EMISSION CONTROL

GENERAL

Emission control systems are required to meet existing standards for exhaust, crankcase and raw fuel vapor emissions. The systems are designed to control the emission of hydrocarbons, carbon monoxide, and oxides of nitrogen at the levels specified by Federal or California Standards.

For 1974, Nationwide Federal Standards and the standards which apply in the State of California differ. This necessitates a number of differences between emission control systems on vehicles built for sale in California and Nationwide. The following general descriptions of emission control systems apply to Nationwide vehicles. Deviations from Nationwide, which apply to the California vehicles only, will follow the general description.

Emission control system usage varies in relation to engine, transmission, and series aplication. The Emission Control Systems Application Chart (at the end of this section) may be used to determine the current system usage for any particular vehicle.

NOTE: *Engines in heavy-duty trucks are painted red to distinguish them from standard engines. The emission control systems used on these red engines differ from standard engines because of the weight classification of heavy-duty trucks.*

This section outlines service procedures for all Jeep Emission Control Systems. In addition, tuneup specifications and procedures as prescribed by the U. S. Emission Control Services Maintenance Chart are also included.

SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
ROUGH IDLE OR STALLING	(1) Improper idle mixture adjustment	(1) Adjust idle mixture
	(2) Damaged tip on idle mixture screws	(2) Replace mixture screw
	(3) Clogged air bleed or idle passages	(3) Clean passages
	(4) Vacuum leak	(4) Check manifold vacuum and repair as necessary
	(5) Improper fuel level	(5) Adjust fuel level
	(6) Restricted air cleaner	(6) Clean or replace air cleaner
	(7) Improper choke setting	(7) Adjust choke
	(8) Choke binding	(8) Locate and eliminate binding condition
	(9) Exhaust manifold heat valve inoperative	(9) Lubricate or replace heat valve as necessary
	(10) Secondary throttle valves not closing (4300 Model, 4V carburetor)	(10) Locate and eliminate binding condition

SERVICE DIAGNOSIS (Continued)

Condition	Possible Cause	Correction
ROUGH IDLE OR STALLING (Continued)	(11) Improper fast idle cam adjustment	(11) Adjust
	(12) Faulty ignition points	(12) Adjust or replace points
	(13) Faulty distributor rotor	(13) Replace rotor
	(14) Leaking engine valves	(14) Check compression and repair as necessary
	(15) Incorrect ignition wiring	(15) Check wiring and correct as necessary
	(16) Faulty coil	(16) Test coil and replace as necessary
	(17) Faulty EGR valve operation	(17) Test EGR system and replace as necessary
	(18) Faulty PCV valve airflow	(18) Test PCV valve and replace as necessary
	(19) Faulty TAC unit	(19) Repair as necessary
FAULTY LOW-SPEED OPERATION	(1) Clogged idle transfer slots	(1) Clean transfer slots
	(2) Restricted idle air bleeds and passages	(2) Clean air bleeds and passages
	(3) Restricted air cleaner	(3) Clean or replace air cleaner
	(4) Improper fuel level	(4) Adjust fuel level
	(5) Faulty spark plugs	(5) Clean or replace spark plugs
	(6) Dirty, corroded, or loose secondary circuit connections	(6) Clean or tighten secondary circuit connections
	(7) Faulty ignition cable(s)	(7) Replace ignition cable(s)
	(8) Faulty distributor cap	(8) Replace cap
	(9) Incorrect ignition point gap	(9) Adjust gap
FAULTY ACCELERATION	(1) Improper pump stroke	(1) Adjust
	(2) Inoperative pump discharge check ball or needle	(2) Clean or replace as necessary
	(3) Worn or damaged pump diaphragm or piston	(3) Replace diaphragm or piston
	(4) Leaking main body cover gasket	(4) Replace gasket
	(5) Engine cold and choke too lean	(5) Adjust choke
	(6) Improper metering rod adjustment (YF Model carburetor)	(6) Adjust metering rod
	(7) Faulty spark plug(s)	(7) Clean or replace spark plug(s)
	(8) Incorrect ignition timing	(8) Adjust timing
	(9) Leaking engine valves	(9) Check compression, repair as necessary
	(10) Faulty coil	(10) Test coil and replace as necessary

SERVICE DIAGNOSIS (Continued)

Condition	Possible Cause	Correction
FAULTY HIGH SPEED OPERATION	(1) Low fuel pump volume	(1) Replace fuel pump
	(2) Clogged vacuum passages	(2) Clean passages
	(3) Improper size or obstructed main jets	(3) Clean or replace as necessary
	(4) Faulty choke operation	(4) Adjust choke
	(5) Clogged secondary metering passages (4300 4V carburetor)	(5) Clean passages
	(6) Restricted air cleaner	(6) Clean or replace as necessary
	(7) Secondary linkage, throttle valves, or shaft binding (4300 4V carburetor)	(7) Locate and eliminate binding condition
	(8) Partially restricted exhaust manifold, exhaust pipe, muffler, or tailpipe	(8) Eliminate restriction
	(9) Auxiliary inlet valve not adjusted properly	(9) Adjust inlet valve
	(10) Improper spark plug gap	(10) Adjust gap
	(11) Worn distributor shaft	(11) Replace shaft
	(12) Faulty distributor rotor	(12) Replace rotor
	(13) Faulty coil	(13) Test coil and replace as necessary
	(14) Incorrect ignition timing	(14) Adjust timing
	(15) Excessive ignition point gap	(15) Adjust point gap
	(16) Breaker arm binding	(16) Replace ignition point assembly
	(17) Improper breaker arm tension	(17) Test breaker arm tension and replace as necessary
	(18) Leaking engine valve(s)	(18) Check compression and repair as necessary
	(19) Faulty valve spring(s)	(19) Inspect and test valve spring tension and replace as necessary
	(20) Faulty distributor centrifugal advance	(20) Check centrifugal advance and repair as necessary
	(21) Faulty distributor vacuum advance	(21) Check vacuum advance and repair as necessary
	(22) Incorrect valve timing	(22) Check valve timing and repair as necessary
	(23) Intake manifold restricted	(23) Pass chain through passages
	(24) Defective TCS system	(24) Test TCS system; repair as necessary
MISFIRE AT ALL SPEEDS	(1) Faulty spark plug(s)	(1) Clean or replace spark plug(s)
	(2) Faulty spark plug cable(s)	(2) Replace as necessary

SERVICE DIAGNOSIS (Continued)

Condition	Possible Cause	Correction
MISFIRE AT ALL SPEEDS (Continued)	(3) Incorrect ignition point gap	(3) Adjust point gap
	(4) Faulty condenser	(4) Replace condenser
	(5) Faulty distributor cap or rotor	(5) Replace cap or rotor
	(6) Faulty coil	(6) Test coil and replace as necessary
	(7) Primary circuit shorted or open intermittently	(7) Trace primary circuit and repair as necessary
	(8) Leaking engine valve(s)	(8) Check compression and repair as necessary
	(9) Faulty hydraulic tappet(s)	(9) Clean or replace tappet(s)
	(10) Faulty valve spring(s)	(10) Inspect and test valve spring tension, repair as necessary
	(11) Worn lobes on camshaft	(11) Replace camshaft
	(12) Vacuum leak	(12) Check manifold vacuum and repair as necessary
	(13) Improper carburetor settings	(13) Adjust carburetor
	(14) Fuel pump volume or pressure low	(14) Replace fuel pump
	(15) Blown cylinder head gasket	(15) Replace gasket
	(16) Intake or exhaust manifold passage(s) restricted	(16) Pass chain through passages
POWER NOT UP TO NORMAL	(1) Incorrect ignition timing	(1) Adjust timing
	(2) Faulty distributor rotor	(2) Replace rotor
	(3) Worn distributor shaft	(3) Replace shaft
	(4) Incorrect spark plug gap	(4) Adjust gap
	(5) Faulty fuel pump	(5) Replace fuel pump
	(6) Incorrect valve timing	(6) Check valve timing and repair as necessary
	(7) Faulty coil	(7) Test coil and replace as necessary
	(8) Faulty ignition	(8) Test cables and replace as necessary
	(9) Leaking engine valves	(9) Check compression and repair as necessary
	(10) Blown cylinder head gasket	(10) Replace gasket
	(11) Leaking piston rings	(11) Check compression and repair as necessary
INTAKE BACKFIRE	(1) Improper ignition timing	(1) Adjust timing
	(2) Improper dwell	(2) Adjust dwell
	(3) Faulty accelerator pump discharge	(3) Repair as necessary
	(4) Improper choke operation	(4) Repair as necessary
	(5) Defective EGR CTO	(5) Replace EGR CTO

SERVICE DIAGNOSIS (Continued)

Condition	Possible Cause	Correction
EXHAUST BACKFIRE	(1) Vacuum leak	(1) Check manifold vacuum and repair as necessary
	(2) Faulty diverter valve	(2) Test diverter valve and replace as necessary
	(3) Faulty choke operation	(3) Repair as necessary
	(4) Exhaust leak	(4) Locate and eliminate leak
PING OR SPARK KNOCK	(1) Incorrect ignition timing	(1) Adjust timing
	(2) Vacuum leak	(2) Check manifold vacuum and repair as necessary
	(3) Excessive combustion chamber deposits	(3) Use combustion chamber cleaner
	(4) Carburetor set too lean	(4) Adjust carburetor
	(5) Distributor centrifugal or vacuum advance malfunction	(5) Check advance and repair as necessary
	(6) Excessively high compression	(6) Check compression and repair as necessary
	(7) Fuel octane rating excessively low	(7) Try alternate fuel source
HARD STARTING (ENGINE CRANKS NORMALLY)	(1) Binding linkage, choke valve or choke piston	(1) Repair as necessary
	(2) Restricted choke vacuum and hot air passages	(2) Clean passages and inspect heat choke tube for leaks
	(3) Improper fuel level	(3) Adjust float level
	(4) Dirty, worn or faulty needle valve and seat	(4) Repair as necessary
	(5) Float sticking	(5) Repair as necessary
	(6) Exhaust manifold heat valve stuck closed (hard hot start only)	(6) Repair as necessary
	(7) Faulty fuel pump	(7) Replace fuel pump
	(8) Incorrect choke bimetal adjustment	(8) Adjust bimetal
	(9) Inadequate unloader adjustment	(9) Adjust unloader
	(10) Faulty ignition coil	(10) Test and replace as necessary
	(11) Wet ignition cables, coil or distributor cap	(11) Repair as necessary
	(12) Improper spark plug gap	(12) Adjust gap

SERVICE DIAGNOSIS (Continued)

Condition	Possible Cause	Correction
HARD STARTING (ENGINE CRANKS NORMALLY)(Continued)	(13) Incorrect initial timing.	(13) Adjust timing.
	(14) Incorrect valve timing.	(14) Check valve timing; repair as necessary.
	(15) Carburetor percolation (hot)	(15) Repair as necessary.
	(16) Improper dwell	(16) Adjust dwell.
	(17) Improper fast idle speed	(17) Adjust fast idle
SURGING (CRUISING SPEEDS TO TOP SPEEDS)	(1) Clogged main jet(s)	(1) Clean main jet(s)
	(2) Undersize main jet(s)	(2) Replace main jet(s)
	(3) Low fuel level	(3) Adjust fuel level
	(4) Low fuel pump pressure or volume	(4) Replace fuel pump
	(5) Blocked air bleeds	(5) Clean air bleeds
	(6) Clogged fuel filter screen	(6) Replace fuel filter
	(7) Restricted air cleaner	(7) Clean or replace air cleaner
	(8) Metering rod not adjusted properly (YF Model Carburetor)	(8) Adjust metering rod
	(9) Improper PCV valve air flow	(9) Test PCV valve and replace as necessary
	(10) Vacuum leak	(10) Check manifold vacuum and repair as necessary

AIR GUARD SYSTEM

GENERAL

This system incorporates a belt driven air pump, diverter (bypass) valve, air injection manifold(s), air injection tubes, and connecting hoses (fig. 4A-1 and 4A-2).

Air is discharged from the air pump to the diverter valve where it is directed to the air distribution manifold(s) or dumped through a bypass port depending on engine operation conditions. The system air pressure is regulated at approximately five psi by a relief valve which is incorporated in the diverter valve. The air is routed through the air injection manifold tubing to injection tubes and then introduced to the engine exhaust ports. As the air is discharged from the injection tubes, it mixes with the hot unburned gases entering the exhaust ports during the exhaust stroke. This results in further burning of the combustion mixture and reduces hydrocarbon and carbon monoxide emission to the atmosphere.

AIR PUMP

The air pump used for V-8 and six-cylinder engines is the same. The major components of the air pump are enclosed in a die-cast aluminum housing. A filter fan assembly, rotor shaft and drive hub are visible on the pump exterior (fig. 4A-3).

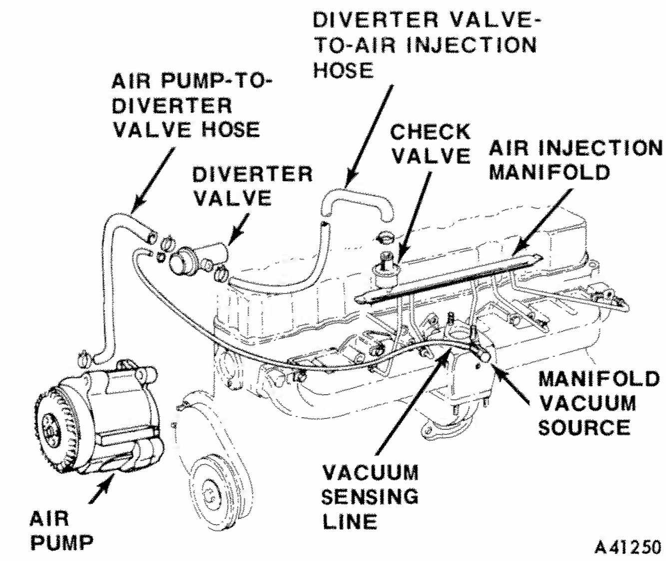


Fig. 4A-1 Air Guard System - Six-Cylinder

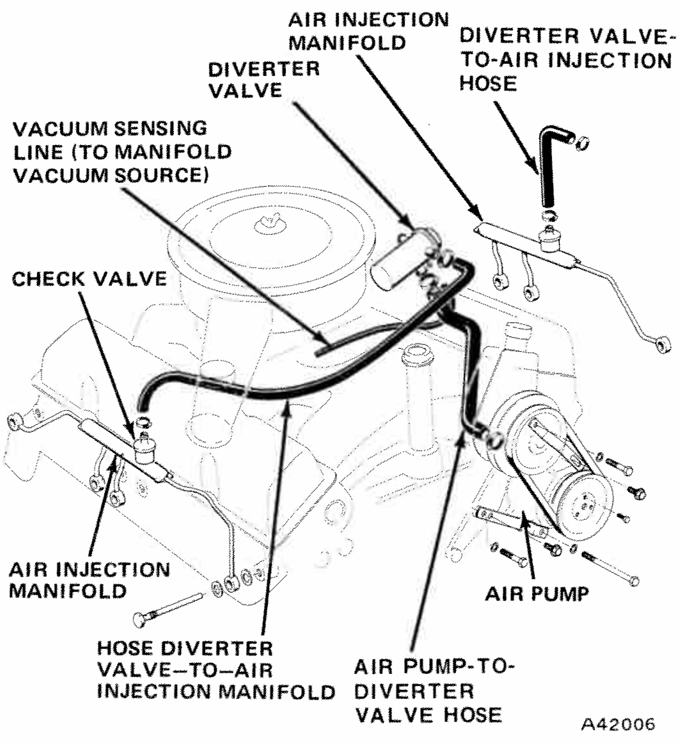


Fig. 4A-2 Air Guard System - V-8

The pump is designed to be relatively service free. The only serviceable item is the filter fan assembly. It is not recommended that the rear housing cover be removed for any reason, since the internal components of the pump are not serviceable.

The aluminum housing has cavities for air intake, compression, and exhaust and a bore for mounting the front bearing. The housing also includes cast metering areas that reduce the noise of intake and compression. Mounting bosses are located on the housing exterior.

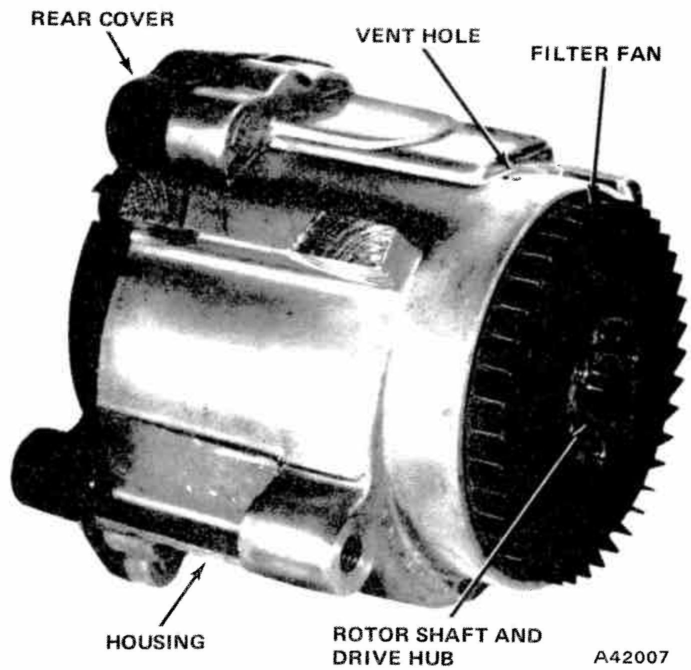


Fig. 4A-3 Air Pump

NOTE: *The relief valve assembly is incorporated in the diverter valve. If defective, the diverter valve assembly must be replaced.*

The front bearing supports the rotor shaft; the bearing is secured in position by plastic, injected around grooves in the housing and bearing outer race.

The rear cover supports the vane pivot pin, rear bearing inner race, and exhaust tube. Dowel pins pressed into the housing correctly position the end cover which is fastened by four bolts.

The rotor positions and drives the two vanes. A stamped steel liner supports carbon shoes and shoe springs which seal the vanes and rotor. The two plastic vanes are molded to hubs which support bearings that rotate on the pivot pin. The pulley drive hub is pressed on the rotor shaft, and bolt holes in the hub provide for attachment of a pulley.

The pump vanes are located 180 degrees apart and rotate around the pivot pin which is located on the centerline of the pump housing. The rotor which drives the vanes rotates off the centerline of the pump housing (fig. 4A-4). This creates changes in the distance between the outside of the rotor and the inner wall of the pump housings during rotor rotation. As the leading vane moves past the intake opening, it is moving from a small area to a large area (defined by the rotor-to-pump housing clearance). This forms a vacuum which draws air into the pump. As the vanes and rotor continue to rotate, the trailing vane passes the intake and traps the air between the vanes. The vanes and rotor move into small area and the entrapped air begins to be compressed. The compression continues until the leading vane passes the exhaust opening where the compressed air passes out of the pump and on to the rest of the Air Guard System.

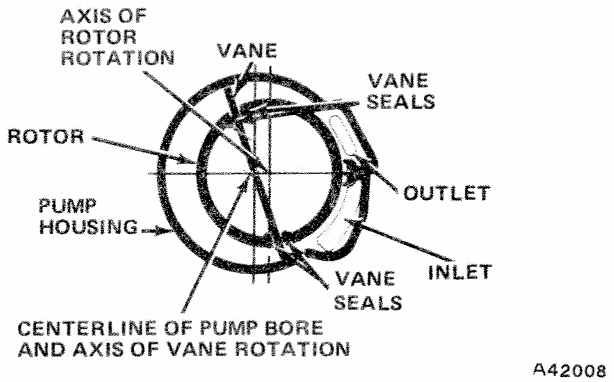


Fig. 4A-4 Air Pump Operation

Removal - Six-Cylinder

(1) Disconnect air pump output hose at back of air pump.
(2) Loosen adjustment bolt and remove drive belt.
(3) Remove front mount bracket-to-engine attaching bolts.
(4) Remove rear mount bracket-to-pump attaching bolts.
(5) Loosen rear mount bracket-to-power steering attaching bolts.
(6) Pull pump down and forward to remove.

Installation - Six-Cylinder

(1) Position pump and install rear mount bracket-to-pump attaching bolts.
(2) Install front mount bracket-to-engine attaching bolts.
(3) Tighten attaching bolts to specified torque.
(4) Adjust power steering drive belt to specified tension.
(5) Connect air pump output hose to back of pump.
(6) Adjust air pump drive belt to specified tension (hand tighten).

Removal - V-8

(1) Disconnect air pump output hose at pump.
(2) Loosen mount bracket-to-pump attaching screws and remove drive belt.
(3) Remove mount bracket-to-pump attaching bolts.
(4) Remove pump.

Installation - V-8

(1) Position pump at mounting location and install mount bracket-to-pump attaching bolts (do not tighten).
(2) Install drive belt and adjust to the specified tension.
(3) Tighten mounting bolts and adjusting strap screw to 20 foot-pounds torque.

NOTE: *If air pump is driven by the air conditioning belt, adjust the belt to the tension specified for the air conditioning belt. Pry only against the cast iron cover when adjusting the belt. Do not pry on the aluminum housing. For all other air pump applications, adjust the belt tension by hand only.*

Fan Replacement

Pry outer disc loose and remove remaining portion as illustrated in figure 4A-5.

NOTE: *It is almost impossible to remove the fan without destroying it. Be careful to prevent fragments from entering the air intake hole. Do not attempt to remove the metal drive hub.*

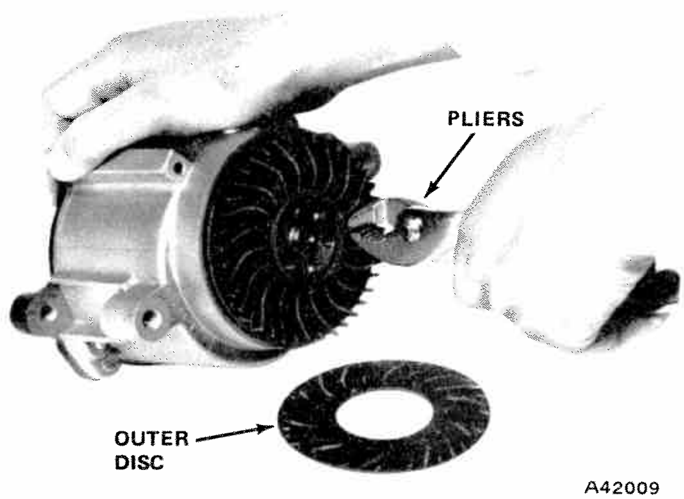


Fig. 4A-5 Centrifugal Filter Fan Removal

Install new filter fan into position by using pulley and bolts as tools.

Draw fan down evenly by alternately torquing bolts. Be sure that outer edge of fan slips into housing. A slight amount of interference with housing bore is normal.

NOTE: *Do not attempt to install a fan by hammering or pressing it on.*

After a new fan is installed, it may squeal upon initial operation until its outside diameter lip has worn in. This may require 20 to 30 miles of operation.

Exhaust Tube Replacement

Grasp exhaust tube in a vise or with suitable pliers and pull out with a twisting motion.

NOTE: *Do not clamp the pump body in a vise.*

Support pump as shown in figure 4A-6.

Insert new exhaust tube into hole and tap into place using a block of wood until approximately 7/8 inch of tube extends above the cover.

