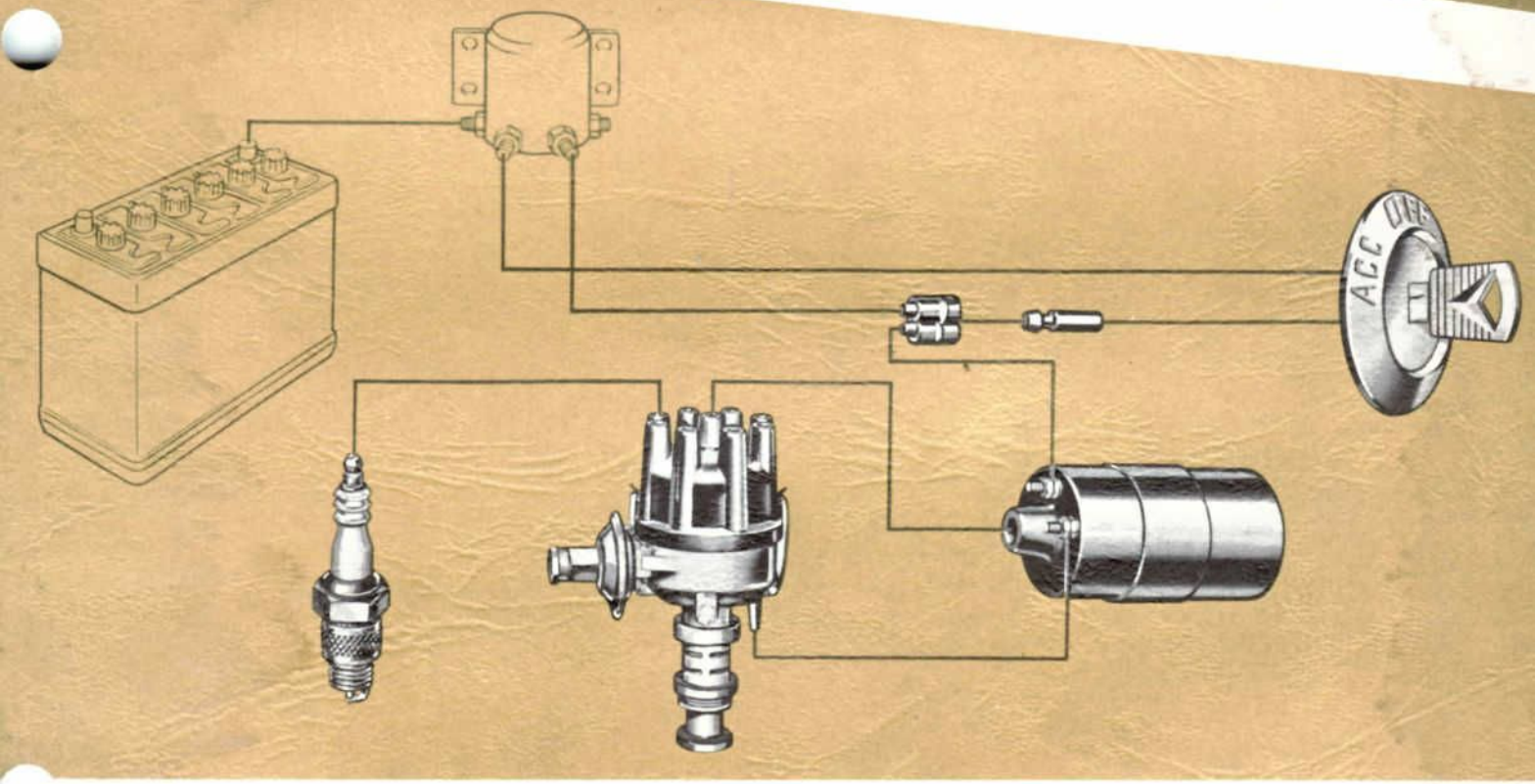
FORD *Service Handbook* 12001



IGNITION SYSTEM MAINTENANCE, DIAGNOSIS, and LIGHT REPAIR

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PART 1

GENERAL INFORMATION

The ignition system consists of a primary (low voltage) circuit and a secondary (high voltage) circuit (Fig. 1).

The primary circuit consists of the:

1. Battery
2. Starter Relay
3. Ignition Switch
4. Primary circuit resistance wire
5. Primary windings of the ignition coil
6. Breaker points
7. Condenser

The secondary circuit consists of the:

1. Secondary windings of the ignition coil
2. Distributor rotor
3. Distributor cap
4. High tension wires
5. Spark plugs

When the breaker points are closed, the primary or low voltage current flows from the battery through the ignition switch to the primary windings in the coil, then to ground through the closed breaker points. When the breaker points open, the magnetic field built up by the primary windings of the coil collapses through the secondary windings of the coil, producing high voltage current. **High voltage is produced every time the breaker points open.** The high voltage current flows through the coil high tension lead to the distributor cap where the rotor distributes the current to one of the spark plug terminals in the distributor cap. This process is repeated for every power stroke of the engine.

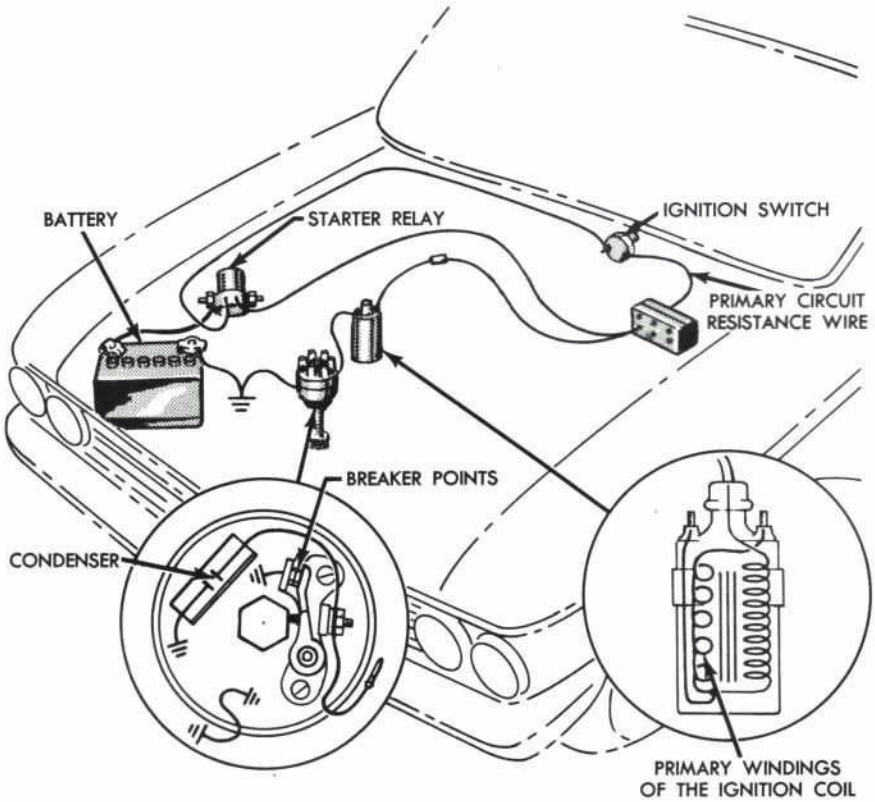

FIG. 1 — Typical Ignition Circuit

The ignition resistor wire is connected in series with the primary circuit between the battery and the coil. This wire is used to prevent excessive primary current by placing a resistance in the circuit. Reducing the excessive primary current helps to prevent breaker point burning. To improve the starting performance, this resistor wire is by-passed while the engine is cranking so that the coil is connected directly to the battery.

The secondary wires (Fig. 2) include the wires connecting the distributor cap to the spark plugs and the wire connecting the center terminal of the distributor cap to the center terminal of the coil. These wires are the radio resistance type that reduce the high-frequency electrical impulses that are the source of ignition interference. To prevent damage to the conductor, never puncture these wires with a probe. When removing the secondary wires from the spark plugs, grasp the moulded cap only. Do not pull on the wire because the wire connection inside the cap may become separated or the weather seal may be damaged.

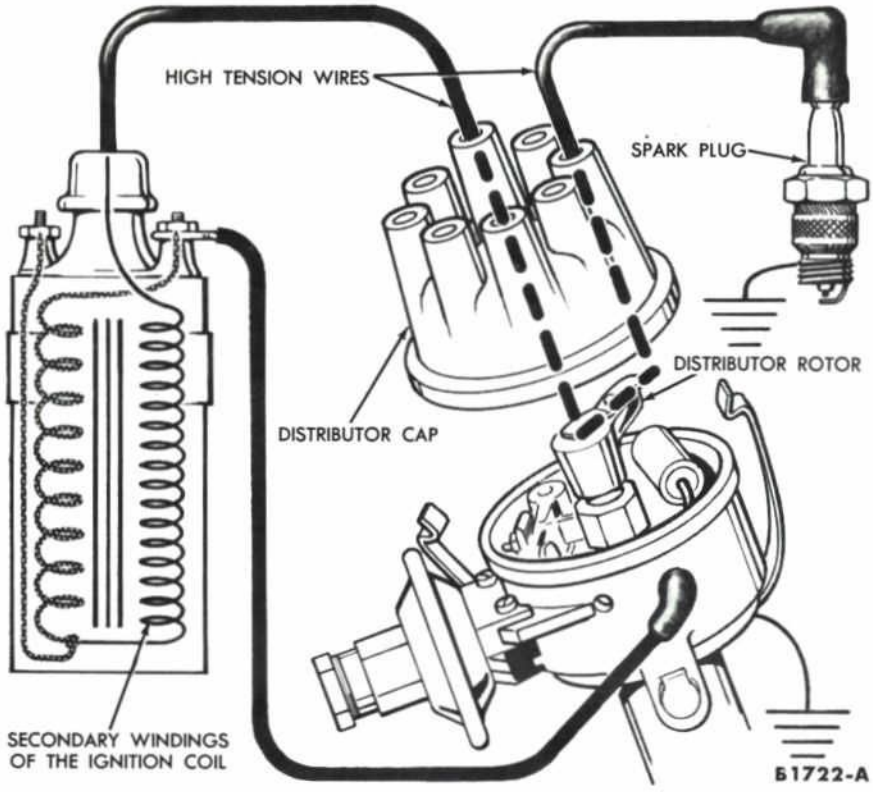

FIG. 2— Secondary Wires

The purpose of the condenser in the ignition system is to prevent arching and pitting at the breaker points and to aid in collapsing the magnetic field of the coil. When the engine will not run, or the breaker points are badly burned, the condenser should be tested. To test the condenser, refer to the primary circuit tests (Part 4).

As the engine speed is increased, the spark must occur earlier so that most of the fuel mixture can be ignited before the exhaust cycle begins. The mechanism that causes the spark to occur earlier is called the spark advance. There are two different types of spark advance— centrifugal and vacuum.

The centrifugal advance mechanism is controlled by weights in the distributor that, as the speed increases, are forced toward the outside of the breaker plate. As the weights move out, the distributor cam is rotated ahead of distributor shaft rotation to advance the spark.

The vacuum advance mechanism is operated by the intake manifold vacuum. The advance mechanism is in the full retard position at idle and as the speed is increased the increasing vacuum causes the breaker plate to rotate in the advance direction.

The high performance engines use a dual point distributor. This distributor is designed so that one breaker point assembly closes the primary circuit and the other opens the primary circuit. This type of construction results in a greater amount of cam angle dwell with approximately the same amount of gap spacing as the single breaker point assembly.

PART 2

ADJUSTMENTS AND LIGHT REPAIRS

1 BREAKER POINTS

The breaker point assembly consists of the stationary point bracket assembly, breaker arm, and the primary wire terminal.

Breaker points should be inspected, cleaned, and adjusted as necessary. Breaker points can be cleaned with chloroform and a stiff bristle brush. Crocus cloth may also be used. Do not use sandpaper or other abrasives because they may damage point surfaces and leave particles of abrasives which may cause excessive wear.

Replace the breaker point assembly if the contacts are badly burned or if excessive metal transfer between the points is evident (Fig. 3). Metal transfer is considered excessive when it equals or exceeds the gap setting.

ADJUST SPRING TENSION

Correct breaker point spring tension is essential to proper engine operation and normal breaker point life. If the spring tension is too great, rapid wear of the breaker arm rubbing block will result, causing the breaker point gap to close, and retard the spark timing. If the spring tension is too weak, the breaker arm will flutter at high engine rpm, resulting in an engine miss.

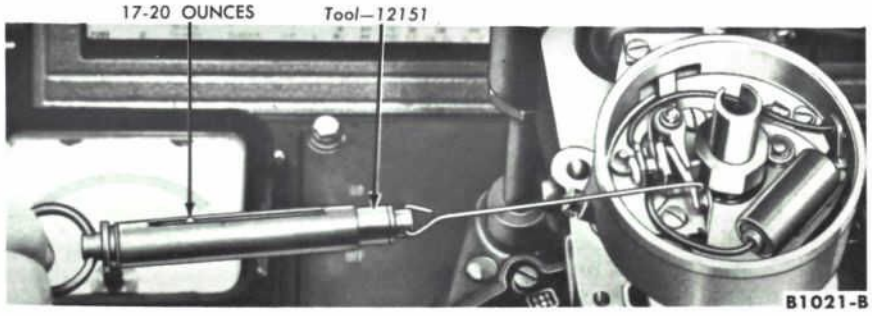

FIG. 4— Checking Breaker Point Spring Tension

To check the spring tension on the engine, crank the engine until the breaker points are closed. Then place a small piece of paper between the breaker points. Now place the hooked end of a spring tension gauge over the movable arm and pull at right angles to the points (Fig. 4) until the points just start to open. When the points are just opening, the paper will fall out. Compare the reading with specifications.

If the tension is not within specifications for the particular distributor being tested, adjust the spring tension.

To adjust the spring tension (Fig. 5), proceed as follows:

1. Disconnect the primary and condenser leads (and the jumper strap on the high performance engine centrifugal advance dis-

CONDITION	CAUSED BY
 BURNED	Any discoloration other than a frosted slate grey shall be considered as burned points.
 EXCESSIVE METAL TRANSFER OR PITTING	Incorrect alignment. Incorrect voltage regulator setting. Radio condenser installed to the distributor side of the coil. Ignition condenser of improper capacity. Extended operation of the engine at speeds other than normal. B1443-B

FIG. 3— Breaker Point Inspection

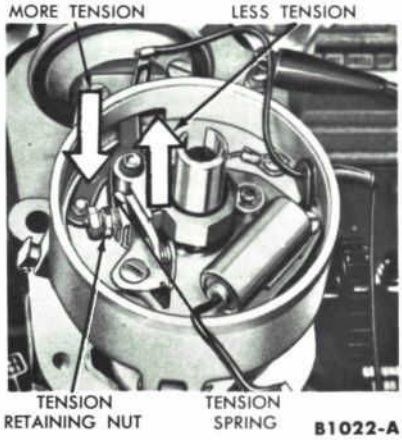

FIG. 5— Adjusting Spring Tension

tributor) at the breaker point assembly primary terminal.

2. Loosen the nut holding the spring in position. Move the spring toward the breaker arm pivot to decrease the tension and in the opposite direction to increase the tension.

3. Tighten the lock nut, and check the spring tension again. Repeat the adjustment until the specified spring tension is obtained.

4. Install the primary and condenser leads (and the jumper strap on the high performance engine centrifugal advance distirbutor) with the lock washer and tighten the nut securely.

On the high performance engine centrifugal advance distributor, loosen the lock nut holding the jumper strap to the other breaker point assembly and follow steps 2 and 3. After the adjustment is completed, connect the jumper strap.

BREAKER POINT ALIGNMENT

The vented type breaker points must be accurately aligned and must strike squarely in order to realize the full advantages provided by this design, and to assure normal breaker point life. Any misalignment of the breaker point surfaces will cause premature wear, overheating, and pitting.

