DISTRIBUTOR IGNITION SYSTEM

Introduction

Your car uses one of three different electronic ignition systems. The 2.5L, 3.0L and 3.8L engines utilize the standard Distributor Ignition (DI) system. The 3.0L/3.2L SHO and the 3.0L Flexible Fuel (FF) engines use two different Electronic Ignition (EI) systems, formerly known as Distributorless Ignition (DIS). The purpose of using an electronic ignition system is to eliminate the deterioration of spark quality which occurred in the earlier breaker point ignition system as the breaker points wore, to extend maintenance intervals, and to provide a more intense and reliable spark at every firing impulse, in order to ignite the leaner gas mixtures necessary to control emissions.

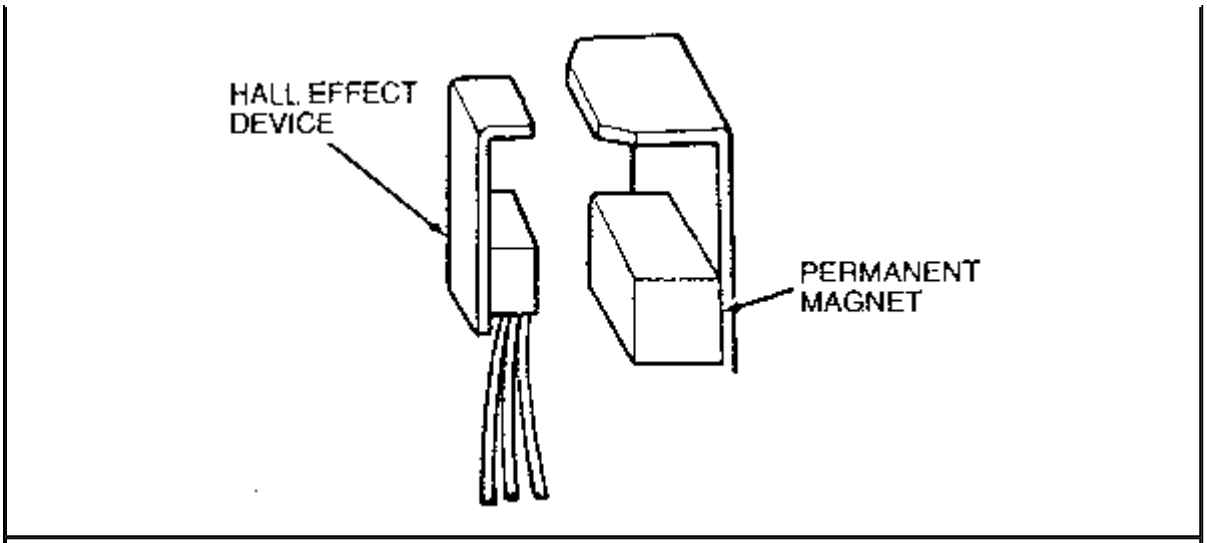
Discription & Operation

Taurus and Sable models equipped with the 2.5L, 3.0L, and 3.8L engines incorporate an ignition system using a Universal Distributor. The ignition system includes:

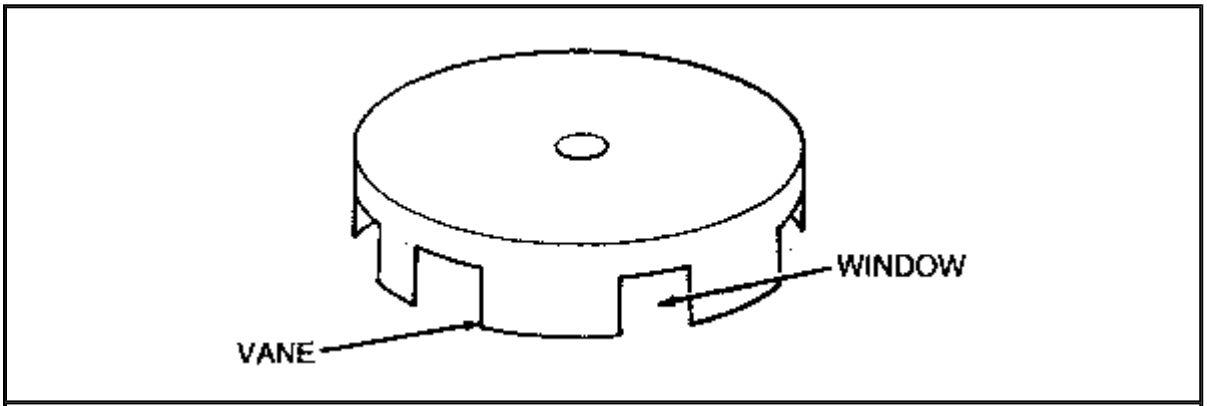
- **A universal distributor that has a diecast housing with a Hall effect distributor stator.**
- **An "E" type ignition coil which transforms battery voltage on the primary circuit, into about 28,000 volts on the secondary circuit each time the ignition coil receives a signal from the Ignition Control Module (ICM).**
- **An ignition control module which features EEC-IV or PCM-controlled ignition coil charge times.**

Some of the earlier models are equipped with a TFI-IV module. TFI stands for Thick Film Integrated and incorporates a molded thermoplastic module mounted on the distributor base. In later systems, the TFI-IV module's functions are carried out by the ignition control module.

In this system, the distributor is driven off the camshaft and uses no centrifugal or vacuum advance. The distributor operates by using a Hall effect vane switch assembly, causing the ignition coil to be switched on and off by the EEC-IV and TFI-IV modules on earlier vehicles, or the Powertrain Control Module (PCM) and the Ignition Control Module (ICM) on later vehicles.



View of the Hall effect vane switch assembly



View of the rotary vane cup which is made of ferrous material

The vane switch is an encapsulated package consisting of a Hall sensor on one side and a permanent magnet on the other side. A rotary vane cup, made of ferrous material, is used to trigger the signal OFF and ON. When the window of the vane cup is between the magnet and the Hall effect device, a magnetic flux field is completed from the magnet through the Hall effect device and back to the magnet. As the vane passes through this opening, the flux lines are shunted through the vane and back to the magnet. During this time, a voltage is produced as the vane passes through the opening. When the vane clears the opening, the window edge causes the signal to go to zero volts. The signal is then used by the EEC-IV or PCM (as applicable) for crankshaft position sensing and the computation of the desired spark advance based on engine demand and calibration. The voltage distribution is accomplished through a conventional rotor, cap and ignition wires.