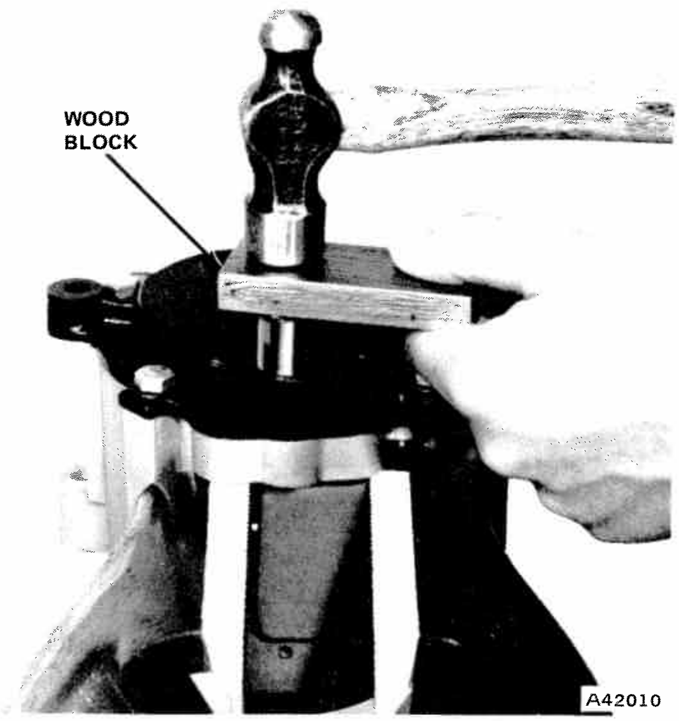


Fig. 4A-6 Exhaust Tube Installation

Air Pump Diagnosis

The air pump is not completely noiseless. Under normal conditions, noise rises in pitch as engine speed increases. Allow for normal break-in wear of the pump prior to replacement for excessive noise.

First check the drive belt tension and tighten as specified. Do not pry on the aluminum housing. Check hoses to be sure they are properly connected and are in good condition. Check that the pump mounting bracket is securely fastened.

Air pump noise can be confused with other engine noise. Remove the drive belt and check the pump to be sure it is operative. A seized pump will not rotate and noise could be caused by the belt slipping.

A chirping or squeaking noise is most likely associated with the vane rubbing in the housing bore and is noticeable at low speed and is heard intermittently. Frequently, vane chirping may be eliminated by increasing pump speed, or allowing the vanes additional wear-in time.

Bearing noise is easily distinguished from vane chirping. Bearing noise is a rolling sound and is noticeable at all speeds. This sound does not necessarily indicate bearing failure. If bearing noise increases to an objectionable level at certain speeds, the pump may have to be replaced.

Failure of a rear bearing is identified by a continuous knocking noise and replacement of the pump is required.

If it is determined that the air pump is not delivering air (determine presence of airflow by removing an exhaust hose), the pump must be replaced.

NOTE: *The pump is equipped with a centrifugal fan-type air filter, located behind the drive pulley. In the event that the engine or underhood compartment is to be cleaned with steam or high-pressure detergent, the filter should be masked off to prevent liquids from entering the pump.*

Service Procedures

The following is a list of service precautions to prevent damage to the air pump. **DO NOT:**

- Attempt to prevent pulley from rotating by inserting tools into the centrifugal filter fan.
- Operate engine with pump belt removed or disconnected.
- Attempt to lubricate.
- Clean centrifugal filter.
- Replace filter by driving or hammering in position.
- Remove drive hub when replacing filter.
- Disassemble pump or remove rear cover.
- Exceed 20 foot-pounds torque on mounting bolts.
- Pry on aluminum housing to adjust belt tension.
- Clamp pump in vise.

DIVERTER (BYPASS) VALVE

A diverter valve is used in all Air Guard applications. The valves for V-8 and six-cylinder engines differ only in the number of outlets. The V-8 diverter valve has two outlets and the six-cylinder diverter valve has only one. The valve momentarily diverts air pump output from reaching the exhaust during rapid deceleration and acts as a pressure release when air pump output is excessive. An internal silencer is incorporated in the diverter housing to muffle the airflow.

In a rapid deceleration condition, high intake manifold vacuum is applied to the diaphragm in the diverter. When the vacuum signal is 20 inches of mercury or more, the spring tension of the diaphragm is overcome. This moves the metering valve down against its upper seat and away from its lower seat, forcing air pump output to vent to atmosphere (fig. 4A-7). Air pump output is diverted only momentarily because of a bleed hole in the diaphragm. This hole allows vacuum to quickly equalize on both sides of the diaphragm and the diaphragm spring returns the metering valve to its normal position.

If the air pump develops excessive output pressure, this pressure will overcome the diaphragm spring ten-

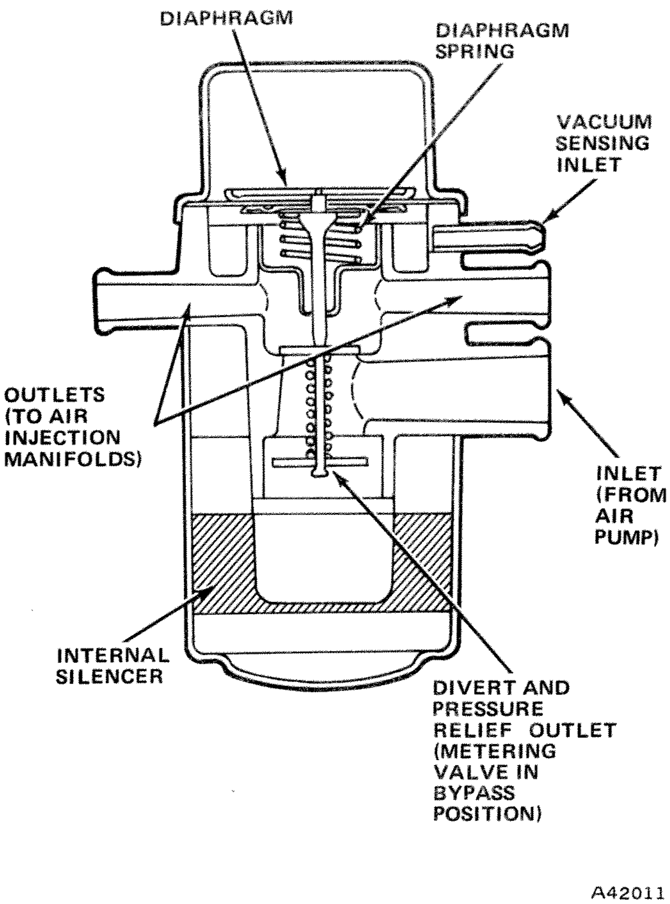


Fig. 4A-7 Diverter Valve (V-8 Shown)

sion, pushing the metering valve down and venting pump output pressure to the atmosphere. When pump output pressure returns to normal, the metering valve will move up and away from the upper seat and against the lower seat, returning to its normal open position, allowing air pump pressure to flow to the exhaust manifold(s).

Diverter Test

(1) Start engine and let idle.

(2) Check diverter vents. Little or no air should flow from vents.

(3) Accelerate engine to 2000 to 3000 rpm and rapidly close throttle. A strong flow of air should pass from the diverter vents. If air does not flow or if backfire occurred, make certain vacuum sensing line has vacuum and is not leaking.

NOTE: *The diverter valve diverts air pump output when 20 inches of Hg or more is applied at vacuum sensing line or pump output exceeds 5 psi.*

(4) Slowly accelerate engine. Between 2500 and 3500 rpm air should begin to flow from diverter vents.

Diverter Replacement

The diverter valve is not serviceable and must be replaced if defective. The valve is suspended by the hoses between the air pump and air injection manifold(s) (fig. 4A-1 and 4A-2). Removal involves disconnecting the hoses and the vacuum sensing line. Installation entails reconnecting the hoses and vacuum line.

AIR INJECTION MANIFOLDS AND TUBES

The air injection manifold(s) are constructed of cold rolled steel with a zinc plating and distributes air from the pump to each of the injection tubes.

A check valve, incorporating a stainless steel spring plunger and an asbestos seat, is integral with the air injection manifold. Its function is to prevent the reverse flow of exhaust gases to the pump should output cease. Reverse flow would damage air pump and connecting hoses.

The air injection tubes project into the exhaust ports, directing air into the vicinity of the exhaust valve seats. The injection tubes, which are made of stainless steel, are inserted through the distribution tubes of the air injection manifold and threaded into the exhaust manifold on V-8 engines. On six-cylinder engines, the injection tubes are inserted into machined bosses of the exhaust manifold. The air injection manifold distribution tubes extend into the injection tubes and are secured to the exhaust manifold by retaining nuts.

Air injection tubes are used for all cylinders except No. 7 on V-8 engines and No. 1 on six-cylinder engines. Two different length injection tubes are used on six-cylinder engines. The shorter tubes are used for No. 3 and No. 4 cylinders.

Removal - Six-Cylinder

NOTE: *Intake and exhaust manifold assembly must be removed to prevent bending or damaging the air distribution manifold during removal.*

(1) Remove intake and exhaust manifold assembly. Refer to Section 1A - Six-Cylinder Engine.

(2) Position manifold in vise and loosen air injection manifold tube retaining nuts at each cylinder exhaust port.

(3) Tap injection tubes lightly and pull away from exhaust manifold.

NOTE: *If tubes are seized, apply heat to the injection tube-to-manifold joint and rotate injection tubes with pliers being careful not to damage tubes.*

Installation - Six-Cylinder

(1) Position injection tube in exhaust manifold openings.

NOTE: *Two different length injection tubes are used on six-cylinder engines. The shorter length injection tubes must be inserted into cylinders 3 and 4.*

(2) Install intake and exhaust manifold assembly. Refer to Section 1A - Six-Cylinder Engine.

(3) Install air inejction manifold and tighten retaining nuts to 15 foot-pounds torque.

Removal - V-8

(1) Disconnect air delivery hose at check valve.

(2) Loosen injection tubes.

(3) Remove air injection manifold and injection tubes as an assembly.

NOTE: *Some inteference to removal may be encountered due to carbon buildup on the tubes.*

(4) Remove the injection tubes and sealing gaskets from the air injection manifold.

Installation - V-8

(1) Install injection tubes through the air injection manifold openings using a new sealing gasket at either side of each opening.

(2) Assemble air injection manifold and injection tubes to exhaust manifold; tighten the tubes to 38 foot-pounds torque.

(3) Connect air delivery hose.

Check Valve Test

To check the air injection manifold valve for proper operation, disconnect the air supply hose at the injection manifold. With the engine running above idle speed, listen and feel for exhaust leakage at the check valve. A slight leak is normal.

ENGINE MODIFICATIONS

The design of certain engine components is directly related to emission standards. The operation of such items as the camshaft, carburetor, ignition distributor and cylinder head affects the amount of emissions. Therefore, the correct combination of engine components, as prescribed by government certification, must be used in service. Refer to the appropriate sections of this manual for servicing these components.

EXHAUST GAS RECIRCULATION (EGR) SYSTEM

GENERAL

The EGR System consists of a diaphragm-actuated flow control valve (EGR valve), coolant temperature override switch (EGR CTO), and connecting hoses (fig. 4A-8 and 4A-9).

Oxides of nitrogen (NOx) are formed by high heat created during combustion. The purpose of the EGR system is to limit the formation of oxides on nitrogen by diluting the intake charge with a metered amount of exhaust gas, thereby reducing the peak temperatures of the gases in the engine combustion chambers.

Exhaust gas enters the combustion chamber with the intake charge. The exhaust gas introduced is inert, and much cooler than combustion temperature. Since it will not burn, peak combustion temperature is lowered.

EGR VALVE

The EGR valve is mounted on a machined surface at the rear of the intake manifold on V-8 engines and on the side of the intake manifold on six-cylinder engines. Valves used with automatic transmissions are calibrated differently than those used with manual transmissions. Calibration is accomplished by the use of differently shaped pintles (fig. 4A-10).

The valve is held in a normally closed position by a coiled spring located above the diaphragm (fig. 4A-11). A special fitting is provided at the carburetor to route ported (above the throttle plate) vacuum through hose connections to a fitting on the valve which is located above the diaphragm. A passage in the intake manifold directs exhaust gas from the exhaust cross over passage (V-8 engine) or from below the heat riser area (six-cylinder engine) to the EGR valve.

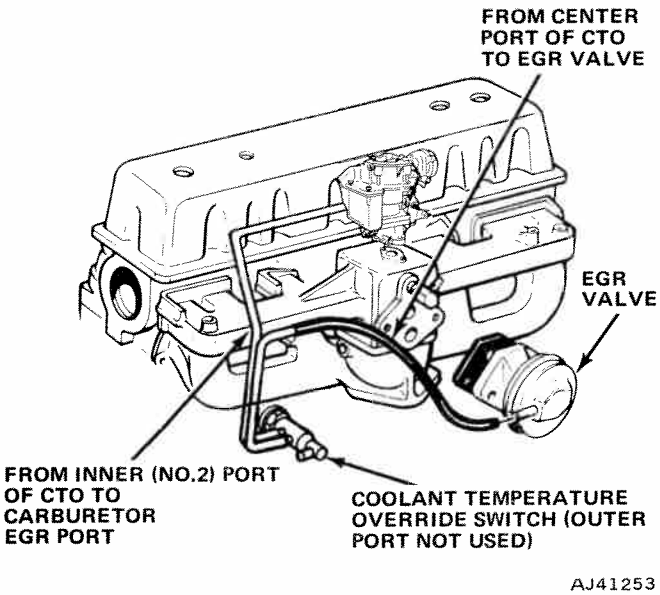


Fig. 4A-8 EGR System - Six-Cylinder

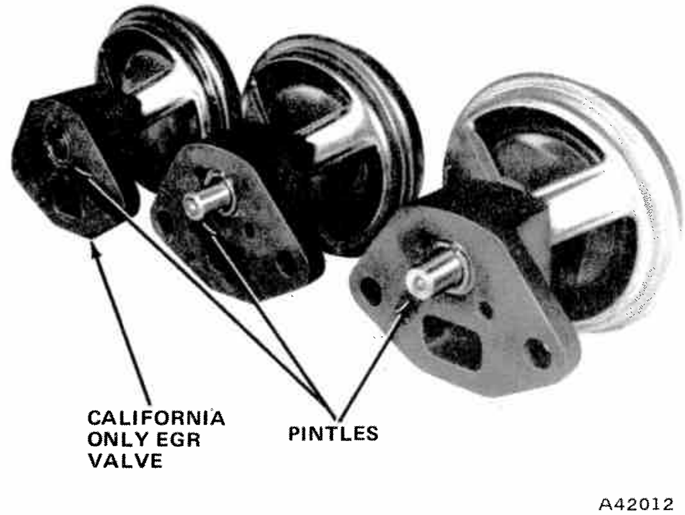


Fig. 4A-10 EGR Valve Pintles

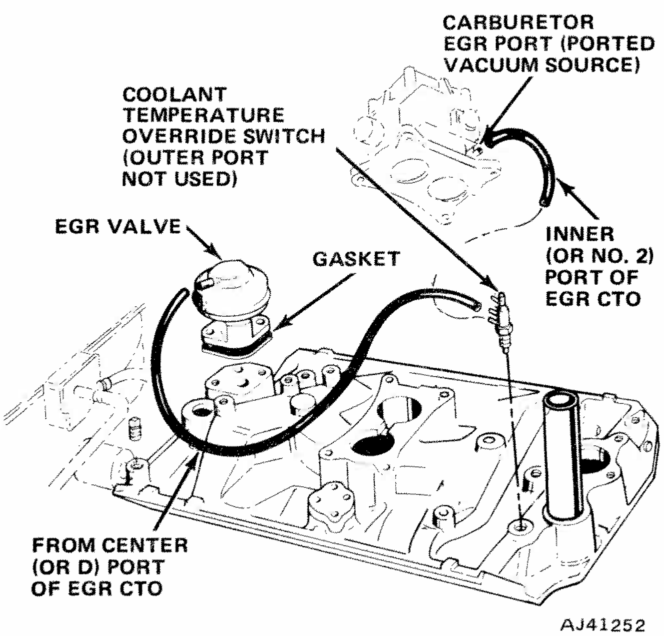


Fig. 4A-9 EGR System - V-8

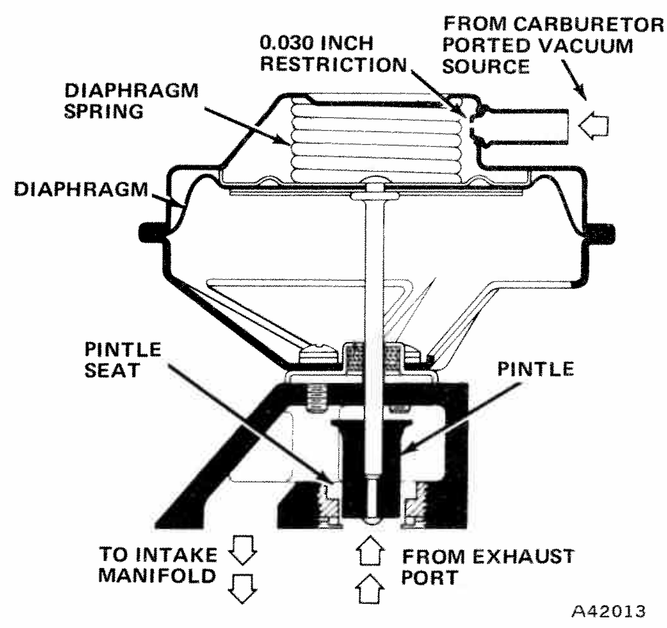


Fig. 4A-11 EGR Valve

When the diaphragm is actuated by vacuum, the pintle is pulled off its seat and exhaust gas is metered through another passage in the intake manifold (V-8 engine) to the floor of the manifold below the carburetor (six-cylinder engine) or to the sidewall of the manifold below the carburetor.

EGR Valve Test

(1) With the engine at operating temperature and running at curb idle speed, manually compress EGR diaphragm, lifting the pintle off its seat. This should cause a sudden drop in engine rpm (approximately 200 rpm) indicating that the EGR valve is closing off the exhaust from the intake passages when no vacuum is applied.

If there is no change in engine rpm but the engine idles properly, the EGR passage to the intake manifold is blocked.

If the engine is idling very poorly, and lifting the pintle off of its seat does not affect idle rpm, there is probably full time EGR caused by the EGR valve sticking open, a defective EGR valve, or a flaw in the intake manifold.

(2) Install a tee in the EGR vacuum signal line near the EGR valve and connect a vacuum gauge to the tee.

(3) Place fingers against the EGR valve diaphragm and slowly accelerate the engine.

(4) While accelerating engine, notice the amount of vacuum indicated when the EGR valve diaphragm first begins to move. Refer to EGR Valve Vacuum Signal Values.

EGR Valve Vacuum Signal Values

Vendor Part Number (Located on Valve)		AMC Part Number	Vacuum Required (Inches) Open Start	Open (max)
7040176	Nationwide	3219052	2.8 to 3.2	5.3 to 5.7
7030881	& California	3218739	2.8 to 3.2	6.9 to 7.3
17050472	California Only	3223981	1.8 to 2.2	3.8 to 4.2

(5) Continue accelerating engine, until vacuum required to achieve maximum recirculation is obtained. Diaphragm should be deeply depressed with no leakage indicated.

Removal

(1) On V-8 engines, remove air cleaner assembly.
(2) Disconnect vacuum line from EGR valve.
(3) Remove two retaining bolts from manifold.
(4) Remove EGR valve and gasket.
(5) Clean EGR pintle if required.
(6) Clean manifold and EGR valve mating surfaces.

Installation

(1) Install new EGR valve gasket.
(2) Install EGR valve.
(3) Install EGR valve retaining bolts and tighten to 13 foot-pounds torque.
(4) Connect vacuum line to EGR valve.
(5) Install air cleaner assembly, if removed.

EGR Valve Maintenance

Remove all lead or carbon deposits from the stainless steel metering pintle of the valve using a wire brush. After cleaning, cap the vacuum inlet and repeatedly open the EGR valve manually by pressing down on the pintle and releasing. Pintle should remain retracted; if it does not, diaphragm has a leak. If the valve does not return to the fully closed position, it must be replaced.

On six-cylinder engines, lead or carbon deposits will build most rapidly in the exhaust gas discharge passage (upper hole). If the deposits cannot be removed with a spiral type wire brush, a 9/16-inch drill may be used. Coat the tip of the drill with heavy grease and use pliers (Vise-Grip) to rotate the bit in the discharge passage.

EGR CTO SWITCH

The EGR CTO switch is located at the coolant passage of the intake manifold (adjacent to oil filler tube) on V-8 engines or at the left front side of the cylinder block on six-cylinder engines. The outer port (No. 1) of the switch is open and not used. The inner port (No. 2) is connected by a hose to the EGR port at the carburetor. The center port (D) is connected to the EGR valve.

When the coolant temperature is below 115 degrees F, no vacuum signal is applied to the EGR valve; therefore, no exhaust gas will flow through the valve. When the coolant temperature reaches 115 degrees F, both the inner port and center port of the switch are open and a vacuum signal is applied to the EGR valve.

EGR CTO Test

NOTE: *Engine coolant temperature must be below 100 degrees F (C mark of temperature gauge).*

(1) Check vacuum lines for leaks and correct routing (fig. 4A-8 and 4A-9).
(2) Disconnect vacuum line at EGR valve and connect vacuum gauge to line.
(3) Operate engine at approximately 1500 rpm; no vacuum should be indicated on gauge. If vacuum is indicated, replace the EGR CTO switch.
(4) Operate engine until coolant temperature exceeds 115 degrees F (temperature gauge needle halfway between cold mark and beginning of band).
(5) Accelerate engine to 1500 rpm; carburetor ported vacuum should be indicated on vacuum gauge. If not, replace EGR CTO switch.

Removal - Six-Cylinder

(1) Drain coolant from radiator.
(2) Disconnect vacuum lines from EGR CTO switch.
(3) Place drain pan under engine below CTO switch.
(4) Using a 7/8-inch open end wrench, remove switch from block.

WARNING: *Be careful of scalding hot water leaking from the block when removing the switch.*

Installation - Six-Cylinder

(1) Install EGR CTO switch in block.
(2) Connect vacuum lines to switch.
(3) Install coolant.
(4) Purge cooling system of air.

Removal - V-8 Engine

(1) Drain coolant from radiator.
(2) Remove air cleaner assembly.
(3) Remove coil bracket attaching screw and tip coil away from EGR CTO switch.
(4) Disconnect vacuum lines from CTO switch.
(5) Using a 7/8-inch open end wrench, remove switch from intake manifold.

Installation - V-8 Engine

(1) Install EGR CTO switch in intake manifold.
(2) Install coil and bracket with attaching screw.
(3) Connect vacuum lines to switch.
(4) Install air cleaner assembly.
(5) Install coolant.
(6) Purge cooling system of air.

CALIFORNIA EXHAUST GAS RECIRCULATION SYSTEM

GENERAL

The major deviation in California EGR systems is the exhaust back-pressure sensor used on 360 CID engines equipped with automatic transmissions (except heavy-duty trucks). The exhaust back-pressure sensor, usage, and operation is explained below.

EGR Hose Routing

California EGR systems with a back-pressure sensor use different vacuum sources and connections. California EGR systems on 360 CID engines with a back-pressure sensor obtain a vacuum signal at the carburetor spark port, rather than at the EGR port (fig. 4A-12).

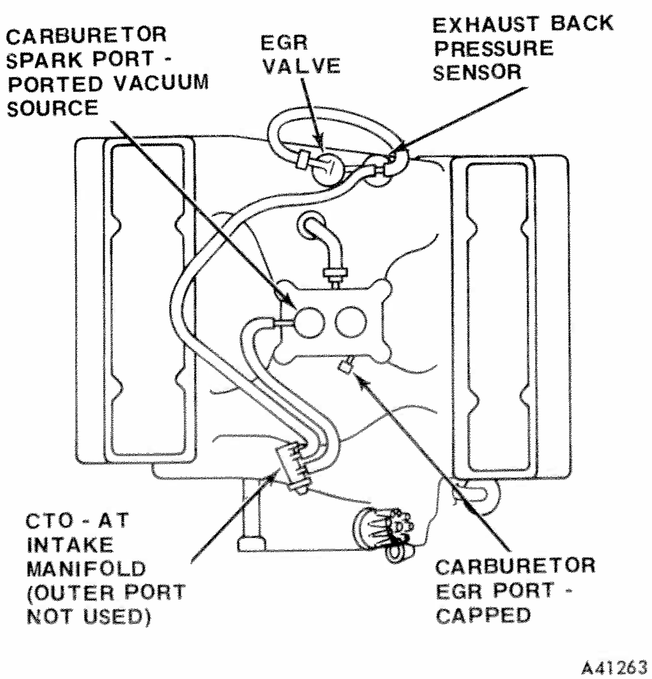


Fig. 4A-12 EGR Vacuum Lines - 360 CID Engines with Back-Pressure Sensor

EXHAUST BACK-PRESSURE SENSOR

This device (fig. 4A-13) consists of a diaphragm valve, spacer and metal tube. The metal tube connects the valve to the spacer. The EGR valve is mounted to the spacer portion of the sensor, and is modulated by the sensor.

