GUARDIAN TUNE

for the

SUPER CHEVROLET SERVICE

CORVAIR

PART II

PART I of Guardian Tune for the Corvair covered:

Mechanical Checks and Adjustments

In this film, we will see the procedures for:

Testing the Guardian Tune

TESTING THE GUARDIAN TUNE

Testing the tune-up proves the results of the mechanical work and uncovers any subnormal or borderline operating conditions which would affect engine performance or cause premature parts failure. Making the following tests eliminates sudden road breakdowns, gives the customer what he is looking for, and promotes return business.

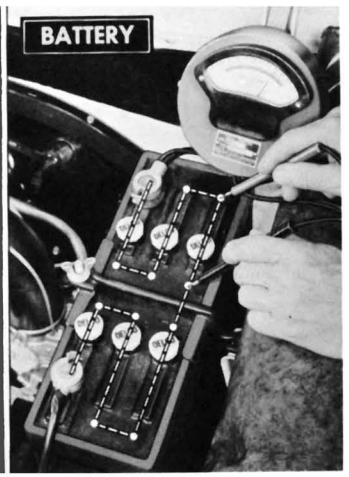
Throughout this film, various types of test equipment are demonstrated to show how and where meter connections are made and to emphasize gauge readings.

Because there are many makes of quality equipment available, the pieces shown in the service procedures do not form a recommendation of a particular manufacturer's product.

The service subjects will be covered in the order shown:

- BATTERY
- CRANKING VOLTAGE
- IGNITION PRIMARY CIRCUIT WIRING
- PRIMARY CIRCUIT OPERATING VOLTAGE
- CHARGING VOLTAGE
- DISTRIBUTOR PRIMARY RESISTANCE TEST
- DWELL AND DWELL VARIATION
- DISTRIBUTOR IDENTIFICATION
- IGNITION TIMING CHARTS
- DISTRIBUTOR ADVANCE
  - — ON-THE-CAR TESTING
  - — BENCH TESTING
- SECONDARY RESISTANCE
- COIL POLARITY
- IGNITION OUTPUT — SECONDARY LEAKAGE

The following test procedure replaces the former hydrometer state of charge, the capacity test and the 3-minute tests. Crank the engine for 3 seconds. If the engine starts, turn the ignition OFF. Turn the headlights ON (low beam) for 1 minute. Then test each cell, using a voltmeter having .01-volt divisions.



Compare individual cell readings and decide what needs to be done by using the following chart as a guide:

BATTERY CONDITION AND GUIDE CHART

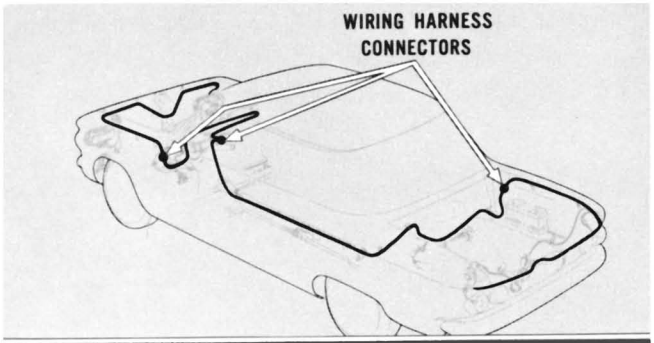
INDIVIDUAL CELL VOLTAGES	COMPARISON OF CELL VOLTAGES	BATTERY CONDITION	SOLUTION
More than 1.95 Volts on All Cells	Less than .05 Volts	Good	Maintain In Service
Less than 1.95 Volts on All Cells	Unable to Test	Discharged	Recharge and Retest
More than 1.95 Volts on Any Cell	More than .05 Volts	Poor	Replace Battery
Less than 1.95 Volts on Any Cell	Less than .05 Volts	Good	Needs Recharging

Battery Recharge: The following information supersedes all other Corvair recharging procedures.

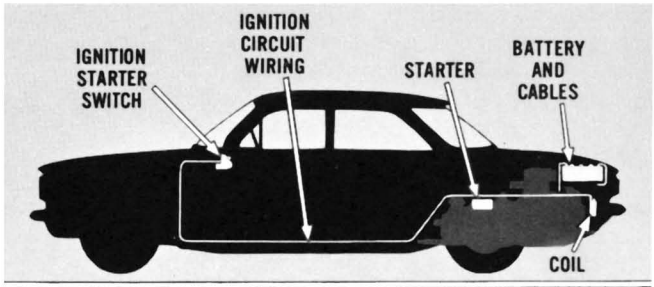
- **Slow Charge:** Batteries may be slow charged at 5 amperes for a minimum of 8 hours.
- **Fast Charge:** If time or equipment prevents slow charging, boost charge with a fast charging unit at 35 amperes for 1 hour. To bring battery closer to a full charge, the fast charger rate should then be reduced to 5 amperes for an additional 4 hours.

