ENGINE AND EMISSION CONTROL

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ENGINE AND EMISSION CONTROL

CONTENTS

17109000063

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ENGINE CONTROL SYSTEM

17100010027

GENERAL INFORMATION

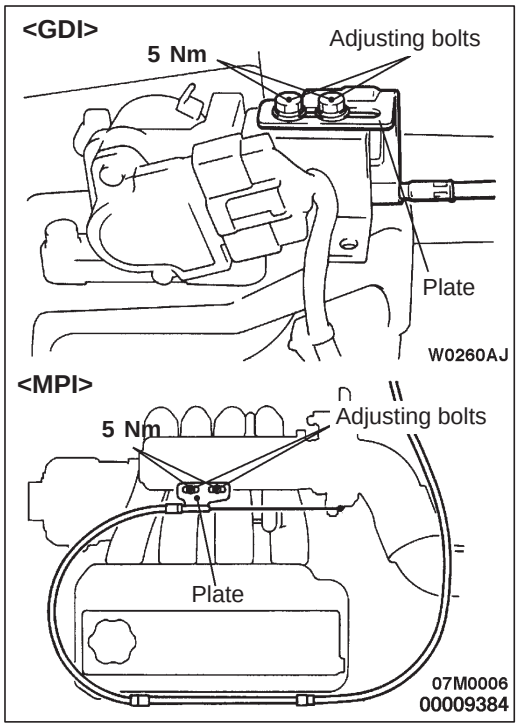
A cable-type accelerator mechanism and a suspended-type pedal have been adopted.

SERVICE SPECIFICATIONS

17100030160

Items		Standard value
Accelerator cable play mm		1 – 2
Engine idle speed r/min	GDI	600 ± 50 – 800 ± 50*
	MPI	750 ± 100

NOTE
*: Varies depending on the transmission oil temperature For details refer to GROUP 11A – On-vehicle Service.



ON-VEHICLE SERVICE

17100090298

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:
   <GDI> 600 ± 50 – 800 ± 50 r/min*
   <MPI> 750 ± 100 r/min

   NOTE
   *: Varies depending on the transmission oil temperature For details refer to GROUP 11A – On-vehicle Service.
4. Stop engine (ignition switch OFF).
5. Confirm there are no sharp bends in accelerator cable.
6. Check inner cable for correct slack.

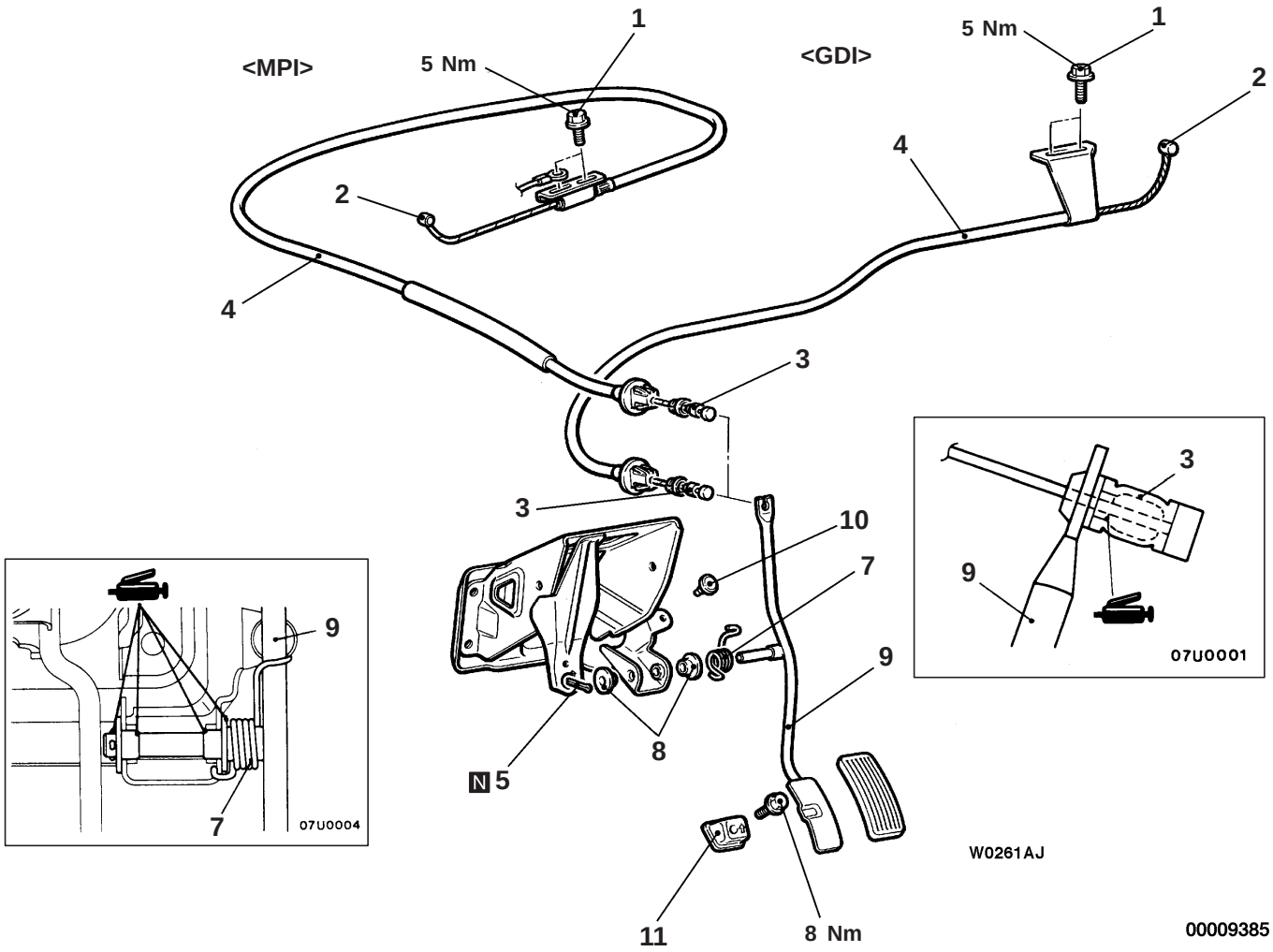
   Standard value: 1 – 2 mm
7. If there is too much slack or no slack, adjust play by the following procedures.
   (1) Loosen the adjusting bolt to release the cable.
   (2) Move the plate until the inner cable play is at the standard value, and then tighten the adjusting bolt.
   (3) After adjusting, check that the throttle lever is touching the stopper.

ACCELERATOR CABLE AND PEDAL

17100120324

REMOVAL AND INSTALLATION

Post-installation Operation
- Accelerator Cable Adjustment (Refer to P.17-3.)



Removal steps

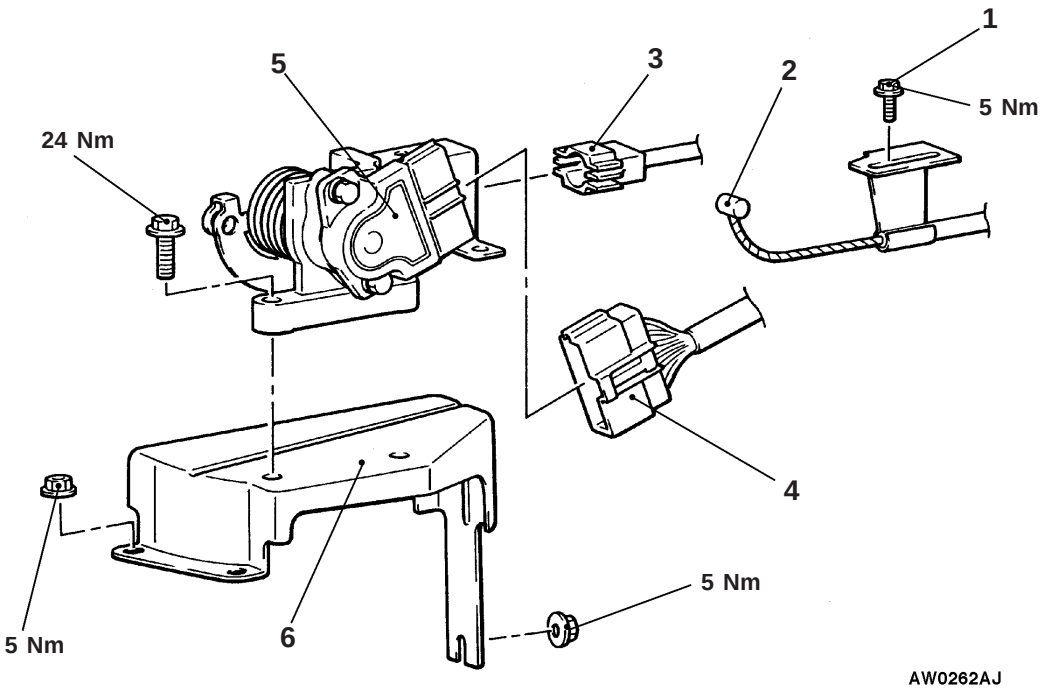
1. Adjusting bolts
2. Inner cable connection (Accelerator pedal position sensor <GDI> or throttle body <MPI> side)
3. Inner cable connection (Accelerator pedal side)
4. Accelerator cable
5. Split pin
6. Accelerator pedal
7. Spring
8. Bushing
9. Pedal pad
10. Stopper
11. Accelerator pedal stopper

ACCELERATOR PEDAL POSITION SENSOR <GDI>

17100120324

REMOVAL AND INSTALLATION

Post-installation Operation
- Accelerator Cable Adjustment (Refer to P.17-3.)



Removal steps

1. Adjusting bolt
2. Inner cable connection
3. Idle position switch connector
4. Accelerator pedal position sensor connector
5. Accelerator pedal position sensor assembly
6. Accelerator pedal position sensor bracket

EMISSION CONTROL SYSTEM

17300010122

GENERAL INFORMATION

The emission control system consists of the following subsystems:
- Crankcase emission control system
- Evaporative emission control system
- Exhaust emission control system

<GDI>

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	Equipped Duty cycle type solenoid valve (Purpose: HC reduction)
Exhaust emission control system	Air-fuel ratio control device–GDI system	Oxygen sensor feedback type (Purpose: CO, HC, NOx reduction)
	Exhaust gas recirculation system ● EGR valve	Equipped Stepper motor type (Purpose: NOx reduction)
	Catalytic converter	Monolith type (Purpose: CO, HC, NOx reduction)

<MPI>

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	Equipped ON/OFF type solenoid valve (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 ON/OFF type solenoid valve (Purpose: NOx reduction)
	Catalytic converter	Monolith type (Purpose: CO, HC, NOx reduction)

EMISSION CONTROL DEVICE REFERENCE TABLE

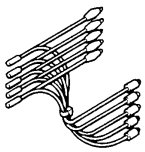
Related parts	Crankcase emission control system	Evaporative emission control system	Air/fuel ratio control system	Catalytic converter	Exhaust gas recircula-tion system	Reference page
PCV valve	×					17-12
Purge control solenoid valve		×				17-17
GDI system component <GDI>		×	×			GROUP 13A
MPI system component <MPI>		×	×			GROUP 13B
Catalytic converter				×		17-23
EGR valve					×	17-21 <GDI> 17-22 <MPI>
EGR control solenoid valve					×	17-22

SERVICE SPECIFICATIONS

17300030135

Items	Standard value
Purge control solenoid valve coil resistance (at 20°C) Ω	36 – 44 <GDI>, 28 – 36 <MPI>
EGR valve coil resistance (at 20°C) Ω <GDI>	10 – 20
EGR control solenoid valve coil resistance (at 20°C) Ω <MPI>	28 – 36

