
ELECTRONIC CONTROL DIESEL

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ECD SYSTEM

PRECAUTION

ED027-02

1. BEFORE WORKING ON FUEL SYSTEM, DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

HINT:

- Any DTC code retained by the computer will be erased when the negative (–) terminal cable is removed from the battery.
- Therefore, if necessary, read the diagnosis before removing the negative (–) terminal cable from the battery.

2. DO NOT SMOKE OR WORK NEAR AN OPEN FLAME WHEN WORKING ON FUEL SYSTEM

3. KEEP DIESEL FUEL AWAY FROM RUBBER OR LEATHER PARTS

4. AIR INDUCTION SYSTEM

- (a) Separation of the engine oil dipstick, oil filler cap, PCV hose, etc. may cause the engine to run out of tune.
- (b) Disconnection, looseness or cracks in the parts of the air induction system between the throttle body and cylinder head will allow air suction and cause the engine to run out of tune.

5. ELECTRONIC CONTROL SYSTEM

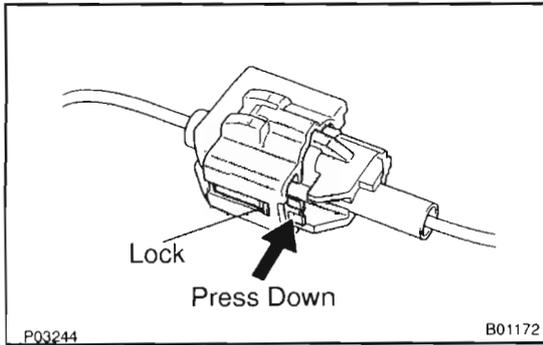
- (a) Before removing ECD wiring connectors, terminals, etc., first disconnect the power by either turning the ignition switch OFF or disconnecting the negative (–) terminal cable from the battery.

HINT:

Always check the DTC before disconnecting the negative (–) terminal cable from the battery.

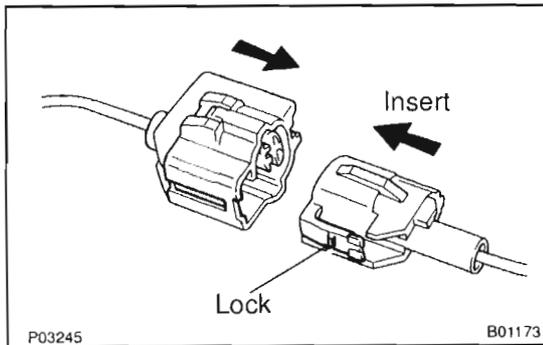
- (b) When installing the battery, be especially careful not to incorrectly connect the positive (+) and negative (–) cables.
- (c) Do not permit parts to receive a severe impact during removal or installation. Handle all ECD parts carefully, especially the engine ECU.
- (d) Do not be careless during troubleshooting as there are numerous transistor circuits and even slight terminal contact can further troubles.
- (e) Do not open the engine ECU cover.
- (f) When inspecting during rainy weather, take care to prevent entry of water. Also, when washing the engine compartment, prevent water from getting on the ECD parts and wiring connectors.
- (g) Parts should be replaced as an assembly.

ED



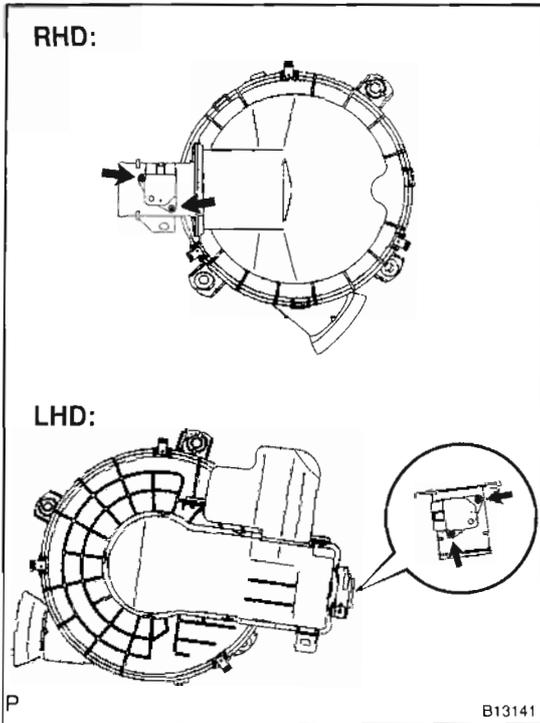
(h) Care is required when pulling out and inserting wiring connectors.

- (1) Release the lock and pull out the connector, pulling on the connectors.



(2) Fully insert the connector and check that it locked.

- (i) When inspecting a connector with a volt/ohmmeter.
 - (1) Carefully take out the water-proofing rubber if it is a water-proof type connector.
 - (2) Insert the test probe in to the connector from the wiring side when checking the continuity, amperage or voltage.
 - (3) Do not apply unnecessary force to the terminal.
 - (4) After checking, install the water-proofing rubber on the connector securely.

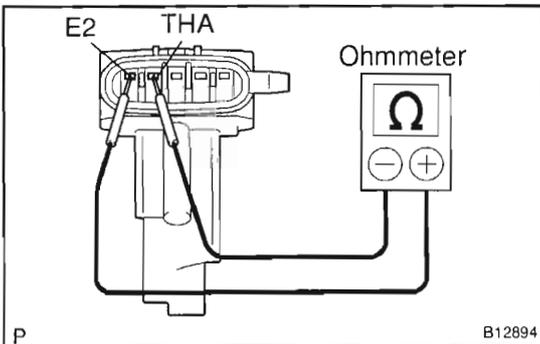


AIR FLOW METER INSPECTION

E002L-03

1. **DISCONNECT AIR FLOW METER CONNECTOR**
2. **REMOVE AIR FLOW METER**

Remove the 2 screws and air flow meter.

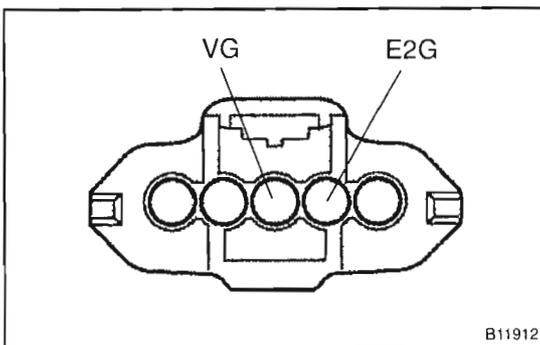


3. INSPECT AIR FLOW METER

- (a) Using an ohmmeter, measure the resistance between terminals THA and E2.