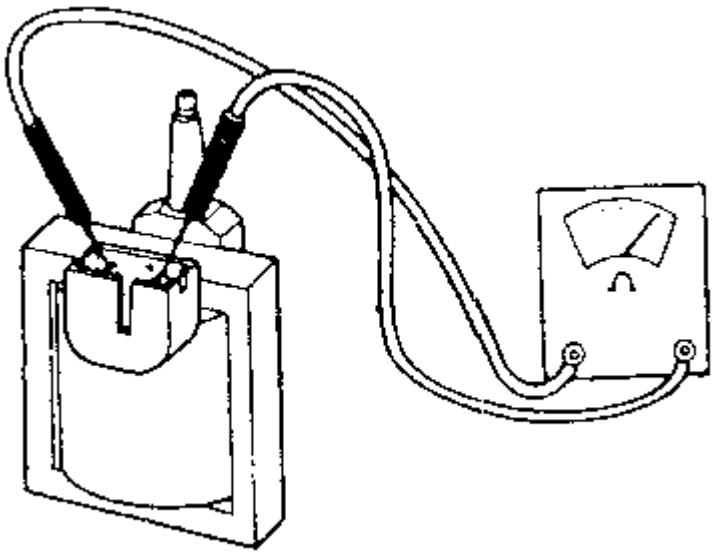
Component Testing

IGNITION COIL

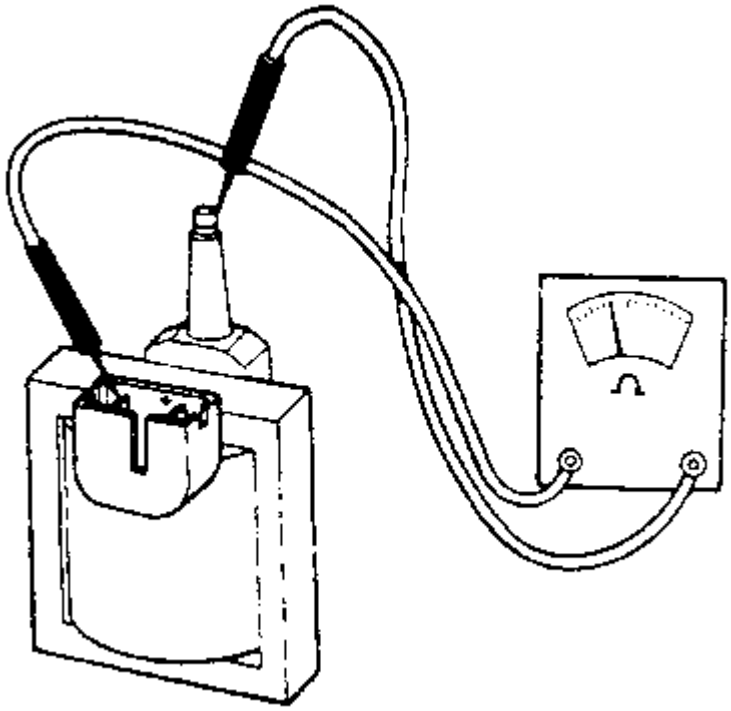
1. **Follow the coil wire from the center terminal on the distributor cap to the end at the ignition coil. Make sure the transaxle is in Park (AT) or Neutral (MT) and that the ignition is turned OFF.**
2. **Separate the wiring harness connector from the ignition module at the distributor. Inspect for dirt, corrosion and damage. Reconnect the harness if no problems are found.**

Push the connector tabs together to separate.

3. **Attach a 12 volt DC test light between the coil Tach terminal and an engine ground, then crank the engine. If the light flashes or is continuous:**
    1. **Turn the ignition switch OFF.**
    2. **Disengage the ignition coil connector on top of the coil and inspect for dirt, corrosion and/or damage.**
    3. **Using an ohmmeter, measure the ignition coil primary resistance from the positive (+) to the negative (-) terminal of the ignition coil. See the corresponding figures for terminal locations.**
    4. **The ohmmeter reading should be 0.3-1.0 ohms. If the reading is less than 0.3 ohms or greater than 1.0 ohms, the ignition coil should be replaced.**
    5. **Using an ohmmeter, measure the coil secondary resistance; connect it to the negative (-) terminal and the high voltage terminal.**
    6. **The resistance should be 6,500-11,500 ohms with the ohmmeter set on ohms x 1000. If the reading is less than 6,500 ohms or greater than 11,500 ohms, replace the ignition coil.**



Testing ignition coil primary resistance



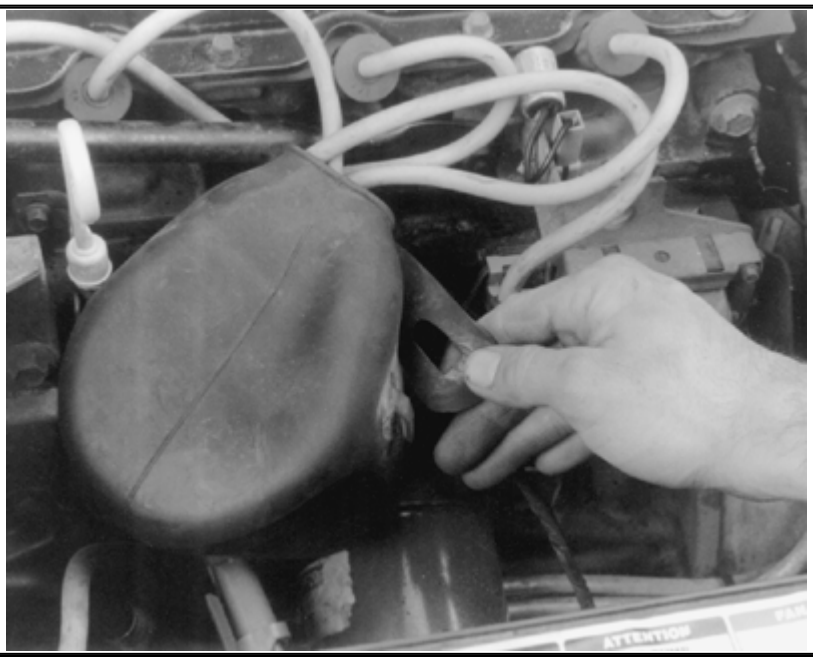
Testing ignition coil secondary resistance