SPECIAL TOOL

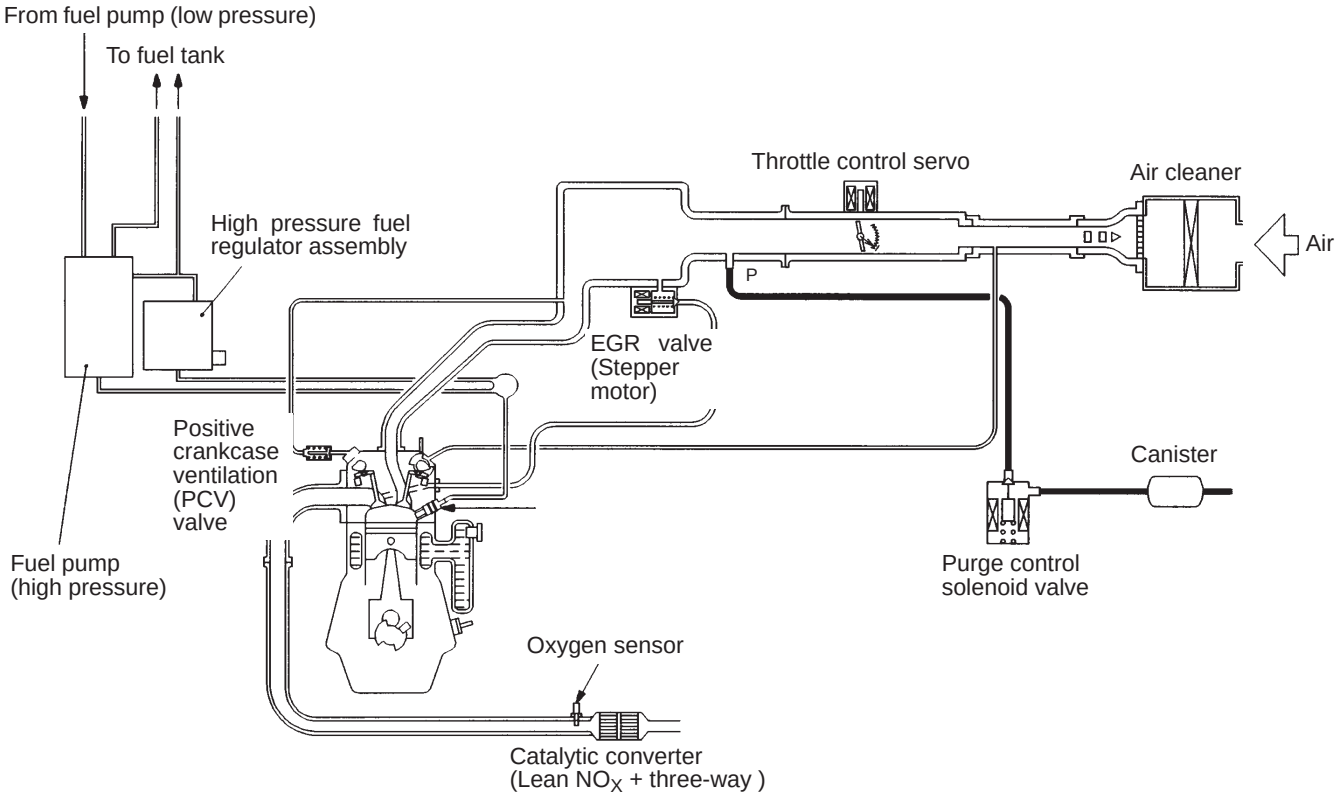
Tool	Number	Name	Use
 B991658	MB991658	Test harness set	Inspection of EGR valve

VACUUM HOSE

17300090140

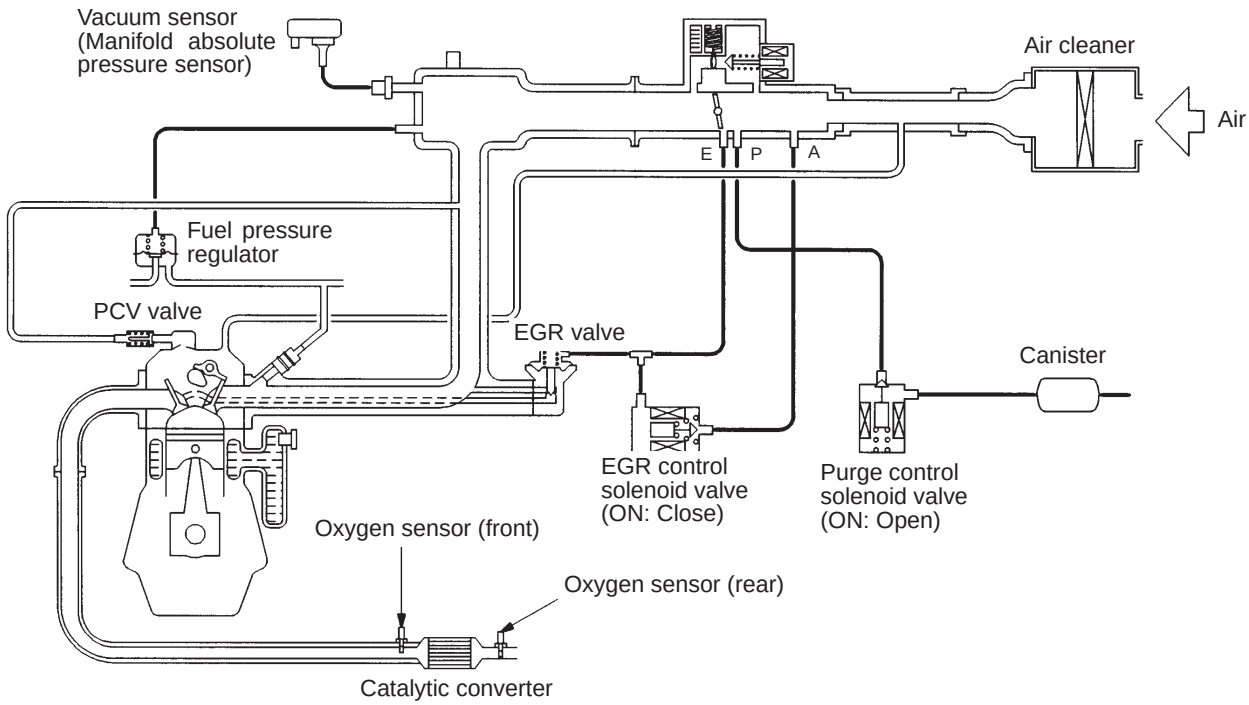
VACUUM HOSE PIPING DIAGRAM

<GDI>



9FU0933

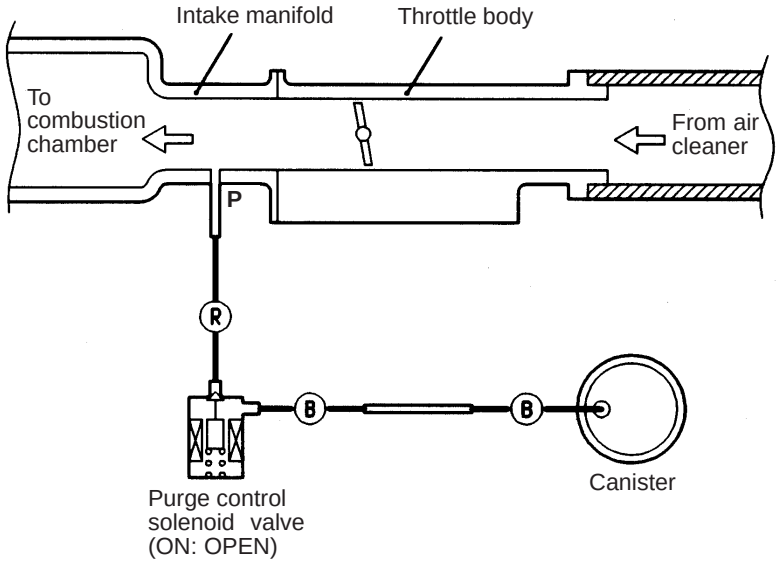
<MPI>



1EM0423

VACUUM CIRCUIT DIAGRAM

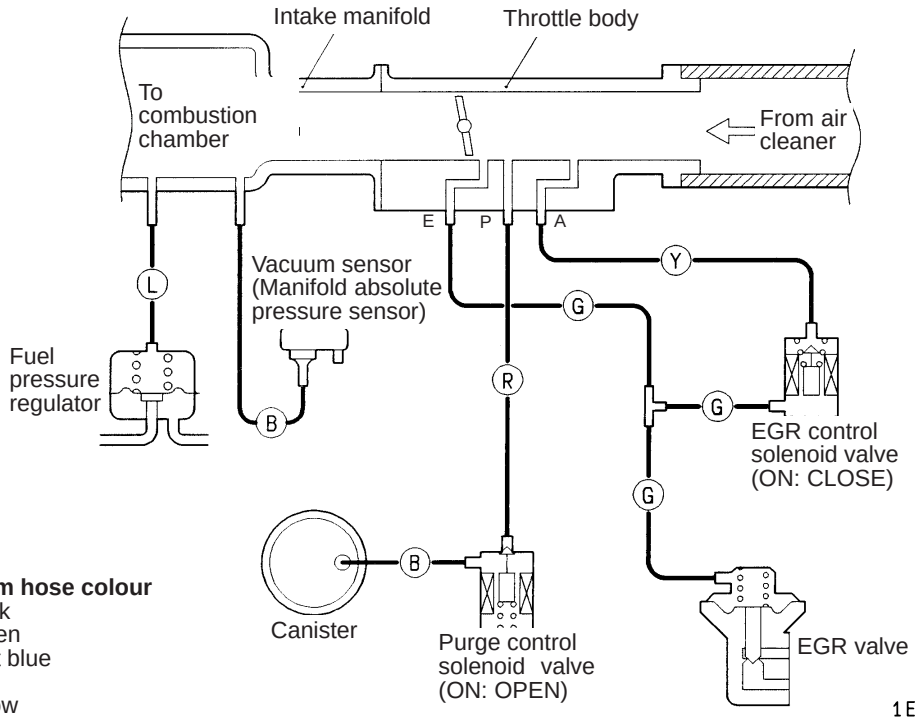
<GDI>



Vacuum hose colour
B: Black
R: Red

W6048AE

<MPI>



Vacuum hose colour
B: Black
G: Green
L: Light blue
R: Red
Y: Yellow

1EM0339

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

17300500124

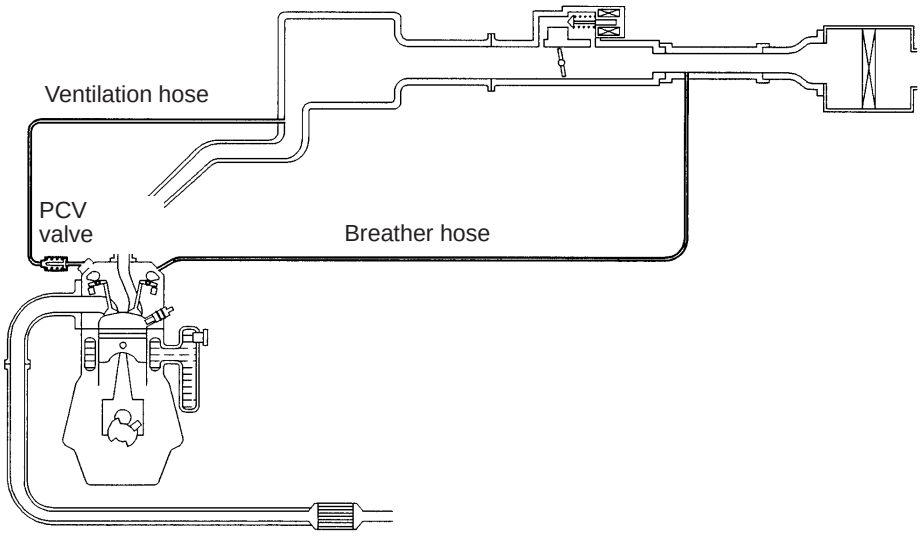
GENERAL INFORMATION

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.

