

# ENGINE AND EMISSION CONTROL

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# ENGINE CONTROL SYSTEM

## GENERAL INFORMATION

A cable-type accelerator mechanism and a suspended-type pedal have been adopted.

## SERVICE SPECIFICATIONS

Items	Standard value
Accelerator cable play mm	1 - 2
Engine idle speed r/min	850 ± 50

## ON-VEHICLE SERVICE

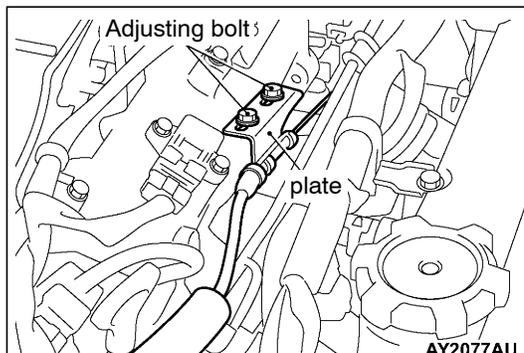
### ACCELERATOR CABLE CHECK AND ADJUSTMENT

1. Turn A/C and lamps OFF.  
Inspect and adjust at no load.
2. Warm engine until stabilized at idle.
3. Confirm idle speed is at prescribed value.

**Standard value: 850 ± 50 r/min**

4. Stop engine (ignition switch OFF).
5. Confirm there are no sharp bends in accelerator cable.
6. Check inner cable for correct slack.

**Standard value: 1 - 2 mm**



7. If there is too much slack or no slack, adjust play by the following procedures.
  - (1) Loosen the adjusting bolt to release the cable.
  - (2) Move the plate until the inner cable play is at the standard value, and then tighten the adjusting bolt to the specified torque.

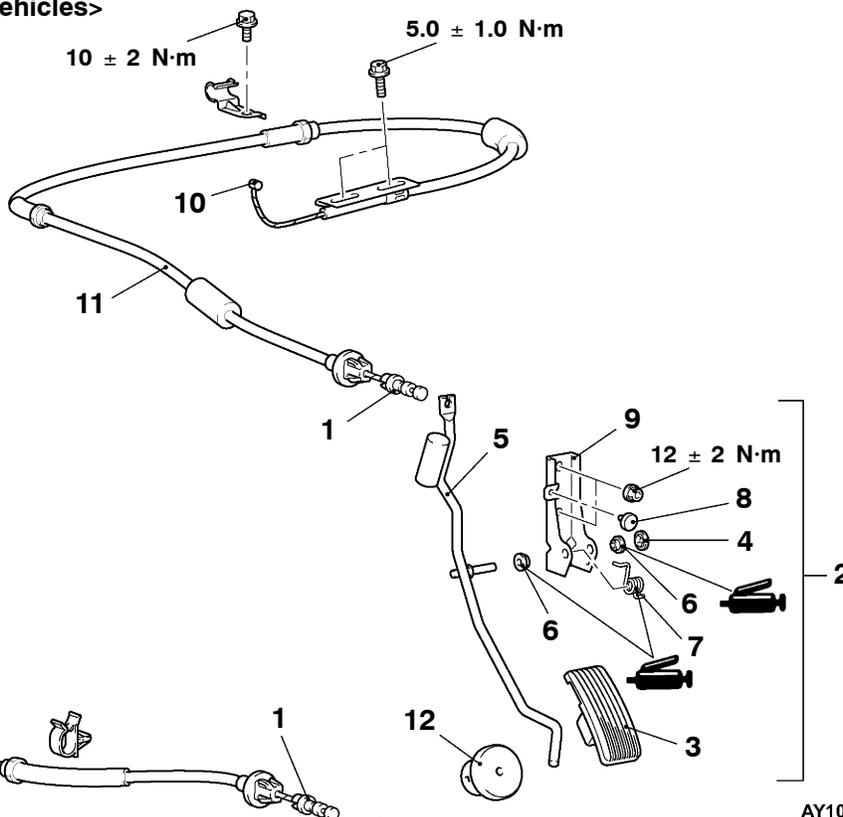
**Tightening torque: 5.0 ± 1.0 N·m**

# ACCELERATOR CABLE AND PEDAL

## REMOVAL AND INSTALLATION

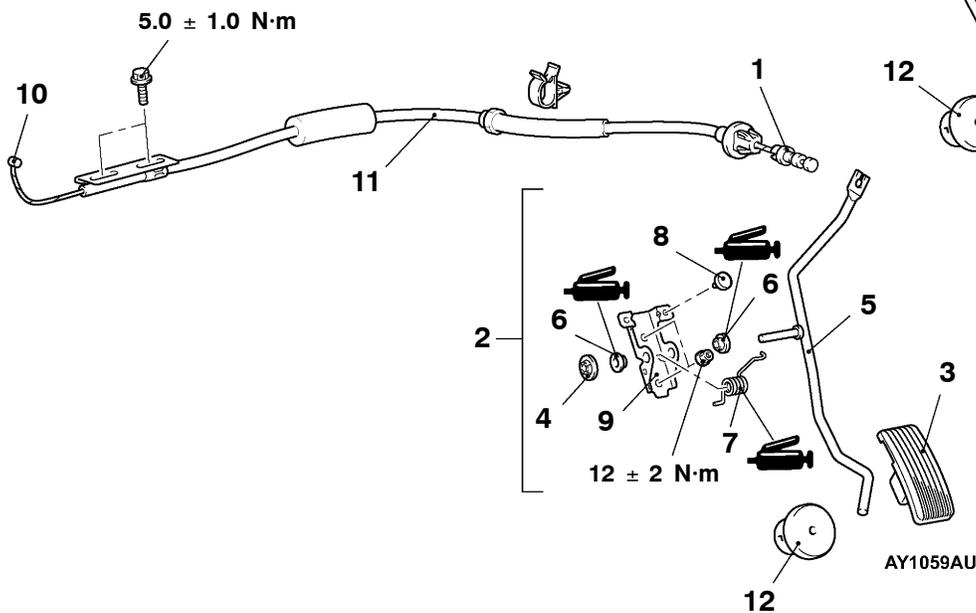
**Post-installation Operation**  
Accelerator Cable Adjustment (Refer to P.17-2.)

