EMISSION CONTROL SYSTEMS

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GENERAL INFORMATION

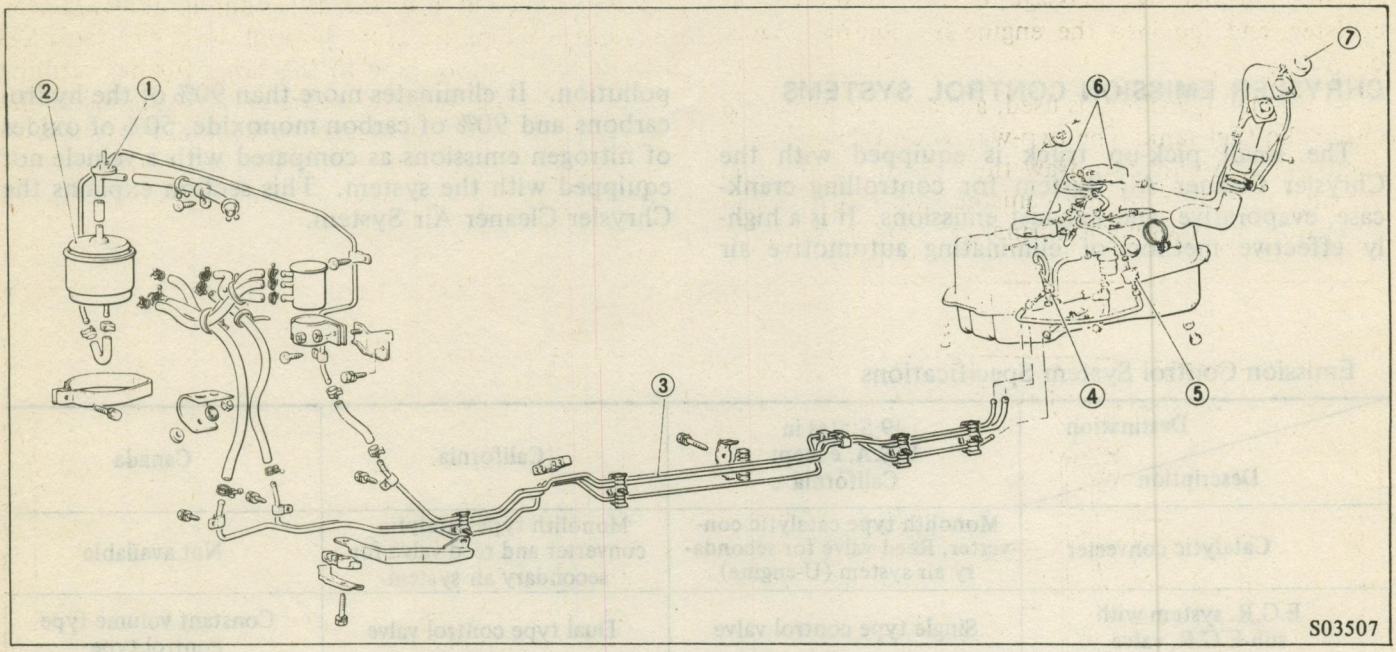
CHRYSLER EMISSION CONTROL SYSTEMS

The small pick-up truck is equipped with the Chrysler Cleaner Air System for controlling crankcase, evaporative, and exhaust emissions. It is a highly effective method of eliminating automotive air pollution. It eliminates more than 90% of the hydrocarbons and 90% of carbon monoxide, 50% of oxides of nitrogen emissions as compared with a vehicle not equipped with the system. This section explains the Chrysler Cleaner Air System.

Emission Control System Specifications

Description \ Destination		49 States in U.S.A. except California	California	Canada
Catalytic converter		Monolith type catalytic converter, Reed valve for secondary air system (U-engine)	Monolith type catalytic converter and reed valve for secondary air system	Not available
E.G.R. system with sub-E.G.R. valve		Single type control valve	Dual type control valve	Constant volume type control type
Heated air intake system		Vacuum type		
Carburetor	Deceleration fuel cut-off system	Air switching valve Coasting air valve E.S.S. relay and solenoid valve		Carburetor with Constant volume type dash pot (vehicles with manual transmission)
	Bowl vent valve	Not available	Available	Not available
Crankcase emission control system		Orifice		
Canister		Small type with purge control valve	Large type with purge control valve	Small type with purge control valve
Fuel filler cap		With relief valve		
High-Altitude compensation system		Not available		

EVAPORATION CONTROL SYSTEM



(1) Purge control valve
(2) Canister
(3) Fuel pipe, vapor
(4) Fuel check valve
(5) Two-way valve
(6) Separator tank
(7) Fuel tank cap

Fig. 1 Evaporation Control System

To prevent hydrocarbons escaping into the atmosphere from the fuel tank due to normal vaporization, Chrysler Corporation has developed the "Evaporation Control System" which prevents such dispersion.

An activated charcoal canister is installed between the fuel tank and the air cleaner. Gasoline vapors are routed to this canister for temporary storage. While the engine is running, outside air is drawn through the canister, purging the vapors from the charcoal. The air-vapor mixture is then routed to the engine combustion chambers through the air cleaner.

Purge control valve is kept closed at idling to shut off the purge air in order to prevent vaporized fuel from entering the air cleaner for positive control of high idle carbon monoxide emission, which is a greater problem at high ambient temperatures.

The carburetor is either vented internally or through the charcoal canister, and thereby prevents escape of gasoline vapors to the atmosphere.

The fuel check valve prevents the fuel leaks from the vent line, when the vehicle rolls over on accident.

(1) When Engine is not Operating

Gasoline vapors produced in the fuel tank with an increase in atmospheric temperature are routed to the separator tank, in which liquid gasoline formed by condensation of the vapors are separated and the gas alone is led into the two-way valve.

The two-way valve pressure valve is designed to open at the gas flux of 350 to 750 cc (21 to 46 cu.in.)/min., admitting the gas into the canister. In this canister, the gas is trapped by the charcoal, preventing the discharge of the harmful gas into the atmosphere.

(2) During Engine Operation

While the engine is running, a vacuum is built above the canister (on the carburetor side) and therefore the air (atmospheric pressure) is drawn into the canister through the inlet holes in the canister case, passing through the filter and the charcoal.

As the air from outside is flowing, the gas trapped by the charcoal is carried away, passing through the passage at the center of the canister into the air cleaner, carburetor and further into the engine cylinders for complete combustion.

During the engine operation, the vapors produced in the fuel tank are also routed directly into the canister through the passage in the center of the canister, and fed into the engine for complete combustion.

As the fuel (gasoline) is used, a vacuum is produced inside the fuel tank. The two-way valve vacuum valve opens for a moment to draw the outside air through the air inlet holes of the canister case into the fuel tank, thus maintaining a normal pressure in the tank.

(3) When Refilling the Tank with Fuel (Gasoline)

During refilling, the air in the fuel tank flows in the leveling pipe out into the atmosphere, allowing easy refueling. When the fuel poured into the tank has closed the leveling pipe in the tank, further refilling cannot be done because of the air pressure inside the tank. If refilling is continued, fuel overflow results.

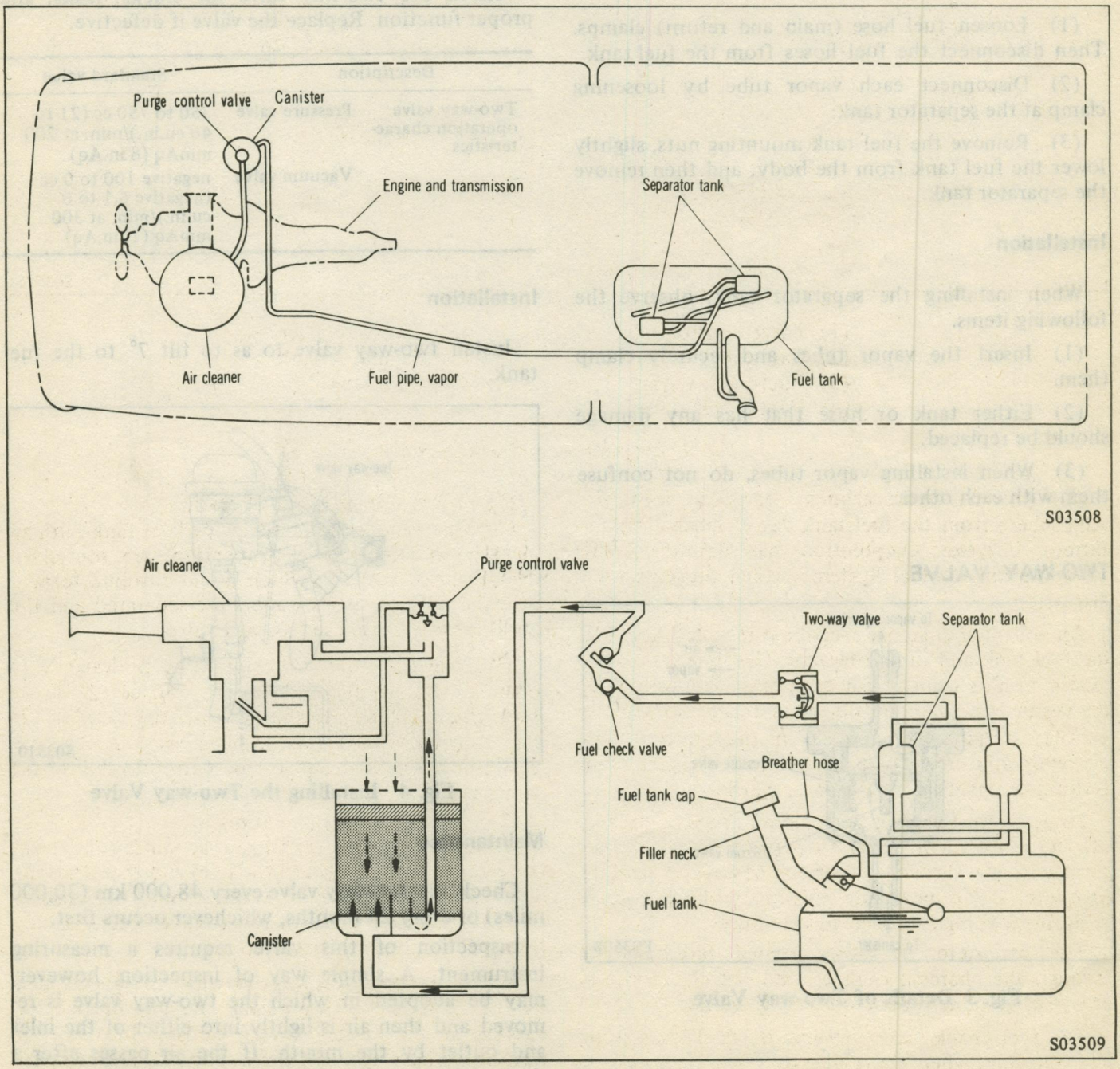


Fig. 2 Evaporation Control System

SEPARATOR TANK

General Information

It's function is to temporarily accommodate an increased volume of gasoline caused by expansion at high ambient temperatures. It also prevents liquid fuel from entering the vapor line during extreme cornering.