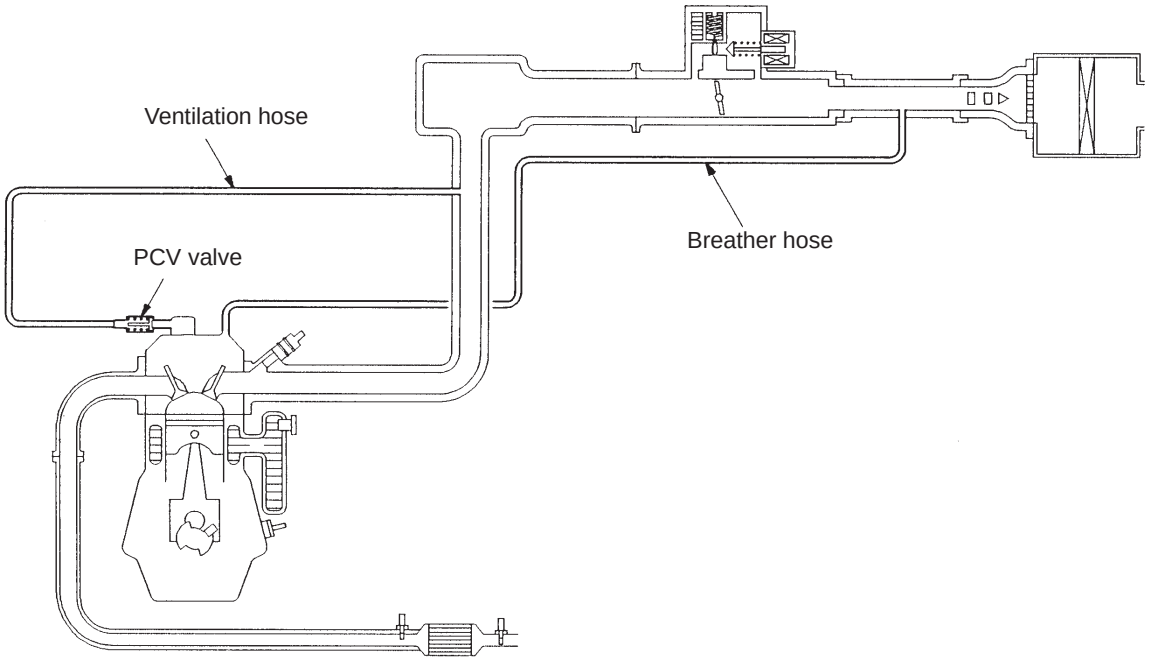
SYSTEM DIAGRAM

<GDI>



9EM0205

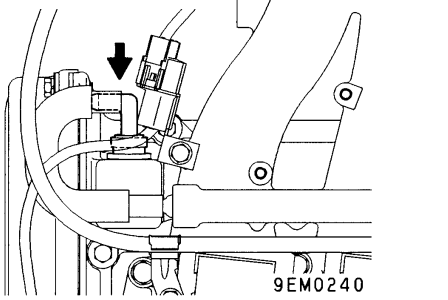
<MPI>



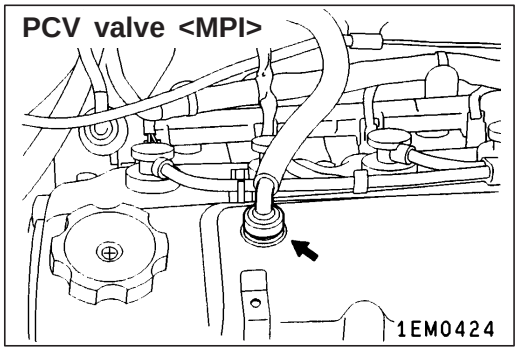
6EM0594

COMPONENT LOCATION

PCV valve <GDI>



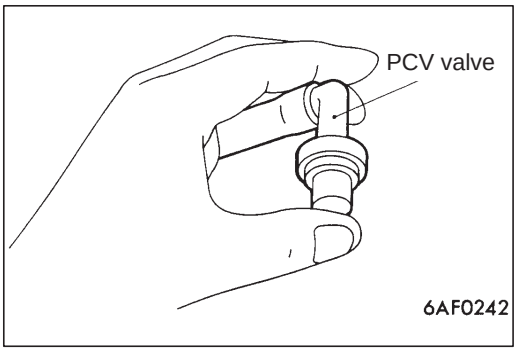
PCV valve <MPI>



POSITIVE CRANKCASE VENTILATION SYSTEM CHECK

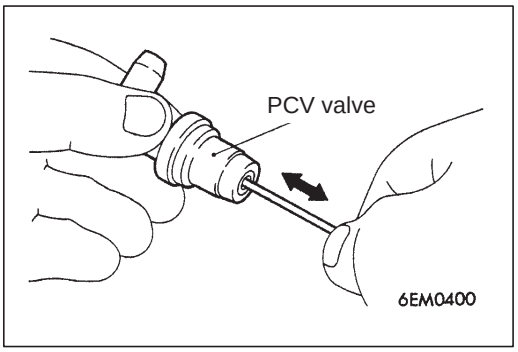
17300110136

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

17300120122

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 clogging in the PCV valve. In this case, clean or replace the PCV valve.

EVAPORATIVE EMISSION CONTROL SYSTEM

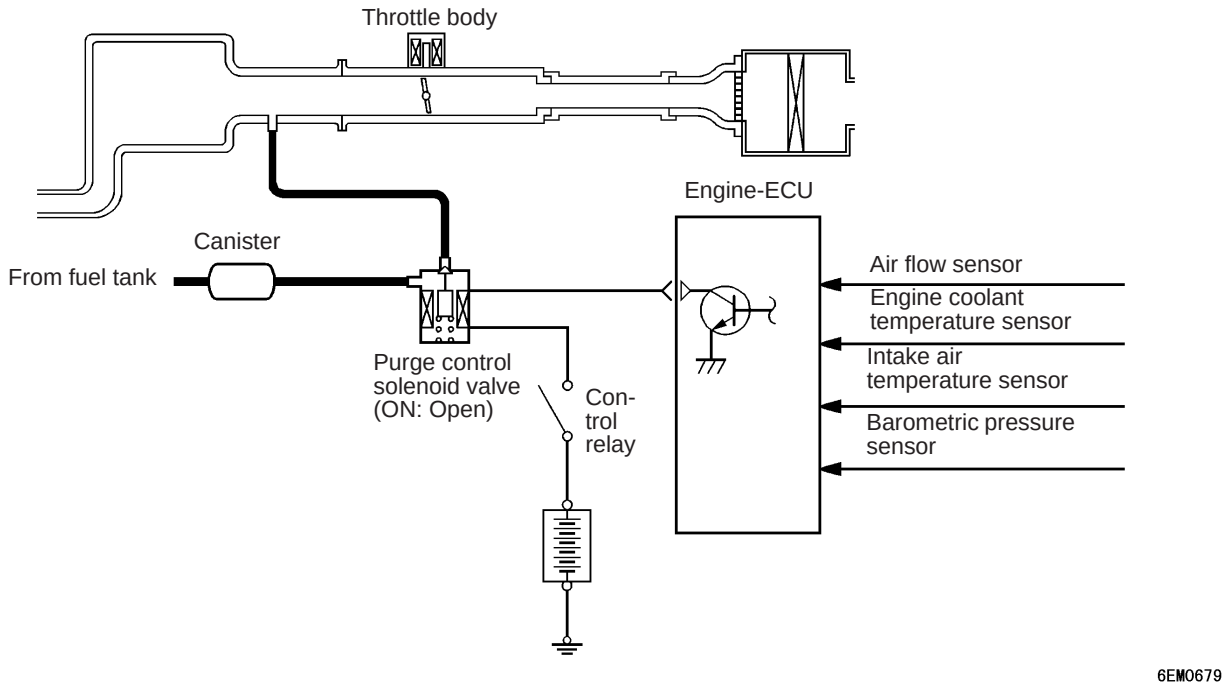
17300510189

GENERAL INFORMATION

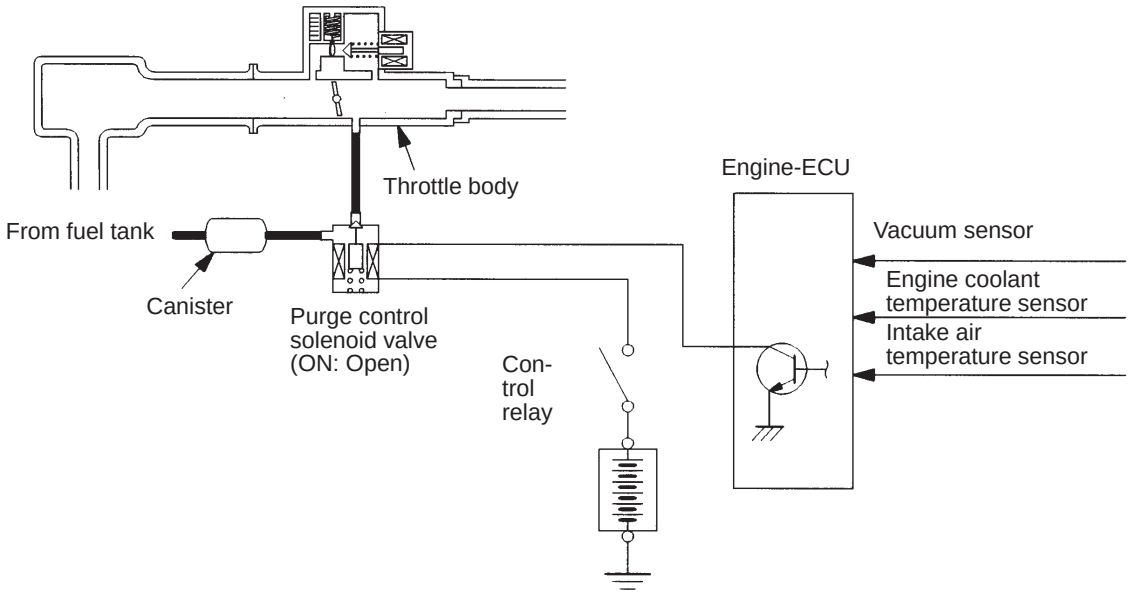
The evaporative emission control system prevents fuel vapours generated in the fuel tank from escaping into the atmosphere.
Fuel vapours from the fuel tank flow through the fuel tank pressure control valve and vapour pipe/hose to be stored temporarily in the canister. When driving the vehicle, fuel vapours 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

<GDI>

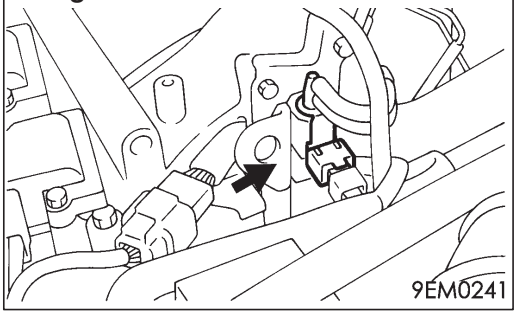


<MPI>

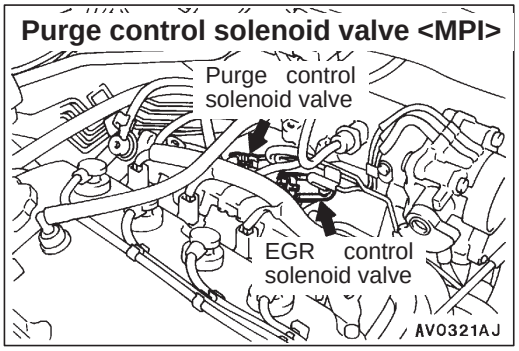


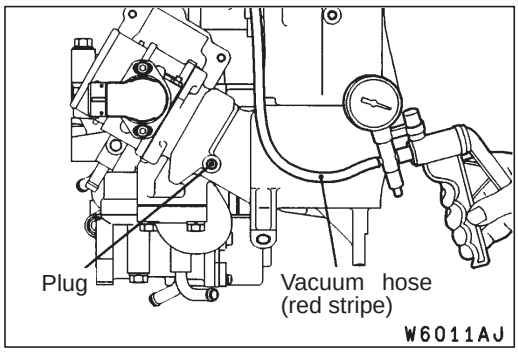
COMPONENT LOCATION

Purge control solenoid valve <GDI>



Purge control solenoid valve <MPI>





PURGE CONTROL SYSTEM CHECK <GDI>

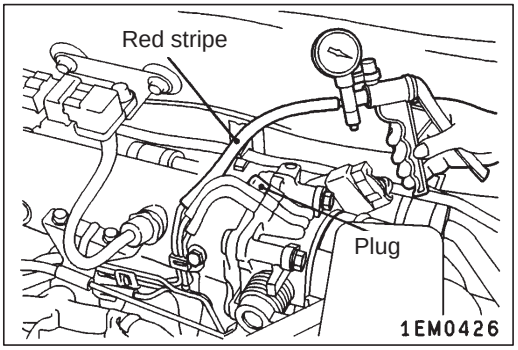
1. Disconnect the vacuum hose (red stripe) from the intake manifold and connect it to a hand vacuum pump.
2. Plug the nipple from which the vacuum hose was removed.
3. When the engine is cold or hot, apply a vacuum of 53 kPa, and check the condition of the vacuum.