To align the breaker points proceed as follows:

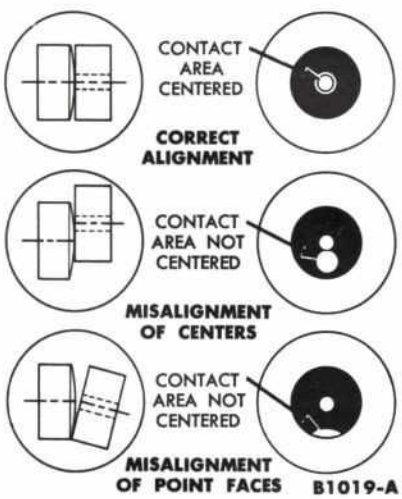

FIG. 6— Aligning Breaker Points

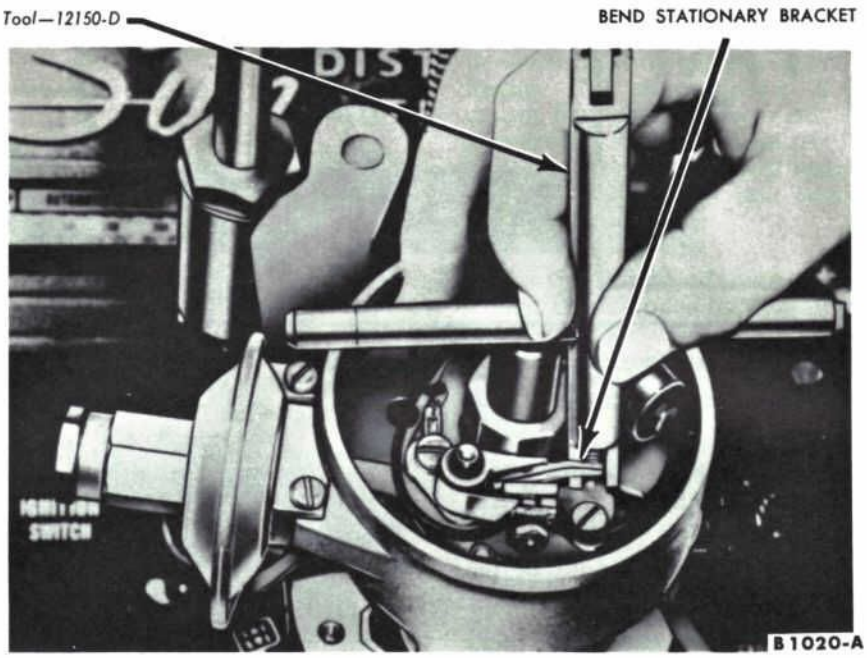

FIG. 7— Adjusting New Breaker Point Gap

1. Turn the cam so that the breaker points are closed and check the alignment of the points as shown in Fig. 6.

2. Align the breaker points to make full face contact by bending the stationary breaker point bracket (Fig. 7). **Do not bend the breaker arm.**

After the breaker points have been properly aligned, adjust the breaker point gap or dwell.

ADJUST GAP OR DWELL

The gap is the maximum breaker point opening obtained when the rubbing block is on a cam lobe. The dwell is the period during which the distributor points remain closed. Therefore, if the point gap is increased the dwell will be decreased.

LOADOMATIC AND DUAL ADVANCE DISTRIBUTORS

On the dual advance distributor, as the pivot plate is rotated from retard (no vacuum) position to the full vacuum position, the dwell decreases slightly (point opening increases). This is because the breaker point rubbing block and cam rotate on a different axis.

New Breaker Points

New breaker points can be adjusted with a feeler gauge or a dwell meter.

To adjust the points with a feeler gauge:

1. Check and adjust the breaker point alignment. Rotate the distributor cam until the rubbing block rests on the peak of a cam lobe.

2. Insert the correct blade of a clean feeler gauge (a smaller blade will result in burned points and a larger blade will result in ignition failure at high speeds) between the breaker points (Fig. 8). The gap should be set to the larger specified dimension because the rubbing block will wear

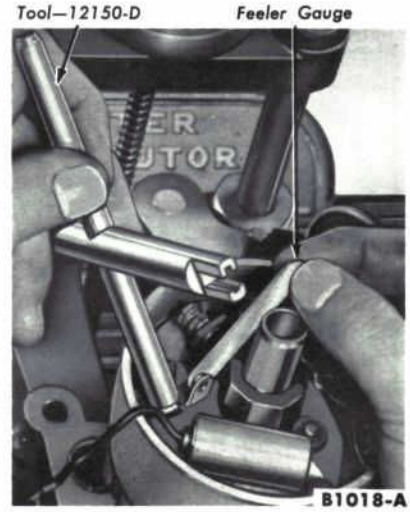

FIG. 8— Breaker Point Alignment

down slightly while seating to the cam.

3. Apply a light film of distributor cam grease to the cam when new points are installed. **Do not use engine oil to lubricate the distributor cam.**

4. If the dwell of the new points is to be adjusted, set the contact dwell to the low specified setting. New points must be set to the low dwell as the rubbing block will wear down slightly while seating to the cam. To set the points with a dwell meter, refer to the procedure for "Used Breaker Points."

5. Set the ignition timing.

Used Breaker Points

If the gap of used breaker points is being checked, use a dwell meter to check the contact dwell. **It is not advisable to use a feeler gauge to check the gap of used breaker points because the roughness of the points make an accurate gap reading or setting impossible.**

Clean the breaker points, then check and adjust the dwell as follows:

1. Calibrate the dwell meter to the set line and connect the leads from the tach dwell unit (the black lead goes to ground and the red lead goes to the distributor side of the coil).

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

3. Operate the engine at idle speed and note the reading on the dwell meter.

4. Stop the engine and adjust the gap (decreasing the gap increases the dwell). Now check the dwell again.

CENTRIFUGAL ADVANCE DISTRIBUTOR

The high performance engine centrifugal advance distributor has a dual set of breaker points. The 292 HD V-8 centrifugal advance distributor has only one set of breaker points.

New Breaker Points

New breaker points on the truck distributors can be adjusted with a feeler gauge or dwell meter. High performance engine breaker points should only be adjusted with a feeler gauge. If using the Sun 900 tester (trucks only), refer to the procedure for "Used Breaker Points."

To adjust the breaker points with a feeler gauge:

1. Check and adjust the breaker point alignment. Rotate the distributor cam until the rubbing block of the breaker point assembly to be adjusted rests on the peak of the cam lobe (on high performance engines adjust one breaker point assembly at a time).

2. Insert the correct blade of a clean feeler gauge between the breaker points. The correct gap should be set to the larger specified opening because the rubbing block will wear down slightly while seating to the cam. If the feeler gauge is loose or if it is binding, loosen the stationary point lock screw and adjust the gap (Fig. 8).

3. Apply a light film of distributor cam grease to the cam when new points are installed. **Do not use engine oil to lubricate the distributor cam.**

4. On the high performance engines, repeat steps 1 through 3 on the other breaker point assembly.

5. Check and adjust the timing.

If the dwell meter is used to adjust new points, be sure that the points are in proper alignment. Set the contact dwell to the low specified setting. New points must be set to the low dwell because the rubbing block will wear down slightly while seating to the cam.

Used Breaker Points

It is not advisable to use a feeler gauge to adjust or to check the gap of used breaker points because the roughness of the points makes an accurate gap reading or setting impossible. If used points are being installed, adjust the dwell as outlined below.

Clean the breaker points and check and adjust the alignment.

Because of the accuracy necessary, do not use the dwell meter on the high performance engines. If the points are worn enough to prevent an accurate reading with a feeler gauge, replace the points.

To adjust the dwell, proceed as follows:

1. Calibrate the dwell meter on the tester to the set line and connect the leads to the tach dwell unit (the black lead goes to ground and the red lead goes to the distributor side of the coil).

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

3. Operate the engine at idle speed and note the reading on the dwell meter.

4. Stop the engine and adjust the gap (decreasing the gap increases the dwell). Now check the dwell again.

REPLACEMENT

The breaker point assembly can be replaced without removing the distributor from the engine.

LOADOMATIC AND DUAL ADVANCE DISTRIBUTORS

Removal

1. Remove the distributor cap and rotor.

2. Disconnect the primary and condenser leads.

3. Remove the screws that secure the breaker point assembly to the breaker plate and remove the breaker point assembly.

Installation

1. Position the breaker point assembly on the breaker plate. Install the hold down screws. Make sure that the ground wire terminal is on the screw furthest from the adjustment slot on the dual advance distributor, and on the screw nearest the adjustment slot on the Loadomatic distributor.

2. Place the primary and condenser leads on the breaker point assembly primary terminal. Install the lock washer and nut. Tighten the nut securely.

3. Adjust the breaker point gap or dwell.

CENTRIFUGAL ADVANCE DISTRIBUTORS

Removal

Remove the distributor cap and rotor (also the dust cover on the 292 HD V-8). Disconnect the primary and condenser wires (also the jumper strap on the high performance engine). Remove the breaker point assembly.

Installation

On the high performance engine, position the breaker point assemblies on the breaker plate and install the retaining screws. Place the primary wire, one end of the jumper strap, and the condenser wire in position on the primary terminal of the breaker point assembly closest to the primary wire (Fig. 9). Tighten the lock nut. Place the other end of the jumper strap on the primary terminal of the other breaker point assembly and tighten the lock nut.

On the 292 HD V-8 engine, position the breaker point assembly on the breaker plate, then install the hold down screws. Make sure that the ground wire terminal is on the screw furthest from the adjustment slot. Now, place the primary and condenser leads on the breaker point assembly primary terminal. Install the lock washer and nut. Then tighten the nut securely.

FIG. 9—Centrifugal Advance Distributor-Dual Breaker Point Installation

2 DISTRIBUTOR CAPS

INSPECTION

To inspect the distributor cap, refer to the secondary circuit preliminary checks (Part 4).

CLEANING

To clean the distributor cap, soak it in a mild cleaning solvent or mineral spirits. Do not use a harsh cleaning solution.

After foreign deposits have been loosened by soaking, scrub the cap with a soft bristle brush. **Do not use a wire brush, file, or other abrasive object.** Dry the cap with compressed air. Before replacing the cap, inspect it for cracks or wear.

REPLACEMENT

To replace the distributor cap, proceed as follows:

1. Remove the 2 clamps from the base of the old cap.
2. Lift the old cap aside. Place and clamp the new cap on the distributor.
3. Remove the #1 wire from the old cap and place it in the #1 position of the new cap.
4. Starting in a clockwise direction, move the rest of the wires, one at a time, from the old cap to the new cap.
5. Transfer the coil wire from the old cap to the new cap.

3 DISTRIBUTOR ROTOR

CLEANING

To clean the rotor, follow the directions above for cleaning the distributor cap.

REPLACEMENT

To remove the rotor, remove the distributor cap and lift the rotor straight up. The distributor shaft is notched so when replacing the rotor it will go on in one position only. When the rotor is in position, press it down firmly and then replace the distributor cap.

4 CONDENSER REPLACEMENT

ALL DISTRIBUTORS

REMOVAL

1. Remove the distributor cap and rotor.
2. Disconnect the condenser lead at the breaker point assembly.
3. Remove the screw that holds the condenser to the breaker plate and remove the condenser.

INSTALLATION

1. Place the condenser in position on the breaker plate and replace the retaining screw.
2. Place the condenser lead on the breaker point assembly and tighten the nut securely.
3. Install the rotor and distributor cap.

5 DISTRIBUTOR SPARK ADVANCE

The spark advance is checked to determine if the ignition timing advances in proper relation to the engine speed and load.

LOADOMATIC DISTRIBUTORS

There are two Loadomatic distributors, one is used with manual-shift transmissions and the other is used with automatic transmissions. The manual-shift transmission distributor has two breaker plate springs while the automatic transmission distributor has only one breaker plate spring. The automatic transmission distributor has a calibration shim, gasket, return spring, stop and washer attached to the diaphragm assembly. These items are not on the manual-shift transmission distributor.

1. Mount the distributor in the distributor tester.

2. Check the breaker point contact dwell. If the contact dwell is not with specifications, adjust the dwell.

3. Check the breaker arm spring tension and adjust, if necessary, to bring the tension within specifications.

MANUAL-SHIFT TRANSMISSIONS

1. Calibrate the test set and adjust it to 0° advance, 0 inch vacuum, and the initial rpm setting listed in the specifications (Refer to "Vacuum Advance Test," Part 4).

2. Check the operation of the vacuum advance at the lowest and highest rpm settings given in the specifications.

If the spark advance is not within the limits under low vacuum, the primary spring adjustment is at fault. If the spark advance is not within the limits under high vacuum, the secondary spring adjustment is at fault.

To adjust the spark advance, release the tension on the retard springs by turning the adjusting posts as required (Fig. 10). Adjust the primary spring (spring farthest from the vacuum chamber) first, for the low vacuum settings. Adjust the secondary spring last, for the high vacuum settings. As a final check, check the advance throughout the entire range.

If it is impossible to adjust both springs to give the correct spark advance throughout the range, one or both springs should be replaced and the spark advance readjusted. If the advance characteristics still cannot be brought within specifications, replace the diaphragm assembly.

AUTOMATIC TRANSMISSIONS

1. Adjust the test set to 0° advance, 0 inch vacuum, and the initial rpm setting listed in the specifications (Part 5).

2. The first and second advance characteristics listed in the specifications are adjusted by increasing or decreasing the tension of the breaker plate spring (Fig. 11). Check the advance characteristics at the specified vacuum and rpm settings. If the spark advance is not within limits, turn the spring adjusting post as required. **Increasing the spring tension will decrease advance. Decreasing the spring tension will increase advance.**

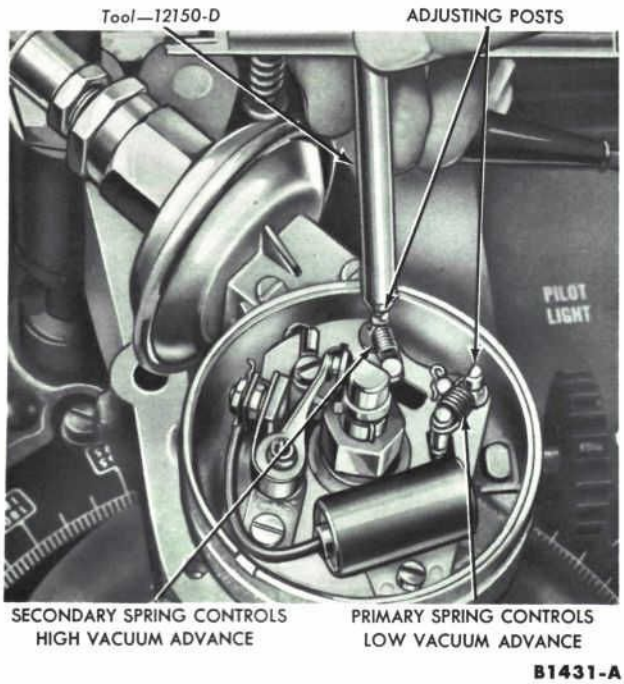

FIG. 10—Distributor Spark Advance Adjustment—Manual-Shift Transmission

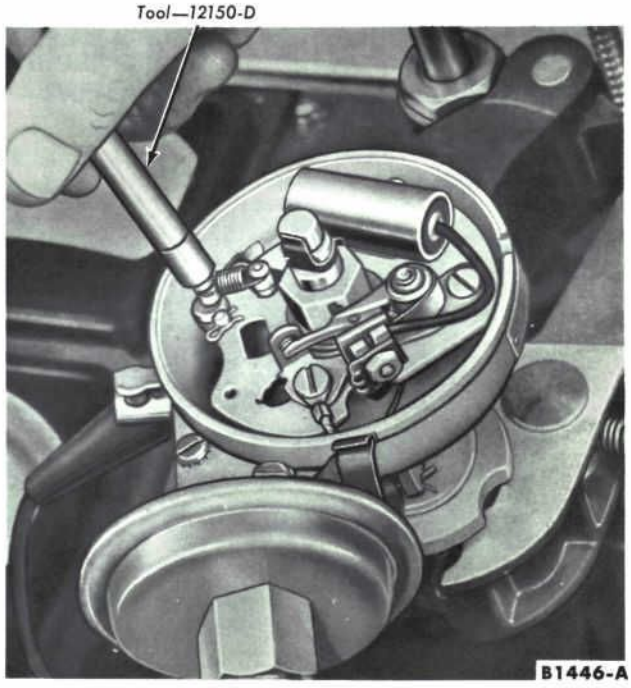

FIG. 11—Breaker Plate Spring Tension—Automatic Transmission Distributor

If it is impossible to obtain the correct spark advance by adjusting the spring, replace the spring.

3. The third advance setting listed in the specifications is adjusted by the addition or removal of the calibration washers behind the stop in the diaphragm housing (Fig. 12). Check the advance setting at the specified vacuum and rpm setting. If the spark advance is not within limits, add or remove washers as necessary. **The addition of a washer will increase advance. The removal of a washer will decrease advance.**

4. The fourth and fifth advance settings listed in the specifications are adjusted by the addition or removal of the calibration shims between the vacuum chamber spring and the vacuum line connection (Fig. 13). Check the advance settings at the specified vacuum and rpm settings. If the spark advance is not within limits, add or remove shims as necessary. **The addition of a shim will decrease advance. The removal of a shim will increase advance.**

DUAL ADVANCE DISTRIBUTOR

1. Mount the distributor on the distributor tester.

2. Check the breaker point contact dwell. If the contact dwell and breaker point gap are not within specifications, adjust the breaker points.

3. Check the breaker arm spring tension and adjust it, if necessary, to bring the tension within specifications.

The dual advance distributor has two independently operated spark advance systems. Each system is adjusted separately. **Adjust the centrifugal advance before adjusting the vacuum advance.**

CENTRIFUGAL ADVANCE

1. To check the centrifugal advance, refer to the centrifugal advance section of the distributor tests (Part 4). Set the test to 0° advance and the initial rpm setting listed in the specifications.

2. Turn the motor control knob to the left position and slowly increase the rpm to the setting specified for the first advance reading listed in the specifications.

