IGNITION SYSTEM

GROUP 9

PART 9-1 GENERAL IGNITION SYSTEM SERVICE

1 DIAGNOSIS AND TESTING

GENERAL INFORMATION

CONVENTIONAL IGNITION SYSTEM

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

The primary circuit consists of the:

1. Battery.
2. Ignition switch.
3. Primary circuit resistance wire.
4. Primary windings of the ignition coil.
5. Breaker points.
6. 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 in the primary windings of the coil moves through the secondary windings of the coil producing high voltage current. **High voltage current is produced each time the breaker points open.** The high voltage flows through the coil high tension lead to the distributor cap where the rotor distributes it to one of the spark plug terminals in the distributor cap. This process is repeated for every power stroke of the engine.

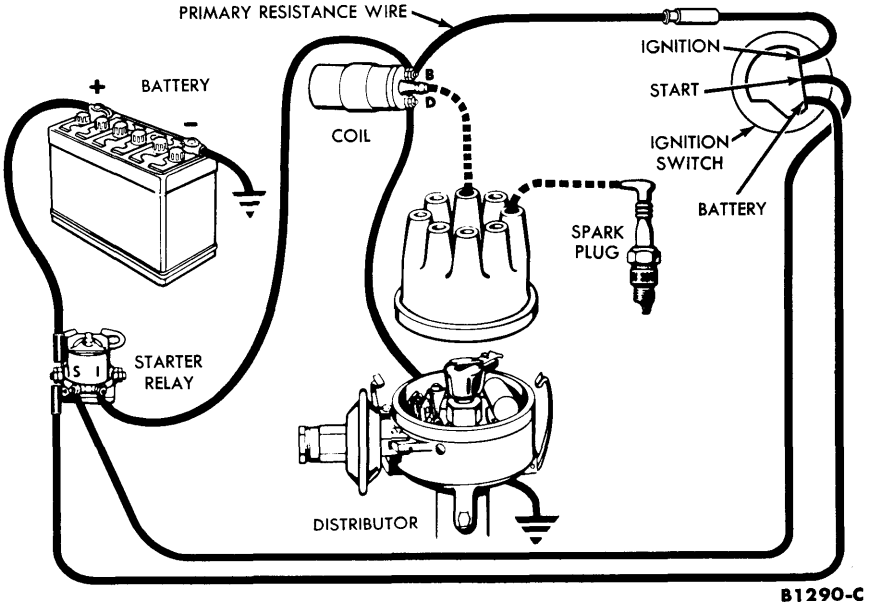


FIG. 1—Typical Conventional Ignition System Circuit

TRANSISTOR IGNITION SYSTEM

The permatuned transistor ignition system is available on the Thunderbird engines. Figure 2 shows a schematic of the transistor ignition system.

The ignition coil primary in the transistor system is designed to draw

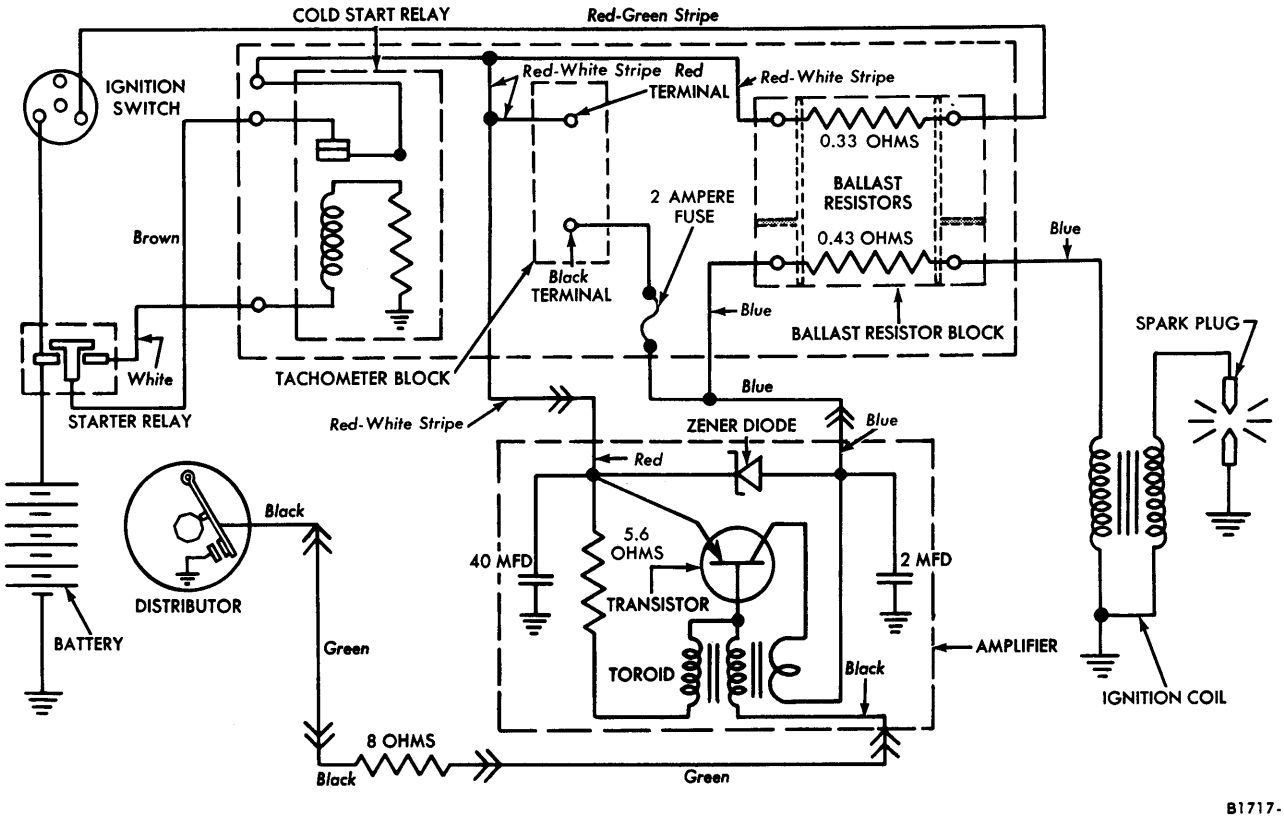


FIG. 2—Typical Transistor Ignition System Schematic

a normal 12 ampere peak current, or approximately 5.5 amperes average current as indicated on an ammeter, in order to provide high spark plug voltage at the higher engine speeds.

The transistor in the system acts as a switch or relay. It is similar in action to a horn relay, except that it has no moving parts, and thus acts with very little time lag. The transistor is connected between the battery and the coil and is used to make and break the coil primary circuit.

The distributor controls the transistor. The 8-ohm resistor, connected between the distributor and the transistor (in the wiring harness), limits the transistor control current (and distributor point current) to 0.5 ampere. The low distributor point current eliminates pitting and gives long distributor point life.

The distributor condenser has been increased in value to 2 mfd. and is located in the amplifier assembly. As in the standard ignition circuit, it absorbs high inductive energy during initial distributor point opening. However, it no longer has any effect on the distributor points as the transistor effectively isolates the points from the coil.

The amplifier assembly (Fig. 3) is mounted under the instrument panel to protect the parts from engine heat.

A ceramic ballast resistor block, a tachometer connector block, and a cold start relay are mounted on a plate in the engine compartment (Fig. 4). A fiber cover encloses the resistor block, tachometer block and cold start relay.

A 2-ampere fuse between the black (large) terminal of the tachometer block and the coil primary circuit prevents the transistor from being damaged by the application of external devices other than normal testing equipment.

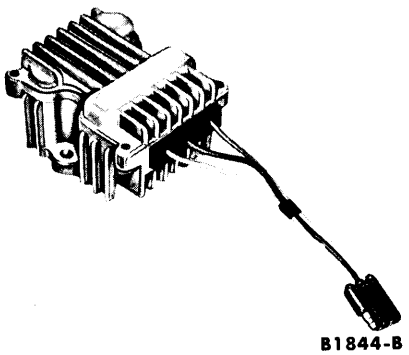


FIG. 3—Amplifier Assembly

The cold start relay contacts are normally closed and they are connected into the circuit only during the start cycle. When the starter relay is closed, the cold start relay is actuated and opens its contacts. If, during starting, the available voltage drops below 10.5 volts, the relay contacts close, thus bypassing the 0.33-ohm resistor in the ballast resistor block and applying full available voltage to the system.

The tachometer block is used to connect a tachometer or other test equipment into the circuit. **Do not connect test equipment into the circuit in any other manner, or readings will be inaccurate and damage may occur to the transistor, or change its operating characteristics.**

Connect the tachometer red lead to the tachometer block red terminal and black lead to the black terminal.

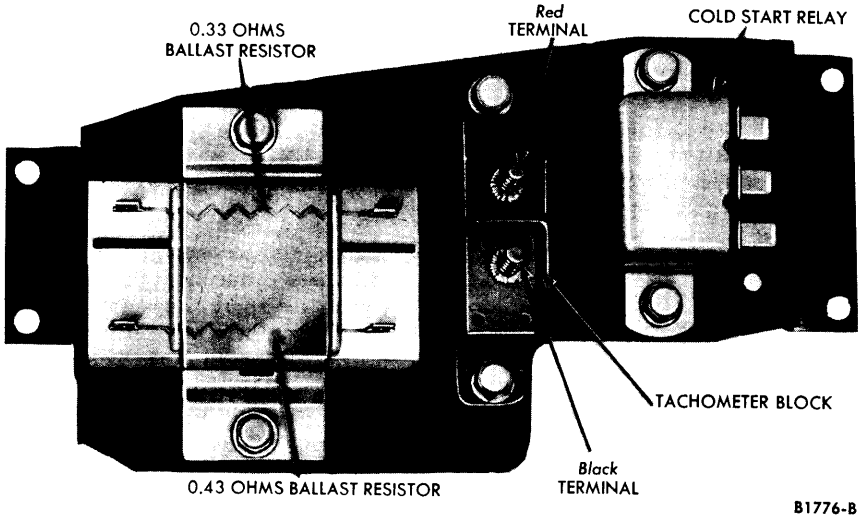


FIG. 4–Ballast Resistors, Tachometer Block and Cold Start Relay With Cover Removed–Typical

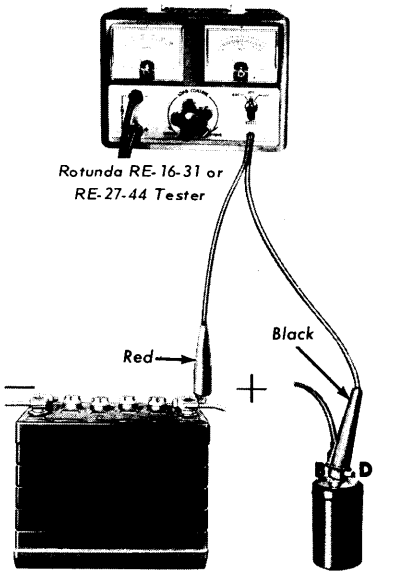


FIG. 5–Battery to Coil Test and Starting Ignition Circuit Test

CONVENTIONAL IGNITION SYSTEM DIAGNOSIS

TROUBLE ISOLATION

Ignition system troubles are caused by a failure in the primary and/or the secondary circuit or incorrect ignition timing. If an engine trouble has been traced to the ignition system from the "Engine Trouble Diagnosis Guide", the trouble can be found by performing an ignition system test on a scope or by further isolating the trouble to the primary or secondary circuit as follows:

1. Disconnect the brown wire from the starter relay "I" terminal and the red and blue wire from the starter relay "S" terminal.
2. Remove the coil high tension lead from the distributor cap.
3. Turn on the ignition switch.
4. While holding the high tension lead approximately 3/16 inch from the cylinder head or any other good ground, crank the engine by using an auxiliary starter switch between the starter relay battery and "S" terminals.

If the spark is good, the trouble lies in the secondary circuit.

If there is no spark or a weak spark, the trouble is in the primary circuit, coil to distributor high tension lead, or the coil.

Primary Circuit. A breakdown or energy loss in the primary circuit can be caused by:

1. Defective primary wiring, or loose or corroded terminals.
2. Burned, shorted, sticking or improperly adjusted breaker points.
3. A defective coil.
4. A defective condenser.

Secondary Circuit. A breakdown or energy loss in the secondary circuit can be caused by:

1. Fouled or improperly adjusted spark plugs.
2. Defective high tension wiring.
3. High tension leakage across the coil, distributor cap or rotor.

PRIMARY CIRCUIT TESTS

A complete test of the primary circuit consists of checking the circuit from the battery to the coil, the circuit from the coil to ground, and the starting ignition circuit.

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

Battery to Coil Test

PROCEDURE

1. Connect the voltmeter leads as shown in Fig. 5.
2. Install a jumper wire from the distributor terminal of the coil to a good ground on the distributor housing.
3. Turn the lights and accessories off.
4. Turn the ignition switch on.

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

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

1. The battery and cables for loose connections or corrosion.
2. The primary wiring for worn insulation, broken strands and loose or corroded terminals.
3. The resistance wire for defects.
4. The relay to ignition switch for defects.

Starting Ignition Circuit Test

PROCEDURE

1. Connect the voltmeter leads as shown in Fig. 5.
2. Disconnect and ground the coil to distributor high tension lead at the distributor.
3. With the ignition switch off, crank the engine by jumping between the battery and the "S" terminal of the starter relay while observing the voltage drop.

RESULTS. 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 the terminals in the circuit or replace the wiring as necessary.

Ignition Switch Test

PROCEDURE

1. Connect the voltmeter leads as shown in Fig. 6.
2. Install a jumper wire from the

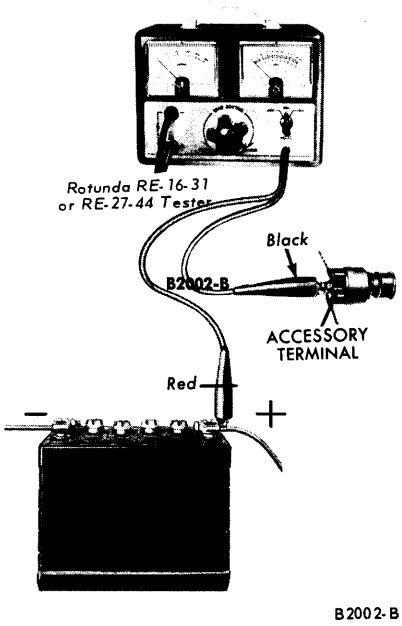


FIG. 6—Ignition Switch Test

distributor terminal of the coil to a good ground on the distributor body.

