	**Check for open circuit in harness and connector between ABS ECU and stop light switch (See page IN–28).**

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

OK

Proceed to next circuit inspection shown on problem symptoms table (See page DI–162).

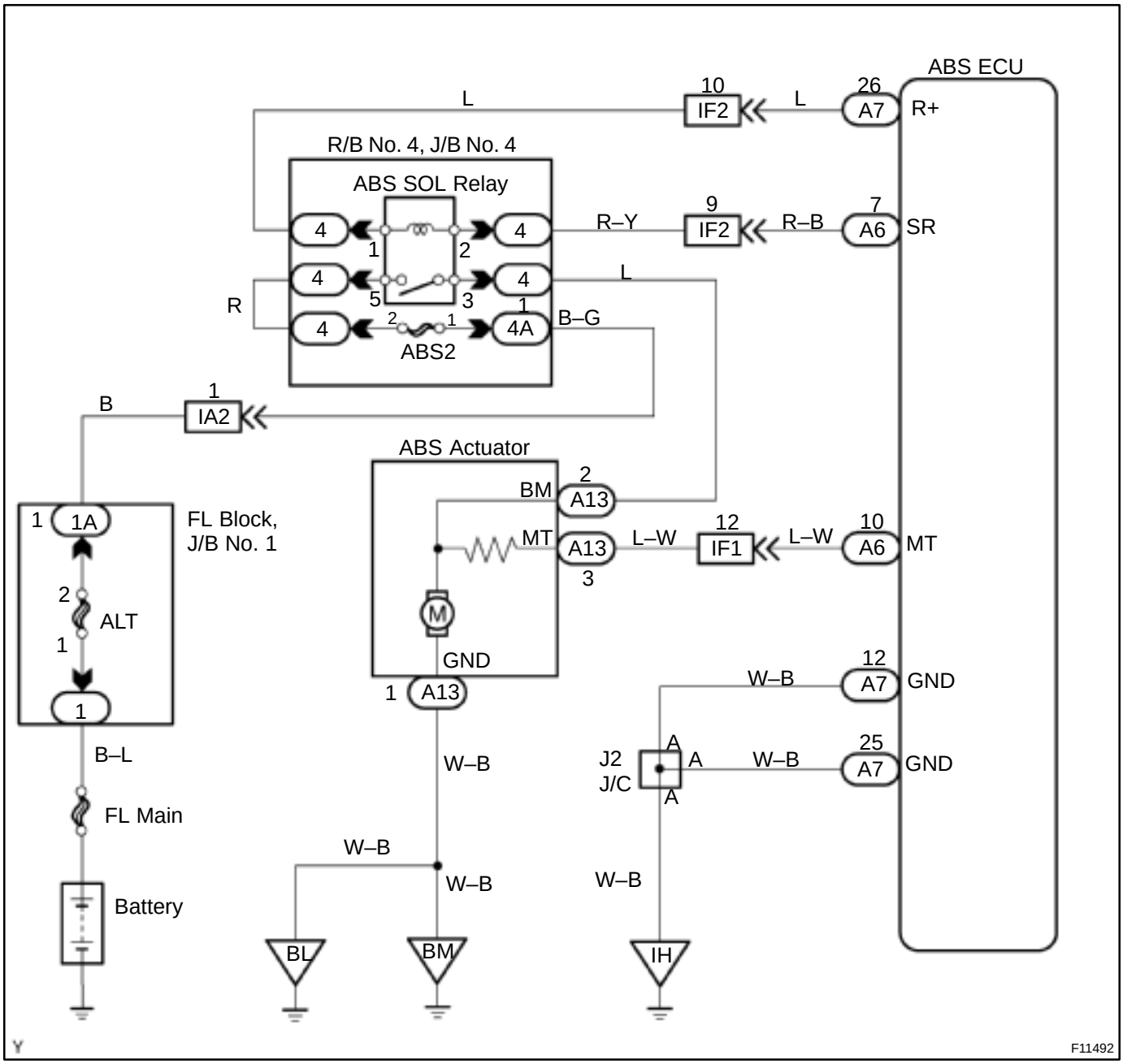
DI7CW–01

DTC	C1251/51	ABS Pump Motor Lock

CIRCUIT DESCRIPTION

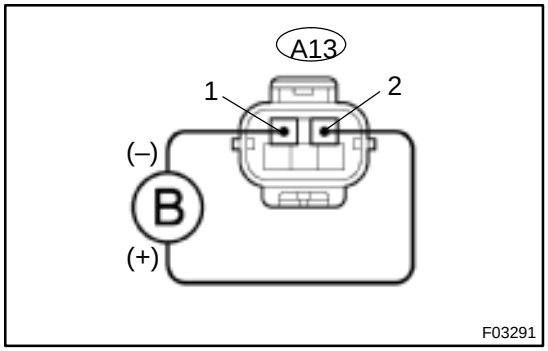
DTC No.	DTC Detection Condition	Trouble Area
C1251/51	ABS actuator pump motor is not operating normally.	ABS pump motor

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check operation of ABS pump motor.**



PREPARATION:

Disconnect the ABS actuator connector.

CHECK:

Connect the positive (+) lead to terminal BM (A13–2) and the negative (–) lead to terminal GND (A13–1) of the ABS actuator connector, and check that the pump motor is operating.

OK:

The running sound of the pump motor should be heard.

NG → **Replace ABS actuator.**

OK

Check for open circuit in harness and connector between ABS ECU and ABS motor relay (Marking: ABS SOL), and ABS motor relay and ABS actuator (See page IN–28).

DI7CX–01

DTC	Always ON	ABS ECU Malfunction

CIRCUIT DESCRIPTION

DTC No.	DTC Detection Condition	Trouble Area
Always ON	ABS ECU internal malfunction is detected.	• Charging system • ABS warning light circuit • Battery • ABS ECU

INSPECTION PROCEDURE

1	**Is DTC output?**

Check DTC on page DI–154.

YES → **Repair circuit indicated by code output.**

NO

2	**Is normal code displayed?**

YES → **Check and replace ABS ECU.**

NO

3	**Is ABS warning light go off?**

YES → **Check and replace ABS ECU.**

NO

4	Check battery voltage.

CHECK:

Check the battery voltage.