If the correct advance is not indicated at this rpm, stop the distributor and bend one spring adjustment bracket to change its tension (Fig. 14). **Bend the adjustment bracket away from the**

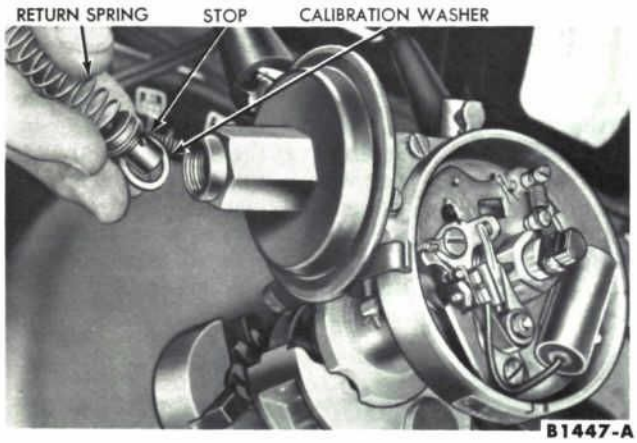

FIG. 12—Changing Calibration Washers—Automatic Transmission Distributor

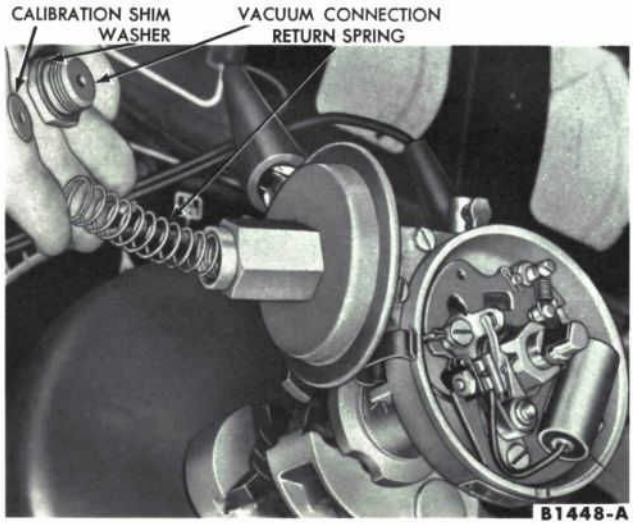

FIG. 13—Changing Calibration Shims—Automatic Transmission Distributor

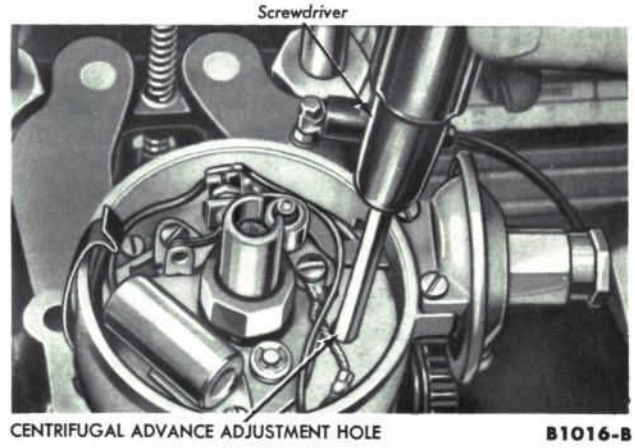

FIG. 14—Centrifugal Advance Adjustment—Dual Advance Distributor

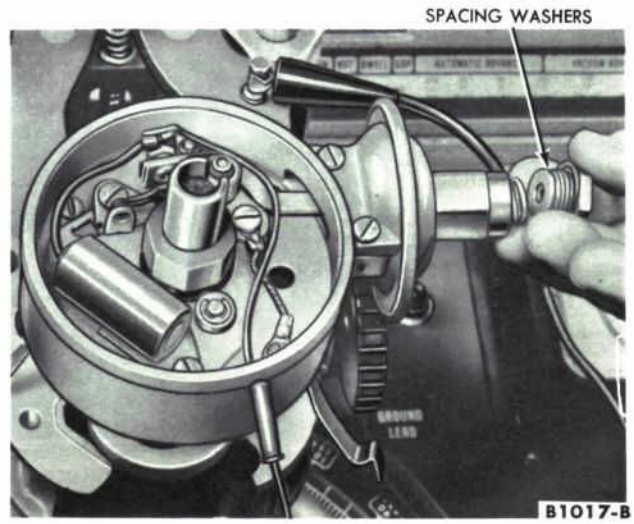

FIG. 15—Vacuum Advance Adjustment—Dual Advance Distributor

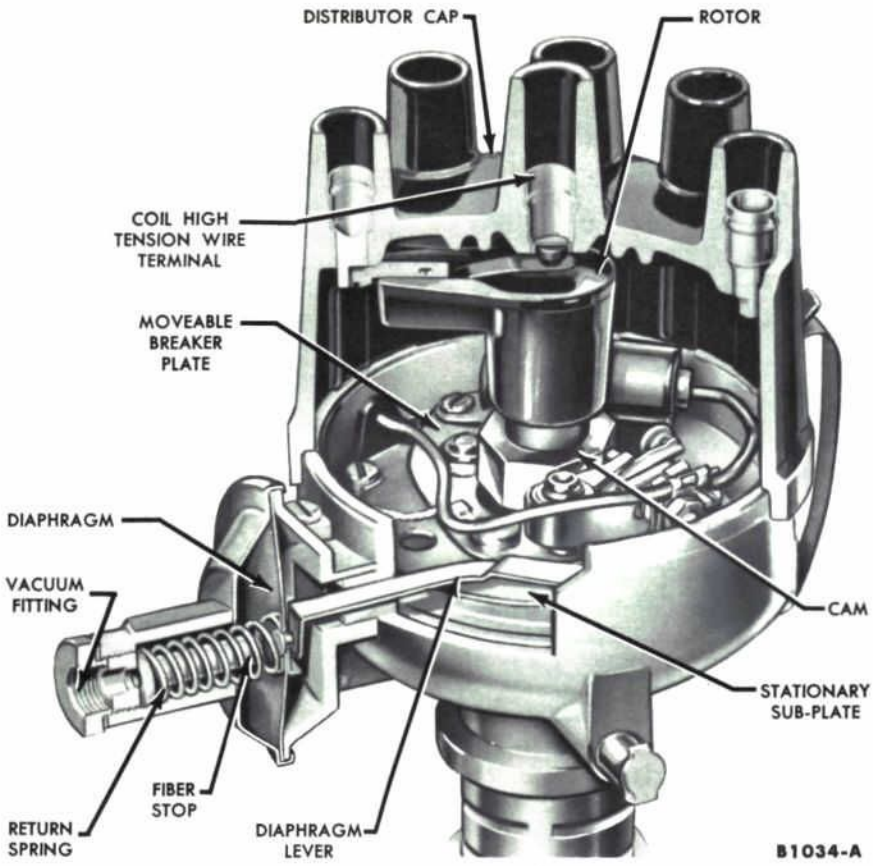

FIG. 16— Vacuum Advance Mechanism

distributor shaft to decrease advance by increasing spring tension, and toward the shaft to increase advance by decreasing spring tension. After adjustment is made, identify the bracket.

3. After the adjustment has been made to one spring, check the minimum advance point again.

4. Operate the distributor at the specified rpm to give an advance just below the maximum. If this advance is not to specifications, stop the distributor and bend the other spring bracket to give the correct advance.

5. Check the advance at all rpm settings listed in the specifications. Operate the distributor both up and down the rpm range.

VACUUM ADVANCE

1. Refer to the vacuum advance section of the distributor tests (Part 4).

2. Set the test set to 0° inch vacuum, and at 1000 rpm.

3. Check the advance at the first vacuum setting given in the specifications.

4. If the advance is incorrect, change the calibration washers between the vacuum chamber spring and nut (Fig. 15). After installing or removing the washers, position the gasket in place and tighten the nut. **The addition of a washer will decrease advance, and the removal of a washer will increase advance.**

5. After one vacuum setting has been adjusted, the others should be checked. **Do not change the original rpm setting when going to a different vacuum setting.** If the other settings are not within limits, it indicates incorrect spring tension, leakage in the vacuum chamber and/or line, or the wrong fiber stop has been installed in the vacuum chamber of the diaphragm housing (Fig. 16).

CENTRIFUGAL ADVANCE DISTRIBUTOR

1. Mount the distributor on the distributor tester.

2. Check the breaker point contact dwell. If the contact dwell and gap are not within specifications, adjust the breaker points.

3. Check the breaker arm spring tension and adjust, if necessary, to bring the tension within specifications.

The distributor has only a centrifugal advance mechanism. Adjust the advance as outlined under "Centrifugal Advance" for the dual advance distributor.

6 IGNITION TIMING

The timing marks on all engines are graduated from top dead center (TDC) through varying degrees before top dead center (BTC). The timing marks are inscribed on either the timing pointer or on the crankshaft pulley or damper. Figs. 17 and 18 show typical timing marks.

To adjust the ignition timing, align the proper timing mark with the pointer or timing notch. The exact setting for each engine is given in the specifications (Part 5).

Under some conditions, the initial ignition timing may be advanced up to 5° over the recommended setting. To do this, advance the timing progressively until engine detonation (spark knock) is evident under actual road test acceleration. Retard the timing until the detonation is eliminated. If the individual requirements of the car and/or if sub-standard fuels are used, the initial timing may be retarded from the recommended setting not to exceed 2° BTC. Warning: If the initial timing is advanced or retarded too far, damage may result to the engine.

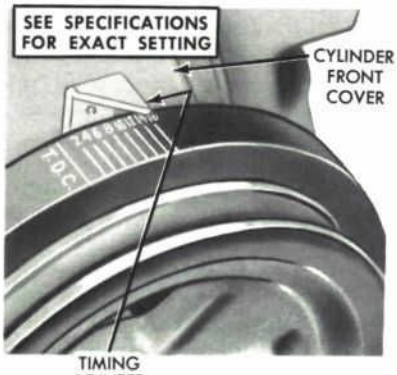

FIG. 17—Mileage Maker Six Timing Marks

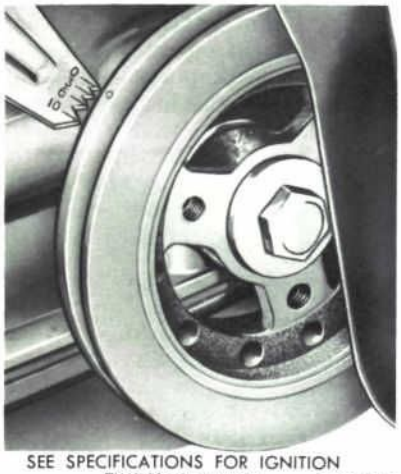

FIG. 18—Typical V-8 Engine Timing Marks

CHECKING AND ADJUSTING

1. On a Loadomatic or dual advance distributor, disconnect the distributor vacuum line.

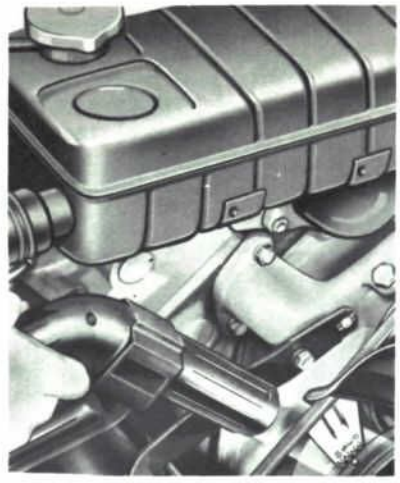

FIG. 19—Checking Ignition Timing—Typical

2. Connect the timing light high tension lead to the No. 1 spark plug and the other two leads of the timing light to the battery terminals. **Do not puncture the spark plug wire or moulded cap.**

3. Clean the dirt from the timing marks and, if necessary, chalk the proper mark and the pointer or notch to improve legibility.

4. Operate the engine at idle speed. Be sure the engine is idling below 550 rpm so that there will be no centrifugal advance on engines with dual advance or centrifugal advance distributors. The timing light should flash just as the proper mark lines up with the pointer or pin to indicate correct timing (Fig. 19). The operator's eye should be in line with the center of the pulley or damper and the timing pointer or notch.

5. If the proper timing mark is not aligned with the pointer, pin, or notch, rotate the distributor until the correct timing mark and the pointer, pin, or notch are aligned.

On all six-cylinder engines, timing is advanced by counter clockwise rotation of the distributor body, and retarded by clockwise rotation.

On all V-8 engines, timing is advanced by clockwise rotation of the distributor body and retarded by counter clockwise rotation.

6. After the ignition timing has been properly set, connect the distributor vacuum line (Loadomatic or dual advance distributor).

7. Check the distributor to determine if the advance mechanism is operating. To do this, hold the timing light so that the timing marks and pointer, pin, or notch can be seen, and accelerate the engine. If no advance is evident, one of the following is the probable cause:

On the Loadomatic or dual advance distributor, no vacuum available at the distributor, vacuum diaphragm leaking, diaphragm link disconnected from the breaker plate, or the breaker plate is binding in the housing or on the bushing.

On the dual advance or centrifugal advance distributor, the centrifugal advance is not operating properly due to weights binding on their pivot points; weight spring tension too great, or the weights binding in the stop plate slots.

7 SPARK PLUGS

REMOVAL

1. Remove the wire from each spark plug by grasping the moulded cap of the wire only. **Do not pull on the wire because the wire connection inside the cap may become separated or the weather seal may be damaged (Fig. 2).**

2. Clean the area around each spark plug with compressed air, then remove the spark plugs with a spark plug wrench containing a rubber insert to prevent damage to the spark plug insulator.

3. Inspect the spark plugs (refer to the secondary circuit tests in Part 4).

CLEANING

Clean the spark plugs on a sand blast cleaner, following the instructions of the cleaner manufacturer. Make certain that the cleaner has clean sand, as the plugs will be fouled by dirty sand. Do not prolong the use of the abrasive blast as it will erode the spark plug insulator. Remove carbon and other deposits from the threads with a stiff wire brush. Any deposits will retard the heat flow from the plug to the cylinder head, causing spark plug overheating and pre-ignition.

Clean the electrode surfaces with a small file (Fig. 20). Dress the electrodes to secure flat, parallel surfaces on both center and side electrodes.

After cleaning, examine the plug carefully for cracked or broken

FIG. 20—Cleaning Spark Plug Electrode

FIG. 21—Setting Spark Plug Gap

insulators, badly pitted electrodes, or other signs of failure (Fig. 36). Replace as required.

ADJUSTMENT

Set the spark plug gap to specifications by bending the ground electrode (Fig. 21). Use a round wire gauge because a flat gauge cannot measure the curved contour of used electrodes. Too small a gap will result in a rough idle, uneven power and poor performance in general. Too large a gap will cause poor performance at high speeds and hard starting.

INSTALLATION

1. Be sure that the spark plugs and the spark plug seats are clean to insure proper heat flow.

2. Install the spark plugs and torque each plug to specifications. When a new spark plug is installed in a new cylinder head, torque the plug to the proper specifications for this condition.

3. Connect the spark plug wires. Push all the weather seals into position.

8 SPARK PLUG WIRE REPLACEMENT

Typical ignition wire installations are shown in Figs. 22 and 23.

When removing the wires from the spark plugs, grasp the moulded cap only. **Do not pull on the wire because the wire connection inside the cap may become separated or the weather seal may be damaged.**

SIX-CYLINDER ENGINES

REMOVAL

1. Disconnect the wires at the spark plugs and at the distributor cap. Remove the weather seals on the distributor end of the wires and remove the rubber rings, if so equipped.

2. Remove the coil high tension lead.

INSTALLATION

1. If so equipped, install a rubber ring on the No. 3 and 4 wires, and on the No. 5 and 6 wires. Connect the wires to the proper spark plugs.

2. Install the weather seals on the distributor end of the wires, and insert the ends of the wires in the correct sockets on the distributor cap. Be sure the wires are forced all the way down into their sockets and that they are held firmly in position. The No. 1 socket is identified on the distributor cap. Install the wires in a clockwise direction in the correct firing order (Refer to Specifications, Part 5), starting at the No. 1 socket. NOTE: Refer to Part I for more wire information.

3. Install the coil high tension lead. Push all the weather seals into position.

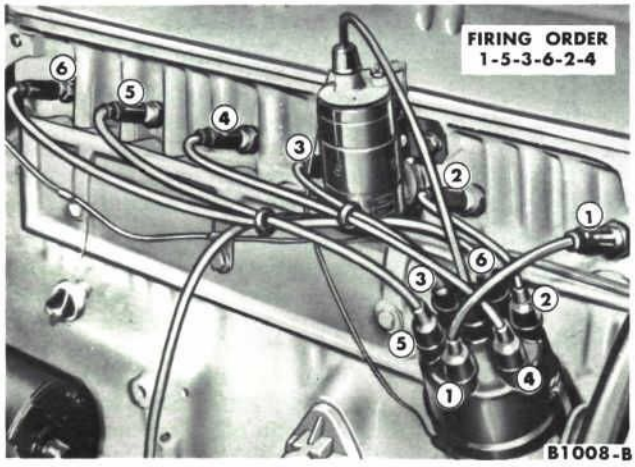

FIG. 22—Typical Six-Cylinder Engine Ignition Wiring

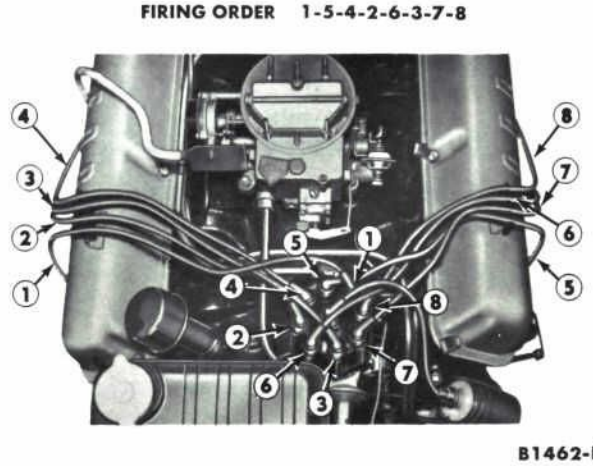

FIG. 23—Typical V-8 Engine Ignition Wiring

V-8 ENGINES

REMOVAL

1. Remove the mounting brackets (if so equipped). Disconnect the wires from the spark plugs and from the distributor cap.

