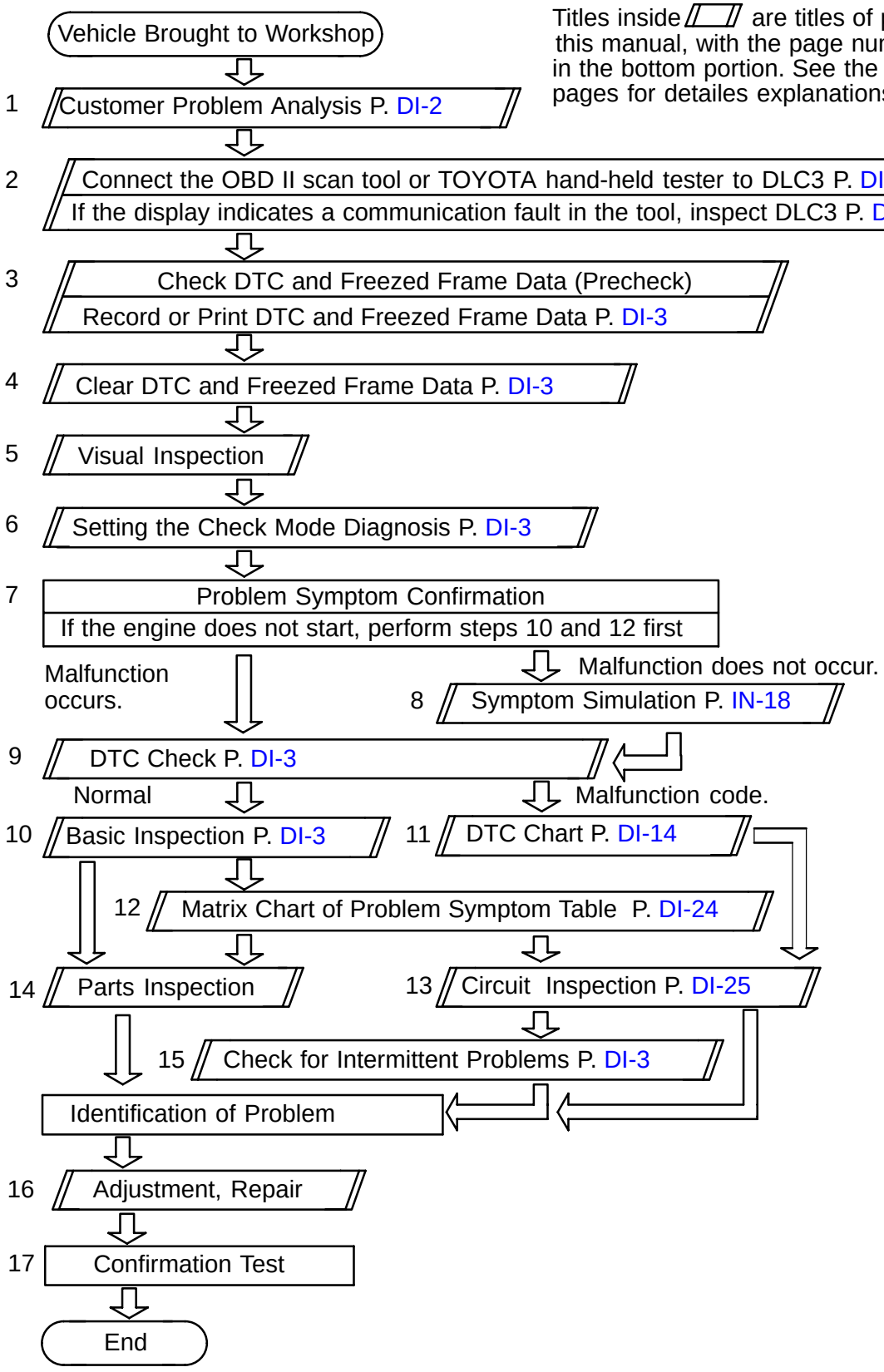
ENGINE (2JZ-GE)

DI4R8-01

HOW TO PROCEED WITH TROUBLESHOOTING

Troubleshoot in accordance with the procedure on the following page.



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

DI4R9-01

CUSTOMER PROBLEM ANALYSIS CHECK

ENGINE CONTROL SYSTEM Check Sheet

Inspector's Name _____

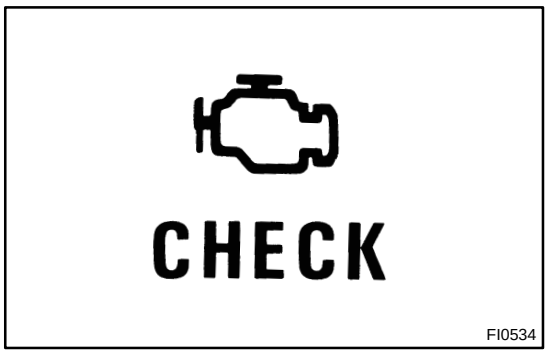
Customer's Name		Model and Model Year	
Driver's Name		Frame No.	
Data Vehicle Brought in		Engine Model	
License No.		Odometer Reading	km / miles

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

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

DI4RA-01



PRE-CHECK

1. DIAGNOSIS SYSTEM

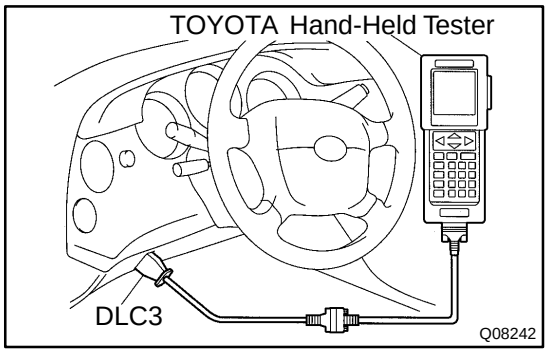
(a) Description

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 detests 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 (DTC) prescribed by SAE J2012 are recorded in the ECM memory.

(See page DI-14)

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



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

DTC include SAE controlled codes and Manufacturer controlled codes.

SAE controlled codes must be set as prescribed by the SAE, while Manufacturer controlled codes can be set freely by the manufacturer within the prescribed limits.

(See DTC chart on page DI-14)

The diagnosis system operates in normal mode during normal vehicle use. It also has a check mode for technicians to simulate malfunction symptoms and troubleshoot. Most DTC use 2 trip detection logic* to prevent erroneous detection and ensure thorough malfunction detection. By switching the ECM to check mode when troubleshooting, the technician can cause the MIL to light up for a malfunction that is only detected once or momentarily. (TOYOTA hand-held tester only)

(See page DI-3)

*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 second drive test, this second detection causes the MIL to light up.

The 2 trip repeats the same mode a 2nd time. (However, the IG switch must be turned OFF between the 1st trip and 2nd trip).

Freeze frame data:

Freeze frame data records the engine condition when a misfire (DTC P0300 - P0306) or fuel trim malfunction (DTC 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.

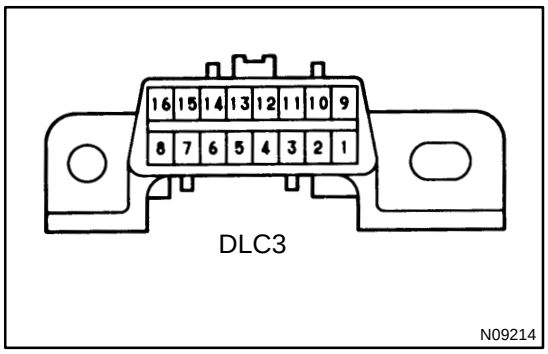
Priorities for Troubleshooting:

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

(1) DTC other than fuel trim malfunction (DTC P0171, P0172), EGR (DTC P0401, P0402), and misfire (DTC P0300 - P0306).
(2) Fuel trim malfunction (DTC P0171, P0172) and EGR (DTC P0401, P0402).
(3) Misfire (DTC 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.



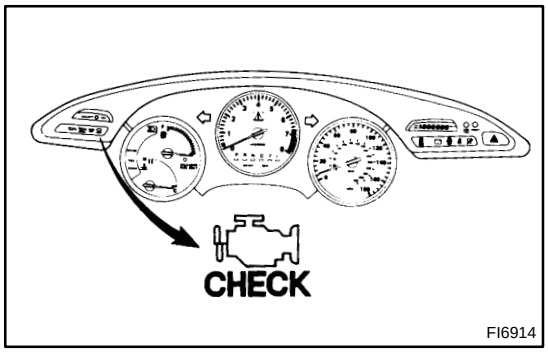
Terminal No.	Connection / Voltage or Resistance	Condition
2	Bus ⊕ Line / Pulse generation	During transmission
4	Chassis Ground / ↔ Body Ground 1 Ω or less	Always
5	Signal Ground / ↔ Body Ground 1 Ω or less	Always
16	Battery Positive / ↔ Body Ground 9 - 14 V	Always

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-40).

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

(1) Prepare the OBD II scan tool (complying with SAE J1978) or TOYOTA hand-held tester.

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

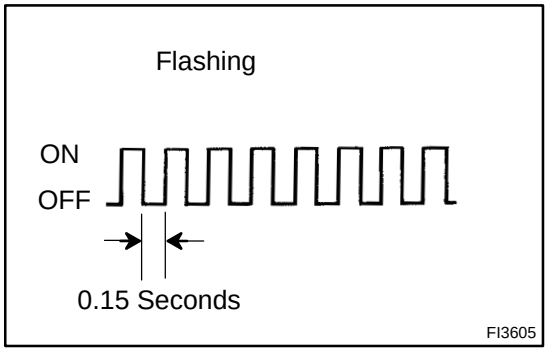
(3) Turn the ignition switch ON and turn the OBD II scan tool or TOYOTA hand-held tester switch ON.

(4) Use the OBD II scan tool or TOYOTA hand-held tester to check the DTC and freezed frame data, note them down. (For operating instructions, see the OBD II scan tool's instruction book.)

(5) See page DI-14 to confirm the details of the DTC.

NOTICE:

When simulating symptoms with an OBD II scan tool (excluding TOYOTA hand-held tester) to check the DTC, use normal mode. For codes on the DTC chart subject to "2 trip detection logic", turn the ignition switch OFF after the symptom is simulated the first time. Then repeat the simulation process again. When the problem has been simulated twice, the MIL lights up and the DTC 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 11V or more.
- Throttle valve fully closed.
- Transmission in park or neutral position.
- Air conditioning switched OFF.

(2) Turn ignition switch OFF.

(3) Prepare the TOYOTA hand-held tester.

(4) Connect the TOYOTA hand-held tester to DLC3 at the lower left 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 DTC, etc.

(9) After simulating the malfunction conditions, use the TOYOTA hand-held tester diagnosis selector to check the DTC 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 DTC, 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.

(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 DTC 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 CTP Switch ON ..... 3.6 m sec. CTP Switch OFF ..... 6.7 m sec.	Returned to normal condition
P0110	Intake air temp. is fixed at 20°C (68°F)	Returned to normal condition
P0115	Engine coolant temp. is fixed at 80°C (176°F)	Returned to normal condition
P0120	VTA is fixed at 0°	The 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 P0155	The 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 1 ignition
P1605	Max. timing retardation	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.

(1) Clear diagnostic trouble codes (See page DI-3)
(2) Set check mode (See page DI-3)
(3) Perform a simulation test (See page IN-18)
(4) Connector connection and terminal inspection (See page IN-28)
(5) Visual check and contact pressure check (See page IN-28)
(6) Connector handling (See page IN-28)

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 causes, 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-14 and continue to troubleshoot.**

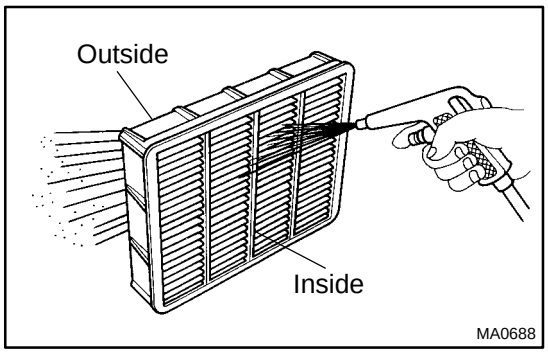
YES

3	**Does engine start?**

NO → **Go to step 7.**

YES

4	Check are filter.



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

NG → **Repair or replace.**

OK

5	Check idle speed.

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

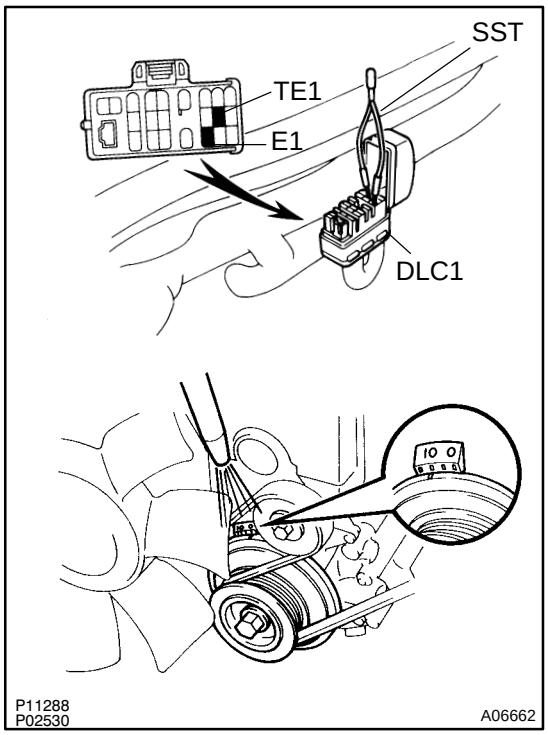
CHECK:
Use CURRENT DATA to check the engine idle speed.

OK:
Idle speed: 700 ± 50 rpm

NG → **Proceed to matrix chart of problem symptoms on page DI-24 .**

OK

6	Check ignition timing.



PREPARATION:A

(a) Warm up engine to normal operating temperature.
(b) Shift transmission into ”N” position.
(c) Keep the engine speed at idle.
(d) Using SST, connect terminals TE1 and E1 of DLC 1.
SST SST 09843-18020
(e) Using a timing light, connect the tester to check wire (See page EM-10).

CHECK:

Check ignition timing.

OK:

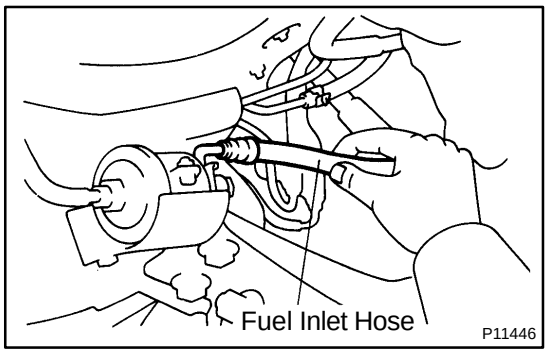
Ignition timing: 10˚ BTDC at idle

NG → **Proceed to IG-1 and continue to troubleshoot.**

OK

Proceed to matrix chart of problem symptoms on page DI-24 .

7	Check fuel pressure.



PREPARATION:

(a) Be sure that enough fuel is in the tank.
(b) Turn ignition switch ON.
(c) Connect the TOYOTA hand-held tester to DLC3 on the vehicle.
(d) Use ACTIVE TEST mode to operate the fuel pump.
(e) 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.

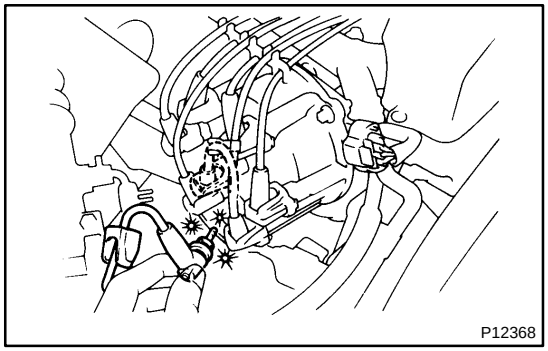
HINT:

At this time, you will hear the sound of flowing.

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

OK

8	Check for spark.



PREPARATION:

(a) Disconnect the high-tension cord from the distributor cap.
(b) Hold the end about 12.5 mm (1/2") from the ground.
(c) Disconnect injector connector.

CHECK:

Check if 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.

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

OK

Proceed to matrix chart of problem systems on page DI-24 .

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 warmed up: CLOSED
FUEL SYS #2	Fuel System Bank 2 OPEN: Air-fuel ratio feedback stopped CLOSED: Air-fuel ratio feedback operating	Idling after warmed up: CLOSED
CALC LOAD	Calculator Load: Current intake air volume as a proportion of max. intake air volume	Idling: 11.7 ~ 21.1 % Racing without load (2,500 rpm): 10.6 ~ 21.1 %
COOLANT TEMP	Engine Coolant Temperature Sensor Value	After warmed up: 80 - 95°C (176 - 203°F)
SHORT FT #1	Short - term Fuel Trim Bank 1	0 ± 20 %
LONG FT #1	Long - term Fuel Trim Bank 1	0 ± 20 %
SHORT FT #2	Short - term Fuel Trim Bank 2	0 ± 20 %
LONG FT #2	Long - term Fuel Trim Bank 2	0 ± 20 %
ENGINE SPD	Engine Speed	Idling: 700 ± 50 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 - 25°
INTAKE AIR	Intake Air Temperature Sensor Valve	Equivalent to Ambient Temp.
MAF	Air Flow Rate Through Mass Air Flow Meter	Idling: 2.5 - 4.4 gm/sec Racing without load (2,500 rpm): 7.9 - 15.8 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 % Fully Open: 65 - 75 %
O2S B1, S1	Voltage Output of Oxygen Sensor Bank 1, Sensor 1	Idling: 0.1 - 0.9 V
02FT, B1, S1	Oxygen Sensor Fuel Trim Bank 1, Sensor 1 (Same as SHORT FT #1)	0 ± 20 %
02S, B1, S2	Voltage Output of Oxygen Sensor Bank 1, Sensor 2	Driving 50 km/h (31mph): 0.1 - 0.9 V
02S, B2, S1	Voltage Output of Oxygen Sensor Bank 2, Sensor 1	Idling: 0.1 ~ 0.9 V
02FT, B2, S1	Oxygen Sensor Fuel Trim Bank 2, Sensor 1 (Same as SHORT FT #2)	0 ± 20 %

*: 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*
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: 1.3 - 3.1 ms
IAC STEP POS	Intake Air Control Valve Step Position Opening position step motor type IAC valve	Idling: 16 - 40 step
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
PNP SW	Park / Neutral Position Switch Signal	P or N position: ON
ELECTRICAL LOAD SIG	Electrical Load Signal	Defogger S/W 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 CYL #5 CYL #6	Abnormal revolution variation for each cylinder	0%
IGNITION	Total number of ignitions for every 1,000 revolutions	0 - 3,0000
EGRT GAS	EGR Gas Temperature Sensor Value	EGR not operating: Temperature between intake air temp. and engine coolant temp.
INTAKE CTRL VSV	Intake Air Control Valve VSV Signal	VSV operating: ON
EGR SYSTEM	EGR system operating condition	Idling: OFF
FUEL PRES UP VSV	Fuel Pressure Up VSV Signal	High temp. restarting: ON
A/C CUT SIG	A/C Cut Signal	A/C S/W OFF: ON
EVAP (PURGE) VSV	EVAP 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
TOTAL FT B2	Total Fuel Trim Bank 2: Average value for fuel trim system of bank 2	Idling: 0.8 - 1.2
02 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 warmed up: 0 - 1,000 m sec.
02 LR B2, S1	Oxygen Sensor Lean Rich Bank 2, Sensor 1 Response time for oxygen sensor output to switch from lean to rich.	Idling after warmed up: 0 - 1,000 m sec.
02 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 warmed up: 0 - 1,000 m sec.
02 RL B2, S1	Oxygen Sensor Rich Lean Bank 2, Sensor 1 Response time for oxygen sensor output to switch from rich to lean.	Idling after warmed up: 0 - 1,000 m sec.

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

DI4RB-01

DIAGNOSTIC TROUBLE CODE CHART

HINT:
Parameters listed in the chart may not be exactly the same as your reading due to the type of instrument or other factors.
If a malfunction code is displayed during the DTC check in check mode, check the circuit for that code listed in the table below. For details of each code, turn to the page reffered 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-25)	Mass Air Flow Circuit Malfunction	Open or short in mass air flow meter circuit Mass air flow meter ECM	○	○
P0101 (DI-29)	Mass Air Flow Circuit Range / Performance problem	Mass air flow meter	○	○
P0110 (DI-30)	Intake Air Temp. Circuit Malfunction	Open or short in intake air temp. sensor circuit Intake air temp. sensor ECM	○	○
P0115 (DI-34)	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-40)	Throttle / Pedal Position Sensor / Switch "A" Circuit Malfunction	Open or short in throttle position sensor circuit Throttle position sensor ECM	○	○
P0121 (DI-44)	Throttle /Pedal Position Sensor / Switch "A" Circuit Range / Peformance Problem	Throttle position sensor	○	○
P0125 (DI-45)	Insufficient Coolant Temp. for Closed Loop Fuel Control	Open or short in heated oxygen sensor circuit Heated oxygen sensor	○	○
P130 (DI-48)	Heated Oxygen Sendor Circuit Malfunction (Bank 1 Sensor 1)	Heated oxygen sensor Fuel trim malfunction	○	○
P0133 (DI-52)	Heated Oxygen Sensor Circuit Slow Response (Bank 1 Sensor 1)	Heated oxygen sensor	○	○

*: ○... MIL lights up

DTC No. (See Page)	Detection Item	Trouble Area	MIL*	Memory
P0135 (DI-53)	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-55)	Heated Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 2)	Heated oxygen sensor	○	○
P0141 (DI-53)	Heated Oxygen Sensor Heater Circuit Malfunction (Bank 1 Sensor 2)	Same as DTC No. P0135	○	○
P0150 (DI-48)	Heated Oxygen Sensor Circuit Malfunction (Bank 2 Sensor 1)	Same as DTC No. P0130	○	○
P0153 (DI-52)	Heated Oxygen Sensor Circuit Slow Response (Bank 2 Sensor 1)	Same as DTC No. P0133	○	○
P0155 (DI-53)	Heated Oxygen Sensor Heater Circuit Malfunction (Bank 2 Sensor 1)	Same as DTC No.P0135	○	○
P0171 (DI-57)	System too Lean (Fuel Trim)	Air Intake (hose loose) Fuel line pressure Injector blockage Heated oxygen sensor malfunction Mass air flow meter Engine coolant temp. sensor	○	○
P0172 (DI-57)	System too Rich (Fuel Trim)	Fuel line pressure Injector blockage, leak Heated oxygen sensor malfunction Mass air flow meter Engine coolant temp. sensor	○	○

*: ○... MIL lights up

DTC No. (See Page)	Detection Item	Trouble Area	MIL*	Memory
P0300 (DI-60)	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 P0305 P0306 (DI-60)	Misfire Detected - Cylinder 1 - Cylinder 2 - Cylinder 3 - Cylinder 4 - Cylinder 5 - Cylinder 6			
P0325 (DI-93)	Knock Sensor 1 Circuit Malfunction	Open or short in knock sensor 1 circuit Knock sensor 1 (looseness) ECM	○	○
P0330 ()DI-65)	Knock Sensor 2 Circuit Malfunction	Open or short in knock sensor 2 circuit Knock sensor 2 (looseness) ECM	○	○
P0335 (DI-69)	Crankshaft Position Sensor ”A” Circuit Malfunction	Open or short in crankshaft position sensor circuit for NE signal Crankshaft position sensor for NE signal Starter ECM	○	○
P0340 (DI-72)	Camshaft Position Sensor Circuit Malfunction	Open or short in camshaft position sensor circuit Camshaft position sensor Open or short in crankshaft position sensor circuit for NE2 signal Crankshaft position sensor for NE2 signal Starter ECM	○	○
P0385 (DI-75)	Crankshaft Position Sensor ”B” Circuit Malfunction	Open or short in crankshaft position sensor circuit for NE2 signal Crankshaft position sensor for NE2 signal ECM	○	○
P0401 (DI-78)	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-89)	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	○	○

*: ○ ... MIL lights up

DTC No. (See Page)	Detection Item	Trouble Area	MIL*	Memory
P0420 (DI-93)	Catalyst System Efficiency Below Threshold	Three-way catalytic converter Open or short in heated oxygen sensor circuit Heated oxygen sensor	○	○
P0441 (DI-96)	Evaporative Emission Control System Incorrect Purge Flow	Open or short in VSV circuit for EVAP VSV for EVAP ECM Vacuum hose blocked or disconnected Charcoal canister	○	○
P0500 (DI-100)	Vehicle Speed Sensor Malfunction	Open or short in vehicle speed sensor circuit Vehicle speed sensor Combination meter ECM	○	○
P0505 (DI-103)	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)	○	○
P0510 (DI-106)	Closed Throttle Position Switch Malfunction	Open in closed throttle position switch circuit Closed throttle position switch ECM	○	○

*: ○ ... MIL lights up

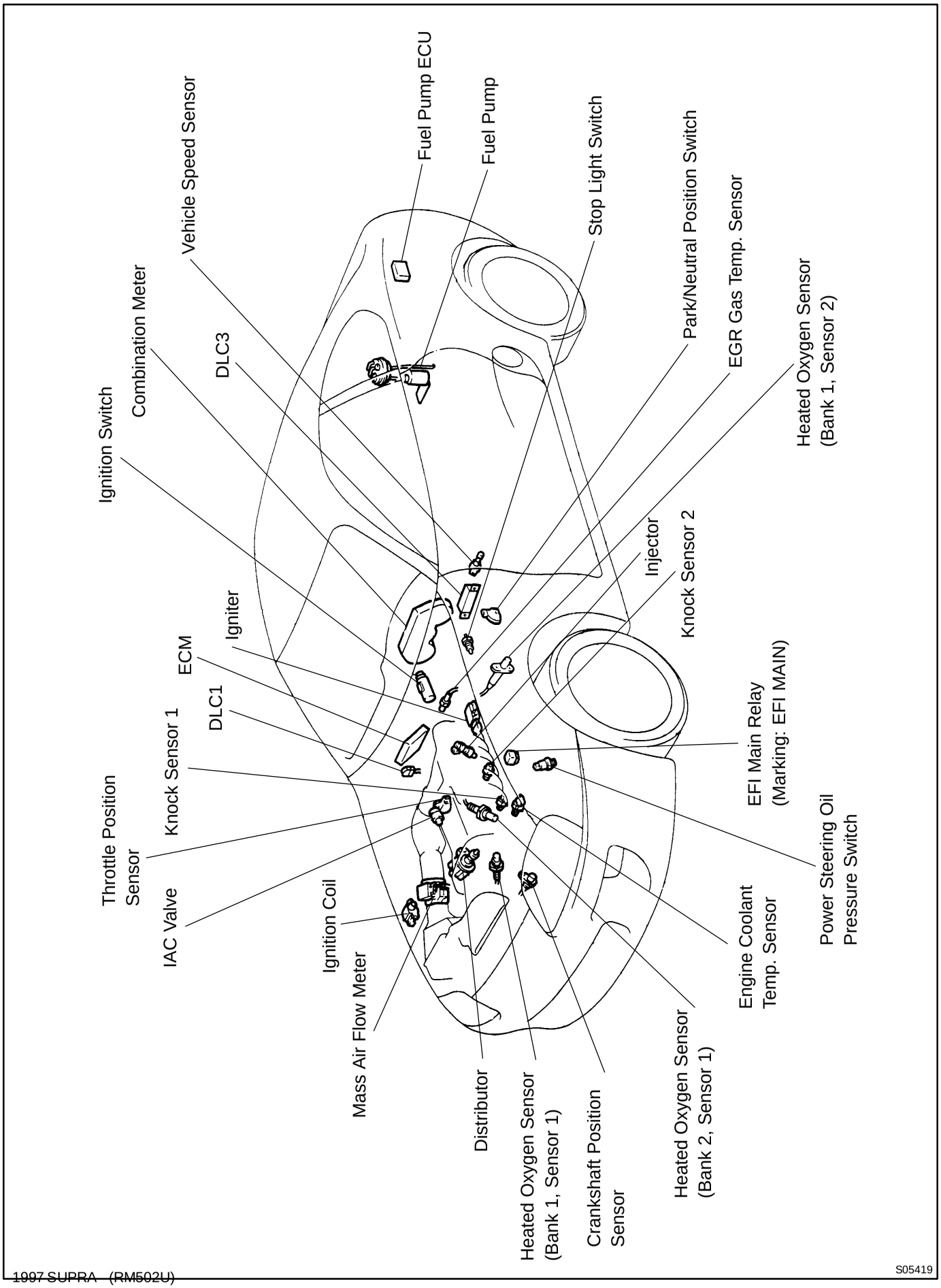
DTC CHART (Manufacture Controlled)

DTC No. (See Page)	Detection Item	Trouble Area	MIL*	Memory
P1200 (DI-110)	Fuel Pump Relay / ECU Circuit Malfunction	Open or short in fuel pump ECU circuit Fuel pump ECU ECM power source circuit Fuel pump ECM	—	○
P1300 (DI-115)	Igniter Circuit Malfunction	Open or short in IGF or IGT circuit from igniter to ECM Igniter ECM	○	○
P1335 (DI-120)	Crankshaft Position Sensor Circuit Malfunction (during engine running)	Open or short in crankshaft position sensor circuit for NE signal Crankshaft position sensor for NE signal Starter ECM	—	○
P1500 (DI-121)	Starter Signal Circuit Malfunction	Open or short in starter signal circuit Open or short in ignition switch or starter relay circuit ECM	—	○
P1520 (DI-123)	Stop Light Switch Signal Malfunction	Short in stop light switch signal circuit Stop light switch ECM	○	○
P1600 (DI-126)	ECM BATT Malfunction	Open in back up power source circuit ECM	○	○
P1605 (DI-128)	Knock Control CPU Malfunction	ECM	○	○
P1780 (DI-129)	Park / Neutral Position Switch Malfunction	Short in park / neutral position switch circuit Park / neutral position switch ECM	○	○

*: —.... MIL dose not light up
○ ... MIL lights up

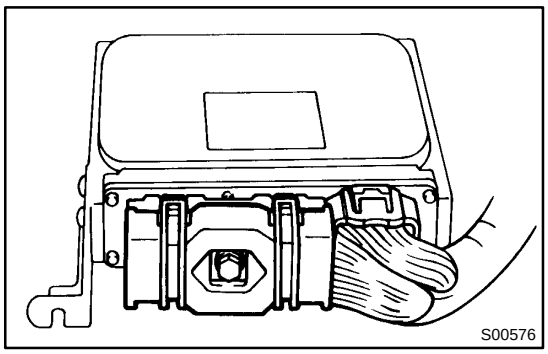
DI4RC-01

PARTS LOCATION



DI4RD-01

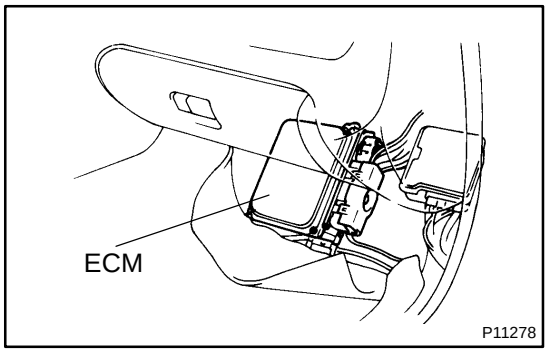
TERMINALS OF ECM



Connectors of the ECM are water-proof and are the bolt type. For water proof type connectors, in order to measure the voltage of ECM terminals and the resistance of connected parts, connect the inspection check harness between the ECM and vehicle wire harness, then perform the inspection.
The inspection method of inserting a tester probe from the other side of connector noticeably reduces the water-proof ability.
Disconnect the connector by fully loosening the bolt.

