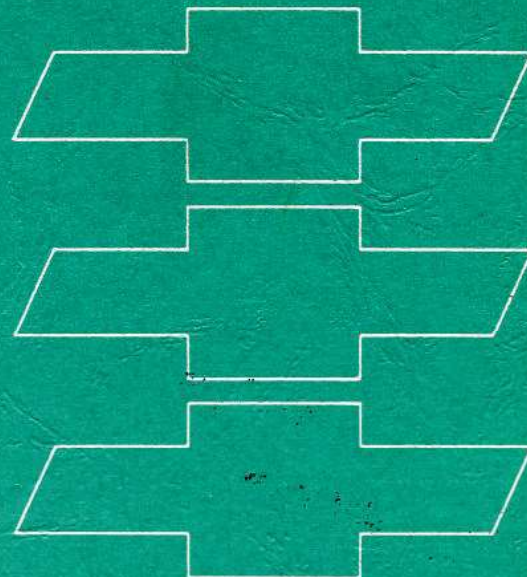
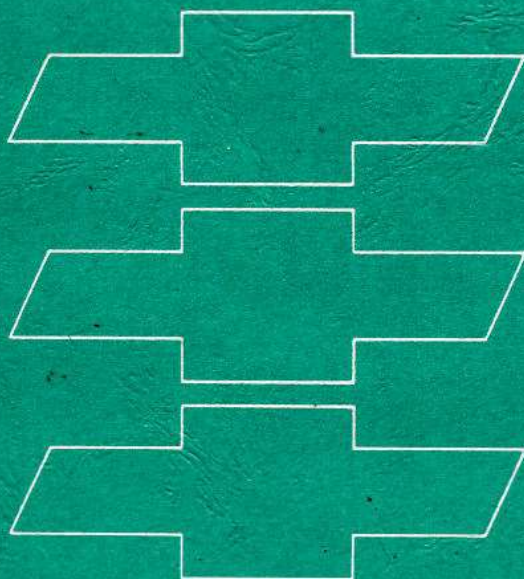


**1965**



**CORVAIR**



**CHASSIS  
SHOP  
MANUAL**



# SECTION 6 ENGINE

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## CORVAIR 10100 AND 10500 SERIES ENGINE TUNE-UP

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## GENERAL DESCRIPTION

The engine tune-up has become increasingly important to the modern automotive engine with its vastly improved power and performance. With the higher compression ratios, improved electrical systems and other advances in design, today's engines have become more sensitive to usage and operating conditions, all of which have decided effect on power and performance.

Since the modern engine is admittedly more temperamental and sensitive to adjustments, some means must be devised to put back into the engine the standard of performance and economy of which it is capable.

Since it is seldom advisable to attempt an improvement in performance by correction of one or two items only, time will normally be saved and more lasting results assured if the serviceman will follow a definite and thorough procedure of analysis and correction of all items affecting power, performance and economy.

The tune-up will be performed in three parts. The first part will consist of visual and mechanical checks and adjustments; the second part will consist of mechani-

cal synchronization of carburetors; while the third part will consist of an instrument checkout that can be performed with any one of the modern compact units of service equipment available for this purpose. Always follow the instructions provided by the manufacturer of the particular equipment to be used.

Additional checks and adjustments are included in the latter part of this section for use as required. Many of these operations would normally be used to isolate and correct trouble located during the tune-up. Where conditions are uncovered requiring major corrective action, refer to the appropriate section of this manual for detailed service information.

All operations included herein will be performed on the vehicle. Illustrations depicting bench operations have been employed for convenience only and are intended only to clarify the operations which will be performed on the vehicle. Since it is impractical to illustrate all possible installations that may be encountered, only a typical installation will be used to illustrate the point in question.

## MECHANICAL CHECKS AND ADJUSTMENTS

### Remove Spark Plugs

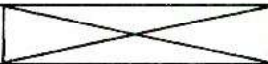
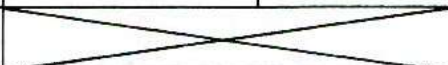
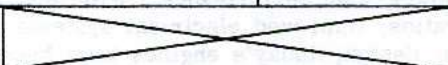
1. Remove spare tire.
2. Remove air cleaner assembly.
3. Disconnect spark plug wires at spark plugs.
4. Remove any foreign matter from around spark plugs by blowing out with compressed air then loosen all plugs one turn.

5. Start engine and accelerate to 1000 rpm to blow out loosened carbon.

**NOTE:** Clearing out carbon in this manner is important in preventing false compression readings due to chips of carbon being lodged under the valves.



## ENGINE TUNE-UP CHART

H.P.			95	110	140	180
COMPRESSION PSI (Note 1)			130			
SPARK PLUGS	Make and Number	Colder Standard	AC44FF		AC42FF Competition	
			AC46FF	AC44FF		
	Gap		.035"	.030"		
IGNITION DISTRIBUTOR	Point Dwell		31°-34°			
	Point Gap		.019 (New) .016 (Used)			
	Arm Spring Tension		19 - 23 Ounces			
	Condenser		.18 - .23 MFD			
BLOWER BELT			55 ± 5 Lbs. (Used) 75 ± 5 Lbs. (New) Using Strand Tension Gauge			
AIR CLEANER			Note 2			
TAPPET ADJUSTMENT			Hydraulic - 1 Turn Down from Zero Lash			
IGNITION TIMING B.T.D.C. (Note 3)		Synchromesh	4°-8°	12°-16°	16°-20°	24°
		Automatic	12°-16°	12°-16°		
ENGINE IDLE RPM		Synchromesh	450-500	600-650		850
		Automatic	Note 4			
FUEL PUMP	Pressure		4 - 5 Lbs. Idle - 1000 R.P.M.			
	Volume		1 Pint in 30 - 45 Seconds			
CRANKCASE VENTILATION			.089" Orifice			

NOTE 1: At cranking speed, throttle wide open -- Maximum Variation 20 pounds between cylinders.

