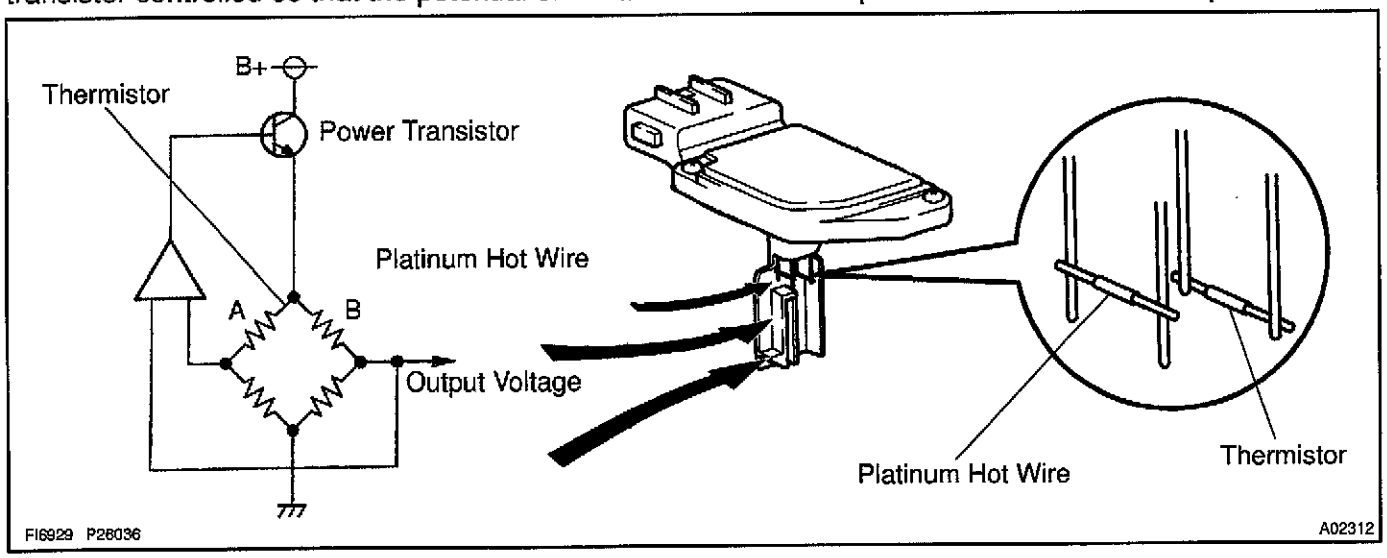
DH1B-01

CIRCUIT INSPECTION

DTC	P0100/31	Air Flow Circuit Malfunction

CIRCUIT DESCRIPTION

The air flow meter uses a platinum hot wire. The hot wire air flow meter consists of a platinum hot wire, thermistor and a control circuit installed in a plastic housing. the hot wire air flow meter works on the principle that the hot wire and thermistor located in the intake air bypass of the housing detect any changes in the intake air temp.
The hot wire is maintained at the set temp. by controlling the current flow through the hot wire. This current flow is 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 temp.

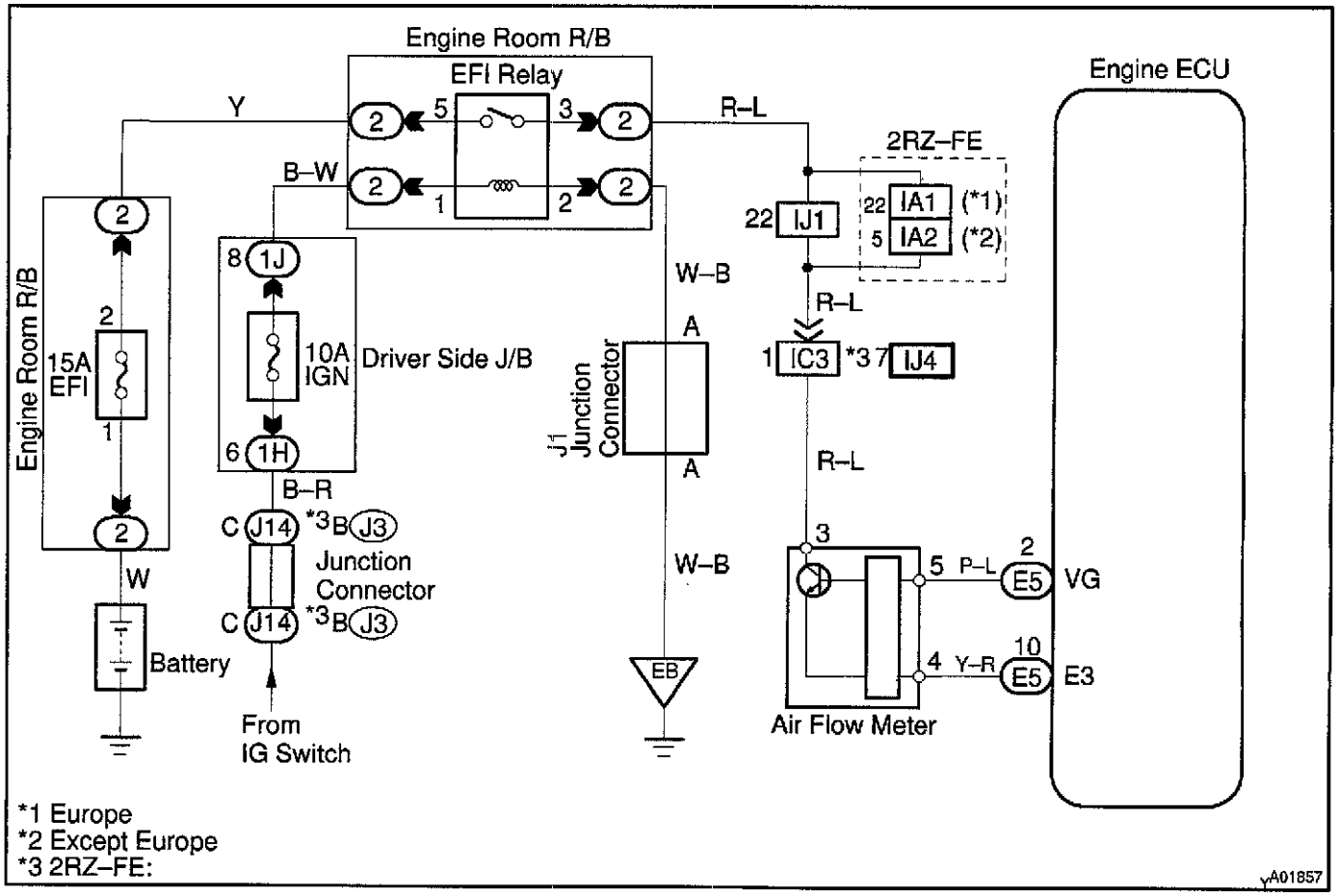


DTC No.	DTC Detecting Condition	Trouble Area
P0100/31	Open or short in air flow meter circuit for 3 sec. engine speed or more 3,000 rpm	• Open or short in air flow meter circuit • Air flow meter • Engine ECU

If the engine ECU detects DTC "P0100/31" it operates the fail safe function, keeping the ignition timing and injection volume constant and marking it possible to drive the vehicle.
HINT:
After confirming DTC "P0100/31" use the hand–held tester to confirm the air flow ratio from "CURRENT DATA".

Mass Air Flow Value (gm/sec.)	Malfunction
Approx. 0	• Air flow meter power source circuit open • VG circuit open or short
271.0 or more	• E2G circuit open

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

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

When using hand–held tester

1	**Connect the hand–held tester, and read value of air flow rate.**

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

CHECK:
Read air flow rate hand–held tester.

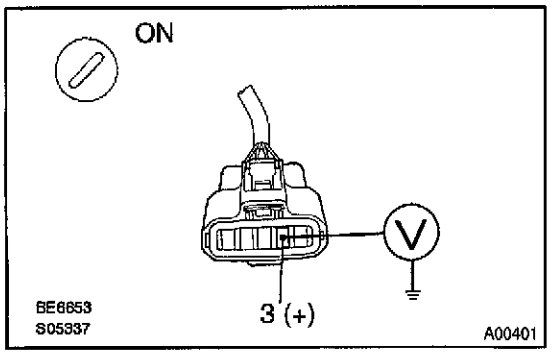
RESULT:

	Type I	Type II
Air flow rate (gm/sec.)	0.0 gm/sec.	271.0 gm/sec. or more

Type I

Type II → **Go to step 5.**

2	**Check voltage of air flow meter power source.**



PREPARATION:
(a) Disconnect the air flow meter connector.
(b) Turn ignition switch ON.

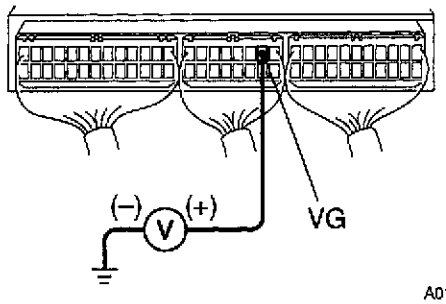
CHECK:
Measure voltage between terminal 3 of air flow meter connector and body ground.

OK:
Voltage: 9 ~ 14 V

NG → **Check for open in harness and connector between EFI main relay (Marking: EFI) and air flow meter (See page IN–21).**

OK

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



PREPARATION:

(a) Remove the glove compartment (See page FI–60).

(b) Start the engine.

CHECK:

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

OK:

Voltage:

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

OK → **Check and replace engine ECU (See page IN–21).**

NG

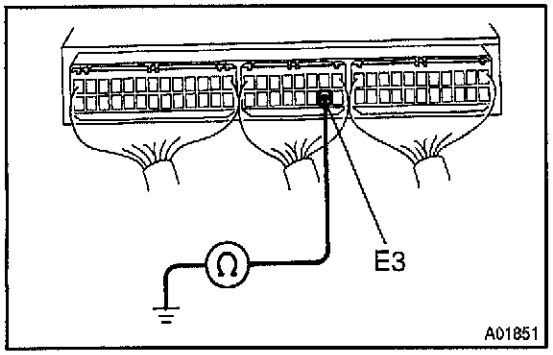
4	Check for open and short in harness and connector between air flow meter and engine ECU (See page IN–21).

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

OK

Replace air flow meter.

5	Check continuity between terminal E3 of engine ECU connector and body ground.



PREPARATION:
Remove the glove compartment (See page FI–60).
CHECK:
Check continuity between terminal E3 of engine ECU connector and body ground.
OK:
Continuity (1 Ω or less)

NG → **Check and replace engine ECU (See page IN–21).**

OK

6	Check for open in harness and connector between air flow meter and engine ECU (See page IN–21).

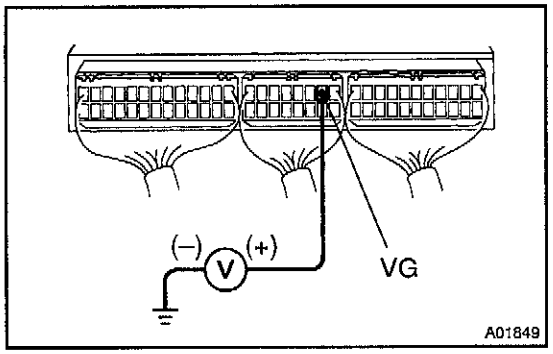
NG → **Repair or replace harness or connector.**

OK

Replace air flow meter.

When not using hand–held tester

1	Check voltage between terminal VG of engine ECU and ground.

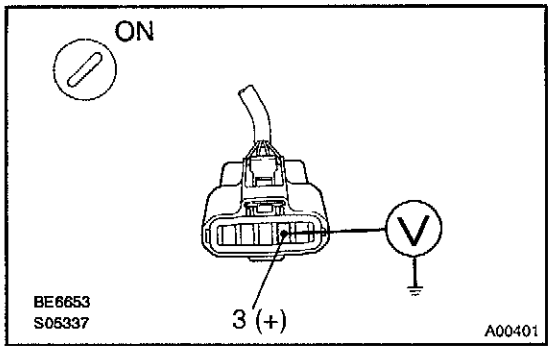


PREPARATION:
Remove the glove compartment (See page FI–60).
CHECK:
Measure voltage between terminal VG of engine ECU and body ground while engine is idling.
OK:
Voltage: 1.1 – 1.5 V
("P" or "N" position and A/C switch OFF)

OK	Check and replace engine ECU (See page IN–21)

OK

2	Check voltage of air flow meter power source



PREPARATION:
Disconnect the air flow meter connecter
Turn the ignition switch ON.
CHECK:
Measure voltage between terminal 3 of air flow meter connector and body ground.
OK:
Voltage: 9 – 14 V

NG	Check for open in harness and connecter between EFI main relay (Marking: EFI) and air flow meter (See page IN–21)

OK

3	**Check for open in harness and connector between air flow meter and engine ECU (See page IN–21).**

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

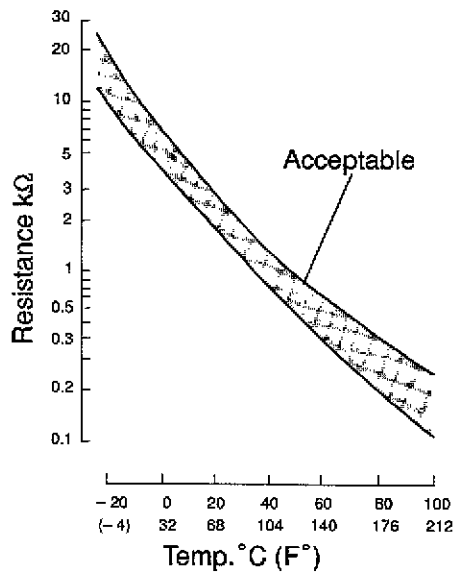
OK

Replace air flow meter.

DI1IC-01

DTC P0110/24 Intake Air Temp. Circuit Malfunction

(fig.1)



CIRCUIT DESCRIPTION

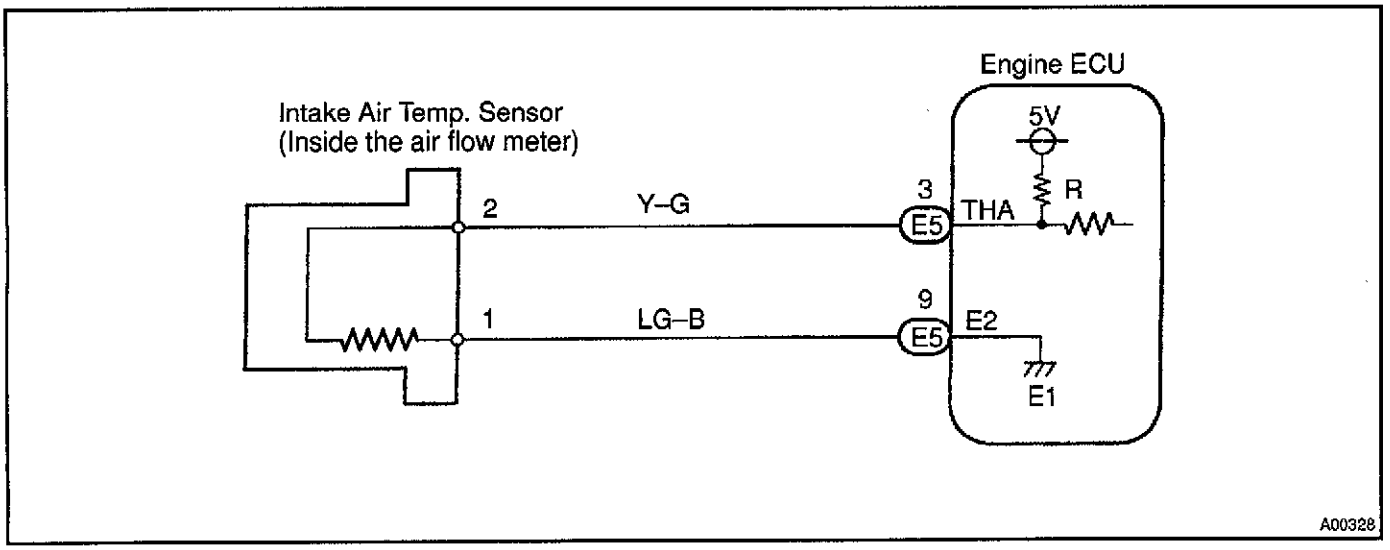
The intake air temp. sensor is built into the air flow meter and sensors the intake air temp.
A thermistor built in the sensor changes the resistance value according to the intake air temp. The lower the intake air temp. the greater the thermistor resistance value, and the higher the intake air temp. the lower the thermistor resistance value (See fig.1).
The air intake temp. sensor is connected to the engine ECU (See below). The 5V power source voltage in the ECU is applied to the intake air temp. sensor from the terminal THA via a resistor R.
That is the resistor R and the intake air temp. sensor are connected in series. When the resistance value of the intake air temp. sensor changes in accordance with changes in the intake air temp. the potential at terminal THA also changes. Based on this signal, the engine ECU increases the fuel injection volume to improve driveability during cold engine operation.
If the engine ECU detects the DTC "P0110/24", it operates the fail safe function in which the intake air temp. is assumed to be 20°C (68°F).

DTC No.	DTC Detecting Condition	Trouble Area
P0110/24	Open or short in intake air temp. sensor circuit for 0.5 sec or more	• Open or short in intake air temp. sensor circuit • Intake air temp. sensor • Engine ECU

HINT:
After confirming DTC P110/24 use the hand–held tester to confirm the intake air temp. from "CURRENT DATA".

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

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- Read freed frame data using hand–held tester. Because freeze frame records the engine conditions when the malfunction is detected, when troubleshooting it is useful for determining whether the vehicle was running or stopped, the engine warmed up or not, the air–fuel ratio lean or rich, etc. at the time of the malfunction.
- If DTC "P0110/24" (Intake Air Temp. Circuit Malfunction), "P0115/22" (Water Temp. Circuit Malfunction), "P0120/41" (Throttle Position Sensor Circuit Malfunction) are output simultaneously, E2 (Sensor Ground) may be open.

When using hand–held tester

1	Connect the hand–held tester, and read value of intake air temp.

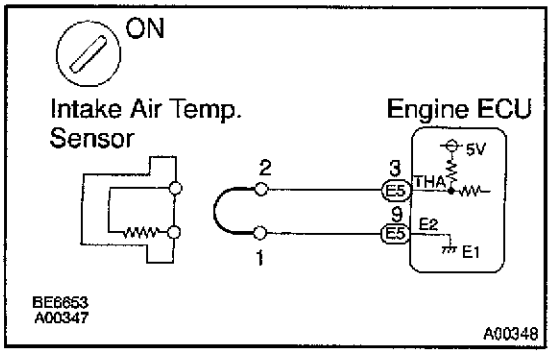
PREPARATION:
(a) Connect the hand–held tester to DLC3.
(b) Turn ignition switch ON and push the hand–held tester main switch ON.
CHECK:
Read temp. value on the hand–held tester.
OK:
Same as actual intake air temp.
HINT:
- If there is open circuit,hand–held tester indicates – 40°C (– 40°F).
- If there is short circuit, hand–held tester indicates 140°C (284°F) or more.

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

OK

Check for intermittent problem
(See gage DI–75)

2	Check for open in harness or engine ECU

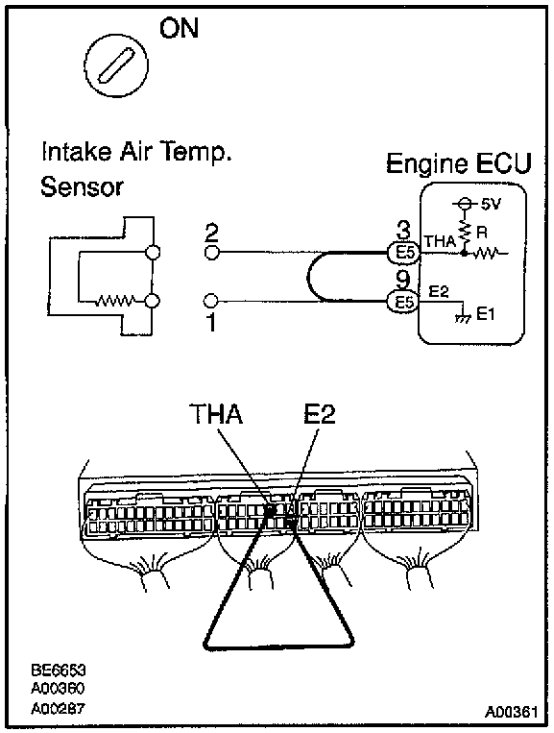


PREPARATION:
(a) Disconnect the air flow meter connector.
(b) Connect sensor wire harness terminals together.
(c) Turn ignition switch ON.
CHECK:
Read temp. value on the hand–held tester.
OK:
Temp. value: 140°C (284°F) or more

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

OK

3	Check for open in harness or engine ECU.



PREPARATION:

(a) Remove the glove compartment (See page FI–60).

(b) Connect between terminals THA and E2 of engine ECU E5 connector.

HINT:

Air flow meter connector is disconnected.

Before checking, do a visual and contact pressure check for the engine ECU connector (See page IN–21).

(c) Turn ignition switch ON.

CHECK:

Read temp. value on the hand–held tester.

OK:

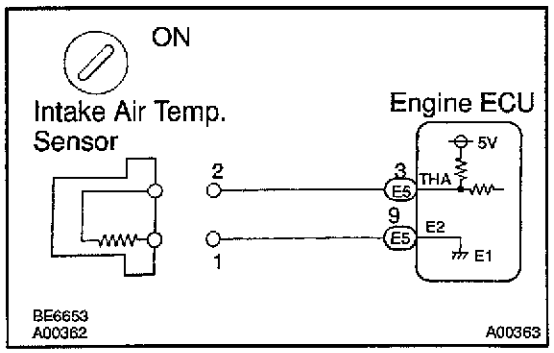
Temp. value: 140°C (284°F) or more

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

NG

Confirm good connection at engine ECU. If OK, replace engine ECU.

4	Check for short in harness and engine ECU.(See page IN–21)



PREPARATION:

(a) Disconnect the air flow meter connector.

(b) Turn ignition switch ON.

CHECK:

Read temp. value on the hand–held tester.

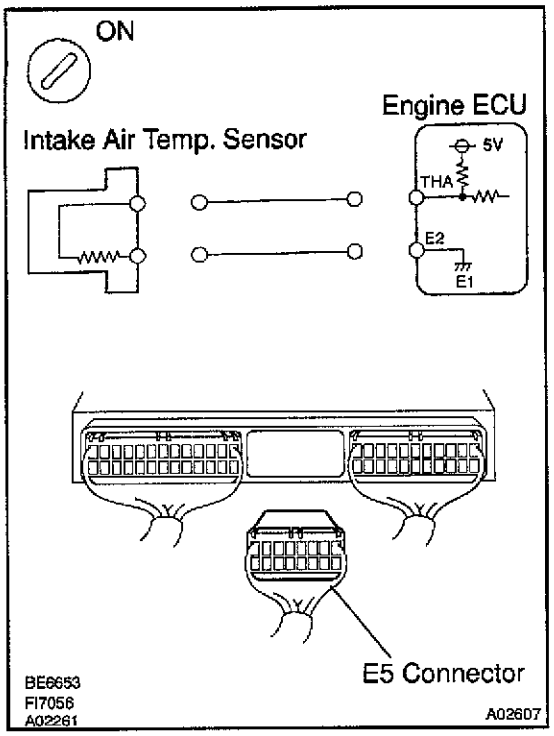
OK:

Temp. value: – 40°C (– 40°F)

OK	Replace intake air temp. sensor.

