EMISSION CONTROL SYSTEMS

CONTENTS

GENERAL INFORMATION

N25BEBAa

The emission control system has the following three major systems.

(1) Crankcase emission control system
(2) Evaporative emission control system
(3) Exhaust emission control system

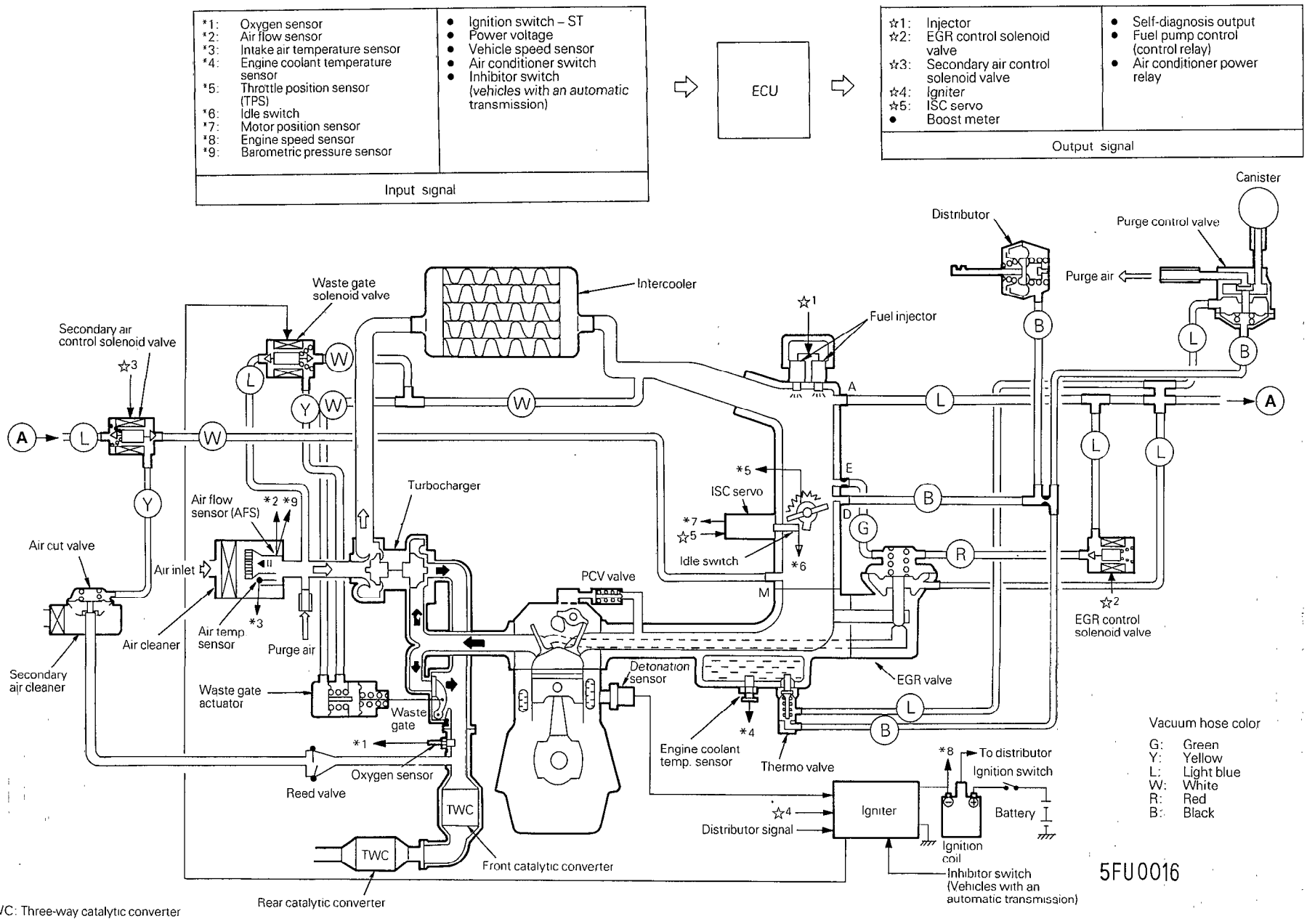
The crankcase emission control system is a system adopting a closed-type crankcase ventilation to prevent blow-by gas from escaping into the atmosphere. The generated gas is instead led to the combustion chamber for combustion.

The evaporative emission control system for preventing loss of fuel vapor from the fuel system to the atmosphere consists of various components (a canister, purge control valve, two-way valve and so on) which collect and lead generated fuel vapor to the combustion chamber for combustion.

The exhaust emission control system consists of an air-fuel ratio control system (ECI system), three-way catalytic converter, exhaust gas recirculation system, secondary air supply system and so on to reduce emissions of CO, HC and NOx.

ECI: Electronically Controlled Injection

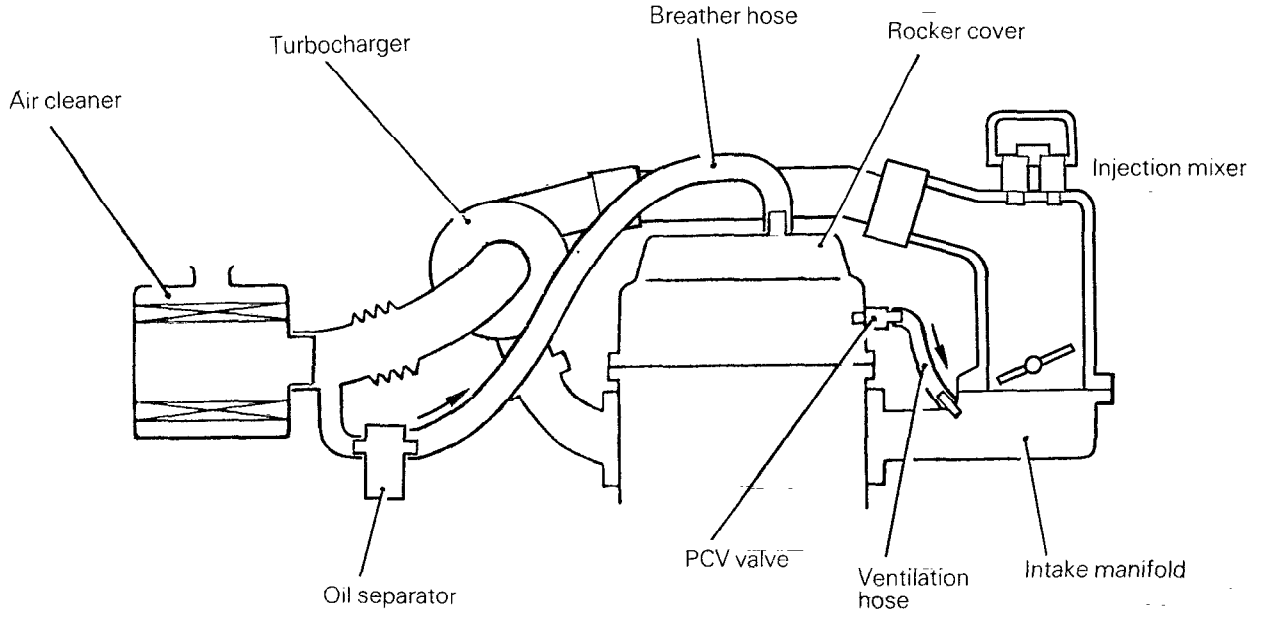
ECI SYSTEM DIAGRAM



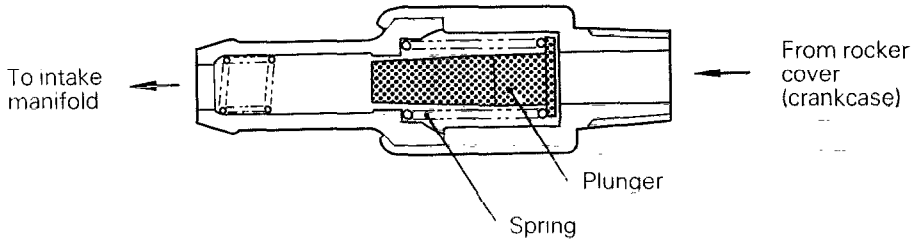
TWC: Three-way catalytic converter

CRANKCASE EMISSION CONTROL SYSTEM

N25HAAAa



6EN121



6EM122

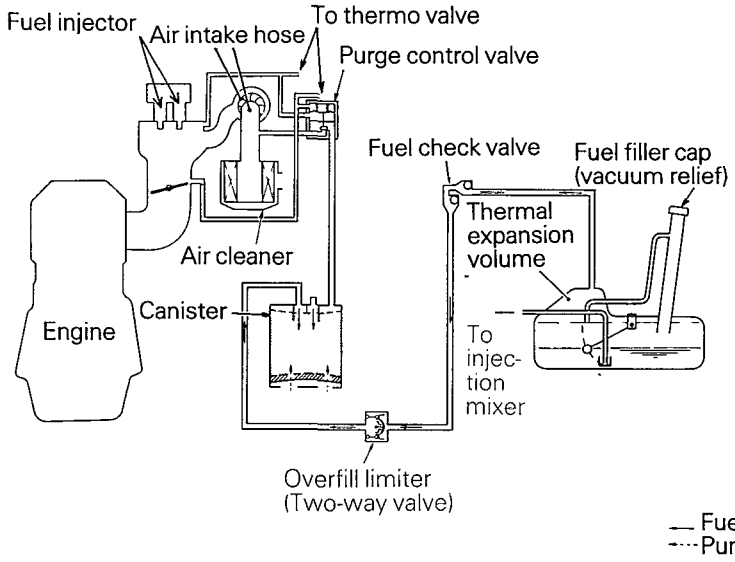
A closed-type crankcase ventilation system is utilized to prevent the blow-by gas from escaping into the atmosphere. This system has a positive crankcase ventilation valve (PCV valve) at the rocker cover.

This system supplies fresh air to the crankcase through the air cleaner. Inside the crankcase, the fresh air is mixed with blow-by gases, and this mixture passes through the PCV valve into the intake manifold.

The PCV valve has a metered orifice through which the mixture of fresh air and blow-by gases is drawn into the intake manifold in response to the intake manifold vacuum. The valve capacity is adequate for all normal driving conditions.