The vacuum signal passes through the EGR CTO switch (when coolant temperature exceeds 115 degress F) to the valve portion of the sensor where it is modulated by exhaust back-pressure.

NOTE: *The inlet nipple of the valve has a 0.030-inch restriction. The vacuum line from the EGR CTO must be connected to this nipple.*

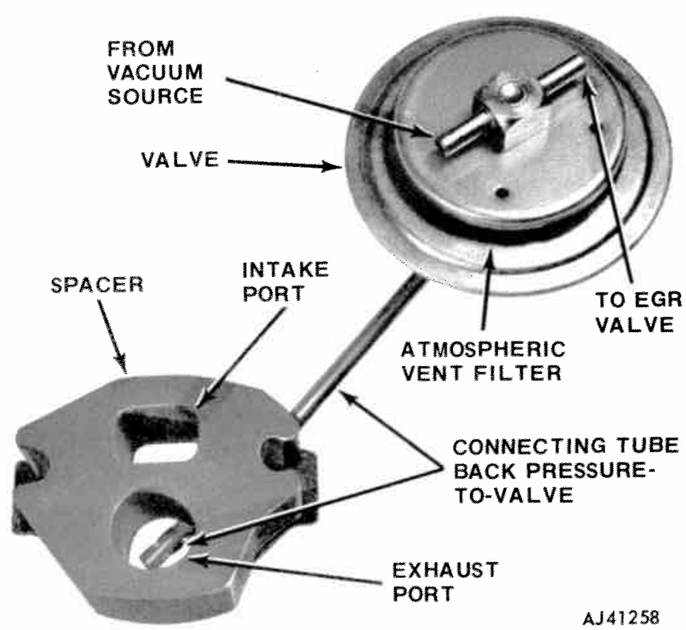


Fig. 4A-13 Exhaust Back-Pressure Sensor - V-8

The metal tube which connects the valve to the spacer projects into the exhaust port of the back-pressure sensor. When exhaust back-pressure is relatively high, as during acceleration and some cruising conditions, back-pressure traveling up through the metal tube overcomes spring tension on the diaphragm within the valve and closes the atmospheric vent.

When the back-pressure sensor valve is not vented to the atmosphere, the vacuum signal passes through the back-pressure sensor valve, and on to the EGR valve. With a vacuum signal to the valve, exhaust gas begins recirculating.

When exhaust back-pressure is too low to overcome diaphragm spring tension, the vacuum signal between the sensor and the EGR valve is vented to the atmosphere at the sensor valve. With no vacuum signal applied to the EGR valve, exhaust gas does not recirculate.

NOTE: *EGR valves used with back-pressure sensors have shorter and more tapered pintles than those used without the back-pressure sensors. The shorter pintles are necessary to match the exhaust gas metering to the back-pressure sensor operation.*

Removal

(1) Remove vacuum lines from exhaust back-pressure sensor valve and EGR valve.

(2) Remove self-tapping screws that attach support bracket to valve portion of back-pressure sensor.

(3) Remove two attaching bolts from EGR valve.

(4) Remove EGR valve and exhaust back-pressure sensor assembly.

(5) Clean all mating surfaces and intake manifold and back-pressure sensor ports.

Installation - V-8 Engine

(1) Install new gasket on intake manifold and position exhaust back-pressure sensor on top of gasket.

NOTE: *Exhaust back-pressure sensor assembly should extend toward the left side on V-8 engines.*

(2) Install new gasket on exhaust back-pressure sensor spacer and install EGR valve.

(3) Install support bracket to valve portion of sensor and tighten screws.

(4) Install two attaching bolts and tighten to 13 foot-pounds torque.

(5) Attach vacuum lines to exhaust back-pressure sensor valve and EGR valve.

EXHAUST BACK-PRESSURE SENSOR TEST

(1) Inspect all EGR vacuum lines for leaks and correct routing.

NOTE: *Be sure vacuum line from EGR CTO is connected to nipple with 0.030-inch restriction.*

(2) Install a tee in vacuum line between EGR valve and exhaust back-pressure sensor.

(3) Attach a vacuum gauge to tee.

(4) Start engine and allow to idle. No vacuum should be indicated.

NOTE: *If vacuum is indicated at idle speed, verify correct line connections. Be sure manifold vacuum is not being used as a source. If carburetor is providing ported vacuum, inspect for partially open throttle plate, which could apply premature ported vacuum to back-pressure sensor.*

(5) Accelerate engine to 2000 rpm and observe vacuum gauge for the following:

- If coolant temperature is below 115 degrees F, no vacuum should be indicated.
- If coolant temperature is above 115 degrees F, carburetor ported vacuum should be indicated.
- If no vacuum was indicated during test, be sure vacuum is being applied to inlet side of back-pressure sensor. Then remove back-pressure sensor and inspect spacer port and tube for restrictions. Restrictions caused by carbon or lead deposits can be removed with spiral wire brush. Otherwise, replace back-pressure sensor.

ELECTRIC ASSIST CHOKE

GENERAL

An electric assist choke is used with all 4V carburetors to match choke operations to engine requirements. It provides supplemental heat to the choke bimetal to speed up choke valve opening after choke cover interior reaches modulating temperature (see Modulating Temperature Chart). The purpose of the electric assist is to reduce emission of carbon monoxide (CO) during the engine warmup period. A special ac terminal is provided at the alternator to supply a seven-volt power source for the electric assist. A thermostatic switch (bimetallic disc) within the choke cover closes when the choke cover interior reaches modulating temperature, allowing current to flow to the heating element (fig. 4A-14). The circuit is completed through the choke cover ground strap and choke housing to engine. As the heating element warms up, heat is absorbed by an attached metal plate which heats the choke bimetal coil.

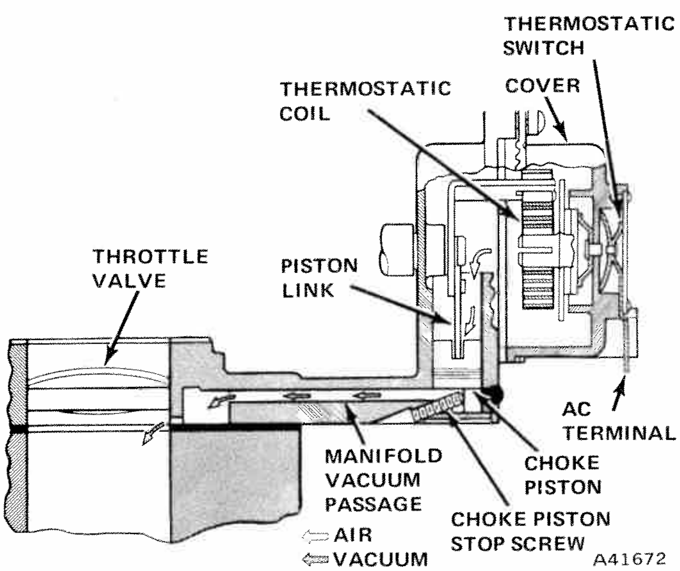


Fig. 4A-14 Electric Assist Choke

After engine shutdown, the thermostatic switch remains closed until the choke cover interior modulating temperature is reached. If the engine is restarted before modulating temperature is reached, current flow will immediately begin warming up the heating element to open the choke.

Once the choke cover interior temperature falls below the modulating temperature, the thermostatic switch opens and current flow to the heating element is shut off. If the engine is restarted at this time, the electric assist will not operate until choke cover interior reaches its modulating temperature.

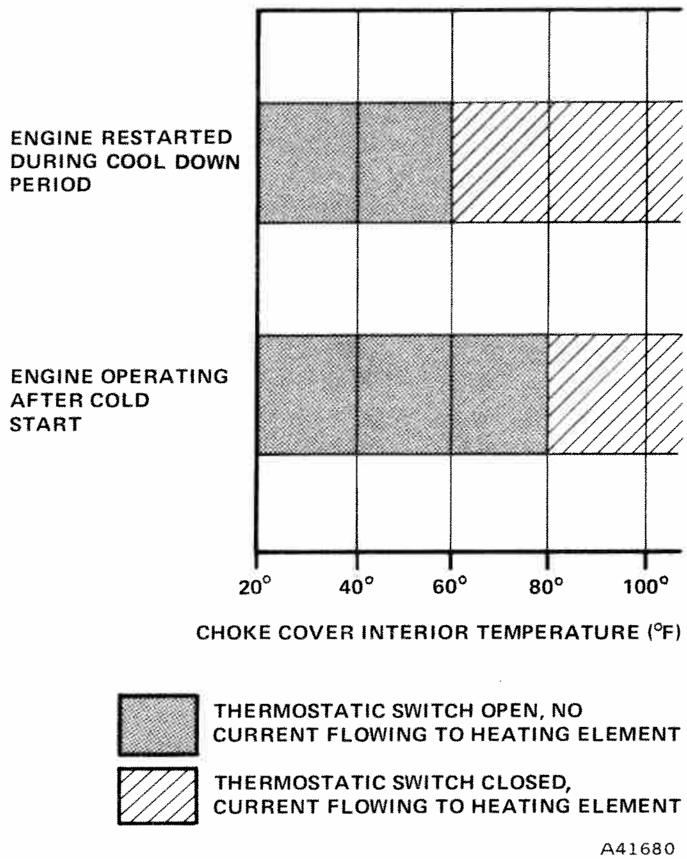
ELECTRIC ASSIST CHOKE TEST

(1) Disconnect electric assist choke wire from choke housing.

(2) Connect one lead of test lamp to spade terminal on choke housing.

(3) Connect other lead of test lamp to connector of choke wire.

THERMOSTATIC SWITCH MODULATION CHART



(4) Using a small thermometer, tape bulb end of thermometer to oval boss on back of bimetal cap assembly.

(5) Start engine.

(6) Read thermometer and observe test lamp. Refer to Thermostatic Switch Choke Modulation Chart.

(7) Read thermometer and observe test lamp. Lamp should be out when 60 degree F to 80 degree F is reached on thermometer. The lamp should light at temperatures above these temperatures.

Once modulating temperature is reached (test lamp lit), choke should fully open within 1 to 1-1 2 minutes.

NOTE: *If test lamp did not light, check 7-volt source from alternator.*

FUEL TANK VAPOR EMISSION CONTROL SYSTEM

GENERAL

A closed fuel tank vent system is used which routes raw fuel vapor into the intake system where it is burned along with the fuel-air mixture preventing raw fuel vapors from entering the atmosphere (fig. 4A-15).

NOTE: *The charcoal canister is not used on 7000 and 8000 GVW Trucks except those built for sale in the state of California.*

FUEL TANK

All vehicles use a woven Saran sleeve-type fuel filter which is attached to the end of the fuel outlet tube inside the fuel tank. This filter is rated at 65 micron and repels water. Under normal conditions it requires no maintenance or service.

FUEL TANK FILLER CAP

The filler cap incorporates a two-way relief valve which is closed to atmosphere under normal operating conditions. The relief valve is calibrated to open only when a pressure of 0.75 to 1.5 psi or a vacuum of 0.25 to 0.5 inches occurs within the tank. When the pressure or vacuum is relieved, the valve returns to the normally closed position. The cap is identified by a black relief valve housing.

NOTE: *It is normal to occasionally encounter an air pressure release when removing the filler cap.*

LIQUID CHECK VALVE

The liquid check valve incorporates a float and Viton needle assembly. In the event that liquid fuel enters the check valve, the float will rise and force the needle upward to close the vent passage; thereby preventing liquid fuel from flowing through the valve (fig. 4A-16).

After passing through the check valve, the fuel vapor is routed through a vent line to the vapor storage canister in the engine compartment.

FUEL VAPOR STORAGE CANISTER

The fuel-resistant nylon body of the canister contains activated charcoal granules which absorb and store the fuel tank vapors until they are drawn into the intake manifold through the carburetor air cleaner (fig. 4A-17).

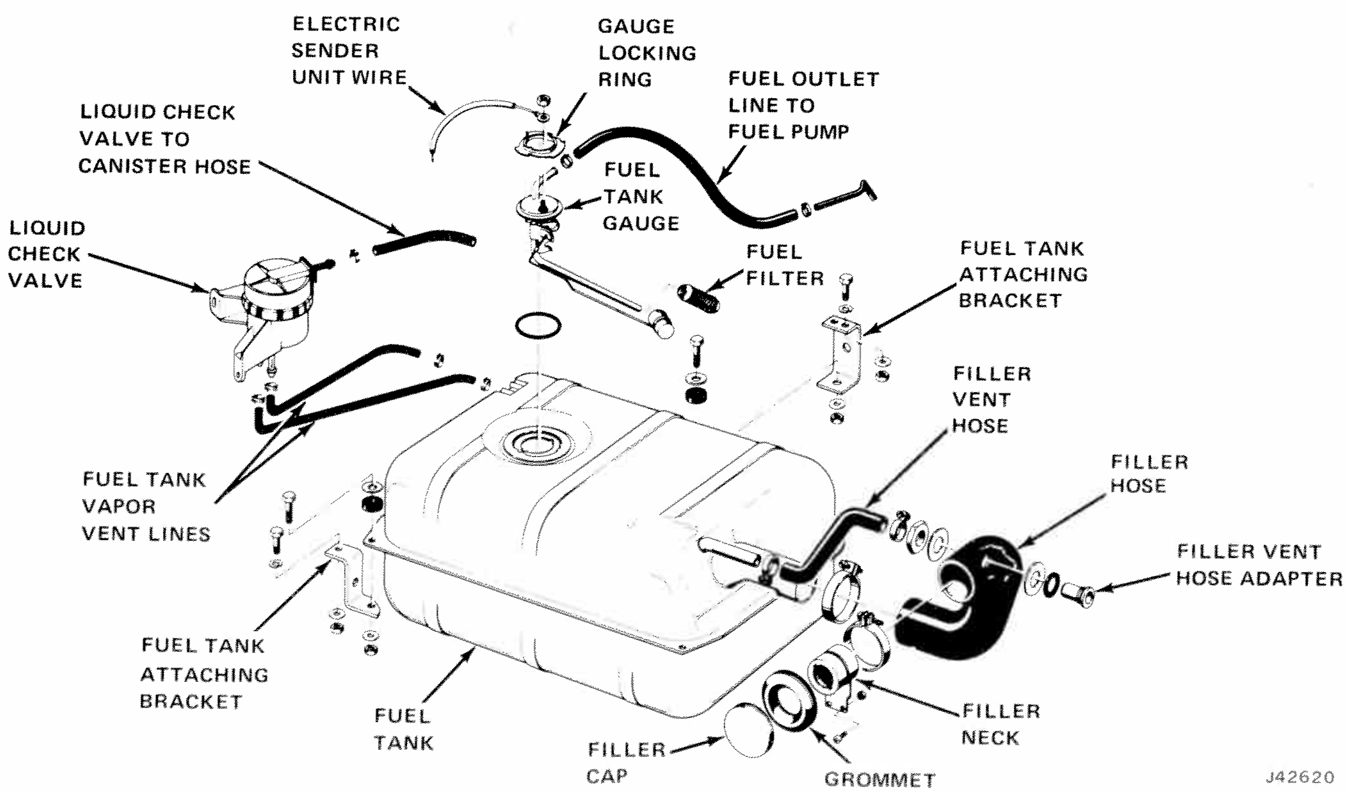


Fig. 4A-15 Fuel Tank Vapor Emission System (Typical)

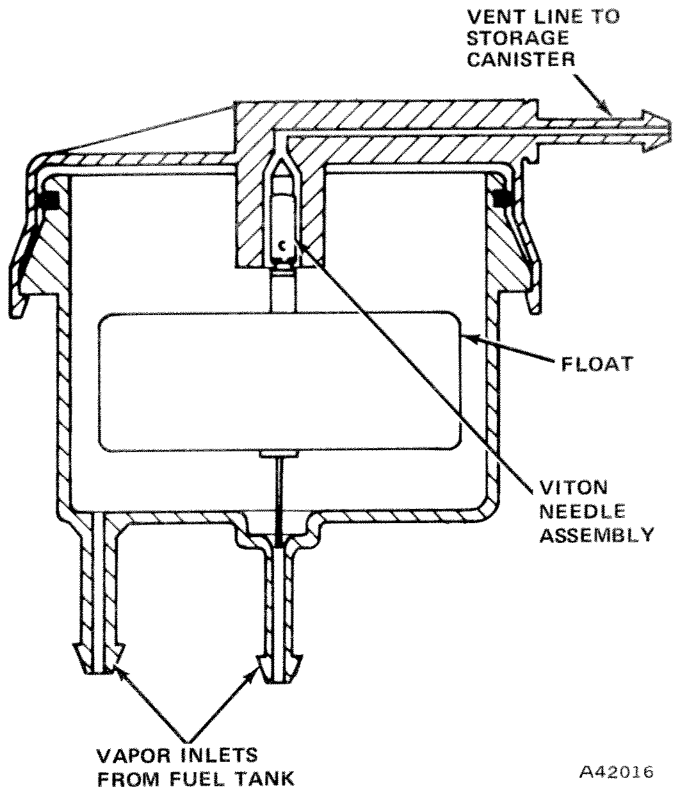


Fig. 4A-16 Liquid Check Valve (Typical)

The canister has two hose connections. One is for the fuel tank vapor vent line and has a metering plug. The other connects to a hose which attaches to a tube at the underside of the air cleaner snorkel. This tube projects into the incoming air stream of the snorkel. Air passing over the tube creates a vacuum that draws fuel vapor from the canister The amount of vapor drawn from the canister is relative to the air velocity passing through the air cleaner snorkel. Higher air velocity creates higher vacuum and an increase in vapor drawn from the canister.

Outside air is drawn into the canister through a replaceable filter pad which is accessible through the bottom of the canister body. The filter pad should be replaced at the recommended mileage intervals listed in the Mechanical Maintenance Schedule.

MAINTENANCE

The fuel tank, filler cap, fuel lines, and vent lines must be maintained in good condition to prevent raw fuel vapors (hydrocarbons) from entering the atmosphere.

Inspect the filler cap for evidence of fuel leakage (stains) at the filler neck opening. Remove the cap and check the condition of the sealing gasket. Replace the filler cap if the gasket is damaged or deteriorated.

Inspect the fuel tank for evidence of fuel leakage (stains). Trace any stain back to its origin and repair or replace the tank as required.

Inspect the fuel and vent lines for leakage or damage, repair or replace as required. Be sure all connections are tight.

If liquid fuel is present at the fuel vapor storage canister, inspect the liquid check valve and replace if necessary.

The filter pad located at the bottom of the canister is the only serviceable item of the canister assembly. It should be replaced at 15,000-mile intervals as prescribed in the Mechanical Maintenance Schedule, located in Section B of this manual.

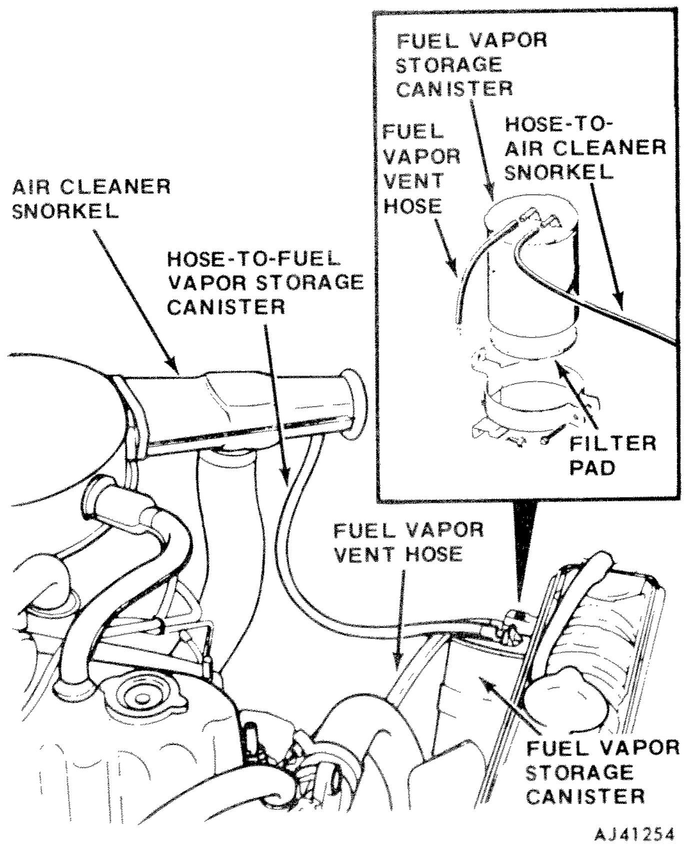


Fig. 4A-17 Fuel Vapor Storage Canister (Six-Cylinder Shown)

POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM

GENERAL

This system incorporates a calibrated airflow PCV valve connected between an intake manifold vacuum source and the engine. Crankcase vapors are drawn through the PCV valve into the intake manifold where they are burned along with the fuel-air mixture (fig. 4A-18). The oil filler cap is closed in this system to prevent any crankcase vapors from entering the atmosphere.

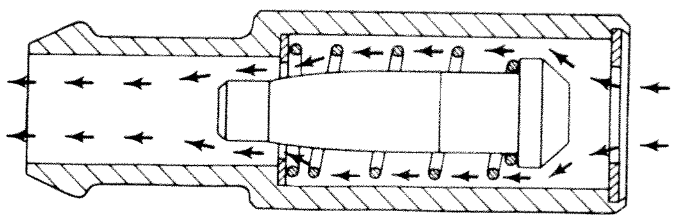


Fig. 4A-18 Positive Crankcase Ventilation Valve Flow

During periods of relatively high manifold vacuum, such as idle or cruise speeds, outside air is drawn from the air cleaner into the crankcase. On six-cylinder engines, the air passes through a polyurethane foam filter located in the oil filler cap. The filler cap is connected by a hose to the air cleaner (fig. 4A-19 and 20).

If crankcase vapor pressures (blow-by) exceed the flow capacity of the PCV valve, airflow in the system will reverse. Crankcase vapors are drawn through the air cleaner element and carburetor and burned along with the fuel-air mixture.

The positive crankcase ventilation system performs two functions:

- Prevents combustion blow-by from entering the atmosphere.
- Ventilates the crankcase with clean air to help prevent the formation of sludge.

Positive Crankcase Ventilation (PCV) Valve

A common PCV valve (colored black) is used on all V-8 and six-cylinder engines.

The PCV valve must be replaced at 15,000-mile intervals as specified in the Mechanical Maintenance Schedule. All hoses in the PCV system should be inspected at this time for leaks or restrictions and cleaned or replaced as required. PCV valve replacement may be required more often under adverse operating conditions.

