DIAGNOSTICS

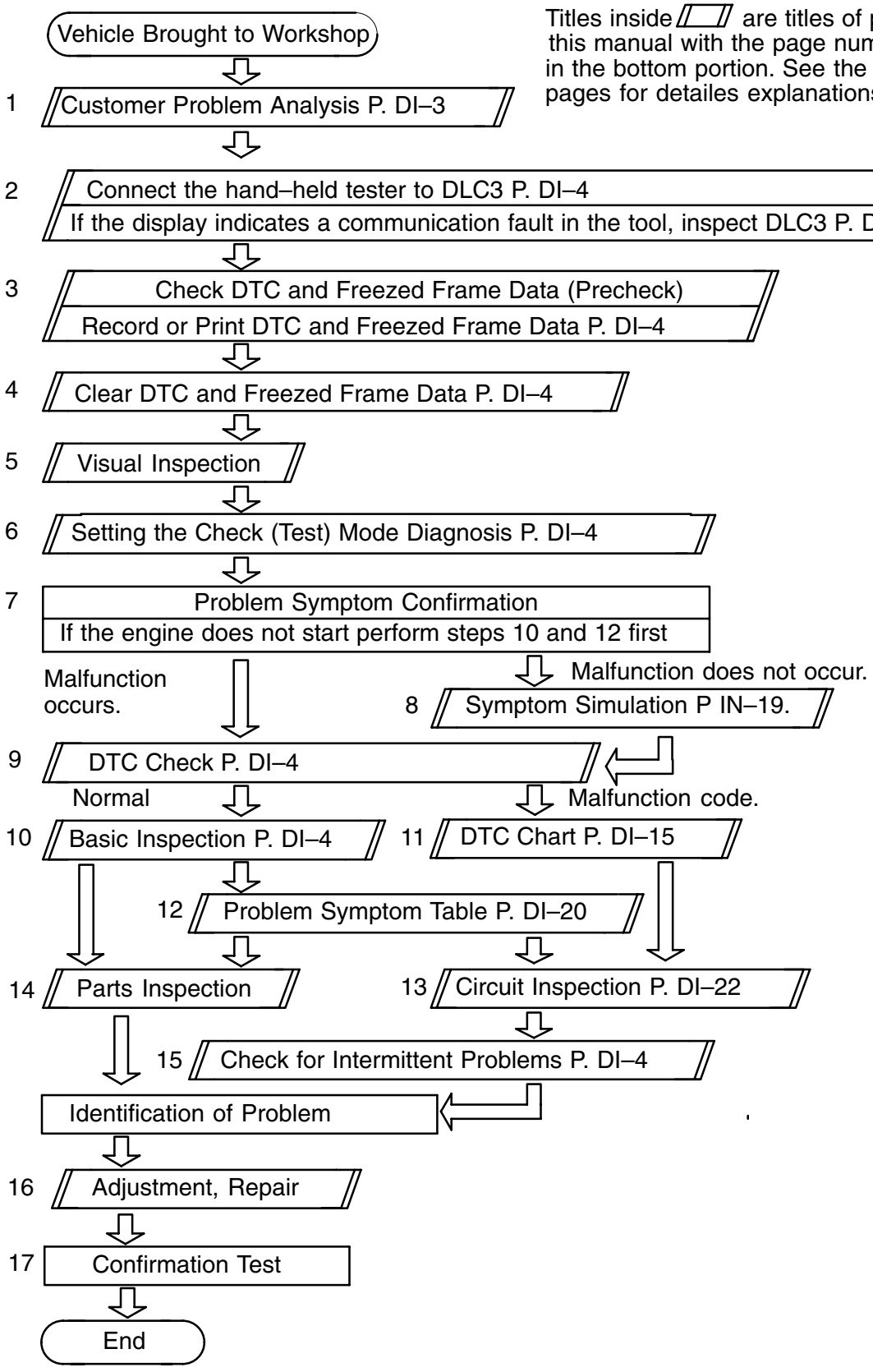
ENGINE DI–1
HOW TO PROCEED WITH TROUBLESHOOTING DI–1
CUSTOMER PROBLEM ANALYSIS CHECK ... DI–3
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ENGINE

HOW TO PROCEED WITH TROUBLESHOOTING

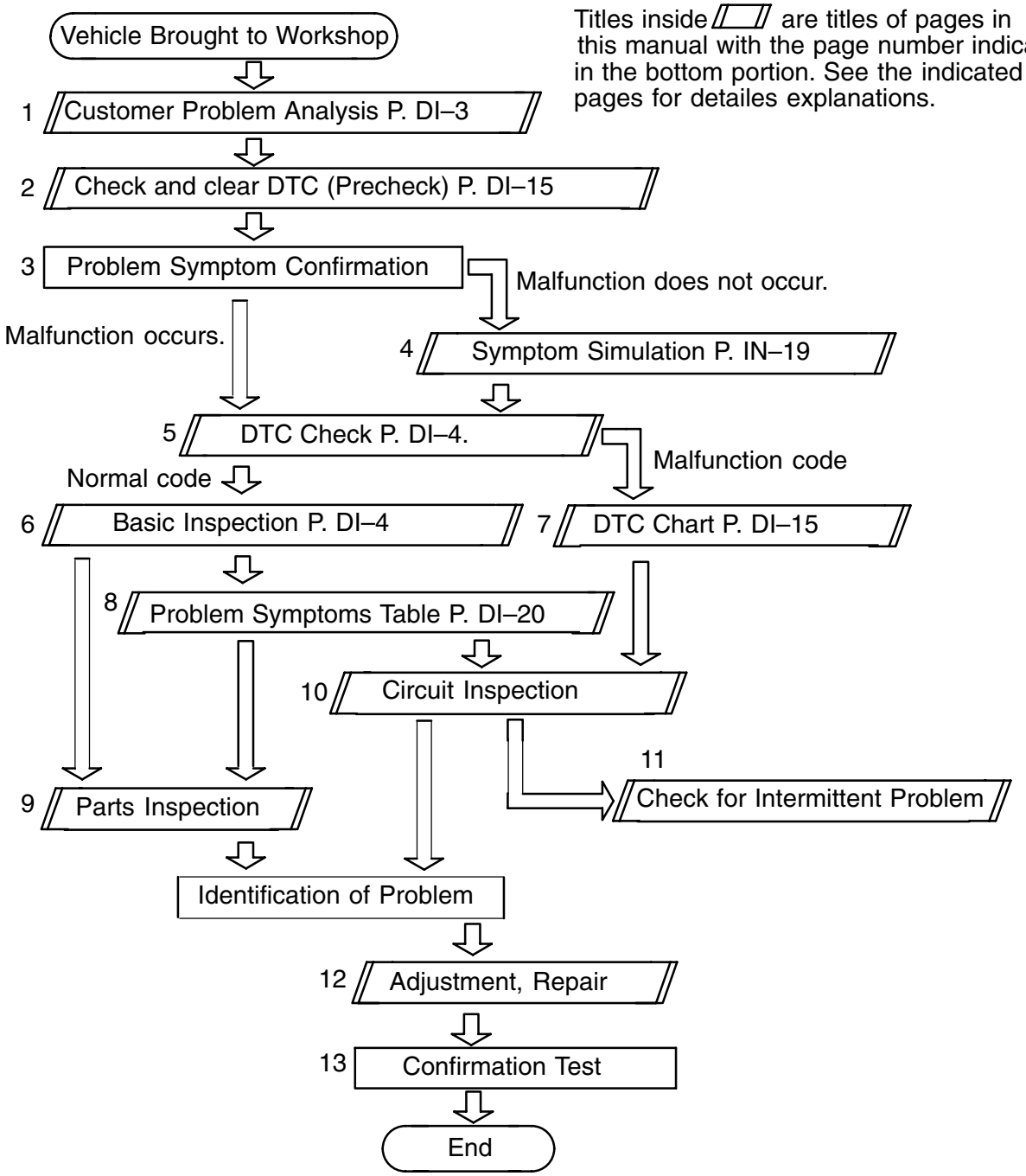
DI1I4–04

When using hand–held tester, troubleshooting 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.

When not using hand–held tester, troubleshooting in accordance with the procedure on the following pages.



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

DI1I5–01

CUSTOMER PROBLEM ANALYSIS CHECK

ENGINE CONTROL SYSTEM Check Sheet

Inspector's Name _____

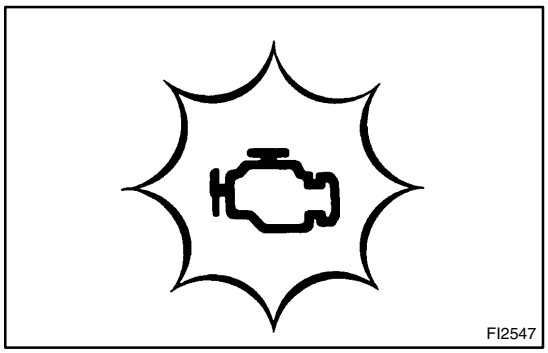
Customer's Name		Model and Model Year	
Driver's Name		Frame No.	
Data Vehicle Brought in		Engine Model	
License No.		Odometer Reading	km miles

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 check engine warning light (CHK ENG)		☐ 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 ( )

DI1I6–02

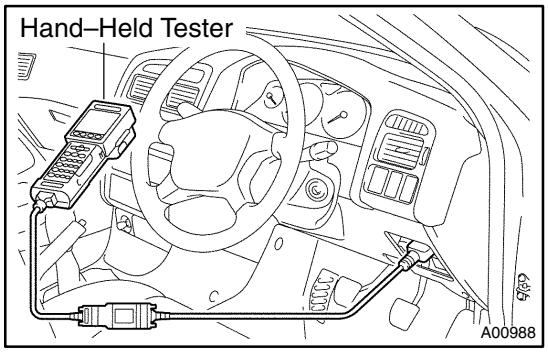

FI2547

PRE–CHECK

1. DIAGNOSIS SYSTEM

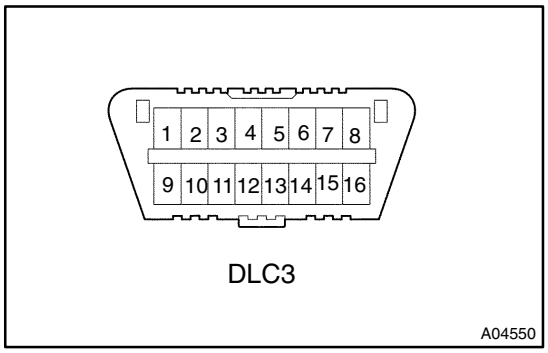
(a) Description

- When troubleshooting Multiplex OBD (M–OBD) vehicles, the only difference from the usual troubleshooting procedure is that you connect the hand–held tester to the vehicle, and read off various data output from the vehicle's engine ECU.
- The vehicle's on–board computer lights up the check engine warning light (CHK ENG) on the instrument panel when the computer detects a malfunction in the computer itself or in drive system components. In addition to the check engine warning light lighting up when a malfunction is detected, the applicable Diagnosis Trouble Code (DTC) are recorded in the engine ECU memory.
  (See page DI–15)
  If the malfunction has been repaired, the check engine warning light goes off automatially but the DTCs remain recorded in the engine ECU memory.



- To check the DTCs, connect the hand–held tester to Data Link Connector 3 (DLC3) on the vehicle. or read the number of blinks of the check engine warning light when TC and CG terminals on the DLC3 are connected. The hand–held tester also enables you to erase the DTCs and activate the several actuaters and check freezed frame data and vaious forms of engine data (For operating instructions, see the hand–held
  tester instruction book.)
- The diagnosis system operates in normal mode during normal vehicle use. It also has a check (test) mode for technicans to simulate malfunction symptoms and troubleshoot. Most DTCs use 2 trip detection logic to prevent erroneous detection and ensure thorough malfunction detection. By switching the engine ECU to check (test) mode using hand–held tester when troubleshooting, the techinician can cause the check engine warning (CHK ENG) to light up for a malfunction that is only detected once or momentarily. (Hand–held tester only)
  (See step 3.)

- * 2 trip detection logic
  When a logic malfunction is fist detected, the malfunction is temporaily stored in the engine ECU memory. If the same malfunction is detected again during the second drive test, this second detection cases the check engine warning (CHK ENG) to light up.
  The 2 trip repeats the same mode for 2 times. (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 malfunction is detected.
  Because freeze frame data records the engine conditions (fuel system, calculator load, water 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.

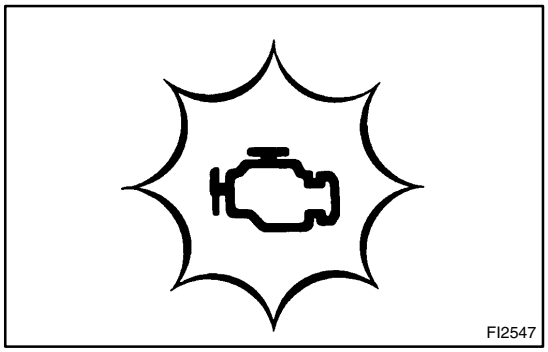


(b) Check the DLC3.
The vehicle's engine ECU uses the ISO 14230 for communication. The terminal arrangement of DLC3 complies with SAE J1962 and matches the ISO 14230 format.

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

HINT:
If your display shows "UNABLE TO CONNECT TO VEHICLE" when you have connected the cable of the hand–held tester to DLC3, turned the ignition switch ON and operated the hand–held tester, 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 is when the tool is connected to another vehicle, the problem is probably in the tool itself, so consult the Service deparment listed in the tool,s instruction manual.


FI2547

2. INSPECT DIAGNOSIS (Normal Mode)

(a) Check the check engine warning light.

(1) The check engine warning (CHK ENG) comes on when the ignition switch is turned ON and the engine is not running.

HINT:

If the check engine warning (CHK ENG) does not light up, troubleshoot the combination meter.

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

(b) Check the DTC, using hand–held tester.

NOTICE:

(Hand–held tester only): When the diagnosis system is switched from normal mode to check (test) mode, it erases all DTCs and freezed frame data recorded in normal mode. So before switching modes, always check the DTCs and freezed frame data, and note them down.

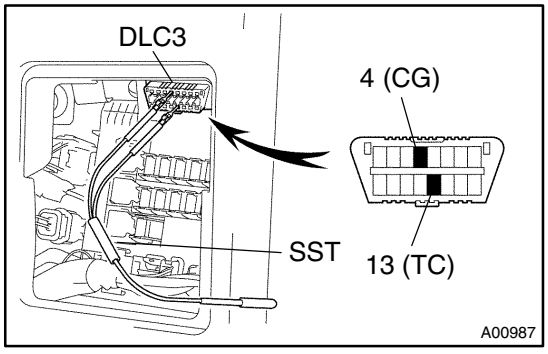
(1) Prepare the hand–held tester.

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

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

(4) Use the hand–held tester to check the DTCs and freezed frame data; note them down. (For operating instructions, see the hand–held tester,s instruction book.)

(5) See page DI–15 to confirm the details of the DTCs.



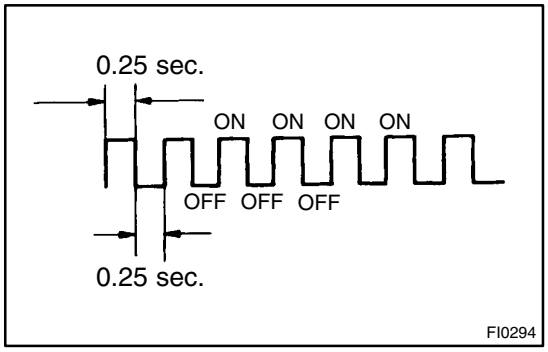
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(c) If you have no hand–held tester, perform the following step (1) to (6).

(1) Turn the ignition switch ON.

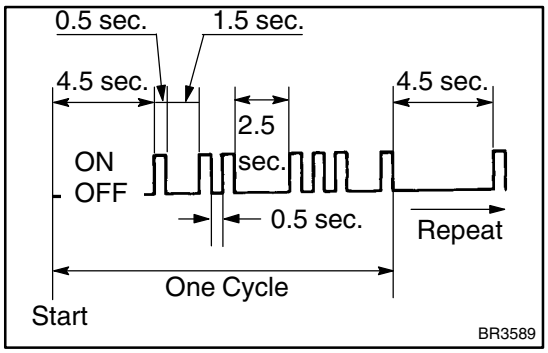
(2) Using SST, connect between terminals 13 (TC) and 4 (CG) of DLC3.

SST 09843 – 18040



FI0294

(3) Read the DTC from the check engine warning light (CHK ENG).



(4) As an example, the blinking patterns for codes, normal, 12 and 31 are as shown on the illustration.
(5) Check the details of the malfunction using the DTC chart on page.
(6) After completing the check, disconnect terminals 13 (TC) and 4 (CG) and turn off the display.

HINT:
In the event of 2 or more malfunction cords, indication will begin from the smaller numbered cord and continue in order to the larger.

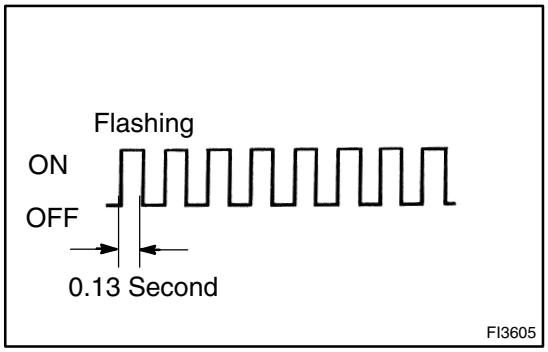
NOTICE:
When simulatiing symptoms without a hand–held tester to check the DTCs, use normal mode. For codes on the DTCs, chart subject to ”2 trip detection logic”, turn the ignition switch OFF after the symptom is simulated the first time. Then repeat the simulation process again. When the problem has been simulated twice, the check engine warning light lights up and the DTCs, are recorded in the engine ECU

3. INSPECT DIAGNOSIS (Check (Test) Mode)

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 (test) mode.

(a) Check the DTC.
(1) Initial conditions
- Battery positive voltage 11V or more.
- Throttle valve fully closed.
- Transmission in ”P” or ”N” position.
- Air conditioning switched OFF.

(2) Turn ignition switch OFF.
(3) Prepare the hand–held tester.
(4) Connect the hand–held tester to DLC3 on the at the lower left of the instrument panel.
(5) Turn the ignition switch ON and switch the push the hand–held tester ON.
(6) Switch the hand–held tester normal mode to check (test) mode. (Check that the check engine warning light (CHK ENG) flashes.)
(7) Start the engine. (The check engine warning (CHK ENG) light 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 hand–held tester diagnosis selector to check the DTCs and freezed frame data, etc.

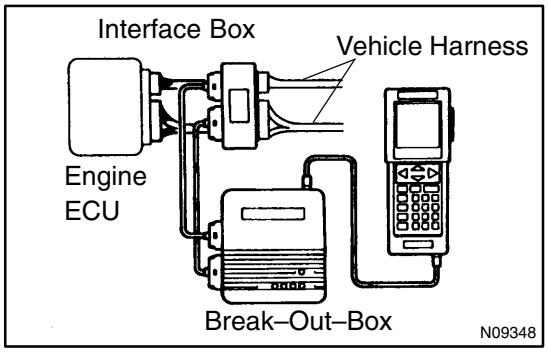
HINT:
Take care not to turn the ignition switch OFF. Turning the ignition switch OFF switches the diagnosis system from check (test) mode to normal mode. so all DTCs, etc. are erased.

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

(b) Clear the DTC.
The following actions will erase the DTCs and freezed frame data.

- Operating the hand–held tester to erase the codes. (See the hand–held tester's instruction book for operating in structions.)
- Disconnecting the battery terminals or EFI fuse.

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



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

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

4. FAIL–SAFE CHART

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

DTC No.	Fail–Safe Operation	Fail–Safe Deactivation Conditions
P0105/31	• Ignition timing fixed at 5° BTDC	Returned to normal condition
P0110/24	Intake air temp. is fixed at 20°C (68°F)	Returned to normal condition
P0115/22	Water temp. is fixed at 80°(176°F)	Returned to normal condition
P0120/41	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 and 0.95 V
P0325/52	Max. timing retardation	IG switch OFF
P0500/42	High RPM for cut is prohibited ISC control prohibited	Returned to normal condition
P1300/14 P1310/15	Fuel cut	Returned to normal condition

5. CHECK FOR INTERMITTENT PROBLEMS

HAND–HELD TESTER only:

By putting the vehicle's engine ECU in check (test) mode, 1 trip detection logic is possible instead of 2 trip detection logic and sensitivity to detect open circuits is increased. This makes it easier to detect intermittent problems.

(1) Clear the DTC (See step 3.).
(2) Set the check (test) mode (See step 3.).
(3) Perform a simulation test (See page IN–9).
(4) Check the connector and terminal (See page IN–19).
(5) Check the visual check and contact pressure (See page IN–19).
(6) Handle the connector (See page IN–19).

6. BASIC INSPECTION

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

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

NO → **Charge or replace battery.**

YES

2	**Is engine cranked ?**

NO → **Proceed to problem table on page DI–20.**

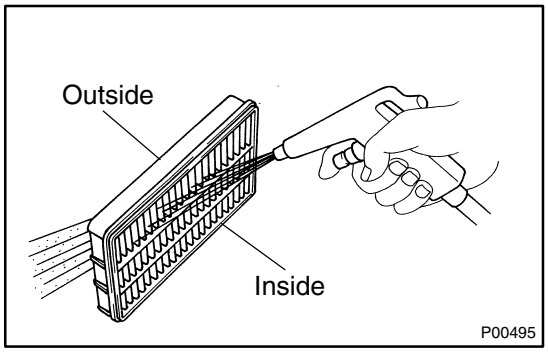
YES

3	**Does engine start ?**

NO → **Go to step 7.**

YES

4	**Check air filter.**

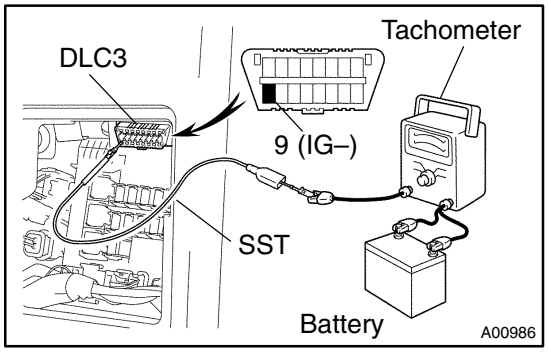


PREPARATION:
Remove the air filter.
CHECK:
Visually check that the air filter is not excessively dirty or oily.
HINT:
If necessary, clean the filter with compressed air. First blow from inside thoroughly, then blow from outside of filter.

NG → **Repair or replace.**

OK

5	**Check engine 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 the ”N” position.
(e) Connect the hand–held tester to DLC3 on the vehicle.
(f) If you have no hand–held tester, connect tachometer test prove to terminal 9 (IG–) of DLC3.
SST 09843–18030

NOTICE:

As some tachometer are not compatible with this ignition system, we recommend that you confirm the compatibility of your until before use.

CHECK:

Check the idle speed.

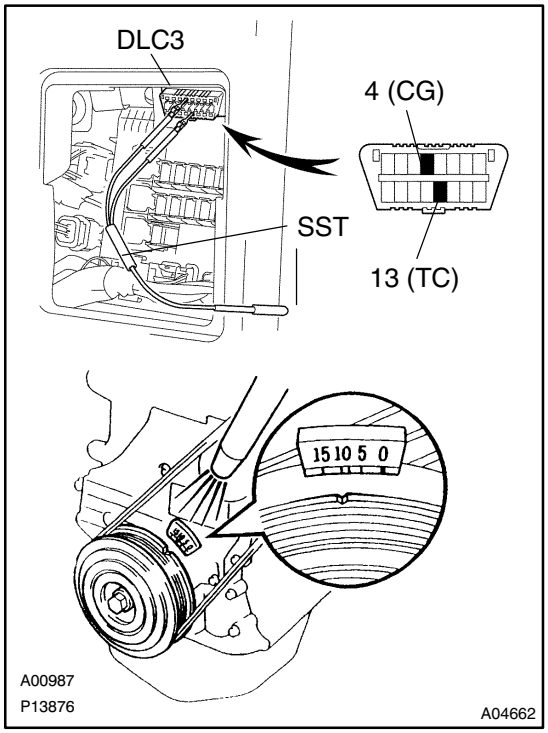
OK:

Idle speed:
w/o daytime running light 650 – 750 rpm
w/ daytime running light 700 – 800 rpm

NG	**Proceed to problem symptoms table on page DI–20.**

OK

6	Check ignition timing.



PREPARATION:

(a) Warm up engine to normal operating temperature.
(b) Switch off all accessories.
(c) Switch off air conditioning
(d) Shift transmission into the ”N” position.
(e) Using SST, connect terminals 13 (TC) and 4 (CG) of DLC3.
SST 09843–18040
(f) Using a timing light, connect the tester to No.1 high–tension cord.

CHECK:

Check ignition timing.

OK:

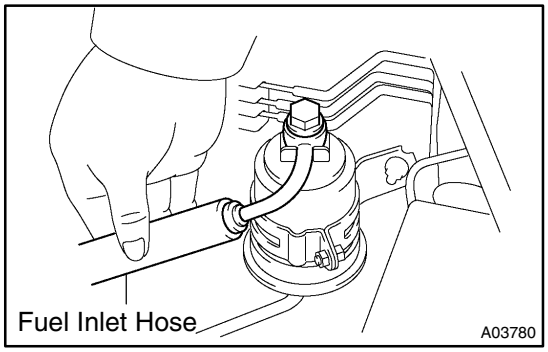
Ignition timing: 10° BTDC at idle

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

OK

Proceed to problem symptoms table on page DI–20.

