

# IGNITION SYSTEM

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## DESCRIPTION AND OPERATION

The high energy ignition system is standard equipment on all engines used by Buick for 1975. This system includes a magnetic-pulse distributor which features integrated electronics and a high energy ignition coil in one compact maintenance free unit (except for L6 engines). In the case of the L6 engine the high energy ignition coil is separate from the distributor. See Figures 1C-1 and 1C-2.

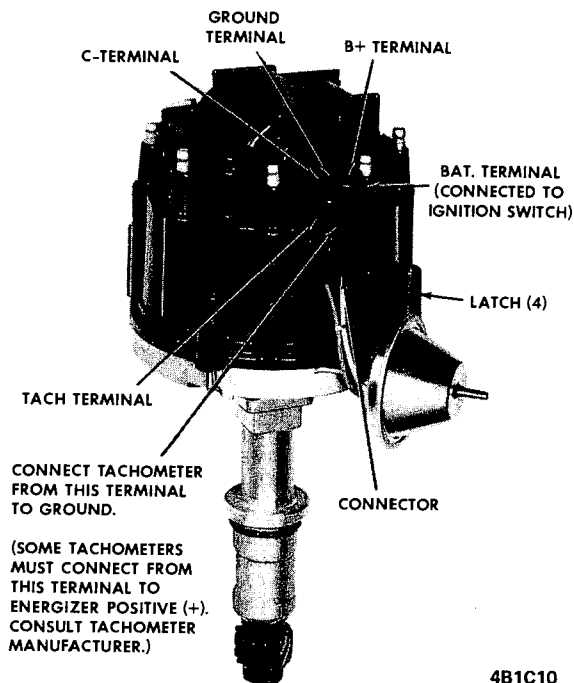


Figure 1C-1 - V-8-H.E.I. Distributor

The distributor contains a pickup-coil, permanent magnet and pole piece with internal teeth (8 equally spaced for

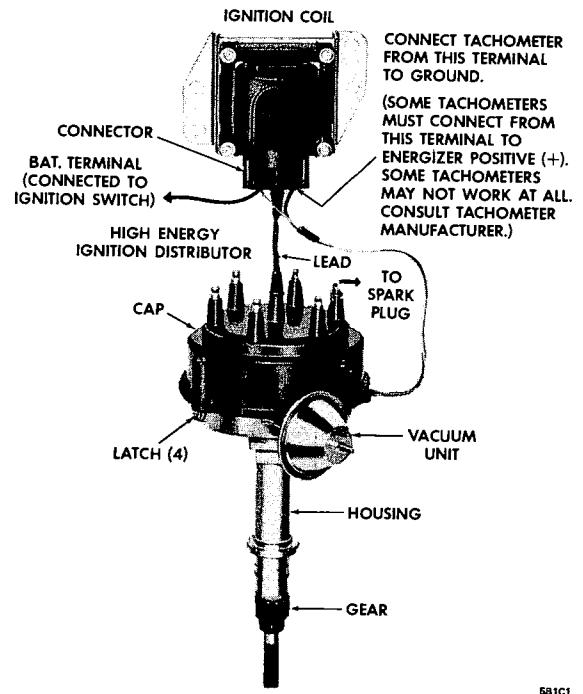


Figure 1C-2 - L6-H.E.I. Distributor

V-8, 6 spaced in 3 banks of 2 each for V-6 and 6 equally spaced for L6) which are located and retained on the distributor shaft upper bushing, an electronic module, a condenser for noise suppression only and a vacuum advance unit. Attached to the lower part of the centrifugal advance weight base is a timer core with external teeth. (8 equally spaced for V-8, 3 equally spaced for V-6 and 6 equally spaced for L6). See Figure 1C-3.

When the distributor shaft rotates, the teeth of the timer core line up and pass the teeth of the pole piece to induce

**DIAGNOSIS**

**TROUBLE SHOOTING THE L6 H.E.I.**

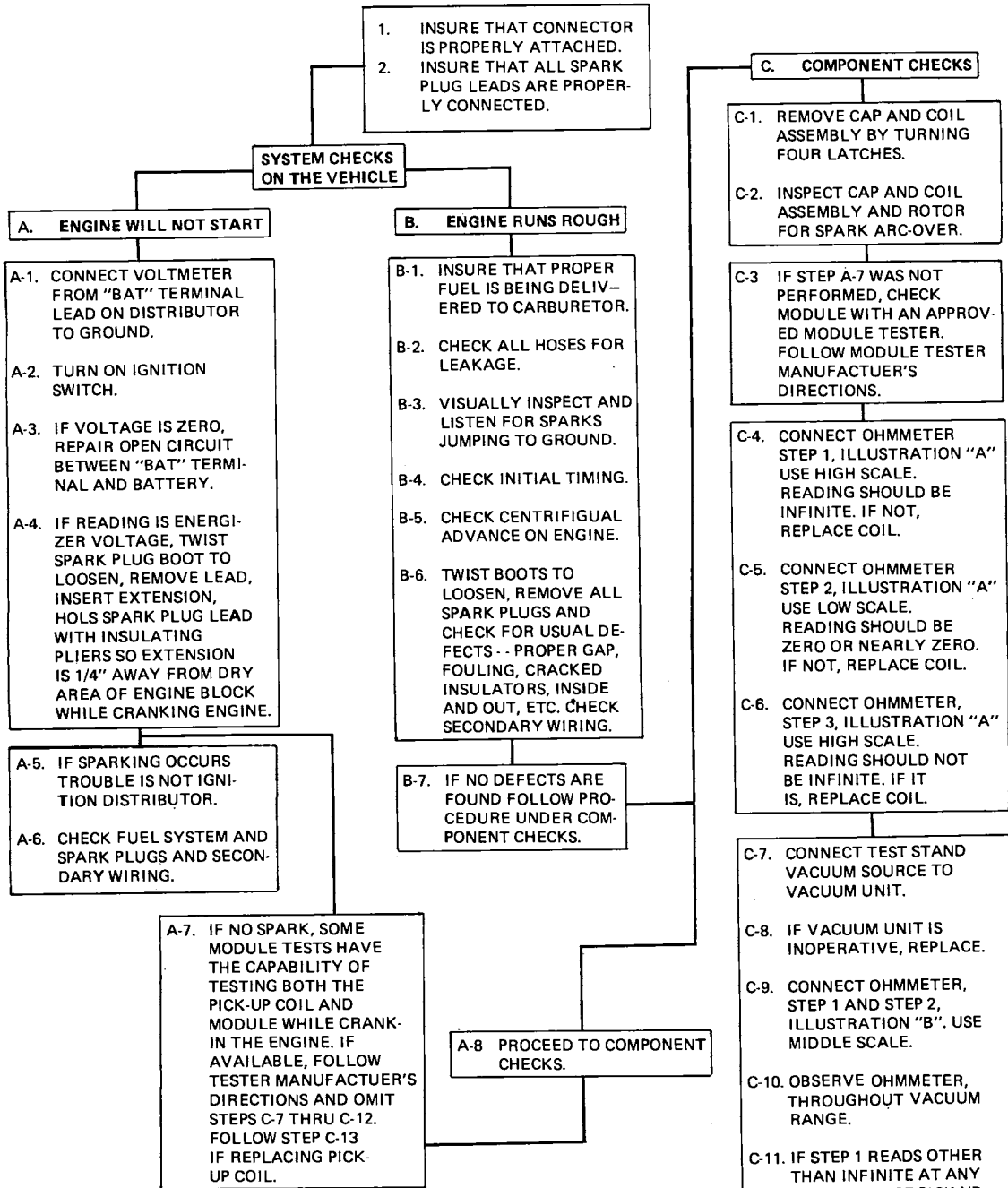


ILLUSTRATION "A"

