

GROUP 17

ENGINE AND EMISSION CONTROL

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ENGINE CONTROL

GENERAL INFORMATION

A cable-type accelerator mechanical suspended-type pedal has been adopted.

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SERVICE SPECIFICATIONS

M1171000300185

Item	Standard value
Accelerator cable play mm	1 – 2
Engine idle speed r/min	800 ± 50

ON-VEHICLE SERVICE

ACCELERATOR CABLE CHECK AND ADJUSTMENT

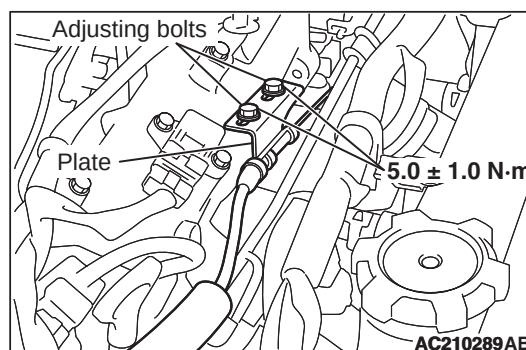
M1171000900488

1. Turn off air conditioner and all lamps. Inspect and adjust at no load.
2. Start engine and allow to idle until it reaches normal operating temperature.
3. Confirm the idle speed is at standard value.

Standard value: 800 ± 50 r/min

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

Standard value: 1 – 2 mm



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

Tightening torque: 5.0 ± 1.0 N·m

ACCELERATOR CABLE AND PEDAL

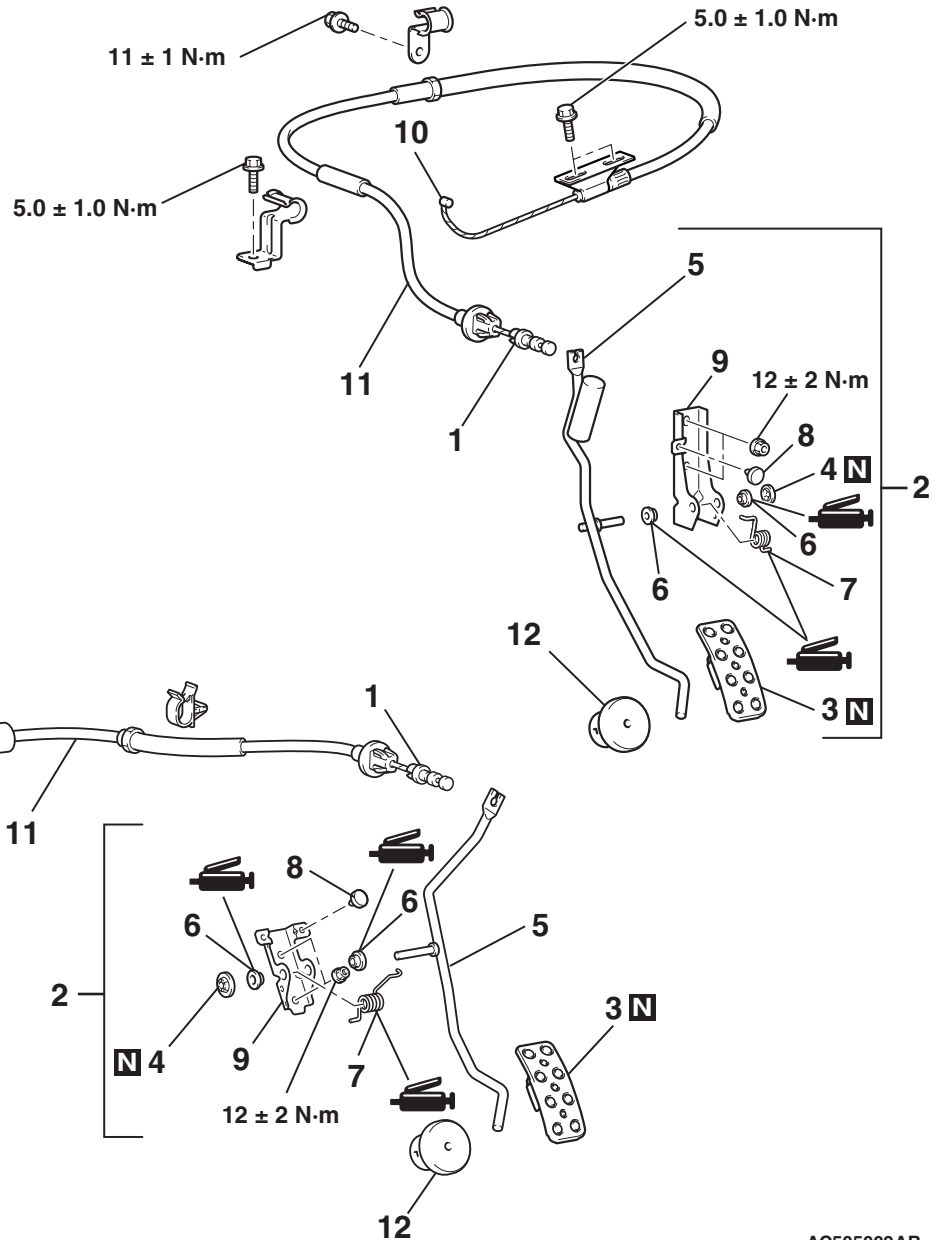
REMOVAL AND INSTALLATION

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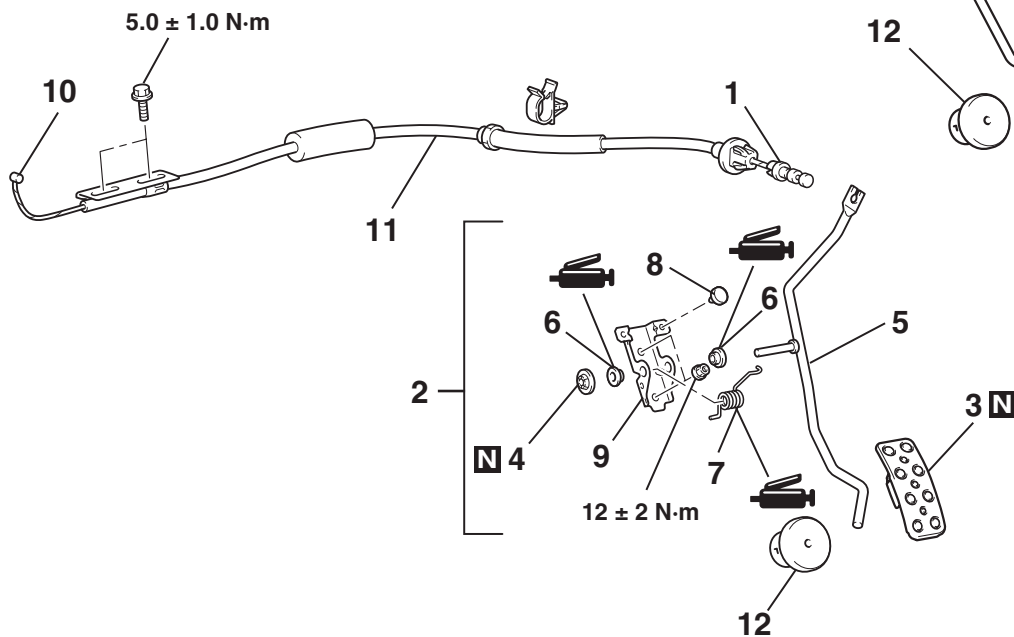
Post-installation Operation

Adjusting the Accelerator Cable (Refer to [P.17-2](#)).