NG

5	Check for short in harness or engine ECU.



PREPARATION:

(a) Remove the glove compartment (See page FI–60).

(b) Disconnect the E5 connector of engine ECU.

HINT:

Intake air temp. sensor connector is disconnected.

(c) Turn ignition switch ON.

CHECK:

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

OK:

Temp. value: – 40°C (– 40°F)

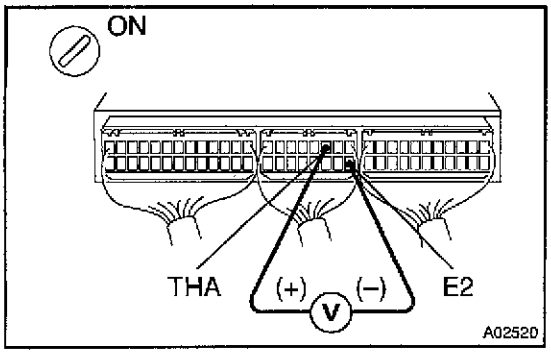
OK → **Repair or replace harness or connector.**

NG

Check and replace engine ECU (See page IN–21).

When not using hand–held tester

1	Check voltage between terminals THA and E2 of engine ECU connecter



PREPARATION:

(a) Remove glove compartment.
(See page FI–60)

(b) Turn ignition switch ON.

CHECK:

Measure voltage between terminals THA and E2 of engine ECU connector

Intake air temp. °C (°F)	Voltage V
20 (68)	0.5 – 3.4
60 (140)	0.2 – 1.0

OK:

OK	Check for intermittent problem (See page DI–75)

NG

2	Check air flow meter (See page FI–29).

NG	Replace air flow meter

OK

3	Check for open and short in harness and connector between engine ECU and air flow meter. (See page IN–21)

NG	Repair or replace harness or connector

OK

Check and replace engine ECU.

DTC	P0115/22	Water Temp. Circuit Malfunction

CIRCUIT DESCRIPTION

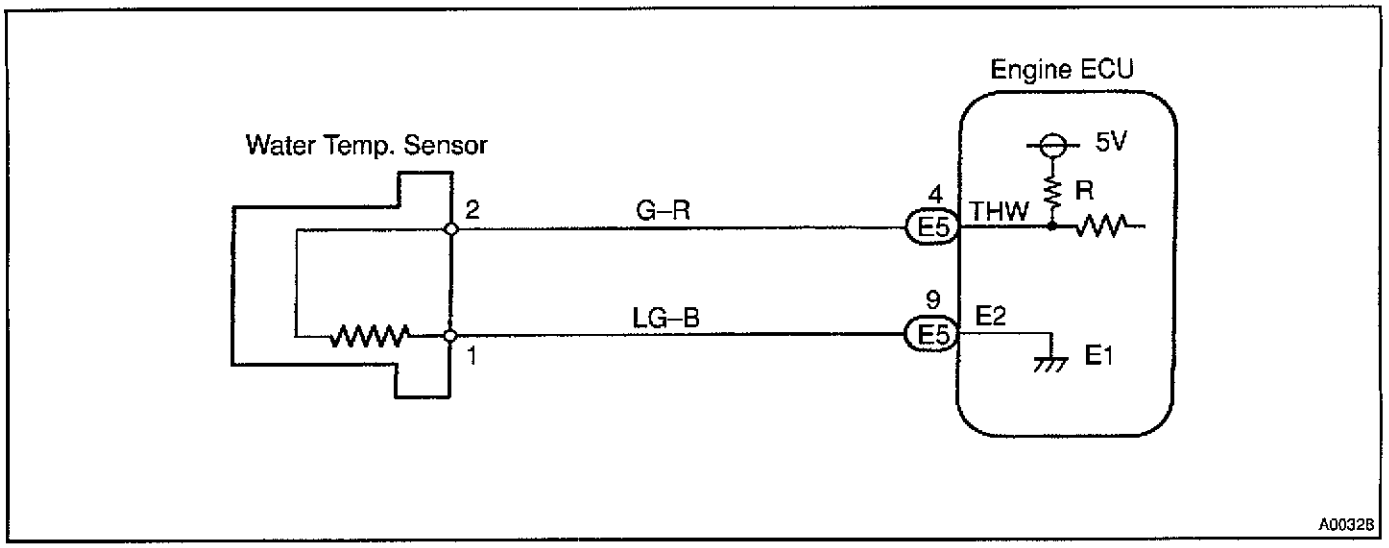
A thermistor built into the water temp. sensor changes the resistance value according to the water temp. The structure of the sensor and connection to the engine ECU is the same as in the air flow meter temp. circuit
malfunction shown on page DI–101.

DTC No.	Detection Item	Trouble Area
P0115/22	Open or short in water temp. sensor circuit 0.5 sec or more	• Open or short in water temp. sensor circuit • Water temp. sensor • Engine Engine ECU

HINT:
After confirming DTC P0115/22 use the hand–held tester to confirm the water temp. from CURRENT DATA.

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

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- Read freed frame data using hand–held tester. Because freeze frame records the engine conditions when the malfunction is detected, when troubleshooting it is useful for determining whether the vehicle was running or stopped, the engine warmed up or not, the air–fuel ratio lean or rich, etc. at the time of the malfunction.
- If DTC "P0110/24" (Intake Air Temp. Circuit Malfunction), "P0115/22" (Water Temp. Circuit Malfunction), "P0120/41" (Throttle Position Sensor Circuit Malfunction) are output simultaneously, E2 (Sensor Ground) may be open.

When using hand–held tester

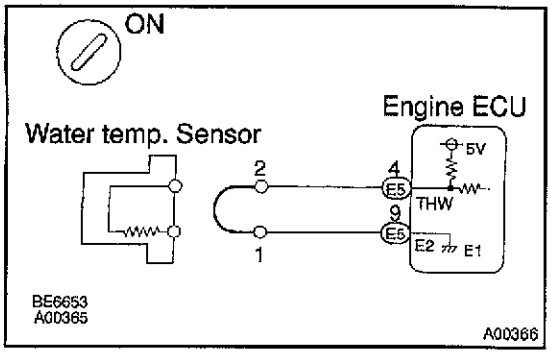
1	Connect the hand–held tester, and read value of water temp.

PREPARATION:
(a) Connect the hand–held tester to the DLC3.
(b) Turn ignition switch ON and push the hand–held tester main switch ON.
CHECK:
Read temp. value on the hand–held tester.
OK:
Same as actual water temp.
HINT:
- If there is open circuit, hand–held tester indicates – 40°C (– 40°F).
- If there is short hand–held tester indicates 140°C (284°F) or more.

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

OK

2	Check for short in harness or engine ECU.

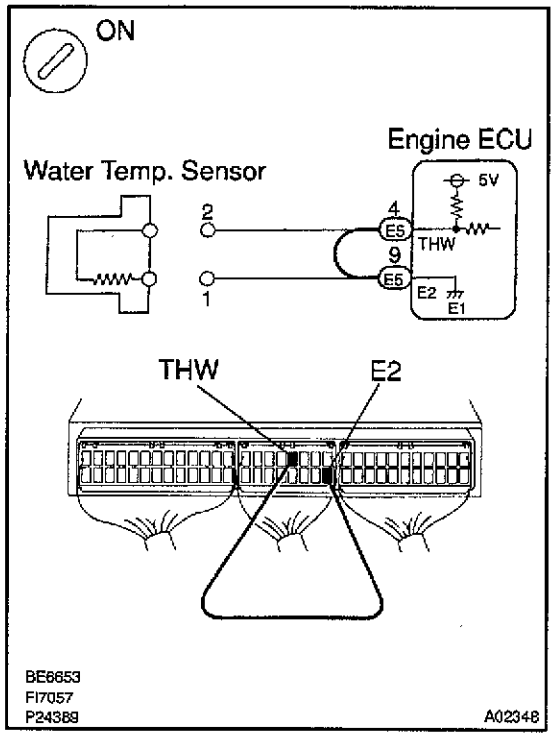


PREPARATION:
(a) Disconnect the water temp. sensor connector.
(b) Connect sensor wire harness terminals together.
(c) Turn ignition switch ON.
CHECK:
Read temp. value on the hand–held tester.
OK:
Temp. value: 140°C (284°F) or more

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

NG

3	Check for open in harness or engine ECU.



PREPARATION:

(a) Remove the glove compartment (See page FI–60).

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

HINT:

Water temp. sensor connector is disconnected. Before checking, do a visual and contact pressure check for the engine ECU connector (See page IN–21).

(c) Turn ignition switch ON.

CHECK:

Read temp. value on the hand–held tester.

OK:

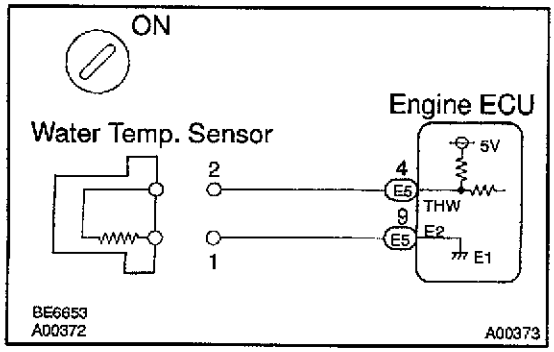
Temp. value: 140°C (284°F) or more

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

NG

Confirm good connection at engine ECU.
If OK, replace engine ECU.

4	Check for short in harness or engine ECU.



PREPARATION:

(a) Disconnect the water temp. sensor connector.

(b) Turn ignition switch ON.

CHECK:

Read temp. value on the hand–held tester.

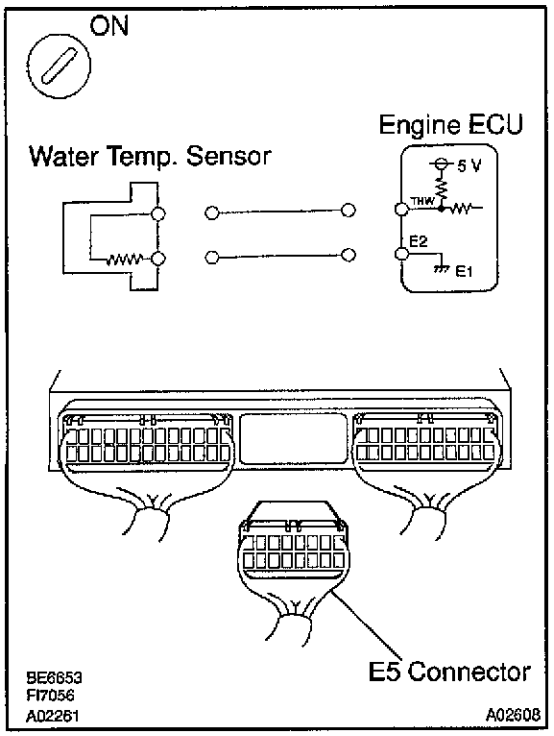
OK:

Temp. value: – 40°C (– 40°F)

OK	Replace water temp. sensor.

NG

5	Check for short in harness or engine ECU.



PREPARATION:

(a) Remove the glove compartment (See page FI–60).

(b) Disconnect the E5 connector of Engine ECU.

HINT:

Water temp. sensor connector is disconnected.

(c) Turn ignition switch ON.

CHECK:

Read temp. value on the hand–held tester.

OK:

Temp. value: – 40°C (– 40°F)

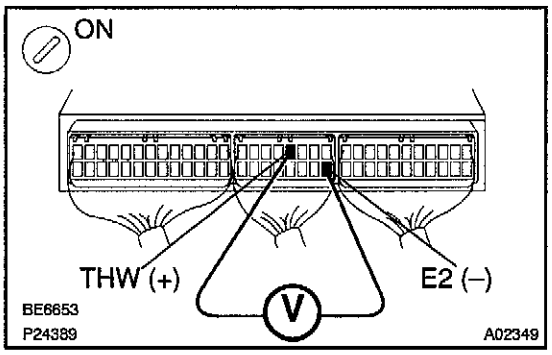
OK	Repair or replace harness or connector.

NG

Check and replace Engine ECU (See page IN–21).

When not using hand–held tester

1	Check voltage between terminals THW and of engine ECU connector.



PREPARATION:

(a) Remove glove compartment. (See page FI–60)

(b) Turn the ignition switch ON

CHECK:

Measure voltage between terminals THW and E2 of engine ECU connecter.

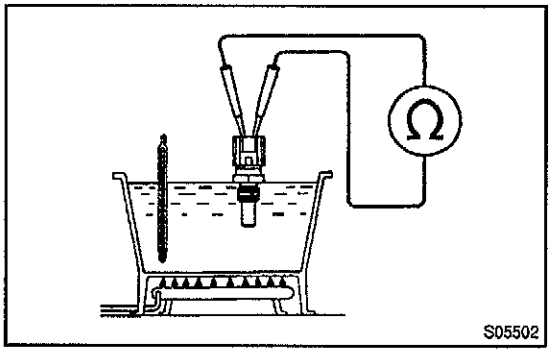
OK:

Water Temp. °C (°F)	Voltage V
20 (68) (Engine is cool)	0.5 ~ 3.4
80 (176) (Engine is hot)	0.2 ~ 1.0

OK	Check for intermittent problems (See page DI–75).

NG

2	Check water temp. sensor.



PREPARATION:

(a) Disconnect the water temp. sensor connecter.

CHECK:

Measure resistance between terminals.

OK:

Resistance is within Acceptable Zone on chart.

Water Temp. °C (°F)	Resistance kΩ
20 (68) (Engine is cool)	2 – 3
80 (176) Engine is hot)	0.2 – 0.4

NG	Replace water temp. sensor

NG

3	Check for open and short in harness and connector between engine ECU and water temp. sensor (See page IN–21).

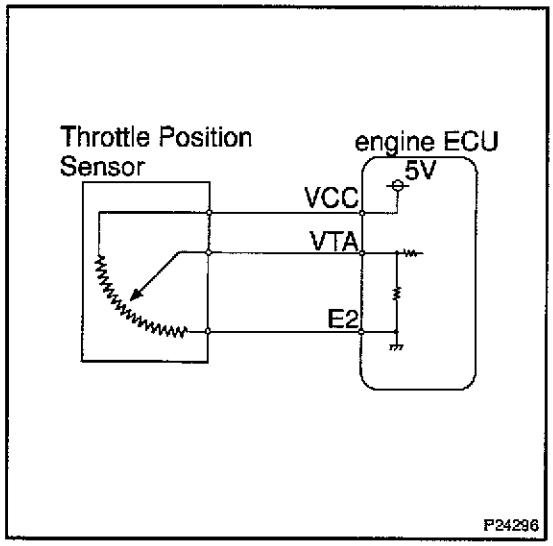
NG → Repair or replace harness or connector

NG

Check and replace Engine ECU (See page IN–21).

DTC	P0120/41	Throttle Position Sensor/Switch Circuit Malfunction

CIRCUIT DESCRIPTION



The throttle position sensor is mounted in the throttle body and detects the throttle valve opening angle.
When the throttle valve is fully closed, a voltage of approximately 0.7 V is applied to terminal VTA of the engine ECU. The voltage applied to the terminals VTA of the engine ECU increases in proportion to the opening angle of the throttle valve and becomes approximately 3.5 ~ 5.0 V when the throttle valve is fully opened. The engine ECU judges the vehicle driving conditions from these signals input from terminal VTA, uses them as one of the condititions for deciding the air–fuel ratio correction, power inctease correction and fuel–cut control etc..

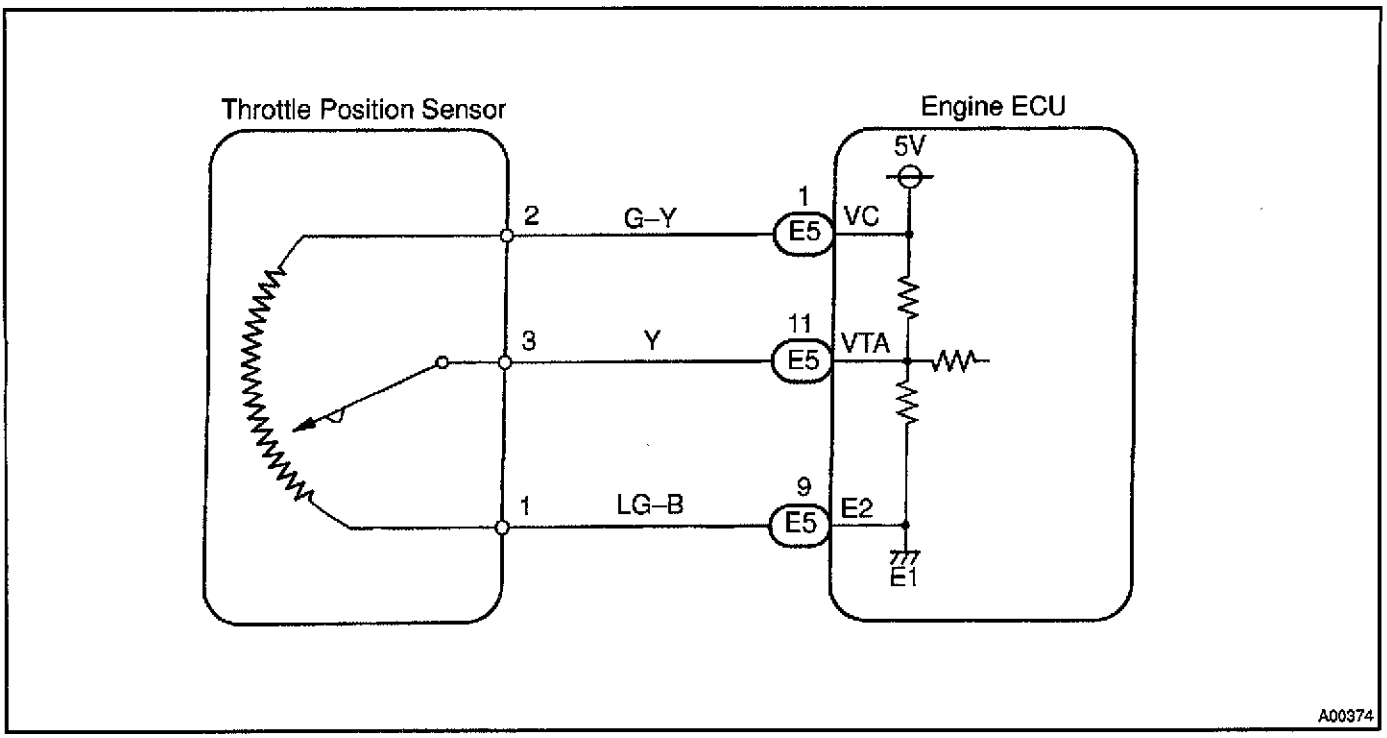
DTC No.	DTC Detecting Condition	Trouble Area
P0120/41	Open or short in throttle position sensor circuit for 0.5 sec. or more	• Open or short in throttle position sensor • Throttle position senor • Engine ECU

HINT:

- After confirming "DTC P0120/41" use the 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 VTA line open or short
Approx. 100 %	Approx. 100 %	E2 line open

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

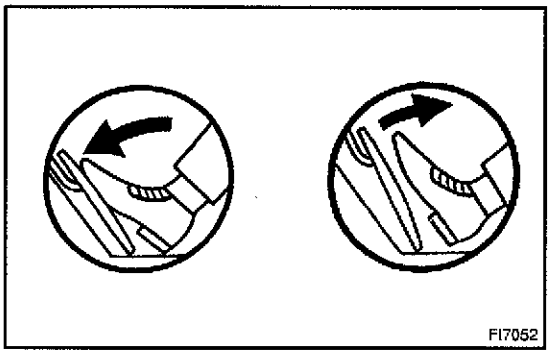
- Read freed frame data using hand–held tester. Because freeze frame records the engine conditions when the malfunction is detected, when troubleshooting it is useful for determining whether the vehicle was running or stopped, the engine warmed up or not, the air–fuel ratio lean or rich, etc. at the time of the malfunction.
- If DTC "P0110/24", "P0115/22" and "P0120/41" are output simultaneously, E2 (Sensor Ground) may be open.

When using hand–held tester

1	**Connect the hand–held tester and read the throttle valve opening percentage.**

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

CHECK:
Read the throttle valve opening percentage.



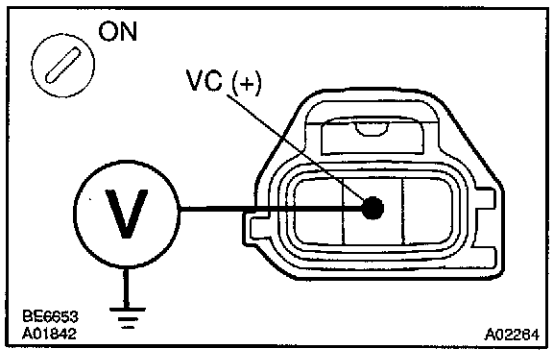
OK:

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

OK → **Check for intermittent problems (See page DI–75).**

NG

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



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

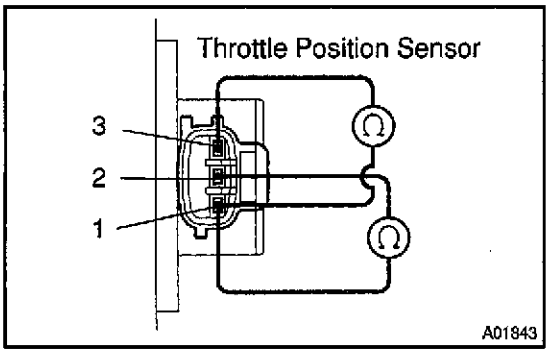
CHECK:
Measure voltage between terminals VC of wire harness side connector and body ground.

