PHASE 5
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UNIVERSAL TECHNICAL INSTITUTE

PHASE 5 - TUNE UP AND EMISSIONS

LIST OF LAB PROJECTS

INSTRUCTOR_____

STUDENT'S NAME_____

COLD TIME ENGINE.	CHECK HEATED AIR INTAKE DOOR OPERATION.	INSPECT AND SERVICE EXHAUST THERMOSTATIC CONTROL VALVE.	TEST T.C.S./T.R.S. SYSTEM.	TEST A.I.R. SYSTEM.	TEST E.G.R. SYSTEM.	PERFORM MINOR TUNE UP.	PERFORM MAJOR TUNE UP.	DIAGNOSE CHRYSLER ELECTRONIC IGNITION SYSTEM.	DIAGNOSE G.M. H.E.I. SYSTEM.	DIAGNOSE FOMOCO ELECTRONIC IGNITION SYSTEM.							

Step by Step Tune-Up Procedure

1. Diagnose – Get the Story
2. Clean and inspect battery
3. Test battery
4. Test cranking voltage
5. Test compression
6. Replace or service spark plugs
7. Inspect coil
8. Inspect distributor cap and rotor
9. Inspect primary wires and secondary cables
10. Replace breaker points
11. Replace condenser
12. Lubricate distributor cam
13. Set breaker point dwell angle
14. Set ignition timing
15. Check centrifugal advance action
16. Check vacuum advance (and retard) action
17. Inspect drive belt condition and test belt tension
18. Test generator or alternator output
19. Test voltage regulator
20. Test charging system insulated and ground circuits
21. Test charging voltage
22. Service manifold heat control valve
23. Service carburetor air cleaner (check action of hot air damper)
24. Replace positive crankcase ventilation system valve
25. Test emission control and EGR Systems, as required
26. Replace fuel filter
27. Test fuel pump
28. Adjust carburetor (use "Lean roll" procedure on E.E.C. engines)
29. Adjust valve clearances (if necessary)

SOLID STATE IGNITION SYSTEMS
GM • FORD • CHRYSLER
• AMERICAN MOTORS

A SPECIAL WORD ON MEASUREMENTS AND METER READINGS IN SERVICING ELECTRONIC IGNITION SYSTEMS

The car manufacturers are constantly upgrading and improving their electronic ignition systems. Because of this there are often discrepancies between meter readings at the same service terminal point in different model years. This is often the result of subtle changes in circuitry and component characteristics. Therefore, in order to make this service bulletin as practical, and as up-to-date as possible, **we have given our measurements in a range of values rather than specific numbers.**

For instance: we show in certain resistance measurements that a component should not be changed if the resistance measurement is "below 1 ohm"—as opposed to "0.4-0.7 ohms". It precludes such admonitions as: "In '75 models 0.4-0.0. and in '76 (early) 0.3-0.0. ohms, and later models use 0.4-0.7". The unit should not be changed if the resistance is between 0 and 1 ohm—so, that's what we say!

However, the final word should always be the car manufacturers service manual, and if you want absolute assurance of the "critical" measurements, refer to the specific car manual.

In addition, where meter measurements determine the failure of a part, and call for its replacement, **make certain** you take the same sequence of readings AFTER installing the new replacement to be sure it's in properly, and it's operative.

THE SMART PROFESSIONAL CHECKS AND DOUBLE-CHECKS HIS SERVICE PROCEEDURES.

PRINCIPLES OF OPERATION

In a conventional ignition system the current flows through the ignition coil primary and through the closed points to ground; this flow is interrupted when the cam and rubbing block cause the breaker points to open. The magnetic field in the coil collapses, inducing a high voltage in the secondary, which fires the spark plugs.

In the electronic ignition system, a toothed gear on the distributor shaft called a reluctor replaces the cam and rubbing block. The reluctor rotates close to (but never touches) a permanent magnet in the pick-up unit. As the reluctor rotates past the pole piece on the pick-up coil, it causes a rapid change in magnetic field which induces a timing pulse in the pick-up coil. This current pulse going to the control unit causes the transistor switch in the control unit to open and interrupt the primary current in the ignition coil. High voltage is induced in the secondary and a spark occurs at the spark plug.

The length of time that current in the ignition coil is interrupted is determined by the control unit. Thus, the "dwell" is "built in" and is always correct unless the control unit is faulty.

PRELIMINARY TESTING

A. GENERAL

If special test equipment is available, perform the trouble shooting procedures with this equipment. (*However,* special test equipment is not required.) A conventional voltmeter and ohmmeter or a multimeter (VOM) can be used efficiently to locate and pinpoint faults in the ignition system's primary circuit.

Since the electronic ignition system works basically the same way as a conventional breaker point system, it is subject to the same trouble sources. Check the following items first:

1. **Be sure battery is in good condition.**
2. **Be sure alternator belt has proper tension.**
3. **Inspect condition of cap, spark plug wires and spark plugs.**
4. **Be sure cable connections at battery are clean and tight. Battery terminal marked Neg. (–) must be installed to ground.**
5. **See that the wiring terminal connectors from distributor and electronic module are securely attached. Check spark plug leads for hook-up to correct cylinders. Don't overlook tower high-tension lead from coil to distributor cap. (Except in case of GM HEI 8-cylinder and V-6 systems.) Be sure lead terminals are secure in their respective sockets.**
6. **At times a malfunction will become evident *only under normal operating conditions.* Therefore, it may become necessary to perform certain trouble shooting procedures under actual field service conditions.**

Problems such as fouled plugs or a defective wiring harness in the high voltage system can be handled in the same manner as in the conventional point set system.

B. IGNITION SECONDARY CHECKS

In the ignition tests, for all electronic ignition systems, the secondary circuit should be checked first. To do this:

1. **Remove a spark plug wire and hold it not more than ¼" from a good engine ground.**
2. **Crank engine and see if a good spark is produced. Be careful about that ¼" because a larger gap may cause arcing from rotor to pick up coil inside the distributor and this could damage the electronic control unit.**
3. **If a good spark is present, the problem is most likely not in the ignition system and other areas must be looked into, such as fuel system, spark advance, etc. If no spark is present, refer to the specific test checks for the particular vehicle in this Bulletin.**

C. WARNINGS • CAUTIONS • CONSIDERATIONS

In servicing electronic ignition, there are certain hazards to look out for! In the GM and Ford electronic systems, the high tension voltage is considerably greater than a conventional ignition system. Exercise great care when working in areas where secondary voltages are present.

When testing transistorized equipment, all connections must be made with power off. Before turning ignition switch "on", always check for shorts to ground particularly around wire support clips or wire tunneled unprotected through holes in body sheet metal. A short can destroy a transistor in a fraction of a second. When taking meter reading, turn ignition switch to "on" position. Then turn to "off" position when reading is completed. Never disconnect any unit with power "on". This may create a voltage peak (spike) which is highly destructive to transistors.

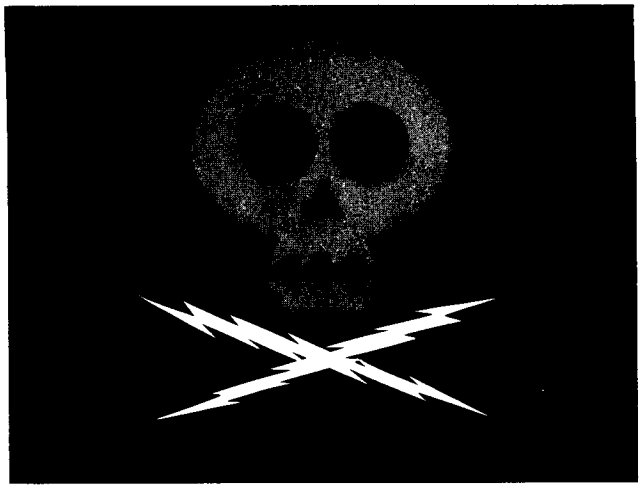


FIG. 1-CAUTION

SERVICING GM HEI SYSTEM

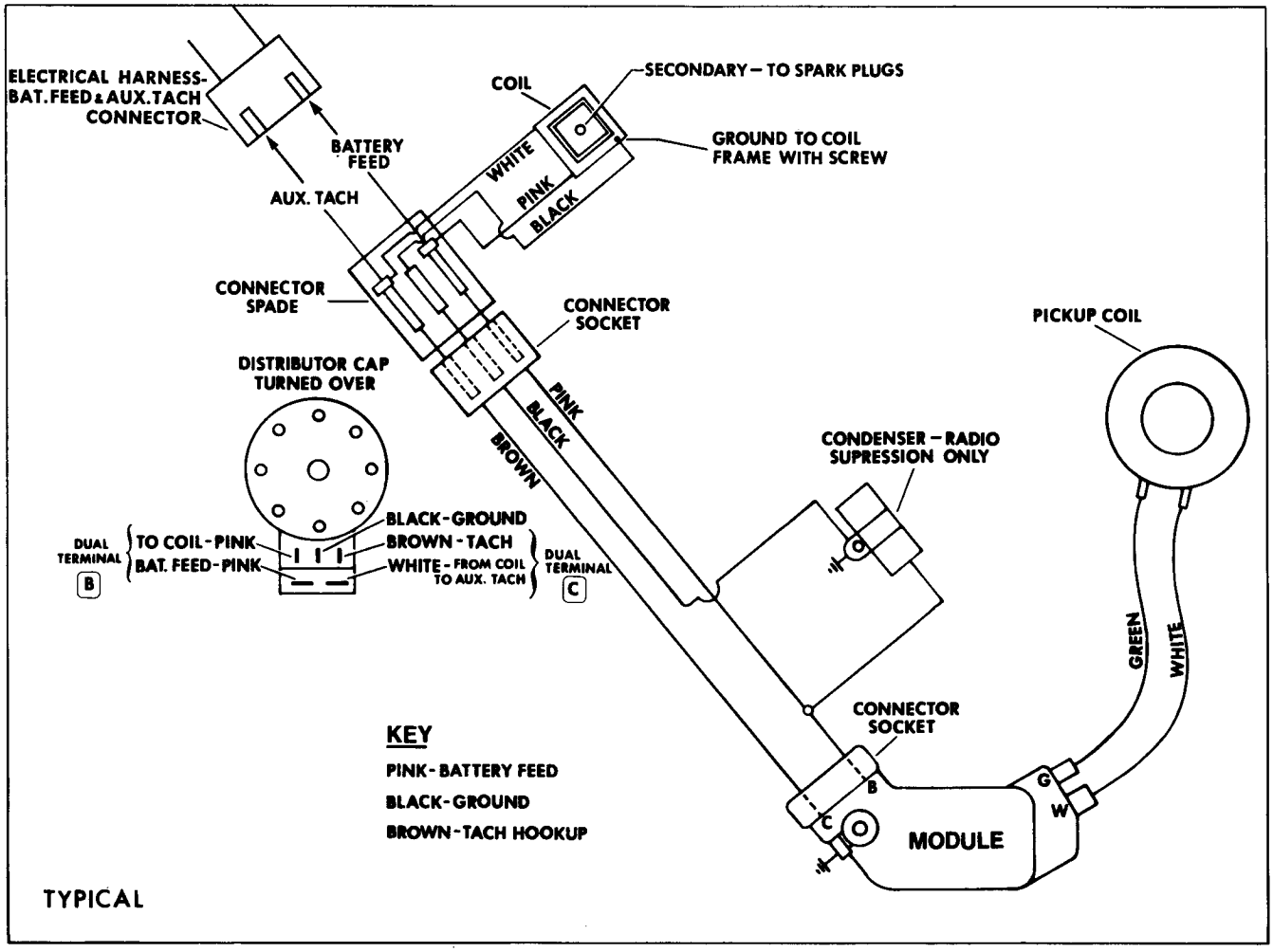


FIG. 2-WIRING DIAGRAM-HEI SYSTEM

SERVICING GM HEI SYSTEM

DESCRIPTION

Type of System

Transistorized: Triggered by a magnetic impulse unit. V8, V6, L6 and L4 engines.

Ballast Resistance

No ballast resistor used.

Ignition Coil Resistance

Special coils: V8 and V6 engines have the coil integral with distributor cap. L4 and L6 engines utilize external coil. Primary resistance; less than 1 ohm.

Secondary Resistance

L4 and L6 engine coils 5000 to 10,000 ohms.
V6 and V8 engine integral with cap, 10,000 to 30,000 ohms.
Note: Before 1975, coils had three wires or terminals. After 1975, coils had four wires or terminals.

Pick-Up Coil Resistance

500-1500 ohms.

Distributor Cap and Rotor

Special

Air Gap (pick up coil and reluctor)

Non-adjustable

Control Unit

Sealed module. (Mounted inside distributor).

TROUBLE SHOOTING

Where disassembly is required to test or replace a component refer to sections on disassembly instructions for V8 and V6 engines and for the L6 and L4.

1. Connecting Tach

a) V6 and V8 (integral coil)

When connecting tachometer, observe the following precautions: Tach terminal C (Fig. 2) of distributor connector must not be grounded or shorted to the other coil terminal. An adapter may be required between distributor and distributor connector to provide access to C terminal for a primary tach hook-up. If adapter is unavailable, carefully remove coil cover exposing terminals C, GRD and B. Be sure to connect tach to terminal C and other tach lead to ground.

b) L4 and L6 engines

The tachometer may be connected to the brown lead terminal at the ignition coil.

2. Failure of Engine to Start

Separate the 2-wire electrical harness (Battery Feed Connector) at the distributor. For V8 and V6 engines, hook up voltmeter to TERMINAL B (BAT) of harness socket end (not distributor side). For L4 and L6 engines, connect voltmeter to red wire terminal of harness connector leading from the distributor. Turn ignition on. If meter indicates BAT voltage, replace connector and check for high voltage at spark plugs.

Caution! Because of the deep protective boots at the spark plug end of the ignition wire the usual spark test causes too long a spark gap and damage to the module can be caused by resulting arcing in the distributor.

To perform a spark test use an external plug with its gap opened wide. Ground the plug frame to the engine then insert plug into ignition wire. With this safe spark gap installed, crank the engine. If a high intensity blue spark is generated, malfunction is not in distributor. Inspect spark plugs and check out fuel system. If sparking does not take place, then follow up by referring to paragraph entitled "ELECTRICAL COMPONENTS TESTING."

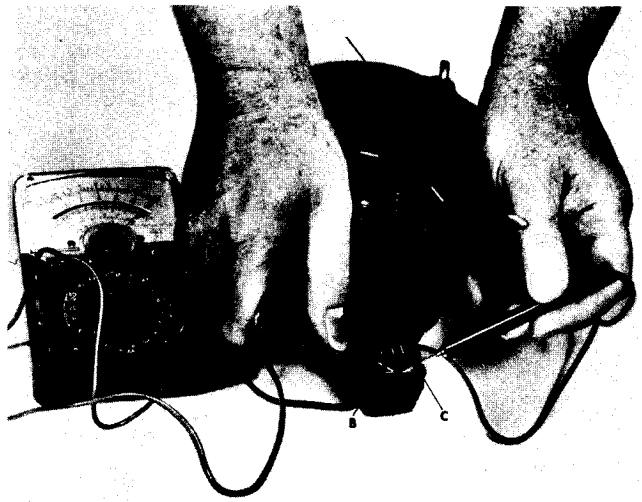


FIG. 3-RESISTANCE CHECK-COIL PRIMARY CIRCUIT

3. Engine Runs Erratically

Check ignition timing, operation of vacuum and centrifugal advance mechanisms, delivery of fuel and operation of carburetor. Check spark plugs for defects and vacuum hoses for leaks. Perform compression test. If malfunction cannot be found or is corrected but erratic condition still exists, then perform electrical components tests as below.