<L.H. drive vehicles>



<R.H. drive vehicles>



AC505002AB

Accelerator pedal removal steps

- >>B<< 1. Inner cable connection (Accelerator pedal side)
2. Accelerator pedal assembly
- >>A<< 3. Accelerator pedal pad
4. Push-on spring nut
5. Accelerator pedal arm assembly

Accelerator pedal removal steps

6. Bushing
7. Spring
8. Stopper
9. Accelerator pedal bracket

Accelerator cable removal steps

- >>B<< 1. Inner cable connection (Accelerator pedal side)
10. Inner cable connection (Throttle lever side)
11. Accelerator cable assembly

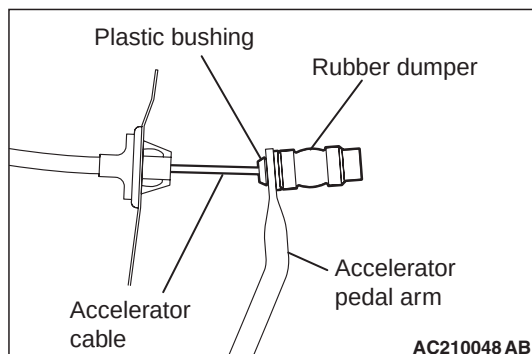
Accelerator pedal stopper removal

12. Accelerator pedal stopper

INSTALLATION SERVICE POINTS**>>A<< ACCELERATOR PEDAL PAD INSTALLATION**

Warm the peg of the accelerator pedal pad with a dryer before installing the pad.

NOTE: If it is difficult to fit, apply soapy water to the peg lightly.

>>B<< INNER CABLE INSTALLATION

Securely fit the plastic bushing on the inner cable of the accelerator cable to the accelerator pedal arm as shown.

EMISSION CONTROL <MPI>**GENERAL INFORMATION**

M1173000100541

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 • EGR valve • EGR control solenoid valve	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**

M1173006600180

Related parts	Crankcase emission control system	Evaporative emission control system	Air/fuel ratio control system	Catalytic converter	Exhaust gas recirculation system
PCV valve	×				
Purge control solenoid valve		×			
Check valve		×			
MPI system component		×	×		
Catalytic converter				×	
EGR valve					×
EGR control solenoid valve					×

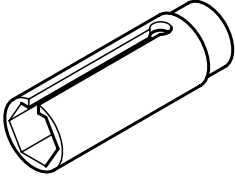
SERVICE SPECIFICATIONS

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Items	Standard value
Purge control solenoid valve coil resistance (at 20°C) Ω	30 – 34
EGR control solenoid valve coil resistance (at 20°C) Ω	29 – 35

SPECIAL TOOL

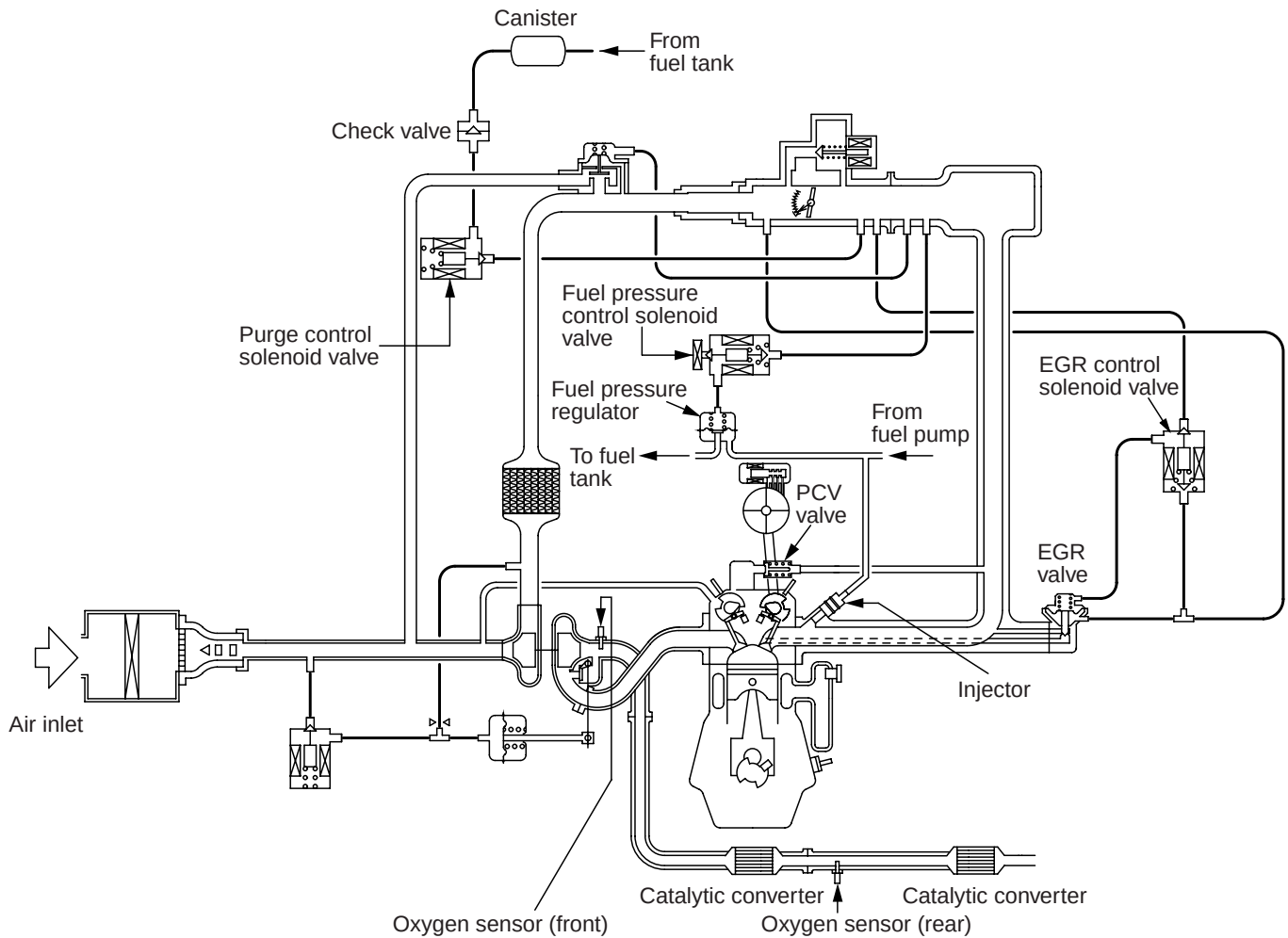
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Tool	Number	Name	Use
	MD998770	Oxygen sensor wrench	Removal and installation of oxygen sensor