<L.H. drive vehicles>



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<R.H. drive vehicles>



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### Accelerator pedal removal steps

1. Accelerator cable assembly connection (Accelerator pedal side)
2. Accelerator pedal assembly
3. Pedal pad
4. Push-on spring nut
5. Accelerator arm assembly
6. Bushing
7. Spring
8. Stopper
9. Accelerator pedal bracket

### Accelerator cable removal steps

1. Accelerator cable assembly (Accelerator pedal side)
10. Accelerator cable assembly connection (Throttle body side)
11. Accelerator cable assembly

### Accelerator pedal stopper removal

12. Accelerator pedal stopper

# EMISSION CONTROL SYSTEM

## GENERAL INFORMATION

The emission control system consists of the following subsystems:

- Crankcase emission control system
- Evaporative emission control system
- Exhaust emission control system

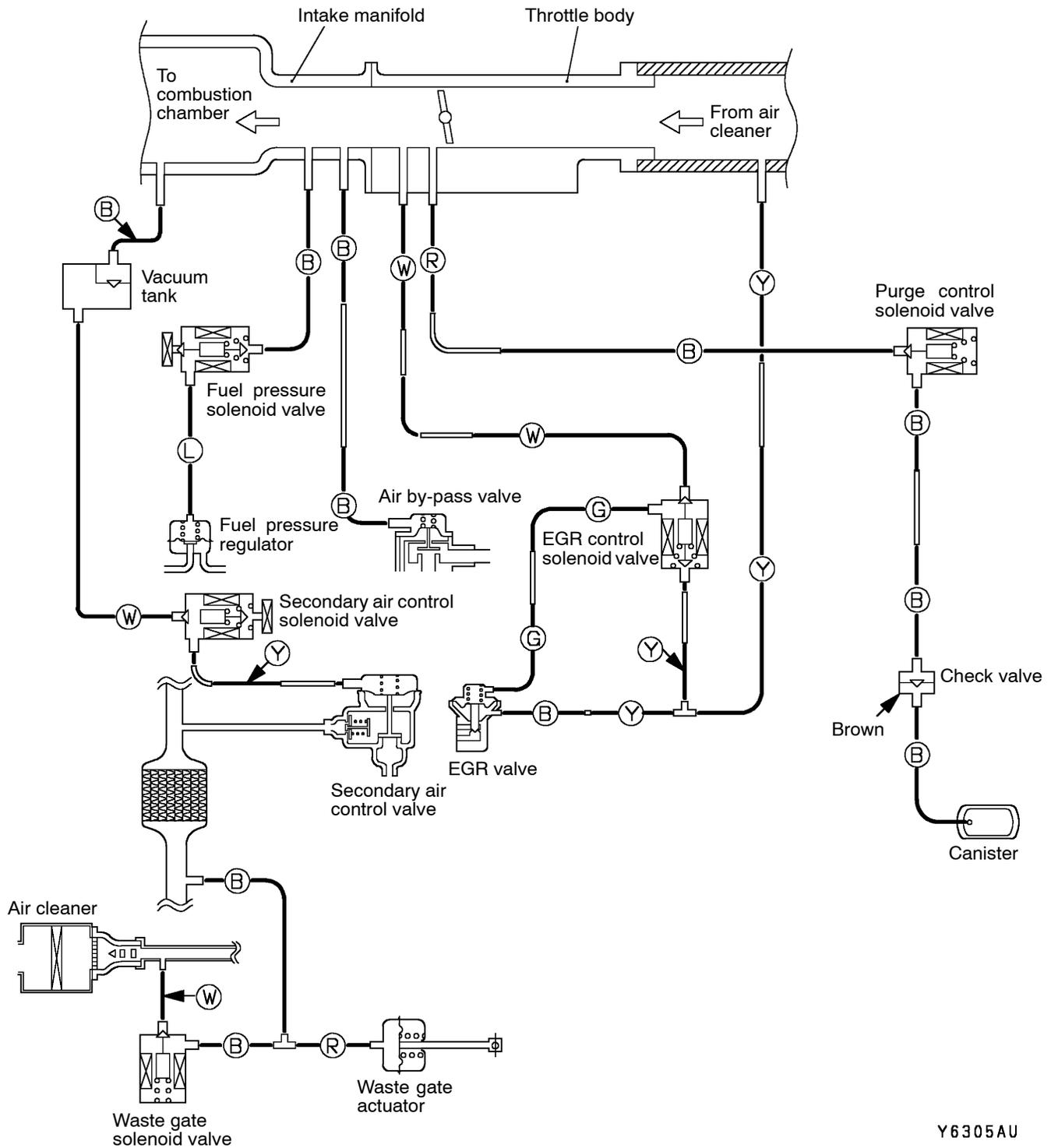
Items	Name	Specification
Crankcase emission control system	Positive crankcase ventilation (PCV) valve	Variable flow type (Purpose: HC reduction)
Evaporative emission control system	Canister Purge control solenoid valve Check valve	Equipped Duty cycle type solenoid valve Equipped (Purpose: HC reduction)
Exhaust emission control system	Air-fuel ratio control device - MPI system	Oxygen sensor feedback type (Purpose: CO, HC, NOx reduction)
	Exhaust gas recirculation system <ul style="list-style-type: none"> <li>• EGR valve</li> <li>• EGR control solenoid valve</li> </ul>	Equipped Single type Duty cycle type solenoid valve (Purpose: NOx reduction)
	Catalytic converter	Monolith type (Purpose: CO, HC, NOx reduction)

## EMISSION CONTROL DEVICE REFERENCE TABLE

Related parts	Crankcase emission control system	Evaporative emission control system	Air/fuel ratio control system	Catalytic converter	Exhaust gas recirculation system	Reference page
PCV valve	×					17-9
Purge control solenoid valve		×				17-12
Check valve		×				17-12
MPI system component		×	×			GROUP 13A
Catalytic converter				×		17-19
EGR valve					×	17-15
EGR control solenoid valve					×	17-16



VACUUM CIRCUIT DIAGRAM



Y6305AU

**Vacuum hose colour**

- B: Black
- G: Green
- L: Light blue
- R: Red
- W: White
- Y: Yellow

**VACUUM HOSE CHECK**

1. Using the piping diagram as a guide, check to be sure that the vacuum hoses are correctly connected.
2. Check the connection condition of the vacuum hoses, (removed, loose, etc.) and check to be sure that there are no bends or damage.