Component Replacement

REMOVAL & INSTALLATION

Distributor Cap and Rotor

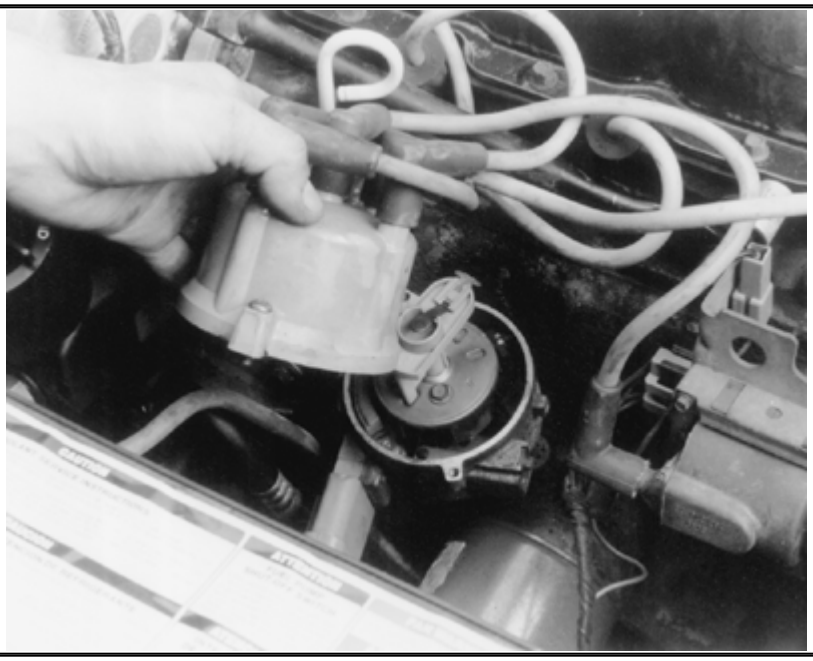
1. **Disconnect the negative battery cable.**
2. **If equipped, remove the distributor cap cover, then disengage the electrical connector, if applicable.**



If equipped, remove the distributor cap cover

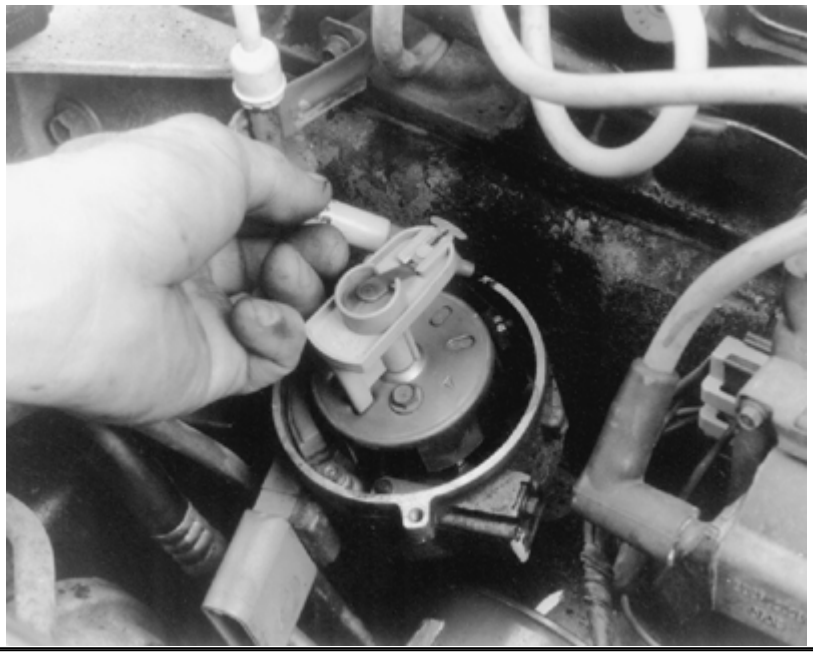
Disengage the electrical connector

3. **If necessary, tag and remove the spark plug wires from the cap.**
4. **Loosen the distributor hold-down screws.**
5. **Remove the distributor cap by lifting it straight off the distributor to prevent damage to the rotor blade and spring.**

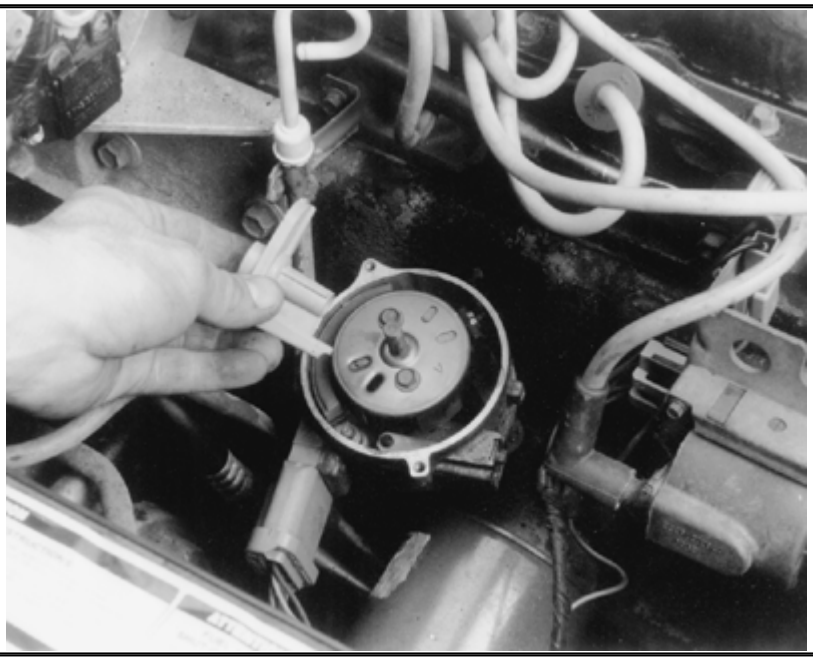


Lift the distributor cap straight up to prevent damage to the rotor blade and spring

6. **Matchmark the position of the rotor, then pull it upward to remove it from the distributor shaft and armature.**



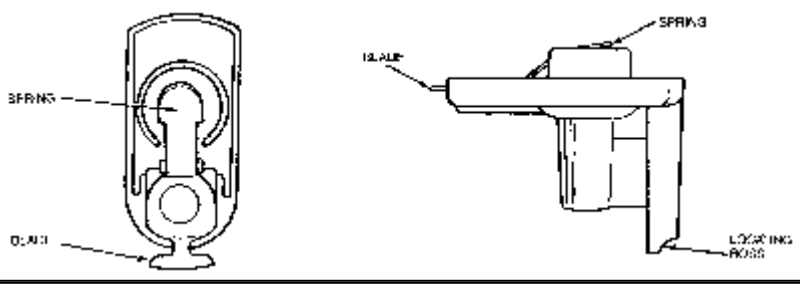
Matchmark the position of the rotor for installation purposes



Pull the rotor upward to remove it from the distributor shaft and armature

To install:

7. **Install the rotor according to the marks made during removal, making sure to align the locating boss on the rotor with the hole on the armature, then fully seat the rotor on the distributor shaft.**



