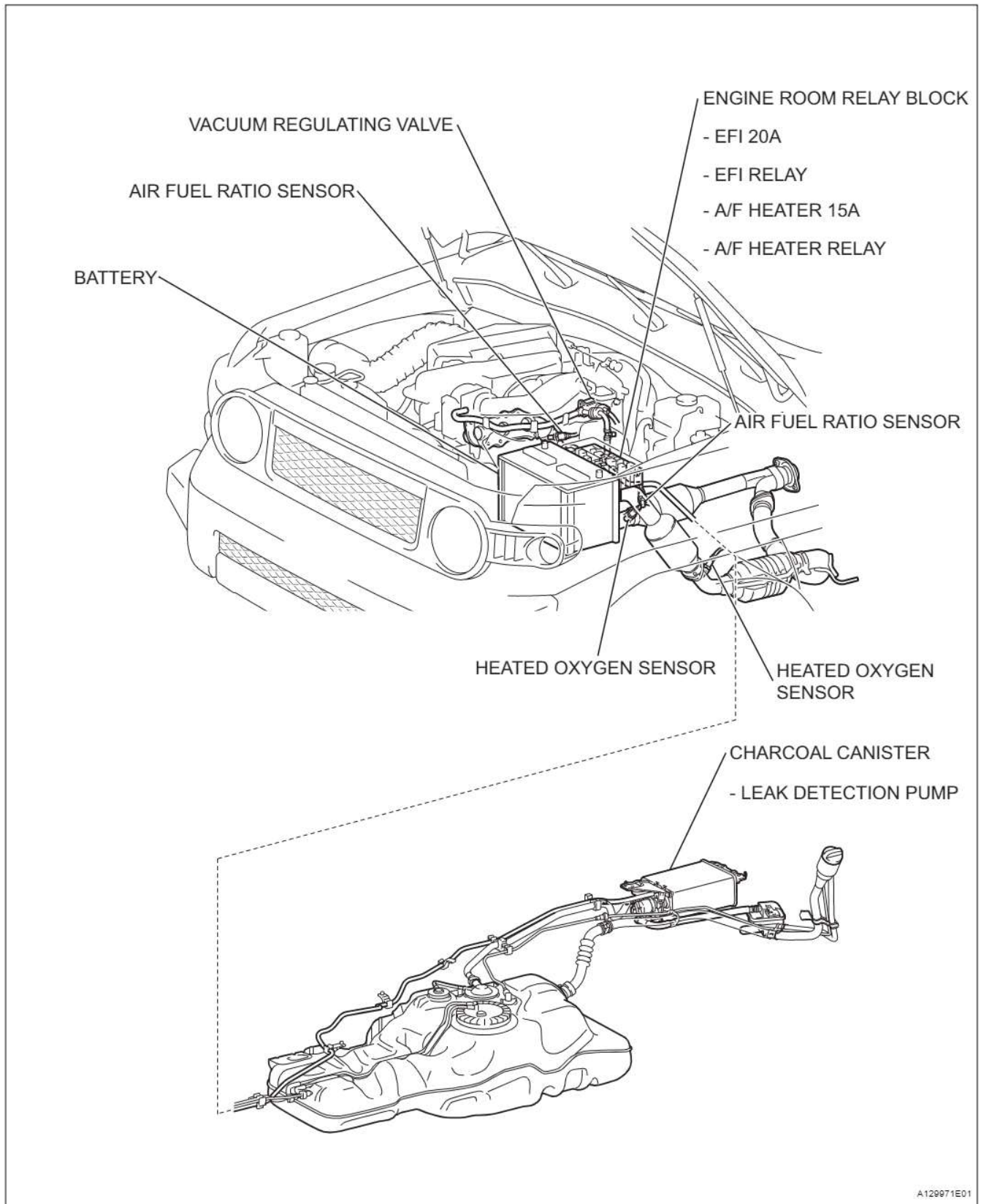


EMISSION CONTROL SYSTEM

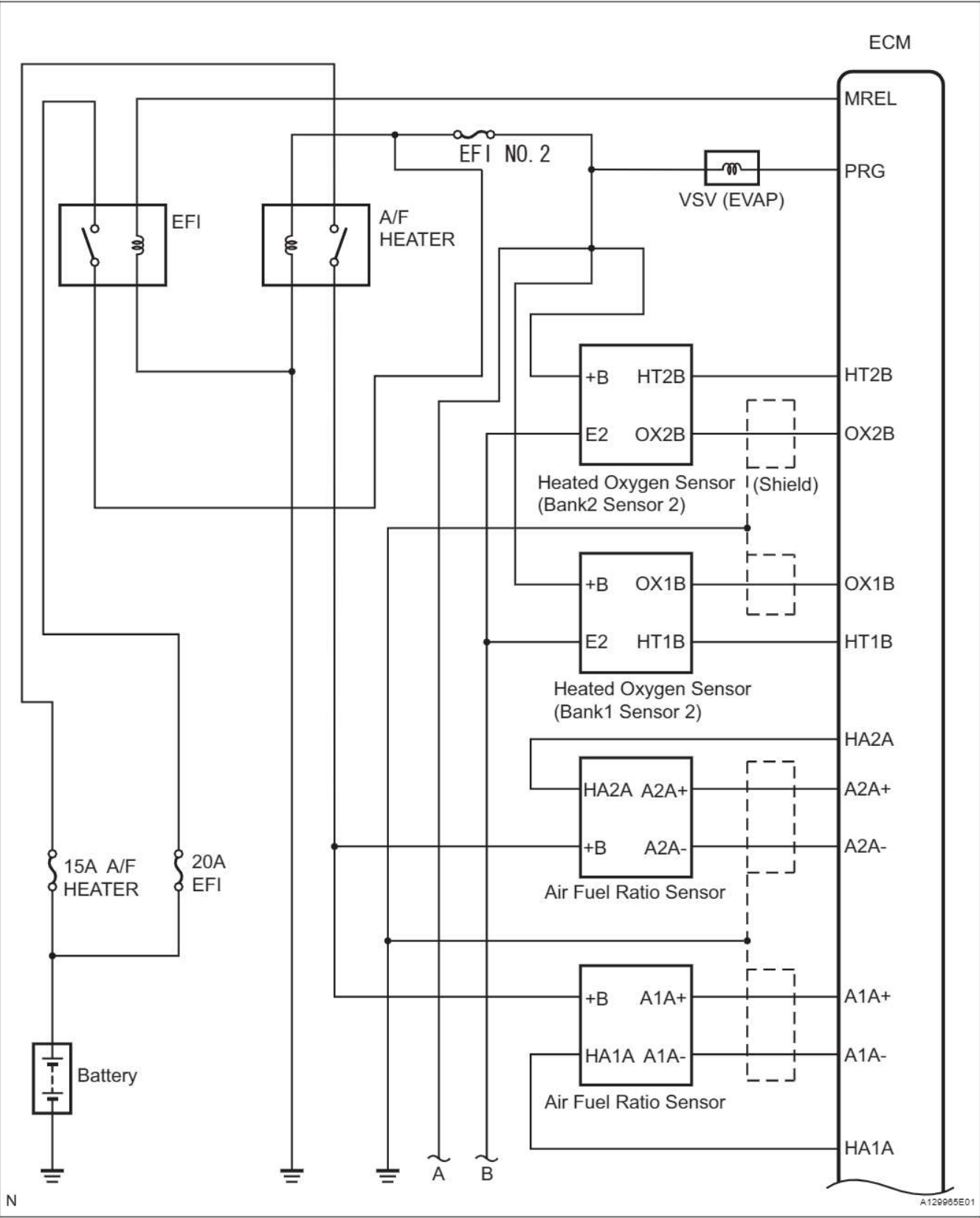
PARTS LOCATION



EC-2

1GR-FE EMISSION CONTROL – EMISSION CONTROL SYSTEM

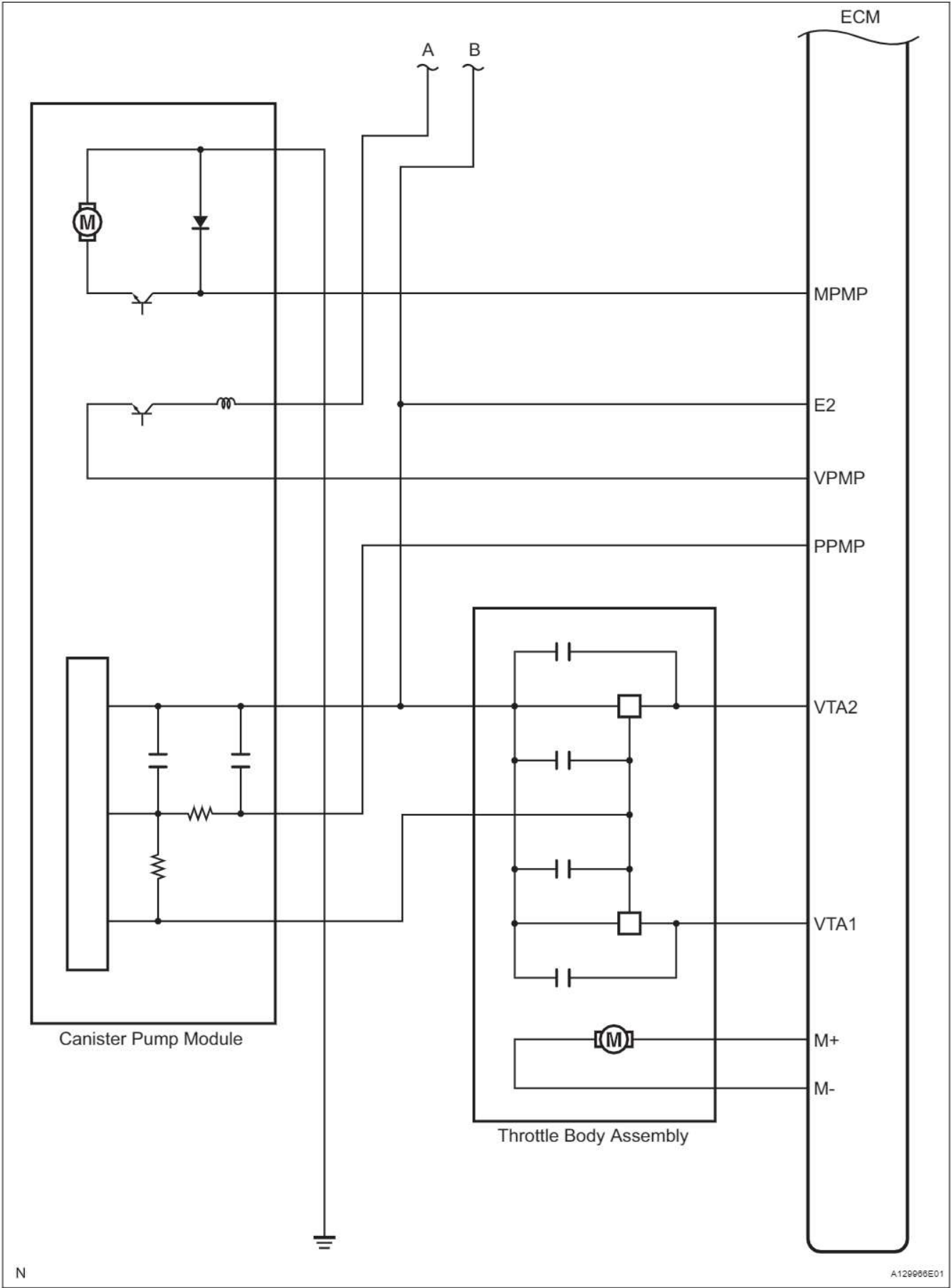
SYSTEM DIAGRAM



1GR-FE EMISSION CONTROL – EMISSION CONTROL SYSTEM

EC-3

EC



ON-VEHICLE INSPECTION

1. INSPECT AIR-FUEL RATIO COMPENSATION SYSTEM

- (a) Measure the voltage between the terminals of the ECM connectors.

