

FOREWORD

This booklet contains a complete review of the discus-
sional slidefilms (Part 1 and Part 2—Guardian Tune
for the Corvair). Keep at least one copy of this booklet
in the Service Department file of Technical Information.

TABLE OF CONTENTS

PART I — MECHANICAL CHECKS AND ADJUSTMENTS

	Page
BEFORE THE TUNE: PRELIMINARY STEPS . . .	2
CYLINDER EFFICIENCY	3
Cylinder Balance Test	3
Compression Test	5
Cylinder Leakage Test	6
SPARK PLUG SERVICE	6
DISTRIBUTOR SERVICE	8
Distributor Centrifugal and Vacuum Advance . . .	9
Vacuum Control Setting (All Models)	10
Distributor Identification	11
Distributor Points	12
Distributor Lubrication	12
FUEL LINE FILTER SERVICE	13
FUEL PUMP SERVICE	13
NORMALIZE ENGINE	13
CHECK COOLING AIR VALVE	14
CARBURETOR ADJUSTMENT PROCEDURES	14
Preliminary Checks	15
Linkage Check: Full Throttle	16

	Page
Synchronizing the Carburetors	17
Choke Unloading	20
Fast Idle Adjustment	20
Slow Idle and Idle Mixture Adjustment	20
Choke Adjustment	21
AIR CLEANER SERVICE	21
BATTERY AND BATTERY CABLE SERVICE	23
FAN BELT SERVICE	23
GENERATOR SERVICE	24

PART II — TESTING THE GUARDIAN TUNE

	Page
BATTERY	26
CRANKING VOLTAGE	28
IGNITION PRIMARY CIRCUIT WIRING	29
PRIMARY CIRCUIT OPERATING VOLTAGE	30
CHARGING VOLTAGE	32
DISTRIBUTOR PRIMARY RESISTANCE TEST	33
DWELL AND DWELL VARIATION	34
DISTRIBUTOR IDENTIFICATION	35
IGNITION TIMING CHART	36
Regular Production Engines	36
High Performance Engines	36
DISTRIBUTOR ADVANCE	37
On-the-Car Testing	37
Bench Testing	39
SECONDARY RESISTANCE	39
COIL POLARITY	40
IGNITION OUTPUT: SECONDARY LEAKAGE	41
ROAD TEST	42

GUARDIAN TUNE

for the



CORVAIR

PART I

COPYRIGHT 1960 CHEVROLET MOTOR DIVISION GENERAL MOTORS CORPORATION

Guardian Tune-up Procedures for the Corvaire engine have been separated into two major areas of service work.

This film, Part I, contains complete information

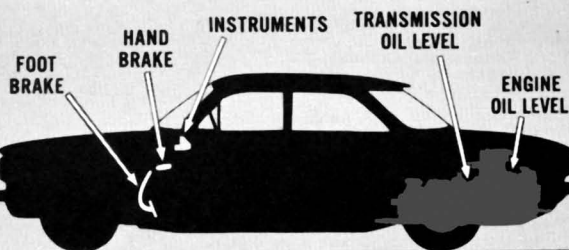
on the **MECHANICAL CHECKS AND ADJUSTMENTS**

See Part II for —

TESTING THE GUARDIAN TUNE

Tuning the Corvaire engine remains basically the same as for regular passenger-car engines. However, certain new and different precautions and service procedures must be observed. Your Review Booklet contains a complete reprint of the films, Part I and Part II.

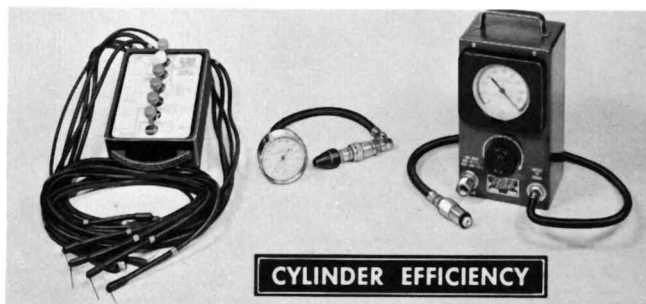
BEFORE THE TUNE: PRELIMINARY STEPS



To protect the mechanic and dealership and to prevent damage to the engine, car interiors, and equipment, always check brake operation (including parking brake), instruments and telltale lights, engine and automatic transmission oil level. Install fender and seat covers.

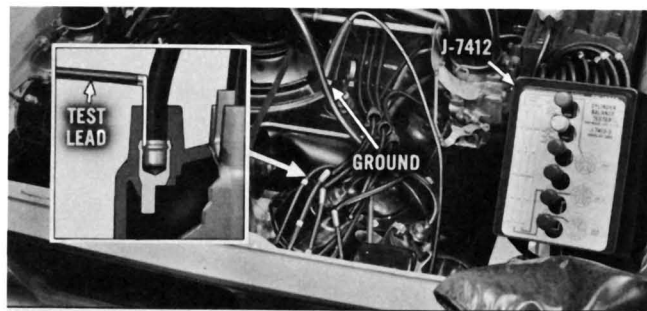
The mechanical procedures of the tune-up are listed in a very logical and practical service order. Follow the operations as listed:

- CYLINDER EFFICIENCY
- SPARK PLUG SERVICE
- DISTRIBUTOR SERVICE
- FUEL LINE FILTER SERVICE
- FUEL PUMP SERVICE
- NORMALIZE ENGINE
- CHECK COOLING AIR VALVE
- CARBURETOR ADJUSTMENT PROCEDURES
- AIR CLEANER SERVICE
- BATTERY AND BATTERY CABLE SERVICE
- FAN BELT SERVICE
- GENERATOR SERVICE



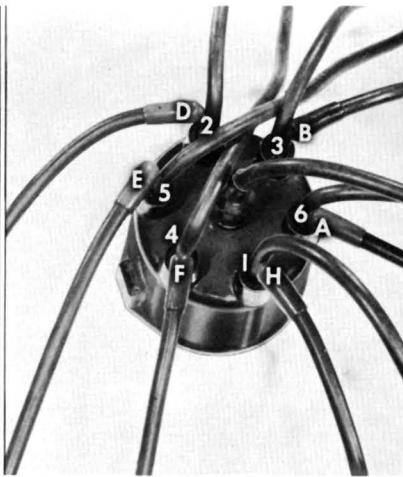
CYLINDER EFFICIENCY

Maximum results from the tune-up depend on peak operating efficiency of individual cylinders. Three practical methods which can be used to provide this information are: the cylinder balance tester, the compression gauge, and the cylinder leakage tester.