CAUTION: The charge rate must be tapered to a lower limit if electrolyte reaches 125 degrees or when gassing becomes excessive.

If the customer complains of battery rundown overnight or during a short period of time, and the light load test indicates all cells are in good condition, perform the following test. Disconnect the positive battery cable from its post and hook up a voltmeter between battery post and cable. All switches and accessories must be OFF.



If meter reads a voltage figure, it indicates a short in the wiring or switches. Disconnect each individual wiring harness at the connectors until the voltmeter reads zero, then trace the cause in that particular circuit.



A reading of 9 volts or more at normal cranking speed indicates the starter switch contacts, the ignition circuit wiring to coil, the starter and battery and cables are in good operating condition. A proper test reading also indicates that sufficient voltage is being delivered to the ignition system during engine cranking.

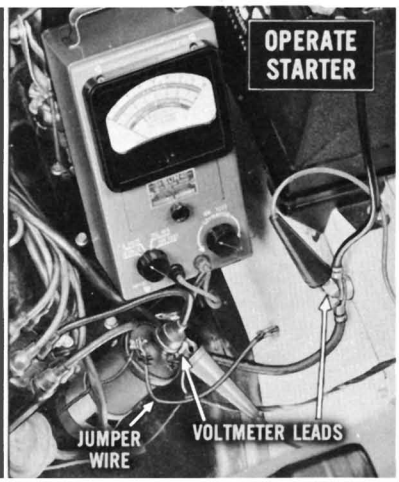
CRANKING VOLTAGE

This test will quickly tell the operating condition of the battery, battery cables, ignition switch wiring and ignition switch contacts. The resistor wire (in series with the coil and ignition switch) is by-passed during the check.

EXCESSIVE VOLTAGE DROP

A reading below 9 volts indicates an excessive voltage drop in the circuit, which must be found and corrected. To help locate the cause of low voltage, proceed to the following test.

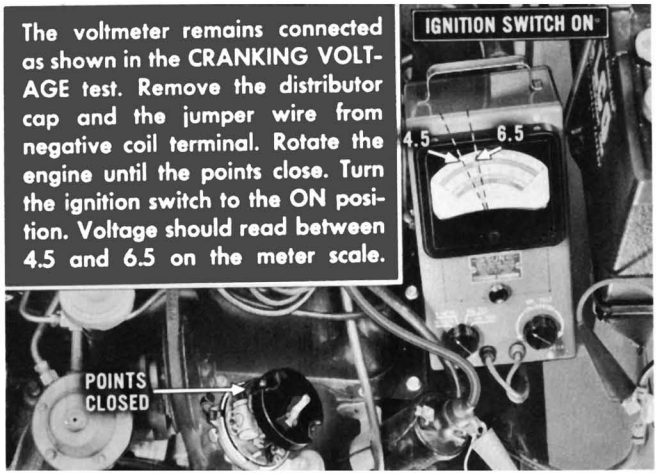
Install a jumper wire from the negative coil terminal to ground to prevent the engine from firing. Connect voltmeter leads to coil primary terminal (positive terminal) and to a good clean ground. Operate the starter using the ignition-starter switch.