3. Turn all of the accessories and lights off.

4. Turn the ignition switch on.

RESULTS. 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.

Resistance Wire Test

PROCEDURE

1. Connect the voltmeter leads as shown in Fig. 7.

2. Install a jumper wire from the distributor terminal of the coil to a good ground on the distributor housing.

3. Turn all of the accessories and lights off.

4. Turn the ignition switch on.

RESULTS. 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.

Coil to Ground Test

PROCEDURE

1. Connect the voltmeter leads as shown in Fig. 8.

2. Close the breaker points.

3. Turn all lights and accessories off.

4. Turn the ignition switch on.

RESULTS. 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 movable breaker point and the breaker plate.
3. The breaker plate and the distributor housing.
4. The distributor housing and engine ground.

Breaker Points. The breaker points are tested by following the procedure under "Ignition System Tests."

Coil. The coil is tested by following the instructions under "Ignition System Tests."

Condenser. The condenser is tested by following the instructions under "Ignition System Tests."

SECONDARY CIRCUIT TESTS

The following procedure is used on both ignition systems.

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. Remove dirt or corrosion from the sockets. Replace the cap if it is defective.

3. Inspect the rotor for cracks or defects. Replace the rotor if it is defective.

Secondary (High Tension) Wires. The secondary wires 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 ignition coil.

These wires are the radio resistance-type which filter out the high frequency electrical impulses that are the source of ignition noise interference. The resistance of each wire should not exceed 24,500 ohms. **When checking the resistance of the wires or setting ignition timing, do not puncture the wires with a probe. The probe may cause a separation in the conductor.**

At regular intervals, clean and inspect the wires for cracked insulation and loose terminals. Repair or replace the wires as required. A spark plug wire set is available for service.

When removing the wires from the spark plugs, grasp and twist the moulded cap, then pull the cap off the spark plug. Do not pull on the wire because the wire connection inside the cap may become separated or the insulator seal may be damaged.

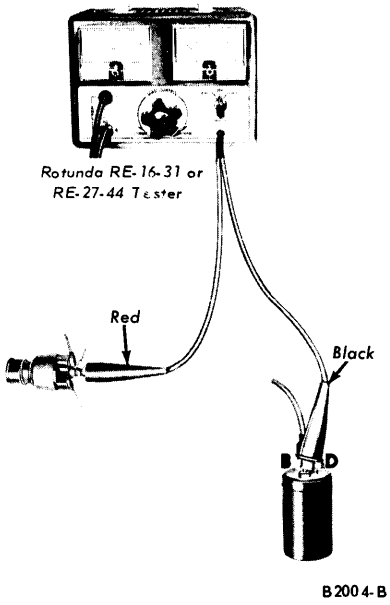


FIG. 7—Resistance Wire Test

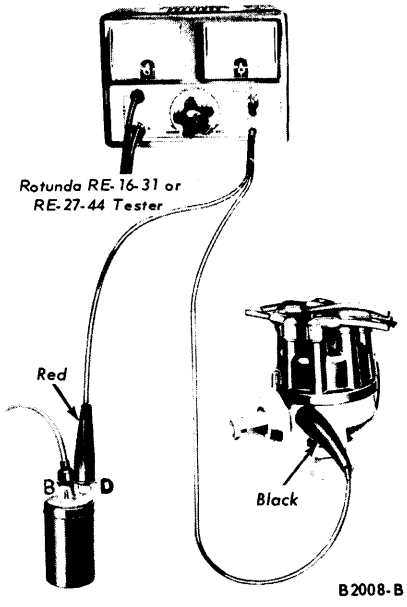


FIG. 8—Coil to Ground Test

SPARK INTENSITY

1. Disconnect a spark plug wire. **Check the spark intensity of one wire at a time.**

2. Install a terminal adapter in the terminal of the wire to be checked. Hold the adapter approximately 3/16-inch from the exhaust manifold and crank the engine, using a remote starter switch. The spark should jump the gap regularly.

3. If the spark intensity of all the wires is satisfactory, the coil, condenser, rotor, distributor cap and the secondary wires are probably satisfactory.

If the spark is good at only some wires, perform a high resistance test of the faulty leads.

If the spark is equal at all wires, but weak or intermittent, make a high resistance check of the coil, distributor cap and the coil to distributor high tension wire.

Spark Plugs. Clean, inspect and gap the plugs following the instructions in Sections 2 and 3. After the proper gap is obtained, check the plugs on a testing machine. Compare the sparking efficiency of the cleaned and gapped plug with a new plug. Replace the plug if it fails to meet 70% of the new plug performance.

Test the 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 with the tester's high tension wire removed from the spark plug. Leakage is indicated by air bubbling through the oil. If the test indicates compression leakage, replace the plug. If the plug is satisfactory, wipe it clean.

Ignition Timing. 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. Defective centrifugal advance.

TRANSISTOR IGNITION SYSTEM DIAGNOSIS

Do not use any other testing procedures or conventional shortcuts than those listed below, or extensive damage can result to the system.

TROUBLE ISOLATION

Ignition troubles are caused by a failure in the primary or secondary circuit, or incorrect ignition timing. Isolate the trouble as follows:

1. Remove the coil high tension lead from the distributor cap.

2. Disconnect the brown wire from the starter relay "I" terminal and the red and blue wire from the starter relay "S" terminal.

3. Turn the ignition switch on.

4. While holding the high tension lead approximately ¼ inch from the cylinder head, crank the engine by using an auxiliary starter switch between the starter relay battery and "S" terminals.

If the spark is good, the trouble lies in the secondary (high voltage) circuit. If there is no spark or a weak spark, the trouble is in the primary (low voltage) circuit.

Primary Circuit. A breakdown or energy loss in the primary circuit can be caused by:

1. Defective primary wiring.

2. Improperly adjusted, contaminated or defective distributor points.

3. Defective amplifier assembly.

The trouble can be isolated by performing a primary circuit test.

Secondary Circuit. A breakdown or energy loss in the secondary circuit can be caused by:

1. Fouled or improperly adjusted spark plugs.

2. Defective high voltage wiring.

3. High voltage leakage across the coil, distributor cap or rotor.

To isolate a trouble in the secondary circuit, proceed as follows:

Turn the ignition switch off and remove the auxiliary starter switch from the starter relay.

Install the coil high tension lead in the distributor cap, the red and blue wire on the starter relay (this goes to the "S" terminal) and the brown wire on the starter relay (this goes on the "I" terminal) and perform a secondary circuit test.

PRIMARY CIRCUIT TESTS

When diagnosis procedures isolate trouble to the primary circuit, make the following tests to locate the defective item. **Do not use any other procedure, conventional short-cut, or connect test equipment in any other manner than that described, or extensive damage can be caused to the transistor ignition system.** Figure 9 shows the transistor ignition system tests in outline form.

Connect a dwell meter to the tachometer block (Fig. 4). Connect the black lead to the black (large) terminal and the red lead to the red (small) terminal. Turn the ignition on and crank the engine. Observe the dwell meter reading.

0° Dwell. A dwell reading of 0° indicates:

1. The distributor points are contaminated or are not closing.

2. An open circuit in the distributor lead to the amplifier.

To determine which item listed is causing the trouble, proceed as follows:

Disconnect the distributor lead at the bullet connector and connect a voltmeter red lead to the red tach block terminal (red - white striped lead) and the voltmeter black lead to the distributor lead from the distributor. **Do not connect the voltmeter to the lead from the amplifier.** Crank the engine and note the voltmeter reading.

If a steady indication of voltage is obtained, the trouble is in the distributor lead to the amplifier. Absence of any voltage indication on the voltmeter shows that there is an open circuit between the distributor lead and the breaker point ground.

0° to 45° Dwell. A dwell reading between 0° and 45° indicates:

1. The transistor and the primary circuit are functioning properly.

2. The trouble could be in the secondary circuit.

45° Dwell. A dwell reading of 45° indicates:

1. No power from the ignition switch.

2. The distributor points are closed and not opening.

3. Defective amplifier assembly.

To determine which of the three items listed are causing the trouble, proceed as follows:

Disconnect the distributor lead at the bullet connector, and crank the engine. If the dwell meter indicates 0° dwell, the distributor points are not opening. If 45° dwell is indicated, the amplifier is malfunctioning or there is no power from the ignition switch.

Use a voltmeter or test light to determine if the transistor (amplifier assembly) is at fault. Connect the voltmeter to the red-green lead

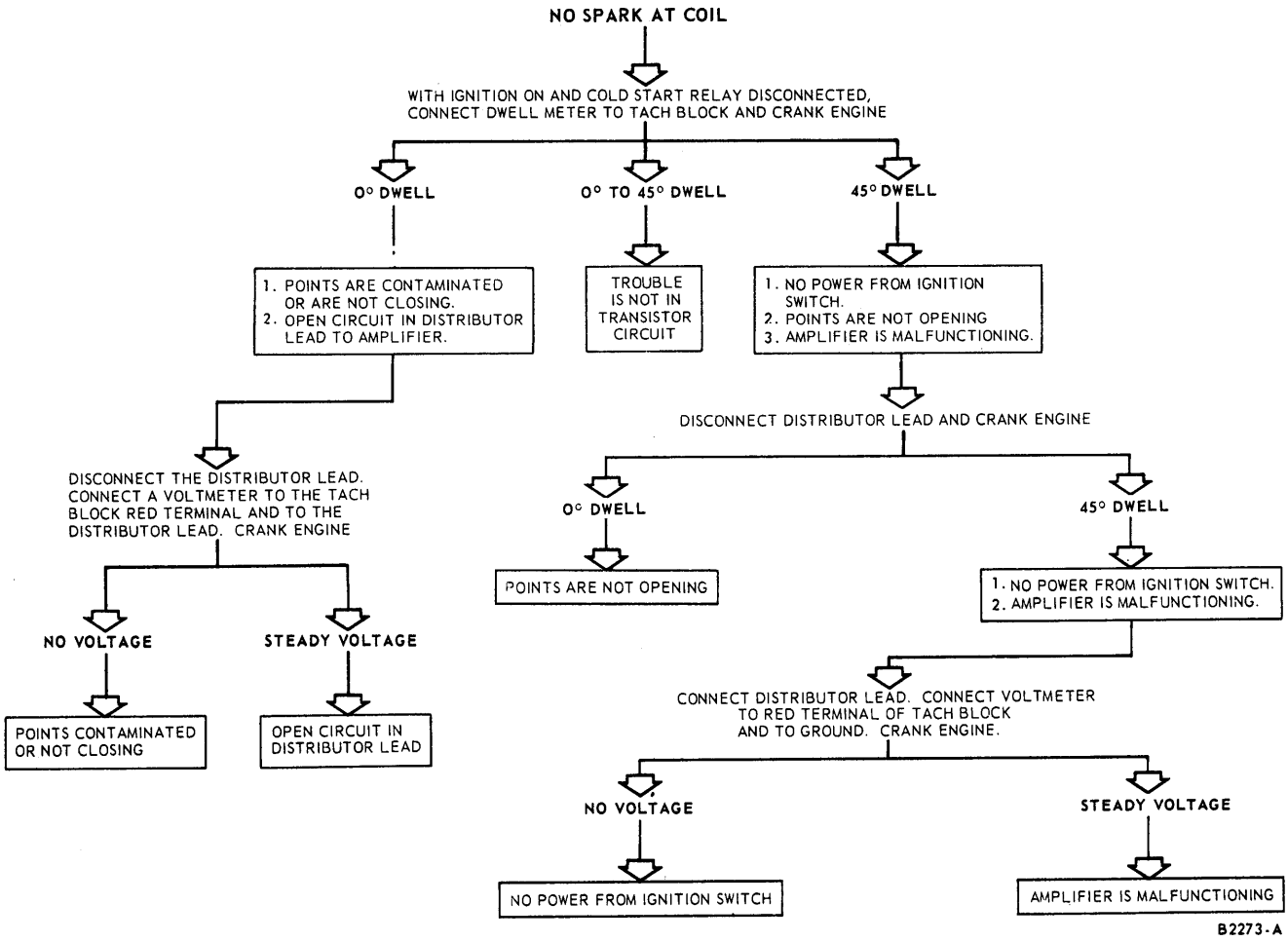


FIG. 9—Transistor Ignition System Test Procedure

terminal of the ballast resistor and to ground. Crank the engine.

If a steady indication of voltage is obtained, the trouble is in the amplifier. Absence of any voltage indication on the voltmeter shows there is an open circuit, or no power between the ignition switch and the amplifier. The ballast resistor could be defective. Replace it with a known good ballast resistor, and repeat the test.

If the test procedure indicates a defective amplifier, replace it with a known good amplifier, and proceed as follows:

Connect the distributor high tension lead at the bullet connector. Then, with the cold start relay disconnected and the dwell meter connected to the tachometer block, crank the engine and observe the indicated dwell. Zero to 45° indicates satisfactory ignition; thus, the amplifier is at fault.

If the dwell reading is still 45°, the wiring from the amplifier through the ballast resistor to the coil is defective. Replace the defective item.

After a repair has been made, run through the test again to check for any other malfunctions.

SECONDARY CIRCUIT TESTS

Refer to the conventional ignition system secondary circuit tests for the proper procedure.

IGNITION SYSTEM TESTS — ROTUNDA TESTERS

TEST CONNECTIONS — RE-27-55, RE-651 AND RE-881

The test connections for the RE-27-55 tester are shown in Fig. 10, the test connections for the RE-651 tester are shown in Fig. 11, and the test connections for the RE-881 tester are shown in Fig. 12.

1. With the tester turned off, plug the power plug into a proper AC outlet.
2. Connect the green lead to the distributor terminal of the coil.

On a car equipped with a transistor ignition, connect this green lead to the terminal on the red side of the tachometer block.

3. Remove the No. 1 plug wire from the distributor cap; place the blue pickup in the cap, and place the plug wire in the pickup.
4. On the RE-27-55 tester, connect the black lead to a good ground. **If the car has a transistor ignition, connect the black lead to the terminal on the black side of the tachometer block.**
5. Clip the red pickup over the coil-to-distributor high tension wire.
6. If the engine timing is to be checked, plug the timing light into its socket.