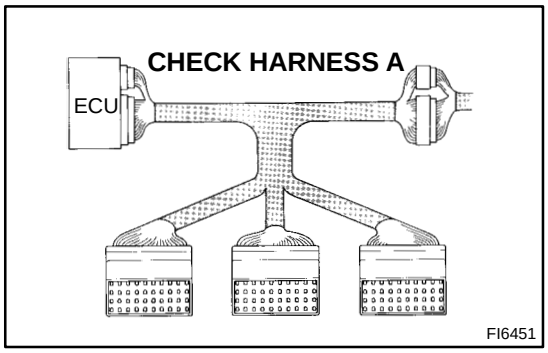
PREPARATION

(a) Turn the ignition switch to LOCK position.
(b) Turn up the passenger side floor mat.
(c) Remove the ECM protector.
(d) Disconnect the connectors from the ECM.
After completely loosening the bolt, the 2 parts of connector can be separated.



NOTICE:

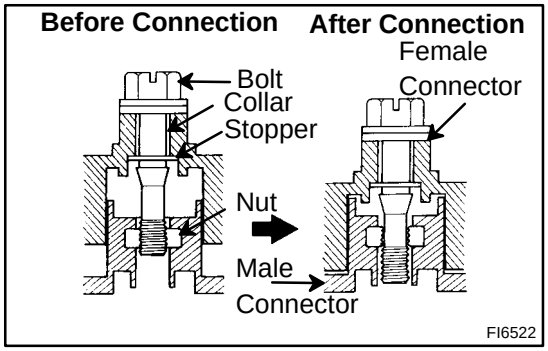
- **Do not pully the wire harness when disconnecting the connector.**
- **When disconnecting the connector, the ECM's back-up power source is cut off, so the DTC, etc. recorded in the ECM memory are cancelled.**
- **Never insert a tester probe or male terminal used for inspection purposes into the female terminal of the vehicle wire harness. Otherwise, the female terminal may be widened, which can result in faulty connection.**



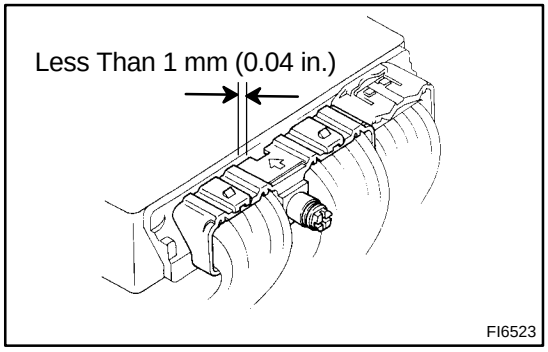
(e) Connect the Check Harness A between ECM and connector of vehicle wire harness.
SST 09990-01000

HINT:
The arrangement of the DLC1 terminals are the same as those of the ECM (See page DI-20).

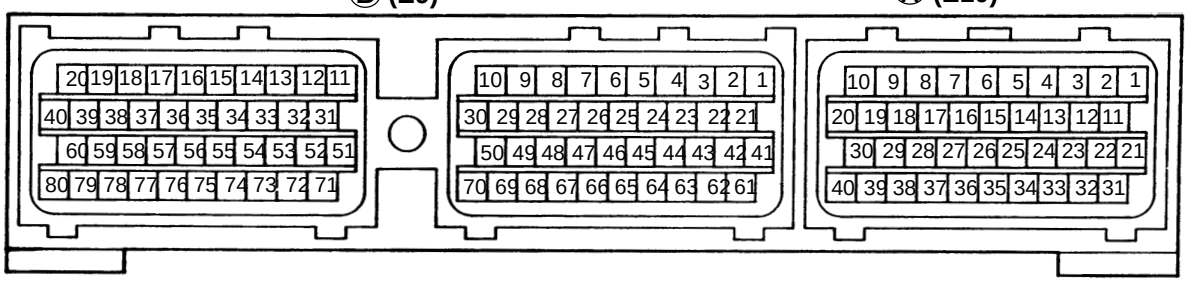
(f) Disconnect the Check Harness A.
(g) Reconnect the connectors to the ECM.
(1) Match the male connector correctly with female connector, then press them together.
(2) Tighten the bolt.
Make sure the connector is completely connected, by tightening the bolt until there is a clearance of less than 1 mm (0.04 in.) between bottom of the male connector and end of the female connector.



(h) Install the ECM protector and floor mat.



ECM Terminals



Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage (V)
BATT (A33) - E1 (B69)	B-W ↔ BR	Always	9 - 14
IGSW (A1) - E1 (B69)	B-W ↔ BR	IG switch ON	9 - 14
+B (A31) - E1 (B69)	B-R ↔ BR	IG switch ON	9 - 14
VC (B41) - E2 (B65)	L-R ↔ W-B	IG switch ON	4.5 - 5.5
IDL1 (B64) - E2 (B65)	R-B ↔ W-B	IG switch ON and apply vacuum to the throttle opener Throttle valve fully closed	-0.1 - 3.0
		IG switch ON Throttle valve fully opened	9 - 14
VTA1 (B43) - E2 (B65)	Y ↔ W-B	IG switch ON Throttle valve fully closed	0.3 - 0.8
		IG switch ON Throttle valve fully opened	3.2 - 4.9
VG (B66) - EVG (B28)	Y-R ↔ BR	Idling, P or N Position, A/C switch OFF	0.7 - 1.7
THA (B45) - E2 (B65)	P-L ↔ W-B	Idling, Intake air temp. 0˚C (32˚F) to 80˚C (176˚F)	0.5 - 3.4
THW (B44) - E2 (B65)	L-Y ↔ W-B	Idling, Engine Coolant temp. 60˚C (140˚F) to 120˚C (248˚F)	0.2 - 1.0
STA (B77) - E1 (B69)	B ↔ BR	Cranking	6.0 or more
#10 (B20) - E01 (B80)	R-L ↔ BR	IG switch ON	6.0 or more
		Idling	Pulse generation (See page DI-60)
#20 (B19) - E01 (B80)	R-Y ↔ BR	IG switch ON	6.0 or more
		Idling	Pulse generation (See page DI-60)
#30 (B18) - E01 (B80)	R-G ↔ BR	IG switch ON	6.0 or more
		Idling	Pulse generation (See page DI-60)
#40 (B17) - E01 (B80)	R-W ↔ BR	IG switch ON	6.0 or more
		Idling	Pulse generation (See page DI-60)
#50 (B16) - E01 (B80)	R ↔ BR	IG switch ON	6.0 or more
		Idling	Pulse generation (See page DI-60)
#60 (B15) - E01 (B80)	R-B ↔ BR	IG switch ON	6.0 or more
		Idling	Pulse generation (See page DI-60)
IGT (B57) - E1 (B69)	R-W ↔ BR	Idling	Pulse generation (See page DI-115)

IGF (B58) - E1 (B69)	R-Y ↔ BR	IG switch ON	4.5 ~ 5.0
		Idling	Pulse generation (See page DI-115)
G1 (B26) - G≧ (B7)	R ↔ G	Idling	Pulse generation (See page DI-65)
G2 (B25) - G≧ (B7)	W ↔ G	Idling	Pulse generation (See page DI-65)
NE (B27) - G≧ (B7)	B ↔ G	Idling	Pulse generation (See page DI-65)
NE2 (B4) - NE2≧ (B5)	B ↔ W	Idling	Pulse generation (See page DI-65)
M-REL (A24) - E1 (B69)	B-Y ↔ BR	IG switch ON	9 - 14
FPC (A22) - E1 (B69)	V-W ↔ BR	IG switch ON	Below 0.5
		Idling	Pulse generation (0 and 4.0 ~ 5.5)
DI (A21) - E1 (B69)	G ↔ BR	Idling	7.0 or more
ACIS (B39) - E01 (B80)	G-Y ↔ BR	IG switch ON	9 - 14
EVAP (B74) - E01 (B80)	V ↔ BR	IG switch ON	9 - 14
EGR (B75) - E01 (B80)	P ↔ BR	Idling	Below 2.0
		Engine speed at 3,500 rpm	9 - 14
ISC1 (B35) - E01 (B80)	Y-B ↔ BR	Idling, When A/C Switch ON or OFF	Pulse generation (See page DI-103)
ISC2 (B34) - E01 (B80)	G-W ↔ BR	Idling, When A/C Switch ON or OFF	Pulse generation (See page DI-103)
ISC3 (B33) - E01 (B80)	L-B ↔ BR	Idling, When A/C Switch ON or OFF	Pulse generation (See page DI-103)
ISC4 (B32) - E01 (B80)	R-B ↔ BR	Idling, When A/C Switch ON or OFF	Pulse generation (See page DI-103)
OX1 (B48) - E1 (B69)	W ↔ BR	Maintain engine speed at 2,500 rpm for 2 min. after warning up	Pulse generation (See page DI-93)
OX2 (B47) - E1 (B69)	R-L ↔ BR	Maintain engine speed at 2,500 rpm for 2 min. after warning up	Pulse generation (See page DI-93)
OX3 (A30) - E1 (B69)	R-L ↔ BR	Maintain engine speed at 2,500 rpm for 2 min. after warning up	Pulse generation (See page DI-93)
HT1 (B71) - E01 (B80)	G ↔ BR	Idling after warning up	Below 3.0
		IG switch ON	9 - 14
HT2 (B72) - E01 (B80)	B-Y ↔ BR	Idling after warning up	Below 3.0
		IG switch ON	9 - 14
HT3 (A36) - E01 (B80)	BR-W ↔ BR	Idling after warning up	Below 3.0
		IG switch ON	9 - 14
KNK1 (B50) - E1 (B69)	W ↔ BR	Idling	Pulse generation (See page DI-65)
KNK2 (B49) - E1 (B69)	W ↔ BR	Idling	Pulse generation (See page DI-65)
NSW (B76) - E1 (B69)	B-W ↔ BR	IG switch ON Other shift position "P" or "N" position	9 - 14
		IG switch ON Shift position in "P" or "N" position	-0.1 - 3.0

SP1 (A2) - E1 (B69)	P ↔ BR	IG switch ON Rotate driving wheel slowly	Pulse generation (See page DI-100)
TE1 (A20) - E1 (B69)	Y-L ↔ BR	IG switch ON	9 - 14
W (A6) - E1 (B69)	L-B ↔ BR	Idling	9 - 14
		IG switch ON	-0.1 - 3.0
OD1 (A12) - E1 (B69)	BR-B ↔ BR	IG switch ON	9 - 14
AC (A34) - E1 (B69)	L-R ↔ BR	A/C switch ON (At idling)	-0.1 - 1.5
		A/C switch OFF	9 - 14
ACMG (A23) - E01 (B80)	W-G ↔ BR	A/C switch ON (At idling)	-0.1 - 3.0
		A/C switch OFF	9 - 14
FPU (B73) - E01 (B80)	W-L ↔ BR	IG switch ON	9 - 14
		Restarting at high engine coolant temp.	Below 2.0
ELS (A15) - E1 (B69)	R-Y ↔ BR	Defogger switch and taillight switch ON	7.5 - 14
		Defogger switch and taillight switch OFF	-0.1 - 1.5
SDL (A8) - E1 (B69)	G ↔ BR	During transmission	Pulse generation

DI4RE-01

PROBLEM SYMPTOMS TABLE

When the malfunction code is not confirmed in the DTC check and the problem still can not be confirmed in the basic inspection, then proceed to this step and perform troubleshooting according to the numbered order given in the table below.

Symptom	Suspect Area	See page
Does not start (Engine does not crank)	1. Starter and Starter relay	ST-14 ST-16
Does not start (No initial combustion)	1. ECM power source circuit 2. Fuel pump control circuit 3. Engine control module (ECM)	DI-132 DI-110 IN-28
Does not start (No complete combustion)	1. Fuel pump control circuit	DI-110
Difficult to start (Engine cranks normally)	1. Starter signal circuit 2. Fuel pump control circuit 3. Compression	DI-121 DI-110 EM-3
Difficult to start (Cold engine)	1. Starter signal circuit 2.Fuel pump control circuit	DI-121 DI-110
Difficult to start (Hot engine)	1. Starter signal circuit 2. Fuel pressure control circuit 3. Fuel pump control circuit	DI-121 DI-137 DI-110
Poor idling (High engine idle speed)	1. A/C signal circuit (compressor circuit) 2. ECM power source circuit	DI-739 DI-132
Poor idling (Low engine idle speed)	1. A/C signal circuit (compressor circuit) 2. Fuel pump control circuit	DI-739 DI-110
Poor idling (Rough idling)	1. Compression 2. Fuel pump control circuit	EM-3 DI-110
Poor idling (Hunting)	1. ECM power source circuit 2. Fuel pump control circuit	DI-132 DI-110
Poor Driveability (Hesitation/Poor acceleration)	1. Fuel pump control circuit 2. A/T faulty	DI-110 DI-333
Poor Driveability (Surging)	1. Fuel pump control circuit	DI-110
Engine stall (Soon after starting)	1. Fuel pump control circuit	DI-110
Engine stall (During A/C operation)	1. A/C signal circuit (compressor circuit) 2. Engine control module (ECM)	DI-739 IN-18

DI4RF-01

CIRCUIT INSPECTION

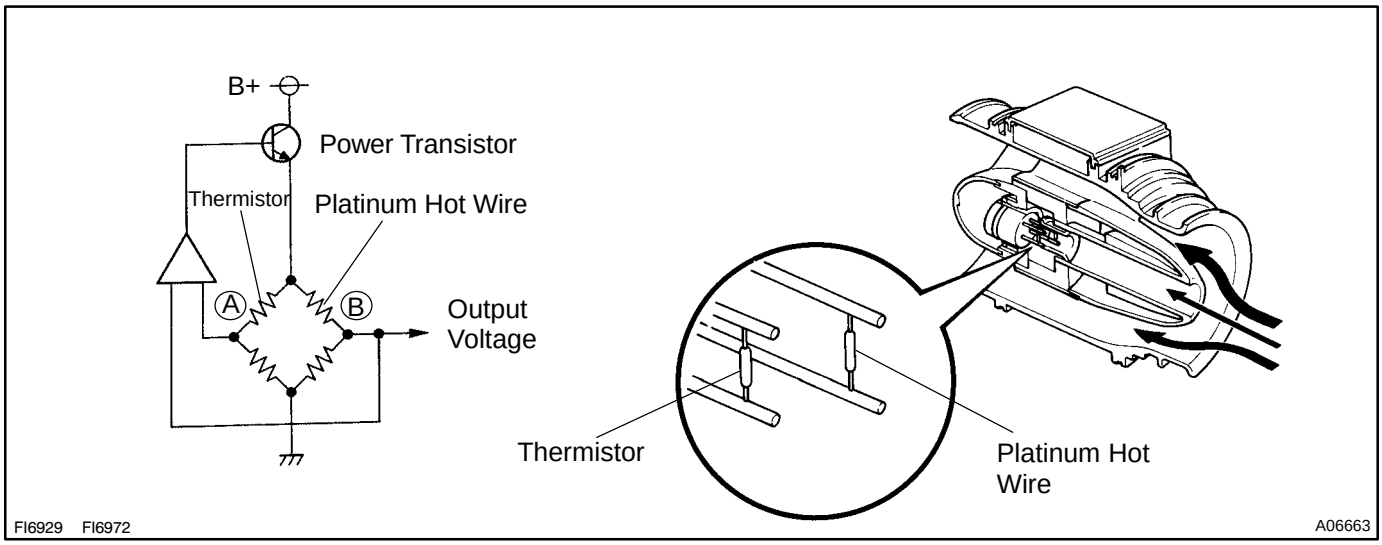
DTC	P0100	Mass Air Flow Circuit Malfunction

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 temperature.

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

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



DTC No.	DTC Detecting Condition	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
	Open or short in mass air flow meter circuit with engine speed 4,000 rpm or more (2 trip detection logic)	

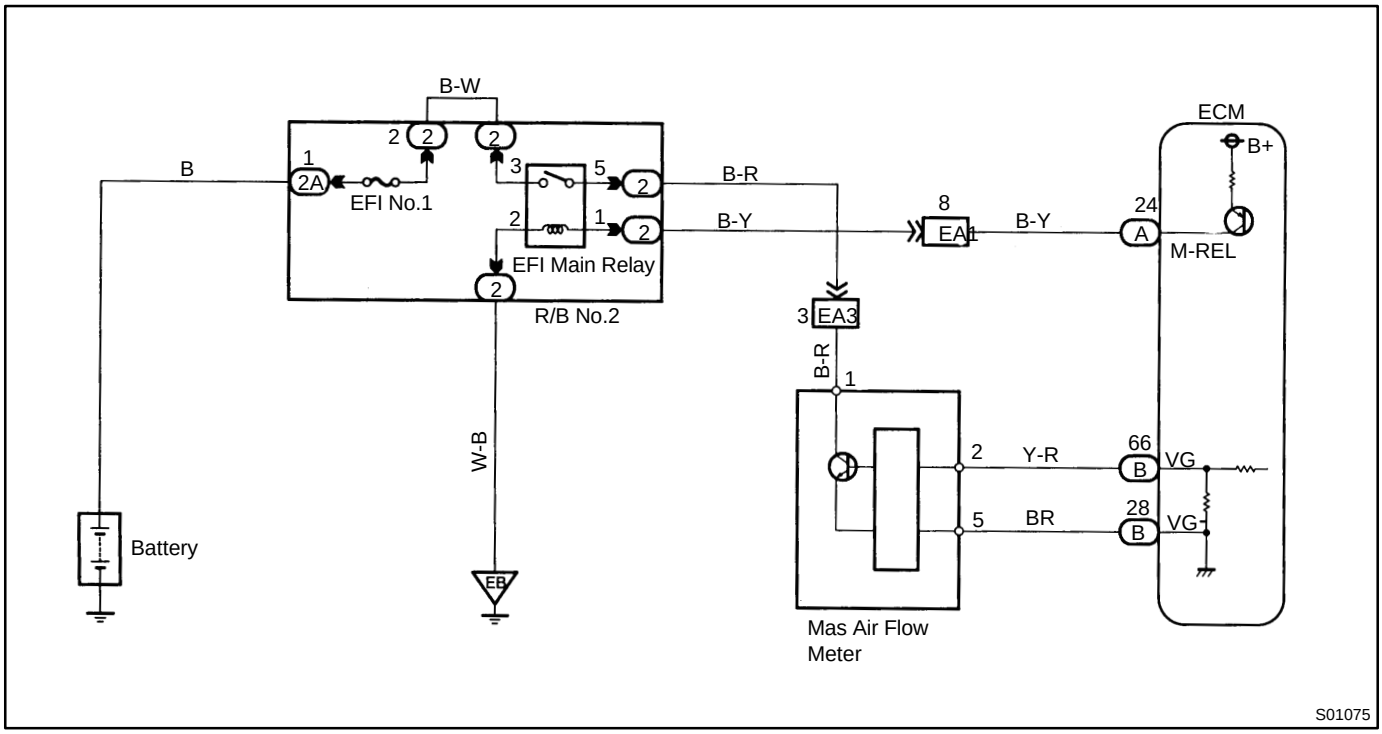
If the ECM detects DTC ”P0100” it operates the fail safe function, keeping the ignition timing and injection volume constant and making it possible to drive the vehicle.

HINT:

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

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

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Connect the 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 ignition switch ON and OBD II scan tool or TOYOTA hand-held tester main switch ON.
(c) Start the engine.

CHECK:

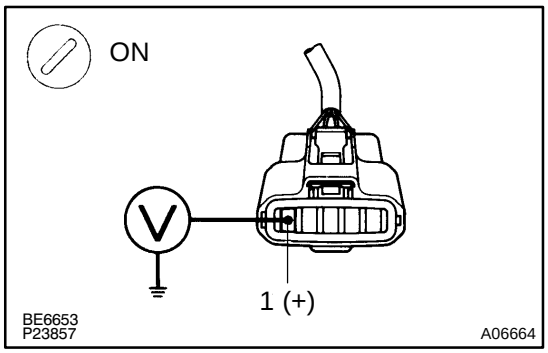
Read mass air flow rate on the OBD II scan tool or TOYOTA hand-held tester.

RESULT:

	Type I	Type II
Mass air flow rate	0.0 gm / sec.	271.0 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 ignition switch ON.

CHECK:

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

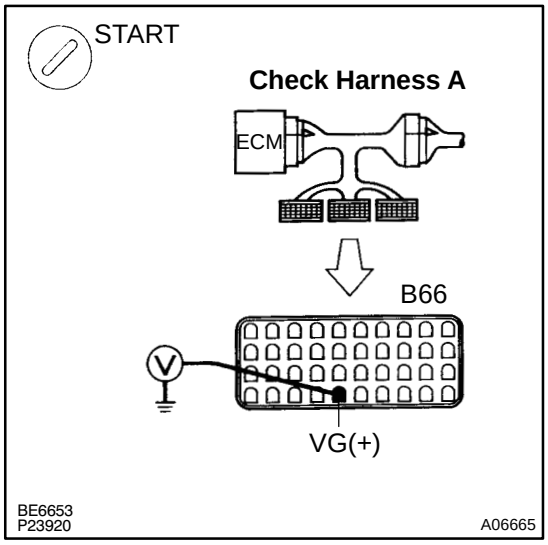
OK:

Voltage: 9 - 14 V

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

OK

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



PREPARATION:

(a) Connect Check Harness A (See page DI-20).

(b) Start the engine.

CHECK:

Measure voltage between terminal VG of ECM and body ground while engine is idling, transmission is in park or neutral position and A/C switch is OFF.

OK:

Voltage: 1.1 - 1.5 V

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

NG

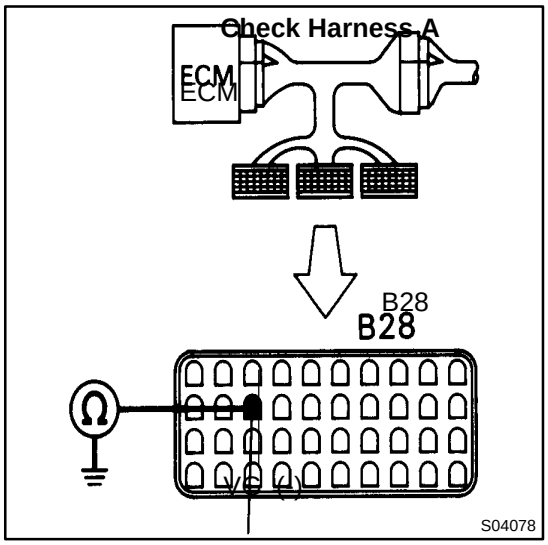
4	**Check for open and short in harness and connector between mass air flow meter and ECM (See page IN-28).**

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

OK

Replace mass air flow meter.

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



PREPARATION:
Connect Check Harness A (See page DI-20).
CHECK:
Check continuity between terminal VG- of ECM and body ground.
OK:
Continuity (1 Ω or less)

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

OK

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

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

OK

Replace mass air flow meter (See page SF-36).

DI4RG-01

DTC	P0101	Mass Air Flow Circuit Range / Performance Problem

CIRCUIT DESCRIPTION

Refer to Mass Air Flow Circuit Malfunction on page DI-25 .

DTC No.	DTC Detecting Condition	Trouble Area
P0101	Conditions (a) and (b) continue with engine speed 1,000 rpm or less: (2 trip detection logic) (a) Closed throttle position switch: ON (b) Mass air flow meter output > 2.2 V	• Mass air flow meter
	Conditions (a) and (b) continue with engine speed 2,000 rpm or more: (2 trip detection logic) (a) Mass air flow meter output < 1.0 V (b) VTA ≧ 0.64 V	

WIRING DIAGRAM

Refer to page DI-25 or the WARNING 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 (See page SF-36).

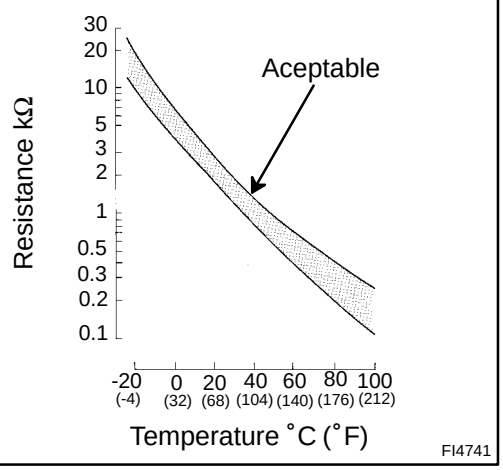
DI4RH-01

DTC	P0110	Intake Air Temp. Circuit Malfunction

CIRCUIT DESCRIPTION

The intake air temperature sensor is built into the air flow meter and senses the intake air temperature.
A thermistor built in the sensor changes the resistance value according to the intake air temperature.
The lower the intake air temperature, the greater the thermistor resistance value, and the higher the intake air temperature, the lower the thermistor resistance value (See Fig. 1).
The intake air temperature sensor is connected to the ECM. The 5 V power source voltage in the ECM is applied to the intake air temperature sensor from the terminal THA via a resistor R.
That is , the resistor R and the intake air temperature sensor are connected in series. When the resistance value of the intake air temperature sensor changes in accordance with changes in the intake air temperature, the potential at terminal THA also changes. Based on this signal, the ECM increases the fuel injection volume to improve driveability during cold engine operation.
If the ECM detects the DTC "P0110", it operates the fail safe function in which the intake air temperature is assumed to be 20˚C (68˚F).

(fig. 1)



<Reference>

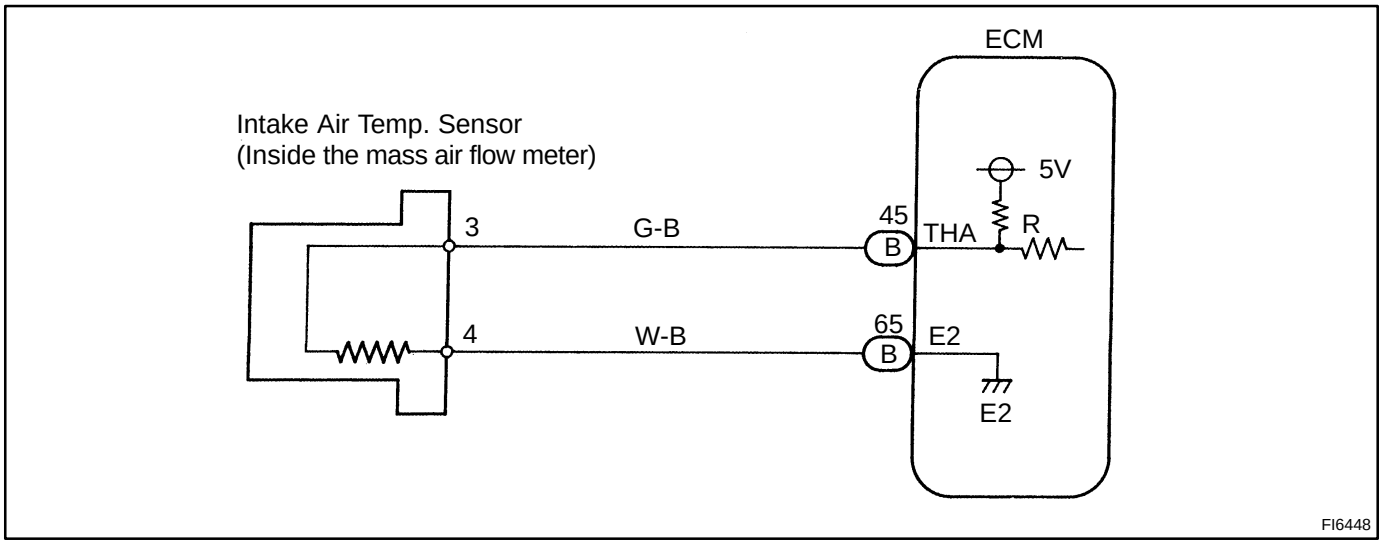
Intake Air Temp. ˚C (˚F)	Resistance (kΩ)	Voltage (V)
-20 (-4)	16.2	4.3
0 (32)	5.9	3.4
20 (68)	2.5	2.4
40 (104)	1.1	1.4
60 (140)	0.6	0.9
80 (176)	0.3	0.5
100 (212)	0.1	0.2

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 temperature from "CURRENT DATA".

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

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If DTC "P0110" (Intake Air Temp. Circuit Malfunction), "P0105" (Engine Coolant Temp. Circuit Malfunction), "P0120" (Throttle/Pedal Position Sensor/Switch "A" Circuit Malfunction) are output simultaneously, E2 (sensor ground) may be open.

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

PREPARATION:

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

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

CHECK:

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

OK:

Same as actual intake air temperature.

HINT:

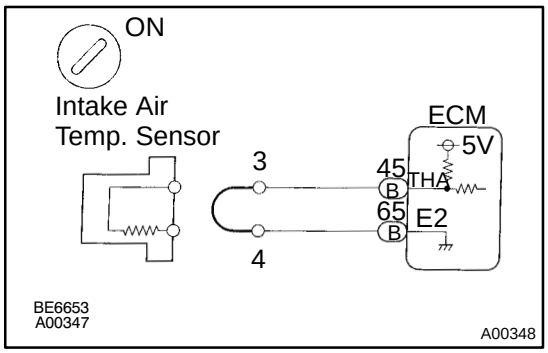
- If there is open circuit, OBD II scan tool or TOYOTA hand-held tester indicates - 40˚C (- 40˚F).
- If there is short circuit, OBD II scan tool or TOYOTA hand-held tester indicates 140˚C (284˚F) or more.

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

OK

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

2	Check for open in harness or ECM.



PREPARATION:

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

CHECK:

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

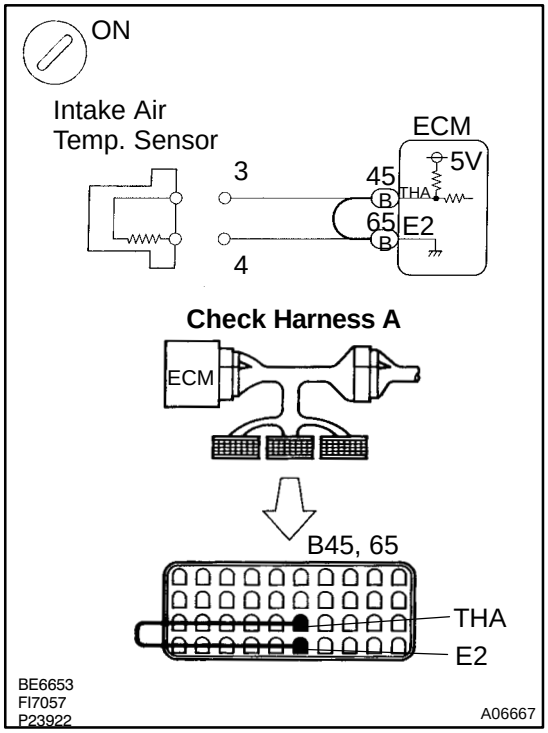
OK:

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

OK	Confirm good connection at sensor. If OK, replace mass air flow meter (See page SF-36).

NG

3	Check for open in harness or ECM.



PREPARATION:

(a) Connect Check Harness A (See page DI-20).
(b) Connect between terminals THA and E2 of ECM connector.

HINT:

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

(c) Turn ignition switch ON.

CHECK:

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

OK:

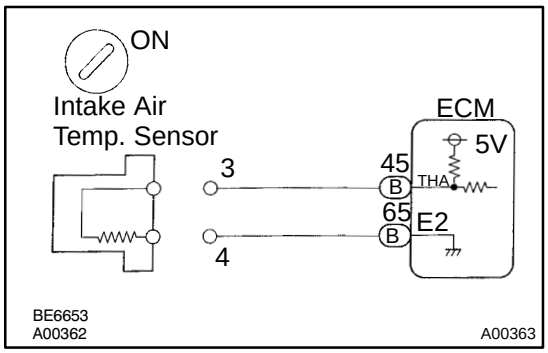
Temperature value: 140˚C (284˚F) or more

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

NG

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

4	Check for short in harness and ECM.



PREPARATION:

(a) Disconnect the mass air flow meter connector.

