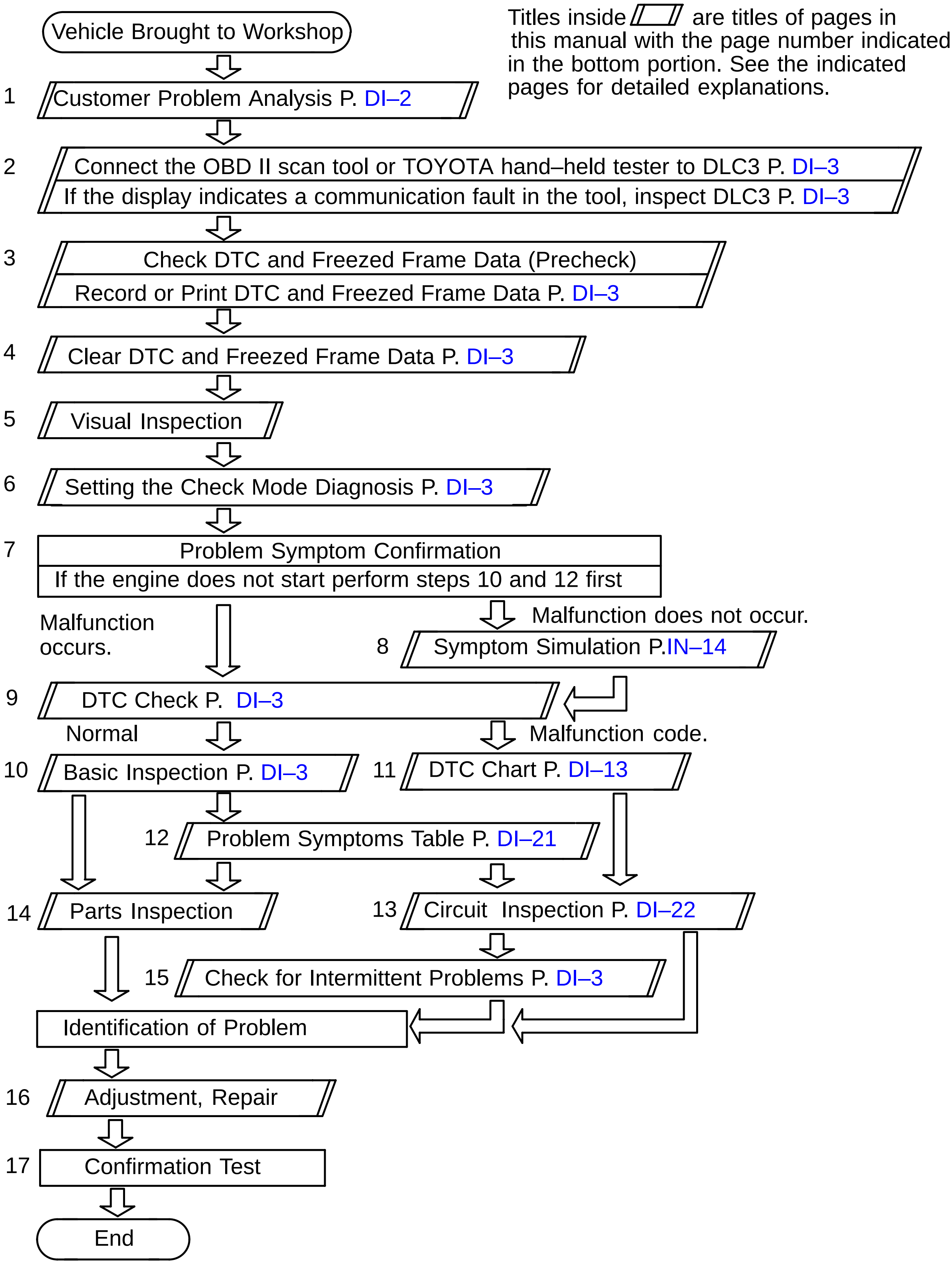
ENGINE (3RZ–FE)

DI0T5–02

HOW TO PROCEED WITH TROUBLESHOOTING

Troubleshoot in accordance with the procedure on the following page.



DI0T6–01

CUSTOMER PROBLEM ANALYSIS CHECK

ENGINE CONTROL SYSTEM Check Sheet

Inspector's Name ____________________

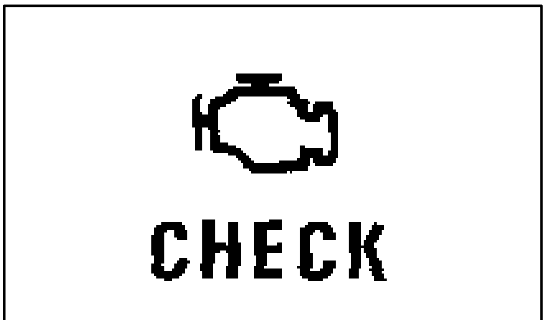
Customer's Name		**Model and Model Year**	
Driver's Name		**Frame No.**	
Data Vehicle Brought in		**Engine Model**	
License No.		**Odometer Reading**	km miles

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

Datas 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 Temp.	☐ **Hot** ☐ **Warm** ☐ **Cool** ☐ **Cold (approx. ____ ˚F/ ____ ˚C)**
	Place	☐ **Highway** ☐ **Suburbs** ☐ **Inner city** ☐ **Uphill** ☐ **Downhill** ☐ **Rough road** ☐ **Other** ____
	Engine Temp.	☐ **Cold** ☐ **Warming up** ☐ **After warming up** ☐ **Any temp.** ☐ **Other** ____
	Engine Operation	☐ **Starting** ☐ **Just after starting (min.)** ☐ **Idling** ☐ **Racing** ☐ **Driving** ☐ **Constant speed** ☐ **Acceleration** ☐ **Deceleration** ☐ **A/C switch ON/OFF** ☐ **Other** ____

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

DI0T7–02



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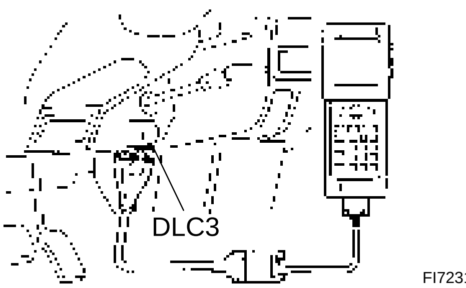


FI7231

PRE–CHECK

1. DIAGNOSIS SYSTEM

(a) Description

- When troubleshooting OBD II vehicles, the only difference from the usual troubleshooting procedure is that you connect to the vehicle 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 computer itself or in drive system components which affect vehicle emissions. In addition to the MIL lighting up when a malfunction is detected, the applicable Diagnostic Trouble Code (DTC) prescribed by SAE J2012 are recorded in the ECM memory (See page DI–13).

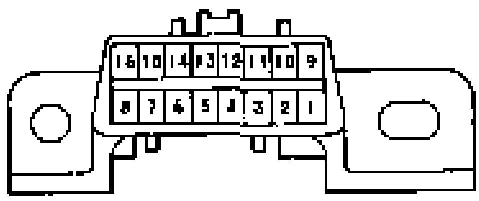
If the malfunction does not reoccur in 3 trips, the MIL goes off but the DTCs remain recorded in the ECM memory.

- 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 vaious 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–13).
- The diagnosis system operates in normal mode during normal vehicle use. It also has a check mode for technicians to simulate malfunction symptoms and troubleshoot. Most DTCs use 2 trip detection logic* to prevent erroneous detection, and ensure thorough malfunction detection. By switching the ECM to check mode when troubleshooting, the technician can cause the MIL to light up for a malfunction that is only detected once or momentarily. (TOYOTA hand–held tester only) (See step – 2)
- *2 trip detection logic: When a logic malfunction is first detected, the malfunction is temporarily stored in the ECM memory. If the same malfunction is detected again during the 2nd drive test, this 2nd detection causes the MIL to light up.

- The 2 trip repeats the same mode a 2nd time (However, the ignition switch must be turned OFF between the 1st trip and 2nd trip.).
- Freeze frame data:
  Freeze frame data records the engine condition when a misfire (DTCs P0300 – P0304) or fuel trim malfunction (DTCs P0171, P0172) or other malfunction (first malfunction only), is detected.
- Because freeze frame data records the engine conditions (fuel system, calculator 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 warmed up or not, the air–fuel ratio 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), EGR (DTCs P0401, P0402), and misfire (DTC P0300 – P0304).



DLC3
N09214

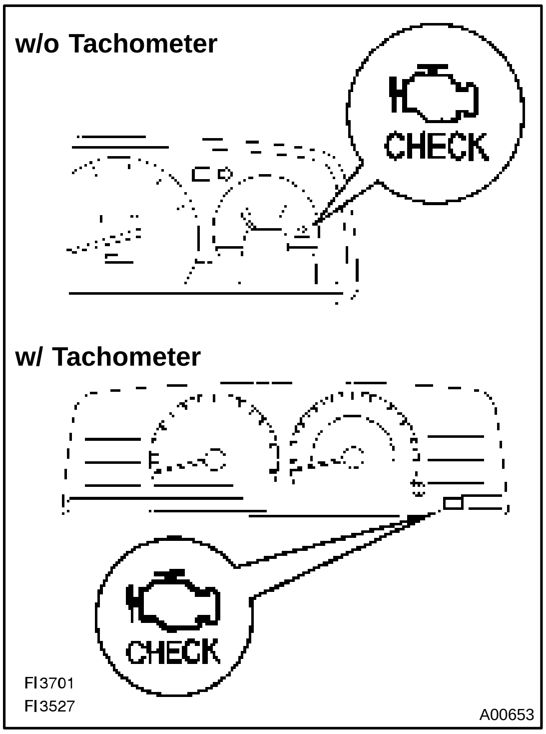
(2) Fuel trim malfunction (DTCs P0171, P0172), and EGR (DTCs P0401, P0402).
(3) Misfire (DTCs P0300 ~ P0304).

(b) Check the DLC3.
The vehicle's ECM uses V.P.W. (Variable Pulse Width) for communication to comply with SAE J1850. The terminal arrangement of DLC3 complies with SAE J1962 and matches the V.P.W. format.

Terminal No.	Connection / Voltage or Resistance	Condition
2	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 DLC3, turned the ignition switch ON and operated the scan tool, there is a problem on the vehicle side or tool side.

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



2. INSPECT DIAGNOSIS (Normal Mode)

(a) Check the MIL.

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

HINT:
If the MIL does not light up, troubleshoot the combination meter.

(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:
TOYOTA hand–held tester only: When the diagnosis system is switched from normal mode to check mode, it erases all DTCs and freezed frame data recorded in 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.

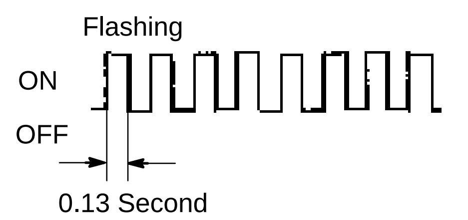
(2) Connect the OBD II scan tool or TOYOTA hand–held tester to the DLC3 at the lower of the instrument panel.

(3) Turn the ignition switch ON and turn 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.)

(5) See page DI–13 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 normal mode. For code on the DTC chart subject to ”2 trip detection logic”, turn the ignition switch OFF after the symptom is simulated the 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.



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3. INSPECT DIAGNOSIS (Check Mode)

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 11 V or more
   - Throttle valve fully closed
   - Transmission in ”P” or ”N” position
   - Air conditioning switched OFF
  (2) Turn the ignition switch OFF.
  (3) Prepare the TOYOTA hand–held tester.
  (4) Connect the TOYOTA hand–held tester to DLC3 at the lower of the instrument panel.
  (5) Turn the ignition switch ON and switch the TOYOTA hand–held tester ON.
  (6) Switch the TOYOTA hand–held tester normal mode to check mode (Check that the MIL flashes.).
  (7) Start the engine (The MIL goes out after the engine start.).
  (8) Simulate the conditions of the malfunction described by the customer.

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

  (9) 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.

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

(b) Clear the DTC.
The following actions will erase the DTCs and freezed frame data.
(1) Operating the OBD II scan tool (complying with SAE J1978) or TOYOTA hand–held tester to erase the codes. (See the OBD II scan tool's instruction book for operating instructions.)
(2) Disconnecting the battery terminals or EFI fuse.

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

4. FAIL–SAFE CHART

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

DTC No.	Fail–Safe Operation	Fail–Safe Deactivation Conditions
P0100	Ignition timing fixed at 5° BTDC Injection time fixed Starting – – – – – – – – 11.6 msec. CTP switch ON – – – – 3.2 msec. CTP switch OFF – – – – 6.0 msec.	Returned to normal condition
P0110	Intake air temp. is fixed at 20°C (68°F)	Returned to normal condition
P0115	Engine coolant temp. is fixed at 80°(176°F)	Returned to normal condition
P0120	VTA is fixed at 0°	Following condition must be repeated at least 2 times consecutively When closed throttle position switch is ON: 0.1 V < VTA < 0.95 V
P0135 P0141	Heater circuit in which an abnormality is detected is turned off	Ignition switch OFF
P0325	Max. timing retardation	Ignition switch OFF
P0336	Fuel cut	Returned to normal condition
P1300	Fuel cut	Returned to normal condition

5. CHECK FOR INTERMITTENT PROBLEMS

TOYOTA HAND–HELD TESTER only:
By putting the vehicle's ECM in 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.
(a) Clear the DTC (See page DI–3).
(b) Set the check mode (See page DI–3).
(c) Perform a simulation test (See page IN–14).
(d) Check the connector and terminal (See page IN–24).
(e) Handle the connector (See page IN–24).

6. BASIC INSPECTION

When the malfunction code is not confirmed in the DTC check, troubleshooting should be performed in the order for all possible circuits to be considered as the causes of the problems. In many cases, by carrying out the basic engine check shown in the following flow chart, the location causing the problem can be found quickly and efficiently. Therefore, 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 page ST–15 and continue to troubleshoot.**

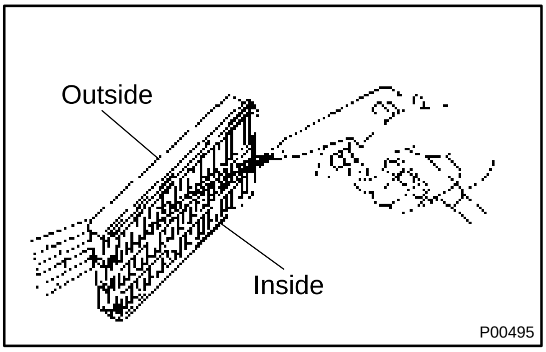
YES

3	**Does engine start?**

NO	**Go to step 7.**

YES

4	**Check air filter.**



PREPARATION:
Remove the air filter.
CHECK:
Visual check that the air filter is not dirty or excessive oily.
HINT:
If necessary, clean the filter with compressed air. First blow from inside thoroughly, then blow from outside of the 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 air conditioning.
(d) Shift the transmission into ”N” position.
(e) Connect the OBD II scan tool or TOYOTA hand–held tester to the DLC3 on the vehicle.

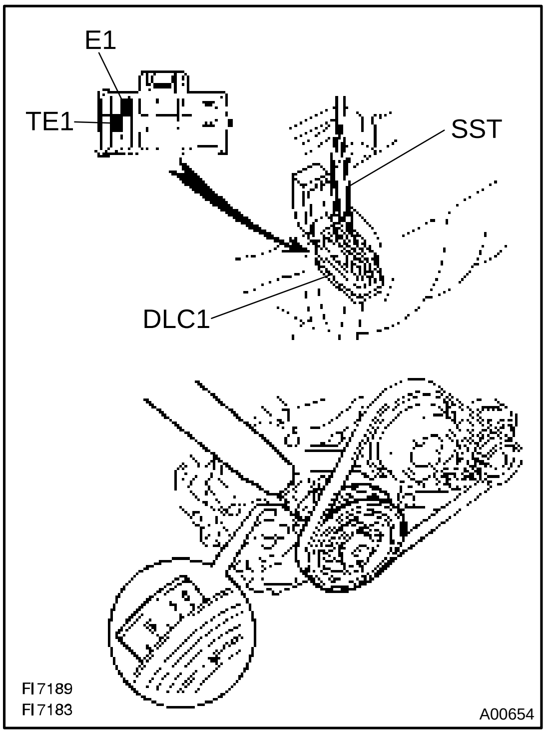
CHECK:
Use CURRENT DATA to check the idle speed.

OK:
Idle speed: 650 – 750 rpm

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

OK

6	**Check ignition timing.**



FI7189
FI7183
A00654

PREPARATION:
(a) Warm up the engine to normal operating temperature.
(b) Shift the transmission into ”N” position.
(c) Keep the engine speed at idle.
(d) Using SST, connect terminals TE1 and E1 of the DLC1.
SST 09843–18020
(e) Using a timing light, connect the tester to the No.1 high–tension cord.

CHECK:
Check the ignition timing.

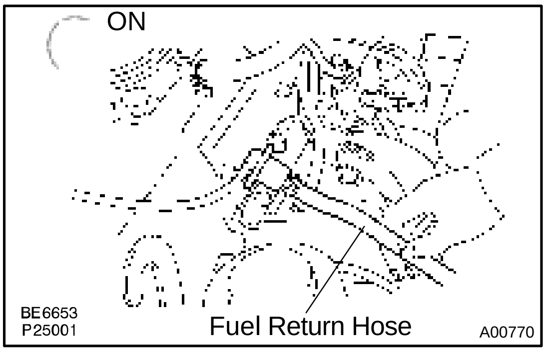
OK:
Ignition timing: Approx. 5° BTDC at idle

NG → **Proceed to IGNITION and continue to trouble-shoot.**

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 "ACTIVE TEST" mode to operate the fuel pump.

CHECK:

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

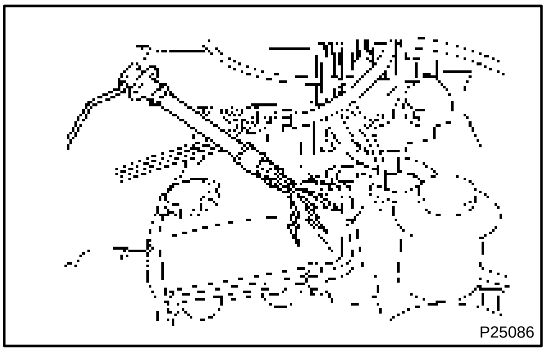
HINT:

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

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

OK

8	**Check for spark.**



PREPARATION:

(a) Disconnect the high–tension cord from the spark plug.
(b) Remove the spark plug.
(c) Install the spark plug to the high–tension cord.
(d) Disconnect the injector connector.
(e) Ground the spark plug.

CHECK:

Check if the spark occurs while engine is being cranked.

NOTICE:

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

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

OK

Proceed to problem symptoms table on page DI–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
CALC LOAD	Calculator Load: Current intake air volume as a proportion of max. intake air volume	Idling: 15.4 – 22.1 % Racing without load (2,500 rpm): 14.7 – 21.5 %
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 %
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 7 – 13°
INTAKE AIR	Intake Air Temp. Sensor Value	Equivalent to Ambient Temp.
MAF	Air Flow Rate Through Mass Air Flow Meter	Idling: 2.7 – 3.9 gm/sec. Racing without load (2,500 rpm): 9.2 – 13.3 gm/sec.
THROTTLE POS	Voltage Output of Throttle Position Sensor Calculated as a percentage: 0 V → 0 %, 5 V → 100 %	Throttle Fully Closed: 7 – 11 % Throttle Fully Open: 65 – 75 %
O2S B1, S1	Voltage Output of Oxygen Sensor Bank 1, Sensor 1	Idling: 0.1 – 0.9 V
O2FT B1, S1	Oxygen Sensor Fuel Trim Bank 1, Sensor 1 (Same as SHORT FT #1)	0 ± 20 %
O2S B1, S2	Voltage Output of Oxygen Sensor Bank 1, Sensor 2	Driving (50 km/h, 31 mph): 0.1 – 0.9 V

*: If no conditions are specifically stated for ”ldling”, it means the shift lever is at N or P 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: 0 g/r
INJECTOR	Fuel injection time for cylinder No.1	Idling: 2.5 – 4.3 ms
IAC DUTY RATIO	Intake Air Control Valve Duty Ratio Opening ratio rotary solenoid type IAC valve	Idling: 24.8 – 50.0 %
STARTER SIG	Starter Signal	Cranking: ON
CTP SW	Closed Throttle Position Switch Signal	Throttle Fully Closed: ON
A/C SIG	A/C Switch Signal	A/C ON: ON
STOP LIGHT SW	Stop Light Switch Signal	Stop light switch ON: 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
EGRT GAS	EGR Gas Temp. Sensor Value	EGR not operating: Temp. between intake air temp. and engine coolant temp.
EGR SYSTEM	EGR System Operating Condition	Idling: OFF
A/C CUT SIG	A/C Cut Signal	A/C S/W OFF: ON
FUEL PUMP	Fuel Pump Signal	Idling: ON
EVAP (PURGE) VSV	EVAP VSV Signal	Idling: OFF
TOTAL FT B1	Total Fuel Trim Bank 1: Average value for fuel trim system of bank 1	Idling: 0.8 – 1.2 V
O2 LR B1, S1	Oxygen Sensor Lean Rich Bank 1, Sensor 1 Response time for oxygen sensor output to switch from lean to rich	Idling after warming up: 0 – 1,000 msec.
O2 RL B1, S1	Oxygen Sensor Rich Lean Bank 1, Sensor 1 Response time for oxygen sensor output to switch from rich to lean	Idling after warming up: 0 – 1,000 msec.

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

DI0T8–02

DIAGNOSTIC TROUBLE CODE CHART

SAE CONTROLLED

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 that code 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.

DTC No. (See Page)	Detection Item	Trouble Area	MIL*	Memory
P0100 (DI–22)	Mass Air Flow Circuit Malfunction	●Open or short in mass air flow meter circuit ●Mass air flow meter ●ECM	●	●
P0101 (DI–26)	Mass Air Flow Circuit Range/Performance Problem	●Mass air flow meter	●	●
P0110 (DI–27)	Intake Air Temp. Circuit Malfunction	●Open or short in intake air temp. sensor circuit ●Intake air temp. sensor ●ECM	●	●
P0115 (DI–33)	Engine Coolant Temp. Circuit Malfunction	●Open or short in engine coolant temp. sensor circuit ●Engine coolant temp. sensor ●ECM	●	●
P0116 (DI–38)	Engine Coolant Temp. Circuit Range/Performance Problem	●Engine coolant temp. sensor ●Cooling system	●	●
P0120 (DI–39)	Throttle/Pedal Position Sensor/Switch "A" Circuit Malfunction	●Open or short in throttle position sensor circuit ●Throttle position sensor ●ECM	●	●
P0121 (DI–43)	Throttle/Pedal Position Sensor/Switch "A" Circuit Range/Performance Problem	●Throttle position sensor	●	●
P0125 (DI–44)	Insufficient Coolant Temp. for Closed Loop Fuel Control	●Open or short in heated oxygen sensor (bank 1 sensor 1) circuit ●Heated oxygen sensor (bank 1 sensor 1)	●	●
P0130 (DI–47)	Heated Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 1)	●Heated oxygen sensor ●Fuel trim malfunction	●	●
P0133 (DI–50)	Heated Oxygen Sensor Circuit Slow Response (Bank 1 Sensor 1)	●Heated oxygen sensor	●	●
P0135 (DI–51)	Heated 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–53)	Heated Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 2)	●Heated oxygen sensor	●	●
P0141 (DI–51)	Heated Oxygen Sensor Heater Circuit Malfunction (Bank 1 Sensor 2)	●Same as DTC No. P0135	●	●

*: ● <<<MIL lights up

DTC No. (See Page)	Detection Item	Trouble Area	MIL*	Memory
P0171 (DI–55)	System too Lean (Fuel Trim)	●Air intake (hose loose) ●Fuel line pressure ●Injector blockage ●Heated oxygen sensor (bank 1 sensor 1) malfunction ●Mass air flow meter ●Engine coolant temp. sensor	●	●
P0172 (DI–55)	System too Rich (Fuel Trim)	●Fuel line pressure ●Injector leak, blockage ●Heated oxygen sensor (bank 1 sensor 1) malfunction ●Mass air flow meter ●Engine coolant temp. sensor	●	●
P0300 (DI–58)	Random/Multiple Cylinder Misfire Detected	●Ignition system ●Injector ●Fuel line pressure ●EGR ●Compression pressure ●Valve clearance not to specification ●Valve timing ●Mass air flow meter ●Engine coolant temp. sensor	●	●
P0301 P0302 P0303 P0304 (DI–58)	Misfire Detected – Cylinder 1 – Cylinder 2 – Cylinder 3 – Cylinder 4			
P0325 (DI–63)	Knock Sensor 1 Circuit Malfunction	●Open or short in knock sensor 1 circuit ●Knock sensor 1 (looseness) ●ECM	●	●
P0335 (DI–66)	Crankshaft Position Sensor "A" Circuit Malfunction	●Open or short in crankshaft position sensor circuit ●Crankshaft position sensor ●Starter ●ECM	●	●
P0336 (DI–69)	Crankshaft Position Sensor "A" Circuit Range/Performance	●Valve timing ●Distributor installation ●ECM	●	●
P0340 (DI–70)	Camshaft Position Sensor Circuit Malfunction	●Open or short in camshaft position sensor circuit ●Camshaft position sensor ●Distoributor ●Starter ●ECM	●	●
P0401 (DI–72)	Exhaust Gas Recirculation Flow Insufficient Detected	●EGR valve stuck closed ●Short in VSV circuit for EGR ●Open in EGR gas temp. sensor circuit ●EGR hose disconnected ●ECM	●	●
P0402 (DI–82)	Exhaust Gas Recirculation Flow Excessive Detected	●EGR valve stuck open ●VSV for EGR open malfunction ●Open in VSV circuit for EGR ●Short in EGR gas temp. sensor circuit ●ECM	●	●
P0420 (DI–86)	Catalyst System Efficiency Below Threshold	●Three–way catalytic convertor ●Open or short in heated oxygen sensor circuit ●Heated oxygen sensor	●	●

*: ● <<<MIL lights up

DTC No. (See Page)	Detection Item	Trouble Area	MIL*	Memory
P0441 (DI–88)	Evaporative Emission Control System Incorrect Purge Flow	●Open or short in VSV circuit for EVAP ●VSV for EVAP ●ECM ●Vacuum hose damaged, blocked or disconnected ●Charcoal canister	●	●
P0500 (DI–92)	Vehicle Speed Sensor Malfunction	●Open or short in No.1 vehicle speed sensor circuit ●No.1 vehicle speed sensor ●ECM ●Speedometer cable	●	●
P0505 (DI–94)	Idle Control System Malfunction	●IAC valve is stuck or closed ●Open or short in IAC valve circuit ●Air intake (hose loose)	●	●
P0510 (DI–97)	Closed Throttle Position Switch Malfunction	●Open in closed throttle position switch circuit ●Closed throttle position switch ●ECM	●	●

*: ● <<<MIL lights up

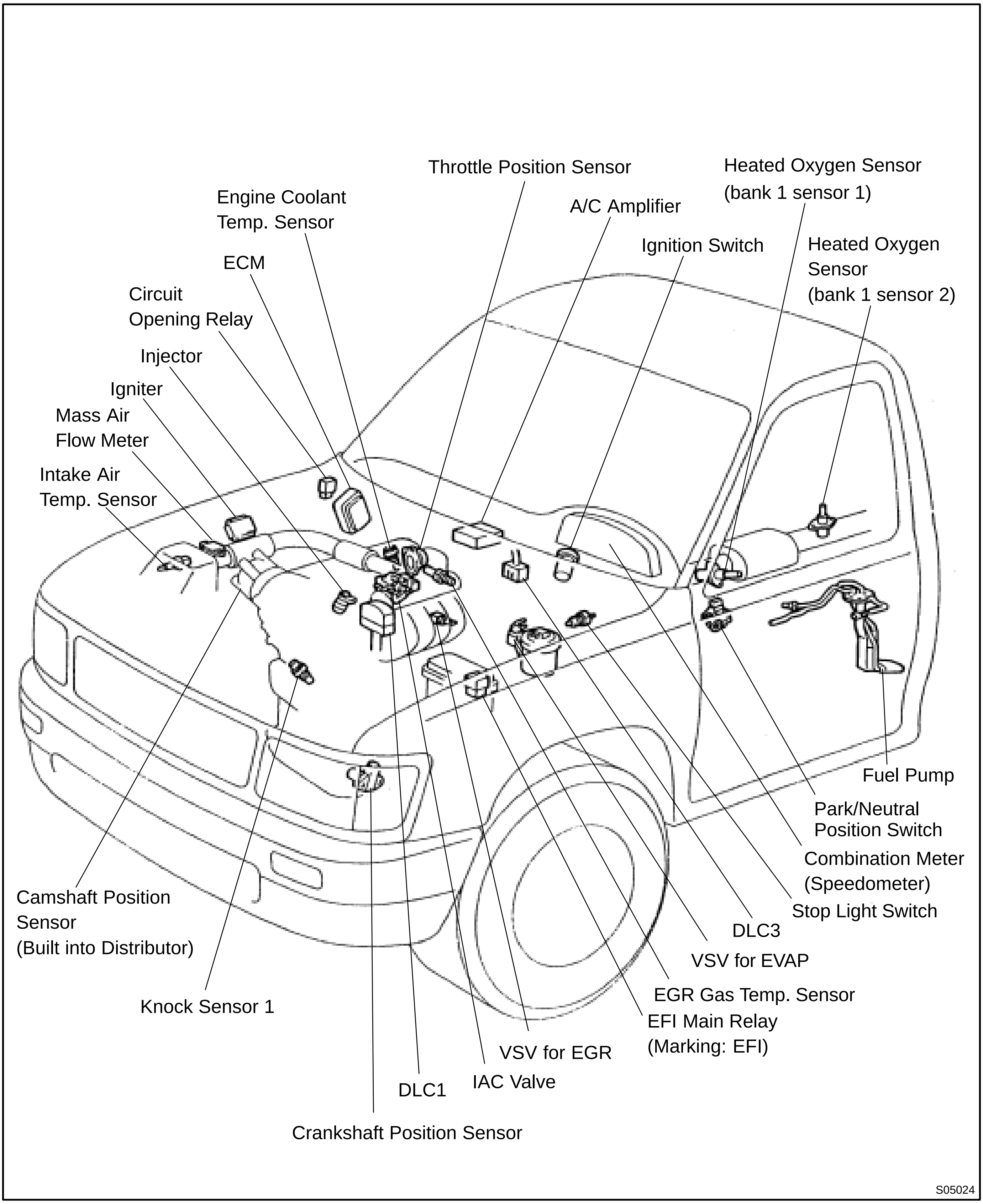
MANUFACTURER CONTROLLED

DTC No. (See Page)	Detection Item	Trouble Area	MIL*	Memory
P1300 (DI–103)	Igniter Circuit Malfunction	●Open or short in IGF or IGT circuit from igniter to ECM ●Igniter ●ECM	●	●
P1335 (DI–109)	Crankshaft Position Sensor Circuit Malfunction (during engine running)	●Open or short in crankshaft position sensor circuit ●Crankshaft position sensor ●ECM	–	●
P1520 (DI–110)	Stop Light Switch Signal Malfunction	●Short in stop light switch signal circuit ●Stop light switch ●ECM	●	●
P1600 (DI–113)	ECM BATT Malfunction	●Open in back up power source circuit ●ECM	●	●
P1780 (DI–115)	Park/Neutral Position Switch Malfunction	●Short in park/neutral position switch circuit ●Park/neutral position switch ●ECM	●	●

*: – <<<MIL does not light up, ● <<<MIL lights up

DI0T9–01

PARTS LOCATION

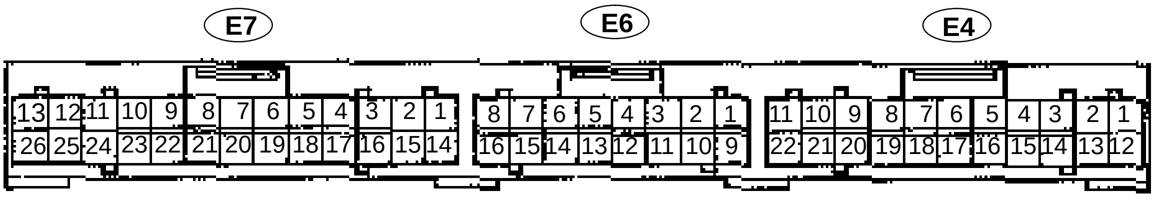


DI0TA–02

TERMINALS OF ECM

For M/T

ECM Terminals



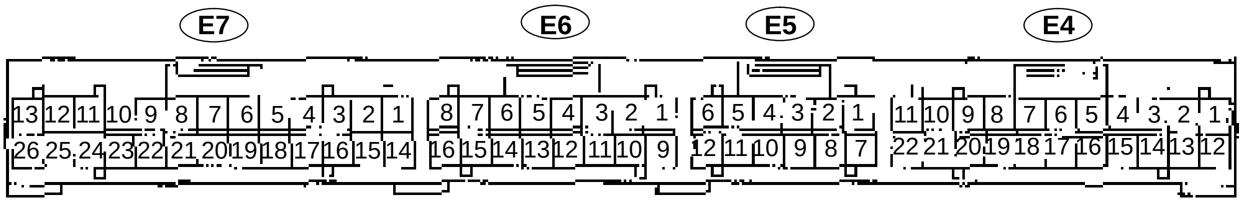
P19559

Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage (V)
BATT (E4–1) – E1 (E7–14)	B–G ↔ BR	Always	9 – 14
+B (E4–12) – E1 (E7–14)	W–R ↔ BR	IG switch ON	9 – 14
VCC (E6–1) – E2 (E6–9)	G–Y ↔ BR–B	IG switch ON	4.5 – 5.5
IDL (E6–12) – E2 (E6–9)	Y–L↔BR–B	IG switch ON, Apply vacuum to throttle opener Throttle valve fully closed	0 – 3.0
		IG switch ON, Throttle valve fully open	9 – 14
VTA (E6–11) – E2 (E6–9)	Y ↔ BR–B	IG switch ON, Apply vacuum to throttle opener Throttle valve fully closed	0.3 – 0.8
		IG switch ON, Throttle valve fully open	3.2 – 4.9
VG (E6–2) – E3 (E6–16)	Y–R ↔ BR	Idling, N position, A/C switch OFF	1.1 – 1.5
THA (E6–7) – E2 (E6–9)	Y–G ↔ BR–B	Idling, Intake air temp. 20°C (68°F)	0.5 – 3.4
THW (E6–4) – E2 (E6–9)	G–Y ↔ BR–B	Idling, Engine coolant temp. 80°C (176°F)	0.2 – 1.0
STA (E4–11) – E1 (E7–14)	B–W ↔ BR	Cranking	6.0 or more
#10 (E7–12) – E01 (E7–13)	W–R ↔ BR	IG switch ON	9 – 14
		Idling	Pulse generation (See page DI–58)
#20 (E7–11) – E01 (E7–13)	W ↔ BR	IG switch ON	9 – 14
		Idling	Pulse generation (See page DI–58)
IGT (E7–20) – E1 (E7–14)	B–L ↔ BR	Idling	Pulse generation (See page DI–103)
IGF (E7–3) – E1 (E7–14)	B–Y ↔ BR	IG switch ON, Disconnect igniter connector	Below 2.0
		Idling	Pulse generation (See page DI–103)
G (E7–5) – G– (E7–18)	B ↔ G	Idling	Pulse generation (See page DI–66)
NE (E7–4) – NE– (E7–17)	W ↔ B	Idling	Pulse generation (See page DI–66)
FC (E4–14) – E1 (E7–14)	G–Y ↔ BR	IG switch ON	9 – 14
EGR (E7–6) – E1 (E7–14)	P ↔ BR	IG switch ON	9 – 14
EVP (E7–23) – E1 (E7–14)	W–G ↔ BR	IG switch ON	9 – 14
RSC (E7–9) – E1 (E7–14)	V–Y ↔ BR	IG switch ON, Disconnect E7 of ECM connector	9 – 14
RSO (E7–10) – E1 (E7–14)	V–R ↔ BR	IG switch ON, Disconnect E7 of ECM connector	9 – 14
OX1 (E6–6) – E1 (E7–14)	B ↔ BR	Maintain engine speed at 2,500 rpm for 2 min. after warming up	Pulse generation

HT1 (E7–2) – E03 (E7–25)	P–G ↔ BR	Idling	Below 3.0
		IG switch ON	9 – 14
HT2 (E7–15) – E03 (E7–25)	R–G ↔ BR	Idling	Below 3.0
		IG switch ON	9 – 14
KNK (E6–13) – E1 (E7–14)	B ↔ BR	Idling	Pulse generation (See page DI–63)
SP1 (E4–9) – E1 (E7–14)	G ↔ BR	IG switch ON, Rotate driving wheel slowly	Pulse generation (See page DI–92)
TE1 (E6–15) – E1 (E7–14)	V–W ↔ BR	IG switch ON	9 – 14
W (E4–5) – E1 (E7–14)	V ↔ BR	Idling	9 – 14
		IG switch ON	Below 3.0
ACT (E4–8) – E1 (E7–14)	L–B ↔ BR	A/C switch OFF at idling	9 – 14
		A/C switch ON at idling	Below 2.0
AC1 (E4–10) – E1 (E7–14)	B–R ↔ BR	A/C switch ON at idling	Below 2.0
		A/C switch OFF idling	9 – 14

For A/T

ECM Terminals



FI6526

Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage (V)
BATT (E4–2) – E1 (E7–24)	B–G ↔ BR	Always	9 – 14
+B (E4–12) – E1 (E7–24)	W–R ↔ BR	IG switch ON	9 – 14
VCC (E6–1) – E2 (E6–9)	G–Y ↔ BR–B	IG switch ON	4.5 – 5.5
IDL (E6–11) – E2 (E6–9)	Y–L ↔ BR–B	IG switch ON, Apply vacuum to throttle opener Throttle valve fully closed	0 – 3.0
		IG switch ON, Throttle valve fully open	9 – 14
VTA (E6–10) – E2 (E6–9)	Y ↔ BR–B	IG switch ON, Apply vacuum to throttle opener Throttle valve fully closed	0.3 – 0.8
		IG switch ON, Throttle valve fully open	3.2 – 4.9
VG (E6–2) – E3 (E6–3)	Y–R ↔ BR	Idling, A/C switch OFF	1.0 – 1.5
THA (E6–12) – E2 (E6–9)	Y–G ↔ BR–B	Idling, Intake air temp. 20°C (68°F)	0.5 – 3.4
THW (E6–4) – E2 (E6–9)	G–Y ↔ BR–B	Idling, Engine coolant temp. 80°C (176°F)	0.2 – 1.0
STA (E4–11) – E1 (E7–24)	B–W ↔ BR	Cranking	6.0 or more
#10 (E7–12) – E01 (E7–13)	W–R ↔ BR	IG switch ON	9 – 14
		Idling	Pulse generation (See page DI–58)
#20 (E7–11) – E01 (E7–13)	W ↔ BR	IG switch ON	9 – 14
		Idling	Pulse generation (See page DI–58)
IGT (E7–23) – E1 (E7–24)	B–L ↔ BR	Idling	Pulse generation (See page DI–103)
IGF (E7–17) – E1 (E7–24)	B–Y ↔ BR	IG switch ON, Disconnect igniter connector	Below 2.0
		Idling	Pulse generation (See page DI–103)
G (E5–11) – G– (E5–5)	B ↔ G	Idling	Pulse generation (See page DI–66)
NE (E5–12) – NE– (E5–6)	W ↔ B	Idling	Pulse generation (See page DI–66)
FC (E7–14) – E1 (E7–24)	G–Y ↔ BR	IG switch ON	9 – 14
EGR (E7–22) – E1 (E7–24)	P ↔ BR	IG switch ON	9 – 14
PRG (E5–1) – E1 (E7–24)	W–G ↔ BR	IG switch ON	9 – 14
RSC (E7–6) – E1 (E7–24)	V–Y ↔ BR	IG switch ON, Disconnect E7 of ECM connector	9 – 14
RSO (E7–7) – E1 (E7–24)	V–R ↔ BR	IG switch ON, Disconnect E7 of ECM connector	9 – 14
OX1 (E6–5) – E1 (E7–24)	B ↔ BR	Maintain engine speed at 2,500 rpm for 2 min. after warming up	Pulse generation

HT1 (E7–3) – E03 (E7–25)	P–G ↔ BR	Idling	Below 3.0
		IG switch ON	9 – 14
HT2 (E7–16) – E03 (E7–25)	R–G ↔ BR	Idling	Below 3.0
		IG switch ON	9 – 14
KNK (E6–6) – E1 (E7–24)	B ↔ BR	Idling	Pulse generation (See page DI–63)
NSW (E4–22) – E1 (E7–24)	B–Y ↔ BR	IG switch ON, Other shift position in ”P”, ”N” position	9 – 14
		IG switch ON, Shift position in ”P”, ”N” position	0 – 3.0
SP1 (E4–8) – E1 (E7–24)	G ↔ BR	IG switch ON Rotate driving wheel slowly	Pulse generation (See page DI–92)
TE1 (E6–7) – E1 (E7–14)	V–W ↔ BR	IG switch ON	9 – 14
W (E4–4) – E1 (E7–24)	V ↔ BR	Idling	9 – 14
		IG switch ON	Below 3.0
ACT (E4–6) – E1 (E7–24)	L–B ↔ BR	A/C switch OFF at idling	9 – 14
		A/C switch ON at idling	Below 2.0
AC1 (E4–7) – E1 (E7–24)	B–R ↔ BR	A/C switch ON at idling	Below 2.0
		A/C switch OFF idling	9 – 14

DI0TB–02

PROBLEM SYMPTOMS TABLE

Symptom	Suspect Area	See page
Engine does not crank (Does not start)	1. Starter and starter relay	STsection
No initial combustion (Does not start)	1. ECM power source circuit 2. Fuel pump control circuit	DI–119 DI–122
No complete combustion (Does not start)	1. Fuel pump control circuit	DI–122
Engine cranks normally (Difficult to start)	1. Starter signal circuit 2. Fuel pump control circuit 3. Compression	DI–116 DI–122 EM–3
Cold engine (Difficult to start)	1. Starter signal circuit 2. Fuel pump control circuit	DI–116 DI–122
Hot engine (Difficult to start)	1. Starter signal circuit 2. Fuel pump control circuit	DI–116 DI–122
High engine idle speed (Poor idling)	1. A/C signal circuit (Compressor circuit) 2. ECM power source circuit	ACsection DI–119
Low engine idle speed (Poor idling)	1. A/C signal circuit (Compressor circuit) 2. Fuel pump control circuit	ACsection DI–122
Rough idling (Poor idling)	1. Compression 2. Fuel pump control circuit	EM–3 DI–122
Hunting (Poor idling)	1. ECM power source circuit 2. Fuel pump control circuit	DI–119 DI–122
Hesitation/Poor acceleration (Poor driveability)	1. Fuel pump control circuit 2. A/T faulty	DI–122 ATsection
Surging (Poor driveability)	1. Fuel pump control circuit	DI–122
Soon after starting (Engine stall)	1. Fuel pump control circuit	DI–122
During A/C operation (Engine stall)	1. A/C signal circuit (Compressor circuit) 2. Engine control module (ECM)	ACsection IN–24

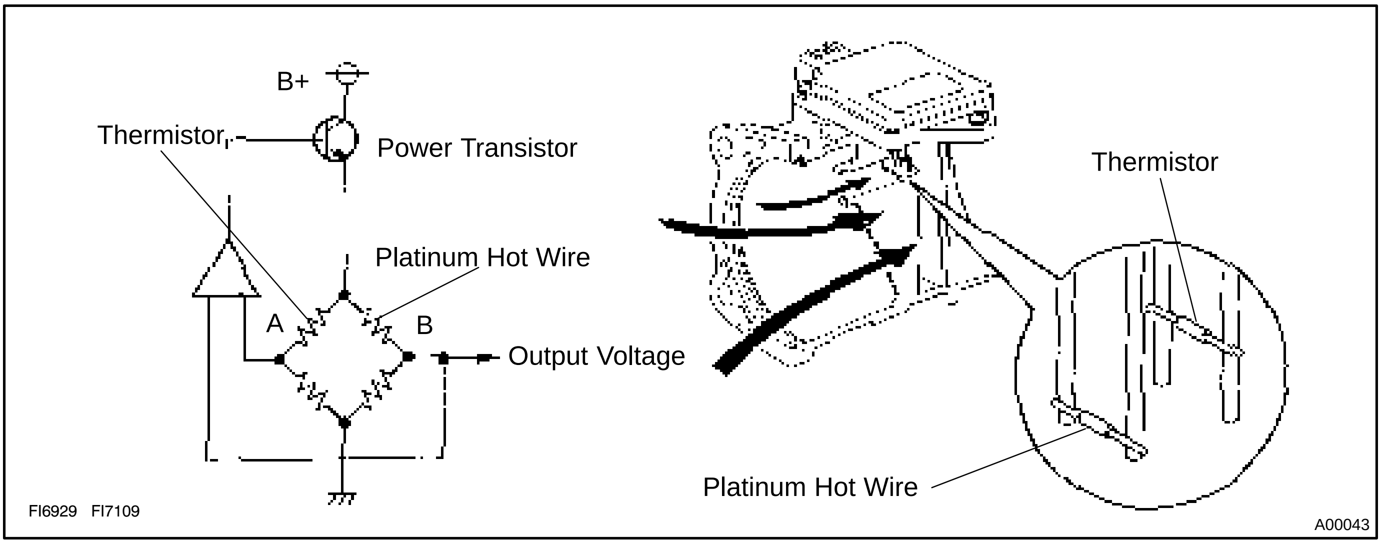
DI0TC–02

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 temp.
The hot wire is maintained at the set temp. by controlling the current flow through the hot wire. This current flow is ten 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 temp.



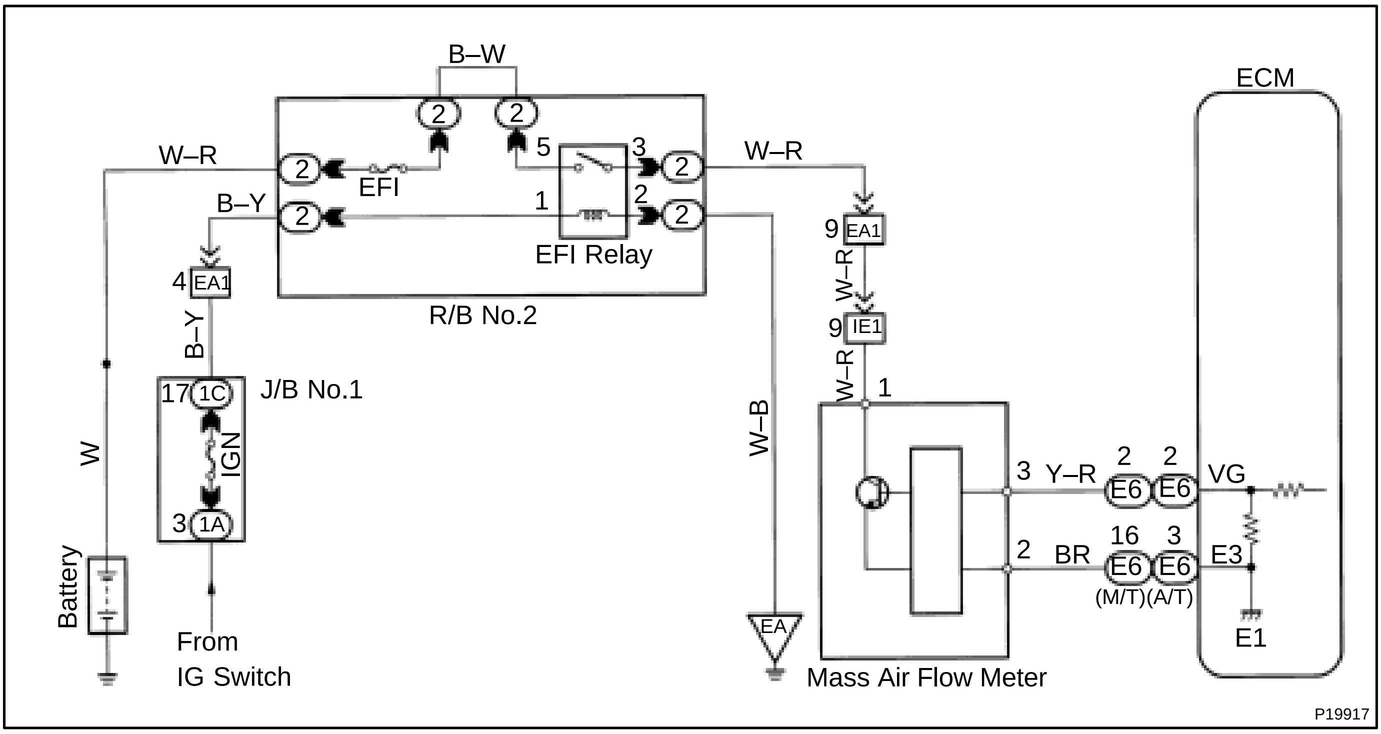
DTC No.	DTC Detecting Condition	Trouble Area
P0100	Open or short in mass air flow meter circuit with engine speed 4,000 rpm or less (2 trip detection logic)	●Open or short in mass air flow meter circuit ●Mass air flow meter ●ECM

If the ECM detects DTC ”P0100” it operates the fail safe function, keeping the ignition timing and injection volume constant and making it possible to drive the vehicle.

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

Mass Air Flow Value (gm/sec.)	Malfunction
0.5	●Mass air flow meter power source circuit open ●VG circuit open or short
202.2 or more	●E3 circuit open

WIRING DIAGRAM



INSPECTION PROCEDURE

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:

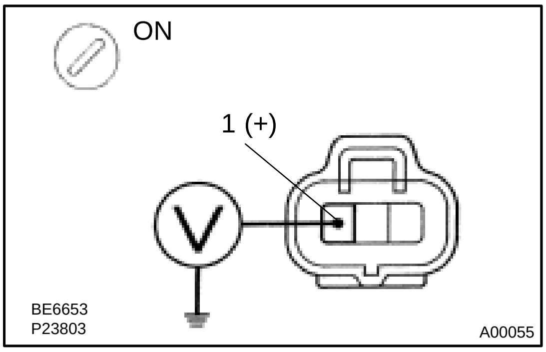
Read mass air flow rate on the OBD II scan tool or TOYOTA hand–held tester.

RESULT:

	Type I	Type II
Mass air flow rate (gm/sec.)	0.5 gm/sec.	202.2 gm/sec. 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.

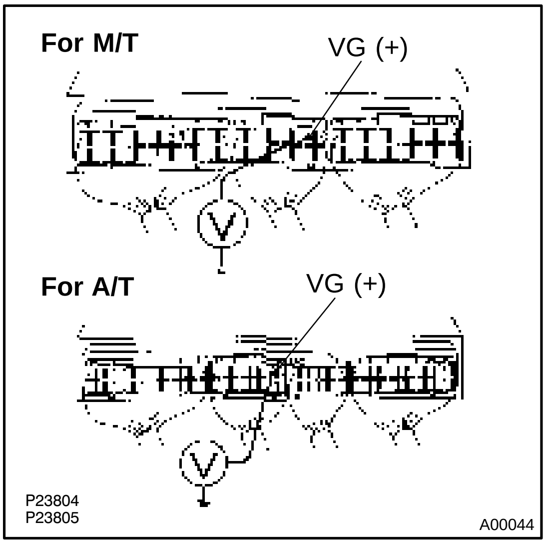
CHECK:
Measure voltage between terminal 1 of mass air flow meter connector and body ground.

OK:
Voltage: 9 – 14 V

NG → **Check for open in harness and connector between EFI main relay (Marking : EFI) and mass air flow meter (See page IN–24).**

OK

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



PREPARATION:
(a) Remove the right cowl side trim (See page SF–50).
(b) Start the engine.

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

OK:
Voltage:
1.0 – 1.5 V (P or N position and A/C switch OFF)

OK → **Check and replace ECM (See page IN–24).**

NG

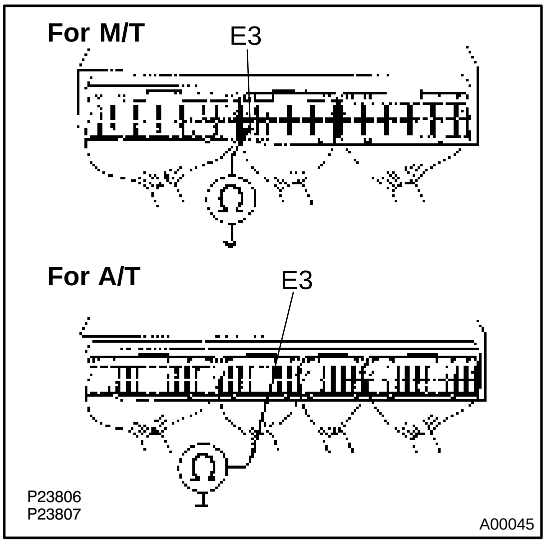
4	**Check for open and short in harness and connector between mass air flow meter and ECM (See page IN–24).**

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

OK

Replace mass air flow meter.

5	**Check continuity between terminal E3 of ECM connector and body ground.**



PREPARATION:

Remove the right cowl side trim (See page SF–50).

CHECK:

Check continuity between terminal E3 of ECM connector and body ground.

OK:

Continuity (1 Ω or less)

NG → **Check and replace ECM (See page IN–24).**

OK

6	**Check for open in harness and connector between mass air flow meter and ECM (See page IN–24).**

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

OK

Replace mass air flow meter

DI0TD–02

DTC	P0101	Mass Air Flow Circuit Range/Performance Problem

CIRCUIT DESCRIPTION

Refer to DTC P0100 on page DI–22.

DTC No.	DTC Detecting Condition	Trouble Area
P0101	Conditions (a), (b) and (c) continue with engine speed 900 rpm or less: (2 trip detection logic) (a) Closed throttle position switch: ON (b) Mass air flow meter output > 2.2 V (c) THW < 70°C (158°F)	●Mass air flow meter
	Conditions (a) and (b) continue with engine speed 1,850 rpm or more: (a) VTA < 0.75 V (b) Mass air flow meter output < 1.0 V	

WIRING DIAGRAM

Refer to DTC P0110 (Intake Air Temp Circuit Malfunction) on page DI–27 for the WIRING DIAGRAM.

INSPECTION PROCEDURE

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

YES → **Go to relevant DTC chart.**

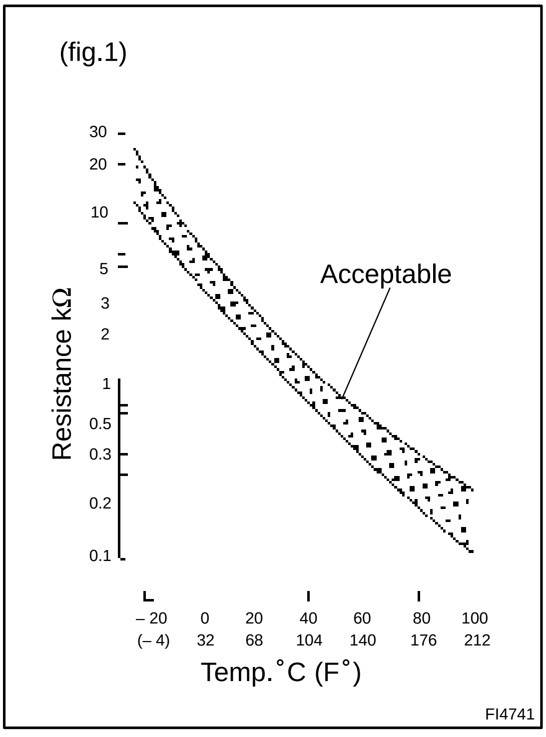
NO ↓

Replace mass air flow meter.

DI0TE–02

DTC	P0110	Intake Air Temp. Circuit Malfunction

CIRCUIT DESCRIPTION



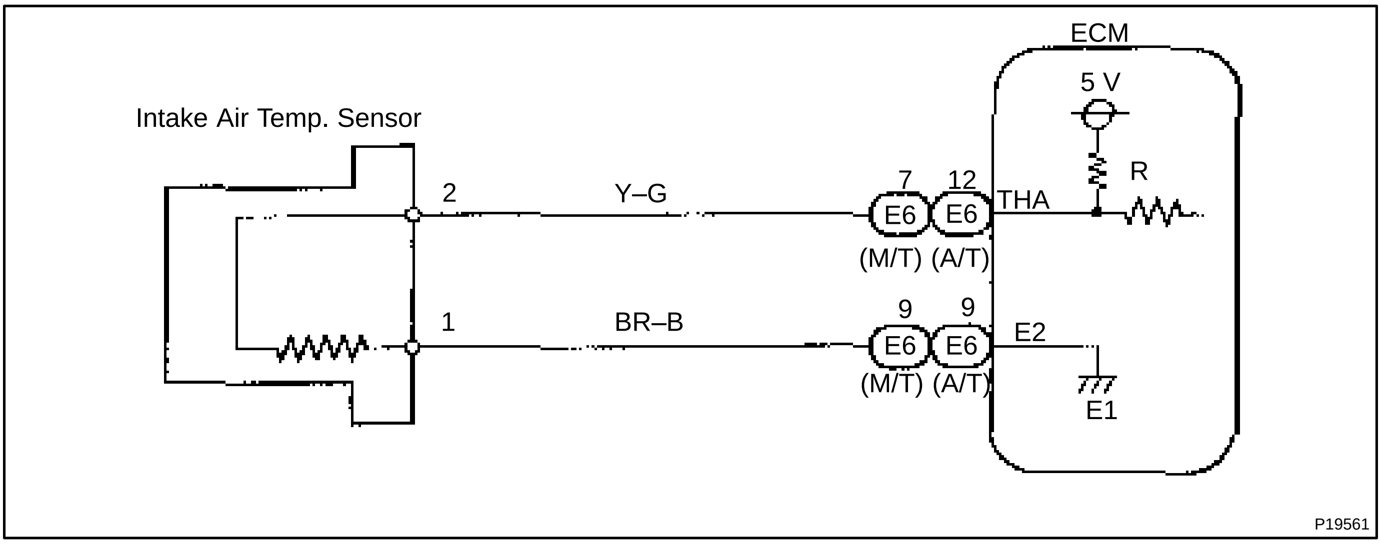
The intake air temp. sensor is built into the air cleaner cap and sensors the intake air temp.
A thermistor built in the sensor changes the resistance value according to the intake air temp. The lower the intake air temp., the greater the thermistor resistance value, and the higher the intake air temp., the lower the thermistor resistance value (See fig.1).
The intake air temp. sensor is connected to the ECM (See below). The 5 V power source voltage in the ECM is applied to the intake air temp. 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 temp., 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.
If the ECM detects the DTC ”P0110”, it operates the fail safe function in which the intake air temp. is assumed to be 20˚C (68˚F).

DTC No.	DTC Detecting Condition	Trouble Area
P0110	Open or short in intake air temp. sensor circuit	●Open or short in intake air temp. sensor circuit ●Intake air temp. sensor ●ECM

HINT:
After confirming DTC P110 use the OBD II scan tool or TOYOTA nand–held tester to confirm the intake air temp. from ”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 P0110, P0115 and P0120 are output simultaneously, E2 (Sensor Ground) may be open.

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

PREPARATION:

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

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

CHECK:

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

OK:

Same as actual intake air temp.

HINT:

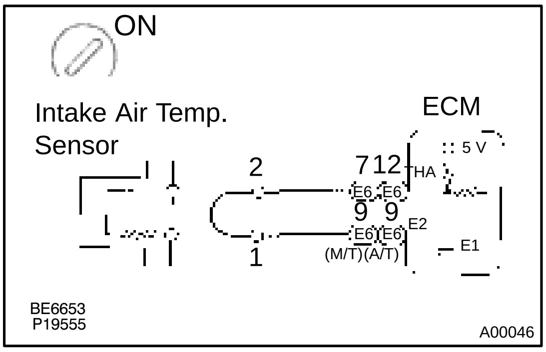
- If there is open circuit, OBD II scan tool or TOYOTA hand–held tester indicates – 40°C (– 40°F).
- If there is short circuit, OBD II scan tool or TOYOTA hand–held tester indicates 140°C (284°F) or more.

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 intake air temp. sensor connector.

(b) Connect the sensor wire harness terminals together.

(c) Turn the ignition switch ON.

CHECK:

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

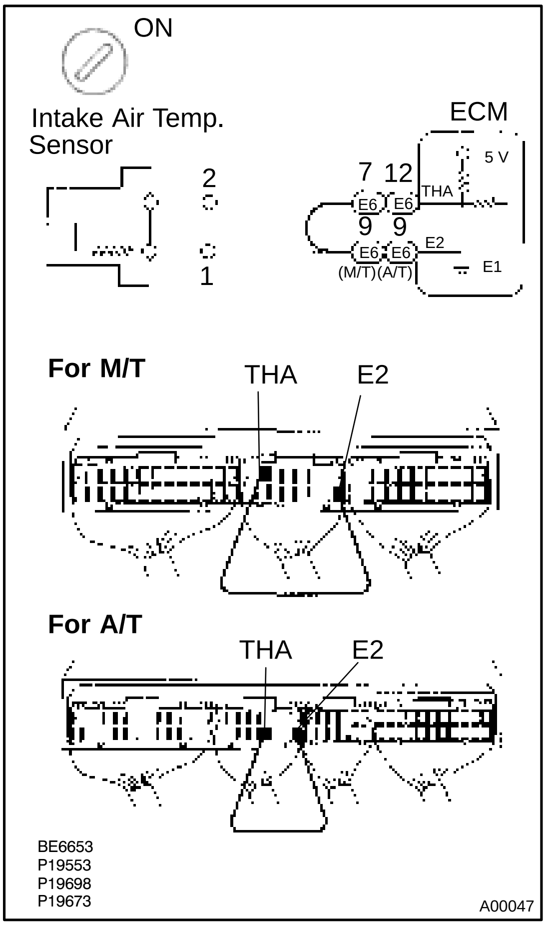
OK:

Temp. value: 140°C (284°F) or more

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

NG

3	**Check for open in harness or ECM.**



PREPARATION:

(a) Remove the right cowl side trim (See page SF–50).

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

HINT:

The intake air temp. sensor connector is disconnected. Before checking, do a visual and contact pressure check for the ECM connector (See page DI–3).

(c) Turn the ignition switch ON.

CHECK:

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

OK:

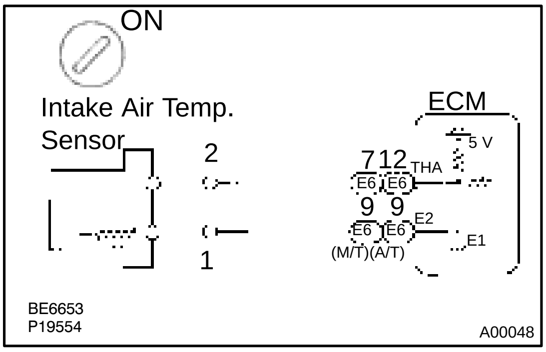
Temp. value: 140°C (284°F) or more

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

NG

Confirm good connection at ECM.
If OK, replace ECM.

4	**Check for short in harness and ECM.**



PREPARATION:

(a) Disconnect the intake air temp. sensor connector.

(b) Turn the ignition switch ON.

CHECK:

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

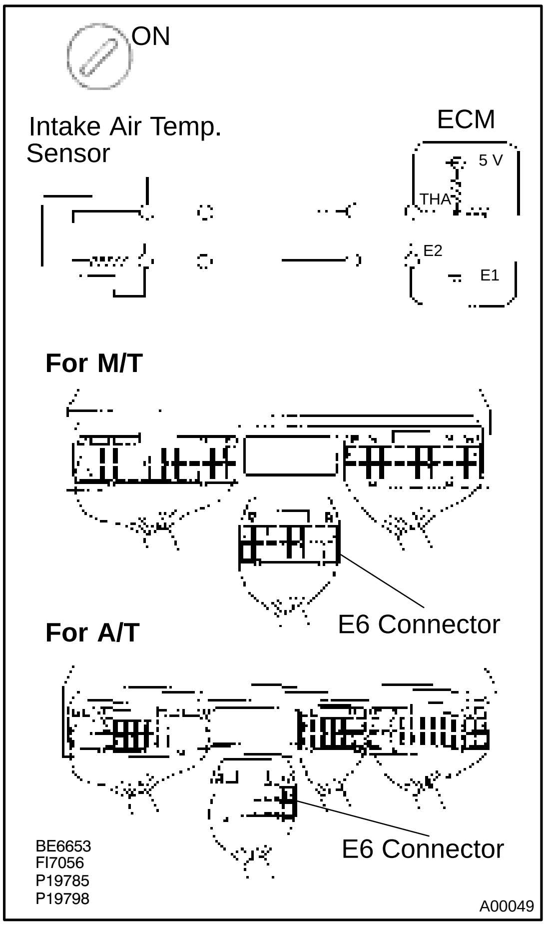
OK:

Temp. value: – 40°C (– 40°F)

OK → **Replace intake air temp. sensor.**

NG

5	Check for short in harness or ECM.



PREPARATION:

(a) Remove the right cowl side trim (See page SF–50).
(b) Disconnect the E6 connector of the ECM.

HINT:
The intake air temp. sensor connector is disconnected.

(c) Turn the ignition switch ON.

CHECK:

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

OK:

Temp. value: – 40°C (– 40°F)

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

NG

Check and replace ECM (See page IN–24).

DI0TF–02

DTC	P0115	Engine Coolant Temp. Circuit Malfunction

CIRCUIT DESCRIPTION

A thermistor built into the engine coolant temp. sensor changes the resistance value according to the engine coolant temp.

The structure of the sensor and connection to the ECM is the same as in the intake air temp. circuit malfunction shown on page DI–27.

If the ECM detects the DTC P0115, it operates the fail safe function in which the engine coolant temp. is assumed to be 80˚C (176˚F).

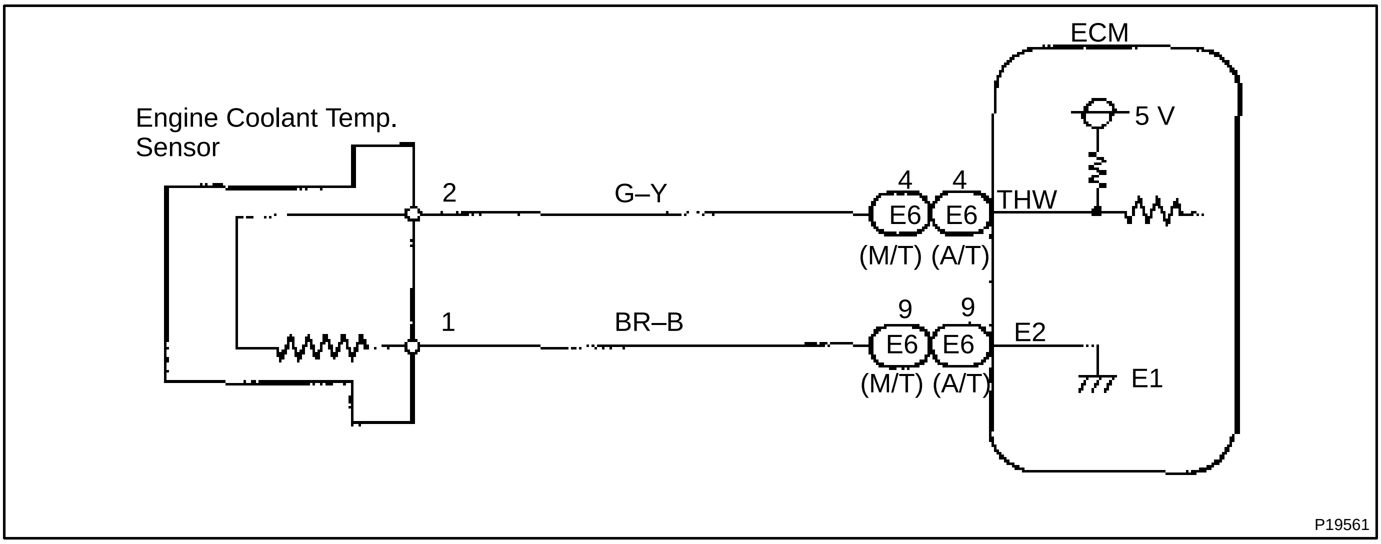
DTC No.	Detection Item	Trouble Area
P0115	Open or short in engine coolant temp. sensor circuit	●Open or short in engine coolant temp. sensor circuit ●Engine coolant temp. sensor ●ECM

HINT:

After confirming DTC P0115 use the OBD II scan tool or TOYOTA hand–held tester to confirm the engine coolant temp. from ”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 P0110, P0115 and P0120 are output simultaneously, E2 (Sensor Ground) may be open.

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

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

OK:
Same as actual engine coolant temp.

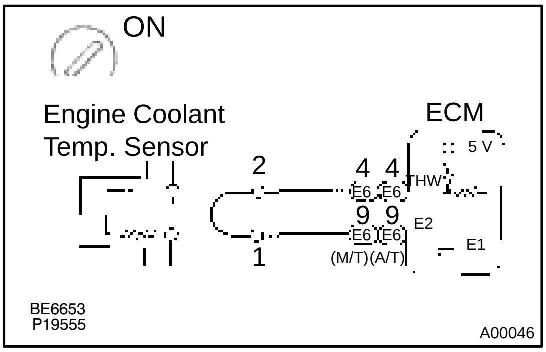
HINT:
- If there is open circuit, OBD II scan tool or TOYOTA hand–held tester indicates – 40°C (– 40°F).
- If there is open circuit, OBD II scan tool or TOYOTA hand–held tester indicates 140°C (284°F) or more.

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 temp. sensor connector.
(b) Connect the sensor wire harness terminals together.
(c) Turn the ignition switch ON.

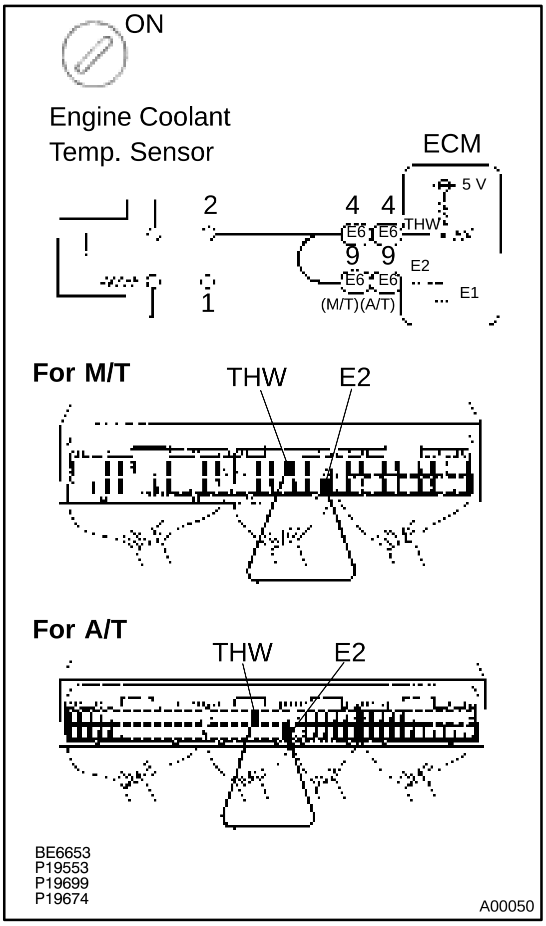
CHECK:
Read temp. value on the OBD II scan tool or TOYOTA hand–held tester.

OK:
Temp. value: 140°C (284°F) or more

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

NG

3	**Check for open in harness or ECM.**



PREPARATION:

(a) Remove the right cowl side trim (See page SF–58).

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

HINT:

The engine coolant temp. sensor connector is disconnected. Before checking, do a visual and contact pressure check for the ECM connector (See page DI–3).

(c) Turn the ignition switch ON.

CHECK:

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

OK:

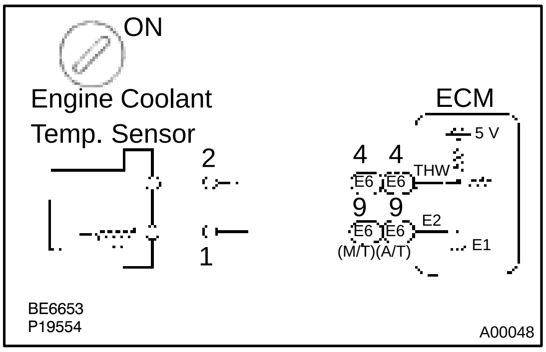
Temp. value: 140°C (284°F) or more

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

NG

Confirm good connection at ECM.
If OK, replace ECM.

4	**Check for open in harness or ECM.**



PREPARATION:

(a) Disconnect the engine coolant temp. sensor connector.

(b) Turn the ignition switch ON.

CHECK:

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

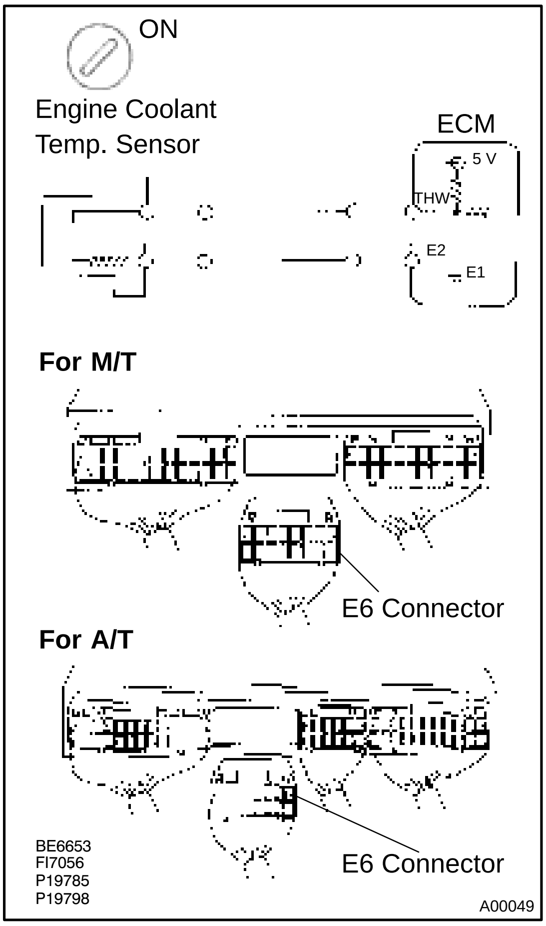
OK:

Temp. value: – 40°C (– 40°F)

OK	**Replace engine coolant temp. sensor.**

NG

5	Check for short in harness or ECM.



PREPARATION:

(a) Remove the right cowl side trim (See page SF–58).

(b) Disconnect the E6 connector of the ECM.

HINT:

The engine coolant temp. sensor connector is disconnected.

(c) Turn the ignition switch ON.

CHECK:

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

OK:

Temp. value: – 40°C (– 40°F)

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

NG

Check and replace ECM (See page IN–24).

DI0TG–02

DTC	P0116	Engine Coolant Temp. Circuit Range/ Performance Problem

CIRCUIT DESCRIPTION

Refer to DTC P0115 on page DI–33.

DTC No.	DTC Detecting 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)	●Engine coolant temp. sensor ●Cooling system
	When engine starts, water temp. is between – 7°C (19.4°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)	
	When engine starts, water temp. is 10°C (50°F) or more And, 2 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 temp. sensor circuit may be open. Perform troubleshooting of DTC P0115 first.

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

YES → **Go to relevant DTC chart.**

NO

2	**Check thermostat (See page CO–9).**

NG → **Replace thermostat.**

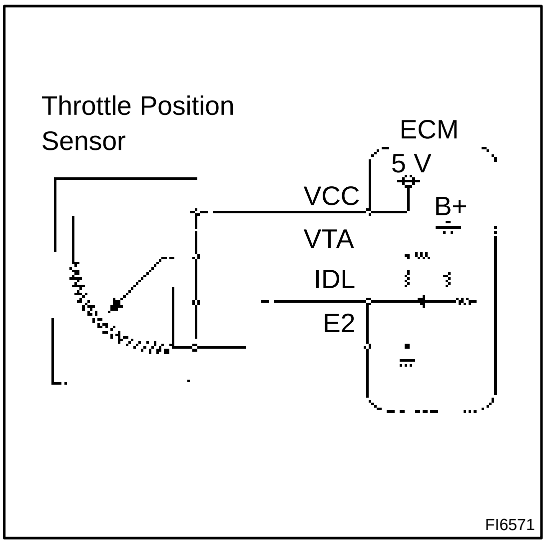
OK

Replace engine coolant temp. sensor (See page SF–45).

DI0TH–02

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, the IDL contacts in the throttle position sensor are on, so the voltage at terminal IDL of the ECM becomes 0 V. At this time, a voltage of approximately 0.3 – 0.8 V is applied to terminal VTA of the ECM. When the throttle valve is opened, the IDL contacts go off and thus the power source voltage of approximately 12 V in the ECM is applied to terminal IDL of the ECM. The voltage applied to terminal VTA of the ECM increases in proportion to the opening angle of the throttle valve and becomes approximately 3.2 – 4.9 V when the throttle valve is fully opened. The ECM judges the vehicle driving conditions from these signals input from terminals VTA and IDL, and uses them as one of the conditions for deciding the air–fuel ratio correction, power increase correction and fuel–cut control etc.

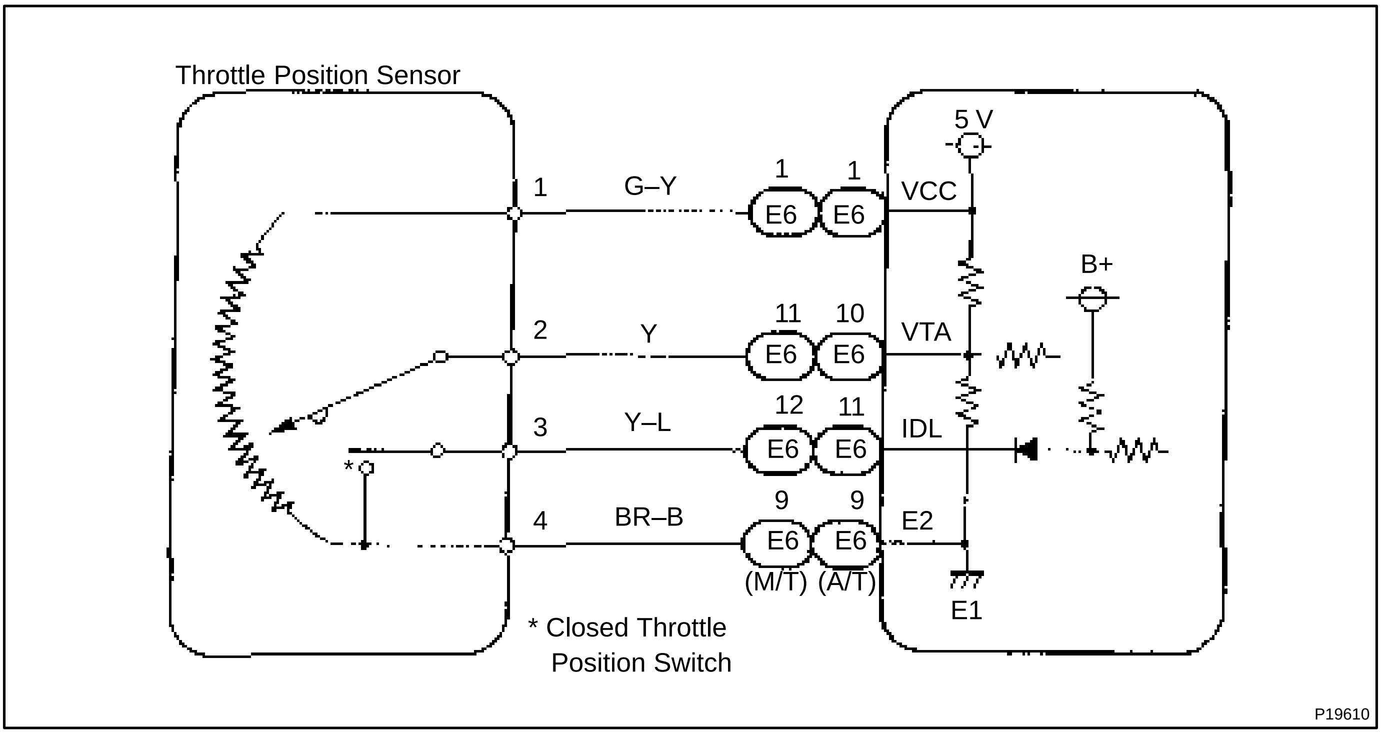
DTC No.	DTC Detecting Condition	Trouble Area
P0120	Condition (a) or (b) continues: (a) VTA < 0.1 V, and closed throttle position switch is OFF (b) VTA > 4.9 V	●Open or short in throttle position sensor circuit ●Throttle position sensor ●ECM

HINT:

- If there is open circuit in IDL line, DTC P0120 does not indicate.
- After confirming DTC P0120 use the OBD II scan tool or TOYOTA hand–held tester to confirm the throttle valve opening percentage and closed throttle position switch condition.

Throttle valve opening position expressed as percentage		Trouble Area
Throttle valve fully closed	Throttle valve fully open	
0 %	0 %	VCC line open VTA line open or short
100 %	100 %	E2 line open

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

If DTCs P0110, P0115 and P0120 are output simultaneously, E2 (Sensor Ground) may be open.

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

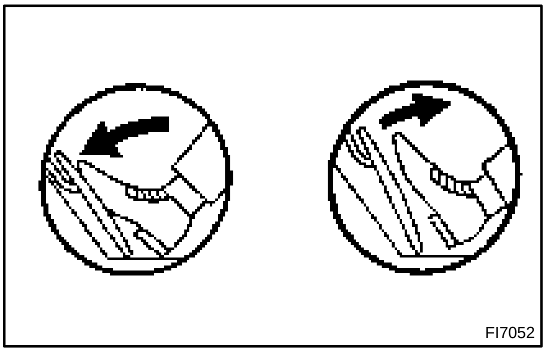
PREPARATION:

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



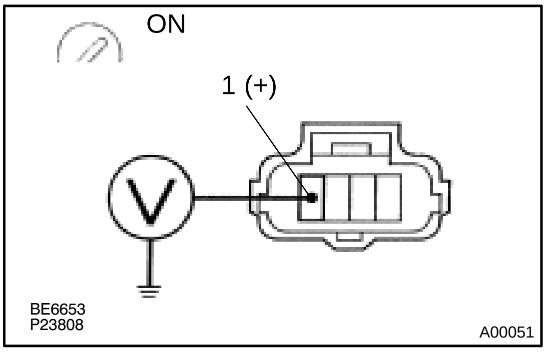
OK:

Throttle valve	Throttle valve opening position expressed as percentage
Fully open	Approx. 75 %
Fully closed	Approx. 10 %

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

NG

2	**Check voltage between terminal 1 of wire harness side connector and body ground.**



PREPARATION:
(a) Disconnect the throttle position sensor connector.
(b) Turn the ignition switch ON.

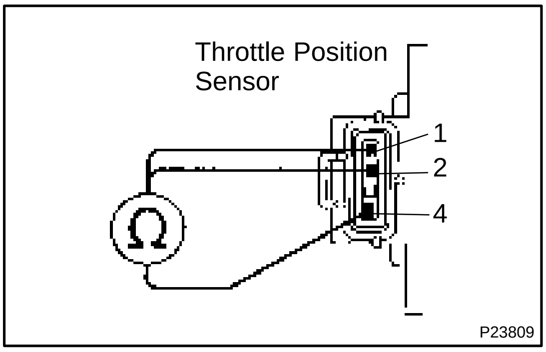
CHECK:
Measure voltage between terminals 1 of wire harness side connector and body ground.

OK:
Voltage: 4.5 – 5.5 V

NG	**Go to step 5.**

OK

3	**Check throttle position sensor.**



PREPARATION:
Disconnect the throttle position sensor connector.

CHECK:
Measure voltage between terminals 1, 2 and 4 of throttle position sensor.

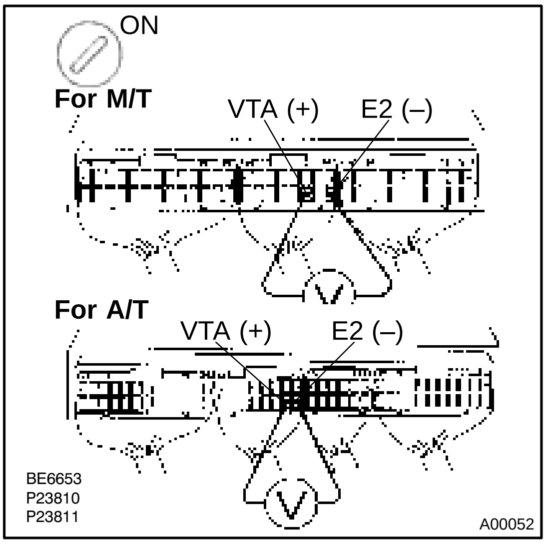
OK:

Terminals	Throttle valve	Resistance
1 – 4	—	2.5 – 5.9 kΩ
2 – 4	Fully closed	0.2 – 5.7 kΩ
2 – 4	Fully open	2.0 – 10.2 kΩ

NG	**Replace throttle position sensor.**

OK

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



PREPARATION:
(a) Remove the right cowl side trim (See page SF–50).
(b) Turn the ignition switch ON.
CHECK:
Measure voltage between terminals VTA and E2 of ECM connector.
OK:

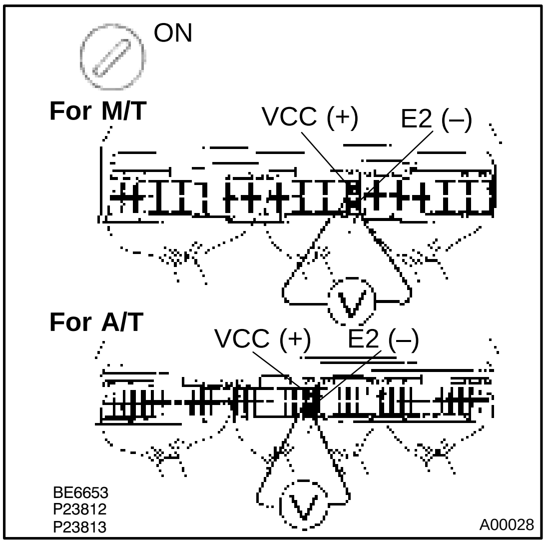
Throttle valve	Voltage
Fully closed	0.3 – 0.8 V
Fully open	2.7 – 5.2 V

NG → **Check for open and short in harness and connector between ECM and throttle position sensor (VTA line) (See page IN–24).**

OK

Check and replace ECM (See page IN–24).

5	Check voltage between terminals VCC and E2 of ECM connector.



PREPARATION:
(a) Remove the right cowl side trim (See page SF–50).
(b) Turn the ignition switch ON.
CHECK:
Measure voltage between terminals VCC and E2 of ECM connector.
OK:
Voltage: 4.5 – 5.5 V

NG → **Check and replace ECM (See page IN–24).**

OK

Check for open in harness and connector between ECM and sensor (VCC line) (See page IN–24).

DI0TI–01

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

CIRCUIT DESCRIPTION

Refer to DTC P0120 on page DI–39.

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

INSPECTION PROCEDURE

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

YES → **Go to relevant DTC chart.**

NO ↓

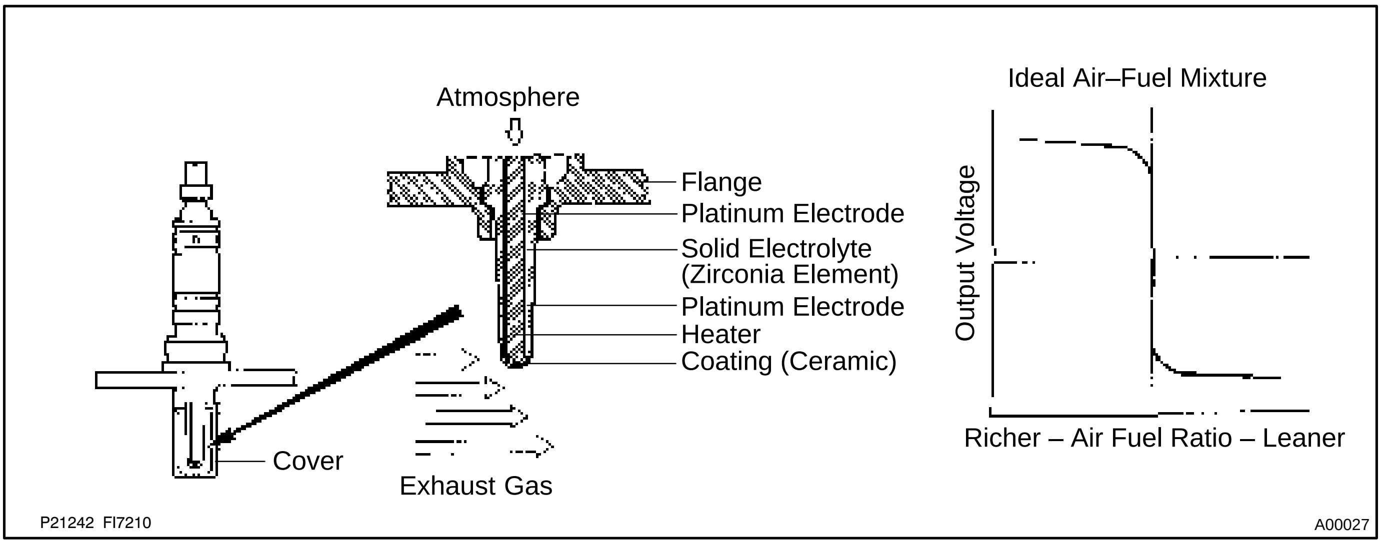
Replace throttle position sensor.

DI0TJ–02

DTC	P0125	Insufficient Coolant Temp. for Closed Loop Fuel Control

CIRCUIT DESCRIPTION

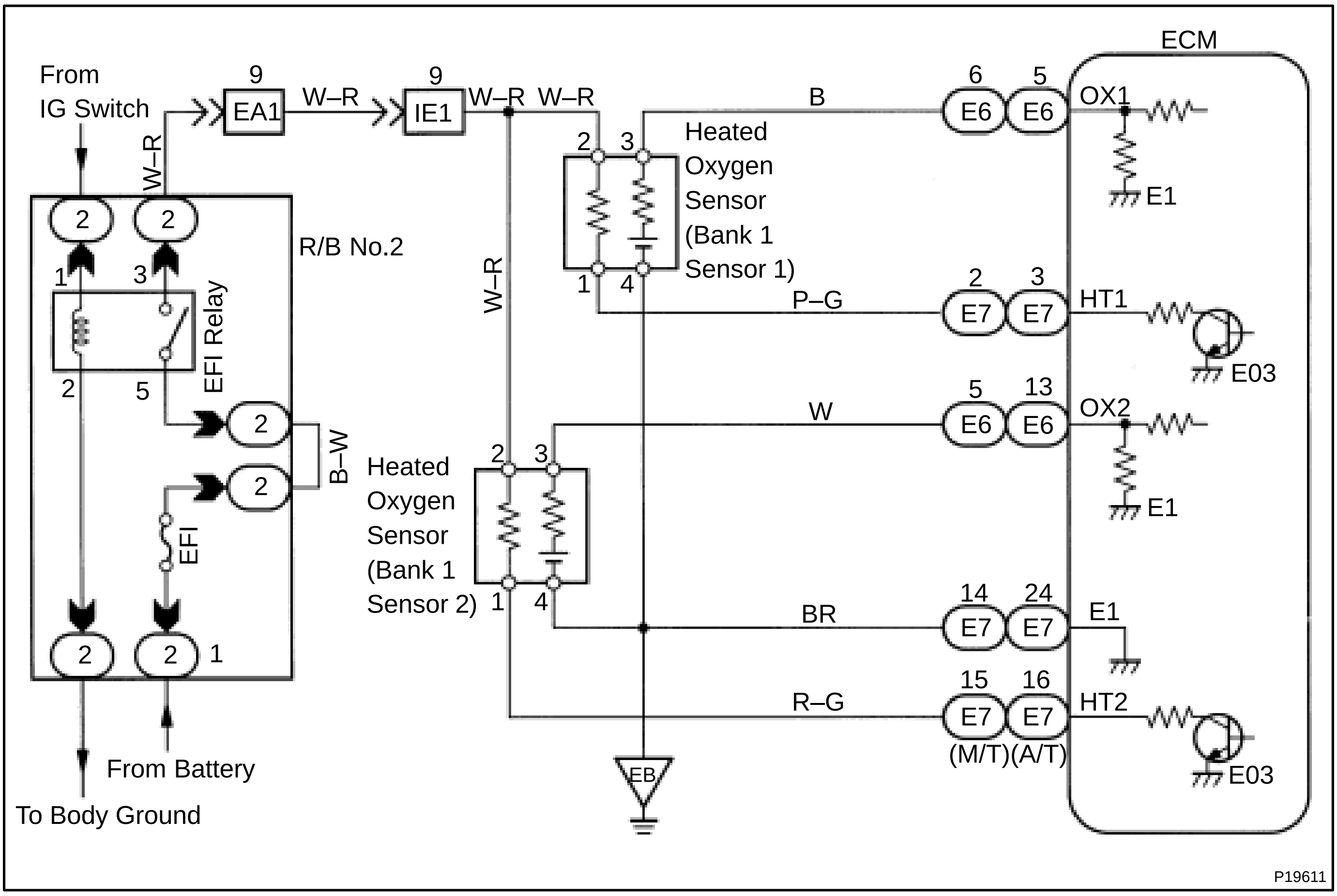
To obtain a high purification rate for the CO, HC and NOx components of the exhaust gas, a three–way catalytic converter is used, but for the most efficient use of the three–way catalytic converter, the air–fuel ratio must be precisely controlled so that it is always close to the stoichiometric air–fuel ratio.
The oxygen sensor has the characteristic where by its output voltage changes suddenly in the vicinity of the stoichiometric air–fuel ratio. This is used to detect the oxygen concentration in the exhaust gas and provide feedback to the computer for control of the air–fuel ratio.
When the air–fuel ratio becomes LEAN, the oxygen concentration in the exhaust increases and the oxygen sensor informs the ECM of the LEAN condition (small electromotive force: 0 V).
When the air–fuel ratio is RICHER than the stoichiometric air–fuel ratio the oxygen concentration in the exhaust gas is reduced and the oxygen sensor informs the ECM of the RICH condition (large electromotive force: 1 V). The ECM judges by the electromotive force from the oxygen sensor whether the air–fuel ratio is RICH or LEAN and controls the injection time accordingly. However, if malfunction of the oxygen sensor causes output of abnormal electromotive force, the ECM is unable to perform accurate air–fuel ratio control.
The 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 Detecting Condition	Trouble Area
P0125	After engine is warmed up, heated oxygen sensor output does not indicate RICH even once when conditions (a), (b), (c) and (d) continue for at least 1.5 min.: (a) Engine speed: 1,500 rpm or more (b) Vehicle speed: 40 ~ 100 km/h (25 ~ 62 mph) (c) Closed throttle position switch: OFF (d) 140 sec. or more after starting engine	●Open or short in heated oxygen sensor (bank 1 sensor 1) circuit ●Heated oxygen sensor (bank 1 sensor 1)

HINT:
After confirming DTC P0125 use the OBD II scan tool or TOYOTA hand–held tester to confirm voltage output of heated oxygen sensor from ”CURRENT DATA”.
If voltage output of heated oxygen sensor is 0 V, heated oxygen sensor circuit may be open or short.

WIRING DIAGRAM



INSPECTION PROCEDURE

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

CHECK:

Read voltage output of heated oxygen sensor (bank 1 sensor 1) when engine is suddenly raced.

HINT:

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

OK:

Heated oxygen sensor (bank 1 sensor 1) output a RICH signal (0.45 V or more) at least once

OK	Check and replace ECM (See page IN–24).

NG

2	**Check for open and short in harness and connector between ECM and heated oxygen sensor (bank 1 sensor 1) (See page IN–24).**

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

OK

Replace heated oxygen sensor (bank 1 sensor 1).

DI0TK–02

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

CIRCUIT DESCRIPTION

Refer to DTC P0125 on page DI–44.

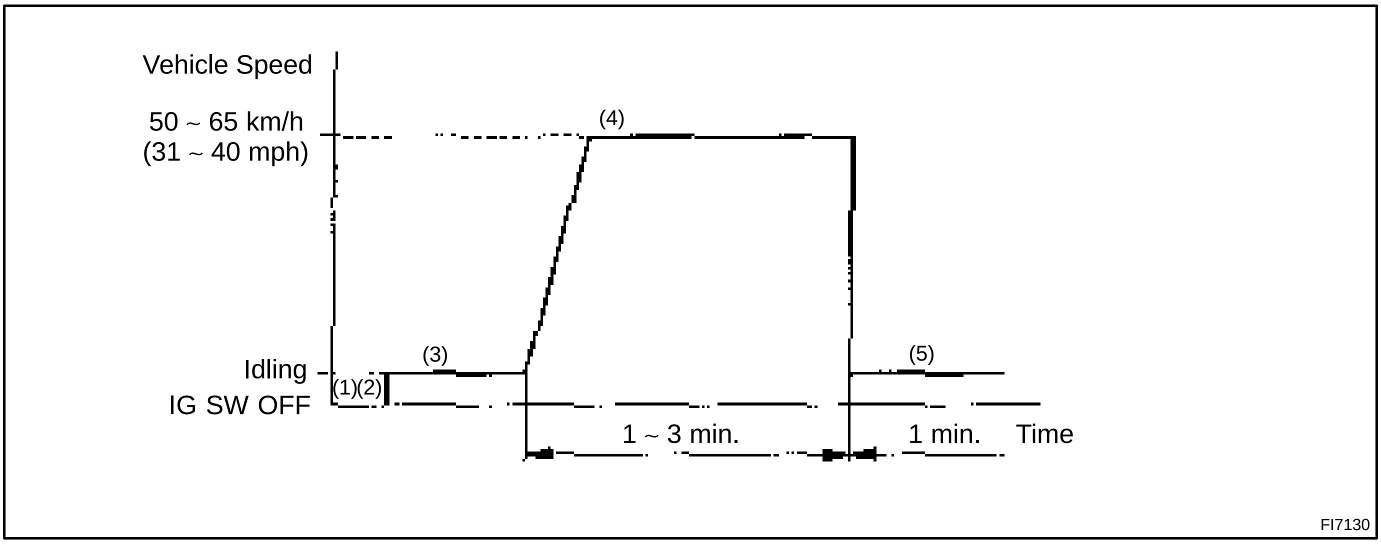
DTC No.	Detection ItemDTC Detecting Condition	Trouble AreaTrouble Area
P0130	Voltage output of heated oxygen sensor remains at 0.4 V or more or 0.55 V or less, during idling after engine is warmed up (2 trip detection logic)	●Heated oxygen sensor ●Fuel trim malfunction

HINT:
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–44.

CONFIRMATION DRIVING PATTERN



(1) Connect the TOYOTA hand–held tester to the DLC3.
(2) Switch the TOYOTA hand–held tester from normal mode to check mode (See page DI–13).
(3) Start the engine and warm it up with all the accessory switches OFF.
(4) Drive the vehicle at 50 – 65 km/h (31 – 40 mph) for 1 – 3 min. to warm up the heated oxygen sensor.
(5) Let the engine idle for 1 min.
HINT:
If a malfunction exists, the MIL will light up during step (5).
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 (3) to (5), then perform steps (3) to (5) again.

INSPECTION PROCEDURE

1	Check for open and short in harness and connector between ECM and heated oxygen sensor (See page IN–24).

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

OK

2	Check for heated oxygen sensor data.

PREPARATION:

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

(b) Warm up the engine to normal operating temp.

CHECK:

Read heated oxygen sensor output voltage and short–term fuel trim.

HINT:

Read the values for the same bank.

RESULT:

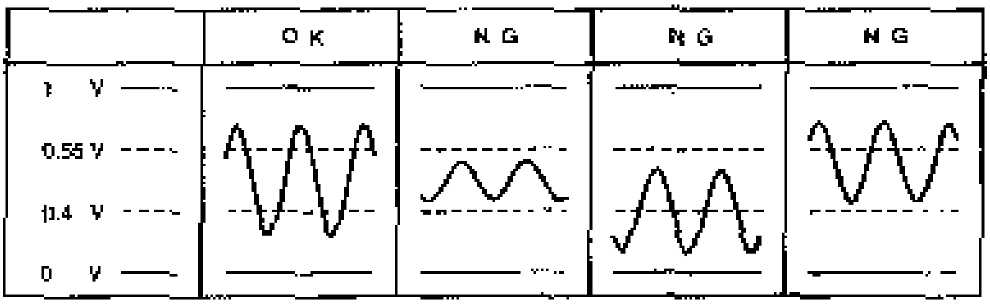
Pattern	Heated oxygen sensor output voltage	Short–term fuel trim
1	Lean condition (Changes at 0.55 V or less)	Changes at about + 20 %
2	Rich condition (Changes at 0.4 V or more)	Changes at about – 20 %
3	Except 1 and 2	

1, 2 → **Check fuel trim system (See page DI–55).**

3

3	Check output voltage of heated oxygen sensor during idling.

PREPARATION:
Warm up the heated oxygen sensor with the engine at 2,500 rpm for approx. 90 sec.
CHECK:
Use the OBD II scan tool or TOYOTA hand–held tester 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.**

NG ↓

Replace heated oxygen sensor.

DI0TL–01

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

CIRCUIT DESCRIPTION

Refer to DTC P0125 on page DI–44.

DTC No.	DTC Detecting Condition	Trouble Area
P0133	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)	●Heated oxygen sensor

HINT:

Sensor 1 refers to the sensor closer to the engine body.

INSPECTION PROCEDURE

1	**Are there any other codes (besides DTC P0133) being output?**

YES → **Go to relevant DTC chart.**

NO

Replace heated oxygen sensor.

DI0TM–02

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

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

CIRCUIT DESCRIPTION

Refer to DTC P0125 on page DI–44.

DTC No.	DTC Detecting Condition	Trouble Area
P0135 P0141	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)	

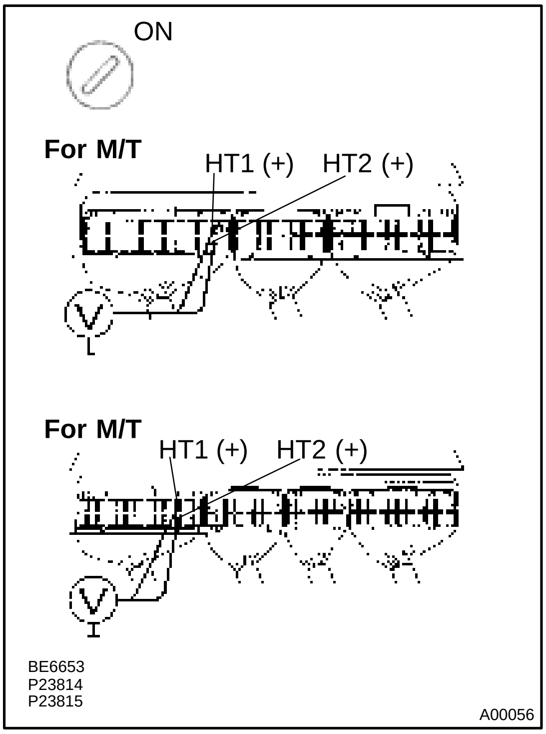
HINT:
- Sensor 1 refers to the sensor closer to the engine body.
- Sensor 2 refers to the sensor farther away from the engine body.

WIRING DIAGRAM

Refer to DTC P0125 on page DI–44.

INSPECTION PROCEDURE

1	**Check voltage between terminals HT1, HT2 of ECM connector and body ground.**



PREPARATION:

(a) Remove the right cowl side trim (See page SF–50).

(b) Turn the ignition switch ON.

CHECK:

Measure voltage between terminals HT1, HT2 of ECM connector and body ground.

HINT:

- Connect terminal HT1 to bank 1 sensor 1.
- Connect terminal HT2 to bank 1 sensor 2.

OK:

Voltage: 9 – 14 V

OK → **Check and replace ECM (See page IN–24).**

NG

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

NG → **Replace heated oxygen sensor.**

OK

Check and repair harness or connector between EFI main relay, heated oxygen sensor and ECM.

DI0TN–02

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

CIRCUIT DESCRIPTION

Refer to DTC P0125 on page DI–44.

DTC No.	DTC Detecting Condition	Trouble Area
P0136	Voltage output of heated oxygen sensor (bank 1 Sensor 2) remains at 0.4 V or more or 0.5 V or less when vehicle is driven at 50 km/h (31 mph) or more after engine is warmed up (2 trip detection logic)	●Heated oxygen sensor

HINT:
Sensor 2 refers to the sensor farther away from the engine body.

WIRING DIAGRAM

Refer to DTC P0125 on page DI–44.

INSPECTION PROCEDURE

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

YES → **Go to relevant DTC chart.**

NO

2	Check for open and short in harness and connector between ECM and heated oxygen sensor (See page IN–24).

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

OK

3	**Check output voltage of heated oxygen sensor (bank 1 sensor 2).**

PREPARATION:

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

(b) Warm up the engine to normal operating temp.

CHECK:

Read voltage output of the heated oxygen sensor (bank 1 sensor 2) when the engine suddenly raced.

HINT:

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

OK:

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

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

NG

Replace heated oxygen sensor.

DI0TO–02

DTC	P0171	System too Lean (Fuel Trim)

DTC	P0172	System too Rich (Fuel Trim)

CIRCUIT DESCRIPTION

Fuel trim refers to the feedback compensation value compared against the basic injection time. Fuel trim includes short–term fuel trim and long–term fuel trim.
Short–term fuel trim is the short–term fuel compensation used to maintain the air–fuel ratio at its ideal theoretical value. The signal from the heated oxygen sensor indicates whether the air–fuel ratio is RICH or LEAN compared to the ideal theoretical value, triggering a reduction in fuel volume if the air–fuel ratio is rich, and an increase in fuel volume if it is lean.
Long–term fuel trim is overall fuel compensation carried out long–term to compensate for continual deviation of the short–term fuel trim from the central value due to individual engine differences, wear over time and changes in the usage environment.
If both the short–term fuel trim and long–term fuel trim are LEAN or RICH beyond a certain value, it is detected as a malfunction and the MIL lights up.

DTC No.	DTC Detecting Condition	Trouble Area
P0171	When air fuel ratio feedback is stable after engine warming up, fuel trim is considerably in error on RICH side (2 trip detection logic)	●Air intake (hose loose) ●Fuel line pressure ●Injector blockage ●Heated oxygen sensor (bank 1 sensor 1) malfunction ●Mass air flow meter ●Engine coolant temp. sensor
P0172	When air fuel ratio feedback is stable after engine warming up, fuel trim is considerably in error on LEAN side (2 trip detection logic)	●Fuel line pressure ●Injector leak, blockage ●Heated oxygen sensor (bank 1 sensor 1) malfunction ●Mass air flow meter ●Engine coolant temp. sensor

HINT:

- When the DTC P0171 is recorded, the actual air–fuel ratio is on the LEAN side. When DTC P0172 is recorded, the actual air–fuel ratio is on the RICH side.
- If the vehicle runs out of fuel, the air–fuel ratio is LEAN and DTC P0171 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 ± 25 %, the system is functioning normally.

INSPECTION PROCEDURE

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

NG → **Repair or replace.**

OK

2	Check for heated oxygen sensor (bank 1 sensor 1) data.

PREPARATION:
(a) Connect the OBD II scan tool or TOYOTA hand–held tester to the DLC3.
(b) Warm up the engine to normal operating temp.
CHECK:
Read heated oxygen sensor output voltage and short–term fuel trim.
RESULT:

Pattern	Heated oxygen sensor output voltage	Short–term fuel trim
1	Lean condition (Changes at 0.55 V or less)	Changes at about + 20 %
2	Rich condition (Changes at 0.4 V or more)	Changes at about – 20 %
3	Except 1 and 2	

3 → **Check for heated oxygen sensor (bank 1 sensor 1) (See page SF–49).**

1, 2

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

NG → **Check and repair fuel pump, pressure regulator, fuel pipe line and filter (See page SF–10).**

OK

4	Check injector injection (See page SF–16).

NG → **Replace injector.**

OK

5	**Check mass air flow meter and engine coolant temp. sensor (See page DI–22,DI–33).**

NG → **Repair or replace.**

OK

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

NG → **Repair or replace.**

OK

Check and replace ECM (See page IN–24).

DI0TP–02

DTC	P0300	Random/Multiple Cylinder Misfire Detected

DTC	P0301	Cylinder 1 Misfire Detected

DTC	P0302	Cylinder 2 Misfire Detected

DTC	P0303	Cylinder 3 Misfire Detected

DTC	P0304	Cylinder 4 Misfire Detected

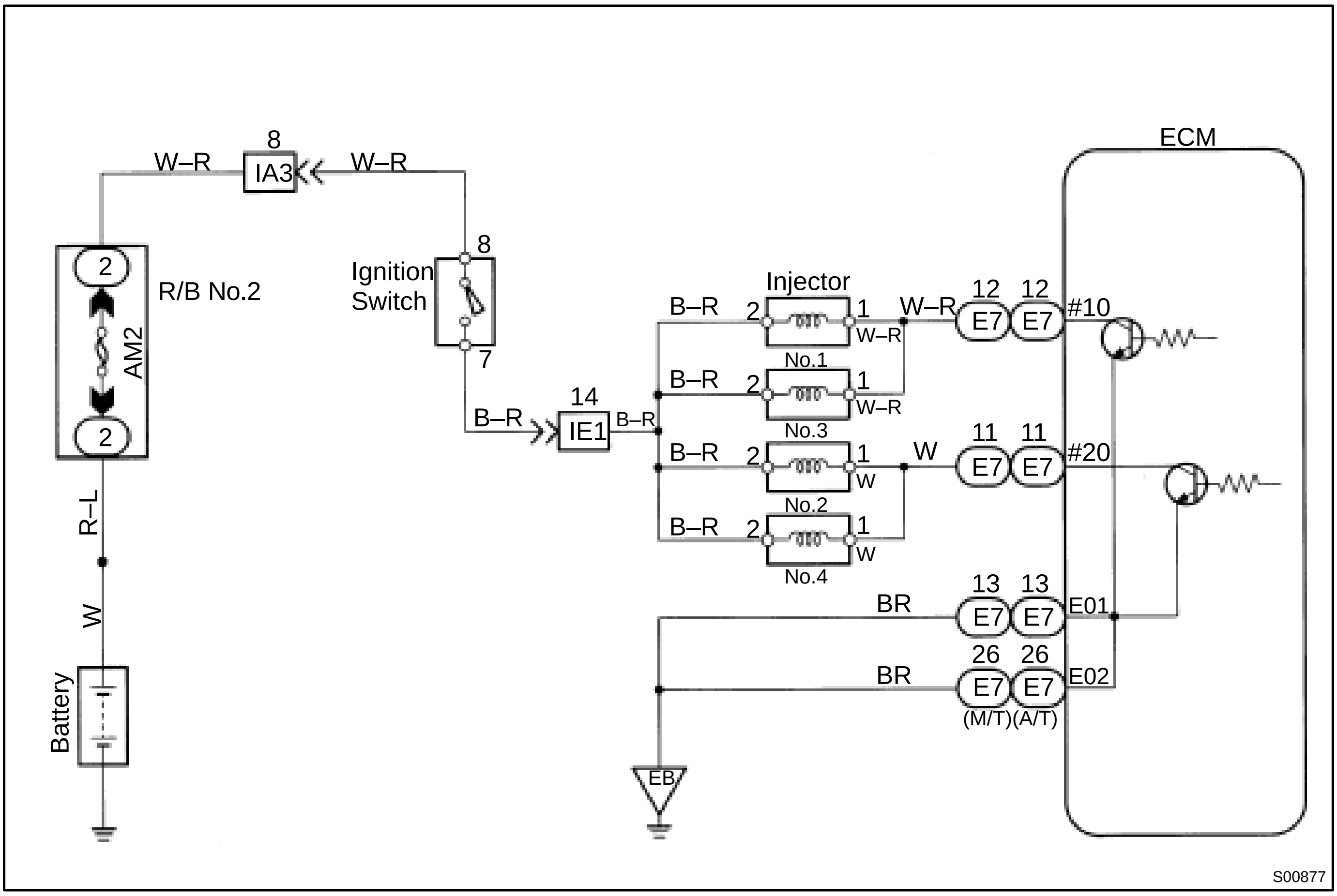
CIRCUIT DESCRIPTION

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 the engine speed change rate indicates 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 will cause catalyst overheating, the MIL blinks when misfiring occurs.

DTC No.	DTC Detecting Condition	Trouble Area
P0300	Misfiring of random cylinders is detected during any particular 200 or 1,000 revolutions	●Ignition system ●Injector ●Fuel line pressure ●EGR ●Compression pressure ●Valve clearance not to specification ●Valve timing ●Mass air flow meter ●Engine coolant temp. sensor
P0301 P0302 P0303 P0304	For any particular 200 revolutions for engine, misfiring is detected which can cause catalyst overheating (This causes MIL to blink)	
	For any particular 1,000 revolutions for engine, misfiring is detected which causes a deterioration in emissions (2 trip detection logic)	

HINT:
When the 2 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

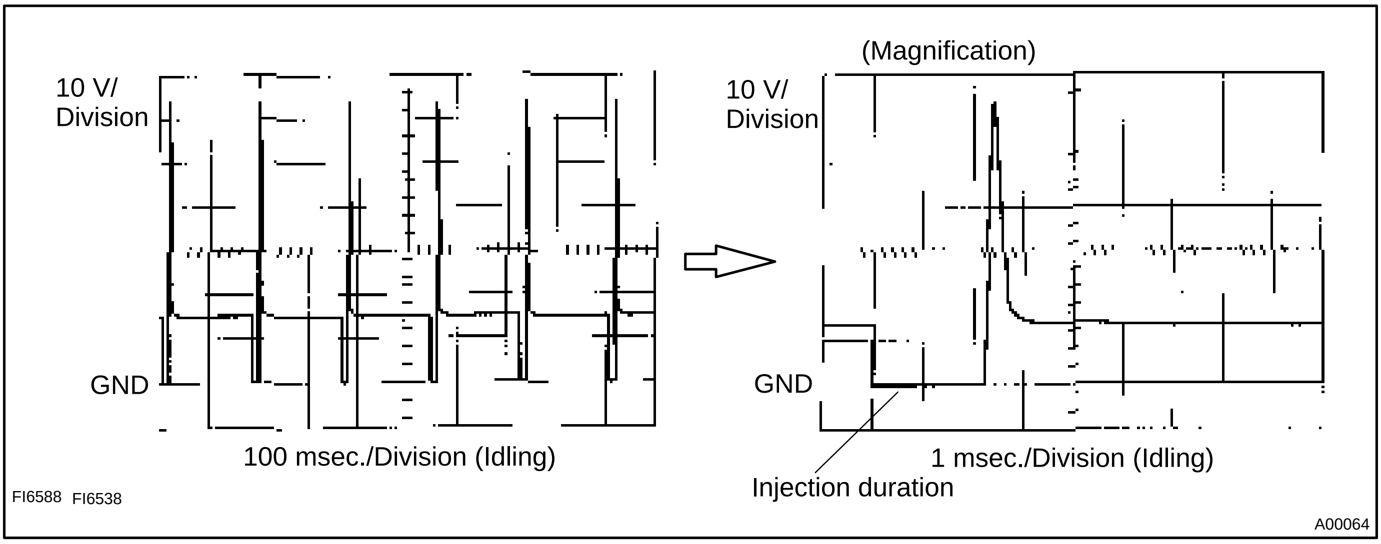


Reference: INSPECTION USING OSCILLOSCOPE
INJECTOR SIGNAL WAVEFORM

With the engine idling, measure between terminals #10, #20 and E01 of ECM.

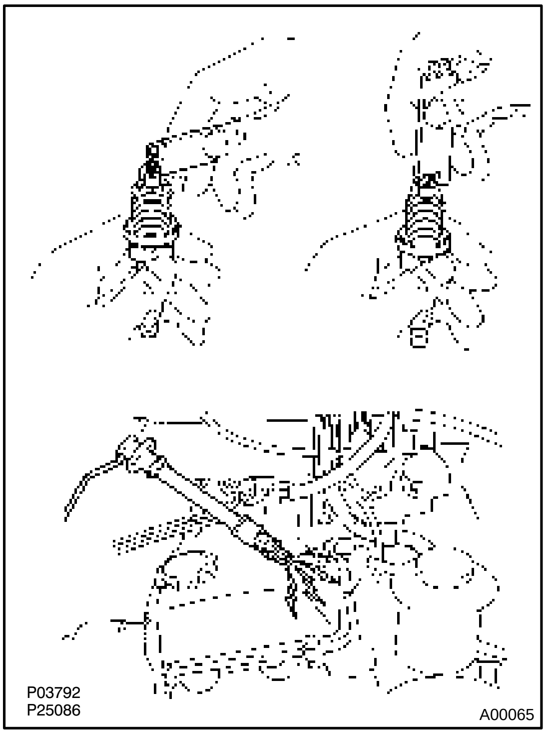
HINT:

The correct waveform is as shown.



INSPECTION PROCEDURE

1	Check spark plug and spark of misfiring cylinder.



PREPARATION:
(a) Disconnect the high–tension cord.
(b) Remove the spark plug.

CHECK:
(a) Check the carbon deposits electrode.
(b) Check the electrode gap.

OK:
(1) No large carbon deposit present. Not wet with gasoline or oil.
(2) Electrode gap: 0.8 mm (0.031 in.).

PREPARATION:
(a) Install the spark plug to the high–tension code.
(b) Disconnect the injector connector.
(c) Ground the spark plug.

CHECK:
Check if the spark occurs while the engine is being craked.

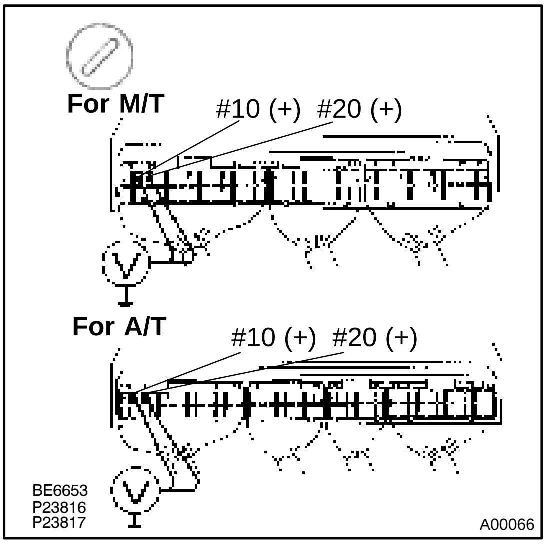
NOTICE:
To prevent excess fuel being injected from the injectors during this test, don't crank the engine for more than 5 – 10 seconds at a time.

OK:
Spark jumps across electrode gap.

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

OK

2	Check voltage of ECM terminal for injector of failed cylinder.



PREPARATION:
(a) Remove the right cowl side trim (See page SF–50).
(b) Turn the ignition switch ON.

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

OK:
Voltage: 9 – 14 V

OK → **Go to step 4.**

NG ↓

3	Check resistance of injector of misfiring cylinder (See page SF–16).

NG → **Replace injector.**

OK ↓

Check for open and short in harness and connector between injector and ECM (See page IN–24).

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

NG → **Check and repair fuel pump, pressure regulator, fuel pipe line and filter (See page SF–10).**

OK ↓

5	Check injector injection (See page SF–16).

NG → **Replace injector.**

OK

6	Check EGR system (See page EC–7).

NG → **Repair EGR system.**

OK

7	Check mass air flow meter and engine coolant temp. sensor (See page DI–22, DI–33).

NG → **Repair or replace.**

OK

Check compression pressure, valve clearance and valve timing.

DI0TQ–02

DTC	P0325	Knock Sensor 1 Circuit Malfunction

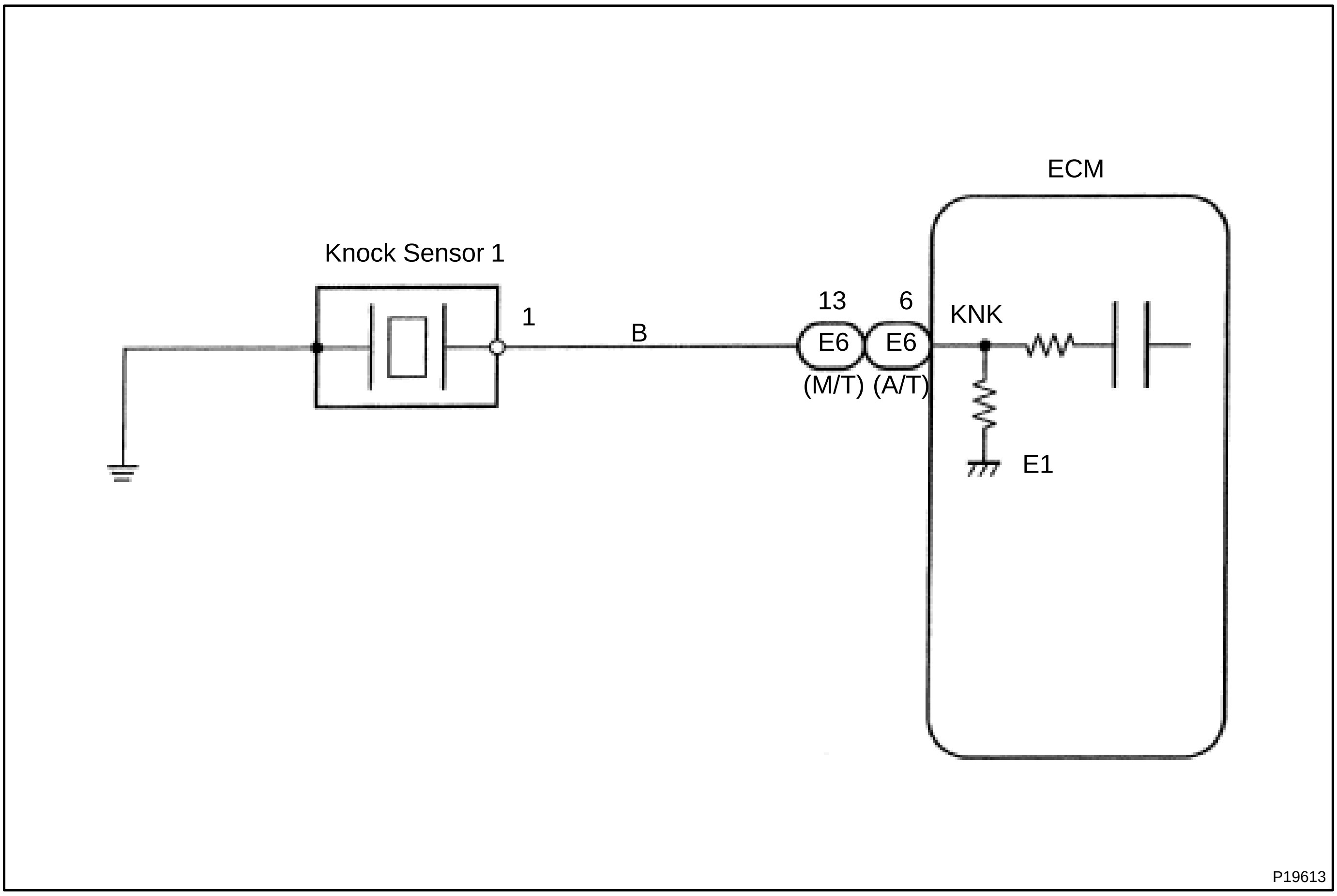
CIRCUIT DESCRIPTION

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

DTC No.	DTC Detecting Condition	Trouble Area
P0325	No knock sensor 1 signal to ECM with engine speed 1,200 rpm or more	●Open or short in knock sensor 1 circuit ●Knock sensor 1 (looseness) ●ECM

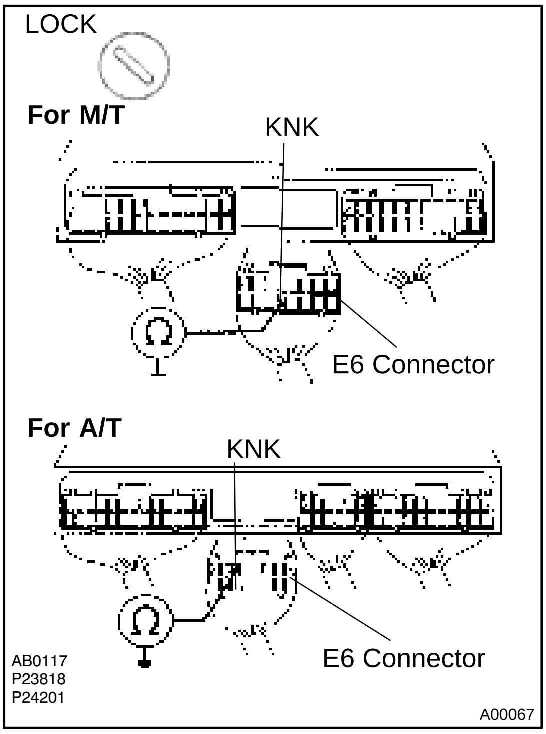
If the ECM detects the above diagnosis conditions, it operates the fail safe function in which the corrective retard angle value is set to the maximum value.