OK:
Voltage 4.5 ~ 5.5 V

NG → **Go to step 5.**

OK

3	Check throttle position sensor.



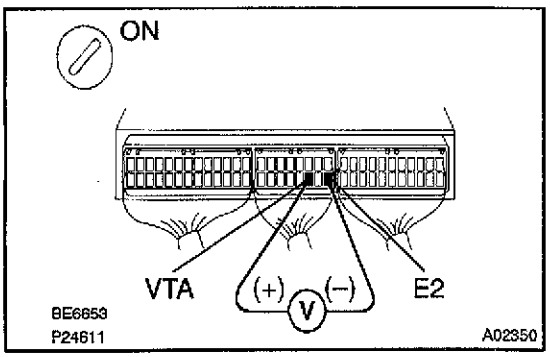
PREPARATION:
Disconnect the throttle position sensor connector.
CHECK:
Measure resistance between terminals 1, 3 and 2 of the throttle position sensor.
OK:

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

NG → **Replace throttle position sensor.**

OK

4	Check voltage between terminals VTA and E2 of engine ECU connector.



PREPARATION:
(a) Remove the glove compartment (See page FI–60).
(b) Turn ignition switch ON.
CHECK:
Measure voltage between terminals VTA and E2 of engine ECU connector.
OK:

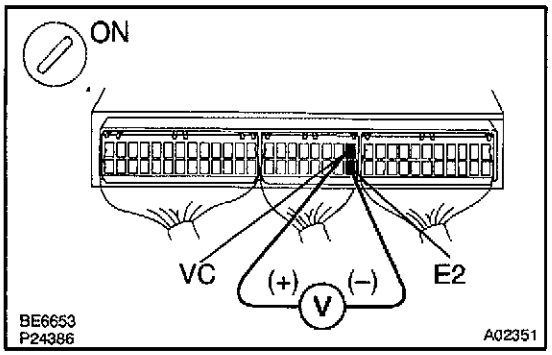
Throttle valve	Voltage
Fully closed	0.3 – 1.0 V
Fully open	2.7 – 5.2 V

NG → **Check for open and short in harness and connector between engine ECU and throttle position sensor (VTA line) (See page IN–21).**

OK

Check and replace engine ECU (See page IN–21).

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



PREPARATION:
(a) Remove the glove compartment (See page FI–60).
(b) Turn ignition switch ON.

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

OK:
Voltage 4.5 ~ 5.5 V

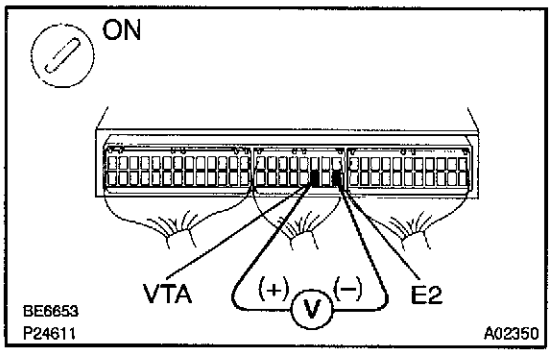
NG → **Check and replace engine ECU (See page IN–21).**

OK

Check for open in harness and connector between engine ECU and sensor (VC line) (See page IN–21).

When not using hand–held tester

1	Check voltage between terminals VTA and E2 of engine ECU.



PREPARATION:
(a) Remove glove compartment. (See page FI–60)
(b) Turn ignition switch ON.

CHECK:
Measure voltage between terminals VTA and E2 of engine ECU.

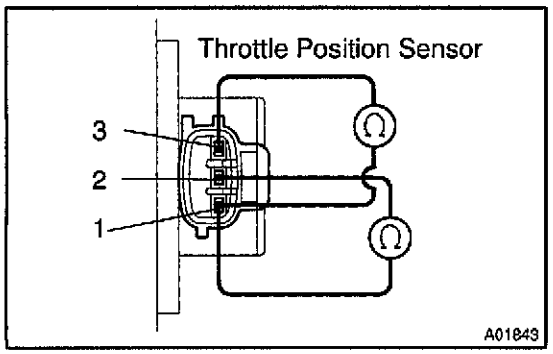
OK:

Throttle valve	Voltage V
Fully open	0.3 – 1.0
Fully closed	2.7 – 5.2

OK → **Check for intermittent problems (See page DI–75).**

NG

2	Check throttle position sensor.



PREPARATION:
Disconnect the throttle position sensor connector.

CHECK:
Measure resistance between terminals 1, 3 and 2 of throttle position sensor

OK:

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

NG → **Replace throttle position sensor**

OK

3	Check for open and short in harness and connector between engine ECU and throttle position sensor (VC, VTA, E2 line)(See page IN–21)

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

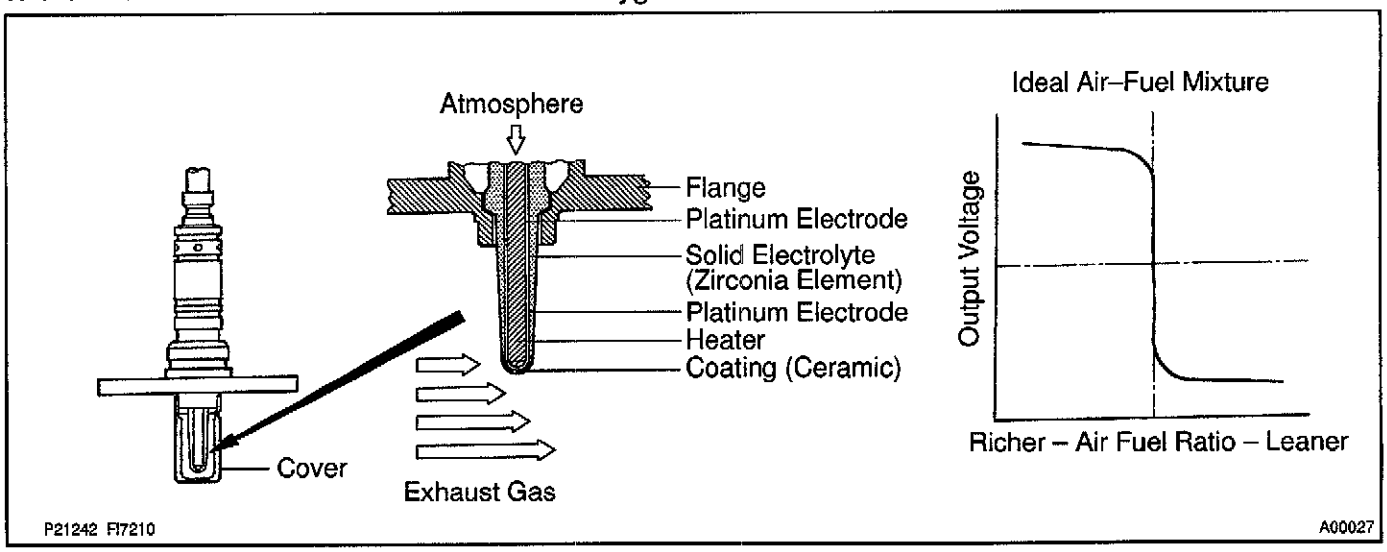
OK

Check and replace engine ECU (See page IN–21).

DTC	P0130/21, 28	Heated Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 1) (2RZ–FE).

CIRCUIT DESCRIPTION

To obtain a high purification rate for the CO, HC and NOx components of the exhaust gas, a three–way catalytic converter is used, but for the most efficient use of the three–way catalytic converter, the air–fuel ratio must be precisely controlled so that it is always close to the stoichiometric air–fuel ratio.
The oxygen sensor has the characteristic where by its output voltage changes suddenly in the vicinity of the stoichiometric air–fuel ratio. This 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 engine ECU of the LEAN condition (small electromotive force: 0 V).
When the air–fuel ratio is RICHER than the stoichiometric air–fuel ratio the oxygen concentration in the exhaust gas in reduced and the oxygen sensor informs the engine ECU of the RICH condition (large electromotive force: 1V). The engine ECU judges by the electromotive force from the oxygen sensor whether the air–fuel ratio is RICH or LEAN and controls the injection time accordingly. However, if malfunction of the oxygen sensor causes output of abnormal electromotive force, the engine ECU is unable to perform accurate air–fuel ratio control.
The main heated oxygen sensors include a heater which heats the zirconia element. The heater is controlled by the engine ECU. When the intake air volume is low (the temp. of the exhaust gas is low) current flows to the heater to heat the sensor for accurate oxygen concentration detection.

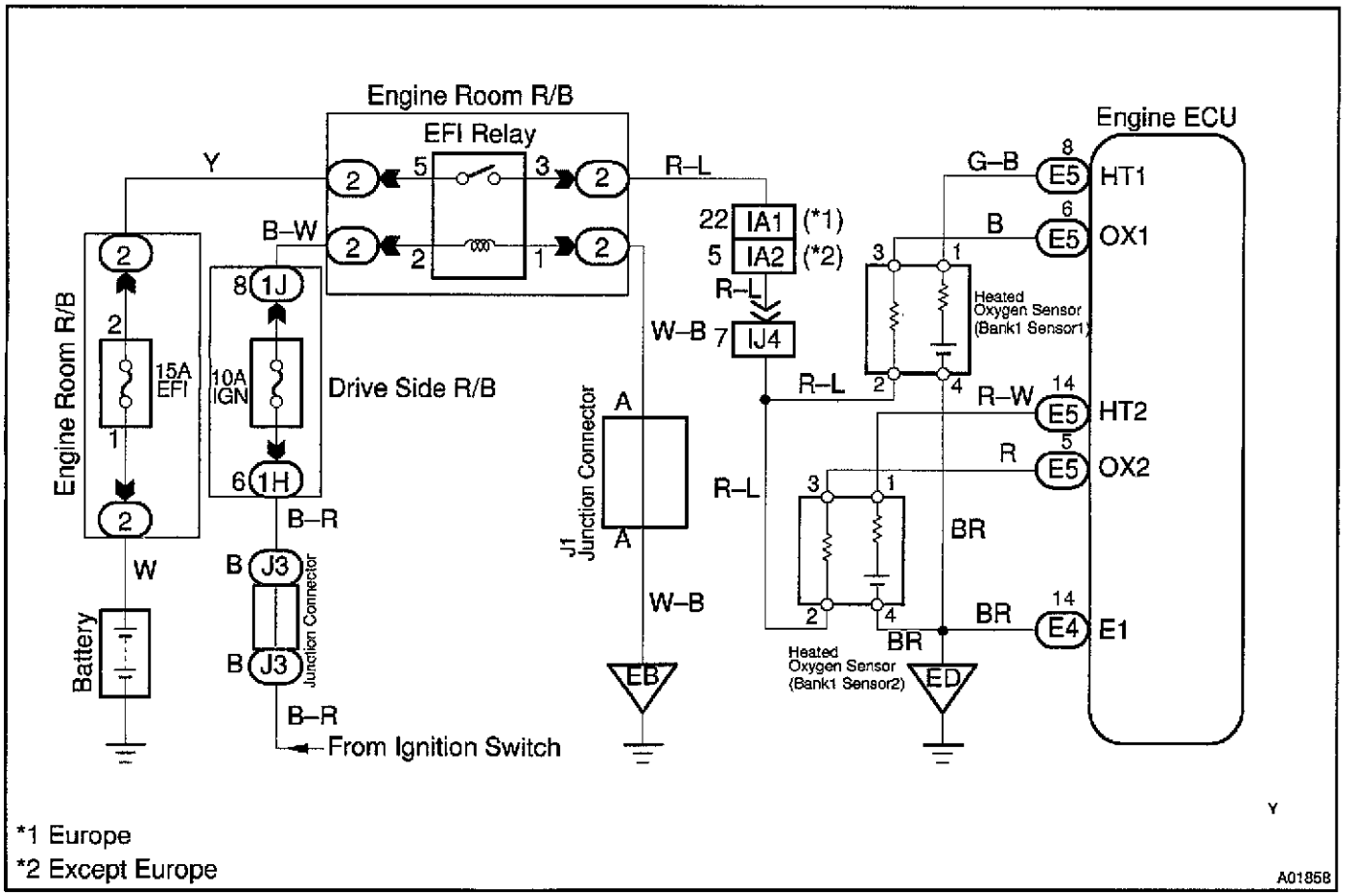


DTC No.	DTC Detecting Condition	Trouble Area
P0130/21, 28	At normal driving speed below 100km/h (60 mph) and engine speed is above 1,500 rpm amplitude of oxygen sensor signal is reduced to between 0.35 – 0.70 V continuosly for 60 sec. or more.(2 trip detection logic)	• Open or short in heated oxygen sensor circuit • Heated oxygen sensor • Engine ECU

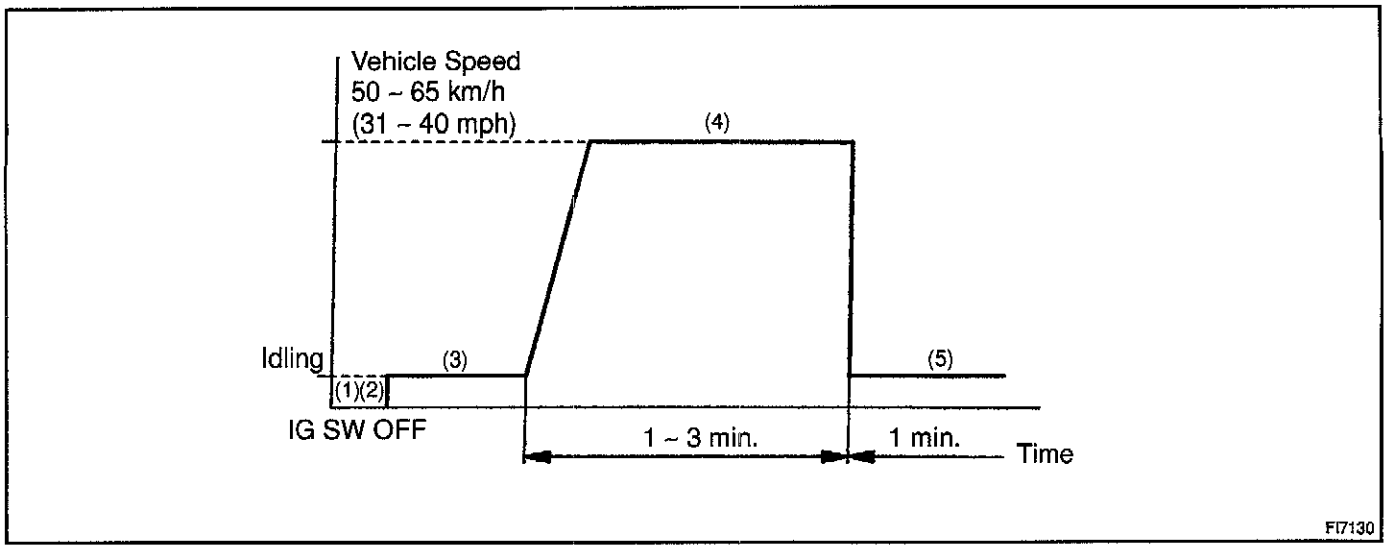
HINT:

- Bank 1 refers to the bank that includes cylinder No.1.
- Sensor 1 is the oxygen sensor of front side.
- The heated oxygen sensor's output voltage and the short–term fuel trim value can be read using the hand–held tester.
- If voltage output of heated oxygen sensor is 0 V, heated oxygen sensor circuit sensor circuit may be open or short.

WIRING DIAGRAM



CONFIRMATION DRIVING PATTERN



(1) Connect the hand–held tester to the DLC3.
(2) Switch the hand–held tester from normal mode to check (test) mode (See page DI–75).
(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 you have no hand–held tester, do step (1) to (5) again.
- If a malfunction exists, the check engine warning (CHK ENG) 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 hand–held tester, turn the ignition switch OFF after performing steps (3) to (5), them perform steps (3) to (5) again.

INSPECTION PROCEDURE

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

When using hand–held tester

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

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

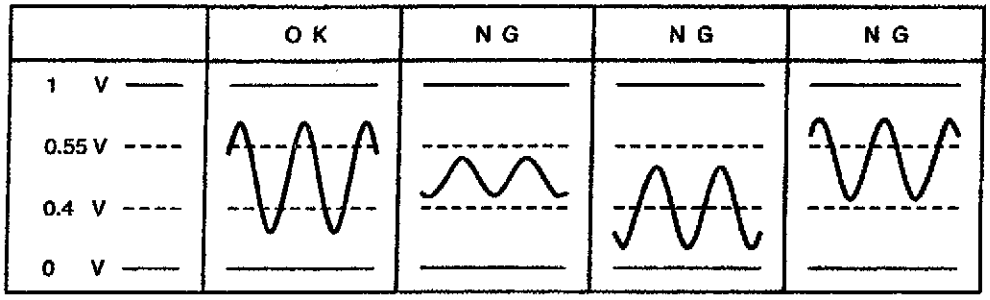
Pattern	Heated oxygen sensor output voltage	Short–term fuel trim
1	Lean condition (Changes at 0.7 V or less)	Changes at about + 20 %
2	Rich condition (Changes at 0.35 V or more)	Changes at about – 20 %
3	Except 1 and 2	

1, 2 → **Check fuel trim system (See page DI–129).**

3 →

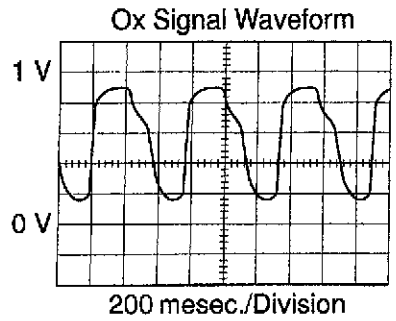
2	**Check the output voltage of heated oxygen sensor during idling.**

PREPARATION:
Warm up the heated oxygen sensor the engine at 2,500 rpm for approx. 90 sec.
CHECK:
Use the hand–held tester read the output voltage of the heated oxygen sensor during idling.
OK:
Heated oxygen sensor output voltage:
Alternates repeatedly between approx. 0.35 V and 0.7 V .



P18349

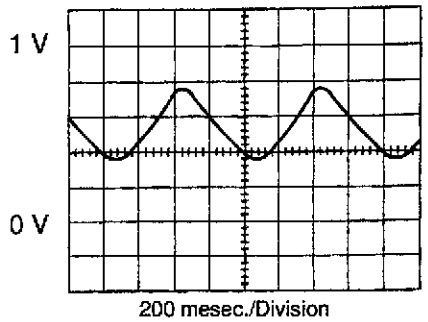
Refernce INSPECTION USING OSCILLOSCOPE



FI6514

- With the engine racing (4,000 rpm) measure waveform between terminals OX1 and E1 of engine ECU.

HINT:
The correct wavefrom is as shown oscillating between approx. 0.1 V and 0.9 V.



A02542

If the oxygen sensor has deteriorated, the amplitude of the voltage will be reduced as shown on the left.

OK → **Perform confirmation driving pattern.**

NG

3	**Check for open and short in harness and connector between engine ECU and heated oxygen sensor (See page IN–21)**

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

NG

Replace heated oxygen sensor.

When not using hand–held tester

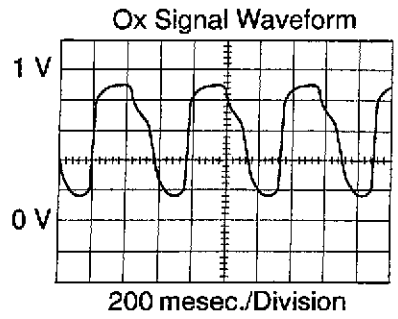
1	**Are these any other codes (besides code P0130/21,28) being output.**

YES → **Go to referents DTC chart (See page DI–119)**

NO

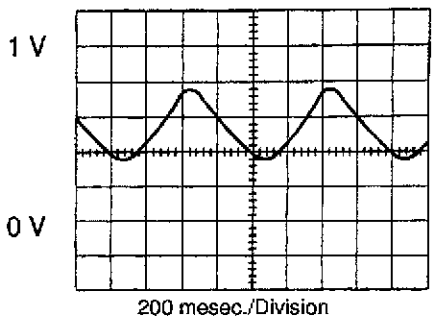
Replace heated oxygen sensor.

Refernce INSPECTION USING OSCILLOSCOPE



- With the engine racing (4,000 rpm) measure waveform between terminals OX1 and E1 of engine ECU.

HINT:
The correct wavefrom is as shown oscillating between approx. 0.1 V and 0.9 V.



If the oxygen sensor has deteriorated, the amplitude of the voltage will be reduced as shown on the left.

DTC	P0135/21,28	Heated Oxygen Sensor Heater Circuit Malfunction (Bank 1 Sensor 1)(2RZ–FE)

DTC	P0141/27,29	Heated Oxygen Sensor Heater Circuit Malfunction (Bank 1 Sensor 2)(2RZ–FE)

CIRCUIT DESCRIPTION

Refer to DTC P0130/21,28 (Oxygen Sensor circuit Malfunction (Bank1)) on page DI–119.

DTC No.	DTC Detecting Condition	Trouble Area
P0135/21,28 P0141/27,29	Open or short in heater circuit of oxygen sensor for 0.5. or more	• Open or short in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • Engine ECU

HINT:

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

WIRING DIAGRAM

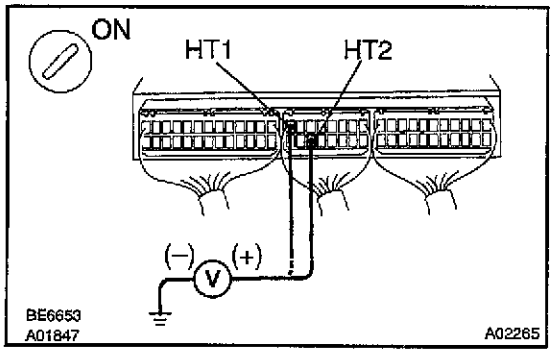
Refer to DTC P0130/21,28 (Oxygen Sensor Circuit Malfunction) on page DI–119.

INSPECTION PROCEDURE

HINT:

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

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



PREPARATION:

(a) Remove the glove compartment (See page FI–60).

(b) Turn ignition switch ON.

CHECK:

Measure voltage between terminals HT1, HT2 engine ECU connector and body ground.

HINT:

- Connect terminal HT1 to bank 1 sensor 1(Fr 02 sensor).
- Connect terminal HT2 to bank 1 sensor 2(Rr 02 sensor).

OK:

Voltage: 9 ~ 14 V

OK	**Check and replace engine ECU (See page IN–21).**

NG

2	**Check resistance of heated oxygen sensor heater (See page FI–59).**

NG	**Replace heated oxygen sensor.**

OK

Check and repair harness or connector between EFI main relay (Marking: EFI) and heated oxygen sensor and engine ECU. (See page IN–21).

DTC	P0136/27,29	Heated Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 2) (2RZ–FE).

CIRCUIT DESCRIPTION

Refer to DTC P0130/21,28 (Oxygen Sensor Circuit Malfunction (Bank1) on page DI–119.

DTC No.	DDTC Detecting Condition	Trouble Area
P0136/27,29	Oxygen sensor (sensor 1) signal is 0.45 V or more and oxygen sensor (Bank 2) signal is 0.45 V or less under conditions (a) and (b): (2 trip detection logic) (a) Water temp.: 80°C (176°F) or more (b) Accelerator pedal: Full depressed for 2 sec. or more	• Open or short in heated oxygen sensor • Heated oxygen sensor • Engine ECU

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

WIRING DIAGRAM

Refer to DTC P0130/21, 28 (Oxygen Sensor circuit Malfunction) on page DI–119.

