

# IGNITION SYSTEM

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### DESCRIPTION AND OPERATION

#### IGNITION SYSTEM

The ignition system basically consists of an ignition switch, ignition coil, distributor, battery and related wiring. The ignition switch is located in the steering column, the ignition coil is located left front inner fender **skirt** and the distributor is located at the left front of the engine.

#### IGNITION SWITCH

The combined ignition switch and steering lock **can be** switched to any one of the below listed positions. Insert key with notch pointing upward.

*(Fully counterclockwise)* Lock position. Ignition locked, steering locked, only with key removed. Electrical circuits disconnected except to main lighting switch and dome lamp. The **key can be** removed.

*0- (First position clockwise from lock)* Garage position. "The key and lock assembly must be pushed "in" to reach this position from lock. The steering is unlocked and the ignition is off. The electrical circuits are the same as in lock position. The key cannot be withdrawn.

*1- (On position.)* All electrical circuits controlled by ignition switch are completed through the switch. The key cannot **be** removed while switch is in drive position.

11- (*Start position.*) The ignition key must be released as soon as engine starts. The switch then returns **automatically** to the on position.

### IGNITION COIL

The ignition coil consists of a laminated non-magnetic iron **core** enclosed by two coils; the primary winding and the secondary winding.

The **primary** circuit consists of the power source (battery), the ignition switch, the ignition coil primary winding, the distributor breaker points with ignition condenser connected in parallel, and all connecting **low** tension wiring.

The secondary circuit consists of the ignition coil secondary winding, the spark plugs, all connecting high **tension** wiring, the distributor cap and the **r o t o r**.

When the ignition switch is turned on and the breaker points are closed, current flows through the ignition **coil** primary winding and produces a magnetic field wound the coil windings.

When the breaker points are separated by the revolving distributor cam, the magnetic field collapses and induces a high voltage surge in the secondary winding, **producing** a spark between the spark plug electrodes.

The ignition condenser which is connected in parallel with the breaker points, prevents arcing between the **separated** breaker contacts, and current flow **after** the breaker points have been separated, thus causing a very rapid collapse of the magnetic field around the Ignition coil.

### IGNITION DISTRIBUTOR

The ignition distributor breaks the primary current, **distributes** the high voltage surges induced in the coil secondary winding to the spark plugs according to the **engine** firing order and sets ignition timing in relation to engine RPM and load.

The **housing** of the distributor contains the centrifugal advance mechanism and the movable breaker plate **with** a breaker lever and contact support. The vacuum advance mechanism is attached to the breaker **plate** and mounted on the outside of the distributor, housing. See Figure 1C-1.

The distributor shaft is driven by a helical gear on the camshaft and in turn drives the engine oil pump. The ignition condenser is mounted on the outside of the housing. The engine output is to a large extent influenced **by** the ignition timing. Maximum engine performance is obtained when the combustion process is well underway as the piston starts **down** on the

power stroke. The air-fuel charges are, however, not burned instantly, so it is necessary to advance the spark in relation to the piston top dead center as engine speed increases or as engine load decreases.

If the spark is too far advanced, the engine knocks, causing a drop in engine power output and overheating. If the spark is retarded, part of the energy developed during combustion is wasted which will result in reduced engine power output, excessive fuel consumption and overheating.

The ignition distributor has a double acting double diaphragm vacuum unit. See Figure 1C-1. The **advance** unit is supplied with "ported" vacuum. That is, vacuum is supplied from a port in the primary barrel of the carburetor located just above the closed throttle valve. This port supplies no vacuum during idling nor during closed throttle deceleration, but supplies full intake manifold vacuum at all speeds where the throttle valve is opened enough to uncover the port.



Figure 1C-1 Ignition Distributor

The retard unit is supplied with intake manifold vacuum at all times by means of a line connected directly to the intake manifold. During idling and deceleration, when there is no vacuum to the advance unit, the retard unit will cause the timing to be retarded 5 degrees. However, during part throttle operation when there is vacuum to the advance unit, the advance unit will overpower the retard unit so that the retard unit has no effect on timing.

The purpose of the retard unit is to reduce hydrocarbon and carbon monoxide emissions during idling and deceleration, where they are especially bad.