OK:

Voltage: 10 – 14 V

NG → **Check and repair charging system.**

OK

5	Check ABS warning light.

PREPARATION:

(a) Disconnect the connector from the ABS ECU.

(b) Connect terminal WA (A7–11) of the wire harness and terminal GND (A7–12, 25) of the ABS ECU connector.

(c) Turn the ignition switch ON.

CHECK:

Check the ABS warning light goes off.

OK → **Check and replace ABS ECU.**

NG

Check for short circuit in harness and connector between combination meter and ABS ECU (See page IN–28).

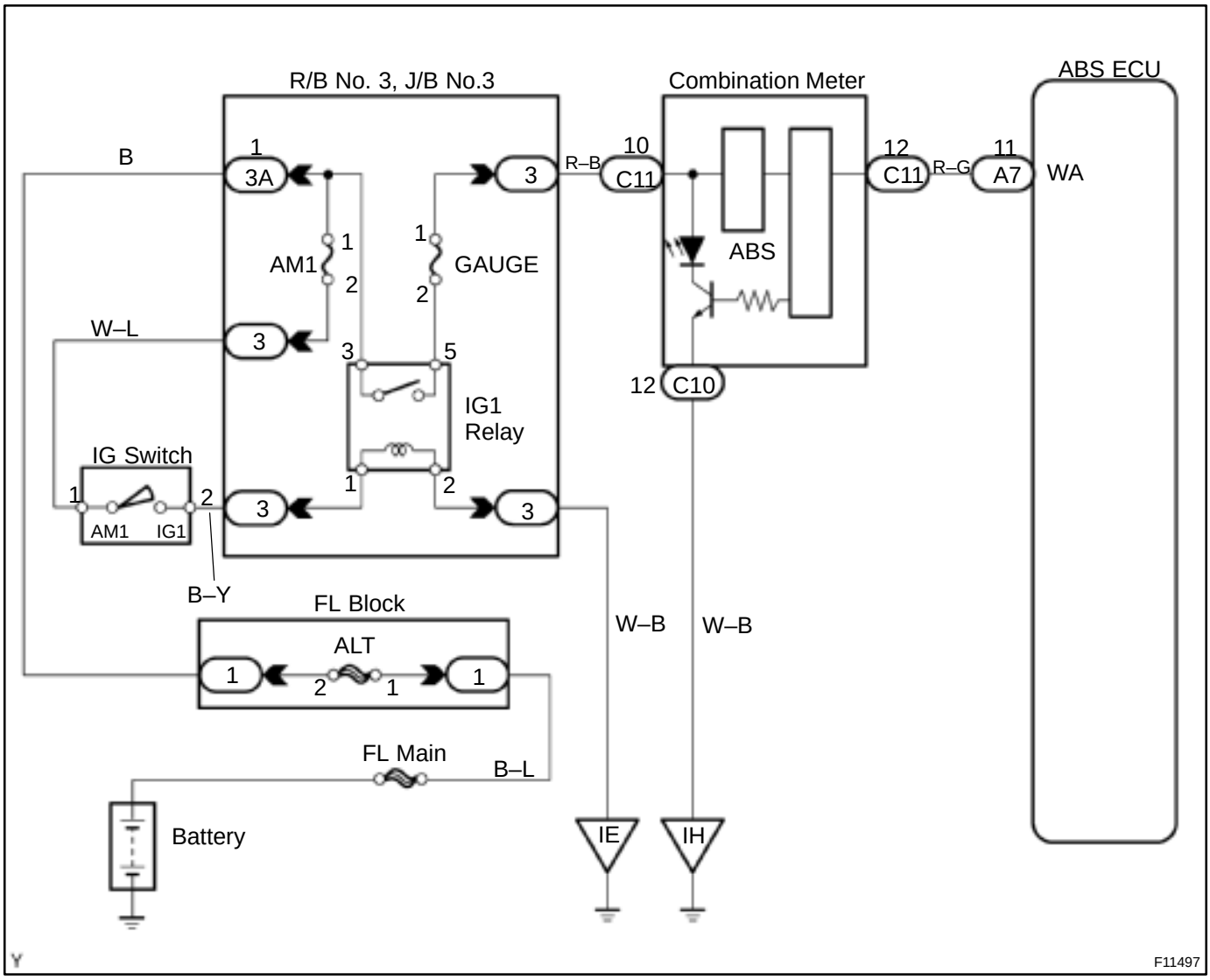
DI7CY–01

ABS Warning Light Circuit

CIRCUIT DESCRIPTION

If the ECU detects trouble, the ABS warning light lights up while at the same time prohibiting ABS control. At this time, the ECU records a DTC in memory.
Connect terminals Tc and CG of the DLC3 to make the ABS warning light blink and output the DTC.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Troubleshoot in accordance with the chart below for each trouble symptom.

ABS warning light does not light up	*1
ABS warning light remains on	*2

*1: Start the inspection from step 1 in case of using the TOYOTA hand–held tester and start from step 2 in case of not using TOYOTA hand–held tester.

*2: After inspection of step 3, start the inspection from step 4 in case of using the TOYOTA hand–held tester and start from step 5 in case of not using TOYOTA hand–held tester.

1	**Check operation of ABS warning light.**

PREPARATION:

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

CHECK:

Check that the ABS warning light lights up on the combination meter using the TOYOTA hand–held tester.

HINT:

ABS warning light turns ”OFF” automatically 2 seconds after it is turnd ”ON”.

OK → **Check and replace ABS ECU.**

NG

2	**Check ABS warning light.**

See combination meter troubleshooting on page BE–2.

NG → **Repair bulb or combination meter assembly.**

OK

3	**Check that connectors are securely connected to ABS ECU.**

NO → **Connect connector to ABS ECU.**

YES

Check for open circuit in harness and connector between combination meter and ABS ECU (See page IN–28).

4	**Check operation of the ABS warning light (See step 1).**

OK → **Check and replace ABS ECU.**

NG

5	**Is DTC output?**

Check DTC on page DI–154.

YES → **Repair circuit indicated by output code.**

NO

Check for short circuit in harness and connector between DLC3 and ABS ECU (See page IN–28).

