SECTION 8

ELECTRICAL SYSTEMS

CONTENTS OF THIS SECTION

ENGINE ELECTRICAL

CORVAIR—500, 700 AND 900 SERIES

INDEX

GENERAL TROUBLE SHOOTING

The wiring diagram for the engine electrical system is included with body and chassis electrical circuit diagrams immediately after the Engine Electrical portion of this section.

Described below are a series of quick checks, which are designed to assist the service man in locating trouble within the various components of the engine electrical system. Additional checks, adjustments and overhaul of these components are also described elsewhere in the Engine Electrical Section (see Index) and should be made when required.

BATTERY

Identifying Deficient Batteries

1. With battery in vehicle and coil secondary lead disconnected, turn on headlamps (Hi Beam), radio, heater (Hi Blower), and crank engine for four 30 second periods allowing 30 seconds between cranks for starter to cool.

   CAUTION: Prolonged continuous cranking can result in permanent damage to starting motor —be sure to follow above sequence of alternate cranking and cooling periods.

2. Check electrolyte for perceptible changes in color —if one or more cells appear "murky," battery is in some stage of failure and should be replaced. If electrolyte remains clear, continue with step No. 3.
3. Connect a battery charger to battery and proceed with a "boost" charge, i.e., 35 amperes for one hour or until electrolyte reaches 125°F, checking occasionally for indications of "murkiness."
4. If electrolyte does not become "murky" during the "boost" charge, battery can be assumed to be in good condition.

1. Quick In-the-Car Battery Test

Inspection

Check outside of battery for damage or signs of serious abuse such as broken case or broken covers. Check inside of battery by removing the vent caps and inspecting for signs of abuse such as electrolyte level too low to see, or bad or unusual odors.

If battery shows signs of serious damage or abuse, it should be replaced. If not, make Light Load Test. (Refer to Figure 7-25).

Light Load Test

Check electrical condition of battery cells as follows:

1. First, place load on battery by cranking engine. If engine starts, turn off ignition immediately. If engine does not start, hold starter switch "ON" for 3 seconds, then release.
2. Then, turn on headlights (low beam). After 1 minute, with lights still "ON" read individual cell voltage of battery with voltmeter (.01 volt division). Compare readings with the following:

- *Uniform Readings*

  If one or more cells read 1.95 volts or more and the difference between the highest and lowest cells is less than .05 volts, battery is good and ready for service.

  However, if any cell reads less than 1.95 volts and difference between the highest and lowest cells is less than .05 volts, battery is good but should be fully recharged for good performance. See "Charging After Light Load Test."

- *Non-Uniform Readings*

  If any cell reads 1.95 volts or more and there is a difference of .05 volts or more between the highest and lowest cell, the battery should be replaced.

- *Low Readings*

  If all cells read less than 1.95 volts, battery is too low to test properly. FAILURE OF THE METER TO REGISTER ON ALL CELLS DOES NOT INDICATE A DEFECTIVE BATTERY. Boost charge battery and repeat Light Load Test. (See Boost Charging for Light Load Test.) If battery is found to be good after boosting, it should be fully recharged for good performance.

  If none of the cells come up to 1.95 volts after the first boost charge, the battery should be given a second boost. Batteries which do not come up after second boost charge should be replaced.

NOTE: If any battery found to be good by the Light Load Test does not perform satisfactorily in subsequent service, it should again be tested by the Light Load Test and if it still tests "good," it should be removed from the car and tested as outlined under OUT-OF-THE-CAR CHARGING AND TESTING.

2. In-the-Car Boosting and Charging

Boost Charging for the Light Load Test

Boost 12-volt Corvair batteries at 35 amperes for one hour or until the electrolyte reaches 125°.

- For best performance, a good battery should be fully charged before being returned to service.
- If batteries are to be fully charged by means of a quick charger, the charge rate must be "tapered" (reduced to a safe limit) when the electrolyte temperature reaches 125°F or when gassing becomes excessive. Failure to do so may harm the battery.

Other Quick Checks

1. Connect a voltmeter across the battery terminals and measure the terminal voltage of the battery

during cranking (remove the coil secondary lead during this check to prevent engine from firing). If the terminal voltage is less than 9.0 volts at room temperature (approx. 80±20°F), the battery should be further checked.

2. If the battery remains undercharged, check for loose generator belt, defective generator, high resistance in the charging circuit, oxidized regulator contact points, or a low voltage setting.
3. If the battery uses too much water, lower the voltage regulator setting.

GENERATOR

1. Check belt tension and adjust at idler pulley as required.
2. Remove wires from BAT terminal of regulator and hook an ammeter between these wires and the regulator BAT terminal. With the engine operating at medium speed, momentarily ground the "F" terminal of the generator. Generator output should increase. If it doesn't, make a complete check of the generator.
3. If output is high and is not affected by grounding the "F" terminal of the generator, disconnect the lead from the "F" terminal of the generator. Generator output should fall off. If it does not, remove the generator and check it for a grounded field.

REGULATOR

Voltage Regulator (fig. 8-1)

Measure the voltage between the "BAT" terminal of the regulator and ground at (1) idle speed, and (2) medium engine speed. The voltage should be higher at a medium engine speed than it is at idle speed. If it is not and the generator passes its tests above, make a complete check of the regulator. If voltage is higher at medium speed, the voltage regulator setting still may require adjustments as discussed previously under Steps 2 and 3 of "OTHER QUICK CHECKS" if the battery remains undercharged or uses too much water.

STARTING MOTOR AND SOLENOID

The following checks may be made:

1. If the solenoid does not pull in, measure the voltage between the switch (S) terminal of the solenoid and ground with the starting switch closed.

   CAUTION: If the solenoid feels warm, allow to cool before checking.

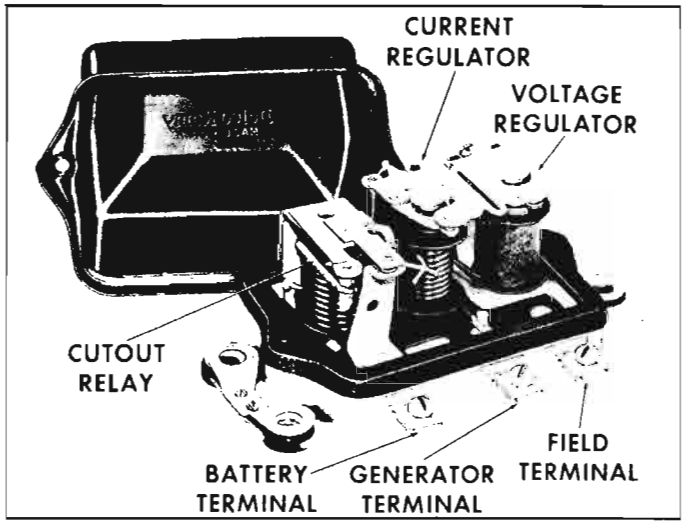

Fig. 8-1—Generator Regulator

If the voltage is less than 7.7 volts, check for excessive resistance in the solenoid control circuit. If the voltage exceeds 7.7 volts, remove the starting motor and check (1) solenoid current draw, (2) starting motor pinion clearance, and (3) freedom of shift lever linkage.

2. If the solenoid "chatters" but does not hold in, check the solenoid for an open "hold-in" winding (see Fig. 8-37 for locating hold-in winding). Whenever it is necessary to replace a starting motor solenoid, always check starting motor pinion clearance.
3. If motor engages but does not crank or cranks slowly, check for excessive resistance in the external starting circuit, trouble within the starting motor, or excessive engine resistance to cranking.

IGNITION SYSTEM

If the engine does not run, the ignition system may be at fault if:

1. There is no spark, during cranking, when a spark plug wire is held ¼ inch from the engine.
2. The engine starts but immediately stops when the ignition switch is released from the START position.

If these checks indicate trouble in the ignition system, follow the procedure outlined under Ignition Circuit—Checks and Adjustments on the Vehicle. This procedure may also be helpful in locating trouble in the ignition system if the car runs but not satisfactorily (also see *Section 7—Engine Tune-Up*).

GENERATING CIRCUIT

The generating circuit includes the battery, generator, regulator, generator telltale light and necessary wiring to connect these parts. The purpose of this system is to convert just enough mechanical energy from the engine into electrical energy to supply all electrically operated units and keep the battery fully charged. The simplified wiring diagram shown in Figure 8-2 illustrates this circuit.

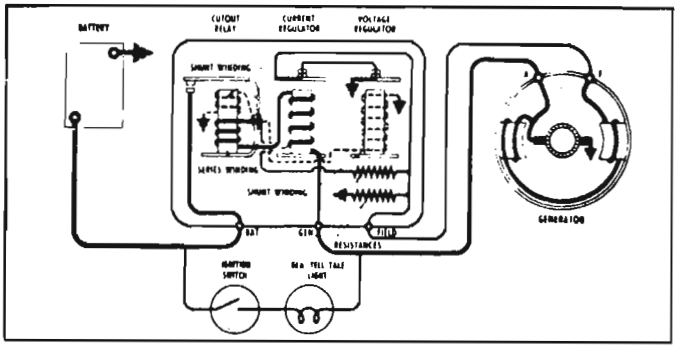

Fig. 8-2—Generating Circuit

Fig. 8-3—Battery

PERIODIC SERVICING

BATTERY

A 7 plate (per cell), 35 ampere hour battery (fig. 8-3) is used for the standard production models. An optional battery is offered and is of 9 plate (per cell), 40 ampere hour capacity.

Liquid level in the battery should be checked at least every 1,000 miles or once every two weeks. If the liquid level is found to be low, water should be added to each cell until the liquid level rises to the bottom of the vent well. **Do not overfill!** Distilled water, or water passed through a "demineralizer" should be used for this purpose in order to eliminate the possibility of harmful impurities being added to the electrolyte. Many common impurities will greatly shorten battery life. **Do not add any substance to the electrolyte except water.**

The external condition of the battery and the battery cables should be checked periodically. The top of the battery should be kept clean and the battery hold-down bolts should be kept properly tightened. Particular care should be taken to see that the tops of 12-volt batteries are kept clean of acid film and dirt because of the high voltage between the battery terminals. 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 its

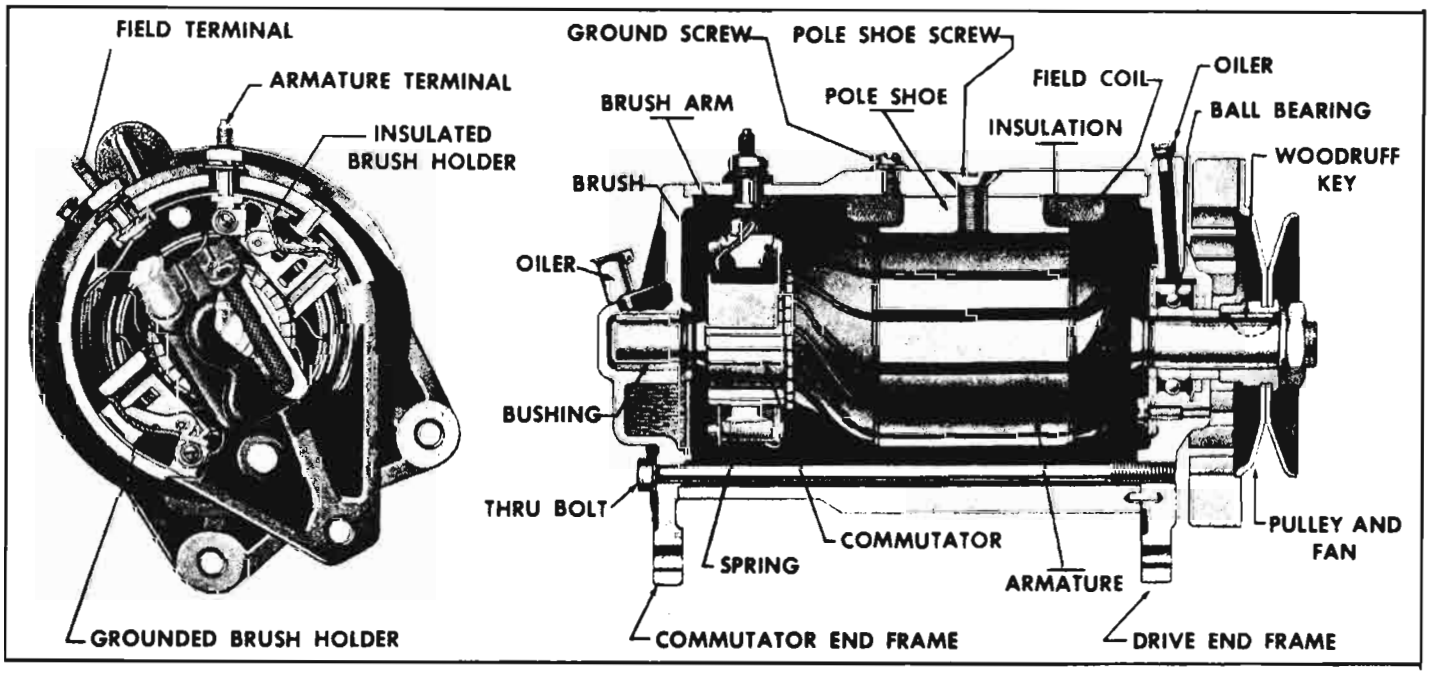

Fig. 8-4—Generator Cross-Section

holder, but they should not be tightened to the point where the battery case will be placed under a severe strain.

To insure good contact, the battery cables should be tight and bottomed on the battery posts. The new spring type battery cable clamps require that the ends of the clamps must be spread with a suitable pliers to remove or install. **It is important that the clamps be fully bottomed during installation.** If the battery posts or cable terminals are corroded, the cables should be disconnected and the terminals and clamps cleaned separately with a soda solution and a wire brush. **It is not recommended that lubrication be applied to the terminals** and cable clamps as it may contribute to slippage of the new type cable clamps from the terminals.

The positive terminal felt washer should be lubricated every 1000 miles with engine oil.

GENERATOR

The hinge cap oilers of the generator (fig. 8-4) should be filled with light engine oil once at each vehicle lubrication period.

Periodic servicing of the generator should include an inspection of the commutator and brushes for cleanliness and wear. If the commutator is dirty it should be cleaned as outlined under Generating Circuit —Checks and Adjustments on the Vehicle in this section. If the brushes are worn down to less than half their original length, they should be replaced.

REGULATOR

Normally, periodic servicing of the regulator is not required. However, it may occasionally be necessary to clean the regulator contact points as outlined under Generating Circuit—Servicing of Units Off The Vehicle.

CHECKS AND ADJUSTMENTS ON THE VEHICLE

GENERATOR TELLTALE LIGHT

If the indicator light stays on after the engine is started and run above idle speed, **stop engine immediately** and check blower belt for broken or slipping belt. If belt checks okay, then check generator. If light stays on at idle only, check for a low idle speed. Also check to see that the generator field is properly grounded by connecting a jumper wire from generator field terminal to ground with engine running at medium speed. If light goes out after connecting jumper wire, then cause of trouble is an improperly grounded generator field circuit.

If the light does not go on with the ignition switch **ON** and engine **OFF**, the indicator bulb should be checked and the telltale light circuit inspected for the possibility of an open circuit or loose connections.

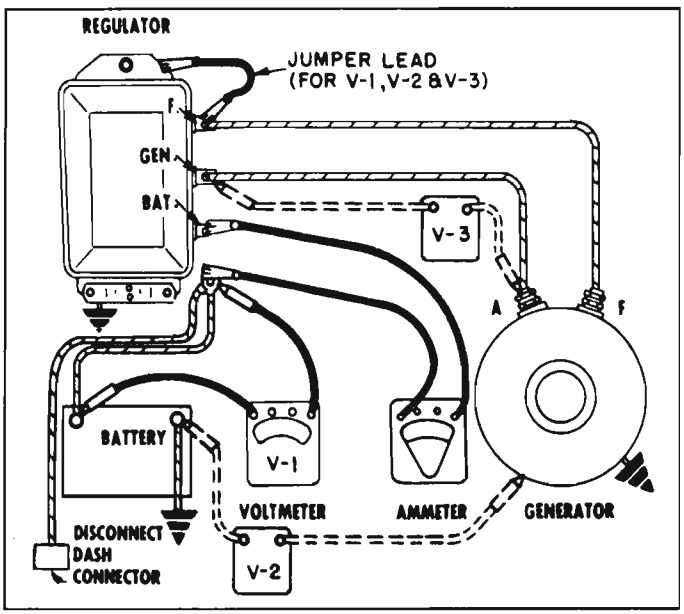

Fig. 8-5—Checking Generator Circuit Resistances

WIRING

Excessive voltage drop (resistance) in the charging circuit tends to keep the battery in an undercharged condition. To check for excessive voltage drop (resulting from loose connections or other high resistance) in the generating circuit, make connections as shown in Figure 8-5 and proceed as follows:

1. Ground the "F" terminal of the regulator.
2. Turn off all accessories and operate the generator at a speed which will produce a charge rate of approximately 20 amperes. If battery is fully charged, it may be necessary to turn on accessories to produce a 20 amp. charge rate.
3. Measure the voltage drop at V-1, V-2 and V-3 as shown in Figure 8-5. Readings V-1 plus V-2 should not exceed 0.5 volt. Reading V-3 should not exceed .03 volt. If the voltage drop exceeds these limits, excessive resistance is indicated in the circuit checked.

If excessive resistance is found, check the wiring for defects, and replace if necessary. Correct poor ground connections and clean and tighten all connections.

BATTERY

If a battery failure is encountered, the cause may lie outside the battery itself. DO NOT BE SATISFIED MERELY TO RECHARGE OR REPLACE IT. FIND THE CAUSE OF FAILURE AND PREVENT RECURRENCE OF TROUBLE.

In-the-Car Testing, Boosting and Charging

See page 8-2 for quick in-the-car battery operations.

Out-of-the-Car Charging and Testing

The procedures outlined below under Slow Charg-

ing and The Full Charge Hydrometer Test (See pages 8-10 and 8-11) should be used on:

Any battery originally found to be "good" by the Light Load Test, but which has since failed to perform satisfactorily in service and which still tests "good" by the Light Load Test (See page 8-2).

CAUTION: The "Full Charge Hydrometer Test" (Page 8-11) is not valid unless battery has been tested and found to be good by the Light Load Test.

REGULATOR

NOTE: The external grounding strap on the Corvair regulator is copper colored to identify it from other regulators. Check to see that correct regulator is installed.

Four regulator electrical checks can be made on the car; the settings of the cutout relay, voltage regulator, and current regulator, and a check for oxidized regulator contact points. Mechanical checks and adjustments requiring removal of the regulator from the car are discussed under *Generating Circuit—Servicing of Units Off the Vehicle.*

The regulator must have the cover in place and must be at operating temperature when the electrical settings are checked. Operating temperature shall be assumed to exist after not less than 15 minutes of operation at a charging rate of 8-10 amperes. For best results, the electrical checks should be made in the following order:

1. Voltage regulator setting.
2. Cutout relay closing voltage.
3. Current regulator setting.
4. Check for Oxidized Regulator Contact Points.

The following procedures are required for making each of these checks:

Voltage Regulator Setting

A method for checking and adjusting the voltage regulator setting is discussed below. However, it is seldom necessary to check and adjust the voltage regulator setting as long as (1) the battery remains satisfactorily charged without excessive use of water and (2) there is no evidence of damage to lights or other voltage-sensitive equipment.

To check the voltage regulator setting, proceed as follows:

1. Connect a ¼-ohm fixed resistor (approximately 25 watts) into the charging circuit at the BAT terminal of the regulator (fig. 8-6).
2. Connect a voltmeter from the regulator BAT terminal to ground.
3. Operate generator at 1600 engine rpm for at least 15 minutes with the ¼-ohm resistor in circuit and cover in place to bring the regulator to operating temperature.

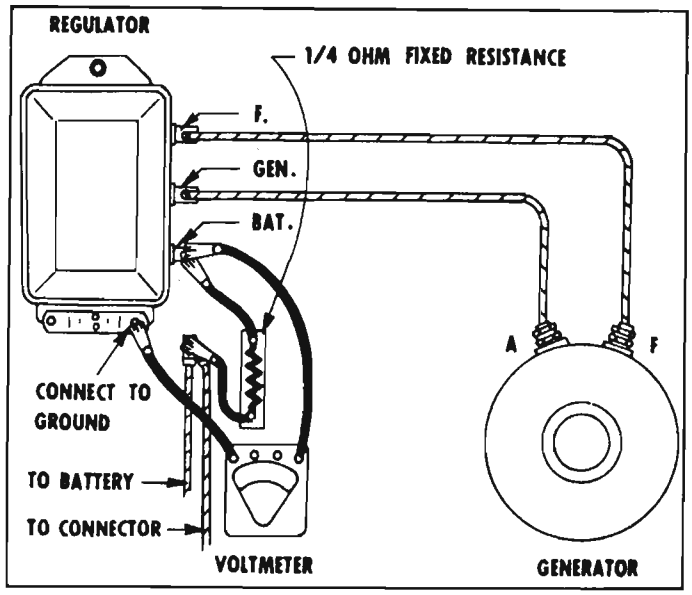

Fig. 8-6—Checking Voltage Regulator Setting

4. Cycle the generator by stopping the engine, then restarting and bringing generator speed back to 1600 engine rpm.
5. Note the voltmeter reading and ambient temperature (temperature of the air surrounding the regulator ¼" from its cover). The voltage reading found represents the voltage regulator setting at the ambient temperature noted. The setting will be different at other ambient temperatures.

   NOTE: If method of measuring ambient temperature is not available, ambient temperature may be assumed to be 40° F above room temperature.

6. Regulator specifications are based on checks made at an ambient temperature of 125° F. If the ambient temperature is above or below 125° when the checks are made, see figure 8-9 for correction factors. Also see *Voltage Regulator vs. Ambient Temperature* on the same page.
7. To adjust the voltage setting, remove the regulato cover and turn the adjusting screw (fig. 8-7).

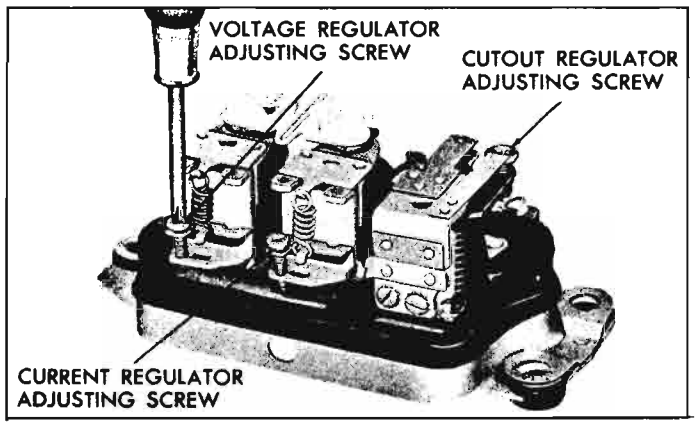

Fig. 8-7—Regulator Adjusting Screws

Increase spring tension to raise the setting; decrease spring tension to lower the setting.

***CAUTION:** Final adjustment should always be made by increasing spring tension to assure contact between the screw head and spring support. Sometimes the spring support does not follow the screw head as spring tension is decreased, and it will be necessary to bend the spring support up to insure contact between the spring support and screw head before final adjustment is completed (fig. 8-8). Failure of the voltage regulator unit to "hold" its setting usually results from—(1) setting or checking the voltage regulator at other than operating temperature, and (2) the screw head not touching the spring support after final adjustment is complete.*

Before taking the reading after each adjustment, replace the regulator cover as quickly as possible and cycle the generator.

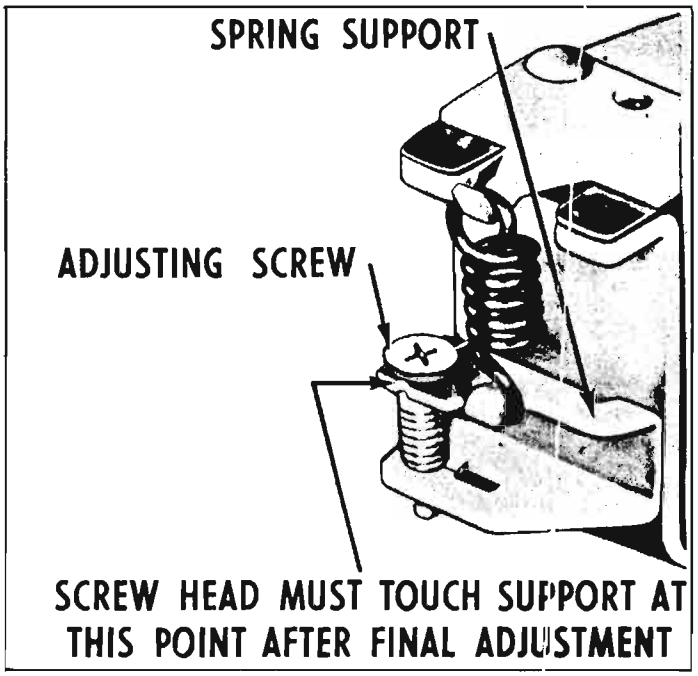

Fig. 8-8—Contact Between Regulator Spring Support and Adjusting Screw

Voltage Regulator vs. Ambient Temperature

The voltage regulator "Normal Range" setting specifications described in this section refer to a regulator which has been brought to a stabilized operating temperature at an ambient temperature of 125° F. Ambient temperature is the temperature of the air surrounding the regulator approximately ¼ of an inch from the regulator cover. Since the stabilized operating temperature of the regulator varies with the ambient temperature, the voltage regulator "Normal Range" setting varies accordingly. Figure 8-9 illustrates the normal range settings at various ambient temperatures and how the voltage regulator setting varies at different ambient temperatures as indicated by the vertical line.

Through the use of the table in Figure 8-9, it is possible to determine correct voltage readings at any ambient temperature from 45° to 165° F.

STANDARD REGULATOR

VOLTAGE REGULATOR SPECIFICATIONS VS REGULATOR AMBIENT TEMPERATURE

REGULATOR AMBIENT TEMPERATURE	VOLTAGE LOW	VOLTAGE HIGH
165° F	13.1	13.9
145° F	13.5	14.3
125° F	13.8	14.7
105° F	14.0	14.9
85° F	14.2	15.2
65° F	14.4	15.4
45° F	14.5	15.6

NORMAL SPECIFICATION RANGE

■ INDICATES PUBLISHED SPECIFICATIONS

Fig. 8-9—Voltage Regulator Correction Factors

When the "corrected" voltage regulator setting falls within the normal range given in the specifications and the battery condition has been satisfactory after a reasonable period of operation with this setting, the regulator setting should not be disturbed.

When the "corrected" voltage regulator setting falls inside or outside the normal range given in the specifications but battery condition has been unsatisfactory after a reasonable period of operation with this setting, tailor the voltage regulator setting as described under *Tailoring the Voltage Regulator Setting* below.

Tailoring the Voltage Regulator Setting

The desired voltage regulator setting is that which keeps the battery in a satisfactory state of charge without causing excessive water usage (as evidenced by

water consumption exceeding one ounce per cell each 1000 miles). In order to obtain the desired setting, tailor the voltage regulator setting as follows:

1. When the battery uses too much water and the "corrected" setting is above the normal range, lower the corrected setting to 14.5–14.8 volts and check for an improved condition over a reasonable service period. When the battery uses too much water and the "corrected" voltage setting is within the normal range, lower the setting 0.1 or 0.2 volts and check for an improved condition over a reasonable service period. Repeat until the battery remains charged with a minimum use of water.
2. When the battery is consistently undercharged and the "corrected" voltage setting is below the normal range, increase the "corrected" setting to 13.8—14.5 volts and check for an improved condition over a reasonable service period. When the battery is consistently undercharged and the "corrected" voltage setting is within the normal range, increase the setting 0.1 volt and check for an improved condition over a reasonable service period. Repeat until the battery remains charged with a minimum use of water.

NOTE: Avoid "corrected" settings above 14.8 volts as these may cause damage to lights and other voltage-sensitive equipment.

It rarely will be found necessary to use a voltage regulator setting outside the normal range in order to correct battery conditions. Batteries which do not respond to voltage regulator settings within the normal range usually will be found to be—(1) batteries used in cars that are operated consistently at low speeds or in heavy traffic, or (2) batteries that have abnormal charging characteristics.

(1) When a car is operated consistently at low speeds or in heavy traffic, the battery may remain undercharged even with a voltage regulator setting of 14.8 volts. Under these operating conditions, generator output and charging time may be insufficient to offset electrical loads on the battery. Periodic recharging of the battery from an outside source will be required in these cases.

(2) Batteries suspected of having abnormal charging characteristics should be given a complete check. If the checks outlined under *Generating Circuit-Checks and Adjustments on the Vehicle* indicate that the battery is still serviceable, a voltage regulator setting outside the normal range may be made provided it does not cause damage to lights or other voltage-sensitive equipment.

On new cars or on other applications where no battery history is available, any "corrected" voltage regulator setting found within the normal range may be considered satisfactory unless local conditions or subsequent battery performance indicate the need for tailoring the voltage regulator setting.

Cutout Relay Closing Voltage

Any setting that falls within the allowable limits given in the specifications is satisfactory so long as the setting is at least 0.5 volt below the voltage regulator setting. It is seldom necessary to check the closing voltage of the cutout relay as long as the relay functions to close and open the charging circuit.

1. Connect a voltmeter between the regulator "GEN" terminal and ground (fig. 8-10).

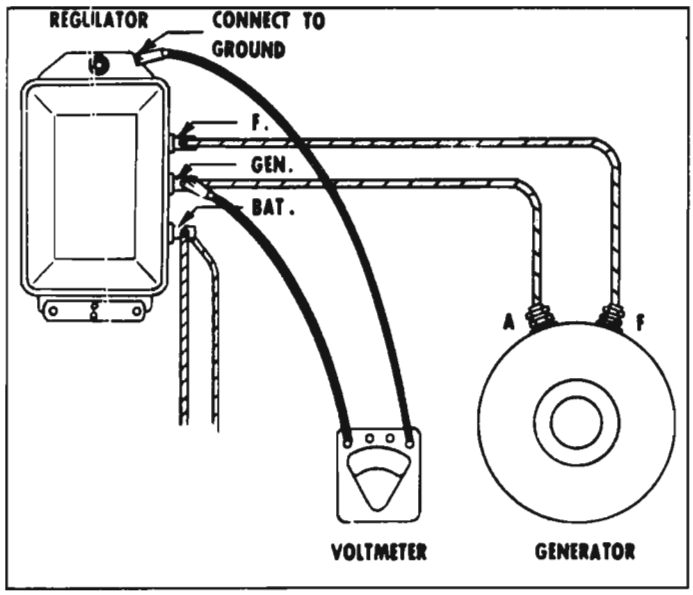

Fig. 8-10—Checking Cutout Relay Closing Voltage

2. Check cutout relay closing voltage by slowly increasing generator speed and noting the voltage at which the relay closes. Closing voltage should be 11.8 to 13.5 volts. Decrease generator speed and make sure the cutout relay contact points open.
3. Adjust the closing voltage by turning the adjusting screw. Turn the screw clockwise to increase the setting and counterclockwise to decrease the setting.

Current Regulator Setting

Any setting that falls within the allowable limits given in the specifications is satisfactory. It is seldom necessary to check the setting of the current regulator unless the generator armature shows signs of overheating.

1. Disconnect battery ground lead. Connect an ammeter into the charging circuit by removing both power wires from BAT terminal of regulator and connecting the ammeter between the power wires and the regulator BAT terminal. Reconnect battery ground lead (fig. 8-11).
2. Turn on all lights and accessories and connect an additional load across the battery, such as a

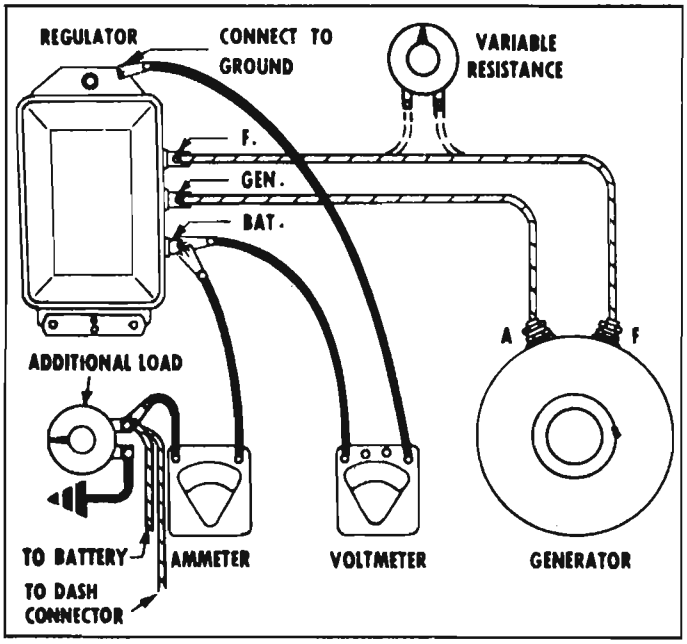

Fig. 8-11—Checking Current Regulator Setting

carbon pile or bank of lights, so as to drop the system voltage to 12.5-13.0 volts.

3. A variable rheostat of 25 watt capacity can be inserted into the generator field circuit as shown in Figure 8-11. This can be used to decrease and increase the voltage of the generator as required in the cycling procedure without changing engine speed.
4. Operate the generator at 1600 engine rpm for at least 15 minutes to establish operating temperature. The regulator cover must be in place.
5. Cycle the generator and note the current regulator setting. (For cycling procedure see instructions under *Voltage Regulator Setting*).
6. To adjust the current setting, turn current regulator adjusting screw shown in the middle unit of Figure 8-7 clockwise to increase current setting or counterclockwise to decrease the setting. See caution note under *Voltage Regulator Setting*.

Check for Oxidized Regulator Contact Points

NOTE: Oxidized regulator contact points may be the cause of a low generator output or a discharged battery.

1. Connect an ammeter into the charging circuit (fig. 8-12) and turn on headlights.
2. Operate the generator at a speed which will produce a charge rate of 5 amperes.
3. Ground the "F" terminal of the regulator as shown in Figure 8-12.
4. If generator output increases more than 2 amperes, oxidized regulator contact points are indicated and the regulator should be removed from the car and both the current and voltage regulator contact points should be cleaned as outlined under *Generating Circuit—Servicing of Units Off the Vehicle.*

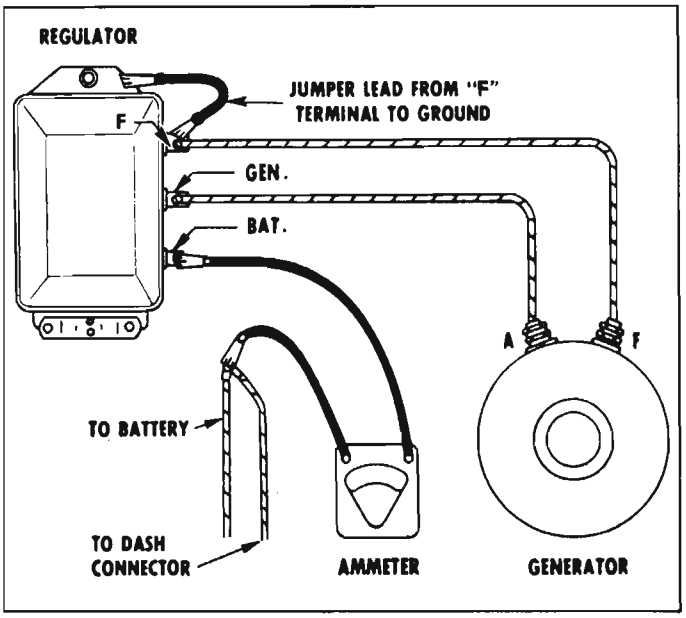

Fig. 8-12—Checking for Oxidized Contact Points

GENERATOR

When belt tension is properly adjusted but the generator does not perform satisfactorily on the car, inspect the commutator. If the commutator is dirty, clean it by holding No. 00 sandpaper or a cleaning stone against it while the generator is operating at idle speed. **Never use emery cloth to clean the commutator.** If this does not satisfactorily improve generator performance the generator should be removed from the car for a thorough check as outlined under *Generating Circuit—Servicing of Units Off the Vehicle.*

SERVICING OF UNITS OFF THE VEHICLE

BATTERY

Testing

Batteries may be tested off the vehicle in the same manner as described under *Generating Circuit—Checks and Adjustments on the Vehicle.*

Common Causes of Battery Failure

When a battery fails, the cause of failure may lie outside the battery itself. For this reason when a battery failure is encountered, **do not be satisfied to merely recharge or replace it. Find the cause of failure and prevent recurrence of the trouble.**

Listed below are some of the common causes of battery failure:

1. Defect in the generating system such as high resistance, slipping blower belt, faulty generator or regulator.
2. Overloads caused by defective starting or excessive use of accessories.
3. Driver habits or driving conditions such as using the vehicle only for short drives.
4. Dirt and electrolyte on top of battery causing a constant drain.
5. Hardened battery plates, commonly called "sulphation" due to battery being in a low state of charge over a long period of time.
6. Physical defects such as shorted cells, loss of active material from the plates, etc.