(b) Turn ignition switch ON.

CHECK:

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

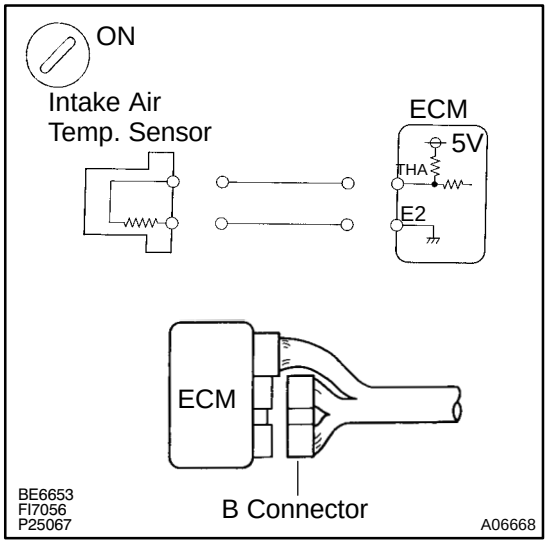
OK:

Temperature value: - 40˚C (- 40˚F).

OK	Replace mass air flow meter. (See page SF-36).

NG

5	Check for short in harness or ECM.



PREPARATION:

(a) Disconnect the B connector from ECM (See page DI-20).

HINT:

Mass air flow meter connector is disconnected.

(b) Turn ignition switch ON.

CHECK:

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

OK:

Temperature value: - 40˚C (- 40˚F)

OK	Repair or replace harness or connector.

NG

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

DI4RI-01

DTC	P0115	Engine Coolant Temp. Circuit Malfunction

CIRCUIT DESCRIPTION

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

The structure of the sensor and connection to the ECM is the same as in the intake air temperature circuit malfunction shown on page DI-30 .

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

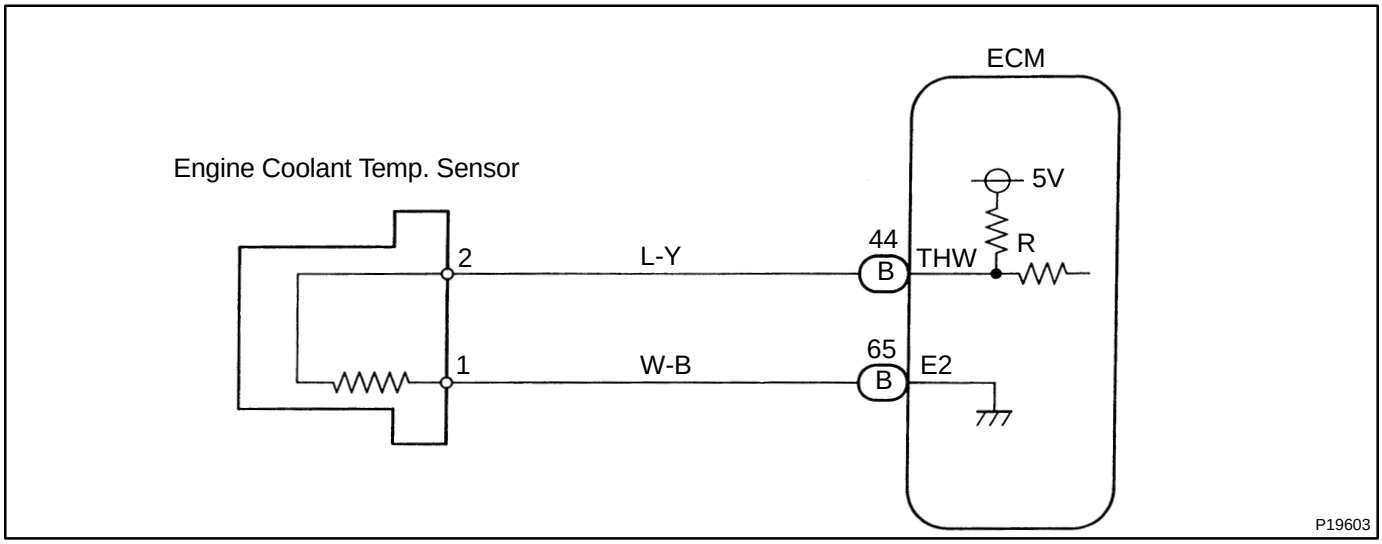
DTC No.	DTC Detecting Condition	Trouble Area
P0115	Open or short in engine coolant temp. sensor circuit.	• Open or short in engine coolant temp. sensor circuit • Engine coolant temp. sensor • ECM

HINT:

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

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

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If DTC "P0110" (Intake Air Temp. Circuit Malfunction), "P0115" (Engine Coolant Temp. Circuit Malfunction), "P0120" (Throttle/Pedal Position Sensor/Switch "A" Circuit Malfunction) are output simultaneously, E2 (sensor ground) may be open.

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

PREPARATION:

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

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

CHECK:

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

OK:

Same as actual engine coolant temperature.

HINT:

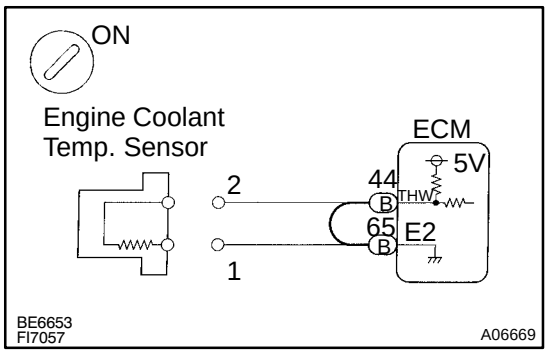
- If there is open circuit, OBD II scan tool or TOYOTA hand-held tester indicates - 40˚C (- 40˚F).
- If there is short circuit, OBD II scan tool or TOYOTA hand-held tester indicates 140˚C (284˚F) or more.

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 engine coolant temp. sensor connector.

(b) Connect sensor wire harness terminals together.

(c) Turn ignition switch ON.

CHECK:

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

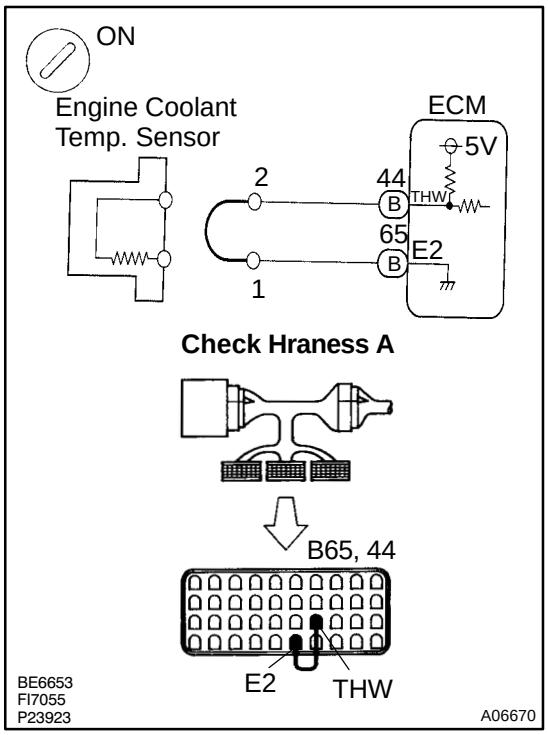
OK:

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

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

NG

3	Check for open in harness or ECM.



PREPARATION:

(a) Connect Check Harness A (See page DI-20).

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

HINT:

Engine coolant temp. sensor connector is disconnected. Before checking, do a visual and contact pressure check for the ECM connector (See page IN-28).

(c) Turn ignition switch ON.

CHECK:

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

OK:

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

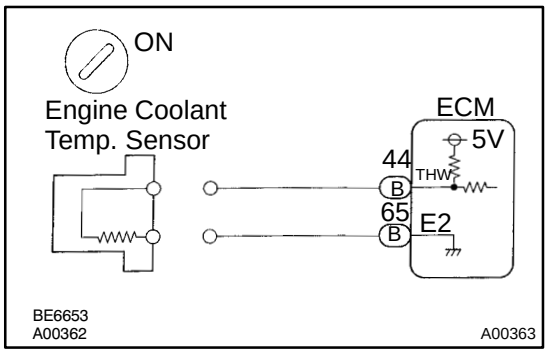
OK

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

NG

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

4	Check for short in harness and ECM.



PREPARATION:

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

(b) Turn ignition switch ON.

CHECK:

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

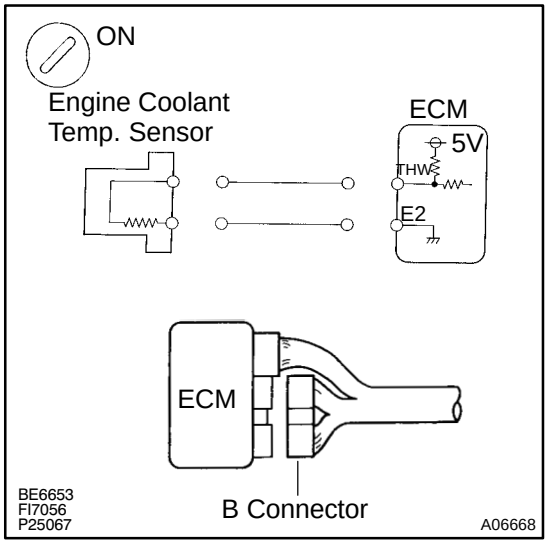
OK:

Temperature value: - 40˚C (- 40˚F)

OK	Replace engine coolant temp. sensor (See page SF-65).

NG

5	Check for short in harness or ECM.



PREPARATION:

(a) Disconnect the B connector from ECM (See page DI-20).

HINT:

Engine coolant temp. sensor connector is disconnected.

(b) Turn ignition switch ON.

CHECK:

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

OK:

Temperature value: - 40˚C (- 40˚F)

OK	Repair or replace harness or connector.

NG

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

DI4RJ-01

DTC	P0116	Engine Coolant Temp. Circuit Range/ Performance Problem

CIRCUIT DESCRIPTION

Refer to Engine Coolant Temp. Circuit Malfunction on page DI-34 .

DTC No.	DTC Detecting Condition	Trouble Area
P0116	When the engine starts, the engine coolant temp. is -7˚C (20˚F) or less. And, 20 min. or more after the engine starts, the engine coolant temp. sensor value is less than 22.4˚C (72.3˚F) (2 trip detection logic)	• Engine coolant temp. sensor • Cooling system
	When the engine starts, the engine coolant temp. is between -7 ˚C (20˚F) and 10˚C (50˚F). And, 5 min. or more after the engine starts, the engine coolant temp. sensor value is less than 22.4˚C (72.3˚F) (2 trip detection logic)	
	When the engine starts, the engine coolant temp. is between 10˚C (50˚F) and 20˚C (68˚F). And, 2 min. or more after the engine starts, the engine coolant temp. sensor value is less than 22.4˚C (72.3˚F) (2 trip detection logic)	
	When the engine starts, the engine coolant temp. is 20˚C (68˚F) or more. And, 2 min. or more after the engine starts, the engine coolant temp. sensor value is less than 42˚C (107.6˚F) (2 trip detection logic)	

INSPECTION PROCEDURE

HINT:

If DTC ”P0115” (Engine Coolant Temp. Circuit Malfunction) and ”P0116” (Engine Coolant Temp. Circuit Range/Performance) 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-15).

NG → Replace thermostat.

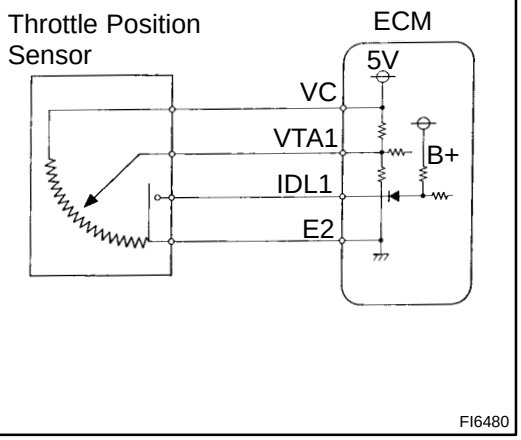
OK →

Replace engine coolant temp. sensor.
(See page CO-15)

DI4RK-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, the IDL1 contacts in the throttle position sensor are on, so the voltage at the terminal IDL1 of the ECM becomes 0 V. At this time, a voltage of approximately 0.7 V is applied to terminal VTA1 of the ECM. When the throttle valve is opened, the IDL1 contacts go off and thus the power source voltage of approximately 12 V in the ECM is applied to the terminal IDL1 of the ECM. The voltage applied to the terminal VTA1 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 VTA1 and IDL1, and uses them as one of the conditions for deciding the air-fuel ratio correction, power increases correction and fuel-cut control etc.

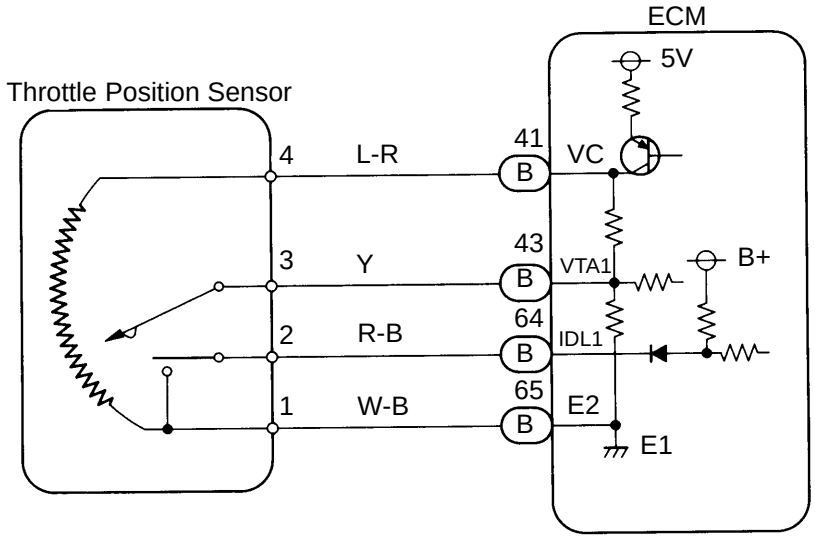
DTC No..	DTC Detecting Condition	Trouble Area
P0120	Condition (a) or (b) continues: (a) VTA < 0.1 V, and closed throttle position switch is OFF (b) VTA > 4.9 V	• Open or short in throttle position sensor circuit • Throttle position sensor • ECM

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 %	VC line open VTA1 line open or short
Approx. 100 %	Approx. 100 %	E2 line open

WIRING DAGRAM



FI6941

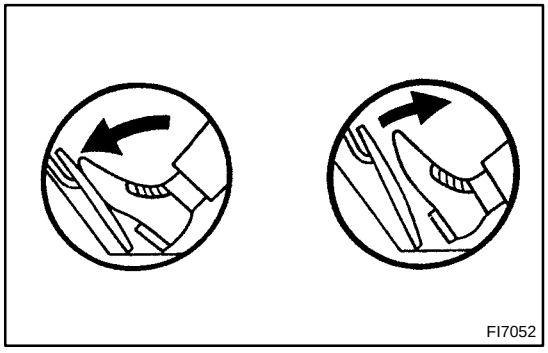
INSPECTION PROCEDURE

HINT:
If DTC ”P0110” ’Intake Air Temp. Circuit Malfunction). ”P0115” (Engine Coolant Temp. Circuit Malfunction), ”P0120” (Throttle/Pedal Position Sensor/Switch ”A” Circuit Malfunction) are output simultaneously, E2 (sensor ground) may be open.

1	**Connect the 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 the DLC 3.
(b) Turn ignition switch ON and OBD II scan tool or TOYOTA hand-held tester main switch ON.

CHECK:
Read the throttle valve opening percentage.



FI7052

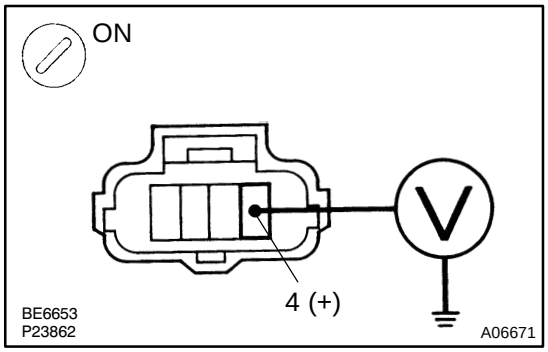
OK:

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

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

NG

2	Check voltage between terminal 4 of wire harness side connector and body ground.



PREPARATION:

(a) Disconnect the throttle position sensor connector.

(b) Turn ignition switch ON.

CHECK:

Measure voltage between terminal 4 of wire harness side connector and body ground.

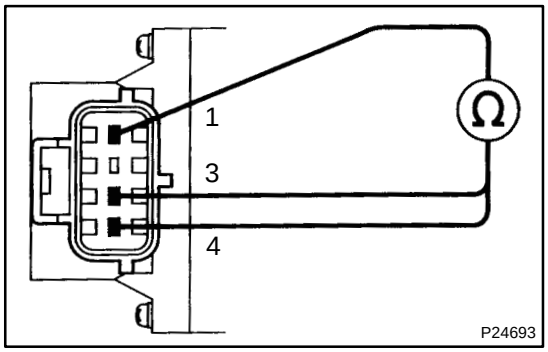
OK:

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 resistance between terminals 4, 3 and 1 of throttle position sensor.

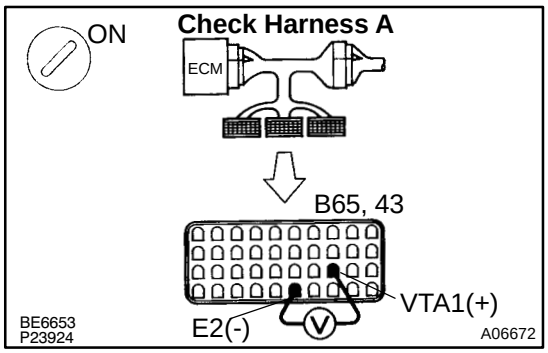
OK:

Terminals	Throttle valve	Resistance
1 - 4	-	3.1 - 7.2 kΩ
1 - 3	Fully closed	0.34 - 6.3 kΩ
1 - 3	Fully open	2.4 - 11.2 kΩ

NG → **Replace throttle position sensor (See page SF-42).**

OK

4	Check voltage between terminals VTA1 and E2 of ECM.



PREPARATION:

(a) Connect Check Harness A (See page DI-20).

(b) Turn ignition switch ON.

CHECK:

Measure voltage between terminals VTA1 and E2 of ECM.

OK:

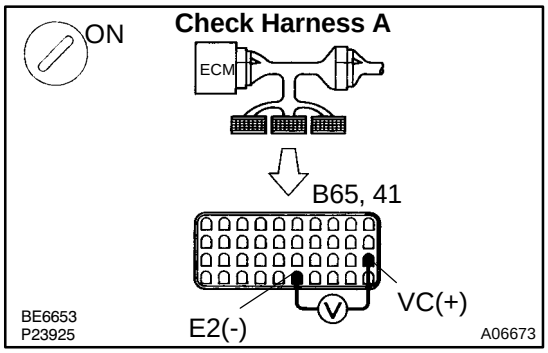
Throttle Valve	Voltage
Fully closed	0.3 - 0.8 V
Fully open	3.2 - 4.9 V

NG → **Check for open and short in harness and connector between ECM and throttle position sensor (VTA line) (See page IN-28).**

OK →

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

5	Check voltage between terminals VC and E2 of ECM.



PREPARATION:

(a) Connect Check Harness A (See page DI-20).

(b) Turn ignition switch ON.

CHECK:

Measure voltage between terminals VC and E2 of ECM connector.

OK:

Voltage 4.5 - 5.5 V

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

OK →

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

DI4RL-01

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

CIRCUIT DESCRIPTION

Refer to Throttle/Pedal Position Sensor/Switch ”A” circuit malfunction on page DI-40 .

DTC No.	DTC Detecting Condition	Trouble Area
P0121	After the vehicle speed has been exceeded 30 km/h (19 mph) even once, the output value of the throttle position sensor is out of the applicable range while the vehicle speed 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.**

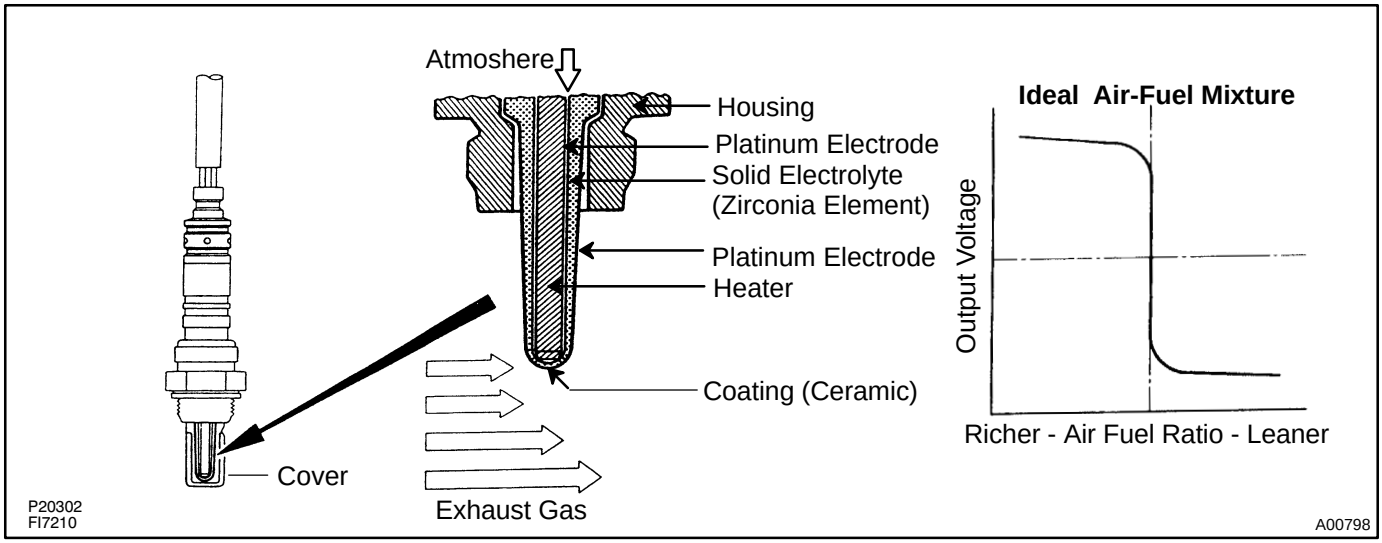
NO

Replace throttle position sensor (See page SF-42).

DTC	P0125	Insufficient Coolant Temp. for Closed Loop Fuel Control

CIRCUIT DESCRIPTION

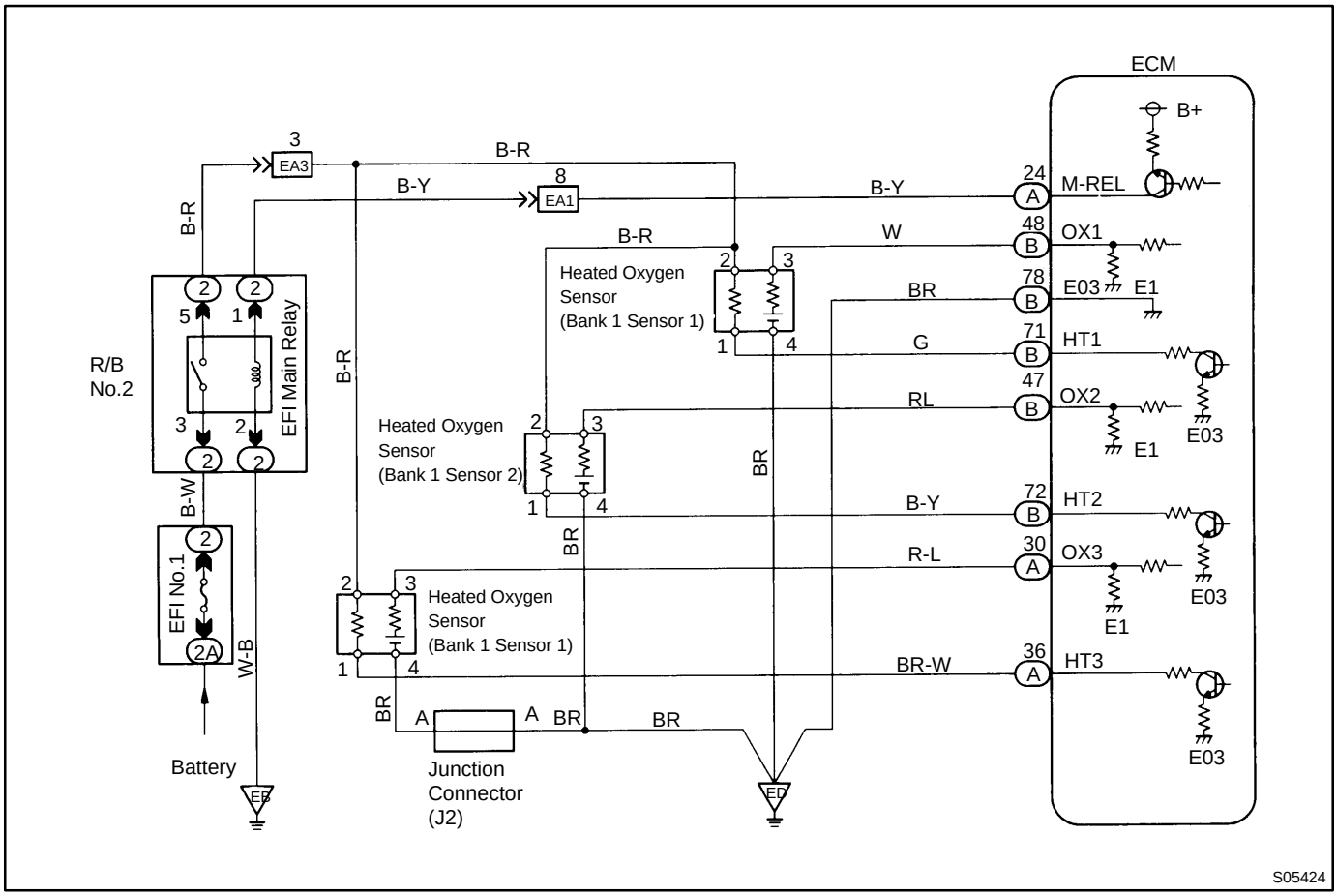
To obtain a high purification rate for the CO, HC and NOx components of the exhaust gas, a three-way catalytic converter is used, but for the most efficient use of the three-way catalytic converter, the air-fuel ratio must be precisely controlled so that it is always close to the stoichiometric air-fuel 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 temperature of the exhaust gas is low) current flows to the heater to heat the sensor for accurate oxygen concentration detection.



DTC No.	DTC Detecting Condition	Trouble Area
P0125	After the engine is warmed up, heated oxygen sensor output does not indicate RICH even once when conditions (a), (b) and (c) continue for at least 2 min.: (a) Engine speed: 1,500 rpm or more (b) Vehicle speed: 40 - 100 km/h (25 - 62 mph) (c) Closed throttle position SW: OFF	• Open or short in heated oxygen sensor circuit • Heated oxygen sensor

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 the OBD II scan tool or TOYOTA hand-held tester and read value for voltage output of heated oxygen sensor.**

PREPARATION:

(a) Connect the OBD II scan tool or TOYOTA hand-held tester to the DLC 3.

(b) Warm up engine to normal operation temperature.

CHECK:

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

HINT:

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

OK:

Both heated oxygen sensors ((bank 1 sensor 1) (bank 2 sensor 1)) output a RICH signal (0.45 V or more) at least once.

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

NG

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

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

OK

Replace heated oxygen sensor (See page SF-70).

DI4RN-01

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

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

CIRCUIT DESCRIPTION

Refer to Insufficient Coolant Temp. for Closed Loop Fuel Control on page DI-45 .

DTC No.	DTC Detecting Condition	Trouble Area
P0130 P0150	Voltage output of heated oxygen sensor remains at 0.4 V or more, or 0.55 V or less, during idling after the engine is warmed up (2trip detection logic)	• Heated oxygen sensor • Fuel trim malfunction

HINT:

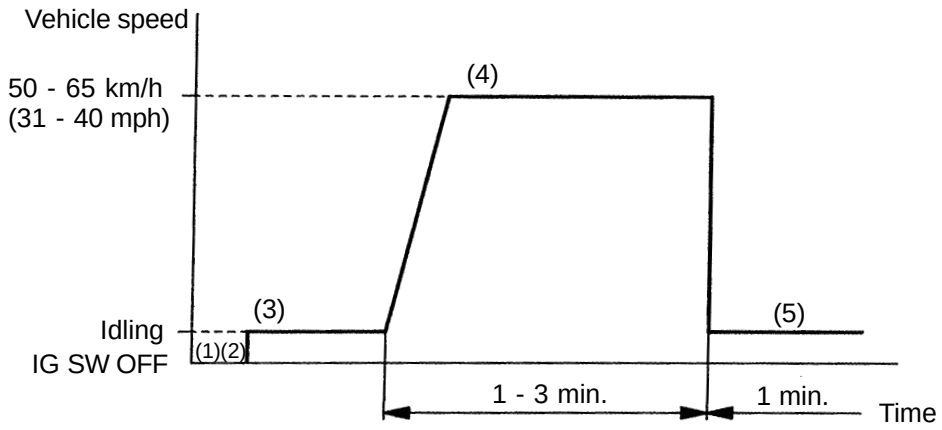
- Bank 1 refers to the bank that includes cylinder No.1.
- Bank 2 refers to the bank that dose not include cylinder No.1.
- Sensor 1 refers to the sensor closer to the engine body.

The heated oxygen sensor's output voltage and the short-term fuel trim value can be read using the OBD II scan tool or TOYOTA hand-held tester.

WIRING DIAGRAM

Refer to page DI-45 for the WIRING DIAGRAM.

CONFIRMATION DRIVING PATTEN



(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-3).
(3) Start the engine and warm it up with all 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-28).**

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 DLC 3.

(b) Warm up engine to normal operating temperature.

CHECK:

Read the 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	

1, 2 → **Check fuel trim system (See page DI-57).**

3

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

PREPARATION:

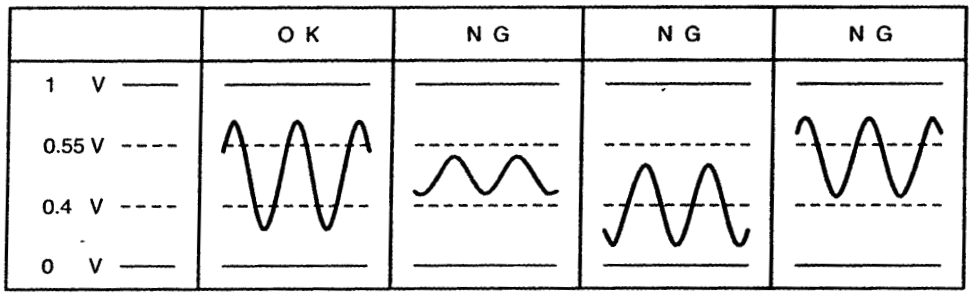
Warm up the heated oxygen sensor with the engine at 2,500 rpm for approx. 90 sec.

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 (See page DI-48).**

NG → **Replace heated oxygen sensor (See page SF-70).**

DI4RO-01

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

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

CIRCUIT DESCRIPTION

Refer to Insufficient Coolant Temp. for Closed Loop Fuel Control on page DI-45 .

