ENGINE AND EMISSION CONTROL

CONTENTS

ENGINE CONTROL SYSTEM

GENERAL

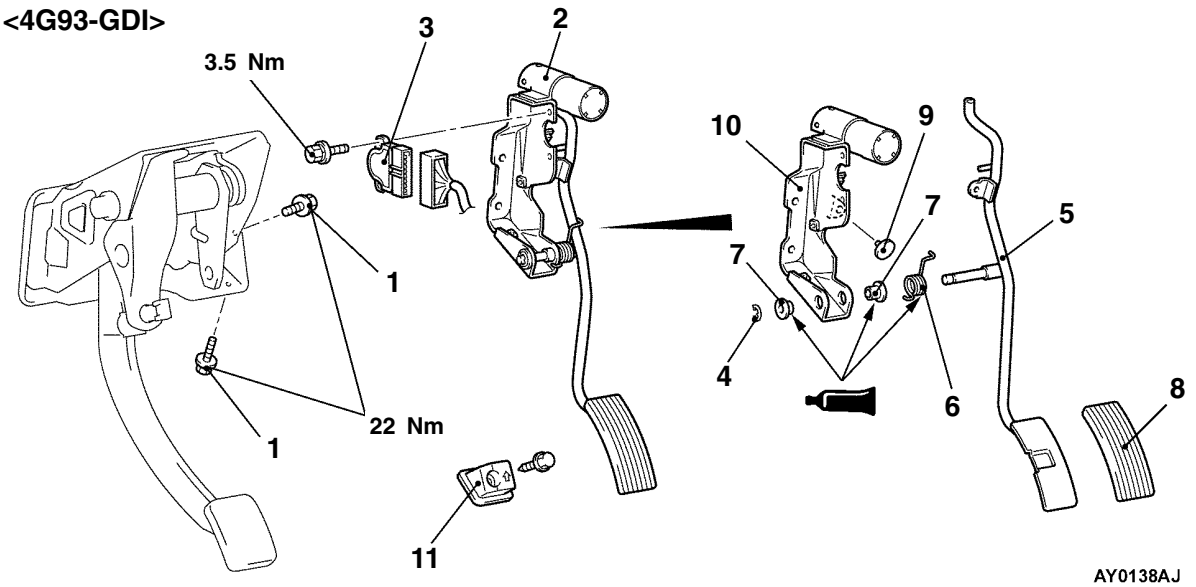
OUTLINE OF CHANGE

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.

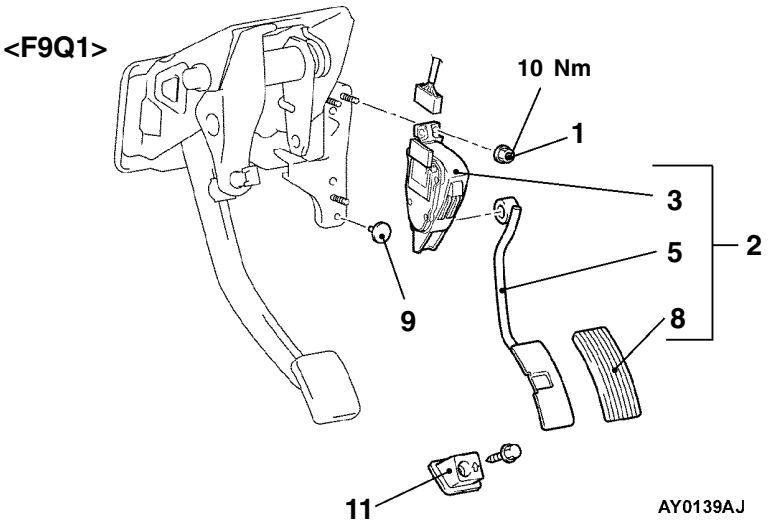
ACCELERATOR PEDAL <4G93-GDI, F9Q1>

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)