Terminals	Resistance	Temperature
THA – E2	13.6 – 18.4 k Ω	-20°C (-4°F)
THA – E2	2.21 – 2.69 k Ω	20°C (68°F)
THA – E2	0.493 – 0.667 k Ω	60°C (140°F)

If the resistance is not as specified, replace the air flow meter.



- (b) Inspect for operation.

- (1) Connect the air flow meter connector.
- (2) Connect the negative (-) terminal cable to the battery.
- (3) Turn the ignition switch ON.
- (4) Using a voltmeter, connect the positive (+) tester probe to terminal VG, and negative (-) tester probe to terminal E2G.
- (5) Blow air into the air flow meter, and check that the voltage fluctuates.

If operation is not as specified, replace the air flow meter.

- (6) Turn the ignition switch OFF.
- (7) Disconnect the negative (-) terminal cable from the battery.
- (8) Disconnect the air flow meter connector.

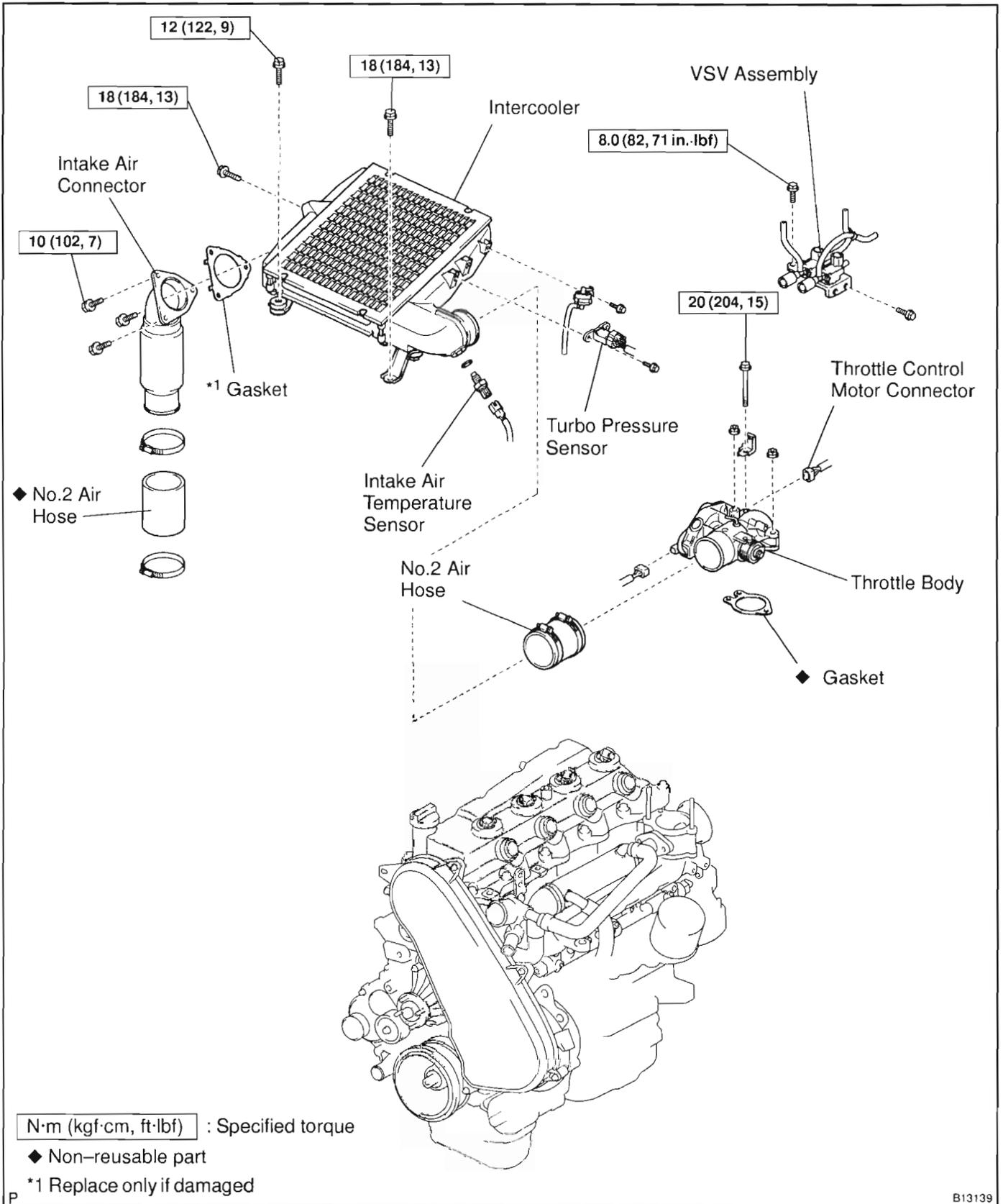
4. REINSTALL AIR FLOW METER

Install the air flow meter with the 2 screws.

5. RECONNECT AIR FLOW METER CONNECTOR

THROTTLE BODY COMPONENTS

ED046-01



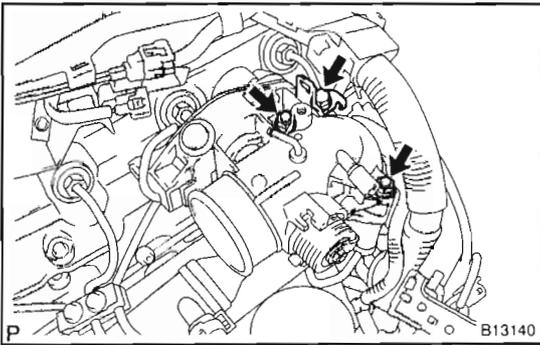
REMOVAL

1. **REMOVE INTERCOOLER (See page TC-10)**
2. **REMOVE DIESEL THROTTLE BODY**
 - (a) Remove the 2 bolts and VSV assembly.
 - (b) Disconnect the 2 connectors from the diesel throttle body.
 - (c) Disconnect the engine wire.
 - (d) Remove the 2 nuts, bolt, bracket, diesel throttle body and gasket.

Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)

HINT:

At the time of installation, please refer to following item.
Place a new gasket.