Out-of-the-Car Charging and Testing

The procedures outlined below under Slow Charging and The Full Charge Hydrometer Test should be used on:

Any battery originally found to be "good" by the Light Load Test, but which has since failed to perform satisfactorily in service and which still tests "good" by the Light Load Test.

CAUTION: The "Full Charge Hydrometer Test" is not valid unless battery has been tested and found to be good by the Light Load Test.

Slow Charging

- Adjust electrolyte to proper level by adding water, then charge battery at 5 amperes for a minimum of 8 hours. Full charge of the battery is indicated when all cell gravities do not increase when checked at three intervals of one hour and all cells are gassing freely.
- Due to the low rate during slow charging, plenty of time must be allowed. Charge periods of 24 hours or more are often required.

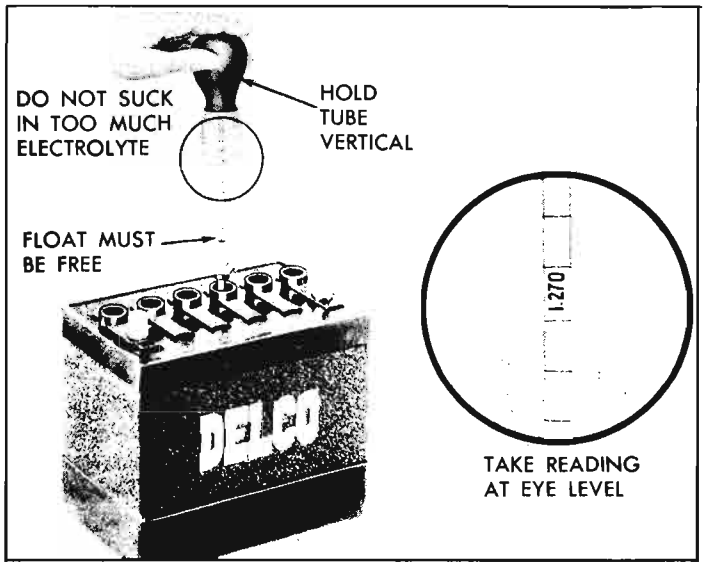

Fig. 8-13—Testing Specific Gravity of Battery (Typical)

The Full Charge Hydrometer Test

1. Make sure battery is fully charged as described under "Slow Charging" above. HYDROMETER READINGS TAKEN ON PARTIALLY CHARGED BATTERIES ARE UNRELIABLE FOR THE FOLLOWING TEST:
2. Measure specific gravity of electrolyte in each cell and compare readings with the following:
   - If cell readings range between 1.250 and 1.290, the battery is ready for use. All it needed was a full charge. Any variation in the specific gravity between cells within this range does not indicate a defective battery.
   - If the specific gravity of any cell or cells falls outside this range, (1.250 to 1.290), replace the battery.

Care of New Batteries in Storage

Wet Batteries

Storage batteries containing fluid electrolyte are commonly called "wet" batteries. Self discharge will cause wet batteries to become discharged and sulphated if they are not properly maintained in storage. To minimize self discharge, wet batteries should be stored in as cool a place as possible, so long as the electrolyte does not freeze. Storage of batteries at temperatures exceeding 60° F. without frequent inspection and recharging is equivalent to the same use as in normal automotive service. A wet battery which has been allowed to stand idle for a long period of time may be so badly damaged by the growth of lead sulphate crystals (sulphation) in the plates that it can never be restored to a normal charged condition. Batteries should be recharged every 30 days to prevent damage of this kind. If storage temperature is high, more frequent charging will be necessary. Check electrolyte level of such batteries and add water if necessary before charging, to bring electrolyte to proper level.

Dry Charged Batteries

A "dry charge" battery contains fully charged positive and negative plates but no fluid electrolyte.

Dry charged batteries should be stored in a dry place away from excessive heat and moisture. Thirty-six months of storage without maintenance produces no deterioration if the battery is properly stored.

Batteries "wet or dry" should be stored on independently supported shelves to avoid damage to battery directly below as in vertical stacking.

After Delco Electrolyte has been added to a dry charged battery, it is then a "wet" battery and should be maintained as any other "wet" battery.

GENERATOR

Removal

1. Disconnect ground cable from battery.
2. Disconnect the armature and field terminal wires from the generator (fig. 8-15).
3. Loosen idler pulley on belt to permit removal of belt from generator pulley.
4. Remove three bolts securing generator to engine.

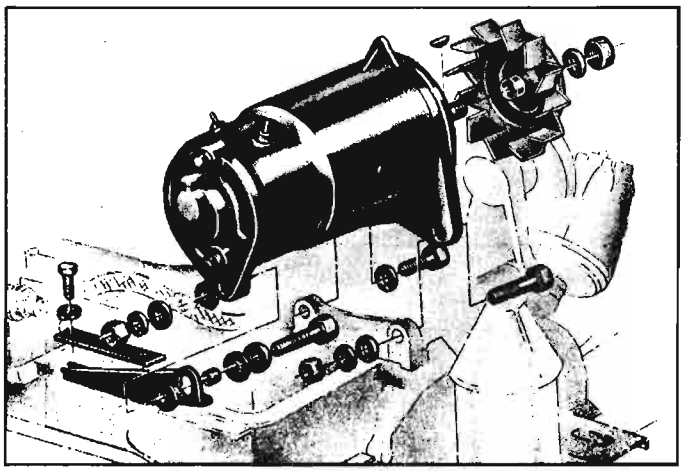

Fig. 8-14—Generator Installation

Brush Replacement

If brushes are worn to their original length they should be replaced.

1. Place generator in a bench vise.
2. Remove the two through bolts and the commutator end frame assembly.
3. Remove the armature and drive end assembly as a unit from the generator (fig. 8-15).
4. Remove the brush lead wire screws (fig. 8-16).
5. Install new brushes, reassemble the generator and install to engine as described under *Installation.*

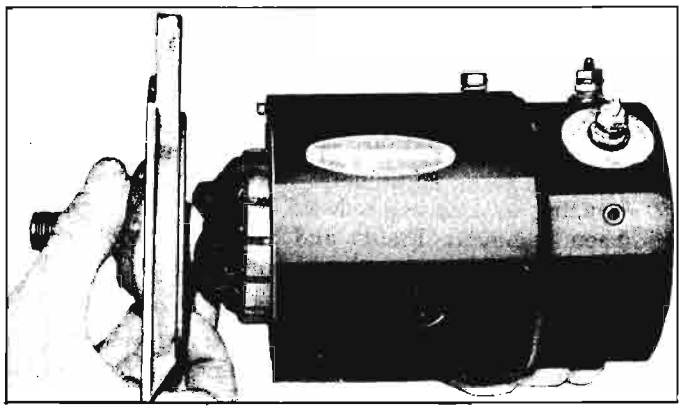

Fig. 8-15—Removing End Frame and Armature from Generator

NOTE: If tests are required immediately after the installation of new brushes, the brushes should be seated to the commutator by using a brush seating paste on the commutator. The soft abrasive meterial of the paste will be carried under the brushes and wear the brush faces to the commutator in a few seconds. Blow all dust from the generator. This will insure accurate readings. If immediate tests are not required, allow the brushes to seat themselves. This will take about 10 hours of operation.

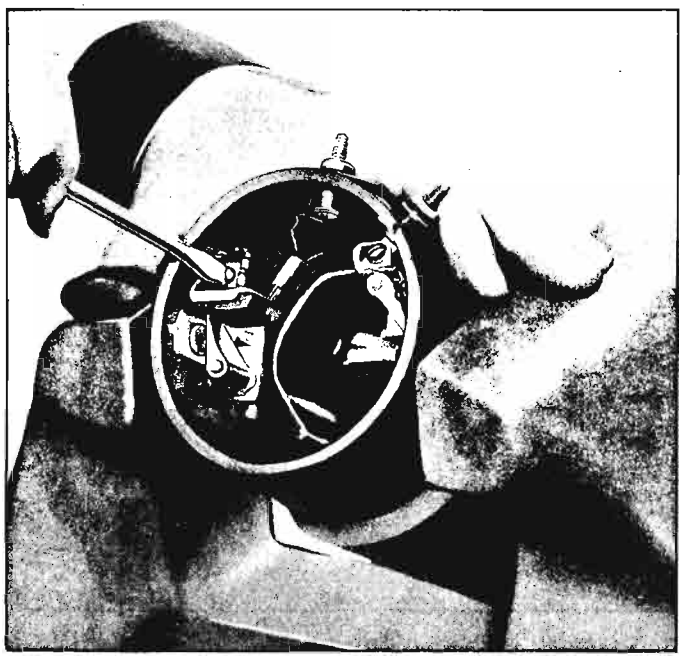

Fig. 8-16—Removing Brush Leads

Disassembly

Refer to Figure 8-17 for an exploded view of the generator.

1. Place the generator in a bench vise. Use the vise as a holding fixture only, being careful not to pinch the generator frame.
2. Remove nut and lockwasher at drive end, then slide pulley and fan off armature shaft and remove key.

   NOTE: It is important to remember that the nut on the end of the shaft has a left-hand thread.

3. Remove the two through bolts and lockwashers and remove the commutator end frame.
4. Remove the drive end frame and armature assembly (fig. 8-15).

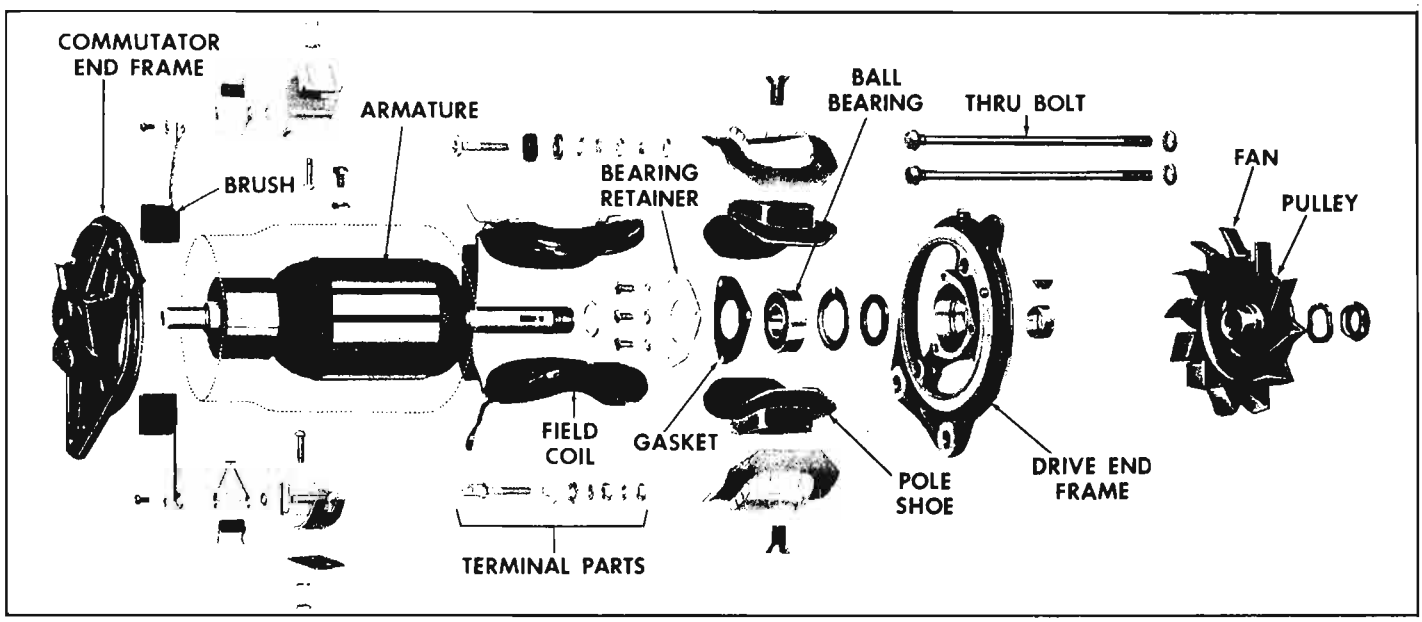

Fig. 8-17—Generator—Exploded View

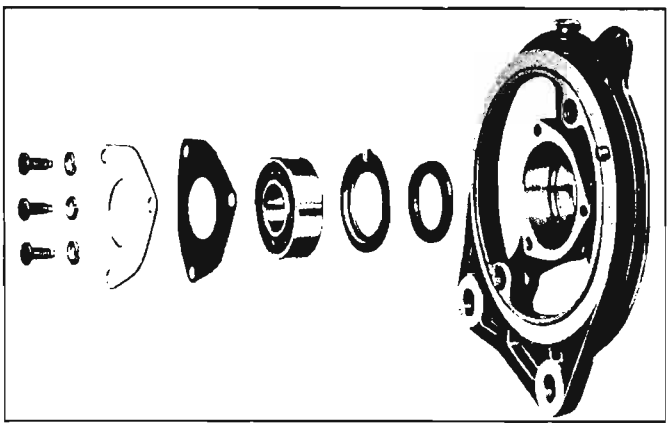

Fig. 8-18—Exploded View of Drive End Frame Assembly

5. Slide the drive end frame and spacer collar off armature shaft. Remove spacer collar from end frame and spacer washer from armature shaft.
6. Remove three drive end bearing retaining plate screws, retaining plate, gasket, ball bearing, retainer, and felt washer from drive end frame (fig. 8-18).
7. Remove the brush lead wire screws (fig. 8-16) and remove brushes.

Cleaning and Inspection

With the generator completely disassembled, except for removal of field coils, the component parts should be cleaned and inspected as described below. Field coils need be removed only where defects in the coils are indicated by the tests described below, in which case the pole shoe screws should be removed and the pole shoes and field coils disassembled. Any defective

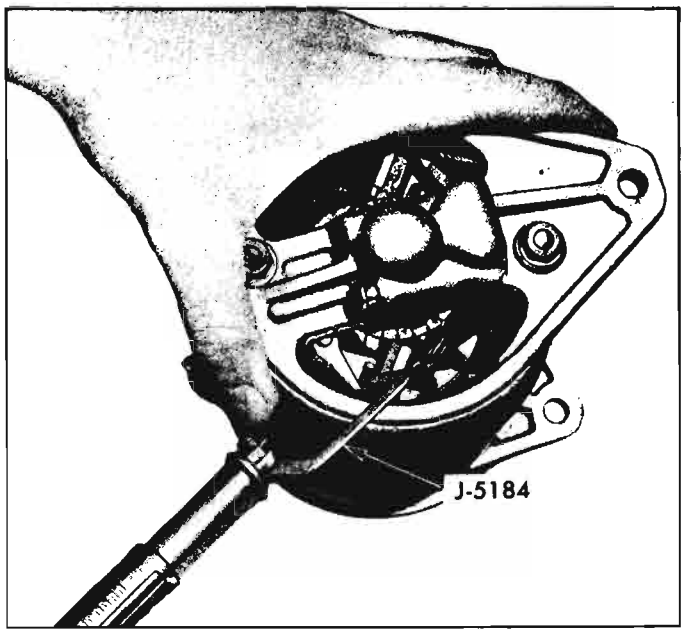

Fig. 8-19—Checking Brush Spring Tension

parts should be replaced or repaired (see *Generator Repairs*).

1. Wash all metal parts except the armature and fields in cleaning solvent. Do not wash generator housing in cleaning solvent if field coils have not been removed. Fields and armature must never be cleaned with any degreasing solvents since this may damage the insulation.
2. After it has been given a thorough cleaning in solvent, inspect generator ball bearing for roughness, scored races, and deformed balls.
3. Check brush holders to see that they are not de-

formed or bent so as to interfere with holding brushes properly against commutator. Check brush spring tension as shown in Figure 8-19. Proper spring tension is approximately 28 ounces.

4. Check fit of armature shaft in bushing in commutator end frame. If bushing is excessively worn, the end frame should be replaced and armature checked for damage. Check field and field pole shoes for indications of rubbing.

5. Inspect armature commutator. If rough, it must be turned down and insulation undercut. Inspect solder at points where armature wires fasten to ends of commutator riser bars to make sure solder is in place so as to assure a good connection. See *Repairs*.

Testing Generator Parts

Use a test lamp capable of detecting high resistance grounds.

Armature Test for Shorts

Check armature for shorts by placing on growler and with hack saw blade over armature core, rotate armature (fig. 8-20). If saw blade vibrates, armature or commutator is shorted. Recheck after cleaning between the commutator bars and if saw blade still vibrates, armature is shorted and must be replaced.

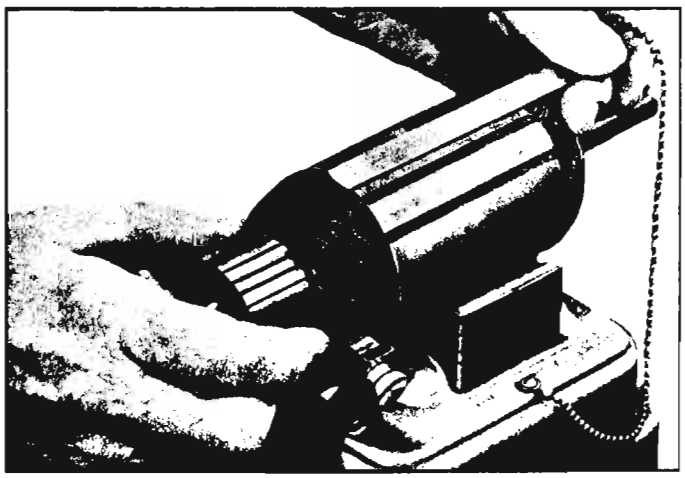

Fig. 8-20—Armature Test for Shorts

Armature Test for Ground

Using test lamp, place one test prod lead on armature core and other on each commutator bar (fig. 8-21). If lamp lights, armature is grounded and must be replaced.

Armature Test for Open Circuit

Check the armature for open circuits by making a bar-to-bar check as shown in Figure 8-22. Inconsistent variations in reading indicate an "open" armature.

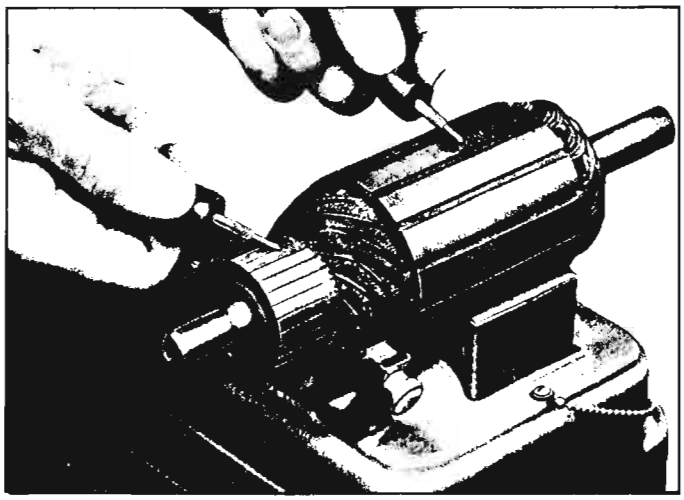

Fig. 8-21—Armature Test for Ground

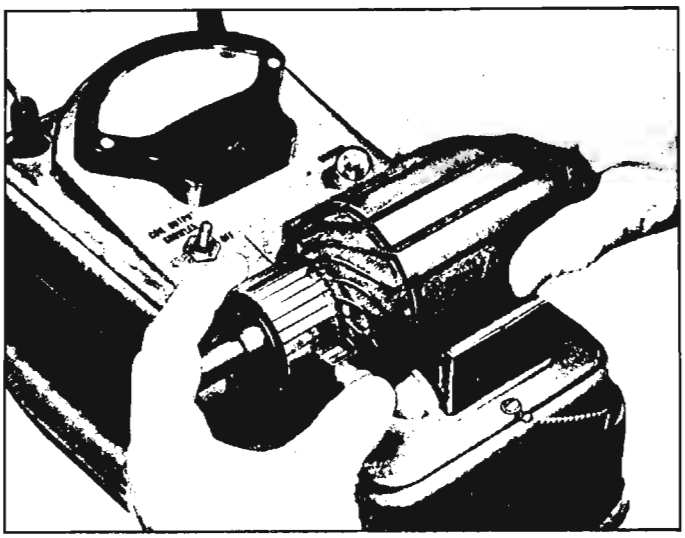

Fig. 8-22—Armature Test for Open Circuit

Field Coil Test for Open Circuit

Using test lamp, place one test prod lead on field terminal on generator frame and the other test prod lead on the end of the field coil lead to the armature terminal (fig. 8-23). If lamp does not light, the field coils are open and must be replaced (unless a loose soldered connection is found at the field terminal).

Field Coil Test for Ground

Using a test lamp, place one test prod lead on ground (touch to generator frame) and other lead on field terminal on generator frame (fig. 8-24). Be sure free end of field wire is not touching ground and field terminal insulation is not broken. If lamp lights, the field coils are grounded. If ground in field coils cannot be located or repaired, coils must be replaced.

Positive Terminal Test for Ground

Using a test lamp, place one test prod lead on generator positive (armature) terminal on generator

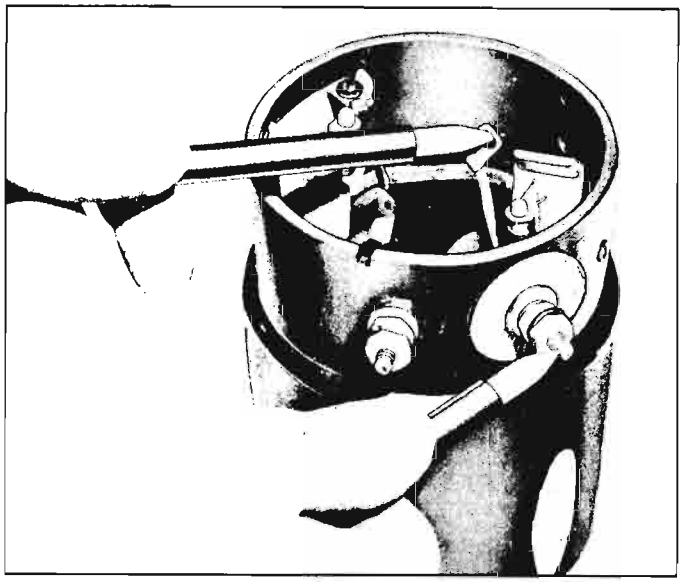

Fig. 8-23—Field Coil Test for Open Circuit

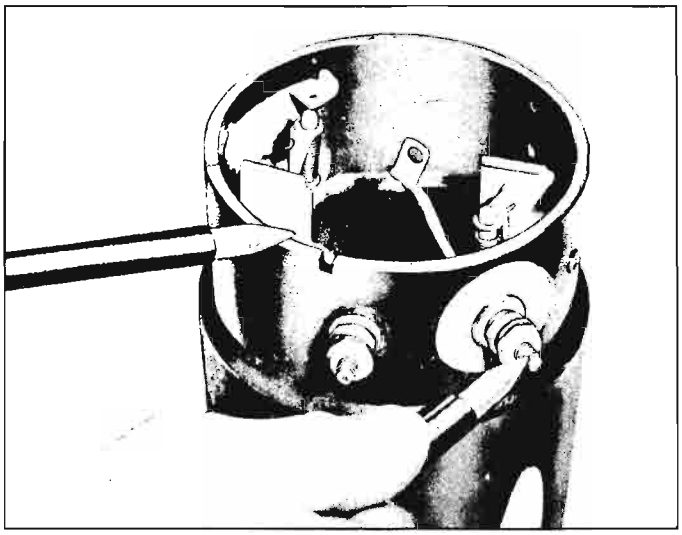

Fig. 8-24—Field Coil Test for Ground

frame, and place other lead on ground on generator frame (fig. 8-25). Be sure loose end of terminal lead is not touching ground. If lamp lights, positive terminal insulation through generator frame is broken down and must be replaced.

Positive Brush Test for Ground

Using a test lamp, place one test prod lead on the positive or insulated brush holder and the other lead on ground. If lamp lights the brush holder is grounded due to defective insulation at the frame (fig. 8-26).

Repairs

Loose Electrical Connections

When an open soldered connection of the armature to commutator leads is found during inspection, it may be resoldered provided resin flux is used for soldering.

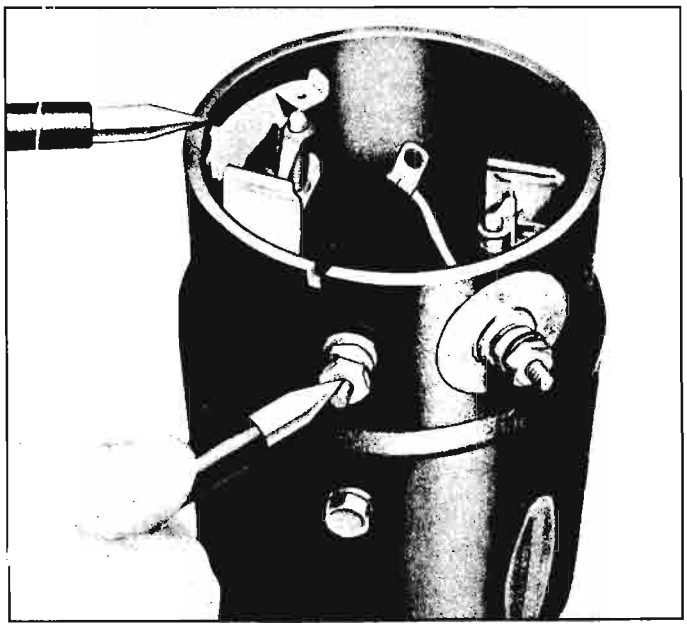

Fig. 8-25—Positive Terminal Test for Ground

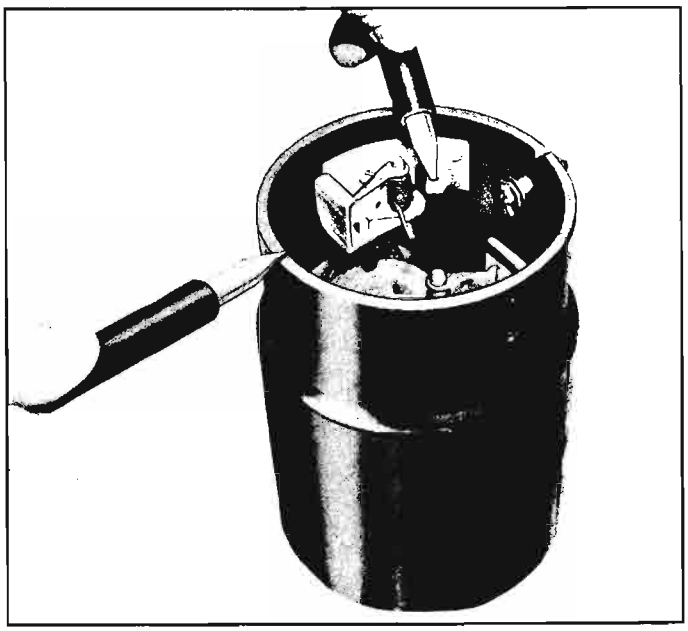

Fig. 8-26—Positive Brush Test for Ground

Caution: Acid flux must never be used on electrical connections.

Turning the Commutator

When inspection shows commutator roughness, it should be cleaned as follows:

1. Turn down commutator in a lathe until it is thoroughly cleaned.

   CAUTION: Do not cut beyond section previously turned.

2. Undercut insulation between commutator bars

1/32". This undercut must be the full width of insulation and flat at the bottom; a triangular groove will not be satisfactory. After undercutting, the slots should be cleaned out carefully to remove any dirt and copper dust.

3. Sand the commutator lightly with No. 00 sandpaper to remove any slight burrs left from undercutting.
4. Recheck armature on growler for short circuits.

Brush Holder Replacement

If brush holders are damaged they can be replaced by special service units which are attached with screws and nuts.

Assembly

After all parts have been thoroughly tested and inspected and worn or damaged parts replaced, the generator should be reassembled. Pack ball bearings with high melting point ball bearing grease before assembly.

1. Install felt washer, retainer, bearing, gasket and retaining plate to drive end frame. Install felt washer retainer with inner depression toward felt washer.
2. Install inner spacer washer on drive end frame of armature shaft and place drive end frame over end of armature. Slide outer spacer collar over shaft into end frame. See Figure 8-15.
3. Install new brushes in brush holders and push brushes back against spring tension.

NOTE: If brush holders are damaged they can be replaced by special service units which are attached with screws and nuts.

4. Install armature and drive end frame assembly to housing. Release brushes so they will contact commutator.
5. Add 2 drops engine oil to porous bushing and assemble commutator end frame over end of armature shaft. Rotate both end frames until dowels engage, then install through bolts.
6. Assemble key, fan and pulley to shaft as follows, then install lockwasher and nut (see fig. 27).
   a. Cradle the generator in a fixture with a back-up plate against the rear bearing cap (to avoid damage to the cap when installing the pulley).
   b. Insert the key into the keyway supporting the lower side of the shaft.
   c. Line up the key and keyway in the pulley and mount on the shaft using a steady press on the pulley if interference is encountered.
   d. Torque the pulley attaching nut to 50-60 ft. lbs.

NOTE: Steps b, c, and d are critical in preventing brinelling of the bearing races resulting in low service life in the field.

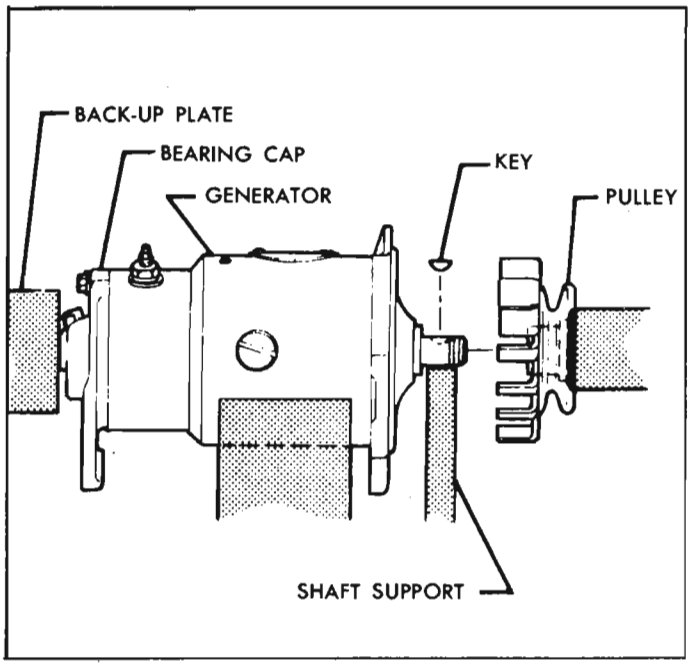

Fig. 8-27—Pulley Assembly

CAUTION: Pulley hub must be pulled down tight against outer spacer collar. This is a left-handed pulley nut.

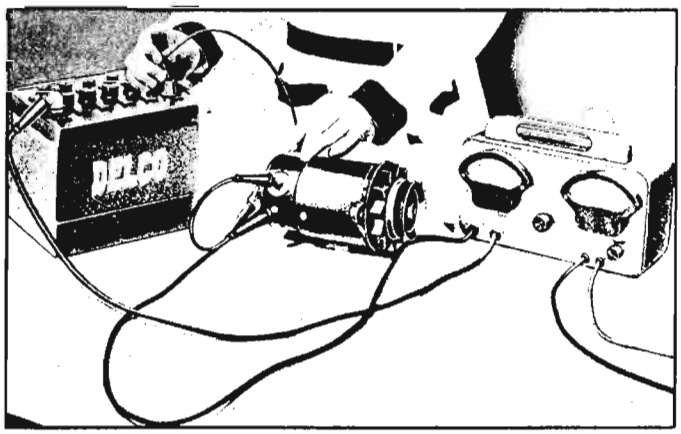

Fig. 8-28—Motoring the Generator

7. Motor the generator (fig. 8-28) as follows: Ground the field terminal to the generator frame and connect the generator armature terminal to the positive post of a 12 volt battery with an ammeter in the circuit. Connect the negative battery terminal to the generator frame. The generator should run as a motor with a current draw as shown in *Section 12 — Specifications.* Failure to meet these specifications is generally the result of tight bearings or a bent armature shaft.

CAUTION: When performing this test make sure the positive post of the battery is connected to the generator armature terminal. Otherwise the residual magnetism of the generator will be reversed, thereby reversing the polarity of the generator.

Installation

1. Place generator in position and install bracket, bolts, lockwashers and nuts (fig. 8-14). Leave loose.
2. Place blower belt over generator drive pulley. Do not tighten idler bracket at this time.
3. Secure the generator as follows:
   a. Tighten the two generator-to-engine oil filter and generator adapter attaching bolts and nut (at drive end of generator) to 15-22 ft. lbs. torque.
   b. Loosely assemble mounting bracket to generator bolt and nut (at commutator end of generator) —do not tighten so that bracket cannot move.
   c. Finger tighten the two bracket to cylinder head bolts.
   d. Tighten mounting bracket to generator bolt and nut (at commutator end of generator) to 8-11 ft. lbs. torque.
   e. Tighten generator bracket to engine rear bolt to 15-22 ft. lbs. torque.
   f. Tighten generator bracket to engine front bolt to 15-22 ft. lbs. torque.
4. Adjust the idler pulley so that there will be a 3/8" deflection with a 15 lb. push midway between blower and idler pulley. Tighten idler pulley.
5. Connect brown positive generator lead to generator armature terminal, dark blue field lead to generator field terminal.

   CAUTION: On radio equipped cars connect radio by-pass condenser to generator armature (A) terminal, NOT to the generator field (F) terminal.

6. Polarize the generator by momentarily connecting a jumper wire between the BAT and GEN terminals on the regulator.
7. Start the engine. If brushes squeak, seat them by placing brush seating paste on the commutator. The soft abrasive material of the paste will be carried under the brushes and wear the brush faces to the commutator contour in a few seconds. Fill cavity through hinge cap oiler on commutator drive end frame.

REGULATOR

While electrical adjustments are made with the regulator on the car as outlined under Checks and Adjustments on the Vehicle, it is necessary to remove the regulator for cleaning contact points and adjusting air gaps on the three regulator units.

Removal

To remove the regulator it is merely necessary to disconnect the leads from the regulator terminals and remove the screws securing the regulator to the engine compartment panel (fig. 8-29). Tape battery lead to prevent grounding.

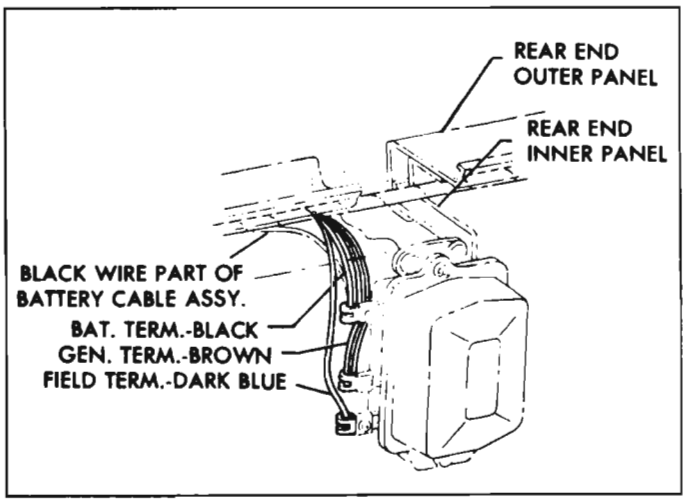

Fig. 8-29—Regulator Installed

Inspection and Adjustment

Electrical settings must be checked and adjusted after making mechanical adjustments described below. Before installing regulator cover, make sure the rubber gasket is in place on the regulator base.