ELECTRICAL COMPONENTS TESTING

V6 and V8 Engines Distributor

1. Cap and Coil Check

a. First remove electrical harness (Battery Feed Connector—2 terminal type), then remove cap-to-distributor connector (3 terminal type). Then lift off distributor cap and coil assembly by turning four cap-to-housing latches ¼ turn. Check cap and coil assembly and rotor for cracks and carbon tracks (arc-over). Replace faulty unit if required.

b. Hook up ohmmeter on low range and check continuity across terminals B and C (Fig. 3). Meter reading should read less than 1 ohm (ignition coil primary). If not, replace coil.

c. In May of 1975, the coil design was changed in V8 and V6 HEI systems. The secondary winding was formerly connected to the primary winding. In coils made since May, 1975, the secondary winding is connected to ground. Secondary resistance of earlier coils is measured between the "Tach" terminal and the carbon brush inside the cap. Secondary resistance of later coils is measured between

the ground terminal and the carbon brush. Reading should be between 10000 & 30000 ohms. The diagram below (Fig. 4) illustrates ohmmeter connections for measuring secondary resistance of either type of HEI coil.

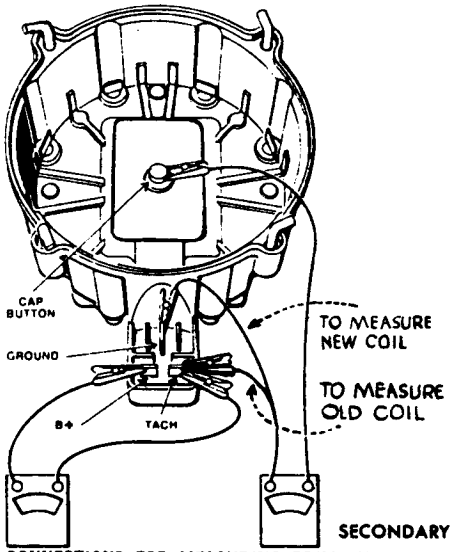


FIG. 4-OHMMETER CONNECTIONS FOR MEASURING PRIMARY AND SECONDARY RESISTANCE OF HEI COIL

d. Lift out coil and check for carbon tracks (arc-over) at spring and seal. If arc-over is present, replace cap unit involved. Reinstall coil in new cap if found to be OK.

2. Cap and Coil Check for L4 and L6 Engines

The coil in the L4 and L6 engine is electrically and physically identical to the V6 and V8. The difference is that the L4-L6 coil is mounted on the engine block, and not in the distributor cap. All the measurements and basic replacement determinations are identical to the V6-V8 coils, except that secondary coil resistance should be between 6000 and 15,000 ohms.

The distributor cap is also identical in appearance and electrical characteristic.

3. Pick Up Coil and Vacuum Advance Check

a. **Short to Ground Test**—Disconnect pick-up coil leads from terminals marked W and G on module. Set ohmmeter to mid-range scale. Connect one ohmmeter lead to ground, the other lead to a pick-up coil wire terminal. The meter reading must be infinite. If not, replace coil. If an external vacuum source is available, perform same test as above while actuating vacuum advance unit. The reading must remain infinite throughout entire vacuum operational range.

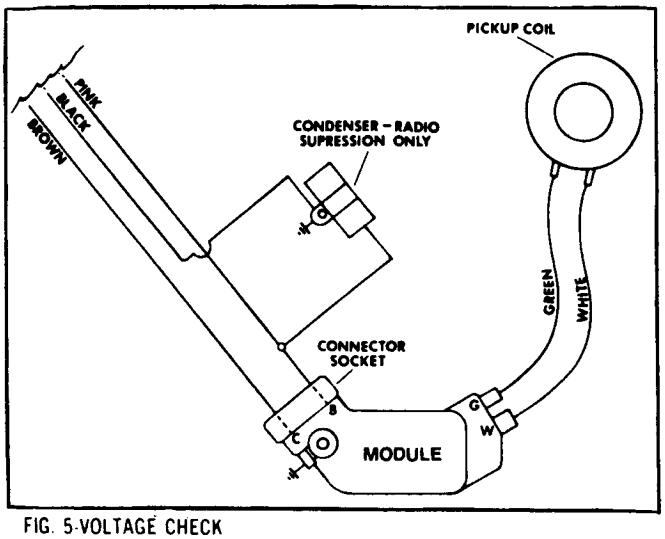


FIG. 5-VOLTAGE CHECK

b. **Open Circuit or High Resistance Test**—With pick-up coil wire leads W and G still disconnected, hook up ohmmeter test leads to the two pick-up coil wire terminals. The meter reading must indicate not less than 500 ohms or more than 1500 ohms.

NOTE: *Shake wiring during test and observe meter for deflections indicating poor or loose connections.*

4. Voltage Check (FIGURE 5)

a. Remove connector from module at terminals B and C.

b. Connect voltmeter and leads to terminal B at connector and other meter lead to ground.

c. Place ignition switch to "ON" position. Meter should read full battery voltage. If meter reading is zero, further test by referring to paragraph entitled "FAILURE OF ENGINE TO START."

d. Turn ignition switch to "OFF" position.

5. Electronic Module

If no fault has been found upon completion of the preceding test procedures, then substitute a STANDARD electronic module, LX-301, into the circuit. If the ignition system works properly with the replacement, discard original since it is nonrepairable.

REMOVAL AND DISASSEMBLY (Distributor in Engine V6 and V8) (FIGURE 6)

1. Removal and Replacement of Coil

(a) Turn off ignition.

(b) From distributor cap remove battery feed and module wire connectors.

(c) Remove three attaching screws then lift off coil cover from distributor cap.

(d) Remove 4 screws at corners of coil frame.

(e) Move ground wire aside and carefully lift out coil along with wire leads and dual terminals.

(f) Lift out and clean coil spring and rubber seal washer.

(g) Apply coating of dielectric lubricant to rubber seal washer.

(h) To install, reverse above procedures.

DO NOT CRISS-CROSS COIL WIRE TERMINALS IN DISTRIBUTOR CAP CONNECTOR. WHEN REPLACING COIL WIRES, LOCATE AS FOLLOWS:

Wire Color*	Terminal Type	Connector Markings
Red	Dual	B + BAT
Yellow	Dual	C TACH
Black	Single	GRD

**Wire color coding is typical. However, variations may occur from year to year and model to model. (Check manual)*

2. Removal and Replacement of Distributor Cap.

(a) Follow procedures as outlined in paragraphs (a) and (b) of Removal and Replacement of Coil.

(b) Remove spark plug wires from distributor cap after first noting location for reassembly. It may be necessary to first remove plastic retaining ring.

(c) Push down, twist ¼ turn counter clockwise to release four distributor cap retainers.

(d) Follow procedures as outlined in paragraphs (c) through (f) of Removal and Replacement of Coil.

(e) To reassemble, reverse order of disassembly.

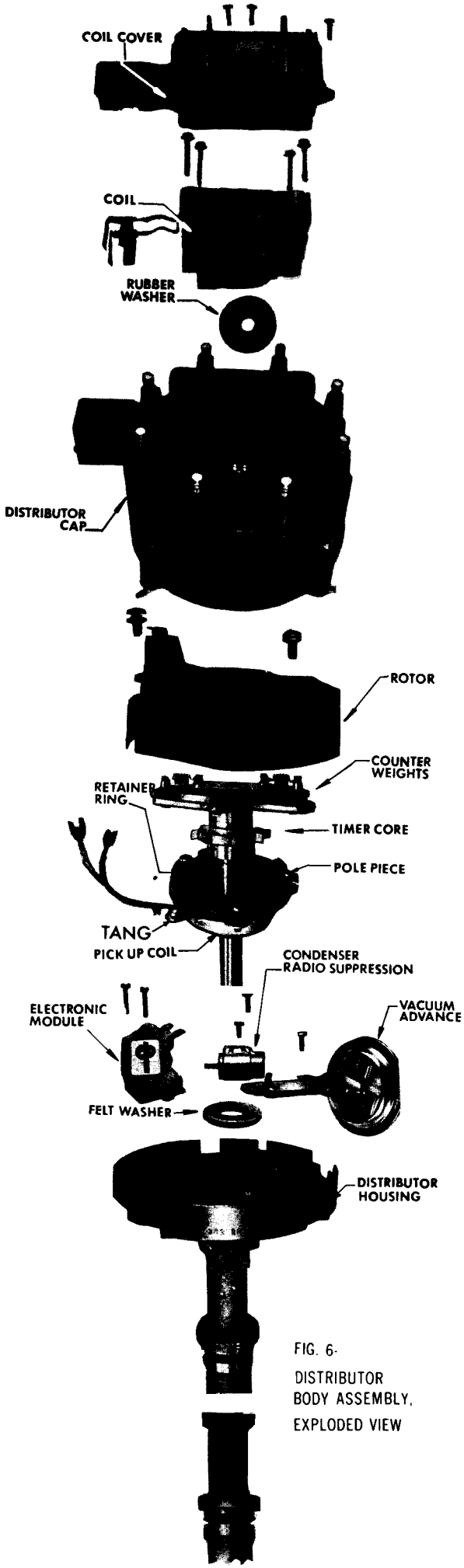


FIG. 6-
DISTRIBUTOR BODY ASSEMBLY, EXPLODED VIEW

3. Removal and Replacement of Vacuum Advance.

(a) Remove distributor cap and coil assembly as indicated in previous removal and replacement paragraphs. Also remove two rotor screws and lift off.

(b) Pull off hose and remove two vacuum advance hold-down screws.

(c) Slide diaphragm mounting bracket section outward, at the same time twist and unhook connecting rod from pick-up coil tang.

(d) Assemble unit in reverse order of disassembly.

4. Removal and Replacement of Electronic Module.

(a) Remove distributor cap and rotor as previously indicated in prior paragraphs.

(b) Loosen and remove two screws from module.

(c) Position module so as to disconnect harness connector and pick-up coil spade terminals. *(NOTE: Different size spade terminals prevent interchange).*

(d) Lift off module.

IMPORTANT—Apply coating of STANDARD #SL-3 Silicone Grease supplied with STANDARD LX-301 control module to mounting surface in distributor before installing. *(This is very important for conducting heat away from the control module.)*

5. Removal and Replacement of Pole Piece and Pick-Up Coil Assembly.

Distributor must be removed from engine and disassembled in order to replace pole piece and pick-up coil. Distributor rotor must remain attached to shaft.

(a) Remove distributor cap and coil assembly as described previously. **Do not remove distributor rotor.**

(b) Mark position No. 1 of rotor to housing and housing to engine. Upon removal of distributor from engine, mark position No. 2 of rotor to housing. The purpose of marking two positions for distributor shaft removal is that when disengaging spiral gears, the distributor shaft will rotate to another position. (No. 2)

(c) With distributor removed, mark position of drive gear with relation to distributor shaft.

(d) Position distributor on firm support and prepare to remove drive gear.

(e) Use a 1/8" pin punch to drive out roll pin and separate washer shim and drive gear from shaft.

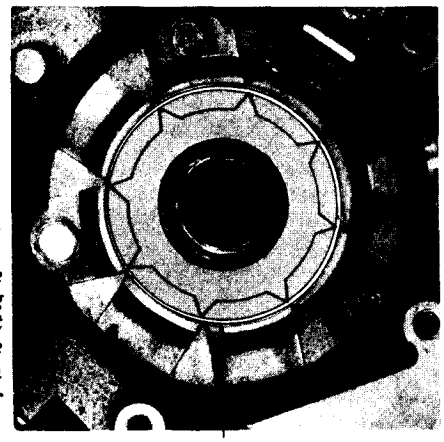
(f) Carefully slide out shaft from housing.

(g) From upper end of housing remove retaining ring and slide off pole piece with pick-up coil as a unit. Be careful not to lose felt lubricating washer under pick-up coil assembly.

(h) Assemble unit in reverse order of disassembly. Pay careful attention to matching up the marking previously added. Failure to do so may result in large timing error and could make the engine impossible to start.

Also, after replacing shaft rotate it slowly by hand and check that timer core does not hit pole piece. It may be necessary to loosen the three screws holding the pole piece and adjust its position to clear timer core. This is most easily done by loosening the three screws and inserting either a strip of .002" to .003" thick material or individual pieces between core and pole teeth as shown at right. Then tighten three screws and remove shims.

NOTE: Because of the problem of matching polarity, it is important that you install both the exact pick-up coil and high tension coil designated for the specific vehicle.



SHIM

L4 and L6 Engine (FIGURE 7)

1. Removal and Replacement of Distributor Cap

(a) Pull spark plug wires from distributor cap (note location for reassembly).

(b) Push down, twist ¼ turn counter clockwise to release 2 distributor cap retainers.

(c) To reassemble, reverse order of disassembly.

2. Removal and Replacement of Vacuum Advance.

(a) Remove distributor cap as indicated in previous removal and replacement paragraphs. Also remove distributor rotor.

(b) Pull off hose and remove the two vacuum advance hold-down screws.

(c) Slide diaphragm mounting bracket section outward at the same time twist and unhook connecting rod from pick-up coil tang.

(d) Assemble unit in reverse order of disassembly.

3. Removal and Replacement of Module.

(a) Remove distributor cap and rotor as previously indicated in prior paragraphs.

(b) Loosen and remove two screws from module.

(c) Position module so as to disconnect harness connector and pick-up coil spade terminals. NOTE: Different size spade terminals prevent interchange.

(d) Lift off module.

IMPORTANT—Apply coating of STANDARD#SL-3 Silicone Grease supplied with STANDARD LX-301 control module to mounting surface in distributor before installing. ***(This is very important for conducting heat away from the control module.)***

4. Removal and Replacement of Pole Piece and Pick-Up Coil.

Distributor must be removed from engine and disassembled in order to replace pole piece and pick-up coil. Distributor rotor must remain attached to shaft.

(a) Remove distributor cap as described previously. **Do not remove distributor rotor.**

Follow procedures paragraphs 5(b) through 5(i) under preceding steps for "Removal and Replacement of Pole Piece and Pick-Up Coil" for the V8 and V6 engines.