INSPECTION

INSPECT DIESEL THROTTLE BODY (See page DI-26)

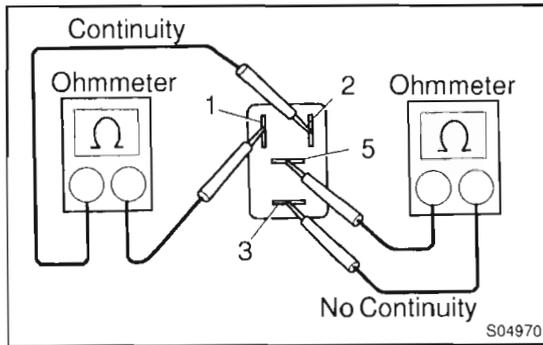
ED

INSTALLATION

Installation is in the reverse order of removal (See page ED-5)

EFI MAIN RELAY INSPECTION

1. REMOVE NO.3 RELAY BOX COVER
2. REMOVE EFI MAIN RELAY (Marking: EFI)



3. INSPECT EFI MAIN RELAY

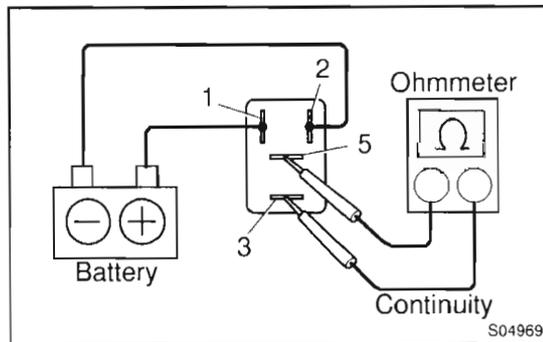
(a) Inspect the relay continuity.

- (1) Using an ohmmeter, check that there is continuity between terminals 1 and 2.

If there is no continuity, replace the relay.

- (2) Check that there is no continuity between terminals 3 and 5.

If there is continuity, replace the relay.



(b) Inspect the relay operation.

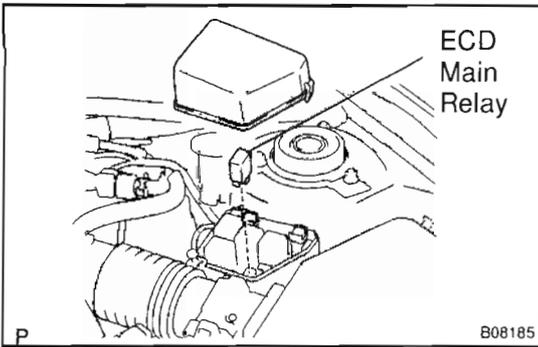
- (1) Apply battery voltage across terminals 1 and 2.

- (2) Using an ohmmeter, check that there is continuity between terminals 3 and 5.

If there is no continuity, replace the relay.

4. REINSTALL EFI MAIN RELAY

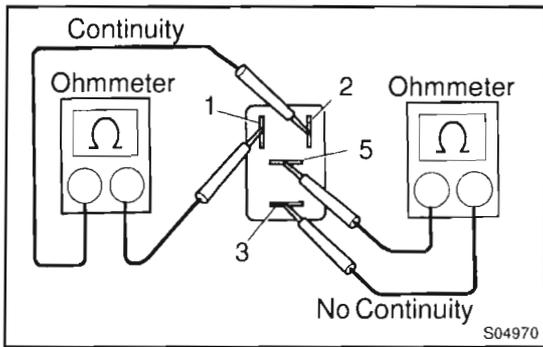
5. REINSTALL RELAY BOX COVER



ECD MAIN RELAY INSPECTION

ED02C-02

1. REMOVE NO.3 RELAY BOX COVER
2. REMOVE ECD MAIN RELAY (Marking: INJ)



3. INSPECT ECD MAIN RELAY

(a) Inspect the relay continuity.

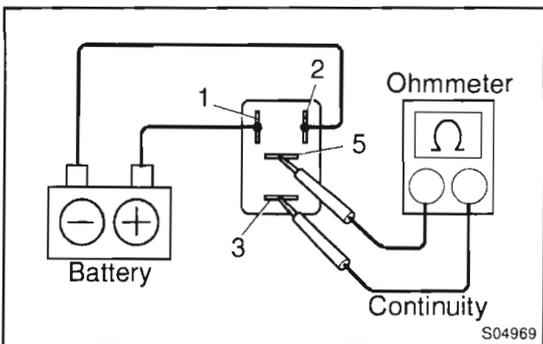
- (1) Using an ohmmeter, check that there is continuity between terminals 1 and 2.

If there is no continuity, replace the relay.

- (2) Check that there is no continuity between terminals 3 and 5.

If there is continuity, replace the relay.

ED



(b) Inspect the relay operation.

- (1) Apply battery voltage across terminals 1 and 2.
- (2) Using an ohmmeter, check that there is continuity between terminals 3 and 5.

If there is no continuity, replace the relay.

4. REINSTALL ECD MAIN RELAY
5. REINSTALL RELAY BOX COVER

VSV FOR TURBO PRESSURE SENSOR INSPECTION

TC00X-03

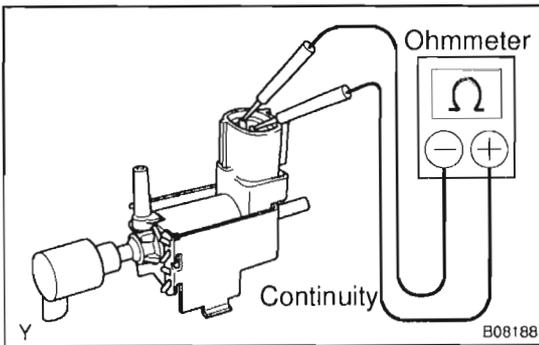
1. REMOVE VSV

2. INSPECT VSV FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the terminals.

Resistance: 37 – 44 Ω at 20° C (68° F)

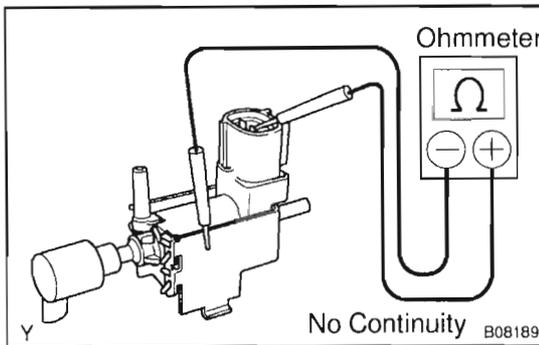
If there is no continuity, replace the VSV.



3. INSPECT VSV FOR GROUND

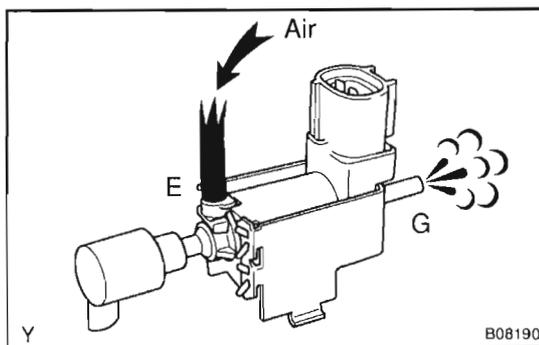
Using an ohmmeter, check that there is no continuity between each terminal and the body.