7	Check fuel pressure.



PREPARATION:

(a) Be sure that enough fuel is in the tank.
(b) Turn the ignition switch ON.
(c) Connect the hand–held tester to the DLC3.
(d) Use ACTIVE TEST mode to operate the fuel pump.
(e) If you have no hand–held tester, connect the positive (+) and negative (–) leads from the battery to the fuel pump connector (See page FI–6 or FI–13).

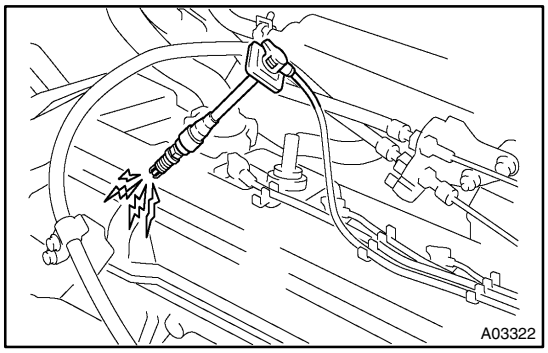
CHECK:

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

NG → **Proceed to page FI–6, FI–13 and continue to troubleshoot.**

OK

8	Check for spark.



PREPARATION:

(a) Remove ignition coil.
(b) Remove the spark plug.
(c) Install the spark plug to the ignition coil, and connect the ignition coil connector.
(d) Hold the end about 12.5 mm (0.5 in.) from the ground.
(e) Disconnect the injector connector.

CHECK:

Check if spark occurs while engine is being cranked.

NOTICE:

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

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

OK

Proceed to problem symptoms table on page DI–20.

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 from those listed here. So do not decide whether a part is faulty or not solely according to the "Normal Condition" here.

Hand–held tester display	Measurement Item	Normal Condition*
FUEL SYS #1 *1	Fuel System Bank 1 OPEN: Air–fuel ratio feedback stopped CLOSED: Air–fuel ratio feedback operating	Idling after warming up: CLOSED
CALC LOAD	Calculator Load: Current intake air volume as a proportion of max. intake air volume	Idling: 19.7 ~ 50.4% Racing without load (2,500rpm): 16.8 ~ 47.4%
WATER TEMP.	Water Temp. Sensor Value	After warming up: 80 ~ 95°C (176 ~ 203°F)
SHORT FT #1	Short–term Fuel Trim Bank 1	0 ± 20%
LONG FT #1	Long–term Fuel Trim Bank 1	0 ± 20%
PIM	Absolute Pressure inside Intake Manifold	Idling: 20 ~ 51 kPa Racing without load (2,500 rpm): 17 ~ 48 kPa
ENGINE SPD	Engine Speed	Idling: 650 ~ 750 rpm
VEHICLE SPD	Vehicle Speed	Vehicle Stopped: 0 km/h (0 mph)
IGN ADVANCE	Ignition Advance: Ignition Timing of Cylinder No. 1	Idling: BTDC 7 ~ 13°
INTAKE AIR	Intake Air Temp. Sensor Value	Equivalent to Ambient Temp.
THROTTLE POS	Voltage Output of Throttle Position Sensor Calculated as a percentage: 0 V → 0%, 5 V → 100%	Throttle Fully Closed: 6 ~ 16% Throttle Fully Open: 64 ~ 98%
O2S B1, S1 *1	Voltage Output of Oxygen Sensor Bank 1, Sensor 1	Idling: 0.1 ~ 0.9 V
O2FT B1, S1 *1	Oxygen Sensor Fuel Trim Bank 1, Sensor 1 (Same as SHORT FT #1)	0 ± 20%
INJECTOR	Fuel injection time for cylinder No.1	Idling: 2.9 ~ 5.1 ms
ISC DUTY RATIO	Intake Air Control Valve Duty Ratio Opening ratio rotary solenoid type IAC valve	Idling: 25 ~ 62%
STARTER SIG	Starter Signal	Cranking: ON
CTP SW	Closed Throttle Position Switch Signal	Throttle Fully Closed: ON
A/C SIG	A/C Switch Signal	A/C ON: ON
STOP LIGHT SW	Stop Light Switch Signal	Stop light switch ON: ON
FC IDL	Fuel Cut Idle: Fuel cut when throttle valve fully closed, during deceleration	Fuel cut operating: ON
NSW *2	Neutral start switch signal	P or N position: ON
ELECT LOAD SIG*2	Electrical Load Signal	Taillight switch ON: ON
FC TAU	Fuel Cut TAU: Fuel cut during very light load	Fuel cut operating: ON
CYL#1, CYL#2, CYL#3, CYL#4	Abnormal revolution variation for each cylinder	0%
EGR SYSTEM	EGR System Operating Condition	Idling: OFF
A/C CUT SIG	A/C Cut Signal	A/C S/W OFF: ON
FUEL PUMP	Fuel Pump Signal	Idling: ON

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

*2 A/T only

DI1I7–04

DIAGNOSTIC TROUBLE CODE CHART

1. SAE CONTROLLED

HINT:

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

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

DTC No. (See Page)	Detection Item	Trouble Area	CHK ENG *1	Memory
P0105/31 (DI–22)	Vacuum Sensor Circuit Malfunction	• Open or short in Vacuum sensor circuit • Vacuum sensor • Engine ECU	○	○
P0110/24 (DI–27)	Intake Air Temp. Circuit Malfunction	• Open or short in intake air temp. sensor circuit • Intake air temp. sensor • Engine ECU	–	○
P0115/22 (DI–34)	Water Temp. Circuit Malfunction	• Open or short in water temp. sensor circuit • Water temp. sensor • Engine ECU	○	○
P0120/41 (DI–40)	Throttle Position Sensor circuit Malfunction	• Open or short in throttle position sensor circuit • Throttle position sensor • Engine ECU	–	○
P0130/21 (DI–46)	Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 1)	• Open or short in oxygen sensor circuit • Oxygen sensor • Engine ECU	–	○
P0135/21 (DI–52)	Oxygen Sensor Heater Circuit Malfunction (Bank 1 Sensor 1)	• Open or short in heater circuit of oxygen sensor • Oxygen sensor • Engine ECU	–	○
P0171/25 (DI–54)	Fuel Trim System too Lean (Air– Fuel Ration Lean Malfunction)	• Air intake (hose loose) • Fuel line pressure • Injector blockage • Open or short in oxygen sensor circuit • Oxygen sensor malfunction • Vacuum sensor • Water temp. sensor	–	○
P0325/52 (DI–59)	Knock Sensor 1 Circuit Malfunction	• Open or short in knock sensor circuit • Knock sensor (looseness) • Engine ECU	○	○
P0335/12,13 (DI–62)	Crankshaft Position Sensor Circuit Malfunction	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Starter • Engine ECU	○	○
P0340/12 (DI–65)	Camshaft Position Sensor Circuit Malfunction	• Open or short in camshaft position sensor circuit • Camshaft position sensor • Starter • Engine ECU	○	○

*1: ○ · · · Check engine warning light (CHK ENG) lights up

– · · · Check engine warning light (CHK ENG) does not lights up

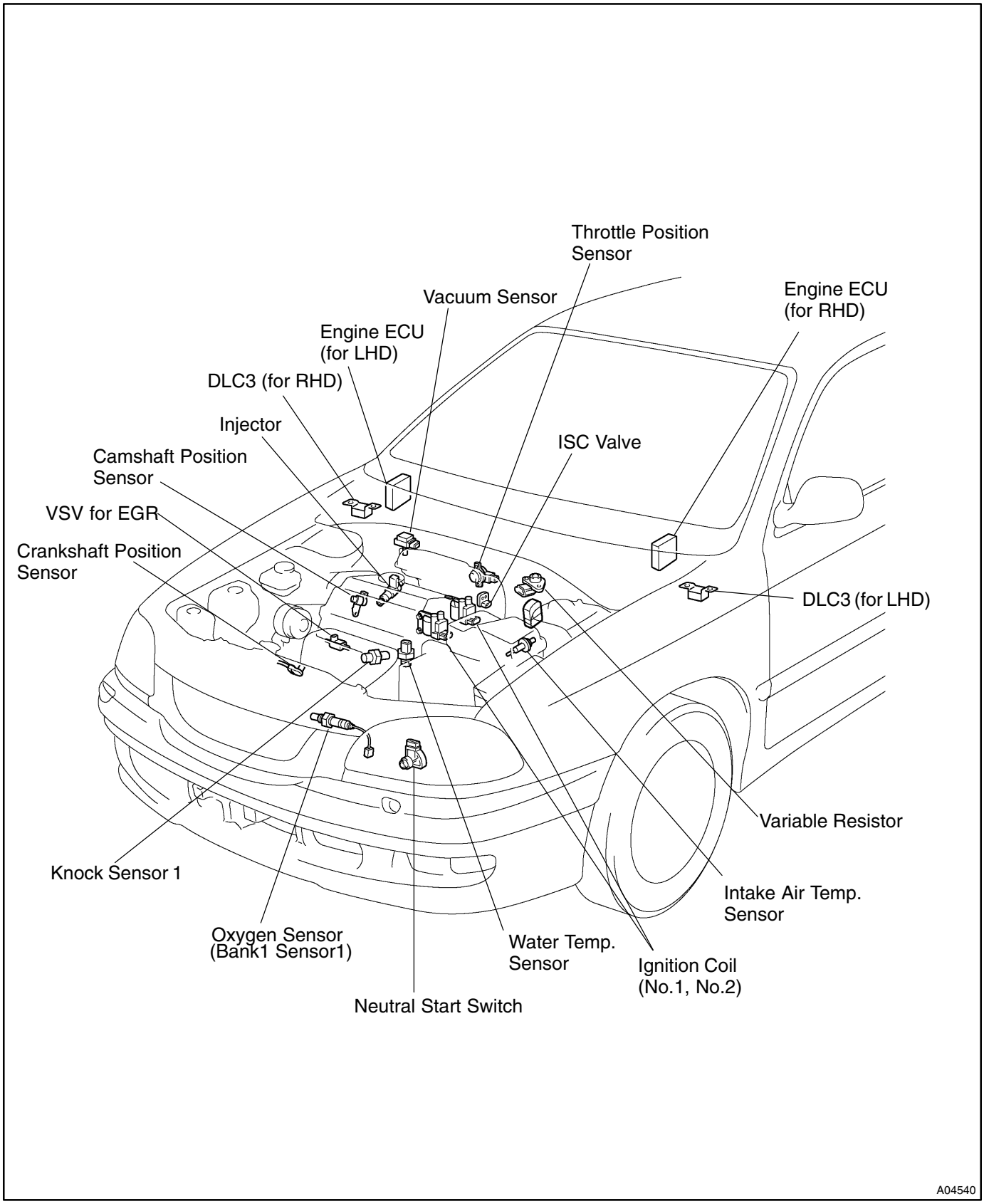
DTC No. (See Page)	Detection Item	Trouble Area	CHK ENG *1	Memory
P0500/42 (DI–68)	Vehicle Speed Sensor Circuit Malfunction	• Open or short in vehicle speed sensor circuit • Vehicle speed sensor • Combination meter • Engine ECU	○	○
P0505/33 (DI–71)	Idle Control System Malfunction	• ISC valve is stuck or closed • Open or short in ISC valve circuit • Air intake (hose loose) • A/C signal circuit	○	○
P1300/14 (DI–76)	Igniter Circuit Malfunction (No.1)	• Open or short in IGF or IGT1 circuit from ignition coil (No.1) (w/Igniter) to ECU • Ignition coil (No.1) (w/Igniter) • Engine ECU	○	○
P1310/15 (DI–76)	Igniter Circuit Malfunction (No.2)	• Open or short in IGF or IGT2 circuit from ignition coil (No.2) (w/Igniter) to ECU • Ignition coil (No.2) (w/Igniter) • Engine ECU	○	○
P1335/13 (DI–81)	Crankshaft Position Sensor Circuit Malfunction (during idling)	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Starter • Engine ECU	–	○
B2799/99 *2	Engine Immobilizer System	• Engine immobilizer system • Open or short in output circuit of Engine ECU for the Engine immobilizer system (IMO) • Open in input circuit of Engine ECU for the Engine immobilizer system (IMI) • Engine ECU	–	○

*1: ○ · · · Check engine warning light (CHK ENG) lights up
– · · · Check engine warning light (CHK ENG) does not lights up

*2: See Pub. No. RM599E BE section

DI32G–01

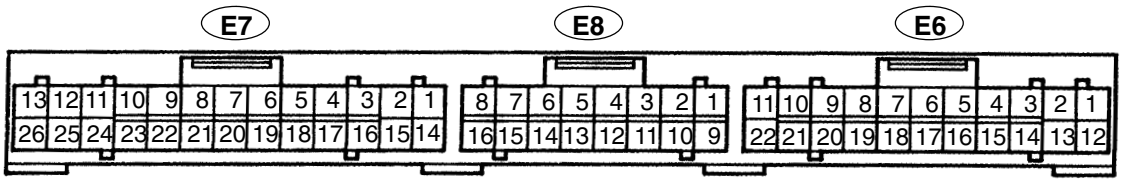
PARTS LOCATION



DI1I9–04

TERMINALS OF ECU

Engine ECU Terminals



P19559

Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage (V)
BATT (E6 – 1) – E1 (E7 – 14)	B–Y ↔ BR	Always	9 ~ 14
+ B (E6 – 12) – E1 (E7 – 14)	B–R ↔ BR	IG switch ON	9 ~ 14
VC (E8 – 1) – E2 (E8 – 9)	R ↔ L	IG switch ON	4.5 ~ 5.5
VTA (E8 – 11) – E2 (E8 – 9)	B–W ↔ L	IG switch ON Throttle valve fully closed	0.3 ~ 1.0
		IG switch ON Throttle valve fully open	3.2 ~ 4.9
PIM (E8 – 2) – E2 (E8 – 9)	P ↔ L	IG switch ON	3.3 ~ 3.9
		Apply vacuum 26.7 kPa (200 mmHg, 7.9 in.Hg)	2.5 ~ 3.1
THA (E8 – 3) – E2 (E8 – 9)	Y–B ↔ L	Idling, Intake air temp. 20°C (68° F)	0.5 ~ 3.4
THW (E8 – 4) – E2 (E8 – 9)	W ↔ L	Idling, Engine coolant temp. 80°C (176°F)	0.2 ~ 1.0
STA (E6 – 11) – E1 (E7 – 14)	B–W (M/T) ↔ BR R–G (A/T) ↔ BR	Cranking	6.0 or more
#10 (E7 – 12) – E01 (E7 – 13)	L ↔ BR	IG switch ON	9 ~ 14
		Idling	Pulse generation (See page DI–82)
#20 (E7 – 11) – E01 (E7 – 13)	R ↔ BR	IG switch ON	9 ~ 14
		Idling	Pulse generation (See page DI–82)
#30 (E7 – 25) – E01 (E7 – 13)	L–R ↔ BR	IG switch ON	9 ~ 14
		Idling	Pulse generation (See page DI–82)
#40 (E7 – 24) – E01 (E7 – 13)	R–W ↔ BR	IG switch ON	9 ~ 14
		Idling	Pulse generation (See page DI–82)
IGT1 (E7 – 20) – E1 (E7 – 14)	G ↔ BR	Idling	Pulse generation (See page DI–76)
IGT2 (E7 – 19) – E1 (E7 – 14)	L–W ↔ BR	Idling	Pulse generation (See page DI–76)
IGF (E7 – 16) – E1 (E7 – 14)	B–Y ↔ BR	IG switch ON	Below 2.0
		Idling	Pulse generation (See page DI–76)
TAC (E6 – 8) – E1 (E7 – 14)	B ↔ BR	Idling	Pulse generation

Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage (V)
G⊕ (E7 – 5) – NE⊖ (E7 – 17)	L ↔ B–W	Idling	Pulse generation (See page DI–62)
NE⊕ (E7 – 4) – NE⊖ (E7 – 17)	B ↔ B–W	Idling	Pulse generation (See page DI–62)
FC (E6 – 14) – E01 (E7 – 13)	G–R ↔ BR	IG switch ON	9 ~ 14
ISCC (E7 – 9) – E01 (E7 – 13)	B–W ↔ BR	IG switch ON (Disconnect E7 of ECU connecter)	9 ~ 14
ISCO (E7 – 10) – E01 (E7 – 13)	B–Y ↔ BR	IG switch ON (Disconnect E7 of ECU connecter)	9 ~ 14
OX*1 (E8 – 6) – E1 (E7 – 14)	B ↔ BR	Maintain engine speed at 2,500 rpm for 2 min. after warning up	Pulse generation (See page DI–46)
VAF*2 (E8 – 6) – E1 (E7 – 14)	R–Y ↔ BR	Maintain engine speed at 2,500 rpm for 2 min. after warning up	Pulse generation (See page DI–112)
HR*1 (E8 – 8) – E1 (E7 – 14)	R–Y ↔ BR	Idling	Below 3.0
		IG switch ON	9 ~ 14
KNK (E8 – 13) – E1 (E7 – 14)	W ↔ BR	Idling	Pulse generation (See page DI–59)
NSW*3 (E7 – 1) – E1 (E7 – 14)	B–W ↔ BR	IG switch ON (Other shift position in "P", "N" position)	9 ~ 14
		IG switch ON (Shift position in "P", "N" position)	0 ~ 3.0
SPD (E6 – 9) – E1 (E7 – 14)	G ↔ BR	IG switch ON (Rotate driving wheel slowly)	Pulse generation (See page DI–68)
TC (E6 – 15) – E1 (E7 – 14)	R ↔ BR	IG switch ON	9 ~ 14
W (E6 – 5) – E1 (E7 – 14)	Y–B ↔ BR	Idling	Below 3.0
		IG switch ON	9 ~ 14
FAN (E8 – 14) – E1 (E7 – 14)	Y–B ↔ BR	IG switch ON (Engine coolant temp. 90°C (194°F) or more)	0 ~ 3.0
		IG switch ON (Engine coolant temp. 105°C (221°F) or more)	9 ~ 14

*1: w/ TWC
*2: w/o TWC
*3: A/T only

DI1IA–04

PROBLEM SYMPTOMS TABLE

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

Symptom	Suspect Area	See page
Engine does not crank (does not start)	1. Starter and starter relay	ST–1 ST–7
	2. Neutral start switch circuit	DI–68
No initial combustion (Dies not start)	1. ECU power source circuit	DI–93
	2. Ignition coil (w/ Igniter) circuit	DI–76
	3. Fuel pump control circuit	DI–97
	3. Injector circuit	DI–82
No complete combustion (Does not start)	1. Fuel pump control circuit	DI–97
	2. Ignition coil (w/ Igniter) circuit	DI–76
	3. Injector circuit	DI–82
Engine cranks normally (Difficult to start)	1. Starter signal circuit	DI–86
	2. ISC valve circuit	DI–71
	3. Fuel pump control circuit	DI–97
	4. Ignition coil (w/ Igniter)	DI–76
	5. Spark plug	IG–1
	6. compression	EG–8*
	7. Injector circuit	DI–82
Cold engine (Difficult to start)	1.Starter signal circuit	DI–86
	2. ISC valve circuit	DI–71
	3. Fuel pump control circuit	DI–97
	4. Injector circuit	DI–82
	5. Ignition coil (w/ Igniter)	IG–1
	6. Spark plug	IG–1
Hot engine (Difficult to start)	1. Starter signal circuit	DI–86
	2. ISC valve circuit	DI–71
	3. Fuel pump control circuit	DI–97
	4. Injector circuit	DI–82
	5. Ignition coil (w/ Igniter)	IG–1
	6. Spark plug	IG–1
Incorrect first idle (Poor idling)	1. ISC valve circuit	DI–71
High engine idle speed (Poor idling)	1. ISC valve circuit	DI–71
	2. ECU power source circuit	DI–93
	3. Neutral start switch circuit	DI–68
	4. Back up power source circuit	DI–88
Low engine idle speed (Poor idling)	1. ISC valve circuit	DI–76
	2. Neutral start switch circuit	DI–68
	3. Fuel pump control circuit	DI–97
	4. Injector circuit	DI–82
	5. Manifold absolute pressure	DI–22
	6. Back up power source circuit	DI–88

*: RM495E

Rough idling (Poor idling)	1. ISC valve circuit 2. Manifold absolute pressure 3. Injector circuit 4. EGR system 5. Variable resistor circuit *1 6. Ignition coil (w/Igniter) circuit 7. Compression 8. Fuel pump control circuit 9. Back up power source circuit	DI–76 DI–22 DI–82 DI–106 DI–112 DI–76 EG–8* DI–97 DI–88
Hunting (Poor idling)	1. ISC valve circuit 2. Manifold absolute pressure circuit 3. ECU power source circuit 4. Fuel pump control circuit	DI–71 DI–22 DI–93 DI–97
Hesitation/Poor acceleration (Poor driveability)	1. Manifold absolute pressure circuit 2. Injector circuit 3. Fuel pump control circuit 4. Variable resistor circuit *1 5. Ignition coil (w/ Igniter) circuit 6. A/T faulty	DI–22 DI–82 DI–97 DI–112 DI–76 –
Muffler explosion, after fire (Poor driveability)	1. Ignition coil (w/ Igniter) 2. Spark plug 3. Injector circuit	IG–1 IG–1 DI–82
Surging (Poor drefveability)	1. Fuel pump control circuit 2. Variable resistor circuit *1 3. Spark plug 4. Injector circuit	DI–97 DI–112 IG–1 DI–82
Engine stall (Soon after starting)	1. Fuel pump control circuit 2. Manifold absolute pressure circuit 3. ISC valve circuit	DI–97 DI–22 DI–71
Engine stall (After accelerator pedal depressed)	1. Manifold absolute pressure circuit	DI–71
Engine stall (After accelerator pedal released)	1. Injector circuit 2. ISC valve circuit 3. Engine ECU	DI–82 DI–71 IN–19
Engine stall (When shifting N to D)	1. Neutral start switch circuit 2. ISC valve circuit	DI–68 DI–71

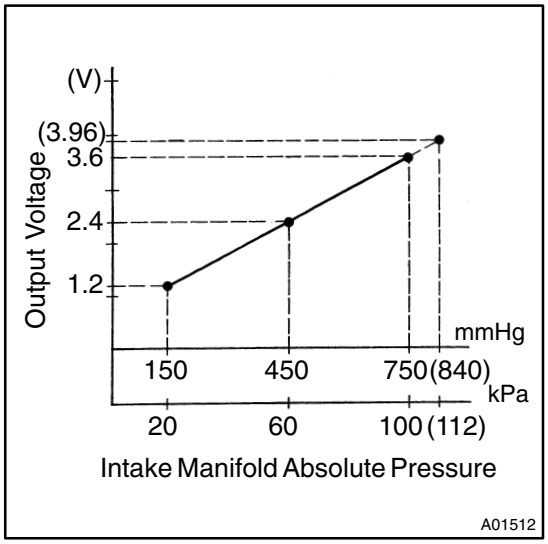
*1: w/o TWC

DI32H–01

CIRCUIT INSPECTION

DTC	P0105/31	Vacuum Sensor Circuit Malfunction

CIRCUIT DESCRIPTION



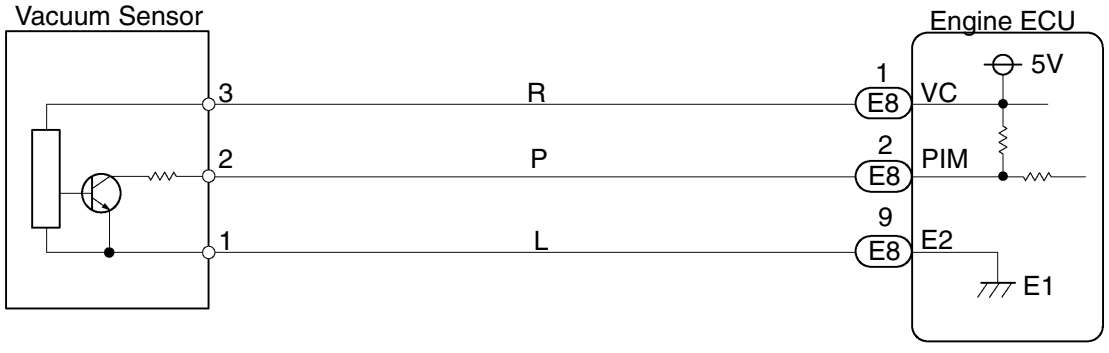
By a built–in sensor unit, the vacuum sensor detects the intake manifold pressure as a voltage. The engine ECU then determines the basic injection duration and basic ignition advance angle based on this voltage.
Since the vacuum sensor does not use the atmospheric pressure as a criterion, but senses the absolute pressure inside the intake manifold (the pressure in proportion to the preset absolute vacuum 0), it is not influenced by fluctuations in the atmospheric pressure due to high altitude and other factors. this permits it to control the airfuel ratio at the proper level under all conditions.

DTC No.	DTC Detecting Condition	Trouble Area
P0105/31	Open or short in vacuum sensor circuit	• Open or short in vacuum sensor circuit • Vacuum sensor • Engine ECU

HINT:After confirming DTC P0105/31, use the hand–held tester to confirm the manifold absolute pressure from ”CURRENT DATA”.