View of the spring, blade and the locating boss on the rotor

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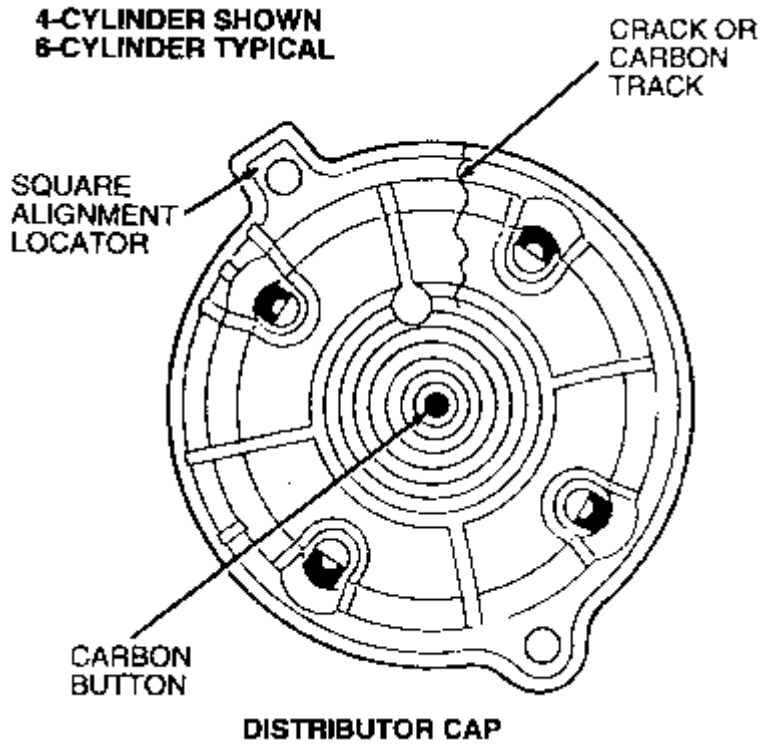
8. **Position the distributor cap on the housing, noting the square alignment locator, if equipped. Tighten the hold-down screws to 18-23 inch lbs. (2.0-2.6 Nm).**



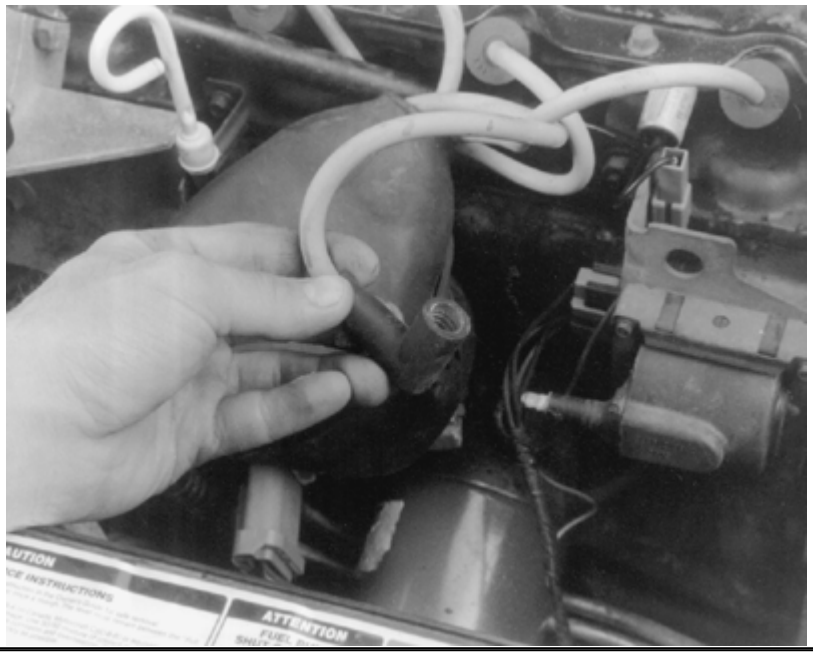
Location of the square alignment indicator on the distributor cap

Click to enlarge

9. **If removed, connect the spark plug wires to their correct location on the distributor cap as tagged during removal.**
10. **If equipped, install the distributor cap cover, then connect the negative battery cable.**

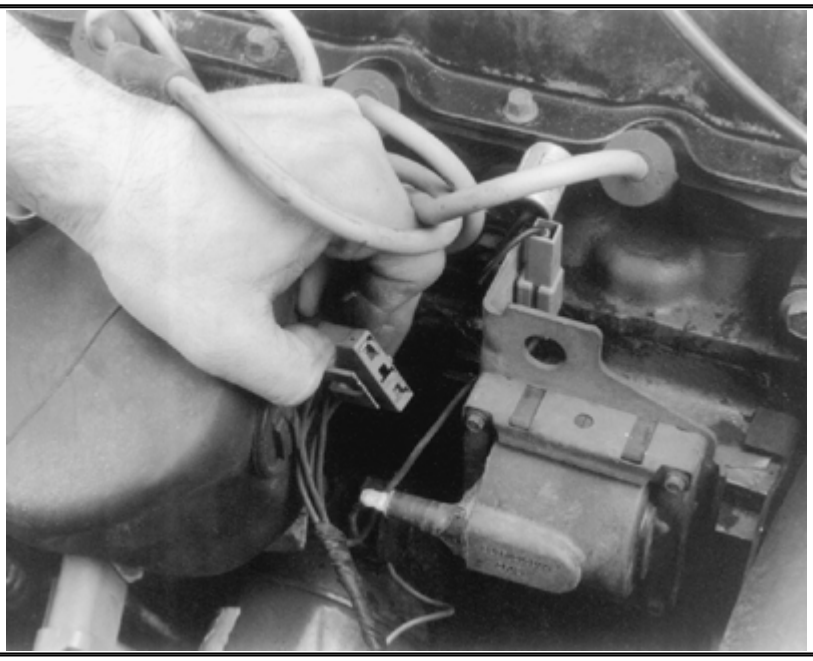
Ignition Coil

1. **Disconnect the negative battery cable.**
2. **Disconnect the distributor-to-ignition coil wire from the ignition coil.**