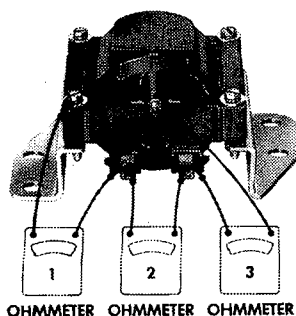
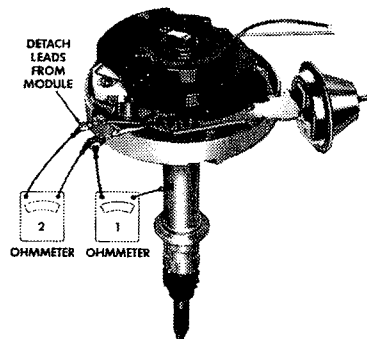


ILLUSTRATION "B"



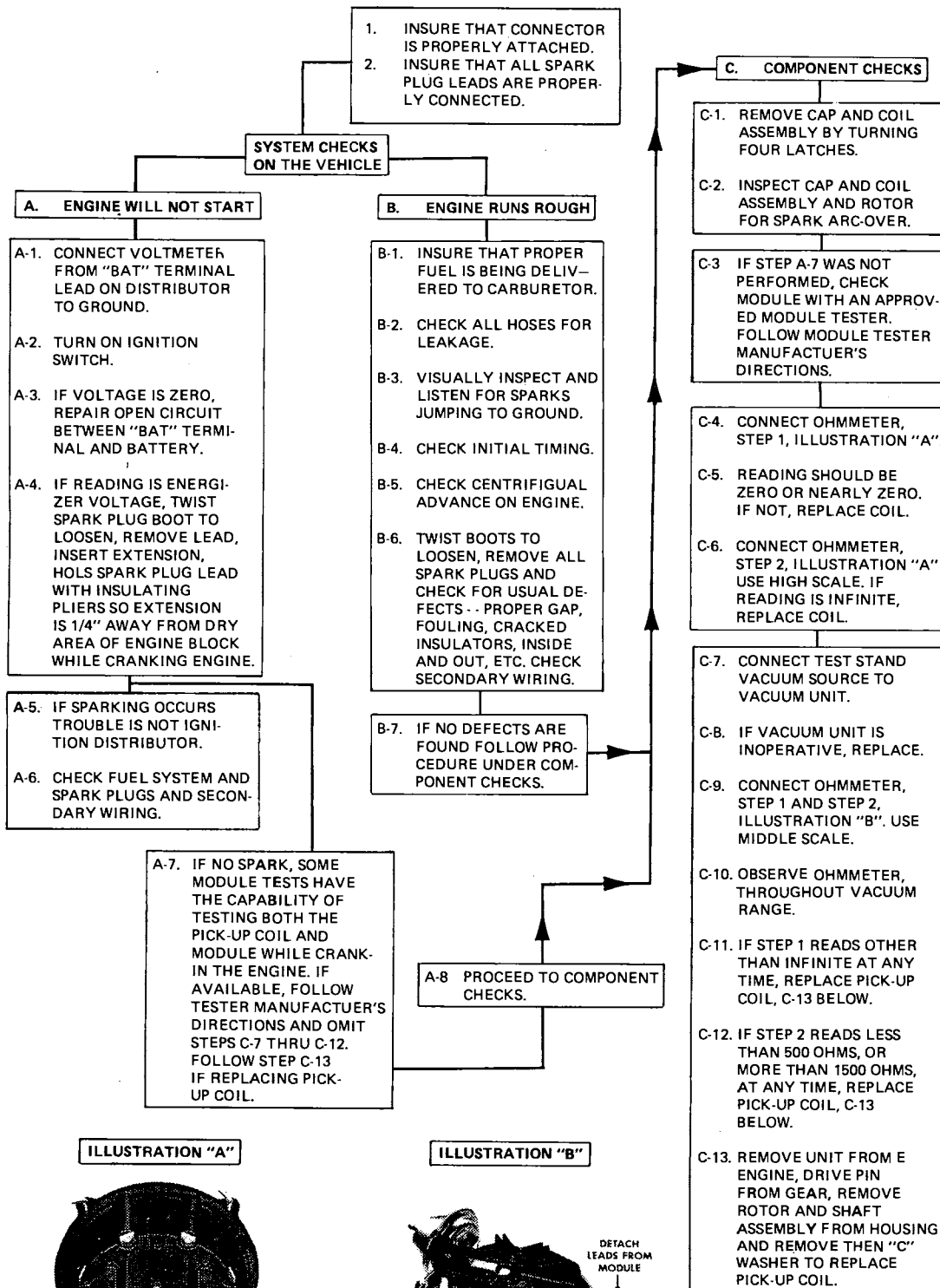


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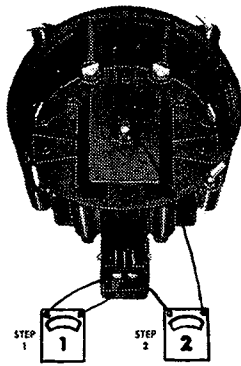
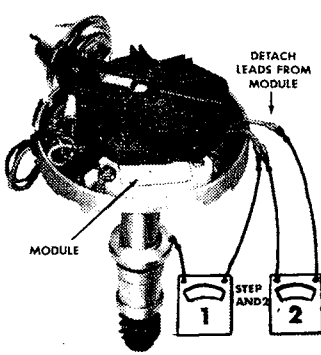


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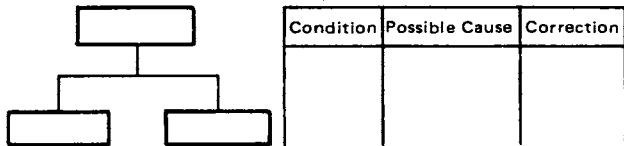