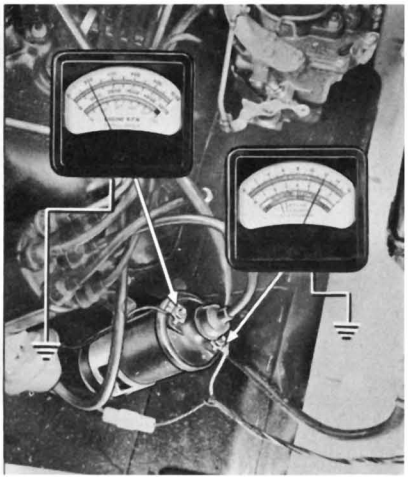
IGNITION PRIMARY CIRCUIT WIRING

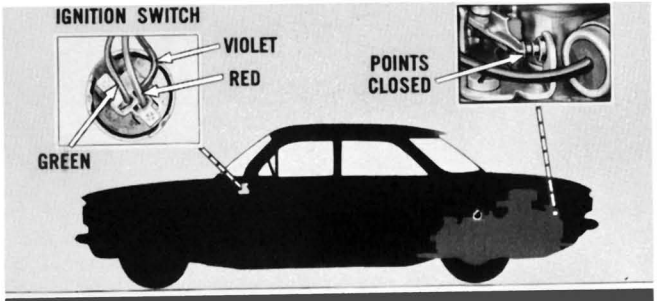
This test checks the same electrical components as the previous test, with one exception: Starter motor "draw" is eliminated, and the resistor wire "draw" will now be represented in the test readings.

The voltmeter remains connected as shown in the CRANKING VOLTAGE test. Remove the distributor cap and the jumper wire from negative coil terminal. Rotate the engine until the points close. Turn the ignition switch to the ON position. Voltage should read between 4.5 and 6.5 on the meter scale.

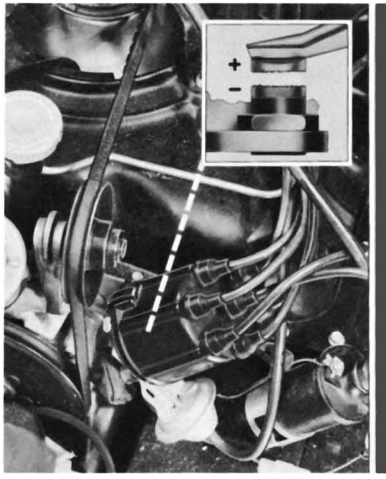


Connect the voltmeter as described for the CRANKING VOLTAGE test. Connect a tachometer. Start the engine and run at 1000 rpm. The voltmeter should read between 10 and 12.5 volts.

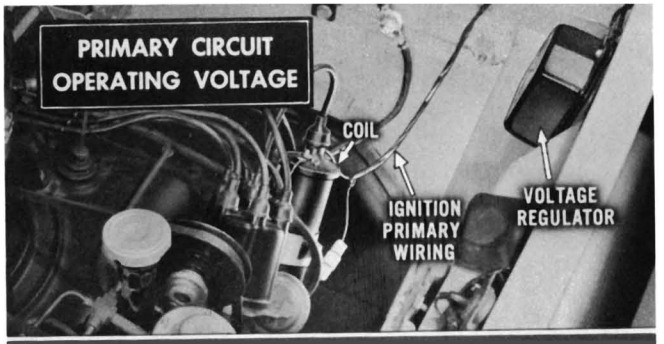




A reading of less than 4.5 volts (points closed) may be caused by loose or corroded wiring at the ignition switch, or main wiring harness connectors, or poor internal contacts in the ignition switch. Inspect all wiring and connectors and correct any electrical difficulty found. If this does not eliminate the cause of low voltage, install a new ignition switch.



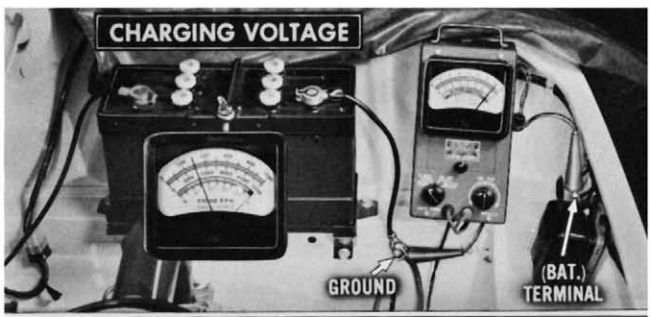
Primary circuit operating voltage over 12.5 volts causes excessive current flow through the points (when closed). This produces excessive heat at the points, which, in turn, results in rapid point burning or bluing. In doing so, an oxide coating forms on the point contact surfaces.



This test is a quick operating check of the voltage regulator, the ignition primary wiring and the coil primary windings. It will also indicate whether short distributor point life is caused by high operating voltage.

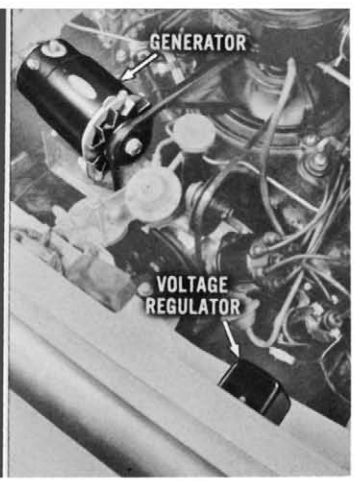
Excessive resistance which builds up at the point contact surfaces eventually limits primary circuit current flow. Therefore the result will be hard starting or an ignition miss on acceleration or at high speeds. When primary circuit operating voltage is over 12.5 volts, the charging system should be tested.