In order to avoid voltage losses for easier starting, a plastic cover has been inserted in the distributor below the rotor as a **separator** to keep the inside of the distributor cup free from condensation.

There is also a plastic hood slipped over the distributor cap with an outlet for the ignition cables as an added protection against moisture from the outside. See Figure 1C-2.

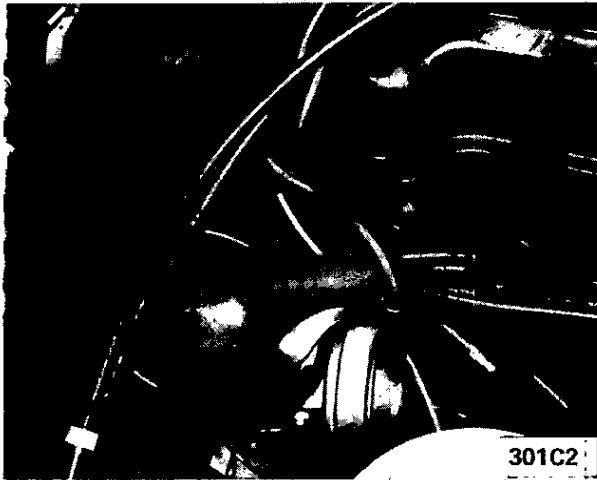


Figure 1C-2 Ignition Distributor With Hood Installed

## MAINTENANCE AND ADJUSTMENTS

### CONTACT POINT REPLACEMENT

#### Removing Contact Points

1. Remove contact support lock screw and remove contact point support. If condenser is to be replaced, it will be necessary to replace condenser and leads as an assembly.

#### Installing Contact Points

1. Lightly lubricate distributor cam with high temperature cam and ball bearing lubricant. Excessive lubricant will throw off into contact points.
2. Position support on breaker plate and install lock screw leaving slightly loose for later adjustment.
3. Plug breaker arm wire in.
4. Adjust breaker point gap to .016".

### DWELL ANGLE ADJUSTMENT

1. Connect dwell meter.
2. Remove distributor cap. Remove rotor. Loosen breaker point set screw approximately 1/8 turn.
3. Insert screwdriver in notch of stationary breaker point. Observe dwell meter while cranking engine. Twist screwdriver as required to obtain a reading of 50 degrees plus or minus 3 degrees.

4. Tighten breaker point set screw, then recheck dwell.

5. Install rotor and cap. Start engine and recheck dwell. It is important that dwell be rechecked, as installation of rotor and cap will sometimes change the dwell angle.

### IGNITION TIMING ADJUSTMENT

#### Preliminary Timing (Engine Won't Run)

To time the ignition on any engine which will run, use subparagraph b only. However, if the timing of an engine is completely off, the following procedure must first be used to get the engine to run.

1. With rocker arm cover removed, rotate crankshaft in a clockwise direction until both valves for No. 1 cylinder are closed and the timing marks line-up. (Valves are completely closed if rocker arms can be "rocked" slightly.)
2. Install distributor in engine so that vacuum advance unit is in original position and notch in distributor rotor lines-up with notch in housing. See Figure 1C-3. If distributor does not seat in engine block, turn distributor shaft so that rotor points about 20 degrees clockwise from distributor timing notch (see Figure 1C-18), then press lightly on distributor housing while cranking engine with starter. After oil pump tang snaps into slot in distributor shaft, start timing again from Step 1, leaving distributor installed.



Figure 1C-3 Rotor Position for Firing No. 1 Cylinder

3. Install distributor clamp and bolt, leaving bolt just loose enough to permit movement of distributor. Install distributor primary wire.

4. Rotate distributor counterclockwise slightly until contact points just start to open. This must be done very carefully or engine will not start.

5. Install distributor cap. Make sure spark plug wires are correctly installed in distributor cap, through clip and on spark plugs.

### Finish Timing

Contact point gap (.016" at widest gap) or dwell 50 degrees plus or minus 3 degrees should always be checked before adjusting ignition timing.

1. Connect timing light to No. 1 spark plug.
2. Disconnect and plug vacuum advance unit and retard unit hoses.
3. Connect a tachometer from distributor side of coil to ground.
4. Start engine. Set idle speed to 900 RPM.
5. Rotate distributor as necessary to align timing marks. Timing mark is a steel ball embedded in the flywheel and a pointer in a window in the right flywheel housing. See Figure 1C-4.