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

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If DTC P0105/31 (Vacuum Sensor Circuit Malfunction), 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.
- Read freeze 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 manifold absolute pressure.**

PREPARATION:

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

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

CHECK:

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

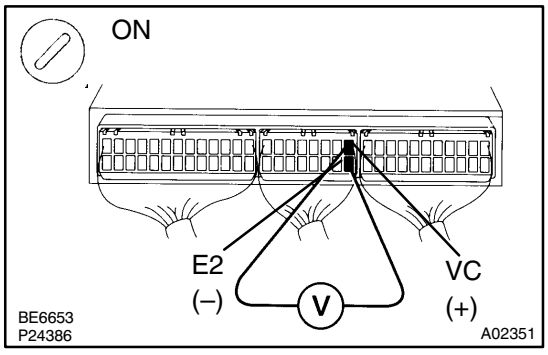
OK:

Same as atmospheric pressure.

OK → **Check for intermittent problems (See page DI–4).**

NG

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



PREPARATION:

(a) Remove glove compartment (See page FI–62).

(b) Turn the ignition switch ON.

CHECK:

Measure voltage between terminals VC and E2 of engine ECU.

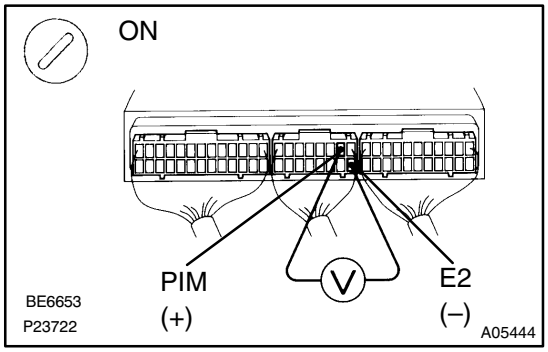
OK:

Voltage: 4.5 – 5.5 V

NG → **Check and replace engine ECU (See page IN–19).**

OK

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



PREPARATION:

(a) Remove glove compartment (See page FI–62).

(b) Turn the ignition switch ON.

CHECK:

Measure voltage between terminals PIM and E2 of engine ECU.

OK:

Voltage: 3.3 – 3.9 V

OK → **Check and replace engine ECU (See page IN–19).**

NG

4	Check for open and short in harness and connector between vacuum sensor and engine ECU.

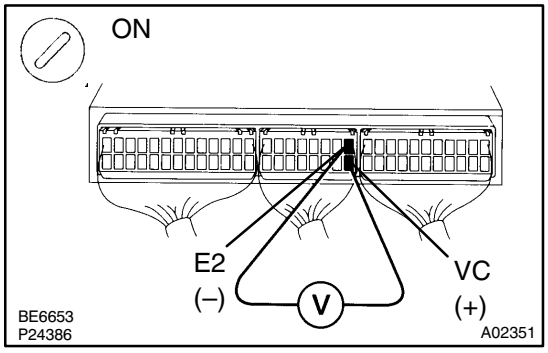
NG → **Repair and replace harness or connector.**

OK

Replace vacuum sensor (See page FI–54).

When not using hand–held tester

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



PREPARATION:
(a) Remove glove compartment (See page FI–62).
(b) Turn ignition switch ON.

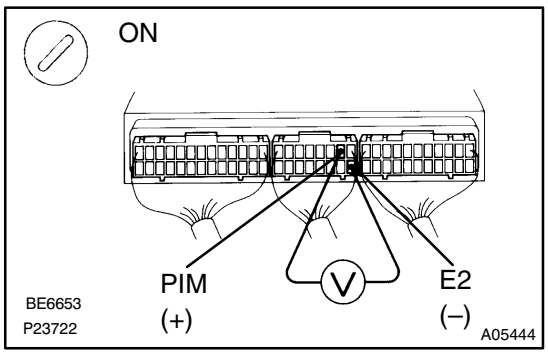
CHECK:
Measure voltage between terminals VC and E2 of engine ECU.

OK:
Voltage: 4.5 – 5.5 V

NG → **Check and replace engine ECU.**

OK

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



PREPARATION:
(a) Remove glove compartment (See page FI–62).
(b) Turn ignition switch ON.

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

OK:
Voltage: 3.3 – 3.9 V

OK → **Check and replace engine ECU.**

NG

3	**Check for open and short in harness and connector between engine ECU and vacuum sensor (See page IN–19).**

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

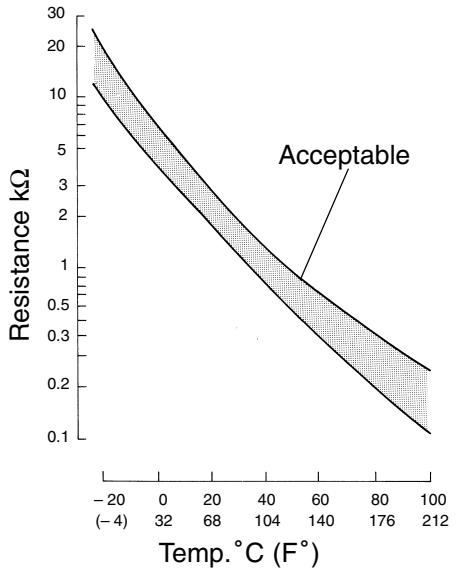
OK

Replace vacuum sensor.

DI32I–01

DTC	P0110/24	Intake Air Temp. Circuit Malfunction

(fig.1)



CIRCUIT DESCRIPTION

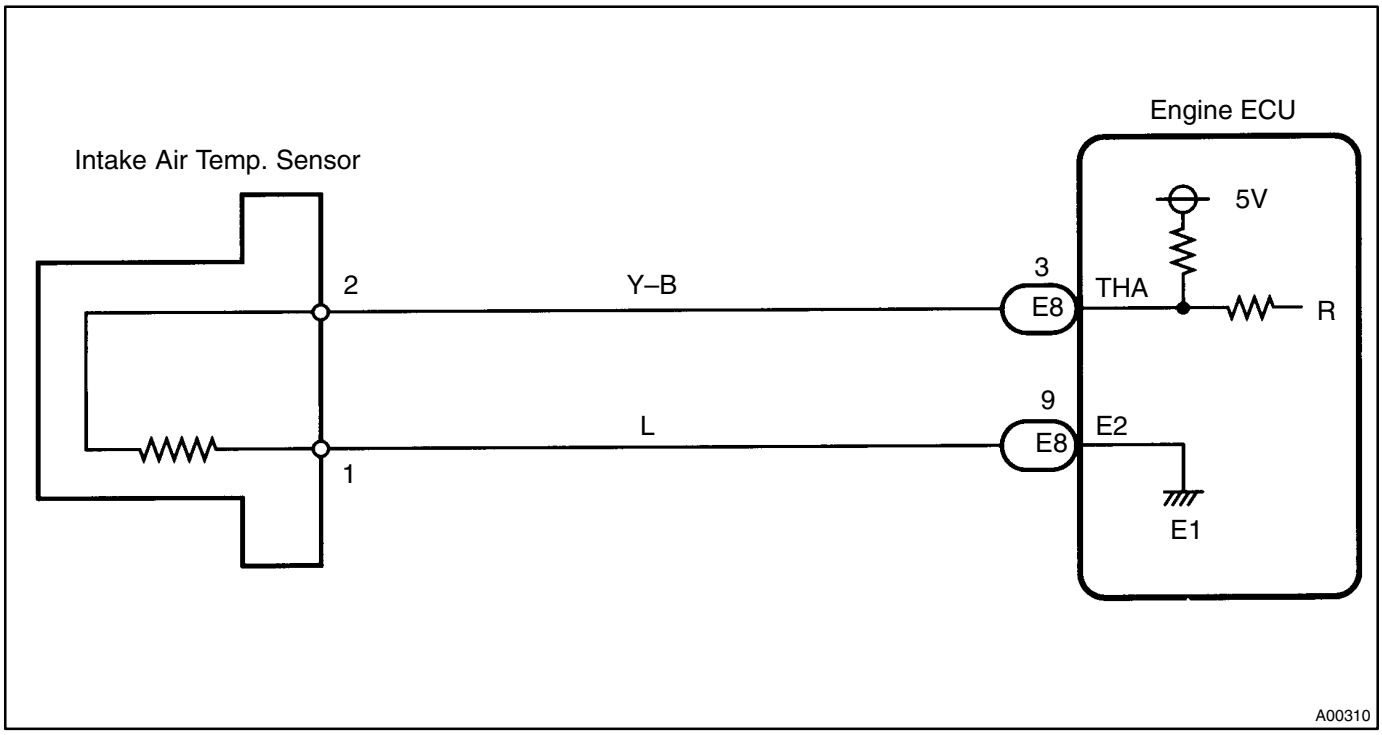
The intake air temp. sensor is mounted on the air cleaner cap and sensors the intake air temp.
A thermistor built in the sensor changes the resistance value according to the intake air temp. The lower the intake air temp. the greater the thermistor resistance value, and the higher the intake air temp. the lower the thermistor resistance value (See fig.1).
The air intake temp. sensor is connected to the engine ECU (See below). The 5V power source voltage in the engine 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 DIAGRA



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 ”P0105/31” (Vacuum Sensor circuit malfunction), ”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.**

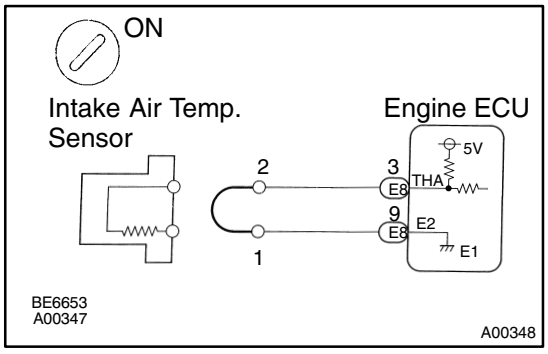
PREPARATION:
(a) Connect the hand–held tester to DLC3.
(b) Turn ignition switch ON and push the hand–held tester main switch ON.
CHECK:
Read temp. value on the hand–held tester.
OK:
Same as actual intake air temp.
HINT:
- If there is open circuit,hand–held tester indicates – 40˚C (– 40˚F).
- If there 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–4).

2	**Check for open in harness or engine ECU.**

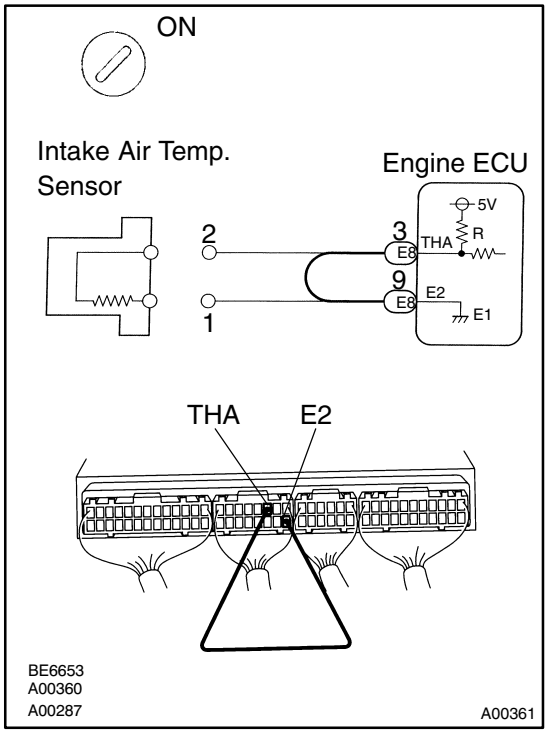


PREPARATION:
(a) Disconnect the intake air temp. sensor connector.
(b) Connect sensor wire harness terminals together.
(c) Turn ignition switch ON.
CHECK:
Read temp. value on the hand–held tester.
OK:
Temp. value: 140˚C (284˚F) or more

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

OK

3	Check for open in harness or engine ECU.



PREPARATION:

(a) Remove the glove compartment (See page FI–62).

(b) Connect between terminals THA and E2 of engine ECU E8 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–19).

(c) Turn ignition switch ON.

CHECK:

Read temp. value on the hand–held tester.

OK:

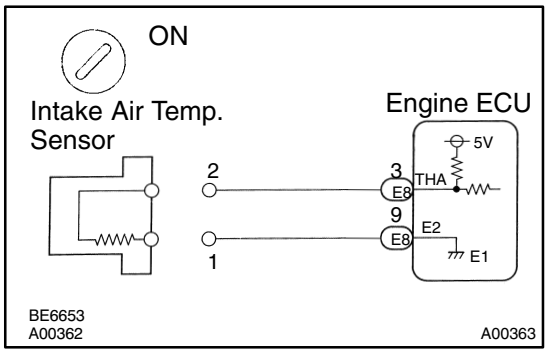
Temp. value: 140˚C (284˚F) or more

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.



PREPARATION:

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

(b) Turn ignition switch ON.

CHECK:

Read temp. value on the hand–held tester.

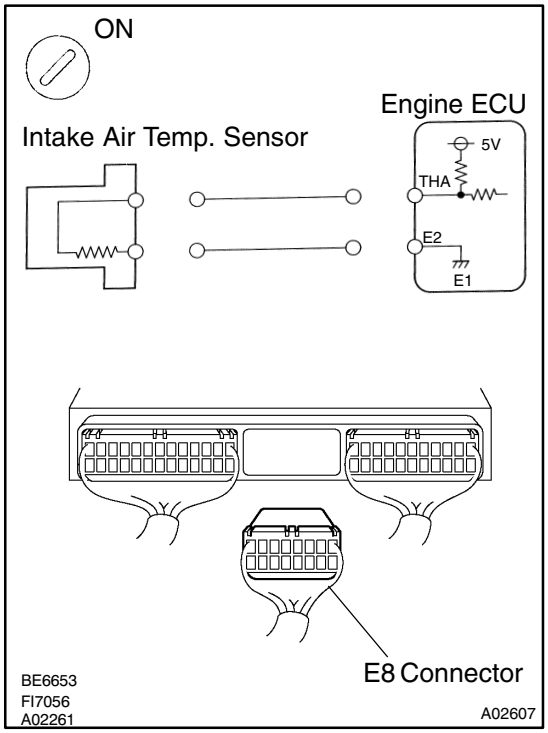
OK:

Temp. value: – 40˚C (– 40˚F)

OK	Replace intake air temp. sensor.

NG

5	Check for short in harness or engine ECU.



PREPARATION:

(a) Remove the glove compartment (See page FI–62).

(b) Disconnect the E8 connector of engine ECU.

HINT:

Intake air 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)

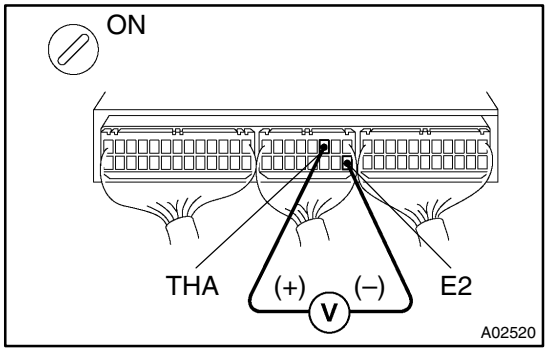
OK → **Repair or replace harness or connector.**

NG

Check and replace engine ECU (See page IN–19).

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–62).

(b) Turn ignition switch ON.

CHECK:

Measure voltage between terminals THA and E2 of engine ECU connector

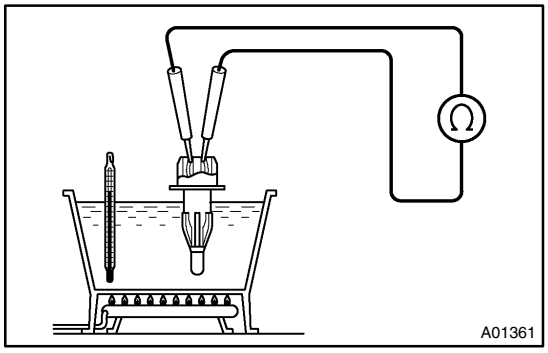
Intake air temp. °C (°F)	Voltage V
20 (68)	0.5 ~ 3.4
60 (140)	0.2 ~ 1.0

OK:

OK	Check for intermittent problem (See page DI–4).

NG

2	Check intake air temp. sensor (See page IN–19).



PREPARATION:

Disconnect the intake air temp. sensor connector.

CHECK:

Measure resistance between terminals.

OK:

Resistance is within acceptable zone on chart.

Engine Coolant Temp.	Resistance
20°C (68°F)	2 – 3 kΩ
80°C (176°F)	0.2 – 0.7 kΩ

NG	Replace intake air temp. sensor.

OK

3	**Check for open and short in harness and connector between engine ECU and air flow meter (See page IN–19).**

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

OK

Check and replace engine ECU.

DI1ID–03

DTC	P0115/22	Water Temp. Circuit Malfunction

CIRCUIT DESCRIPTION

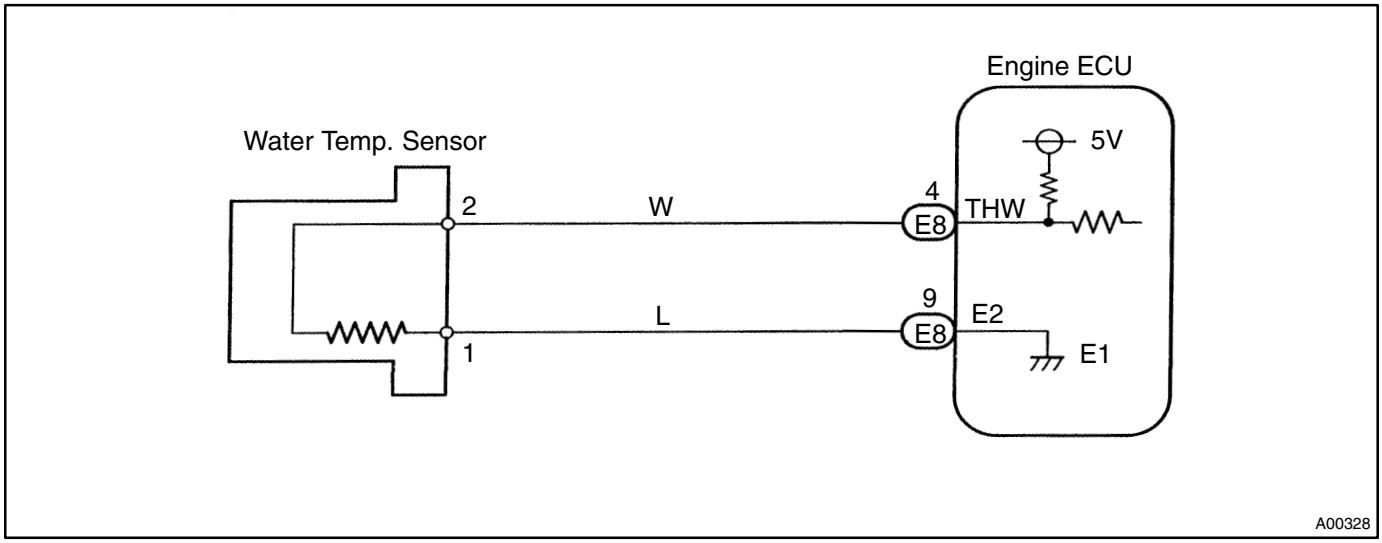
A thermistor built into the water temp. sensor changes the resistance value according to the water temp. The structure of the sensor and connection to the engine ECU is the same as in the DTC P0110/24 (Intake air temp. circuit malfunction) shown on page DI–27.

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 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 ”P0105/31” (Vacuum Sensor circuit malfunction), ”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

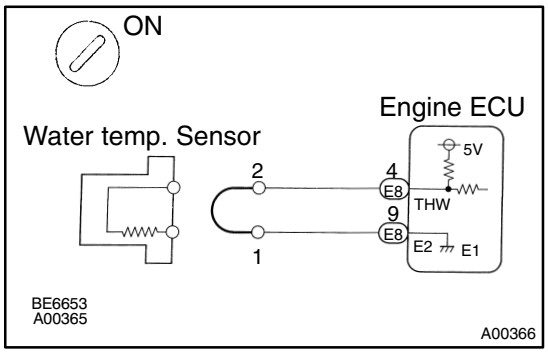
1	**Connect the hand–held tester, and read value of water temp.**

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.**

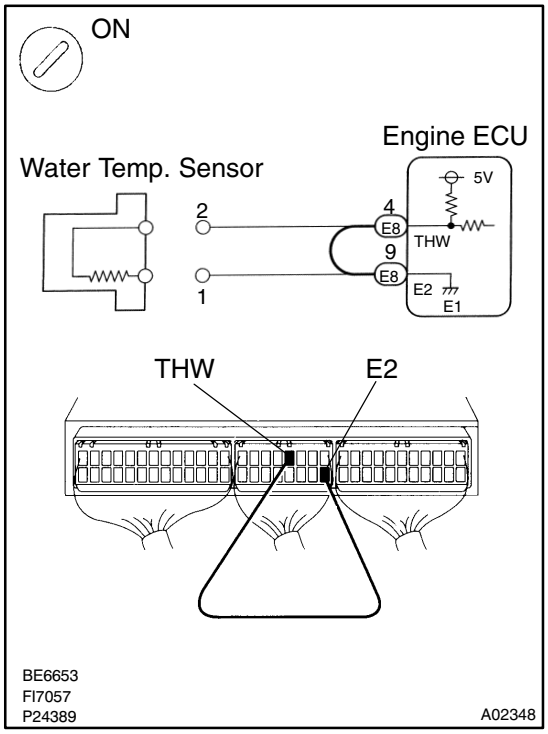


PREPARATION:
(a) Disconnect the water temp. sensor connector.
(b) Connect sensor wire harness terminals together.
(c) Turn ignition switch ON.
CHECK:
Read temp. value on the hand–held tester.
OK:
Temp. value: 140˚C (284˚F) or more

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–62).

(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–19).

(c) Turn ignition switch ON.

CHECK:

Read temp. value on the hand–held tester.

OK:

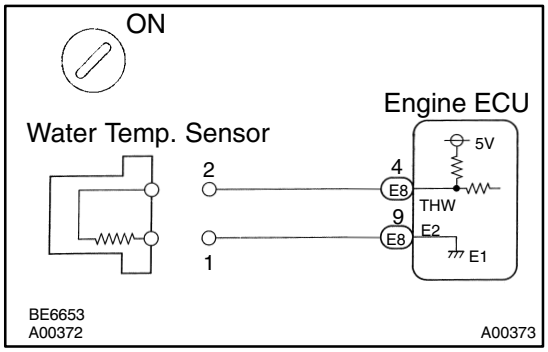
Temp. value: 140°C (284°F) or more

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.

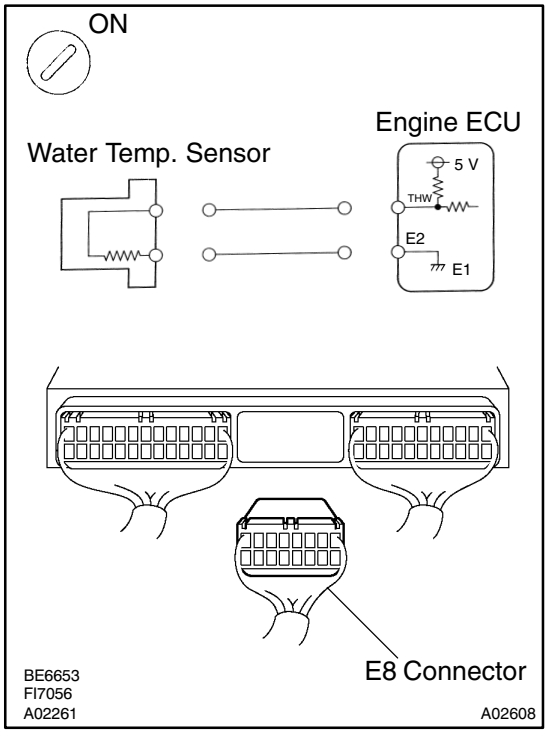
OK:

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–62).

(b) Disconnect the E8 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)

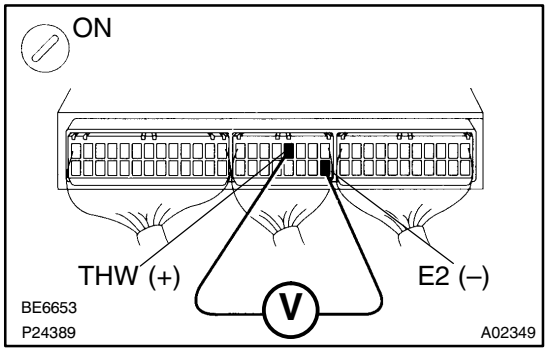
OK → **Repair or replace harness or connector.**

NG

Check and replace engine ECU (See page IN–19).

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–62)

(b) Turn the ignition switch ON

CHECK:

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

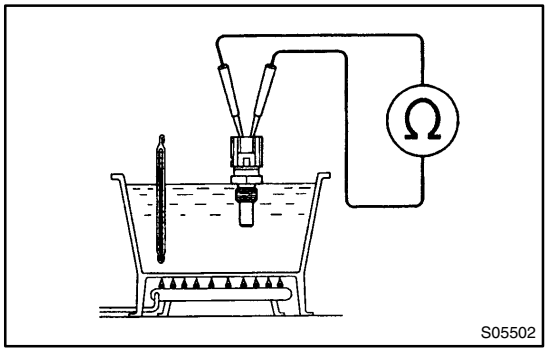
OK:

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–4).