VACUUM HOSE

VACUUM HOSE PIPING DIAGRAM

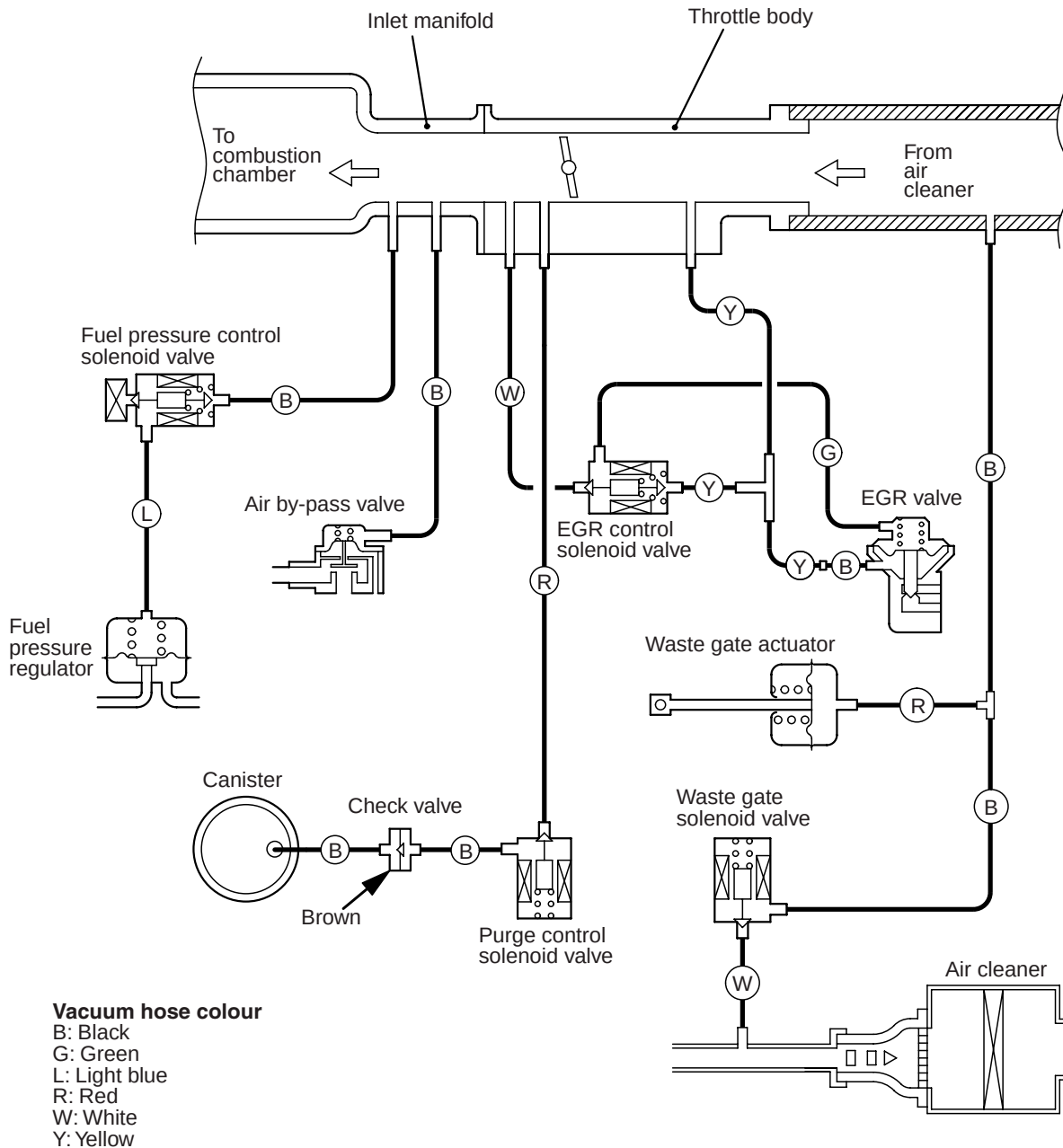
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VACUUM CIRCUIT DIAGRAM

M1173007100586



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VACUUM HOSE CHECK

M1173007300193

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

M1173007200141

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 (CRANKCASE EMISSION CONTROL SYSTEM)

M1173005000691

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.

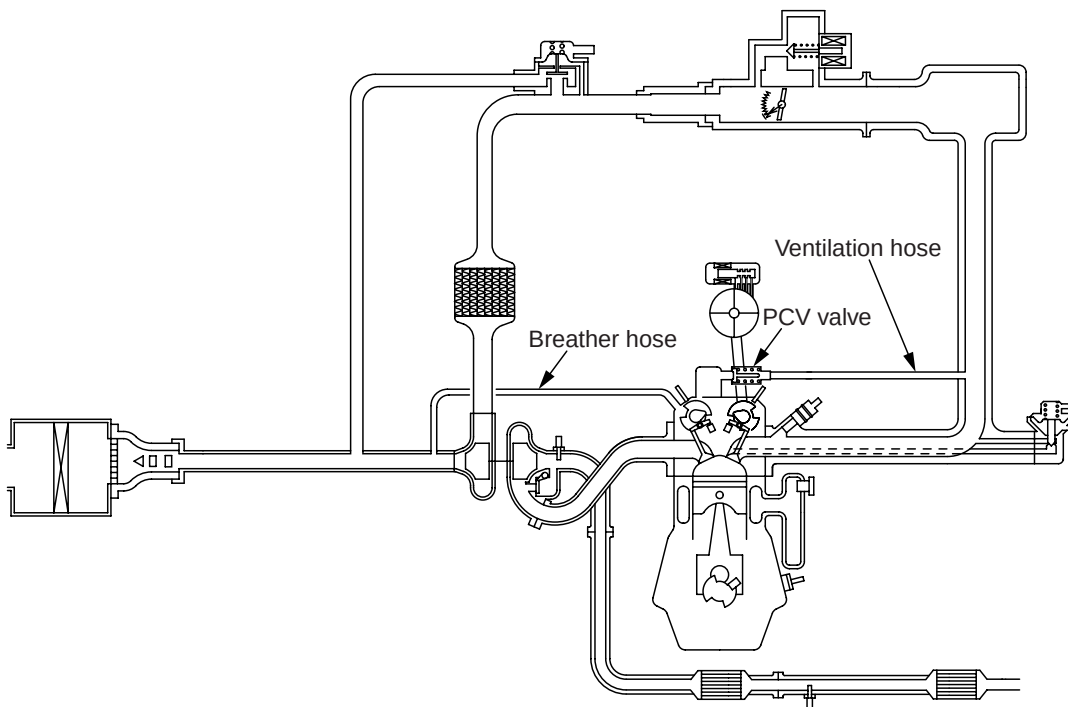
The air becomes mixed with the blow-by gases inside the crankcase.

The blow-by gas inside the crankcase is drawn into the inlet manifold through the positive crankcase ventilation (PCV) valve.

The PCV valve lifts the plunger according to the inlet 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.