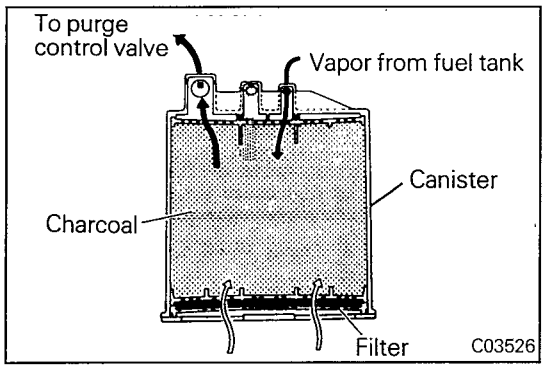
EVAPORATIVE EMISSION CONTROL SYSTEM

N25HBAB



03U0045

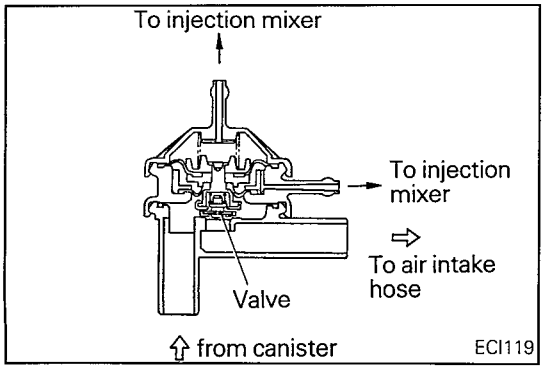
In order to prevent the loss of fuel vapor from the fuel system into the atmosphere, the evaporative emission control system consists of charcoal canister, a purge control valve, etc.



CANISTER

N25HBBB

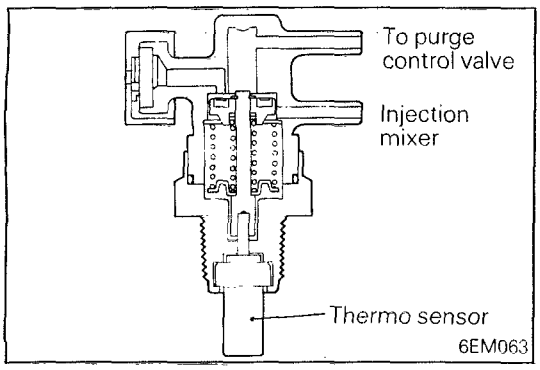
While the engine is inoperative, fuel vapor generated inside the fuel tank is absorbed and stored in canister.
When the engine is running, the fuel vapor absorbed in canister is drawn into the air intake hose through the purge control valve.



PURGE CONTROL VALVE

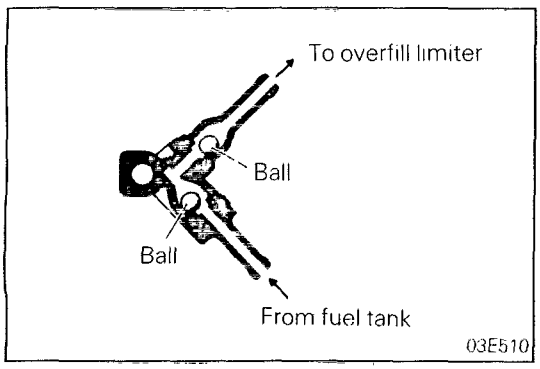
N25HBDB

The purge control valve is kept being closed during idling to prevent vaporized fuel from entering into the air intake hose for positive control of high-idle CO emission, which is a particular problem under high ambient temperature condition and once the throttle ported vacuum or turbocharged pressure working on the diaphragm of the valve exceeds the pre-set value, the purge control valve is opened.



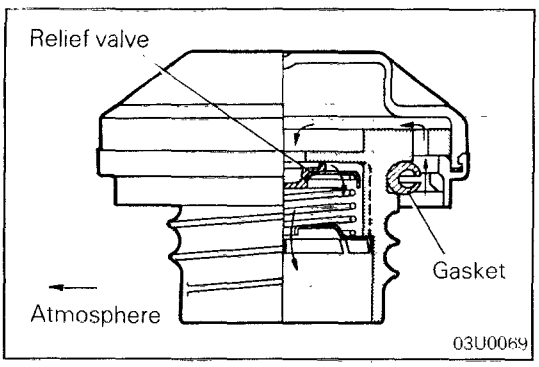
THERMO VALVE N25HBFA

The thermo valve, for sensing the engine coolant temperature at the intake manifold, closes the purge control valve when the engine coolant temperature is lower than the pre-set value in order to reduce CO and HC emissions under engine warm-up conditions, and opens the purge control valve when the engine coolant temperature is above the pre-set temperature.



FUEL CHECK VALVE N25HBGA

The fuel check valve is used to prevent fuel leaks, should the car suddenly roll over. This valve is connected in the fuel vapor line (between fuel tank and overfill limiter) and is installed on the fuel tank.
The fuel check valve contains two balls as shown in the illustration. Under normal conditions, the gasoline vapor passage in the valve is opened, but if roll-over occurs one of the balls closes the fuel passage, thus preventing fuel leaks.

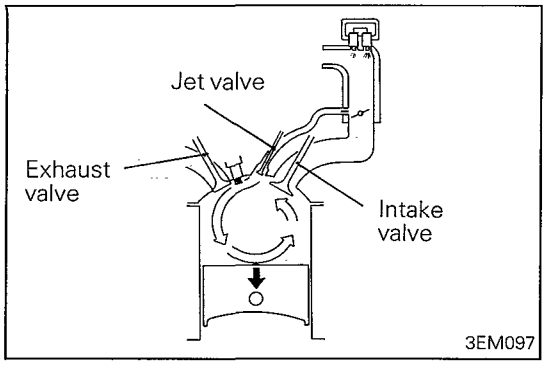


FUEL FILLER CAP N25HBHA

Fuel filler cap is equipped with relief valve to prevent the escape of fuel vapor into the atmosphere.

EXHAUST EMISSION CONTROL SYSTEM N25HCAC

Exhaust emissions (CO, HC, NOx) are controlled by a combination of engine modifications and the addition of special control components.
Modifications to the combustion chamber, intake manifold, camshaft, carburetor and ignition system form the basic control system.
Additional control devices include a jet air system, an exhaust gas recirculation (EGR) system, dual catalytic converters, a secondary air supply system, a dash pot, a heated air intake system and high altitude compensation system.
These systems have been integrated into a highly effective system which controls exhaust emissions while maintaining good driveability and fuel economy.



JET AIR SYSTEM N25HCBB

In addition to the intake valve and exhaust valve, a jet valve has been provided for drawing jet air (super lean mixture or air) into the combustion chamber.
A jet air passage is provided in the injection mixer, intake manifold and cylinder head. Jet air flows through two intake openings provided near the throttle valve of the injection mixer, goes through the passage in the intake manifold and cylinder head, and flows through the jet valve and the jet opening into the combustion chamber.
The jet valve is actuated by the same cam as the intake valve and by a common rocker arm so that the jet valve and intake valve open and close simultaneously.
The jet air flowing out of the jet opening scavenges the residual gases around the spark plug and creates a good ignition condition. It also produces a strong swirl in the combustion chamber which continues throughout the compression stroke and improves flame propagation after ignition, assuring high combustion efficiency.

AIR-FUEL RATIO CONTROL SYSTEM [ELECTRONICALLY CONTROLLED INJECTION (ECI) SYSTEM] N25HCCBa

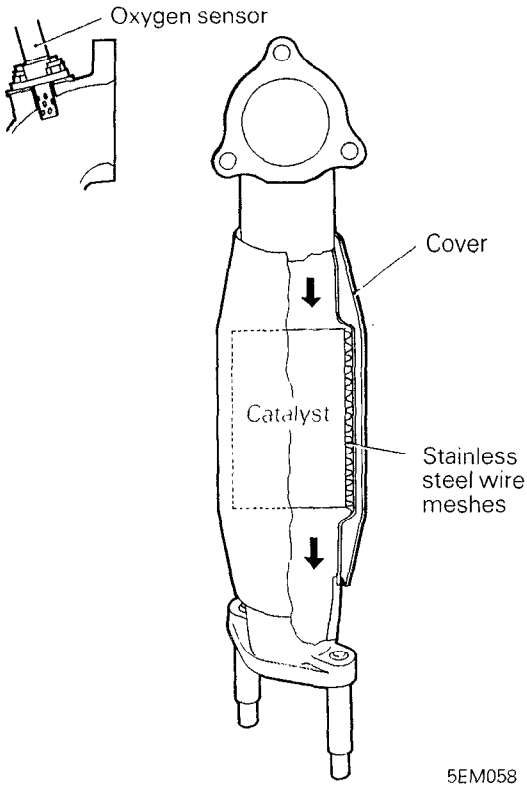
The ECI system uses oxygen sensor electric signals to control and drive the injector installed upstream of the throttle valve so as to accurately control the air-fuel ratio for minimizing emissions.
This in turn allows the engine to produce exhaust gases of the proper composition to permit the use of a three-way catalyst.
The three-way catalyst is designed to convert the three pollutants (1) hydrocarbons (HC), (2) carbon monoxide (CO), and (3) oxides of Nitrogen (NOx) into harmless substances.
There are two operating modes in the ECI system:
(1) Open Loop
Air-fuel ratio is controlled by information programmed into the ECU at manufacture.
(2) Closed Loop
Air-fuel ratio is varied by the ECU based on information supplied by the oxygen sensor.

NOTE
Refer to GROUP 14 FUEL SYSTEM – General Information.

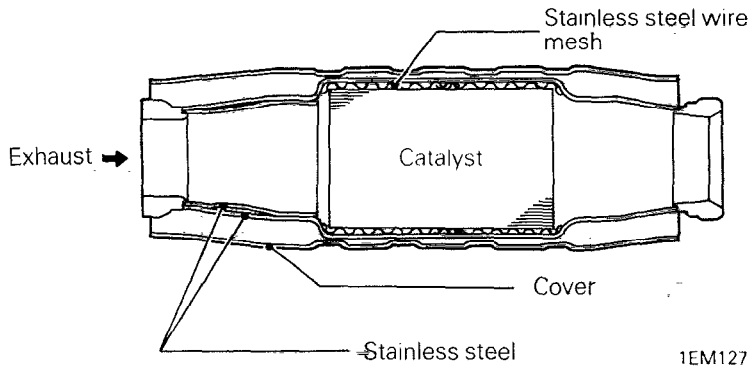
CATALYTIC CONVERTER

N25HCDB

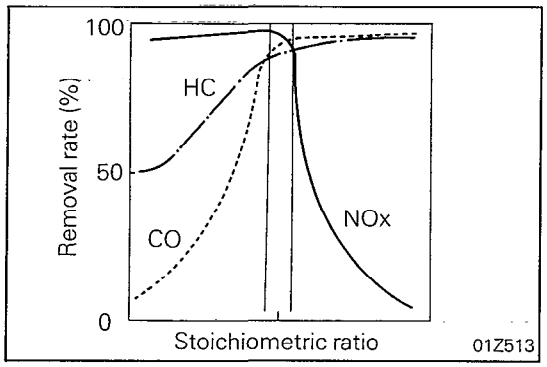
Front catalytic converter



Rear catalytic converter



The three-way catalytic converters which are monolithic type with catalytic compositions applied to the integrally constructed honeycomb carrier surface are installed to the exhaust port of the turbocharger (front catalytic converter) and in the center of the exhaust pipe (rear catalytic converter). The converter, working in combination with the air-fuel ratio feedback control of the oxygen sensor, oxidizes CO and HC and reduces NOx.