Cleaning Regulator Contact Points

Regulator contact points will not operate indefinitely without some attention. Dirty or oxidized contact points arc and burn, cause reduced generator output and run down batteries. It has been found that a great majority of all regulator troubles can be corrected by a simple cleaning of contact points plus possibly some

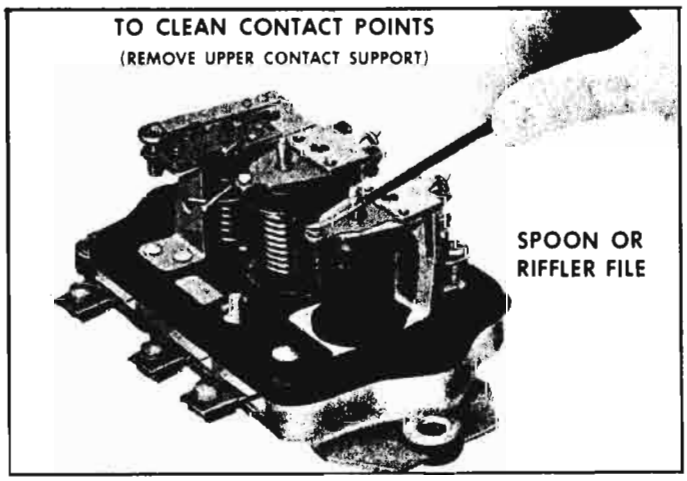

Fig. 8-30—Cleaning Regulator Contact Points

readjustment. If the points are properly cleaned the regulator will be restored to normal operation. If improperly cleaned, improvement in performance will be small and only temporary.

To clean the contact points, remove cover and remove the nylon nuts and upper contact support (fig. 8-30).

Use a spoon or riffler file and file each point separately. **Never use sandpaper or emery cloth to clean the contact points because particles of embedded grit in the regulator points will cause them to arc and corrode. Do not file contact points excessively.**

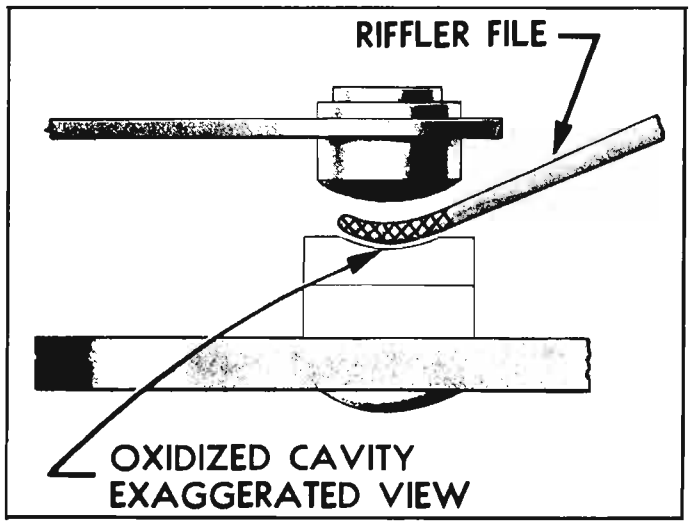

Fig. 8-31—Use of the Riffler File

The large flat contact point, located on the armature of both current and voltage units, always develops a slight cavity (fig. 8-31) and will require the most attention. It is not necessary to have a flat surface on this contact point, but a riffler filer should be used to remove all oxides so that pure metal is exposed.

The small soft-alloy contact point, located on the upper contact support of current and voltage regulator units, does not oxidize. This contact point may be cleaned with crocus cloth, or other fine abrasive material, followed by a thorough wash with a clean commercial solvent to remove any foreign material remaining on the contact surface.

Voltage and Current Regulator Contacts

1. The **large flat point** should be cleaned with a spoon or riffler file so that pure metal is exposed. After filing the contacts they should be thoroughly washed with a clean commercial solvent to remove any foreign materials.
2. The **small soft-alloy** contact point should be cleaned as described below for cutout relay contact points.

Cutout Relay Contacts

The contact points on these units are of a soft material and SHOULD NOT BE CLEANED WITH A RIFFLER FILE.

1. Clean these contact points with crocus cloth or fine abrasive material.
2. Thoroughly wash the points with a clean commercial solvent to remove any foreign materials.

CAUTION: Never use emery cloth or sandpaper to clean the contact points.

Contact Support Brackets

After cleaning or replacing the voltage or current regulator contact supports, reassemble as shown in Figure 8-1.

Cutout Relay Air Gap and Point Opening

1. Place fingers on armature directly above core and move armature down until points just close and then measure air gap between armature and center core (fig. 8-32). Air gap should be .020".

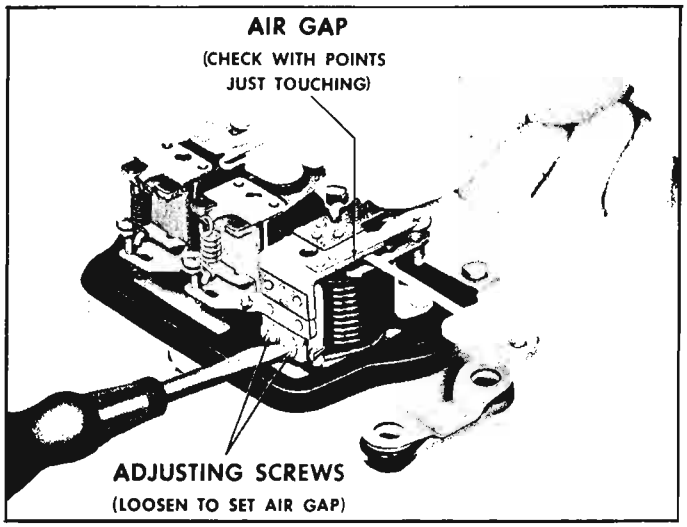

Fig. 8-32—Adjusting Cutout Relay Air Gap

2. To adjust air gap, loosen two screws at back of relay and raise or lower armature as required. Tighten screws securely after adjustment (fig. 8-32).
3. Check point opening and adjust to .020" by bending upper armature stop (fig. 8-33).
4. After making air gap and point opening adjustments, recheck closing voltage and make any necessary adjustments.

Voltage Regulator Air Gap

1. Push armature down to core and release it until contact points just touch and then measure air gap between armature and center of core (fig. 8-34). Air gap should be .075".
2. Adjust gap by raising or lowering contact support brackets as required by turning nylon nut on top of voltage regulator unit. (fig. 8-34).
3. After making air gap adjustment, recheck voltage setting and make necessary readjustments.

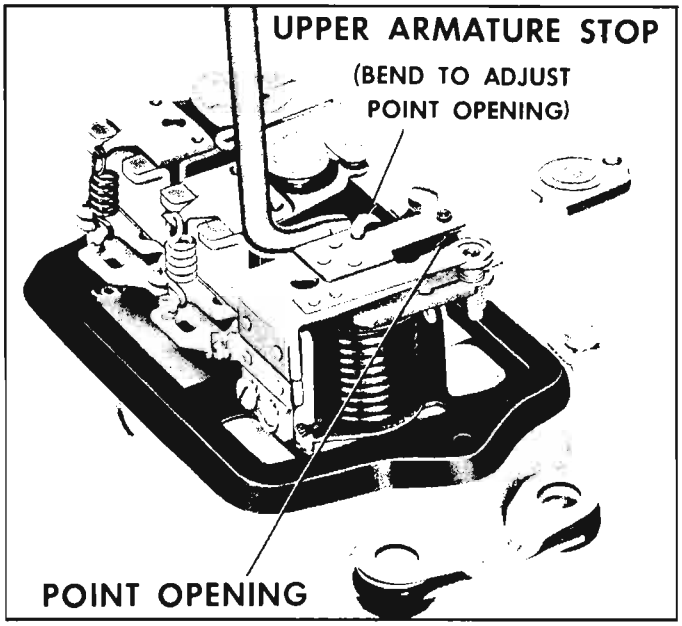

Fig. 8-33—Adjusting Cutout Relay Point Opening

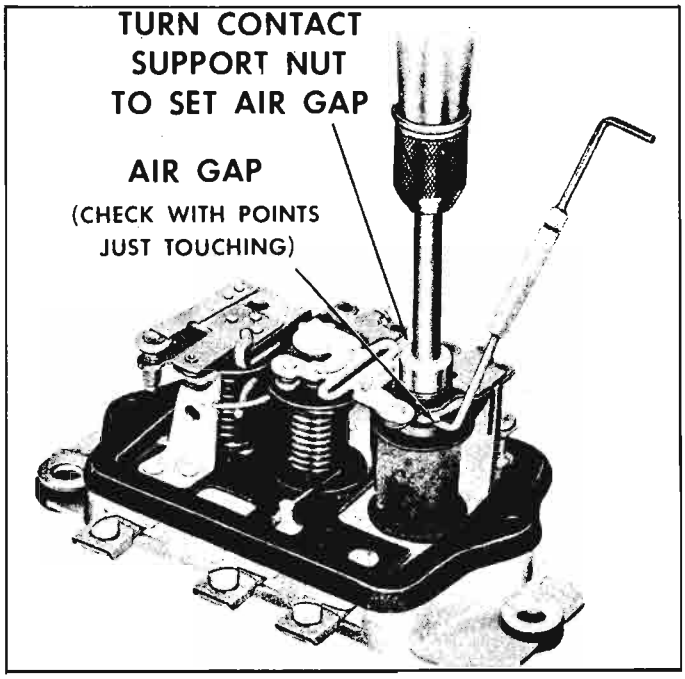

Fig. 8-34—Adjusting Regulator Air Gap

Current Regulator Air Gap

1. Check and adjust current regulator air gap in exactly the same manner as voltage regulator (fig. 8-34). Air gap should be .075".
2. After making air gap adjustment, recheck current setting and make necessary readjustments.

Replacing Springs

If it becomes necessary to replace the spiral spring on either the current or voltage regulator unit, the new spring should first be hooked on the lower spring support and then stretched up until it can be hooked at the upper end. Stretch the spring only by means of a screwdriver blade inserted between the turns. Do not pry the spring into place, as this is likely to bend the spring supports. After installing a new spring, readjust the unit setting as previously described.

Installation

1. Make sure attaching area is clean for proper ground, then install regulator and tighten mounting screws.

   CAUTION: Do not tighten the mounting screws excessively as this will destroy the cushioning effect of rubber grommets in the mounting.

2. Attach BAT (black), GEN (brown), and FIELD (dark blue) leads to regulator and polarize generator as outlined below.
3. Check and adjust the electrical settings of the regulator on the car as outlined under *Generator Circuit-Checks and Adjustments on the Vehicle.* Make sure the rubber gasket is in place between the cover and the regulator base.

RADIO BY-PASS CONDENSERS

The installation of radio by-pass condensers on the field terminal of the regulator or generator will cause the regulator contact points to burn and oxidize so that generator output will be reduced and a rundown battery will result. If a condenser is found connected to either of these terminals, remove the condenser and clean the regulator contact points as previously explained. **Never connect radio by-pass condensers to the field terminal of the regulator or generator.**

POLARIZING THE GENERATOR

After reconnecting leads, momentarily connect a jumper lead between the GEN and BAT terminals of the regulator. This allows a momentary surge of current to flow through the generator which correctly polarizes it. Failure to do this may result in severe damage to the equipment since reversed polarity causes vibration, arcing, and burning of the relay contact points.

STARTING CIRCUIT

The type of starting motor used has four field coils, all of which are connected in series from the motor terminal of the solenoid to the insulated brushes (fig. 8-35).

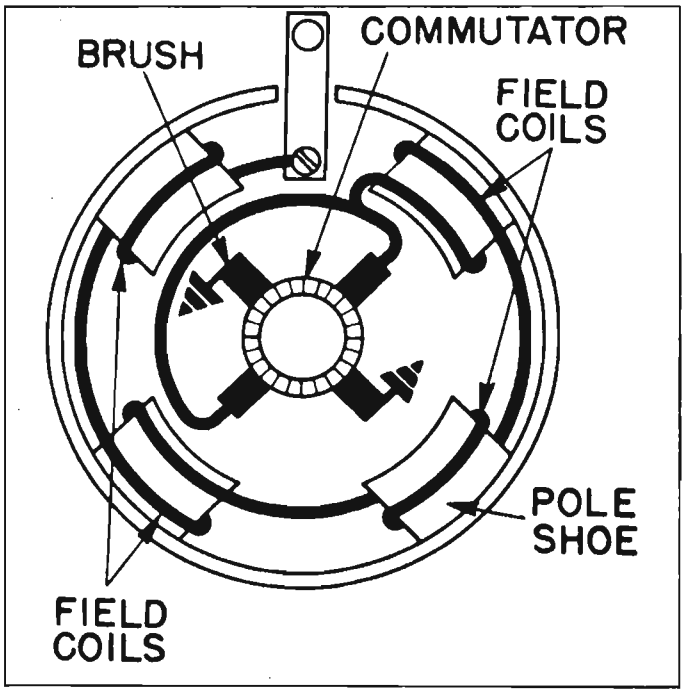

Fig. 8-35—Starting Motor Circuit—Series Field Coils

PERIODIC SERVICING

No periodic lubrication of the starting motor or solenoid is required. Since the starting motor and brushes cannot be inspected without disassembling the unit, no service is required on these units between overhaul periods.

CHECKS AND ADJUSTMENTS ON THE VEHICLE

Although the starting motor (fig. 8-36) cannot be checked against specifications on the car, a check can be made for excessive resistance in the starting circuit. Place a voltmeter across points in the cranking circuit indicated below and observe the reading with the starting switch closed and the motor cranking (distributor

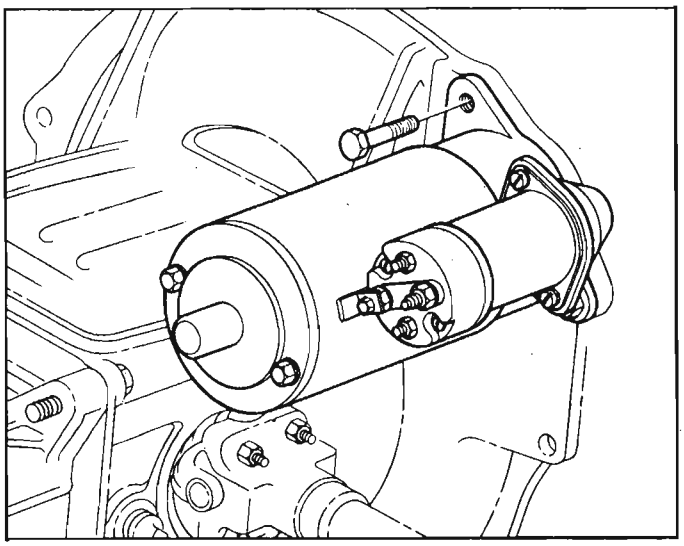

Fig. 8-36—Starting Motor Installed

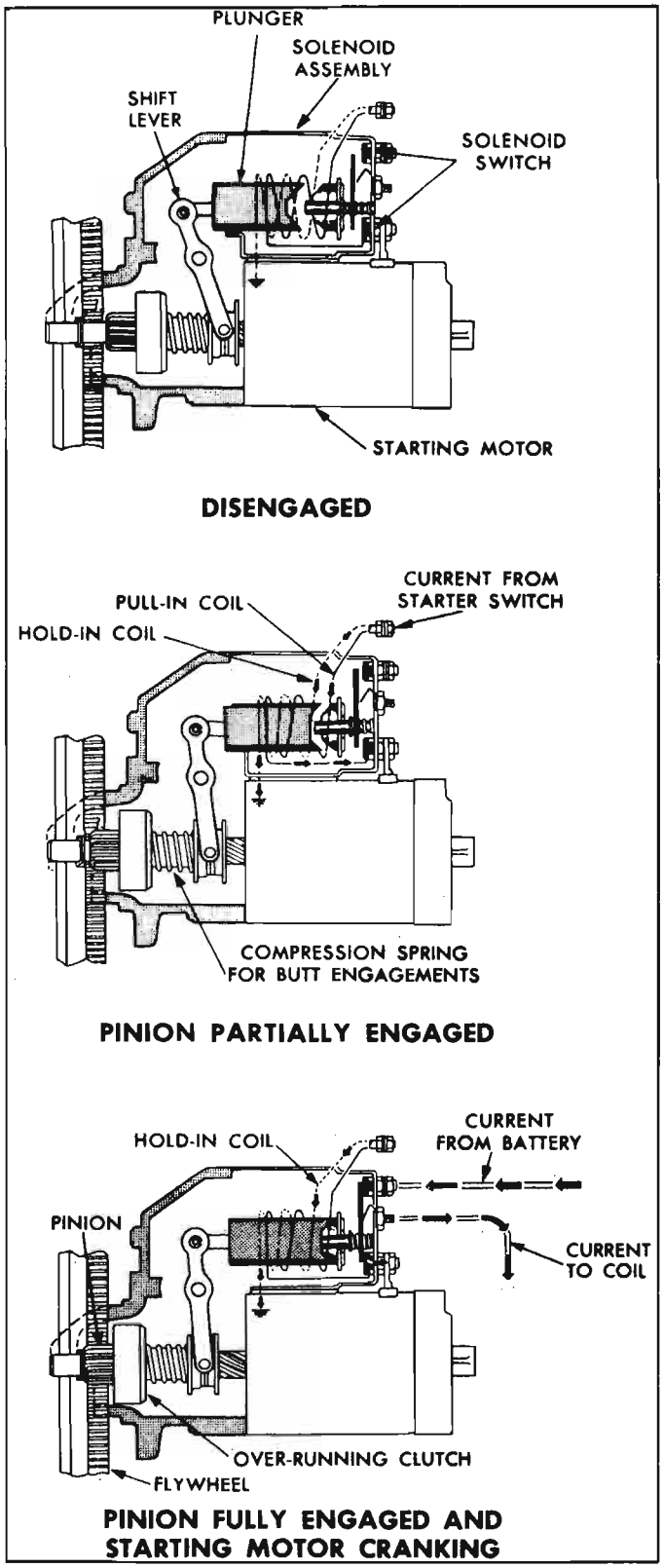

Fig. 8-37—Solenoid Operation

primary lead grounded to prevent engine firing).

From battery positive post **to** solenoid battery terminal.

From battery negative post **to** starting motor housing.

From solenoid battery terminal **to** solenoid motor terminal.

If voltage drop in any of above checks exceeds 0.2 volt, excessive resistance is indicated in that portion of starting circuit and the cause of the excessive resistance should be located and corrected in order to obtain maximum efficiency in the circuit.

CAUTION: Do not operate the starting motor continuously for more than 30 seconds to avoid overheating.

When the solenoid fails to pull in, the trouble may be due to excessive voltage drop in the solenoid control circuit. To check for this condition, close the starting switch and measure the voltage drop between the BATTERY terminal of the solenoid and the SWITCH (S) terminal of the solenoid. (fig. 8-37).

1. If this voltage drop exceeds 3.5 volts, excessive resistance in the solenoid control circuit is indicated and should be corrected.
2. If the voltage drop does not exceed 3.5 volts and the solenoid does not pull in, measure the voltage available at the SWITCH terminal of the solenoid.
3. If the solenoid does not feel warm, it should pull in whenever the voltage available at the SWITCH terminal is 7.7 volts or more. When the solenoid feels warm, it will require a somewhat higher voltage to pull in.

SERVICING OF UNITS OFF THE VEHICLE

STARTING MOTOR

Removal

1. Remove battery ground cable. Disconnect violet lead wire from solenoid (S) terminal, black battery cable from the solenoid battery terminal, and the yellow lead wire from the solenoid (R) terminal.
2. Remove the starter mounting bolts and lockwashers.
3. Pull starter assembly forward to clear housing and remove starter.

Disassembly

Refer to Figures 8-38 and 8-39.

1. Disconnect the field coil connectors from the "motor" solenoid terminal.
2. Remove through bolts.
3. Remove commutator end frame, field frame assembly and armature assembly from drive housing (fig. 8-40).

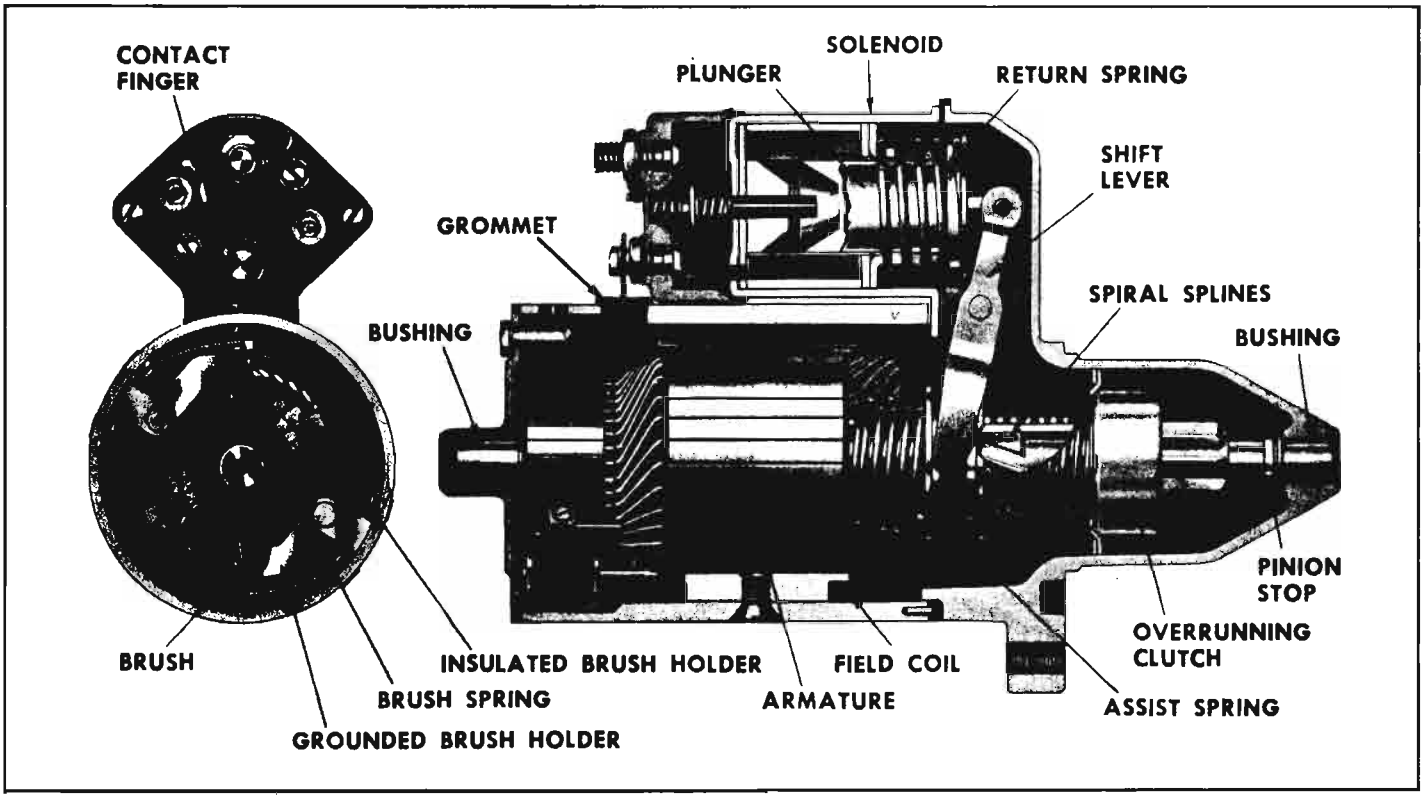

Fig. 8-38—Starting Motor Cross Section

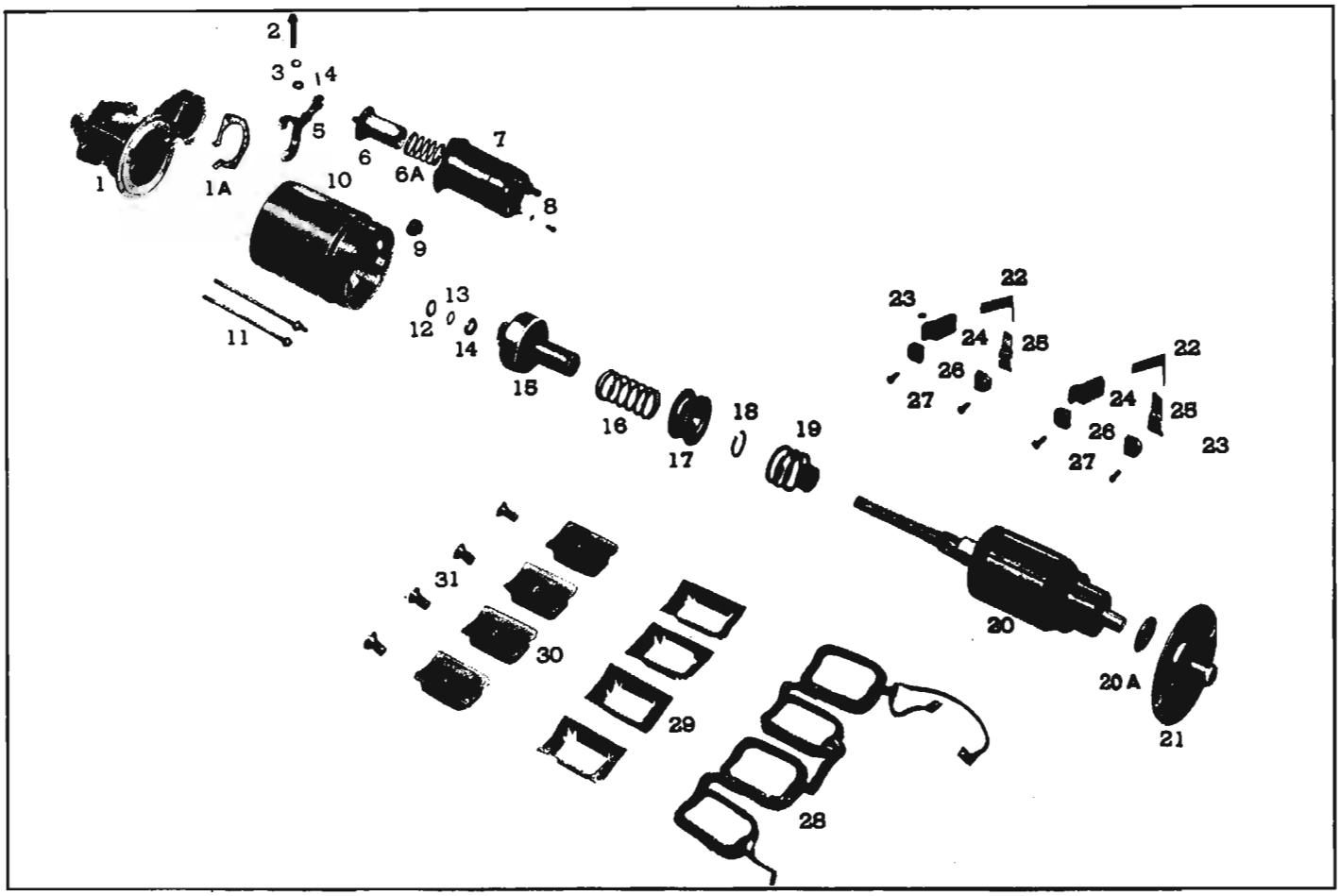

Fig. 8-39—Starting Motor Parts Layout

1. Drive Housing
1A. Gasket
2. Shift Lever Bolt
3. Shift Lever Nut and Lock Washer
4. Pin
5. Shift Lever
6. Solenoid Plunger
6A. Solenoid Return Spring
7. Solenoid Case
8. Screw and Lock Washer
9. Grommet
10. Field Frame
11. Through Bolts
12. Thrust Collar
13. Snap Ring
14. Retainer
15. Overrunning Clutch Assembly
16. Spring
17. Collar
18. Snap Ring
19. Assist Spring
20. Armature
20A. Brake Washer
21. Commutator End Frame
22. Brush Springs
23. Washer
24. Insulated Brush Holders
25. Grounded Brush Holders
26. Brush
27. Screws
28. Field Coils
29. Insulators
30. Pole Shoes
31. Screws

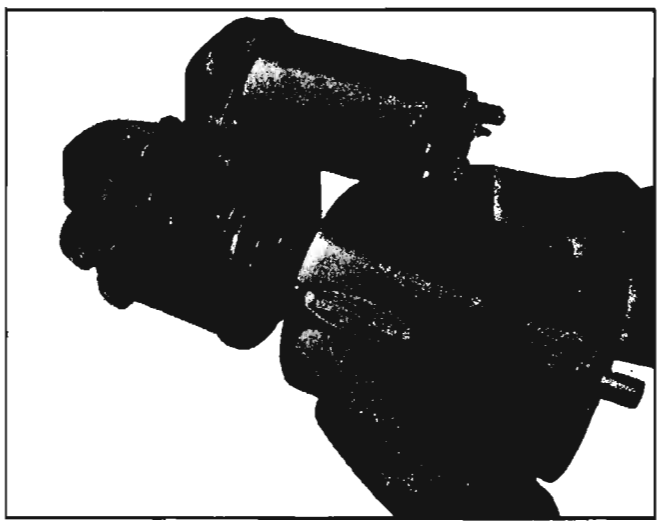

Fig. 8-40—Pulling Field Frame From Armature

NOTE: A resistance will be felt when removing components from drive housing on all service replacement or Powerglide model starting motors. This is due to a composition shield which is pressed into the drive housing. This shield is not serviced separately and should not be removed.

4. Remove overrunning clutch from armature shaft as follows:
   a. Slide thrust collar (fig. 8-41) off end of armature shaft.
   b. Slide a standard half-inch pipe coupling or other metal cylinder of suitable size (an old pinion of suitable size can be used if available) onto shaft so end of coupling or cylinder butts against edge of retainer (fig. 8-42). Tap end of coupling with hammer, driving retainer towards armature end of snap ring.
   c. Remove snap ring from groove in shaft using

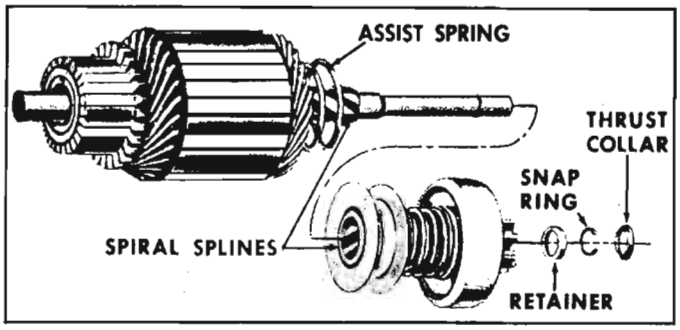

Fig. 8-41—Exploded View of Armature and Overrunning Clutch Assembly

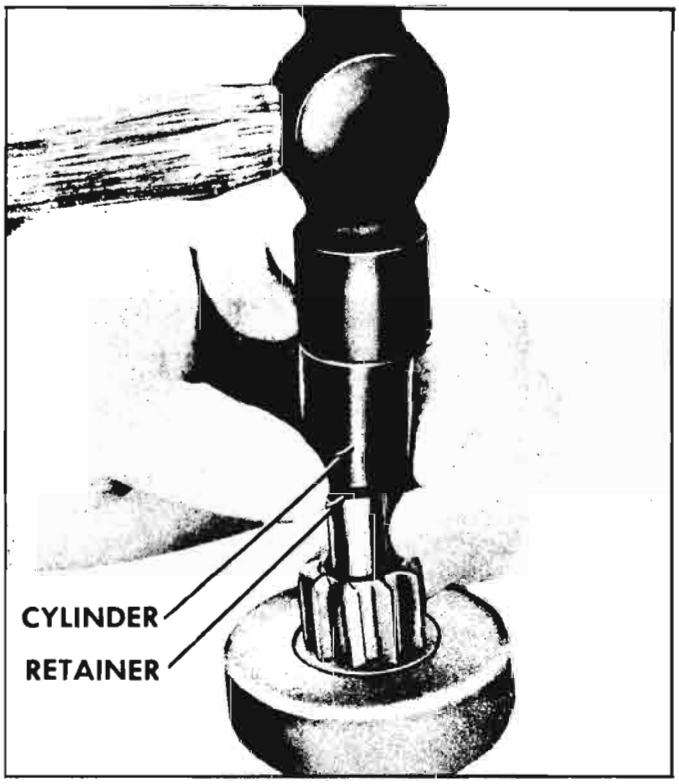

Fig. 8-42—Driving Retainer Off Snap Ring

pliers or other suitable tool. If the snap ring is too badly distorted during removal, it may be necessary to use a new one when reassembling clutch.

d. Slide retainer and clutch from armature shaft.

5. Disassemble brush rigging from field frame.
   a. Release "V" spring from slot in brush holder support.
   b. Lift brush holders, brushes, and spring upward as a unit and remove from support pin. Remove flat washers from support pins.
   c. Disconnect leads from each brush.
   d. Repeat operation for other set of brushes.

Cleaning and Inspection

With the starting motor completely disassembled, except for removal of field coils, the component parts should be cleaned and inspected as described below. Field coils need be removed only where defects in the coils are indicated by the tests described below, in which case the pole shoe screws should be removed and the pole shoes and field coils disassembled. Any defective parts should be replaced or repaired (see Repairs).

1. Clean all starting motor parts, but **do not use grease dissolving solvents for cleaning the overrunning clutch, armature, and field coils** since such a solvent would dissolve the grease packed in the clutch mechanism and would damage armature and field coil insulation.
2. Test overrunning clutch action. The pinion should turn freely in the overrunning direction and must not slip in the cranking direction. Check pinion teeth to see that they have not been chipped, cracked, or excessively worn. Check the spring for normal tension and the drive collar for wear. If necessary the spring or collar can be replaced by forcing the collar toward the clutch and removing lock ring from end of tube.
3. Check brush holders to see that they are not deformed or bent, but will properly hold brushes against the commutator.
4. Check the condition of the brushes and if pitted or worn to one-half their original length, they should be replaced.
5. Check fit of armature shaft in bushing of drive housing. Shaft should fit snugly in the bushing. If the bushing is worn, it should be replaced. Apply No. 20 oil to this bushing before reassembly. Avoid excessive lubrication.
6. Check fit of bushing in commutator end frame. If this bushing is damaged or worn excessively, the end frame assembly must be replaced. Apply No. 20 oil to this bushing before reassembly. **Avoid excessive lubrication.** Lubricant forced onto the commutator would gum and cause poor commutation with a resulting decrease in cranking motor performance.
7. Inspect armature commutator. If commutator is rough or out of round, it should be turned down and undercut. Inspect the points where the armature conductors join the commutator bars to make sure that it is a good firm connection. A burned commutator bar is usually evidence of a poor connection. See Turning the Commutator described under Generator Repairs.

Testing Starting Motor Parts

Refer to Figures 8-35 for starting motor internal circuit diagram. Use a test lamp capable of detecting high resistance grounds.

Armature Test for Shorts

Check the armature for short circuits by placing on growler and holding hack saw blade over armature core while armature is rotated (fig. 8-43). If saw blade

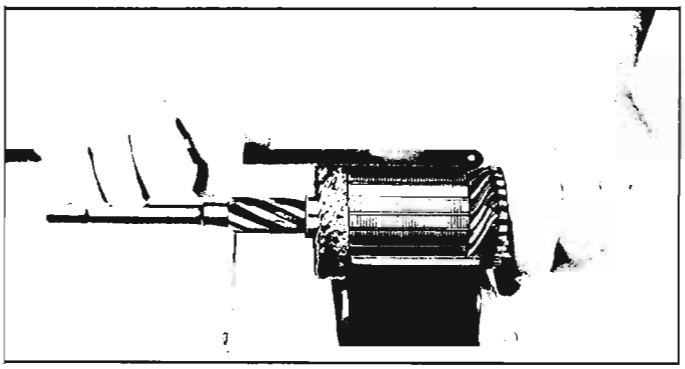

Fig. 8-43—Armature Test for Shorts

vibrates, armature is shorted. Recheck after cleaning between the commutator bars. If saw blade still vibrates, replace the armature.