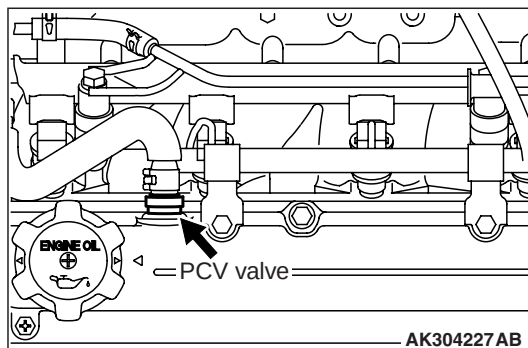
SYSTEM DIAGRAM



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COMPONENT LOCATION (CRANKCASE EMISSION CONTROL SYSTEM)

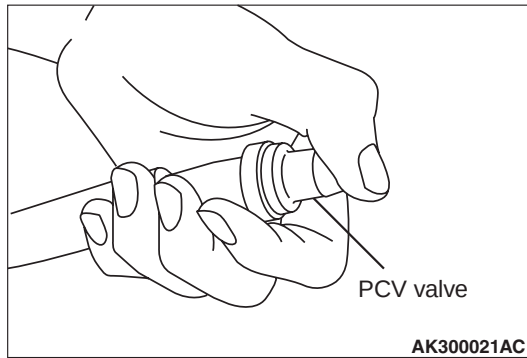
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POSITIVE CRANKCASE VENTILATION SYSTEM CHECK

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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.



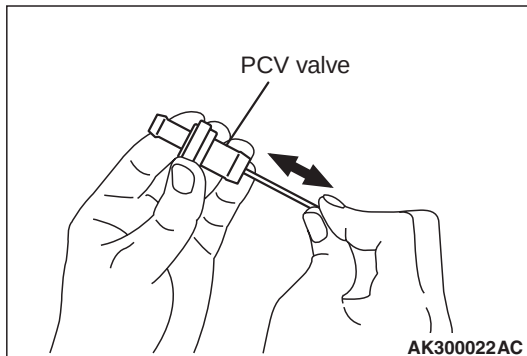
5. Place a finger at the opening of the PCV valve and check that vacuum of the inlet manifold is felt.

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.

POSITIVE CRANKCASE VENTILATION (PCV) VALVE CHECK

M1173001200336



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 (EVAPORATIVE EMISSION CONTROL SYSTEM)

M1173005100717

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

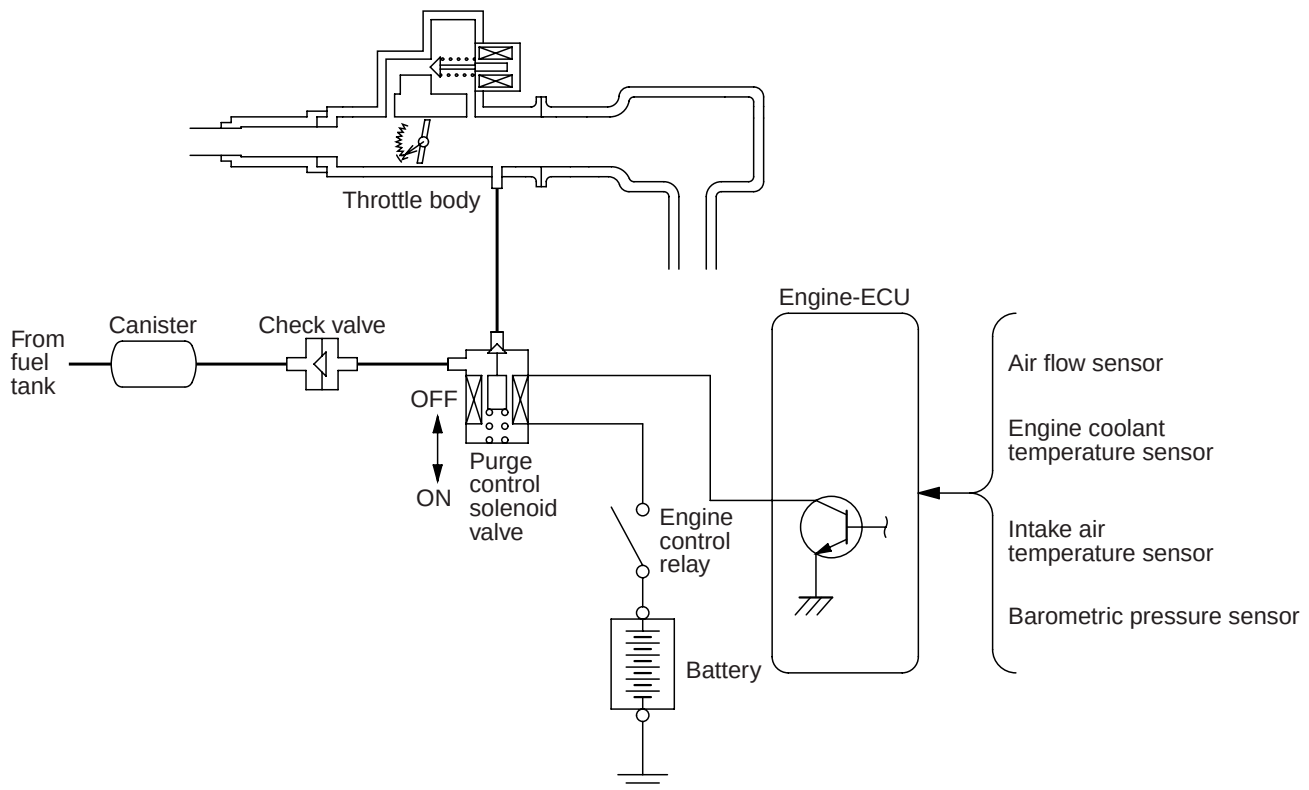
Fuel vapors from the fuel tank flow through the fuel tank pressure control valve and vapor pipe/hose to be stored temporarily in the canister.

When driving the vehicle, fuel vapors stored in the canister flow through the purge solenoid and purge port and go into the inlet manifold to be sent to the combustion chamber.

When the engine coolant temperature is low or when the inlet 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 vapor flow to the inlet manifold.

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

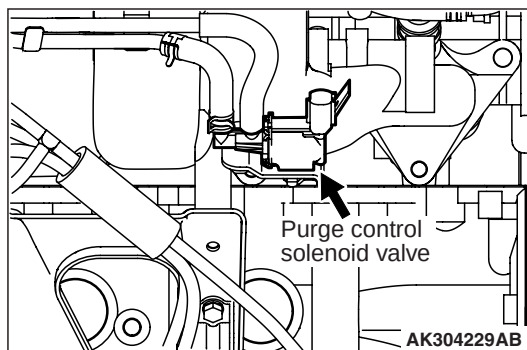
SYSTEM DIAGRAM



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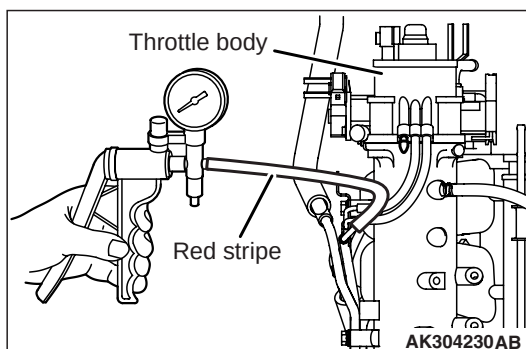
COMPONENT LOCATION (EVAPORATIVE
EMISSION CONTROL SYSTEM)

M1173007500302



PURGE CONTROL SYSTEM CHECK

M1173001400664



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 negative pressure of 53 kPa, and check the condition of the negative pressure.

