

GROUP 17

**ENGINE AND
EMISSION
CONTROL**

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ENGINE CONTROL

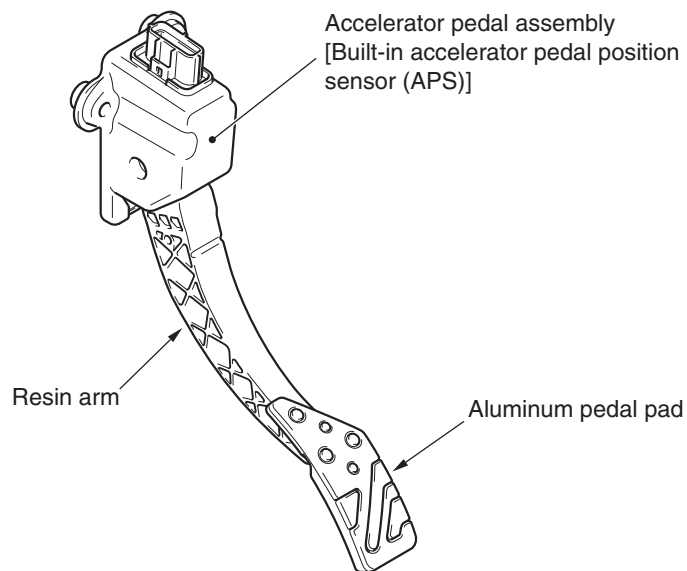
GENERAL INFORMATION

For the accelerator system, an electronic throttle valve control system has been adopted, disposing of an accelerator cable. This system detects the accelerator pedal travel by using a accelerator pedal position sensor (APS) in the accelerator pedal assembly for electronic control of the throttle valve angle.

To the arm of accelerator pedal assembly, a resin arm is employed in order to reduce weight. Also, the aluminum pedal pad has been adopted to enhance the sporty image.