NOTE 2: PAPER ELEMENT -- Service at 12,000 miles initially -- Check every 6,000 miles thereafter.  
OIL BATH -- Change oil at regular engine oil change intervals.

NOTE 3: At idle speed with vacuum advance line disconnected and plugged.

NOTE 4: Idle speed on engines with automatic transmission should be set as low as possible to obtain a smooth idle and prevent creep in drive or harsh shifts during transmission operation.



6. Stop engine and remove spark plugs.

**NOTE:** A piece of 7/16 I.D. soft rubber or soft plastic tubing approximately 8" long may be used to remove the spark plugs after they have been loosened.

#### Test Compression

1. Block throttle and choke in wide open position.
2. Hook up starter remote control cable and insert compression gauge firmly in spark plug port (fig. 1).

**CAUTION:** Whenever the engine is cranked remotely at the starter, with a special jumper cable or other means, the primary distributor lead must be disconnected from the negative post on the coil and the ignition switch must be in the "ON" position. Failure to do this will result in a damaged grounding circuit in the ignition switch.

**NOTE:** Unless special adapters are available, it will be necessary to remove carburetors to perform the compression test.

3. Crank engine through at least four compression strokes to obtain highest possible reading.

#### Clean and Inspect Spark Plugs

Inspect each plug individually for badly worn electrodes, glazed, broken or blistered porcelains and replace plugs where necessary. Refer to spark plug diagnosis information Section 6Y for an analysis of plug conditions. Use new spark plug gaskets with cleaned plugs.

#### Install Spark Plugs and Torque to Specifications

#### Service Ignition System

1. Replace brittle or damaged spark plug wires. Install all wires to proper spark plug.
2. Tighten all ignition system connections.
3. Replace or repair any wires that are frayed, loose or damaged.
4. Remove distributor cap, rotor, and dust shield. Clean cap and inspect for cracks, carbon tracks and burned or corroded terminals. Replace cap where necessary.
5. Clean rotor and inspect for damage or deterioration. Replace rotor where necessary.

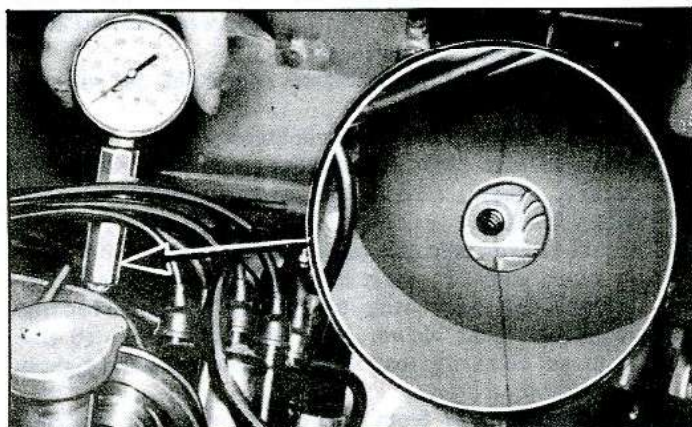


Fig. 1—Checking Compression

6. Check the distributor centrifugal advance mechanism by turning the distributor cam to see if the springs return it to its retarded position. If the cam does not return readily, the distributor must be disassembled and the cause of the trouble corrected.
7. Check to see that the vacuum spark control operates freely by turning the movable breaker plate to see if the spring returns it to the retarded position. Any stiffness in the operation of the vacuum spark control will affect the ignition timing. Correct any interference or binding condition noted.
8. Examine distributor points and clean or replace if necessary.

- Contact points with an overall gray color and only slight roughness or pitting need not be replaced.
- Dirty points should be cleaned with a clean point file.

Use only a few strokes of a clean, fine-cut contact file. The file should not be used on other metals and should not be allowed to become greasy or dirty. Never use emery cloth or sandpaper to clean contact points since particles will embed and cause arcing and rapid burning of points. Do not attempt to remove all roughness nor dress the point surfaces down smooth. Merely remove scale or dirt.

- Replace points that are burned or badly pitted.

9. Clean cam lobe with cleaning solvent, lubricate cam lobe with "Delco Remy Cam and Ball Bearing Lubricant" or its equivalent and rotate cam lubricator wick 1/2 turn.

**NOTE:** Where prematurely burned or badly pitted points are encountered, the ignition system and engine should be checked to determine the cause of trouble so it can be eliminated. Unless the condition causing point burning or pitting is corrected, new points will provide no better service than the old points. Refer to Section 6Y for an analysis of point burning or pitting.

10. Adjust distributor contact point gap to .019" (new points) or .016" (used points), using a feeler gauge or dial indicator (fig. 2). Breaker arm rubbing block should be on extreme top of cam lobe during adjustment.

**NOTE:** If contact points have been in service they should be cleaned before adjusting with a feeler gauge.

- Check alignment of distributor points with points closed (fig. 3). Align new points where necessary, but do not attempt to align used points. Instead, replace used points where serious misalignment is observed.
- If necessary, align points by bending fixed contact support. Use an alignment tool if available. Do not bend breaker arm.
- After alignment, readjust point gap.

11. Make sure all distributor wire terminals are clean and tight.
12. Install dust shield, rotor and distributor cap. Press all wires firmly into cap towers.