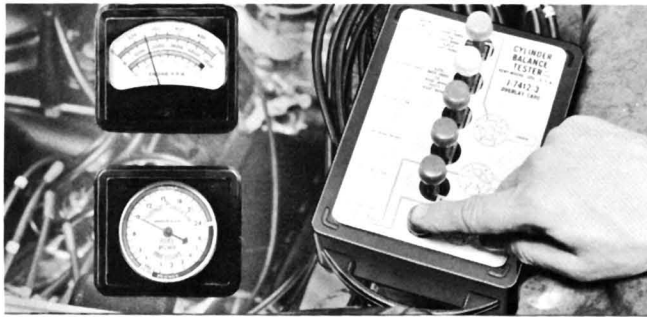
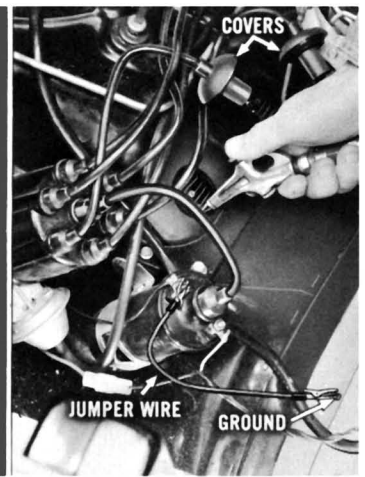


Cylinder Balance Test: This test quickly compares power output of pairs or banks of cylinders through rpm and vacuum readings. Insert the test lead prongs of J-7412 into the distributor cap spark plug sockets. Ground the unit. **CAUTION:** Do not pierce the wires.

For ease of hookup of the test leads to the distributor cap sockets, each of the test lead wires is lettered. The lead marked "H" is inserted into distributor cap socket No. 1. The others are then installed as follows: F-4, E-5, D-2, B-3, A-6.



Compression Test: Connect a jumper wire from negative side of coil to ground. Carefully pull neoprene covers to disconnect plug wires. Loosen all plugs, then blow compressed air around the plug cavities to remove any dirt which may drop into the cylinders. Remove all plugs.



Rotate the fast idle cam to obtain a constant 1500 rpm. Depress the panel buttons in the order shown on the overlay card. Note vacuum and rpm for each pair or bank of cylinders being tested. Equal gauge readings indicate that the engine can be successfully tuned.



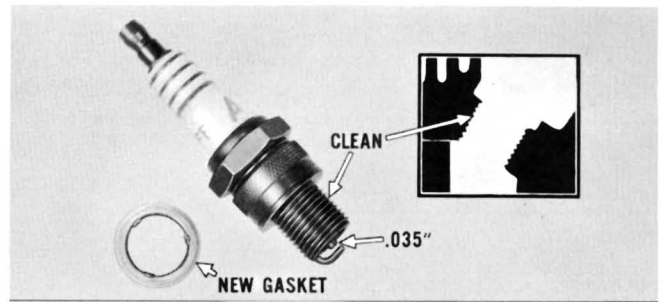
Remove the air cleaner and hoses. Block or hold the accelerator rod in the wide-open throttle position. Crank the engine over at least FOUR compression strokes. Compression should read at least 130 psi. Variation between the highest and lowest reading cylinders should not be more than 20 psi.

More than 1" variation of vacuum and 50 rpm between cylinders indicates unequal power output. A compression test or a cylinder leakage test should be performed to determine if the cause of cylinder "unbalance" is poor compression or if other factors are at fault which can be corrected during normal tune-up procedures.

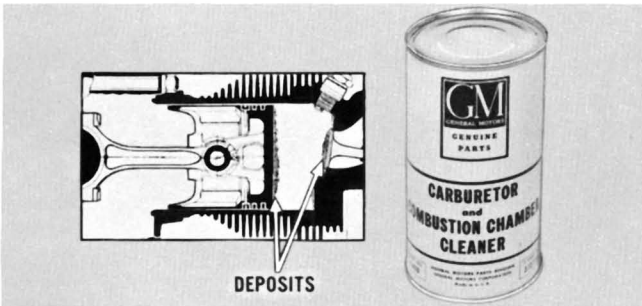
GENERAL NOTE: If one or more cylinders are below minimum compression, stop all work and advise the customer. Injecting oil into the weak cylinder to determine if valves or rings are at fault is not reliable. Oil will not seal the compression rings as in "L" head or "V8" engines, because of the horizontally opposed cylinder arrangement.



Cylinder Leakage Test: This test will help locate the exact cause of low compression through the use of compressed air. Air leakage into manifolds with the piston at TDC (compression stroke) means valve trouble. Leakage into the crankcase indicates faulty rings. Air escaping between head and piston cylinder means a defective head gasket.



If new plugs are needed, install AC 46FF for normal city driving. For drivers who travel at high speeds or on long trips, use colder heat range spark plugs, AC 44FF. Gap new or cleaned plugs .035". ALWAYS use new gaskets and make sure the cylinder head and plug threads are clean.



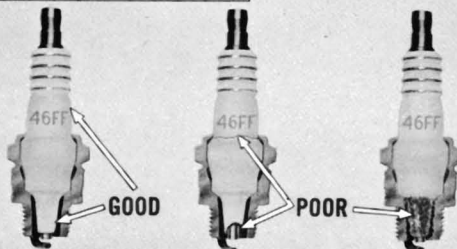
Unusually high compression may be caused by excessive combustion chamber deposits. These deposits can be inexpensively removed with GM Carburetor and Combustion Chamber Cleaner, Part Number 3727702. Follow the instructions on the can label.