**VACUUM HOSE INSTALLATION**

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

## CRANKCASE EMISSION CONTROL SYSTEM

### GENERAL INFORMATION

The crankcase emission control system prevents blow-by gases from escaping inside the crankcase into the atmosphere.

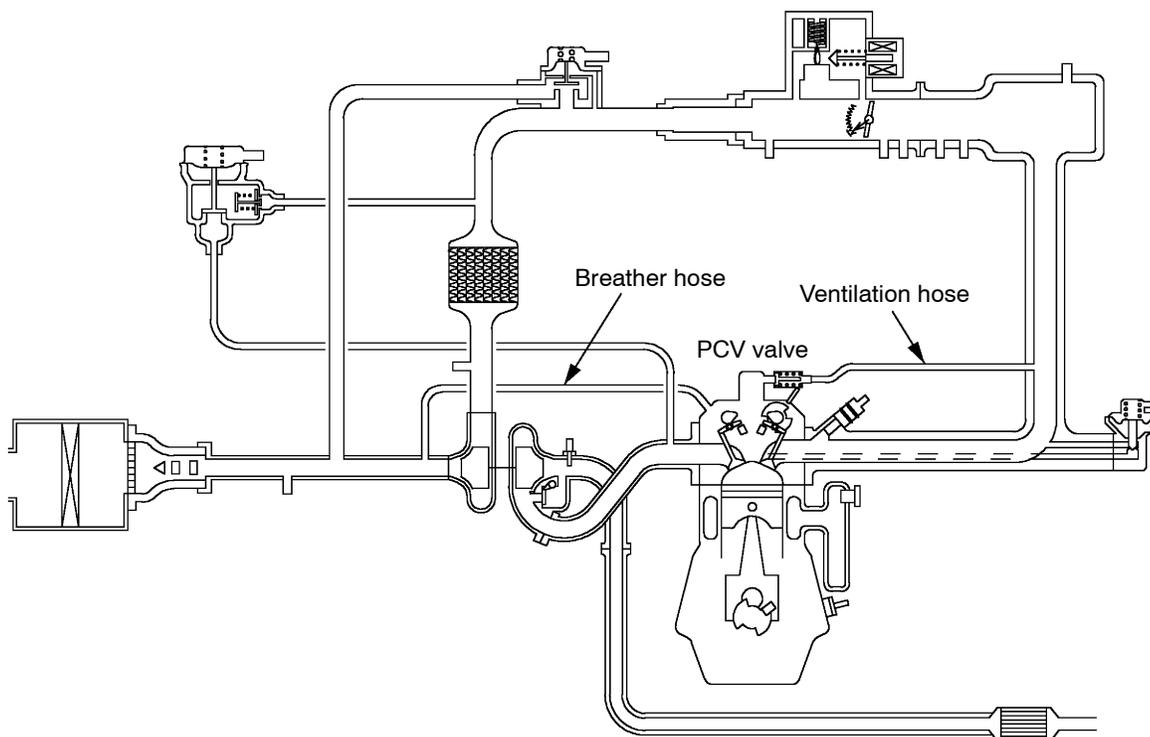
Fresh air is sent from the air cleaner into the crankcase through the breather hose. The air becomes mixed with the blow-by gases inside the crankcase.

The blow-by gas inside the crankcase is drawn into the intake manifold through the positive

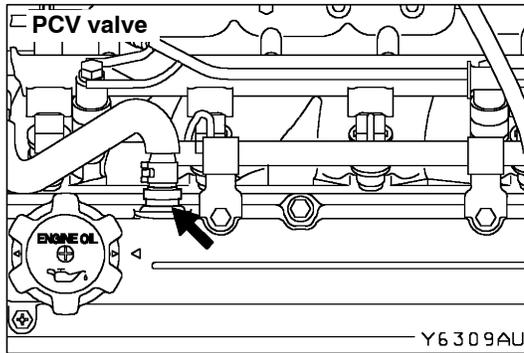
crankcase ventilation (PCV) valve.

The PCV valve lifts 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.

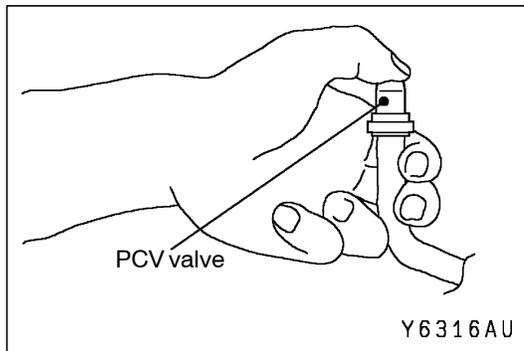
### SYSTEM DIAGRAM



Y6303AU

**COMPONENT LOCATION****POSITIVE CRANKCASE VENTILATION SYSTEM CHECK**

1. Remove the ventilation hose from the PCV valve.
2. Remove the PCV valve from the rocker cover.
3. Reinstall the PCV valve at the ventilation hose.
4. Start the engine and run at idle.

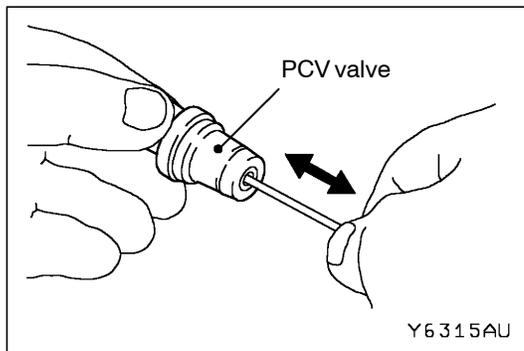


5. Place a finger at the opening of the PCV valve and check that vacuum of the intake manifold is felt.

**NOTE**

At this moment, the plunger in the PCV valve moves back and forth.

6. If vacuum is not felt, clean the PCV valve or replace it.

**PCV VALVE CHECK**

1. Insert a thin rod into the PCV valve from the side shown in the illustration (rocker cover installation side), and move the rod back and forth to check that the plunger moves.
2. If the plunger does not move, there is a clogging in the PCV valve. In this case, clean or replace the PCV valve.