M2170001000905

CONSTRUCTION DIAGRAM



AC613376AB

AUTO-CRUISE CONTROL SYSTEM

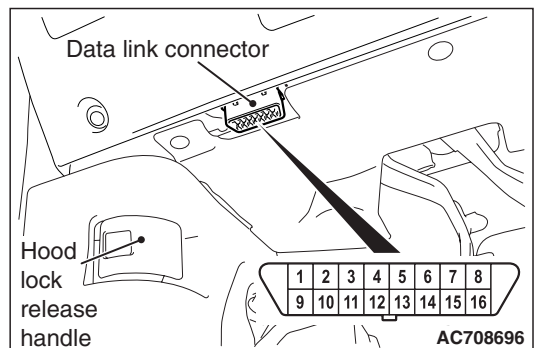
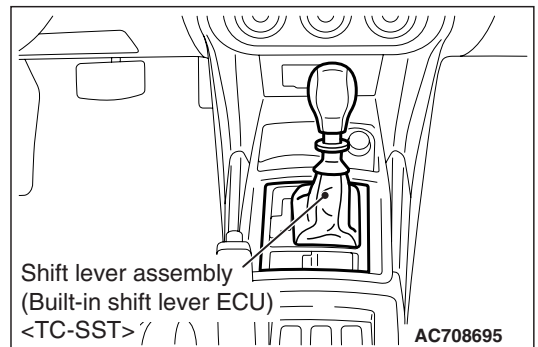
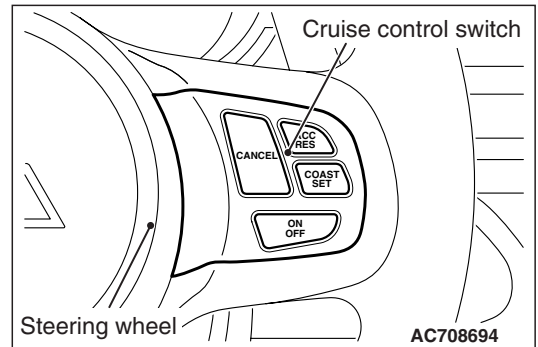
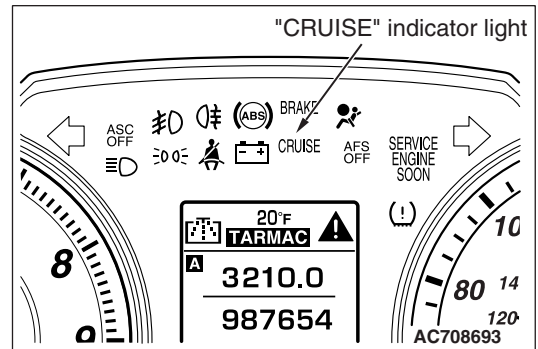
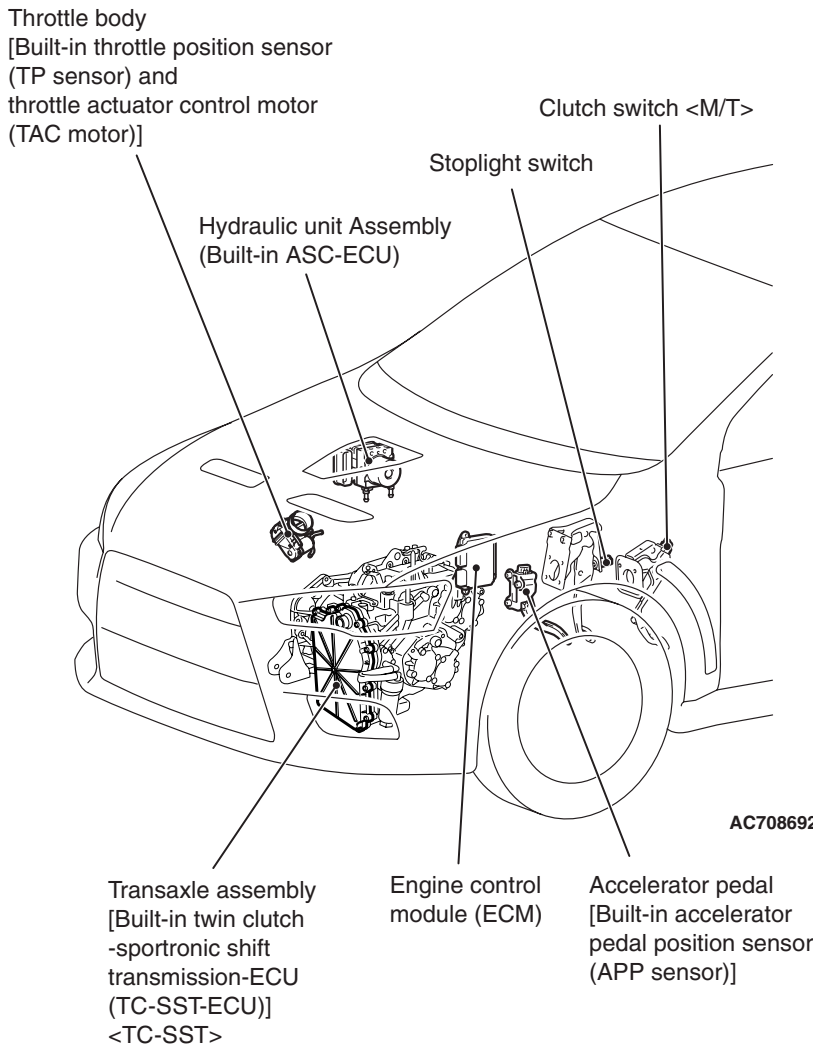
GENERAL INFORMATION

By using the cruise control system, the driver can drive at preferred speeds in a range of approximately 40 to 200 km/h (25 to 125 mph) without depressing the accelerator pedal.

For this cruise control system, in conjunction with the electronic throttle valve control system, the engine control module (ECM) electronically controls the throttle valve.