Function

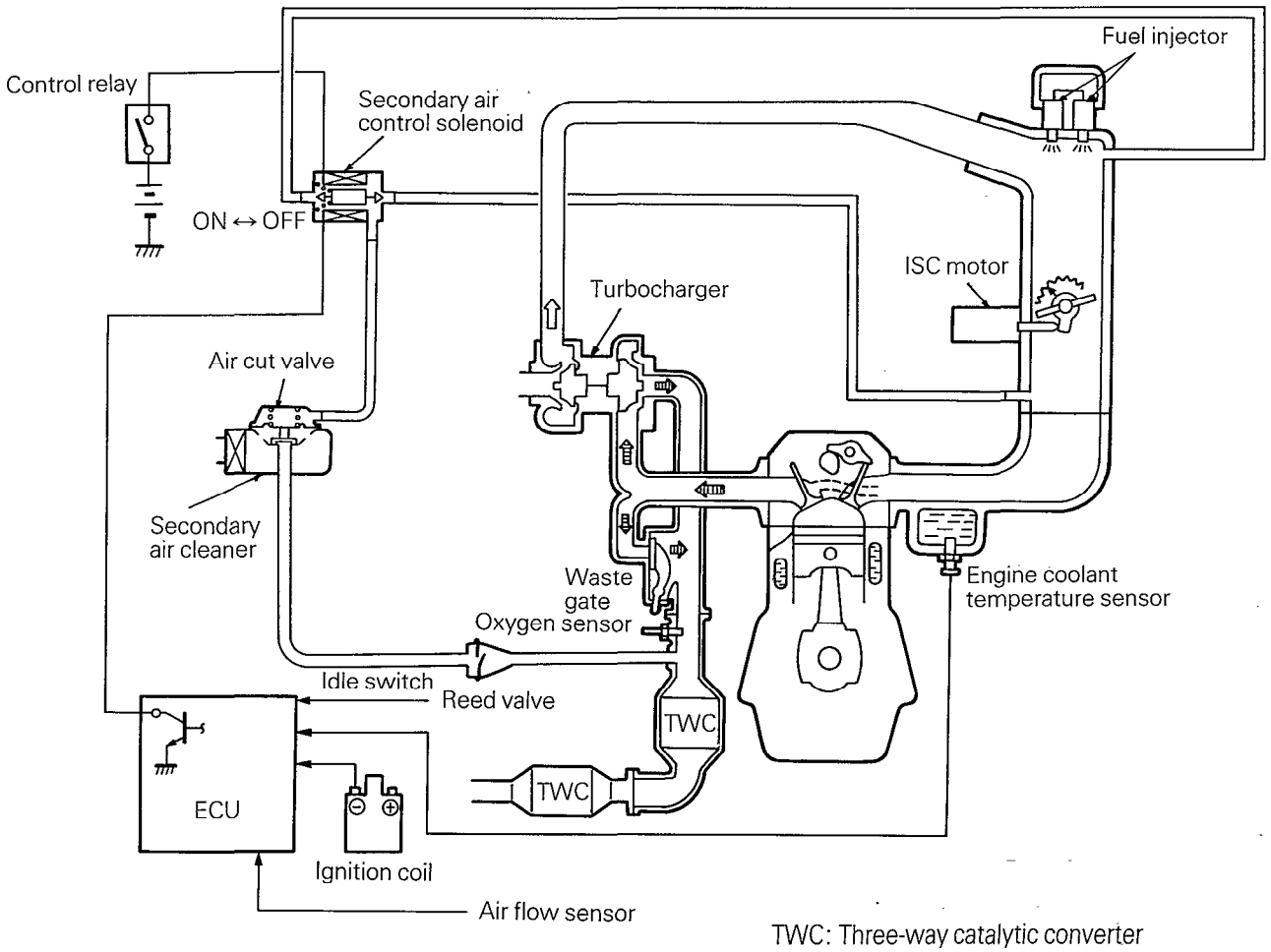
The three-way catalytic converter removes CO, HC and NOx most effectively in the vicinity of the stoichiometric ratio. The air-fuel ratio feedback control by the oxygen sensor controls the air-fuel mixture to the stoichiometric ratio and the catalytic converter promotes both oxidation and reduction of resultant exhaust gas to make it clean before it is released to atmosphere.

Caution

The catalytic converters require the use of unleaded gasoline only. Leaded gasoline will destroy the effectiveness of the catalysts as an emission control device. Under normal operating conditions, the catalytic converters will not require maintenance. However, it is important to keep the engine properly tuned. If the engine is not kept properly tuned, engine misfiring may cause overheating of the catalysts. This may cause heat damage to the converters or vehicle components. This situation can also occur during diagnostic testing if any spark plug cables are removed and the engine is allowed to idle for a prolonged period of time.

SECONDARY AIR SUPPLY SYSTEM

N25HCED



5EM059

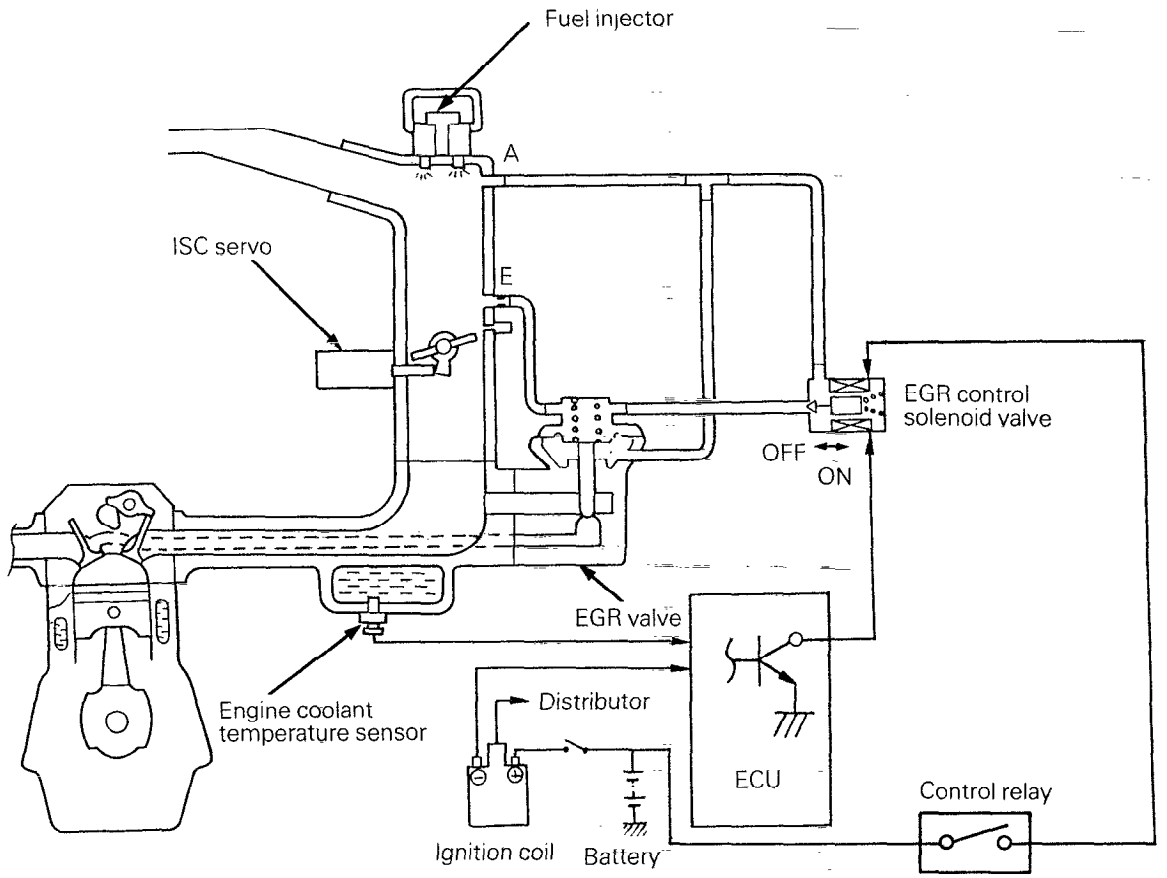
The reed valve supplies secondary air into the exhaust pipe for the purpose of promoting oxidation of exhaust emissions. The reed valve is actuated by exhaust vacuum being generated from pulsation in the exhaust manifold, and additional air is supplied into the exhaust manifold through the secondary air cleaner.

Contents of Control

When the engine coolant is cold [15 to 63°C (59 to 145°F)], when the engine is at idle, or when the vehicle is decelerating, the ECU turns on the power transistor to energize the secondary air control solenoid valve. As a result, the intake manifold vacuum is introduced to the air cut valve and the secondary air is supplied to the exhaust pipe.

EXHAUST GAS RECIRCULATION (EGR) SYSTEM

N25HCFB



3EM147

Exhaust Gas Recirculation (EGR) system is designed to reduce oxides of nitrogen in the vehicle exhaust.
In this system, the exhaust gas is partially recirculated from an exhaust port at the cylinder head into a port located at the intake manifold while the EGR flow is controlled by an EGR control valve, an EGR control solenoid valve, and an ECU.

Contents of Control

As the engine is warmed up and the engine coolant temperature rises [to 55°C (131°F) or higher] but the engine speed is low (approximately 3,500 rpm or less), the ECU turns off the power transistor so as to shut off current flowing to the EGR control solenoid valve. As a result, the mixing body E port vacuum acts on the EGR valve to open it.
At this time, the EGR flow rate is controlled by the E port vacuum. Namely during idling or wide throttle valve opening operation when the E port vacuum is low, the EGR valve is closed by the spring force so that EGR gas does not flow.

NOTE
During idling, the EGR gas is shut off to ensure stable idling operation.