## V8 AND V6 ENGINES

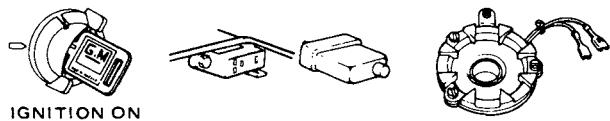
### DIAGNOSIS CHARTS

#### Introduction

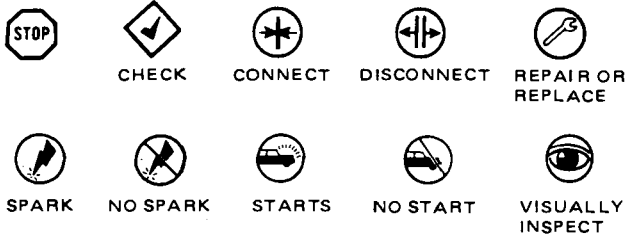
This section presents a systematic method of diagnosing and troubleshooting the High Energy Ignition system. The charts you will be using are different from the ones you have used before. They aren't "go-no go" decision trees or tables. All procedures apply to both V8 and V6.



Instead the new diagnosis and troubleshooting charts use pictures plus a few words to help you solve a problem,

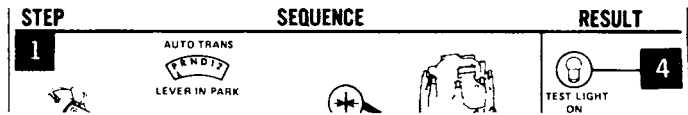


and symbols have replaced words.

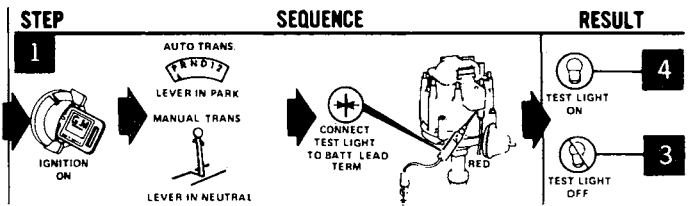


#### Using the Charts

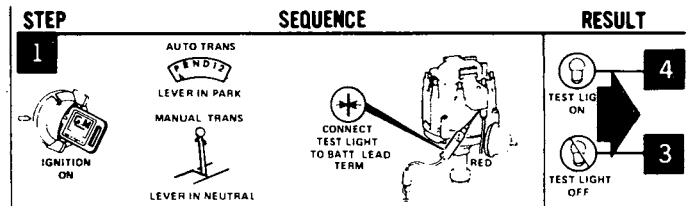
The charts are divided into three sections: step, sequence and result.



Always start at the first step and go through the complete sequence from left to right.



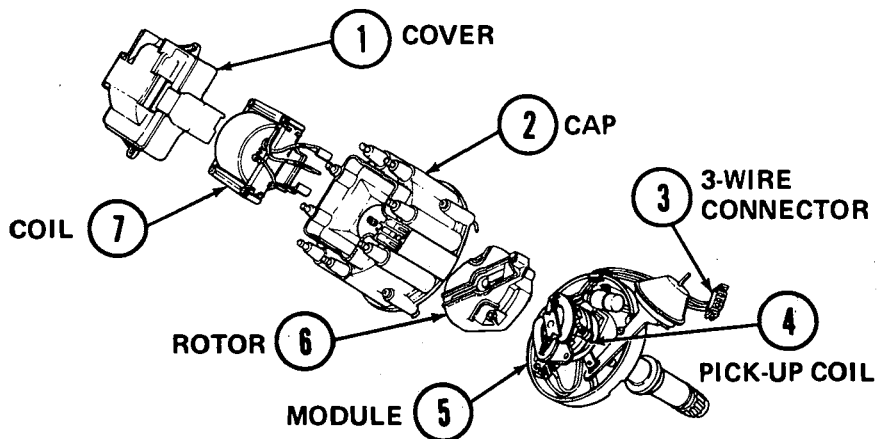
A sequence could be checking the battery lead terminal on the distributor. Each sequence ends with a result and tells you the next step to go to.



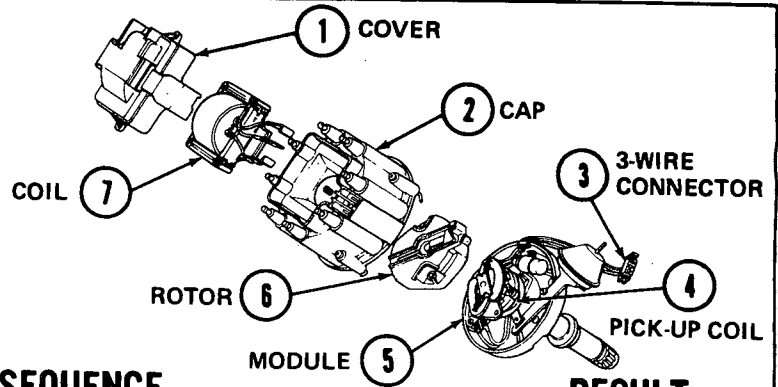
Work through each step of the diagnosis and troubleshooting charts till the system is repaired. **STOP**

To find where parts are located in the system just look at the parts locator at the top of each chart.

#### Parts Locator



**PROBLEM:**  
engine **CRANKS** but  
**WILL NOT START**



**STEP**

**SEQUENCE**

**RESULT**

**1**

AUTO TRANS. PRND12 LEVER IN PARK  
MANUAL TRANS. LEVER IN NEUTRAL

IGNITION ON

C. GRD B+ TACH BAT

CONNECT TEST LIGHT TO BAT. LEAD TERM.

RED II

TEST LIGHT ON

TEST LIGHT OFF

**4**

**3**

**2**

C. GRD B+ TACH BAT

RED

INSERT TEST LIGHT IN RED B+ WIRE

TEST LIGHT OFF

REPAIR LEAD OR CONNECTOR

TEST LIGHT ON

TEST LIGHT ON

STARTS

NO START

**5**

**5**

**STOP**

**3**

BAT. TERM. CHECK

IGNITION SW.

RED II

REPAIR OR REPLACE AS NECESSARY

TEST LIGHT ON

STARTS

NO START

**4**

**4**

DISCONNECT OVERRIDE RELAY

CONNECT REMOTE START SW.