Armature Test for Ground

Place one lead on the armature core or shaft and the other on the commutator (fig. 8-44). If the lamp lights, the armature is grounded and must be replaced.

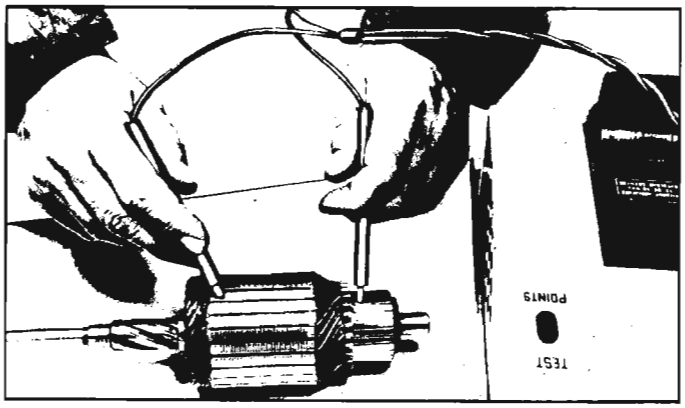

Fig. 8-44—Armature Test for Ground

Field Coil Test for Open Circuit

Place one lead on each end of the field coils (fig. 8-45). If the lamp does not light, the field coils are open and will require replacement.

Field Coil Test for Ground

Place one lead on the connector bar and the other on the field frame (fig. 8-46). If the lamp lights, the field coils are grounded.

Repairs

Loose Electrical Connections

When an open soldered connection of the armature to commutator leads is found during inspection, it may be resoldered provided resin flux is used for soldering.

CAUTION: Acid flux must never be used on electrical connections.

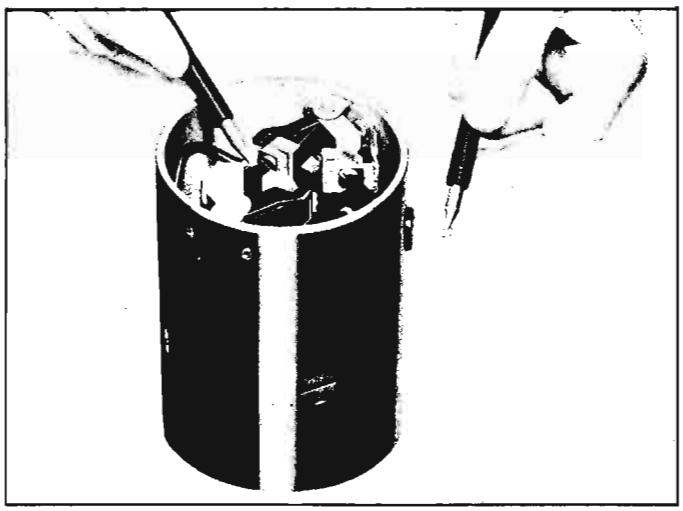

Fig. 8-45—Field Coil Test for Open Circuit

Turning the Commutator

When inspection shows commutator roughness, it should be cleaned as follows:

1. Turn down commutator in a lathe until it is thoroughly cleaned.

   CAUTION: Do not cut beyond section previously turned.

2. Undercut insulation between commutator bars $\frac{1}{32}$". This undercut must be the full width of insulation and flat at the bottom; a triangular groove will not be satisfactory. After undercutting, the slots should be cleaned out carefully to remove any dirt and copper dust.
3. Sand the commutator lightly with No. 00 sandpaper to remove any slight burrs left from undercutting.

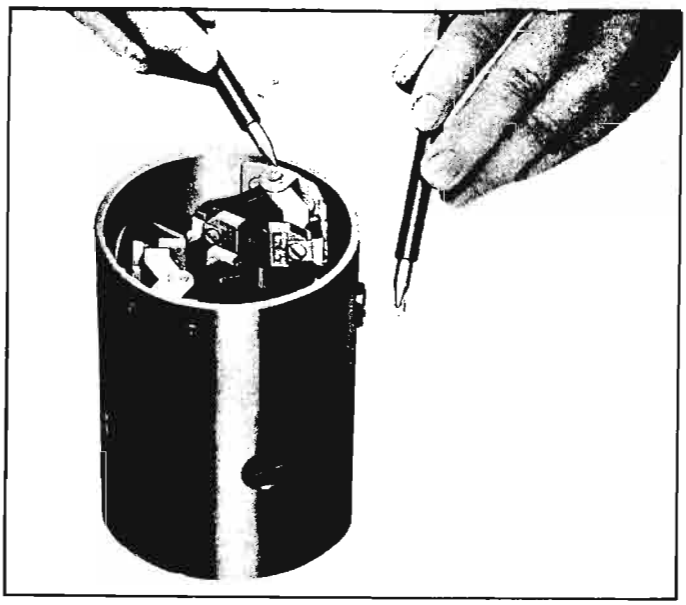

Fig. 8-46—Field Coil Test for Ground

4. Recheck armature on growler for short circuits.

Brush Holder Replacement

If brush holders are damaged, they can be replaced by special service units which are attached with screws and nuts.

Assembly

After all parts have been thoroughly tested and inspected and worn or damaged parts replaced, the generator should be reassembled.

1. Assemble brush rigging to field frame as follows:
   a. Assemble brushes to brush holders.
   b. Place flat washer over each support pin, then assemble insulated and grounded brush holders together with the "V" spring and position as a unit on the support pin. Push holders and spring to bottom of support and rotate spring to engage the "V" in slot in support.
   c. Attach ground wire to grounded brush and field lead wire to insulated brush.
   d. Repeat for another set of brushes.
2. Assemble overrunning clutch assembly to armature shaft.
   a. Lubricate drive end of armature shaft with No. 10 oil.
   b. Slide clutch assembly onto armature shaft with pinion outward (fig. 8-41).

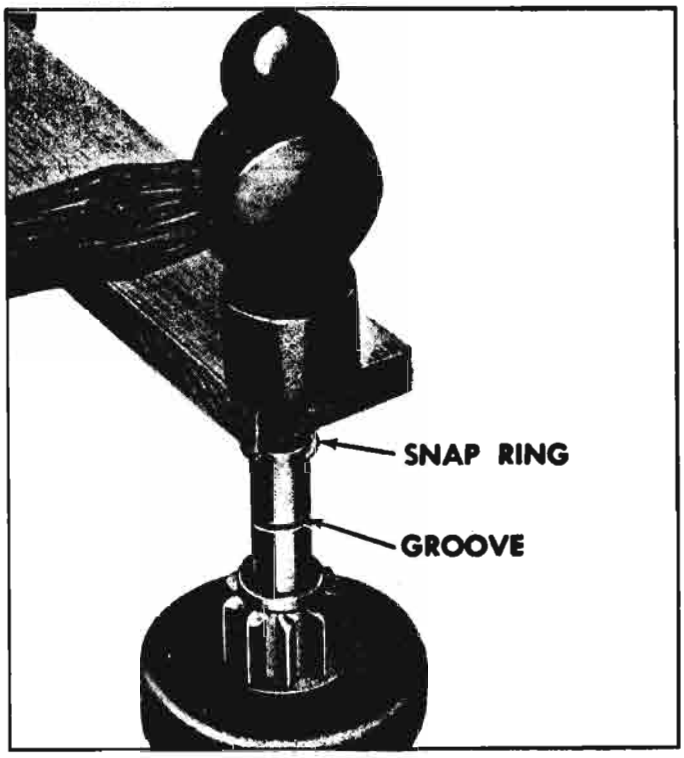

Fig. 8-47—Forcing Snap Ring Over Shaft

   c. Slide retainer onto shaft with cupped surface facing end of shaft (away from pinion).
   d. Stand armature on end of wood surface with commutator down. Position snap ring on upper end of shaft and hold in place with a block of wood. Hit wood block a blow with hammer forcing snap ring over end of shaft (fig. 8-47). Slide snap ring down into groove.
   e. Assemble thrust collar on shaft with shoulder next to snap ring (fig. 8-41).
   f. Place armature flat on work bench, and position retainer and thrust collar next to snap ring. Then, using two pair of pliers at same time (one pair on either side of shaft), grip retainer and thrust collar and squeeze until snap ring is forced into retainer (fig. 8-48). Be certain shaft is not scored during this operation.

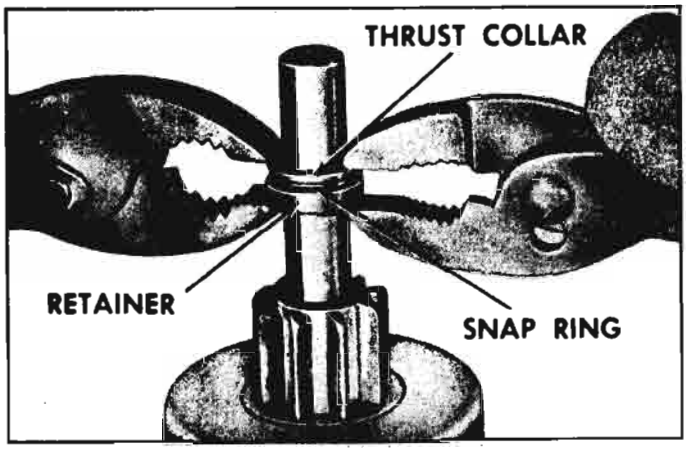

Fig. 8-48—Forcing Snap Ring Into Retainer

3. Place 4 or 5 drops of light engine oil in drive housing bushing. Make sure thrust collar is in place against snap ring and retainer and slide armature and clutch assembly into place in drive housing, engaging shift lever with clutch.

   NOTE: A resistance will be felt when installing components to drive housing on all service replacement or Powerglide model starting motors. This is due to the composition shield in the drive housing which seats against the outer front beveled edge of the overrunning clutch with motor fully assembled.

4. Position field frame over armature and apply special sealing compound between frame and solenoid case. Position frame against drive housing using care to prevent damage to the brushes.
5. Place 4 to 5 drops of light engine oil in bushing in commutator end frame. Place leather brake washer on armature shaft and slide commutator end frame onto shaft.
6. Reconnect the field coil connectors to the "motor" solenoid terminal.

After reassembly, a "Free Speed" check of the starting motor may be made if equipment is available. To

make this check, connect a 12 volt battery in series with an ammeter to the starting motor terminal and ground. Use a mechanical drive type tachometer to determine the speed reached by the starting motor. Failure of the starting motor to perform according to the following specifications may be due to tight or dirty bushings, or high resistance connections.

Volts 10.6
Amperes ..... 58 Min.–80 Max.
Rpm ..... 6750 Min.–8600 Max.

Installation

1. Place starting motor and solenoid assembly in position and install attaching bolts.
2. Connect starter-ignition switch violet wire to solenoid (S) terminal, black battery cable to solenoid battery (BAT) terminal and yellow wire to solenoid (R) terminal.
3. Install battery ground cable. Check operation of starter on vehicle.

SOLENOID

Removal

1. Remove starting motor as previously described.
2. Remove the outer screw and washer from the motor connector strap terminal.
3. Remove the two screws retaining solenoid housing to end frame assembly.
4. Twist solenoid clockwise to remove flange keys from keyway slot in housing; then remove solenoid assembly and gasket.

Replacement of Contacts

1. With solenoid removed from motor, remove nuts and washers from switch (S) and motor connector strap terminals.
2. Remove the two solenoid and cover retaining screws and washers and remove end cover from solenoid body. Do not damage sealing gasket.

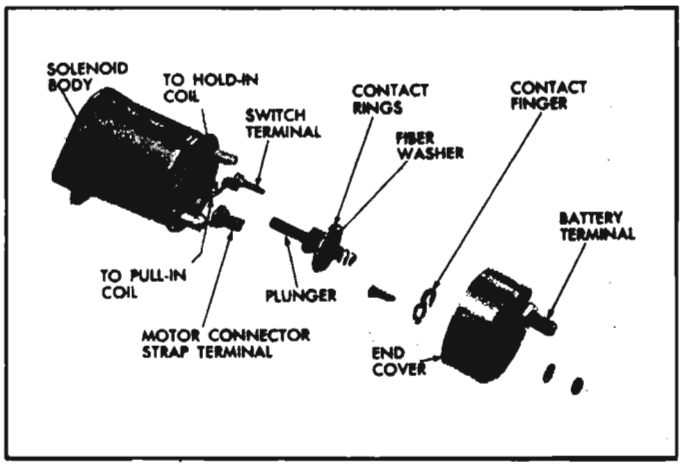

Fig. 8-49—Exploded View of Solenoid

3. Compress solenoid plunger contact ring slightly and remove outer spring, retainer, fiber washer and contact ring (fig. 8-49).
4. Remove nut and washer from battery terminal on end cover and remove battery terminal. Remove resistance wire by-pass terminal and contactor.
5. Remove motor connector strap terminal and solder new terminal in position.
6. Using a new battery terminal, install terminal, washer and retaining nut to end cover. Install by-pass terminal and contactor.
7. Place new contact ring and fiber washer on plunger, compress contact ring and install retainer and outer spring.
8. Position end cover over switch and motor terminals and install end cover retaining screws. Also install washers and nuts on the solenoid switch and starting motor terminals.
9. Test solenoid for proper operation.

Testing Current Draw of Windings

Refer to Figure 8-49.

To check the current draw of the hold-in winding, connect a variable source of voltage (in series with an ammeter) to the switch terminal of the solenoid and ground. To check the current draw of both windings, ground the solenoid motor connector strap terminal, and connect a source of voltage (in series with an ammeter) to the switch terminal of the solenoid and ground. Current draw should be:

Hold-in Windings–10½-12½ Amperes at 10 Volts
Both Windings–42-49 Amperes at 10 Volts

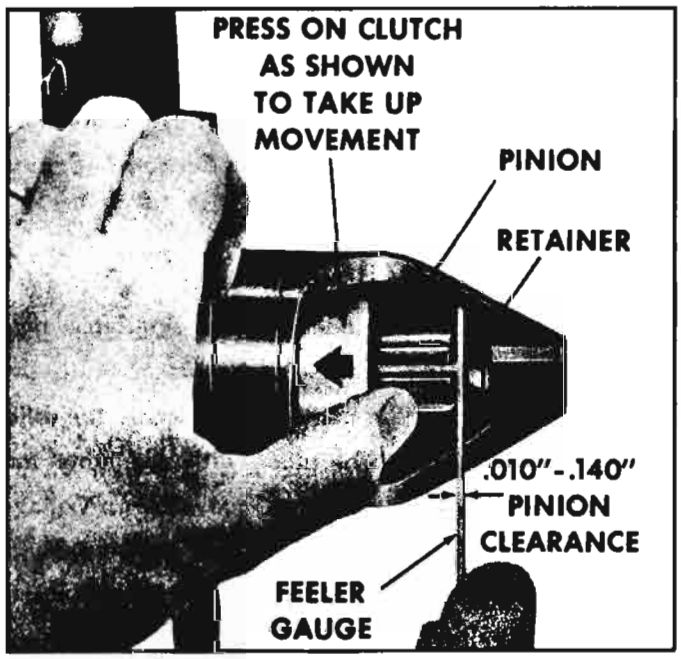

Fig. 8-50—Checking Pinion Clearance

CAUTION: Either of the above checks must be completed in a minimum length of time to prevent heating of the solenoid windings. Heating will cause the current draw readings to be below the specifications which are based on a temperature of 80°F.

Installation

1. Place solenoid (use special sealing compound around edge) in position and gasket in place on starting motor and install the two attaching bolts.
2. Install the lockwasher and nut to the motor connector strap terminal.
3. Install solenoid plunger and connect linkage to the shift lever.
4. Check pinion clearance as decribed below and install starting motor.

Pinion Clearances

The pinion clearance should be checked (fig. 8-50), after motor has been reassembled. If clearance is not within specified limits (.010-.140) it may indicate excessive wear of solenoid linkage shift lever yoke buttons or improper assembly of the shift lever mechanism. Worn or defective parts should be replaced since no provision is made for adjusting of pinion clearance.

IGNITION CIRCUIT

PERIODIC SERVICING

The distributor and spark plugs are the only ignition system components that require periodic service. The remainder of the ignition system requires only periodic inspection to check operation of the units, tightness of the electrical connections, and condition of the wiring. When checking coil, test with a reputable tester.

DISTRIBUTOR

Every 1000 Miles

Fill hinge cap oiler with SAE-20 oil.

Every 5000 Miles

1. Apply 1 drop of light engine oil to the breaker lever pivot.
2. Apply a little Delco-Remy Cam and Ball Bearing Lubricant or other similar high melting point, non-bleeding grease to the cam.

SPARK PLUGS

Spark plugs should be removed, inspected, cleaned and regapped every 5000 miles. Defective plugs should be replaced. See *Servicing of Units Off the Vehicle.*

CHECKS AND ADJUSTMENTS ON THE VEHICLE

TIMING

For efficient operation, the ignition must be properly timed. This operation is described in *Section 7—Engine Tune-up.*

IGNITION CIRCUIT CHECKS

If the checks outlined under *General Trouble Shooting* indicate that the ignition system is at fault, the following checks may be made to help locate the difficulty. All checks are to be made with the lights and accessories off and in the sequence shown. Voltage readings referred to are indicated on Figure 8-51. If the engine starts but immediately stops when the starting switch is released from the START position steps 1-4 may be omitted.

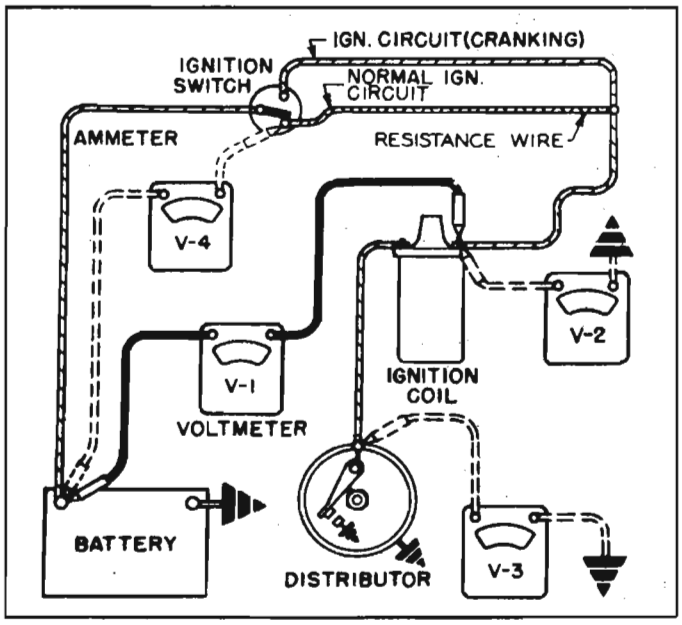

Fig. 8-51—Ignition Circuit Checks

Step No.	Operation	Specification	Possible Trouble
1	Check all connections in primary and secondary circuit.		
2	Remove secondary coil lead from distributor cap. Hold ¼ inch from engine while cranking, and observe if spark occurs.	If spark occurs, check..	...Distributor cap Rotor Spark plug wiring
3	Check Voltage V-1 while cranking.	1 Volt max.	Open in ignition circuit used during cranking Ignition switch not closing ignition circuit used during cranking Ground in circuit from coil terminal to ignition switch Ground in coil
4	Check Voltage V-2 ignition switch "On," points open.	Normal battery voltage.	...Low battery Points not open Ground in circuit from coil to distributor Ground in distributor Ground in coil Ground in ignition circuit used during cranking or in the lead connecting the coil to the resistance wire
5	Check Voltage V-2 ignition switch "On," points closed.	4½-6½ Volts – If over 6½, check.....	...Contacts not closed Loose connection in distributor Distributor not grounded to engine Faulty contacts; if faulty, recheck Step 5 Loose connection between coil and distributor Resistance wire out of circuit due to shorted or incorrect wiring. Starting contacts of ignition switch stay closed Harness has too little resistance. Resistance should be 1.8 ohms Coil primary is open
		If under 4½, check....	...Loose connection from resistance wire attachment to coil through ignition switch circuit to battery Harness is open or has too much resistance. Resistance should be 1.8 ohms
6	Check Voltage V-3 ignition switch "On," points closed.	0.2 Volts max.	Contacts not closed Loose connection in distributor Distributor not grounded to engine. Faulty contacts; if faulty, recheck Step 5. **NOTE: The voltage drop across the distributor points should not exceed 0.125 volts.**
7	Check Voltage V-4 ignition switch "On," points closed.	0.7 Volts max.	Loose connection from resistance wire attachment to coil through ignition switch circuit to battery

Step No.	Operation	Specification	Possible Trouble
8	If these checks fail to find cause of trouble, remove distributor, coil, and resistance wire from engine and check to specifications. Also check wiring harness.		

SERVICING OF UNITS OFF THE VEHICLE

DISTRIBUTOR CONTACT POINTS

Criteria for Replacing Points

Examine the distributor points. Dirty points should be cleaned with a clean point file. Normal point condition is an overall grey color. If a test instrument for checking resistance is available, check the point resistance. The criteria for point quality should be a combination of visual inspection and a resistance or voltage drop check. If the points are badly worn, pitted or misaligned, replacement is recommended. If, with the points closed and the ignition switch in the ON position, there is less than a 0.125 volt drop across the points, the points may be considered satisfactory for further use. This check may be made with a sensitive voltmeter or one of the various point resistance meters available for this purpose.

Abnormal Point Wear

Under normal operating conditions, distributor contact points will provide many thousands of miles of service. Points which have undergone several thousand miles of operation will have a rough surface, but this should not be interpreted as meaning that the points are worn out. If the roughness between the points matches so that a large contact area is maintained, the points will continue to provide satisfactory service until most of the tungsten is worn off.

However, if the points burn or pit, they will soon become unsatisfactory for further operation. Not only must they be replaced, but the ignition system and engine must be checked to determine the cause of the trouble so it can be eliminated. Unless the condition causing the point burning or pitting is corrected, the new points will provide no better service than the old points.

Burning of Points

Contact point burning will result from high voltage, presence of oil or other foreign material, defective condenser and improper point adjustment. High voltage causes an excessively high current flow through the contact points which burns them rapidly. High voltage can result from an improperly adjusted or inoperative voltage regulator.

Oil or crankcase vapors which work up into the distributor and deposit on the point surfaces will cause them to burn rapidly. This is easy to detect since the oil produces a smudgy line under the contact points. Clogged engine breather pipes permit crankcase pressure to force oil or vapors up into the distributor. Over-oiling the distributor will also produce the condition.

If the contact point opening is too small (cam angle too large), the points will be closed too large a part of the total operating time. Average current flow through the points will be too high so the points will burn rapidly and arcing will occur between the points resulting in low secondary voltage and engine miss.

High series resistance in the condenser circuit will prevent normal condenser action so the contact points will burn rapidly. This resistance may be caused by a loose condenser mounting or lead connection, or by poor connections inside the condenser. See Distributor Condenser in this section for a discussion of condenser testing.

Pitting of Points

Contact point pitting results from an out-of-balance condition in the ignition system which causes transfer of tungsten from one point to the other so that a tip builds up on one point while a pit forms in the other (figs. 8-52 and 8-53). The direction in which the tungsten transfers can be used as a basis for analysis and correction of pitting. For instance, if the material transfers from the negative to the positive point (fig. 8-52) one or more of these corrections may be made: increase condenser capacity, shorten condenser lead; separate distributor-to-coil low- and high-tension leads; move these leads closer to ground.

If the material transfers from the positive to the negative point (fig. 8-53) reduce condenser capacity, move distributor-to-coil leads closer together, move these leads away from ground, or lengthen condenser lead.

Cleaning of Points

Dirty contact points should be dressed with a few strokes of a clean, fine-cut contact file. The file should

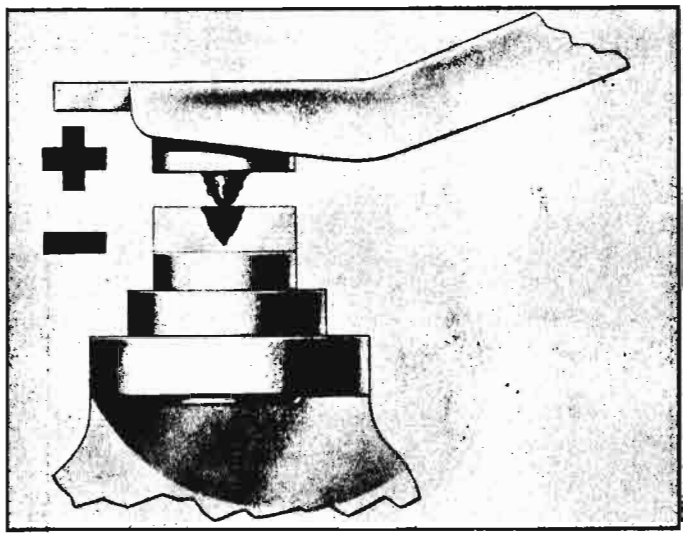

Fig. 8-52—Material Transfer—Negative to Positive Point

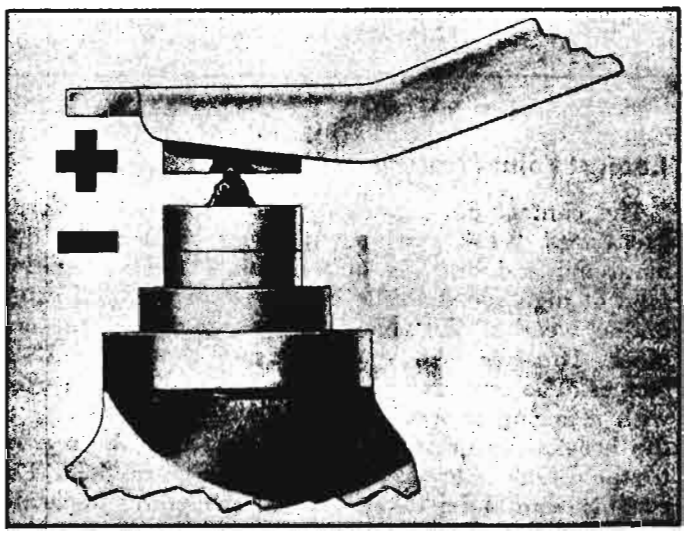

Fig. 8-53—Material Transfer—Positive to Negative Point

not be used on other metals and should not be allowed to become greasy or dirty. **Never use emery cloth to clean contact points.** Contact surfaces, after considerable use, may not appear bright and smooth, but this is not necessarily an indication that they are not functioning satisfactorily. Do not attempt to remove all roughness nor dress the point surfaces down smooth; merely remove scale or dirt.

Badly burned or pitted contact points should be replaced and the cause of trouble determined so it can be eliminated. High resistance or loose connections in the condenser circuit, oil or foreign materials on the contact surfaces, improper point adjustment or high voltages may cause oxidized contact points. Check for these conditions where burned contacts are experienced. An out-of-balance condition in the ignition system, often the result of too much or too little condenser capacity, is indicated where point pitting is encountered.

Setting and Alignment of Points

The point opening of new points can be checked with a feeler gauge, but the use of a feeler gauge on rough or uncleaned used points is not recommended since accurate gauging cannot be done on such points. The gauge measures between high spots on the points instead of the true point opening (fig. 8-54). Contact

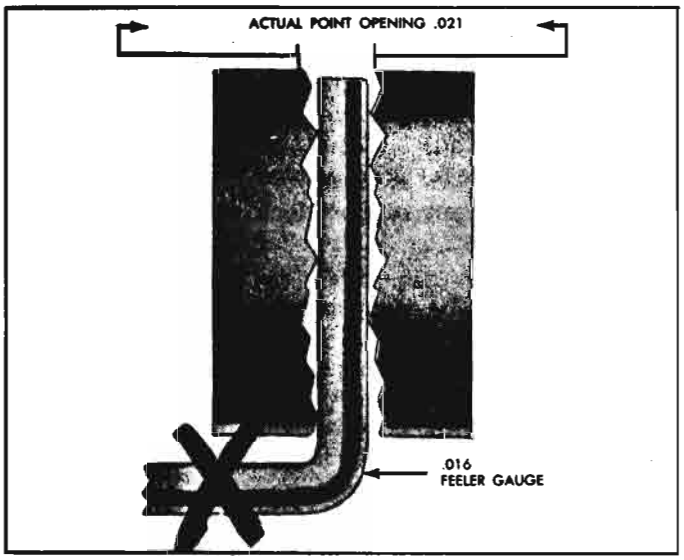

Fig. 8-54—Inaccurate Gauging of Rough Points

points must be set to the proper opening. Points set too close may tend to burn and pit rapidly. Points with excessive separation tend to cause a weak spark at high speed. Proper point settings for all models are:

.019" new points
.016" used points

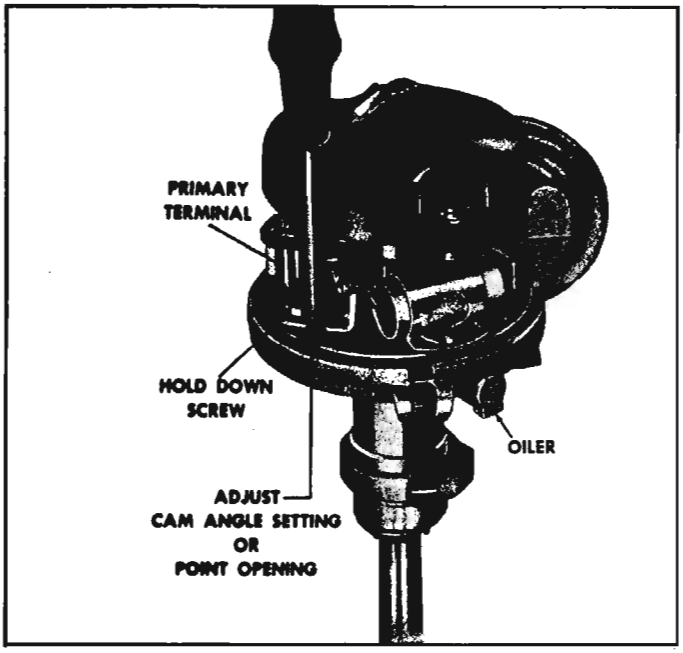

Fig. 8-55—Point Adjustment

New points must be set to the larger opening as the rubbing block will wear down slightly while seating to the cam. Contact points should be cleaned before adjusting if they have been in service.

To adjust contact point opening:

1. Turn or crank the distributor shaft until the breaker arm rubbing block is on the extreme top of a lobe of the cam which will provide maximum breaker point opening.
2. Loosen contact support lock screw.
3. Place screwdriver on hole provided in plate and point support and move point support (fig. 8-55) to obtain a .019" opening for new points and a .016" opening for used points.
4. Tighten contact support lock screw and recheck point opening.
5. Align points (fig. 8-56) by bending the fixed contact support if necessary, then recheck point opening. Do not bend breaker lever. Align new points but do not attempt to align used points. Instead replace used points where serious misalignment is observed. Use an aligning tool if available.

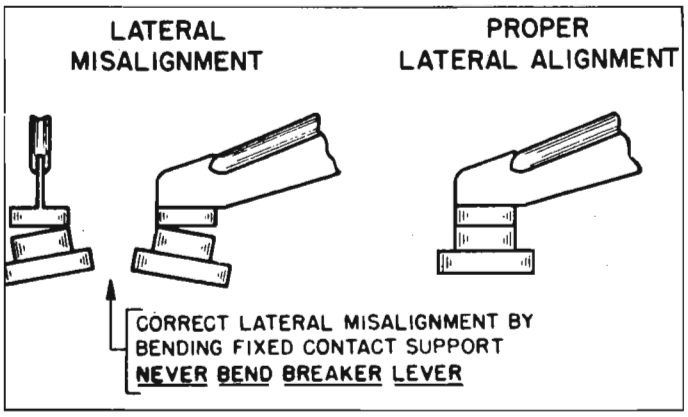

Fig. 8-56—Alignment of Points

6. Position of breaker plate is determined by the vacuum unit mounting screws. Indexed scale stamped on plate should have 23° mark opposite notch in distributor casting. This setting should be checked when installing new points and adjusted, if necessary. See Figure 8-57.
7. After checking and adjusting contact point opening to specifications, the cam angle or dwell should be checked with a contact angle meter if such equipment is available. Cam angle should be 31°-35°. If the cam angle is less than the specified minimum check for defective or misaligned contact points or worn distributor cam lobes. The variation in cam angle readings between idle speed and 1750 engine RPM should not exceed 3°. Excessive variation in this speed range indicates wear in the distributor.

NOTE: Cam angle readings taken at speeds above 1750 engine RPM may prove unreliable on some cam angle meters.

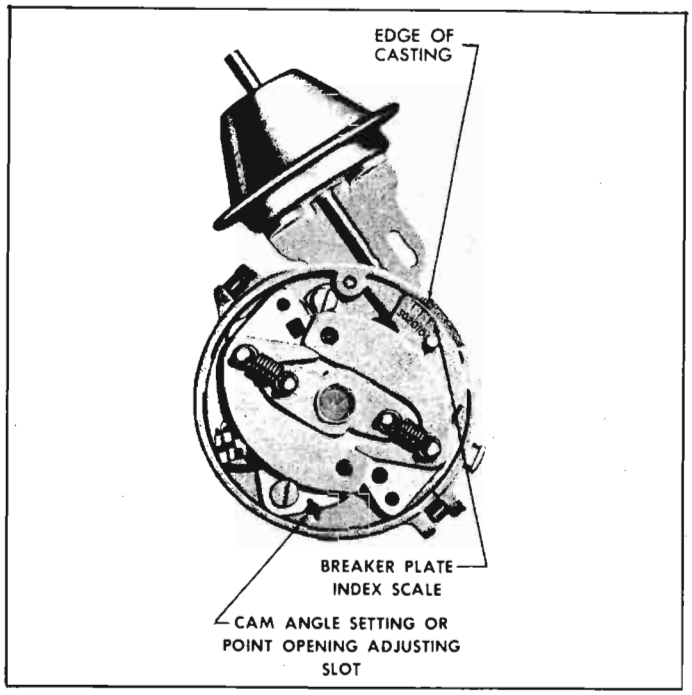

Fig. 8-57—Breaker Plate Positioning

Contact Point Pressure

The contact point pressure must fall within specified limits. Weak tension will cause chatter resulting in arcing and burning of the points and an ignition miss at high speed, while excessive tension will cause undue wear of the contact points, cam and rubbing block. Breaker arm spring tension should be 19-23 ounces. The contact point pressure should be checked with a spring gauge. The scale should be hooked to the breaker lever and the pull exerted at 90 degrees to the breaker lever as shown in Figure 8-58. The reading should be taken just as the points separate. The pressure can be adjusted by bending the breaker lever spring. If the pressure is excessive, it can be decreased by pinching the spring carefully. To increase pressure, the lever must be removed from the distributor so the spring can be bent away from the lever. Avoid excessive spring distortion.

NOTE: For ease in installing new points, the breaker lever spring tension is pre-set and the points are aligned.

Contact Point Replacement

Refer to Figure 8-57.

1. Release distributor cap clamps, remove cap and pull it back out of the way.
2. Loosen primary terminal screw and remove both wire leads.
3. Remove the contact support hold down screws and remove contact point assembly.
4. Carefully wipe the protective film of oil from contact points of a new set.