The following steps pertain to the RE-651 and RE-881 testers only.

7. Disconnect the battery positive cable at the battery.
8. Install the battery adapter to the battery post.
9. Connect the battery positive cable to the battery adapter.

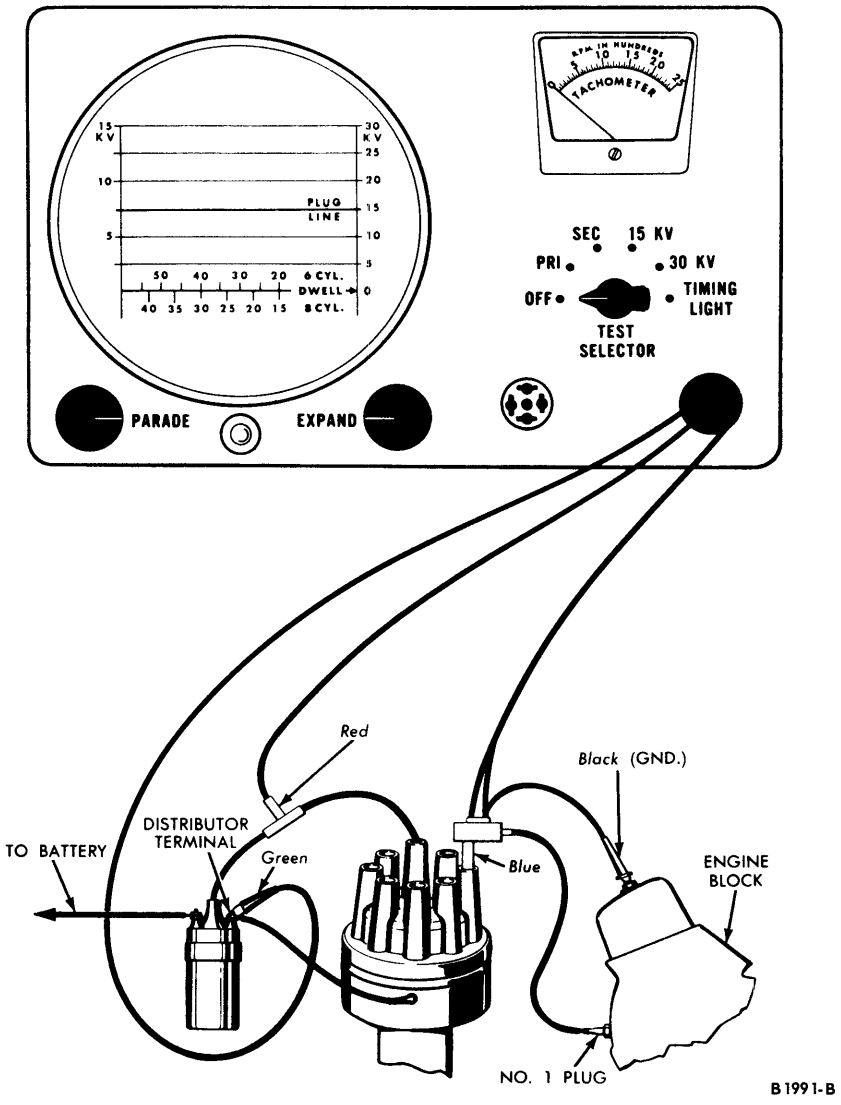


FIG. 10—Rotunda RE-27-55 Test Connections

10. Connect the shunt to the adapter.

11. Connect the shunt spade terminal and the yellow lead to the battery cable post on the battery adapter.

12. Turn the ground polarity switch to the minus position. On the RE-881 tester, turn the volts switch to the 20 volt position.

POINT RESISTANCE TEST

RE-651 Tester

1. Remove and ground the high tension wire from the center of the distributor.

2. Turn the volts switch to the point resistance (PT. RES.) position. The points should be closed for this test. If the breaker points are open, the meter will read the battery voltage (0 to 40 scale).

3. Disconnect the brown lead ("I" terminal) and the red and blue lead ("S" terminal) at the starter relay. Install the auxiliary starter switch between the battery and "S" terminals of the starter relay. With the ignition switch "ON", tap the auxiliary starter switch until the lowest voltmeter reading is obtained.

4. Depress the PT. RES. pushbutton.

5. The voltmeter pointer should read within the 12V area as shown in black on the meter dial. If not, check for incorrect breaker point spring tension or for burned or pitted points.

6. Connect the high tension wire to the distributor.

RE-881 Tester

1. Remove and ground the high tension wire from the center of the distributor.

2. Disconnect the brown lead ("I" terminal) and the red and blue lead ("S" terminal) at the starter relay. Install an auxiliary starter switch between the battery and "S" terminals of the starter relay. With the ignition switch "ON", tap the auxiliary starter switch until the lowest voltmeter reading is obtained.

3. The voltmeter pointer should read in the black, OK PT. RES. area. If it does not, check for improper breaker point spring tension or for burned or pitted points.

4. Connect the high tension wire to the distributor.

IGNITION TIMING

Refer to Section 2 of this part for timing mark locations.

Disconnect the vacuum line. If necessary, clean and mark the desired timing mark.

RE-27-55 Tester

1. Start the engine and allow it to warm up.

2. Operate the engine below 550 rpm and point the timing light toward the pointer. The desired timing mark should line up with the pointer. If it does not, loosen the distributor hold down bolt and rotate the distributor until the mark lines up with the pointer. Now tighten the hold down bolt and check the timing.

RE-651 Tester

1. Turn the rpm selector to the 1000 position.

2. Depress the advance timing pushbutton.

3. Start the engine and allow it to warm up.

4. Operate the engine below 550 rpm.

5. Turn the advance knob until the ignition advance meter reads 0°.

6. Point the timing light toward the timing pointer. The desired timing marks should line up. If they do not, loosen the distributor hold down bolt and rotate the distributor until the desired timing marks line up. Tighten the distributor hold down bolt and check the timing.

RE-881 Tester. The method of testing is the same as the RE-651 tester with the exception of Step 1 which should (for the RE-881) read "turn the rpm selector to the 800 position".

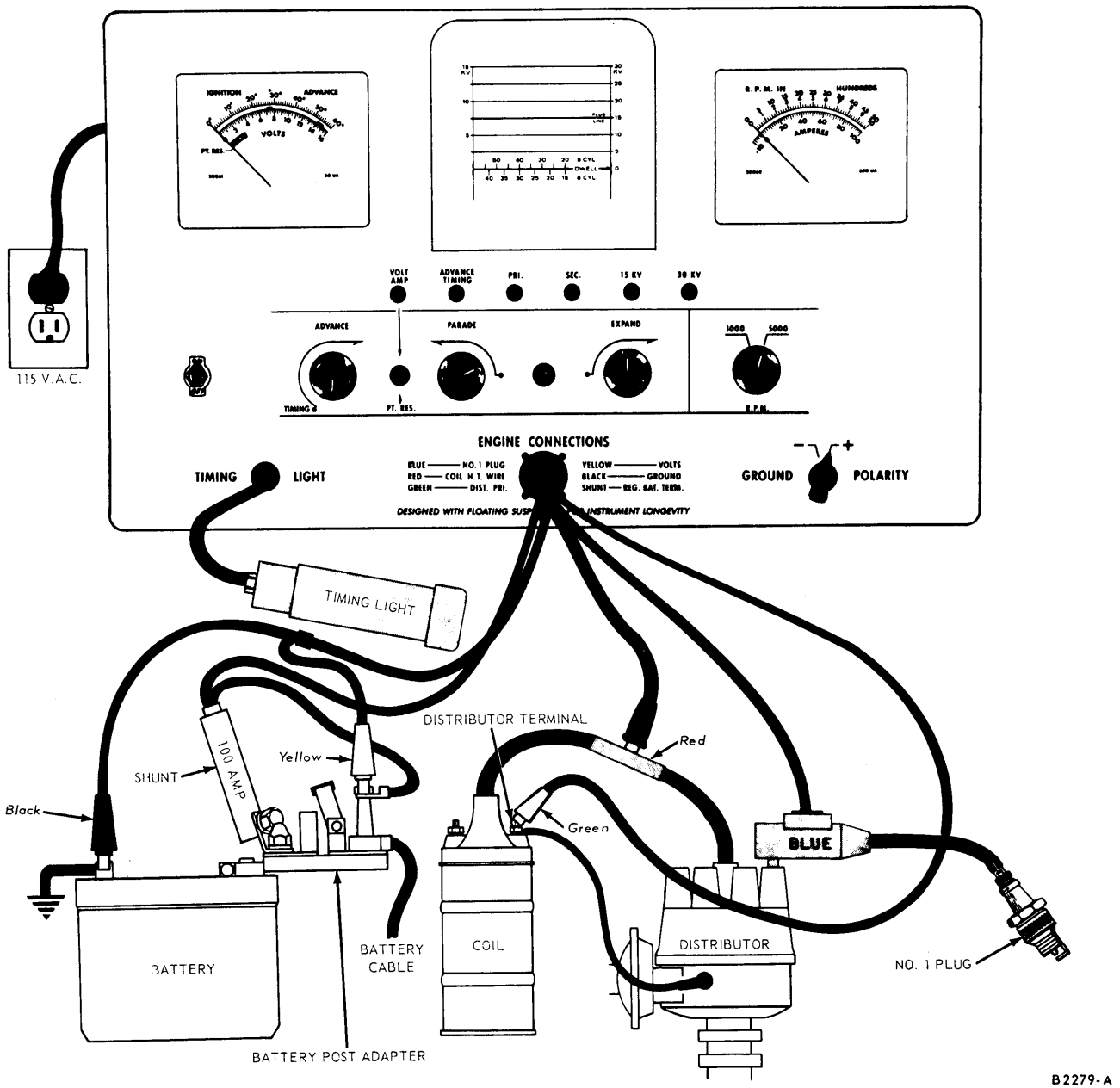


FIG. 11—Rotunda RE-651 Test Connections

SUPERIMPOSED PRIMARY PATTERN

Procedure

RE-27-55 TESTER

1. With the engine running at 1000 rpm, turn the test selector switch to the primary (PRI.) position.

2. Adjust the parade control to position the left end of the pattern at the left vertical line on the screen.

3. Adjust the expand control so that the right end of the pattern is at the right vertical line on the screen.

RE-651 TESTER

1. Turn the rpm selector to the 5000 position. Start the engine and adjust it to 1000 rpm.

2. Depress the PRI. pushbutton on the console panel.

3. Adjust the parade and expand controls to position the left end of the pattern at the left vertical line on the screen and the right end of the pattern at the right vertical line on the screen.

RE-881 TESTER. The test procedure for the RE-881 is the same as the test procedure for the RE-651 except for the setting of the rpm selector. For the RE-881 tester, the rpm selector is turned to the 1600 position.

Results. A normal test pattern is shown in Fig. 13.

Point A indicates the spark plug line which is the time when the points open. At B, the coil energy is used up sufficiently so that the plug no longer fires and only the energy stored in the breaker point condenser remains. This coil/condenser oscillation which is indicated in the pattern between B and C is completely used up at C which is

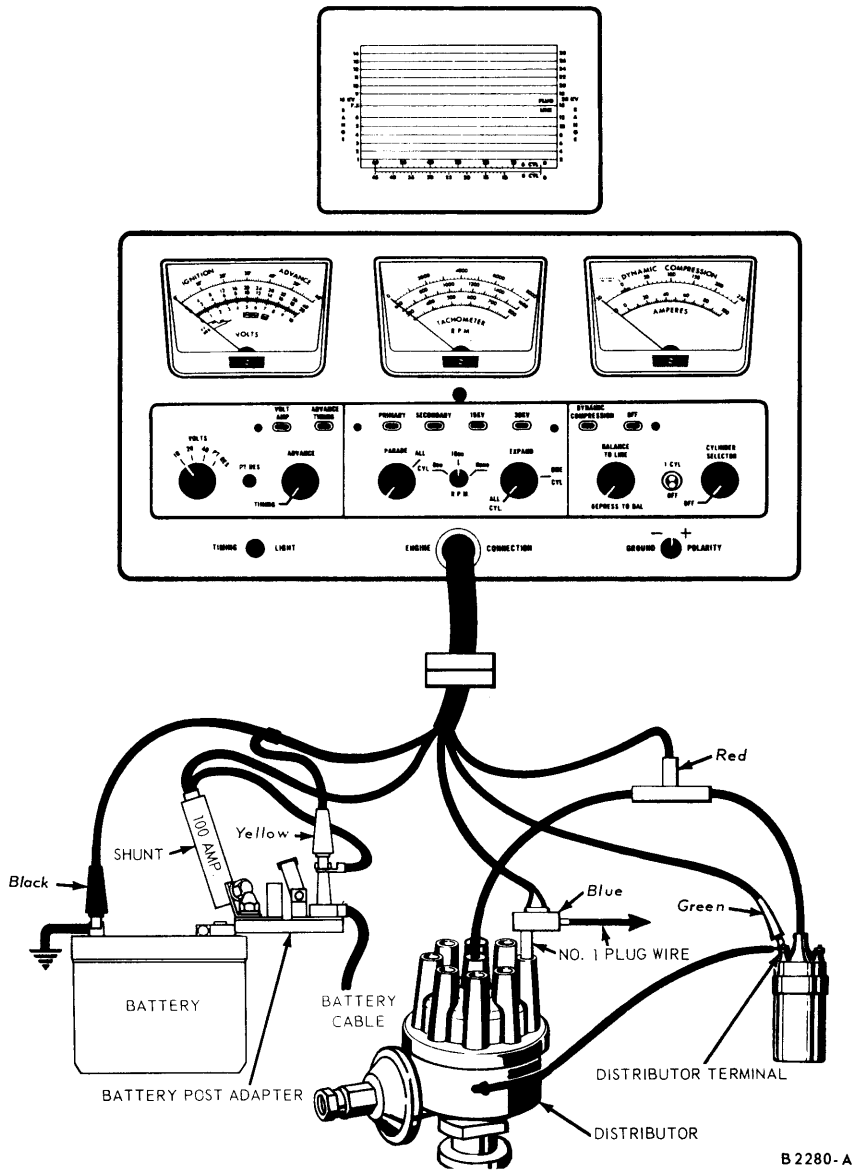


FIG. 12—Rotunda RE-881 Test Connections

the points close mark. The portion of the pattern between C and D is the points close time, which is cam angle or dwell time. The points close time on a transistorized ignition system is below the 0 line. At D, the points again open and the firing cycle repeats.