REMOVE A SPARK PLUG WIRE, INSERT EXTENSION AND PERFORM SPARK TEST

USING INSULATED PLIERS HOLD SPARK PLUG WIRE 1/4" AWAY FROM ENG. BLOCK WHILE CRANKING ENGINE

EXTENSION

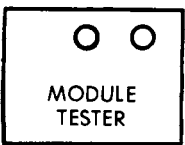
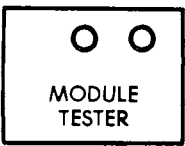
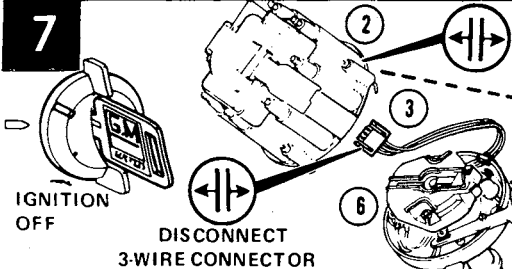
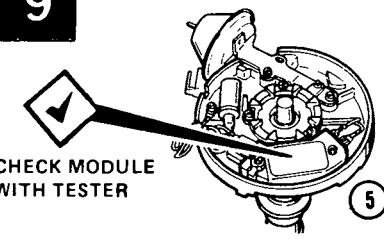
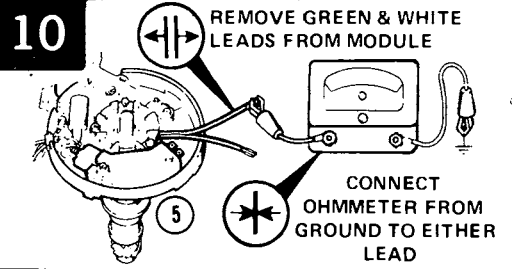
NO SPARK

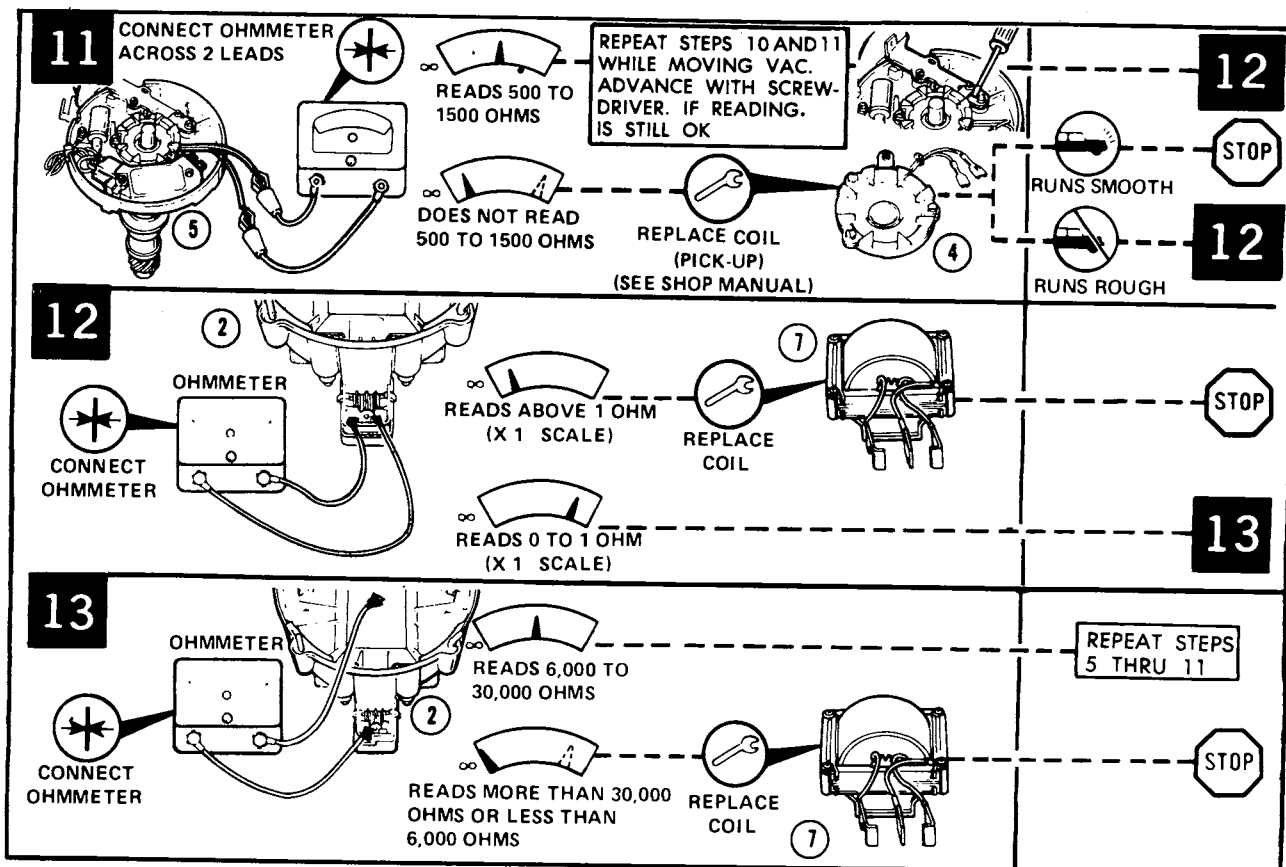
SPARK

**2**

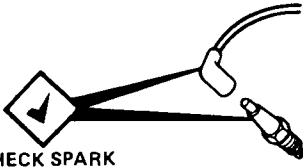
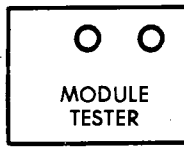
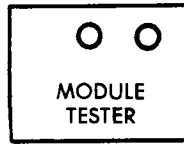
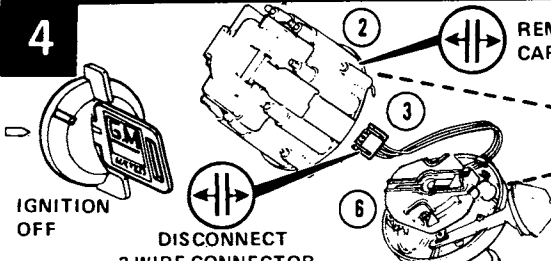
PROBLEM IS NOT IGNITION SYSTEM CHECK