PCV VALVE TEST

The valve may be tested at idle speed for correct flow rate (cfm) providing the engine manifold vacuum is at least 14 inches Hg. When checking vacuum, connect the gauge to a fitting which is as centrally

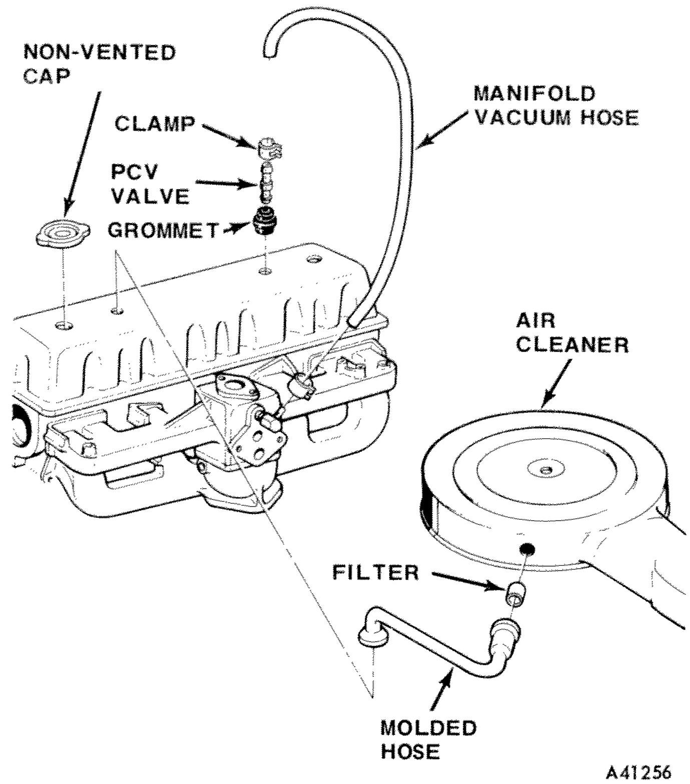


Fig. 4A-19 PCV System - Six-Cylinder

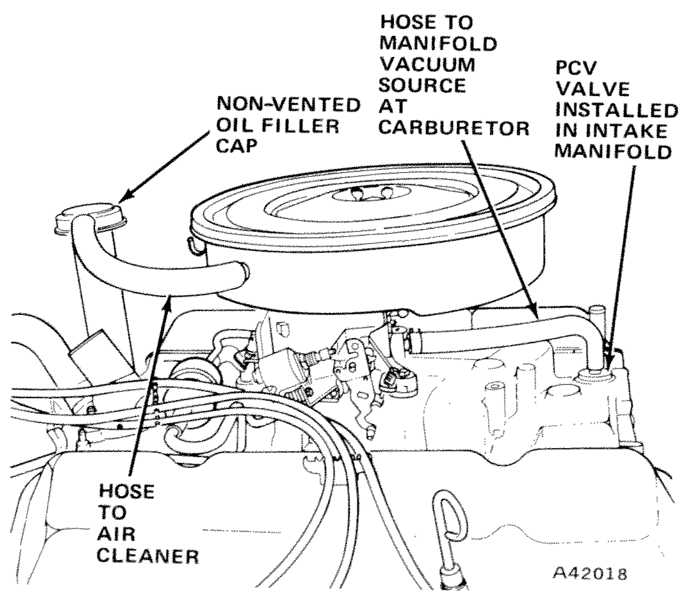


Fig. 4A-20 PCV System - V-8

located as possible on the intake manifold.

Remove the valve from the grommet in the intake manifold (V-8) or cylinder head cover (Six-Cylinder) and connect the plastic hose of PCV Valve Tester J-23111 to the valve (fig. 4A-21).

NOTE: *The PCV valve must be held in a horizontal position and tapped lightly during the test. Hold the tester in a vertical position.*

Start the engine and allow it to idle and observe the flow rate (cfm). Refer to PCV Valve Flow Chart.

A valve which flows above or below specification must be replaced. The correct PCV valve should be used for replacement.

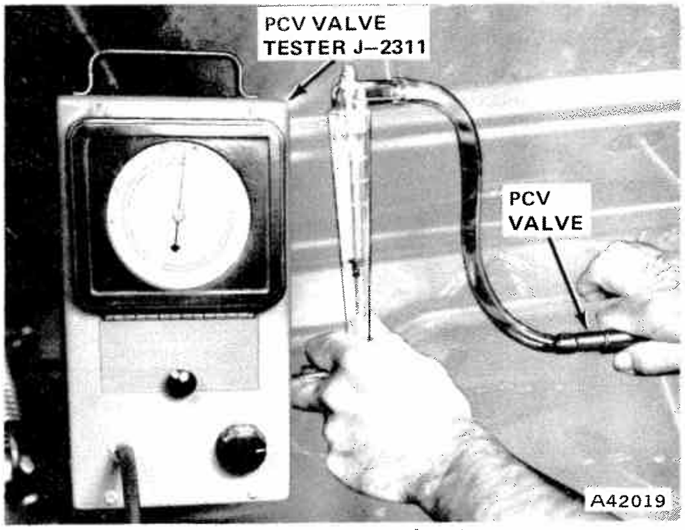


Fig. 4A-21 PCV Valve Test

PCV AIR INLET FILTER - SIX-CYLINDER

The wire gauze air inlet filter is located within the air cleaner end of the moulded rubber hose which is connected between the air cleaner and cylinder head cover (fig. 4A-22). It must be cleaned in kerosene at the mileage intervals recommended in the Mechanical Maintenance Schedule.

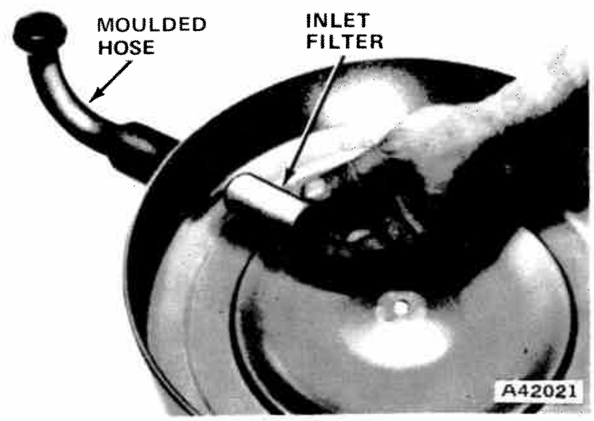


Fig. 4A-22 PCV Air Inlet Filter - Six-Cylinder

PCV VALVE FLOW CHART

ENGINE MANIFOLD VACUUM (In. Hg.)	AIRFLOW (cfm)
20	1.35-1.65
18	1.35-1.65
16	1.35-1.65
14	1.35-1.65
12	1.35-2.2
10	1.8 -2.9
8	2.5 -3.5
6	2.9 -4.0
3	3.3 -4.4

THERMOSTATICALLY CONTROLLED AIR CLEANER (TAC) SYSTEM

SIX-CYLINDER ENGINE

This system consists of a two-piece heat shroud positioned exhaust manifold, a hot air hose, and an air duct and valve assembly which is located in the air cleaner snorkel (fig. 4A-23).

The air duct and valve assembly incorporates an air valve, a thermostat unit and two springs.

The temperature of the air entering the air cleaner is thermostatically controlled by the air duct and valve assembly. Air from the engine compartment, or heated air from the shrouded exhaust manifold is supplied to the engine.

The thermostat unit in the air duct is exposed to incoming air. The spring-loaded air valve is connected to the thermostat unit through linkage. The spring holds the air valve in the closed position (heat on) until the thermostat unit overcomes the spring tension.

During the engine warmup period when the air temperature entering the air duct is less than 105 degrees F, the thermostat is in the retracted position and the air valve is held in the closed position (heat on) by the spring, thus shutting off the air from the engine compartment. Air is then drawn from the shroud at the exhaust manifold.

As the temperature of the air passing the thermostat unit rises, the thermostat starts to open and pulls the air valve down. This allows cooler air from the engine compartment to enter the air cleaner. When the temperature of the air reaches 130 degrees F, the air valve is in the open position (heat off) so that only engine compartment air is allowed to enter the air cleaner.

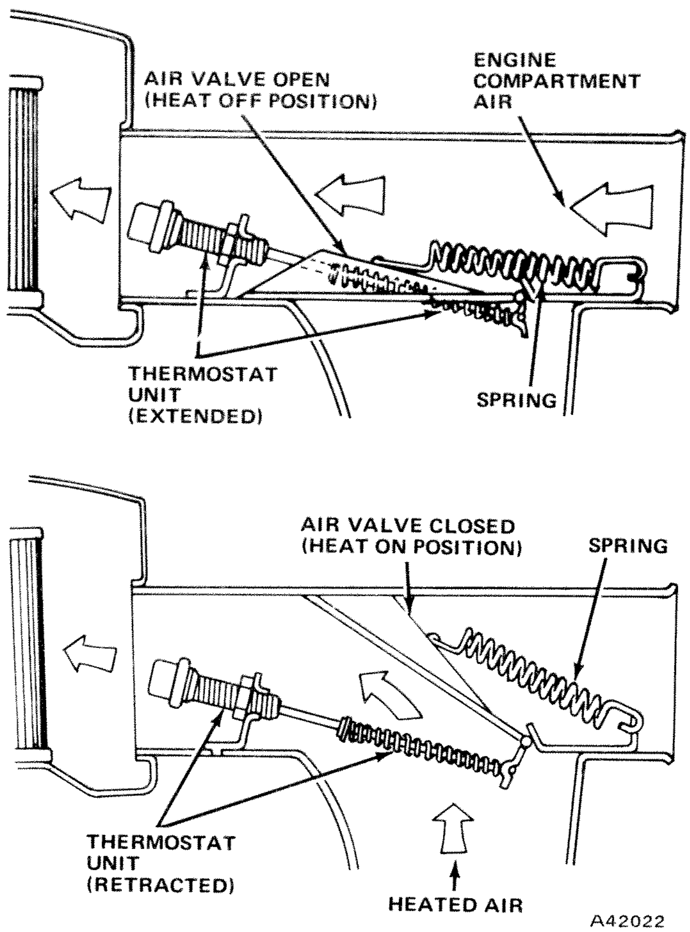


Fig. 4A-23 TAC System - Six-Cylinder

TAC Operational Test - Six-Cylinder

(1) Remove air cleaner top half and immerse snorkel in cold water making certain thermostat unit is covered.

(2) Place a thermometer in water and observe the temperature while heating water slowly.

NOTE: *With water temperature at 105 degrees F or less, air valve must be in closed (heat on) position.*

(3) Heat water until temperature reaches 130 degrees F; air valve must be in fully open (heat off) position.

NOTE: *If air valve does not open and close at temperatures specified, check valve mechanism for a binding condition or a disconnected or defective spring. If valve mechanism is in satisfactory condition, thermostat unit is defective and air cleaner assembly must be replaced.*

V-8 ENGINE

This system consists of a heat shroud which is integral with the right-hand exhaust manifold, a hot air hose, a special air cleaner assembly (equipped with a thermal sensor), and a vacuum motor and air valve assembly.

The thermal sensor incorporates an air bleed valve which regulates the amount of vacuum applied to the vacuum motor, thereby controlling the air valve position to supply either heated air from the exhaust manifold or air from the engine compartment (fig. 4A-24).

During the warmup period when underhood air temperatures are low, the air bleed valve is closed and sufficient vacuum is applied to the vacuum motor to hold the air valve in the closed (heat on) position.

As the temperature of the air entering the air cleaner approaches approximately 115 degrees F, the air bleed valve opens to decrease the amount of vacuum applied to the vacuum motor. The diaphragm spring in the vacuum motor then moves the air valve into the open (heat off) position, allowing only underhood air to enter the air cleaner.

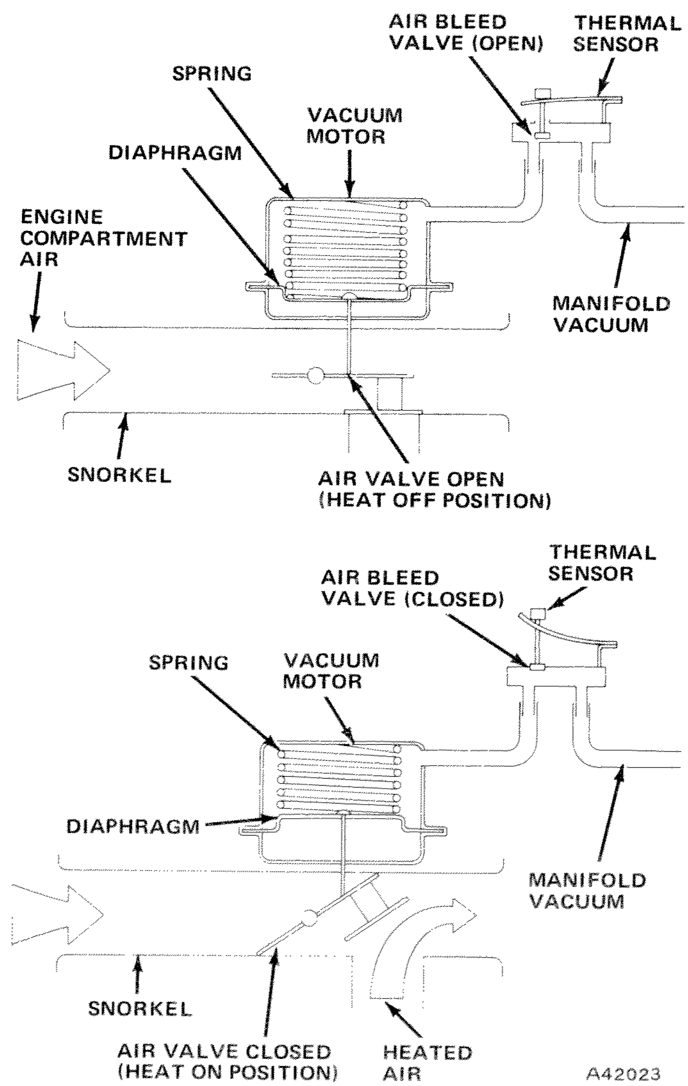


Fig. 4A-24 TAC System - V-8

The air valve in the air cleaner snorkel will also open, regardless of air temperature, during heavy acceleration operation to obtain maximum airflow through the air cleaner.

TAC Operational Test - V-8

(1) Remove air cleaner assembly from engine and allow to cool at room temperature.

(2) After cooling, sight through air cleaner snorkel to observe position of air valve; it should be fully open to outside air.

(3) Install air cleaner assembly to engine and connect hot air tube and manifold vacuum hose.

(4) Start engine and observe position of air valve, it should be fully closed to outside air.

(5) Move the throttle lever rapidly to approximately 1/2 to 3/4 opening and release, air valve should open and then close again.

(6) Allow engine to warm to operating temperature and observe position of air valve; it should be fully open to outside air.

If air valve does not close at room temperature with vacuum applied, check for a mechanical bind in the snorkel, vacuum motor linkage disconnected, vacuum leaks in hoses or connections at the vacuum motor, thermal sensor, and intake manifold.

If air valve mechanism is operating freely and no vacuum leaks are detected, connect a hose from an intake manifold vacuum source directly to vacuum motor.

If air valve now closes, thermal sensor is defective and must be replaced.

If air valve does not close, vacuum motor is defective and must be replaced.

VACUUM THROTTLE MODULATING SYSTEM (VTM)

This system is designed to reduce the emission of hydrocarbons (HC) during rapid throttle closure at high speeds.

The system consists of a deceleration valve located at the right front side of the intake manifold and a throttle modulating diaphragm located at the carburetor base. The deceleration valve is connected by one hose to a manifold vacuum source and by another hose to the throttle modulating diaphgram (fig. 4A-25).

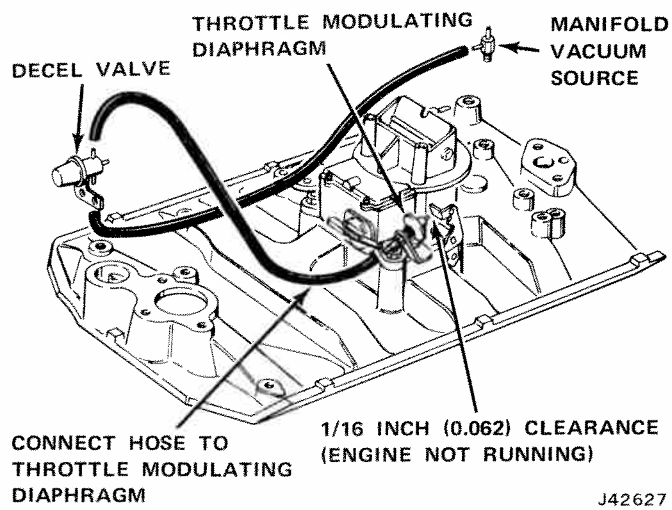


Fig. 4A-25 Vacuum Throttle Modulating System

During high speed deceleration, when manifold vacuum reaches approximately 21 to 22 inches, the deceleration valve triggers a vacuum signal to the throttle modulating diaphgram and causes a plunger to move out and open the throttle slightly. The increased throttle opening allows more air to enter the combustion chambers and lean out the overrich mixture, thereby reducing the emission of hydrocarbons.

The deceleration valve calibration is preset at time of manufacture and normally does not require adjustment. To check and adjust the throttle modulating diaphgram, proceed as follows:

(1) With engine not running and curb idle speed previously set, position throttle lever against curb idle adjusting screw.

(2) Measure clearance between the throttle modulating diaphragm plunger and the throttle lever. It should be 1/16 inch (0.062 inch).

(3) Adjust by loosening the jamnut and turning the diaphragm assembly.

VACUUM ADVANCE MODULATION (VAM) SYSTEMS

Jeep engines use all of the following components in various combinations to modulate the vacuum signal applied to the distributor vacuum advance unit. The method of operation of the components is described later in this section.

Transmission Controlled Spark System (TCS) includes:

- Solenoid Vacuum Valve
- Solenoid Control Switch (Manual or Automatic
- Transmission)

Coolant Temperature Override Switch (Spark CTO) Thermal Vacuum Switch (TVS) - V-8 engines with standard cooling system only.

Six different combinations of these components are used on V-8 engines to control vacuum advance to the distributor. Six-cylinder engines use only one combination. All vacuum advance modulation systems make use of the 160 degrees F CTO switch located at the thermostat housing, although all ports on the switch are not used in every application. Other components and vacuum line routings differ for each of the six different V-8 engine systems currently in use. These systems are shown in figures 4A-26 through 4A-32 and are identified by the components used in each. To find the applications of each system, refer to the Vacuum Advance Modulation (VAM) Usage Chart.

VACUUM ADVANCE MODULATION (VAM) USAGE CHART

VACUUM ADVANCE MODULATION SYSTEM	APPLICATION
Spark CTO (All Ports Used)	401 CID with Heavy-Duty Cooling (except Heavy-Duty Truck) - Nationwide 360/401 CID, Heavy-Duty Truck (except with Heavy-Duty Cooling) - Nationwide and California
Spark CTO (No. 2 Port Not Used)	304 CID - California 360/401 CID with Heavy-Duty Cooling (except Heavy-Duty Truck) - California
Spark CTO (No. 2 Port Not Used) and TVS	360/401 CID with Standard Cooling (except Heavy-Duty Truck) - California
Spark CTO (All Ports Used) and TVS	401 CID with Standard Cooling (except Heavy-Duty Truck) - Nationwide 360/401 CID, Heavy-Duty Truck with Standard Cooling Nationwide and California
Spark CTO (All Ports Used), TVS, TCS	360 CID with Standard Cooling (except Heavy-Duty Truck) - Nationwide
Spark CTO (All Ports Used), TCS	304 CID - Nationwide 360 CID with Heavy-Duty Cooling (except Heavy-Duty Truck) - Nationwide All six-cylinder engines - Nationwide and California

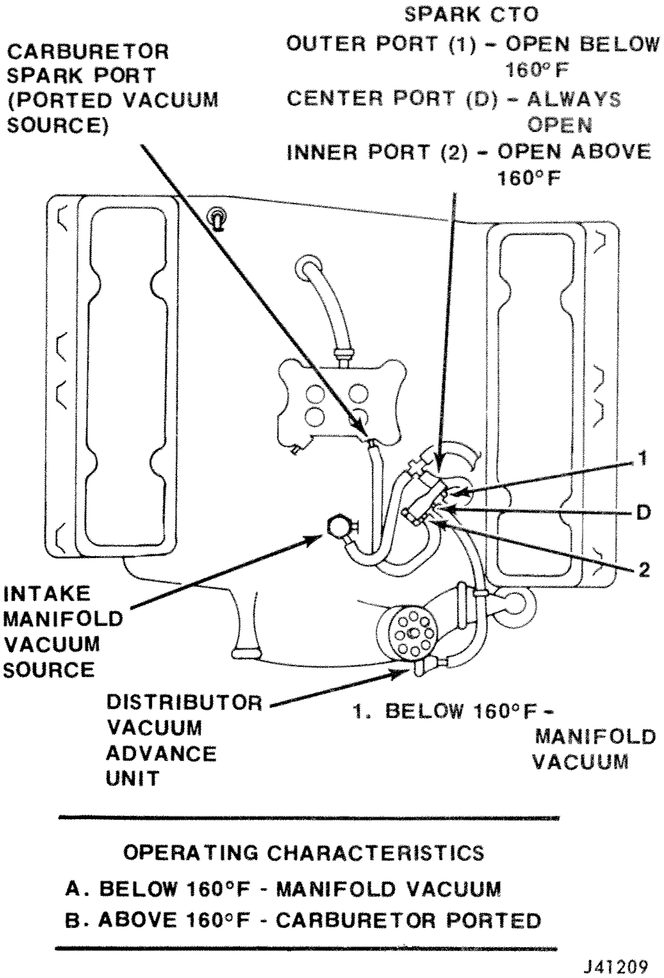


Fig. 4A-26 Spark CTO (All Ports Used)

VAM TEST

NOTE: *Coolant temperature should be below 160 degrees F (at or below the C mark of temperature gauge) to begin test.*

(1) Check for proper hose connections and leaks.

(2) Disconnect vacuum line from distributor vacuum advance mechanism.

(3) Using a tee fitting, connect tee into distributor vacuum line.

(4) Connect a vacuum gauge to open port of tee fitting.

(5) Locate correct illustration of VAM system being tested (fig. 4A-26 through 4A-32). The correct VAM illustration identifies the operating characteristics of the system according to vacuum supply and coolant temperature.

(6) Start engine. Verify vacuum available at temperature indicated on illustration.

(7) If vacuum indications are inaccurate, each component of the VAM system must be tested as outlined later in this section. Begin with the Spark CTO Test.

NOTE: *A ported vacuum source can be distinguished from manifold vacuum source by engine rpm. At idle, a ported vacuum source should have little or no vacuum, while a manifold vacuum source should have about 16 to 20 inches of mercury (Hg) indicated.*

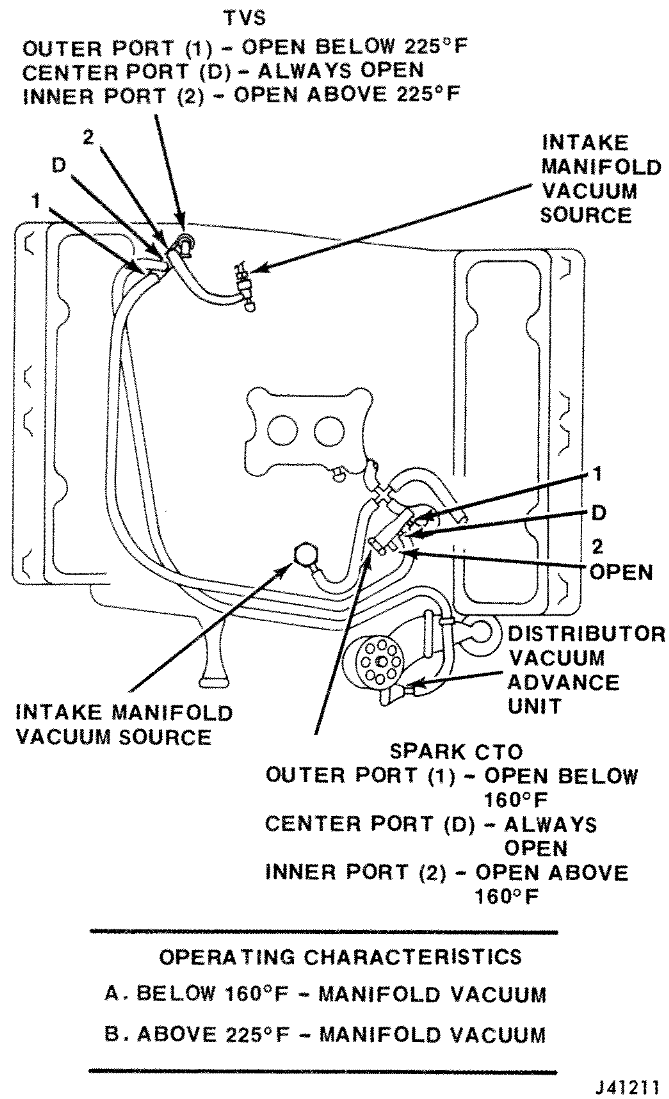


Fig. 4A-27 Spark CTO (No. 2 Port Not Used)

THERMAL VACUUM SWITCH (TVS)

This switch, which is located on the heater coolant outlet at the right rear of the intake manifold, is used on all Cherokees, Wagoneers, and Trucks equipped with 360 or 401 CID engines and standard cooling.