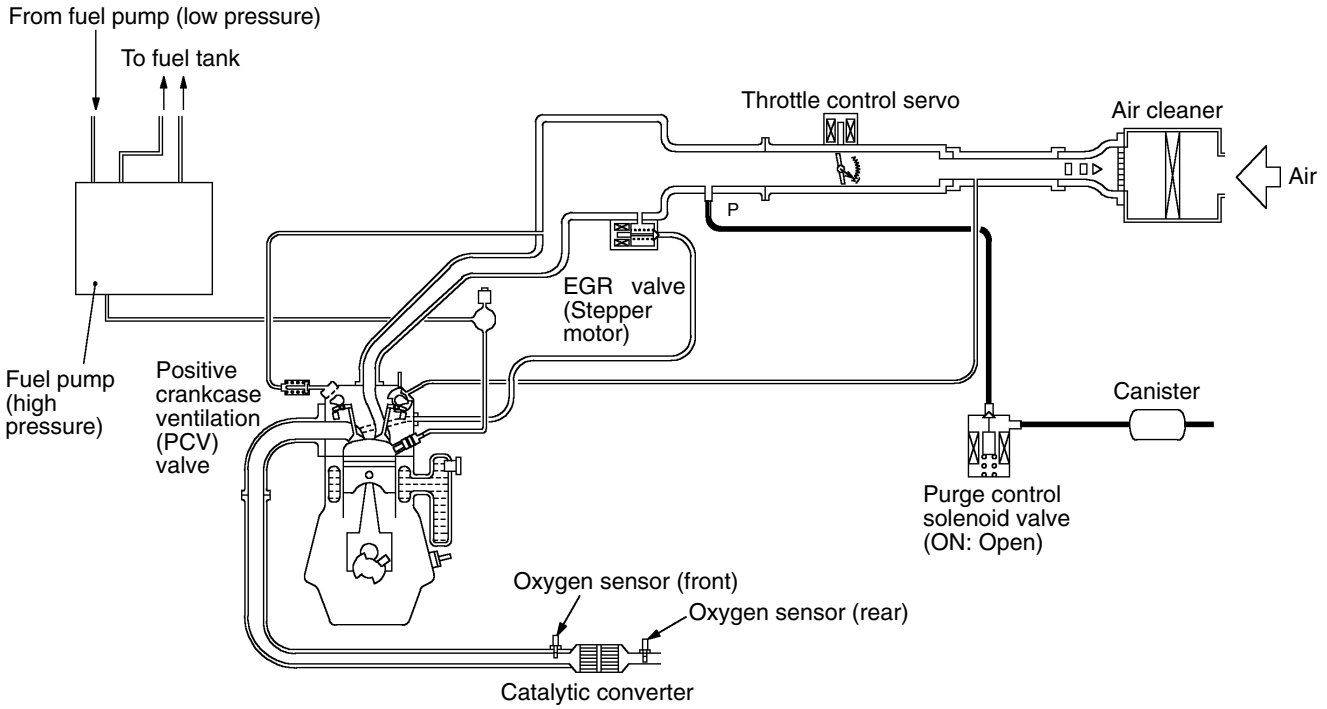
SERVICE SPECIFICATIONS

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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