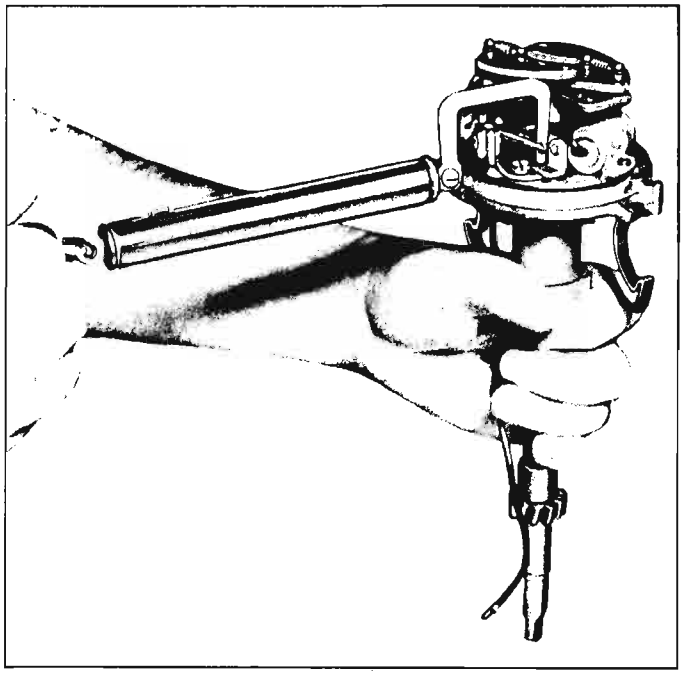

Fig. 8-58—Checking Breaker Arm Spring Tension

5. Place contact point assembly in position over pivot post, and install hold down screws.
6. Insert wire leads into position and tighten primary terminal screw securely.
7. Set point opening and align points as described under *Setting and Alignment of Points*. Point opening should be .019".
8. Check and set ignition timing with a timing light. See Tune-up in Section 7.

DISTRIBUTOR CONDENSER

Performance

The following four factors affect condenser performance and each factor must be considered in making any condenser test.

Breakdown—a failure of the insulating material—a direct short between the metallic elements of the condenser. This prevents any condenser action.

Low Insulation Resistance (Leakage)—prevents condenser from holding a charge. All condensers are subject to leakage which up to a certain limit is not objectionable.

High Series Resistance—excessive resistance in the condenser circuit due to broken strands in condenser lead or to defective connections. This will cause burned points and ignition failure upon initial start and at high speeds.

Capacity—determined by the area of the metallic elements and the insulating and impregnating materials.

For a complete check of the condenser, use a tester which will check for the above conditions. Follow the instructions given by the manufacturer of the test equipment. Condenser capacity should be .18-.23 microfarad.

DISTRIBUTOR

Removal

1. Disconnect the distributor primary wire from coil.
2. Remove the distributor cap by releasing two spring clamps.
3. Remove the vacuum line from the distributor.

   NOTE: Mark position of rotor arm so that distributor may be reinstalled in the same position.

4. Remove distributor clamp screw and hold down clamp; then remove distributor.
5. If necessary to remove secondary leads from distributor cap, mark position on cap tower for lead to No. 1 cylinder. This will aid in reinstallation of leads in cap.

Disassembly

Refer to Figure 8-59.

With the distributor removed from the vehicle it is advisable to place it in a distributor testing machine or synchroscope.

CAUTION: When mounting the distributor in any distributor testing machine or synchroscope, extreme care must be taken not to score or otherwise damage the lower distributor shaft with the testing machine drive mechanism. A protective adapter, available from the manufacturers of such testing machines for use with the Corvair distributor, must be used over the lower 1 ⅜" of the distributor shaft.

Test the distributor for variation of spark, correct centrifugal and vacuum advance and condition of contacts. This test will give valuable information on distributor condition and indicate parts replacement which may be necessary. Check area on breaker plate just beneath breaker points. A smudgy line indicates that oil or crankcase vapors have been present between points.

1. Remove the rotor.
2. Remove both weight springs and both advance weights.
3. Drive gear pin and thrust washer pin from shaft with a flat drift punch.
4. Slide gear and thrust washers off the shaft.
5. Remove any burrs around pin holes in shaft with flat file. These burrs will damage housing bushing it not removed before removal of shaft.
6. Pull shaft and cam weight base assembly from housing.
7. Remove circuit breaker cam and weight base assembly from shaft.
8. Remove condenser hold-down screw, condenser and bracket from breaker plate after removing condenser and primary leads from primary terminal.

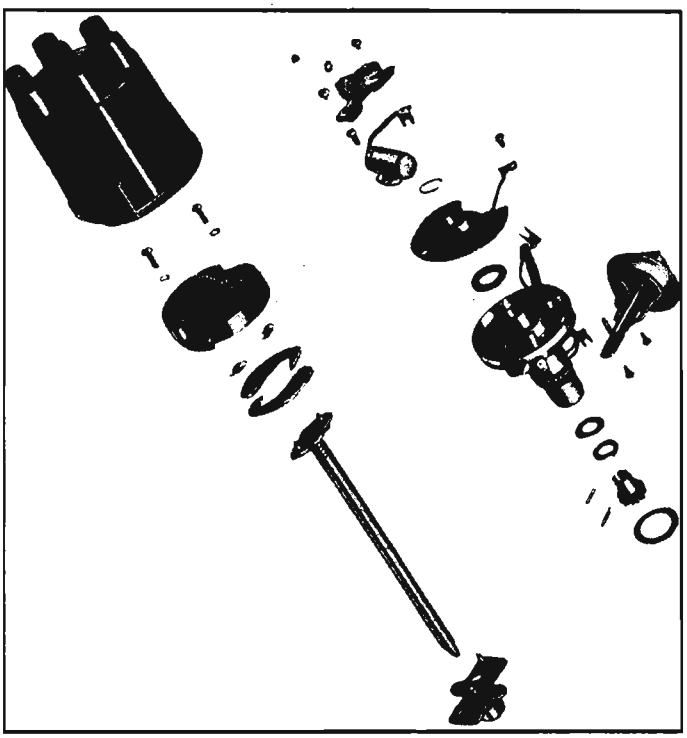

Fig. 8-59—Distributor Exploded View

9. Remove spring retainer ground lead, and remove breaker plate from housing.
10. To remove the vacuum advance unit, remove the two attaching screws.
11. Remove the felt washe.. ..om around the bushing in the housing.

NOTE: Shaft bushings in the housing are not serviced. If bushings are found to be defective, replace complete housing assembly.

Cleaning and Inspection

1. Wash all parts in cleaning solvent except cap, rotor, condenser, breaker plate assembly and vacuum control unit. Degreasing compounds may damage insulation of these parts or saturate the lubricating felt in the case of the breaker plate assembly.
2. Inspect the breaker plate assembly for damage or wear and replace if necessary.
3. Inspect the shaft for wear, and check its fit in the bearings in the distributor body. If the shaft or bearings are worn, the shaft and distributor body should be replaced.
4. Mount the shaft in "V" blocks and check the shaft alignment with a dial gauge. The runout should not exceed .002".
5. Inspect the governor weights for wear or burrs and free fit on their pins.
6. Inspect the cam for wear or roughness. Then check its fit on the end of the shaft. It should be absolutely free, without any looseness.
7. Inspect the condition of the distributor points (see Distributor Contact Points). Dirty points should be cleaned and badly pitted points should be replaced.
8. Test the condenser for series resistance, microfarad capacity (.18 to .23), leakage or breakdown, following the instructions given by the manufacturer of the test equipment used.
9. Inspect the distributor cap and spark plug wires for damage.

Assembly

Refer to Figure 8-59.

1. Replace the felt washer around the bushing in the housing.
2. Replace the vacuum advance unit and do not tighten hold down screws.
3. Install the breaker plate in housing and the spring retainer on the upper bushing.
4. Position breaker plate with 23° mark in line with scribe mark on housing and tighten vacuum unit hold-down screws (fig. 8-57).
5. Replace contact set assembly.
6. Replace condenser and connect.
7. Replace cam and weight base assembly on shaft.

NOTE: If lubrication in grooves at top of shaft was removed during disassembly and inspection replace with Plastilube #2.

8. Install shaft and cam weight assembly in housing.
9. Slide thrust washers and gear on shaft and secure with pins.
10. Install advance weights and springs.
11. Replace rotor.
12. Check for dwell angle as described in "Adjusting of Dwell Angle."

Installation—Engine Not Disturbed

1. Coat drive gear on end of shaft with "Molycote."
2. Turn rotor about ⅛ turn in a counterclockwise direction past the mark previously placed on the distributor housing.
3. Push the distributor down into position in the block with the housing in a normal "installed" position (fig. 8-60).

NOTE: It may be necessary to move rotor slightly to start gear into mesh with camshaft gear, but rotor should line up with the mark when distributor is down in place.

4. Tighten distributor clamp screw snugly and connect the vacuum line, primary wire to coil terminal and install cap. Also install spark plug and high tension wires to cap if removed (fig. 8-57). It is important that the spark plug wires be installed in their proper location in the supports as shown.
5. Time ignition as described under Tune-up in Section 7.

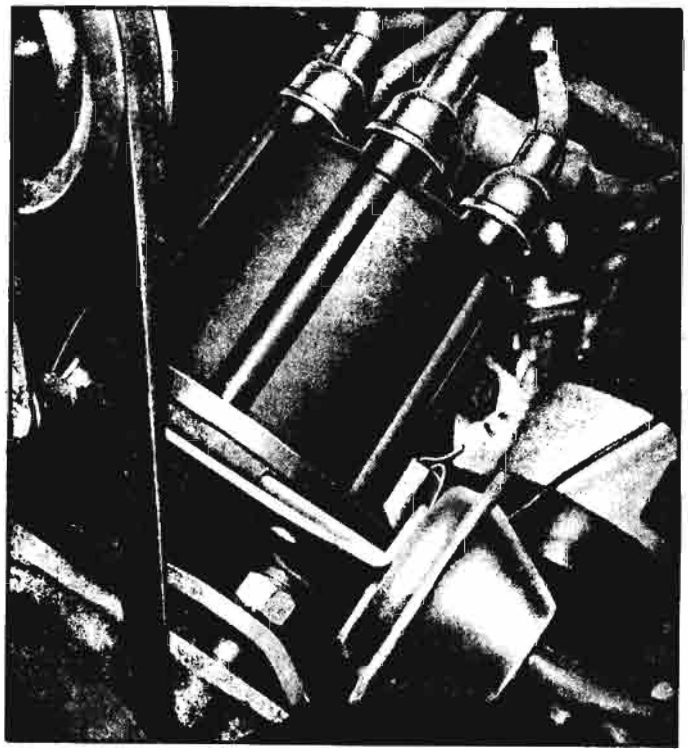

Fig. 8-60—Distributor Installed

Installation—Engine Disturbed

1. Locate Number 1 piston in firing position by either of two methods described below.
   a. Remove Number 1 spark plug and with compression gauge on plug hole crank engine until compression is indicated in Number 1 cylinder. Continue cranking until crankshaft pulley timing notch lines up with "O" timing mark on engine rear housing pad or . . .
   b. Remove left bank rocker cover and crank engine until Number 1 intake valve closes and continue to crank slowly until "O" pointer lines up with timing notch on crankshaft pulley.
2. Position distributor to opening in block in normal installed attitude (see Figure 8-60 noting position of vacuum control unit).
3. Position rotor to point toward harmonic balancer of engine (with distributor housing held in installed attitude), then turn rotor clockwise approximately ⅛ turn more toward left cylinder bank and push distributor down to engage crankshaft. It may be necessary to rotate rotor slightly until crankshaft engagement is felt.
4. While pressing firmly down on distributor housing, kick starter over a few times to make sure oil pump shaft is engaged. Install hold-down clamp and bolt and snug up bolt.
5. Turn distributor body slightly until points just open and tighten distributor clamp bolt.
6. Place distributor cap in position and check to see that rotor lines up with terminal for Number 1 spark plug.

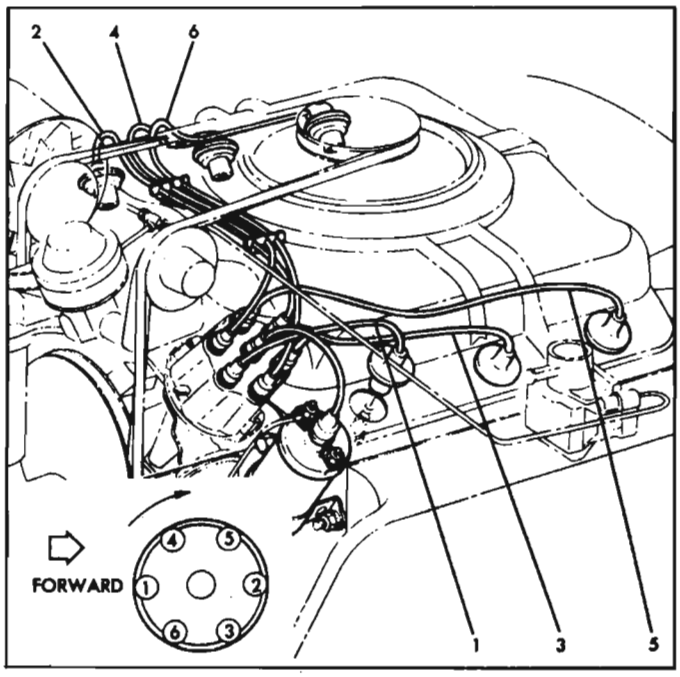

Fig. 8-61—Distributor, Spark Plug Wire and Cylinder Numbering

7. Install cap, check all high tension wire connections and connect spark plug wires if they have been removed (see fig. 8-61). It is important that the wires be installed in their proper location in the supports.

   NOTE: Wires must be installed as indicated to prevent cross-firing.

8. Connect vacuum line to distributor and distributor primary wire to coil terminal.
9. Start engine and set timing as described under Tune-up in Section 7.

COIL REPLACEMENT

1. Disconnect ignition switch and distributor leads from terminals on coils.
2. Pull high tension wire from center terminal of coil.
3. Remove the two coil support mounting bolts or loosen friction clamp screw and remove coil.
4. Place new coil in position and install attaching bolts or tighten clamp screw.
5. Place high tension lead securely in center terminal of coil and connect ignition switch and distributor primary leads to terminals on coil.
6. Start engine and test coil operation.

SPARK PLUGS

Removal

1. Remove spark plug wires.
2. Remove any foreign matter from around spark plugs by blowing out with compressed air.

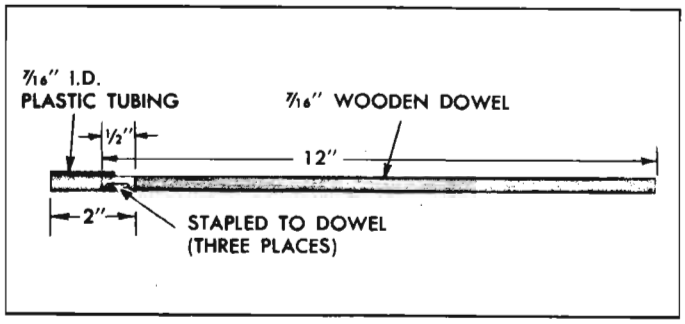

Fig. 8-62—Spark Plug Holding Tool

3. Using a $^{13}/_{16}$" spark plug socket, remove the spark plugs.

NOTE: To remove or loosen the center spark plugs, it will be necessary to disconnect or remove carburetor throttle rod and use a universal drive on spark plug socket. It may be desirable to use a special spark plug socket that is equipped with an internal "O" ring seal to grip the spark plug and avoid the possibility of dropping spark plugs into engine shroud assembly. A tool may be fabricated as shown in Figure 8-62 to remove the spark plug after it has been loosened if a special spark plug socket is not available.

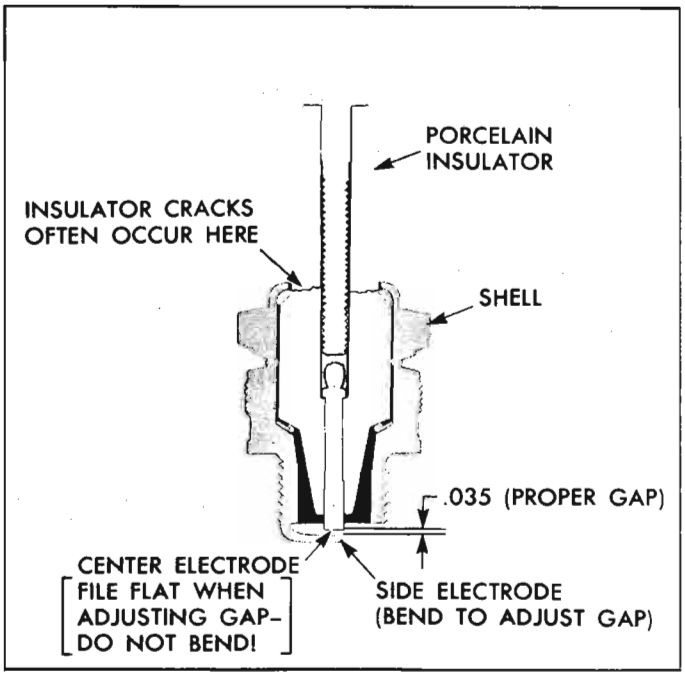

Fig. 8-63—Spark Plug Detail

Inspection

Refer to Figure 8-63.

Spark plug life is governed to a large extent by operating conditions and plug life varies accordingly. To insure peak performance, spark plugs should be checked, cleaned and regapped every 5000 miles.

Worn and dirty plugs may give satisfactory operation at idling speed, but under operating conditions they frequently fail. Faulty plugs are evident in a number of ways such as wasting gas, power loss, loss of speed, hard starting and general poor engine performance.

Spark plug failure, in addition to normal wear, may be due to dirty or leaded plugs, excessive gap or broken insulator.

Dirty or leaded plugs may be evident by black carbon deposits, or red, brown, yellow or blistered oxide deposits on the plugs. The black deposits are usually the result of slow speed driving and short runs where sufficient engine operating temperature is seldom reached. Worn pistons, rings, faulty ignition, over-rich carburetion and spark plugs which are too "cold" will also result in carbon deposits. Red, brown, etc., oxide deposits, a consequence of the use of leaded fuel, usually result in spark plug failure under severe operating conditions. The oxides have no adverse effect on plug operation as long as they remain in a powdery state. But, under high speed or hard pull, the powder oxide deposits melt and form a heavy glaze coating on the insulator which, when hot, acts as a good electrical conductor, allowing current to follow the deposits and short out the plug.

Excessive gap wear on plugs of low mileage, usually indicates the engine is operating at high speeds or loads that are consistently greater than normal or that a plug which is too "hot" is being used. In addition, electrode wear may be the result of plug overheating, caused by combustion gases leaking past the threads and gasket, due to insufficient compression of the spark plug gasket, dirt under the gasket seat, or the use of old gaskets. Too "lean" carburetion will also result in excessive electrode wear.

Broken insulators are usually the result of improper installation or carelessness when regapping the plug. Broken upper insulators usually result from a poor fitting wrench or an outside blow. The cracked insulator may not make itself evident immediately, but will as soon as oil or moisture penetrates the fracture. The fracture is usually just below the crimped part of the shell and may not be visible.

Broken lower insulators usually result from carelessness when regapping and generally are visible. In fairly rare instances, this type of a break may result from the plug operating too "hot" such as encountered in sustained periods of high speed operation or under extremely heavy loads. When regapping a spark plug, to avoid lower insulator breakage, always make the gap adjustment by bending the ground (side) electrode. Never bend the center wire. Spark plugs with broken insulators should always be replaced.

Cleaning and Regapping

Clean the spark plugs thoroughly using an abrasive type cleaner. All spark plugs must be of the same make and number or heat range (AC46FF is standard equipment). Use a round feeler gauge to adjust the spark plug gaps to .035" (fig. 8-64).

SPARK PLUG DIAGNOSIS

PLUG CONDITIONS	FACTORS CAUSING THIS CONDITION	CORRECTIVE ACTION
Plug "Flash Over" (Firing from upper terminal to base of plug)	Dirty insulator tops—oil, dirt and moisture on insulator will shunt current to base of plug. The above condition can be caused by failure of spark plug boot.	Keep plugs wiped clean with cloth moistened with cleaning solvent. Check spark plug boot and and replace if necessary.
Oil or Carbon Fouling	Wet, black deposits on firing end of plug indicate oil pumping condition. This is usually caused by worn piston rings, pistons, cylinders or sticky valves. Soft, fluffy, dry black carbon deposits usually indicate a rich mixture operation, excessive idling, improper operation of automatic choke or faulty adjustment of carburetor. Hard baked-on, black carbon deposits result from use of too cold a plug.	Correct engine condition. In most cases plugs in this condition will be serviceable after proper cleaning and regapping. If troubles are not eliminated, use "hotter" type plug. Use "hotter" type plug.
Lead Fouling (Light & powdery or shiny glazed coating on firing end)	By-products of combustion and fuel additives, deposited as a powder which may later melt and glaze on insulator tip.	Remove deposits by blast cleaning. If this is not possible, plugs should be replaced.
Normal Electrode Wear	Due to intense heat, pressure and corrosive gases together with spark discharge, the electrode wears and gap widens.	Plugs should be regapped every 5000 miles.
Rapid Electrode Wear	Condition may be caused by (1) burned valves, (2) gas leakage past threads and seat gaskets, due to insufficient installation torque or damaged gasket, (3) too lean a mixture or (4) plug too "hot" for operating speeds and loads.	Correct engine condition. Install plugs to specified torque. Use a new spark plug seat gasket each time a new or cleaned spark plug is installed. Use "colder" type plug if condition continues to exist.
Broken Upper Insulator (Firing around shell crimp under load conditions)	Careless removal or installation of spark plug.	Replace with a new spark plug.
Broken Lower Insulator (Firing Tip)	The cause is usually carelessness in regapping by either bending of centerwire to adjust the gap or permitting the gapping tool to exert pressure against the tip of the center electrode or insulator when bending the side electrode to adjust the gap. Fracture or breakage of lower insulator may also accasionally occur if the engine has been operated under conditions causing severe and prolonged detonation or pre-ignition.	Replace with a new spark plug. Use "colder" type plug for the particular type of operation.
Damaged Shell	Very seldom occurs but cause is almost always due to mishandling by applying excessive torque during installation. This failure is usually in the form of a crack in the Vee of the thread next to the seat gasket or at the groove below the hex.	Replace with a new spark plug.

CAUTION: Before adjusting gap, file center electrode flat. In adjusting the spark plug gap, never bend the center electrode which extends through the porcelain center. Always make adjustment by bending the ground (side) electrode.

Installation

1. Inspect spark plug hole threads and clean before installing plugs. Corrosion deposits can be removed with a 14 mm. x 1.25 SAE spark plug tap (available through local jobbers) or by using a small, soft wire brush in an electric drill. If a tap is used, coat it with plenty of grease to catch any chips.

   CAUTION: Use extreme care when using tap to prevent cross threading. Also, crank engine several times to blow out any material dislodged during cleaning operation.

2. Install spark plugs to engine using new gaskets and tighten to 20-25 ft. lbs. torque.

   NOTE: Do not use any "anti-seize" compound on spark plug threads as this will act as an insulator and not allow proper spark plug cooling. Be careful when installing plug to prevent gasket from falling into engine shroud assembly. It may be desirable to use a spark plug socket that is equipped with an internal "O" ring seal to grip the spark plug or to fabricate a tool as shown in Figure 8-62 to start the plug into the cylinder head to avoid the possibility of dropping plugs into engine shroud assembly.

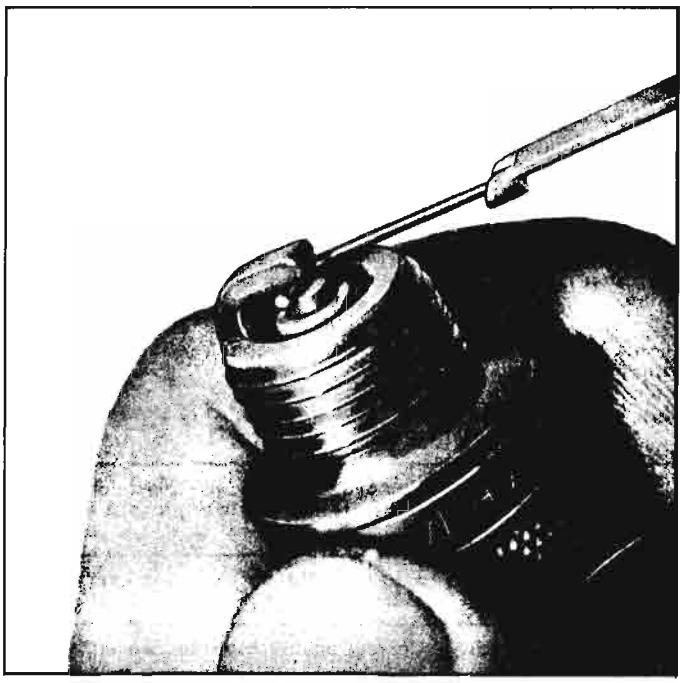

Fig. 8-64—Setting Spark Plug Gap

3. Secure wires and access covers.

   NOTE: Be certain spark plug access covers are tightly in place. If as many as two are loose, all air pressure in cooling system will be lost and engine will overheat. In addition, a whistling sound may develop that could be difficult to locate.

4. Reconnect carburetor throttle rod.

   NOTE: Improper installation is one of the greatest single causes of unsatisfactory spark plug service. Improper installation is the result of one or more of the following practices:

   - **Installation of plugs with insufficient torque to fully seat the gasket.**
   - **Installation of plugs using excessive torque which changes gap settings.**
   - **Installation of plugs on dirty gasket seal.**
   - **Installation of plugs to corroded spark plug hole threads.**
   - **Installation of plugs using excessive torque or abuse which cracks porcelain or insulation.**

Failure to install plugs properly will cause them to operate at excessively high temperatures and result in reduced operating life under mild operation or complete destruction under severe operation where the intense heat cannot be dissipated rapidly enough. Always remove corrosion deposits in hole threads before installing plugs. When corrosion is present in threads, normal torque is not sufficient to compress the plug gasket and early failure from overheating will result. Always use a new gasket and wipe seats in head clean. The gasket must be fully compressed on clean seats to complete heat transfer and provide a gas tight seal in the cylinder. For this reason as well as the necessity of maintaining correct plug gap, the use of correct torque is extremely important during installation.

IGNITION SWITCH

Removal

1. Raise engine compartment lid and disconnect negative battery cable from battery.
2. Remove lock cylinder by positioning switch in "LOCK" position and inserting wire in small hole in cylinder face. Push in on wire to depress plunger and continue to turn key counterclockwise until lock cylinder can be removed.
3. Using suitable spanner wrench (Tool J-7607 or J-5893 by filing off inside of tangs), remove the front attaching nut (fig. 8-65).

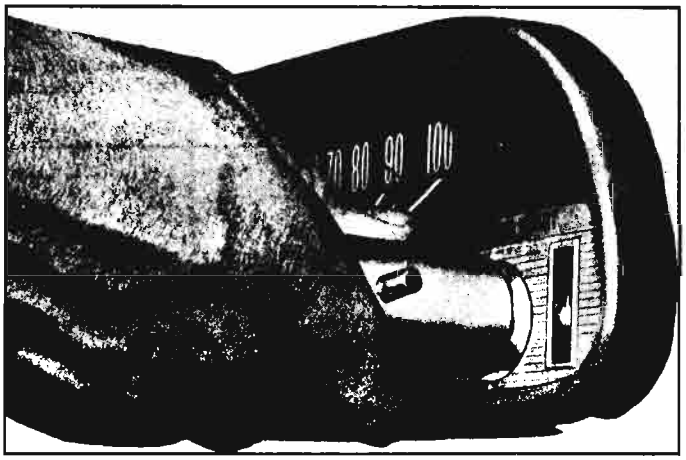

Fig. 8-65—Removing Ignition Switch Nut

4. Withdraw switch and remove the three wire connector from the rear of the ignition switch. To remove the "theft"—resistant connector:
   a. Fashion a suitable tool out of heavy wire stock and press tool on the lock clip within the slot in the connector.
   b. Holding the wire tool firmly in place, gently work the connector away from the switch until the connector is released.

Installation

1. Install the three wire connector to the back of the ignition switch.
2. Set the switch into position on the dash and install the front attaching nut. Tighten nut with Tool J-7607 or reworked Tool J-5893.
3. Push lock cylinder into place.
4. Reconnect battery cable to battery and lower compartment lid.

TROUBLES AND REMEDIES

Symptom & Probable Cause	Probable Remedy
BATTERY AND STARTING CIRCUIT	
Slow Engine Cranking Speed	
Partially discharged battery	Charge or change battery & determine cause of battery condition
Low Capacity battery	Cycle battery to improve capacity or replace it
Faulty battery cell	Replace battery
Loose or corroded terminals	Clean and tighten terminals
Under capacity cables	Replace battery cables
Burned starter solenoid switch contacts	Replace solenoid
Internal starting motor trouble	Overhaul starting motor
Heavy oil or other engine trouble causing undue load	Make necessary repairs to engine
Starter Engages but Will Not Crank Engine	
Partially discharged battery	Charge or change battery
Faulty battery cells	Replace battery
Bent armature shaft or damaged drive mechanism	Overhaul starter
Faulty armature or fields	Overhaul starter
Starter Will Not Run	
Battery fully discharged	Replace or charge battery
Disconnected Battery cables	Replace faulty cables
Shorted or open starter circuit	Make necessary repairs
GENERATING CIRCUIT	
Low Charging Rate	
Fully charged battery & low charging rate	This is a normal condition with a fully charged battery
Blower belt slipping	Replace or adjust belt
Generator commutator dirty	Clean commutator
High resistance in charging circuit	Check charging circuit progressively & make necessary repairs to remove high resistance
Too low voltage setting of voltage regulator unit	Adjust voltage regulator
Oxidized voltage regulator points	Clean and adjust points
Partially shorted field coils	Overhaul generator
High Charging Rate With Fully Charged Battery	
Voltage regulator setting too high	Adjust voltage regulator
Voltage regulator points stuck	Clean and adjust points and readjust regulator
Regulator unit improperly grounded	Remove regulator and clean connections. Readjust regulator
Generator field circuit to regulator short circuited	Test to locate short circuit and make necessary repairs
Shunt field circuit short circuited within regulator	Replace regulator

Low Battery and No Charging Rate (Gen. Ind. Light "ON")

Blower belt broken or loose	Replace or tighten blower belt
Charging circuit open between regulator and battery	Locate open circuit and make necessary repairs
Cut-out voltage winding open circuited	Replace regulator unit
Corroded points in current and voltage regulator	Clean points and readjust regulator
Open circuit between generator and regulator	Locate open circuit and make necessary repairs to wiring
Internal trouble in generator	Overhaul generator

IGNITION CIRCUIT

Engine Will Not Start

(See Starting & Fuel System Troubles)	
Weak battery	Charge battery
Excessive moisture on high tension wiring or spark plugs	Dry parts
Cracked distributor cap	Replace cap
Faulty coil or condenser	Replace faulty unit
Coil to distributor high tension wire not in place	Properly install wire
Loose connections or broken wire in low tension circuit	Tighten or replace wires
Improperly adjusted or faulty distributor points	Clean and adjust or replace points

Hard Starting

(See Starting and Fuel System Troubles)	
Faulty or improperly set spark plugs	Clean and adjust or replace spark plugs
Improperly adjusted or faulty distributor points	Clean or replace and adjust points
Loose connections in primary circuit	Tighten loose connections
Worn or oil soaked high tension wires	Replace high tension wires
Low capacity condenser	Replace condenser
Low capacity coil	Replace coil
Faulty distributor cap or rotor	Replace faulty part

Engine Misfires

Dirty or worn spark plugs	Clean or replace plugs
Damaged insulation on high tension wires or wires disconnected	Connect or replace wires
Distributor cap cracked	Replace cap
Poor cylinder compression	See Engine Troubles and Remedies
Improper distributor point adjustment	Adjust distributor points

Noise And/Or Engine Overheats

(See Engine)	
Loose Spark Plug Covers	Secure Covers

WIRING DIAGRAMS

CORVAIR—500, 700 and 900 SERIES

INDEX

INTRODUCTION

The wiring diagrams, Figures 8-66—8-86, show all the electrical components and circuits on the 1960 Corvair. The junction block (Fig. 8-87) provides convenient power takeoffs and fuse clips for all lamps and accessories.