When engine coolant temperature reaches 225 degrees F, port No. 1 closes and port No. 2 opens. This allows intake manifold vacuum to be routed through ports No. 2 and D. Port D is connected by a hose either to port No. 2 of the coolant temperature override switch or directly to the distributor vacuum advance unit. Therefore, intake manifold is applied to the distributor vacuum advance diaphragm resulting in full vacuum advance. The full vacuum advance causes the engine speed to increase approximately 220 rpm.

When the coolant temperature drops below 225 degrees F, port No. 2 of the TVS switch closes and vacuum is again routed through ports No. 1 and D. Engine speed decreases due to reduced distributor vacuum advance.

NOTE: *The operation and outward appearance of the TVS and coolant temperature override switches are identical. However, they can be identified by the part number stamped on the switch body.*

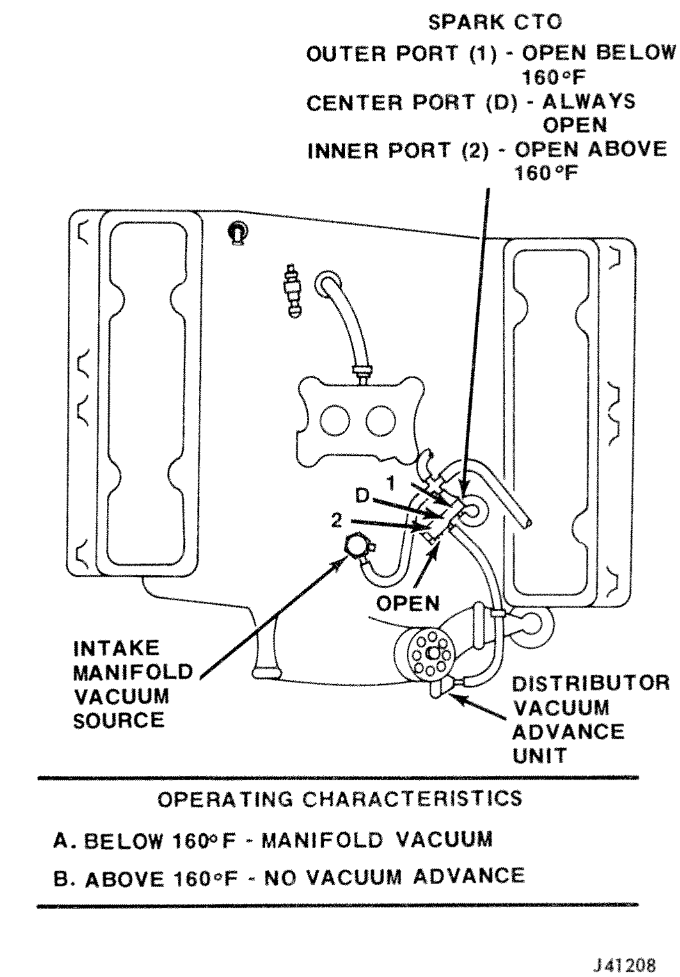


Fig. 4A-28 Spark CTO

TVS TEST

NOTE: *Begin test with coolant temperature below 225 degrees F.*

(1) Remove all vacuum lines from TVS switch. Plug those lines that will create a vacuum leak.

(2) Connect a vacuum line from a manifold vacuum source to port No. 1 (outer) of the TVS.

(3) Connect a vacuum gauge to port D (center) of TVS.

(4) Start engine. Manifold vacuum should be indicated on vacuum gauge; if not, replace TVS.

(5) With engine still running and coolant temperature **below** 225 degrees F, disconnect vacuum line from port No. 1 (outer) of TVS and connect to port No. 2 (inner).

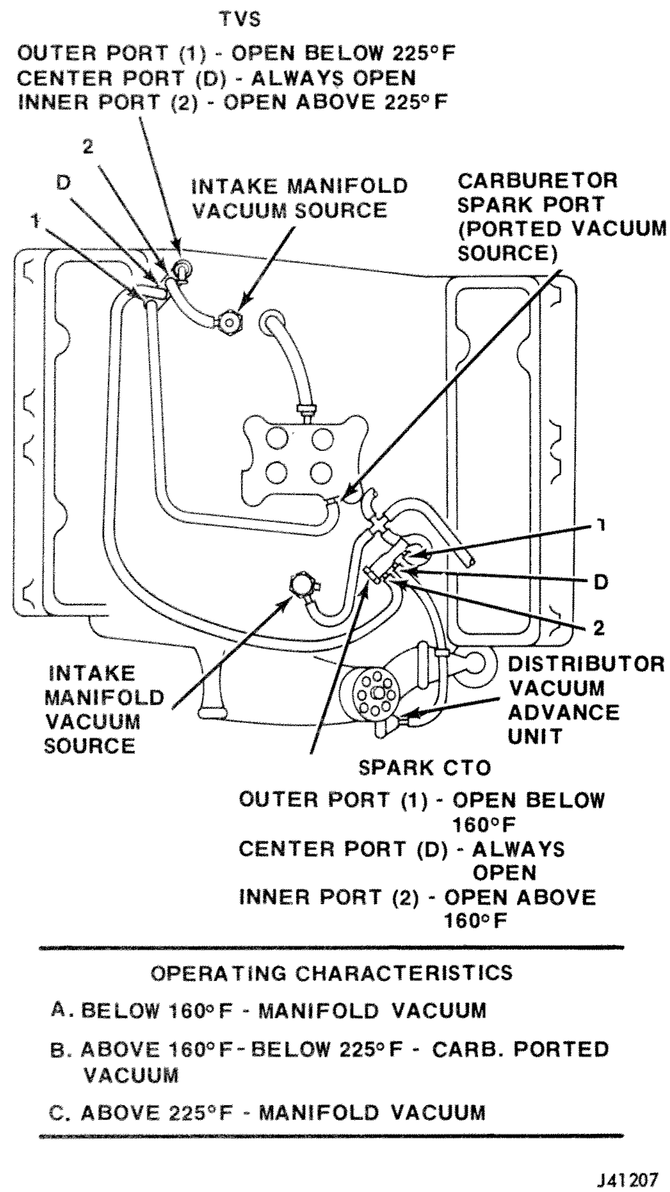


Fig. 4A-29 Spark CTO (All Ports Used) and TVS

(6) No manifold vacuum should be indicated on vacuum gauge. Replace TVS if vacuum is indicated.

(7) Keep engine running until coolant temperature exceeds 225 degrees F (approximately the end of the temperature gauge band). Manifold vacuum should be indicated; if not, replace TVS.

NOTE: *It may be necessary to block the radiator with cardboard to bring coolant temperature up to 225 degrees F.*

(8) Disconnect line from port No. 2 and connect it to No. 1. No vacuum should be indicated, otherwise replace TVS.

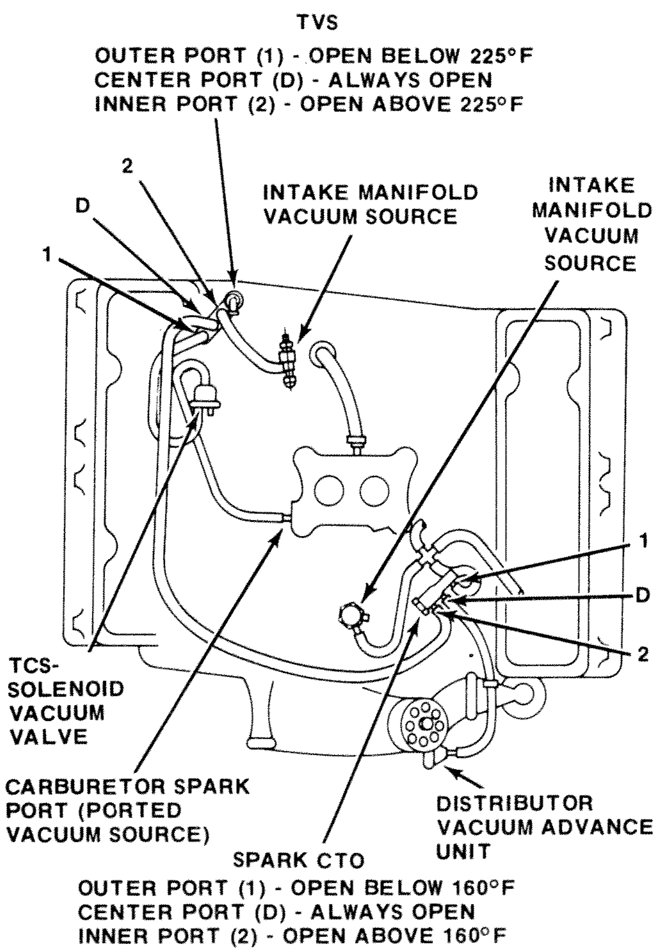
(9) Reconnect vacuum lines to TVS.

Removal - V-8 Engine

(1) Drain coolant from radiator.
(2) Remove air cleaner assembly.
(3) Remove heater hose if necessary.
(4) Disconnect vacuum lines from TVS.
(5) Using a 7 8-inch, open-end wrench, remove switch from coolant outlet.

Installation - V-8 Engine

(1) Install TVS on heater outlet.
(2) Install heater hose if removed.
(3) Connect vacuum lines to switch.
(4) Install ir cleaner assembly.
(5) Install coolant.
(6) Purge cooling system of air.



OPERATING CHARACTERISTICS

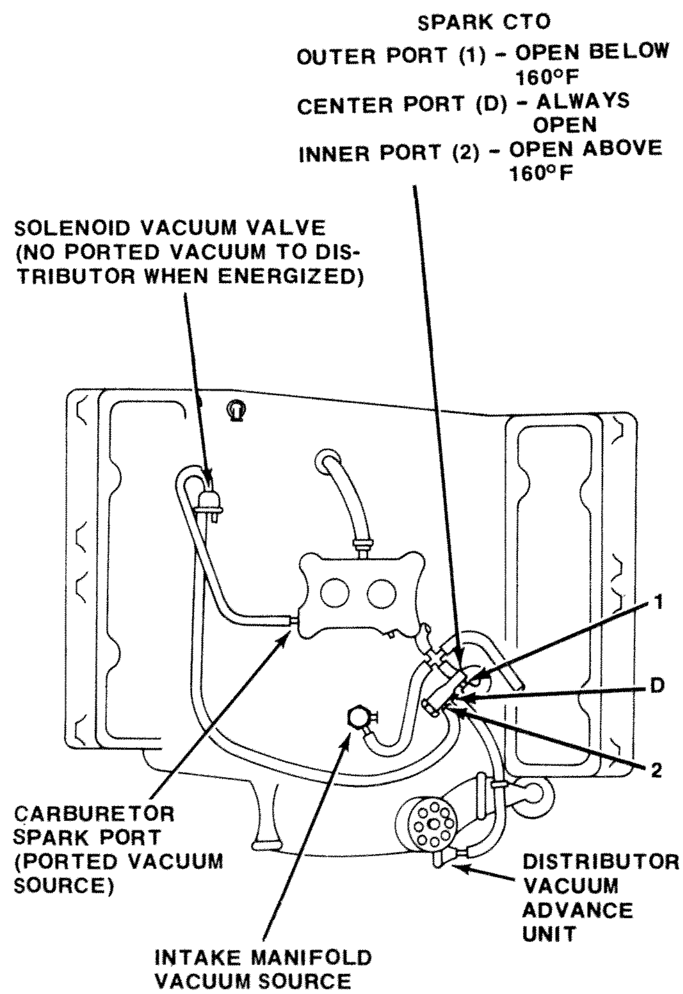
A. BELOW 160°F - MANIFOLD VACUUM

B. ABOVE 160°F, BELOW 225°F - CARB. PORTED VACUUM (IN HIGH GEAR MANUAL TRANSMISSION OR ABOVE 34 MPH AUTOMATIC TRANSMISSION)

C. ABOVE 225°F - MANIFOLD VACUUM

J41212

Fig. 4A-30 Spark CTO (All Ports Used), TVS, TCS



OPERATING CHARACTERISTICS

A. BELOW 160°F - MANIFOLD VACUUM

B. ABOVE 160°F - CARBURETOR PORTED VACUUM (IN HIGH GEAR MANUAL TRANSMISSION OR ABOVE 34 MPH AUTOMATIC TRANSMISSION)

J41210

Fig. 4A-31 Spark CTO (All Ports Used) TCS

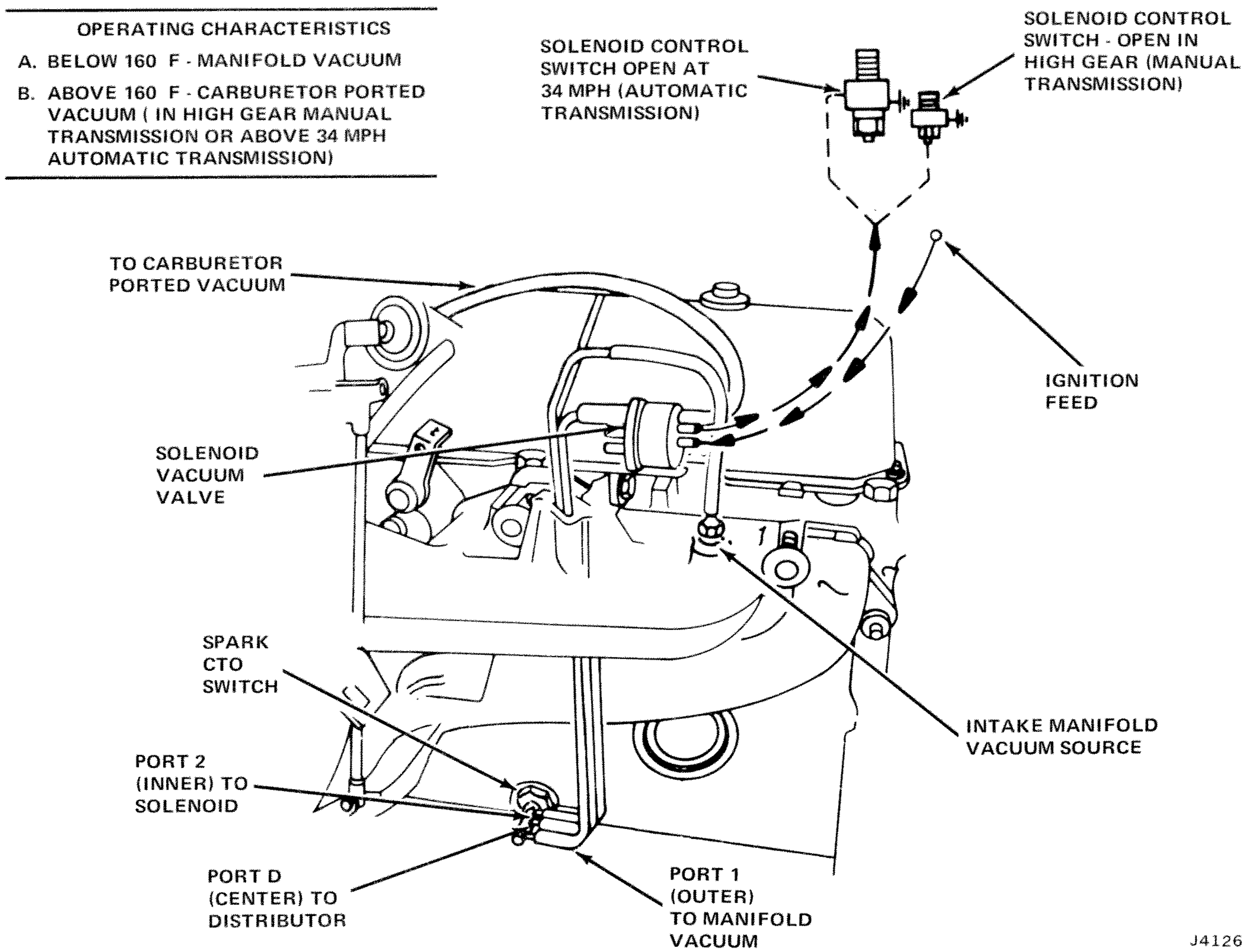


Fig. 4A-32 Spark CTO (All Ports Used), TCS-Six-Cylinder

TRANSMISSION CONTROLLED SPARK (TCS) SYSTEM

GENERAL

The purpose of this system is to reduce the emission of oxides of nitrogen by lowering the peak combustion temperature during the power stroke. The system incorporates a solenoid vacuum valve, a solenoid control switch, and related wiring and vacuum lines (fig. 4A-33).

SOLENOID VACUUM VALVE

This valve is attached to the intake manifold at the rear right side of the intake manifold (V-8 engines) or to a bracket at the rear of the intake manifold (six-cylinder engines). When the valve is energized (ground circuit complete), carburetor ported vacuum is blocked and the distributor vacuum line is vented to atmosphere through a port in the valve, resulting in no vacuum advance. When the valve is de-energized (ground circuit open), ported vacuum is applied to the distributor resulting in normal vacuum advance.

SOLENOID CONTROL SWITCH

This switch opens or closes in relation to vehicle speed or gear range. At speeds above 32 to 36 mph (automatic transmission) or high gear (manual transmission), the switch opens and breaks the ground circuit to the solenoid vacuum valve.

At speeds under 32 to 36 mph (automatic transmission) or lower gear ranges (manual transmission), the switch is closed and completes the ground circuit to the solenoid vacuum valve.

On manual transmissions, the switch is operated by the shifter shaft, which is screwed into the transmission case.

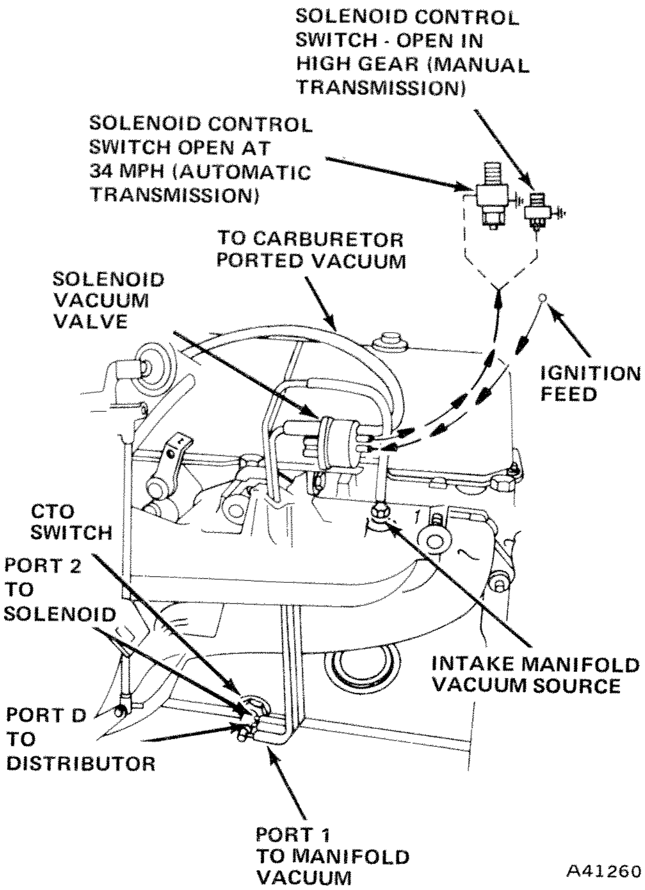


Fig 4A-33 Typical TCS System - Six-Cylinder Shown

On automatic transmissions, the switch is located along the speedometer cable on the firewall. The switch is operated by speedometer cable rpm. The cable attaches to both ends of the switch. At 32 to 36 mph (533 to 599 cable rpm), the switch will open the ground circuit.

TCS TEST

A vacuum gauge, probe type test lamp, and a jumper wire are used to check the operation of the TCS system.

(1) Turn ignition switch on.

(2) Disconnect wire connector from solenoid vacuum valve.

(3) Connect wire lead of test lamp to ground.

(4) Touch probe end of test lamp to each terminal of connector. Test lamp should light at one of the terminals; if not, ignition feed portion of TCS system is defective.

(5) Connect wire lead of test lamp to battery positive post.

NOTE: *Manual transmission equipped vehicles must be in neutral to begin step (6).*

(6) Touch probe end of test lamp to solenoid vacuum valve ground wire terminal at connector (opposite the terminal which caused test lamp to light in step (4)). Test lamp should light; if not, use the following procedure:

(a) Disconnect wire at solenoid control switch.

(b) Using a jumper wire, connect one end to switch wire connector and other end to ground.

(c) If test lamp lights when solenoid control switch wire is grounded with jumper wire, solenoid control switch is defective. If test lamp does not light, solenoid control switch wire is defective.

(7)

(a) Disconnect vacuum line from vent side of solenoid vacuum valve.

(b) Using a vacuum gauge, connect gauge to solenoid vacuum valve where hose was disconnected.

(c) Start engine. With solenoid vacuum valve attached, no vacuum should be indicated; otherwise, replace solenoid vacuum valve.

(d) Disconnect wires from solenoid vacuum valve. Ported vacuum should be indicated; if not, replace solenoid vacuum valve.

(8) Manual transmission equipped:

(a) Place gear selector in high gear.

(b) Test lamp should go out; if not, solenoid control switch is defective.

(9) Automatic transmission equipped:

(a) Raise and support vehicle so that rear wheels are free to rotate.

(b) Disconnect solenoid control switch wire. Connect wire lead of test lamp to solenoid control switch wire male connector. Touch probe end of test lamp to switch wire female connector.

(c) Start engine. Test lamp should light; if not, solenoid control switch is defective.

(d) Slowly accelerate engine 32 to 36 mph, test lamp should go out. If the test lamp goes out at a speed outside of this range, switch should be replaced.

NOTE: *With decreasing speed, the solenoid control switch will close the ground circuit at 22 to 28 mph (366 to 466 cable rpm). Make tests while increasing speed or accelerating engine only.*

(10) Stop engine.

(11) Reconnect wire connector to solenoid control switch and lower vehicle.

SPARK COOLANT TEMPERATURE OVERRIDE SWITCH (SPARK CTO)

This switch is threaded into the thermostat housing on V-8 engines and into the left rear side of the block on six-cylinder engines. Its purpose is to improve driveability during the warmup period by providing full distributor vacuum advance until the engine coolant temperature has reached 160 degrees F. The switch incorporates a thermal unit which reacts to coolant temperatures and moves a check ball inside the switch up or down to open or close the switch ports. Either intake manifold or carburetor ported vacuum is thereby routed to the distributor vacuum advance diaphragm (fig. 4A-34).

When the coolant temperature is below 160 degrees F, ports No. 1 and D are open and port No. 2 is closed. When the coolant temperature reaches 160 degrees F, port No. 1 closes and ports No. 2 and D are open.