If points A and C are below the 0 line, the battery polarity is incorrect. This could be caused by a battery that is either installed incorrectly or improperly charged, causing a polarity reversal.

If the firing line is not below the 0 horizontal line and there are no oscillations at point C, there is an open circuit at the coil high tension tower. This could be caused by a broken wire inside the coil tower, or a broken center contact on the distributor rotor.

If the dwell time is too short, the breaker points are incorrectly set (the larger the gap, the smaller the dwell).

If point A is at a reduced height, and the distance to B is short or nonexistent, and the oscillations at point C are reduced in height, there is a high resistance in the coil primary circuit. This could be caused by a fouled plug, defective ignition switch, or a bad wire or connection. If the scope pattern is still the same after the above ignition parts have been checked and proven satisfactory, run the 15 KV test to check for a gasket

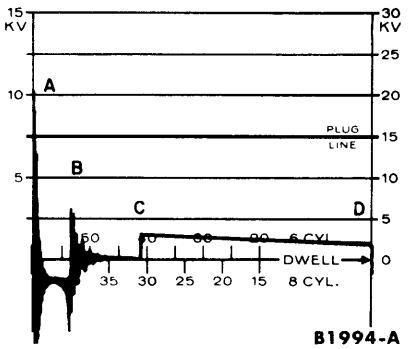


FIG. 13—Normal Superimposed Primary Pattern

leak or a lean fuel mixture.

If point A is at a greatly reduced height and there are no oscillations at point B, the coil has a defective primary winding or the condenser has an excessive series resistance.

If there is a variation at points C and D, the cam lobes are uneven, the distributor shaft is bent, or the distributor bushings are worn.

SUPERIMPOSED SECONDARY PATTERN

Procedure

RE-27-55 TESTER

1. With the engine running at 1000 rpm, turn the test selector switch to the secondary (SEC.) position.

2. Adjust the parade and expand controls so that the left end of the pattern is at the left vertical line on the screen and the right end of the pattern is at the right vertical line on the screen.

RE-651 AND RE-881 TESTERS. The procedure is the same as the procedure for the primary (superimposed) except the SEC. pushbutton is depressed instead of the primary pushbutton.

Results. A normal test pattern is shown in Fig. 14.

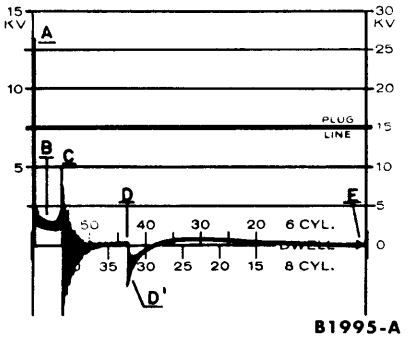


FIG. 14—Normal Superimposed Secondary Pattern

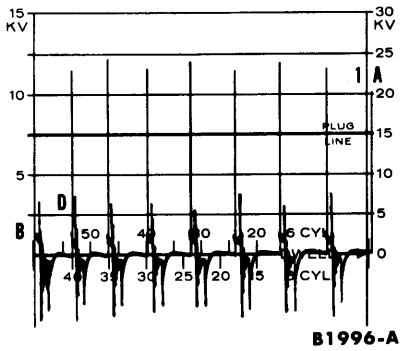


FIG. 15—Normal 15 KV Pattern

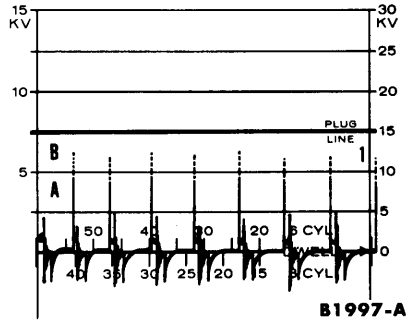


FIG. 16—Normal 30 KV Pattern

Point A is the points open time. The height of the pattern at point A indicates the high tension voltage required to overcome the spark plug gap resistance.

Point B is the plug firing line. Notice that this portion of the pattern is quite thick. Remember that this pattern is actually 8 firing patterns superimposed one on top of the other. This increase in thickness of the pattern at B is caused by slight variations in the plug gap, distributor rotor gap and slight differences in the resistance of the individual spark plug circuits.

The pattern area between points C and D shows the coil/condenser oscillations to be correct. No point bounce at D indicates correct breaker point spring tension.

The few so-called damped oscillations appearing at D are normal and are caused by the surge of current through the coil primary winding when the breaker points first close.

This current levels off and decreases slightly toward the points open position at E as indicated by the slight downward slope of the curve at about the 15° mark on the cam angle scale.

To observe the coil/condenser oscillations and the damped oscillations at D' in greater detail, adjust the expand control so that the pattern area between points C and D' nearly fills the screen.

If there is erratic action at points C and D and there is a blotch above point E, the breaker points are burned or badly pitted.

If the length of B is reduced and the pattern between C and D is not superimposed, there is a series gap in the coil high tension tower or wire.

If the line at B is sloping downward greatly (resistor plugs will cause a slight slope), there is a high resistance in the spark plug wires, distributor cap or rotor.

If point D' is varying erratically, the distributor is badly worn. If this variation is definite instead of erratic, the advance mechanism in the distributor is defective.

If the dwell line between points D' and E is not the smooth line shown, there is a loose connection in the primary circuit. Check the primary circuit for loose connections, damaged wires or a defective starter switch.

15 KV PATTERN

Procedure

RE-27-55 TESTER. with the engine operating at 1000 rpm, turn the test selector switch to the 15 KV position. Adjust the expand and parade controls to produce the pattern shown in Fig. 15.

RE-651 TESTER. With the rpm selector at the 5000 position and the engine operating at 1000 rpm, depress the 15 KV pushbutton. Adjust the expand and parade controls to produce the pattern shown in Fig. 15.

RE-881 TESTER. With the rpm selector at the 1600 position and the engine operating at 1000 rpm, depress the 15 KV pushbutton. Adjust the expand and parade controls to produce the pattern shown in Fig. 15.

Results. A normal 15 KV pattern is shown in Fig. 15. The spark plug line (A) for the No. 1 spark plug is on the extreme right hand side of the screen. The remainder of the No. 1 firing pattern is on the left side of the screen. The remainder of the patterns are shown from left to right in their firing order.

With the exception of the No. 1 spark plug line (which should be shorter than the others), the patterns should be similar. If one of the patterns differs from the others, adjust the expand and parade controls until that pattern fills the screen in the same manner as in the secondary test (Fig. 14).

The following list of symptoms will refer to Fig. 14.

If the points open line (A) is higher than the rest and the plug firing line (B) is sloped downward at an unusually large slope, there is excessive resistance in the high tension wire to that cylinder or in the distributor cap.

If the points open line (A) is low and the firing line (B) is long and nearly straight, the spark plug is shorted out.

If the points open line (A) is low and the firing line (B) is long and wide, the spark plug gap is out of adjustment.

If there are no oscillations at points C or D, the coil primary windings are partially shorted.

If the points open line (A) and the oscillations at point D are both displaced to the right on all cylinders, check the breaker points.

If all of the points open lines (A) are at varied heights, check the idle adjustment of the carburetor (always adjust the idle mixture on the rich side).

30 KV PATTERN

Procedure

RE-27-55 TESTER. With the engine running at 600 rpm, turn the test selector switch to the 30 KV position. Adjust the expand and parade controls to produce the pattern shown in Fig. 16.

RE-651 TESTER. With the rpm selector at the 5000 position and the engine operating at 600 rpm, depress the 30 KV pushbutton. Adjust the expand and parade controls to produce the pattern shown in Fig. 16.

RE-881 TESTER. With the rpm selector at the 1600 position and the engine operating at 600 rpm, depress the 30 KV pushbutton. Adjust the expand and parade controls to produce the pattern shown in Fig. 16.

Results. A normal 30 KV pattern is shown in Fig. 16. The spark plug line (A) for the No. 1 spark plug is on the extreme right hand side of the screen. The remainder of the No. 1 firing pattern is on the left side of the screen. The remainder of the patterns are shown from left to right in their firing order.

Notice the average height of the solid part of the points open line. Increase the speed of the engine and notice the height of the dotted lines. The difference is the required igni-

tion output under load. The maximum output should be between 13.5 and 15 KV.

If the maximum for one or more of the plugs is above 15 KV, check the complete circuit (s) of the plug (s) for any trouble that would cause this resistance. If the maximum does not increase during the increase in engine speed, check for a fouled or improperly gapped spark plug or for very low compression.

Remove the high tension wire **at the distributor cap** for any plug except No. 1. Notice the change between the average points open line and the points open line of the cylinder with the high tension wire removed. This height difference is the coil reserve. The coil reserve should be at least 30% of the maximum output. If it is less than 30%, replace the coil.

Remove and do not ground one spark plug wire at the spark plug. If a plug firing line shows up on the scope for that cylinder, check the plug wire and distributor cap for bad insulation.

DISTRIBUTOR CHECKS

DISTRIBUTOR DIAPHRAGM LEAKAGE AND FREENESS OF OPERATION

These tests can be made with the distributor installed on the engine. The tests are sufficient for an engine tune-up. However, if there are indications that the spark advance is not functioning properly, remove the distributor from the engine and check the distributor spark advance on a distributor test set.

Check the vacuum advance mechanism for freeness of operation by manually rotating the breaker plate in the direction of 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 described for the particular distributor.

To check the diaphragm for leakage:

1. Remove the vacuum line from the distributor. Adjust the vacuum pressure of a distributor tester to its maximum position. Hold your hand over the end of the tester's vacuum hose and note the maximum reading obtained. **Do not exceed 25 inches Hg.**

2. If the maximum reading is 25 inches Hg or less, connect the tester's vacuum line to the vacuum fitting on the diaphragm **without changing any of the adjustments.** The maximum gauge reading should not be less than it was in Step 1. If it is less, the diaphragm is leaking and should be replaced.

DISTRIBUTOR SHAFT END PLAY

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 the specified limits.

If the shaft end play is not to specifications, check the location of the distributor shaft collar.

DISTRIBUTOR TESTS— ROTUNDA RE-27-44 TESTER

TEST CONNECTIONS

Conventional Ignition System Distributor

1. Connect the red lead to the distributor terminal of the coil.
2. Connect the black lead to a good ground on the engine.

Transistor Ignition System Distributor

1. Connect the red lead to the red (small) tach block terminal.
2. Connect the black lead to the black (large) tach block terminal.

DWELL ANGLE CHECK

1. Connect the tester.
2. Turn the test control knob to the set position.
3. Adjust the set control knob until the needle on the dwell meter lines up with the set line.
4. Start the engine and let it idle.
5. Turn the test control knob to the 8 CYL position.
6. Read the dwell angle on the dwell meter and compare the reading to specifications.
7. Turn off the engine.
8. If the dwell angle was below the specified amount, the breaker point gap is too large. If the dwell angle was above the specified amount, the breaker point gap is too small.

If the dwell is to specifications, turn the test selector knob to the OFF position and disconnect the tester leads.

DWELL ANGLE ADUSTMENT

If the dwell angle is not within specifications, proceed as follows:

1. Remove the coil high tension lead from the distributor and ground it.
2. Remove the distributor cap and place it out of the way.
3. Disconnect the brown wire ("I" terminal) and the red and blue wire ("S" terminal) from the starter relay.
4. Loosen the breaker point assembly retaining screw near the breaker point contacts.
5. With the ignition on, crank the engine with an auxiliary starter switch connected between the battery and "S" terminals of the starter relay and adjust the gap to specifications.
6. Release the auxiliary starter switch and tighten the breaker point assembly retaining screw.
7. Since the adjustment may have changed when the retaining screw was tightened, crank the engine again with the auxiliary starter switch and check the dwell.

DISTRIBUTOR TESTS — ROTUNDA RE-236 TESTER

MOUNTING DISTRIBUTOR

1. Adjust the distributor support arm in relation to the distributor shaft length.
2. Set the distributor in the support arm and enter the lower end of the distributor shaft in the Syncrograph chuck.
3. Tighten the chuck on the distributor shaft, using the wrench located near the support arm column.
4. Align the distributor shaft by shifting the support arm and distributor, then tighten the clamp screw.
5. Clamp the distributor securely in the distributor support arm clamp so that it will not turn in its mounting.
6. Connect the Synchrograph test lead to the primary or distributor-transistor lead wire of the distributor. Since the resistor ignition distributor does not have a condenser, it will be necessary to install one in the circuit of the tester (Fig. 17).

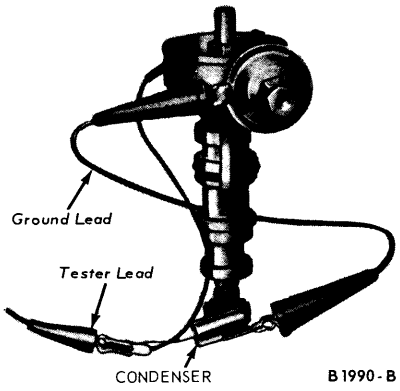


FIG. 17–Testing Transistor Ignition Distributor

MECHANICAL OPERATIONS

1. Turn the OFF, SET, CAM, SYNC. switch to SET.
2. Adjust the SET TACH control so the tachometer pointer is on the SET line.
3. Turn the OFF, SET, CAM, SYNC. switch to SYNC. position.
4. Turn the MOTOR switch to the LEFT.
5. Adjust the speed control to vary the distributor speed between 400 and 4000 engine rpm, or at the maximum speed of the engine on which the distributor is used. Erratic or thin faint flashes of light preceding the regular flashes as the speed of rotation is increased can be due to weak breaker arm spring tension or binding of the breaker arm on the pivot pin.
6. Operate the distributor at approximately 2500 engine rpm and move the protractor scale so that the zero degree mark on the scale is opposite one of the neon flashes. The balance of all the flashes should come within 1°, plus or minus, evenly around the protractor scale. A variation larger than 1° or erratic or wandering flashes may be caused by a worn cam or distributor shaft or a bent distributor shaft.