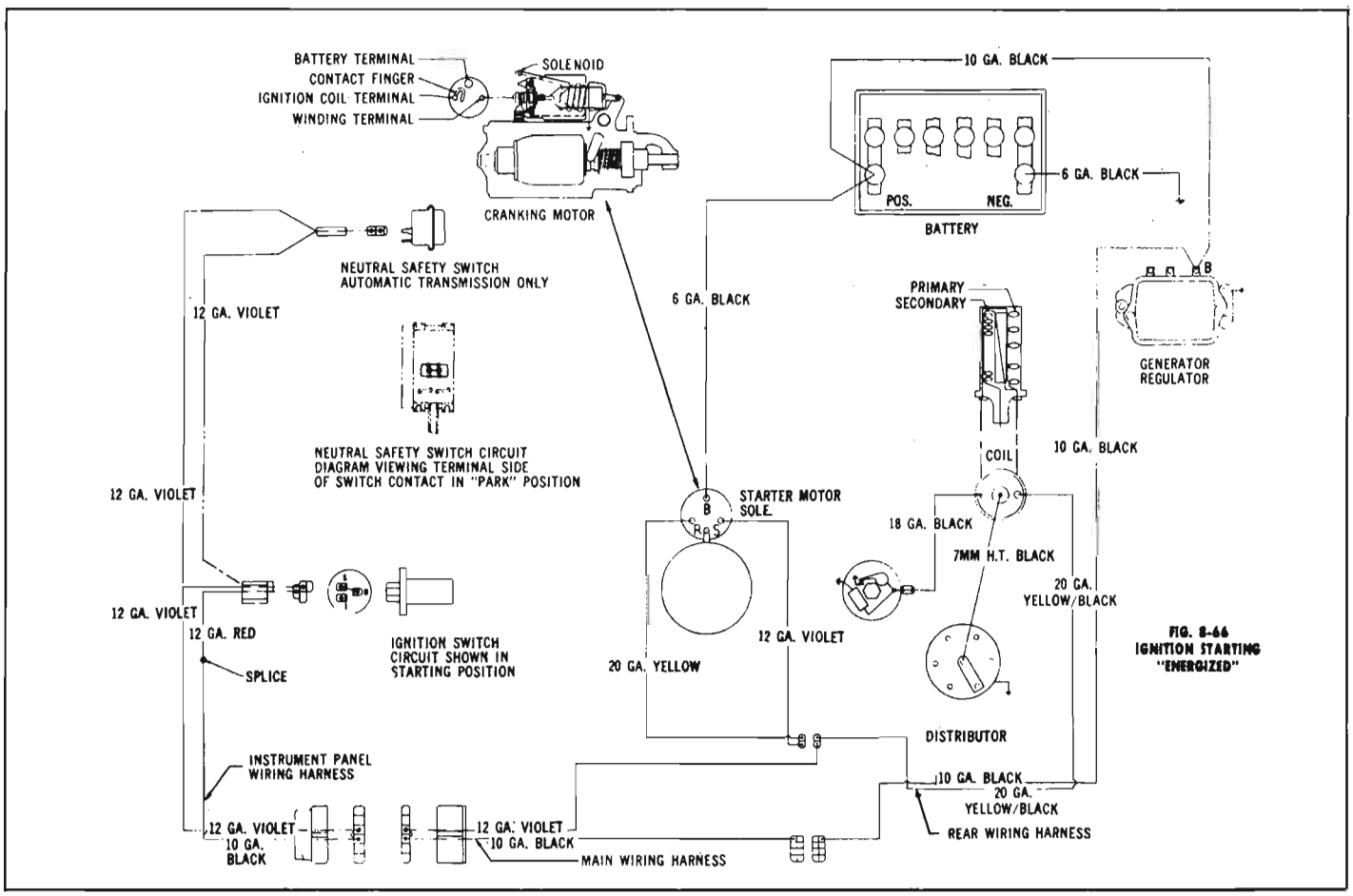

FIG. 8-66
IGNITION STARTING
"ENERGIZED"