Removal

(1) Loosen fuel hose (main and return) clamps. Then disconnect the fuel hoses from the fuel tank.

(2) Disconnect each vapor tube by loosening clamp at the separator tank.

(3) Remove the fuel tank mounting nuts, slightly lower the fuel tank from the body, and then remove the separator tank.

Installation

When installing the separator tank, observe the following items.

(1) Insert the vapor tubes and securely clamp them.

(2) Either tank or hose that has any damage should be replaced.

(3) When installing vapor tubes, do not confuse them with each other.

TWO-WAY VALVE

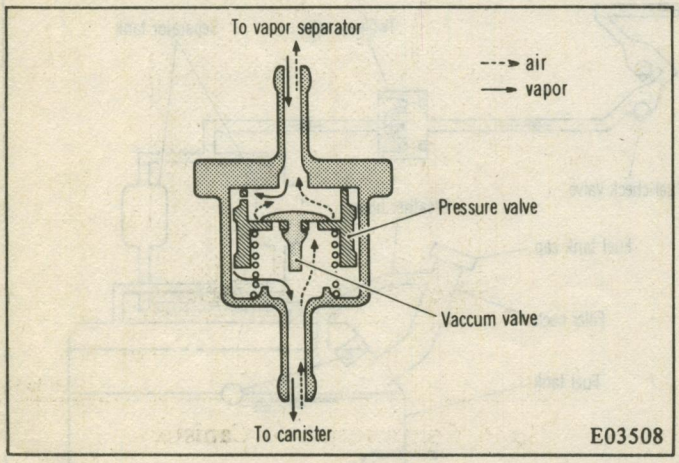


Fig. 3 Details of Two-way Valve

General Information

The two-way valve consists of a pressure valve and a vacuum valve, the pressure valve is designed to open when the fuel tank internal pressure has increased over the normal pressure and the vacuum valve opens when the vacuum has been produced in the tank.

Inspection

Check the two-way valve for cracks, leaks, and proper function. Replace the valve if defective.

Description		Standard value
Two-way valve operation characteristics	Pressure valve	350 to 750 cc (21 to 46 cu.in.)/min. at 200 mmAq (8 in.Aq)
	Vacuum valve	negative 100 to 0 cc (negative 6.1 to 0 cu.in.)/min. at 300 mmAq (12in.Aq)

Installation

Install two-way valve to as to tilt 7° to the fuel tank.

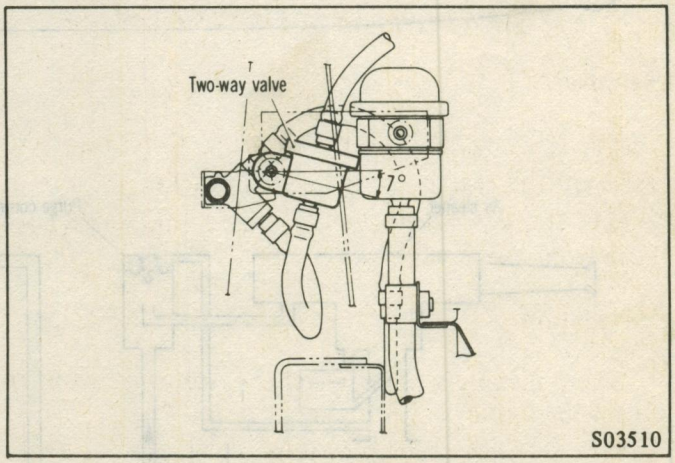


Fig. 4 Installing the Two-way Valve

Maintenance

Check the two-way valve every 48,000 km (30,000 miles) or every 24 months, whichever occurs first.

Inspection of this valve requires a measuring instrument. A simple way of inspection, however, may be adopted in which the two-way valve is removed and then air is lightly into either of the inlet and outlet by the mouth. If the air passes after a slight resistance, the valve is in good condition.

FUEL CHECK VALVE

Operation

Fuel check valve is used to prevent fuel leaks, should the vehicle suddenly roll over.

The fuel check valve contains two balls as shown in Fig. 5. Under normal condition, the gasoline vapor passage in the valve is opened, but if roll-over takes place either of the balls closes the fuel passage, thus preventing fuel leaks.

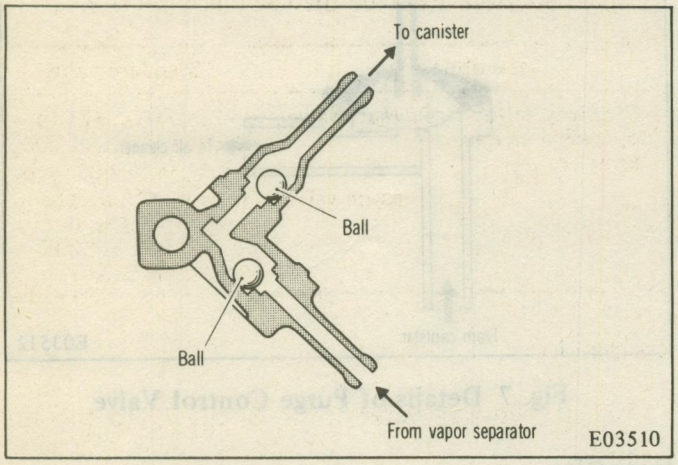


Fig. 5 Construction of Fuel Check Valve

Removal

(1) Remove the bolt mounting the fuel check valve on the rear body mounting bracket.

(2) Remove hose attaching clamps and disconnect hose from check valve.

Installation

When installing the fuel check valve, observe the following items.

(1) Securely tighten each hose clamp.

(2) Replace hose if it has a crack.

(3) Securely tighten the valve mounting bolt.

CANISTER

General Information

It is likely that much of hydrocarbon are discharged into the atmosphere because of breathing caused by changes of fuel tank temperature and fuel vapor generated within the fuel tank.

To prevent this, the vapor is led into the canister that traps gasoline with charcoal while the engine is stationary. During engine operation, however, the fresh air is drawn into the canister to carry away gasoline from the charcoal into the air cleaner, through which the gasoline is brought into the combustion chamber. This operation is repeated while the vehicle is in operation, so that the charcoal will never be excessively loaded with the gasoline.

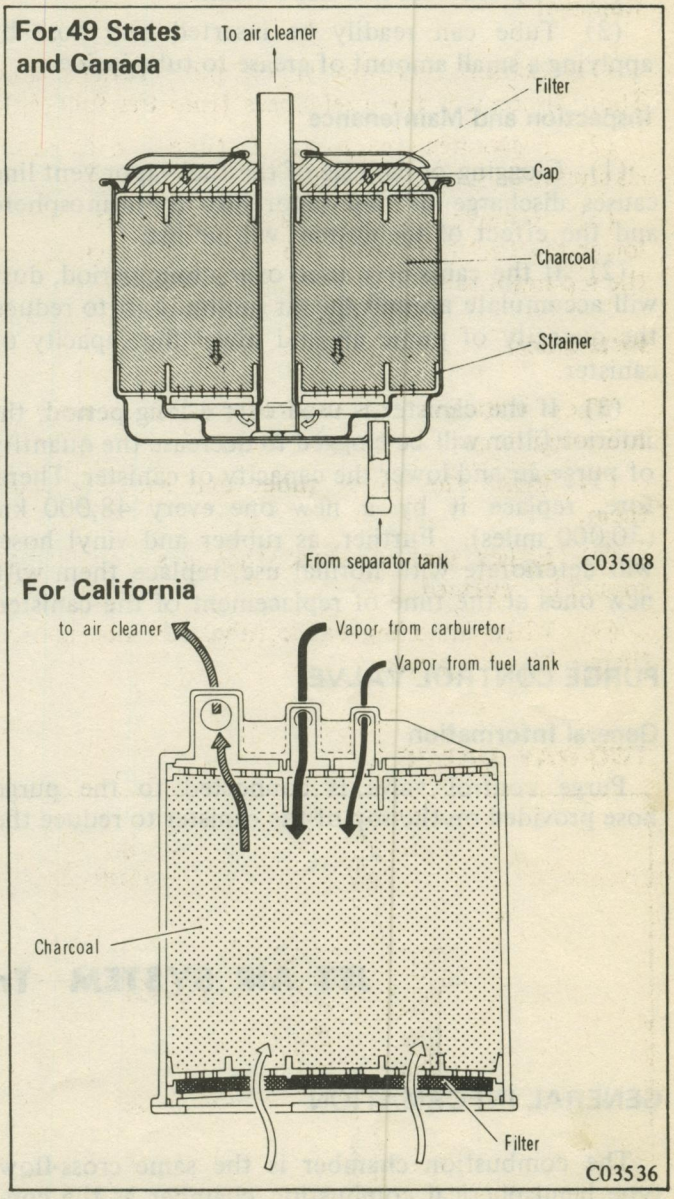


Fig. 6 Construction of Canister

Removal

(1) Remove the clamp, on the canister side of the hose leading to the air cleaner.

(2) Remove the clamp coupling on the canister side of the vapor hose from the separator tank.

(3) Remove canister band tightening bolt.

Installation

When installing the canister, observe the following items.

(1) Securely tighten each clamp.

(2) Replace hose if it has a crack.

(3) Tube can readily be inserted into hose by applying a small amount of grease to tube inside.

Inspection and Maintenance

(1) Clogging or damage of the fuel vapor vent line causes discharge of fuel vapor into the atmosphere and the effect of the system will be lost.

(2) If the canister is used over a long period, dust will accumulate around the air suction port to reduce the quantity of purge air and lower the capacity of canister.

(3) If the canister is used over a long period, the interior filter will be clogged to decrease the quantity of purge air and lower the capacity of canister. Therefore, replace it by a new one every 48,000 km (30,000 miles). Further, as rubber and vinyl hoses will deteriorate with normal use, replace them with new ones at the time of replacement of the canister.

PURGE CONTROL VALVE

General Information

Purge control valve is connected to the purge hose provided on the top of the canister to reduce the quantity of hydrocarbon generated at engine idling.