- FUEL SYSTEM
- PLUGS
- FLOODED

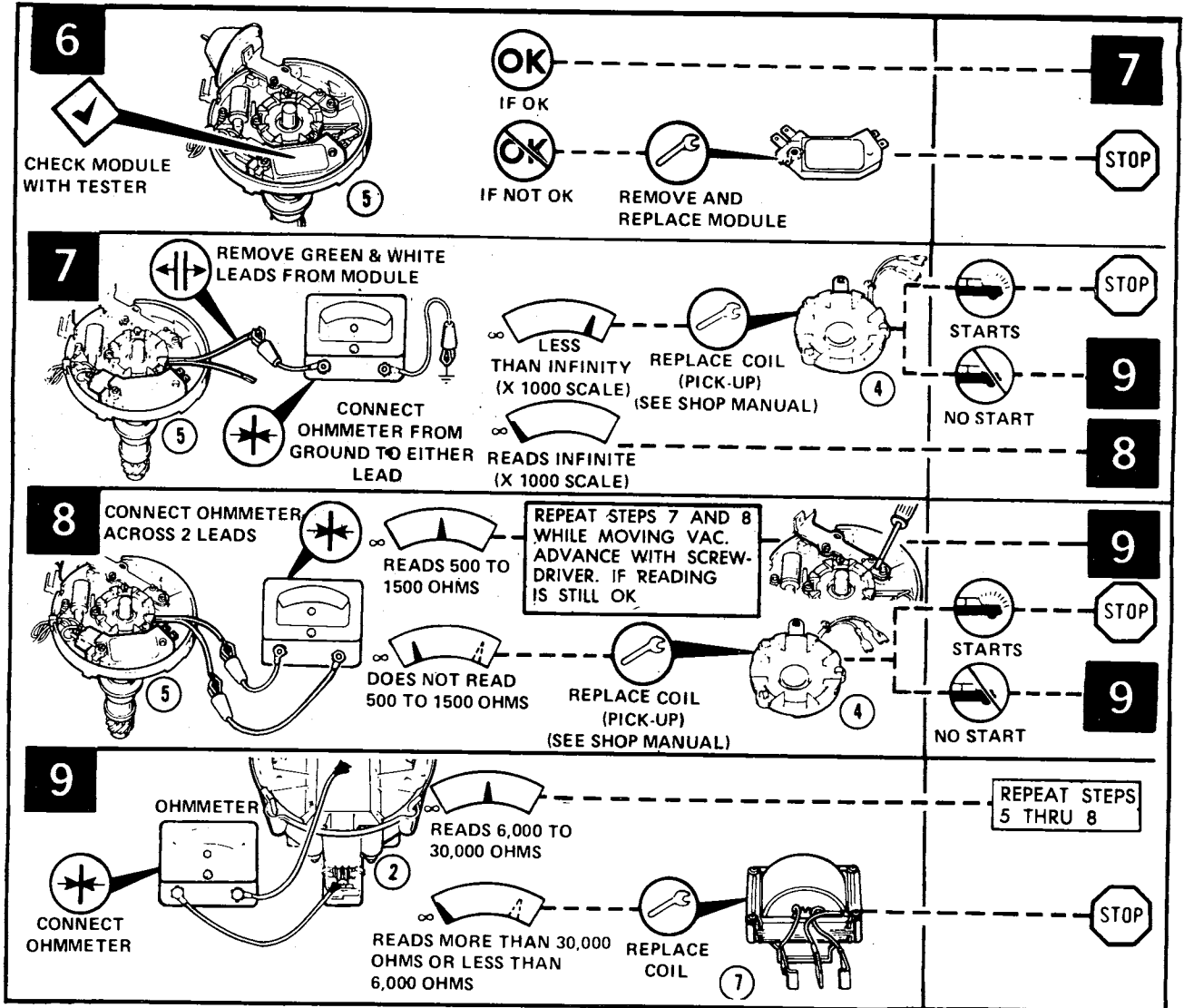
STEP	SEQUENCE	RESULT
<p><b>5</b></p>  <p>MODULE TESTER</p>	<p>DETERMINE IF MODULE TESTER WILL TEST BOTH PICKUP COIL AND MODULE WHILE CRANKING</p>	<p>YES <b>6</b></p> <p>NO <b>7</b></p>
<p><b>6</b></p>  <p>MODULE TESTER</p>	<p>TEST PICKUP COIL AND MODULE PER TESTER MANUFACTURER'S PROCEDURES</p> <p>OK IF OK</p> <p>NO OK IF NOT OK</p> <p>REPLACE DEFECTIVE PART</p>	<p><b>7</b></p> <p>STOP</p>
<p><b>7</b></p>  <p>IGNITION OFF</p> <p>DISCONNECT 3-WIRE CONNECTOR</p> <p>REMOVE CAP ASSY.</p> <p>VISUALLY INSPECT FOR MOISTURE, DUST CRACKS, BURNS, ETC.</p> <p>REPAIR AS NECESSARY</p>	<p>STARTS</p> <p>NO START</p>	<p>STOP</p> <p><b>8</b></p>
<p><b>8</b></p>	<p>IF STEP 6 WAS PERFORMED</p> <p>IF STEP 6 WAS NOT PERFORMED</p>	<p><b>12</b></p> <p><b>9</b></p>
<p><b>9</b></p>  <p>CHECK MODULE WITH TESTER</p>	<p>OK IF OK</p> <p>NO OK IF NOT OK</p> <p>REMOVE AND REPLACE MODULE</p>	<p><b>10</b></p> <p>STOP</p>
<p><b>10</b></p>  <p>REMOVE GREEN &amp; WHITE LEADS FROM MODULE</p> <p>CONNECT OHMMETER FROM GROUND TO EITHER LEAD</p> <p>LESS THAN INFINITY (X 1000 SCALE)</p> <p>READS INFINITE (X 1000 SCALE)</p> <p>REPLACE COIL (PICK-UP) (SEE SHOP MANUAL)</p>	<p>STARTS</p> <p>NO START</p>	<p>STOP</p> <p><b>12</b></p> <p><b>11</b></p>



**PROBLEM: engine RUNS ROUGH or CUTS OUT**

STEP	SEQUENCE	RESULT
<p><b>1</b></p>  <p>CHECK SPARK PLUGS &amp; PLUG WIRES</p>	<p>OK</p> <p>NO</p> <p>REPAIR OR REPLACE</p>	<p><b>2</b></p> <p>STOP</p> <p>RUNS SMOOTH</p> <p>RUNS ROUGH</p> <p><b>2</b></p>
<p><b>2</b></p>  <p>MODULE TESTER</p> <p>DETERMINE IF MODULE TESTER WILL TEST BOTH PICKUP COIL AND MODULE WHILE CRANKING</p>	<p>YES</p> <p>NO</p>	<p><b>3</b></p> <p><b>4</b></p>
<p><b>3</b></p>  <p>MODULE TESTER</p> <p>TEST PICKUP COIL AND MODULE PER TESTER MANUFACTURER'S PROCEDURES</p>	<p>OK</p> <p>IF OK</p> <p>NO</p> <p>IF NOT OK</p> <p>REPLACE DEFECTIVE PART</p>	<p><b>4</b></p> <p>STOP</p>
<p><b>4</b></p>  <p>IGNITION OFF</p> <p>DISCONNECT 3-WIRE CONNECTOR</p> <p>REMOVE CAP ASSY.</p> <p>VISUALLY INSPECT FOR MOISTURE, DUST, CRACKS, BURNS, ETC.</p> <p>REPAIR AS NECESSARY</p>	<p>STARTS</p> <p>NO START</p>	<p>STOP</p> <p><b>5</b></p>
<p><b>5</b></p> <p>IF STEP 3 WAS PERFORMED</p> <p>IF STEP 3 WAS NOT PERFORMED</p>	<p>---</p> <p>---</p>	<p><b>9</b></p> <p><b>6</b></p>





hose is hot, choke valve fully open and air-conditioner turned off if so equipped.

