EMISSION CONTROL SYSTEM

PURPOSE

The emission control systems are installed to reduce the amount of HC, CO and NOx exhausted from the engine ((3) and (4)), to prevent the atmospheric release of blow-by gas containing HC (1) and evaporated fuel containing HC being released from the fuel tank (2).

The function of each system is shown in the table below:

<table>
<thead>
<tr>
<th>System</th>
<th>Abbreviation</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Positive Crankcase Ventilation</td>
<td>PCV</td>
<td>Reduces HC</td>
</tr>
<tr>
<td>(2) Evaporative Emission Control</td>
<td>EVAP</td>
<td>Reduces evaporated HC</td>
</tr>
<tr>
<td>(3) Three-way Catalytic Converter</td>
<td>TWC</td>
<td>Reduces HC, CO and NOx</td>
</tr>
<tr>
<td>(4) Sequential Multiport Fuel Injection*</td>
<td>SFI</td>
<td>Injects a precisely timed, optimum amount of fuel for reduced exhaust emissions</td>
</tr>
</tbody>
</table>

Remark: * For inspection and repair of the SFI system, refer to the SF section in this manual.
EVAPORATIVE EMISSION (EVAP) CONTROL SYSTEM

COMPONENTS

- Air Filter
- Air Drain Hose
- Charcoal Canister Bracket
- Detection Pump
- O-Ring

N·m (kgf·cm, ft·lbf): Specified torque
◆ Non-reusable part

14.7 (150, 11)

EMISSION CONTROL (1GR-FE) - EVAPORATIVE EMISSION (EVAP) CONTROL SYSTEM
INSPECTION

1. **INSPECT LINES AND CONNECTIONS**
   Visually check for loose connections, sharp bends or damage.

2. **INSPECT FUEL TANK**
   Visually check for deformation, cracks or fuel leakage.

3. **INSPECT FUEL TANK CAP**
   Visually check if the cap and/or gasket are deformed or damaged.
   If necessary, repair or replace the cap.

4. **INSPECT EVAP SYSTEM LINE**
   (a) Warm up the engine to normal operating temperature and stop the engine.
   (b) Install a vacuum gauge (EVAP control system test equipment vacuum gauge) into the EVAP service port on the purge line.
   (c) When using a hand-held tester:
       Operation of the VSV for EVAP:
       (1) Connect a hand-held tester to the Controller Area Network Vehicle Interface Module (CAN VIM). Then connect the CAN VIM to the Date Link Connector 3 (DLC3).
       (2) Start the engine.
       (3) Turn the hand-held tester ON.
       (4) Enter the following menus: DIAGNOSIS / ENHANCED OBDII/ ACTIVE TEST / EVAP VAV (ALONE)
(d) When not using a hand-held tester:
Operation of the VSV for the EVAP.
(1) Disconnect the VSV for the EVAP connector.
(2) Connect leads from the positive (+) and negative (-) battery terminals to the VSV for EVAP terminals.
(3) Start the engine.

(e) Check the vacuum when the engine idles.
Vacuum:
Maintain between 0.368 and 19.713 in.Hg (5 to 268 in.Aq) for over 5 seconds
HINT:
If the vacuum does not change, the hose connecting the VSV and the service port is loose or blocked, or the VSV is malfunctioning.

(f) When using a hand-held tester:
Conclude operation of the VSV for EVAP.
(1) Stop the engine.
(2) Disconnect the hand-held tester from the DLC3.

(g) When not using a hand-held tester:
Conclude operation of the VSV for EVAP.
(1) Stop the engine.
(2) Disconnect the positive (+) and negative (-) leads of the battery from the VSV for EVAP terminals.
(3) Connect the VSV for EVAP connector.

(h) Disconnect the vacuum gauge from the EVAP service port on the purge line.

(i) Connect a pressure gauge to the EVAP service port on the purge line.

(j) Check the pressure.
(1) Prepare a rubber hose that has an inside diameter of 15 to 18.5 mm.
(2) Disconnect the atmospheric side hose of the pump module.
(3) Connect the prepared rubber hose to the pump module, and pinch the rubber hose with the clip to prevent air from entering into the canister passage.
(4) Apply pressure (13.5 to 15.5 in.Aq, 0.99 to 1.14 in.Hg) from the EVAP service port.

**Pressure:**
The gauge should still read over 7.7 to 8.8 in.Aq (0.57 to 0.65 in.Hg) for 2 minutes after the pressure is applied.

**HINT:**
If you cannot apply pressure, the hose connecting the VSV, charcoal canister and fuel tank has slipped off or the VSV is open.

(5) Check if the pressure decreases when the fuel tank cap is removed while applying pressure.

**HINT:**
If the pressure does not decrease when the filler cap is removed, the hose connecting the service port and the fuel tank may be blocked.