WIRING DIAGRAM



INSPECTION PROCEDURE

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



PREPARATION:

(a) Remove the right cowl side trim (See page EG–146).

(b) Disconnect the E6 connector of ECM.

CHECK:

Measure resistance between terminal KNK of ECM connector and body ground.

OK:

Resistance: 1 MΩ or higher

OK → **Go to step 3.**

NG ↓

2	Check knock sensor (See page SF–46.).

NG → **Replace knock sensor.**

OK ↓

3	Check for open and short in harness and connector between ECM and knock sensor (See page IN–24).

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

OK ↓

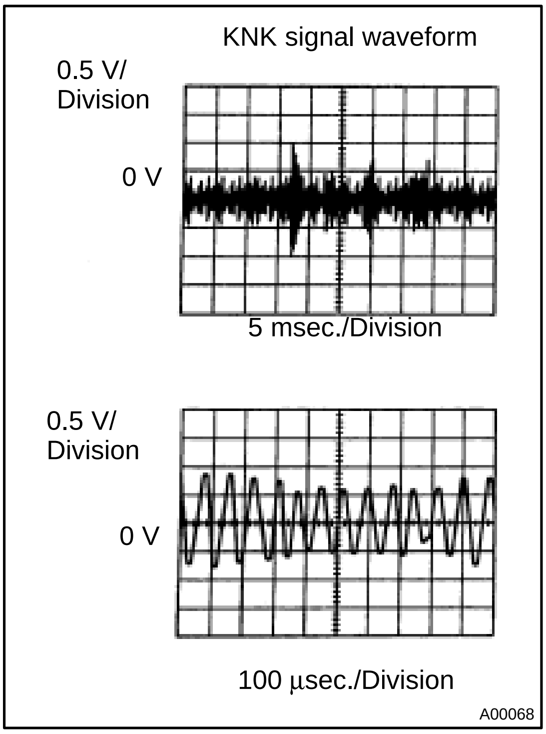
4	Does malfunction disappear when a good knock sensor is installed?

YES → **Replace knock sensor.**

NO

Check and replace ECM (See page IN–24).

Reference: INSPECTION USING OSCILLOSCOPE



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

HINT:
The correct waveform is as shown.

- Spread the time on the horizontal axis, and confirm that period of the wave is 151 µsec.
  (Normal mode vibration frequency of knock sensor: 6.6 kHz).

HINT:
If normal mode vibration frequency is not 6.6 kHz the sensor is malfunctioning.

DI0TR–02

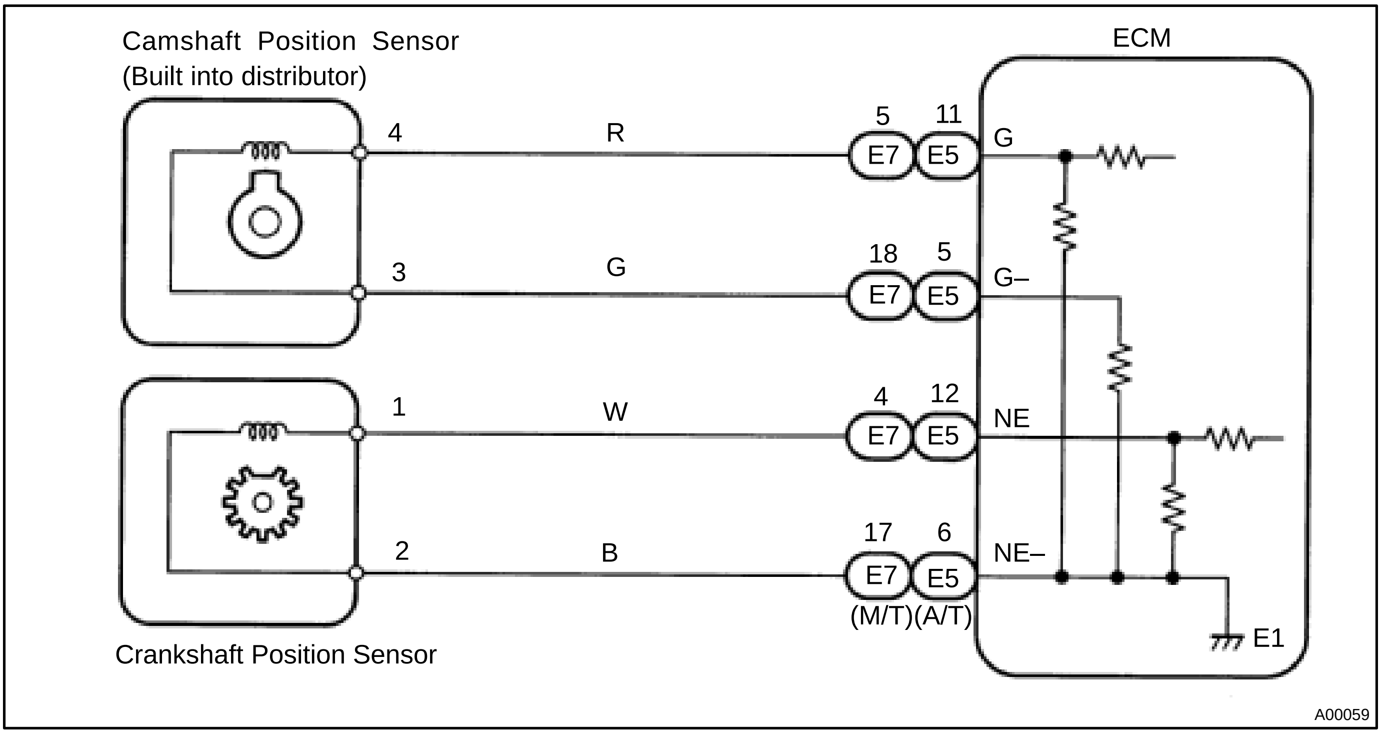
DTC	P0335	Crankshaft Position Sensor ”A” Circuit Malfunction

CIRCUIT DESCRIPTION

Crankshaft position sensor (NE signal) consist of a signal plate and pickup coil.
The NE signal plate has 34 teeth and is mounted on the crankshaft. The NE signal sensor generates 34 signals of every engine revolution. The ECM detects the standard crankshaft angle based on the G signals, and the actual crankshaft angle the engine speed by the NE signals.

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

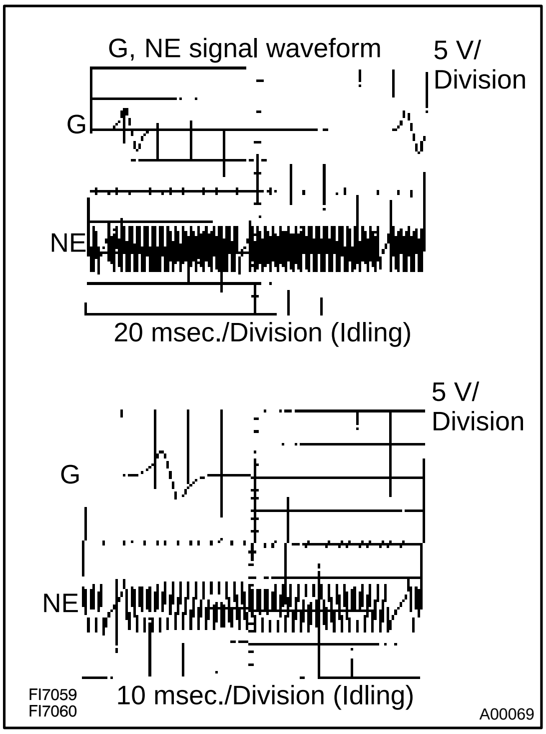
WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check resistance of crankshaft position sensor (See page IG–13).

Reference: INSPECTION USING OSCILLOSCOPE



During cranking or idling, check between terminals G and G–, NE and NE– of ECM

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–24).

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

OK

3	Inspect sensor installation and teeth of signal plate.

NG → **Tighten the sensor. Replace signal plate.**

OK

Check and replace ECM (See page IN–24).

DI0TS–02

DTC	P0336	Crankshaft Position Sensor ”A” Circuit Range/Performance

CIRCUIT DESCRIPTION

Refer to DTC P0335 on page DI–66.
If the ECM records the DTC P0336, it operates the fail safe function, stopping the fuel injection.

DTC No.	DTC Detecting Condition	Trouble Area
P0336	Deviation on crankshaft position sensor signal and camshaft position sensor signal	●Valve timing ●Distributor installation ●ECM

INSPECTION PROCEDURE

1	Check valve timing (See page EM–36).

NG → **Adjust valve timing.**

OK ↓

2	Check distributor installation (See page EM–5).

NG → **Reinstall distributor.**

OK ↓

Check and replace ECM (See page IN–24).

DI0TT–02

DTC	P0340	Camshaft Position Sensor Circuit Malfunction

CIRCUIT DESCRIPTION

Camshaft position sensor (G signal) consist of signal plate and pickup coil. The G signal plate has one tooth on its outer circumference and is built into the distributor.
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 has 34 teeth and is mounted on the crankshaft. The NE signal sensor generates 34 signals for every engine revolution. The ECM detects the standard crankshaft angle based on the G signals and the actual crankshaft angle and the engine speed by the NE signals.

DTC No.	DTC Detecting Condition	Trouble Area
P0340	No camshaft position sensor signal to ECM during cranking (2 trip detection logic) No camshaft position sensor signal to ECM during engine running	●Open or short in camshaft position sensor circuit ●Camshaft position sensor ●Distributor ●Starter ●ECM

WIRING DIAGRAM

Refer to DTC P0335 on page DI–66.

INSPECTION PROCEDURE

1	Check resistance of camshaft position sensor (See page EM–3).

Reference: INSPECTION USING OSCILLOSCOPE

Refer to DTC P0335 on page DI–66.

NG → **Replace distributor housing.**

OK

2	Check for open and short in harness and connector between ECM and distributor (See page IN–24).

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

OK

3	Check air gap (See page EM–1).

NG → **Replace distributor housing.**

OK ↓

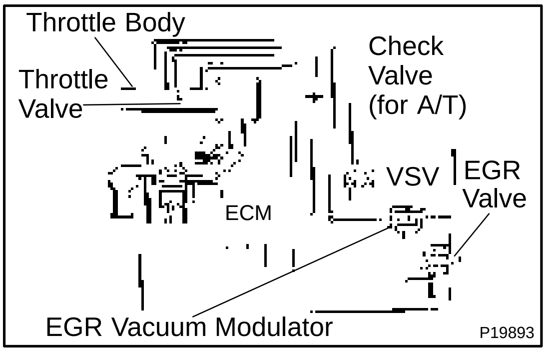
Check and replace ECM (See page IN–24).

DI0TU–02

DTC	P0401	Exhaust Gas Recirculation Flow Insufficient Detected

CIRCUIT DESCRIPTION

The EGR system recirculates exhaust gas, which is controlled to the proper quantity to suit the driving conditions, into the intake air mixture to slow down combustion, reduce the combustion temp. and reduce NOx emissions. The amount of EGR is regulated by the EGR vacuum modulator according to the engine load.

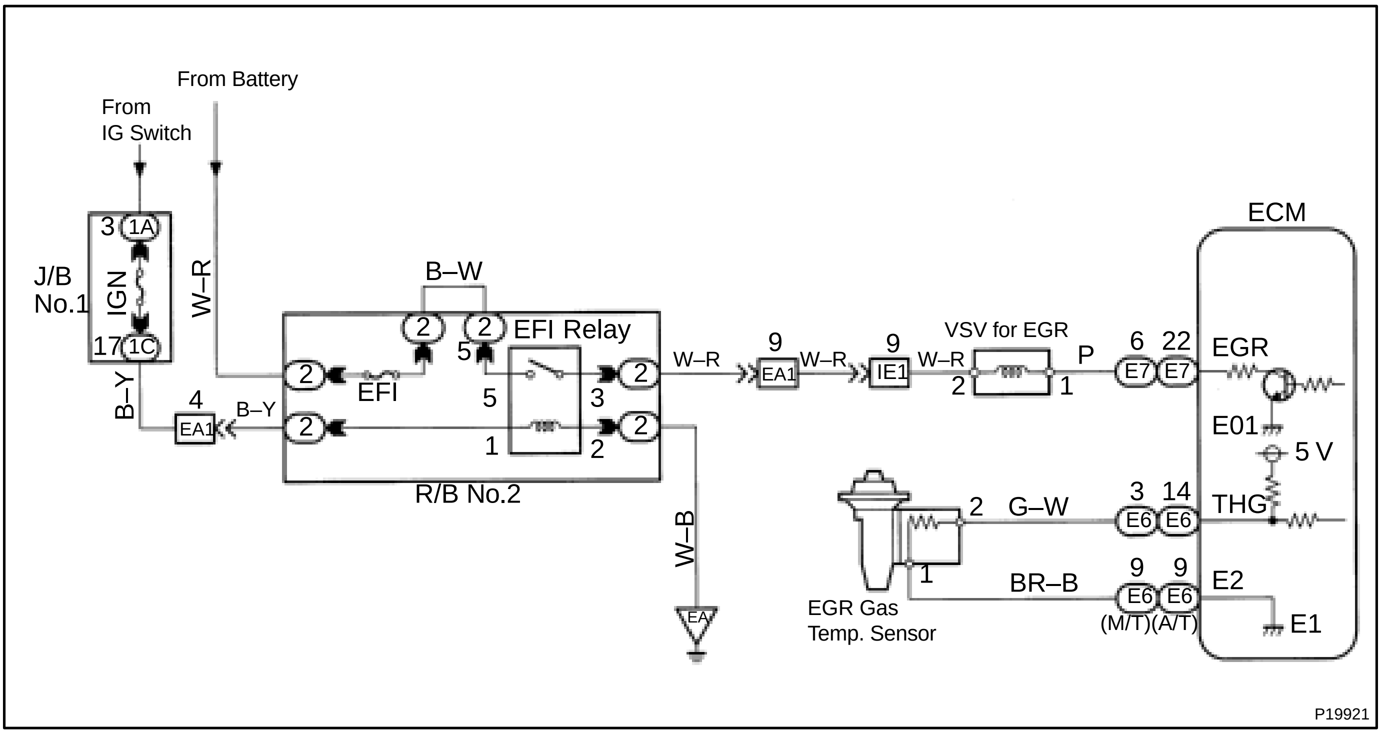


If even one of the following conditions is fulfilled, the VSV is turned ON by a signal from the ECM.
This results in atmospheric air acting on the EGR valve, closing the EGR valve and shutting off the exhaust gas (EGR cut–off).
Under the following conditions, EGR is cut to maintain driveability:

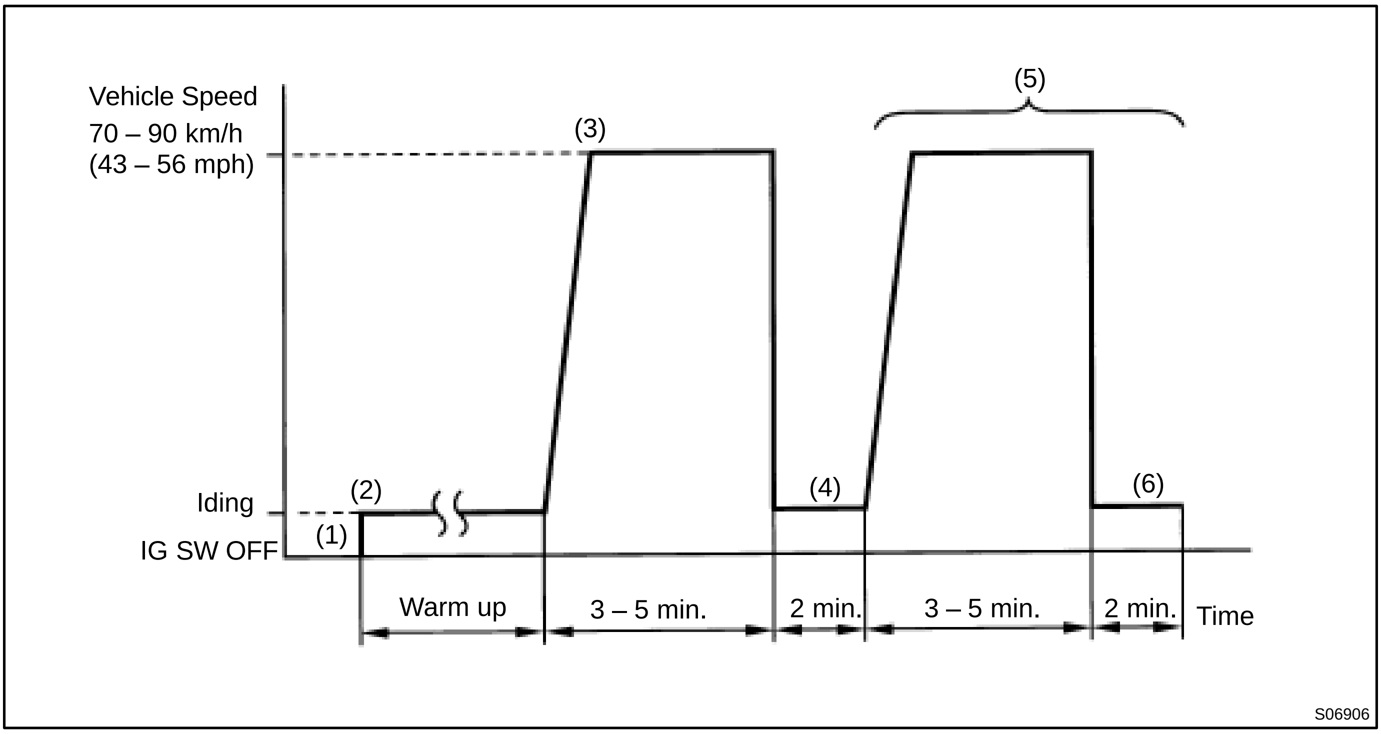
- Before the engine is warmed up
- During deceleration (throttle valve closed)
- Light engine load (amount of intake air very small)
- Engine racing

DTC No.	DTC Detecting Condition	Trouble Area
P0401	After engine is warmed up and run at 80 km/h (50 mph) for 3 to 5 min., EGR gas temp. sensor value does not exceed 35˚C (95˚F) above ambient air temp. (2 trip detection logic)	•EGR valve stuck closed •Short in VSV circuit for EGR •Open in EGR gas temp. sensor circuit •EGR hose disconnected •ECM

WIRING DIAGRAM



SYSTEM CHECK DRIVING PATTERN



(1) Connect the OBD II scan tool or TOYOTA hand–held tester to the DLC3.
(2) Start and warm up the engine with all the accessories switched OFF.
(3) Run the vehicle at 70 – 90 km/h (43 – 56 mph) for 3 min. or more.
(4) Idle the engine for about 2 min.
(5) Do steps (3) and (4) again.
(6) Check the ”READINESS TESTS” mode on the OBD II scan tool or TOYOTA hand–held tester.
If ”COMPL” is displayed and the MIL does not light up, the system is normal.
If ”INCMPL” is displayed and the MIL does not light up, run the vehicle step (5) from somes times and check it.
HINT:
”INCMPL” is displayed when either condition (a) or (b) exists.
(a) The system check is incomplete.
(b) There is a malfunction in the system.
If there is a malfunction in the system, the MIL will light up after steps (2) to (5) above are done.

INSPECTION PROCEDURE
TOYOTA hand–held tester:

1	**Connect TOYOTA hand–held tester and read value of EGR gas temp. value.**

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 EGR gas temp. on the TOYOTA hand–held tester.

OK:

EGR gas temp.: 10˚C (50˚F) or more

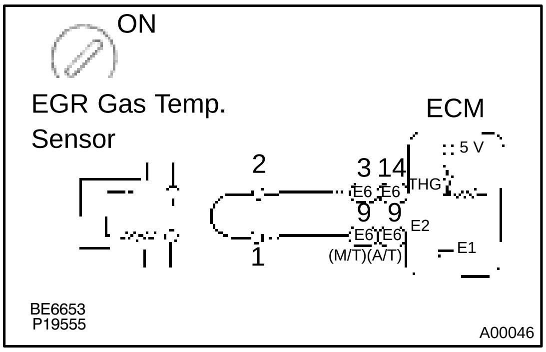
HINT:

If there is an open circuit, the TOYOTA hand–held tester indicates 3.1˚C (37.6˚F).

OK → **Go to step 4.**

NG

2	**Check for open in harness or ECM.**



PREPARATION:

(a) Disconnect the EGR gas temp. sensor connector.

(b) Connect the sensor wire harness terminals together.

(c) Turn the ignition switch ON.

CHECK:

Read EGR gas temp. on the TOYOTA hand–held tester.

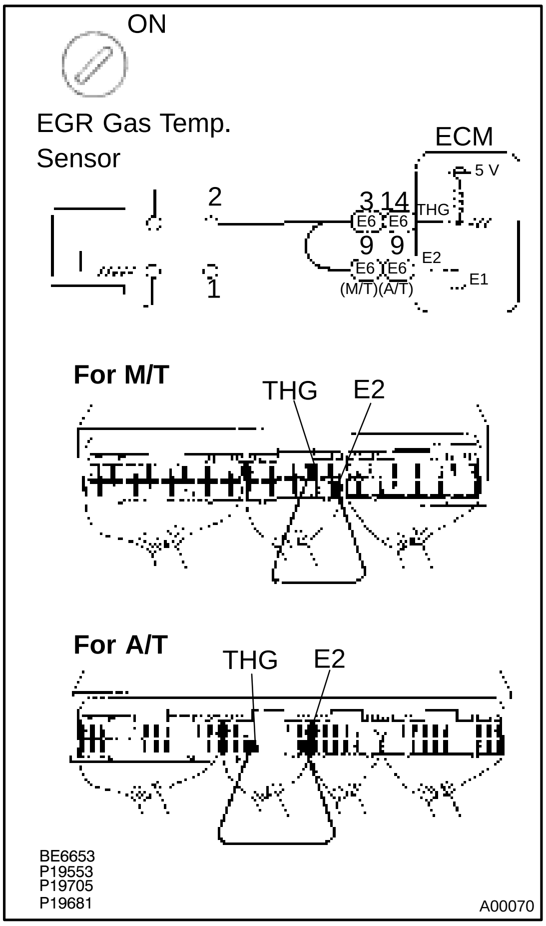
OK:

EGR gas temp.: 159.3˚C (318.7˚F)

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

NG

3	Check for open in harness or ECM.



PREPARATION:

(a) Remove the right cowl side trim (See page SF–50).

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

HINT:

The EGR gas temp. sensor connector is disconnected. Before checking, do a visual check and contact pressure check for the ECM connector (See page IN–24).

CHECK:

Read EGR gas temp. on the TOYOTA hand–held tester.

OK:

EGR gas temp.: 159.3°C (318.7°F)

OK	Open in harness between terminals E2 or THG. Repair or replace harness.

NG

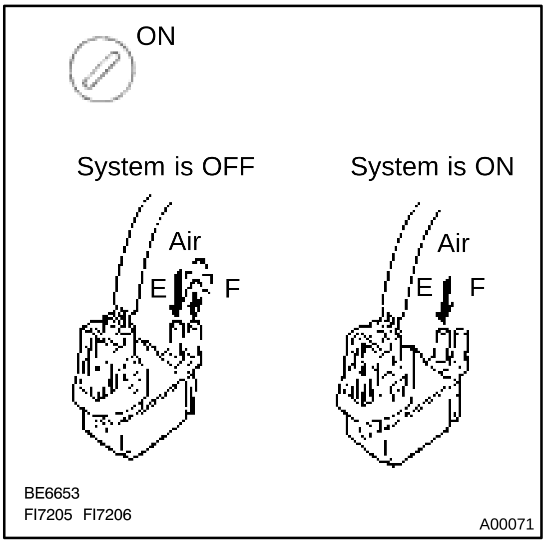
Confirm connection at ECM.
If OK, replace ECM.

4	Check connection of vacuum hose and EGR hose (See page EC–2).

NG	Repair or replace.

OK

5	Check VSV for EGR.



PREPARATION:
Select the "ACTIVE TEST" mode on the TOYOTA hand–held tester.

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

OK:

EGR system is OFF:
Air flows from port E to port F.
EGR system is ON:
Air does not flow from port E to port F.

OK → **Go to step 7.**

NG ↓

6	Check operation of VSV for EGR (See page SF–43).

NG → **Replace VSV for EGR.**

OK ↓

Check for short in harness and connector between VSV and ECM (See page IN–24).

7	Check EGR vacuum modulator (See page SF–43).

NG → **Repair or replace.**

OK ↓

8	**Check EGR valve (See page SF–43).**

NG → **Repair or replace.**

OK

9	**Check value of EGR gas temp. 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 ”ACTIVE TEST” mode on the TOYOTA hand–held tester (EGR system ON).
(d) Race the engine at 4,000 rpm for 3 min.

CHECK:

Measure EGR gas temp. while racing engine at 4,000 rpm.

OK:

EGR gas temp. after 3 min.: 140°C (284°F) or more

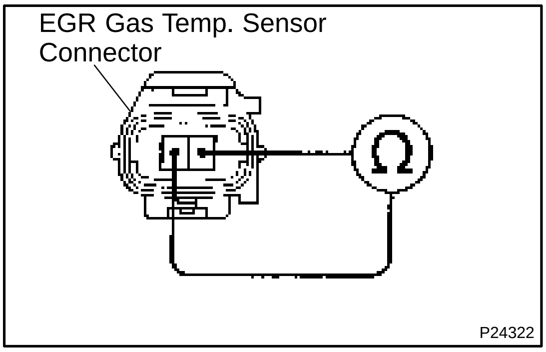
NG → **Replace EGR gas temp. sensor.**

OK

Check and replace ECM (See page IN–24).

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

1	**Check resistance of EGR gas temp. sensor.**

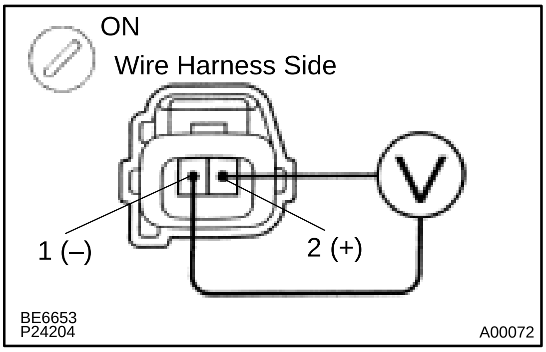


PREPARATION:
Disconnect the EGR gas temp. sensor connector.
CHECK:
Measure resistance between terminals of EGR gas temp. sensor connector.
OK:
Resistance: 600 kΩ or less
HINT:
If there is open circuit, ohmmeter indicates 720 kΩ or more.

NG	**Check and replace EGR gas temp. sensor (See page SF–48).**

OK

2	**Check for open in harness or ECM.**

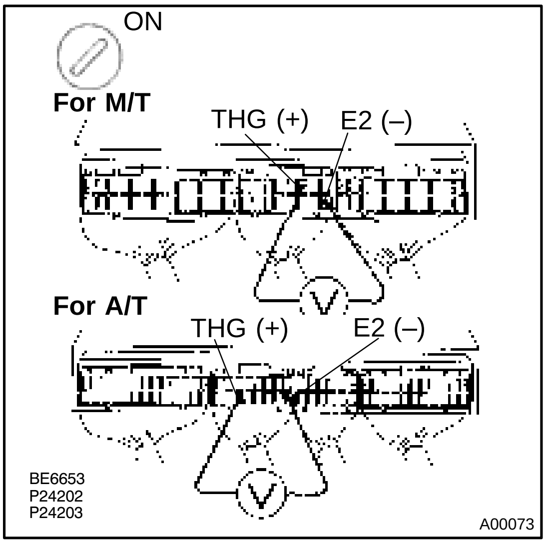


PREPARATION:
(a) Disconnect the EGR gas temp. sensor connector.
(b) Turn the ignition switch ON.
CHECK:
Measure voltage between terminals of EGR gas temp. sensor wire harness side connector.
OK:
Voltage: 4.5 – 5.5 V

OK	**Go to step 4.**

NG

3	Check for open in harness or ECM.



PREPARATION:

(a) Remove the right cowl side trim (See page SF–50).

(b) Turn the ignition switch ON.

CHECK:

Measure voltage between terminals of THG and E2 of ECM connector.

HINT:

The EGR gas temp. sensor connector is disconnected.

OK:

Voltage: 4.5 – 5.5 V

OK → **Open in harness between terminals E2 or THG. Repair or replace harness.**

NG

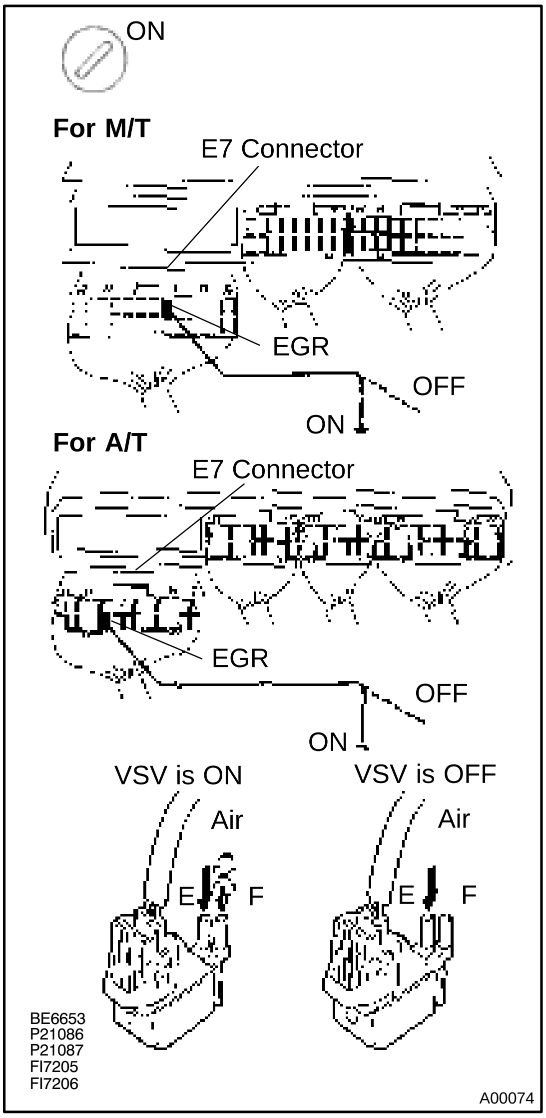
Confirm connection at ECM.
If OK, replace ECM.

4	Check connection of vacuum hose and EGR hose (See page EC–2).

NG → **Repair or replace.**

OK

5	**Check VSV for EGR.**



PREPARATION:

(a) Remove the right cowl side trim (See page SF–50).

(b) Disconnect the E7 connector of ECM.

(c) Turn the ignition switch ON.

CHECK:

Check VSV function:

(1) Connect between terminal EGR of ECM and body ground (ON).

(2) Disconnect between terminal EGR of ECM and body ground (OFF).

OK:

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

OK	**Go to step 7.**

NG

6	**Check operation for VSV for EGR (See page SF–43).**

NG	**Replace VSV for EGR.**

OK

Check for open in harness and connector between R/B NO.2 and ECM (See page IN–24).

7	Check EGR vacuum modulator (See page EC–7).

NG → **Repair or replace.**

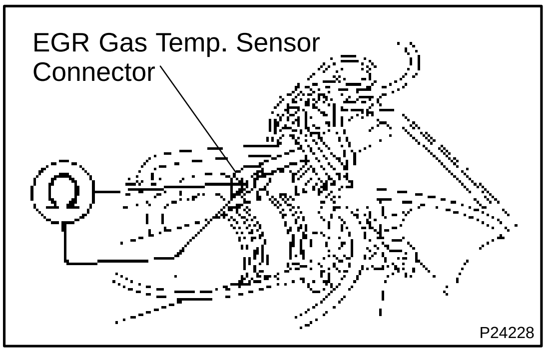
OK

8	Check EGR valve (See page EC–7).

NG → **Repair or replace.**

OK

9	Check resistance of EGR gas temp. sensor.



PREPARATION:

(a) Disconnect the EGR gas temp. sensor connector.
(b) Start the engine and warm it up.
(c) Disconnect the VSV connector for EGR.
(d) Race the engine at 4,000 rpm or 3 min.

CHECK:

Measure resistance of the EGR gas temp. sensor while racing the engine at 4,000 rpm.

OK:

Resistance of EGR gas temp. sensor after 3 min.:
4.3 kΩ or less

HINT:
Resistance: 188.6 – 439.0 kΩ at 20°C (68°F)

NG → **Replace EGR gas temp. sensor.**

OK

Check and replace ECM (See page IN–24).

DI0TV–02

DTC	P0402	Exhaust Gas Recirculation Flow Excessive Detected

CIRCUIT DESCRIPTION

Refer to DTC P0401 on page DI–72.

DTC No.	DTC Detecting Condition	Trouble Area
P0402	EGR gas temp. sensor value is high during EGR cut–off when engine is cold and vacuum is applied to port E (2 trip detection logic)	●EGR valve stuck open ●VSV for EGR open malfunction ●Open in VSV circuit for EGR ●Short in EGR gas temp. sensor circuit ●ECM
	EGR valve is always open (2 trip detection logic)	

WIRING DIAGRAM

Refer to DTC P0401 on page DI–72.

SYSTEM CHECK DRIVING PATTERN

Refer to DTC P0401 on page DI–72.

INSPECTION PROCEDURE

TOYOTA hand–held tester:

1	Connect TOYOTA hand–held tester and read EGR gas temp. value.

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 EGR gas temp. on the TOYOTA hand–held tester.

OK:

EGR gas temp.: 150°C (302°F) or less (Not immediately after driving)

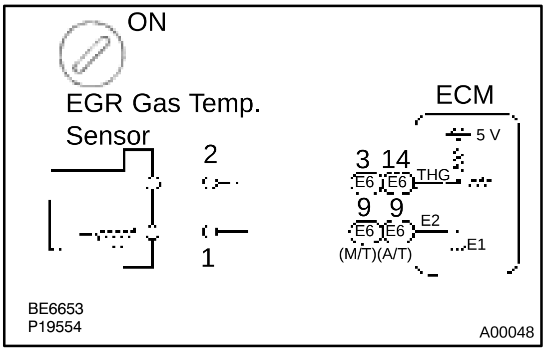
HINT:

If there is a short circuit, the TOYOTA hand–held tester indicates 159.3°C (318.7°F).

OK → **Go to step 4.**

NG

2	Check for short in harness and ECM.

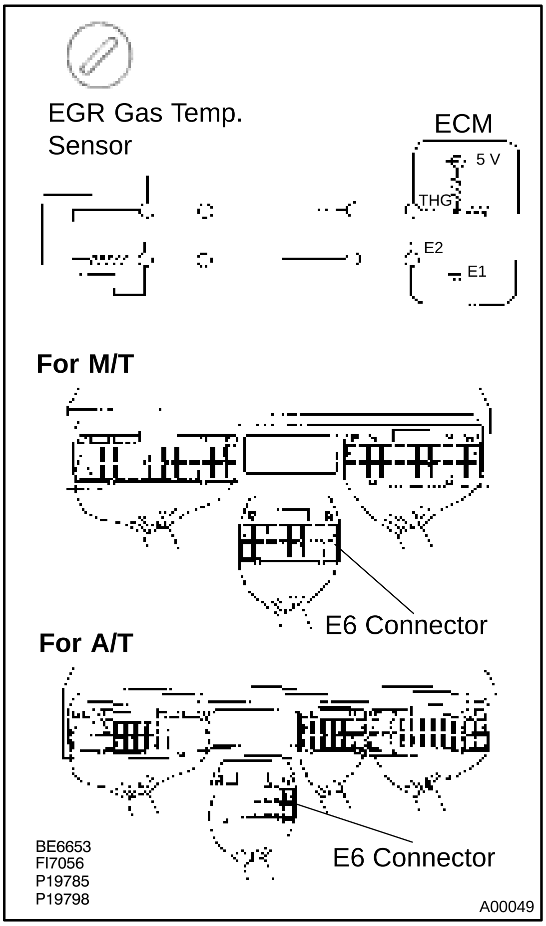


PREPARATION:
Disconnect the EGR gas temp. sensor connector.
CHECK:
Read EGR gas temp. on the TOYOTA hand–held tester.
OK:
EGR gas temp.: 3.1°C (37.6°F)

OK	Replace EGR gas temp. sensor.

NG

3	Check for short in harness or ECM.



PREPARATION:
(a) Remove the glove compartment (See page SF–50).
(b) Disconnect the E6 connector of the ECM.
HINT:
The EGR gas temp. sensor is disconnected.
CHECK:
Read EGR gas temp. on the TOYOTA hand–held tester.
OK:
EGR gas temp.: 3.1°C (37.6°F)

OK	Repair or replace harness or connector.

NG

Check and replace ECM (See page IN–24).

4	Check VSV for EGR (See page SF–43).

OK → **Check EGR valve (See page EC–7).**

NG

5	Check operation of VSV for EGR (See page EC–7).

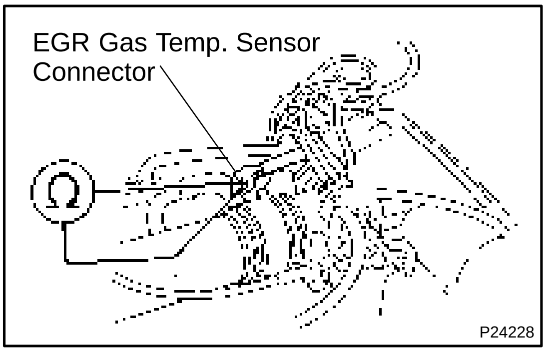
NG → **Replace VSV for EGR.**

OK

Check for open in harness and connector between R/B No.2 and ECM (See page IN–24).

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

1	Check resistance of EGR gas temp. sensor.



PREPARATION:
Disconnect the EGR gas temp. sensor connector.
CHECK:
Measure resistance between terminals of EGR gas temp. sensor connector.
OK:
Resistance: 2.5 kΩ or more
(Not immediately after driving)
HINT:
If there is short circuit, ohmmeter indicates 200 Ω or less.

NG → **Replace EGR gas temp. sensor.**

OK

2	Check for short in harness and connector between EGR gas temp. sensor and ECM (See page IN–24).

NG → Repair or replace harness or connector.

OK

3	Check VSV for EGR (See page SF–43).

OK → Check EGR valve (See page EC–7).

NG

4	Check operation of VSV for EGR (See page SF–43).

NG → Replace VSV for EGR.

OK

5	Check for open in harness and connector between R/B N0.2 and ECM (See page IN–24).

NG → Repair or replace harness or connector.

OK

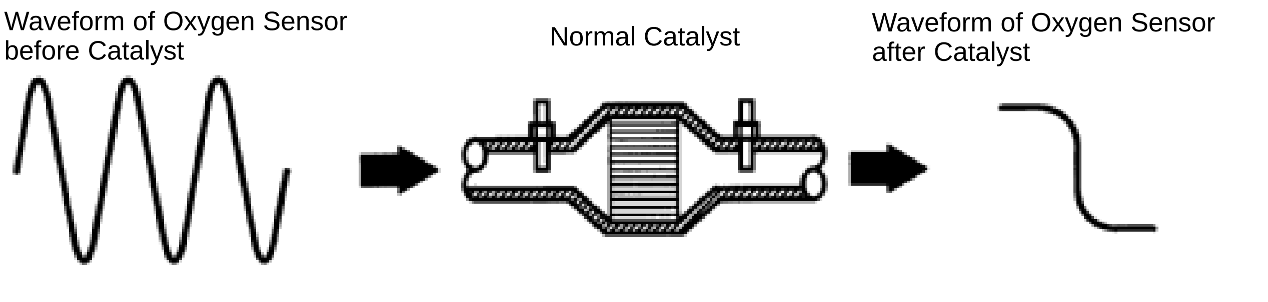
Check and replace ECM (See page IN–24).

DI0TW–02

DTC	P0420	Catalyst System Efficiency Below Threshold

CIRCUIT DESCRIPTION

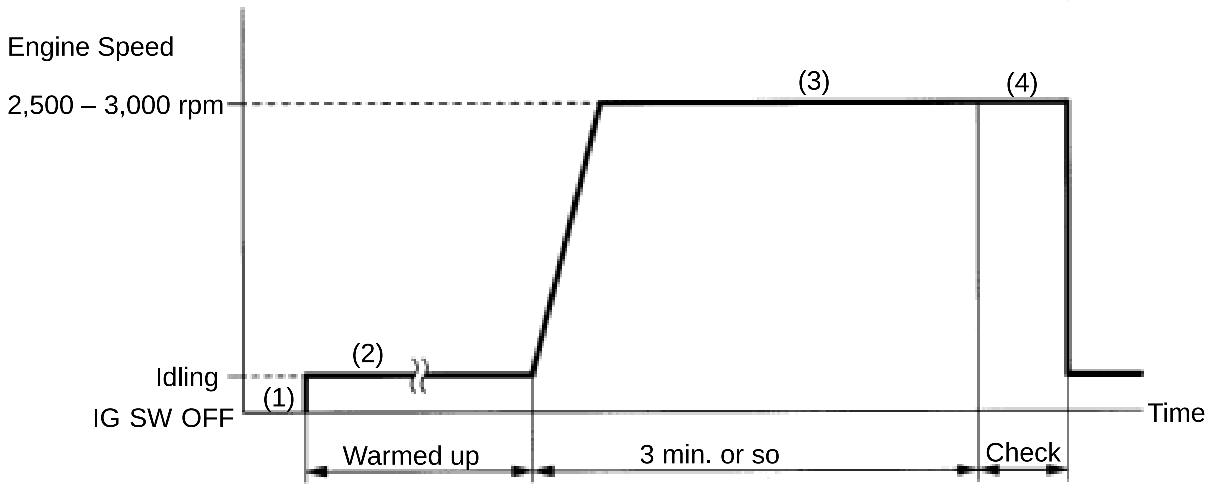
The ECM compares the waveform of the oxygen sensor located before the catalyst with the waveform of the oxygen sensor located after the catalyst to determine whether or not catalyst performance has deteriorated.
Air–fuel ratio feedback compensation keeps the waveform of the oxygen sensor before the catalyst repeatedly changing back and forth from rich to lean.
If the catalyst is functioning normally, the waveform of the oxygen sensor after the catalyst switches back and forth between rich and lean much more slowly than the waveform of the oxygen sensor before the catalyst.
But when both waveforms change at a similar rate, it indicates that catalyst performance has deteriorated.



FI7081

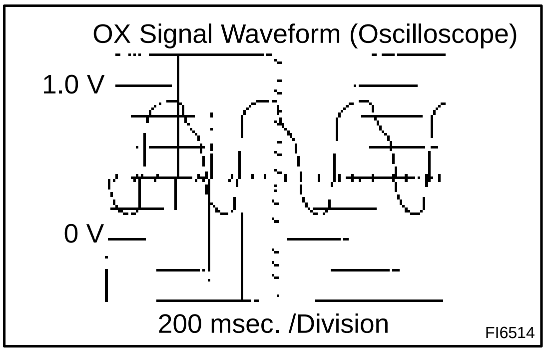
DTC No.	DTC Detecting Condition	Trouble Area
P0420	After engine and catalyst are warmed up, and while vehicle is driven within set vehicle and engine speed range, waveforms of heated oxygen sensors (bank 1 sensor 1, 2) have same amplitude (2 trip detection logic)	●Three–way catalytic converter ●Open or short in heated oxygen sensor (bank 1 sensor 1, 2) circuit ●Heated oxygen sensor (bank 1 sensor 1, 2)

CONFIRMATION ENGINE RACING PATTERN



P25762

(1) Connect the OBD II scan tool or TOYOTA hand–held tester to the DLC3.
(2) Start engine and warm it up with all accessories switched OFF until the water temperature is stable.
(3) Race the engine at 2,500 – 3,000 rpm for about 3 min.
(4) After confirming that the waveform of the heated oxygen sensor, bank 1 sensor 1 (OX1), oscillate around 0.5 V during feedback to the ECM, check the waveform of the heated oxygen sensor bank 1 sensor 2 (OX2).



HINT:
If there is a malfunction in the system, the waveform of the heated oxygen sensor bank 1 sensor 2 (OX2) is almost the same as that of the heated oxygen sensor bank 1 sensor 1 (OX1) 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

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

YES → **Go to relevant DTC chart.**

NO

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

NG → **Repair or replace.**

OK

3	**Check heated oxygen sensor (bank 1 sensor 2) (See page DI–53).**

NG → **Repair or replace.**

OK

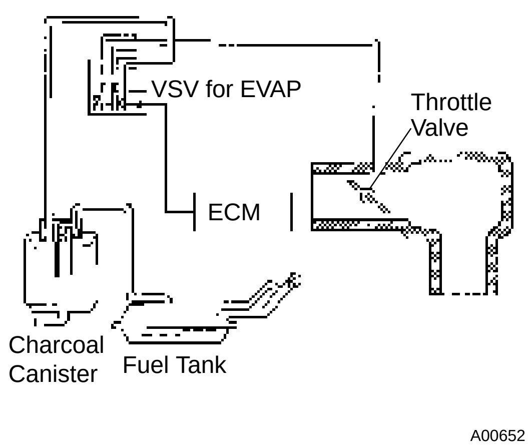
Replace three–way catalytic converter.

DI0TX–02

DTC	P0441	Evaporative Emission Control System Incorrect Purge Flow

CIRCUIT DESCRIPTION

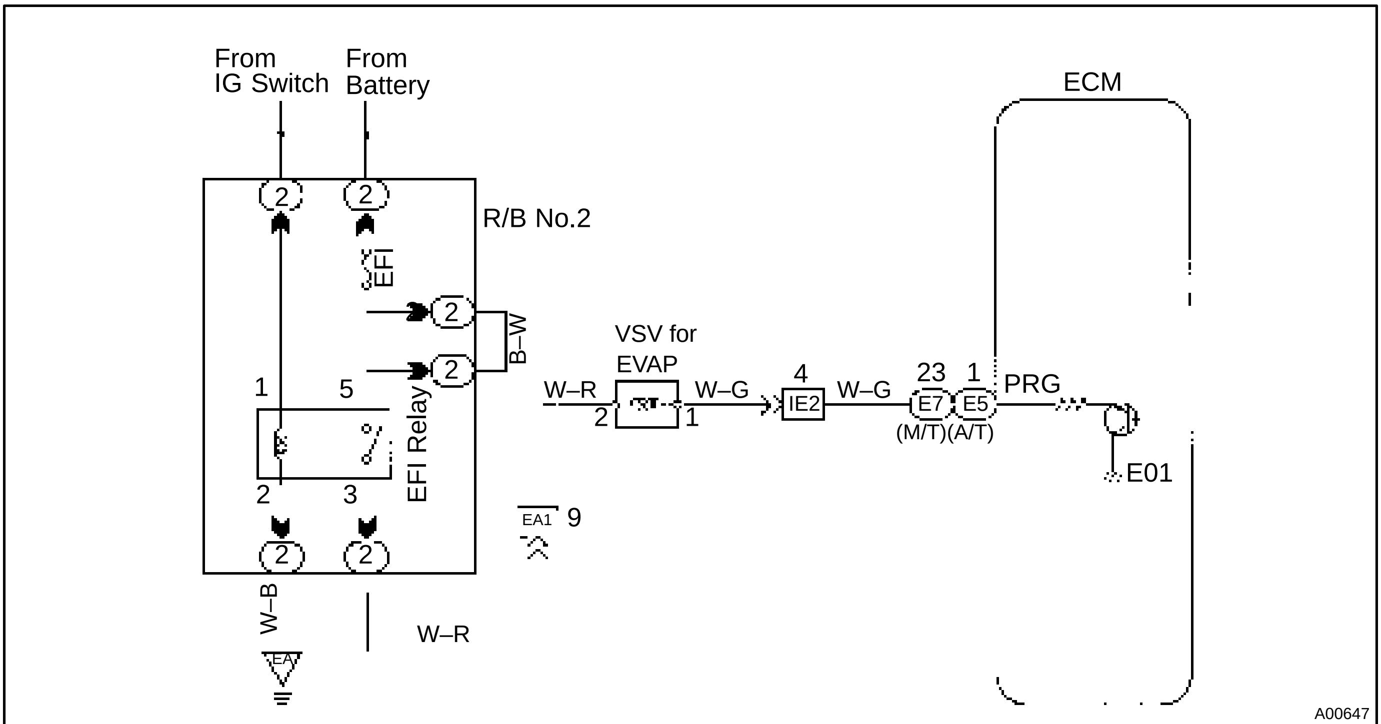
Fig 1



To reduce HC emissions, evaporated fuel from the fuel tank is routed through the charcoal canister to the intake manifold for combustion in the cylinders.
The ECM changes the duty signal to the VSV for EVAP so that the intake quantity of HC emissions is appropriate for the driving conditions (engine load, engine speed, vehicle speed, etc.) after the engine is warmed up.

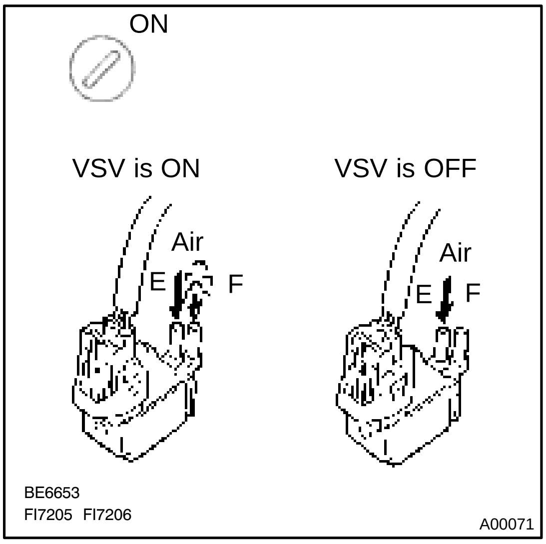
DTC No.	DTC Detecting Condition	Trouble Area
P0441	Proper response to computer command dose not occur (2 trip detection logic)	●Open or short in VSV circuit for EVAP ●VSV for EVAP ●ECM ●Vacuum hose cracks, hole, blocked, damaged or disconnected ●Charcoal canister

WIRING DIAGRAM



INSPECTION PROCEDURE
TOYOTA hand–held tester:

1	**Connect TOYOTA hand–held tester and check operation of VSV for EVAP.**



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

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

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

OK → **Go to step 4.**

NG ↓

2	**Check operation of VSV for EVAP (See page SF–43).**

NG → **Replace VSV for EVAP.**

OK ↓

3	**Check for open and short in harness and connector between EFI main relay (Marking: EFI) and ECM (See page IN–24).**

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

OK ↓

Check and replace ECM (See page IN–24).

4	Check connection of vacuum hose (See Fig 1 in circuit description).

NG → **Repair or replace.**

OK

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

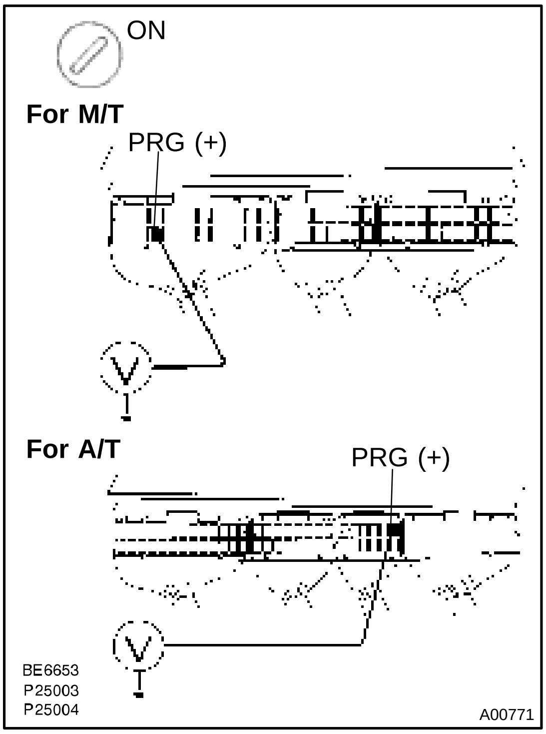
OBD II scan tool (excluding TOYOTA hand–held tester):

1	Check operation of VSV for EVAP (See page SF–44).

NG → **Replace VSV for EVAP.**

OK

2	Check voltage between terminal PRG of ECM connector and body ground.



PREPARATION:

(a) Remove the right cowl side trim (See page SF–50).

(b) Turn the ignition switch ON.

CHECK:

Measuve voltage between terminal PRG of ECM connector and body ground.

OK:

Voltage: 9 – 14 V

NG → **Check and repair harness or connector.**

OK

3	**Check connection of vacuum hose (See Fig 1 in circuit description).**

NG → **Repair or replace.**

OK

4	**Check charcoal canister (See page EC–5).**

NG → **Repair or replace.**

OK

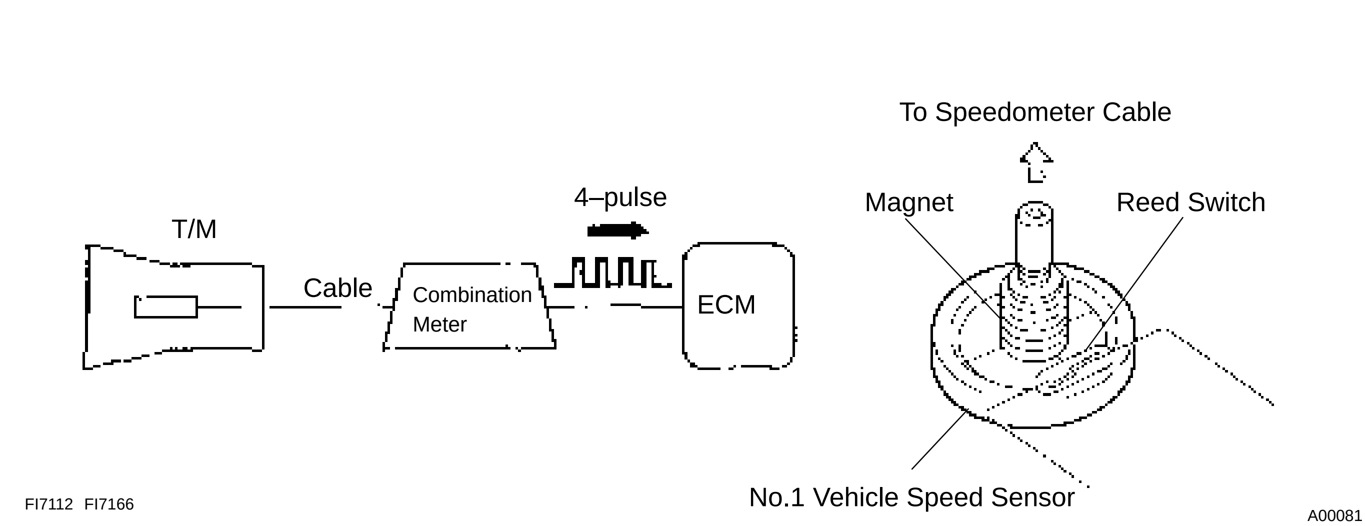
Check and replace ECM (See page IN–24).

DI0TY–04

DTC	P0500	Vehicle Speed Sensor Malfunction

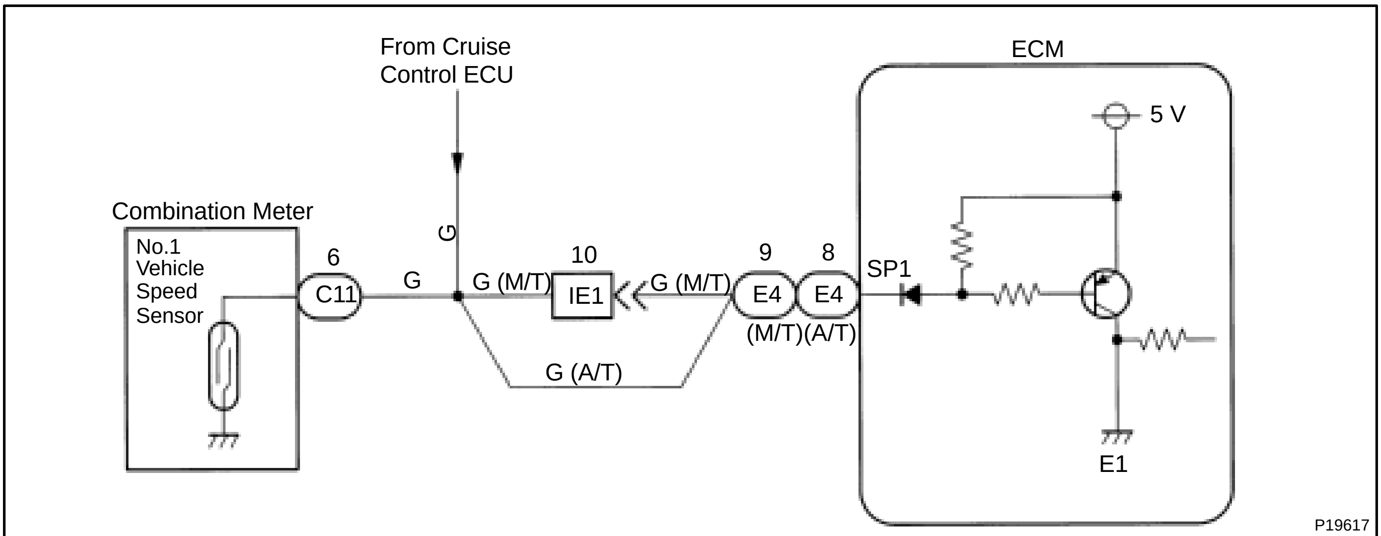
CIRCUIT DESCRIPTION

This No.1 vehicle speed sensor is mounted in the combination meter. It contains a magnet which is rotated by the speed meter cable.
Turning the reed switch ON and OFF 4 times for every revolution of the speedmeter.
It is then transmitted to the ECM. The ECM determines the vehicle speed based on the frequency of these pluse signals.



DTC No.	DTC Detecting Condition	Trouble Area
P0500	No vehicle speed sensor signal to ECM under conditions (a) (2 trip detection logic) (a) Vehicle is being driven	●Open or short in No.1 vehicle speed sensor circuit ●No.1 vehicle speed sensor ●ECM ●Speedometer cable

WIRING DIAGRAM



INSPECTION PROCEDURE

1 Check operation of speedometer.

CHECK:

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

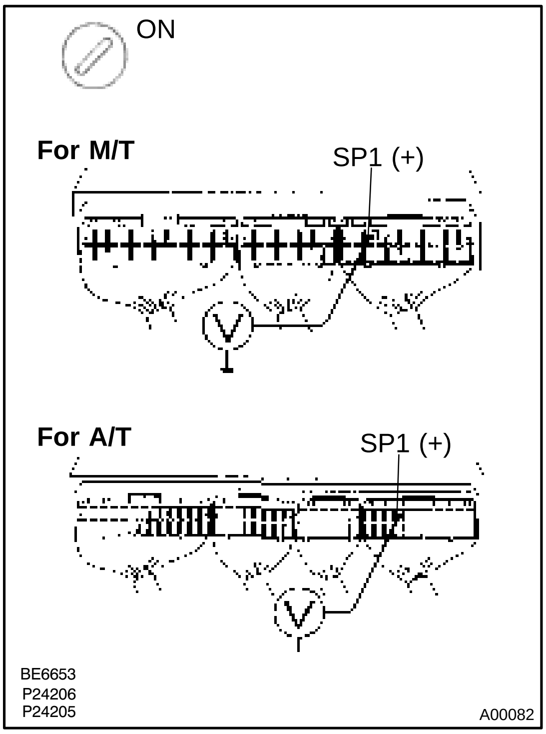
HINT:

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

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

OK

2 Check voltage between terminal SP1 of ECM connector and body ground.



PREPARATION:

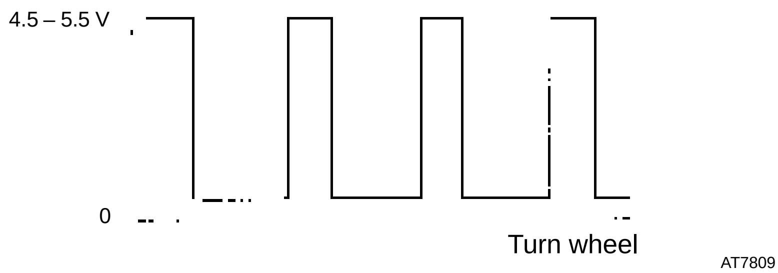
(a) Remove the right cowl side trim (See page SF–50).
(b) Disconnect the cruise control ECU connector.
(c) Shift the shift lever to neutral.
(d) Jack up the rear wheels on one side.
(e) Turn the ignition switch ON.

CHECK:

Measure voltage between terminal SP1 of ECM connector and body ground when the wheel is turned slowly.

OK:

Voltage is generated intermittently.



NG → **Check and repair harness and connector between combination meter and ECM.**

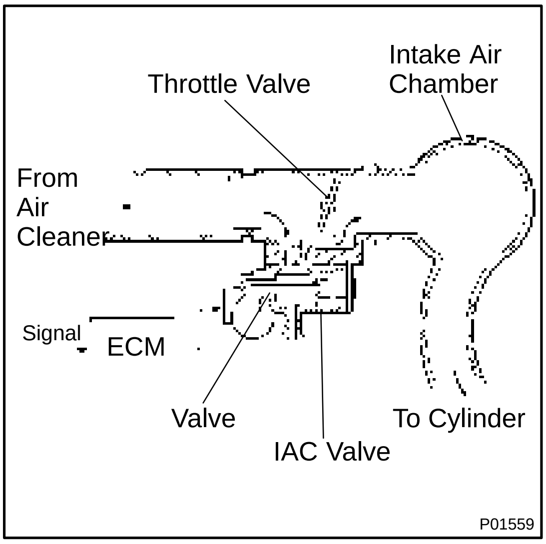
OK

Check and replace ECM (See page IN–24).

DI0TZ–02

DTC	P0505	Idle Control System Malfunction

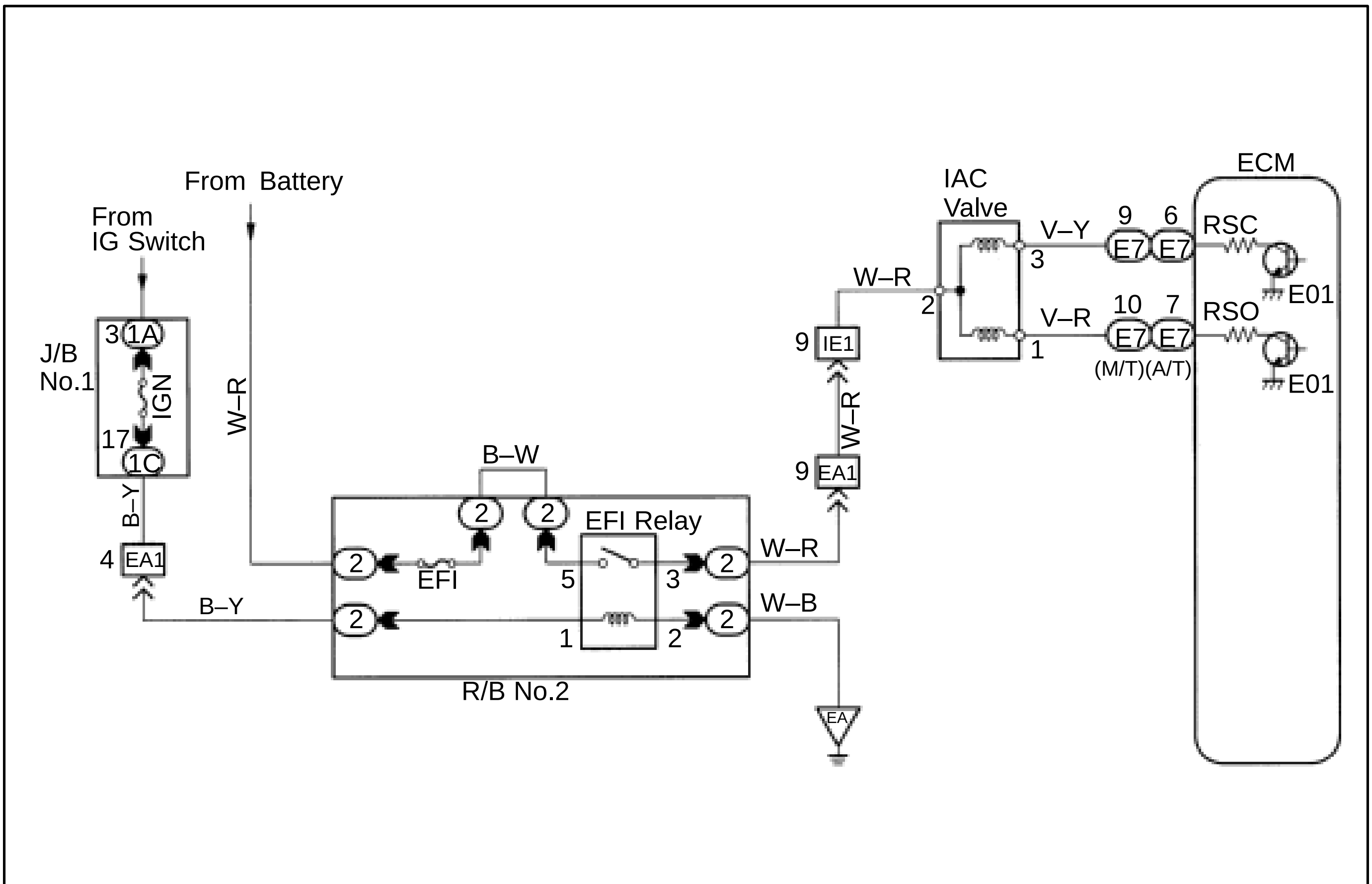
CIRCUIT DESCRIPTION



The rotary solenoid type IAC valve is located in front of the intake air chamber 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 Detecting Condition	Trouble Area
P0505	Idle speed continues to vary greatly from target speed (2 trip detection logic)	●IAC valve is stuck or closed ●Open or short in IAC valve circuit ●Air intake (hose loose)

WIRING DIAGRAM



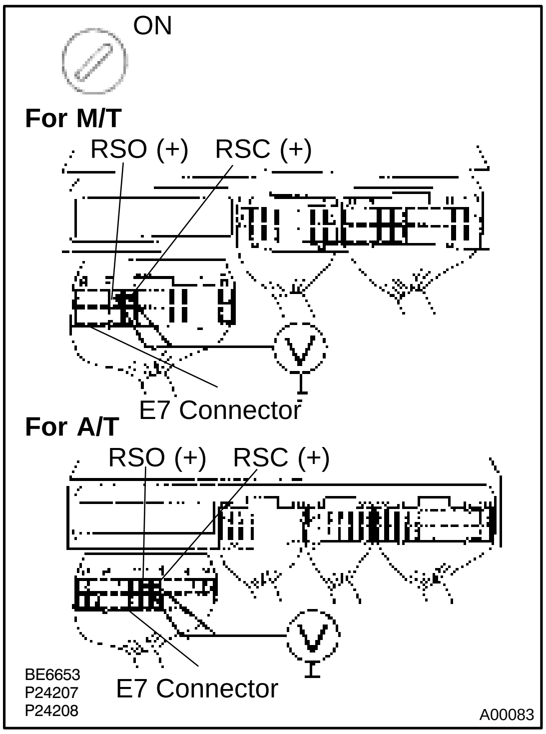
INSPECTION PROCEDURE

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

NG — **Repair or replace.**

OK

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



PREPARATION:

(a) Remove the right cowl side trim (See page SF–51).

(b) Disconnect the E7 connector of the ECM.

(c) Turn the ignition switch ON.

CHECK:

Measure voltage between terminals RSO and RSC of ECM connector and body ground.

OK:

Voltage: 9 – 14 V

OK — **Go to step 4.**

NG

3	**Check IAC valve (See page SF–35).**

NG → **Replace IAC valve.**

OK

Check for open and short in harness and connector between R/B No.2 and IAC valve, IAC valve and ECM (See page IN–24).

4	**Check operation of IAC valve (See page SF–35).**

NG → **Repair or replace IAC valve.**

OK

Check and replace ECM (See page IN–24).

DI0U0–02

DTC	P0510	Closed Throttle Position Switch Malfunction

CIRCUIT DESCRIPTION

Refer to DTC P0120 on page DI–39.

DTC No.	DTC Detecting Condition	Trouble Area
P0510	Closed throttle position switch does not turn ON even once when vehicle is driven (2 trip detection logic)	●Open in closed throttle position switch circuit ●Closed throttle position switch ●ECM

HINT:
After confirming DTC P0510 use the TOYOTA hand–held tester to confirm the closed throttle position switch signal from ”CURRENT DATA”.

Throttle Valve	Closed Throttle Position Switch Signal	Malfunction
Fully closed	OFF	Open circuit
Fully open	ON	Short circuit

WIRING DIAGRAM

Refer to DTC P0120 on page DI–39.

INSPECTION PROCEDURE

HINT:
If DTC P0110, P0115 and P0120 are output simultaneously, E2 (sensor ground) may be open.

TOYOTA hand–held tester:

1	Connect TOYOTA hand–held tester and read CTP switch signal.

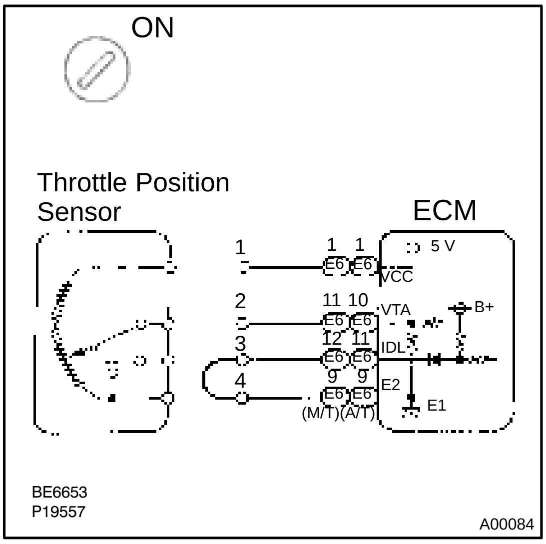
PREPARATION:
(a) Connect the TOYOTA hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the TOYOTA hand–held tester main switch ON.

CHECK:
Read CTP switch signal on the TOYOTA hand–held tester.

RESULT:

Throttle Valve	Closed Throttle Position Switch Signal	Malfunction
Fully closed	OFF	Open circuit: Go to step 2
Fully open	ON	Short circuit: Go to step 4

2	Check for open in harness or ECM.



PREPARATION:

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

(b) Disconnect the throttle position sensor connector.

(c) Connect the sensor wire harness terminals between terminals 3 and 4.

(d) Turn the ignition switch ON.

CHECK:

Read CTP switch signal on the TOYOTA hand–held tester.

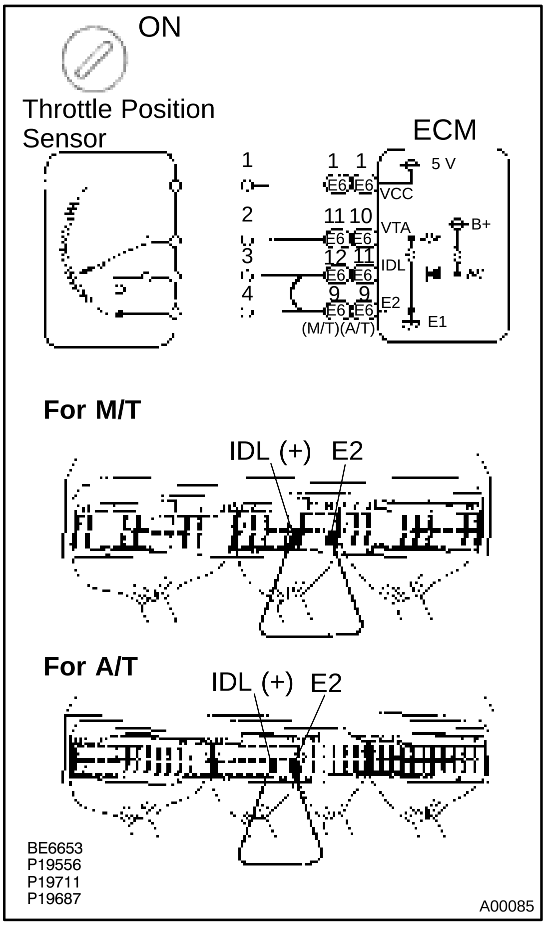
OK:

CTP switch signal: ON

OK	**Confirm good connection at sensor. If OK, replace throttle position sensor.**

NG

3	Check for open in harness or ECM.



PREPARATION:

(a) Remove the right cowl side trim (See page SF–50).

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

HINT:

Throttle position sensor connector is disconnected.

Before checking, do a visual check and contact pressure check for the connector (See page IN–24).

(c) Turn the ignition switch ON.

CHECK:

Read CTP switch signal on the TOYOTA hand–held tester.

OK:

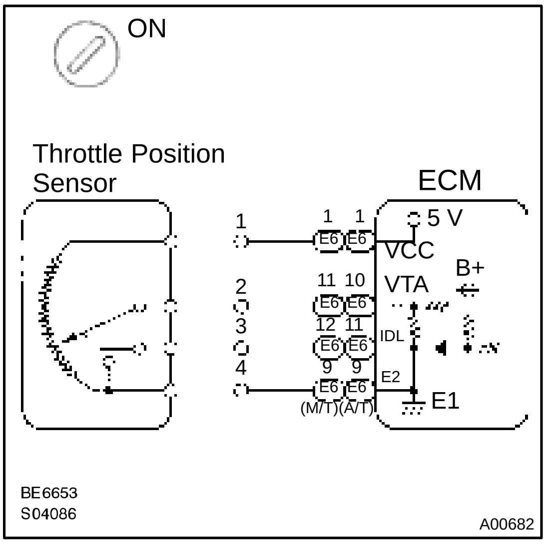
CTP switch signal: ON

OK	Open in harness between ECM and throttle position sensor, repair or replace harness.

NG

Confirm connection at ECM.
If OK, replace ECM.

4	**Check for short in harness or ECM.**



PREPARATION:

(a) Connect the TOYOTA hand–held tester to the DLC3.
(b) Disconnect the throttle position sensor connector.
(c) Turn the ignition switch ON.

CHECK:

Read CTP switch signal on the TOYOTA hand–held tester.

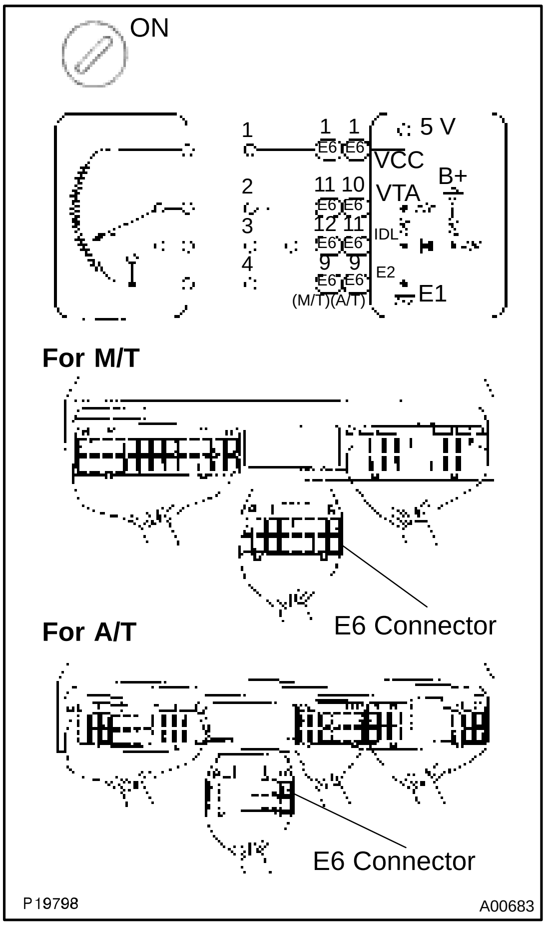
OK:

CTP switch signal: OFF

OK → **Confirm good connection at sensor. If OK, replace throttle position sensor.**

NG

5	**Check for short in harness or ECM.**



PREPARATION:

(a) Remove right cowl side trim (See page SF–50).

(b) Disconnect the E6 connector of the ECM.

(c) Turn the ignition switch ON.

HINT:

Throttle position sensor connector is disconnected.

CHECK:

Read CTP switch signal on TOYOTA hand–held tester.

OK:

CTP switch signal: OFF

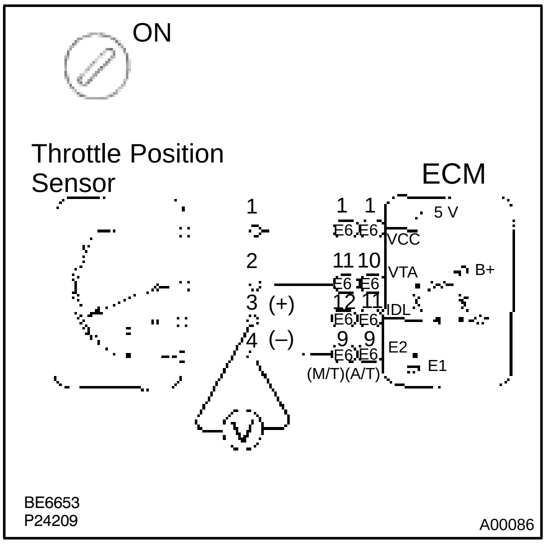
OK — **Short in harness between ECM and throttle position sensor, repair or replace harness.**

NG

Confirm connection at ECM.
If OK, replace ECM.

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

1	**Check for open in harness or ECM.**



PREPARATION:

(a) Disconnect the throttle position sensor connector.

(b) Turn the ignition switch ON.

CHECK:

Measure voltage between terminals 3 and 4 of throttle position sensor connector.

OK:

Voltage: 9 – 14 V

OK	**Confirm good connection at sensor. If OK, replace throttle position sensor.**

NG

2	**Check for open in harness and connector between throttle position sensor and ECM (See page IN–24).**

NG	**Open in harness between ECM and throttle position sensor.**

OK

Confirm connection at ECM.
If OK, replace ECM.

DI0U1–02

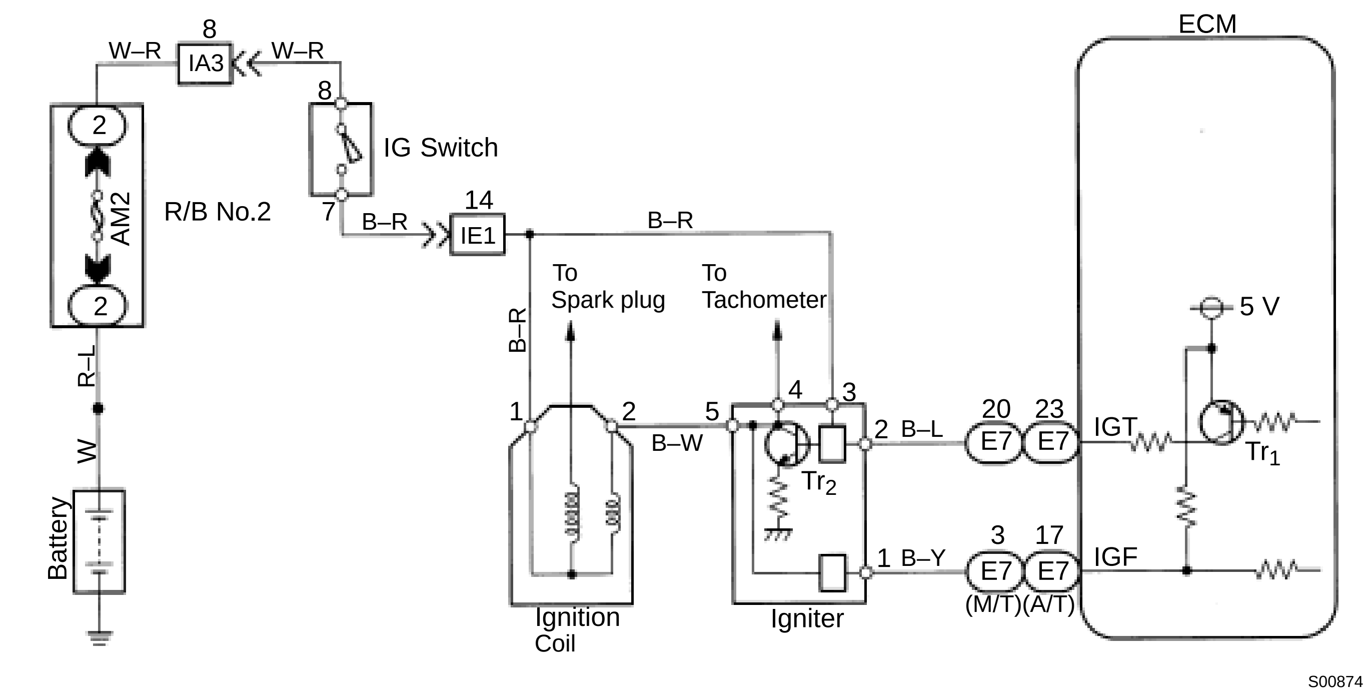
DTC	P1300	Ignition Circuit Malfunction

CIRCUIT DESCRIPTION

The ECM determines the ignition timing, turns on Tr_1 at a predetermined angle (°CA) before the desired ignition timing and outputs an ignition signal (IGT) "1" to the igniter.
Since the width of the IGT signal is constant, the dwell angle control circuit in the igniter determines the time the control circuit starts primary current flow to the ignition coil based on the engine rpm and ignition timing one revolution ago, that is, the time the Tr_2 turns on.
When it reaches the ignition timing, the ECM turns Tr_1 off and outputs the IGT signal "0".
This turns Tr_2 off, interrupting the primary current flow and generating a high voltage in the secondary coil which causes the spark plug to spark. Also, by the counter electromotive force generated when the primary current is interrupted, the igniter sends an ignition confirmation signal (IGF) to the ECM. The ECM stops fuel injection as a fail safe function when the IGF signal is not input to the ECM.

DTC No.	DTC Detecting Condition	Trouble Area
P1300	No IGF signal to ECM for 4 consecutive IGT signal during engine running	●Open or short in IGF or IGT circuit from igniter to ECM ●Igniter ●ECM

WIRING DIAGRAM



S00874

INSPECTION PROCEDURE

1	Check spark plug and spark (See page IG–1).

NG	Go to step 4.

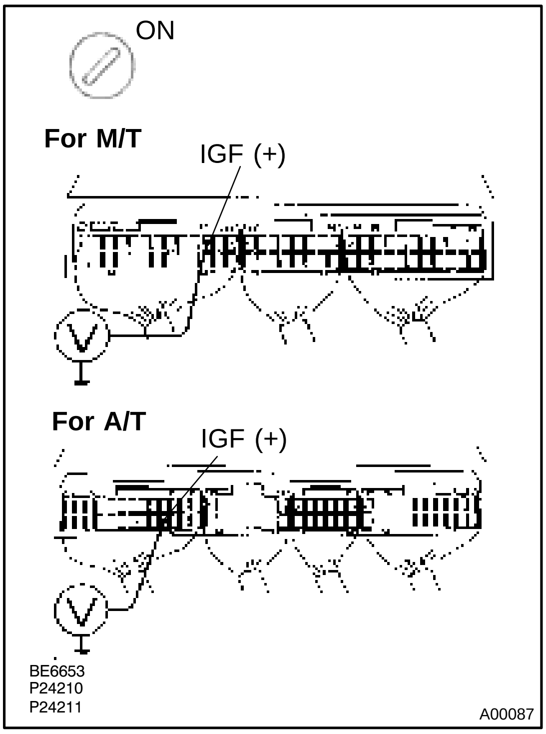
OK

2	Check for open and short in harness and connector in IGF signal circuit between ECM and igniter (See page IN–24).

NG	Repair or replace harness or connector.

OK

3	Disconnect igniter connector and check voltage between terminal IGF of ECM connector and body ground.



PREPARATION:
(a) Disconnect the igniter connector.
(b) Remove the right cowl side trim (See page SF–50).
(c) Turn the ignition switch ON.

CHECK:
Measure voltage between terminal IGF of ECM connector and body ground.

OK:
Voltage: 4.5 – 5.5 V

OK → **Replace igniter.**

NG ↓

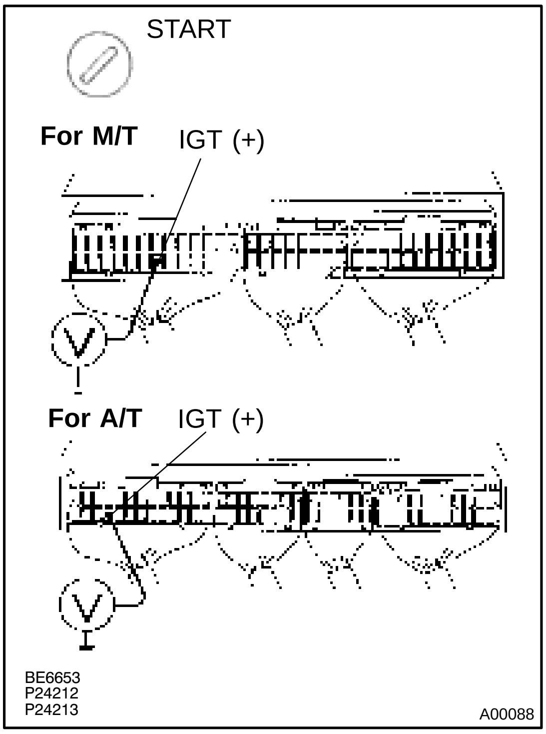
Check and replace ECM (See page IN–24).

4	Check for open and short in harness and connector in IGT signal circuit between ECM and igniter (See page IN–24).

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

OK ↓

5	**Check voltage between terminals IGT of ECM connector and body ground.**



PREPARATION:

Remove the right cowl side trim (See page SF–50).

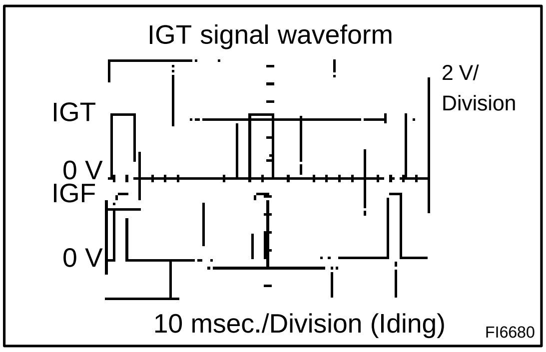
CHECK:

Measure voltage between terminals IGT of ECM connector and body ground when 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 waveform between terminals IGT and E1 of ECM.

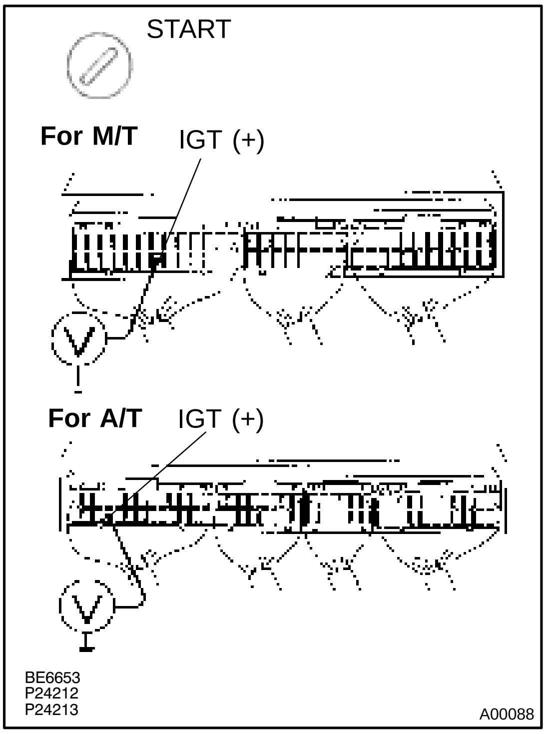
HINT:

The correct waveforms are as shown.

NG	**Check and replace ECM (See page IN–24).**

OK

6	**Disconnect igniter connector and check voltage between terminals IGT of ECM connector and body ground.**

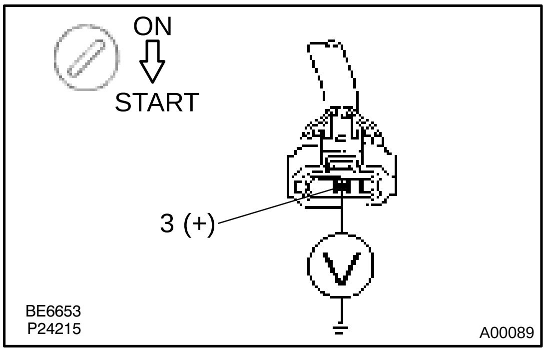


PREPARATION:
Disconnect the igniter connector.
CHECK:
Measure voltage between terminals IGT of ECM connector and body ground when engine is cranked.
OK:
Voltage: More than 0.1 V and less than 4.5 V

NG → **Check and replace ECM (See page IN–24).**

OK

7	**Check voltage between terminal 3 of igniter connector and body ground.**



PREPARATION:
Disconnect the igniter connector.
CHECK:
When the ignition switch is turned to ”ON” and ”STA” position, measure voltage between terminal 3 of igniter connector and body ground.
OK:
Voltage: 9 – 14 V

NG → **Check and repair igniter power source circuit.**

OK

8	**Check for open and short in harness and connector between ignition switch and ignition coil, ignition coil and igniter (See page IN–24).**

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

OK

9	**Check ignition coil (See page IG–1).**

NG → **Replace ignition coil.**

OK

Replace igniter.

DI0U2–01

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

CIRCUIT DESCRIPTION

Refer to DTC P0335 on page DI–66.

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

WIRING DIAGRAM

Refer to DTC P0335 on page DI–66.

INSPECTION PROCEDURE

Refer to DTC P0335 on page DI–66.

DI0U3–02

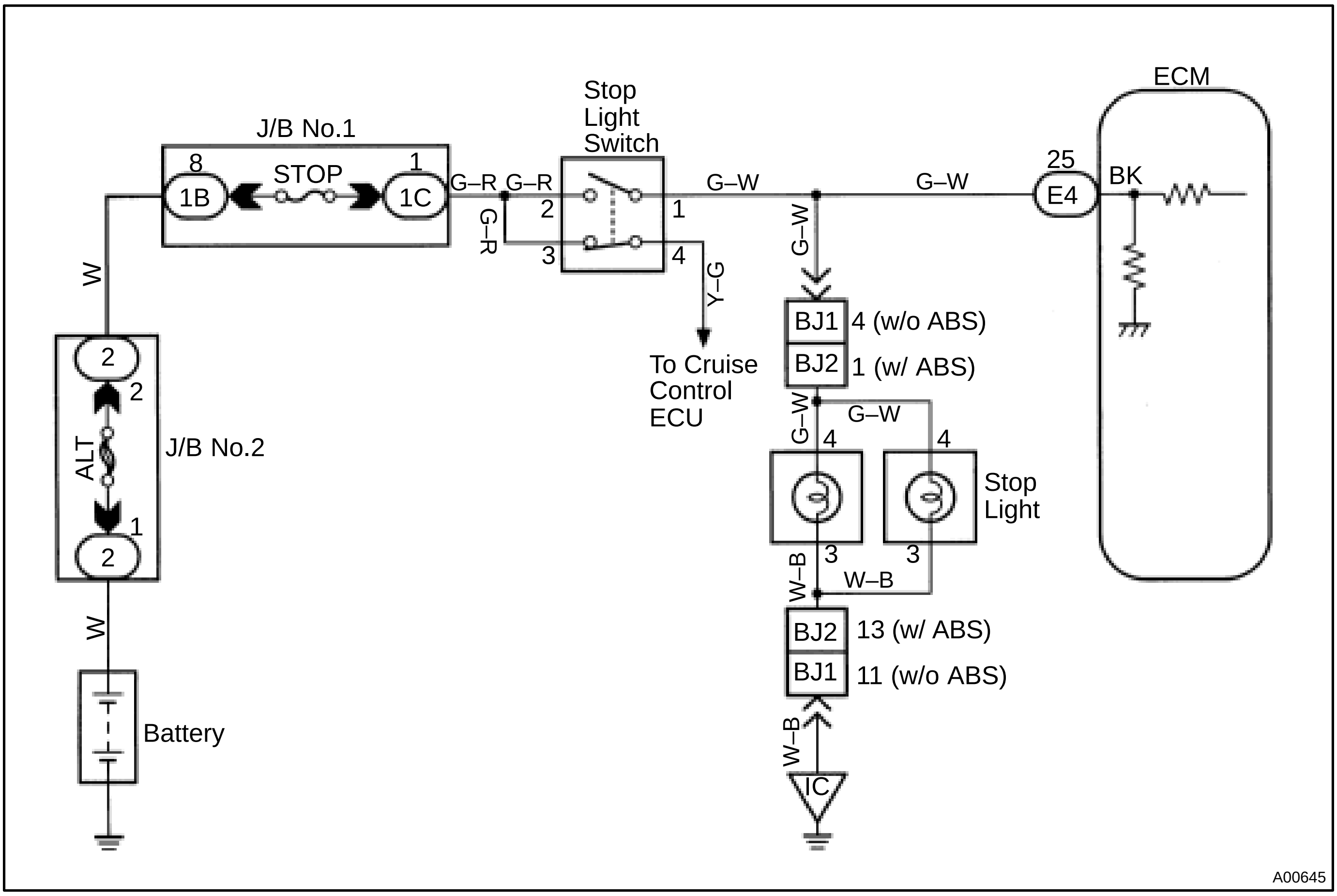
DTC	P1520	Stop Light Switch Signal Malfunction (A/T only)

CIRCUIT DESCRIPTION

This signal is used to detect when the brakes have been applied. The STP (BK) signal voltage is the same as the voltage supplied to the stop lights.
The STP (BK) signal is used mainly to control the fuel cut–off engine speed. (The fuel cut–off engine speed is reduced slightly when the vehicle is braking.)

DTC No.	DTC Detecting Condition	Truble Area
P1520	Stop light switch does not turn off even once vehicle is driven (2 trip detection logic)	●Short in stop light switch signal circuit ●Stop light switch ●ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

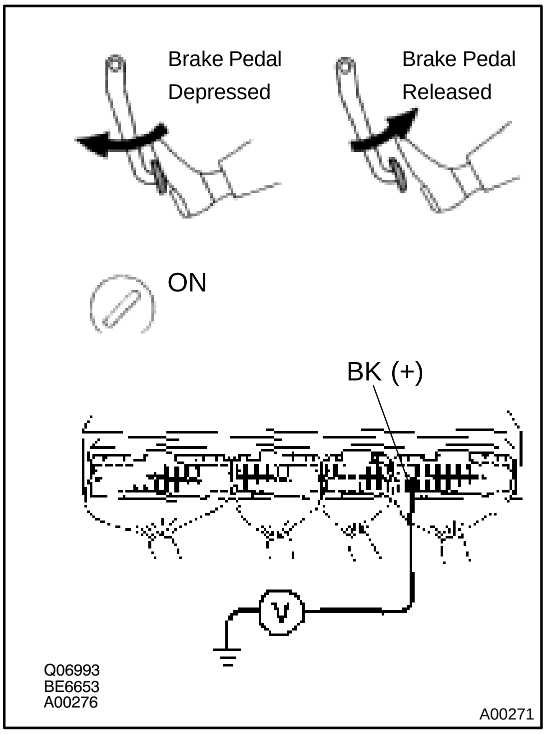
1	Check operation of stop light.

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

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

OK ↓

2	Check STP (BK) 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 TOYOTA hand–held tester main switch ON.
CHECK:
Read STP signal on the TOYOTA hand–held tester.
OK:
Brake pedal is depressed: STP .... ON
Brake pedal is released: STP .... OFF
When not using TOYOTA hand–held tester:
PREPARATION:
(a) Remove the right cowl side trim (See page SF–50).
(b) Turn the ignition switch ON.
CHECK:
Check voltage between terminal BK of ECM connector and body ground.
OK:

Brake pedal	Voltage
Depressed	7.5 – 4 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–24).**

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

OK ↓

Check and replace ECM.

DI0U4–02

DTC	P1600	ECM BATT Malfunction

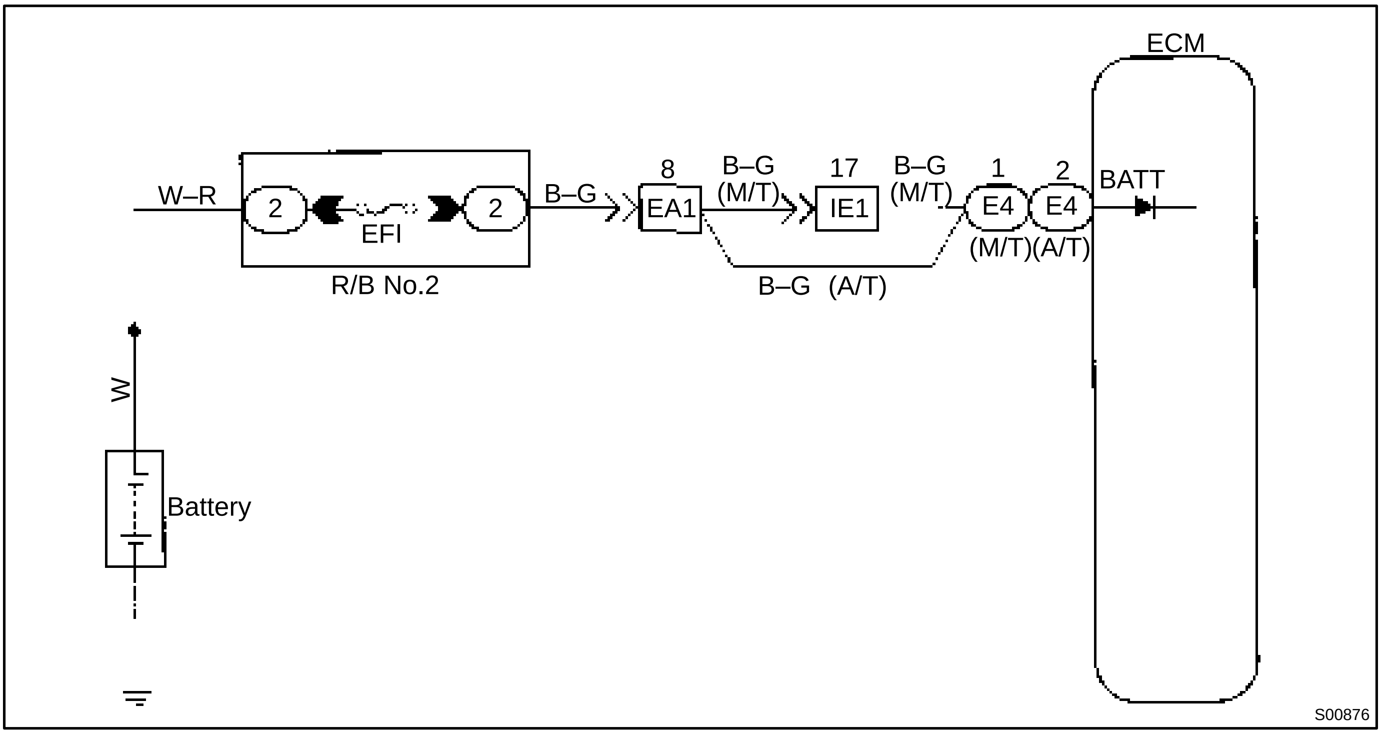
CIRCUIT DESCRIPTION

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

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

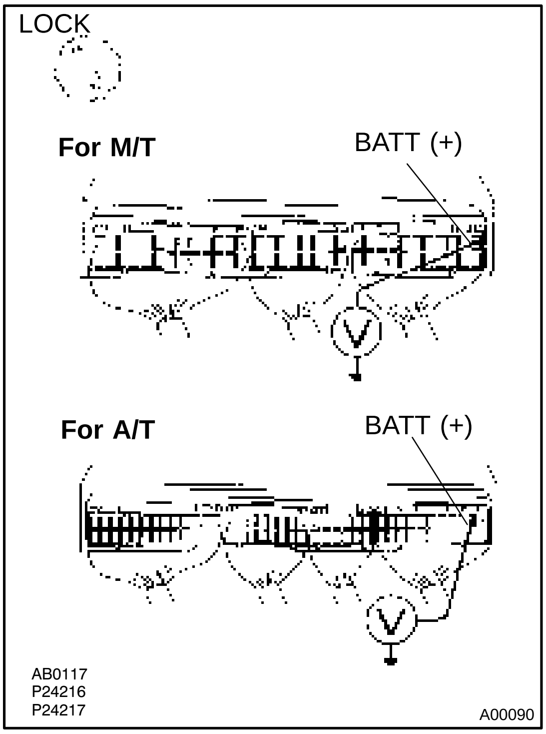
HINT:
If DTC P1600 appear, the ECM does not store another DTC.

WIRING DIAGRAM



INSPECTION PROCEDURE

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

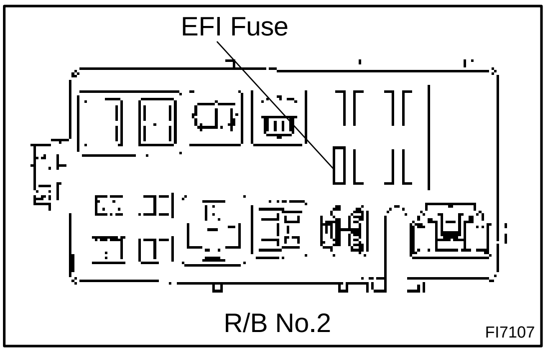


PREPARATION:
Remove the right cowl side trim (See page SF–50).
CHECK:
Measure voltage between terminal BATT of ECM connector and body ground.
OK:
Voltage: 9 – 14 V

OK → **Check and replace ECM (See page IN–24).**

NG

2	Check EFI fuse.



PREPARATION:
Remove the EFI fuse from the R/B No2.
CHECK:
Check continuity of EFI fuse.
OK:
Continuity

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

OK

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

DI0U5–02

DTC	P1780	Park/Neutral Position Switch Malfunction (A/T Only)

CIRCUIT DESCRIPTION

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

DTC No.	DTC Detecting Condition	Trouble Area
P1780	2 or more switches are ON simultaneously for ”N”, ”2” and ”L” position (2 trip detection logic)	●Short in park/neutral position switch circuit ●Park/neutral position switch ●ECM
	When driving under conditions (a) and (b) for 30 sec. or more the park/neutral position switch is ON (N position): (2 trip detection logic) (a) Vehicle speed: 70 km/h (44 mph) or more (b) Engine speed: 1,500 – 2,500 rpm	

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

WIRING DIAGRAM

Refer to DTC P1780 on page DI–115.

INSPECTION PROCEDURE

Refer to DTC P1780 on DI–115.

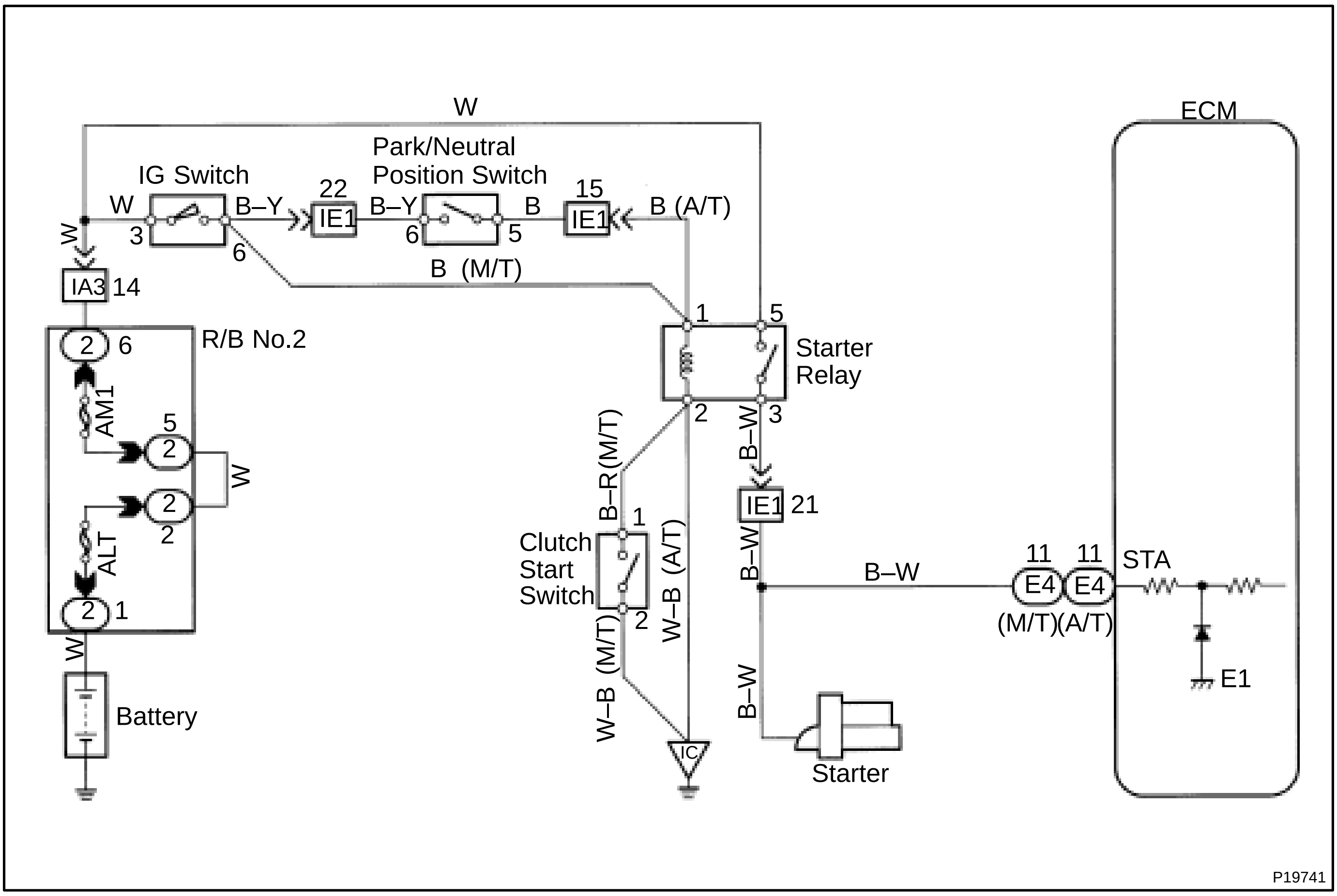
DI0U6–02

Starter Signal Circuit

CIRCUIT DESCRIPTION

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

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

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

TOYOTA hand–held tester:

1	**Connect TOYOTA hand–held tester and 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 STA signal on the TOYOTA hand–held tester while starter operates.

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 (See page IN–24).**

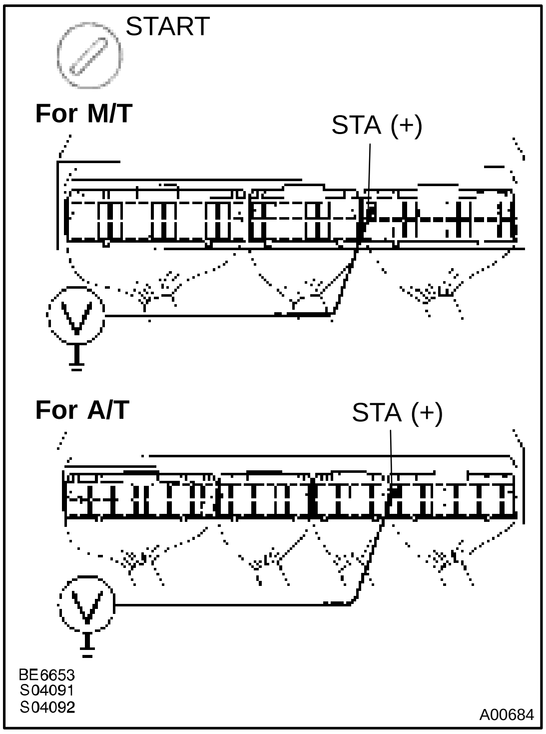
NG → **Repair or replace harness or connector.**

OK ↓

Check and replace ECM (See page IN–24).

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

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



PREPARATION:
Remove right cowl side trim (See page SF–50).

CHECK:
Measure voltage between terminal STA of ECM connector and body ground, during engine cranking.

OK:
Voltage: 6.0 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 (See page IN–24).**

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

OK

Check and replace ECM (See page IN–24).

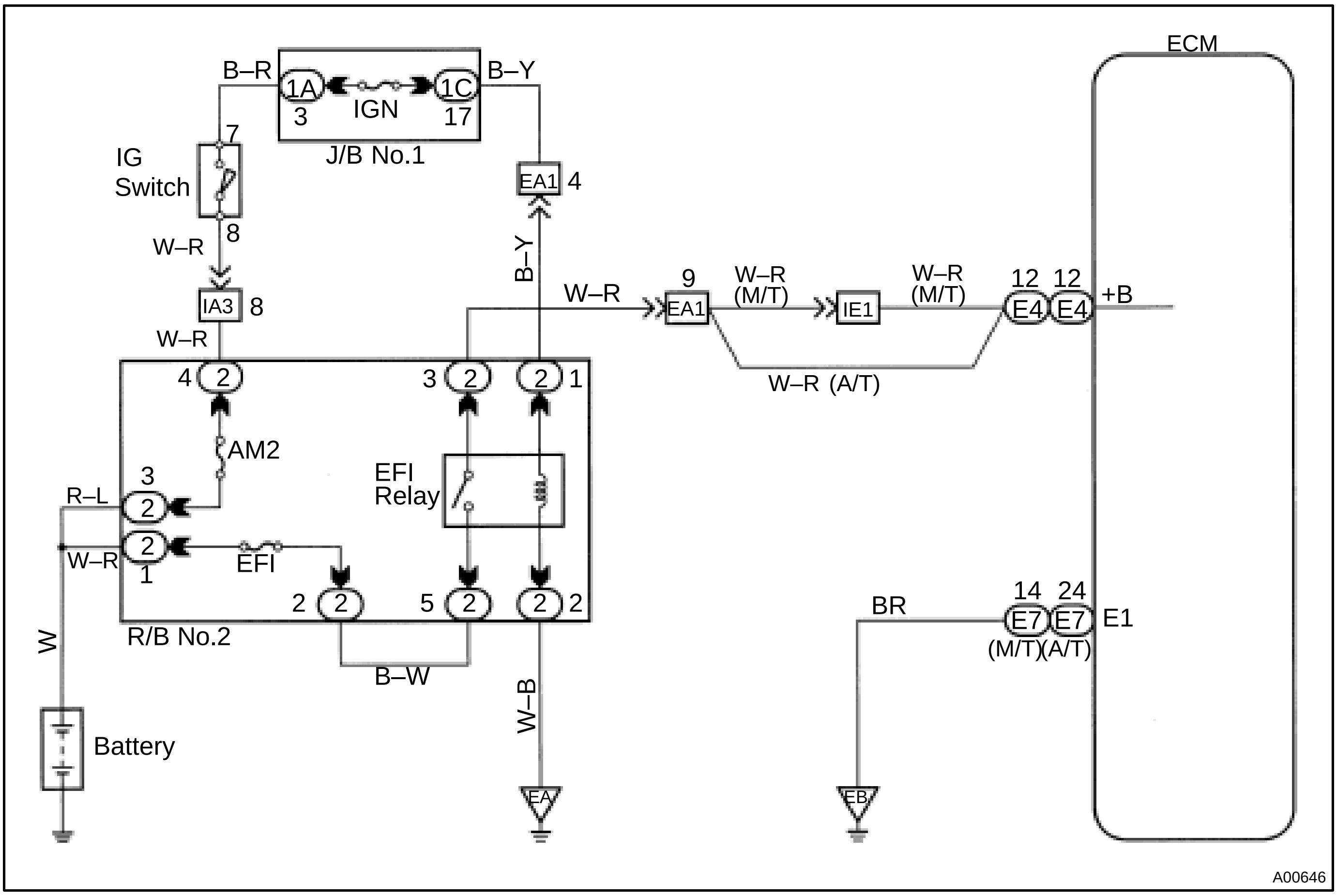
DI0U7–02

ECM Power Source Circuit

CIRCUIT DESCRIPTION

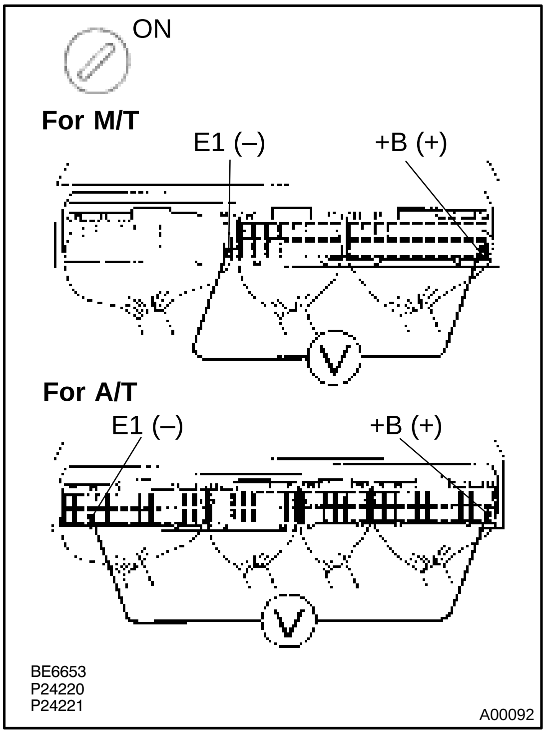
When the ignition switch is turned ON, battery positive voltage is applied to the coil, closing the contacts of the EFI main relay (Making: EFI) and supplying power to terminal +B of the ECM.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check voltage between terminals + B and E1 of ECM connector.



PREPARATION:
(a) Remove the right cowl side trim (See page SF–50).
(b) Turn the ignition switch ON.

CHECK:
Measure voltage between terminals + B and E1 of ECM connector.

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 and body ground (See page IN–24).

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

OK

3	Check EFI main relay (Marking: EFI) (See page SF–40).

NG → **Replace EFI main relay.**

OK

4	Check EFI fuse (See page DI–115, step 2).

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

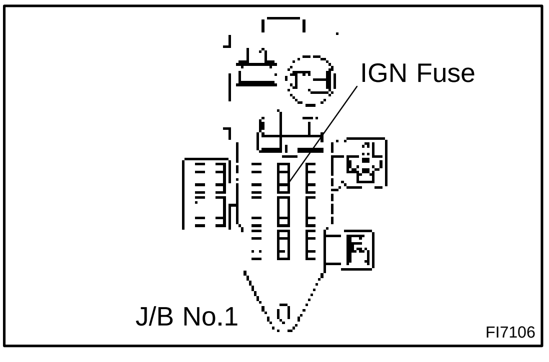
OK

5	Check for open in harness and connector between EFI main relay (Marking: EFI) and battery, EFI main relay (Marking: EFI) and ECM (See page IN–24).

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

OK

6	Check IGN fuse.



PREPARATION:
Remove the IGN fuse from the J/B No.1.
CHECK:
Check continuity of IGN fuse.
OK:
Continuity

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

OK

7	Check ignition switch (See page BE–12).

NG → **Replace ignition switch.**

OK

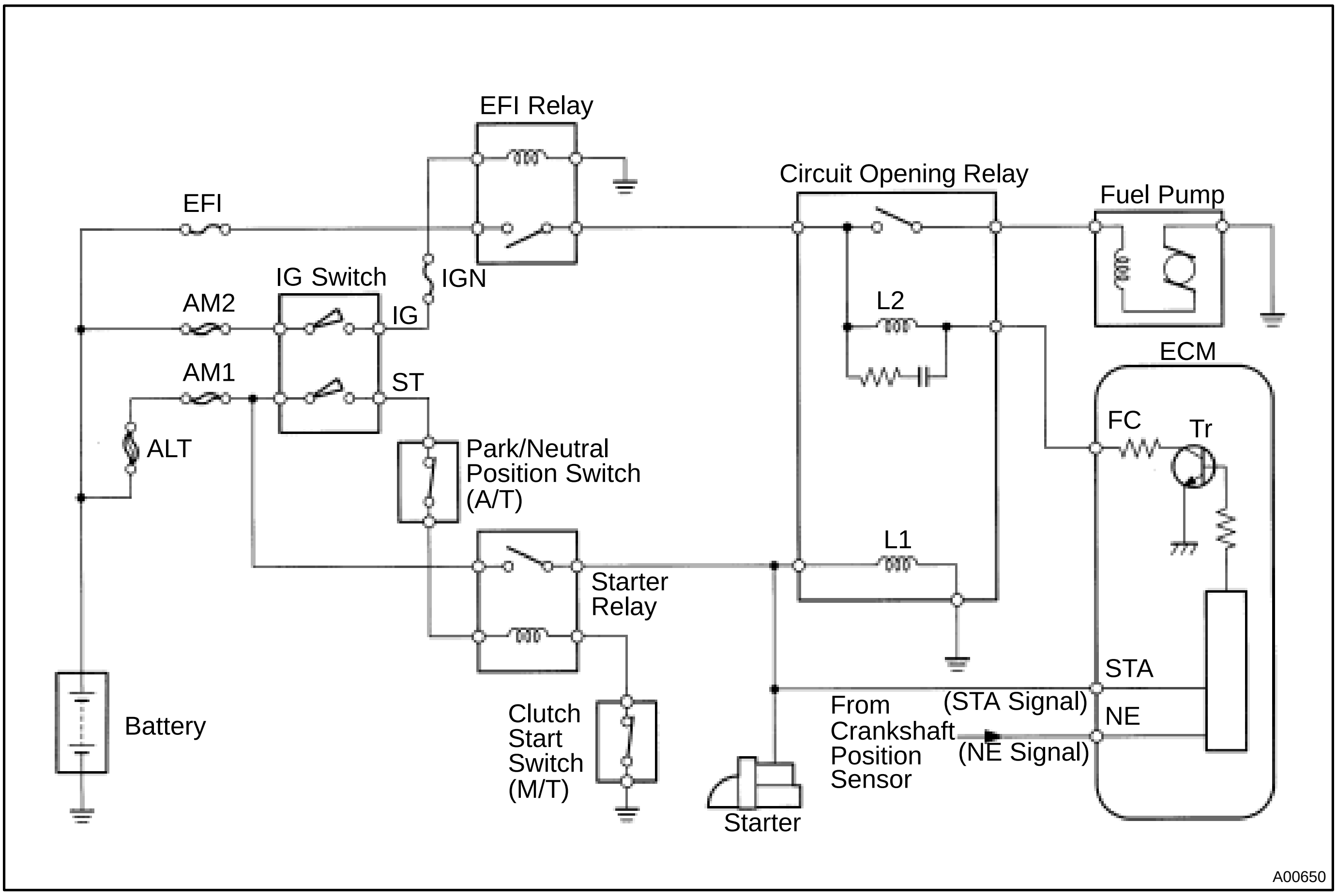
Check for open in harness and connector between IG switch and EFI main relay, EFI main relay and body ground (See page IN–24).

DI0U8–02

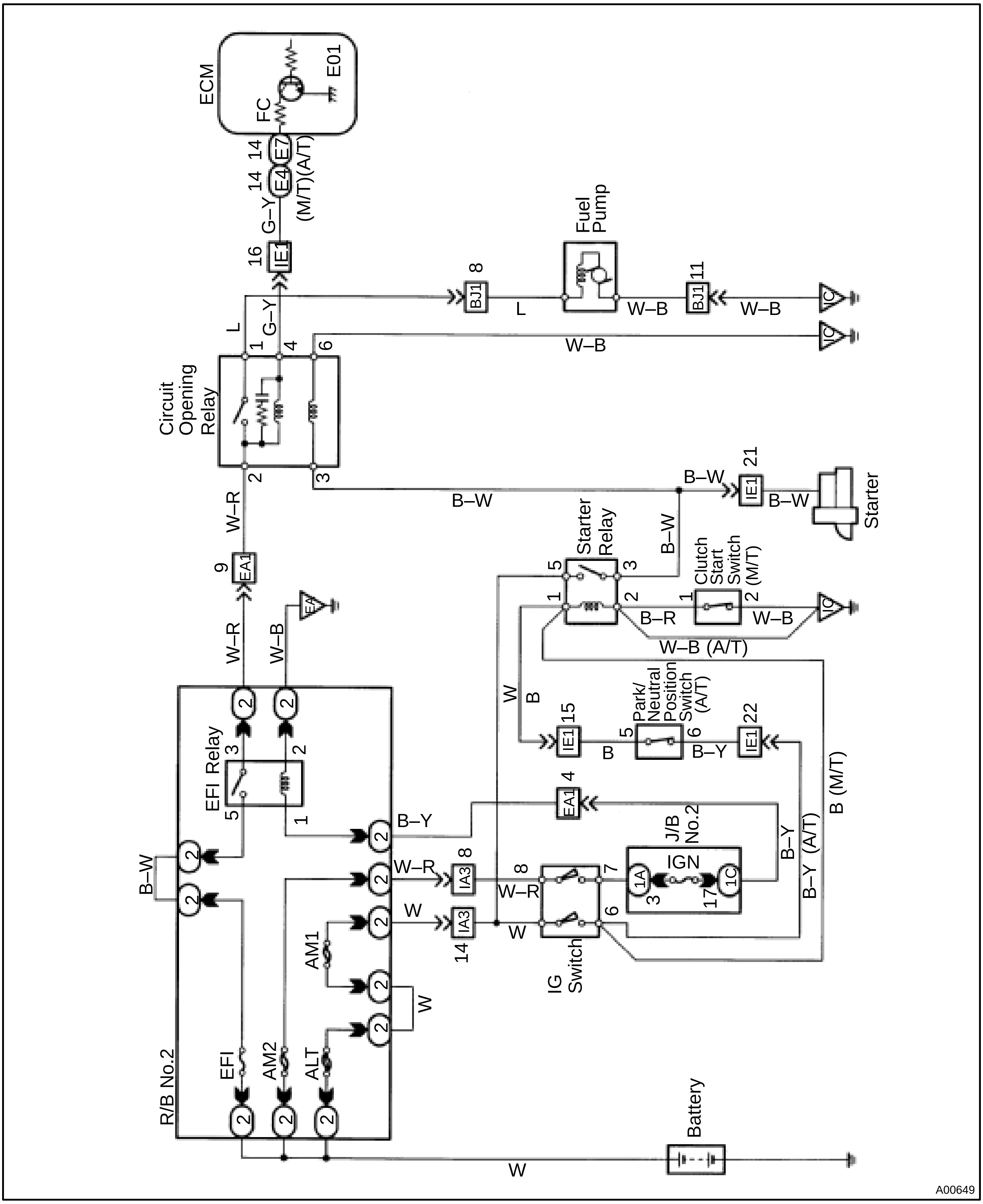
Fuel Pump Control Circuit

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, the starter relay switches on and current flows to coil L1 of the circuit opening relay. Thus the circuit opening relay switches on, power is supplied to the fuel pump and the fuel pump operates.
When the STA signal and NE signal are input to the ECM, Tr is turned ON, current flows to coil L2 of the circuit opening relay, the relay witches on 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.