The purge control valve is constructed as shown in Fig. 7, and its operation is controlled by negative pressure (D vacuum) generated at the port provided slightly above the carburetor throttle valve. While the engine is idling, therefore, the valve is closed to stop up the evaporated gas passage, and while the engine is running at 1,500 rpm or more the valve is opened.

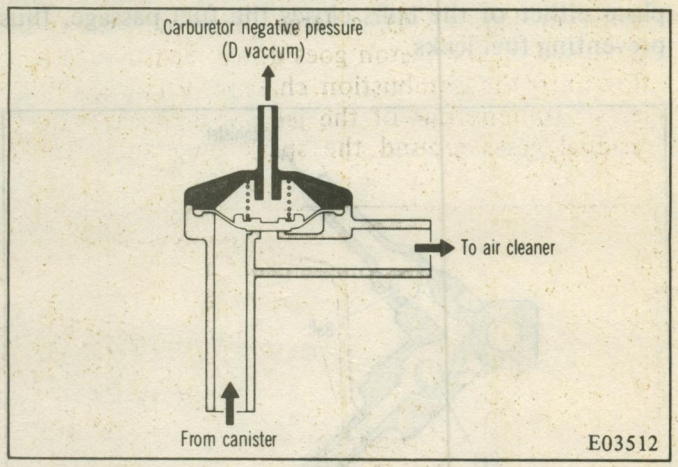


Fig. 7 Details of Purge Control Valve

Inspection

(1) The cooling water temperature should be 80 to 90°C (180 to 190°F).

(2) Disconnect the purge hose from the air cleaner and blow into the purge hose. If the valve is not open, it is in normal condition. Then, start the engine and increase the engine speed to 1,500 to 2,000 rpm and blow into the purge hose. If the valve open, it is normal.

JET AIR SYSTEM—Trucks for U.S.A. only—

GENERAL INFORMATION

The combustion chamber is the same cross-flow type hemispherical combustion chamber as the conventional one. 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. The jet valve assembly consists of the jet valve, jet body and spring and is screwed into the jet piece which is press-fitted into the cylinder head with its jet opening toward the spark plug.

A jet air passage is provided in the carburetor, intake manifold and cylinder head. Air flows through the two intake openings provided near the primary throttle valve of the carburetor, 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 the common rocker arm so that the jet valve and intake valve open and close simultaneously.

On the intake stroke, the air-fuel mixture flows through the intake valve port into the combustion chamber. At the same time, jet air is forced into the combustion chamber because of the pressure difference produced between both ends of the jet air passage (between the jet air intake openings in the carburetor throttle bore and the jet opening of the jet piece) as the piston moves down.

When the throttle valve opening is small (during idling or light load), a large pressure difference is produced as the piston goes down, causing jet air to flow into the combustion chamber very rapidly.The jet air running 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.

When the throttle valve opening is increased, more air-fuel mixture is drawn in from the intake valve port so that the pressure difference is reduced and less jet air forced in.

The jet air swirl dwindles with increase of the throttle valve opening, but the intensified inflow of normal intake air-fuel mixture can satisfactorily promote combustion.

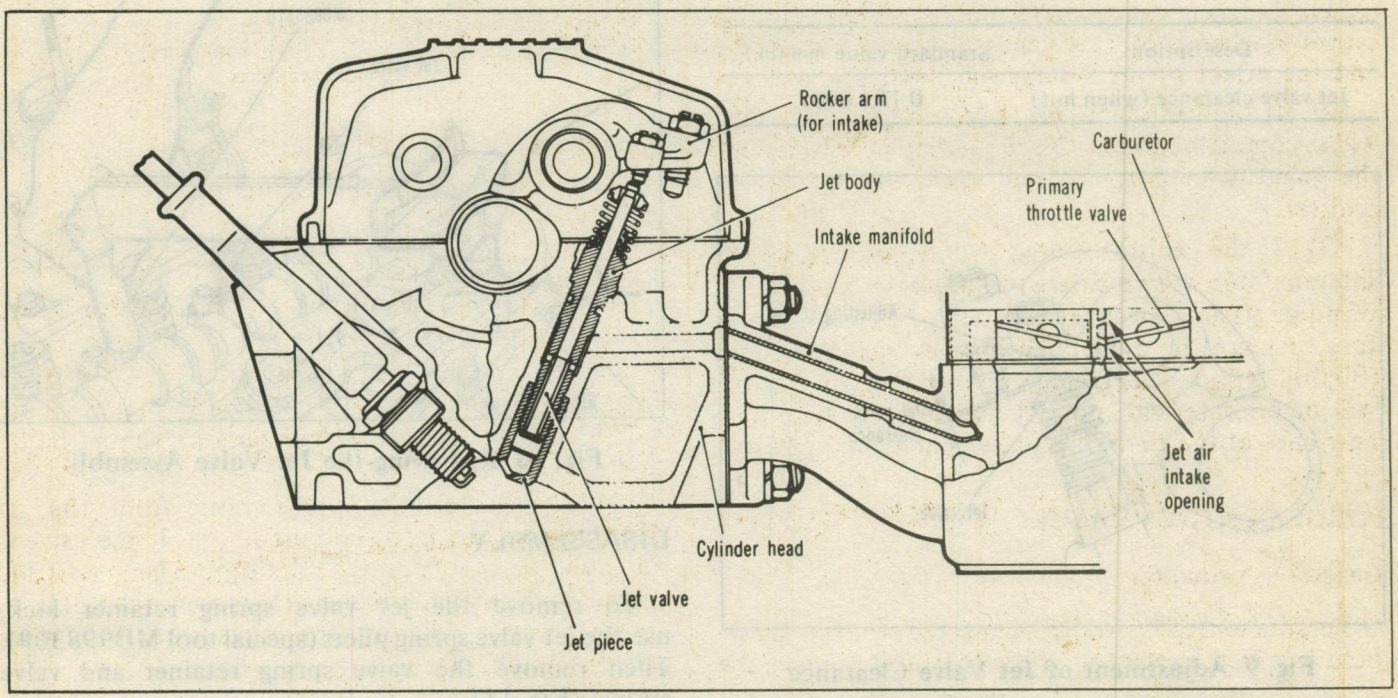


Fig. 8 Jet Air System

JET VALVE CLEARANCE ADJUSTING PROCEDURES

CAUTIONS:

- **An incorrect jet valve clearance will affect the emission levels and could also cause engine troubles. Jet valve clearance must be correctly adjusted in accordance with the procedures described below.**
- **Adjust the jet valve clearance before adjusting the intake valve clearance. Furthermore, the cylinder head bolts should be retightened before attempting this adjustment.**
- **The jet valve clearance should be adjusted with the intake valve adjusting screw fully loosened.**

(1) Warm up the engine until the coolant temperature reaches 80 to 90°C (170 to 190°F).

(2) Position piston at top dead center on compression stroke.

(3) Back off the intake valve side adjusting screw (two or more turns).

(4) Loosen the lock nut on the jet valve adjusting screw.

(5) Back off the jet valve adjusting screw (counterclockwise) and place a 0.15 mm (.006 in.) leaf of the feeler gauge between the top end of the jet valve stem and the bottom end of the adjusting screw.

Description	Standard value mm (in.)
Jet valve clearance (when hot)	0.15 (.006)

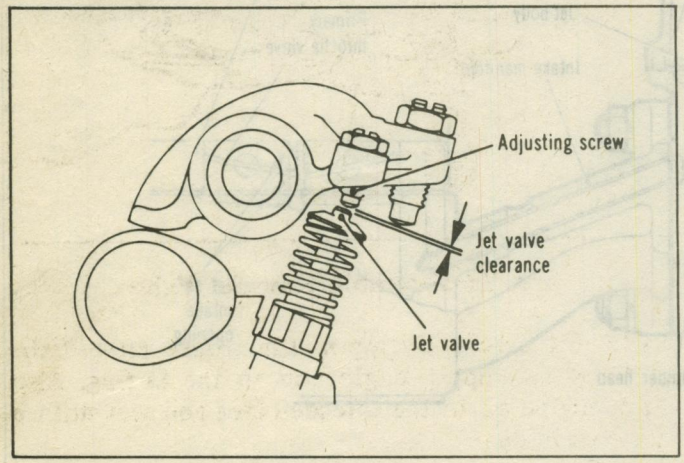


Fig. 9 Adjustment of Jet Valve Clearance

(6) Turn down the adjusting screw (clockwise) until the bottom end of the adjusting screw touches the feeler gauge. Since the jet valve spring is weak in tensile strength, use special care not to force the jet valve in. Be careful particularly if the adjusting screw is hard to turn.

(7) While holding the adjusting screw in place with a screwdriver, tighten the lock nut firmly.

(8) Check with leaf of the feeler gauge to ensure a 0.15 mm (.006 in.) clearance.

(9) Adjust intake valve clearance.

JET VALVE REMOVAL

(1) To remove the jet valve assembly only, remove the rocker arm and roker shaft. For removal of parts up to the rocker arm and rocker shaft, refer to GROUP 9 ENGINE.

(2) Remove the jet valve assembly using jet valve socket wrench. (special tool MD998310). (Fig. 10)

CAUTION:
When the jet valve socket wrench is used, make certain that the wrench is not tilted with respect to the center of the jet valve. If the tool is tilted, the valve stem might be bent by the force exerted to the valve spring retainer, resulting in defective jet valve operation.