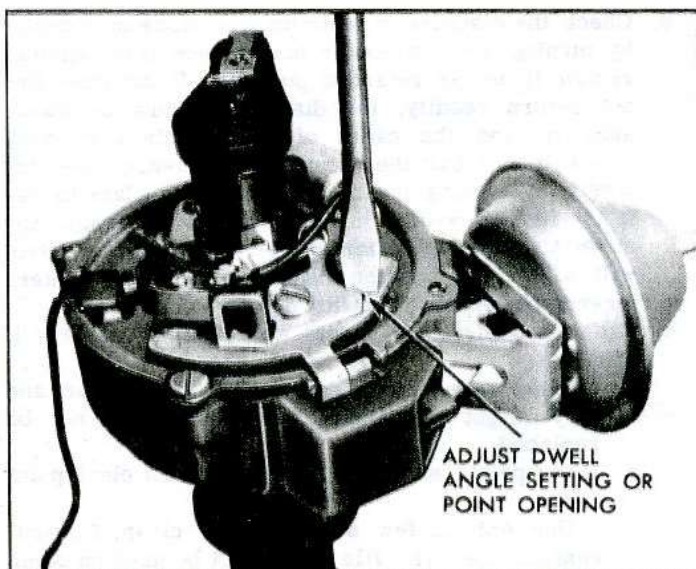


Fig. 2—Point Adjustment

**NOTE:** Cap must be installed with notch to vacuum advance lever opening on housing.

#### Service Battery and Battery Cables

Inspect battery and cables and perform necessary service on these components. See Additional Checks and Adjustments for battery tests.

Inspect for signs of corrosion on battery, cables and surrounding area, loose or broken carriers, cracked or bulged cases, dirt and acid, electrolyte leakage and low electrolyte level. Fill cells to proper level with distilled water or water passed through a "demineralizer".

The top of the battery should be clean and the battery hold-down bolts properly tightened. Particular care should be taken to see that the tops of batteries are kept clean of acid film and dirt. For best results when cleaning batteries, wash first with a dilute ammonia or soda solution to neutralize any acid present and then flush off with clean water. Care must be taken to keep vent plugs tight so that the neutralizing solution does not enter the cell. The hold-down bolts should be kept tight enough to prevent the battery from shaking around in the holder, but they should not be tightened to the point where the battery case will be placed under a severe strain.

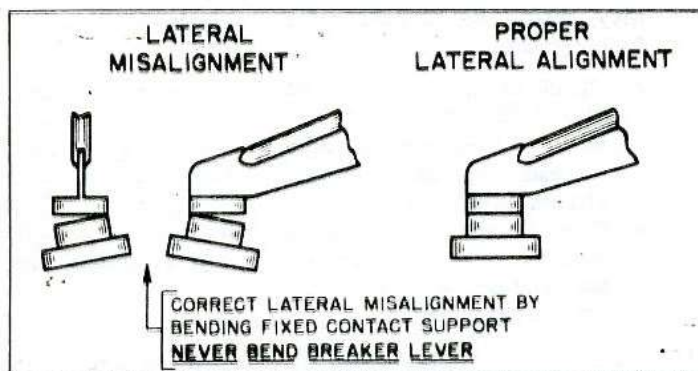


Fig. 3—Point Alignment

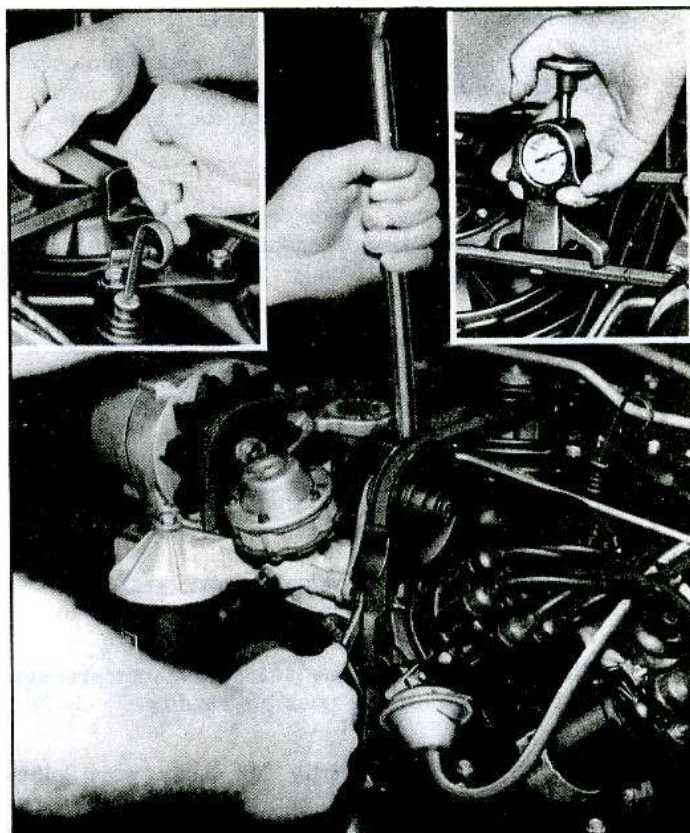


Fig. 4—Blower Belt and Guide Adjustment

To insure good contact, the battery cables should be tight on the battery posts and fully bottomed. To remove or install spring type cable clamps, a suitable pliers must be used to spread the ends of the clamps. Oil battery terminal felt washer. If the battery posts or cable terminals are corroded, the cables should be cleaned separately with a soda solution and a wire brush. It is NOT recommended that the battery posts and cable clamps be greased prior to installing cables to battery as this may contribute to slippage of the calmps from the battery posts.

If battery has remained undercharged, check for loose (worn) blower belt, defective Delcotron, high resistance in the charging circuit, oxidized regulator contact points, or a low voltage setting.

If the battery has been using too much water the voltage output (regulator setting) of the Delcotron is too high.

#### Service Blower Belt and Delcotron

1. Inspect blower belt condition and check deflection of belt.

If belt damage is noted, replace the belt. A slightly damaged belt must be replaced to prevent premature failure. Install blower belt over pulleys (Delcotron pulley last).