Standard voltage

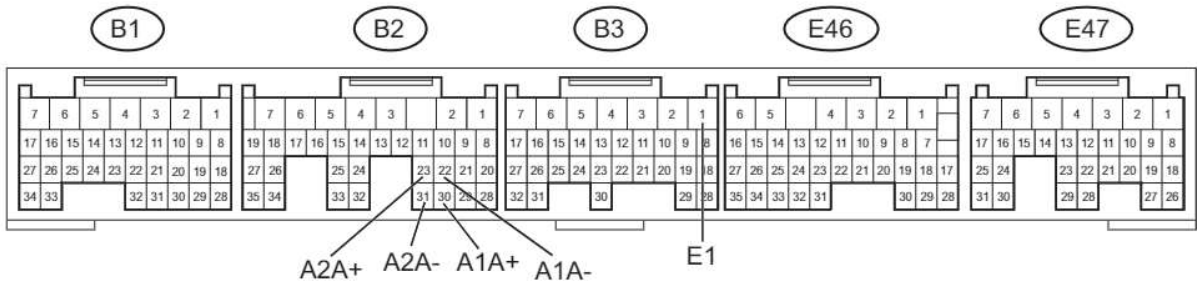
Tester Connection	Condition	Specified Condition
B2-22 (A1A-) - B3-1(E1)	Ignition switch ON	3.3 V
B2-23 (A2A+) - B3-1(E1)	Ignition switch ON	3.3 V
B2-30 (A1A+) - B3-1 (E21)	Ignition switch ON	2.9 V
B2-31 (A2A-) - B3-1(E1)	Ignition switch ON	2.9 V

NOTICE:

Connect test leads from the back side of the connector. Do not disconnect the connectors from the ECM.

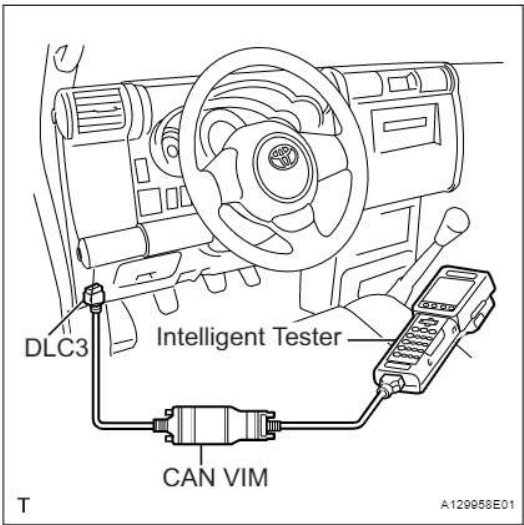
HINT:

Voltage between the terminals of the ECM is kept constant regardless of the voltage of the A/F sensor.



Y

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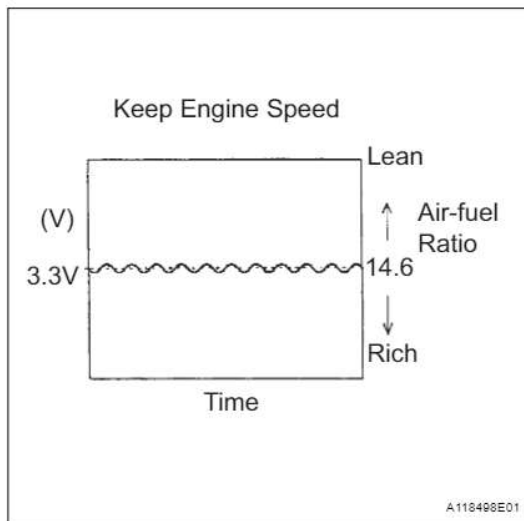
T

A120958E01

- (b) Connect the intelligent tester to the DLC3.
(c) Turn the ignition switch ON.
(d) Select the following menu items: DIAGNOSIS / ENHANCED OBD II / DATA LIST / AFS B1 S1 and O2S B1 S2.
(e) Warm up the A/F sensor with the engine speed at 2,500 rpm for approximately 2 minutes.

1GR-FE EMISSION CONTROL – EMISSION CONTROL SYSTEM

EC-5



- (f) Maintain the engine speed at 2,500 rpm and confirm that the display on the intelligent tester, when AFS B1 S1 is selected, is as shown in the illustration.
HINT:

- The display on the intelligent tester may slightly differ from the illustration.
- Only the intelligent tester displayed the waveform of the A/F sensor.

- (g) Confirm that the waveform displays on the intelligent tester, when O2S B1 S2 is selected, changes between 0 V and 1 V with the engine speed at 2,500 rpm.

OK:

The voltage output oscillates more than 8 times in 10 seconds.

CAUTION:

- Perform the check immediately after warming up the engine.
- If the voltage variation could not be verified, warm up the heated oxygen sensor again. If it could not be verified even after warming up the sensor again, check the DTC No. (See page [ES-57](#))

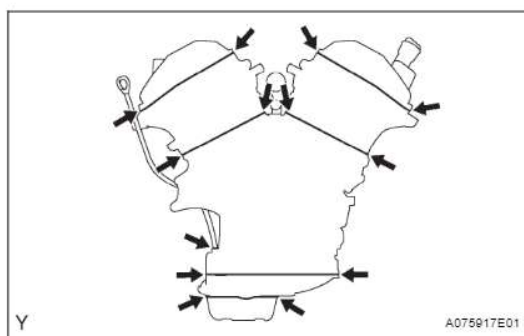
EC

2. INSPECT FUEL CUT-OFF RPM

- Increase the engine speed to at least 3,500 rpm.
- Use a sound scope to check for injector operating sounds.
- Check that the injector operating sounds stop momentarily and then resume when the accelerator pedal is released.

Fuel cut off rpm:**2,500 rpm****Fuel return rpm:****1,200 rpm****3. VISUALLY INSPECT HOSES, CONNECTIONS AND GASKETS**

- Check the appearance.
 - Check if the indicated portions of the engine assembly are cracked, leaking or damaged.
HINT:
Disconnection of the engine oil level gauge, oil filler cap, PCV hose, etc. may cause the engine to run improperly. Disconnected, loose or cracked parts in the air induction system between the throttle body and cylinder head will allow air suction and cause the engine to run improperly.
If necessary, repair the engine assembly.

**4. INSPECT FUEL CUT OFF VALVE AND FILL CHECK VALVE**

- Disconnect the vent line hose from the fuel tank.
(See page [FU-45](#))
- Connect the pressure gauge to the vent hose port.

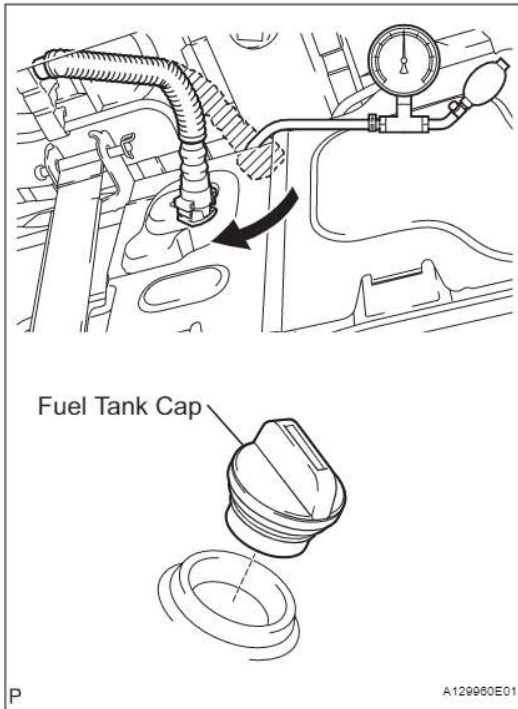
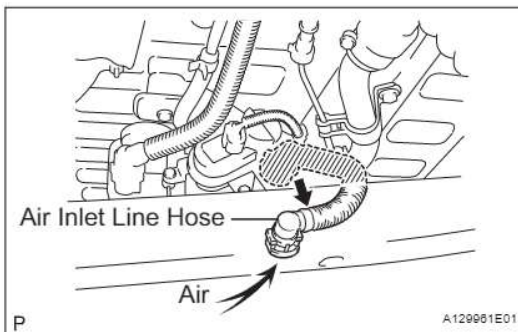
EC-6**1GR-FE EMISSION CONTROL – EMISSION CONTROL SYSTEM**

- (c) Fill the fuel tank with fuel.
- (d) Apply pressure at 4 kPa (0.04 kgf*cm², 0.58 psi) to the vent port of the fuel tank.

HINT:

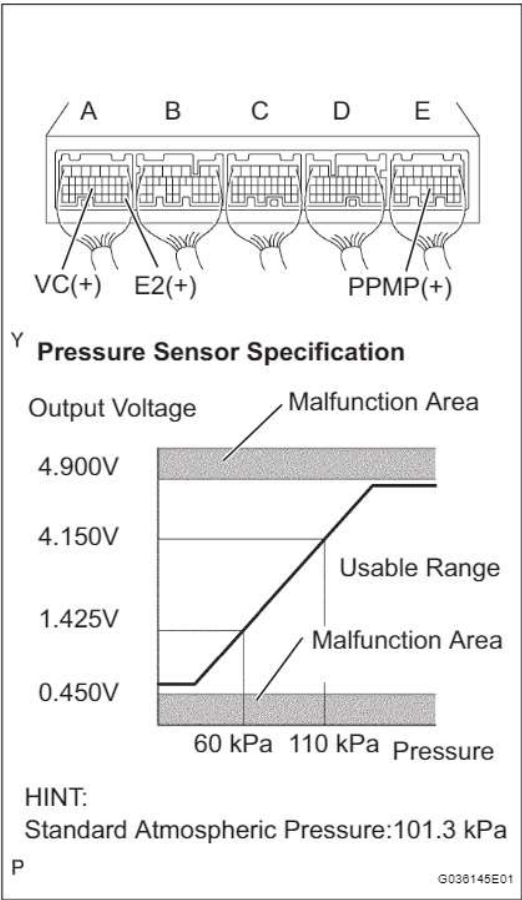
Check the amount of fuel left in the fuel tank.