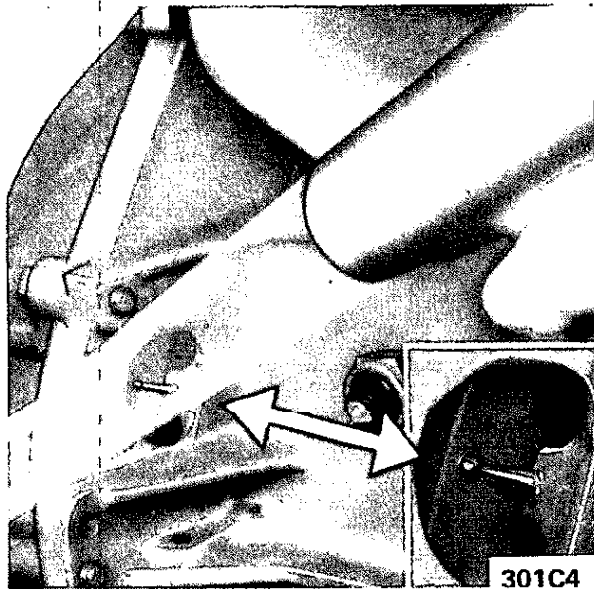


Figure 1C-4 Ignition Timing Marks

6. Tighten clamp bolt securely and recheck timing mark alignment.

7. Reconnect vacuum hoses and adjust engine idle speed and mixture.

### IGNITION WIRE INSPECTION

1. The coil and spark plug wires are of a special

resistance type. These secondary ignition wires reduce television and radio interference.

2. Wipe ignition wires with a cloth moistened with solvent and wipe dry. Bend wires to check for brittle, cracked or swollen insulation. Defective insulation will permit missing or cross-firing of spark plugs, therefore any defective wires must be replaced.

3. If wire insulation is in good condition, clean any terminals that are corroded and replace any terminals that are broken or damaged. Terminals must fit tight on spark plugs and in distributor cap.

4. Replace any hardened, cracked or loose cap nipples or spark plug boots.

5. Check resistance of each wire from contact inside distributor cap to spark plug or coil terminal. Replace any wire having over 10,000 ohms resistance reading. See Figure 1C-5.



Figure 1C-5 Checking Ignition Wire Resistance

### CHECK IGNITION OUTPUT

1. Disconnect secondary coil wire so that engine will not start. Connect a voltmeter from the battery side of the coil primary to ground and check voltage while engine is cranking. Reading should be 10 volts or more. Low reading could be caused by a defective battery, a discharged battery, high starter current draw, a bad connection in the starter circuit or a bad connection in the primary ignition circuit.

2. Connect an oscilloscope according to manufacturer's instructions. Disconnect coil wire. Crank engine and read coil output voltage. Reading should exceed 20 KV (20,000 volts).

3. Start engine and disconnect a wire from a spark plug. Read output voltage of disconnected spark plug circuit. Reading should exceed 20 KV (20,000 volts).

### CHECK DISTRIBUTOR

1. Clean distributor cap and inspect it for cracks or tracking. Inspect inner segments for erosion and outer sockets for corrosion.

2. Clean and inspect ignition wires. Make sure resistance of each wire is less than 10,000 ohms. Replace any defective spark plug boots or distributor cap nipples. See paragraph 1C-12.

3. Inspect breaker points and replace if necessary. Adjust breaker point gap to .016 inch with rubbing block on **peak of** cam lobe or check dwell and adjust if not 50 degrees plus or minus 3 degrees. 4. Check dwell variation by reading dwell at idle and at 3000 RPM. Dwell must not vary more than 3 degrees. Excessive variation means distributor shaft, cam or breaker plate are worn or damaged--overhaul distributor and replace defective parts.

5. Check distributor condenser for a minimum series resistance and insulation leakage. Check for a capacity between .15 and .20 microfarads.

6. Check total advance (centrifugal and vacuum) at 2500 engine RPM using a timing light having a dial for reading advance.

(a) The timing marks are aligned with both the vacuum advance and the vacuum retard hoses disconnected and plugged.