INSPECTION PROCEDURE

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

When using hand–held tester

1	**Are there any other codes (besides DTC P0136/27,29) being output?**

YES → **Go to relevant DTC chart.**

NO

2	**Check for open and short in harness and connector between engine ECU and heated oxygen sensor (See page IN–21).**

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 hand–held tester to the DLC3.
(b) Warm up engine to normal operating temp.
CHECK:
Read voltage output of heated oxygen sensor (bank 1 sensor 2) when engine suddenly raced.
HINT:
Perform quick racing to 4,000 rpm 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).

When not using hand–held tester

1	**Are these any other codes (besides code DTC P0136/27,29) being output.**

YES → **Go to relerant DTC chart.**

NO

Replace heated oxygen sensor (bank 1 sensor 2).

DTC	P0171/25	System too Lean (Fuel Trim)

CIRCUIT DESCRIPTION

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

DTC No.	DTC Detecting Condition	Trouble Area
P0171/25	Oxygen sensor voltage is 0.45 V or less (lean) for 90 sec. under conditions (a) and (b), (c): (2 trip detection logic) (a) Water temp: 70°C (158°F) or more (b) Engine speed: 1,500 rpm or more (c) Vehicle speed: 100 km/h or less	• Air intake (hose loose) • Fuel line pressure • Injector blockage • Open or short in oxygen sensor circuit • Oxygen sensor malfunction • Air flow meter • Water temp. sensor

HINT:

- 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

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

When using hand–held tester

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

NG → **Repair or replace.**

OK

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

PREPARATION:

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

(b) Warm up engine to normal operating temp.

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 FI–59).**

1, 2 ↓

3	**Check fuel pressure (See page FI–14).**

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

OK ↓

4	**Check injector injection (See page FI–20).**

NG → **Replace injector.**

OK ↓

5	Check air flow meter and water temp. sensor (See page FI–29).

NG → Repair or replace.

OK

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

NG → Repair or replace.

OK

Check and replace engine ECU (See page IN–21).

When not using hand–held tester

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

NG → Repair or replace.

OK

2	Check fuel pressure (See page FI–14).

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

OK

3	Check injector injection (See page FI–20).

NG → Replace injector.

OK

4	Check air flow meter (See page FI–29).

NG → Repair or replace.

OK

5	Check water temp. sensor (See page FI–55).

NG → Repair or replace.

OK

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

NG → Repair or replace.

OK

7	Does malfunction disappear when a good oxygen sensor installed.

YES → Replace oxygen sensor.

NO →

Check and replace engine ECU
(See page IN–21).

DI1U–01

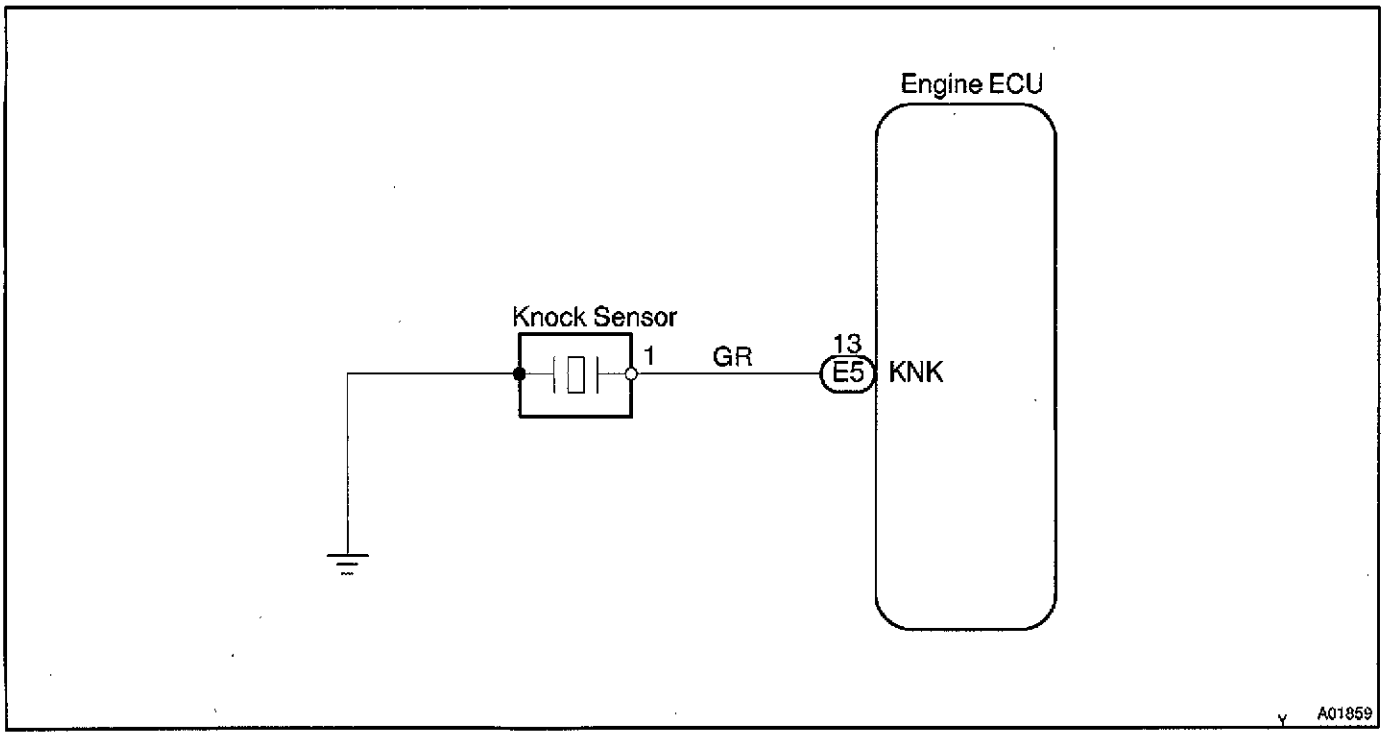
DTC	P0325/52	Knock Sensor Circuit Malfunction

CIRCUIT DESCRIPTION

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

DTC No.	DTC Detecting Condition	Trouble Area
P0325/52	No knock sensor 1 signal to engine ECU with engine speed between 1,700 rpm and 5,200 rpm	• Open or short in knock sensor circuit • Knock sensor (looseness) • Engine ECU

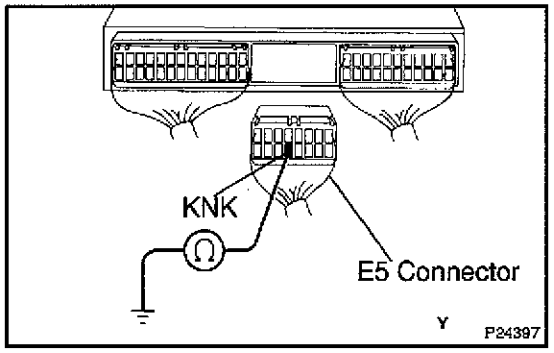
WIRING DIAGRAM



INSPECTION PROCEDURE

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

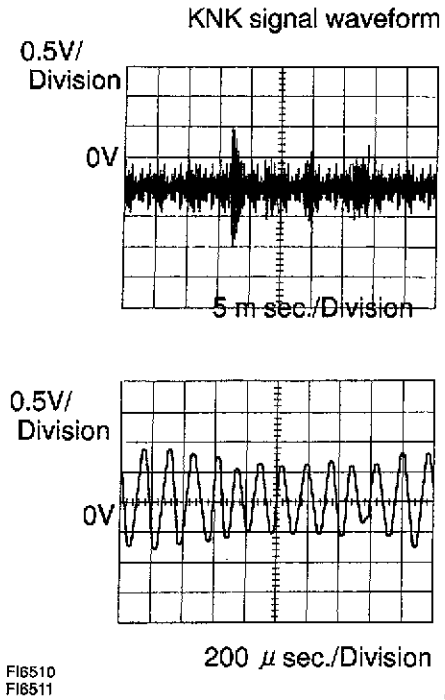
1	**Check continuity between terminal KNK of engine ECU connector and body ground.**



PREPARATION:
(a) Remove the glove compartment (See page FI–60).
(b) Disconnect the E5 connector of engine ECU.

CHECK:
Measure resistance between terminal KNK of engine ECU connector and body ground.

OK:
Resistance: 1 MΩ or higher



Reference: INSPECTION USING OSCILLOSCOPE
- With the engine racing (4,000 rpm) measure between terminal KNK of engine ECU and body ground.

HINT:
The correct waveform is as shown.

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

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

OK	Go to step 3 .

NG

2	Check knock sensor (See page FI–58).

NG → Replace knock sensor.

OK

3	Check for open and short in harness and connector between engine ECU and knock sensor (See page IN–21).

NG → Repair or replace harness or connector.

OK

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

YES → Replace knock sensor.

NO

Check and replace engine ECU
(See page IN–21).

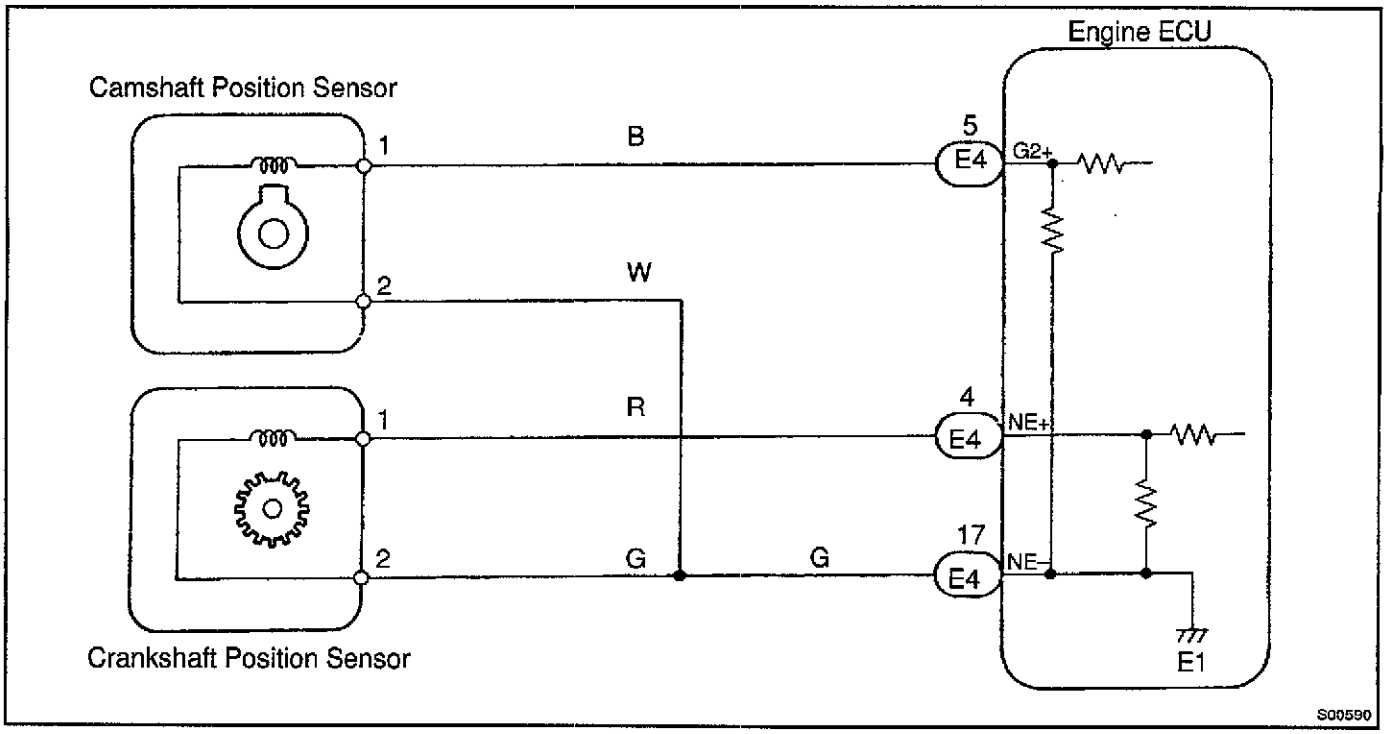
DTC	P0335/12	Crankshaft Position Sensor Circuit Malfunction

CIRCUIT DESCRIPTION

Crankshaft position sensor (NE signal) consist of a signal plate and pick up coil.
The NE signal plate has 34 teeth and is mounted on the crankshaft. The NE signal sensor generates 34 signals of every engine revolution. The engine ECU detects the standard crankshaft angle based on the G2+ signals, and the actual crankshaft angle the engine speed by the NE signals.

DTC No.	DTC Detecting Condition	Trouble Area
P0335/12	No crankshaft position sensor signal to engine ECU during cranking	• Open or short in crankshaft position sensor circuit. • Crankshaft position sensor • Starter • Engine ECU

WIRING DIAGRAM



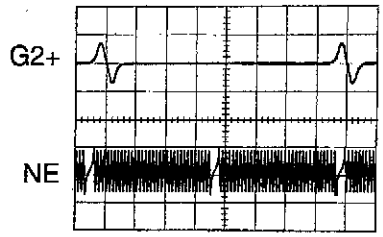
INSPECTION PROCEDURE

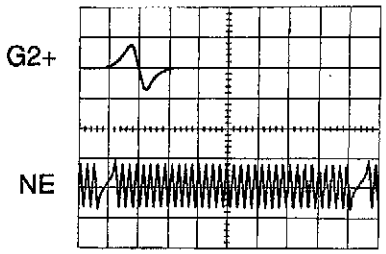
HINT:

- Read freed frame data using hand–held tester. Because freeze frame records the engine conditions when the malfunction is detected, when troubleshooting it is useful for determining whether the vehicle was running or stopped, the engine warmed up or not, the air–fuel ratio lean or rich, etc. at the time of the malfunction.
- Perfrom troubleshooting of DTC P0335/12 first. If no trouble is found, troubleshoot the following mechanical system.

1	**Check resistance of crankshaft position sensor (See page IG–12).**

G2+, NE signal waveforms





A01991
A01992

Reference: INSPECTION USING OSCILLOSCOPE

During cranking or idling, check between terminals G2+ and NE–, NE+ and NE– of engine ECU

HINT:

The correct waveforms are as shown.

A02359

NG → **Replace crankshaft position sensor.**

OK

2	**Check for open and short in harness and connector between engine ECU and crankshaft position sensor (See page IN–21).**

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

OK

3	Inspect sensor installation and teeth of signal plate.

NG → Tighten the sensor. Replace signal plate.

OK →

Check and replace engine ECU
(See page IN–21).

DI1IL–01

DTC	P0340/12	Camshaft Position Sensor Circuit Malfunction

CIRCUIT DESCRIPTION

Camshaft position sensor (G2+ signal) consist of a signal plate and pick up coil. The G2+ signal plate has one tooth on its outer circumference and is mounted on the camshaft.
When the camshafts rotate, 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 plate has 34 teeth and is mounted on the crankshaft. The NE signal sensor generates 34 signals for every engine revolution. The engine ECU detects the standard crankshaft angle based on the G2+ signals and the actual crankshaft angle and the engine speed by the NE signals.

DTC No.	DTC Detecting Condition	Trouble Area
P0340/12	No camshaft position sensor signal to engine ECU during cranking	• Open or short in camshaft position sensor circuit • Camshaft position sensor • Starter • Engine ECU
	Open in NE– circuit+	

WIRING DIAGRAM

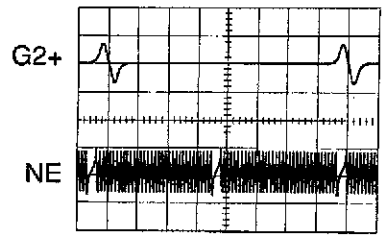
Refer to DTC P0335/12 on page DI–137 for the WIRING DIAGRAM.

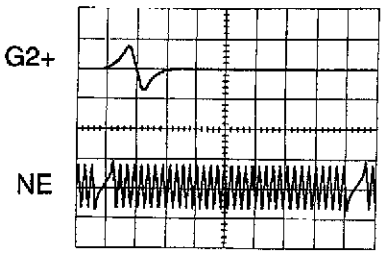
INSPECTION PROCEDURE

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

1	**Check resistance of camshaft position sensor (Signal generator) (See page IG–8).**

G2+, NE signal waveforms





A01991
A01992

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

A02359

NG → **Replace camshaft position sensor.**

OK

2	**Check for open and short in harness and connector between engine ECU and camshaft position sensor (See page IN–21).**

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

OK

3	Inspect sensor installation.

NG → Tighten the sensor.

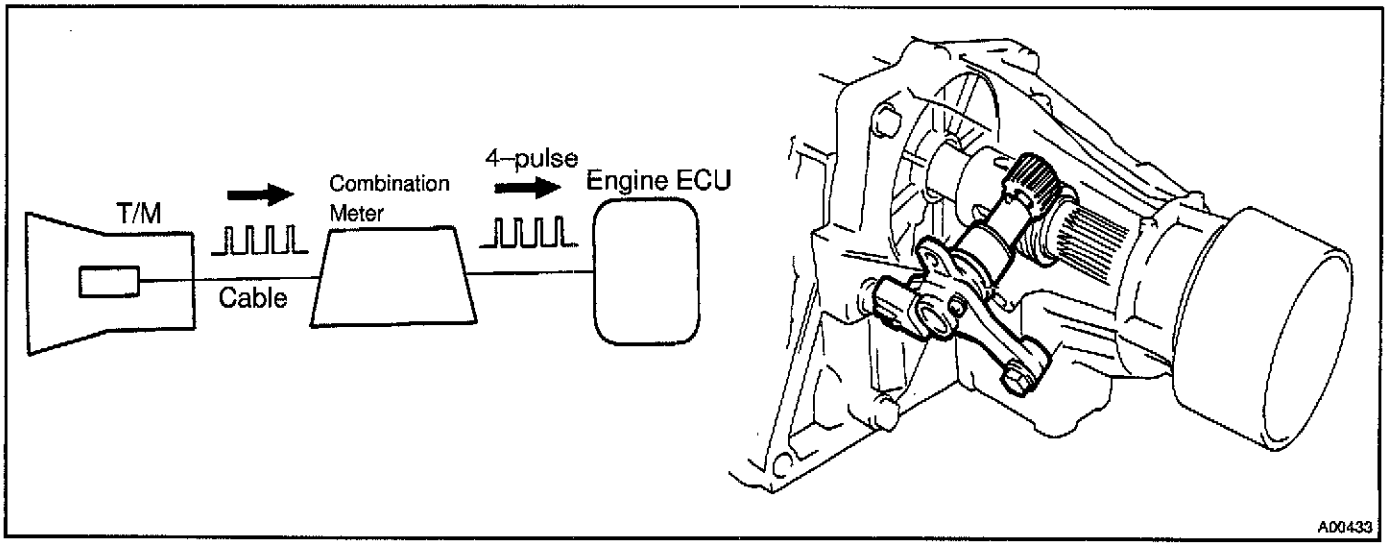
OK →

Check and replace engine ECU (See page IN–21).

DTC P0500/42 Vehicle Speed Sensor Malfunction

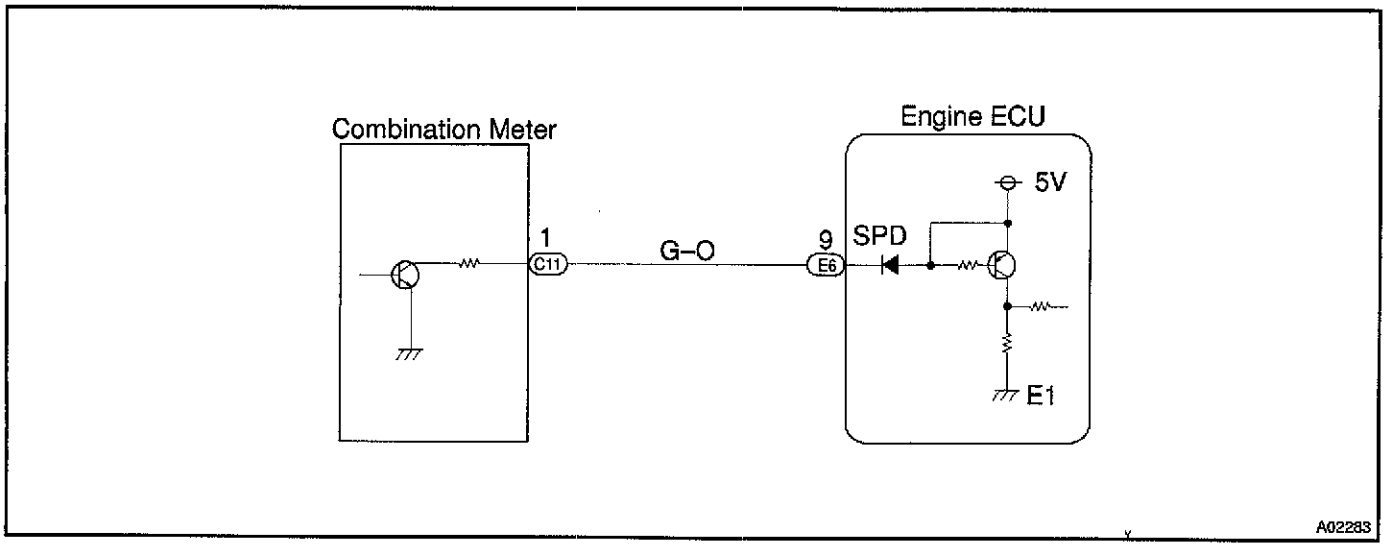
CIRCUIT DESCRIPTION

The vehicle speed sensor 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 engine ECU. The engine ECU determines the vehicle speed based on the frequency of these pulse signals.



DTC No.	DTC Detecting Condition	Trouble Area
P0500/42	No vehicle speed sensor signal to engine ECU during vehicle driving	• Combination meter • Open or short in vehicle speed sensor circuit • Engine ECU • Vehicle speed sensor

WIRING DIAGRAM



INSPECTION PROCEDURE

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

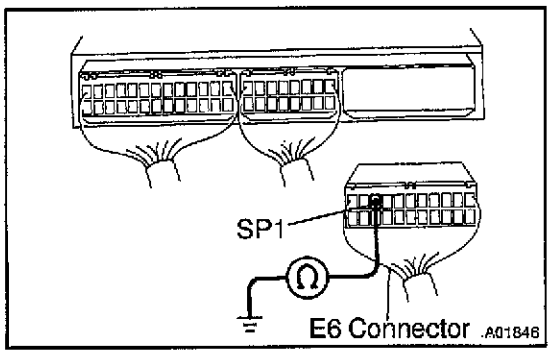
1	**Check operation of speedometer.**

CHECK:
Drive the vehicle and check if the operation of the speedometer in the combination meter is normal.
HINT:
The vehicle speed sensor is operating normally if the speedometer display is normal.