DTC No.	DTC Detecting Condition	Trouble Area
P0133 P0153	Response time for the 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 the engine is warmed up (2trip detection logic)	• Heated oxygen sensor

HINT:

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

INSPECTION PROCEDURE

1	Are there any other codes (besides DTC P0133, P0153) being output?

YES → Go to relevant DTC chart.

NO →

Replace heated oxygen sensor (See page SF-70).

DI4RP-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)

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

CIRCUIT DESCRIPTION

Refer to Insufficient Coolant Temp. for Closed Loop Fuel Control on page DI-45 .

DTC No.	DTC Detecting Condition	Trouble Area
P0135 P0141 P0155	When the 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 0.20 A or less when the heater operates (2 trip detection logic)	

HINT:

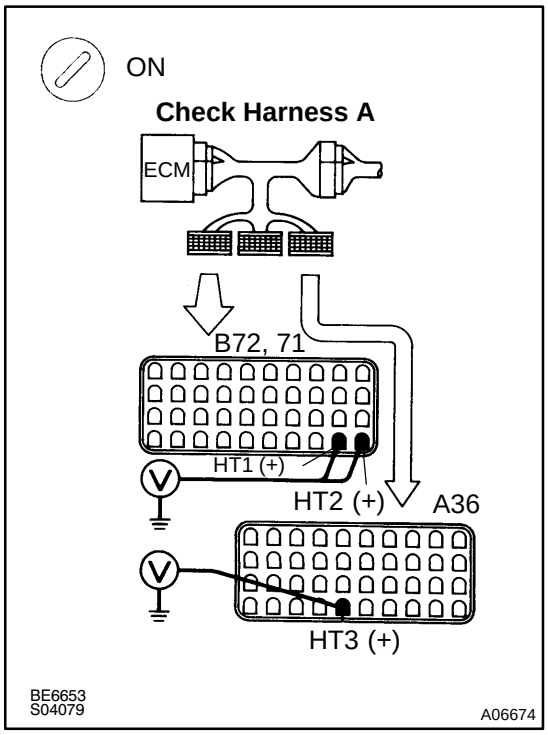
- Bank 1 refers to the bank that includes cylinder No.1.
- Bank 2 refers to the bank that dose not includes cylinder No.1.
- Sensor 1 refers to the sensor closer to the engine body.
- Sensor 2 refers to the sensor farther away from the engine body.

WIRING DIAGRAM

Refer to page DI-45 for the WIRING DIAGRAM.

INSPECTION PROCEDURE

1	**Check voltage between terminals HT1, HT2, HT3 of ECM connector and body ground.**



PREPARATION:

(a) Connect Check Harness A (See page DI-20).

(b) Turn ignition switch ON.

CHECK:

Measure voltage between terminals HT1, HT2, HT3 of ECM connector and body ground.

HINT:

- Connect terminal HT1 to bank 1 sensor 1.
- Connect terminal HT2 to bank 1 sensor 2.
- Connect terminal HT3 to bank 2 sensor 1.

OK:

Voltage: 9 - 14 V

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

NG

2	**Check resistance of heated oxygen sensor heater (See page SF-72).**

NG → **Replace heated oxygen sensor (See page SF-70).**

OK

Check and repair harness or connector between EFI main relay (Making: EFI MAIN) and heated oxygen sensor and ECM.

DI4RQ-01

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

CIRCUIT DESCRIPTION

Refer to Insufficient Coolant Temp. for Closed Loop Fuel Control on page DI-45 .

DTC No.	DTC Detecting Condition	Trouble Area
P0136	Voltage output of the heated oxygen sensor (bank 1 sensor 2) remains at 0.4 V or more or 0.5 V or less when the vehicle is driven at 40km/h (25 mph) or more after the engine is warmed up (2 trip detection logic)	• Heated oxygen sensor

HINT:

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

WIRING DIAGRAM

Refer to page DI-45 . for the WIRING DIAGRAM.

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-28).**

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

OK

3	**Check the 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 DLC 3.

(b) Warm up engine to normal operating temperature.

CHECK:

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

HINT:

Perform quick racing to 4,000 rpm for 3 min. using 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 (bank 1 sensor 2) (See page SF-70).

DI4RR-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 indicated 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 the air fuel ratio feedback is stable after engine warning up, the fuel trim is considerably in error on the RICH side (2 trip detection logic)	• Air intake (hose loose) • Fuel line pressure • Injector blockage • Heated oxygen sensor malfunction • Mass air flow meter • Engine coolant temp. sensor
P0172	When the air fuel ratio feedback is stable after engine warning up, the fuel trim is considerably in error on the LEAN side (2 trip detection logic)	• Fuel line pressure • Injector blockage, leak • Heated oxygen sensor 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-1).**

NG → **Repair or replace.**

OK

2	**Check for heated oxygen sensor data.**

PREPARATION:

(a) Connect the OBDII scan tool or TOYOTA hand-held tester to the DLC3.

(b) Warm up engine to normal operating temperature.

CHECK:

Read the 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	

3 → **Check for heated oxygen sensor (See page DI-48).**

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-22).**

NG → **Replace injector.**

OK ↓

5	**Check mass air flow meter and engine coolant temp. sensor (See page DI-25 , DI-34).**

NG → **Repair or replace.**

OK

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

NG → **Repair or replace.**

OK

Check and replace ECU (See page IN-28).

DI4RS-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.

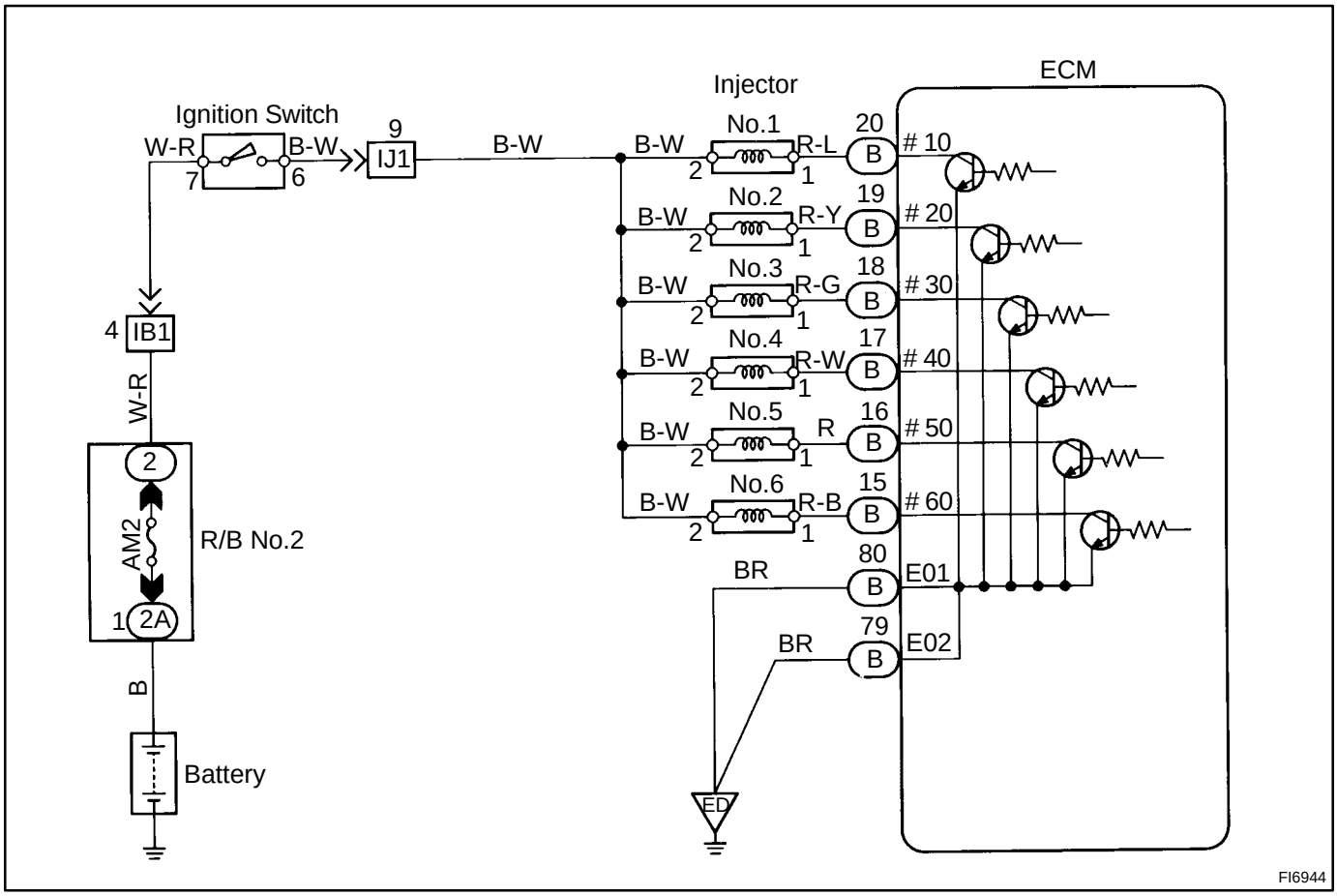
If the misfire rate is high enough and the driving conditions will cause catalyst overheating, the MIL blinks when misfiring occurs.

DTC No.	DTC Detecting Condition	Trouble Area
P0300	Misfiring of random cylinders is detected during the 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 of the engine, misfiring is detected which can cause catalyst overheating (This causes MIL to blink)	
	For any particular 1,000 revolutions of the engine, misfiring is detected which causes a deterioration in emission (2 trip detection logic)	

HINT:

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

WIRING DIAGRAM

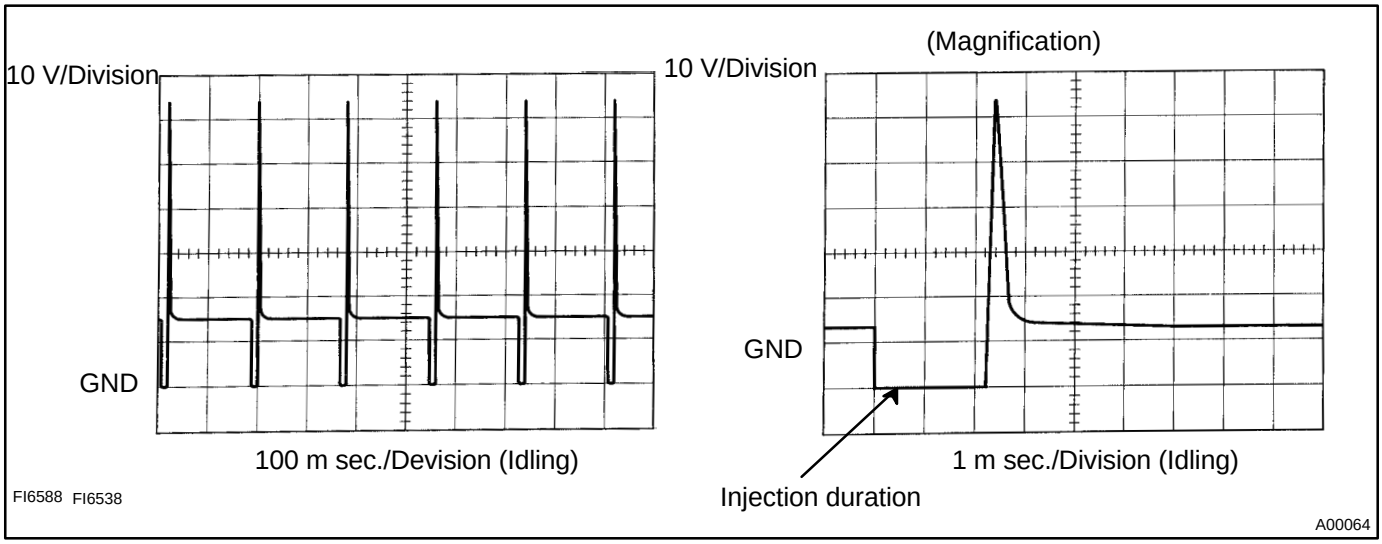


Reference INSPECTION USING OSCILLOSCOPE
INJECTOR SIGNAL WAVEFORM

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

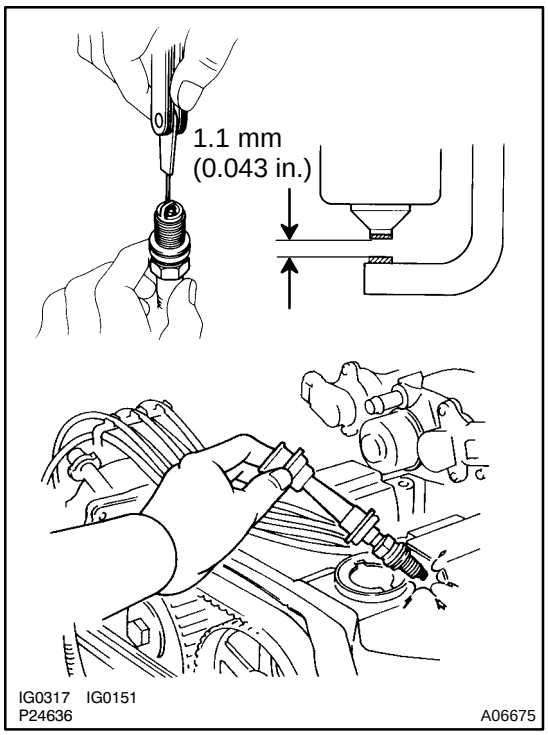
HINT:

The correct waveform is as shown.



INSPECTION PROCEDURE

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



PREPARATION:

(a) Remove the No.3 timing belt cover (See page EM-12).
(b) Disconnect the high-tension cord.
(c) Remove the spark plug.

CHECK:

(a) Check the carbon deposits on electrode.
(b) Check electrode gap.

OK:

(1) No large carbon deposit present.
Not wet with gasoline or oil.
(2) Electrode gap: 1.1 - 1.3 mm
(0.043 - 0.051 in.)

PREPARATION:

(a) Install the spark plug to the high-tension cord.
(b) Ground the spark plug.
(c) Disconnect injector connector.

CHECK:

Check if 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.

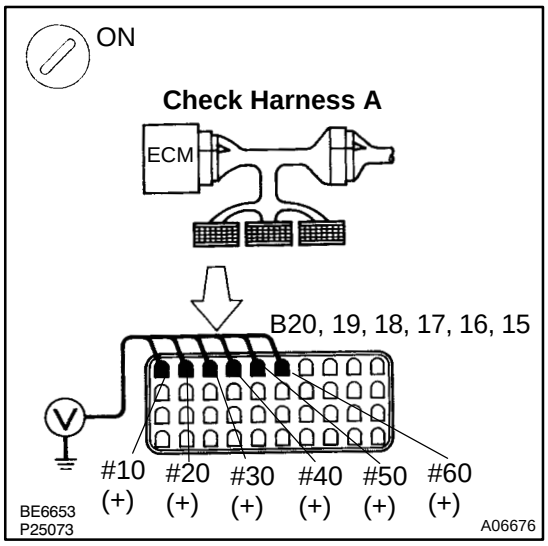
OK:

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) Connect Check Harness A (See page DI-20).

(b) Turn ignition switch ON.

CHECK:

Measure voltage between applicable terminal of ECM 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-22).

NG → **Replace injector.**

OK

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

4	Check fuel pressure (See page SF-1).

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-22).

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-25 , DI-34).

NG → Repair or replace.

OK

Check the compression pressure (See page EM-3), valve clearance (See page EM-4) and valve timing (See page EM-19).

DI4RT-01

DTC	P0325	Knock Sensor 1 Circuit Malfunction

DTC	P0330	Knock Sensor 2 Circuit Malfunction

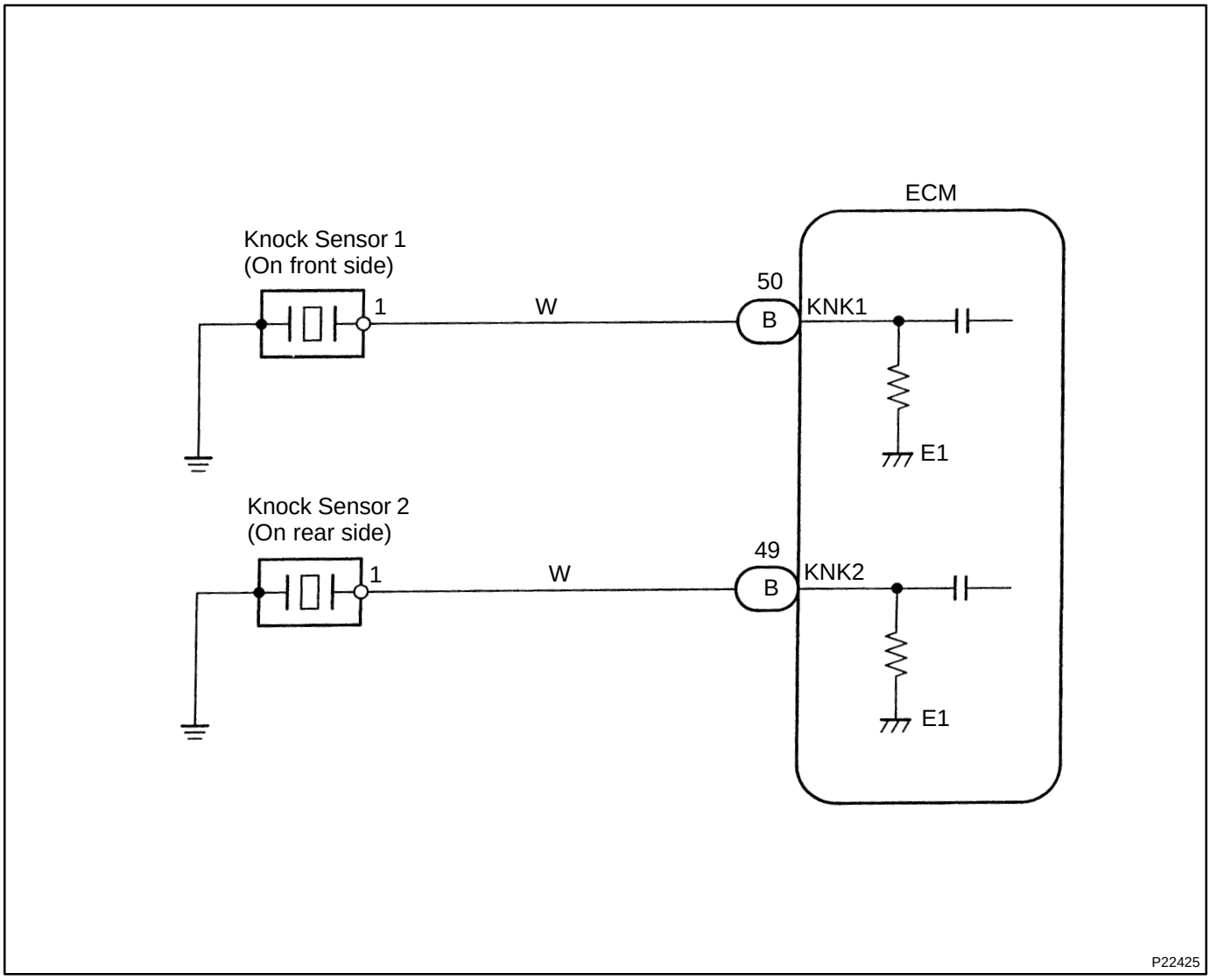
CIRCUIT DESCRIPTION

Knock sensors are fitted one each to the front and rear of the left side 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 1,600 rpm and 5,200 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 1,600 rpm and 5,200 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

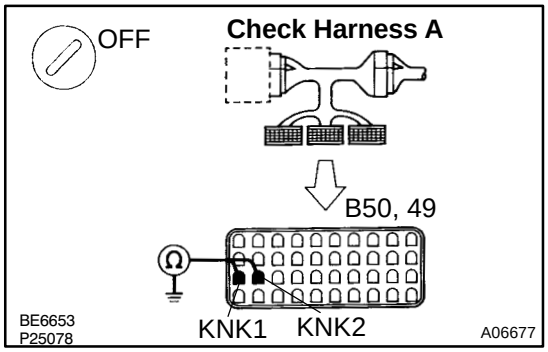


INSPECTION PROCEDURE

HINT:

- DTC P0325 is for the knock sensor circuit on the front side.
- DTC P0330 is for the knock sensor circuit on the rear side.

1	**Check continuity between terminal KNK1, KNK2 of ECM connector and body, ground.**



PREPARATION:

Connect Check Harness A to the connectors on the wire harness side (See page DI-20).

HINT:

The other side of Check Harness A is not connected to the ECM terminals.

CHECK:

Measure resistance between terminal KNK1, KNK2 of ECM connector and body ground.

HINT:

Connect terminal KNK1 to knock sensor 1.

Connect terminal KNK2 to knock sensor 2.

OK:

Resistance: 1 MΩ or higher

OK	**Go to step 3.**

NG

2	**Check knock sensor (See page SF-67).**

NG	**Replace knock sensor.**

OK

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

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

OK

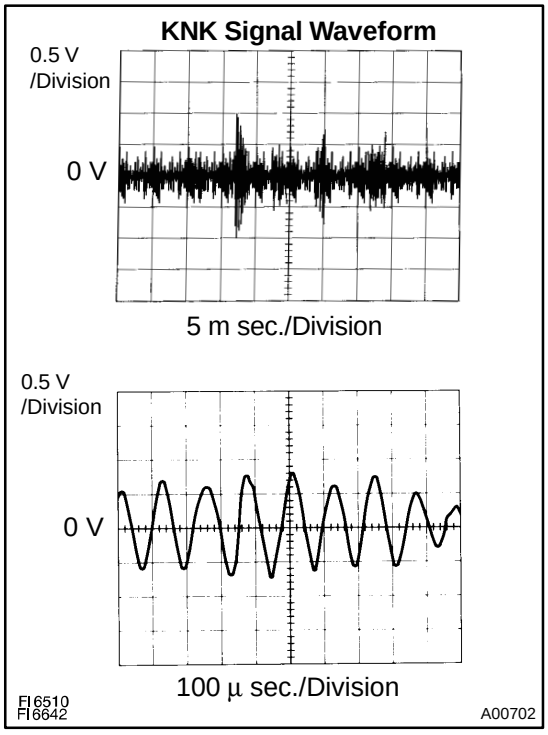
4	**Does malfunction disappear when a good knock senor is installed?**

YES → **Replace knock sensor.**

NO

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

Reference INSPECTION USING OSCILLOSCOPE



- With the engine racing (4,000 rpm) measure waveform between terminals 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 123 µsec. (Normal, mode vibration frequency of knock sensor: 8.1 KHz).

HINT:
If normal mode vibration frequency is not 8.1 KHz, the sensor is malfunctioning.

DI4RU-01

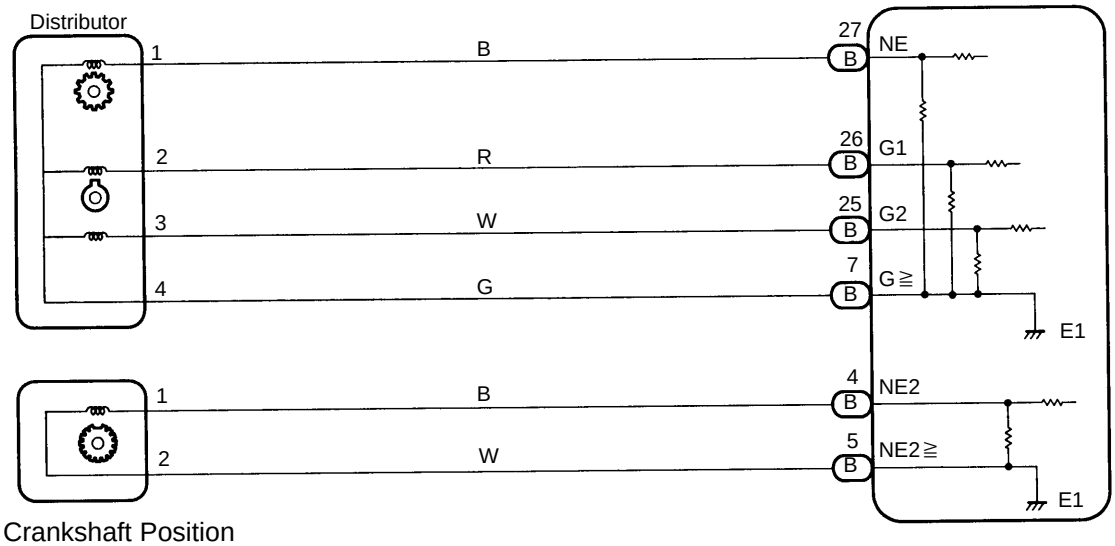
DTC	P0335	Crankshaft Position Sensor ”A” Circuit Malfunction

CIRCUIT DESCRIPTION

The crankshaft position sensor (NE signal) consists of a signal plate and a pick up coil. The NE signal plate has 24 teeth and is built into the distributor.
When the camshaft rotates, the protrusion on the signal plate and the air gap on the pick up coil change, causing fluctuations in the magnetic field and generating an electromotive force in the pick up coil.
The NE signal sensor generates 24 signals for every engine revolution. The ECM detects the standard crankshaft angle based on the G1, G2 signals, detects the actual crankshaft angle and the engine speed by the NE signals, and detects misfire by NE2 signals.

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

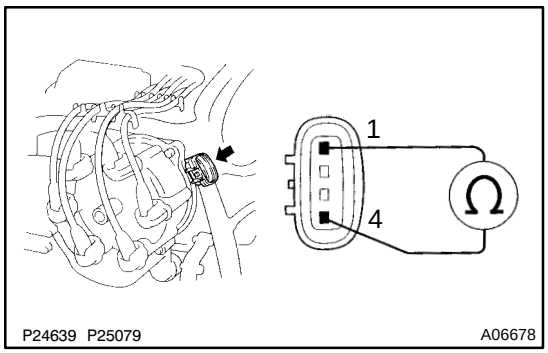
WIRING DIAGRAM



S01077

INSPECTION PROCEDURE

1	Check resistance of crankshaft position sensor for NE signal.

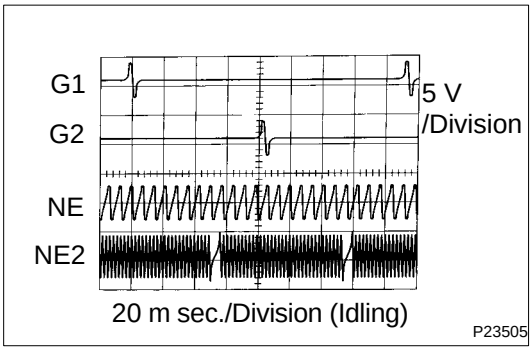


PREPARATION:
Disconnect distributor connector.
CHECK:
Measure resistance between terminals 1 and 4 of distributor connector.
OK:

	Resistance
Cold	155 ~ 250 Ω
Hot	190 ~ 290 Ω

"Cold" is from -10˚C (14˚F) to 50˚C (122˚F) of engine coolant temperature and "Hot" is from 50˚C (122˚F) to 100˚C (212˚F).

Reference INSPECTION USING OSCILLOSCOPE



- During cranking or idling, check between ECM terminals G1, G2, NE and G≧, and between NE2 and NE2≧.

HINT:
The correct waveforms are as shown.

NG → **Replace distributor housing assembly (See page IG-12).**

OK

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

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

OK

3	Check air gap (See page IG-1).

NG → Replace distributor housing assembly (See page IG-12).

OK →

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

DI4RV-01

DTC	P0340	Camshaft Position Sensor Circuit Malfunction

CIRCUIT DESCRIPTION

The camshaft position sensors (G1 and G2 signals) consist of a signal plate and a pick up coil.
The G1, G2 signal plates each have one tooth on the outer circumference and are built into the distributor. When the camshaft rotates, the protrusion on the signal plate and the air gap on the pick up coil change, causing fluctuations in the magnetic field and generating an electromotive force in the pick up coil.
The ECM detects the standard crankshaft angle based on the G1, G2 signals, detects the actual crankshaft angle and engine speed by the NE signals, and detects misfire by NE2 signals.

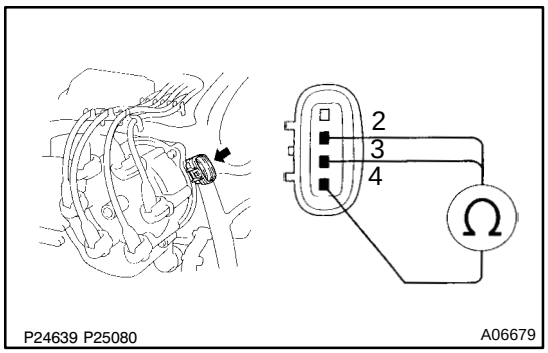
DTC No.	DTC Detecting Condition	Trouble Area
P0340	No camshaft position sensor signal to ECM with engine speed 600 rpm or more	• Open or short in camshaft position sensor circuit • Camshaft position sensor • Open or short in crankshaft position sensor circuit for NE2 signal • Crankshaft position sensor for NE2 signal • Starter • ECM
	No crankshaft position sensor signal (NE2 signal) to ECM during cranking	

WIRING DIAGRAM

Refer to page DI-69 for the WIRING DIAGRAM.

INSPECTION PROCEDURE

1	**Check resistance of camshaft position sensor.**



PREPARATION:

Disconnect camshaft position sensor connector.

CHECK:

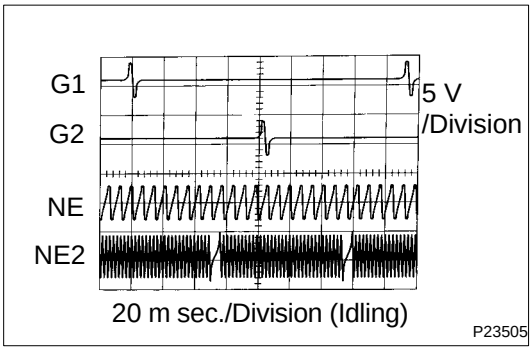
Measure resistance between terminals 2, 3 and 4 of distributor connector.

OK:

	Resistance
Cold	125 - 200 Ω
Hot	160 - 235 Ω

"Cold" is from - 10˚C (14˚F) to 50˚C (122˚F) of engine coolant temperature and "Hot" is from 50˚C (122˚F) to 100˚C (212˚F).

Reference INSPECTION USING OSCILLOSCOPE



- During cranking or idling check between ECM terminals G1, G2, NE and G≧, and between NE2 and NE2≧.

HINT:

The correct waveforms are as shown.

NG	**Replace distributor housing assembly (See page IG-12).**

OK

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

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

OK

3	Check air gap (See page IG-1).

NG → Adjust air gap or replace distributor housing assembly (See page IG-12).

OK →

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

DI4RW-01

DTC	P0385	Crankshaft Position Sensor ”B” Circuit Malfunction

CIRCUIT DESCRIPTION

The crankshaft position sensor (NE2 signal) consists of a signal plate a pick up coil.
The NE2 signal plate has 34 teeth and is mounted on the crankshaft. When the crankshaft rotates, the protrusion on the signal plate and the air gap on the pick up coil change, causing fluctuations in the magnetic field and generating an electromotive force in the pick up coil.
The NE2 signal sensor generates 34 signals for every engine revolution. The ECM detects the standard crankshaft angle based on G1, G2 signals, detects the actual crankshaft angle and the engine speed by NE signals, and detects misfire by NE2 signals.