## EVAPORATIVE EMISSION CONTROL SYSTEM

### GENERAL INFORMATION

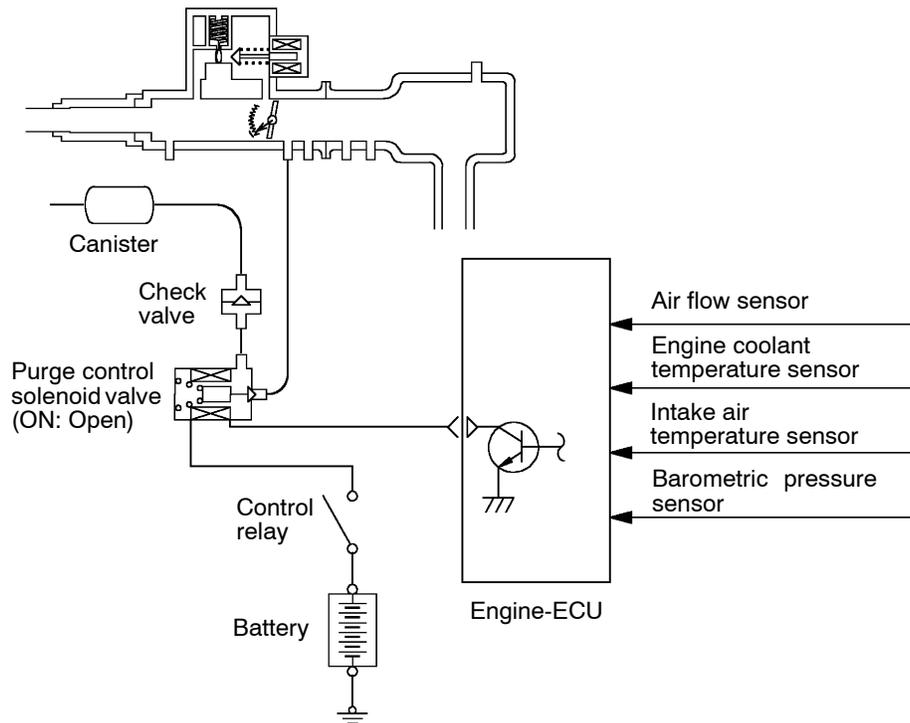
The evaporative emission control system prevents fuel vapours generated in the fuel tank from escaping into the atmosphere.

Fuel vapours from the fuel tank flow through the fuel tank pressure control valve and vapour pipe/hose to be stored temporarily in the canister. When driving the vehicle, fuel vapours stored in the canister flow through the purge solenoid and purge port and go into the intake manifold to be sent 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 unit turns the purge solenoid off to shut off the fuel vapour flow to the intake manifold.

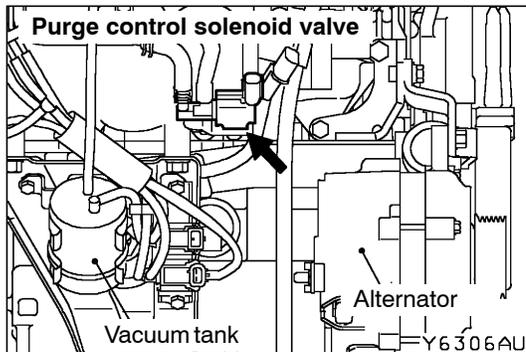
This does not only insure the driveability when the engine is cold or running under low load but also stabilize the emission level.

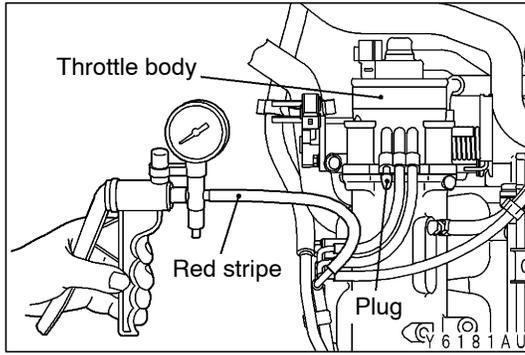
### SYSTEM DIAGRAM



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### COMPONENT LOCATION





**PURGE CONTROL SYSTEM CHECK**

1. Disconnect the vacuum hose (red stripe) from throttle body and connect it to a hand vacuum pump.
2. Plug the nipple from which the vacuum hose was removed.
3. When the engine is cold or hot, apply a vacuum of 53 kPa, and check the condition of the vacuum.

**When engine is cold**

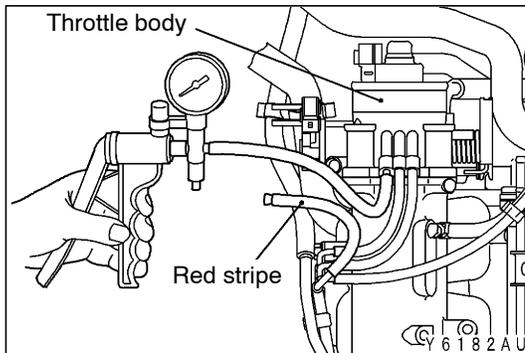
**(Engine coolant temperature: 40°C or less)**

Engine condition	Normal condition
At idle	Vacuum is maintained
3,000 r/min	

**When engine is hot**

**(Engine coolant temperature: 80°C or higher)**

Engine condition	Normal condition
At idle	Vacuum is maintained
3,000 r/min (within 3 minutes after engine starts)	Vacuum will leak.