6. Disconnect and plug hose at distributor vacuum advance.

7. Direct timing light beam on engine timing indicator and mark on harmonic balancer. Slowly rotate distributor until mark on harmonic balancer is aligned with specified degree mark on timing indicator. See Figure 1C-4. Refer to specifications section for proper setting.

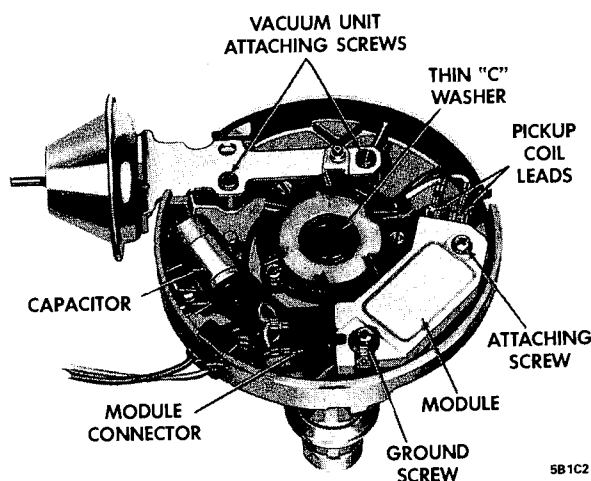


Figure 1C-3 - L6 H.E.I. Distributor Housing

voltage into the pickup coil which signals the all-electronic module to open the ignition coil primary circuit. Maximum inductance occurs at the moment the timer core teeth are lined up with the teeth on the pole piece. At the instant the timer core teeth start to pass the pole piece teeth, the primary current decreases and a high voltage is induced into the ignition coil secondary winding and is directed through the rotor and high voltage leads to fire the spark plugs. This system does not require a resistance wire. There are no contact points and condenser to replace which eliminates the need for periodic ignition tune-ups.

Spark plugs will last longer because the higher secondary voltage available will fire eroded (wider than normal) spark plug gaps.

H.E.I. provides reliable, constant output for long periods of time and miles without the deterioration associated with contact sets. Engine starting is improved because of the higher voltage output available at lower cranking speeds. There is no periodic lubrication required on this new distributor. Engine oil lubricates the lower bushing and an oil filled reservoir provides lubrication for the upper bushing.

## MAINTENANCE AND ADJUSTMENTS

### Setting Ignition Timing (Engine Running)

1. Connect 12 volt power timing light to No. 1 cylinder following instrument manufacturers instructions. Do not insert sharp objects along the boot or nipple. Always use an adapter or inductive pick-up.
2. Calibrate and connect tachometer between distributor side of coil and ground following manufacturers instructions.
3. Make certain plug wires, boots and nipples are in good condition and properly installed. Loosen distributor clamp bolt.
4. Set parking brake and block a drive wheel front and rear.
5. Start engine and allow to warm up until upper radiator

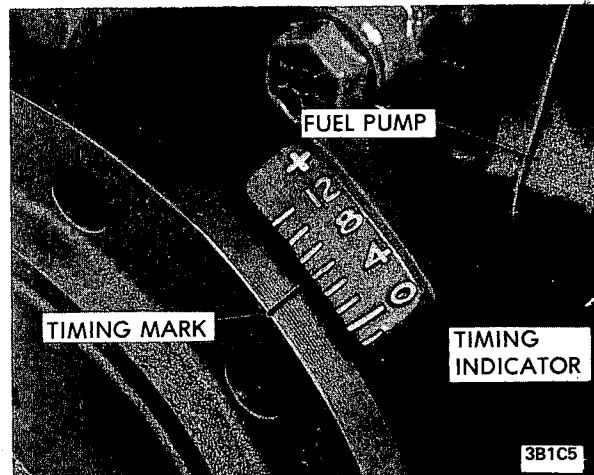


Figure 1C-4 - Timing Mark and Indicator

8. Tighten distributor to engine clamp bolt.
9. Recheck and adjust if necessary the idle speed and timing.
10. Unplug and connect hose to vacuum advance unit.
11. Shut engine off and disconnect timing light and tachometer.

### Setting Ignition Timing (Engine Won't Run)

1. With No. 1 spark plug removed and with hole plugged, rotate crankshaft in a forward direction using a suitable wrench on the harmonic balancer to crankshaft bolt. When plug blows from No. 1 cylinder, continue rotation until timing mark on balancer is aligned with proper mark on timing indicator. No. 1 cylinder is now in position to fire.
2. If removed, install distributor in engine with rotor in position to fire No. 1 cylinder and with vacuum control in position to connect vacuum hose. Install distributor clamp and bolt with lock washer, leaving bolt just loose enough to allow movement of distributor with hand pressure.
3. Install distributor cap. Make sure that spark plug wires are correctly installed in distributor cap, through clips on rocker arm covers, and on spark plugs.

### SPARK PLUG AND WIRE SERVICE

Spark plug wire is of special resistance type construction with a carbon impregnated linen core. It is designed to eliminate radio and television interference radiation and is superior in resistance to crossfire. Care must be used when removing spark plug wires to prevent pulling terminals off and or breaking the core.

1. Remove spark plug wires by grasping the boots and not the wire.

2. Remove spark plugs avoiding insulator damage.

### Inspection

1. Clean spark plug wires with a kerosene moistened cloth and wipe dry. Inspect for broken, worn spots or cuts in the insulation and corroded, broken or distorted terminals. Replace wires as required.

2. Inspect spark plugs carefully for cracked or broken insulators and worn or burned electrodes. Replace as required. If spark plugs appear to be in good condition except for carbon or oxide deposits, they should be cleaned with a blast type cleaner, adjusted and reinstalled. Plugs with a wet or oily deposit should be cleaned first with a degreasing solvent and thoroughly dried. Manufacturers instructions must be followed when cleaning plugs.

### Adjusting Spark Plug Gap

To accurately adjust spark plug gap use round wire feeler gauge. Adjust gap by bending side electrode only. The specified gap is .060" for all engines except the 260 V-8 and .080" for the 260 V-8 engine. Check gap by sliding correct round wire feeler gauge between end of center electrode and side electrode.

### Spark Plug and Wire Installation

1. Install properly gapped spark plugs and tighten to 15-25 ft. lbs. for all engines. Do not overtighten as they will be difficult to remove the next time.

2. Install plug wires making sure each spark plug is connected to its respective distributor cap tower. Insure that all boots are properly seated.