SPECIFICATIONS

N25CA--

GENERAL SPECIFICATIONS

Items	Specifications
Crankcase emission control system	
Positive crankcase ventilation (PCV) valve	Variable flow rate type (Purpose: Control of HC emission)
Evaporative emission control system	
Canister	Equipped
Two-way valve	Equipped
Purge control valve	Dual diaphragm type (Purpose: Control of HC emission)
Exhaust emission control system	
Jet air control combustion type	Jet swirl type (Purpose: Control of CO emission)
Air-fuel ratio control system – ECI TURBO system	Oxygen sensor feedback type (Purpose: Control of CO, HC, NOx emission)
Three-way catalytic converter	Dual monolithic type (Front and Rear CC) (Purpose: Control of CO, HC, NOx emission)
Secondary air supply system	
Reed valve	Reed type
Secondary air control solenoid valve	On-off solenoid valve
Secondary air cleaner	Separate type (Purpose: Control of CO, HC emission)
Exhaust gas recirculation system	
EGR valve	Single type
EGR control solenoid valve	On-off solenoid valve (Purpose: Control of NOx emission)

SERVICE SPECIFICATIONS

N25CB--

Items	Specifications
Secondary air control solenoid valve coil resistance [at 20°C (68°F)] Ω	36 – 44
EGR control solenoid valve coil resistance [at 20°C (68°F)] Ω	36 – 44
Thermo valve opening temperature °C (°F)	60 (140)

TORQUE SPECIFICATIONS

N25CC--

Items	Nm	ft.lbs.
Secondary air pipe reed valve side joint	50 – 70	37 – 52
Secondary air pipe exhaust manifold side joint	70 – 100	52 – 73
EGR valve attaching bolt	7 – 11	5 – 8
Thermo valve	20 – 40	15 – 30

TROUBLESHOOTING

N25EA--a

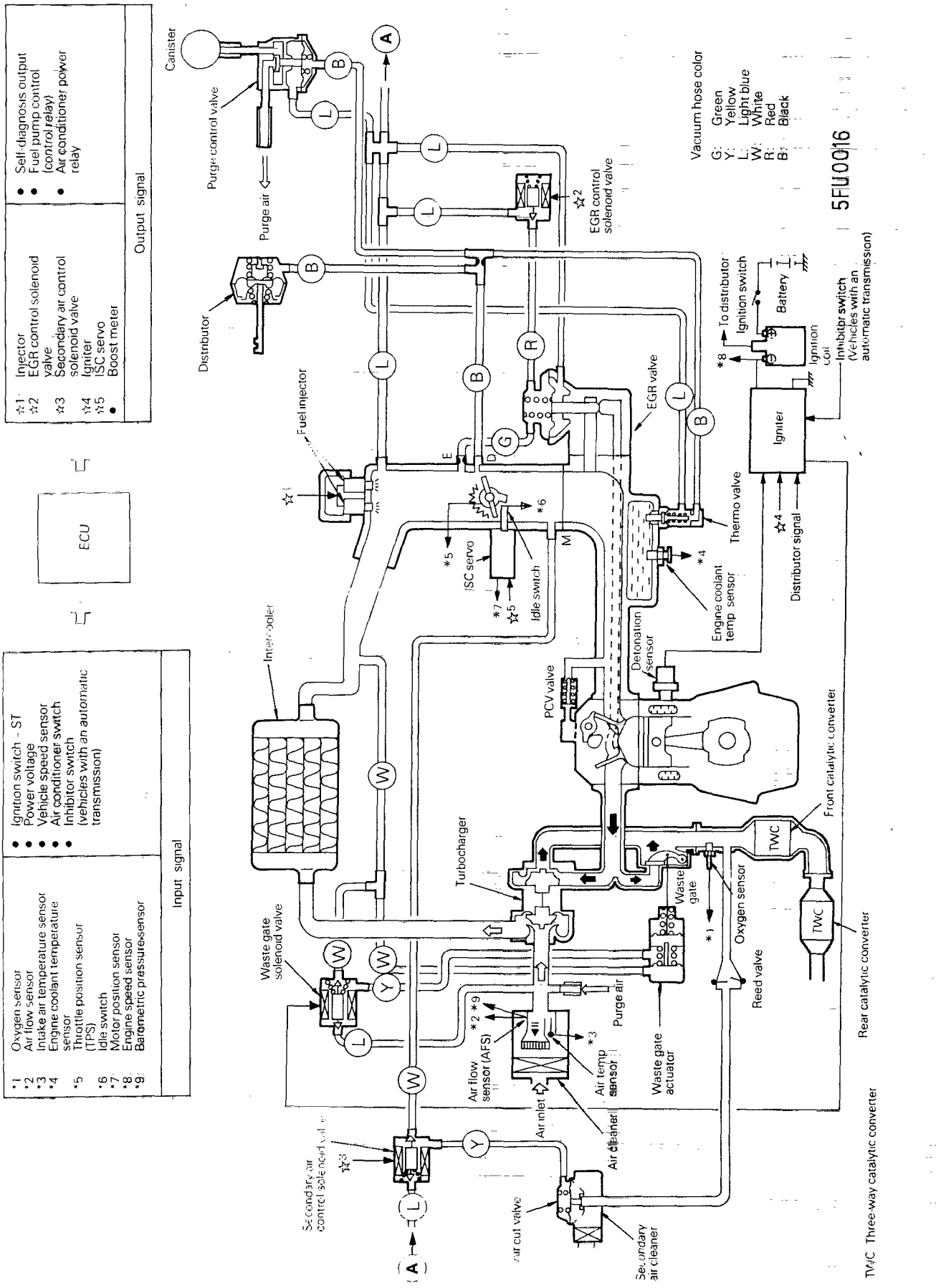
Symptom	Probable cause	Remedy
Engine will not start or is hard to start (Cranking possible)	EGR valve kept open	Repair or replace
	Vacuum hose disconnected or damaged	Repair or replace
Rough idle or engine stalls	EGR valve kept open	Repair or replace
	Vacuum hose disconnected or damaged	Repair or replace
	Purge control system faulty	Troubleshoot the system and check components under suspicion
Engine hesitates or poor acceleration	Exhaust gas recirculation system faulty	Troubleshoot the system and check each component under suspicion
Poor fuel mileage	Exhaust gas recirculation system faulty	Troubleshoot the sytem and check components under suspicion

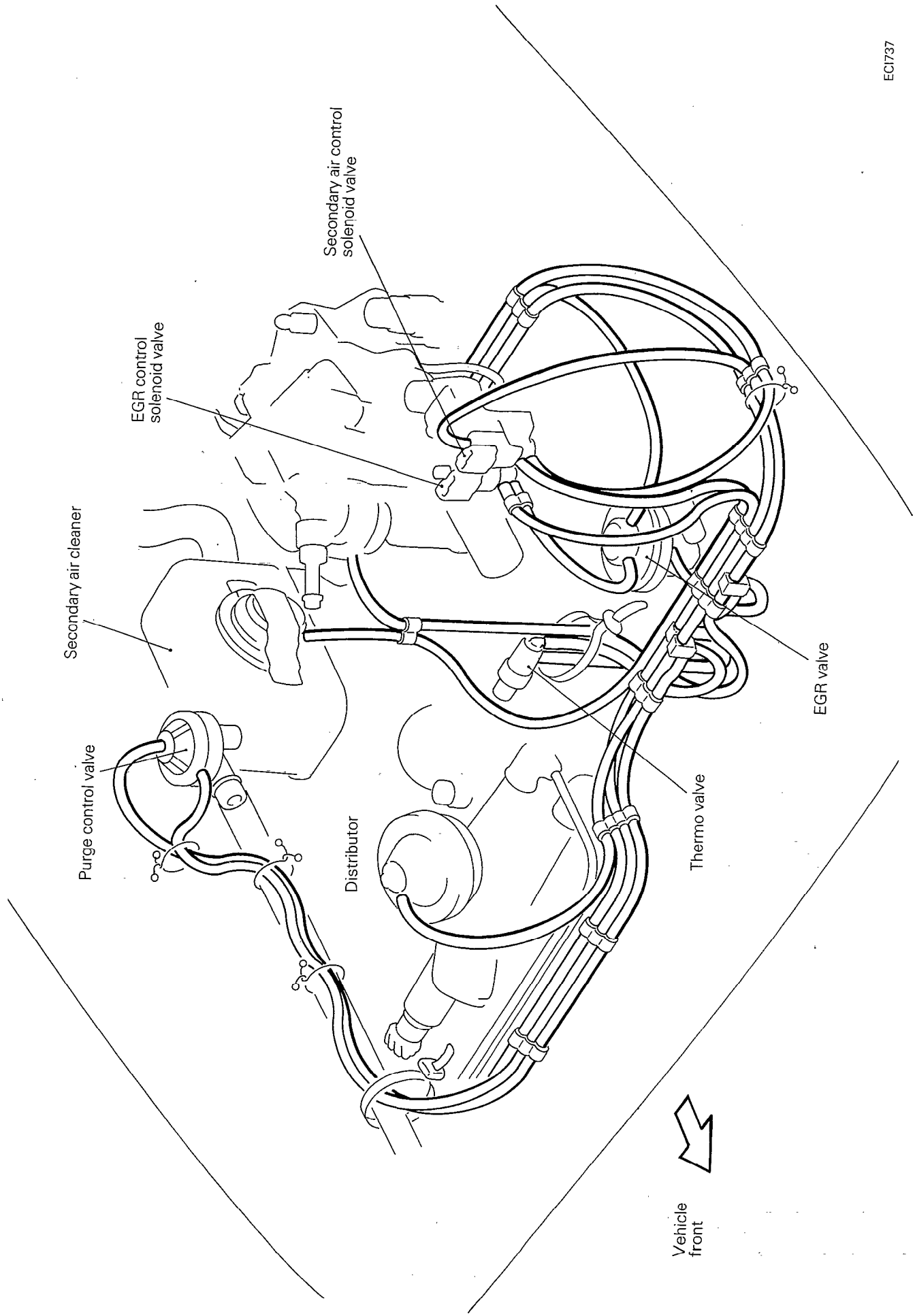
Emission control device / Allied parts	Crankcase emission control system	Evaporative emission control system	Jet air system	Air-fuel ratio control system	Three-way catalytic converter	Secondary air supply system	Exhaust gas recirculation system
PCV valve	X						
Purge control valve		X					
Thermo valve		X					
Canister		X					
Overfill limiter (Two-way valve)		X					
Jet valve			X				
ECI system component				X		X	X
Three-way catalytic converter					X		
Secondary air cleaner						X	
Reed valve						X	
Secondary air control solenoid valve						X	
EGR valve							X
EGR control solenoid valve							X

VACUUM HOSES

N25JA--

VACUUM HOSES DIAGRAM




Secondary air control solenoid valve
EGR control solenoid valve
Secondary air cleaner
Purge control valve
Distributor
Thermo valve
EGR valve
Vehicle front
EC1737

INSPECTION

N25JCAC

(1) Check that the vacuum hoses have been connected correctly according to the vacuum hoses diagram.
(2) Check hose connection (disconnections, loose clamping, etc.) and check for bends, damage and other abnormalities.