SPECIAL NOTE ON GM COIL SELECTION

Selection of the proper coil and pickup is especially important in GM HEI Systems. Some pickups have reversed magnets and some coils have reversed windings. These variations are to correct hard-starting conditions. When the battery cable is near the distributor, a magnetic field is created by the starting current which can be 300 amps or more. At the same time, the battery is heavily loaded and therefore provides reduced voltage. The reversed coils and pickups cause the magnetic field to add rather than detract from the normal magnetism. The physical locations of the distributor to the cable determines which components are correct. DO NOT SUBSTITUTE ANOTHER COIL JUST BECAUSE IT FITS!

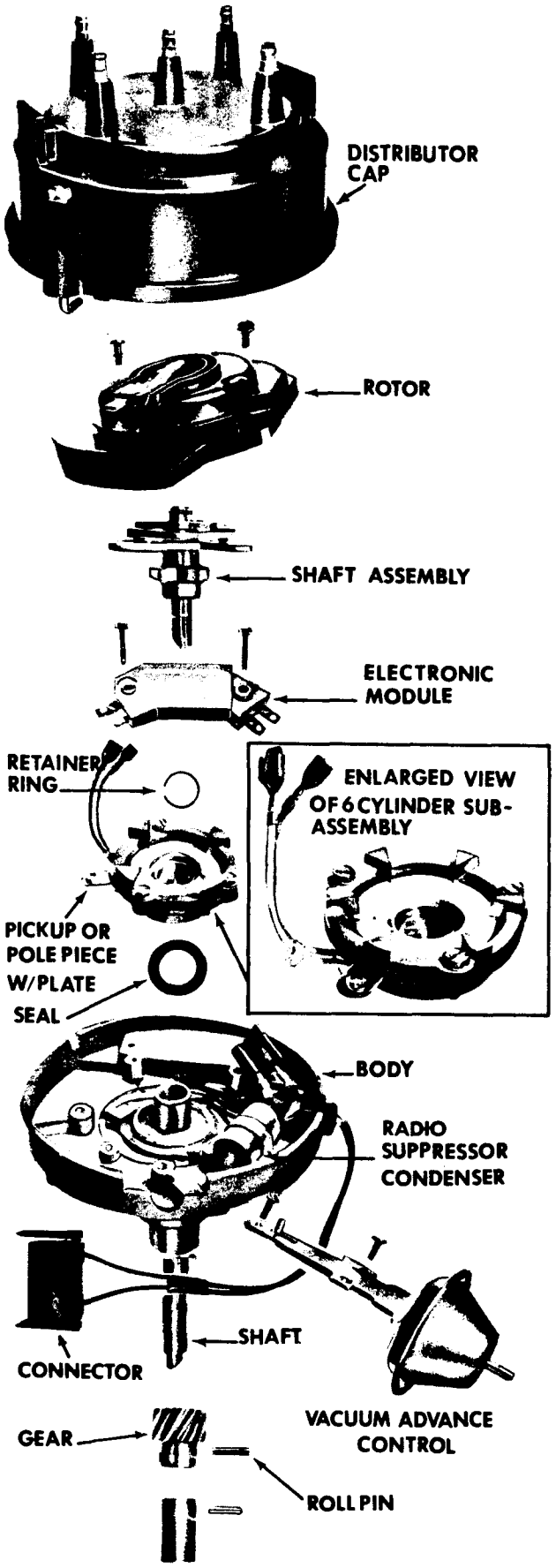


FIG. 7 DISTRIBUTOR BODY ASSEMBLY, EXPLODED VIEW

SERVICING FORD SOLID STATE IGNITION

DESCRIPTION

Type of System
Transistorized; triggered by a magnetic impulse unit. 8, 6 and 4 cylinder.

Ignition Coil Resistance
Conventional style coil.
Primary Resistance: 1.0-2.0 ohms
Secondary Resistance: 7,000-13,000 ohms

Ballast Resistance—1.4 ohms. (cable type). System uses a starting bypass circuit.

Pick-Up Coil Resistance—400-800 ohms (orange and purple distributor wires.)

Air Gap (magnetic pick-up)
Non-adjustable (pre-set)

Control Unit—Sealed and grounded through black distributor wire.

Distributor Cap and Rotor—Special

TROUBLE SHOOTING

1. Tach Hookup

Connect meter in conventional manner, one lead to negative side of coil terminal, other lead to chassis ground.

If a compression test is required, be sure power is "OFF", then disconnect both the three and four wire terminal connectors from the module before preceeding.

2. Failure of Engine to Start

Check high voltage by holding terminal of plug wire ¼" from engine block while cranking engine. If spark appears, malfunction is not in distributor or wiring harness.

When testing, never pull wire numbers #1 or #8 on 8 cylinder engines—#1 or #5 on 6 cylinders, #2 or #4 on a V-6 engine and #1 or #3 on 4 cylinder engine. If you do, it might cause internal arcing between distributor cap segments and top of pick up coil assembly thus destroying the module. In addition, always ground the tower coil secondary if high tension lead is removed from either end.

Inspect condition of spark plugs.

Disconnect and remate the two electrical connectors at the ignition module and the one at distributor. Corrosion at the connector terminals can cause difficulty in starting.

Check out fuel system.

If sparking does not occur, then follow up by further electrical testing including components.

3. Engine Runs Erratically

Check ignition timing, operation of vacuum and centrifugal advance mechanism, delivery of fuel and operation of carburetor. Also inspect spark plugs for defects and vacuum hoses for leaks. If malfunction cannot be found or is corrected but erratic condition still exists—then perform electrical components test as outlined below.

ELECTRICAL COMPONENTS TESTING

1. Voltage Check—At Coil

Connect appropriate test leads of voltmeter to + side of coil and ground (see Fig. 9). Crank engine ... meter reading should indicate a cranking voltage of approximately 8 volts or more depending on condition of battery. If reading is zero (0) check wire connections at starter solenoid, seat belt interlock, wiring, neutral safety and ignition switches for open circuit. And then correct. *If O.K.*, move ignition switch to "ON" (engine not running) position and connect meter as before. If voltage reading is zero, check loom ballast resistor, wiring and ignition switch for open circuit. If meter reads battery voltage, then check coil primary or wiring for "open" circuit, also the electronic module *could be* defective. Replace faulty unit or repair wiring as needed. If read-out is normal (4.9 to 7.9 volts), then follow up by testing electrical components.

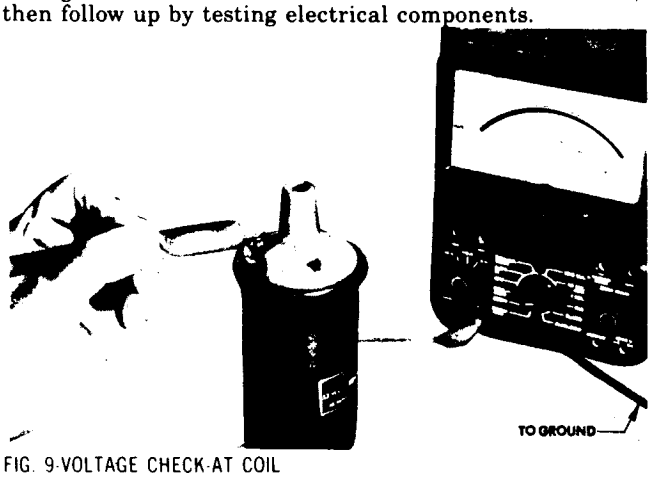


FIG. 9-VOLTAGE CHECK-AT COIL

2. Voltage Check—At Harness

Perform voltage check as before except from harness connector (socket) side of electronic module. *Do not perform test on electronic module (spade) side of connector.*

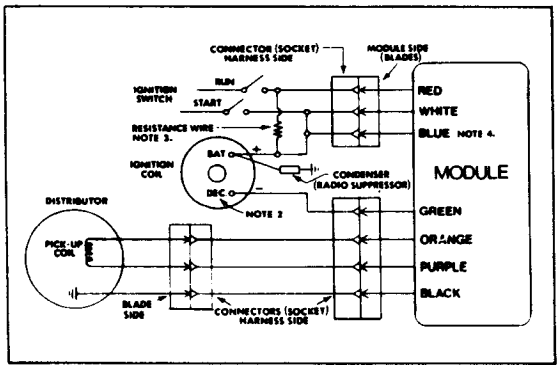


FIG. 8 TYPICAL WIRING DIAGRAM LX 201, 202, 203

NOTES:

1. LOCATION OF WIRE COLOR WITH REFERENCE TO CONNECTORS MAY VARY WITH YEAR AND MODEL OF VEHICLE.
2. TERMINAL DESIGNATION (SOME MODELS)
3. KEY RESISTANCE WIRE—1.4 OHMS (LOOM BALLAST)
4. BLUE WIRE HAS BEEN DELETED STARTING IN 1976 MODELS.

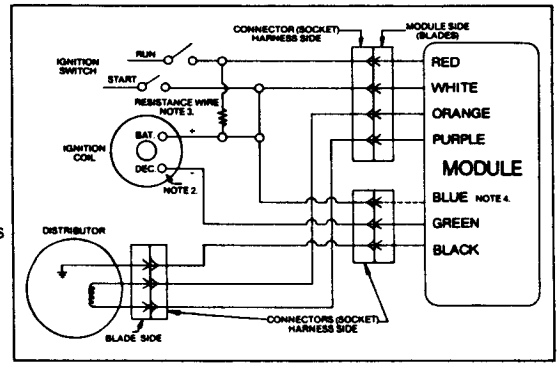


FIG. 8A. LX 200 WIRING DIAGRAM

SPECIAL NOTE: The wire color coding referenced in the following text applies only to module connector (spade) side. If wire colors on the harness connector (socket) side differ, then cross-match from one side (spade terminal) to the other (socket terminal) by physically tracing individual wire terminals as they extend from inside each connector to the outside wiring harness.

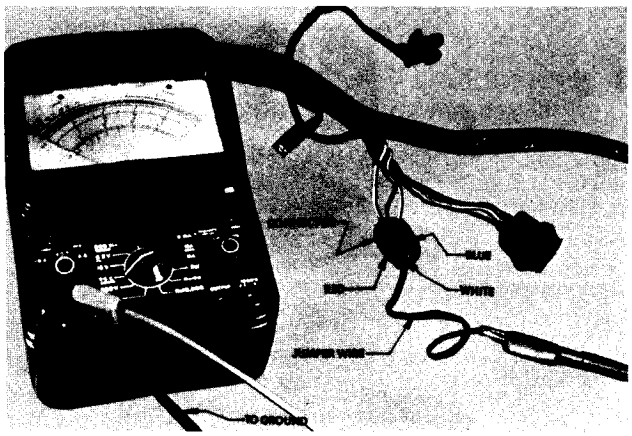


FIG. 10-VOLTAGE CHECK-HARNESS CONNECTOR.

(a) With ignition "OFF" separate electronic module connectors from harness connectors (socket) side and insert a spade jumper wire into (white wire) socket side.

(b) Hook up voltmeter leads to jumper wire and ground (see Fig. 10)

(c) With ignition switch in "START" position crank engine. If meter reads zero, check for malfunction at starter solenoid wire connections, seat belt interlock, wiring, neutral safety and ignition switches for open circuit and correct. If meter reads 8 to 12 volts then continue with further tests.

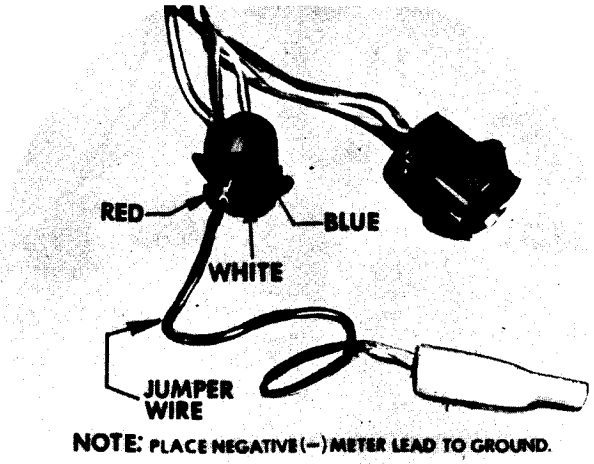


FIG. 11-RED WIRE CHECK

(d) Remove spade jumper wire from (white) socket side and insert it into socket side (red) wire (see Fig. 11).

(e) Hook up voltmeter leads to jumper wire and ground.

(f) Move ignition switch to "ON". If meter reading is zero, check wiring and ignition switch for open circuit. If meter pointer deflects to full battery voltage, conclude that the electronic module is receiving power, however, it might be faulty. See "Electronic Module" under ELECTRICAL COMPONENTS TESTING.

(g) Turn ignition "OFF", remove meter leads and jumper wire.

3. Cap and Coil Check

(a) Remove distributor cap and turn over. Examine cap and rotor for hairline cracks, carbon tracks (arc-over) or moisture. Replace damaged cap or rotor if required. If moisture is present, determine cause. Sometimes the cause could be a plugged vent hole in distributor housing.

(b) With ignition switch in "OFF" position, check continuity across (+) and (–) terminals of coil primary winding (see Fig. 12). Meter should indicate 1 to 2 ohms. If not, replace coil.

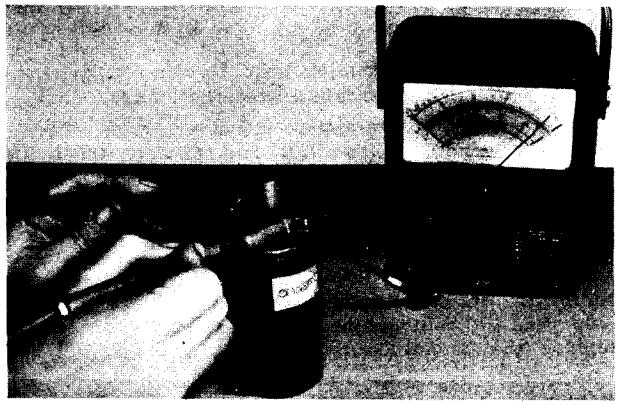


FIG. 12-RESISTANCE CHECK-COIL PRIMARY

(c) With ignition switch remaining "OFF", move ohmmeter selector switch to mid-range position. Connect leads across coil tower (secondary) and (–) terminal (see Fig. 13). If meter reads infinity (open circuit), replace coil. However, if a meter reading of 7,000 to 13,000 ohms is obtained, coil is O.K. Follow up by further electrical testing.

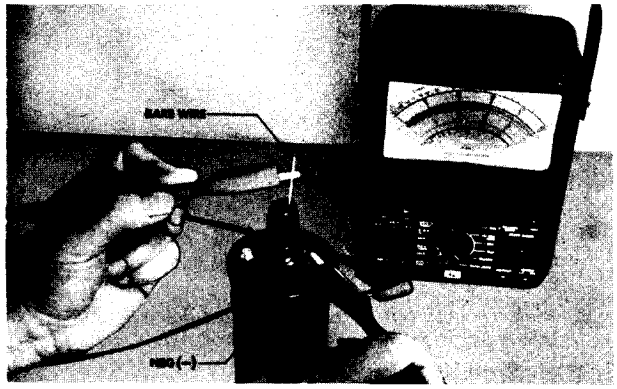


FIG. 13-RESISTANCE CHECK-TOWER COIL SECONDARY

4. Pick Up Coil and Vacuum Advance Check

NOTE: Although the pick up coil and reluctor have a fixed clearance, check shaft bushing for excessive wear which can cause increased gap clearance resulting in a hard starting engine.