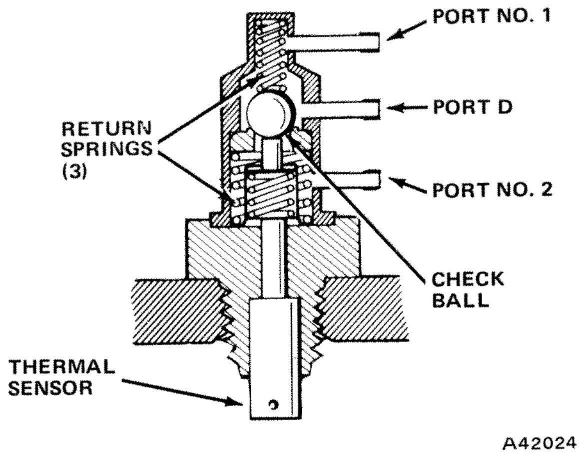


Fig. 4A-34 Spark CTO

SPARK CTO TEST

NOTE: *Begin test with coolant temperature below 160 degrees F.*

(1) Remove all vacuum lines from CTO switch. Plug those lines that will create a vacuum leak.

(2) Connect a vacuum line from a manifold vacuum source to port No. 2 (outer) of the CTO.

(3) Connect a vacuum gauge to port D (center) of CTO.

(4) Start engine. Manifold vacuum should be indicated on vacuum gauge; if not, replace CTO.

(5) With engine still running and coolant temperature **below** 160 degrees F, disconnect vacuum line from port No. 1 (outer) of CTO and connect to port No. 2 (inner).

(6) No manifold vacuum should be indicated on vacuum gauge. Replace CTO if vacuum is indicated.

(7) Keep engine running until coolant temperature exceeds 160 degrees F (approximately the beginning of the temperature gauge band). Manifold vacuum should be indicated, if not, replace CTO.

(8) Disconnect line from port No. 2 and connect it to port No. 1. No vacuum should be indicated; otherwise, replace CTO.

(9) Reconnect vacuum lines to CTO.

Removal - Six-Cylinder

(1) Drain coolant from radiator.

(2) Disconnect vacuum lines from spark CTO switch.

(3) Place a drain pan under the engine below CTO switch.

(4) Using a 7 8-inch, open-end wrench, remove switch from block.

WARNING: *Be careful of scalding hot water leaking from block when removing the switch.*

Installation - Six-Cylinder

(1) Drain coolant from radiator.

(2) Connect vacuum lines to switch.

(3) Install coolant.

Removal - V-8 Engine

(1) Drain coolant from radiator.

(2) Remove air cleaner assembly.

(3) Disconnect vacuum lines from CTO switch.

(4) Using a 7/8-inch, open-end wrench, remove switch from thermostat housing.

Installation - V-8 Engine

(1) Install spark CTO switch in thermostat housing.

(2) Install coil and bracket with attaching screw.

(3) Connect vacuum lines to switch.

(4) Install air cleaner assembly.

(5) Install coolant.

(6) Purge cooling system of air.

EMISSION CONTROL MAINTENANCE

GENERAL

The procedures that follow outline scheduled maintenance items identified in the U. S. Emission Control Service, but not outlined in the previous Emission Control System descriptions. Service procedures for components of particular Emission Control Systems are outlined under that system. However, emission control also relies upon overall engine performance for efficiency. If engine performance is questionable, refer to the Engine Performance Diagnosis Guide and Diagnosis with Scope Analyzer at the end of this section.

U.S. EMISSION CONTROL SERVICES

A precision electronic diagnosis should be purchased whenever questionable engine performance occurs between the scheduled complete precision tune-ups.

SCHEDULED ROUTINE SERVICES

At 5-10-20-25-35-40-50-55-65-70-80-85-95-100,000 miles
Heat Valve (exhaust manifold) - inspect and lubricate
Drive Belts - inspect condition and tension and correct if required

EXHAUST GAS RECIRCULATION VALVE SERVICES

At 10-20-30-40-50-60-70-80-90-100,000 miles
Exhaust Gas Recirculation Valve - inspect and clean*
Exhaust Gas Recirculation Discharge Port (6 cylinder) - inspect and clean if required*
*Service every 10,000 miles if leaded fuel is used
Service every 25,000 miles if lead-free fuel is used

COMPLETE PRECISION TUNE-UP

At 15-30-45-60-75-90,000 miles
Engine Oil Filler Cap (filter type) - clean
Heat Valve (exhaust manifold) - inspect and lubricate
Drive Belts - inspect condition and tension and correct if required
Carburetor Air Cleaner Element - inspect and clean if required
Fuel Filter Element - replace
PCV Valve - replace
PCV Hoses - inspect and replace if required
PCV Filter (6 cylinder) - clean
Coil and Spark Plug Wires - inspect and replace if required
Spark Plugs - clean, inspect, regap and test (replace if required)
Ignition Points and Condenser - inspect and replace if required
(check dwell and set if required)
Distributor Cam Lubricator - replace
Ignition Timing - check and set if required
Distributor Advance Mechanisms - check and correct if required
Distributor Cap and Rotor - inspect and replace if required
Idle Speed and Mixture - check and reset
Choke Linkage - inspect for free movement (correct if required)
Transmission Controlled Spark Systems - inspect and correct if required
Fuel System, Cap, Tank, Lines and Connections - inspect for integrity and correct if required
Fuel Vapor Inlet Filter at Charcoal Canister - replace
Air-Guard System Hoses - inspect and correct if required
TAC System - inspect and correct if required
Vacuum Fittings, Hoses and Connections - inspect and correct if required

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IGNITION SYSTEM

Spark Plug Wires

To remove wires from spark plugs, twist the boot slightly to break the seal. Grasp the rubber protector boot and lift straight up with a steady, even pull. Do not pull on the wire itself as this will damage the wire.

To remove wires from the distributor cap or coil tower, loosen the boot first, then grasp the upper part of the boot and the wire and gently pull straight up.

Wire Test

Do not puncture the spark plug wires with a probe while performing any test. This may cause a separation in the conductor. The preferred method is to remove the suspected wire(s) and use an ohmmeter to test for resistance according to the length of the particular wire.

Resistance Values

When installing each spark plug wire or the coil high tension wire, be certain a good tight connection is made at the spark plug, distributor cap tower, or coil tower. The protector boots at the spark plugs and distributor cap must fit tightly. A partially seated wire creates an additional gap in the circuit and the resulting spark jump will cause terminal corrosion and wire damage.

Spark Plugs

The spark plugs should be removed from the engine and examined for burned electrodes and dirty, fouled, cracked, or broken procelains. Plugs should be replaced at the mileage intervals recommended in the U. S. Emission Control Service Chart. Plugs with low mileage may be cleaned. After cleaning, the center electrode should be filed flat with a point file. The gaps must be set to 0.033 to 0.037 inch (fig. 4A-35).

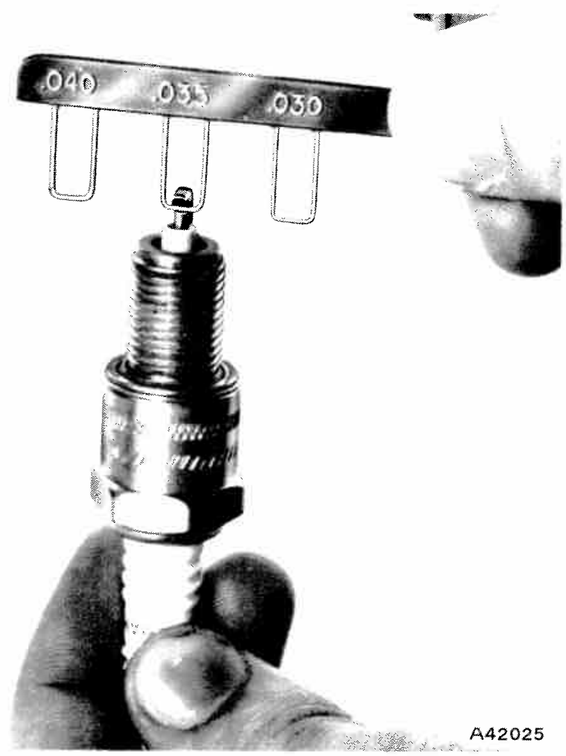

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Fig. 4A-35 Spark Plug Gap Check

Always use a torque wrench when installing spark plugs. Distortion from overtightening will change the gap clearance of the plug. Tighten to 25 to 30 foot-pounds torque.

Spark Plug Condition

Refer to figure 4A-36.

Gap Bridging - (A) - May be traced to flying deposits in the combustion chamber. In a few cases, fluffy deposits may accumulate on the plugs during in-town driving; when the engine is suddenly put under heavy load, this material can melt and bridge the gap.

Scavenger Deposits - (B) - Fuel scavenger deposits shown may be white or yellow. They may appear to be harmful but this is a normal appearance with certain brand fuels. Such materials are designed to change the chemical nature of deposits to lessen misfire tendencies. Notice that accumulation on the ground electrode and shell areas may be unusually heavy, but the material is easily removed. Such plugs can be considered normal in condition, and can be cleaned with standard practices.

Chipped Insulator - (C) - Usually results from bending the center electrode during regapping of the plug. Under certain conditions, severe detonation can also split insulator firing ends.

Pre-ignition Damage - (D) - Caused by excessive temperatures, produces melting of the center electrode and, somewhat later, the ground electrode. Insulators will appear relatively clean of deposits. Check for correct plug heat range, overadvanced ignition timing and similar reasons for overheating.

Cold Fouling (or Carbon Fouled) - (E) - Dry, black appearance of one or two plugs in a set. Check for sticking valves or bad ignition leads. Fouling of the entire set may be caused by a clogged air cleaner, a sticking exhaust manifold heat valve, or a faulty choke.

Overheating - (F) - Indicated by a dead white or gray insulator which appears blistered. Electrode gap wear rate will be considerably in excess of 0.001 inch per 1000 miles. This may suggest that a cooler heat range should be used; however, overadvanced ignition timing, detonation, and cooling system stoppages can also cause overheating.

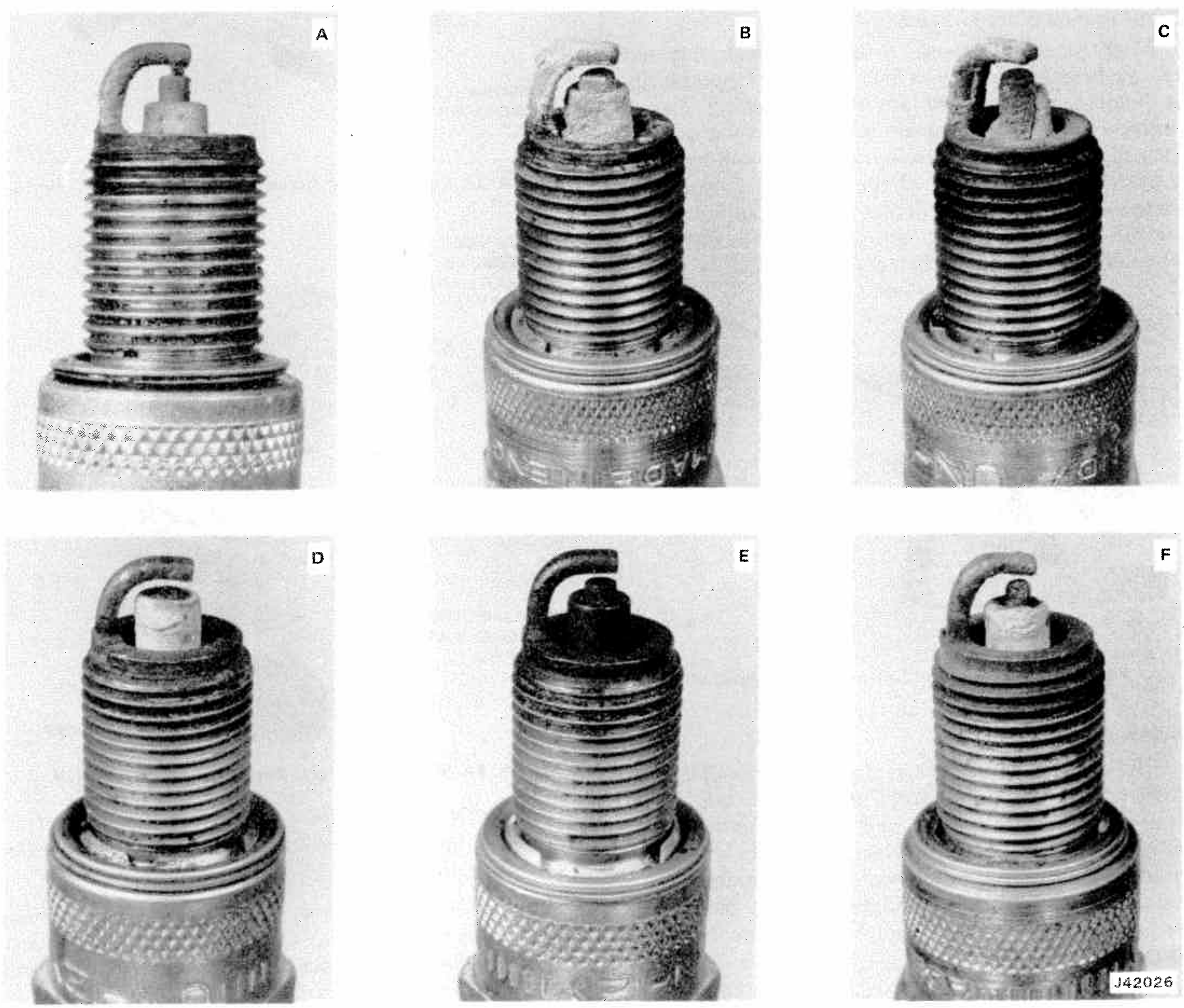

Fig. 4A-36 Spark Plug Conditions

Ignition Coil

When an ignition coil is suspected of being defective, it should be checked on the vehicle. A coil may break down after it has reached operating temperature. It is important that the coil be at operating temperature when tests are made. Perform the tests following the instructions of the test equipment manufacturer.

Distributor Contact Points

The distributor contact points should be replaced at the mileage intervals specified in the Mechanical Maintenance Schedule, or oftener if they become badly burned or pitted.

Burned contact points may be caused by high resistance or loose connections in the primary circuit, oil or foreign materials on the contact surfaces or high breaking current. Check for these conditions when burned contacts are encountered.

After considerable use, contact surfaces may not appear bright and smooth but this is not necessarily an indication that they are malfunctioning. Rough contacts which are grayish in color have a greater area of contact than new contacts and will perform satisfactorily until most of the tungsten is worn off. Pitted or transferred contacts is a normal condition and the contacts need not be replaced until the transfer has exceeded 0.020 inch (fig. 4A-37).

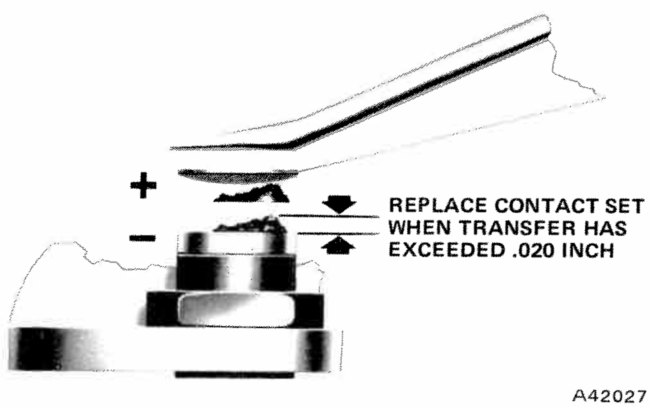

Fig. 4A-37 Distributor Contact Point Condition

Replacement

The contact points are replaced as a complete assembly. The service replacement contact assembly has the breaker lever spring and point alignment pre-adjusted at the factory. Normally, only the dwell angle (point opening) requires adjustment after replacement. However, in some cases the points may require alignment. Use a point aligning tool to align the point contact surfaces.

The condenser and primary leads are retained by tension of the breaker point spring against a nylon insulator. Remove the leads by pulling straight upward.

Remove the six-cylinder contact point assembly by removing the attaching screw (fig. 4A-38). Remove the V-8 contact point assembly by loosening the two attaching screws (fig. 4A-39).

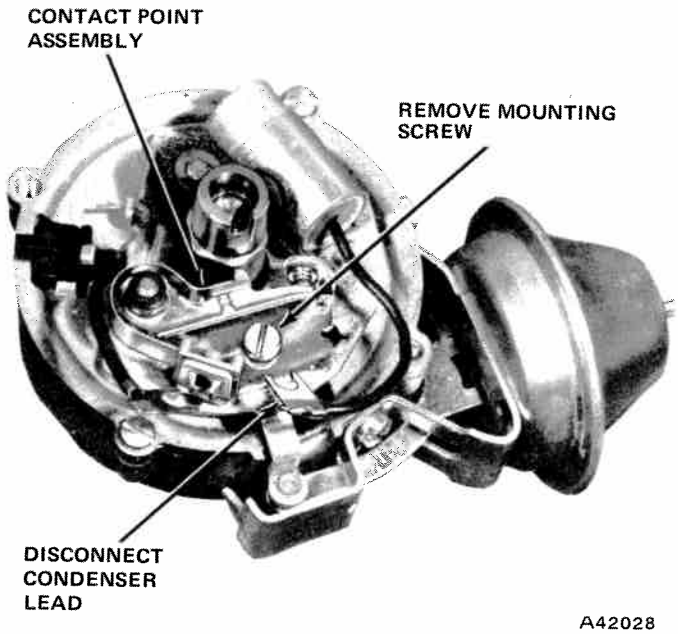

Fig. 4A-38 Contact Point Assembly Removal - Six-Cylinder

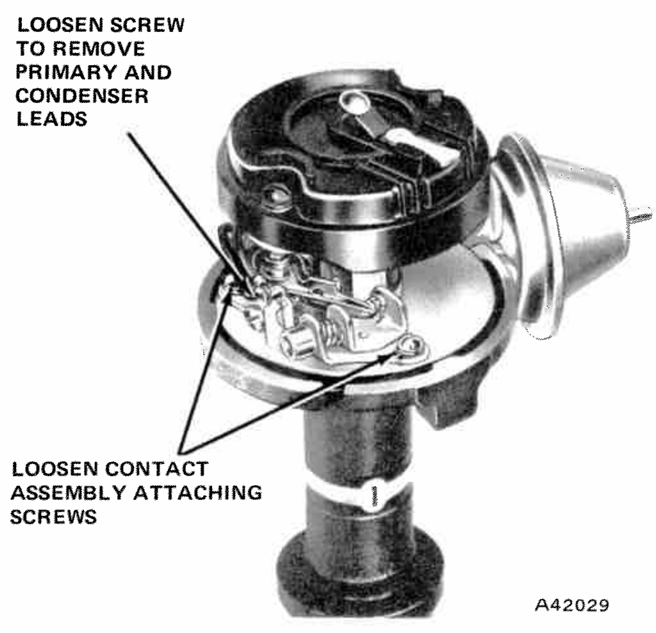

Fig. 4A-39 Contact Point Assembly Removal - V-8

CAUTION: *Six-Cylinder - Make sure the locating dowel on the contact set enters the locating hole in the breaker plate.*

V-8 - Make sure pilot hole in the contact base is positioned over the locating dowel on the breaker plate. Observe the location of condenser lead, primary lead, and the plate ground lead (fig. 4A-40). Leads must be properly located to eliminate interference with cap, weight base and breaker advance plate.

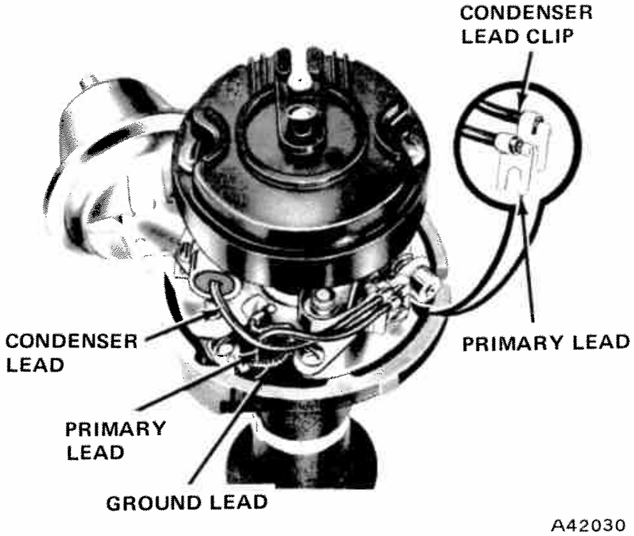

Fig. 4A-40 Primary and Condenser Lead Attachment - V-8

Distributor Point Dwell

Dwell is the period during which the distributor points remain closed for each ignition cycle. The dwell meter electrically measures this period and registers the average for each cylinder in terms of degrees of distributor cam rotation.

The total number of degrees for each ignition cycle is 360 divided by the number of cylinders. Figure 4A-41 shows 60 degrees (between dotted lines) for each cylinder of a six-cylinder engine and 32 degrees as the dwell. A study of this illustration shows that a wider point setting will result in less dwell and a closer point setting will increase the dwell.

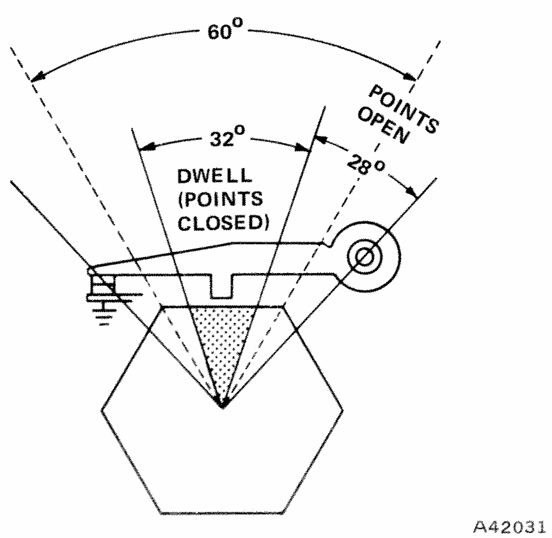

Fig. 4A-41 Point Dwell - Six-Cylinder Shown

To check point dwell, connect the red lead of a dwell meter to the distributor terminal at the coil.

(1) Connect black lead to ground.

(2) Set selector switch to position which corresponds to the number of cylinders in the engine being tested.

Operate engine at idle speed and note readings, refer to Specifications.

If the dwell reading is not to specification, the trouble could be incorrect point spacing, defective point rubbing block or breaker arm, or a misaligned or worn distributor cam.

Dwell Variation

Dwell variation is determined by noting any dwell change as the engine is operated at different speeds. Excessive variation indicates a change in point opening that can result from shaft or bushing wear, or from the distributor plate shifting because of wear or looseness.

Measure dwell variation at idle speed using the same test setup as for checking dwell. Increase speed to 1750 rpm; note dwell reading. Then slowly reduce speed to idle while observing dwell meter. Dwell variation should not exceed three degrees.

If dwell variation exceeds three degrees between idle speed and 1750 rpm, wear in the distributor shaft bushings or breaker plate is indicated. Distributor should then be checked more thoroughly on a distributor tester.

Dwell Angle Adjustment - Six-Cylinder

Remove distributor cap and rotor and loosen contact assembly retaining screw slightly. Connect a dwell meter positive lead to ignition coil negative terminal and negative lead to ground.