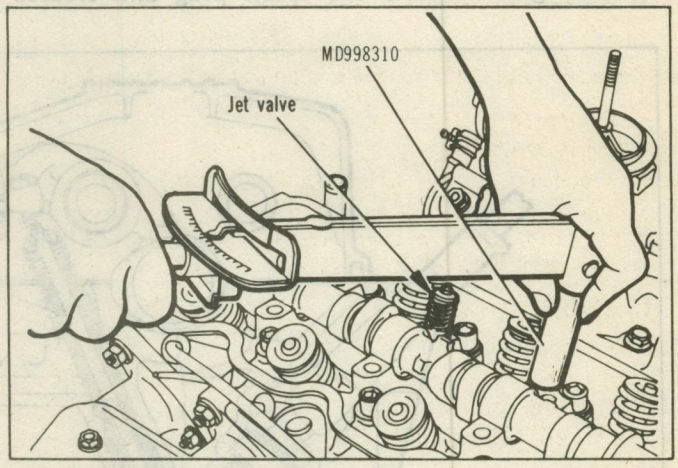


Fig. 10 Removing the Jet Valve Assembly

DISASSEMBLY

To remove the jet valve spring retainer lock, use the jet valve spring pliers (special tool MD998309). Then remove the valve spring retainer and valve spring. (Fig. 11)

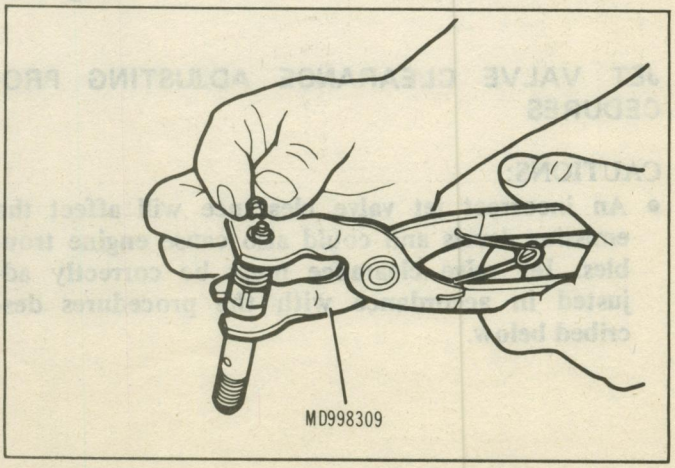


Fig. 11 Disassembling the Jet Valve

INSPECTION OF JET VALVE

(1) Check to ensure that the jet valve slides smoothly in the jet body and has no play. Do not disturb the combination of the jet valve and jet body. Replace the jet valve and jet body as an assembly.

(2) Check the face of the jet valve and the seat of the jet body for seizure and damage. If defective, replace the jet valve and jet body as an assembly.

(3) Check the jet valve spring for deterioration, cracks or damage. Replace if defective.

Description	Standard dimension
Jet valve stem O.D.	4.3 mm (.1693 in.)
Valve face angle	45°
Jet valve spring	
Free length	29.6 mm (1.1654 in.)
Load	34.3 N/21.5 mm (5.5 lbs./.846 in.)

REASSEMBLY

(1) Install the jet valve stem seal onto the jet body, using the jet valve stem seal installer (special tool MD998308). DO NOT reuse old jet valve stem seal. (Fig. 12)

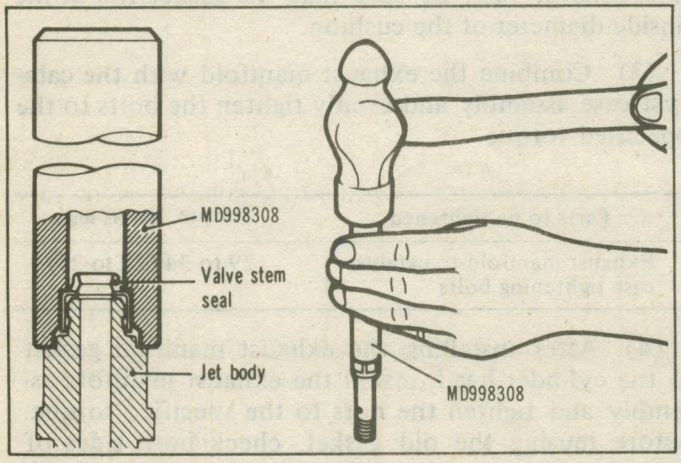


Fig. 12 Installing the Jet Valve Stem Seal

(2) Apply engine oil to the jet valve stem before inserting the jet valve in the jet body. When the valve is inserted, use care to prevent damage to the new valve stem seal lips. After insertion, check to ensure that the valve slides smoothly.

(3) Mount the jet valve spring and jet valve spring retainer. While compressing the spring with the jet valve spring pliers (special tool MD998309), install the retainer lock. When the spring is compressed with the pliers, be careful not to damage to the valve stem by the bottom of the spring retainer. (Fig. 13)

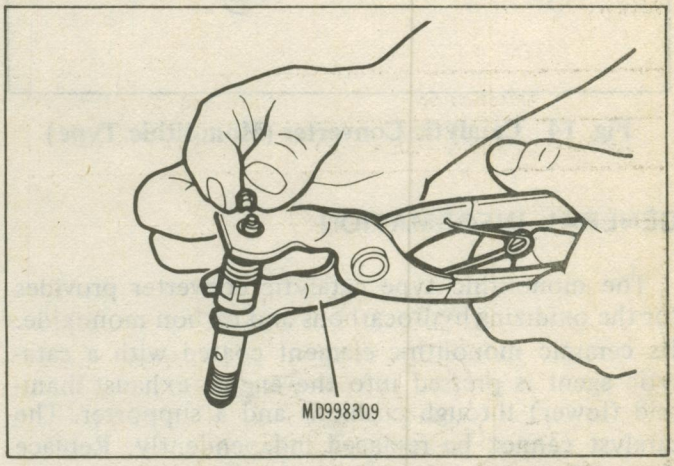


Fig. 13 Assembling the Jet Valve

(4) Fit a new O ring in the groove around the jet body and apply engine oil to the O ring. Also apply engine oil to the threaded area and seat surface of the jet body.

Installation

(1) Screw the jet valve assembly into the cylinder head by hand, and tighten to the specified torque, using the jet valve socket wrench (special tool MD998310). Hold the jet valve socket wrench firmly and make sure it is not tilted with respect to the center of the jet valve.

Part to be tightened	Torque Nm (ft-lbs.)
Jet valve assembly	18 to 21 (13 to 15)

(2) For installation of parts subsequent to the rocker arm and rocker shaft, refer to GROUP 9 ENGINE.

CATALYTIC CONVERER —Trucks for U.S.A. only—

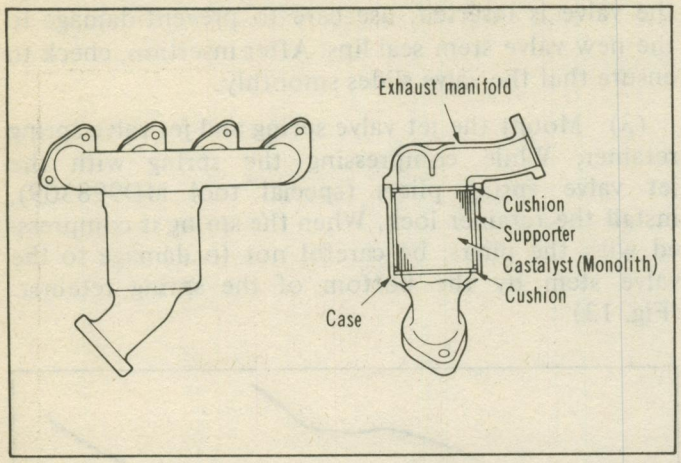


Fig. 14 Catalytic Converter (Monolithic Type)

GENERAL INFORMATION

The monolithic type catalytic converter provides for the oxidizing hydrocarbons and carbon monoxide. Its ceramic monolithic element coated with a catalytic agent is pressed into the engine exhaust manifold (lower) through cushions and a supporter. The catalyst cannot be replaced independently. Replace the catalyst and exhaust manifold (lower) as an assembly.

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

CAUTION:
Operation of any type, including idling, should be avoided if engine misfiring occurs. Under this condition, the exhaust system will operate at an abnormally high temperature and may cause damage to the catalyst or other underbody parts of the car. Alteration or deterioration of the ignition or fuel systems, or any type of operating condition which results in engine misfiring must be corrected to avoid overheating the catalytic converter. Proper maintenance and tune-up according to manufacturer's specifications should be made to correct the condition as soon as possible. Interrupting the ignition at high speeds with the transmission in gear can result in an overheated catalyst.

REMOVAL

CAUTION:
Before removing or inspecting the exhaust system, ensure that the exhaust system is cool enough.

(1) Remove the air cleaner.

(2) Remove the air duct and heat cowl.

(3) Disconnect the front exhaust pipe at exhaust manifold.

(4) Remove stud nuts attaching the exhaust manifold to the cylinder head. Slide manifold off studs and away from cylinder head.

(5) Remove bolts securing the exhaust manifold to the catalyst case assembly.

INSTALLATION

(1) Place a new cushion on the catalyst. Be sure the cushion is not deformed.

(2) Place a new corrosion resistant steel gasket on the catalyst case. Be sure that the gasket fits in the inside diameter of the cushion.

(3) Combine the exhaust manifold with the catalyst case assembly and evenly tighten the bolts to the specified torque.

Parts to be tightened	Torque Nm (ft-lbs.)
Exhaust manifold-to-catalyst case tightening bolts	29 to 34 (22 to 25)

(4) After installing the exhaust manifold gasket to the cylinder head, install the exhaust manifold assembly and tighten the nuts to the specified torque. Before reusing the old gasket, check both sides of the gasket for damage. The gasket may be reused if there are no signs of damage.

Parts to be tightened	Torque Nm (ft-lbs.)
Exhaust manifold assembly mounting nuts	15 to 19 (11 to 14)

(5) Install the heat cowl.

(6) Install the air duct.

(7) Install the air cleaner.

SECONDARY AIR SUPPLY SYSTEM —Trucks for California and Trucks with W-engine for 49 states—

The reed valve supplies secondary air into the exhaust manifold 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 extra air is drawn through the air cleaner and supplied into the exhaust manifold, by the valve motion corresponding the exhaust vacuum.

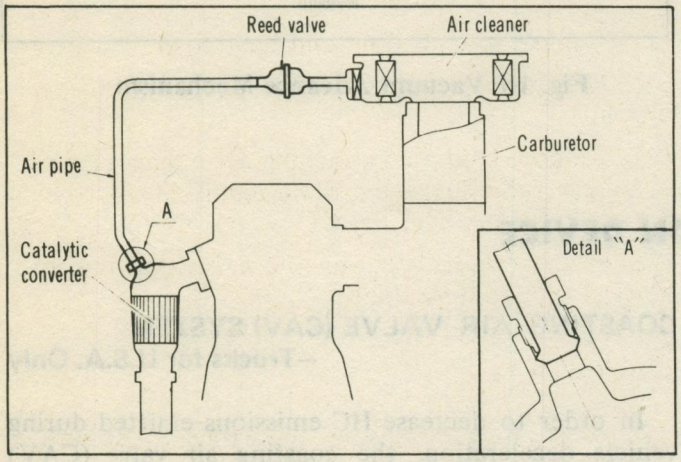


Fig. 15 Secondary Air Supply System

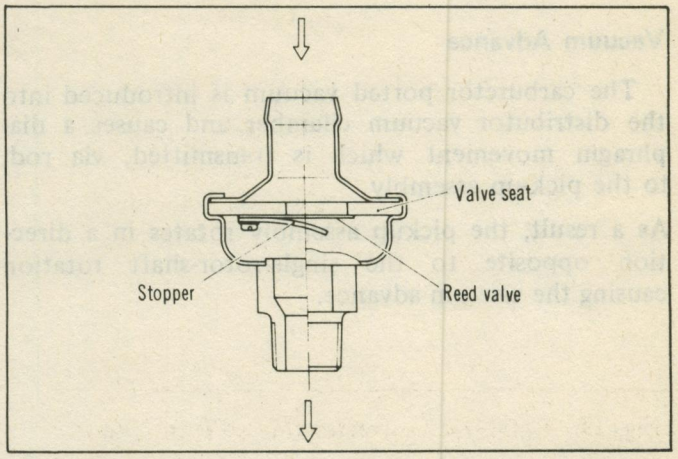


Fig. 16 Reed Valve

INSPECTION

(1) Check the air hose and air pipe for damage and cracks. Replace if necessary.