DWELL ANGLE

1. Turn the OFF, SET, CAM, SYNC. switch to the CAM position. Operate the distributor at about 1000 rpm.
2. Adjust the breaker point gap until the cam angle is to specifications.

BREAKER PLATE WEAR

A worn breaker plate on a dual advance distributor will cause the breaker point gap and contact dwell to change as engine speed and load conditions are varied.

On a dual advance distributor, adjust the test set 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 dwell angle variation exceeds this limit, there is excessive wear at the stationary subplate pin or the diaphragm rod is bent or distorted.

DISTRIBUTOR SPARK ADVANCE

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

1. Check the contact dwell. If the contact dwell or the breaker point gap is not within specifications, adjust the breaker points.
2. Check the breaker arm spring tension and adjust it, if necessary.

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. Operate the distributor in the direction of rotation (counterclockwise) and adjust the speed to the initial rpm setting listed in the specifications. Move the protractor scale so that one of the flashes lines up with the zero degree mark.
2. 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. 18). Bend the adjustment bracket away from the distributor shaft to decrease advance (increase spring tension) and toward the shaft to increase advance (decrease spring tension). After the adjustment is made, identify the bracket.

3. After an 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.

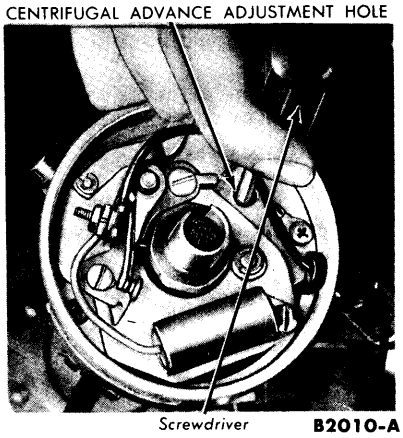


FIG. 18–Centrifugal Advance Adjustment

Vacuum Advance

1. Connect the test set vacuum line to the fitting on the diaphragm.
2. Set the test set to 0° advance, 0 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. 19). 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

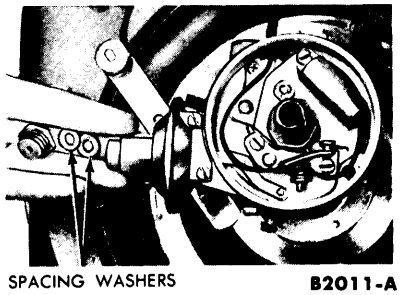


FIG. 19–Vacuum Advance Adjustment

settings are not within limits, there is 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.

DISTRIBUTOR TESTS – ROTUNDA RE-1416 TESTER

MOUNTING DISTRIBUTOR

1. Clamp the distributor securely in the distributor support arm clamp so that it will not turn in its mounting.
2. Loosen the hand-operated locking screw on the side of distributor support arm, and adjust the support arm column up or down by turning the crank on the knob at the top of the column until the distributor shaft or adapter shaft can be securely fastened in the driving chuck. Use adapter shafts provided when driving distributors have short shafts.
3. Securely tighten the drive chuck to the distributor drive shaft by means of the chuck key, attached by a chain to the Syncrograph.
4. Rotate the drive chuck by hand to make sure the distributor shaft turns freely and then tighten the locking screw on the distributor support arm.
5. Connect the Syncrograph test lead to the primary or distributor-transistor lead wire of the distributor. Since the transistor ignition distributor does not have a condenser, it will be necessary to install one in the circuit of the tester (Fig. 17).

BREAKER POINT RESISTANCE

1. Turn the test selector to the POINT RES. position.
2. Revolve the chuck by hand until the distributor breaker contacts are closed.
3. The meter pointer on the cam angle meter should read in the OK zone at the left side of the meter scale. If the meter pointer does not fall in the OK zone, there is excessive resistance caused by a faulty contact across the distributor points, a faulty primary lead, or a poorly grounded base plate. A faulty contact across the distributor points indicates improper spring tension or burned or pitted points.

INSULATION AND LEAKAGE

1. Turn the test selector to the cam angle position and revolve the chuck by hand until the distributor breaker contacts are open.
2. The cam angle meter should show a zero reading. If a zero reading is not obtained, a short circuit to ground exists.

A short could be caused by poor primary or distributor-transistor lead wire insulation, a shorted condenser or a short between the breaker arm and breaker plate.

MECHANICAL OPERATION

1. Turn the test selector to the SYNCHRO. 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 to correspond with the direction of rotation, as listed in the rotation column of the distributor specifications.

If it is necessary to reverse the rotation of the drive motor, turn the motor control switch to the OFF position and allow the chuck to come to a complete stop before reversing the switch.

3. Adjust the rpm control to vary the distributor speed between 400 and 4000 engine rpm or at the maximum speed of the engine on which the distributor is used. Erratic or thin, faint flashes of light preceding the regular flashes as the speed of rotation is increased can be due to weak breaker arm spring tension or binding of the breaker arm on the pivot pin.
4. Operate the distributor at approximately 2500 engine rpm.
5. 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 all the flashes should come within 1°, plus or minus, evenly around the protractor scale. A larger variation than 1° or erratic or wandering flashes may be caused by a worn cam or distributor shaft or a bent distributor shaft.

DWELL ANGLE

1. Turn the cylinder selector to the figure corresponding to the number of lobes on the cam of the distributor being tested.
2. Turn the test selector switch to the cam angle position and operate the distributor at approximately 1000 engine rpm.
3. Adjust the distributor breaker point gap to the dwell angle shown in the specifications.

BREAKER PLATE WEAR

A worn breaker plate will cause the breaker point gap and contact dwell to change as engine speed and load conditions are varied.

Adjust the test set 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 0 to maximum vacuum at a constant rpm. If the dwell angle variation exceeds this limit, there is excessive wear at the stationary subplate pin or the diaphragm rod is bent or distorted.

DISTRIBUTOR SPARK ADVANCE

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

1. Check the contact dwell. If the contact dwell or the breaker point gap is not within specifications, adjust the breaker points.
2. Check the breaker arm spring tension and adjust it, if necessary.

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. Operate the distributor in the direction of rotation (counterclockwise) and adjust the speed to the initial rpm setting listed in the specifications. Move the protractor scale so that one of the flashes lines up with the zero degree mark.
2. 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. 18). **Bend the adjustment bracket away from the distributor shaft to decrease advance (increase spring tension) and toward the shaft to increase advance (decreaes spring tension).** After the adjustment is made, identify the bracket.

3. After an 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. Connect the test set vacuum line to the fitting on the diaphragm and turn the vacuum supply switch on.

2. Set the test set to 0° advance, 0 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. 19). 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.

2 COMMON ADJUSTMENTS AND REPAIRS

BREAKER POINTS

REPLACEMENT

The breaker point replacement procedure is in Part 9-2, Section 2.

ALIGNMENT

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

1. Turn the cam so that the breaker points are closed and check the alignment of the points (Fig. 20).

If the distributor is in the engine, close the points by proceeding as follows:

Disconnect the brown and the red and blue wires from the starter relay and, with the ignition switch off, crank the engine by using an auxiliary starter switch between the "S" and the battery terimnals of the starter relay.

2. Align the breaker points to make full face contact by bending the stationary breaker point bracket (Fig. 21). **Do not bend the breaker arm.**

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

GAP AJDUSTMENT

A scope, a dwell meter, or a feeler gauge can be used to check the gap of new breaker points.

A scope or a dwell meter can be used to check the gap of used breaker points. Due to the roughness of used points, it is not advisable to use a feeler gauge to check the gap.

To check and adjust the breaker points with a feeler gauge:

1. Check and adjust the breaker point alignment.

2. Rotate the distributor until the rubbing block rests on the peak of a cam lobe.

If the distributor is in the engine, place the rubbing block on the peak of the cam by proceeding as follows:

Disconnect the brown and the red and blue wires from the starter relay and, with the ignition switch off, crank the engine by using an auxiliary starter switch between the "S" and battery terminals of the starter relay.

Insert the correct blade of a clean feeler gauge between the breaker points (Fig. 22). The gap should be set to the larger opening because the rubbing block will wear down slightly while seating to the cam.

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

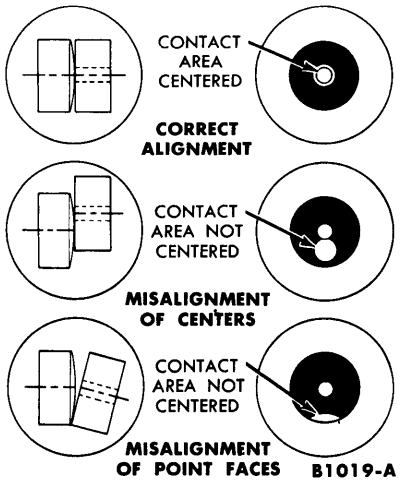


FIG. 20—Breaker Point Alignment

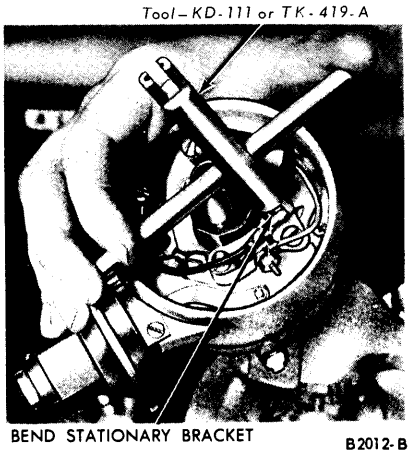


FIG. 21—Aligning Breaker Points

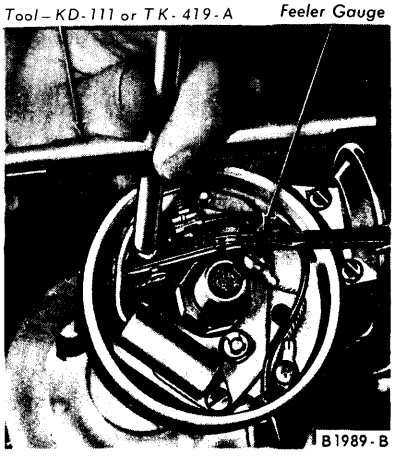


FIG. 22—Adjusting New Breaker Point Gap

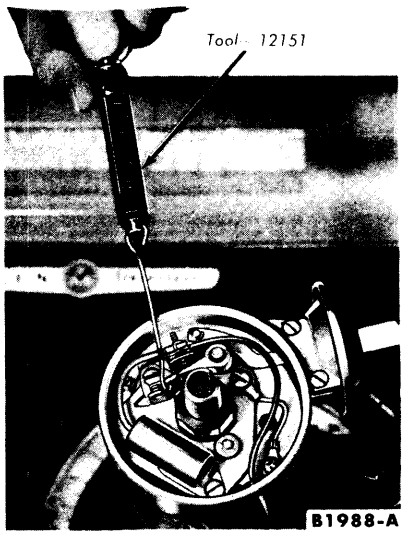


FIG. 23—Checking Breaker Point Spring Tension

Set the ignition timing.

If a scope or a dwell meter is used to adjust new points, be sure the points are in proper alignment. Also, set the contact dwell to the low setting. New points must be set to the low dwell as the rubbing block will wear down slightly while seating to the cam.

To check and adjust the breaker points with a scope, refer to "Ignition System Tests".

To check and adjust the breaker points with a dwell meter, refer to "Distributor Tests."

SPRING TENSION ADJUSTMENT

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 up 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.

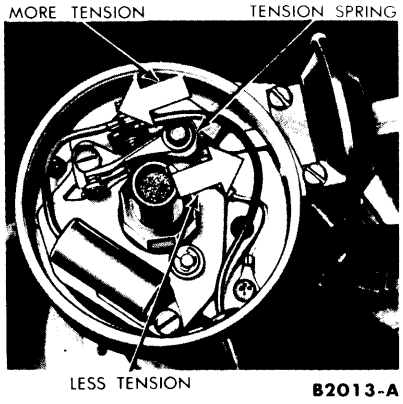


FIG. 24—Adjusting Breaker Point Spring Tension

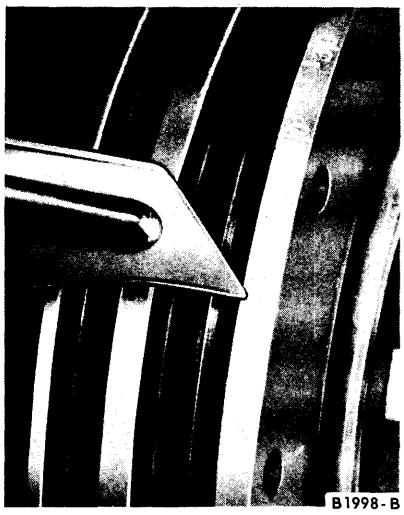


FIG. 25—Typical Timing Marks

To check the spring tension on either the pivot-type or the pivotless breaker points, place the hooked end of the spring tension gauge over the movable breaker point. Pull the gauge at a right angle (90°) to the movable arm until the breaker points just start to open (Fig. 23). If the tension is not within specifications, adjust the spring tension on the pivot-type points or replace the breaker point assembly on the pivotless points.

To adjust the spring tension (Fig. 24).

1. Disconnect the primary or distributor-transistor lead wire and the condenser lead (if so equipped) 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 tension and in the opposite direction to increase tension.**
3. Tighten the lock nut, then check spring tension. Repeat the adjustment until the specified spring tension is obtained.
4. Install the primary or distributor-transistor lead wire and the condenser lead (if so equipped) with the lockwasher and tighten the nut securely.

IGNITION TIMING

TIMING MARK LOCATIONS

The crankshaft damper (Fig. 25) has 15 timing marks ranging from top dead center (TDC) to 30° before top dead center (BTDC).

Refer to the specifications (Part 9-3) for the correct ignition timing.

ADJUSTMENT

The procedure for adjusting the ignition timing is covered under "Ignition System Tests."