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–19).**

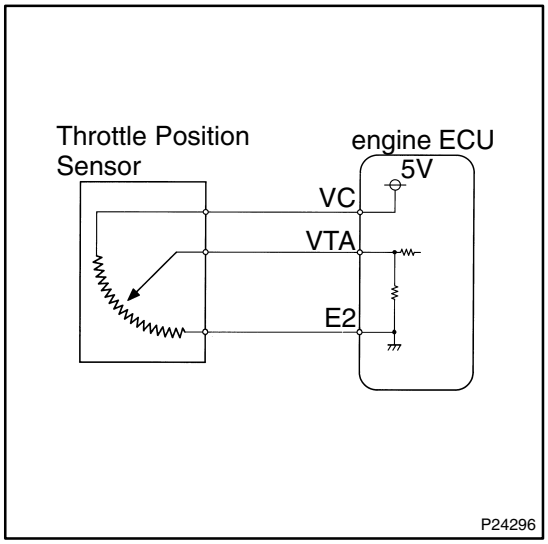
NG → **Repair or replace harness or connector.**

NG

Check and replace engine ECU (See page IN–19).

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 0.3 ~ 0.8 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 3.2 ~ 4.9 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..

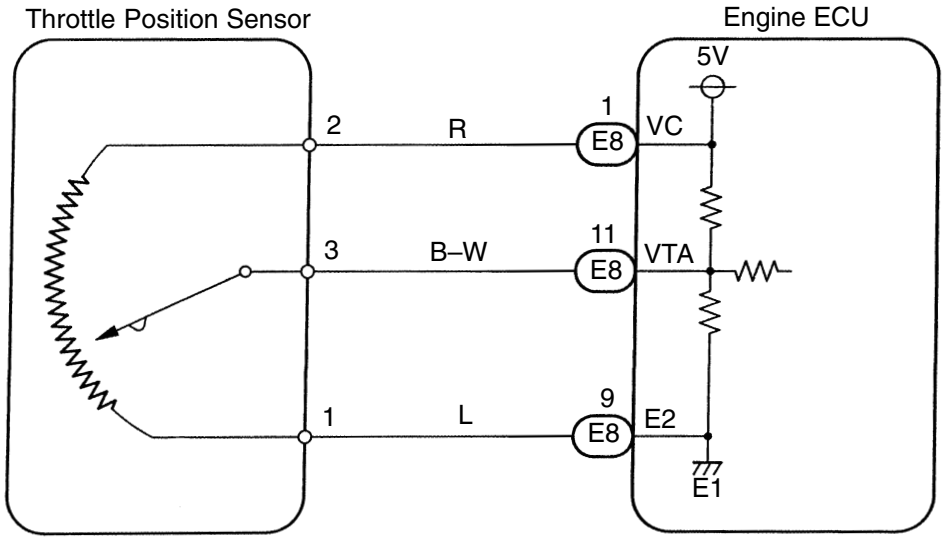
DTC No.	DTC Detecting Condition	Trouble Area
P0120/41	Open or short in throttle position sensor circuit for 0.5 sec. or more	• Open or short in throttle position sensor • Throttle position senor • Engine ECU

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

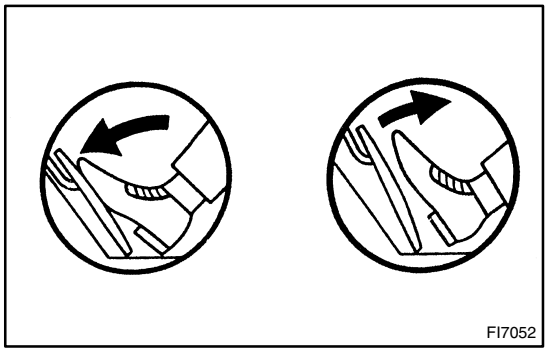
HINT:

- 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.



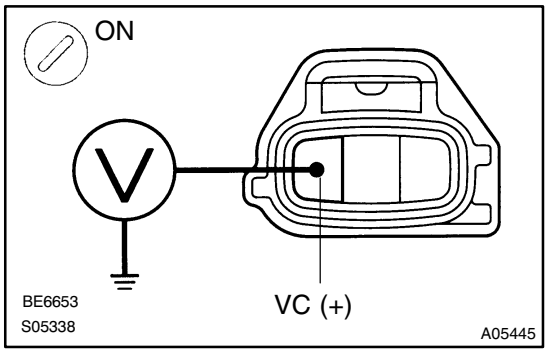
OK:

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

OK → **Check for intermittent problems (See page IN–19).**

NG

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

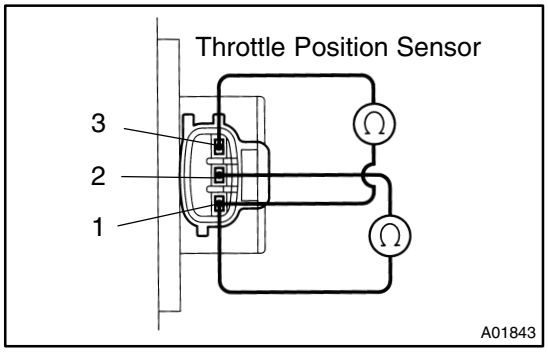


PREPARATION:
(a) Disconnect the throttle position sensor connector.
(b) Turn ignition switch ON.
CHECK:
Measure voltage between terminals VC of wire harness side connector and body ground.
OK:
Voltage 4.5 ~ 5.5 V

NG → **Go to step 5.**

OK

3	Check throttle position sensor.



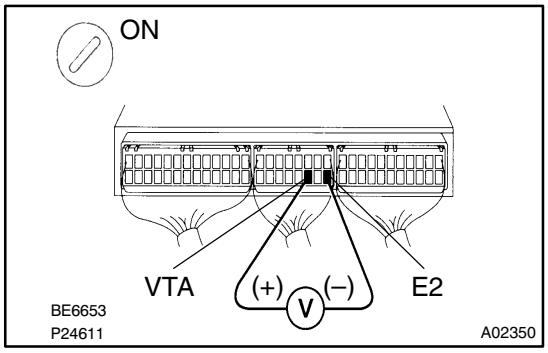
PREPARATION:
Disconnect the throttle position sensor connector.
CHECK:
Measure resistance between terminals 1, 3 and 2 of the throttle position sensor.
OK:

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–62).
(b) Turn ignition switch ON.
CHECK:
Measure voltage between terminals VTA and E2 of engine ECU connector.
OK:

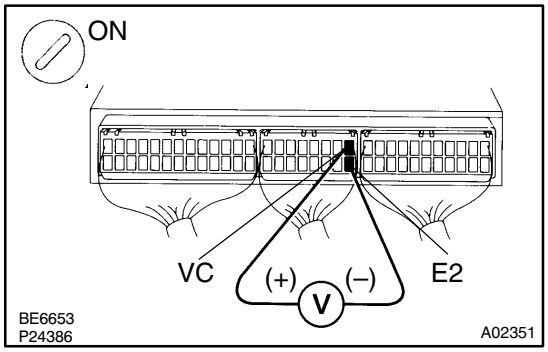
Throttle valve	Voltage
Fully closed	0.3 ~ 1.0 V
Fully open	3.2 ~ 4.9 V

NG → **Check for open and short in harness and connector between engine ECU and throttle position sensor (VTA line) (See page IN–19).**

OK

Check and replace engine ECU (See page IN–19).

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



PREPARATION:

(a) Remove the glove compartment (See page FI–62).

(b) Turn ignition switch ON.

CHECK:

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

OK:

Voltage 4.5 ~ 5.5 V

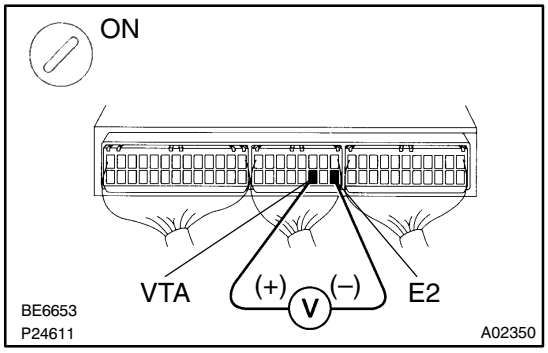
NG → **Check and replace engine ECU (See page IN–19).**

OK

Check for open in harness and connector between engine ECU and sensor (VC line) (See page IN–19).

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–62)

(b) Turn ignition switch ON.

CHECK:

Measure voltage between terminals VTA and E2 of engine ECU.

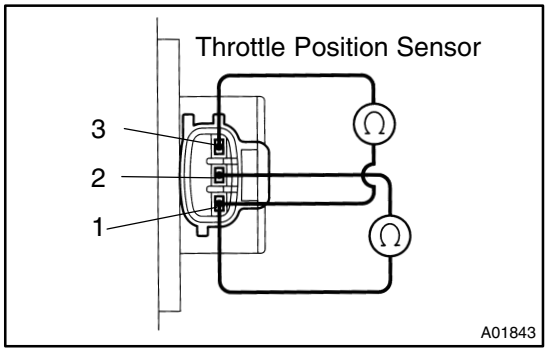
OK:

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

OK → **Check for intermittent problems (See page DI–4).**

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 – 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

3	Check for open and short in harness and connector between engine ECU and throttle position sensor (VC, VTA, E2 line)(See page IN–19).

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

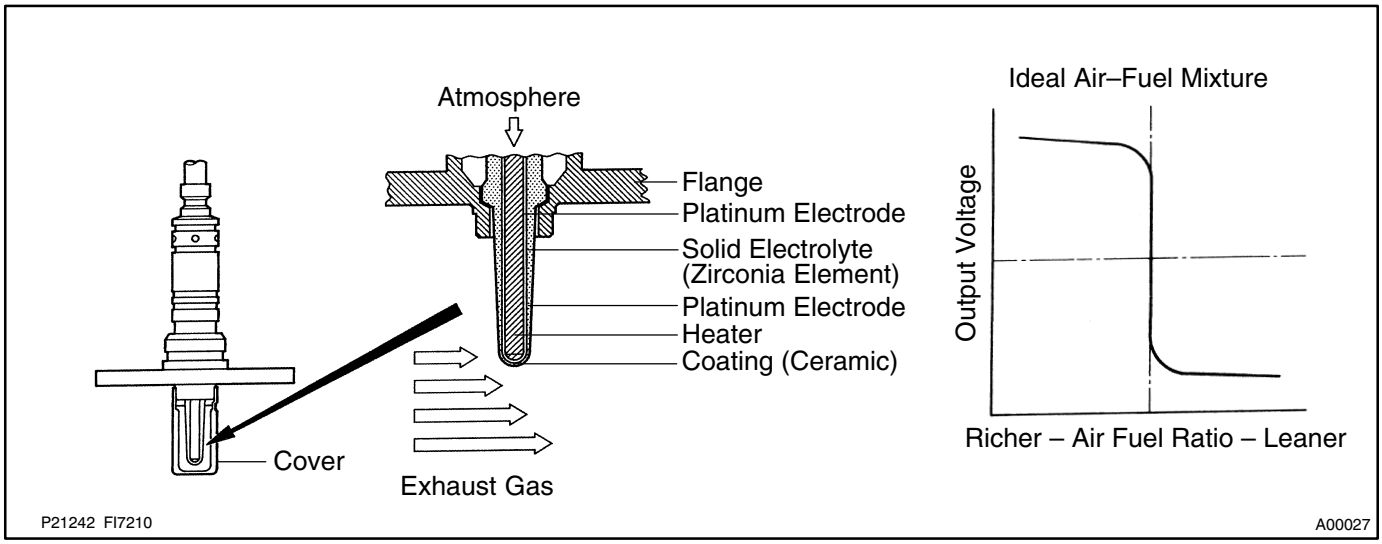
OK

Check and replace engine ECU (See page IN–19).

DTC	P0130/21	Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 1)

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 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.

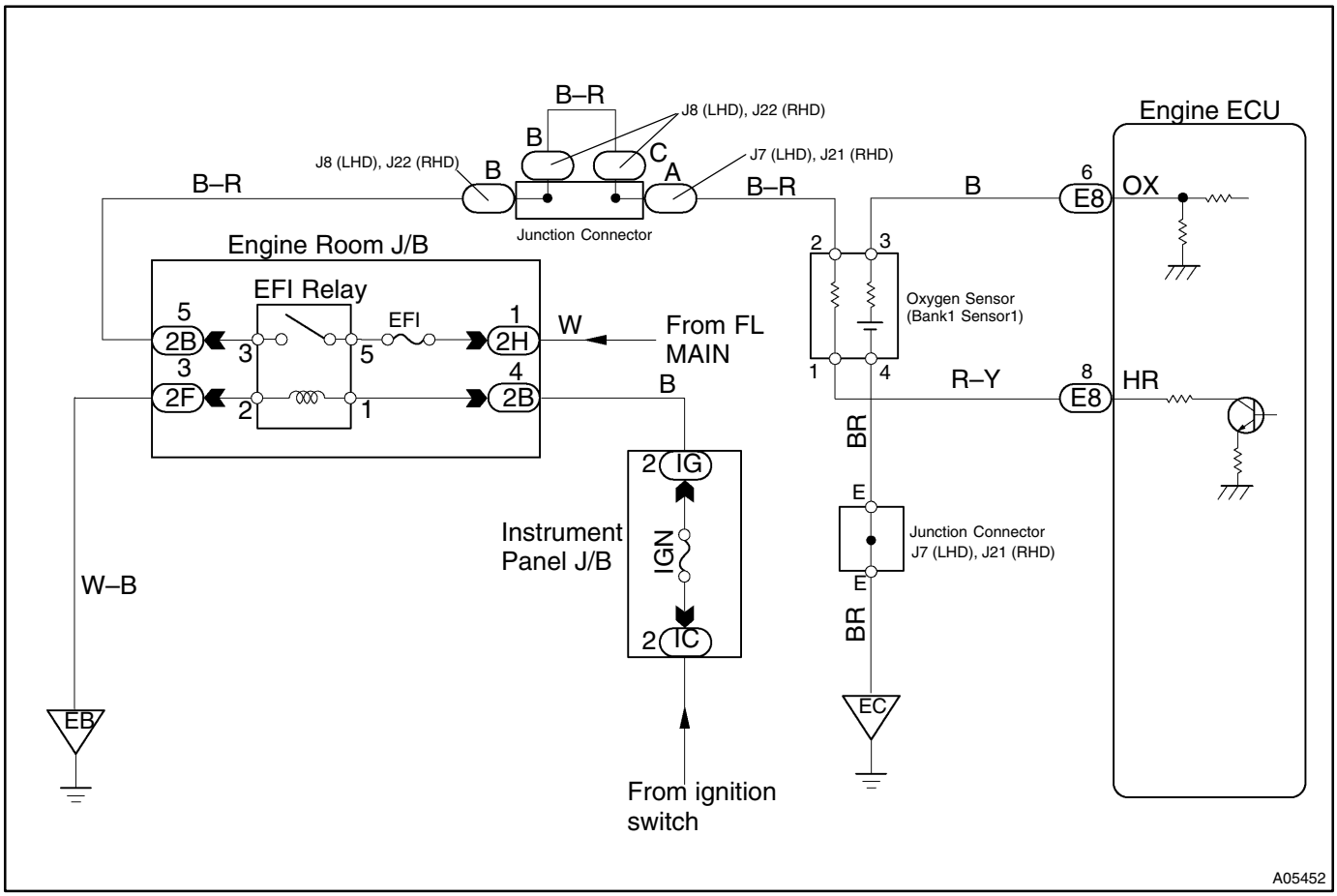


DTC No.	Detection Item	Trouble Area
P0130/21	Oxygen sensor signal amplitude is reduced to below 0.35 V and 0.70 V for 60 sec. under condition (a) ~ (c): (2 trip detection logic) (a) Engine coolant temp.: 80°C (176°F) and 95°C (203°F) (b) Engine speed: 1,500 rpm or more (c) Load driving (Example A/T in over drive (5th gear for M/T), A/C ON, Flat road, 80km/h (50 mph)). Note: When idling, or under partial load condition, oxygen sensor becomes cold and it will be not activated. Be sure to confirm as fast as possible after engine racing.	• Oxygen sensor circuit • Oxygen sensor • Fuel trim malfunction

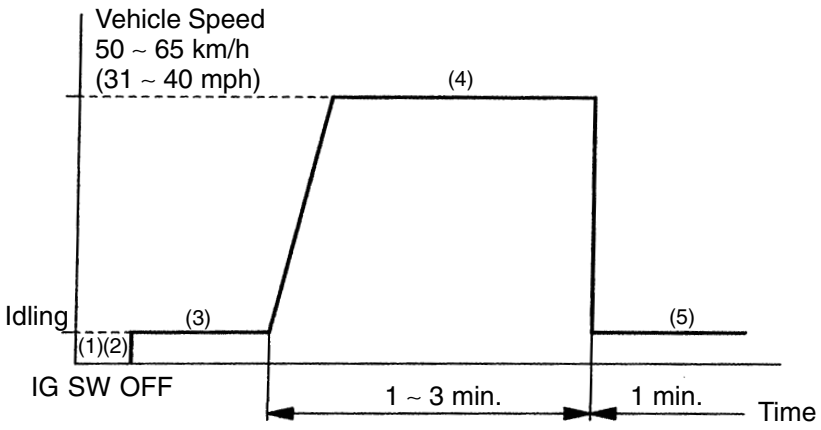
HINT:

- The oxygen sensor's output voltage and the short–term fuel trim value can be read using the hand–held tester.
- If voltage output of oxygen sensor is 0 V, 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–4).
(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 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 oxygen sensor data.**

PREPARATION:
(a) Connect the hand–held tester to the DLC3.
(b) Warm up engine to normal operating temp.

CHECK:
Read the oxygen sensor output voltage and short–term fuel trim.

RESULT:

Pattern	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–54).**

3 →

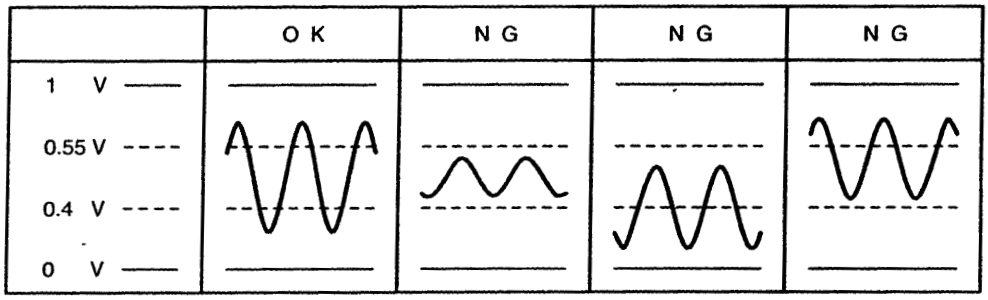
2	**Check the output voltage of oxygen sensor during idling.**

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

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

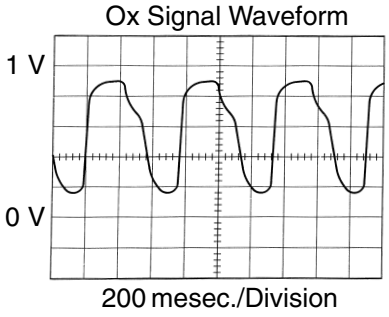
OK:

Oxygen sensor output voltage:
Alternates repeatedly between approx. 0.35 V and 0.7 V .



P18349

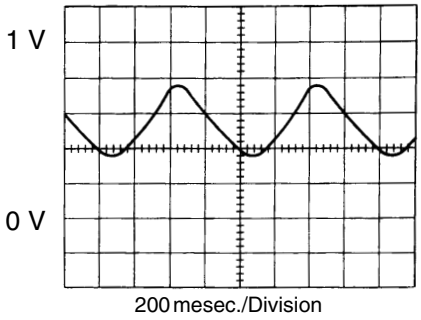
Reference INSPECTION USING OSCILLOSCOPE



FI6514

- With the engine racing (4,000 rpm) measure waveform between terminals OX 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 oxygen sensor (See page IN–19).**

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

NG

Replace oxygen sensor.

When not using hand–held tester

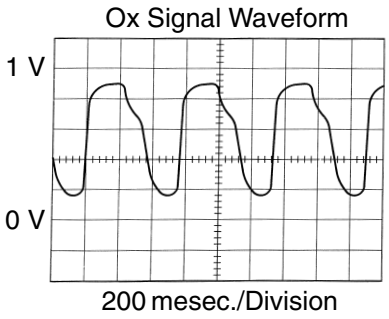
1	**Are these any other codes (besides code 21) being output.**

YES → **Go to referents DTC chart (See page DI–15).**

NO

Replace oxygen sensor.

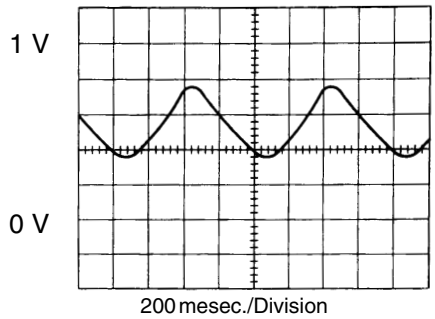
Reference INSPECTION USING OSCILLOSCOPE



FI6514

- With the engine racing (4,000 rpm) measure waveform between terminals OX 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.

DI1IG–03

DTC	P0135/21	Oxygen Sensor Heater Circuit Malfunction (Bank 1)

CIRCUIT DESCRIPTION

Refer to DTC P0130/21 (Oxygen Sensor circuit Malfunction (Bank1)) on page DI–46.

DTC No.	DTC Detecting Condition	Trouble Area
P0135/21	Open or short in heater circuit of oxygen sensor for 0.5. or more	• Open or short in heater circuit of oxygen sensor • 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

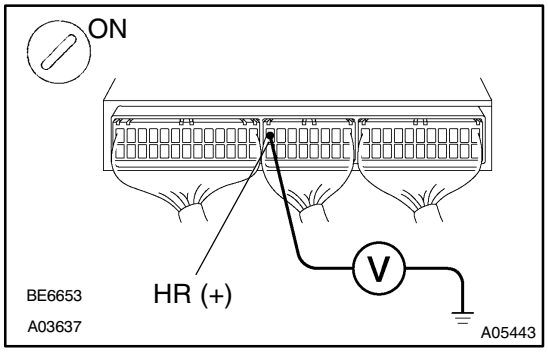
Refer to DTC P0130/21 (Oxygen Sensor Circuit Malfunction) on page DI–46.

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 HR of engine ECU connector and body ground.



PREPARATION:

(a) Remove the glove compartment (See page FI–62).

(b) Turn ignition switch ON.

CHECK:

Measure voltage between terminals HR engine ECU connector and body ground.

OK:

Voltage: 9 ~ 14 V

OK	Check and replace engine ECU (See page IN–19).

NG

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

NG	Replace oxygen sensor.

OK

Check and repair harness or connector between EFI main relay (Marking: EFI) and oxygen sensor and engine ECU (See page IN–19).

DTC	P0171/25	Fuel Trim System too Lean (Air – Fuel Ratio Lean Malfunction)

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 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: 60°C (140°F) or more (b) Engine speed: 1,500 rpm or more (c) Vehicle speed: 100 km/h or less	• Gas leakage on exhaust system • Air intake (hose loose) • Fuel line pressure • Injector blockage • Open or short in oxygen sensor circuit • Oxygen sensor malfunction • Vacuum sensor • Water temp. sensor

HINT:

- If the total of the short–term fuel trim value and long–term fuel trim value is within ± 38 %, 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	**Ask customer whether vehicles runs out of fuel.**

YES → **DTC P0171 was recorded because the vehicle runs out of fuel.**

NO

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

NG → **Repair or replace.**

OK

3	**Check for oxygen sensor data.**

PREPARATION:

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

(b) Warm up engine to normal operating temp.

CHECK:

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

HINT:

Read the values for the same bank.

RESULT:

Pattern	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 oxygen sensor (See page DI–46).**

1, 2

4	**Check fuel pressure (See page FI–1).**

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

OK

5	Check injector injection (See page FI–1).

NG → Replace injector.

OK

6	Check vacuum sensor and water temp. sensor (See page DI–22 and DI–27).

NG → Repair or replace.

OK

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

NG → Repair or replace.

OK

8	Check gas leakage on exhaust system.

NG → Repair or replace.

OK

Check and replace engine ECU (See page IG–1).

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–1).

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

OK

3	Check injector injection (See page DI–82).

NG → Replace injector.

OK

4	Check vacuum sensor (See page DI–22).

NG → Repair or replace.

OK

5	Check water temp. sensor (See page DI–27).

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–19).