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CONSTRUCTION DIAGRAM



AC708692

AC708694

AC708695

AC708696

AC708691 AB

COMPONENTS AND FUNCTIONS

Component		Function
Accelerator pedal position sensor (APP sensor)		Informs the ECM of the accelerator pedal depression.
ASC-ECU		<ul style="list-style-type: none"> • Outputs the cruise control cancel signal to ECM. • The vehicle speed signal is sent to the ECM.
Clutch switch <M/T>		Because the constant speed driving is cancelled by the clutch operation, the clutch pedal status is detected.
"CRUISE" indicator light		<ul style="list-style-type: none"> • The light is included in the combination meter and illuminates when the "ON/OFF" switch is pressed (cruise control system: ON). • Depending on the flashing status of indicator light, it displays the diagnostic trouble code signal of cruise control system.
Cruise control switch	"ON/OFF" switch	Power switch for cruise control system.
	"ACC/RES" switch	Vehicle speed is set with the "ACC/RES" switch and "COAST/SET" switch.
	"COAST/SET" switch	
	"CANCEL" switch	Cancels the cruise speed setting.
Data link connector		If the scan tool is connected, the input check code from the ECM can be read.
Engine control module (ECM)		<ul style="list-style-type: none"> • Based on the input signal from each sensor and switch, it outputs the target throttle valve opening angle signal to the TAC motor. • Based on the input signal from each sensor and switch, it outputs the shift control signal to the TC-SST-ECU <TC-SST>. • Based on the vehicle speed signal from the ASC-ECU, it calculates the vehicle speed. • Based on the shift lever "N" position signal of the shift lever ECU from the TC-SST-ECU, it cancels constant speed driving <TC-SST>. • Outputs the ON/OFF signals of "CRUISE" indicator light and cruise control system. • The diagnostic trouble code signal is sent to the "CRUISE" indicator light. • The input check code is sent to the data link connector.
Shift lever ECU <TC-SST>		Because the constant speed driving is cancelled by the shift lever operation, it detects the "N" position.
Stoplight switch		<ul style="list-style-type: none"> • Because the constant speed driving is canceled by the brake operation, it detects the brake pedal status. • As for the stoplight switch, two built-in switches, the stoplight switch which is also used for the stoplight illumination and the brake switch which is used exclusively for the cruise control, are integrated, and thus the reliability is enhanced.

Component	Function
Throttle actuator control motor (TAC motor)	The throttle valve opens and closes in response to the target throttle valve opening angle signal from the ECM.
Throttle position sensor (TP sensor)	Informs the ECM of the throttle valve opening angle.
Twin clutch-sportronic shift transmission-ECU (TC-SST-ECU)	<ul style="list-style-type: none"> Based on the transaxle control signal from the ECM, it controls the transaxle. Transmits the shift lever "N" position signal from the shift lever ECU sent to the ECM. TC-SST drive mode signal from the shift lever ECU sent to the ECM.