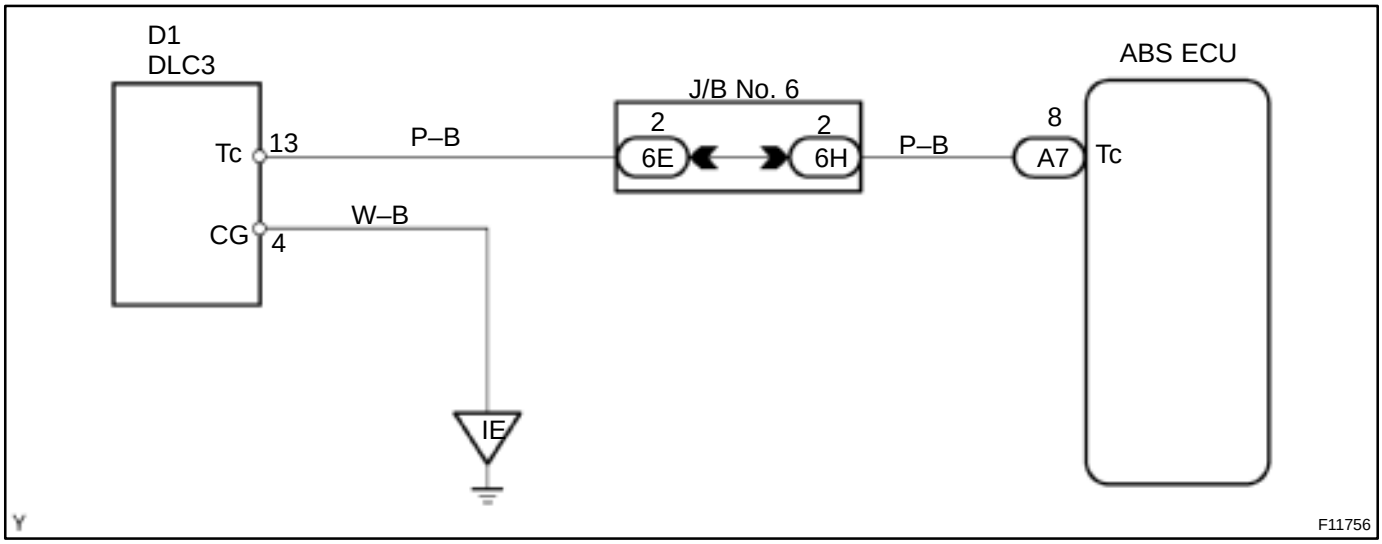
DI7CZ–01

Tc Terminal Circuit

CIRCUIT DESCRIPTION

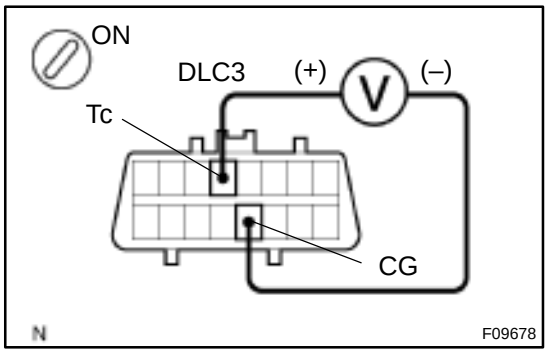
Connecting between terminals Tc and CG of the DLC3 causes the ABS ECU to display the DTC by flashing the ABS warning light.

WIRING DIAGRAM



INSPECTION PROCEDURE

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



CHECK:

(a) Turn the ignition switch ON.

(b) Measure the voltage between terminals Tc and CG of the DLC3.

OK:

Voltage: 10 – 14 V

OK	**If ABS warning light does not blink even after Tc and CG are connected, ECU may be defective.**

NG

2	**Check for open and short circuit in harness and connector between ABS ECU and DLC3, and DLC3 and body ground (See page IN–28).**

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

OK

Check and replace ABS ECU.

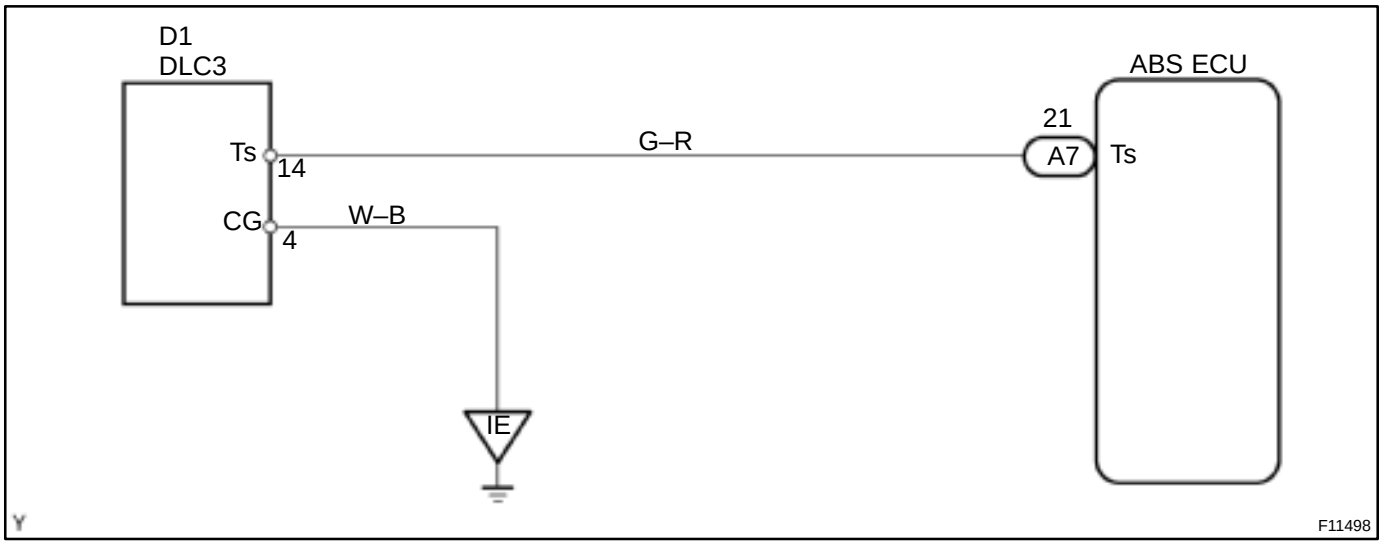
DI7D0–01

Ts Terminal Circuit

CIRCUIT DESCRIPTION

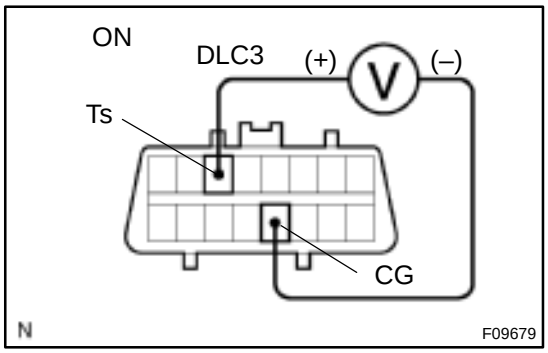
The sensor check circuit detects abnormalities in the speed sensor signal which cannot be detected with the DTC check.
Connecting terminals Ts and CG of the DLC3 starts the check.