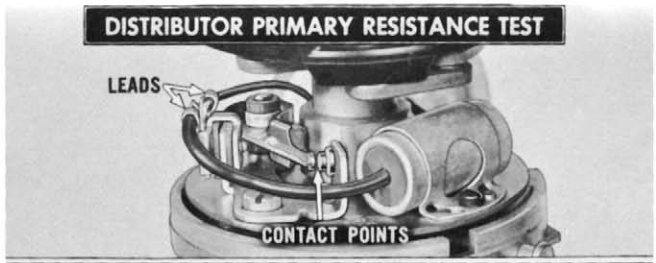
GENERAL NOTE: During primary circuit operating voltage tests or charging system tests, it is important to bear in mind that the voltage regulator is "speed sensitive" and "temperature sensitive." Therefore, when the gauge reading is noted, the voltage regulator must be at operating temperature, and engine rpm should be maintained at the exact speed called for in the various tests.



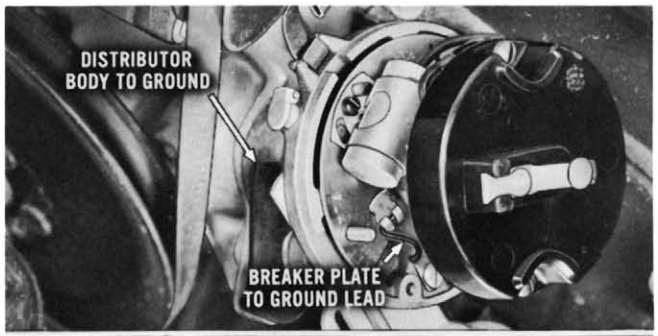
Connect the voltmeter to the battery (BAT.) terminal of the voltage regulator and to a good ground. Run the engine at a constant 1500 rpm. A reading of 14 to 15 volts indicates the charging system and voltage regulator are operating satisfactorily.

A charging rate above 15 volts or below 14 volts indicates additional tests are necessary to localize the trouble. The difficulty may be caused by poor electrical connections, excessive resistance in the regulator ground circuit, a defective generator field circuit, a misadjusted or improperly operating voltage regulator.



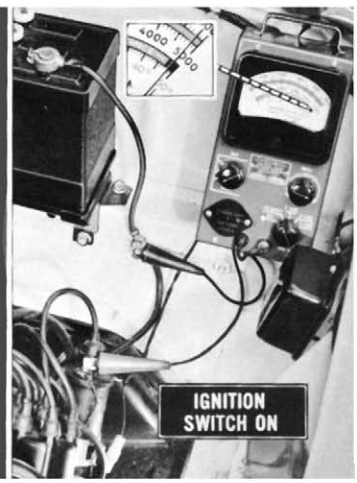


This test measures primary circuit resistance within the distributor assembly. Excessive resistance will reduce primary current flow through the coil, thus weakening its ability to handle peak loads. Factors causing this condition may be traced to oxidized contact points, loose or improperly connected leads, or leads which are frayed internally. Also contributing to excessive resistance may be —



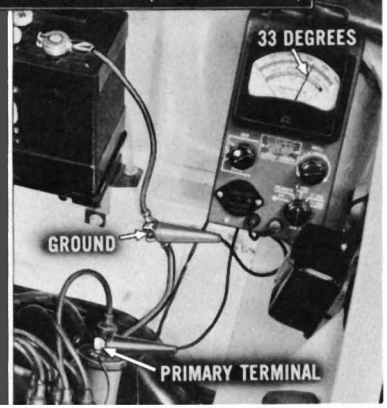
— a poor ground connection between breaker plate and distributor body, or a poor ground at the distributor mounting to the engine. Testing for these conditions requires the use of a meter as follows:

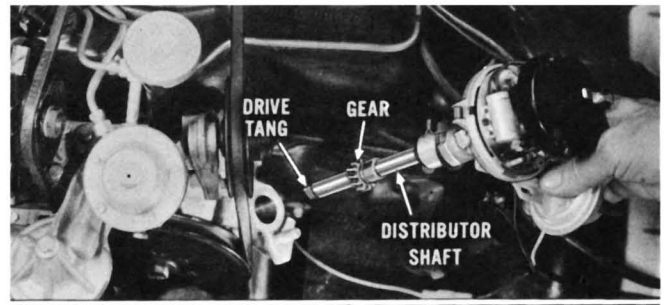
Connect the test meter as directed by the manufacturer. Turn the ignition-starter switch ON. The meter should read in the black bar when the points are closed. An incorrect meter reading indicates a poor distributor primary circuit which must be corrected before proceeding with tests.