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 (fore approximately 3 minutes after the engine is started.)	Vacuum will leak.



PURGE CONTROL SYSTEM CHECK <MPI>

17300140166

1. Disconnect the vacuum hose (red stripe) from the 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 while the engine is idling, and check the condition of the engine and the vacuum.

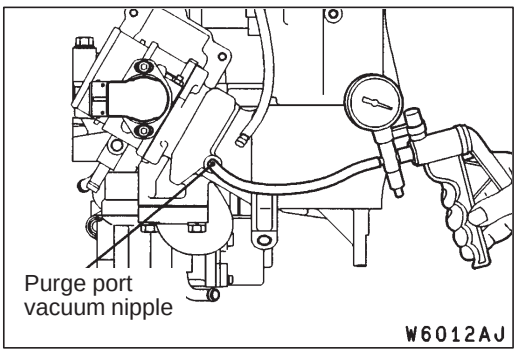
When engine is cold
(Engine coolant temperature: 40°C or less)

Vacuum	Engine condition	Normal condition
53 kPa	3,000 r/min	Vacuum is maintained

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

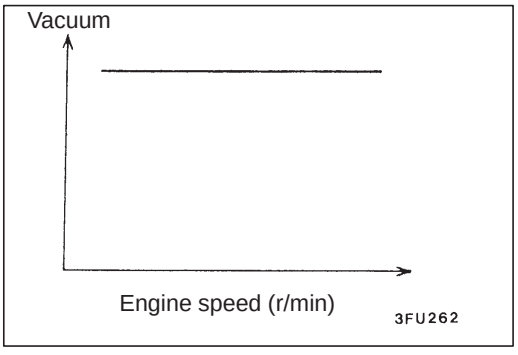
Vacuum	Engine condition	Normal condition
53 kPa	At idle	Vacuum is maintained
	3,000 r/min	Vacuum will leak for approximately 3 minutes after the engine is started. After 3 minutes have passed, the vacuum will be maintained momentarily, after which it will again leak.*

NOTE
*: The vacuum will leak continuously if the atmospheric pressure is approximately 77 kPa or less, or the temperature of the intake air is approximately 50°C or higher.



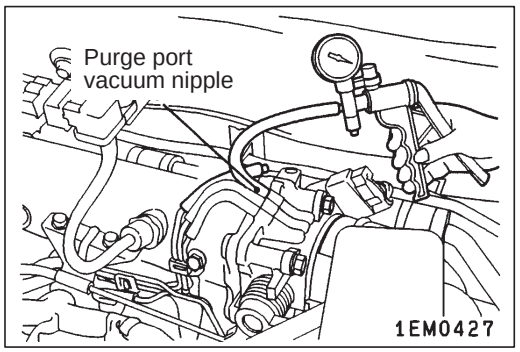
PURGE PORT VACUUM CHECK <GDI>

1. Disconnect the vacuum hose (red stripe) from the intake manifold purge vacuum nipple and connect a hand vacuum pump to the nipple.



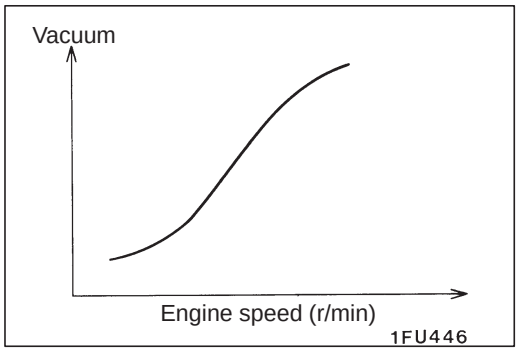
2. Start the engine and check that the vacuum remains fairly constant after racing the engine.

NOTE
If vacuum changes, it is possible that the intake manifold purge port may be clogged and require cleaning.



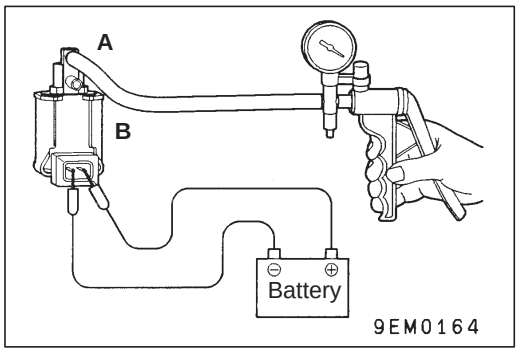
PURGE PORT VACUUM CHECK <MPI> 17300150138

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



2. Start the engine and check that, after raising the engine speed by racing the engine, purge vacuum raises according to engine speed.

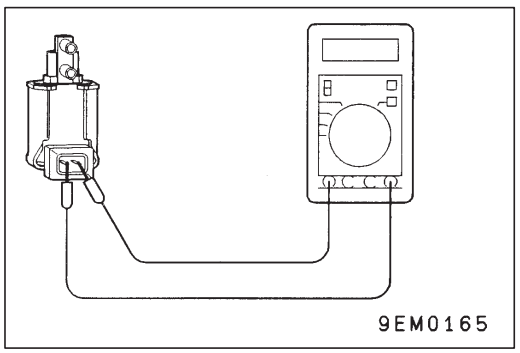
   NOTE
   If there is a problem with the change in vacuum, the throttle body purge port may be clogged and require cleaning.



PURGE CONTROL SOLENOID VALVE CHECK 17300170127

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

1. Disconnect the vacuum hose (black stripe, red stripe) 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:

   36 – 44 Ω (at 20°C) <GDI>

   28 – 36 Ω (at 20°C) <MPI>

EXHAUST GAS RECIRCULATION (EGR) SYSTEM

17300520137

GENERAL INFORMATION

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 nitrogen oxides (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 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 so as not to decrease the driveability.

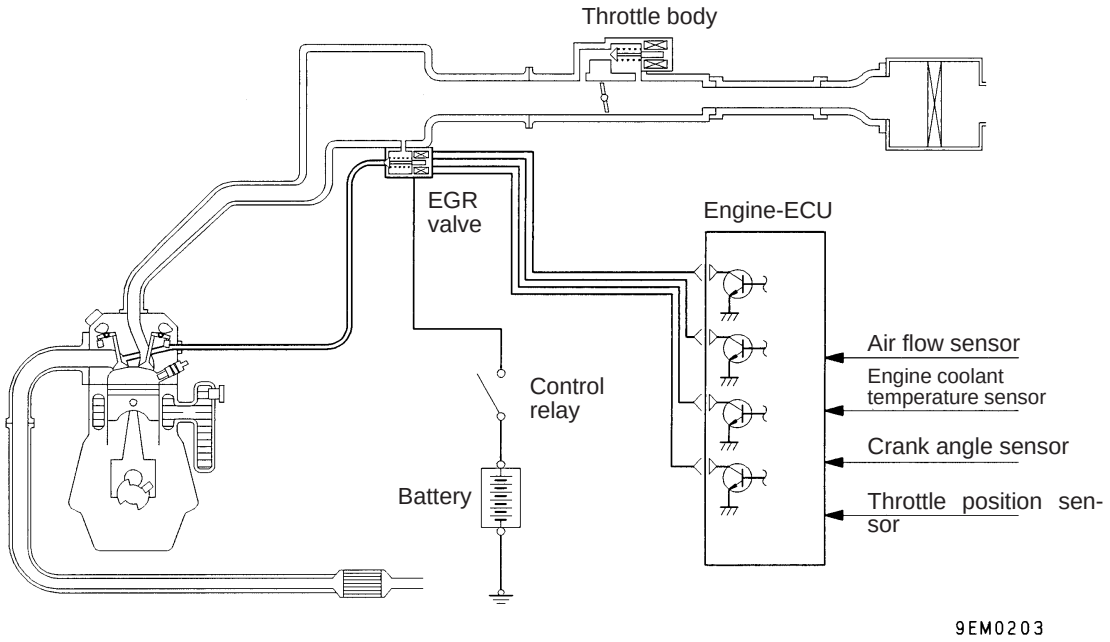
OPERATION

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.

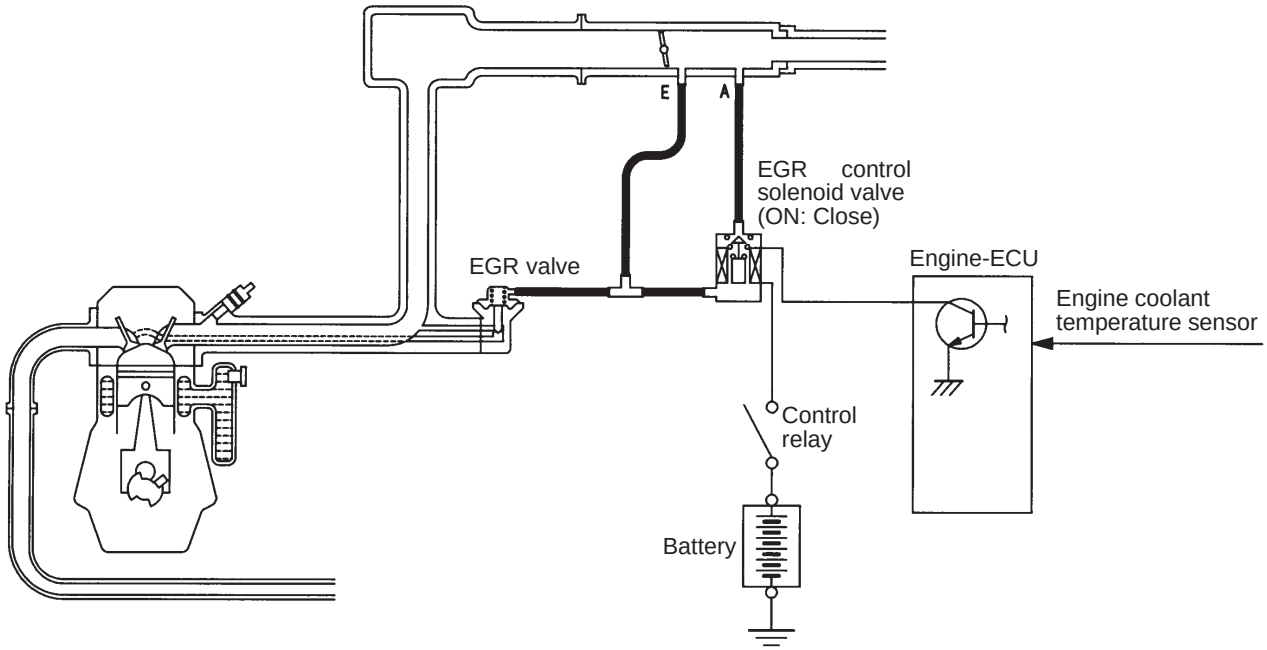
- The engine coolant temperature is low.
- The engine is at idle.
- The throttle valve is widely opened.