GENERAL NOTE

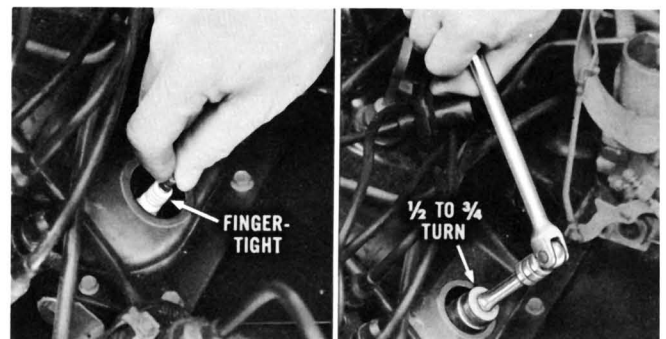


Corvair spark plugs also differ from the conventional 14MM type used in regular passenger car engines, both in thread length and thread design. Thread length is longer to project into the combustion chamber correctly and the use of "rolled" threads helps to eliminate possible damage to the aluminum cylinder head.

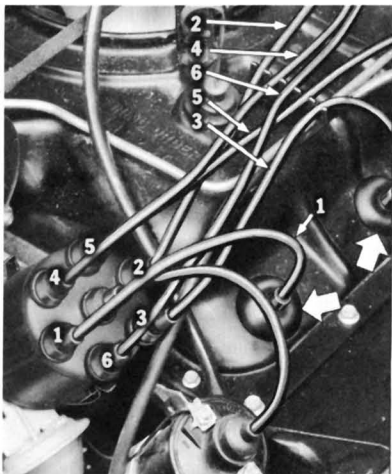
SPARK PLUG SERVICE



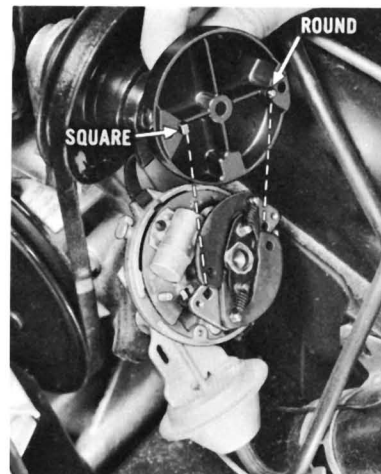
If the cylinder balance test results were good or if the compression readings were normal, carefully inspect all plugs to determine if they will fire properly until the next tune. This requires good judgment, experience, mileage information and, if possible, a knowledge of owner driving habits.



Screw the plugs all the way down until they seat on the gasket finger-tight. Tighten the plugs $\frac{1}{2}$ to $\frac{3}{4}$ turn further to provide the proper seal. If a torque wrench is used, tighten plugs to 20 to 25 foot-pounds.



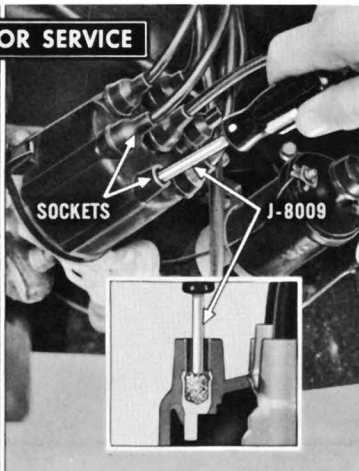
Connect all plug wires and plug covers. Improperly installed covers reduce the efficiency of the air pressure cooling system, and can cause engine overheating. Check plug wire routing. Cross firing may occur if improperly positioned.



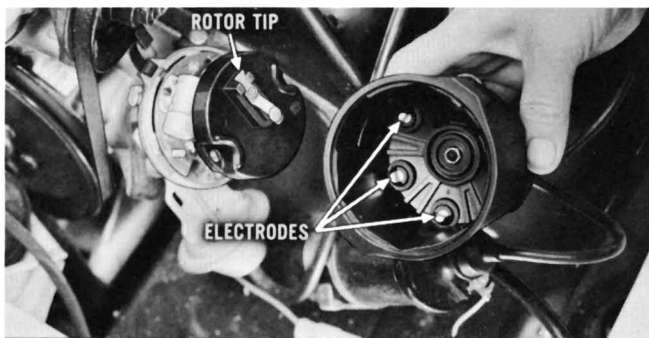
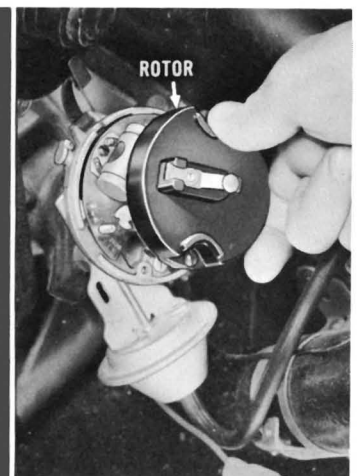
When reassembling or installing a rotor, note the round and square dowels for proper positioning. Tighten attaching screws evenly to avoid breakage.

DISTRIBUTOR SERVICE

Inspect spark plug and secondary coil wire sockets. Clean dirty or corroded sockets using a cleaning brush such as J-8009. Clean the outer surfaces of the cap with a clean, dry cloth. Check carefully for hairline cracks or other damage. Replace if necessary.

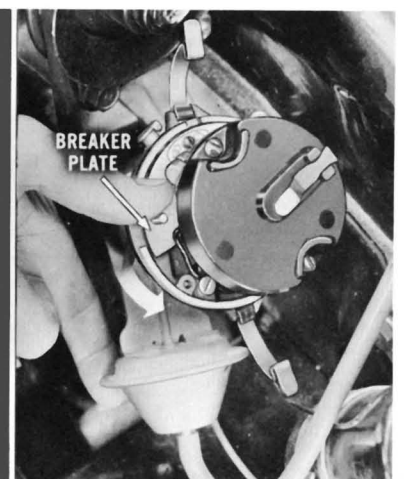


Distributor Centrifugal and Vacuum Advance:
Turn the rotor clockwise until it reaches the stop, then release. The centrifugal advance springs should quickly return the rotor to the retarded position.