- (e) Remove the fuel tank cap, and check that the pressure decreases.
If the pressure does not decrease, replace the fuel tank assembly.
- (f) Reconnect the vent line hose to the fuel tank.

**EC****5. CHECK AIR INLET LINE**

- (a) Disconnect the air inlet line hose from the charcoal canister. (See page [EC-9](#))
- (b) Check that air flows freely into the air inlet line.
If air does not flow freely into the air inlet line, repair or replace the air inlet line.
- (c) Reconnect the air inlet line hose to the charcoal canister.

1GR-FE EMISSION CONTROL – EMISSION CONTROL SYSTEM



6. INSPECT LEAK DETECTION PUMP PRESSURE SENSOR

- (a) Measure the power source voltage of the ECM connectors.

Standard voltage

Tester Connection	Condition	Specified Condition
A23 (VC) - A28 (E2)	Ignition switch ON	4.5 to 5.5 V

If the voltage is not as specified, check the ECM, leak detection pump and wire harness.

- (b) Measure the power output voltage of the ECM connectors.

- (1) Remove the fuel tank cap.

Standard voltage

Tester Connection	Condition	Specified Condition
E22 (PPMP) - A28 (E2)	Ignition switch ON	1.425 to 4.150 V

If the voltage is not as specified, check the ECM, leak detection pump and wire harness.

- (2) Install the fuel tank cap.

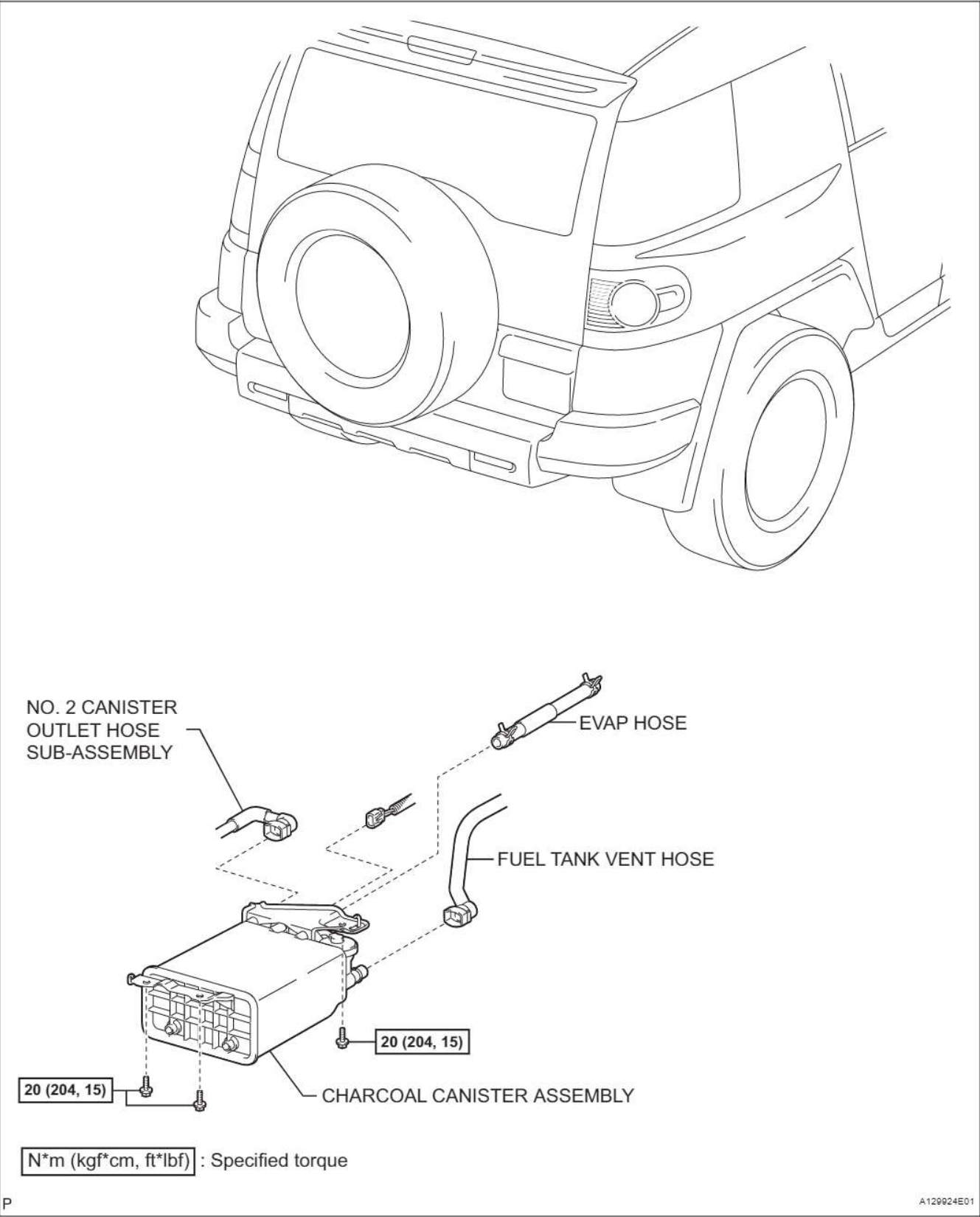
EC

EC-8

1GR-FE EMISSION CONTROL – CANISTER

CANISTER
COMPONENTS

EC



REMOVAL

1. DISCHARGE FUEL SYSTEM PRESSURE

(See page [FU-1](#))

2. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

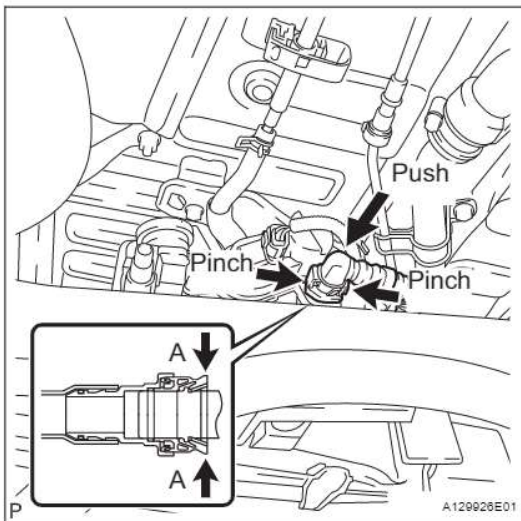
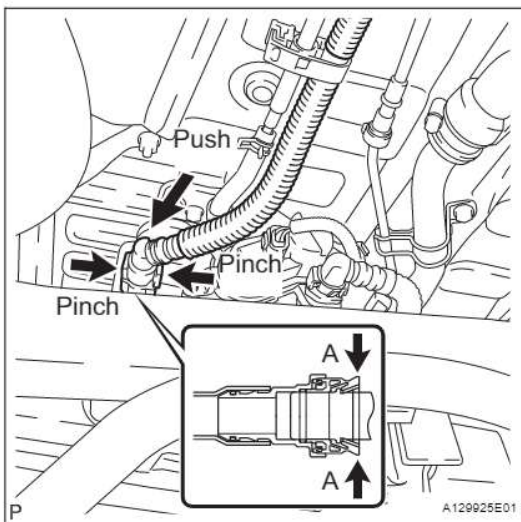
3. REMOVE CHARCOAL CANISTER ASSEMBLY

(a) Disconnect the fuel tank breather tube from the fuel tank.

- (1) Push the connector deep inside.
- (2) Pinch portion A, as shown in the illustration.
- (3) Pull out the connector.

NOTICE:

- Remove any dirt and foreign objects from the fuel tank vent hose connector before performing the work.
- Do not allow any scratches or foreign objects on the parts when disconnecting, as the fuel tank vent hose connector has the O-ring that seals the pipe.
- Perform the work by hand. Do not use any tools.
- Do not forcibly bend, twist or turn the nylon tube.
- Protect the disconnected part by covering it with a vinyl bag after disconnecting the fuel tank vent hose.
- If the fuel vent connector and pipe are stuck, push and pull them to release.



(b) Disconnect the No. 2 canister outlet hose sub-assembly.

- (1) Push the connector deep inside.
- (2) Pinch portion A, as shown in the illustration.
- (3) Pull out the connector.

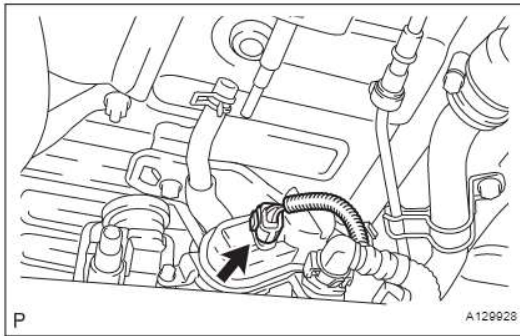
NOTICE:

- Remove any dirt and foreign objects from the fuel tank vent hose connector before performing the work.
- Do not allow any scratches or foreign objects on the parts when disconnecting, as the fuel tank vent hose connector has the O-ring that seals the pipe.
- Perform the work by hand. Do not use any tools.
- Do not forcibly bend, twist or turn the nylon tube.
- Protect the disconnected part by covering it with a vinyl bag after disconnecting the fuel tank vent hose.
- If the fuel vent connector and pipe are stuck, push and pull them to release.