NG → **Check speedometer (See Pub. No. RM585E)**

OK

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

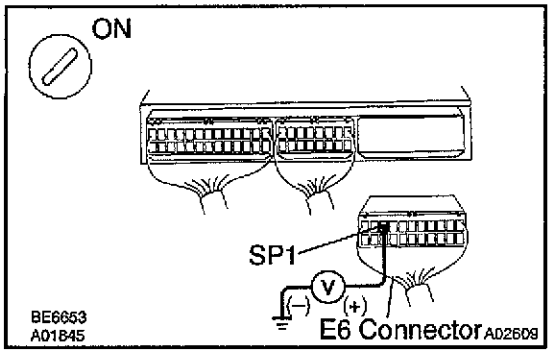


PREPARATION:
(a) Remove the glove compartment (See page FI–60).
(b) Disconnect the E6 engine ECU connector.
CHECK:
Check continuity between terminal SPD of engine ECU and body ground.
OK:
NO continuity (1MΩ or higher)

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

OK

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



PREPARATION:

(a) Remove the glove compartment (See page FI–60).
(b) Disconnect the E6 engine ECU connector.
(c) Turn the ignition switch ON.

CHECK:

Measure voltage between terminal SPD of engine ECU and body ground

OK:

Voltage: 9 – 14 V

NG → **Check for open in harness and connector between J/B and engine ECU(See page IN–21)**

OK →

4	Check for open in harness and connector between J/B and combination meter (See page IN–21)

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

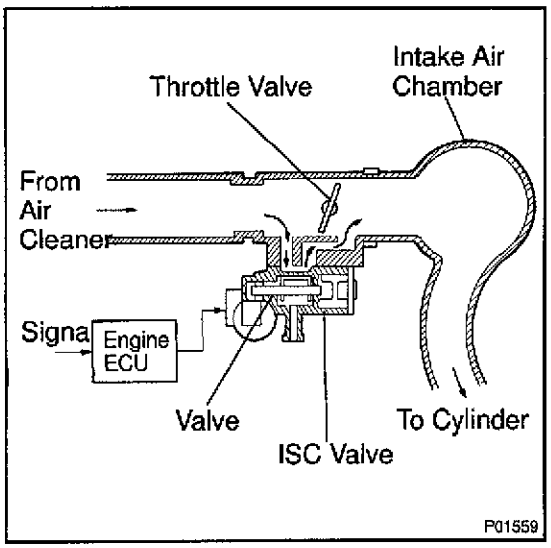
OK →

Check and replace engine ECU (See page IN–21).

D1IN–01

DTC	P0505/33	Idle Control System Malfunction

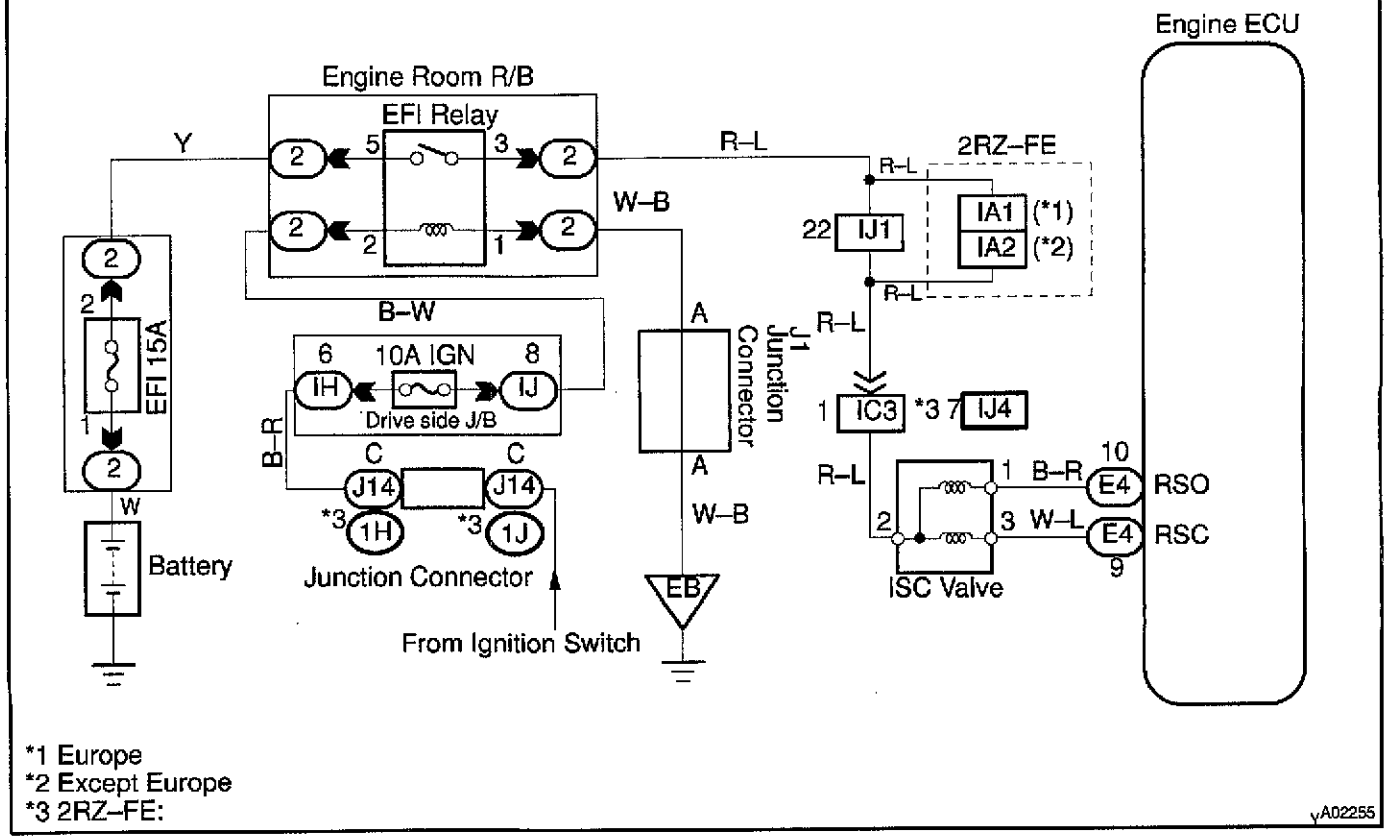
CIRCUIT DESCRIPTION



The rotary solenoid type ISC valve is located in front of the intake air chamber and intake air bypassing the throttle valve is directed to the ISC valve through a passage.
In this way the intake air volume bypassing the throttle valve is regulated, controlling the engine speed.
The engine ECU operates only the ISC valve to perform idle–up and provide feedback for the target idling speed.

DTC No.	DTC Detecting Condition	Trouble Area
P0505/33	Open or short in ISC valve circuit.	• Open or short in ISC valve circuit • ISC valve • Engine ECU

WIRING DIAGRAM



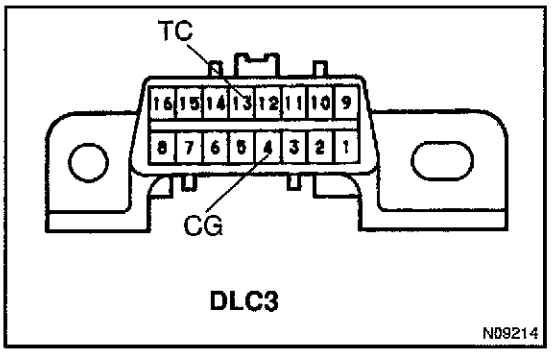
*1 Europe
*2 Except Europe
*3 2RZ–FE:

INSPECTION PROCEDURE

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

When using hand–held tester

1	**Check engine idle speed.**



DLC3

PREPARATION:
(a) Warm up engine to normal operating temp.
(b) Switch off all accessories.
(c) Switch off air conditioning.
(d) Shift transmission into "N" or neutral position.
(e) Connect hand–held tester to DLC3 on the vehicle.
(f) Using SST connect terminals 13(TC) and 4(CG) of the DLC3.
SST 09843 – 18040

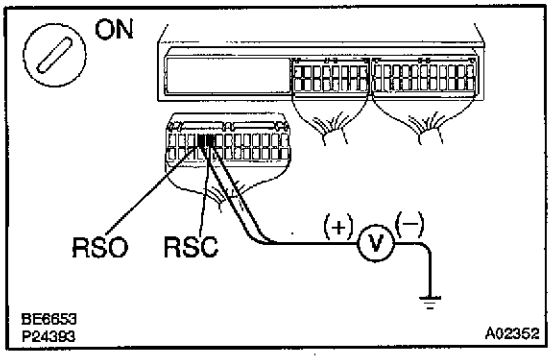
CHECK:
Check the difference of engine speed between the ones less than 5 sec. and more than 5 sec. after connecting terminals B(TC) and 4(CG) of the DLC3.
HINT:
Read the values for the same bank.

OK:
Difference of engine speed: More than 100 rpm

OK	**Check for intermittent problems (See page DI–75).**

NG

2	Check voltage between terminals RSO, RSC of engine ECU connector and body ground.



PREPARATION:
(a) Remove glove compartment. (See page FI–62).
(b) Disconnect the E4 connector of engine ECU.
(c) Turn ignition switch ON.

CHECK:
Measure voltage between terminals RSO, RSC of engine ECU connector and body ground,

OK:
Voltage: 9 ~ 14 V

OK → **Go to step 4.**

NG

3	Check ISC valve (See page FI–48).

NG → **Replace ISC valve.**

OK

Check for open and short in harness and connector between E/G Room J/B and ISC valve, ISC valve and ECU (See page IN–21).

4	Check operation of the ISC valve (See page FI–48).

NG → **Repair or replace ISC valve.**

OK

5	Check the blockage of ISC valve and the passage to bypass the throttle valve.

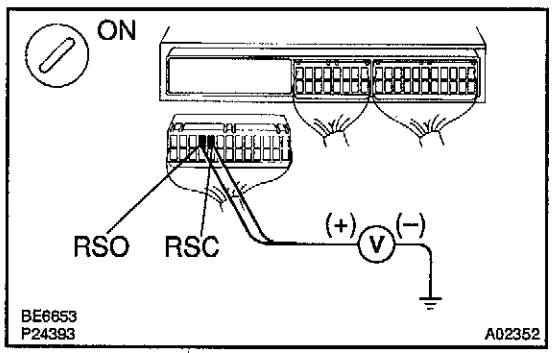
NG → Repair or replace ISC valve.

OK

Check and replace engine ECU (See page IN–21).

When not using hand–held tester

1	Check voltage between terminals RSO, RSC of engine ECU and body ground.



PREPARATION:
(a) Remove glove compartment. (See page FI–62).
(b) Disconnect the E4 connector of engine ECU.
(c) Turn ignition switch ON.

CHECK:
Measure voltage between terminals RSO, RSC of engine ECU connector and body ground,

OK:
Voltage: 9 ~ 14 V

OK → Go to step 5.

NG

2	Check ISC valve.

NG → Replace ISC valve.

OK

Check for open and short in harness and connector between J/B and ISC valve and engine ECU (See page IN–21).

3	Check operation of the ISC valve.

NG → Replace ISC valve.

OK

4	Check the blockage of ISC valve and the passage to bypass the throttle valve.

NG → Repair or replace ISC valve.

OK

Check and replace engine ECU
(See page IN–21).

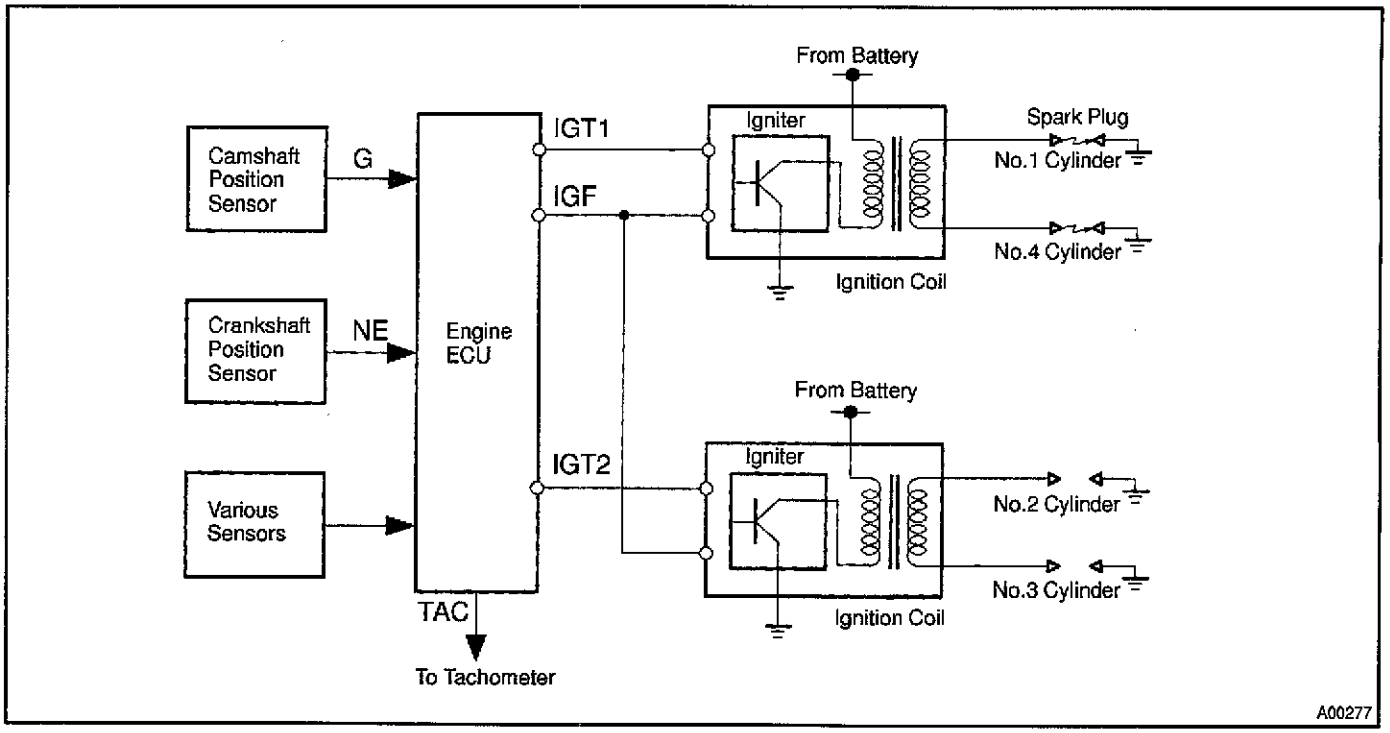
DH1O–01

DTC	P1300/14,15	Ignition Circuit Malfunction (Bank 1)

DTC	P1310/14,15	Ignition Circuit Malfunction (Bank 2)

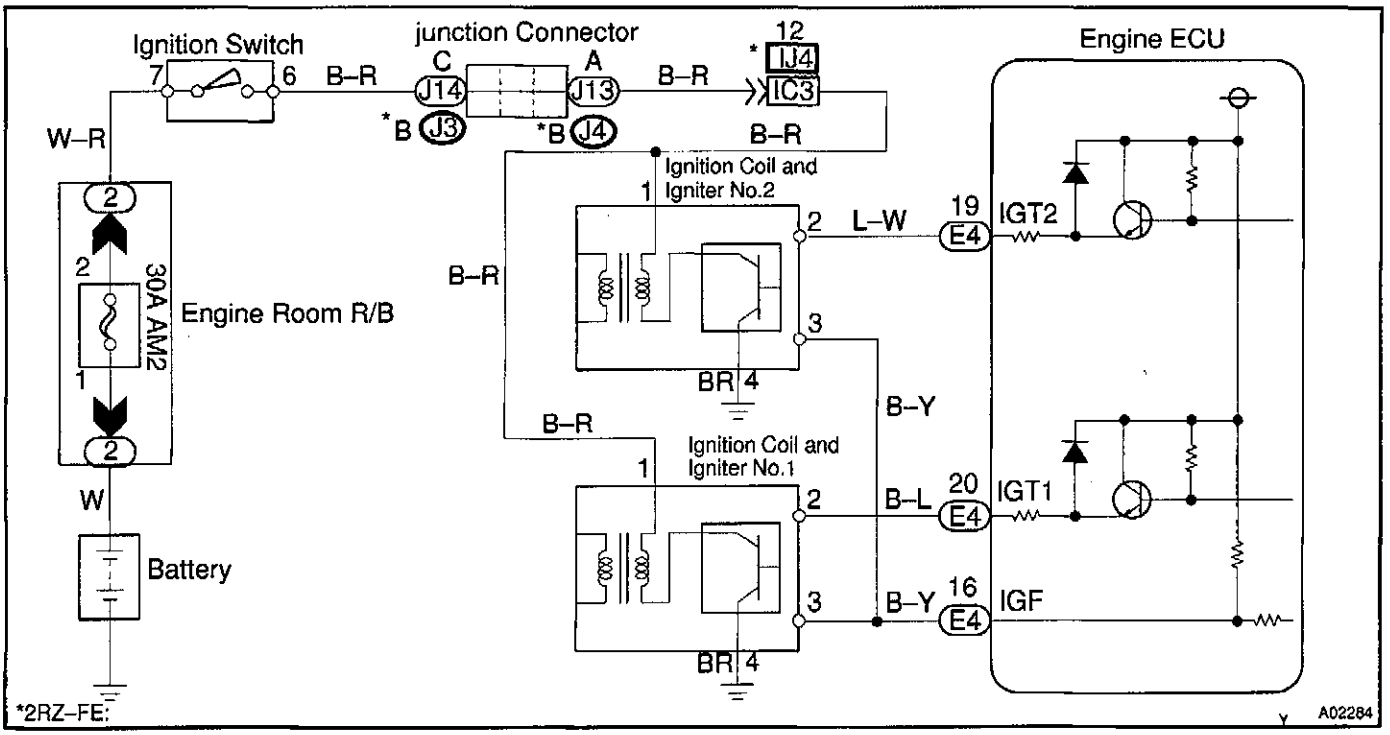
CIRCUIT DESCRIPTION

A DIS (Direct Ignition System) has been adopted, The DIS improves the ignition timing accuracy, reduces high–voltage loss, and enhances the overall reliability of the ignition system by eliminating the distributor. The DIS is a 2–cylinder simultaneous ignition system which ignites 2 cylinders simultaneously with 1 ignition coil. In the 2–cylinder simultaneous ignition system, each of the 2 spark plugs is connected to the end of the secondary winding, High voltage generated in the secondary winding is applied directly to the 2 spark plugs. The sparks of the 2 spark plugs pass simultaneously from the center electrode to the ground electrode. The engine ECU determines ignition timing and outputs the ignition signals (IGT) for each cylinder. Based on IGT signals, the power transistors in the igniter cuts off the current to the primary coil in the ignition coil is supplied simultaneously to the 2 spark plugs via the high–tension cords that are connected to the both ends of the secondary coil. At the same time, the igniter also sends an ignition confirmation signal (IGF) as a fail–safe measure to the engine ECU.



DTC No	DTC Detecting Condition	Trouble Area
P1300/14,15 P1310/14,15	No IGF signal to engine ECU while engine is running	• Open or short in IGF or IGT circuit from ignition coil to engine ECU. • Ignition coil • engine ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:
Read freed frame data using hand–held tester. Because freeze frame records the engine conditions when the malfunction is detected, when troubleshooting it is useful for determining whether the vehicle was running or stopped, the engine warmed up or not, the air–fuel ratio lean or rich, etc. at the time of the malfunction.
DTC P1300/14,15 is for the ignition circuit of No.1 and No.4 cylinders.
DTC P1310/14,15 is for the ignition circuit of No.2 and No.3 cylinders.

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

NG → **Go to step 4.**

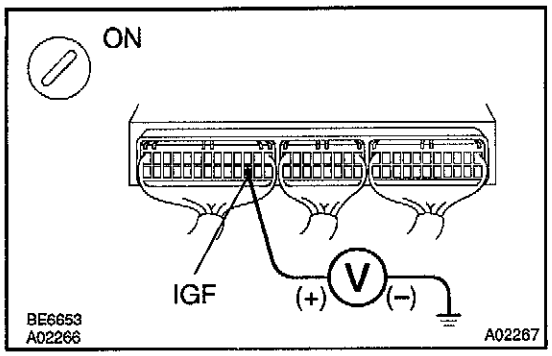
OK

2	**Check for open and short in harness and connector in IGF signal circuit between engine ECU and igniter (See page IN–21).**

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

OK

3	Disconnect ignition coil (w/ igniter) connector and check voltage between terminal IGF of engine ECU connector and body ground.



PREPARATION:

(a) Disconnect the ignition coil (w/ igniter) connector.
(b) Remove the glove compartment.
(c) Turn ignition switch ON.

CHECK:

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

OK:

Voltage: 4.5 ~ 5.5 V

OK → **Replace ignition coil (w/ igniter).**

NG

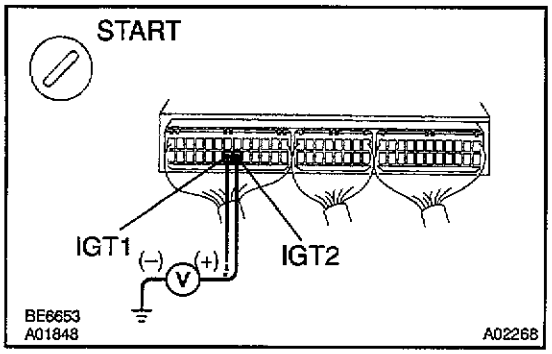
Check and replace ECU (See page IN–21).

4	Check for open and short in harness and connector in IGT1 and IGT2 signal circuit between engine ECU and ignition coil (w/ igniter) (See page IN–21).

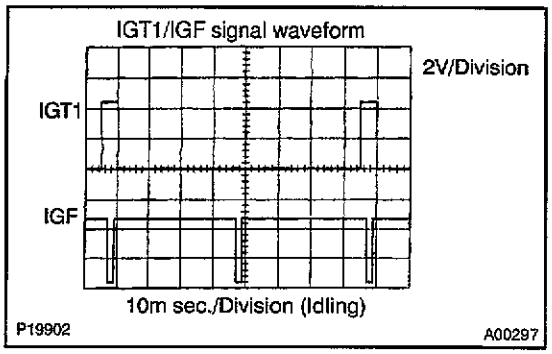
NG → **Repair or replace harness or connector.**

OK

5	Check voltage between terminals IGT1 and IGT2 of engine ECU connector and body ground.



PREPARATION:
Remove the grove compartment.
CHECK:
Measure voltage between terminals IGT1 and IGT2 of engine ECU connector and body ground when engine is cranked.
OK:
Voltage: More than 0.1 V and less than 4.5 V

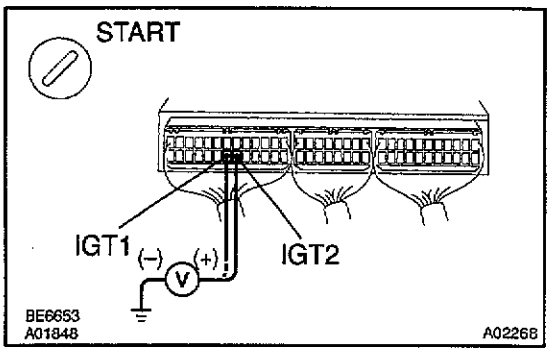


Reference: INSPECTION USING OSCILLOSCOPE
During idling, check waveform between terminals IGT1 and E1 of engine ECU.
HINT:
The correct waveform are as shown.
IGT2 signal waveform is same as the IGT1 signal waveform.

