

GROUP 17c

EMISSION CONTROL <MFI>

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EVAPORATIVE EMISSION CANISTER AND
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GENERAL DESCRIPTION (CATALYTIC
CONVERTER)..... 17c-19

GENERAL INFORMATION

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The emission control system consists of the following subsystems:

- Positive crankcase ventilation system

- Evaporative emission system
- Exhaust emission control system

SERVICE SPECIFICATIONS

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ITEM	STANDARD VALUE
Emission control system	
EGR valve (Stepper Motor) connector resistance [at 20°C (68°F)] Ω	20 - 24
Evaporative emission purge solenoid coil resistance [at 20°C (68°F)] Ω	22 - 26
Evaporative emission ventilation solenoid coil resistance [at 20°C (68°F)] Ω	17 - 21
Purge flow cm ³ /s (SCFH) [at 80 - 95°C (176 - 205°F) with sudden revving]	20 (2.5)

DIAGNOSIS

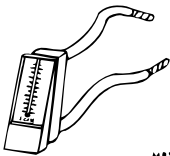
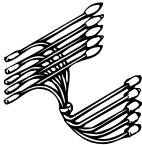
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SYMPTOM	PROBABLE CAUSE	REMEDY
Engine will not start or hard to start	Vacuum hose disconnected or damaged	Repair or replace
	The EGR valve (Stepper Motor) is not closed.	Repair or replace
	Malfunction of the evaporative emission purge solenoid	Repair or replace
Rough idle or engine stalls	The EGR valve (Stepper Motor) is not closed.	Repair or replace
	Vacuum hose disconnected or damaged.	Repair or replace
	Malfunction of the positive crankcase ventilation valve	Replace
	Malfunction of the purge control system	Check the system; If there is a problem, check its component parts.
Engine hesitates or poor acceleration	Malfunction of the exhaust gas recirculation system	Check the system; If there is a problem, check its component parts.
Excessive oil consumption	Positive crankcase ventilation line clogged	Check positive crankcase ventilation system
Poor fuel mileage	Malfunction of the exhaust gas recirculation system	Check the system; If there is a problem, check its component parts.



SPECIAL TOOLS

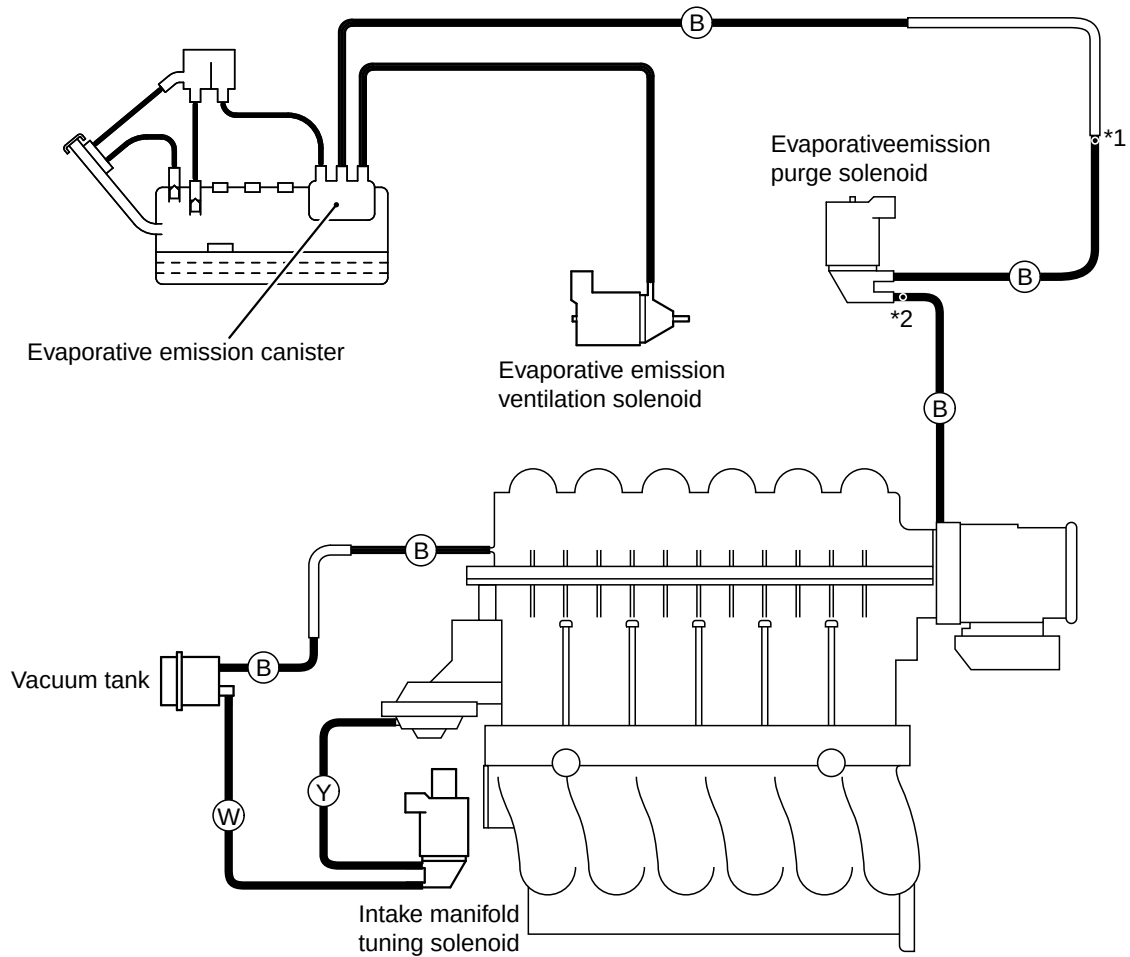
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TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 MB991700	MB995061 Purge flow indicator	MLR6890A Part of MIT280220	Inspection of purge control system
 MB991658	MB991658 Test harness set	Tool not available	Inspection of EGR valve (Stepper Motor)

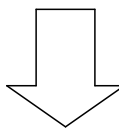
VACUUM HOSES

VACUUM HOSE ROUTING

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B: Black
W: White
Y: Yellow
*1: White paint mark
*2: Red paint mark