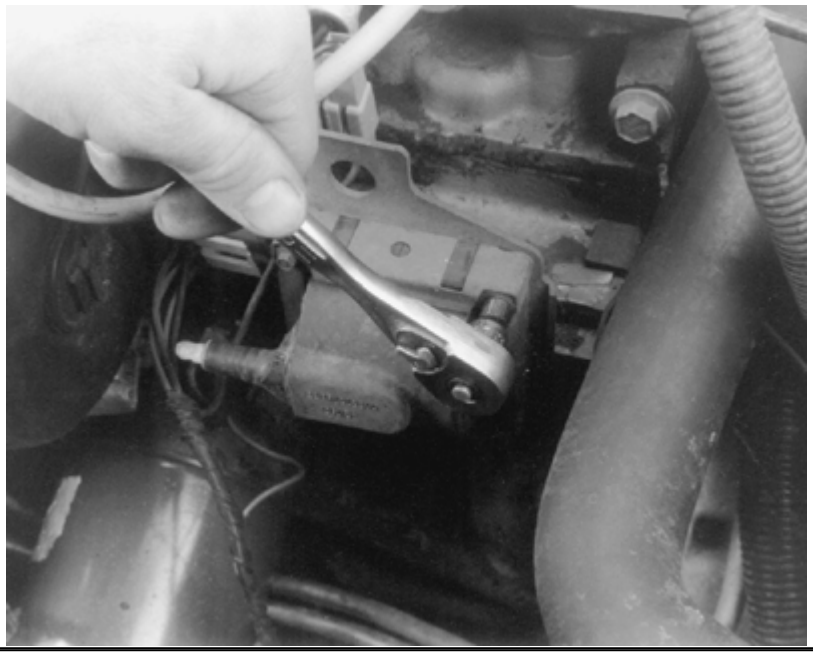
Disconnect the distributor-to-ignition coil wire-early model 2.5L shown

3. **Disengage the TFI-IV harness or the engine control sensor wiring connector from the ignition coil, as applicable.**



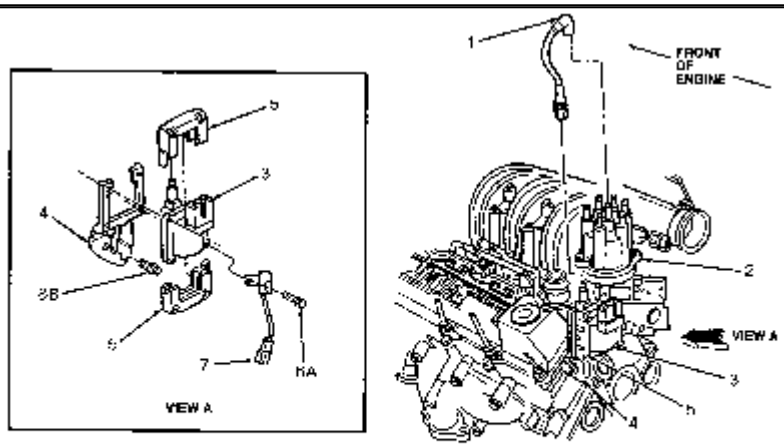
Disengage the engine wiring connector from the coil-early model 2.5L shown

4. **On the 3.8L engine, disengage the engine control wiring connector from the radio ignition interference capacitor.**
5. **Remove the ignition coil retaining screws and the ignition coil and radio interference capacitor (if equipped) from the ignition coil mounting bracket.**



Remove the ignition coil retaining screws

6. **Remove the ignition coil cover from the ignition coil by releasing the locking tabs on both sides of the cover, then remove the ignition coil.**



Ignition coil and related components-late model 3.0L shown

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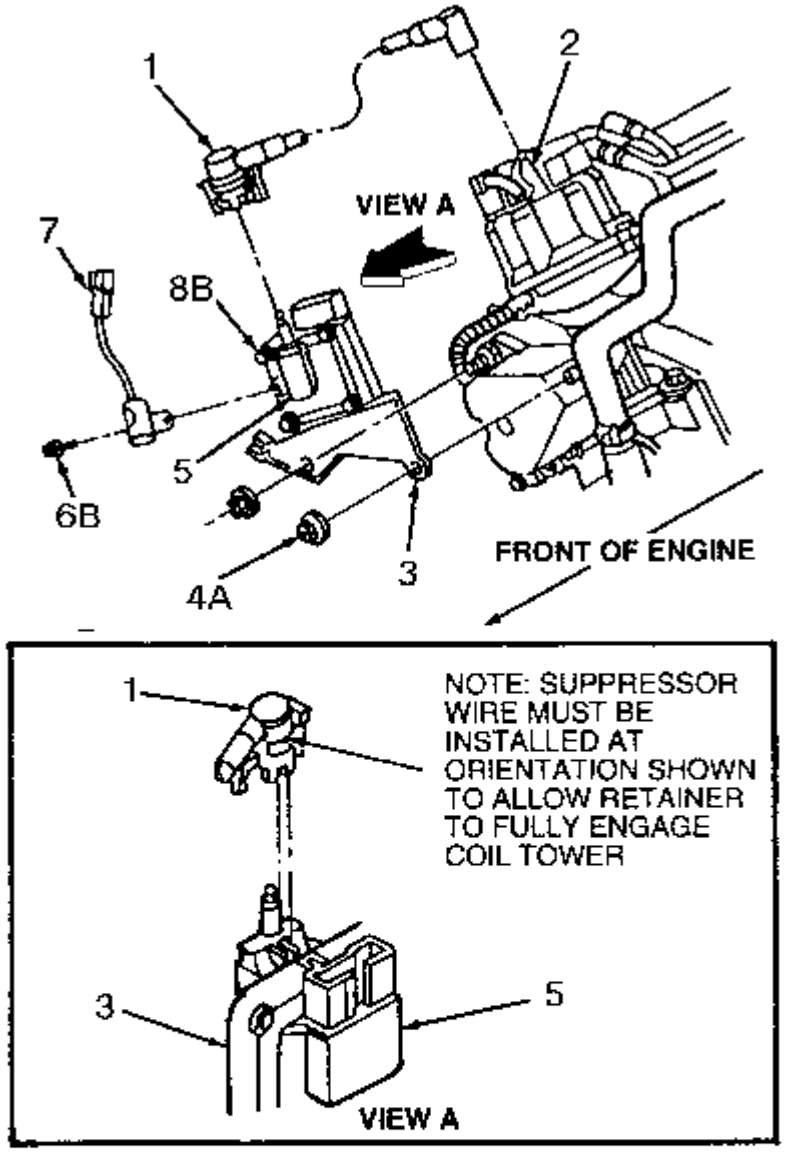


1 Ignition coil to distributor high tension wiring
2 Distributor cap
3 Ignition coil mounting bracket
4A Nut (2 req'd)
5 Ignition coil
6B Screw
7 Radio ignition interference capacitor
8B Screw (4 req'd)
A Tighten to 40-50 Nm (30-41 lb.ft.)
B Tighten to 2.8-4.0 Nm (25-35 lb.in.)