Engine idle should be 900 RPM.

(b) Reconnect vacuum hoses. Run engine at 3600 RPM and adjust knob until timing marks are aligned. Read advance on dial. Maximum centrifugal advance should be between 28-32 degrees.

7. **If** total advance is out of specifications, check centrifugal advance only, at 2500 RPM. **Disconnect** and plug all vacuum hoses. Maximum vacuum advance should be 1-5 degrees at 4.5-5.0 in. hg.

8. Replace centrifugal or vacuum advance parts as required to bring distributor total advance within specifications.

9. Check operation of vacuum retard unit (rear unit) by **first** making sure timing marks are aligned with vacuum hoses disconnected and at slow idle (700 RPM). Then connect vacuum hose to vacuum retard unit (rear unit). Timing ball should move in a **retard** direction (upward).

### CHECK SPARK PLUGS

1. Remove spark plugs. If electrodes are badly worn, discard plugs. If inner or outer porcelain is cracked or broken, discard plugs.

2. Note color and general appearance of inner end of spark plug. Brown to grayish - tan deposits and slight electrode wear indicate correct spark plug heat range. Plugs having this appearance may be cleaned, regapped, **tested** and reinstalled.

3. Clean spark plugs in a sand blast type cleaner. Clean only enough to remove deposits, not enough to wear away porcelain. If deposits are too hard to remove or if porcelain is glazed, discard plugs.

4. After cleaning spark plugs, clean firing surfaces of electrodes with a line file.

5. Test cleaned spark plugs on a pressure tester by comparing spark of the used plugs with that of a new plug. Install tested plugs, using new **gaskets**.

6. If removed spark plugs have excessive carbon fouling and if the car will be driven mostly at low speeds in city driving, it is advisable to replace plugs with a hotter plug, **AC43FS**.

7. If removed plugs show rapid electrode wear or inner porcelain breakage at low mileage. Check for a vacuum leak such as a poor manifold to head fit.

8. **Gap** spark plugs carefully (new or cleaned) using a .030 round wire feeler gage.

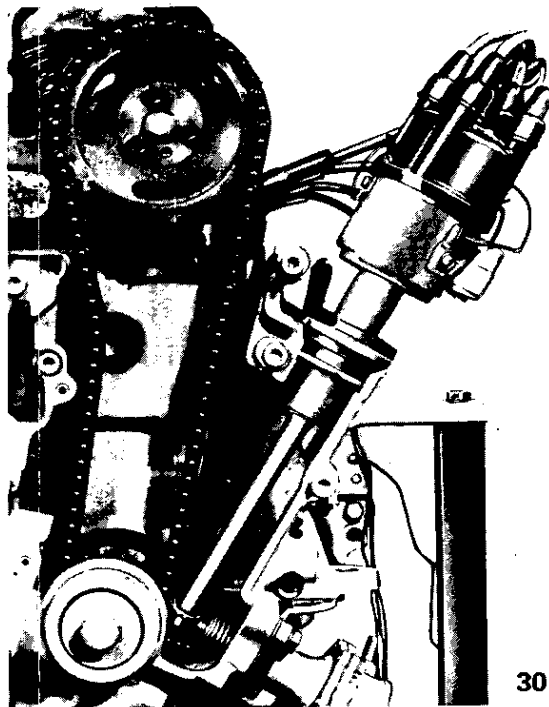


Figure 1C-6 Distributor Installation

9. Install spark plugs using a 13/16 deep socket, an extension and a torque wrench. Tighten to 22-29 lb.ft.

## MAJOR REPAIR

### DISTRIBUTOR OVERHAUL

#### Distributor Removal

1. Remove fuel pump. This is necessary because the fuel pump will block the distributor drive gear, thereby preventing removal of the distributor. See Figure 1C-6.
2. Set No. 1 cylinder at firing point by turning engine