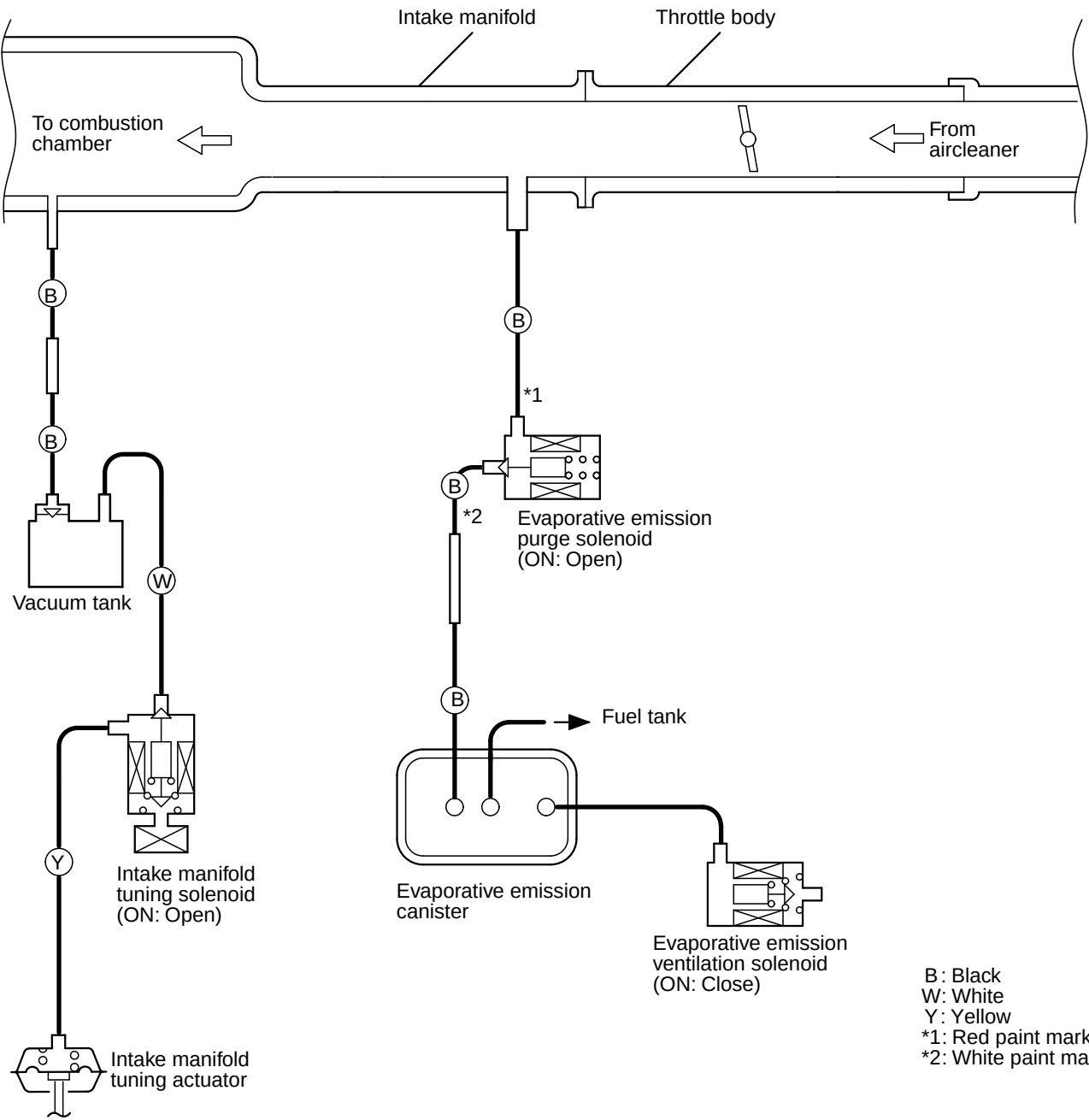


Front

ZK600371AA00

VACUUM CIRCUIT DIAGRAM

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VACUUM HOSE INSTALLATION

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1. When connecting the vacuum hoses, they should be securely inserted onto the nipples.
2. Connect the hoses correctly, using the VACUUM HOSE ROUTING diagram as a guide.

VACUUM HOSE CHECK

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1. Using the VACUUM HOSE ROUTING diagram as a guide, check that the vacuum hoses are correctly connected.
2. Check the connection of the vacuum hoses, (removed, loose, etc.) and confirm that there are no sharp bends or damage.

POSITIVE CRANKCASE VENTILATION SYSTEM

GENERAL INFORMATION (POSITIVE CRANKCASE VENTILATION SYSTEM)

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The positive crankcase ventilation (PCV) system prevents the escape of blow-by gases from inside the crankcase into the atmosphere.

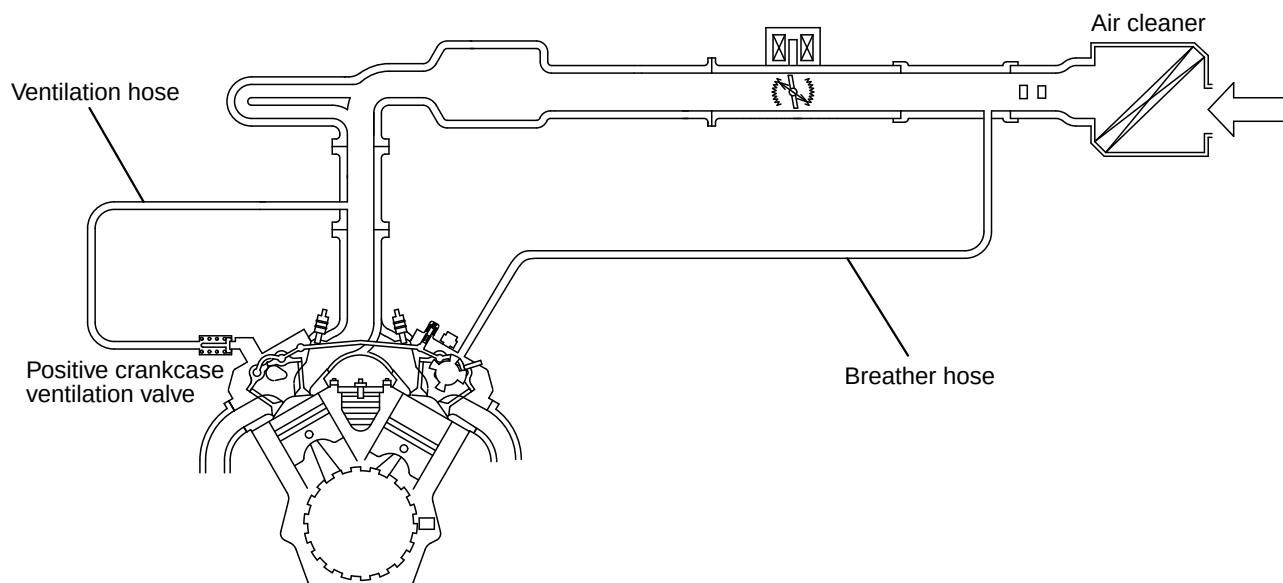
Fresh air is sent from the air cleaner into the crankcase through the breather hose to be mixed with the blow-by gas inside the crankcase.