CONSTRUCTION AND OPERATION

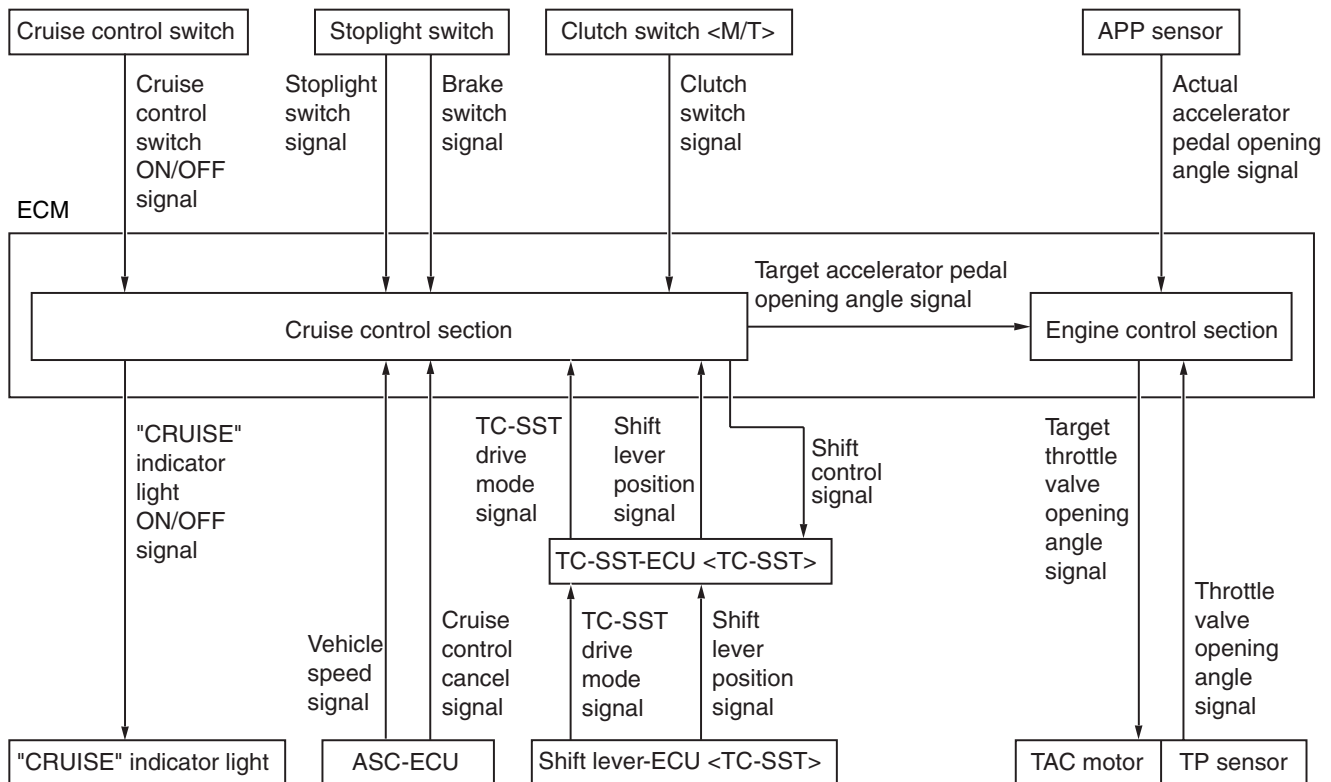
SYSTEM OUTLINE

The cruise control section in ECM calculates the cruise control system operation status based on the signals sent from switches and sensors. Based on the calculation, the cruise control section outputs the target accelerator pedal opening angle signal to the engine control section, and shift control signal to TC-SST-ECU <TC-SST>, and "CRUISE" indicator light ON/OFF signal to the combination meter.

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In the engine control section, the target accelerator pedal opening angle value is calculated based on the target accelerator pedal opening angle signal from the cruise control section, actual accelerator pedal opening angle signal from the APP sensor, and the throttle valve opening angle signal from the TP sensor, and the vehicle speed is controlled by the driving of TAC motor.

BLOCK DIAGRAM



AC708697

SYSTEM FUNCTIONS**SET FUNCTION**

1. During driving with the vehicle speed range from approximately 40 to 200 km/h (25 to 125 mph), press and release the "COAST/SET" switch.
2. The vehicle speed when the "COAST/SET" switch is released is memorized. Thereafter, the constant speed driving is performed at that vehicle speed.
3. When the "COAST/SET" switch is operated during the driving with the vehicle speed of approximately 200 km/h (125 mph) or more, the constant speed driving will not be performed.

COAST FUNCTION

1. When the "COAST/SET" switch is continuously pressed for approximately 0.5 second or longer during constant speed driving, the throttle valve becomes fully closed while the switch is pressed, and the vehicle is decelerated.
2. When the "COAST/SET" switch is released, the vehicle speed at that time is now memorized. Thereafter, the constant speed driving is performed at that vehicle speed.
3. Also when the "COAST/SET" switch is pressed for less than approximately 0.5 second, the vehicle is decelerated approximately 1.6 km/h (1 mph) from the vehicle speed of constant speed driving, and the decelerated vehicle speed is now memorized. Thereafter, the constant speed driving is performed at that vehicle speed.
4. When the "COAST/SET" switch is continuously pressed and the vehicle speed is decelerated to approximately 40 km/h (25 mph) or less, the set function and coast function are cancelled, and the constant speed driving is cancelled.

RESUME FUNCTION

1. When the "CANCEL" switch is pressed or the brake pedal is depressed during the constant speed driving, it cancels the constant speed driving.
2. Subsequently, when the "ACC/RES" switch is pressed during driving with the vehicle speed of approximately 40 km/h (25 mph) or more, the constant speed driving is performed with the vehicle speed memorized at the last cancellation of constant speed driving.

ACCELERATOR FUNCTION

1. When the "ACC/RES" switch is continuously pressed for approximately 0.5 second or more during constant driving, it accelerates the vehicle with specified acceleration while the switch is pressed.
2. Then, when the "ACC/RES" switch is released, the vehicle speed at that time is now memorized. Thereafter, the constant speed driving is performed at that vehicle speed.
3. Also, when the "ACC/RES" switch is pressed for less than approximately 0.5 second, the vehicle is accelerated approximately 1.6 km/h (1 mph) from the vehicle speed of constant speed driving, and the accelerated vehicle speed is now memorized. Thereafter, the constant speed driving is performed at that vehicle speed.
4. It is possible to keep pressing the "ACC/RES" switch until the vehicle speed is accelerated to approximately 200 km/h (125 mph) or above. However, after the "ACC/RES" switch is released, the vehicle speed of approximately 200 km/h (125 mph) becomes the newly memorized vehicle speed. Thereafter, the constant speed driving is performed at that speed.

CANCEL FUNCTION

When any of the following conditions are satisfied, the constant speed driving will be cancelled.