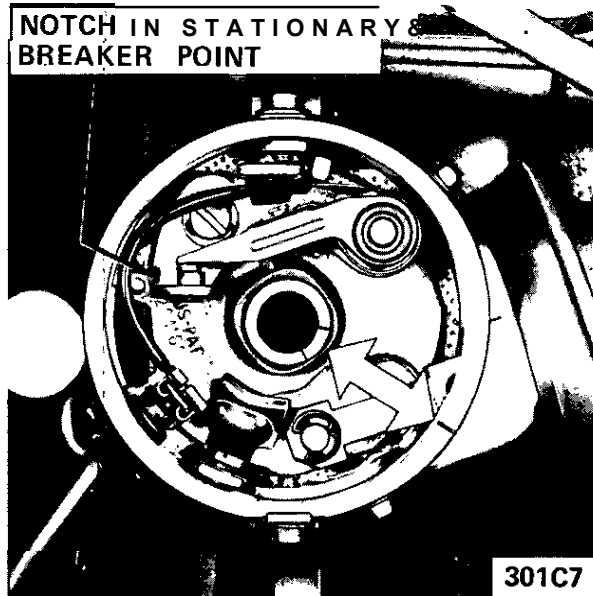


Figure 1C-7 Aligning Shaft Cutout With Notch

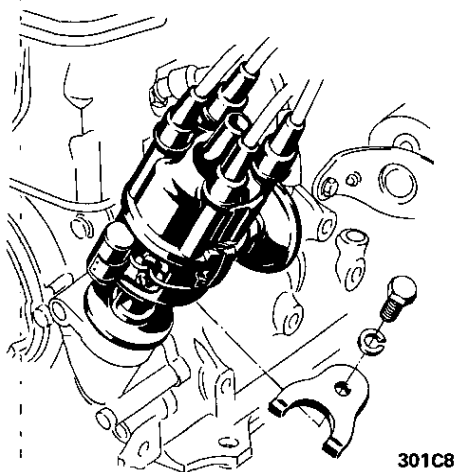


Figure 1C-8 Removing Distributor

until cutout in distributor shaft (or rotor tip) points to notch in distributor housing. See Figure 1C-7.

3. Ball imbedded in flywheel should be approximately aligned with pointer in housing. See Figure 1C-4.

4. Remove distributor hold-down clamp and remove distributor. See Figure 1C-8. Cover bore in timing case to prevent foreign material from dropping into engine. To make reinstallation of distributor easy, do not rotate crankshaft or oil pump.