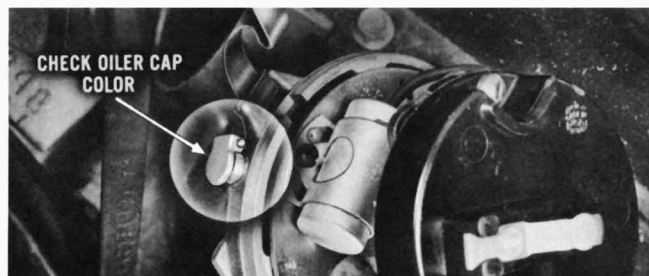


Wipe the inside of the cap and rotor surfaces with a clean, dry cloth. If chipped, cracked or showing signs of carbonized paths, replace. If the rotor tip or the cap electrodes are badly burned, replace.

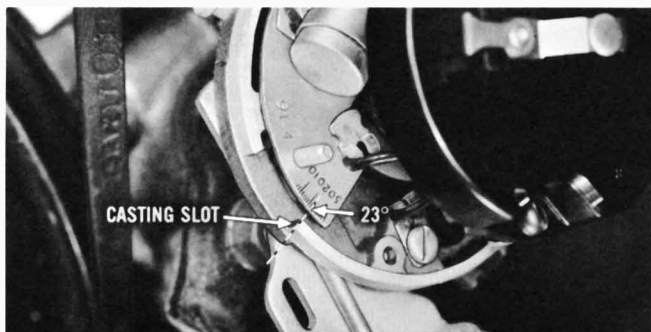
Turn the vacuum control breaker plate counterclockwise. The vacuum control spring should return the breaker plate to its retarded position without any delay.



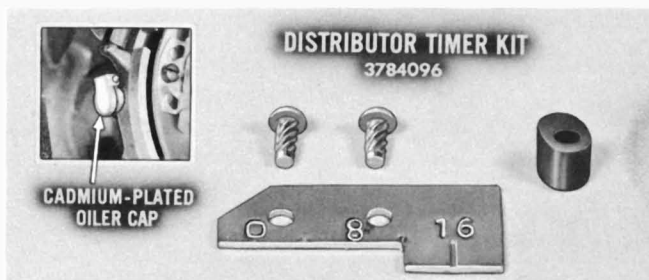
If either the rotor or breaker plate does not return promptly to its retarded position, remove the distributor from the engine and correct the cause of binding or stiffness before proceeding with the tune-up. Improper operation of either of these spark control units will directly affect distributor timing, the degree of spark advance, and cause sluggish engine performance.



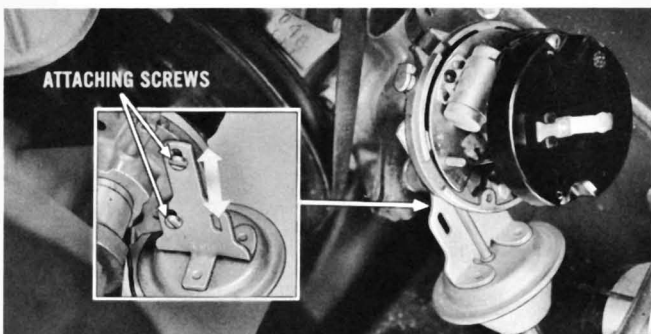
Distributor Identification: When tuning Powerglide-equipped engines, check the distributor oiler cap. A **BLACK** cap indicates the centrifugal advance mechanism is the intermediate or late type and has a specific advance curve. A copper-plated cap indicates the engine is the high-performance unit.



Vacuum Control Setting (all models): The vacuum control is properly set when the 23-degree mark on the calibrated scale is aligned to the edge of the casting slot on the distributor body.



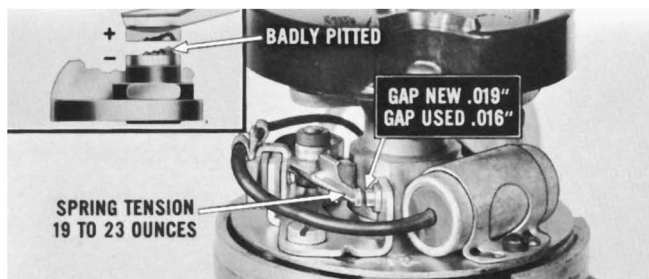
All engines teamed with Powerglide which have a cadmium-plated oiler cap should have the distributor modified. Distributor Timer Kit, Part Number 3784096, is available for field use and contains installation instructions. After installation of this kit the oiler cap must be painted black for future identification.



If the vacuum control setting has changed, loosen the two attaching screws on the underside of the distributor body. Slide the unit as needed to align marks. Tighten screws securely.

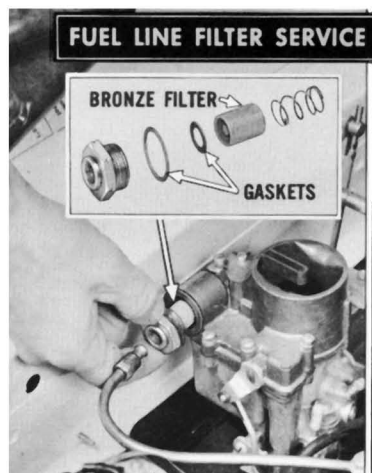
The operating difference between distributors with black or cadmium-plated oiler caps (Powerglide) is due to the design of the stop pin bushing. Late design stop pin bushings change the centrifugal advance curve. The bushing can be checked when the rotor is positioned at the 2 o'clock position. A small mirror will be helpful.





Distributor Points: Install new points if badly pitted. If mildly rough, use a clean point file. Never attempt to file smooth by removing all of the roughness. Gap new points .019" — used points .016". Dwell should always be checked (33°). See Part II for dwell tests.

NOTE: Spring tension should be 19 to 23 ounces.



Disconnect both fuel lines and remove both large inlet nuts. Remove the sintered bronze filters, the filter gaskets and springs. Blow compressed air in the opposite direction to fuel flow to remove loose particles and reinstall parts as shown.

Excessive pitting and rapid failure of the contact points indicates a malfunction in the ignition system which must be corrected. Meter equipment will uncover the cause which may be: excessive primary circuit resistance, high primary circuit operating voltage, incorrect coil polarity, or a condenser—with improper capacity, series resistance or leakage. Testing for these conditions is covered later.