2. Pull the wires from the brackets (if so equipped) and from the supporting brackets on the valve rocker arm covers.

3. Remove the coil high tension lead.

INSTALLATION

1. Install new wires in the brackets (if so equipped). Be sure all the wires are positioned correctly.

2. Install weather seals on the distributor end of the wires.

3. Insert each wire in the proper distributor cap socket. Be sure the wires are forced all the way down into their sockets. The No. 1 socket is identified on the distributor cap. Install the wires in the direction of distributor rotation in the firing order (Refer to Specifications, Part 5), starting at the No. 1 socket.

4. Cylinders are numbered from front to rear in the right bank 1-2-3-4 and in the left bank 5-6-7-8. Connect the wires to the proper spark plugs, then install the coil to distributor high tension lead.

5. Push all weather seals into position over the distributor cap sockets.

9 IGNITION RESISTANCE WIRE REPLACEMENT

FALCON, FAIRLANE, GALAXIE AND THUNDERBIRD

Check the primary resistance wire for excessive resistance as outlined under "Primary Circuit Tests" Fig. 30).

If replacement is necessary:

1. Cut the brown wire and the red (green stripe) wire from the upper quick disconnect at the dash panel in the engine compartment. Cut the wires as close to the quick disconnect as possible.

2. Solder a male bullet-type terminal (Fig. 24) to the brown wire and to the red (green stripe) wire making a single terminal of the two wires. Using a female bullet terminal connector, connect the wires to one end of the service replacement resistance wire. **Do not splice the resistance wire.**

3. Drill a 3/4-inch hole through one of the accessory dimples in the dash panel.

4. Install a grommet into the hole drilled in the dash panel.

5. Thread one end of the service replacement resistance wire through the grommet in the dash panel. Disconnect the present pink wire and connect the new wire to the red (green tracer) jumper wire at the ignition switch. Make sure the wire is routed through the retaining clips.

6. Cut off and discard (at the point where it enters the taped area) the length of defective pink resistance wire which is not enclosed in the taped portion of the wiring assembly.

B-, F-, C-, H- AND T-SERIES TRUCKS

1. Solder a bullet terminal to a 16-gauge wire, 3-inches long, and solder an eyelet terminal to the other end.

2. Disconnect the defective resistance wire (pink) from the coil terminal of the ignition switch.

3. Connect the eyelet of the 3-inch wire to the coil terminal of the ignition switch. Connect the new resistance wire to the other end of the 3-inch wire, using a bullet terminal connector (Fig. 25).

4. Route the new resistance wire along the routing of the defective wire and through the clips. At the

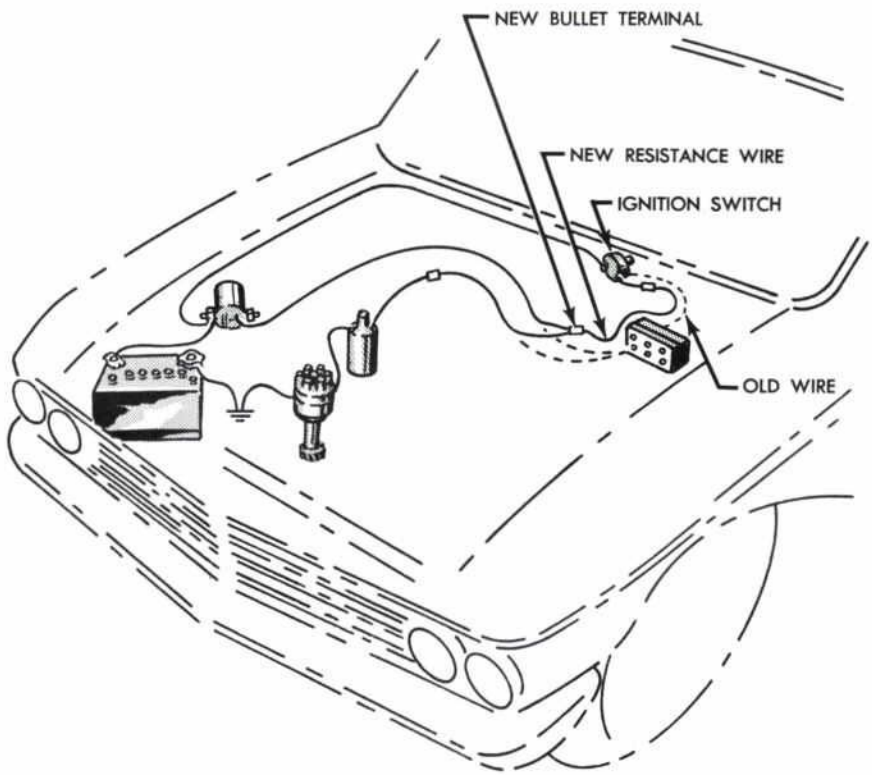

FIG. 24—Typical Passenger Car Resistance Wire Replacement B1723-A

same time, remove the defective wire from the clips. Continue routing the wire along the outside of the main wiring harness and through the grommet in the dash panel. Tape the replacement wire to the main harness in several places.

If a grommet is not used, drill a 3/4-inch hole through one of the accessory dimples in the dash panel and install a grommet in the drilled hole.

5. Cut the red (green tracer) wire from the upper quick disconnect at the dash panel in the engine compartment. Cut the wire as close as possible to the quick disconnect.

6. Solder a male bullet terminal to the red (green tracer) wire. Using a female bullet terminal, connect this wire to the end of the new resistance wire. **Do not splice the resistance wire.**

7. Cut off and discard the defective pink wire which is not enclosed in the taped portion of the main wiring harness. Cut the wire where it enters the taped area.

P-SERIES TRUCKS

1. Solder a bullet terminal to 16-gauge wire, 3-inches long, and solder an eyelet terminal to the other end.

2. Disconnect the defective resistance wire (pink) from the coil terminal of the ignition switch.

3. Connect the 3-inch wire to the coil terminal of the ignition switch. Connect the new resistance wire (Fig. 26) to the other end, using a bullet terminal connector.

4. Route the new resistance wire along the main wiring harness and through the grommet in the dash panel. Route the new wire to the coil through the clips.

5. Fabricate a 16-gauge wire to reach from the battery terminal of the coil to the resistance wire. Solder a bullet terminal on one end and an eyelet terminal on the other end. Connect this wire to the resistance wire, using a bullet terminal connector. **Do not splice the resistance wire.** Make sure the wire is routed along the existing wiring and through the clips to the coil.

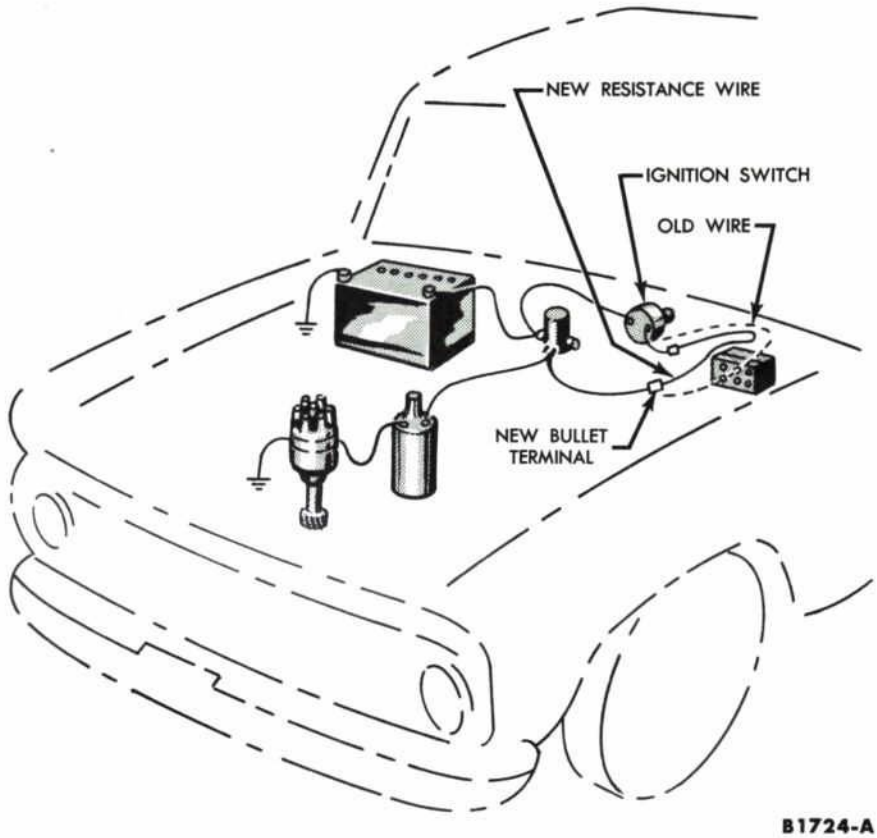

FIG. 25—Typical B, F, C, and T Series Resistance Wire Replacement

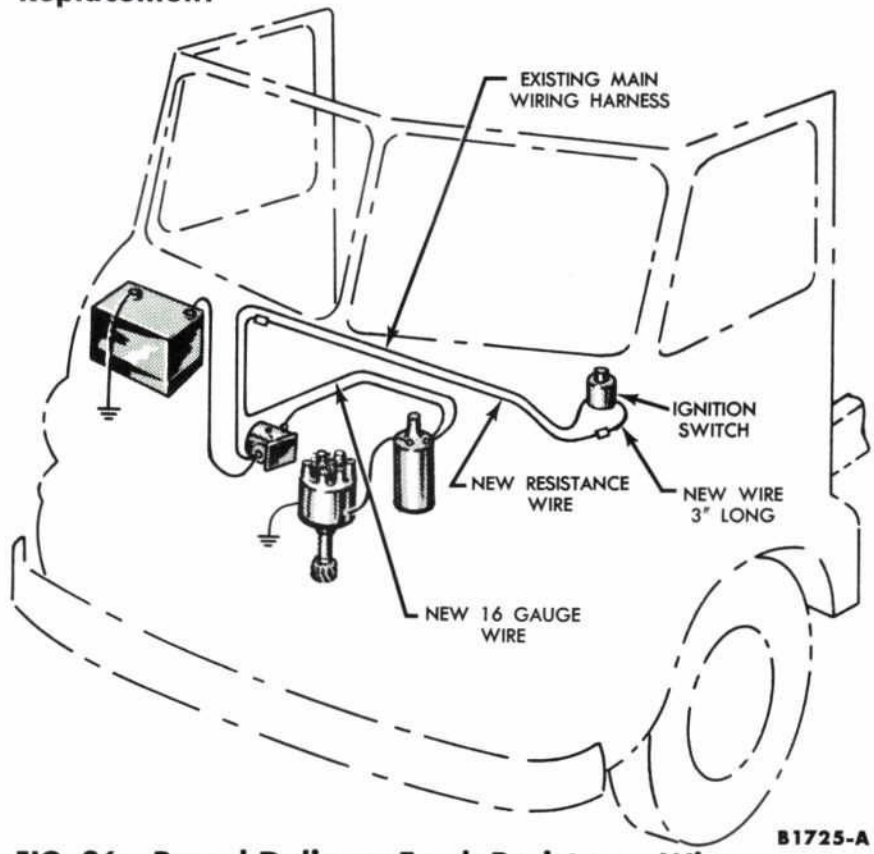

FIG. 26—Parcel Delivery Truck Resistance Wire Replacement

PART 3

DIAGNOSIS GUIDE

Ignition system troubles become apparent in faulty engine operation. The troubles are caused by a failure in the primary and/or the secondary circuit, or by incorrect ignition timing and result in the symptoms listed. The tests should be performed in the order shown.

TABLE 1—Trouble Diagnosis Guide

SYMPTOM	POSSIBLE CAUSES	TESTS TO PERFORM	ALTERNATE TESTS
ENGINE WILL NOT START	No spark or a weak spark at the spark plugs.	Disconnect a spark plug wire and check the spark intensity at the end of the wire by installing a terminal adapter in the terminal of the wire to be checked. Hold the adapter approximately 3/16-inch from the engine block and, with the ignition switch on, crank the engine. If there is no spark, or a weak or intermittent spark, at the spark plugs, the cause of the trouble is in the ignition system. Isolate the trouble to the primary or secondary circuit as follows: Remove the coil high tension lead from the distributor cap (Fig. 1). Hold the high tension lead approximately 3/16-inch away from the cylinder head. With the ignition switch on, crank the engine and check for a spark. If the spark is good, the trouble lies in the secondary circuit. A break down or energy loss in the secondary circuit can be caused by: 1. Defective high tension wiring. 2. High tension leakage across the distributor cap, or rotor. If there is no spark, or a weak spark, the trouble is in the primary circuit, coil to distributor high tension lead, or in the coil. A breakdown or energy loss of the primary circuit can be caused by: 1. Defective primary wiring. 2. Burned or improperly adjusted breaker points. 3. High tension leakage across the coil or a defective ignition coil.	Check the starting system and check for hydrostatic lock.

TABLE 1—Trouble Diagnosis Guide (Cont.)

SYMPTOM	POSSIBLE CAUSES	TESTS TO PERFORM	ALTERNATE TESTS
ENGINE WILL NOT START (Cont.)		4. A defective condenser. Make the necessary repairs or adjustments as described in Part 4.	
ENGINE STARTS BUT FAILS TO KEEP RUNNING	High tension wire leakage or open ignition resistor.	Check the wiring as described in Part 4.	Check the fuel system.
ENGINE RUNS BUT MISSES STEADILY AT ALL SPEEDS	Defective spark plugs or secondary circuit.	Remove and ground the spark plug wire from a cylinder. If the speed changes when the wire is grounded, that cylinder was delivering power. If no change in the engine speed is noticed, the miss was caused by that cylinder not delivering power. Check the rest of the cylinders, one at a time, to see if they are delivering power. The cylinder or cylinders that are not delivering power should have the trouble isolated by performing a spark intensity test (Part 4). If the spark is good, inspect and test the spark plug (Part 4). If the spark is weak, check the spark plug wire and distributor cap (Part 4).	Check the engine for a mechanical defect.
ENGINE MISSES ERRATICALLY AT ALL SPEEDS	Defective distributor, coil, or spark plugs.	Check breaker points, secondary wiring, coil and spark plugs as described in Part 4.	If the ignition system is not at fault, check the fuel system, the cooling system, and the engine.
ENGINE MISSES AT IDLE ONLY	Wear in the distributor.	Check for excessive end play in the distributor shaft and determine if the distributor cam lobes are excessively worn. These procedures are described in Part 4.	If the trouble is not in the ignition system, check the cooling system and the engine.
ENGINE MISSES AT HIGH SPEED ONLY	Primary and/or secondary circuit defects.	Check each of the following: breaker point alignment, spacing, and spring tension, condenser connections, worn or improper spark plug cap, coil, condenser, and spark advance (Refer to Part 4 for the checks).	If the trouble is not in the ignition system, check the cooling and fuel systems.
ROUGH ENGINE IDLE	Breaker points, plugs, or timing.	The trouble may be caused by improperly adjusted or defective breaker points, fouled, improperly adjusted or misfiring spark plugs, incorrect ignition timing or high tension leak at the 90° boot at the distributor end of the spark plug wire.	If the trouble is not in the ignition system, check the vacuum booster pump, the cooling and fuel systems, and the engine.

TABLE 1—Trouble Diagnosis Guide (Cont.)