(2) Check the air pipe connection for leakage.

(3) Start and run the engine at idle.

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

(5) Put your hand lightly on the intake port of reed valve. If your hand feels suction, the reed valve is good. Check to ensure that no exhaust emission is blown back. Replace if defective.

ELECTRONIC IGNITION SYSTEM

This system consists of an ignition coil, a breaker point-less type distributor, an electronic ignition control unit, spark plugs and ignition wires. For details, refer to GROUP 8 ELECTRICAL.

SPARK ADVANCE MECHANISM

The distributor is equipped with both centrifugal and vacuum advance mechanisms which operate independently of each other.

Centrifugal Advance

The distributor shaft rotation causes the governor weights on the shaft to move outward due to the centrifugal force. The governor weight motion is trans-

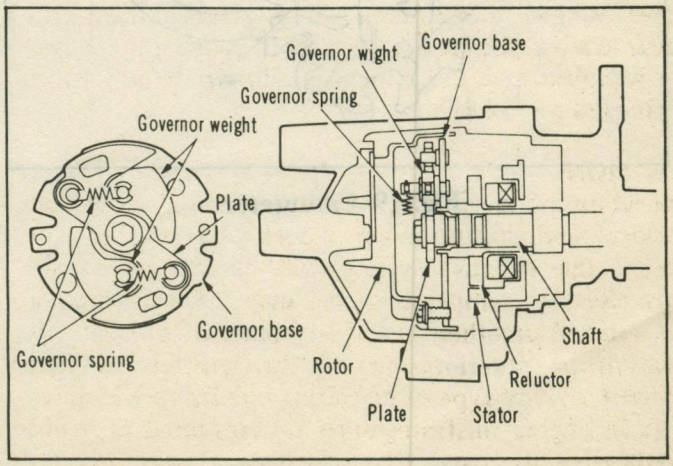


Fig. 17 Centrifugal Advance Mechanism

ferred to the signal-rotor-shaft on the distributor shaft, and subsequent rotation of the signal-rotor-shaft brings corresponding degrees of centrifugal advance.

Vacuum Advance

The carburetor ported vacuum is introduced into the distributor vacuum chamber and causes a diaphragm movement which is transmitted, via rod, to the pick-up assembly.

As a result, the pickup assembly rotates in a direction opposite to the single-rotor-shaft rotation causing the vacuum advance.

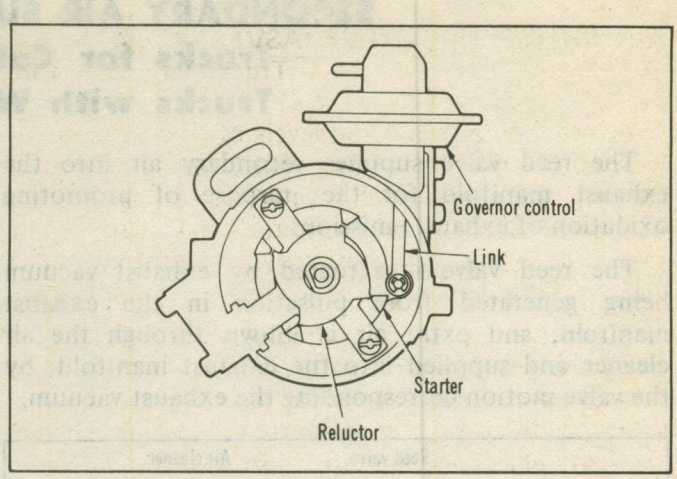


Fig. 18 Vacuum Advance Mechanism

DECELERATION DEVICE

The deceleration device is used to decrease HC emissions during vehicle deceleration. It includes the coasting air valve (CAV) system and the air switching valve (ASV) system.

The CAV and the ASV are built into the carburetor. (Fig. 19)

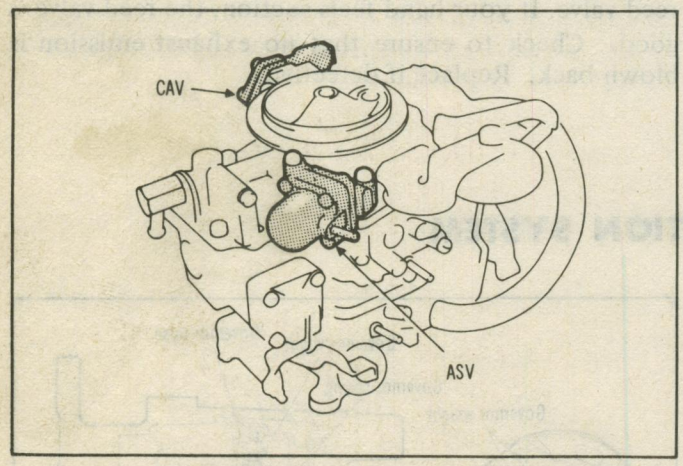


Fig. 19 Carburetor

COASTING AIR VALVE (CAV) SYSTEM —Trucks for U.S.A. Only

In order to decrease HC emissions emitted during vehicle deceleration, the coasting air valve (CAV) which is activated by the carburetor ported vacuum supplies additional air into the intake manifold.

The activation of the CAV is suspended by opening the solenoid valve, when the engine speed sensor detects engine speeds at or below the specified value, in order to keep smooth vehicle operation in transient phase and not to cause unexpected engine stalling.

The solenoid valve and the engine speed sensor are commonly used for the air switching valve system.

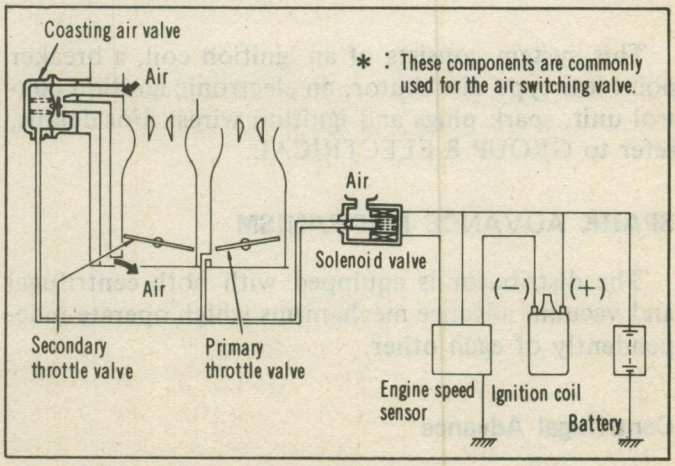
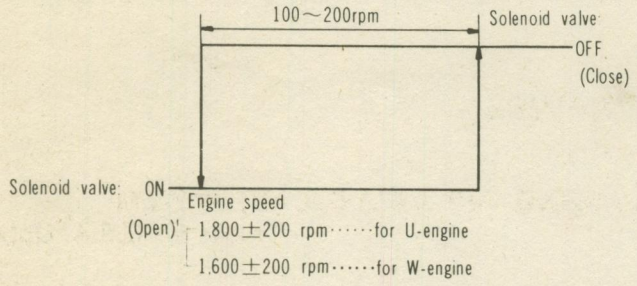


Fig. 20 Air Switching Valve System

AIR SWITCHING VALVE (ASV) SYSTEM — Trucks for U.S.A. Only

In order to improve the levels of fuel economy as well as HC emissions during vehicle deceleration, the air switching valve which is activated by the carburetor ported vacuum cuts off the fuel flow to the bypass holes and pilot outlet by supplying additional air into the slow passage.

The activation of air switching valve is suspended by opening the solenoid valve, when the engine speed sensor detects engine speeds at or below the specified value, in order to keep smooth vehicle operation in transient phase and not to cause unexpected engine stalling.



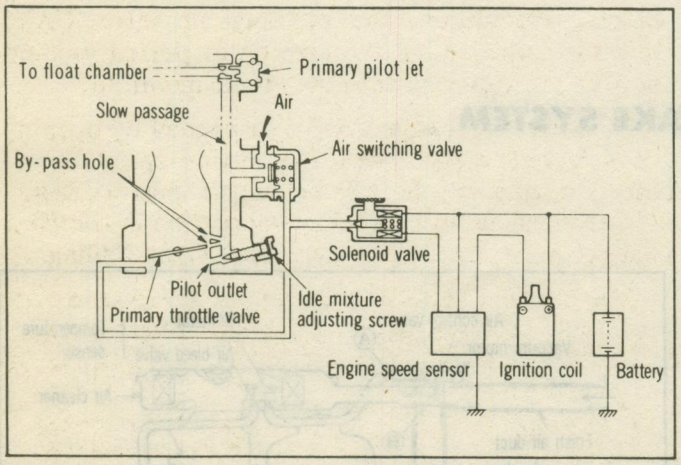


Fig. 21 Air Switching Valve System

TEST

(1) Run the engine at idle.

(2) Disconnect the solenoid valve connector to turn off the solenoid valve. (Manifold vacuum will act on the air switching valve, causing the valve to open.) If the idle speed falls excessively or the engine stalls, the air switching valve and solenoid valve are good. If the idle speed does not change, check the vacuum passeage for clogging and check the condition of the air swtiching valve or solenoid valve.

(3) With the engine at idle, battery voltage should be present at the solenoid connector. If the voltage is present, the electrical wiring or engine speed sensor is defective.

(4) Increase the engine speed to 1,500 rpm. Check to ensure that a voltage is present at the solenoid valve connector. If there is no voltage, the engine speed sensor is defective.

(5) Increase the engine speed to 2,500 rpm. Check to ensure that no voltage is present at the solenoid valve connector. If there is a voltage, the engine speed sensor is defective.

DASH POT — Trucks for Canada with Manual Transmission only

The carburetor is equipped with a dash pot which delays the throttle valve closure onto its normal idling position, thereby reducing the amount of HC emissions emitted.