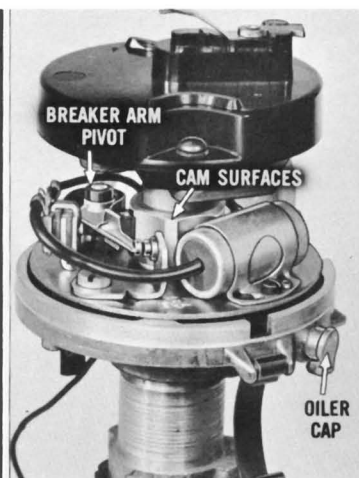
FUEL PUMP SERVICE

Generally, during a tune-up, the fuel pump is not tested for pressure or volume unless there is a complaint of poor high-speed performance or the carburetors tend to flood. The service procedures for these two tests are covered in detail on Pages 7-15 of the Corvair Shop Manual.

However, normal service during a tune-up should include tightening the pump cover screws, the pump body attaching bolts and checking all gasoline line connections.

Distributor Lubrication:

Fill the oiler cap reservoir with light engine oil and apply one or two drops to the breaker arm pivot. Apply a thin film of Delco-Remy Cam and Ball Bearing Lubricant (or equivalent) to the cam surfaces. Install the cap. **NOTE:** Distributor removed for photographic purposes only.

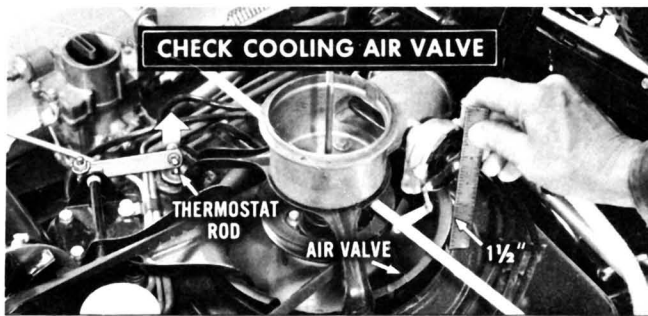


NORMALIZE ENGINE

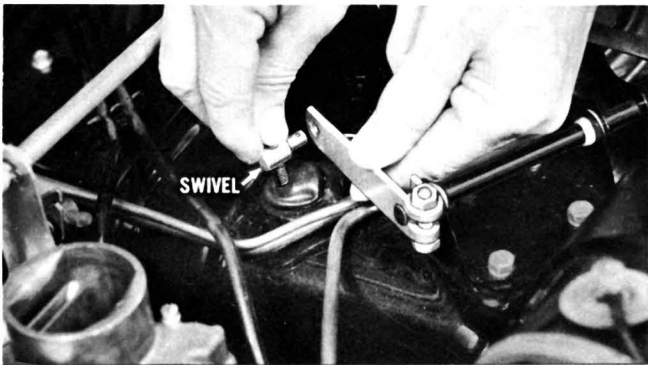
Start the engine and run until normal operating temperature is reached (10 to 15 minutes). During engine warm-up quick-check each of the items listed. If any of the components fail to operate properly, the customer should be notified of the extent of the trouble.

- Windshield Wiper
- Headlights (both beams)
- Parking Lights
- Taillights
- Stop Lights
- Directional Lights
- Horns and Accessories
- Instruments and Indicator Lights
- Brake and Clutch Pedal Adjustment

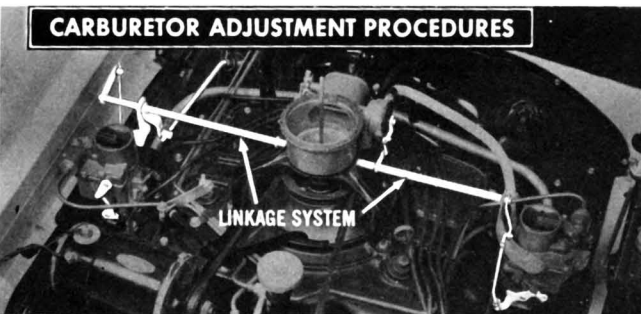
The following service work must be performed with the engine at normal operating temperature to insure accurate checks and adjustments.



With the engine normalized, turn ignition switch OFF. Pull up on the thermostat rod (not the cooling air ring) until the bellows is stopped within its mounting bracket. The opening of the air valve directly opposite the hinge should measure $1\frac{1}{2}$ \".



If the measurement is incorrect, disconnect the swivel and adjust the length of the rod. Reinstall swivel and recheck. Make sure all air valve ring bumpers are in place.



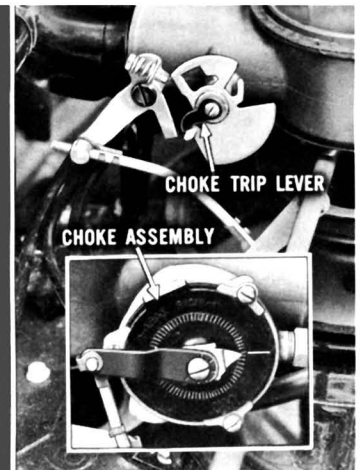
To achieve maximum performance and mileage from the Corvair engine, both carburetors must be "in balance." Improper adjustment of the connecting linkage can cause an "out of balance" condition which results in rough idle, stalling and surging.