When engine is cold

(Engine coolant temperature: 40°C or less)

Engine condition	Normal condition
At idle	Negative pressure is maintained.
3,000 r/min	

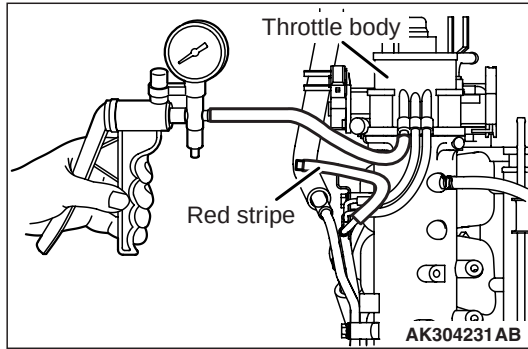
When engine is hot

(Engine coolant temperature: 80°C or higher)

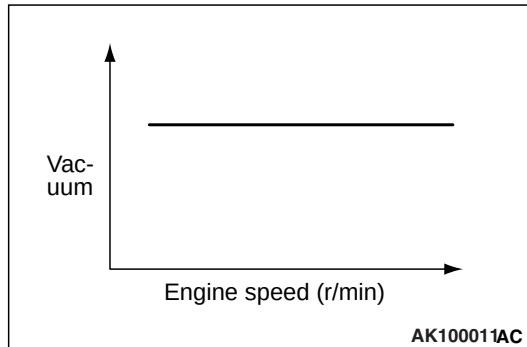
Engine condition	Normal condition
At idle	Negative pressure is maintained.
3,000 r/min (within 3 minutes after engine starts)	

PURGE PORT VACUUM CHECK

M1173001500252



1. Disconnect the vacuum hose (red stripe) from the throttle body and connect a hand vacuum pump to the nipple.
2. Plug the vacuum hose (red stripe).

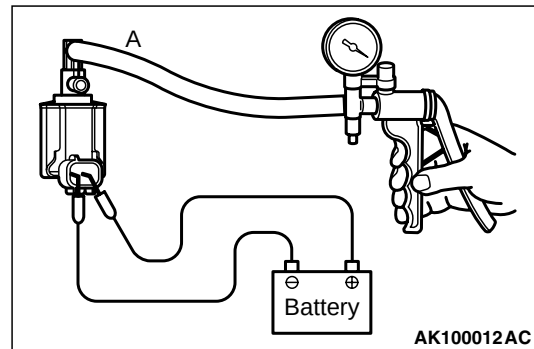


3. Start the engine.
4. Check that a fairly constant negative pressure is generated regardless of the engine speed.
5. If no negative pressure is generated, the port is probably blocked and should be cleaned.

PURGE CONTROL SOLENOID VALVE CHECK

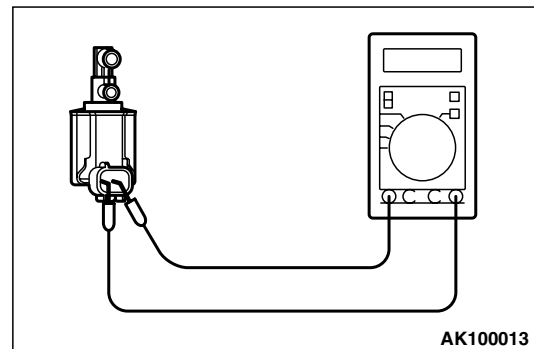
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NOTE: When disconnecting the vacuum hose, always make a mark so that it can be reconnected at original position.



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 negative pressure with voltage applied directly from the battery to the purge control solenoid valve and without applying voltage.

Battery voltage	Normal condition
Applied	Negative pressure leaks
Not applied	Negative pressure maintained

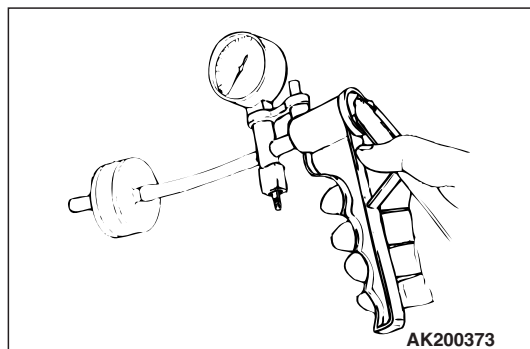


5. Measure the resistance between the terminals of the solenoid valve.

Standard value: 30 – 34 Ω (at 20°C)

CHECK VALVE CHECK

M1173006200085



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

Connect nipple colour	Normal condition
Black	Negative pressure leaks
Brown	Negative pressure is maintained

FUEL VAPOUR CANISTER REMOVAL AND INSTALLATION

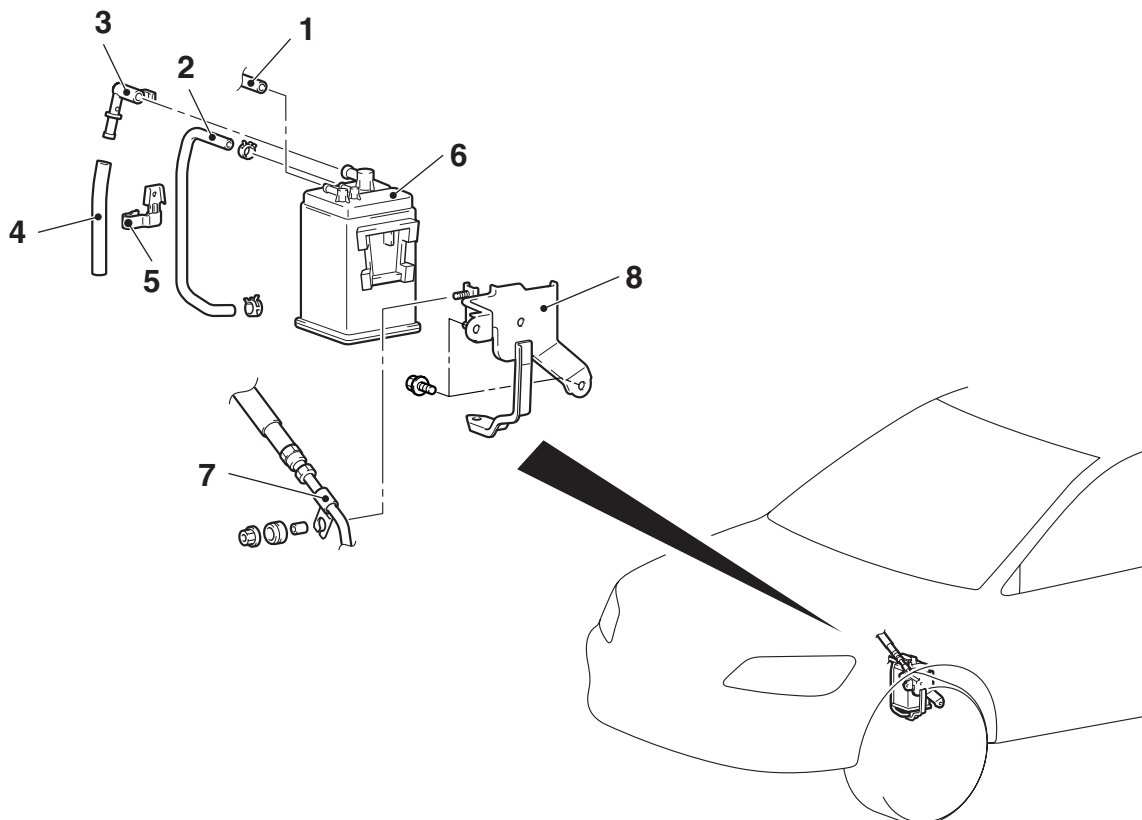
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Pre-removal Operation

- Air Pipe C, Air Hose D Removal (Refer to GROUP 15, Intercooler [P.15-6](#)).
- Battery and Battery Tray Removal
- Air Cleaner Assembly Removal (Refer to GROUP 15, Air Cleaner [P.15-5](#)).