WIRING DIAGRAM



INSPECTION PROCEDURE

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



CHECK:

(a) Turn the ignition switch ON.
(b) Measure the voltage between terminals Ts and CG of the DLC3.

OK:

Voltage: 10 – 14 V

OK → **If ABS warning light does not blink even after Ts and CG are connected, ECU may be defective.**

NG

2	**Check for open and short circuit in harness and connector between ABS ECU and DLC3, and DLC3 and body ground (See page IN–28).**

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

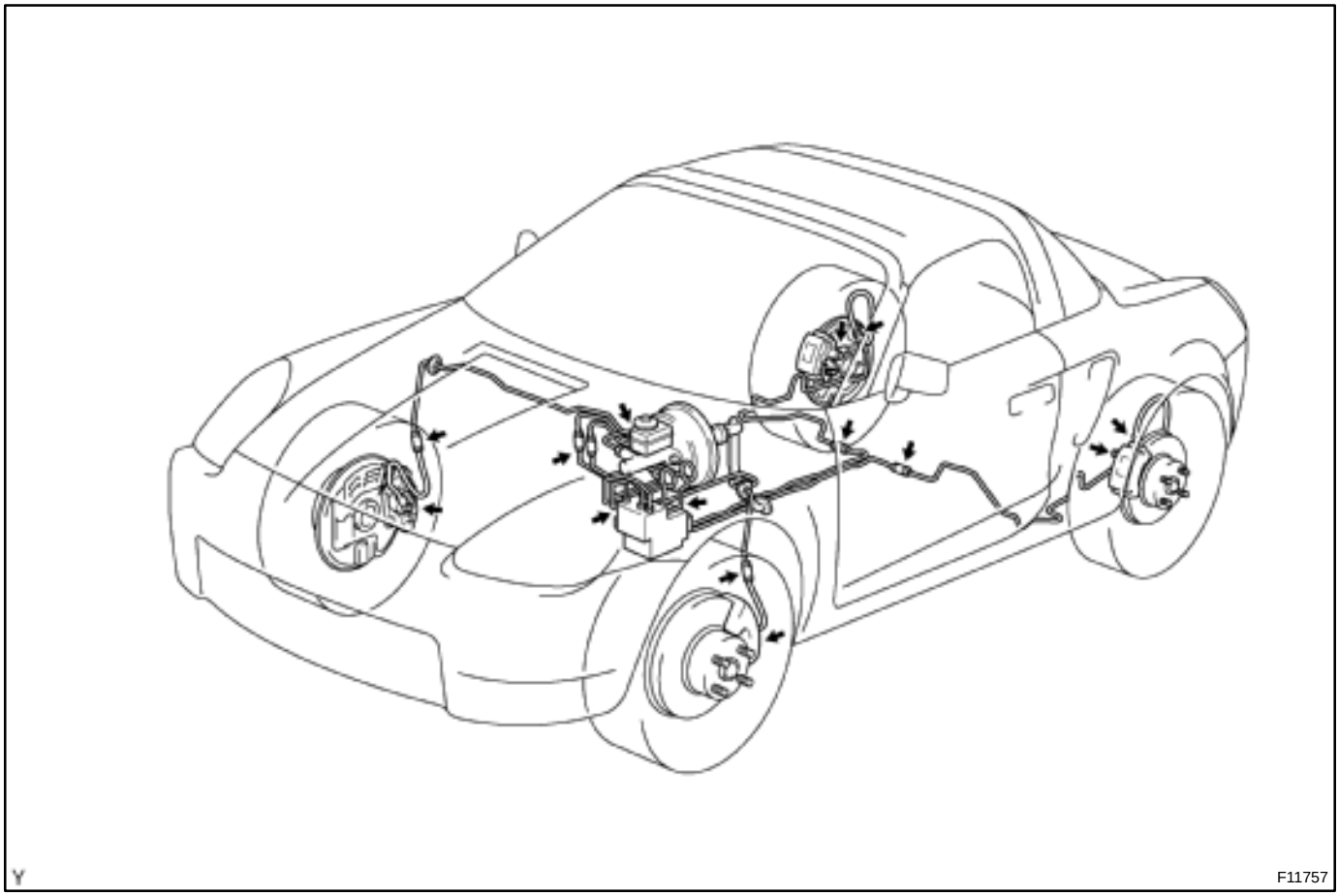
OK

Check and replace ABS ECU.

DI7D1–01

Check for Fluid Leakage

Check for fluid leakage from actuator or hydraulic lines.