(k) Disconnect the pressure gauge from the EVAP service port on the purge line.

5. **INSPECT FUEL CUTOFF VALVE AND FILL CHECK VALVE**

(a) Disconnect the vent line hose from the fuel tank.
(b) Connect the pressure gauge to the fuel tank.
(c) Fill the fuel tank with fuel.
(d) Apply pressure of 4 kPa (41 gf/cm², 0.58 psi) to the vent port of the fuel tank.

**HINT:**
It is necessary to check the amount of fuel in the fuel tank. When the fuel tank is full, the float valve of the fill check valve is closed and no air can pass through.
(e) Remove the fuel tank cap, and check that the pressure drops.

If the pressure does not drop, replace the fuel tank assembly.
(f) Reconnect the vent line hose to the fuel tank.
6. **CHECK AIR INLET LINE**  
(a) Disconnect the air inlet line hose from the charcoal canister.  
(b) Check that air can flow freely into the air inlet line. If air cannot flow freely into the air inlet line, repair or replace it.  
(c) Reconnect the air inlet line hose to the charcoal canister.

7. **REMOVE CHARCOAL CANISTER ASSEMBLY**

8. **INSPECT CHARCOAL CANISTER ASSEMBLY**  
(a) Visually check the charcoal canister for cracks or damage. If cracks or damage are found, replace the charcoal canister assembly.

(b) Check charcoal canister operation.  
(1) With the purge port closed, blow 1.67 kPa (17.0 gf/cm², 0.24 psi) of air into the vent port, and check that air flows from the air inlet port. If the result is not as specified, replace the charcoal canister assembly.

(2) With the vent port closed, blow 1.10 kPa (11.2 gf/cm², 0.16 psi) of air to the air inlet port, and check that air flows from the purge 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.
   (3) While holding port B, with the purge port and the air inlet port closed and port A open, apply 19.6 kPa (0.2 kgf/cm², 2.81 psi) of pressurized air into the vent port, then confirm that pressure is retained for 1 minute.
   If the result is not as specified, replace the charcoal canister assembly.

(d) Check leak detection pump.
   (1) Remove the detection pump from the charcoal canister.
   (2) Check that air flows from port A to B and then to C.
   If the result is not as specified, replace the charcoal canister assembly.

   (3) Connect the positive (+) lead of the battery to terminal 7 and the negative (-) lead to terminal 6.
   (4) Check that the valve is closed.
   If the result is not as specified, replace the charcoal canister assembly.
   (5) Install the detection pump.

9. INSPECT VSV FOR EVAP (See page SF-65 )
10. REINSTALL CHARCOAL CANISTER ASSEMBLY
POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM INSPECTION

1. REMOVE V-BANK COVER
2. REMOVE VENTILATION VALVE
3. INSPECT VENTILATION VALVE
   (a) Install a clean hose to the ventilation valve.
   (b) Inspect ventilation valve operation.
      (1) Blow air into the cylinder head side, and check that air passes through smoothly.
      CAUTION:
      Do not suck air through the valve. Petroleum substances inside the valve are harmful.

   (2) Blow air into the intake manifold side, and check that air does not pass through smoothly.
   If operation is not as specified, replace the ventilation valve.
   (c) Remove the clean hose from the ventilation valve.

4. INSTALL VENTILATION VALVE
   Install the ventilation valve to the LH cylinder head cover.
   Torque: 27 N·m (275 kgf·cm, 20 ft·lbf)

5. VISUALLY INSPECT HOSES, CONNECTIONS AND GASKETS
   (a) Check for cracks, leaks or damage.
   HINT:
   Separation of the engine oil dipstick, oil filler cap, PCV hose, etc. may cause engine failure or malfunctions. Disconnection, looseness or cracks in parts of the air induction system between the throttle body and cylinder head will allow air suction and cause an engine failure or malfunctions.

6. INSTALL V-BANK COVER
THREE-WAY CATALYTIC CONVERTER (TWC) SYSTEM COMPONENTS

- Exhaust Manifold RH
- A/F Sensor (Bank 1)
- Heated Oxygen Sensor (Bank 1)
- Gasket
- RH Front Exhaust Pipe
- TWC
- Manifold Stay
- Spring
- Gasket
- Exhaust Manifold LH
- A/F Sensor (Bank 2)
- Heated Oxygen Sensor (Bank 2)
- Gasket
- Exhaust Pipe Support
- LH Front Exhaust Pipe

N·m (kgf·cm, ft·lbf) : Specified torque
Non-reusable part
THREE-WAY CATALYTIC CONVERTER (TWC) SYSTEM

ON-VEHICLE INSPECTION

1. CHECK EXHAUST PIPE ASSEMBLY
   (a) Check the connections for looseness or damage.
   (b) Check the clamps for weakness, cracks or damage.