#### Disassembly

1. Remove distributor cap retaining spring clips, and vacuum control units. See Figure 1C-9.

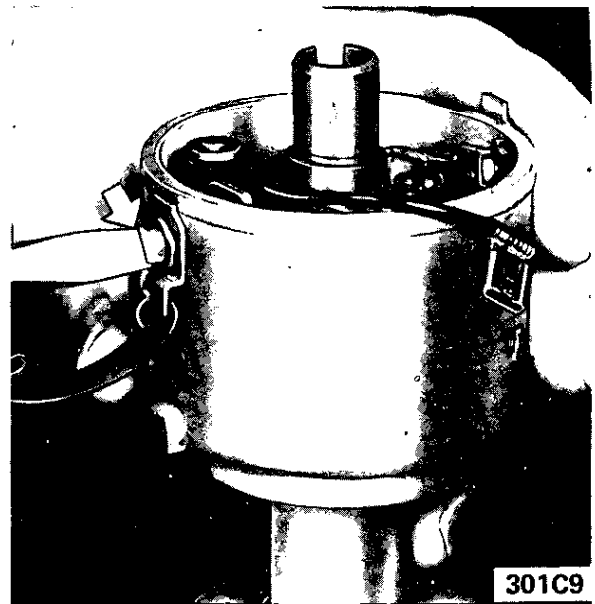


Figure 1C-9 Removing Retaining Clips

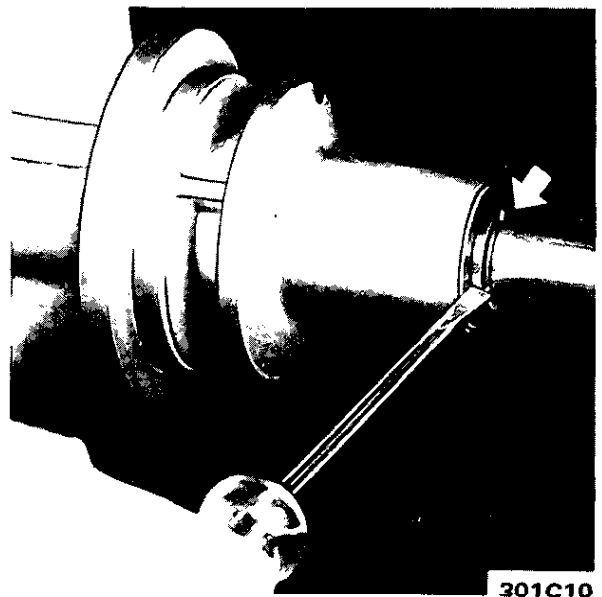
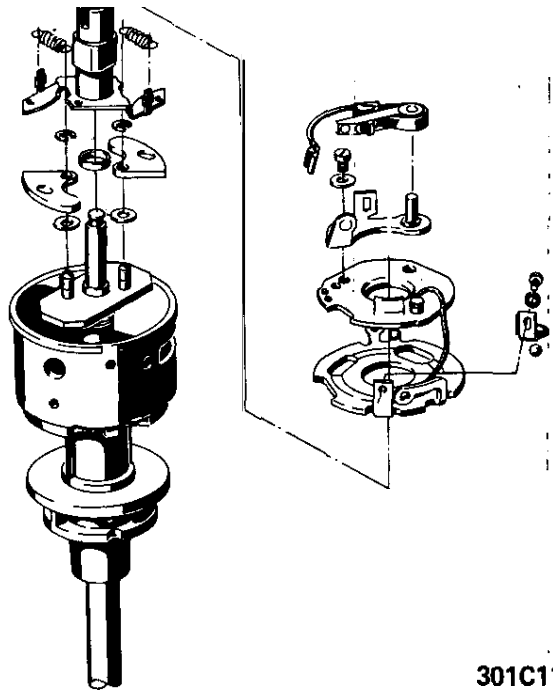


Figure 1C-10 Removing Retaining Ring

2. Push retaining ring out of groove in distributor shaft. See Figure 1C-10.

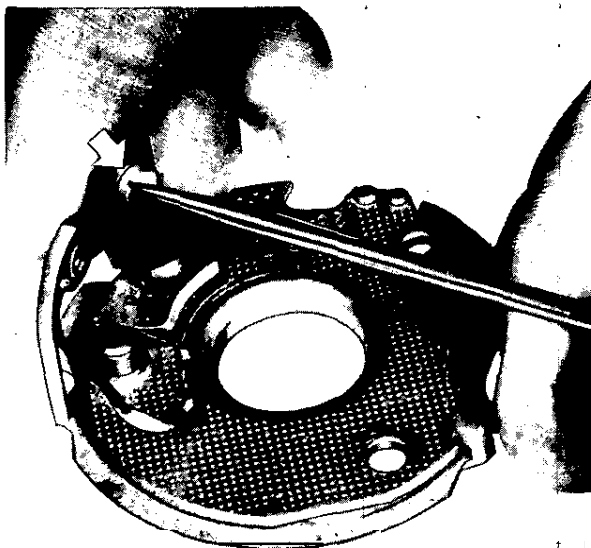
3. Push up on distributor shaft. Remove breaker plate from distributor housing. Remove breaker points from breaker plate. See Figure 1C-11.



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Figure 1C-11 Removing Breaker Plate

4. Disassemble breaker plate by unscrewing ball thrust spring screw. Remove spring and ball. See Figure 1C-12.



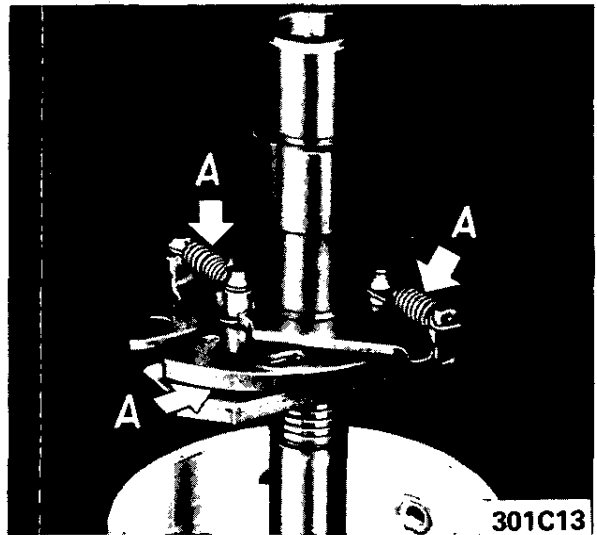
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Figure 1C-12 Disassembling Breaker Plate

5. For cleaning, partly pull distributor shaft together with centrifugal advance mechanism out of distributor housing. Do not disassemble advance mechanism.