INSTALLATION

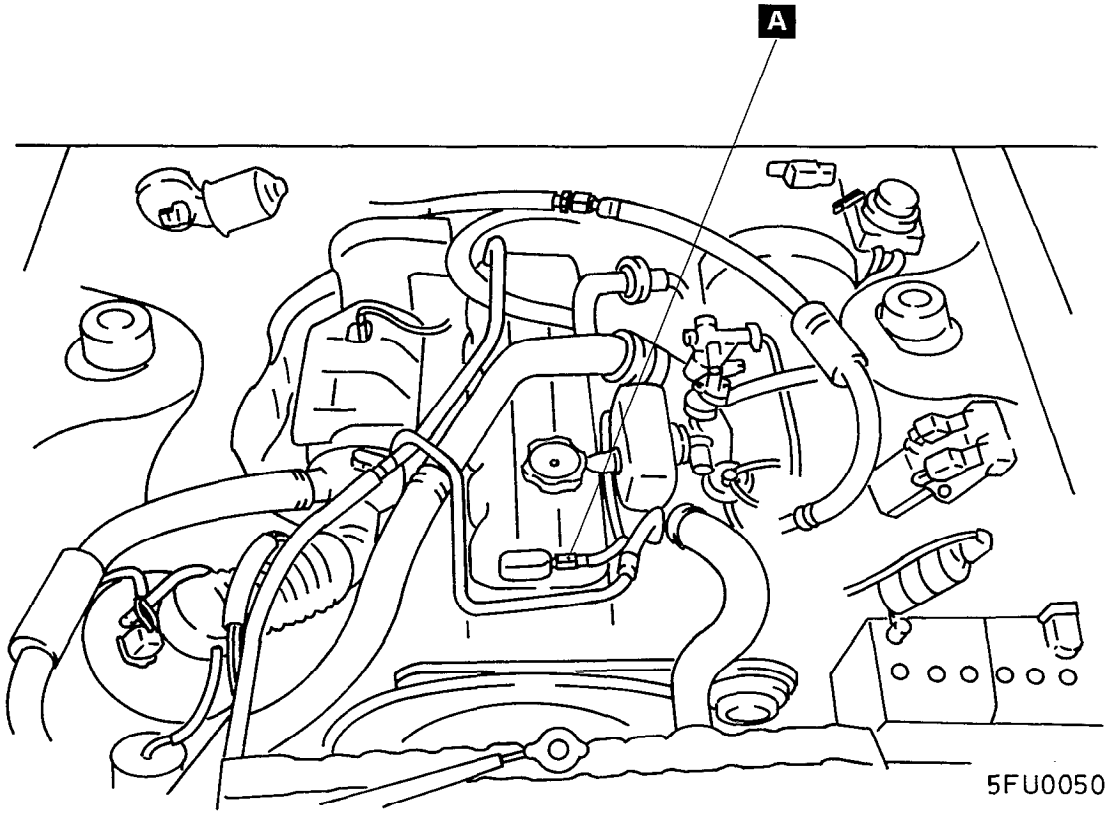
N25JDAC

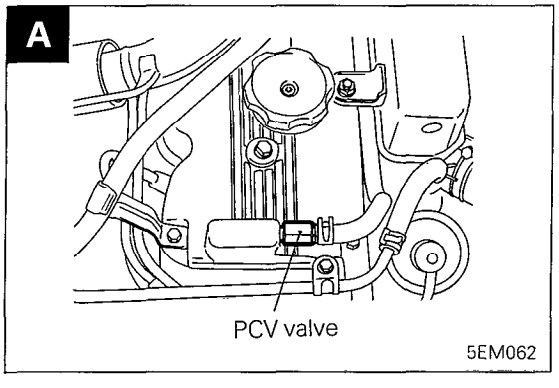
(1) When connecting a hose, connect securely to the nipple.
(2) Connect correctly referring to the vacuum hoses diagram.

CRANKCASE EMISSION CONTROL SYSTEM

N25KA--

COMPONENTS LOCATION





Name	Symbol
PCV valve	A

POSITIVE CRANKCASE VENTILATION (PCV) VALVE

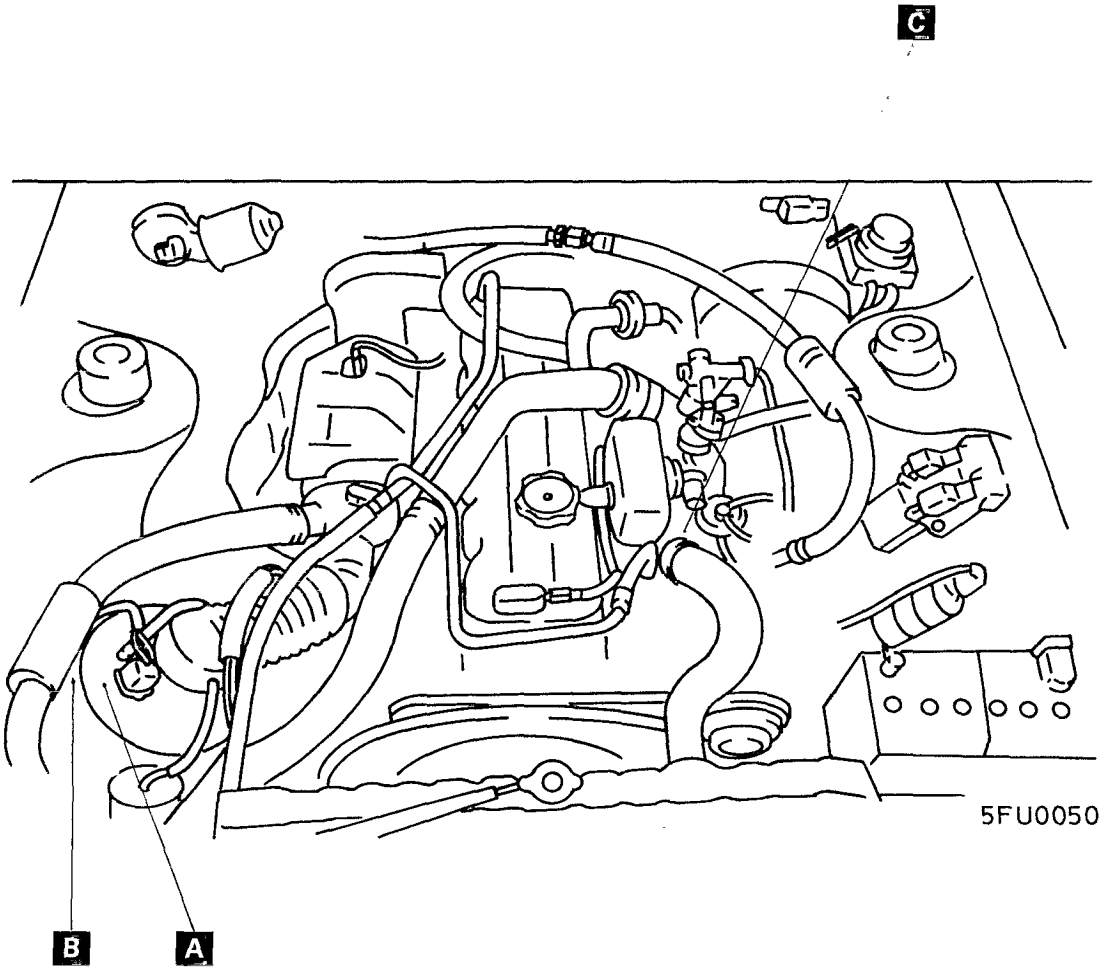
N25KBAA

Refer to GROUP 0 LUBRICATION AND MAINTENANCE – Maintenance Service for the inspection of the positive crankcase ventilation (PCV) valve.