SPARK PLUG WIRE REPLACEMENT

When removing the wires from the spark plugs, grasp the moulded cap only. Do not pull on the wire because the wire connection inside

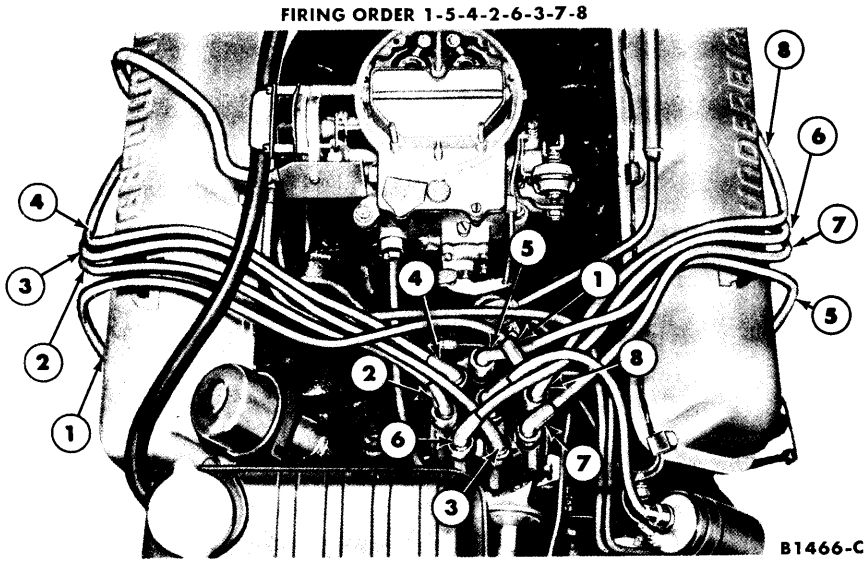


FIG. 26—Ignition Wiring

the cap may become separated or the weather seal may be damaged.

A typical ignition wiring installation is shown in Fig. 26.

Removal

1. Disconnect the wires from the spark plugs and distributor cap.
2. Pull the wires from the brackets on the valve rocker arm covers and remove the wires.
3. Remove the coil high tension lead.

Cleaning and Inspection

Refer to Section 3 of this part for the proper cleaning and inspection procedure.

Installation

1. Insert each wire in the proper socket of the distributor cap. Be sure the wires are forced all the way down into their sockets. The No. 1 socket is identified on the cap. Install the wires in a counterclockwise direction in the firing order (1-5-4-2-6-3-7-8) starting at the No. 1 socket. Cylinders are numbered from front to rear; right bank 1-2-3-4, left bank 5-6-7-8.
2. Remove the brackets from the old spark plug wire set and install them on the new set in the same relative position. Install the wires in the brackets on the valve rocker arm covers (Fig. 26). Connect the wires to the proper spark plugs. Install the coil high tension lead. **Be sure the No. 7 spark plug wire is positioned in the bracket as shown in Fig. 26.**

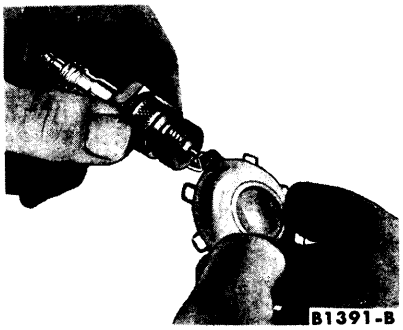


FIG. 27—Gapping Spark Plugs

SPARK PLUG REPLACEMENT

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.**
2. Clean the area around each spark plug port with compressed air, then remove the spark plugs.

Cleaning and Inspection. Refer to Section 3 of this part for the proper cleaning and inspection procedure.

ADJUSTMENT

Set the spark plug gap by bending the ground electrode (Fig. 27).

INSTALLATION

1. Install the spark plugs and torque each plug to specifications.
2. Connect the spark plug wires. Push all weather seals into position.

RESISTANCE WIRE REPLACEMENT

The primary resistance wire is checked for excessive resistance as outlined under "Resistance Wire Test."

To replace the resistance wire:

1. Fabricate a 3-inch, 16-gauge jumper wire with a bullet-type terminal on one end and an eyelet-type terminal on the other end. Solder the terminals to the wire.
2. Disconnect the defective resistance wire (pink or black) from the coil terminal of the ignition switch. Cut the wire off at the point where it enters the taped area of the harness.
3. Connect the 3-inch jumper wire to the coil terminal of the ignition switch. Connect the replacement resistance wire to the other end of the jumper wire, using a bullet terminal connector.
4. Route the replacement resistance wire along the harness and through the grommet in the dash panel. Tape the wire to the harness where necessary to prevent it from hanging loose.
5. Disconnect the defective resistance wire from the bullet connector in the engine compartment, and connect the replacement wire in its place.
6. Cut the defective wire off at the point where it enters the taped area of the harness.

3 CLEANING AND INSPECTION

SPARK PLUGS

Clean the plugs on a sand blast cleaner, following the manufacturer's instructions. **Do not prolong the use of the abrasive blast as it will erode the 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. 28). Dress the electrodes to secure flat parallel surfaces on both the center and side electrode.

After cleaning, examine the plug carefully for cracked or broken insulators, badly pitted electrodes, and other signs of failure. Replace as required.

Examine the firing ends of the spark plugs, noting the type of deposits and the degree of electrode erosion. Refer to Fig. 29 for the various types of spark plug fouling and their causes.

DISTRIBUTOR

Soak all parts of the distributor assembly (except the condenser, breaker point assembly, lubricating wick, vacuum diaphragm, distributor base oil seal and electrical wiring) in a mild cleaning solvent or mineral spirits. Do not use a harsh cleaning solution. Wipe all parts that can not be immersed in a solvent with a clean dry cloth.

After foreign deposits have been loosened by soaking, scrub the parts with a soft bristle brush. **Do not use a wire brush, file, or other abrasive object.** Dry the parts with compressed air.

Examine the bushing surface of the distributor shaft and the bushings for wear. The dual advance distributor has two bushings. The minimum allowable shaft diameter at the bushing is 0.4675 inch and the maximum allowable inside diameter of

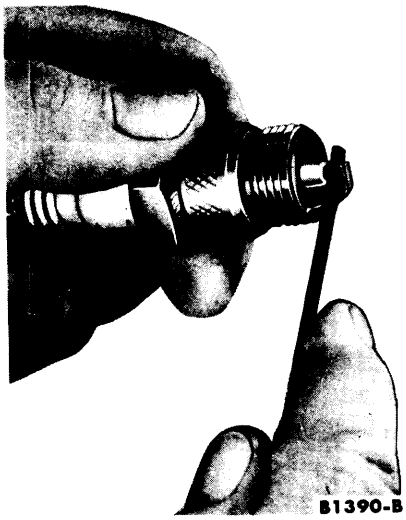


FIG. 28–Cleaning Spark Plug Electrode

the bushing should be within specifications. Replace worn parts.

Inspect the distributor cam lobes for scoring and signs of wear. If any lobe is scored or worn, replace the cam assembly.

Inspect the breaker plate assembly for signs of distortion. In addition, inspect the stationary sub-plate for worn nylon contact buttons. Replace the breaker plate assembly if it is defective.

The breaker point assembly and condenser (if so equipped) should be replaced whenever the distributor is overhauled.

Inspect all electrical wiring for fraying, breaks, etc., and replace any that are not in good condition.

Check the distributor base for cracks or other damage.

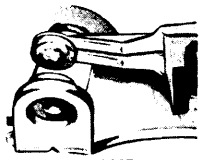
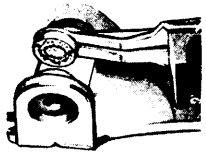
Check the diaphragm housing, bracket and rod for damage. Check the vacuum line fitting for stripped threads or other damage. Test the vacuum fittings, case and diaphragm for leakage as explained under "Distributor Tests." Replace all defective parts.

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. Replace the breaker point

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-E

FIG. 29–Spark Plug Inspection

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. 30—Breaker Point Inspection

assembly if the contacts are badly burned or excessive metal transfer between the points is evident (Fig. 30). Metal transfer is considered excessive when it equals or exceeds the gap setting.

SECONDARY WIRING

Wipe the wires with a damp cloth and check for fraying, breaks, etc. Replace any wires that are not in good condition.

COIL

Wipe the coil with a damp cloth and check for any cracks or other defects.

PART 9-2 DUAL ADVANCE DISTRIBUTORS

1 DESCRIPTION AND OPERATION

The dual advance distributor (Figs. 1 and 2) has two independently operated spark advance systems. A centrifugal advance mechanism is located below the stationary sub-plate assembly, and a vacuum operated spark control diaphragm is located on the side of the distributor base. As speed increases, the centrifugal weights cause the cam to advance or move ahead with respect to the distributor drive shaft. The rate of advance is controlled by calibrated springs.

The vacuum advance mechanism has a spring-loaded diaphragm which is connected to the breaker plate. The spring-loaded side of the diaphragm is airtight and is connected through a vacuum line to the carburetor throttle bore. When the throttle plates open, the distributor vacuum passage is exposed to manifold vacuum, which causes the diaphragm to move against the tension of the spring. This action causes the movable breaker plate to pivot on the stationary sub-plate. The breaker point rubbing block, which is positioned on the opposite side of the cam from the pivot pin, then moves against distributor rotation and advances the spark timing. As the movable breaker plate is rotated from retard position to full advance position, the dwell decreases slightly. This is because the breaker point rubbing block and the cam rotate on different axes.

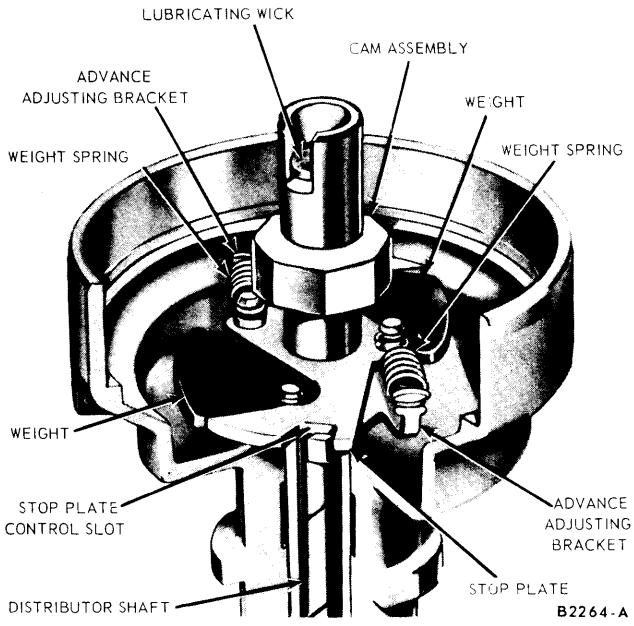


FIG. 1—Centrifugal Advance Mechanism

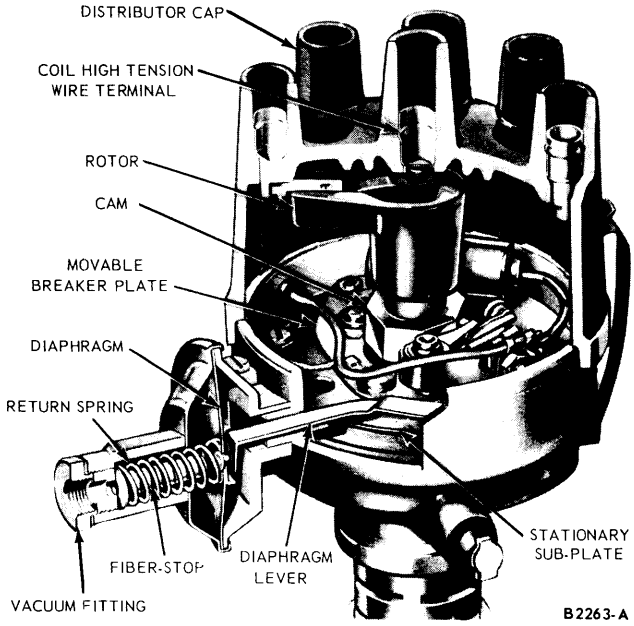


FIG. 2—Vacuum Advance Mechanism

2 IN-CAR ADJUSTMENTS AND REPAIRS

BREAKER POINT AND CONDENSER REPLACEMENT

CONVENTIONAL IGNITION SYSTEM DISTRIBUTOR

Removal

1. Remove the distributor cap and the rotor.

2. Disconnect the primary and the condenser wires from the breaker point assembly.

3. Remove the breaker point assembly and condenser retaining screws. Lift the breaker point assembly and condenser out of the distributor.

Installation

1. Place the breaker point assembly and the condenser in position and install the retaining screws. Be sure to place the ground wire under the breaker point assembly screw farthest from the breaker point contacts (Figs. 3 and 4).

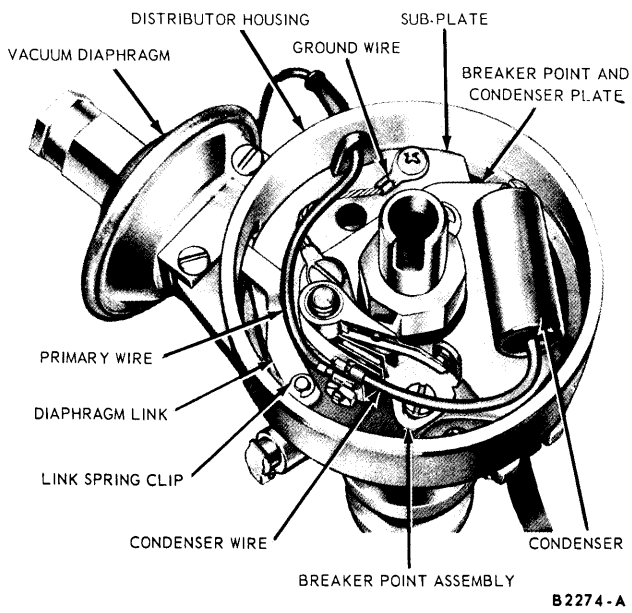


FIG. 3—Breaker Plate Installed—Pivot-Type Points

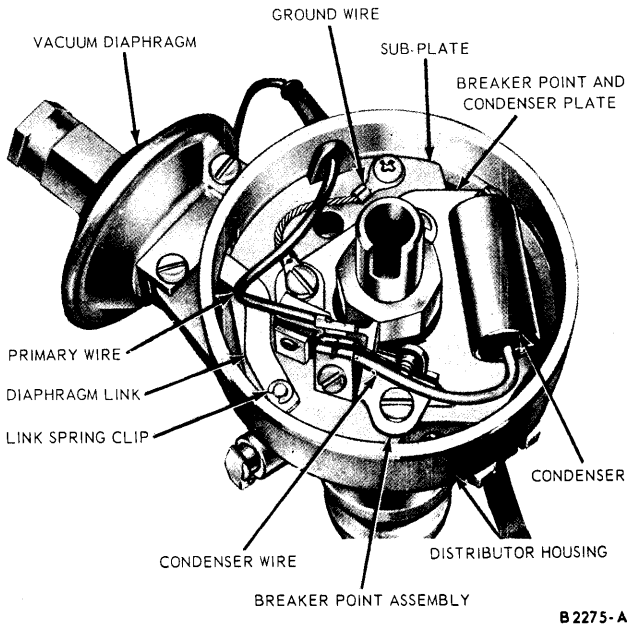


FIG. 4—Breaker Plate Installed—Pivotless Points

2. Align and adjust the breaker point assembly by following the procedure in Part 9-1.

3. Connect the primary and condenser wires to the breaker point assembly.

4. Install the rotor and the distributor cap.

TRANSISTOR IGNITION SYSTEM DISTRIBUTOR

Removal

1. Remove the distributor cap, the rotor, and the dust cover.

2. Disconnect the distributor-transistor wire from the breaker point assembly.

3. Remove the retaining screws from the breaker point assembly and lift the breaker point assembly out of the distributor.