- The cruise control system is stopped by the pressing the "ON OFF" switch.
- The "CANCEL" switch is pressed.
- The brake pedal is depressed.
- The clutch pedal is depressed <M/T>.
- The shift lever is shifted to the "N" position <TC-SST>.
- TC-SST drive mode is set to the "SPORT" mode and "S-SPORT" mode <TC-SST>.
- The vehicle speed becomes approximately 40 km/h (25 mph) or less.
- The vehicle speed is reduced approximately 15 km/h (9 mph) or more from the speed at which the constant speed driving was started.
- An abnormality occurs in the vehicle speed signal.
- The engine coolant temperature becomes abnormally high.
- The ASC is operated.
- An abnormality occurs to the ECM.
- An abnormality occurs to the TC-SST-ECU <TC-SST>.
- An abnormality occurs to the CAN communication.

FAIL-SAFE FUNCTION

When any of the following conditions are satisfied, the cruise control system function is stopped until the system returns to normal. Also, when any of the conditions are satisfied during the constant speed driving, the constant speed driving is cancelled immediately.

- An abnormality occurs to the cruise control switch.
- An abnormality occurs to the stoplight switch.

When any of the following conditions are satisfied, stop the vehicle once and turn the ignition switch to "LOCK" (OFF). Otherwise, even when the system returns to normal, the cruise control system function will continue to be stopped. Also, when any of the conditions are satisfied during the constant speed driving, the constant speed driving is cancelled immediately.

- ECM abnormality
- Vehicle speed signal abnormality
- TP sensor abnormality
- APP sensor abnormality

DIAGNOSIS FUNCTION

- The diagnostic trouble code check is possible with the "CRUISE" indicator light.
- To facilitate the system check, check the service data output with the scan tool.

NOTE: For diagnostic items, service data output items, and check method, refer to the Service Manual.