SYMPTOM	POSSIBLE CAUSES	TESTS TO PERFORM	ALTERNATE TESTS
ROUGH ENGINE IDLE (Cont.)		Perform the indicated tests as described in Part 4.	
POOR ACCELERATION	Breaker points, plugs or timing.	Check the ignition timing. Check for fouled or improperly adjusted spark plugs. Adjust or replace the breaker points. Check the distributor advance. These checks and adjustments are described in Part 2.	Check the fuel and exhaust systems and the transmission.
ENGINE MISSES UNDER LOAD	Plugs, coil, or spark advance.	Check plugs for fouling, improper gap, or wrong heat range. Also check for a weak coil or improper spark advance. These checks are described in Part 4.	
ENGINE SURGE	Timing, plugs, breaker points or advance.	Check the initial timing, spark plug gap, breaker point gap, distributor spark advance, distributor diaphragm or vacuum line leak, or loose spark plugs. These checks are described in Parts 2 and 4.	
ENGINE DOES NOT DEVELOP FULL POWER, OR HAS POOR HIGH SPEED PERFORMANCE	Timing or distributor.	The ignition timing may be out of adjustment, or there may be a defective coil, condenser, or rotor. The distributor may not be advancing properly. There may be excessive play in the distributor shaft or the distributor cam lobes may be excessively worn. The trouble may also be caused by fouled or improperly adjusted spark plugs, or improperly adjusted or defective breaker points. If equipped with a governor, it may be improperly adjusted or defective. Make a complete check of the ignition system as described in Part 4 until the cause of the trouble has been isolated, then replace or adjust the defective component as described in Part 2.	The trouble may be in the fuel, exhaust, or cooling systems or in the engine or transmission.
EXCESSIVE FUEL CONSUMPTION	Defective distributor or spark plugs.	Check the adjustment and condition of the spark plugs. Check the distributor advance or vacuum diaphragm. These checks are described in Part 2.	
ENGINE OVERHEATS	Incorrect ignition timing.	Check and adjust as described in Part 2.	Check the engine, cooling system, and temperature sending unit.

PART 4

IGNITION SYSTEM TESTS

Most of the ignition system can be tested by using the Sun 900 Scope Motor Tester. Make the connections as follows (Fig. 27):

1. Plug the power cord into a proper outlet.

2. Place the AC master switch in the ON position.

3. Turn the Tach-Dwell selector switch to the (CAL.) position and adjust the dwell calibrator until the meter pointer reads on the SET LINE.

4. Turn the Tach-Dwell RPM switch to the 5,000 position.

5. Connect the Tach-Dwell leads; connect the red insulator lead to the primary distributor lead at the coil. Connect the black insulator lead to a good ground.

6. Connect the TRIGGER PICKUP into the circuit of the first spark plug in the firing order.

7. Turn the Voltage Leakage unit control counterclockwise to the TIMING position.

8. Connect a jumper lead from the distributor primary to a good ground.

9. Set the Voltage Leakage switch to the 20V position.

10. Connect the Voltage Leakage test leads; the red lead is connected to the battery side of the coil and the black lead is connected to a good ground.

11. Remove the high tension wire from the coil and leave the wire disconnected.

12. Insert the Scope PATTERN PICKUP into the coil tower and attach the ground clip to a good ground.

13. Set the Scope GROUND POLARITY switch to the positive (+) position.

14. Turn the Scope DISPLAY SELECTOR to the SCOPE CHECK position and adjust the horizontal and vertical knobs until the trace appears on the zero (0) line (allow about 30 seconds for warm up before adjustment).

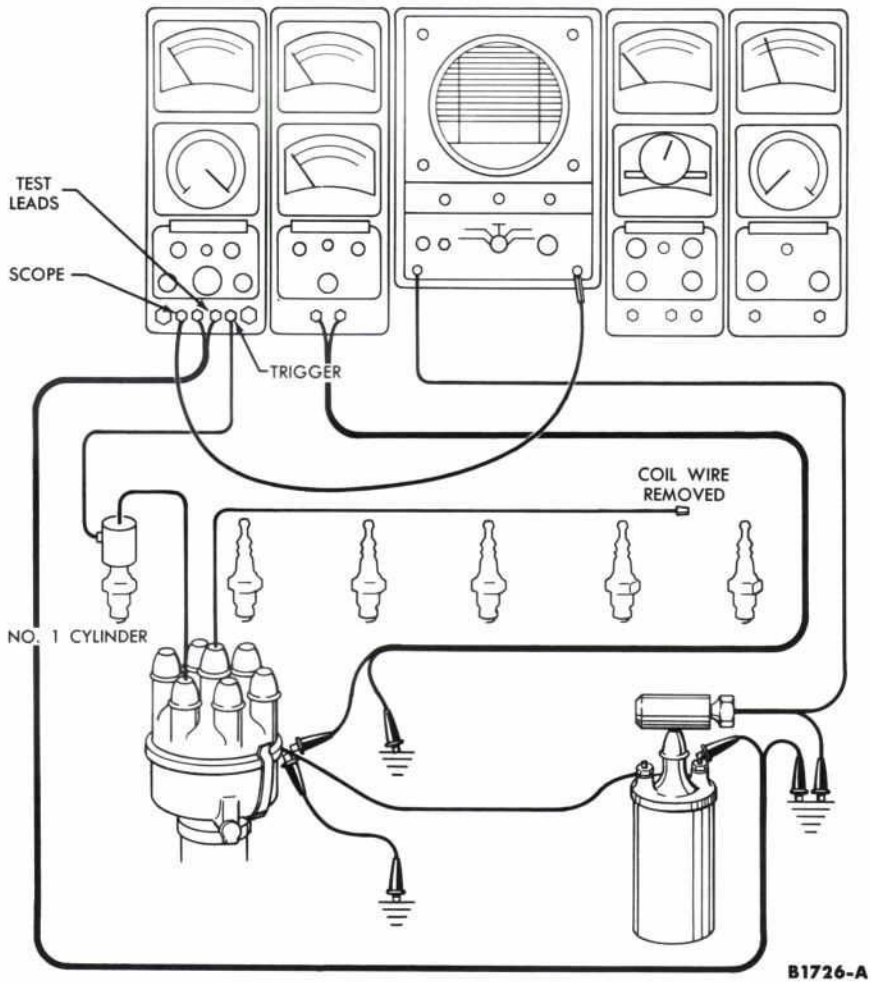

FIG. 27—Ignition Testing Connections

1 PRIMARY CIRCUIT TESTS

PRELIMINARY CHECKS

A complete test of the primary circuit consists of checking the circuit from the battery to the coil, from the coil to ground, and the starting ignition circuit. Typical test procedures are shown in Figs. 28 through 32.

Excessive voltage drop in the primary circuit will reduce the secondary output of the ignition coil, resulting in hard starting and poor engine performance.

1. Inspect the battery for corrosion due to acid and dirt. If

PROCEDURE

1. Connect the voltmeter leads as shown.
2. Install a jumper wire.
3. Turn the ignition switch on.
4. Turn the accessories and the lights off.

VOLTMETER READING

If the voltmeter reading is 6.9 volts or less, the primary circuit from battery to coil is satisfactory.

If the voltmeter reading is greater than 6.9 volts, check:

1. All components in the battery to coil circuit as outlined under "Preliminary Checks."
2. Resistance wire for defects.
3. Relay to ignition switch for defects.

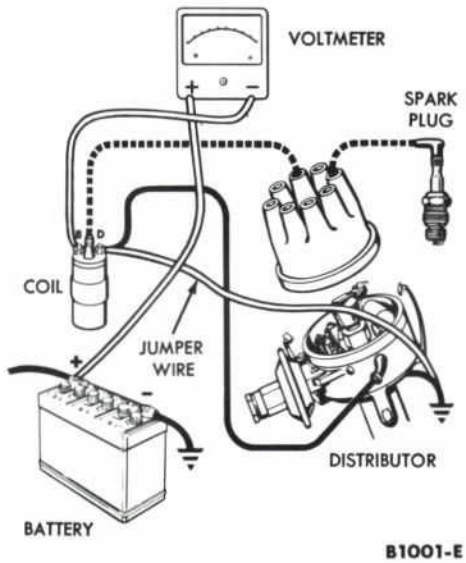

FIG. 28— Battery To Coil Test

PROCEDURE

1. Connect the voltmeter leads as shown.
2. Install a jumper wire.
3. Turn the ignition switch on.
4. Turn the accessories and the lights off.

VOLTMETER READING

If the voltmeter reading is 0.3 volt or less, the ignition switch and the relay to switch wire are satisfactory.

If the voltmeter reading is greater than 0.3 volt, either the ignition switch and or the wire are defective.

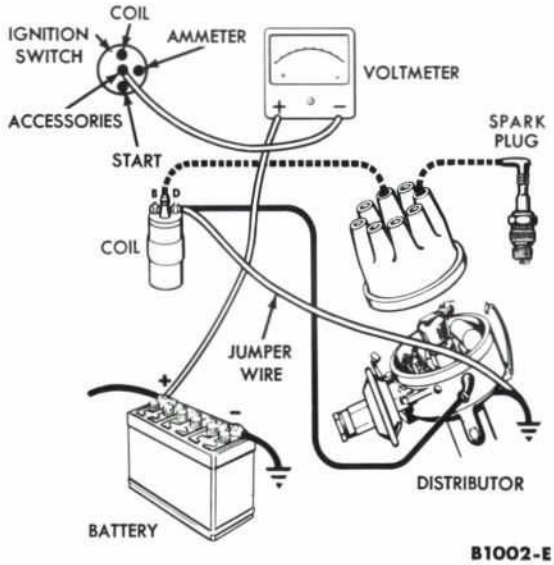

FIG. 29— Ignition Switch Test

necessary, clean the battery and cables with a baking soda solution. Be sure the cable connectors and the contacting surfaces on the battery, engine, and relay are clean. Tighten the cables securely when they are installed. Test the battery to determine if it is in good condition, needs recharging, or must be replaced.

2. Inspect all the primary wiring for worn insulation, broken strands, and loose or corroded terminals. Replace any defective wiring. Make sure all the connections are tight.

CRANKING VOLTAGE

1. With the tester connected, turn the ignition switch on. **Make sure that the transmission is in neutral and that the parking brake is set.**

2. Crank the engine, observe the speed and note the reading on the voltmeter.

If the meter reads less than the specified voltage, check for the following: weak battery, defective cables, connections, switch, starter, by-pass circuit, or ignition circuit to coil.

If the speed is uneven or slow, the engine or starting circuit is defective.

BREAKER POINTS

1. With the motor tester connected, turn the scope display selector to the individual cylinder (INDIVIDUAL CYL.) position.

2. Remove the jumper lead from the distributor to ground.

3. Insert the coil high tension wire into the Scope pattern pickup.

4. Run the engine at 1200 rpm.

5. Observe the point open and point close signals (Fig. 33). If an unusual point close signal is obtained (an unusual point close signal is one that does not have a short straight downward line followed by a series of closely grouped rapidly diminishing oscillations), check for poor point contact, misaligned points, or a weak point spring tension (Part 2).

If an unusual point open signal is obtained (an unusual point open signal is one that does not form a firing line that is straight up and down), check for dirty or burned points, or a high series resistance.

COIL

POLARITY

1. Connect the motor tester.

2. Remove the jumper lead from the distributor to ground, if it is still connected.

3. Insert the coil high tension lead into the scope PATTERN PICKUP.

4. Adjust the engine speed to 1200 rpm.

5. Turn the scope display selector to the ALL CYLINDERS position, and adjust the pattern length control until all cylinders appear between the vertical lines on both sides of the screen.

6. Rotate the PATTERN SHIFT control counterclockwise until the last pattern on the screen appears complete.

7. Observe the patterns, noting if they are upright or inverted (Fig. 33).

If they are inverted, check for the scope GROUND POLARITY switch in the minus (-) position, battery polarity reversed, coil improperly connected, or incorrect coil.

PROCEDURE

1. Connect the voltmeter leads as shown.
2. Install a jumper wire.
3. Turn the ignition switch on.
4. Turn the accessories and the lights off.

VOLTMETER READING

If the voltmeter reading is 6.6 volts or less, the resistance wire is satisfactory.

If the voltmeter reading is greater than 6.6 volts, replace the resistance wire.

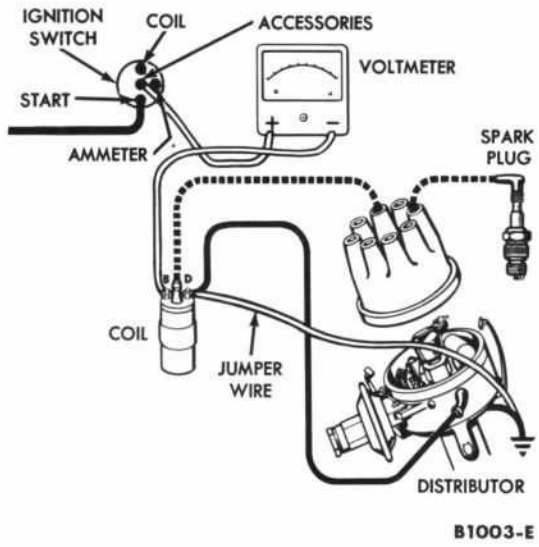

FIG. 30—Resistance Wire Test

PROCEDURE

1. Connect the voltmeter leads as shown.
2. Disconnect the high tension lead from the distributor cap and ground the lead.
3. Using a remote starter switch, crank the engine while observing the voltage drop.

VOLTMETER READING

If the voltage drop is 0.1 volt or less, the starting ignition circuit is satisfactory.

If the voltage drop is greater than 0.1 volt, clean and tighten terminals in the circuit or replace wiring as necessary.

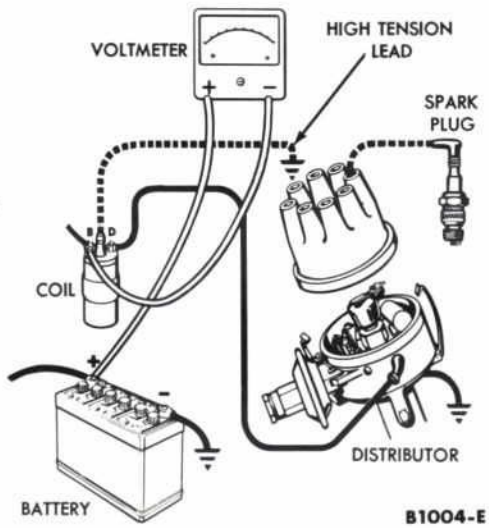

FIG. 31—Starting Ignition Circuit Test

CONDENSER-COIL UNIT

To check the coil for shorted or open windings and for primary or secondary resistance, calibrate the Condenser-Coil Unit as follows:

1. Turn the AC SWITCH to ON.
2. Set the Condenser-Coil Unit selector switch at the OHMS position.
3. Set the Condenser-Coil OHMS switch to the desired range.
4. Connect the TEST LEADS together.
5. Adjust the Condenser-Coil CALIBRATOR until the meter pointer reads zero on the OHMS scale.
6. Disconnect the TEST LEADS.
7. Disconnect all leads from the coil.

SHORTED OR OPEN WINDINGS

1. Calibrate the Condenser-Coil Unit (the ohm switch should be in the OHMS position).
2. Connect the TEST LEADS; one to each coil primary terminal. Observe the polarity.
3. Insert the COIL PICKUP into the secondary tower of the coil and connect the ground lead of the pickup to a good ground.
4. Turn the Condenser-Coil Unit selector switch to the COIL TEST position and observe the wave pattern visible on the coil test scope.

Refer to figure 34 for checking the data obtained.

PRIMARY RESISTANCE

1. Calibrate the Condenser-Coil Unit (set the ohm switch to the OHMS position).
2. Connect the TEST LEADS; one to each primary terminal of the coil.
3. Observe the meter reading and compare it with specifications.

SECONDARY RESISTANCE

1. With the ohm switch set at the OHMS X1000 position, calibrate the Condenser-Coil Unit.
2. Install the coil pickup test lead in the tower of the coil.
3. Connect the ohmmeter test leads; one to either primary terminal and the other to the open (pigtail) end of the COIL PICK-UP test lead.
4. Observe the meter reading and compare it with specifications.

If the meter reading exceeds 20,000 ohms, the secondary winding is open.

CONDENSER

For the condenser tests, calibrate the Condenser-Coil Unit as follows:

1. Set the selector switch to the CONDENSER position.
2. Connect the TEST LEADS together.
3. After allowing approximately one minute for the tester to warm up, adjust the CALIBRATOR until the meter pointer reads on the SET LINE at the right end of the meter scale. **Do not change this setting during the tests.**

RESISTANCE

1. Connect the TEST LEADS; one to the primary terminal of the distributor and the other to a ground on the distributor body.
2. With the condenser test switch in the SERIES RESISTANCE position, the meter should read in the black bar at the right end of the scale.

PROCEDURE

1. Connect the voltmeter leads as shown.
2. Turn the ignition switch on.
3. Turn the accessories and the lights off.
4. Close the breaker points.

VOLTMETER READING

If the voltmeter reading is 0.1 volt or less, the primary circuit from coil to ground is satisfactory.

If the voltmeter reading is greater than 0.1 volt, test the voltage drop of each of the following:

1. Coil to distributor primary wire.
2. The moveable breaker point and the breaker plate.
3. The breaker plate and the distributor housing.
4. The distributor housing and engine ground.