NG	Check and replace engine ECU (See page IN–21).

OK

6	Disconnect ignition coil (w/ igniter) connector and check voltage between terminals IGT1 and IGT2 of engine ECU connector and body ground.

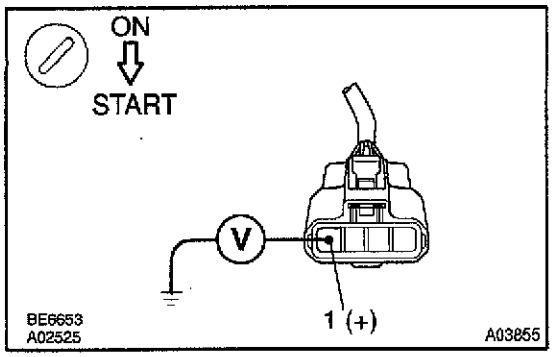


PREPARATION:
(a) Disconnect the ignition coil (w/ igniter) connector.
(b) Remove the glove compartment.
CHECK:
Measure voltage between terminals IGT1 and IGT2 of engine ECU connector and body ground when engine is cranked.
OK:
Voltage: More than 0.1 V and less than 4.5 V

NG	Check and replace engine ECU (See page IN–21).

OK

7	Check ignition coil (w/ igniter) power source circuit.



PREPARATION:
Disconnect the ignition coil (w/ igniter) with igniter connector.
CHECK:
Measure voltage between terminal 1 of ignition coil (w/ igniter)connector and body ground, when ignition switch is turned to "ON" and "STA" position.
OK:
Voltage: 9 ~ 14 V

NG → **Repair ignition coil (w/ igniter) power source circuit.**

OK

8	Check for open and short in harness and connector between ignition switch and ignition coil (w/ igniter) (See page IN–21).

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

OK

9	Check ignition coil (w/ igniter) (See page IN–21).

NG → **Replace ignition coil (w/ igniter).**

OK

10	Check EFI main relay (Marking: EFI) (See page IN–21).

NG → Replace EFI main relay (Marking: EFI)

OK

Replace ignition coil (w/ igniter).

DTC	P1335/13	Crankshaft Position Sensor Circuit Malfunction (during engine running)

CIRCUIT DESCRIPTION

Refer to DTC P0335/12 (Crankshaft Position Sensor Circuit Malfunction) on page DI–137.

DTC No.	DTC Detecting Condition	Trouble Area
P1335/13	No crankshaft position sensor signal to engine ECU with engine speed 1,000 rpm or more	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Starter • Engine ECU

WIRING DIAGRAM

Refer to DTC P0335/12 (Crankshaft Position Sensor Circuit Malfunction) on page DI–137 for the WIRING DIAGRAM.

INSPECTION PROCEDURE

HINT:
Read freed frame data using hand–held tester. Because freeze frame records the engine conditions when the malfunction is detected, when troubleshooting it is useful for determining whether the vehicle was running or stopped, the engine warmed up or not, the air–fuel ratio lean or rich, etc. at the time of the malfunction. Refer to DTC P0335/12 (Crankshaft Position Sensor Circuit Malfunction) on page DI–137.

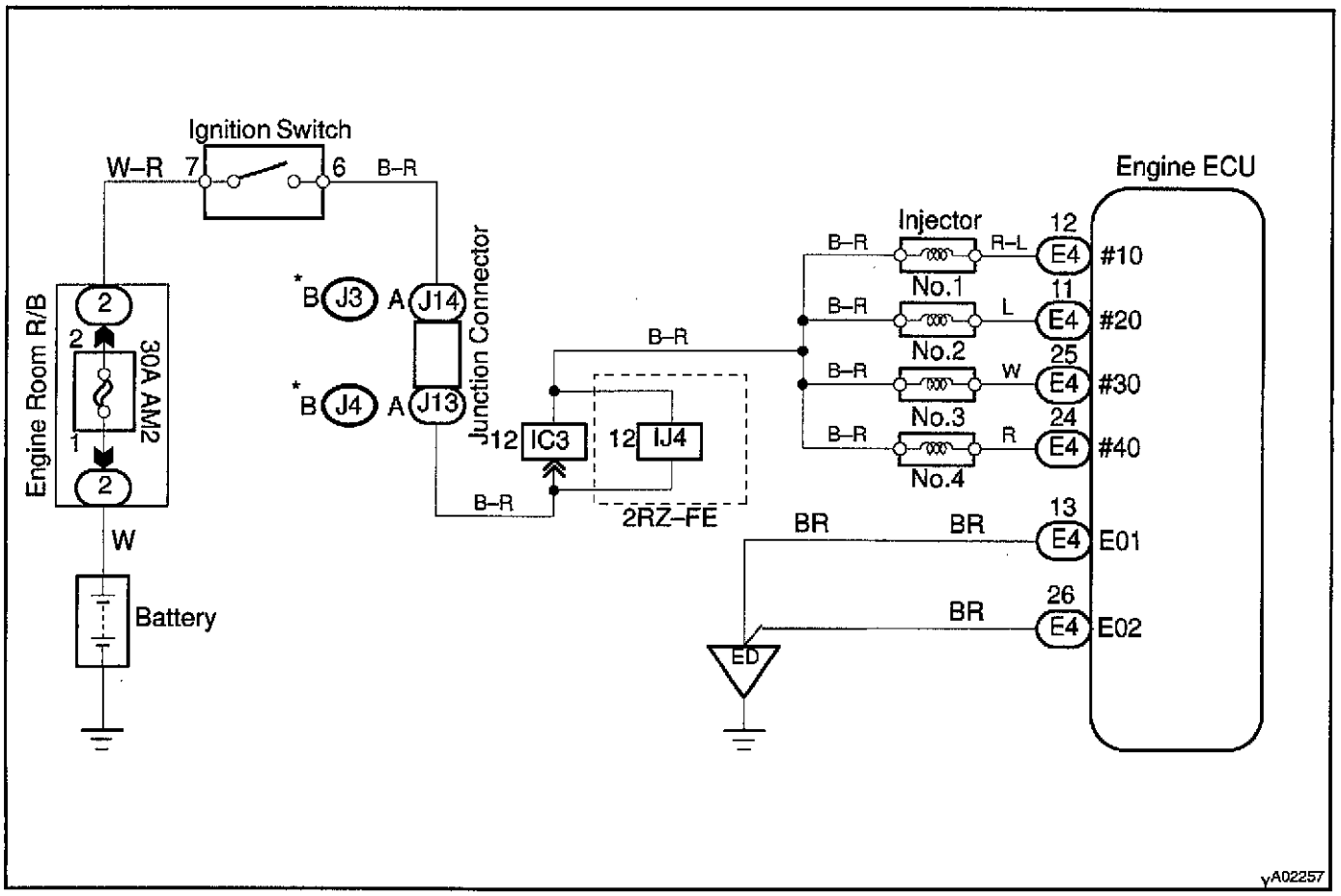
DI1IQ-01

Injector Circuit

CIRCUIT DESCRIPTION

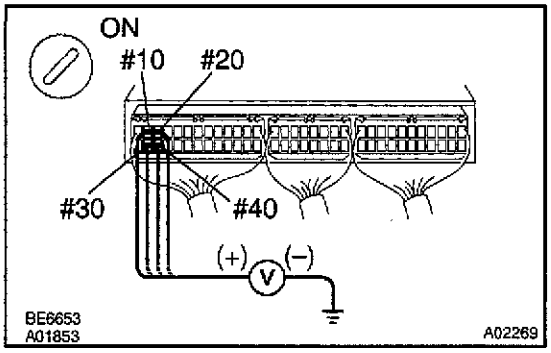
The injectors are located in the intake manifold. They inject fuel into the cylinders based on the signals from the engine ECU.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check voltage between terminals #10 ~ 40 of engine ECU and body ground.



PREPARATION:
(a) Remove glove compartment (See page FI–60).
(b) Turn ignition switch ON.

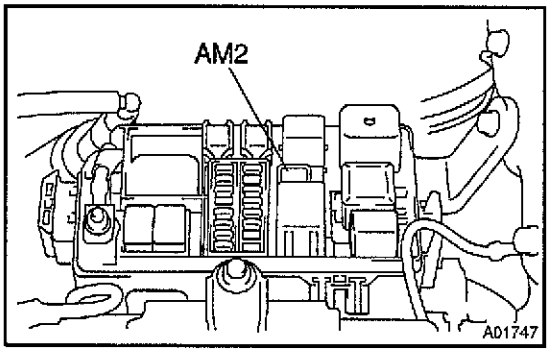
CHECK:
Measure voltage between terminals #10 ~ #40 of engine ECU and body ground.

OK:
Voltage: 9 – 14 V

OK	Go to step 4.

NG

2	Check AM2 fuse.



PREPARATION:
Remove AM2 fuse from J/B No.2.

CHECK:
Check continuity of AM2 fuse.

OK:
Continuity

NG	Check for short in the harness and all the components connected to AM2 fuse.

OK

3	Check resistance of injectors (See page FI–20).

NG → Replace injector.

OK →

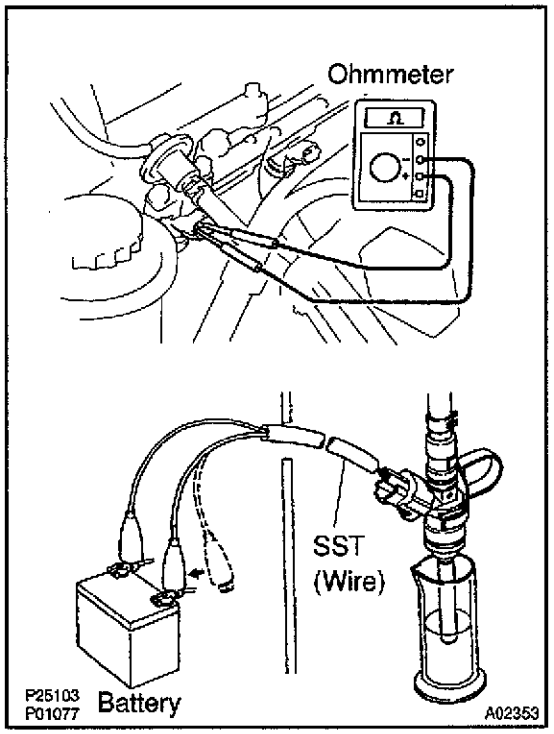
Check and repair harness and connector between engine ECU and battery.

4	Check for open in harness and connector between terminal E01, E02 of engine ECU connector and body ground (See page IN–21).

NG → Repair or replace harness or connector.

OK →

5	Check injectors.



PREPARATION:
Disconnect injector connector (See page FI–62).
CHECK:
Measure resistance of injector.
OK:
Resistance: Approx. 13.4 ~ 14.2 Ω at 20°C (68°F)
CHECK:
Check injection volume of injector (See page FI–20).
OK:

- **Injection Volume**
  2RZ–FE:
  64 ~ 78 cm^3/15 sec.
  (4.0 ~ 4.8 cu in./15 sec.)
  Difference between each injector:
  Less than 14 cm^3 (0.3 cu in.)
  3RZ–FE:
  72 ~ 86 cm^3/15 sec.
  (4.4 ~ 5.2 cu in./15 sec.)
  Difference between each injector:
  Less than 14 cm^3 (0.3 cu in.)
- **Leakage**
  Fuel drop: 1 drop or less per 3 minutes

NG → **Replace injector.**

OK

Proceed to next circuit inspection shown on problem symptoms table (See page DI–92).

DI1IR–01

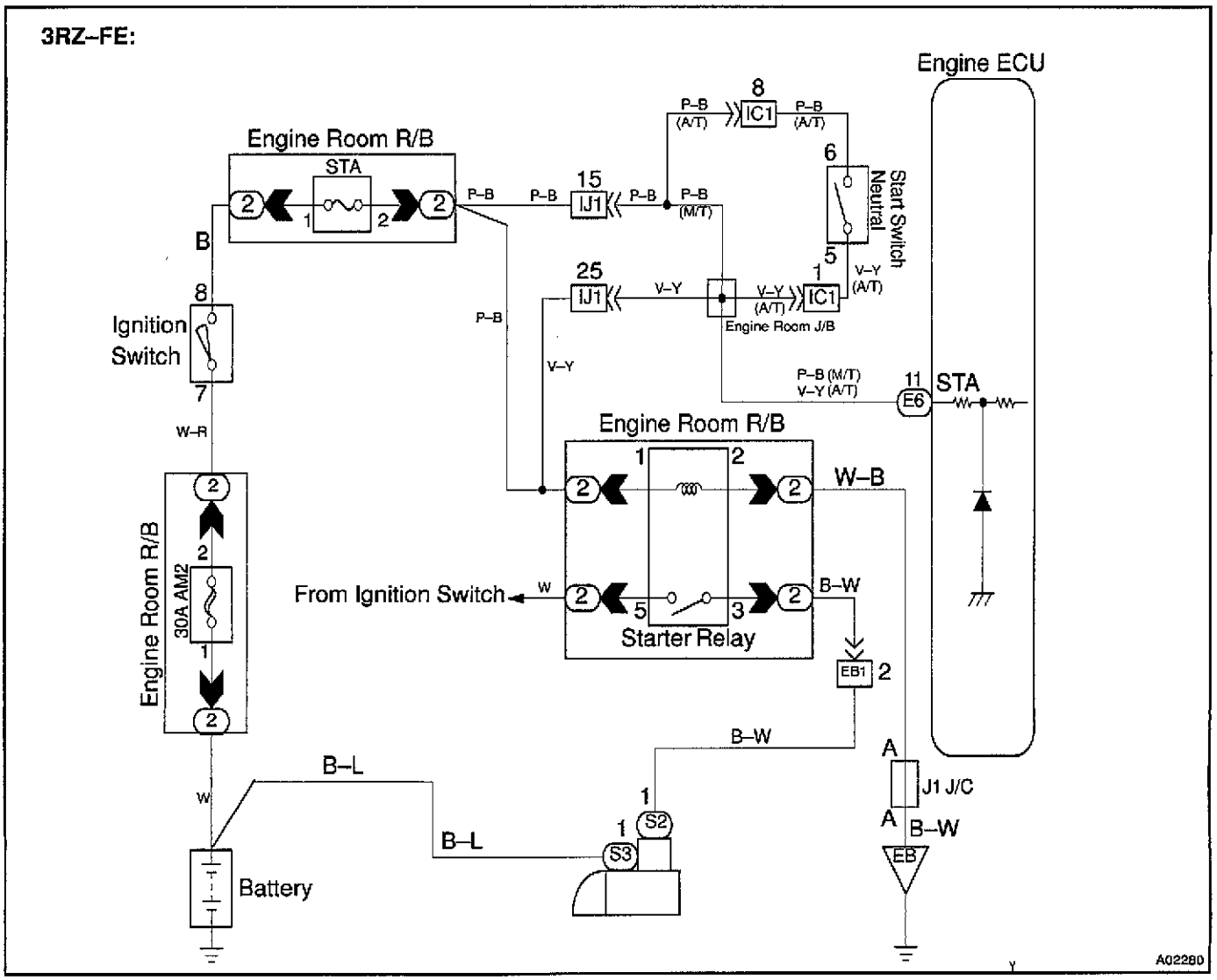
Starter Signal Circuit

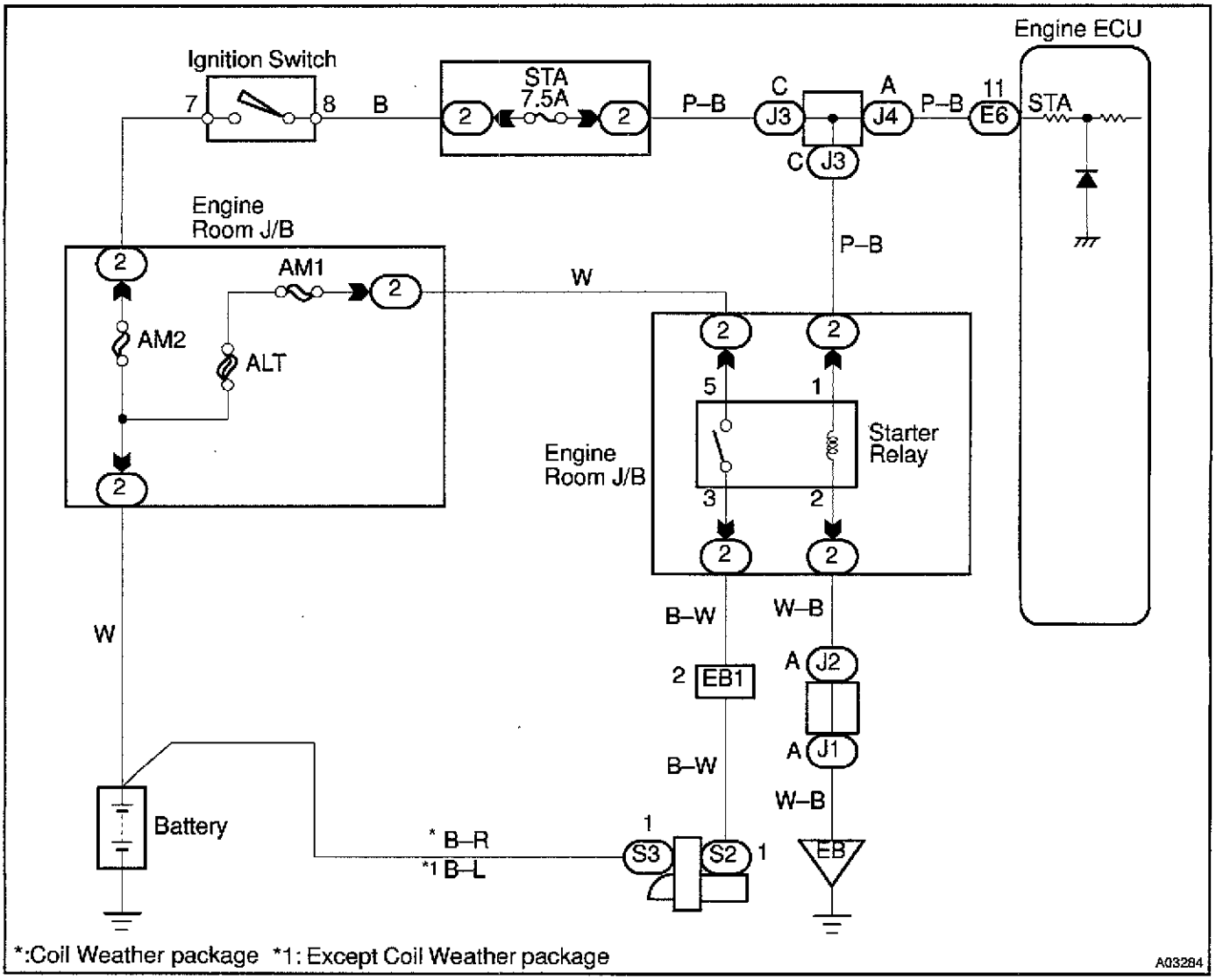
CIRCUIT DESCRIPTION

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

WIRING DIAGRAM

3RZ–FE:




Engine ECU
Ignition Switch
7
8
B
STA
7.5A
2
2
P–B
C
J3
A
J4
P–B
11
E6
STA
C
J3
Engine
Room J/B
2
AM1
2
W
P–B
AM2
ALT
2
2
2
5
1
Starter
Relay
Engine
Room J/B
3
2
2
2
W
B–W
W–B
2
EB1
A
J2
A
J1
B–W
W–B
Battery
* B–R
*1 B–L
1
S3
S2
1
EB
*:Coil Weather package *1: Except Coil Weather package
A03284

INSPECTION PROCEDURE

HINT:This diagnostic chart is based on the premise that engine is cranked normally. If the engine is not cranked, proceed to the problem symptoms table (See page DI–92)

1	**Check the starter signal.**

Using hand–held tester:

PREPARATION:

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

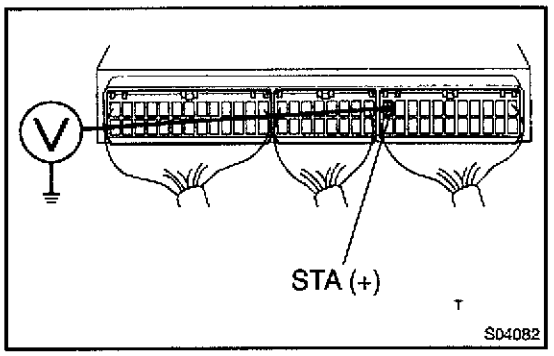
(b) Turn the ignition switch ON and hand–held tester main switch ON.

CHECK:

Read the starter signal on the hand–held tester during cranking.

OK:

Starter signal: ON



When not using hand–held tester:

PREPARATION:

Remove glove compartment (see page FI–60).

CHECK:

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

OK:

Voltage: 6.0 V or more

OK	**Proceed to next circuit inspection shown on problem symptoms table (See page DI–92).**

NG

2	**Check for open in harness and connector between engine ECU and starter relay (See page IN–21).**

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

OK

Check and replace engine ECU (See page IN–21).