2. INSPECT TWC
   Check for dents or damage.
   If any part of the protector is damaged or dented to the extent that it contacts the TWC, repair or replace it.

3. INSPECT HEAT INSULATOR
   (a) Check the heat insulator for damage.
   (b) Check for adequate clearance between the TWC and heat insulator.
REPLACEMENT

1. REMOVE HEATED OXYGEN SENSOR (BANK 1)
   (a) Disconnect the heated oxygen sensor.
   (b) Remove the heated oxygen sensor.

2. SEPARATE EXHAUST CENTER PIPE
   Remove the 4 bolts and 2 springs from the exhaust center pipe.

3. REMOVE RH FRONT EXHAUST PIPE
   (a) Remove the 2 nuts and RH front exhaust pipe.
   (b) Remove the 2 gaskets from the RH front exhaust pipe.

4. REMOVE HEATED OXYGEN SENSOR
   (BANK 2 OXYGEN SENSOR)
   (a) Disconnect the heated oxygen sensor connector.
   (b) Remove the heated oxygen sensor.

5. REMOVE LH FRONT EXHAUST PIPE
   (a) Remove the 2 nuts, exhaust pipe support and LH front ex-
   haust pipe.
   (b) Remove the 2 gaskets from the LH front exhaust pipe.

6. REMOVE MANIFOLD STAY
   Remove the 6 bolts and 2 manifold stays.

7. REMOVE A/F SENSOR (BANK 1)
   (a) Disconnect the A/F sensor connector.
   (b) Remove the A/F sensor.

8. REMOVE EXHAUST MANIFOLD RH
   Remove the 6 nuts, exhaust manifold RH and gasket.

9. REMOVE A/F SENSOR (BANK 2)
   (a) Disconnect the A/F sensor connector.
   (b) Remove the A/F sensor.
10. REMOVE EXHAUST MANIFOLD LH
Remove the 6 nuts, exhaust manifold LH and gasket.

11. INSTALL EXHAUST MANIFOLD RH
(a) Set a new gasket to the RH cylinder head with the oval shape facing forward.

**NOTICE:**
Be careful of the installation direction.

(b) Install the exhaust manifold with the 6 nuts. Tighten the nuts uniformly in several steps.
**Torque: 21 N·m (214 kgf·cm, 15 ft·lbf)**

12. INSTALL A/F SENSOR (BANK 1)
(a) Install the A/F sensor.
**Torque: 44 N·m (450 kgf·cm, 33 ft·lbf)**

(b) Connect the A/F sensor connector.

13. INSTALL EXHAUST MANIFOLD LH
(a) Set a new gasket to the LH cylinder head with the oval shape facing backward.

**NOTICE:**
Be careful of the installation direction.

(b) Install the exhaust manifold with the 6 nuts. Tighten the nuts uniformly in several steps.
**Torque: 21 N·m (214 kgf·cm, 15 ft·lbf)**

14. INSTALL A/F SENSOR (BANK 2)
(a) Install the A/F sensor.
**Torque: 44 N·m (450 kgf·cm, 33 ft·lbf)**

(b) Connect the A/F sensor connector.

15. INSTALL MANIFOLD STAY
Install the 2 manifold stays with the 6 bolts.
**Torque: 40 N·m (408 kgf·cm, 30 ft·lbf)**
16. INSTALL LH FRONT EXHAUST PIPE
   (a) Install 2 new gaskets to the LH front exhaust pipe.
   (b) Install the LH front exhaust pipe with 2 new nuts.
       Torque: 62 N·m (630 kgf·cm, 46 ft·lbf)
   (c) Install the exhaust pipe support.

17. INSTALL HEATED OXYGEN SENSOR (BANK 2 OXYGEN SENSOR)
   (a) Install the heated oxygen sensor.
       Torque: 44 N·m (450 kgf·cm, 33 ft·lbf)
   (b) Connect the heated oxygen sensor connector.

18. INSTALL RH FRONT EXHAUST PIPE
   (a) Install 2 new gaskets to the RH front exhaust pipe.
   (b) Install the RH front exhaust pipe with 2 new nuts.
       Torque: 62 N·m (630 kgf·cm, 46 ft·lbf)

19. INSTALL HEATED OXYGEN SENSOR (BANK 1 OXYGEN SENSOR)
   (a) Install the heated oxygen sensor.
       Torque: 44 N·m (450 kgf·cm, 33 ft·lbf)
   (b) Connect the heated oxygen sensor connector.

20. CONNECT EXHAUST CENTER PIPE
    (a) Install the 2 bolts.
        Torque: 48 N·m (489 kgf·cm, 35 ft·lbf)
    (b) Install the 2 bolts and springs.
        Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)