CAUTION: *Place transmission in Neutral or Park position. Apply brake firmly.*

Turn car ignition on and crank engine with remote control starter switch while observing the dwell meter reading. Adjust dwell angle by inserting a screwdriver blade in the adjusting slot of the breaker plate and

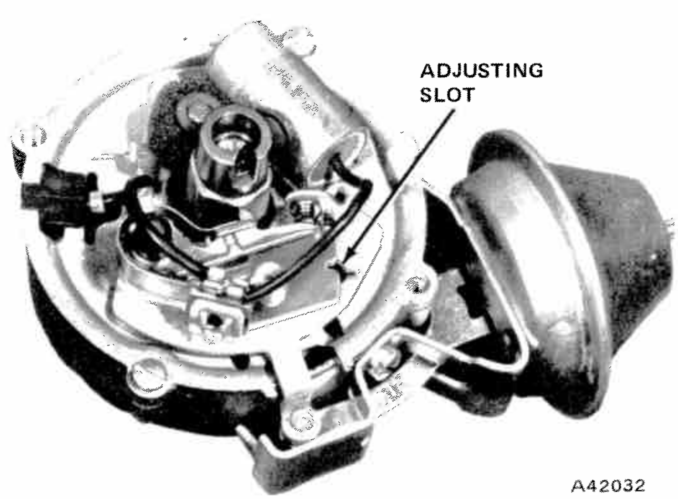

Fig. 4A-42 Adjusting Dwell (Point Spacing) - Six-Cylinder moving the plate until the specified setting is indicated on the dwell meter (fig. 4A-42). Tighten retaining screw and recheck dwell angle. Install distributor rotor and cap, verify dwell angle with the engine running.

Dwell Angle Adjustment - V-8

With the engine running at idle, the dwell angle is adjusted by raising the window provided in the cap and inserting an allen wrench into the head of the adjusting screw as shown in figure 4A-43.

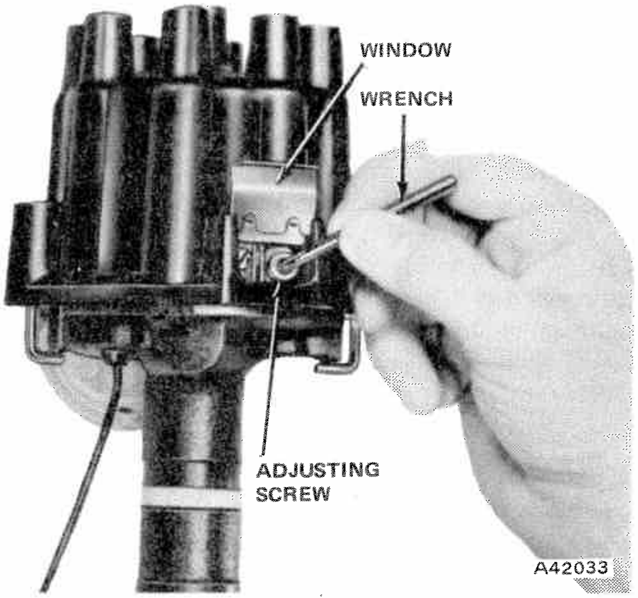

Fig. 4A-43 Adjusting Dwell (Point Spacing) V-8

Breaker Arm Spring Tension

One of the most important items to check is the breaker arm spring tension. This is checked with a spring scale hooked immediately behind the breaker lever contact (fig. 4A-44). Spring tension should be 17 to 21 ounces. The breaker arm on a new set may produce a tension exceeding that specified.

Condenser

The purpose of the condenser in the ignition system is to prevent arcing and pitting at the breaker points and to aid in collapsing the magnetic field of the ignition coil. In order to function properly and to assure good ignition, the condenser must have three important characteristics:

- Minimum Series Resistance
- Correct Capacity
- Minimum Insulation Leakage

The condenser should be checked at the same time as the points. A capacity, leakage, and series resistance test should be made on the condenser.

For a complete check of the condenser, follow the instructions of the manufacturer's test equipment being used.

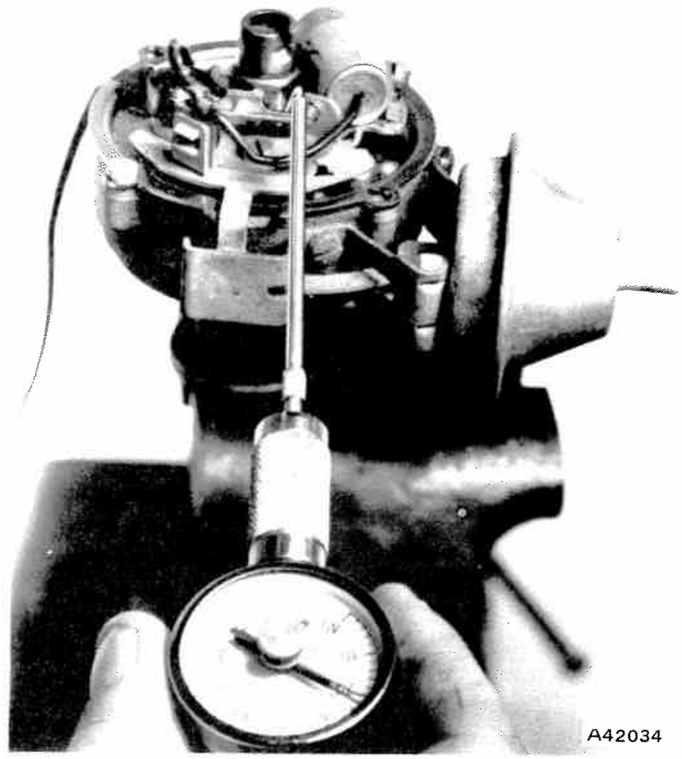

Fig. 4A-44 Breaker Arm Spring Tension - Six-Cylinder Shown

Distributor Cam Lubricator

All distributors are equipped with a cam lubricator. Never oil the lubricator; replace at recommended mileage intervals.

Distributor Rotor

The rotor should be visually inspected for cracks, evidence of burning on the top of the metal strip, or evidence of mechanical interference with the cap. If any of the above conditions are found, the rotor should be replaced. Some burning is normal on the end of the metal strip. **This should never be filed.**

Distributor Cap

The distributor cap should be removed and wiped clean with a dry rag. A visual inspection should be made for cracks, carbon runners, and corroded high tension terminals. If any of these conditions are found, the cap should be replaced. In replacing the cap, be sure that the high tension wires are installed in the same towers from which they were removed and that they are pushed down firmly in place.

If the inserts inside the cap are excessively burned, the cap should be replaced. However the vertical face of the insert will show some evidence of burning through normal operation. The inserts should also be checked for evidence of mechanical interference with the rotor tip.

Distributor Resistance Test

Excessive resistance in the ignition primary circuit from the distributor side of the coil through the points, and to the distributor ground will prevent the coil from producing sufficient output for good overall ignition. Any resistance in this portion of the ignition system will be indicated on a dwell meter during this test (fig. 4A-45).

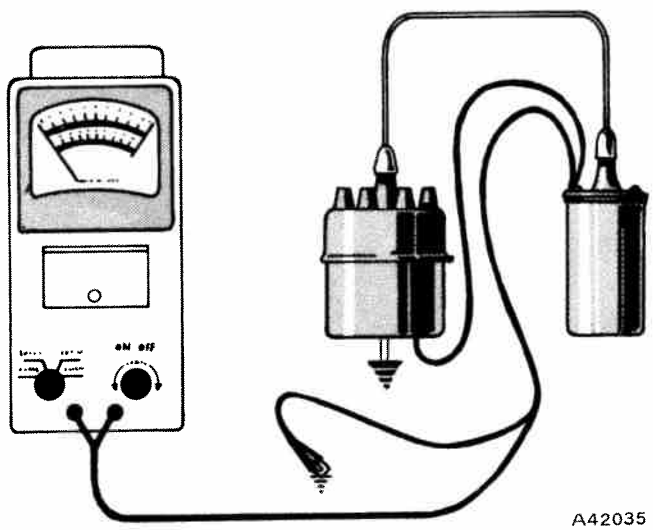

Fig. 4A-45 Distributor Resistance Test

A tach-dwell tester is used for the following tests. Follow the manufacturer's operating instructions.

Test Procedure

(1) Connect red lead to distributor primary lead at coil.

(2) Connect black lead to ground.

(3) Turn ignition switch on but do not start engine; observe dwell meter.

NOTE: *If meter reads zero, crank the engine a fraction of a revolution to close the breaker points.*

Distributor resistance is normal if dwell meter pointer is within range of black bar.

(4) If dwell meter pointer is not within black bar, remove test lead from distributor terminal of coil and connect to each of the following points to determine cause of excessive resistance.

- Distributor primary terminal in the distributor
- Breaker point bracket
- Ground side of points
- Distributor housing

Where a noticeable change occurs in the meter reading in these steps, make necessary correction and repeat test.

Initial Ignition Timing

A graduated degree scale located on the timing chain cover is used for timing the ignition system. A milled notch on the vibration damper is used to reference the No. 1 firing position of the crankshaft with the timing marks on the scale as shown in figures 4A-46 and 4A-47.

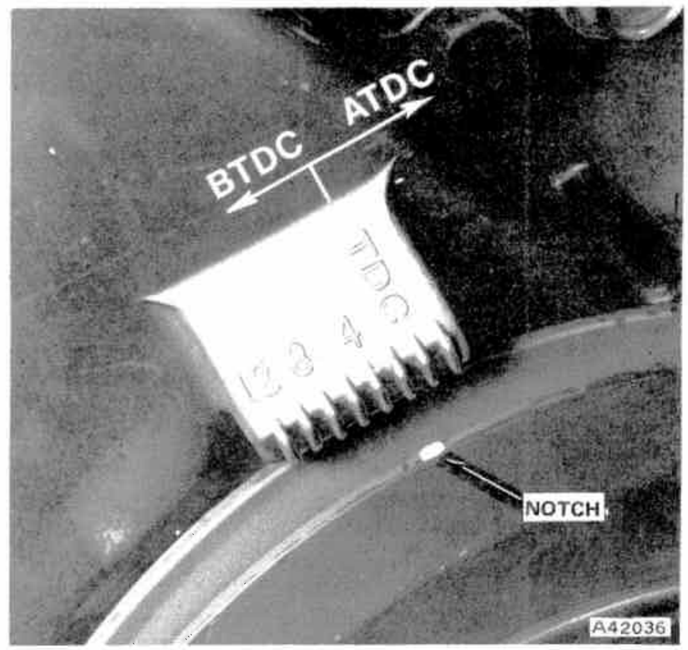

Fig. 4A-46 Timing Mark Location - Six-Cylinder

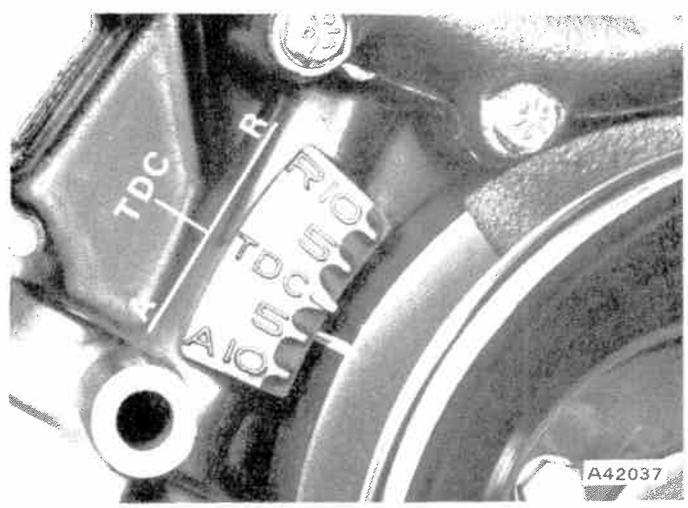

Fig. 4A-47 Timing Mark Location - V-8

Timing Procedure

(1) Disconnect distributor vacuum hose.

(2) Connect an ignition timing light and a properly calibrated tachometer.

NOTE: *If a timing light incorporating an advance control feature is used, the control must be in the off position.*

(3) Start engine.

(4) Adjust idle speed to 500 rpm.

(5) Adjust initial ignition timing to setting specified on the Tuneup Specifications (On Vehicle) Chart by loosening the distributor holddown clamp and rotating the distributor.

(6) Verify ignition timing after tightening distributor holddown clamp.

Distributor Advance Test Procedure

NOTE: *Distributor advance may also be tested with the distributor out of the vehicle. Follow testing equipment manufacturer's instructions. Refer to Distributor Specifications (On Distributor Tester).*

Adjustable Advance Control Timing Light Procedure

(1) Disconnect the TCS solenoid vacuum valve wires.

(2) Increase engine speed to 2000 rpm.

(3) Turn advance control of ignition timing light until the ignition timing has returned to the initial setting.

NOTE: *The degree reading on the advance meter should be as specified in the Tuneup Specification (On Vehicle) Chart.*

(4) If the total advance at 2000 rpm is less than specified, disconnect vacuum advance hose at distributor.

(5) Check maximum centrifugal degrees advance at engine rpm specified.

If the centrifugal advance degrees are as specified, the vacuum unit must be replaced.

CARBURETION

Engine Idle Speed and Mixture Setting Procedures

The engine and related systems must be performing properly prior to marking carburetor idle speed and mixture adjustments. The idle speed and mixture adjustments must be made with the engine at operating temperature and air cleaner in place (fig. 4A-48, -49, and -50).

Plastic idle limiter caps are installed over the idle mixture screw(s) on all carburetors. The limiters are designed to regulate the adjustment range of the idle mixture screw(s), thereby effectively controlling the exhaust emission level at idle speeds to comply with Federal Standards for emission control. The limiter caps must be removed in order to perform the lean drop idle setting using the tachometer procedure. The infrared analyzer procedure does not normally require limiter cap removal.

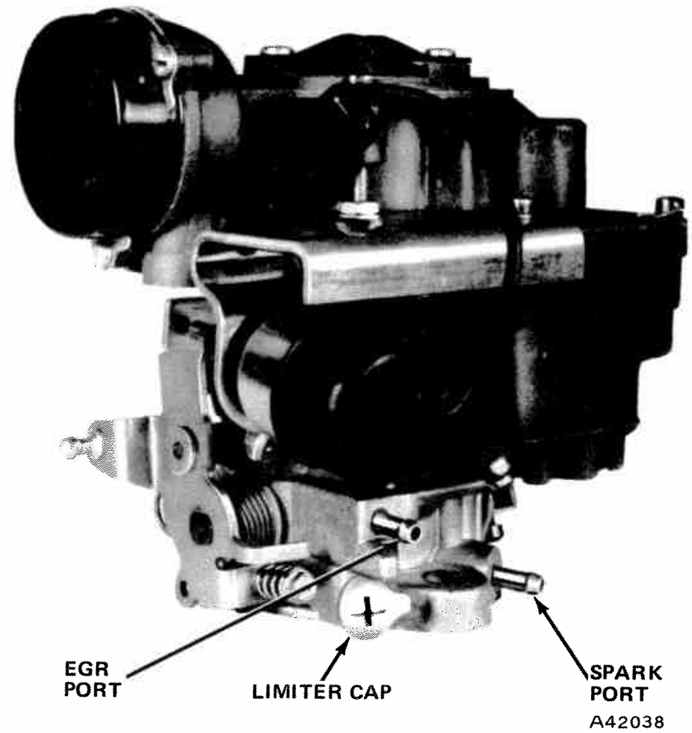

Fig. 4A-48 Model YF Carburetor

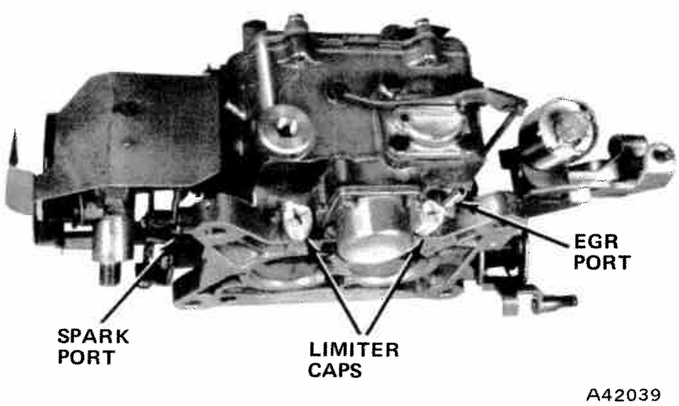

Fig. 4A-49 Model 2100 Carburetor

Proper idle speed and mixture adjustments can be made by following a standard tachometer procedure, in which the idle mixture is adjusted to a lean drop idle setting. A preferred infrared (IR) analyzer procedure, in which the idle mixture is adjusted to obtain a specified carbon monoxide level, may also be used. When following the tachometer procedure, adjustments must be made in the exact detailed sequence outlined to obtain lean drop idle settings and satisfactory idle quality.

WARNING: *Set park brake firmly. Do not accelerate.*

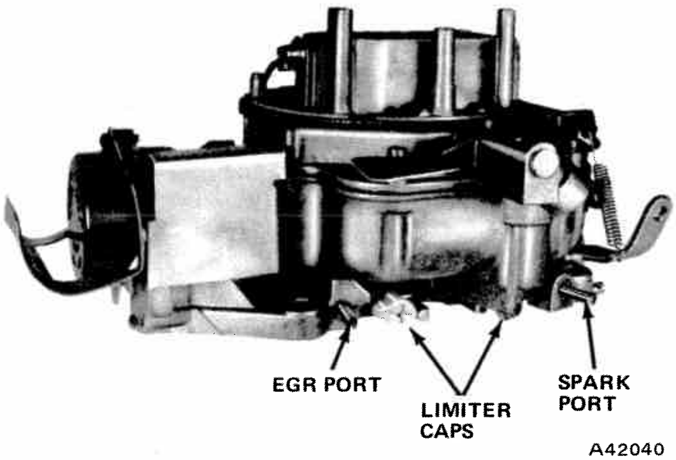

Fig. 4A-50 Model 4300 Carburetor

Tachometer Procedure

NOTE: *To compensate for fuel and temperature variations while performing the idle mixture adjustment:*

(a) Do not idle engine over three minutes at a time.

(b) If the idle mixture adjustment is not completed within three minutes, run engine at 2000 rpm for one minute.

Recheck the idle mixture adjustment at the specified rpm and adjust as required. If the idle mixture adjustment is not completed within three minutes, repeat step (b).

(1) Adjust idle screw(s) to the full rich stop(s). Note position of screw head slot inside limiter cap slots.

(2) Carefully remove idle limiter cap(s) by installing a sheet metal screw in center of cap and turning clockwise. Discard the cap(s).

(3) Reset idle screw(s) to the approximate position noted before the limiter cap(s) was removed (step 2).

NOTE: *The tachometer used should have an expanded scale of 400 to 800 to 0 to 1000 rpm. The instrument should be periodically inspected and calibrated to allow not more than two percent error.*

(4) Start engine and warm to operating temperature.

(5) Adjust idle speed to 30 rpm above the following specified rpm.

Six-Cylinder: Automatic - 550 rpm
Six-Cylinder: Manual - 600 rpm
V-8 Engine: Automatic - 700 rpm
V-8 Engine: Manual - 750 rpm

NOTE: *On all V-8 engines with automatic transmissions, the throttle-stop solenoid is used to adjust curb idle speed. Use the following procedure for idle speed adjustment.*

(a) With solenoid wire connected, loosen solenoid locknut and turn solenoid in or out to obtain specificied idle rpm.

(b) Tighten solenoid bracket.

(c) Disconnect solenoid wire and adjust curb idle speed screw to obtain specified idle rpm.

(d) Connect solenoid wire.

Engine	Transmission	RPM Drop
232-258	Automatic	20 rpm
232-258	Manual	35 rpm
All V-8's	All	40 rpm

(6) Starting from full rich stop position (as established before limiter(s) was removed) turn mixture screw(s) clockwise (leaner) until a loss of engine rpm is indicated.

(7) Turn mixture screw(s) counterclockwise until the highest rpm reading is obtained at lean best idle setting. On carburetors incorporating two mixture screws, turn both screws equally unless the engine demands otherwise.

NOTE: *If the idle speed changed more than 30 rpm during the mixture adjustment, reset to 30 rpm above the specified rpm and repeat the adjustment.*

(8) As a final adjustment, turn mixture screw(s) clockwise until specified drop in engine rpm is obtained.

(9) If rough idle is experienced, the mixture screw(s) may be adjusted independently providing the specified carbon monoxide level is maintained.

(10) If unable to obtain specified carbon monoxide level at either stop, remove limiter cap(s) and adjust idle speed mixture as outlined above.

(11) Install new (blue) service idle limiter cap(s) over idle mixture screw(s) with limiter cap ear(s) positioned against the full rich stop(s). Be careful not to disturb idle mixture setting while installing the cap(s). Press cap(s) firmly and squarely into place.

Infrared (IR) Analyzer Procedure (Preferred)

NOTE: *To compensate for fuel and temperature variations while performing the idle mixture adjustment:*

(a) Do not idle engine over three minutes at a time.

(b) If the idle mixture adjustment is not completed within three minutes, run engine at 2000 rpm for one minute.

(c) Recheck the idle mixture adjustment at the specified rpm and adjust as required. If the idle mixture adjustment is not completed within three minutes, repeat step (b).

NOTE: *The IR analyzer to be used must be periodically inspected and calibrated to assure accurate readings.*

(1) Connect IR analyzer by precisely following the instructions of the manufacturer.

(2) Start engine and allow sufficient warmup time for engine and analyzer to stabilize.

(3) Recalibrate IR analyzer before proceeding to adjust carburetor.

(4) Insert probe of analyzer at least 18 inches into tailpipe. If car is equipped with dual exhaust, insert probe into the side opposite exhaust manifold heat valve.

NOTE: *The exhaust system and the test equipment must be free of leaks to prevent erroneous readings.*

(5) Adjust idle speed to 30 rpm above the following specified rpm.

Six-Cylinder: Automatic - 550 rpm
Six-Cylinder: Manual - 600 rpm
V-8 Engine: Automatic - 700 rpm
V-8 Engine: Manual - 750 rpm

NOTE: *On all V-8 engines with automatic transmissions, the throttle stop solenoid is used to adjust curb idle speed. Use the following procedure for idle speed adjustment.*

(a) With solenoid wire connected, loosen solenoid locknut and turn solenoid in or out to obtain specified idle rpm.

(b) Tighten solenoid locknut.

(c) Disconnect solenoid wire and adjust curb idle speed screw to obtain specified idle rpm.

(d) Connect solenoid wire.

(6) Observe CO level and compare to following table.

Engine Idle CO Level	
Six-Cylinder less Air Guard	1.0 - 1.5%
Six-Cylinder with Air Guard	0.5 - 1.0%
V-8 with Air Guard	0.5 - 1.0%

(7) If less than specified, turn screws counterclockwise 1 16 turn at a time, until specified CO reading is obtained.

(8) If greater than specified, turn screw(s) clockwise until specified CO reading is obtained.

(9) Allow ten seconds for meter to stabilize after each adjustment.

NOTE: *If the idle speed changed more than 30 rpm during the mixture adjustment, reset to the specified rpm and repeat the adjustment until the specified carbon monoxide level is obtained.*

Choke Linkage

All choke linkage including the fast idle cam should be checked for free movement at the mileage intervals specified in the Mechanical Maintenance Schedule.

Free carburetor linkage by applying Jeep Carburetor and Combustion Area Cleaner, or equivalent. Never use oil to lubricate carburetor linkage.

For correct choke system adjustments, refer to Fuel - Carburetion - Exhaust section of this manual.

Exhaust Manifold Heat Valve

An often overlooked, but highly important emission related component is the exhaust manifold heat valve. This valve can affect the gas mileage, performance, driveability and especially emission levels.

This valve is to be inspected for correct operation and lubricated with Jeep Heat Valve Lubricant or equivalent, every 5000 miles. Refer to the Fuel - Carburetion - Exhaust section for service procedures.

DIAGNOSIS WITH SCOPE ANALYZER

General

The scope analyzer is an ignition tester that provides a quick, convenient, and accurate means of measuring ignition system performance quality. Display of all phases of the ignition cycle is graphically shown on the oscilloscope (cathode ray tube) of the test equipment at the very same instant in which they occur while the engine is operating. The pattern (waveform) displayed on the oscilloscope is an easy-to-interpret picture of the ignition system operations.

Most engine performance problems are due to ignition system condition; thus a fundamental understanding of the principles of operation of an ignition system simplifies the interpretation of oscilloscope (Scope Analyzer) patterns.