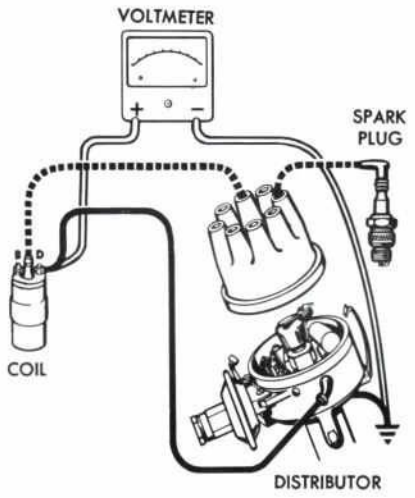

FIG. 32—Coil To Ground Test

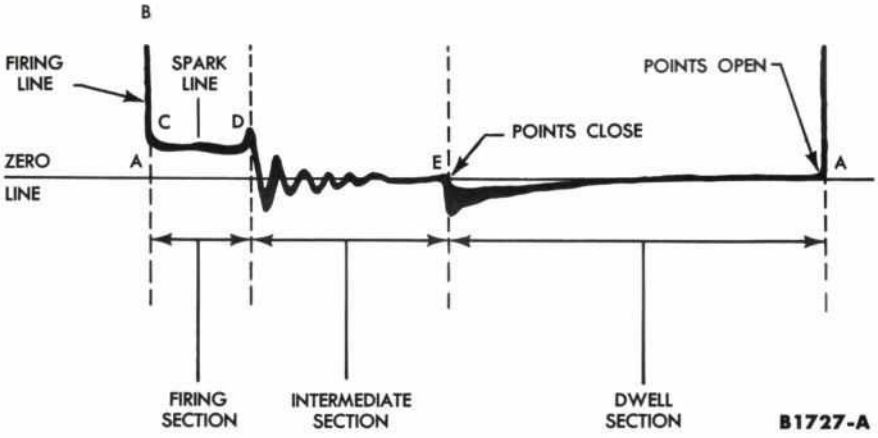

FIG. 33—Typical Scope Pattern

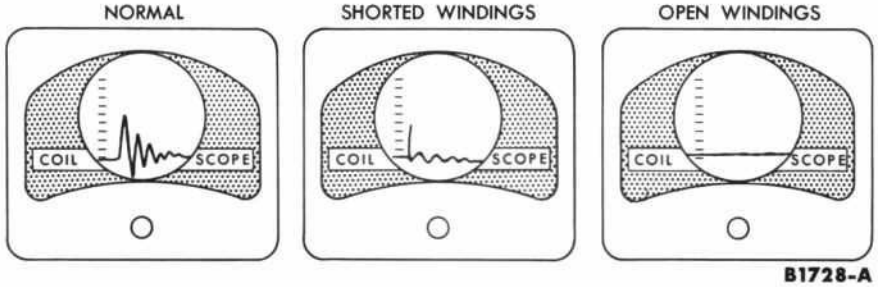

FIG. 34—Coil Test Patterns

3. Move the condenser pigtail. If a deflection of the meter is noted, the pigtail is making poor contact and the condenser should be replaced.

If the reading is outside the black bar, move the grounded lead to the body of the condenser. If the reading improves, the condenser is not properly grounded to the distributor housing.

CAPACITY

1. Turn the condenser test switch to the CAPACITY position.

2. Read the red scale of the meter (0 to 0.5) for the microfarad capacity of the condenser being tested.

3. Refer to the specifications for the recommended condenser capacity.

If the readings do not fall in the specifications, replace the condenser.

LEAKAGE

1. Turn the condenser test switch to the LEAKAGE position.

2. The meter should now read in the black bar at the left end of the scale if the condenser leakage is satisfactory.

If the meter pointer reads outside the black bar, the condenser insulation is leaking and the condenser should be replaced.

NOTE: If the condenser does not meet specifications while mounted in the distributor, remove the condenser and retest it. The same procedure is followed as above. If the condenser tests bad in the distributor, but tests good when removed, there is a short or ground in the distributor primary circuit. Inspect the insulation of the distributor primary terminal and the internal circuit of the distributor.

2 SECONDARY CIRCUIT TESTS

PRELIMINARY CHECKS

1. Remove the coil to distributor high tension lead and the spark plug wires from the distributor cap and from the spark plugs. Inspect the terminals for looseness and corrosion. Inspect the wires for breaks and cracked insulation. Replace all defective wiring.

2. Clean the inside of the distributor cap and inspect it for cracks, burned contacts, or permanent carbon tracks (Fig. 35). Carbon tracks are caused by a combination of heat and moisture. If carbon tracks exist, in all probability the cap is cracked. Oil inside a cap is an indication of

FIG. 35—Carbon Tracks

a worn shaft bushing which allows oil fumes to enter the cap. If the cap is defective, replace it. Otherwise, remove the dirt and corrosion from the sockets. Check the rubbing contact for wear, cracks, or chips.

3. Inspect the rotor for cracks or a burned tip. If the rotor is defective, replace it.

FIRING VOLTAGE

1. Connect the Tester.

2. Remove the jumper from the distributor to ground.

3. Insert the coil high tension lead into the Scope pickup.

4. Adjust the engine speed to 1200 rpm.

5. Turn the Scope DISPLAY SELECTOR to the ALL CYLINDERS position, and adjust the PATTERN LENGTH control until all of the cylinders appear between the vertical lines on the screen.

6. Rotate the PATTERN SHIFT control counterclockwise until the last pattern on the screen appears complete.

7. Observe the height of each firing line, on the scope, and compare for uniformity and height (Fig. 33).

If the firing voltages are uniform, but high, check for worn spark plugs, late ignition timing, lean fuel mixture, too large a rotor gap, or a break in the coil wire.

If the firing voltages are uneven, check for worn spark plugs, uneven compression, breaks in spark plug wires, or a cocked or worn distributor cap.

CONDITION	IDENTIFICATION	CAUSED BY
 OIL FOULING	Wet, sludgy deposits.	Excessive oil entering combustion chamber through worn rings and pistons, excessive clearance between valve guides and stems, or worn or loose bearings.
 GAS FOULING	Dry, black, fluffy deposits.	Incomplete combustion caused by too rich a fuel-air mixture or by a defective coil, breaker points or ignition cable.
 BURNED OR OVERHEATING	White, burned, or blistered insulator nose and eroded electrodes.	Inefficient engine cooling, or engine overheating caused by improper ignition timing, wrong type of fuel, loose spark plugs, or too hot a plug, low fuel pump pressure.
 NORMAL CONDITIONS	Rusty brown to grayish-tan powder deposit and minor electrode erosion.	Regular or unleaded gasoline.
 NORMAL CONDITIONS	White, powdery deposits.	Highly leaded gasolines.
 CARBON FOULING	Hard, baked on black carbon.	Too cold a plug. Weak ignition, defective fuel pump, dirty air cleaner, too rich a fuel mixture.
 SILICONE DEPOSIT	Hard and scratchy	Formed when fine sand particles combine with anti-knock compounds in the fuel. Most common industry areas. The plugs cannot be cleaned.
 SPLASHED FOULING		Deposits, accumulated after a long period of misfiring, suddenly loosened when normal combustion chamber deposits are restored after new plugs are installed. During a high speed run these deposits are thrown into the plug. B1005-D

FIG. 36—Spark Plug Inspection

AVAILABLE VOLTAGE

1. Make the same connections and adjustments as for the firing voltage test above.

2. Disconnect a spark plug wire with a pair of insulated pliers.

3. Hold the wire away from a ground and notice the upward extent of the pattern on the scope.

If the available voltage is less than 20KV, check for excessive resistance in the primary circuit, low primary input voltage, defective coil, dwell less than specified, or defective secondary insulation.

SECONDARY INSULATION

1. Continue with the same connections and adjustments as in the last two tests.

2. Observe the downward extent of the pattern of the spark plug with the wire removed.

3. Connect the spark plug wire.

4. Perform this test on all of the cylinders (trigger cylinder may be tested in the SCOPE CHECK position).

If the lower extent is not at least half the size of the upper extent, check for insulation leakage in the coil, coil tower, rotor, coil wire, distributor cap, or spark plug wire.

SECONDARY RESISTANCE

1. The connections and adjustments for this test are the same as for the last three tests, except for the Scope DISPLAY SELECTOR switch which is now placed in the ALL CYLINDERS position.

2. Observe and compare the spark line (Fig. 33) of the patterns for length, height, angle and oscillations.

If all cylinders are affected, check for high resistance in the coil tower, coil wire, rotor, or distributor cap tower; also check for an accumulation of deposits on the spark plugs, or poor contact between the rotor and distributor cap.

If one or more cylinders are affected, check for high resistance in the distributor cap tower, spark plug wires, spark plugs.

SPARK PLUGS

INSPECTION

Examine the firing ends of the spark plugs, noting the type of deposits and the degree of electrode erosion. Refer to Fig. 36 for the various types of spark plug fouling and their causes.

TESTING

To test the spark plugs on the car, connect the motor tester in the same manner as for the firing voltage test.

1. Turn the DISPLAY SELECTOR switch to the ALL CYLINDERS position; rotate the pattern shift control in the full clockwise position.

2. Momentarily accelerate the engine to about 2,000 rpm and return to 1,200 rpm.

3. Observe the rise of the firing lines during the momentary engine acceleration.

If one or more of the firing lines is higher than the others, check for wide plug gap, open spark plug resistor wire, or badly deteriorated electrodes.

If one or more of the firing lines is lower than the others, check for spark plug fouling, flashover, or cracked insulators.

To test the plugs off the engine, set the gap to specifications, and install the plug in a testing machine. Compare the efficiency with a new plug. Replace the plug if it fails to meet requirements.

Test the spark plugs for compression leakage at the insulator seal. Apply a coating of oil to the shoulder of the plug where the insulator projects through the shell, and to the top of the plug, where the center electrode and terminal project from the insulator. Place the spark plug under pressure. Leakage is indicated by air bubbling through the oil. If the test indicates compression leakage, replace the spark plug. If the plug is satisfactory, wipe it clean.

IGNITION TIMING FAULTS

Incorrect ignition timing can be caused by:

1. Timing incorrectly adjusted.

2. Distributor bushing and/or shaft worn, or a bent distributor shaft.

3. Defective vacuum advance system.

4. Improper breaker point gap.

5. Pre-ignition (caused by spark plugs of the wrong heat range), or fouled or improperly adjusted spark plugs.

3 DISTRIBUTOR TESTS

CENTRIFUGAL ADVANCE

This test is performed on the Distributor Tester as follows:

1. Plug the tester power cord in.

2. Mount the distributor in the Distributor Tester and attach the test lead to the primary terminal of the distributor. **Do not disconnect the condenser.**

3. Turn the TEST SELECTOR switch to the SYNCRO position.

4. Operate the distributor as slow as possible, and move the protractor scale so that one of the flashes is at zero degrees.

5. Increase the speed to correspond with the lowest speed shown in the specifications. Note the number of degrees the neon flash has moved from the zero degrees mark, and compare with specifications. Check the advance degrees at all the speeds shown in the specifications.

If the centrifugal advance does not conform with the specifications to within plus or minus one degree, unless otherwise stated, it may be due to the following:

1. Improper weight spring tension.

2. Faulty or dirty advance weight mechanism.

3. Excessive end play of distributor shaft.

If the flashes are uneven or intermittent, check for excessive cam wear, worn bearings, weak breaker arm spring tension or bent distributor shaft.

VACUUM ADVANCE

1. Follow the first three steps of the centrifugal advance test.

2. Attach the vacuum advance fitting to the vacuum unit and attach a vacuum hose between the distributor vacuum control and the vacuum outlet located at the upper right corner of the front panel. Check the zero setting of the vacuum gauge and, if necessary, adjust the small knob at the lower edge of the dial rim, so that the vacuum gauge hand rests at zero.

3. Turn the vacuum supply switch to the ON position.

4. Adjust the vacuum control knob until the vacuum gauge registers the amount indicated in the specifications.

5. Operate the distributor at the speeds indicated in the specifications and check the degrees of advance with those in the specifications. If the readings obtained differ from those in the specifications by more than one degree, unless otherwise specified, the vacuum control should be adjusted or replaced.

6. Turn the test selector switch to the cam angle position.

7. Operate the distributor at approximately 2500 engine rpm.

8. Vary the vacuum from zero to the maximum listed in the specifications and back to zero again. While doing this, watch the cam angle meter for any change in the reading. A change of greater than 2 degrees may be caused by the following: worn breaker plate, worn breaker plate bearings, worn bearing race in the distributor housing or worn bushings in the distributor housing.

DISTRIBUTOR RESISTANCE

1. Remove the jumper lead from the distributor to ground.

2. With the ignition switch on, the dwell meter should read in the black bar at the right end of the scale.

If the dwell meter is not within the black bar, there is high resistance at internal or external distributor connections, contact points, or distributor mounting.

To locate the excessive resistance, trace the primary circuit by moving the tester lead step by step through the distributor toward the ground lead.

All resistance must be eliminated before proceeding with any other tests.

CAM LOBE ACCURACY

Worn cam lobes will cause the corresponding cylinders to fire out of time, result in a loss of power, and cause overheating of the spark plugs.

Install the distributor on the Distributor Tester and check the accuracy of the cam lobes as outlined below. If the test indicates that any lobe is worn, replace the cam.

To check for a worn cam, proceed as follows:

1. Turn the TEST SELECTOR knob to the SYNCRO position and check to make sure that the drive chuck is securely tightened on the distributor shaft.

2. Turn the MOTOR CONTROL switch to the LEFT for V-8 engines and to the RIGHT for 6-cylinder engines.

3. Operate the distributor at approximately 2500 engine rpm.

4. Move the protractor scale with the adjustment control so that the zero degree mark on the scale is opposite one of the neon flashes. The balance of the flashes should come within 1 degree around the scale.

A larger variation could also be caused by a worn distributor shaft or a bent distributor shaft.

DIAPHRAGM LEAKAGE AND FREENESS OF OPERATION

These tests can be made with the distributor installed on the engine. If there are indications that the spark advance is not functioning properly, remove the distributor from the engine and check it on the Distributor Tester following the instructions under "Spark Advance" (Part 2).

Check the vacuum advance mechanism for freeness of operation by manually rotating the breaker plate in the direction of normal rotation. **Do not rotate the plate by pushing on the condenser or the breaker points. Use a hook or other suitable instrument to rotate the plate.** The breaker plate should turn without binding and return to its original position when released. If the breaker plate binds, remove the plate. Clean, inspect and lubricate it as recommended for the particular distributor.

To check the diaphragm for leakage:

1. Adjust the vacuum gauge to 25 inches Hg. following the instructions of the test set manufacturer.

2. Install the vacuum hose on the diaphragm vacuum line fitting. The vacuum gauge reading should not fall off when the vacuum is applied to the diaphragm assembly, if no leak exists. If a leak is indicated by the test, replace the diaphragm assembly.

BREAKER PLATE WEAR TEST—LOADOMATIC AND DUAL ADVANCE DISTRIBUTORS

A worn breaker plate will cause the breaker point gap and contact dwell to change as engine speed and load conditions are varied. Perform the dwell check (Part 2).

LOADOMATIC DISTRIBUTOR

There should not be over 3° variation in dwell between engine idle speed and 2500 rpm. If the contact dwell changes more than 3°, the plate bushing (upper bushing) should be replaced.

DUAL ADVANCE DISTRIBUTOR

Adjust the Distributor Tester to 0° advance, 0-inches vacuum, and 1000 rpm. Adjust the dwell angle to 26°. Apply vacuum to the distributor diaphragm and increase it very slowly while observing the indicated dwell angle. The maximum dwell angle variation should not exceed 6° when going from zero to maximum vacuum at constant rpm. If the dweel angle variation exceeds this limit, there is excessive wear at the stationary sub-plate pin, or the diaphragm rod is bent or distorted.

DISTRIBUTOR GEAR BACKLASH—LOADOMATIC DISTRIBUTOR

The dual advance or centrifugal advance distributor backlash can not be accurately checked on the car or on the Distributor Tester.

1. Mount a dial indicator on the distributor so that the indicator point rests on the rotor, 5/8 inch from the center.

2. Turn the rotor as far as it will go and set the dial indicator on zero.

3. Turn the rotor in the opposite direction and note the reading on the dial indicator. This is the backlash, which should be within specifications. If it is not within specifications, it indicates incorrect number of teeth on the distributor or camshaft gear, or excessively worn gears.

DISTRIBUTOR SHAFT END PLAY

If the shaft end play is not to specifications, check the location of the gear on the shaft (Loadomatic distributor), or the distributor shaft collar (dual advance or centrifugal advance distributor).

LOADOMATIC DISTRIBUTOR

The shaft end play can be checked with the distributor installed on the engine.

1. Mount a dial indicator on the distributor so that the indicator tip rests on the top of the distributor shaft.

2. Push the shaft down as far as it will go and set the dial indicator on zero.

3. Pull the distributor shaft upward as far as it will go and read the end play. The end play should be within specifications with the distributor removed or installed.

DUAL ADVANCE AND CENTRIFUGAL ADVANCE DISTRIBUTOR

1. Remove the distributor from the engine.

2. Place the distributor in the holding tool and clamp it in a vise.

3. Push the distributor shaft upward as far as it will go, then check the end play with a feeler gauge placed between the collar and the distributor base. The end play should be within specifications.

4 GOVERNOR TESTS

IDENTIFICATION

Two types of governors are used in the 100-800 Series trucks. A velocity governor is used as optional equipment on the 223 Six and on the 292 MD V-8 engines. A vacuum governor is used on all HD V-8 engines. A mechanical flyweight type of governor is used in the 850-1100 Series trucks.