When adjusting carburetor linkage and carburetor components, follow the procedures in the order listed:

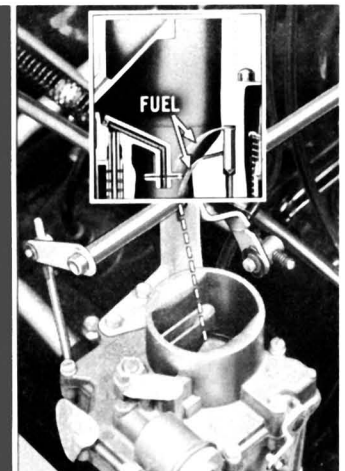
- Preliminary Checks
- Linkage Check: Full Throttle
- Synchronizing the Carburetors
- Choke Unloading
- Fast Idle Adjustment
- Slow Idle and Idle Mixture Adjustment
- Choke Adjustment

Begin this important part of the tune-up by checking the following:

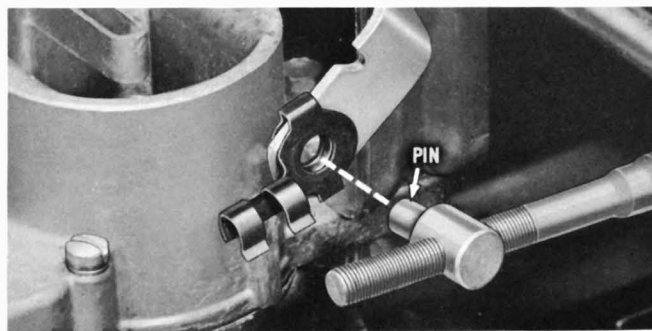
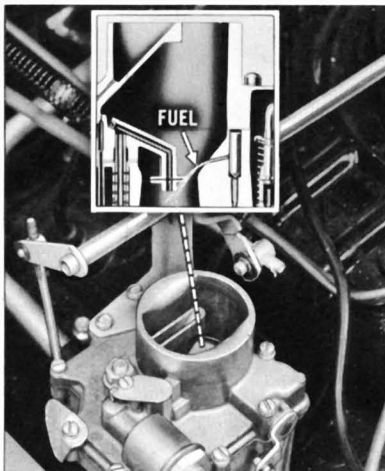
Preliminary Checks:
Before making any carburetor adjustments, check the color of the choke trip lever. If **BLACK**, it indicates that the choke assembly has been changed over to the late type. Kit 3781235 should be installed on all Corvairs which do not have this modification.



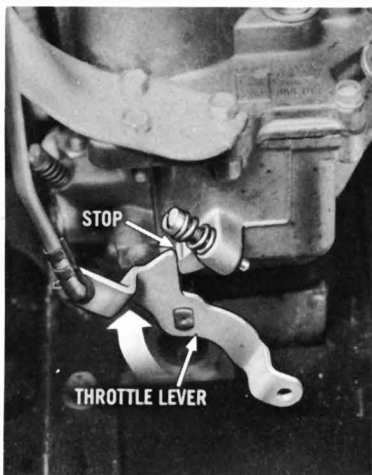
Severe hesitation on acceleration may be caused by insufficient fuel being discharged by the accelerating pump circuits. Late model carburetors and those which have been modified should show **TWO** distinct streams of fuel when the throttle valves are opened.



If only one stream is noted from either carburetor and the discharge openings are not plugged, install the Carburetor Accelerating pump unit, Part Number 7017524. Complete instructions are packaged with the kit.



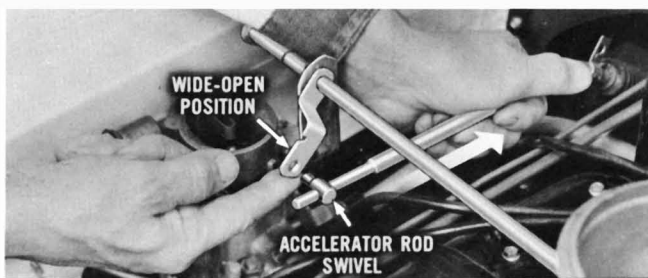
Rotate the swivel on the accelerator rod to align the swivel pin to the cross shaft lever hole. The pin should enter the attachment hole without forcing. Connect linkage and make sure clip is firmly installed.



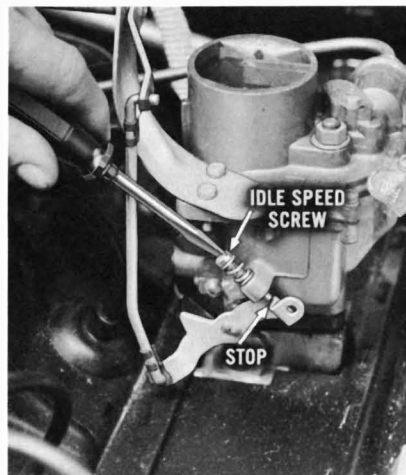
Linkage Check — Full Throttle:
Depress the accelerator pedal all the way down to the floor mat. Check to see if the carburetor throttle levers reach their stops. If wide-open throttle position cannot be reached, proceed as follows:

SYNCHRONIZING THE CARBURETORS

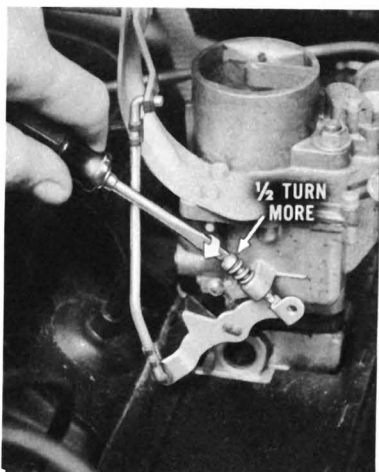
CAUTION: Throughout the linkage and carburetion checks and adjustments, engine rpm should be increased or decreased by means of the accelerator rod ONLY. Never open the throttle valves by any other parts of the linkage system as this may upset the relationship of linkage components and give false readings and improper settings. During these adjustment steps the engine must be at normal operating temperature.



Disconnect the accelerator rod swivel from the cross shaft lever. Hold the lever in the wide-open throttle position. With the accelerator pedal held all the way down to the floor mat (a pedal depressor tool may be used) grasp the accelerator rod and push firmly toward the front of the car to remove all slack in the linkage.



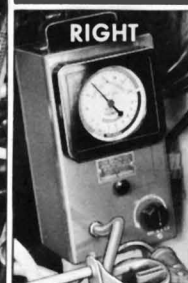
With the engine not running, make sure the choke is in the full OFF position. Back off both idle speed screws until they clear the throttle shaft lever stops.