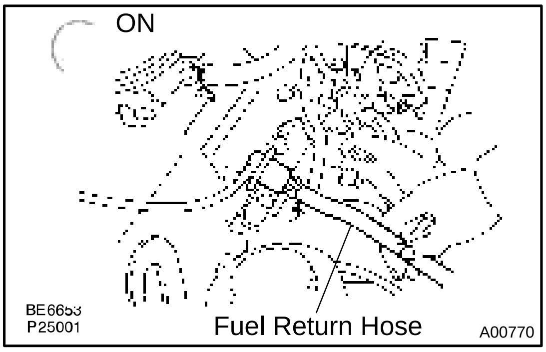
WIRING DIAGRAM



INSPECTION PROCEDURE

TOYOTA hand–held tester:

1	**Connect TOYOTA hand–held tester and check operation of fuel pump.**



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) Use "ACTIVE TEST" mode to operate the fuel pump.

CHECK:

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

OK:

There is pressure in the fuel return hose.

HINT:

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

OK	**Go to step 7.**

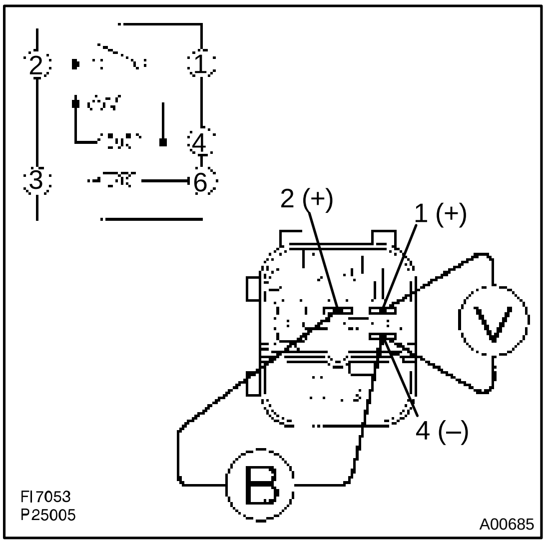
NG

2	**Check for ECM power source circuit (See page DI–119).**

NG	**Repair or replace.**

OK

3	**Check circuit opening relay.**

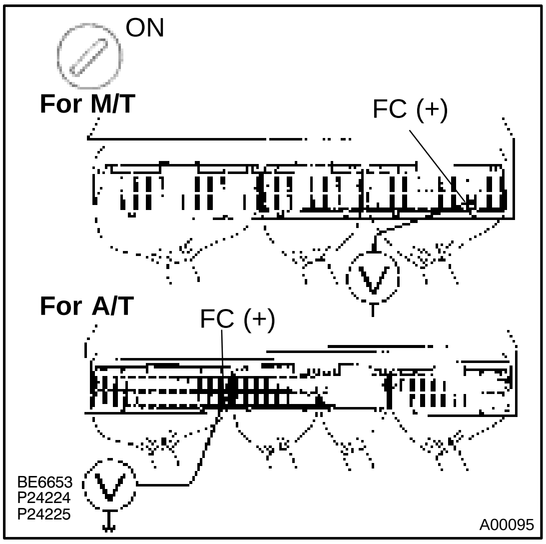


PREPARATION:
Remove the circuit opening relay (See page SF–42).
CHECK:
(a) Apply battery voltage between terminals 2 and 4.
(b) Measure voltage between terminals 1 and 4.
OK:
Voltage: Same as battery

NG → **Replace circuit opening relay.**

OK

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



PREPARATION:
(a) Remove the right cowl side trim (See page SF–50).
(b) Turn the ignition switch ON.
CHECK:
Measure voltage between terminal FC of ECM connector and body ground.
OK:
Voltage: 9 – 14 V

NG → **Check for open in harness and connector between EFI main relay and circuit opening relay, circuit opening relay and ECM.**

OK

5	Check fuel pump (See page SF–5).

NG — Repair or replace fuel pump.

OK

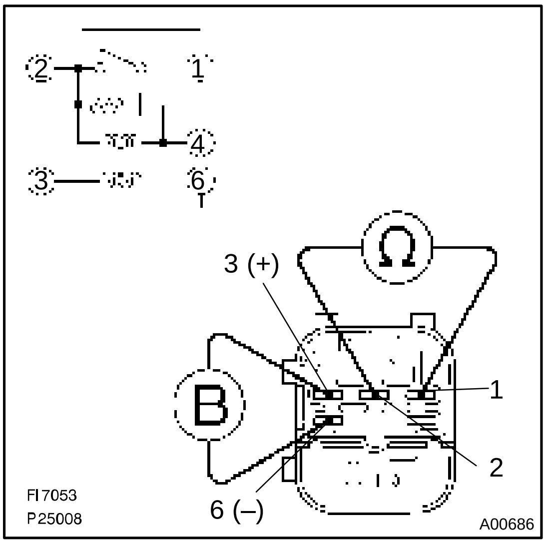
6	Check for open in harness and connector between circuit opening relay and fuel pump, fuel pump and body ground (See page IN–24).

NG — Repair or replace harness or connector.

OK

Check and replace ECM.

7	Check circuit opening relay.



PREPARATION:

Remove the circuit opening relay (See page SF–42).

CHECK:

(a) Apply battery voltage between terminals 3 and 6.

(b) Check continuity between terminal 1 and 2.

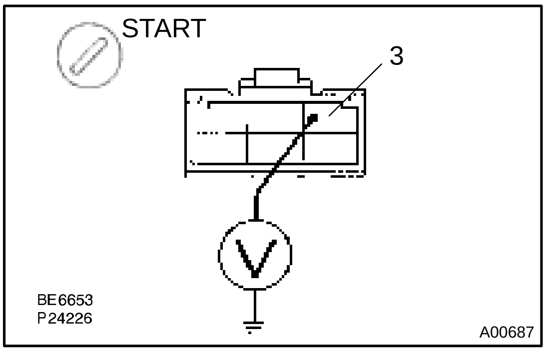
OK:

Continuity

NG — Replace circuit opening relay.

OK

8	**Check voltage between terminal 3 of circuit opening relay connector and body ground.**



CHECK:

Measure voltage between terminal 3 of circuit opening relay connector and body ground when engine is cranked.

OK:

Voltage: 9 – 14 V

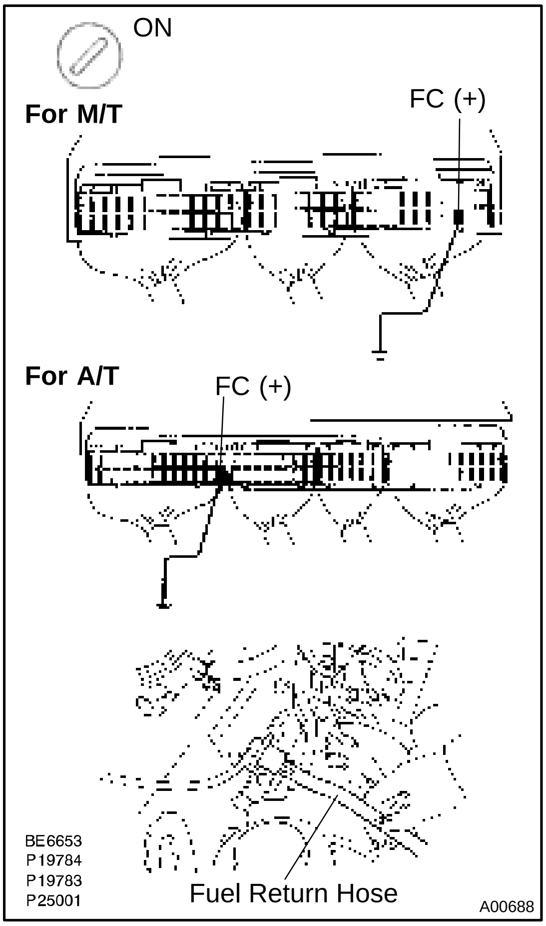
NG — **Check for starter signal circuit (See page DI–116).**

OK

Check for open in harness and connector between terminal 6 of circuit opening relay connector and body ground (See page IN–24).

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

1	**Check operation of fuel pump.**



PREPARATION:
(a) Remove the right cowl side trim (See page SF–50).
(b) Turn the ignition switch ON.

CHECK:
(a) Connect between terminal FC of ECM connector and body ground.
(b) Check for fuel pressure in the fuel return hose when it is pinched off.

OK:
There is pressure in the fuel return hose.

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

OK → **Go to step 7.**

NG

2	**Check for ECM power source circuit (See page DI–119).**

NG → **Repair or replace.**

OK

3	Check circuit opening relay (See page SF–42).

NG → **Replace circuit opening relay.**

OK

4	Check voltage between terminal FC of ECM connector and body ground (See page SF–42).

NG → **Check for open in harness and connector between EFI main relay and circuit opening relay, circuit opening relay and ECM.**

OK

5	Check fuel pump (See page IG–1).

NG → **Repair or replace fuel pump.**

OK

6	Check for open in harness and connector between circuit opening relay and fuel pump, fuel pump and body ground (See page IN–24).

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

OK

Check and replace ECM.

7	**Check circuit opening relay (See page SF–42).**

NG → **Replace circuit opening relay.**

OK

8	**Check voltage between terminal 3 of circuit opening relay connector and body ground (See page SF–42).**

NG → **Check for starter signal circuit (See page DI–116).**

OK

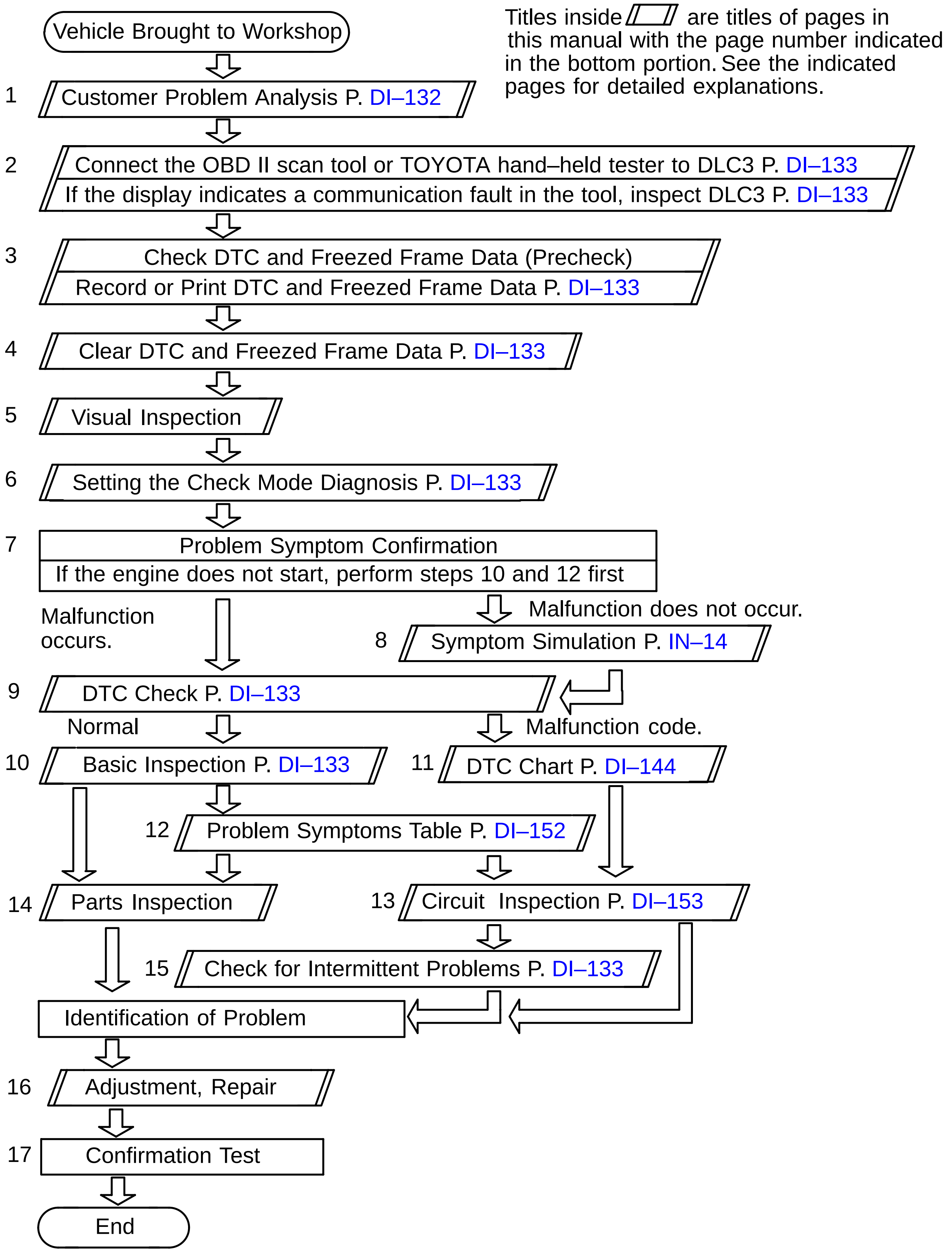
Check for open in harness and connector between terminal 6 of circuit opening relay connector and body ground (See page IN–24).

ENGINE (5VZ–FE)

HOW TO PROCEED WITH TROUBLESHOOTING

DI0U9–01

Troubleshoot in accordance with the procedure on the following page.



DI0UA–01

CUSTOMER PROBLEM ANALYSIS CHECK

ENGINE CONTROL SYSTEM Check Sheet

Inspector's Name ______________________

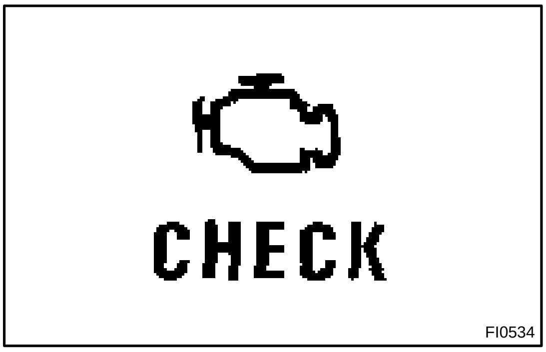
Customer's Name		Model and Model Year	
Driver's Name		Frame No.	
Date Vehicle Brought in		Engine Model	
License No.		Odometer Reading	km miles

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

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

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

DI0UB–01



FI0534

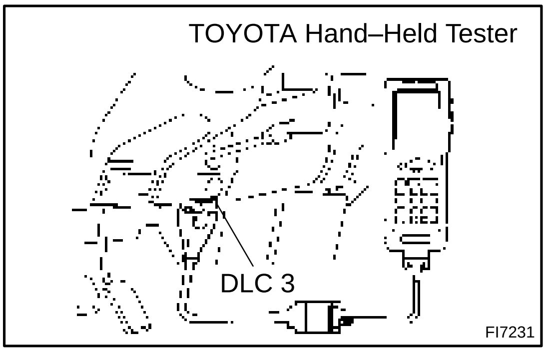
PRE–CHECK

1. DIAGNOSIS SYSTEM

(a) Description

- When troubleshooting OBD II vehicles, the only difference from the usual troubleshooting procedure is that you connect to the vehicle 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 computer itself or in drive system components which affect vehicle emissions. In addition to the MIL lighting up when a malfunction is detected, the applicable Diagnostic Trouble Codes (DTCs) prescribed by SAE J2012 are recorded in the ECM memory (See page DI–144).

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



FI7231

- 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–144).

- The diagnosis system operates in normal mode during normal vehicle use. It also has a check mode for technicians to simulate malfunction symptoms and troubleshoot. Most DTCs use 2 trip detection logic* to prevent erroneous detection, and ensure thorough malfunction detection. By switching the ECM to check mode when troubleshooting, the technician can cause the MIL to light up for a malfunction that is only detected once or momentarily. (TOYOTA hand–held tester only)
- *2 trip detection logic: When a logic malfunction is first detected, the malfunction is temporarily stored in the ECM memory. If the same malfunction is detected again during the 2nd drive test, this 2nd detection causes the MIL to light up.
- The 2 trip repeats the same mode a 2nd time. (However, the ignition switch must be turned OFF between the 1st trip and 2nd trip.)
- Freeze frame data:
  Freeze frame data records the engine condition when a misfire (DTCs P0300 – P0306) or fuel trim malfunction (DTCs P0171, P0172) or other malfunction (first malfunction only), is detected.
- Because freeze frame data records the engine conditions (fuel system, calculator 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 warmed up or not, the air–fuel ratio 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.

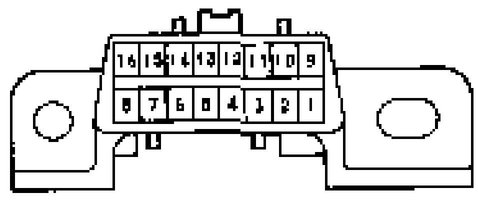
(1) DTCs other than fuel trim malfunction (DTCs P0171, P0172), EGR (DTCs P0401, P0402) and misfire (DTCs P0300 – P0306).

(2) Fuel trim malfunction (DTCs P0171, P0172) and EGR (DTCs P0401, P0402).

(3) Misfire (DTCs P0300 – P0306).

(b) Check the DLC3

The vehicle's ECM uses V.P.W. (Variable Pulse Width) for communication to comply with SAE J1850. The terminal arrangement of DLC3 complies with SAE J1962 and matches the V.P.W. format.



DLC3

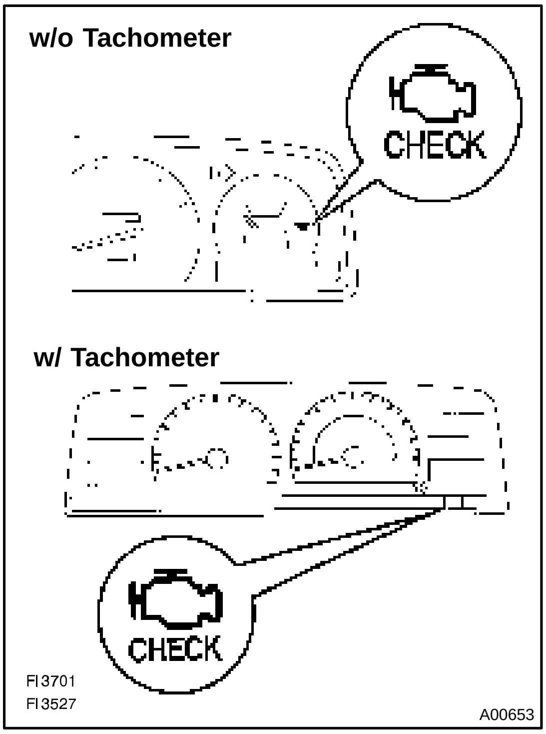
N09214

Terminal No.	Connection / Voltage or Resistance	Condition
2	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 DLC3, turned the ignition switch ON and operated the scan tool, there is a problem on the vehicle side or tool side.

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



2. INSPECT DIAGNOSIS (Normal Mode)

(a) Check the MIL

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

HINT:

If the MIL does not light up, troubleshoot the combination meter (See page BE–36).

(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:

TOYOTA hand–held tester only: When the diagnosis system is switched from normal mode to check mode, it erases all DTCs and freezed frame data recorded in 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 the DLC3 at the lower of the instrument panel.

(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.)

(5) See page DI–133 to confirm the details of the DTCs.

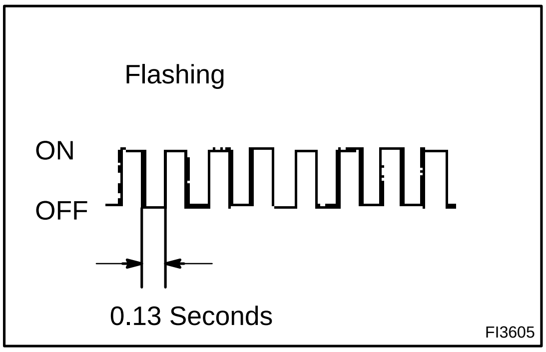
NOTICE:
When simulating symptoms with an OBD II scan tool (excluding TOYOTA hand–held tester) to check the DTCs, use normal mode. For code on the DTC chart subject to ”2 trip detection logic”, turn the ignition switch OFF after the symptom is simulated the 1st time. Then repeat the simulation process again. When the problem has been simulated twice, the MIL lights up and the DTCs are recorded in the ECM.

3. INSPECT DIAGNOSIS (Check Mode)

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 11 V or more
- Throttle valve fully closed
- Transmission in ”P” or ”N” position
- Air conditioning switched OFF

(2) Turn the ignition switch OFF.
(3) Prepare the TOYOTA hand–held tester.
(4) Connect the TOYOTA hand–held tester to DLC3 at the lower of the instrument panel.
(5) Turn the ignition switch ON and push the TOYOTA hand–held tester switch ON.
(6) Switch the TOYOTA hand–held tester normal mode to check mode. (Check that the MIL flashes.)



FI3605

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

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

(9) 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.

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

(b) Clear the DTC.
The following actions will erase the DTCs and freezed frame data.
(1) Operating the OBD II scan tool (complying with SAE J1978) or TOYOTA hand–held tester to erase the codes. (See the OBD II scan tool's instruction book for operating instructions.)
(2) Disconnecting the battery terminals or EFI fuse.

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

4. FAIL–SAFE CHART

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

DTC No.	Fail–Safe Operation	Fail–Safe Deactivation Conditions
P0100	Ignition timing fixed at 10° BTDC	Returned to normal condition
P0110	Intake air temp. is fixed at 20°C (68°F)	Returned to normal condition
P0115	Engine coolant temp. is fixed at 80°(176°F)	Returned to normal condition
P0120	VTA is fixed at 0°	Following condition must be repeated at least 2 times consecutively 0.1 V < VTA < 0.95 V
P0135 P0141	Heater circuit in which an abnormality is detected is turned off	Ignition switch OFF
P0325 P0330	Max. timing retardation	Ignition switch OFF
P1300	Fuel cut	IGF signal is detected for 6 consective ignitions

5. CHECK FOR INTERMITTENT PROBLEMS

TOYOTA HAND–HELD TESTER only:
By putting the vehicle's ECM in 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.
(a) Clear the DTCs (See page DI–133).
(b) Set the check mode (See page DI–133).
(c) Perform a simulation test (See page IN–14).
(d) Check the connector and terminal (See page IN–24).
(e) Handle the connector (See page IN–24).

6. BASIC INSPECTION

When the malfunction code is not confirmed in the DTC check, troubleshooting should be performed in the order for all possible circuits to be considered as the causes of the problems. In many cases, by carrying out the basic engine check shown in the following flow chart, the location causing the problem can be found quickly and efficiently. Therefore, 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 page ST–6and continue to trouble-shoot.**

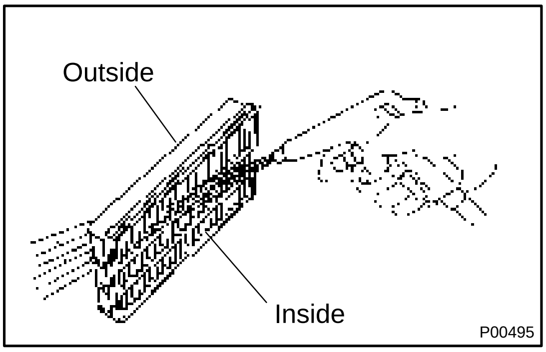
YES

3	Does engine start?

NO → **Go to step 7.**

YES

4	Check air filter.



PREPARATION:
Remove the air filter.
CHECK:
Visual check that the air filter is not dirty or excessive oily.
HINT:
If necessary, clean the filter with compressed air. First blow from inside thoroughly, then blow from outside of the 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 air conditioning.
(d) Shift the transmission into ”N” position.
(e) Connect the OBD II scan tool or TOYOTA hand–held tester to the DLC3 on the vehicle.

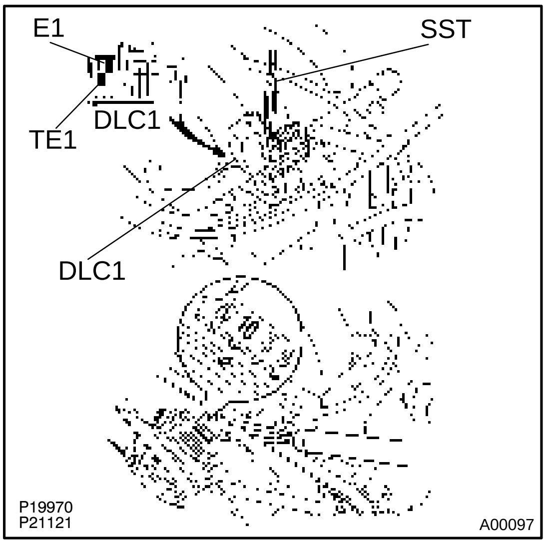
CHECK:
Use ”CURRENT DATA” to check the idle speed.

OK:
Idle speed: 650 – 750 rpm

NG → **Proceed to problem symptoms table on page** **DI–152.**

OK

6	Check ignition timing.



PREPARATION:
(a) Warm up the engine to normal operating temperature.
(b) Shift the transmission into ”N” position.
(c) Keep the engine speed at idle.
(d) Using SST, connect terminals TE1 and E1 of the DLC1.
SST 09843–18020
(e) Using a timing light, connect the tester to the No.1 high–tension cord.

CHECK:
Check the ignition timing.

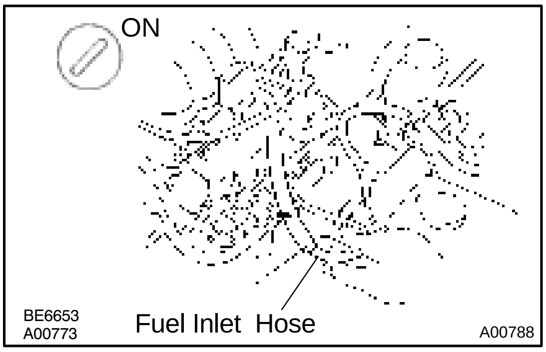
OK:
Ignition timing: 8 – 12° BTDC at idle

NG → **Proceed to page Ignition system and continue to troubleshoot.**

OK

Proceed to problem symptoms table on page **DI–152.**

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 "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–5).

CHECK:

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

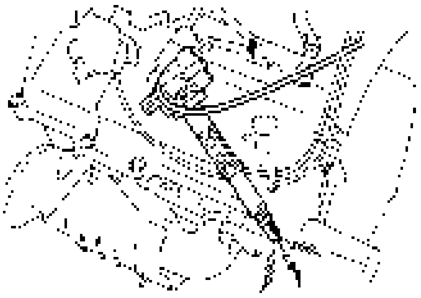
HINT:

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

NG	Proceed to page SF–5 and continue to trouble-shoot.

OK

8	Check for spark.


P21163

PREPARATION:

(a) Remove the ignition coil or disconnect the high–tension cord from the spark plug.
(b) Remove the spark plug.
(c) Install the spark plug to the ignition coil or high–tension cord.
(d) Disconnect the injector connector.
(e) Hold the end about 12.5 mm (0.61 in.) from the ground.

CHECK:

Check if the spark occurs while engine is being cranked.

NOTICE:

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

NG → **Proceed to page IG–1 and continue to trouble-shoot.**

OK

Proceed to problem symptoms table on page DI–152.

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
CALC LOAD	Calculator Load: Current intake air volume as a proportion of max. intake air volume	Idling: 14.9 – 21.3 % Racing without load (2,500rpm): 16.5 ~ 23.5%
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 %
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 12.5 – 22.0°
INTAKE AIR	Intake Air Temp. Sensor Value	Equivalent to Ambient Temp.
MAF	Air Flow Rate Through Mass Air Flow Meter	Idling: 3.2 – 4.6 gm/sec. Racing without load (2,500 rpm): 12.9 – 18.3 gm/sec.
THROTTLE POS	Voltage Output of Throttle Position Sensor Calculated as a percentage: 0 V → 0 %, 5 V → 100 %	Throttle valve fully closed: 7 – 11 % Throttle valve fully open: 65 – 75 %
O2S B1, S1	Voltage Output of Oxygen Sensor Bank 1, Sensor 1	Idling: 0.1 – 0.9 V
O2FT B1, S1	Oxygen Sensor Fuel Trim Bank 1, Sensor 1 (Same as SHORT FT #1)	0 ± 20 %
O2S B1, S2	Voltage Output of Oxygen Sensor Bank 1, Sensor 2	Driving 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 N or P 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*1
MISFIRE RPM	Engine RPM for first misfire range	Misfire 0: 0 rpm
MISFIRE LOAD	Engine load for first misfire range	Misfire 0: 0 g/r
INJECTOR	Fuel injection time for cylinder No.1	Idling: 1.82 – 3.15 ms
IAC DUTY RATIO	Intake Air Control Valve Duty Ratio Opening ratio rotary solenoid type IAC valve	Idling: 22 – 46 %
STARTER SIG	Starter Signal	Cranking: ON
A/C SIG	A/C Switch Signal	A/C ON: ON
PNP SW	Park/Neutral Position Switch Signal	P or N position: ON
STOP LIGHT SW	Stop Light Switch Signal	Stop light switch ON: 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 #6	Abnormal revolution variation for each cylinder	0 %
IGNITION	Total number of ignition for every 1,000 revolutions	0 – 3,000
EGRT GAS*2	EGR Gas Temp. Sensor Value	EGR not operating: Temp. between intake air temp. and engine coolant temp.
EGR SYSTEM*2	EGR System Operating Condition	Idling: OFF
A/C CUT SIG	A/C Cut Signal	A/C S/W OFF: ON
FUEL PUMP	Fuel Pump Signal	Idling: ON
EVAP (PURGE) VSV	EVAP VSV Signal	VSV operating: ON
VAPOR PRESS VSV	Vapor Pressure 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
O2 LR B1, S1	Oxygen Sensor Lean Rich Bank 1, Sensor 1 Response time for oxygen sensor output to switch from lean to rich	Idling after warming up: 0 – 1,000 msec.
O2 RL B1, S1	Oxygen Sensor Rich Lean Bank 1, Sensor 1 Response time for oxygen sensor output to switch from rich to lean	Idling after warming up: 0 – 1,000 msec.

*1: If no conditions are specifically stated for ”Idling”, it means the shift lever is at N or P position, the A/C switch is OFF and all accessory switches are OFF.
*2: Only for 2WD models with a load capacity of 0.5 ton and regular cab.

DI0UC–01

DIAGNOSTIC TROUBLE CODE CHART

SAE CONTROLLED

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 that code 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.

DTC No. (See Page)	Detection Item	Trouble Area	MIL*	Memory
P0100 (DI–153)	Mass Air Flow Circuit Malfunction	● Open or short in mass air flow meter circuit ● Mass air flow meter ● ECM		
P0101 (DI–157)	Mass Air Flow Circuit Range/Performance Problem	● Mass air flow meter		
P0110 (DI–158)	Intake Air Temp. Circuit Malfunction	● Open or short in intake air temp. sensor circuit ● Intake air temp. sensor ● ECM		
P0115 (DI–162)	Engine Coolant Temp. Circuit Malfunction	● Open or short in engine coolant temp. sensor circuit ● Engine coolant temp. sensor ● ECM		
P0116 (DI–166)	Engine Coolant Temp. Circuit Range/Performance Problem	● Engine coolant temp. sensor ● Cooling system		
P0120 (DI–167)	Throttle/Pedal Position Sensor/Switch ”A” Circuit Malfunction	● Open or short in throttle position sensor circuit ● Throttle position sensor ● ECM		
P0121 (DI–172)	Throttle/Pedal Position Sensor/Switch ”A” Circuit Range/Performance Problem	● Throttle position sensor		
P0125 (DI–173)	Insufficient Coolant Temp. for Closed Loop Fuel Control	● Open or short in heated oxygen sensor (bank 1 sensor 1) circuit ● Heated oxygen sensor (bank 1 sensor 1)		
P0130 (DI–176)	Heated Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 1)	● Heated oxygen sensor ● Fuel trim malfunction		
P0133 (DI–179)	Heated Oxygen Sensor Circuit Slow Response (Bank 1 Sensor 1)	● Heated oxygen sensor		
P0135 (DI–180)	Heated Oxygen Sensor Heater Circuit Malfunction (Bank 1 Sensor 1)	● Open or short in heater circuit of heated oxygen sensor ● Heated oxygen sensor ● ECM		
P0136 (DI–182)	Heated Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 2)	● Heated oxygen sensor		
P0141 (DI–180)	Heated Oxygen Sensor Heater Circuit Malfunction (Bank 1 Sensor 2)	● Same as DTC No. P0135		

*: <<<MIL lights up

DTC No. (See Page)	Detection Item	Trouble Area	MIL	Memory
P0171 (DI–184)	System too Lean (Fuel Trim)	● Air intake (hose loose) ● Fuel line pressure ● Injector blockage ● Heated oxygen sensor (bank 1 sensor 1) malfunction ● Mass air flow meter ● Engine coolant temp. sensor	*1	
P0172 (DI–184)	System too Rich (Fuel Trim)	● Fuel line pressure ● Injector leak, blockage ● Heated oxygen sensor (bank 1 sensor 1) malfunction ● Mass air flow meter ● Engine coolant temp. sensor	*1	
P0300 (DI–187)	Random/Multiple Cylinder Misfire Detected	● Ignition system ● Injector ● Fuel line pressure ● EGR*3 ● Compression pressure ● Valve clearance not to specification ● Valve timing ● Mass air flow meter ● Engine coolant temp. sensor	*2	
P0301 P0302 P0303 P0304 P0305 P0306 (DI–187)	Misfire Detected – Cylinder 1 – Cylinder 2 – Cylinder 3 – Cylinder 4 – Cylinder 5 – Cylinder 6		*2	
P0325 (DI–192)	Knock Sensor 1 Circuit Malfunction	● Open or short in knock sensor 1 circuit ● Knock sensor 1 (looseness) ● ECM	*1	
P0330 (DI–192)	Knock Sensor 2 Circuit Malfunction	● Open or short in knock sensor 2 circuit ● Knock sensor 2 (looseness) ● ECM	*1	
P0335 (DI–195)	Crankshaft Position Sensor "A" Circuit Malfunction	● Open or short in crankshaft position sensor circuit ● Crankshaft position sensor ● Starter ● ECM	*1	
P0340 (DI–198)	Camshaft Position Sensor Circuit Malfunction	● Open or short in camshaft position sensor circuit ● Camshaft position sensor ● Starter ● ECM	*1	
P0401*3 (DI–200)	Exhaust Gas Recirculation Flow Insufficient Detected	● EGR valve stuck closed ● Short in VSV circuit for EGR ● Open in EGR gas temp. sensor circuit ● EGR hose disconnected ● ECM	*1	
P0402*3 (DI–210)	Exhaust Gas Recirculation Flow Excessive Detected	● EGR valve stuck open ● EGR VSV open malfunction ● Open in VSV circuit for EGR ● Short in EGR gas temp. sensor circuit ● ECM	*1	
P0420 (DI–214)	Catalyst System Efficiency Below Threshold	● Three–way catalytic converter ● Open or short in heated oxygen sensor (bank 1 sensor 1, 2) circuit ● Heated oxygen sensor (bank 1 sensor 1, 2)	*1	

*1: MIL lights up
*2: MIL lights up or blinking
*3: Only for 2WD models with a load capacity of 0.5 ton and regular cab.

DTC No. (See Page)	Detection Item	Trouble Area	MIL*	Memory
P0440 (DI–216)	Evaporative Emission Control System Malfunction	● Vapor pressure sensor ● Fuel tank cap incorrectly installed ● Fuel tank cap cracked or damaged ● Vacuum hose cracked, holed, blocked, damaged or disconnected ● Hose or tube cracked, holed, damaged or insufficient seal ● Fuel tank cracked, holed or damaged ● Charcoal canister cracked, holed or damaged		
P0441 (DI–223)	Evaporative Emission Control System Incorrect Purge Flow	● Open or short in VSV circuit for EVAP ● VSV for EVAP ● Open or short in vapor pressure sensor circuit ● Vapor pressure sensor ● Open or short in VSV circuit for vapor pressure sensor ● VSV for vapor pressure sensor ● Vacuum hose cracked, holed, blocked, damaged or disconnected ● Charcoal canister cracked, holed or damaged		
P0446 (DI–223)	Evaporative Emission Control System Vent Control Malfunction			
P0450 (DI–236)	Evaporative Emission Control System Pressure Sensor Malfunction	● Open or short in vapor pressure sensor circuit ● Vapor pressure sensor ● ECM		
P0500 (DI–238)	Vehicle Speed Sensor Malfunction	● Open or short in No.1 vehicle speed sensor circuit ● No.1 vehicle speed sensor ● ECM ● Speedometer cable		
P0505 (DI–240)	Idle Control System Malfunction	● IAC valve is stuck or closed ● Open or short in IAC valve circuit ● Open or short in A/C signal circuit ● Air intake (hose loose)		

*: <<<MIL lights up

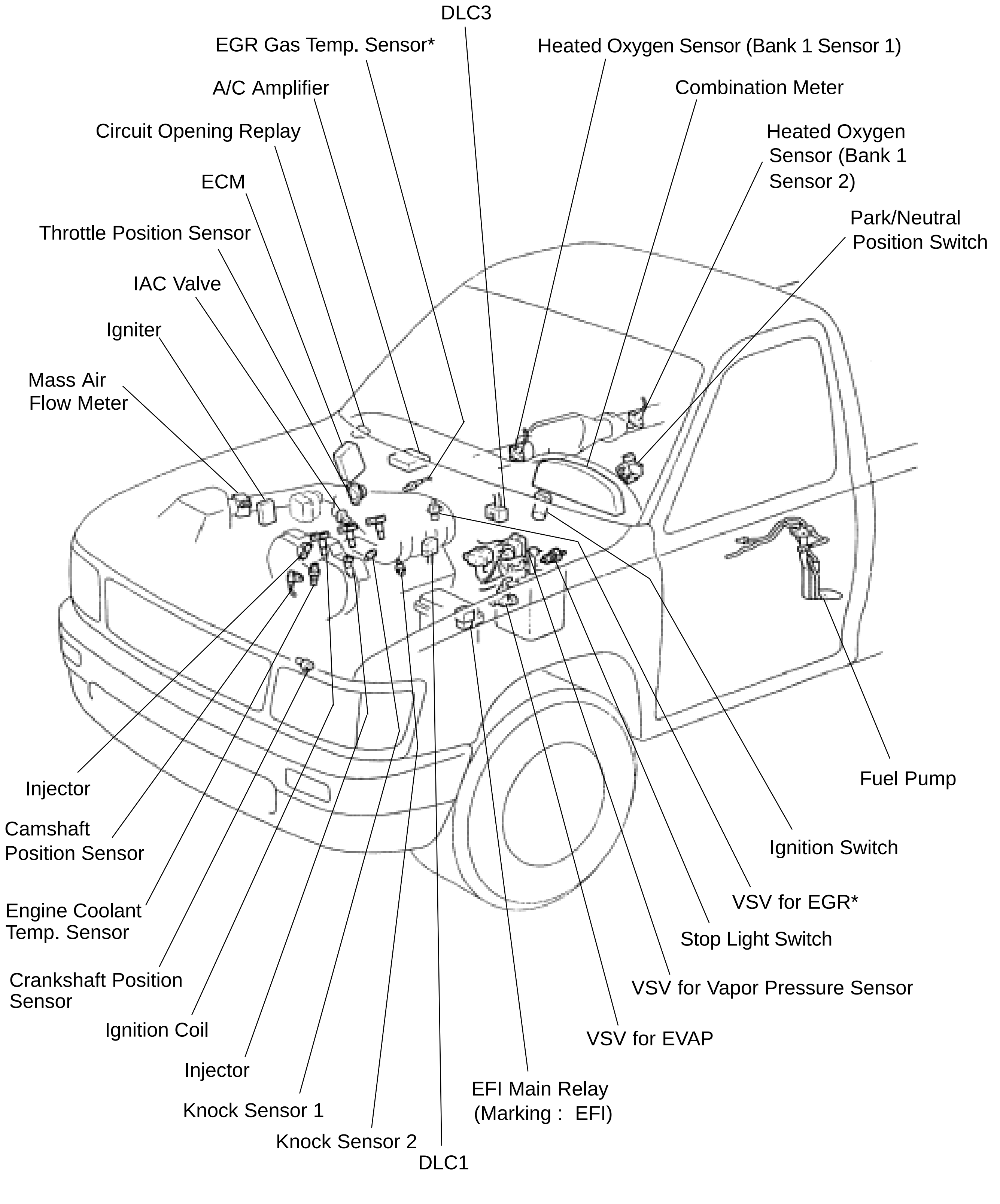
MANUFACTURER CONTROLLED

DTC No. (See Page)	Detection Item	Trouble Area	MIL*	Memory
P1300 (DI–243)	Igniter Circuit Malfunction	● Open or short in IGF or IGT circuit from igniter to ECM ● Igniter ● ECM		
P1335 (DI–249)	Crankshaft Position Sensor Circuit Malfunction (during engine running)	● Open or short in crankshaft position sensor circuit ● Crankshaft position sensor ● Starter ● ECM	–	
P1520 (DI–250)	Stop Light Switch Signal Malfunction	● Short in stop light switch signal circuit ● Stop light switch ● ECM		
P1600 (DI–253)	ECM BATT Malfunction	● Open in back up power source circuit ● ECM		
P1780 (DI–255)	Park/Neutral Position Switch Malfunction	● Short in park/neutral position switch circuit ● Park/neutral position switch ● ECM		

*: – <<<MIL does not light up, <<<MIL lights up

DI0UD–01

PARTS LOCATION



*: Only for 2WD models with a load capacity of 0.5 ton and regular cab.

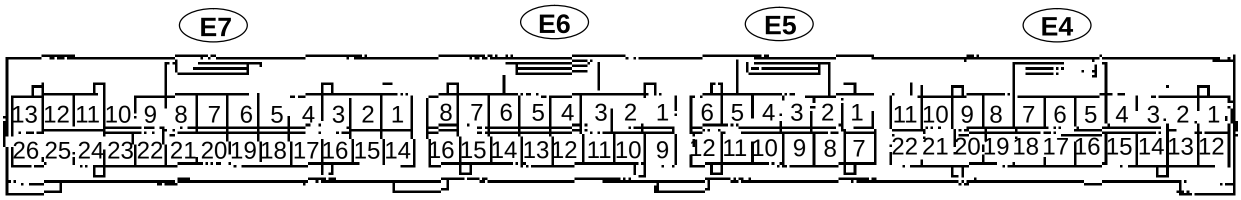
A00783

DI0UE–01

TERMINALS OF ECM

For M/T

ECM Terminals



FI6526

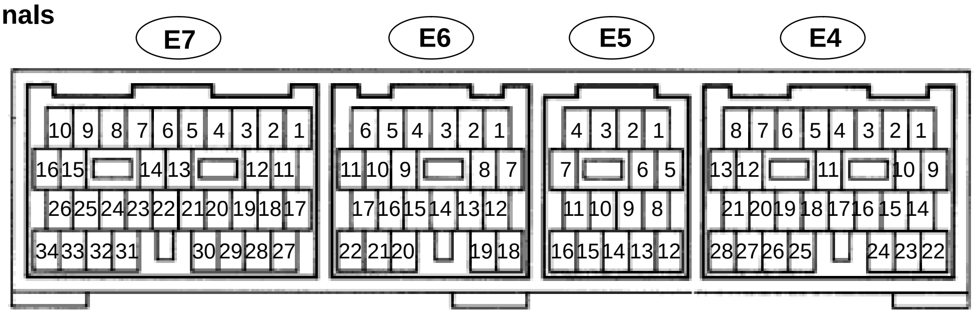
Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage (V)
BATT (E4–2) – E1 (E7–24)	B–G ↔ BR	Always	9 – 14
+B (E4–12) – E1 (E7–24)	W–R ↔ BR	IG switch ON	9 – 14
VCC (E6–1) – E2 (E6–9)	G–B ↔ BR–B	IG switch ON	4.5 – 5.5
VTA (E6–10) – E2 (E6–9)	Y–B ↔ BR–B	IG switch ON, Apply vacuum to throttle opener Throttle valve fully closed	0.3 – 0.8
		IG switch ON, Throttle valve fully open	3.2 – 4.9
VG (E6–2) – E3 (E6–8)	GR–R ↔ BR–W	Idling, N position, A/C switch OFF	1.1 – 1.5
THA (E6–12) – E2 (E6–9)	Y–G ↔ BR–B	Idling, Intake air temp. 20°C (68°F)	0.5 – 3.4
THW (E6–4) – E2 (E6–9)	G–R ↔ BR–B	Idling, Engine coolant temp. 80°C (176°F)	0.2 – 1.0
STA (E4–11) – E1 (E7–24)	B–W ↔ BR	Cranking	6.0 or more
#10 (E7–12) – E01 (E7–13)	W–R ↔ BR	IG switch ON	9 – 14
		Idling	Pulse generation (See page DI–187)
#20 (E7–11) – E01 (E7–13)	W ↔ BR	IG switch ON	9 – 14
		Idling	Pulse generation (See page DI–187)
#30 (E7–25) – E01 (E7–13)	W–G ↔ BR	IG switch ON	9 – 14
		Idling	Pulse generation (See page DI–187)
#40 (E7–10) – E01 (E7–13)	Y–K ↔ BR	IG switch ON	9 – 14
		Idling	Pulse generation (See page DI–187)
#50 (E7–9) – E01 (E7–13)	W–L ↔ BR	IG switch ON	9 – 14
		Idling	Pulse generation (See page DI–187)
#60 (E7–8) – E01 (E7–13)	Y–B ↔ BR	IG switch ON	9 – 14
		Idling	Pulse generation (See page DI–187)
IGT1 (E7–23) – E1 (E7–24)	B–L ↔ BR	Idling	Pulse generation (See page DI–243)
IGT2 (E7– 22) – E1 (E7–24)	BR–Y ↔ BR	Idling	Pulse generation (See page DI–243)
IGT3 (E7–21) – E1 (E7–24)	B–W ↔ BR	Idling	Pulse generation (See page DI–243)

Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage (V)
IGF (E7–17) – E1 (E7–24)	B–Y ↔ BR	IG switch ON, Disconnect igniter connector	4.5 – 5.5
		Idling	Pulse generation (See page DI–243)
G (E5–11) – G– (E5–5)	B ↔ W	Idling	Pulse generation (See page DI–195)
NE (E5–12) – NE– (E5–6)	G ↔ L	Idling	Pulse generation (See page DI–195)
FC (E7–14) – E1 (E7–24)	G–Y ↔ BR	IG switch ON	9 – 14
		Idling	0 – 3.0
EGR* (E7–18) – E1 (E7–24)	R–W ↔ BR	IG switch ON	9 – 14
THG* (E6–14) –E2(E6–9)	P ↔ BR–B	IG switch ON	4.5 – 5.5
EVP (E7–5) – E1 (E7–24)	W–G ↔ BR	IG switch ON	9 – 14
RSC (E7–6) – E1 (E7–24)	B–R ↔ BR	IG switch ON, Disconnect E7 of ECM connector	9 – 14
RSO (E7–7) – E1 (E7–24)	BR–R ↔ BR	IG switch ON, Disconnect E7 of ECM connector	9 – 14
OX1 (E6–5) – E1 (E7–24)	W ↔ BR	Maintain engine speed at 2,500 rpm for 2 min. after warming up	Pulse generation (See page DI–176)
OX2 (E6–13) – E1 (E7–24)	R ↔ BR	Maintain engine speed at 2,500 rpm for 2 min. after warming up	Pulse generation (See page DI–176)
HT1 (E5–3) – E03 (E5–7)	P–G ↔ BR	Idling	Below 3.0
		IG switch ON	9 – 14
HT2 (E5–9) – E03 (E5–7)	R–G ↔ BR	Idling	Below 3.0
		IG switch ON	9 – 14
KNK1 (E6–6) – E1 (E7–24)	B ↔ BR	Idling	Pulse generation (See page DI–192)
KNK2 (E6–3) – E1 (E7–24)	GR ↔ BR	Idling	Pulse generation (See page DI–192)
SP1 (E4–8) – E1 (E7–24)	G ↔ BR	IG switch ON Rotate driving wheel slowly	Pulse generation (See page DI–238)
TE1 (E6–7) – E1 (E7–24)	V–W ↔ BR	IG switch ON	9 – 14
W (E4–4) – E1 (E7–24)	V ↔ BR	Idling	9 – 14
		IG switch ON	Below 3.0
ACT (E4–6) – E1 (E7–24)	L–B ↔ BR	A/C switch OFF at Idling	Below 2.0
		A/C switch ON at idling	5 or more
AC1 (E4–7) – E1 (E7–24)	B–R ↔ BR	A/C switch ON at idling	Below 2.0
		A/C switch OFF at Idling	9 – 14
TPC (E7–3) – E1 (E7–24)	LG–R ↔ BR	IG switch ON Disconnect vacuum hose from vapor pressure sensor	9 – 14
PTNK (E5–4) – E2 (E6–9)	R–L ↔ BR–B	IG switch ON	3.0 – 3.6
		IG switch ON Apply vacuum 2.0 kPa (15 mmHg, 0.6 in.Hg)	1.3 – 2.1
SDL (E4–19) – E1 (E7–24)	W ↔ BR–B	During transmission	Pulse generation

*: Only for 2WD models with a load capacity of 0.5 ton and regular cab.

For A/T

ECM Terminals



Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage (V)
BATT (E4–14) – E1 (E5–16)	B–G ↔ BR	Always	9 – 14
+B (E4–22) – E1 (E5–16)	W–R ↔ BR	IG switch ON	9 – 14
VCC (E6–1) – E2 (E6–22)	G–B ↔ BR–B	IG switch ON	4.5 – 5.5
VTA (E6–7) – E2 (E6–22)	Y–B ↔ BR–B	IG switch ON, Apply vacuum to throttle opener Throttle valve fully closed	0.3 – 0.8
		IG switch ON, Throttle valve fully open	3.2 – 4.9
VG (E6–8) – E3 (E6–18)	GR–R ↔ BR–W	Idling, P or N position, A/C switch OFF	1.1 – 1.5
THA (E6–14) – E2 (E6–22)	Y–G ↔ BR–B	Idling, Intake air temp. 20°C (68°F)	0.5 – 3.4
THW (E6–20) – E2 (E6–22)	G–Y ↔ BR–B	Idling, Engine coolant temp. 80°C (176°F)	0.2 – 1.0
STA (E7–13) – E1 (E5–16)	B–W ↔ BR	Cranking	6.0 or more
#10 (E7–10) – E01 (E7–34)	W–R ↔ BR	IG switch ON	9 – 14
		Idling	Pulse generation (See page DI–187)
#20 (E7–9) – E01 (E7–34)	W ↔ BR	IG switch ON	9 – 14
		Idling	Pulse generation (See page DI–187)
#30 (E7–8) – E01 (E7–34)	W–G ↔ BR	IG switch ON	9 – 14
		Idling	Pulse generation (See page DI–187)
#40 (E7–7) – E01 (E7–34)	Y–R ↔ BR	IG switch ON	9 – 14
		Idling	Pulse generation (See page DI–187)
#50 (E7–6) – E01 (E7–34)	W–L ↔ BR	IG switch ON	9 – 14
		Idling	Pulse generation (See page DI–187)
#60 (E7–5) – E01 (E7–34)	Y–B ↔ BR	IG switch ON	9 – 14
		Idling	Pulse generation (See page DI–187)
IGT1 (E7–24) – E1 (E5–16)	B–L ↔ BR	Idling	Pulse generation (See page DI–243)
IGT2 (E7–25) – E1 (E5–16)	BR–B ↔ BR	Idling	Pulse generation (See page DI–243)
IGT3 (E7–26) – E1 (E5–16)	B–W ↔ BR	Idling	Pulse generation (See page DI–243)
IGF (E7–12) – E1 (E5–16)	B–Y ↔ BR	IG switch ON, Disconnect igniter connector	4.5 – 5.5
		Idling	Pulse generation (See page DI–243)

Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage (V)
G (E6–10) – G– (E6–11)	B ↔ W	Idling	Pulse generation (See page DI–195)
NE (E6–5) – NE– (E6–6)	G ↔ L	Idling	Pulse generation (See page DI–195)
FC (E5–4) – E1 (E5–16)	G–Y ↔ BR	IG switch ON	9 – 14
		Idling	0 – 3.0
EGR* (E5–8) – E1 (E5–16)	R–W ↔ BR	IG switch ON	9 – 14
EVP (E5–15) – E1 (E5–16)	W–G ↔ BR	IG switch ON	9 – 14
THG* (E6–21) – E2 (E6–22)	P ↔ BR–B	IG switch ON	4.5 – 5.5
RSC (E7–22) – E1 (E5–16)	B–R ↔ BR	IG switch ON, Disconnect E7 of ECM connector	9 – 14
RSO (E7–23) – E1 (E5–16)	BR–R ↔ BR	IG switch ON, Disconnect E7 of ECM connector	9 – 14
OX1 (E6–13) – E1 (E5–16)	W ↔ BR	Maintain engine speed at 2,500 rpm for 2 min. after warming up	Pulse generation (See page DI–176)
OX2 (E6–19) – E1 (E5–16)	R ↔ BR	Maintain engine speed at 2,500 rpm for 2 min. after warming up	Pulse generation (See page DI–176)
HT1 (E7–16) – E03 (E7–1)	P–G ↔ W–B	Idling	Below 3.0
		IG switch ON	9 – 14
HT2 (E7–15) – E03 (E7–1)	R–W ↔ W–B	Idling	Below 3.0
		IG switch ON	9 – 14
KNK1 (E6–17) – E1 (E5–16)	B ↔ BR	Idling	Pulse generation (See page DI–192)
KNK2 (E6–16) – E1 (E5–16)	GR ↔ BR	Idling	Pulse generation (See page DI–192)
NSW (E7–14) – E1 (E5–16)	B–O ↔ BR	IG switch ON, Other shift position in ”P”, ”N” position	9 – 14
		IG switch ON, Shift position in ”P”, ”N” position	0 – 3.0
SP1 (E4–12) – E1 (E5–16)	G ↔ BR	IG switch ON Rotate driving wheel slowly	Pulse generation (See page DI–238)
TE1 (E5–5) – E1 (E5–16)	V–W ↔ BR	IG switch ON	9 – 14
W (E5–3) – E1 (E5–16)	V ↔ BR	Idling	9 – 14
		IG switch ON	Below 3.0
ACT (E4–5) – E1 (E5–16)	L–B ↔ BR	A/C switch OFF at idling	Below 2.0
		A/C switch ON at idling	5 or more
AC1 (E4–20) – E1 (E5–16)	B–R ↔ BR	A/C switch ON at idling	Below 2.0
		A/C switch OFF at idling	9 – 14
TPC (E5–13) – E1 (E5–16)	LG–R ↔ BR	IG switch ON Disconnect vacuum hose from vapor pressure sensor	9 – 14
PTNK (E6–15) – E2 (E6–22)	R–L ↔ BR–B	IG switch ON	3.0 – 3.6
		IG switch ON Apply vacuum 2.0 kPa (15 mmHg, 0.6 in.Hg)	1.3 – 2.1
SDL (E4–18) – E1 (E5–16)	W ↔ BR	During transmission	Pulse generation
BK (E4–25) – E1 (E5–16)	G–W ↔ BR	IG switch ON, Brake pedal is depressed	7.5 – 14
		IG switch ON, Brake pedal is released	Below 1.5
OD1 (E4–7) – E1 (E5–16)	Y–R ↔ BR	IG switch ON	9 – 14
THG* (E6–12) – E2 (E6–22)	P ↔ BR–B	IG switch ON	3.9 – 5.0
		IG switch ON	9 – 14
FC (E5–4) – E1 (E5–16)	G–Y ↔ BR	Idling	0 – 3.0

*: Only for 2WD models with a load capacity of 0.5 ton and regular cab.

DI0UF–01

PROBLEM SYMPTOMS TABLE

Symptom	Suspect Area	See page
Engine does not crank (Does not start)	1. Starter and starter relay	ST–6, ST–17
No initial combustion (Does not start)	1. ECM power source circuit 2. Fuel pump control circuit 3. Engine control module (ECM)	DI–259 DI–263 IN–24
No complete combustion (Does not start)	1. Fuel pump control circuit	DI–263
Engine cranks normally (Difficult to start)	1. Starter signal circuit 2. Fuel pump control circuit 3. Compression	DI–256 DI–263 EM–2
Cold engine (Difficult to start)	1. Starter signal circuit 2. Fuel pump control circuit	DI–256 DI–263
Hot engine (Difficult to start)	1. Starter signal circuit 2. Fuel pump control circuit	DI–256 DI–263
High engine idle speed (Poor idling)	1. A/C signal circuit (Compressor circuit) 2. ECM power source circuit	AC–79 DI–259
Low engine idle speed (Poor idling)	1. A/C signal circuit (Compressor circuit) 2. Fuel pump control circuit	AC–79 DI–263
Rough idling (Poor idling)	1. Compression 2. Fuel pump control circuit	EM–2 DI–263
Hunting (Poor idling)	1. ECM power source circuit 2. Fuel pump control circuit	DI–259 DI–263
Hesitation/Poor acceleration (Poor driveability)	1. Fuel pump control circuit 2. A/T faulty	DI–263 DI–289
Surging (Poor driveability)	1. Fuel pump control circuit	DI–263
Soon after starting (Engine stall)	1. Fuel pump control circuit	DI–263
During A/C operation (Engine stall)	1. A/C signal circuit (Compressor circuit) 2. Engine control module (ECM)	AC–79 IN–24

DI0UG–01

CIRCUIT INSPECTION

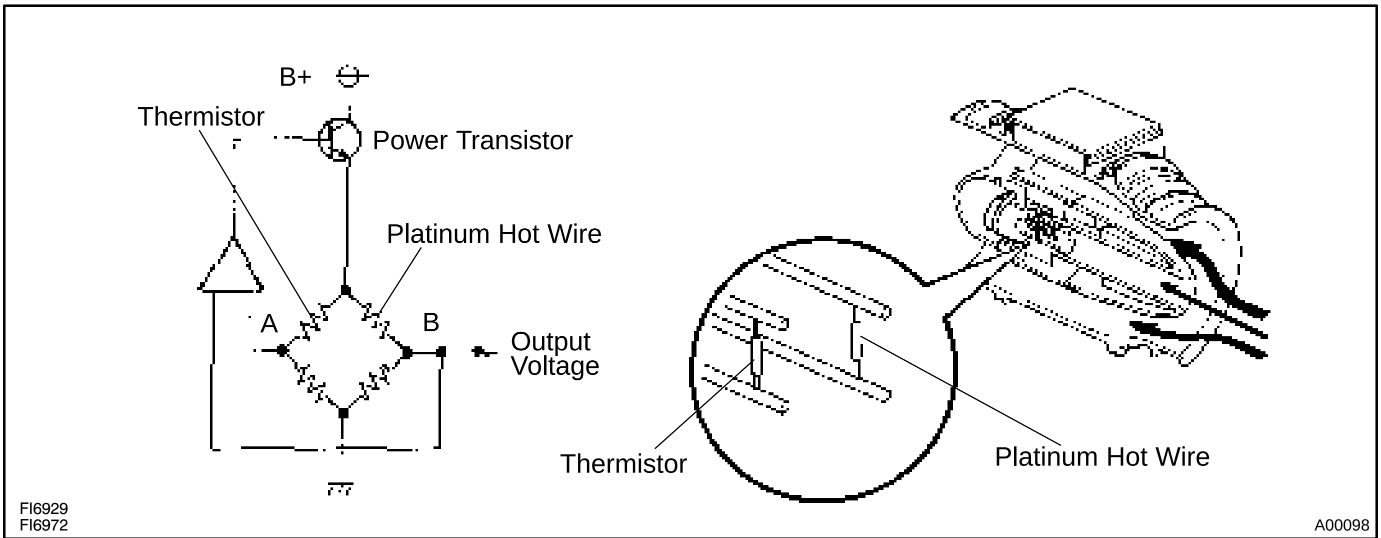
DTC	P0100	Mass Air Flow Circuit Malfunction

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 temp.

The hot wire is maintained at the set temp. by controlling the current flow through the hot wire. This current flow is ten 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 temp.



DTC No.	Detection ItemDTC	Trouble Area
P0100	Open or short in mass air flow meter circuit with engine speed 4,000 rpm or less	●Open or short in mass air flow meter circuit ●Mass air flow meter ●ECM
P0100	Open or short in mass air flow meter circuit with engine speed 4,000 rpm or more (2 trip detection logic)	

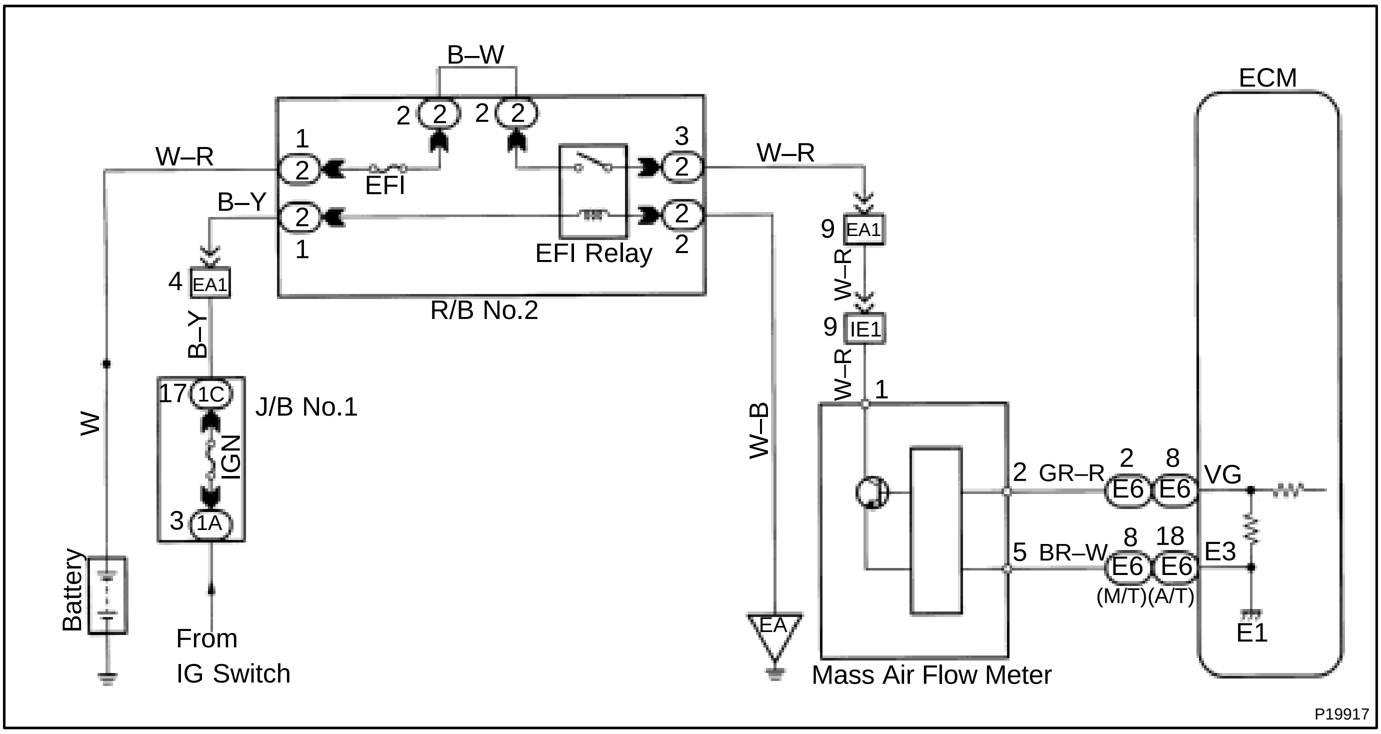
If the ECM detects DTC ”P0100” it operates the fail sefe function, keeping the ignition timing and injection volume constant and making it possible to drive the vehicle.

HINT:

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

Mass Air Flow Value (gm/sec.)	Malfunction
Approx. 0	●Mass air flow meter power source circuit open ●VG circuit open or short
11.0 – 25.1 (idling after warming up)	●E3 circuit open

WIRING DIAGRAM



INSPECTION PROCEDURE

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:

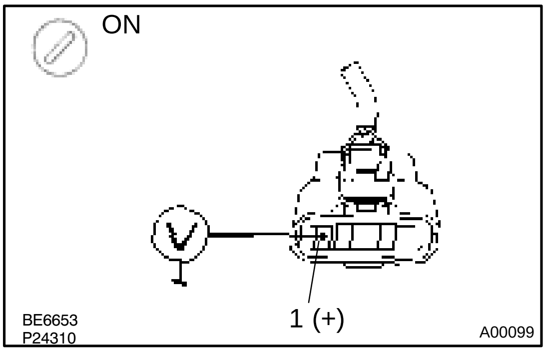
Read mass air flow rate on the OBD II scan tool or TOYOTA hand–held tester.

RESULT:

	Type I	Type II
Mass air flow rata (gm/sec.)	Approx. 0	11.0 – 25.1 (idling after warming up)

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

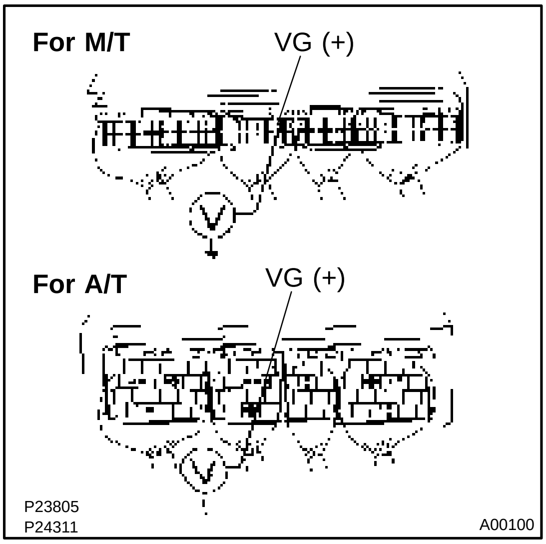
OK:

Voltage: 9 – 14 V

NG → **Check for open in harness and connector between EFI main relay and mass air flow meter (See page IN–24).**

OK ↓

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



PREPARATION:

(a) Remove the right cowl side trim (See page SF–58).

(b) Start the engine.

CHECK:

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

OK:

Voltage:

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

OK → **Check and replace ECM (See page IN–24).**

NG ↓

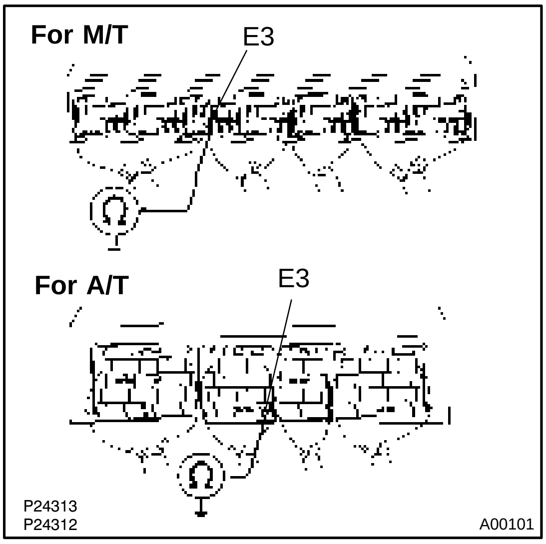
4	**Check for open and short in harness and connector between mass air flow meter and ECM (See page IN–24).**

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

OK

Replace mass air flow meter.

5	**Check continuity between terminal E3 of ECM and body ground.**



PREPARATION:
Remove the right cowl side trim (See page SF–58).
CHECK:
Check continuity between terminal E3 of ECM connector and body ground.
OK:
Continuity (1 Ω or less)

NG → **Check and replace ECM (See page IN–24).**

OK

6	**Check for open in harness and connector between mass air flow meter and ECM (See page IN–24).**

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

OK

Replace mass air flow meter.

DI0UH–01

DTC	P0101	Mass Air Flow Circuit Range/Performance Problem

CIRCUIT DESCRIPTION

Refer to DTC P0100 on page DI–153.

DTC No.	DTC Detecting Condition	Trouble Area
P0101	After engine is warmed up, conditions (a) and (b) continue 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 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

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

NO → **Replace mass air flow meter.**

YES

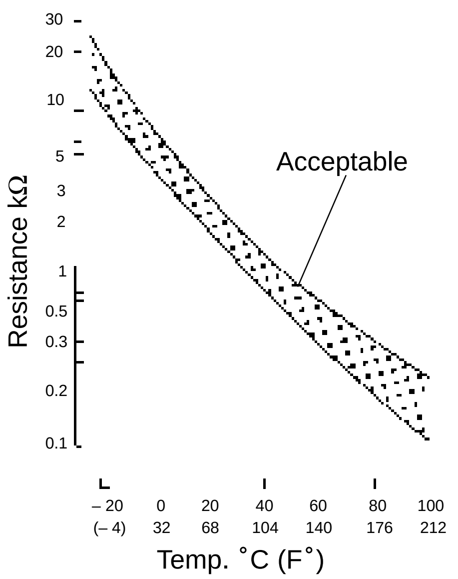
Go to relevant DTC chart.

DI0UI–01

DTC	P0110	Intake Air Temp. Circuit Malfunction

CIRCUIT DESCRIPTION

(fig. 1)



FI4741

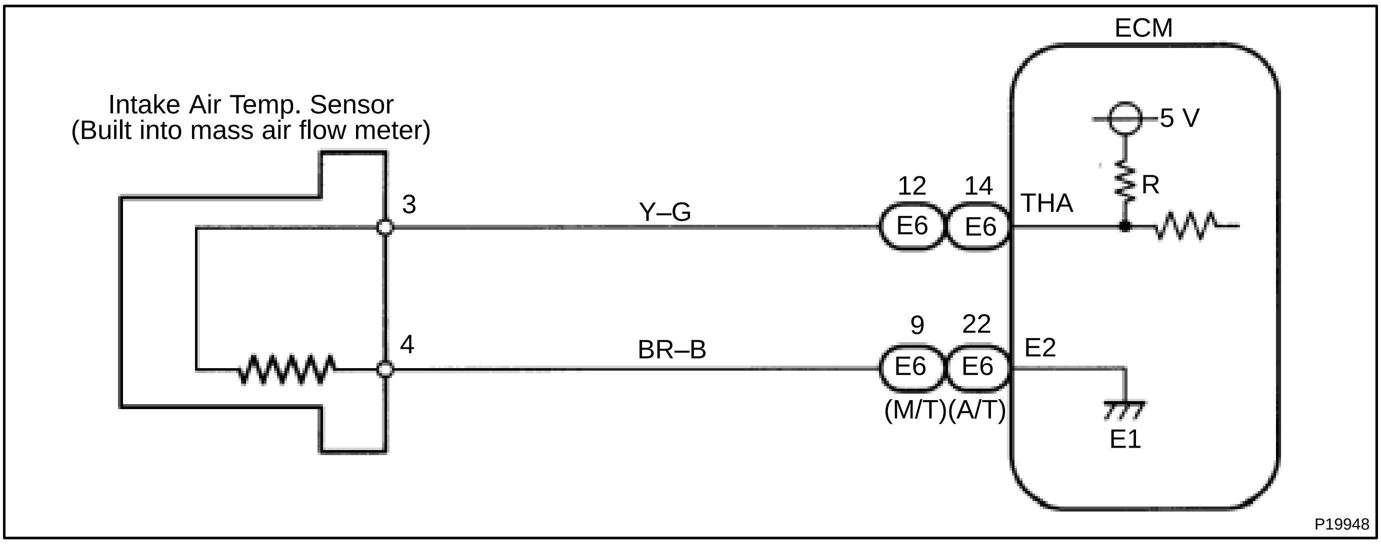
The intake air temp. sensor is built into the mass air flow meter and senses the intake air temp.
A thermistor built in the sensor changes the resistance value according to the intake air temp.
The lower the intake air temp., the greater the thermistor resistance value, and the higher the intake air temp., the lower the thermistor resistance value (See fig. 1).
The intake air temp. sensor is connected to the ECM (See below). The 5 V power source voltage in the ECM is applied to the intake air temp. sensor from the terminal THA via resistor R.
That is, the resistor R and the intake air temp. sensor are connected in series. When the resistance value of the intake air temp. sensor changes in accordance with changes in the intake air temp., 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.
If the ECM detects the DTC ”P0110”, it operates the fail safe function in which the intake air temp. is assumed to be 20˚C (68˚F).

DTC No.	DTC Detecting Condition	Trouble Area
P0110	Open or short in intake air temp. sensor circuit	●Open or short in intake air temp. sensor circuit ●Intake air temp. sensor ●ECM

HINT:
After confirming DTC P0110 use the OBD II scan tool or TOYOTA hand–held tester to confirm the intake air temp. from ”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 P0110, P0115 and P0120 are output simultaneously, E2 (Sensor Ground) may be open.

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

PREPARATION:

(a) Connector 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 temp. value on the OBD II scan tool or TOYOTA hand–held tester.

OK:

Same as actual intake air temp.

HINT:

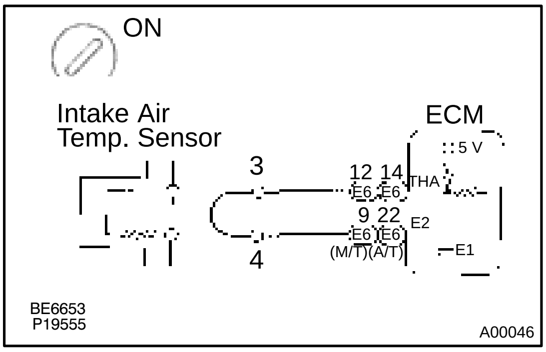
- If there is open circuit, OBD II scan tool or TOYOTA hand–held tester indicates – 40°C (– 40°F).
- If there is short circuit, OBD II scan tool or TOYOTA hand–held tester indicates 140°C (284°F) or more.

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–133).

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.

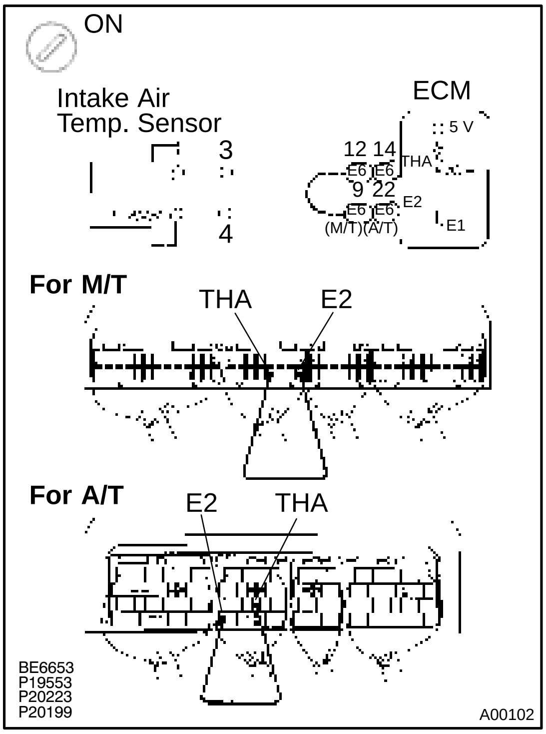
CHECK:
Read temp. value on the OBD II scan tool or TOYOTA hand–held tester.

OK:
Temp. value: 140°C (284°F) or more

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

NG

3	Check for open in harness or ECM.



PREPARATION:
(a) Remove the right cowl side trim (See page SF–58).
(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–24).
(c) Turn the ignition switch ON.

CHECK:
Read temp. value on the OBD II scan tool or TOYOTA hand–held tester.

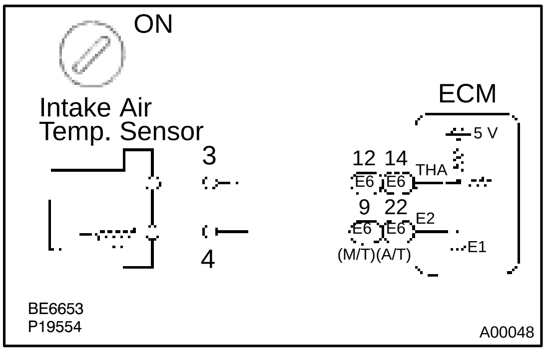
OK:
Temp. value: 140°C (284°F) or more

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.

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

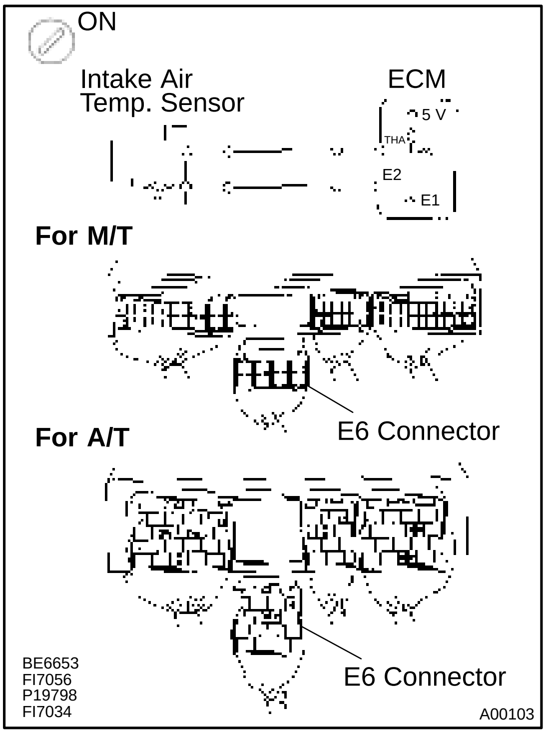
OK:

Temp. value: – 40°C (– 40°F)

OK	Replace mass air flow meter.

NG

5	Check for short in harness or ECM.



PREPARATION:

(a) Remove the right cowl side trim (See page SF–58).

(b) Disconnect the E6 connector of the ECM.

HINT:

The mass air flow meter connector is disconnected.

(c) Turn the ignition switch ON.

CHECK:

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

OK:

Temp. value: – 40°C (– 40°F)

OK	Repair or replace harness or connector.

NG

Check and replace ECM (See page IN–24).

DI0UJ–01

DTC	P0115	Engine Coolant Temp. Circuit Malfunction

CIRCUIT DESCRIPTION

A thermistor built into the engine coolant temp. sensor changes the resistance value according to the engine coolant temp.

The structure of the sensor and connection to the ECM is the same as in the intake air temp. circuit malfunction shown on page DI–158.

If the ECM detects the DTC P0115, it operates the fail safe function in which the engine coolant temp. is assumed to be 80˚C (176˚F).

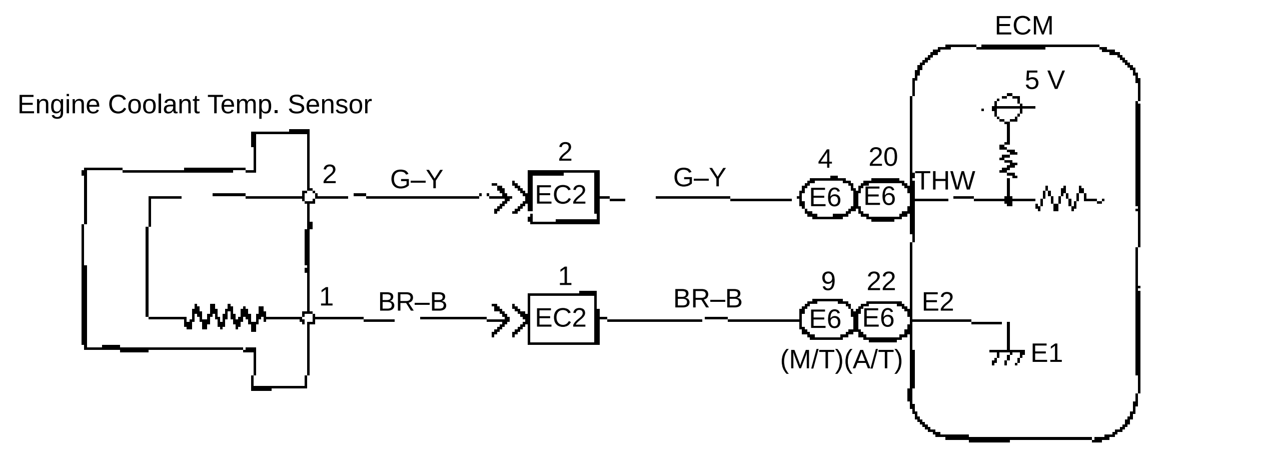
DTC No.	Detection Item	Trouble Area
P0115	Open or short in engine coolant temp. sensor circuit	●Open or short in engine coolant temp. sensor circuit ●Engine coolant temp. sensor ●ECM

HINT:

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

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

WIRING DIAGRAM



P19947

INSPECTION PROCEDURE

HINT:
If DTCs P0110, P0115 and P0120 are output simultaneously, E2 (sensor ground) may be open.

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

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

OK:
Same as actual engine coolant temp.

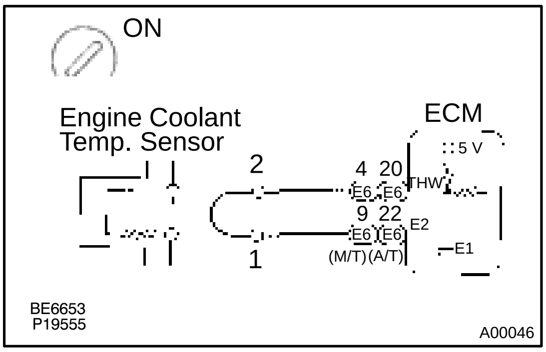
HINT:
- If there is open circuit, OBD II scan tool or TOYOTA hand–held tester indicates – 40°C (– 40°F).
- If there is open circuit, OBD II scan tool or TOYOTA hand–held tester indicates 140°C (284°F) or more.

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–133).

2	**Check for open in harness or ECM.**



PREPARATION:
(a) Disconnect the engine coolant temp. sensor connector.
(b) Connect the sensor wire harness terminals together.
(c) Turn the ignition switch ON.

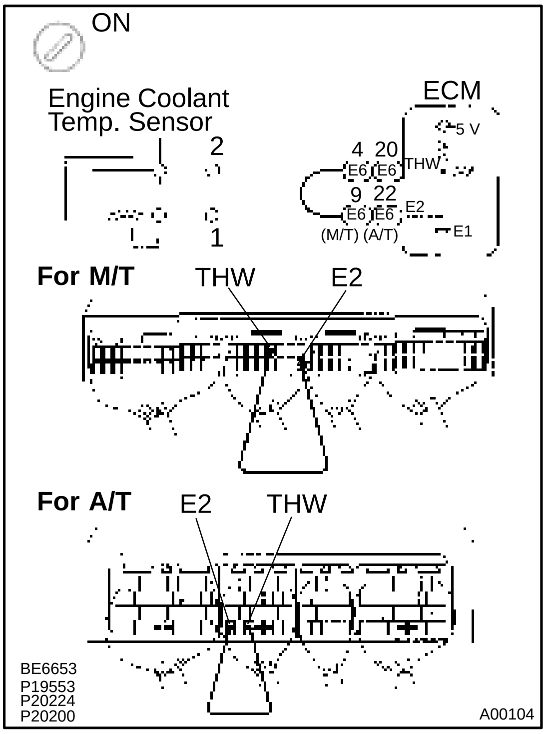
CHECK:
Read temp. value on the OBD II scan tool or TOYOTA hand–held tester.

OK:
Temp. value: 140°C (284°F) or more

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

NG

3	**Check for open in harness or ECM.**



PREPARATION:

(a) Remove the right cowl side trim (See page SF–58).

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

HINT:

The engine coolant temp. sensor connector is disconnected. Before checking, do a visual and contact pressure check for the ECM connector (See page IN–24).

(c) Turn the ignition switch ON.

CHECK:

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

OK:

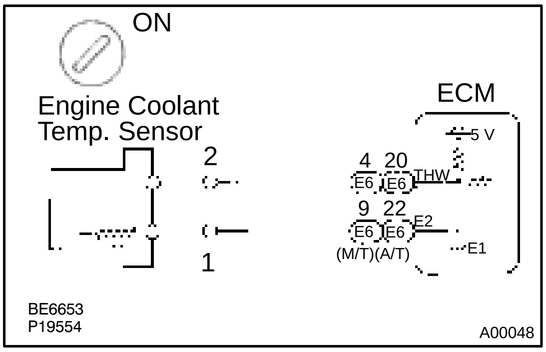
Temp. value: 140°C (284°F) or more

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.

4	**Check for short in harness and ECM.**



PREPARATION:

(a) Disconnect the engine coolant temp. sensor connector.

(b) Turn the ignition switch ON.

CHECK:

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

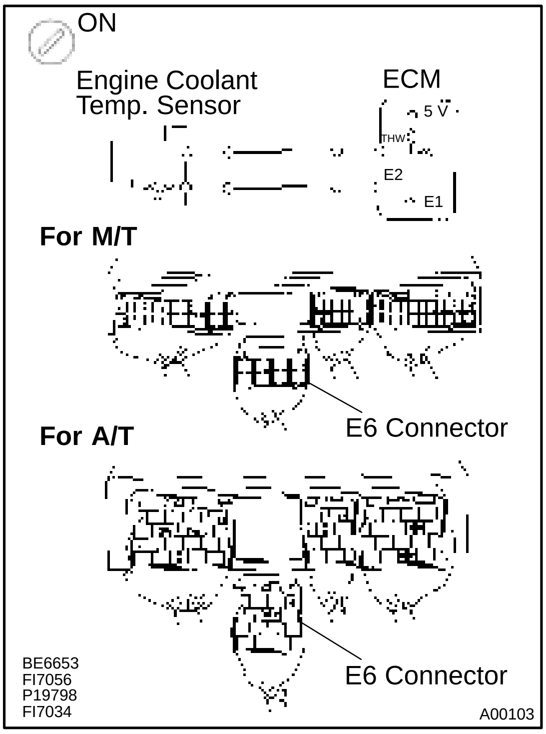
OK:

Temp. value: – 40°C (– 40°F)

OK → **Replace engine coolant temp. sensor.**

NG ↓

5	Check for short in harness or ECM.



PREPARATION:

(a) Remove the right cowl side trim (See page SF–58).

(b) Disconnect the E6 connector of the ECM.

HINT:

The engine coolant temp. sensor connector is disconnected.

(c) Turn the ignition switch ON.

CHECK:

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

OK:

Temp. value: – 40°C (– 40°F)

OK	Repair or replace harness or connector.

NG

Check and replace ECM (See page IN–24).

DI0UK–01

DTC	P0116	Engine Coolant Temp. Circuit Range/ Performance problem

CIRCUIT DESCRIPTION

Refer to DTC P0115 on page DI–162.

DTC No.	DTC Detecting Condition	Trouble Area
P0116	If THW ≧ – 7°C (19.4°F) at engine start, 20 min. or more after starting engine, engine coolant temp. sensor value is 35°C (95°F) or less (2 trip detection logic)	●Engine coolant temp. sensor ●Cooling system
	If THW ≧ – 7°C (19.4°F) at engine start, 5 min. or more after starting engine, engine coolant temp. sensor value is 35°C (95°F) or less (2 trip detection logic)	

INSPECTION PROCEDURE

HINT:

If DTCs P0115 and P0116 are output simultaneously, engine coolant temp. sensor circuit may be open.Perform troubleshooting of DTC P0115 first.

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

YES → **Go to relevant DTC chart.**

NO

2	Check thermostat (See page CO–9).

NG → **Replace thermostat.**

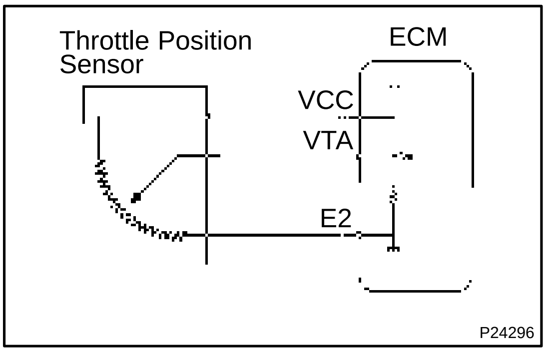
OK

Replace engine coolant temp. sensor.

DI0UL–01

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

CIRCUIT DESCRIPTION



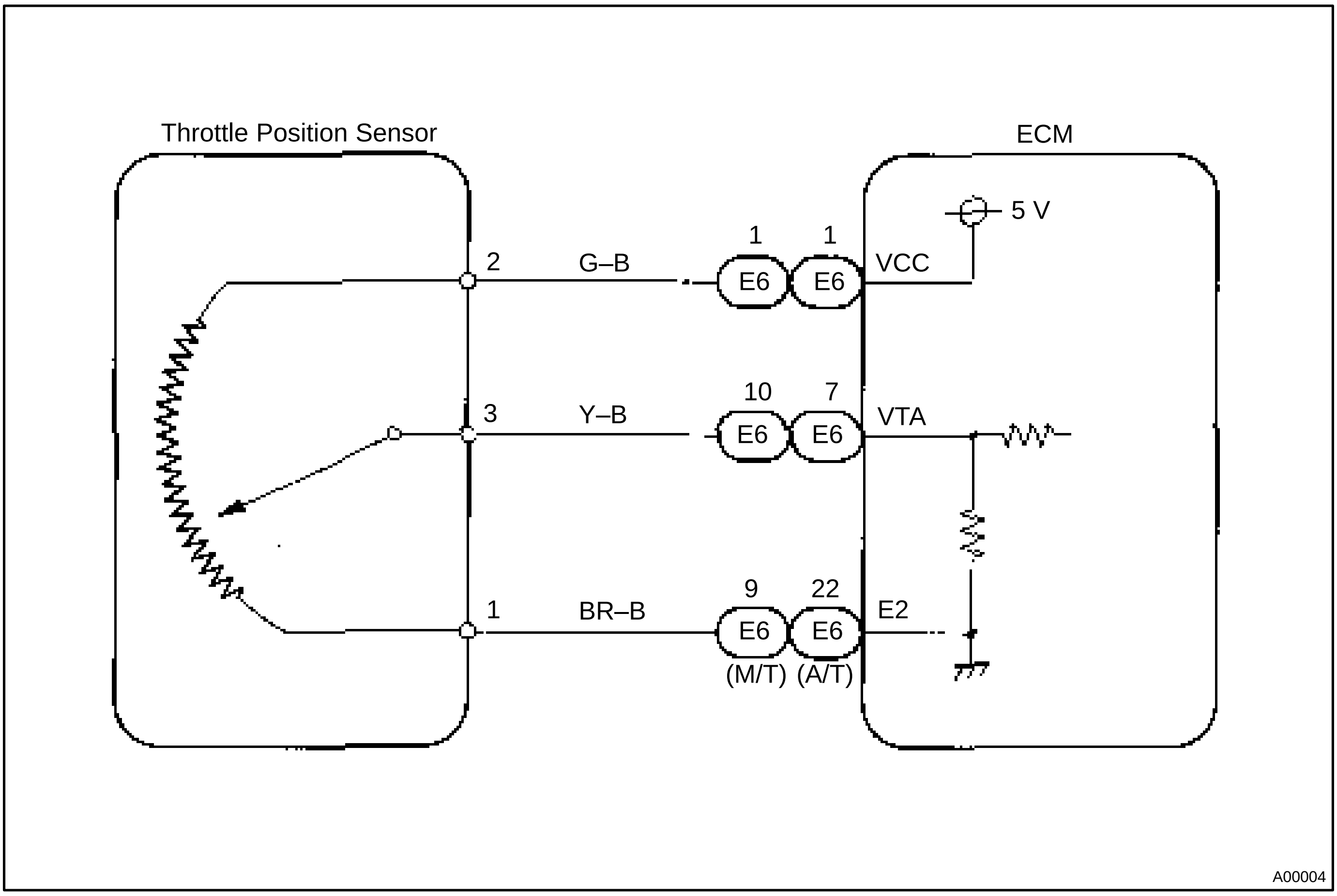
The throttle position sensor is mounted in the throttle body and detects the throttle valve opening angle. When the throttle valve is fully closed, a voltage of approximately 0.7 V is applied to terminal VTA of the ECM. The voltage applied to the terminals VTA of the ECM increases in proportion to the opening angle of the throttle valve and becomes approximately 2.7 ~ 5.2 V when the throttle valve is fully opened. The ECM judges the vehicle driving conditions from these signals input from terminals VTA and uses them as one of the conditions for deciding the air–fuel ratio correction, power increase correction and fuel–cut control etc.

DTC No.	DTC Detecting Condition	Trouble Area
P0120	Condition (a) or (b) continues: (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 and closed throttle position switch condition.

Throttle valve opening position expressed as percentage		Trouble Area
Throttle valve fully closed	Throttle valve fully open	Trouble Area
0 %	0 %	VCC line open VTA line open or short
Approx. 99 %	Approx. 100 %	E2 line open

WIRING DIAGRAM



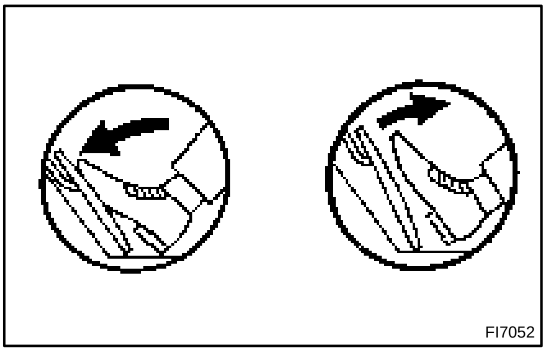
INSPECTION PROCEDURE

HINT:
If DTCs P0110, P0115 and P0120 are output simultaneously, E2 (sensor ground) may be open. If DTCs P0110, P0115 and P0120 are output simultaneously, E2 (sensor ground) may be open.

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

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


FI7052

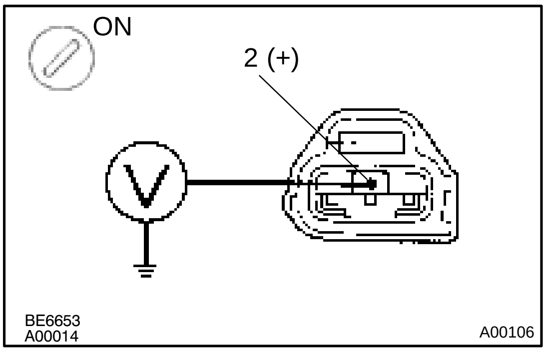
OK:

Throttle valve	Throttle valve opening position expressed as percentage
Fully open	Approx. 75 %
Fully closed	Approx. 10 %

OK → **Check for intermittent problems (See page DI–133).**

NG ↓

2	**Check voltage between terminal 2 of wire harness side connector and body ground.**



BE6653
A00014
A00106

PREPARATION:
(a) Disconnect the throttle position sensor connector.
(b) Turn the ignition switch ON.

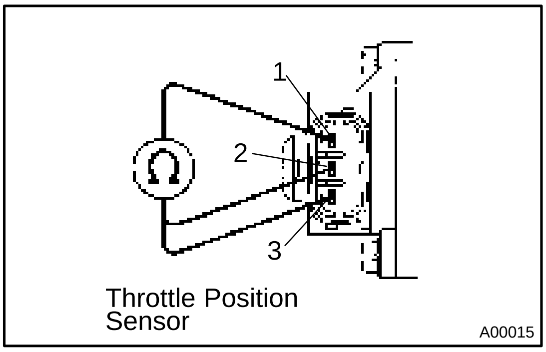
CHECK:
Measure voltage between terminals 2 of wire harness side connector and body ground.

OK:
Voltage: 4.5 – 5.5 V

NG → **Go to step 5.**

OK ↓

3	**Check throttle position sensor.**



PREPARATION:

Disconnect the throttle position sensor connector.

CHECK:

Measure voltage between terminals 1, 2 and 3 of throttle position sensor.

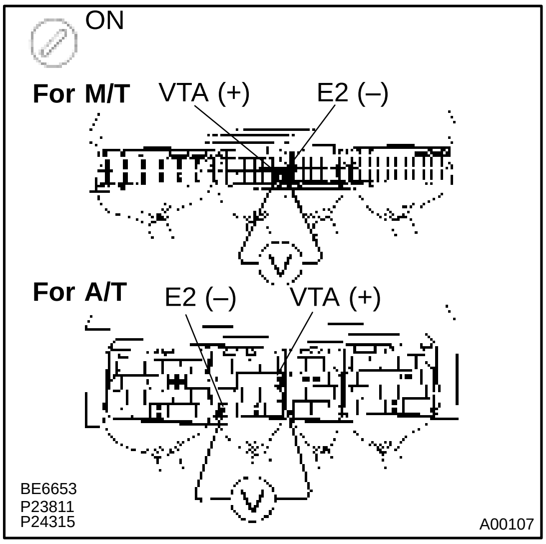
OK:

Terminals	Throttle valve	Resistance
1 – 2	—	2.5 – 5.9 kΩ
1 – 3	Fully closed	0.2 – 5.7 kΩ
	Fully open	2.0 – 10.2 kΩ

NG	**Replace throttle position sensor.**

OK

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



PREPARATION:

(a) Remove the right cowl side trim (See page SF–58).

(b) Turn the ignition switch ON.

CHECK:

Measure voltage between terminals VTA and E2 of ECM connector.

OK:

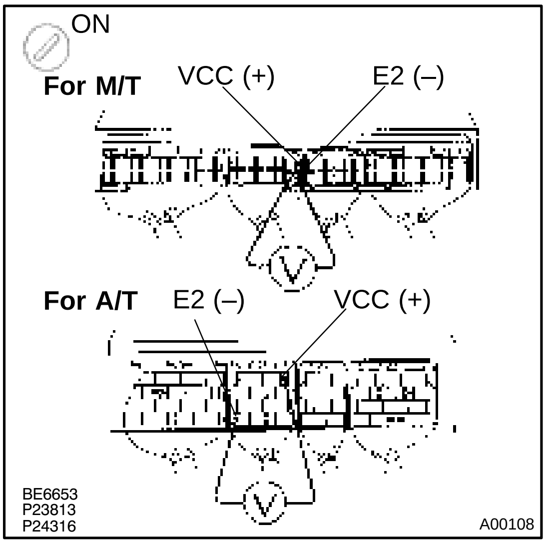
Throttle valve	Voltage
Fully closed	1.0 V
Fully open	2.72 ~ 5.2 V

NG	**Check for open and short in harness and connector between ECM and throttle position sensor (VTA line) (See page IN–24).**

OK

Check and replace ECM (See page IN–24).

5	**Check voltage between terminals VCC and E2 of ECM.**



PREPARATION:

(a) Remove the right cowl side trim (See page SF–58).

(b) Turn the ignition switch ON.

CHECK:

Measure voltage between terminals VCC and E2 of ECM connector.

OK:

Voltage: 4.5 – 5.5 V

NG	**Check and replace ECM (See page IN–24).**

OK

Check for open in harness and connector between ECM and sensor (VCC line) (See page IN–24).

DI0UM–01

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

CIRCUIT DESCRIPTION

Refer to DTC P0120 on page DI–167.

DTC No.	DTC Detecting 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 the applicable range while vehicle speed between 30 km/h (19 mph) and 0 km/h (0 mph)	●Throttle position sensor

INSPECTION PROCEDURE

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

YES → **Go to relevant DTC chart.**

NO

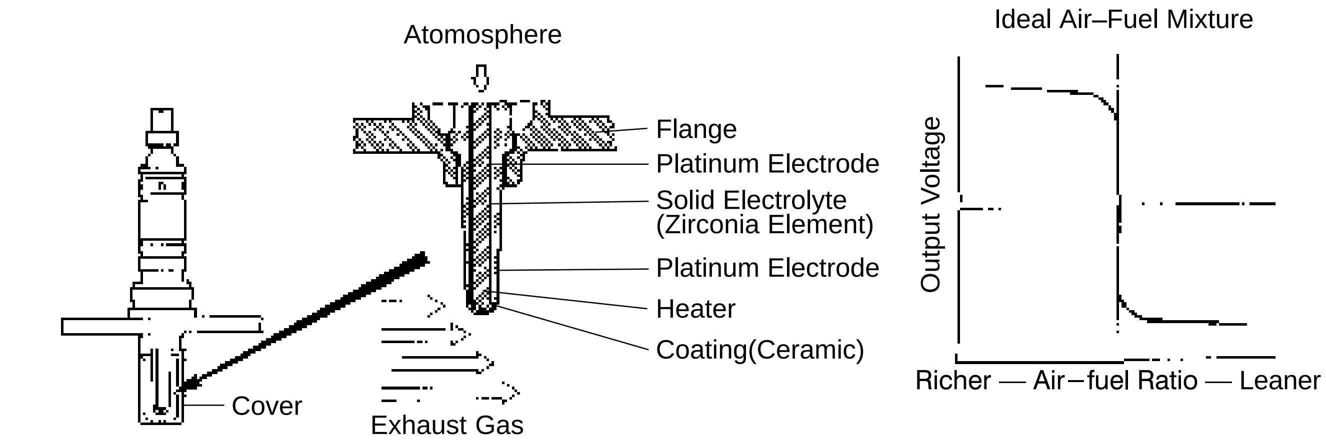
Replace throttle position sensor.

DI0UN–01

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 oxygen sensor has the characteristic whereby its output voltage changes suddenly in the vicinity of the stoichiometric air–fuel ratio. This characteristic is used to detect the oxygen concentration in the exhaust gas and provide feedback to the computer for control of the air–fuel ratio.
When the air–fuel ratio becomes LEAN, the oxygen concentration in the exhaust increases and the oxygen sensor informs the ECM of the LEAN condition (small electromotive force: 0 V).
When the air–fuel ratio is RICHER than the stoichiometric air–fuel ratio the oxygen concentration in the exhaust gas is reduced and the oxygen sensor informs the ECM of the RICH condition (large electromotive force: 1 V). The ECM judges by the electromotive force from the oxygen sensor whether the air–fuel ratio is RICH or LEAN and controls the injection time accordingly. However, if malfunction of the oxygen sensor causes output of abnormal electromotive force, the ECM is unable to perform accurate air–fuel ratio control.
The 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.

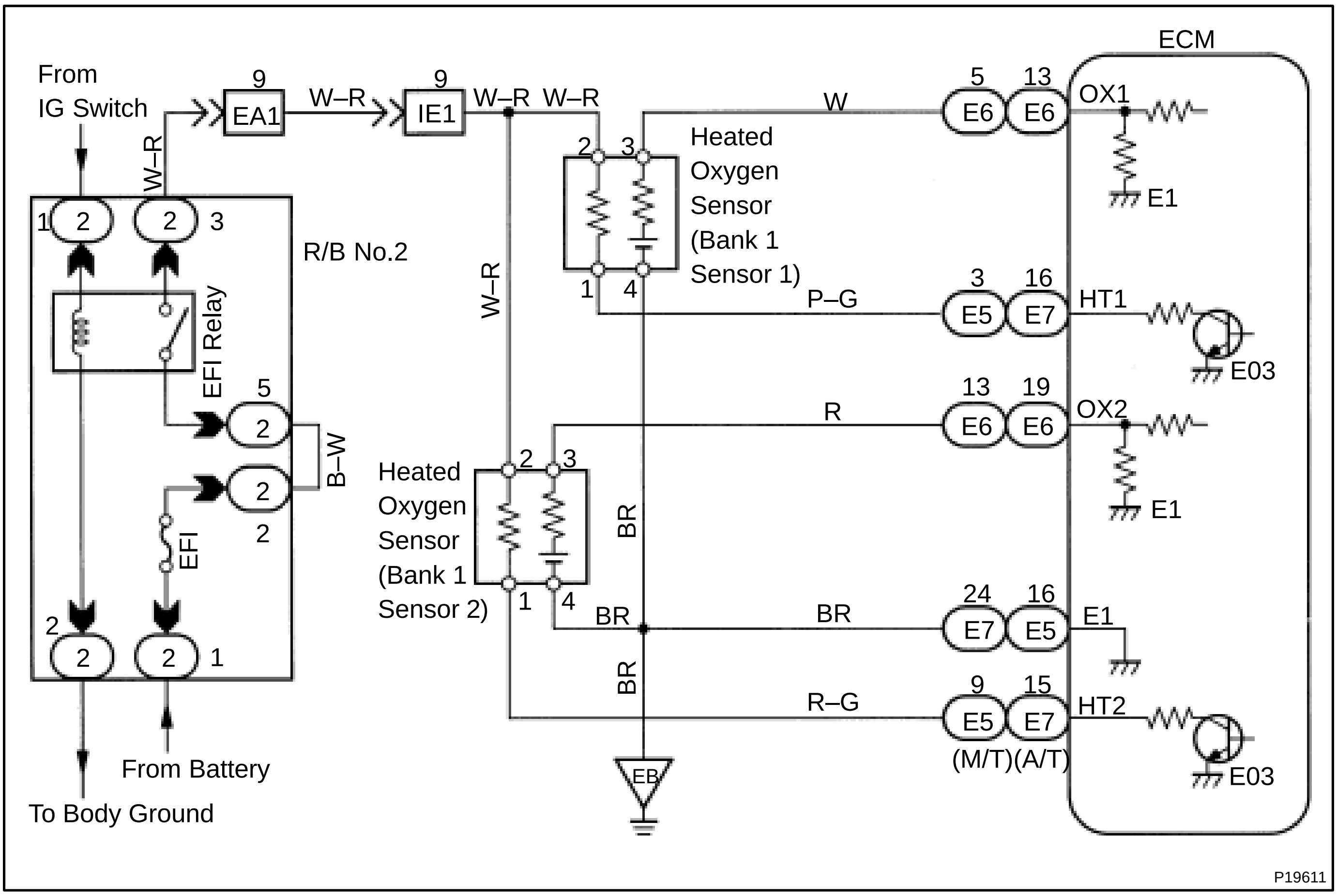


P21242 FI7210 A00027

DTC No.	DTC Detecting Condition	Trouble Area
P0125	After engine is warmed up, heated oxygen sensor output does not indicate RICH even once when conditions (a), (b), (c) and (d) continue for at least 1.5 min.: (a) Engine speed: 1,500 rpm or more (b) Vehicle speed: 40 – 100 km/h (25 – 62 mph) (c) Throttle valve does not fully closed (d) 140 sec. or more after starting engine	●Open or short in heated oxygen sensor (bank1 sensor 1) circuit ●Heated oxygen sensor (bank 1 sensor 1)

HINT:
After confirming DTC P0125 use the OBD II scan tool or TOYOTA hand–held tester to confirm voltage output of heated oxygen sensor from "CURRENT DATA".
If voltage output of heated oxygen sensor is 0 V, heated oxygen sensor circuit may be open or short.

WIRING DIAGRAM



INSPECTION PROCEDURE

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

CHECK:
Read voltage output of heated oxygen sensor (bank 1 sensor 1) when engine is suddenly raced.
HINT:
Perform quick racing to 4,000 rpm 3 times using the accelerator pedal.

OK:
Heated oxygen sensor (bank 1 sensor 1) output a RICH signal (0.45 V or more) at least once

OK → **Check and replace ECM (See page IN–24).**

NG

2	Check for open and short in harness and connector between ECM and heated oxygen sensor (bank 1 sensor 1) (See page IN–24).

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

OK

Replace heated oxygen sensor (bank 1 sensor 1).

DI0UO–01

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

CIRCUIT DESCRIPTION

Refer to DTC P0125 on page DI–173.

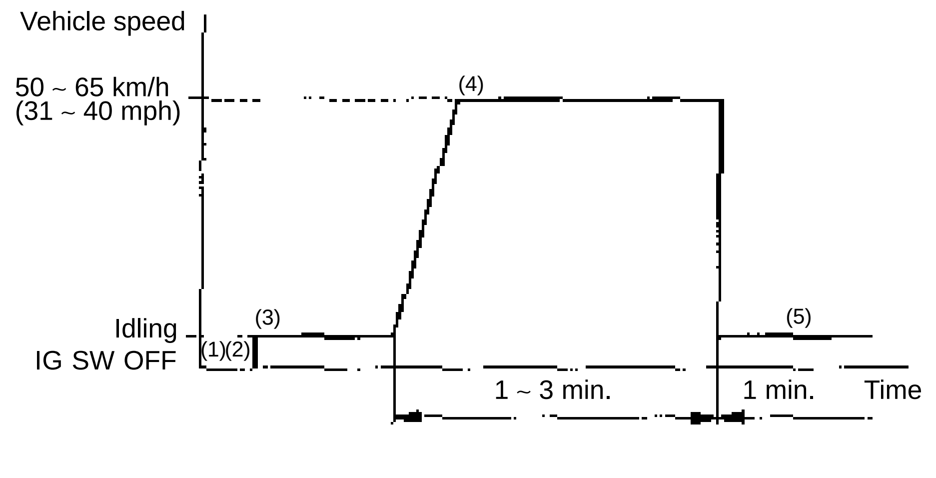
DTC No.	DTC Detecting Condition	Trouble Area
P0130	Voltage output of heated oxygen sensor remains at 0.35 V or more, or 0.55 V or less, during idling after engine is warmed up (2 trip detection logic)	●Heated oxygen sensor ●Fuel trim malfunction

HINT:
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–173.

CONFIRMATION DRIVING PATTERN



(1) Connect the TOYOTA hand–held tester to the DLC3.
(2) Switch the TOYOTA hand–held tester from normal mode to check mode (See page DI–133).
(3) Start the engine and warm it up with all the accessory switches OFF.
(4) Drive the vehicle at 50 – 65 km/h (31 – 40 mph) for 1 – 3 min. to warm up the heated oxygen sensor.
(5) Let the engine idle for 1 min.
HINT:
If a malfunction exists, the MIL will light up during step (5).
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 (3) to (5), then perform steps (3) to (5) again.

INSPECTION PROCEDURE

1	Check for open and short in harness and connector between ECM and heated oxygen sensor (See page IN–24).

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

OK

2	Check for heated oxygen sensor data.

PREPARATION:

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

(b) Warm up the engine to normal operating temp.

CHECK:

Read heated oxygen sensor output voltage and short–term fuel trim.

RESULT:

Pattern	Heated oxygen sensor output voltage	Short–term fuel trim
1	Lean condition (Changes at 0.55 V or less)	Changes at about + 20 %
2	Rich condition (Changes at 0.35 V or more)	Changes at about – 20 %
3	Except 1 and 2	Except 1 and 2

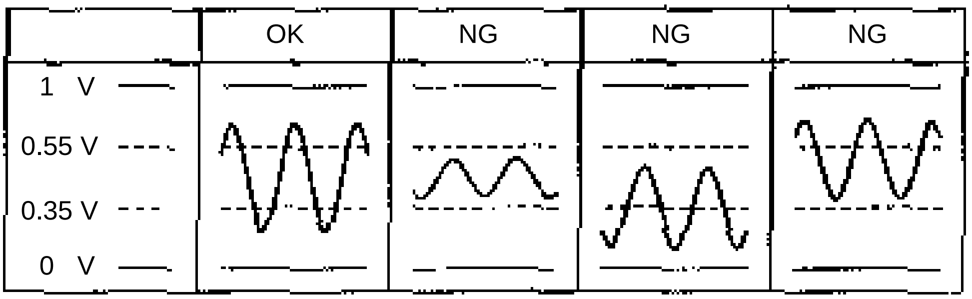
1, 2 → **Check fuel trim system (See page DI–187).**

3

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

PREPARATION:
Warm up the heated oxygen sensor with the engine at 2,500 rpm for approx. 90 sec.
CHECK:
Use the OBD II scan tool or TOYOTA hand–held tester read the output voltage of the heated oxygen sensor during idling.
OK:

Heated oxygen sensor output voltage:
Alternates repeatedly between less than 0.35 V and more than 0.55 V (See the following table)



OK → **Perform confirmation driving pattern.**

NG ↓

Replace heated oxygen sensor.

DI0UP–01

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

CIRCUIT DESCRIPTION

Refer to DTC P0125 on page DI–173.

DTC No.	DTC Detecting Condition	Trouble Area
P0133	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)	●Heated oxygen sensor

HINT:
Sensor 1 refers to the sensor closer to the engine body.

INSPECTION PROCEDURE

1	**Are there any other codes (besides DTC P0133) being output?**

YES → **Go to relevant DTC chart.**

NO

Replace heated oxygen sensor.

DI0UQ–01

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

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

CIRCUIT DESCRIPTION

Refer to DTC P0125 on page DI–173.

DTC No.	DTC Detecting Condition	Trouble Area
P0135 P0141	When heater operates, heater current exceeds 2.35 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:

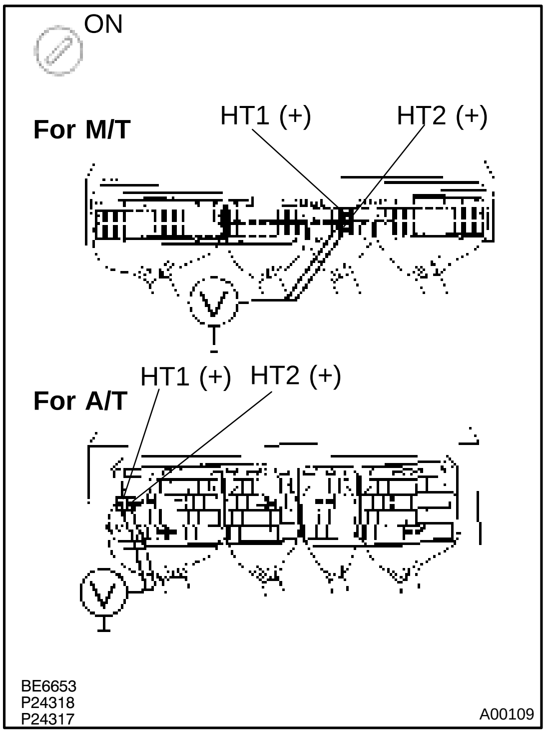
- Sensor 1 refers to the sensor closer to the engine body.
- Sensor 2 refers to the sensor farther away from the engine body.

WIRING DIAGRAM

Refer to DTC P0125 on page DI–173.

INSPECTION PROCEDURE

1	Check voltage between terminals HT1, HT2 of ECM connector and body ground.



PREPARATION:

(a) Remove the right cowl side trim (See page SF–58).

(b) Turn the ignition switch ON.

CHECK:

Measure voltage between terminals HT1, HT2 of ECM connector and body ground.

HINT:

- Connect terminal HT1 to bank 1 sensor 1.
- Connect terminal HT2 to bank 1 sensor 2.

OK:

Voltage: 9 – 14 V

OK	Check and replace ECM (See page IN–24).

NG

2	Check resistance of heated oxygen sensor heater (See page SF–57).

NG → **Replace heated oxygen sensor.**

OK

Check and repair harness or connector between EFI main relay, heated oxygen sensor and ECM (See page IN–24).

DI0UR–01

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

CIRCUIT DESCRIPTION

Refer to DTC P0125 on page DI–173.

DTC No.	DTC Detecting Condition	Trouble Area
P0136	Voltage output of heated oxygen sensor (bank 1 sensor 2) remains at 0.4 V or more or 0.5 V or less when vehicle is driven at 50 km/h (31 mph) or more after the engine is warmed up. (2 trip detection logic).	●Heated oxygen sensor

HINT:
Sensor 2 refers to the sensor farther away from the engine body.

WIRING DIAGRAM

Refer to DTC P0125 on page DI–173.

INSPECTION PROCEDURE

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

YES → **Go to relevant DTC chart.**

NO

2	Check for open and short in harness and connector between ECM and heated oxygen sensor (See page IN–24).

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 operating temp.

CHECK:

Read voltage output of the heated oxygen sensor (bank 1 sensor 2) when the engine suddenly raced.

HINT:

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

OK:

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

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

NG ↓

Replace heated oxygen sensor.

DI0US–01

DTC	P0171	System too Lean (Fuel Trim)

DTC	P0172	System too Rich (Fuel Trim)

CIRCUIT DESCRIPTION

Fuel trim refers to the feedback compensation value compared against the basic injection time. Fuel trim includes short–term fuel trim and long–term fuel trim.
Short–term fuel trim is the short–term fuel compensation used to maintain the air–fuel ratio at its ideal theoretical value. The signal from the heated oxygen sensor indicates whether the air–fuel ratio is RICH or LEAN compared to the ideal theoretical value, triggering a reduction in fuel volume if the air–fuel ratio is rich, and an increase in fuel volume if it is lean.
Long–term fuel trim is overall fuel compensation carried out long–term to compensate for continual deviation of the short–term fuel trim from the central value due to individual engine differences, wear over time and changes in the usage environment.
If both the short–term fuel trim and long–term fuel trim are LEAN or RICH beyond a certain value, it is detected as a malfunction and the MIL lights up.

DTC No.	DTC Detecting Condition	Trouble Area
P0171	When air fuel ratio feedback is stable after engine warming up, fuel trim is considerably in error on RICH side (2 trip detection logic)	●Air intake (hose loose) ●Fuel line pressure ●Injector blockage ●Heated oxygen sensor (bank 1 sensor 1) malfunction ●Mass air flow meter ●Engine coolant temp. sensor
P0172	When air fuel ratio feedback is stable after engine warming up, fuel trim is considerably in error on LEAN side (2 trip detection logic)	●Fuel line pressure ●Injector leak, blockage ●Heated oxygen sensor (bank 1 sensor 1) malfunction ●Mass air flow meter ●Engine coolant temp. sensor

HINT:

- When DTC P0171 is recorded, the actual air–fuel ratio is on the LEAN side. When DTC P0172 is recorded, the actual air–fuel ratio is on the RICH side.
- If the vehicle runs out of fuel, the air–fuel ratio is LEAN and DTC P0171 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 ± 25 %, the system is functioning normally.

INSPECTION PROCEDURE

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

NG → **Repair or replace.**

OK

2	**Check for heated oxygen sensor (bank 1 sensor 1) data.**

PREPARATION:
(a) Connect the OBD II scan tool or TOYOTA hand–held tester to the DLC3.
(b) Warm up the engine to normal operating temp.
CHECK:
Read heated oxygen sensor (bank 1 sensor 1) output voltage and short–term fuel trim.
RESULT:

Pattern	Heated oxygen sensor output voltage	Short–term fuel trim
1	Lean condition (Changes at 0.55 V or less)	Changes at about + 20 %
2	Rich condition (Changes at 0.35 V or more)	Changes at about – 20 %
3	Except 1 and 2	Except 1 and 2

3 → **Check for heated oxygen sensor (bank 1 sensor 1) (See page DI–176).**

1, 2

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

NG → **Check and repair fuel pump, pressure regulator, fuel pipe line and filter (See page SF–5).**

OK

4	**Check injector injection (See page SF–21).**

NG → **Replace injector.**

OK

5	Check mass air flow meter and engine coolant temp. sensor (See page SF–29, SF–49).

NG → Repair or replace.

OK

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

NG → Repair or replace.

OK

Check and replace ECM (See page IN–24).

DI0UT–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

DTC	P0305	Cylinder 5 Misfire Detected

DTC	P0306	Cylinder 6 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 the engine speed change rate indicates that misfire has occurred.When the misfire rate equals or exceeds the count indicating that the engine condition has deteriorated, the MIL lights up.

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

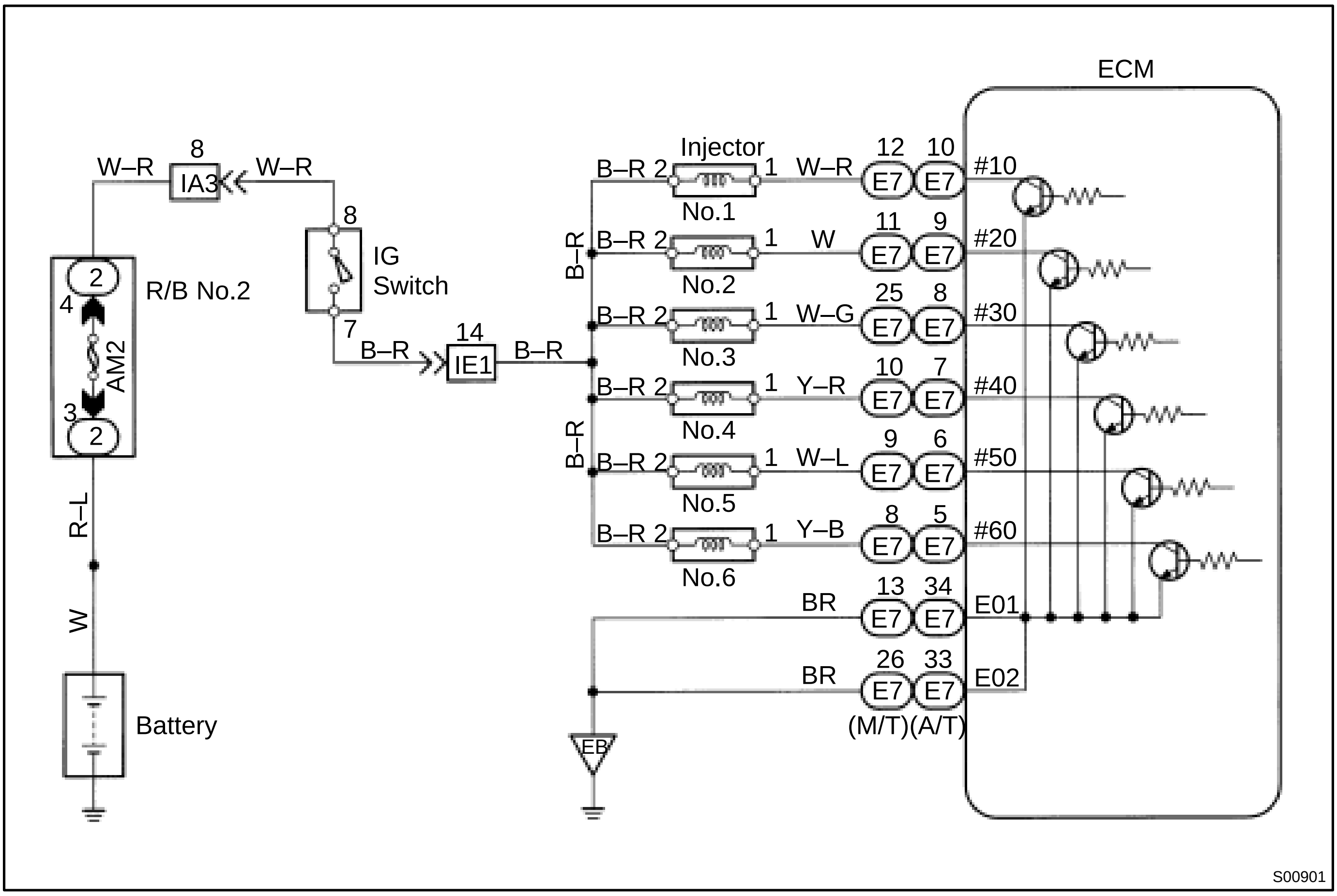
DTC No.	DTC Detecting Condition	Trouble Area
P0300	Misfiring of random cylinders is detected during any particular 200 or 1,000 revolutions	●Ignition system ●Injector ●Fuel line pressure ●EGR* ●Compression pressure ●Valve clearance not to specification ●Valve timing ●Mass air flow meter ●Engine coolant temp. sensor
P0301 P0302 P0303 P0304 P0305 P0306	For any particular 200 revolutions for engine, misfiring is detected which can cause catalyst overheating (This causes MIL to blink)	
	For any particular 1,000 revolutions of engine, misfiring is detected which causes a deterioration in emission (2 trip detection logic)	

*: Only for 2WD models with a load capacity of 0.5 ton and regular cab.