Installation

1. Place the breaker point assembly in position and install the retaining screws. Be sure to place the ground wire under the breaker point assembly screw farthest from the breaker point contacts (Fig. 3).

2. Align and adjust the breaker point assembly by following the procedure in Part 9-1.

3. Connect the distributor-transistor wire to the breaker point assembly.

4. Install the dust cover, the rotor, and the distributor cap.

VACUUM DIAPHRAGM REPLACEMENT

CONVENTIONAL AND TRANSISTOR IGNITION SYSTEM DISTRIBUTORS

Removal

1. Remove the distributor cap, the rotor, and the dust cover (if so equipped).

2. Remove the vacuum line from the diaphragm fitting.

3. Remove the spring clip that secures the diaphragm link to the movable breaker plate.

4. Remove the diaphragm retaining screws and slide the diaphragm out of the distributor.

Installation

1. Slide the diaphragm into the opening in the distributor and place the link in its position.

2. Install the spring clip that secures the diaphragm link to the movable breaker plate and install the diaphragm retaining screws.

3. Install the vacuum line on the diaphragm fitting.

4. Install the dust cover (if so equipped), the rotor, and the distributor cap.

BREAKER PLATE AND SUB-PLATE REPLACEMENT

CONVENTIONAL IGNITION SYSTEM DISTRIBUTOR

Refer to Figs. 3 and 4 for the correct location of parts.

Removal

1. Remove the distributor cap and the rotor.

2. Remove the breaker point assembly, the condenser, and the vacuum diaphragm.

3. Working from the inside of the distributor, pull the primary wire through the opening in the distributor.

4. Remove the spring clip, the flat washer, and the spring washer securing the breaker plate to the sub-plate.

5. Remove the sub-plate retaining screws and lift both plates out of the distributor.

Installation

1. Place the breaker plate in position on the sub-plate.

2. Install the spring washer, the flat washer, and the spring clip that secures the breaker plate to the sub-plate.

3. Install the sub-plate hold down screws (the ground wire should be under the sub-plate hold down screw near the primary wire opening in the distributor).

4. Working from the inside of the distributor, push the primary wire through the opening in the distributor.

5. Install the breaker point assembly, the condenser, and the vacuum diaphragm.

6. Install the rotor and the distributor cap.

TRANSISTOR IGNITION SYSTEM DISTRIBUTOR

The transistor ignition system distributor does not have a condenser. It does have a lubricating wick on the breaker point assembly rubbing

block. With the exception of these two items, Fig. 3 shows the correct location of parts.

Removal

1. Remove the distributor cap, the rotor, and the dust cover.
2. Remove the breaker point assembly and the vacuum diaphragm.
3. Working from the inside of the distributor, pull the distributor-transistor wire through the opening in the distributor.
4. Remove the spring clip, the flat washer, and the spring washer securing the breaker plate to the sub-plate.
5. Remove the sub-plate retaining screws and lift both plates out of the distributor.

Installation

1. Place the breaker plate in position on the sub-plate.
2. Install the spring washer, the flat washer, and the spring clip that secures the breaker plate to the sub-plate.
3. Install the sub-plate hold down screws (the ground wire should be under the sub-plate hold down screw near the distributor-transistor wire opening in the distributor).
4. Working from the inside of the distributor, push the distributor-transistor wire through the opening in the distributor.
5. Install the breaker point assembly and the vacuum diaphragm.
6. Install the dust cover, the rotor, and the distributor cap.

CAM AND CENTRIFUGAL ADVANCE MECHANISM REPLACEMENT

CONVENTIONAL AND TRANSISTOR IGNITION SYSTEM DISTRIBUTORS

Removal

1. Remove the distributor cap, the rotor, and the dust cover (if so equipped).
2. Working from the inside of the distributor, pull the primary or distributor-transistor wire through the opening in the distibutor.
3. Remove the breaker point and condenser plate retaining screws and lift the plate assembly out of the distributor.
4. Mark one of the distributor weight springs and its brackets. Also mark one of the weights and its pivot pin.
5. Carefully unhook and remove the weight springs.
6. Lift the lubricating wick from the cam assembly. Remove the cam assembly retainer and lift the cam assembly off the distributor shaft. Remove the thrust washer.
7. Remove the weight retainers and lift the weights out of the distributor.

Installation

1. Fill the grooves in the weight pivot pins with distributor cam lubricant.
2. Position the weights in the distributor (the marked weight is placed on the marked pivot pin) and install the weight retainers.
3. Place the thrust washer on the shaft.
4. Fill the grooves in the upper portion of the distributor shaft with distributor cam lubricant.
5. Install the cam assembly. Be sure that the marked spring bracket on the cam assembly is near the marked spring bracket on the stop plate. Place a light film of distributor cam lubricant on the distributor cam lobes. Install the retainer and the wick. Saturate the wick with SAE 10W engine oil.
6. Install the weight springs. Be sure that the marked spring is attached to the marked spring brackets.
7. Install the breaker point and condenser plate assembly.
8. Working from the inside of the distributor, push the primary or distributor-transistor wire through the opening in the distributor.
9. Install the dust cover (if so equipped), the rotor, and the distributor cap.

ADJUSTMENTS

Refer to Part 9-1, Section 3 for the adjustment procedures.

3 REMOVAL AND INSTALLATION

REMOVAL

1. On a conventional ignition system, disconnect the primary wire at the coil. On a transistor ignition system, disconnect the distributor-transistor lead from the quick disconnect. Disconnect the vacuum advance line at the distributor. Remove the distributor cap.
2. Scribe a mark on the distributor body and engine block indicating the position of the body in the block, and scribe another mark on the distributor body indicating the position of the rotor. These marks can be used as guides when installing the distributor in a correctly timed engine.
3. Remove the distributor hold down cap screw and clamp. Lift the distributor out of the block.

Do not rotate the crankshaft while the distributor is removed, or it will be necessary to time the engine.

INSTALLATION

1. If the crankshaft was rotated while the distributor was removed from the engine, it will be necessary to time the engine. Rotate the crankshaft until No. 1 piston is on TDC (after the compression stroke). Align the TDC mark on the timing pointer with the timing pin on the crankshaft damper. Position the distributor in the block with the rotor at the No. 1 firing position.

Make sure the oil pump intermediate shaft properly engages the distributor shaft. It may be necessary to crank the engine with the starter, after the distributor drive gear is partially engaged, in order to engage the oil pump intermediate shaft.

Install, but do not tighten, the retaining clamp and screw. Rotate the distributor body counterclockwise until the breaker points are just starting to open. Tighten the clamp.

2. If the crankshaft has not been rotated, position the distributor in the block with the rotor aligned with the mark previously scribed on the distributor body, and the marks on the distributor body and engine block in alignment. Install the retaining clamp.
3. Install the distributor cap.
4. On a conventional ignition system, connect the primary wire to the coil. On a transistor ignition system, connect the distributor-transistor lead to the quick disconnect.
5. Check the ignition timing with a timing light and adjust if necessary. Connect the vacuum line, and check the advance with the timing light when the engine is accelerated.

4 MAJOR REPAIR OPERATIONS

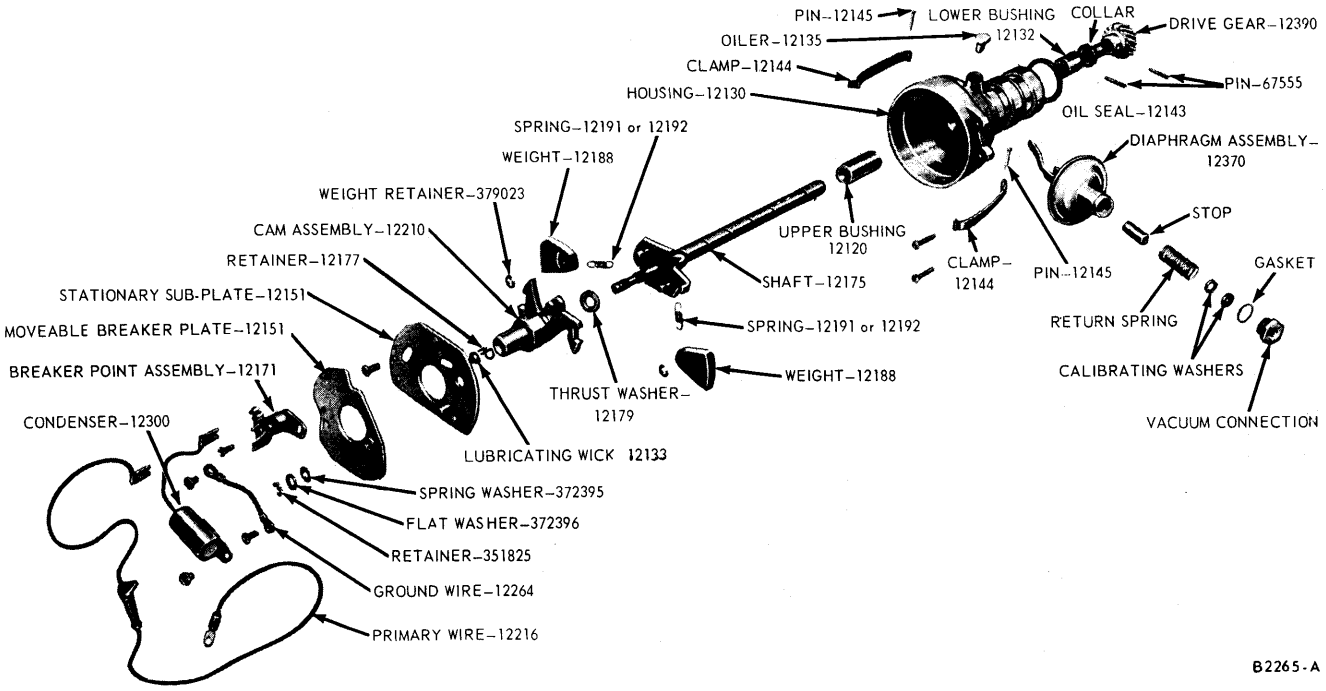


FIG. 5—Typical Dual Advance Distributor

To perform the operations in this section, it will be necessary to remove the distributor from the car and install it in a vise.

BENCH DISASSEMBLY

The distributor assembly is shown in Fig. 5.

CONVENTIONAL IGNITION SYSTEM DISTRIBUTOR

1. Remove the rotor.

2. Disconnect the primary and the condenser wires from the breaker point assembly.

3. Remove the breaker point assembly and condenser retaining screws. Lift the breaker point assembly and condenser out of the distributor.

4. Remove the spring clip that secures the diaphragm link to the movable breaker plate.

5. Remove the diaphragm retaining screws and slide the diaphragm out of the distributor.

6. Working from the inside of the distributor, pull the primary wire through the opening in the distributor.

7. Remove the spring clip, the flat washer, and the spring washer securing the breaker plate to the subplate.

8. Remove the sub-plate retaining screws and lift both plates out of the distributor.

9. Mark one of the distributor weight springs and its brackets. Also mark one of the weights and its pivot pin.

10. Carefully unhook and remove the weight springs.

11. Lift the lubricating wick from the cam assembly. Remove the cam assembly retainer and lift the cam assembly off the distributor shaft. Remove the thrust washer.

12. Remove the weight retainers and lift the weights out of the distributor.

13. Remove the distributor cap clamps.

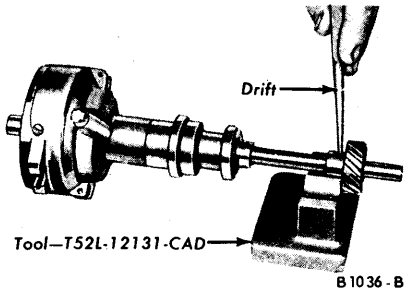


FIG. 6—Gear Pin Removal or Installation

14. If the gear and shaft are to be used again, mark the gear and the shaft so that the pin holes can be easily aligned for assembly. Remove the gear roll pin (Fig. 6), and then remove the gear (Fig. 7).

15. Remove the shaft collar roll pin (Fig. 8).

16. Invert the distributor and place it on a support plate in a position that will allow the distributor shaft to clear the support plate and press the shaft out of the collar and the distributor housing (Fig. 9).

17. Remove the distributor shaft upper bushing (Fig. 10). Invert the distributor and remove the lower bushing in a similar manner.

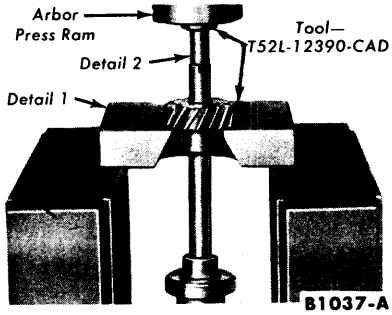


FIG. 7—Gear Removal

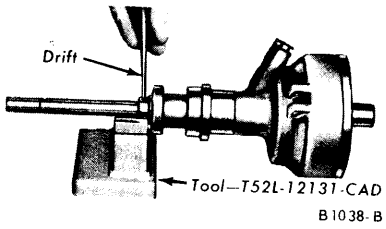


FIG. 8–Collar Retaining Pin Removal or Installation

TRANSISTOR IGNITION SYSTEM DISTRIBUTOR

1. Remove the rotor and the dust cover.
2. Disconnect the distributor-transistor lead from the breaker point assembly.
3. Remove the retaining screws from the breaker point assembly and lift the breaker point assembly out of the distributor.
4. Remove the spring clip that secures the diaphragm link to the movable breaker plate.
5. Remove the diaphragm retaining screws and slide the diaphragm out of the distributor.
6. Working from the inside of the distributor, pull the distributor-transistor wire through the opening in the distributor.