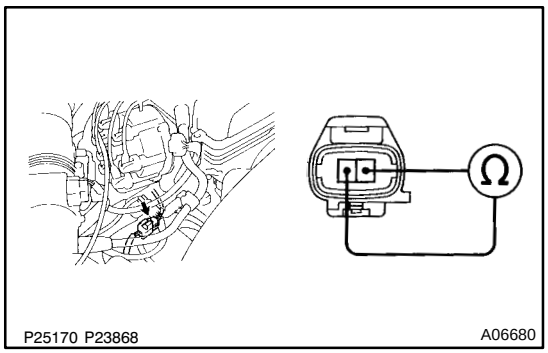
DTC No.	DTC Detecting Condition	Trouble Area
P0385	No crankshaft position sensor signal (NE2 signal) to ECM with engine speed 600 rpm or more (2 trip detection logic)	• Open or short in crankshaft position sensor for NE2 signal • Crankshaft position sensor for NE2 signal • ECM

WIRING DIAGRAM

Refer to page DI-69 for the WIRING DIAGRAM.

INSPECTION PROCEDURE

1	**Check resistance of crankshaft position sensor for NE2 signal.**

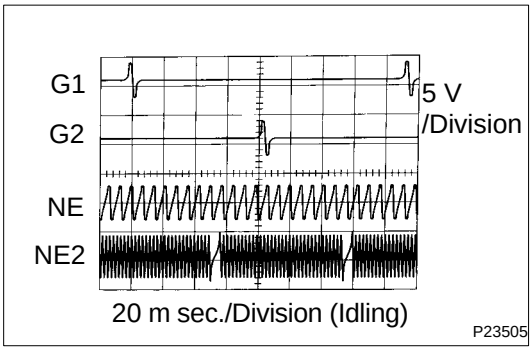


PREPARATION:
Disconnect crankshaft position sensor connector.
CHECK:
Measure resistance between terminals 1 and 2 of crankshaft position sensor connector.
OK:

	Resistance
Cold	1,630 - 2,740 Ω
Hot	2,065 - 3,225 Ω

"Cold" is from - 10˚C (14˚F) to 50˚C (122˚F) and "Hot" is from 50˚C (122˚F) to 100˚C (212˚F).

Reference INSPECTION USING OSCILLOSCOPE



- During cranking or idling check between ECM terminals G1, G2, NE and G≧, and between NE2 and NE2≧.

HINT:
The correct waveforms are as shown.

NG → **Replace crankshaft position sensor (See page IG-19).**

OK

2	**Check for open and short in harness and connector between ECM and crankshaft position sensor for NE2 signal (See page IN-28).**

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

OK

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

NG → **Tighten the sensor. Replace signal plate (See page IG-19).**

OK

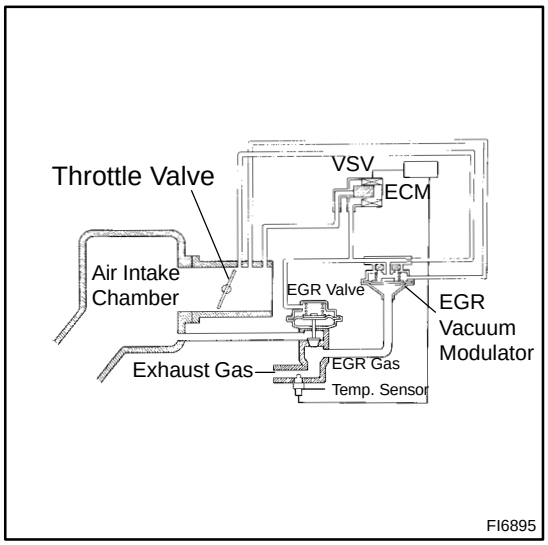
Check and replace ECM (See page IN-28).

DI4RX-01

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 temperature and reduce NOx emissions. The amount of EGR is regulated by the EGR vacuum modulator according to the engine load.

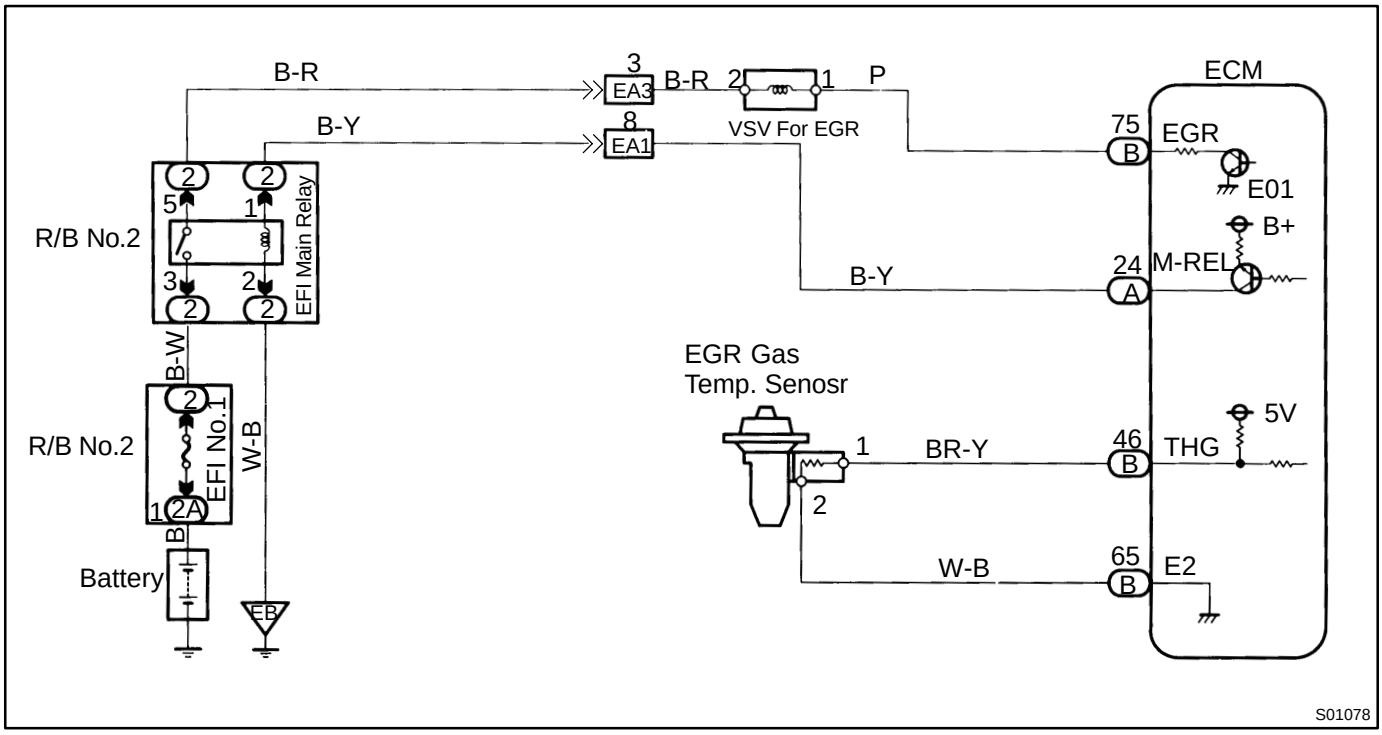


If even one of the following conditions is fulfilled, the VSV is turned ON by a signal from the ECM. This results in atmospheric air acting on the EGR valve, closing the EGR valve and shutting off the exhaust gas (EGR cut-off).
Under the following conditions, EGR is cut to maintain driveability.

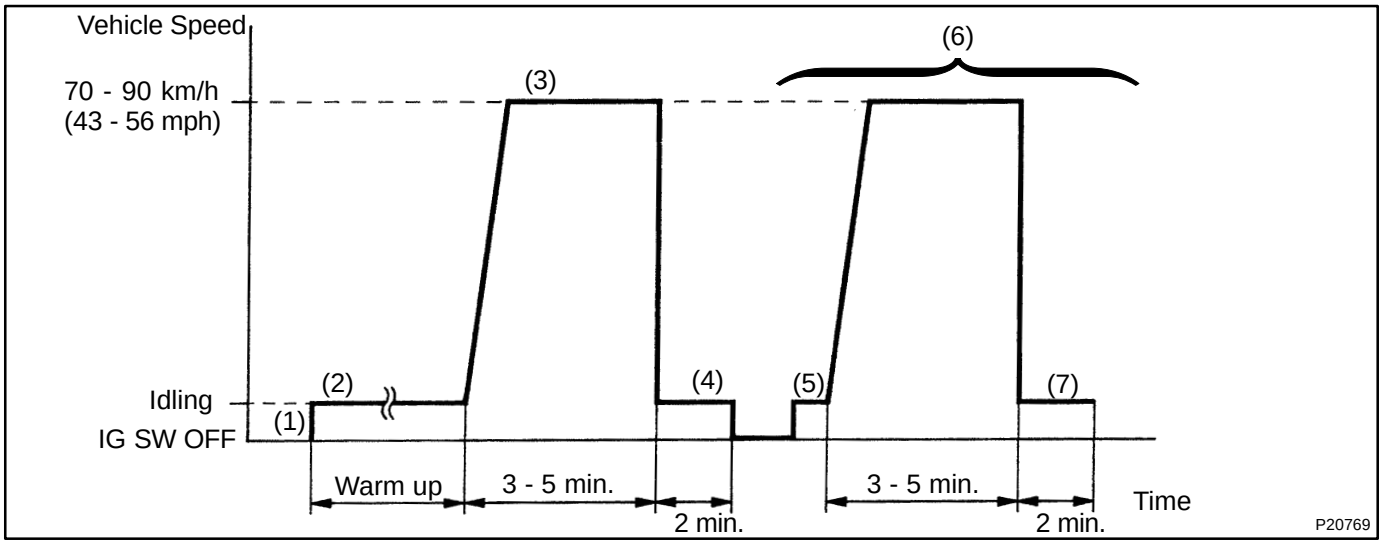
- Before the engine is warmed up
- During deceleration (throttle valve closed)
- Light engine load (amount of intake air very small)
- Engine racing.

DTC No.	DTC Detecting Condition	Trouble Area
P0401	After the engne is warmed up and run at 80 km/h (50 mph) for 3 to 5 min., the EGR gas temperature sensor value does not exceed 40 °C (72 °F) above the ambient air temperature (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 the engine and warm it up with all 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) Stop at safe place and turn the ignition switch OFF.
(6) Start the engine and do steps (3) and (4) again.
(7) 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 again 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 (6) above are done.

INSPECTION PROCEDURE
TOYOTA hand-held tester:

1	**Connect the TOYOTA hand-held tester and read value of EGR gas temperature.**

PREPARATION:

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

(b) Turn ignition switch ON and TOYOTA hand-held tester main switch ON.

CHECK:

Read EGR gas temperature on TOYOTA hand-held tester.

OK:

EGR gas temp.: 10˚C (50˚F) or more

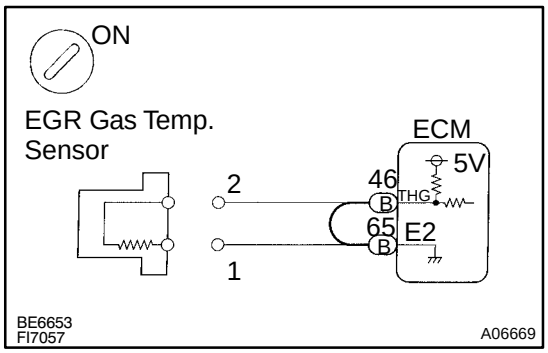
HINT:

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 sensor wire harness terminals together.

(c) Turn ignition switch ON.

CHECK:

Read EGR gas temperature on the TOYOTA hand-held tester.

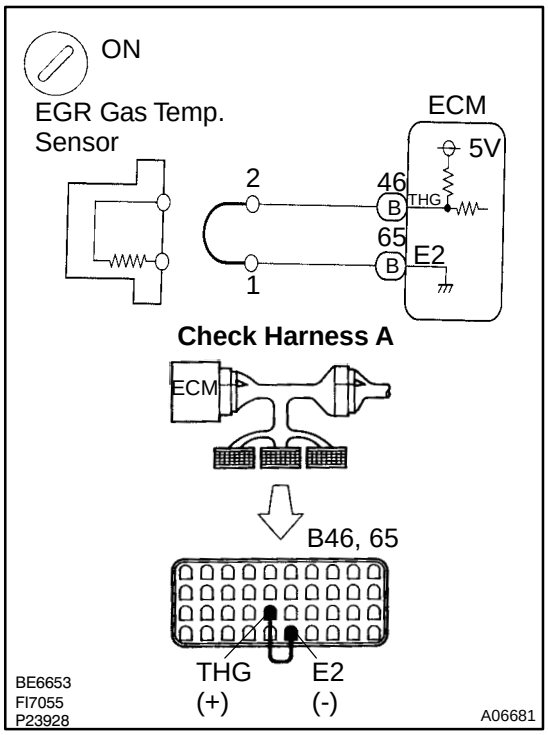
OK:

EGR gas temp.: 159.3˚C (318.7˚F)

OK → **Confirm good connection at sensor.**
If OK, replace EGR gas temp. sensor (See page EC-7).

NG

3	Check for open in harness or ECM.



PREPARATION:

(a) Connect Check Harness A (See page DI-20).

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

HINT:

EGR gas temp. sensor connector is disconnected. Before checking, do a visual check and connect pressure check for the ECM connector (See page IN-28).

CHECK:

Read EGR temperature 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

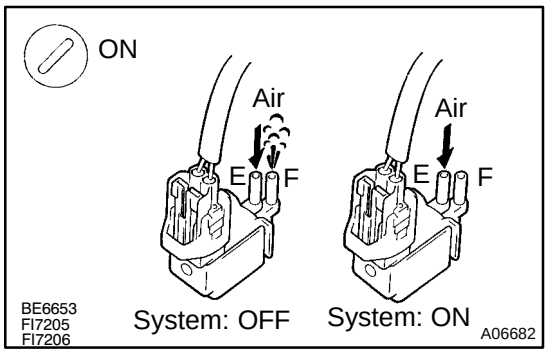
Confirm connection at ECM.
If OK, replace ECM.

4	Check the connection of the vacuum hose, EGR hose (See page EC-7).

NG → **Repair or replace.**

OK

5	**Check the 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 from pipe E is flows out through pipe F.
EGR system is ON:
Air does not flow from pipe E to pipe F.

OK	**Go to step 7.**

NG

6	**Check operation of the VSV for EGR (See page SF-61).**

NG	**Replace VSV for EGR.**

OK

Check for open in harness and connector between VSV and ECM (See page IN-28).

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 value of EGR gas temp. sensor.**

PREPARATION:

(a) Connect the TOYOTA hand-held tester to the DLC3.
(b) Turn ignition switch ON and 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 the EGR gas temp. while racing engine at 4,000 rpm.

OK:

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

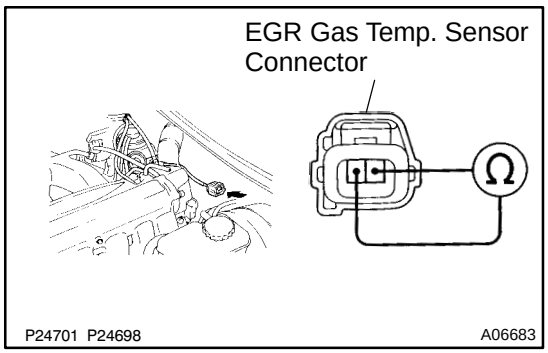
NG → **Replace EGR gas temp. sensor (See page SF-68).**

OK

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

OBDII scan tool (excluding TOYOTA hand-held tester)

1	Check resistance of EGR gas temp. sensor.



PREPARATION:
Disconnect EGR gas temp. sensor connector.
CHECK:
Measure resistance between terminals of EGR gas temp. sensor connector.
OK:

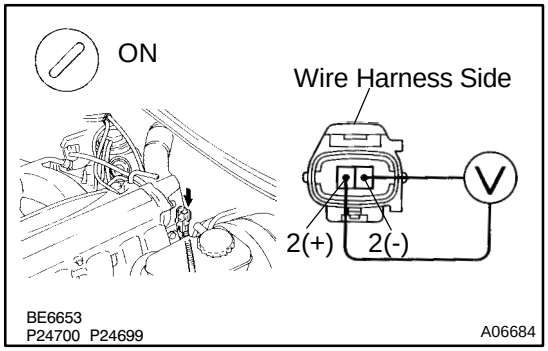
Resistance: 600 kΩ or less.

HINT:
If there is open circuit, ohmmeter indicates 720 kΩ or more.

NG	Check and replace EGR gas temp. sensor (See page SF-69).

OK

2	Check for open in harness or ECM.



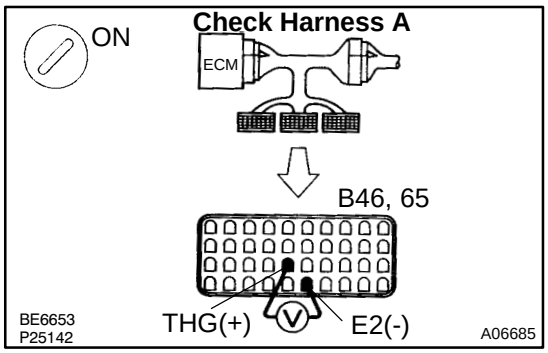
PREPARATION:
(a) Disconnect EGR gas temp. sensor connector.
(b) Turn ignition switch ON.
CHECK:
Measure voltage between terminals of EGR gas temp. sensor wire harness side connector.
OK:

Voltage: 4.5 - 5.5 V

OK	Go to step 4.

NG

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



PREPARATION:

(a) Connect Check Harness A (See page DI-20).

(b) Turn ignition switch ON.

CHECK:

Measure voltage between terminals THG and E2 of EGM connector.

OK:

Voltage: 4.5 - 5.5 V

OK	**Open in harness between terminal E2 or THG. repair or replace harness.**

NG

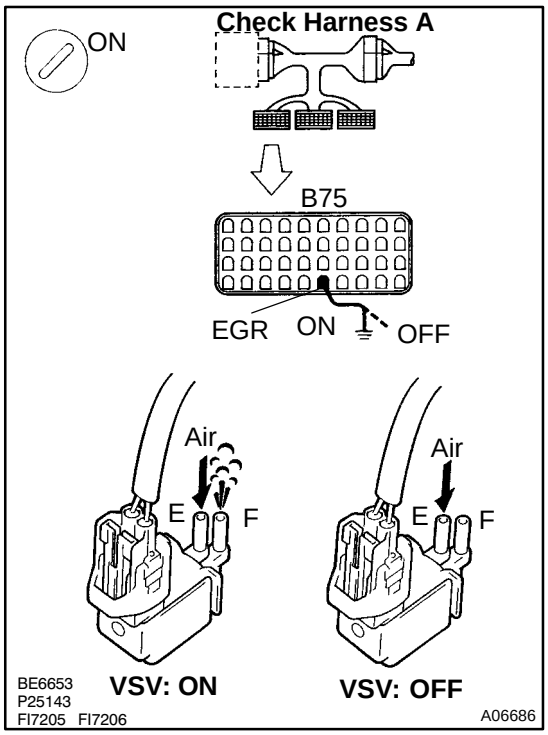
Confirm connection at ECM.
If OK, replace ECM.

4	**Check connection of vacuum hose, EGR hose (See page EC-7).**

NG	**Repair or replace.**

OK

5	Check the VSV for EGR.



PREPARATION:

(a) Connect Check Harness A to the connectors on the wire harness side (See page DI-20).

HINT:

The other side of Check Harness A is not connected to the ECM terminals.

(b) Turn 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 from pipe E flows out through pipe F.
(2) VSV is OFF:
Air does not flow from pipe E to pipe F.

OK	Go to step 7.

NG

6	Check operation of the VSV for EGR (See page SF-59).

NG	Replace VSV for EGR.

OK

Check for open in harness and connector between engine room R/B and ECM (See page IN-28).

7	**Check EGR vacuum modulator (See page EC-7).**

NG → **Repair or replace.**

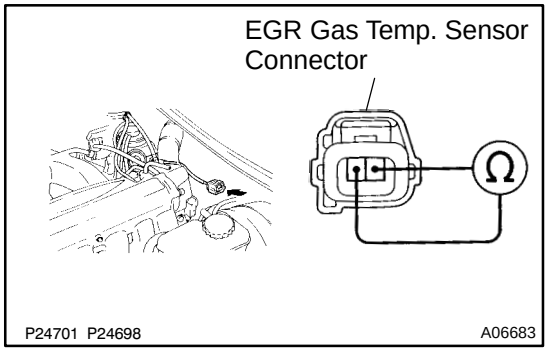
OK

8	**Check EGR valve (See page EC-7).**

NG → **Repair or replace.**

OK

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



PREPARATION:

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

CHECK:

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

OK:

Resistance of EGR gas temp. senor 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 (See page SF-68).**

OK

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

DI4RY-01

DTC	P0402	Exhaust Gas Recirculation Flow Excessive Detected

CIRCUIT DESCRIPTION

Refer To Exhaust Gas Recirculation Flow Insufficient Detected on page DI-78 .

DTC No.	DTC Detecting Condition	Trouble 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 do that vacuum is applied to port E) (2 trip detection logic)	• EGR valve stuck open • EGR VSV 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)	

See DTC P0401 for SYSTEM CHECK DRIVING PATTERN and WIRING DIAGRAM.

INSPECTION PROCEDURE

TOYOTA hand-held tester

1	Connect the TOYOTA hand-held tester and read EGR gas temperature value.

PREPARATION:

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

(b) Turn ignition switch ON and TOYOTA hand-held tester main switch ON.

CHECK:

Read EGR gas temperature on the TOYOTA hand-held tester.

OK:

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

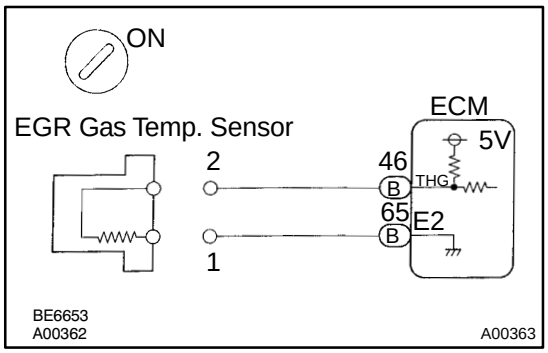
HINT:

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.

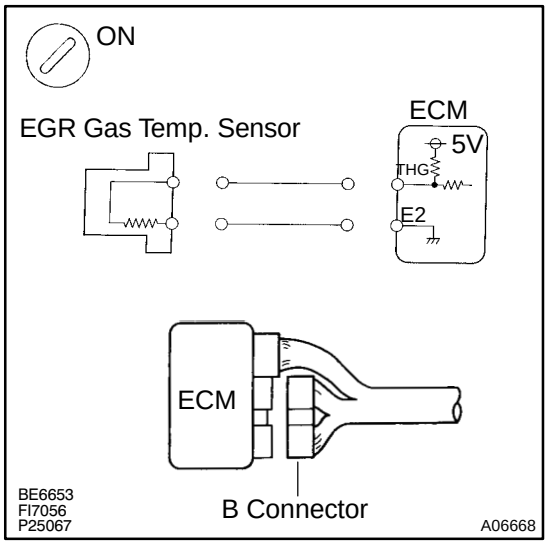


PREPARATION:
Disconnect the EGR gas temp. sensor connector.
CHECK:
Read EGR gas temp. on the TOYOTA hand-held tester.
OK:
EGR gas temp.: 3.1˚C (37.6˚F)

OK	Replace EGR gas temp. sensor (See page SF-68).

NG

3	Check for short in harness or ECM.



PREPARATION:
(a) Disconnect the B connector from ECM (See page DI-20).
HINT:
EGR gas temp. sensor is disconnected.
(b) Turn ignition switch ON.
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-28).

4	Check the VSV for EGR (See page DI-78 , step 5).

OK → Check EGR valve (See page EC-7).

NG

5	Check operation of the VSV for EGR (See page SF-59).

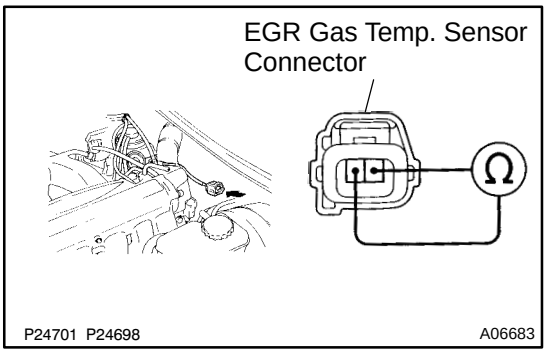
NG → Replace VSV for EGR.

OK

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

OBDII scan tool (excluding TOYOTA hand-held tester)

1	Check resistance of EGR gas temp. sensor.



PREPARATION:
Disconnect 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 (See page SF-68).

OK

2	Check for short in harness and connector between EGR gas temp. sensor and ECM (See page IN-18).

NG → Repair or replace harness or connector.

OK ↓

3	Check the VSV for EGR (See page DI-78 , step 5).

OK → Check EGR valve (See page EC-7).

NG ↓

4	Check operation of the VSV for EGR (See page SF-59).

NG → Replace VSV for EGR.

OK ↓

5	Check for short in harness and connector between VSV and ECM (See page IN-28).

NG → Repair or replace harness or connector.

OK ↓

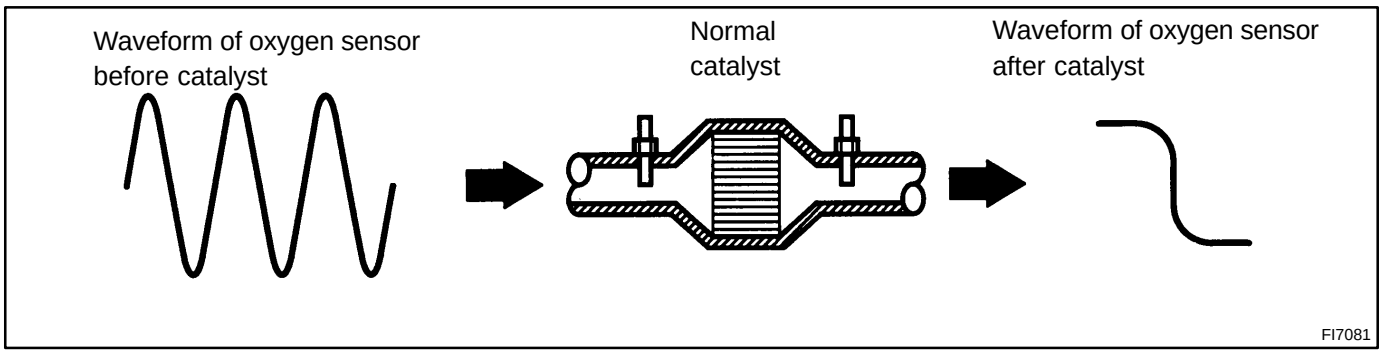
Check and replace ECM (See page IN-28).

DI4RZ-01

DTC	P0420	Catalyst System Efficiency Below Threshold

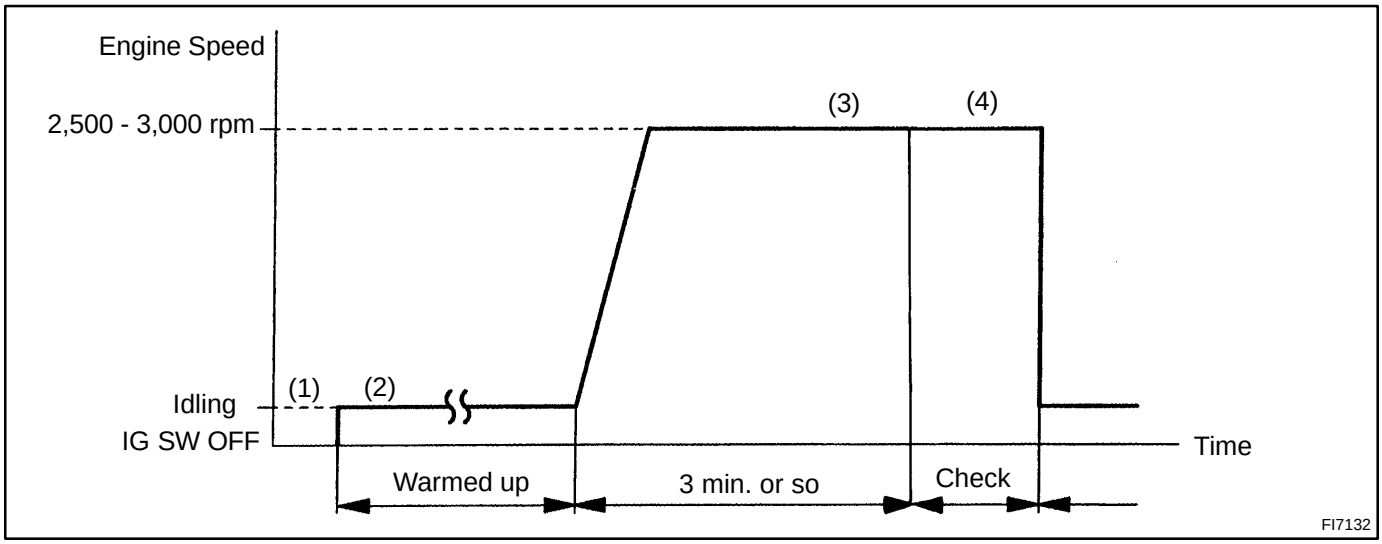
CIRCUIT DESCRIPTION

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 wavaforms change at a similar rate, it indicates that catalyst performance has deteriorated.



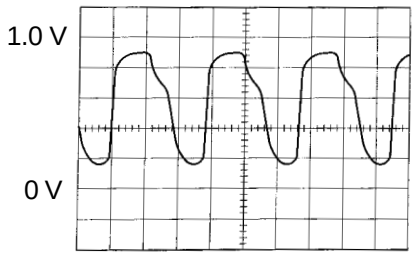
DTC No.	DTC Detecting Condition	Trouble Area
P0420	After the engine and the catalyst are warmed up, and while the vehicle is driven within the set vehicle and engine speed range, the waveforms of the heated oxygen sensors (bank 1, 2 sensor 1 and bank 1 sensor 2) have the same amplitude (2 trip detection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

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, OX3 and E1 of ECM.
(2) Start engine and warm it up with all accessories switched OFF until water temperature is stable.
(3) Race the engine at 2,500 - 3,000 rpm for about 3 min.
(4) After confirming that the waveforms of the heated oxygen sensors, bank 1, 2 sensor 1 (OX1, OX2), oscillate around 0.5 V during feedback to the ECM, check the waveform of the heated oxygen senor, bank 1 sensor 2 (OX3).

OX Signal Waveform (Oscilloscope)



HINT:
If there is a malfunction in the system, the waveform of the heated oxygen senor, bank1 sensor 2 (OX3), is almost the same as that of the heated oxygen sensors, bank 1, 2 senor 1 (OX1, OX2), 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 code (besides DTC P0420) being output?**

YES → **Go to relevant DTC chart.**

NO

2	Check heated oxygen senor (bank 1, 2 sensor 1) (See page DI-48).

NG → Repair or replace.

OK

3	Check heated oxygen senor (bank1 sensor 2) (See page DI-48).

NG → Repair or replace.

OK

Replace three-way catalytic converter (See page DI-55).

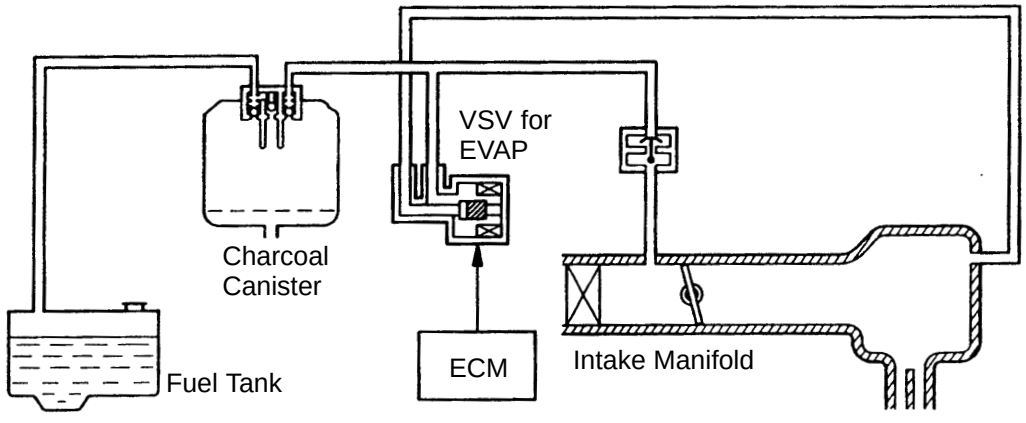
DI4S0-01

DTC	P0441	Evaporative Emission Control System Incorrect Purge Flow

CIRCUIT DESCRIPTION

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.