## NEUTRAL START AND BACK-UP LAMP SWITCH

### Removal

1. Disconnect wiring connectors from switch.
2. Remove the two attaching screws and lift switch off column.

### Installation

#### WITH MANUAL TRANSMISSION

1. Position shift lever in REVERSE.
2. Assemble switch to column by inserting switch carrier tang into shift tube slot and installing the retaining screws.
3. Move shift lever out of reverse to shear switch pin and then check operation.
4. If switch needs to be reset, position shift lever in REVERSE, loosen retaining screws, rotate switch slightly on column until gauge hole in back of switch freely admits a No. 41 size drill to depth of 3/8 inch and then secure retaining screws.

#### WITH AUTOMATIC TRANSMISSION (COLUMN SHIFT)

1. Position shift lever in NEUTRAL.
2. Assemble switch to column by inserting switch carrier tang into shift tube slot and installing the retaining screws.

3. Move shift lever out of NEUTRAL to extreme position to shear switch pin and then check operation.

4. If switch needs to be reset, position shift lever in NEUTRAL, loosen retaining screws, rotate switch slightly on column until gauge hole in back of switch freely admits a No. 41 size drill to a depth of 3/8 inch and then secure retaining screws.

#### WITH AUTOMATIC TRANSMISSION (CONSOLE SHIFT)

1. Since this switch is fixed in PARK position with an internal plastic shear pin, position steering column in LOCK position.

2. Rotate shift bowl clockwise (as viewed from upper end of column) and lightly hold against lock stop.

3. Assemble switch to column by inserting switch carrier tang into shift tube slot and installing the retaining screws.

4. Unlock shift column, move shift lever out of PARK to shear switch pin and check operation.

5. If switch needs to be reset, position shift lever in NEUTRAL, loosen retaining screws, rotate switch on column slightly until gauge hole in back of switch freely admits a No. 41 size drill to a depth of 3/8 inch and then secure retaining screws.

## IGNITION SWITCH

### Removal

1. Disconnect battery ground cable.
2. Loosen and lower steering column. Refer to Group 3 Section F for procedure.
3. Disconnect electrical connectors from ignition switch.
4. Remove the two ignition switch attaching screws and lift switch off actuating rod.

### Installation

1. Place shift bowl in any position except "PARK" and rotate lock cylinder counter-clockwise until the rack bottoms against the lower surface of the cast in bowl plate.
2. Move the ignition switch slider first to accessory position then two positions in the opposite direction (off unlock position).
3. Fit the slider hole onto the actuator rod and assemble the ignition switch to the steering column being careful not to move the switch out of detent. Use correct screws and tighten to 35 in. lbs.
4. Attach electrical connectors.
5. Assemble steering column to instrument panel following the procedures in Group 3, Section F.

## MAJOR REPAIR

### HIGH ENERGY IGNITION SYSTEM (DISTRIBUTOR IN ENGINE)

#### Ignition Coil Replacement.

1. Disconnect feed and module wire terminal connectors

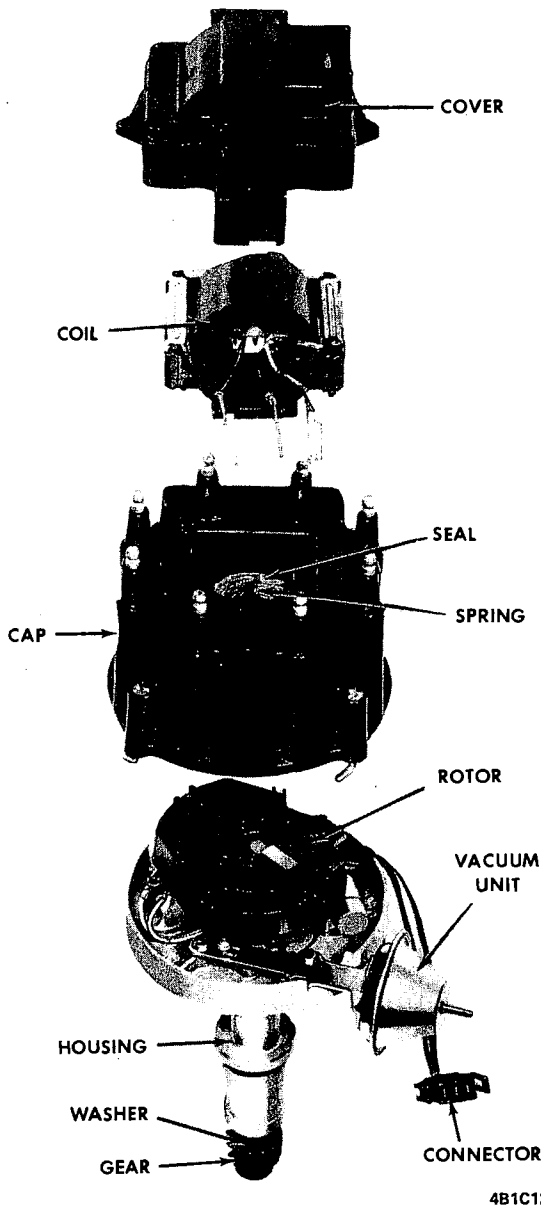


Figure 1C-5 - H.E.I. Distributor V-8 shown

from distributor cap V-6 and V-8. On L6, remove terminal connector and secondary from coil.

2. Remove ignition set retainer V-6 and V-8.

3. Remove the four coil cover to distributor cap screws and coil cover V-6 and V-8.

4. Remove the four coil to distributor cap screws V-6 and V-8. On L6, remove four coil to mounting bracket screws and remove coil.

5. Using a suitable tool press coil wire spade terminals up out of distributor cap V-6 and V-8.

6. Lift coil up out of distributor cap V-6 and V-8.

7. Remove and clean coil spring, rubber seal washer and coil cavity of distributor cap V-6 and V-8.

8. Coat rubber seal with dielectric lubricant furnished in new ignition coil package V-6 and V-8.

### Distributor Cap Replacement

1. Remove feed and module wire terminal connectors from distributor cap V-6 and V-8.

2. Remove retainer and spark plug wires from cap V-6 and V-8. On L6, remove spark plug and coil wires from distributor cap.

3. Depress and release the four distributor cap to housing retainers and lift off cap assembly.

4. Remove four coil cover screws and cover V-6 and V-8.

5. Using finger or suitable tool push spade terminals up out of distributor cap V-6 and V-8.

6. Remove four coil screws, lift coil, coil spring and rubber seal washer out of cap coil cavity V-6 and V-8.

7. Using new distributor cap reverse above procedures for assembly being sure to clean and lubricate rubber seal washer with dielectric lubricant furnished for V-6 and V-8.

### Rotor Replacement

1. Disconnect feed and module wire connectors from distributor for V-6 and V-8. On L6, remove spark plug and coil secondary wires from distributor cap.