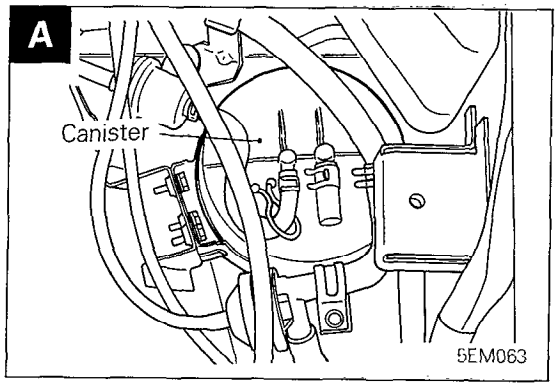
EVAPORATIVE EMISSION CONTROL SYSTEM

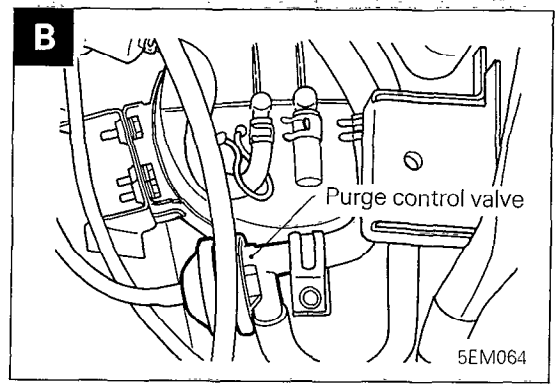
N25LA-·

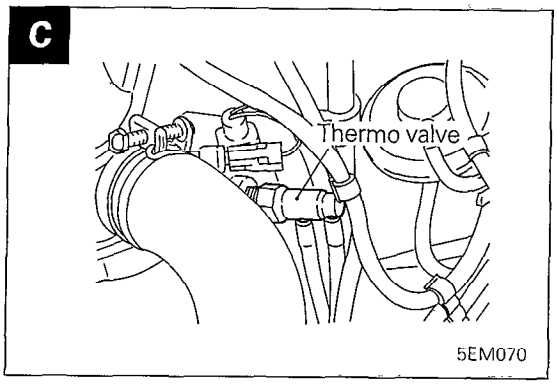
COMPONENTS LOCATION



Name	Symbol
Canister	A
Purge control valve	B
Thermo valve	C

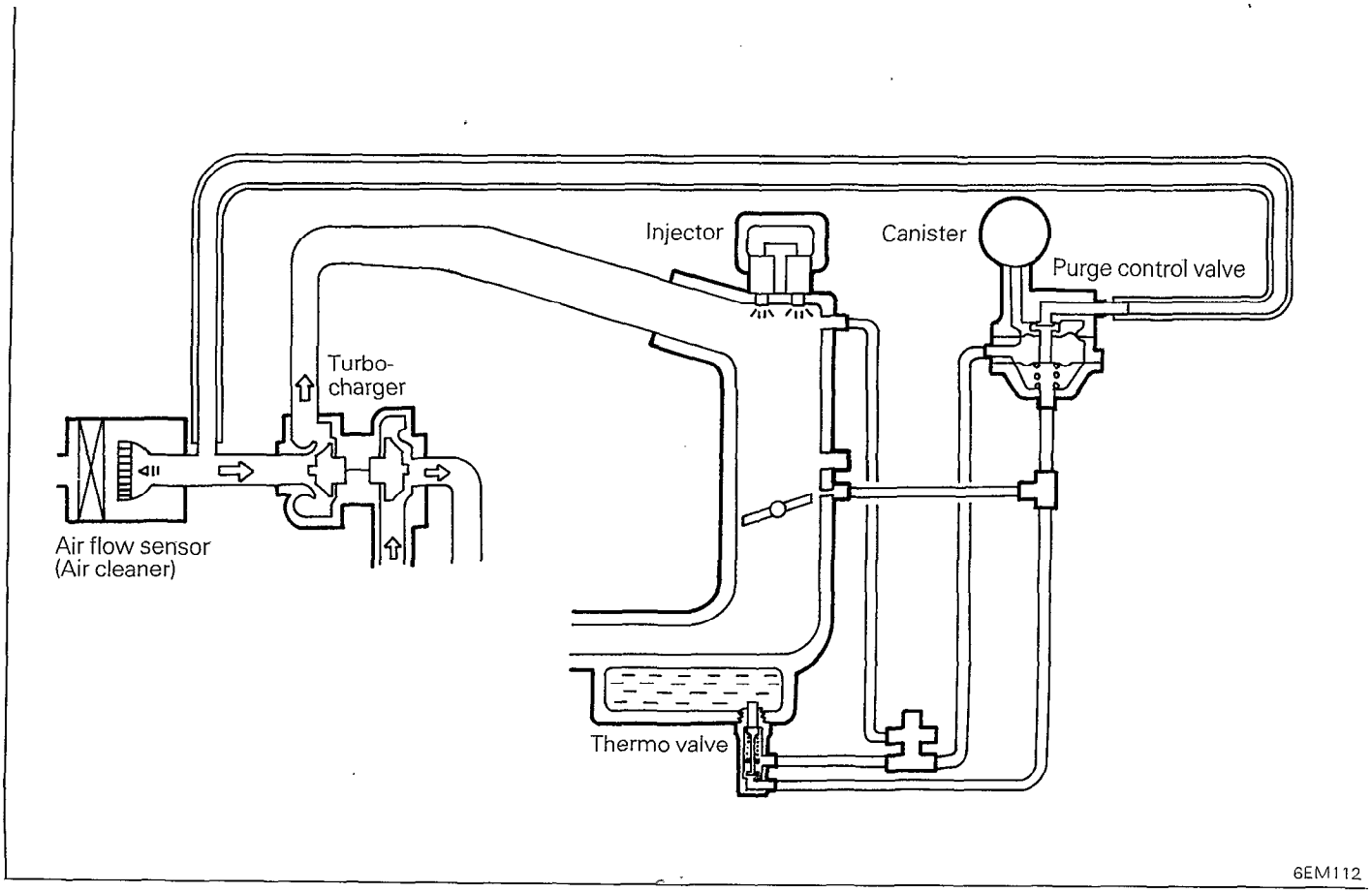


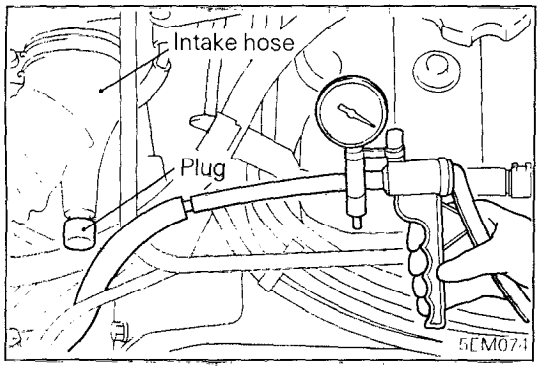




PURGE CONTROL SYSTEM

N25LBAB





INSPECTION

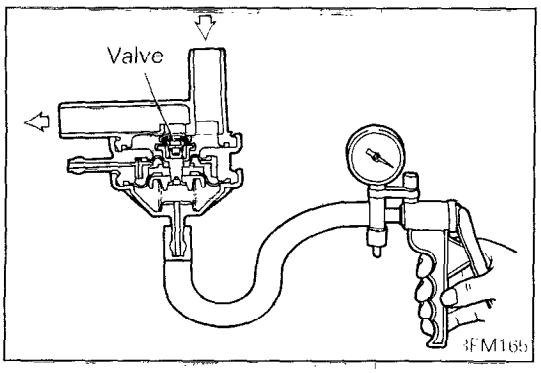
(1) Disconnect the purge air hose from the air intake hose and plug the air intake hose. Then, connect a hand vacuum pump to the disconnected purge air hose.
(2) Check the following both when the engine is cold [engine coolant temperature 45°C (113°F) or less] and when it is hot [engine coolant temperature 85 to 95°C (185 to 205°F)].

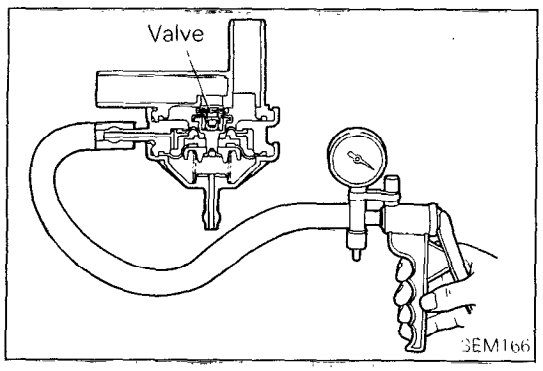
When engine is cold

Vacuum	Engine state	Normal condition
13 kPa (1.9 psi)	2,500 rpm	Vacuum is held

When engine is hot

Vacuum	Engine state	Normal condition
13 kPa (1.9 psi)	Idling	Vacuum is held
13 kPa (1.9 psi)	2,500 rpm	Vacuum leaks





PURGE CONTROL VALVE

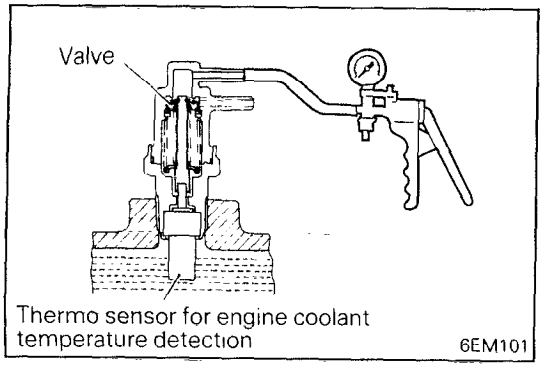
N25IBCBa

INSPECTION

(1) Remove the purge control valve.
(2) Connect a hand vacuum pump to the vacuum nipple of the purge control valve.
(3) Apply a vacuum of 53 kPa (7.7 psi) and check air tightness.
(4) Blow in air lightly from the canister side nipple and check conditions as follows.

Hand vacuum pump vacuum	Normal condition
0 kPa (0 psi) (No vacuum is applied)	Air does not blow through
27 kPa (3.9 psi) or more	Air blows through

(5) Connect a hand vacuum pump to the positive pressure nipple of the purge control valve.
(6) Apply a vacuum of 53 kPa (7.7 psi) and check air tightness.



THERMO VALVE

N25IBDG

INSPECTION

(1) Disconnect the vacuum hoses (black and blue stripe) from the thermo valve and connect a hand vacuum pump to the thermo valve.
(2) Apply vacuum and check thermo valve condition as follows.

Engine coolant temperature	Normal condition
45°C (113°F) or less	Vacuum leaks
80°C (176°F) or more	Vacuum holds

REMOVAL

(1) When removing the thermo valve, do not use wrenches or other tools on the resin part.
(2) When disconnecting the vacuum hose, put a mark on the hose so that it may be reconnected at original position.

INSTALLATION

(1) When installing, apply sealant (3M NUT Locking No. 4171 or equivalent) to the threads and tighten to 20 to 40 Nm (15 to 30 ft.lbs.).
(2) When installing the thermo valve, do not use wrenches or other tools on the resin part.

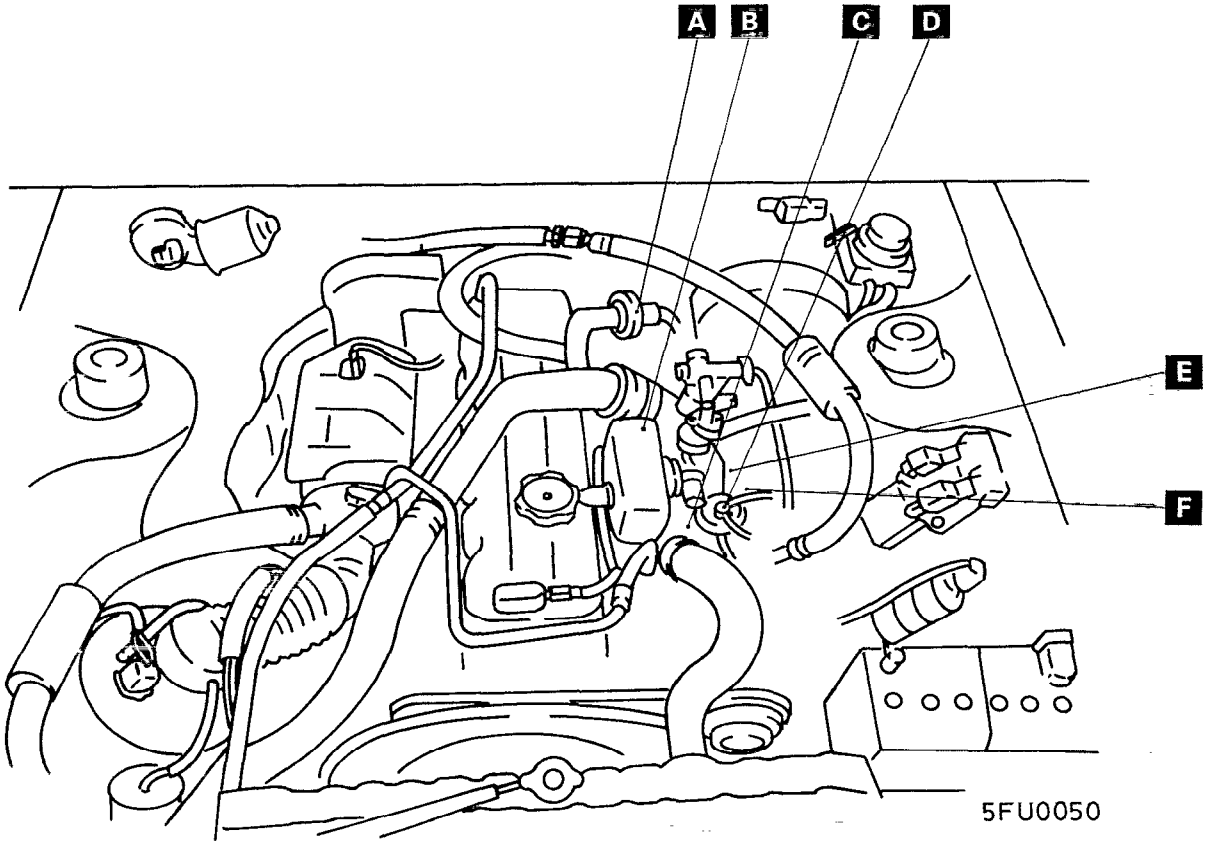
OVERFILL LIMITER (TWO-WAY VALVE) N25IBEB

Refer to GROUP 14 FUEL SYSTEM – Fuel Tank for the inspection of the overfill limiter (two-way valve).