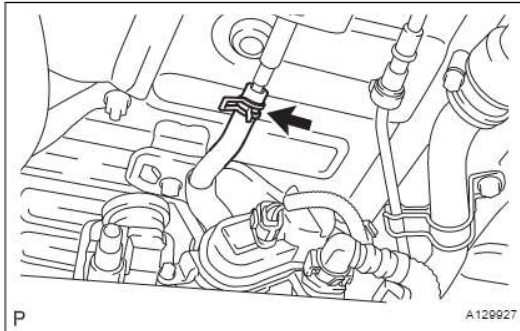
EC

EC-10

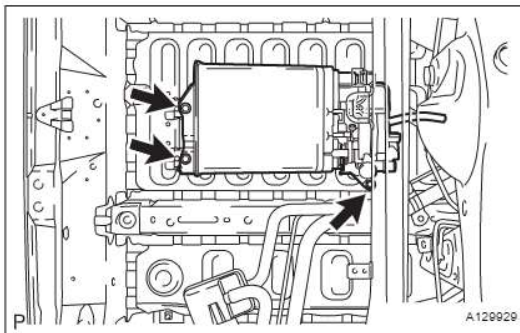
1GR-FE EMISSION CONTROL – CANISTER



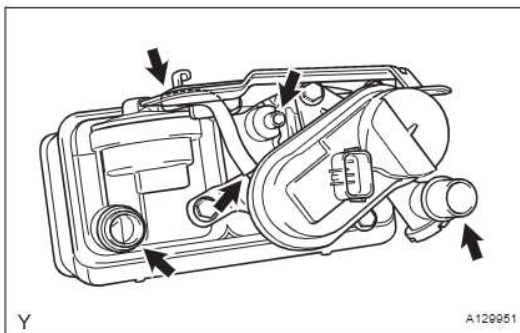
(c) Disconnect the connector.



(d) Disconnect the EVAP hose.



(e) Remove 3 bolts, then remove charcoal the canister assembly.



INSPECTION

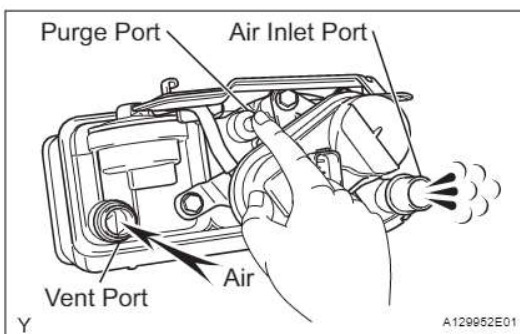
1. INSPECT CHARCOAL CANISTER ASSEMBLY

(a) Visually check the charcoal canister for cracks and damage.

If there is any cracks or damage, replace the charcoal canister assembly.

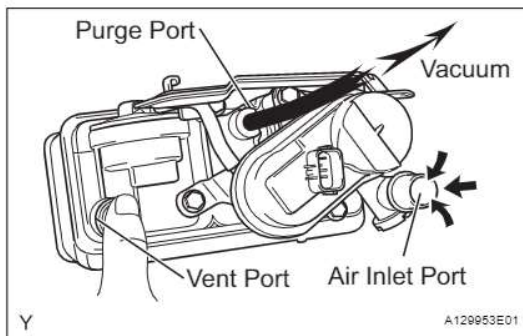
(b) Check the charcoal canister operation.

- (1) While holding the purge port closed, blow pressurized air at 1.67 kPa (17.0 gf/cm², 0.24 psi) into the vent port, and check that the air flows from the air inlet port. If the result is not as specified, replace the charcoal canister assembly.

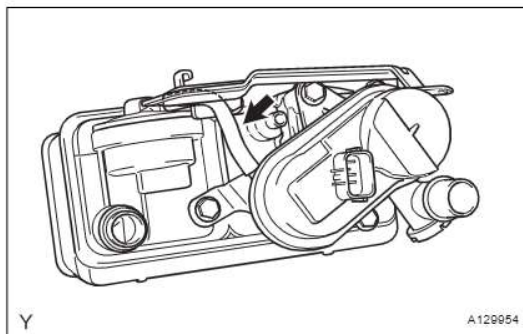


1GR-FE EMISSION CONTROL – CANISTER

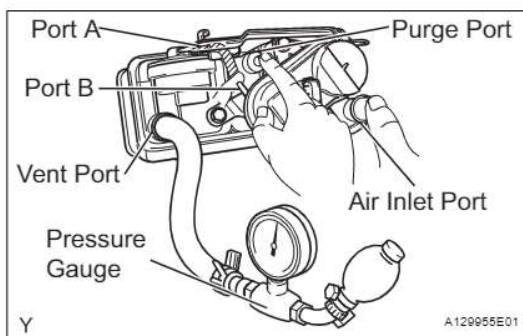
EC-11



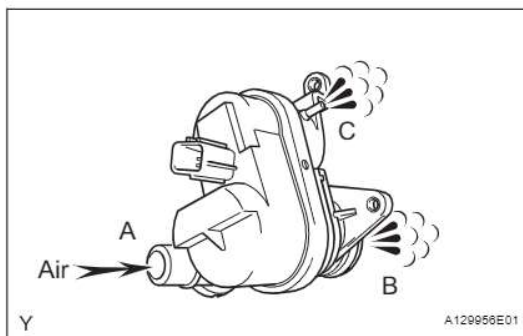
- (2) While holding the vent port closed, apply a vacuum of 1.10 kPa (8.3 mmHg, 0.32 in.Hg) into the purge port, and check that the air flows from the air inlet port. If the result is not as specified, replace the charcoal canister assembly.



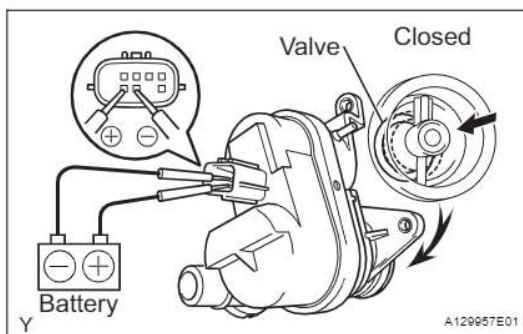
- (c) Check for air leakage.
(1) Remove the air hose between ports A and B.



- (2) Connect the pressure gauge to the vent port of the charcoal canister.
SST 09992-00242
(3) While holding port B, the purge port and air inlet port closed with your fingers, leave port A open and apply pressurized air at 19.6 kPa (0.2 kgf/cm², 2.81 psi) into the vent port. Check that the pressure is retained. If the result is not as specified, replace the charcoal canister assembly.



- (d) Check the leak detection pump.
(1) Check that air flows from port A to ports B and C. If the result is not as specified, replace the pump module.



- (2) Apply battery positive voltage across the terminals.
(3) Check that the valve is closed. If the result is not as specified, replace the pump module.

EC

EC-12

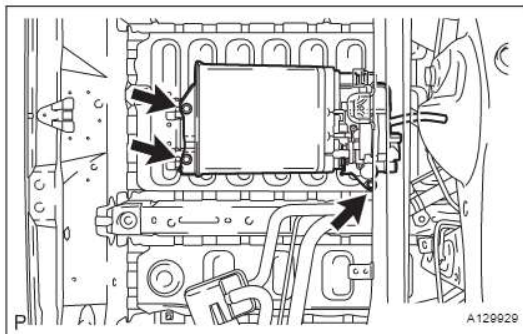
1GR-FE EMISSION CONTROL – CANISTER

INSTALLATION

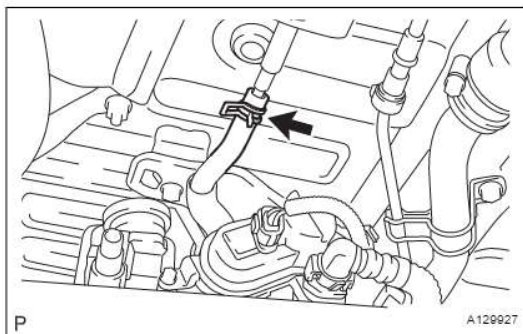
1. INSTALL CHARCOAL CANISTER ASSEMBLY

- (a) Install the canister with the 3 bolts.

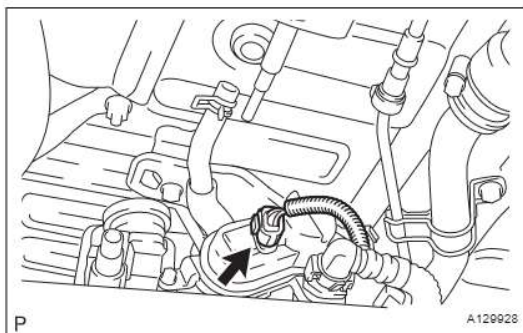
Torque: 20 N*m (204 kgf*cm, 15 ft.*lbf)



- (b) Connect the connector.



- (c) Connect the EVAP hose.

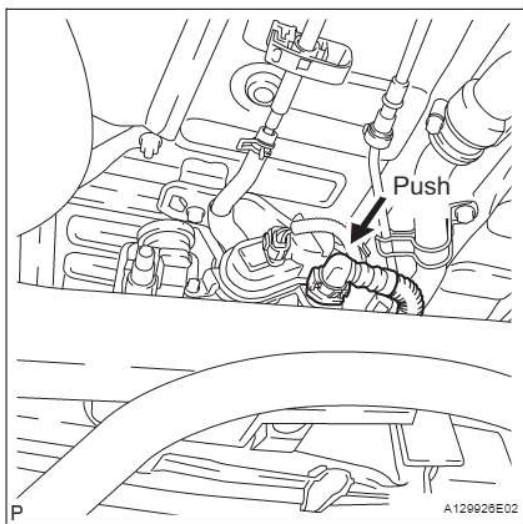


- (d) Connect the No. 2 canister outlet hose sub-assembly.

- (1) Align the fuel tank vent hose connector with the pipe, then push in the fuel tank vent connector until the retainer makes a "click" sound to connect the fuel tank vent hose to the charcoal canister.

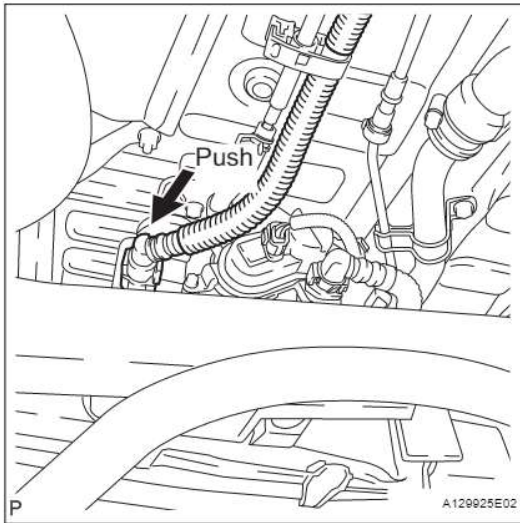
NOTICE:

- Check that there are no scratches or foreign objects on the disconnected parts of the fuel tank vent connector and pipe before performing the work.
- After connecting the fuel tank vent hose, check that the fuel tank vent hose is securely connected by pulling the quick connector.



1GR-FE EMISSION CONTROL – CANISTER

EC-13



(e) Connect the fuel tank vent hose.