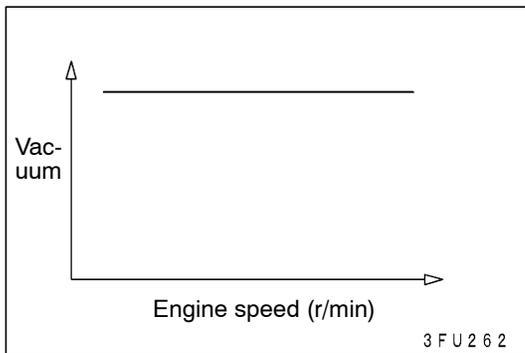


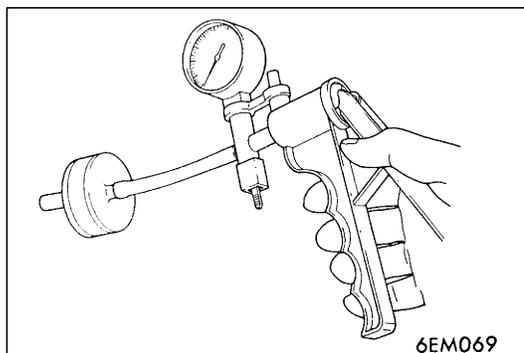
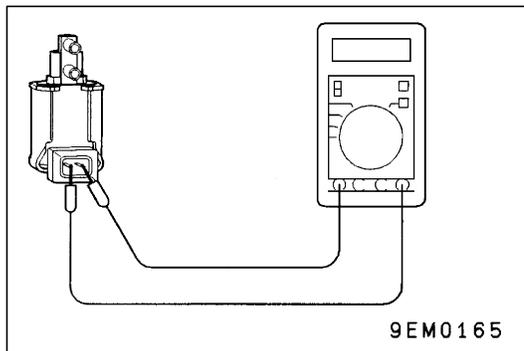
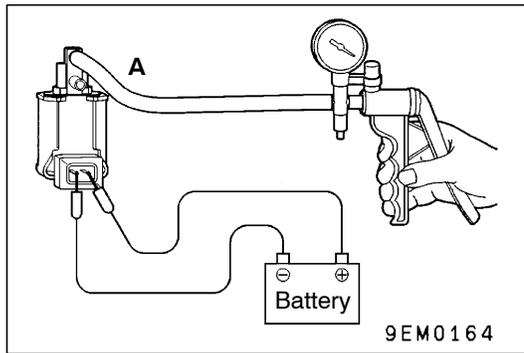
**PURGE PORT VACUUM CHECK**

1. Disconnect the vacuum hose (red stripe) from the throttle body purge vacuum nipple and connect a hand vacuum pump to the nipple.
2. Confirm that the vacuum is approximately constant regardless of the engine rotation speed.

**NOTE**

If vacuum changes, it is possible that the throttle body purge port maybe clogged and require cleaning.





## PURGE CONTROL SOLENOID VALVE CHECK

### NOTE

When disconnecting the vacuum hose, always make a mark so that it can be reconnected at original position.

1. Disconnect the vacuum hose from the solenoid valve.
2. Disconnect the harness connector.
3. Connect a hand vacuum pump to nipple (A) of the solenoid valve (refer to the illustration at left).
4. Check airtightness by applying a vacuum with voltage applied directly from the battery to the purge control solenoid valve and without applying voltage.

Battery voltage	Normal condition
Applied	Vacuum leaks
Not applied	Vacuum maintained

5. Measure the resistance between the terminals of the solenoid valve.

**Standard value: 30 - 34  $\Omega$  (at 20°C)**

## CHECK VALVE CHECK

Connect a hand vacuum pump to the check valve, apply vacuum and check the airtightness.

Connected nipple colour	Normal condition
Black	Vacuum leaks
Brown	Vacuum is maintained

## EXHAUST GAS RECIRCULATION (EGR) SYSTEM

### GENERAL INFORMATION

The exhaust gas recirculation (EGR) system lowers the nitrogen oxide (NO<sub>x</sub>) emission level. When the air/fuel mixture combustion temperature is high, a large quantity of nitrogen oxides (NO<sub>x</sub>) is generated in the combustion chamber. Therefore, this system recirculates part of emission 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 NO<sub>x</sub>.

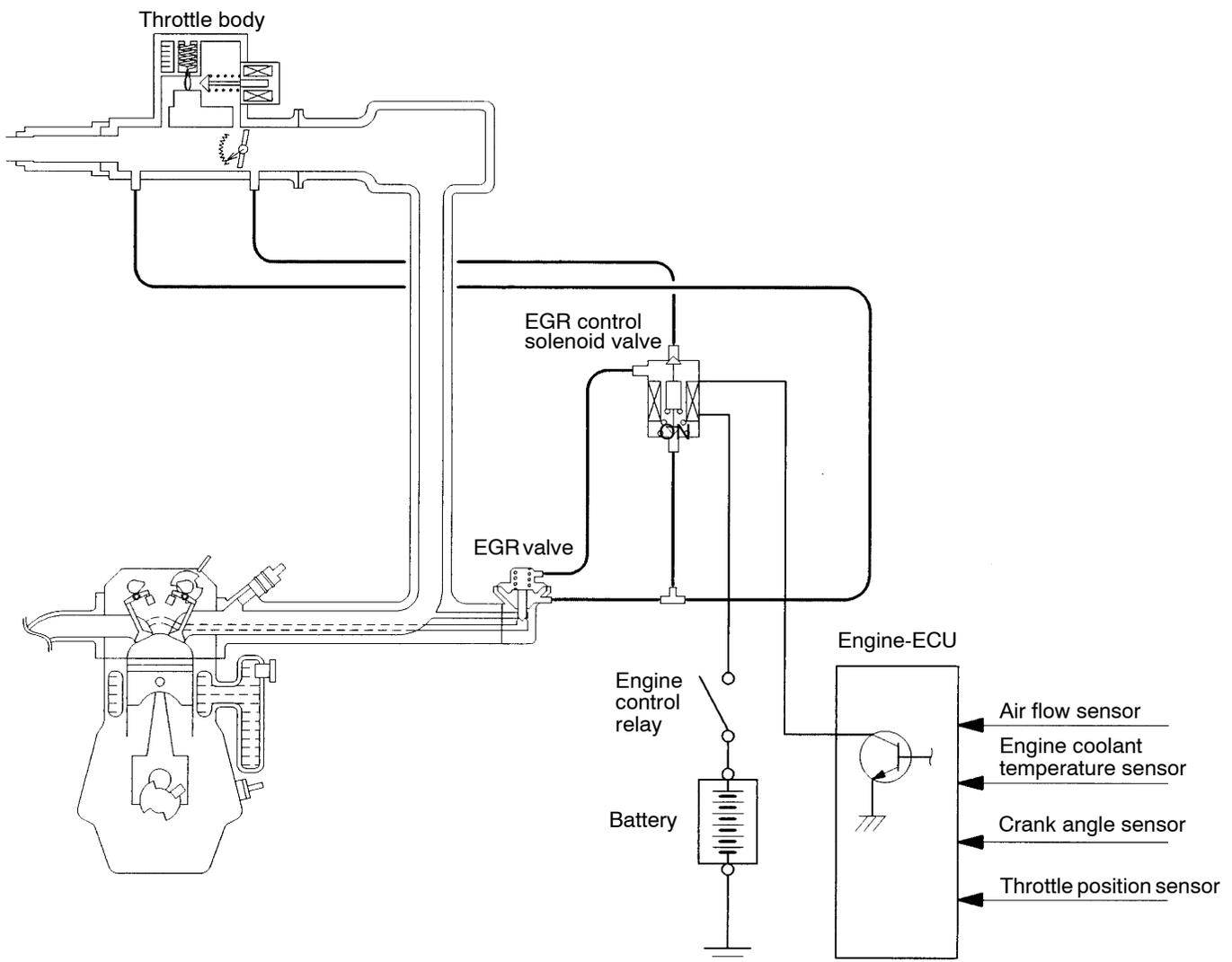
The EGR flow rate is controlled by the EGR valve so as not to decrease the driveability.