Ignition coil and related components-late model 3.8L shown

Click to enlarge

To install:

7. **Install the ignition coil, then attach ignition coil cover, making sure the cover is firmly in place.**
8. **If removed, connect the ignition coil and radio interference capacitor, then install the ignition coil retaining screws. Tighten the retaining screws to 25-35 inch lbs. (2.8-4.0 Nm).**
9. **Connect the coil wire, then engage any electrical connectors that were removed.**
10. **Connect the negative battery cable.**

Ignition Control Module (ICM)

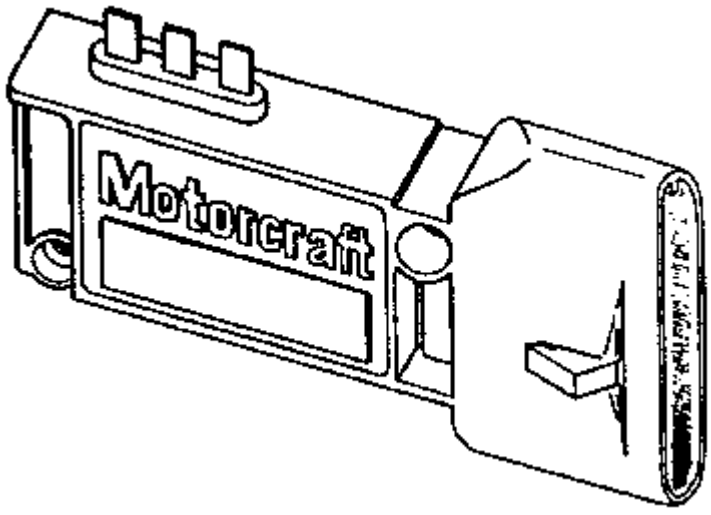
In earlier models, the ICM was referred to as the TFI-IV Ignition Module; the name was later changed to Ignition Control Module (ICM).

2.5L AND 3.0L ENGINES

1. **Remove the distributor cap and position it away from the work area, with the wires still attached.**
2. **Disengage the engine control sensor wiring connector (late model vehicles) or the TFI-IV harness connector from the ignition control module.**
3. **Remove the distributor from the engine. For details, please refer to the procedure located later in this section.**
4. **Place the distributor on a work bench, then remove the two module retaining screws.**

Do NOT attempt to lift the module from the mounting surface before moving the entire module toward the distributor flange! This will cause the pins to break at the distributor / module connector.

5. **Pull the right-hand side of the module down toward the distributor mounting flange and back up to disengage the module terminals from the connector in the distributor housing. The module may then be pulled toward the flange and away from the distributor.**
6. **Remove the module from the distributor.**



The ignition control module (or TFI ignition module, as applicable), is located on the distributor

To install:

7. **Coat the metal base of the module with Silicone Dielectric Compound D7AZ-19A331-A, or equivalent meeting Ford specifications, approximately $^{1}/_{32}$ in. (0.79mm) thick.**
8. **Place the module on the distributor housing mounting flange.**
9. **Carefully position the module toward the distributor housing, then align the three distributor connecting pins.**
10. **Install the two module retaining screws, then starting with the upper right-hand screw, tighten the screws to 15-35 inch lbs. (1.7-4.0 Nm).**
11. **Install the distributor as explained later in this section.**
12. **Install the distributor cap, then tighten the mounting screws to 18-23 inch lbs. (2.0-2.6 Nm).**
13. **Engage the engine control sensor wiring connector or TFI-IV harness connector, as applicable, to the module.**
14. **Connect the negative battery cable.**
15. **Using an inductive timing light, check the timing and adjust as necessary. This procedure is covered later in this section.**

3.8L ENGINE

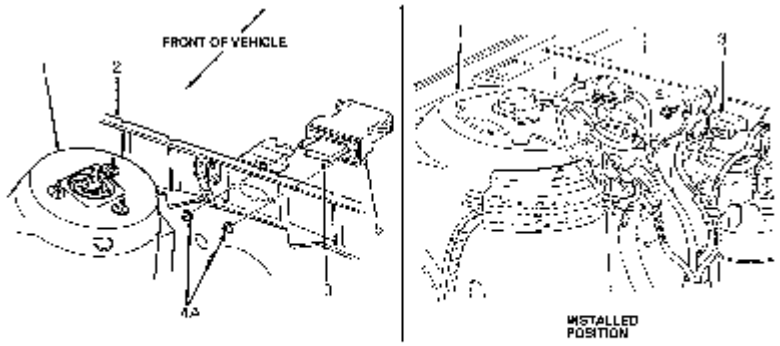
1. **Disconnect the negative battery cable.**
2. **Remove the screws attaching the cowl vent screen to the top of the cowl.**
3. **Separate the engine compartment cowl seal strip from the cowl vent screen and the cowl dash extension panel in the area of the ignition control module.**
4. **Lift the cowl vent screen off to allow access to the ignition control module/TFI module assembly.**

The connector latch is underneath the ICM/TFI shroud. Press upward to unlatch.

5. **Disengage the engine control sensor wiring connector from the ICM or TFI, as applicable.**

The ignition control module and heatsink are mounted with the heatsink fins pointed downward.

6. **Remove the two retaining nuts attaching the ICM/TFI and heatsink to the dash panel, then remove the ICM/TFI and the heatsink.**
7. **Remove the two module retaining screws, then remove the ICM or TFI from the heatsink.**
8. **While holding the module connector shroud with one hand, pull the seal off the other end of the module.**



1 RH front fender apron
2 Dash panel
3 Ignition control module
4 Retaining nuts (2 req'd)
5 Ignition control module heat sink
A Tighten to 5-8 Nm (44-70 lb.in.)

Location of the ignition control module-3.8L engines only

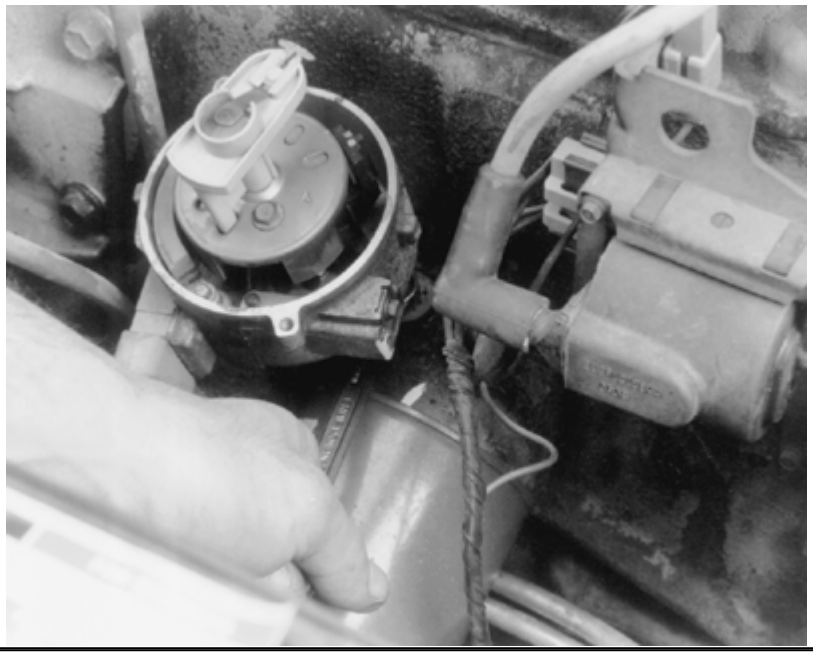
Click to enlarge

To install:

9. **Coat the metal base of the ICM or TFI module uniformly with Silicone Dielectric Compound D7AZ-19A331-A or equivalent, about $^{1}/_{32}$ in. (0.79mm) thick.**
10. **Place the module onto the heatsink. Install the retaining screws, then tighten them to 15-35 inch lbs. (1.7-4.0 Nm).**
11. **Push the seal over the module connector shroud and heatsink studs with the metal part toward the heatsink.**
12. **Insert the module and heatsink into the cowl dash extension panel enough to have the mounting studs protrude into the engine compartment side.**
13. **Hand-tighten the retaining nuts to 44-70 inch lbs. (5-8 Nm).**
14. **Engage the engine control sensor wiring connector to the module.**
15. **Install the cowl vent screen and retaining screws, then install the engine compartment cowl panel and seal strip.**
16. **Connect the negative battery cable.**

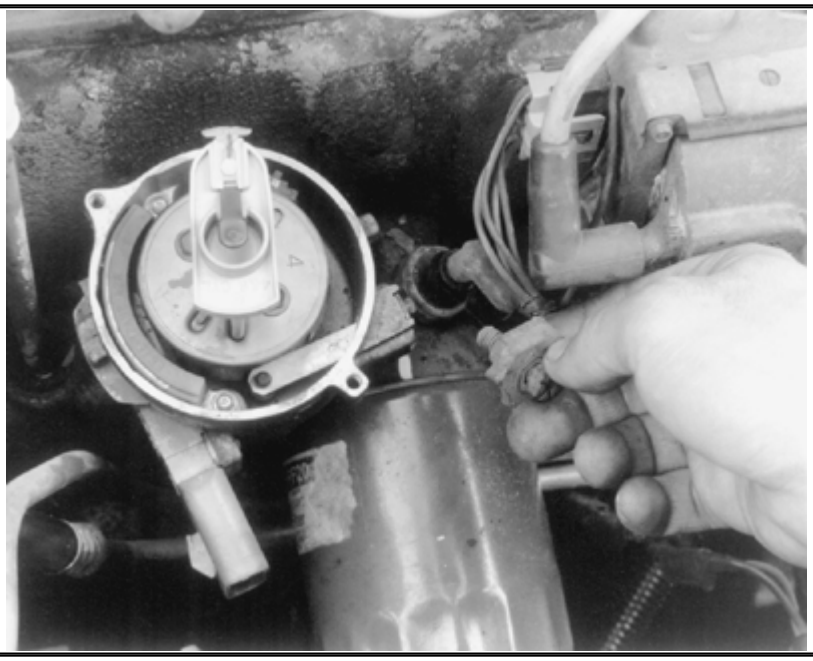
Distributor

1. **Disconnect the negative battery cable.**
2. **Disconnect the engine control sensor wiring from the distributor.**
3. **With a marker, chalk or crayon, mark the position of the No. 1 cylinder distributor cap wire tower on the distributor housing for installation reference.**
4. **Loosen the distributor cap hold-down screws, then pull the cap straight up and off the distributor to prevent damage to the distributor rotor blade and spring.**
5. **Position the distributor cap with the ignition wires intact, out of the way.**

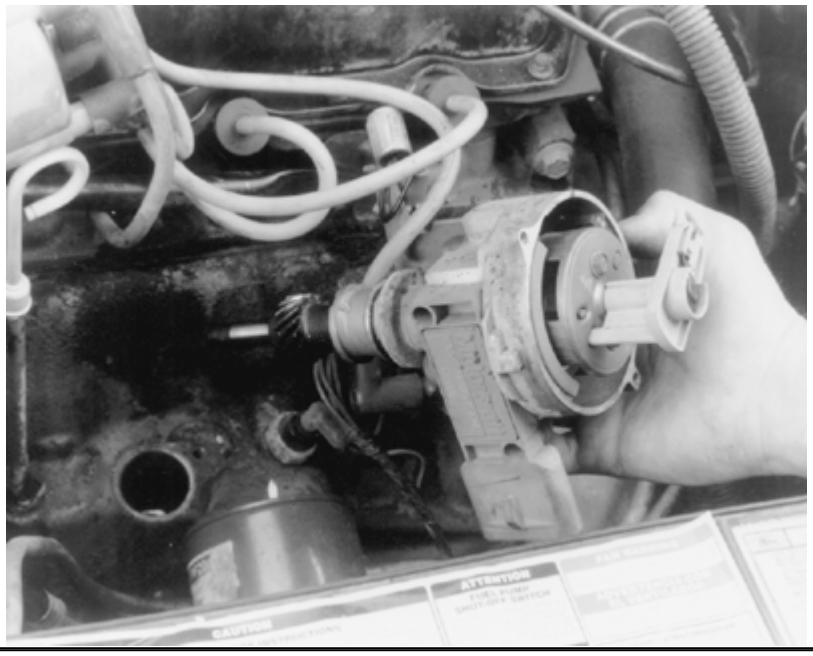


Position the cap with the wires intact out of the way for ease of removal

6. **Matchmark the position of the rotor, then remove it by pulling it upward from the distributor shaft and armature.**
7. **Disconnect the hold-down clamp and distributor retaining bolt, then remove the distributor from the engine by pulling it upward.**



Removing the distributor hold-down bolt. Note: The preferred method requires the removal of the rotor when removing the distributor.



Lift the distributor from the engine; once the distributor is lifted partly out it, may be tilted slightly and removed