VELOCITY GOVERNOR

The velocity governor (Fig. 37) is calibrated and adjusted at the factory. There are no provisions made for remedying malfunctions of this governor in service except to increase or decrease the governed speed (see Part 4). If the governor does not operate satisfactorily, replace the unit.

VACUUM GOVERNOR

To determine whether the governor is at fault when loss of power and performance are encountered, make the following test:

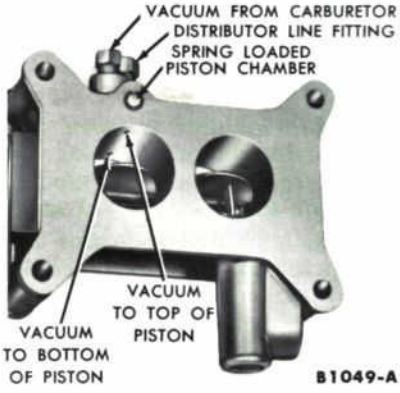

FIG. 37—Velocity Governor

1. Disconnect the governor vacuum line at the carburetor.

2. Operate the engine under load to determine if the engine reaches governed rpm. **Disconnecting the governor line makes the governor control inoperative. Do not exceed recommended governed engine rpm.**

3. If the engine performs satisfactorily, the trouble is in the governor control. If the engine does not operate satisfactorily, the trouble is not in the governor system. Connect the governor vacuum line.

If the trouble is in the governor, it can be isolated to the controlling unit, vacuum lines, or the throttle actuating unit as follows:

Disconnect the governor vacuum line at the distributor (Fig. 38). Operate the engine at governed speed. **Disconnecting the governor line makes the governor control inoperative. Do not exceed recommended governed engine speed.**

Place a finger over the end of the line, if there is no change in engine speed, the trouble is in the throttle actuating unit on the carburetor. If the engine speed changes, the trouble is in the controlling unit on the distributor.

LOSS OF SPEED CONTROL

Check for vacuum leaks, operation of the governor valve in the distributor with the distributor installed in the Distributor Tester.

ERRATIC OPERATION UNDER LOAD

Check for binding of the throttle shaft and throttle lever.

NO GOVERNING ACTION

Check for vacuum leak in the controlling unit, throttle actuating unit, or in the fittings or lines.

Check to determine that the governor valve in the controlling unit is not stuck.

Check to be sure that the carburetor passages are unobstructed.

OVER-GOVERNING

Check to be sure that the passages in the carburetor and/or distributor are unobstructed.

Check for improper governor adjustment.

Check to determine that the governor spring pin in the throttle actuating unit is installed in the correct hole.

MECHANICAL FLYWEIGHT TYPE GOVERNOR

If under certain conditions of loading, the engine will not approach the no load governed engine speed within 200-300 rpm, the load limitation of the engine has been exceeded, or the governor throttles the engine too soon. To determine which of these two conditions is at fault, make the following test:

1. Check the accelerator linkage to be sure that wide open throttle position is achieved when the accelerator pedal is depressed to the floor. Be sure that the accelerator

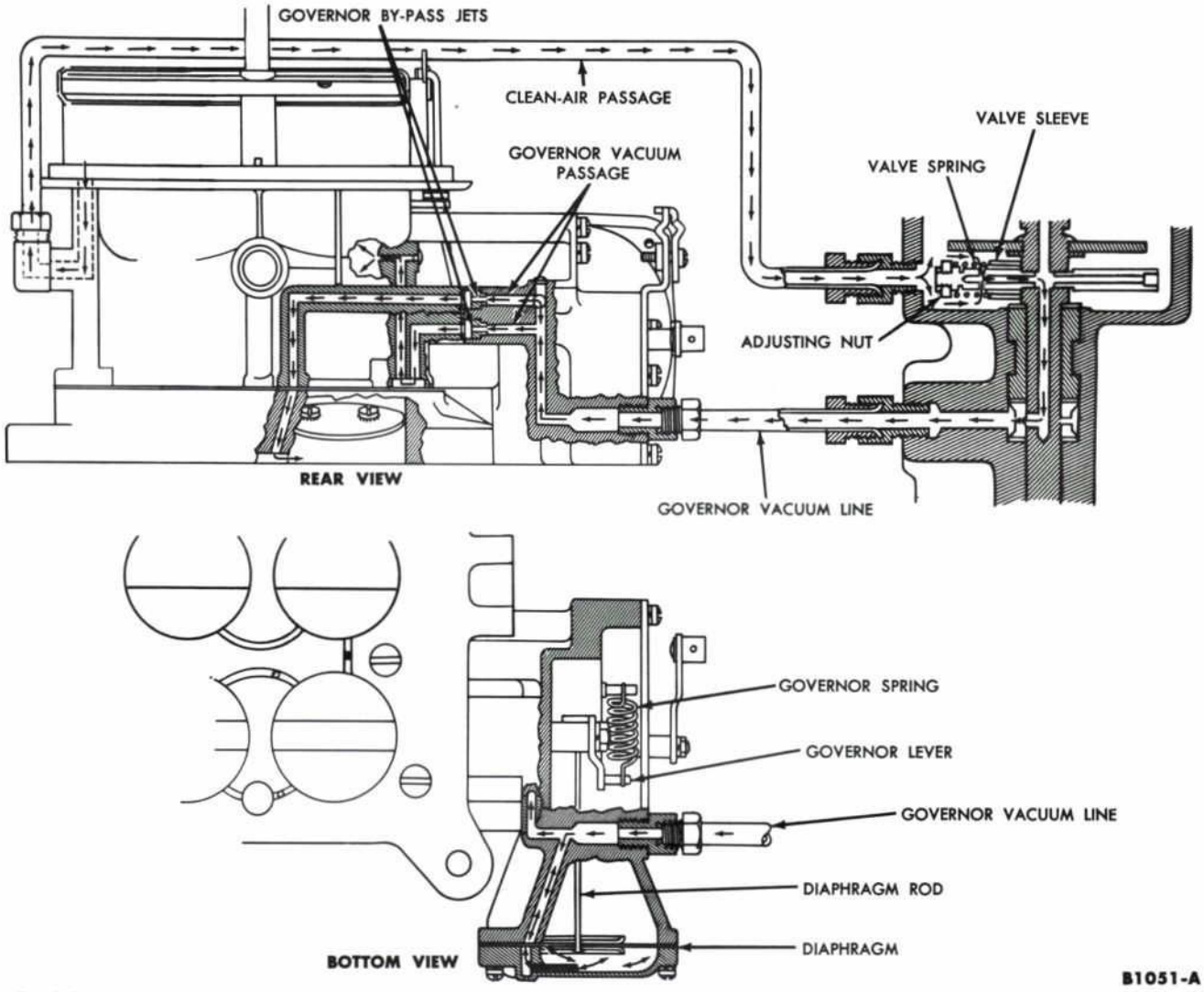

FIG. 38— Vacuum Governor System

rod or cable is attached to the proper hole in the throttle lever.

2. Check the operation in the choke plate from the full open to the full closed position for proper adjustment and freedom of operation. **On a C- or H-Series truck, the choke plate will not close completely when the choke knob is pulled all the way out.**

If there is any bind in the choke cable on a C- or H-Series truck, examine the cable for sharp or reverse bends. **Be sure the end of the cable is bent downward to prevent interference with the bottom of the air cleaner, thereby restricting opening of the choke plate.**

3. Install an intake manifold vacuum gauge with a sufficiently long hose so that the gauge can be observed in the cab during operation.

4. Test drive the truck under identical load conditions and road speeds which existed during the loss of power.

5. Accelerate the engine up to governed speed each time through all the gears until maximum road speed is achieved in high gear. Each time the engine is accelerated up to governed speed, the intake manifold vacuum rises as the governor starts to control engine speed, even though the accelerator pedal is completely depressed.

6. When maximum road speed has been reached, the manifold vacuum, with the accelerator pedal still depressed to the floor, will be very low (1-3 inches Hg) unless the governor has started to control engine speed.

If the manifold vacuum remains very low (1-3 inches Hg) when maximum speed is obtained, the load limit of the engine has been exceeded.

If the governor has started to control the engine speed, the manifold vacuum will be higher (5.0-15.0 inches Hg), depending upon how much the governor has closed the throttle plates.

If the manifold vacuum rises and engine rpm has not approached the no load governed speed (within 300 rpm), increase the sensitivity of the governor as follows:

If the governor spring is attached to the outer hole in the governor lever (longest moment arm) the sensitivity of the governor can be increased by installing the spring in the inner hole.

If the governor spring is already installed in the inner hole, install a new governor spring.

5 GOVERNOR ADJUSTMENTS

VELOCITY GOVERNOR

Connect a tachometer to the engine. With the engine at normal operating temperature, operate the engine at wide open throttle and compare the rpm with the operating range of the governor. The operating range is stamped on the governor plate.

If governed speed is within range, stop the engine and remove the tachometer.

If adjustment is required, remove the governor seal. To increase the rpm, turn the cap counterclockwise. To decrease the rpm, turn the cap clockwise. When adjustment is complete, stop the engine, seal the cap, and remove the tachometer.

VACUUM GOVERNOR

1. Connect a tachometer to the engine. With the engine at normal operating temperature, operate the engine at wide open throttle and note the engine rpm registered on the tachometer.

2. Stop the engine and remove the adjusting hole plug from the controlling unit housing (Fig. 39).

3. With the ignition switch off, crank the engine until the governor adjusting nut is aligned with the adjustment hole. Turn the adjusting nut clockwise to increase governed speed and counterclockwise to decrease governed speed. One full turn of the adjusting nut will change top speed about 150 rpm.

4. Repeat the above procedure until the proper top speed is obtained. Install the adjusting hole plug and tighten it securely. Attach a new locking wire and lead seal to the adjusting hole plug and the adjacent fin. Remove the tachometer.

MECHANICAL FLYWEIGHT TYPE GOVERNOR

1. Disconnect the throttle control rod at the carburetor (Fig. 40).

2. Loosen the top nut on the primary spring adjusting eye bolt.

3. Tighten the bottom nut finger tight, then turn it two additional turns to preload the spring. Tighten the top nut.

4. Move the throttle to the wide open position and connect the governor throttle rod to the carburetor control arm.

5. Adjust the governor throttle control rod so that the governor throttle control auxiliary lever is full forward. This is the wide open throttle position. Next, shorten the rod one full turn. This will position the throttle plates slightly off wide open position and will avoid compression of the control rod linkage.

6. Check the accelerator linkage to be sure that wide open throttle position is achieved when the accelerator pedal is depressed to the floor. Be sure that the accelerator rod or cable is attached to the proper hole in the throttle lever.

7. Check the operation of the choke plate from the full open to the full closed position for proper adjustment and freedom of operation. **On a C- or H-Series truck, the choke plate will not close completely when the choke knob is pulled all the way out.**

If there is any bind in the choke cable on a C- or H-Series truck, examine the cable for sharp or reverse bends. **Be sure the end of the cable is bent downward to prevent interference with the bottom of the air cleaner, thereby restricting opening of the choke plate.**

8. To adjust the speed, operate the engine (with the parking brake applied) until normal operating temperature has been reached. Depress the throttle to the full wide open position and adjust the speed by increasing the tension of the governor main spring to increase the rpm, and by decreasing the tension to decrease the rpm.

Sensitivity of the governor can be sharpened by installing the governor spring in the hole closest to the governor lever arm pivot. Adjust the governed speed after changing the spring position.

FIG. 39—Governor Adjustment Access

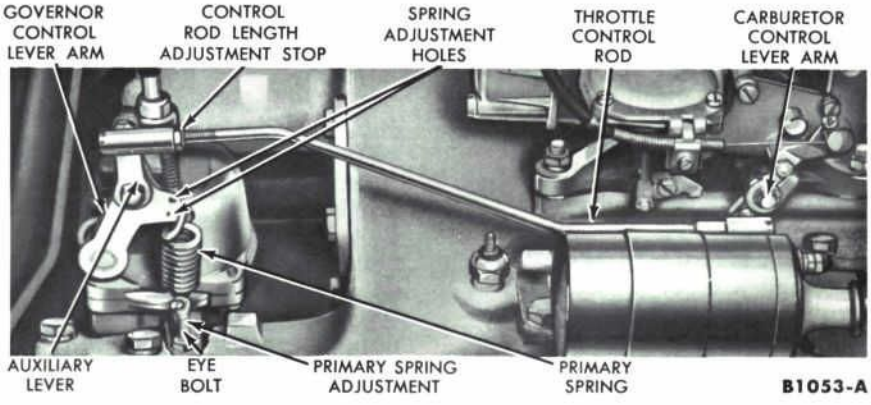

FIG. 40—Mechanical Governor Adjustments

PART 5

SPECIFICATIONS

GENERAL DISTRIBUTOR SPECIFICATIONS

Passenger Cars

Engine and Transmission	Initial Advance Crankshaft Degrees* (btc)	Breaker Arm Spring Tension (ounces)	Contact Spacing	Dwell at Idle Speed	Engine Idle Speed (rpm)
144 SIX—Manual-Shift —Automatic	4° 10°	17-20	0.024-0.026	35°-38°	500-550† 475-525†
170 SIX—Manual-Shift —Automatic	4° 10°	17-20	0.024-0.026	35°-38°	500-550† 475-525†
223 SIX—Manual-Shift —Automatic	6° 12°	17-20	0.024-0.026	35°-38°	500-525 450-475
221 V-8—Manual-Shift —Automatic	6° 6°	12-20	0.014-0.016	26°-28½°	500-525 475-500
292 V-8—Manual-Shift —Automatic	5° 12°	17-20	0.014-0.016	26°-28½°	500-525 450-475
352 V-8—Manual-Shift —Automatic	5° 8°	17-20	0.014-0.016	26°-28½°	500-525 450-475
390 V-8—Manual-Shift —Automatic	5° 8°	17-20	0.014-0.016	26°-28½°	500-525 475-500
390 V-8 P.I.—Manual-Shift —Automatic	12° 12°	17-20	0.014-0.016	26°-28½°	575-600 550-575
390 V-8 T-Bird—Automatic	8°	17-20	0.014-0.016	26°-28½°	475-500
390 and 406 V-8 H.P.—Manual-Shift	14°	27-32	0.019-0.021	NOT APPLICABLE	675-700

*In order to obtain optimum engine performance and fuel economy, it is permissible to advance the initial ignition timing a maximum of 5° in excess of normal or factory setting. See page 9, Part 2

†These idle speeds are for engines without positive crankcase ventilation, for vehicles with the positive crankcase ventilation, add 50 rpm to each of the figures.

Trucks

Engine and Transmission	Initial Advance Crankshaft Degrees* (btc)	Breaker Arm Spring Tension (ounces)	Contact Spacing New Points Only	Dwell at Idle Speed	Engine Idle Speed (rpm)
144 and 170 SIX—Manual-Shift	4°	17-20	0.024-0.026	35°-38°	550-575
223 SIX—Manual-Shift —Automatic	6° 6°	17-20	0.024-0.026	35°-38°	500-550 475-525
262 SIX—Manual-Shift	2°	17-20	0.024-0.026	35°-38°	500-550

*In order to obtain optimum engine performance and fuel economy, it is permissible to advance the initial timing a maximum of 5° in excess of normal or factory setting. See page 9, Part 2

Trucks (Continued)

Engine and Transmission	Initial Advance Crankshaft Degrees* (btc)	Breaker Arm Spring Tension (ounces)	Contact Spacing New Points Only	Dwell at Idle Speed	Engine Idle Speed (rpm)
292 V-8 MD & HD—Manual-Shift —Automatic	8° 8°	17-20	0.014-0.016	26°-28½°	550-500 475-525
302 V-8 HD—Manual-Shift —Automatic	8° 8°	17-20	0.014-0.016	26°-28½°	525-575 475-525
332 V-8 HD—Manual-Shift —Automatic	8° 8°	17-20	0.014-0.016	26°-28½°	525-575 475-525
401 V-8 SD	10°				500-550
477 V-8 SD	Allowable Range	17-20	0.014-0.016	26°-28½°	500-550
534 V-8 SD	2°-15°				500-550

*In order to obtain optimum engine performance and fuel economy, it is permissible to advance the initial timing a maximum of 5° in excess of normal or factory setting. See page 9, Part 2

DISTRIBUTOR ADVANCE CHARACTERISTICS

144 Six Distributor (C2DF-12127-E)

Manual-Shift Transmission

Set test stand to 0° @ 300 rpm and 0 inches of Mercury

Distributor (rpm)	Vacuum (Inches of Mercury)	Advance (Degrees)	Adjustment
400	0.33	0	Adjust Primary Spring
600	0.78	½-1½	" " "
800	1.30	3½-4½	" " "
1400	3.45	10-12	" " "
1800	5.00	12½-15	" " "
2000	5.35	12¾-15½	Adjust Secondary Spring
Maximum Advance Limit @ 2500	10.00	16½°	

144 Six Distributor (C0DF-12127-B)

Automatic Transmission

Set test stand to 0° @ 600 rpm and 0 inches of Mercury

Distributor (rpm)	Vacuum (Inches of Mercury)	Advance (Degrees)	Adjustment
700	0.65	0	Adjust Primary Spring
1000	1.27	1½-2½	" " "
1600	2.93	4¾-5¾	" " "
2000	3.94	5¾-7	Adjust Secondary Spring
Maximum Advance Limit			15¾°

170 Six Distributor (C1DF-12127-B)

Manual-Shift Transmission

Set test stand to 0° @ 450 rpm and 0 inches of Mercury

Distributor (rpm)	Vacuum (Inches of Mercury)	Advance (Degrees)	Adjustment
700	0.43	1½-2½	Adjust Primary Spring
1000	0.92	5¼-6¼	" " "
1300	1.50	7½-8¾	" " "
1700	2.40	10-11¼	" " "
2000	3.00	11-12¼	Adjust Secondary Spring
Maximum Advance Limit @ 2000	10.00	16½°	" " "

170 Six Distributor (C2DF-12127-C)

Automatic Transmission

Set test stand to 0° @ 400 rpm and 0 inches of Mercury

Distributor (rpm)	Vacuum (Inches of Mercury)	Advance (Degrees)	Adjustment
650	0.35	0	Adjust Primary Spring
900	0.76	¾-1¾	" " "
1250	1.40	4-5	" " "
2000	3.00	8½-9¾	Adjust Secondary Spring
Maximum Advance Limit @ 2000	10.00	11¾°	" " "

170 Six Economy Distributor (C2UF-12127-A)

Manual-Shift Transmission

Set test stand to 0° @ 350 rpm and 0 inches of Mercury

Distributor (rpm)	Vacuum (Inches of Mercury)	Advance (Degrees)	Adjustment
500	0.34	0-1	Adjust both springs
800	0.79	4-5	" " "
1400	2.13	9-10	" " "
2000	3.5	11½-13	" " "

221 V-8 Distributor (C20F-12127-A)

Centrifugal Advance

Disconnect the vacuum line—Set test stand to 0° @ 350 rpm

Distributor (rpm)	Vacuum (Inches of Mercury)	Advance (Degrees)	Adjustment
475	0	0	Adjust Primary Spring
575	0	½-1½	" " "
725	0	3¾-4¾	" " "
925	0	6-7	" " "
2000	0	9¾-11¼	" " "

Distributor Advance Characteristics (Continued)

Vacuum Advance

Set test stand to 0° @ 1000 rpm and 0 inches of Mercury

Distributor (rpm)	Vacuum (Inches of Mercury)	Advance (Degrees)
1000	8.0	1-4
1000	12.0	6-9
1000	17.5	9-12

Maximum Advance Limit.....12½° @ 20" Hg.