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



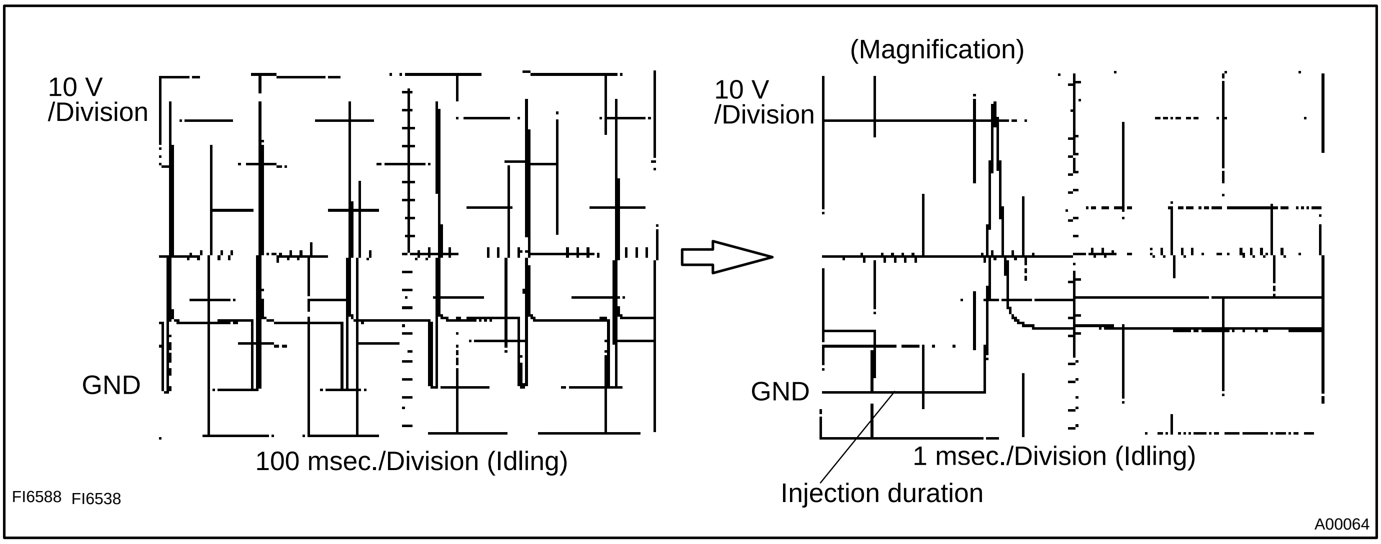
Reference INSPECTION USING OSCILLOSCOPE

INJECTOR SIGNAL WAVEFORM

With the engine idling, measure between terminals #10 – #60 and E01 of ECM.

HINT:

The correct waveform is as shown.



INSPECTION PROCEDURE

1	**Check spark plug and spark of misfiring cylinder.**

PREPARATION:

(a) Remove the ignition coil and high–tension cord.

(b) Remove the spark plug.

CHECK:

(a) Check the spark plug type.

(b) Check for carbon deposits on electrode.

(c) Check the electrode gap.

OK:

(1) Twin ground electrodes type.
Recommended spark plug:
ND K16TR11
NGK BKR5EKB–11

(2) No large carbon deposit present. Not wet with gosoline or oil.

(3) Electrode gap: 1.0 – 1.1 mm (0.039 – 0.043 in.)

PREPARATION:

(a) Install the spark plug to the ignition coil or high–tension cord.

(b) Disconnect the injector connector.

(c) Ground the spark plug.

CHECK:

Check if the spark occurs while the engine is being cranked.

NOTICE:

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

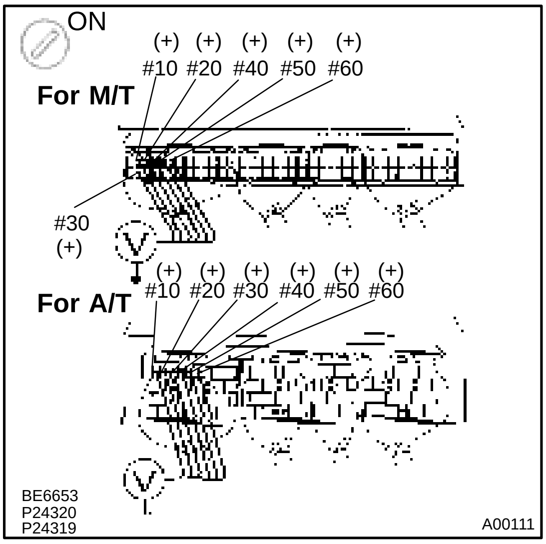
OK:

Spark jumps across electrode gap.

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

OK

2	Check voltage of ECM terminal for injector of failed cylinder.



PREPARATION:

(a) Remove the right cowl side trim (See page SF–58).

(b) Turn the ignition switch ON.

CHECK:

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

OK:

Voltage: 9 – 14 V

OK → **Go to step 4.**

NG ↓

3	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–24).

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

NG → **Check and repair fuel pump, pressure regulator, fuel pipe line and filter (See page SF–5).**

OK ↓

5	Check injector injection (See page SF–21).

NG → **Replace injector.**

OK

6	Check EGR system (See page EC–9).*

NG → **Repair EGR system.***

OK

*: Only for 2WD models with a load capacity of 0.5 ton and regular cab.

7	Check mass air flow meter and engine coolant temp. sensor (See page SF–29 and SF–49).

NG → **Repair or replace.**

OK

Check the compression pressure (See page EM–2), valve clearance (See page EM–3) and valve timing (See page EM–16).

DI0UU–01

DTC	P0325	Knock Sensor 1 Circuit Malfunction

DTC	P0330	Knock Sensor 2 Circuit Malfunction

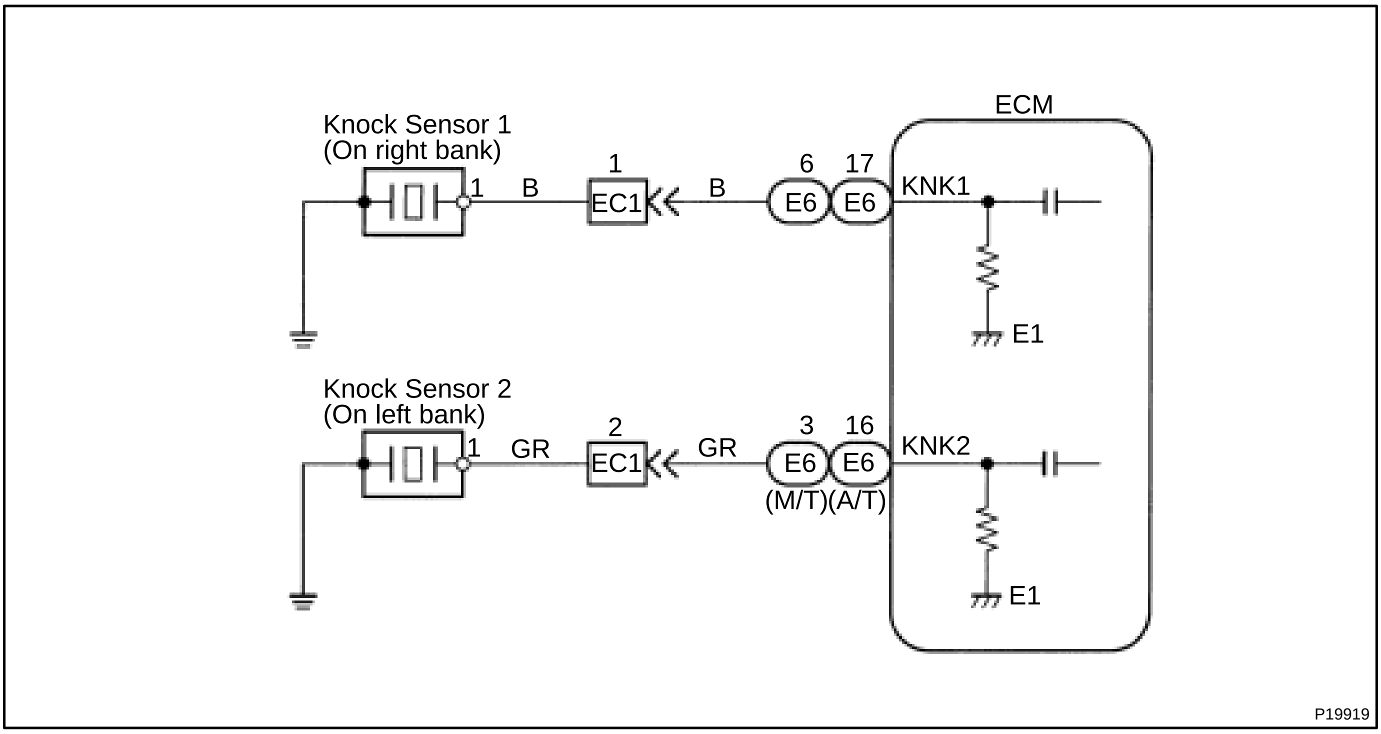
CIRCUIT DESCRIPTION

Knock sensors are fitted one to the right bank and left bank of the cylinder block to detect engine knocking. This sensor contains a piezoelectric element which generates a voltage when it becomes deformed, which occurs when the cylinder block vibrates due to knocking. If engine knocking occurs, ignition timing is retarded to suppress it.

DTC No.	DTC Detecting Condition	Trouble Area
P0325	No knock sensor 1 signal to ECM with engine speed between 1,760 rpm and 5,600 rpm	●Open or short in knock sensor 1 circuit ●Knock sensor 1 (looseness) ●ECM
P0330	No knock sensor 2 signal to ECM with engine speed between 1,760 rpm and 5,600 rpm	●Open or short in knock sensor 2 circuit ●Knock sensor 2 (looseness) ●ECM

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

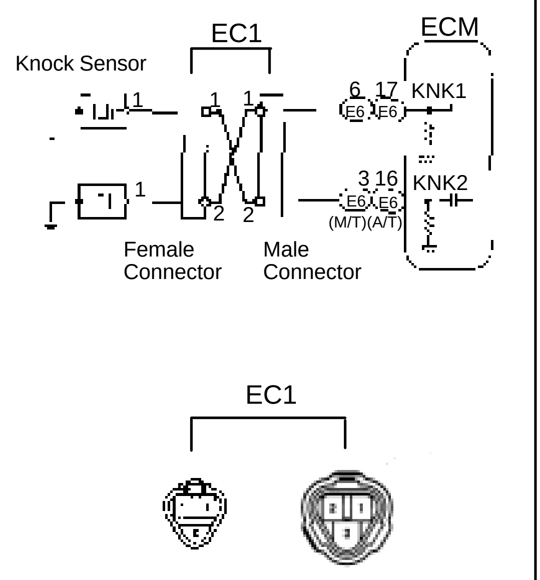
WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:
DTC P0325 is for the right bank knock sensor circuit. DTC P0330 is for the left bank knock sensor circuit.

1	**Connect OBD II scan tool or TOYOTA hand–held tester and check knock sensor circuit.**



PREPARATION:

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

(b) Disconnect the wire to wire connector EC1.

(c) Connect the terminals of the disconnected EC1 male connector and EC1 female as follows.

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

(d) Turn the ignition switch ON and push the OBDII scan tool or TOYOTA hand–held tester main switch ON.

(e) After the engine is warmed up, perform quick racing to 4,000 rpm 3 times.

CHECK:

Check the DTC.

RESULT:

Type I	DTC same as when vehicle brought in P0325 → P0325 or P0330 → P0330
Type II	DTC different to when vehicle brought in P0325 → P0330 or P0330 → P0325

Type II → **Go to step 3.**

Type I

2	**Check for open and short in harness and connector between EC1 connector and ECM (See page IN–24).**

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

OK

Check and replace ECM (See page IN–24).

3	**Check for open and short in harness and connector between EC1 connector and knock sensor (See page IN–24).**

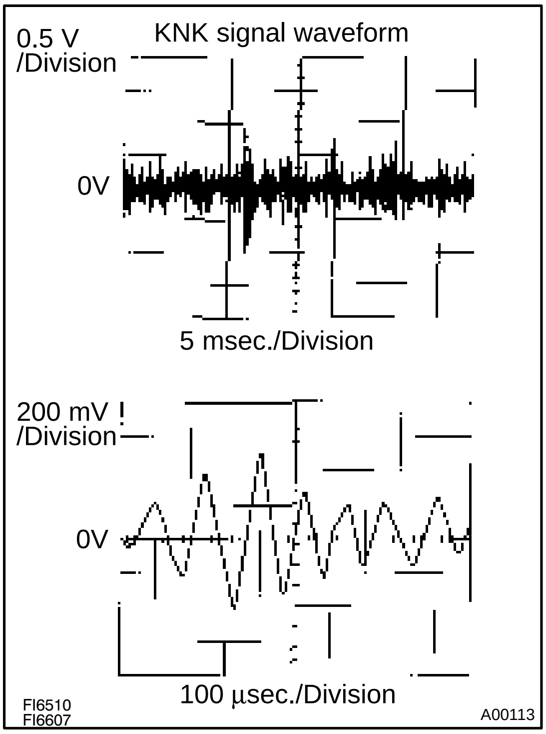
HINT:
- If DTC P0325 has changed to P0330, check the knock sensor circuit on the right bank side.
- If DTC P0330 has changed to P0325, check the knock sensor circuit on the left bank side.

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

OK

Replace knock sensor.

Reference INSPECTION USING OSCILLOSCOPE



- With the engine racing (4,000 rpm), measure between terminal KNK1, KNK2 of ECM and body ground.

HINT:
The correct waveform is as shown.

- Spread the time on the horizontal axis, and confirm that period of the wave is 141 µsec.
(Normal mode vibration frequency of knock sensor: 7.1 kHz)

HINT:
If normal mode vibration frequency is not 7.1 kHz, the sensor is malfunctioning.

DI0UV–01

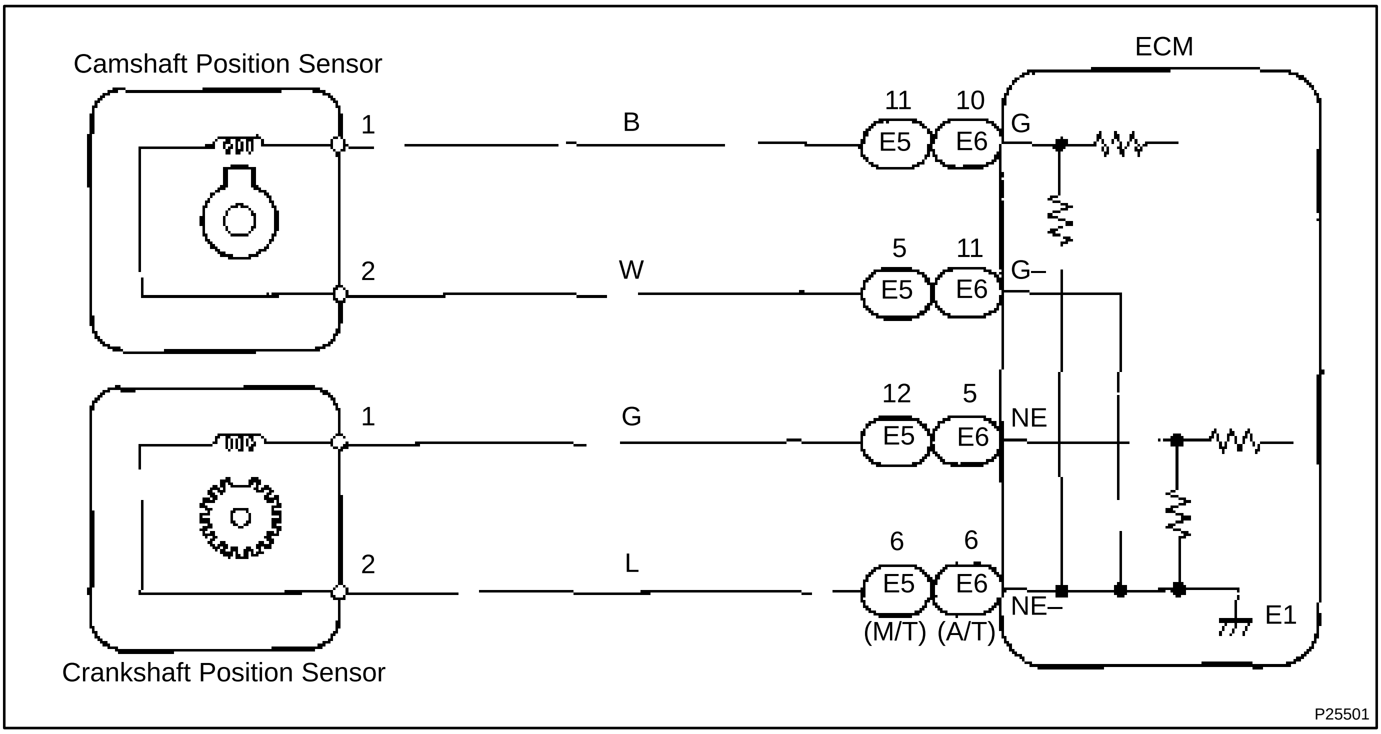
DTC	P0335	Crankshaft Position Sensor ”A” Circuit Malfunction

CIRCUIT DESCRIPTION

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

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

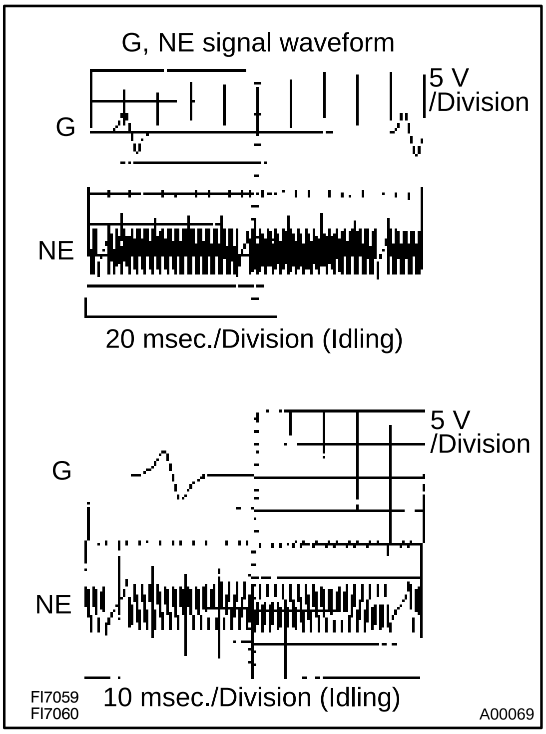
WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check resistance of crankshaft position sensor (See page IG–13).

Reference INSPECTION USING OSCILLOSCOPE



During cranking or idling, check between terminals G and G–, NE and NE– of ECM

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–24).

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

OK

3	**Inspect sensor installation and teeth of signal plate.**

NG → **Tighten the sensor. Replace signal plate.**

OK

Check and replace ECM (See page IN–24).

DI0UW–01

DTC	P0340	Camshaft Position Sensor Circuit Malfunction

CIRCUIT DESCRIPTION

The camshaft position sensor which detects the crankshaft angle signal (G signal), has been installed on the front of right bank cylinder head. The timing rotor has been integrated with the right bank camshaft timing pulley. When the camshafts rotate, the protrusion on the timing rotor 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 has 34 teeth and is mounted on the crankshaft. The NE signal sensor generates 34 signals for every engine revolution. The ECM detects the standard crankshaft angle based on the G signals and the actual crankshaft angle and the engine speed by the NE signals.

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

WIRING DIAGRAM

Refer to DTC P0335 on page DI–195.

INSPECTION PROCEDURE

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

Reference INSPECTION USING OSCILLOSCOPE

Refer to DTC P0335 on page DI–195.

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–24).

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

OK

3	Inspect sensor installation.

NG → **Tighten the sensor.**

OK

Check and replace ECM (See page IN–24).

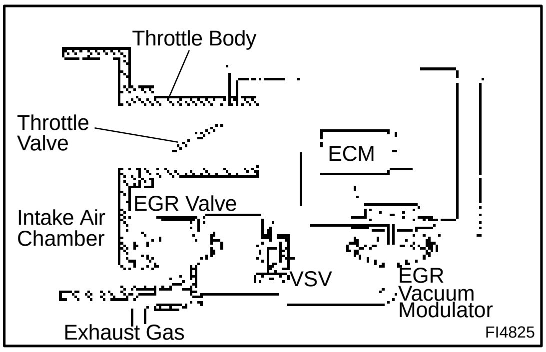
DI0UX–01

DTC	P0401	Exhaust Gas Recirculation Flow Insufficient Detected*

*: Only for 2WD models with a load capacity of 0.5 ton and regular cab.

CIRCUIT DESCRIPTION

The EGR system recirculates exhaust gas which is controlled to the proper quantity to suit the driving conditions, into the intake air mixture to slow down combustion, reduce the combustion temp. and reduce NOx emissions. The amount of EGR is regulated by the EGR vacuum modulator according to the engine load.

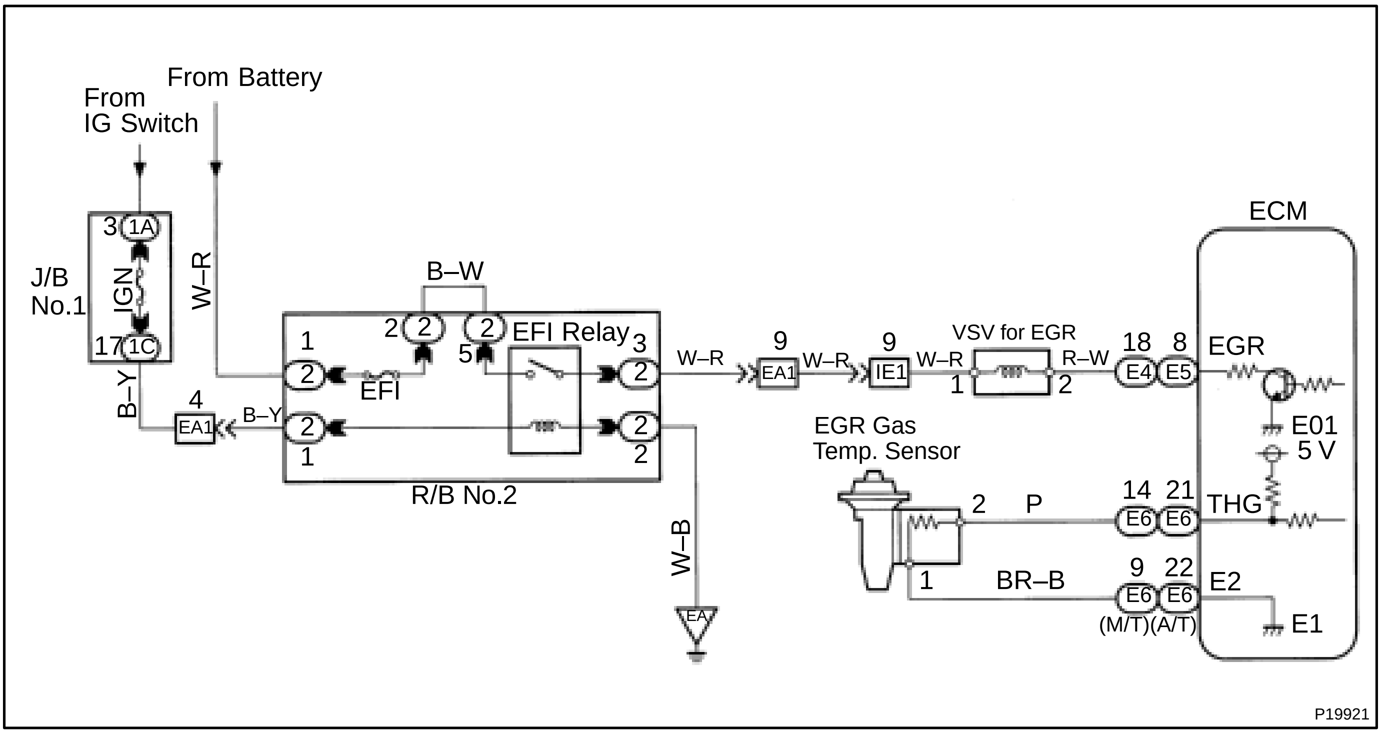


If even one of the following conditions is fulfilled, the VSV is turned ON by a signal from the ECM.
This results in atmospheric air acting on the EGR valve, closing the EGR valve and shutting off the exhaust gas (EGR cut–off).
Under the following conditions, EGR is cut to maintain driveability:

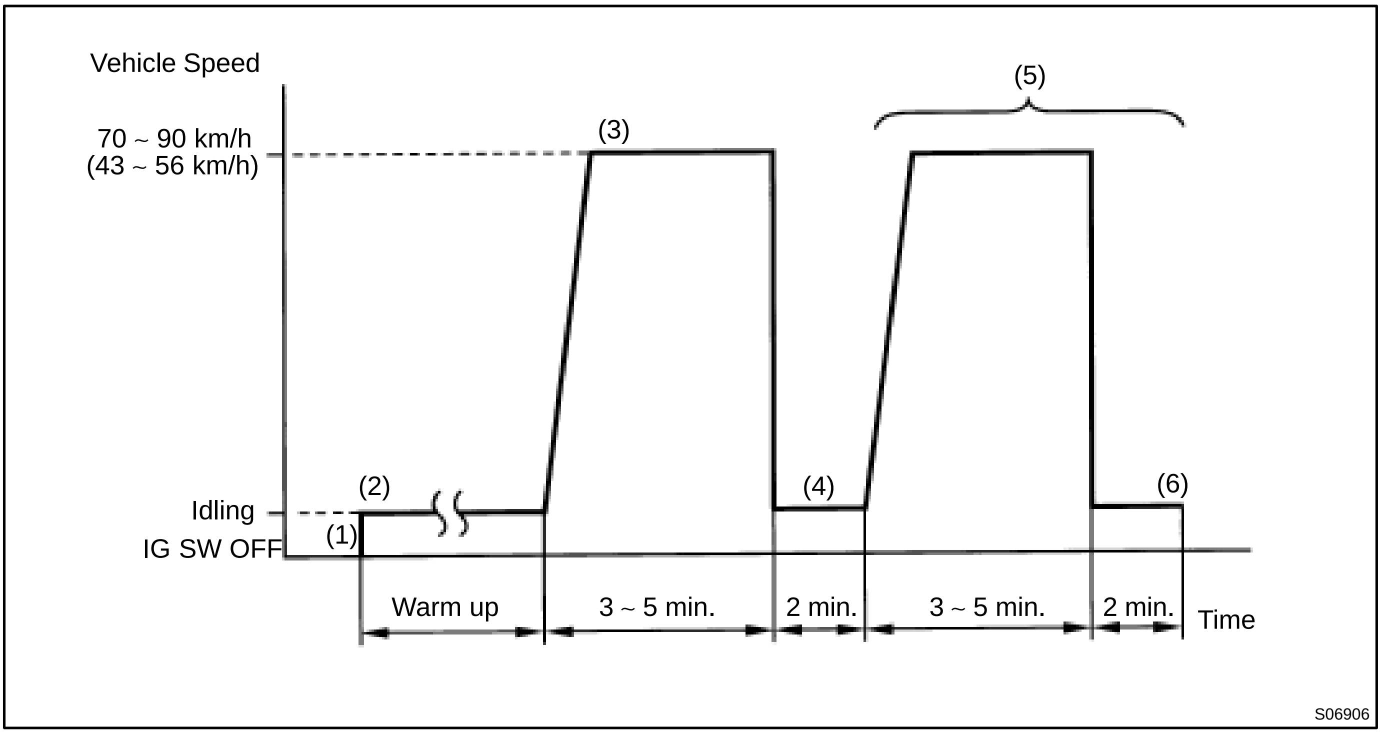
- Before the engine is warmed up
- During deceleration (throttle valve closed)
- Light engine load (amount of intake air very small)
- Engine racing

DTC No.	DTC Detecting Condition	Trouble Area
P0401	After engine is warmed up and run at 80 km/h (50 mph) for 3 to 5 min., EGR gas temp. sensor valve does not exceed 60˚C (140˚F) above ambient air temp. (2 trip detection logic)	●EGR valve stuck closed ●Short in VSV circuit for EGR ●Open in EGR gas temp. sensor circuit ●EGR hose disconnected ●ECM

WIRING DIAGRAM



SYSTEM CHECK DRIVING PATTERN



(1) Connect the OBD II scan tool or TOYOTA hand–held tester to the DLC3.
(2) Start and warm up the engine with all the accessories switched OFF.
(3) Run the vehicle at 70 – 90 km/h (43 – 56 mph) for 3 min. or more.
(4) Idle the engine for about 2 min.
(5) Do steps (3) and (4) again.
(6) Check the ”READINESS TESTS” mode on the OBD II scan tool or TOYOTA hand–held tester.
If ”COMPL” is displayed and the MIL does not light up, the system is normal.
If ”INCMPL” is displayed and the MIL does not light up, run the vehicle step (5) from some time and check it.
HINT:
”INCMPL” is displayed when either condition (a) or (b) exists:
(a) The system check is incomplete.
(b) There is a malfunction in the system.
If there is a malfunction in the system, the MIL will light up after steps (2) to (5) above are done.

INSPECTION PROCEDURE

TOYOTA hand–held tester:

1	Connect TOYOTA hand–held tester and read value of EGR gas temp. value.

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 EGR gas temp. on the TOYOTA hand–held tester.

OK:

EGR gas temp.: 10˚C (50˚F) or more

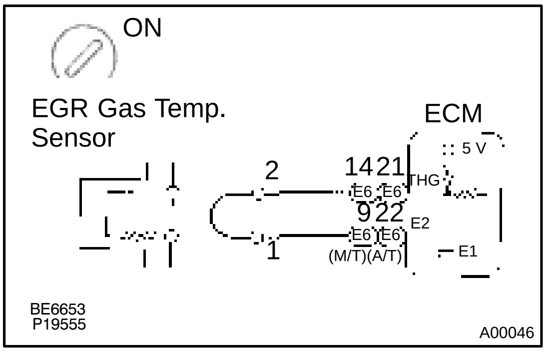
HINT:

If there is an open circuit, the TOYOTA hand–held tester indicates 3.1˚C (37.6˚F).

OK → **Go to step 4.**

NG

2	Check for open in harness or ECM.



PREPARATION:

(a) Disconnect the EGR gas temp. sensor connector.

(b) Connect the sensor wire harness terminals together.

(c) Turn the ignition switch ON.

CHECK:

Read EGR gas temp. on the TOYOTA hand–held tester.

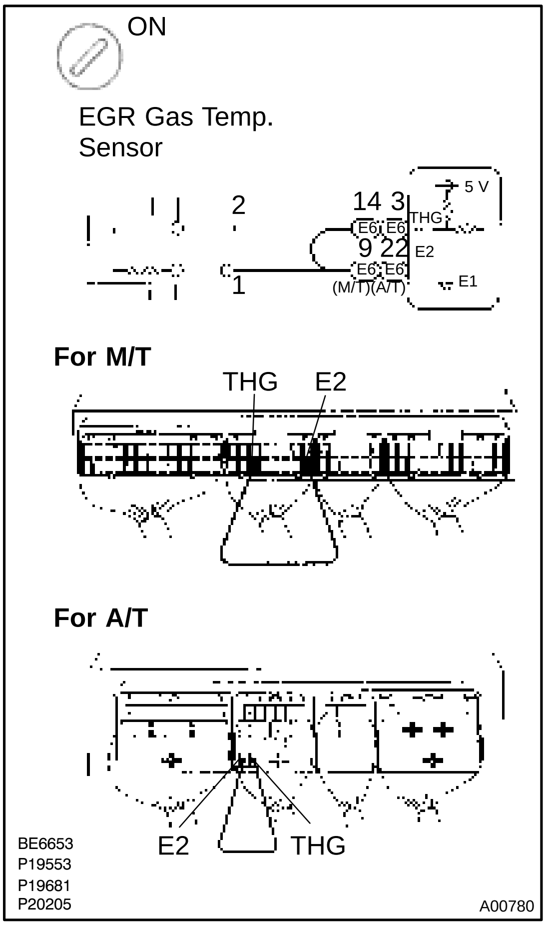
OK:

EGR gas temp.: 159˚C (318.2˚F)

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

NG

3	Check for open in harness or ECM.



PREPARATION:

(a) Remove the right cowl side trim (See page SF–58).

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

HINT:

The EGR gas temp. sensor connector is disconnected.

Before checking, do a visual check and contact pressure check for the ECM connector (See page IN–24).

CHECK:

Read EGR gas temp. on the TOYOTA hand–held tester.

OK:

EGR gas temp.: 159˚C (318.2˚F)

OK → **Open in harness between terminals E2 or THG. Repair or replace harness.**

NG

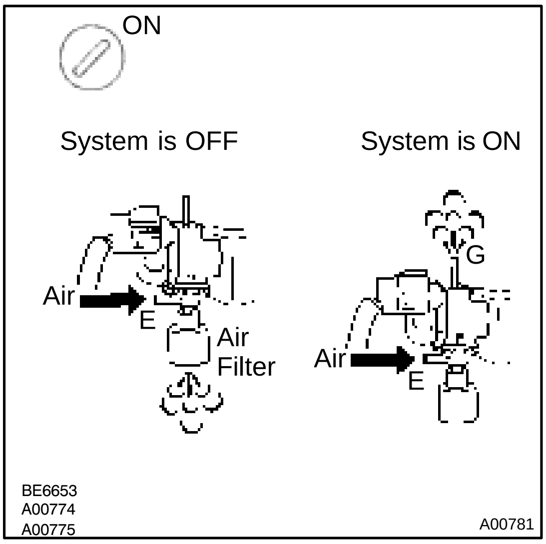
Confirm connection at ECM.
If OK, replace ECM.

4	Check connection of vacuum hose and EGR hose (See page EC–9).

NG → **Repair or replace.**

OK ↓

5	Check VSV for EGR.



PREPARATION:
Select the "ACTIVE TEST" mode on the TOYOTA hand–held tester.

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

OK:

EGR system is OFF:
Air flows from port E to the air filter.
EGR system is ON:
Air flows from port E to port G.

OK → **Go to step 7.**

NG ↓

6	Check operation of VSV for EGR (See page EC–9).

NG → **Replace VSV for EGR.**

OK ↓

Check for open in harness and connector between VSV and ECM (See page IN–24).

7	**Check EGR vacuum modulator (See page EC–9).**

NG → **Repair or replace.**

OK

8	**Check EGR valve (See page EC–9).**

NG → **Repair or replace.**

OK

9	**Check value of EGR gas temp. 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 ”ACTIVE TEST” mode on the TOYOTA hand–held tester (EGR system ON).
(d) Race the engine at 4,000 rpm for 3 min.

CHECK:

Measure EGR gas temp. while racing engine at 4,000 rpm.

OK:

EGR gas temp. after 3 min.: 140°C (284°F) or more

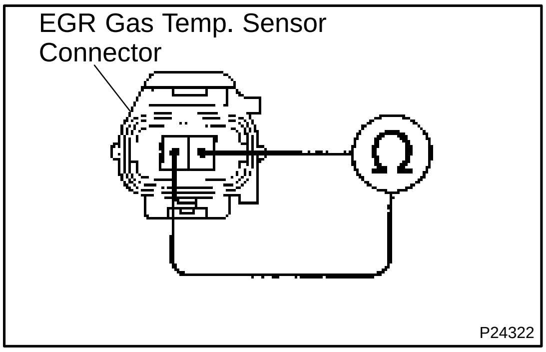
NG → **Replace EGR gas temp. sensor.**

OK

Check and replace ECM (See page IN–24).

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

1	**Check resistance of EGR gas temp. sensor.**

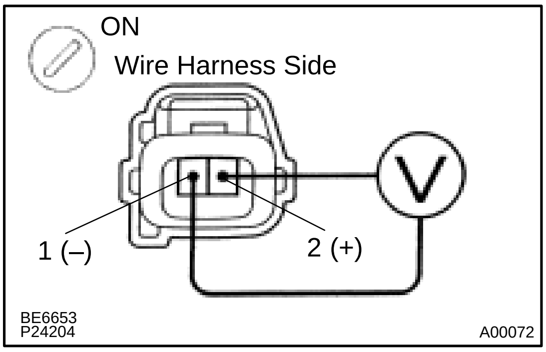


PREPARATION:
Disconnect the EGR gas temp. sensor connector.
CHECK:
Measure resistance between terminals of EGR gas temp. sensor connector.
OK:
Resistance: 600 kΩ or less
HINT:
If there is open circuit, ohmmeter indicates 720 kΩ or more.

NG	**Check and replace EGR gas temp. sensor (See page SF–56).**

OK

2	**Check for open in harness or ECM.**

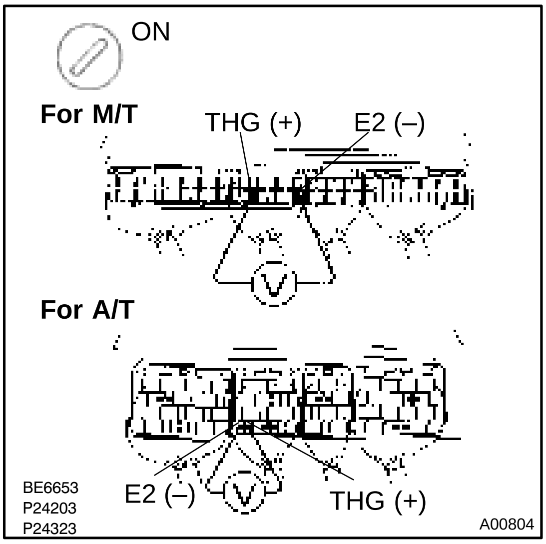


PREPARATION:
(a) Disconnect the EGR gas temp. sensor connector.
(b) Turn the ignition switch ON.
CHECK:
Measure voltage between terminals of EGR gas temp. sensor wire harness side connector.
OK:
4.5 – 5.5 V

OK	**Go to step 4.**

NG

3	**Check for open in harness or ECM.**



PREPARATION:
(a) Remove the right cowl side trim (See page SF–58).
(b) Turn the ignition switch ON.
CHECK:
Measure voltage between terminals of THG and E2 of ECM connector.
HINT:
The EGR gas temp. sensor connector is disconnected.
OK:
4.5 – 5.5 V

OK → **Open in harness between terminals E2 or THG. Repair or replace harness.**

NG

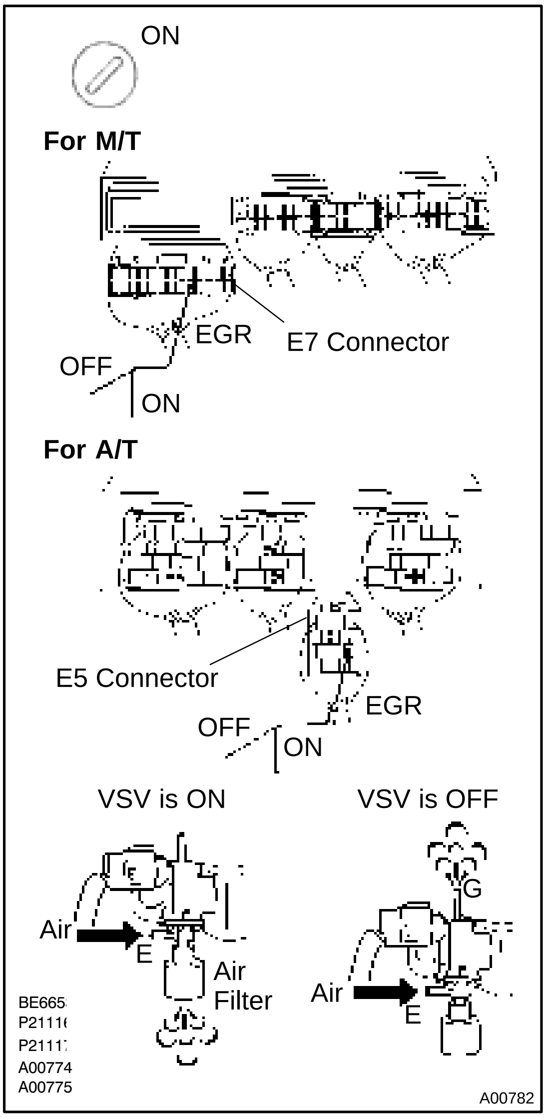
Confirm connection at ECM.
If OK, replace ECM.

4	**Check connection of vacuum hose and EGR hose (See page EC–2).**

NG → **Repair or replace.**

OK

5	Check VSV for EGR.



PREPARATION:
(a) Remove the right cowl side trim (See page SF–58).
(b) Disconnect the E7 or E5 connector of the ECM.
(c) Turn the ignition switch ON.

CHECK:
Check VSV function:
(1) Connect between terminal EGR of ECM connector and body ground (ON).
(2) Disconnect between terminal EGR of ECM connector and body ground (OFF).

OK:
(1) VSV is ON:
Air flows from port E to the air filter.
(2) VSV is OFF:
Air flows from port E to port G.

OK → **Go to step 7.**

NG

6	Check operation for VSV for EGR (See page SF–45).

NG → **Replace VSV for EGR.**

OK

Check for open in harness and connector between R/B No.2 and ECM (See page EC–1).

7	**Check EGR vacuum modulator (See page EC–9).**

NG → **Repair or replace.**

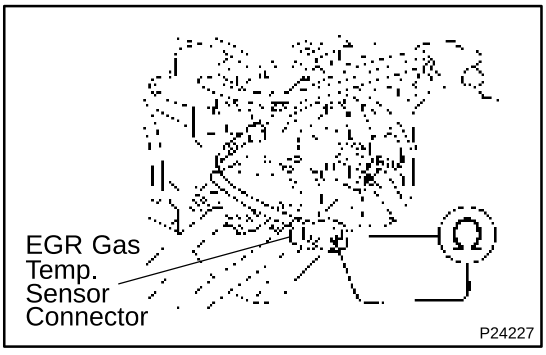
OK

8	**Check EGR valve (See page EC–9).**

NG → **Repair or replace.**

OK

9	**Check resistance of EGR gas temp. sensor.**



PREPARATION:

(a) Disconnect the EGR gas temp. sensor connector.
(b) Start the engine and warm it up.
(c) Disconnect the VSV connector for EGR.
(d) Race the engine at 4,000 rpm or 3 min.

CHECK:

Measure resistance of the EGR gas temp. sensor while racing the engine at 4,000 rpm.

OK:

Resistance of EGR gas temp. sensor after 3 min.:
4.3 kΩ or less

HINT:
Resistance: 188.6 ~ 439.0 kΩ at 20°C (68°F)

NG → **Replace EGR gas temp. sensor.**

OK

Check and replace ECM (See page IN–24).

DI0UY–01

DTC	P0402	Exhaust Gas Recirculation Flow Excessive Detected*

*: Only for 2WD models with a load capacity of 0.5 ton and regular cab.

CIRCUIT DESCRIPTION

Refer to DTC P0401 on page DI–200.

DTC No.	Detection ItemDTC Detecting Condition	Trouble AreaTrouble Area
P0402	EGR gas temp. sensor value is high during EGR cut–off when engine is cold (Race engine at about 4,000 rpm without load so that vacuum is applied to port E) (2 trip detection logic)	●EGR valve stuck open ●VSV for EGR open malfunction ●Open in VSV circuit for EGR ●Short in EGR gas temp. sensor circuit ●ECM
P0402	EGR valve is always open (2 trip detection logic)	

WIRING DIAGRAM

Refer to DTC P0401 on page DI–200.

SYSTEM CHECK DRIVING PATTERN

Refer to DTC P0401 on page DI–200.

INSPECTION PROCEDURE

TOYOTA hand–held tester:

1	Connect TOYOTA hand–held tester and read EGR gas temp. value.

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 EGR gas temp. on the TOYOTA hand–held tester.

OK:

EGR gas temp.: 159˚C (318.2˚F) or less (Not immediately after driving)

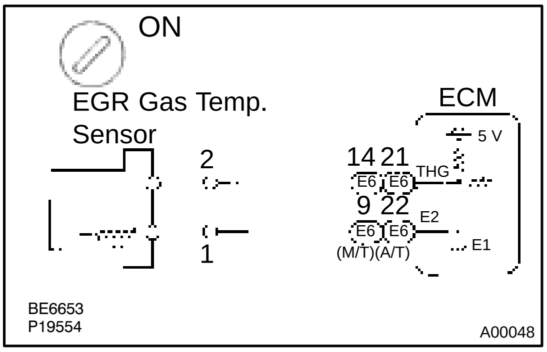
HINT:

If there is a short circuit, the TOYOTA hand–held tester indicates 159.3˚C (318.7˚F).

OK	Go to step 4.

NG

2	**Check for short in harness and ECM.**



PREPARATION:
Disconnect the EGR gas temp. sensor connector.

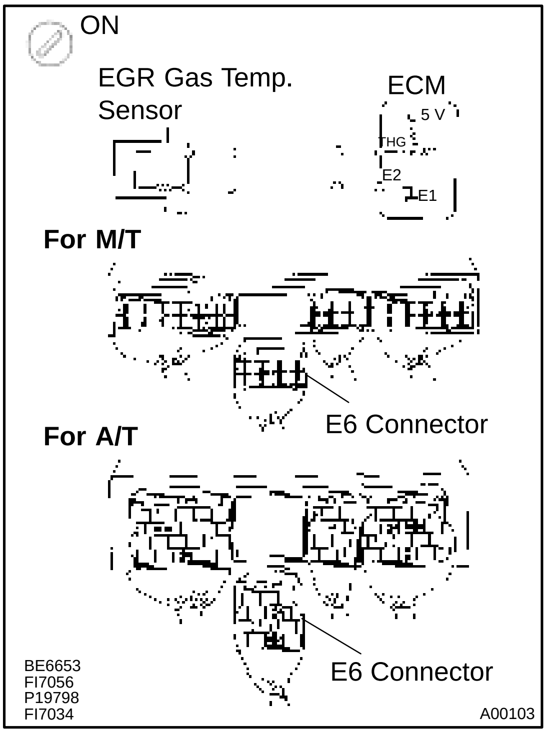
CHECK:
Read EGR gas temp. on the TOYOTA hand–held tester.

OK:
EGR gas temp.: 3.1°C (37.6°F)

OK → **Replace EGR gas temp. sensor.**

NG ↓

3	**Check for short in harness or ECM.**



PREPARATION:
(a) Remove the right cowl side trim (See page SF–58).
(b) Disconnect the E6 connector of ECM.

HINT:
The EGR gas temp. sensor is disconnected.

CHECK:
Read EGR gas temp. on the TOYOTA hand–held tester.

OK:
EGR gas temp.: 3.1°C (37.6°F)

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

NG ↓

Check and replace ECM (See page IN–24).

4	Check VSV for EGR (See page DI–200, step 5).

OK → **Check EGR valve (See page EC–9).**

NG

5	Check operation of VSV for EGR (See page SF–45).

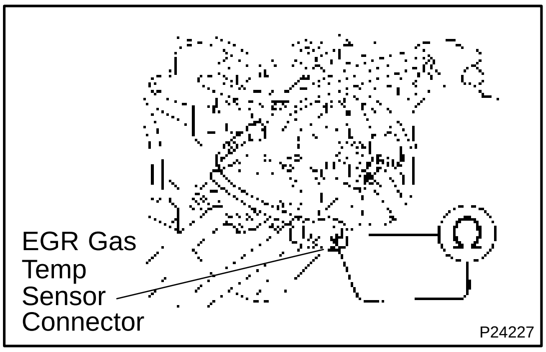
NG → **Replace VSV for EGR.**

OK

Check for short in harness and connector between VSV and ECM (See page IN–24).

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

1	Check resistance of EGR gas temp. sensor.



PREPARATION:
Disconnect the EGR gas temp. sensor connector.
CHECK:
Measure resistance between terminals of EGR gas temp. sensor connector.
OK:
Resistance: 2.5 kΩ or more
(Not immediately after driving)
HINT:
If there is short circuit, ohmmeter indicates 200 Ω or less.

NG → **Replace EGR gas temp. sensor.**

OK

2	Check for short in harness and connector between EGR gas temp. sensor and ECM (See page IN–24).

NG → Repair or replace harness or connector.

OK ↓

3	Check VSV for EGR (See page DI–200, step 5).

OK → Check EGR valve (See page EC–9).

NG ↓

4	Check operation of VSV for EGR (See page SF–45).

NG → Replace VSV for EGR.

OK ↓

5	Check for short in harness and connector between VSV and ECM (See page IN–24).

NG → Repair or replace harness or connector.

OK ↓

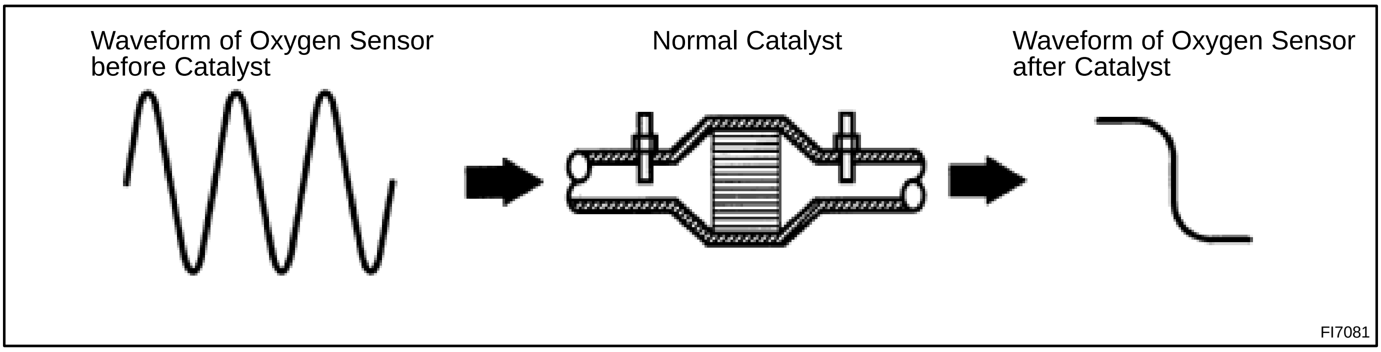
Check and replace ECM (See page IN–24).

DI0UZ–01

DTC	P0420	Catalyst System Efficiency Below Threshold

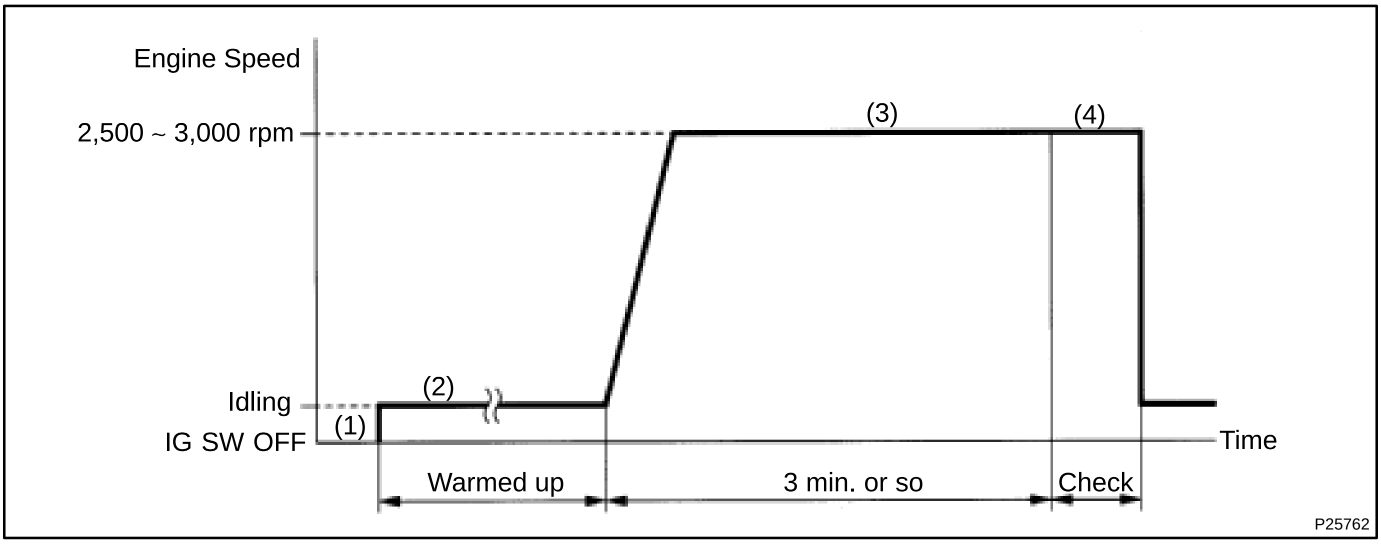
CIRCUIT DESCRIPTION

The ECM compares the waveform of the oxygen sensor located before the catalyst with the waveform of the oxygen sensor located after the catalyst to determine whether or not catalyst performance has deteriorated.
Air–fuel ratio feedback compensation keeps the waveform of the oxygen sensor before the catalyst repeatedly changing back and forth from rich to lean.
If the catalyst is functioning normally, the waveform of the oxygen sensor after the catalyst switches back and forth between rich and lean much more slowly than the waveform of the oxygen sensor before the catalyst.
But when both waveforms change at a similar rate, it indicates that catalyst performance has deteriorated.

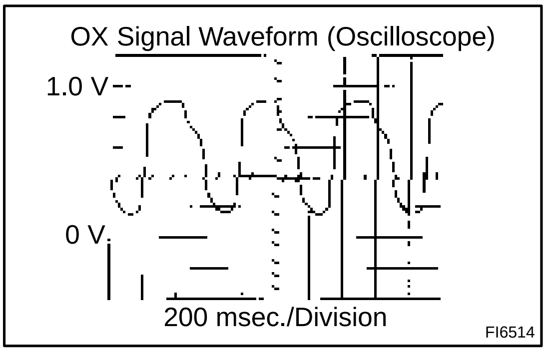


DTC No.	DTC Detecting Condition	Trouble Area
P0420	After engine and catalyst are warmed up, and while vehicle is driven within set vehicle and engine speed range, waveforms of heated oxygen sensors (bank 1 sensor 1, 2) have same amplitude (2 trip detection logic)	●Three–way catalytic converter ●Open or short in heated oxygen sensor (bank 1 sensor 1, 2) circuit ●Heated oxygen sensor (bank 1 sensor 1, 2)

CONFIRMATION ENGINE RACING PATTERN



(1) Connect the TOYOTA hand–held tester to the DLC3, or connect the probe of the oscilloscope between terminals OX1, OX2 and E1 of ECM.
(2) Start engine and warm it up with all accessories switched OFF until water temp. is stable.
(3) Race the engine at 2,500 ~ 3,000 rpm for about 3 min.
(4) After confirming that the waveform of the heated oxygen sensor, bank 1 sensor 1 (OX1), oscillate around 0.5 V during feedback to the ECM, check the waveform of the heated oxygen sensor bank 1 sensor 2 (OX2).



HINT:
If there is a malfunction in the system, the waveform of the heated oxygen sensor bank 1 sensor 2 (OX2) is almost the same as that of the heated oxygen sensor bank 1 sensor 1 (OX1) 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

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

YES → **Go to relevant DTC chart.**

NO

2	**Check heated oxygen sensor (bank 1 sensor 1) (See page DI–176).**

NG → **Repair or replace.**

OK

3	**Check heated oxygen sensor (bank 1 sensor 2) (See page DI–182).**

NG → **Repair or replace.**

OK

Replace three–way catalytic converter.

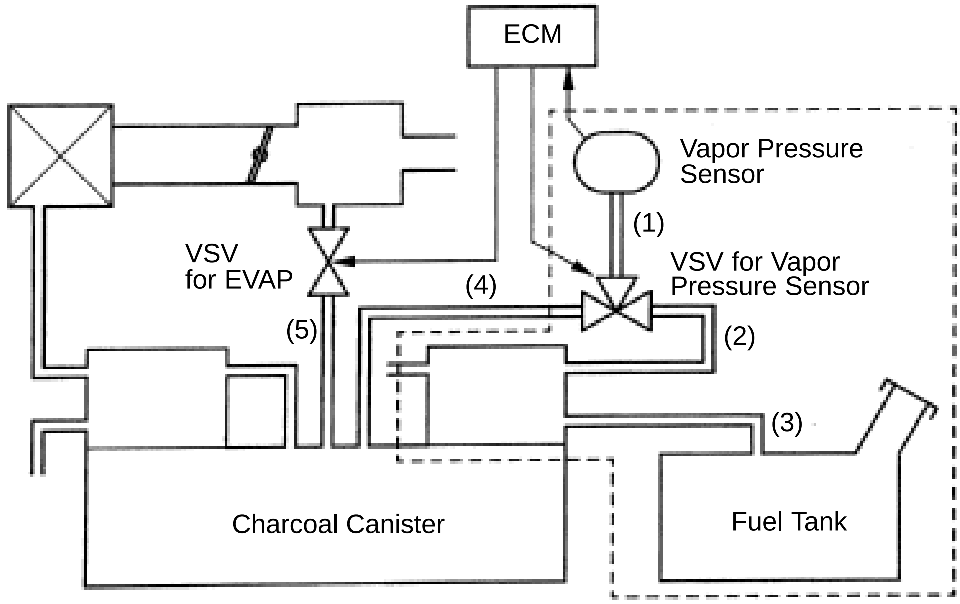
DI0V0–01

DTC	P0440	Evaporative Emission Control System Malfunction

CIRCUIT DESCRIPTION

The vapor pressure sensor and VSV for vapor pressure sensor 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.

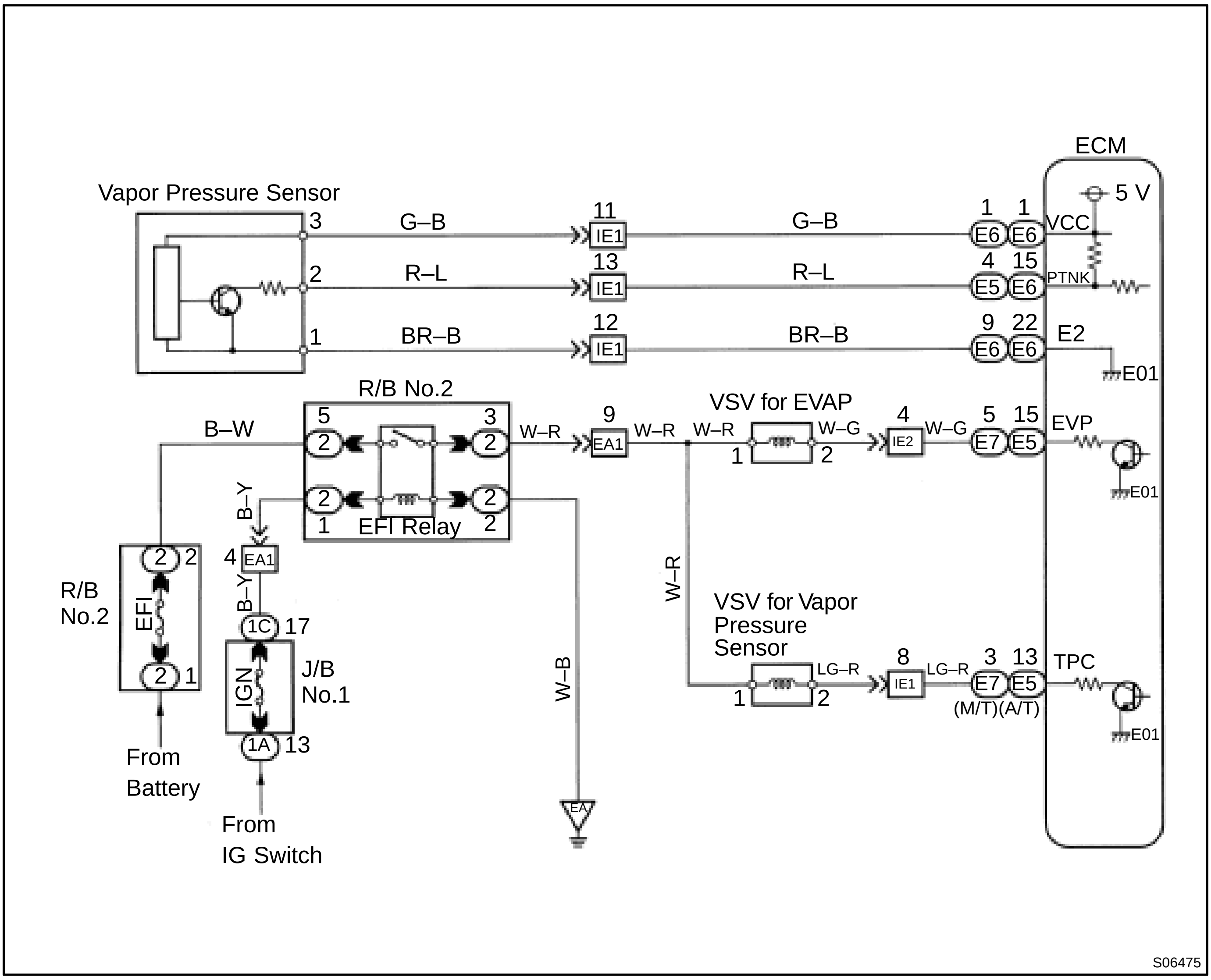
fig. 1



S00043

DTC No.	DTC Detecting Condition	Trouble Area
P0440	Fuel tank pressure is atmospheric pressure after vehicle is driven for 20 min. (2 trip detection logic)	●Vapor pressure sensor ●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) ●Hose or tube cracked, holed, damaged or loose seal ((3) in fig. 1) ●Fuel tank cracked, holed or damaged ●Charcoal canister cracked, holed or damaged

WIRING DIAGRAM

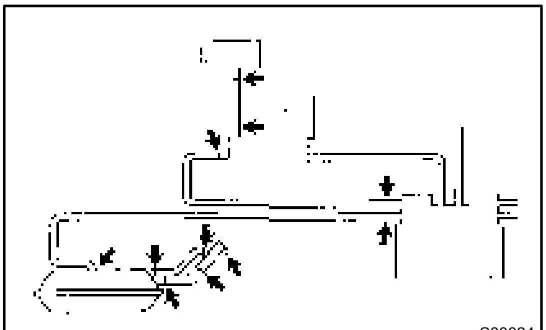


INSPECTION PROCEDURE

HINT:

- If DTC P0441, P0446 or P0450 is output after DTC P0440, first troubleshoot DTC P0441, P0446 or P0450. 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 loose, it was the cause of the DTC. If the fuel tank cap was not loose or if the customer was not sure if it was loose, troubleshoot according to the following procedure.

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.**


S00024

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 to TOYOTA genuine parts.**

OK

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

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

OK

4	**Check fuel tank cap.**

NG → **Replace fuel tank cap.**

OK

5	**Check filler neck for damage.**

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

NG → **Replace filler pipe.**

OK

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

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

NG → **Repair or replace.**

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, 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.**

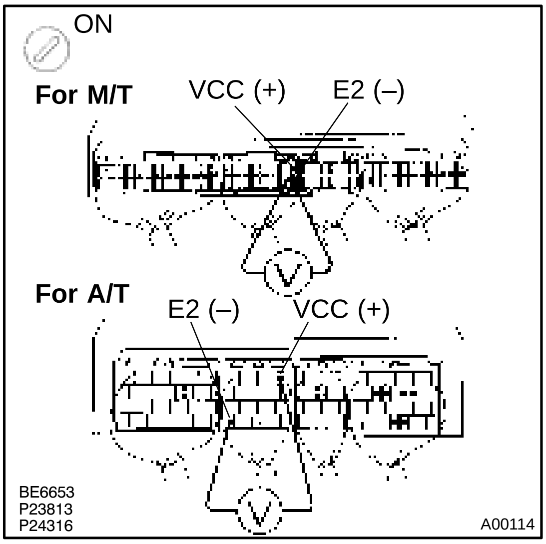
OK

8	**Check charcoal canister for cracks, hole and damage).**

NG → **Replace charcoal canister.**

OK

9	Check voltage between terminals VCC and E2 of ECM connector.



CHECK:
(a) Remove the right cowl side trim (See page SF–58).
(b) Turn the ignition switch ON.

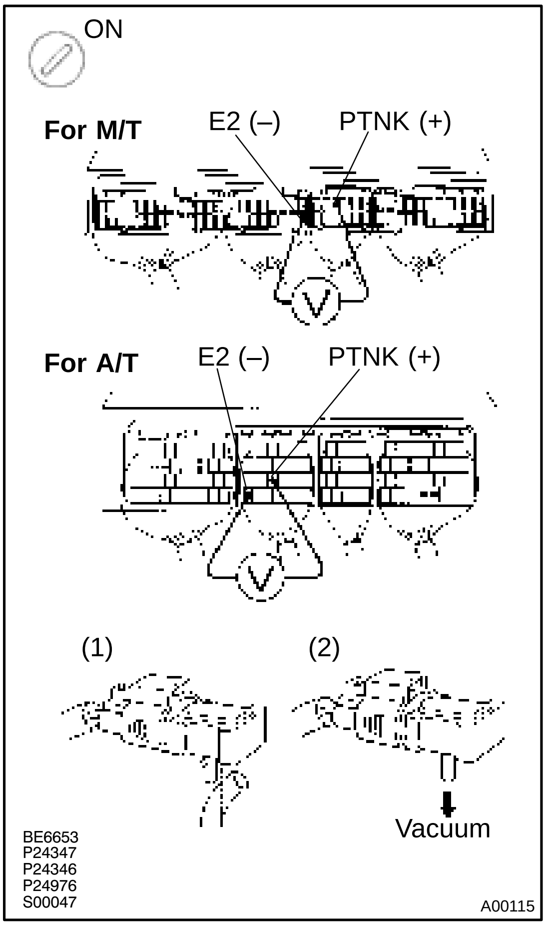
CHECK:
Measure voltage between terminals VCC and E2 of ECM connector.

OK:
Voltage: 4.5 – 5.5 V

NG	Check and replace ECM (See page IN–24).

OK

10	Check voltage between terminals PTNK and E2 of ECM connector.



PREPARATION:
(a) Remove the right cowl side trim (See page SF–58).
(b) Turn the ignition switch ON.

CHECK:
Measure voltage between terminals PTNK and E2 of ECM connector.
(1) Disconnect the vacuum hose from the vapor pressure sensor.
(2) Using the MITYVAC (Hand–Held Vacuum Pump), apply a vacuum of 4.0 kPa (30 mmHg, 1.18 in.Hg) to the vapor pressure sensor.

NOTICE:
The vacuum applied to the vapor pressure sensor must be less than 66.7 kPa (500 mmHg, 19.7 in.Hg).

OK:
(1) Voltage: 3.0 – 3.6 V
(2) Voltage: 0.5 V or less

OK	Go to step 12.

NG

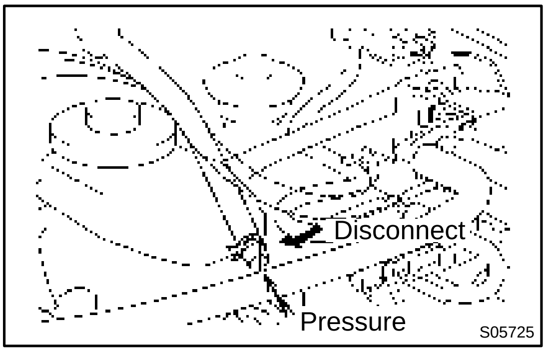
11	Check for open and short in harness and connector between vapor pressure sensor and ECM (See page IN–24).

NG	Repair or replace harness or connector.

OK

Replace vapor pressure sensor.

12	**Check fuel tank for cracks and damage.**



PREPARATION:

(a) Disconnect the vacuum hose the from charcoal canister.

(b) Correctly install the fuel tank cap.

(c) Apply a pressure of 5 kPa (0.05 kgf/cm^2, 0.71 psi) to the fuel tank.

CHECK:

Check whether the pressure is maintained after 1 min.

OK:

Pressure applied to the fuel tank is maintained.

NG	**Replace fuel tank.**

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.

DI0V1–01

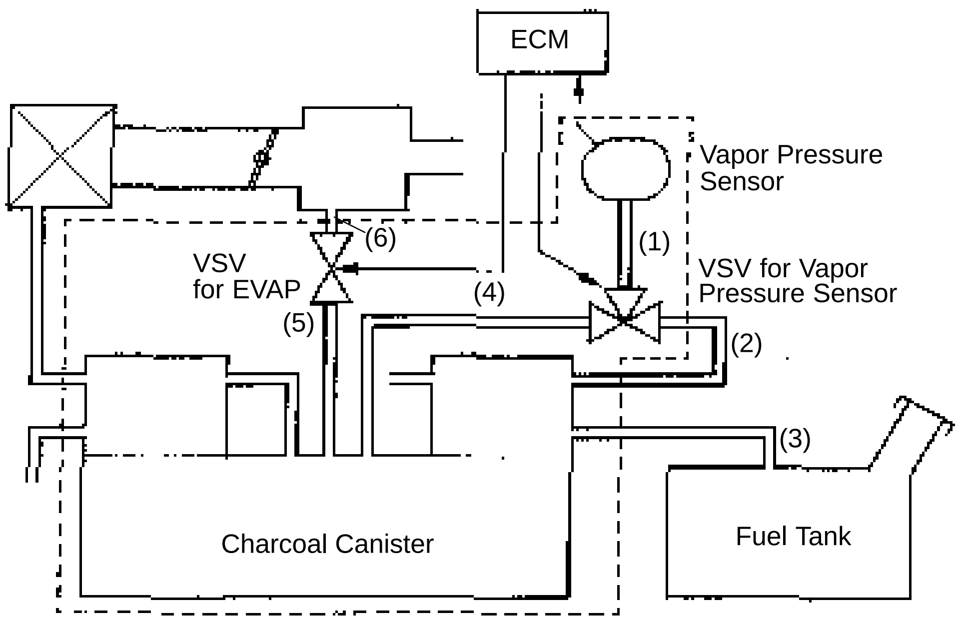
DTC	P0441	Evaporative Emission Control System Incorrect Purge Flow

DTC	P0446	Evaporative Emission Control System Vent Control Malfunction

CIRCUIT DESCRIPTION

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

fig. 1



S00044

<table>
<tr><th>DTC No.</th><th>DTC Detecting Condition</th><th>Trouble Area</th></tr>
<tr><td rowspan="2">P0441</td><td>Pressure in charcoal canister does not drop during purge control (2 trip detection logic)</td><td rowspan="5">●Open or short in VSV circuit for EVAP
●Open or short in VSV circuit for vapor pressure sensor
●Open or short in vapor pressure sensor circuit
●VSV for EVAP
●VSV for vapor pressure sensor
●Vapor pressure sensor
●Vacuum hose cracks, holed blocked, damaged or disconnected ((1), (4), (5) and (6) in fig. 1)
●Charcoal canister cracks, holed or damaged</td></tr>
<tr><td>During purge cut–off, pressure in charcoal canister is very low compared with atmospheric pressure (2 trip detection logic)</td></tr>
<tr><td rowspan="3">P0446</td><td>When VSV for vapor pressure sensor is OFF, ECM judges that there is no continuity between vapor pressure sensor and charcoal canister (2 trip detection logic)</td></tr>
<tr><td>When VSV for vapor pressure sensor is OFF, ECM judges that there is no continuity between vapor pressure sensor and fuel tank (2 trip detection logic)</td></tr>
<tr><td>After purge cut off operates, pressure in charcoal canister is maintained at atmospheric pressure (2 trip detection logic)</td></tr>
</table>

WIRING DIAGRAM

Refer to DTC P0440 on page DI–216.

INSPECTION PROCEDURE

HINT:
If DTC P0441, P0446 or P0450 is output after DTC P0440, first troubleshoot DTC P0441, P0446 or P0450. If no malfunction is detected, troubleshoot DTC P0440 next.

TOYOTA hand–held tester:

1	**Check VSV connector for EVAP, VSV connector for vapor pressure sensor and vapor pressure sensor connector for looseness and disconnection.**

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

OK

2	**Check vacuum hose between throttle body and VSV for EVAP, VSV for EVAP and charcoal canister, charcoal canister and VSV for vapor pressure sensor, VSV for vapor pressure sensor and vapor pressure sensor.**

<u>**CHECK:**</u>
(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

3	Check voltage between terminals VCC and E2 of ECM connector (See page DI–216, step 9).

NG → Check and replace ECM (See page IN–24).

OK ↓

4	Check voltage between terminals PTNK and E2 of ECM connector (See page DI–216, step 10).

OK → Go to step 6.

NG ↓

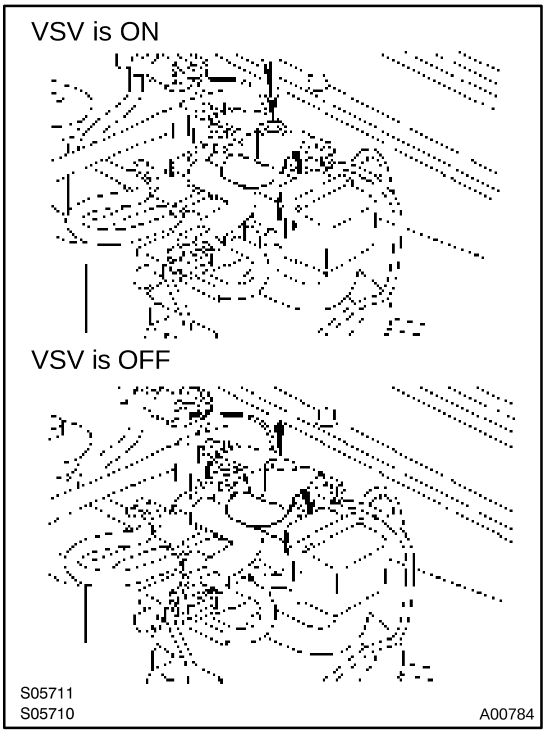
5	Check for open and short in harness and connector between vapor pressure sensor and ECM (See page IN–24).

NG → Repair or replace harness or connector.

OK ↓

Replace vapor pressure sensor.

6	Check the 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 VSV vacuum hose for EVAP from the charcoal canister.
(d) Start the engine.

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

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

OK → **Go to step 10.**

NG

7	Check vacuum hose between throttle body and VSV for EVAP, 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

8	Check operation of VSV for EVAP (See page SF–46).

NG → Replace VSV.

OK

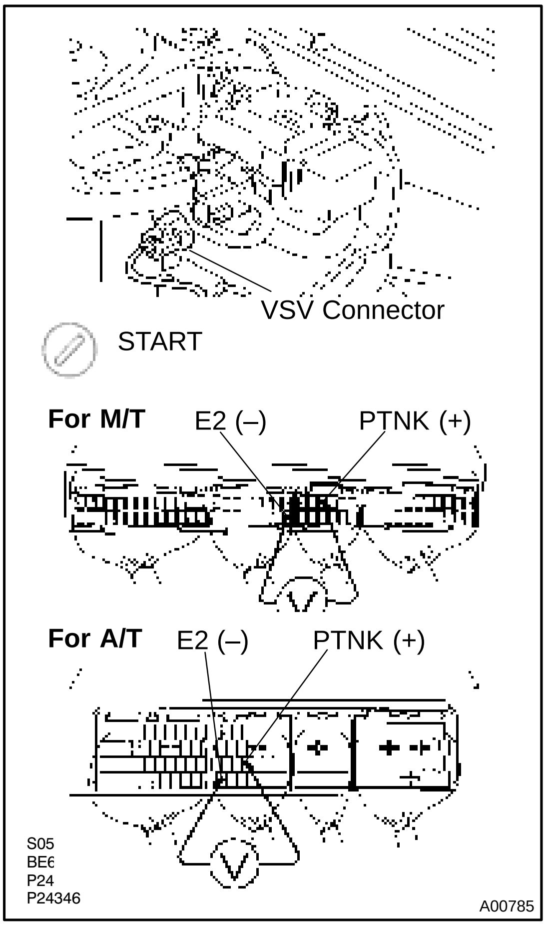
9	Check for open and short in harness and connector between EFI main relay (Marking: EFI), VSV for EVAP and ECM (See page IN–24).

NG → Repair or replace harness or connector.

OK

Check and replace ECM (See page IN–24).

10	**Connect TOYOTA hand–held tester, when VSV connector for vapor pressure sensor is disconnected and VSV for EVAP is ON, measure voltage between terminals PTNK and E2 of ECM connector.**



PREPARATION:
(a) Connect the TOYOTA hand–held tester to the DLC3.
(b) Disconnect the VSV connector for the vapor pressure sensor.
(c) Select the "ACTIVE TEST" mode on the TOYOTA hand–held tester.
(d) Start the engine.

CHECK:
Measure voltage between terminals PTNK and E2 of ECM connector, when VSV for EVAP is ON, using the TOYOTA hand–held tester.

OK:
Voltage: 2.0 V or less

OK	**Go to step 13.**

NG

11	**Check vacuum hose between charcoal canister and VSV for vapor pressure sensor, vapor pressure sensor and VSV for vapor pressure sensor.**

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

12	Check operation of VSV for vapor pressure sensor (See page SF–46).

NG → **Replace VSV.**

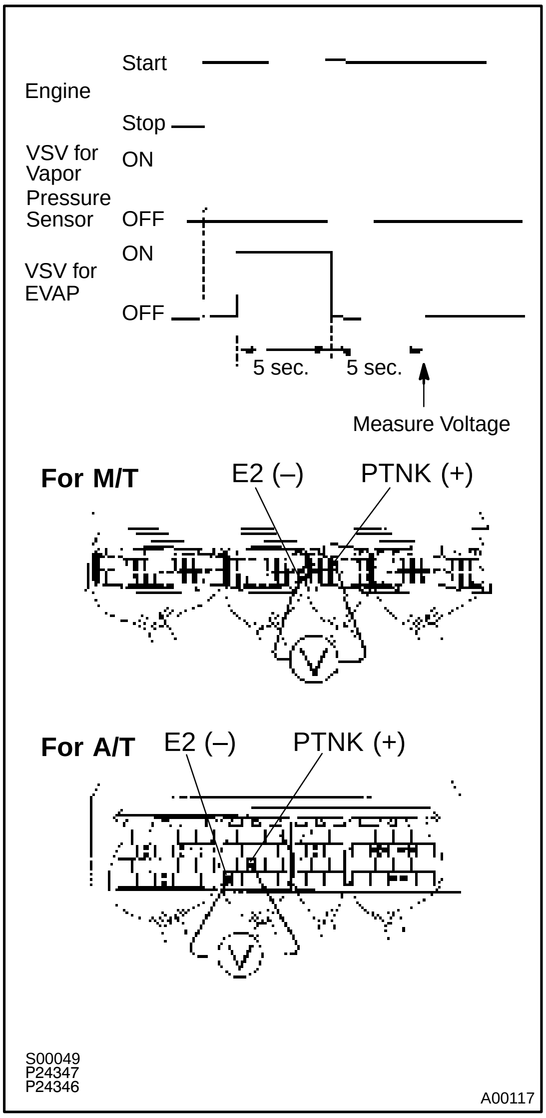
OK

13	Check for open and short in harness and connector between EFI main relay (Marking: EFI), VSV for vapor pressure sensor and ECM (See page IN–24).

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

OK

14	Check charcoal canister.



PREPARATION:

(a) Connect the TOYOTA hand–held tester to the DLC3.
(b) Remove the fuel tank cap.
(c) Disconnect the VSV connector for the vapor pressure sensor.
(d) Select the ”ACTIVE TEST” mode on the TOYOTA hand–held tester.
(e) Start the engine.
(f) The VSV for the EVAP is ON by the TOYOTA hand–held tester and remains on for 5 sec.

CHECK:

Measure voltage between terminals PTNK and E2 of ECM connector 5 sec. after switching VSV for EVAP from ON to OFF.

OK:

Voltage: 2.5 V or less

NG	Replace charcoal canister.

OK

Check and replace ECM (See page IN–24).

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

1	**Check VSV connector for EVAP, VSV connector for vapor pressure sensor and vapor pressure sensor connector for looseness and disconnection.**

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

OK

2	**Check vacuum hoses between throttle body and VSV for EVAP, VSV for EVAP and charcoal canister, charcoal canister and VSV for vapor pressure sensor, VSV for vapor pressure sensor and vapor pressure sensor.**

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

3	**Check voltage between terminals VCC and E2 of ECM connector (See page DI–216, step 9).**

NG → **Check and replace ECM (See page IN–24).**

OK

4	**Check voltage between terminals PTNK and E2 of ECM connector (See page DI–216, step 10).**

OK → **Go to step 6.**

NG

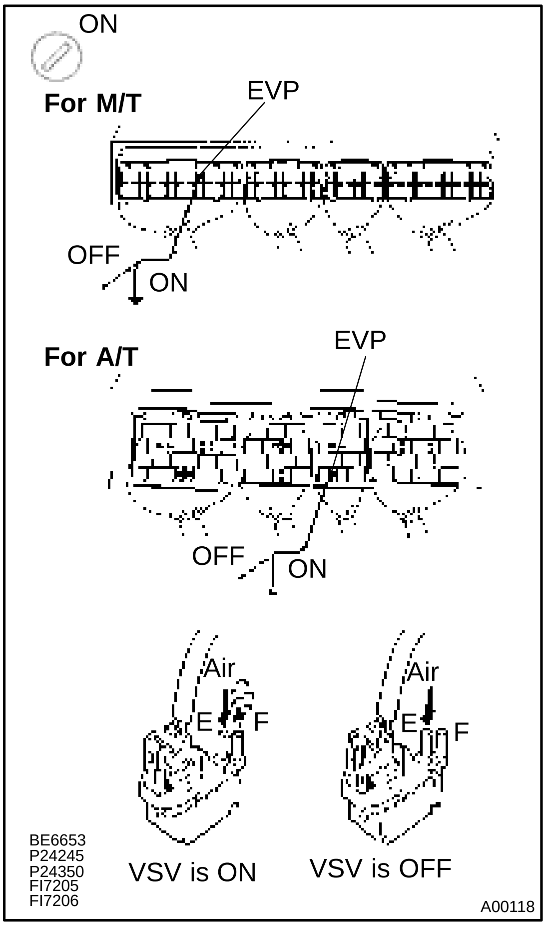
5	**Check for open and short in harness and connector between vapor pressure sensor and ECM (See page IN–24).**

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

OK

Replace vapor pressure sensor.

6	**Check VSV for EVAP.**



PREPARATION:

(a) Remove the right cowl side trim (See page SF–58).

(b) Turn the ignition switch ON.

CHECK:

Check VSV function.

(1) Connect between terminal EVP of ECM and body ground.

(2) Disconnect between terminal EVP of ECM and body ground.

OK:

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

OK → **Go to step 9.**

NG

7	Check operation of VSV for EVAP (See page SF–46).

NG → **Replace VSV.**

OK ↓

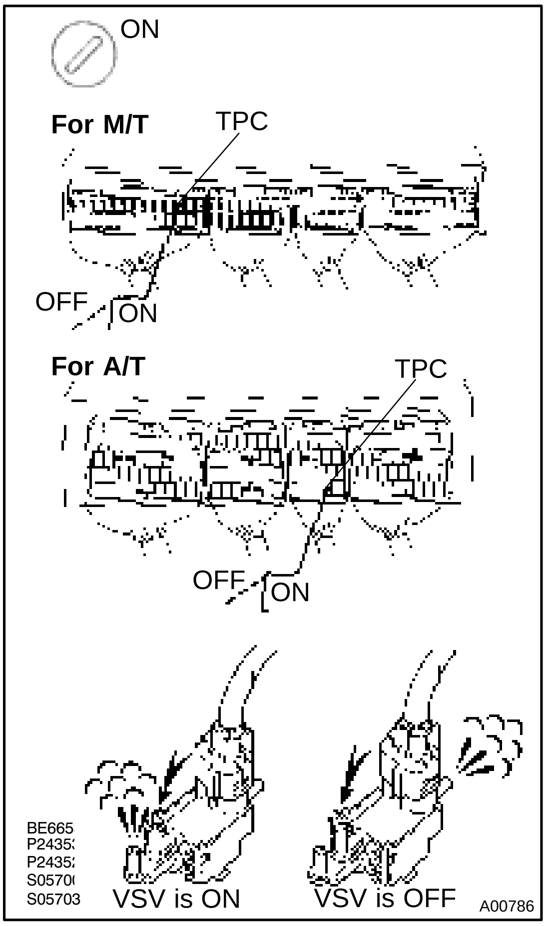
8	Check for open and short in harness and connector between EFI main relay (Marking: EFI), VSV for EVAP and ECM (See page IN–24).

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

OK ↓

Check and replace ECM (See page IN–24).

9	**Check VSV for vapor pressure sensor.**



PREPARATION:
(a) Remove the right cowl side trim (See page SF–58).
(b) Turn the ignition switch ON.

CHECK:
Check VSV function.
(1) Connect between terminal TPC of ECM and body ground (ON).
(2) Disconnect between terminal TPC of ECM and body ground (OFF).

OK:
(1) VSV is ON:
Air flows from port E to port F.
(2) VSV is OFF:
Air flows from port E to port G.

OK	**Check and replace charcoal canister (See page EC–1).**

NG

10	**Check operation of VSV for vapor pressure sensor (See page SF–47).**

NG	**Replace VSV.**

OK

11	**Check for open and short in harness and connector between EFI main relay (Marking: EFI), VSV for vapor pressure sensor and ECM (See page IN–24).**

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

OK

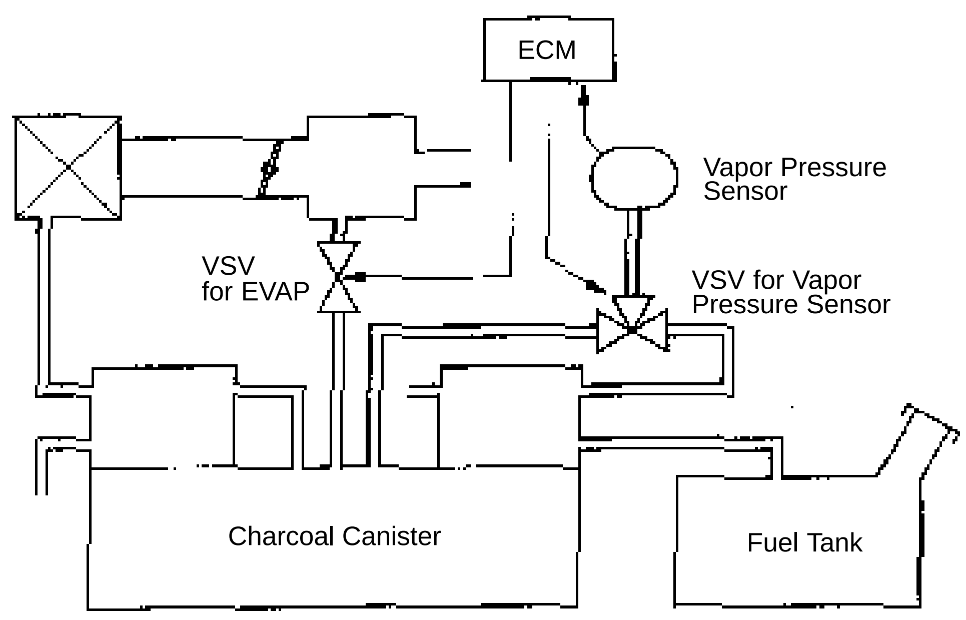
Check and replace ECM (See page IN–24).

DI0V2–01

DTC	P0450	Evaporative Emission Control System Pressure Sensor Malfunction

CIRCUIT DESCRIPTION

The vapor pressure sensor and VSV for vapor pressure sensor 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 is recorded by the ECM when the vapor pressure sensor malfunction.



DTC No.	DTC Detecting Condition	Trouble Area
P0450	Condition (a) or (b) continues: (2 trip detection logic) (a) PTNK < 0.5 V (b) PTNK > 4.5 V	●Open or short in vapor pressure sensor circuit ●Vapor pressure sensor ●ECM

WIRING DIAGRAM

Refer to DTC P0440 on page DI–216.

INSPECTION PROCEDURE

HINT:
If DTC P0441, P0446 or P0450 is output after DTC P0440, first troubleshoot DTC P0441, P0446 or P0450. If no malfunction is detected, troubleshoot DTC P0440 next.

1	**Check voltage between terminals VCC and E2 of ECM connector (See page DI–216, step 9).**

NG → **Check and replace ECM (See page IN–24).**

OK

2	**Check voltage between terminals PTNK and E2 of ECM connector (See page DI–216, step 10).**

OK → **Check and replace ECM (See page IN–24).**

NG

3	**Check for open and short in harness and connector between the vapor pressure sensor and ECM (See page IN–24).**

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

OK

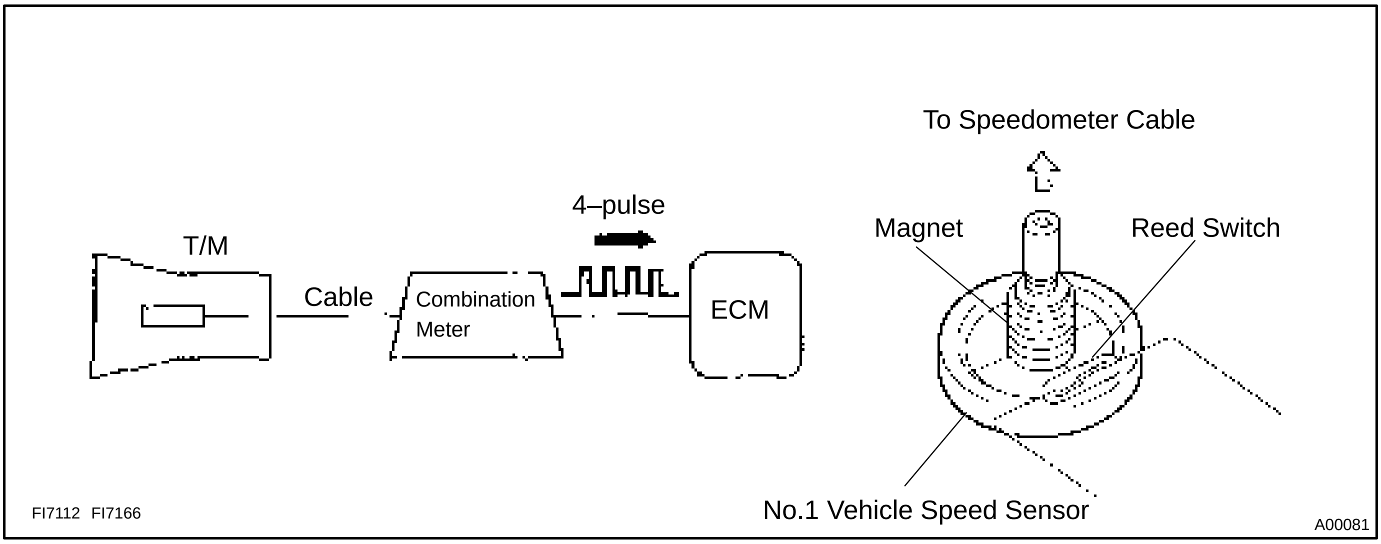
Replace vapor pressure sensor.

DI0V3–01

DTC	P0500	Vehicle Speed Sensor Malfunction

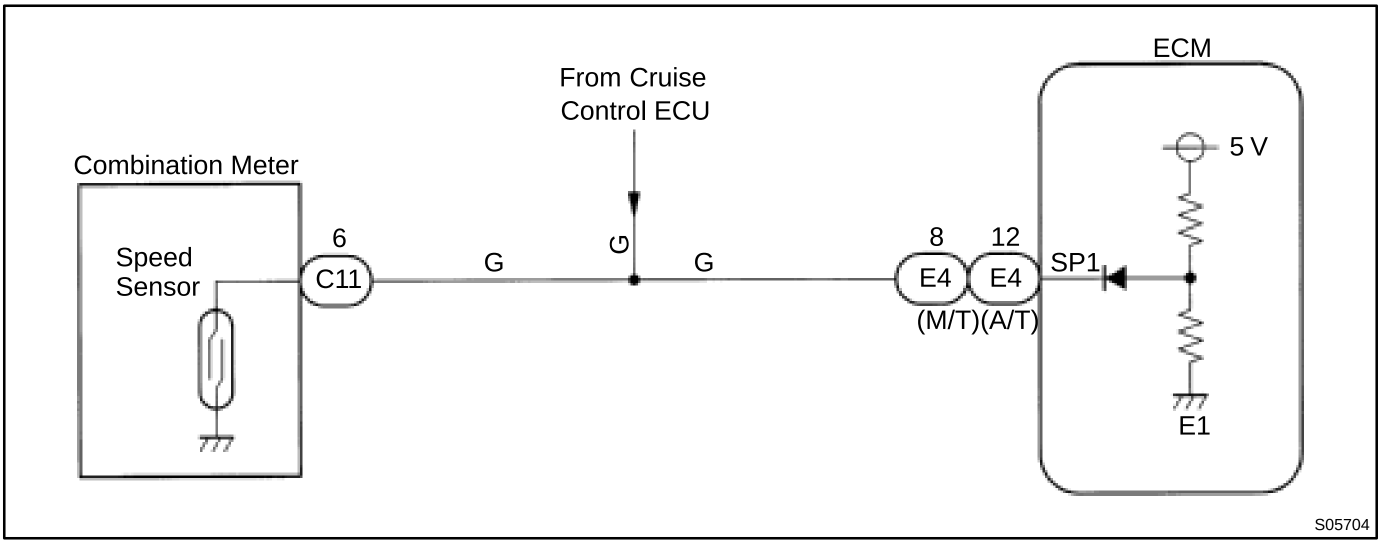
CIRCUIT DESCRIPTION

This sensor is mounted in the combination meter. It contains a magnet which is rotated by the speed meter cable.
Turning the reed switch ON and OFF 4 times for every revolution of the speedmeter.
It is then transmitted to the ECM. The ECM determines the vehicle speed based on the frequency of these pulse signals.



DTC No.	DTC Detecting Condition	Trouble Area
P0500	No speed sensor signal to ECM under conditions (a) (2 trip detection logic) (a) Vehicle is being driven	●Open or short in No.1 vehicle speed sensor circuit ●No.1 vehicle speed sensor ●ECM ●Speedometer cable

WIRING DIAGRAM



INSPECTION PROCEDURE

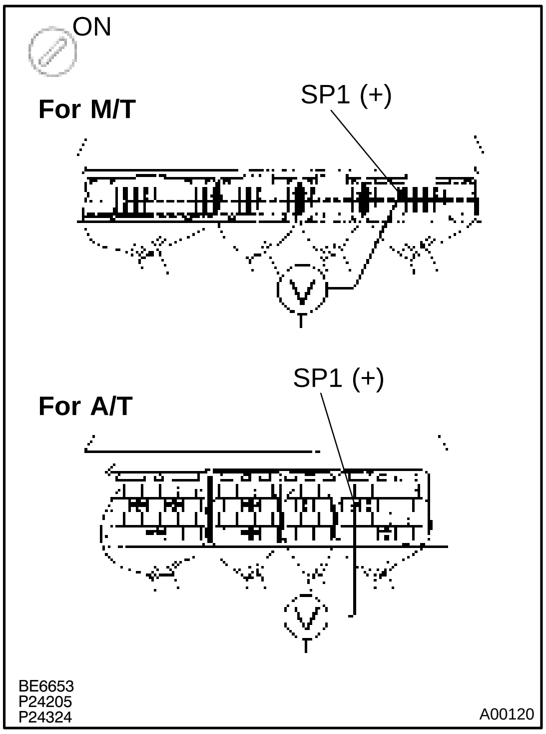
1	Check operation of speedometer.

CHECK:
Drive the vehicle and check if the operation of the speedometer in the combination meter is normal.
HINT:
The vehicle speed is operating normally if the speedometer display is normal.

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

OK

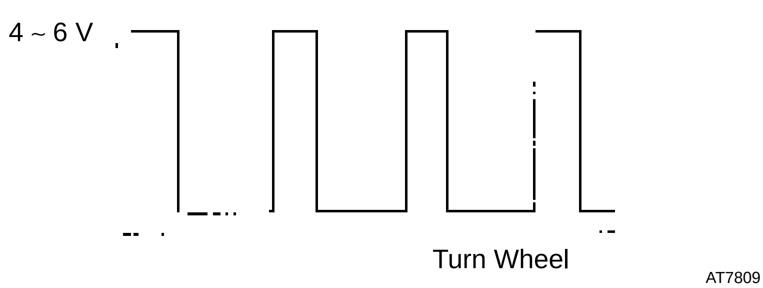
2	Check voltage between terminal SP1 of ECM connector and body ground.



PREPARATION:
(a) Remove the right cowl side trim (See page SF–58).
(b) Disconnect the cruise control ECU connector.
(c) Shift the shift lever to neutral.
(d) Jack up the rear wheel on one side.
(e) Turn the ignition switch ON.

CHECK:
Measure voltage between terminal SP1 of ECM connector and body ground when the wheel is turned slowly.

OK:
Voltage is generated intermittently.



NG → **Check and repair harness and connector between combination meter and ECM.**

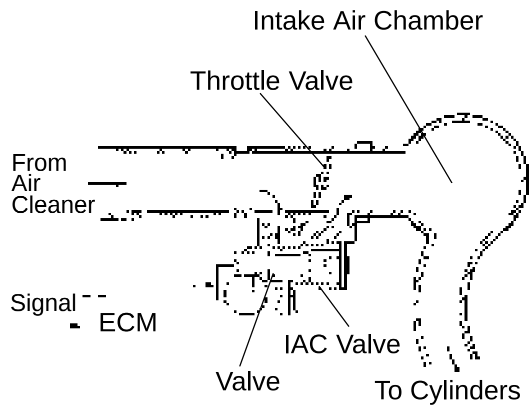
OK

Check and replace ECM (See page IN–24).

DI0V4–01

DTC	P0505	Idle Control System Malfunction

CIRCUIT DESCRIPTION

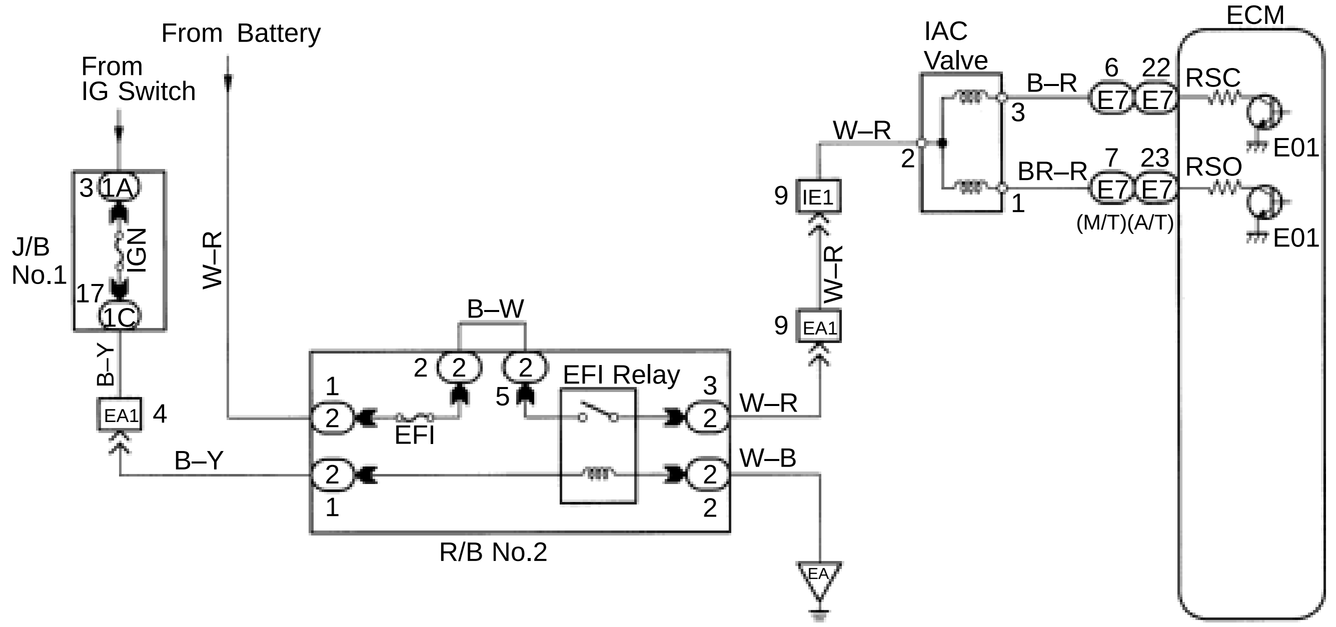


P01559

The rotary solenoid type IAC valve is located in front of the intake air chamber 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 and a VSV for idle–up control is also added (for air conditioning).

DTC No.	DTC Detecting Condition	Trouble Area
P0505	Idle speed continues to vary greatly from target speed (2 trip detection logic)	●IAC valve is stuck or closed ●Open or short in IAC valve circuit ●Open or short in A/C signal circuit ●Air intake (hose loose)

WIRING DIAGRAM



1997 TOYOTA T100 (RM507U)

P19957

INSPECTION PROCEDURE

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

NG → **Repair or replace.**

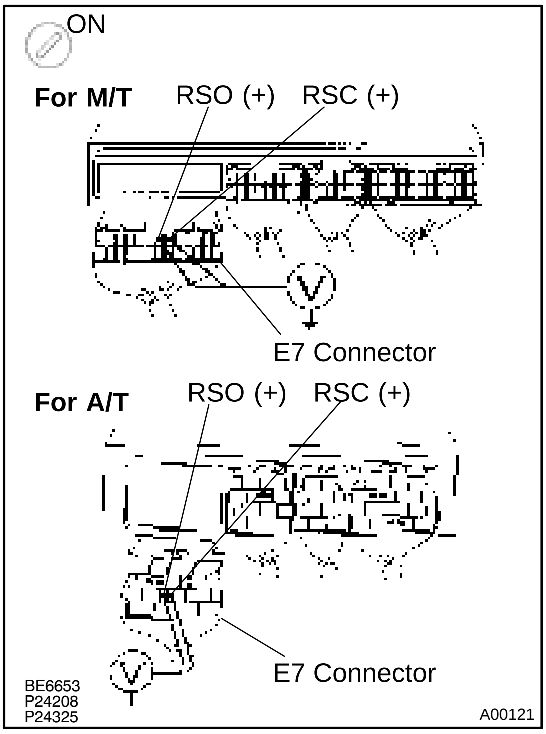
OK

2	Check A/C signal circuit (See page AC–79).

NG → **Repair or replace.**

OK

3	Check voltage terminals RSO and RSC of ECM connector and body ground.



PREPARATION:

(a) Remove the right cowl side trim (See page SF–58).
(b) Disconnect the E7 connector of ECM.
(c) Turn the ignition switch ON.

CHECK:

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

OK:

Voltage: 9 – 14 V

OK → **Go to step 5.**

NG

4	Check IAC valve (See page SF–37).

NG → Replace IAC valve.

OK ↓

Check for open and short in harness and connector between R/B No.2 and IAC valve, IAC valve and ECM (See page IN–24).

5	Check operation of the IAC valve (See page SF–41).

NG → Repair or replace IAC valve.

OK ↓

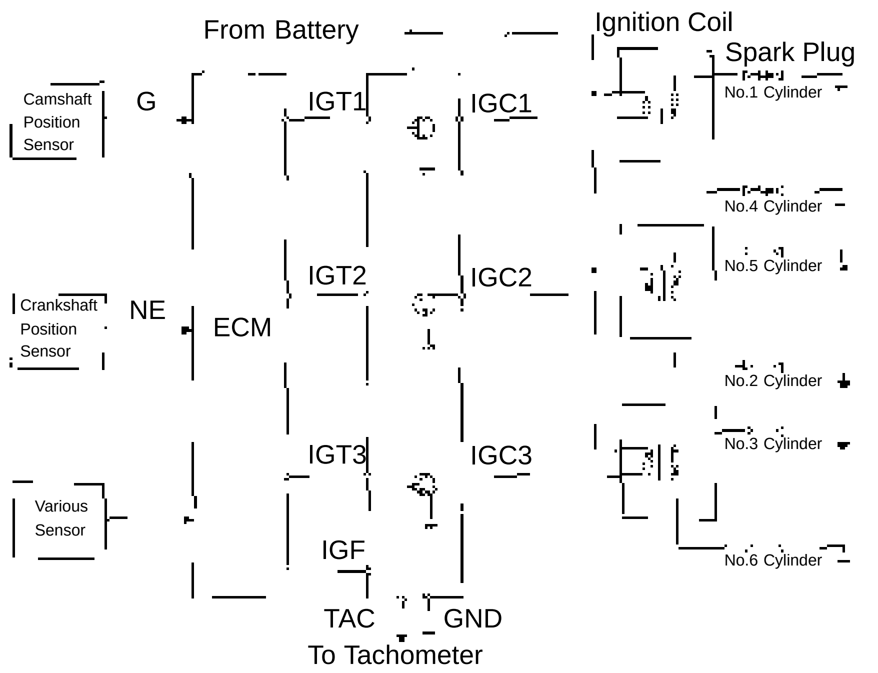
Check and replace ECM (See page IN–24).

DI0V5–01

DTC	P1300	Igniter Circuit Malfunction

CIRCUIT DESCRIPTION

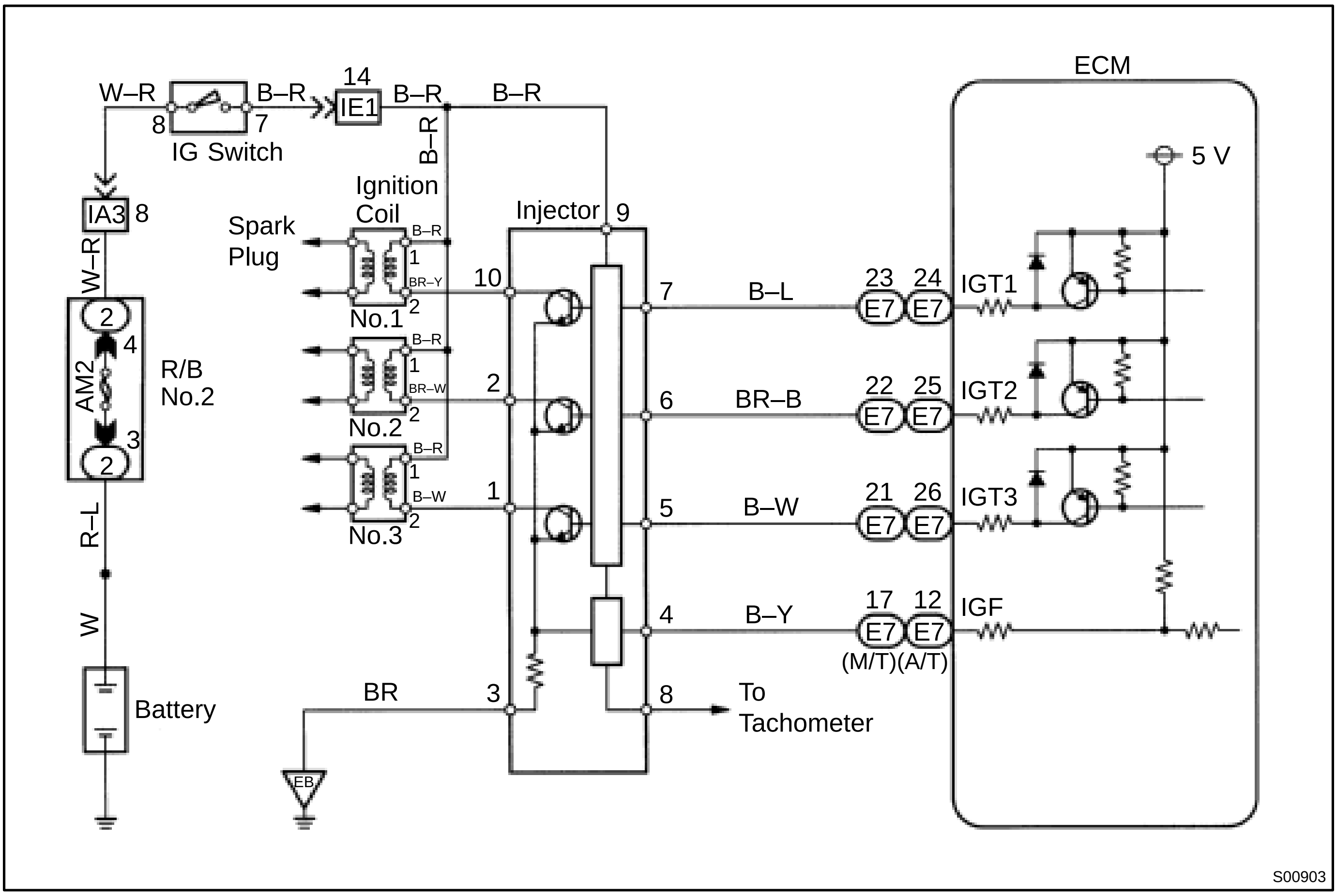
A DIS (Direct Ignition System) has been adopted. The DIS improves the ignition timing accuracy, reduces high–voltage loss, and enhances the overall reliability of the ignition system by eliminating the distributor. The DIS is a 2–cylinder simultaneous ignition system which ignites 2 cylinders simultaneously with one ignition coil. In the 2–cylinder simultaneous ignition system, each of the 2 spark plugs is connected to the end of the secondary winding. High voltage generated in the secondary winding is applied directly to the spark plugs. The sparks of the 2 spark plugs pass simultaneously from the center electrode to the ground electrode.
The ECM determines ignition timing end outputs the ignition signals (IGT) for each cylinder. Based on IGT signals, the igniter controls the primary ignition signals (IGC) for all ignition coils. At the same time, the igniter also sends an ignition confirmation signal (IGF) as a fail–safe measure to the ECM.



S00251

DTC No.	DTC Detecting Condition	Trouble Area
P1300	No IGF signal to ECM for 6 consecutively IGT signals during engine running	●Open or short in IGF or IGT circuit from igniter to ECM ●Igniter ●ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check spark plug (See page IG–1).**

NG — **Go to step 4.**

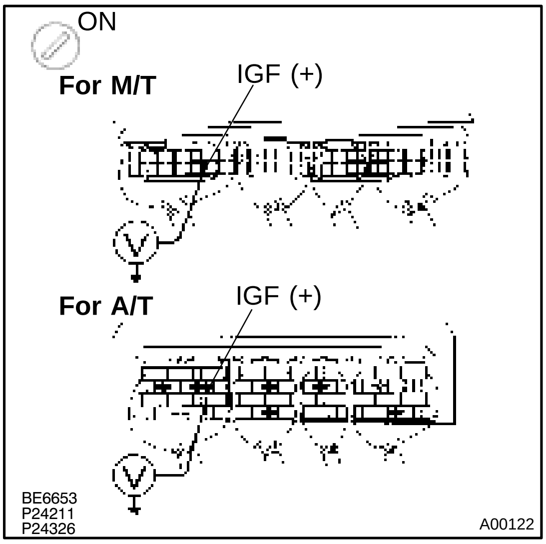
OK

2	**Check for open and short in harness and connector in IGF signal circuit between ECM and igniter (See page IN–24).**

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

OK

3	**Disconnect igniter connector and check voltage between terminal IGF of ECM connector and body ground.**



PREPARATION:
(a) Disconnect the igniter connector.
(b) Remove the right cowl side trim (See page SF–58).
(c) Turn the ignition switch ON.

CHECK:
Measure voltage between terminal IGF of ECM connector and body ground.

OK:
Voltage: 4.5 – 5.5 V

OK → **Replace igniter.**

NG

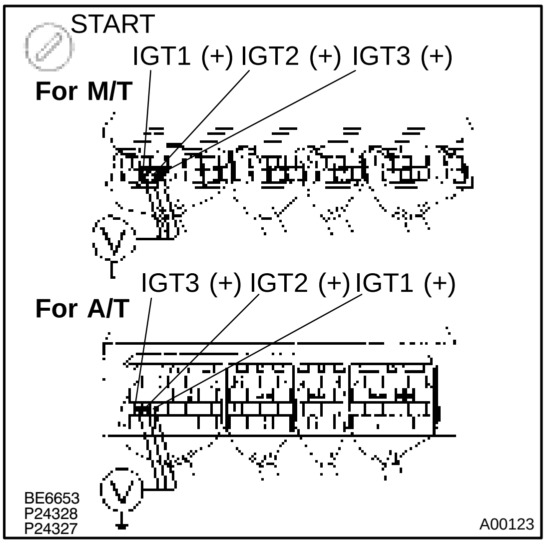
Check and replace ECM (See page IN–24).

4	Check for open and short in harness and connector in IGT1 – 3 signal circuit between ECM and igniter (See page IN–24).

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

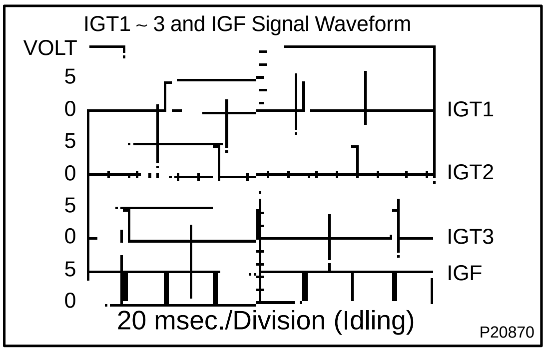
OK

5	Check voltage between terminals IGT1 – 3 of ECM connector and body ground.



PREPARATION:
Remove the right cowl side trim (See page SF–58).
CHECK:
Measure voltage between terminal IGT1 – 3 of ECM connector and body ground when engine is cranked.
OK:
Voltage: More than 0.1 V and less than 4.5 V

Reference INSPECTION USING OSCILLOSCOPE

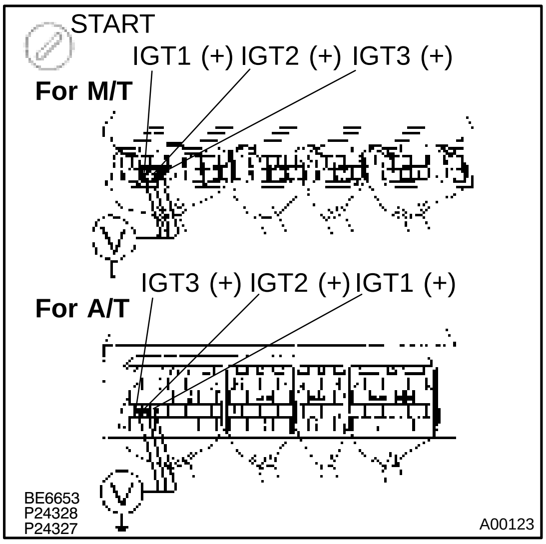


During idling, check waveform between terminals IGT1 – 3, IGF and E1 of ECM.
HINT:
The correct waveforms are as shown.

NG → **Check and replace ECM (See page IN–24).**

OK

6	**Disconnect igniter connector and check voltage between terminals IGT1 – 3 of ECM connector and body ground.**



PREPARATION:
(a) Disconnect the igniter connector.
(b) Remove the right cowl side trim (See page SF–58).

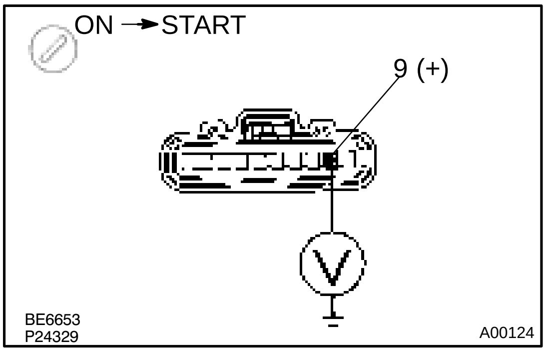
CHECK:
Measure voltage between terminals IGT1 ~ 3 of ECM connector and body ground when engine is cranked.

OK:
Voltage: More than 0.1 V and less than 5.0 V

NG	**Check and replace ECM (See page IN–24).**

OK

7	**Check voltage between terminal 9 of igniter connector and body ground.**



PREPARATION:
Disconnect the igniter connector.

CHECK:
Measure voltage between terminal 9 of igniter connector and body ground, when ignition switch is turned to ”ON” and ”START” position.

OK:
Voltage: 9 – 14 V

NG	**Check and repair igniter power source circuit.**

OK

8	**Check for open and short in harness and connector between ignition switch and ignition coil, ignition coil and igniter (See page IN–24).**

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

OK

9	**Check ignition coil (See page IG–1).**

NG → **Replace ignition coil.**

OK

Replace igniter.

DI0V6–01

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

CIRCUIT DESCRIPTION

Refer to DTC P0335 on page DI–195.

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

WIRING DIAGRAM

Refer to DTC P0335 on page DI–195.

INSPECTION PROCEDURE

Refer to DTC P0335 on page DI–195.

DI0V7–01

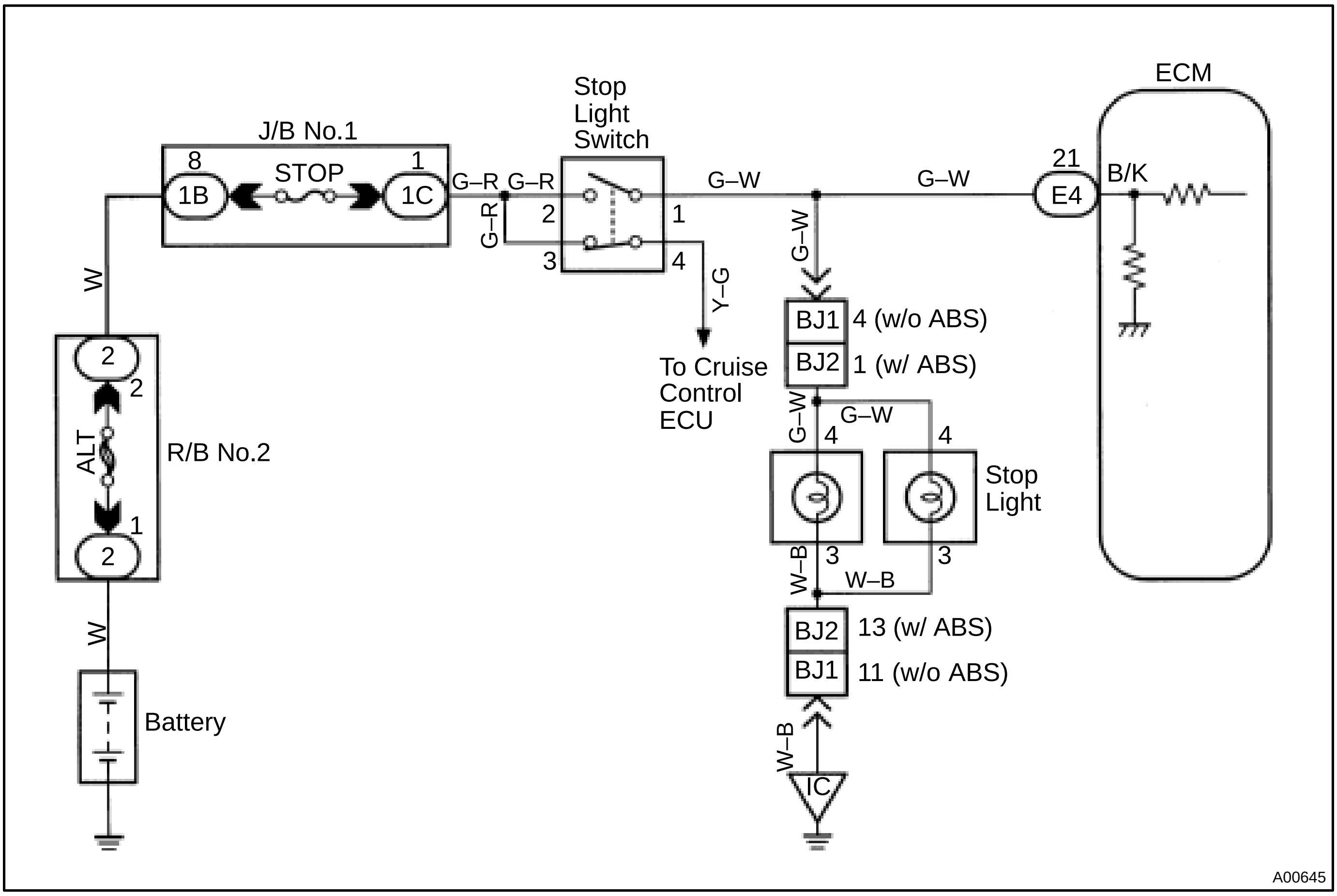
DTC	P1520	Stop Light Switch Signal Malfunction (Only for A/T)

CIRCUIT DESCRIPTION

This signal is used to detect when the brakes have been applied. The BK signal voltage is the same as the voltage supplied to the stop lights.
The BK signal is used mainly to control the fuel cut–off engine speed. (The fuel cut–off engine speed is reduced slightly when the vehicle is braking.)

DTC No.	DTC Detecting Condition	Trouble Area
P1520	Stop light switch does not turn off even once the vehicle is driven (2 trip detection logic)	●Short in stop light switch signal circuit ●Stop light switch ●ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

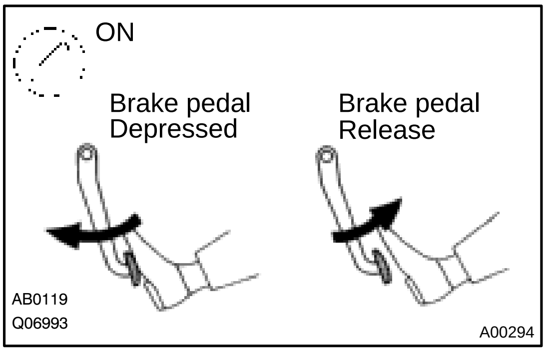
1 Check operation of stop light.

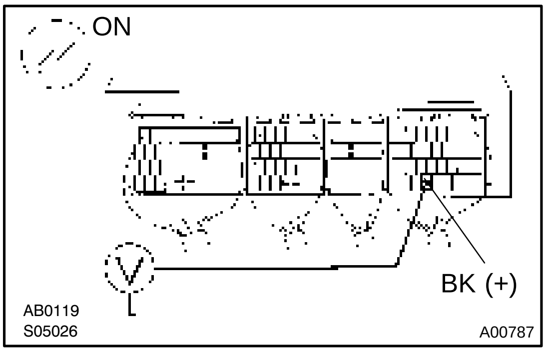
CHECK:
Check if stop lights go on and off normally when the brake pedal is operated and released.

NG → **Check and repair stop light circuit (See page BE–30).**

OK

2 Check BK 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 TOYOTA hand–held tester main switch ON.
CHECK:
Read BK signal on the TOYOTA hand–held tester.
OK:
Brake pedal is depressed: STP .... ON
Brake pedal is released: STP .... OFF
When not using TOYOTA hand–held tester:
PREPARATION:
Turn the ignition switch ON.
CHECK:
Check voltage between terminal BK of ECM and body ground.
OK:

Brake pedal	Voltage
Depressed	7.5 – 14 V
Release	Below 1.5 V

OK → **Check for intermittent problems (See page DI–133).**

NG

3	Check harness and connector between stop light switch and ECM (See page IN–24).

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

OK ↓

Check and replace the ECM
(See page IN–24).