DI32J–01

DTC	P0325/52	Knock Sensor Circuit Malfunction

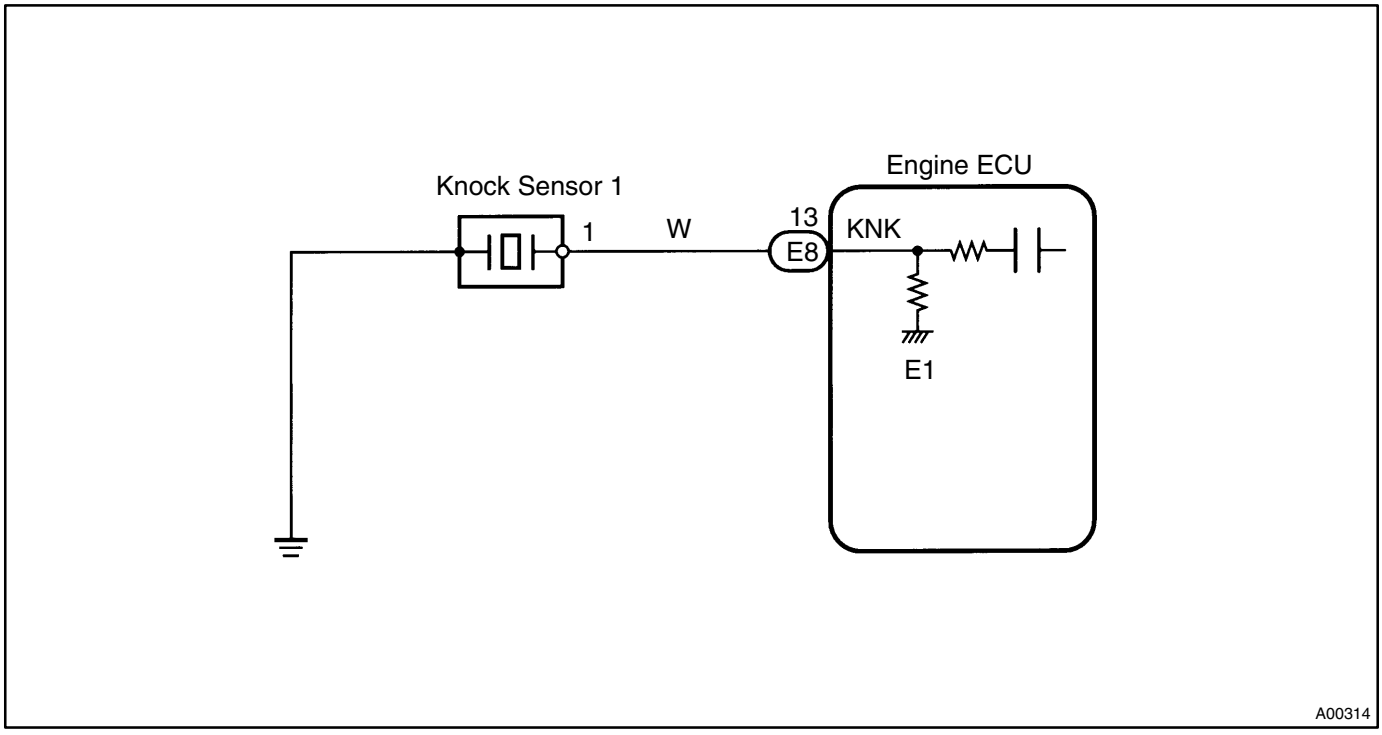
CIRCUIT DESCRIPTION

The knock sensor is fitted to the cylinder block to detect engine knocking. This sensor contains a piezoelectric element which generates a voltage when it becomes deformed, 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 signal to engine ECU with engine speed, 1,200 rpm or more	• Open or short in knock sensor circuit • Knock sensor (looseness) • Engine ECU

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

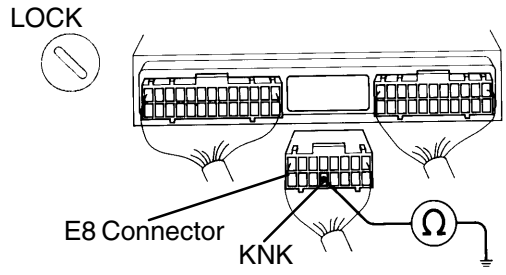
WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:
Read freeze 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.**

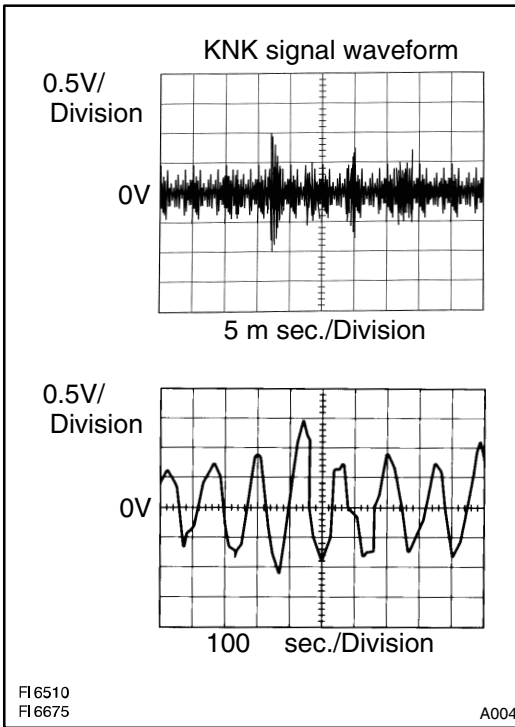


PREPARATION:
(a) Remove glove compartment (See page FI–62).
(b) Disconnect the "E8" connector of engine ECU.

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.

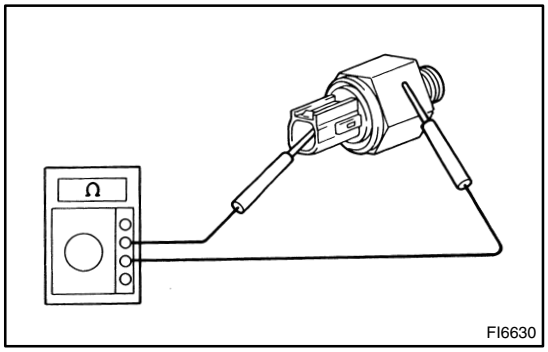
- Spread the time on the horizontal axis, and confirm that period of the wave is 132 μ sec.
  (Normal mode vibration frequency of knock sensor: 7.6 kHz)

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

OK	**Go to step 3 .**

NG

2	Check knock sensor.



PREPARATION:
Disconnect knock sensor connector.
CHECK:
Measure resistance between the knock sensor terminal and body.
OK:
Resistance: 1 MΩ or higher.

NG → **Replace knock sensor.**

OK

3	Check for open and short in harness and connector between engine ECU and knock sensor (See page IN–19).

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–19).

DI1IK–03

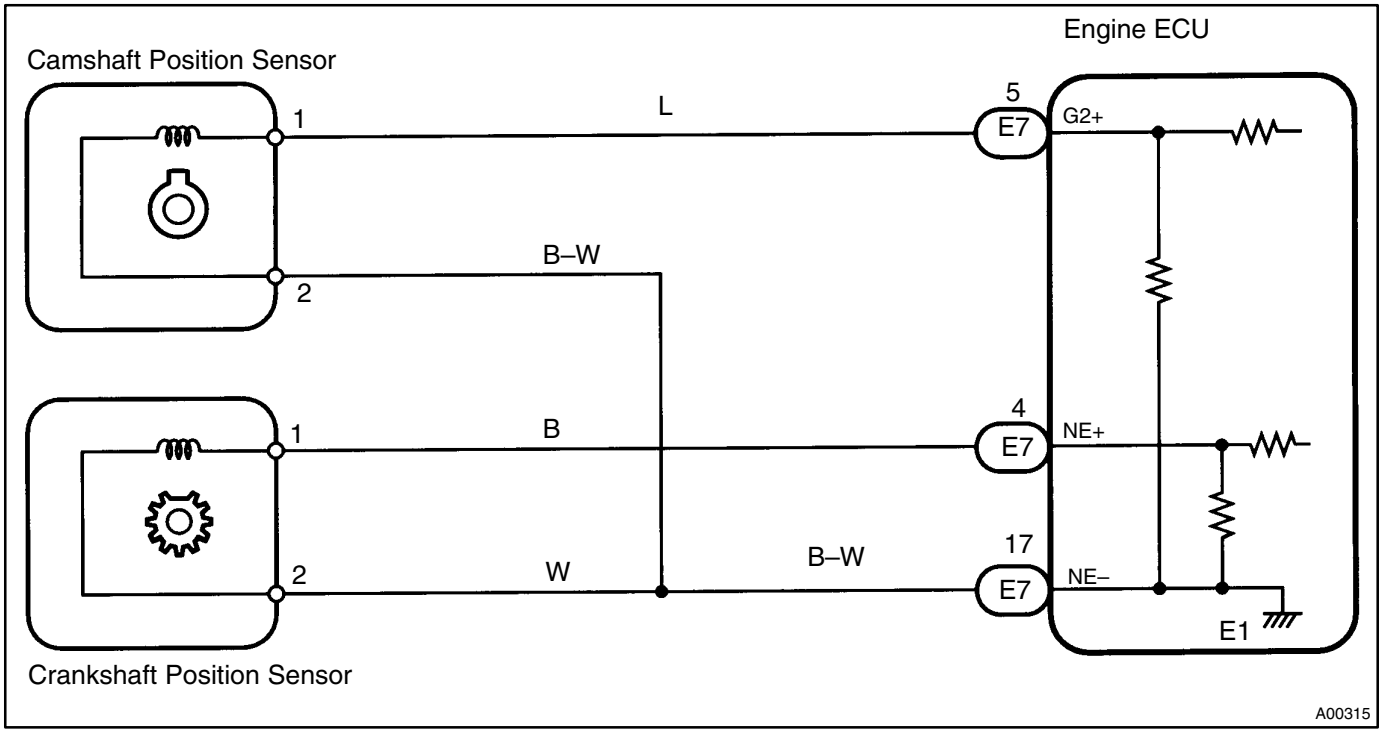
DTC	P0335/12, 13	Crankshaft Position Sensor Circuit Malfunction

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 G+ signals, and the actual crankshaft angle the engine speed by the NE signals.

DTC No.	DTC Detecting Condition	Trouble Area
P0335/12, 13	No crankshaft position sensor signal to engine ECU during cranking.	• Open or short in crankshaft position sensor circuit. • Crankshaft position sensor • Starter • Engine ECU
	No crankshaft position sensor signal to engine ECU with engine speed 600 rpm	

WIRING DIAGRAM



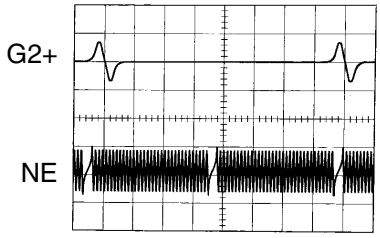
INSPECTION PROCEDURE

HINT:

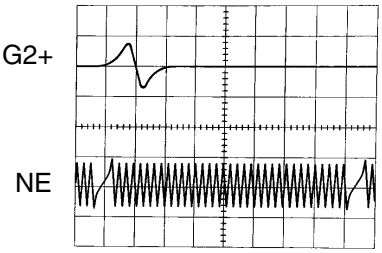
- Read freed frame data using hand–held tester. Because freeze frame records the engine conditions when the malfunction is detected, when troubleshooting it is useful for determining whether the vehicle was running or stopped, the engine warmed up or not, the air–fuel ratio lean or rich, etc. at the time of the malfunction.
- Perfrom troubleshooting of DTC P0335/12, 13 first. If no trouble is found, troubleshoot the following mechanical system.

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

G2+, NE signal waveforms



A01991



A01992

Reference: INSPECTION USING OSCILLOSCOPE

During cranking or idling, check between terminals G+ 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–19).**

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–19).

DTC	P0340/12	Camshaft Position Sensor Circuit Malfunction

CIRCUIT DESCRIPTION

Camshaft position sensor (G+ signal) consist of a signal plate and pick up coil. The G+ 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 G+ 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
	No camshaft position sensor signal to engine ECU during cranking.	
	Open in NE– circuit	

WIRING DIAGRAM

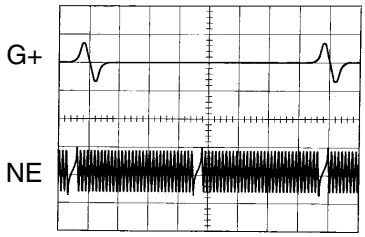
Refer to DTC P0335/12, 13 on page DI–62 for the WIRING DIAGRAM.

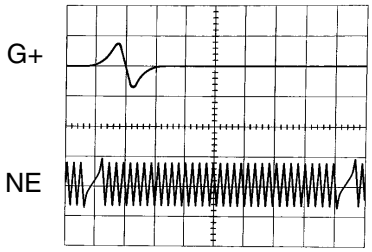
INSPECTION PROCEDURE

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 (See page IG–1).**

G+, NE signal waveforms





A01991
A01992

Reference: INSPECTION USING OSCILLOSCOPE
During cranking or idling, check between terminals G+ 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–19).**

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

OK

3	**Inspect sensor installation.**

NG → **Tighten the sensor.**

OK

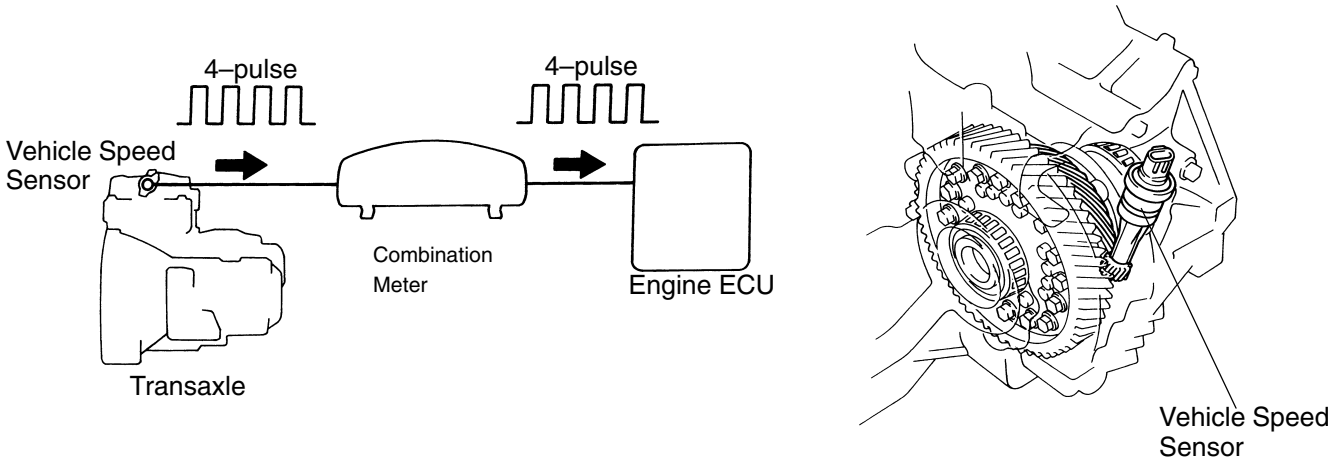
Check and replace engine ECU (See page IN–19).

DI1IM–04

DTC	P0500/42	Vehicle Speed Sensor Malfunction

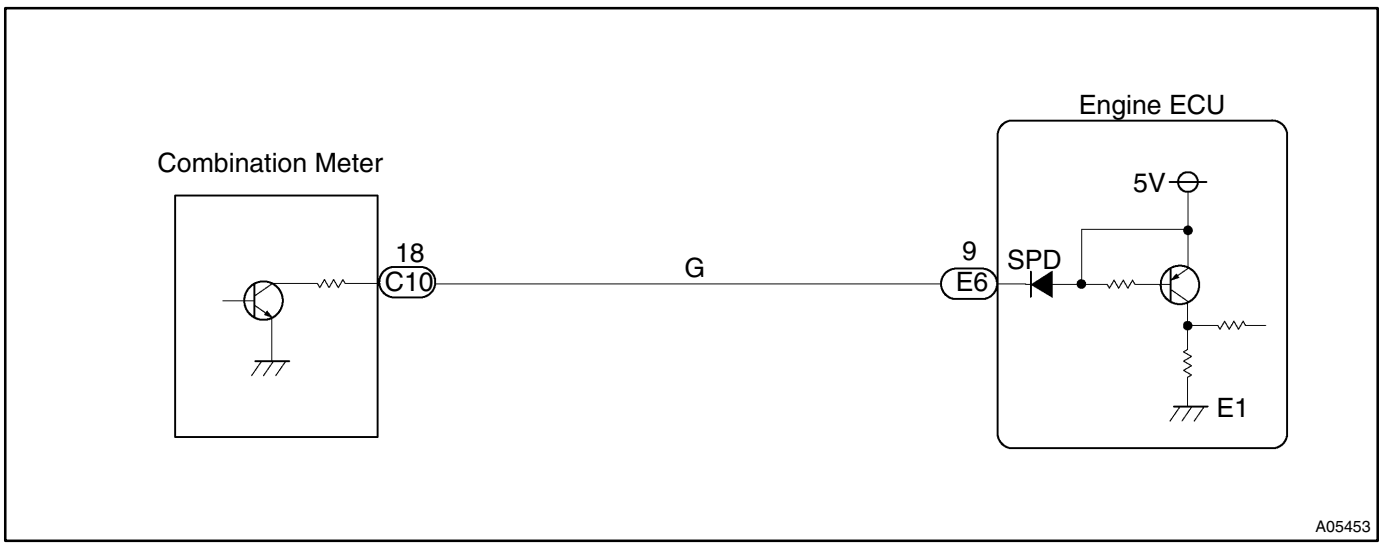
CIRCUIT DESCRIPTION

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.

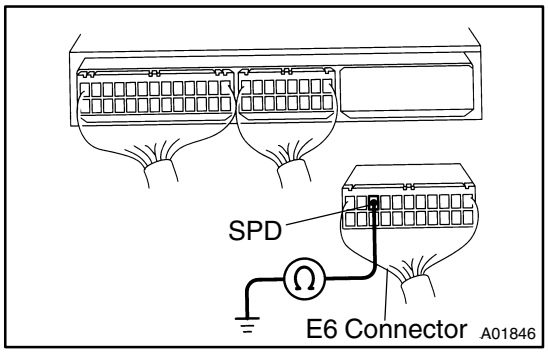
1	**Check operation of speedometer.**

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.**

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–62).
(b) Disconnect the E6 engine ECU connector.

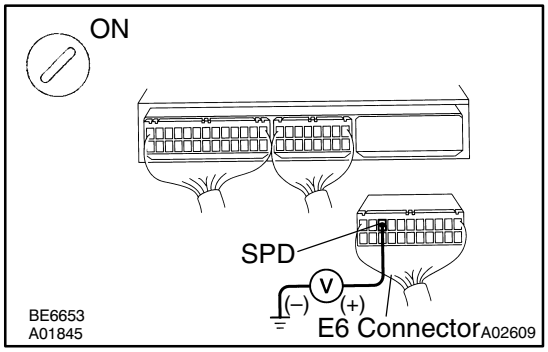
CHECK:
Check continuity between terminal SPD of engine ECU and body ground.

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–62).
(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–19).**

OK

4	Check for open in harness and connector between J/B and combination meter (See page IN–19)

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

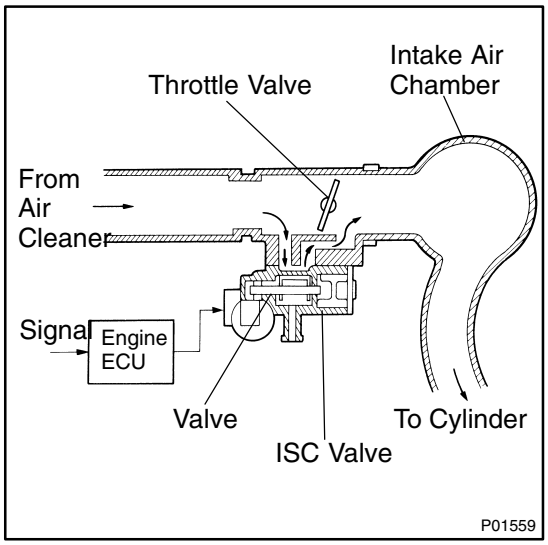
OK

Check and replace engine ECU (See page IN–19).

DI32K–01

DTC	P0505/33	Idle Control System Malfunction

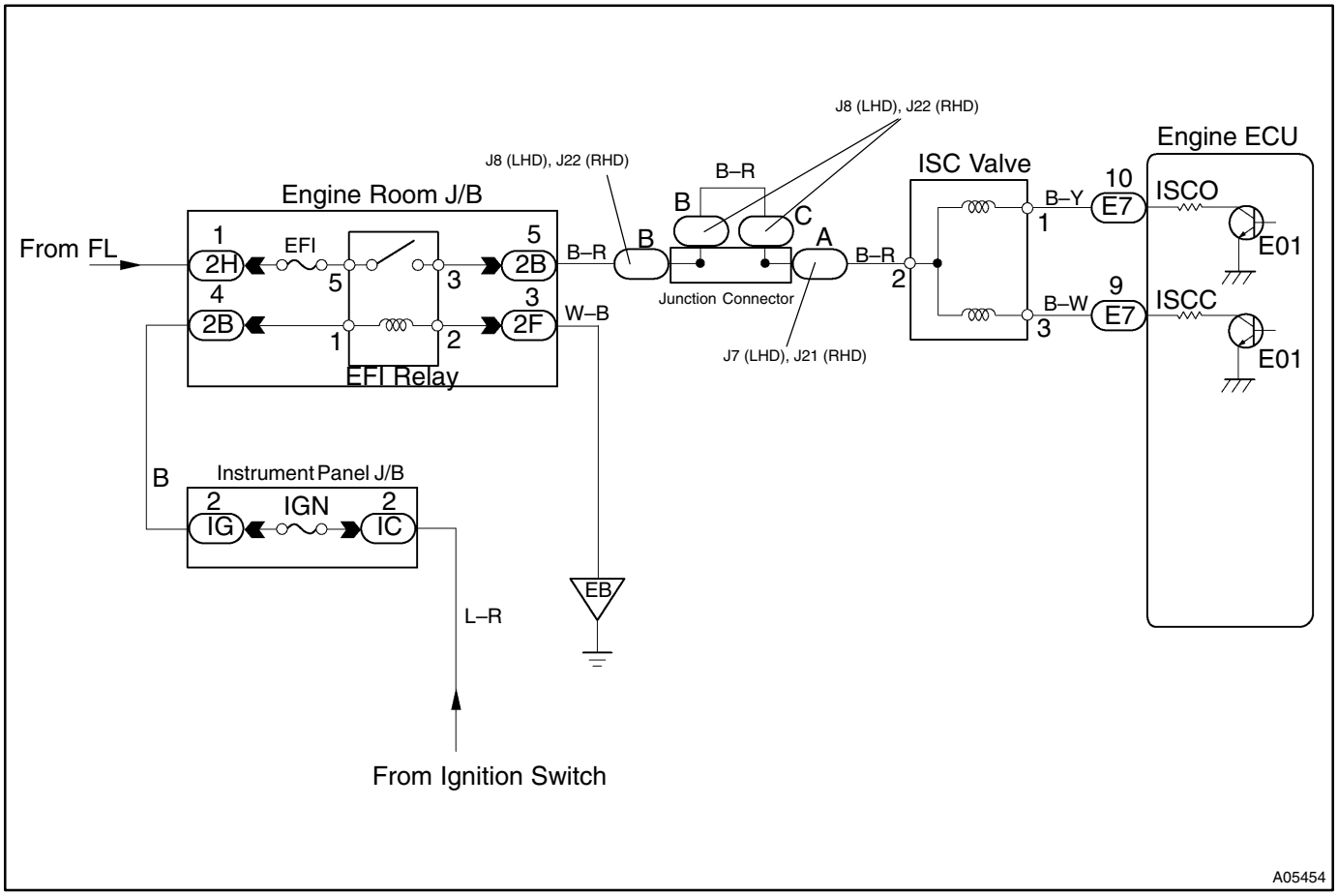
CIRCUIT DESCRIPTION



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



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 operation of the ISC valve.**

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

CHECK:
Check engine speed when the ISC valve operated by hand–held tester.

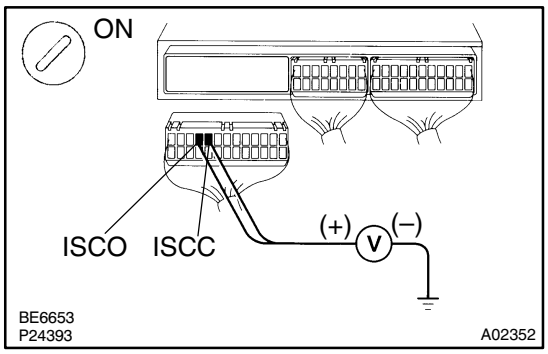
OK:

Engine speed is increased and decreased in response to change of ISC duty ratio.

OK → **Go to step 4**

NG

2	**Check voltage between terminals ISCO, ISCC of engine ECU connector and body ground.**



PREPARATION:
(a) Remove glove compartment. (See page FI–62).
(b) Disconnect the E7 connector of engine ECU.
(c) Turn ignition switch ON.

CHECK:
Measure voltage between terminals ISCO, ISCC 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–40).

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–19).

4	Check air induction system.

NG → Repair or replace.

OK →

5	Check the A/C signal circuit.

NG → Repair or replace.

OK →

Check and replace engine ECU (See page IN–19).

When not using hand–held tester

1	**Check air induction system.**

OK → **Repair or replace.**

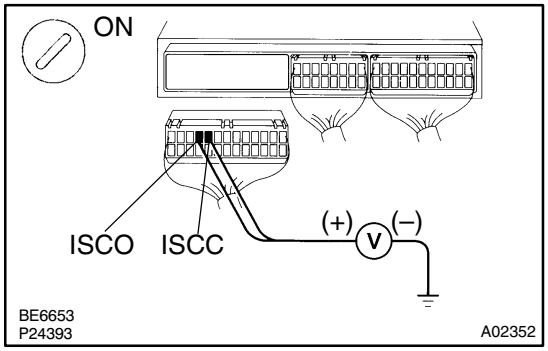
OK

2	**Check for A/C signal circuit.**

OK → **Repair or replace.**

OK

3	**Check voltage between terminals ISCO, ISCC of engine ECU and body ground.**



PREPARATION:
(a) Remove glove compartment. (See page FI–62).
(b) Disconnect the E7 connector of engine ECU.
(c) Turn ignition switch ON.