### OPERATION

The EGR valve is being closed and does not recirculate exhaust gases under one of the following conditions. Otherwise, the EGR valve is opened and recirculates exhaust gases.

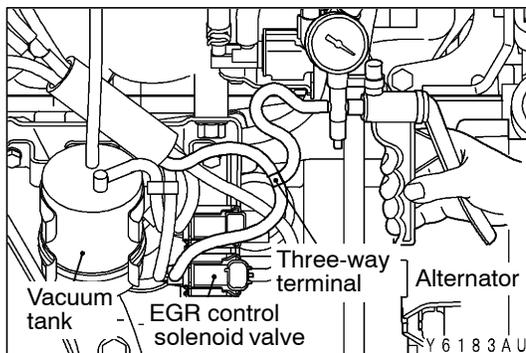
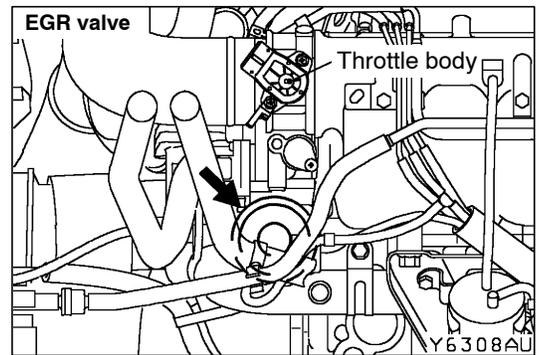
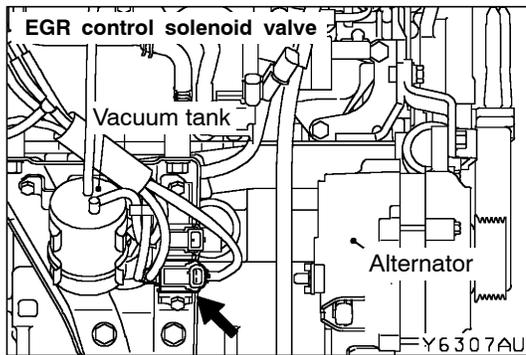
- The engine coolant temperature is low.
- The engine is at idle.
- The throttle valve is widely opened.

### SYSTEM DIAGRAM



V6029AE

## COMPONENT LOCATION



## EXHAUST GAS RECIRCULATION (EGR) CONTROL SYSTEM CHECK

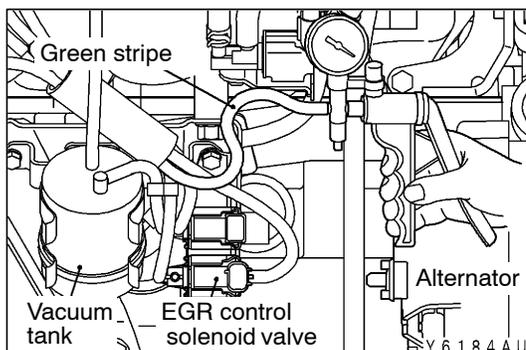
1. Disconnect the vacuum hose (green stripe) from the EGR control solenoid valve, and then connect a hand vacuum pump via the three-way terminal.
2. When the engine is hot or cold, check the condition of vacuum by racing the engine.

**When engine is cold****(Engine coolant temperature: 20°C or less)**

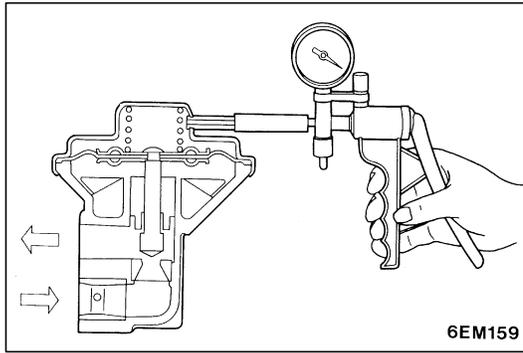
Throttle valve	Normal vacuum condition
Open quickly	No vacuum will generate (the same as barometric pressure.)

**When engine is hot****(Engine coolant temperature: 80°C or higher)**

Throttle valve	Normal vacuum condition
Open quickly	It will momentarily rise over 13 kPa



3. Disconnect the three-way terminal.
4. Connect the hand vacuum pump to the vacuum hose (green stripe).
5. Check whether the engine stalls or the idling is unstable when a vacuum of 27 kPa or higher is applied during idling.



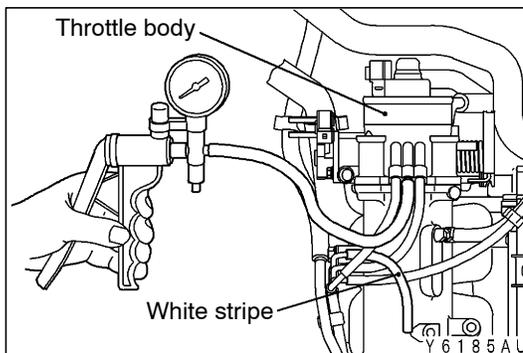
### EGR VALVE CHECK

1. Remove the EGR valve and inspect for sticking, carbon deposits, etc. If found, clean with a suitable solvent so that the valve seats correctly.
2. Connect a hand vacuum pump to the EGR valve.
3. Apply 67 kPa of vacuum, and check that the vacuum is maintained.
4. Apply a vacuum and check the passage of air by blowing through one side of the EGR passage.