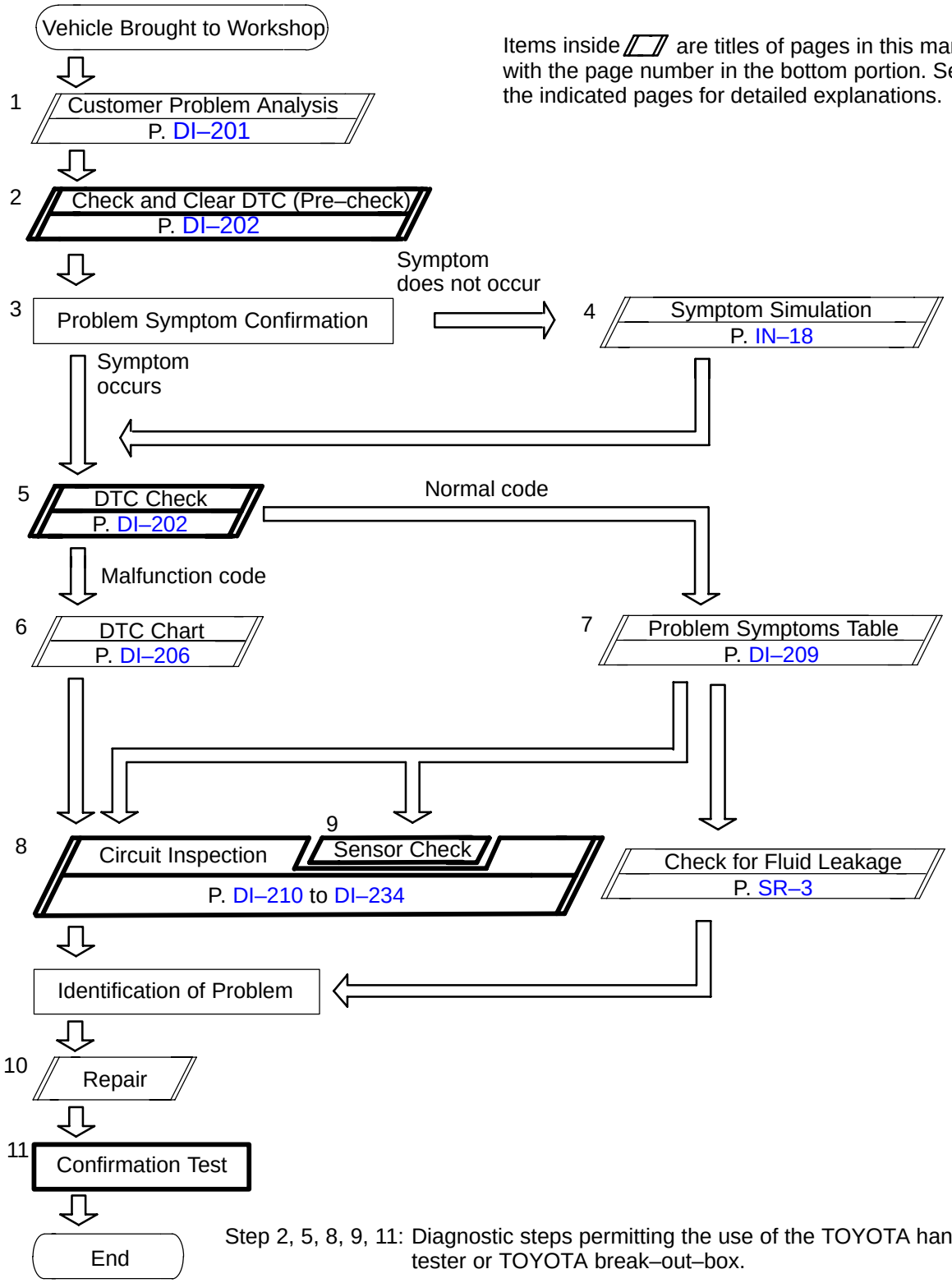
F11757

ELECTRO–HYDRAULIC POWER STEERING

DI7C2–01

HOW TO PROCEED WITH TROUBLESHOOTING

Troubleshooting in accordance with the procedure on the following pages.



Items inside ▱ are titles of pages in this manual, with the page number in the bottom portion. See the indicated pages for detailed explanations.

Step 2, 5, 8, 9, 11: Diagnostic steps permitting the use of the TOYOTA hand–held tester or TOYOTA break–out–box.

DI7C3–01

CUSTOMER PROBLEM ANALYSIS CHECK

EHPS Check Sheet

Inspector's Name :

Customer's Name		**Registration No.**	
		Registration Year	/ /
		Frame No.	
Date Vehicle Brought In	/ /	**Odometer Reading**	km miles

Date Problem First Occurred	/ /
Frequency Problem Occurs	☐ Continuous ☐ Intermittent (times a day)

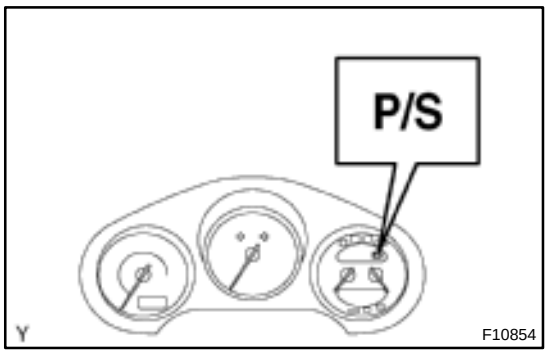
Symptoms	☐ P/S does not operate.	
	☐ P/S does not operate efficiently.	
	☐ At the time of idling, steering control force is great. (Rest swing is heavy).	
	☐ Even if the vehicle speed is increased, steering effort does not become greater.	
	P/S Warning Light Abnormal	☐ Remains ON ☐ Does not Light Up

DTC Check	**1st Time**	☐ Normal Code ☐ Malfunction Code (Code)
	2nd Time	☐ Normal Code ☐ Malfunction Code (Code)

DI7C4–01

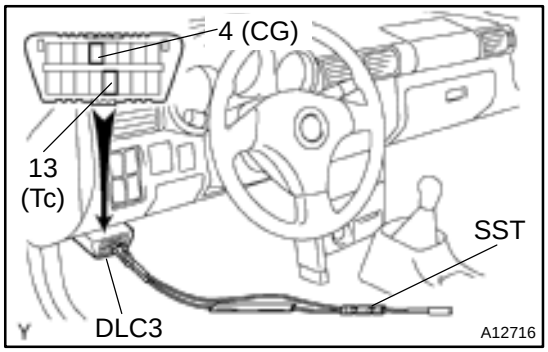
PRE–CHECK

1. DIAGNOSIS SYSTEM

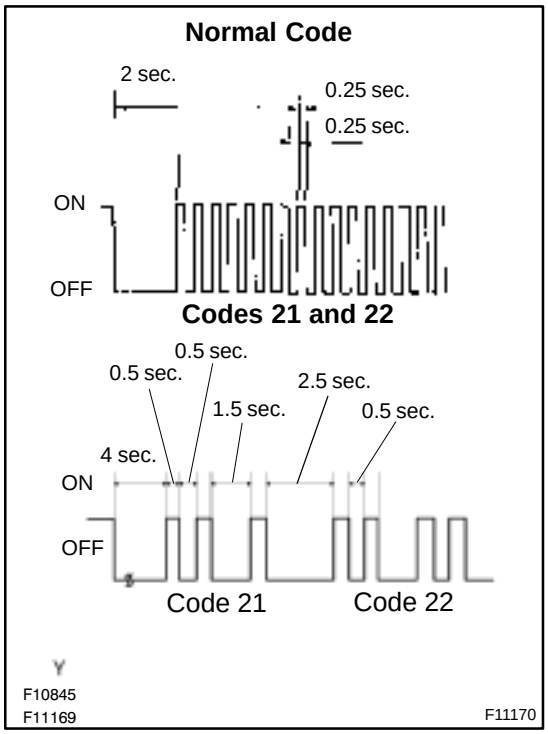


(a) Check the indicator.
When the ignition switch is turned ON, check that the P/S warning light goes on for 2 seconds.