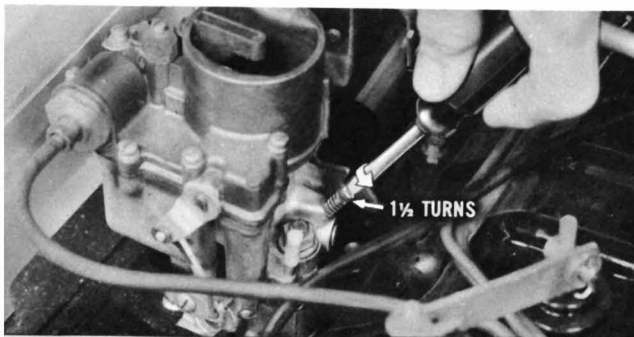
Starting with the **RIGHT** carburetor, turn the idle speed screw in until it just touches the throttle shaft lever, then turn clockwise an additional $\frac{1}{2}$ turn. Repeat this procedure for the left carburetor.



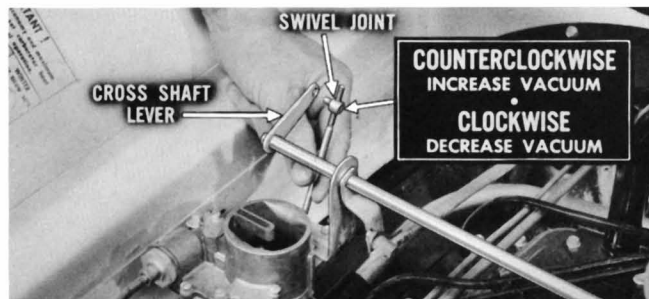
Connect a vacuum gauge to the right carburetor vacuum control tube. The hose must be a tight fit to insure accurate results.



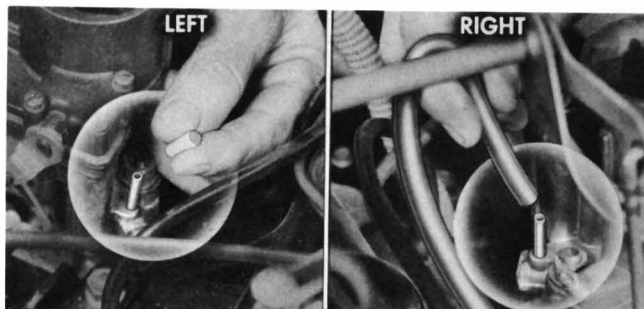
Note the vacuum reading, then connect the vacuum gauge to the left carburetor and again note the gauge reading.



Turn the idle mixture screws on both carburetors in until they are lightly seated, then back off $1\frac{1}{2}$ turns. This is an approximate setting. Connect the tachometer and start engine.

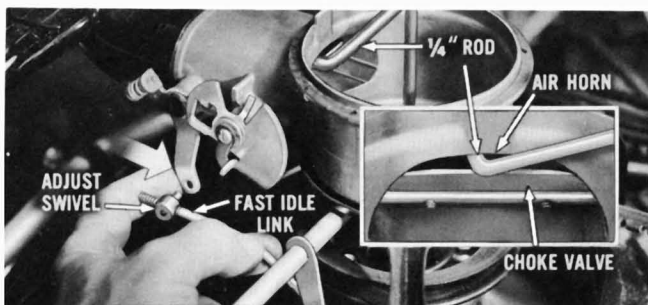


If the carburetors show a difference of more than 1" of vacuum, they are "out of balance." Disconnect the left carburetor swivel joint at the cross shaft lever. Turn the swivel counterclockwise to **INCREASE** left carburetor vacuum; clockwise **DECREASES** left carburetor vacuum.



Disconnect the vacuum spark control hose from the right carburetor and the spark control plastic cap from the left carburetor. Rotate the fast idle cam to produce a constant 1200 rpm. A higher or lower rpm will reduce the accuracy of the balance settings.

If engine rpm changes when setting the swivel, reset the fast idle cam to 1200 rpm and re-check for vacuum differences. Replace spark control hose and plastic cap.



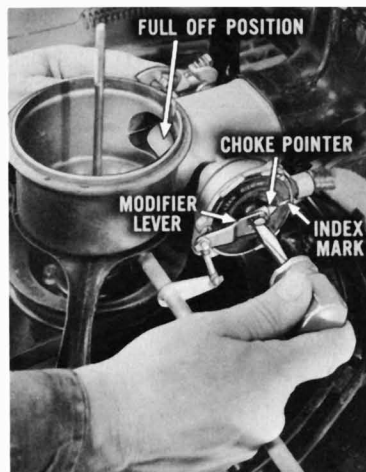
Choke Unloading: Hold or block the accelerator pedal to the floor mat (through detent on Powerglide models). Using a suitable $\frac{1}{4}$ " diameter rod, adjust the swivel on the fast idle link to obtain $\frac{1}{4}$ " clearance between the top of the choke valve and the upper wall of the air horn.

- Adjust the idle mixture screws on both carburetors to obtain the highest and steadiest vacuum reading.
- Turn the screws in or out as required, but keep in mind that both screws should be turned an equal amount to achieve precise vacuum and engine idle smoothness and maintain synchronization.
- Adjust both idle speed screws in equal amounts to produce the engine rpm shown in the chart below.

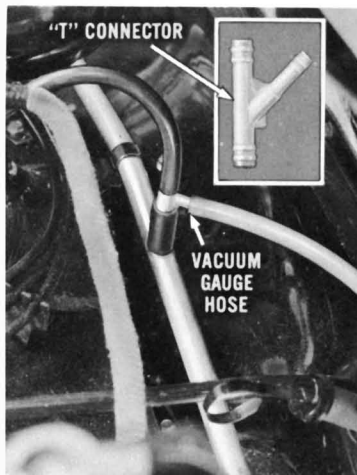
TRANSMISSION	RPM	RANGE
Powerglide	500	Drive Position
3-Speed	500	Neutral Position



Fast Idle Adjustment: When the carburetors have been balanced as closely as possible, rotate the fast idle cam counterclockwise to the maximum high position. Adjust the fast idle screw to obtain 2200 rpm. Normal operation of the choke will then provide about 1500 rpm.



Choke Adjustment: Place the choke in the full OFF position. To adjust, loosen the modifier lever attaching screw slightly, and rotate the choke pointer to the index mark. Tighten the lever screw. If a lean condition is noted on acceleration (after a cold start), set pointer 3 to 4 notches rich.