- (1) Align the fuel tank vent hose connector with the pipe, then push in the fuel tank vent connector until the retainer makes a "click" sound to connect the fuel tank vent hose to the charcoal canister.

NOTICE:

- Check that there are no scratches or foreign objects on the disconnected parts of the fuel tank vent connector and pipe before performing the work.
- After connecting the fuel tank vent hose, check that the fuel tank vent hose is securely connected by pulling the quick connector.

2. **CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**

Torque: 3.9 N*m (40 kgf*cm, 35 in.*lbf)

3. **CHECK FOR FUEL LEAKAGE** (See page [FU-7](#))

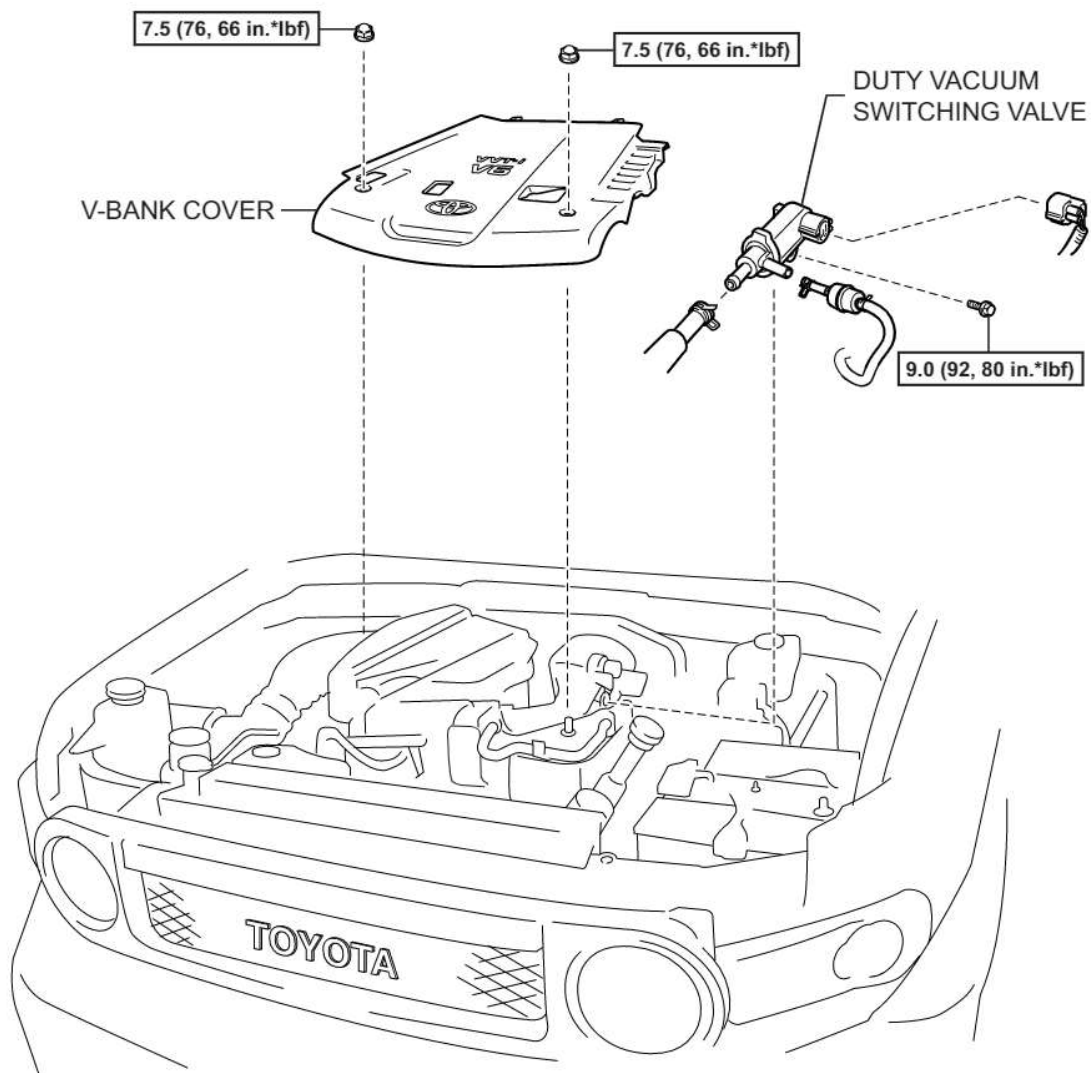
EC

EC-14

1GR-FE EMISSION CONTROL – VACUUM SWITCHING VALVE

VACUUM SWITCHING VALVE

COMPONENTS



N*m (kgf*cm, ft*lbf) : Specified torque

T

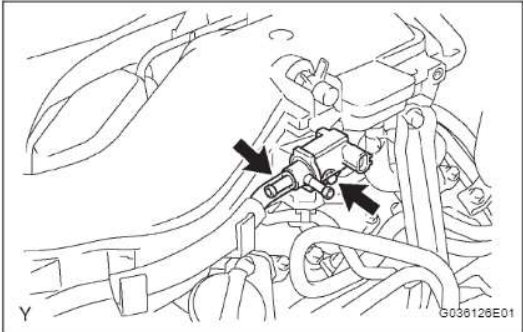
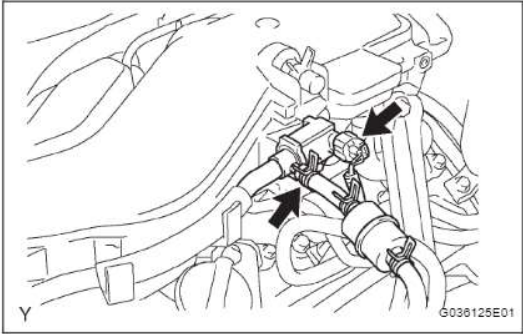
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REMOVAL

1. DISCONNECT CABLE FROM NEGATIVE BATTERY
TERMINAL
2. REMOVE V-BANK COVER (See page ES-428)
3. REMOVE DUTY VACUUM SWITCHING VALVE

(a) Disconnect the connector.

(b) Disconnect the fuel vapor feed hose.



- (c) Remove the bolt, then separate the vacuum switching valve from the intake air surge tank.
- (d) Disconnect the hose, then remove the vacuum switching valve.

EC

INSPECTION

1. INSPECT DUTY VACUUM SWITCHING VALVE

(a) Check the resistance.

(1) Using an ohmmeter, measure the resistance between the terminals.

Standard resistance

Tester Connection	Specified Condition
1 - 2	26 to 30 Ω at 20°C (68°F)

If the result is not as specified, replace vacuum switching valve No. 1.

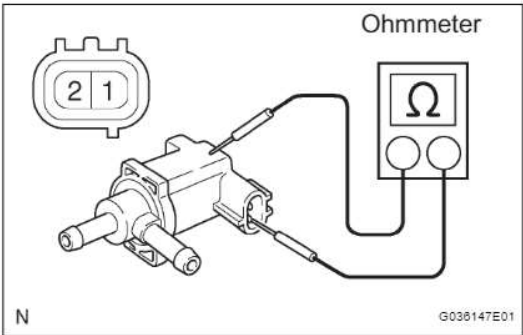
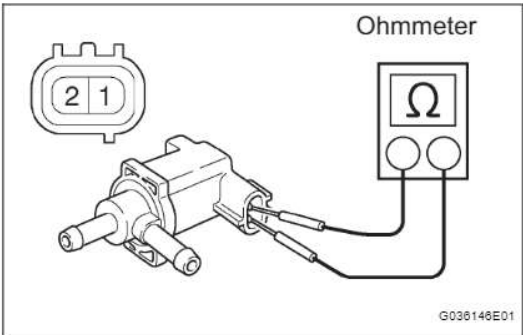
- (b) Check vacuum switching valve No. 1 for ground.

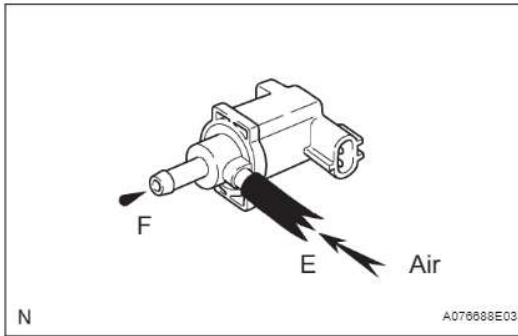
(1) Using an ohmmeter, check the resistance between each terminal and the body.

Standard resistance

Tester Connection	Specified Condition
1 - Body	10 MΩ or higher
2 - Body	10 MΩ or higher

If the result is not as specified, replace vacuum switching valve No. 1.

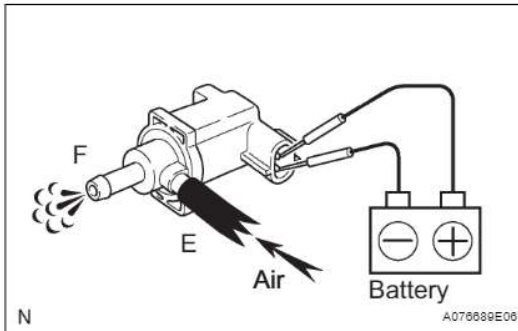


EC-16**1GR-FE EMISSION CONTROL – VACUUM SWITCHING VALVE**

(c) Check the operation.

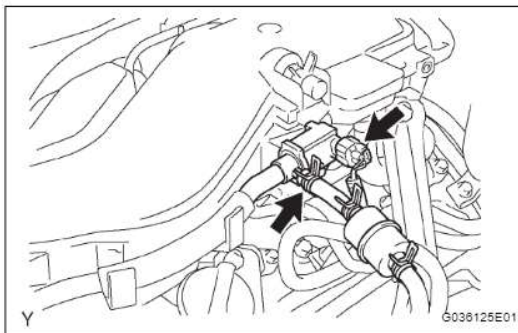
- (1) Check that air does not flow from port E to port F.

If the operation is not as specified, replace vacuum switching valve No. 1.



- (2) Apply battery voltage across the terminals.

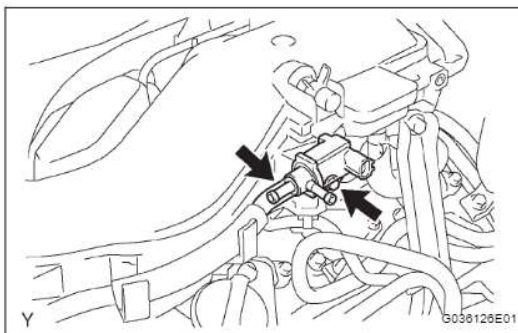
- (3) Check that air flows from port E to port F.
If the operation is not as specified, replace vacuum switching valve No. 1.