SYSTEM DIAGRAM

<GDI>

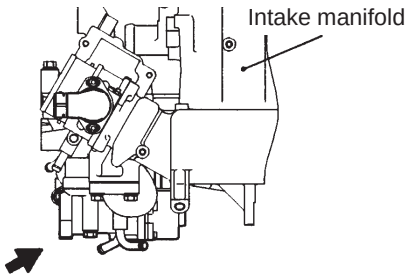


<MPI>

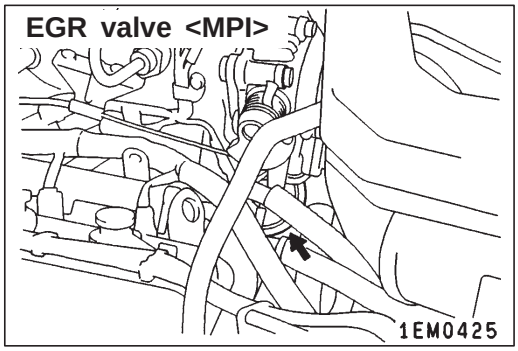


COMPONENT LOCATION

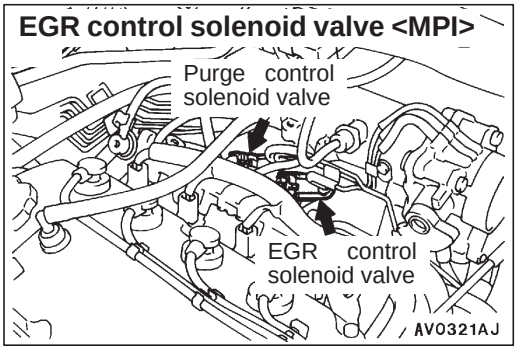
EGR control solenoid valve <GDI>



EGR valve <MPI>



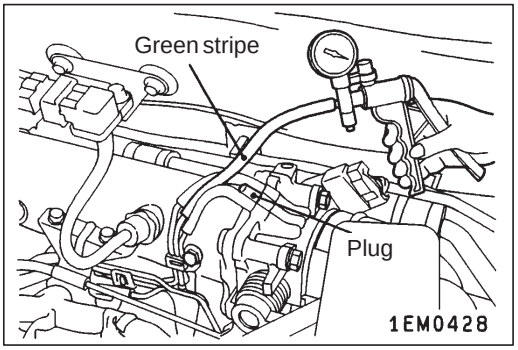
EGR control solenoid valve <MPI>



EXHAUST GAS RECIRCULATION (EGR) CONTROL SYSTEM CHECK <GDI>

17300260152

Refer to GROUP 13A – Troubleshooting.



EXHAUST GAS RECIRCULATION (EGR) CONTROL SYSTEM CHECK <MPI>

17300260152

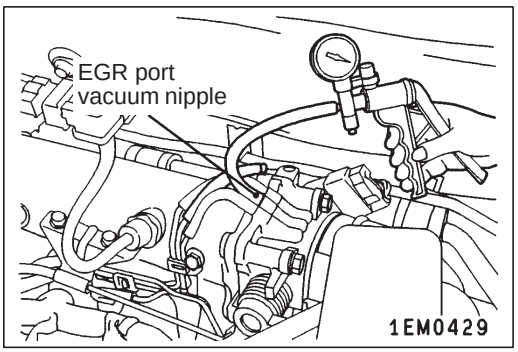
1. Disconnect the vacuum hose (green stripe) from the throttle body, and connect a hand vacuum pump to the vacuum hose.
2. Plug the nipple from which the vacuum hose was removed.
3. When the engine is cold and hot, apply a vacuum while the engine is idling, and check the condition of the engine and the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

When engine is cold (Engine coolant temperature: 40°C or less)

Hand vacuum pump	Normal engine condition	Normal vacuum condition
Vacuum is applied	No change	Vacuum leaks

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

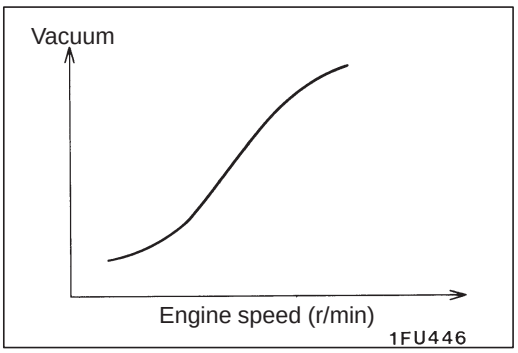
Hand vacuum pump	Normal engine condition	Normal vacuum condition
5.3 kPa	No change	Vacuum is maintained
27 kPa	Idling becomes slightly unstable or engine stalls.	Vacuum is maintained



EGR PORT VACUUM CHECK <MPI>

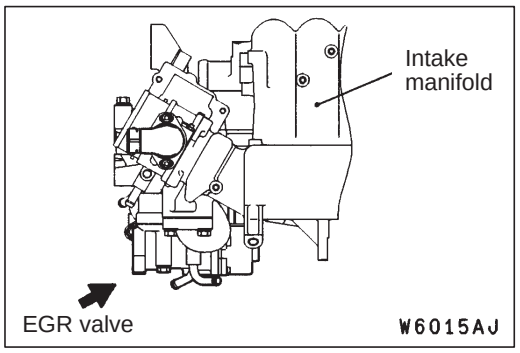
17300290106

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



2. Start the engine and check to see that, after raising the engine speed by racing the engine, EGR vacuum raises proportionately with the rise in engine speed.

NOTE
If there is a problem with the change in vacuum, it is possible that the throttle body EGR port may be clogged and require cleaning.

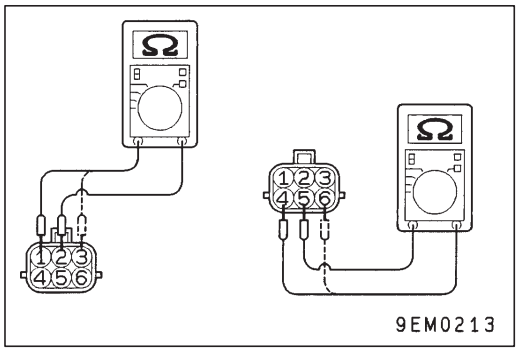


EGR VALVE CHECK <GDI>

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 to ON (without starting the engine).
2. If the operation sound cannot be heard, check the stepper motor drive circuit.

   NOTE
   If the circuit is normal, the cause is probably a malfunction of the stepper motor or of the engine-ECU.



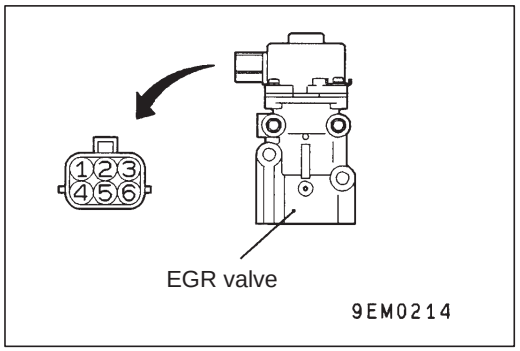
Checking the Coil Resistance

1. Disconnect the EGR valve connector.
2. Measure the resistance between the EGR valve-side connector terminal No.2 and terminal No.1 or terminal No.3.

   Standard value: 10 – 20 Ω (at 20°C)

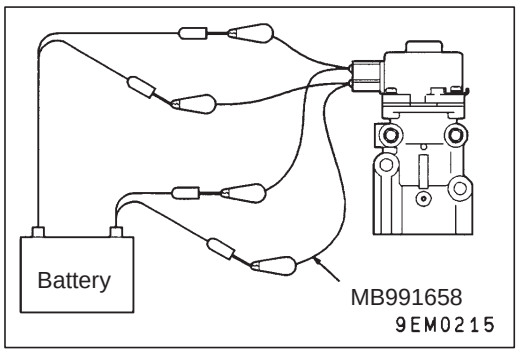
3. Measure the resistance between the EGR valve-side connector terminal No.5 and terminal No.4 or terminal No.6.

   Standard value: 10 – 20 Ω (at 20°C)



Operation Check

1. Remove the EGR valve.
2. Connect the special tool (test harness set) to the EGR valve-side connector.
3. Connect terminal No.2 and terminal No.5 to the positive (+) terminal of power supply of approximately 6 V.
4. Connect each clip to the negative (–) terminal of power supply in the order given below to test if any vibration occurs (as though the stepper motor is shaking slightly) due to the operation of the stepper motor.

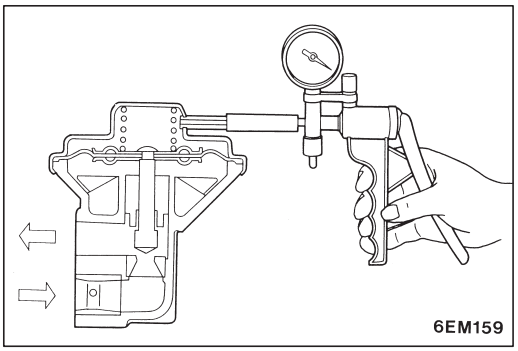


   (1) Connect terminal No.1 and terminal No.4 to the negative (–) terminal of the power supply.
   (2) Connect terminal No.3 and terminal No.4 to the negative (–) terminal of the power supply.
   (3) Connect terminal No.3 and terminal No.6 to the negative (–) terminal of the power supply.
   (4) Connect terminal No.1 and terminal No.6 to the negative (–) terminal of the power supply.
   (5) Connect terminal No.1 and terminal No.4 to the negative (–) terminal of the power supply.
   (6) Repeat the test in the order from (5) to (1).
5. If the results of testing show that the vibration could be felt, the stepper motor is normal.

EGR VALVE CHECK <MPI>

17300280110

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.

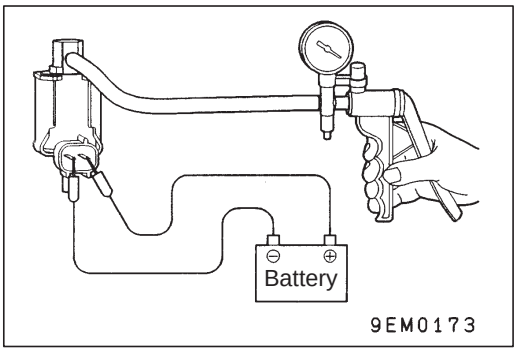


4. Apply a vacuum and check the passage of air by blowing through one side of the EGR passage.

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.

   Specified torque: 22 Nm



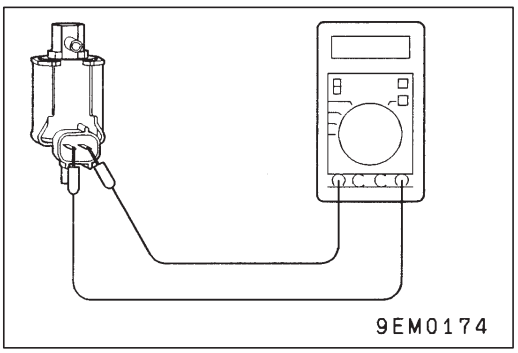
EGR CONTROL SOLENOID VALVE CHECK <MPI>

17300310123

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) 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	Normal condition
Not applied	Vacuum leaks
Applied	Vacuum maintained



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

   Standard value: 28 – 36 Ω (at 20°C)

EGR VALVE

REMOVAL AND INSTALLATION

Refer to GROUP 15 – Intake Manifold.