EMISSION CONTROL

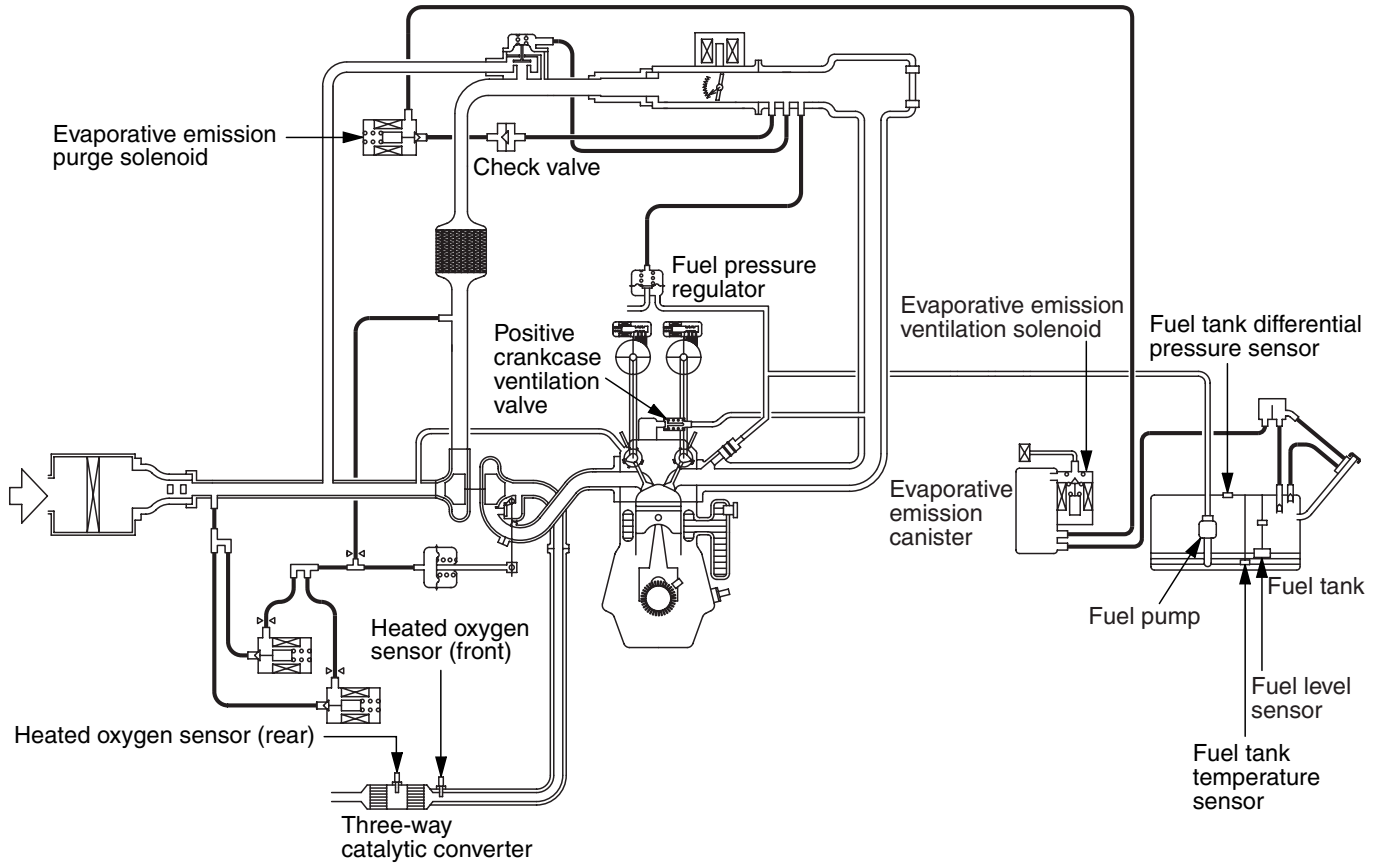
GENERAL INFORMATION

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The following changes have been made to the controls of the 2.0L engine provided on the LANCER EVOLUTION-IX.

Improvement / Additions	Remark
Rear exhaust system is applied.	Performance of exhaust gas after-treatment right after engine starts is improved due to early warm up.
Exhaust gas recirculation (EGR) system is discontinued.	System is simplified.

SYSTEM CONFIGURATION DIAGRAM



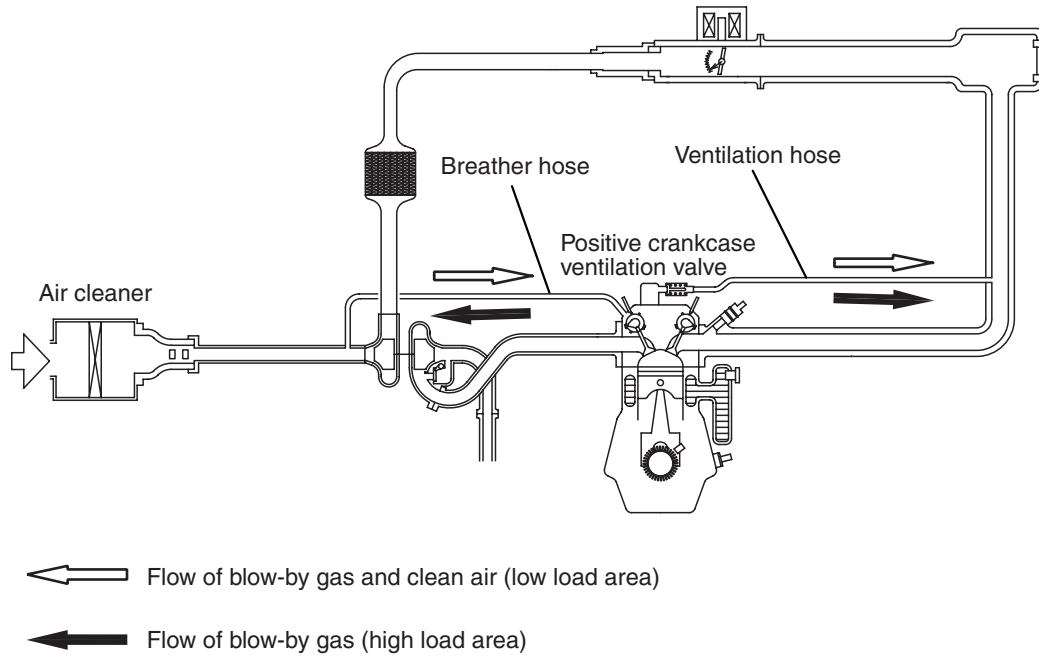
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Exhaust gas cleaning devices list

System		Objective / Function	Composition parts
Crankcase ventilation system		HC decrease Re-combustion of blow-by gas.	Positive crankcase ventilation (PCV) valve
Evaporative emission control system		HC decrease Re-combustion of fuel vapor gas.	<ul style="list-style-type: none"> • Canister • Evaporative emission purge solenoid
Emission reduction systems	Air-fuel ratio feedback control	Decrease of CO, HC and NOx Controls air-fuel ratio of air-fuel mixture to become theoretical air-fuel ratio (about 14.7), which is when the 3-way catalytic converter's cleaning performance is best. It also controls optimum fuel supply based on coolant temperature, driving conditions etc.	<ul style="list-style-type: none"> • ECM • Mass airflow sensor • Injectors • Heated oxygen sensor • Crankshaft position sensor etc.
	Catalytic converter	Decrease of CO, HC and NOx It facilitates oxidation of CO and HC and reduction of NOx so that all 3 component gases are cleaned simultaneously.	Monolith catalyst