HINT:
If the indicator check result is not normal, proceed to trouble-shooting for the P/S warning light circuit (See page DI–227).

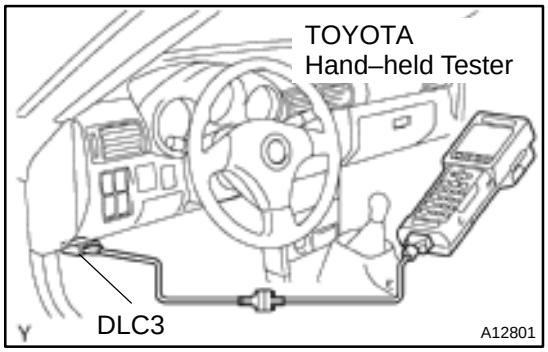


(b) In case of not using TOYOTA hand–held tester:
Check the DTC.
(1) Using SST, connect terminals Tc and CG of the DLC3.
SST 09843–18040
(2) Turn the ignition switch ON.
(3) Read the DTC from the P/S warning light on the combination meter.



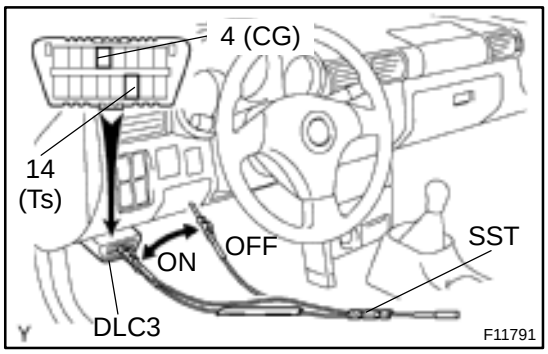
HINT:
- If no code appears, inspect the diagnostic circuit and P/S warning light circuit (See page DI–227 or DI–230).
- As an example, the blinking patterns for normal code and codes 21 and 22 are shown on the left.

(4) Codes are explained in the DTC chart on page DI–206.
(5) After completing the check, disconnect terminals Tc and CG of the DLC3, and turn off the display.
If 2 or more malfunctions are indicated at the same time, the lowest numbered DTC will be displayed first.

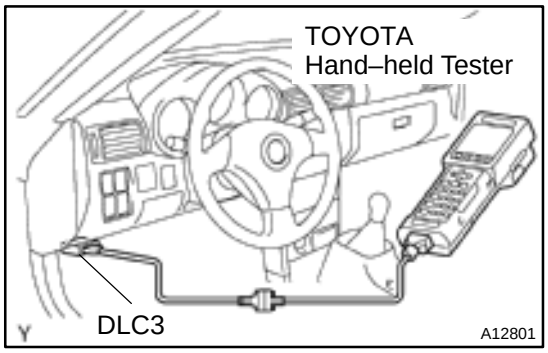


(c) In case of using TOYOTA hand–held tester:
Check the DTC.
(1) Hook up the TOYOTA hand–held tester to the DLC3.
(2) Turn the ignition switch ON.
(3) Read the DTC by following the prompts on the tester screen.

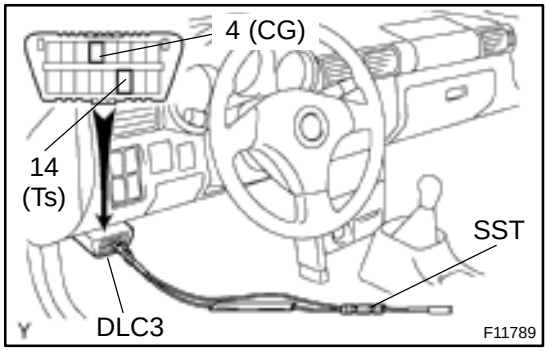
HINT:
Please refer to the TOYOTA hand–held tester operator's manual for further details.



(d) In case of not using TOYOTA hand–held tester:
Clear the DTC.
(1) Using SST, connect terminals Ts and CG of the DLC3.
SST 09843–18040
(2) Turn the ignition switch ON.
(3) By making CG terminal ON and OFF 4 times within 8 seconds, delete DTC of the ECU.
If making CG terminal ON and OFF within 0.1 second, DTC of will not be deleted.
(4) Check that the warning light shows the normal code.
(5) Remove the SST from the terminals of the DLC3.
SST 09843–18040



(e) In case of using TOYOTA hand–held tester:
Clear the DTC.
(1) Hook up the TOYOTA hand–held tester to the DLC3.
(2) Turn the ignition switch ON.
(3) Operate the TOYOTA hand–held tester to erase the codes. (See TOYOTA hand–held tester operator's manual.)

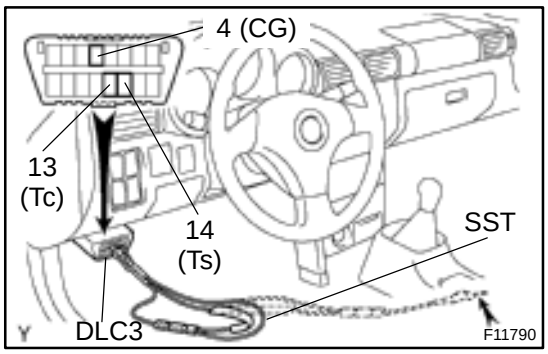


2. INPUT SIGNAL CHECK (TEST MODE)

(a) In case of not using TOYOTA hand–held tester:
Check the input signal.
(1) Turn the ignition switch OFF.
(2) Using SST, connect terminals Ts and CG of the DLC3.
SST 09843–18040
(3) Start the engine.
(4) Check that the P/S warning light goes on.