223 Six Distributor (C1AF-12127-E, C2AF-12127-E)

Manual-Shift Transmission

Set test stand to 0° @ 250 rpm and 0 inches of Mercury

Distributor (rpm)	Vacuum (Inches of Mercury)	Advance (Degrees)	Adjustment
350	0.25	0	Adjust Primary Spring
500	0.48	1-2	" " "
1100	1.93	6-7	" " "
2000	4.80	10¼-11½	Adjust Secondary Spring

223 Six Truck Distributor (Step Stop) (C0AF-12127-A)

Automatic Transmission

Set test stand to 0° @ 400 rpm and 0 inches of Mercury

Distributor (rpm)	Vacuum (Inches of Mercury)	Advance (Degrees)	Adjustment
800	1.08	3½-4½	Adjust Primary Spring
1000	1.70	6¼-7¼	" " "
1200	2.38	7½-8½	Add or remove stop washers
2000	5.63	7½-8½	Add or remove vacuum spring washers
1450	6.50	9-10½	Add or remove vacuum spring washers
Maximum Advance Limit @ 400	10.00	13	Replace contact plate

223 Six Taxicab Distributor (FET-12127-B)

Manual-Shift Transmission

Set test stand to 0° @ 350 rpm and 0 inches of Mercury

Distributor (rpm)	Vacuum (Inches of Mercury)	Advance (Degrees)	Adjustment
450	0.38	0	Adjust Primary Spring
650	0.79	2½-3½	" " "
1100	2.85	6¾-7¾	" " "
1400	4.33	8¾-9¾	" " "
1800	5.99	10¼-11¼	Adjust Secondary Spring

Maximum Advance Limit.....13°

262 Six Truck Distributor (Step Stop) (C1TF-12127-D

Set test stand to 0° @ 250 rpm and 0 inches of Mercury

Distributor (rpm)	Vacuum (Inches of Mercury)	Advance (Degrees)	Adjustment
400	0.42	0-1¼	Adjust Primary Spring
800	1.03	5-6	" " "
1000	1.62	7¾-8¾	" " "
1200	2.32	8½-9½	Add or remove stop washers
2000	5.65	8½-9½	Add or remove vacuum spring washers
1600	7.30	10¾-12¼	Add or remove vacuum spring washers
Maximum Advance Limit @ 1600	10.00	13	Replace contact plate

292 V-8 Passenger Distributor (C0AF-12127-A)

Centrifugal Advance

Disconnect the vacuum line—Set test stand to 0° @ 300 rpm

Distributor (rpm)	Vacuum (Inches of Mercury)	Advance (Degrees)	Adjustment
500	0	0	Adjust Primary Spring
800	0	1¼-2¼	" " "
1300	0	5-6¼	" " "
2000	0	10¼-11¾	" " "

Maximum Advance Limit.....18°

Vacuum Advance

Set test stand to 0° @ 1000 rpm and 0 inches of Mercury

Distributor (rpm)	Vacuum (Inches of Mercury)	Advance (Degrees)
1000	7	0.1
1000	12½	5-8
1000	16	8-11
1000	20	9½-12½

Maximum Advance Limit.....12½°

292 V-8 2V Truck Distributor (C0TF-12127-B)

Centrifugal Advance

Disconnect the vacuum line—Set test stand to 0° @ 300 rpm

Distributor (rpm)	Vacuum (Inches of Mercury)	Advance (Degrees)	Adjustment
550	0	0	Adjust Primary Spring
700	0	¾-1¾	" " "
900	0	3¼-4¼	" " "
1150	0	5½-6½	Adjust Secondary Spring
1600	0	8¼-10	" " "
1800	0	9½-10¾	" " "

Maximum Advance Limit.....10¾°

Distributor Advance Characteristics (Continued)

Vacuum Advance

Set test stand to 0° @ 1000 rpm and 0 inches of Mercury

Distributor (rpm)	Vacuum (Inches of Mercury)	Advance (Degrees)
1000	5	0-1
1000	10	3¾-6¾
1000	13	5½-8½

Maximum Advance Limit.....8½°

292 V-8 4V Truck Distributor (C0TF-12102-C)

Manual-Shift Transmission

Centrifugal Advance with Engine Governor

Governor opens at 1800 rpm, closes at 1900 rpm—Set test stand to 0° @ 250 rpm

Distributor (rpm)	Vacuum (Inches of Mercury)	Advance (Degrees)	Adjustment
400	0	0	Adjust Primary Spring
500	0	½-1½	" " "
900	0	5½-6½	" " "
1250	0	8½-9½	Adjust Secondary Spring
2000	0	10¾-12¼	" " "

Maximum Advance Limit.....18°

302-332 V-8 Truck Distributor (C1TF-12102-A) (C1TF-12102-B)

Manual-Shift Transmission

Centrifugal Advance with Engine Governor

Governor opens at 1800 rpm, closes at 1900 rpm. Disconnect the vacuum line—Set test stand to 0° @ 250 rpm

Distributor (rpm)	Vacuum (Inches of Mercury)	Advance (Degrees)	Adjustment
325	0	0	Adjust Primary Spring
425	0	¾-1¾	" " "
600	0	6-7	" " "
800	0	8-9	Adjust Secondary Spring
2000	0	10¾-12¼	" " "

Vacuum Advance

Set test stand to 0° @ 1000 rpm and 0 inches of Mercury

Distributor (rpm)	Vacuum (Inches of Mercury)	Advance (Degrees)
1000	7.5	1-4¼
1000	11.0	5-7¾
1000	14.0	5½-8½

Maximum Advance Limit.....8½°

302-332 V-8 Truck Distributor (C1TF-12102-A) (C1TF-12102-B)

Automatic Transmission

Centrifugal Advance with Engine Governor

Governor opens at 1900 rpm, closes at 2000 rpm. Disconnect the vacuum line—Set test stand to 0° @ 250 rpm

Distributor (rpm)	Vacuum (Inches of Mercury)	Advance (Degrees)	Adjustment
325	0	0	Adjust Primary Spring
425	0	¾-1¾	" " "
600	0	6-7	" " "
800	0	8-9	Adjust Secondary Spring
2000	0	10¾-12¼	" " "

Vacuum Advance

Set test stand to 0° @ 1000 rpm and 0 inches of Mercury

Distributor (rpm)	Vacuum (Inches of Mercury)	Advance (Degrees)
1000	7.5	1-4¼
1000	11.0	5-7¾
1000	14.0	5½-8½

Maximum Advance Limit.....8½°

352 V-8 Distributor (C0AF-12127-E)

Manual-Shift Transmission

Centrifugal Advance

Disconnect the vacuum line—Set test stand to 0° @ 300 rpm

Distributor (rpm)	Vacuum (Inches of Mercury)	Advance (Degrees)	Adjustment
500	0	0	Adjust both Springs
775	0	1-2	" " "
1250	0	5-6¼	" " "
2000	0	11½-13	" " "

Maximum Advance Limit.....18°

Vacuum Advance

Set test stand to 0° @ 1000 rpm and 0 inches of Mercury

Distributor (rpm)	Vacuum (Inches of Mercury)	Advance (Degrees)
1000	5	0-1
1000	10	5-8
1000	13½	8-11
1000	17	9½-12½

Maximum Advance Limit.....12½°

352 V-8 Distributor (C0AF-12127-D)

Automatic Transmission

Centrifugal Advance

Disconnect the vacuum line—Set test stand to 0° @ 200 rpm

Distributor (rpm)	Vacuum (Inches of Mercury)	Advance (Degrees)	Adjustment
300	0	0	Adjust Both Springs
500	0	¾-1¾	" " "
1100	0	5-6¼	" " "
2000	0	11½-13	" " "

Maximum Advance Limit.....18°

Distributor Advance Characteristics (Continued)

Vacuum Advance

Set test stand to 0° @ 1000 rpm and 0 inches of Mercury

Distributor (rpm)	Vacuum (Inches of Mercury)	Advance (Degrees)
1000	5	0-1
1000	10	5-8
1000	13½	8-11
1000	17	9½-12½

Maximum Advance Limit.....12½°

390 V-8 Distributor (C2AF-12127-A)

Centrifugal Advance

Set test stand to 0° @ 250 rpm and 0 inches of Mercury

Distributor (rpm)	Vacuum (Inches of Mercury)	Advance (Degrees)	Adjustment
325	0	0	Adjust Primary Spring
400	0	½-1¼	" " "
500	0	3½-4½	" " "
600	0	5-6	Adjust Secondary Spring
2000	0	10¾-12¼	" " "

Vacuum Advance

Set test stand to 0° @ 1000 rpm and 0 inches of Mercury

Distributor (rpm)	Vacuum (Inches of Mercury)	Advance (Degrees)
1000	6	0-2½
1000	10	4-7
1000	15	5-½8½

Maximum Advance Limit.....8½° @ 20 Hg.

390 and 406 V-8 Distributor (C0AF-12127-K

Dual Points

Set test stand to 0° @ 250 rpm and 0 inches of Mercury

Distributor (rpm)	Vacuum (Inches of Mercury)	Advance (Degrees)	Adjustment
650	0	2¼-3¾	Adjust Primary Spring
800	0	5-6½	" " "
1125	0	7¾-9	Adjust Secondary Spring
2000	0	11½-13	" " "

Maximum Advance Limit @ 2500 rpm.....14°

390 V-8 P.I. and T-Bird Distributor (C2SF-12127-A)

Centrifugal Advance

Disconnect the vacuum line—Set test stand to 0° @ 250 rpm

Distributor (rpm)	Vacuum (Inches of Mercury)	Advance (Degrees)	Adjustment
325	0	0	Adjust Primary Spring
425	0	1¼-2¼	" " "
550	0	5-6	" " "
700	0	7½-8½	Adjust Secondary Spring
1300	0	9¾-11¼	" " "
2000	0	12¼-14½	" " "

Vacuum Advance

Set test stand to 0° @ 1000 rpm and 0 inches of Mercury

Distributor (rpm)	Vacuum (Inches of Mercury)	Advance (Degrees)
1000	6	0-2½
1000	10	4-7
1000	15	5½-8½

Maximum Advance Limit.....8½°

401, 477, 534 S.D. V-8 Distributor (C0TF-12127-C)

Centrifugal Advance

Disconnect the vacuum line—Set test stand to 0° @ 250 rpm

Distributor (rpm)	Vacuum (Inches of Mercury)	Advance (Degrees)	Adjustment
350	0	0	Adjust Both Springs
500	0	1¼-2¼	" " "
1100	0	10¼-11¾	" " "
1400	0	12¼-14¼	" " "

Maximum Advance Limit @ 2500.....14¼°

Vacuum Advance

Set test stand to 0° @ 1000 rpm and 0 inches of Mercury

Distributor (rpm)	Vacuum (Inches of Mercury)	Advance (Degrees)
1000	5½	0-2½
1000	9	5-7¾
1000	10	5½-8½

Maximum Advance Limit.....8½° @ 20" Hg.

DISTRIBUTOR SHAFT END PLAY CLEARANCE—(INCHES)
All Six-Cylinder Engines.....0.005—0.008
All V-8 Engines.....0.022—0.030

DISTRIBUTOR GEAR BACKLASH
Loadomatic Distributor.....0.003—0.005

CONDENSER

Capacity (Microfarads).....0.21—0.25
Minimum Leakage (Megohms).....5
Maximum Series Resistance (Ohms).....1

COIL

Primary Coil Resistance—Ohms.....1.40—1.54 (75° F.)
Secondary Coil Resistance—Ohms.....8000—8800 (75° F.)
Primary Resistance Wire.....1.30—1.40 (75° F.)
Amperage Draw—Engine Stopped.....4.5
Amperage Draw—Engine Idling.....2.5

GOVERNORS

VACUUM GOVERNOR

Spring Color (Throttle Actuating Mechanism)	
All HD V-8 Engines	Blue
Spring Position (Throttle Actuating Mechanism)	
All HD V-8 Engines	No. 1
Upper By-Pass Jet (Throttle Actuating Mechanism)	
292 HD Engine	26
302 and 332 HD Engines	29
Lower By-Pass Jet (Throttle Actuating Mechanism)	
292 HD Engine	25
302 and 332 HD Engines	59

Governed Speed—Engine rpm

	LOAD	NO LOAD
Conventional Drive Transmission	3400—3800	3600—4000
Automatic Transmission	3800	4000

MECHANICAL GOVERNOR

Spring Color (Governor Spring) Pink*

Governed Speed—Engine rpm

	NO LOAD
401, 477, and 534 Engines	2500—3700

*If governed speeds below 3300 rpm are desired, governor spring color coded Brown must be used.

FIRING ORDER

Trucks	
6 Cylinder Engines	1-5-3-6-2-4
8 Cylinder Engines	1-5-4-8-6-3-7-2
Cars	
144, 170, and 223 Engines	1-5-3-6-2-4
292 Engines	1-5-4-8-6-3-7-2
221, 352, 390, and 406 Engines	1-5-4-2-6-3-7-8

DISTRIBUTOR CAM ROTATION

6 Cylinder Engines	Clockwise
8 Cylinder Engines	Counter Clockwise

SPARK PLUGS

APPLICATION	Type
GALAXIE	
223 Six Without Econ. Carb.	AutoLite BTF-6
223 Six With Econ. Carb.	AutoLite BF-82
292 V-8	AutoLite BF-82
352, 390 V-8 (Including Police Interceptor)	AutoLite BF-42
390, 406 V-8 High Performance	AutoLite BF-32
FAIRLANE	
170 Six	AutoLite BF-82
221 V-8	AutoLite BF-82
260 V-8	AutoLite BF-82
FALCON	
144 Six	AutoLite BF-82
170 Six	AutoLite BF-82
THUNDERBIRD	
390 V-8 With 4-V Carb.	AutoLite BF-42
390 V-8 With 6-V Carb.	AutoLite BF-32
ECONOLINE	
144 Six	AutoLite BF-82
170 Six	AutoLite BF-82
TRUCK	
223 Six Without Econ. Carb.	AutoLite BTF-6
223 Six With Econ. Carb.	AutoLite BF-82
262 Six	AutoLite BTF-31
292 V-8 F-100 and F-250 Series	AutoLite BTF-6
292 V-8 Except F-100 and F-250 Series	AutoLite BTF-31
302, 332, 401, 477, 534 V-8	AutoLite BTF-31

GENERAL

Size	18mm
Gap (In.)	
Truck—144, 170, 223 and 292 MD	0.032—0.036
Truck (All Other Engines)	0.028—0.032
Pass. Cars (All)	0.032—0.036
Torque (Ft. Lbs.—All)	15—20**

**20—30 Ft.-Lbs. When 2 new plugs are installed in a new cyl. head.

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