CRANKCASE VENTILATION SYSTEM

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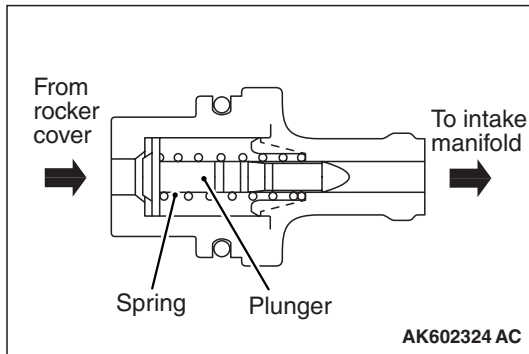
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A blow-by gas reduction device prevents blow-by gas from being expelled into the atmosphere and is of closed type. A positive crankcase ventilation (PCV) valve is provided in the ventilation hose from the rocker cover to the intake manifold. During low load driving, clean air is supplied to the crankcase by the air intake hose via the breather hose and rocker cover, and it mixes with the blow-by gas in the crank-

case. The blow-by gas in the crankcase is induced to the intake manifold through the rocker cover and PCV valve. During high load driving, blow-by gas in the crankcase is induced to the intake manifold through the rocker cover and PCV valve and at the same time also via the air intake hose and throttle body due to negative pressure in the air cleaner.

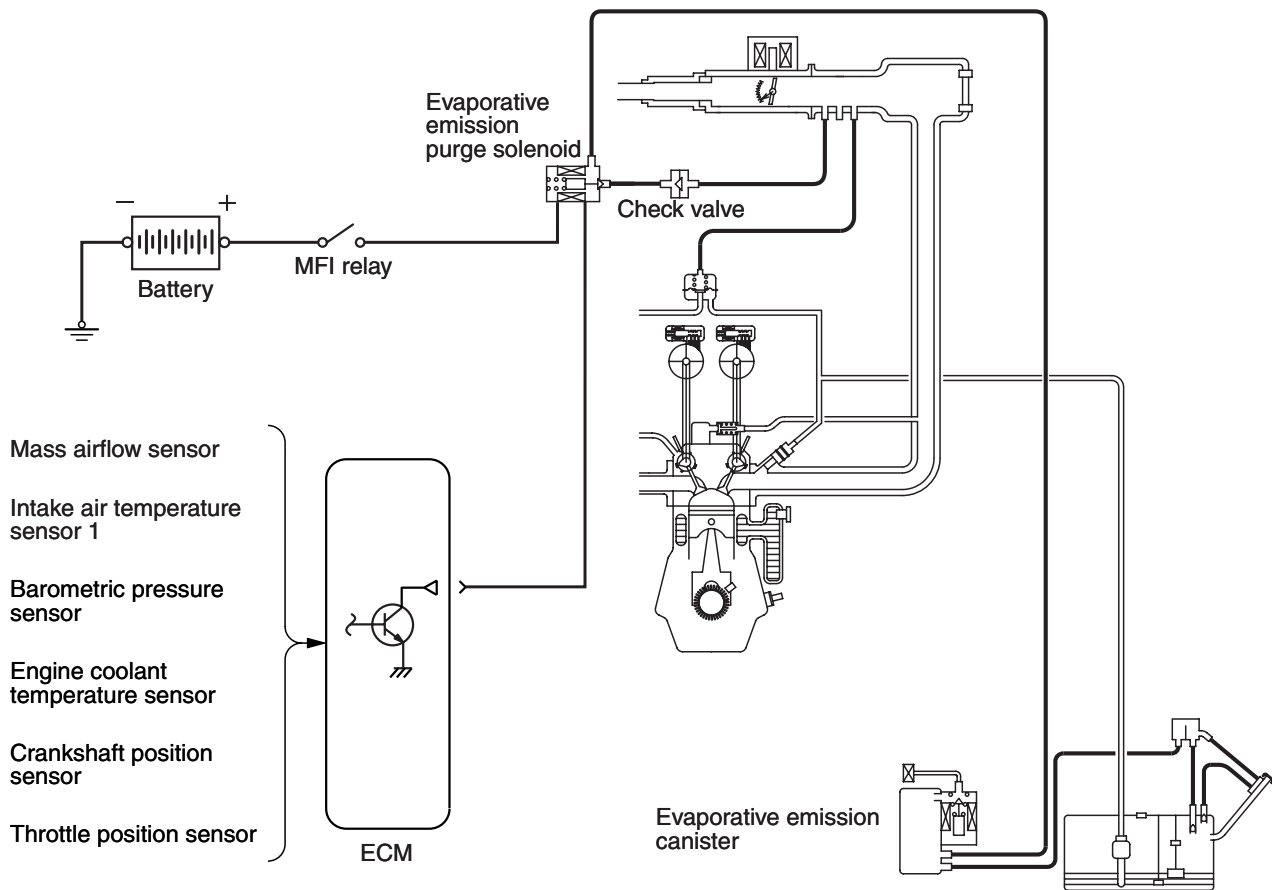
POSITIVE CRANKCASE VENTILATION (PCV) VALVE