The dash pot is controlled by a servo valve.

The servo valve detects intake manifold vacuum and closes its valve, if the vacuum exceeds a pre-set value.

When the servo valve is closed, the air in the diaphragm chamber of dash pot cannot leak out. As the result, the diaphragm position of dash pot is locked and the throttle valve opening is retained through the carburetor linkage. The combination system of dash pot and servo valve has a function like a throttle valve positioner.

If manifold vacuum is below the pre-set value, the servo valve is opened and the dash pot works normally.

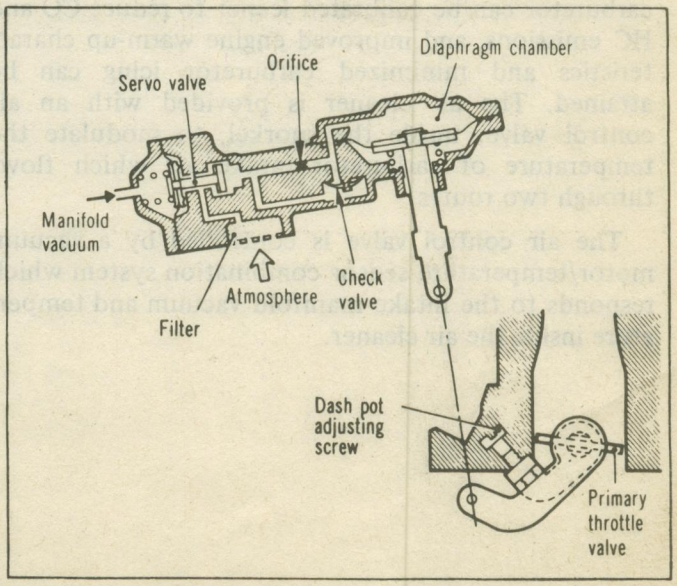


Fig. 22 Dash Pot

Dash Pot Adjustment

CAUTION:
Make certain that correct idling adjustment is made before dash pot adjustment.

(1) Push the dash pot rod up through its entire stroke (until it comes to a stop) as shown in Fig. 23.

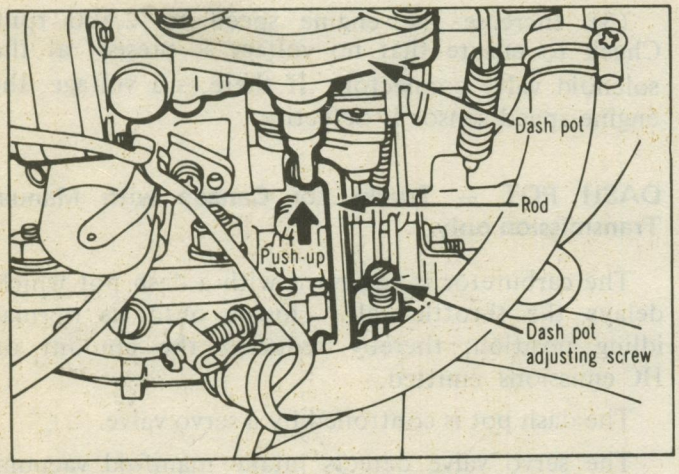


Fig. 23 Dash Pot Adjustment

(2) Measure the engine speed (set speed) under the condition of step (1) and the time required between the sudden release of the dash pot rod under the condition of step (1) and the following of the engine speed to the speed specified for measurement of required time. The set speed should be adjusted by the dash pot adjusting screw.

Description	Standard value	
	U-engine	W-engine
Set speed (rpm)	2200 ± 100	1700 ± 100
Required time (sec.)	3 to 6	
Speed specified for measurement of required time (rpm)	900	

HEATED AIR INTAKE SYSTEM

All 1980 models are equipped with a temperature regulated air cleaner, as shown in Fig. 24, so that the carburetor can be calibrated leaner to reduce CO and HC emissions, and improved engine warm-up characteristics and minimized carburetor icing can be attained. The air cleaner is provided with an air control valve, inside the snorkel, to modulate the temperature of carburetor intake air which flows through two routes.

The air control valve is controlled by a vacuum motor/temperature sensor combination system which responds to the intake manifold vacuum and temperature inside the air cleaner.

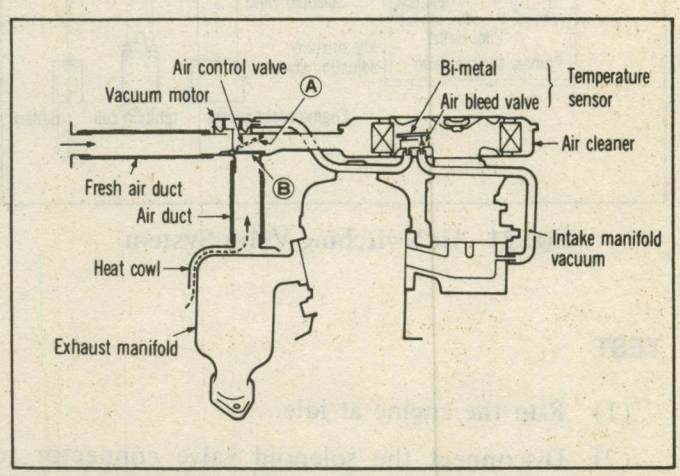


Fig. 24 Heated Air Intake System

Operation

(1) When the bi-metal senses the temperature inside air cleaner of below about 29°C (84°F), the air bleed valve of temperature sensor assembly remains closed. Then the intake manifold vacuum is applied to the diaphragm of the vacuum motor, which in turn, openes the air control valve so as to let the pre-heated intake air flows through the heat cowl and air duct into the air cleaner. (Fig. 25)

(2) When the bi-metal senses the temperature inside air cleaner of above about 45°C (113°F), the air bleed valve is fully opened. As a result, the intake air to the carburetor comes directly through the fresh air duct, since the air control valve is positioned at (B), as shown in Fig. 23, regardless of the intake manifold vacuum.

(3) At intermediate temperature, the air entering the carburetor is a blend of fresh air and pre-heated air as regulated by the thermostatically actuated air control valve.

INSPECTION

(1) Make sure all vacuum hoses and the heat cowl to air cleaner air duct are properly attached and are in good condition.

(2) With a cold engine and ambient temperature less than 30°C (84°F), the air control valve in the snorkel should be in the up or heat on position.

(3) With the engine warmed up and running, check the air temperature entering the snorkel or at the sensor. When the air temperature entering the outer end of snorkel is 45°C (113°F) or higher, the door should be in the down position (heat off).

(4) Remove the air cleaner from the engine and allow the air cleaner to cool down to 30°C (84°F). With 380 mm Hg. (15 in. Hg.) vacuum applied to the sensor, the valve should be in the UP (heat on) position. Should the door not rise to the heat on position, check the vacuum motor for proper operation.

(5) To test the vacuum motor, apply 250 mm (10 inches) of vacuum using pump tool number C-4207 or equivalent (Fig. 25). The valve should be in the full up position. Should the vacuum motor not perform adequately, replace air cleaner body assembly.

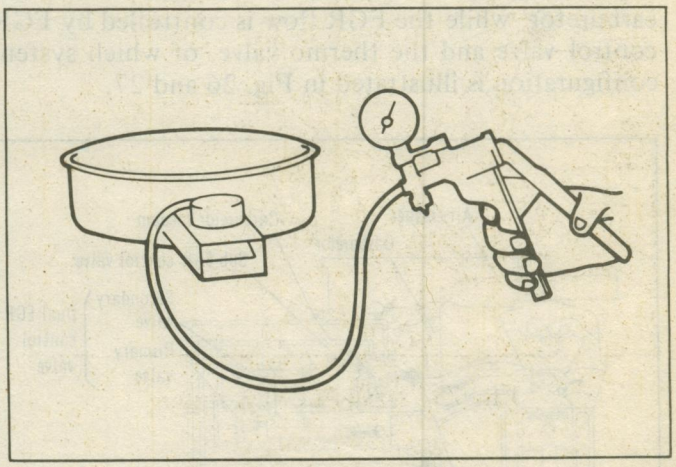


Fig. 25 Testing Vacuum Motor

EXHAUST GAS RECIRCULATION (EGR) SYSTEM —Trucks for U.S.A. only—

All vehicles utilize an Exhaust Gas Recirculation (EGR) system to reduce oxides of nitrogen in the vehicle exhaust.

In this system, the exhaust gas is partially re-circulated from an exhaust port of cylinder head into a port located at the intake manifold below the carburetor, while the EGR flow is controlled by EGR control valve and the thermo valve, of which system configuration is illustrated in Fig. 26 and 27.

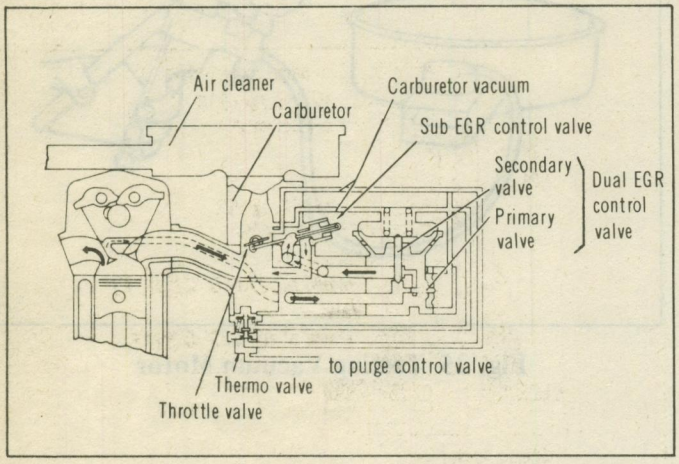


Fig. 26 EGR System —Trucks for California only

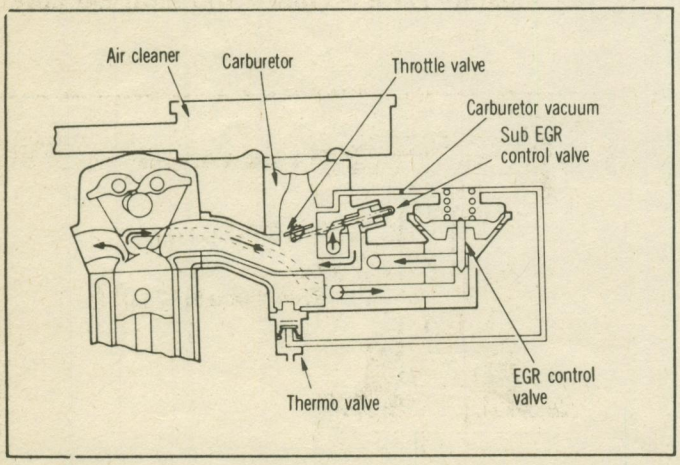


Fig. 27 EGR System —Trucks for 49 states only

EGR CONTROL VALVE

Stringent NOx emission standards require more increased EGR flow, which in turn adversely affects practical driveability.