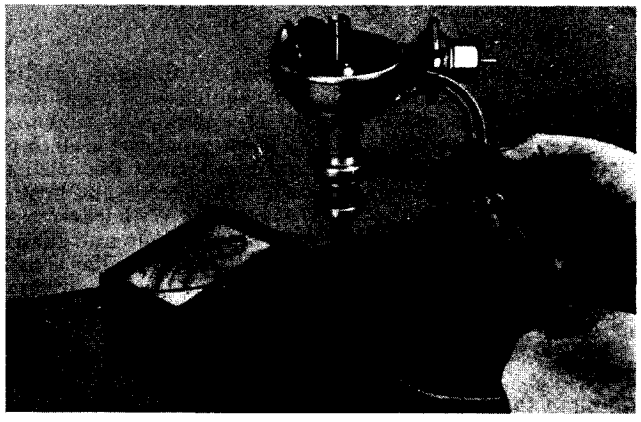


FIG. 14-SHORT TO GROUND TEST-PICKUP COIL

(a) *Short to Ground Test*—With ignition "OFF", separate distributor connector from harness connector (socket) side. Hook up ohmmeter leads to distributor connector spade terminals (see Fig. 14) and individually check orange and purple wires to ground (black wire and engine block). Reading must indicate infinity (no pointer movement). If not, replace pick up coil. If external vacuum source is available, perform same test above while activating vacuum advance unit. Reading must remain infinite throughout vacuum operational range.

If external vacuum source is not available, check by manually advancing vacuum unit during which time meter pointer must remain motionless throughout the forward and return movement range.

(b) *Open Circuit or High Resistance Test*—Hook up ohmmeter test leads (See Fig. 15) to the pick up coil (orange and purple wires) of the distributor side of connector. Set selector knob to mid-scale range. Meter must read 400 to 800 ohms. If reading is infinite (open coil), replace pick up coil assembly.

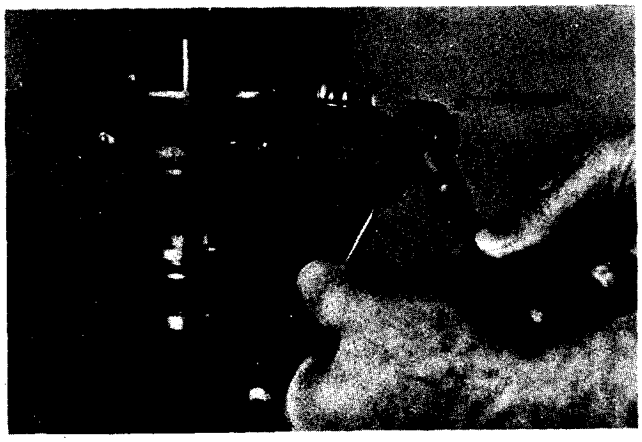


FIG. 15-OPEN CIRCUIT OR HIGH RESISTANCE TEST- PICKUP COIL

1. *Flex wiring during test and observe meter for deflections which would indicate poor or loose connections.*
2. *Pick-up coil temperature should be cold (70-100°F) when performing these measurements.*

5. Electronic Module

If no fault has been found upon completion of the preceding test procedures, then substitute STANDARD electronic module LX201,2 or 3 into the circuit. If the ignition system works properly with the replacement, discard the original since it is nonrepairable.

REMOVAL AND DISASSEMBLY

1. With ignition "OFF", disconnect three wire connectors from distributor and remove distributor cap.

2. Lift off rotor.

3. Note that one of two grooves of reluctor I.D. is indexed to distributor shaft and locked on with a roll pin. Before removing, mark position of appropriate reluctor groove with reference to shaft. Then mark reluctor top surface to prevent reversal during reassembly. Remove as follows: Use a thinjawed gear puller if available and hook-on inner surface (not the teeth) of reluctor. Withdraw from shaft at the same time, check position of roll pin and guard against it falling inside distributor housing. If puller is not available, reluctor can be removed by two screwdrivers placed under inner portion of reluctor and carefully pried up. *CAUTION: Do not exert pressure on teeth.*

4. Disconnect vacuum hose and remove two vacuum advance hold-down screws. Disengage linkage arm from pin and slide out unit from distributor housing.

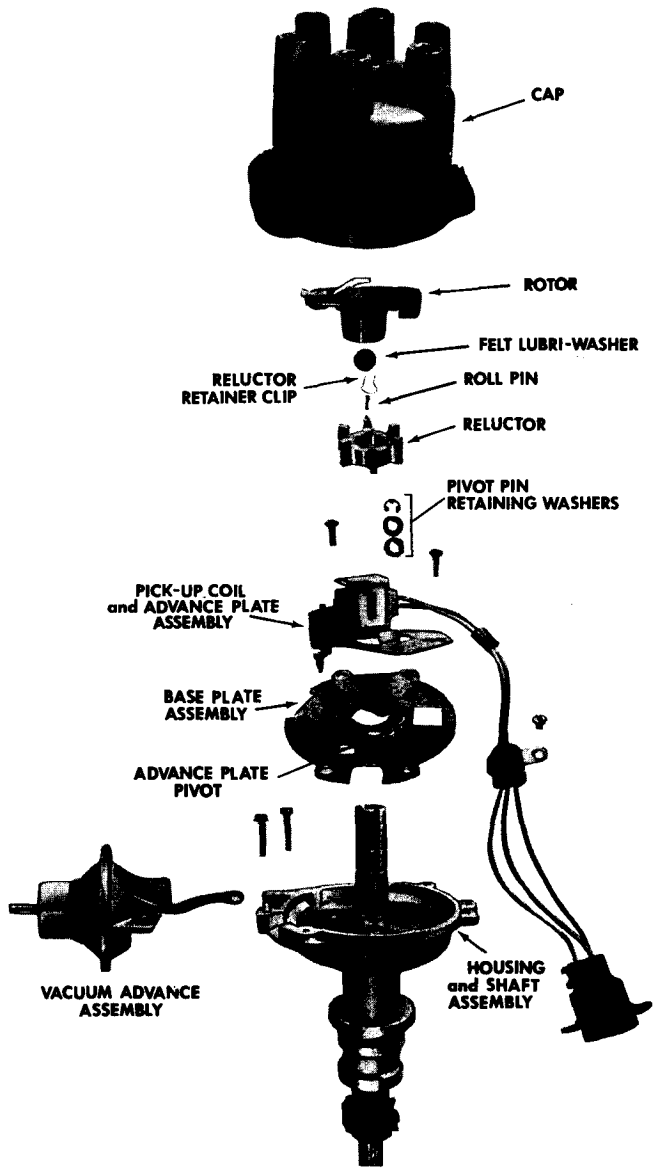


FIG. 16-PARTIAL EXPLODED VIEW • 6 Cyl. distributor

5. The pick up coil assembly, although free to rotate on the stationary base is held captive by a retaining clip. Remove the clip, grounding screw and grommet. The pick up assembly can then be lifted out.

6. The electronic module is generally found in the engine compartment but varies as to exact location among the different car models. However, it is usually mounted on the fire wall or fender well. Before removing, make sure ignition switch is "OFF". Disconnect the three and four wire connectors. Then unscrew three mounting bolts releasing module.

7. Assemble in reverse order of disassembly.

NOTES ON ASSEMBLY:

1. Within distributor, be sure grommet mounting hold-down screw is secure since it provides the ground termination (black wire) for the module.

2. Replacement of reluctor, pick up coil assembly or module should not affect ignition timing or dwell.

3. To waterproof connectors, apply coating of Lubriplate D.S. to (spade) connectors at the module and also at the distributor.

SERVICING CHRYSLER ELECTRONIC IGNITION

DESCRIPTION

Type of System
Transistorized: triggered by a magnetic impulse unit. 8 and 6 cylinder.

Ballast Resistance
Dual: Auxiliary 5 ohms
Primary: Before 1978: 0.5 ohms at room temperature increases to 1.4 ohms when hot.
After 1978: Fixed 1.4 ohms.

Ignition Coil Resistance
Conventional type.
Primary Resistance: 1.4-1.8 ohms.
Secondary Resistance: 8,000-11,700 ohms.

Pick-Up Resistance
150-900 ohms.

Distributor Cap and Rotor
Conventional type.

Air Gap (Magnetic pick up)
.008" (+ −.002") adjustable with nonmagnetic feeler gauge.

Control Unit
Sealed with exposed switching transistor. Grounded through housing.

TROUBLE SHOOTING

1. Tach Hookup

Connect meter in conventional manner (i.e.) one lead to negative side of coil terminal, the other lead to chassis ground.

If a compression test is required, be sure power is "OFF", then disconnect the harness connector from the module before proceeding.

2. Failure of Engine to Start

Check high voltage by holding terminal of a plug wire ¼" from engine block while cranking engine. (Same as other systems.) If spark appears, malfunction is not in distributor or wiring harness.

Inspect condition of spark plugs and check out fuel system.

If sparking does not occur, then follow up by further electrical testing including components. Also check air gap of magnetic pick-up. Excessive gap or very low cranking speed may cause failure to start.

3. Engine Runs Erratically

Check ignition timing, operation of vacuum and centrifugal advance mechanism, delivery of fuel and operation of carburetor. Also inspect spark plugs for defects and vacuum hoses for leaks. If malfunction cannot be found or is corrected but erratic condition still exists—then perform electrical components test as outlined below.

AIR GAP

Just as with the point gap in a conventional system, the gap between pick-up and reluctor must be correct. Difficulty in starting the engine, which is not traceable to improper carburetor adjustment or excessively low battery voltage, may be due to improper air gap setting. The air gap between pick-up coil pole piece and reluctor teeth may change due to wear in the distributor shaft and bushings, the automatic advance, or the vacuum advance plate. The air gap should therefore be checked when trouble shooting and at every tune-up. And gap should be set to proper setting (see specifications).

ELECTRICAL COMPONENTS TESTING

1. Coil Check

The ignition coil should be checked with an ohmmeter. Both primary and secondary coil resistances should be within manufacturers specifications. The *primary* resistance readings should be between 1.4 and 1.8 ohms. The *secondary* resistance readings should be between 8,000 and 11,700 ohms.

A faulty ignition coil may be replaced with a BLUE STREAK heavy duty replacement unit, UC-12X.

FIG. 17-MEASURING COIL PRIMARY

2. Control Unit

If an electronic ignition tester is available, it may be used to check out the control unit. If a tester is not available, the following tests, requiring only a voltmeter and ohmmeter, will help to determine if the control unit is faulty.

A. Connect the negative lead of the voltmeter to a good chassis ground. Connect the positive meter lead to the positive (+) terminal of the ignition coil.

B. Turn on the ignition but do not start the engine.

C. Connect positive meter lead to negative (−) terminal of the ignition coil. The meter should read from .4 to 1 volt. If incorrect meter readings are obtained at either coil terminal, see table below for possible trouble.

Meter Reading	Possible Trouble
1. Zero voltage at (+) terminal	1. (a) Defective ignition switch
	(b) Defective ballast resistor
	(c) Open wiring
2. Battery voltage (about 10V) at both terminals	2. (a) Defective control unit
	(b) Poor connection between coil and control unit
	(c) Poor ground between control unit case and fire wall
3. Normal voltage at (+) terminal (6 to 7.6 volts) but very low or zero volts at (−) terminal	3. (a) Defective control unit
	(b) Grounded wiring between coil and control unit

D. Turn off the ignition.

E. If all previous component checks are satisfactory but the ignition system still does not function properly then the control unit is probably defective.

F. A substitution test, replacing the control unit with a STANDARD control unit, LX-101 will quickly tell whether the control unit is causing the problem.

NOTE: Refer to the section on removal and installation before trying to replace the control unit.

G. If the ignition system works properly with the LX-101 replacement then the original unit is defective and should be discarded since it is not repairable.

3. Pick-Up

Two problems can occur with the pick-up. It can be mechanically damaged if there is interference between the pick-up pole piece and reluctor, with the engine running (improper air gap). It can have an electrical fault such as an open coil or short to chassis. To check the pick-up do the following:

(A) Check the pick-up coil resistance by connecting an ohmmeter across the connector pins. Resistance should be between 150-900 ohms.

(B) Check coil insulation by measuring resistance between one connector pin and ground. The reading should be infinity.

NOTE: Flex the cable leading to the pick-up coil when making resistance checks in order to discover possible intermittent faults.

4. Dual Ballast Resistor

The dual ballast resistor has two parts (see Fig. 18). Compensating resistor which limits current in the primary coil just as in a conventional point system. Auxiliary resistor which limits current to the control unit. Both resistors can be checked with an ohmmeter as follows:

(A) Be sure ignition is OFF.

(B) Before removing wires from resistor terminals make a note of the wire color at each terminal. This will help in replacing them correctly after the check.

(C) Measure auxiliary ballast resistor. It should be between 4.75 and 5.75 ohms.

(D) Measure compensating ballast resistor. It should be between 0.5 and 1.5 ohms.

(E) If either resistor is not within specifications or is open circuit, the unit must be replaced. Use a Standard Motor Products high temperature rated unit No. RU-12.

(F) Replace harness wires to the correct terminals.

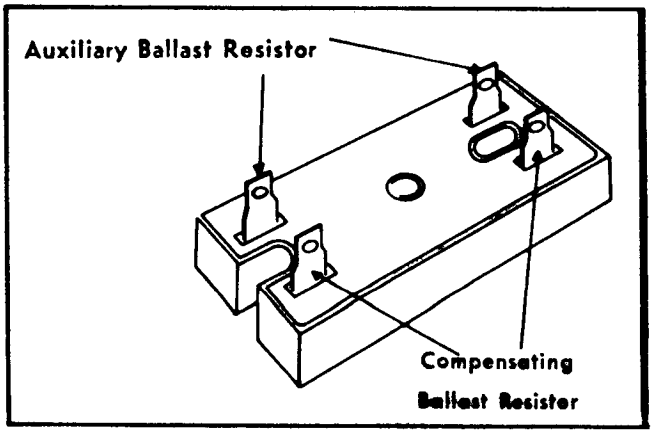


FIG. 18-BALLAST RESISTOR

5. Reluctor

The strength and shape of the electrical timing pulse generated when the reluctor teeth pass the pick-up pole piece depends very much on the air gap. If the reluctor teeth are deformed in any way, the air gap is changed and the ignition may become erratic.

(a) Inspect the reluctor teeth. If any are chipped, nicked or rounded, the reluctor must be replaced.

(b) The very edges of the reluctor teeth may appear to be sharp and somewhat jagged. This is normal. DO NOT ATTEMPT TO FILE THE EDGES SMOOTH.

If both the pick-up and the reluctor check out properly, reassemble rotor, distributor cap and reconnect molded plug of pick-up to harness connector.