Vacuum	Passage of air
5.3 kPa or less	Air is not blown out
27 kPa or more	Air is blown out

5. Replace the gasket, and tighten to the specified torque.

**Tightening torque:  $20 \pm 2$  N·m**



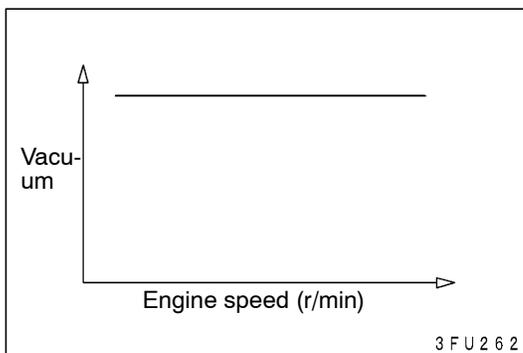
### EGR PORT VACUUM CHECK

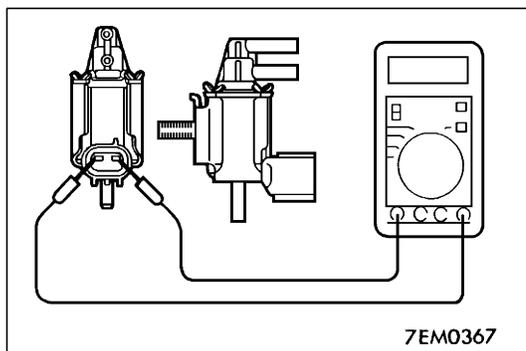
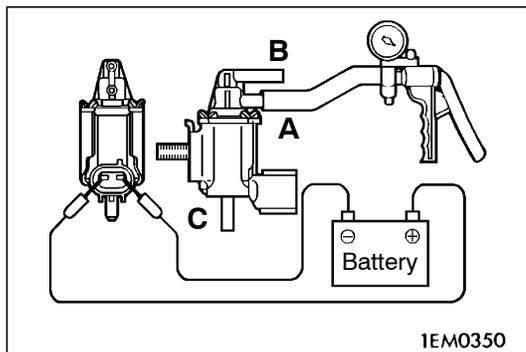
1. Disconnect the vacuum hose (White stripe) from the throttle body EGR vacuum nipple and connect a hand vacuum pump to the nipple.

2. Start the engine and check vacuum remains fairly constant after racing the engine.

#### NOTE

If the vacuum fluctuates, the throttle body EGR port may be clogged and need cleaning.





## EGR CONTROL SOLENOID VALVE CHECK

### NOTE

When disconnecting the vacuum hose, always make a mark so that it can be reconnected at original position.

1. Disconnect the vacuum hose (yellow stripe, green stripe, white stripe) from the solenoid valve.
2. Disconnect the harness connector.
3. Connect a hand vacuum pump to the nipple to which the green-striped vacuum hose was connected.
4. Check airtightness by applying a vacuum with voltage applied directly from the battery to the EGR control solenoid valve and without applying voltage.

Battery voltage	B nipple condition	Normal condition
Not applied	Open	Vacuum maintained
Applied	Open	Vacuum leaks
	Closed	Vacuum maintained

5. Measure the resistance between the terminals of the solenoid valve.

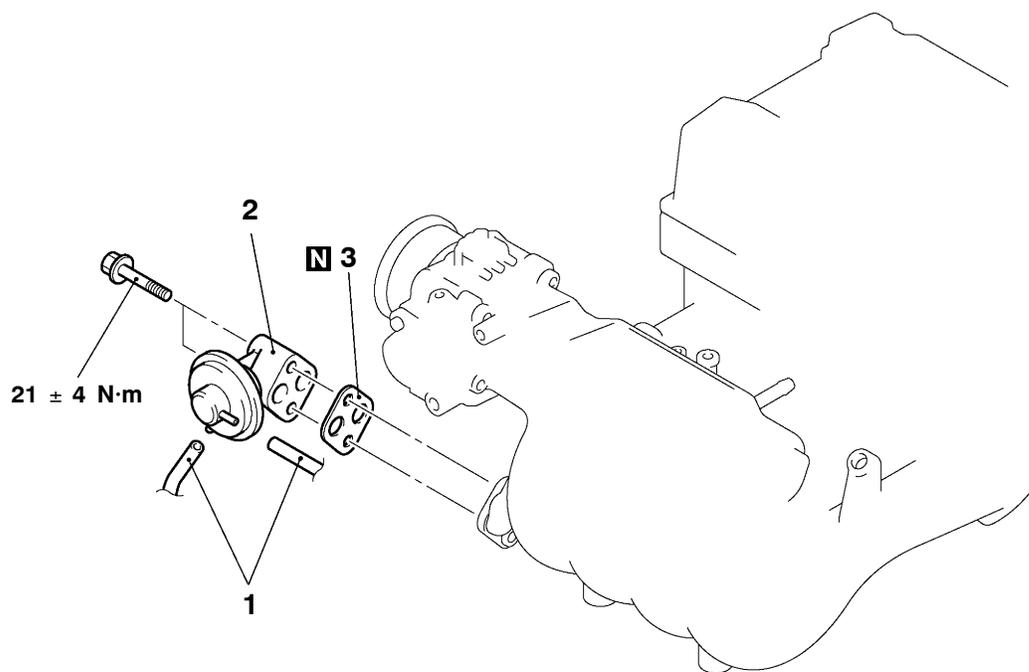
**Standard value: 29 - 35  $\Omega$  (at 20°C)**

## EGR VALVE

### REMOVAL AND INSTALLATION

**Pre-removal and Post-installation Operation**

Air Hose E Removal and Installation  
(Refer to GROUP 15 - Inter Cooler.)