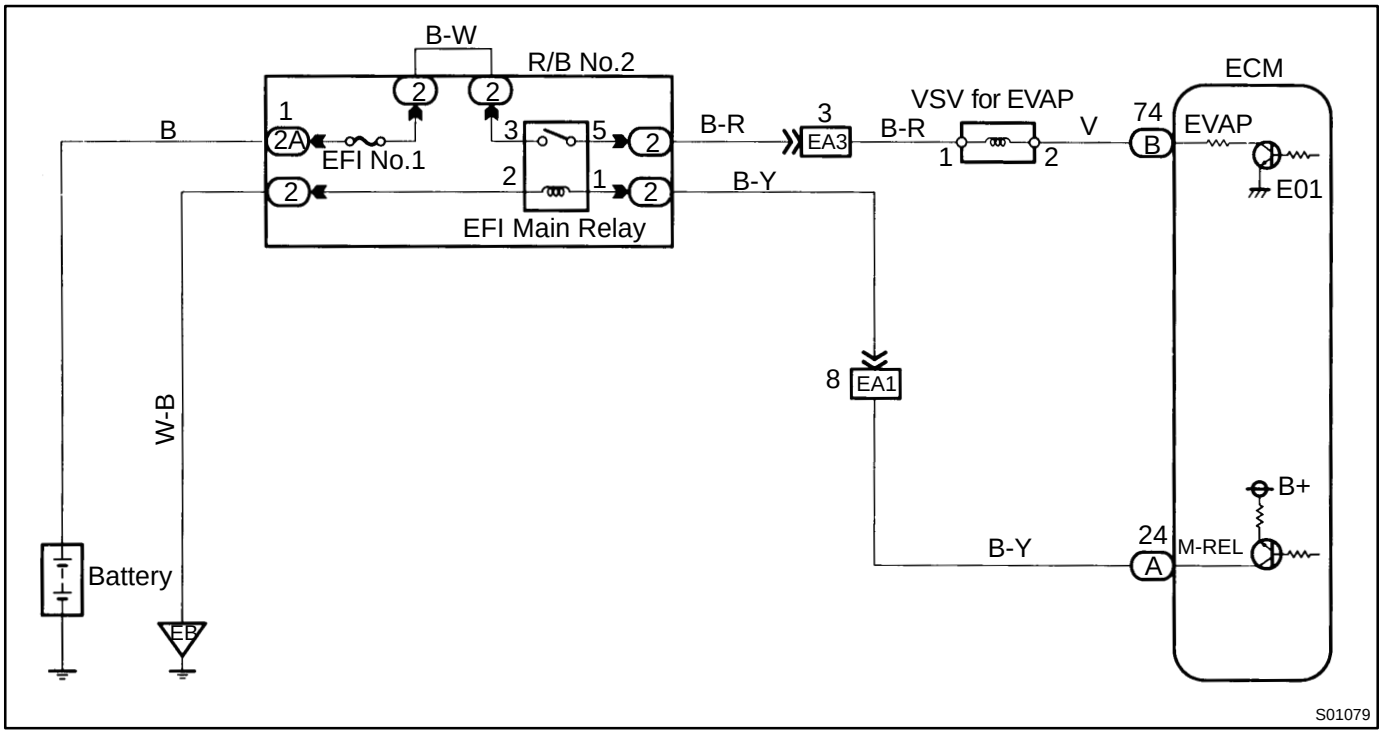
The ECM changes the duty signal to the VSV for EVAP so that the intake quantity of HC emissions is appropriate for the driving conditions (engine load, engine speed, etc.) after the engine is warme up.



P25165

DTC No.	DTC Detecting Condition	Trouble Area
P0441	The proper response to the computer command does not occur (2 trip detection logic)	• Open or short in VSV circuit for EVAP • VSV for EVAP • Vacuum hose blocked or disconnected • ECM • Charcoal canister

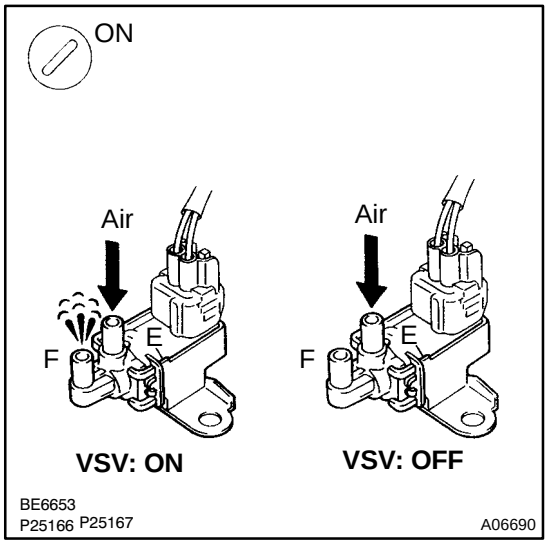
WIRING DIAGRAM



INSPECTION PROCEDURE

TOYOTA hand-held tester

1	**Connector the TOYOTA hand-held tester and check operation of VSV for EVAP.**



PREPARATION:

(a) Connect the TOYOTA hand-held tester to the DLC3.
(b) Turn 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 VSV is operated by the TOYOTA hand-held tester.

OK:

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

OK	**Go to step 4.**

NG

2	Check VSV for EVAP (See page SF-61).

NG → Replace VSV for EVAP.

OK

3	Check for open and short in harness and connector between EFI main relay and ECM (See page IN-28).

NG → Repair or replace harness or connector.

OK

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

4	Check connection of vacuum hose (See page EC-5).

NG → Repair or replace.

OK

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

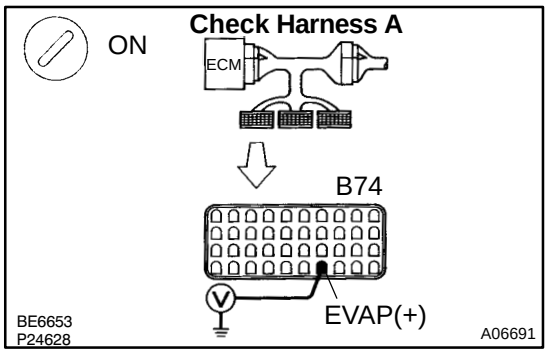
OBDII scan tool (excluding TOYOTA hand-held tester)

1	Check VSV for EVAP (See page SF-61).

NG → Replace VSV for EVAP.

OK

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



PREPARATION:

(a) Connect Check Harness A (See page DI-20).

(b) Turn ignition switch ON.

CHECK:

Measure voltage between terminal EVAP 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 page EC-5).**

NG → **Repair or replace.**

OK

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

NG → **Repair or replace.**

OK

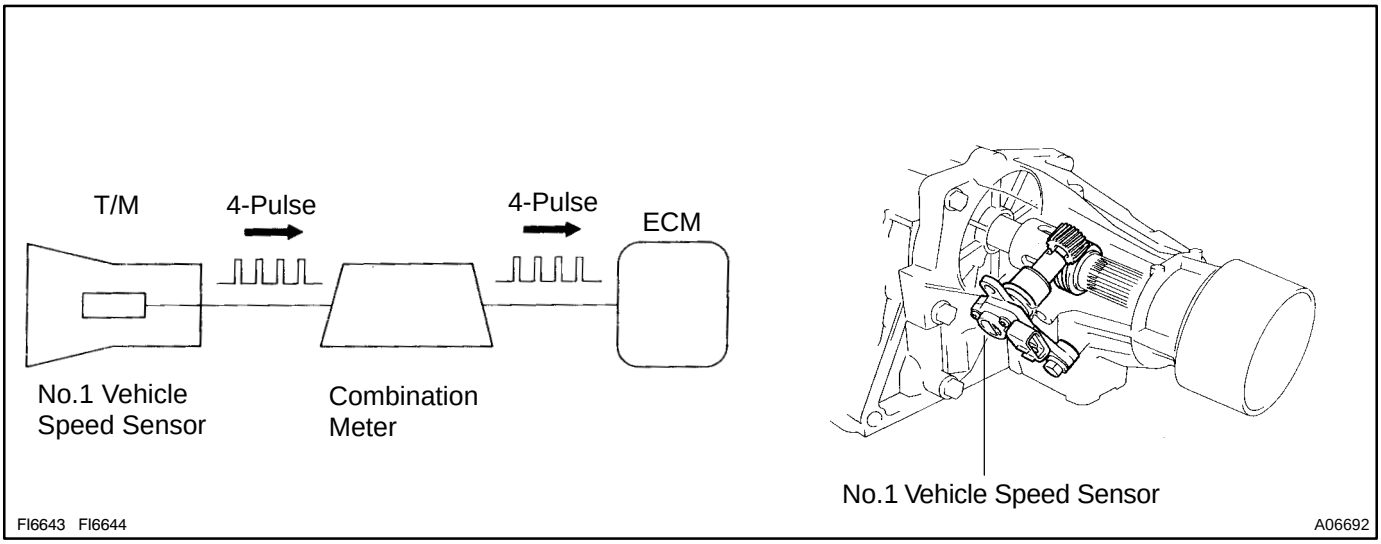
Check and replace ECM (See page IN-28).

DI4S1-01

DTC	P0500	Vehicle Speed Sensor Malfunction

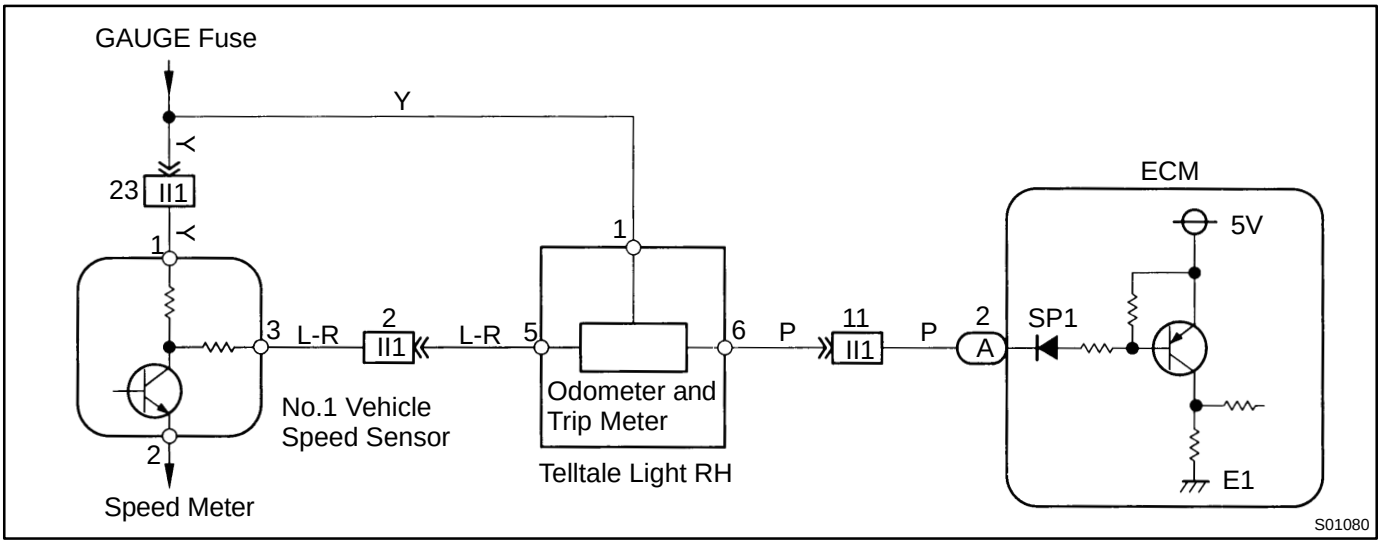
CIRCUIT DESCRIPTION

The No.1 vehicle speed senor outputs a 4-pulse signal for every revolution of the rotor shaft, which is rotated by the transmission output shaft via the driven gear. After this signal is converted into a more precise rectangular waveform by the waveform shaping circuit inside the combination meter, it is then transmitted to the ECM. The ECM determines the vehicle speed based on the frequency of these pulse signals.



DTC No.	DTC Detecting Condition	Trouble Area
P0500	No vehicle speed sensor signal to ECM under the following conditions: (2 trip detection logic) For A/T: (a) Park/neutral position switch is OFF (b) Vehicle is being driven For M/T: (a) Engine speed is between 2,000 rpm and 5,000 rpm (b) Vehicle is being driven at 88 km/h (54 mph) or more	• Open or short in vehicle speed sensor circuit • Vehicle speed sensor • Combination meter • ECM

WIRING DIAGRAM



1997 SUPRA (RM502U)

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.

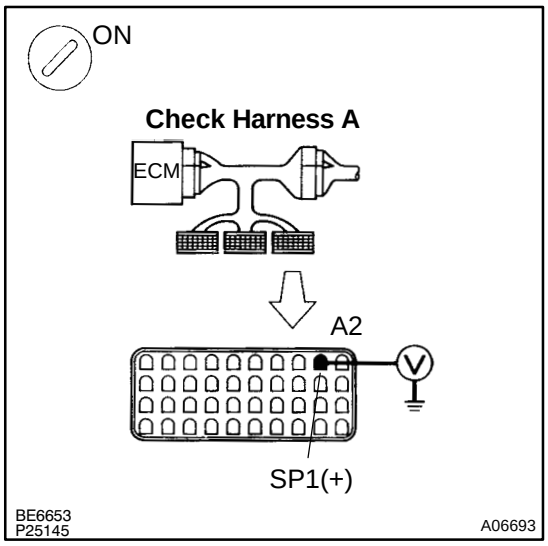
HINT:

The No.1 vehicle speed sensor is operating normally if the speedometer display is normal.

NG → **Check speedometer circuit (See page BE-40).**

OK

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



PREPARATION:

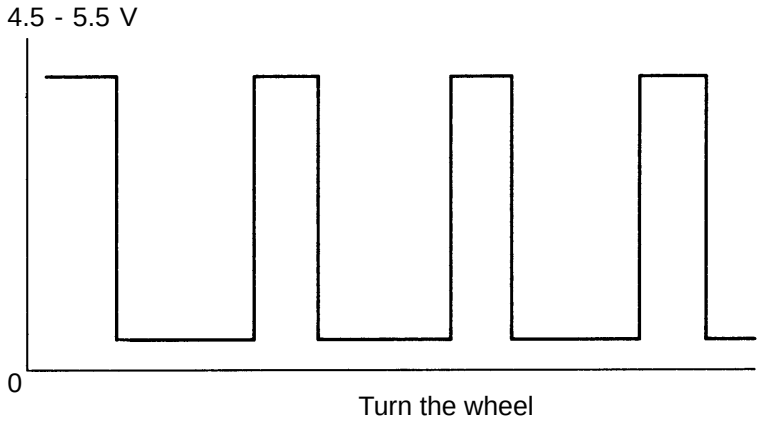
(a) Shift the shift lever to neutral position.
(b) Jack up one of rear wheels.
(c) Connect Check Harness A (See page DI-20 .)
(d) Disconnect power steering ECU connector and cruise control ECU connector.
(e) Turn ignition switch ON.

CHECK:

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

OK:

Voltage is generated intermittently.



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

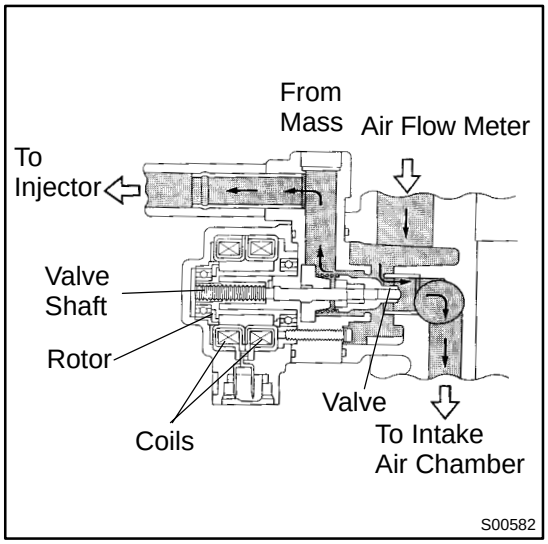
OK

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

DI4S2-01

DTC	P0505	Idle Control System Malfunction

CIRCUIT DESCRIPTION



The step motor type IAC valve is located in front of the intake air chamber. Intake air bypassing the throttle valve is directed to the IAC valve through a passage. A step motor is built into the IAC valve. It consists of 4 coils, a magnetic rotor, valve shaft and valve.

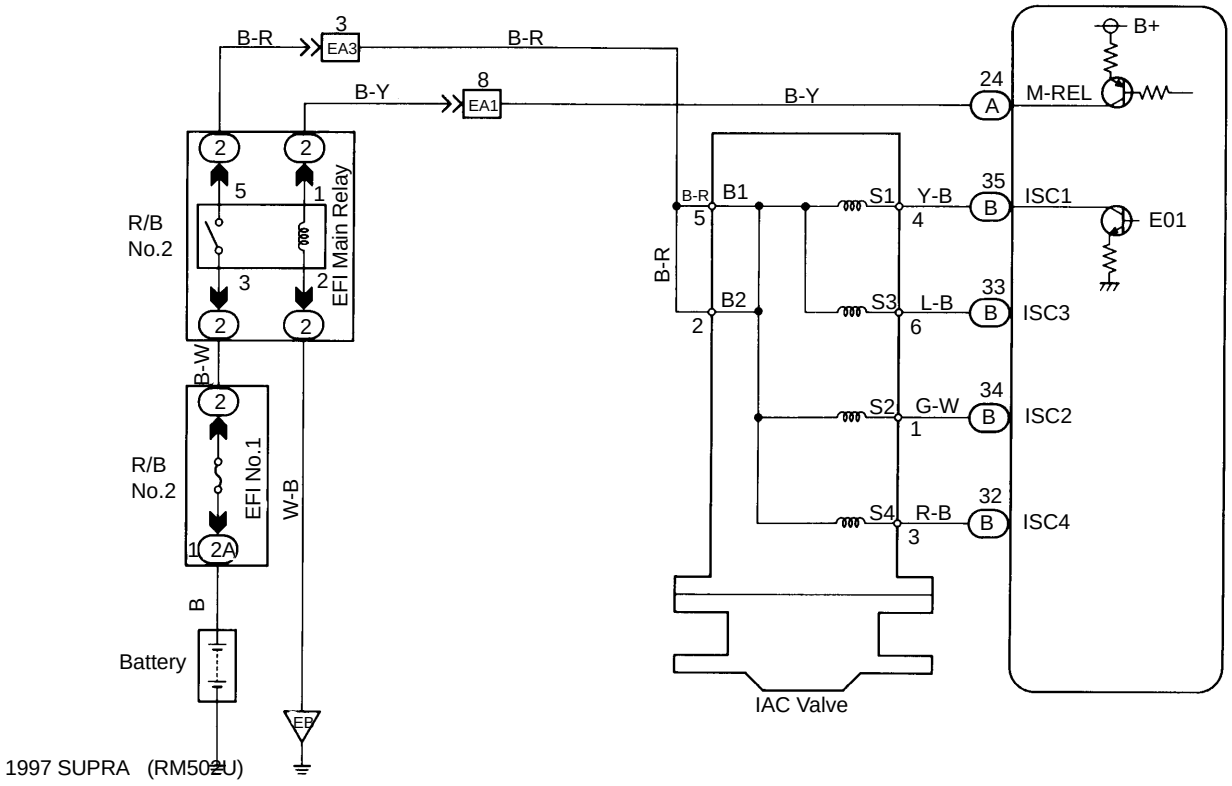
When current flows to the coils due to signals from the ECM, the rotor turns and moves the valve shaft forward or backward, changing the clearance between the valve and valve seat.

In this way the intake air volume bypassing the throttle valve is regulated, controlling the engine speed.

There are 125 possible positions to which the valve can be opened.

DTC No.	DTC Detecting Condition	Trouble Area
P0505	Idle speed continues to vary greatly from the 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)

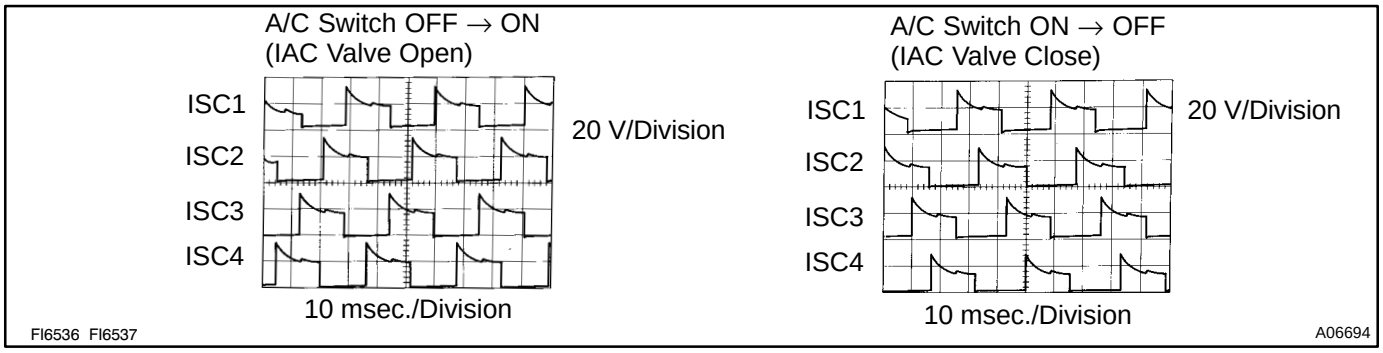
WIRING DIAGRAM



Reference INSPECTION USING OSCILLOSCOPE

- With engine idling measure waveforms between terminals ISC1, ISC2, ISC3, ISC4 and E01 of ECM when A/C switch ON or OFF.

HINT:
The correct waveforms are as shown.



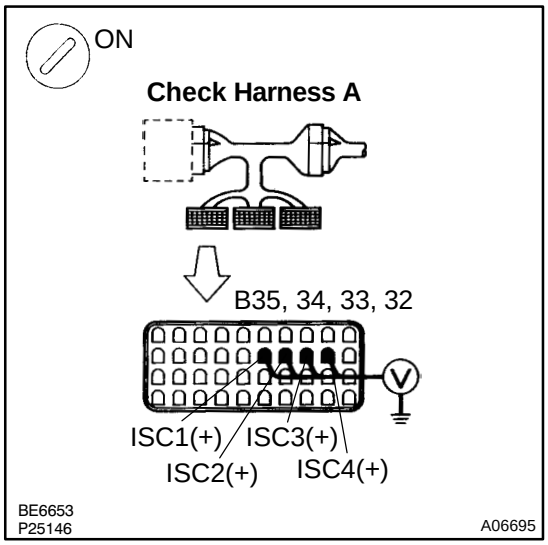
INSPECTION PROCEDURE

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

NG → **Repair or replace.**

OK

2	**Check voltage between terminals ISC1, ISC2, ISC3, ISC4 of ECM connector and body ground.**



PREPARATION:

(a) Connect Check Harness A to the connectors on the wire harness side (See page DI-20).

HINT:
The other side of Check Harness A is not connected to the ECM terminals.

(b) Turn ignition switch ON.

CHECK:

Measure voltage between terminals ISC1, ISC2, ISC3, ISC4 of ECM connector and body ground.

OK:

Voltage: 9 - 14 V

OK → **Go to step 4.**

NG

3	Check IAC valve (See page SF-45).

NG → Replace IAC valve.

OK

Check for open and short in harness and connector between EFI main relay (Marking: EFI MAIN) and IAC valve, IAC valve and ECM (See page IN-28).

4	Check operation of the IAC valve (See page SF-45).

NG → Repair or replace IAC valve.

OK

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

DI4S3-01

DTC	P0510	Closed Throttle Position Switch Malfunction

CIRCUIT DESCRIPTION

Refer to Throttle/Pedal Position Sensor/Switch ”A” Circuit Malfunction on page DI-40 .

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

HINT:

After confirming DTC P0510 use the TOYOTA hand-held tester to confirm closed throttle position switch signal from ”CURRENT DATE”.

Throttle Valve	Closed throttle position switch signal	Malfunction
Fully Closed	OFF	Open Circuit
Fully Open	ON	Short Circuit

WIRING DIAGRAM

Refer to page DI-40 for the WIRING DIAGRAM.

INSPECTION PROCEDURE

HINT:

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

TOYOTA hand-held tester

1	**Connect the TOYOTA hand-held tester and read CTP switch signal.**

PREPARATION:

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

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

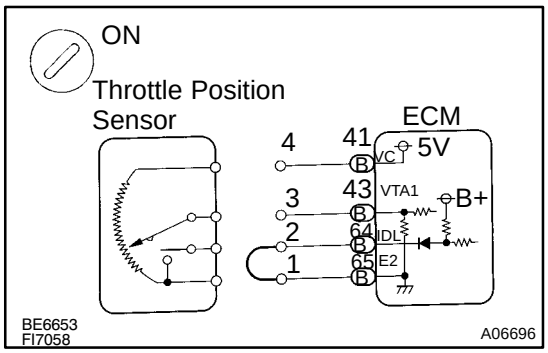
CHECK:

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 sensor wire harness terminals between terminals 1 and 2.
(d) Turn ignition switch ON.

CHECK:

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

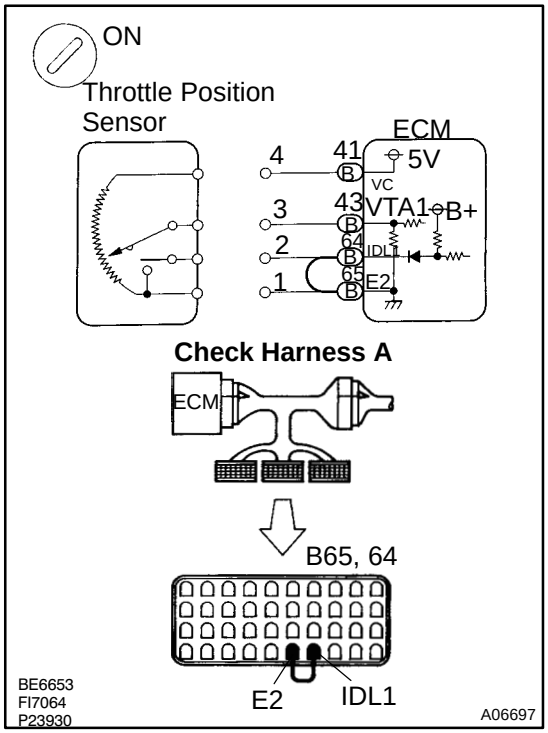
OK:

CTP switch signal: ON

OK	Confirm good connection at sensor. If OK, replace throttle position sensor (See page SF-42).

NG

3	Check for open in harness or ECM.



PREPARATION:

(a) Connect Check Harness A (See page DI-20).
(b) Connect between terminals IDL and E2 of 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-28).

(c) Turn ignition switch ON.

CHECK:

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

OK:

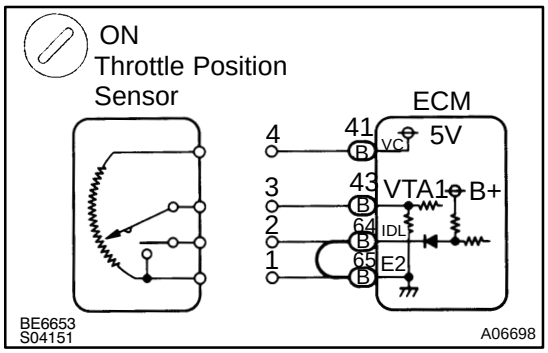
CTP switch signal: ON

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 ignition switch ON.

CHECK:

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

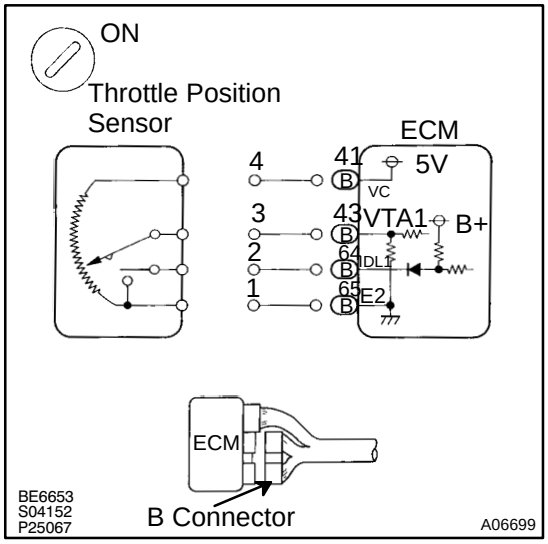
OK:

CTP switch signal: OFF

OK	Confirm good connection at sensor. If OK, replace throttle position sensor (See page SF-42).

NG

5	Check for short in harness or ECM.



PREPARATION:

(a) Disconnect the B connector from ECM
(See page DI-20).

HINT:

Throttle position sensor connector is disconnected.

(b) Turn ignition switch ON.

CHECK:

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

OK:

CTP switch signal: OFF

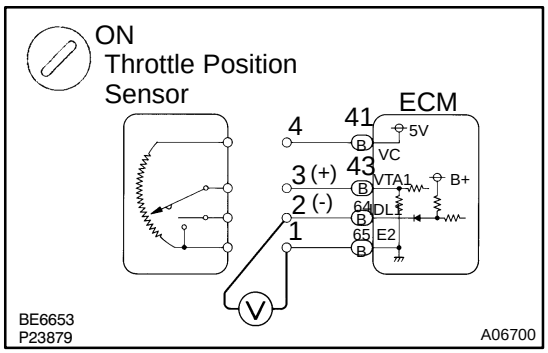
OK	Short in harness between ECM and throttle position sensor, repair or replace harness.

NG

Confirm connection at ECM.
If OK, replace ECM.

OBDII scan tool (excluding TOYOTA hand-held tester)

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



PREPARATION:

(a) Disconnect the throttle position sensor connector.

(b) Turn ignition switch ON.

CHECK:

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

OK:

Voltage: 9 - 14 V

OK	**Confirm good connection at sensor. If OK, replace throttle position sensor (See page SF-42).**

NG

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

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

OK

Confirm connection at ECM.
If OK, replace ECM.