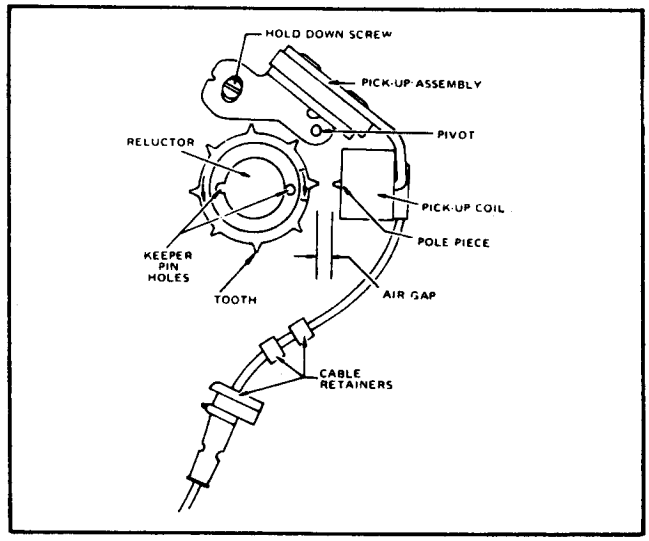


FIG. 19-PICKUP AND RELUCTOR

COMPONENT REMOVAL AND INSTALLATION

Disassembly of the distributor may require its removal from the car because of lack of accessability. Be sure to note position of rotor and housing before removal.

NOTE: Before removing pick-up or reluctor you should study Fig. 19 . *Disconnect the pick-up connector, then remove the distributor head and rotor. Rotate the engine until a reluctor tooth is directly opposite the pole piece of the coil. With the 8 cylinder engine only, it is necessary to note the direction of the reluctor turns when the engine is turned over by the starter motor. Use a pencil to draw an arrow showing this direction on the distributor plate. This information is not required on 6 cylinder engines.*

Reluctor

1. Turn off the ignition.

2. Check the air gap to be sure that the reluctor will clear the pole piece as it is removed.

3. Remove the reluctor by prying the bottom of the reluctor up with 2 small pry bars. Be sure to save the keeper pin. (If necessary, screwdrivers may be substituted for the prybars.) Be careful not to damage the reluctor teeth.

4. Examine the STANDARD replacement reluctor (LX-104 LX-105). Notice the 2 holes, on 8 toothed reluctor only, for the keeper pin and the arrows indicating opposite directions of rotation.

5. Mount the pin in the hole which points in the proper direction of rotation. See Fig. 20

6. Recheck the arrow you marked on the distributor plate. It should match the arrow near the keeper pin.

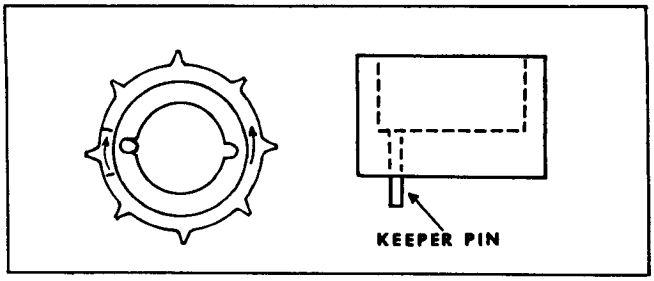


FIG. 20-RELUCTOR KEEPER PIN

7. Start the reluctor on the distributor shaft. Rotate the reluctor until the keeper pin is aligned over the distributor shaft keyway. Press the reluctor firmly into place. Be careful not to nick or deform the reluctor teeth (you may wish to use a piece of wood or hammer handle to slide the reluctor home).

8. Adjust air gap. (See following section on Pick-up Installation for directions).

After replacing pick-up or reluctor remember to replace rotor, distributor cap and reconnect pick-up molded connector to harness wiring.

NOTE: The spark dwell is determined by the control unit. It cannot be changed by varying the air gap.

Pick Up Assembly

1. Remove distributor cap and rotor.

2. Remove reluctor as in the preceding section.

3. Remove the two screws and lockwashers attaching the vacuum control unit to distributor housing; disengage the control arm from upper plate, and remove control.

4. Remove two screws and lockwashers on side of distributor which attach the lower plate and lift out the pick-up coil as an assembly.

When replacing the pick-up, note that there are two plates held by a spring clip ("spider"). The pick-up coil is permanently mounted to the top plate and is replaced as a unit. The bottom plate and spring clip should be retained for reuse.

5. Position the STANDARD LX-102 (8 cyl.) or LX-103 (6 cyl.) replacement pick-up on the bottom mounting plate. Snap on the "spider" (spring clip). Mount unit with 2 screws and lock washers.

6. Place the cable in the cable retainers.

7. Reassemble vacuum control unit. Make sure activating pin on vacuum unit is engaged in proper hole of the upper advance plate.

8. Loosen pick-up hold-down screw and pivot the pole piece away from the shaft.

9. Replace reluctor as described in preceding "RELUCTOR" section.

10. The proper air gap is .008". Use a nonmagnet feeler gauge to set the air gap between the pole piece and the reluctor tooth. When the gap is set tighten the hold-down screw to about 10 inch-pounds.

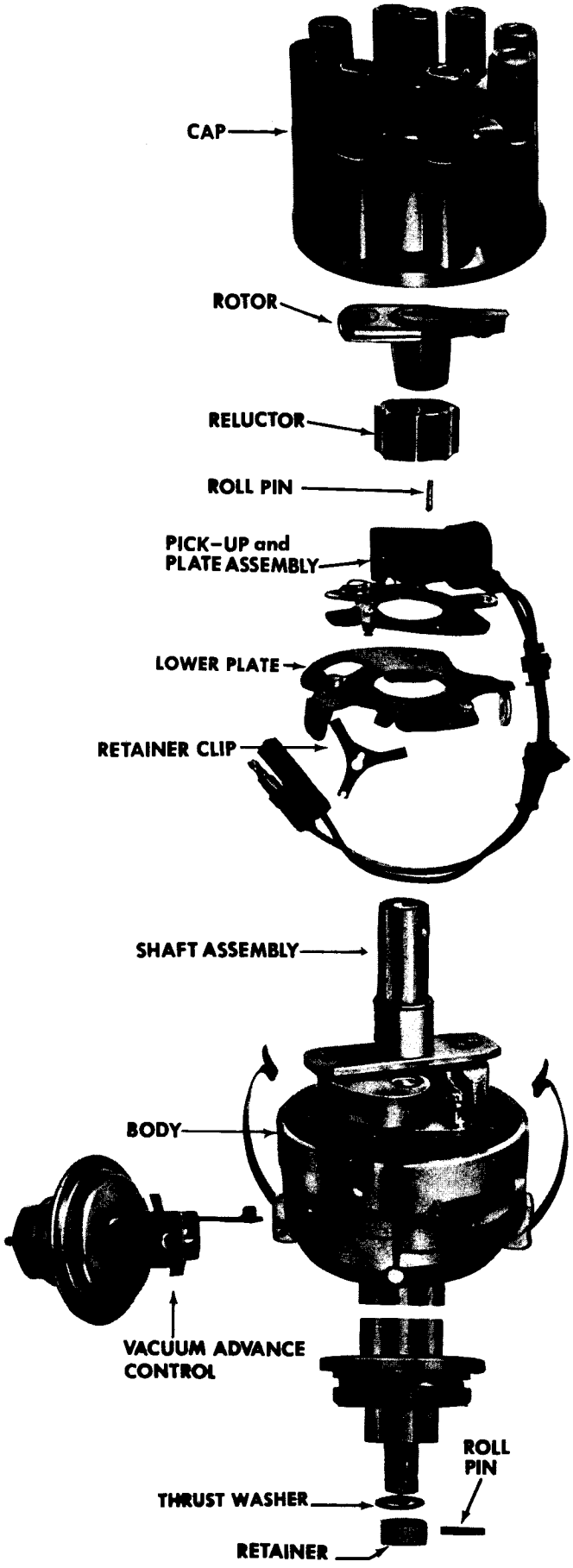


FIG. 21-EXPLODED VIEW DRAWING (8 Cylinder)

11. Rotate engine at least two complete revolutions and check that at least .006" gap is maintained at each reluctor tooth. A change in gap may indicate wear in distributor shaft (side play).

If possible, apply vacuum to the vacuum chamber and check that pole piece does not hit reluctor teeth.

Control Unit

1. Turn off ignition before disconnecting the control unit or it may be permanently damaged.

2. Loosen the retaining screw in the center of the connector. Unplug the harness connector from the control unit.

3. The control unit is fastened to the firewall by two screws. Remove both screws and save them.

NOTE: It is very important to have a good electrical connection (ground) between the case of the control unit and the firewall. The best way to do this is to use the original mounting screws which have a captive toothed washer under the screw head. If the original screws are lost a good connection can be made by using separate toothed washers under the replacement screw heads.

4. Mount the replacement unit to the firewall using the proper hardware as described in the note above.

5. Check for a good ground by connecting an ohmmeter from a good chassis ground to pin 5 on the control unit connector. See Fig. 22 for connector pin numbers. The ohmmeter should read 0 ohms. It may be necessary to scrape away paint to get a good connection.

6. Replace harness connector on control unit and fasten securely in place.

NOTE: Harness connector should be completely engaged on mating control unit connector by hand. DO NOT attempt to pull down the tightfitting connector by using the center retaining screw since you will probably strip the threads on the control unit connector.

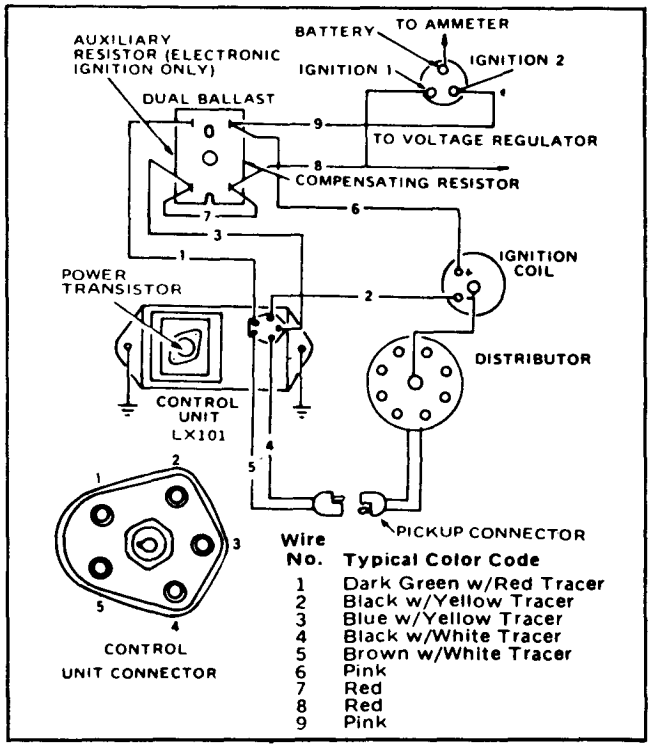


FIG. 22-WIRING TO CONTROL UNIT

AMERICAN MOTORS: BREAKERLESS INDUCTIVE DISCHARGE (BID) IGNITION SYSTEM

DESCRIPTION

Type of System
Transistorized; triggered by electro-magnetic impulse unit. 8, 6 and 4 cylinder.

Ignition Coil Resistance
Conventional style coil.
Primary: 2 ohms.
Secondary: 800-1200 ohms.

Ballast Resistance
No ballast resistor used.

Pick-up (Sensor) Coil Resistance
(1 to 4 ohms)

Air Gap
Non-adjustable (pre-set)

Control Unit
Sealed and grounded through black distributor wire.
Trigger wheel clearance 0.05-0.06

Distributor Cap and Rotor
Conventional type

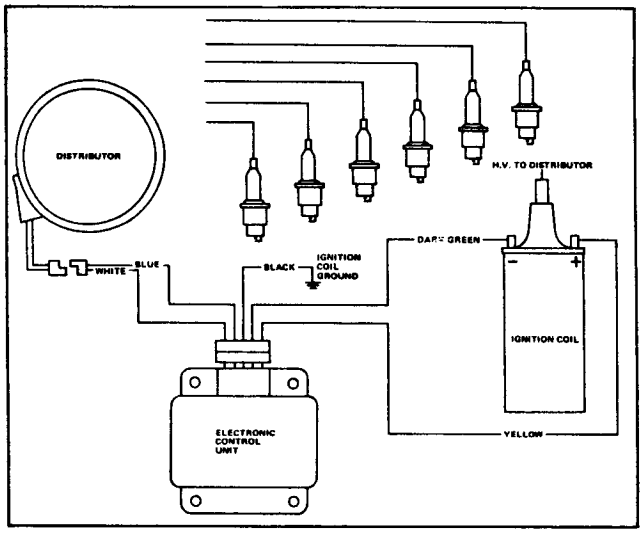


FIG. 23-TYPICAL WIRING DIAGRAM

SERVICE, MAINTENANCE, REPLACEMENT.

The BID Ignition System consists of five major components: an electronic ignition control unit, an ignition coil, a distributor, high tension wires, and spark plugs. (Figure 23)

DESCRIPTION OF COMPONENTS:

Control unit: The electronic control unit is a solid-state, moisture-resistant module. The component parts are permanently encapsulated to resist vibration and engine environmental conditions. The unit has built-in current regulation, reverse polarity protection and transient voltage protection.

Because the control unit has built-in current regulation—there is no resistance wire or ballast resistor used in the primary circuit. Battery voltage is present at the ignition coil positive terminal whenever the ignition key is in the ON or START position. Therefore, there is no need for an ignition system bypass during cranking. The primary (low voltage) coil current is electronically regulated by the control unit. *(This unit is not repairable, and must be replaced with a new unit if it is faulty or damaged.)*

Ignition Coil: The ignition coil is a conventional-type coil much the same as a BLUE STREAK Coil. The function of the ignition coil in the BID ignition system is to transform battery voltage in the primary winding to a high voltage for the secondary system, just as in a conventional point system.

Distributor: The distributor is conventional except that a sensor and trigger wheel replace the usual contact points, condenser and distributor cam.

The distributor uses two spark advance systems (mechanical and vacuum) to establish the optimum spark timing setting required for various engine speed and load conditions. The two systems operate independently, yet work together to provide proper spark advance. The mechanical (centrifugal) advance system is built internally into the distributor and consists of two flyweights which pivot on long-life, low-friction bearings and are controlled by calibrated springs which hold the weights in a no-advance position. The flyweights respond to engine speed, and rotate the trigger wheel with respect to the distributor shaft to advance the spark as engine speed increases and retard the spark as engine speed decreases.

The vacuum advance system incorporates a vacuum diaphragm unit which moves the distributor sensor in response to the changes in the carburetor throttle bore vacuum.

Sensor/Trigger Wheel: The sensor (a component of the distributor) is a small coil, wound of fine wire, which receives an alternating current signal from the electronic control unit.

The sensor develops an electromagnetic field which is used to detect the presence of metal. The sensor detects the edges of the metal in the teeth of the trigger wheel. (Fig. 24). When a leading edge of a trigger wheel tooth aligns with the center of the sensor coil, a signal is sent to the control unit to open the coil primary circuit.