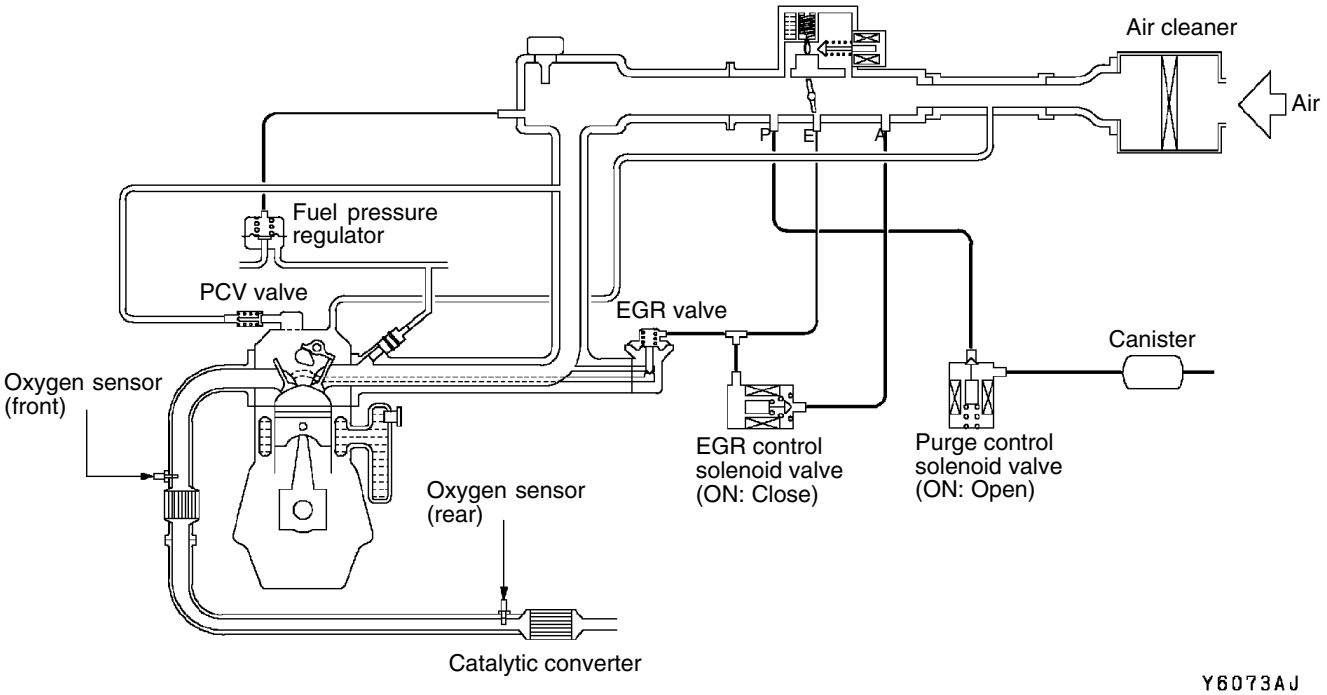
<MPI>



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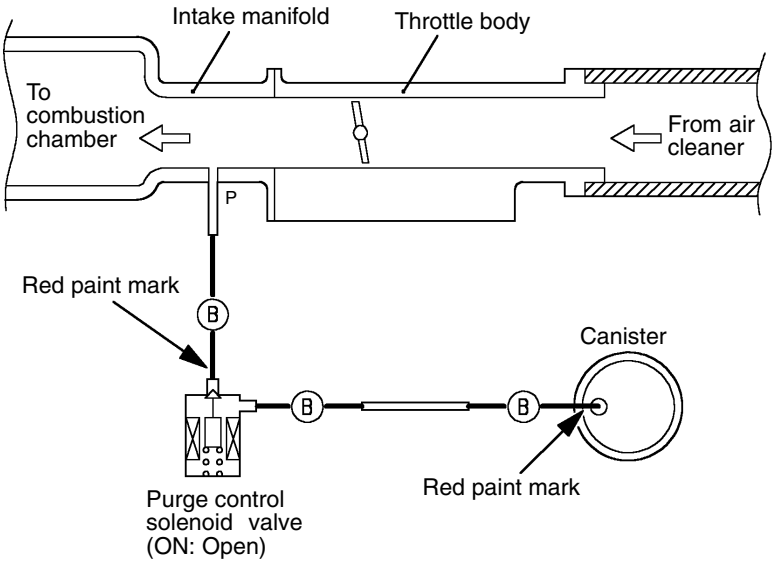
VACUUM CIRCUIT DIAGRAM