Post-installation Operation

- Air Cleaner Assembly Installation (Refer to GROUP 15, Air Cleaner [P.15-5](#)).
- Battery and Battery Tray Installation
- Air Pipe C, Air Hose D Installation (Refer to GROUP 15, Intercooler [P.15-6](#)).



AC310639 AB

Removal steps

1. Emission vacuum hose connection
2. Fuel vapour control line hose
3. Fuel vapour control check valve
4. Fuel vapour control line hose

Removal steps (Continued)

5. Fuel vapour control line clamp
6. Fuel vapour canister
7. Fuel high-pressure hose clamp
8. Fuel vapour canister bracket

EXHAUST GAS RECIRCULATION (EGR) SYSTEM

GENERAL INFORMATION (EGR SYSTEM)

M1173005200684

The exhaust gas recirculation (EGR) system lowers the nitrogen oxide (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 emission gas from the exhaust port of the cylinder head to the combustion chamber through the inlet manifold to decrease the air/fuel mixture combustion temperature, resulting in reduction of NOx.

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

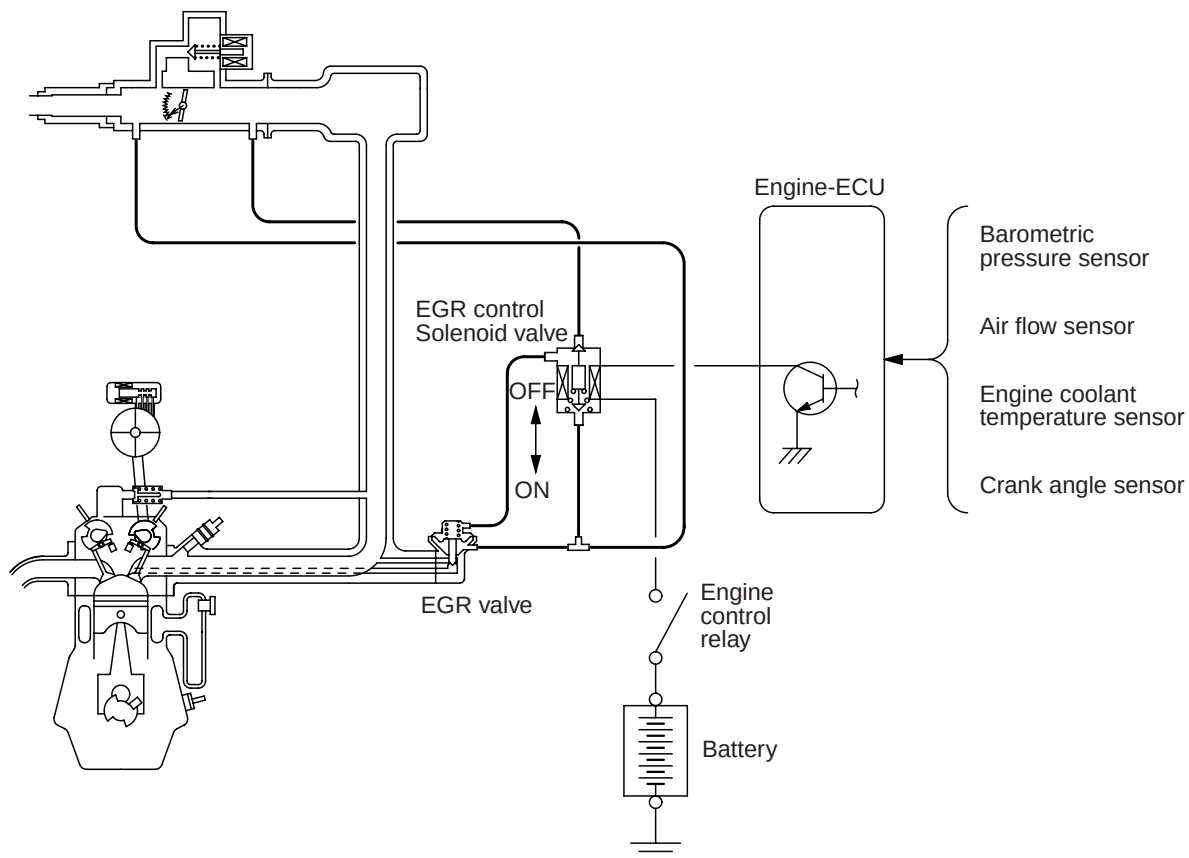
OPERATION

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.

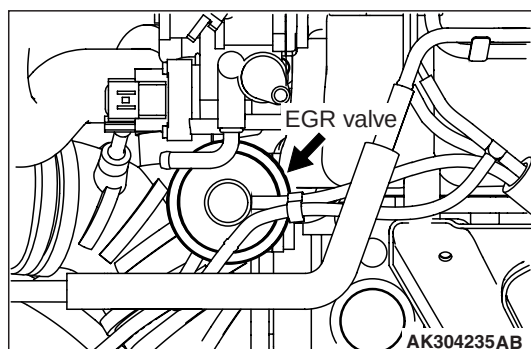
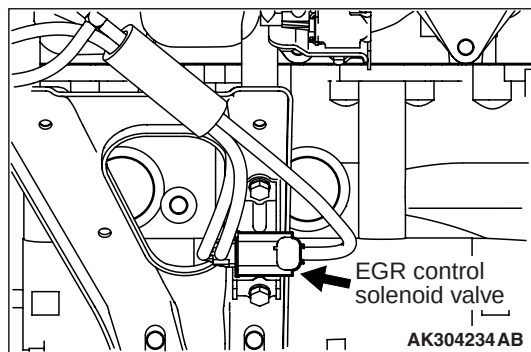
- The engine coolant temperature is low.
- The engine is at idle.
- The throttle valve is widely opened.