To solve this problem, it is desirable that the EGR flow is increased to attain effective NOx reduction during high-load vehicle operation, and decreased to cover such poor driveability under low-load operation.

Consequently, the EGR flow is controlled by a combination of "Dual EGR control valve" and "Sub EGR control valve", or another combination of "EGR control valve" and "Sub EGR control valve".

Dual EGR Control Valve —Trucks for California Only

Dual EGR control valve consists of primary —and secondary— valves which are controlled by different carburetor vacuums in response to the throttle valve openings, while the EGR flow is suspended at idle and WOT operations.

The primary valve controls EGR flow for vehicle operation with relatively narrow throttle valve openings, while the secondary control valve allows to recirculate exhaust gas into the intake mixture when the throttle valve is further opened.

The vacuum to be applied on the dual EGR control valve is controlled by a thermo valve as described in next section.

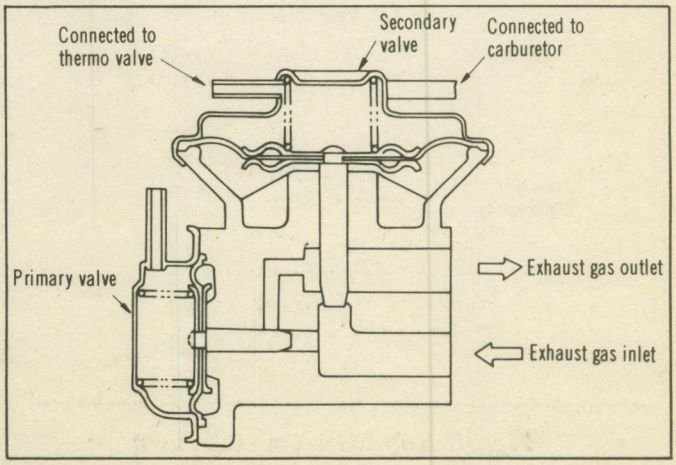


Fig. 28 Dual EGR Control Valve —Trucks for California only

EGR Control Valve – Trucks for 49 States only

EGR control valve, which is a conventional type one, is controlled by the carburetor vacuums in response to the throttle valve openings, while the EGR flow is suspended at idle and WOT operations.

The vacuum to be applied on the EGR control valve is controlled by a thermo valve as described in next section.

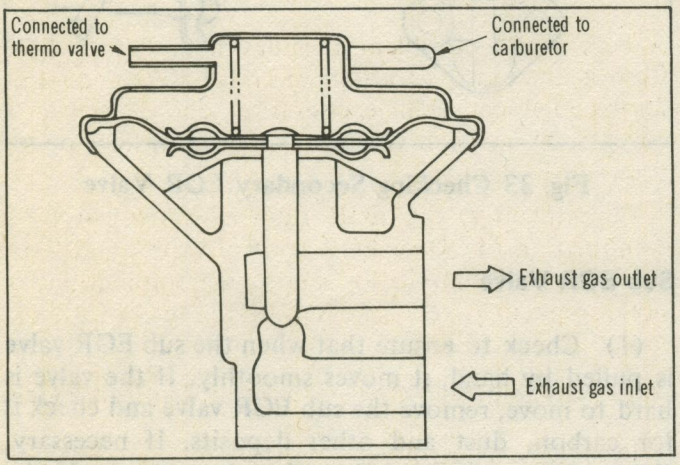


Fig. 29 EGR Control Valve – Trucks for 49 States only

Sub EGR Control Valve

Sub EGR control valve is directly opened and closed with the motion of throttle valve through a linkage, as shown in Fig. 30, in order to closely modulate the EGR flow controlled by the EGR controlled valve, in response to the throttle valve opening.

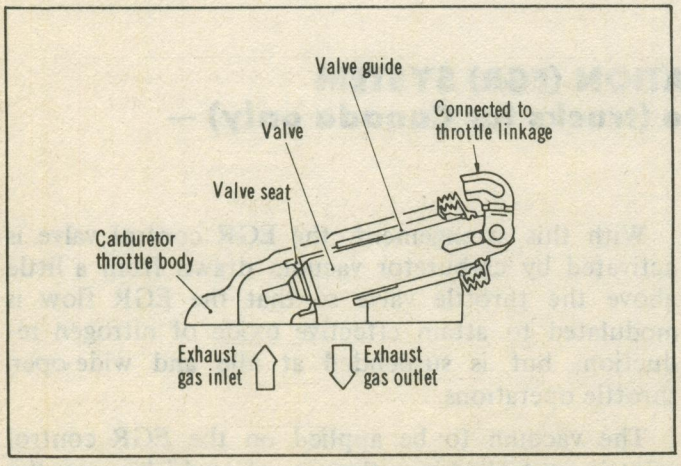


Fig. 30 Sub EGR Control Valve

THERMO VALVE

A thermo valve incorporated in the EGR system, for sensing the coolant temperature at the intake manifold, closes the EGR control valve when the coolant temperature is lower than a pre-set value in order to prevent deterioration of the vehicle driveability and startability under initial start-up condition, and the thermo valve opens the EGR control valve when the coolant temperature becomes above the pre-set temperature.

But once the engine is stopped and the coolant temperature becomes lower than the other pre-set value again, the thermo valve returns to the "Open" position, resulting the EGR control valve to be closed.

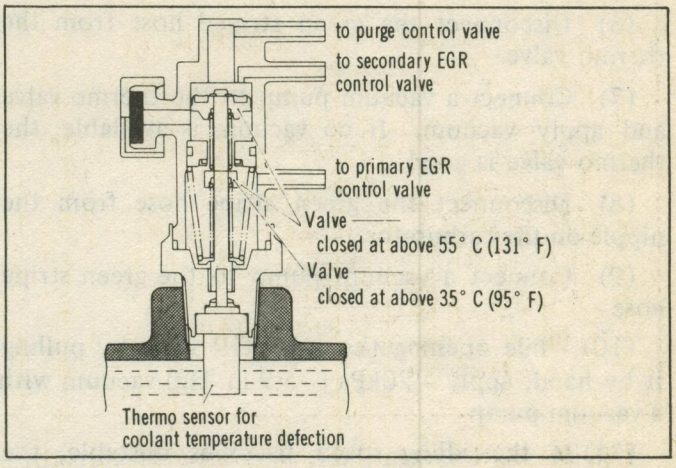


Fig. 31 Thermo Valve –Trucks for California only

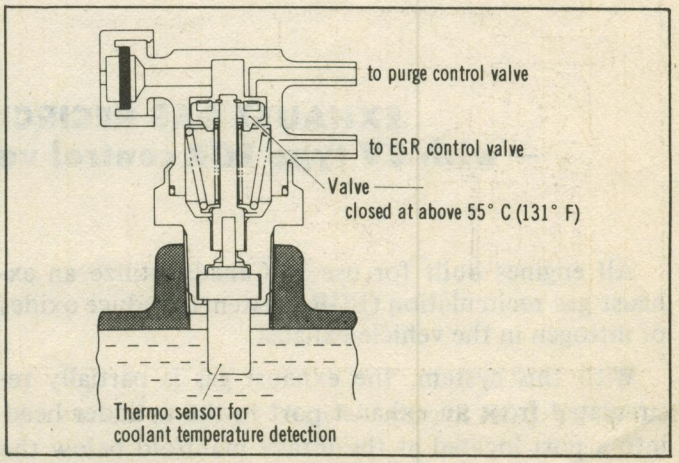


Fig. 32 Thermo Valve –Trucks for 49 states only

EGR SYSTEM TEST

(1) Check the vacuum hose for routing and installtion.

(2) Cold start and run the engine at idle speed.

(3) Check to ensure that increasing engine rpm (idle ↔ 2,500 rpm) does not cause the secondary EGR valve to operate. If the secondary EGR valve operates, replace the thermo valve.

(4) Warm up the engine until the coolant temperature exceeds 55°C (131°F).

(5) Check to ensure that when engine rpm's are increased as described under step (3), the secondary valve operates. If it does not operate, inspect the EGR control valve or the thermo valve.

(6) Disconnect the green striped hose from the thermo valve.

(7) Connect a vacuum pump to the thermo valve and apply vacuum. If no vacuum is available, the thermo valve is good.

(8) Disconnect the green stripe hose from the nipple on the carburetor.

(9) Connect a vacuum pump to the green stripe hose.

(10) While opening the sub EGR valve by pulling it by hand, apply −20kPa (−5.9 in. Hg) vacuum with a vacuum pump.

(11) If the idling speed becomes unstable, the secondary valve is operating properly. If the idling speed remains unchanged, the valve is not operating. Replace the EGR valve.

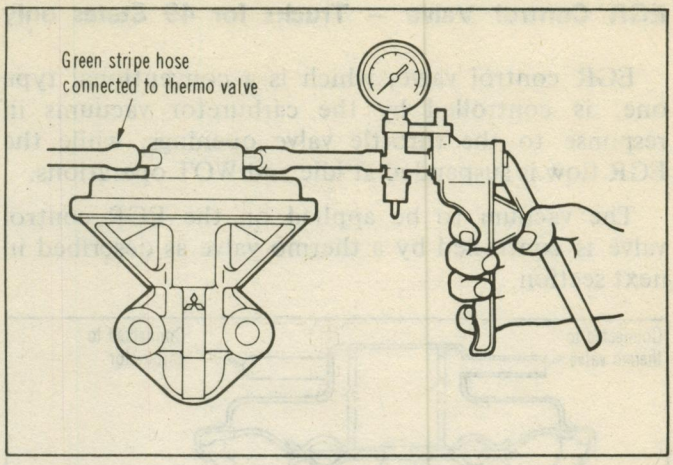


Fig. 33 Checking Secondary EGR Valve

Sub EGR Valve

(1) Check to ensure that when the sub EGR valve is pulled by hand, it moves smoothly. If the valve is hard to move, remove the sub EGR valve and check it for carbon, dust and other deposits. If necessary, clean with a solvent and apply oil sparingly. If the valve is still hard to move, replace the sub EGR valve.

(2) When the sub EGR valve cannot be removed with ease, spray a solvent several times from outside with the rubber boot removed, then turn and remove the sub EGR valve.