<GDI>



Vacuum hose colour
B: Black

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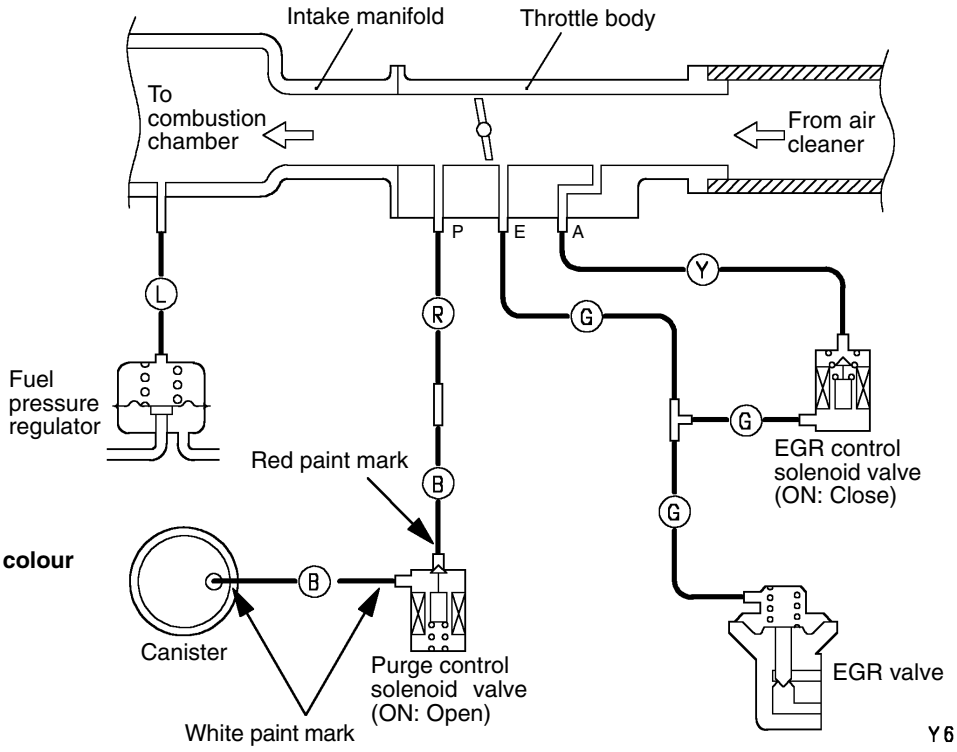
<MPI>



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

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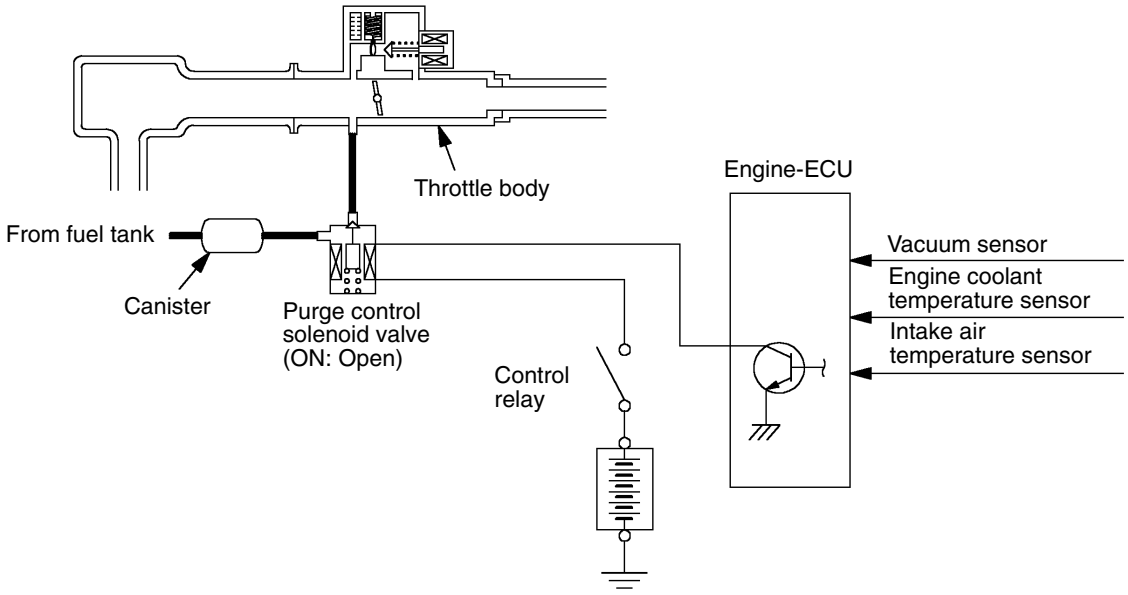
EVAPORATIVE EMISSION CONTROL SYSTEM