DI0V8–01

DTC	P1600	ECM BATT Malfunction

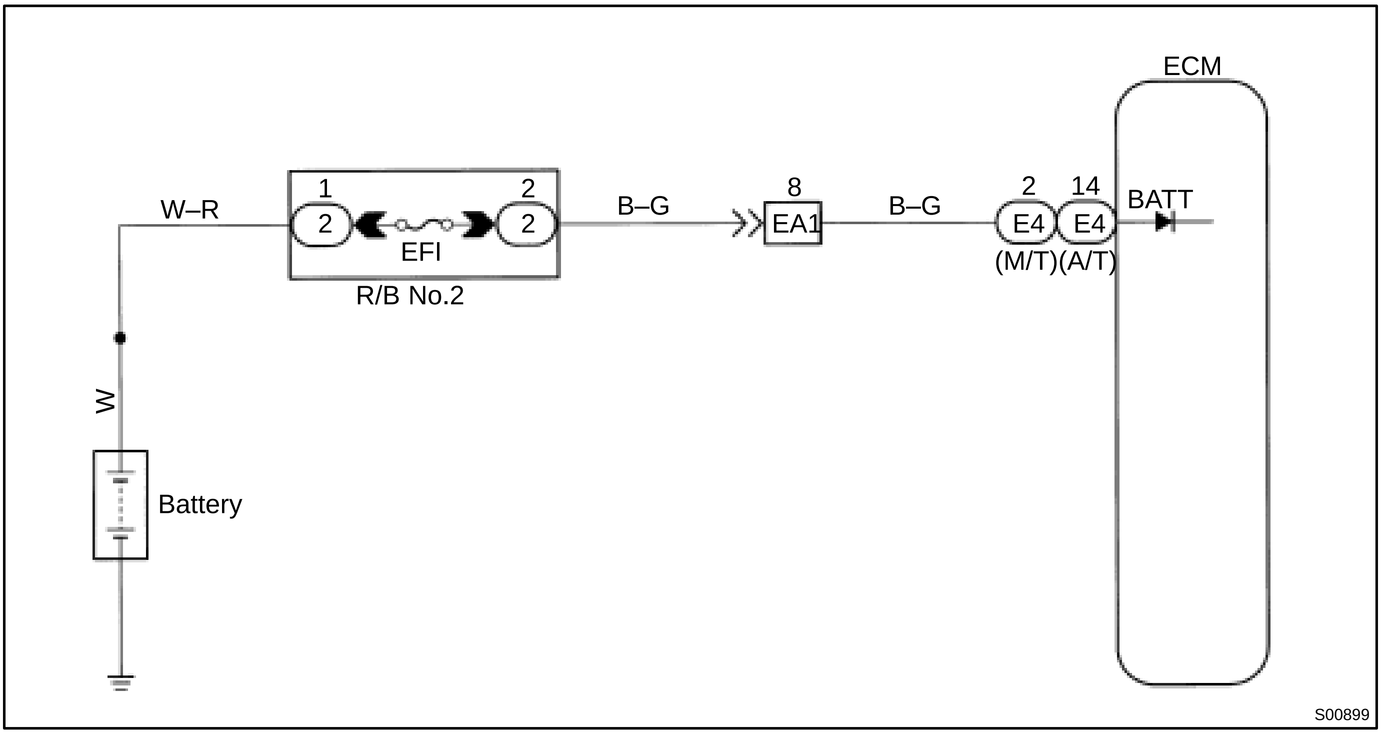
CIRCUIT DESCRIPTION

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

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

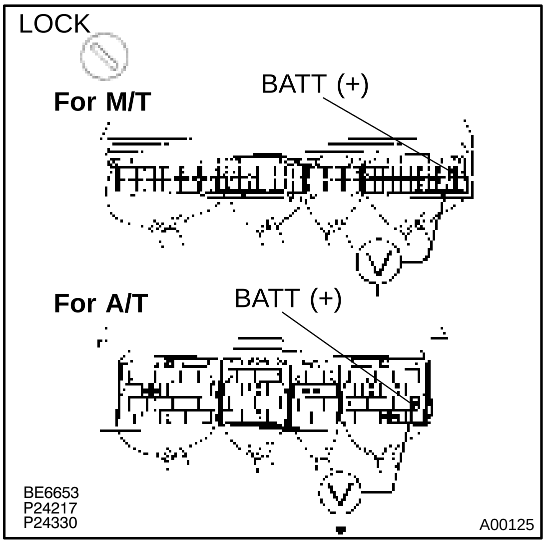
HINT:
If DTC P1600 appear, the ECM does not store another DTC.

WIRING DIAGRAM



INSPECTION PROCEDURE

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



PREPARATION:

Remove the right cowl side trim (See page SF–58).

CHECK:

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

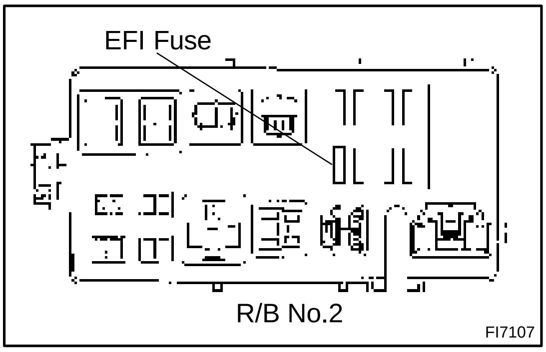
OK:

Voltage: 9 – 14 V

OK → **Check and replace ECM (See page IN–24).**

NG ↓

2	Check EFI fuse.



PREPARATION:

Remove the EFI fuse from the R/B No.2.

CHECK:

Check continuity of EFI fuse.

OK:

Continuity

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

OK ↓

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

DI0V9–01

DTC	P1780	Park/Neutral Position Switch Malfunction

CIRCUIT DESCRIPTION

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

DTC No.	DTC Detecting Condition	Trouble Area
P1780	2 or more switches are ON simultaneously for ”R”, ”N”, ”2” and ”L” and position (2 trip detection logic)	●Short in park/neutral position switch circuit ●Park/neutral position switch ●ECM
	When driving under conditions (a) and (b) for 30 sec. or more park/neutral position switch is ON (N position): (2 trip detection logic) (a) Vehicle speed: 70 km/h (44 mph) or more (b) Engine speed: 1,500 ~ 2,500 rpm	

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

WIRING DIAGRAM

Refer to DTC P1780 on page DI–255.

INSPECTION PROCEDURE

Refer to DTC P1780 on page DI–255.

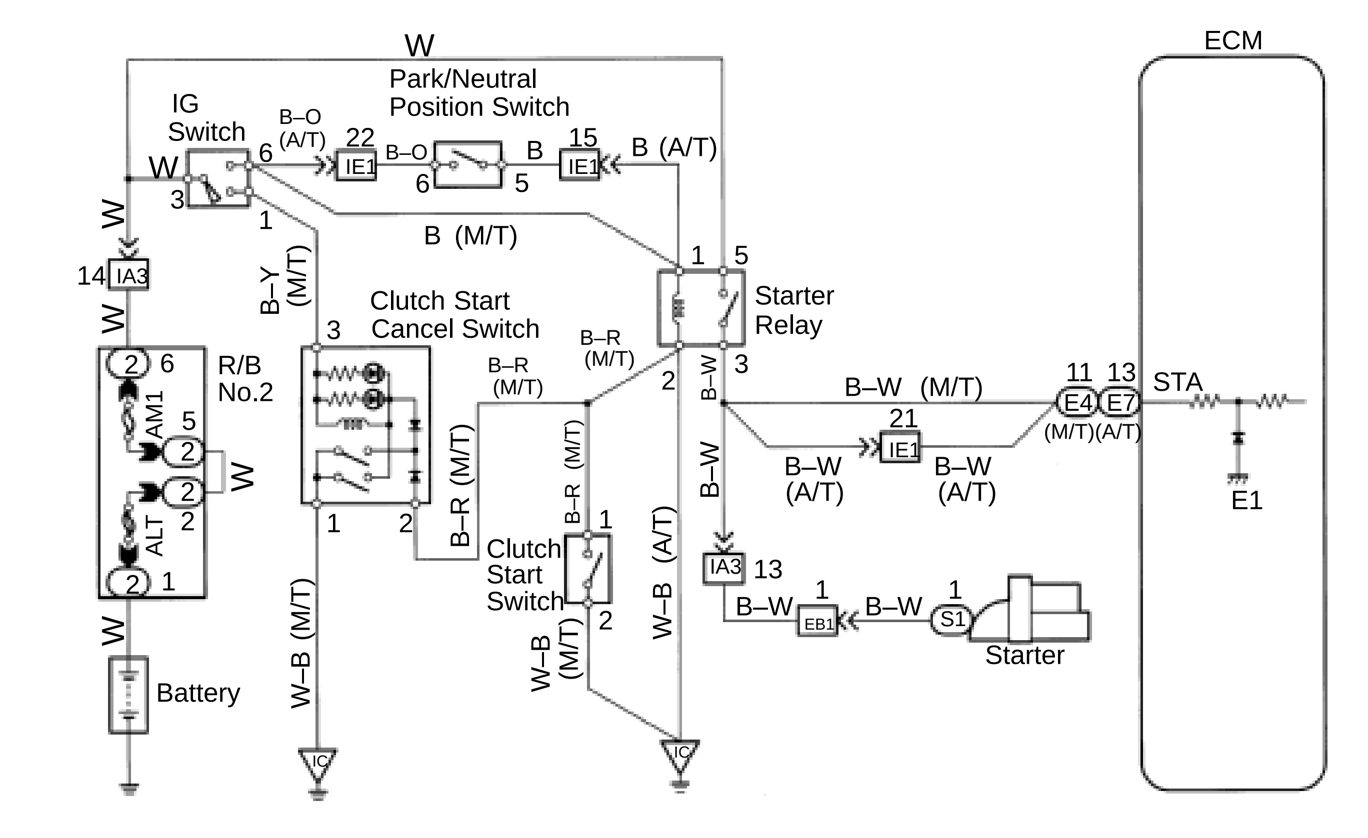
DI0VA–01

Starter Signal Circuit

CIRCUIT DESCRIPTION

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

WIRING DIAGRAM



A00772

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–152.

TOYOTA hand–held tester:

1	**Connect TOYOTA hand–held tester and 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 STA signal on the TOYOTA hand–held tester while starter operates.

OK:

Ignition Switch Position	ON	START
STA signal	OFF	ON

OK → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–152).**

NG

2	**Check for open in harness and connector between ECM and starter relay (Marking: ST) (See page IN–24).**

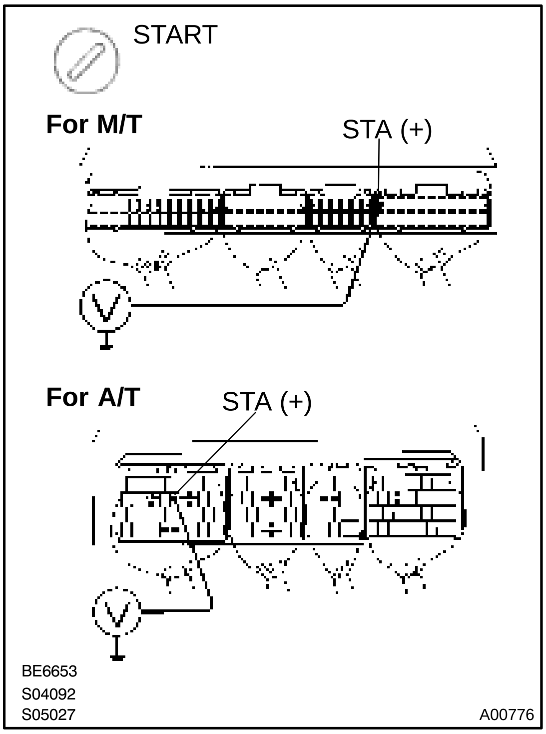
NG → **Repair or replace harness or connector.**

OK

Check and replace ECM (See page IN–24).

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

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



PREPARATION:
Remove the right cowl side trim (See page SF–58).
CHECK:
Measure voltage between terminal STA of ECM connector and body ground, during engine cranking.
OK:
Voltage: 6 V or more

OK → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–152).**

NG

2	**Check for open in harness and connector between ECM and starter relay (See page IN–24).**

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

OK

Check and replace ECM (See page IN–24).

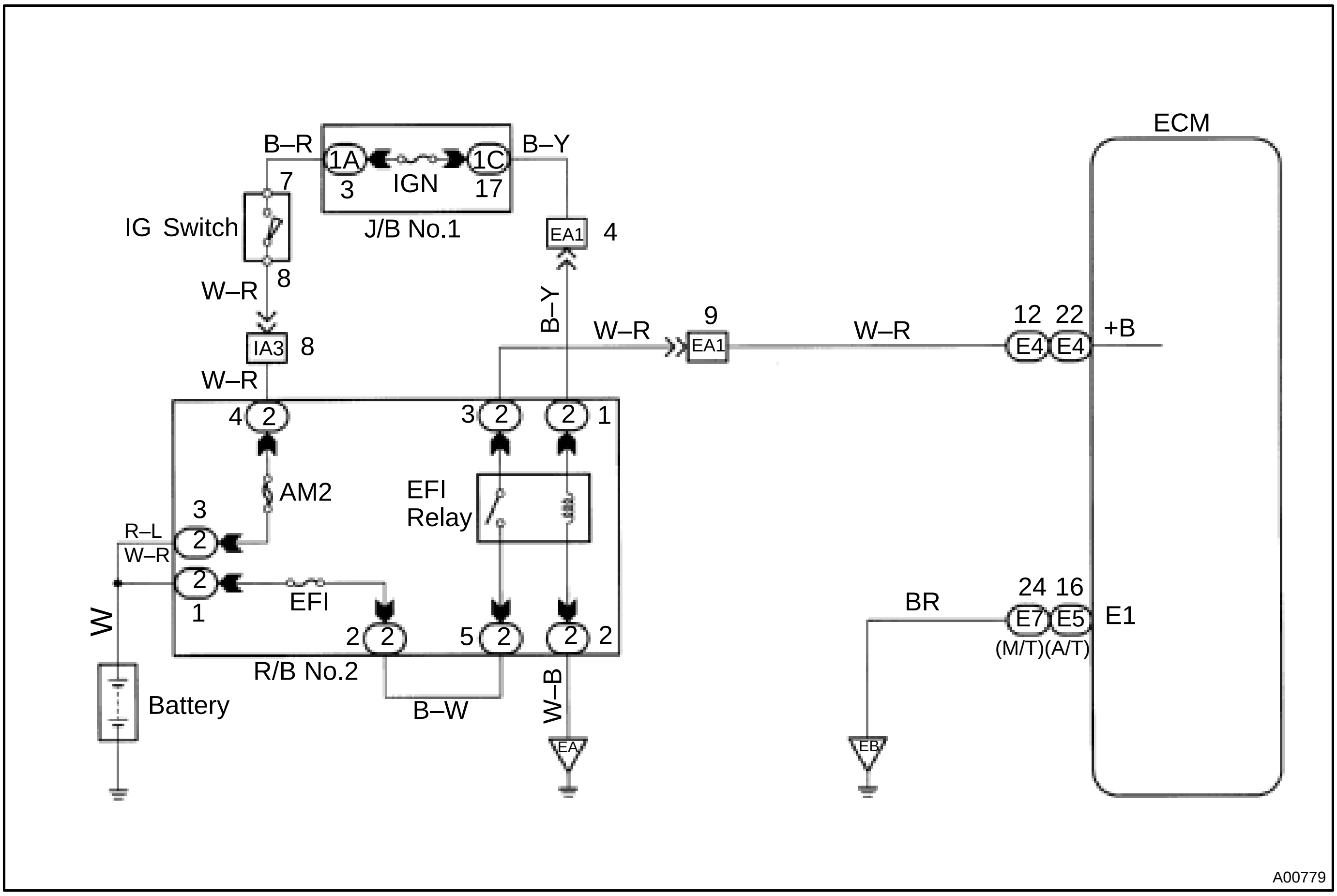
DI0VB–01

ECM Power Source Circuit

CIRCUIT DESCRIPTION

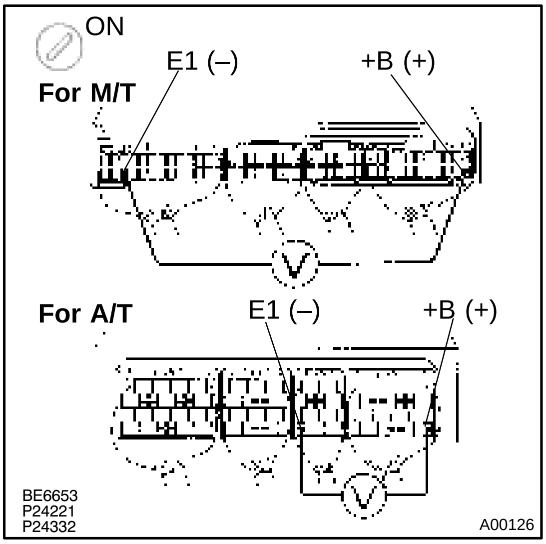
When the ignition switch is turned ON, battery positive voltage is applied to the coil, closing the contacts of the EFI main relay (Marking: EFI) and supplying power to terminal +B of the ECM.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check voltage between terminals + B and E1 of ECM connector.**



PREPARATION:

(a) Remove the right cowl side trim (See page SF–58).

(b) Turn the ignition switch ON.

CHECK:

Measure voltage between terminals + B and E1 of ECM connector.

OK:

Voltage: 9 – 14 V

OK → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–152).**

NG

2	**Check for open in harness and connector between terminal E1 of ECM and body ground (See page IN–24).**

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

OK

3	**Check EFI main relay (Marking: EFI) (See page SF–43).**

NG → **Replace EFI main relay.**

OK

4	**Check EFI fuse (See page DI–253, step 2).**

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

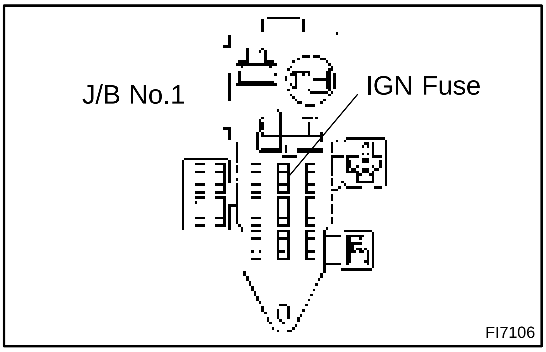
OK

5	**Check for open harness and connector between EFI main relay (Marking: EFI) and battery, EFI main relay (Marking: EFI) and ECM (See page IN–24).**

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

OK

6	**Check IGN fuse.**



PREPARATION:
Remove the IGN fuse from the J/B No.1.
CHECK:
Check continuity of IGN fuse.
OK:
Continuity

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

OK

7	Check ignition switch (See page BE–12).

NG — Replace ignition switch.

OK

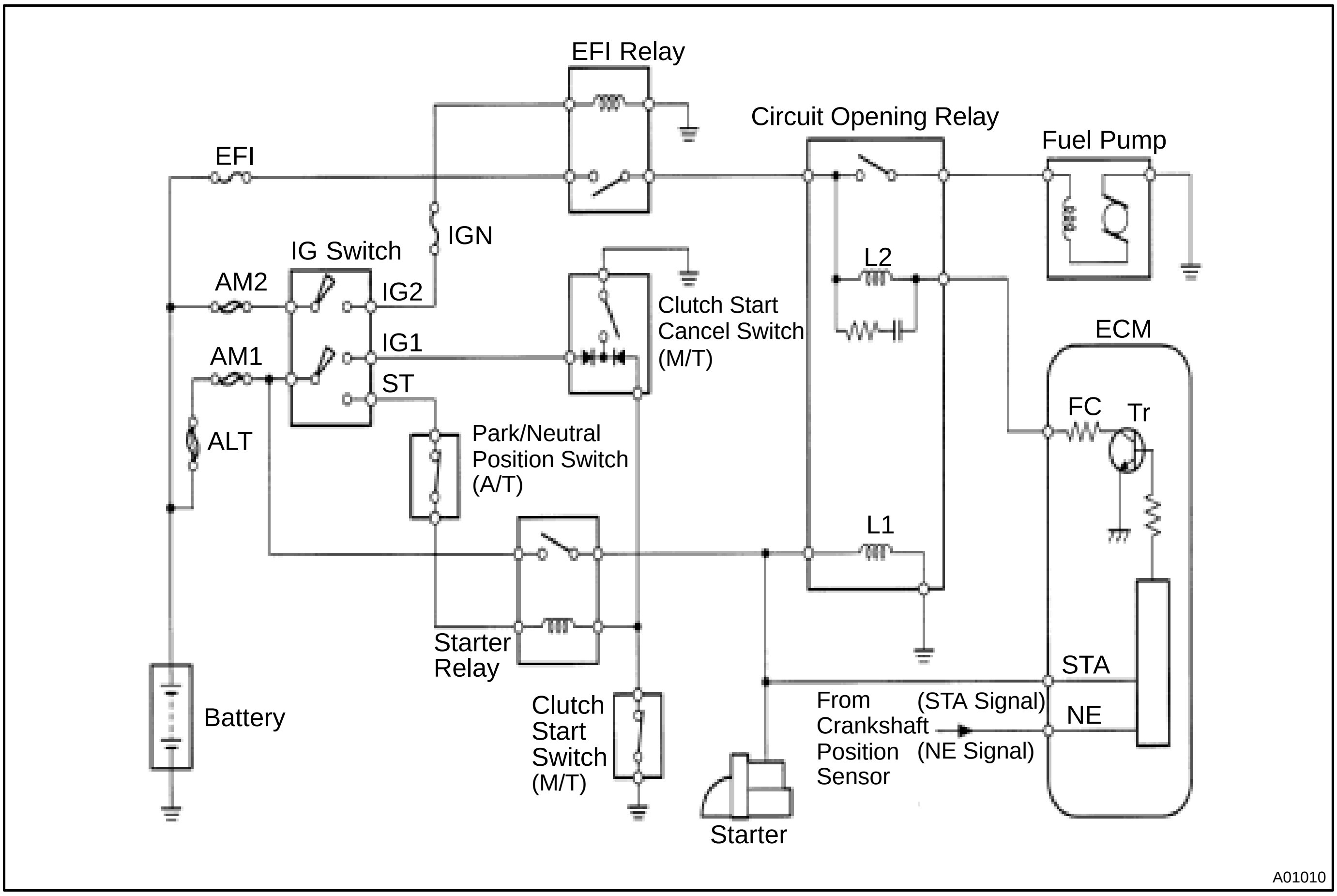
Check for open in harness and connector between IG switch and EFI main relay, EFI main relay and body ground (See page IN–24).

DI0VC–01

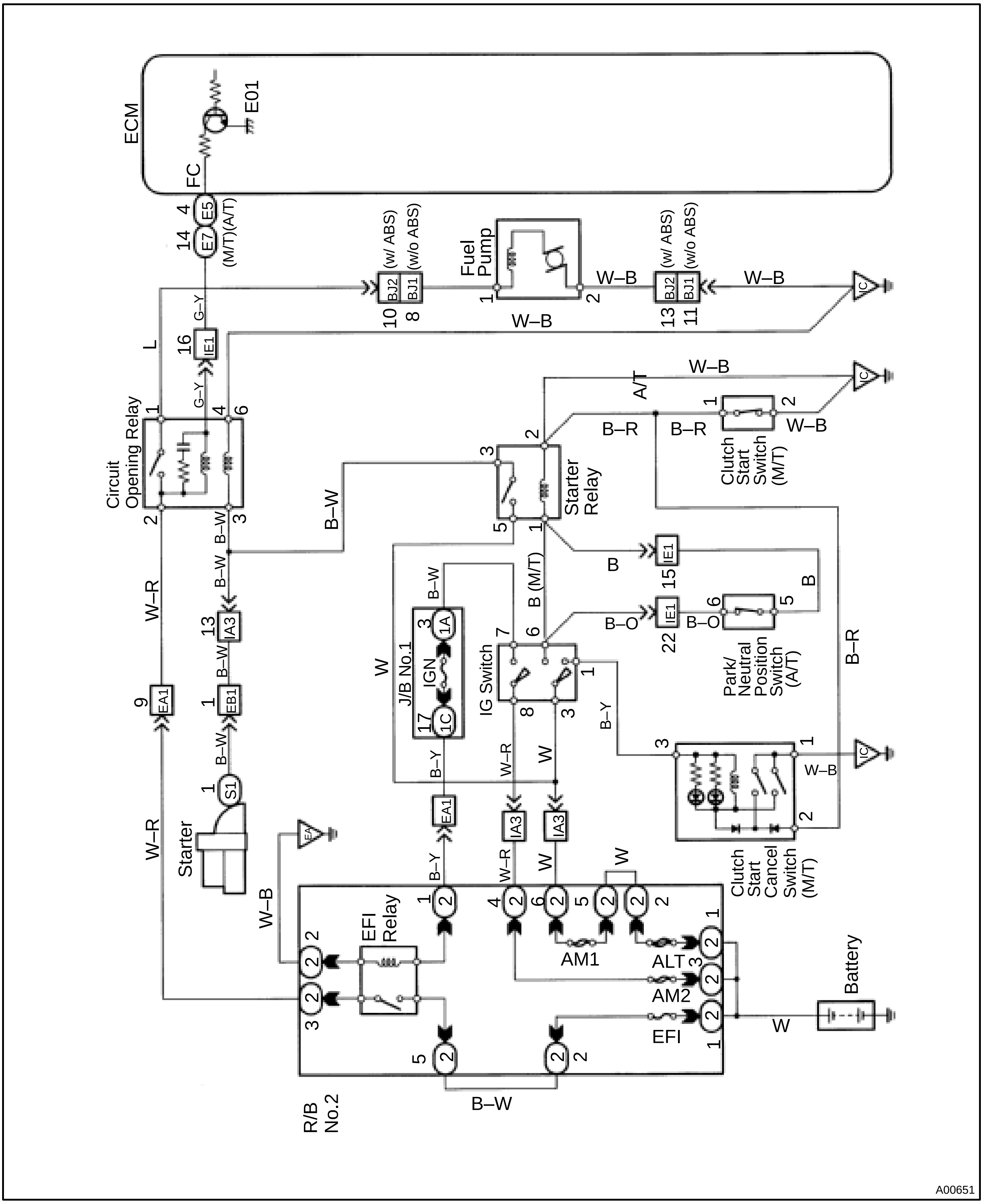
Fuel Pump Control Circuit

CIRCUIT DESCRIPTION

The fuel pump is switched on (low voltage at terminal FC) when STA is on or while the NE signal is input to the ECM.
In the diagram below, when the engine is cranked, current flows from terminal ST of the ignition switch to the starter relay coil, the starter relay switches on and current flows to coil L1 of the circuit opening relay. Thus the circuit opening relay switches on, power is supplied to the fuel pump and the fuel pump operates.
When the STA signal and NE signal are input to the ECM, Tr is turned ON, current flows to coil L2 of the circuit opening relay, the relay switches on 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.



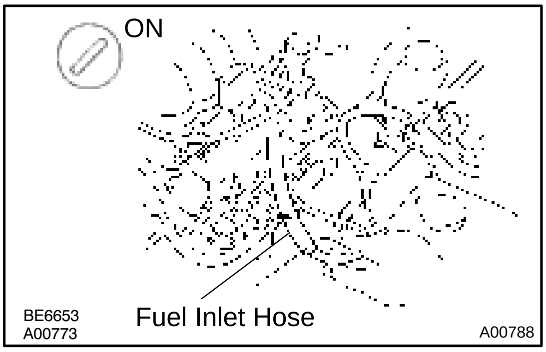
WIRING DIAGRAM



INSPECTION PROCEDURE

TOYOTA hand–held tester:

1	**Connect TOYOTA hand–held tester and check operation of fuel pump.**



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) Use "ACTIVE TEST" mode to operate the fuel pump.

CHECK:

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

OK:

There is pressure in the fuel inlet hose.

HINT:

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

OK	**Go to step 7.**

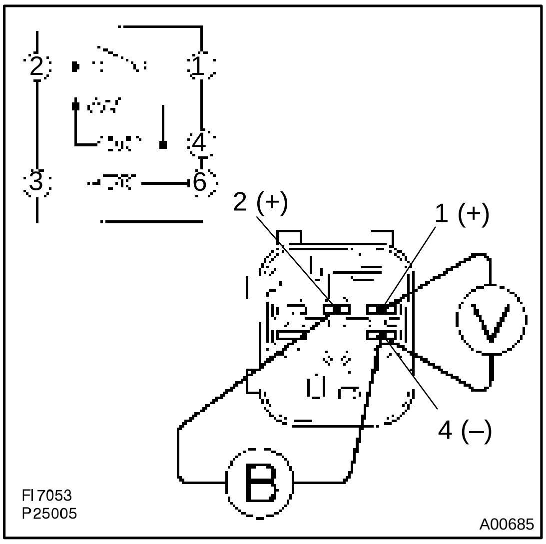
NG

2	**Check for ECM power source circuit (See page DI–253).**

NG	**Repair or replace.**

OK

3	**Check circuit opening relay.**



PREPARATION:
Remove the circuit opening relay (See page SF–44).

CHECK:
(a) Apply battery voltage between terminals 2 and 4.
(b) Measure voltage between terminals 1 and 4.

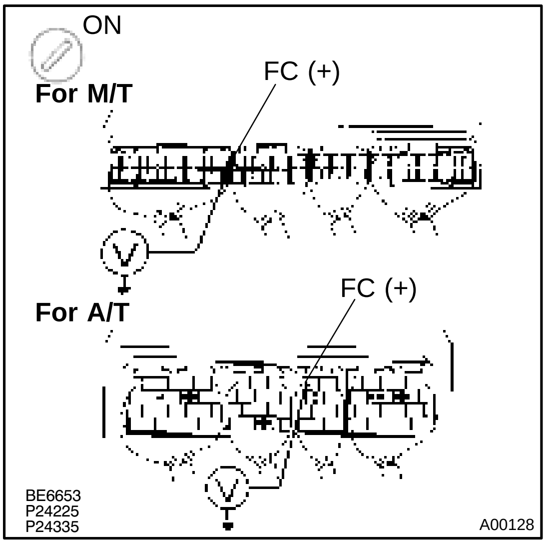
OK:

Voltage: Same as battery

NG → **Replace circuit opening relay.**

OK

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



PREPARATION:
(a) Remove the right cowl side trim (See page SF–58).
(b) Turn the ignition switch ON.

CHECK:
Measure voltage between terminal FC of ECM connector and body ground.

OK:
Voltage: 9 – 14 V

NG → **Check for open in harness and connector between EFI main relay and circuit opening relay, and ECM (See page IN–24).**

OK

5	Check fuel pump (See page SF–5).

NG → Repair or replace fuel pump.

OK

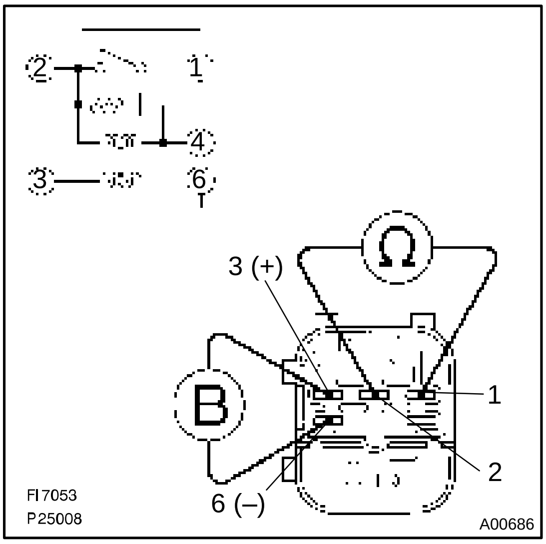
6	Check for open in harness and connector between circuit opening relay and fuel pump, fuel pump and body ground (See page IN–24).

NG → Repair or replace harness or connector.

OK

Check and replace ECM (See page IN–24).

7	Check circuit opening relay.



PREPARATION:

Remove the circuit opening relay (See page SF–44).

CHECK:

(a) Apply battery voltage between terminals 3 and 6.

(b) Check continuity between terminal 1 and 2.

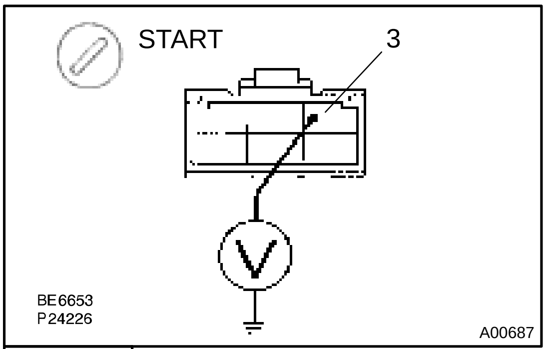
OK:

Continuity

NG → Replace circuit opening relay.

OK

8	Check voltage between terminal 3 of circuit opening relay connector and body ground.



CHECK:
Measure voltage between terminal 3 of circuit opening relay connector and body ground when engine is cranked.
OK:
Voltage: 9 – 14 V

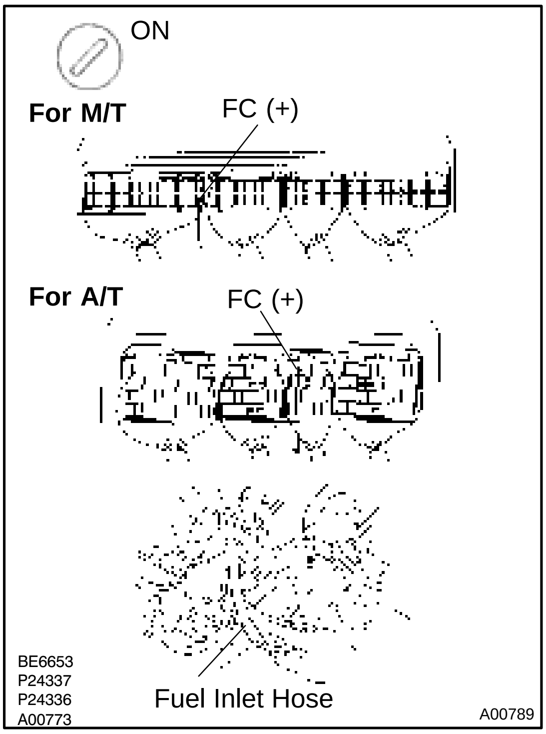
NG → **Check for starter signal circuit (See page DI–256).**

OK

Check for open in harness and connector between terminal 6 of circuit opening relay connector and body ground (See page IN–24).

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

1	Check operation of fuel pump.



PREPARATION:
(a) Remove the right cowl side trim (See page SF–58).
(b) Turn the ignition switch ON.
CHECK:
(a) Connect between terminal FC of ECM connector and body ground.
(b) Check for fuel pressure in the inlet hose when it is pinched off.
OK:
There is pressure in the fuel inlet hose.
HINT:
At this time, you will hear a fuel flowing noise.

OK → **Go to step 7.**

NG

2	Check for ECM power source circuit (See page DI–259).

NG → Repair or replace.

OK

3	Check circuit opening relay (See page DI–263, step 3).

NG → Replace circuit opening relay.

OK

4	Check voltage between terminal FC of ECM connector and body ground (See page DI–263, step 4).

NG → Check for open in harness and connector between EFI main relay and circuit opening relay and ECM (See page IN–24).

OK

5	Check fuel pump (See page SF–5).

NG → Repair or replace fuel pump.

OK

6	Check for open in harness and connector between circuit opening relay and fuel pump, fuel pump and body ground (See page IN–24).

NG → Repair or replace harness or connector.

OK

Check and replace ECM (See page IN–24).

7	Check circuit opening relay (See page DI–263, step 7).

NG → Replace circuit opening relay.

OK

8	Check voltage between terminal 3 of circuit opening relay connector and body ground (See page DI–263, step 8).

NG → Check for starter signal circuit (See page DI–256).

OK

Check for open in harness and connector between terminal 6 of circuit opening relay connector and body ground (See page IN–24).

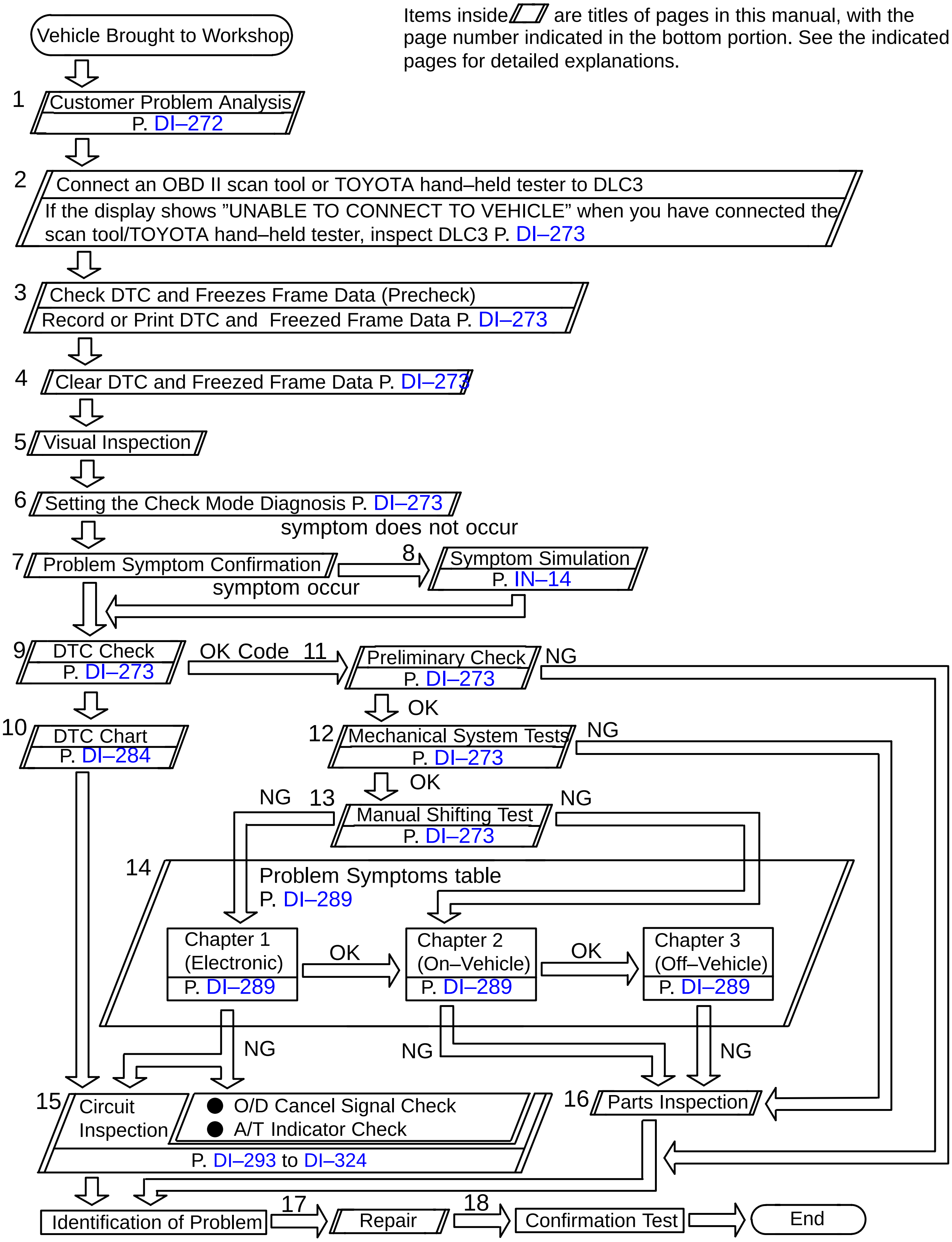
AUTOMATIC TRANSMISSION

DI0VD–01

HOW TO PROCEED WITH TROUBLESHOOTING

Troubleshoot in accordance with the procedure on the following page.

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



DI0VE–01

CUSTOMER PROBLEM ANALYSIS CHECK

Transmission Control System Check Sheet

Inspector's Name :

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

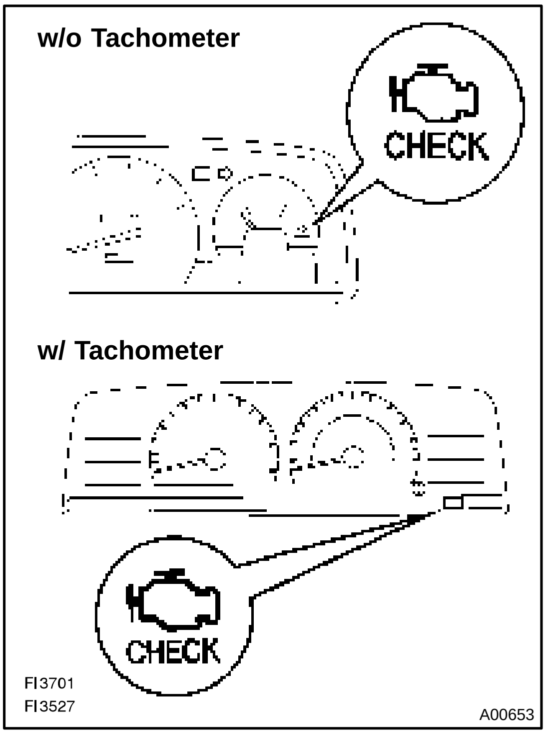
Date Problem Occurred	/ /
How Often Does Problem Occur?	● Continuous ● Intermittent (times a day)

Symptoms	● Vehicle does not move (● Any position ● Particular position)
	● No up–shift (● 1st → 2nd ● 2nd → 3rd ● 3rd → O/D)
	● No down–shift (● O/D → 3rd ● 3rd → 2nd ● 2nd → 1st)
	● Lock–up malfunction
	● Shift point too high or too low
	● Harsh engagement (● N → D ● Lock–up ● Any drive position)
	● Slip or shudder
	● No kick–down
	● Others ( )

Check Item	Malfunction Indicator Lamp	● Normal ● Remains ON

DTC Check	1st Time	● Normal code ● Malfunction code (Code)
	2nd Time	● Normal code ● Malfunction code (Code)

DI0VF–01



FI3701
FI3527
A00653

PRE–CHECK

1. DIAGNOSIS SYSTEM

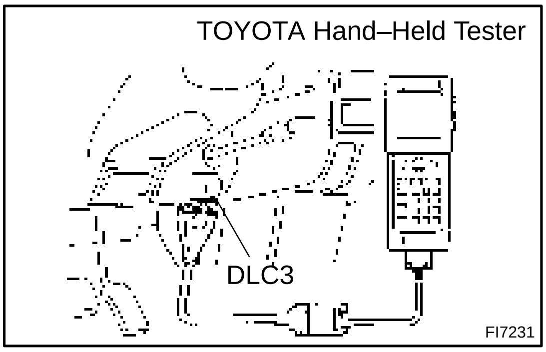
(a) Description

- When troubleshooting OBD II vehicles, the only difference from the usual troubleshooting procedure is that you connect to the vehicle an OBD II scan tool complying with SAE J1987 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 computer itself or in drive system components which affect vehicle emissions. In addition to the MIL lighting up when a malfunction is detected, the applicable DTCs prescribed by SAE J2012 are recorded in the ECM memory.

  (3RZ–FE: See page DI–13)
  (5VZ–FE: See page DI–144)

If the malfunction only occurs in 3 trips, the MIL goes off but the DTCs remain recorded in the ECM memory.



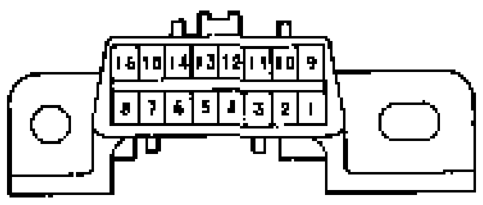
FI7231

- To check the DTCs, connect an OBD II scan tool or TOYOTA hand–held tester to DLC3 on the vehicle. The OBD II scan tool or TOYOTA hand–held tester also enables you to erase the DTCs and check freeze frame data and various forms of engine data (For 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–284).

- The diagnosis system operates in normal mode during normal vehicle use, and also has a check mode for technicians to simulate malfunction symptoms and perform troubleshooting. Most DTCs use 2 trip detection logic(*) to prevent erroneous detection. By switching the ECM to check mode when troubleshooting, the technician can cause the MIL to light up and for a malfunction that is only detected once or momentarily (TOYOTA hand–held tester) (See page DI–273).
- *2 trip detection logic:
  When a logic malfunction is first detected, the malfunction is temporarily stored in the ECM memory. If the same malfunction is detected again during the 2nd test drive, this 2nd detection causes the MIL to light up.

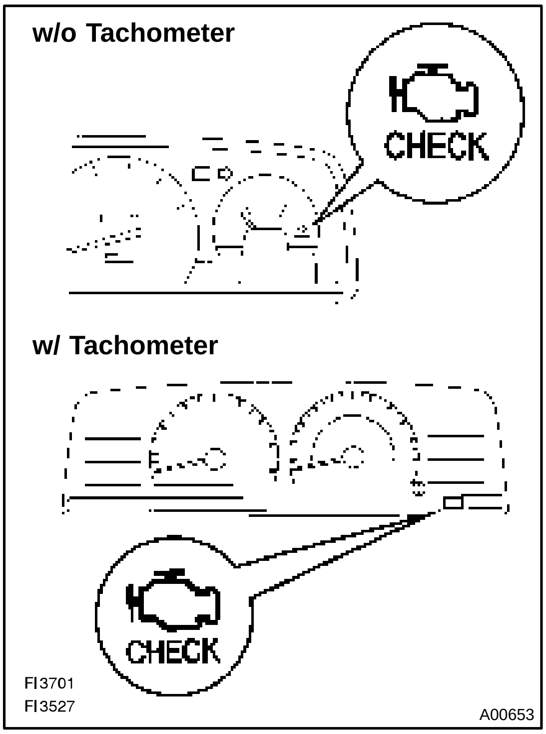

N09214

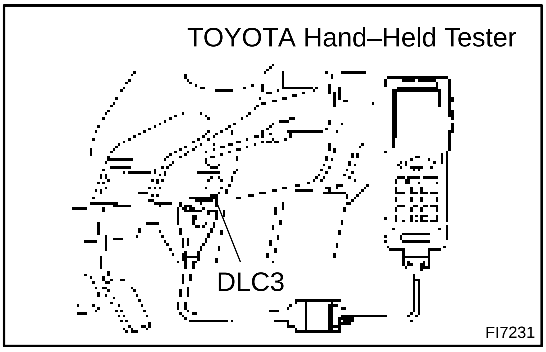
(b) Inspect the DLC3.
The vehicle's ECM uses the V.P.W. (Variable Pulse Width) for communication to comply with SAE J1850. The terminal arrangement of DLC3 complies with SAE J1962 and matches the V.P.W. format.

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

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

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





2. INSPECT DIAGNOSIS (NORMAL MODE)

(a) Check the MIL.

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

HINT:

If the MIL does not light up, troubleshoot the combination meter (See page BE–38).

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

(b) Check the DTC.

NOTICE:

TOYOTA hand–held tester only: When the diagnostic system is switched from normal mode to check mode, it erases all DTCs and freezed frame data recorded in normal mode. So before switching modes, always check the DTCs and freezed frame data, and note them down.

(1) Prepare an 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 at the lower of the instrument panel.

(3) Turn the ignition switch ON and turn 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 and note them down (For operating instructions, see the OBD II scan tool's instruction book).

(5) See page DI–284 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 normal mode. For codes on the DTCs chart subject to ”2 trip detection logic”, turn the ignition switch off after the symptoms have been simulated the 1st time. Then repeat the simulation process again. When the program has been simulated twice, the MIL lights up and the DTCs are recorded in the ECM.

3. INSPECT DIAGNOSIS (CHECK MODE)

HINT:

TOYOTA hand–held tester only: Compared to the normal mode, the check mode has high sensing ability to detect malfunctions. Furthermore, the same diagnostic items which are detected in Normal mode can also be detected in Check mode.

(a) Check the DTC.

(1) Check the initial conditions.

- Battery positive voltage 11 V or more
- Throttle valve fully closed
- Transmission in P position
- Air conditioning switched off

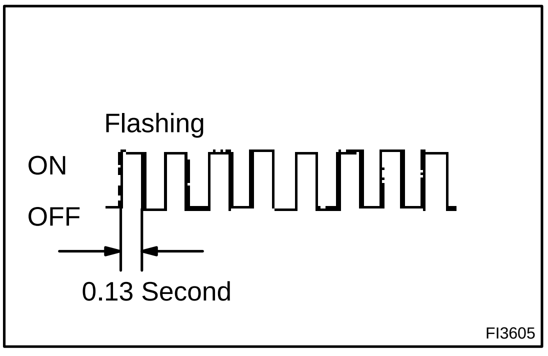
(2) Turn the ignition switch OFF.

(3) Prepare a TOYOTA hand–held tester.

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

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

(6) Switch the TOYOTA hand–held tester from Normal mode to Check mode (Check that the MIL flashes).



(7) Start the engine (MIL goes out after the engine starts).

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

NOTICE:

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

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

HINT:

Take care not to turn the ignition switch OFF, as turning it off switches the diagnosis system from Check mode to Normal mode, so all DTCs, etc. are erased.

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

(b) Clear the DTC.

The following actions will erase the DTC and freezed frame data. Operating an OBD II scan tool (complying with SAE J1978) or TOYOTA hand–held tester to erase the codes (See the OBD II scan tool's instruction book for operating instructions.).

NOTICE:

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

4. ROAD TEST

NOTICE:

Perform the test at normal operating ATF temperature 50 – 80°C (122 – 176°F).

(a) D position test

Shift into the D position and fully depress the accelerator pedal and and check the following points:

(1) Check up–shift operation.

1 → 2, 2 → 3 and 3 → O/D up–shift takes place, at the shift point shown in the automatic shift schedule (See page SS–49).

HINT:

There is no O/D up–shift or lock–up when the coolant temperature is below 60°C (140°F).

Evaluation:

Problem	Possible cause
If there is no 1→ 2 up–shift	●Shift solenoid valve No.2 is stuck ●1–2 shift valve is stuck
If there is no 2 → 3 up–shift	●Shift solenoid valve No.1 is stuck ●2–3 shift valve is stuck
If there is no 3 → O/D up–shift	●3–4 shift valve is stuck
If the shift point is defective	●Throttle valve, 1–2 shift valve, 2–3 shift valve, etc. are defective
If the lock up is defective	●Shift solenoid valve SL is stuck ●Lock–up relay valve is stuck

(2) Check for shift shock and slip.

Check for shock and slip at the 1 → 2, 2 → 3 and 3 → O/D up–shifts.

Evaluation:

Problem	Possible cause
If the shock is excessive	●Line pressure is too high ●Accumulator is defective ●Check ball is defective

(3) Check for abnormal noises and vibration.

Run at the D position lock–up or O/D gear and check for abnormal noises and vibration.

HINT:

The check for the cause of abnormal noises and vibration must be done very thoroughly as it could also be due to loss of balance in the differential torque converter clutch, etc.

(4) Check kick–down operation.

While running in the D position, 2nd, 3rd and O/D gears, check to see that the possible kick–down vehicle speed limits for 2 → 1, 3 → 2 and O/D → 3 kick–downs conform to those indicated on the automatic shift schedule (See page SS–49).

(5) Check abnormal shock and slip at kick–down.

(6) Check the lock–up mechanism.

- Drive in D position, O/D gear, at a steady speed (lock–up ON).
- Lightly depress the accelerator pedal and check that there is lock–up.

If there is a big jump in engine speed, there is no lock–up.

(b) 2 position test

Shift into the 2 position and fully depress the accelerator pedal and check the following points:

(1) Check up–shift operation.

Check to see that the 1 → 2 up–shift takes place and that the shift point conforms to the automatic shift schedule (See page SS–49).

HINT:
There is no O/D up–shift and lock–up in the 2 position.

(2) Check engine braking.
While running in the 2 position and 2nd gear, release the accelerator pedal and check the engine braking effect.

Evaluation:

Problem	Possible cause
If there is no engine braking effect	•2nd coast brake defective

(3) Check for abnormal noises during acceleration and deceleration, and for shock at up–shift and down–shift.

(c) L position test
Shift into the 2 position and fully depress the accelerator pedal and check the following points:

(1) Check no up–shift.
While running in the L position, check that there is no up–shift to 2nd gear.

(2) Check engine braking.
While running in the L position, release the accelerator pedal and check the engine braking effect.

Evaluation:

Problem	Possible cause
If there is no engine braking effect	•1st and reverse brake is defective

(3) Check for abnormal noises during acceleration and deceleration.

(d) R position test
Shift into the R position and fully depress the accelerator pedal and check for slipping.

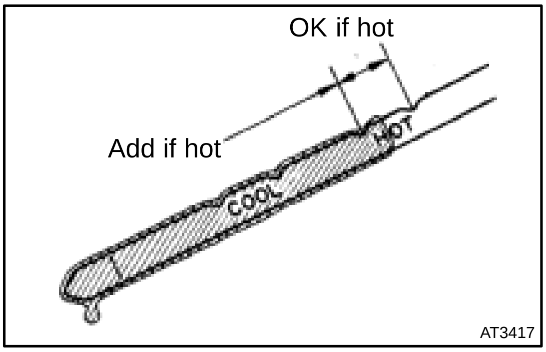
CAUTION:
Before conducting this test ensure that the test area is free from people and obstruction.

(e) P position test
Stop the vehicle on a grade (more than 5°) and after shifting into the P position, release the parking brake. Then, check to see that the parking lock pawl holds the vehicle in place.

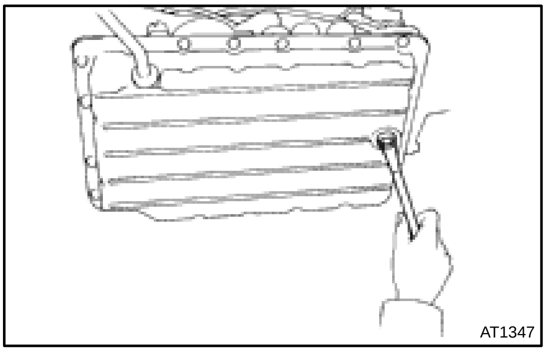
5. BASIC INSPECTION

(a) Check the fluid level.

HINT:
- Drive the vehicle so that the engine and transmission are at normal operating temperature.
  Fluid temp.: 70 – 80°C (158 – 176°F)
- Only use the COOL range on the dipstick as a rough reference when the fluid is replaced or the engine does not run.



(1) Park the vehicle on a level surface and set the parking brake.
(2) With the engine idling and the brake pedal depressed, shift the shift lever into all positions from P to L position and return to P position.
(3) Pull out the dipstick and wipe it clean.
(4) Push it back fully into the pipe.
(5) Pull it out and check that the fluid level is in the HOT range.


AT1347

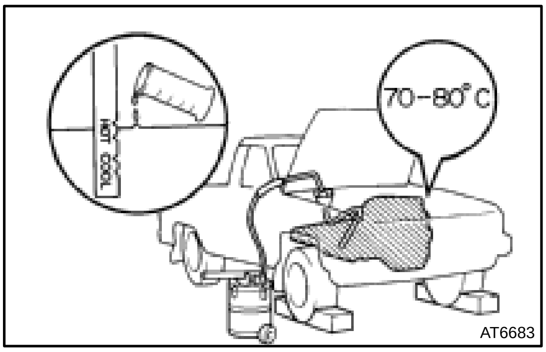
If the level is at the low side, add new fluid.

Fluid type: ATF D–II or DEXRON®III (DEXRON®II)

NOTICE:
Do not overfill.

(b) Check the fluid condition.
If the fluid smells burnt or is black, replace it.

(c) Replace the ATF.
(1) Remove the drain plug and drain the fluid.
(2) Reinstall the drain plug securely.

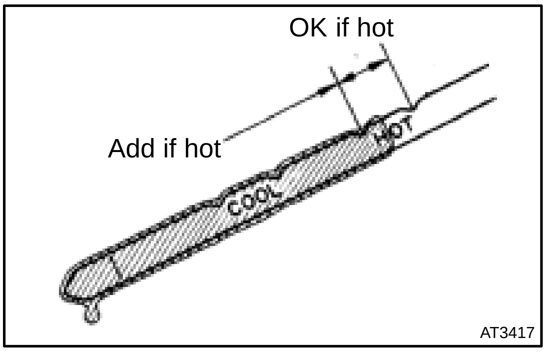


AT6683

(3) With the engine OFF, add new fluid through the oil filler pipe.

Fluid type: ATF D–II or DEXRON®III (DEXRON®II)
Capacity:
A340E: 1.6 liters (1.7 US qts, 1.4 Imp. qts)
A340F: 2.0 liters (2.1 US qts, 1.8 Imp. qts)

(4) Start the engine and shift the shift lever into all positions from P to L position and then shift into P position.

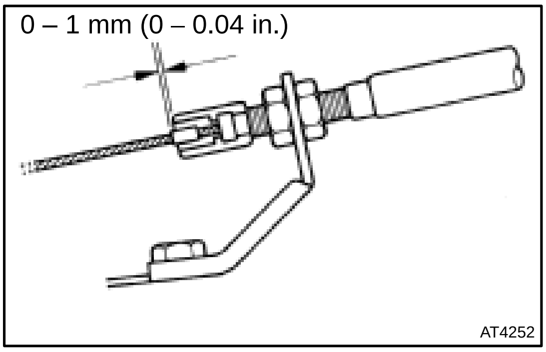


AT3417

(5) With the engine idling, check the fluid level. Add fluid up to the COOL level on the dipstick.
(6) Check the fluid level at the normal operating temperature, 70 – 80°C (158 – 176°F), and add as necessary.

NOTICE:
Do not overfill.

(d) Check the fluid leaks.
Check for leaks in the transmission.
If there are leaks, it is necessary to repair or replace O–rings, FIPGs, oil seals, plugs or other parts.

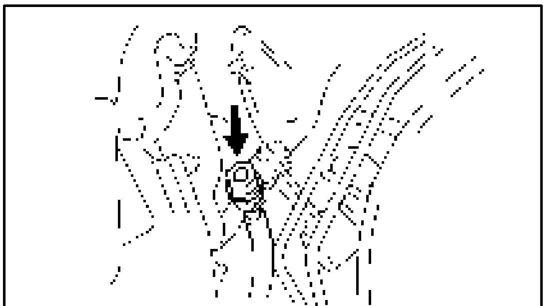


AT4252

(e) INSPECT AND ADJUST THROTTLE CABLE
(1) Check that the accelerator pedal is fully released.
(2) Check that the inner cable is not slack.
(3) Measure the distance between the outer cable end and stopper on the cable.

Standard distance: 0 – 1 mm (0 – 0.04 in.)

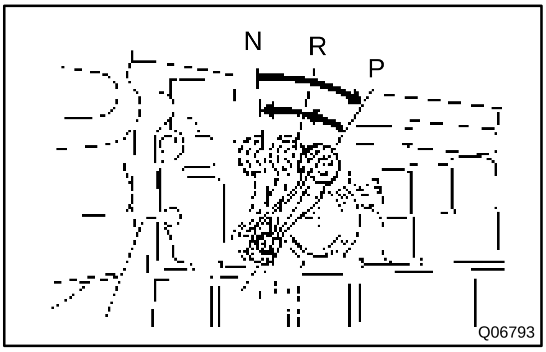
If the distance is not standard, adjust the cable by the adjusting nuts.

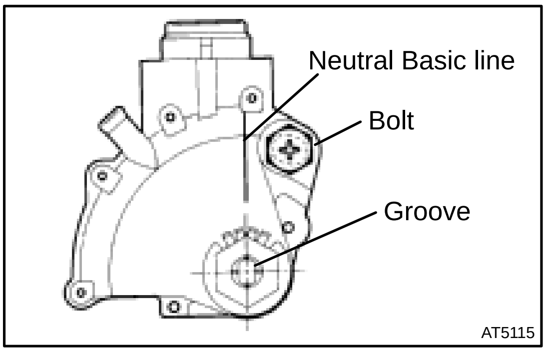


Q03104

(f) Inspect and adjust the shift lever position.
When shifting the shift lever from the N position to other positions, check that the lever can be shifted smoothly and accurately to each position and that the position indicator is not aligned with the correct position.

If the indicator is not aligned with the correct position, carry out the following adjustment procedures.
(1) Remove the nut on the No.1 gear shifting rod.
(2) Push the No.1 gear shifting rod fully downward.





(3) Return the No.1 gear shifting rod 2 notches to N position.
(4) Set the shift lever to N position.
(5) While holding the shift lever lightly toward the R position side, adjust the No.1 gear shifting rod nut.
(6) Tighten the No.1 gear shifting rod nut.
Torque: 25 N·m (260 kgf·cm, 19 ft·lbf)
(7) Start the engine and make sure that the vehicle moves forward when shifting the lever from the N to D position and reverses when shifting it to the R position.

(g) Inspect and adjust the park/neutral position.
Check that the engine can be started with the shift lever only in the N or P position, but not in other positions.If it is not as stated above, carry out the following adjustment procedure.
(1) Loosen the park/neutral position switch bolt and set the shift lever to the N position.
(2) Align the groove and neutral basic line.
(3) Hold in position and tighten the bolt.
Torque: 13 N·m (130 kgf·cm, 10 ft·lbf)

(h) Check the idle speed.
Idle speed (In N position and air conditioner OFF):
3RZ–FE: 700 ± 50 rpm
5VZ–FE: 700 ± 50 rpm

6. MECHANICAL SYSTEM TESTS

(a) Measure the stall speed.
The object of this test is to check the overall performance of the transmission and engine by measuring the stall speeds in the D and R positions.

NOTICE:

- **Do the that at normal operating fluid temperature 50 – 80°C (122 – 176°F)**
- **Do not continuously run this test longer than 5 seconds.**
- **To ensure safety, conduct this test in a wide, clear, level area which provides good traction.**
- **The stall test should always be carried out in pairs. One technician should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is doing the test.**

(1) Chock the 4 wheels.
(2) Connect an OBD II scan tool or TOYOTA hand–held tester to DLC3.
(3) Fully apply the parking brake.
(4) Keep your left foot pressed firmly on the brake pedal.
(5) Start the engine.
(6) Shift into the D position. Press all the way down on the accelerator pedal with your right foot. Quickly read the stall speed at this time.

Stall speed:
3RZ–FE: 1,950 ± 150 rpm
5VZ–FE: 2,150 ± 150 rpm

(7) Do the same test in R position.

Stall speed:
3RZ–FE: 1,950 ± 150 rpm
5VZ–FE: 2,150 ± 150 rpm

Evaluation:

Problem	Possible cause
(a) Stall speed low in D and R positions	●Engine output may be insufficient ●Stator one–way clutch is operating properly ●HINT: If more than 600 rpm below the specified value, the torque converter could be faulty.
(b) Stall speed high in D position	●Line pressure too low ●forward clutch slipping ●No.2 one–way clutch not operating properly ●O/D one–way clutch not operating properly
(c) Stall speed high in R position	●Line pressure too low ●Direct clutch slipping ●1st and reverse brake slipping ●O/D one–way clutch not operating properly
(d) Stall speed high in D and R positions	●Line pressure too low ●Improper fluid level ●O/D one–way clutch not operating properly

(b) Measure the time lag.
When the shift lever is shifted while the engine is idling, there will be a certain time lapse or lag before the shock can be felt. This is used for checking the condition of the O/D direct clutch, forward clutch, direct clutch, and 1st and reverse brake.

NOTICE:

- **Do the test at normal operating fluid temperature 50 – 80˚C (122 – 176˚F)**
- **Be sure to allow 1 minute interval between tests.**
- **Take 3 measurements and take the average value.**

(1) Fully apply the parking brake.
(2) Start the engine and check idle speed.

Idle speed (In N position and air conditioner OFF):
3RZ–FE: 700 ± 50 rpm
5VZ–FE: 700 ± 50 rpm

(3) Shift the shift lever from N to D position. Using a stop watch, measure the time from when the lever is shifted until the shock is felt.
In the same manner, measure the time lag for N → R.

Time lag:
N → D Less than 1.2 seconds
N → R Less than 1.5 seconds

Evaluation (If N → D time or N → R time lag is longer than specified):

Problem	Possible cause
N → D time lag is longer	●Line pressure too low ●Forward clutch worn ●O/D one–way clutch not operating properly
N → R time lag is longer	●Line pressure too low ●Direct clutch worn ●1st and reverse brake worn ●O/D one–way clutch not operating properly

7. HYDRAULIC TEST

(a) Measure the line pressure.

NOTICE:

- **Do the test at normal operation fluid temperature 50 – 80°C (122 – 176°F).**
- **The line pressure test should always be carried out in pairs. One technician should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is doing the test.**
- **Be careful to prevent SST's hose from interfering with the exhaust pipe.**

(1) Warm up the fluid.

(2) Remove the test plug on the transmission case right side and connect SST.
(See page AT–27 and AT–34 for the location to connect SST)

SST 09992–00094

(3) Fully apply the parking brake and chock the 4 wheels.

(4) Start the engine and check idling speed.

(5) Keep your left foot pressed firmly on the brake pedal and shift into D position.

(6) Measure the line pressure when the engine is idling.

(7) Depress the accelerator pedal all the way down. Quickly read the highest line pressure when engine speed reaches stall speed.

NOTICE:

Release the accelerator pedal and stop test if the rear wheels begin to rotate before the engine speed reaches specified stall speed.

(8) In the same manner, do the test in R position.

Specified line pressure:

3RZ–FE

Condition	D position kPa (kgf/cm^2, psi)	R position kPa (kgf/cm^2, psi)
Idling	363 – 422 (3.7 – 4.3, 53 – 61)	490 – 588 (5.0 – 6.0, 71 – 85)
Stall	932 – 1,177 (9.5 – 12.0, 135 – 171)	1,294 – 1,638 (13.2 – 16.7, 188 – 238)

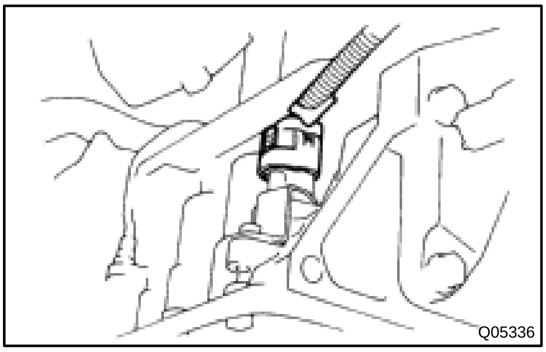
5VZ–FE

Condition	D position kPa (kgf/cm^2, psi)	R position kPa (kgf/cm^2, psi)
Idling	363 – 422 (3.7 – 4.3, 53 – 61)	608 – 696 (6.2 – 7.1, 88 – 101)
Stall	902 – 1,147 (9.2 – 11.7, 131 – 166)	1,432 – 1,942 (14.6 – 19.8, 208 – 282)

If the measured pressures are not up to specified values, recheck the throttle cable adjustment and retest.

Evaluation

Problem	Possible cause
If the measured value at all positions are higher	●Throttle cable out of adjustment ●Throttle valve defective ●Regulator valve defective
If the measured value at all positions are lower	●Throttle cable out of adjustment ●Throttle valve defective ●Regulator valve defective ●Oil pump defective ●O/D direct clutch defective
If pressure is low in the D position only	●D position circuit fluid leakage ●Forward clutch defective
If pressure is low in the R position only	●R position circuit fluid leakage ●Direct clutch defective ●1st and reverse brake defective


Q05336

8. MANUAL SHIFTING TEST

HINT:
With this test, it can be determined whether the trouble is within the electrical circuit or is a mechanical problem in the transmission.

(a) Disconnect the solenoid wire.
(b) Inspect the manual driving operation.
- Check that the shift and gear positions correspond with the table below.
- While driving, shift through the L, 2 and D positions. Check that the gear change corresponds to the shift position.

Shift Position	Gear Position
D	O/D
2	3rd
L	1st
R	Reverse
P	Pawl Lock

HINT:
If the L, 2 and D position gear positions are difficult to positions are difficult to distinguish, do the following read test.
If any abnormality is found in the above test, the problem is in the transmission itself.

(c) Connect the solenoid wire.
(d) Cancel out DTC. (See page DI–273).

DI0VG–01

DIAGNOSTIC TROUBLE CODE CHART

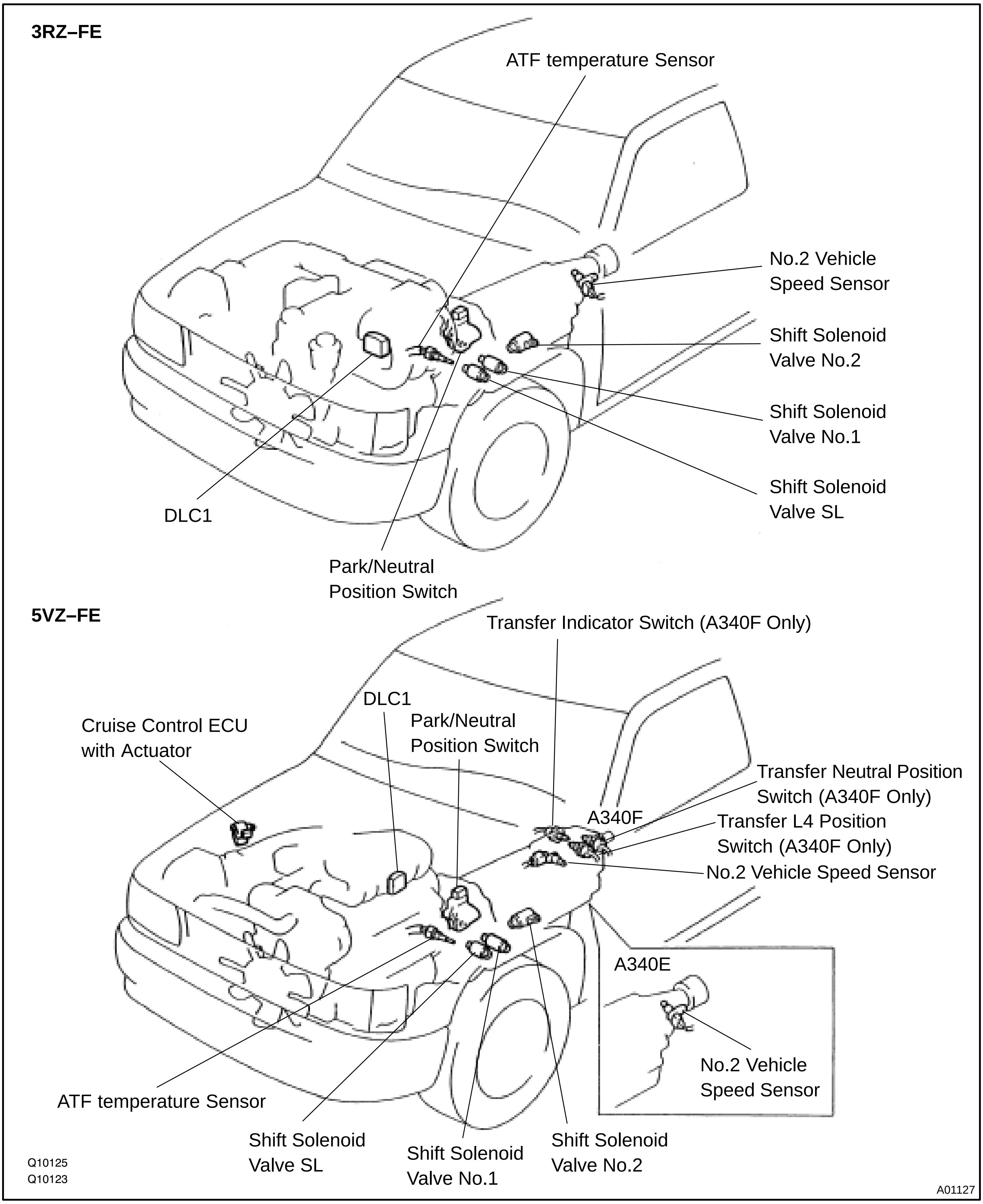
If a DTC is displayed during the DTC check, check the circuit listed for that code in the table below and proceed to the page given.

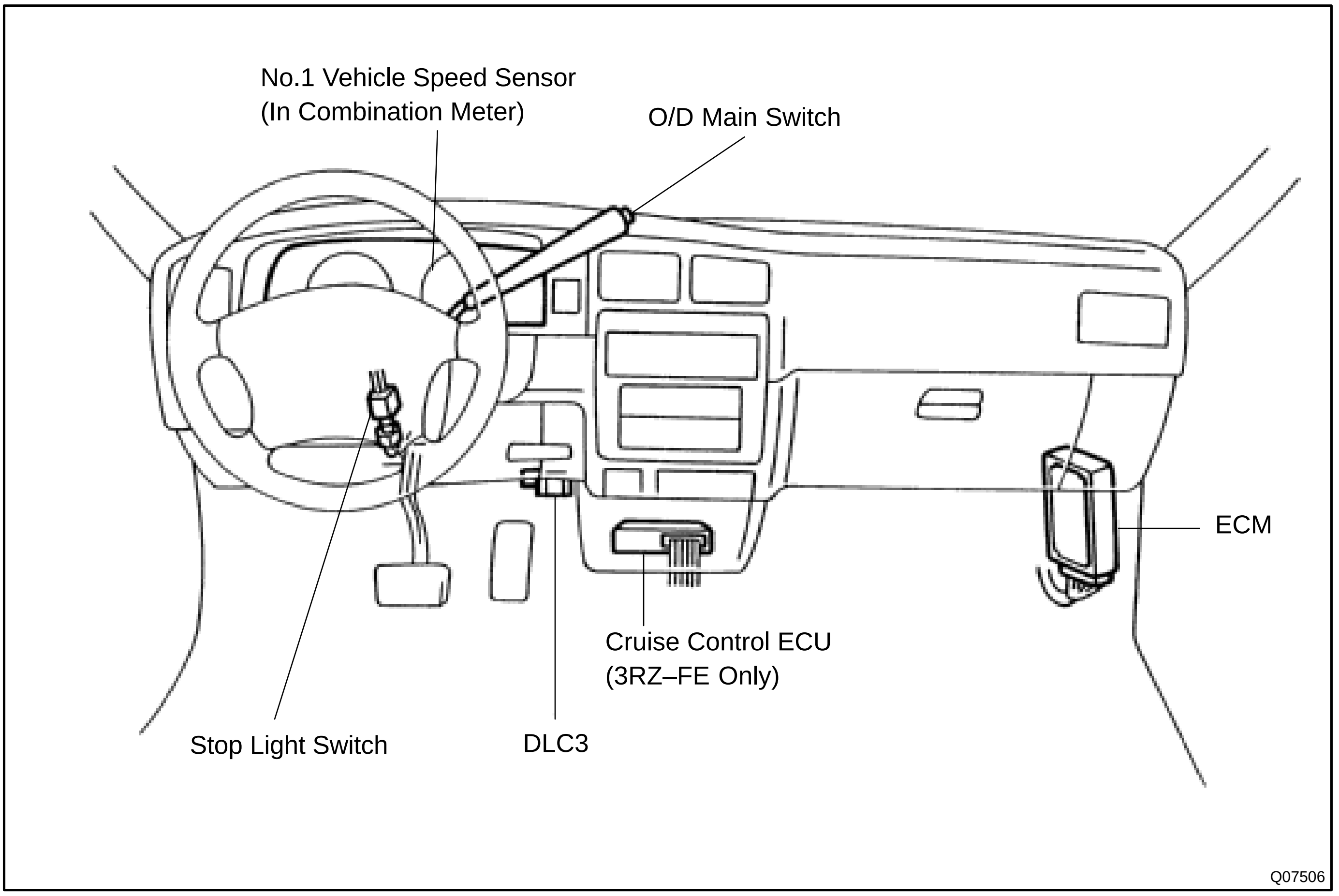
*: ● ... MIL lights up

DTC No. (See Page)	Detection Item	Trouble Area	MIL *	Memory
P0500 3RZ–FE: (DI–92) 5VZ–FE: (DI–238)	Vehicle Speed Sensor Malfunction (No.1 Vehicle Speed Sensor)	Open or short in No.1 vehicle speed sensor circuit No.1 vehicle speed sensor Speedometer cable ECM	●	
P0710 (DI–294)	Transmission Fluid Temperature Sensor Malfunction (ATF Temperature Sensor)	Open or short in ATF temperature sensor circuit ATF temperature sensor ECM	●	
P0750 (DI–296)	Shift Solenoid A Malfunction (Shift Solenoid Valve No.1)	Shift solenoid valve No.1 is stuck open or closed Valve body is blocked up or stuck	●	
P0753 (DI–297)	Shift Solenoid A Electrical Malfunction (Shift Solenoid Valve No.1)	Open or short in shift solenoid valve No.1 circuit Shift solenoid valve No.1 ECM	●	
P0755 (DI–296)	Shift Solenoid B Malfunction (Shift Solenoid Valve No.2)	Shift solenoid valve No.2 is stuck open or closed Valve body is blocked up or stuck	●	
P0758 (DI–297)	Shift Solenoid B Electrical Malfunction (Shift Solenoid Valve No.2)	Open or short in shift solenoid valve No.2 circuit Shift solenoid valve No.2 ECM	●	
P0770 (DI–301)	Shift Solenoid E Malfunction (Shift Solenoid Valve SL)	Shift solenoid valve SL is stuck open or closed Valve body is blocked up or stuck Lock–up clutch	●	
P0773 (DI–303)	Shift Solenoid E Electrical Malfunction (Shift Solenoid Valve SL)	Open or short in shift solenoid valve SL circuit Shift solenoid valve SL ECM	●	
P1520 (DI–307)	Stop Light Switch Signal Malfunction	Short in stop light switch signal circuit Stop light switch ECM	●	
P1700 (DI–308)	Vehicle Speed Sensor No.2 Malfunction (No.2 Vehicle Speed Sensor)	Open or short in No.2 vehicle speed sensor circuit No.2 vehicle speed sensor ECM	●	
P1780 (DI–314)	Park/Neutral Position Switch Malfunction	Short in park/neutral position switch circuit Park/neutral position switch ECM	●	

DI0VH–01

PARTS LOCATION



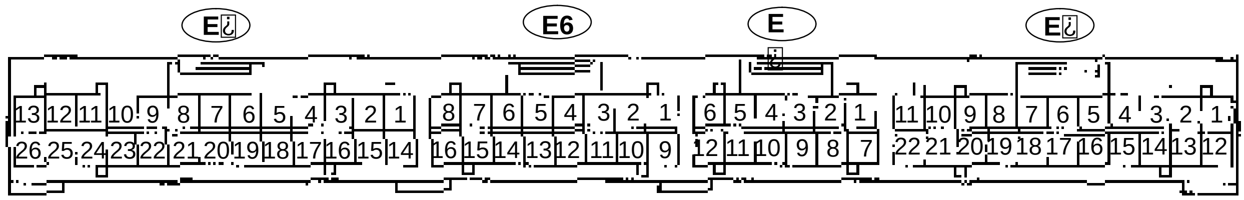

No.1 Vehicle Speed Sensor
(In Combination Meter)
O/D Main Switch
ECM
Cruise Control ECU
(3RZ–FE Only)
Stop Light Switch
DLC3
Q07506

DI0VI–01

TERMINALS OF ECM

3RZ–FE:

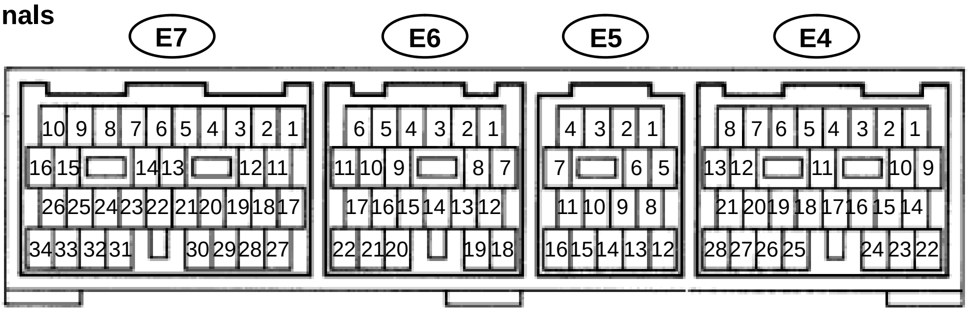
ECM Terminals



FI6526

Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage (V)
S1 – E1 (E7, 10 – E7, 24)	W ↔ BR	IG switch ON	9 – 14
		1st or 2nd gear	9 – 14
		3rd or O/D gear	Below 1.5
S2 – E1 (E7, 9 – E7, 24)	B–W ↔ BR	IG switch ON	Below 1.5
		2nd or 3rd gear	9 – 14
		1st or O/D gear	Below 1.5
SL – E1 (E7, 8 – E7, 24)	Y–B ↔ BR	IG switch ON	Below 1.5
		Vehicle driving under lock–up position	9 – 14
$SP2^{+}$ – $SP2^{-}$ (E5, 10 – E5, 4)	BR–R ↔ W–R	Vehicle is running	Pulse signal is output Below 1.5 ↔ 4 – 10
OD2 – E1 (E4, 5 – E7, 24)	Y–G ↔ BR	O/D main switch ON (Pushed in)	9 – 14
		O/D main switch OFF (Pushed once again)	Below 3
OIL – E2 (E7, 21 – E6, 9)	G–B ↔ BR–B	ATF temperature: 110˚C (230˚F) or more	Below 1.5
L – E1 (E4, 15 – E7, 24)	V–W ↔ BR	IG switch ON, Shift lever L position	7.5 – 14
		IG switch ON, Shift lever other than L position	Below 1.5
2 – E1 (E4, 16 – E7, 24)	P–G ↔ BR	IG switch ON, Shift lever 2 position	7.5 – 14
		IG switch ON, Shift lever other than 2 position	Below 1.5
R – E1 (E4, 17 – E7, 24)	R–B ↔ BR	IG switch ON, Shift lever R position	7.5 – 14
		IG switch ON, Shift lever other than R position	Below 1.5
NSW – E1 (E4, 22 – E7, 24)	B–Y ↔ BR	IG switch ON, Shift lever P or N position	Below 3
		IG switch ON, Shift lever other than P or N position	9 – 14

5VZ–FE:



Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage (V)
S1 – E1 (E7, 11 – E5, 16)	W ↔ BR	IG switch ON	9 – 14
		1st or 2nd gear	9 – 14
		3rd or O/D gear	Below 1.5
S2 – E1 (E7, 17 – E5, 16)	B–W ↔ BR	IG switch ON	Below 1.5
		2nd or 3rd gear	9 – 14
		1st or O/D gear	Below 1.5
SL – E1 (E7, 27 – E5, 16)	Y–B ↔ BR	IG switch ON	Below 1.5
		Vehicle driving under lock–up position	9 – 14
SP2 – E1 (E6, 9 – E5, 16)	BR–R ↔ BR	Turn one rear wheel slowly	Pulse signal is output Below 1.5 ↔ 4 ~ 6
OD1 – E1 (E4, 7 – E5, 16)	Y–R ↔ BR	IG switch ON	9 – 14
OD2 – E1 (E4, 6 – E5, 16)	Y–G ↔ BR	O/D main switch ON (Pushed in)	9 – 14
		O/D main switch OFF (Pushed once again)	Below 3
OIL – E2 (E6, 12 – E6, 22)	G–B ↔ BR–B	ATF temperature: 110˚C (230˚F) or more	Below 1.5
L – E1 (E4, 3 – E5, 16)	V–W ↔ BR	IG switch ON, Shift lever L position	7.5 – 14
		IG switch ON, Shift lever other than L position	Below 1.5
2 – E1 (E4, 2 – E5, 16)	P–G ↔ BR	IG switch ON, Shift lever 2 position	7.5 – 14
		IG switch ON, Shift lever other than 2 position	Below 1.5
R – E1 (E4, 1 – E5, 16)	R–B ↔ BR	IG switch ON, Shift lever R position	7.5 – 14
		IG switch ON, Shift lever other than R position	Below 1.5
NSW – E1 (E7, 14 – E5, 16)	B–O ↔ BR	IG switch ON, Shift lever P or N position	Below 3
		IG switch ON, Shift lever other than P or N position	9 – 14
TFN – E1 (E4, 17 – E5, 16)	Y ↔ BR	IG switch ON, Transfer N position	Below 3
		IG switch ON, Transfer other than N position	9 – 14

DI0VJ–01

PROBLEM SYMPTOMS TABLE

If a normal code is displayed during the diagnostic trouble code check but the trouble still occurs, check the circuits for each symptom in the order given in the charts on the following pages and proceed to the page given for troubleshooting.

The Matrix Chart is divided into 3 chapters.

Chapter 1: Electronic Circuit Matrix Chart
Chapter 2: On–vehicle Repair Matrix Chart
Chapter 3: Off–vehicle Repair Matrix Chart

- If the instruction "Proceed to next circuit inspection shown on matrix chart" is given in the flow chart for each circuit, proceed to the circuit with the next highest number in the table to continue the check.
- If the trouble still occurs even though there are no abnormalities in any of the other circuits, then check and replace the ECM.

Chapter 1: Electronic Circuit Matrix Chart

Symptom	Suspect Area	See page
No up–shift (A particular gear, from 1st to 3rd gear, is not up–shifted)	1. ECM	DI–287
No up–shift (3rd → O/D)	1. O/D main switch & O/D OFF indicator light circuit 2. O/D cancel signal circuit 3. ECM	DI–319 DI–317 DI–287
No down–shift (O/D → 3rd)	1. O/D main switch & O/D OFF indicator light circuit 2. O/D cancel signal circuit 3. ECM	DI–319 DI–317 DI–287
No down–shift (A particular gear, from 1st to 3rd gear, is not up–shifted)	1. ECM	DI–287
No lock–up	1. ECM	DI–287
No lock–up off	1. ECM	DI–287
Shift point too high or too low	1. ECM	DI–287
Up–shift to O/D from 3rd while O/D main switch is OFF	1. O/D main switch & O/D OFF indicator light circuit 2. ECM	DI–319 DI–287
Up–shift to O/D from 3rd while engine is cold	1. ECM	DI–287
No kick–down	1. ECM	DI–287
Engine stalls when starting off or stopping	1. ECM	DI–287

Chapter 2: On–Vehicle Repair Matrix Chart
(● : A340E, A340F, A340H AUTOMATIC TRANSMISSION Repair Manual Pub. No. RM391U)
(● : A340F, A343F AUTOMATIC TRANSMISSION Repair Manual Pub. No. RM479U)

Symptom	Suspect Area	See page
Vehicle does not move in any forward position and reverse position	1. Throttle cable 2. No.1 gear shifting rod 3. Manual valve 4. Parking lock pawl 5. Off–vehicle repair matrix chart	DI–273 DI–273 ● AT–18 DI–289
Vehicle does not move in R position	1. Off–vehicle repair matrix chart	DI–289
Vehicle does not move in particular position or positions (except R position)	1. Off–vehicle repair matrix chart	DI–289
No up–shift (1st → 2nd)	1. 1–2 shift valve 2. Off–vehicle repair matrix chart	● DI–289
No up–shift (2nd → 3rd)	1. 2–3 shift valve 2. Off–vehicle repair matrix chart	● DI–289
No up–shift (3rd → O/D)	1. 3–4 shift valve 2. Off–vehicle repair matrix chart	● DI–289
No down–shift (O/D → 3rd)	1. 3–4 shift valve 2. Off–vehicle repair matrix chart	● DI–289
No down–shift (3rd → 2nd)	1. 2–3 shift valve 2. Off–vehicle repair matrix chart	● DI–289
No down–shift (2nd → 1st)	1. 1–2 shift valve 2. Off–vehicle repair matrix chart	● DI–289
No lock–up or No lock–up off	1. Lock–up relay valve 2. Off–vehicle repair matrix chart	● DI–289
Harsh engagement (N → D)	1. Accumulator control valve 2. Off–vehicle repair matrix chart	● DI–289
Harsh engagement (Lock–up)	1. Lock–up relay valve 2. Off–vehicle repair matrix chart	● DI–289
Harsh engagement (N → R)	1. Accumulator control valve 2. C_2 accumulator 3. Off–vehicle repair matrix chart	● ● DI–289
Harsh engagement (N → L)	1. Low coast modulator valve	●
Harsh engagement (1st → 2nd → 3rd → O/D)	1. Throttle valve 2. Actuator control valve	● ●
Harsh engagement (2nd → 3rd)	1. Accumulator control valve 2. C_2 accumulator 3. Off–vehicle repair matrix chart	● ● DI–289
Harsh engagement (3rd → O/D)	1. Accumulator control valve 2. B_0 accumulator 3. Off–vehicle repair matrix chart	● ● DI–289
Harsh engagement (O/D → 3rd)	1. Accumulator control valve 2. C_0 accumulator 3. Off–vehicle repair matrix chart	● ● DI–289
Slip or shudder (Forward and reverse)	1. Throttle cable 2. No.1 gear shifitng rod 3. Oil strainer 4. Pressure relief valve 5. Off–vehicle repair matrix chart	DI–273 DI–273 AT–13 ● DI–289

Symptom	Suspect Area	See page
Slip or shudder (Particular position)	1. Throttle cable 2. No.1 gear shifting rod 3. Off–vehicle repair matrix chart	DI–273 DI–273 DI–289
No engine braking (1st: L position)	1. Low coast modulator valve 2. Off–vehicle repair matrix chart	● DI–289
No engine braking (2nd: 2 position)	1. 2nd coast modulator valve 2. Off–vehicle repair matrix chart	● DI–289
No kick–down	1. 1–2 shift valve 2. 2–3 shift valve	● ●

Chapter 3: Off–Vehicle Repair Matrix Chart
(● : A340E, A340F, A340H AUTOMATIC TRANSMISSION Repair Manual Pub. No. RM391U)
(● : A340F, A343F AUTOMATIC TRANSMISSION Repair Manual Pub. No. RM479U)

Symptom	Suspect Area	See page
Vehicle does not move in any forward position and reverse position	1. O/D one–way clutch (F_0) 2. O/D direct clutch (C_0) 3. O/D planetary gear unit 4. Torque converter clutch	● ● ● AT–39
Vehicle does not move in R position	1. Front and rear planetary gear unit 2. Direct clutch (C_2) 3. 1st and reverse brake (B_3) 4. O/D direct clutch (C_0)	● ● ● ●
No up–shift (1st → 2nd)	1. 2nd brake (B_2) 2. No. 1 one–way clutch (F_1)	● ●
No up–shift (2nd → 3rd)	1. Direct clutch (C_2)	●
No up–shift (3rd → O/D)	1. O/D brake (B_0)	●
No lock–up or No lock–up off	1. Torque converter clutch	AT–39
Harsh engagement (N → D)	1. Forward clutch (C_1) 2. O/D one–way clutch (F_0) 3. No. 2 one–way clutch (F_2)	● ● ●
Harsh engagement (N → R)	1. Direct clutch (C_2) 2. 1st and reverse brake (B_3) 3. O/D one–way clutch (F_0)	● ● ●
Harsh engagement (N → 2)	1. Forward clutch (C_1) 2. O/D one–way clutch (F_0) 3. No. 2 one–way clutch (F_2)	● ● ●
Harsh engagement (N → L)	1. Forward clutch (C_1) 2. 1st and reverse brake (B_3) 3. O/D one–way clutch (F_0) 4. No. 2 one–way clutch (F_2)	● ● ● ●
Harsh engagement (Lock–up)	1. Torque converter clutch	AT–39
Slip or shudder (Forward and reverse: After warm–up)	1. Torque converter clutch 2. O/D one–way clutch (F_0) 3. O/D direct clutch (C_0)	AT–39 ● ●
Slip or shudder (Particular position: Just after engine starts)	1. Torque converter clutch	AT–39
Slip or shudder (R position)	1. Direct clutch (C_2) 2. 1st and reverse brake (B_3)	● ●
Slip or shudder (1st)	1. Forward clutch (C_1) 2. No. 2 one–way clutch (F_2)	● ●
Slip or shudder (2nd)	1. 2nd brake (B_2) 2. 2nd coast brake (B_1) 3. No. 1 one–way clutch (F_1)	● ● ●
Slip or shudder (3rd)	1. Direct clutch (C_2)	●
Slip or shudder (O/D)	1. O/D brake (B_0)	●
No engine braking (1st ~ 3rd: D position)	1. 2nd brake (B_2)	●
No engine braking (1st: L position)	1. 1st and reverse brake (B_3)	●
No engine braking (2nd: 2 position)	1. 2nd coast brake (B_1)	●
Poor acceleration (All position)	1. Torque converter clutch	AT–39
Poor acceleration (O/D)	1. O/D direct clutch (C_0) 2. O/D planetary gear unit	● ●
Engine stalls when starting off or stopping	1. Torque converter clutch	AT–39

DI0VK–01

CIRCUIT INSPECTION

DTC	P0500	Vehicle Speed Sensor Malfunction (No.1 Vehicle Speed Sensor)

See page 3RZ–FE DI–92, 5VZ–FE DI–238.

DI0VL–01

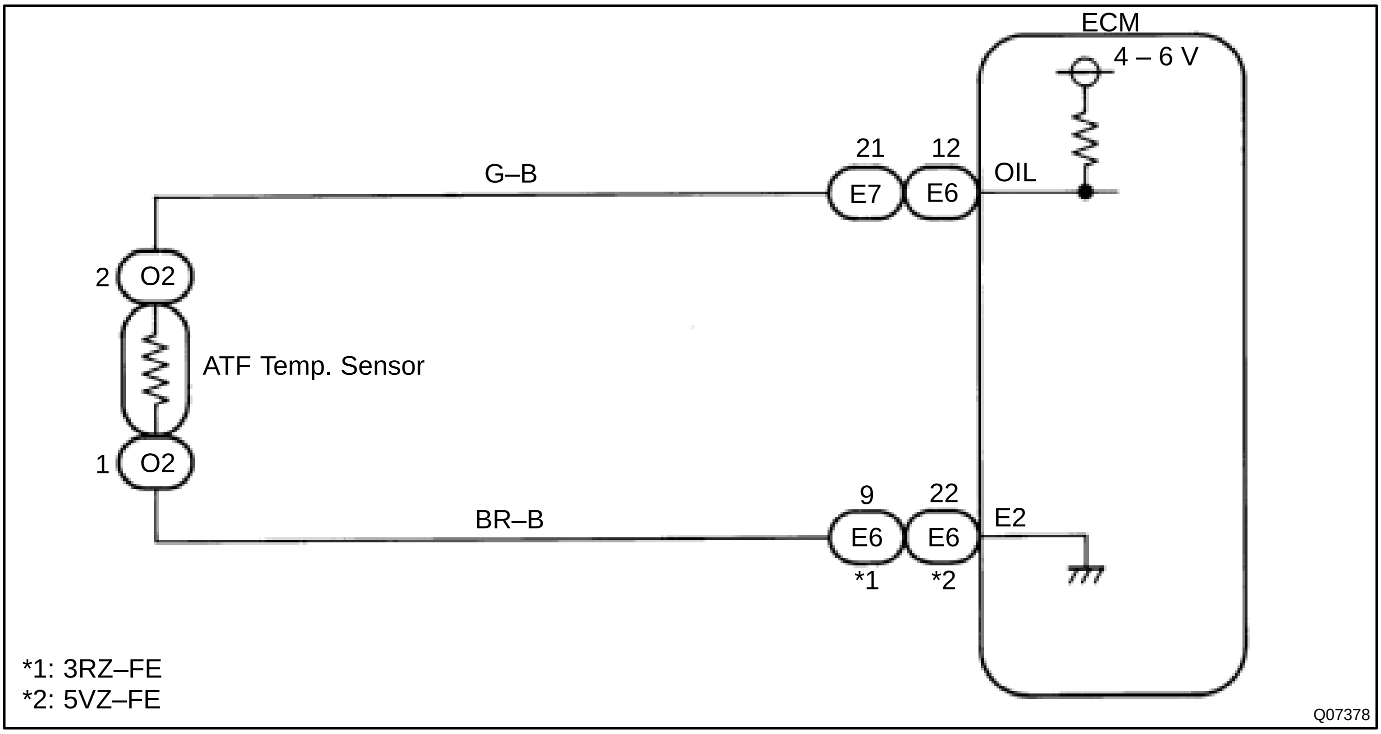
DTC	P0710	Transmission Fluid Temperature Sensor Malfunction (ATF Temperature Sensor)

CIRCUIT DESCRIPTION

The ATF temperature sensor converts fluid temperature into a resistance value which is input into the ECM.

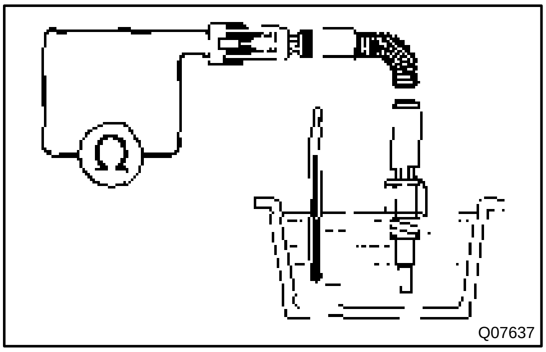
DTC No	DTC Detecting Condition	Trouble Area
P0710	Either (a) or (b) is detected for 0.5 sec. or more: (2 trip detection logic) (a) Temp. sensor resistance is less than 79 Ω (b) After engine has been operating for 15 minutes or more, resistance at temp. sensor is more than 156 kΩ	•Open or short in ATF temp. sensor circuit •ATF temp. sensor •ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check ATF Temperature Sensor.**


Q07637

PREPARATION:
Remove the ATF temperature sensor.
CHECK:
Measure resistance between terminals of ATF temperature sensor at 20˚C (68˚F) and 110˚C (230˚F).
OK:
Resistance:
20˚C (68˚F): Approx. 13.0 kΩ
110˚C (230˚F): Approx. 800 Ω

NG → **Replace ATF temperature sensor.**

OK

2	**Check harness and connector between ATF temperature sensor and ECM (See page IN–24).**

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

OK

Check and replace ECM.

DI0VM–01

DTC	P0750, P0755	Shift Solenoid A/B Malfunction (Shift Solenoid Valve No.1/No.2)

SYSTEM DESCRIPTION

The ECM uses signals from the vehicle speed sensor to detect the actual gear position (1st, 2nd, 3rd or O/D gear).

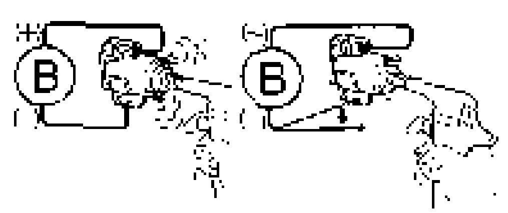
Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical trouble of the shift solenoid valves and valve body.

DTC No.	DTC Detecting Condition	Trouble Area
P0750 P0755	During normal driving, gear required by ECM does not match actual gear (2 trip detection logic)	●Shift solenoid valve No.1/No.2 is stuck open or closed ●Valve body is blocked up or stuck

Check the shift solenoid valve No.1 when DTC P0750 is output and check shift solenoid valve No.2 when DTC P0755 is output.

INSPECTION PROCEDURE

1	**Check shift solenoid valve No.1 or No.2 operation.**



Q07640

PREPARATION:

(a) Remove the oil pan.

(b) Remove the shift solenoid valve No.1 or No.2.

CHECK:

(a) Applying 490 kPa (5 kgf/cm^2, 71 psi) of compressed air, check that the solenoid valve does not leak air.

(b) When battery positive voltage is supplied to the shift solenoid valve, check that the solenoid valve opens.

NG	**Replace shift solenoid valve No.1 or No.2.**

OK

2	**Check valve body (See page DI–289).**

NG	**Repair or replace valve body.**

OK

Repair or replace transmission
(See page AT–27, AT–34).

DI0VP–01

DTC	P0753, P0758	Shift Solenoid A/B Electrical Malfunction (Shift Solenoid Valve No.1/No.2)

CIRCUIT DESCRIPTION

Shifting from 1st to O/D is performed in combination with ON and OFF of the shift solenoid valves No.1 and No.2 controlled by ECM. If an open or short circuit occurs in either of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valve to allow the vehicle to be operated smoothly (Fail safe function).

Fail Safe Function:

If either of the shift solenoid valve circuits develops an open or short, the ECM turns the other shift solenoid ON and OFF to shift to the gear positions shown in the table below. The ECM also turns the shift solenoid valve SL OFF at the same time. If both solenoids are malfunction, hydraulic control cannot be performed electronically and must be done manually.

Manual shifting as shown in the following table must be done (In the case of a short circuit, the ECM stops sending current to the short circuited solenoid).

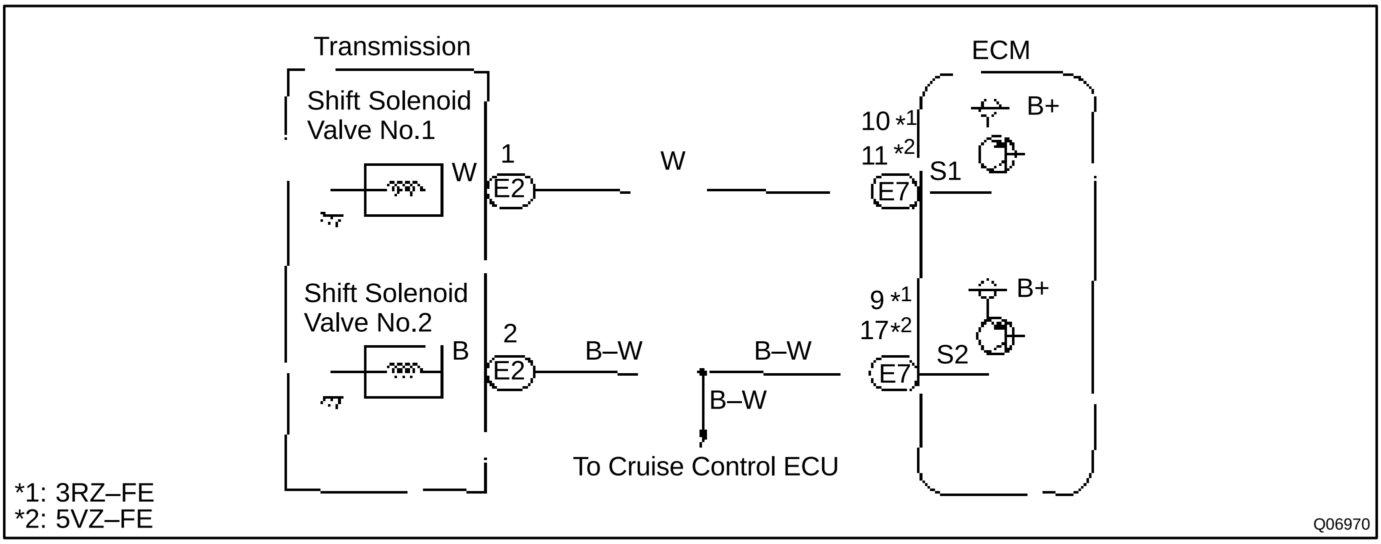
<table>
<tr><th rowspan="3">Position</th><th colspan="3">NORMAL</th><th colspan="3">SHIFT SOLENOID NO.1 MALFUNCTIONING</th><th colspan="3">SHIFT SOLENOID NO.2 MALFUNCTIONING</th><th>BOTH SOLENOIDS MALFUNCTIONING</th></tr>
<tr><th colspan="2">Solenoid valve</th><th rowspan="2">Gear</th><th colspan="2">Solenoid valve</th><th rowspan="2">Gear</th><th colspan="2">Solenoid valve</th><th rowspan="2">Gear</th><th rowspan="2">Gear when shift selector is manually operated</th></tr>
<tr><th>No.1</th><th>No.2</th><th>No.1</th><th>No.2</th><th>No.1</th><th>No.2</th></tr>
<tr><td rowspan="4">D</td><td>ON</td><td>OFF</td><td>1st</td><td>X</td><td>ON</td><td>3rd</td><td>ON</td><td>X</td><td>1st</td><td>O/D</td></tr>
<tr><td>ON</td><td>ON</td><td>2nd</td><td>X</td><td>ON</td><td>3rd</td><td>OFF</td><td>X</td><td>O/D</td><td>O/D</td></tr>
<tr><td>OFF</td><td>ON</td><td>3rd</td><td>X</td><td>ON</td><td>3rd</td><td>OFF</td><td>X</td><td>O/D</td><td>O/D</td></tr>
<tr><td>OFF</td><td>OFF</td><td>O/D</td><td>X</td><td>OFF</td><td>O/D</td><td>OFF</td><td>X</td><td>O/D</td><td>O/D</td></tr>
<tr><td rowspan="3">2</td><td>ON</td><td>OFF</td><td>1st</td><td>X</td><td>ON</td><td>3rd</td><td>ON</td><td>X</td><td>1st</td><td>3rd</td></tr>
<tr><td>ON</td><td>ON</td><td>2nd</td><td>X</td><td>ON</td><td>3rd</td><td>OFF</td><td>X</td><td>3rd</td><td>3rd</td></tr>
<tr><td>OFF</td><td>ON</td><td>3rd</td><td>X</td><td>ON</td><td>3rd</td><td>OFF</td><td>X</td><td>3rd</td><td>3rd</td></tr>
<tr><td rowspan="2">L</td><td>ON</td><td>OFF</td><td>1st</td><td>X</td><td>OFF</td><td>1st</td><td>ON</td><td>X</td><td>1st</td><td>1st</td></tr>
<tr><td>ON</td><td>ON</td><td>2nd</td><td>X</td><td>ON</td><td>2nd</td><td>ON</td><td>X</td><td>1st</td><td>1st</td></tr>
</table>

X: Malfunctions

Check the shift solenoid valve No.1 when DTC P0753 is output and check the shift solenoid valve No.2 when DTC P0758 is output.

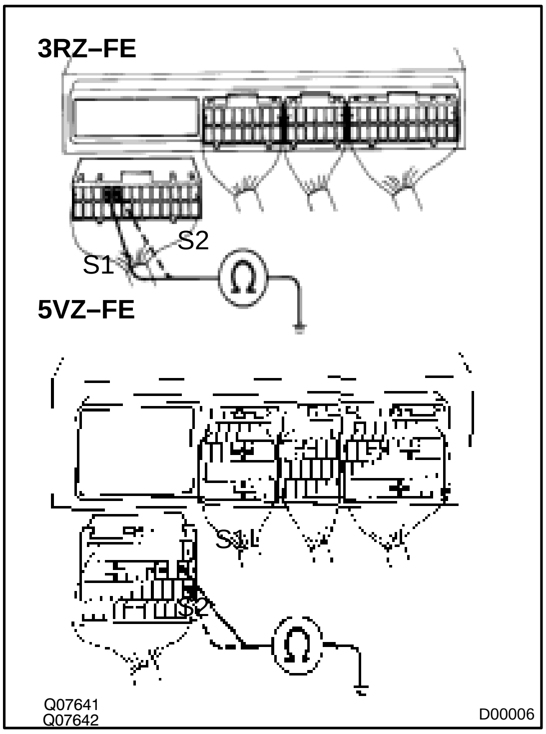
DTC No.	DTC Detecting Condition	Trouble Area
P0753 P0758	ECM checks for open or short circuit in shift solenoid valves No.1 and No.2 circuit when it changes ECM records DTC P0753 or P0758 if condition (a) or (b) is detected once, but it does not light up MIL After ECM detects condition (a) or (b) continuously 2 times or more in one–trip, it causes MIL light up until condition (a) or (b) disappears After that, if ECM detects condition (a) or (b) once, it starts lighting up MIL again: (a) Solenoid resistance is 8 Ω or less (short circuit) when solenoid is energized (b) Solenoid resistance is 100 kΩ or more (open circuit) when solenoid is not energized	●Open or short in shift solenoid valve No.1/No.2 circuit ●Shift solenoid valve No.1/No.2 ●ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Measure resistance between terminal S1 or S2 of ECM connector and body ground.**

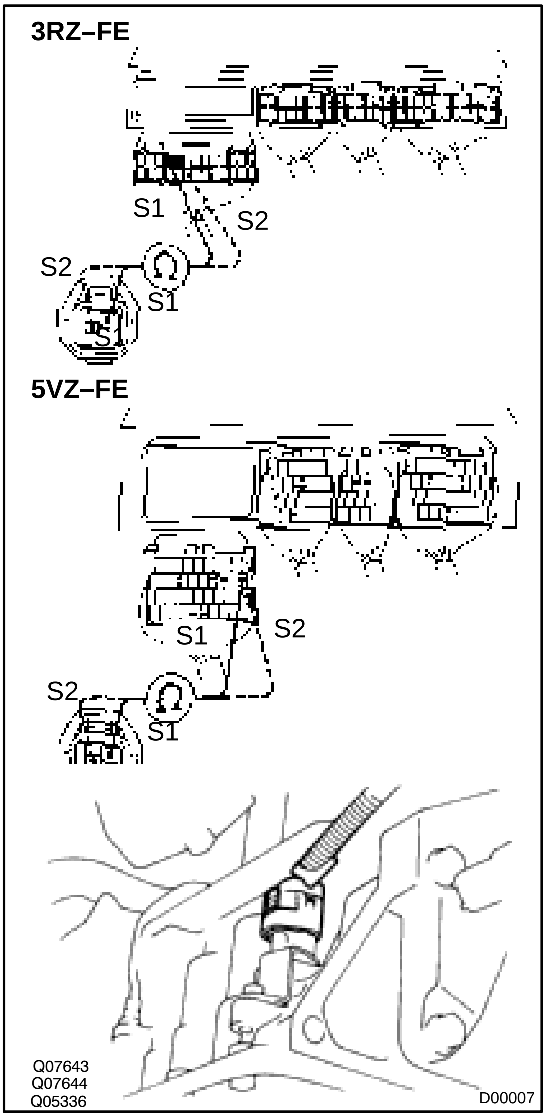


PREPARATION:
Disconnect the connector from the ECM.
CHECK:
Measure resistance between terminal S1 or S2 of ECM connector and body ground.
OK:
Resistance: 11 – 15 Ω

OK	**Check and replace ECM.**

NG

2	Check harness and connector between ECM connector and automatic transmission solenoid connector.



PREPARATION:

Disconnect the solenoid connector from the automatic transmission.

CHECK:

Check the harness and connector between terminal S1 or S2 of ECM connector and terminal S1 or S2 of solenoid connector.

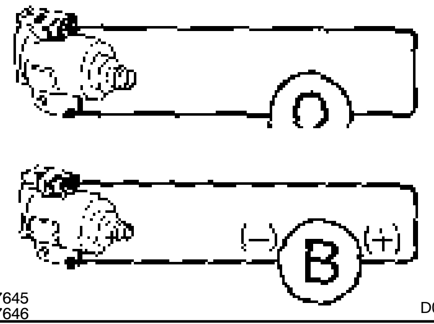
OK:

There is no open and no short circuit.

NG	Repair or replace harness or connector.

OK

3	Check shift solenoid valve No.1 or No.2.



Q07645
Q07646
D00005

PREPARATION:
(a) Remove the oil pan.
(b) Remove the shift solenoid valve No.1 or No.2.

CHECK:
(a) Measure resistance between solenoid connector and solenoid body.
(b) Connect positive lead to terminal of solenoid connector, negative lead to solenoid body.

OK:
(a) Resistance: 11 – 15 Ω
(b) The solenoid makes an operating noise.

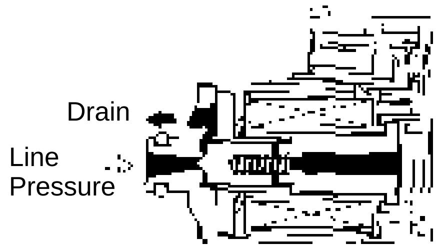
NG	Replace solenoid valve.

OK

Repair or replace solenoid wire.

DI0VR–01

DTC	P0770	Shift Solenoid E Malfunction (Shift Solenoid Valve SL)



Q06995

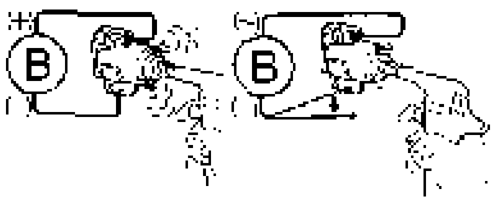
SYSTEM DESCRIPTION

The ECM uses the signals from the Throttle position sensor, mass air flow meter and crankshaft position sensor to monitor the engagement condition of the lock–up clutch.
Then the ECM compares the engagement condition of the lock–up clutch with the lock–up schedule in the ECM memory to detect mechanical trouble of the shift solenoid valve SL, valve body and torque converter clutch.

DTC No.	DTC Detecting Condition	Trouble Area
P0770	Lock–up does not occur when driving in the lock–up range (normal driving at 80 km/h [50 mph]), or lock–up remains ON in the lock–up OFF range (2 trip detection logic)	●Shift solenoid valve SL is stuck open or closed ●Valve body blocked up or stuck ●Lock–up clutch

INSPECTION PROCEDURE

1	**Check solenoid valve SL operation.**



Q07640

PREPARATION:

(a) Remove the oil pan.

(b) Remove the shift solenoid valve SL.

CHECK:

(a) Applying 490 kPa (5 kgf/cm^2, 71 psi) of compressed air, check that the solenoid valve does not leak air.

(b) When battery voltage is supplied to the shift solenoid valve, check that the solenoid valve opens.

NG → **Replace solenoid valve SL.**

OK

2	Check valve body (See page DI–289).

NG — Repair or replace valve body.

OK

Replace torque converter clutch (See page AT–27, AT–34).

DI0VU–01

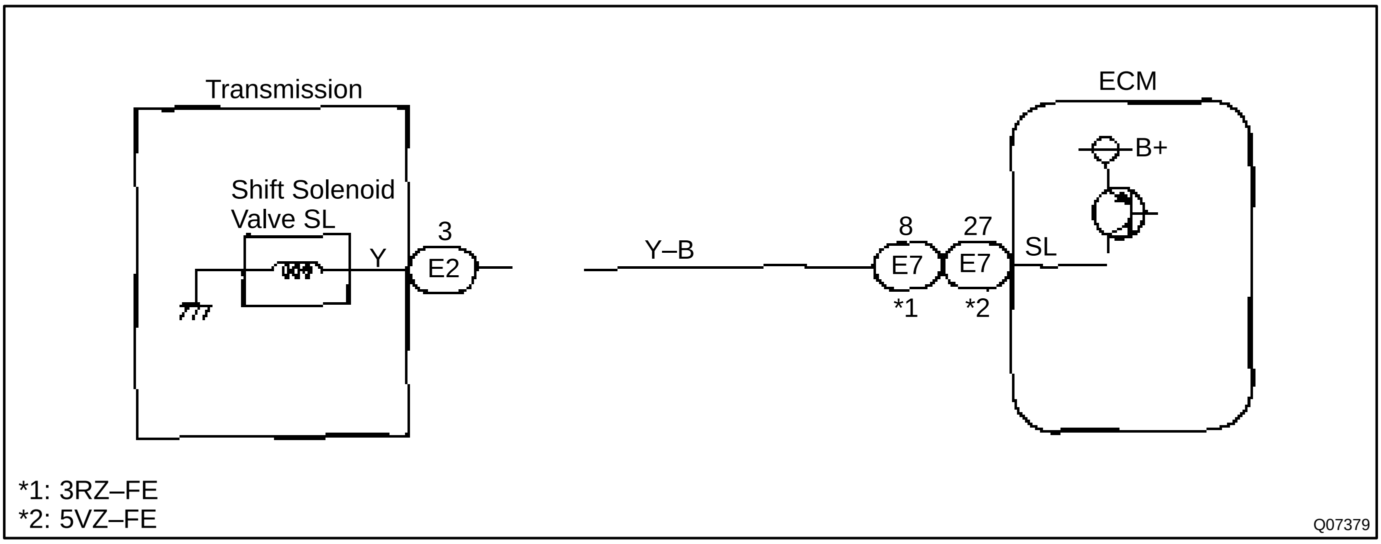
DTC	P0773	Shift Solenoid E Electrical Malfunction (Shift Solenoid Valve SL)

CIRCUIT DESCRIPTION

The shift solenoid valve SL is turned ON and OFF by signals from the ECM to control the hydraulic pressure acting on the lock–up relay valve, which then controls operation of the lock–up clutch.
Fail safe function:
If the ECM detects a malfunction, it turns the shift solenoid valve SL OFF.

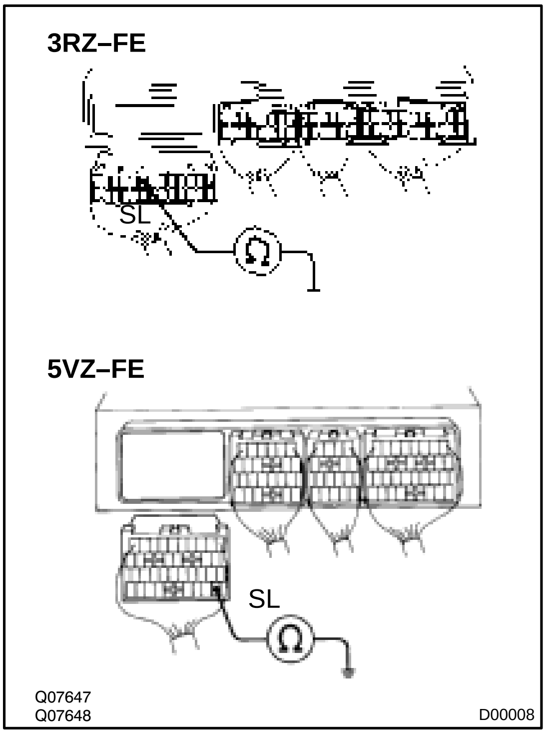
DTC No.	Detection ItemDTC Detecting Condition	Trouble Area
P0773	Either (a) or (b) are detected for 1 time: (2 trip detection logic) (a) Solenoid resistance is 8 Ω or less (short circuit) when solenoid is energized (b) Solenoid resistance is 100 kΩ or more (open circuit) when solenoid is not energized	●Open or short in shift solenoid valve SL circuit ●Shift solenoid valve SL ●ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Measure resistance between terminal SL of ECM connector and body ground.

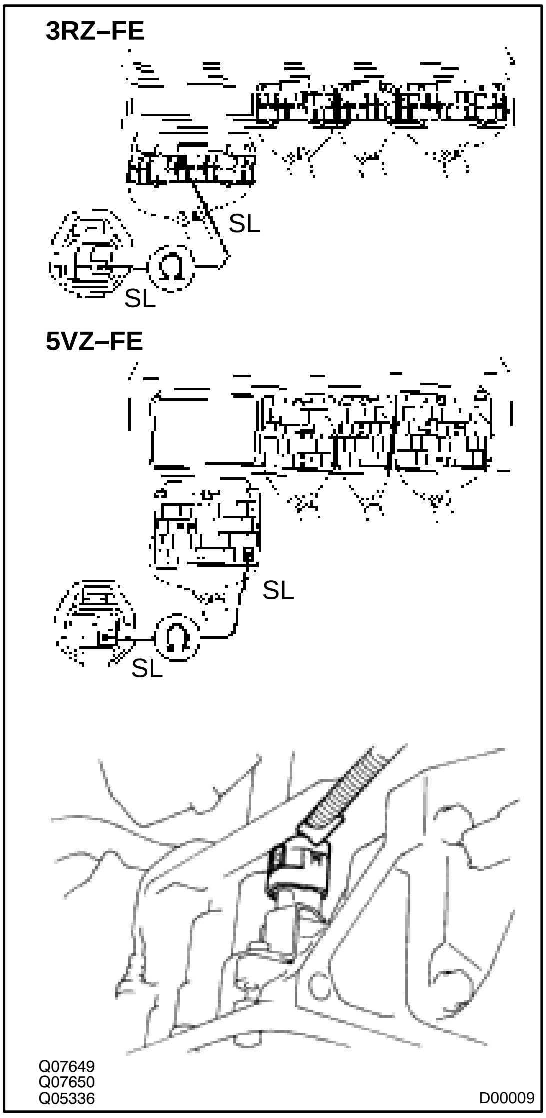


PREPARATION:
Disconnect the connector from the ECM.
CHECK:
Measure resistance between terminal SL of ECM connector and body ground.
OK:
Resistance: 11 – 15 Ω

OK → **Check and replace ECM.**

NG

2	**Check harness and connector between ECM connector and automatic transmission solenoid connector.**



PREPARATION:

Disconnect the solenoid connector from the transmission.

CHECK:

Check the harness between terminal SL of ECM connector and terminal SL of transmission solenoid connector.

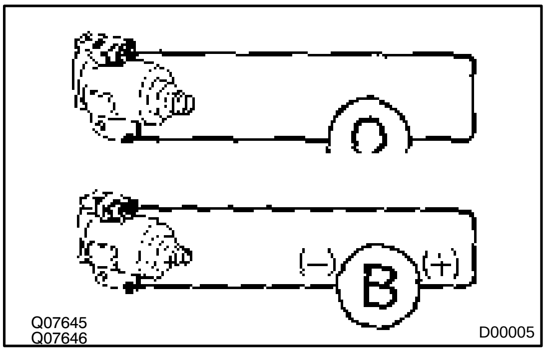
OK:

There is no open or short circuit.

NG	**Repair or replace tharness or connector.**

OK

3	**Check shift solenoid valve SL.**



Q07645
Q07646
D00005

PREPARATION:

(a) Remove the oil pan.

(b) Remove the shift solenoid valve SL.

CHECK:

(a) Measure resistance between terminal SL of shift solenoid valve and solenoid body.

(b) Connect positive lead to terminal of solenoid connector, negative lead to solenoid body.

OK:

(a) Resistance: 11 – 15 Ω

(b) The shift solenoid valve SL makes operation noise.

NG → **Replace shift solenoid valve SL.**

OK

Repair or replace solenoid wire.

DI0VW–01

DTC	P1520	Stop Light Switch Signal Malfunction

CIRCUIT DESCRIPTION

The purpose of this circuit is to prevent the engine from stalling, while driving in lock–up condition, when brakes are suddenly applied.
When the brake pedal is operated, this switch sends a signals to the ECM. Then the ECM cancels operation of the lock–up clutch while braking is in progress.

DTC No.	DTC Detecting Condition	Trouble Area
P1520	Stop light switch does not turn off even once the vehicle is driven (2 trip detection logic)	●Short in stop light switch signal circuit ●Stop light switch ●ECM

WIRING DIAGRAM

See page 3RZ–FE DI–110, 5VZ–FE DI–250.

INSPECTION PROCEDURE

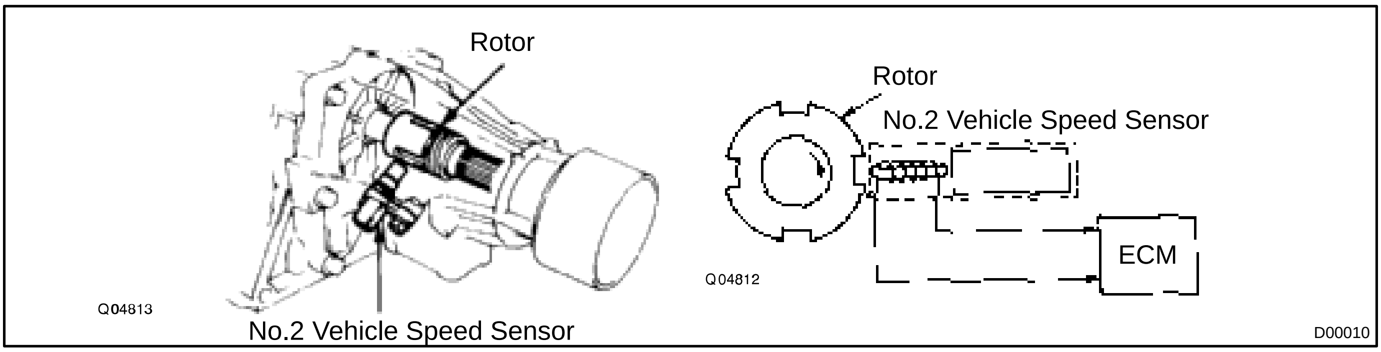
See page 3RZ–FE DI–110, 5VZ–FE DI–250.

DI0VZ–01

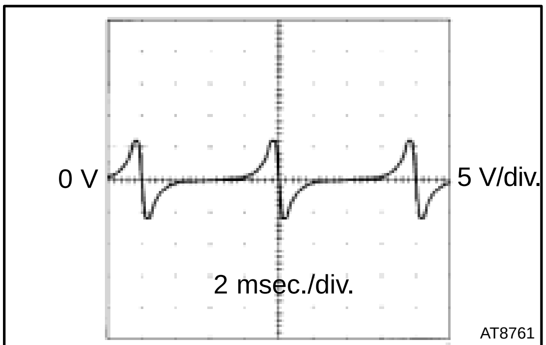
DTC	P1700	Speed Sensor No.2 Circuit Malfunction (No.2 Vehicle Speed Sensor) (3RZ–FE)

CIRCUIT DESCRIPTION

The No.2 vehicle speed sensor detects the rotation speed of the transmission output shaft and sends signals to the ECM. The ECM determines the vehicle speed based on these signals.
An AC voltage is generated in the No.2 vehicle speed sensor coil as the rotor mounted on the output shaft rotates, and this voltage is sent to the ECM.
The gear shift point and lock–up timing are controlled by the ECM based on the signals from this vehicle speed sensor and the throttle position sensor signal.
If the No.2 vehicle speed sensor malfunctions, the ECM uses input signals from the No.1 vehicle speed sensor as a back–up signal.