If there is continuity, replace the VSV.



4. INSPECT VSV OPERATION

(a) Check that air does not flow from port E to G.

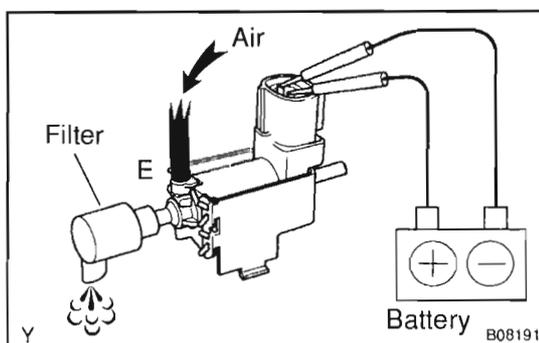


(b) Apply battery voltage across the terminals.

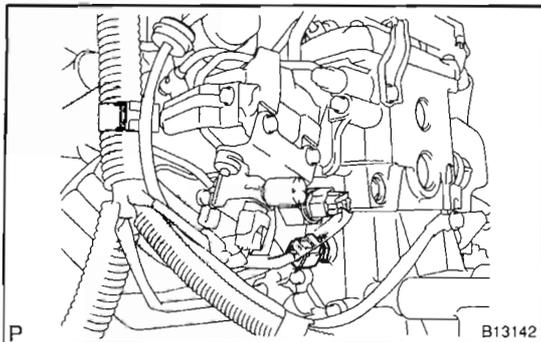
(c) Check that air flows from port E to filter.

If operation is not as specified, replace the VSV.

5. REINSTALL VSV



ED



WATER TEMPERATURE SENSOR INSPECTION

ED02D-02

1. **DRAIN ENGINE COOLANT**
2. **REMOVE WATER TEMPERATURE SENSOR**
 - (a) Disconnect the sensor connector.
 - (b) Using a 19 mm deep socket wrench, remove the sensor and gasket.

3. INSPECT WATER TEMPERATURE SENSOR

Using an ohmmeter, measure the resistance between the terminals.

Resistance: Refer to the chart graph

If the resistance is not as specified, replace the water temperature sensor.

4. REINSTALL WATER TEMPERATURE SENSOR

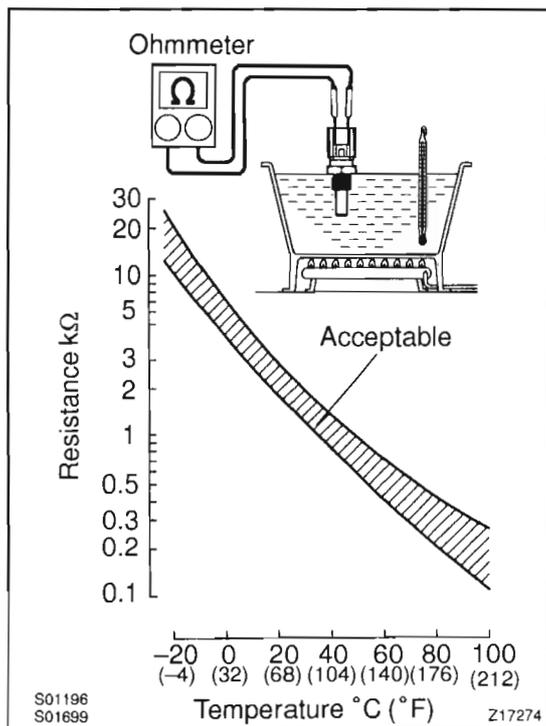
- (a) Using a 19 mm deep socket wrench, install a new gasket and the sensor.

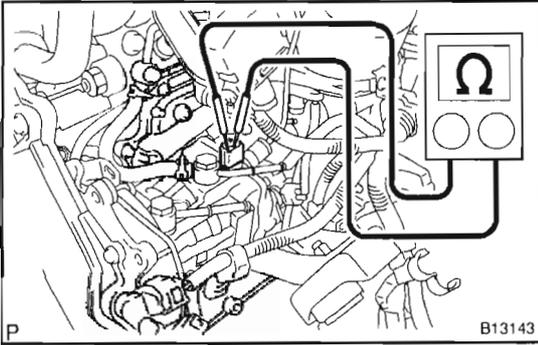
Torque: 20 N·m (208 kgf·cm, 15 ft·lbf)

- (b) Connect the sensor connector.

5. REFILL WITH ENGINE COOLANT

(See page CO-2)





FUEL TEMPERATURE SENSOR INSPECTION

ED02F-02

1. **DISCONNECT FUEL TEMPERATURE SENSOR CONNECTOR**
2. **INSPECT FUEL TEMPERATURE SENSOR**

Using an ohmmeter, measure the resistance between terminals.

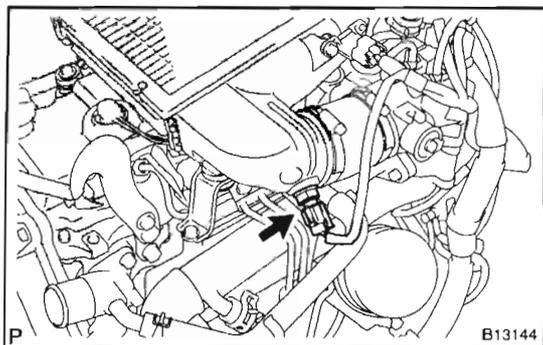
Resistance:

2.21 – 2.79 k Ω at 20°C (68°F)

0.287 – 0.349 k Ω at 80°C (176°F)

If the resistance is not specified, replace the supply pump (See page FU-16).

3. **RECONNECT FUEL TEMPERATURE SENSOR CONNECTOR**



INTAKE AIR TEMPERATURE SENSOR INSPECTION

E002E-02

1. REMOVE INTAKE AIR TEMP. SENSOR

- (a) Disconnect the sensor connector.
- (b) Using a 22 mm deep socket wrench, remove the intake air temp. sensor.

2. INSPECT INTAKE AIR TEMP. SENSOR

Using an ohmmeter, measure the resistance between terminals.

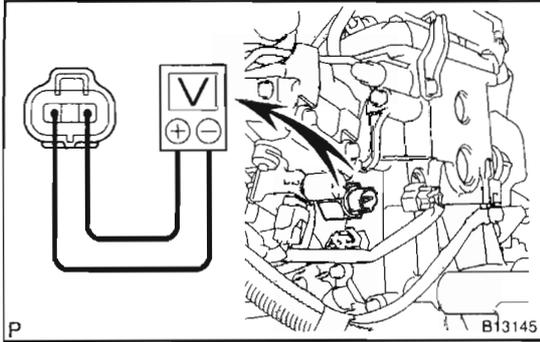
Resistance: 2.187 – 2.673 k Ω at 20°C (68°F)

3. REINSTALL INTAKE AIR TEMP. SENSOR

- (a) Using a 22 mm deep socket wrench, install the intake air temp. sensor.