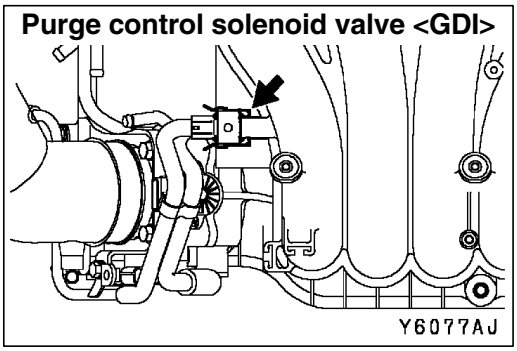
SYSTEM DIAGRAM

<MPI>

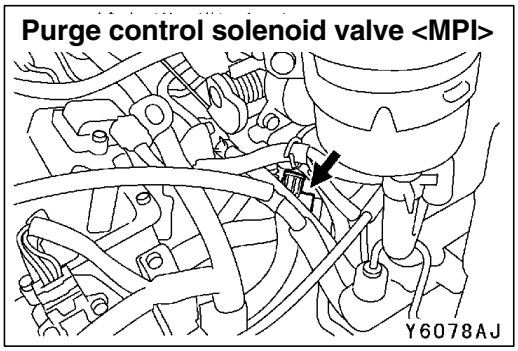


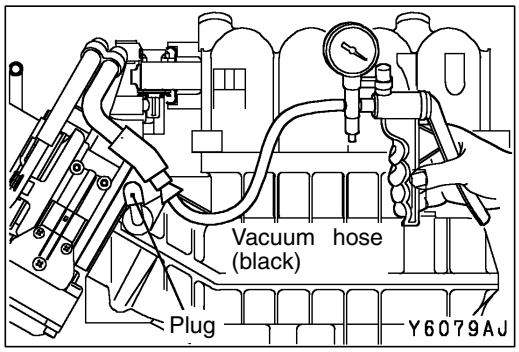
COMPONENT LOCATION

Purge control solenoid valve <GDI>



Purge control solenoid valve <MPI>





PURGE CONTROL SYSTEM CHECK <GDI>

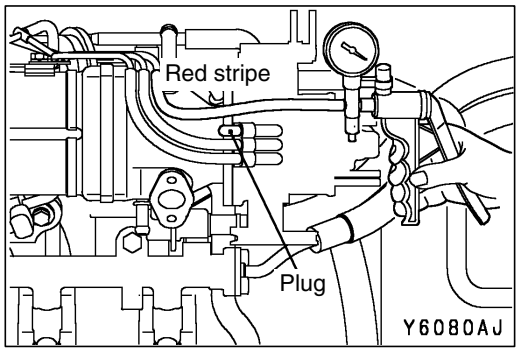
1. Disconnect the vacuum hose (black) from the intake manifold and connect it to a hand vacuum pump.
2. Plug the nipple from which the vacuum hose was removed.
3. When the engine is cold or hot, apply a vacuum of 53 kPa, and check the condition of the vacuum.

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>

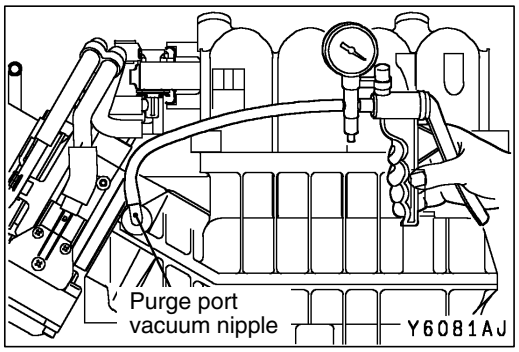
1. Disconnect the vacuum hose (red stripe) from the throttle body and connect it to a hand vacuum pump.
2. Plug the nipple from which the vacuum hose was removed.
3. When the engine is cold or hot, apply a vacuum of 53 kPa, and check the condition of the engine and the vacuum.