SYSTEM DIAGRAM



COMPONENT LOCATION (EGR SYSTEM)

M1173007600309



1. Disconnect the vacuum hose (Green stripe) from the EGR 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.

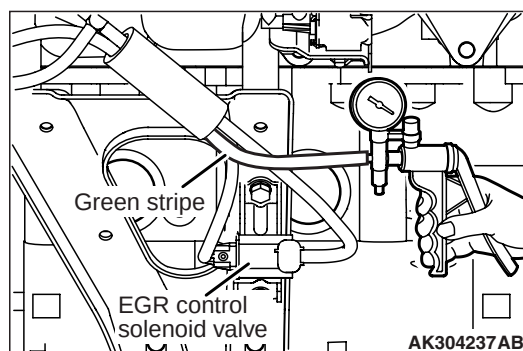
When engine is cold**(Engine coolant temperature: 20°C or less)**

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)**

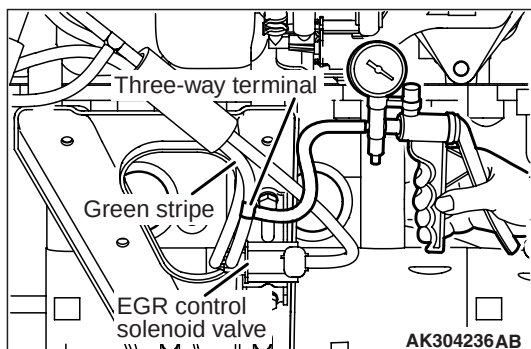
Throttle valve	Normal vacuum condition
Open quickly	It will momentarily rise over 13 kPa

3. Disconnect the three-way terminal.



EGR SYSTEM CHECK

M1173002600393

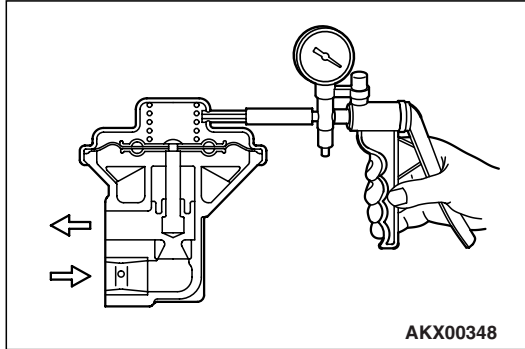


4. Connect the hand vacuum pump to the EGR valve nipple (Green stripe).
5. Check whether the engine stalls or the idling is unstable when a vacuum of 27 kPa or higher is applied during idling.

EGR VALVE CHECK

M1173002800308

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 negative pressure of 67 kPa, and check that the negative pressure is maintained.



4. Apply negative pressure and check the passage of air by blowing through one side of the EGR passage.

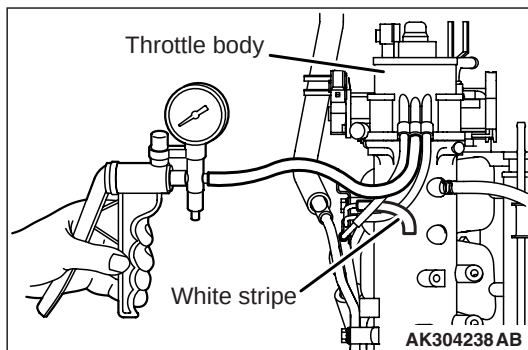
Vacuum	Passage of air
5.3 kPa or less	Air is not blown out
27 kPa or more	Air is blown out

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

Tightening torque: 20 ± 2 N·m

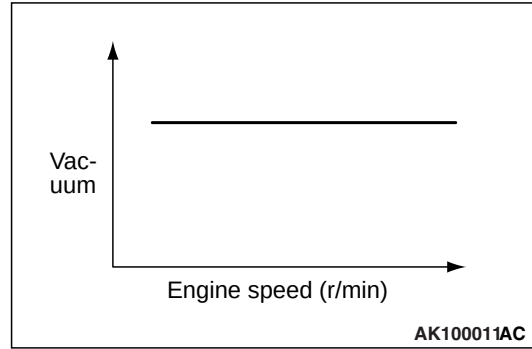
EGR PORT VACUUM CHECK

M1173002900242



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

2. Plug the vacuum hose (White stripe).

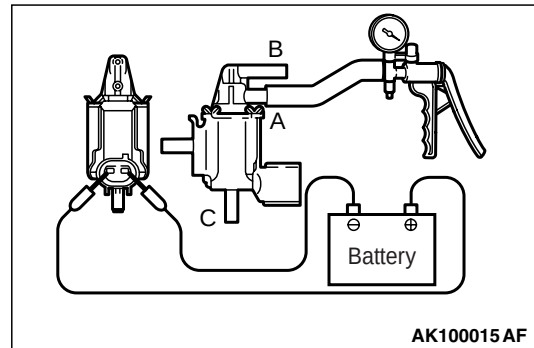


3. Start the engine.
4. Check that a fairly constant vacuum is generated regardless of the engine speed.
5. If no vacuum is generated, the port is probably blocked and should be cleaned.

EGR CONTROL SOLENOID VALVE CHECK

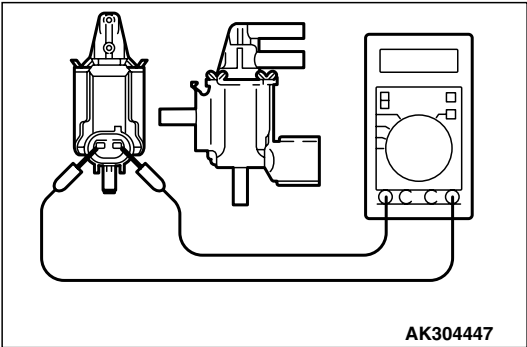
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NOTE: When disconnecting the vacuum hose, always make a mark so that it can be reconnected at original position.



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 air tightness by applying negative pressure with voltage applied directly from the battery to the EGR control solenoid valve and without applying voltage.