CHECK:
Measure voltage between terminals ISCO, ISCC of engine ECU
connector and body ground,

OK:
Voltage: 9 ~ 14 V

OK → **Go to step 5.**

NG

4	**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–19).

5	**Check operation of the ISC valve.**

NG → **Replace ISC valve.**

OK

Check and replace engine ECU (See page IN–19).

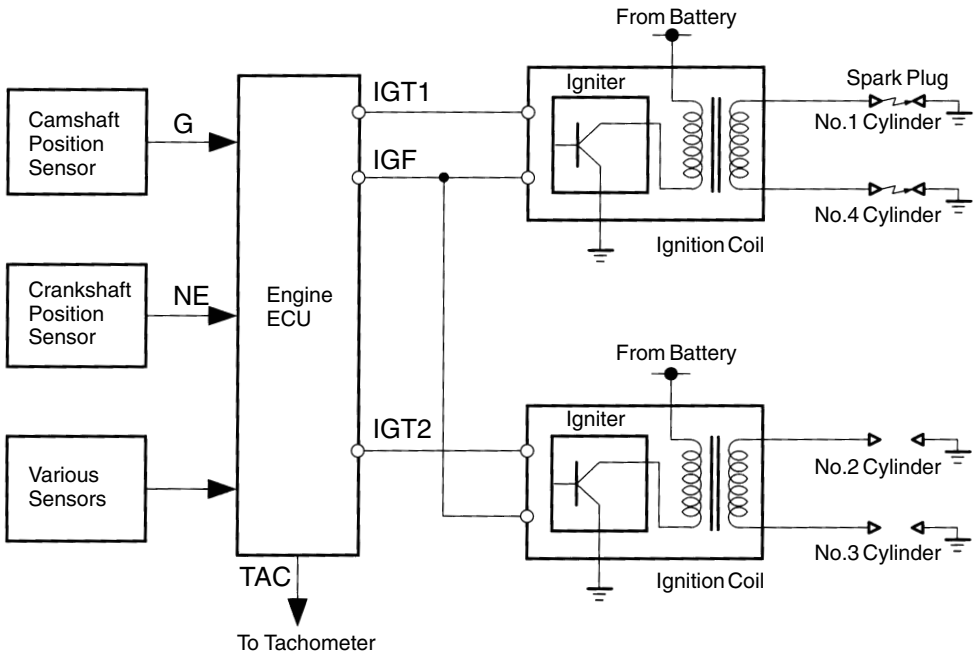
DI1IO–04

DTC	P1300/14	Igniter Malfunction Malfunction (No.1)

DTC	P1310/15	Igniter Malfunction Malfunction (No.2)

CIRCUIT DESCRIPTION

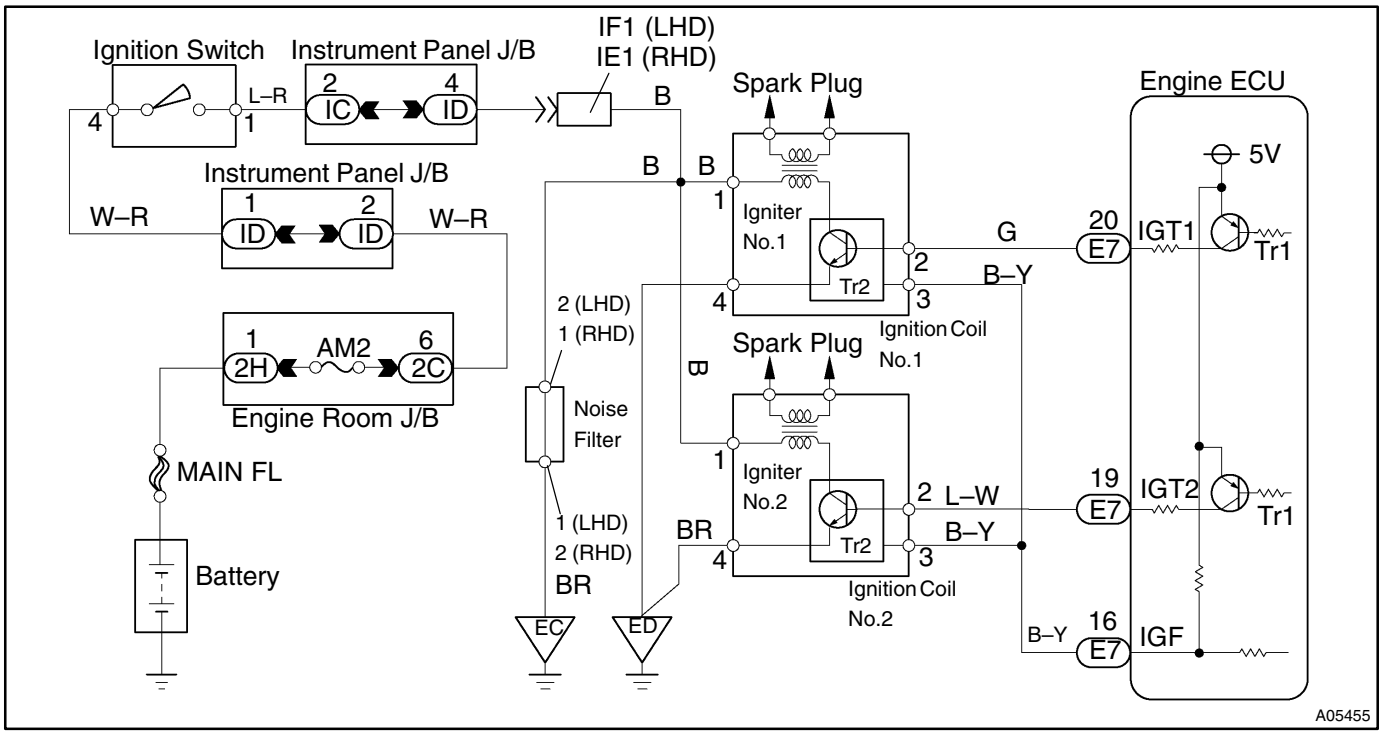
A DIS (Direct Ignition System) has been adopted, The DIS improves the ignition timing accuracy, reduces high–voltage loss, and enhances the overall reliability of the ignition system by eliminating the distributor. The DIS is a 2–cylinder simultaneous ignition system which ignites 2 cylinders simultaneously 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 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	No IGF signal to engine ECU for 4 consecutive IGT1 signals during engine running	• Open or short in IGF or IGT circuit from igniter to engine ECU • Ignition coil No.1 (w/ Igniter No.1) • Engine ECU
P1310/15	No IGF signal to engine ECU for 4 consecutive IGT2 signals during engine running	• Open or short in IGF or IGT circuit from igniter to engine ECU • Ignition coil No.2 (w/ Igniter No.2) • Engine ECU

HINT:
Ignition coil No.1 is for cylinder No.1 and No.4, and ignition coil No.2 is for cylinder No.2 and No.3.

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 is for the ignition circuit of No.1 and No.4 cylinders.

DTC P1310/15 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.**

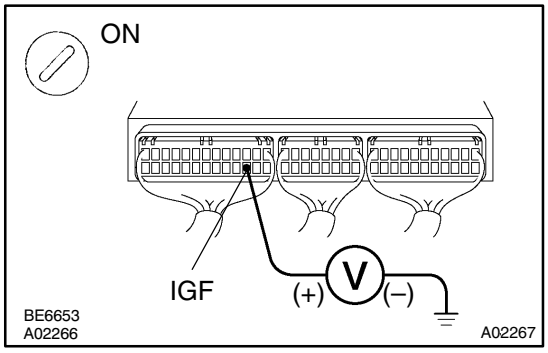
OK

2	**Check for open and short in harness and connector in IGF signal circuit between engine ECU and ignition coil No.1, No.2 (See page IN–19).**

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

OK

3	**Disconnect ignition coil No.1, No.2 connector and check voltage between terminal IGF of engine ECU connector and body ground.**



PREPARATION:

(a) Disconnect the ignition coil No.1, No.2 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 igniter.**

NG

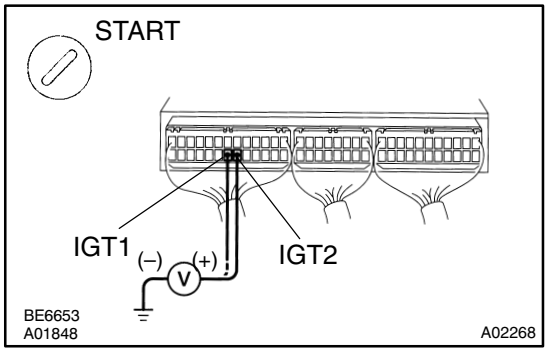
Check and replace engine ECU (See page IN–19).

4	**Check for open and short in harness and connector in IGT1 and IGT2 signal circuit between engine ECU and ignition coil No.1, No.2 (See page IN–19).**

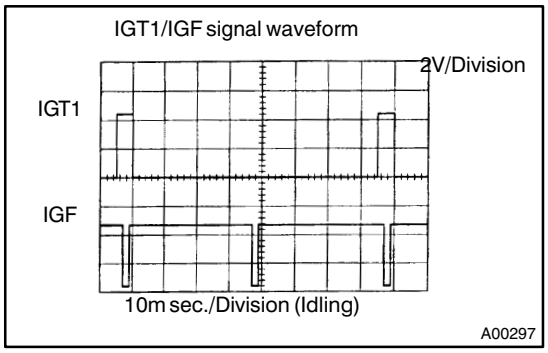
NG → **Repair or replace harness or connector.**

OK

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



PREPARATION:
Remove the grove compartment (See page FI–62).
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

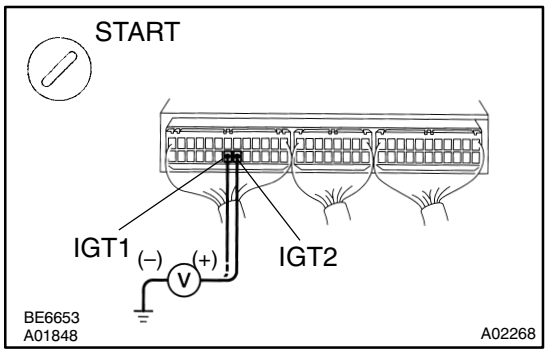


Reference: INSPECTION USING OSCILLOSCOPE
During idling, check waveform between terminals IGT1 and E1 of engine ECU.
HINT:
The correct waveform are as shown.
IGT2 signal waveform is same as the IGT1 signal waveform.

NG → **Check and replace engine ECU (See page IN–19).**

OK

6	Disconnect ignition coil No.1, No.2 connector and check voltage between terminals IGT1,2 of engine ECU connector and body ground.

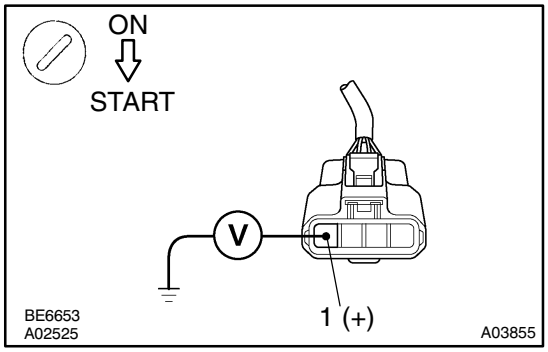


PREPARATION:
(a) Disconnect the ignition coil No.1, No.2 connector.
(b) Remove the glove compartment (See page FI–62).
CHECK:
Measure voltage between terminals IGT1 and IGT2 of engine ECU connector and body ground when engine is cranked.
OK:
Voltage: More than 0.1 V and less than 4.5 V

NG → **Check and replace engine ECU (See page IN–19).**

OK

7	Check ignition coil No.1, No.2 power source circuit.



PREPARATION:
Disconnect the ignition coil No.1, No.2 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 No.1, No.2 power source circuit.**

OK

8	Check for open and short in harness and connector between ignition switch and ignition coil No.1, No.2 (See page IN–19).

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

OK

9	Check EFI main relay (Marking: EFI) (See page FI–45).

NG → **Replace EFI main relay (Marking: EFI)**

OK

Replace ignition coil No.1, No.2.

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–62.

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, 13 (Crankshaft Position Sensor Circuit Malfunction) on page DI–62 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–62.

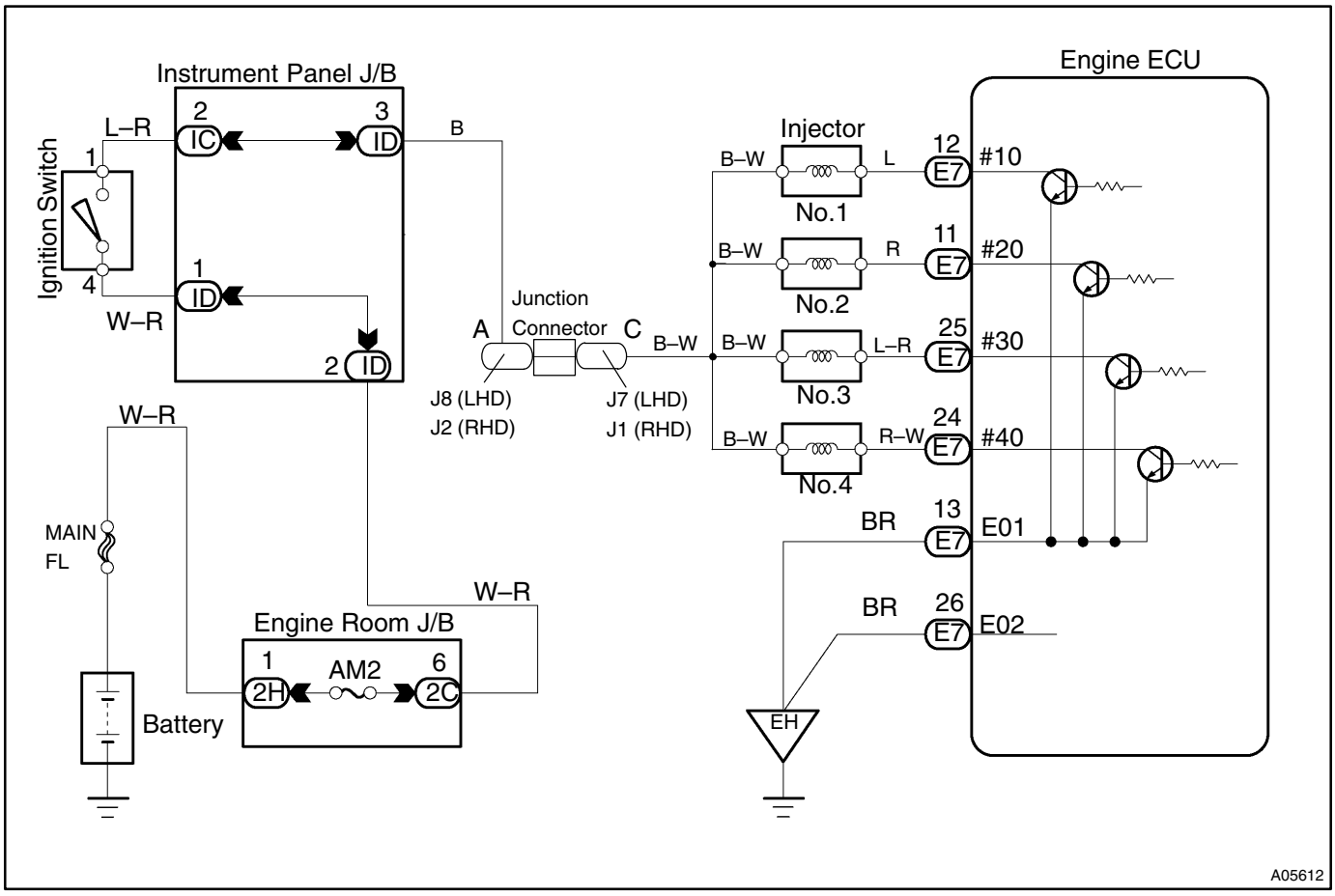
DI1IQ–03

Injector Circuit

CIRCUIT DESCRIPTION

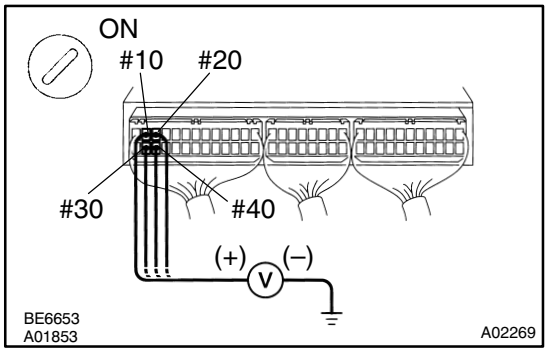
The injectors are located in the intake manifold. They inject fuel into the cylinders based on the signals from the engine ECU.

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–62).

(b) Turn ignition switch ON.

CHECK:

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

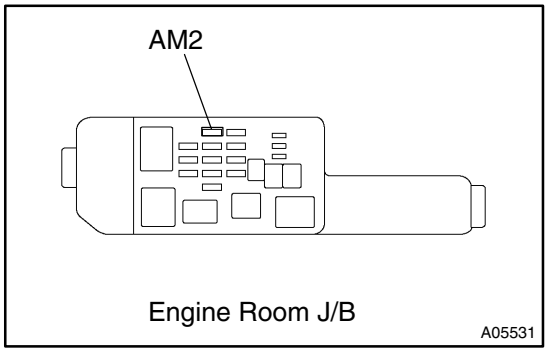
OK:

Voltage: 9 – 14 V

OK	**Go to step 4.**

NG

2	**Check AM2 fuse.**



PREPARATION:

Remove AM2 fuse from engine roome J/B.

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–25).

NG → Replace injector.

OK →

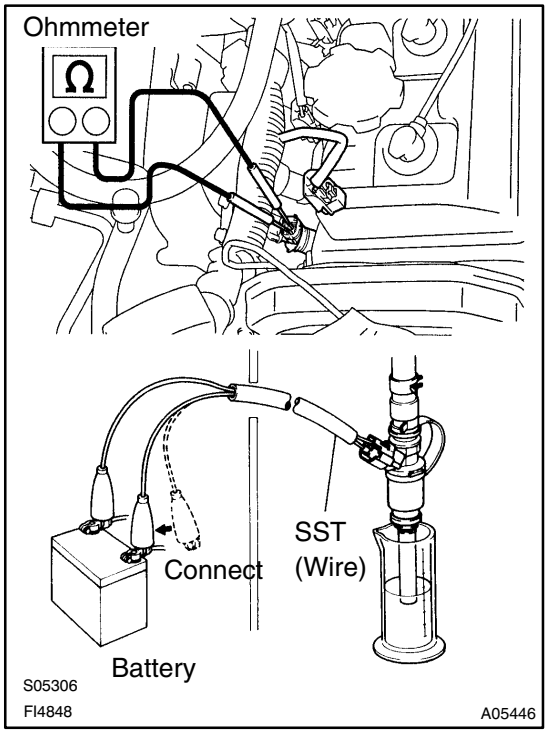
Check and repair harness and connector between engine ECU and battery.

4	Check for open in harness and connector between terminal E01, E02 of engine ECU connector and body ground (See page IN–19).

NG → Repair or replace harness or connector.

OK →

5	Check injectors.



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

- **Injection Volume**
  51 ~ 63 cm^3/15 sec.
  (3.1 ~ 3.8 cu in./15 sec.)
  Difference between each injector:
  Less than 12 cm^3 (0.7 cu in.)
- **Leakage**
  Fuel drop: 1 drop or less per 12 minutes

NG → **Replace injector.**

OK

Proceed to next circuit inspection shown on problem symptoms table (See page DI–20).

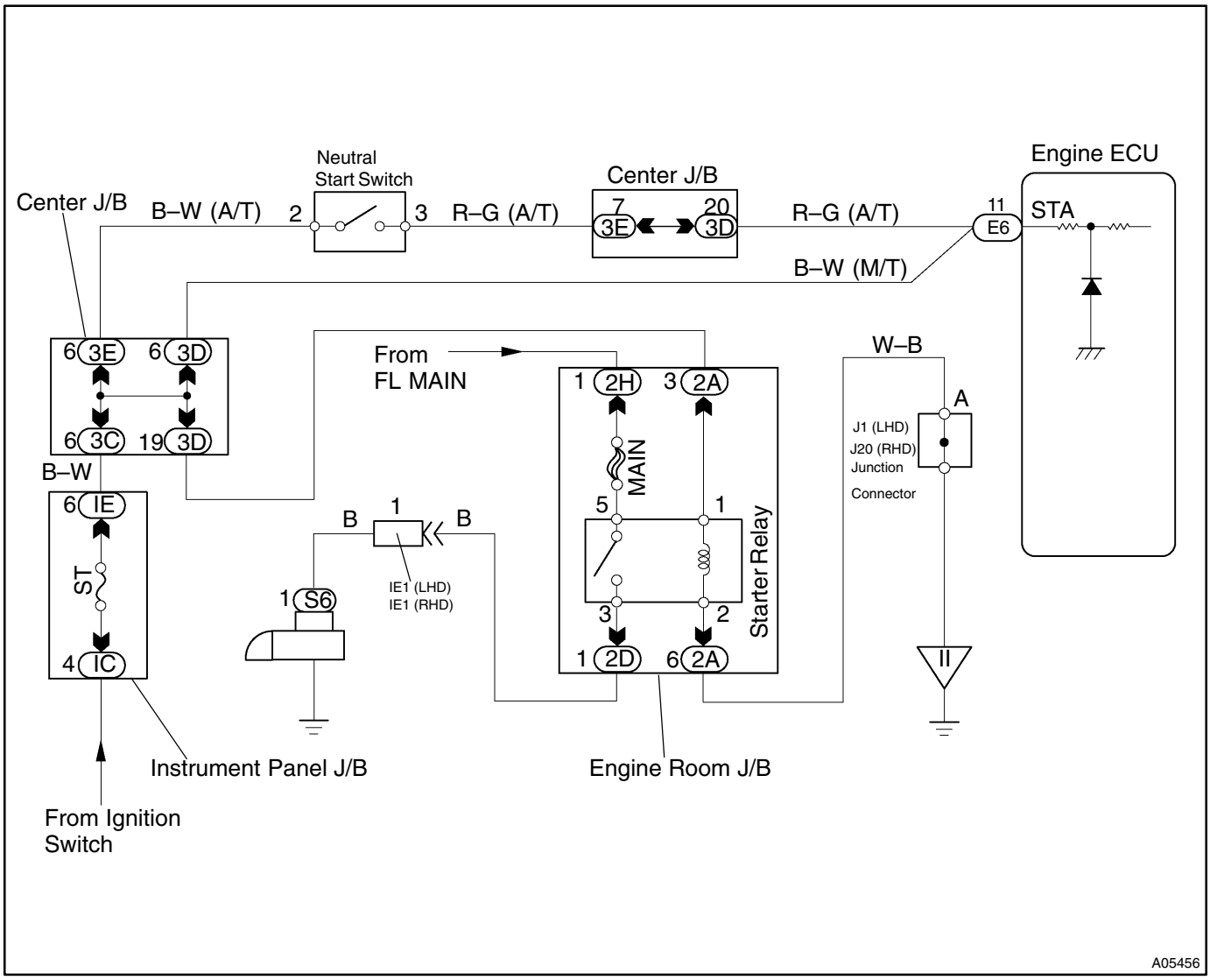
DI32L–01

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



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–20)

1	**Check the starter signal.**

Using hand–held tester:

PREPARATION:

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

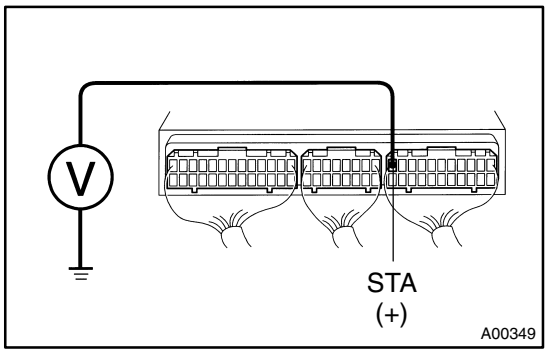
(b) Turn the ignition switch ON and hand–held tester main switch ON.

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–62).

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–20).**

NG

2	**Check for open in harness and connector between engine ECU and starter replay (See page IN–19).**

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

OK

Check and replace engine ECU (See page IN–19).