2. Adjust blower belt and guides as follows:

- Place a 1/16" shim between belt and rear guide (fig. 4), then using a bar and a strand tension gauge adjust blower belt. Fifty-five lbs.  $\pm$  5 lbs. (used belt), 75 lbs.  $\pm$  5 lbs. (new belt) and tighten securely.
- Remove shim from between blower belt and rear guide and using shim as a gauge adjust upper guide (fig. 4) and tighten securely.



3. If a new belt was installed run belt in at 1500 rpm for at least two minutes, then recheck deflection.

**NOTE:** If a strand tension gauge is not available adjust belt to give a  $\frac{3}{8}$  deflection between blower and idler pulley under a 15 pound load and have belt set with a strand tension gauge as soon as possible.

4. Replace or repair frayed or broken Delcotron wires and tighten all wire connections.

#### Service Fuel Lines and Fuel Filter

Inspect fuel lines for kinks, bends or leaks and if engine has been flooding, replace fuel inlet filter.

**NOTE:** If a complaint of poor high speed performance exists on the vehicle, fuel pump tests should be performed.

#### Service Air Cleaner

Refer to Engine Fuel, Section 6M.

#### Service Crankcase Ventilation (Fig. 5)

1. Disconnect hose from vent pipe.
2. Inspect for deteriorated or plugged hoses.
3. Clean positive ventilation orifice, using a  $\frac{5}{64}$ " drill (inserted through orifice in vent pipe and twisted by hand).
4. Connect hose to vent pipe, then inspect all connections.

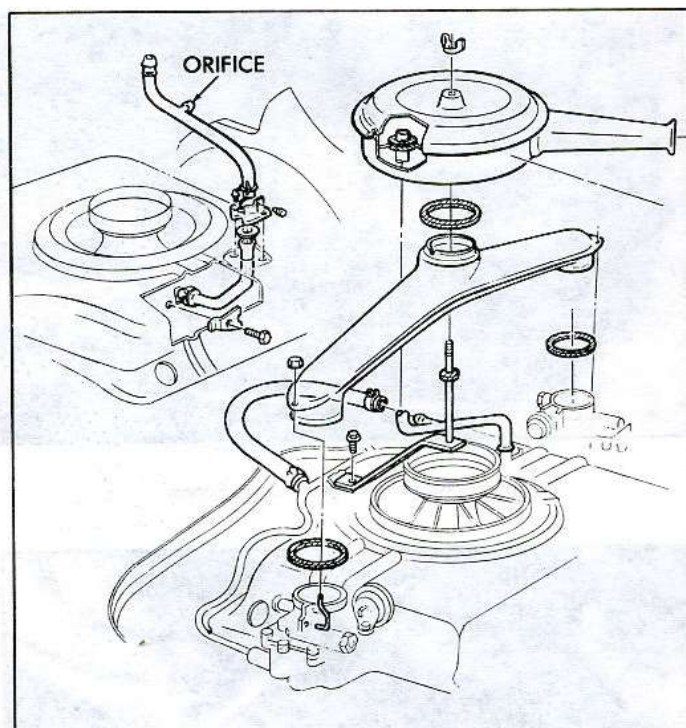


Fig. 5—Crankcase Ventilation

## CARBURETOR SYNCHRONIZATION

#### Mechanical Adjustments

1. Disconnect accelerator control rod swivel at cross shaft lever and connect accelerator pull back spring to swivel hole in cross shaft lever "A" (fig. 6).

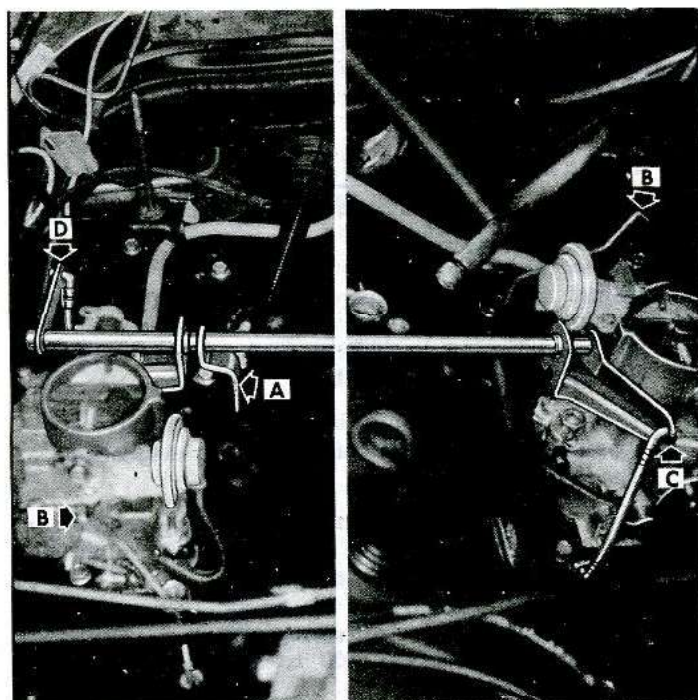


Fig. 6—Carburetor Linkage

2. Disconnect choke rods at choke shaft levers on both carburetors and open choke valves "B" (fig. 6), then tighten carburetor hold down nuts.
3. Back idle screws away from throttle shaft levers on both carburetors (2-1/2 turns should be sufficient) to leave clearance between the throttle shaft levers and idle screws.
4. Disconnect throttle rod from cross shaft lever on R/H carburetor "C" (fig. 6).

**NOTE:** A strip of paper approximately  $\frac{3}{8}$ " wide and 8" long should be used in the following step. Feeler gauge stock will not provide a SENSITIVE feel and should not be used.

5. Set idle screw on L/H carburetor by placing strip of paper between idle screw and throttle shaft lever and turning screw in until a firm drag is felt on the paper. Turn idle screw in 1-1/2 additional turns (fig. 7).