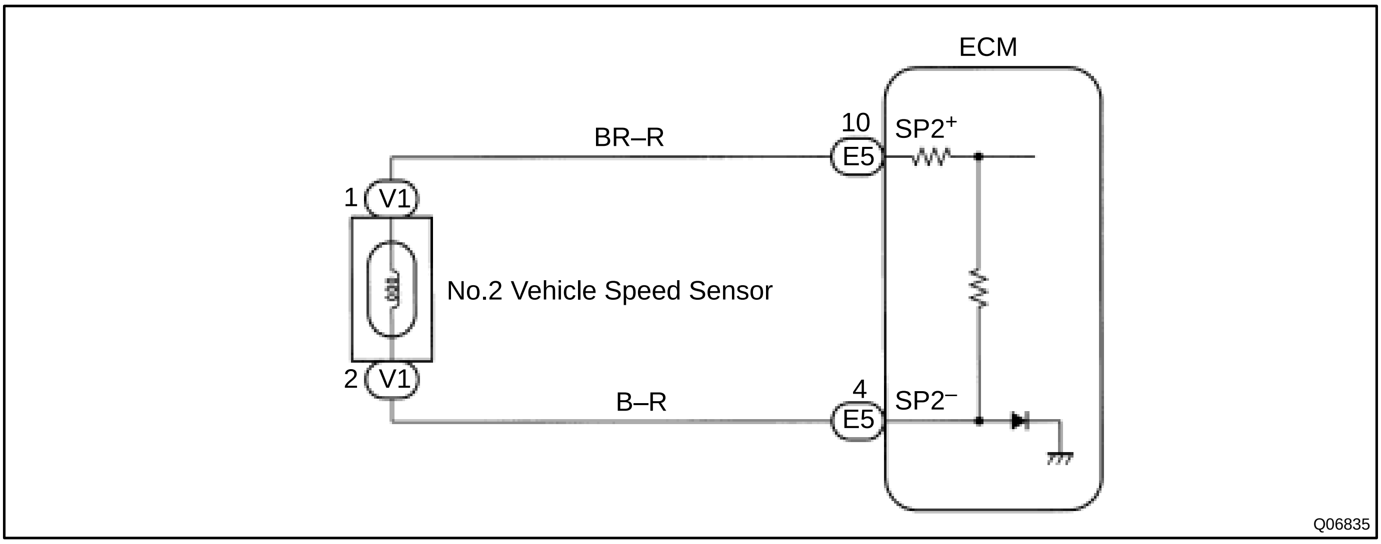
DTC No.	DTC Detecting Condition	Trouble Area
P1700	All conditions below are detected 500 times or more continuously: (2 trip detection logic) (a) No signal from No.2 vehicle speed sensor is input to ECM while 4 pulses of No.1 vehicle speed sensor signal is sent (b) Vehicle speed: 9 km/h (5.6 mph) or more for as least 4 seconds (c) Park/neutral position switch: OFF (Other than P or N)	●Open or short in No.2 vehicle speed sensor circuit ●No.2 vehicle speed sensor ●ECM



Reference

Wavefrom between terminals $SP2^{+}$ and $SP2^{-}$ when vehicle speed is approx. 60 km/h (37 mph).

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check vehicle speed value or resistance between terminals SP2+ and SP2– of ECM.

When using OBD II scan tool or TOYOTA hand–held tester:

PREPARATION:

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

(b) Start the engine and OBD II scan tool or TOYOTA hand–held tester main switch ON.

CHECK:

Drive the vehicle and read vehicle speed value.

OK:

Vehicle speed matches tester speed value.

When not using OBD II scan tool or TOYOTA hand–held tester:

PREPARATION:

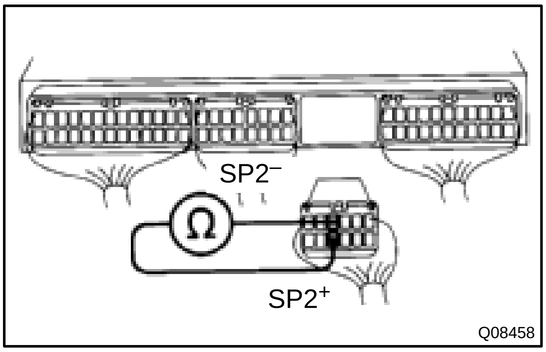
Disconnect the connector from the ECM.

CHECK:

Check resistance between terminals SP2+ and SP2– of ECM.

OK:

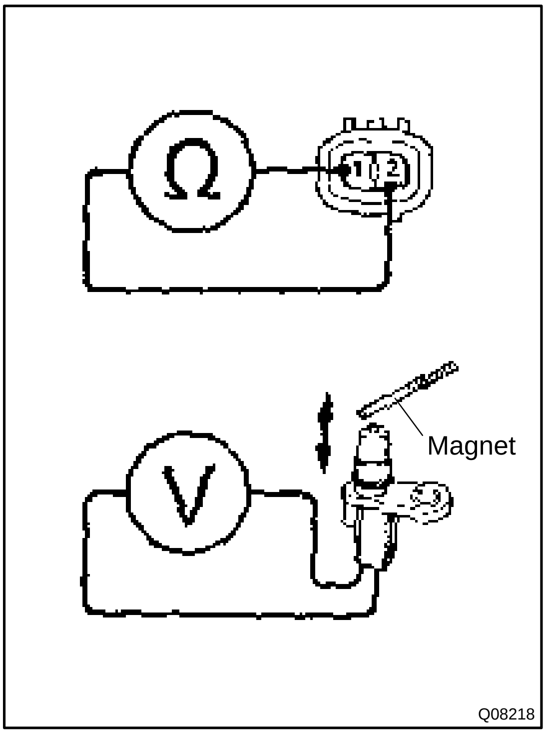
Resistance: 560 – 680 Ω



OK	Check and replace ECM.

NG

2	**Check No.2 vehicle speed sensor.**



PREPARATION:

Remove the No.2 vehicle speed sensor from the transmission.

CHECK:

(a) Measure resistance between terminals 1 and 2 of vehicle speed sensor.

(b) Check voltage between terminals 1 and 2 of vehicle speed sensor when a magnet is put close to the front end of the vehicle speed sensor then taken away quickly.

OK:

(a) Resistance: 560 – 680 Ω

(b) Voltage is generated intermittently.

HINT:

The voltage generated is extremely low.

NG → **Replace No.2 vehicle speed sensor.**

OK

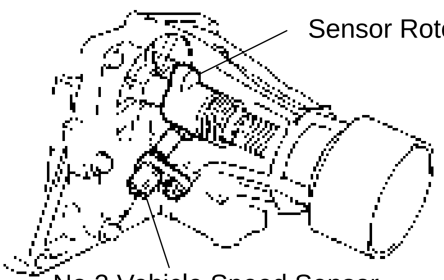
Check and repair the harness and connector between ECM and No.2 vehicle speed sensor (See page IN–24).

DI0W1–01

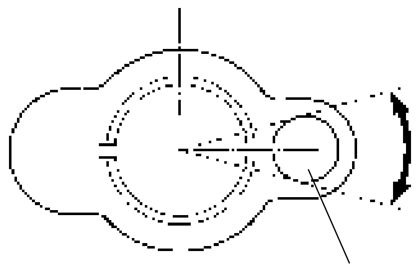
DTC	P1700	Speed Sensor No.2 Circuit Malfunction (No.2 Vehicle Speed Sensor) (5VZ–FE)

CIRCUIT DESCRIPTION

A rotor with built in permanent magnet is mounted on the output shaft. Every time the output shaft (and thus the rotor) makes one complete revolution, the permanent magnet acticates the reed switch, which is built into the No.2 vehicle speed sensor, causing it to generate signal. This shignal, which corresponds to the governor pressure in a conventional automatic transmission, is sent to the ECM, which uses it in controlling the shift points and the operation of the look–up clutch.
This sensor outputs one pulse for every one revolution of the output shaft.
If the No.2 vehicle speed sensor malfunctions, the ECM uses input signals from the No.1 vehicle speed sensor as a back–up signal.



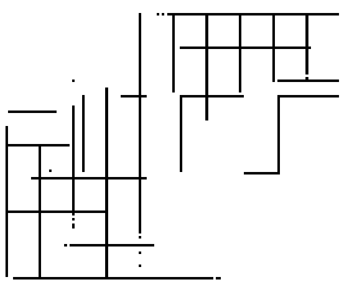
Q06437



Q06436

D00222

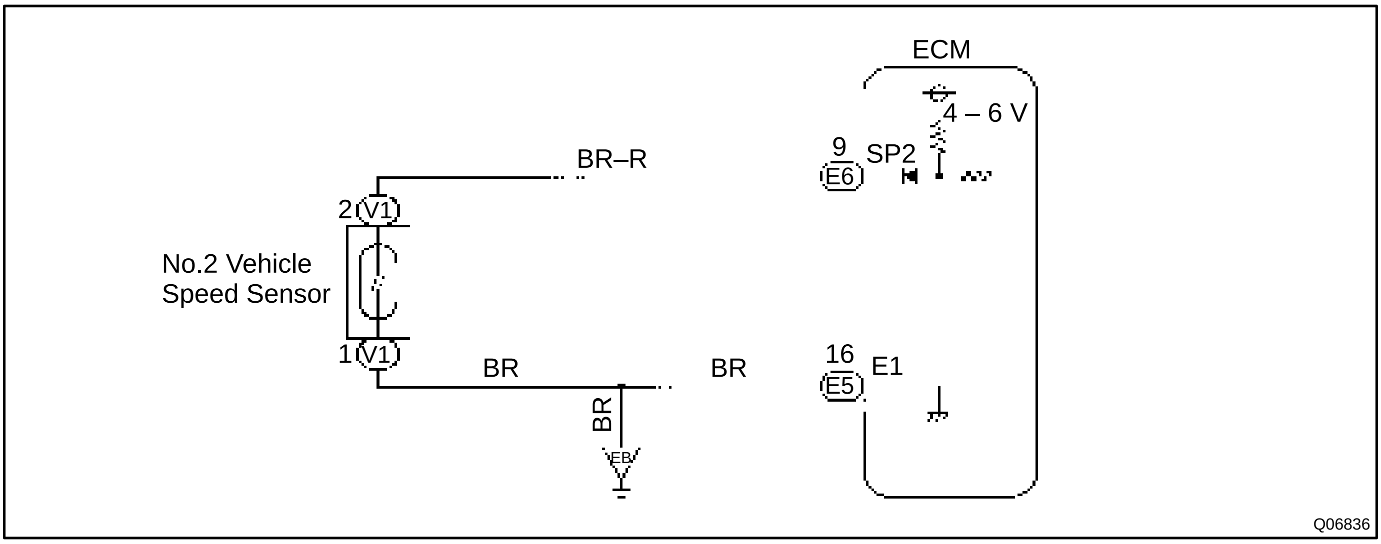
DTC No.	DTC Detecting Condition	Trouble Area
P1700	All conditions below are detected 500 times or more continuously: (2 trip detection logic) (a) No signal from No.2 vehicle speed sensor is input to ECM while 4 pulses of No.1 vehicle speed sensor signal is sent (b) Vehicle speed: 9 km/h (5.6 mph) or more for as least 4 seconds (c) Park/neutral position switch: OFF (Other than P or N) (d) Transfer position: Other than N position (A340F only)	●Open or short in No.2 vehicle speed sensor circuit ●No.2 vehicle speed sensor ●ECM



D00251

Reference
Wavefrom between terminals SP2 and E1 when vehicle speed is approx. 60 km/h (37 mph).

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check vehicle speed value or resistance between terminals SP2 and E1 of ECM.**

When using OBD II scan tool or TOYOTA hand–held tester:

PREPARATION:

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

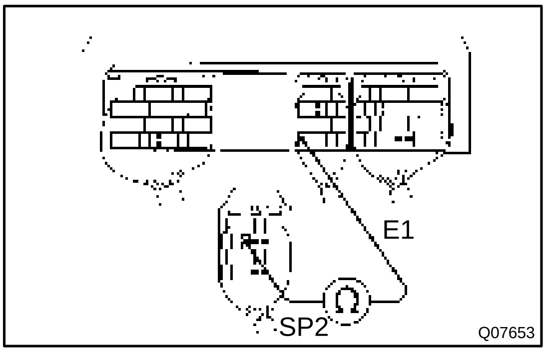
(b) Start the engine and OBD II scan tool or TOYOTA hand–held tester main switch ON.

CHECK:

Drive the vehicle and read vehicle speed value.

OK:

Vehicle speed matches tester speed value.



When not using OBD II scan tool or TOYOTA hand–held tester:

PREPARATION:

(a) Disconnect the connector from the ECM.

(b) Shift the shift lever to N position.

(c) Jack up the rear wheels on one side.

CHECK:

Check that there is continuity between terminals SP2 and E1 of ECM while slowly turning the jacked–up wheel by hand.

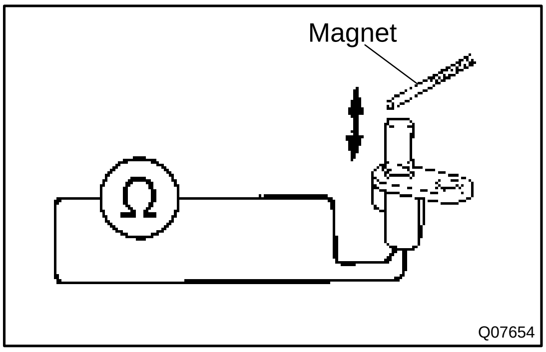
OK:

Resistance: Changes between 0 Ω and ∞ Ω

OK	**Check and replace ECM.**

NG

2	Check No.2 vehicle speed sensor.



PREPARATION:
Remove the No.2 vehicle speed sensor from the transmission.

CHECK:
Check that there is continuity between terminals of No.2 vehicle speed sensor connector when a magnet is put close to it as shown.

OK:

Resistance: Changes between 0 Ω and ∞ Ω

NG → **Replace No.2 vehicle speed sensor.**

OK

Check and repair harness and connector between ECM and No.2 vehicle speed sensor (See page IN–24). Check and repair sensor rotor.

DI0W5–01

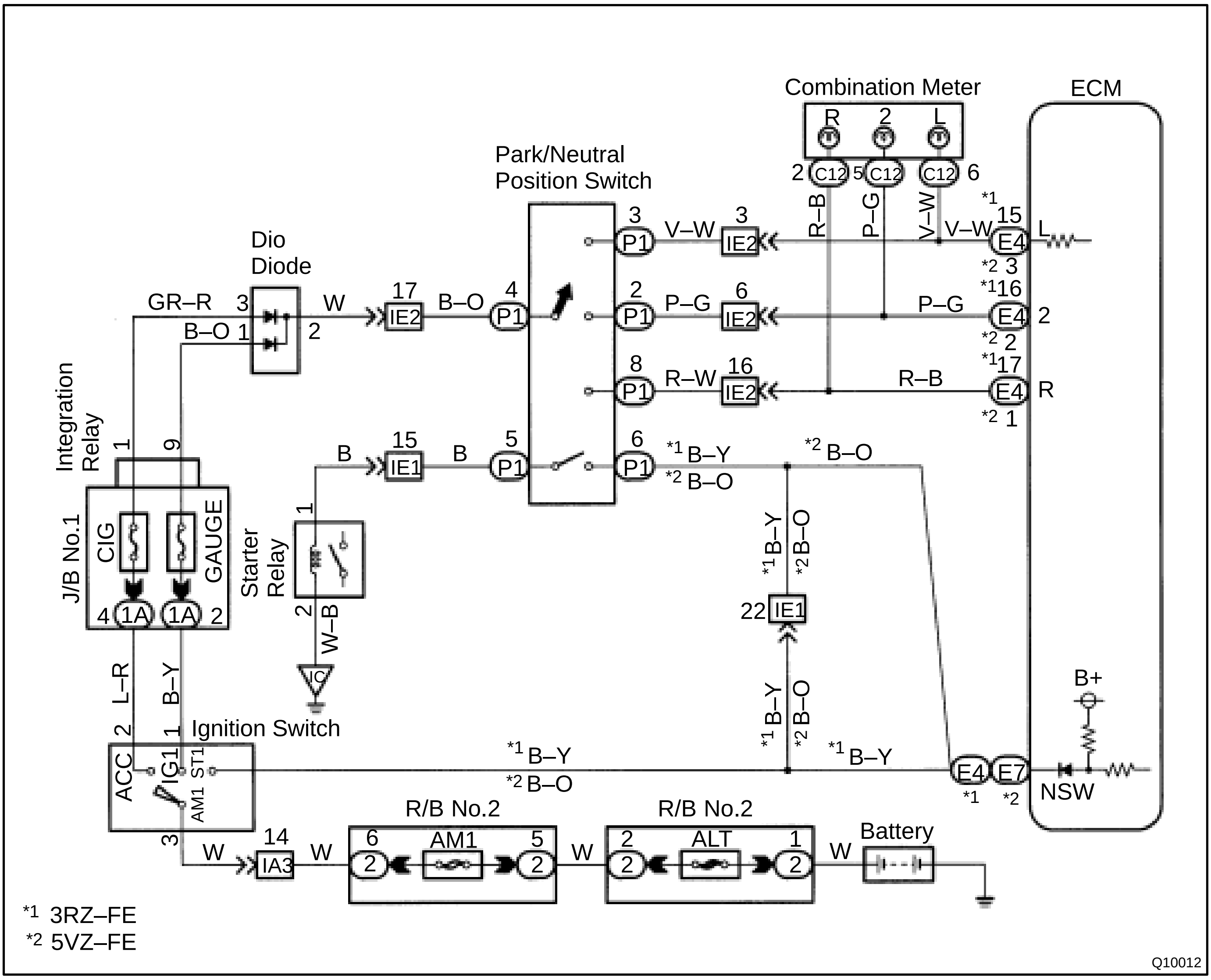
DTC	P1780	Park/Neutral Position Switch Malfunction

CIRCUIT DESCRIPTION

The park/neutral position switch detects the shift lever position and sends signals to the ECM.
The ECM receives signals (NSW, R, 2 and L) from the park/neutral position switch. When the signal is not sent to the ECM from the park/neutral position switch, the ECM judges that the shift lever is in D position.

DTC No.	DTC Detection Condition	Trouble Area
P1780	2 or more switches are ON simultaneously for R, N, 2 and L positions (2 trip detection logic)	●Short in park/neutral position switch circuit ●Park/neutral position switch ●ECM
	When driving under conditions (a), (b) and (c) for 30 seconds or more, park/neutral position switch is ON (N position) (2 trip detection logic) (a) Vehicle speed: 70 km/h (44 mph) or more (b) Engine speed: 1,500 ~ 2,500 rpm (c) Engine load: 0.6 g/rev	

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Read PNP, REVERSE, 2ND and LOW signals.**

When using TOYOTA hand–held tester:

PREPARATION:

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

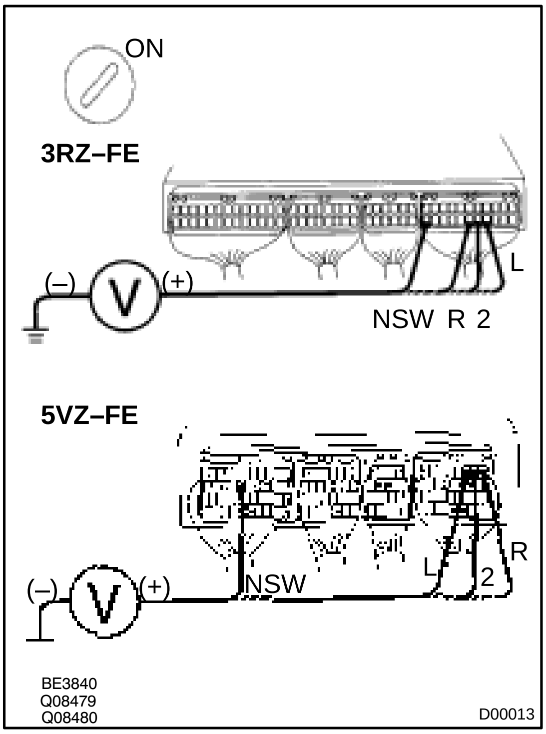
(b) Turn the ignition switch ON and TOYOTA hand–held tester main switch ON.

CHECK:

Shift lever into the P, R, N, 2 and L positions, and read the PNP, REVERSE, 2ND and LOW signals on the TOYOTA hand–held tester.

OK:

Shift position	Signal
2	2ND OFF → ON
L	LOW OFF → ON
R	REVERSE OFF → ON
P, N	PNP OFF → ON



When not using TOYOTA hand–held tester:

PREPARATION:

Turn the ignition switch ON.

CHECK:

Measure voltage between terminals NSW, 2, L and R of ECM and body ground when the shift lever is shifted to the following positions.

OK:

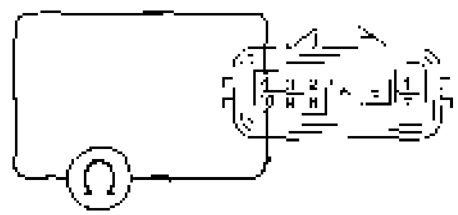
Position	NSW–Body ground	R–Body ground	2–Body ground	L–Body ground
P, N	0 V	0 V	0 V	0 V
R	9 ~ 14 V*	7.5 ~ 14 V*	0 V	0 V
D	9 ~ 14 V	0 V	0 V	0 V
2	9 ~ 14 V	0 V	7.5 ~ 14 V*	0 V
L	9 ~ 14 V	0 V	0 V	7.5 ~ 14 V*

*: The voltage will drop slightly due to lighting up of the back up light.

OK	**Check and replace ECM.**

NG

2	**Check park/neutral position switch.**


Q07657

PREPARATION:
(a) Jack up the vehicle.
(b) Disconnect the park/neutral position switch connector.

CHECK:
Check continuity between each terminal shown below when the shift lever is moved to each position.

OK:

Shift Position	Terminal No. to continuity	Terminal No. to continuity
P	4 – 7	5 – 6
R	4 – 8	–
N	4 – 10	5 – 6
D	4 – 9	–
2	2 – 4	–
L	3 – 4	–

NG → **Replace park/neutral position switch.**

OK

Repair or replace harness and connector between battery and park/neutral position switch, park/neutral position switch and ECM (See page IN–24).

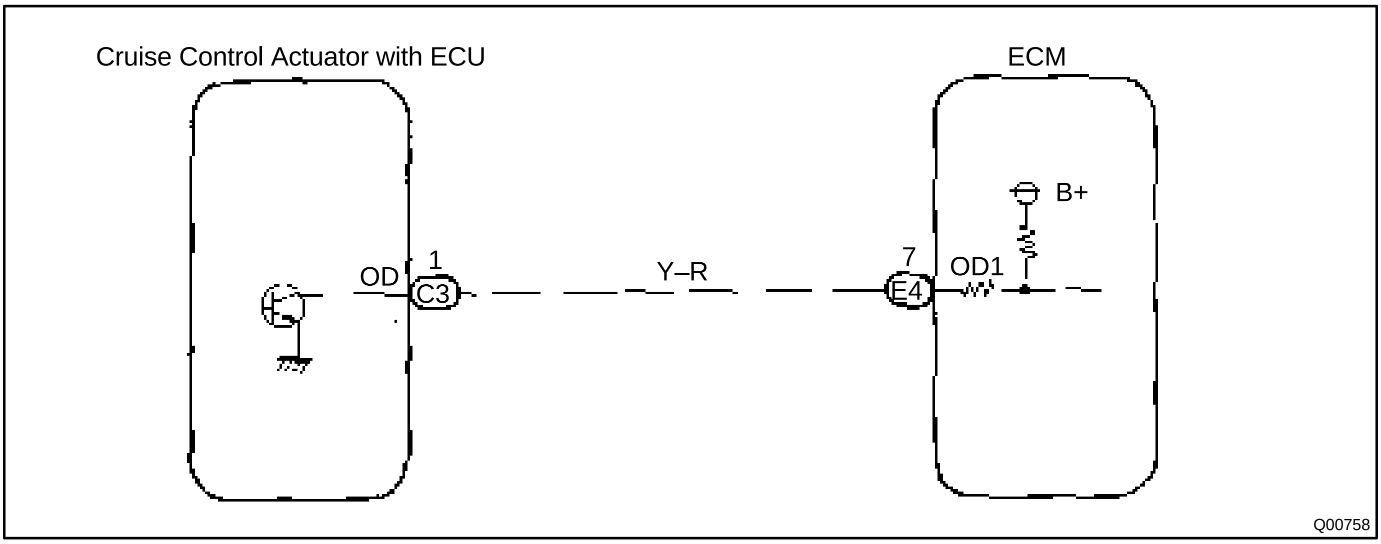
DI0W9–01

O/D Cancel Signal Circuit (5VZ–FE only)

CIRCUIT DESCRIPTION

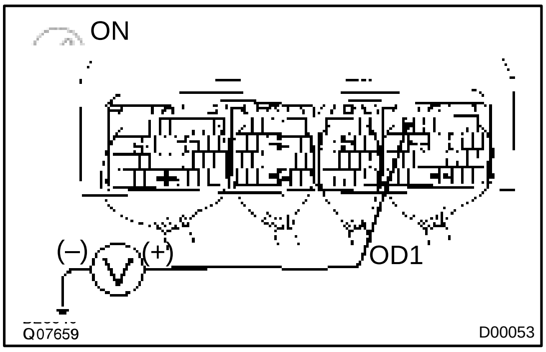
While driving uphill with cruise control activated, in order to minimize gear shifting and provide smooth cruising overdrive may be prohibited temporarily under some condition.
The cruise control ECU sends O/D cut signals to the ECM as necessary and the ECM cancels O/D shifting until these signals are discontinued.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check voltage between terminal OD1 of ECM and body ground.



PREPARATION:
Turn the ignition switch ON.

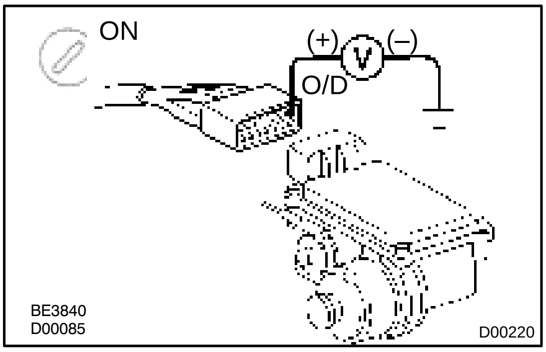
CHECK:
Measure voltage between terminal OD1 of ECM and body ground.

OK:
Voltage: 9 – 14 V

OK	Proceed to next circuit inspection shown on problem symptoms table (See page DI–289).

NG

2	**Check voltage between terminal OD of cruise control ECU harness side connector and body ground.**



PREPARATION:
(a) Disconnect the cruise control ECU connector.
(b) Turn the ignition switch ON.
CHECK:
Measure voltage between terminal OD of cruise control ECU harness side connector and body ground.
OK:
Voltage: 9 – 14 V

OK → **Check and replace cruise control actuator with ECU.**

NG

3	**Check harness and connector between cruise control ECU and ECM (See page IN–24).**

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

OK

Check and replace ECM.

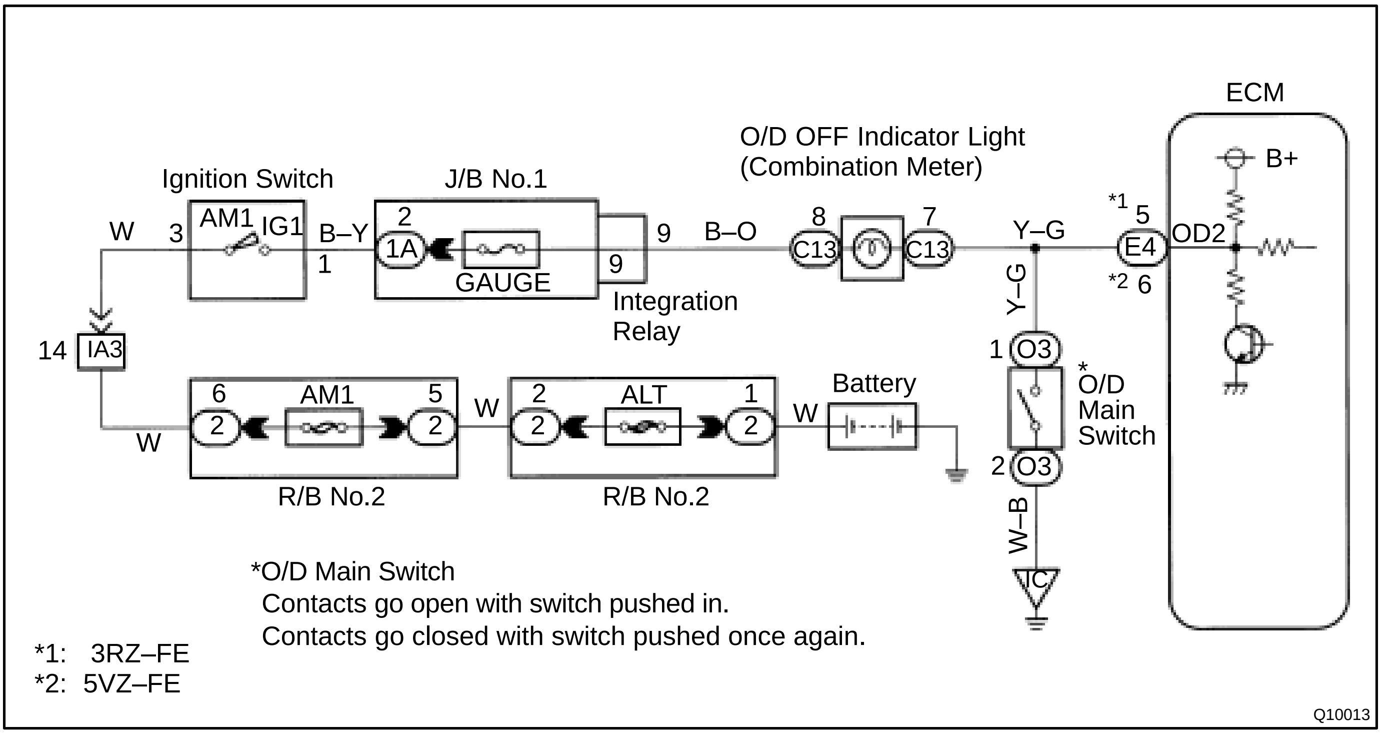
DI0WD–01

O/D Main Switch & O/D OFF Indicator Light Circuit

CIRCUIT DESCRIPTION

The O/D main switch contacts go open when the switch is pushed in and go closed when it is pushed out. In O/D main switch at OFF position, the O/D OFF indicator light lights up, and the ECM prohibits shifting O/D.

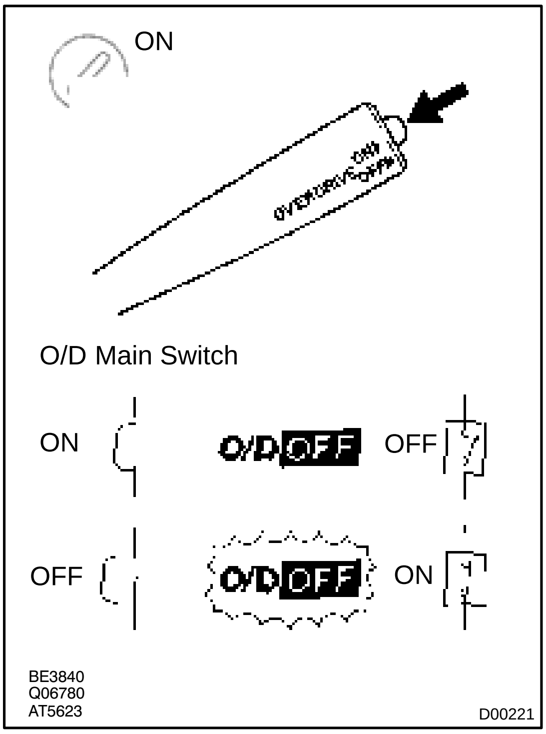
WIRING DIAGRAM



INSPECTION PROCEDURE

O/D OFF indicator light does not light up:

1	**Check operation of O/D main switch.**



PREPARATION:

Turn the ignition switch ON.

CHECK:

(a) Check the O/D OFF indicator light when O/D main switch is pushed in to ON.

(b) Check the O/D OFF indicator light when O/D main switch is pushed again to OFF.

OK:

(a) O/D OFF indicator light goes off
(b) O/D OFF indicator light lights up

NG	**Go to step 4.**

OK

2	Check OVRDRIVE CUT SW2 signal.

When using TOYOTA hand–held tester:

PREPARATION:

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

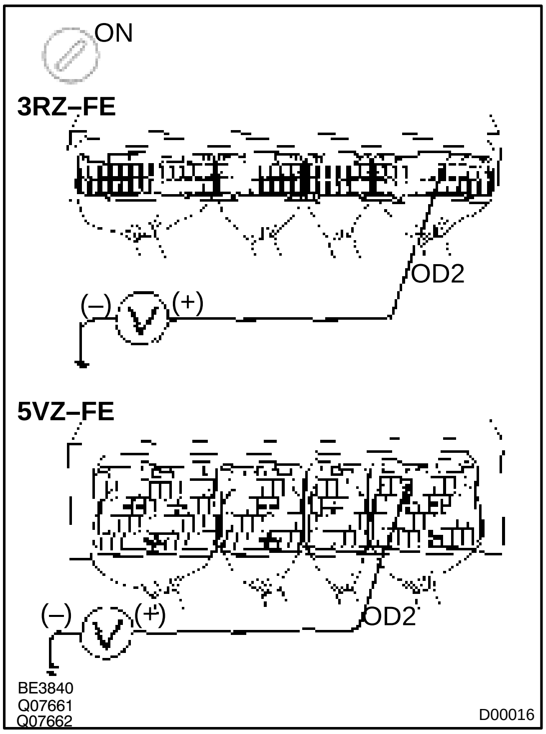
(b) Turn the ignition switch ON and TOYOTA hand–held tester main switch ON.

CHECK:

Read the "OVRDRIVE CUT SW2" signal on the TOYOTA hand–held tester.

OK:

O/D main switch condition	OVRDRIVE CUT SW2 signal
ON (Pushed in)	ON
OFF (Pushed once again)	OFF



When not using TOYOTA hand–held tester:

PREPARATION:

Turn the ignition switch ON.

CHECK:

Check voltage between terminal OD2 of ECM and body ground.

OK:

O/D main switch condition	Voltage
ON (Pushed in)	9 – 14 V
OFF (Pushed once again)	Below 3 V

OK → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–289).**

NG

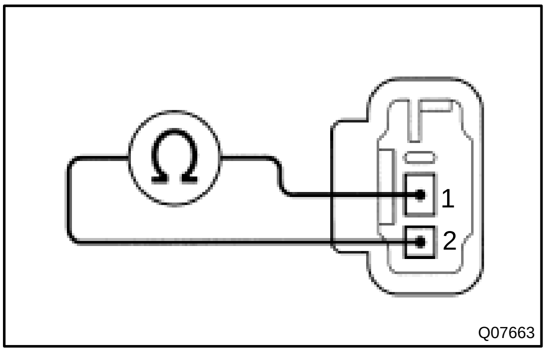
3	**Check harness and connector between O/D OFF indicator light and ECM (See page IN–24).**

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

OK

Check O/D main switch.

4	**Check O/D main switch.**



PREPARATION:

Disconnect the O/D main switch connector.

CHECK:

Check continuity resistance between terminal 1 and 2 of O/D main switch connector.

OK:

O/D main switch condition	Specified condition
ON (Pushed in)	No continuity
OFF (Pushed once agin)	Continuity

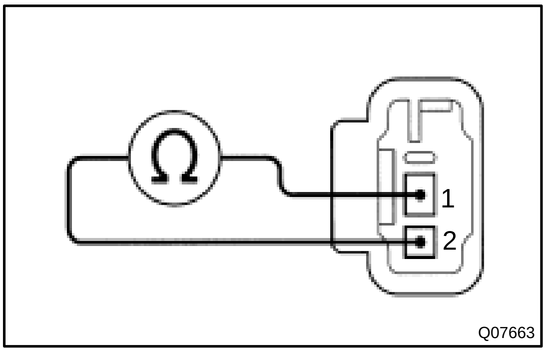
NG → **Replace O/D main switch.**

OK

Check and replace the combination meter (See page BE–38).

O/D OFF indicator light remains ON:

5	**Check O/D main switch.**



PREPARATION:

Disconnect the O/D main switch connector.

CHECK:

Check continuity between terminals 1 and 2 of O/D main switch connector.

OK:

O/D main switch	Specified condition
ON	No continuity
OFF	Continuity

NG → **Replace O/D main switch.**

OK

6	**Check harness and connector between O/D OFF indicator light and O/D main switch, O/D OFF indicator light and ECM (See page IN–24).**

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

OK

Check and replace ECM.

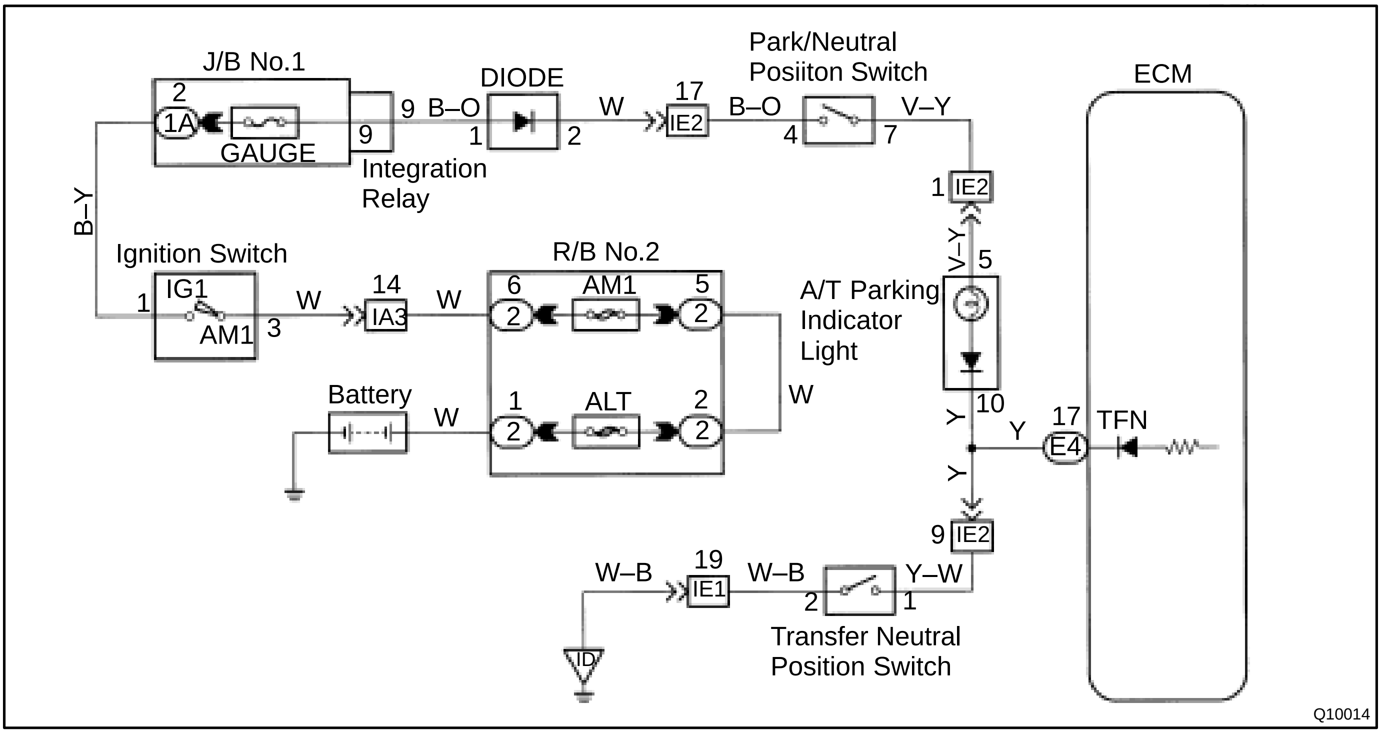
DI0WI–01

A/T. P. (Automatic Transmission Parking) Indicator Circuit (4WD only)

CIRCUIT DESCRIPTION

The propeller shaft and wheels are free even when the transmission shift lever is set to P as long as the transfer shift lever is in Neutral position. The A/T. P. indicator light lights up to warn the drive that the propeller shaft and wheels are not locked.
If the A/T. P. indicator light goes on, the transfer shift lever should be shifted out of N position.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check park/neutral position switch (See page DI–314).**

NG — **Replace park/neutral position switch.**

OK

2	**Check transfer neutral position switch (See page TR–9).**

OK → **Replace transfer neutral position switch.**

NG

3	**Check combination meter (See page BE–38).**

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

OK

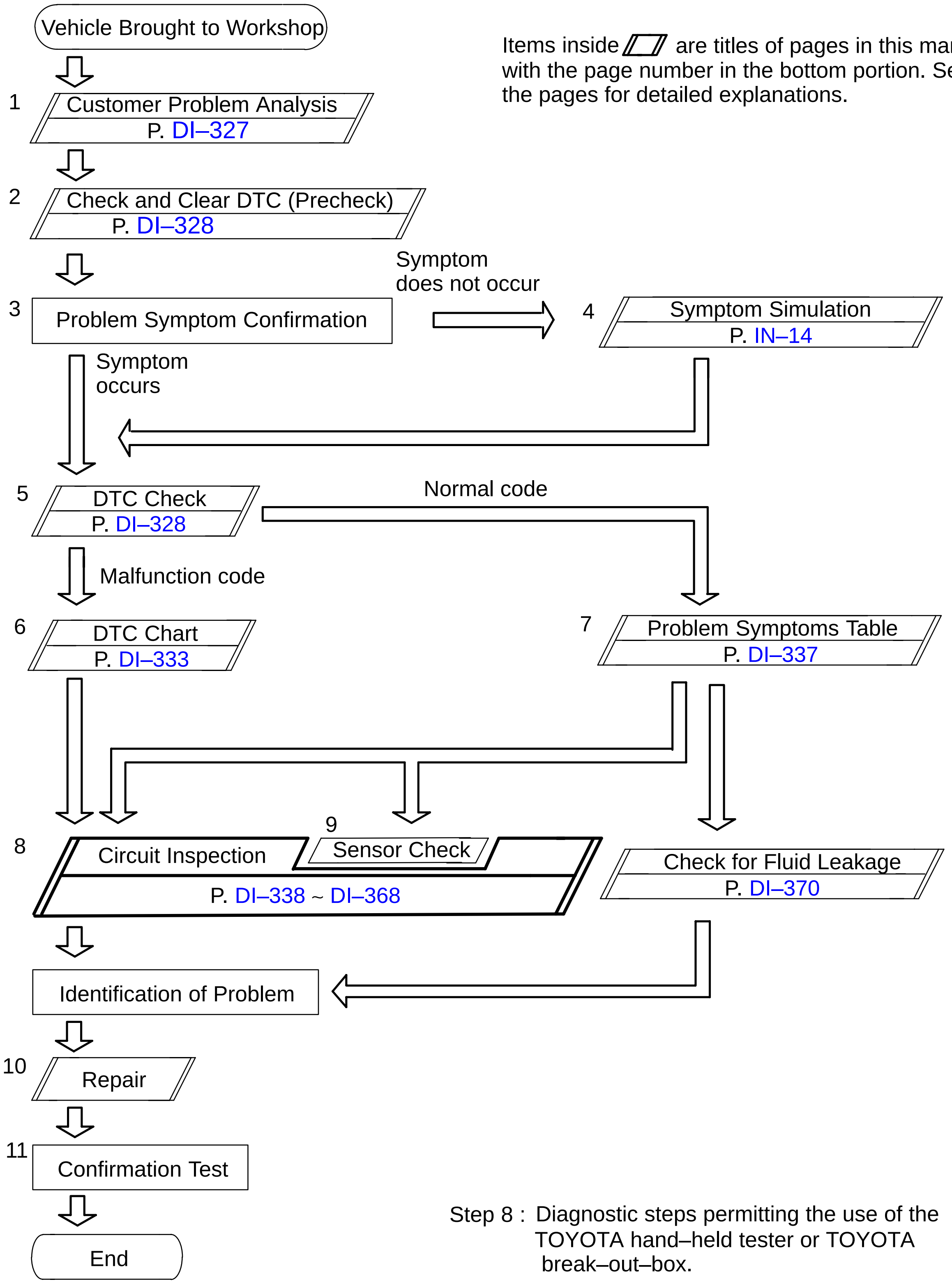
Check and replace harness and connector (See page IN–24).

ANTI–LOCK BRAKE SYSTEM

HOW TO PROCEED WITH TROUBLESHOOTING

DI0ZF–01

Troubleshoooting 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 pages for detailed explanations.

Step 8 : Diagnostic steps permitting the use of the TOYOTA hand–held tester or TOYOTA break–out–box.

DI0ZI–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)

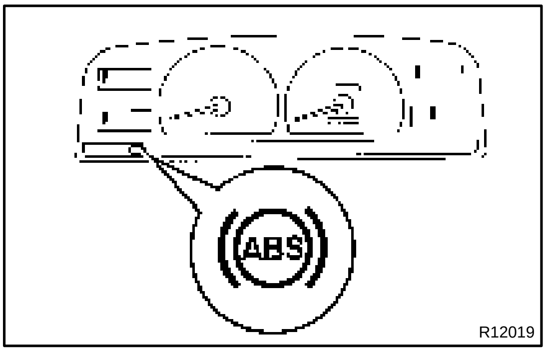
Symptoms	☐ ABS does not operate.	
	☐ ABS does not operate efficiently.	
	ABS Warning Light Abnormal	☐ Remains ON ☐ Does not Light Up

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

DI0ZM–01

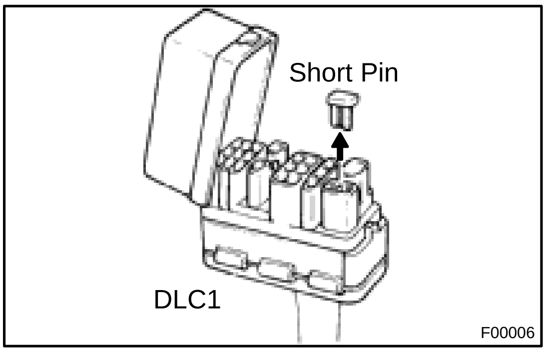
PRE–CHECK

1. DIAGNOSIS SYSTEM

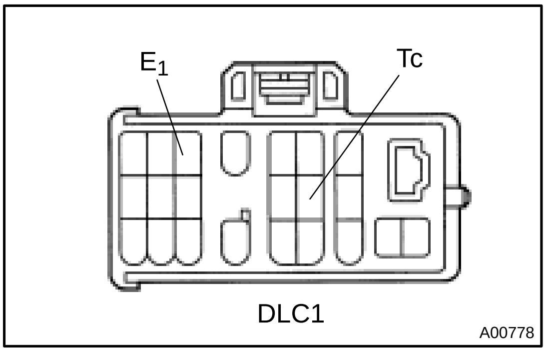


(a) Check the indicator light.
When the ignition switch is turned ON, check that the ABS warning light goes on for 3 seconds.

HINT:
If the indicator check result is not normal, proceed to trouble-shooting for the ABS warning light circuit (See page DI–362).

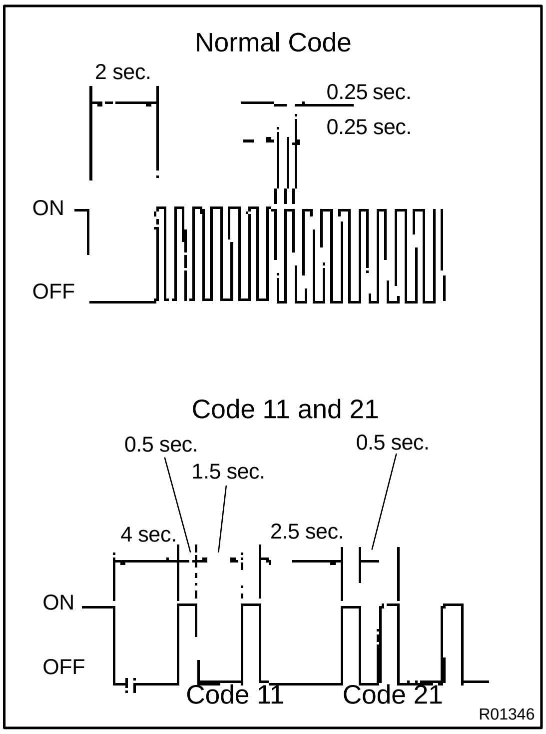


(b) Check the DTC.
(1) Turn the ignition switch ON.
(2) Disconnect the short pin from the DLC1.



(3) Using SST, connect terminals Tc and E_1 of the DLC1.
SST 09843–18020
(4) Read the DTC from the ABS warning light on the combination meter.

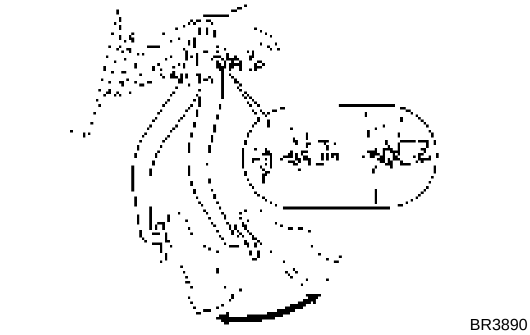
HINT:
- If no code appears, inspect the diagnostic circuit or ABS warning light circuit (See page DI–362 or DI–366).



- As an example, the blinking patterns for normal code and codes 11 and 21 are shown on the left.

(5) Code are explained in the code table on page DI–333.
(6) After completing the check, disconnect terminals Tc and E_1, and turn off the display.

If 2 or more malfunctions are indicated at the same time the lowest numbered DTC will be displayed 1st.



BR3890

(c) Clear the DTC.

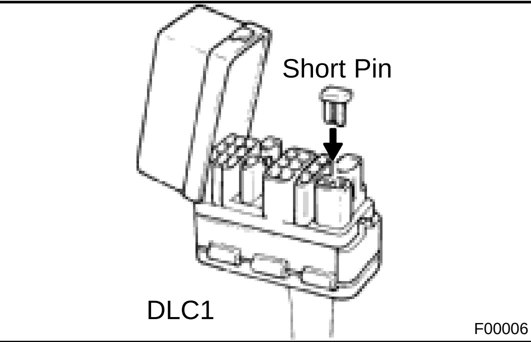
(1) Using SST, connect terminals Tc and E_1 of the DLC1 and remove the short pin from the DLC1.

SST 09843–18020

(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.



F00006

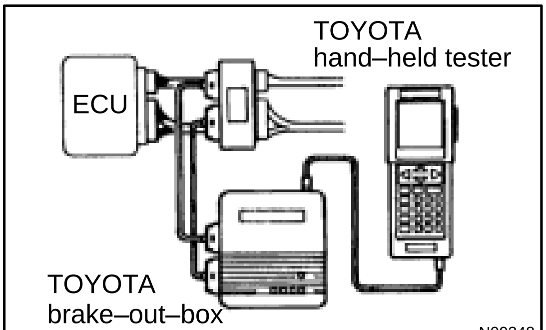
(5) Remove the SST from the terminals of the DLC1.

SST 09843–18020

(6) Connect the short pin to the DLC1.

HINT:

Cancellation can also be done by removing the ECU–B fuse, but in this case, other memory systems will also be cancelled out.



N09348

(d) Using TOYOTA brake–out–box and TOYOTA hand–held tester, measure the ECU terminal value.

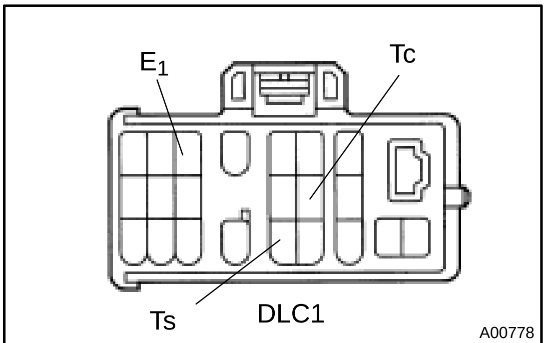
(1) Hook up the TOYOTA hand–held tester and TOYOTA break–out–box to the vehicle.

(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.



A00778

2. SPEED SENSOR SIGNAL AND DECELERATION SENSOR CHECK

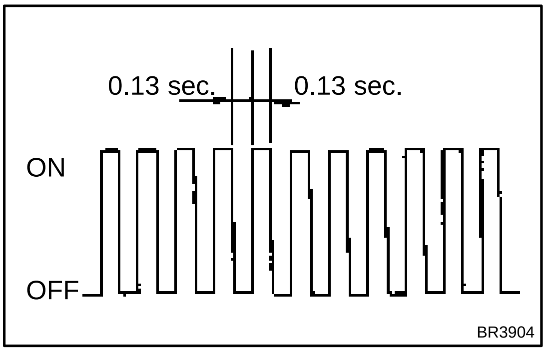
(a) Check the speed sensor signal.

(1) Turn the ignition switch OFF.

(2) Using SST, connect terminals Ts and E_1 of the DLC1.

SST 09843–18020

(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–362).

(5) Drive vehicle straight forward.

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

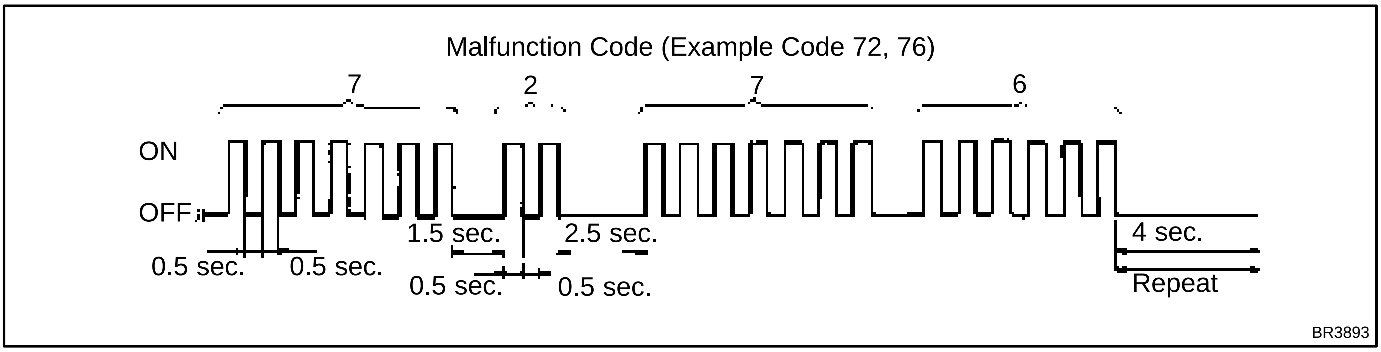
(6) Stop the vehicle.

(7) Using SST, connect terminals Tc and E_1 of the DLC1.

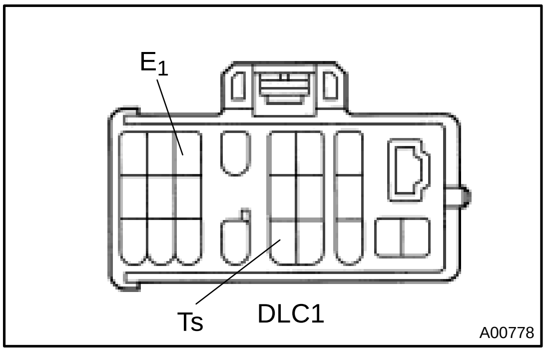
SST 09843–18020

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

HINT:
- See the list of DTC on page DI–333.
- If every sensor is normal, a normal code is output (A cycle of 0.25 sec. ON and 0.25 sec. OFF is repeated).
- If 2 or more malfunction are indicated at the same time, the lowest numbered code will be displayed 1st.



(9) After doing the check, disconnect terminals Ts and E_1, Tc and E_1 of the DLC1, and ignition switch turned OFF.



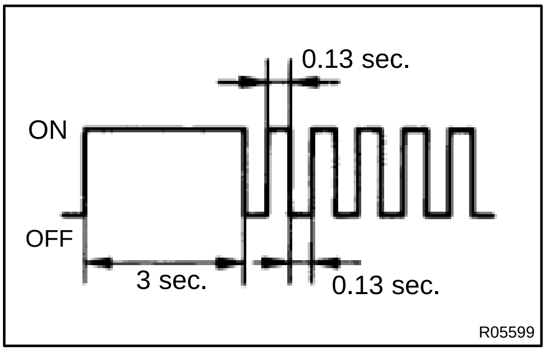
(b) Check the deceleration sensor detection point.

(1) Turn the ignition switch OFF.

(2) Using SST, connect terminals Ts and E_1 of the DLC1.

SST 09843–18020

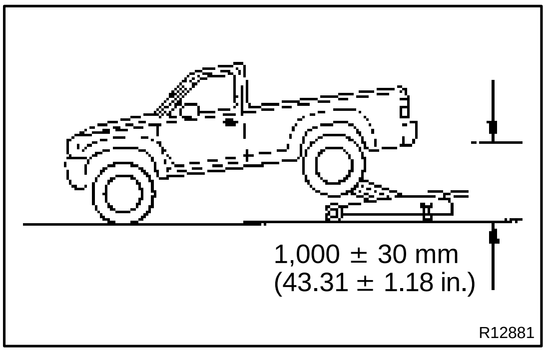
(3) Start the engine.



(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–362).



(5) Jack up the rear side of the vehicle slowly.

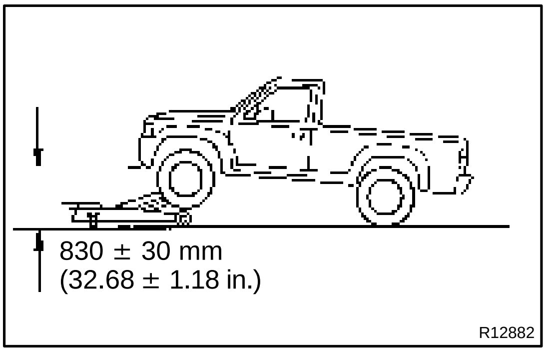
HINT:

When measuring the height, measure at the center of the lower body of the vehicle.

(6) Check that the warning light blinks.

If the warning light turns on, inspect the deceleration sensor installation. If the sensor installation is OK, replace the deceleration sensor.

(7) Jack down the vehicle slowly.



(8) Jack up the front side of the vehicle slowly, as shown.

HINT:

When measuring the height, measure at the center of the lower body of the vehicle.

(9) Check that the warning light blinks.

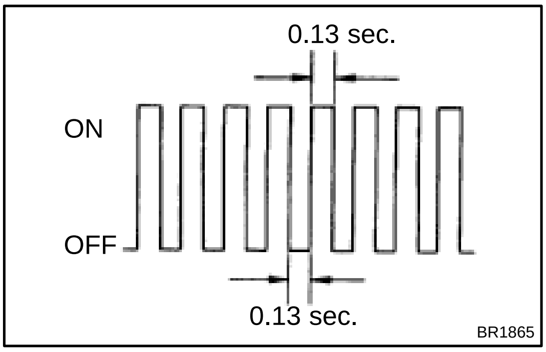
If the warning light turns on, inspect the deceleration sensor installation. If the sensor installation is OK, replace the deceleration sensor.

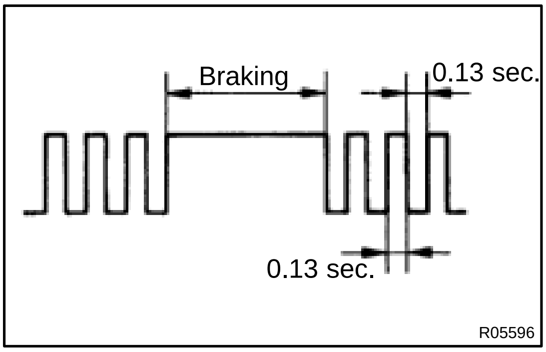
(10) Jack down the vehicle slowly.

(c) Check the deceleration sensor operation.

(1) Drive the vehicle straight ahead at about 20 km/h (12.4 mph) or more, lightly depress the brake pedal.

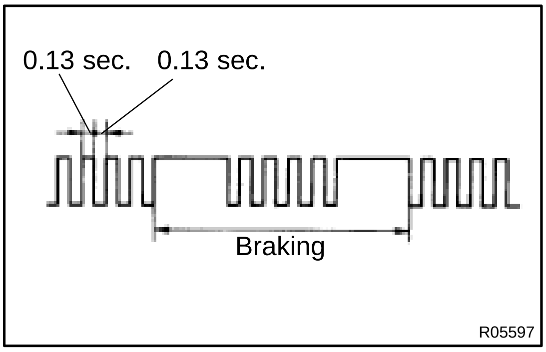
(2) Check that there is no change in the warning light pattern.





(3) Drive the vehicle straight ahead at about 20 km/h (12.4 mph) or more, and depress the brake pedal moderately.

(4) Check that the warning light turns on while braking.



(5) Drive the vehicle straight ahead at about 20 km/h (12.4 mph) or more, and depress the brake pedal strongly.

(6) Check that the warning light pattern changes while braking, as shown.

If the operation is not as specified, inspect the deceleration sensor installation. If the sensor installation is OK, replace the deceleration sensor.

(7) Stop the vehicle and turn the ignition switch OFF.

(8) Remove the SST from the terminals of the DLC1.
SST 09843–18020

(d) Check the DTC of the speed sensor function.

Code No.	Diagnosis	Trouble Area
71	Low output voltage of right front speed sensor	●Right front speed sensor ●Sensor installation
72	Low output voltage of left front speed sensor	●Left front speed sensor ●Sensor installation
73	Low output voltage of right rear speed sensor	●Right rear speed sensor ●Sensor installation
74	Low output voltage of left rear speed sensor	●Left rear speed sensor ●Sensor installation
75	Abnormal change in output voltage of right front speed sensor	●Right front speed sensor rotor
76	Abnormal change in output voltage of left front speed sensor	●Left front speed sensor rotor
77	Abnormal change in output voltage of right rear speed sensor	●Right rear speed sensor rotor
78	Abnormal change in output voltage of left rear speed sensor	●Left rear speed sensor rotor
79*	Deceleration sensor is faulty	●Deceleration sensor ●Sensor installation

*: 4WD models

DI0ZQ–01

DIAGNOSTIC TROUBLE CODE CHART

HINT:

Using SST 09843–18020, connect terminals Tc and E_1, and remove the short pin.

If a malfunction code is displayed during the DTC check, check the circuit listed that 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.

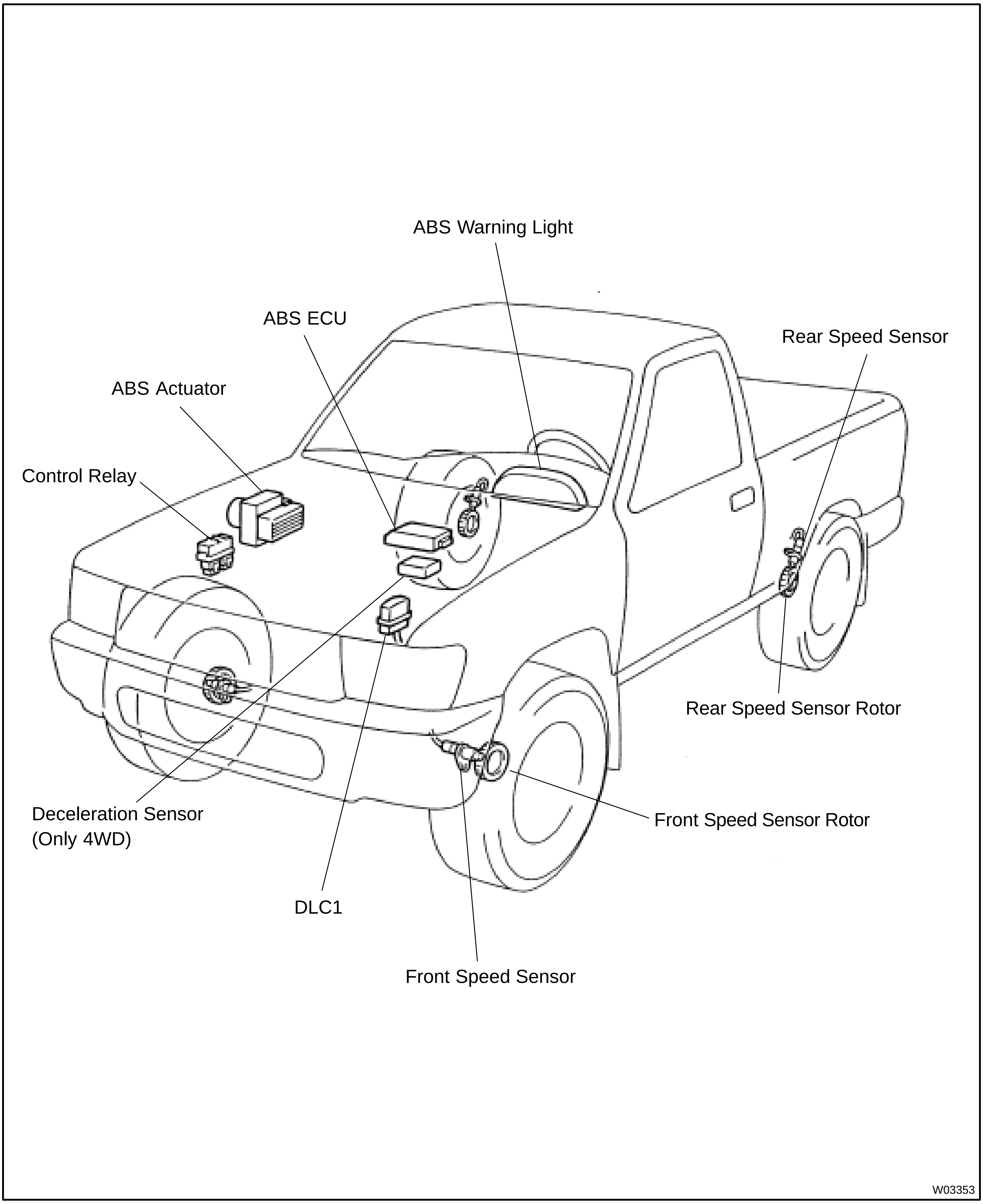
DTC No. (See Page)	Detection Item	Trouble Area
11 (DI–338)	Open circuit in ABS control (solenoid) relay circuit	●ABS control (solenoid) relay ●Open or short in ABS control (solenoid) relay circuit ●ECU
12 (DI–338)	Short circuit in ABS control (solenoid) relay circuit	●ABS control (solenoid) relay ●B+ short in ABS control (solenoid) relay circuit ●ECU
13 (DI–341)	Open circuit in ABS control (motor) relay circuit	●ABS control (motor) relay ●Open or short in ABS control (motor) relay circuit ●ECU
14 (DI–341)	Short circuit in ABS control (motor) relay circuit	●ABS control (motor) relay ●B+ short in ABS control (motor) relay circuit ●ECU
21 (DI–344)	Open or short circuit in 2–position solenoid circuit for right front wheel	●ABS actuator ●Open or short in SFRR or SFRH circuit ●ECU
22 (DI–344)	Open or short circuit in 2–position solenoid circuit for left front wheel	●ABS actuator ●Open or short in SFLR or SFLH circuit ●ECU
23 (DI–344)	Open or short circuit in 2–position solenoid circuit for rear wheel	●ABS actuator ●Open or short in SRR or SRH circuit ●ECU
31 (DI–347)	Right front wheel speed sensor signal malfunction	●Right front, left front, right rear and left rear speed sensor ●Open or short in each speed sensor circuit ●ECU
32 (DI–347)	Left front wheel speed sensor signal malfunction	
33 (DI–347)	Right rear wheel speed sensor signal malfunction	
34 (DI–347)	Left rear wheel speed sensor signal malfunction	
37 (DI–351)	Neither front speed sensor rotor missing	●Front axle hub ●Right front, left front speed sensor ●Wire harness for sensor system ●ECU
37 (DI–352)	Some tire is different size from the other tires	●Tire size ●ECU
41 (DI–353)	Low battery positive voltage or abnormally high battery positive voltage	●Battery ●IC regulator ●Open or short in power source circuit ●ECU
43* (DI–356)	Malfunction in deceleration sensor	●Deceleration sensor ●Wire harness for deceleration sensor system ●ECU
44* (DI–357)	Open or short in deceleration sensor circuit	●Deceleration sensor ●Open or short in deceleration sensor circuit ●ECU

49 (DI–359)	Open or short circuit in stop light switch circuit	●Stop light switch ●Open or short in stop light switch circuit ●ECU
51 (DI–361)	Pump motor is locked Open in pump motor ground	●ABS pump motor
Always ON	Malfunction in ECU	●ECU

*: 4WD models

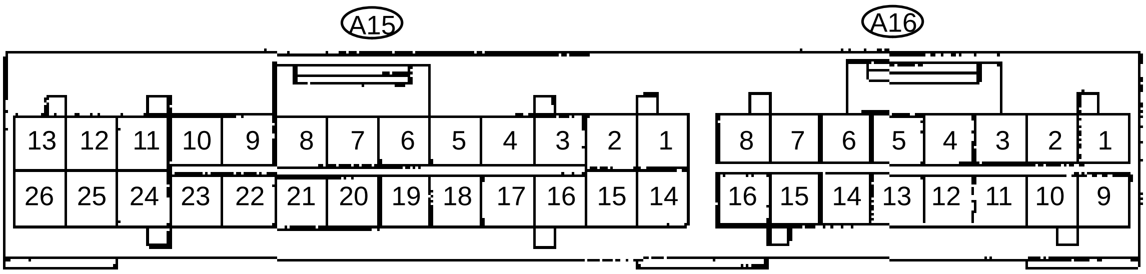
DI0ZT–01

PARTS LOCATION



DI7HH–01

TERMINALS OF ECU



R00463

Symbols (Terminals No.)	STD Voltage (V)	Condition
BAT (A15 – 22) – GND (A15 – 11, 24)	10 – 14	Always
IG1 (A15 – 10) – GND (A15 – 11, 24)	10 – 14	IG switch ON
SR (A16 – 5) – R+ (A16 – 3)	9 – 14	IG switch ON, ABS warning light OFF
MR (A16 – 4) – R+ (A16 – 3)	Below 1.0	IG switch ON
SFRH (A16 – 8) – GND (A15 – 11, 24)	10 – 14	IG switch ON, ABS warning light OFF
SFRR (A16 – 16) – GND (A15 –11, 24)	10 – 14	IG switch ON, ABS warning light OFF
SFLH (A16 – 1) – GND (A15 – 11, 24)	10 – 14	IG switch ON, ABS warning light OFF
SFLR (A16 – 2) – GND (A15 – 11, 24)	10 – 14	IG switch ON, ABS warning light OFF
SRR (A16 – 10) – GND (A15 – 11, 24)	10 – 14	IG switch ON, ABS warning light OFF
SRH (A16 – 9) – GND (A15 – 11, 24)	10 – 14	IG switch ON, ABS warning light OFF
AST (A16 – 11) – GND (A15 – 11, 24)	10 – 14	IG switch ON, ABS warning light OFF
WA (A15 – 25) – GND (A15 – 11, 24)	Below 2.0	IG switch ON, ABS warning light ON
	10 – 14	IG switch ON, ABS warning light OFF
STP (A15 – 21) – GND (A15 – 11, 24)	Below 1.5	Stop light switch OFF
	8 – 14	Stop light switch ON
Tc (A15 – 20) – GND (A15 – 11, 24)	10 – 14	IG switch ON
Ts (A15 – 6) – GND (A15 – 11, 24)	10 – 14	IG switch ON
FR+ (A16 – 6) – FR– (A16 – 7)	AC generation	IG switch ON Slowly turn right front wheel
FL+ (A16 – 13) – FL– (A16 – 14)	AC generation	IG switch ON Slowly turn left front wheel
RR+ (A15 – 15) – RR– (A15 – 16)	AC generation	IG switch ON Slowly turn right rear wheel
RL+ (A15 – 1) – RL– (A15 – 2)	AC generation	IG switch ON Slowly turn left rear wheel
GS1 (A15 – 19) – GND (A15 – 11, 24)	about 2 or 4	IG switch ON
GS2 (A15 – 7) – GND (A15 – 11, 24)	about 2	IG switch ON
EXI (A15 – 8) – GND (A15 – 11, 24)	Below 2.0	IG switch ON, transfer is in L4 or H4 position
	10 – 14	IG switch ON, transfer is in H4 position
EXI3 (A15 – 9) – GND (A15 – 11, 24)	Below 2.0	IG switch ON, transfer is in L4 position
	10 – 14	IG switch ON, transfer is in a position other than L4

DI0ZZ–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.

Symptoms	Inspection Circuit	See page
ABS does not operate.	Only when 1. – 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. IG power source circuit. 3. Speed sensor circuit. 4. Check the ABS actuator with a checker. If abnormal, check the hydraulic circuit for leakage (See page DI–xx).	 DI–328 DI–353 DI–347 BR–58
ABS does not operate efficiently.	Only when 1. – 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. If abnormal, check the hydraulic circuit for leakage (See page DI–370).	 DI–328 DI–347 DI–359 BR–58
ABS warning light abnormal.	1. ABS warning light circuit. 2. ABS ECU.	DI–362
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–362 DI–366
Speed sensor signal check cannot be done.	1. Ts terminal circuit. 2. ABS ECU.	DI–368

DI103–01

CIRCUIT INSPECTION

DTC	11, 12	ABS Control (Solenoid) Relay Circuit

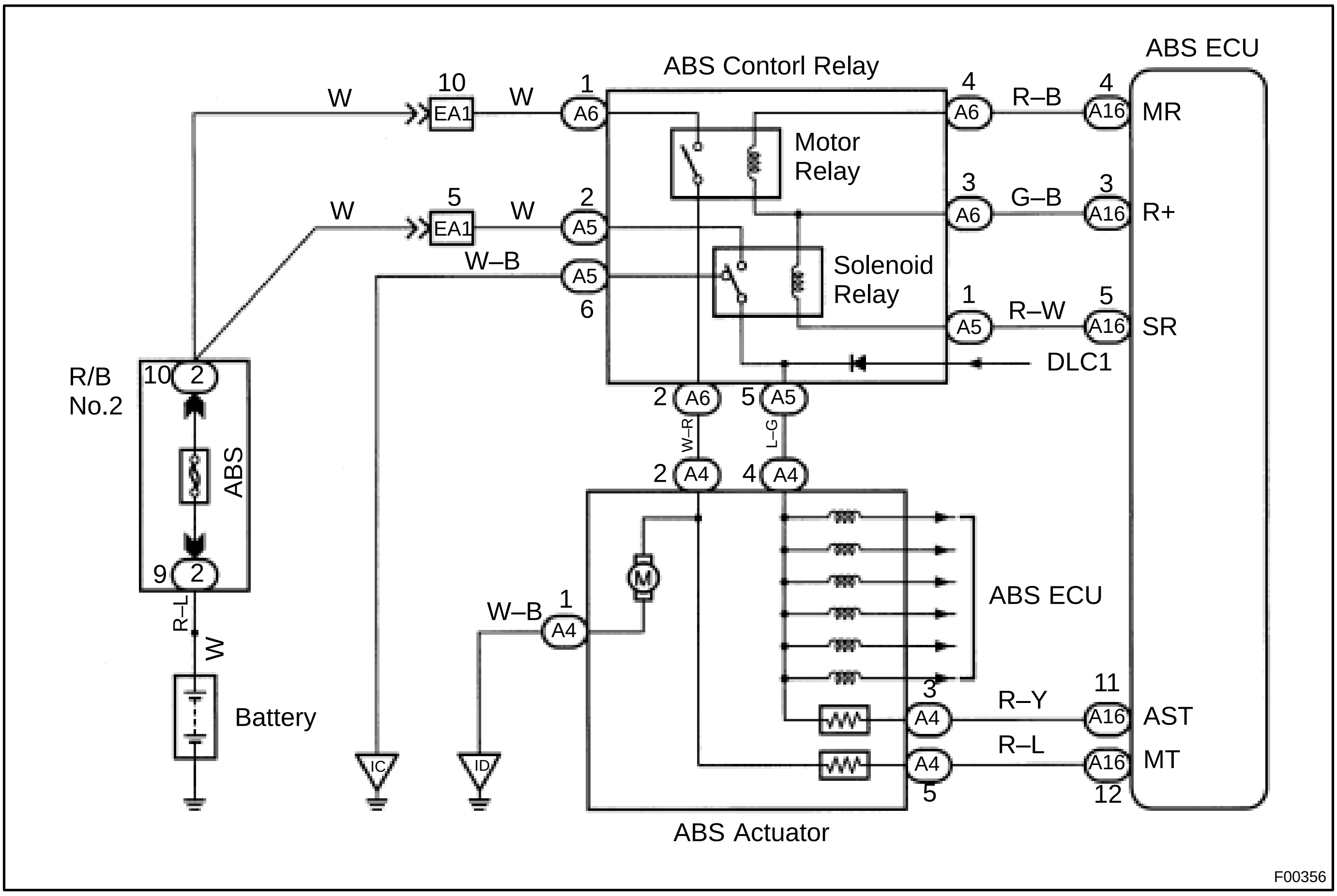
CIRCUIT DESCRIPTION

This relay supplies power to each ABS solenoid. After the ignition switch is turned ON, if the initial check is OK, the relay goes on.

DTC No.	DTC Detecting Condition	Trouble Area
11	Conditions 1 and 2 continue for 0.2 sec. or more: 1. ABS control (solenoid) relay terminal (SR) voltage: Battery positive voltage 2. ABS control (solenoid) relay monitor terminal (AST) voltage: 0V	•ABS control (solenoid) relay •Open or short in ABS control (solenoid) relay circuit •ECU
12	Conditions 1 and 2 continue for 0.2 sec. or more: 1. ABS control (solenoid) relay terminal (SR) voltage: 0 V 2. ABS control (solenoid) relay monitor terminal (AST) voltage: Battery positive voltage	•ABS control (solenoid) relay •B+ short in ABS control (solenoid) relay circuit •ECU

Fail safe function:
If trouble in the ABS control (solenoid) relay circuit, the ECU cuts off current to the ABS control (solenoid) relay and prohibits ABS control.

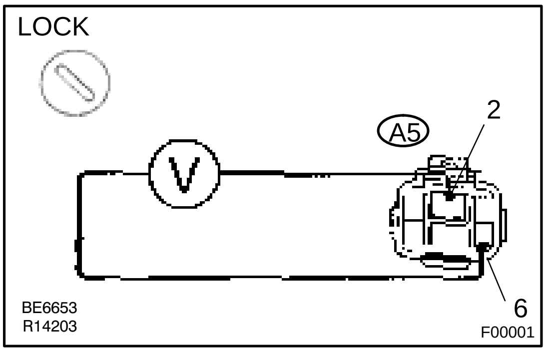
WIRING DIAGRAM



F00356

INSPECTION PROCEDURE

1	**Check voltage between terminals A5 – 2 and A5 – 6 of ABS control relay connector.**

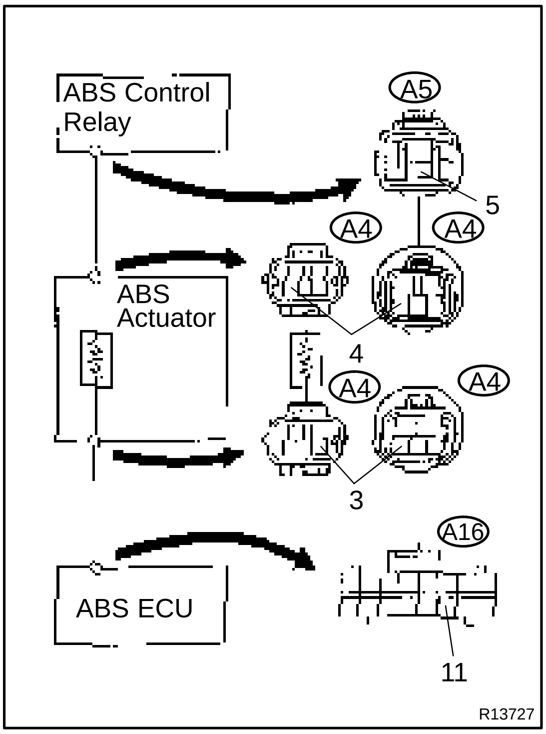


PREPARATION:
Disconnect the ABS control relay connector.
CHECK:
Measure the voltage between terminals A5 – 2 and A5 – 6 of ABS control relay harness side connector.
OK:
Voltage: 10 – 14 V

NG	**Check and repair harness or connector.**

OK

2	**Check continuity between terminals A5 – 5 and A4 – 4, A4 – 4 and A4 – 3, A4 – 3 and A16 – 11.**

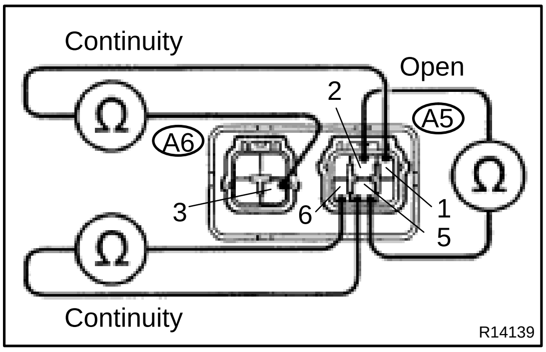


PREPARATION:
Disconnect the 2 connectors from the ABS actuator.
CHECK:
Check continuity between terminals A5 – 5 and A4 – 4, A4 – 4 and A4 – 3, A4 – 3 and A16 – 11.
OK:
Continuity
HINT:
There is a resistance of 26 ~ 40 Ω between terminals A4 – 4 and A4 – 3.

NG	**Repair or replace harness or ABS actuator.**

OK

3	**Check ABS control (solenoid) relay.**

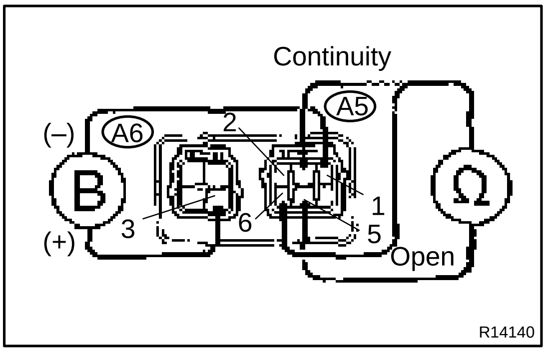


CHECK:

Check continuity between each terminal of ABS control (solenoid) relay.

OK:

Terminals A5 – 1 and A6 – 3	Continuity (Reference value 80 Ω)
Terminals A5 – 5 and A5 – 6	Continuity
Terminals A5 – 2 and A5 – 5	Open



CHECK:

(a) Apply battery positive voltage between terminals A5 – 1 and A6 – 3.

(b) Check continuity between each terminal of ABS control (solenoid) relay.

OK:

Terminals A5 – 5 and A5 – 6	Open
Terminals A5 – 2 and A5 – 5	Continuity

NG → **Replace ABS control relay.**

OK

4	**Check for open and short in harness and connector between ABS control relay and ABS ECU (See page IN–24).**

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

OK

**If same code is still output after DTC is deleted, check contact condition of each connection.
If connections are normal, ECU may be defective.**

DI106–01

DTC	13, 14	ABS Control (Motor) Relay Circuit

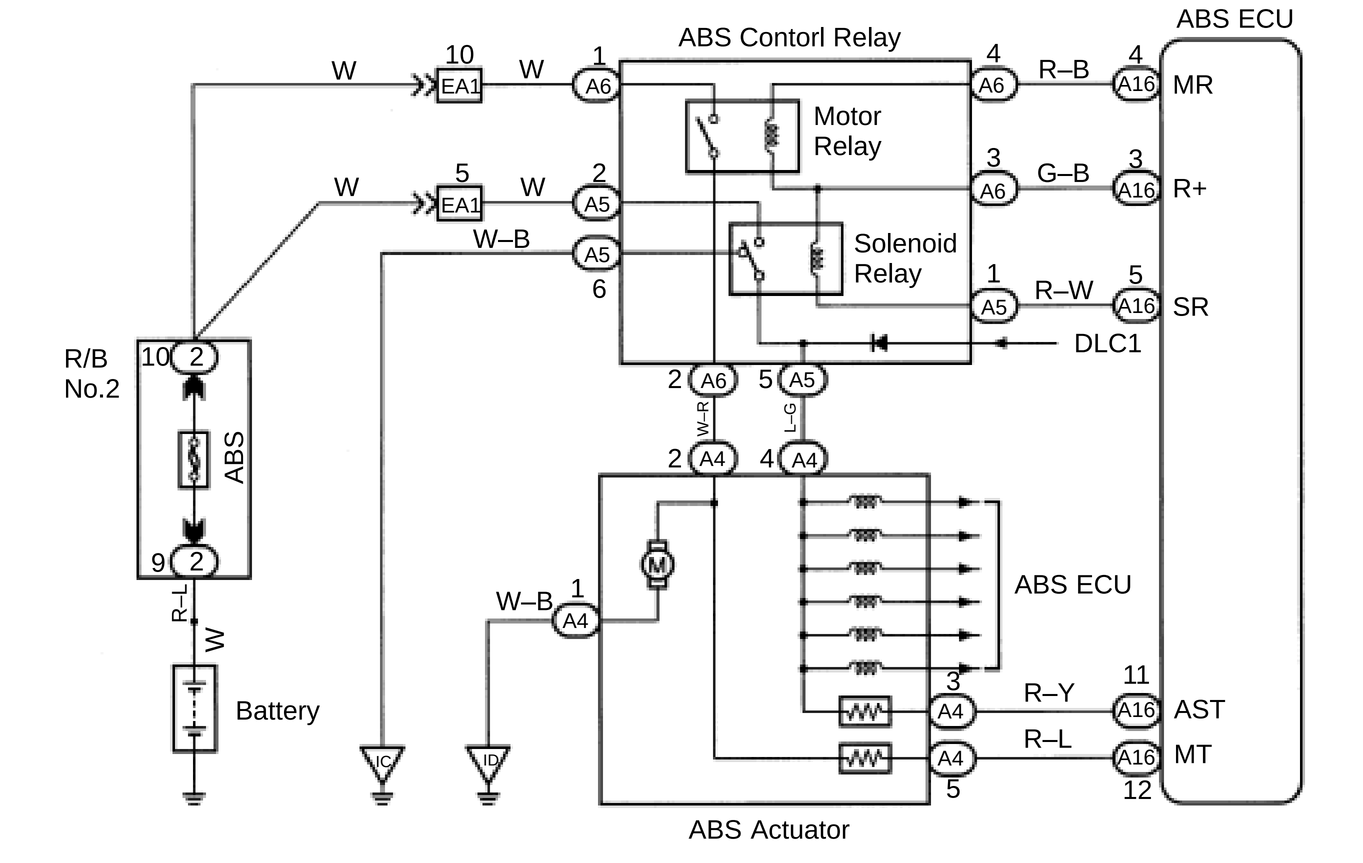
CIRCUIT DESCRIPTION

The ABS control (motor) relay supplies power to the ABS pump motor. While the ABS is activated, the ECU switches the ABS control (motor) relay ON and operates the ABS pump motor.

DTC No.	DTC Detecting Condition	Trouble Area
13	Conditions 1 and 2 continued for 0.2 sec. or more: 1. ABS control (motor) relay terminal (MR) voltage: Battery positive voltage 2. ABS control (motor) relay monitor terminal (MT) voltage: 0 V	●ABS control (motor) relay ●Open or short in ABS control (motor) relay circuit ●ECU
14	Conditions 1 and 2 continued for 2.5 sec. or more: 1. ABS control (motor) relay terminal (MR) voltage: 0 V 2. ABS control (motor) relay monitor terminal (MT) voltage: Battery positive voltage	●ABS control (motor) relay ●B+ short in ABS control (motor) relay circuit ●ECU

Fail safe function:
If trouble occurs in the ABS control (motor) relay circuit, the ECU cuts off current to the ABS control (solenoid) relay and prohibits ABS control.

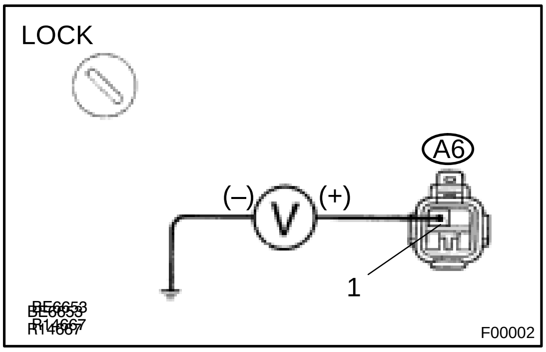
WIRING DIAGRAM



F00356

INSPECTION PROCEDURE

1	**Check voltage between terminal A6 – 1 of ABS control relay and body ground.**

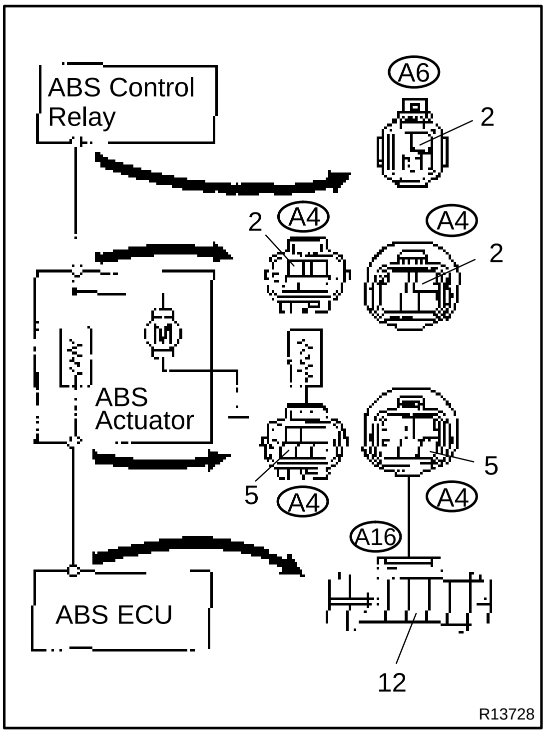


PREPARATION:
Disconnect the ABS control relay connector.
CHECK:
Measure voltage between terminal A6 – 1 of ABS control relay harness side connector and body ground.
OK:
Voltage: 10 – 14 V

NG	**Check and repair harness or connector.**

OK

2	**Check continuity between terminals A6 – 2 and A4 – 2, A4 – 2 and A4 – 5, A4 – 5 and A16 – 12.**

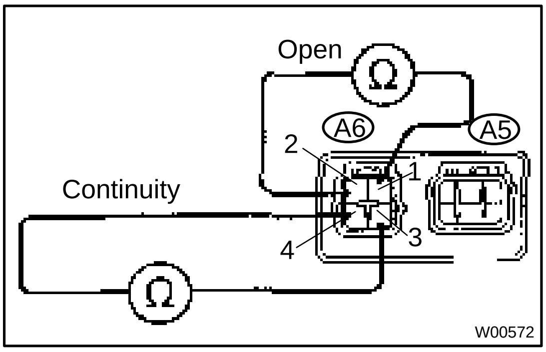


PREPARATION:
Disconnect the 2 connectors from the ABS actuator.
CHECK:
Check continuity between terminals A6 – 2 and A4 – 2, A4 – 2 and A4 – 5, A4 – 5 and A16 – 12.
OK:
Continuity
HINT:.
There is a resistance of 26 ~ 40 Ω between terminals A4 – 2 and A4 – 5

NG	**Repair or replace harness or ABS actuator.**

OK

3	**Check ABS control (motor) relay.**

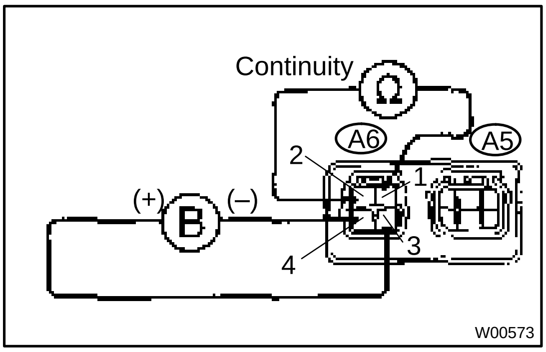


CHECK:

Check continuity between each terminal of ABS control (motor) relay.

OK:

Terminals A6 – 3 and A6 – 4	Continuity (Reference value 62 Ω)
Terminals A6 – 1 and A6 – 2	Open



CHECK:

(a) Apply battery positive voltage between terminals A6 – 3 and A6 – 4.

(b) Check continuity between terminals of ABS control relay.

OK:

Terminals A6 – 1 and A6 – 2	Continuity

NG → **Replace ABS control relay.**

OK

4	**Check for open and short in harness and connector between ABS control relay and ABS ECU (See page IN–24).**

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

OK

If same code is still output after DTC is deleted, check contact condition of each connection. If connections are normal, ECU may be defective.

DI10A–01

DTC	21, 22, 23	ABS Actuator Solenoid Circuit

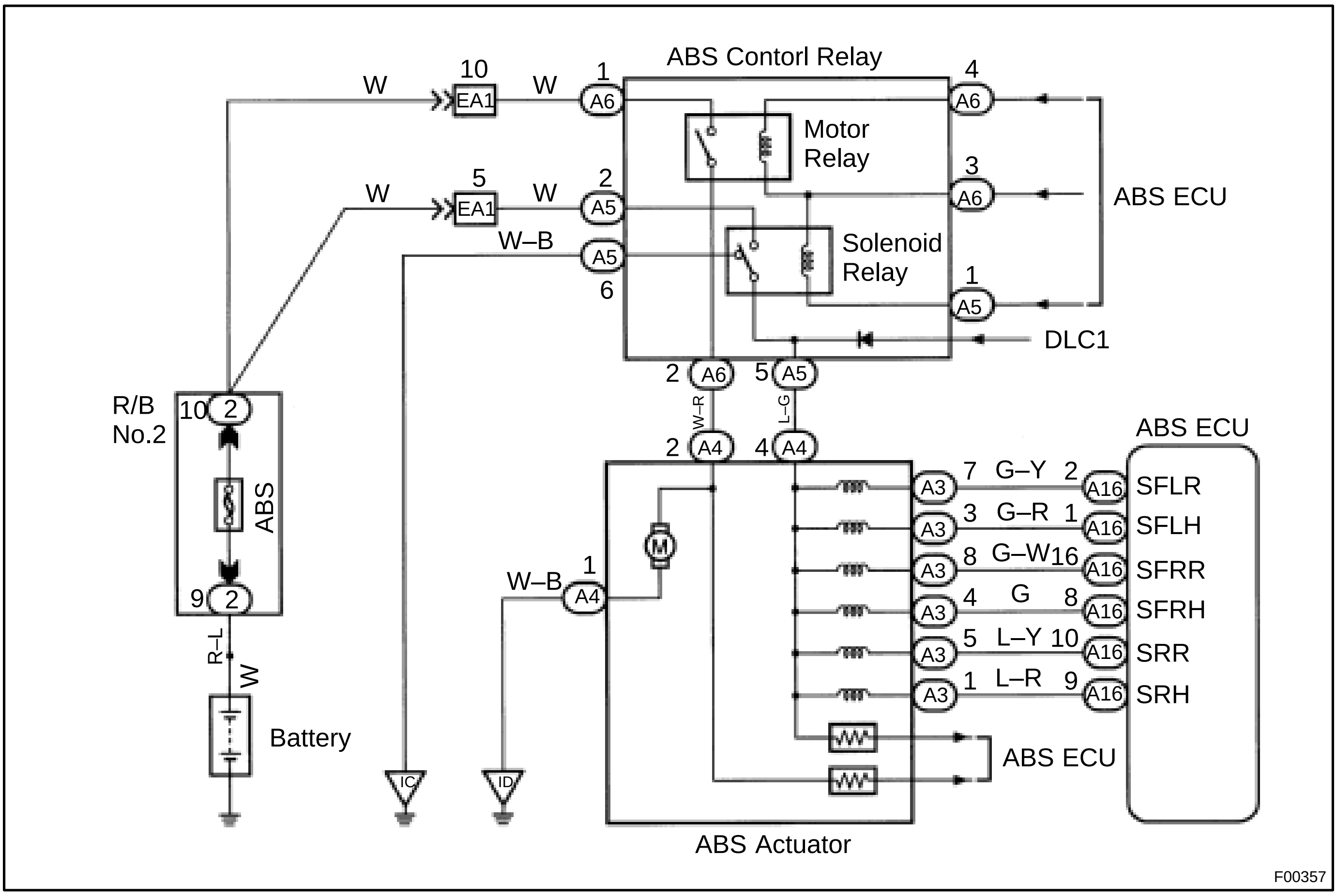
CIRCUIT DESCRIPTION

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 Detecting Condition	Trouble Area
21	Conditions 1 through 3 continue for 0.02 sec. or more: 1. ABS control (solenoid) relay terminal (SR) voltage: Battery positive voltage 2. Voltage of ABS ECU terminal AST: Battery positive voltage 3. When power transistor of ECU is ON, voltage of terminal SFRR or SFRH is 0 V or battery positive voltage.	●ABS actuator ●Open or short in SFRR or SFRH circuit ●ECU
22	Conditions 1 through 3 continue for 0.02 sec. or more: 1. ABS control (solenoid) relay terminal (SR) voltage: Battery positive voltage 2. Voltage of ABS ECU terminal AST: Battery positive voltage 3. When power transistor of ECU is ON, voltage of terminal SFLR or SFLH is 0 V or battery positive voltage.	●ABS actuator ●Open or short in SFLR or SFLH circuit ●ECU
23	Conditions 1 through 3 continue for 0.02 sec. or more: 1. ABS control (solenoid) relay terminal (SR) voltage: Battery positive voltage 2. Voltage of ABS ECU terminal AST: Battery positive voltage 3. When power transistor of ECU is ON, voltage of terminal SRR or SRH is 0 V or battery positive voltage.	●ABS actuator ●Open or short in SRR or SRH circuit ●ECU

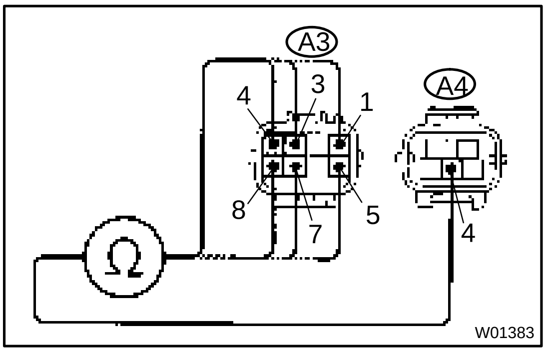
Fail safe function:
If trouble occurs in the actuator solenoid circuit, the ECU cuts off current to the ABS control (solenoid) relay and prohibits ABS control.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check ABS actuator solenoid.



PREPARATION:
Disconnect the 2 connectors from the ABS actuator.

CHECK:
Check continuity between terminals A4 – 4 and A3 – 1, 3, 4, 5, 7, 8 of ABS actuator connector.

OK:
Continuity

HINT:
Resistance of each solenoid coil
SFRH, SFLH, SRH: 5.0 Ω
SFRR, SFLR, SRR: 2.2 Ω

NG	Replace ABS actuator.

OK

2	**Check for open and short in harness and connector between ABS ECU and actuator (See page IN–24).**

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

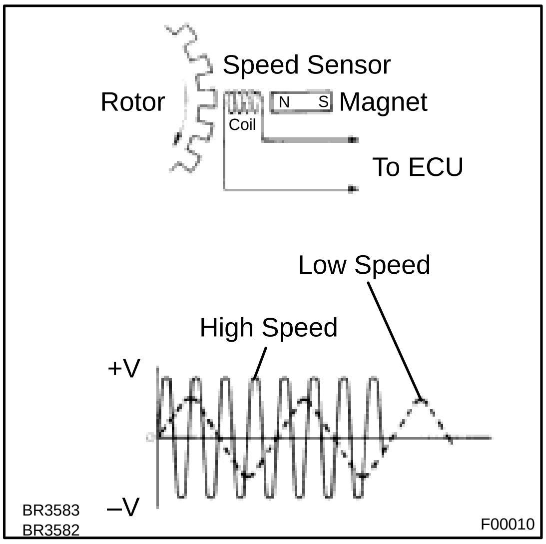
OK

If same code is still output after DTC is deleted, check contact condition of each connection. If connector are normal, ECU may be defective.

DI10D–01

DTC	31, 32, 33, 34	Speed Sensor Circuit

CIRCUIT DESCRIPTION



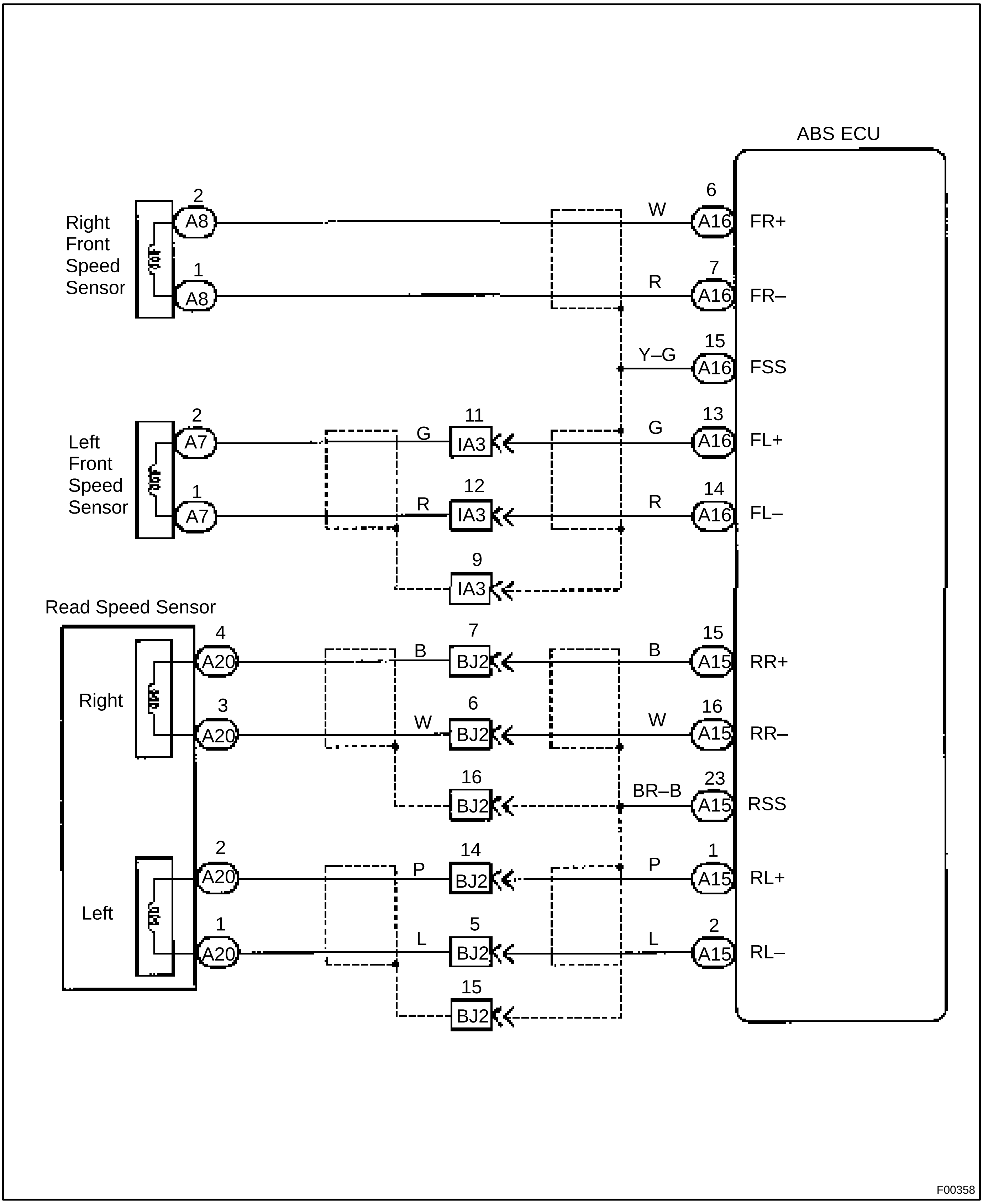
The speed sensor detects wheel speed and sends the appropriate signals to the ECU. These signals are used to control the ABS system. The front and rear rotors each have 48 serrations.
When the rotors rotate, the magnetic field emitted by the permanent magnet in the speed sensor generates an AC voltage. 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 Detecting Condition	Trouble Area
31, 32, 33, 34	Detection of any of conditions 1 through 3: 1. At vehicle speed of 10 km/h (6 mph) or more, pulses are not input for 15 sec. 2. Momentary interruption of speed sensor signal occurs at least 7 times in time between switching the ignition switch ON and switching it OFF. 3. Abnormal fluctuation of speed sensor signals with vehicle speed 20 km/h (12 mph) or more. 4. An open is detected in speed sensor circuit for 0.6 sec.	●Right front, left front, right rear, left rear speed sensor ●Open or short in each speed sensor circuit ●ECU
35	Speed sensor signal is not input for about 1 sec. while left front and right rear speed sensor signals are being checked with IG switch ON.	●Open in left front or right rear speed sensor circuit ●ECU
36	Speed sensor signal is not input for about 1 sec. while right front and left rear speed sensor signals are being checked with IG switch ON.	●Open in right front or left rear speed sensor circuit ●ECU

HINT:
- DTC No. 31 is for the right front speed sensor.
- DTC No. 32 is for the left front speed sensor.
- DTC No. 33 is for the right rear speed sensor.
- DTC No. 34 is for the left rear speed sensor.

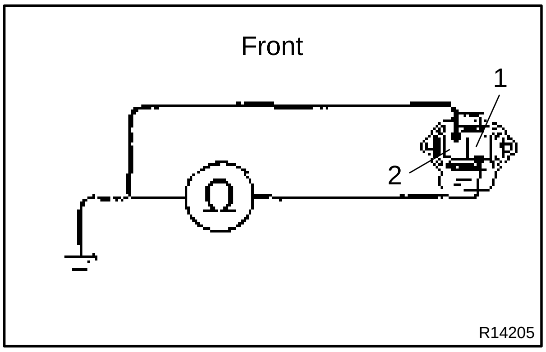
Fail safe function:
If trouble occurs in the speed sensor circuit, the ECU cuts off current to the ABS control (solenoid) relay and prohibits ABS control.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check speed sensor.**



Front

PREPARATION:

Disconnect the speed sensor connector.

CHECK:

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

OK:

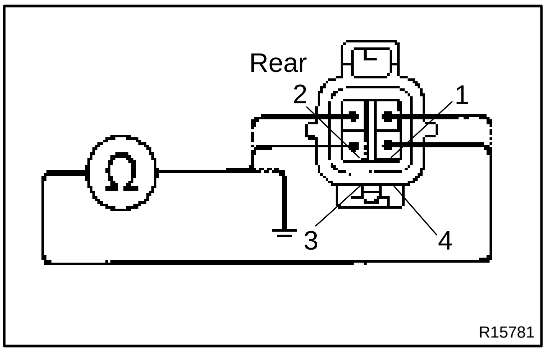
Resistance: 0.6 – 1.8 kΩ

CHECK:

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

OK:

Resistance: 1 MΩ or higher



Rear

PREPARATION:

Disconnect the speed sensor connector.

CHECK:

Measure resistance between terminals 1 and 2, 3 and 4 of speed sensor connector.

OK:

Resistance: 0.6 – 2.05 kΩ

CHECK:

Measure resistance between terminals 1 and 2, 3 and 4 of speed sensor connector and body ground.

OK:

Resistance: 1 MΩ or higher

NG	**Replace speed sensor.**

NOTICE:
Check the speed sensor signal last (See page DI–328).

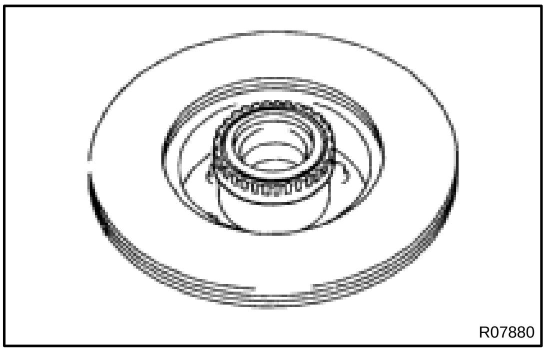
OK

2	**Check for open and short in harness and connector between each speed sensor and ECU (See page IN–24).**

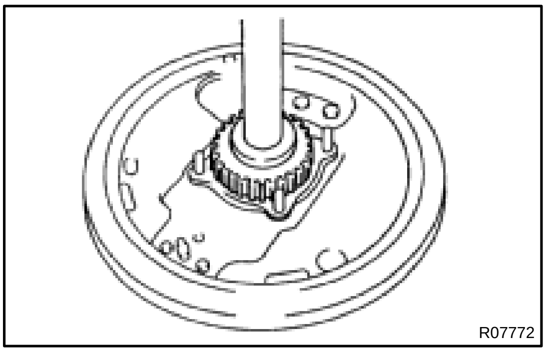
NG	**Repair or replace harness or connector.**

OK

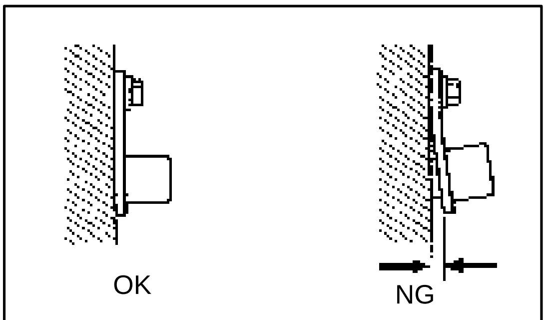
3	Check sensor rotor and sensor installation.



R07880



R07772



BR3795

Front

PREPARATION:

Remove the axle hub (See page SA–16 or SA–23).

CHECK:

Check the sensor rotor serrations.

OK:

No scratches or missing teeth.

CHECK:

Check the sensor tip.

OK:

No scratches or foreign objects on the sensor tip.

Rear

PREPARATION:

Remove the axle shaft (See page SA–131).

CHECK:

Check the sensor rotor serrations.

OK:

No scratches or missing teeth.

CHECK:

Check the sensor tip.

OK:

No scratches or foreign objects on the sensor tip.

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 or rotor.

NOTICE:

Check the speed sensor signal last (See page DI–328).

OK

Check and repalce ABS ECU.

DI10F–01

DTC	37	Neither Front Speed Sensor Rotor Missing

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
37	With front wheels stationary and rear wheels rotating at 20+ km/h (12+ mph) for 10+ secs, turn ignition switch ON then OFF 8 times, in succession.	●Front axle hub ●Right front, left front speed sensor ●Wire harness for sensor system ●ECU

INSPECTION PROCEDURE

1	Check front axle hub (See page SA–15 or SA–22).

NG → **Replace front axle hub.**

OK

2	Check front speed sensor (See page DI–347).

NG → **Replace front speed sensor.**

OK

3	Check for open or short in harness and connector between speed sensor and ECU (See page IN–24).

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

OK

Check and replace ABS ECU.

DI10H–01

DTC 37 Tires of Different Size

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
37	Driving at more than 30 km/h (19 mph) for more than 60 seconds with 1 or 2 tires of different size.	●Tire size ●ECU

INSPECTION PROCEDURE

1 Check tire size.

NG → **Replace tires so that all 4 tires are of the same size.**

OK

Check and replace ABS ECU.

DI10J–01

DTC	41	IG Power Source Circuit

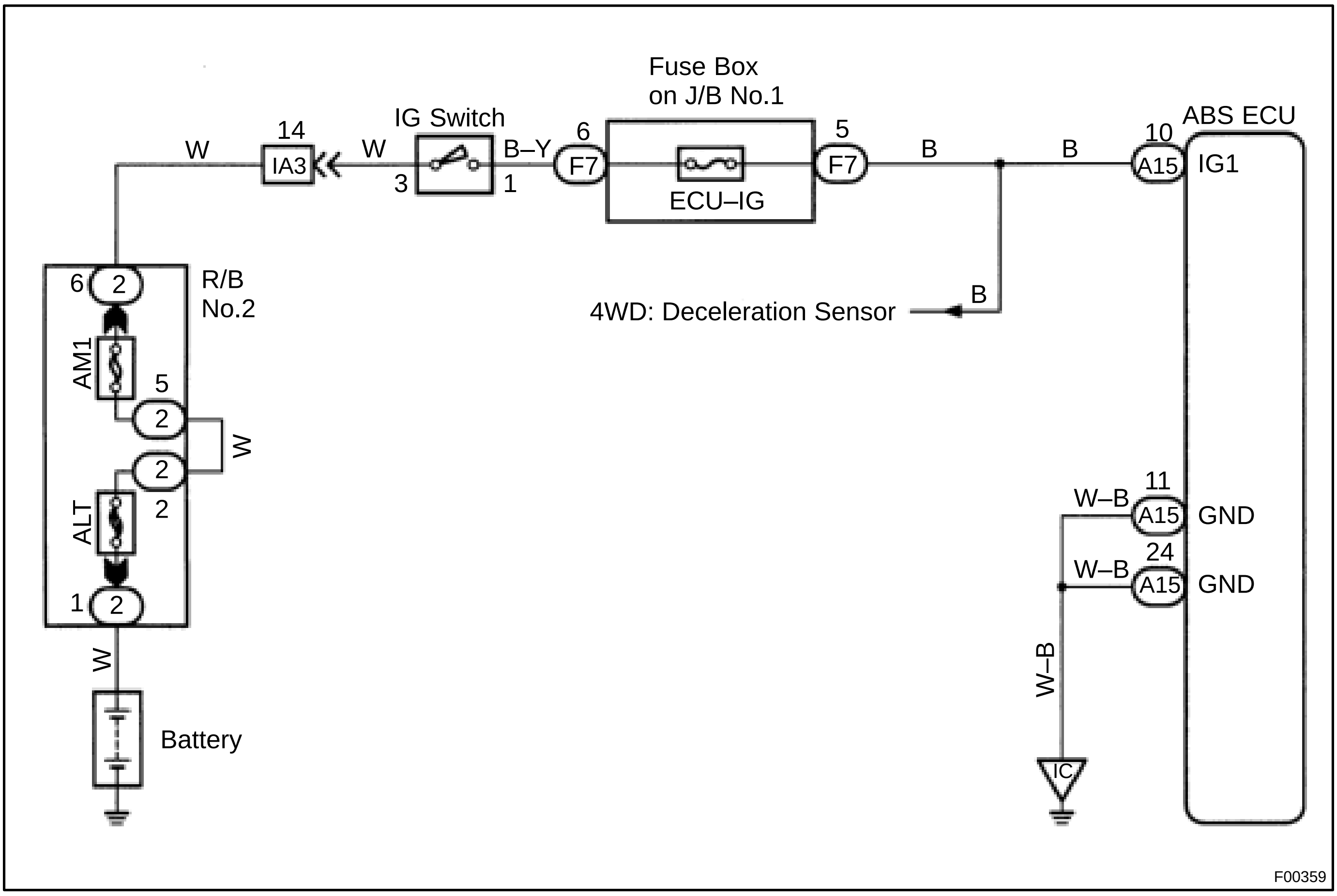
CIRCUIT DESCRIPTION

This is the power source for the ECU, hence the actuators.

DTC No.	DTC Detecting Condition	Trouble Area
41	Vehicle speed is 3 km/h (1.9 mph) or more and voltage of ECU terminal IG1 remains at more than 17 V or below 9.5 V for more than 10 sec.	●Battery ●IC regulator ●Open or short in power source circuit ●ECU

Fail safe function:
If trouble occurs in the power source circuit, the ECU cuts off current to the ABS control (solenoid) relay and prohibits ABS control.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check battery positive voltage.**

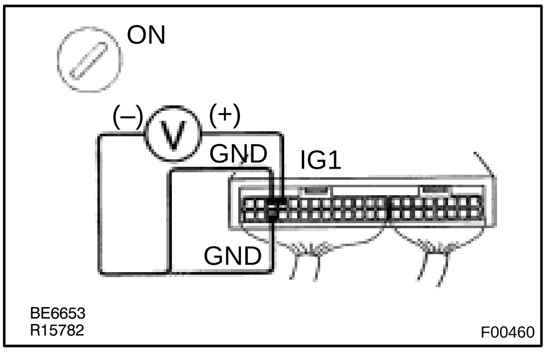
OK:

Voltage: 10 – 14 V

NG → **Check and repair charging system.**

OK ↓

2	**Check voltage between terminals IG1 and GND of ABS ECU connector.**



PREPARATION:

Remove the ABS ECU with the connectors still connected.

CHECK:

(a) Turn the ignition switch ON.

(b) Measure voltage between terminals IG1 and GND of ABS ECU connector.

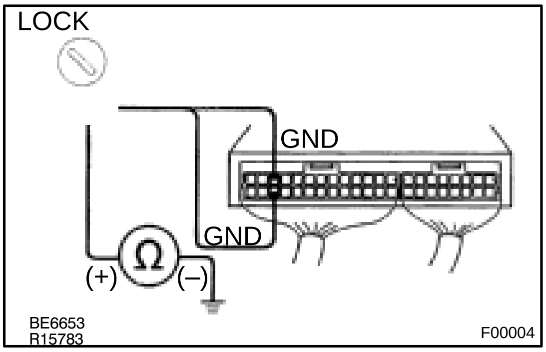
OK:

Voltage: 10 – 14 V

OK → **Check and replace ABS ECU.**

NG ↓

3	**Check continuity between terminals GND of ABS ECU connector and body ground.**



CHECK:

Measure resistance between terminals GND of ABS ECU connector and body ground.

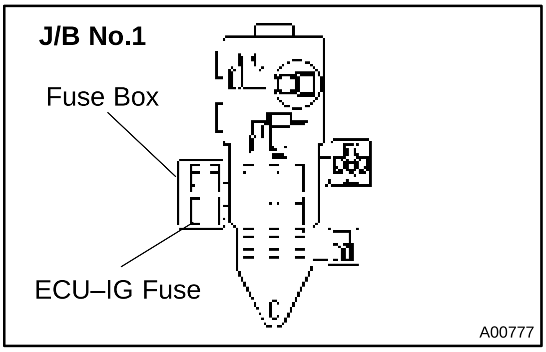
OK:

Resistance: 1 Ω or less

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

OK ↓

4	Check ECU–IG fuse.



PREPARATION:
Remove the ECU–IG fuse from the J/B No.1.
CHECK:
Check continuity of ECU–IG fuse.
OK:
Continuity

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

OK ↓

Check for open in harness and connector between ABS ECU and battery (See page IN–24).

DI10K–01

DTC 43 Malfunction in Deceleration Sensor

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
43	Either of following 1 or 2 is detected: 1. After the battery terminal is connected, input from the deceleration sensor does not change at one cycle (0 km/h → more than 30 km/h → 0 km/h) for 16 times continuously. 2. When the brake pedal is not depressed at vehicle speed of 5 km/h or more, forward and backward G (more than 0.4 G) is detected for 30 seconds or more.	●Deceleration sensor ●Wire harness for deceleration sensor system ●ECU

INSPECTION PROCEDURE

1 Check deceleration sensor (See page DI–328).

NG → **Replace deceleration sensor.**

OK

2 Check for open or short in harness and connector between sensor and ECU (See page IN–24).

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

OK

Check and replace ABS ECU.

DI10M–01

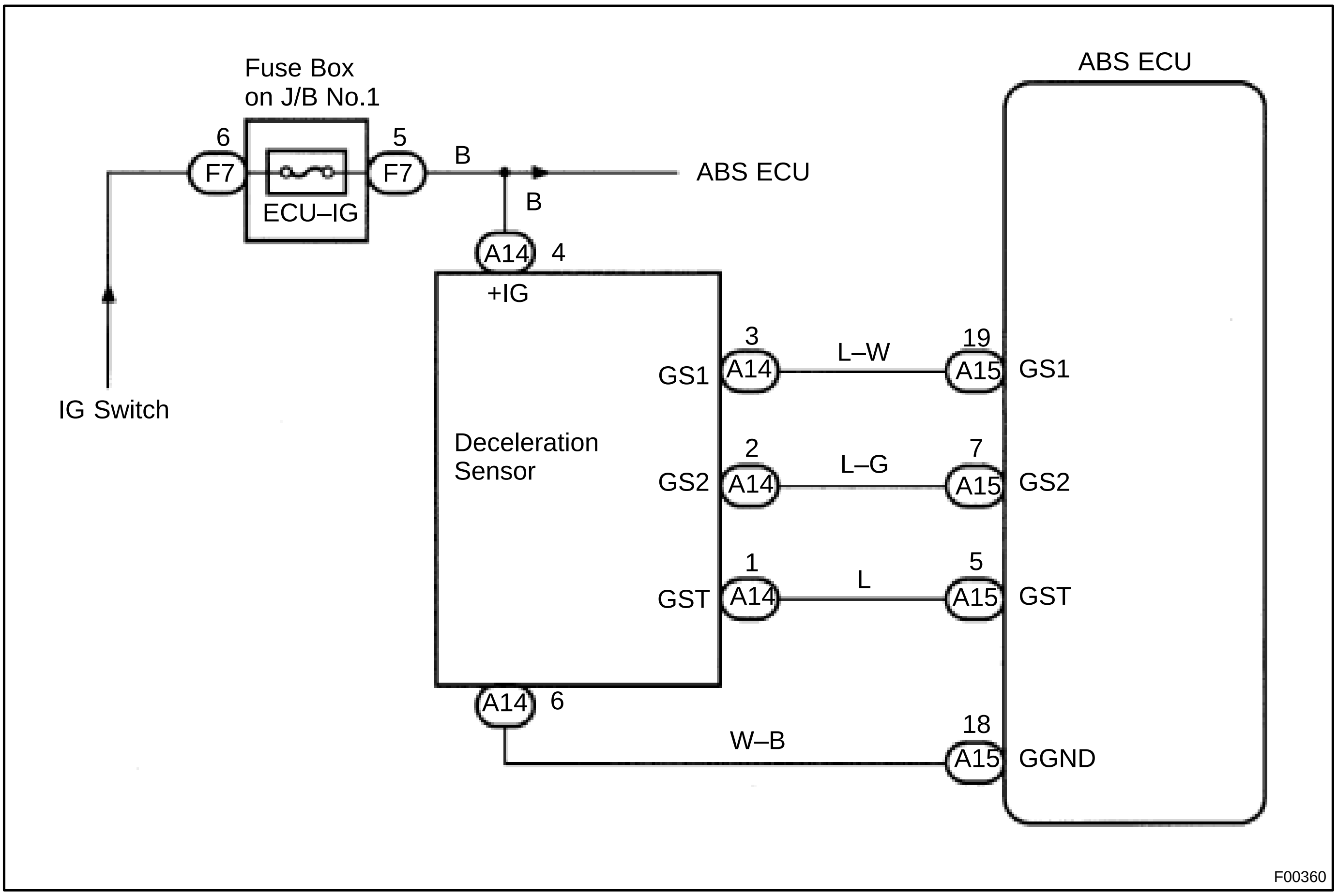
DTC	44	Deceleration Sensor Circuit

CIRCUIT DESCRIPTION

This sensor detects deceleration on the vehicle. The sensor signal is used in ABS control. If the sensor functions abnormally, the ABS warning light comes on but the ABS still operates.