DWELL AND DWELL VARIATION (ALL MODELS)

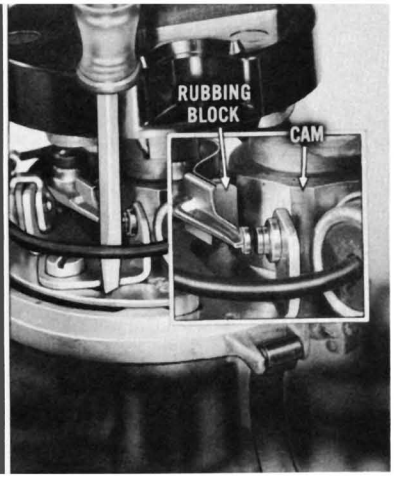
Connect a dwell meter to the primary terminal of the coil, distributor side, and to a good clean ground. With the engine at normal idle speed, the dwell should be 33 degrees.





If dwell varies more than the 3-degree limit, pull the distributor (noting rotor position) and check the distributor shaft, the bushings, the breaker plate, gear teeth and drive tang. If any parts are worn or loose, service or replace as required. Repeat dwell tests.

If dwell reading is not within limits, recheck the point gap and, if necessary, regap points to obtain proper dwell specifications. Use a screw driver as shown to make adjustment. Also inspect carefully for a misaligned point rubbing block or a worn distributor cam.

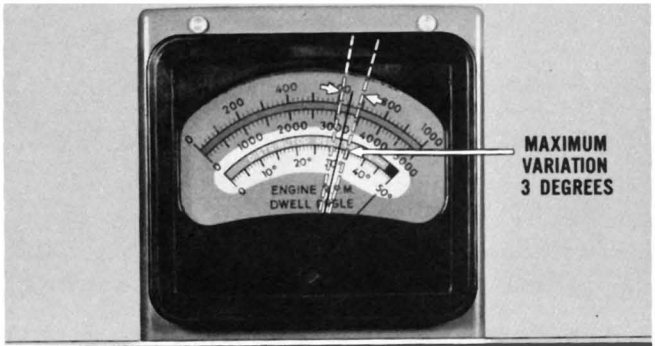


DISTRIBUTOR IDENTIFICATION

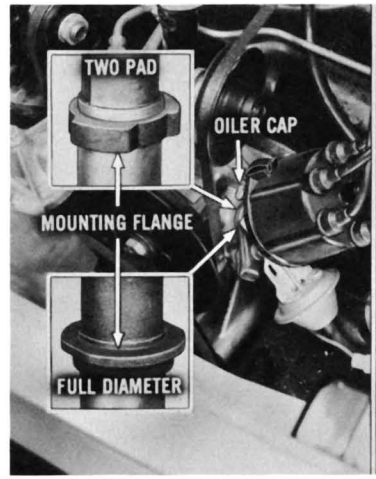
Before checking ignition timing and the degrees of advance, the distributor model must be correctly identified.

Recent changes have been made in the construction of the centrifugal advance mechanism and in distributor model application. These changes provide maximum engine-operating efficiency for the various power team options.

Knowing the distributor model will also tell whether the engine is the high-performance or regular-production unit.



Slowly bring engine up to a constant 1500 rpm. Note the dwell reading. Return engine to idle speed and note the dwell reading again. Dwell reading should not vary more than a total of 3 degrees within the rpm range.



Check the distributor color-coded oiler cap and determine the type of distributor mounting flange used. Two designs are in service, the two-pad type or the full-diameter type. When the oiler cap color and flange design are known, check the following charts to determine the correct specifications.