**NOTE:** This will give an initial idle speed of 500-600 rpm.

6. Connect throttle rod to cross shaft lever on R/H carburetor and disconnect throttle rod from cross shaft lever on L/H carburetor "D" (fig. 6).
7. Set idle screw on R/H carburetor in the same manner as L/H carburetor.
8. Adjust throttle rod on L/H carburetor by holding up on rod (so throttle shaft lever is against idle screw) and turning rod in lower swivel until rod freely enters hole in cross shaft lever (fig. 8).
9. Connect throttle rod on L/H carburetor to cross shaft lever.



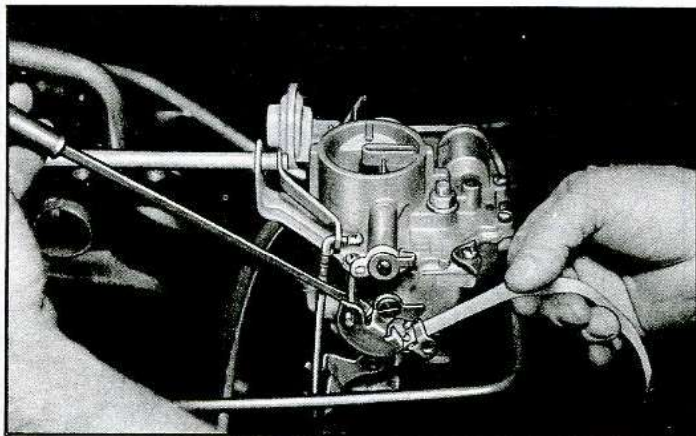


Fig. 7—Adjusting Idle Speed Screw

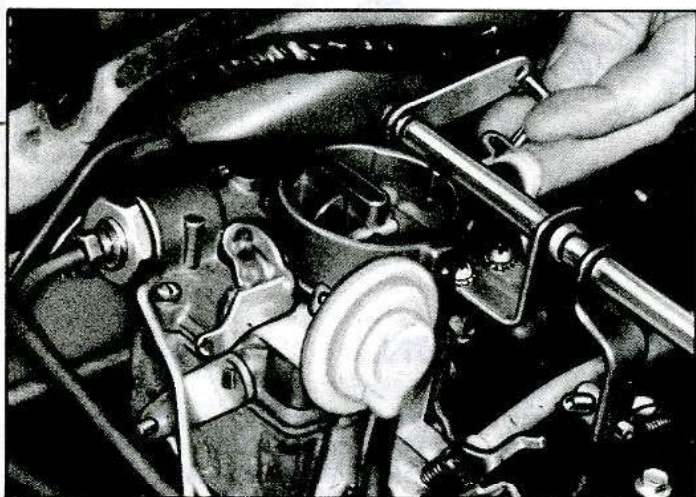


Fig. 8—Adjusting Throttle Rod



Fig. 9—Adjusting Accelerator Rod

10. Remove accelerator pull back spring from cross shaft lever, hold cross shaft lever in the full throttle position and pull accelerator control rod rearward (on vehicles equipped with Powerglide, pull through detent), and adjust swivel on accelerator control rod until it freely enters hole in cross shaft lever (fig. 9). Then connect swivel and pull back spring and be sure carburetors return to idle position (idle screws against throttle levers).
11. Turn idle mixture screws on both carburetors lightly to its seat and back out 1-1/2 turns.

## INSTRUMENT CHECK-OUT

### Instrument Hook-Up

1. Remove distributor vacuum advance hose from R/H carburetor spark port tube and plastic cap from L/H carburetor spark port tube.
2. Connect vacuum gauge, dwell meter, tachometer and timing light.

**NOTE:** The vacuum gauge must be connected to both carburetor spark port tubes. A windshield washer tee makes this possible (fig. 10).

### Ignition Dwell

1. Start engine and check ignition dwell.  
If dwell is not within specifications, recheck point gap, check for wrong point assembly, defective or misaligned point, worn rubbing block or worn distributor cam.
2. Check dwell variation.  
Slowly accelerate engine to 1500 rpm and note dwell reading. Return engine to idle and note dwell reading. If dwell variation exceeds specifications, check for worn distributor shaft, worn distributor shaft bushing or loose breaker plate.

**CAUTION:** Accelerate engine at accelerator rod only. Do not open throttle by grasping other portions of linkage.

### Set Ignition Timing

1. Adjust timing as required by loosening distributor clamp bolt and rotating distributor body until specified timing is indicated at tab (fig. 11), then tighten distributor clamp bolt.

**NOTE:** Timing should be advanced as far as possible (within specifications) unless detonation (spark-knock) occurs.

2. Check operation of centrifugal advance mechanism by accelerating engine and watching clockwise (advance) movement of timing mark.