CATALYTIC CONVERTER

17300530055

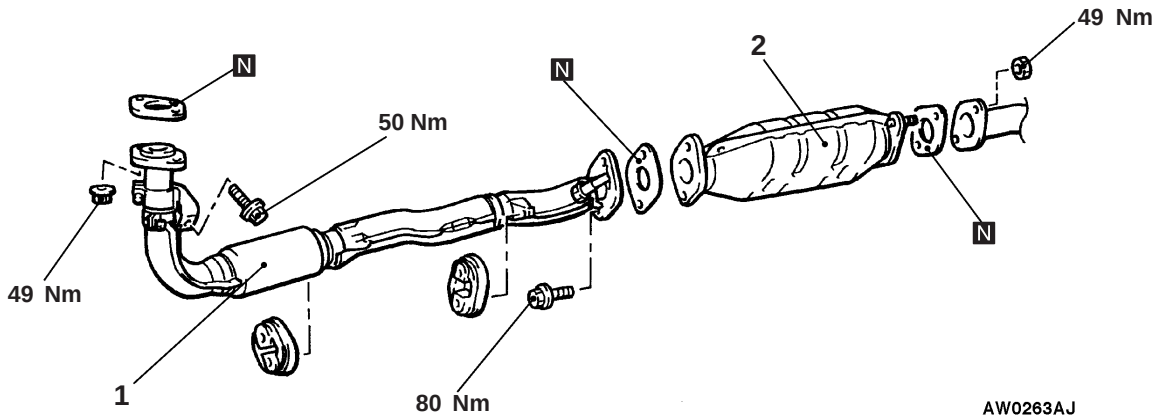
GENERAL INFORMATION

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

17300390318



Removal steps

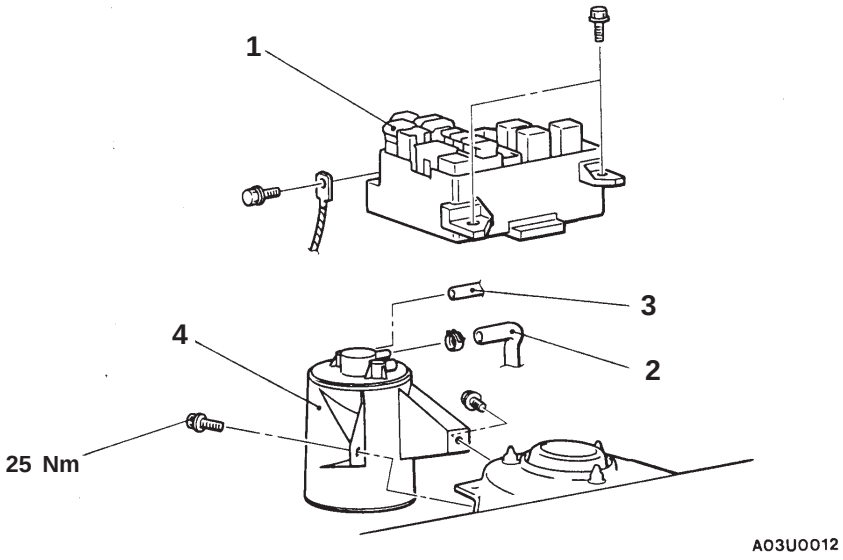
1. Front exhaust pipe
2. Catalytic converter

CANISTER

17300420024

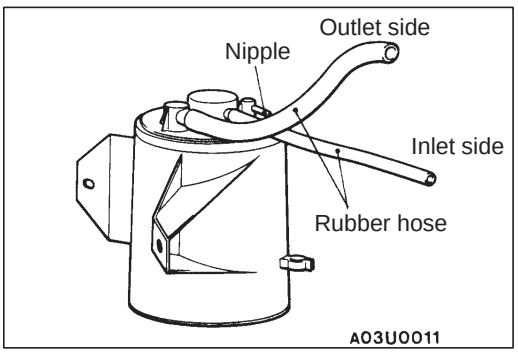
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Air Cleaner, Air Intake Hose Removal and Installation



Removal steps

1. Relay box
2. Vapour hose connection
3. Purge hose connection
4. Canister



INSPECTION

17300430027

SIMPLE INSPECTION OF CHECK VALVE INSIDE CANISTER

1. Connect clean rubber hoses to the nipples on the inlet side and outlet side.
2. Close off the other nipple with your finger and then check the operation of the check valve.

Inspection procedure	Normal condition
Light blow from inlet side (fuel tank side).	Air passes through with a slight feeling of resistance.
Lightly blow from outlet side (atmosphere side).	Air passes through.

ENGINE AND EMISSION CONTROL

CONTENTS

ENGINE CONTROL SYSTEM

GENERAL

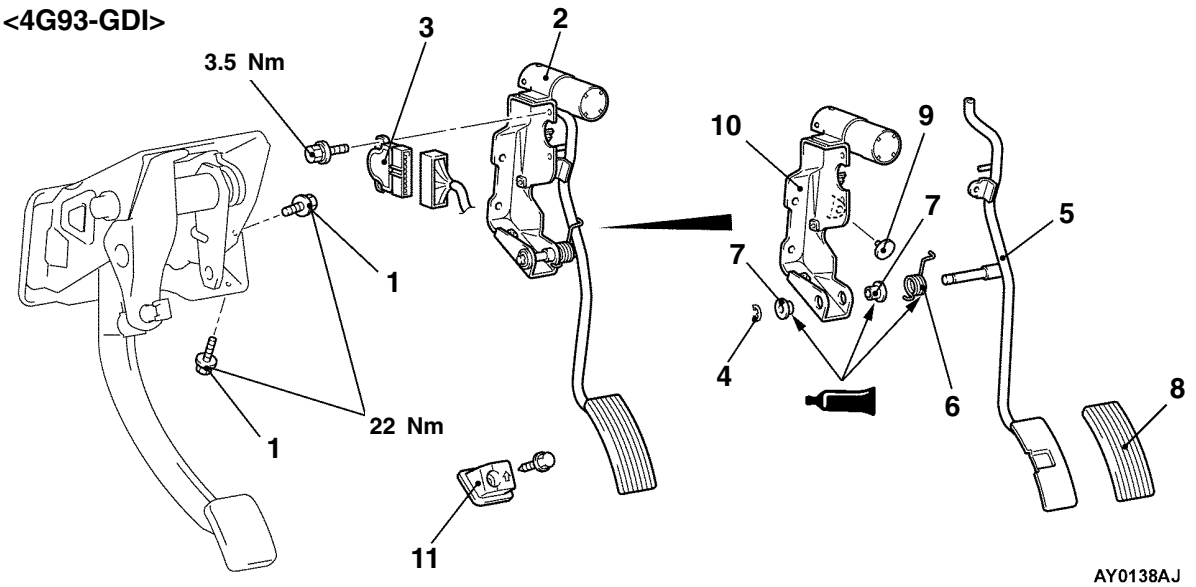
OUTLINE OF CHANGE

The following service procedures have been established due to the adoption of the accelerator pedal position sensor directly attached to the accelerator pedal used in the 4G93-GDI engine and the F9Q1 engine.

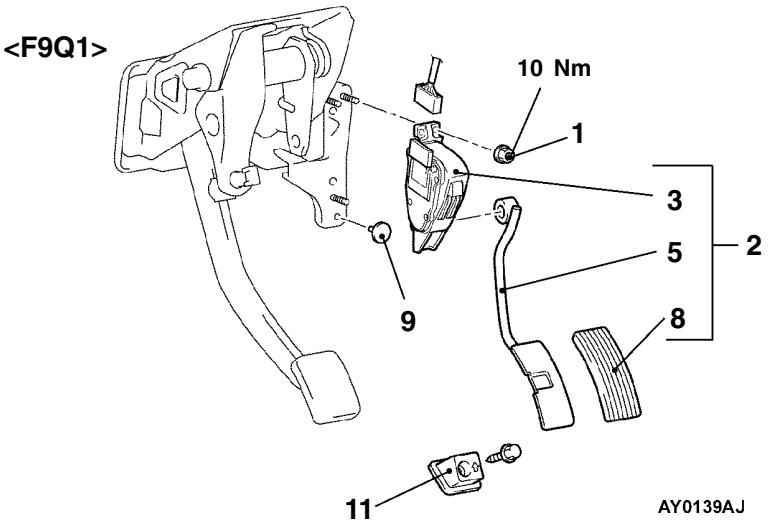
ACCELERATOR PEDAL <4G93-GDI, F9Q1>

REMOVAL AND INSTALLATION

<4G93-GDI>



<F9Q1>



Removal steps

1. Accelerator pedal assembly mounting bolts or nuts
2. Accelerator pedal assembly
3. Accelerator pedal position sensor
4. Snap ring <4G93-GDI>
5. Accelerator pedal
6. Spring <4G93-GDI>
7. Bushing <4G93-GDI>
8. Pedal pad
9. Stopper
10. Accelerator support member assembly <4G93-GDI>
11. Accelerator pedal stopper

EMISSION CONTROL SYSTEM <4G93-GDI,4G13-MPI>

GENERAL

OUTLINE OF CHANGES

The service procedures have been established to describe revised sections due to the changed items shown below.

<4G93-GDI Engine>

- The purge control solenoid valve has been changed to the one with increased flow amount, and the layout of vacuum pipe and other parts has been changed.

<4G13-MPI Engine>

- The purge control solenoid valve has been changed from ON/OFF control to duty control, and the throttle body intake purge port has been changed from the upstream side to the downstream side. Furthermore, the purge control solenoid valve has been changed to the one with increased flow amount.
- The mounting positions of EGR valve and EGR control solenoid valve have been changed.

GENERAL INFORMATION

The evaporative emission control system used in the 4G13-MPI engine has been changed from before.

<4G13-MPI>

Item	Name	Specification
Evaporative emission control system	Canister	Equipped
	Purge control solenoid valve	Duty cycle type solenoid valve (Purpose: HC reduction)

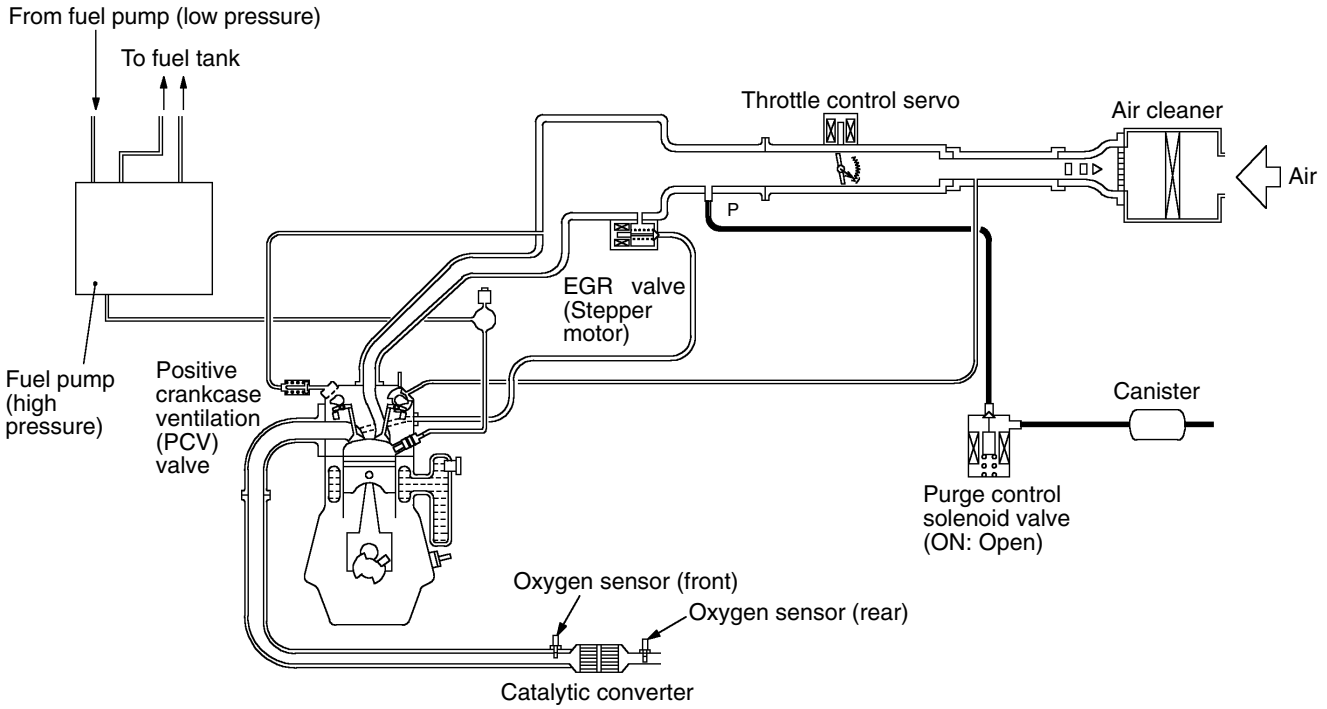
SERVICE SPECIFICATIONS

Item	Standard value
Purge control solenoid valve coil resistance (at 20°C) Ω	30 – 34