Torque: 34.3 N·m (350 kgf·cm, 25 ft·lbf)

- (b) Connect the sensor connector.



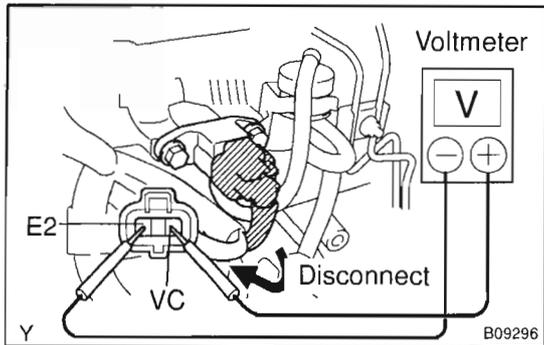
FUEL PRESSURE SENSOR INSPECTION

ED02G-02

1. **INSPECT POWER SOURCE VOLTAGE OF FUEL PRESSURE SENSOR**
 - (a) Disconnect the sensor connector.
 - (b) Turn the ignition switch ON.
 - (c) Using a voltmeter, measure the voltage between connector terminals VCC and GND of the wiring harness side.
Voltage: 4.75 – 5.25 V
 - (d) Turn the ignition switch OFF.
 - (e) Reconnect the sensor connector.
2. **INSPECT VOLTAGE BETWEEN TERMINALS PCR AND E2 (See page DI-79)**

TURBO PRESSURE SENSOR INSPECTION

E0048-01



1. INSPECT POWER SOURCE VOLTAGE OF TURBO PRESSURE SENSOR

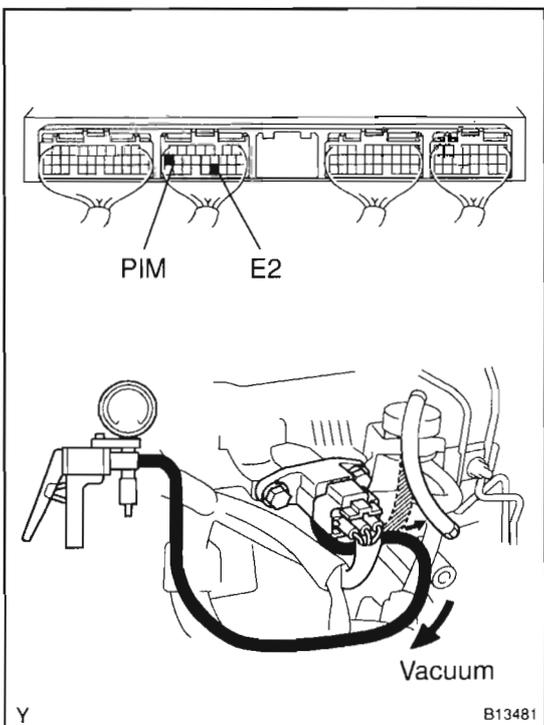
- (a) Disconnect the turbo pressure sensor connector.
- (b) Turn the ignition switch ON.
- (c) Using a voltmeter, measure the voltage between connector terminals VC and E2 of the wiring harness side.
Voltage: 4.5 – 5.5 V
- (d) Turn the ignition switch OFF.
- (e) Reconnect the turbo pressure sensor connector.

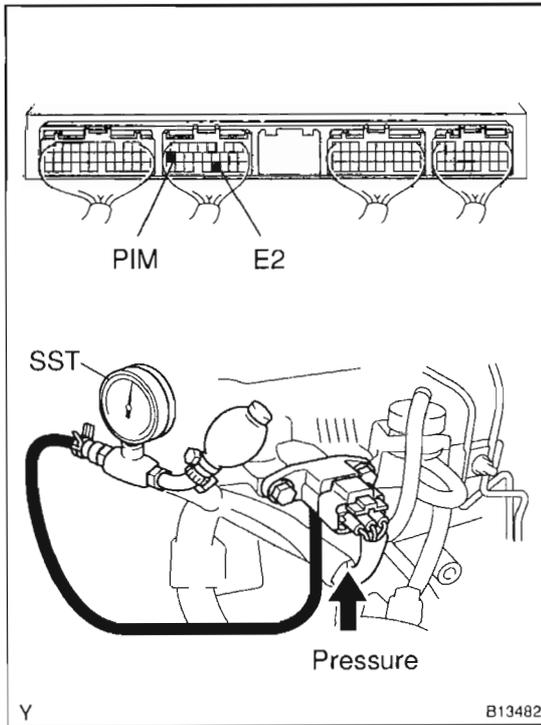
2. INSPECT SUPPLY POWER OF TURBO PRESSURE SENSOR

- (a) Turn the ignition switch ON.
- (b) Disconnect the vacuum hose from the turbo pressure sensor.
- (c) Connect a voltmeter to terminals PIM and E2 of the engine ECU, and measure the output voltage under ambient atmospheric pressure.
- (d) Apply vacuum to the turbo pressure sensor in 13.3 kPa (100 mmHg, 3.94 in.Hg) segments to 40.0 kPa (300 mmHg, 11.81 in.Hg).
- (e) Measure the voltage drop from step (c) above for each segment.

Voltage drop:

Applied vacuum kPa (mmHg, in.Hg)	Voltage drop V
13.3 (100, 3.94)	0.1 – 0.3
26.7 (200, 7.87)	0.3 – 0.5
40.0 (300, 11.81)	0.5 – 0.7





- (f) Using SST (turbocharger pressure gauge), apply pressure to the turbo pressure sensor in 19.6 kPa (0.20 kgf/cm², 2.84 psi) segments to 98.0 kPa (1.00 kgf/cm², 14.2 psi).

SST 09992-00242

- (g) Measure the voltage up from step (c) above for each segment.

Voltage up:

Applied pressure kPa (kgf/cm ² , psi)	Voltage up V
19.6 (0.20, 2.84)	0.1 – 0.4
39.2 (0.40, 5.69)	0.4 – 0.7
58.8 (0.60, 8.53)	0.7 – 1.0
78.5 (0.80, 11.4)	1.0 – 1.3
98.0 (1.00, 14.2)	1.3 – 1.6

- (h) Reconnect the vacuum hose to the turbo pressure sensor.