### Check Carburetor Synchronization as Follows:

1. Accelerate engine to 1100 to 1200 rpm and hold steady.

**NOTE:** A tool to hold engine rpm steady may be manufactured with a small turn buckle and



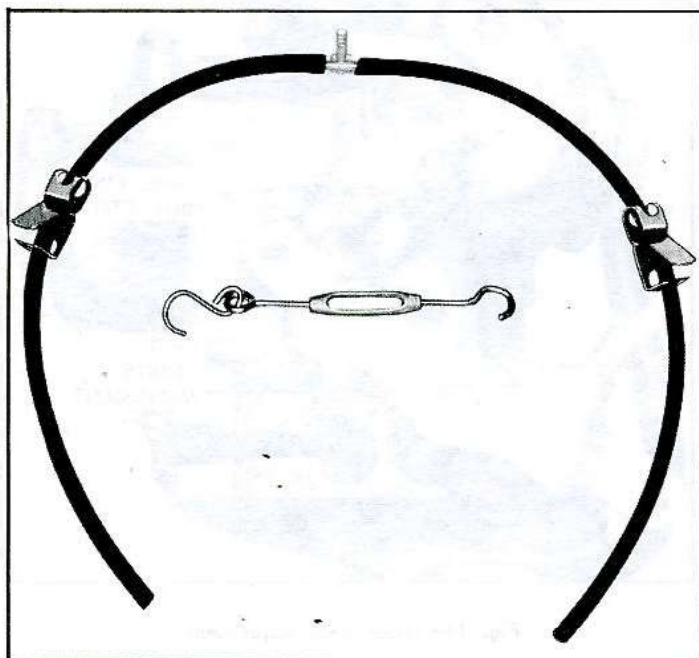


Fig. 10—Vacuum Gauge Adapter and Turnbuckle

hooks (fig. 10). When this tool is installed between the accelerator rod and fuel line the rpm can be adjusted by turning turnbuckle.

2. With rpm set to 1100 to 1200 and steady, note vacuum reading. Pinch shut vacuum gauge hose to R/H carburetor and note vacuum reading. If vacuum decreases, return engine to idle and lengthen throttle rod (one turn) on L/H carburetor, then recheck.

If vacuum increases, return engine to idle and shorten throttle rod (one turn) on L/H carburetor, then recheck.

If vacuum remains steady ( $\pm 1$ " ) open hose to R/H carburetor and pinch shut vacuum gauge hose to L/H carburetor. Vacuum should remain steady ( $\pm 1$ " ).

3. Disconnect vacuum gauge from spark port tubes and reinstall distributor vacuum advance hose on R/H carburetor and plastic cap on L/H carburetor.

#### Vacuum Advance

Check operation of vacuum advance by accelerating engine and watching movement of vacuum advance arm.

#### Idle Speed and Mixture Adjustment

1. Disconnect choke diaphragm hoses from both carburetor bases and connect vacuum gauge at these locations.
2. Adjust idle speed (duplicate adjustment on both carburetors) to obtain specified engine idle.
3. Adjust idle mixture screws on both carburetors to obtain peak, steady vacuum at specified idle speed.

#### Adjust Fast Idle Cam Clearance (Fig. 12)

1. Stop engine.
2. With throttle lever on next to the highest step of fast idle cam, bend tang to obtain .078" clearance between idle speed screw and throttle lever.

#### Adjust Vacuum Diaphragm (Fig. 13)

1. Hold choke valve closed with a rubber band.
2. Hold vacuum diaphragm arm squarely against diaphragm.

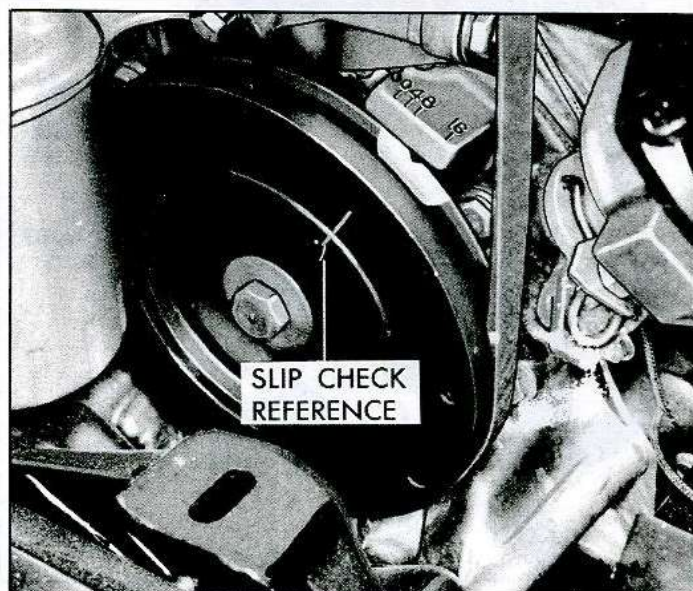


Fig. 11—Ignition Timing

3. Measure clearance between lower edge of choke valve and wall of bowl cover. Clearance should be .180" to .5".
4. If necessary to adjust, disconnect and bend diaphragm link.
5. At this setting, throttle lever fast idle tang should rest on next to the highest step of fast idle cam. If not, adjust by bending outer choke shaft lever tang.

#### Adjust Vapor Vent (Fig. 14)

The vent should just start opening when idle screw is on high step of fast idle cam. The valve will then be open at idle setting. If necessary, adjust by bending throttle lever tang.

**NOTE:** It is hard to see this valve when carburetor is installed. A mirror will aid in making this adjustment.

#### Adjust Choke (Fig. 15)

Hold choke valve closed and, while holding the control rod up against the stop in choke thermostat bracket, adjust upper choke control rod until it freely enters hole in choke shaft lever, then lengthen rod two turns and connect.

**CAUTION:** To minimize the possibility of deforming the control rod while adjusting, always turn the vertical portion. Do not "crank" the rod using offset portion.

#### Adjust Choke Unloader (Fig. 16)

Check unloader adjustment by holding throttle valve in wide open position and insert a .312" wire gauge between choke valve lower edge and wall of bowl cover. To adjust, if necessary, bend tang on throttle lever.

#### Final Adjustment

1. Install air cleaner assembly.
2. Start engine, and if necessary, readjust carburetor idle speed and mixture.
3. Shut engine off, remove instruments, then connect choke vacuum break hoses, and install spare tire.