VACUUM HOSE

VACUUM HOSE PIPING DIAGRAM

<GDI>



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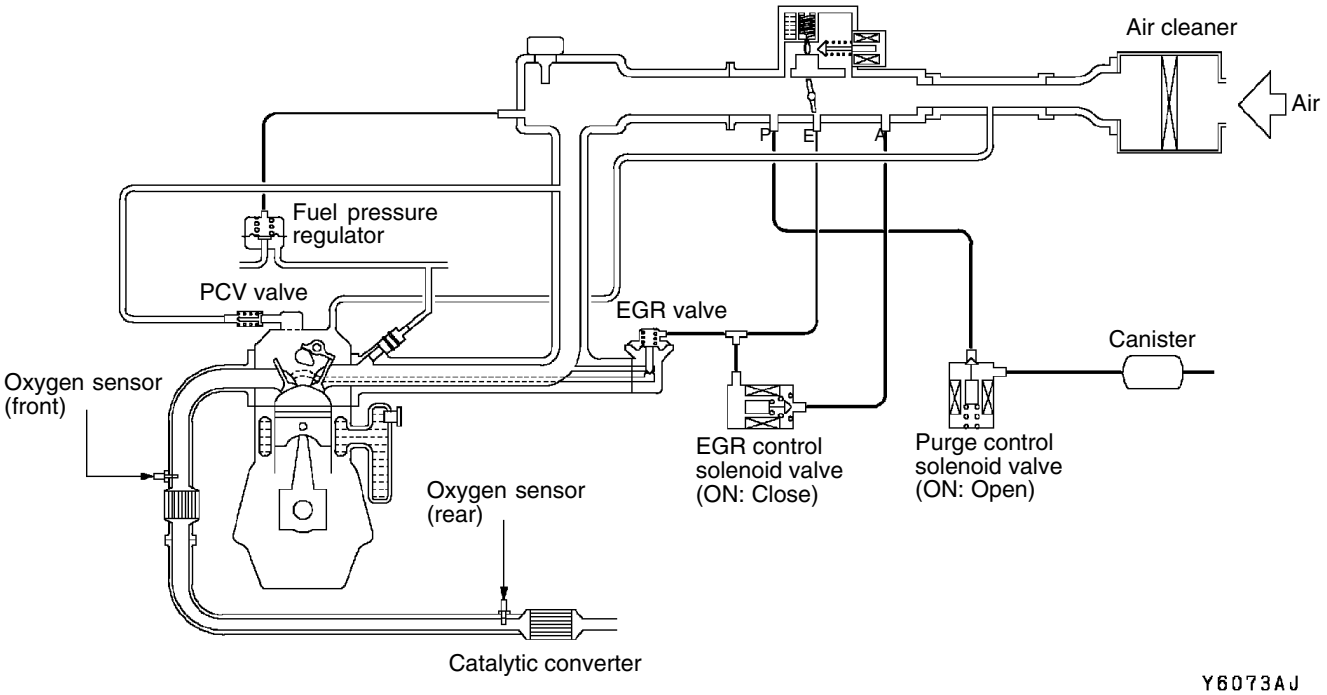
<MPI>



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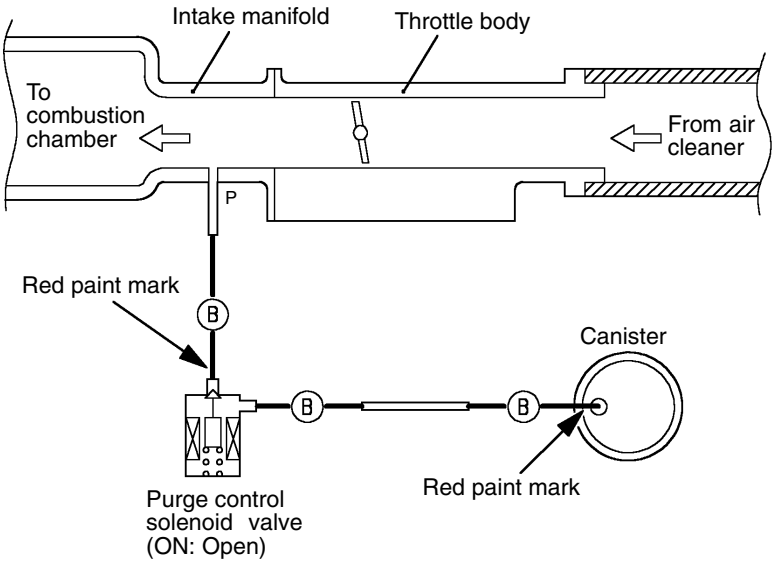
VACUUM CIRCUIT DIAGRAM

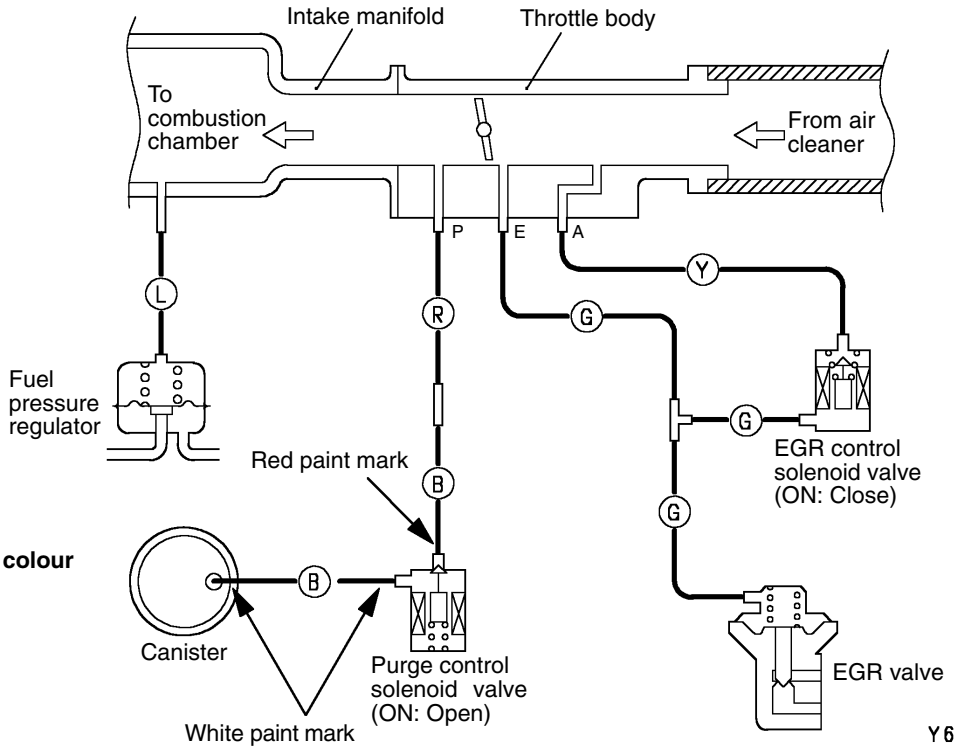
<GDI>



Vacuum hose colour
B: Black

Y6074AJ

<MPI>



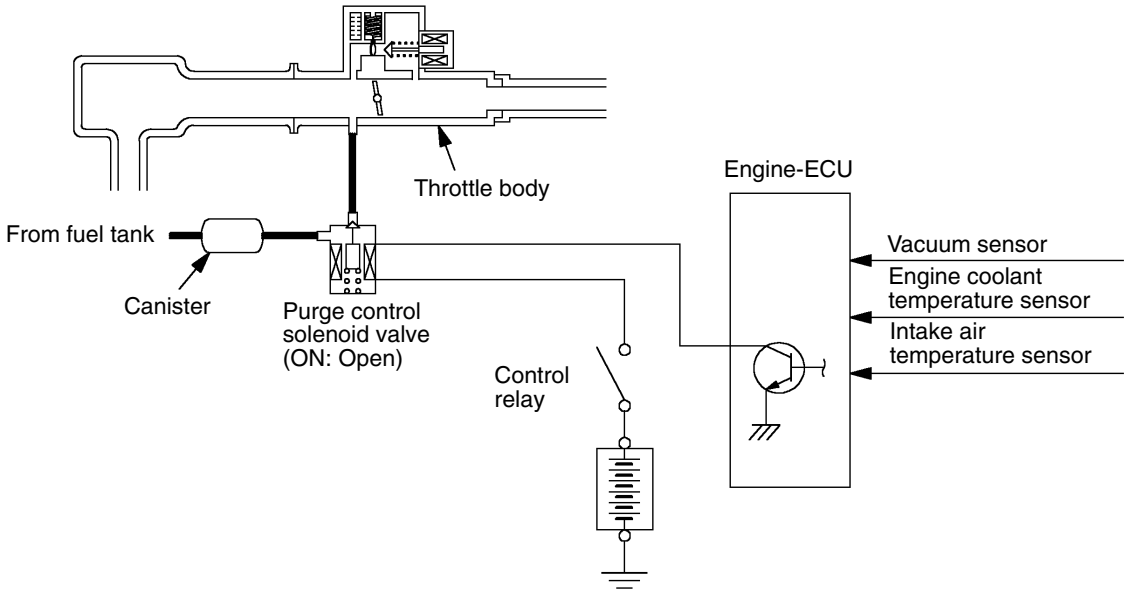
Vacuum hose colour
B: Black
G: Green
L: Light blue
R: Red
Y: Yellow

Y6075AJ

EVAPORATIVE EMISSION CONTROL SYSTEM

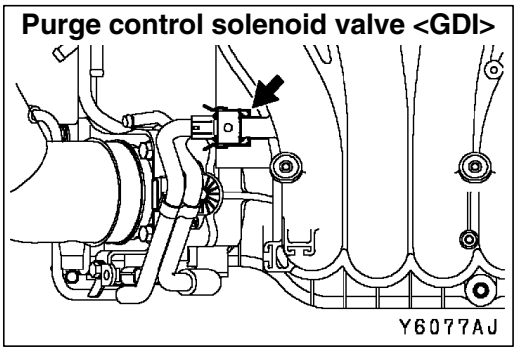
SYSTEM DIAGRAM

<MPI>

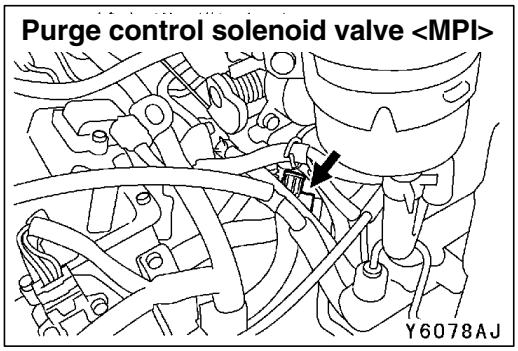


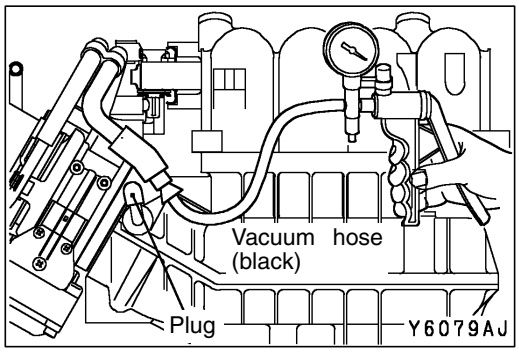
COMPONENT LOCATION

Purge control solenoid valve <GDI>



Purge control solenoid valve <MPI>





PURGE CONTROL SYSTEM CHECK <GDI>

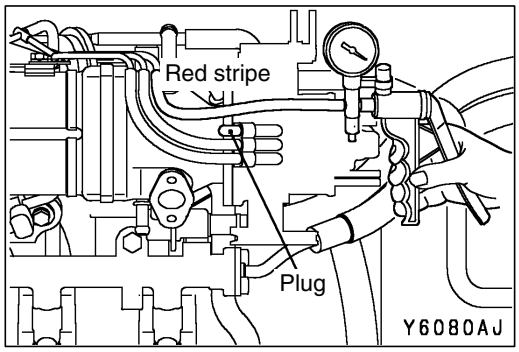
1. Disconnect the vacuum hose (black) from the intake manifold and connect it to a hand vacuum pump.
2. Plug the nipple from which the vacuum hose was removed.
3. When the engine is cold or hot, apply a vacuum of 53 kPa, and check the condition of the vacuum.