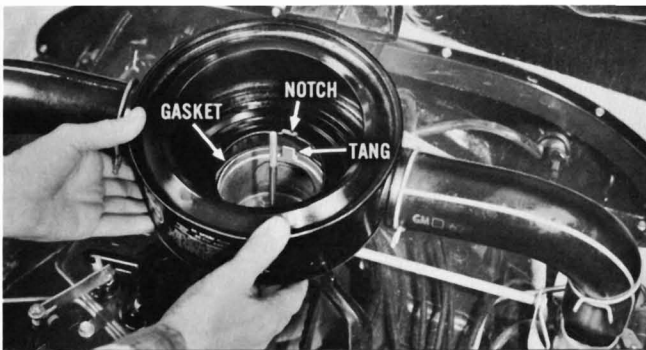
Slow Idle and Idle Mixture Adjustment: Connect the vacuum gauge hose to the vacuum balance tube. On cars teamed with Powerglide, remove the modulator hose at the plastic "T" fitting and attach the gauge at this point. Standard transmission models require the use of a "T" connector.



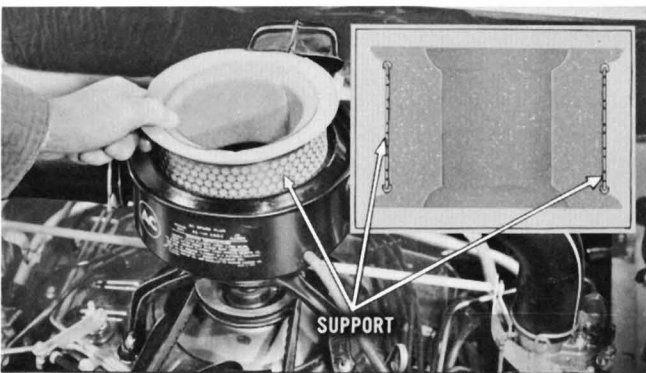
Proper maintenance service of the air filter element (every 2,000 miles) is extremely important to provide maximum engine life and a minimum of fuel consumption. Replace torn or ripped elements. Thoroughly clean the element in clean kerosene or mineral spirits. **CAUTION:** Never use a hot degreaser or solvents containing acetone or paint thinner.



Squeeze dry, then immerse in light engine oil. Squeeze the element to remove excess oil. Never shake, wring or swing the filter element when removing cleaning solvent or excess oil. **NOTE:** Applying oil to the filter element with a squirt gun is not recommended because some areas may not receive sufficient oiling.



Clean the air cleaner assembly and cover. Install a new gasket on the air horn casting. Install the unit so that the notch indexes with the tang.



Install the filter element into the screen support. The upper and lower flanges must provide a good seal to the air cleaner and to the cover when installed.

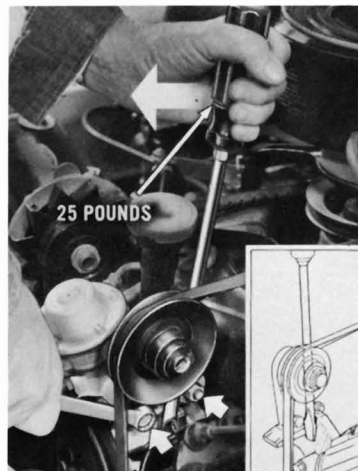
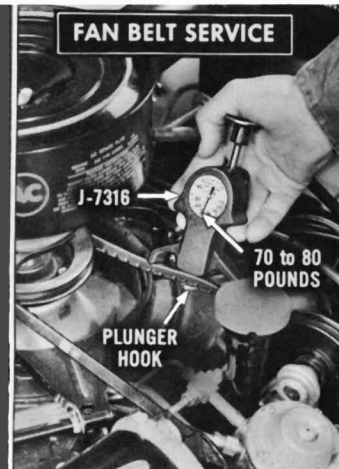
BATTERY AND BATTERY CABLE SERVICE

- Clean up all corrosion on battery or cables and the surrounding area. Use a soda solution or diluted ammonia to neutralize acid. Flush off with clear water.

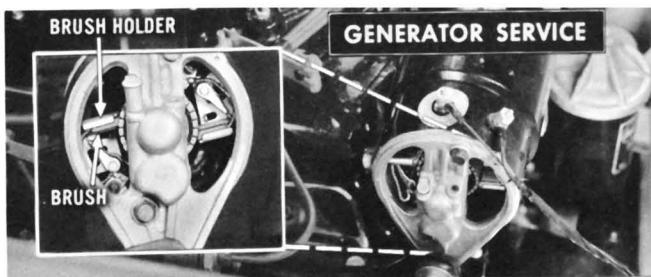
NOTE: Remove and clean the battery out of the car if corrosion is excessive.

- Inspect battery case for cracks or bulges.
 - Check the electrolyte level.
 - Check battery hold-down strap.
 - Make sure the cables are tight to the battery posts.
- If any indication of battery trouble is noted by the customer or through visual inspection, follow the test procedures in Part II.

Inspect and replace belt if cracked, frayed or greasy. Check adjustment using a universal strand tension gauge, such as J-7316, located mid-point between the blower and idler pulleys. The plunger hook must contact the wide section on toothed belts. Correct tension: 70 to 80 pounds.



If belt needs adjustment and a tension gauge is not available, loosen the idler bracket bolt and nut. Insert a 16" (over-all length) screw driver between the pulley and bracket with the blade tip against the engine boss. Hold a 25-pound pull, then tighten the attaching nut and bolt.



Check the brushes for free movement in the holders. Brushes which are less than half of their original length ($\frac{15}{16}$ ") should be replaced. Clean oily or dirty commutators using a soft, clean rag. Worn-out brushes or a scored commutator should be corrected as shown in the Corvaire Shop Manual, Pages 8-11 to 8-16.

Now that we've seen the extent of the mechanical steps, the details of adjustments and the service precautions to observe, refer to the next section, Part II, for complete testing procedures. Testing will assure the mechanic that adjustments and corrections have been made that will insure customer satisfaction and eliminate hidden deficiencies that would cause premature performance failure.

End of **PART I**

**GUARDIAN TUNE FOR THE
CORVAIR**

See **PART II** for:

**TESTING THE
GUARDIAN TUNE**