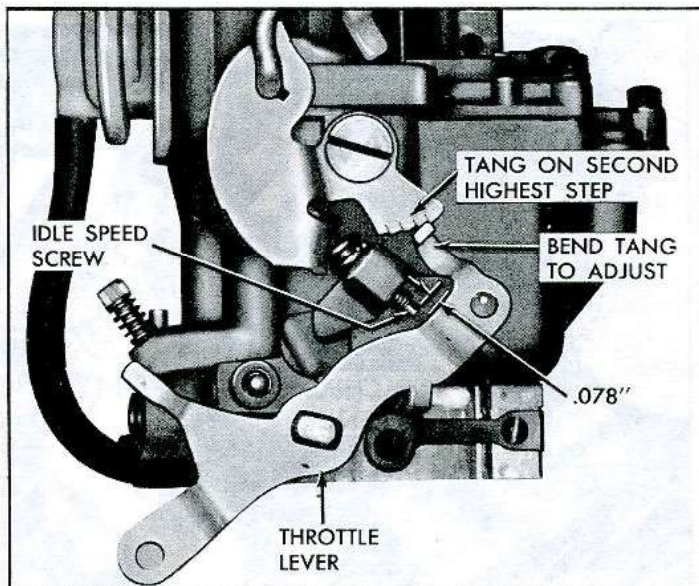


Fig. 12—Fast Idle Cam Adjustment

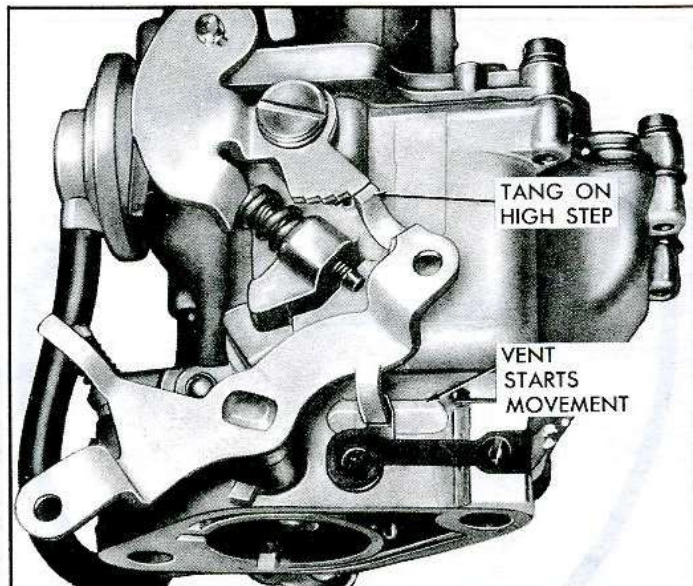


Fig. 14—Vapor Vent Adjustment

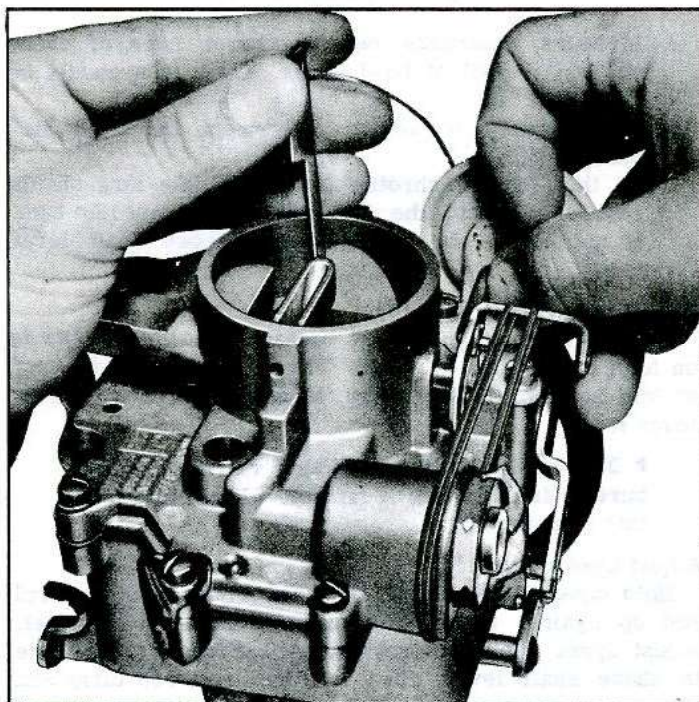


Fig. 13—Vacuum Diaphragm Adjustment

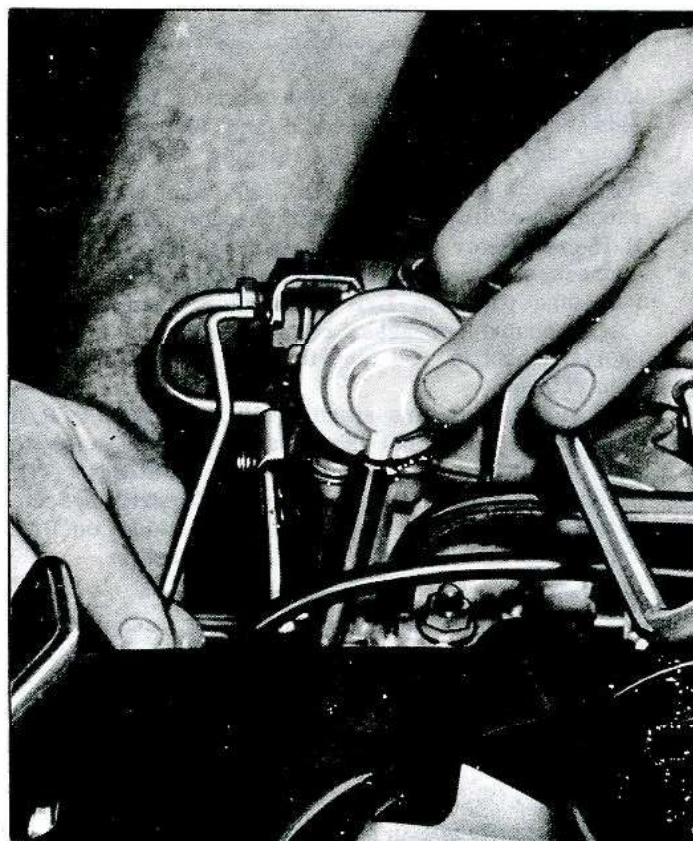


Fig. 15—Choke Control Rod Adjustment

## ADDITIONAL CHECKS

### Cylinder Balance Test (Fig. 17)

It is often difficult to locate a weak cylinder. A compression test, for example, will not locate a leaky intake manifold, a valve not opening properly due to a worn camshaft, or a defective spark plug.