The blow-by gas inside the crankcase is drawn into the intake manifold through the PCV valve.

The PCV valve is designed to lift the plunger according to the intake manifold vacuum so as to regulate the flow of blow-by gas properly.

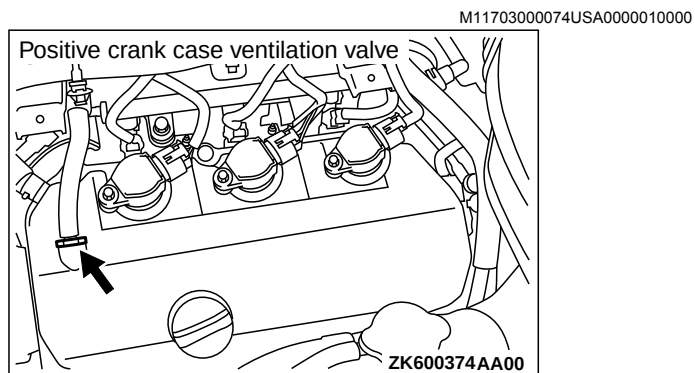
In other words, the blow-by gas flow is regulated during low load engine operation to maintain engine stability, while the flow is increased during high load operation to improve the ventilation performance.

SYSTEM DIAGRAM



ZK600373 AA00

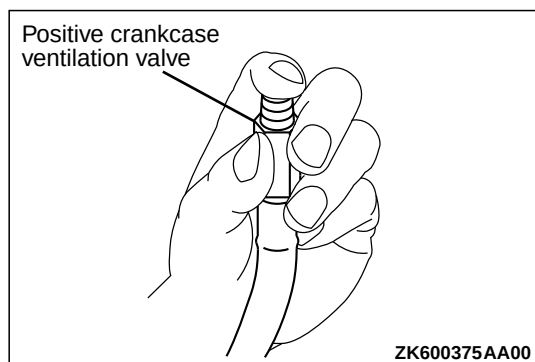
COMPONENT LOCATION

POSITIVE CRANKCASE VENTILATION SYSTEM
CHECK

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1. Remove the positive crankcase ventilation (PCV) valve from the rocker cover, then reconnect the PCV valve to the vacuum supply hose.

POSITIVE CRANKCASE VENTILATION SYSTEM



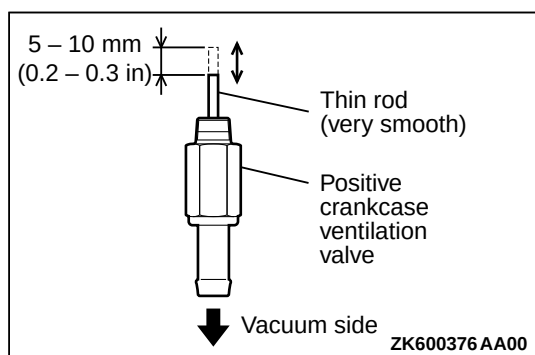
2. With the engine idling, put your finger on the open end of the PCV valve, and check for negative pressure (vacuum).

NOTE: At this time, the plunger in the PCV valve should move back and forth as the open end is covered and uncovered.

3. If negative pressure is not felt, clean or replace the PCV valve. Inspect the vacuum supply hose and vacuum supply hose port for restriction or plugged condition.

POSITIVE CRANKCASE VENTILATION VALVE CHECK

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1. Hold the positive crankcase ventilation (PCV) valve with the vacuum side down. Insert a thin rod, and using light pressure, depress the end of the PCV valve spring by 5 - 10 mm (0.2 - 0.3 inch). Release pressure on the rod to see if the PCV valve spring will lift the rod to its original position.
2. If the rod returns quickly to its original position, the PCV valve is OK. If the stick does not return quickly, clean or replace the PCV valve.

EVAPORATIVE EMISSION CONTROL SYSTEM

GENERAL INFORMATION (EVAPORATIVE EMISSION SYSTEM)

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The evaporative emission (EVAP) system prevents fuel vapors generated in the fuel tank from escaping into the atmosphere.

Fuel vapors from the fuel tank flow through the vapor pipe/hose to be stored temporarily in the EVAP canister.

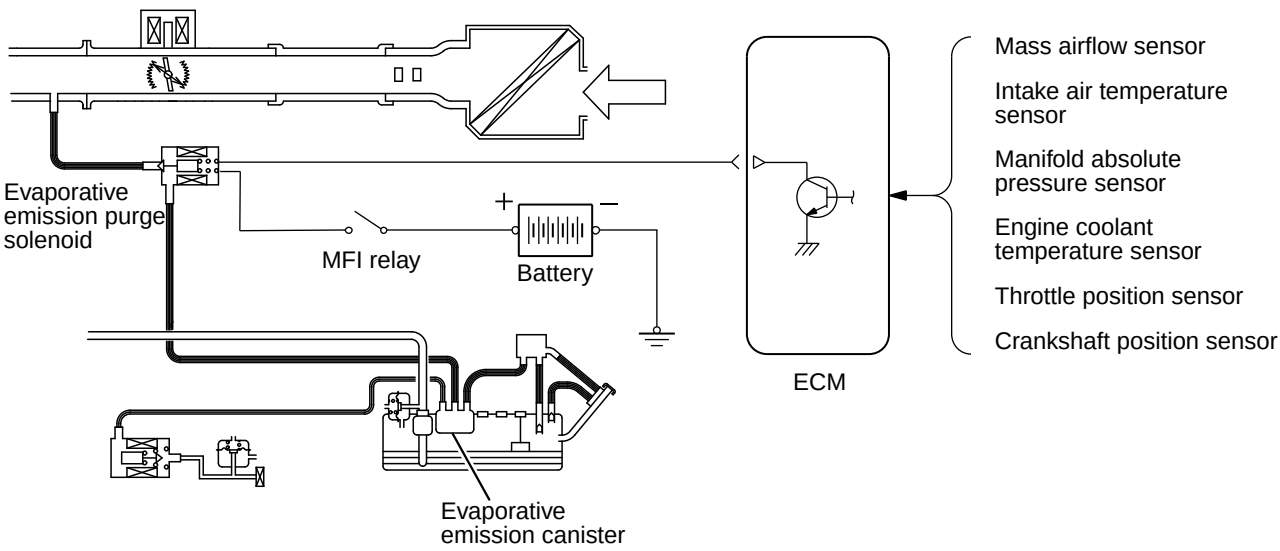
When the vehicle is in operation, fuel vapors stored in the EVAP canister flow through the EVAP purge solenoid, purge port and intake manifold plenum to the combustion chamber.