DTC No.	DTC Detecting Condition	Trouble Area
44	Either of following 1 or 2 is detected: 1. An open or short is detected in circuit GS1 or GS2 for 1sec. 2. After the ignition is turned ON, test signal is output by GST. During this time, a trouble signal is detected for 0.5 sec.	•Deceleration sensor •Open or short in deceleration sensor circuit •ECU

WIRING DIAGRAM



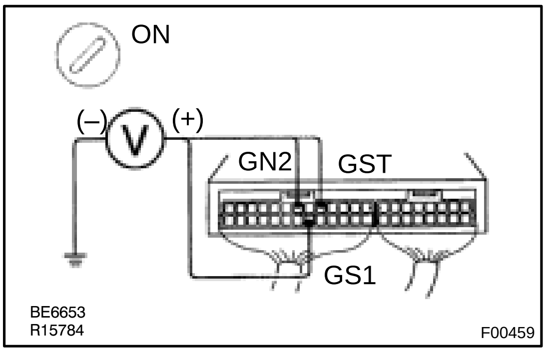
INSPECTION PROCEDURE

1	**Check for open and short in harness and connector between Deceleration sensor and ECU (See page IN–24).**

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

OK

2	**Check voltage between terminals GS1, GS2, GST of ABS ECU and body ground.**



PREPARATION:

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

(b) Disconnect the deceleration sensor connector.

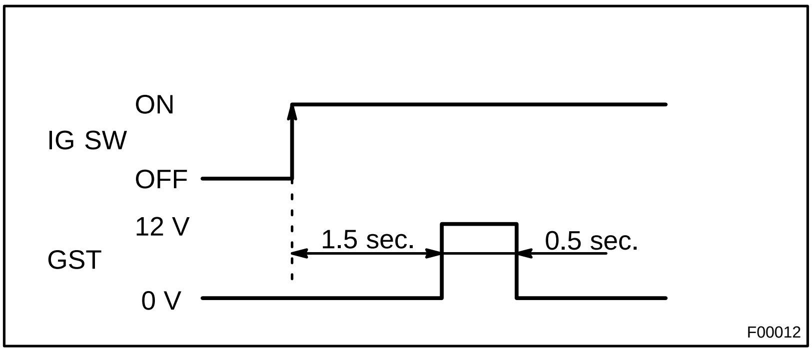
(c) Turn the ignition switch ON.

CHECK:

Measure voltage between terminals GS1, GS2, GST of ECU and Body ground.

OK:

Voltage:
GS1, GS2: about 5 V
GST: As shown below



NG → **Check and replace ABS ECU.**

OK

Check and replace deceleration sensor.

DI10O–01

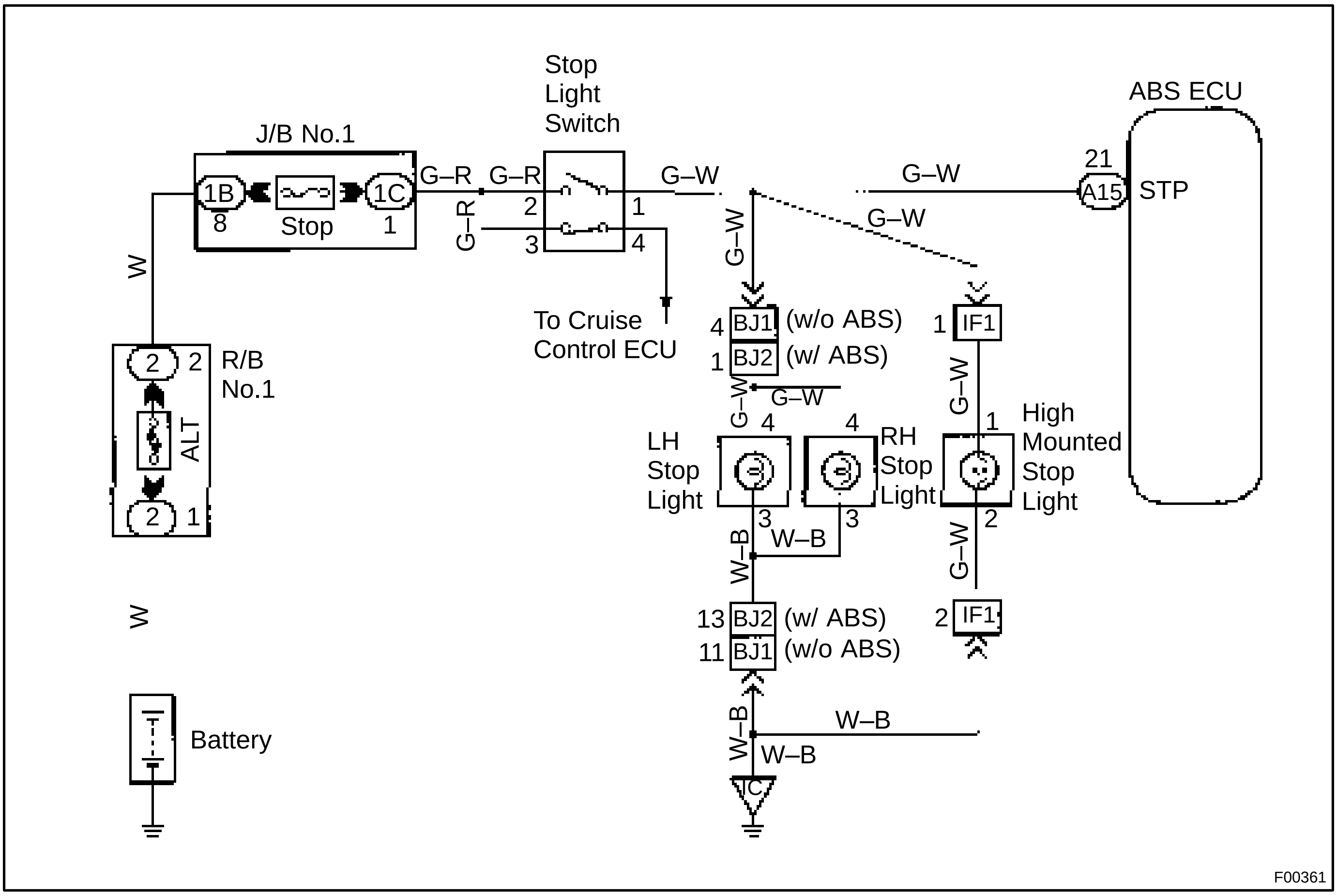
DTC	49	Stop Light Switch circuit

CIRCUIT DESCRIPTION

This stop light switch senses whether the brake pedal is depressed or released, and sends the signal to the ECU.

DTC No.	DTC Detecting Condition	Trouble Area
49	ABS ECU terminal IG1 voltage is 9.5 V to 18.0 V and ABS is in non–operation, open circuit of stop light switch circuit continues for 0.3 sec. or more.	●Stop light switch ●Open or short in stop light switch circuit ●ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

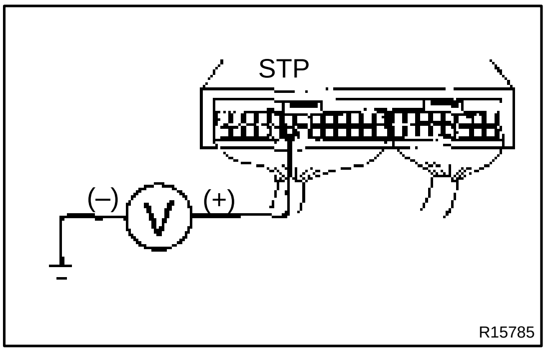
1	**Check operation of stop light.**

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 of ABS ECU and body ground.**



PREPARATION:
Remove the ABS ECU with the connectors still connected.
CHECK:
Measure voltage between terminal STP of ABS ECU and body ground when brake pedal is depressed.
OK:
Voltage: 8 –14 V

OK → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–337).**

NG

3	**Check for open in harness and connector between ABS ECU and stop light switch (See page IN–24).**

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

OK

Check and replace ABS ECU

DI10Q–01

DTC	51	ABS Pump Motor Lock

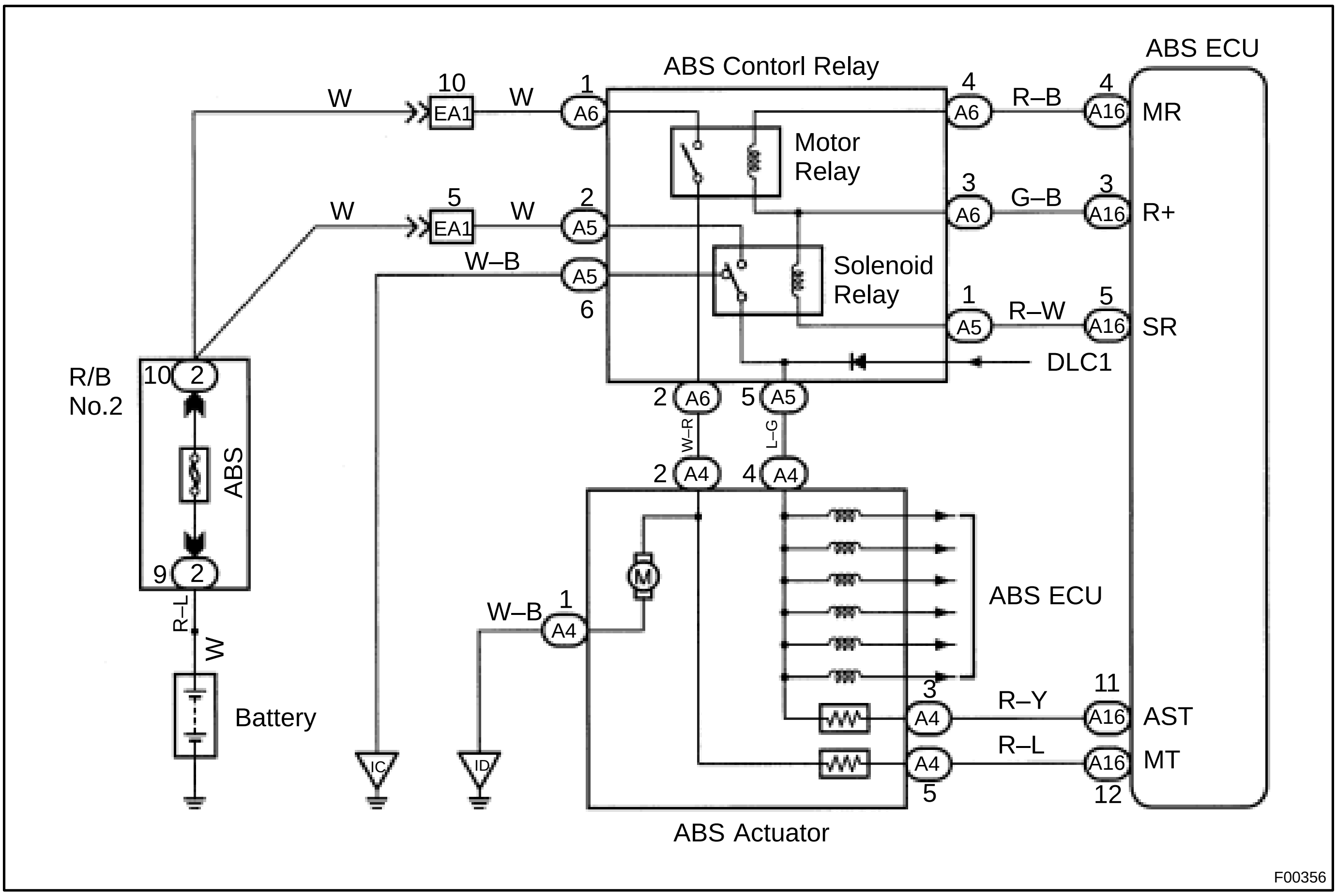
CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
51	Pump motor is not operating normally during initial check.	●ABS pump motor

Fail safe function:

If trouble occurs in the ABS pump motor, the ECU cuts off current to the ABS control (solenoid) relay and prohibits ABS control.

WIRING DIAGRAM



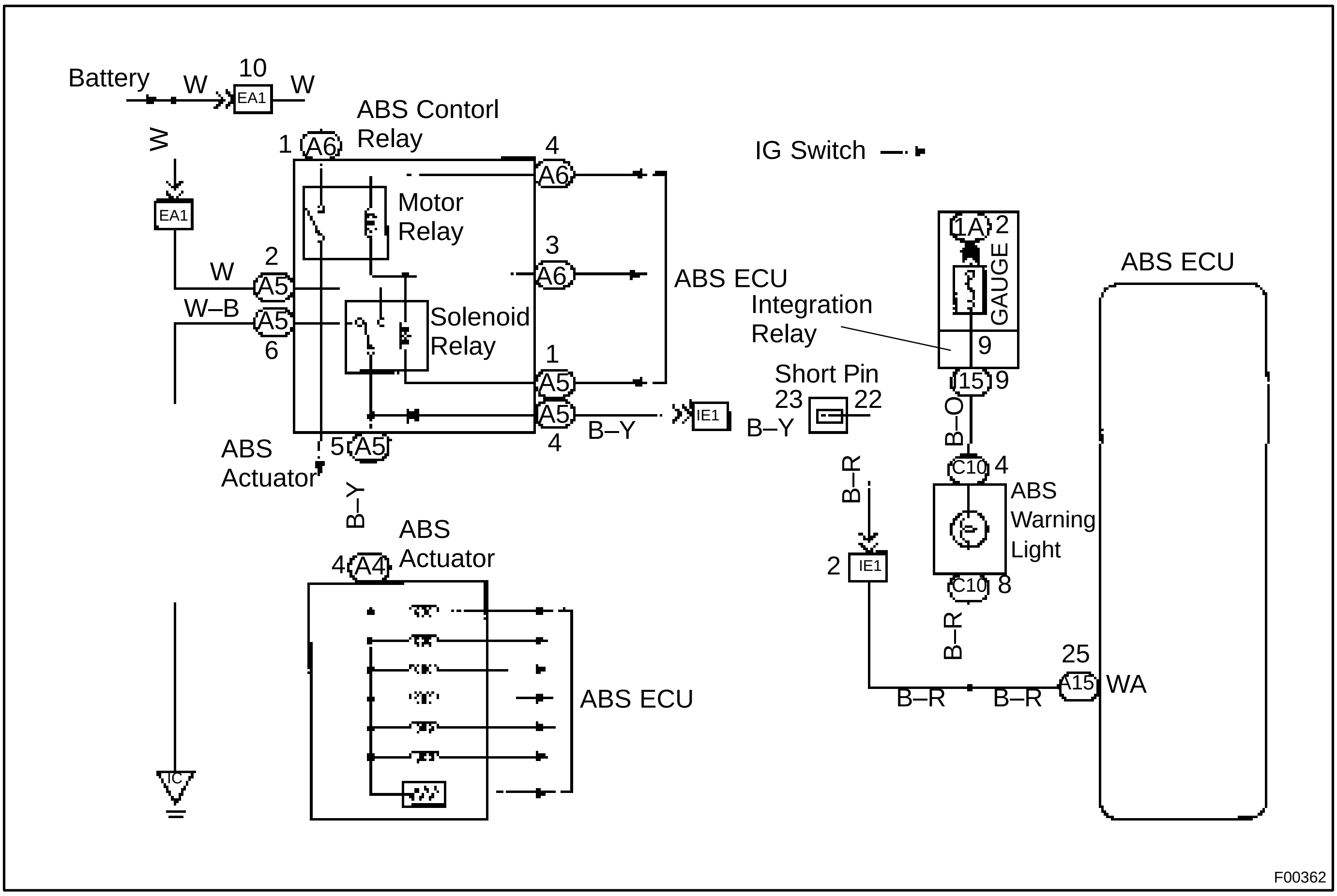
DI10S–01

ABS Warning Light Circuit

CIRCUIT DESCRIPTION

If the ECU detects trouble, it lights the ABS warning light while at the same time prohibiting ABS control. At this time, the ECU records a DTC in memory.
After removing the short pin of the DLC1, connect terminals Tc and E_1 of the DLC1 to make the ABS warning light blink and output the DTC.

WIRING DIAGRAM



INSPECTION PROCEDURE

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

ABS warning light does not light up	Go to step 1
ABS warning light remains on	Go to step 3

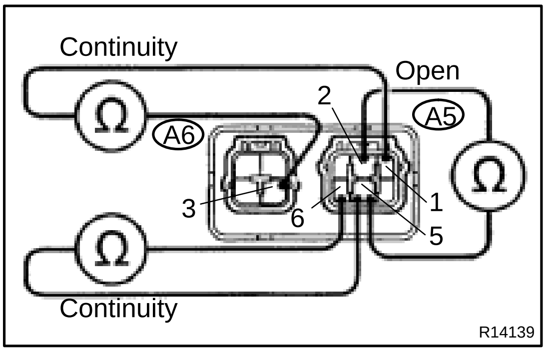
1 Check ABS warning light.

See Combination Meter Troubleshooting on page BE–2.

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

OK

2	**Check ABS control relay.**



PREPARATION:

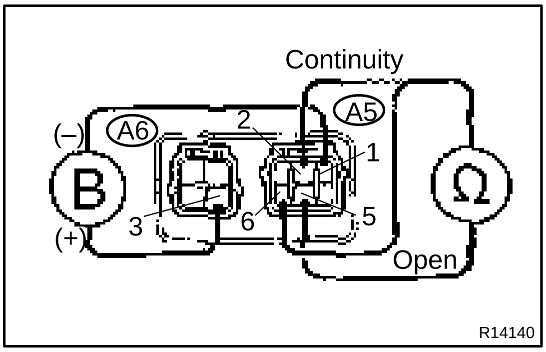
Disconnect the connectors from the control relay.

CHECK:

Check continuity between each terminal of ABS control relay.

OK:

Terminals A5 – 1 and A6 – 3	Continuity (Reference value 80 Ω)
Terminals A5 – 5 and A5 – 6	Continuity
Terminals A5 – 2 and A5 – 5	Open



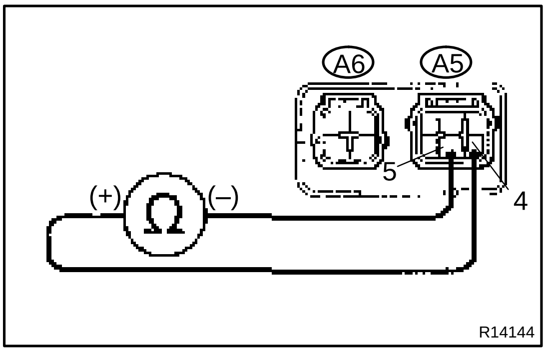
CHECK:

(a) Apply battery positive voltage between terminals A5 – 1 and A6 – 3.

(b) Check continuity between each terminal of ABS control relay.

OK:

Terminals A5 – 5 and A5 – 6	Open
Terminals A5 – 2 and A5 – 5	Continuity



CHECK:

Connect the < test lead to terminal A5 – 4 and the ⊖ test lead to terminal A5 – 5. Check continuity between terminals.

OK:

Continuity

If there is no continuity, connect the ⊖ test lead to terminal A5 – 4 and the < lead to terminal A5 – 5. Recheck continuity between terminals.

NG	**Replace ABS control relay.**

OK

Check for open in harness and connector between DLC1, ABS control relay and body ground (See page IN–24).

3	Is DTC output?

Check DTC on page DI–328.

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

NO

4	Does ABS warning light go off if short pin is removed?

NO → **Check for short in harness and connector between warning light, DLC1 and ECU (See page IN–24).**

YES

5	Check ABS control relay (See step 2).

NG → **Replace ABS control relay.**

OK

Check for short in harness and connector between DLC1 and ABS control relay (See page IN–24).

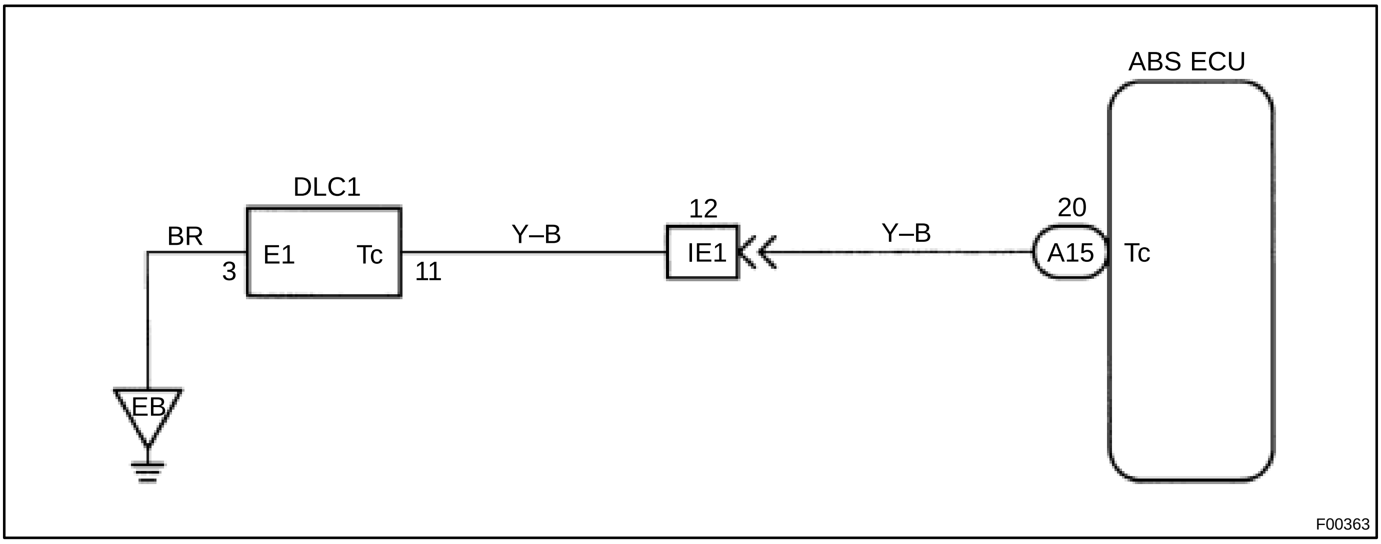
DI10U–01

Tc Terminal Circuit

CIRCUIT DESCRIPTION

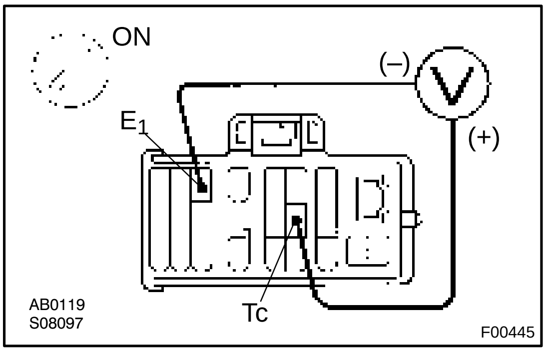
Connecting terminals Tc and E_1 of the DLC1 causes the ECU to display the DTC by flashing the ABS warning light.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check voltage between terminals Tc and E_1 of DLC1.**



CHECK:

(a) Turn the ignition switch ON.

(b) Measure voltage between terminals Tc and E_1 of DLC1.

OK:

Voltage: 10 – 14 V

OK → **If ABS warning light does not blink even after Tc and E_1 are connected, ECU may be defective.**

NG

2	**Check for open and short in harness and connector between ABS ECU and DLC1, DLC1 and body ground (See page IN–24).**

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

OK

Check and replace ABS ECU.

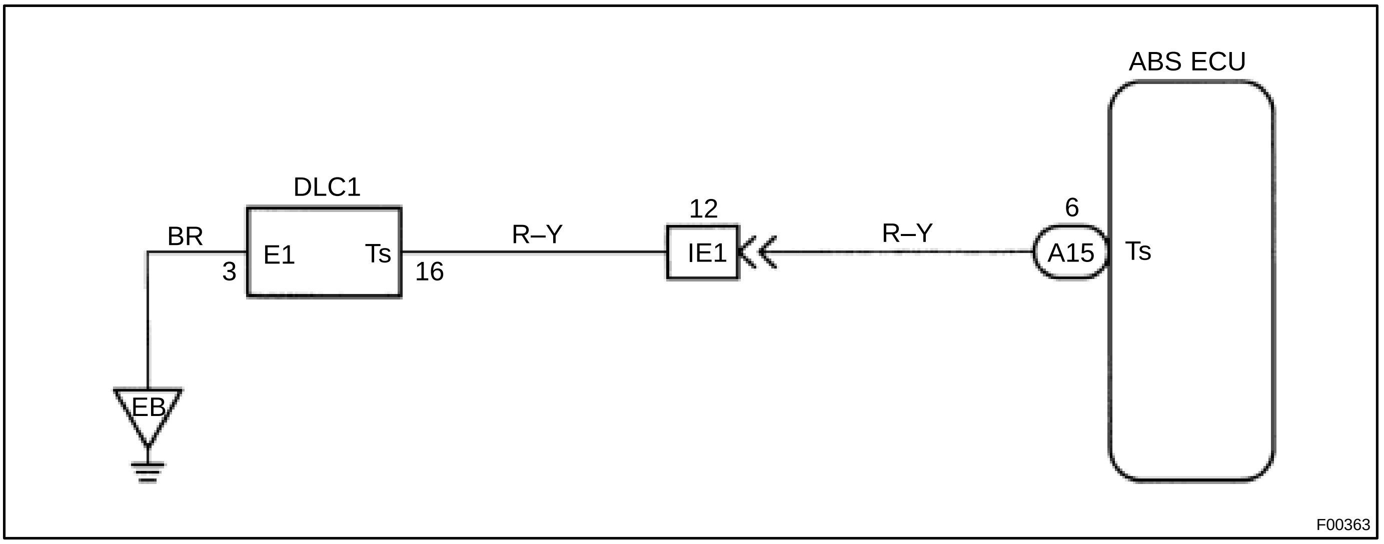
DI10W–01

Ts Terminal Circuit

CIRCUIT DESCRIPTION

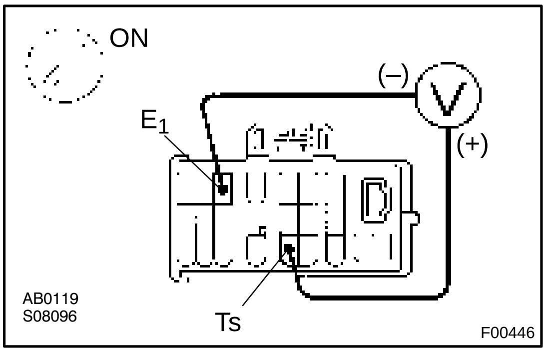
The sensor check circuit detects abnormalities in the speed sensor signal which cannot be detected with the DTC check.
Connecting terminals Ts and E_1 of the DLC1 in the engine compartment starts the check.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check voltage between terminals Ts and E_1 of DLC1.**



CHECK:

(a) Turn the ignition switch ON.

(b) Measure voltage between terminals Ts and E_1 of DLC1.

OK:

Voltage: 10 – 14 V

OK → **If ABS warning light does not blink even after Ts and E_1 are connected, ECU may be defective.**

NG

2	**Check for open and short in harness and connector between ABS ECU and DLC1, DLC1 and body ground (See page IN–24).**

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

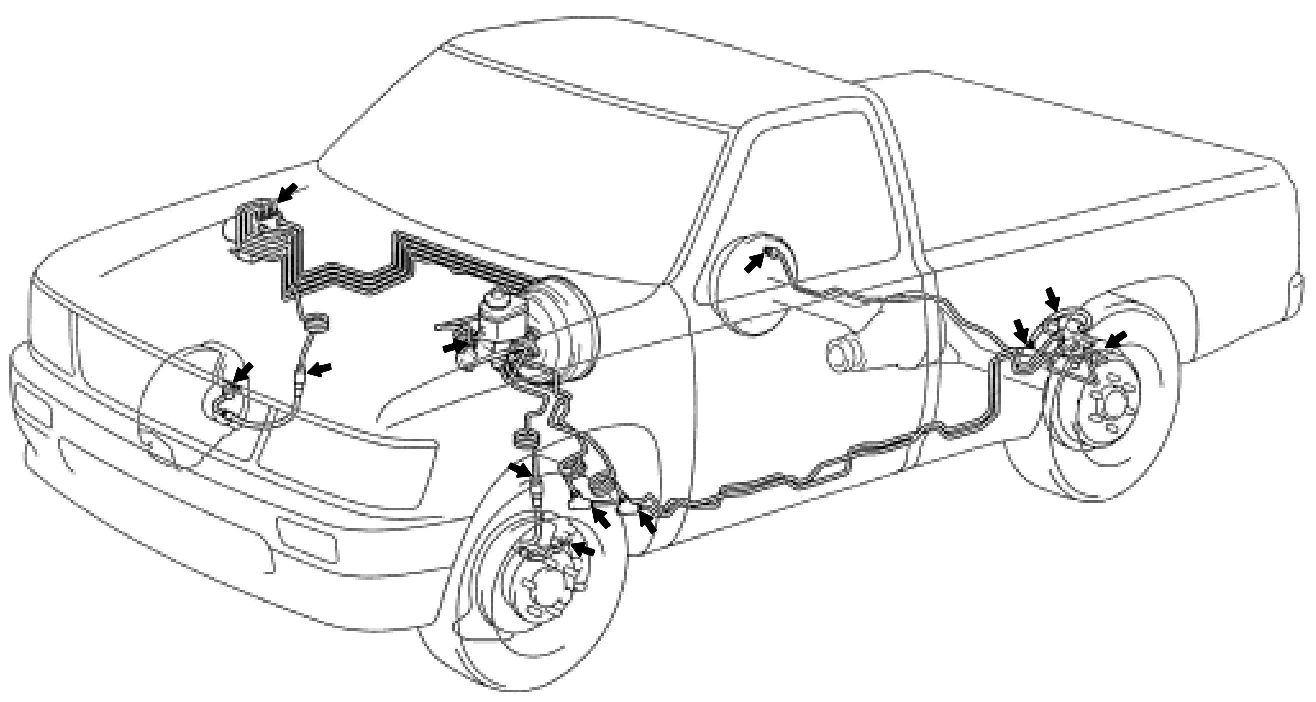
OK

Check and replace ABS ECU.

DI10Y–01

Check for fluid Leakage

Check for fluid leakage from actuator or hydraulic lines.



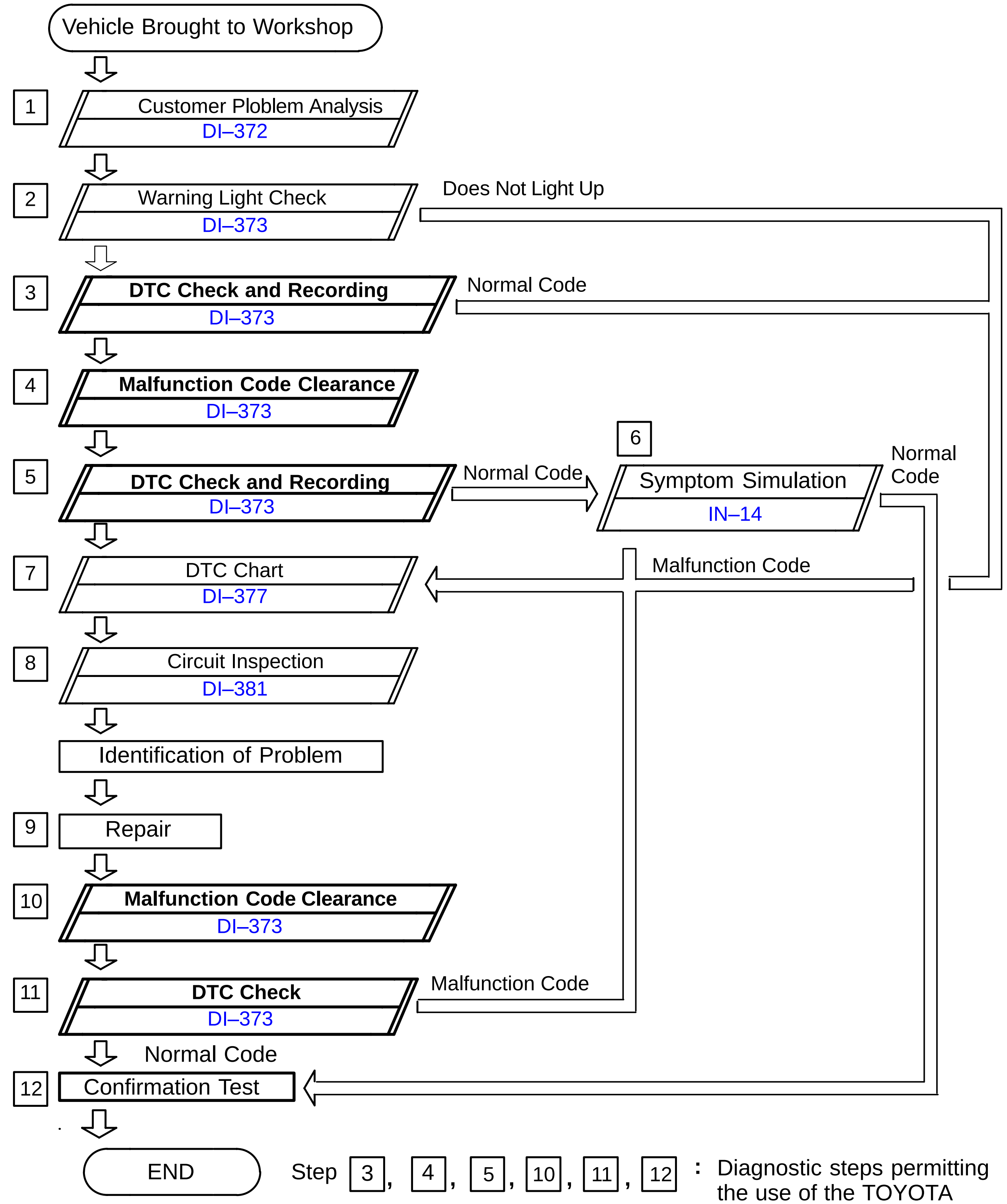
F00447

SUPPLEMENTAL RESTRAINT SYSTEM

DI0XG–01

HOW TO PROCEED WITH TROUBLESHOOTING

Troubleshooting in accordance with the procedure on the following pages.



Step 3, 4, 5, 10, 11, 12 : Diagnostic steps permitting the use of the TOYOTA hand–held tester.

DI0XH–01

CUSTOMER PROBLEM ANALYSIS CHECK

Supplemental Restraint System Check Sheet

Inspector's Name ______________________

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

Date Problem Dist Occurred	/ /
Weather	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Other
Temperature	Approx.

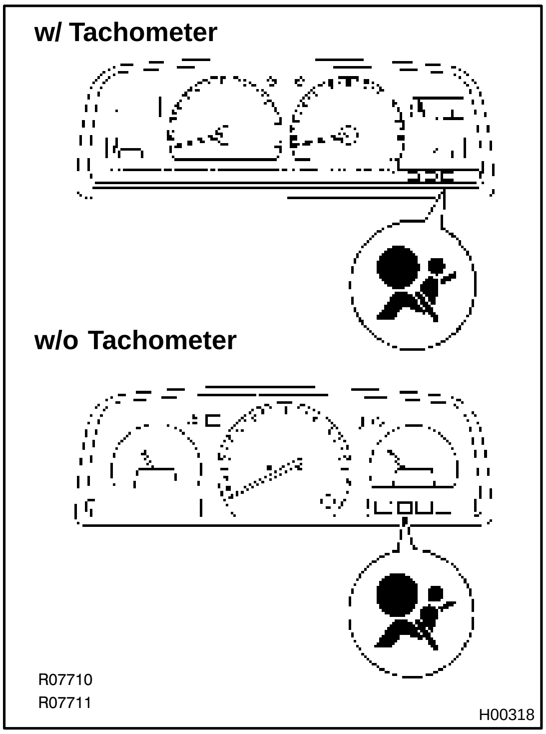
Vehicle Operation	☐ Starting ☐ Idling ☐ Driving [☐ Constant speed ☐ Acceleration ☐ Deceleration ☐ Other]
Road Conditions	
Details of Problem	

Vehicle Inspection, Repair History Prior to Occurrence of Malfunction (Including Supplemental Restraint System)	

Diagnosis System Inspection

SRS Warning Light Inspection	**1st Time**	☐ Remains ON ☐ Sometimes Lights Up ☐ Does Not Light Up
	2nd Time	☐ Remains ON ☐ Sometimes Lights Up ☐ Does Not Light Up
DTC Inspection	**1st Time**	☐ Normal Code ☐ Malfunction Code [Code.]
	2nd Time	☐ Normal Code ☐ Malfunction Code [Code.]

DI0XJ–01



PRE–CHECK

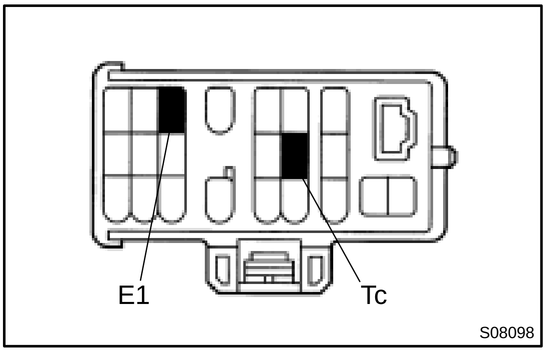
1. SRS warning light check

(a) Turn the ignition switch to ACC or ON and check that the SRS warning light lights up.

(b) Check that the SRS warning light goes out after approx. 6 seconds.

HINT:

- When the ignition switch is at ACC or ON and the SRS warning light remains on or flashes, the airbag sensor assembly has detected a malfunction code.
- If, after approx. 6 seconds have elapsed, the SRS warning light sometimes lights up or the SRS warning light lights up even when the ignition switch is OFF, a short in the SRS warning light circuit can be considered likely. Proceed to ”SRS warning light system malfunction” on page DI–412, DI–414.



2. DTC check (Using diagnosis check wire)

(a) OUTPUT DTC

(1) Turn the ignition switch to ACC or ON position and wait approx. 20 seconds.

(2) Using SST, connect terminals Tc and E1 of the DLC1.

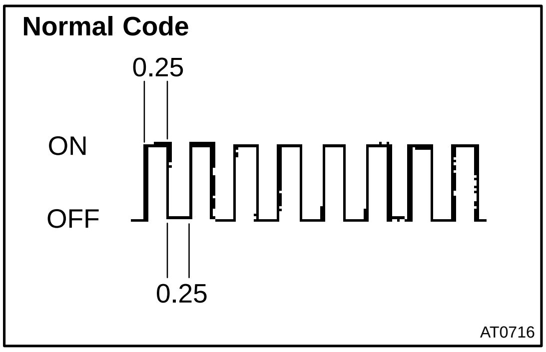
SST SST 09843–18020

NOTICE:

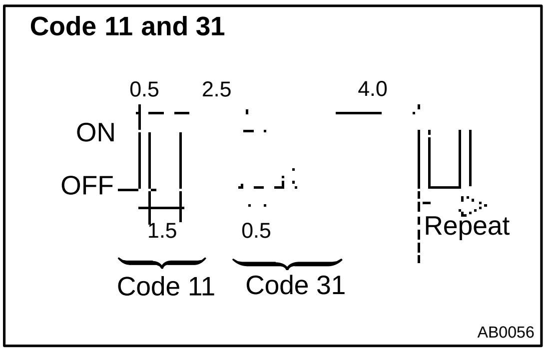
Never make a mistake with the terminal connection position as this will cause a malfunction.

(b) READ DTC

Read the 2–digit DTC as indicated by the number of times the SRS warning light blinks. As an example, the blinking patterns, normal, 11 and 31 are as shown on the illustration.



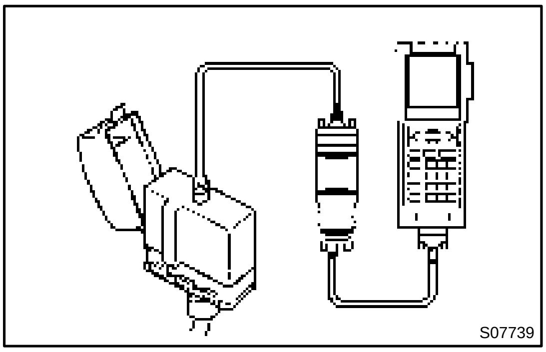
- Normal code indication
  The light will blink 2 times per second.
- Malfunction code indication
  The first blinking output indicates the first digit of a 2–digit DTC. After a 1.5 second pause, the second blinking output will indicate the second digit.



If there are 2 or more codes, there will be a 2.5 second pause between each codes. After al the codes have been output, there will be a 4.0 second pause and they will all be repeated.

HINT:

- In the event of a number of trouble codes, indication will start from the smallest numbered code.
- If it does not output a DTC or outputs a DTC without terminal connection, proceed to the Tc terminal circuit inspection on page DI–417.



3. DTC check (Using TOYOTA hand–held tester)

(a) Hook up the TOYOTA hand–held tester to the DLC1.

(b) Read the DTCs by following the prompts on the tester screen.

HINT:

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

4. DTC clearance (Using diagnosis check wire)

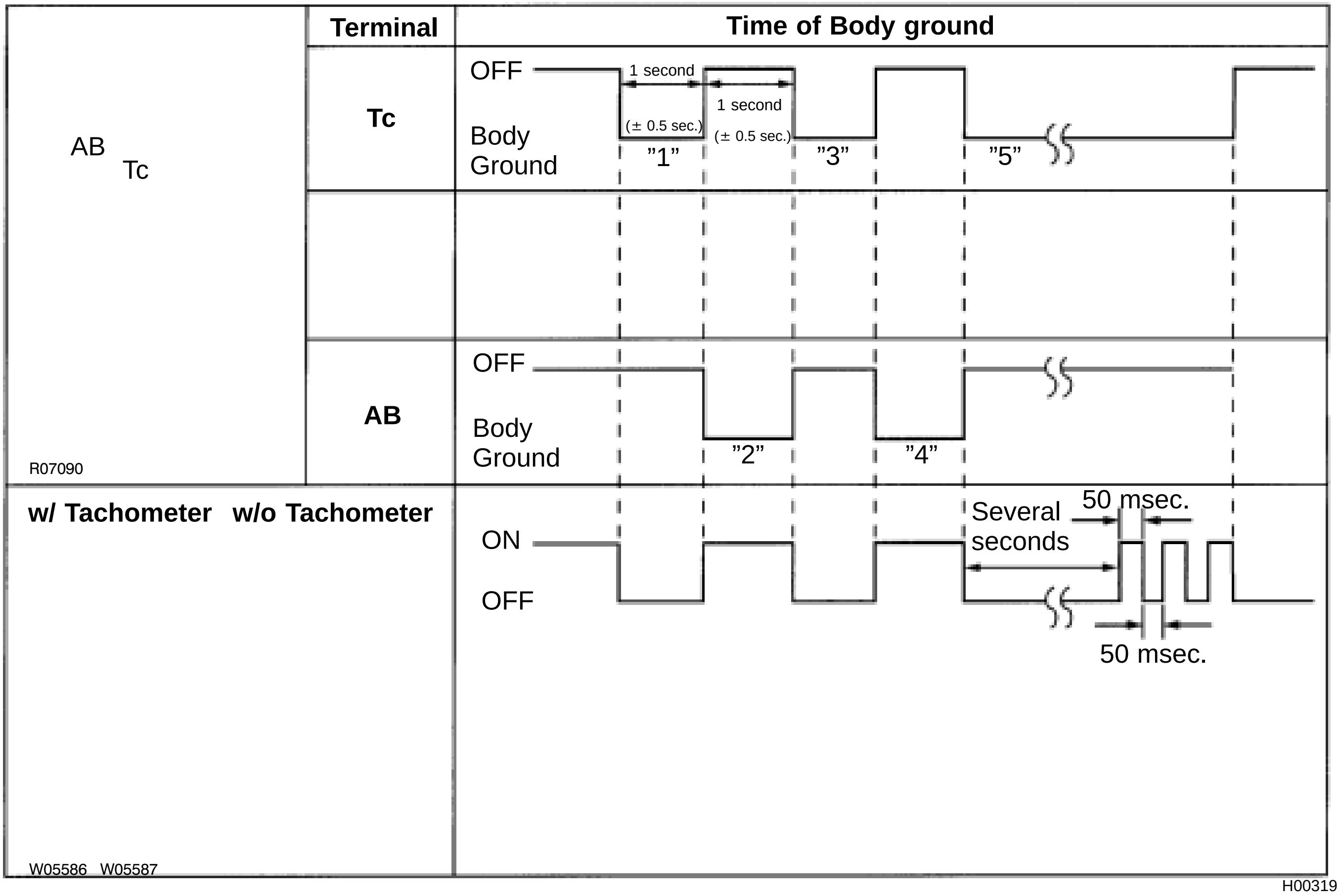
(a) Conncect the 2 service wires to terminals Tc nad AB of DLC1.

(b) Turn the ignition switch to ACC or ON and wait approx. 6 seconds.

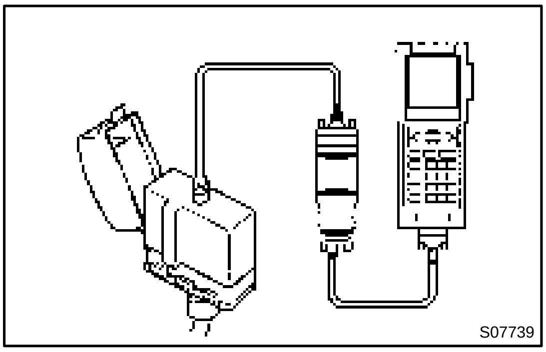
(c) Starting with the Tc terminal, apply body ground alternately to terminal Tc and terminal AB twice each in cycles of 1.0 seconds. Confirm that body ground is absolute. Finally, keep applying body ground to terminal Tc.

HINT:

When alternately groundling terminals Tc and AB, release grounf from one terminal and immediately apply it to the other terminal within an interval of 0.2 second. If DTCs do not clear, repeat the above procedure until the codes are cleared.



(d) Several seconds after doing the clearing procedure, the SRS warning light will blink in a 50 msec. cycle to indicate the codes have been cleared.



5. DTC clearance (Using TOYOTA hand–held tester)

(a) Hook up the TOYOTA hand–held tester to the DLC1.

(b) Clear the DTCs by following the prompts on the tester screen.

HINT:

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

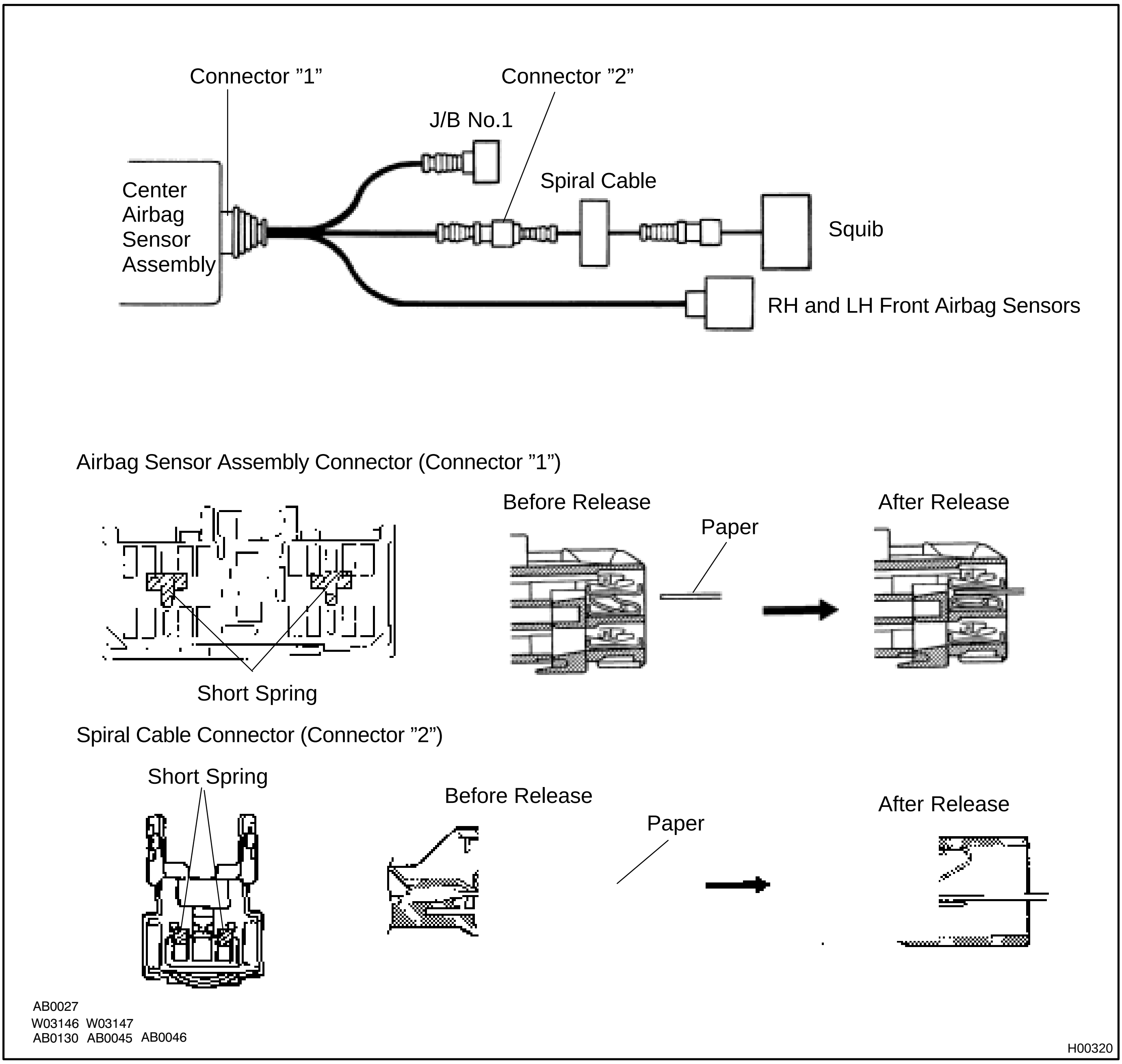
6. RELEASE METHOD OF AIRBAG ACTIVATION PREVENTION MECHANISM

An airbag activation prevention mechanism is built into the connector for the squib circuit of the SRS.

When release of the airbag activation prevention mechanism is directed in the troubleshooting procedure, as shown in the illustration of the connectors ”1” and ”2” below, insert paper which is the same thickness as the male terminal, between the terminal and the short spring.

CAUTION:
NEVER RELEASE the airbag activation prevention mechanism on the steering wheel pad connector.
NOTICE:

- **Do not release the airbag activation prevention mechanism unless specifically directed by the troubleshooting procedure.**
- **If the paper inserted is too thick the terminal and short spring may be damaged, so always use paper the same thickness as the male terminal.**



DI0XK–01

DIAGNOSTIC TROUBLE CODE CHART

If a malfunction code is displayed during the DTC check, check the circuit listed for that code in the table below (Proceed to the page given for that circuit.).

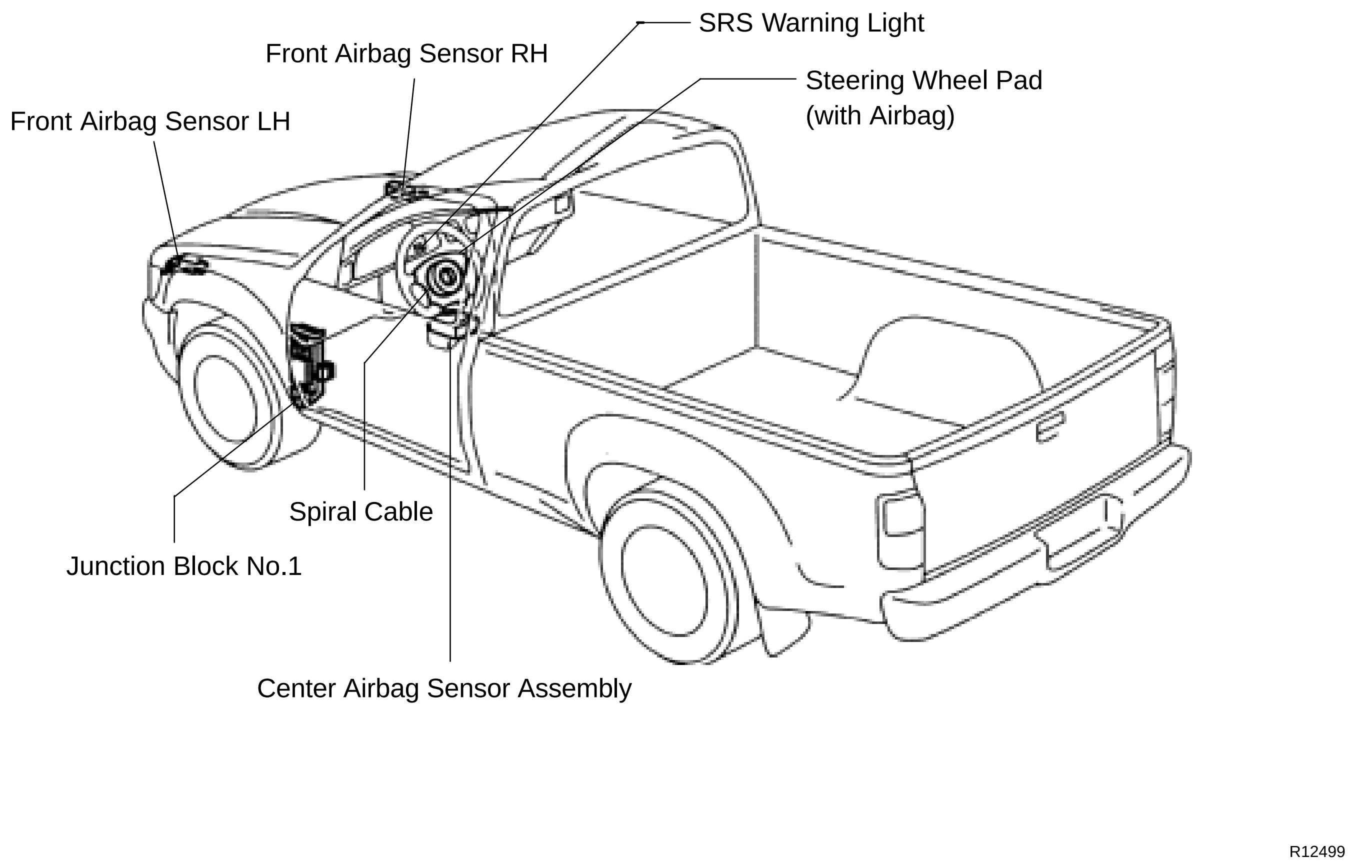
DTC No. (See Page)	Detection Item	Trouble Area	SRS Warning Light
Normal (DI–409)	●System normal	–	OFF
	●Source voltage drop	●Battery ●Center airbag sensor assembly	ON
11 (DI–381)	●Short in squib circuit or front airbag sensor circuit (to ground)	●Steering wheel pad (D squib) ●Front airbag sensor ●Spiral cable ●Center airbag sensor assembly ●Wire harness	ON
12 (DI–387)	●Short in squib circuit or front airbag sensor circuit (to B+)	●Steering wheel pad (D squib) ●Front airbag sensor ●Spiral cable ●Center airbag sensor assembly ●Wire harness	ON
13 (DI–393)	●Short in D squib circuit	●Steering wheel pad (D squib) ●Spiral cable ●Center airbag sensor assembly ●Wire harness	ON
14 (DI–398)	●Open in D squib circuit	●Steering wheel pad (D squib) ●Spiral cable ●Center airbag sensor assembly ●Wire harness	ON
15 (DI–403)	●Open in front airbag sensor circuit	●Front airbag sensor ●Center airbag sensor assembly ●Wire harness	ON
31 (DI–407)	●Center airbag sensor assembly malfunction	●Center airbag sensor assembly	ON

HINT:

- When the SRS warning light remains lit up and the DTC is the normal code, this means a source voltage drop. This malfunction is not stored in memory by the center airbag sensor assembly and if the power source voltage returns to normal, approx. 10 seconds the SRS warning light will automatically go out.
- When 2 or more codes are indicated, the lowest numbered code will apper first.
- If a code not listed on the chart is displayed, the center airbag sensor assembly is faulty.

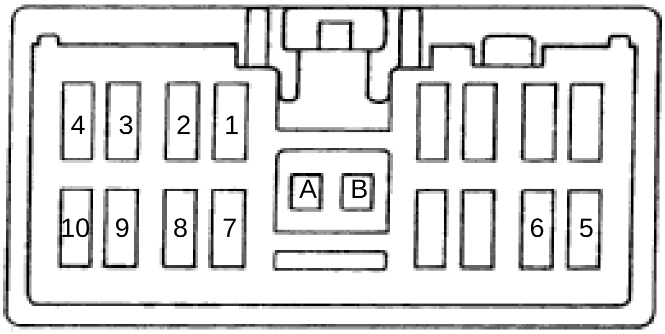
DI0XL–01

PARTS LOCATION



DI7HL–01

TERMINALS OF ECU



W02759

No.	Symbol	Terminal Name
A	–	Electrical Connection Check Mechanism
B	–	Electrical Connection Check Mechanism
1	LA	SRS Warning Light
2	D–	Squib ⊖ (Driver)
3	D+	Squib < (Driver)
4	T_C	Diagnosis
5	E2	Ground
6	E1	Ground
7	+SR	Front Airbag Sensor RH <
8	+SL	Front Airbag Sensor LH ⊖
9	IG2	Power Source (IGN Fuse)
10	ACC	Power Source (CIG Fuse)

DI0XN–01

PROBLEM SYMPTOMS TABLE

Proceed with troubleshooting of each circuit in the table below.

Symptom	Suspect Area	See page
●With the ignition switch at ACC or ON, the SRS warning light sometimes lights up after approx. 6 seconds have elapsed. ●SRS warning light is always lit up even when ignition switch is in the LOCK position.	●SRS warning light circuit (Always lit up when ignition switch is in LOCK position.)	DI–412
●With the ignition switch at ACC or ON, the SRS warning lights does not light up.	●SRS warning light circuit (Does not light up when ignition switch is turned to ACC or ON.)	DI–414
●DTC not displayed. ●SRS warning light is always lit up a DTC check procedure. ●DTC displayed without Tc and E1 terminal connection.	●Tc terminal circuit	DI–417

DI0XO–01

CIRCUIT INSPECTION

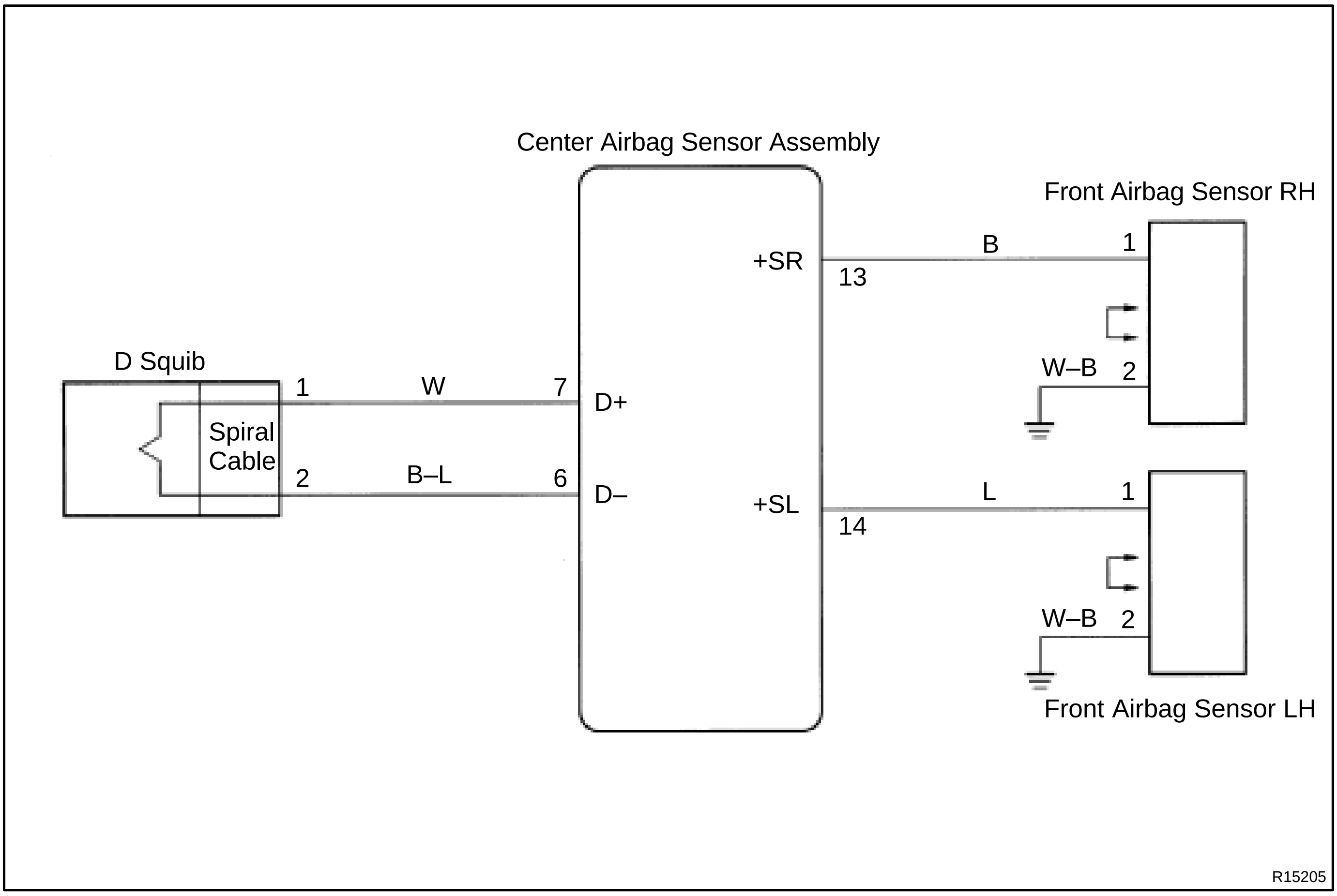
DTC	11	Short in Squib Circuit (to Ground)

CIRCUIT DESCRIPTION

The squib circuit consists of the center airbag sensor assembly, spiral cable and steering wheel pad. If causes the SRS to deploy when the SRS deployment conditions are satisfied.
The front airbag sensor detects the deceleration force in a frontal collision and is located in the front fender apron on the left and right sides.
For details of the function of each component, see OPERATION on page RS–2.
DTC 11 is recorded when ground short is detected in the squib circuit or front airbag sensor circuit.

DTC No.	DTC Detecting Condition	Trouble Area
11	●Short circuit in squib wire harness (to ground) ●Squib malfunction ●Short circuit in front airbag sensor +S wire harness (to ground) ●Front airbag snesor malfunction ●Spiral cable malfunction ●Center airbag sensor assembly malfunction	●Steering wheel pad (D squib) ●Front airbag sensor ●Spiral cable ●Center airbag sensor assembly ●Wire harness

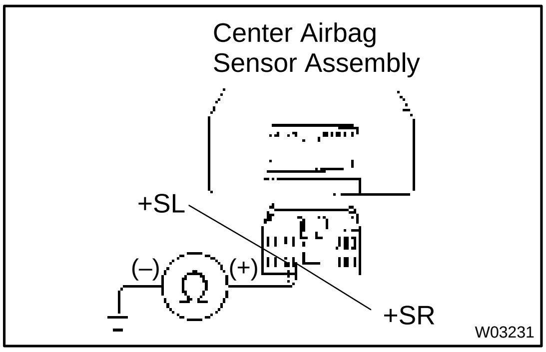
WIRING DIAGRAM



INSPECTION PROCEDURE

1	Preparation. (See step 1 on page DI–409)

2	Check front airbag sensor circuit. (Measure resistance between terminals +SR, +SL of center airbag sensor assembly connector.)

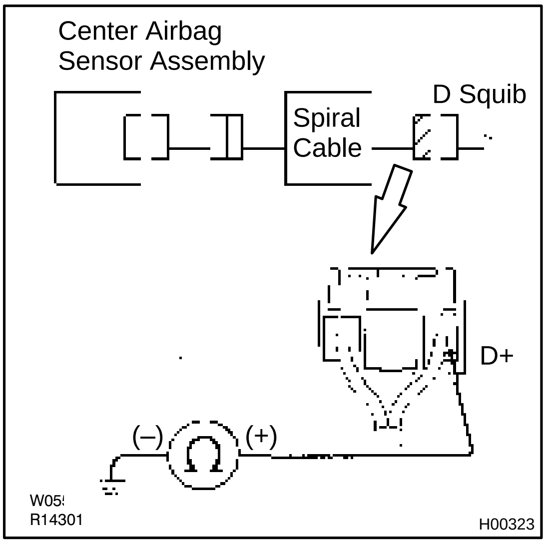


CHECK:
Measure resistance between terminals +SR, +SL of harness side connector of center airbag sensor assembly and body ground.
OK:
Resistance: 755 – 855 Ω

NG → **Go to step 6.**

OK

3	Check D squib circuit.

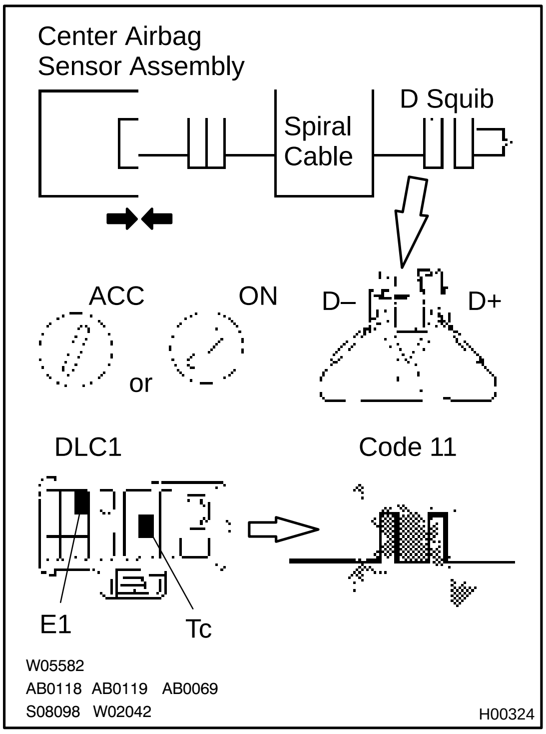


CHECK:
For connector on spiral cable side between spiral cable and steering wheel pad, measure resistance between D+ and body ground.
OK:
Resistance: 1MΩ or higher

NG → **Go to step 7.**

OK

4	**Check center airbag sensor assembly.**



PREPARATION:

(a) Connect connector to center airbag sensor assembly.

(b) Using a service wire, connect D+ and D– on spiral cable side of connector between spiral cable and steering wheel pad.

(c) Connect negative (–) terminal cable to battery, and wait at least 2 seconds.

CHECK:

(a) Turn ignition switch to ACC or ON, and wait at least 20 seconds.

(b) Clear malfunction code stored in memory.
(See page DI–373)

(c) Turn ignition switch to LOCK, and wait at least 20 seconds.

(d) Turn ignition switch to ACC or ON, and wait at least 20 seconds.

(e) Using SST, connect terminals Tc and E1 of DLC1.
SST 09843–18020

(f) Check DTC.

OK:

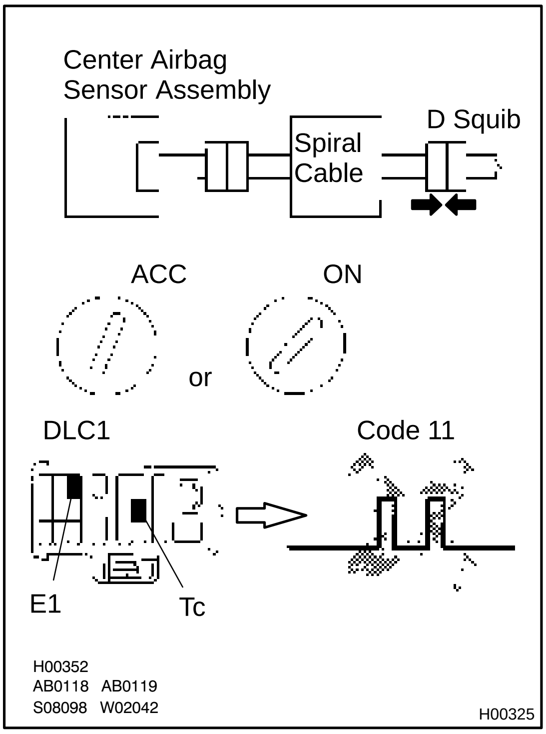
DTC 11 is not output.

HINT:
Codes other than code 11 may be output at this time, but they are not relevant to this check.

NG	**Replace center airbag sensor assembly.**

OK

5	**Check D squib.**



PREPARATION:

(a) Turn ignition switch to LOCK.

(b) Disconnect negative (–) terminal cable from the battery, and wait at least 90 seconds.

(c) Connect steering wheel pad connector.

(d) Connect negative (–) terminal cable to battery, and wait at least 2 seconds.

CHECK:

(a) Turn ignition switch to ACC or ON, and wait at least 20 seconds.

(b) Clear malfunction code stored in memory.
(See page DI–373)

(c) Turn ignition switch to LOCK, and wait at least 20 seconds.

(d) Turn ignition switch to ACC or ON, and wait at least 20 seconds.

(e) Using SST, connect terminals Tc and E1 of DLC1.
SST 09843–18020

(f) Check DTC.

OK:

DTC 11 is not output.

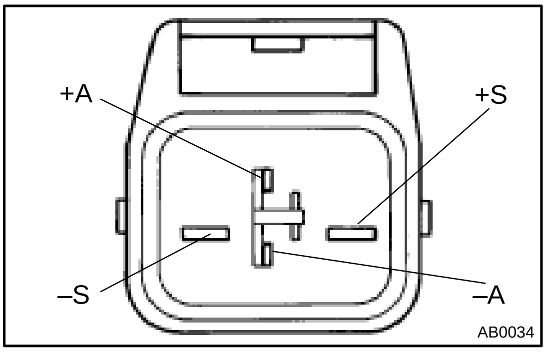
HINT:
Codes other than code 11 may be output at this time, but they are not relevant to this check.

NG	**Replace steering wheel pad.**

OK

**From results of above inspection, malfunctioning part can now be considered normal.
To make sure of this, use simulation method to check. If malfunctioning part can not be detected by imulation method, replace all SRS components including wire harness.**

6	**Check front airbag sensor.**



PREPARATION:
Disconnect front airbag sensor connector.

CHECK:
Measure resistance between each terminal of front airbag sensor.

OK:

Terminal	Resistance
+S – +A	Less than 1 Ω
+S – –S	1 MΩ or higher
–S – –A	755 – 855 Ω

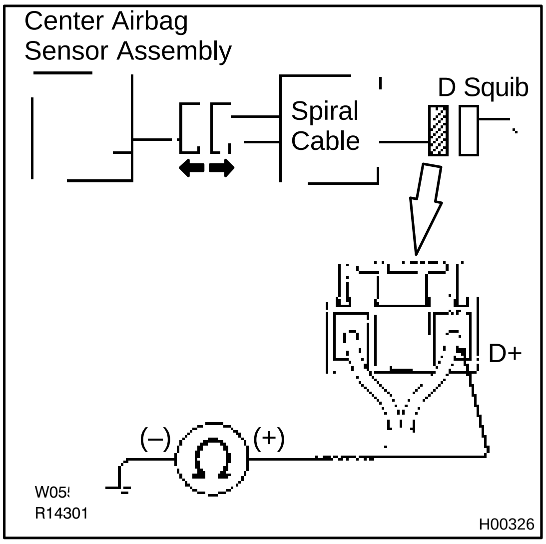
NOTICE:
- **Do not press ohmmeter probes too strongly against terminals of front airbag sensor.**
- **Make sure front airbag sensor connector is properly connected.**

NG → **Replace front airbag sensor.**

OK

Repair or replace harness or connector between center airbag sensor assembly and front airbag sensor.

7	**Check spiral cable.**



PREPARATION:
Disconnect connector between center airbag sensor assembly and spiral cable.

CHECK:
For connector on spiral cable side between spiral cable and steering wheel pad, measure resistance between D+ and body ground.

OK:
Resistance: 1MΩ or higher

NG → **Repair or replace spiral cable.**

OK

Repair or replace harness or connector between center airbag sensor assembly and spiral cable.

DI0XP–01

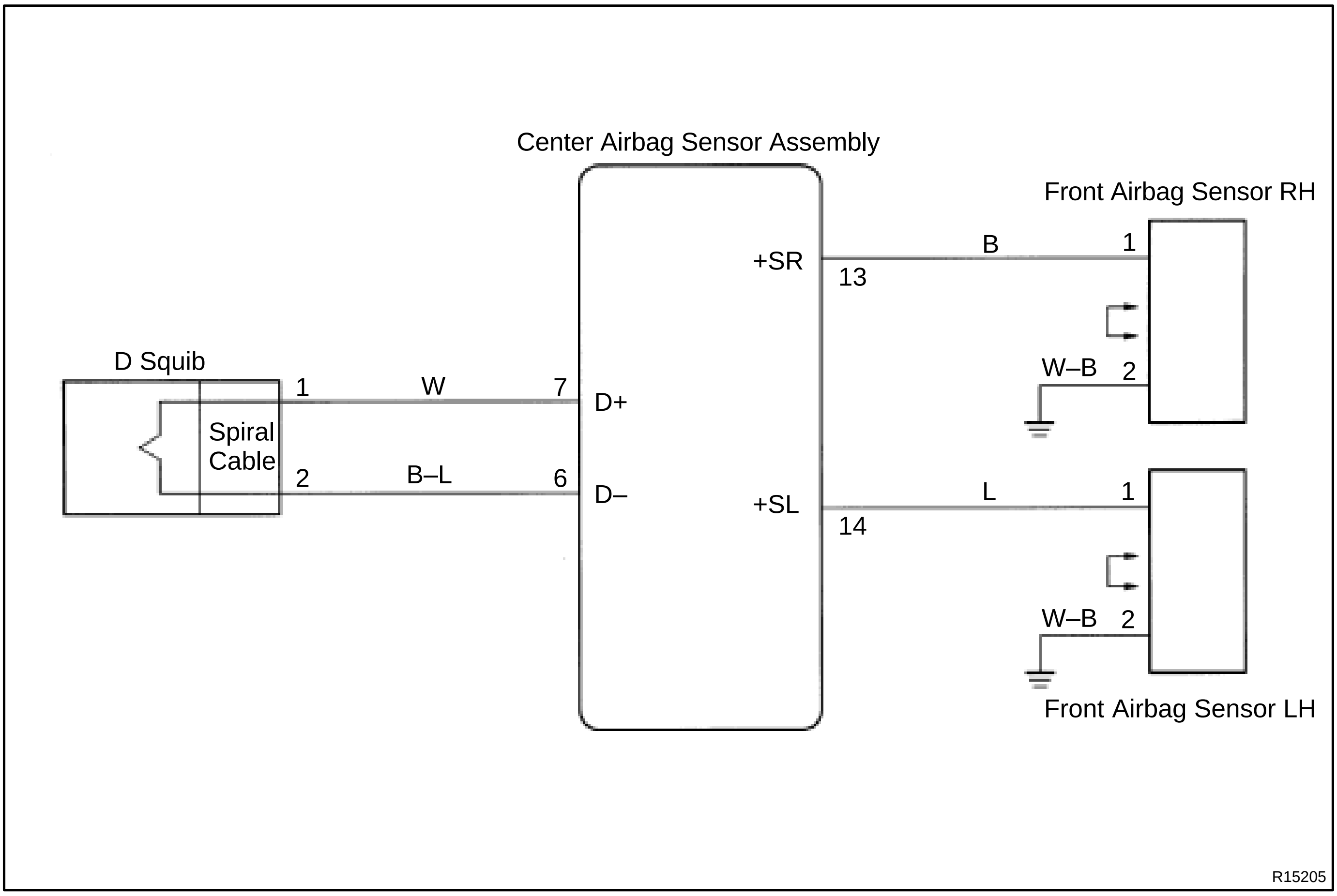
DTC	12	Short in Squib Circuit or Front Airbag Sensor Circuit (to B+)

CIRCUIT DESCRIPTION

The squib circuit consists of the airbag sensor assembly, spiral cable, steering wheel pad and front passenger airbag assembly. It causes the SRS to deploy when the SRS deployment conditions are satisfied.
The front airbag sensor detects the deceleration force in a frontal collision and is located in the front fender on the left and right sides.
For details of the function of each components, see page OPERATION on page RS–2.
DTC 12 is recorded when a B+ short is detected in the squib circuit or front airbag sensor circuit.

DTC No.	DTC Detecting Condition	Trouble Area
12	●Short circuit in squib wire harness (to B+) ●Squib malfunction ●Short circuit in front airbag sensor +S wire harness (to B+) ●Open circuit in RH and LH front airbag sensor harness ●Spiral cable malfunction ●Center airbag sensor assembly malfunction	●Steering wheel pad (D squib) ●Front airbag sensor ●Spiral cable ●Center airbag sensor assembly ●Wire harness

WIRING DIAGRAM



INSPECTION PROCEDURE

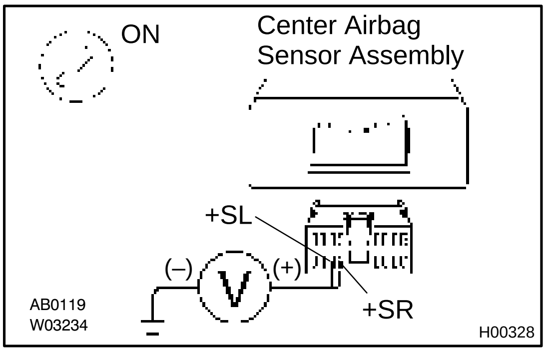
1	**Preparation. (See step 1 on page DI–409)**

2	**Check front airbag sensor circuit. (Measure resistance between terminals +SR, +SL of center airbag sensor assembly connector.) (See step 2 on page DI–381)**

NG → **Go to code 15. (See page DI–403)**

OK

3	**Check front airbag sensor circuit. (Measure voltage between terminals +SR or +SL of center airbag sensor assembly connector and body ground.)**



PREPARATION:

(a) Connect negative (–) terminal cable to battery.

(b) Turn ignition switch to ON.

CHECK:

Measure voltage between terminals +SR or +SL of harness side connector of center airbag sensor assembly and body ground.

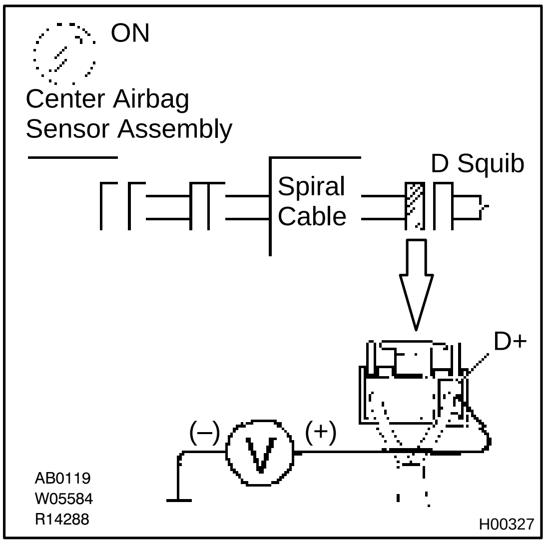
OK:

Voltage: 0 – 0.1 V

NG → **Repair or replace harness or connector between center airbag sensor assembly and front airbag sensor. (See page RS–32)**

OK

4	**Check D squib circuit.**



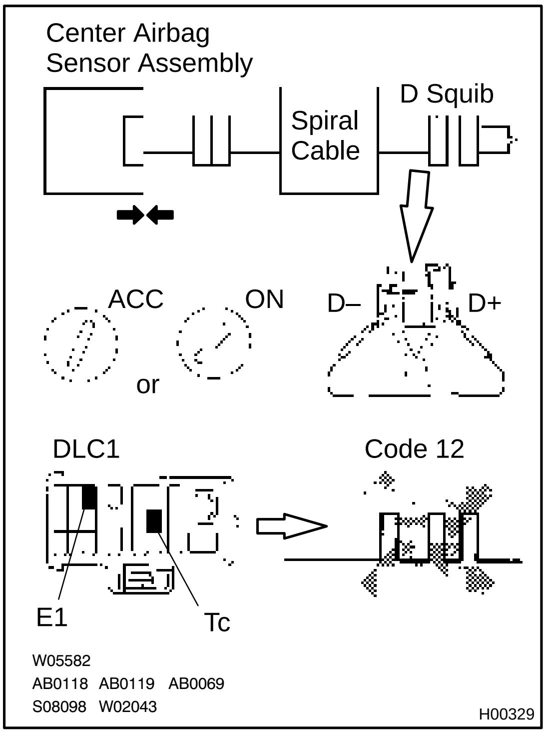
CHECK:
For connector on spiral cable side between spiral cable and steering wheel pad, measure voltage between D+ and body ground.

OK:
Voltage: 0 V

NG	**Go to step 7.**

OK

5	**Check center airbag sensor assembly.**



PREPARATION:

(a) Turn ignition switch LOCK.

(b) Disconnect negative (–) terminal cable from battery.

(c) Connect connector to center airbag sensor assembly.

(d) Using a service wire, connect D+ and D– on spiral cable side of connector between spiral cable and steering wheel pad.

(e) Connect negative (–) terminal cable to battery, and wait at least 2 seconds.

CHECK:

(a) Turn ignition switch to ACC or ON, and wait at least 20 seconds.

(b) Clear malfunction code stored in memory.
(See page DI–373)

(c) Turn ignition switch to LOCK, and wait at least 20 seconds.

(d) Turn ignition switch to ACC or ON, and wait at least 20 seconds.

(e) Using SST, connect terminals Tc and E1 of DLC1.
SST 09843–18020

(f) Check DTC.

OK:

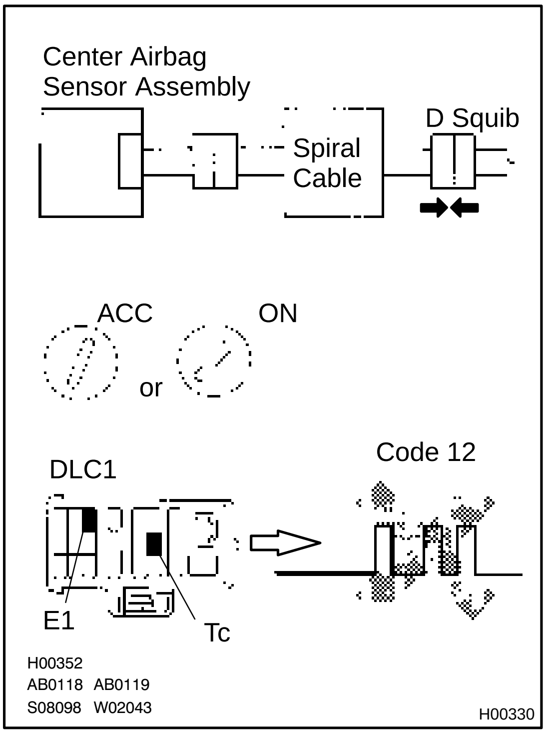
DTC 12 is not output.

HINT:
Codes other than code 12 may be output at this time, but they are not relevant to this check.

NG	**Replace center airbag sensor assembly.**

OK

6	Check D squib.



PREPARATION:

(a) Turn ignition switch to LOCK.

(b) Disconnect negative (–) terminal cable from the battery, and wait at least 90 seconds.

(c) Connect steering wheel pad connector.

(d) Connect negative (–) terminal cable to battery, and wait at least 2 seconds.

CHECK:

(a) Turn ignition switch to ACC or ON, and wait at least 20 seconds.

(b) Clear malfunction code stored in memory.
(See page DI–373)

(c) Turn ignition switch to LOCK, and wait at least 20 seconds.

(d) Turn ignition switch to ACC or ON, and wait at least 20 seconds.

(e) Using SST, connect terminals Tc and E1 of DLC1.
SST 09843–18020

(f) Check DTC.

OK:

DTC 12 is not output.

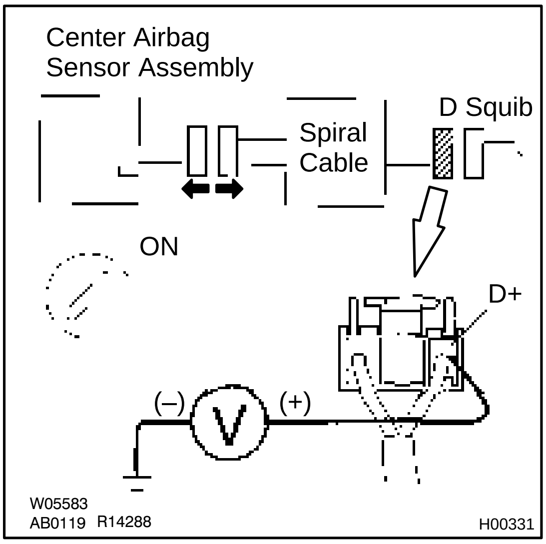
HINT:
Codes other than code 12 may be output at this time. but they are not relevant to this check.

NG	Replace steering wheel pad.

OK

From results of above inspection, malfunctioning part can now be considered normal.
To make sure of this, use simulation method to check.

7	**Check spiral cable.**



PREPARATION:

(a) Turn ignition switch to LOCK.

(b) Disconnect connector between center airbag sensor assembly and spiral cable.

(c) Turn ignition switch ON.

CHECK:

For connector on spiral cable side between spiral cable and steering wheel pad, measure voltage between D+ and body ground.

OK:

Voltage: 0 V

NG	**Repair or replace spiral cable.**

OK

Repair or replace harness or connector between center airbag sensor assembly and spiral cable.

DI0XS–01

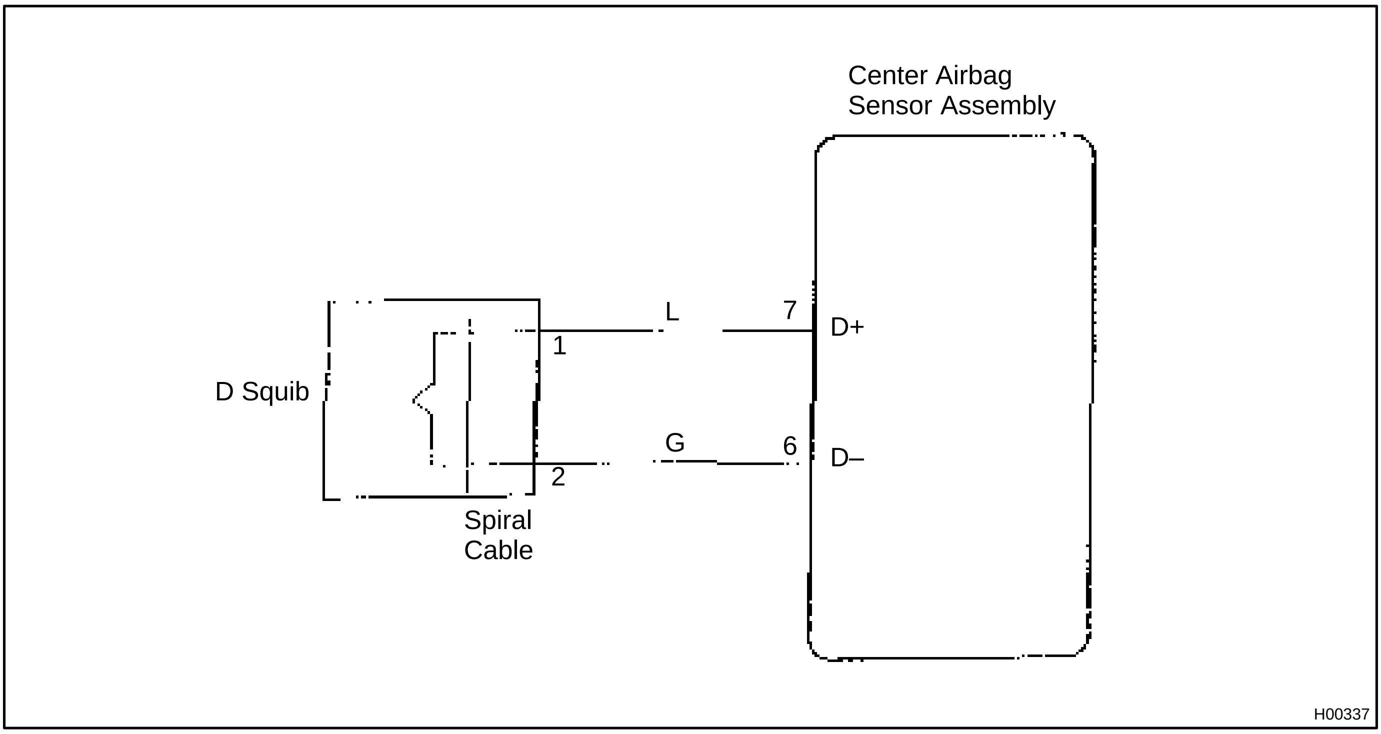
DTC	13	Short in D Squib Circuit

CIRCUIT DESCRIPTION

The D squib circuit consists of the center airbag sensor assembly, spiral cable and steering wheel pad. It causes the airbag to deploy when the airbag deployment conditions are satisfied.
For details of the function of each components, see OPERATION on page RS–2.
DTC 13 is recorded when an short is detected in the D squib circuit.

DTC No.	DTC Detecting Condition	Trouble Area
13	●Open circuit between D+ wire harness and D– wire harness of squib ●D squib malfunction ●Spiral cable malfunction ●Center airbag sensor assembly malfunction	●Steering wheel pad (D squib) ●Spiral cable ●Center airbag sensor assembly ●Wire harness

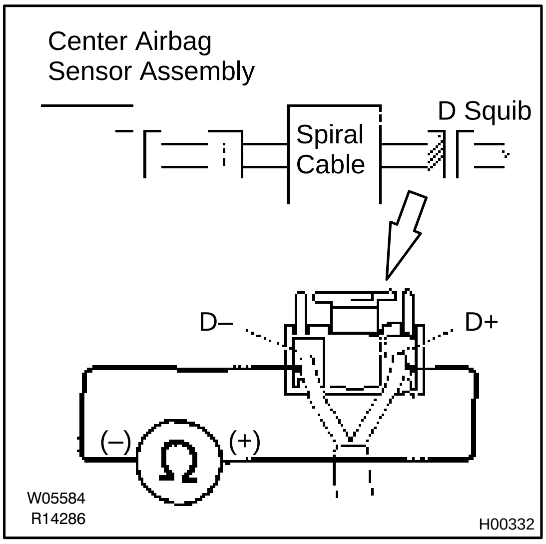
WIRING DIAGRAM



INSPECTION PROCEDURE

1	Preparation. (See step 1 on page DI–409)

2	Check D squib circuit.



PREPARATION:
Release airbag activation prevention mechanism on center airbag sensor assembly side of airbag squib connector. (See step 6 on page DI–373).

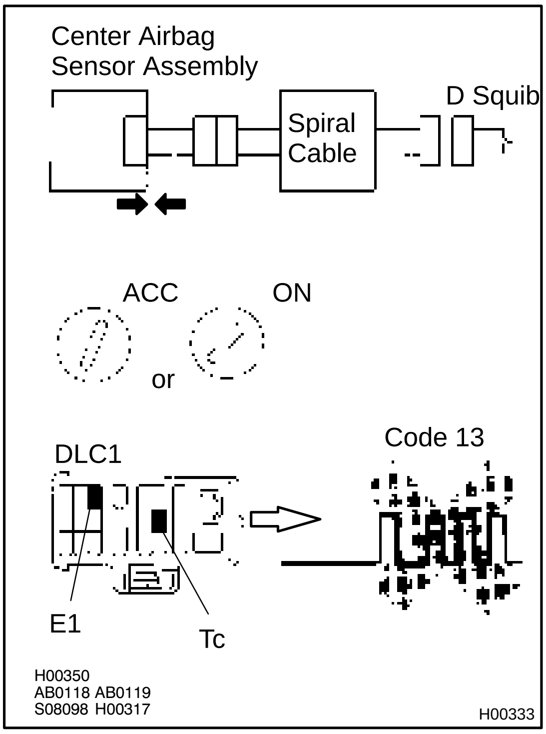
CHECK:
For connector on spiral cable side between spiral cable and steering wheel pad, measure resistance between D+ and D–.

OK:
Resistance: 1 M Ω or higher

NG	Go to step 5.

OK

3	**Check center airbag sensor assembly.**



PREPARATION:

(a) Connect connector to center airbag sensor assembly.

(b) Connect negative (–) terminal cable to battery, and wait at least 2 seconds.

CHECK:

(a) Turn ignition switch to ACC or ON, and wait at least 20 seconds.

(b) Clear malfunction code stored in memory.
(See page DI–373)

(c) Turn ignition switch to LOCK, and wait at least 20 seconds.

(d) Turn ignition switch to ACC or ON, and wait at least 20 seconds.

(e) Using SST, connect terminals Tc and E1 of DLC1.
SST 09843–18020

(f) Check DTC.

OK:

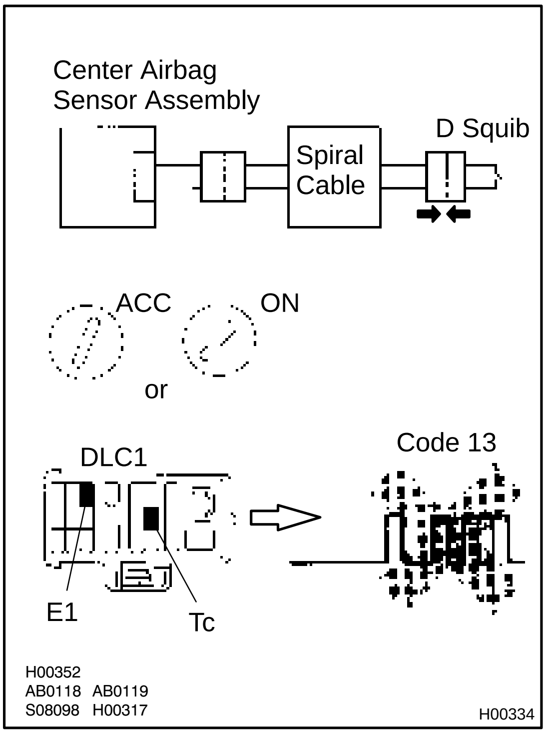
DTC 13 is not output.

HINT:
Codes other than code 13 may be output at this time, but they are relevant to this check.

NG	**Replace center airbag sensor assembly.**

OK

4	**Check D squib.**



PREPARATION:

(a) Turn ignition switch to LOCK.

(b) Disconnect negative (–) terminal cable from the battery, and wait at least 90 seconds.

(c) Connect steering wheel pad connector.

(d) Connect negative (–) terminal cable to battery, and wait at least 2 seconds.

CHECK:

(a) Turn ignition switch to LOCK, and wait at least 20 seconds.

(b) Turn ignition switch to ACC or ON, and wait at least 20 seconds.

(c) Clear malfunction code stored in memory.
(See page DI–373)

(d) Turn ignition switch to LOCK, and wait at least 20 seconds.

(e) Turn ignition switch to ACC or ON, and wait at least 20 seconds.

(f) Using SST, connect terminals Tc and E1 of DLC1.
SST 09843–18020

(g) Check DTC.

OK:

DTC 13 is not output.

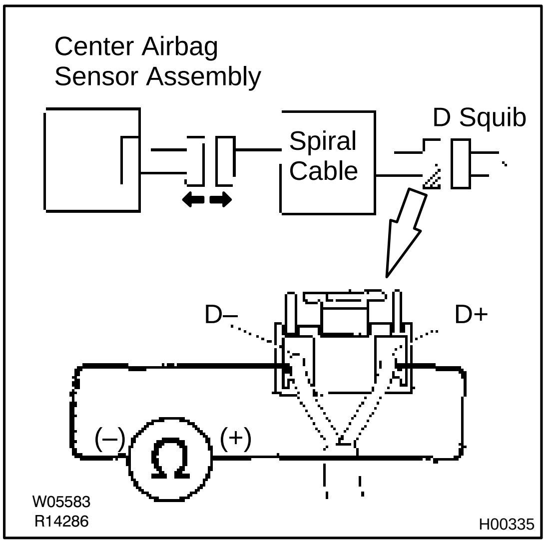
HINT:
Codes other than code 13 may be output at this time, but they are not relevant to this check.

NG	**Replace steering wheel pad.**

OK

From results of above inspection, malfunctioning part can now be considered normal.
To make sure of this, use simulation method to check.

5	**Check spiral cable.**



PREPARATION:

(a) Disconnect connector between center airbag sensor assembly and spiral cable.

(b) Release airbag activation prevention mechanism on center airbag sensor assembly side of spiral cable connector. (See page DI–373)

CHECK:

For connector on spiral cable side between spiral cable and steering wheel pad, measure resistance D+ and D–.

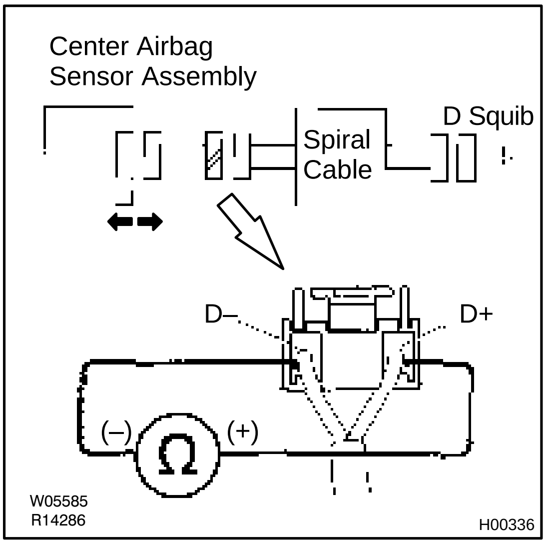
OK:

Resistance: 1 M Ω or higher

NG	**Repair or replace spiral cable.**

OK

6	**Check harness between center airbag sensor assembly and spiral cable.**



PREPARATION:

Release airbag activation prevention mechanism on center airbag sensor assembly connector. (See page DI–373)

CHECK:

For connector on airbag sensor assembly side between center airbag sensor assembly and spiral cable, measure resistance D+ and D–.

OK:

Resistance: 1 M Ω or higher

NG	**Repair or replace harness or connector between center airbag sensor assembly and spiral cable.**

OK

**From results of above inspection, malfunctioning part can now be considered normal.
To make sure of this, use simulation method to check.**

DI0XT–01

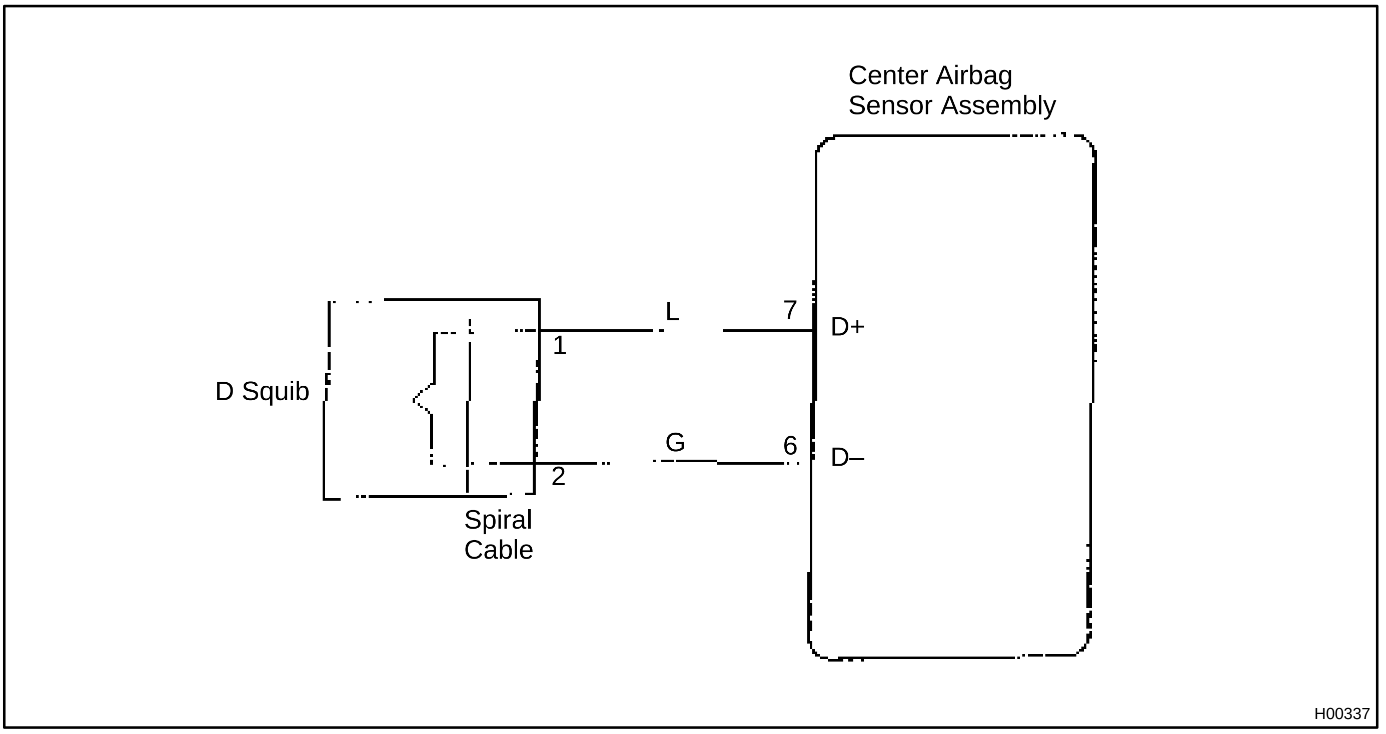
DTC	14	Open in D Squib Circuit

CIRCUIT DESCRIPTION

The D squib circuit consists of the center airbag sensor assembly, spiral cable and steering wheel pad. It causes the airbag to deploy when the airbag deployment conditions are satisfied.
For details of the function of each components, see OPERATION on page RS–2.
DTC 14 is recorded when an open is detected in the D squib circuit.

DTC No.	DTC Detecting Condition	Trouble Area
14	●Open circuit in D+ wire harness or D– wire harness of squib ●D squib malfunction ●Spiral cable malfunction ●Center airbag sensor assembly malfunction	●Steering wheel pad (D squib) ●Spiral cable ●Center airbag sensor assembly ●Wire harness

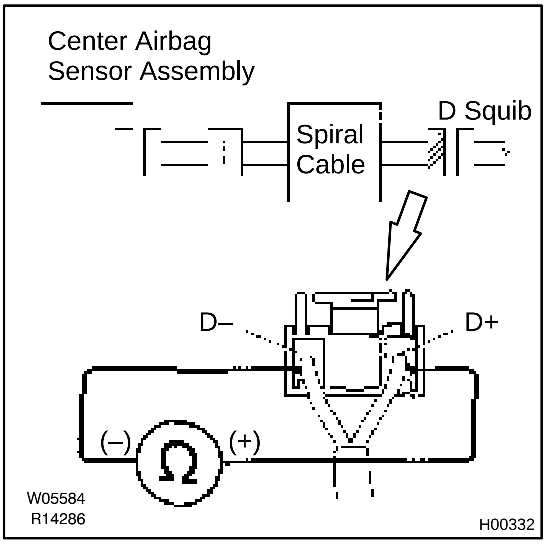
WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Preparation. (See step 1 on page DI–409)**

2	**Check D squib circuit.**

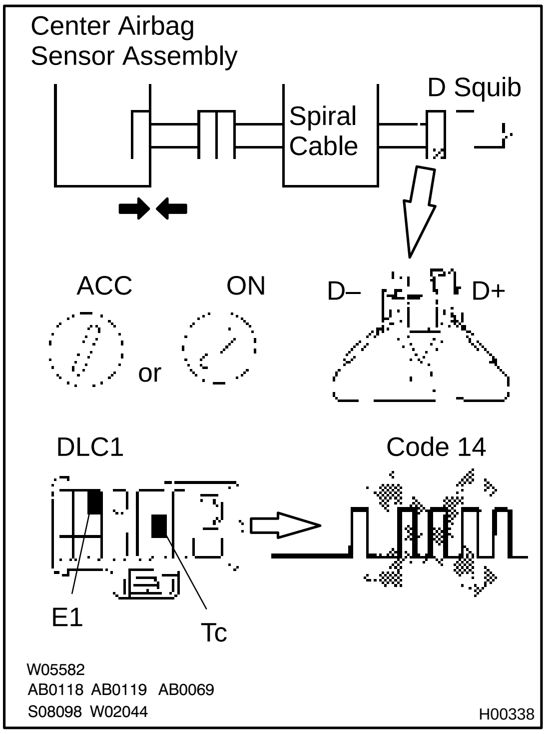


CHECK:
For connector on spiral cable side between spiral cable and steering wheel pad, measure resistance between D+ and D–.
OK:
Resistance: Below 1 Ω

NG → **Go to step 5.**

OK

3	Check center airbag sensor assembly.



PREPARATION:

(a) Connect connector to center airbag sensor assembly.

(b) Using a service wire, connect D+ and D– on spiral cable side of connector between spiral cable and steering wheel pad.

(c) Connect negative (–) terminal cable to battery, and wait at least 2 seconds.

CHECK:

(a) Turn ignition switch to ACC or ON, and wait at least 20 seconds.

(b) Clear malfunction code stored in memory.
(See page DI–373)

(c) Turn ignition switch to LOCK, and wait at least 20 seconds.

(d) Turn ignition switch to ACC or ON, and wait at least 20 seconds.

(e) Using SST, connect terminals Tc and E1 of DLC1.
SST 09843–18020

(f) Check DTC.

OK:

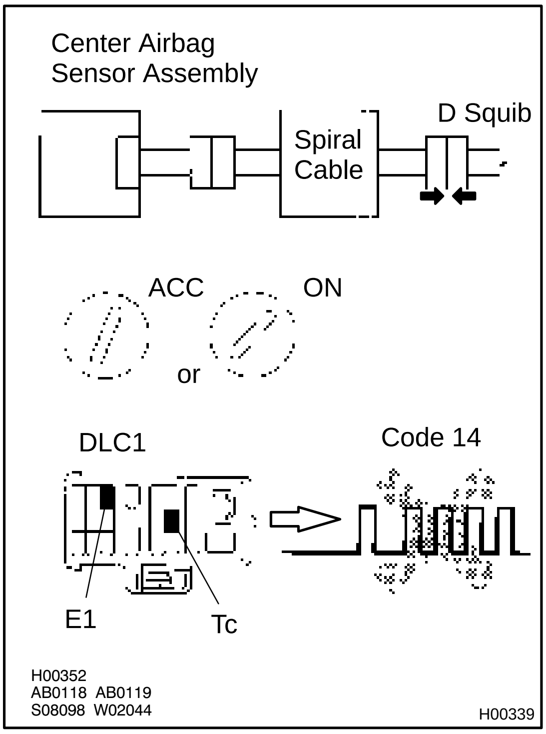
DTC 14 is not output.

HINT:
Codes other than code 14 may be output at this time, but they are relevant to this check.

NG	Replace center airbag sensor assembly.

OK

4	**Check D squib.**



PREPARATION:
(a) Turn ignition switch to LOCK.
(b) Disconnect negative (–) terminal cable from the battery, and wait at least 90 seconds.
(c) Connect steering wheel pad connector.
(d) Connect negative (–) terminal cable to battery, and wait at least 2 seconds.

CHECK:
(a) Turn ignition switch to ACC or ON, and wait at least 20 seconds.
(b) Clear malfunction code stored in memory.
(See page DI–373)
(c) Turn ignition switch to LOCK, and wait at least 20 seconds.
(d) Turn ignition switch to ACC or ON, and wait at least 20 seconds.
(e) Using SST, connect terminals Tc and E1 of DLC1.
SST 09843–18020
(f) Check DTC.

OK:
DTC 14 is not output.

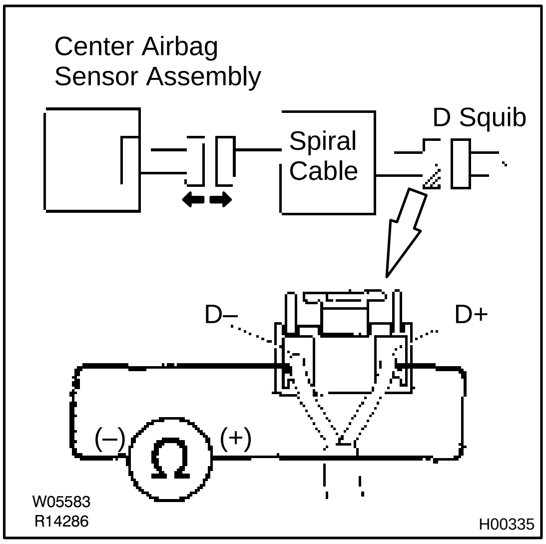
HINT:
Codes other than code 14 may be output at this time, but they are not relevant to this check.

NG	**Replace steering wheel pad.**

OK

From results of above inspection, malfunctioning part can now be considered normal.
To make sure of this, use simulation method to check.

5	**Check spiral cable.**

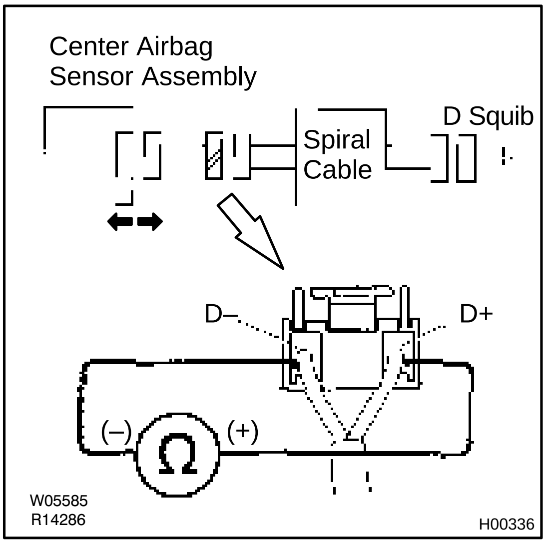


PREPARATION:
Disconnect connector between center airbag sensor assembly and spiral cable.
CHECK:
For connector on spiral cable side between spiral cable and steering wheel pad, measure resistance D+ and D–.
OK:OK:
Resistance: Below 1 Ω

NG	**Repair or replace spiral cable.**

OK

6	**Check harness between center airbag sensor assembly and spiral cable.**



PREPARATION:
Release airbag activation prevention mechanism on center airbag sensor assembly connector.
CHECK:
For connector on airbag sensor assembly side between center airbag sensor assembly and spiral cable, measure resistance D+ and D–.
OK:
Resistance: Below 1 Ω

NG	**Repair or replace harness or connector between center airbag sensor assembly and spiral cable.**

OK

From results of above inspection, malfunctioning part can now be considered normal. To make sure of this, use simulation method to check.

DI0XV–01

DTC	15	Open in Front Airbag Sensor Circuit

CIRCUIT DESCRIPTION

The front airbag sensor detects the deceleration force in a frontal collision and is located in the front fender on the left and right sides.

For details of the function of each component, see OPERATION on page RS–2.

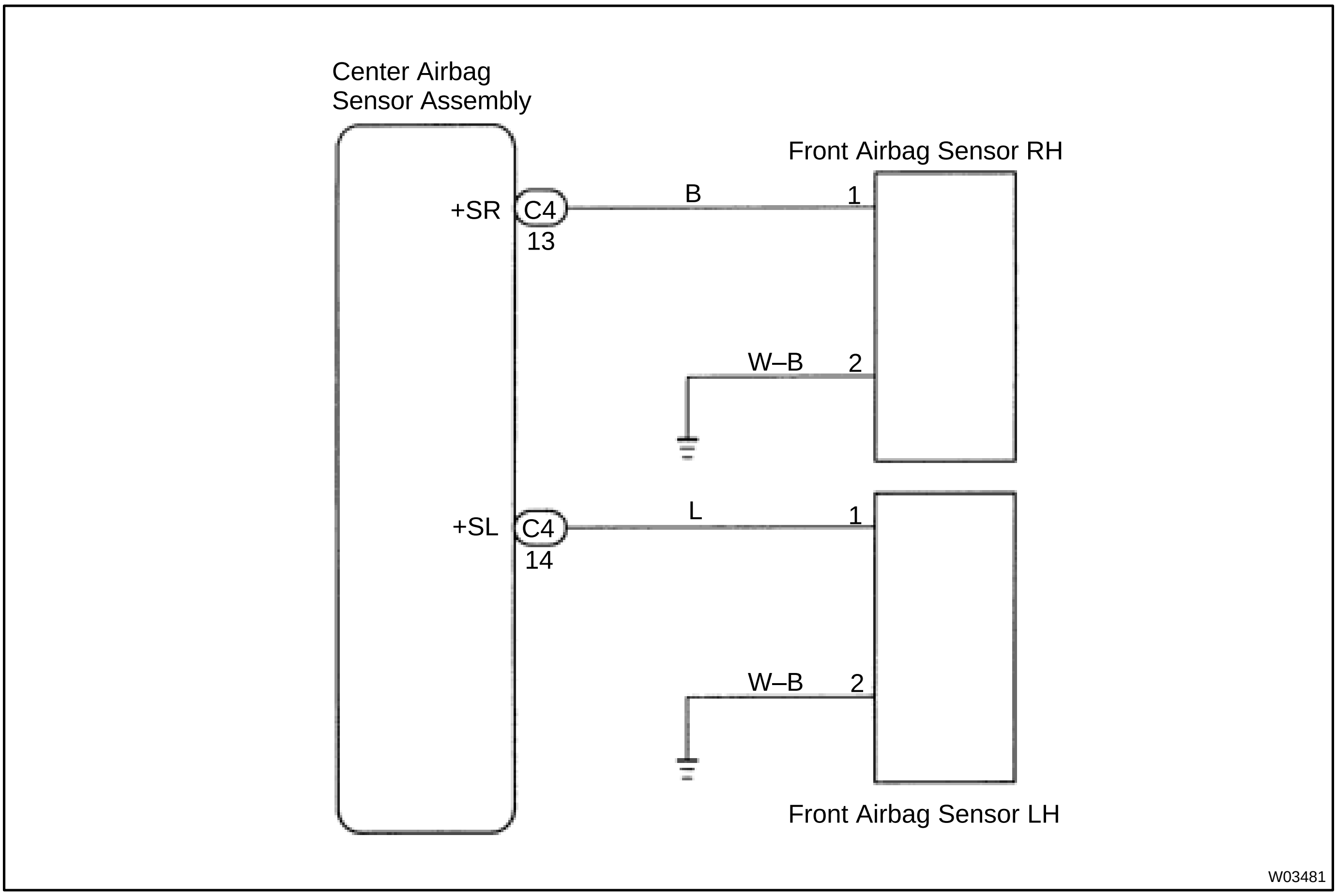
DTC 15 is recorded when an open is detected in the front airbag sensor circuit.

NOTICE:

The front airbag sensor connector is equipped with an electrical connection check mechanism for the purpose of detecting an open in the front airbag sensor (See page RS–2). This mechanism is constructed so that when the terminals of the front airbag sensor have been connected (when the connector housing lock is in the locked condition), the connection detection pin on the wire harness side connects with the terminals for diagnosis use on the sensor side. If the connector is not properly connected, the diagnosis system may detect only a malfunction code, even through the SRS is functioning normally. When connecting the front airbag sensor connector, make sure it is connected properly. If DTC 15 is displayed after the front airbag sensor connector has been connected, check again that it is properly connected.

DTC No.	DTC Detecting Condition	Trouble Area
15	●Open cirxuit in +S wire harness or –S wire harness of front airbag sensor. ●Front airbag sensor malfunction. ●Malfunction of electrical connection check mechanism of front airbag sensor ●Center airbag sensor assembly malfunction.	●Front airbag sensor ●Center airbag sensor ●Wire harness

WIRING DIAGRAM

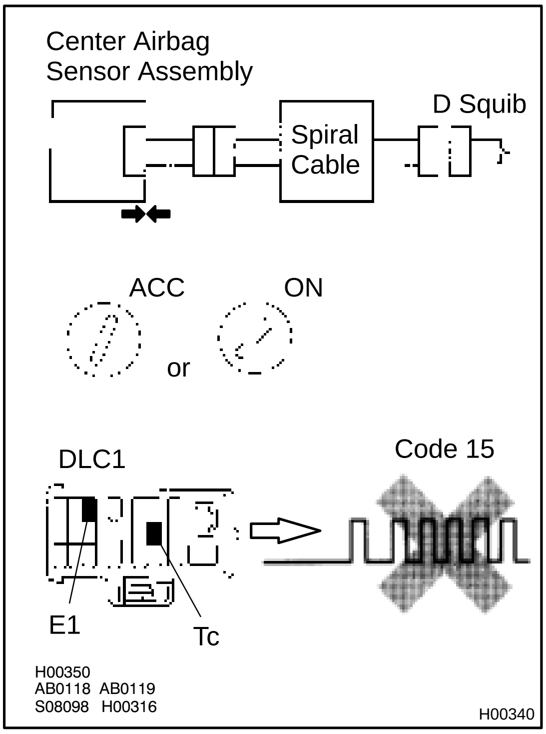


INSPECTION PROCEDURE

1	**Preparaiton. (See step 1 on page DI–409)**

2	**Check front airbag sensor (Measure resistance between terminals +SR and +SL of center airbag sensor assembly connector.). (See step 2 on page DI–381)**

3	**Check center airbag sensor assembly.**



PREPARATION:

(a) Connect center airbag assembly connector.

(b) Connect negative (–) terminal cable to battery, and wait at least 2 seconds.

CHECK:

(a) Turn ignition switch to ACC or ON, and wait at least 20 seconds.

(b) Clear malfunction code stored in memory.
(See page DI–373)

(c) Turn ignition switch to LOCK, and wait at least 20 seconds.

(d) Turn ignition switch to ACC or ON, and wait at least 20 seconds.

(e) Using SST, connect terminals Tc and E1 of DLC1.
SST 09843–18020

(f) Check DTC.

OK:

DTC 15 is not output.

HINT:
Codes other than code 15 may be output at this time, but they are not relevant to this check.

NG	**Replace center airbag sensor assembly.**

OK

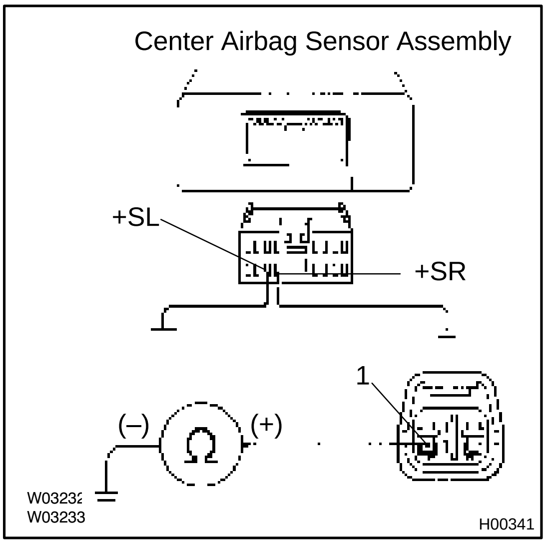
From results of above inspectiohn, malfunction part can now be considered normal.
To make sure of this, use simulation method to check.

4	**Check front airbag sensor. (See step 6 on page DI–381)**

NG	**Replace front airbag sensor.**

OK

5	**Check harness between center airbag sensor assembly and front airbag sensor.**



PREPARATION:
Using a service wire, connect +SR and +SL on wire harness side of the center airbag sensor assembly connector.
CHECK:
Measure resistance between terminal 1 of harness side connector of front airbag sensor and body ground.
OK:
Resistance: Below 1 Ω
NOTICE:
- **Lightly touch ohmmeter probes at position shown in illustration.**
- **Make sure the front airbag sensor connector is properly connected.**

NG → **Repair or replace harness or connector between center airbag sensor assembly and front airbag sensor. (See page RS–32)**

OK

**From results of above inspection, malfunction part can now be considered normal.
To make sure of this, simulation method to check.**

DI0XW–01

DTC	31	Center Airbag Sensor Assembly Malfunction

CIRCUIT DESCRIPTION

The center airbag sensor assembly consists of a center airbag sensor, safing sensor, drive circuit, diagnosis circuit and ignition control, etc.
It receives signals from the airbag sensors, judges whether or not the SRS must be activated, and diagnosis system malfunction.
DTC 31 is recorded when occurrence of a malfunction in the center airbag sensor assembly is detected.

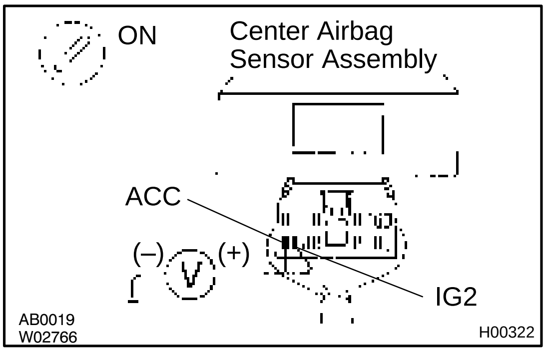
DTC No.	DTC Detecting Condition	Trouble Area
31	•Center airbag sensor assembly malfunction	•Center airbag sensor assembly

INSPECTION PROCEDURE

HINT:
When a malfunction code other than code 31 is displayed at the same time, first repair the malfunction indicated by the malfunction code other than code 31.

1	Preparation (See step 1 on page DI–409).

2	Check voltage at IG2 and ACC of center airbag sensor assembly.



PREPARATION:
(a) Connect negative (–) terminal cable to battery.
(b) Turn ignition switch ON.

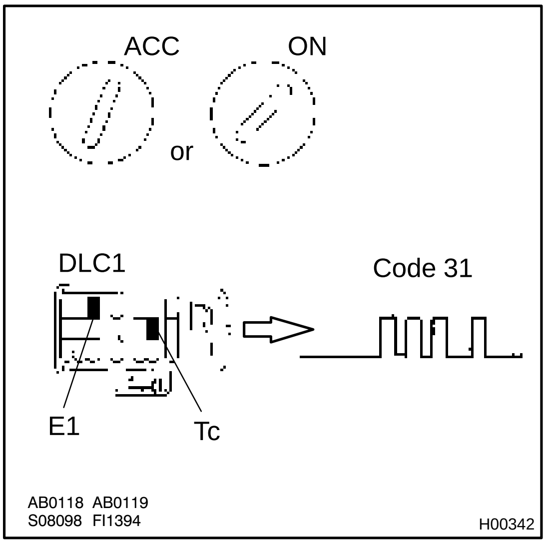
CHECK:
Measure voltage between terminals IG2 and ACC of center airbag sensor assembly and body ground.

OK:
Voltage: Below 16 V

NG	Check battery and charging system. (3RZ–FE: See page CH–2) (5VZ–FE: See page CH–1)

OK

3	**Is DTC 31 output again?**



PREPARATION:

Clear malfunction code.

CHECK:

(a) Turn ignition switch to LOCK, and wait at least 20 seconds.

(b) Turn ignition switch to ACC or ON, and wait at least 20 seconds.

(c) Repeat operation in steps (a) and (b) at least 5 times.

(d) Using SST, connect terminals Tc and E1 of DLC1.
SST 09843–18020

(e) Check the DTC.

NO → **Using simulation method, reproduce malfunction symptoms (See page IN–14).**

YES

Replace center airbag sensor assembly.