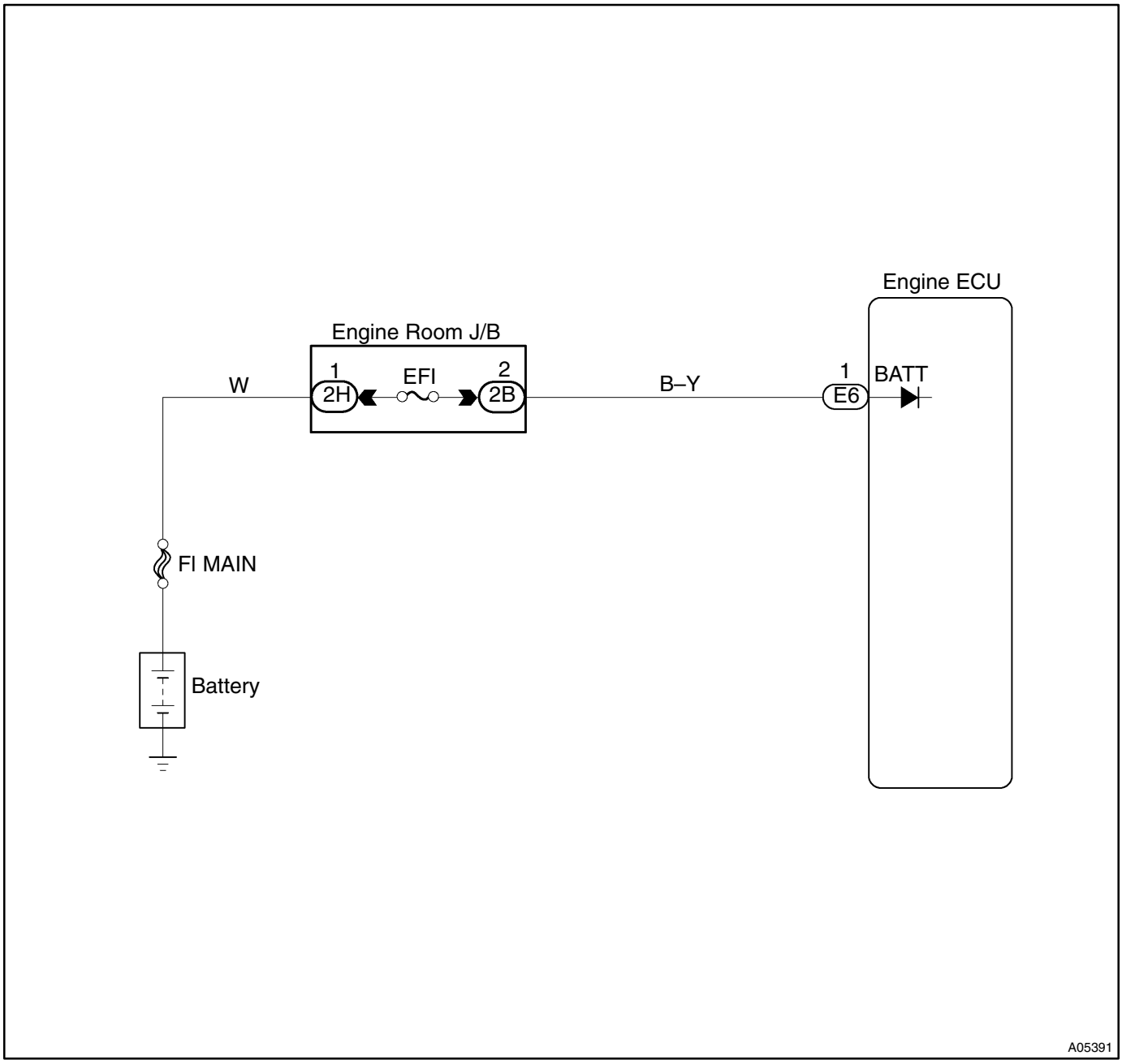
DI1IS–04

Back Up Power Source Circuit

CIRCUIT DESCRIPTION

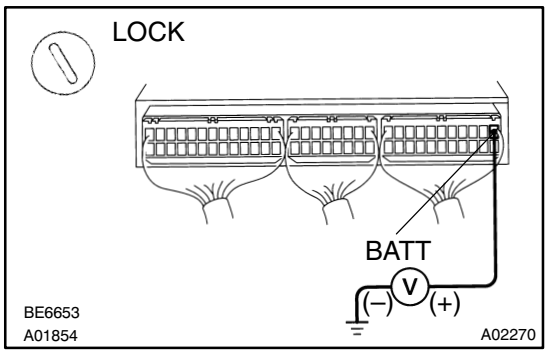
Battery voltage is supplied to terminal BATT of the engine ECU even when the ignition switch is OFF for use by the DTC memory and air–fuel ratio adaptive control value memory, etc.

WIRING DIAGRAM



INSPECTION PROCEDURE

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

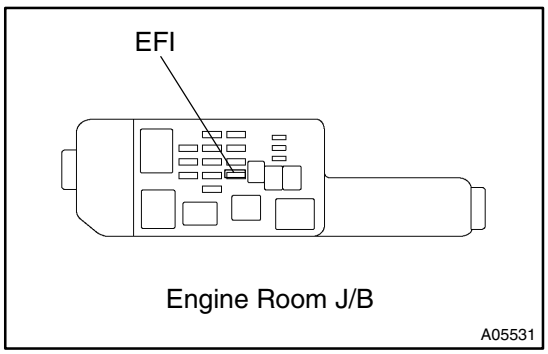


PREPARATION:
Remove glove compartment (See page FI–62).
CHECK:
Measure voltage between terminal BATT of engine ECU connector and body ground.
OK:
Voltage: 9 – 14V

OK → **Check and replace engine ECU (See page IN–19).**

NG

2	**Check EFI fuse.**



PREPARATION:
Remove EFI fuse from engine room J/B.
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.

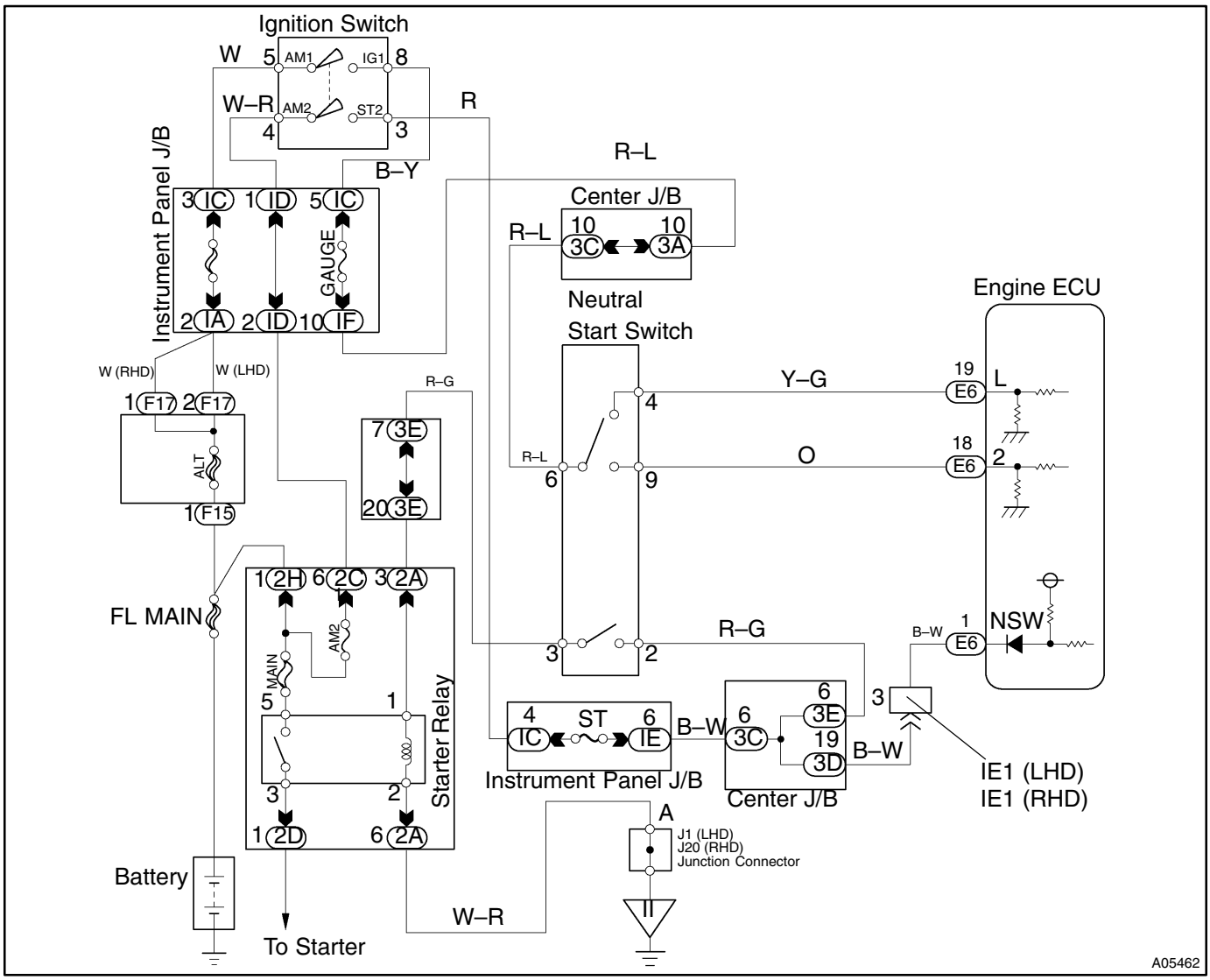
DI1IT–03

Neutral Start Switch Circuit

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 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.

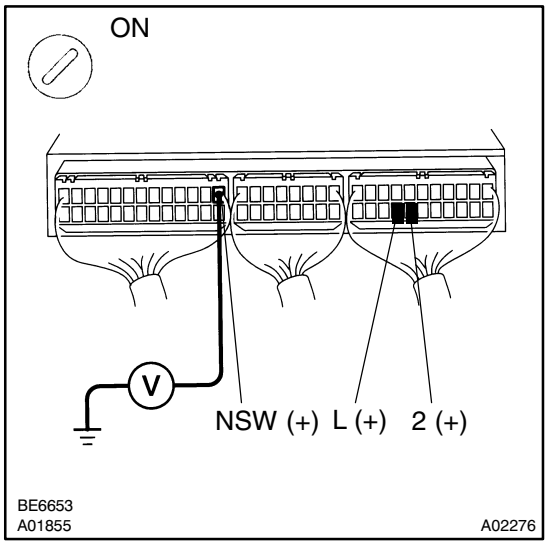
(b) Turn the ignition switch ON and hand–held tester main switch ON.

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

OK:

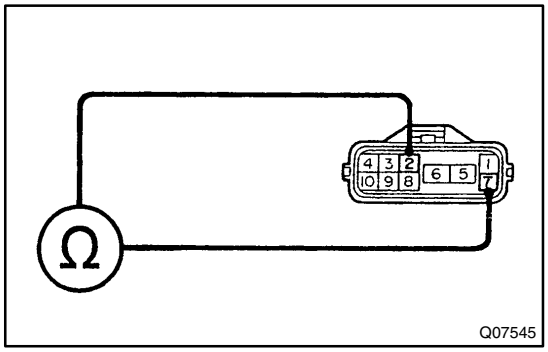
Position	R–Body ground	NSW–Body ground	2–Body ground	L–Body ground
P, N	0V	Below 1V	Below 1V	Below 1V
D	Below 1V	7.5 ~ 14V	Below 1V	Below 1V
2	Below 1V	7.5 ~ 14V	7.5 ~ 14V	Below 1V
L	Below 1V	7.5 ~ 14V	Below 1V	7.5 ~ 14V

*: 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–20).**

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
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–19).

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

OK ↓

Check and replace engine ECU.

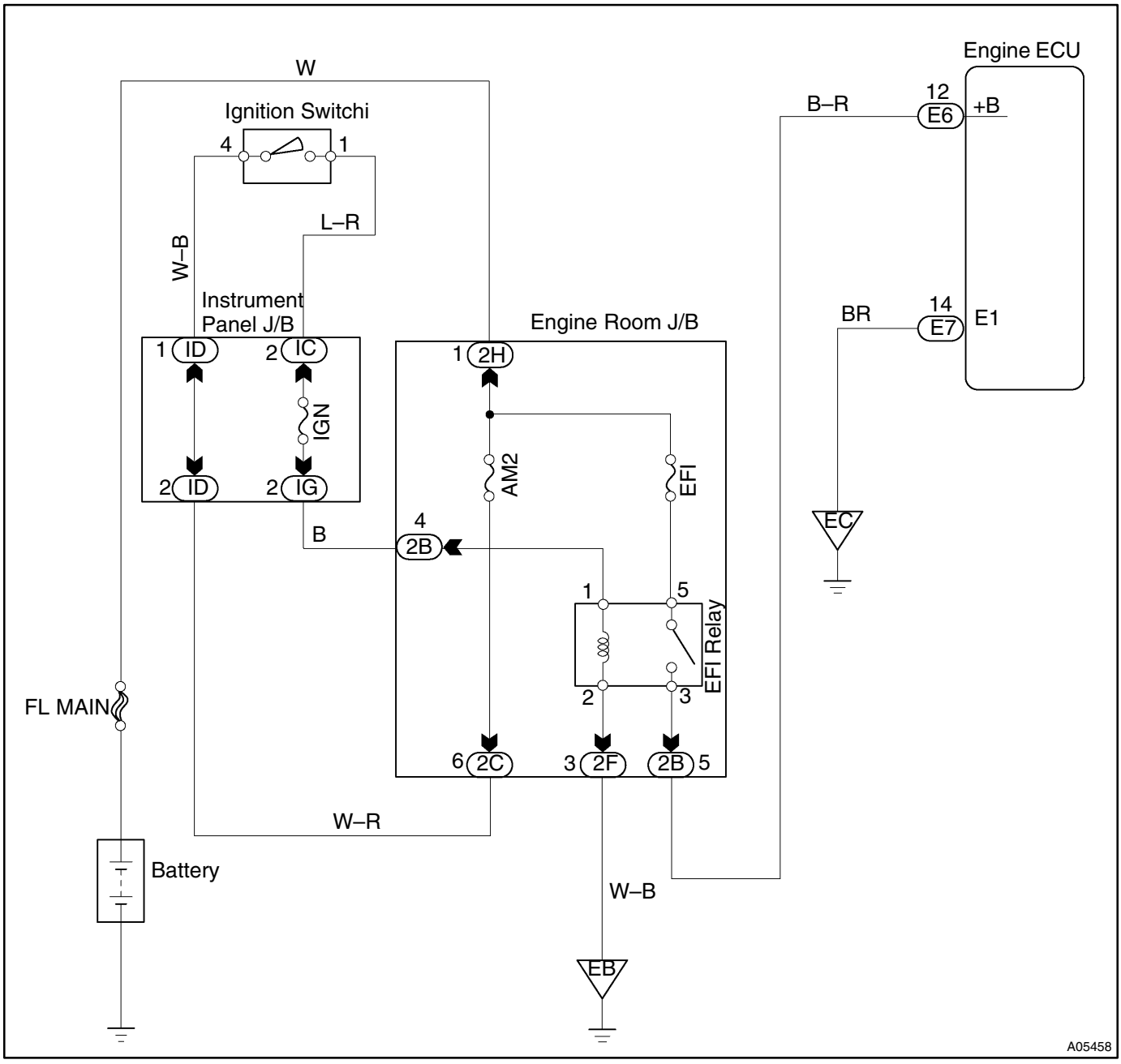
DI1IU–03

ECU Power Source Circuit

CIRCUIT DESCRIPTION

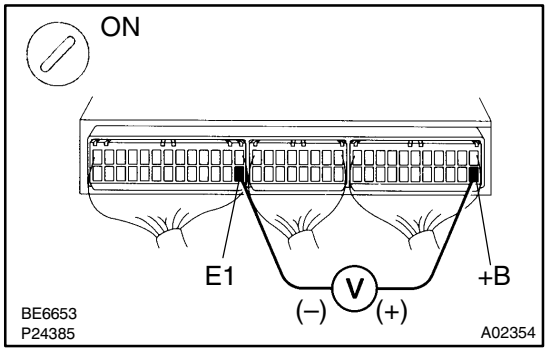
When the ignition switch is turned ON, battery positive voltage is applied to the coil, closing the contacts of the EFI main relay and supplying power to the terminal +B of the engine ECU.

WIRING DIAGRAM



INSPECTION PROCEDURE

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



PREPARATION:

(a) Remove glove compartment (See Page FI–62).

(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–20).**

NG

2	**Check for open in harness and connector between terminal E1 of engine ECU and body ground (See page IN–19).**

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

OK

3	**Check EFI main relay (See page FI–45).**

NG → **Replace EFI main relay.**

OK

4	**Check EFI fuse .**

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

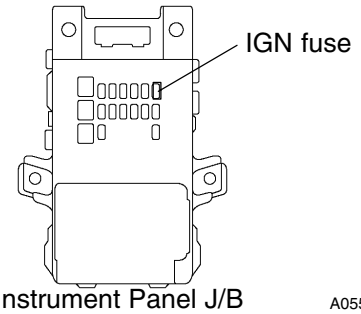
OK

5	**Check for open in harness and connector between main relay and battery, main relay and engine ECU (See page IN–19).**

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

OK

6	**Check IGN fuse.**



PREPARATION:
Remove IGN fuse from the instrument panel J/B.
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 →

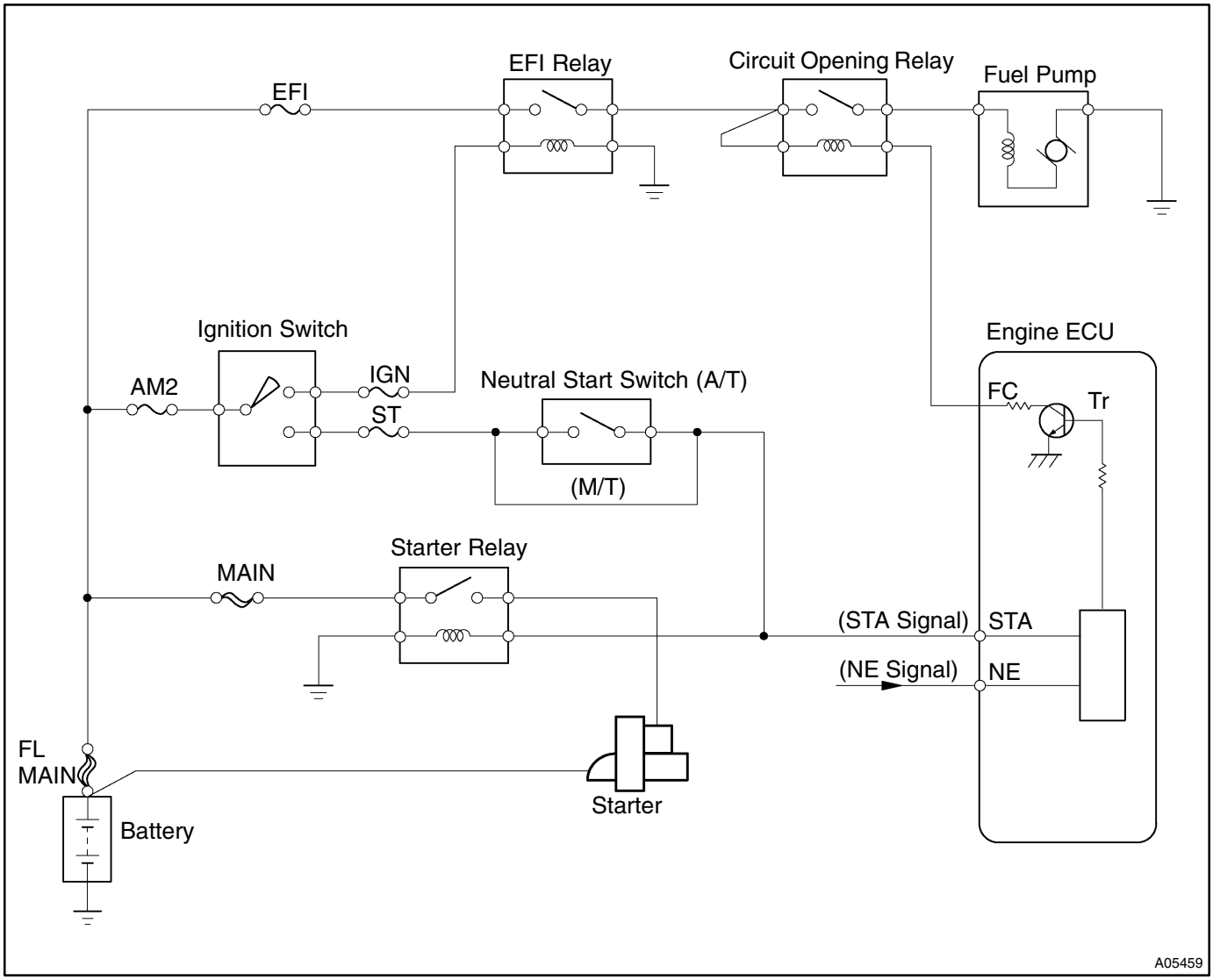
Check for open in harness and connector between IG switch and main relay, main relay and body ground (See page IN–19).

DI32M–01

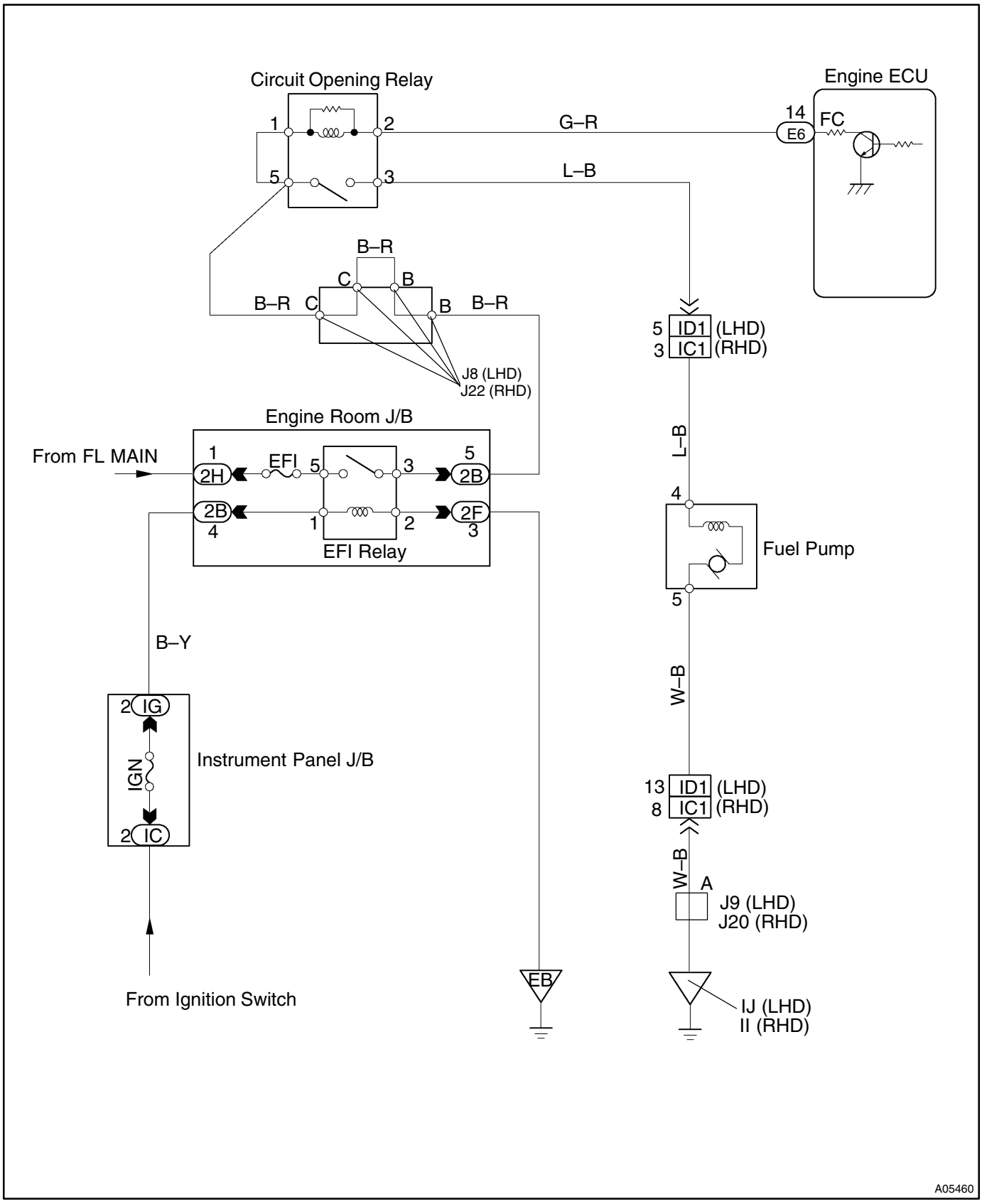
Fuel Pump Control Circuit

CIRCUIT DESCRIPTION

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

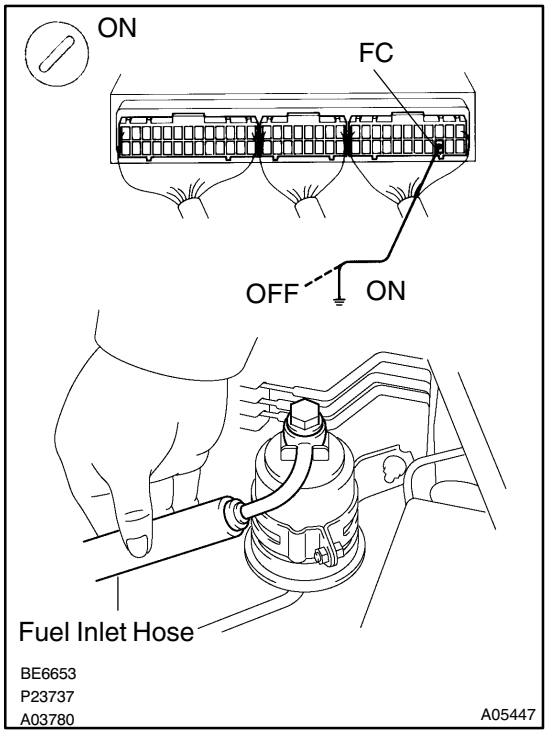


WIRING DIAGRAM



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–6 or FI–13).