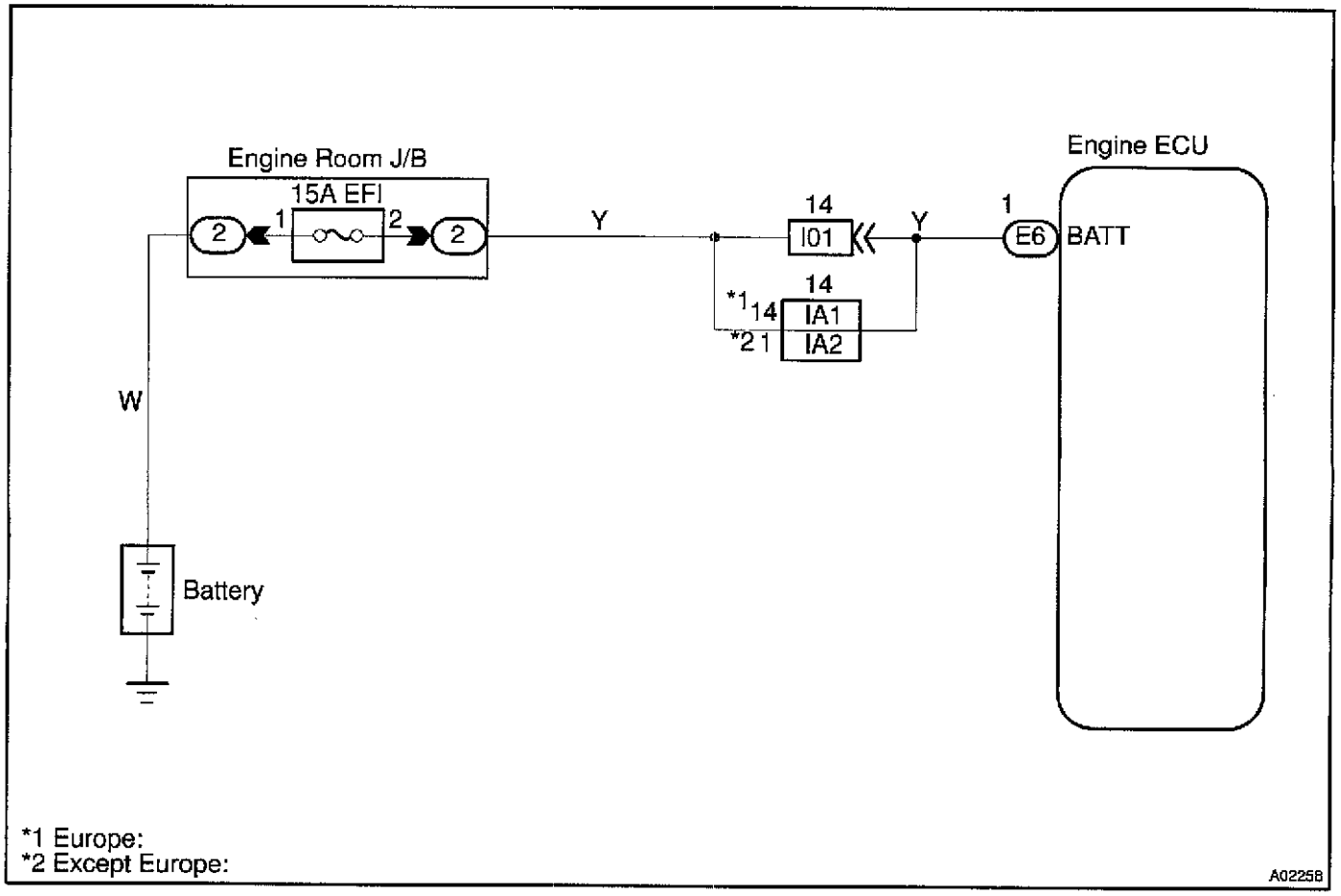
DI1IS–01

Back Up Power Source Circuit

CIRCUIT DESCRIPTION

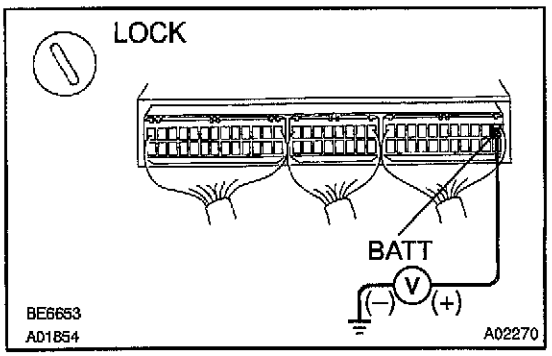
Battery voltage is supplied to terminal BATT of the engine ECU even when the ignition switch is OFF for use by the DTC memory and air–fuel ratio adaptive control value memory, etc.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check voltage between terminal BATT of engine ECU connector and body ground

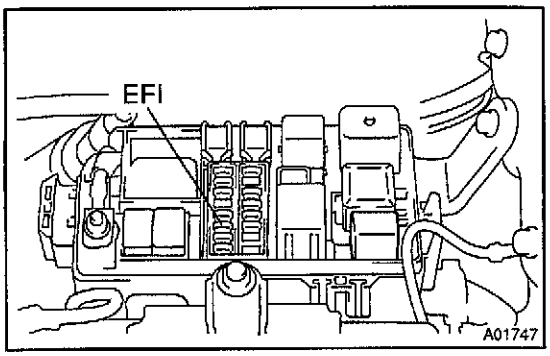


PREPARATION:
Remove glove compartment (See page FI–60).
CHECK:
Measure voltage between terminal BATT of engine ECU connector and body ground.
OK:
Voltage: 9 – 14V

OK → **Check and replace engine ECU (See page IN–21).**

NG

2	Check EFI fuse.



PREPARATION:
Remove EFI fuse from J/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

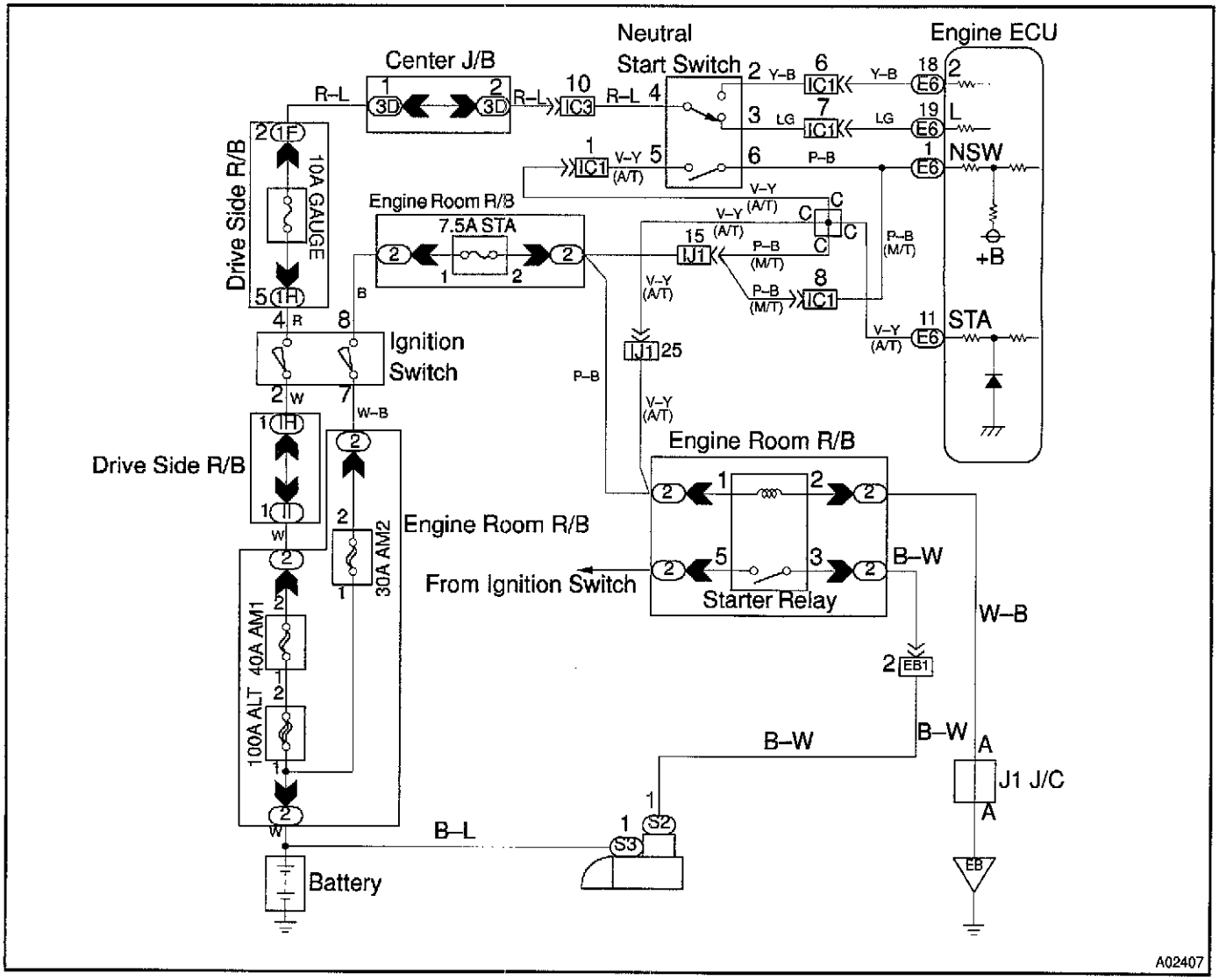
Check and repair harness or connector between battery, EFI fuse and engine ECU.

Neutral Start Switch Circuit (3RZ–FE).

CIRCUIT DESCRIPTION

The neutral start switch goes on when the shift lever is in the N or P shift position. When it goes on terminal NSW of the engine ECU is grounded to body ground via the starter relay thus the terminal NSW voltage becomes 0V. When the shift lever is in the D, 2, L or R position, the neutral start switch goes off, so the voltage of engine ECU terminal NSW becomes battery voltage, the voltage of the engine ECU 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.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check , 2, L and NSW signals.**

When using hand–held tester:

PREPARATION:

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

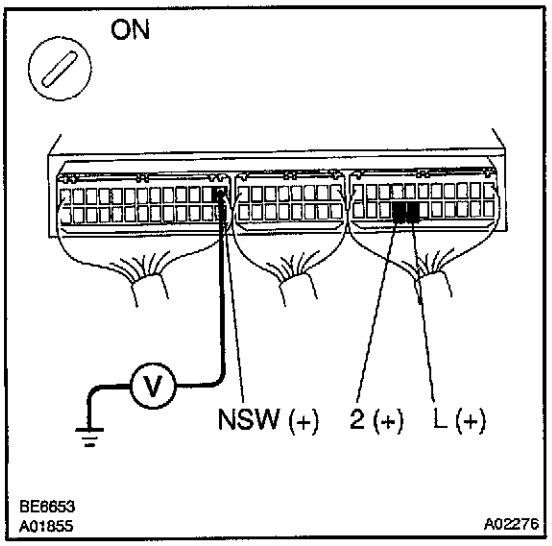
(b) Turn the ignition switch ON and hand–held tester main switch ON.

CHECK:

Shift the shift lever to the P, N, 2, or positions, and read the NSW, 2 and L signal on the hand–held tester.

OK:

Shift position	Signal
P, N	NSW OFF → ON
2	2 OFF → ON
L	L OFF → ON



When not using hand–held tester:

PREPARATION:

Turn the ignition switch ON.

CHECK:

Measure the voltage between the terminals NSW, 2, L of engine ECU and body ground when the shift lever is shifted to the following positions.

OK:

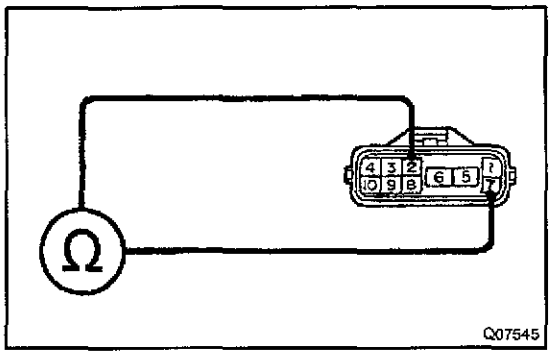
Position	R–Body ground	NSW–Body ground	2–Body ground	L–Body ground
P, N	0V	Below 1V	Below 1V	Below 1V
D	Below 1V	7.5 ~ 14V	Below 1V	Below 1V
2	Below 1V	7.5 ~ 14V	7.5 – 14V	Below 1V
L	Below 1V	7.5 ~ 14V	Below 1V	7.5 ~ 14V

*: The voltage will drop slightly due to lighting up of the back up light.

OK → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–92).**

NG

2	Check neutral start switch.



PREPARATION:

Remove the neutral start switch

CHECK:

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

OK:

Shift position	Terminal No. to continuity	Terminal No. to continuity
P	5 – 6	2 – 7
R	2 – 8	–
N	5 – 6	2 – 9
D	2 – 10	–
2	2 – 3	–
L	2 – 4	–

NG → **Replace neutral start switch.**

OK ↓

3	Check harness and connector between battery and neutral start switch, neutral start switch and engine ECU (See page IN–21).

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

OK ↓

Check and replace engine ECU.

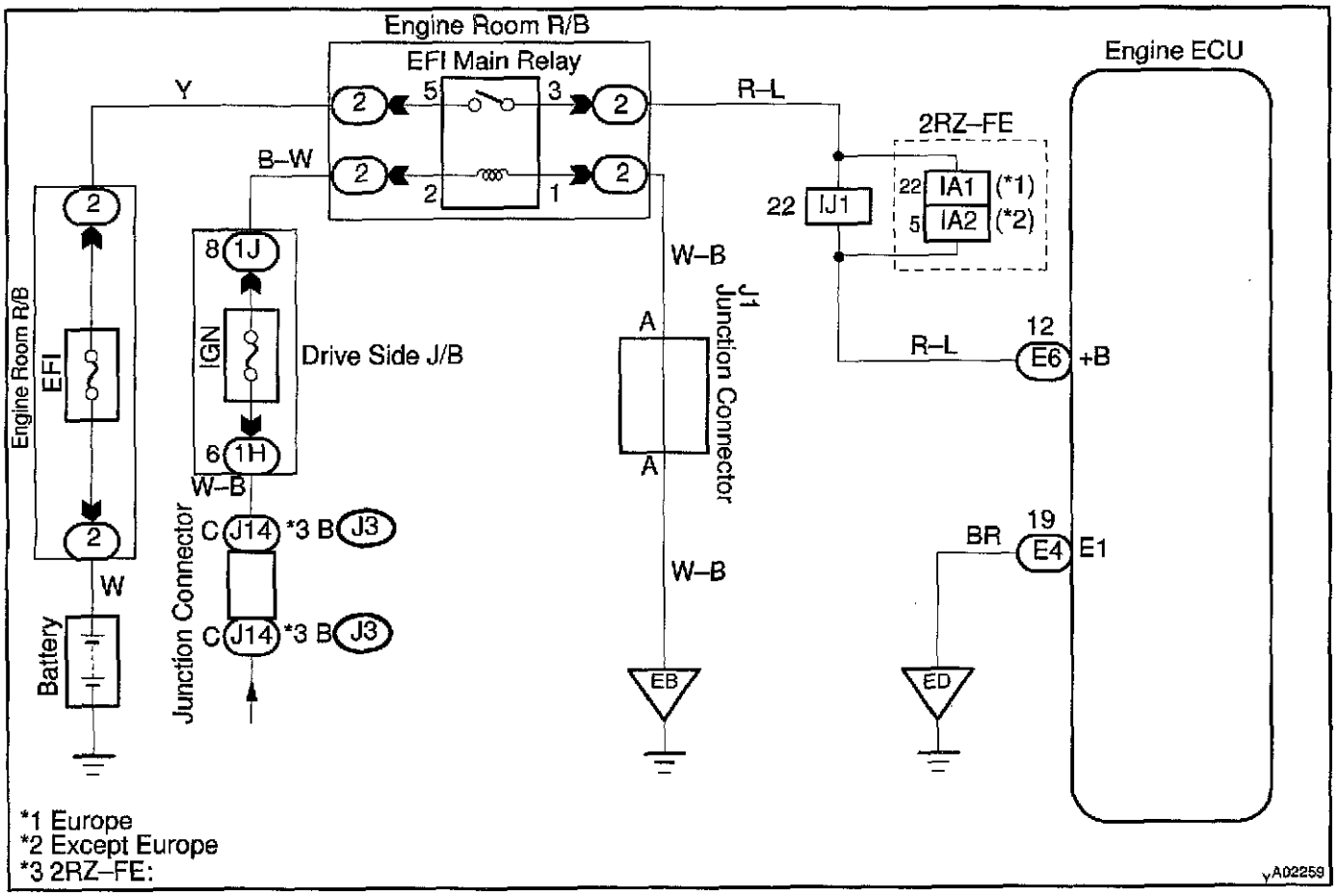
DI1IU–01

ECU Power Source Circuit

CIRCUIT DESCRIPTION

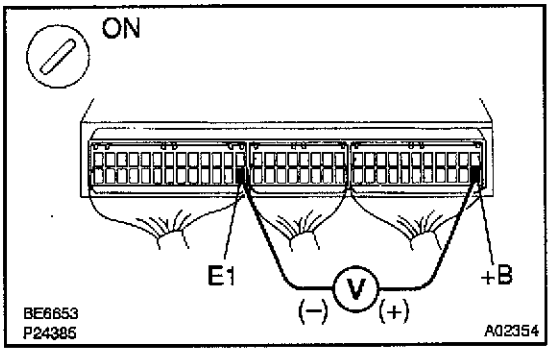
When the ignition switch is turned ON, battery positive voltage is applied to the coil, closing the contacts of the EFI main relay and supplying power to the terminal +B of the engine ECU.

WIRING DIAGRAM



INSPECTION PROCEDURE

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



PREPARATION:

(a) Remove glove compartment (See Page FI–60).

(b) Turn ignition switch ON.

CHECK:

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

OK:

Voltage: 9 – 14V

OK	**Proceed to next circuit inspection shown on problem symptoms table (See page DI–92).**

NG

2	**Check for open in harness and connector between terminal E1 of engine ECU and body ground (See page IN–21).**

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

OK

3	**Check EFI main relay (See page FI–50).**

NG	**Replace EFI main relay.**

OK

4	**Check EFI fuse .**

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

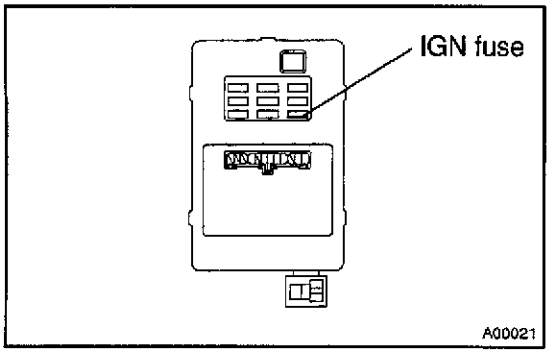
OK

5	**Check for open in harness and connector between main relay and battery, main relay and engine ECU (See page IN–21).**

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

OK

6	**Check IGN fuse.**



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

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

OK

7	Check ignition switch .

NG → Replace ignition switch.

OK

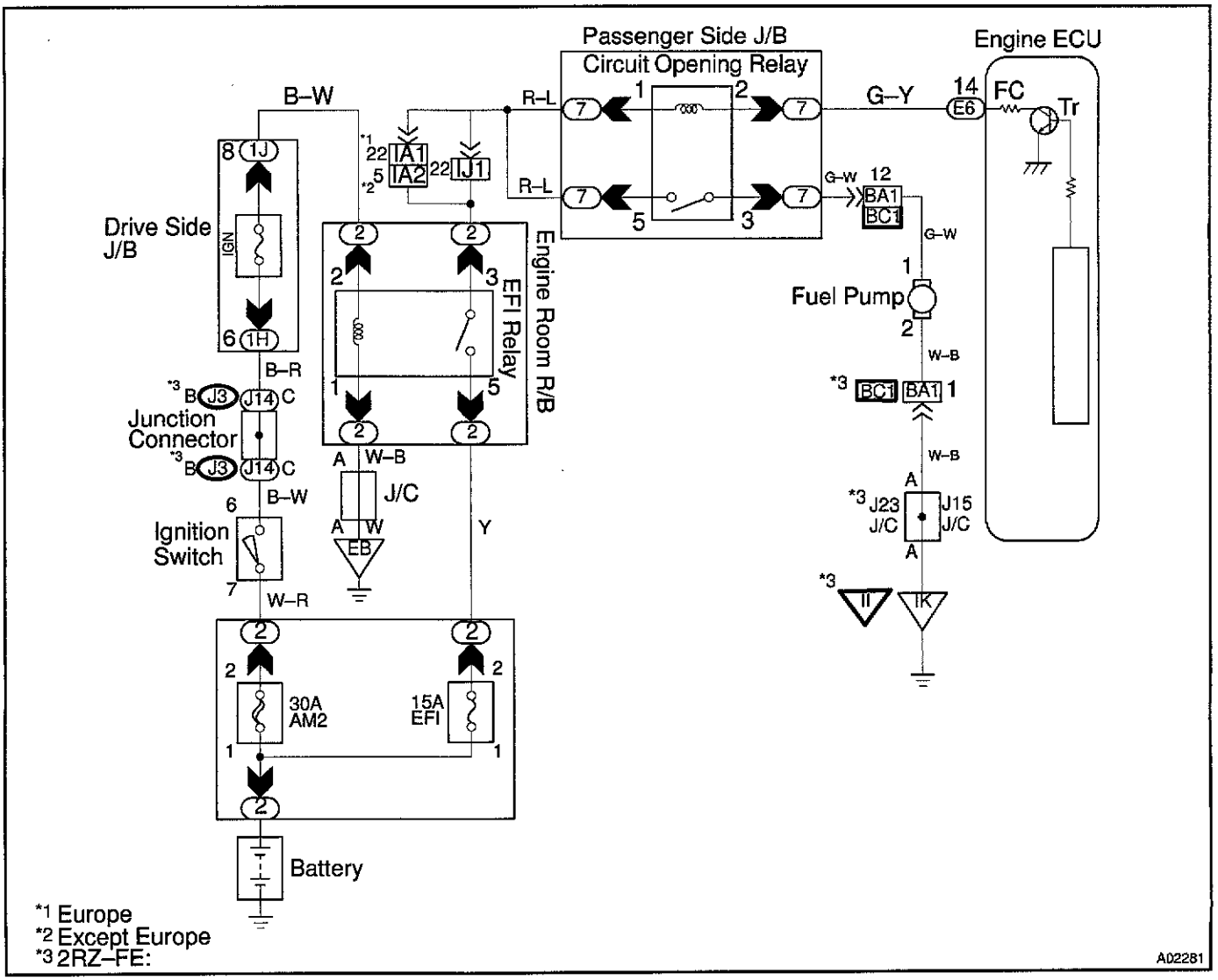
Check for open in harness and connector between IG switch and main relay, main relay and body ground (See page IN–21).

Fuel Pump Control Circuit

CIRCUIT DESCRIPTION

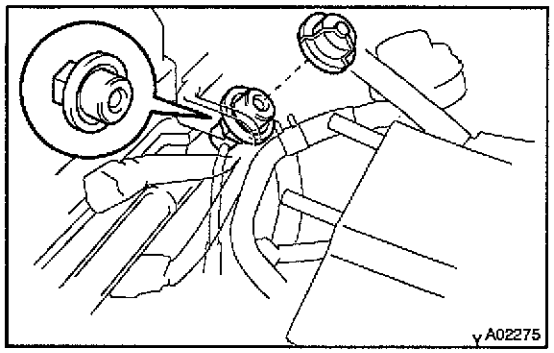
In the diagram below, when the engine is cranked, current flows from terminal ST of the ignition switch to the starter relay coil and also current flows to terminal STA of engine ECU (STA signal).
When the STA signal and NE signal are input to the engine ECU, Tr is turned ON, current flows to coil of the circuit opening relay, the relay switches on, power is supplied to the fuel pump and the fuel pump operates. While the NE signal is generated (engine running), the engine ECU keeps Tr ON (circuit opening relay ON) and the fuel pump also keeps operating.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check fuel pump operation.



PREPARATION:

(a) Connect the hand held tester to the DLC3.
(b) Turn the ignition switch ON and hand–held tester main switch ON.
(c) Select the active test mode on the hand–held tester.
(d) If you have no hand–held tester, connect the positive (+) and negative (–) leads from the battery to the fuel pump connector (See page FI–11).