EXHAUST EMISSION CONTROL SYSTEM

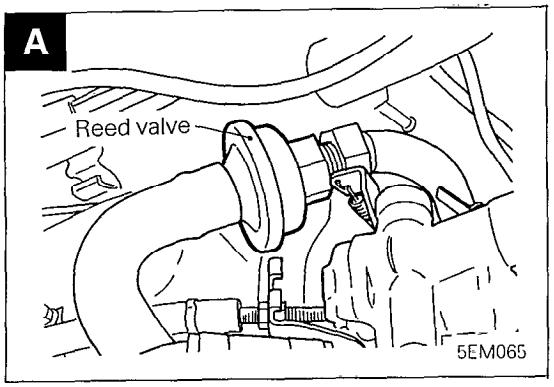
N25MA··

COMPONENTS LOCATION

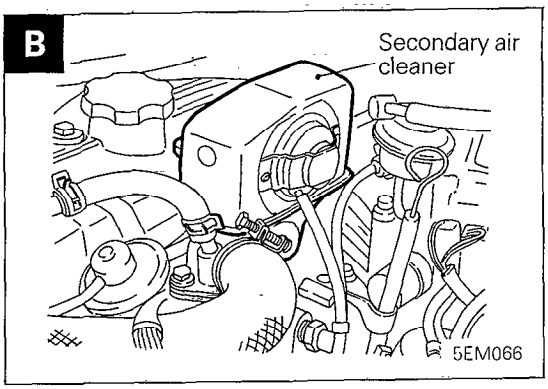


Name	Symbol	Name	Symbol
EGR control solenoid valve	E	Secondary air cleaner	B
EGR valve	D	Secondary air control solenoid valve	F
Reed valve	A	Thermo valve	C

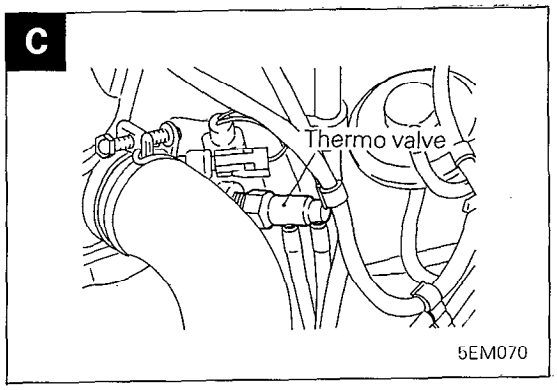
A


Reed valve
5EM065

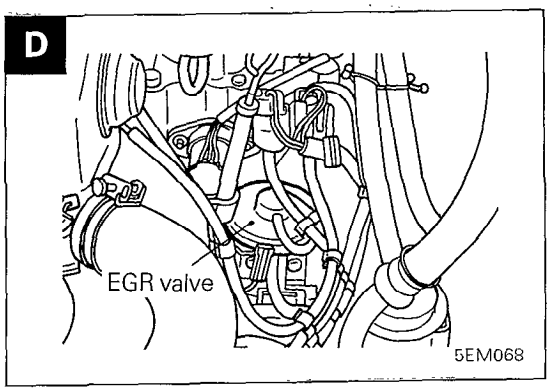
B


Secondary air cleaner
5EM066

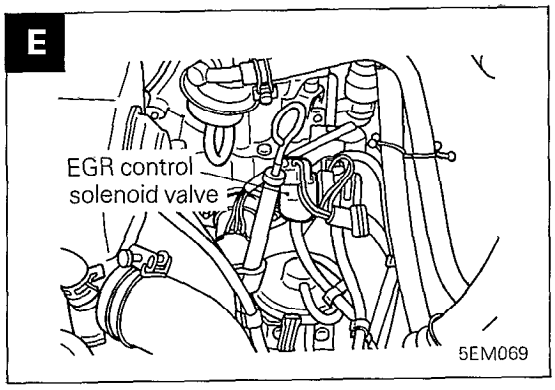
C


Thermo valve
5EM070

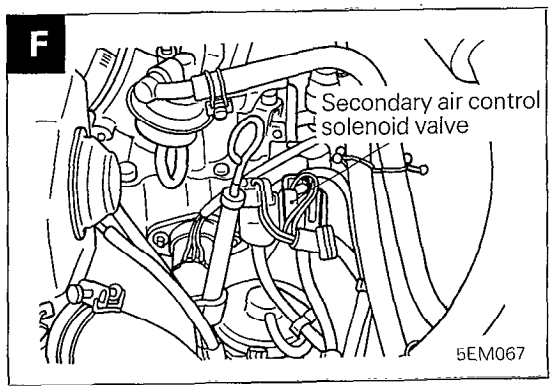
D


EGR valve
5EM068

E


EGR control solenoid valve
5EM069

F


Secondary air control solenoid valve
5EM067

AIR-FUEL RATIO CONTROL (ECI) SYSTEM N25ICABa

Refer to GROUP 14 FUEL SYSTEM – Service Adjustment Procedures for the inspection of the air-fuel ratio control (ECI) system.

THREE-WAY CATALYTIC CONVERTER N25ICBAa

REMOVAL AND INSTALLATION

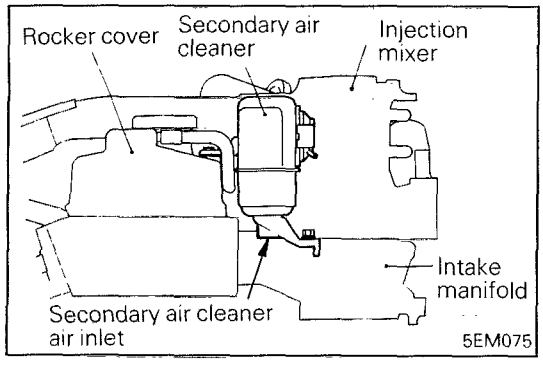
For removal and installation procedures, refer to GROUP 11 INTAKE AND EXHAUST SYSTEM – Exhaust Pipes and Mufflers.

INSPECTION

Check for damage, cracks or fusion and replace if faulty.

Caution

1. **Operation of any type, including idling, should be avoided if engine misfiring occurs. Under this condition the exhaust system will operate at abnormally high temperature, which may cause damage to the catalyst or under-body parts of the vehicle.**
2. **Alteration or deterioration of ignition or fuel system, or any type of operating condition which results in engine misfiring must be corrected to avoid overheating the catalytic converters.**
3. **Proper maintenance and tuneup according to manufacturer's specifications should be made to correct the conditions as soon as possible.**



SECONDARY AIR SUPPLY SYSTEM N25ICCCa

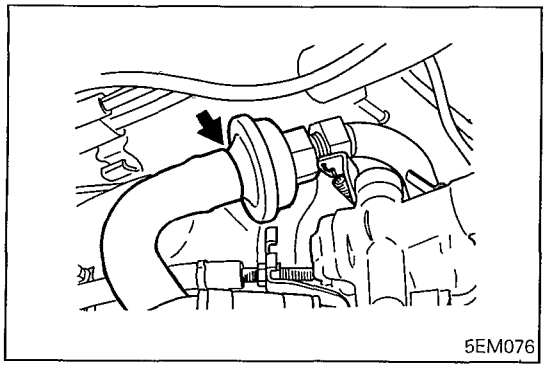
INSPECTION

Put a finger at the end of the extension hose to check air suction.

Caution

When a suction is felt by this inspection procedure, use care not to be sealded by exhaust gas flowing backward due to breakage of reed valve.

Engine coolant temperature	Engine state	Air suction
40 - 60°C (104 - 140°F)	Idling	Yes
70°C (158°F) or more		No
	Rapid deceleration from 4,000 rpm	Yes

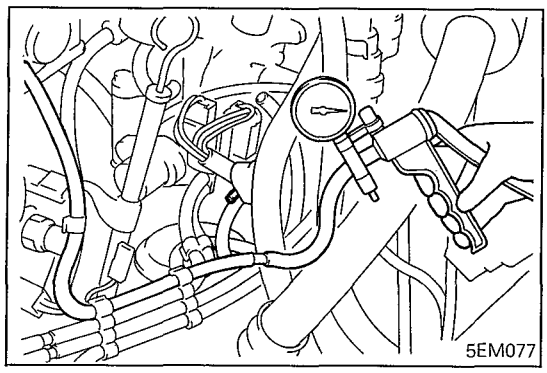


SECONDARY AIR CLEANER

N25ICDBa

INSPECTION

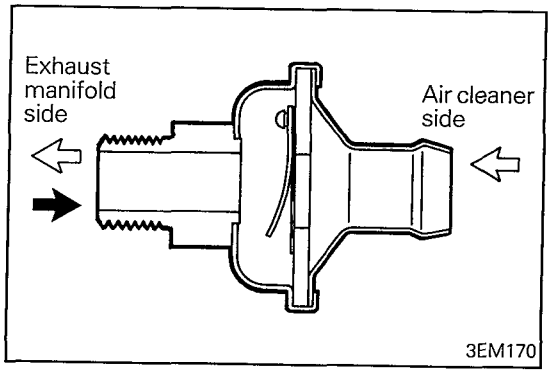
(1) Disconnect the air hose from the reed valve.



(2) Disconnect the vacuum hose (yellow stripe) from the secondary air control solenoid valve and connect a hand vacuum pump to the hose end.

(3) Apply a vacuum of 67 kPa (10.0 psi) and check air tightness.
(4) Blow in air from the end of the extension hose connected in step (1) and check condition as follows.

Hand vacuum pump vacuum	Normal condition
4 kPa (0.6 psi) or less	Air does not blow through
20 kPa (3.0 psi) or more	Air blows through



REED VALVE

N25ICEAa

INSPECTION

(1) Remove the reed valve.
(2) Blow in air and check condition as follows.

Air blow direction	Normal condition
Air cleaner side to exhaust manifold side	Air blows through
Exhaust manifold side to air cleaner side	Air does not blow through

(3) If any fault is found in above checks, replace the reed valve.