EXHAUST GAS RECIRCULATION (EGR) SYSTEM —with CV type EGR control valve (trucks for Canada only)—

All engines built for use in Canada utilize an exhaust gas recirculation (EGR) system to reduce oxides of nitrogen in the vehicle exhaust.

With this system, the exhaust gas is partially recirculated from an exhaust port in the cylinder head into a port located at the intake manifold below the carburetor. The EGR flow is controlled by an EGR control valve attached to the intake manifold.

With this arrangement, the EGR control valve is activated by carburetor vacuum drawn from a little above the throttle valve so that the EGR flow is modulated to attain effective oxide of nitrogen reduction, but is suspended at idle and wide-open throttle operations.

The vacuum to be applied on the EGR control valve is controlled by a thermo valve which senses the coolant temperature at the intake manifold underside.

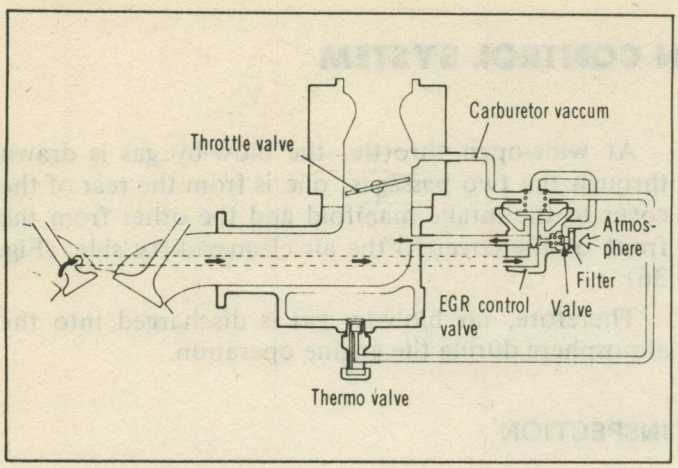


Fig. 34 EGR System (trucks for Canada only)

EGR CONTROL VALVE

Stringent oxides of nitrogen emission standards requires more EGR flow, which in turn adversely affects practical driveability.

The EGR flow is increased to attain effective oxides of nitrogen reduction during high-load vehicle operation, and decreased to prevent poor driveability under low-load operation.

Consequently, the carburetor vacuum working on the diaphragm to the EGR control valve is controlled by a vacuum control valve, which responds to the vehicle operating load by detecting intake manifold vacuum.

If the intake manifold vacuum is below 205 mm (7.9 in.) Hg (27 kPa), the vacuum control valve is closed, and the EGR control valve works like a conventional type.

If the intake manifold vacuum rises to 205 mm (7.9 in.) Hg (27 kPa) or higher, the vacuum control valve is opened and permits the atmospheric pressure to leak into the carburetor vacuum, through an orifice. Then, the EGR control valve opening is decreased in response to the level of the decreased carburetor vacuum. As the result, the EGR flow under low-load vehicle operation is relatively low in comparison with the EGR flow during high-load vehicle operation.

THERMO VALVE (Fig. 35)

A thermo valve incorporated in the EGR system senses the coolant temperature and closes the EGR control valve when the coolant temperature is lower than a pre-set value. This prevents deterioration of the vehicle driveability and startability under initial start-up conditions. The thermo valve opens the EGR control valve when the coolant temperature rises above the pre-set temperature.

Once the engine is stopped and the coolant temperature goes lower than a second pre-set value, the thermo valve returns to the "open" position.

The pre-set temperature values are tabulated below.

Coolant temperature	Valve for EGR control
Above 55°C (131°F) ±5°C (9°F)	Closed
Below 45°C (113°F) ±10°C (18°F)	Opened

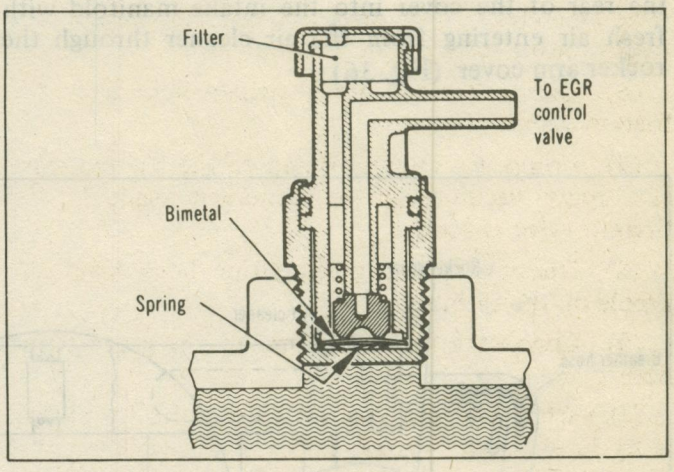


Fig. 35 Thermo Valve

INSPECTION

Check operation of the EGR system using the following procedures and replace if defective.

(1) Start the engine. (The engine should be cold)

(2) Run the engine (from idle to 2,500 rpm). Put your finger under the EGR contorl valve to check for operation of the disphragm. When the engine is cold [the engine coolant temperature below 55°C (131°F)], the diaphragm should be stationary. If it operates, check for a clogged vacuum hose (with green stripe) between EGR control valve and thermo valve or a defective thermo valve.

(3) If nothing wrong was noted during the preceeding checks, warm up the engine until the engine coolant temperature exceeds 40°C (104°F), and proceed to step (4).

(4) Run the engine and check to see if the diaphragm of the EGR control valve operates. If the diaphragm operates, the valve is good. If it doesn't, a cracked or clogged vacuum hose, defective thermo valve, broken EGR control valve diaphragm, valve bearing, etc. should be suspected.

CRANKCASE EMISSION CONTROL SYSTEM

A closed-type crankcase ventilation system is utilized to prevent the blow-by gas from escaping into the atmosphere. This system has a small orifice fixed at the intake manifold or at the rocker arm cover. (Fig. 37 and 38)

The blow-by gas is led through a rubber hose from the front of the rocker arm cover into the air cleaner, and through another hose from the rear of the same cover into the intake manifold through the orifice. At narrow-open throttle, the blow-by gas is drawn from the rear of the cover into the intake manifold with fresh air entering from the air cleaner through the rocker arm cover. (Fig. 36)

At wide-open throttle, the blow-by gas is drawn through the two passages; one is from the rear of the cover to the intake manifold and the other from the front of the cover to the air cleaner dirty side. (Fig. 36)

Therefore, no blow-by gas is discharged into the atmosphere during the engine operation.

INSPECTION

(1) Check crankcase ventilation breather hoses. If the breather hoses and jet are clogged, poor crankcase ventilation will result. Check and clean the hoses and jet. Replace them if necessary.

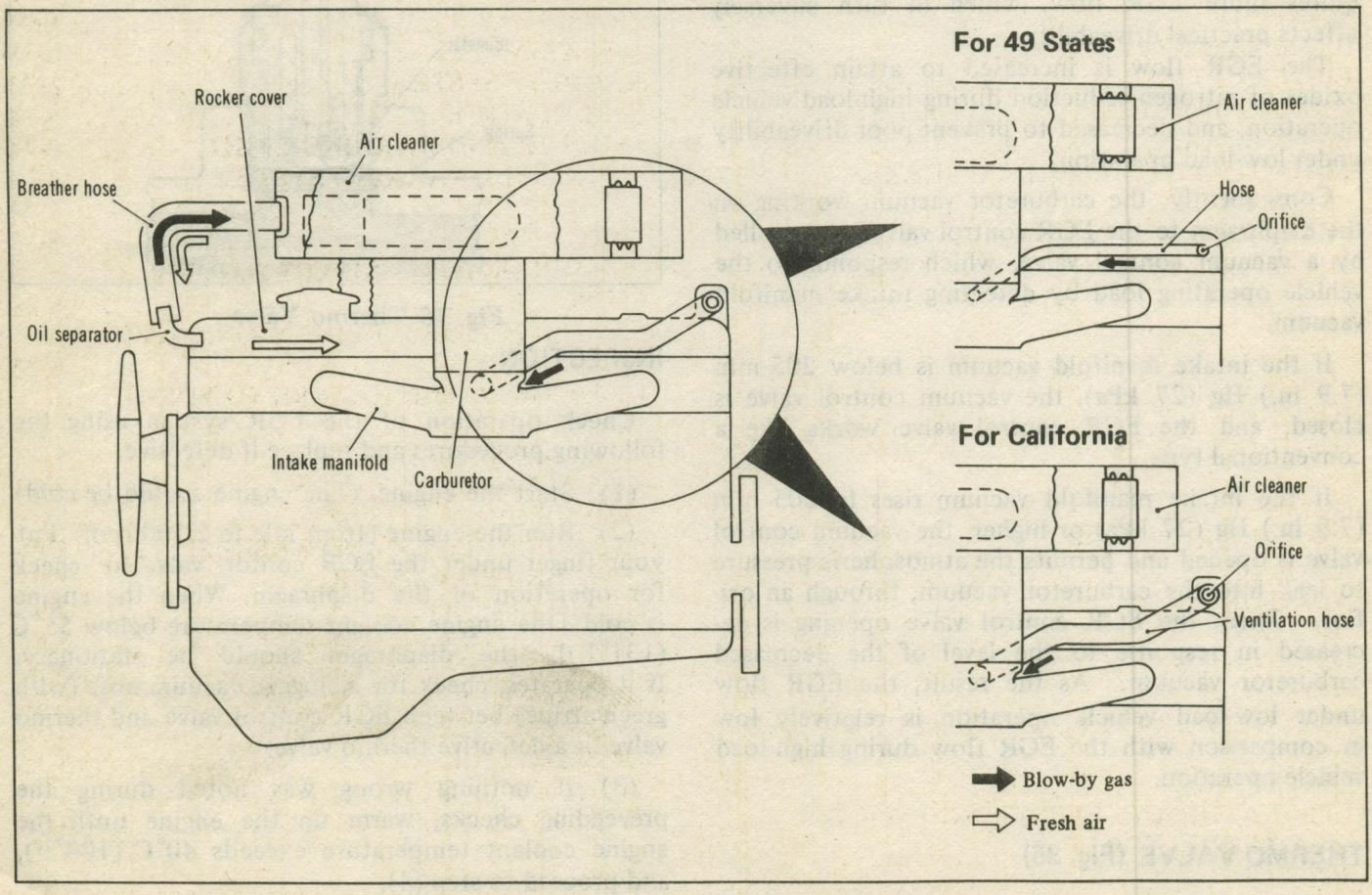


Fig. 36 Crankcase Emission Control System