CAMSHAFT POSITION SENSOR INSPECTION

ED02I-02

NOTICE:

"Cold" and "Hot" in the following sentences express the temperature of the sensor itself. "Cold" is from -10°C (14°F) to 50°C (122°F) and "Hot" is from 50°C (122°F) to 100°C (212°F).

1. DISCONNECT CAMSHAFT POSITION SENSOR CONNECTOR

2. INSPECT CAMSHAFT POSITION SENSOR

Using an ohmmeter, measure the resistance between terminals.

Resistance:

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

If the resistance is not as specified, replace the camshaft position sensor.

Torque: 8.5 N·m (87 kgf·cm, 75 in.-lbf)

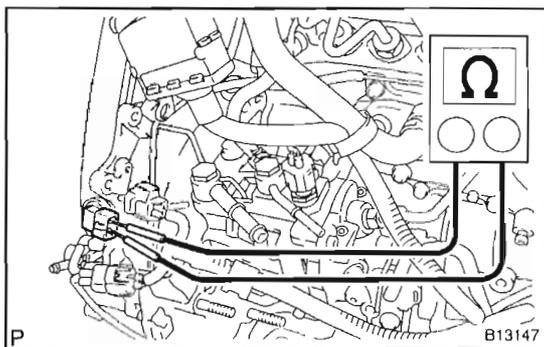
NOTICE:

Be careful not drop and shock the sensor.

HINT:

Apply engine oil to the O-ring.

3. RECONNECT CAMSHAFT POSITION SENSOR CONNECTOR



CRANKSHAFT POSITION SENSOR INSPECTION

ED02J-02

NOTICE:

"Cold" and "Hot" in the following sentences express the temperature of the sensor itself. "Cold" is from -10°C (14°F) to 50°C (122°F) and "Hot" is from 50°C (122°F) to 100°C (212°F).

1. **DISCONNECT CRANKSHAFT POSITION SENSOR CONNECTOR**
2. **INSPECT CRANKSHAFT POSITION SENSOR**

Using an ohmmeter, measure the resistance between terminals.

Resistance:

Cold	1,630 – 2,740 Ω
Hot	2,065 – 3,225 Ω

If the resistance is not as specified, replace the crankshaft position sensor.

Torque: 8.5 N·m (87 kgf·cm, 75 in.·lbf)

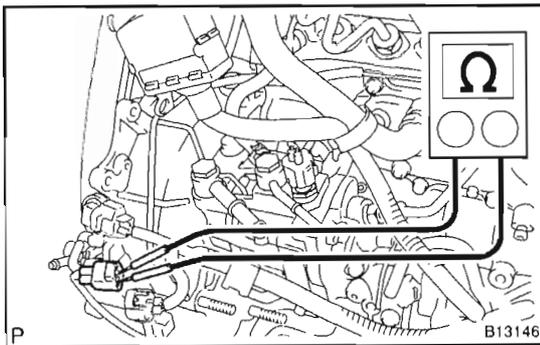
NOTICE:

Be careful not drop and shock the sensor.

HINT:

Apply engine oil to the O-ring.

3. **RECONNECT CRANKSHAFT POSITION SENSOR CONNECTOR**



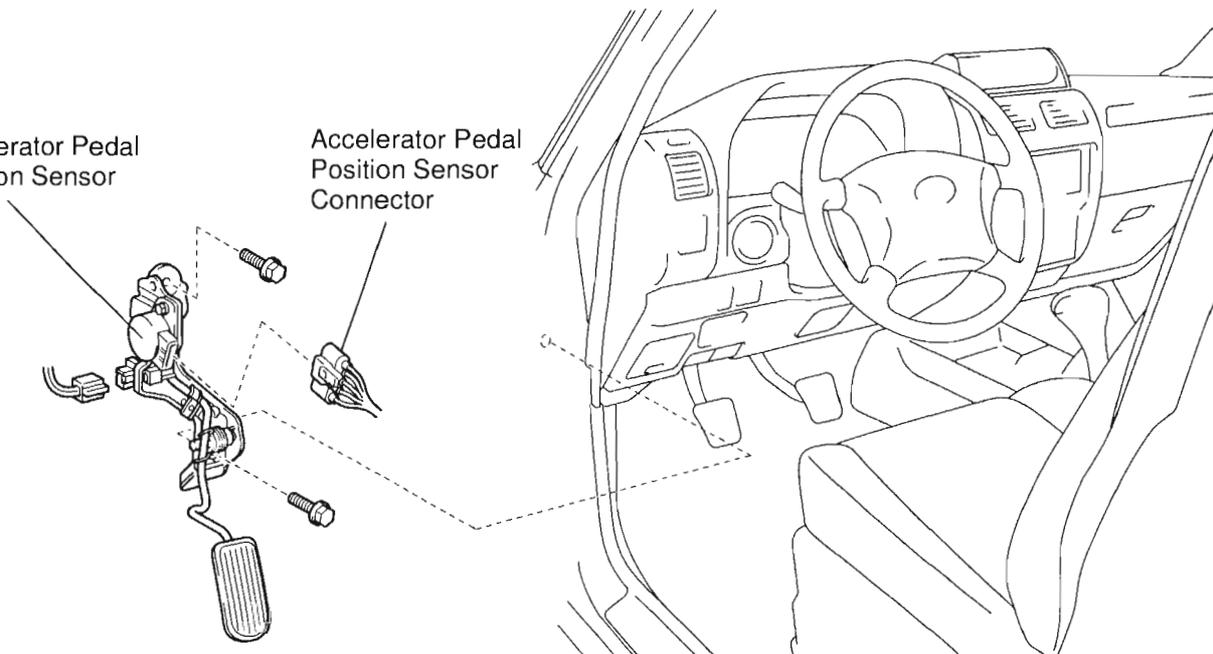
ACCELERATOR PEDAL POSITION SENSOR COMPONENTS

ED04C-01

LHD:

Accelerator Pedal Position Sensor

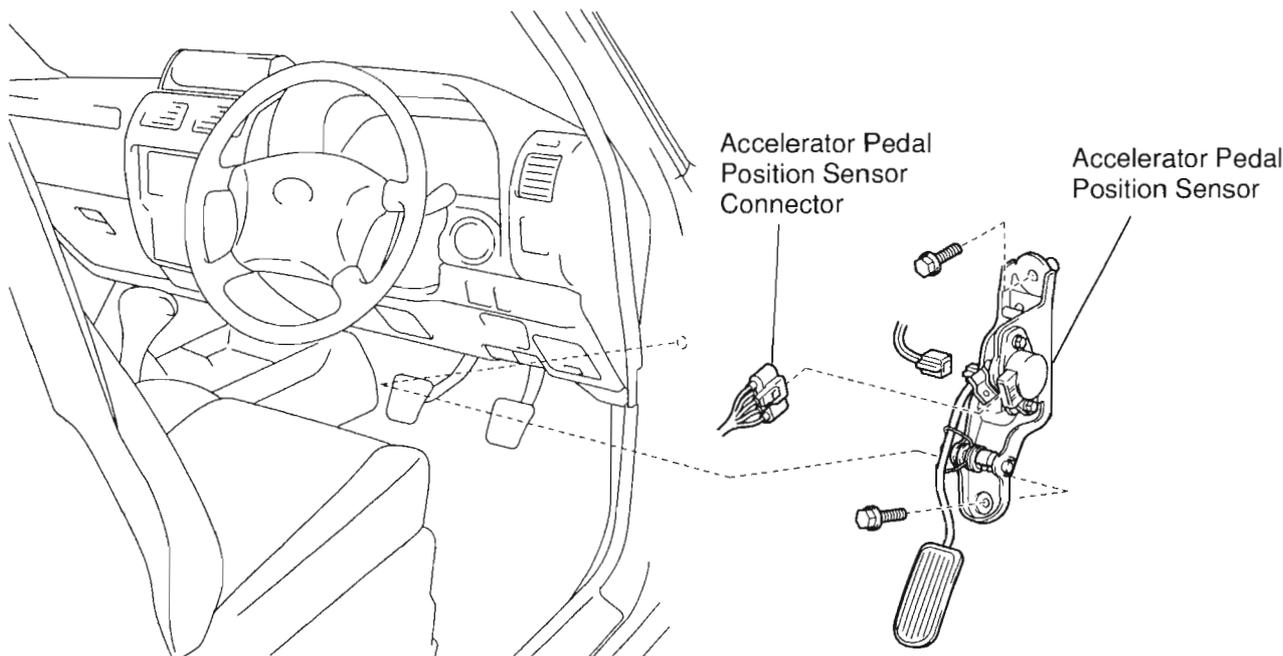
Accelerator Pedal Position Sensor Connector



RHD:

Accelerator Pedal Position Sensor Connector

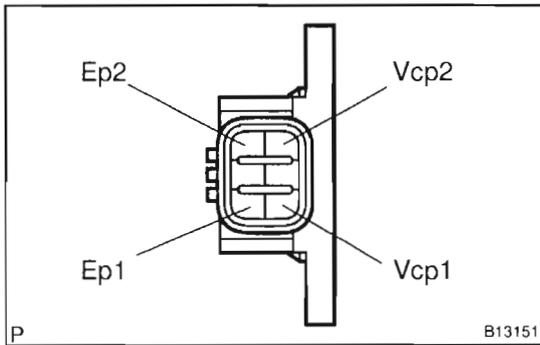
Accelerator Pedal Position Sensor



INSPECTION

INSPECT ACCELERATOR PEDAL POSITION SENSOR

- (a) Disconnect the accelerator pedal position sensor connector.



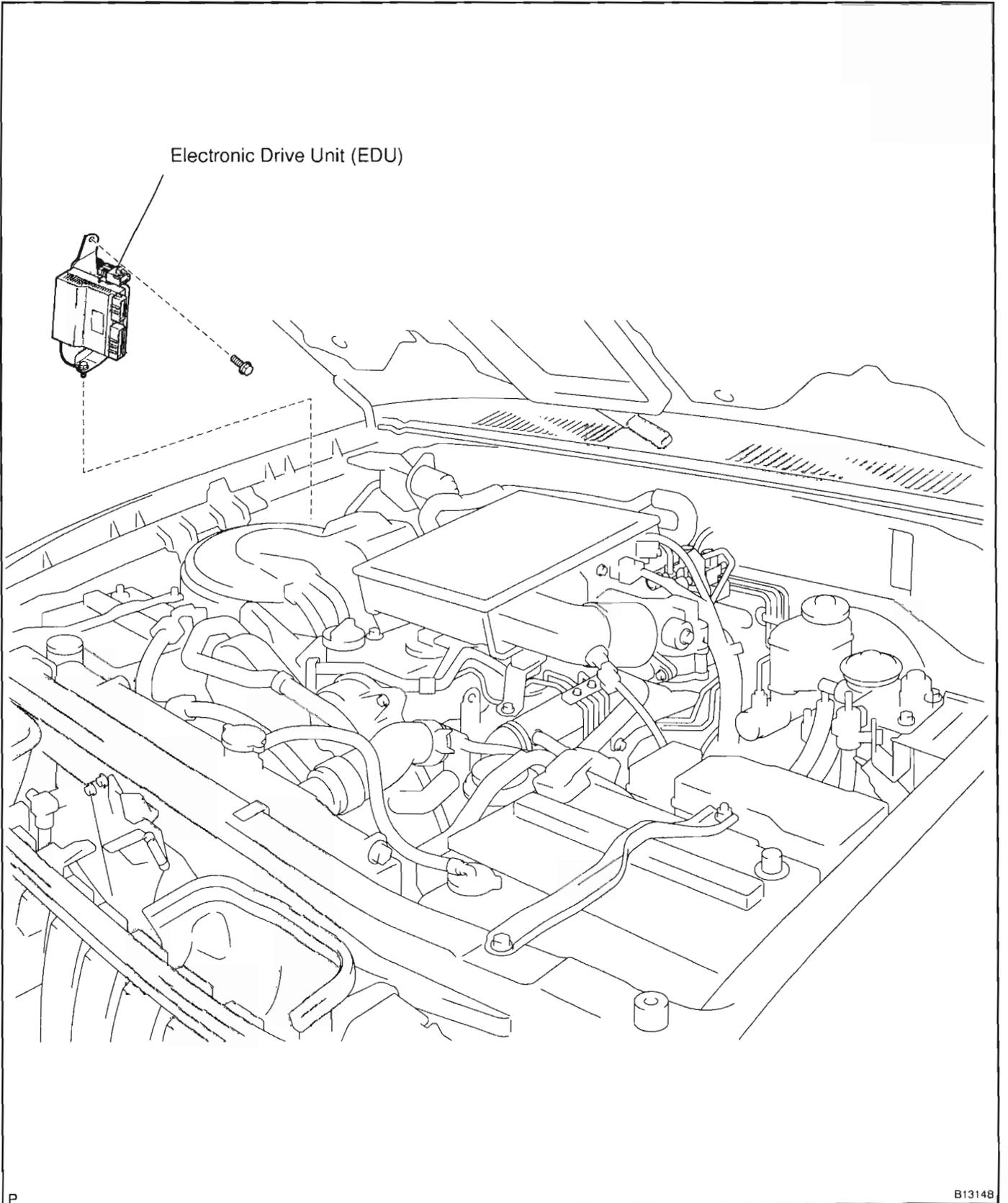
- (b) Using an ohmmeter, measure the resistance between each terminals.