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–20).**

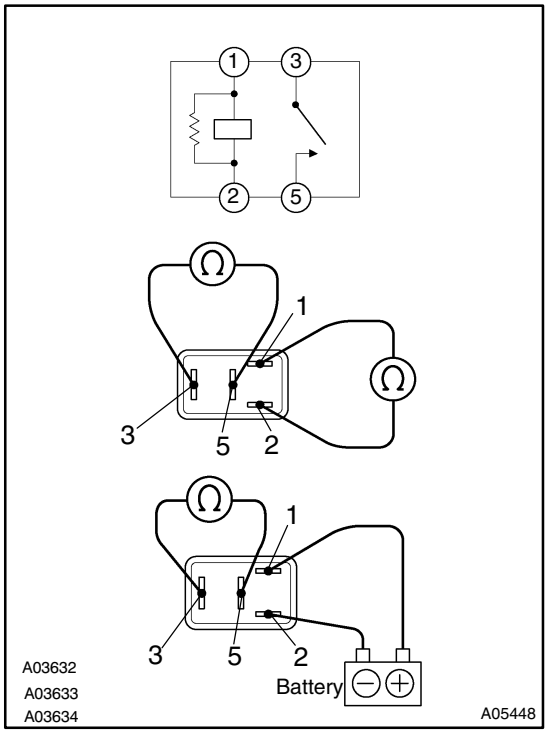
NG

2	**Check for engine ECU power source circuit (See page DI–93).**

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.

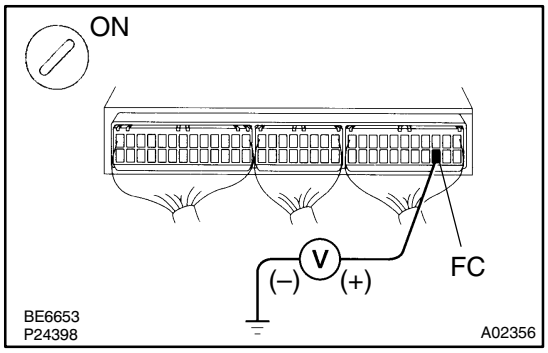
OK:

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–62).

(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–6, FI–13).

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–19).

NG → Repair or replace harness or connector.

OK

Check and replace engine ECU (See page IN–19).

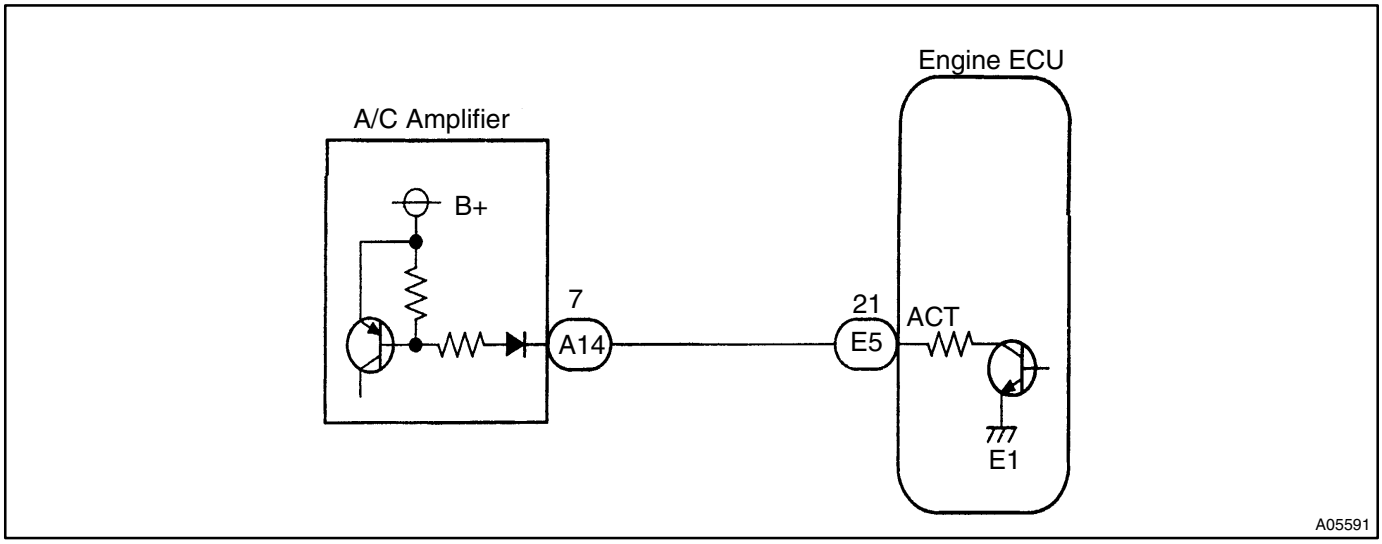
DI32N–01

A/C Cut Control Circuit

CIRCUIT DESCRIPTION

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

WIRING DIAGRAM



INSPECTION PROCEDURE

When using hand–held tester

1	**Connect the hand–held tester and check operation of air conditioning cut control.**

PREPARATION:

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

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

(c) Start the engine and conditioning switch ON.

HINT:

A/C magnet clutch is turned ON.

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

CHECK:

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

OK:

A/C magnet clutch is turned OFF.

OK → **Proceed to next circuit inspection shown on matrix chart (See page DI–20).**

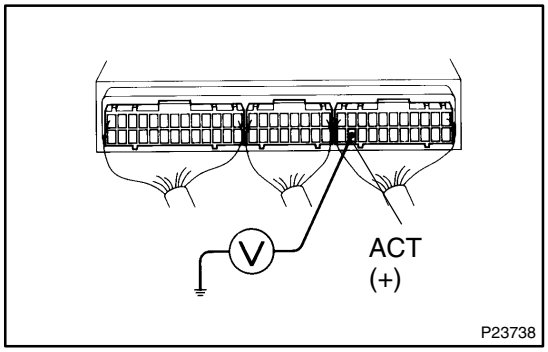
NG

2	**Check for open and short in harness and connector between engine ECU and A/C amplifier (See page IN–19).**

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

OK

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



PREPARATION:

(a) Remove glove compartment (See page FI–62).

(b) Start the engine.

CHECK:

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

OK:

A/C switch condition	Voltage
ON	9 ~ 14 V
OFF	Below 2.0 V

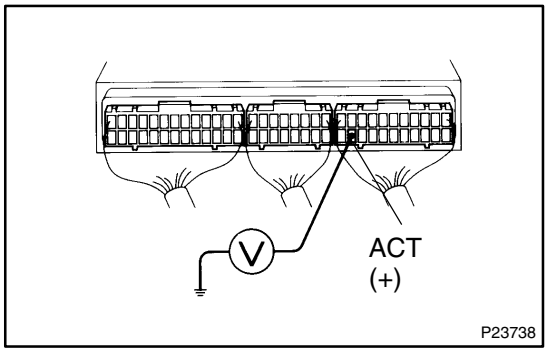
NG → **Check and replace A/C amplifier.**

OK

Check and replace engine ECU (See page IN–19).

When not using hand–held tester

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



PREPARATION:

(a) Remove glove compartment (See page FI–62).

(b) Start the engine.

CHECK:

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

OK:

A/C switch condition	Voltage
ON	9 ~ 14 V
OFF	Below 2.0 V

OK → **Check and replace engine ECU (See page IN–19).**

NG

2	**Check for open and short in harness and connector between engine ECU and A/C amplifier (See page IN–19).**

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

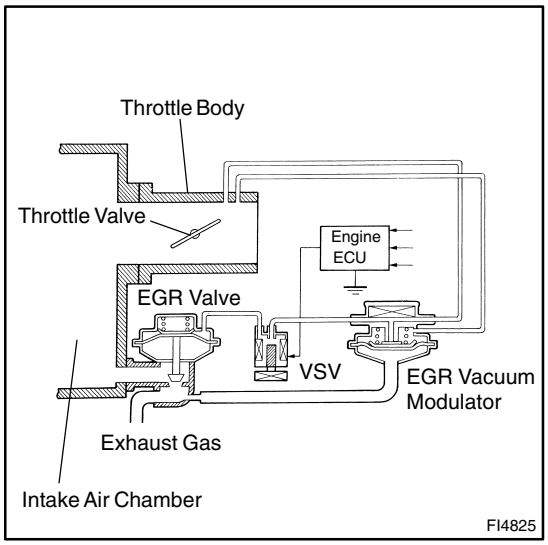
OK

Check and A/C amplifier.

DI1IW–02

EGR System

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).

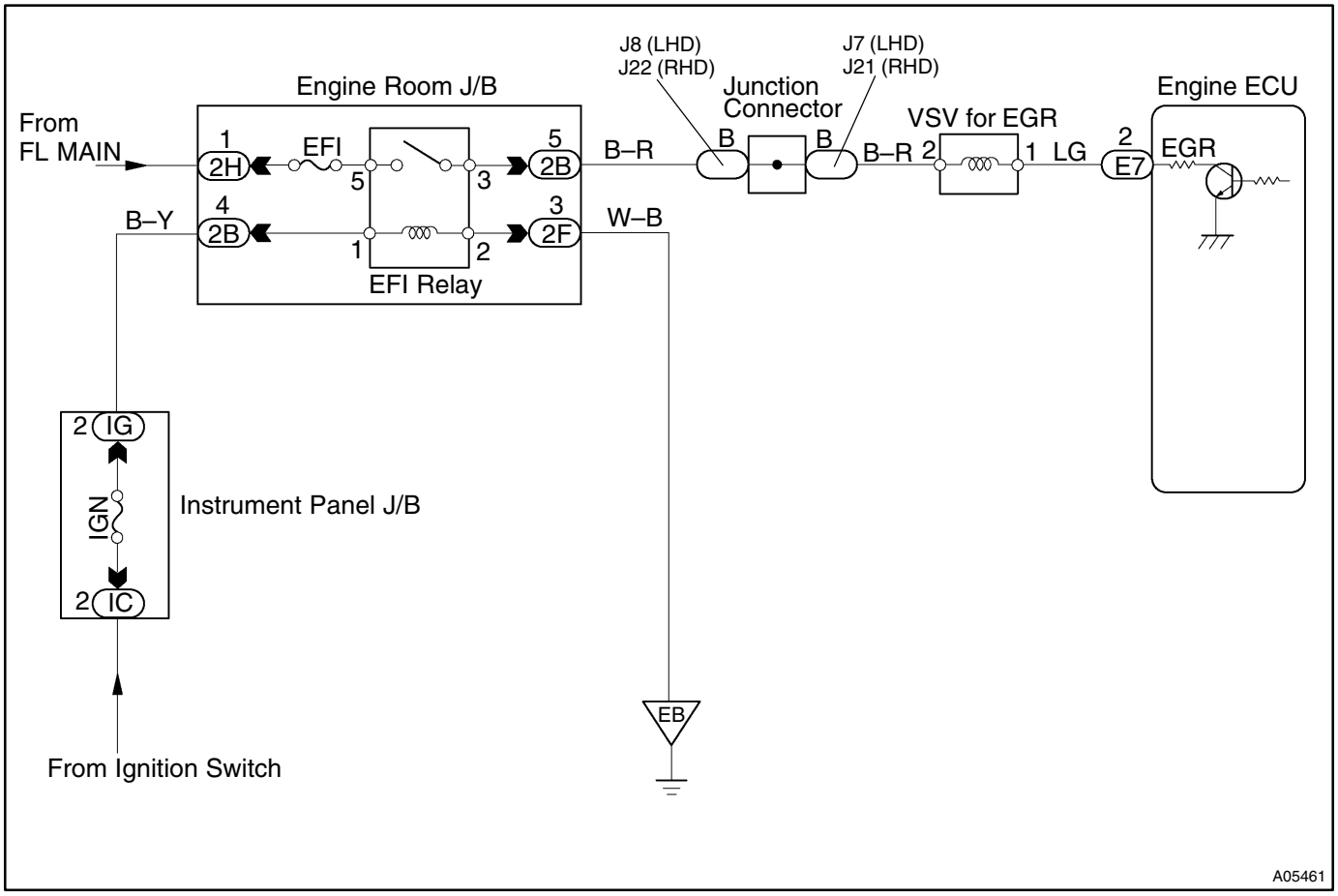
Under the following conditions, EGR is cut to maintain driveability.

Before the engine is warmed up

During deceleration (Throttle valve closed)

Light engine load (amount of intake air very small)

Engine racing



INSPECTION PROCEDURE

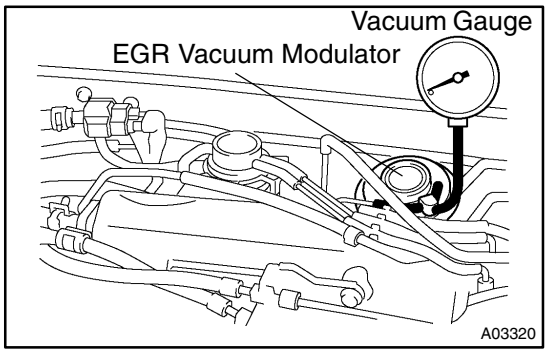
When using hand–held tester

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

NG → **Repair or replace.**

OK

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

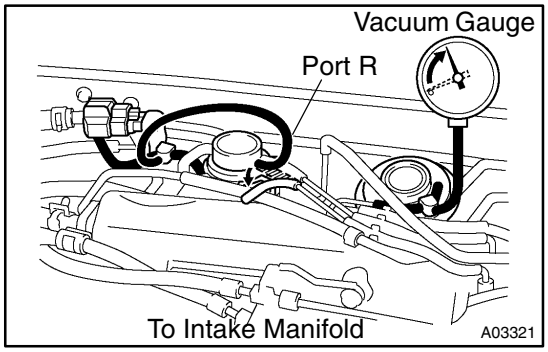
OK:

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

OK → **Prceed to next circuit inspection shown on problem symptoms table (See page DI–20).**

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)

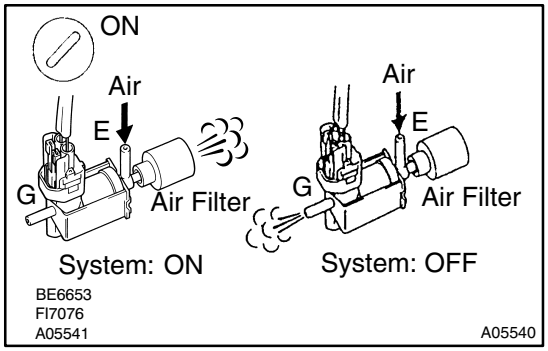
Type I → **Replace EGR vacuum modulator.**

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–48).**

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–19).**

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

Check and replace engine ECU.

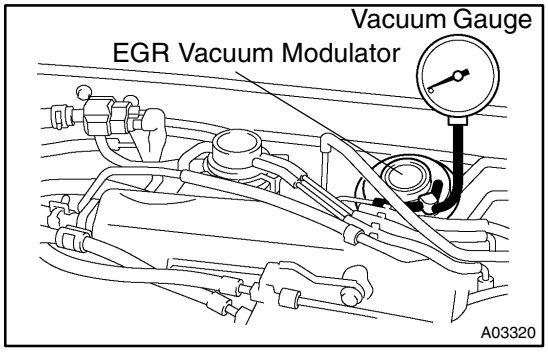
When not using hand–held tester

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.**



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 2,800 rpm.

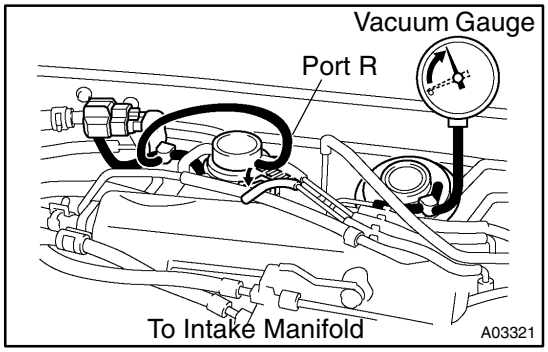
OK:

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

OK → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–20).**

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 VSV for EGR (See page FI–48).**

NG → **Replace VSV for EGR.**

OK

5	**Check for open and short in harness and connector between VSV for EGR and engine ECU. (See page IN–19).**

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

OK

Check and replace engine ECU.

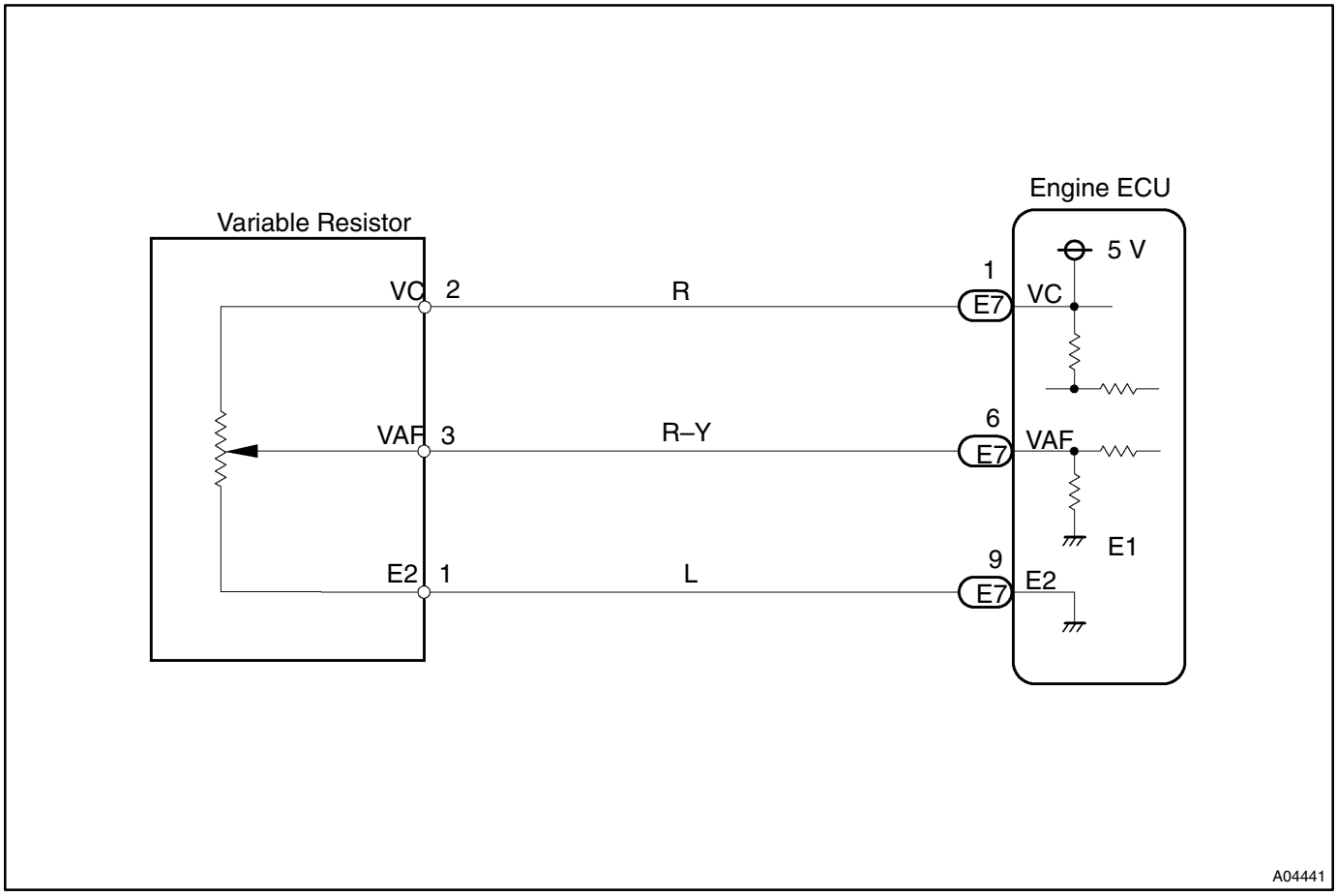
DI1IX–02

Variable Resistor Circuit

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.

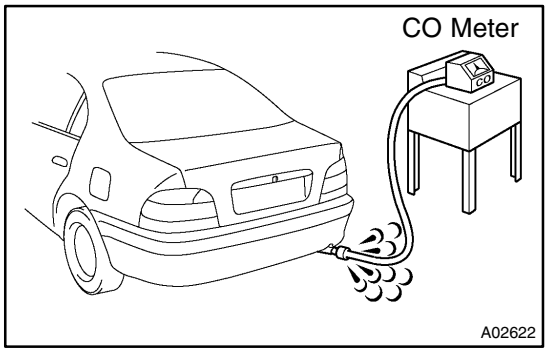
WIRING DIAGRAM



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.

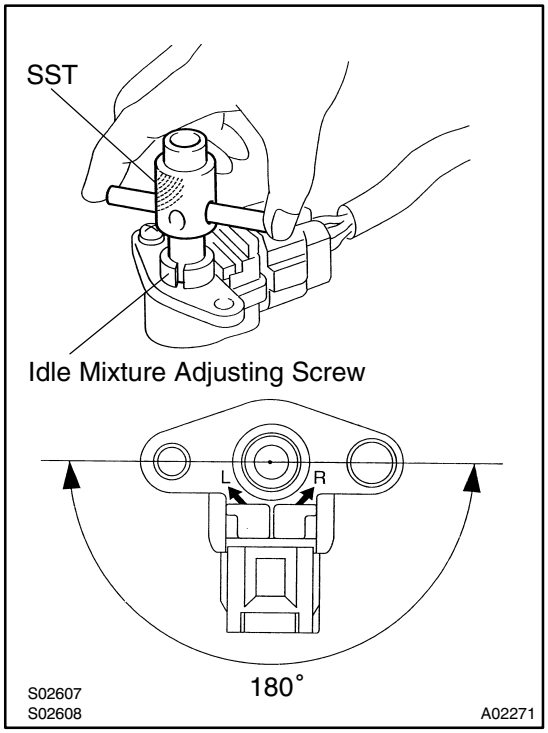
CHECK:
Insert a tester probe at least 40 cm (1.3 ft) into the tailpipe. Measure the concentration with 1 – 3 minutes after racing the engine to allow the concentration to stabilize.

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–20).**

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.

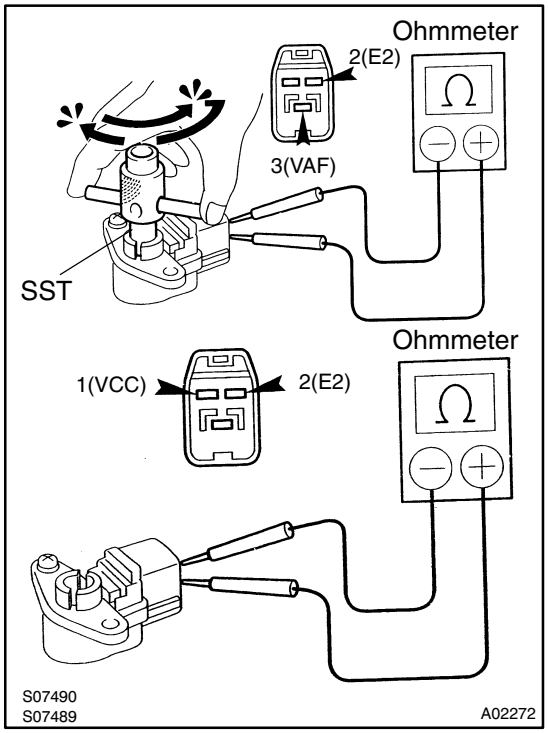
NG → **Type I**
See page EM–1 and go on troubleshooting.

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.

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OK:

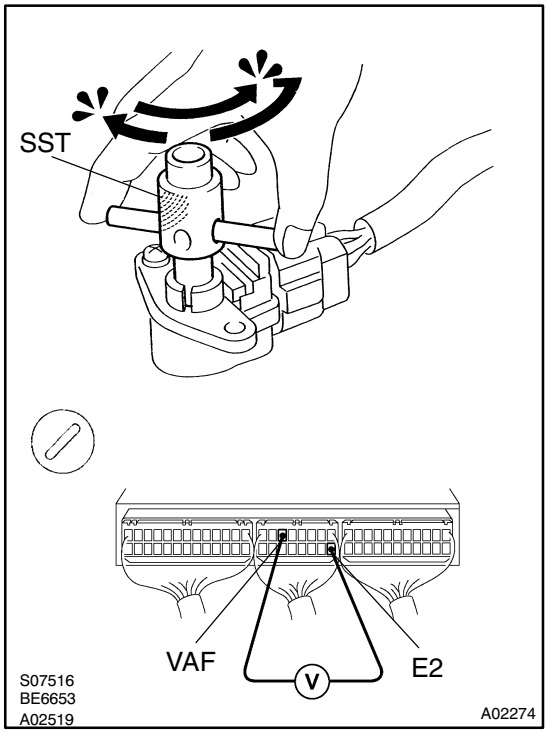
Resistance:

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.

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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–19).

NG	Repair or replace harness or connector.

OK

Check and replace engine engine ECU.