When the engine coolant temperature is low or when the intake air quantity is small (when the engine is at idle, for example), the engine control module (ECM) brings the EVAP purge solenoid into the OFF state to shut off the fuel vapor flow to the intake manifold plenum. This ensures driveability when the engine is cold or running under low load and also stabilizes the emission level.

An EVAP ventilation solenoid is provided between the EVAP canister and atmosphere to monitor for OBD-II EVAP leaks. This solenoid is normally OFF. However, it turns ON when monitoring the OBD-II EVAP leaks and shuts off the atmosphere flow to the EVAP canister. Then the fuel tank differential pressure sensor monitors the fuel vapor pressure to detect OBD-II EVAP leaks. The fuel overflow limiter valve and the leveling valve prevent fuel from being overfilled. The fuel overflow limiter valve and the leveling valve prevents fuel leaks if the vehicle is rolled over in an accident.

The EVAP ventilation valve releases the air from the fuel tank through the EVAP canister into the atmosphere when the fuel tank pressure increases due to refueling, etc. The EVAP ventilation valve and the air filter supply the atmospheric air to the EVAP canister when the fuel tank pressure decreases.

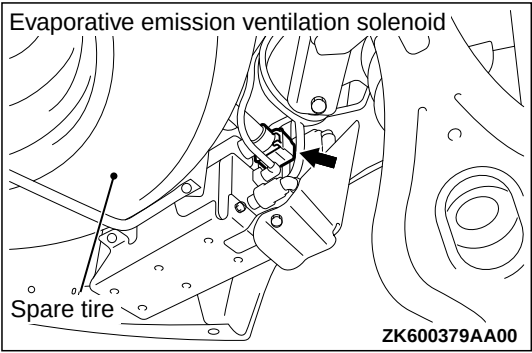
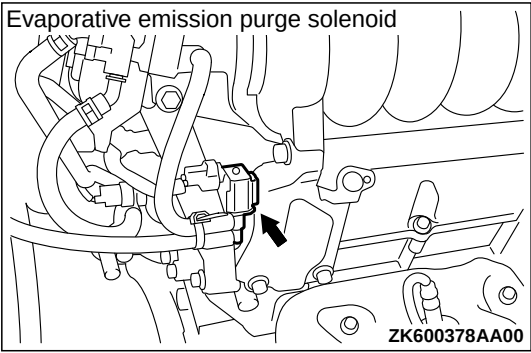
SYSTEM DIAGRAM



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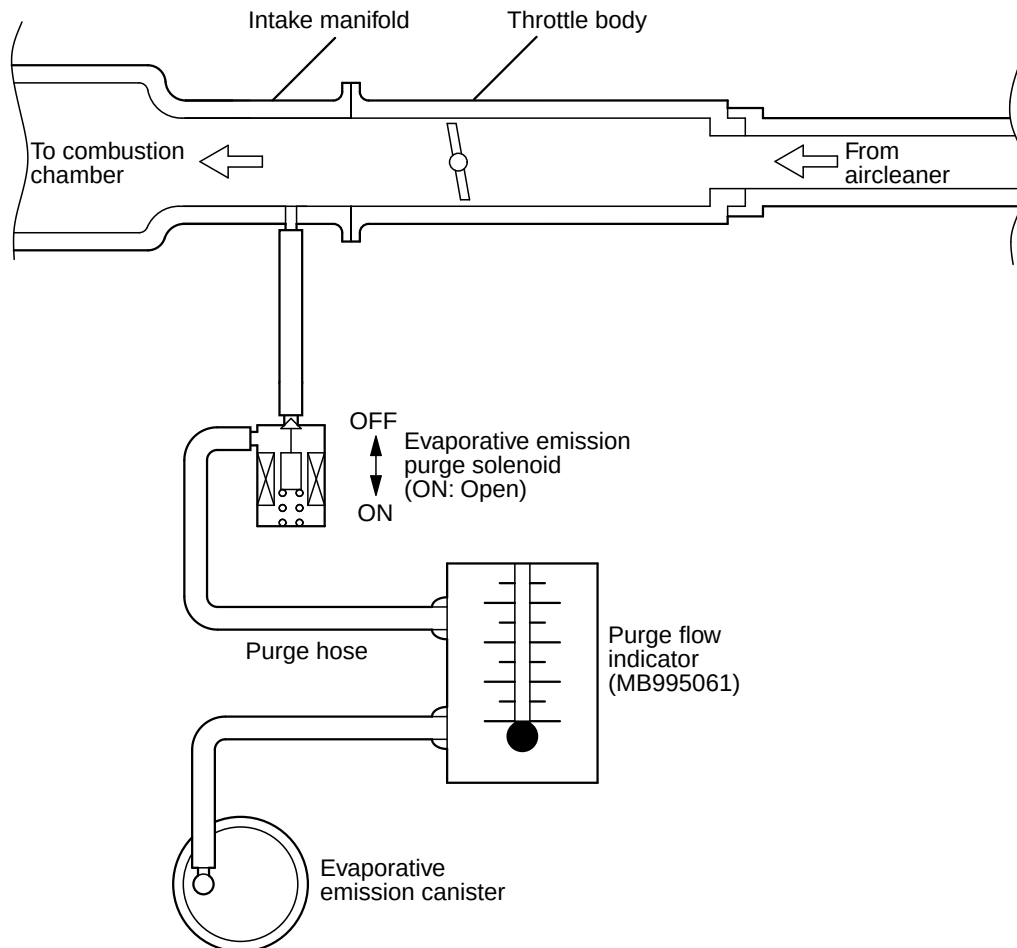
COMPONENT LOCATION

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PURGE CONTROL SYSTEM CHECK (PURGE FLOW CHECK)

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Required Special Tool:

MB995061: Purge Flow Indicator

1. Disconnect the purge hose from the evaporative emission (EVAP) purge solenoid, and connect special tool MB995061 between the EVAP purge solenoid and the purge hose.
2. Before inspection, set the vehicle in the following conditions:
 - Engine coolant temperature: 80 - 95°C (176 - 203°F)
 - Lights, electric cooling fan and accessories: OFF
 - Transaxle: Neutral (P range on vehicles with A/T)

NOTE: Vehicles for Canada, the headlight, taillight, etc. remain lit even when the lighting switch is in "OFF" position but this is no problem for checks.