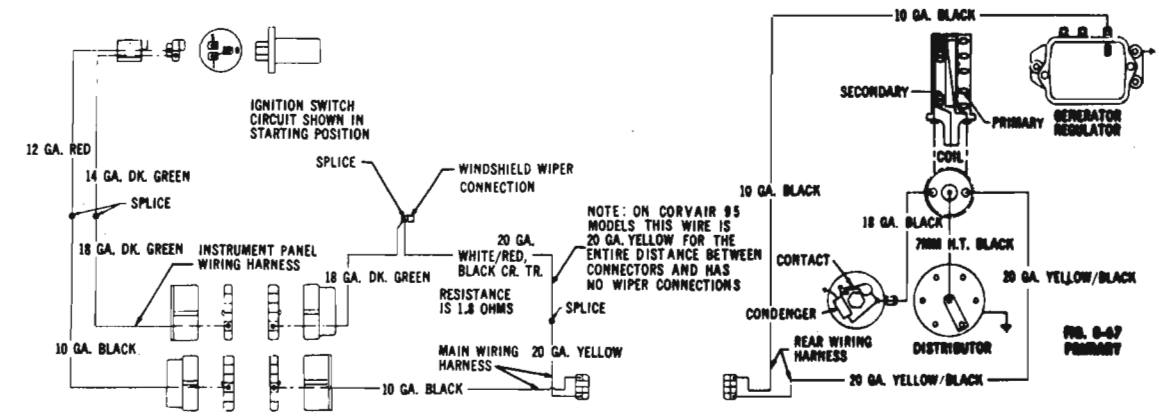

FIG. 8-67 PRIMARY

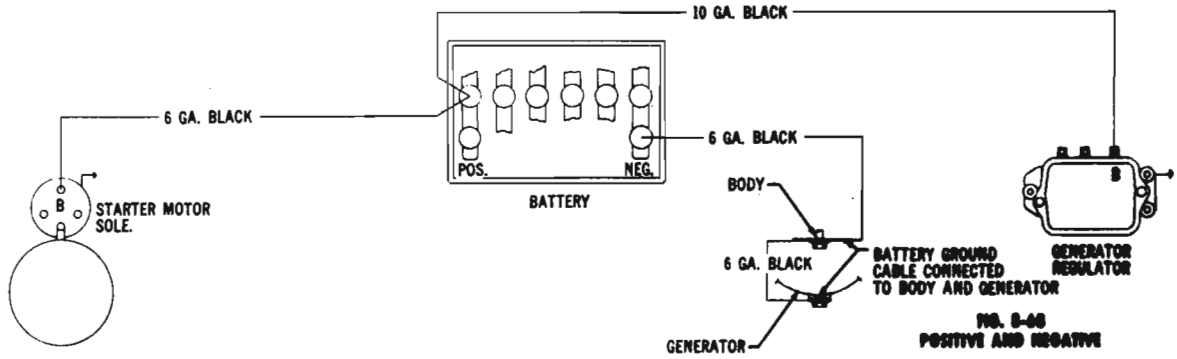

FIG. 8-68 POSITIVE AND NEGATIVE

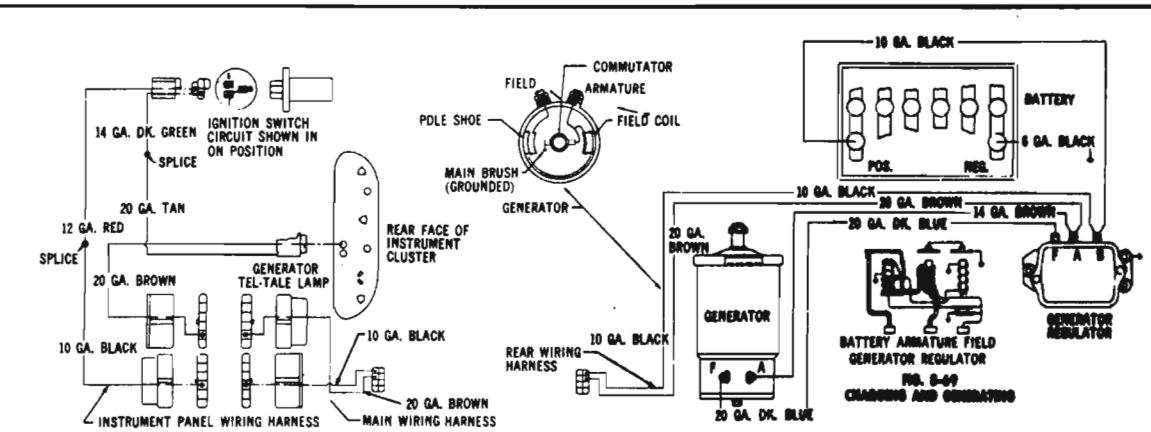

FIG. 8-69 CHARGING AND GENERATING

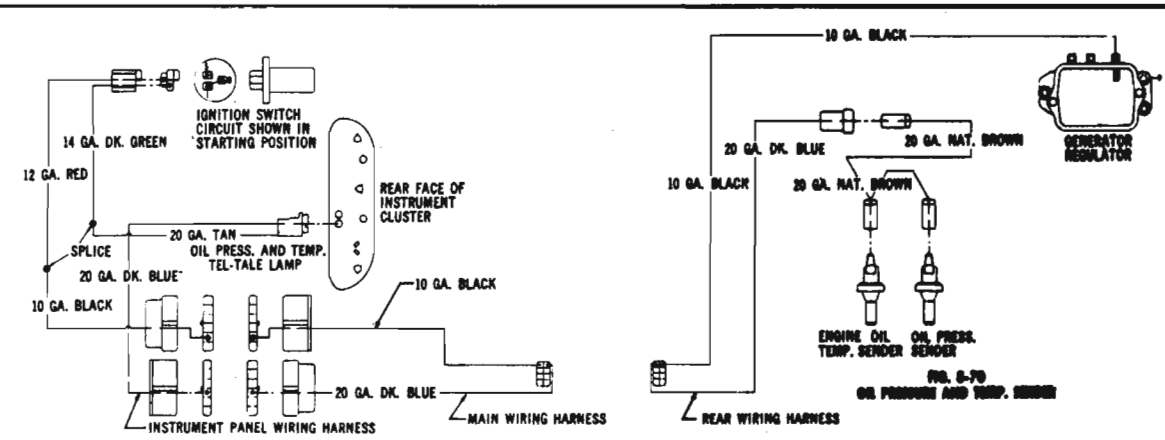

FIG. 8-70 OIL PRESSURE AND TEMP. SENDER

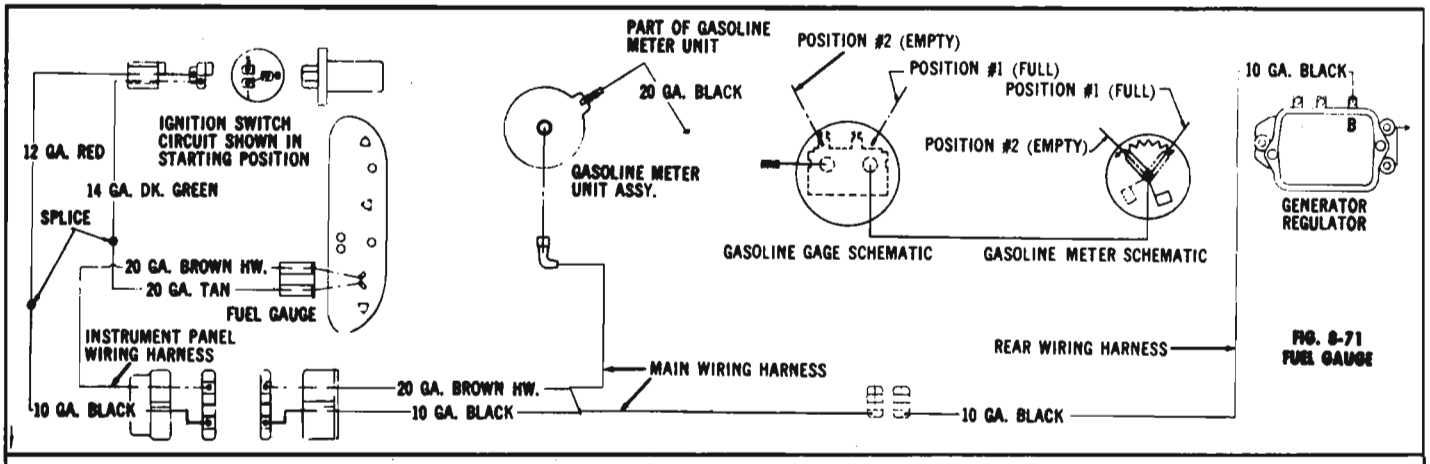

FIG. 8-71 FUEL GAUGE

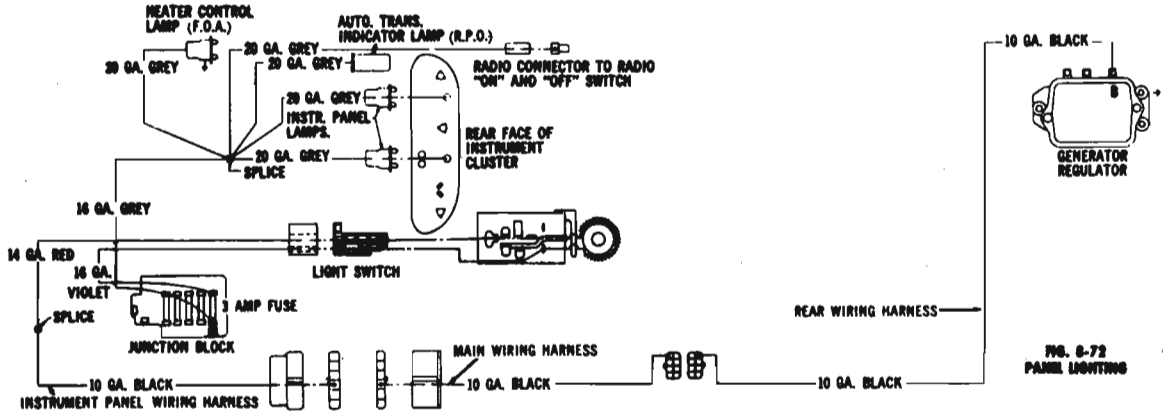

FIG. 8-72 PANEL LIGHTING

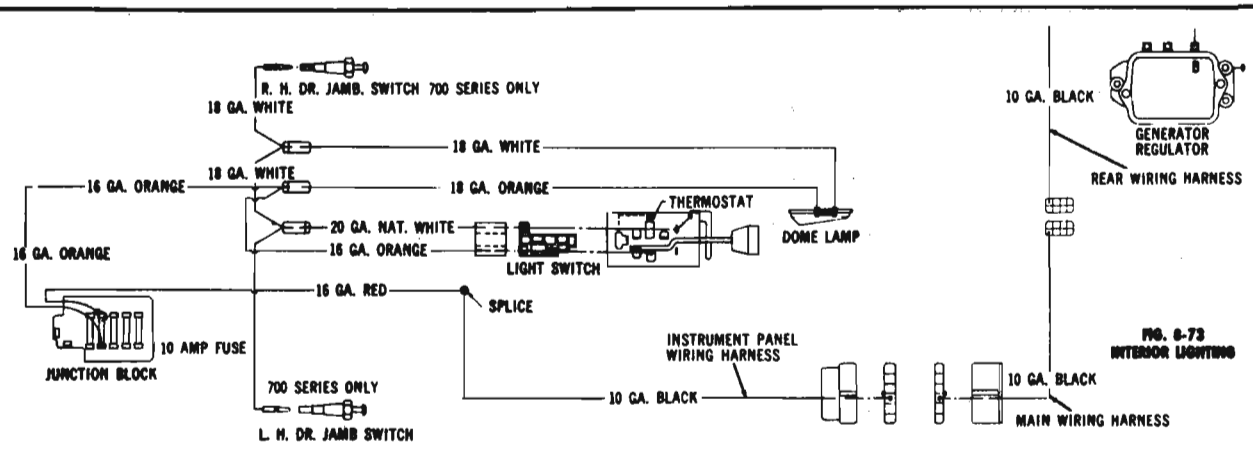

FIG. 8-73 INTERIOR LIGHTING

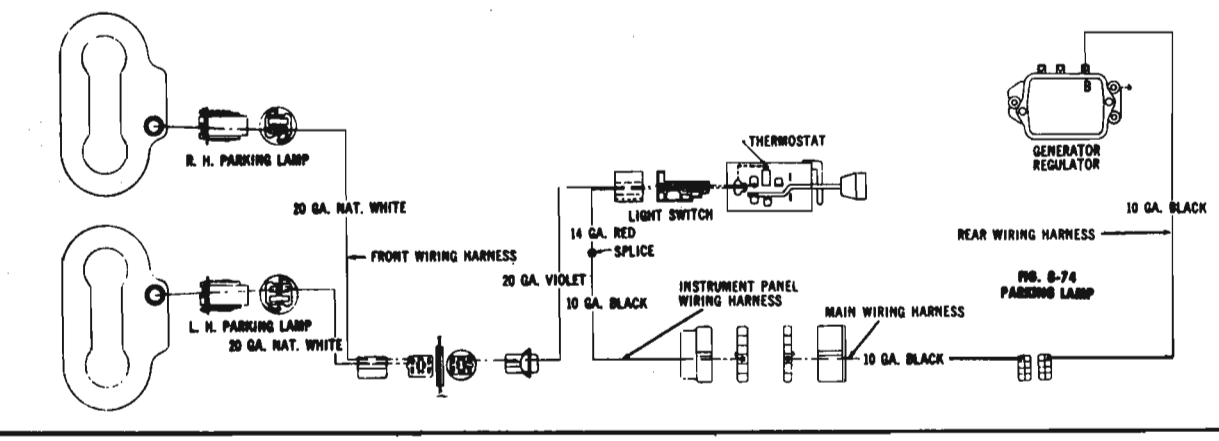

FIG. 8-74 PARKING LAMP

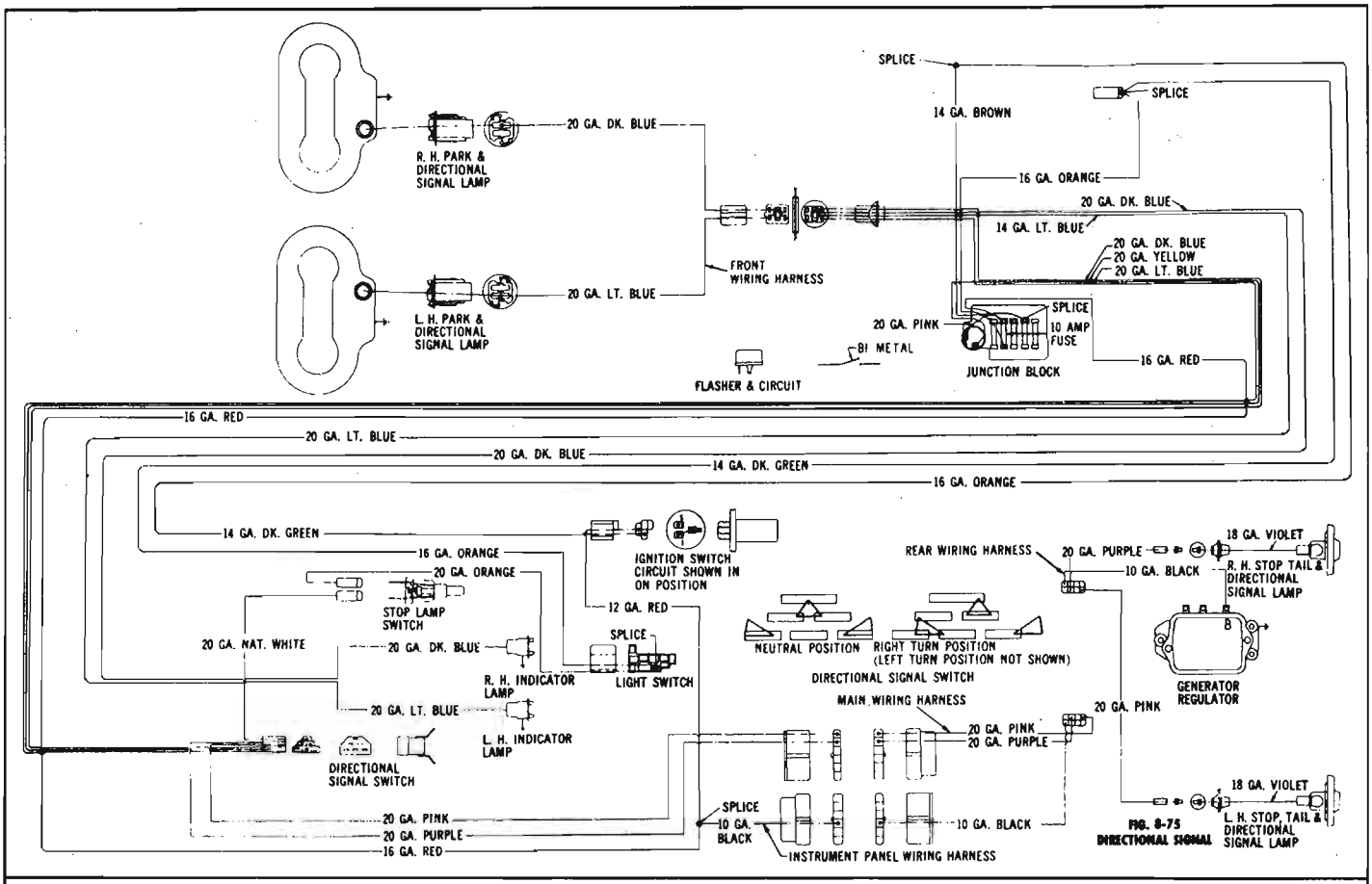

FIG. 8-75 DIRECTIONAL SIGNAL

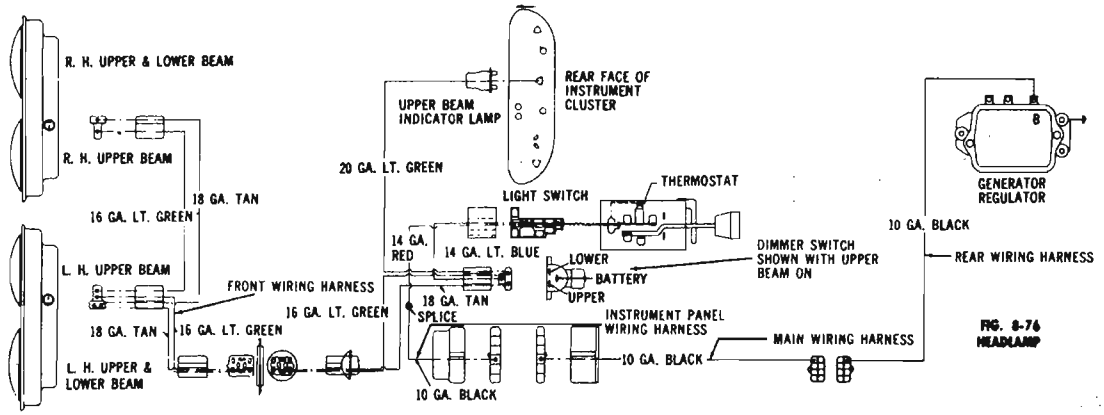

FIG. 8-76 HEADLAMP

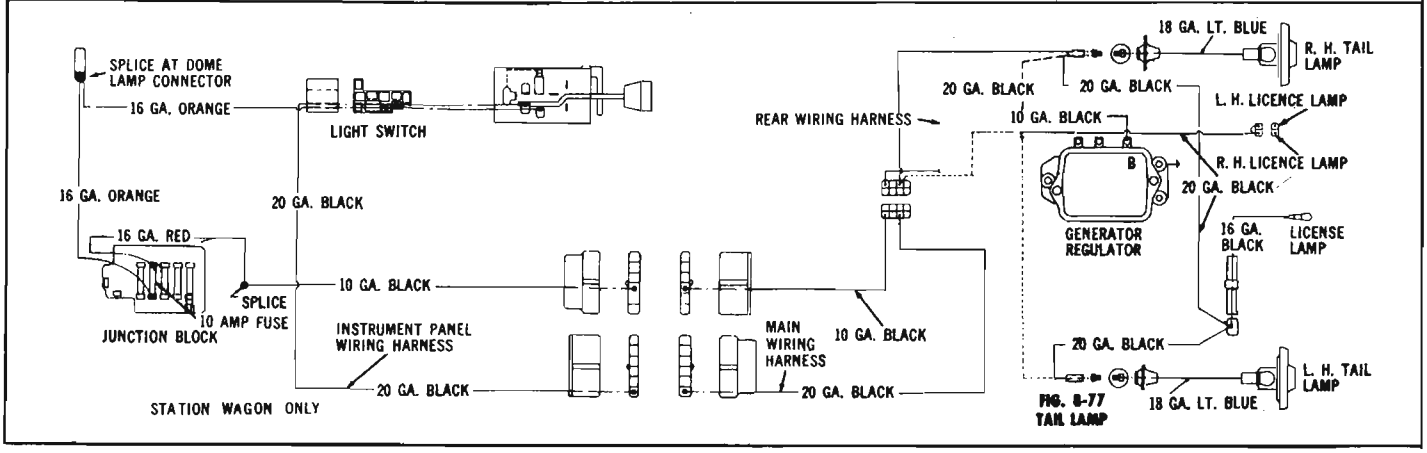

FIG. 8-77 TAIL LAMP

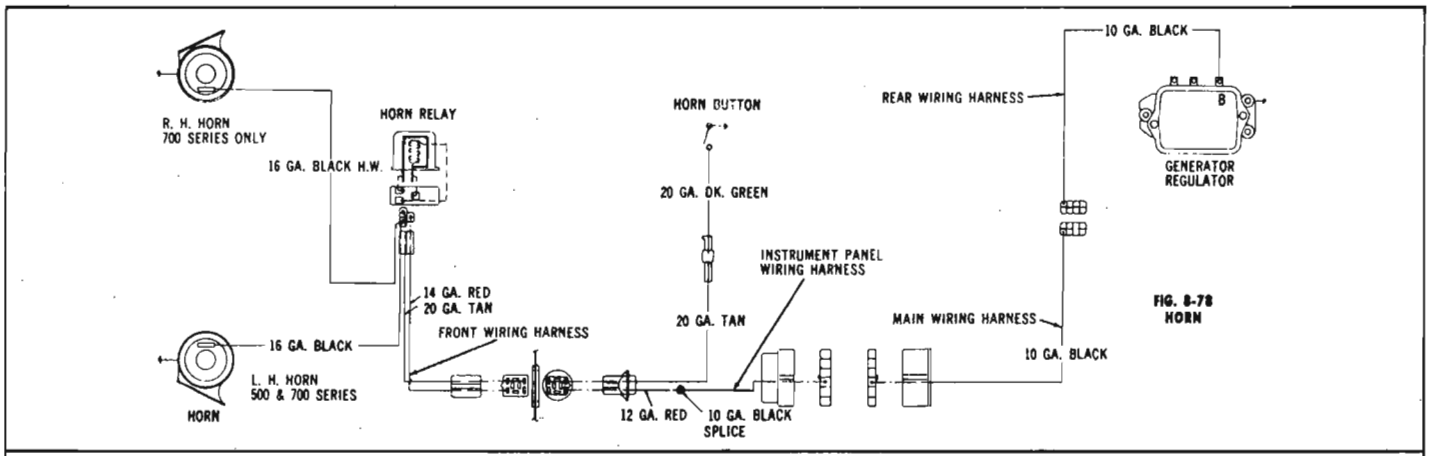

FIG. 8-78
HORN

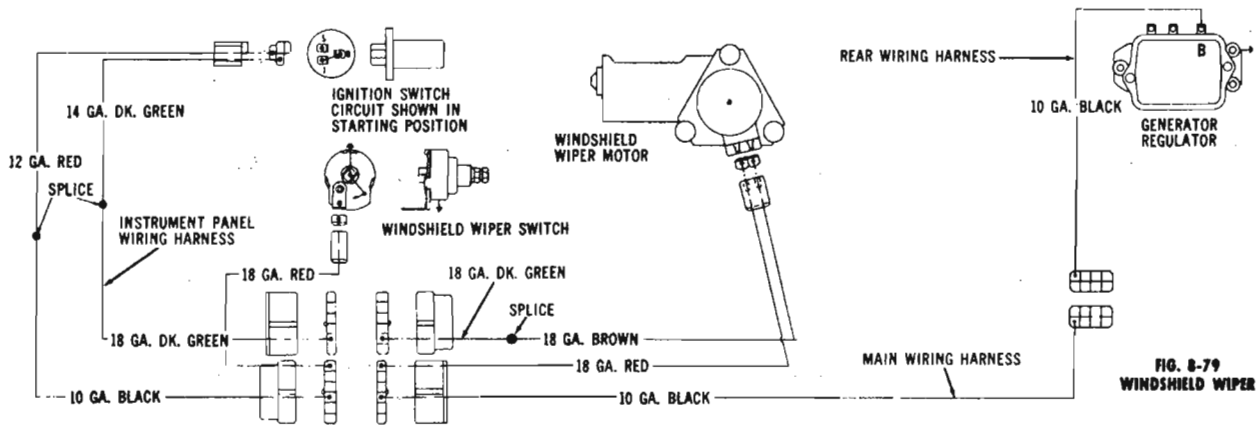

FIG. 8-79
WINDSHIELD WIPER

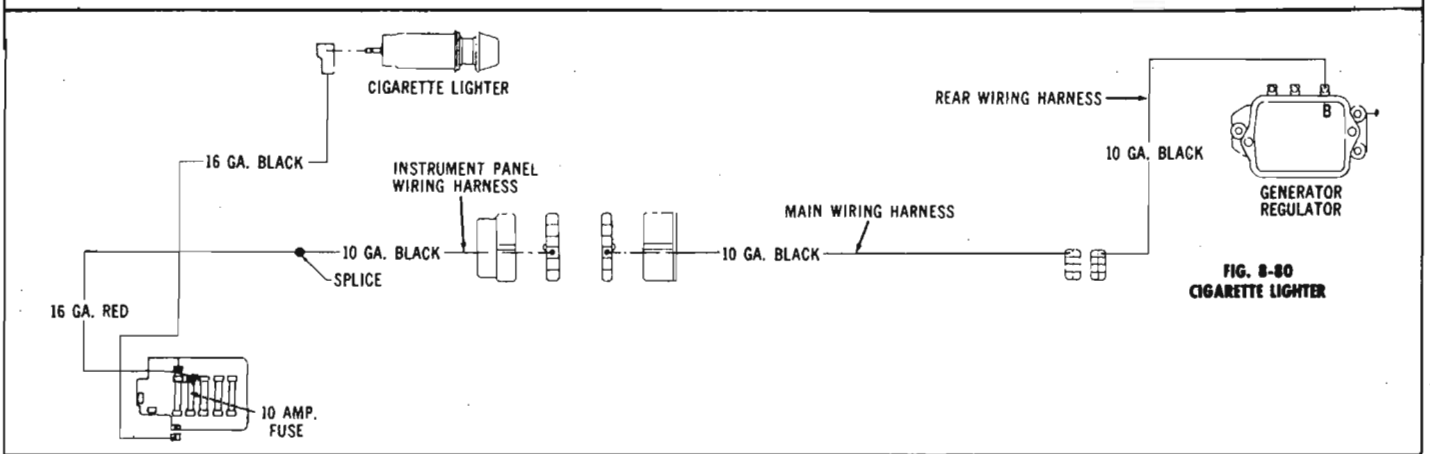

FIG. 8-80
CIGARETTE LIGHTER

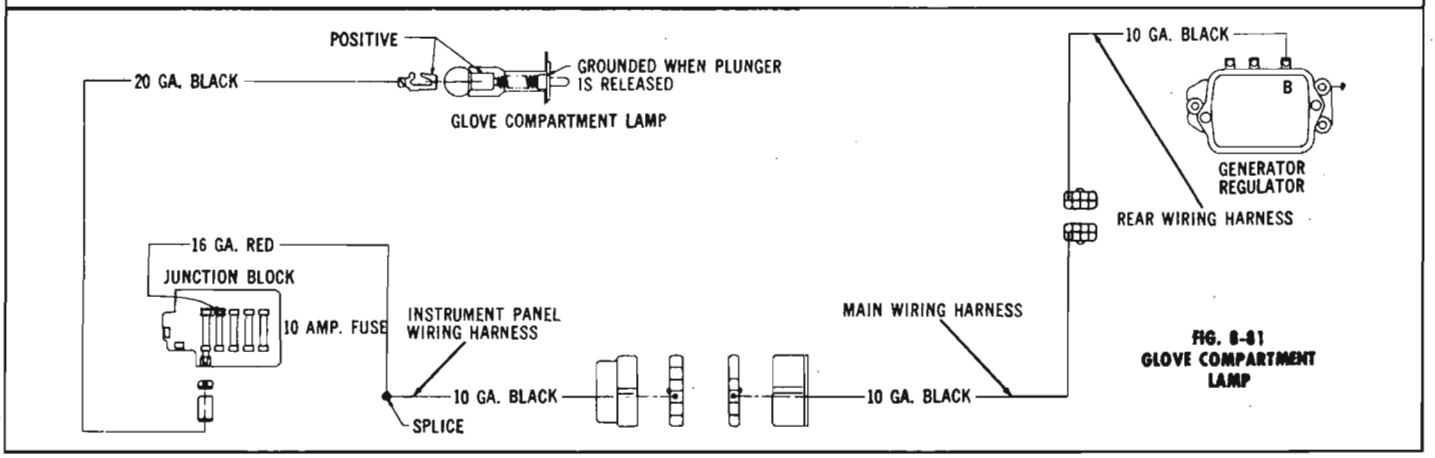

FIG. 8-81
GLOVE COMPARTMENT
LAMP

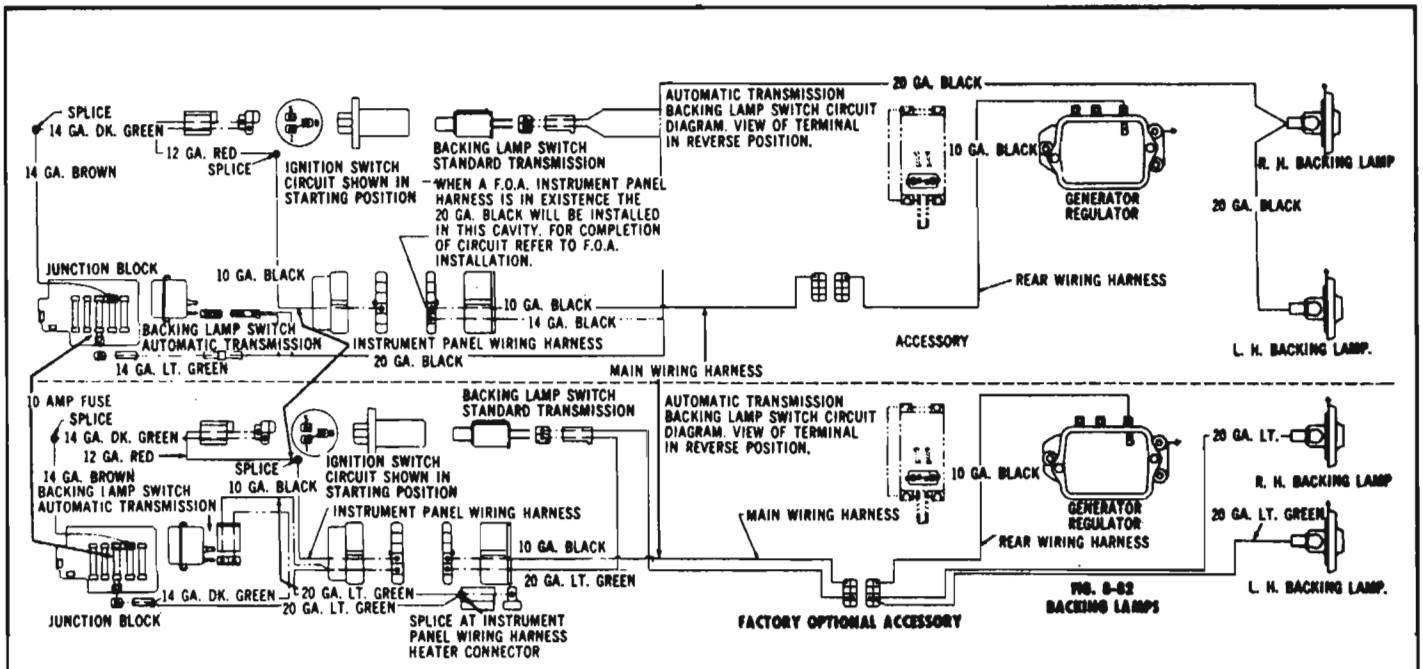

FIG. 8-82 BACKING LAMPS

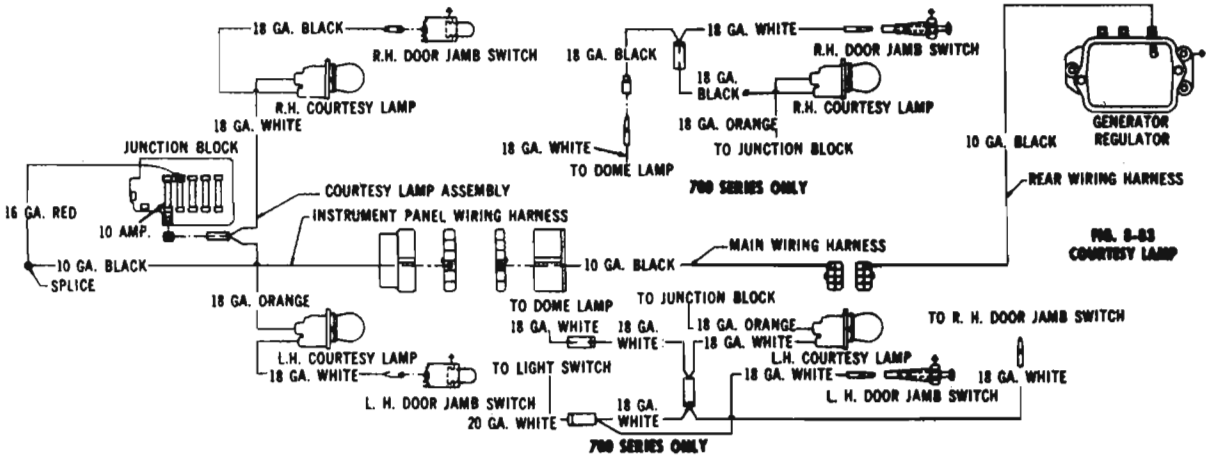

FIG. 8-83 COURTESY LAMP

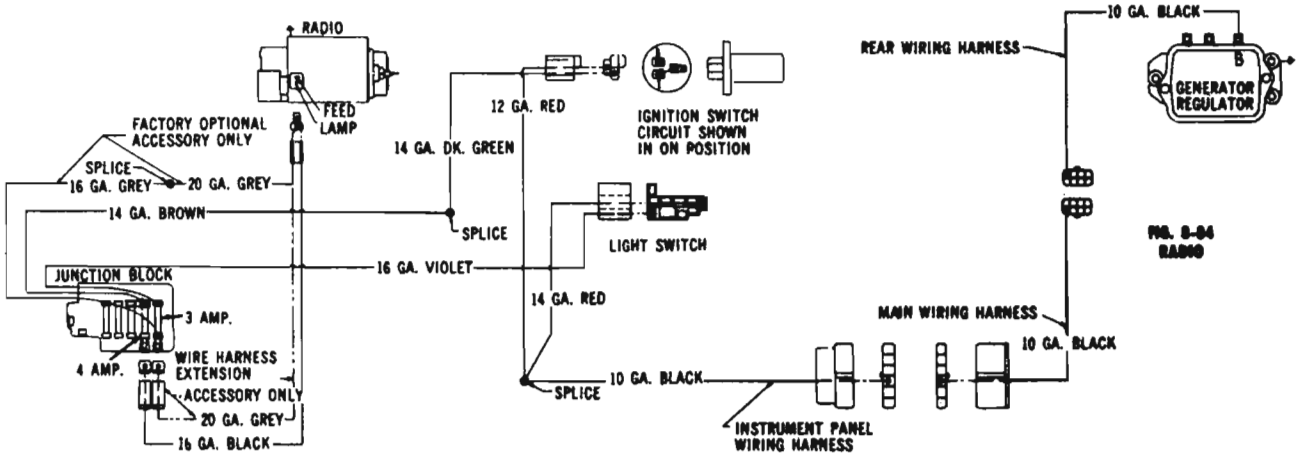

FIG. 8-84 RADIO

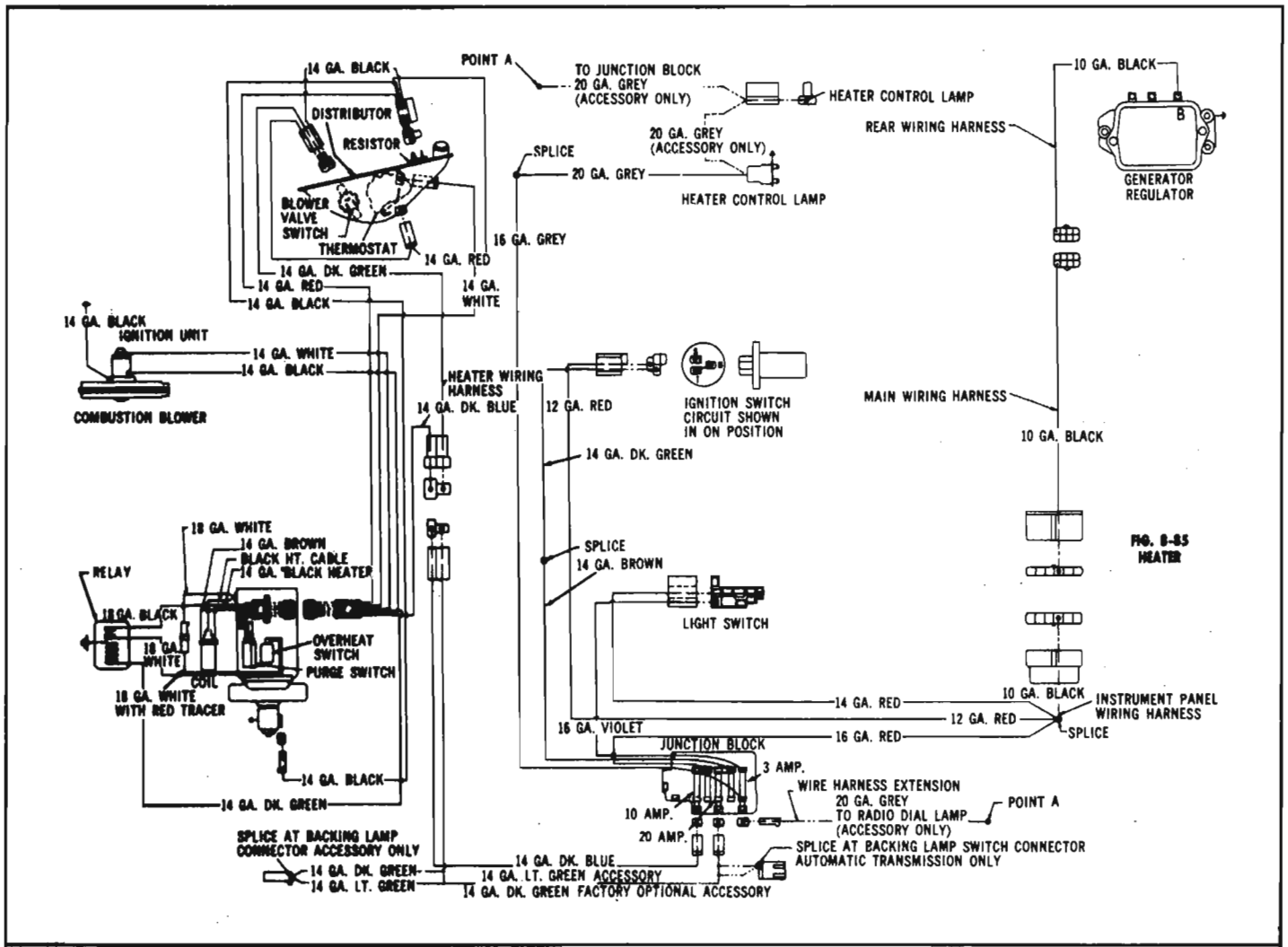

FIG. 8-85
HEATER

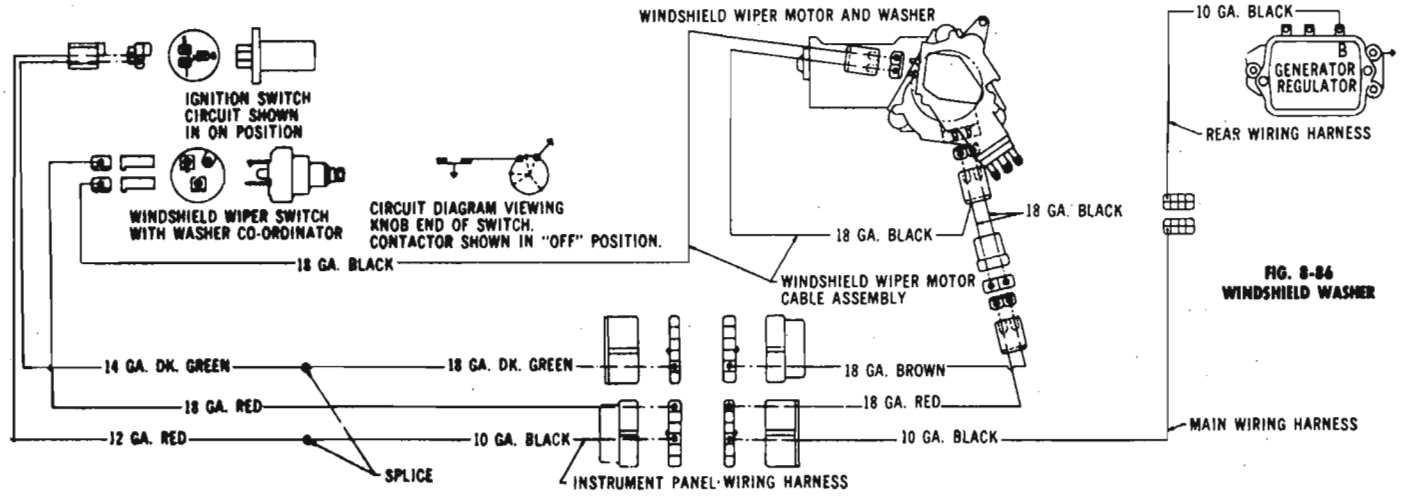

FIG. 8-86
WINDSHIELD WASHER

CHASSIS ELECTRICAL

CORVAIR—500, 700 and 900 SERIES

INDEX

LIGHTING SYSTEM

HEADLAMPS

Sealed Beam Unit Replacement

1. Remove four headlamp door retaining screws and remove door.
2. With long nosed pliers remove the retaining spring (fig. 8-88) from the retaining ring. Remove the retaining ring attaching screws (fig. 8-89). Do not disturb the adjusting screws.
3. The retaining ring may now be removed and the sealed beam unit and mounting ring pulled forward. Disconnect connector plug from the sealed beam unit and remove the unit (fig. 8-90).
4. Replace mounting ring. Attach connector to new sealed beam unit (fig. 8-91) and place unit in position in the mounting ring, being certain that the number molded into the lens face is at the top (fig. 8-92).

   NOTE: In the dual headlight installation, the inboard unit is designated "1". The outboard unit is designated "2".

5. Set the retaining ring in place and replace the retaining ring attaching screws, then use long nosed pliers to engage retaining spring in hole in retaining ring.
6. Replace the headlamp door and four retaining screws.

   NOTE: Remove and replace any of the four headlights in the same manner.

Safety Aimer and Headlamp Adjustment

Since the Corvair engine is located at the rear of the vehicle and the luggage compartment is forward of the passenger compartment, headlamp beam deflection which results from passenger and luggage loading is downward rather than upward as in the case of vehicles with front-mounted engines.

The T-3 Safety Aimer, Type B (fig. 8-93), consists of a circular base the size of a Corvair sealed beam unit (5¾" diameter) which attaches to the sealed beam unit by means of a plunger operated suction cup. (An adapter converts the aimer for use with 7" T-3 Sealed Beam units when desired.) Attached to the front of the base and extending perpendicular to the base is an "L" shaped arm. When mounted on the sealed beam unit this arm points toward the center of the car and is parallel to the ground. Mounted in the arm between the base and cross arm is a bubble level which may be adjusted to compensate for variations in floor levelness. With the Safety-Aimer, the headlights may be correctly aimed in the daylight without even turning them on. The T-3 Aimer meets SAE specifications for mechanical headlamp aimers.

While aiming headlamps, car should be at curb weight, that is, with spare tire and filled to capacity with gas and oil but no passengers. Tires should be uniformly inflated to recommended pressure.

Before adjusting aim of headlamp bounce car up and down and roll the vehicle back and forth several times to allow suspension to settle. The floor should be

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INDEX

LIGHTING SYSTEM

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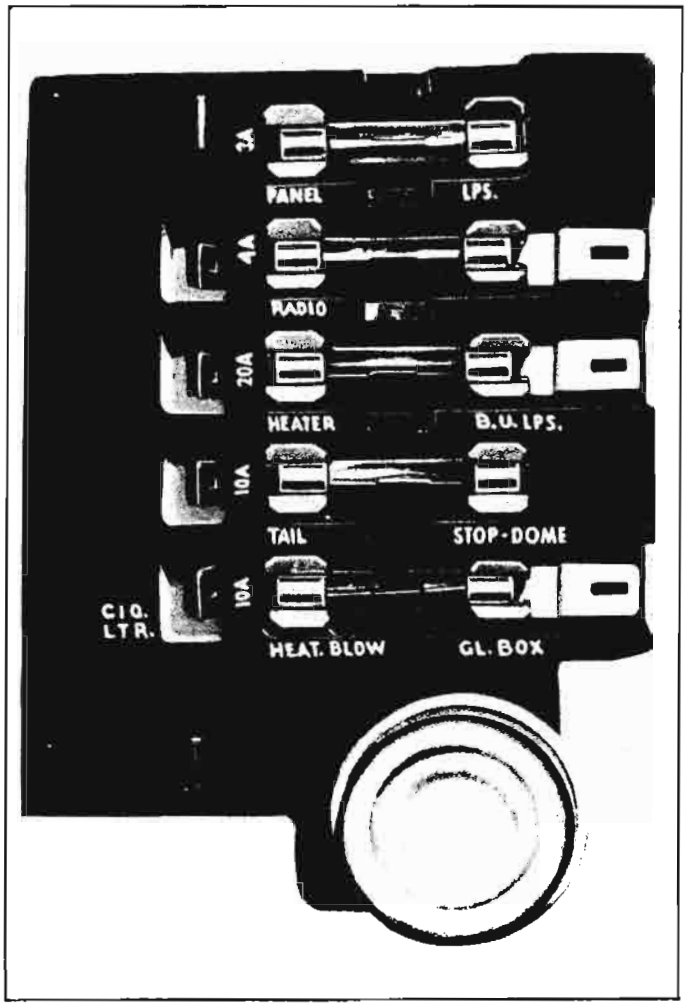


Fig. 8-87—Junction Block

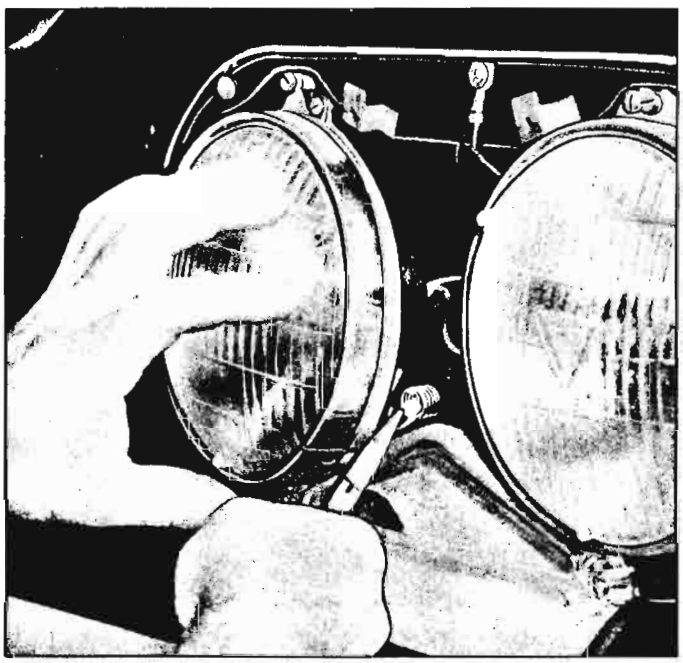


Fig. 8-88—Removing Retaining Ring Spring

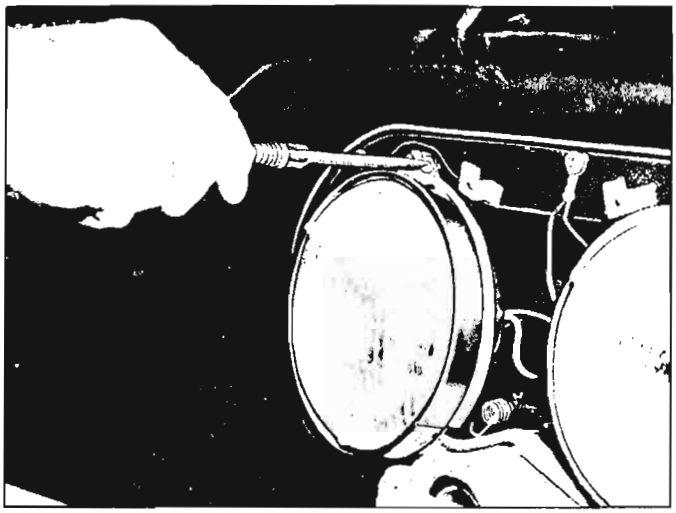


Fig. 8-89—Retaining Ring Attaching Screws

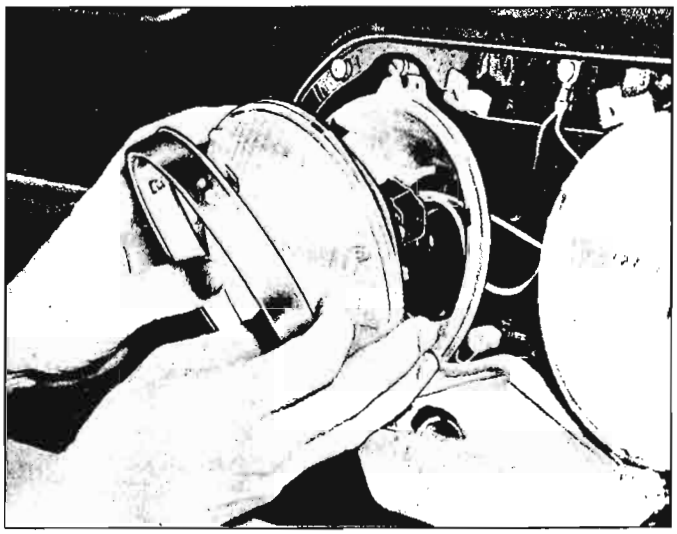


Fig. 8-90—Removing Retaining Ring, Sealed Beam Unit and Mounting Ring

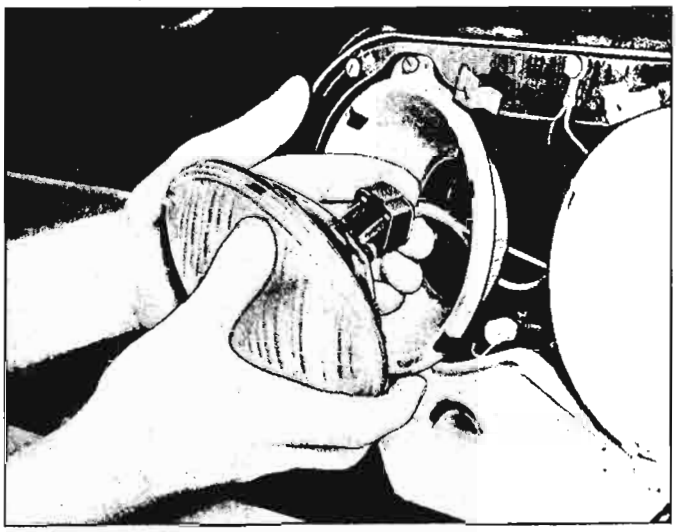


Fig. 8-91—Connecting Sealed Beam Unit

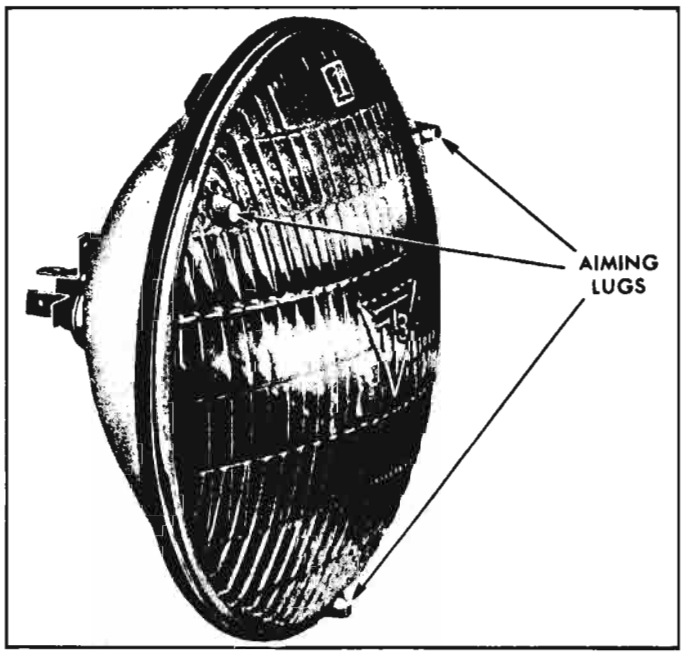


Fig. 8-92—T-3 Headlamp Unit

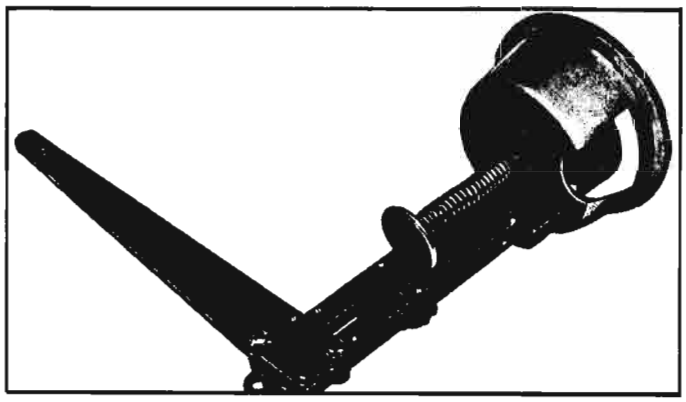


Fig. 8-93—T-3 Safety Aimer—Type B

reasonably level with enough room to walk around the car. If the area is level the T-3 Aimer can be used as it comes from the factory. Before the Aimer is packaged, the bubbles are set for use on level aiming space. The Aimer itself provides a means of checking any given area for levelness.

The following Corvair headlamp aiming procedures are based on a recommended "0" deflection from horizontal for the vertical aim. Where State laws require aiming other than that recommended below, follow the regulations of those States whenever adjusting headlamps.

Checking the Calibration of the T-3 Aimer

The factory calibration of the T-3 Aimers may be quickly checked by using an easily constructed checking fixture (fig. 8-94). Construct such a fixture as follows:

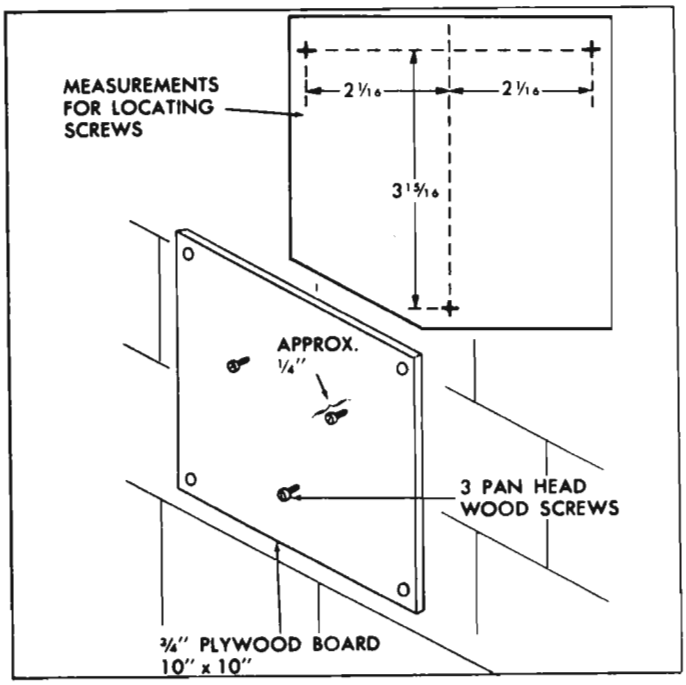


Fig. 8-94—T-3 Aimer Checking Fixture

1. Fasten a 10-inch square of ¾" plywood to the wall.
2. Install three ½" No. 6 pan head wood screws on the wooden board as shown in Figure 8-94 so that the screw heads are approximately ¼ inch from the board and spaced as shown.
3. Set the numeral "0" in the DOWN view window of the aimer.
4. Hold the seating plane of the aimer in contact with the three screws and with the horizontal arm parallel with the floor (fig. 8-95). The screw heads must be long enough to provide clearance between the flange of the aimer and the board.

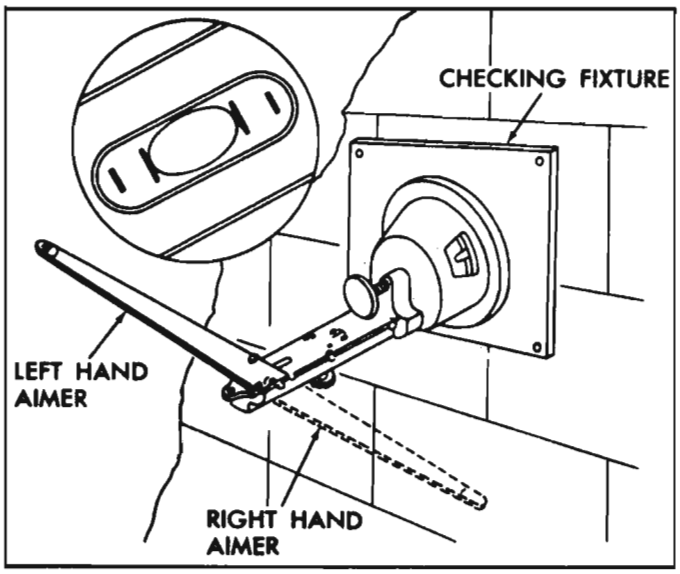


Fig. 8-95—Checking Vertical Calibration

5. Adjust the three woodscrews until the bubble in the T-3 Aimer is centered. Leave the woodscrews in this position.

After the checking fixture has been constructed and adjusted as outlined above, the T-3 Aimers may be quickly and easily checked should they ever be dropped or damaged.

Vertical Check of Aimer

1. With the numeral "0" in the DOWN window of the aimer, hold the aimer seating plane against the three screws on the plywood board with the horizontal arm parallel to the floor (fig. 8-95). If the bubble is centered, the aimer is in calibration.
2. If the bubble is not centered, adjust screw (fig. 8-99) on the bottom of the aimer until the bubble is centered. The aimer is now calibrated vertically for a level floor.

Horizontal Check of Aimer

Rotate the aimer so that the horizontal arm points toward the floor (fig. 8-96). Tie a small weight on the end of a three foot string and connect the opposite end of the string to the slot in the aimer arms. The string should fall as shown in Figure 8-96. If it falls outside the tolerances shown, the aimer should be replaced.

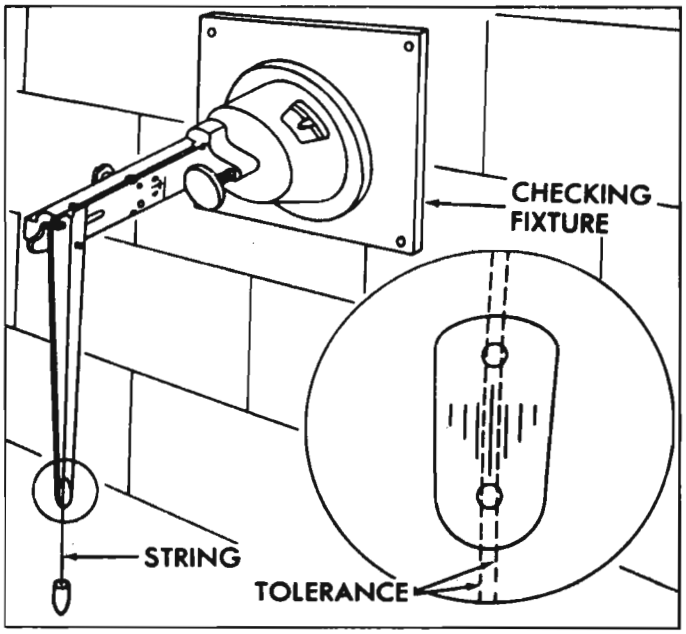


Fig. 8-96—Checking Horizontal Calibration

How to Select a Level Aiming Area

1. Select area you believe to be level.
2. Remove headlamp doors and install aimers on each headlamp (fig. 8-97) making sure aiming lugs engage smooth inner ring of the aimer. To install aimer, press firmly on the knob extending out from the center of the aimer base. This forces the suction cup into place on the sealed beam unit.

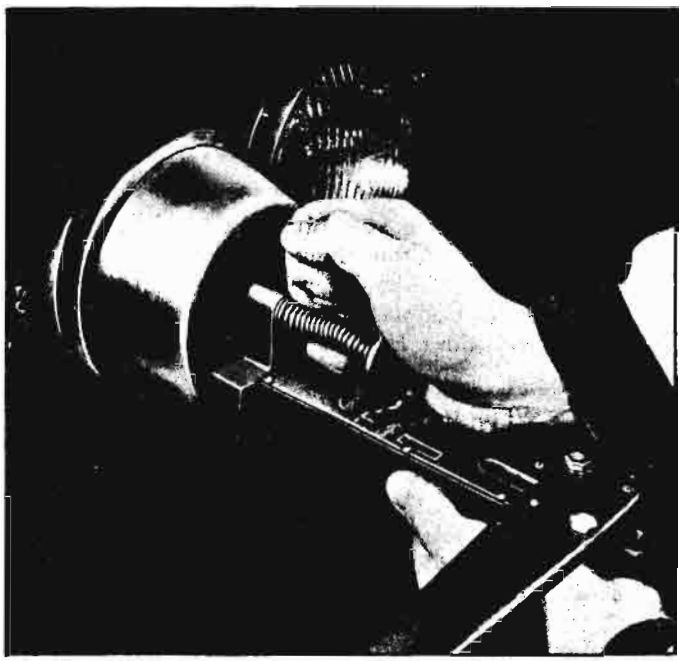


Fig. 8-97—Installing Aimer on Headlamp Unit

3. Loosen the slider knob beneath the aimer arm and set the numeral "0" in the DOWN view window (fig. 8-98). Back vertical lamp adjuster out on each lamp until bubble is outside of black line of vial then center bubble in between black lines of vial by turning clockwise.

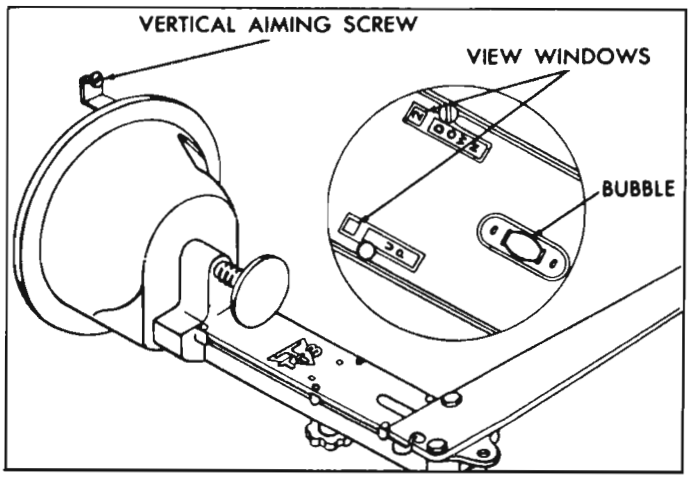


Fig. 8-98—Selecting Level Aiming Area

4. After both bubbles are centered, turn the car around end for end, making sure the tires rest in the spots made on the floor before the car was moved.
5. If the bubbles are still within the two outside black marks on the vials, the floor is level enough as it comes from the factory to use the aimers.

NOTE: A quick level check can be made by using the T-3 Safety-Aimer as a level. Use with a true eight to ten foot two by four as an extension. Make sure pads on base of aimer are used. Place the board where you expect the wheels to be and take readings as outlined above.

6. If either bubble moves outside the black lines of the vial there is too much slant to the floor. Try driving the car in at different angles onto the aiming area. If bubbles can not be centered follow procedure under *How to Compensate for Unlevel Floor.*

NOTE: When level portion of floor is obtained, mark tire spots on floor so spots can be used next time without calibrating aimer. These will be a different set of marks than the ones used for the Chevrolet Passenger Car. New marks will be required for the Corvair due to the shorter wheelbase and tread.

To Compensate for Unlevel Floors

If your floor is not level within the limits specified, the T-3 Aimer can be calibrated to compensate for the error in the floor. Follow this procedure with both aimers.

1. Drive the car onto the area for which you wish to compensate the aimers, and install the aimers in place on either the No. 1 or the No. 2 pair of headlamps.
2. Loosen knob beneath the aimer arm and move the slider until the bubble is centered.
3. Record the numeral in the view window. (This numeral is to be used only for recalibration.)
4. Move the slider to a position halfway between this recorded numeral and the numeral "0" in the DOWN window. (This numeral is used only in recalibration and not for headlamp aiming.)
5. Recalibrate aimers by turning screw shown in Figure 8-99 until the bubble is centered.
6. The T-3 Aimers are now calibrated for the selected area. All future aiming must be done in the same area and with the car pointed in the same direction. Mark the tire spots on the floor so that future cars (Corvairs only) can be located in the same position.

NOTE: Due to the difference in wheelbase and tread, the Corvair will have different set of marks than the Chevrolet Passenger Car.

Headlamp Adjustment—T-3 Headlamp

It is important to note that different aiming specifications are needed for the Corvair. This is because headlight beam deflection is downward, rather than upward as in the case with front-mounted engines. Passengers and luggage loaded behind the engine

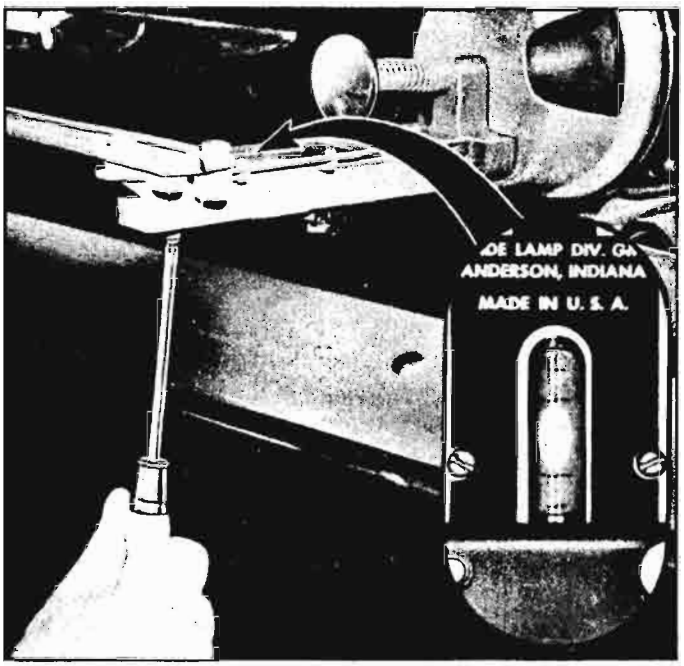


Fig. 8-99—Turning Level Adjusting Screw to Calibrate Aimer

(standard Chevrolet) cause upward beam deflection while passenger and luggage loaded in front of the engine cause downward beam deflection.

1. Drive vehicle onto selected aiming area. Tires should be at recommended pressures, and the vehicles should be unloaded—no extreme load in front compartment and no passengers.
2. Remove headlamp doors.
3. Mount the T-3 Aimers on either the No. 1 or No. 2 pair of headlamps so that the points of the headlamps engage the smooth inner ring of the aimers.
4. Secure the aimers to the headlamp units by pressing knob extending out from center of aimer base firmly. Rotate the crossarms to approximately horizontal position and pointing toward center of the car.
5. With both aimers in place on the same pair of headlamp units, knot both ends of the elastic string and fasten, using slots provided, from the left to the right aimer across the top of the horizontal crossarms (fig. 8-100).
6. Bounce car up and down and roll the vehicle back and forth several times to allow suspension to settle.
7. Rotate both aimers so that the points of the crossarms just clear the string.

Horizontal Adjustment

8. a. Turn horizontal aiming screw, Figure 8-101, on left-hand lamp until the string is positioned over the crossarm centerline. Turn the screw clockwise in making the final adjustment to take up play in the headlamp mechanism.

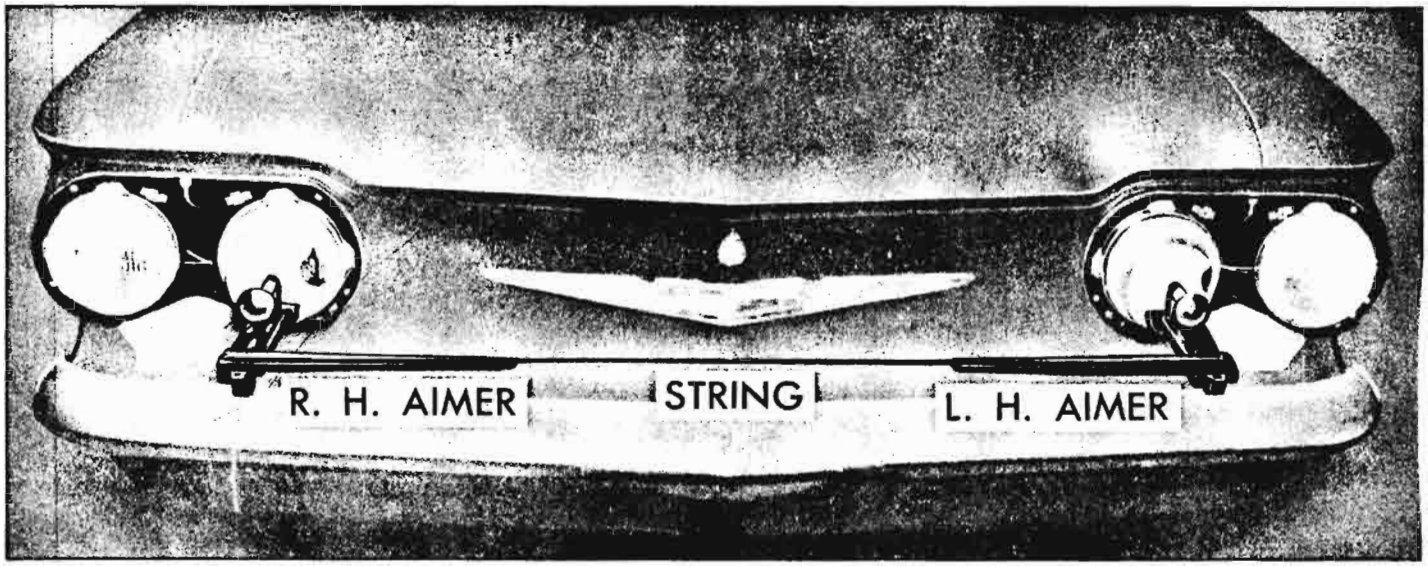


Fig. 8-100—Aimers and String Installed on No. 1 Headlamp Units

b. Repeat the same operation on the right-hand lamp to complete the horizontal adjustment of this pair of lamps.