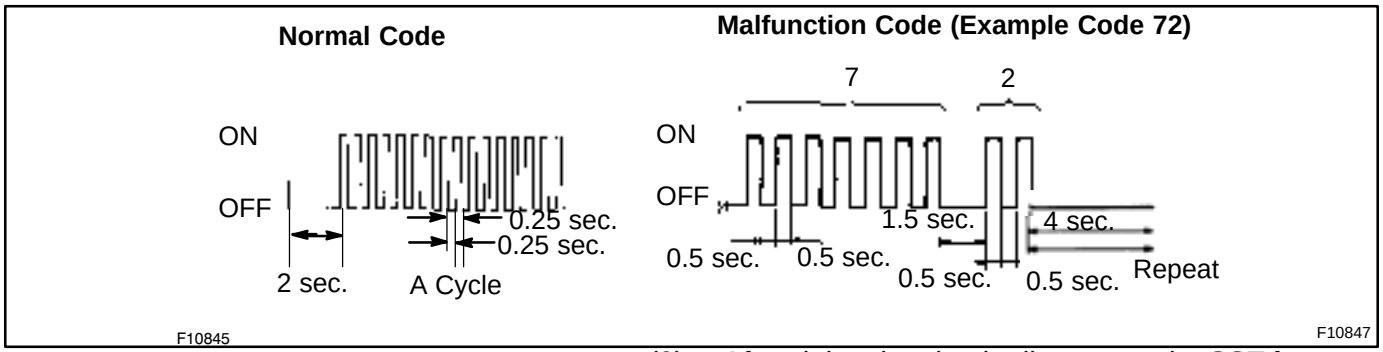
HINT:
If the P/S warning light does not go on, inspect the P/S warning light circuit (See page DI–227).

(5) Drive vehicle straight forward at the speed faster than 20 km/h (12 mph) for several seconds.
(6) Stop the vehicle.

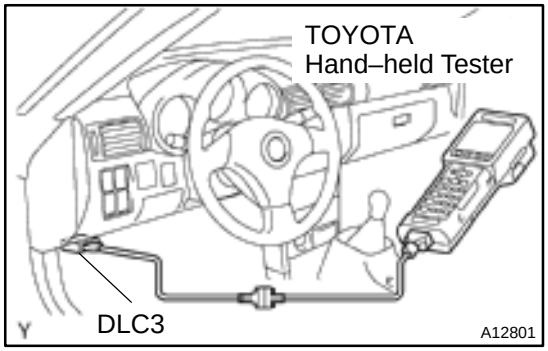


(7) Using SST, connect terminals Tc and CG of the DLC3.
SST 09843–18040
(8) Read the number of blinks of the P/S warning light.

HINT:
- See the list of DTC shown on the bottom of this page.
- Even a sensor is normal, it outputs code 72 during test mode.
- Whether or not the sensor is normal can be judged if the warning light goes off during driving.



(9) After doing the check, disconnect the SST from terminals Ts, Tc and CG of the DLC3, and turn the ignition switch OFF.
SST 09843–18040



(b) In case of using TOYOTA hand–held tester:
Check the input signal.
(1) Hook up the TOYOTA hand–held tester to the DLC3.
(2) Do steps (3) to (6) on the previous page.
(3) Read the DTC by following the prompts on the tester screen.

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

DTC of input signal check function:

Code No. (See page)	Diagnosis	Trouble Area
C1572/72 (DI–222)	Speed sensor malfunction (Test mode)	• Right front, left front, right rear, left rear or speed sensor • Sensor installation • Right front, left front, right rear, left rear or speed sensor rotor • Right front, left front, right rear, left rear or speed sensor circuit • ABS ECU • Combination meter • Vane pump assembly with motor

DI7C5–01

DIAGNOSTIC TROUBLE CODE CHART

HINT:

- Using SST 09843–18040, connect terminals Tc and CG of the DLC3.
- If a malfunction code is displayed during the DTC check, check the circuit listed for the code. For details of each code, turn to the page referred to under the ”See page” for respective ”DTC No.” in the DTC chart.