REGULAR PRODUCTION ENGINES IGNITION TIMING CHART

POWER TEAM	DISTRIBUTOR PART NO.	OILER CAP COLOR	IGNITION TIMING	MOUNTING FLANGE
Early Production: All	1110252	Cadmium	4 BTDC*	2 Pads
Late Production: Standard Transmission	1110258	Zinc	4 BTDC	Full Diameter
Intermediate Production: Powerglide	1110256	Black	16 BTDC**	2 Pads
Late Production: Powerglide	1110259	Black	13 BTDC	Full Diameter

*Powerglide models which have the field-modified distributor (see Part I) are set to 16 degrees initial timing.

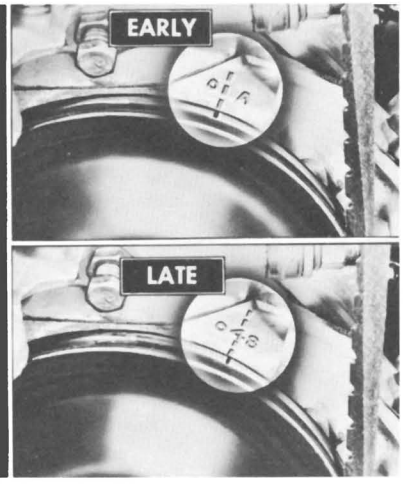
**If detonation or pre-ignition occurs during the road-test, retard the timing to 14 degrees.

HIGH-PERFORMANCE ENGINES IGNITION TIMING CHART

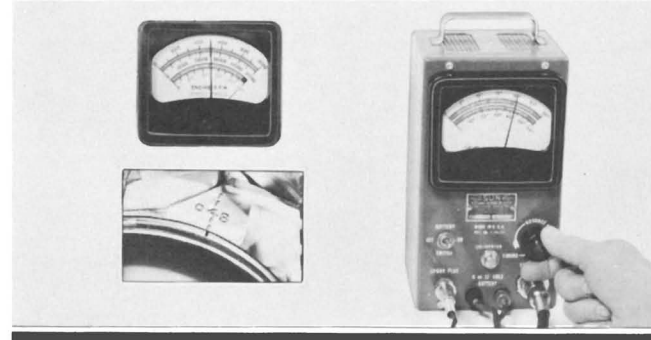
POWER TEAM	DISTRIBUTOR PART NO.	OILER CAP COLOR	IGNITION TIMING	MOUNTING FLANGE
Early Production: All	1110257	Copper	16 BTDC**	2 Pads
Late Production: All	1110260	Copper	13 BTDC	Full Diameter

**If detonation or pre-ignition occurs during the road-test, retard the timing to 14 degrees.

When timing early model regular-production engines equipped with a standard transmission, the 4-degree BTDC setting is ⅛ the distance between the letters "O" and "A." Late model engines have a 4-degree indicator mark.



This on-the-car test quickly checks the degrees of spark advance produced by the centrifugal and vacuum control units. Connect a tachometer and advance tester which is equipped with a timing light. Initial timing must be correct to make this check.



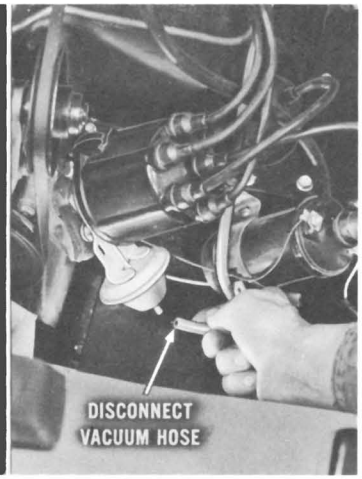
Bring engine rpm up to 2500. Adjust meter knob to electronically align timing mark to proper initial setting. Check the following chart for correct advance specifications.

DISTRIBUTOR ADVANCE SPECIFICATIONS — ON-THE-CAR TESTING

Power Team	Oiler Cap Color	Mounting Flange	Vacuum Hose Connected Degrees	Vacuum Hose Disconnected Degrees
Early Production: All	Cadmium	2 Pads	41° to 45°	18° to 22°
Late Production: Standard Transmission	Zinc	Full Diameter	41° to 45°	18° to 22°
Intermediate Production: Powerglide	Black	2 Pads	29½° to 33½°	6½° to 10½°
Late Production: Powerglide	Black	Full Diameter	32½° to 36½°	9½° to 13½°
Early High-Performance Engines	Copper	2 Pads	26° to 30°	11° to 15°
Late High-Performance Engines	Copper	Full Diameter	26° to 30°	11° to 15°

NOTE: All figures are read in "engine degrees" and at 2500 rpm.