EC**INSTALLATION****1. INSTALL DUTY VACUUM SWITCHING VALVE**

- (a) Connect the hose to the vacuum switching valve.

- (b) Install the vacuum switching valve with the bolt.

Torque: 9.0 N*m (92 kgf*cm, 80 in.*lbf)



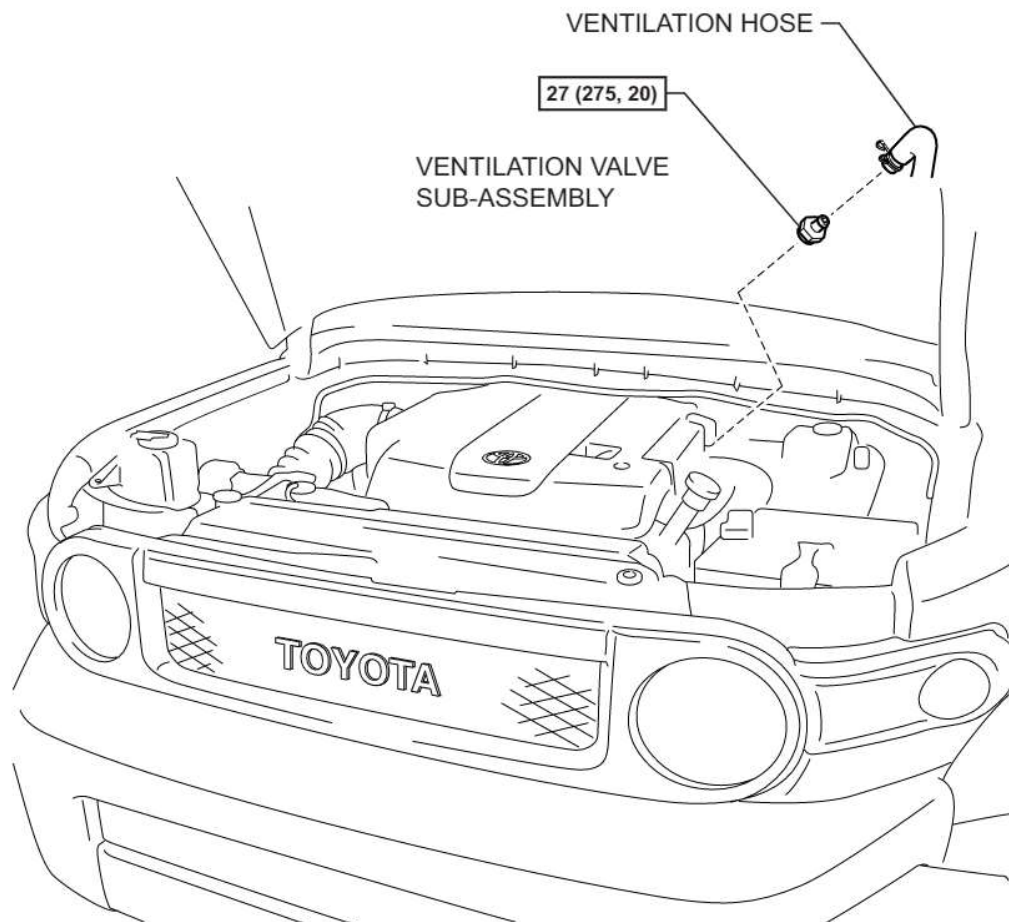
- (c) Connect the vapor feed hose.

- (d) Connect the connector.

2. INSTALL V-BANK COVER (See page [ES-431](#))**3. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**

Torque: 3.9 N*m (40 kgf*cm, 35 in.*lbf)

VENTILATION VALVE COMPONENTS



N*m (kgf*cm, ft*lbf) : Specified torque

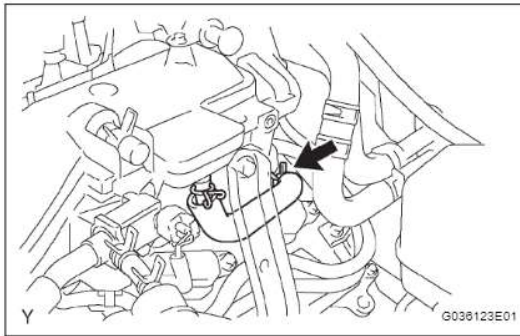
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EC

EC-18

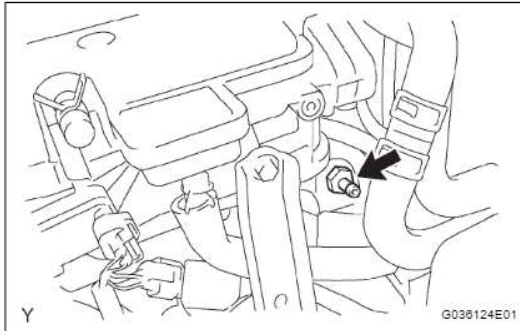
1GR-FE EMISSION CONTROL – VENTILATION VALVE



REMOVAL

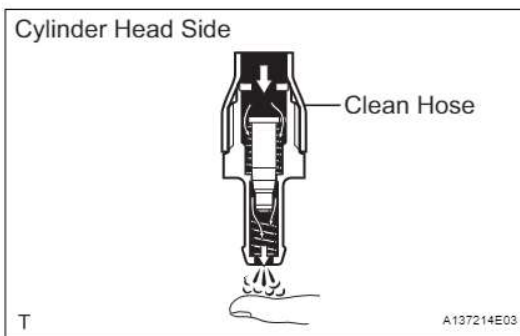
1. REMOVE VENTILATION VALVE SUB-ASSEMBLY

(a) Disconnect the ventilation hose.



(b) Remove the ventilation valve.

EC



INSPECTION

1. INSPECT VENTILATION VALVE SUB-ASSEMBLY

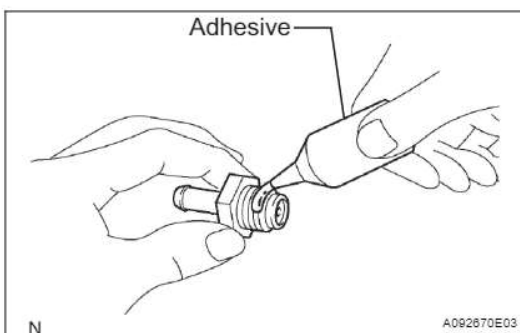
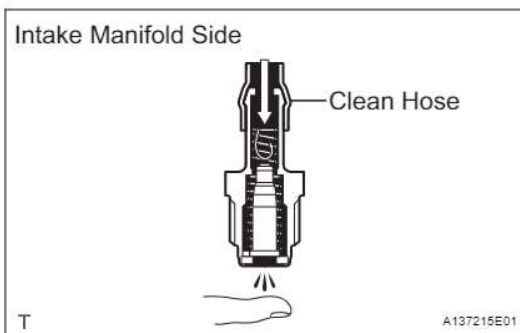
(a) Check the operation.

- (1) Install a clean hose as shown in the illustration.
- (2) Blow air into the cylinder head side and check that the air passes through freely.

CAUTION:

Do not suck air through the ventilation valve. Petroleum substances inside the ventilation valve are harmful.

- (3) Blow air into the intake manifold side and check that the air does not pass through freely. If the operation is not as specified, replace the ventilation valve.



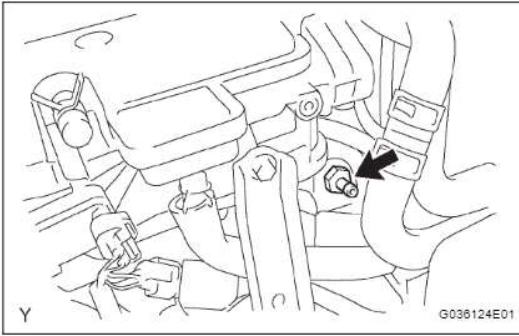
INSTALLATION

1. INSTALL VENTILATION VALVE SUB-ASSEMBLY

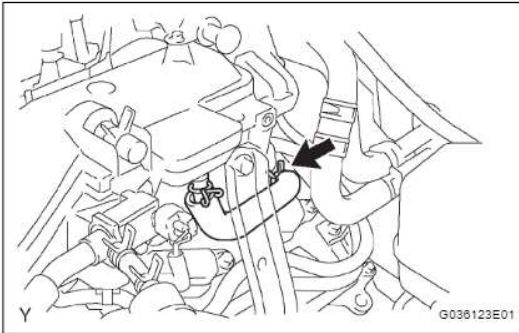
(a) Apply adhesive to 2 or 3 threads of the valve.

Adhesive:

Toyota Genuine Adhesive 1324, Three Bond 1344 or the equivalent.

1GR-FE EMISSION CONTROL – VENTILATION VALVE**EC-19**

- (b) Install the ventilation valve.
Torque: 27 N*m (275 kgf*cm, 20 ft.*lbf)