DI4S4-01

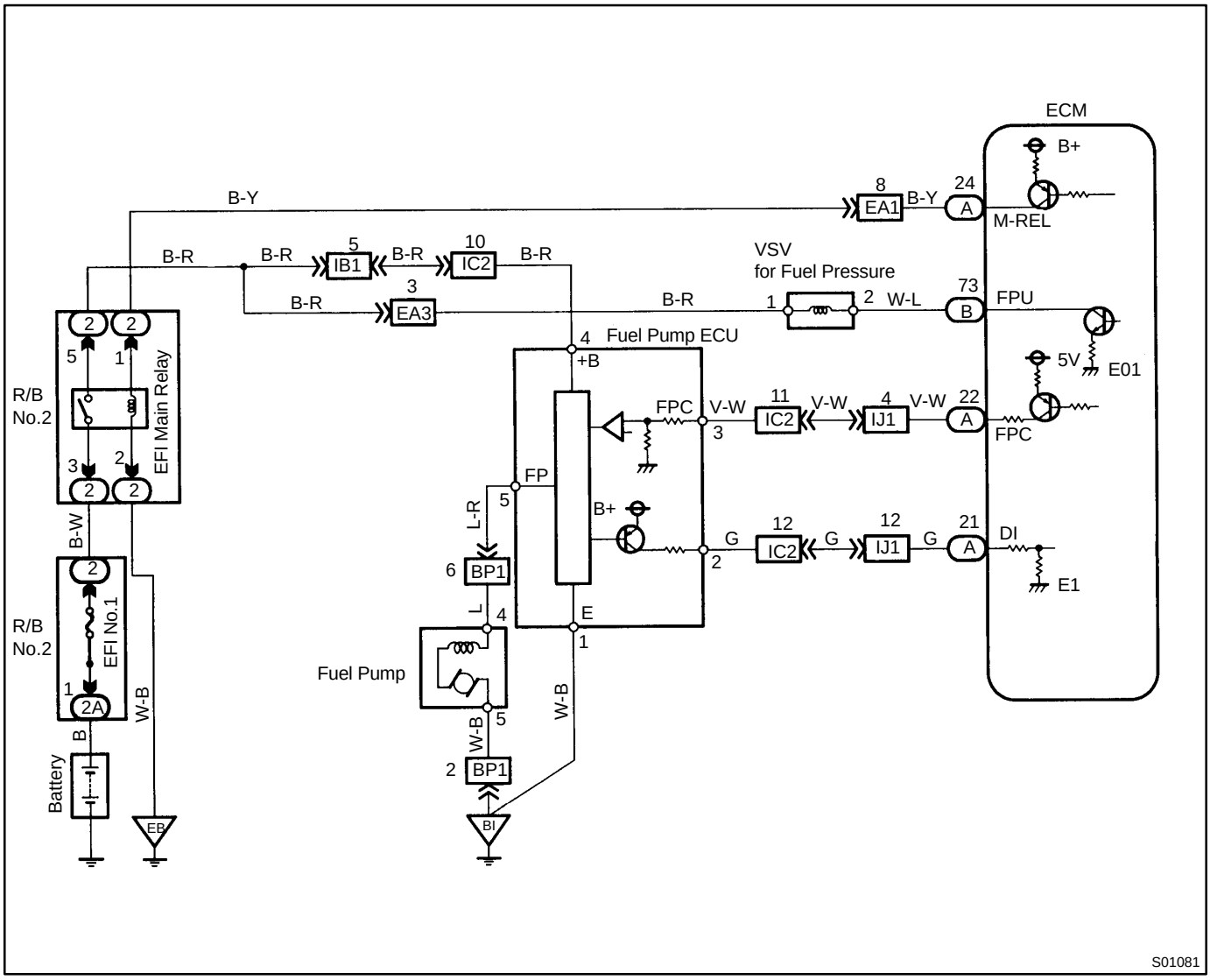
DTC	P1200	Fuel Pump Relay/ECU Circuit Malfunction

CIRCUIT DESCRIPTION

The fuel pump speed is controlled at 2 steps (high speed, low speed) by the condition of the engine (starting, light load, heavy load), when the engine starts (STA ON), the ECM sends a Hi signal (about 5 V) to the fuel pump ECU (FPC terminal).
The fuel pump ECU then outputs Hi voltage (battery positive voltage) to the fuel pump so that the fuel pump operates at high speed.
After the engine starts, during idling or light loads, the ECM outputs a Low signal (about 2.5 V) to the fuel pump ECU, the fuel pump ECU outputs Low voltage (about 9 V) to the fuel pump and causes the fuel pump to operate at low speed.
If the intake air volume increases (high engine load), the ECM sends a Hi signal to the fuel pump ECU and causes the fuel pump to operate at high speed.

DTC No.	DTC Detecting Condition	Trouble Area
P1200	Open or short in fuel pump circuit for 1 sec. or more with engine speed 1,000 rpm or less (2 trip detection logic)	• Open or short in fuel pump ECU circuit • Fuel pump ECU • ECM power source circuit • Fuel pump • ECM
	Open in input circuit of fuel pump ECU (FPC) with engine speed 1,000 rpm or less (2 trip detection logic)	
	Open or short in diagnostic signal line (DI) of fuel pump ECU with engine speed 1,000 rpm or less (2 trip detection logic)	

WIRING DIAGRAM



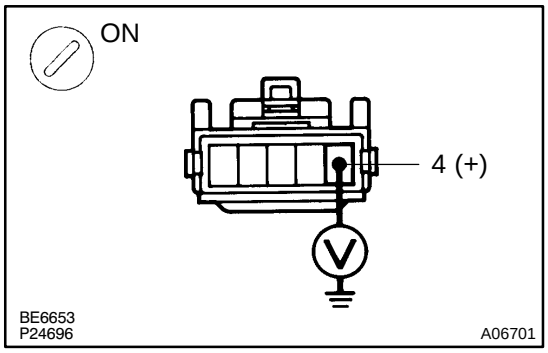
INSPECTION PROCEDURE

1	**Check operation of fuel pump (See page SF-5).**

OK → **Go to step 7.**

NG

2	**Check voltage of fuel pump ECU power source.**



PREPARATION:
(a) Remove LH quarter trim panel (See page SF-73).
(b) Disconnect fuel pump ECU connector.
(c) Turn ignition switch ON.

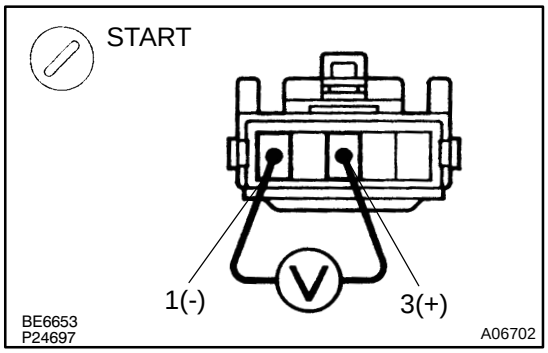
CHECK:
Measure voltage between terminal 4 of fuel pump ECU connector and body ground.

OK:
Voltage: 9 - 14 V

NG → **Check for open and short in harness and connector between EFI main relay (Marking: EFI MAIN) and fuel pump ECU (See page IN-28).**

OK

3	**Check voltage between terminals 1 and 3 of fuel pump ECU connector.**



PREPARATION:
(a) Remove LH quarter trim panel (See page SF-73).
(b) Disconnect fuel pump ECU connector.

CHECK:
Measure voltage between terminals 1 and 3 of fuel pump ECU connector when ignition switch is turned to start.

OK:
Voltage: 4.5 - 5.5 V

OK → **Go to step 5.**

NG

4	Check for open and short in harness and connector between terminals FPC of ECM and 3 of fuel pump ECU, terminal 1 of fuel pump ECU and body ground (See page IN-28).

NG → Repair or replace harness or connector.

OK →

Check and replace ECM.

5	Check fuel pump (See page SF-5).

NG → Repair or replace fuel pump.

OK →

6	Check for open and short in harness and connector between terminal 5 of fuel pump ECU and fuel pump, fuel pump and body ground (See page IN-28).

NG → Repair or replace harness or connector.

OK →

Replace fuel pump ECU.

7	**Check for open and short in harness and connector between terminals DI of ECM and 2 of fuel pump ECU (See page IN-28).**

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

OK

Check and replace ECM.

DI4S5-01

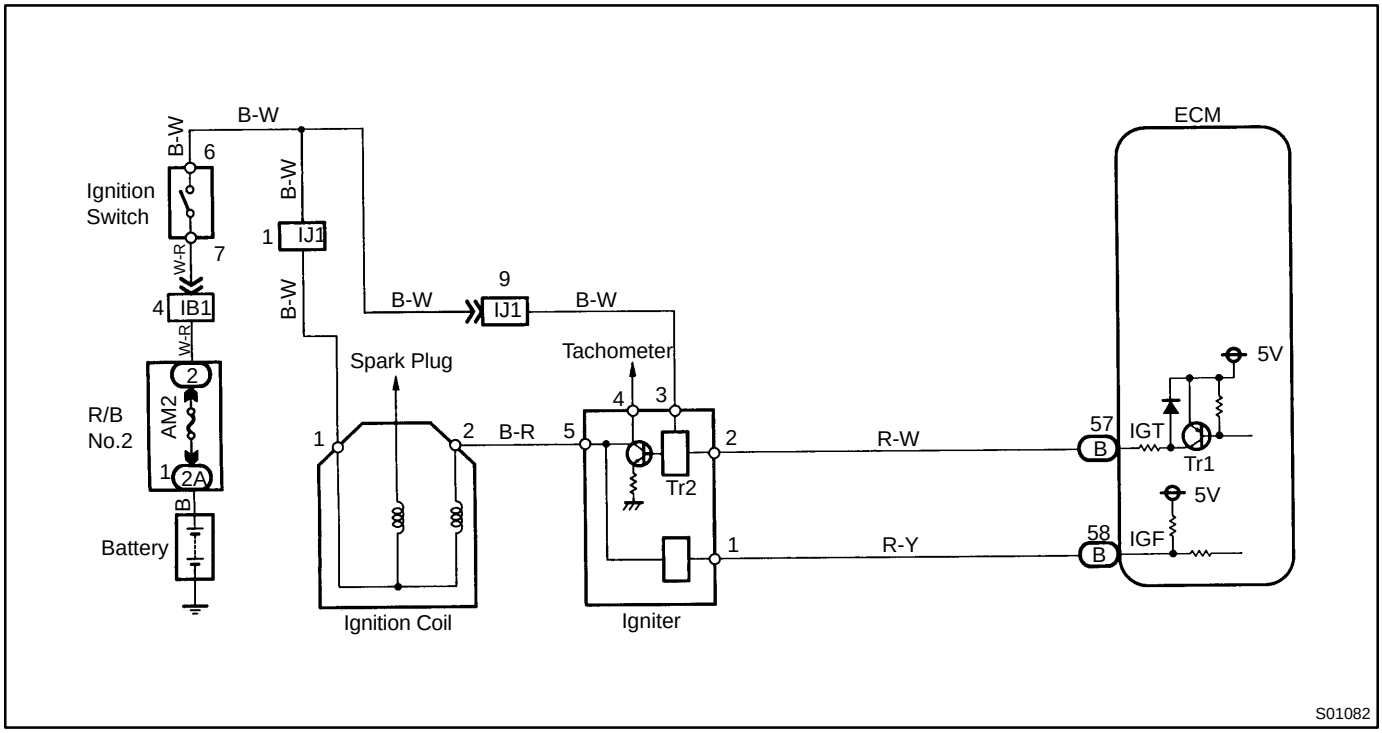
DTC	P1300	Igniter Circuit Malfunction

CIRCUIT DESCRIPTION

The ECM determines the ignition timing, turns on Tr1 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 Tr2 turns on.
When it reaches the ignition timing, the ECM turns Tr1 off and outputs the IGT signal ”0”.
This turns Tr2 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 12 consecutive 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 and spark of misfiring cylinder (See page DI-60).

NG → Go to step 4.

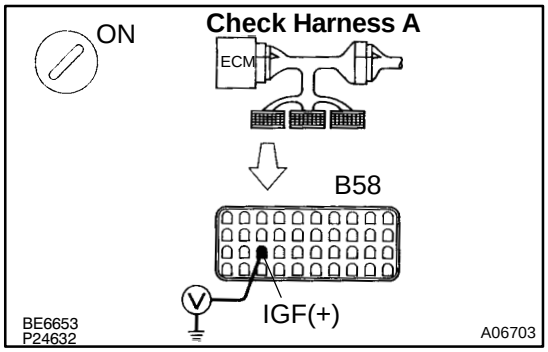
OK

2	Check for open and short in harness and connector in IGF signal circuit between ECM and igniter (See page IN-28).

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) Connect Check Harness A (See page DI-20).

(b) Turn 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 (See page IG-1).

NG

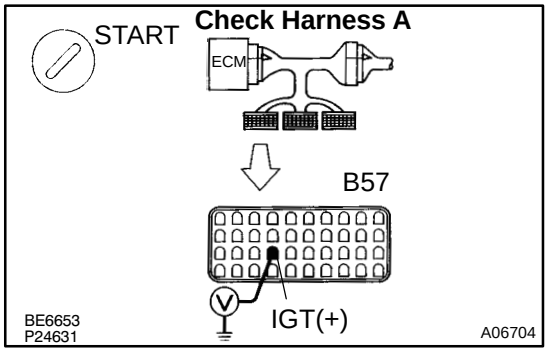
Check and replace ECM (See page IN-28).

4	**Check for open and short in harness and connector in IGT signal circuit between ECM and igniter (See page IN-18).**

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

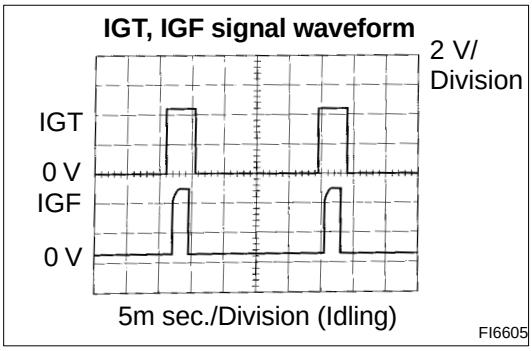
OK

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



PREPARATION:
Connect Check Harness A (See page DI-20).
CHECK:
Measure voltage between terminal 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



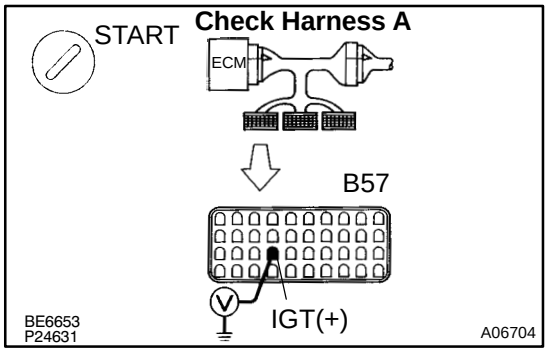
- During cranking or idling, check waveforms between terminal IGT, IGF and E1 of ECM.

HINT:
The correct rectangular waveforms are as shown.

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

OK

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



PREPARATION:

(a) Disconnect igniter connector.

(b) Connect Check Harness A (See page DI-20).

CHECK:

Measure voltage between terminal IGT of ECM connector and body ground when engine is cranked.

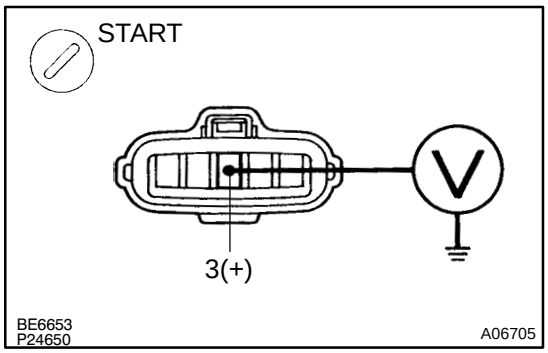
OK:

Voltage: More than 0.1 V and less than 4.5 V

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

OK

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



PREPARATION:

Disconnect igniter connector.

CHECK:

Measure voltage between terminal 3 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-28).**

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

OK

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

NG → **Replace ignition coil**

OK

Replace igniter.

DI4S6-01

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

CIRCUIT DESCRIPTION

Refer to Crankshaft Position Sensor ”A” Circuit Malfunction on page DI-69 .

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

See DTC P0335 for the WIRING DIAGRAM and INSPECTION PROCEDURE.

DI4S7-01

DTC	P1500	Starter Signal Circuit Malfunction

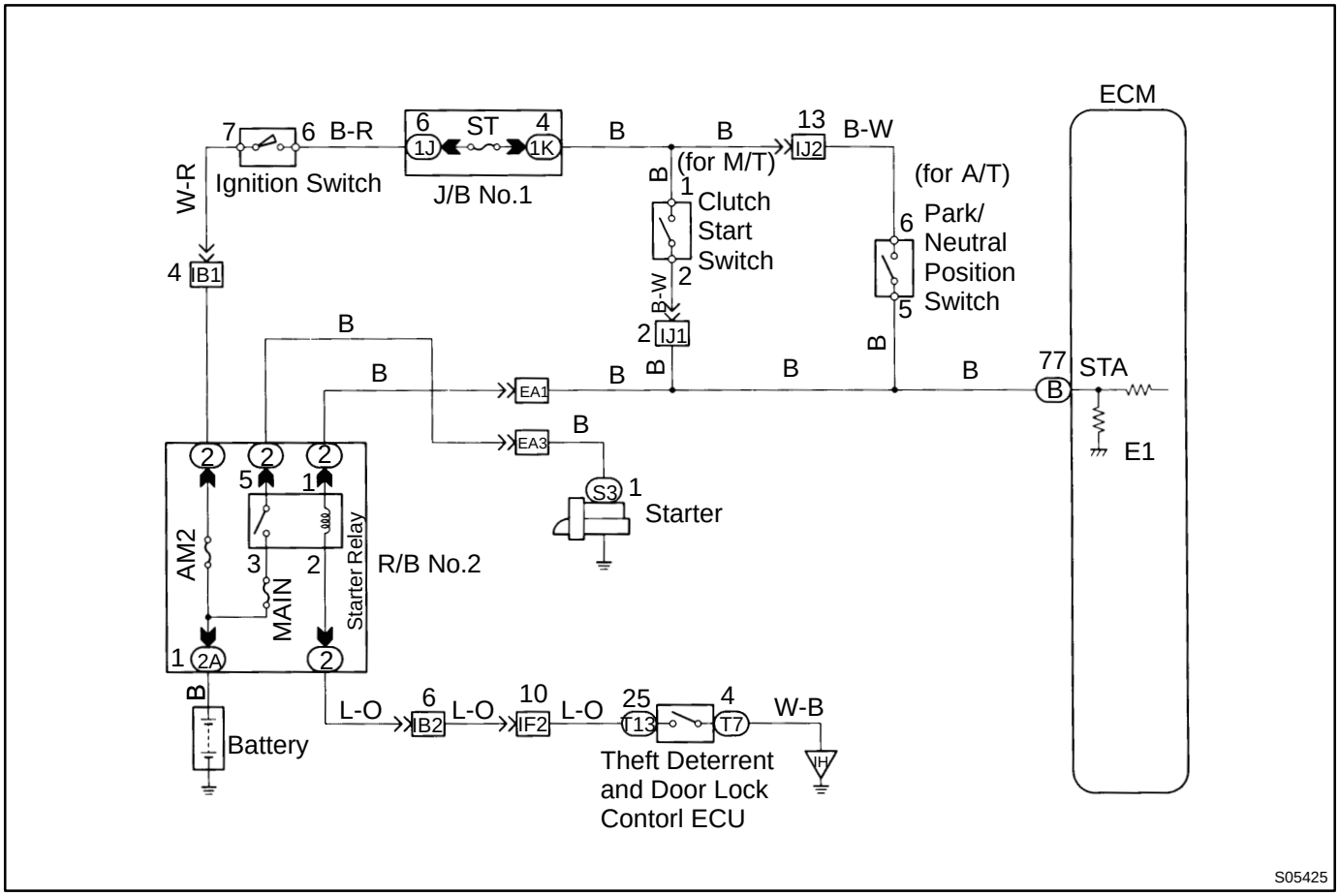
CIRCUIT DESCRIPTION

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

DTC No.	DTC Detecting Condition	Trouble Area
P1500	No starter signal to ECM	• Open or short in starter signal circuit • Open or short in ignition switch or starter relay circuit • ECM

HINT:
In this circuit, diagnosis can only be made in the check mode.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

This diagnostic chart is based on the premise that the engine is cranked normally. If the engine is not ranked, proceed to the matrix chart of problem symptoms on page DI-24 .

1	**Connect the TOYOTA hand-held tester and check STA signal.**

PREPARATION:

(a) Connect the TOYOTA hand-held tester to the DLC 3.

(b) Turn ignition switch ON, and 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 matrix chart (See page DI-24).**

NG

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

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

OK

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

DI4S8-01

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

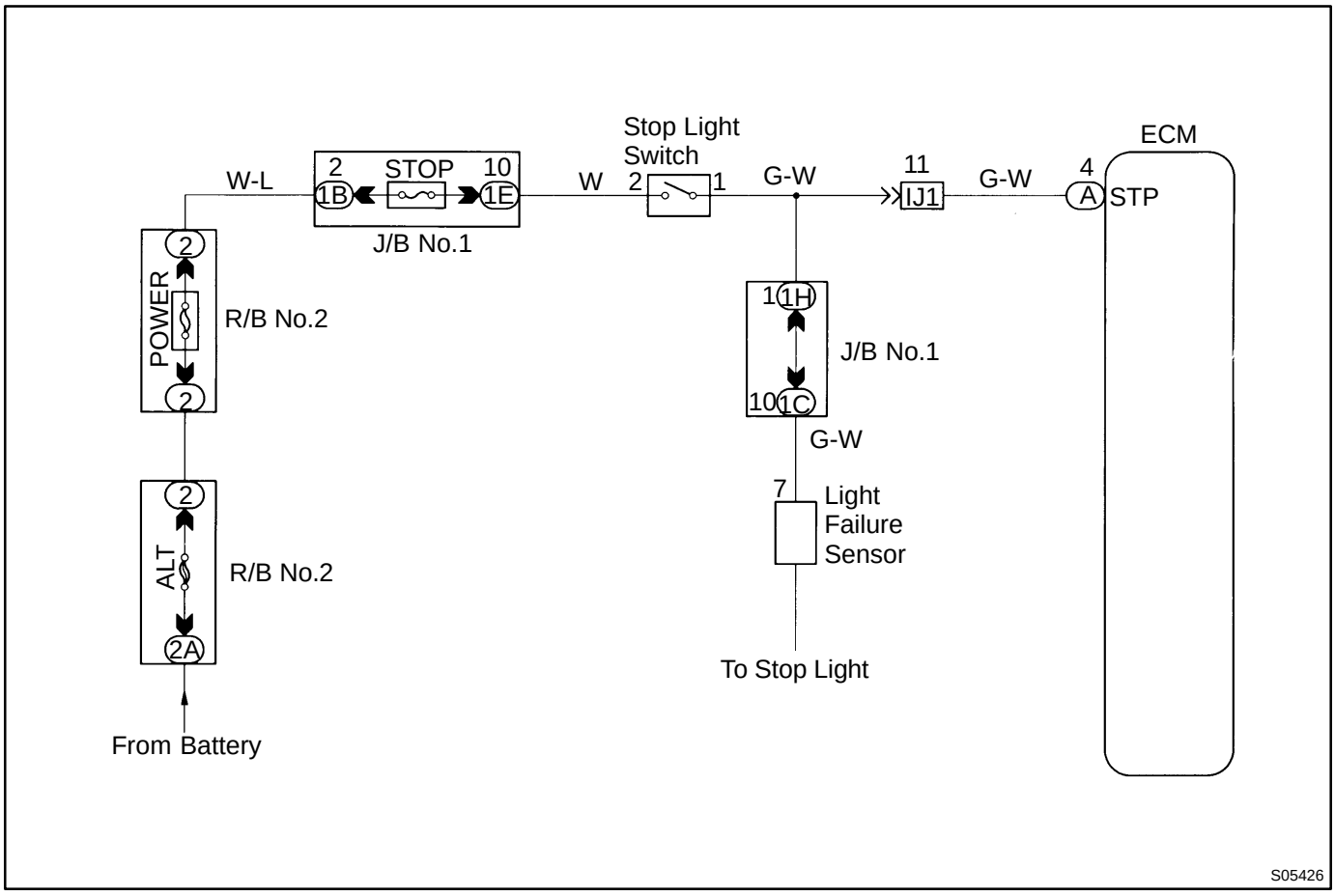
CIRCUIT DESCRIPTION

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

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

DTC No.	DTC Detecting Condition	Trouble Area
P1520	The 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

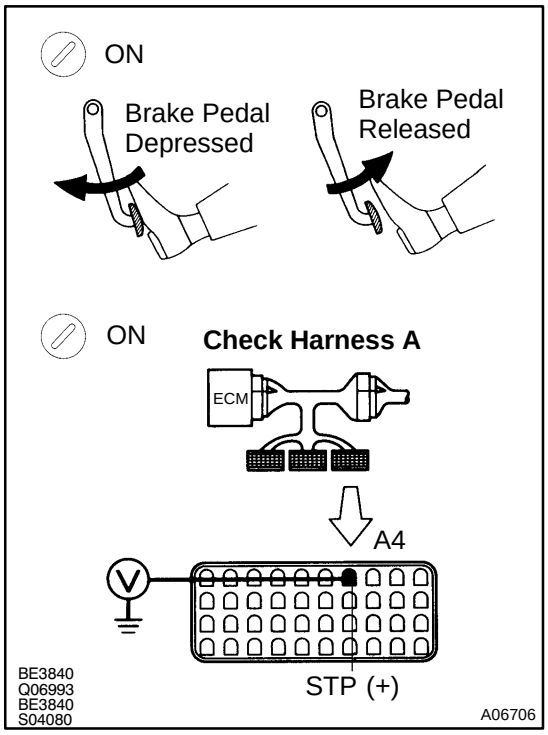
1	**Check operation of stop light.**

CHECK:
Check if the 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-33).**

OK

2	**Check STP signal.**



When using TOYOTA hand-held tester:

PREPARATION:

(a) Connect the TOYOTA hand-held tester to the DLC3.
(b) Turn the ignition switch ON and TOYOTA hand-held tester main switch ON.

CHECK:

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

OK:

Break pedal is depressed: STP ... ON
Break pedal is released: STP ... OFF

When not using TOYOTA hand-held tester:

PREPARATION:

Connect Check Harness A (See page DI-20).

CHECK:

(a) Turn ignition switch ON.
(b) Check voltage between terminal STP of ECM and body ground.

OK:

Brake pedal	Voltage
Depressed	7.5 - 14 V
Released	Below 1.5 V

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

NG

3	**Check harness and connector between ECM and stop light switch (See page IN-28).**

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

OK

Check and replace ECM.

DI4S9-01

DTC	P1600	ECM BATT Malfunction

CIRCUIT DESCRIPTION

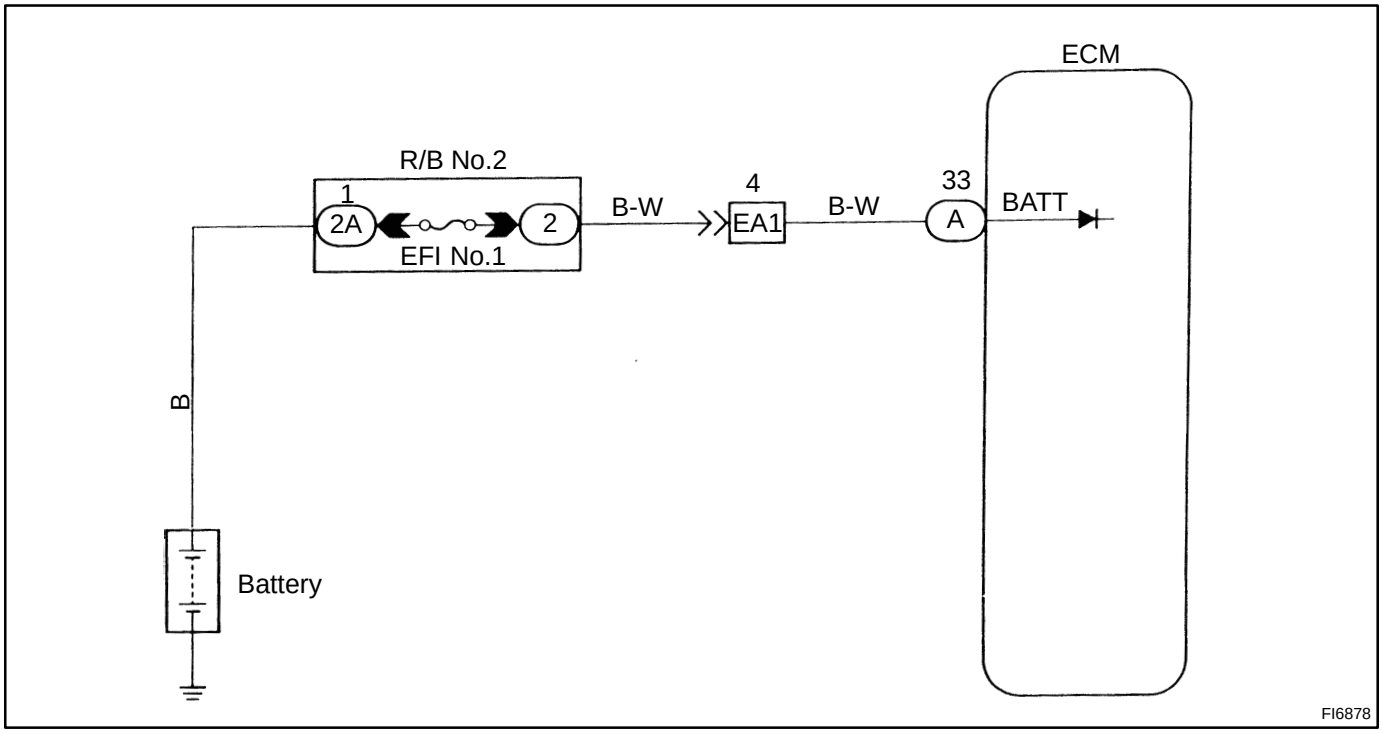
Battery positive voltage is supplied to terminal BATT of the ECM even when the ignition switch is OFF for use by the DTC memory and air-fuel ratio adaptive control value memory, etc.

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

HINT:

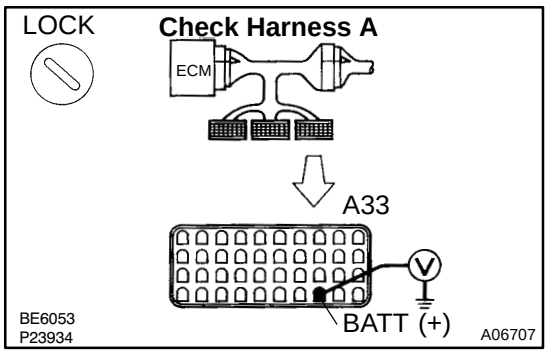
If DTC P1600 appear, the ECM does not store another DTC.

WIRING DIAGRAM



INSPECTION PROCEDURE

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

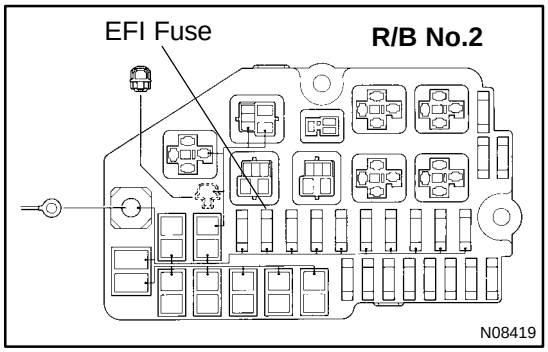


PREPARATION:
Connect Check Harness A (See page DI-20).
CHECK:
Measure voltage between terminal BATT of ECM connector and body ground.
OK:
Voltage: 9 - 14 V

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

NG

2	**Check EFI fuse.**



PREPARATION:
Remove EFI fuse from R/B No.2.
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.

DI4SA-01

DTC	P1605	Knock Control CPU Malfunction

CIRCUIT DESCRIPTION

Refer to Knock Sensor 1, 2 Circuit Malfunction on page DI-65 .

DTC No.	DTC Detecting Condition	Trouble Area
P1605	Engine control computer malfunction (for knock contorl)	• ECM

WIRING DIAGRAM

Refer to page DI-65 for the WIRING DIAGRAM.

INSPECTION PROCEDURE

1	Are there any other codes (besides DTC P1605) being output?

YES → Go to relevant DTC chart.