Reed valve tightening torque:
50 – 70 Nm (37 – 52 ft.lbs.)

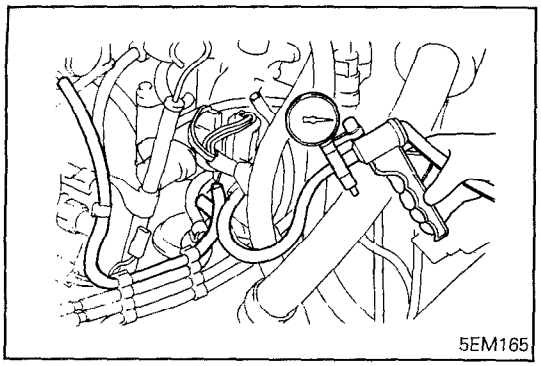
SECONDARY AIR CONTROL SOLENOID VALVE

N25ICGBa

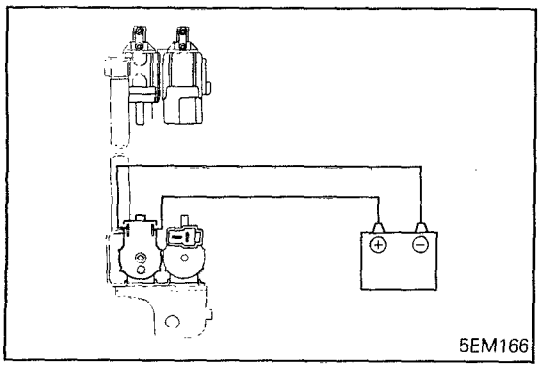
INSPECTION

NOTE
When disconnecting the vacuum hose, put a mark on the hose so that it may be reconnected at original position.

(1) Disconnect the vacuum hoses (blue stripe, yellow stripe, white stripe) from the solenoid valve.
(2) Disconnect the harness connector.

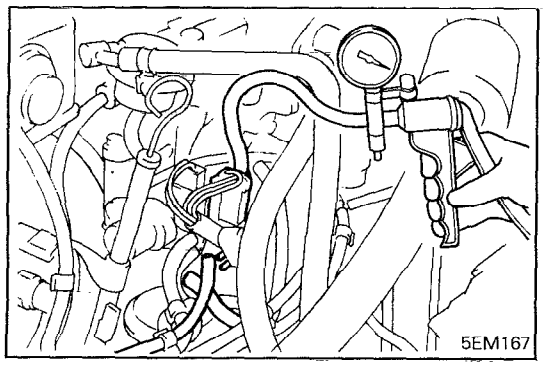

5EM165

(3) Connect a hand vacuum pump to the nipple to which white stripe vacuum hose has been connected.

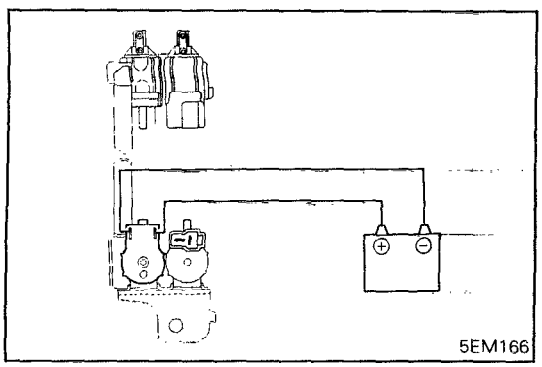

5EM166

(4) Apply vacuum and check air tightness both when the battery voltage is applied directly to the solenoid valve terminal and when not applied.

Battery voltage	Normal condition
When applied	Vacuum leaks
When not applied	Vacuum holds

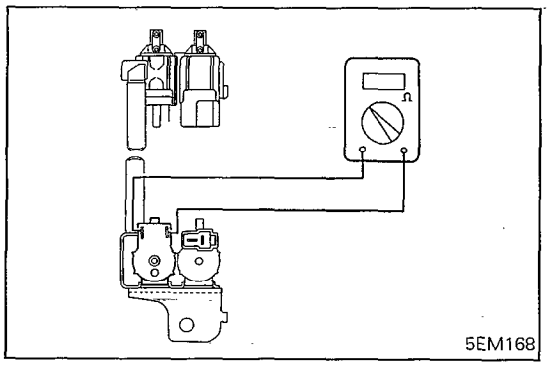

5EM167

(5) Connect a hand vacuum pump to the nipple to which blue stripe vacuum hose has been connected.


5EM166

(6) Apply vacuum and check air tightness both when the battery voltage is applied directly to the solenoid valve terminal and when not applied.

Battery voltage	Normal condition
When applied	Vacuum holds
When not applied	Vacuum leaks

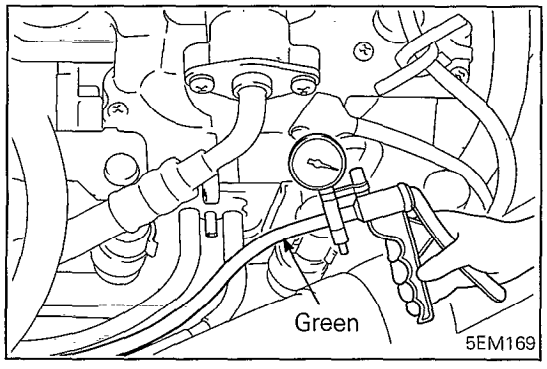


(7) Measure solenoid coil resistance.
Standard value: 36 – 44 Ω [at 20°C (68°F)]

ENGINE COOLANT TEMPERATURE SENSOR AND IDLE SWITCH

N25ICHAa

Refer to GROUP 14 FUEL SYSTEM – Inspection of ECI System Components for the inspection of these parts.



EXHAUST GAS RECIRCULATION (EGR) SYSTEM

N25ICJBa

INSPECTION

(1) Disconnect the vacuum hose (green stripe) from the mixing body and connect a hand vacuum pump to the vacuum hose.
(2) Check the following both when the engine is cold [engine coolant temperature 50°C (122°F) or less] and when it is hot [engine coolant temperature 85 to 95°C (185 to 205°F)].

When engine is cold

Vacuum	Engine state	Normal condition
Apply vacuum	Idling	Vacuum leaks from EGR control solenoid valve

When engine is hot

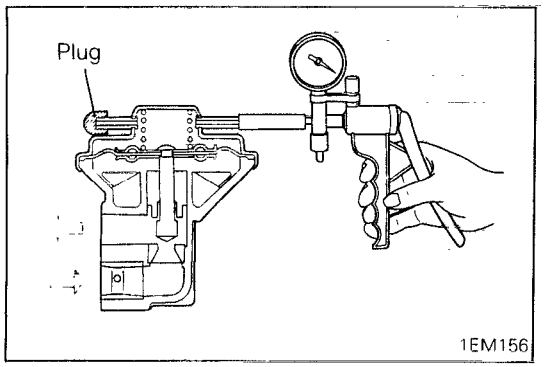
Vacuum	Engine state	Normal condition
8 kPa (1.2 psi)	Idling	Vacuum holds
23 kPa (3.3 psi)	Stall or unstable idling condition	Vacuum holds

EGR VALVE

N25ICKBa

INSPECTION

(1) Remove the EGR valve and check it for sticking, deposit of carbon, etc.
If such condition exists, clean with adequate solvent to ensure correct valve seat contact.



(2) Connect a hand vacuum pump to the EGR valve.

Caution
Plug one nipple of the EGR valve.

(3) Apply a vacuum of 67 kPa (10.0 psi) and check air tightness.
(4) Blow in air from one passage of the EGR to check condition as follows.

Vacuum	Normal condition
8 kPa (1.2 psi) or less	Air does not blow through
23 kPa (3.3 psi) or more	Air blows through

Caution
When installing the EGR valve, use a new gasket and tighten to 7 to 11 Nm (5 to 8 ft.lbs.).

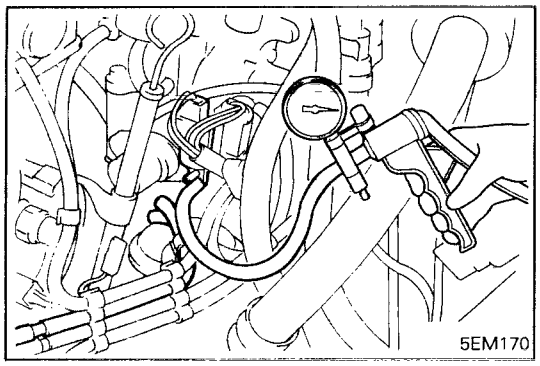
EGR CONTROL SOLENOID VALVE

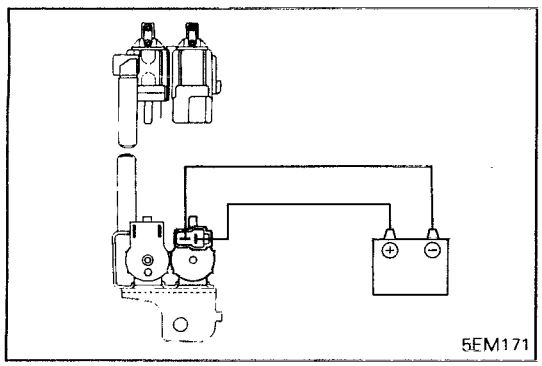
N25ICRAa

INSPECTION

NOTE
When disconnecting the vacuum hose, put a mark on the hose so that it may be reconnected at original position.

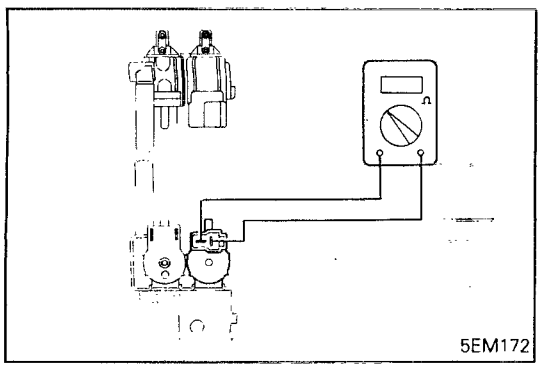
(1) Disconnect the vacuum hoses (blue stripe, red stripe) from the solenoid valve.
(2) Disconnect the harness connector.
(3) Connect a hand vacuum pump to the nipple to which red stripe vacuum hose has been connected.





(4) Apply vacuum and check air tightness both when the battery voltage is applied directly to the EGR control solenoid valve and when not applied.

Battery voltage	Normal condition
When applied	Vacuum leaks
When not applied	Vacuum holds



(5) Measure solenoid coil resistance.
Standard value: 36 – 44 Ω [at 20°C (68°F)]