3. Run the engine at idle for more than four minutes.

4. Check the purge flow volume when engine is revved suddenly several times.

Standard value: Momentarily 20 cm³/s (2.5 SCFH) or more.

5. If the purge flow volume is less than the standard value, check it again with the vacuum hose disconnected from the EVAP canister. If the purge flow volume is less than the standard value, check the vacuum port and the vacuum hose for clogging. Also check the EVAP purge solenoid. If the purge flow volume is at the standard value, replace the EVAP canister.

EVAPORATIVE EMISSION PURGE SOLENOID CHECK

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1. Disconnect the vacuum hose (black, black with red paint mark) from the evaporative emission (EVAP) purge solenoid.

NOTE: When disconnecting the vacuum hose, always place an identification mark so that it can be reconnected at its original position.

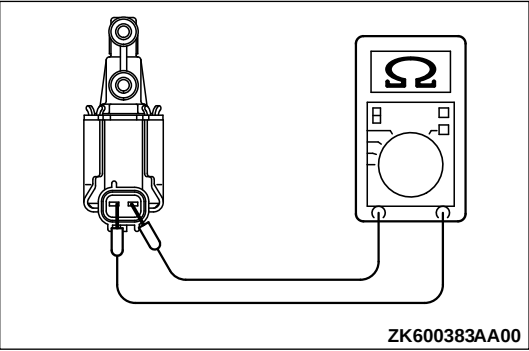
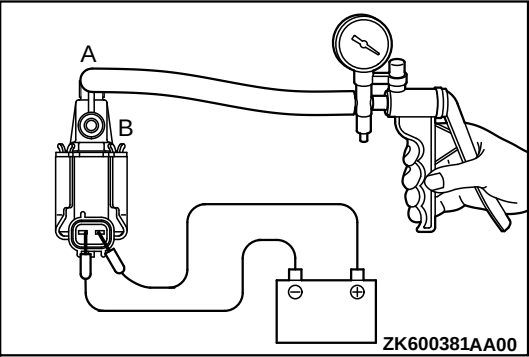
2. Disconnect the harness connector.
3. Connect a hand vacuum pump to nipple (A) of the EVAP purge solenoid (refer to the illustration at left).
4. As described in the chart below, check airtightness by applying a vacuum with voltage applied directly from the battery to the EVAP purge solenoid valve and without applying voltage.

BATTERY VOLTAGE	POSITIVE	NORMAL CONDITION
Applied		Vacuum leaks
Not applied		Vacuum maintained

5. Measure the resistance between the terminals of the EVAP purge solenoid.

Standard value: 22 - 26 ohms [at 20°C (68°F)]

6. Replace the solenoid if resistance is out of specification.



MASS AIRFLOW SENSOR CHECK

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To inspect these parts, refer to GROUP 13A, Multiport Fuel Injection (MFI) - Multiport Fuel Injection (MFI) Diagnosis - Diagnostic Trouble Code Chart P.13Ab-44.

BAROMETRIC PRESSURE SENSOR CHECK

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To inspect the sensor, refer to GROUP 13A, Multiport Fuel Injection (MFI) - Multiport Fuel Injection (MFI) Diagnosis - Diagnostic Trouble Code Chart P.13Ab-44.

ENGINE COOLANT TEMPERATURE SENSOR CHECK

M11703000081USA0000010000

To inspect the sensor, refer to GROUP 13A, Multiport Fuel Injection (MFI) - Multiport Fuel Injection (MFI) Diagnosis - Diagnostic Trouble Code Chart P.13Ab-44.

INTAKE AIR TEMPERATURE SENSOR CHECK

M11703000082USA0000010000

To inspect the sensor, refer to GROUP 13A, Multiport Fuel Injection (MFI) - Multiport Fuel Injection (MFI) Diagnosis - Diagnostic Trouble Code Chart P.13Ab-44.

FUEL TANK DIFFERENTIAL PRESSURE SENSOR CHECK

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To inspect the sensor, refer to GROUP 13B, Fuel Supply - Fuel Tank - Fuel Tank Inspection - Fuel Tank Differential Pressure Sensor Check P.13B-25.

EVAPORATIVE EMISSION VENTILATION SOLENOID CHECK

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Refer to Emission Control - Evaporative Emission Canister and Fuel Tank Pressure Relief Valve - Inspection - Evaporative Emission Ventilation Solenoid Check P.17c-19.

EXHAUST GAS RECIRCULATION (EGR) SYSTEM

GENERAL INFORMATION (EXHAUST GAS RECIRCULATION SYSTEM)

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The exhaust gas recirculation system (EGR) lowers the nitrogen oxides (NOx) emission level. When the air/fuel mixture combustion temperature is high, a large quantity of NOx is generated in the combustion chamber. Therefore, this system recirculates part of exhaust gas from the exhaust port of the cylinder head to the combustion chamber through the intake manifold to decrease the air/fuel mixture combustion temperature, resulting in reduction of NOx. The EGR

flow rate is controlled by the EGR valve (Stepper Motor) for driveability quality.