6. Clean and check all parts. Replace any defective parts.

7. Coat sliding parts of centrifugal advance mechanism and return springs with grease. See "A" in Figure 1C-13.



301C13

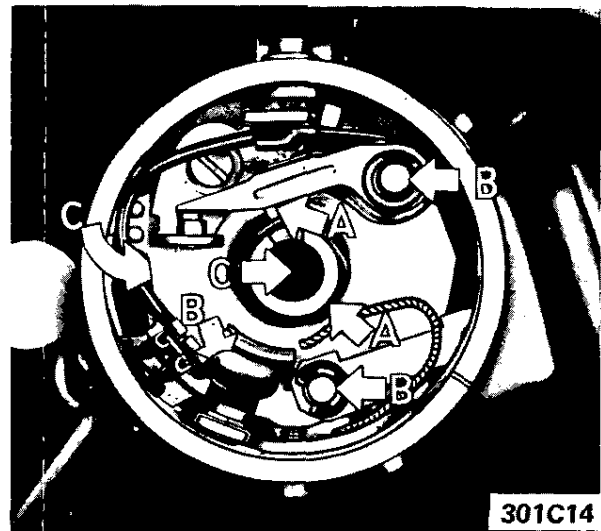
Figure 1C-13 Lubricating Centrifugal Mechanism

Reassembly

1. Install new breaker points on breaker plate.

2. Install retaining ring on distributor shaft.

3. Install vacuum units, ignition condenser and cap retaining clips.



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Figure 1C-14 Lubricating Upper Distributor

4. Oil sliding parts of breaker plate at "B". Oil felt in cam at "C". Apply a thin layer of high melting point grease to the cam, using a finger at "A". See Figure K-14.