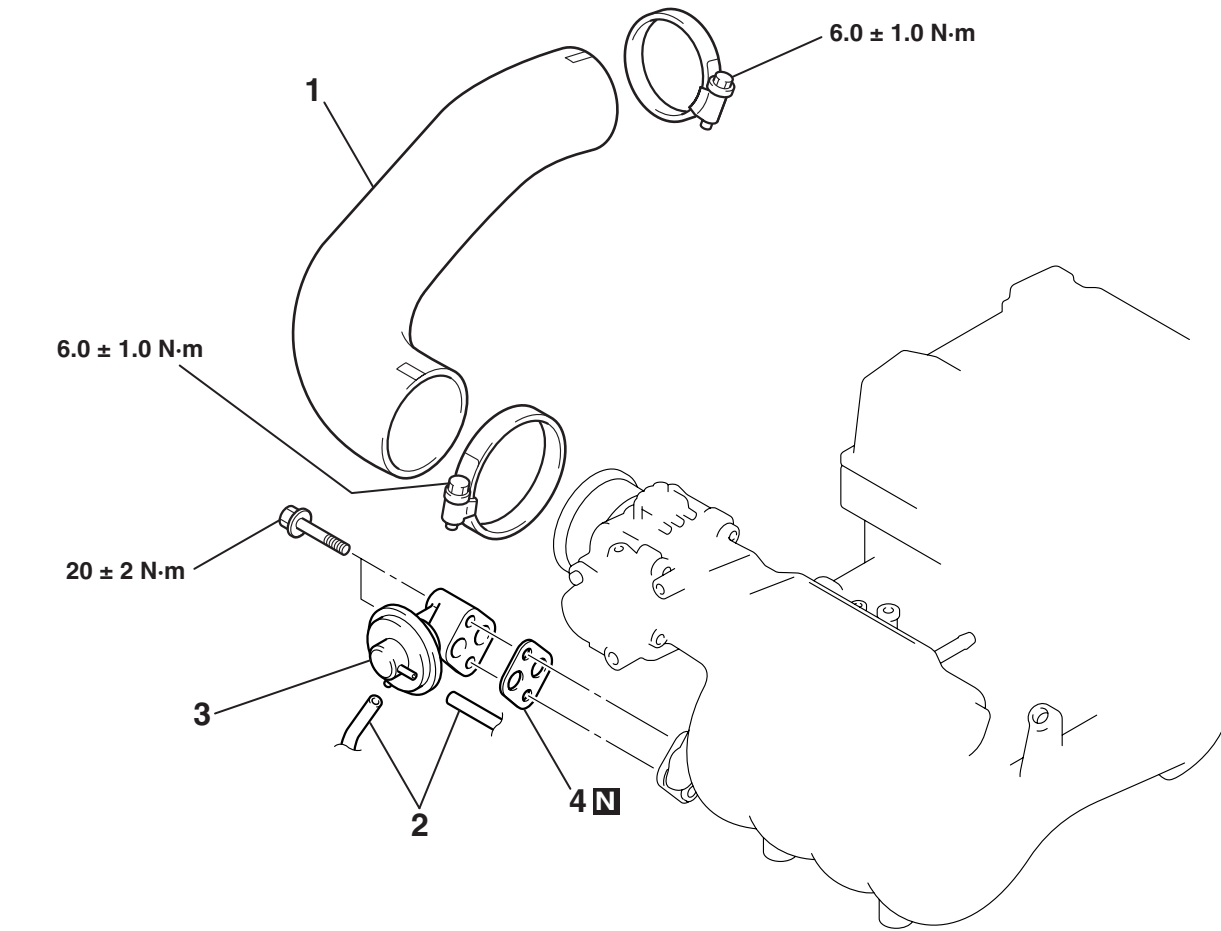
Battery voltage	Nipple condition	Normal condition
Applied	Both nipples open	Negative pressure leaks
	Nipple "B" closed	Negative pressure maintained
Not applied	Both nipples open	Negative pressure leaks
	Nipple "C" closed	Negative pressure maintained



5. Measure the resistance between the terminals of the solenoid valve.
- Standard value: 29 – 35 Ω (at 20°C)**

EGR VALVE REMOVAL AND INSTALLATION

M1173010500272



AC210292AB

- Removal steps**
- <<A>> >>A<<
- Strut tower bar
 - 1. Intercooler air hose E

- Removal steps (Continued)**
- 2. Vacuum hose connection
 - 3. EGR valve
 - 4. EGR valve gasket

REMOVAL SERVICE POINT

<<A>> STRUT TOWER BAR REMOVAL

1. Remove the strut tower bar. (Refer to GROUP 42, Strut Tower Bar P.42-9).
2. After removing the strut tower bar, install the top of the strut assembly temporarily with the strut tower bar mounting nuts.

INSTALLATION SERVICE POINT

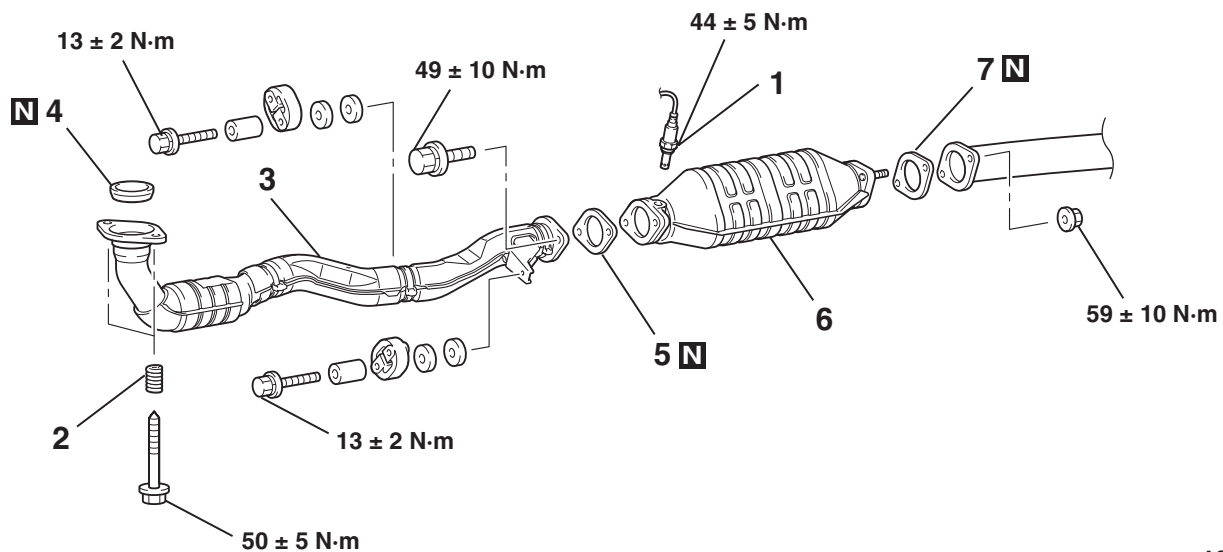
>>A<< STRUT TOWER BAR INSTALLATION

1. Remove the nuts that are temporarily securing the strut assembly.
2. Install the strut tower bar. (Refer to GROUP 42, Strut Tower Bar P.42-9).

CATALYTIC CONVERTER

REMOVAL AND INSTALLATION

M1173003900472

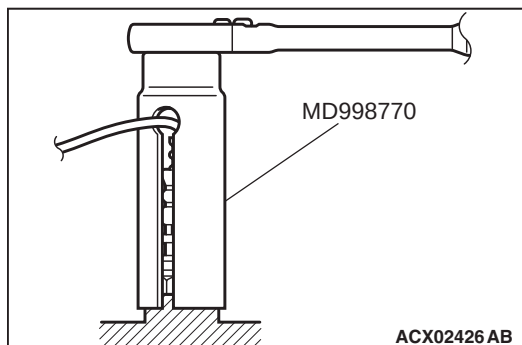


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- <<A>> >>A<<
- Removal steps**
1. Oxygen sensor (Rear)
 2. Spring
 3. Front exhaust pipe
 4. Seal ring

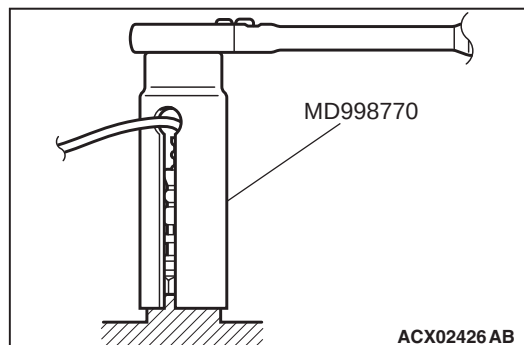
- Removal steps (Continued)**
5. Gasket
 6. Catalytic converter
 7. Gasket

REMOVAL SERVICE POINT

<<A>> OXYGEN SENSOR (REAR)
REMOVAL

Use special tool oxygen sensor wrench (MD998770) to remove the oxygen sensor (rear).

INSTALLATION SERVICE POINT

>>A<< OXYGEN SENSOR (REAR)
INSTALLATION

Use special tool oxygen sensor wrench (MD998770) to install the oxygen sensor (rear).