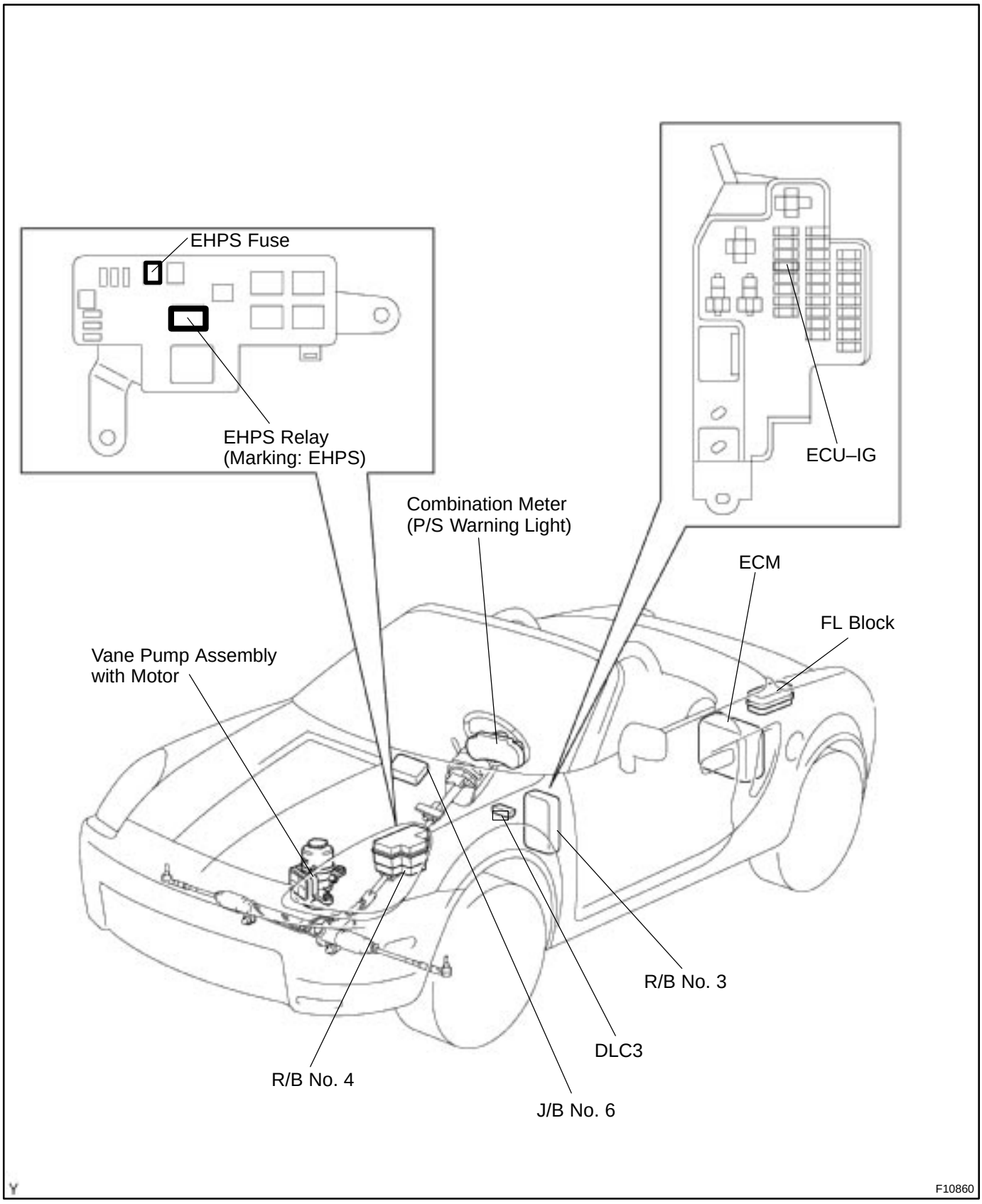
DTC No. (See page)	Detection Item	Trouble Area
C1521/21 (DI–210)	Power Steering Motor Malfunction	• Motor temp. sensor (built in vane pump assembly with motor) • Vane pump assembly with motor
C1522/22 (DI–210)	Power Steering Motor Malfunction	• Motor temp. sensor (built in vane pump assembly with motor) • Vane pump assembly with motor
C1523/23 (DI–210)	Power Steering Motor Malfunction	• Power steering motor (built in vane pump assembly with motor) • Vane pump assembly with motor
C1533/33 (DI–214)	Power Steering ECU Malfunction	• Power steering motor (built in vane pump assembly with motor) • Vane pump assembly with motor
C1539/39 (DI–214)	Power Steering ECU Malfunction	Vane pump assembly with motor
C1552/52 (DI–218)	PIG Power Source Drop Voltage Malfunction	• Open EHPS relay circuit • EHPS relay • Vane pump assembly with motor
C1553/53 (DI–221)	When resetting voltage, vehicle is being driven	Vane pump assembly with motor
Always ON (DI–224)	Malfunction in ECU	• Charging system • Power source circuit • Vane pump assembly with motor

HINT:

There is a case that TOYOTA hand–held tester cannot be used when P/S warning light is always on.

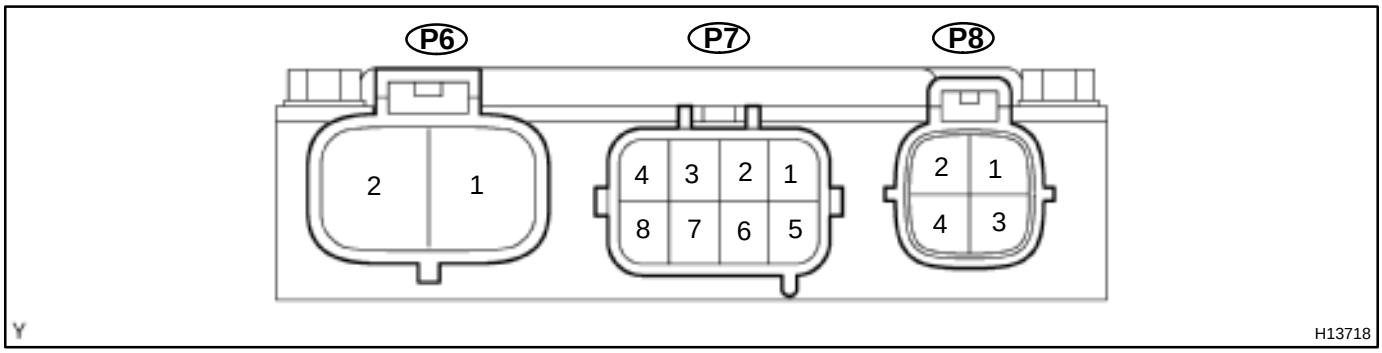
DI7C6–01

PARTS LOCATION



DI7C7–01

TERMINALS OF ECU



Symbols (Terminal No.)	Wiring Color	Condition	STD Voltage (V)
MH (P6–1) – PGND (P6–2)	W–G ↔ W–B	IG switch ON, After 1 sec. or more	10 – 14
IDUP (P7–1) – PGND (P6–2)	L–O ↔ W–B	Idling	10 – 14
SPD (P7–2) – PGND (P6–2)	V–W ↔ W–B	IG switch ON, When vehicle speed 12 mph (20 km/h)	Pulse generation (Se page DI–222)
Tc (P7–3) – PGND (P6–2)	P–B ↔ W–B	IG switch ON, Tc terminal ON	Below 1.0
		IG switch ON, Tc terminal OFF	5
MRLY (P7–5) – PGND (P6–2)	W–L ↔ W–B	IG switch ON, After 1 sec. or more	Below 1.0
EFI (P7–6) – PGND (P6–2)	W–G ↔ W–B	Idling	5
Ts (P7–7) – PGND (P6–2)	G–R ↔ W–B	IG switch ON, Ts terminal ON	Below 1.0
		IG switch ON, Ts terminal OFF	5
IGB (P8–1) – PGND (P6–2)	B–R ↔ W–B	IG switch ON	10 – 14
SIL (P8–2) – PGND (P6–2)	W–G ↔ W–B	IG switch ON	10 – 14
WL (P8–4) – PGND (P6–2)	W ↔ W–B	After IG switch ON and P/S warning light turns on for 2 sec., then it goes off	Below 1.0