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**Removal steps**

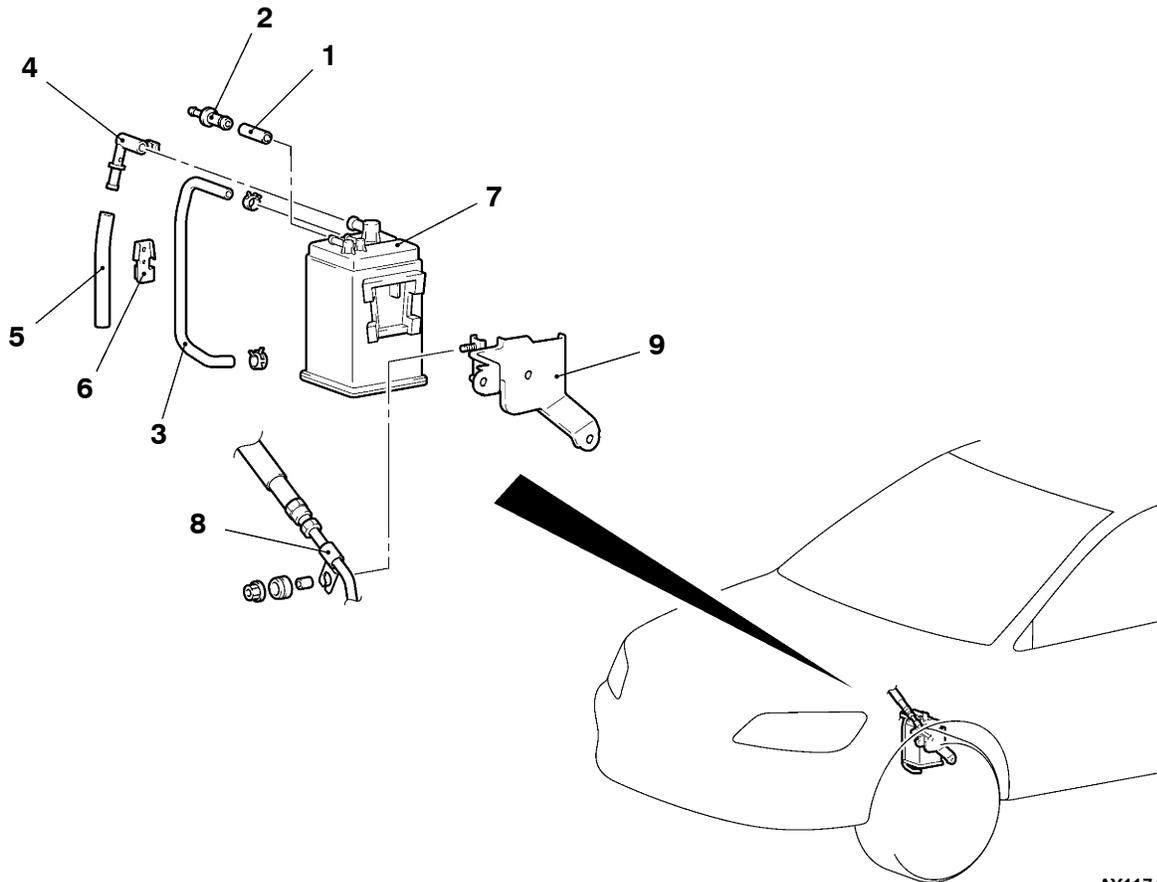
1. Vacuum hose connection
2. EGR valve
3. EGR valve gasket

## CANISTER

### REMOVAL AND INSTALLATION

#### Pre-removal and Post-installation Operation

- Air Pipe C, Air Hose D Removal and Installation (Refer to GROUP 15 - Inter Cooler.)
- Battery and Battery Tray Removal and Installation
- Air Cleaner Assembly Removal and Installation (Refer to GROUP 15 - Air Cleaner.)



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#### Canister removal steps

- |                   |                              |
|-------------------|------------------------------|
| 1. Purge hose     | 6. Hose clamp                |
| 2. Check valve    | 7. Canister                  |
| 3. Vapor hose     | 8. Fuel high pressure hose   |
| 4. Vent connector | 9. Canister bracket assembly |
| 5. Vapor hose     |                              |

## CATALYTIC CONVERTER

### GENERAL INFORMATION

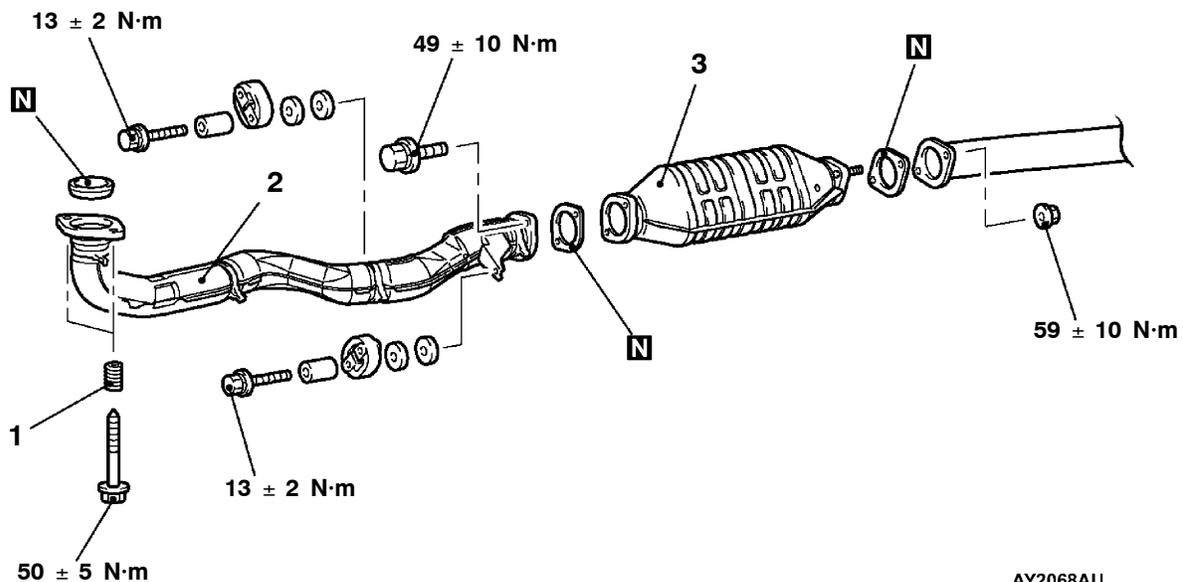
The three-way catalytic converter, together with the closed loop air-fuel ratio control based on the oxygen sensor signal, oxidizes carbon monoxides (CO) and hydrocarbons (HC) and reduces nitrogen oxides (NOx).

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.

### REMOVAL AND INSTALLATION

#### Pre-removal and Post-installation Operation

- Under Cover Removal and Installation (Refer to GROUP 51 - Front Bumper.)
- Crossmember Bar Removal and Installation (Refer to GROUP 32 - Engine Roll Stopper, Centermember.)



#### Removal steps

1. Spring
2. Front exhaust pipe
3. Catalytic converter

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## NOTES