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

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

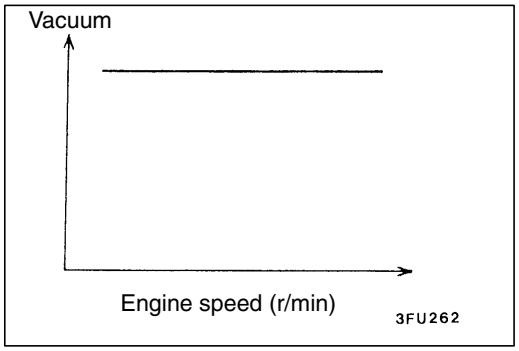
When engine is hot
(Engine coolant temperature: 80°C or higher)

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.



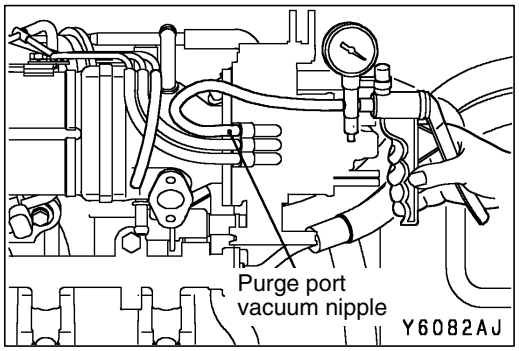
PURGE PORT VACUUM CHECK <GDI>

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



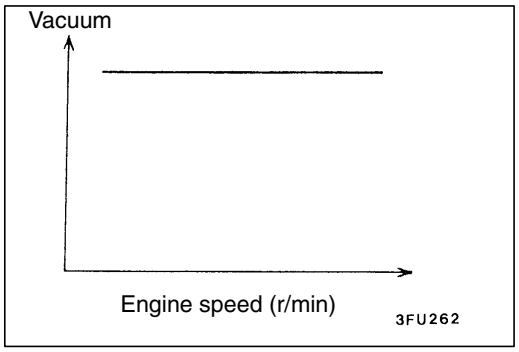
2. Start the engine and check that the vacuum remains fairly constant after racing the engine.

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



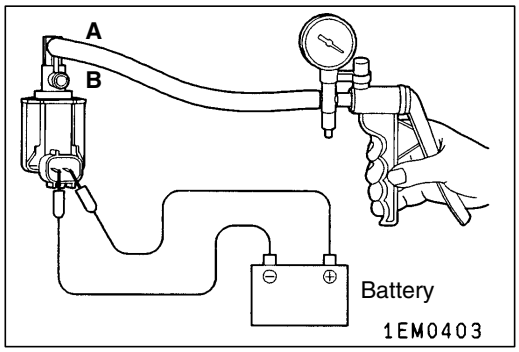
PURGE PORT VACUUM CHECK <MPI>

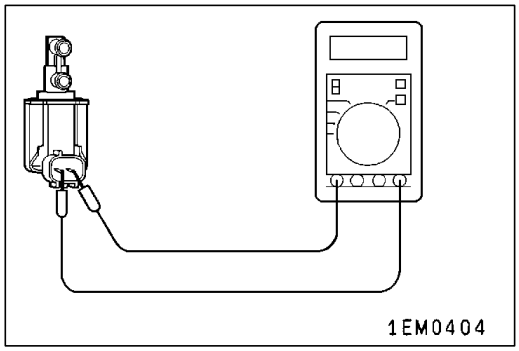
1. Disconnect the vacuum hose (red stripe) from the throttle body purge vacuum nipple and connect a hand vacuum pump to the nipple.



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.

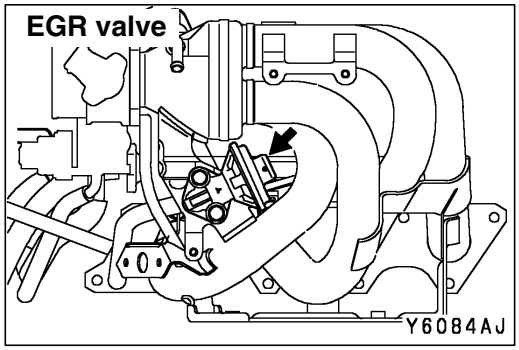
Battery voltage	Normal condition
Applied	Vacuum leaks
Not applied	Vacuum maintained