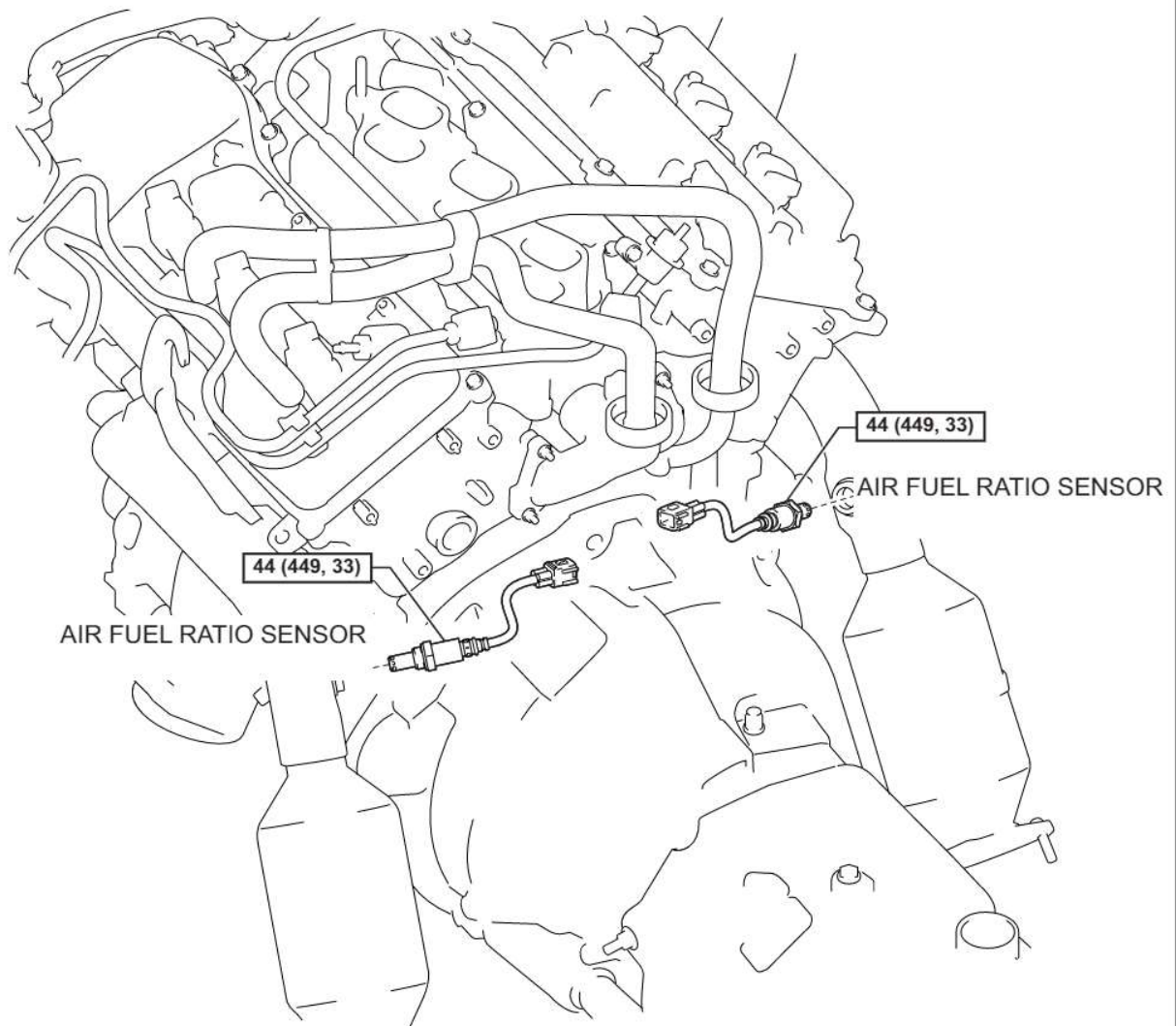
- (c) Connect the ventilation hose.

EC

EC-20

1GR-FE EMISSION CONTROL – AIR FUEL RATIO SENSOR

AIR FUEL RATIO SENSOR COMPONENTS



N*m (kgf*cm, ft*lb) : Specified torque

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REMOVAL

CAUTION:

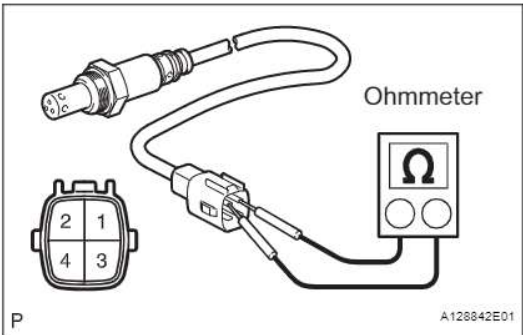
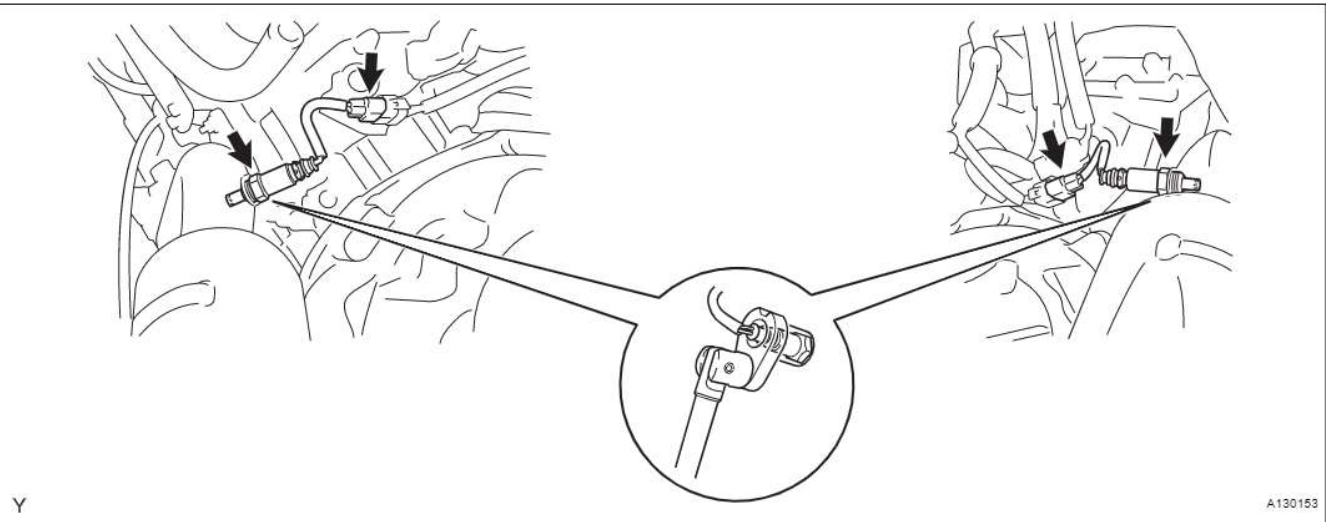
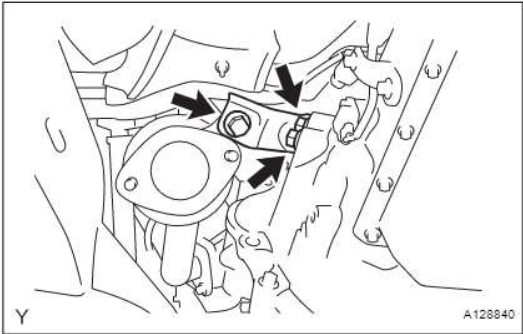
- Wear protective gloves when removing the sensor.
- The exhaust pipe assembly is extremely hot immediately after the engine has stopped.
- Confirm that the exhaust pipe assembly has cooled down before removing it.

1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

2. REMOVE AIR FUEL RATIO SENSOR

- (a) Remove the 3 bolts, then remove the No. 2 exhaust manifold stay. (for LH Bank)
- (b) Disconnect the 2 air fuel ratio sensor connectors.
- (c) Using SST, remove the 2 air fuel ratio sensors from the exhaust manifold.

SST 09224-00010



INSPECTION

1. REMOVE AIR FUEL RATIO SENSOR

- (a) Check the resistance.
- (1) Using an ohmmeter, measure the resistance between the terminals.

Standard resistance

Tester Connection	Specified Condition
1 (HT) - 2 (+B)	1.8 to 3.4 Ω at 20°C (68°F)
1 (HT) - 4 (E)	10 kΩ or higher

If the result is not as specified, replace the air fuel ratio sensor.

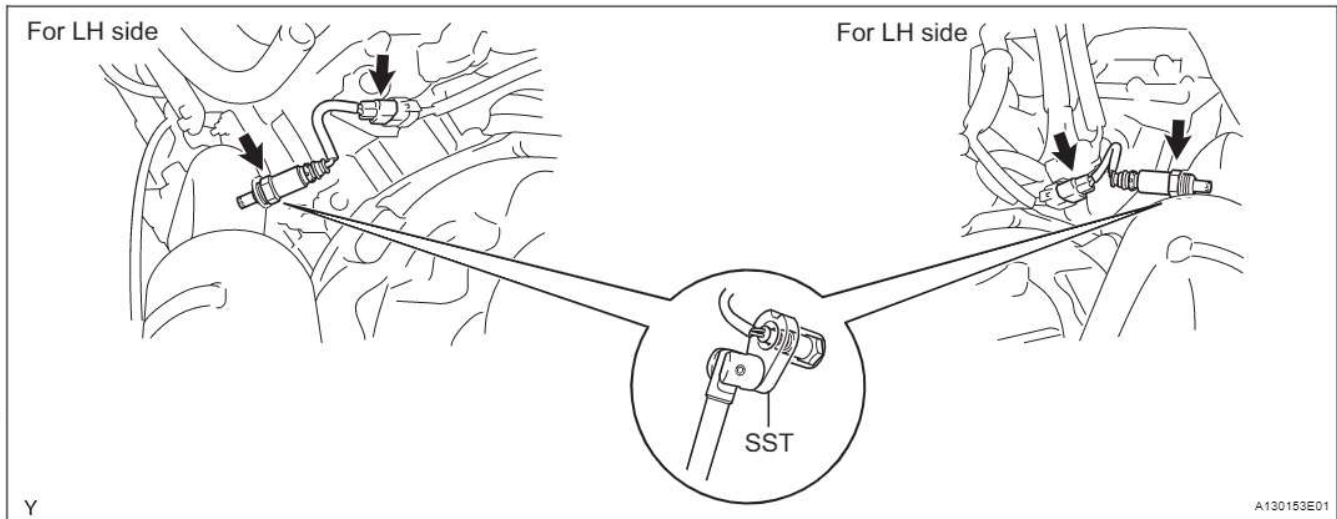
EC

EC-22**1GR-FE EMISSION CONTROL – AIR FUEL RATIO SENSOR****INSTALLATION****1. INSTALL AIR FUEL RATIO SENSOR**

- (a) Using SST, install the 2 air fuel ratio sensors onto the exhaust manifold.

SST 09224-00010

Torque: 44 N*m (449 kgf*cm, 33 ft.*lbf)

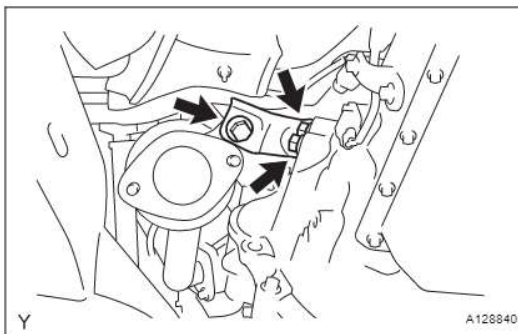


- (b) Connect the 2 air fuel ratio sensor connectors.