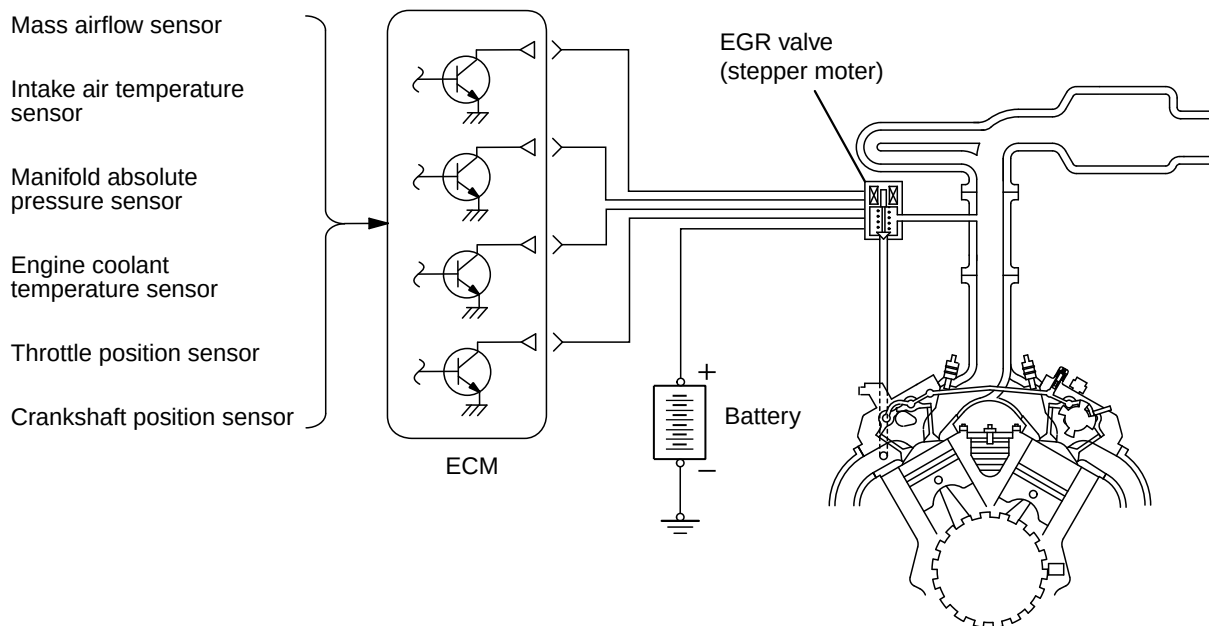
OPERATION

When the engine coolant temperature is low, when the engine is at idle or when a wide open throttle operation is performed, the EGR valve (Stepper Motor) is kept closed, achieving no EGR. After warming up the engine, the EGR valve (Stepper Motor) can be opened by the engine control module (ECM).

The ECM monitors the EGR system and illuminates the Malfunction Indicator Lamp (SERVICE ENGINE

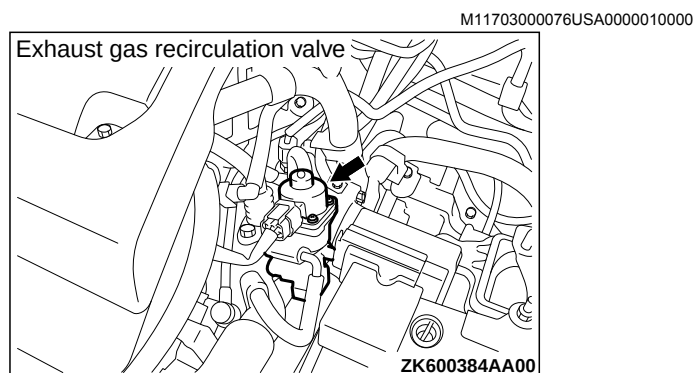
SOON or Check Engine Lamp) to indicate that there is a malfunction.

SYSTEM DIAGRAM



ZK602754AA00

COMPONENT LOCATION



EGR VALVE (STEPPER MOTOR) CHECK

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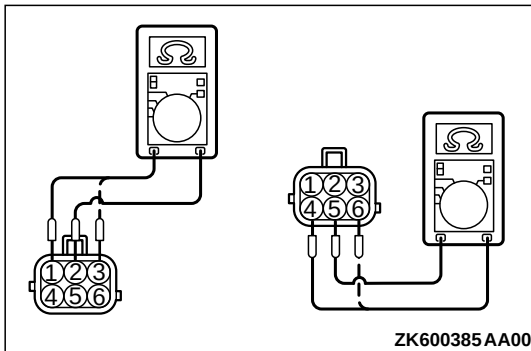
Required Special Tool:

MB991658: Test Harness Set

Checking the Operation Sound

1. Check that the operation sound of the stepper motor can be heard from the EGR valve when the ignition switch is turned ON (without starting the engine).
2. If the operation sound cannot be heard, inspect the drive circuit of the stepper motor.

NOTE: If the operation sound is not heard, and the circuit is normal, either the stepper motor or the ECM or PCM may have failed.



Checking the Coil Resistance

1. Remove the EGR valve.
2. Measure the resistance between terminal No. 2 and either terminal No. 1 or terminal No. 3 of the connector at the EGR valve.

Standard value: 20 - 24 Ω [at 20°C (68°F)]

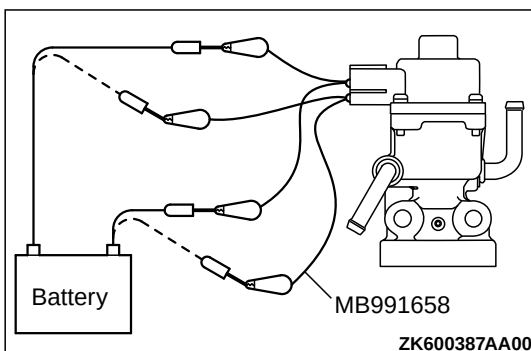
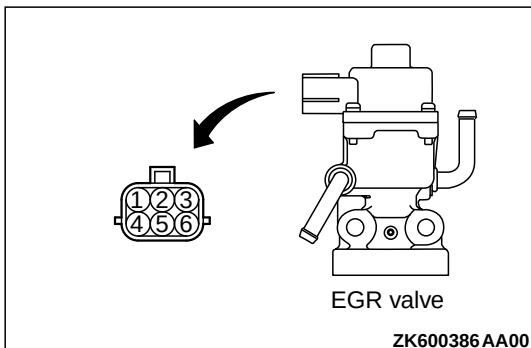
3. If the resistance is not within the standard, replace the EGR valve.
4. Measure the resistance between terminal No. 5 and either terminal No. 6 or terminal No. 4 of the connector at the EGR valve.

Standard value: 20 - 24 Ω [at 20°C (68°F)]

5. If the resistance is not within the standard, replace the EGR valve.

Operation Check

1. Remove the EGR valve.
2. Connect special tool MB991658 to the EGR valve.



3. Connect the battery positive (+) terminal to terminal No. 2.

CAUTION

Connecting battery voltage to the EGR valve for a long time could damage the coil.

4. Connect terminals 1 and 3 to the negative (-) terminal of the battery, in order to test whether the stepper motor vibrates (with a slight shudder), indicating that the stepper motor is operating.

5. Connect the battery positive (+) terminal to terminal No. 5.

CAUTION

Connecting battery voltage to the EGR valve for a long time could damage the coil.