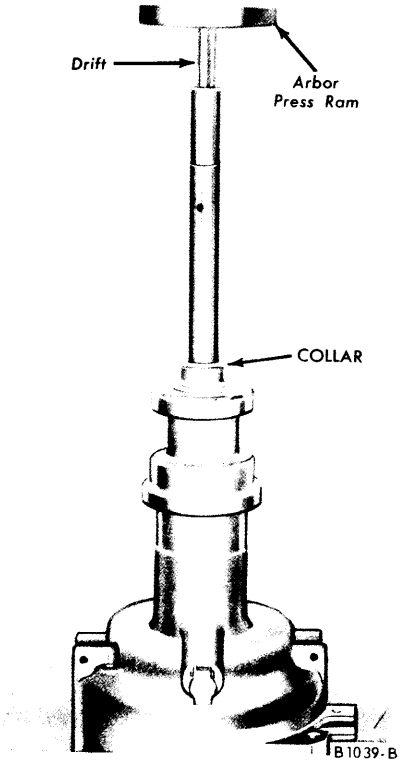


FIG. 9–Shaft Removal

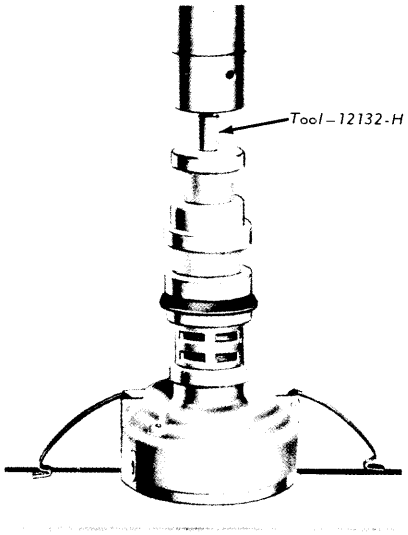


FIG. 10–Upper Bushing Removal

7. Follow steps 7-17 under "Conventional Ignition System Distributor".

BENCH ASSEMBLY

ORIGINAL SHAFT AND GEAR

Conventional Ignition System Distributors

1. Oil the new upper bushing, and position it on the bushing replacer tool. Install the upper bushing (Fig. 11). When the tool bottoms against the distributor base, the bushing will be installed to the correct depth.

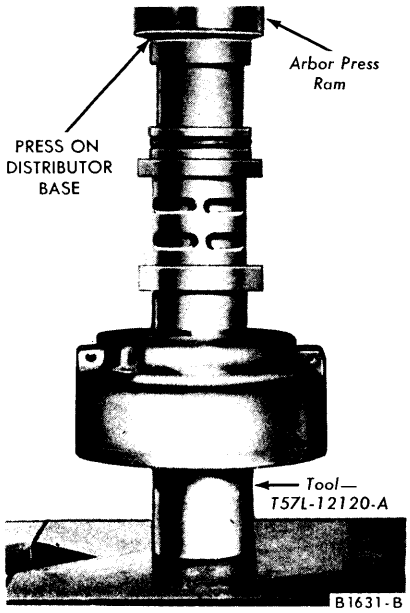


FIG. 11–Upper Bushing Installation

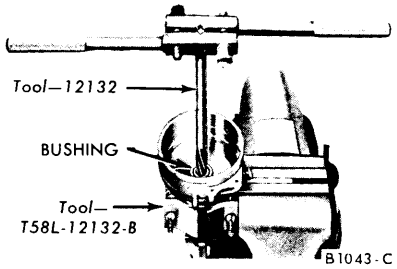


FIG. 12–Burnishing Bushing

Invert the distributor and install the lower bushing in a similar manner.

2. Burnish the bushing to the proper size (Fig. 12).
3. Oil the shaft and slide it into the distributor body.
4. Place the collar in position on the shaft and align the holes in the collar and the shaft, then install a new pin. Install the distributor cap clamps.
5. Check the shaft end play with a feeler gauge placed between the collar and the base of the distributor. If the end play is not within specifications, replace the shaft and gear.
6. Attach the distributor shaft supporting tool to the distributor. Tighten the backing screw in the tool enough to remove all shaft end play.
7. Install the assembly in a press. Press the gear on the shaft (Fig. 13), using the marks made on the gear and shaft as guides to align the pin holes.
8. Remove the distributor from the press. Install the gear retaining pin (Fig. 6).
9. Position the distributor in a vise. Fill the grooves in the weight pivot

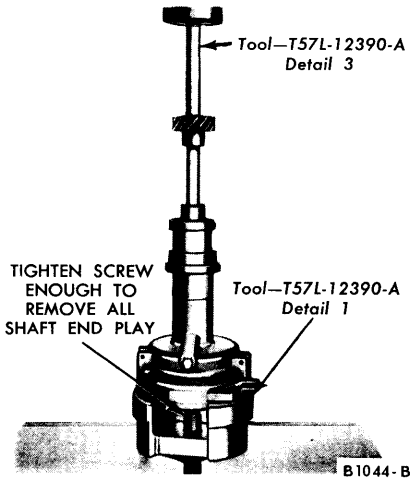


FIG. 13–Original Shaft and Gear Installation

pins with a distributor cam lubricant.

10. Position the weights in the distributor (the marked weight is placed on the marked pivot pin) and install the weight retainers.

11. Place the thrust washer on the shaft.

12. Fill the grooves in the upper portion of the distributor shaft with distributor cam lubricant.

13. Install the cam assembly. Be sure that the marked spring bracket on the cam assembly is near the marked spring bracket on the stop plate. Place a light film of distributor cam lubricant on the distributor cam lobes. Install the retainer and the wick. Saturate the wick with SAE 10W engine oil.

14. Install the weight springs. Be sure that the marked spring is attached to the marked spring brackets.

15. Place the breaker plate in position on the sub-plate.

16. Install the spring washer, the flat washer, and the spring clip that secures the breaker plate to the sub-plate.

17. Install the sub-plate hold down screws (the ground wire should be under the sub-plate hold down screw near the primary wire opening in the distributor).

18. Working from the inside of the distributor, push the primary wire through the opening in the distributor.

19. Slide the diaphragm into the opening in the distributor and place the link in its position.

20. Install the spring clip that secures the diaphragm link to the movable breaker plate and install the diaphragm retaining screws.

21. Place the breaker point assembly and the condenser in position and install the retaining screws. Be sure to place the ground wire under the breaker point assembly screw farthest from the breaker point contacts. Align and adjust the breaker point assembly by following the procedure in Part 9-1.

22. Connect the primary and condenser leads to the breaker point assembly.

23. Install the rotor and the distributor cap.

24. Check and adjust (if necessary) the centrifugal and vacuum advance (Refer to Part 9-1).

Transistor Ignition System Distributor

1. Follow steps 1-16 under "Conventional Ignition System Distributor."

2. Install the sub-plate hold down screws (the ground wire should be under the sub-plate hold down screw near the distributor-transistor wire opening in the distributor).

3. Working from the inside of the distributor, push the distributor-transistor wire through the opening in the distributor.

4. Slide the diaphragm into the opening in the distributor and place the link in its position.

5. Install the spring clip that secures the diaphragm link to the movable breaker plate and the diaphragm retaining screws.

6. Place the breaker point assembly in position and install the retaining screws.

7. Align and adjust the breaker point assembly by following the procedure in Part 9-1.

8. Connect the distributor-transistor wire to the breaker point assembly.

9. Check and adjust (if necessary) the centrifugal and vacuum advance (Refer to Part 9-1).

10. Install the dust cover and the rotor.

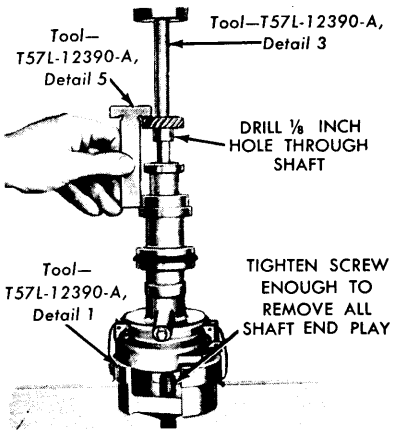


FIG. 14—New Shaft and Gear Installation

NEW SHAFT AND GEAR

Conventional and Transistor Ignition Distributor

The shaft and gear are placed as an assembly. One part should not be replaced without replacing the other. Refer to Fig. 5 for the correct location of the parts.

1. Follow steps 1, 2, and 3 under "Installing Original Shaft and Gear—Conventional Ignition System Distributor."

2. Attach the distributor shaft supporting tool to the distributor and install the assembly in a vise. Insert a 0.002-inch feeler gauge between the backing screw and the shaft. Tighten the backing screw on the tool enough to remove all shaft end play. Remove the feeler gauge and allow the shaft to rest on the backing screw. Slide the collar on the shaft. While holding the collar in place against the distributor base (Fig. 14), drill a ⅛-inch hole through the shaft using the access opening in the collar as a pilot.

3. Position the gear on the end of the shaft. Install the assembly in a press.

4. With the backing screw on the support tool tightened enough to remove all end play, press the gear on the shaft to the specified distance from the bottom face of the gear to the bottom face of the distributor mounting flange (Fig. 14). Drill a ⅛-inch hole through the shaft using the hole in the gear as a pilot.

5. Remove the distributor from the press and remove the support tool. Install the collar retaining pin (Fig. 8) and the gear retaining pin (Fig. 6).

6. On a conventional ignition system distributor, complete the assembly by following steps 8 thru 24 under "Installing Original Shaft and Gear—Conventional Ignition System Distributor."

On a transistor ignition system distributor, complete the assembly by following steps 8-16 under "Installing Original Shaft and Gear—Conventional Ignition System Distributor" and steps 2-10 under "Installing Original Shaft and Gear—Transistor Ignition System Distributor."

PART 9-3 SPECIFICATIONS

DISTRIBUTOR

GENERAL

Conventional Ignition System

Breaker Arm Spring Tension (Ounces)	17-20
Contact Spacing (Inches)	0.014-0.016
Dwell Angle at Idle Speed	26°-28½°

Transistor Ignition System

Breaker Arm Spring Tension (Ounces)	17-20
Contact Spacing (Inches)	0.019-0.021
Dwell Angle at Idle Speed	22°-24°

DIMENSIONS

Shaft End Play With Distributor Removed (Inches)	0.022-0.032
Gear Location Dimension, From Bottom of Gear to Bottom of Mounting Rib (Inches)	3.071-3.077

CONDENSER

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

IGNITION TIMING

Recommended Setting* ..... 6°BTDC

*For altitude operation, and/or to obtain optimum engine performance and fuel economy, the initial ignition timing may be advanced 5° over the "normal" setting. No further improvement in engine performance or fuel economy will be achieved by advancing beyond this point. Advance the timing progressively until engine detonation (spark knock) is evident under actual roadtest acceleration. Retard the timing until the detonation (spark knock) is eliminated. If the individual requirements of the ear and/or the use of sub-standard fuels dictate, the initial timing may have to be retarded from the recommended setting to eliminate detonation (spark knock). If retiming is necessary, it should be done progressively and not to exceed 2°BTDC.

ADVANCE CHARACTERISTICS

Note: The advance characteristics given apply to the distributor with the indicated number only. The distributor number is stamped on the distributor housing or on a plate attached to the distributor housing.

Conventional Ignition System (Distributor No. C5AF-12127-C) and Transistor Ignition System (Distributor No. C5SF-12127-B).

CENTRIFUGAL ADVANCE. Set the test stand to 0° at 250 rpm and 0 inches of vacuum.

Distributor (rpm)	Advance (Degrees)	Vacuum (Inches of Mercury)
450	1¼-2¼	0
500	3½-4½	0
800	5¾-6¾	0
1600	9-10½	0
2000	10¾-12	0

Maximum Advance Limit ..... 13°

ADVANCE CHARACTERISTICS (continued)

VACUUM ADVANCE. Set the test stand to 0° at 1000 rpm and 0 inches of vacuum.

Distributor (rpm)	Advance (Degrees)	Vacuum (Inches) of Mercury)
1000	2-5	8
1000	4-7	10
1000	5½-8½	14

Maximum Advance Limit ..... 8½°

SPARK PLUGS

Type	Autolite BF-42
Size	18 mm.
Gap (inches)	0.032-0.036
Torque (ft-lbs.)	15-20*

*When a new spark plug is installed in a new replacement cylinder head, torque the spark plug to 20-30 ft-lbs.

COIL

Conventional Ignition System

Primary Resistance (Ohms)*	1.40-1.54 (75° F.)
Secondary Resistance (Ohms)	8000-8800 (75° F.)
Amperage Draw	
Engine Stopped	4.5
Engine Idling	2.5
*Primary Circuit Resistor	1.30-1.40 (75° F.)

Transistor Ignition System

Primary Resistance (Ohms)*	0.226-0.252 (75° F.)
Secondary Resistance (Ohms)*	4900-5680 (75° F.)
Amperage Draw	
Engine Cranking	4.0
Engine Idling	5.0
*Primary Circuit Resistor	
Emittor	0.30-0.36 (75° F.)
Collector	0.39-0.47 (75° F.)
Base	7.00-9.00 (75° F.)

SPECIAL TOOLS

DESCRIPTION	TOOL NO.
Breaker point aligning tool	KD-111 or TK-419-A
Breaker point spring tension scale	12151
Bushing burnisher	12132
Bushing remover	12132-A
Bushing installer	T57L-12120-A
Distributor holding clamp	T58L-12132-B
Distributor testers	RE-236 RE-1416
Drive gear installing fixture	T57L-12390-A
Drive gear locating gauge	T57L-12390-A5
Drive gear remover kit	T52L-12390-CAD
Ignition scopes	RE-27-55 RE-651 RE-881
Tach-dwell tester	RE-27-44
Timing light	13-07