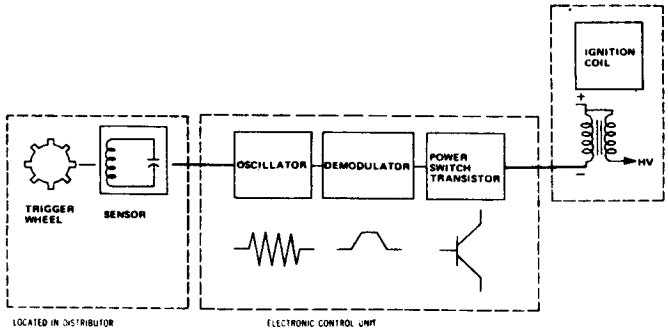


FIG. 24-CONTROL SYSTEM

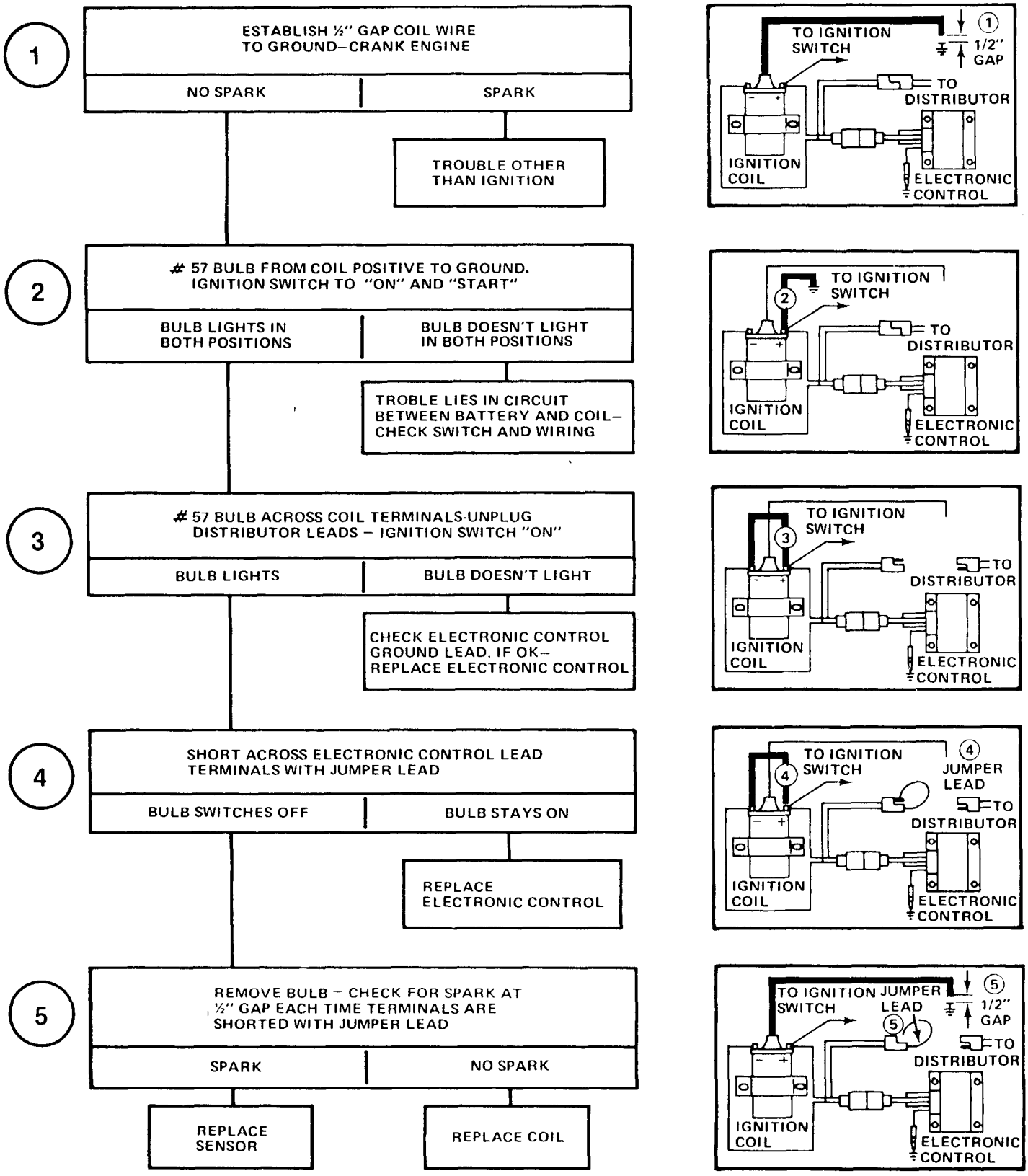


FIG. 25 TROUBLE SHOOTING STEP CHART

NOTE: *There are no wearing surfaces between the trigger wheel and sensor. Dwell angle remains constant and requires no adjustment.*

HOW IT OPERATES:

With the ignition switch in the START or RUN position the control unit is activated (Figure 28). At this time, an oscillator, contained in the control unit, excites the sensor which is contained in the distributor. When the sensor is excited, it develops an electromagnetic field. As the leading edge of a tooth of the trigger wheel enters the sensor field, the tooth reduces the strength of oscillation in the sensor. As the oscillator strength is reduced to a predetermined level, the demodulator circuit reacts and issues a signal. The demodulator switching signal controls a power transistor which is in series with the coil primary circuit. The power transistor switches the coil primary circuit off, thereby inducing the high voltage in the coil secondary winding. High voltage is then distributed to the spark plugs by the distributor cap, rotor, and ignition cables.

TROUBLE SHOOTING

Introduction.

The BID Ignition System—except for the Control Unit and Sensor/Trigger Wheel—uses conventional ignition parts in the rest of the system—spark plugs, coil, ignition cable, etc. And the same things that go wrong with these conventional parts in conventional systems, also may go wrong in the BID Ignition System.

Therefore the same kind of tests should be made on them if the ignition system fails, before you check out the BID components:

1. Check battery voltage.
2. Check wires/cables for frayed, broken, disconnections. Connectors between module and harness and between distributor pick-up coil and harness are a source of trouble because of corrosion, check connectors in following manner:
   a. Clean terminals with cotton swab soaked in alcohol.
   b. Insert shank end of a No. 16 drill (.177" diameter) into female terminals of connectors. Drill shank should fit snugly in terminal.
   c. If necessary, use pliers to crimp terminal to obtain a tighter fit. Be careful not to distort shape of terminal or damage rubber connector cover.
   d. Coat terminals of connectors with Lubriplate DS before assembly. Make sure connector halves are completely together. New parts should be checked for fit and lubricated before installation.
3. Make sure that starting circuit works.
4. Check for shorts, etc.

In other words, make certain the "conventional" part of the system is operative, then go on to the BID system.

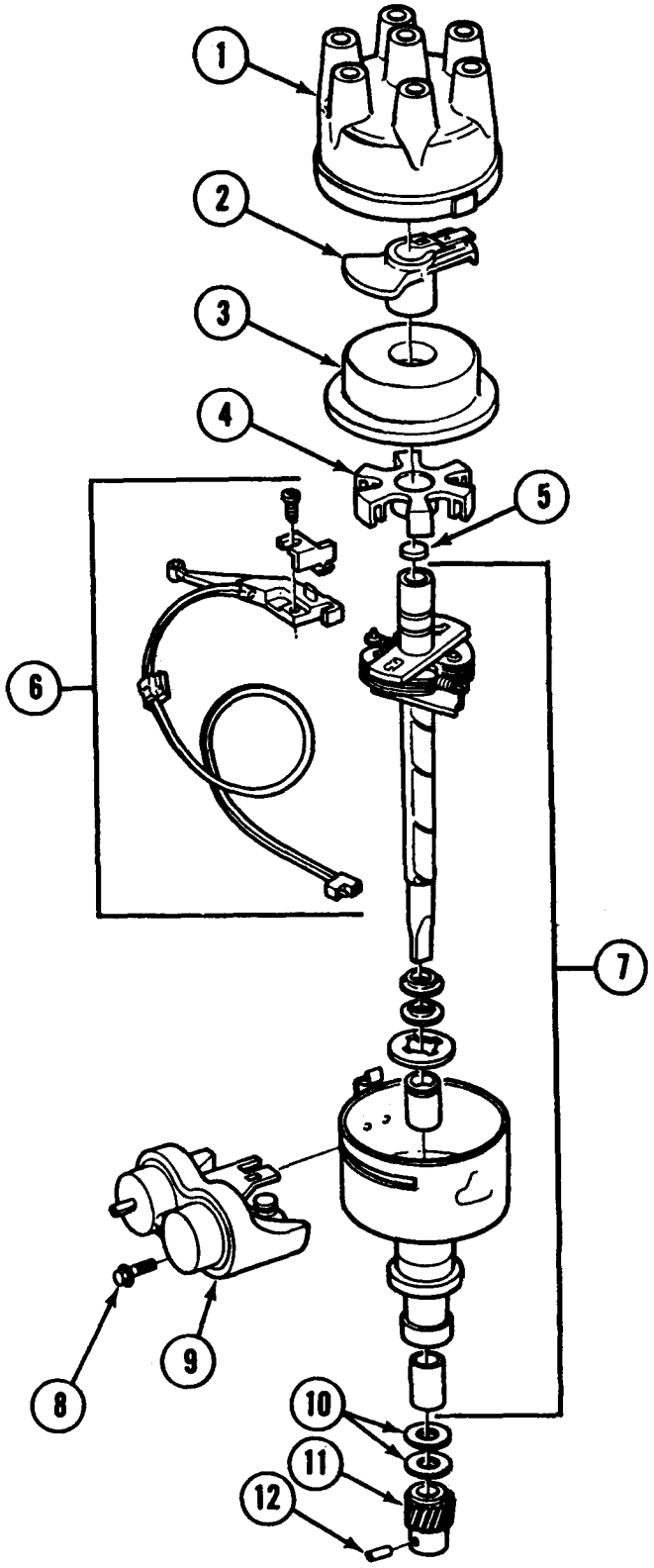
BID Quick Check.

For a quick simple, and effective on-vehicle test, use a No. 57 light bulb, and a jumper wire, and follow the BID Ignition System Trouble-Shooting Step Chart Fig. 25
In most cases this should be sufficient. However, where a more comprehensive test is necessary, refer to your American Motors Service Manuals for the BID system test you need.

The electronic components of the BID System (sensor, electronic ignition control unit) are not repairable, and where tests indicate that they are faulty, replace them with STANDARD Elextron replacement Solid State Ignition components.

SERVICING THE DISTRIBUTOR.

When replacing the sensor or vacuum chamber on six-cylinder and V-8 engines, the distributor should be removed from the engine for ease of component replacement. (**See Fig. 26**).



LEGEND

1. DISTRIBUTOR CAP
2. ROTOR
3. DUST SHIELD
4. TRIGGER WHEEL
5. FELT
6. SENSOR ASSEMBLY
7. HOUSING
8. VACUUM CONTROL SCREW
9. VACUUM CONTROL
10. SHIM
11. DRIVE GEAR
12. PIN

FIG. 26-EXPLODED VIEW OF THE DISTRIBUTOR ASSEMBLY (6 Cylinder)

Distributor Service:

(1) Unfasten distributor cap retaining clips. Remove distributor cap.

(2) Disconnect vacuum hose from distributor vacuum advance unit.

(3) Disconnect distributor sensor wiring connector.

(4) Scribe a mark on distributor housing in line with tip of rotor, and note position of rotor and distributor housing in relation to surrounding engine parts as reference points for installing distributor.

(5) Remove distributor holddown bolt and clamp.

(6) Withdraw distributor carefully from engine.

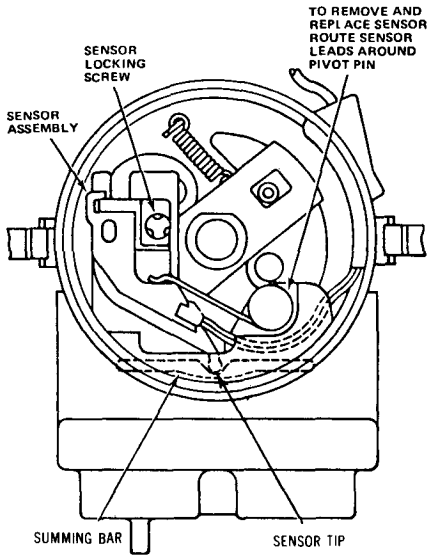


FIG. 27-REMOVAL,INSTALLATION OF SENSOR ASSEMBLY

Component Replacement:

(1) Place distributor in suitable holding device.

(2) Remove rotor and dust shield (Figure 26).

(3) Remove trigger wheel using a small gear puller. Be sure the puller jaws are gripping the inner shoulder of the trigger wheel or the trigger wheel may be damaged during removal. Use a thick flat washer as a spacer. Do not press against the small center shaft.

(4) Loosen the sensor locking screw about three turns.

The sensor locking screw has a tamperproof head design which requires a special driver bit tool #J-25097 available from American Motors. If driver bit is not available, use small needlenose pliers to remove the screw. The replacement sensor has a conventional slotted head screw.

Lift the sensor grommet out of the distributor bowl. Pull sensor leads out of the slot around the sensor spring pivot pin (Figure 27). Lift and release sensor spring, making sure it clears the leads, then slide the sensor off the bracket.

(5) Clean dirt or grease off of the vacuum chamber bracket. Clean and dry sensor and bracket. The material used for sensor and vacuum chamber requires no lubrication.

(6) Assemble either cleaned "old" sensor or new replacement sensor, sensor guide, flat washer and retaining screw. Install retaining screw only far enough to hold assembly together and be sure it does not project beyond the bottom of the sensor.

(7) Install sensor assembly on vacuum chamber bracket, making certain that tip of sensor is located properly in summing bar (Fig. 27.). Place sensor spring in proper position on sensor. Then route sensor leads around spring pivot pin. Install sensor lead grommet in distributor bowl, and make certain leads are positioned so that they cannot be caught by the trigger wheel.

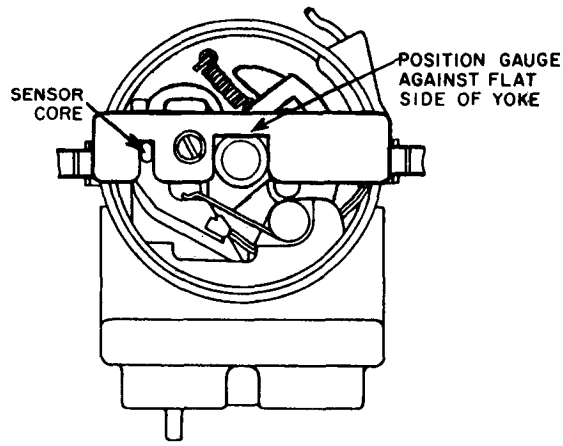


FIG. 28-POSITIONING OF SENSOR GAUGE

(8) Place the sensor positioning gauge over the yoke and move the sensor sideways until the gauge can be positioned as shown in Figure 28. With the gauge in place, use a small blade screwdriver to snug down the retaining screw. Check the sensor position by removing and replacing the gauge. When properly positioned, it should be possible to remove and replace the gauge without any side movement of the sensor. Tighten the retaining screw to 5 to 10 oz.-in. torque, then recheck the sensor position as before.