6. Connect terminals 4 and 6 to the negative (-) terminal of the battery, in order to test whether the stepper motor vibrates (with a slight shudder), indicating that the stepper motor is operating.

7. If vibrations can be felt as a result of the test, the stepper motor is determined to be normal.

EGR VALVE (STEPPER MOTOR) CLEANING

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NOTE: DO not use solvents or other cleaning agents, which will enter the motor and cause a malfunction.

Remove the EGR valve and make sure that it is not stuck and does not have any carbon deposits. If there are any carbon deposits, use a wire brush to clean it.

MASS AIRFLOW SENSOR CHECK

M11703000504USA0000010001

To inspect these parts, refer to GROUP 13A, Multiport Fuel Injection (MFI) - Multiport Fuel Injection (MFI) Diagnosis - Diagnostic Trouble Code Chart P.13Ab-44.

ENGINE COOLANT TEMPERATURE SENSOR CHECK

M11703000081USA0000010001

To inspect the sensor, refer to GROUP 13A, Multiport Fuel Injection (MFI) - Multiport Fuel Injection (MFI) Diagnosis - Diagnostic Trouble Code Chart P.13Ab-44.

CRANKSHAFT POSITION SENSOR CHECK

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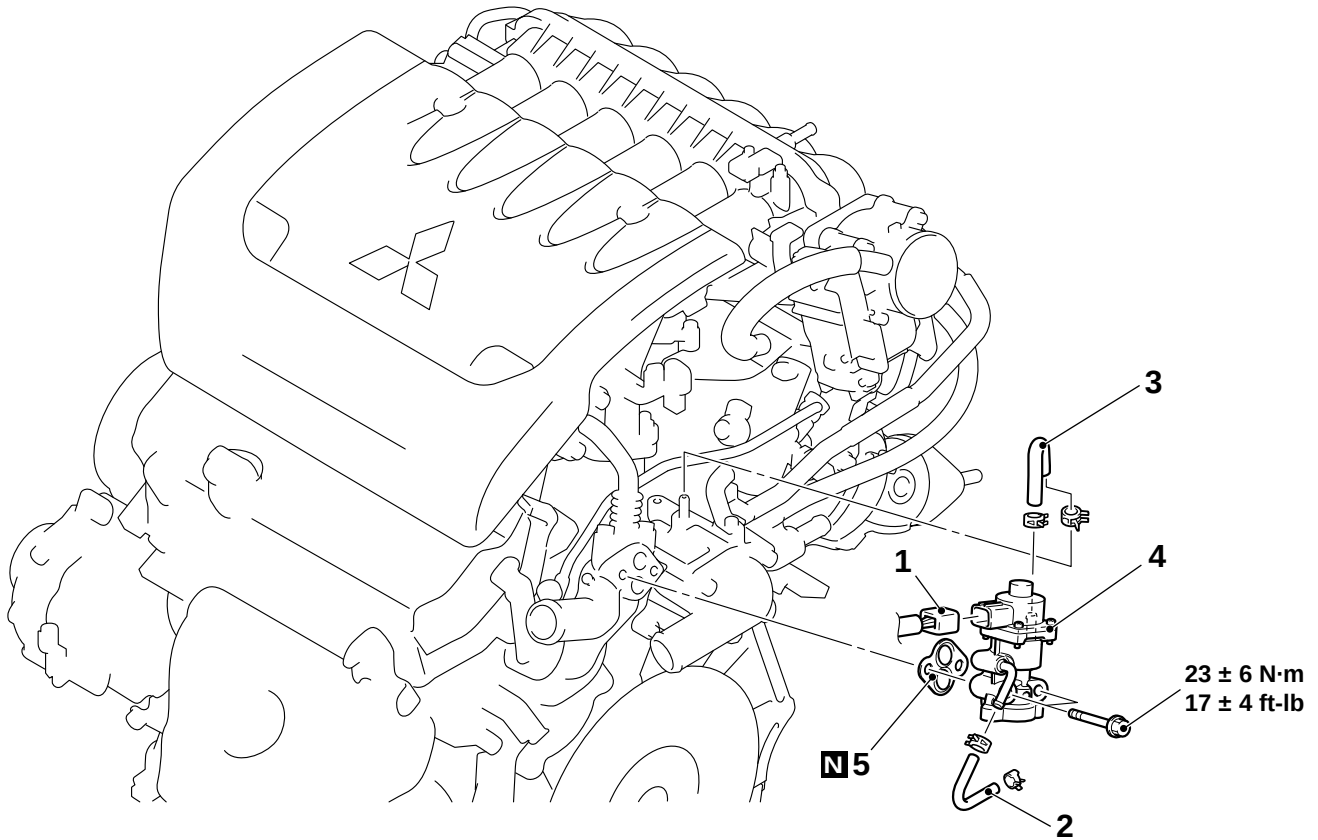
To inspect the sensor, refer to GROUP 13A, Multiport Fuel Injection (MFI) Multiport Fuel Injection (MFI) Diagnosis - Diagnostic Trouble Code Chart P.13Ab-44.

REMOVAL AND INSTALLATION

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Pre-removal and Post-installation Operation

- Engine Coolant Draining and Refilling (Refer to GROUP 14, On-vehicle Service - Engine Coolant Replacement P.14-15).
- Air Cleaner Intake Duct Removal and Installation (Refer to GROUP 15, Air Cleaner P.15-6).