PCV valve lifts the plunger according to negative pressure in the intake manifold to create appropriate ventilation for the crankcase.



EVAPORATIVE EMISSION CONTROL SYSTEM

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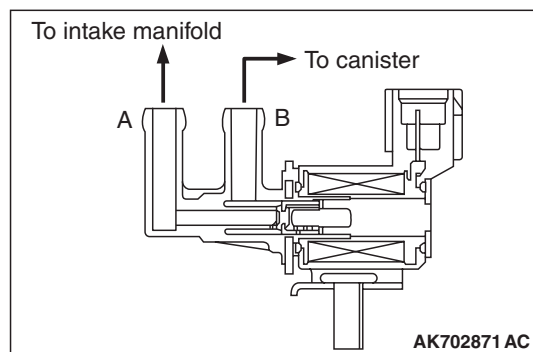


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HC (hydrocarbon) generated in the fuel tank are adsorbed by the active carbon in the canister and stored. HC stored in the canister is introduced to the intake manifold when engine is in operation where it is mixed with intake air and combusted. ECM introduces optimum HC amount according to driving con-

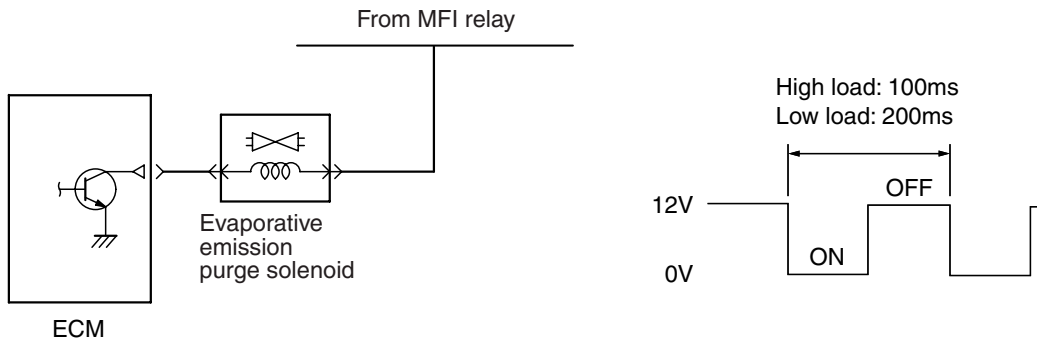
ditions and so performs duty control on the evaporative emission purge solenoid. Also, the evaporative emission purge solenoid is closed during deceleration or immediately after engine start to restrict change in air-fuel ratio and prevent engine from stalling.

EVAPORATIVE EMISSION PURGE SOLENOID



AK702871 AC

An evaporative emission purge solenoid is installed in the intake manifold. The evaporative emission purge solenoid controls the intake volume of fuel vapor gas from the canister. The evaporative emission purge solenoid is a duty control type solenoid valve. When current is not passing through the coil, nipple A is kept airtight and fuel vapor gas cannot be sucked in. When current passes through the coil, air can pass between nipple A and B and fuel vapor gas is sucked in. ECM changes the ON duty ratio according to engine's operating condition to control the intake volume of fuel vapor gas.



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EMISSION REDUCTION SYSTEMS

These decrease CO, HC and NOx in the exhaust gases and consist of air-fuel ratio feedback control and catalytic converter.

M2171000800161

1. AIR-FUEL RATIO FEEDBACK CONTROL

Refer to GROUP 13A – Multiport Fuel System (MFI) – Fuel Injection Control [P.13A-32](#).

2. CATALYTIC CONVERTER

Catalytic converter is installed in the exhaust pipe below the floor. Based on appropriate air-fuel ratio feedback from oxygen sensor, CO and HC are oxidized and NOx is reduced. Catalytic converter is a monolith with beehive design with catalysts on the unit surface. It is protected by a thermally insulating mat and enclosed in a shell.