With the cylinder balance test, the power output of one cylinder may be checked against another, using a set of

grounding leads. When the power output of each cylinder is not equal, the engine will lose power and run roughly. Tool J-7412 is available to perform this test.

Perform a cylinder balance test as follows:

1. Connect the tachometer and vacuum gauge.
2. Start engine and run at 1500 rpm.



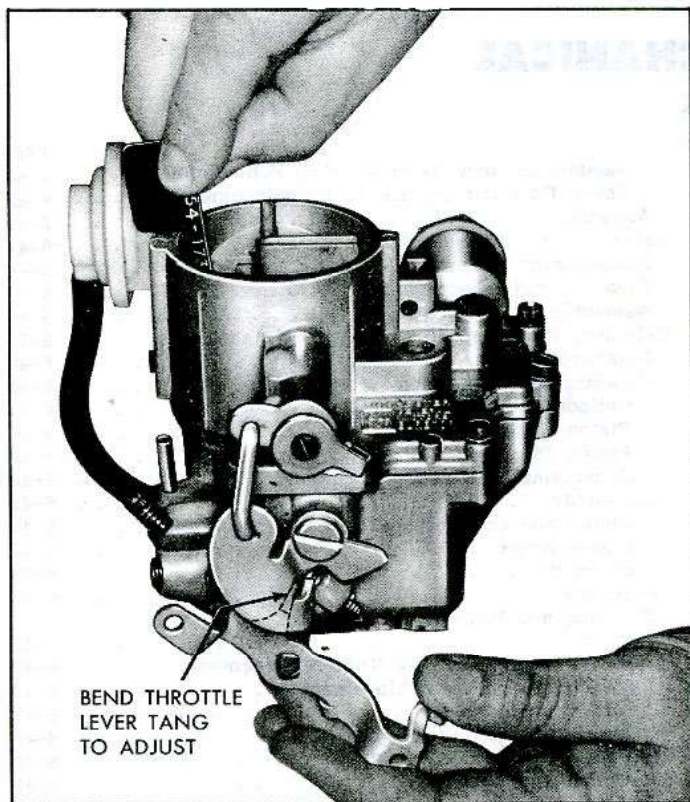


Fig. 16—Choke Unloader Adjustment

3. Ground large clip of grounding leads and connect individual leads to all spark plugs except the pair being tested. Divide the firing order in half and arrange one-half over the other. The cylinders to be tested together appear one over the other, i.e.,  
 Firing Order=1-4-5-2-3-6= $\frac{1-4-5}{2-3-6}$ =1-2, 4-3, 5-6.
4. Operate engine on each pair of cylinders in turn and note engine rpm and manifold vacuum for each pair. A variation of more than 1 inch of vacuum or 40 rpm between pairs of cylinders being tested indicates that the cylinders are off balance.
5. To isolate one weak cylinder, short out one bank of cylinders at a time. The bank giving the lower readings will include the weak cylinder.

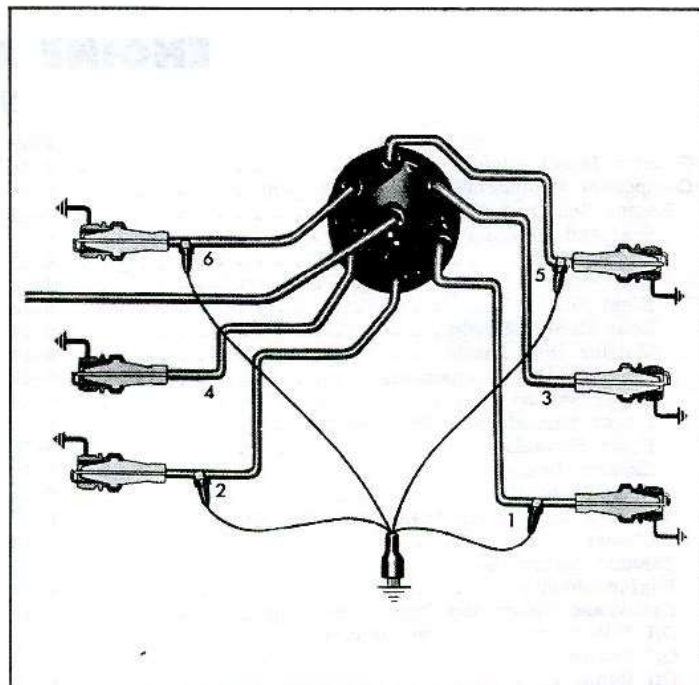


Fig. 17—Cylinder Balance Test

#### Starting Circuit Checks

See Engine Electrical--Section 6Y, for a description of these checks.

#### Charging Circuit Checks

See Engine Electrical--Section 6Y, for a description of these checks and regulator adjustments.

#### Ignition Circuit Checks

See Engine Electrical--Section 6Y, for a description of these checks.

#### Fuel Pump Tests

If the owner has complained of poor high speed performance, the fuel pump may be at fault. Too low a pump pressure or volume will cause a high speed miss because of lack of fuel delivered to the carburetors, while too high a pressure will cause carburetor flooding. See Engine Fuel--Section 6M for a description of fuel pump checks.



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