If the degrees of advance is incorrect with the vacuum hose connected, disconnect the vacuum control line at the carburetor to obtain only a centrifugal advance reading. Repeat the test procedure at 2500 rpm.

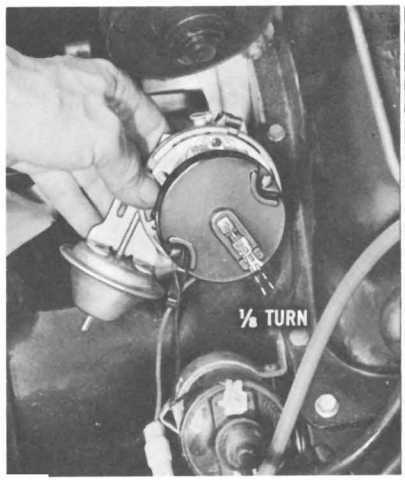


When testing distributor operation in a bench test unit, the degrees of advance should be within the specifications shown.

OILER CAP	DISTRIBUTOR PART NO.	CENTRIFUGAL ADVANCE*	RPM*	VACUUM ADVANCE DEGREES (Hg)	DWELL
Cadmium or Zinc	1110252 1110258	0° 16°	200 1800	0° at 6" 23° at 15.2"	33
Black	1110256 1110259	0° 10°	850 1800	0° at 7" 23° at 16"	33
Copper	1110257	0° 3.2° 12°	350 600 2400	0° at 8" 15° at 15.5"	33
	1110260			0° at 6" 23° at 15.2"	

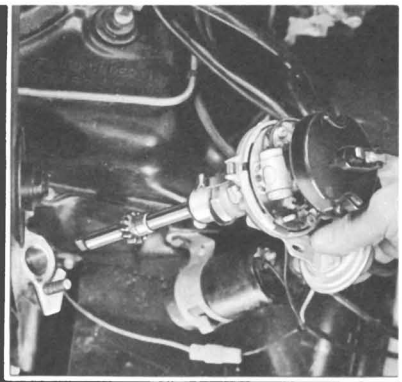
*NOTE: Advance specifications are shown in DISTRIBUTOR RPM and DISTRIBUTOR degrees.

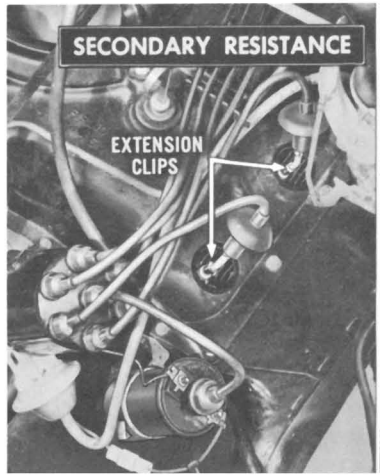
If centrifugal advance now reads correctly within the limits shown on the advance specification chart, the cause of improper total advance is improper vacuum control system operation. If necessary, remove distributor (note rotor position) and install a new control unit. Set advance plate to 23 degrees.



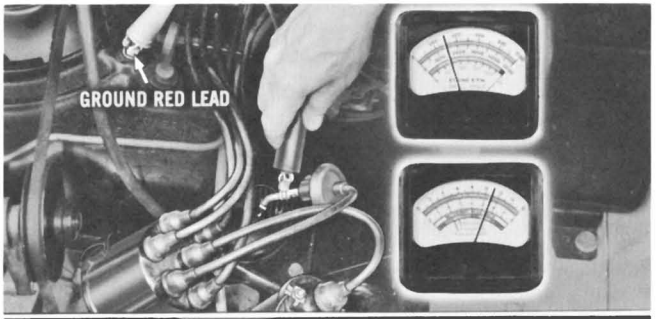
Reinstall distributor by turning rotor about ⅛ turn in a counterclockwise direction past the mark (or noted position) previously made. Mesh gears, install clamp and all connections. Install distributor cap and recheck timing.

If the advance reading is not within the limits as specified, with the vacuum hose connected or disconnected, the distributor must be removed from the car and overhauled. Note or mark rotor arm position. See Pages 8-31 and 8-32 of the Corvair Shop Manual for service instructions.