NO →

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

DI4SB-01

DTC	P1780	Park/Neutral Position Switch Malfunction

CIRCUIT DESCRIPTION

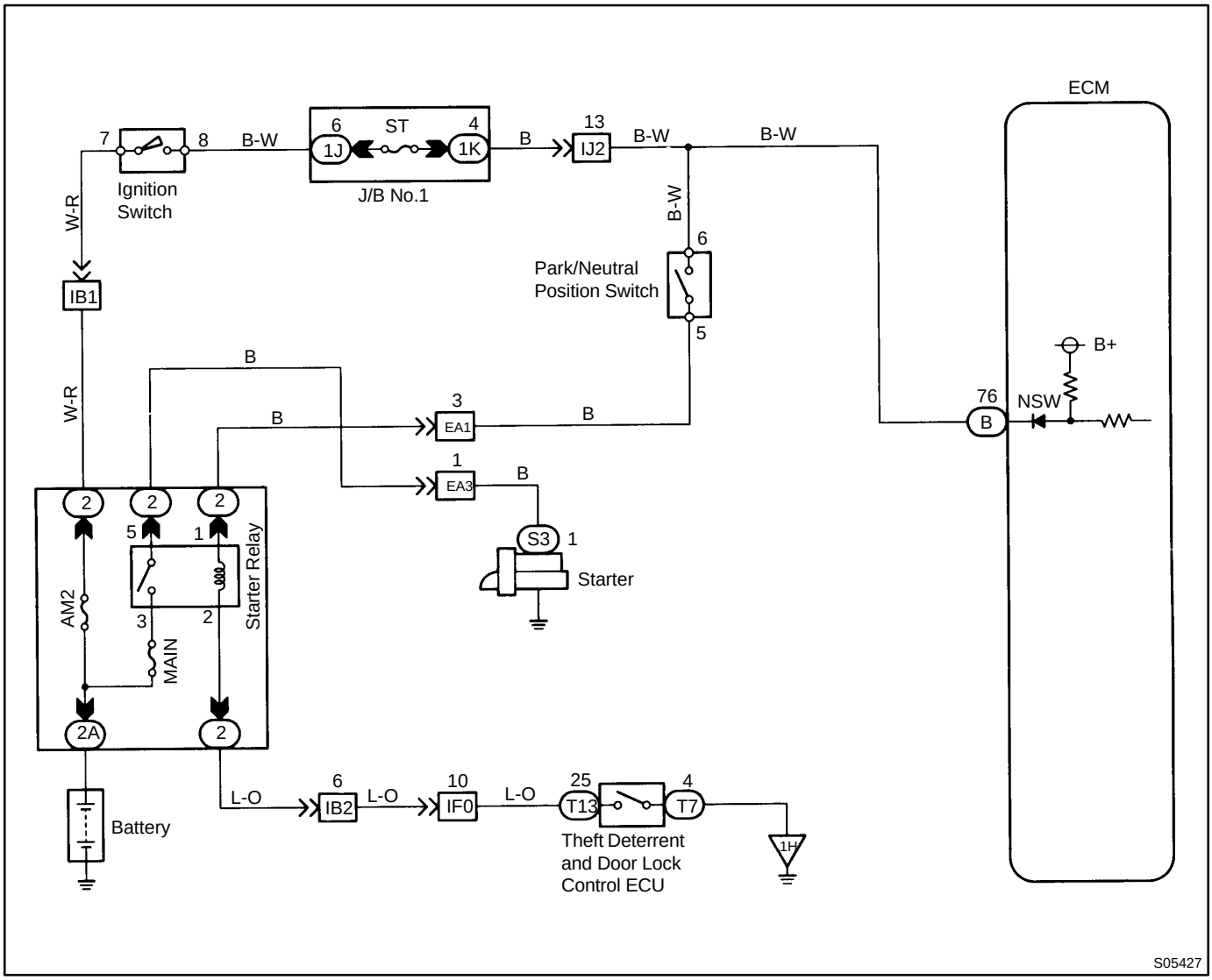
The park/neutral position switch goes on when the shift lever is in the N or P shift position. When it goes on terminal NSW of the ECM is grounded to body ground via the starter relay thus the terminal NSW voltage becomes 0 V. When the shift lever is in the D, 2, L or R position, the park/neutral position 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 ”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: 2,000 - 2,500 rpm	

HINT:

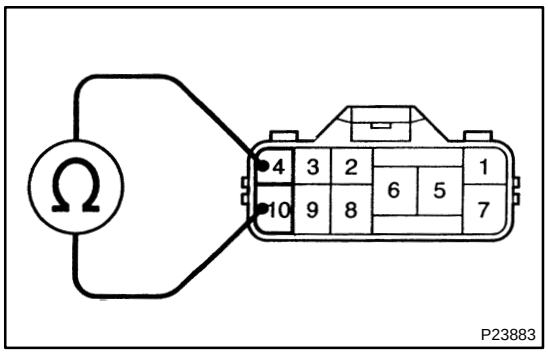
After confirming DTC P1780 use the TOYOTA hand-held tester to confirm the PNP switch signal from ”CURRENT DATA”.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check park/neutral position switch.



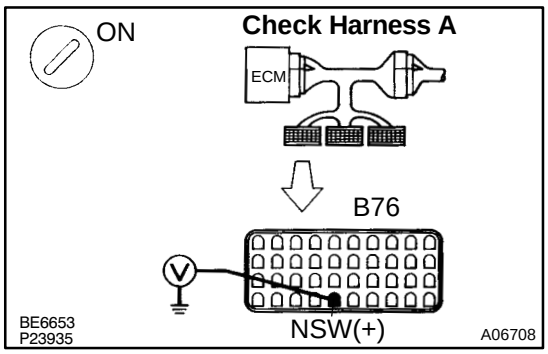
PREPARATION:
Disconnect park/neutral position switch connector.
CHECK:
Check continuity between each terminal shown below when the shift lever is positioned to each range.
OK:

Shift Position	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 (See page AT-8).**

OK ↓

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



PREPARATION:
Connect Check Harness A (See page DI-20).
CHECK:
(a) Turn ignition switch ON.
(b) Measure voltage between terminal NSW of ECM connector and body ground when the shift lever is positioned to the following positions.
OK:

Shift lever position	P or N	L, 2, D or R
Voltage	0 V	9 - 14 V

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

NG ↓

Check for open and short in harness and connector between ECM and park/neutral position switch (See page IN-28).

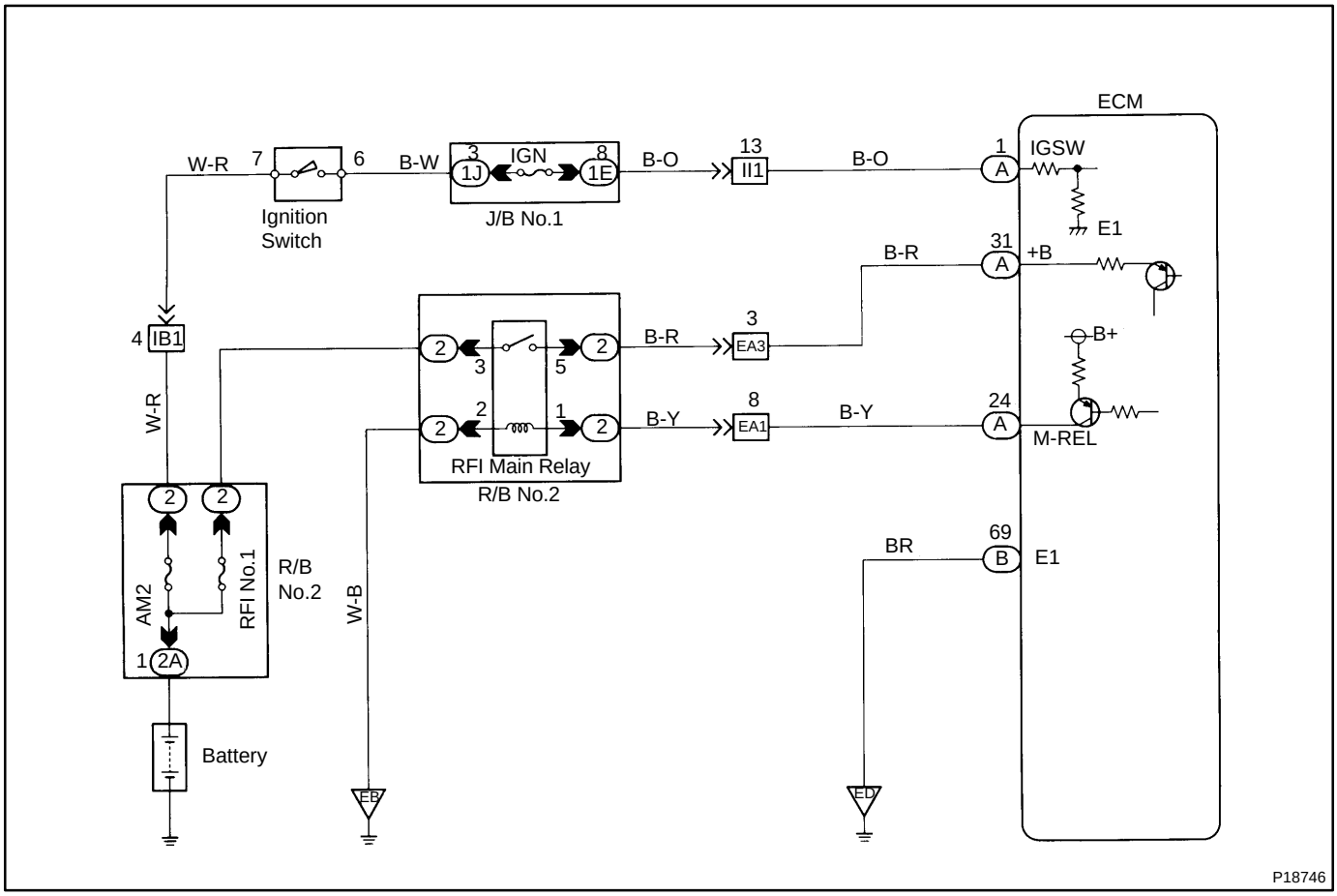
DI4SC-01

ECM Power Source Circuit

CIRCUIT DESCRIPTION

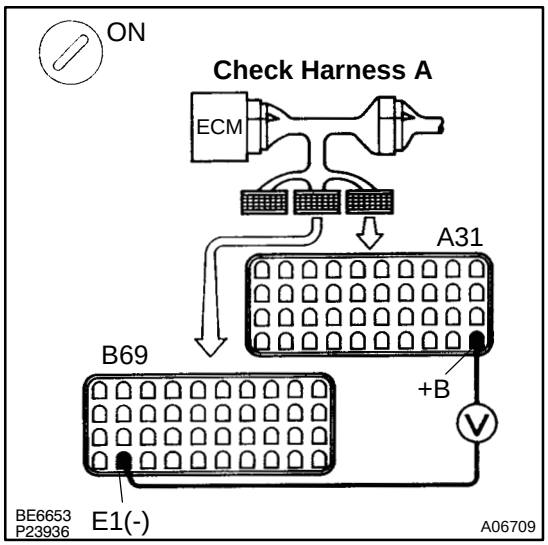
When the ignition switch is turned ON, battery positive voltage is applied to the coil, closing the contacts of the EFI main relay and supplying power to the terminals +B of the ECM.

WIRING DIAGRAM



INSPECTION PROCEDURE

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



PREPARATION:

(a) Connect Check Harness A (See page DI-20).

(b) Turn 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 matrix chart (See page DI-24).**

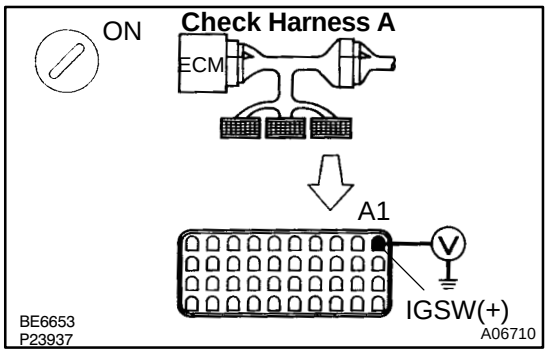
NG

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

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

OK

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

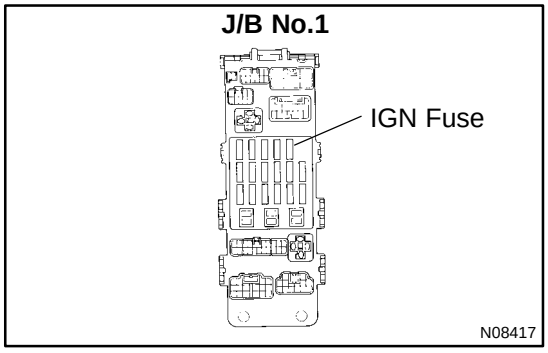


PREPARATION:
Turn ignition switch ON.
CHECK:
Measure voltage between terminal IGSW of ECM and body ground.
OK:
Voltage: 9 - 14 V

OK	Go to step 6.

NG

4	Check IGN fuse.



PREPARATION:
Remove IGN fuse from 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

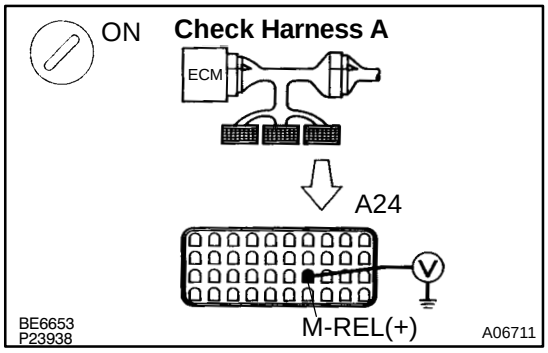
5	**Check ignition switch (See page BE-13).**

NG → **Replace ignition switch.**

OK

Check for open and short in harness and connector between battery and ignition switch, ignition switch and ECM (See page IN-28).

6	**Check voltage between terminal M-REL of ECM connector and body ground.**



PREPARATION:
Turn ignition switch ON.
CHECK:
Measure voltage between terminal M-REL of ECM and body ground.
OK:
Voltage: 9 - 14 V

NG → **Check and replace ECM.**

OK

7	**Check EFI fuse (See page DI-128).**

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

OK

8	Check EFI main relay (Marking: EFI MAIN) (See page SF-55).

NG → Replace EFI main relay (Marking: EFI MAIN).

OK

9	Check for open and short in harness and connector between terminal M-REL of ECM connector and body ground (See page IN-28).

NG → Repair or replace harness or connector.

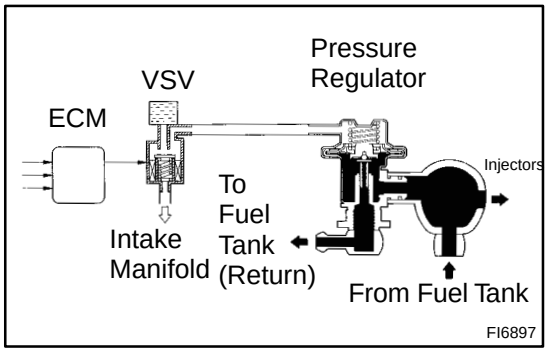
OK

Check for open and short in harness and connector between terminal +B of ECM connector and battery (See page IN-28).

DI4SD-01

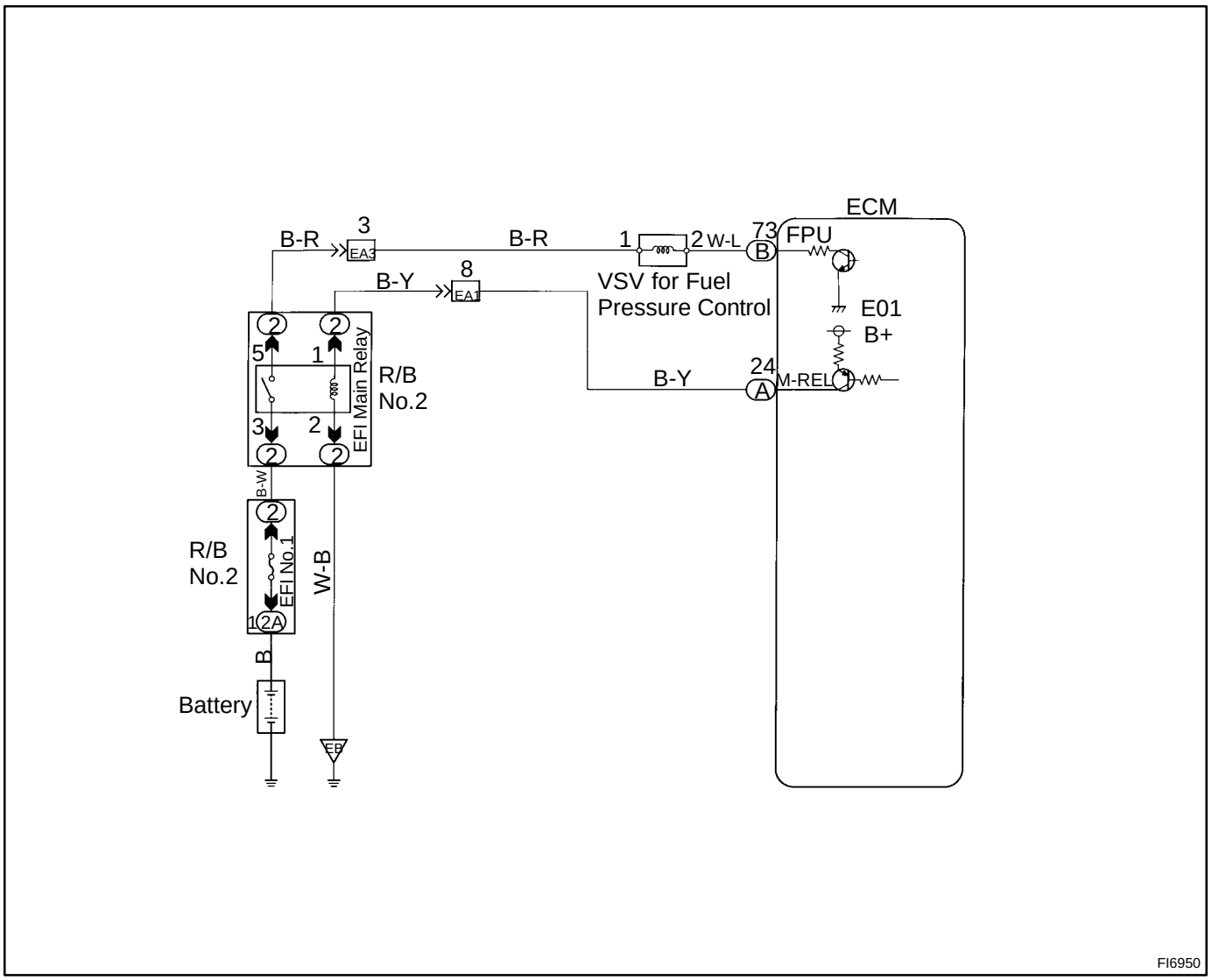
Fuel Pressure Control Circuit

CIRCUIT DESCRIPTION



The ECM turns on a VSV (Vacuum Switching Valve) to draw the air into the diaphragm chamber of the pressure regulator if it detects that the temperature of the engine coolant is too high during engine staring.
The air drawn into the chamber increases the fuel pressure to prevent fuel vapor lock at high engine temperature in order to help the engine start when it is warm.
Fuel pressure control ends approx. 120 sec. after the engine is started.

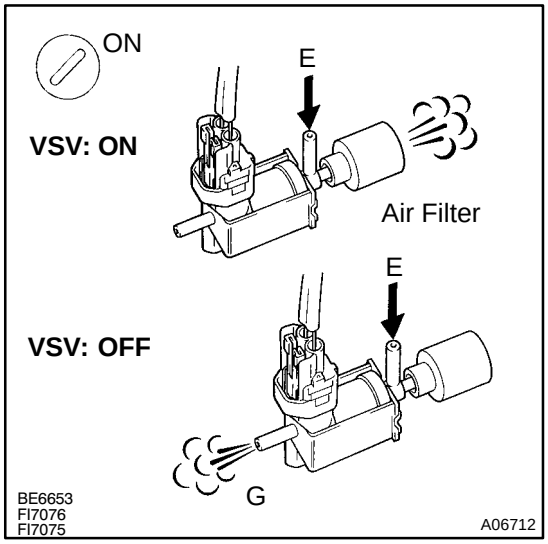
WIRING DIAGRAM



INSPECTION PROCEDURE

TOYOTA hand-held tester

1	**Connect the TOYOTA hand-held tester and check operation of VSV for fuel pressure control.**



PREPARATION:

(a) Connect the TOYOTA hand-held tester to the DLC3.
(b) Turn 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 VSV is operated by the TOYOTA hand-held tester.

OK:

VSV is ON:
Air from pipe E flows out through the air filter.
VSV is OFF:
Air from pipe E flows out through pipe G.

OK	**Check and repair fuel pressure regulator (See page SF-5).**

NG

2	**Check VSV for fuel pressure control (See page SF-57).**

NG	**Replace VSV for fuel pressure control.**

OK

3	**Check for open and short in harness and connector between EFI main relay (Marking: EFI MAIN) and ECM (See page IN-28).**

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

OK

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

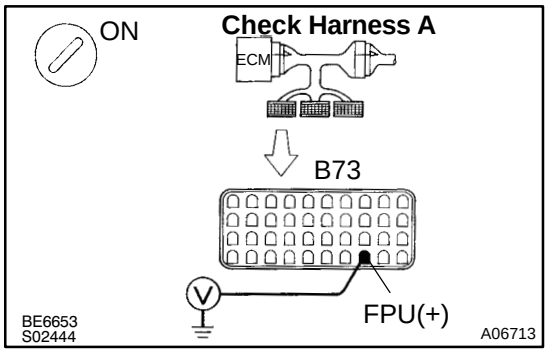
OBDII scan tool (excluding TOYOTA hand-held tester)

1	**Check VSV for fuel pressure control (See page SF-57).**

NG → **Replace VSV for fuel pressure control.**

OK

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



PREPARATION:

(a) Connect Check Harness A (See page DI-20).

(b) Turn ignition switch ON.

CHECK:

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

OK:

Voltage: 9 - 14 V

NG → **Check for open and short in harness and connector between EFI main relay (Marking: EFI MAIN) and ECM (See page IN-28).**

OK

3	Check fuel pressure regulator (See page SF-1).

NG → Repair or replace.

OK →

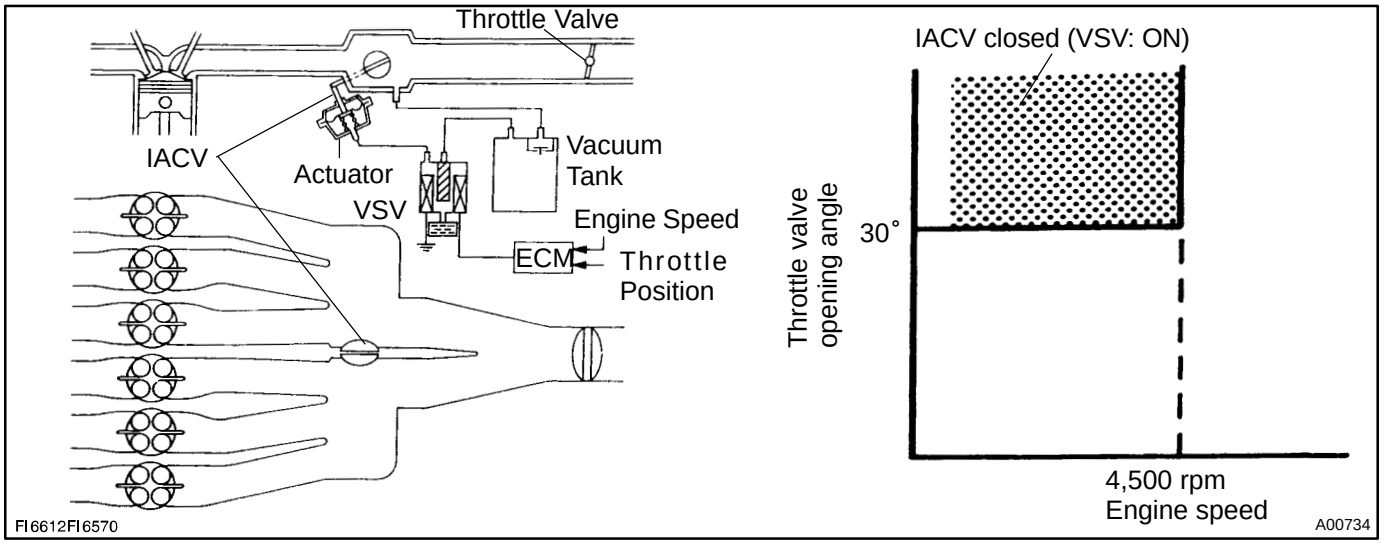
Check and replace ECM (See page IN-28).

DI4SE-01

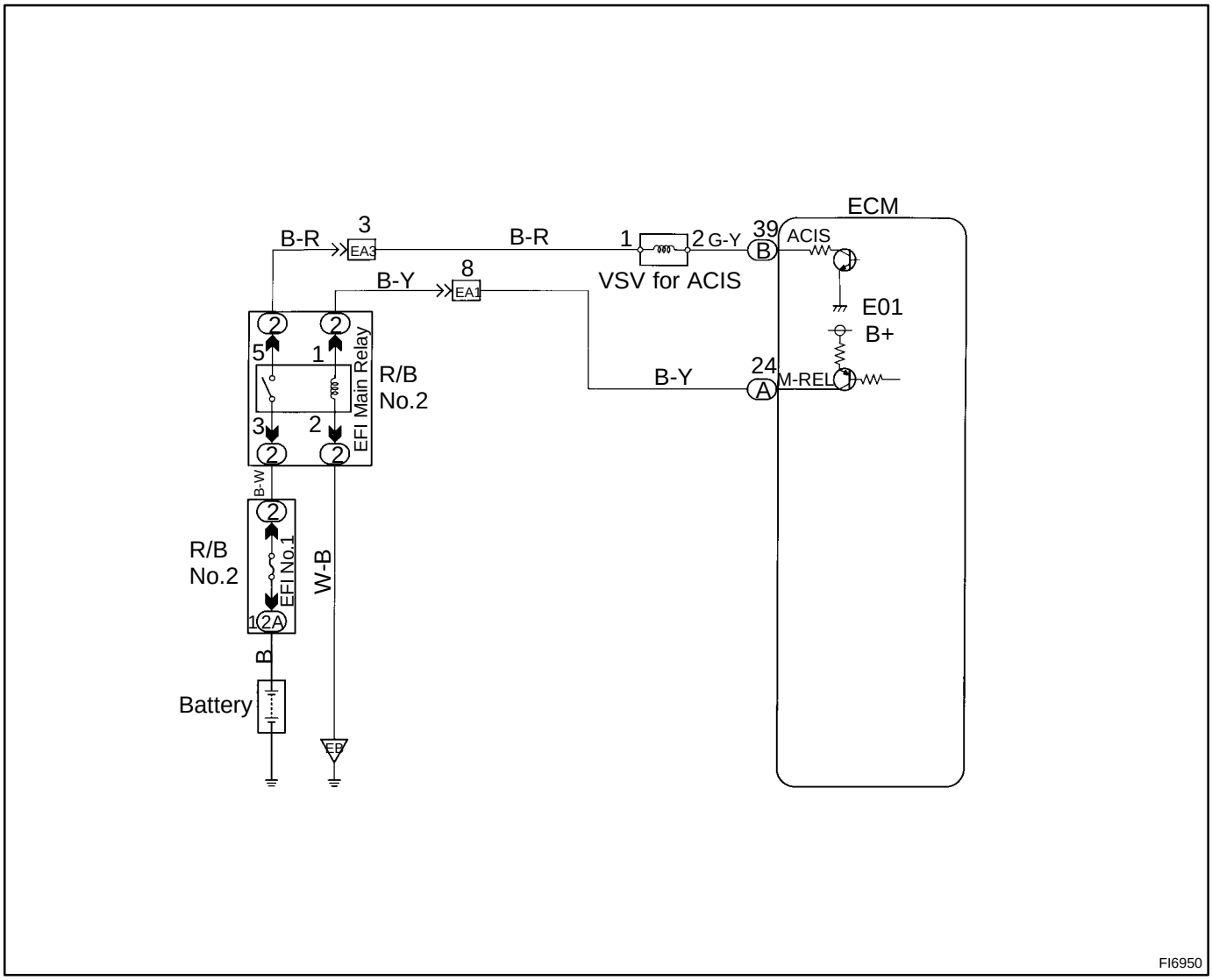
IACV Control Circuit

CIRCUIT DESCRIPTION

This circuit opens and closes the IACV (Intake Air Control Valve) in response to the engine load in order to increase the intake efficiency (ACIS: Acoustic Control Indication System).
When the engine speed is 4,500 rpm or less and the throttle valve opening angle is 30° or more, the ECM turns the VSV ON and closes the IACV. At all other times, the VSV is OFF, so the IACV is open.



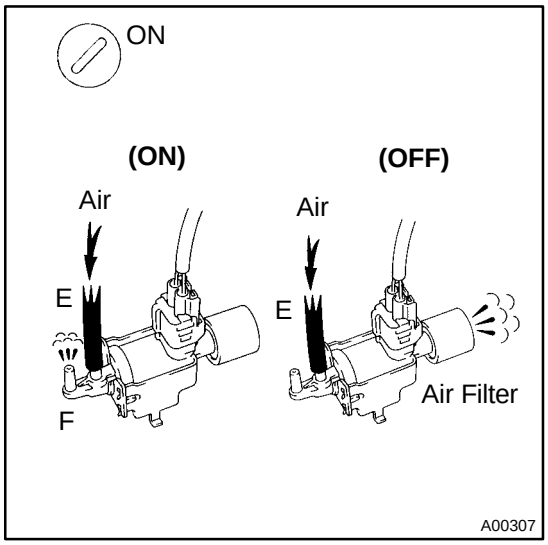
WIRING DIAGRAM



INSPECTION PROCEDURE

TOYOTA hand-held tester

1	**Connect the TOYOTA hand-held tester and check operation of VSV for ACIS.**



PREPARATION:

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

(b) Turn 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 VSV is operated by TOYOTA hand-held tester.

OK:

VSV is ON:
Air from pipe E flows out through pipe F.
VSV is OFF:
Air from pipe E flows through the air filter.

OK	**Check for vacuum tank (See page SF-50).**

NG

2	**Check VSV for ACIS (See page SF-63).**

NG	**Replace VSV for ACIS.**

OK

3	**Check for open and short in harness and connector between EFI main relay (Marking: EFI MAIN) and ECM (See page IN-28).**

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

OK

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

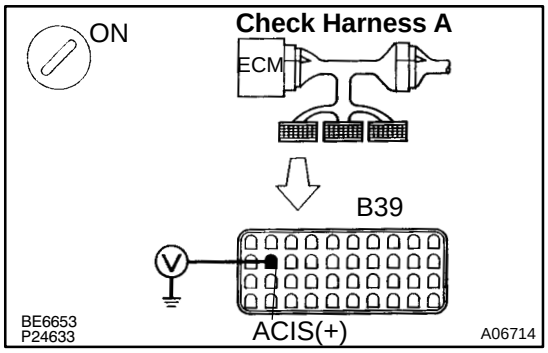
OBDII scan tool (excluding TOYOTA hand-held tester)

1	**Check VSV for ACIS (See page SF-63).**

NG → **Replace VSV for ACIS.**

OK

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



PREPARATION:

(a) Connect Check Harness A (See page DI-20).

(b) Turn ignition switch ON.

CHECK:

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

OK:

Voltage: 9 - 14 V

NG → **Check for open and short in harness and connector between EFI main relay (Marking: EFI MAIN) and ECM (See page IN-28).**

OK

3	**Check for vacuum tank (See page SF-50).**

NG → **Repair or replace.**

OK

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