CHECK:

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

OK:

The pulsation damper screw rises up.

OK → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–92).**

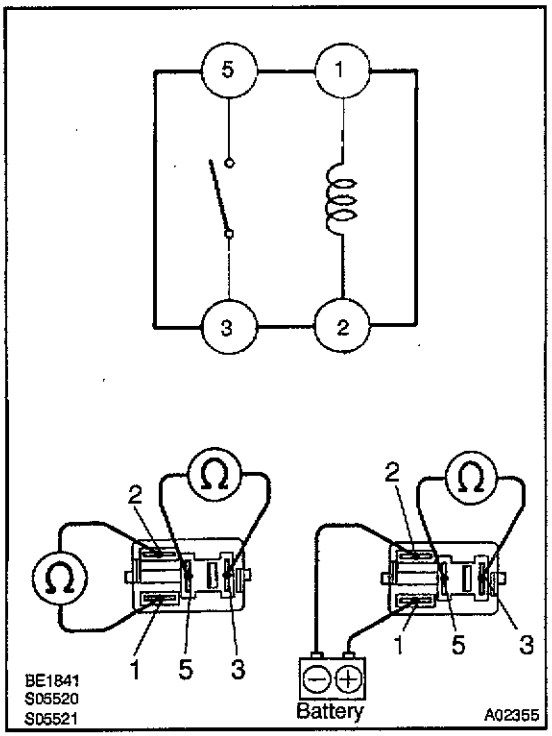
NG

2	Check for engine ECU power source circuit (See page DI–170).

NG → **Repair or replace.**

OK

3	Check circuit opening relay.



PREPARATION:

(a) Remove the lower instrument cover.

(b) Remove circuit opening relay.

CHECK:

Check continuity between terminals of circuit opening relay shown below.

OK:

Terminals 3 and 5	Open
Terminals 1 and 2	Continuity (Reference value 74 Ω)

CHECK:

(a) Apply battery positive voltage between terminals 1 and 2.

(b) Check continuity between terminals 3 and 5.

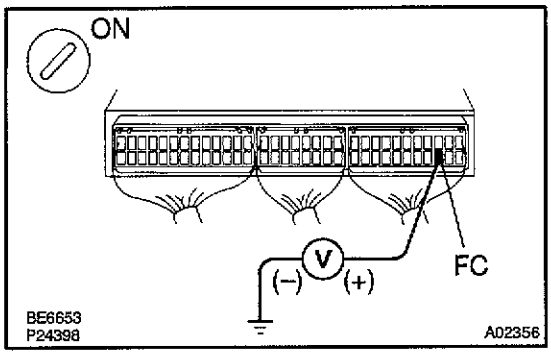
OK:

Terminals 3 and 5	Continuity

NG → **Replace circuit opening relay.**

OK

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



PREPARATION:

(a) Remove glove compartment (See page FI–60).

(b) Turn ignition switch ON.

CHECK:

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

OK:

Voltage: 9 ± 14 V

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

OK

5	Check fuel pump (See page FI–11).

NG → Repair or replace fuel pump.

OK

6	Check for open in harness and connector between circuit opening relay and fuel pump, fuel pump and body ground (See page IN–21).

NG → Repair or replace harness or connector.

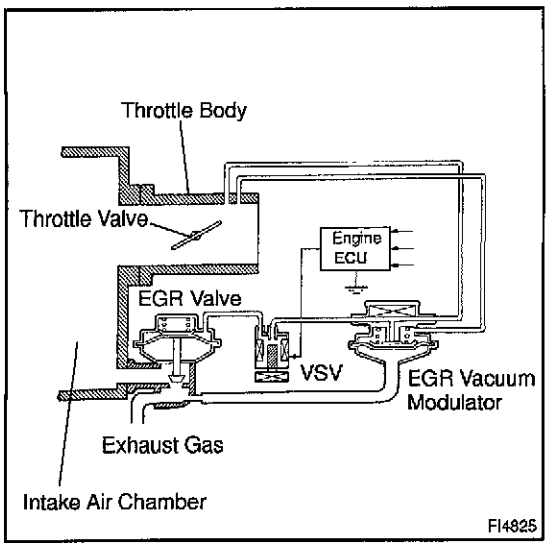
OK

Check and replace engine ECU (See page IN–21).

DI1W–01

EGR System (2RZ–FE).

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 engine ECU. This results in atmospheric air acting on the EGR valve, closing the EGR valve and shutting off the exhaust (EGR cut–off).

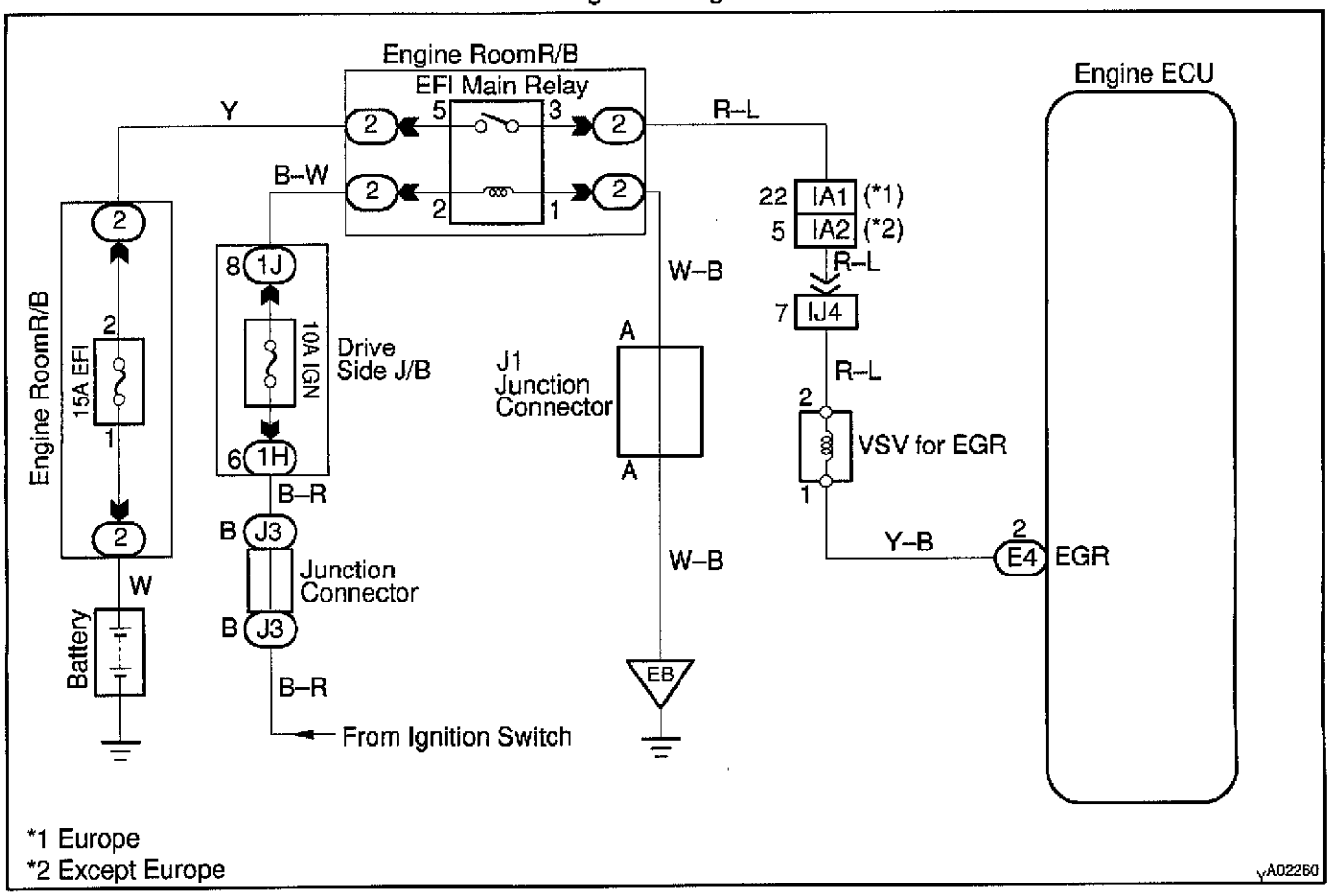
Under the following conditions, EGR is cut to maintain driveability.

Before the engine is warmed up

During deceleration (Throttle valve closed)

Light engine load (amount of intake air very small)

Engine racing



INSPECTION PROCEDURE

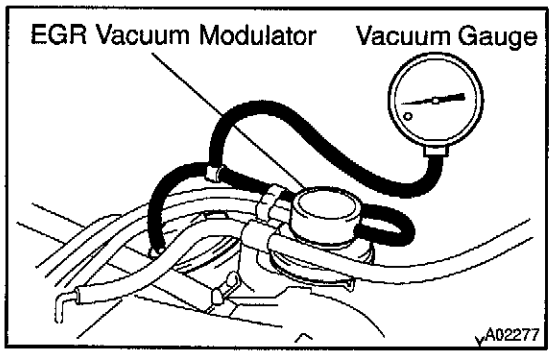
When using hand–held tester

1	**Check the connection of vacuum hose.**

NG → **Repair or replace.**

OK

2	**Check the vacuum between EGR valve and VSV for EGR at 3,000 rpm.**



PREPARATION:

(a) Using a 3–way connector, connect a vacuum gauge to the hose between VSV and EGR valve.

(b) Warm up the engine to above 80°C (176°F).

CHECK:

Check the vacuum at 3,000 rpm.

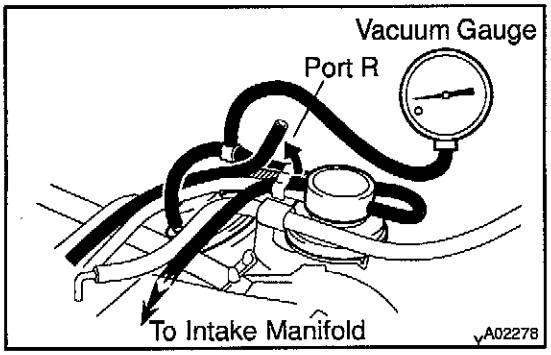
OK:

Vacuum:10 kPa (75 mmHg, 3.0 in.Hg)

OK → **Prceed to next circuit inspection shown on problem symptoms table (See page DI–92)**

NG

3	Check the vacuum between EGR valve and VSV for EGR at 3,500 rpm.



PREPARATION:

(a) Using a 3–way connector, connect a vacuum gauge to the hose between VSV and EGR valve.
(b) Warm up the engine to above 80°C (176°F).
(c) Disconnect the vacuum hose from port R of EGR vacuum modulator and connect port R directly to the intake manifold with another hose.

CHECK:

Check the vacuum at 3,500rpm.

RESULT:

Type	Vacuum
I	0 kPa (0 mmHg, 0 in. Hg)
II	0 kPa (0 mmHg, in. Hg) ~ 40 kPa (300 mmHg, 11.8 in. Hg)
III	40 kPa (300 mmHg, 11.8 in. HG)

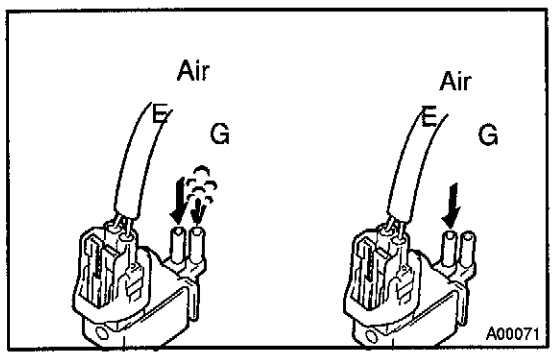
Type I → **Replace EGR vacuum modulator.**

Type II → **Go to step 4.**

Type III

Check the EGR valve, and repair or replace EGR valve.

4	Check the VSV circuit for EGR.



PREPARATION:

Select the ACTIVE TEST mode on the hand–held tester.

CHECK:

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

OK:

EGR system is OFF:
Air from pipe E is flowing out through air filter.
EGR system is ON:
Air from pipe E is flowing out through pipe G.

OK → **Check the connection, damage and blockage of vacuum hose.**

NG

5	Check VSV for EGR (See page FI–53)

NG → Replace VSV for EGR.

OK

6	Check for open and short in harness and connector between VSV for EGR and engine ECU (See page IN–21)

NG → Repair or replace harness or connector.

Check and replace engine ECU.

When not using hand–held tester

1	Check the connection of vacuum hose.

NG → Repair or replace.

OK

2	Check the vacuum between EGR valve and VSV for EGR at 2,800 rpm

OK → Proceed to next circuit inspection shown on problem symptoms table (See page DI–92)

NG

3	Check the vacuum between EGR valve and VSV for EGR at 3,500 rpm

Type I → Replace EGR vacuum modulator.

Type II → Go to step 4.

Type III

Check the EGR valve, and repair or replace EGR valve.

5	Check VSV for EGR (See page FI–53).

NG → Replace VSV for EGR.

OK

6	Check for open and short in harness and connector between VSV for EGR and engine ECU. (See page IN–21)

NG → Repair or replace harness or connector.

OK

Check and replace engine ECU.

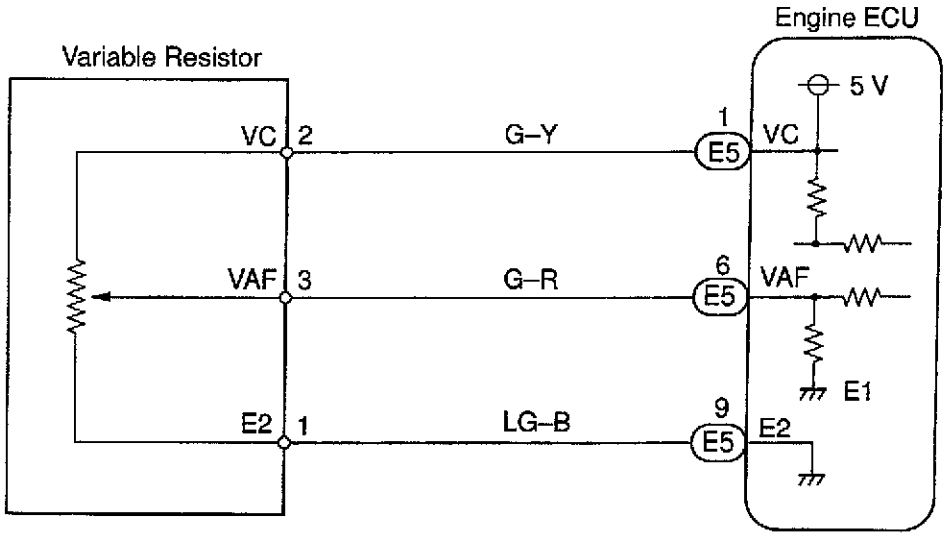
DI1IX-01

Variable Resistor Circuit (3RZ–FE)

CIRCUIT INSPECTION

This resistor is used change the air–fuel ratio of the air–fuel mixture.
The idle mixture is adjusted using this resistor.
Turning the idle mixture adjusting screw clockwise moves the contacts inside the resistor, raising the terminal VAF voltage. Conversely, turning the screw counterclockwise lowers the terminal VAF voltage.
When the terminal VAF voltage rises, the engine ECU increases the injection volume slightiy, marking the air–fuel mixture a little richer.

WIRING DIAGRAM

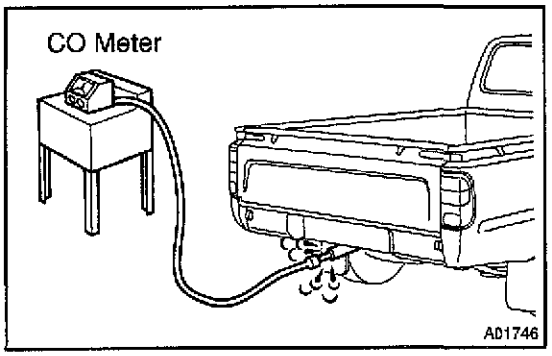


FI6851

INSPECTION PROCEDURE

NOTICE:
Always use a CO meter when adjusting the idle mixture. If a CO meter is not available, DO NOT ATTEMPT TO ADJUST IDLE MIXTURE.

1	**Check CO concentration.**



PREPARATION:
(a) Warm up engine to normal operating temp.
(b) All accessories switched OFF.
(c) All vacuum lines properly connected.
(d) Transmission in "N" position.
(e) Connect the hand–held tester or tachometer.
(f) Ignition timing check correctly.
(g) Idle speed check correctly.
(h) Check that the CO meter is properly calibrated.
(i) Race the engine at 2,500 rpm about 2 minutes.

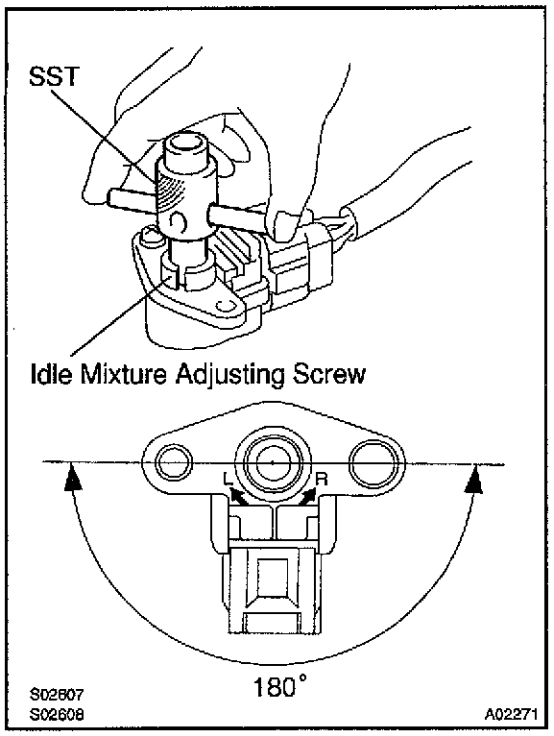
CHECK:
Insert a tester probe at least 40 cm (1.3 ft) into the tailpipe. Measure the concentration with 1 – 3 minutes after racing the engine to allow the concentration to stabilize.

OK:
Idle CO concentration: 1.5 ± 0.5 %

OK → **CO concentration is normal. Proceed to next circuit inspection shown problem symptom tables (See page DI–92)**

NG

2	**Adjust CO concentration.**



PREPARATION:

Same condition as step 1 of this chart.

CHECK:

Using SST, adjust the idle mixture by turning the idle mixture adjusting screw in the variable resistor.

SST 09243–00020

RESULT:

OK	Concentration: 1.5 ± 0.5%
NG type I	Change in CO concentration
NG type II	No change in CO concentration

HINT:

Always check idle speed after turning the idle mixture adjusting screw. If it is incorrect, readjust idle speed.

Adjustable range of the idle mixture adjust to turn this screw is 180 degrees. Do not turn this screw more than it.

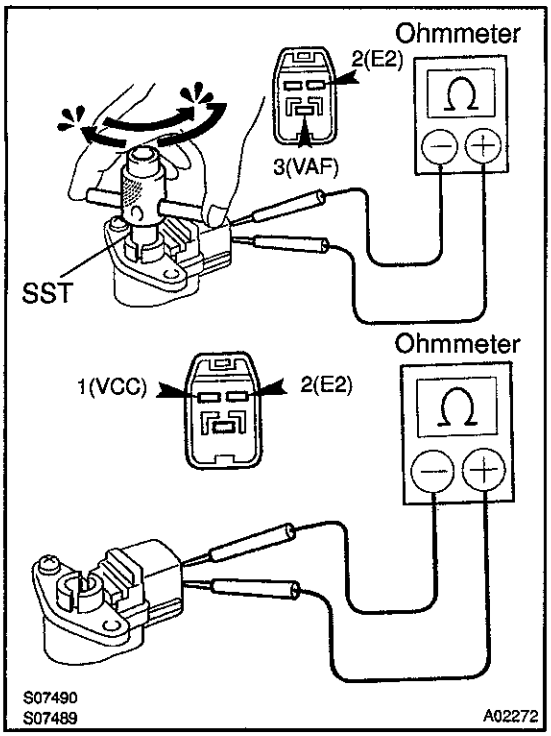
NG → **Type I**
See page EM–3 and go on troubleshooting

NG → **Type II**
Go to step 3.

OK

Adjustment is complete.

3	Check resistance of variable resistor.



Check Resistance Between 1 and 2:

PREPARATION:

Disconnect the variable resistor connector.

CHECK:

Measure resistance between terminals 1 and 2 the variable resister.

OK:

Resistance: 4 – 6 Ω

Check Resistance Between 1 and 3:

CHECK:

Measure resistance between terminals 1 and 3 when turning the idle mixture adjusting screw fully clockwise and counter-clockwise using SST.

SST 09243 – 00020

OK:

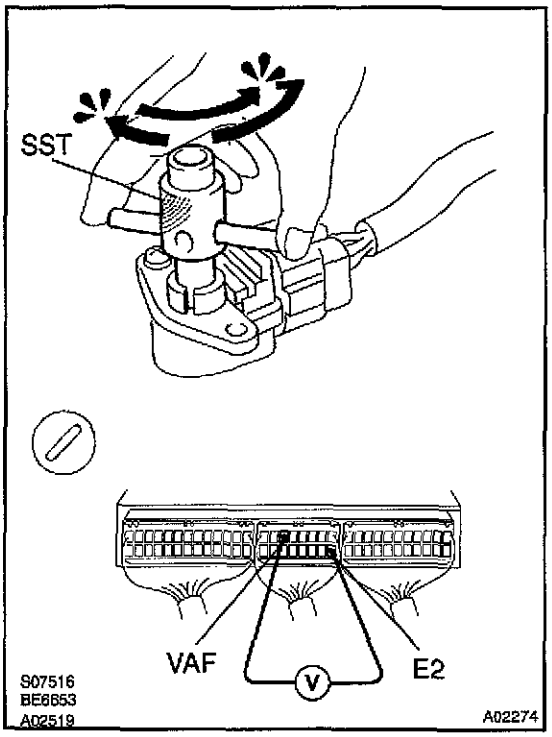
Resistance:

Change from about 5 kΩ to 0 kΩ accordingly

NG	Replace variable resister.

OK

4	Check voltage between terminals VAF and E2 of engine engine ECU connector.



PREPARATION:

(a) Reconnect the variable resistor connector.
(b) Remove the instrument panel under cover.
(c) Turn the ignition switch ON.

CHECK:

Measure voltage between terminals VAF and E2 of engine ECU connector while slowly turning the idle mixture adjusting screw first fully counterclockwise and then fully clockwise, using SST.

SST 09243 – 00020

OK:

Voltage changes smoothly from 0 V to about 5 V, i.e. does not suddenly jump up to 5 V down to 0 V.

OK	Check and replace engine ECU.

NG

5	Check for open and short in harness and connector between variable resistor and engine ECU (See page IN–21).

NG	Repair or replace harness or connector.

OK

Check and replace engine engine ECU.