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 ● For 4 minutes after the engine is started	Vacuum is maintained
● 3,000 r/min ● For 3 minutes after the engine is started	Vacuum will leak.



PURGE CONTROL SYSTEM CHECK <MPI>

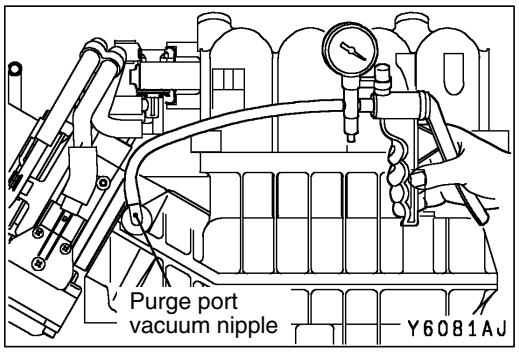
1. Disconnect the vacuum hose (red stripe) from the throttle body and connect it to a hand vacuum pump.
2. Plug the nipple from which the vacuum hose was removed.
3. When the engine is cold or hot, apply a vacuum of 53 kPa, and check the condition of the engine and the vacuum.

When engine is cold
(Engine coolant temperature: 40°C or less)

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

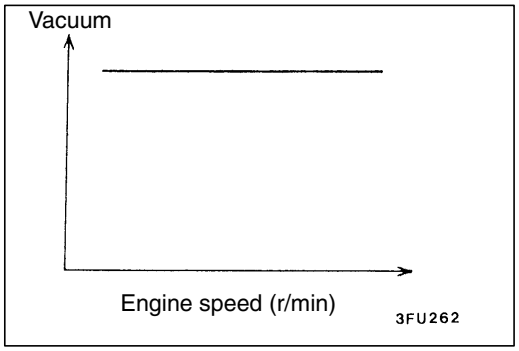
When engine is hot
(Engine coolant temperature: 80°C or higher)

Engine condition	Normal condition
At idle	Vacuum is maintained.
3,000 r/min (for approximately 3 minutes after the engine is started.)	Vacuum will leak.



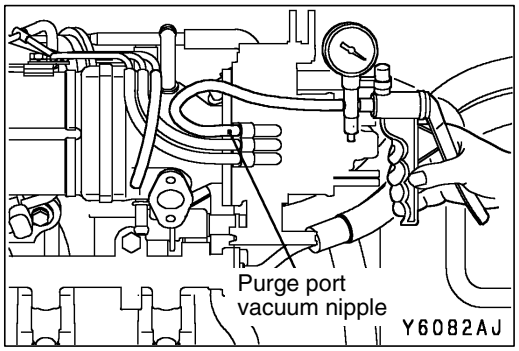
PURGE PORT VACUUM CHECK <GDI>

1. Disconnect the vacuum hose (black) from the intake manifold purge vacuum nipple and connect a hand vacuum pump to the nipple.



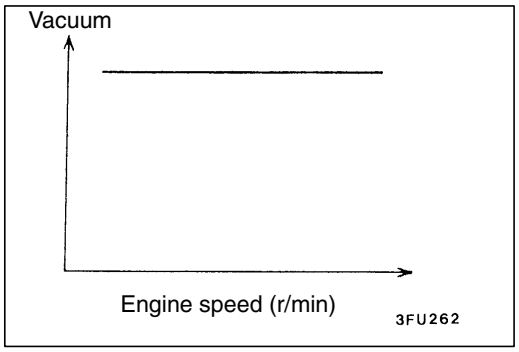
2. Start the engine and check that the vacuum remains fairly constant after racing the engine.

   NOTE
   If vacuum changes, it is possible that the intake manifold purge port may be clogged and require cleaning.



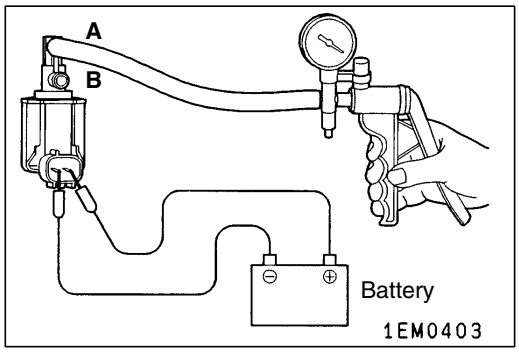
PURGE PORT VACUUM CHECK <MPI>

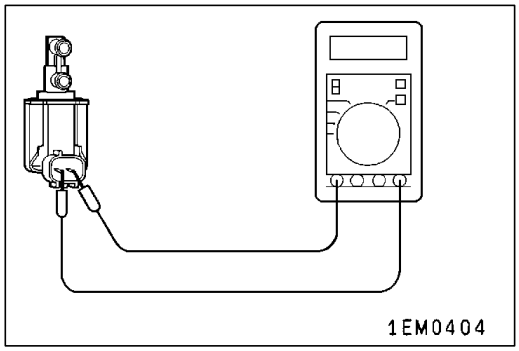
1. Disconnect the vacuum hose (red stripe) from the throttle body purge vacuum nipple and connect a hand vacuum pump to the nipple.



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

   NOTE
   If vacuum changes, it is possible that the intake manifold purge port may be 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 (black stripe, red stripe) 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.

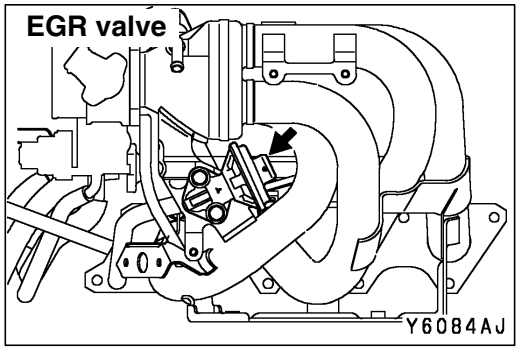
Battery voltage	Normal condition
Applied	Vacuum leaks
Not applied	Vacuum maintained

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

   Standard value: 30 – 34 Ω (at 20°C)

EXHAUST GAS RECIRCULATION (EGR) SYSTEM <MPI>

COMPONENT LOCATION



EGR VALVE

REMOVAL AND INSTALLATION

Refer to GROUP 15 – Intake Manifold.

EMISSION CONTROL SYSTEM <F9Q1>

GENERAL

OUTLINE OF CHANGE

The following maintenance service points have been established to correspond to the adoption of the F9Q1 engine.

GENERAL INFORMATION

The electronically-controlled EGR system consists of an EGR valve, engine-ECU and various sensors. The EGR valve is optimally controlled by the engine-ECU in response to the engine operation conditions, based on data input from each of the sensors. In this way, the EGR valve is controlled to reduce NOx emissions while maintaining good engine performance.

Items	Name	Specification
Exhaust emission control system	Exhaust gas recirculation system ● EGR valve ● EGR valve position sensor	Electronically-controlled EGR system Electric motor type Potentiometer type

SERVICE SPECIFICATIONS

Items	Standard value
EGR valve resistance Ω (at 20°C)	7.5 – 8.5
EGR valve position sensor resistance kΩ (at 20°C)	2.4 – 5.6

EXHAUST GAS RECIRCULATION (EGR) SYSTEM

GENERAL INFORMATION

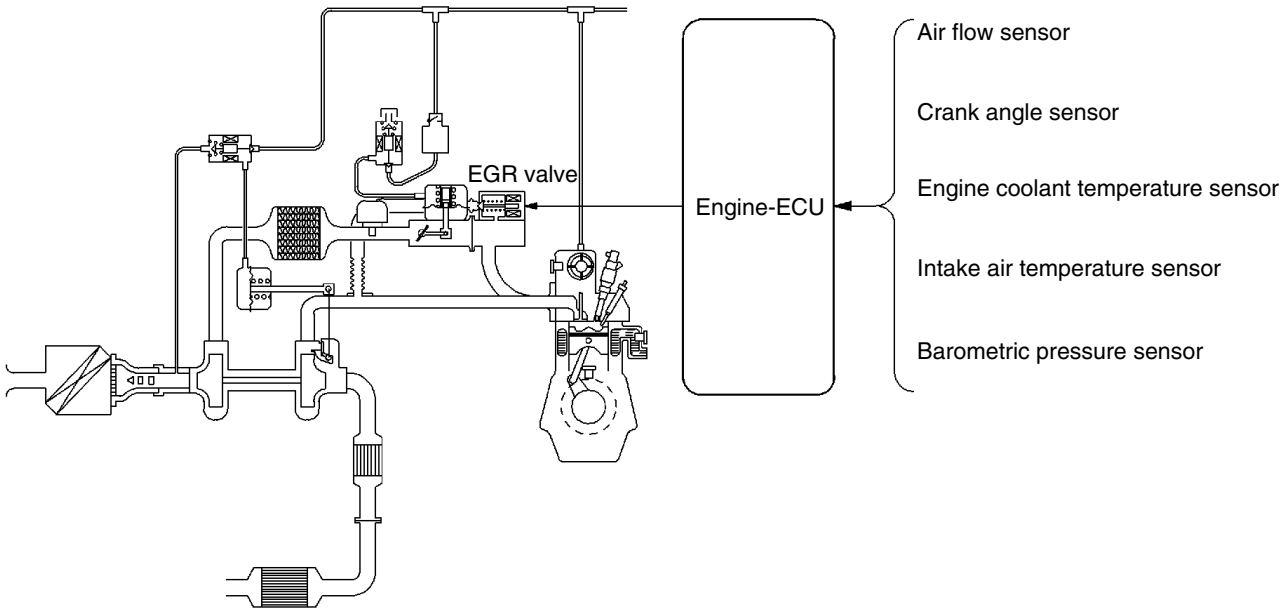
The electronically-controlled EGR system consists of an EGR valve, engine-ECU and various sensors. The EGR valve is optimally controlled by the engine-ECU in response to the engine operation conditions, based on data input from each of the sensors. In this way, the EGR valve is controlled to reduce NOx emissions while maintaining good engine performance.

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 throttle valve is widely opened.

SYSTEM DIAGRAM



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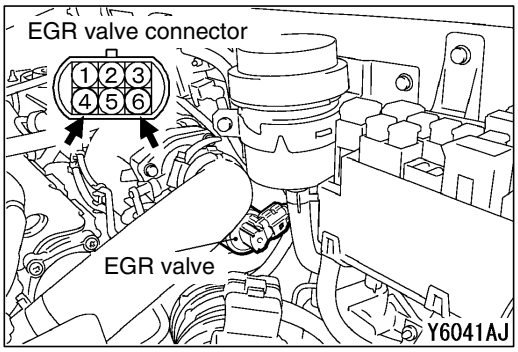
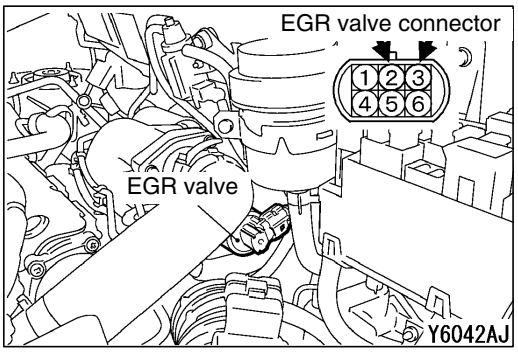


EGR VALVE CHECK

1. Disconnect the EGR valve connector.
2. Measure the resistance between the EGR valve side connector terminal 4 and terminal 6.

   Standard value: 7.5 – 8.5 Ω (at 20°C)
3. If the resistance is outside the standard value, replace the EGR valve.



EGR VALVE POSITION SENSOR CHECK

1. Disconnect the EGR valve connector.
2. Measure the resistance between the EGR valve side connector terminal 2 and terminal 3.

   Standard value: 2.4 – 5.6 Ω (at 20°C)

3. If the resistance is outside the standard value, replace the EGR valve.