5. Adjust breaker point gap to .016 inches.

6. Grease control rod eye at "A". See Figure 1C-15.

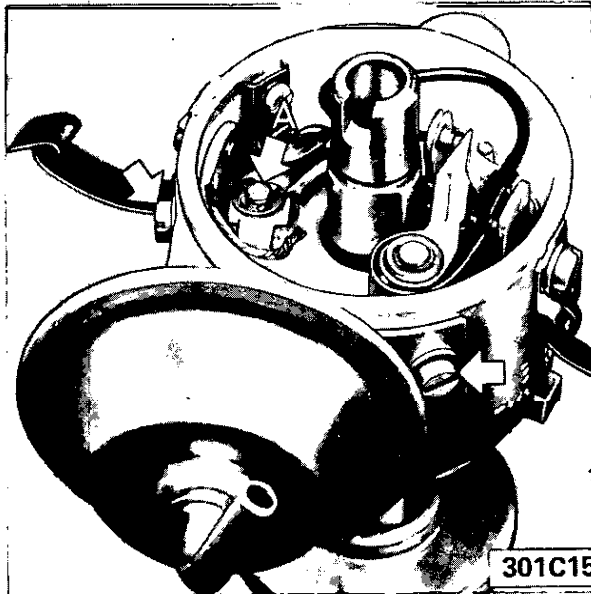


Figure 1C-15 Lubricating Control Rod Eye

7. Reinstall distributor cap nipples and spark plug boots. If hardened or cracked, use new parts. See Figure 1C-16.



Figure 1C-16 Reinstalling Nipples

#### Distributor Installation

1. Make sure oil pump slot is in position to receive distributor shaft tang. See Figure 1C-17.

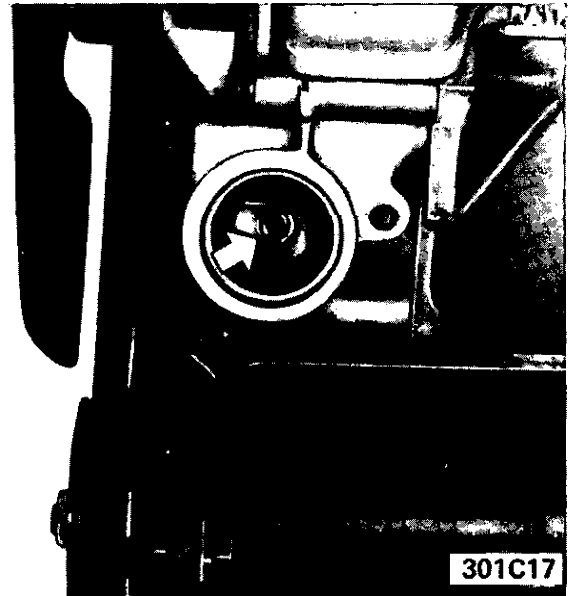


Figure 1C-17 Oil Pump Slot

2. Inspect paper gasket on distributor housing and replace if necessary.

3. Install distributor with vacuum units in original position and with shaft cutout (rotor tip) in position shown in Figure 1C-18. Distributor shaft will turn as distributor is installed, causing the rotor tip notch to align with the housing notch when distributor is seated.

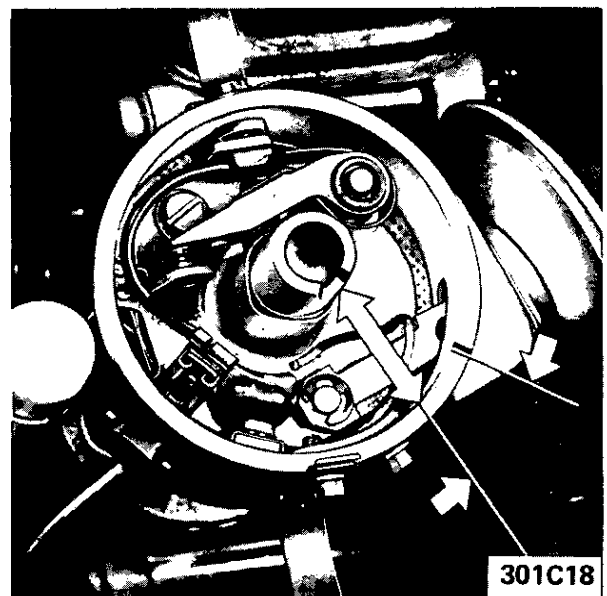


Figure 1C-18 Shaft Position for Starting Installation

4. Install distributor clamp, bolt and lockwasher tight. Align marks on rotor tip and housing.

5. Install fuel pump.

6. Adjust ignition timing.



## SPECIFICATIONS

## IGNITION COIL

Ignition Coil Number .....	K12 V
Ignition Coil Current Draw, Amperes at 12.5 Volts	
Engine Stopped .....	3.8
Engine Idling .....	2.3

## DISTRIBUTOR

Distributor Type Number: .....	JFU4
Total Advance (Centrifugal and Vacuum), Engine Degrees at 3600 R.P.M.	
Engine RPM .....	29-37
Centrifugal Advance, Engine Degrees and RPM	
Start Advance, at <b>RPM</b> .....	1000-1200
Medium Advance, Degrees at RPM .....	7.5-15 at 1400
Maximum Advance, <b>Degrees</b> at RPM .....	28-32 at 3600
Vacuum Advance, Engine Degrees <b>and In.</b> of Vacuum	
Start Advance, at In. of Vacuum .....	-5 at 2.9-4.1 In.
Maximum Advance, Degrees at In. of Vacuum .....	1.5 at 4.5-5.0 In.
Vacuum Retard, Engine Degrees at Closed Throttle .....	-5
Condenser Capacity in <b>MicroFarads</b> .....	15-20
Breaker Spring Tension in Ounces .....	14 to 19
Breaker Point Gap in Inches .....	.016
Dwell angle in Engine Degrees .....	50 $\pm$ 3
Firing Order .....	1-3-4-2
Spark Plug or Coil Cable, Max. <b>Resistance</b> in Ohms .....	10,000

## SPARK PLUGS

Make and Model - Production .....	AC42FS
Make and Model - Replacement .....	AC42FS
If carbon fouling occurs, use .....	AC43FS
Spark Plug Torque in <b>Lb.Ft.</b> .....	22-29
Spark Plug Gap in Inches .....	.028-.031