(9) Remove the gauge and set the trigger wheel in place on the yoke. Visually check to make certain the sensor core is positioned approximately in the center of the trigger wheel legs and that the trigger wheel legs cannot touch the sensor core.

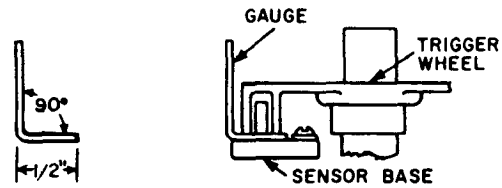


FIG. 29-USE OF SENSOR GAUGE

(10) Support the distributor shaft and press the trigger wheel onto the yoke. Bend the wire gauge to the dimension shown in Figure 29, then use the guage to measure the distance between the trigger wheel legs and the sensor base as shown in Figure 29. Install the trigger wheel until it just touches the gauge.

(11) Add 3 to 5 drops of SAE 20 oil to the top of the yoke.

(12) Install dust shield and rotor. Re-install distributor. Time engine to specifications.

COMPONENT SPECIFICATIONS

Sensor	**Resistance 1.8 + 10% Ohms at 77°F. Measure across sensor load terminals.**
Coil	**Primary Resistance: 1 to 2 Ohms. Secondary Resistance: 8,000 to 12,000 Ohms open circuit output 20 KV minimum.**

THE BID Ignition System is another electronic ignition system that the professional mechanic can service profitably once he understands the "electronics". It is really no more complicated than replacing conventional points and condensers. Since the electronic parts are replaced completely—being unrepairable—it's really easy to do.

SYSTEM USAGE TABLE

CAR MAKE	SYSTEM OR UNITS	DESIGNED TO CONTROL	YEAR INTRODUCED
American Motors:	Positive Crankcase Ventilation (PCV)	HC, CO	1968
	Coolant Temperature Override (CTO)	HC, CO	1974
	Engine Modification (Engine Mod.)	HC, CO	1968
	Air Injection (Air Guard)	HC, CO	1968
	Transmission Controlled Spark (TCS)	HC, NOx	1971
	Fuel Tank Vapor Control (FTVC)	HC	1974
	Thermostatically Controlled Air Cleaner (TAC)	HC, CO	1970
	Idle Mixture Limiter Caps	HC, CO	1968
	Throttle Stop Solenoid	Dieseling	1968
	Thermostatic Vacuum Switch (TVS)	Overheating	1968
	Fuel Evaporation Control	HC	1971
	Exhaust Gas Recirculation (EGR)	NOx	1973
Chrysler Corporation:	Positive Crankcase Ventilation (PCV)	HC, CO	1968
	Cleaner Air System (CAS)	HC, CO	1968
	Coolant Control Exhaust Gas Recirculation Valve (CCEGR)	NOx	1975
	Air Injection System	HC, CO	1972
	Exhaust Gas Recirculation (EGR)	NOx	1972
	Distributor Retard Solenoid	HC, NOx	1970
	Catalytic Converter	NOx, HC, CO	1975
	Distributor Advance Solenoid	Promotes Fast Start	1972
	Heated Air System Air Cleaner	HC, CO	1970

HC = Hydrocarbons
CO = Carbon Monoxide
NOx = Nitrogen Oxides

CAR MAKE	SYSTEM OR UNITS	DESIGNED TO CONTROL	YEAR INTRODUCED
Chrysler Corporation: (Continued)	Deceleration Vacuum Advance Valve	HC, CO	1968
	Idle Mixture Limiter Cap	HC, CO	1968
	Throttle Stop Solenoid	Dieseling	1968
	Fuel Evaporation Control	HC	1970
Ford Motor Company:	Positive Crankcase Ventilation (PCV)	HC, CO	1968
	Improved Combustion (IMCO)	HC, CO	1968
	Air Injection (Thermactor)	HC, CO	1968
	Electronic Distributor Modulator	HC, NOx	1970
	Electronic Spark Control (ESC)	HC, NOx	1972
	Transmission Regulated Spark Control (TRS)	HC, NOx	1972
	Exhaust Gas Recirculation (EGR)	NOx	1974
	Catalytic Converter	NOx, HC, CO	1975
	Spark Delay Valve	NOx	1974
	Thermostatic Vacuum Switch (TVS)	Overheating	1968
	Dual Diaphram Distributor	Promotes Fast Start; HC	1968
	Idle Mixture Limiter Caps	HC, CO	1968
	Throttle Positioner Solenoid	HC, CO; Dieseling	1968
	Deceleration Valve	HC, CO	1970
	Cold Temperature Actuated Vacuum System (TAV System)	Spark Advance According To Override Temperature	1974

HC = Hydrocarbons
CO = Carbon Monoxide
NOx = Nitrogen Oxides

CAR MAKE	SYSTEM OR UNITS	DESIGNED TO CONTROL	YEAR INTRODUCED
General Motors Division:			
Buick -	Positive Crankcase Ventilation (PCV)	HC, CO	1968
	Controlled Combustion System (CCS)	HC, CO	1968
	Air Injection Reactor (AIR)	HC, CO	1972
	Transmission Controlled Spark (TCS)	HC, NOx	1970
	Exhaust Gas Recirculation (EGR)	NOx	1972
	Thermo Air Cleaner	HC, CO	1970
	Idle Mixture Limiter Caps	HC, CO	1968
	Throttle Stop Solenoid (Anti-Diesel Solenoid)	Dieseling	1968
	Thermostatic Vacuum Switch (TVS)	Overheating	1968
	Fuel Evaporation Control	HC	1970
	TCS-TVS Combination Valve	HC, CO	1972
	Catalytic Converter	NOx, HC, CO	1975
Cadillac -	Positive Crankcase Ventilation (PCV)	HC, CO	1968
	Air Injection Reactor (AIR)	HC, CO	1968
	Controlled Combustion System (CCS)	HC, CO	1970
	Transmission Controlled Spark (TCS)	HC, NOx	1970
	Speed Control Switch System (SCS)	NOx	1972
	Thermostatically Controlled Air Cleaner (Thermac)	HC, CO	1970
	Thermostatic Vacuum Switch (TVS)	Overheating	1968
	Idle Limiter Caps	HC, CO	1968
	Throttle Stop Solenoid (Anti-Diesel Solenoid)	Dieseling	1971
	Fuel Evaporation Control	HC	1970
	Catalytic Converter	NOx	1975

HC = Hydrocarbons
CO = Carbon Monoxide
NOx = Nitrogen Oxides

CAR MAKE	SYSTEM OR UNITS	DESIGNED TO CONTROL	YEAR INTRODUCED
Chevrolet -	Positive Crankcase Ventilation (PCV)	HC, CO	1968
	Controlled Combustion System (CCS)	HC, CO	1968
	Air Injection Reactor (AIR)	HC, CO	1968
	Transmission Controlled Spark (TCS)	HC, NOx	1970
	Combined Emission Control Valve (CEC)	NOx, HC, CO	1971
	Thermostatically Controlled Air Cleaner (Thermac)	HC, CO	1968
	Idle Mixture Limiter Caps	HC, CO	1968
	Throttle Stop Solenoid (Anti-Diesel Solenoid)	Dieseling	1968
	Fuel Evaporation Control (FEC)	HC	1970
	Catalytic Converter	NOx, HC, CO	1975
Oldsmobile -	Positive Crankcase Ventilation (PCV)	HC, CO	1968
	Controlled Combustion System (CCS)	HC, CO	1968
	Transmission Controlled Spark (TCS)	HC, NOx	1970
	Distributor Vacuum Control Switch (TVS-TCS Combination Valve)	NOx; Overheating	1971
	Thermostatically Controlled Air Cleaner	HC, CO	1968
	Idle Mixture Limiter Caps	HC, CO	1968
	Throttle Stop Solenoid (Anti-Diesel Solenoid)	Dieseling	1968
	Combined Emission Control Valve (CEC)	NOx, HC, CO	1971
	Fuel Evaporation Control (FEC)	HC	1970
	Thermostatic Vacuum Switch (TVS)	Overheating	1968
	Catalytic Converter	NOx, HC, CO	1975

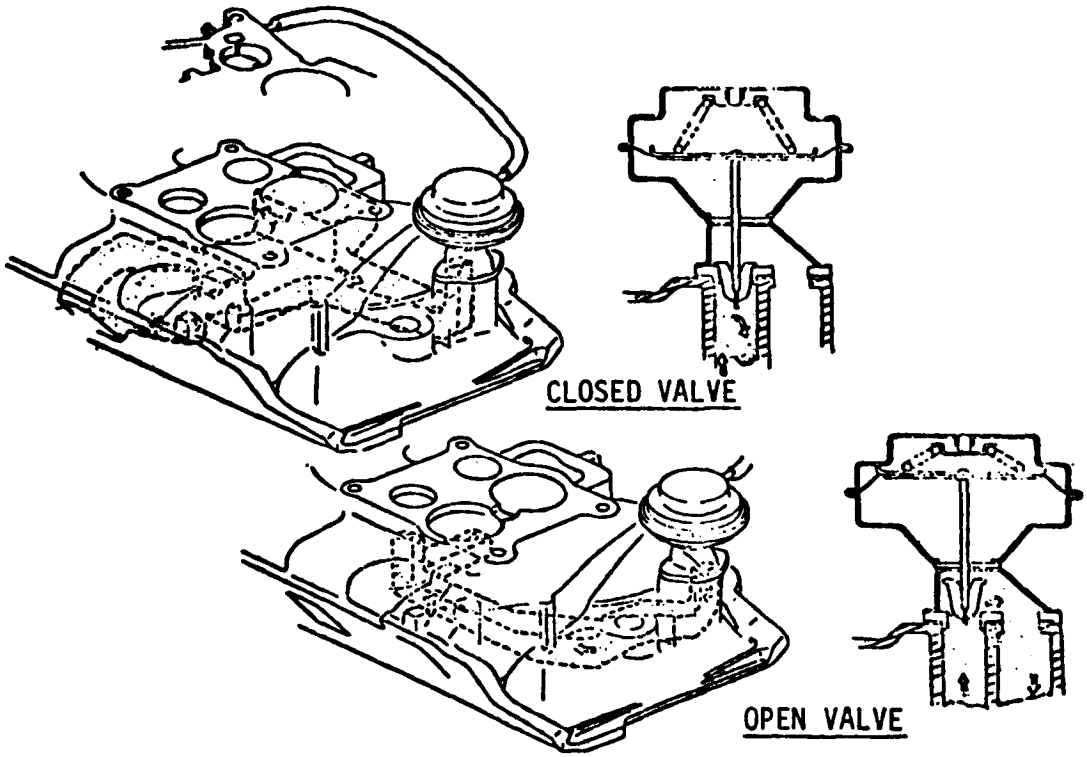
HC = Hydrocarbons
CO = Carbon Monoxide
NOx = Nitrogen Oxides

CAR MAKE	SYSTEM OR UNITS	DESIGNED TO CONTROL	YEAR INTRODUCED
Pontiac -	Positive Crankcase Ventilation (PCV)	HC, CO	1968
	Controlled Combustion System (CCS)	HC, CO	1968
	Catalytic Converter	NOx, HC, CO	1975
	Transmission Controlled Spark (TCS)	HC, NOx	1970
	Speed Controlled Spark (SCS)	HC, NOx	1972
	Combined Emission Control Valve (CEC)	NOx, HC, CO	1971
	Auto-Therm Air Cleaner	HC, CO	1968
	Idle Mixture Limiter Caps	HC, CO	1968
	Idle Stop Solenoid (Anti-Diesel Solenoid)	Dieseling	1968
	Fuel Evaporation Control (FEC)	HC	1970

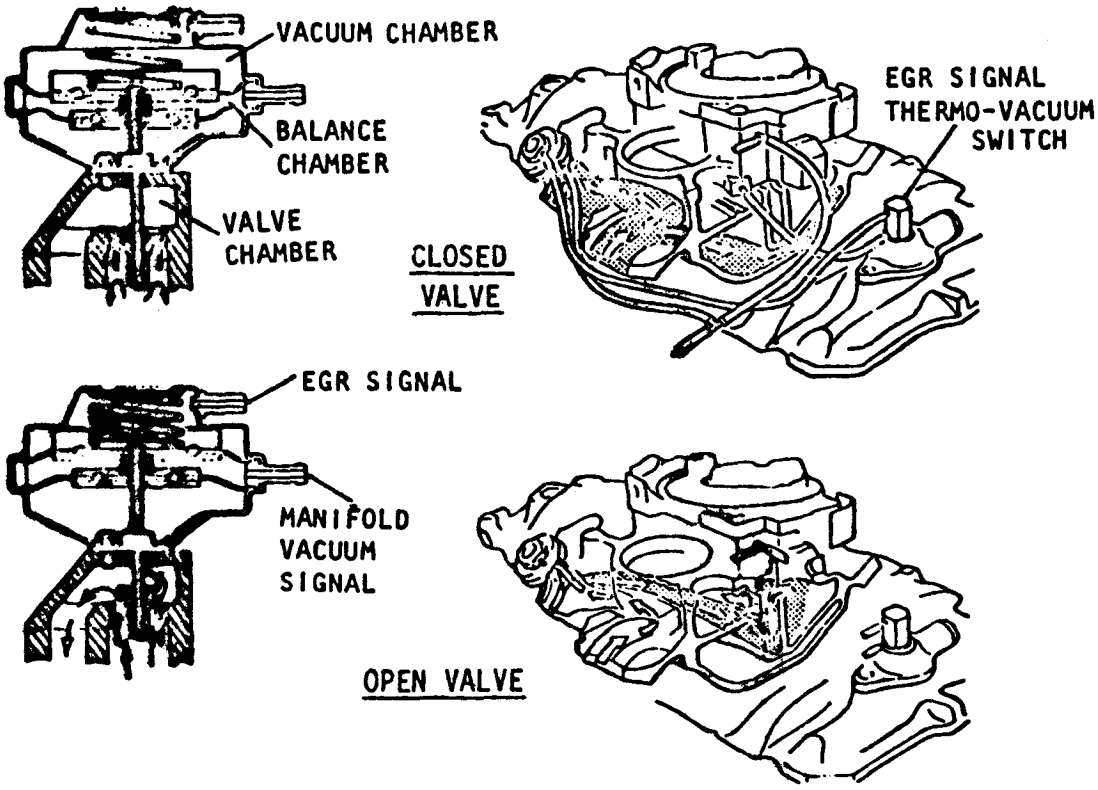
HC = Hydrocarbons
CO = Carbon Monoxide
NOx = Nitrogen Oxides

EMISSIONS STANDARDS
(Maximum Allowable Limits)