The following are the key items which must be to factory specifications and in satisfactory condition to assure that the ignition system will operate normally:

- Distributor contact point dwell
- Ignition timing
- Dwell variation
- Distributor cam lobe accuracy
- Available voltage
- Required voltage
- Wiring insulation and quality
- Secondary (high tension) resistance with limits
- Distributor contact point condition and operation

The ignition system can be completely tested with an area-type procedure by the use of a scope analyzer and timing light.

The scope analyzer test can lead directly to the trouble and save valuable time in diagnosis and repair.

If trouble is indicated, detailed tests must be made

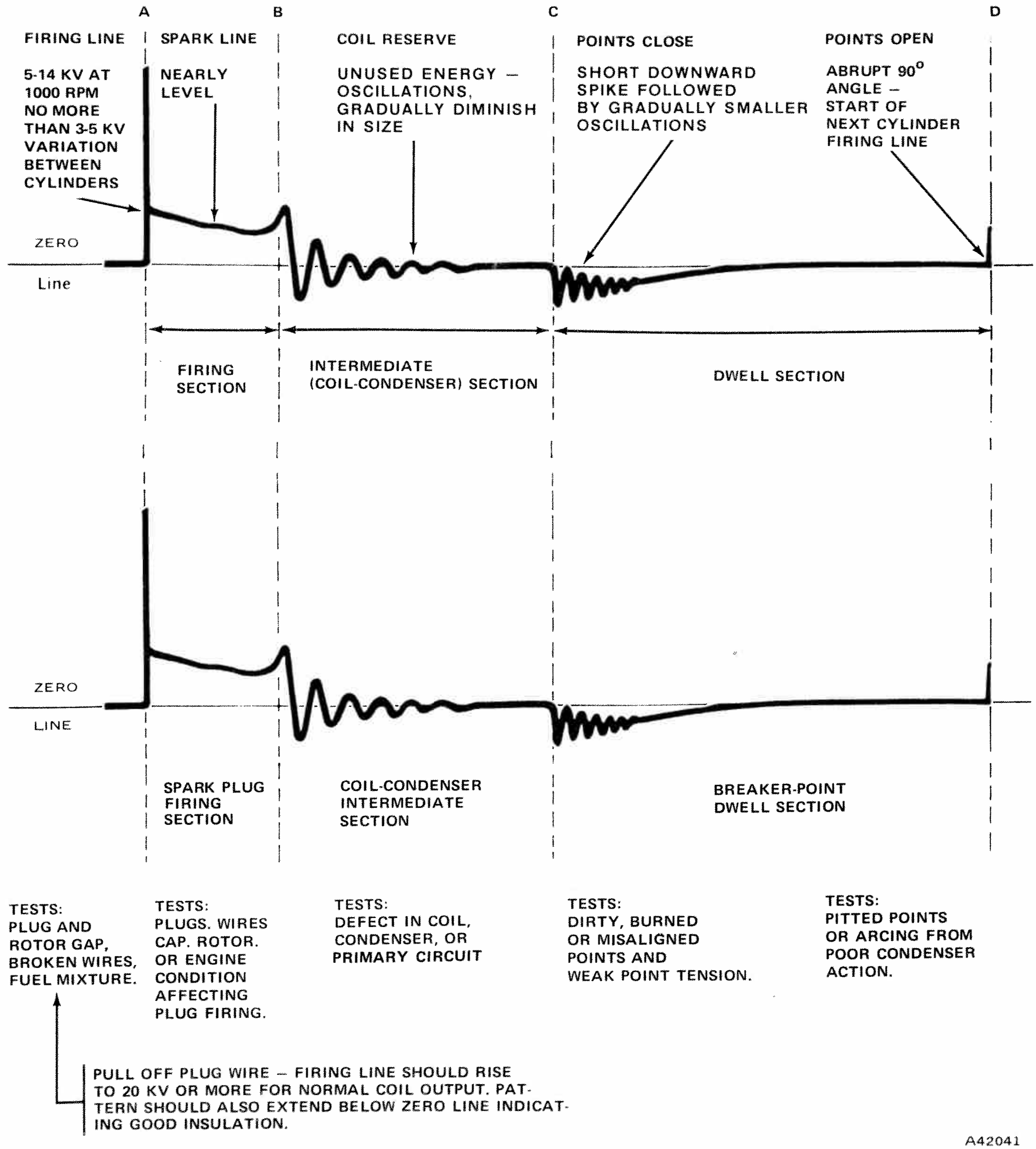

Fig. 4A-51 Individual Scope Tests

to pinpoint the problem. The specific part(s) to be further tested are indicated by the results of the area tested such as is accomplished with the use of a scope analyzer.

A scope analyzer also serves as a final check to assure that whatever repair work has been performed has corrected the problem and that the system is functioning properly.

Each manufacturer provides thorough and detailed description of the numerous capabilities and test procedures possible with their test equipment. In the case of scope analyzers, typical patterns reflecting various conditions are clearly defined in the manufacturer's manuals. A good number of scope analyzers also combine in a single unit most of the equipment necessary to perform a complete test of an operating engine.

The scope cannot automatically diagnose the operating performance of an engine; the technician must interpret the display pattern and relate it to the part(s) causing the problem.

Oscilloscope test equipment can show the technician a great deal of information. Spark plug operation is more accurately checked by using a scope analyzer as it indicates exactly how the plugs are firing during actual engine operation.

Without the aid of a scope, extensive testing is usually required to detect bad secondary wiring or reversed coil polarity. Poor or borderline condensers do not show up unless tested separately. Weak coils with shorted windings must be separately tested. Yet, all of these items and many more are checked quickly and accurately by observing the pattern on a scope. The dwell adjustment can be done with meter equipment. However, is the dwell the same for all cylinders? Is the distributor firing each cylinder at the same crankshaft degrees as the No. 1 cylinder? These problems are indicated quickly on the scope.

Most scopes use the same basic cylinder display pattern. Connections, procedures, and controls may vary from one to the other. Various modes of cylinder pattern display are possible: stacked, parade, superimposed, or individual. Simultaneous comparisons can be made to detect the particular cylinder having the problem; the cylinder then can be shown individually for further diagnosis.

The scope pattern (waveform) illustrates voltage in relationship to time. All vertical movement of the pattern trace represents voltage, one polarity when the trace is above the zero line and the opposite polarity when the trace is below the zero line; thus the oscillating pattern waveform above and below the zero line represents ac voltage. This vertical movement (voltage) can be measured by comparing the pattern to the graduations on the vertical scale of the scope screen, calibrated in kv (thousands of volts). Firing line height can be read directly in kv.

Horizontal movement of the pattern trace represents time. The scope screen horizontal scale is graduated in terms of distributor degrees of rotation. If the scope trace is adjusted so that the ignition cycle starts at zero degrees and ends as the proper degree (45 degrees, V-8 or 60 degrees, six-cylinder) on the dwell scale of the scope, this would then represent one complete ignition cycle.

Any portion of the pattern then can be accurately measured in the distributor degrees of rotation. For example, the length of the Dwell Section (described later) would indicate the time in distributor degrees that the distributor points are closed.

Once a basic pattern (waveform) of ignition system operation is understood, the use of the scope analyzer is relatively simple. It is the ignition system itself that will determine the shape of the pattern waveform because the pattern represents actual ignition system operation. Therefore, the only subject that really requires any study to become proficient in the use of the scope analyzer is subject scope pattern (waveform) interpretation.

The pattern displayed on the oscilloscope is a simple one, having just five signals to remember. Figure 4A-51 illustrates the five basic signals and the three sections of an ignition cycle.

Scope Pattern Interpretation

Primary and secondary circuits are interrelated through common ground and coil windings. This permits analysis of both sections when viewing secondary action on the scope.

Although primary waveforms are not as informative as the secondary type, ignition system problems that affect either the Intermediate (Coil-Condenser) or Dwell (Breaker Point) section of the patterns will be indicated in both types of waveforms.

Each part of the waveform represents a specific phase of ignition system operation. For the purpose of understanding and analyzing the scope analyzer pattern, it is divided into three sections: The Firing Section, the Intermediate Section (coil-condenser), and the Dwell Section.

Each section of the complete ignition cycle should be studied individually for particular problems; overall review of the complete cycle can be confusing. Scope manufacturer's manuals are quite thorough in describing and illustrating various conditions that cause the pattern to vary from the normal operating ignition cycle.

Firing Section

This portion of the pattern illustrates the actual firing of the spark plug and is composed of only two lines:

Firing Line - A vertical line indicating the voltage (peak or spike) required to overcome the spark plug and rotor gaps.

Spark Line - A horizontal line indicating the voltage required to maintain the spark.

Two separate events involve the firing of the spark plug. The first is the creation of the firing or ionization voltage. The second event is the arc maintaining voltage or spark line.

Point A in the typical pattern (fig. 4A-51) represents the instant at which the breaker points have separated causing a magnetic field to collapse through the coil windings. The discharge or resulting high voltage is indicated by the vertical rise or spike in the pattern. The height of A indicates the voltage required to fire the spark plug and bridge the rotor gap, sometimes referred to as the firing or ionization voltage.

Firing voltage is the amount of voltage required to establish a spark across the electrodes of a spark plug. In a running engine, the actual amount of voltage required to fire a particular spark plug at a particular instant depends on the net result of many factors such as rotor gap, breaks in the secondary wires, spark plug gap, spark plug electrode shape, improperly connected wire terminals, temperature, compression, air-fuel ratio, engine speed, and load.

Since current does not flow in the secondary until the arc is formed across the plug, the peak voltage is created with no current flowing in the secondary. In order to detect resistance in a circuit, current must be passed through the circuit. Therefore, peak voltage readings do not indicate resistance in the secondary.

Actual firing voltages can be easily measured at any reasonable engine speed by observing the height of the firing line on the secondary pattern of each cylinder. At any given engine speed, the firing voltage of all cylinders of an engine should be fairly uniform and within a normal range for that particular engine. engine.

Available voltage is the maximum voltage an ignition system is able to produce under a given operating condition. The ignition coil will produce its maximum secondary voltage whenever it attempts to fire an impossible gap, such as when a spark plug wire is removed from a spark plug and held at a distance from ground. Available voltage is always greater than the voltage requirements generally encountered under normal operating conditions. The difference in available voltage and that actually required to fire the spark plugs is the Ignition Reserve.

The maximum secondary voltage available from the ignition system depends on the combined effect of coil design, coil condition, applied primary voltage, primary circuit resistance, distributor contact condition, dwell angle and engine speed. The normal functioning ignition system is capable of producing well over 20,000 volts and may even produce as high as 30,000 volts. However, should any of the factors involved in the operation of the ignition system deteriorate from their normal condition or adjustment, it will usually result in a change in available voltage values. Therefore, measuring the available voltage or coil reserve provides a quick means of determining the overall efficiency of any particular system.

Once the plug fires, there is a noticeable drop in secondary voltage to point B. As the spark continues to bridge the gap, the spark voltage remains at a fairly constant low value until the spark extinguishes at point C.

A normal spark line is 4 degrees to 7 degrees (read on horizontal scale of scope) at 1000 rpm. If the spark line is not normal, then the spark plug is not firing correctly, probably due to condition of spark plugs, secondary wiring, rotor, cap, or combustion chamber problems.

Once the arc has been formed across the spark plug gap, the voltage reduces to a value needed to maintain the arc across the plug. As long as the coil can supply the lower voltage, the arc will remain. The duration of this spark forms the spark line.

The spark will burn as long as the coil can supply the proper energy. The spark line ends only because the coil has run out of energy. The spark line length is a measure of the reserve of the coil. If the coil has very little reserve after ionizing the gap, all spark lines will be short. If the reserve is high, all spark lines will be long. This will not indicate the maximum reserve of the coil due to its built-in capacity, but does indicate the voltage left in the coil after the plug gap is fired. This reserve or remaining voltage is basically controlled by degrees of dwell and resistance in the secondary circuit.

Intermediate (Coil-Condenser) Section

This portion of the pattern, which immediately follows the Firing Section, is seen as a series of gradually diminishing oscillations which disappear or nearly disappear by the time the Dwell Section begins. Beginning at Point B, the remaining coil energy dissipates itself as an oscillating current which gradually dies out as it approaches Point C. The oscillation results from the combined effects of the coil and the condenser in dissipating energy.

The Intermediate Section represents the dissipation of the energy remaining in the coil after the spark plug has ceased firing and can be observed when each cylinder's pattern is displayed individually.

The number of oscillations that can be observed depends on a number of factors such as dwell angle, engine speed, duration of spark, degree of coil saturation and coil and condenser condition. There must be at least 4 oscillations in this section (at 1000 rpm). Usually there are 5 or 6. Note the rate at which these oscillations diminish. Normally, they should diminish gradually, but should the system contain a weak coil or leaky condenser, they will dimish to zero rapidly. In this case, probably only one or two oscillations will be seen at an engine speed of 1500 rpm, providing the dwell angle and firing section are normal.

Under operating conditions where the firing line is quite long or the dwell angle is greater than specified, the intermediate section may be shortened by the closing of the breaker points before all of the coil energy has been dissipated. Under these conditions, fewer than normal oscillations having a fairly high amplitude at the instant of point closing may be displayed.

This indicates that the energy level in the coil is still quite high at the time of point close and does not necessarily mean that the coil or condenser are defective.

Dwell Section

This portion represents the period of time during the ignition cycle in which the distributor contact points are closed. The Dwell Section begins at point C when the contact points close. Closing the points causes a short downward line followed by a series of small rapidly diminishing oscillations. These oscillations represent the buildup of the magnetic field around the coil that occurs when the contact points are closed. The dwell section continues until the points open at the beginning of the next waveform (point D).

In analyzing this section of the pattern, the point close and the point open portions should be carefully observed. Normally, when the points close, this action is seen as a short vertical line followed by a series of diminishing oscillations. The first line should be higher than any of the oscillations following. If the first line is not as long as one or more of the following, it indicates poor point contact. If the oscillations start to die out and then start again, it indicates a point bounce condition.

When the contact points open, the end of the dwell section should appear as a clean right angle formed by the horizontal dwell line and the vertical firing line of the next cylinder pattern. Point arcing upon opening of the contact points will be seen at the right end of the dwell section just prior to the firing line of the next pattern. This will appear as a false start to firing, followed later by the actual firing line, or by a hook at the end of the point close signal.

Proper distributor point dwell is important to the overall operation and efficiency of the ignition system. It should be set to assure adequate coil saturation to meet the firing requirements at all engine speeds. Dwell angle can be accurately measured on most scopes.

The accuracy of the distributor cam determines the ignition timing relationship of all cylinders. Should one or more lobes of the distributor cam become worn or should the distributor shaft be bent, uneven timing of the various cylinders would result.

Cam lobe accuracy can be checked by superimposing all of the cylinders on parade type pattern scopes. On a multiline raster scope, the vertical alignment of all of the point open signals shows immediately any condition that affects timing from one cylinder to the next.

JEEP TUNE-UP SPECIFICATIONS (ON VEHICLE)

Engine CID	Trans.	Spark Plugs	Break Arm Tension	Condenser Capacity	Point Gap	Cam Dwell Angle	Initial Timing - @700 RPM or Less With Vacuum Hose Disconnected		Curb Idle Speed (RPM)		Distributor Model Number	Vacuum Unit Number	Total (2) Advance @2000 RPM	Centrifugal Advance	
							Set-To	OK Range	Set-To	OK Range				Degrees	RPM
232	Man.	N-12Y Gap — .033-.037 Inches	17-21 oz.	18-23 Mfd.	.016 Inch.	31°-34°	5°	4°-6°	600	550-650	110 529	449	27°-36°	0-4 9-14 14-18 14-19	1000 1600 2000 3000
258	Man.						3°	2°-4°	600	550-650					
	Auto.								550 (1)	500-600					
304	Man.					29°-31°	5°	4°-6°	750	700-800	1112179	448	29.5°-37.5°	0-2 9-13 16-19.5 21.5-25.5	800 1500 2000 3000
360 (2V)	Man.								750	700-800	1112112	448	28.5°-37°	0-3.5 7-11 15-19 19.5-23.5	1000 1500 2000 3000
	Auto.								700 (1)	650-750	1112215	450	26.5°-35.5°	0-3 10-14.5 13-17 18.5-23	800 1500 2000 3000
360 (4V)/401	Man.								750	700-800					
	Auto.								700 (1)	650-750					
401 Heavy Duty (Painted Red)	Man.						2.5°	1.5°-3.5°	650	600-700					
	Auto.								600 (1)	550-650					

(1) Idle To Be Set With Transmission In Drive and Park Brake Applied. Do Not Accelerate Engine. Air Conditioning Must Be 'Off' For Final Idle Setting.

(2) Disconnect TCS Wires At Solenoid Vacuum Valve

J41294

JEEP DISTRIBUTOR SPECIFICATIONS (ON DISTRIBUTOR TESTER)

Distributor Model Number	Vacuum Unit Number	Distributor Degrees and RPM				
		Centrifugal Advance		Vacuum Advance (Inches of Mercury)		Full Vacuum Advance Degrees
		Degrees	RPM	Start	Full	
1110529	449	0-2 4.5-7 7-9 7-9.5 10-13 12-14	500 800 1000 1500 2000 2300	5-7	12.75-13	6.5-9
1112179	448	0.1 4.5-6.5 8-9.75 12.5-13.5 15-17	400 750 1000 1600 2200	5-7	11.25-12.75	6.75-8.25
1112112	448	0-1.75 4.5-6.5 7.5-9.5 9.75-11.75 12-14	500 800 1000 1500 2000	5-7	11.25-12.75	6.75-8.25
1112215	450	0-1.5 4-6.75 6.5-8.5 10-12 14-16	400 600 1000 1600 2200	4-6	11.5-13	6.75-8.25

J41292

SPECIFICATIONS

Accelerator Pump - Snap throttle
from 1000 rpm .... 1 to 1-1/2 AFR Enrichment

Belt Tension
Predelivery or belt with previous service (Except V-8, W/AC) .... 90-115 lb
V-8, W/AC .... 105-130 lb
New Belt .... 125-155 lb
Air Pump*
Hand-tighten (50 lbs. maximum - new belt) .... 35-45 lb
*If driven by AC belt, use tension specified for W/AC

Cam Lobe Variation - At 1000 rpm .... 2^{o} max.

Carbon Monoxide Level at Idle
Six-cylinder w/o Air Guard 1.0-1.5%
Six-cylinder with Air Guard 0.5-1.0%
V-8 with Air Guard 0.5-1.0%

Carbon Monoxide Level at 1000 RPM
Six-cylinder 0.5%
V-8, 2V - automatic 0.7%
V-8, 2V - manual 0.3%
V-8, 4V - all 0.5%

Cranking Vacuum - This test must have operating battery voltage, completely closed throttle valve(s), PCV valve completely closed .... 9 inches/min.

Cranking Voltage - Engine at operating temperature .... 9.6 v/min.

Dwell Variation - From idle to 1000 rpm
(on dwell meter) .... 3^{o} max.

Ignition Coil

Engine	Six Cylinder	V-8	
Manufacturer	Delco-Remy or AMC	Delco-Remy	AM
Primary Resistance (Ohms)	1.40-1.65 @75° F	1.77-2.05 @75° F	1.64-1.80 @75° F
Secondary Resistance (Ohms)	3,000-20,000 @75° F	3,000-20,000 @75° F	9,300-11,800 @75° F

Coil Output - When cranking, coil H.T. lead removed from dist., battery, voltage of 9.6 min. .... 24 kv min.

Maximum Starter Draw .... 180-220 amps max.
Rotor Air Gap - At 1000 rpm .... 5-8 kv
Spark Plug - Firing Voltage at 1000 rpm .... 5-14 kv

1974 JEEP EMISSION CONTROL SYSTEMS APPLICATION CHART

Jeep Model	CJ-5/6			
Model Code	83 and 84			
Engine CID	232/258		304	
Transmission	M			
Emission Control System	NW	Cal.	NW	Cal.
Air Guard			•	•
Engine Mod	•	•	•	•
EGR	•	•	•	•
TAC	•	•	•	•
TCS	•	•	•	
TVS				
Spark CTO	•	•	•	•
PCV	•	•	•	•
FTVEC	•	•	•	•
BPS				
Electric Choke				
VTM				•

Jeep Model	Cherokee									
Model Code	16 and 17									
Engine CID	258		360 (2V)				360 (4V)		401	
Transmission	M	A	M	A	M	A	A		A	
Emission Control System	NW		NW		Cal.		NW	Cal.	NW	Cal.
Air Guard	•	•	•	•	•	•	•	•	•	•
Engine Mod	•	•	•	•	•	•	•	•	•	•
EGR	•	•	•	•	•	•	•	•	•	•
TAC	•	•	•	•	•	•	•	•	•	•
TCS	•	•	•	•						
TVS			← Standard Cooling Only →							
Spark CTO	•	•	•	•	•	•	•	•	•	•
PCV	•	•	•	•	•	•	•	•	•	•
FTVEC	•	•	•	•	•	•	•	•	•	•
BPS						•		•		
Electric Choke							•	•	•	•
VTM					•					

Jeep Model	Wagoneer					
Model Code	14 and 15					
Engine CID	360 (2V)		360 (4V)		401	
Transmission	A		A		A	
Emission Control System	NW	Cal.	NW	Cal.	NW	Cal.
Air Guard	•	•	•	•	•	•
Engine Mod	•	•	•	•	•	•
EGR	•	•	•	•	•	•
TAC	•	•	•	•	•	•
TCS	•		•			
TVS	← Standard Cooling Only →					
Spark CTO	•	•	•	•	•	•
PCV	•	•	•	•	•	•
FTVEC	•	•	•	•	•	•
BPS		•		•		
Electric Choke			•	•		
VTM						

Jeep Model	Truck									
Model Code	25 and 45									
Engine CID	258		360 (2V)				360 (4V)		401	
Transmission	M	A	M	A	M	A	A		A	
Emission Control System	NW		NW		Cal.		NW	Cal.	NW	Cal.
Air Guard	•	•	•	•	•	•	•	•	•	•
Engine Mod	•	•	•	•	•	•	•	•	•	•
EGR	•	•	•	•	•	•	•	•	•	•
TAC	•	•	•	•	•	•	•	•	•	•
TCS	•	•	•	•			•			
TVS			← Standard Cooling Only →							
Spark CTO	•	•	•	•	•	•	•	•	•	•
PCV	•	•	•	•	•	•	•	•	•	•
FTVEC	•	•	•	•	•	•	•	•	•	•
BPS						•		•		
Electric Choke							•	•	•	•
VTM					•					

Jeep Model	Truck							
Model Code	46 (Heavy Duty)							
Engine CID	360 (2V)				401			
Transmission	M	A	M	A	M	A	M	A
Emission Control System	NW		Cal.		NW		Cal.	
Air Guard	•	•	•	•	•	•	•	•
Engine Mod	•	•	•	•	•	•	•	•
EGR	•	•	•	•	•	•	•	•
TAC	•	•	•	•	•	•	•	•
TCS								
TVS	← Standard Cooling Only →							
Spark CTO	•	•	•	•	•	•	•	•
PCV	•	•	•	•	•	•	•	•
FTVEC			•	•			•	•
BPS								
Electric Choke								
VTM	•	•	•	•	•	•	•	•

Engine Mod - Emission Calibrated Distributor, Carburetor, Camshaft
Air Guard - Air Injection System
EGR - Exhaust Gas Recirculation System
TAC - Thermostatically Controlled Air Cleaner
TCS - Transmission Controlled Spark System
TVS - Thermal Vacuum Switch
Spark CTO - Coolant Temperature Override Switch (160°)
PCV - Positive Crankcase Ventilation System

FTVEC - Fuel Tank Vapor Emission Control System
Electric Choke - Electric Assist Choke
BPS - Back Pressure Sensor
VTM - Vacuum Throttle Modulator
M - Manual Transmission
A - Automatic Transmission
NW - Nationwide application
Cal. - California only

J41293

TECHNICAL SERVICE LETTER REFERENCE

Date	Letter No.	Subject	Changes information on Page No.