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

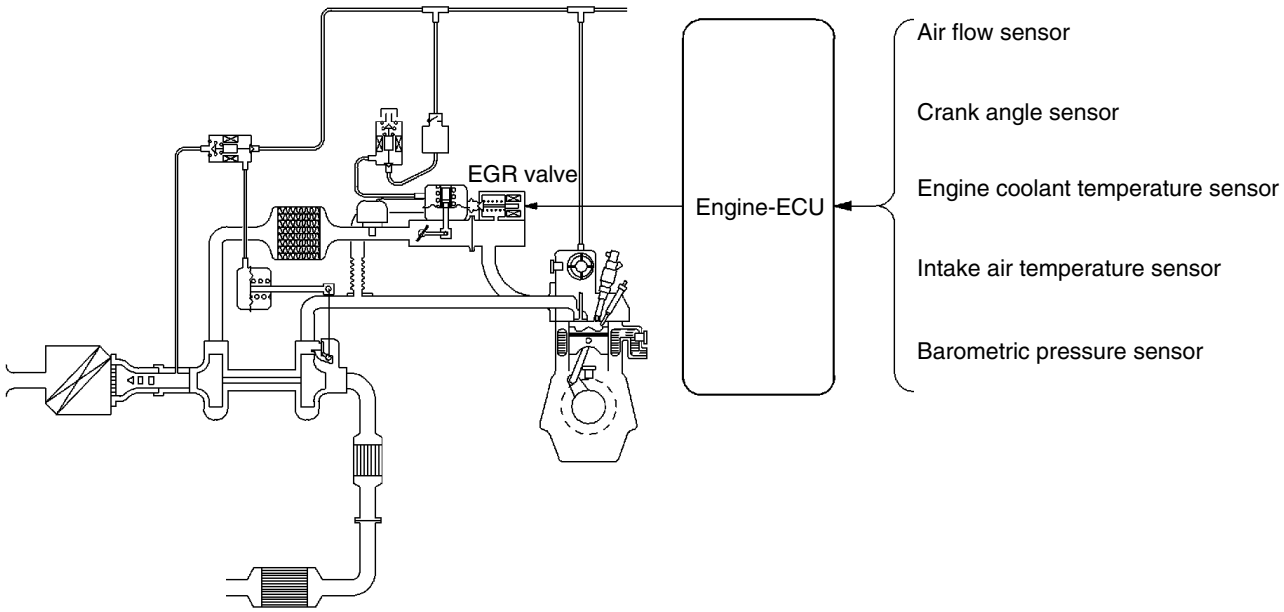
The electronically-controlled EGR system consists of an EGR valve, engine-ECU and various sensors. The EGR valve is optimally controlled by the engine-ECU in response to the engine operation conditions, based on data input from each of the sensors. In this way, the EGR valve is controlled to reduce NOx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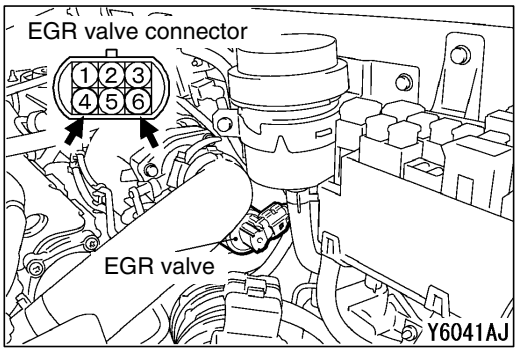
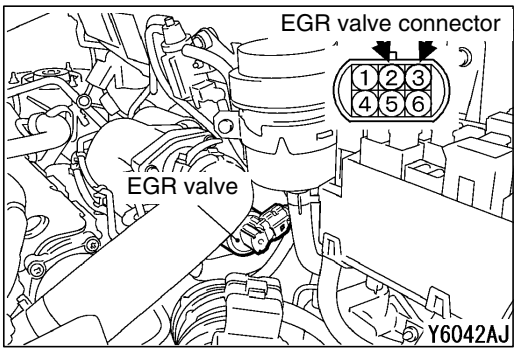


EGR VALVE CHECK

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.