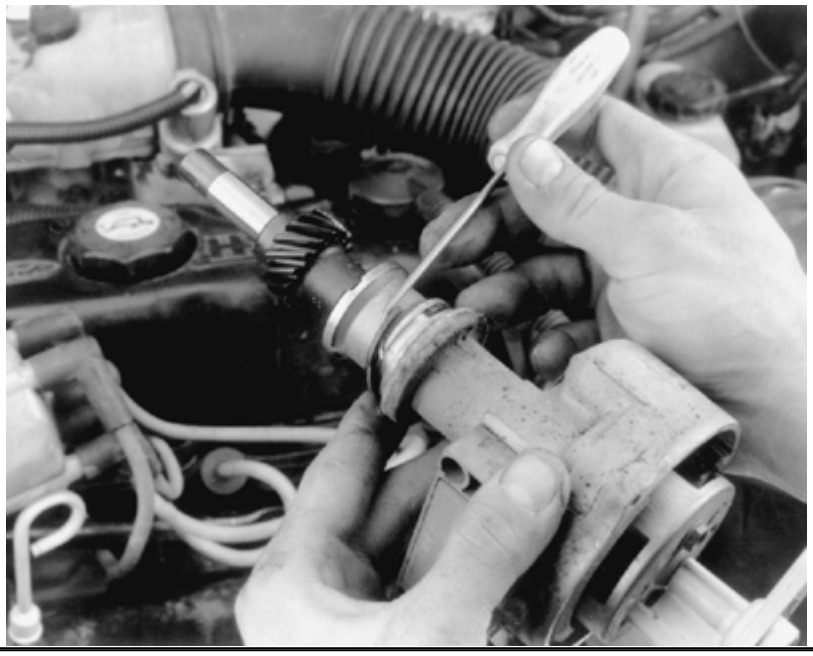
8. **Cover the distributor opening in the cylinder block or engine front cover, as applicable, with a clean rag to prevent any foreign material or debris from entering the engine.**

To install:

CAUTION

Before installing the distributor, you must coat the entire drive gear and the camshaft distributor gear through the distributor hole with Engine Assembly Lubricant D9AZ-19579-D or equivalent.

Inspect the distributor before installing it. Inspect the O-ring. It should fit tightly and NOT have any cuts. The distributor drive gear should be free of nicks, cracks and excessive wear. When rotated, the distributor should move freely, without binding.

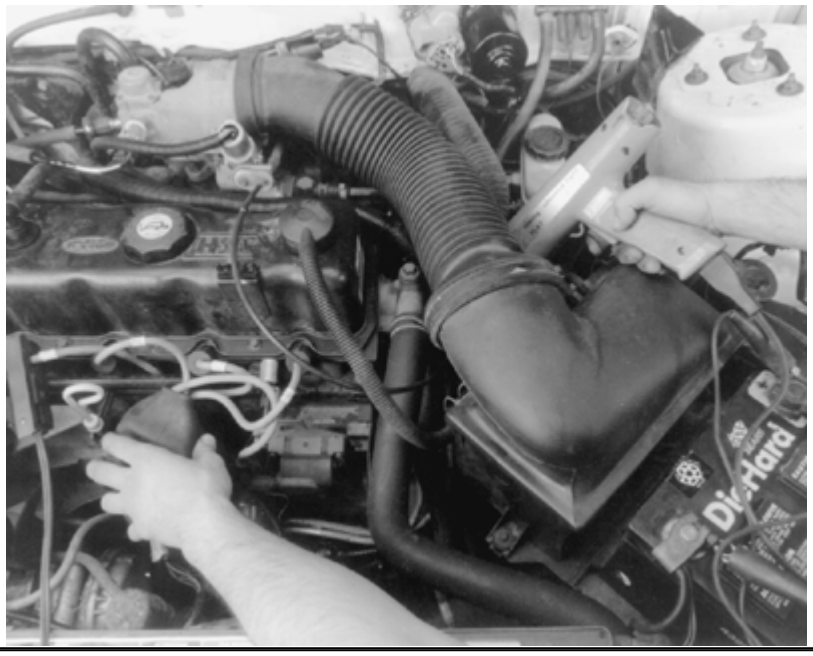


If the O-ring is cracked or nicked, it must be replaced

TIMING NOT DISTURBED

This condition exists if the engine has not been rotated while the distributor was removed.

1. **Install the distributor and the rotor, aligning the distributor housing and the rotor with the marks made during removal.**
2. **Install the distributor hold-down bolt and clamp. Only snug the bolt at this time.**
3. **Connect the wiring harness to the distributor.**
4. **Install the rotor and the distributor cap. Make sure the ignition wires are securely connected to the distributor cap and spark plugs. Tighten the distributor cap screws to 18-23 inch lbs. (2.0-2.6 Nm).**
5. **Connect a suitable timing light to the engine (following the manufacturer's instructions) and connect the negative battery cable, then start the engine and set the initial timing. Timing procedures are located later in this section.**
6. **Turn the engine OFF, then tighten the distributor hold-down bolt to 17-25 ft. lbs. (23-34 Nm) on the 2.5L engine, 14-21 ft. lbs. (19-28 Nm) on the 3.0L engine, or 20-29 ft. lbs. (27-39 Nm) on the 3.8L engine.**
7. **Start the engine and recheck the timing to verify it did not change while tightening the hold-down bolt, then stop the engine and remove the timing light.**



After the distributor is installed, check the timing with a timing light

TIMING DISTURBED

This condition exists if the engine has been rotated with the distributor removed. To correctly install the distributor, the No. 1 piston must be at TDC of the compression stroke.

1. **Disconnect the spark plug wire and the spark plug from the No. 1 cylinder.**
2. **Place your finger over the spark plug hole, then rotate the engine clockwise (by turning the crankshaft pulley) until compression is felt at the spark plug hole.**
3. **With the No. 1 piston on the compression stroke, align the timing pointer with the TDC mark on the crankshaft damper.**
4. **Align the locating boss on the rotor with the hole on the armature. Install the rotor on the distributor shaft, making sure it is fully seated on the distributor shaft. Rotate the shaft so the rotor tip is pointing toward the distributor cap's No. 1 spark plug tower position.**
5. **While installing the distributor, continue turning the rotor slightly, so the leading edge of the vane is centered in the distributor stator assembly.**
6. **Rotate the distributor in the block to align the leading edge of the vane and distributor stator assembly. Make sure the rotor is pointing toward the distributor cap No. 1 spark plug tower position.**

If the vane and distributor stator cannot be aligned by rotating the distributor in the block, remove the distributor just enough to disengage the distributor gear from the camshaft gear. Turn the rotor enough to engage the distributor gear on another tooth of the camshaft gear. Repeat this procedure, if necessary.

7. **Install the distributor hold-down bolt and clamp. Only snug the bolt at this time.**
8. **Connect the wiring harness to the distributor, then install the distributor cap. Tighten the distributor cap hold-down screws to 18-23 inch lbs. (2.0-2.6 Nm).**
9. **Install the No. 1 spark plug and wire.**
10. **Connect a suitable timing light (following the manufacturer's instructions) and**

connect the negative battery cable. Start the engine, then check and adjust the timing, as necessary.

11. **Turn the engine OFF, then tighten the distributor hold-down bolt. Tighten the bolt to 17-25 ft. lbs. (23-34 Nm) on the 2.5L engine, 14-21 ft. lbs. (19-28 Nm) on the 3.0L engine, or 20-29 ft. lbs. (27-40 Nm) on the 3.8L engine.**
12. **Start the engine and recheck the timing to verify it did not change while tightening the hold-down bolt, then stop the engine and remove the timing light.**