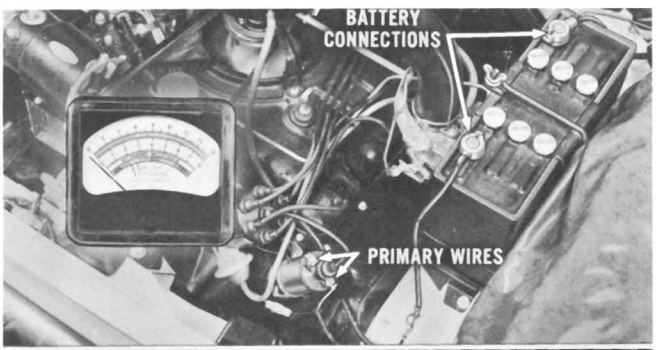
This test checks the ability of the secondary circuit to conduct the proper voltage and current to the spark plugs. Install extension clips between the plug terminals and plug wires.



Run the engine at 1500 rpm. Ground the red lead of the secondary resistance tester, then touch each plug (in order) with the black lead. A uniform reading of "5" to "5½" within the GOOD range indicates the secondary circuit components are in good operating condition.

COIL POLARITY

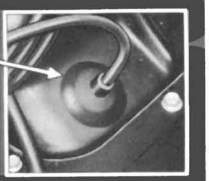
This test is made with the same meter and at the same time as the secondary resistance test. Correct meter readings will indicate that the coil is properly installed for polarity and the battery is properly installed and charged in the correct direction.



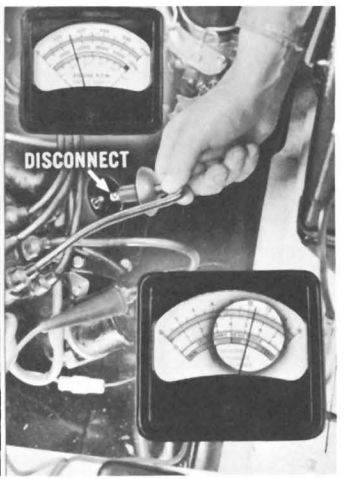
If the pointer reads off the scale to the left with the meter properly connected, it indicates reversed coil polarity. Check for reversed primary wires, battery connections, or battery charged incorrectly. Service as required.

IGNITION OUTPUT — SECONDARY LEAKAGE

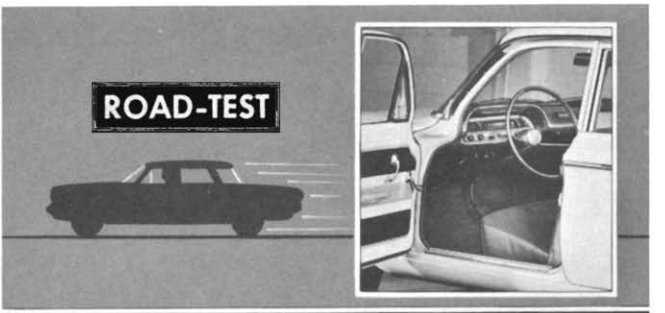
The output test checks the over-all efficiency of the ignition system. The secondary leakage test checks the condition of the secondary wiring insulation. Hook up the meter as directed by the manufacturer. Loosen all spark plug wires and access covers (do not disconnect).



With the meter set as directed by the manufacturer and the engine running at 1500 rpm, disconnect one plug wire. Meter should read in the GOOD band of the scale. Replace wire and repeat test for each plug. Good readings indicate the ignition output and secondary insulation are good and there are no carbon paths in the distributor cap.



If the customer has made a serious complaint about excessive fuel consumption, it is suggested that the vehicle be road-tested with a Gas-per-Mile Gauge such as J-8381. Specific instructions are packaged with the unit and are also described in detail in the Chevrolet Service News of November, 1959, Pages 4 and 5. The mileage test should be made with the customer present and will help show any unusual driving habits which have contributed to the poor mileage complaint.



A final CHECK of the tune-up should be performed on a ROAD-TEST. Note engine operation at the various speeds and throttle openings. Before turning the repair order in as a completed job, make sure that all grease or dirt on floor mats, seats, handles or steering wheel is wiped clean.

Engines which do not indicate the need for a thorough checking and testing may require only a smaller series of service operations which have been previously covered.

This is called: **ENGINE SMOOTH-UP**

This type of tune-up, which is only part of the over-all or complete Guardian Tune-up, consists of a:

- CYLINDER BALANCE OR COMPRESSION TEST
- CHECKING, CLEANING OR REPLACING PLUGS
- BATTERY TEST
- DISTRIBUTOR CHECKS AND CORRECTIONS
- SET TIMING
- SYNCHRONIZE CARBURETORS, ADJUST IDLE RPM AND MIXTURE
- ROAD-TEST

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