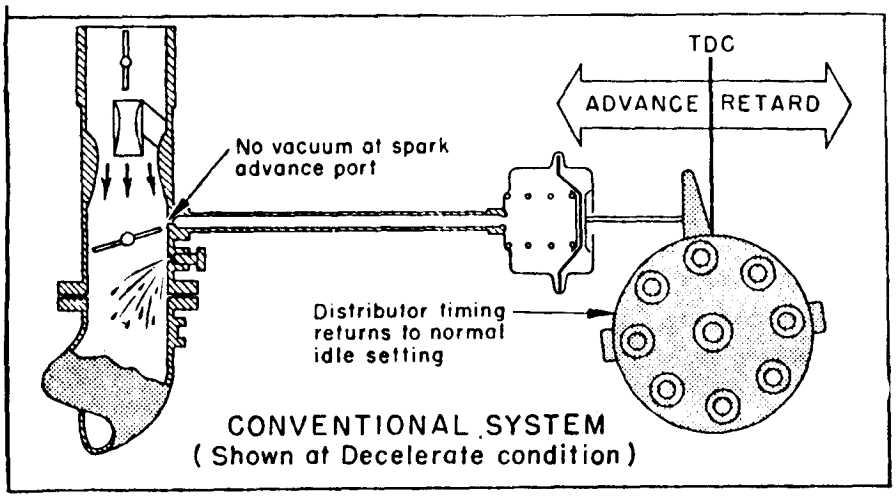
VEHICLE TYPE	CURB WEIGHT (lbs)	MODEL YEAR	NUMBER OF CYLINDERS	IDLE PASS/FAIL HC (PPM)	IDLE PASS/FAIL CO (%)	CONDITIONING MODE DIAGNOSTIC INFORMATION HC (PPM)	CONDITIONING MODE DIAGNOSTIC INFORMATION CO (%)
4-Stroke Light-Duty	8500 or less	1981 & newer	ALL	250	1.50	100	0.50
4-Stroke Light-Duty	6000 or less	1975 - 1980	4 or less	250	2.50	120	1.00
			more than 4	250	2.20	120	1.00
4-Stroke Vehicles	ALL	1972 - 1974	4 or less	450	6.00	380	3.50
			more than 4	400	5.50	300	3.00
4-Stroke Vehicles	ALL	1971 & older	4 or less	800	6.50	450	4.25
			More than 4	750	6.50	380	3.50
4-Stroke Heavy-Duty	more than 8500	1979 & newer	ALL	350	5.00	300	3.00
	more than 6000	1975 - 1978	ALL	350	5.00	300	3.00
4-Stroke Reconstructed	ALL	ALL	ALL	1200	7.50	700	5.25
4-Stroke Motorcycles	ALL	ALL	ALL	1800	5.50	500	5.00
2-Stroke Vehicles	ALL	ALL	ALL	18,000	5.00	18,000	5.00

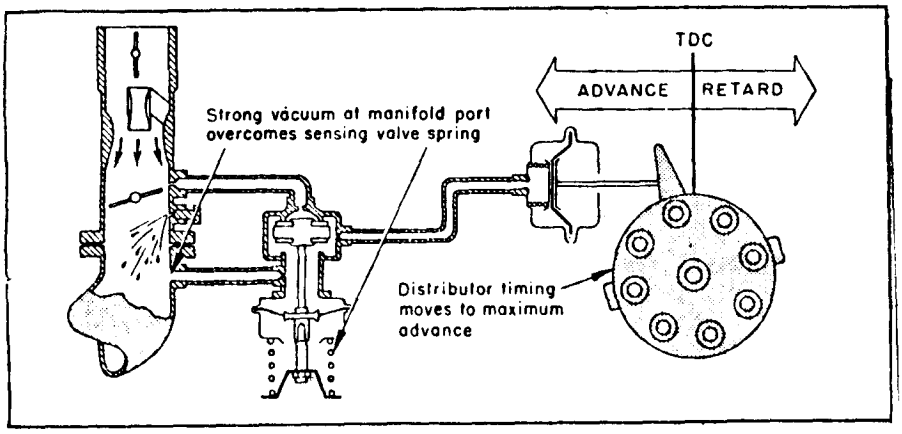


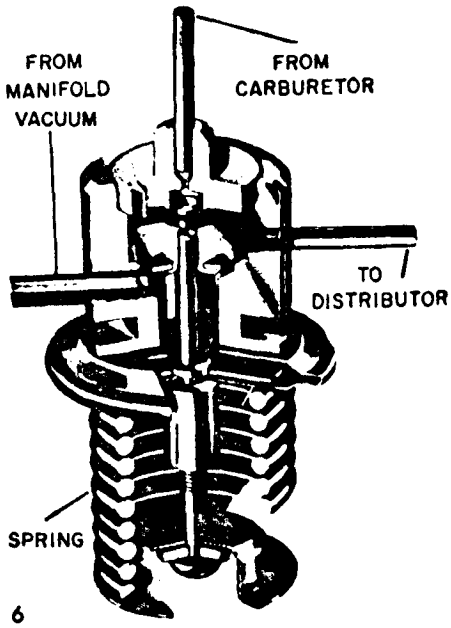
Vacuum Modulated Control Valve System



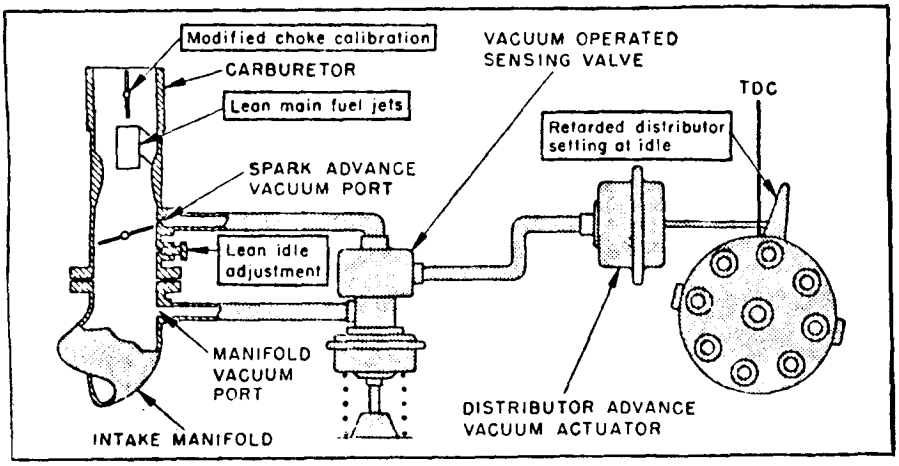
Dual Diaphragm Vacuum Modulated Control Valve System

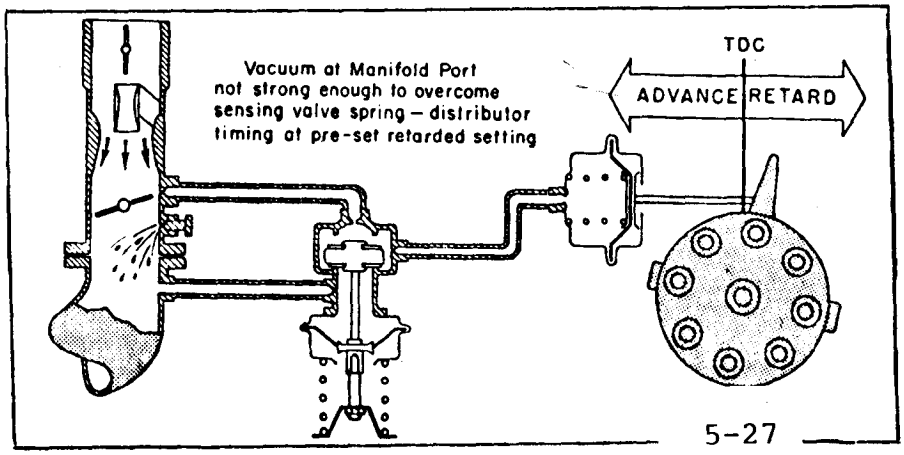

TDC
ADVANCE
RETARD
No vacuum at spark advance port
Distributor timing returns to normal idle setting
CONVENTIONAL SYSTEM
(Shown at Decelerate condition)

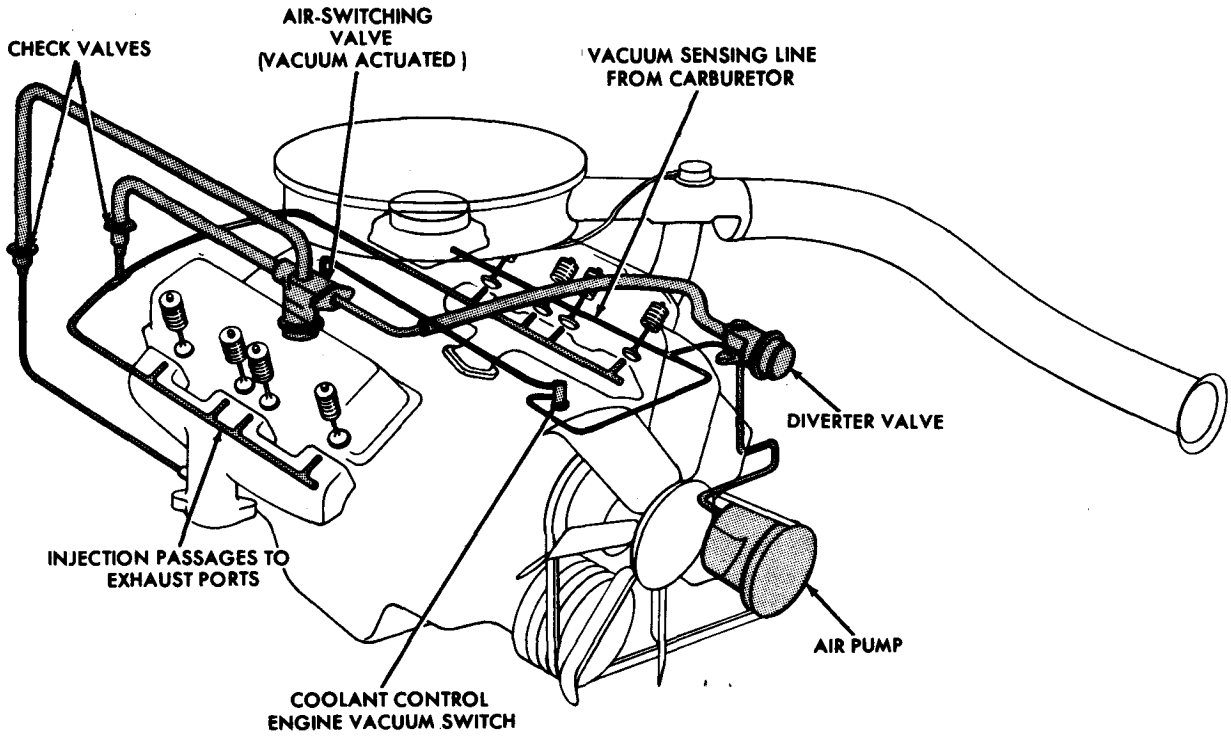

TDC
ADVANCE
RETARD
Strong vacuum at manifold port overcomes sensing valve spring
Distributor timing moves to maximum advance


FROM MANIFOLD VACUUM
FROM CARBURETOR
TO DISTRIBUTOR
SPRING

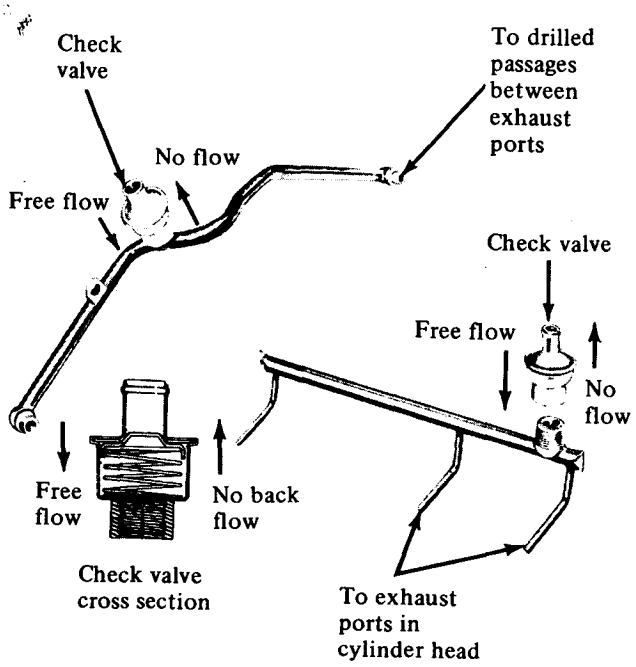
6


Modified choke calibration
CARBURETOR
Lean main fuel jets
SPARK ADVANCE VACUUM PORT
Lean idle adjustment
MANIFOLD VACUUM PORT
INTAKE MANIFOLD
VACUUM OPERATED SENSING VALVE
TDC
Retarded distributor setting at idle
DISTRIBUTOR ADVANCE VACUUM ACTUATOR

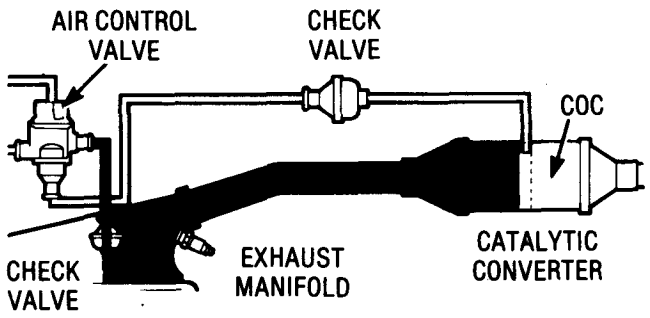

Vacuum at Manifold Port not strong enough to overcome sensing valve spring – distributor timing at pre-set retarded setting
TDC
ADVANCE
RETARD



An air injection system. (Courtesy of Chrysler Corporation)

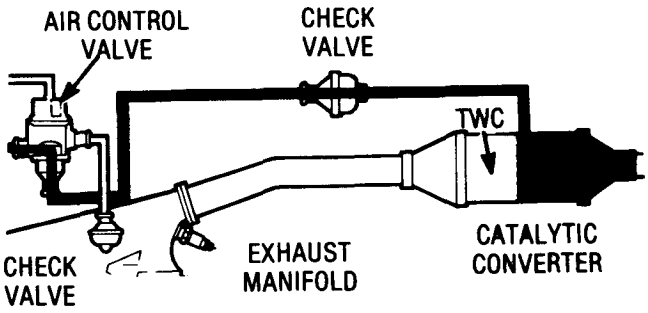


Check valves used in the Ford air injection system. (Courtesy of Ford Motor Company, Dearborn)



Air is injected into the exhaust manifold during engine warm-up. (Courtesy of Ford Motor Company, Dearborn)

Three-Way Catalytic Converters



Air is injected into the "mid-bed" of the catalytic converter during normal hot engine operation. (Courtesy of Ford Motor Company, Dearborn)

NOTES