Resistance: at 20°C (68°F)

Terminals	Resistance
$V_{CP1} - E_{P1}$	1.5 – 6.0 k Ω
$V_{CP2} - E_{P2}$	

ELECTRONIC DRIVER UNIT (EDU) COMPONENTS

ED04E-01



INSPECTION

1. REMOVE EDU

- (a) Disconnect the 2 connectors.
- (b) Remove the 2 bolts and EDU.

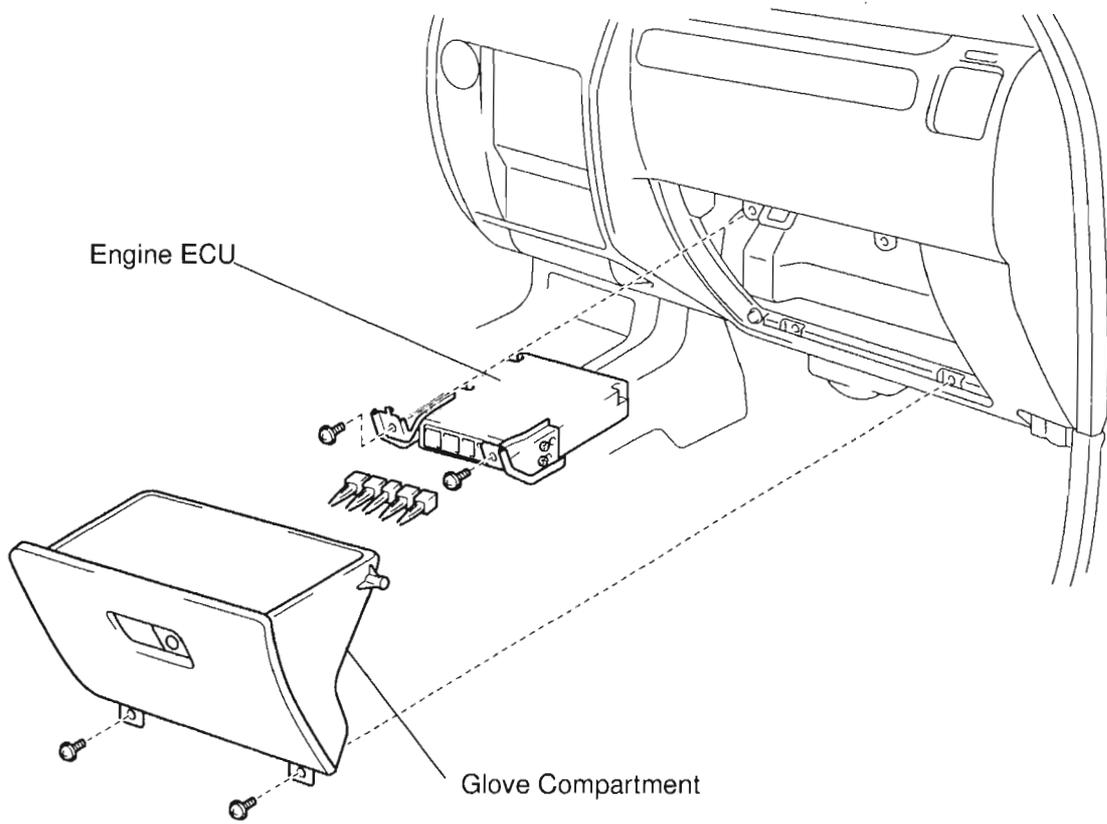
2. INSPECT EDU (See page DI-88)

3. INSTALL EDU

- (a) Install the EDU with the 2 bolts.
- (b) Connect the 2 connectors.

ENGINE ECU COMPONENTS

ED020-03

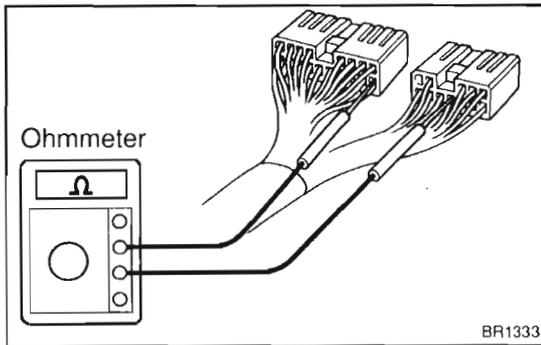


INSPECTION

HINT:

The ECD circuit can be checked by measuring the resistance and voltage at the wiring connectors of the engine ECU.

1. **REMOVE ENGINE ECU FROM VEHICLE BODY**
2. **INSPECT VOLTAGE OF ENGINE ECU**
(See page DI-16)



3. INSPECT RESISTANCE OF ECD CIRCUITRY

- (a) Turn the ignition switch OFF.
- (b) Disconnect the 4 connectors from the engine ECU.
- (c) Measure the resistance between each terminal of the wiring connectors.

NOTICE:

- **Do not touch the engine ECU terminals.**
- **The tester probe should be inserted in the wiring connector from the wiring side.**

Terminals	Condition	STD resistance (Ω)
LU+A – +B	–	15 – 30
LU-A – +B	–	15 – 30
LU+B – +B	–	15 – 30
LU-B – +B	–	15 – 30
THOP – E1	80°C (176°F) – 0.287 – 0.349 k	10 or less
THW – E2	Coolant temp. 20°C (68°F)	2.59 – 2.32 k
THA – E2	Intake air temp. 20°C (68°F)	2.187 – 2.673 k
THF – E2	Fuel temp. 20°C (68°F)	2.21 – 2.79 k
G+ – G-	Cold (-10°C (14°F) to 50°C (122°F)) Hot (50°C (122°F) to 100°C (212°F))	1630 – 2740 2065 – 3225
NE+ – NE-	Cold (-10°C (14°F) to 50°C (122°F)) Hot (50°C (122°F) to 100°C (212°F))	1630 – 2740 2065 – 3225
PDL – E1	Accelerator pedal fully opened	10 or less
THAF – E2	–	2.0 – 3.0 k
MREL – E01	–	60 – 80
EDUREL – E01	–	60 – 80
EGR – +B	20°C (68°F)	11 – 13
EGRC – +B	20°C (68°F)	37 – 44
PA – +B	20°C (68°F)	37 – 44
RINJ1 – E01	20°C (68°F)	30 – 9600
RINJ2 – E01	20°C (68°F)	30 – 9600
RINJ3 – E01	20°C (68°F)	30 – 9600
RINJ4 – E01	20°C (68°F)	30 – 9600
PCV1 – COM	20°C (68°F)	1.5 – 1.8
PCV2 – COM	20°C (68°F)	1.5 – 1.8