2. Depress and release the four distributor cap to housing retainers and lift off cap assembly.

3. Remove the two rotor attaching screws and rotor. See Figure 1C-5.

4. Reverse above procedures for installation.

### Vacuum Advance Replacement

1. Remove distributor cap and rotor as previously described.

2. Disconnect vacuum hose from vacuum advance unit.

3. Remove two vacuum advance retaining screws, pull advance unit outward, rotate and disengage operating rod from tang. See Figure 1C-6.

4. Reverse above procedures for installation.

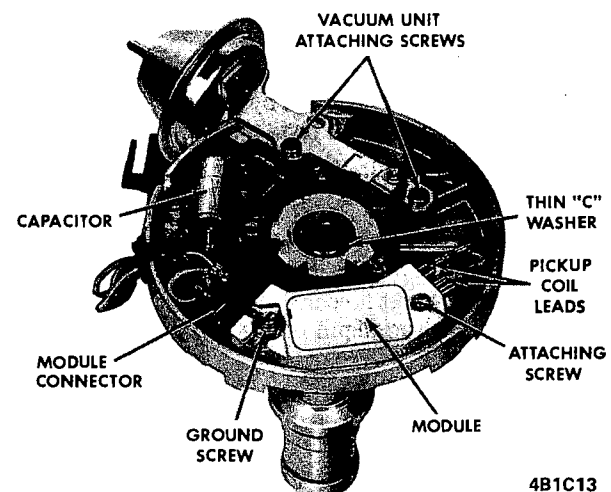


Figure 1C-6 - H.E.I. Distributor Housing V-8 Shown

1. Remove distributor cap and rotor as previously described.
2. Disconnect harness connector and pickup coil spade connectors from module.
3. Remove two screws and module from distributor housing. See Figure 1C-6.
4. Coat bottom of new module with dielectric lubricant furnished and reverse the above procedures for installation.

#### Distributor Removal

1. Disconnect ground cable from battery.
2. Disconnect feed and module terminal connectors from distributor cap for V-6 and V-8. On L6, disconnect terminal connector and secondary coil wire from coil and remove spark plug wires from numbers 1 and 2 spark plugs.
3. Disconnect hose at vacuum advance.
4. Depress and release the four distributor cap to housing retainers and lift off cap assembly.
5. Using crayon or chalk make locating marks on rotor and module and on distributor housing and engine for installation purposes.
6. Loosen and remove distributor clamp bolt, clamp and lift distributor out of engine noting relative position of rotor and module alignment marks then make a second mark on the rotor to align with the one mark on the module.

#### Distributor Installation

1. With new "O" ring on distributor housing, the second mark on the rotor aligned with the mark on the module, install distributor taking care to align the mark on the housing with the one on the engine. It may be necessary to lift the distributor and turn the rotor slightly to align the gears and oil pump drive shaft.
2. With the respective marks aligned, install clamp and bolt finger tight.

3. Install and secure distributor cap.
4. Connect feed and module connectors to distributor cap on V-6 and V-8. On L6, connect 1 and 2 spark plug wires as well as the terminal connector and coil secondary wire.
5. Connect timing light to engine and plug vacuum advance hose.
6. Connect ground cable to battery.
7. Start engine and set timing.
8. Turn engine off, tighten distributor clamp bolt, disconnect timing light, unplug and connect hose to vacuum advance.

#### Service Procedures (Distributor Removed) Driven Gear Replacement

1. With distributor cap and rotor removed, use a 1/8" pin punch and tap out the driven gear roll pin.
2. Hold rotor end of shaft and rotate driven gear to shear any burrs in roll pin hole.
3. Remove driven gear from shaft.
4. Reverse above procedures for installation.

#### Main Shaft Replacement

1. With driven gear and rotor removed, gently pull main shaft out of housing.
2. Remove advance springs, weights and slide weight base plate off mainshaft.
3. Reverse above procedures for installation.

#### Pole Piece, Magnet or Pickup Coil Replacement

1. With main shaft out of housing, remove three retaining screws, pole piece, magnet and or pickup coil. See Figure 1C-5.
2. Reverse removal procedures for installation making sure the pole piece teeth do not contact the timer core teeth by installing and rotating main shaft. Loosen three screws and realign pole piece if necessary.

**SPECIFICATIONS**

DISTRIBUTOR	CLOCKWISE					
	231 ENGINE	250 ENGINE	260 ENGINE	360 ENGINE	400 ENGINE	455 ENGINE
ROTATION, TOP VIEW	CLOCKWISE					
FIRING ORDER	165432 153624 18436572					
V-6 ENGINES						
L-6 ENGINES						
V-8 ENGINES						
TIMING, CRANKSHAFT DEGREES (WITH VACUUM DISCONNECTED AND ENGINE IDLING)	12° BTC @ IDLE	10° BTC @ IDLE	14° BTC @ 1100 CAL. 18° BTC @ 1100 FED.	12° BTC @ IDLE	16° BTC @ IDLE	12° BTC @ IDLE
CENTRIFUGAL ADVANCE, CRANKSHAFT DEGREES, R.P.M.	0° @ 1000	0° @ 1100	0° @ 650	0° @ 750-1400	0° @ 1200	0° @ 750-1350
START ADVANCE	10° @ 2000	7° @ 2300	19° @ 2400	4-8° @ 2100	4° @ 1400	9-12° @ 3000
MEDIUM ADVANCE	16° @ 4100	16° @ 4200	28° @ 4400	10-14° @ 4500	16° @ 4400	14-18° @ 4400
MAXIMUM ADVANCE						
VACUUM ADVANCE, CRANKSHAFT DEGREES AND INCHES OF VACUUM	0° @ 5-7"	18° @ 15" CAL. 18° @ 12" FED.	0° @ 4" 24° @ 15"	0° @ 6.5-8.5" 10-16° @ 11.5"	0° @ 6-8" 25° @ 10.5-13.5"	0° @ 4-6" 14-20° @ 11"
START ADVANCE	18° @ 10"					
MAXIMUM ADVANCE						
<b>SPARK PLUGS</b>						
MAKE AND MODEL (NORMAL OPERATION)	ACR44SX	ACR46TX	ACR46SX	ACR45TSX	4BBL ACR45TSX	ACR45TSX
THREAD AND SHELL HEX. SIZES	14MM, 13/16 3/8	14MM, 5/8 3/8	14MM, 13/16 3/8	14MM, 5/8 3/8	14MM, 5/8 3/8	14MM, 5/8 3/8
TERMINAL NUT LENGTH	.060	.060	.080	.060	.060	.060
GAP AT TIPS	15-25 FT.-LBS	15-25 FT.-LBS	15-25 FT.-LBS	15-25 FT.-LBS	15-25 FT.-LBS	15-25 FT.-LBS
TIGHTENING TORQUE (LBS FT.)						

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Figure 1C-7 - Distributor and Spark Plug Specifications