ZC6020680000

Removal steps

1. EGR valve connector
2. Water hose
3. Water hose

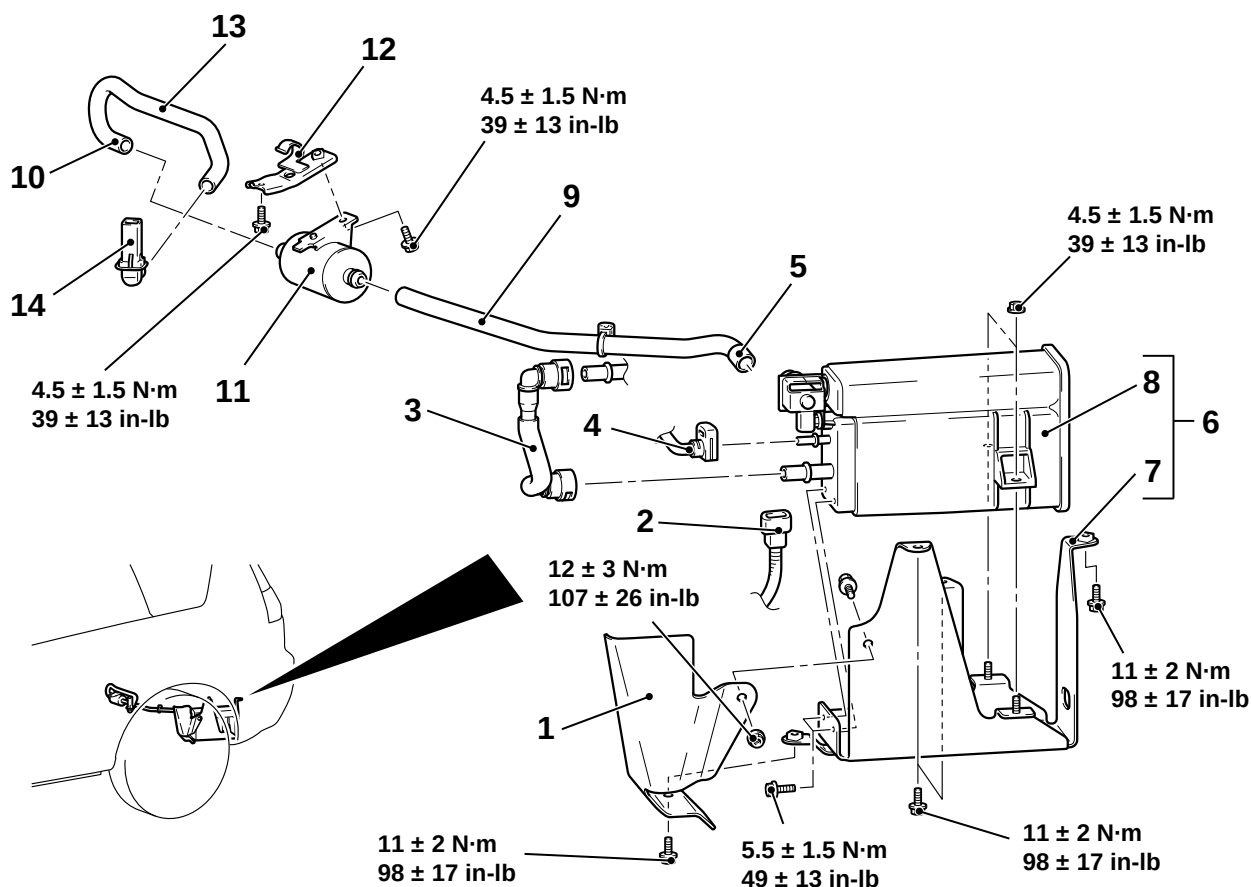
Removal steps

4. EGR valve
5. EGR valve gasket

EVAPORATIVE EMISSION CANISTER AND FUEL TANK PRESSURE RELIEF VALVE

REMOVAL AND INSTALLATION

M11703000048USA0000010000



ZC602420AA00

Removal steps

1. Evaporative emission canister protector
2. Evaporative emission ventilation solenoid connector
3. Fuel vapor tube assembly
4. Fuel purge pipe assembly connection
5. Vent hose A connection
6. Evaporative emission canister and bracket assembly
7. Evaporative emission canister bracket
8. Evaporative emission canister and evaporative emission ventilation solenoid assembly
9. Vent hose A

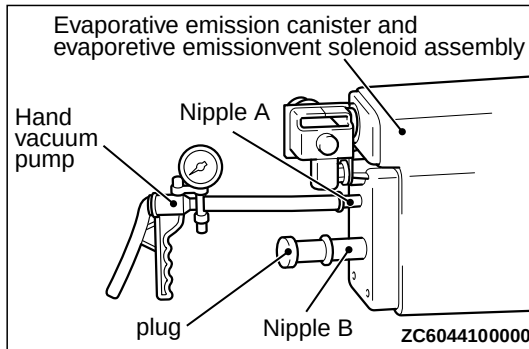
Removal steps

10. Vent hose B connection
11. Air filter
12. Air filter bracket
13. Vent hose B
14. Vent pipe

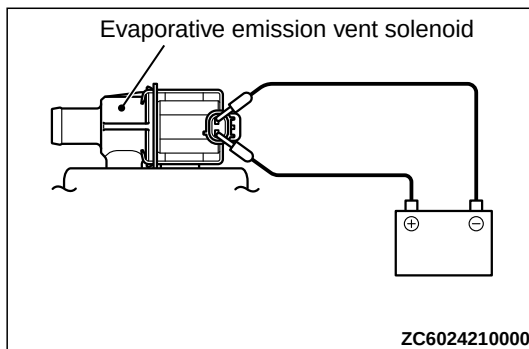
INSPECTION

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EVAPORATIVE EMISSION VENTILATION SOLENOID CHECK

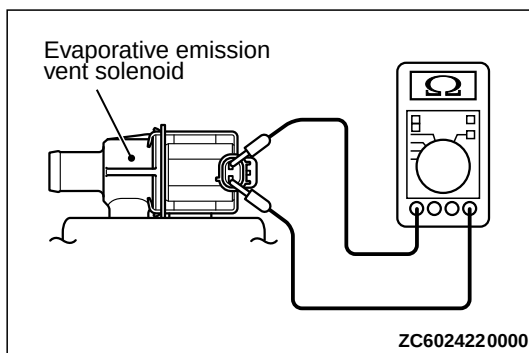


1. Connect a hand vacuum pump to nipple (A) of the evaporative emission canister and evaporative emission ventilation solenoid assembly.
2. Connect a plug to nipple (B) of the evaporative emission canister and evaporative emission ventilation solenoid assembly.



3. Check air tightness by applying a vacuum with voltage applied directly from the battery to the evaporative emission ventilation solenoid and without applying voltage.

Battery voltage	Normal condition
Applied	Vacuum maintained
Not applied	Vacuum leaks



4. Measure the resistance between the terminals of the solenoid.
Standard value: 17 - 21 Ω [at 20°C (68°F)]

CATALYTIC CONVERTER

GENERAL DESCRIPTION (CATALYTIC CONVERTER)

M11703000053USA0000010000

The three way catalytic converter, together with the closed loop air-fuel ratio control based on the oxygen sensor signal, oxidizes carbon monoxides (CO) and hydrocarbons (HC), also reduces nitrogen oxides (NOx).

When the mixture is controlled at stoichiometric air-fuel ratio, the three way catalytic converter provides

the highest purification against the three constituents, namely, CO, HC and NOx.

MEMO