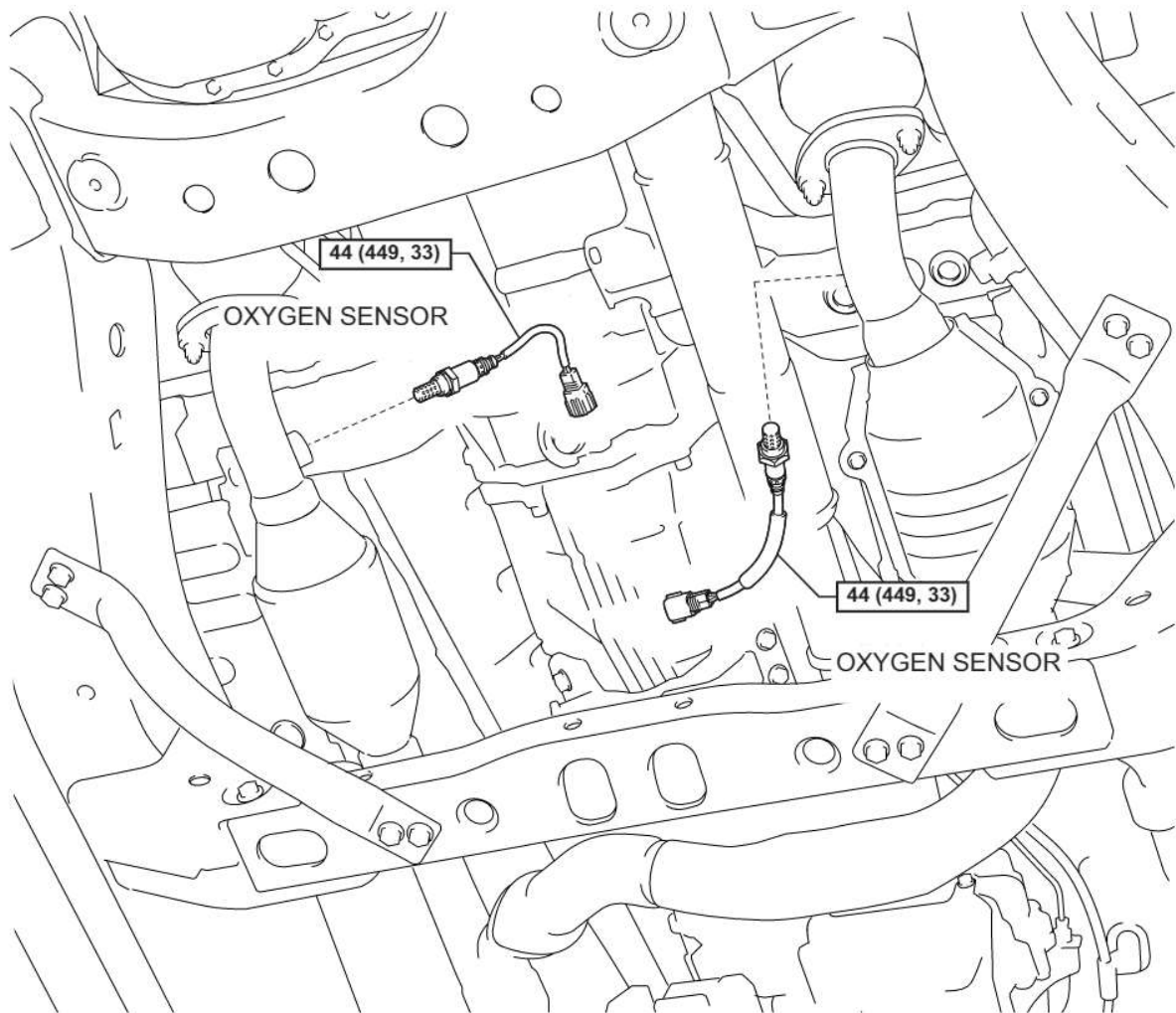
- (c) Install the exhaust manifold stay with the 3 bolts. (for LH Bank)

2. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

Torque: 3.9 N*m (40 kgf*cm, 35 in.*lbf)

**EC**

HEATED OXYGEN SENSOR COMPONENTS



N*m (kgf*cm, ft*lb) : Specified torque

P

A129978E01

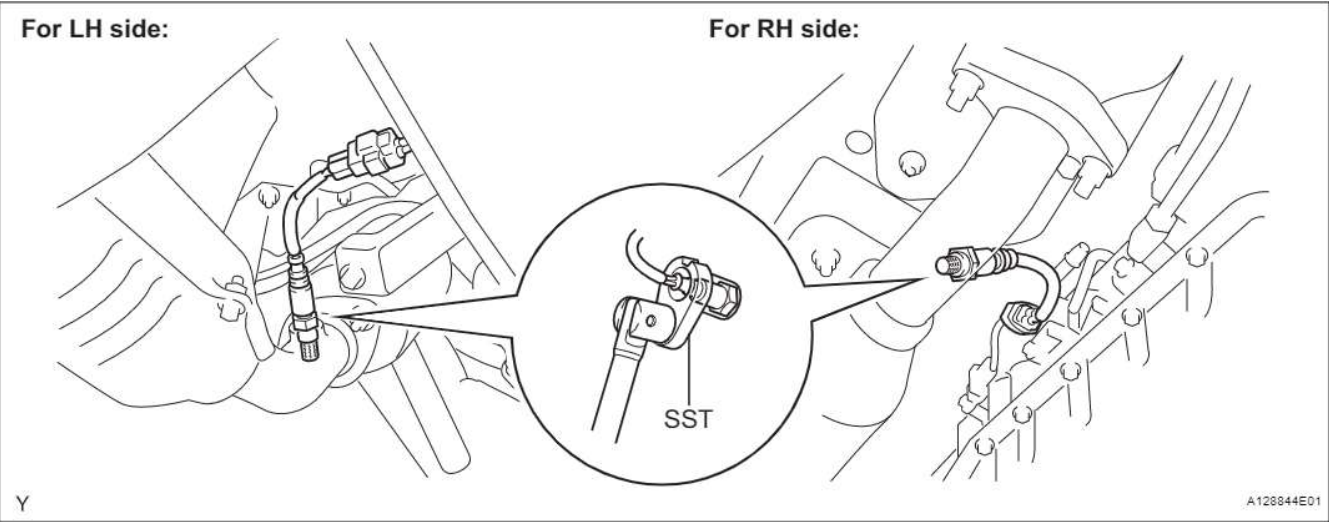
EC

EC-24

1GR-FE EMISSION CONTROL – HEATED OXYGEN SENSOR

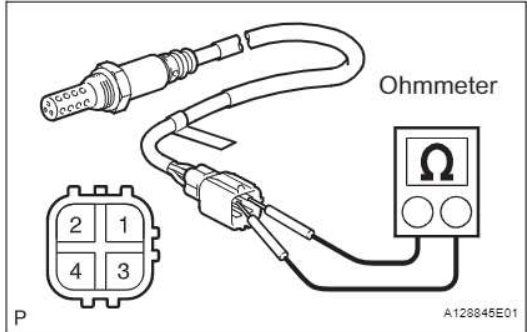
REMOVAL

- 1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL
 - 2. REMOVE HEATED OXYGEN SENSOR
 - (a) Disconnect the 2 heated oxygen sensors connectors.
 - (b) Using SST, remove the 2 heated oxygen sensors from the exhaust pipe.
- SST 09224-00010



INSPECTION

- 1. INSPECT HEATED OXYGEN SENSOR
 - (a) Check the resistance.
 - (1) Using an ohmmeter, measure the resistance between the terminals.
- Standard resistance



Tester Connection	Specified Condition
1 (HT) - 2 (+B)	11 to 16 Ω at 20°C (68°F)
1 (HT) - 4 (E)	10 kΩ or higher

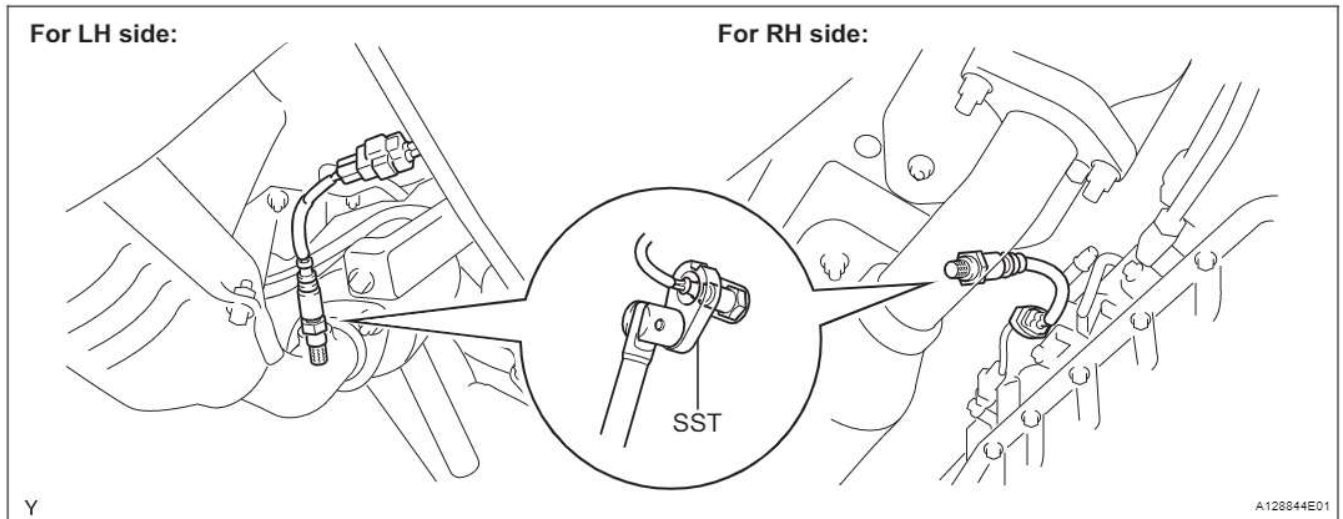
INSTALLATION

1. INSTALL HEATED OXYGEN SENSOR

- (a) Using SST, install the 2 heated oxygen sensors onto the exhaust pipe.

SST 09224-00010

Torque: 44 N*m (449 kgf*cm, 33 ft.*lbf)

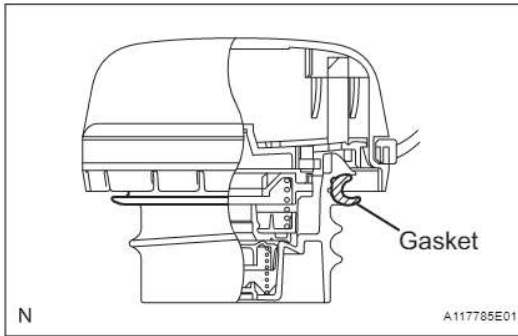


- (b) Connect the 2 heated oxygen sensor connectors.

2. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

Torque: 3.9 N*m (40 kgf*cm, 35 in.*lbf)

EC

EC-26**1GR-FE EMISSION CONTROL – FUEL TANK CAP****FUEL TANK CAP****ON-VEHICLE INSPECTION****1. INSPECT FUEL TANK CAP ASSEMBLY**

- (a) Check that there is no deformation or damage to fuel tank cap or gasket. If necessary replace the fuel tank cap.

EC