DI0XX–01

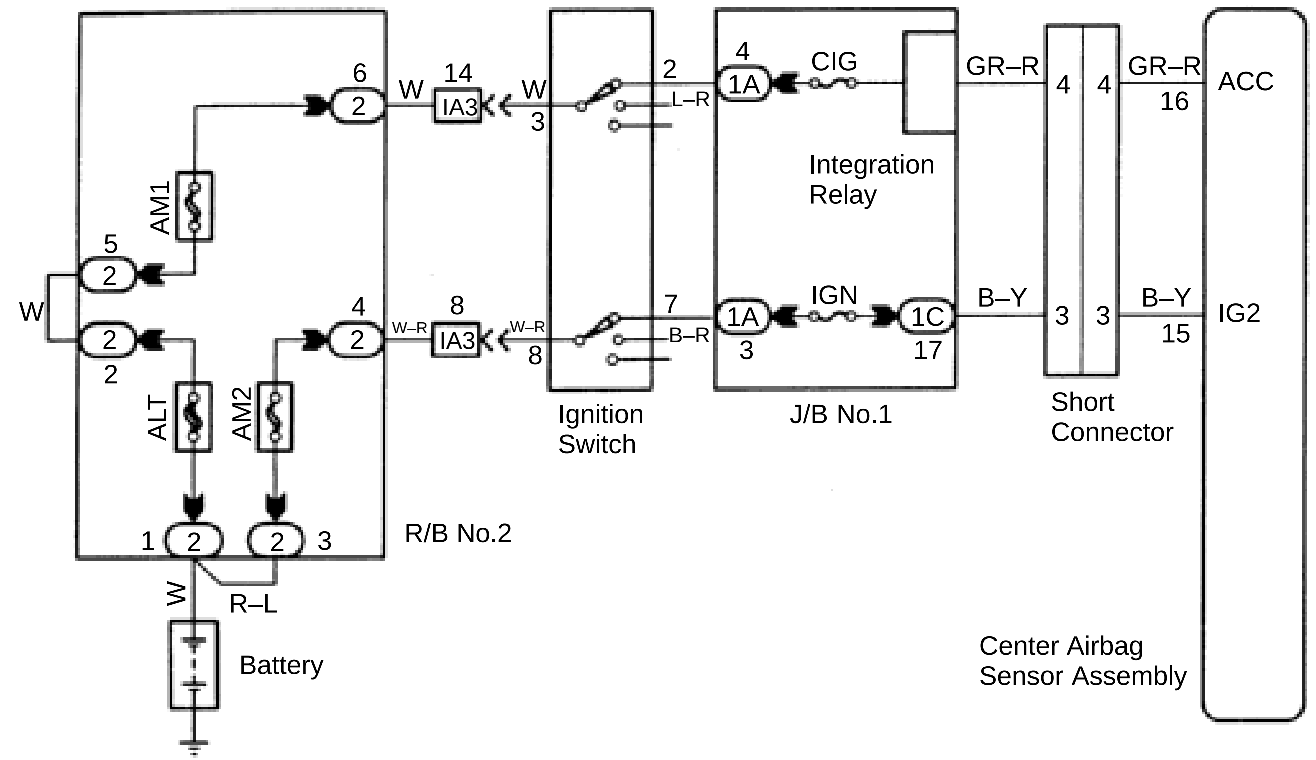
DTC	Normal	Source Voltage Drop

CIRCUIT DESCRIPTION

The SRS is equipped with a voltage–increase circuit (DC–DC converter) in the center airbag sensor assembly in case the source voltage drops.
When the battery voltage drops, the voltage–increase circuit (DC–DC converter) functions to increase the voltage of the SRS to normal voltage.
The diagnosis system malfunction display for this circuit is different to other circuits–when the SRS warning light remains lit up and the DTC is a normal code, source voltage drop is indicated.
Malfunction in this circuit is not recorded in the center airbag sensor assembly, and the source voltage returns to normal, after approx. 10 seconds the SRS warning light automatically goes off.

DTC No.	Diagnosis
(Normal)	Source voltage drop

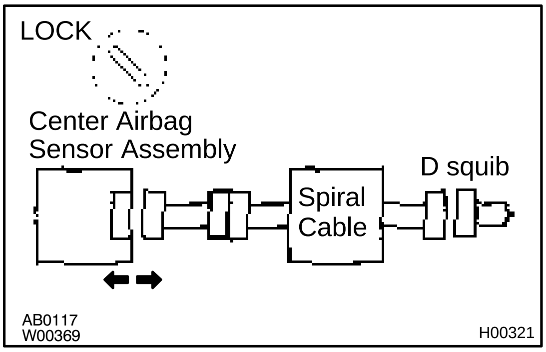
WIRING DIAGRAM



R15204

INSPECTION PROCEDURE

1	Preparation.



PREPARATION:

(a) Turn ignition switch to LOCK.

(b) Disconnect negative (–) terminal cable from the battery, and wait at least 90 seconds.

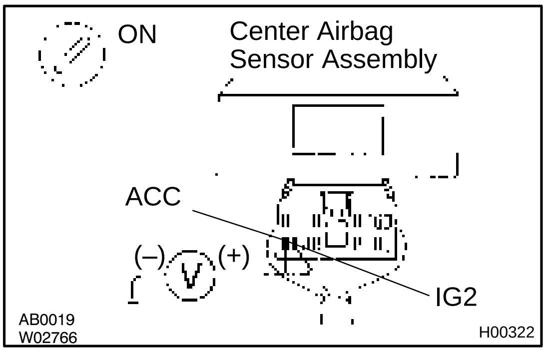
(c) Remove steering wheel pad. (See SR section)

(d) Disconnect connector of airbag sensor assembly. (See page RS–32)

CAUTION:

Store the steering wheel pad with front surface facing upward.

2	Check source voltage.



PREPARATION:

(a) Connect negative (–) terminal cable to battery.

(b) Turn ignition switch ON.

CHECK:

Measure voltage at IG2 or ACC on sensor and operate electric system. (defogger, wiper, headlight, heater blower, etc.)

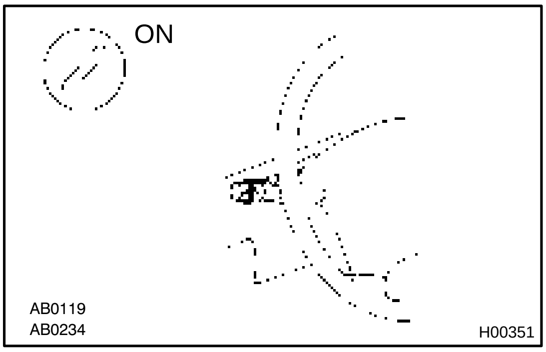
OK:

Voltage: 10 – 14 V

NG	Check harness between battery and center airbag sensor assembly, and check battery and charging system.

OK

3	**Does SRS warning light turn off?**



PREPARATION:

(a) Turn ignition switch to LOCK.
(b) Connect steering wheel pad connector.
(c) Connect center airbag sensor assembly connector.
(d) Turn ignition switch ON.

CHECK:

Operate electric system (defogger, wiper, headlight, heater blower, etc.), and check that SRS warning light goes off.

NO → **Check for DTCs. If a DTC is output, perform troubleshooting for DTC. If a normal code is output, replace center airbag sensor assembly.**

YES

From results of above inspection, malfunctioning part can now be considered normal. To make sure of this, use simulation method to check.

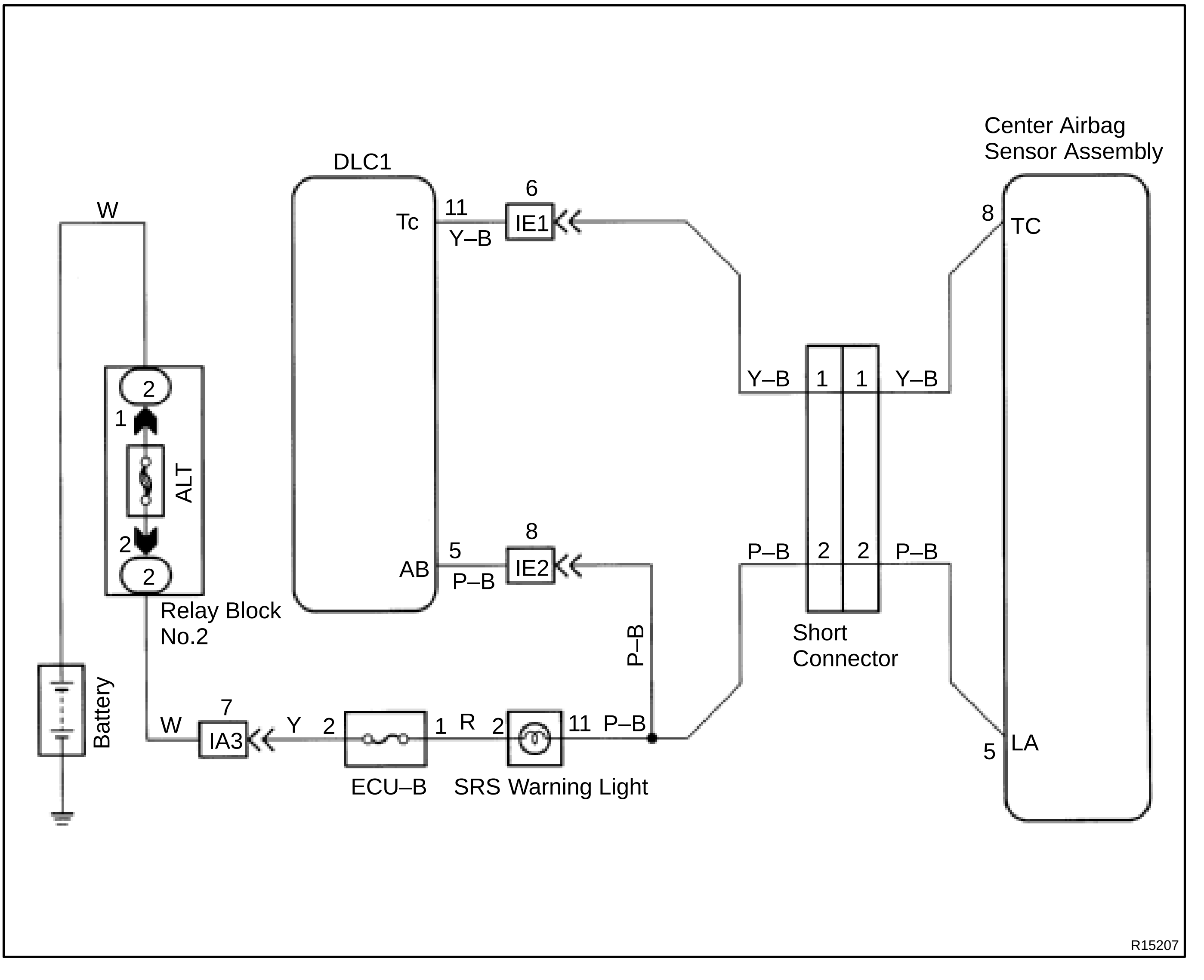
DI0XY–01

SRS Warning Light Circuit Malfunction (Always lit up, when ignition switch is in LOCK position.)

CIRCUIT DESCRIPTION

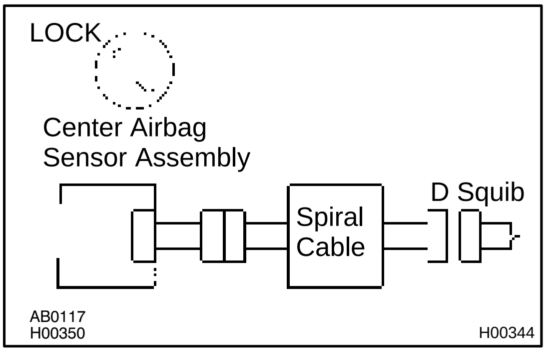
The SRS warning light is located on the combination meter.
When the SRS is normal, the SRS warning light lights up for approx. 6 seconds after the ignition switch is turned from LOCK position to ACC or ON position, and then turns off automatically.
If there is a malfunction in the SRS, the SRS warning light lights up to inform the driver of the abnormality.
When terminals Tc and E1 of the DLC1 are connected, the DTC is displayed by the blinking of the SRS warning light.

WIRING DIAGRAM



INSPECTION PROCEDURE

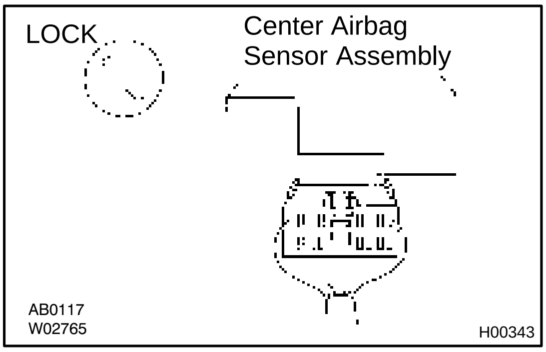
1	**Preparation.**



PREPARATION:
(a) Turn ignition switch to LOCK.
(b) Disconnect negative (–) terminal cable from the battery, and wait at least 90 seconds.
(c) Remove steering wheel pad (See page SR–13 or SR–26).

CAUTION:
Store the steering wheel pad with the front surface facing upward.

2	**Does SRS warning light turn off?**



PREPARATION:
(a) Disconnect center airbag sensor assembly connector.
(b) Connect negative (–) terminal cable to battery.

CHECK:
Check operation of SRS warning light.

NO → **Check SRS warning light circuit or terminal AB circuit of DLC1.**

YES

Replace center airbag sensor assembly.

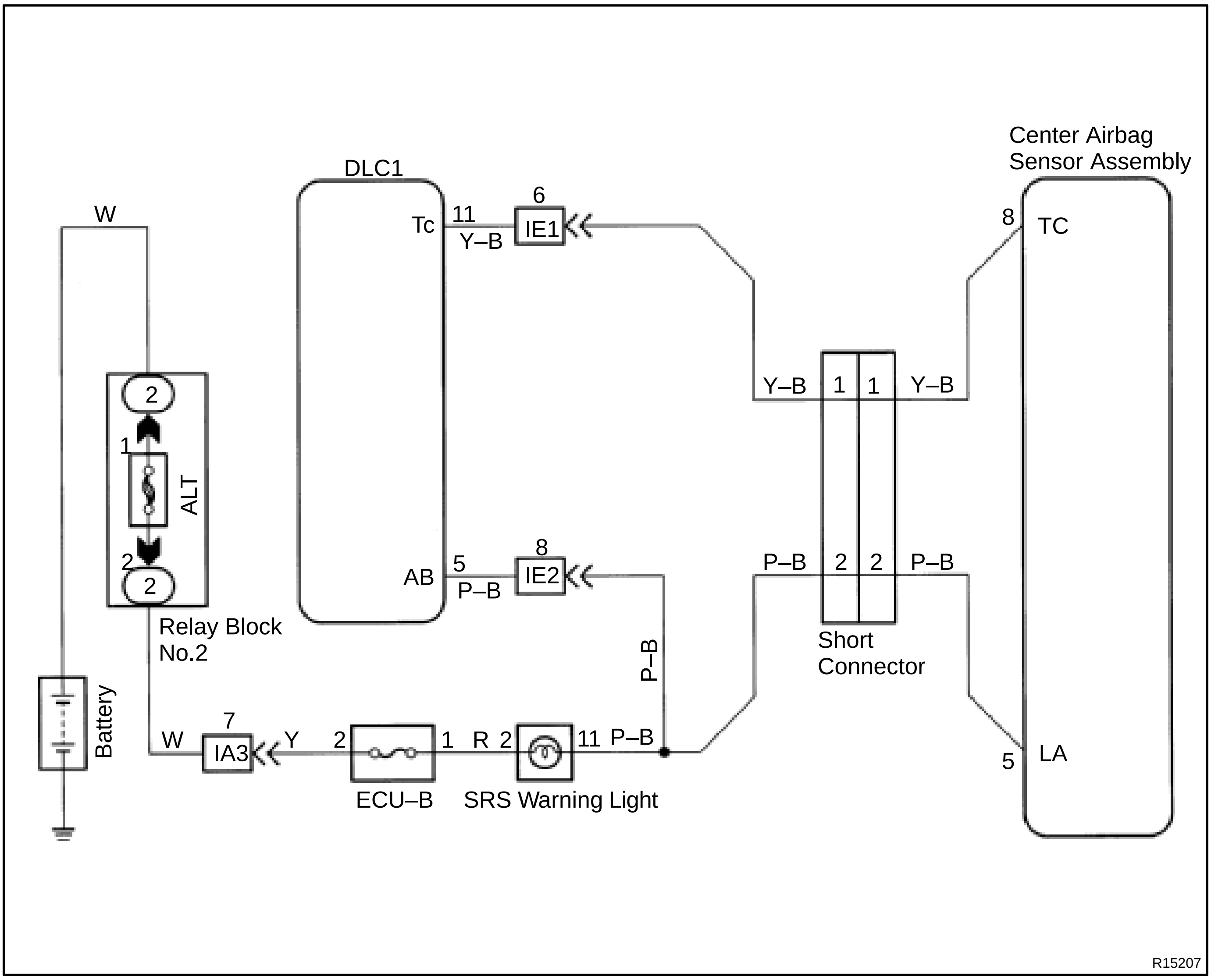
DI0XZ–01

SRS Warning Light Circuit Malfunction (Does not light up, when ignition switch is turned to ACC or ON.)

CIRCUIT DESCRIPTION

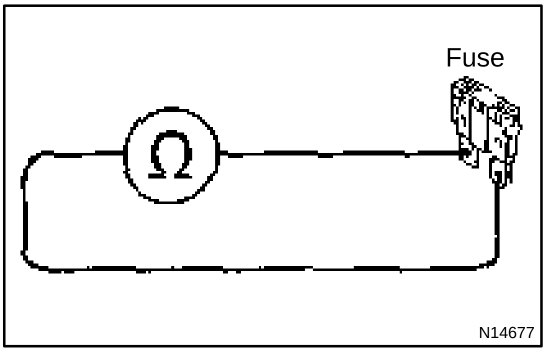
The SRS warning light is located on the combination meter.
When the SRS is normal, the SRS warning light lights up for approx. 6 seconds after the ignition switch is turned from LOCK position to ACC or ON position, and then turns off automatically.
If there is a malfunction in the SRS, the SRS warning light lights up to inform the driver of the abnormality When terminal Tc and E1 of the DLC1 are connected, the DTC is displayed by the blinking of the SRS warning light.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check ECU–B Fuse.**



PREPARATION:
Remove ECU–B fuse.
CHECK:
Check continuity of ECU–B fuse.
OK:

Continuity

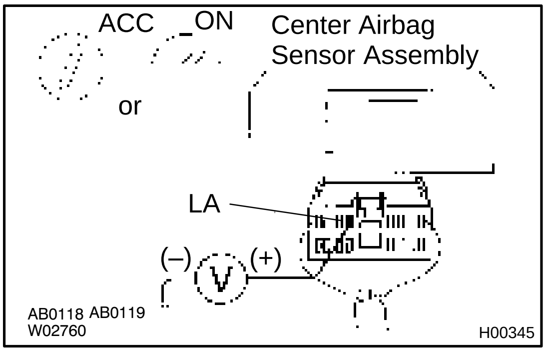
HINT:
- Fuse may be burnt out even if it appears to be OK during visual inspection.
- If fuse is OK, install it.

NG → **Go to step 5.**

OK

2	**Preparation. (See step 1 on page DI–409)**

3	**Check SRS warning light circuit.**



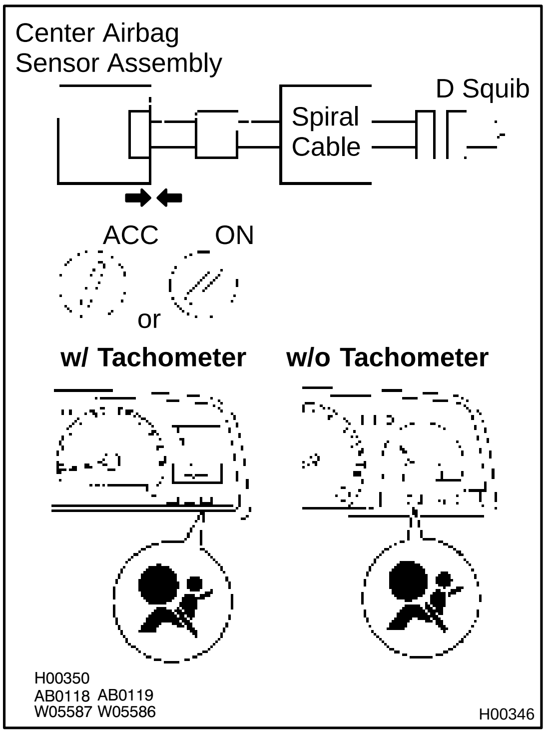
PREPARATION:
(a) Connect negative (–) terminal cable to battery.
(b) Turn ignition switch to ACC or ON.
CHECK:
Measure voltage LA terminal of harness side connector of center airbag sensor assembly and body ground.
OK:

Voltage: 10 – 14 V

NG → **Check SRS warning light bulb/repair SRS warning light circuit.**

OK

4	Does SRS warning light come on?



PREPARATION:
(a) Disconnect negative (–) terminal cable from the battery.
(b) Connect center airbag sensor assembly connector.
(c) Connect negative (–) terminal cable to battery, and wait at least 2 seconds.
(d) Turn ignition switch to ACC or ON.

CHECK:
Check operation of SRS warning light.

OK:
SRS warning light comes on.

NO → **Check terminal LA of center airbag sensor assembly. If normal, replace center airbag sensor assembly.**

YES

From results of above inspection, malfunctioning part can now be considered normal. To make sure of this, use simulation method to check.

5	Is new ECU–B fuse burnt out again?

NO → **Using simulation method, reproduce malfunction symptoms. (See page IN–14)**

YES

Check harness between ECU–B fuse and SRS warning light.

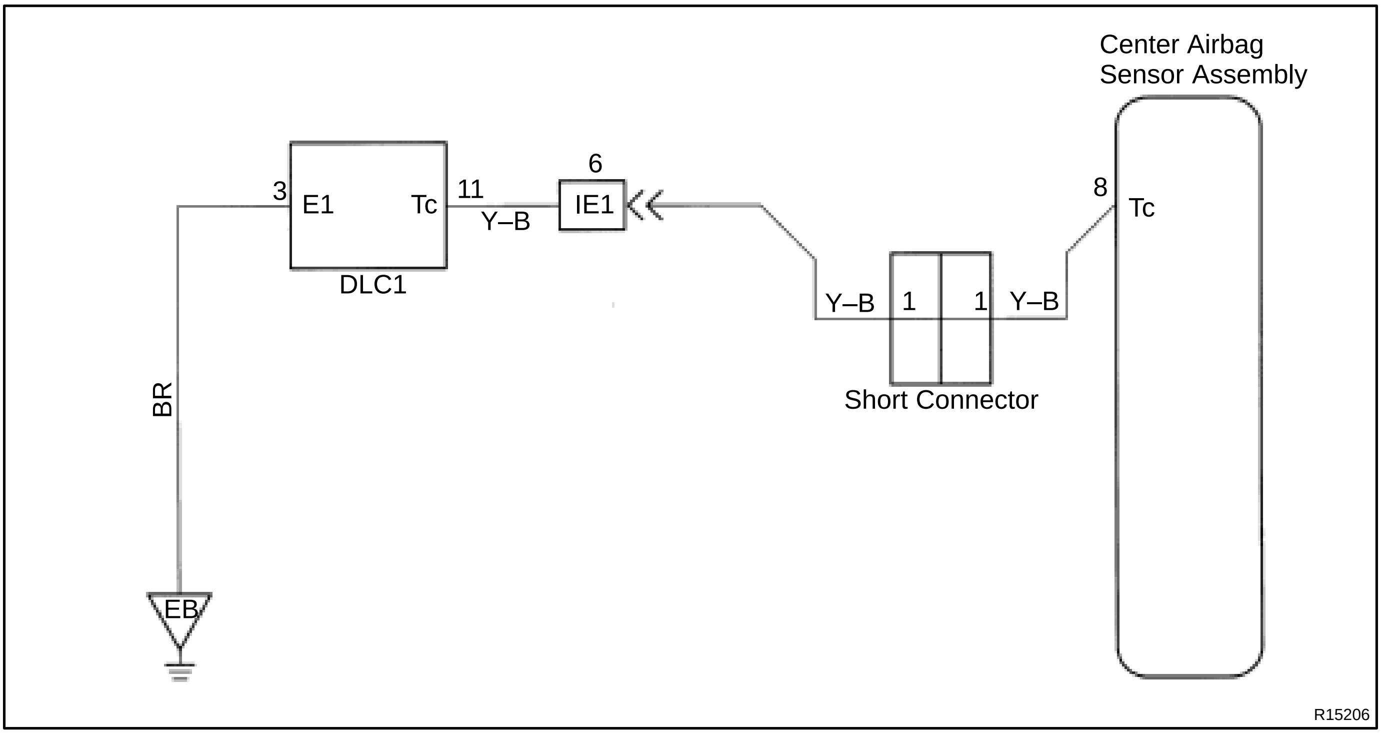
DI0Y1–01

Tc Terminal Circuit

CIRCUIT DESCRIPTION

By connecting terminal Tc and E1 of the DLC1, the airbag sensor assembly is set in the DTC output mode. The DTCs are displayed by the blinking of the SRS warning light.

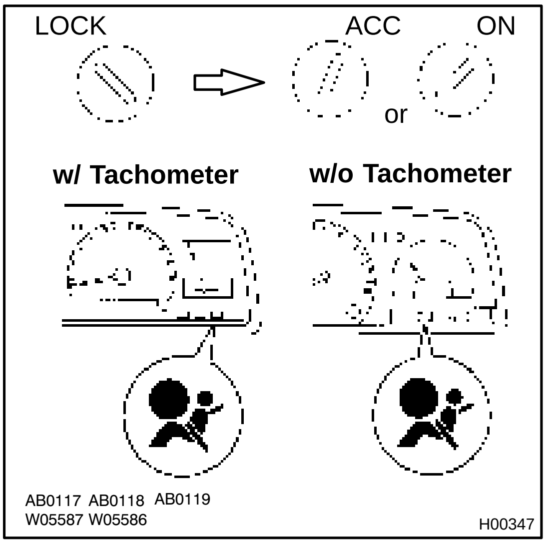
WIRING DIAGRAM



INSPECTION PROCEDURE

If DTC is not displayed, do following troubleshooting:

1	Does SRS warning light up for approx. 6 seconds?

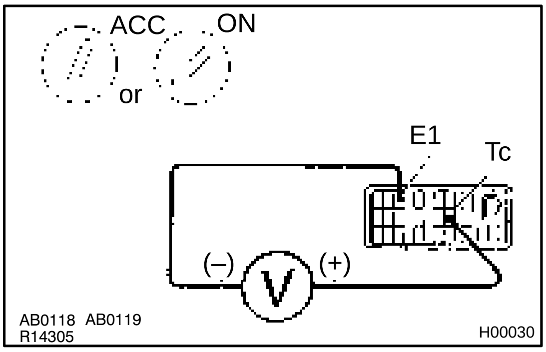


PREPARATION:
Check operation of SRS warning light after ignition switch is turned from LOCK position to ACC or ON position.

NO → **Check SRS warning light system (See page DI–373).**

YES

2	Check voltage between terminals Tc and E1 of DLC1.

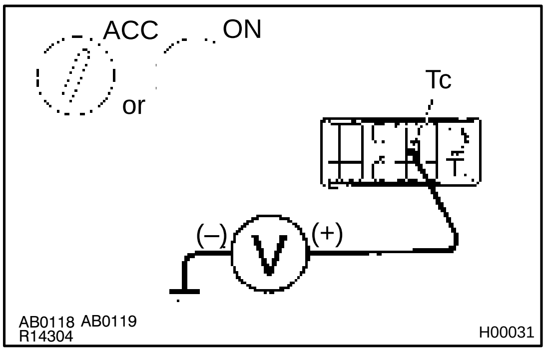


PREPARATION:
Turn ignition switch to ACC or ON.
CHECK:
Measure voltage between terminals Tc and E1 of DLC1.
OK:
Voltage: 10 – 14 V

OK → **Go to step 4.**

NG

3	**Check voltage between terminals Tc of DLC1 and body ground.**



CHECK:

Measure voltage between terminal Tc of DLC1 and body ground.

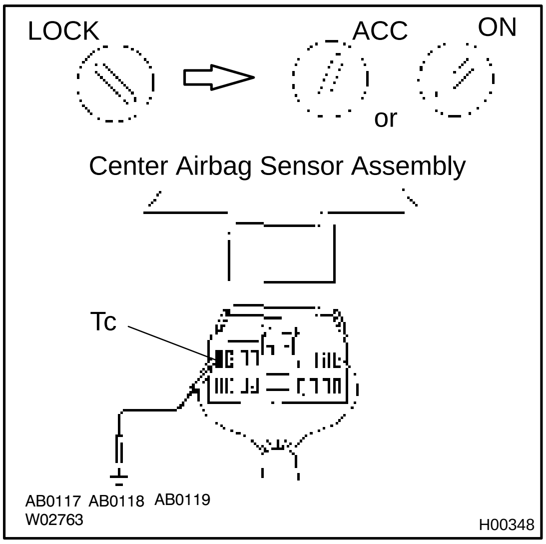
OK:

Voltage: 10 – 14 V

OK → **Check harness between terminal E1 of DLC1 and body ground.**

NG

4	**Check center airbag sensor assembly.**



PREPARATION:

(a) Turn ignition switch to LOCK.
(b) Disconnect negative (–) terminal cable from the battery, and wait at least 90 seconds.
(c) Remove steering wheel pad (See page SR–13 or SR–26).
(d) Disconnect center airbag sensor assembly connector.
(e) Insert service wire into terminal Tc from back side as shown.
(f) Connect center airbag sensor assembly connector with service wire.
(g) Connect negative (–) terminal cable to battery.
(h) Turn ignition switch to ACC or ON, and wait at least 20 seconds.
(i) Connect service wire of terminal Tc to body ground.

CHECK:

Check operation of SRS warning light.

OK:

SRS waning light comes on.

NOTICE:

Never make a mistake with the terminal connection position as this cause a malfunction.

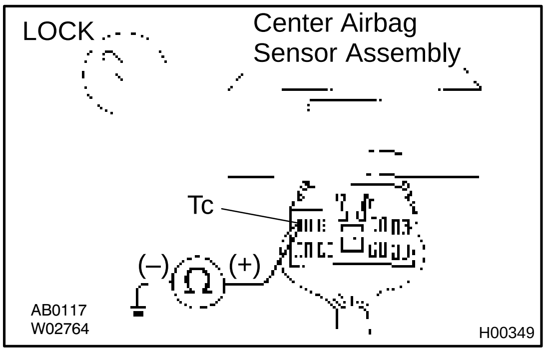
OK → **Check harness between center airbag sensor assembly and DLC1.**

NG

Replace center airbag sensor assembly.

If DTC is displayed without DTC check procedure, perform following trouble-shooting:

1	Check resistance between terminal Tc of center airbag sensor assembly and body ground.



PREPARATION:
(a) Turn ignition switch to LOCK.
(b) Disconnect negative (–) terminal cable from the battery, and wait at least 90 seconds.
(c) Disconnect center airbag sensor assembly connector.

CHECK:
Check resistance between terminal Tc of center airbag sensor assembly connector and body ground.

OK:
Resistance: 1MΩ or Higher

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

OK

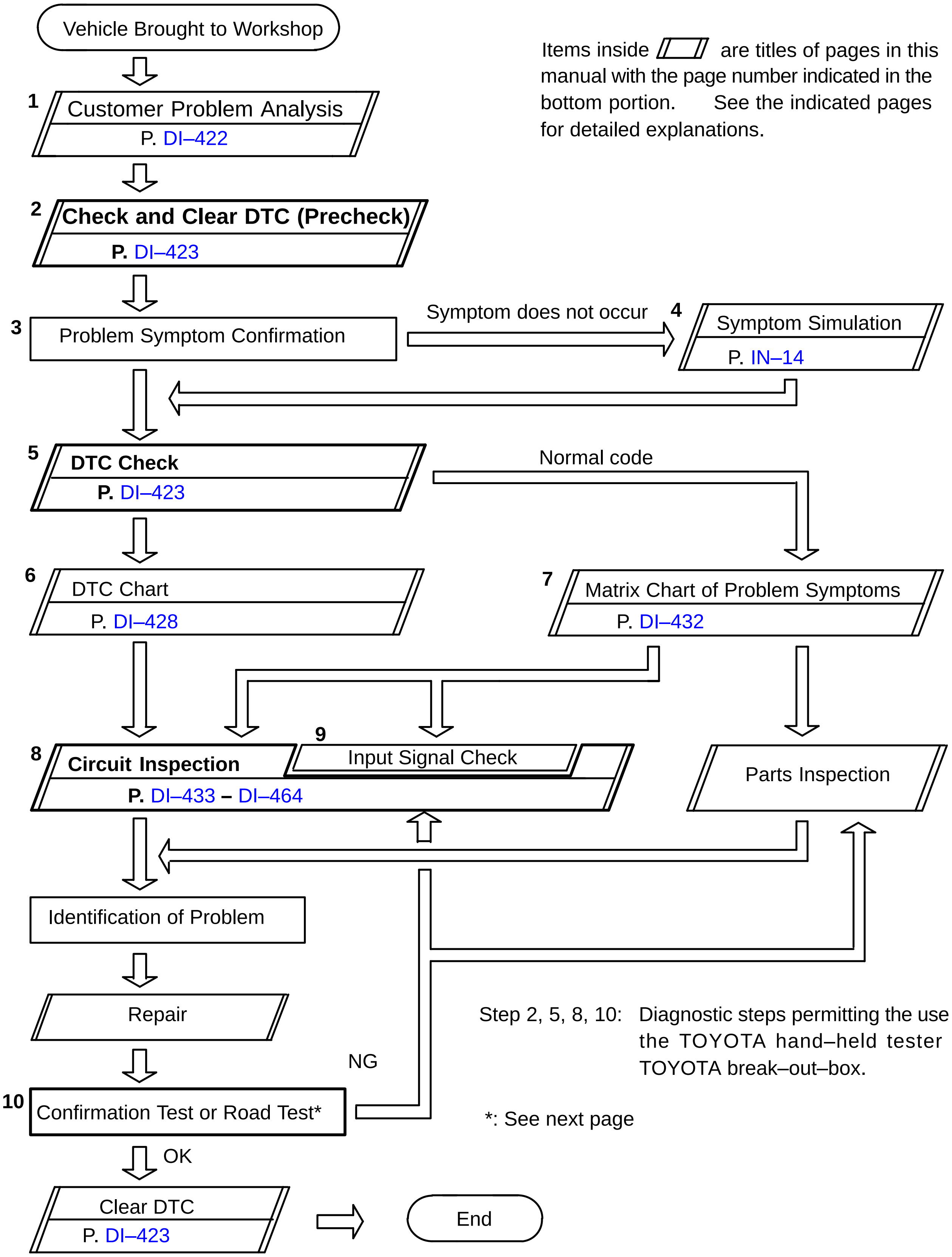
Replace center airbag sensor assembly.

CRUISE CONTROL SYSTEM

HOW TO PROCEED WITH TROUBLESHOOTING

DI0YH–01

Troubleshooting in accordance with the procedure on the following pages.



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

Step 2, 5, 8, 10: Diagnostic steps permitting the use of the TOYOTA hand–held tester or TOYOTA break–out–box.

*: See next page

DI0YJ–01

CUSTOMER PROBLEM ANALYSIS CHECK

CRUISE CONTROL SYSTEM Check Sheet

Inspector's name: ________________

Customer's Name		**Registration No.**	
		Registration Year	
		Frame No.	
Date of Vehicle Brought in	/ /	**Odometer Reading**	**km** **Mile**

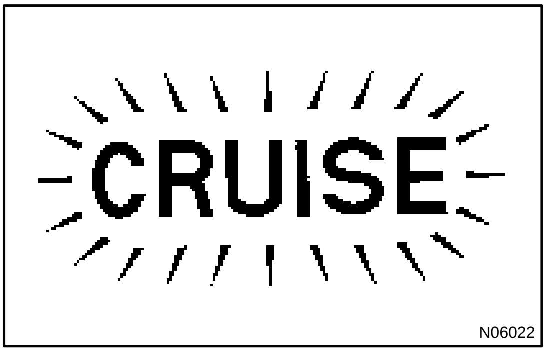
Condition of Problem Occurrence	**Date of Problem Occurrence**	/ /
	How Often does Problem Occur?	☐ Continuous ☐ Intermittent (Times a day)
	Vehicle Speed when Problem Occurred	**km** **Mile**

Symptoms	☐ Auto cancel occurs	• Driving condition ● City driving ● Freeway ● Up hill ● Down hill • After cancel occurred, did the driver activate cruise control again? ● Yes ● No
	● Cancel does not occur	● With brake ON ● Except D position shift ● At 40 km/h (25 mph) or less ● When control SW turns to CANCEL position
	● Cruise control malfunction	● Slip to acceleration side ● Slip to deceleration side ● Hunting occurs ● O/D cut off does not occur ● O/D does not return
	● Switch malfunction	● SET ● ACCEL ● COAST ● RESUME ● CANCEL
	●	● Remains ON ● Does not light up ● Blinking

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

DI0YM–01

PRE–CHECK



N06022

1. DIAGNOSIS SYSTEM

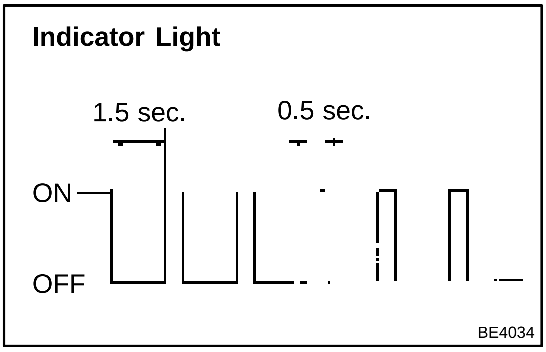
(a) Check the indicator.

(1) Turn the ignition switch to ON.

(2) Check that the CRUISE MAIN indicator light comes on when the cruise control main switch is turned on, and that the indicator light goes off when the main switch is turned OFF.

HINT:

If the indicator check result is not normal, proceed to trouble-shooting (See page BE–36) for the combination meter section.

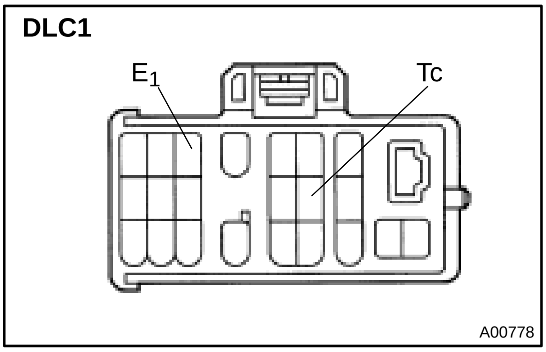


BE4034

(b) Check the DTC.

HINT:

If a malfunction occurs in the No. 1 vehicle speed sensors or actuator, etc. during cruise control driving, the ECU actuates AUTO CANCEL of the cruise control and turns on and off the CRUISE MAIN indicator light to inform the driver of a malfunction. At the same time, the malfunction is stopped in memory as a diagnostic trouble code.



A00778

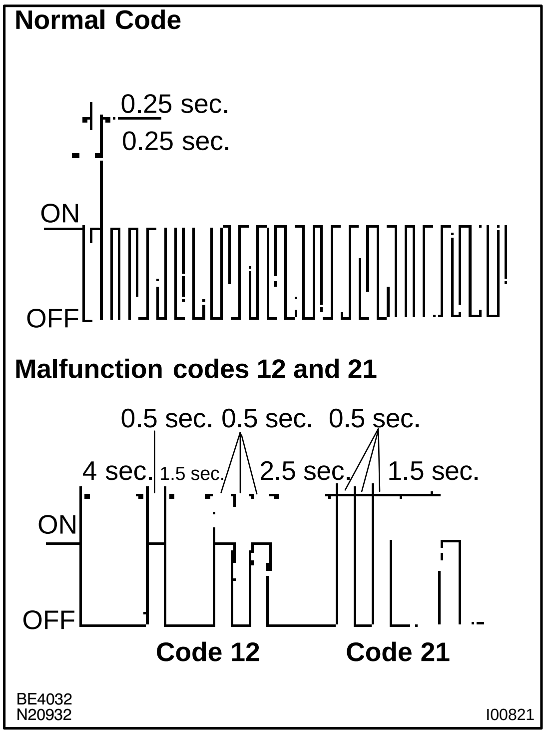
(c) Using diagnosis check wire, check the output of DTC.

(1) Turn the ignition switch ON.

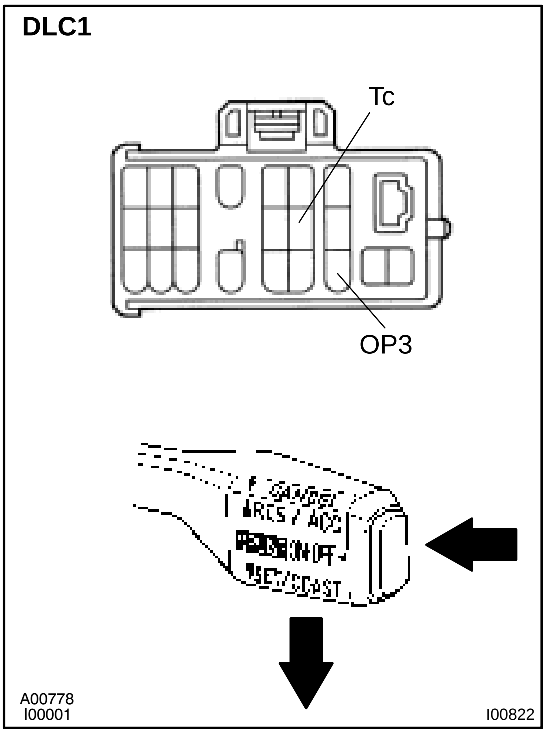
(2) Using SST, connect terminals Tc and E_1 of DLC1.

SST 09843–18020

(3) Read the DTC on the CRUISE MAIN indicator light.



HINT:
- If the DTC is not output, inspect the diagnosis circuit (See page DI–462).
- As an example, the blinking patterns for codes; normal, 12 and 21 are shown in the illustration.



2. DTC CLEARANCE

(a) Using SST, connect terminals Tc and OP3 of the DLC1.
SST 09843–18020

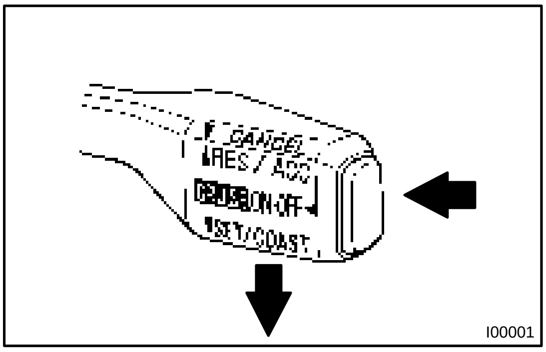
(b) Press the control switch to SET/COAST position and hold it down or hold it up.

(c) Push the main switch ON.

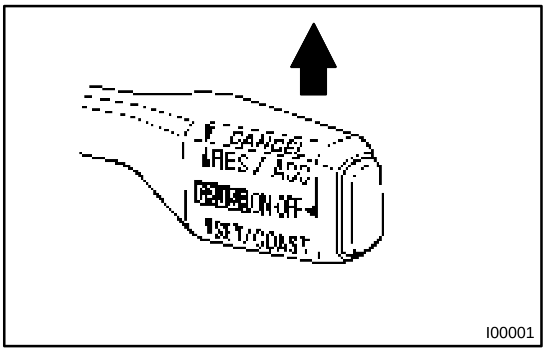
(d) Check that the CRUISE MAIN indicator light blinks twice or 3 times repeatedly of after 3 seconds.

(e) Turn the SET/COAST switch OFF.

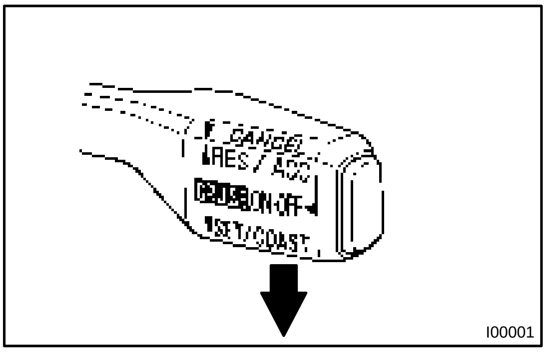
3. PROBLEM SYMPTOM CONFIRMATION (ROAD TEST)



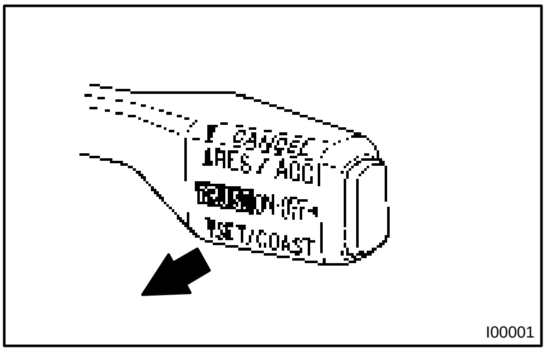
(a) Inspect the SET switch.
  (1) Push the main switch ON.
  (2) Drive at a desired speed (40 km/h (25 mph) or higher).
  (3) Press the control switch to the SET/COAST.
  (4) After releasing the switch, check that the vehicle cruises at the desired speed.



(b) Inspect the ACCEL switch.
  (1) Push the main switch ON.
  (2) Drive at a desired speed (40 km/h (25 mph) or higher).
  (3) Check that the vehicle speed is increased while the control switch turned to RES/ACC, and that the vehicle cruises at the set speed when the switch is released.
  (4) Momentarily press the control switch upward in the RES/ACC and then immediately release it. Check that the vehicle speed increases by about 1.5 km/h (Tap–up function).



(c) Inspect the COAST.
  (1) Push the main switch ON.
  (2) Drive at a desired speed (40 km/h (25 mph) or higher).
  (3) Check that the vehicle speed is decreased while the control switch is turned to SET/COAST, and the vehicle cruise at the set speed when the switch is released.
  (4) Momentarily press the control switch is turned to SET/COAST, and then immediately release it. Check that the vehicle speed decreases by about 1.5 km/h (Tap–down function).



I00001

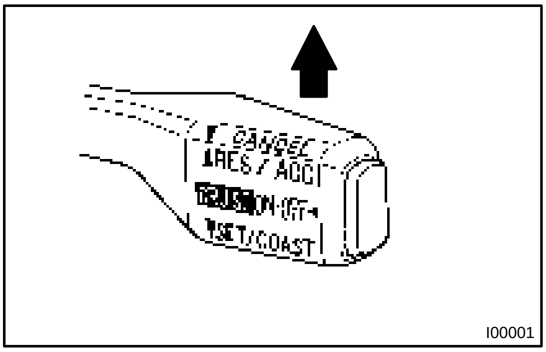
(d) Insepct the CANCEL switch.

(1) Push the main switch ON.

(2) Drive at a desired speed (40 km/h (25 mph) or higher).

(3) When operating one of the followings, check that the cruise control system is cancelled and that the normal driving mode is reset.

- Depress the brake pedal
- Depress the clutch pedal (M/T)
- Shift to except D position (A/T)
- Turn the main switch OFF
- Pull the cruise control switch to CANCEL



I00001

(e) Inspect the RESUME switch.

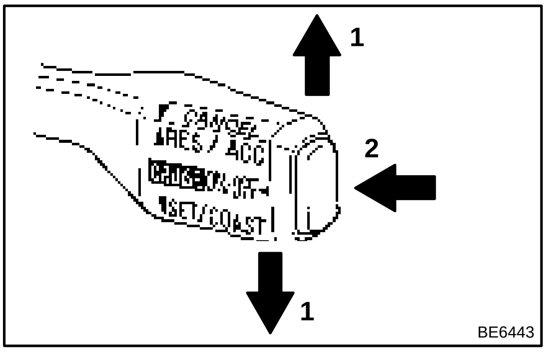
(1) Push the main switch ON.

(2) Drive at a desired speed (40 km/h (25 mph) or higher).

(3) When operating one of the followings, check that the cruise control system is cancelled and that the normal driving mode is reset.

- Depress the brake pedal
- Depress the clutch pedal (M/T)
- Shift to except D position (A/T)
- Turn the main switch OFF
- Pull the cruise control switch to CANCEL

(4) After the control switch is turned to RES/ACC at the driving speed of more than 40 km/h (25 mph), check that the vehicle restores the speed prior to the cancellation.



4. INPUT SIGNAL CHECK

HINT:

(1) For check No.1 – No.2:
- Turn the ignition switch ON.

(2) For check No.3:
- Turn ignition switch ON.
- Shift to D position.

(3) For check No.4:
- Jack up the vehicle.
- Start the engine.
- Shift to D position.

(a) Press the control switch to SET/COAST or RES/ACC position and hold it down or hold it up ”1”.

(b) Push the main switch ON ”2”.

(c) Check that the CRUISE MAIN indicator light blinks twice or 3 times repeatedly after 3 seconds.

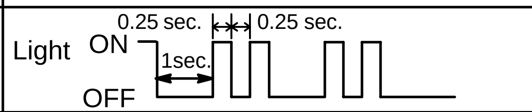
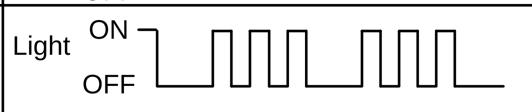
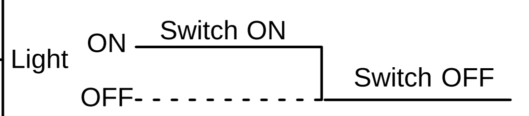
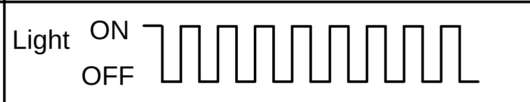
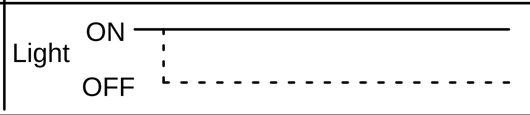
(d) Turn the SET/COAST or RES/ACC switch OFF.

(e) Operate each switch as listed in the table below.

(f) Read the blinking pattern of the CRUISE MAIN indicator light.

(g) After performing the check, turn the main switch OFF.

HINT:
When 2 or more signals are input to the ECU, the lowest numbered code will be displayed first.

No.	Operation Method	CRUISE MAIN Indicator LIght Blinking Pattern	Diagnosis
1	Turn SET/COAST switch ON		SET/COAST switch circuit is normal
2	Turn RES/ACC switch ON		RES/ACC switch circuit is normal
3	Turn CANCEL switch ON		CANCEL switch circuit is normal
	Turn stop light switch ON Depress brake pedal		Stop light switch circuit is normal
	Turn Park/Neutral Position switch OFF (Shift to except D position)		Park/Neutral Position switch circuit is normal
	Turn clutch switch OFF (Depress clutch pedal)		Clutch switch circuit is normal
4	Drive at about 40 km/h (25 mph) or higher		Vehicle Speed Sensor is normal
	Drive at about 40 km/h (25 mph) or below		

DI0YN–01

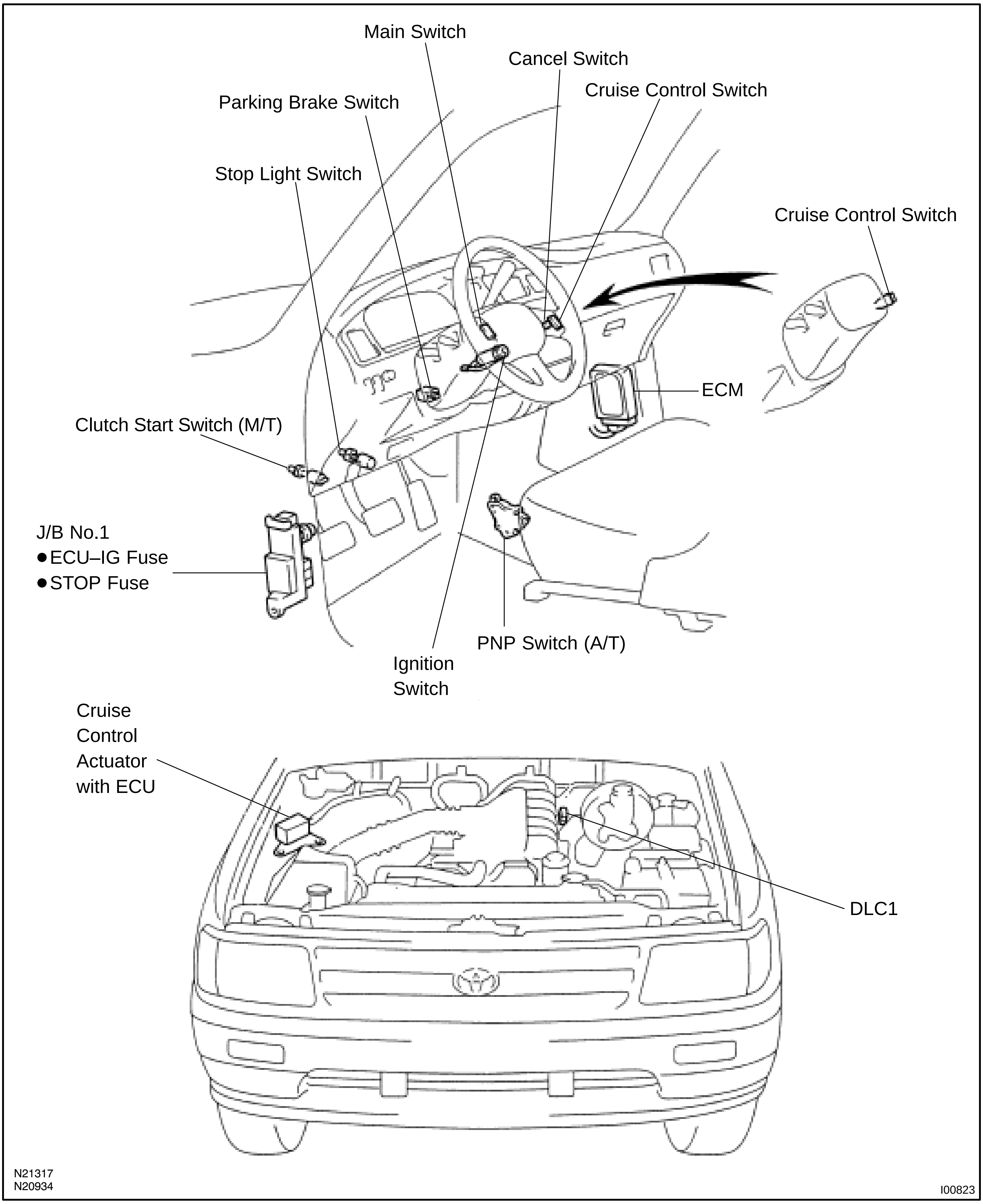
DIAGNOSTIC TROUBLE CODE CHART

If a malfunction code is displayed during the diagnostic trouble code check, check the circuit listed for that code in the table below and proceed to the appropriate page.

DTC No. (See Page)	Detection Item	Trouble Area
12 (DI–433)	Actuator Circuit	●Connector of cruise control actuator with ECU ●Stop fuse and stop light switch ●Cruise control actuator with ECU
14 (DI–435)	Actuator Motor Circuit Actuator Position Sensor	●Connector of cruise control actuator with ECU ●Cruise control actuator with ECU
21 (DI–436)	Vehicle Speed Sensor Circuit	●Harness or connector between vehicle speed sensor and combination meter, combination meter and cruise control actuator with ECU ●Speed sensor (in combination meter) ●Combination meter ●Cruise control actuator with ECU
23 (DI–438)	Vehicle Speed Sensor Circuit	●Speed sensor (in combination meter) ●Combination meter cable ●Cruise control actuator with ECU
32 (DI–439)	Control Switch Circuit (Cruise Control Switch)	●Harness or connector between control switch and cruise control actuator with ECU ●Cruise control switch ●Cruise control actuator with ECU

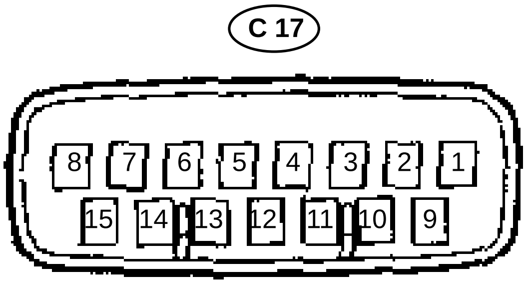
DI0YO–01

PARTS LOCATION



DI0YP–01

TERMINALS OF ECM



Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage (V)
OD ↔ GND (C–1 ↔ C–9, 10)	Y–R ↔ W–B	During cruise control driving OD switch ON, (During on float road)	max. +B
		During cruise control driving OD switch OFF (3rd driving)	max. 1 V
L ↔ GND (C–2 ↔ C–9, 10)	Y–G ↔ W–B	During cruise control driving	max. +B
		Except during cruise control driving	Below 1 V
CCS ↔ GND (C–3 ↔ C–9, 10	G–Y ↔ W–B	Ignition switch ON Cruise control switch neutral position	10 – 16 V
		Ignition switch ON Cruise control switch CANCEL position hold ON	5.1 – 8.3 V
		Ignition switch ON Cruise control switch SET/COAST position hold ON	2.4 – 4.0 V
		Ignition switch ON Cruise control switch RES/ACC position hold ON	0.8 – 1.4 V
B ↔ GND (C–4 ↔ C–9, 10)	L–R ↔ W–B	Ignition switch ON	min. (+B – 1.5 V)
STP– ↔ GND (C–6 ↔ C–9, 10)	G–W ↔ W–B	Depress brake pedal	min. (+B – 2 V)
		Release brake pedal	max. 2 V
SPD ↔ GND (C–7 ↔ C–9, 10)	G ↔ W–B	During cruise control driving (Pulse generated)	min. 3 V or min. (+B – 2 V)
		Engine start Stoppage a car	min 1.5 V
IDL ↔ GND (C8 ↔ C–9, 10)	Y–L ↔ W–B	Ignition switch ON Throttle valve fully opened	min. (+B – 2 V)
		Ignition switch ON Throttle valve fully closed	max. 3 V
GND ↔ Body Ground (C–9, 10 ↔ Body Ground)	W–B ↔ Body Ground	Always	max. 1 V
PI ↔ GND (C–11 ↔ C–9, 10)	B–L ↔ W–B	Ignition switch ON Cruise control main switch OFF, Main indicator light OFF	min. +B
		Ignition switch ON Cruise control main switch ON, Main indicator light ON	max. 1.2 V
ECT ↔ GND (C–12 ↔ C–9, 10)	R–Y ↔ W–B	During cruise control driving O/D off switch OFF (3rd driving)	min. (+B – 2 V)
		During cruise control driving O/D off switch ON	max. 0.5 V

Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage (V)
D ↔ GND (C–13 ↔ C–9, 10)	W–B ↔ W–B	Ignition switch ON, Shift lever D position (A/T) or clutch pedal pushed in (M/T)	min. (+B – 2 V)
		Ignition switch ON, Shift lever except D position (A/T) or clutch pedal depressed (M/T)	max. 2 V
TC ↔ GND (C–14 ↔ C–9, 10)	Y–B ↔ W–B	Ignition switch ON DLC1 Tc open	min. (+B – 2 V)
		Ignition switch ON DLC1 Tc ↔ E1 short	max. 2 V
CMS ↔ GND (C–15 ↔ C–9, 10)	G–B ↔ W–B	Ignition switch ON Cruise control main switch OFF, Main indicator light OFF	min. (+B – 2 V)
		Ignition switch ON Cruise control main switch hold ON, Main indicator light ON	max. 2 V

DI0YQ–01

PROBLEM SYMPTOMS TABLE

Symptom	Suspect Area	See page
SET not occourring or CANCEL occurring. (DTC is Normal)	1. Main Switch Circuit (Cruuise control switch) 2. Vehicle Speed Sensor Circuit 3. Control Switch Circuit (Cruise control switch) 4. Stop Light Switch Circuit 5. PNP Switch or Clutch Switch Circuit 6. Cruise Control Actuator with ECU	DI–458 DI–436 DI–439 DI–442 IN–24
SET not occurring or CANCEL occurring. (DTC does not output)	1. ECU Power Source Circuit 2. Cruise Control Actuator with ECU	DI–456 IN–24
Actual vehicle speed deviates above or below the set speed.	1. Vehicle Speed Signal Abnormal 2. Electronically Controlled Transmission Communication Circuit 3. Idle Signal Circuit (Main throttle position sensor) 4. Cruise Control Actuator with ECU	DI–438 DI–447 DI–444 IN–24
Gear shifting frequent between 3rd O/D when driving on uphill road. (Hurting)	1. Electronically Controlled Transmission Communication Circuit 2. Cruise Contorl Actuator with ECU	DI–447 IN–24
Cruise control not cancelled, even when brake pedal is depressed.	1. Stop Light Switch Circuit 2. Cruise Control Actuator with ECU	DI–442 IN–24
Cruise control not cancelled, even when transmission is shifted to ”N” position.	1. Park/Neutral Position Switch Circuit 2. Cruise Control Actuator with ECU	DI–451 IN–24
Cruise control not cancelled, even when clutch pedal is depressed.	1. Clutch Switch Circuit 2. Cruise Control Actuator with ECU	DI–454 IN–24
Control switch does not operate. (SET/COAST, ACC/RES, CANCEL not possible)	1. Contorl Switch Circuit (Cruise Control Switch) 2. Cruise Control Actuator with ECU	DI–439 IN–24
SET possible at 40 km/h (25 mph) or less, or CANCEL does not operate at 40 km/h (25 mph) or less.	1. Vehicle Speed Signal Abnormal 2. Cruise Control Actuator with ECU	DI–438 IN–24
Poor response is ACCEL and RESUME modes.	1. Electronically Controlled Transmission Communication Circuit 2. Cruise Control Actuator with ECU	DI–447 IN–24
O/D does not RESUME, even through the road is uphill.	1. Electronically Controlled Transmission Communication Circuit 2. Cruise Control Actuator with ECU	DI–447 IN–24
DTC memory is erased.	1. ECU Power Source Circuit 2. Cruise Control Actuator with ECU	DI–456 IN–24
DTC is not output, or is output when is should not be.	1. Diagnosis Circuit 2. Cruise Control Actuator with ECU	DI–462 IN–24
Cruise MAIN indicator light remains ON or fall to light up.	1. Cruise MAIN Indicator Light Switch Circuit	DI–460

DI0YR–01

CIRCUIT INSPECTION

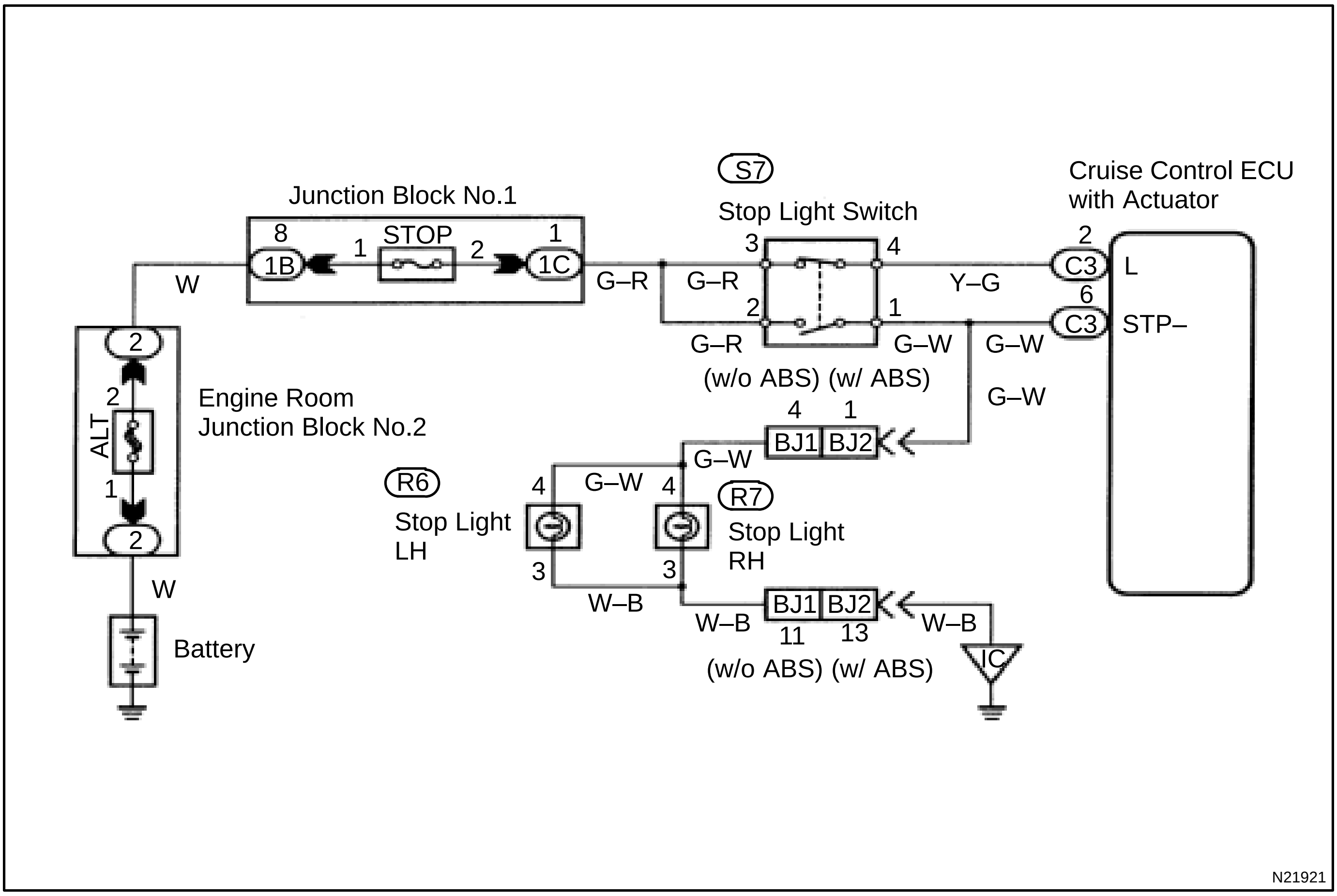
DTC	12	Actuator Circuit

CIRCUIT DESCRIPTION

This circuit turns on the magnetic clutch inside the actuator during cruise control operation according to the signal from the ECU. If a malfunction occurs in the actuator or speed sensor, etc. during cruise control operation, the rotor shaft between the motor and control plate is released.
When the brake pedal is depressed, the stop light switch turns on, supplying electrical power to the stop¿light. Power supply to the magnetic clutch is mechanically cut and the magnetic clutch is turned OFF.
When driving downhill, if the vehicle speed exceeds the set speed by 15 km/h (6 mph) above the set speed, then cruise control at the set speed is resumed.

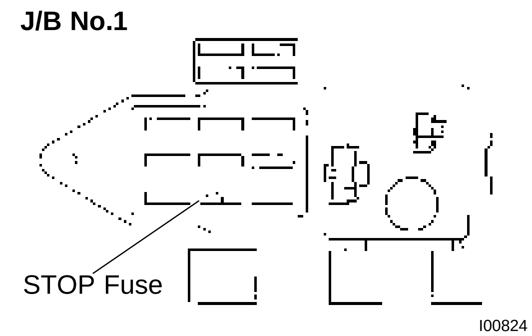
DTC No.	Detection Item	Trouble Area
12	●Short in actuator with ECU circuit ●Open in actuator with ECU circuit	●Connector of cruise control actuator with ECU ●Stop fuse and stop light switch ●cruise control actuator with ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check STOP fuse.

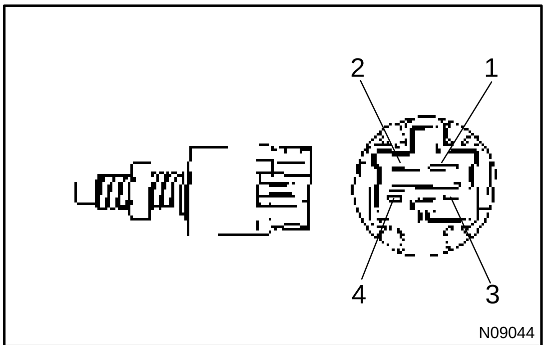


PREPARATION:
Remove STOP fuse from J/B No.1.
CHECK:
Check fuse continuity.
OK:
There is continuity.

NG → **Replace STOP fuse.**

OK ↓

2	Check stop light switch.



PREPARATION:
Disconnect stop light switch connector.
CHECK:
Check continuity between terminals.

Switch position	Continuity
Switch pin free (Brake pedal depressed)	1 – 2
Switch pin pushed in (Brake pedal released)	3 – 4

NG → **Replace stop light switch.**

OK ↓

Check and replace cruise control actuator with ECU (See page IN–24).

DI0YS–01

DTC	14	Actuator Mechanical Malfunction

CIRCUIT DESCRIPTION

The circuits detects the rotation position of the actuator contorl plate and sends a signal to the ECU.

DTC No.	Detection Item	Trouble Area
14	●Cruise contorl actuator motor open and shout.	●Connector of cruise control actuator with ECU ●Cruise control actuator with ECU

INSPECTION PROCEDURE

1	**Check connector of cruise control actuator with ECU (See page IN–24).**

NG → **Repair or replace connector.**

OK

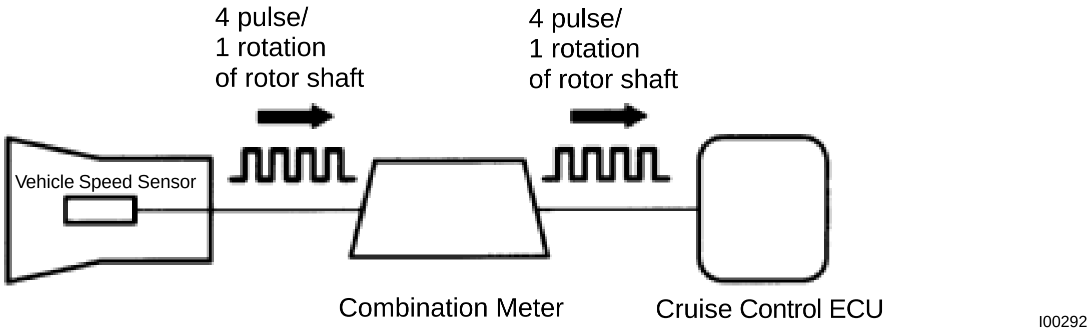
Check and replace cruise control actuator with ECU (See page IN–24).

DI0YT–01

DTC	21	Open in Vehicle Speed Sensor Circuit

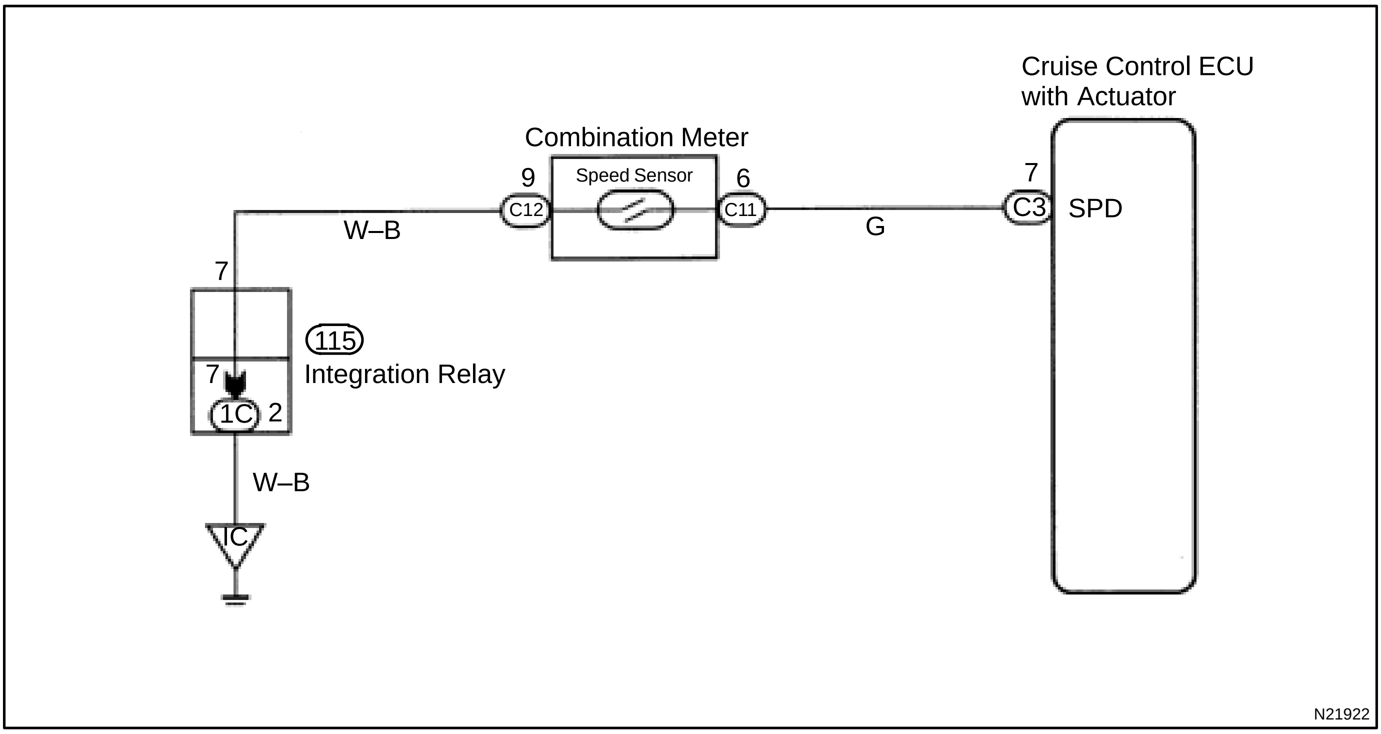
CIRCUIT DESCRIPTION

The combination meter sends the vehicle speed signal to the cruise control ECU. The cruise control ECU calculates the vehicle speed by of the vehicle speed signal sent from the combination meter.



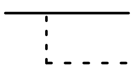
DTC No.	Detection Item	Trouble Area
21	Speed signal is not input to cruise control ECU while cruise control is set.	●Harness or connector between combination meter and cruise control actuator with ECU ●Speed sensor (in combination meter) ●Combination meter ●Cruise control actuator with ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Input signal check.**

Input Signal	Indicator Light Blinking Pattern
Drive at about 40 km/h (25 mph) or below	Light ON OFF 
Drive at about 40 km/h (25 mph) or higher	Light ON OFF 

CHECK:

(a) See input signal check on page DI–423.

(b) Check indicator light operation when driving with vehicle speed above 40 km/h (25 mph), and with vehicle speed below 40 km/h (25 mph).

OK:

Vehicle speed above 40 km/h (25 mph):
Indicator light blinks
Vehicle speed below 40 km/h (25 mph):
Indicator light stays on

OK → **Check and replace cruise control actuator with ECU (See page IN–24).**

NG

2	**Check harness and connector between combination meter and cruise control actuator with ECU (See page IN–24).**

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

OK

3	**Check speedometer sensor (See page BE–38).**

NG → **Repair or replace speed sensor or combination meter assembly.**

OK

Check and replace cruise control actuator with ECU (See page IN–24).

DI0YU–01

DTC	23	Vehicle Speed Signal Abnormal

CIRCUIT DESCRIPTION

See page DI–436.

DTC No.	Detection Item	Trouble Area
23	●Actuator vehicle speed has dropped either by 16 km/h (10 mph) or more below the set speed, or by 20% or more of the set speed.	●Speed sensor (in combination meter) ●Cruise control actuator with ECU

WIRING DIAGRAM

See page DI–436.

INSPECTION PROCEDURE

1	**Check speedometer circuit (See page BE–2).**

NG → **Repair or replace speed sensor or combination meter assembly.**

OK ↓

Check and replace cruise control actuator with ECU (See page IN–24).

DI0YV–01

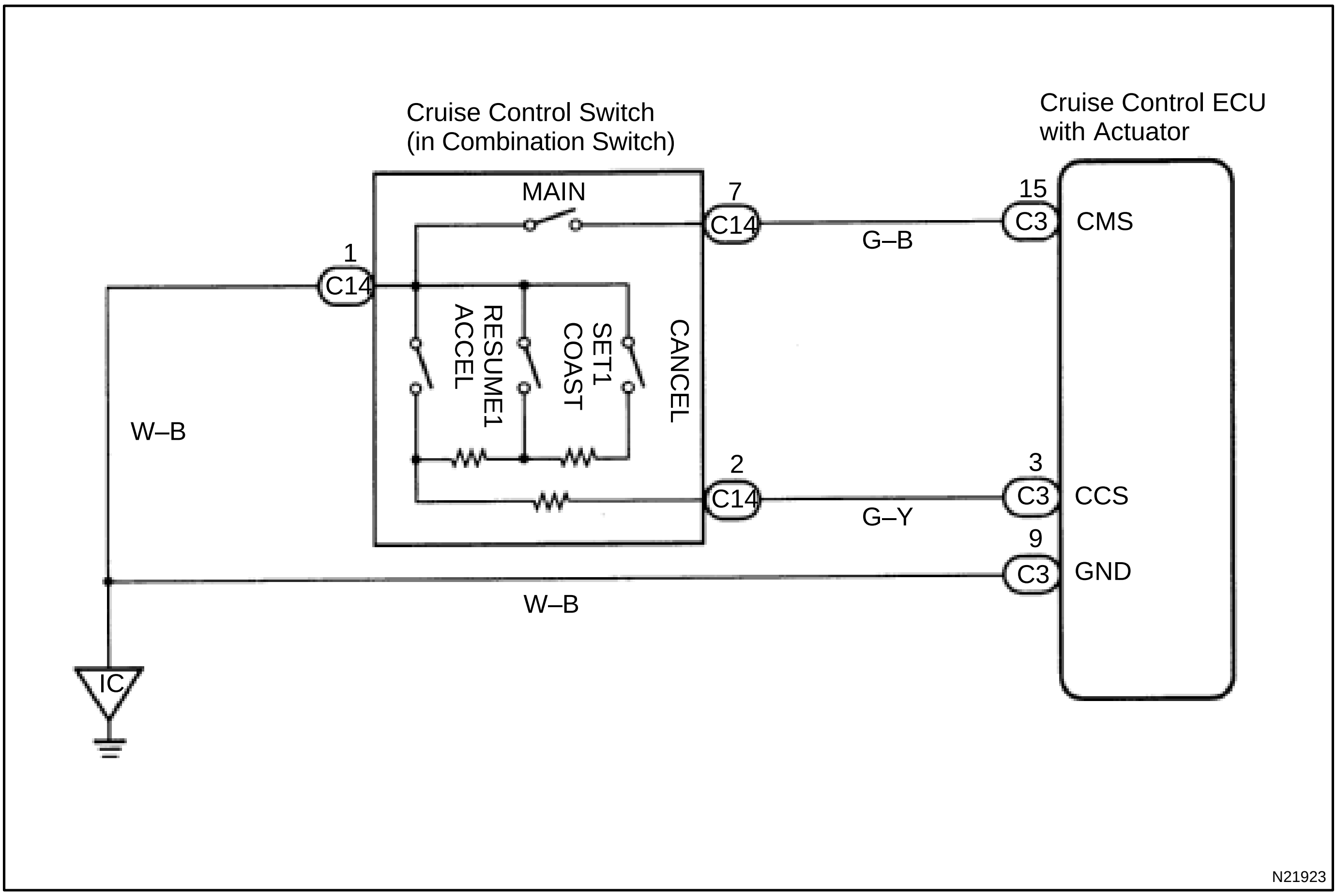
DTC	32	Control Switch Circuit (Cruise Control Switch)

CIRCUIT DESCRIPTION

This circuit carries the SET/COAST, RES/ACC and CANCEL signals (each voltage) to the ECU.

DTC No.	Detection Item	Trouble Area
32	Short in control switch circuit	•Harness or connector between control switch and cruise control actuator with ECU •Cruise control switch •Cruise control actuator with ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Input signal check.**

Input Signal	Indicator Light Blinking Pattern
SET/COAST switch	ON / OFF, 2 Pulses
RES/ACC switch	ON / OFF, 3 Pulses
CANCEL switch	ON / OFF, SW OFF / SW ON

PREPARATION:

See input signal check on page DI–423.

CHECK:

Check the indicator light operation when each of the SET/COAST, RES/ACC and CANCEL is turned on.

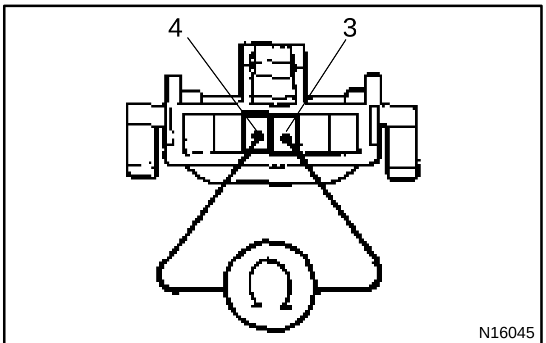
OK:

SET/COAST, RES/ACC switch
The signals shown in the table on the left should be output when each switch is ON. The signal should disappear when the switch is turned OFF.
CANCEL switch
The indicator light goes off when the cancel switch is turned ON.

OK → **Wait and see.**

NG

2	**Check control switch.**



N16045

PREPARATION:

(a) Remove steering wheel center pad.

(b) Disconnect control switch connector.

CHECK:

Measure resistance between terminals 3 and 4 of control switch connector when control switch is operated.

Switch position	Resistance (Ω)
Neutral	∞ (No continuity)
RES/ACC	50 – 80
SET/COAST	180 – 220
CANCEL	400 – 440

OK → **Replace control switch.**

NG

3	**Check harness and connector between cruise control switch and cruise control actuator with ECU (See page IN–24).**

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

OK

4	**Input signal check (See step 1).**

OK → **Wait and see.**

NG

Check and replace cruise control actuator with ECU (See page IN–24).

DI0YW–01

Stop Light Switch Circuit

CIRCUIT DESCRIPTION

When the brake is on, battery positive voltage normally applies through the STOP fuse and stop light switch to terminal STP– of the ECU, and the ECU turns the cruise control off.
A fail–safe function is provided so that cancel functions normally, even if there is a malfunction in the stop light signal circuit.
If the harness connected to terminal STP– has an open circuit, terminal STP– will have battery positive voltage and the cruise control will be turned off.
Also, when the brake is on, the magnetic clutch is cut mechanically by the stop light switch, turning the cruise control off.

WIRING DIAGRAM

See page DI–436.

INSPECTION PROCEDURE

1	**Check operation of stop light.**

CHECK:
Check that stop light comes on when brake pedal is depressed, and turns off when brake pedal is released.

NG → **Check stop light system.**

OK

2	**Input signal check.**

Input Signal	Indicator Light Blinking Pattern
Stop light switch ON	Light ON / OFF; SW OFF, SW ON

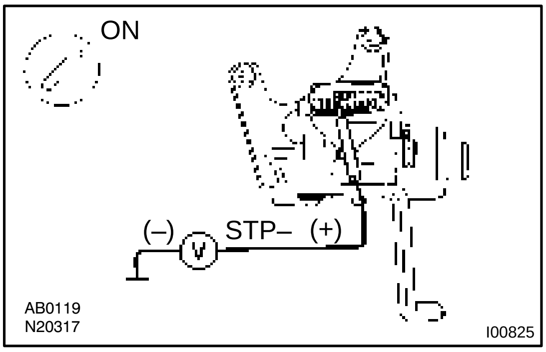
CHECK:
(a) See input signal check on DI–423.
(b) Check the indicator light when the brake pedal is depressed.

OK:
The indicator light goes off when the brake pedal is depressed.

OK → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–432).**

NG

3	Check voltage between terminal STP– of cruise control actuator with ECU connector and body ground.



PREPARATION:

Remove cruise control ECU with connectors still connected.

CHECK:

(a) Turn ignition switch ON.

(b) Measure voltage between terminal STP– of cruise control ECU connector and body ground when the brake pedal is depressed and released.

OK:

Depressed	10 – 14 V
Released	Below 1 V

OK → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–432).**

NG

4	Check for open in harness and connectors between terminal STP– of cruise control actuator with ECU and stop light switch (See page IN–24).

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

OK

Check and replace cruise control ECU actuator with (See page IN–24).

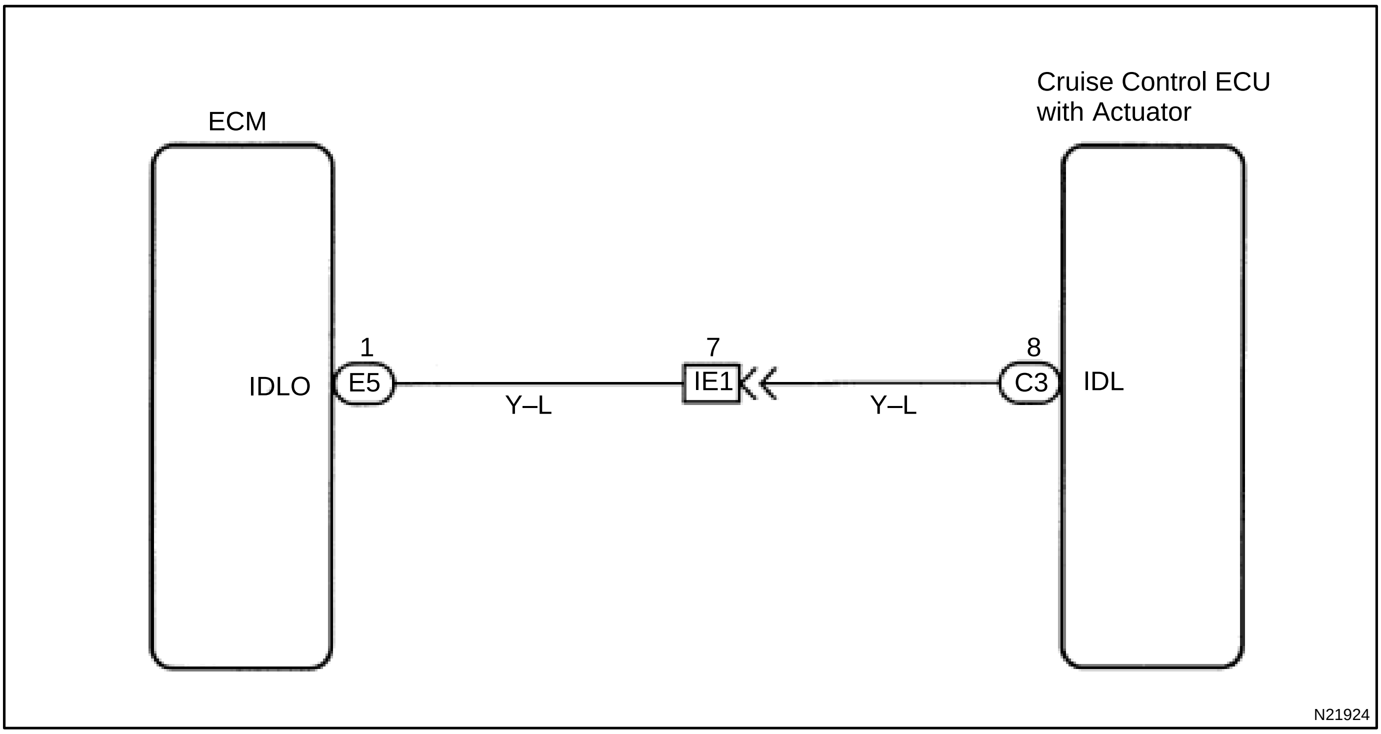
DI0YX–01

Idle Switch Circuit

CIRCUIT DESCRIPTION

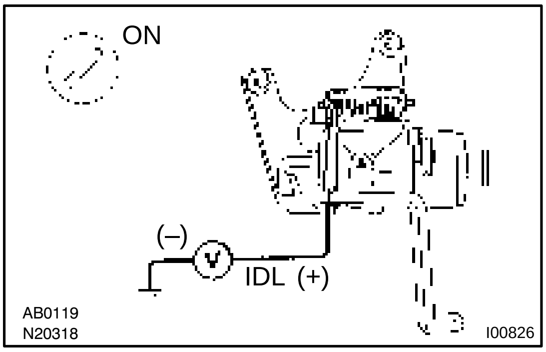
When the ”IDLO” terminal of ECM is turned ON, a signal is sent to the ECU. The ECU uses this signal to correct the discrepancy between the throttle valve position and the actuator position sensor valve to enable accurate cruise control at the set speed. If the idle switch is malfunctioning, problem symptoms also occur in the engine, so also inspect engine.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check voltage between terminal IDL of ECU connector and body ground.**



PREPARATION:

(a) Remove cruise control ECU with connector still connected.

(b) Disconnect ECM and ABS ECU connectors.

(c) Turn ignition switch ON.

CHECK:

Measure voltage between terminal IDL of ECU connector and body ground when the throttle valve is fully closed and fully opened.

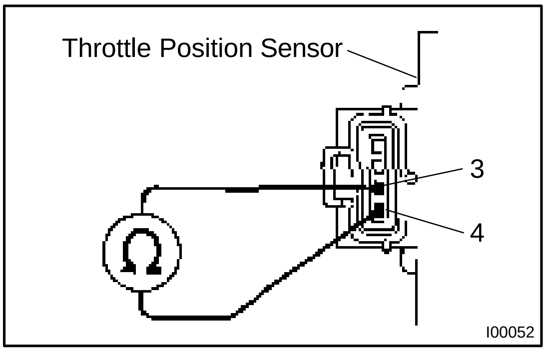
OK:

Throttle valve position	Voltage
Fully opened	10 – 14 V
Fully closed	Below 2 V

OK → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–432).**

NG

2	**Check throttle position sensor.**



PREPARATION:

Disconnect throttle position sensor connector.

CHECK:

Measure resistance between terminals 3 and 4 of throttle position sensor connector when the throttle valve is fully closed and fully opened.

OK:

Throttle valve position	Resistance
Fully opened	1 MΩ or higher
Fully closed	Below 2.3 kΩ

NG → **Replace throttle position sensor.**

OK

3	**Check for open and short in harness and connector between ECU and ECM (See page IN–24).**

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

OK

Check and replace cruise control actuator with ECU (See page IN–24).

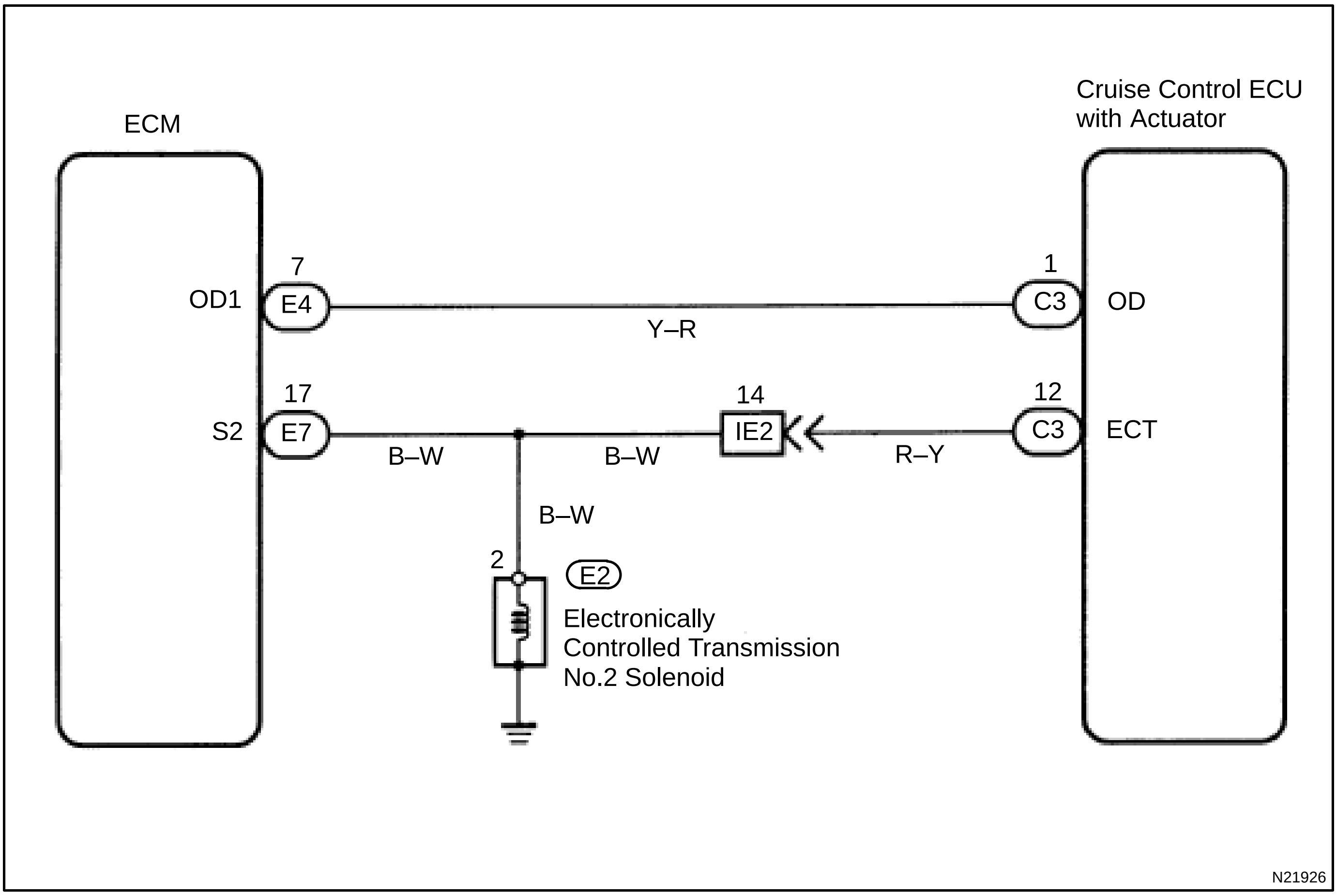
DI0YY–01

Electronically Controlled Transmission Communication Circuit

CIRCUIT DESCRIPTION

When driving uphill under cruise control, in order to reduce shifting due to ON–OFF overdrive operation and to provide smooth driving, when down shifting in the electronically controlled transmission occurs, a signal to prevent upshift until the end of the up hill slope is sent from the cruise control ECU to the electronically controlled transmission.
Terminal ECT of the cruise control ECU detects the shift change signal (output to electronically controlled transmission No. 2 solenoid) from the electronically controlled transmission.
If vehicle speed down, also when terminal electronically controlled transmission of the cruise control ECU receives down shifting signal, it sends a signal from terminal OD to ECM to cut overdrive until the end of the uphill slope, and the gear shifts are reduced and gear shift points in the electronically controlled transmission are changed.

WIRING DIAGRAM



INSPECTION PROCEDURE

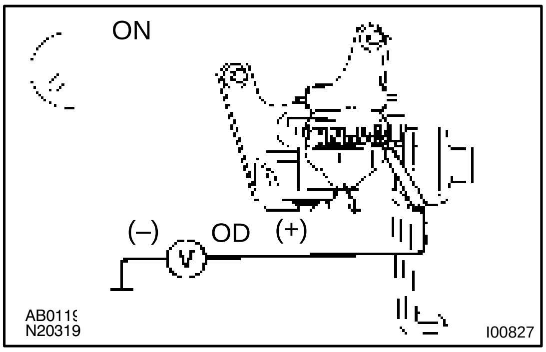
1	**Check operation of overdrive.**

PREPARATION:
Test drive after engine warms up.
CHECK:
Check that overdrive ON ↔ OFF occurs with operation of OD switch ON–OFF.

NG → **Check and repair electronically controlled transmission (See page DI–271).**

OK

2	**Check voltage between terminal OD of harness side connector of cruise control actuator with ECU and body ground.**

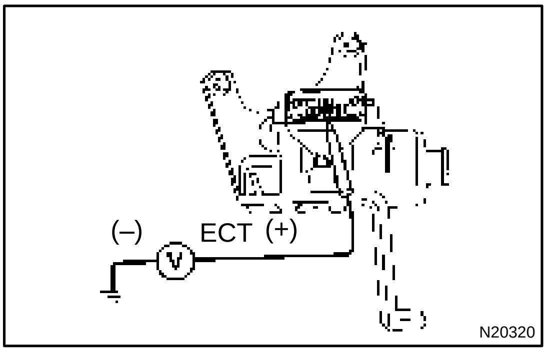


PREPARATION:
Remove cruise control ECU with connector still connected.
CHECK:
(a) Disconnect cruise control ECU connector.
(b) Turn ignition switch ON.
(c) Measure voltage between terminal OD of harness side connector of cruise control ECU and body ground.
OK:
Voltage: 10 – 14 V

NG → **Go to step 5.**

OK

3	**Check voltage between terminal ECT of cruise control actuator with ECU connector and body ground (On test drive).**



PREPARATION:

(a) Connect cruise control ECU connector.

(b) Test drive after engine warms up.

CHECK:

Check voltage between terminal ECT of cruise control ECU connector and body ground when OD switch is ON and OFF.

OK:

OD switch position	Voltage
ON	8 – 14 V
OFF	Below 0.5 V

OK → **Proceed to next circuit inspection shown on problem symptoms table(See page DI–432).**

NG

4	**Check harness and connector between terminal ECT of cruise control actuator with ECU and electronically controlled transmission solenoid (See page IN–24).**

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

OK

Check and replace cruise control actuator with ECU (See page IN–24).

5	**Check harness and connector between terminal OD of cruise control actuator with ECU and terminal OD1 of ECM (See page IN–24).**

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

OK

Check and replace cruise control actuator with ECU (See page IN–24).

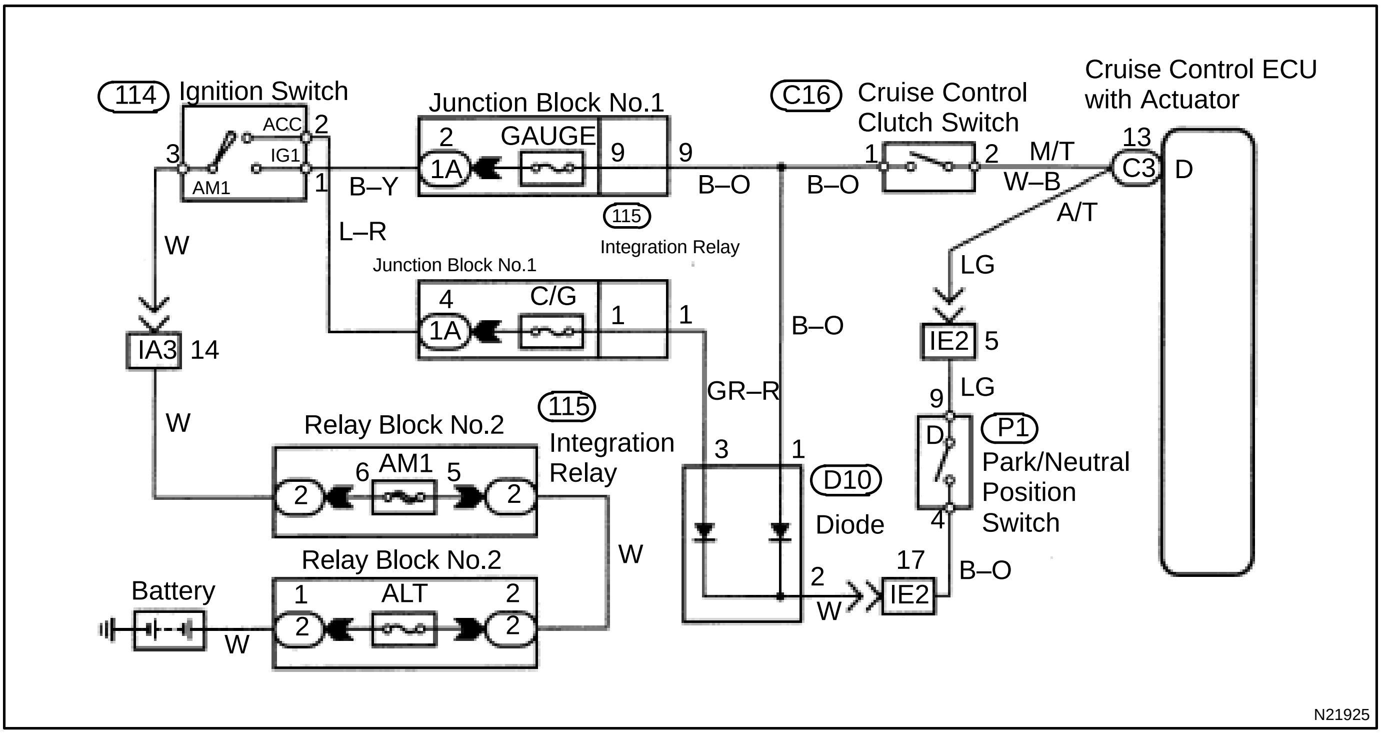
DI0YZ–01

Park/Neutral Position Switch Circuit

CIRCUIT DESCRIPTION

When the shift position is put in except D position, a signal is sent from the park/neutral position switch to the ECU. When this signal is input during cruise control driving, the ECU cancels the cruise control.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check starter operation.**

CHECK:

Check that the starter operates normally and that the engine starts.

NG → **Proceed to engine troubleshooting.**
(3RZ–FE: See page DI–1)
(5VZ–FE: See page DI–131)

OK

2	**Input signal check.**

Input Signal	Indicator Light Blinking Pattern
Turn PNP switch OFF (Shift to except D position)	Light ON SW ON / OFF SW OFF

PREPARATION:

See input signal check on page DI–423.

CHECK:

Check the indicator light when shifting into except D position.

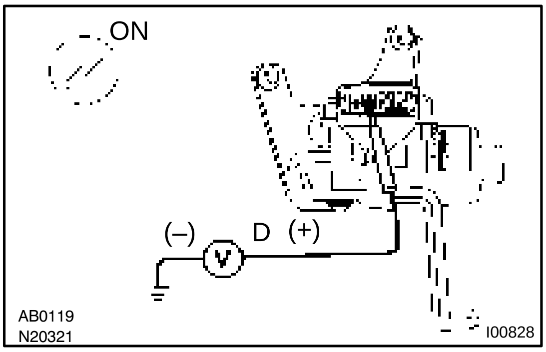
OK:

The indicator light goes off when shifting into except D position.

OK → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–432).**

NG

3	**Check voltage between terminal D of cruise control actuator with ECU and body ground.**



PREPARATION:

Turn ignition switch ON.

CHECK:

Measure voltage between terminal D of cruise control ECU connector and body ground when shifting into D position and other ranges.

OK:

Shift Position	Voltage
D position	10 – 14 V
Other positions	Below 1 V

OK → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–432).**

NG

4	**Check harness and connector between PNP switch and cruise control actuator with ECU (See page IN–24).**

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

OK

Check and replace cruise control actuator with ECU (See page IN–24).

DI0Z0–01

Clutch Switch Circuit

CIRCUIT DESCRIPTION

When the clutch pedal is depressed, the clutch switch sends a signal to the cruise control ECU. When the signal is input to the cruise control ECU during cruise control driving, the cruise control ECU cancels cruise control.

WIRING DIAGRAM

Refer to Park/ Neutral Position switch circuit on page DI–451.

INSPECTION PROCEDURE

1	Check starter operation.

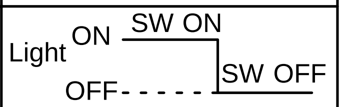
CHECK:

Check that the starter operates normally and that the engine starts.

NG → **Proceed to engine troubleshooting.**
(3RZ–FE: See page DI–1)
(5VZ–FE: See page DI–131)

OK ↓

2	Input signal check.

Input Signal	Indicator Light Blinking Pattern
Clutch switch OFF (Depress clutch pedal)	

PREPARATION:

See input signal check on page DI–423.

CHECK:

Check the indicator light when clutch pedal depressed.

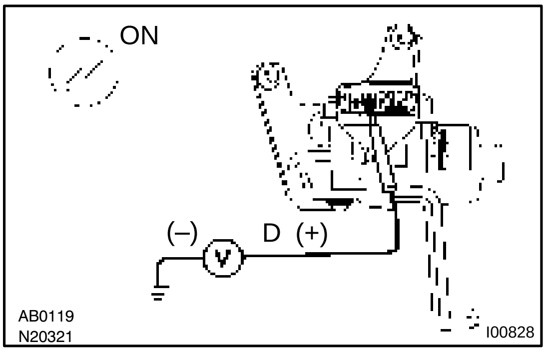
OK:

The indicator light goes off when clutch pedal depressed.

OK → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–432).**

NG ↓

3	**Check voltage between terminal D of cruise control actuator with ECU and body ground.**



PREPARATION:

Turn ignition switch ON.

CHECK:

Measure voltage between terminal D of cruise control ECU connector and body ground when clutch pedal depressed and pushed in.

OK:

Shift Position	Voltage
Clutch pedal depressed	10 – 14 V
Clutch pedal pushed in	Below 1 V

OK → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–432).**

NG

4	**Check for open in harness and connector between cruise control actuator with ECU and GAUGE fuse (See page IN–24).**

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

OK

Check and replace cruise control actuator with ECU (See page IN–24).

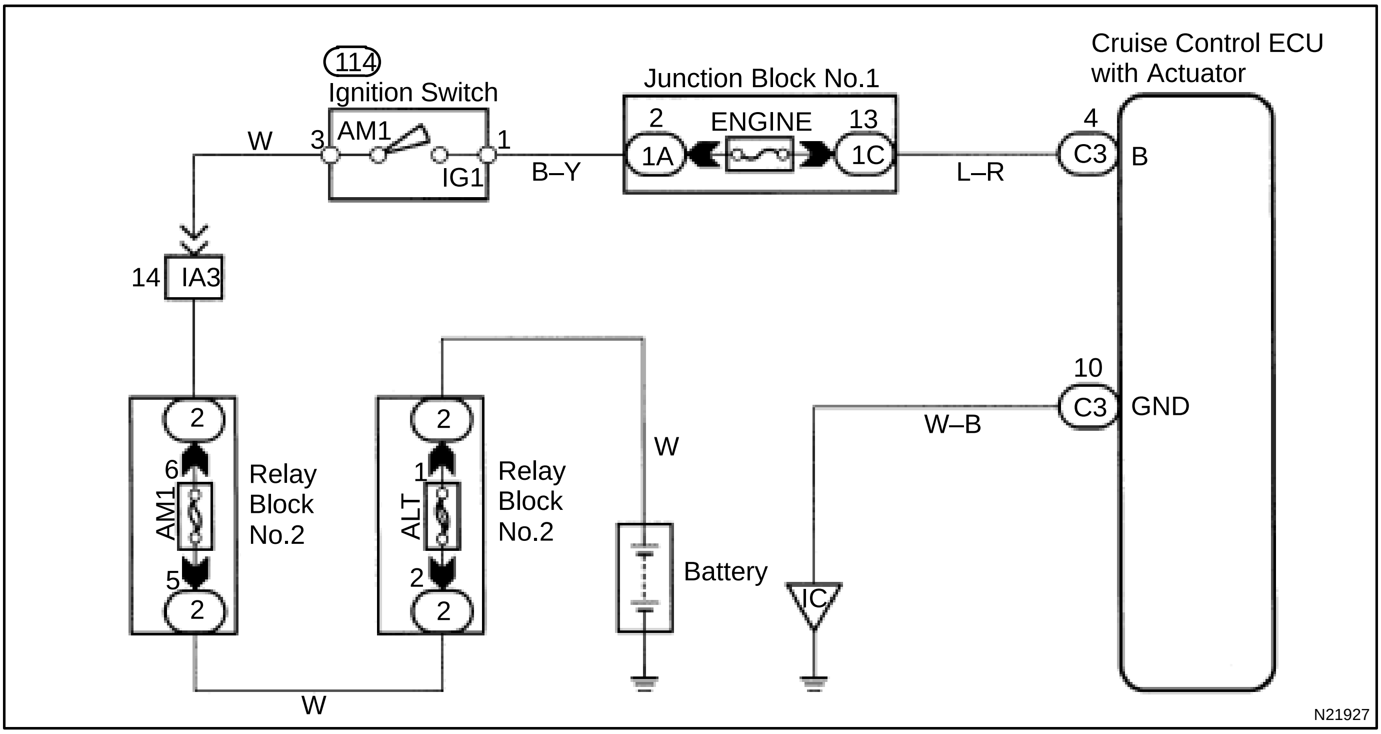
DI0Z1–01

ECU Power Source Circuit

CIRCUIT DESCRIPTION

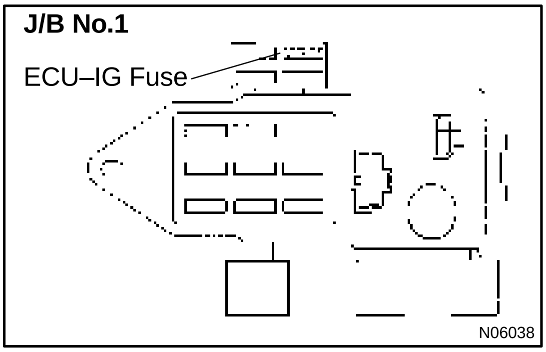
The ECU power source supplies power to the actuator and sensors, etc. When terminal GND and the cruise control ECU case are grounded.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check ECU–IG fuse.**

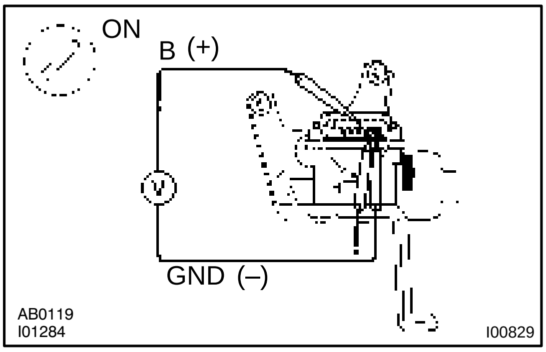


PREPARATION:
Remove ECU–IG fuse from J/B No.1.
CHECK:
Check continuity of ECU–IG fuse.
OK:
Continuity

NG → **Check for short in all harness and components connected to ECU–IG fuse.**

OK

2	Check voltage between terminals B and GND of cruise control actuator with ECU connector.



PREPARATION:

Remove cruise control ECU with connector still connected.

CHECK:

(a) Turn ignition switch ON.

(b) Measure voltage between terminals B and GND of cruise mcontrol ECU connector.

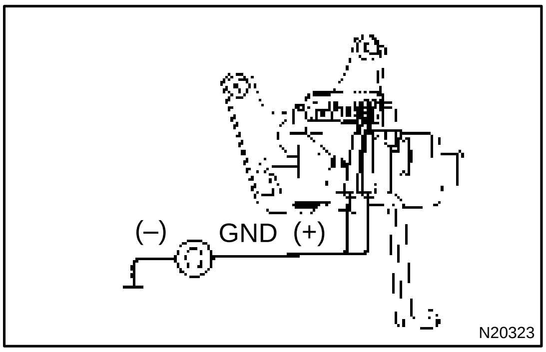
OK:

10 – 14 V

OK	Proceed to next circuit inspection shown on problem symptoms table (See page DI–432).

NG

3	Check resistance between terminal GND of cruise control actuator with ECU connector and body ground (See page IN–24).



CHECK:

Measure resistance between terminal GND of cruise control ECU connector and body ground.

OK:

Resistance: Below 1 Ω

NG	Repair or replace harness or connector.

OK

Check and repair harness and connector between battery and cruise control actuator with ECU (See page IN–24).

DI0Z2–01

Main Switch Circuit (Cruise Control Switch)

CIRCUIT DESCRIPTION

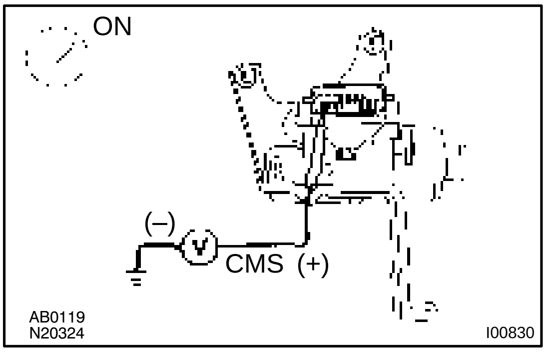
When the cruise control main switch is turned off, the cruise control does not operate.

WIRING DIAGRAM

See page DI–439.

INSPECTION PROCEDURE

1	Check voltage between terminal CMS of cruise control actuator with ECU connector and body ground.



PREPARATION:

Remove cruise control ECU with connector still connected.

CHECK:

(a) Turn ignition switch ON.

(b) Measure voltage between terminal CMS of cruise control ECU connector and body ground when main switch is held on and off.

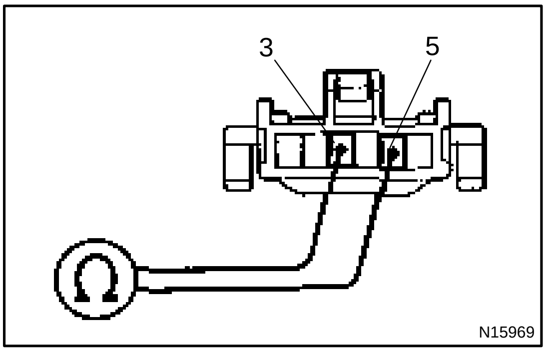
OK:

Main switch	Voltage
OFF	10 – 14 V
ON	Below 1 V

OK → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–432).**

NG

2	Check main switch continuity.



PREPARATION:

(a) Remove steering wheel center pad (See page SR–9).

(b) Disconnect cruise control switch connector.

CHECK:

Check continuity between terminals 3 and 5 of cruise control switch connector when main switch is held on and off.

OK:

Switch position	Tester connection	Specified condition
OFF	3 – 5	No continuity
Hold ON	3 – 5	Continuity

NG → **Replace control switch.**

OK

3	Check harness and connector between cruise control actuator with ECU and main switch (See page IN–24).

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

OK

Check and replace cruise control actuator with ECU (See page IN–24).

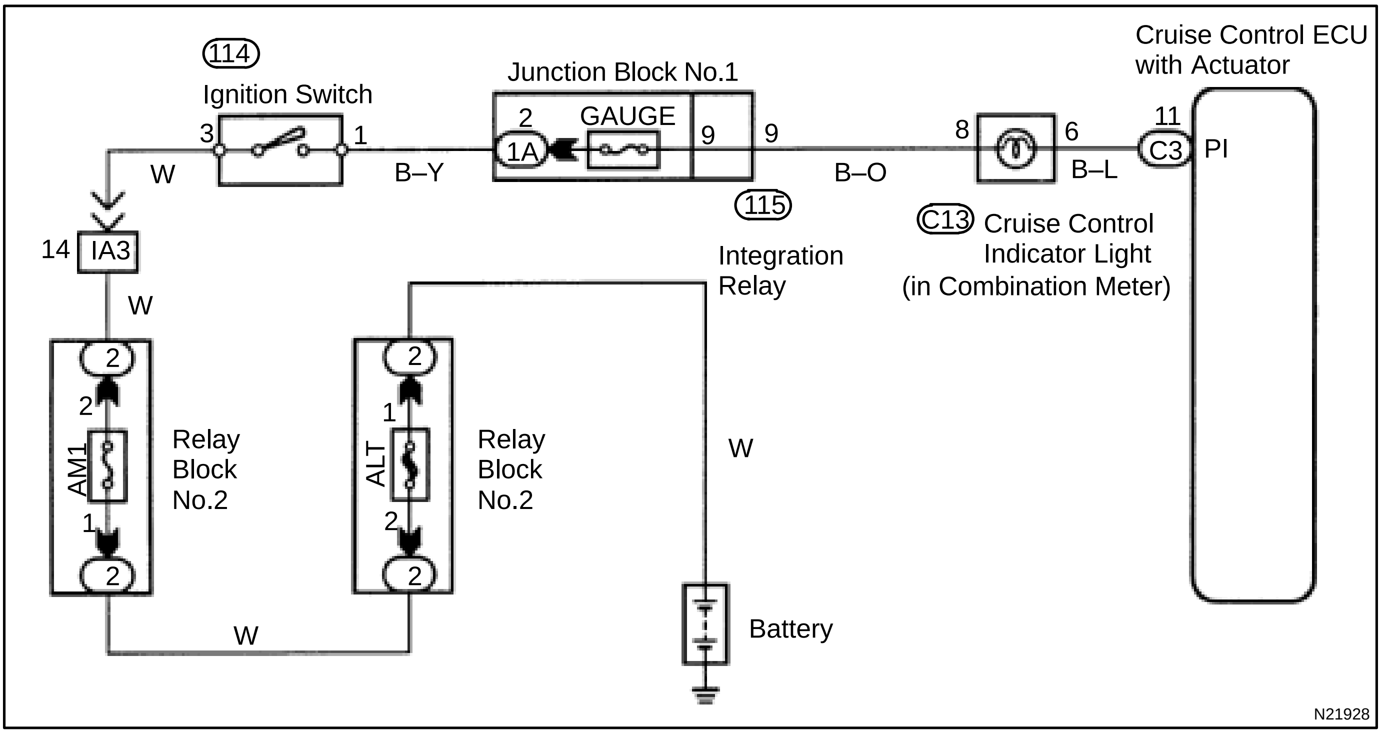
DI0Z3–01

CRUISE MAIN Indicator Light Circuit

CIRCUIT DESCRIPTION

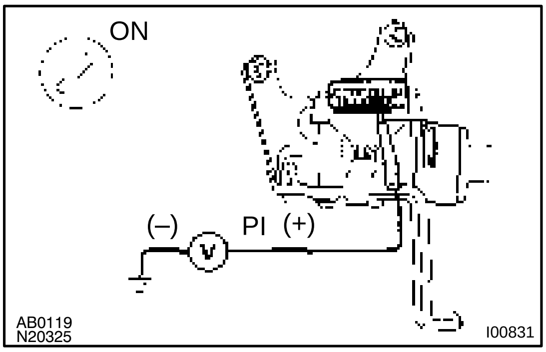
When the cruise control main switch is turned ON, CRUISE MAIN indicator light lights up.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check voltage between terminals PI of cruise control actuator with ECU connector and body ground.**



PREPARATION:

Turn ignition switch ON.

CHECK:

Measure voltage between terminals PI of cruise control ECU connector and body ground when main switch on and off.

OK:

Switch position	Voltage
OFF	10 – 16 V
ON	Below 1.2 V

OK → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–432).**

NG

2	**Check combination meter (See page BE–38).**

NG → **Replace combination meter.**

OK

Check and replace cruise control actuator with ECU (See page IN–24).

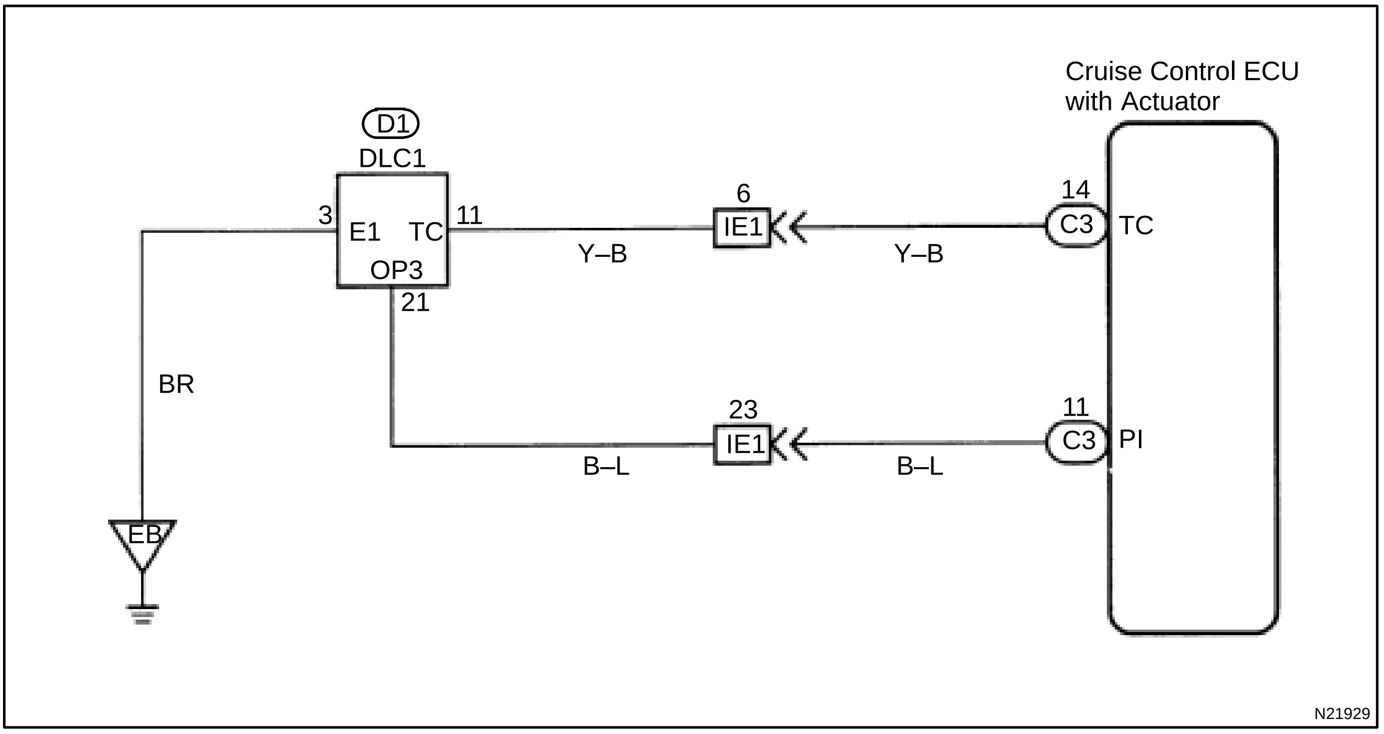
DI0Z4–01

Diagnosis Circuit

CIRCUIT DESCRIPTION

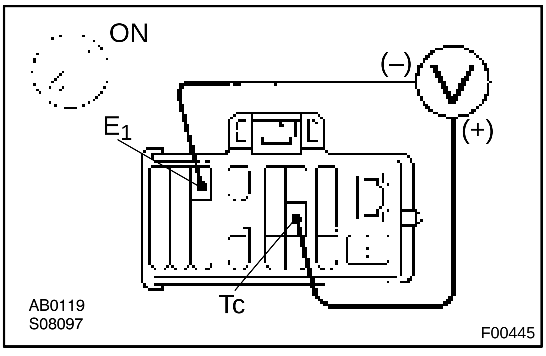
This circuit sends a signal to the ECU that DTC output is required.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check voltage between terminals Tc and E_1 of DLC1.**



CHECK:

(a) Turn ignition switch ON.

(b) Measure voltage between terminals Tc and E_1 of DLC1.

OK:

Voltage: 10 – 14 V

OK	**Proceed to next circuit inspection shown on problem symptoms table (See page DI–432).**

NG

2	**Check harness and connector between cruise control actuator with ECU and DLC1, DLC1 and body ground (See page IN–24).**

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

OK

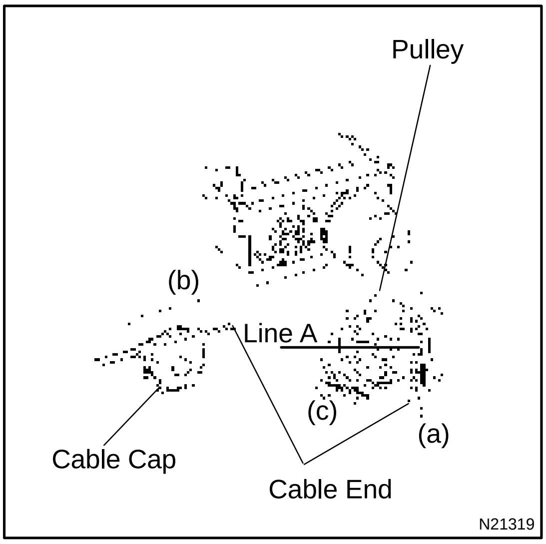
Check and replace cruise control actuator with ECU (See page IN–24).

DI0Z5–01

Actuator Control Cable

INSPECTION PROCEDURE

1	**Check actuator control cable.**



PREPARATION:

(a) Remove actuator control cable.

(1) Insert the inner cable end into the pulley and pull it up to the line ”A”, show in the illustration.
The end of the spring prevents to pulley from slipping out.

(2) Install the cable cap to the fit it with the actuator.

(3) Turn the cable cap clockwise to lock.

(b) Install actuator control cable.
Installation in the reverse order of removal.

CHECK:

(a) Check that the actuator, control cable throttle link are properly installed and that the cable and link are connected correctly.

(b) Check that the actuator and bell crank are operating smoothly.

(c) Check that the cable is not loose or too tight.

OK:

Freeplay: less than 10 mm

HINT:

- If the control cable is very loose, the vehicle’s loss of speed going uphill will be large.
- If the control cable is too tight, the idle RPM will become high.