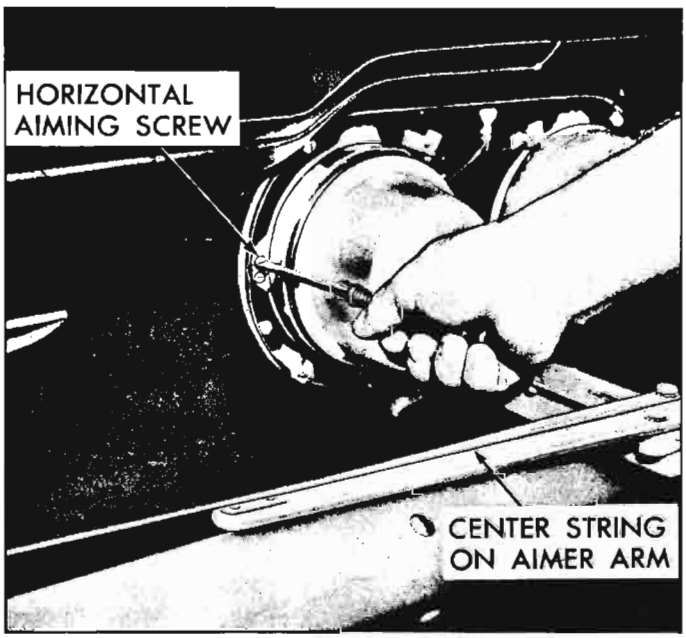


Fig. 8-101—Headlamp Horizontal Adjustment

Vertical Adjustment

9. a. Numeral "0" should appear in the DOWN window of each aimer. If not, loosen knob beneath aimer arm and slide back and forth until the numeral does appear.

   b. Turn headlamp vertical aim screw (fig. 8-102) on the left-hand unit counterclockwise until the bubble is at the end of the level toward the T-3 unit. Then turn screw clockwise until the bubble is centered.

   c. Repeat this operation on the right-hand headlamp unit.

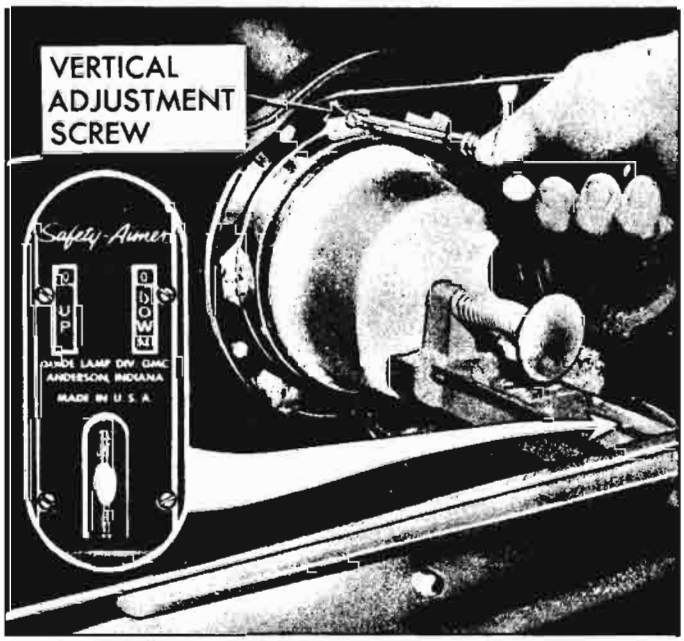


Fig. 8-102—Headlamp Vertical Adjustment

10. Recheck the string at the ends of each crossarm for correct setting and the bubble on each aimer for centered position.

11. Remove the aimers by pulling on the suction cup tabs through the openings in the aimers (fig. 8-103) and mount the aimers on the other pair of headlamp units. Repeat steps 4 through 10.

12. When both pairs of headlamps have been properly aimed, remove the safety aimers and replace the headlamp doors.

Fig. 8-103—Removing Aimer from Headlamp

Headlamp Adjustment—Aiming Screen Method

Information relative to aiming the headlamps without using the T-3 Aimer is contained in Figure 8-104.

LIGHTING SWITCH REPLACEMENT

1. Disconnect ground cable from battery.
2. Pull knob out to headlamp ON position.
3. Reach under the instrument panel and depress the switch shaft (fig. 8-105) and remove knob and shaft assembly.
4. Remove the retaining ferrule, using a wide-blade screwdriver or Tool J-7673, and bezel, then lower the switch assembly (fig. 8-106).
5. Disconnect the multi-plug connector from the lighting switch. A screwdriver may be inserted in the side of the switch to pry the plug from the switch.
6. Connect the multi-plug connector to a new lighting switch.
7. Set the switch in position and install the bezel and ferrule (fig. 8-106), using a screwdriver or Tool J-7673.
8. Push the switch knob and shaft assembly into position so that it snaps into its detent.
9. Connect battery ground cable and check operation of lights.

STOPLIGHT SWITCH REPLACEMENT

1. Disconnect the two connectors from stoplight switch. Switch is located under the instrument panel adjacent to the brake pedal (fig. 8-107).
2. Remove the locknut from plunger end of switch and remove switch. Remove second locknut from switch.
3. Install locknut on new switch and set switch in same approximate position on brace as switch previously removed.
4. Install second locknut on switch and adjust position for proper operation. Electrical contact should be made when brake pedal is depressed ½"-¾" from fully released position.
5. Install the two connectors and check operation of switch.

DIMMER SWITCH REPLACEMENT

1. Lift interior floor mat.
2. Remove the connector from the switch (fig. 8-108).
3. Remove the two bolts that secure switch to floor pan. Remove switch.
4. Connect the connector to the new switch.
5. Secure the switch to the floor pan with two attaching screws.
6. Replace floor mat and check operation of switch.

WINDSHIELD WIPER SWITCH REPLACEMENT

1. Remove the connector(s) from the rear of the switch. A single connector is used on units without windshield washers. Two connectors are used on units with windshield washers (fig. 8-109).
2. Remove the small set screw from bottom of wiper knob and remove knob.
3. Remove attaching nut and bezel and withdraw wiper switch from under dash panel.

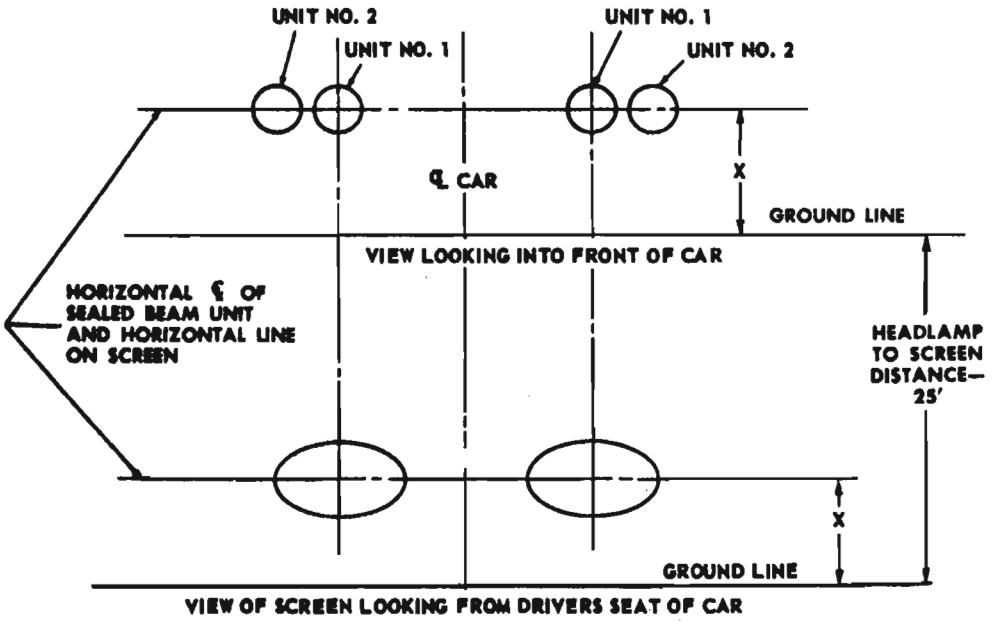
   NOTE: To avoid damage to switch, it will be necessary to seat push button (on washer equipped units only) before removing or installing nut.

4. Set new switch in place and install bezel and attaching nut.
5. Set knob in place and secure it with set screw.
6. Attach connectors to rear of switch as shown in Figure 8-109 and test operation of wipers and washers.

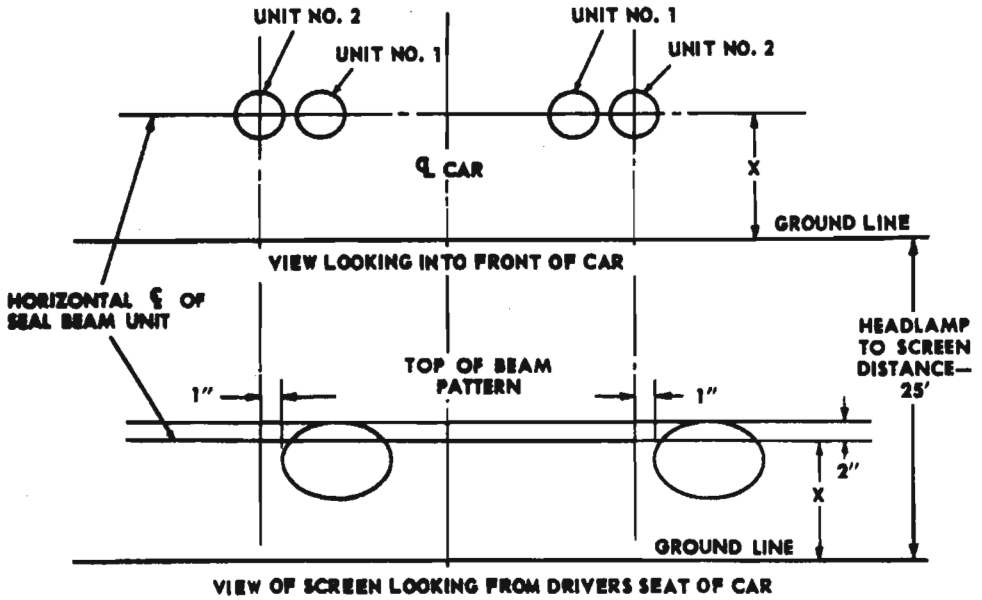
   NOTE: The washer connector is the lead that is not enclosed in the harness. It is secured to the outside of the harness.

NEUTRAL SAFETY SWITCH REPLACEMENT

1. Remove the retainer from pin on the transmission range selector assembly (fig. 8-110).
2. Remove the two screws that attach the switch to the range selector assembly.
3. Lower the switch and remove the starting circuit connector and the back-up lamp circuit connector (if used).
4. With the nylon contact block pushed all the way in, scribe a mark across the metal plate at the



UPPER BEAM ADJUSTMENT



WHEN LOWER BEAM ADJUSTMENT IS COMPLETED ON NO. 2 UNITS THE UPPER BEAMS IN THESE UNITS ARE CORRECTLY MADE AUTOMATICALLY.

LOWER BEAM ADJUSTMENT

THE ABOVE ARE THE RECOMMENDED SETTINGS. FOLLOW STATE OR LOCAL RECOMMENDATIONS WHEN IN CONFLICT WITH ABOVE.

Fig. 8-104—Headlamp Aiming Guide

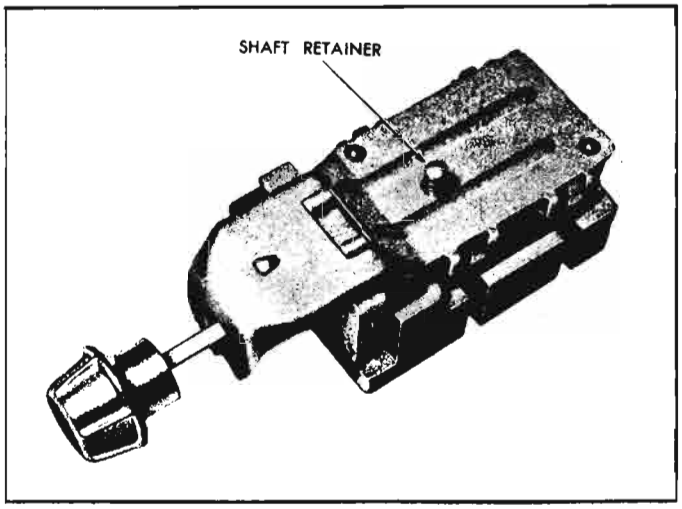


Fig. 8-105—Lighting Switch Shaft Retainer

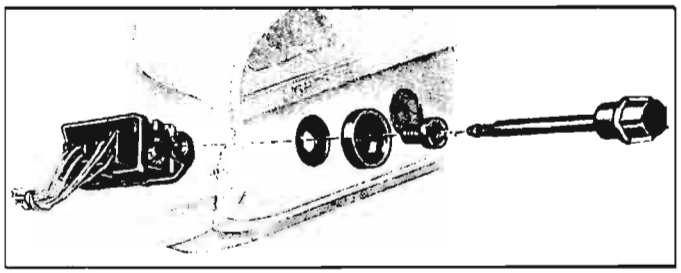


Fig. 8-106—Lighting Switch—Exploded View of Installation

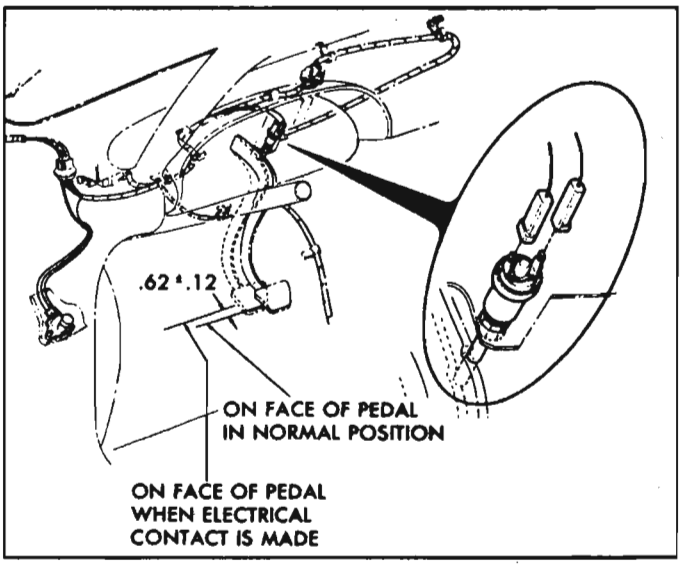


Fig. 8-107—Stoplight Switch Installation

back (open end) of the contact block (A—Fig. 8-110). Then pull nylon contact block out until front of contact block lines up with the scribe mark (B—Fig. 8-110).

5. Install connector(s) onto new switch.
6. Place switch plunger onto pin or range selector assembly and loosely install the two attaching screws.
7. Install the retainer onto pin on range selector.
8. Place transmission range selector into "N"—neutral position.
9. Test operation of switch. Engine must only start in "N"—neutral position. Check operation of backing lamps (if installed).

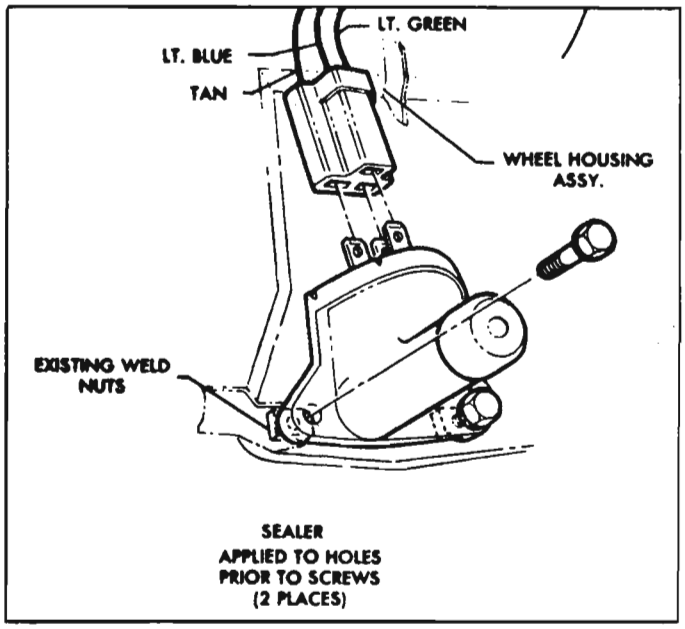


Fig. 8-108—Dimmer Switch Installation

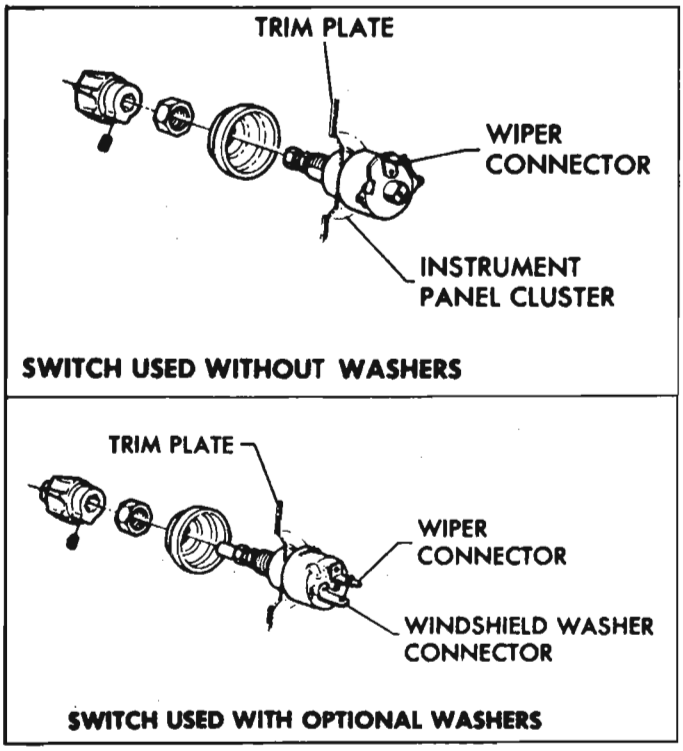


Fig. 8-109—Windshield Wiper Switch Installation

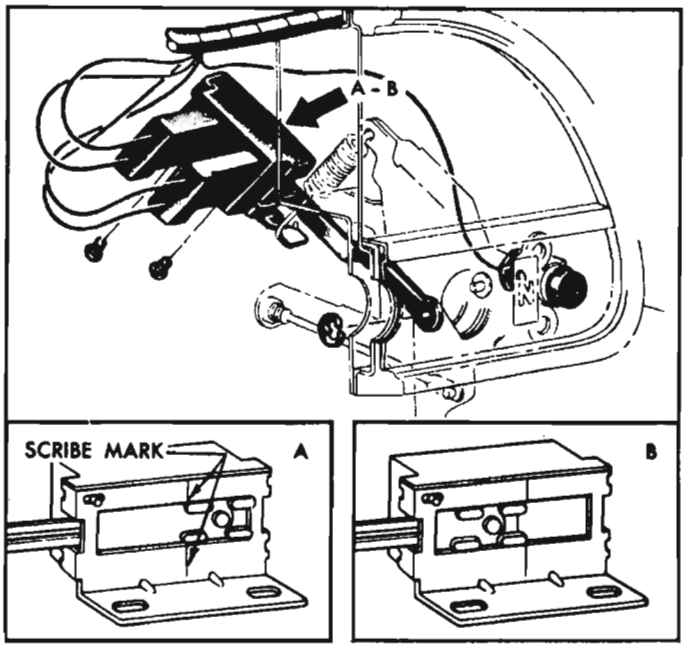


Fig. 8-110—Neutral Safety Switch Installation

BACK-UP LAMP SWITCH REPLACEMENT (3-SPEED ONLY)

1. Remove the underbody tunnel front cover attaching screws and withdraw cover.
2. Remove the connector from back of switch. Remove the metal screw that attaches switch to underbody and withdraw switch.
3. Plug connector into switch and secure switch onto underbody.
4. Position the gearshift lever in reverse. Adjust striker on shifter tube so that tang pushes plunger into switch body. The distance between switch and tang on striker should be ⅜" (fig. 8-111).
5. Check operation of switch before replacing tunnel front cover.

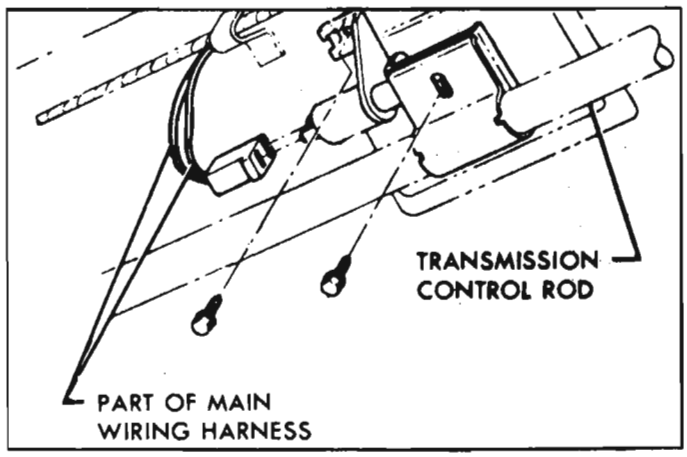


Fig. 8-111—Back-Up Lamp Switch Installation

INSTRUMENT PANEL COMPARTMENT LAMP SWITCH REPLACEMENT

1. Reach into panel compartment, depress bulb in end of switch, and turn it counterclockwise. Remove bulb.
2. Push switch out of mounting hole. Carefully pull wire and terminal out of switch (fig. 8-112).
3. Insert wire and terminal into new switch.
4. Push switch into place and install bulb by setting it in place, depressing and turning it clockwise.

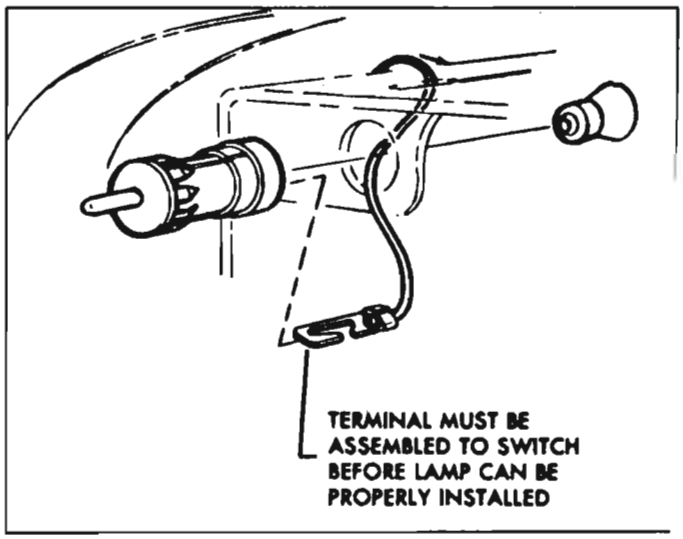


Fig. 8-112—Instrument Panel Compartment Lamp Switch Installation

BULB AND LAMP BODY SERVICE

Parking Lamp

1. To replace the bulb:
   a. Pull socket and bulb assembly free of mounting from inside front compartment.
   b. Remove bulb from socket and install new bulb to socket.
   c. Snap bulb and socket assembly into mounting.
2. To remove and install the parking lamp—headlamp housing:
   a. Remove the four screws that retain the headlamp door (bezel).
   b. Remove the two screws that retain the parking lamp lens to the headlamp assembly.
   c. Remove the four screws securing the headlamp assembly to the fender. The parking lamp unit is integral with the headlamp assembly.
   d. From under front fender, remove the nut that secures lamp housing stud. Disconnect headlamp connector from top of housing and remove parking lamp—headlamp housing. Remove the

parking lamp socket from housing and remove housing assembly.

e. To assemble and install the assembly, reverse the above procedure and test the operation of the lamp.

Tail, Stop and Back-Up Lamp

1. To replace bulb:
   a. Remove the two screws securing lens to housing and remove lens. See Figure 8-113 for typical installation.
   b. Remove bulb and install new bulb.
   c. Install lens to body and secure with two screws.
2. To remove lamp housing assembly:
   a. Remove the two lens attaching screws and lens.
   b. Loosen the two screws that secure the housing.
   c. Twist assembly to the left and pull straight out. Disconnect connector from tail wiring harness.
   d. To assemble and install the assembly, reverse the above procedure and test operation of the lamp.

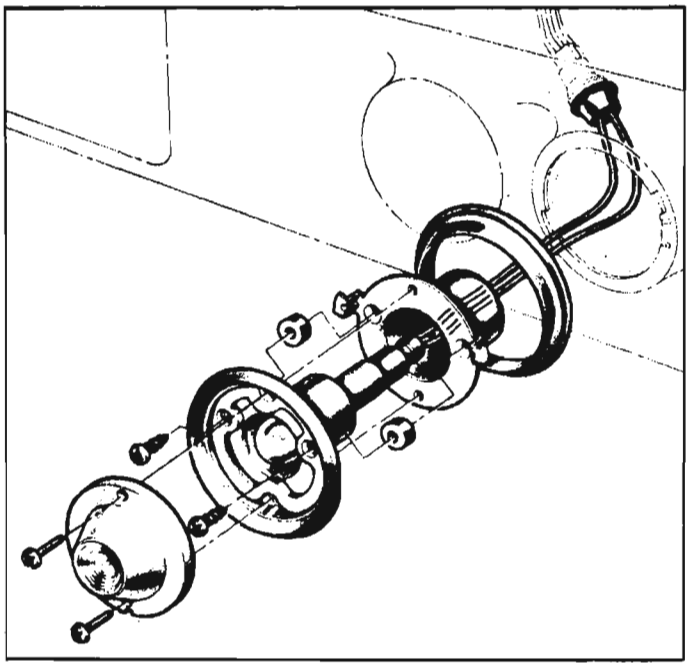


Fig. 8-113—Tail, Stop and Back-Up Lamp—Exploded View of Installation (Typical)

INSTRUMENTS AND GAGES

INSTRUMENT CLUSTER

All instruments, gauges or indicators are located in the instrument cluster. The cluster, as a complete assembly may be removed from the opening above the steering wheel. However, individual units may be removed without taking out the complete cluster. All indicator or cluster illuminating lamp sockets may be quickly snapped in or out of position. Figure 8-114 shows all electrical connections to the back of the cluster.

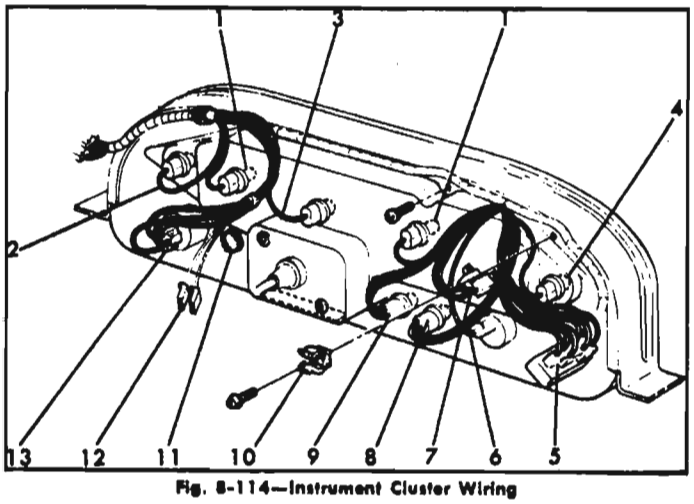


Fig. 8-114—Instrument Cluster Wiring

1. Instrument Cluster Lamps (Gray)
2. Right Turn Indicator Lamp (Dark Blue)
3. Hi-Beam Indicator Lamp (Light Green)
4. Left Turn Indicator (Light Blue)
5. Light Switch
6. Windshield Wiper Switch (Red)
7. Connector—Gas Gauge (Brown and Tan)
8. Oil Pressure and Temperature Indicator Lamp (Dark Blue and Tan)
9. Generator Indicator Lamp (Tan and Brown)
10. Harness Clip
11. Cigarette Lighter Plug
12. Stop Lamp Connectors (Orange and White)
13. Ignition Switch

Removal

1. Disconnect the battery ground cable from the battery (fig. 8-115).
2. Remove the connectors from the back of the instrument cluster. Pull harness out of retaining clips on back of cluster (fig. 8-114). Disconnect

Fig. 8-115—Removing Positive Battery Cable

speedometer cable.

3. Remove light switch as outlined previously. From beneath dash, remove nut attaching lighter assembly (if installed) and withdraw lighter.
4. Lower the mast jacket and steering wheel assembly from the instrument panel (see Section 4) or remove the steering wheel on three-speed models or steering wheel and direction signal housing on automatic transmission models to give clearance for cluster removal.
5. Remove the eleven screws that attach the cluster assembly to the instrument panel. Two of the screws attach from the rear and are not shown in Figure 8-116.
6. Remove instrument cluster, instrument center panel and seal by pulling straight out, turning slightly to clear transmission range selector (if used).

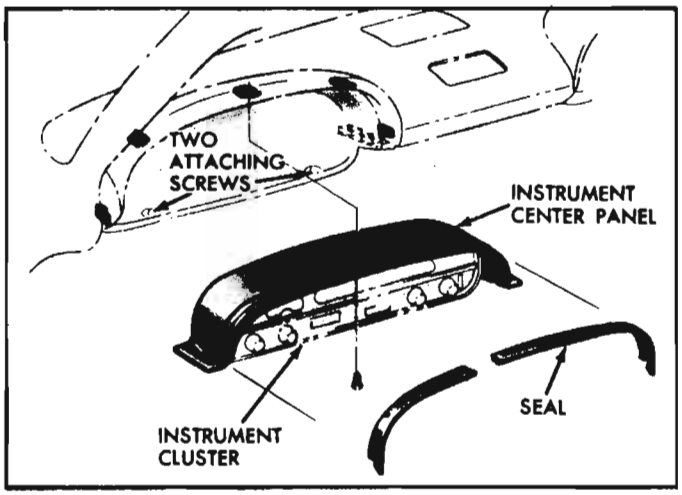


Fig. 8-116—Instrument Cluster Attaching Screws

Installation

1. Set cluster and instrument center panel in place. Before tightening screws, be certain all parts are in alignment, then tighten the eleven attaching screws.
2. Replace steering wheel and direction signal housing or align mast jacket and steering wheel assembly to instrument panel (see Section 4).
3. Install light switch, lighter and all connectors to rear of cluster assembly. Refer to Figure 8-114. Connect speedometer cable.
4. Connect battery ground cable and test operation of all electrical units.

GENERATOR TELLTALE INDICATOR

The generator telltale indicator should light after the ignition switch is turned on and before the engine is started.

Ignition on, engine not running and telltale light off—

1. Indicator bulb burned out, replace bulb.
2. Open circuit or loose connection in the telltale light circuit.

Telltale light remains on after engine has started—

1. If light stays on at all engine speeds, shut off engine immediately and check for broken or slipping belt.

   CAUTION: Do not attempt to run engine without installed and properly adjusted belt.
2. If light stays on at idle only, check for low idle speed or slipping belt. Flickering of the light at idle speeds is normal.
3. Check generator output.

OIL PRESSURE AND TEMPERATURE TELLTALE INDICATOR

The oil indicator should light after the ignition switch is turned on and before the engine is started. This is a check on the operation of the bulb or wiring.

Telltale light on, engine running—

1. Oil pressure is low, or cylinder head temperature is high. First check oil level and apparent operating temperature of engine. If light is still on, remove the pressure sender (fig. 8-117) and check oil pressure with a reliable pressure gauge. If engine has cooled, and light remains on, temperature sender unit is defective.
2. Electric circuit grounded between senders and telltale light.
3. Sender calibration wrong. Replace sender.

Ignition on, engine not running and telltale light off—

1. Telltale light burned out, replace bulb.
2. Open circuit between light and ignition switch or between light and switches. See Figure 8-70.
3. Pressure switch stuck. Replace switch.
4. One of the switches not grounded. Check threads of switch for foreign material.

FUEL GAUGE

The most common cause of fuel gauge trouble is high resistance in the circuit. Make sure all connections are tight and free from dirt, paint or corrosion.

Gasoline Gauge Circuit Tester

Since the fuel gauge consists of two remotely located

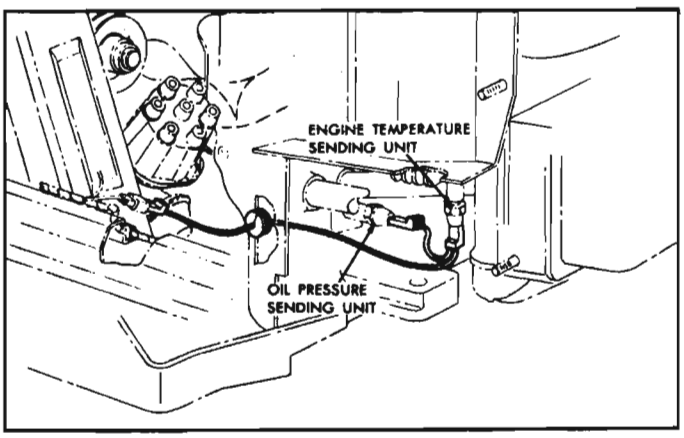


Fig. 8-117—Oil Pressure and Cylinder Head Temperature Senders

units and the connecting wires, it is sometimes difficult to determine which unit is at fault when the gauge fails to operate properly. A tester may readily be made by obtaining an operative tank unit (not necessarily a current model) and several wiring connectors from parts stock. Attach a length of white wire and a length of dark wire to a double connector as shown in Figure 8-119. To the free end of each wire, attach a single plug-in connector. (This will be referred to as the remote lead.) Next, attach two spring terminal clips to each end of a five foot length of black wire. Attach one of the clips to the tank unit ground wire and the tester is ready for use. Test a malfunctioning circuit as follows:

1. Remove the wiring harness connector from the fuel tank unit and attach this connector to the tank unit connector of the tester.
2. Attach the clip, on the tester black lead, to a good ground.
3. Turn on the ignition switch.
4. Move the tester float arm up and down.
   a. The instrument panel fuel gauge unit should indicate the full range from FULL to EMPTY with no sticking or hanging up of the needle.
   b. If the unit operates erratically, check to see that the gauge is properly and tightly mounted to the instrument panel.

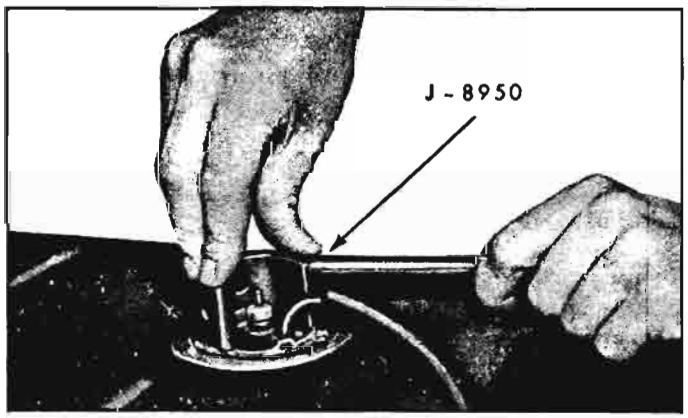


Fig. 8-118—Removing Fuel Tank Gauge Unit

   c. If the gauge reads FULL, regardless of the position of the testing unit float arm, a short in the wiring between the gauge and the tester is indicated.
   d. If the gauge unit operates properly, the fuel tank unit installed in the vehicle is inoperative and should be checked further.
5. Checks may be made on the individual circuit components in the following manner:

Checking the Instrument Panel Fuel Gauge

1. Plug the connector of the tester into the dark wire connector of the remote lead.
2. Remove the harness connector from the back of the fuel gauge and plug the double connector of the remote lead into the terminals on the fuel gauge.
3. Plug the white wire connector of the remote lead into a junction block power take off.
4. Attach the clip, on the ground wire from the resistance box, to ground.
5. Move the float arm on the tester up and down and check that the fuel gauge needle moves freely from the FULL to EMPTY marks. If not, check all attaching nuts and connections and recheck. If the needle sticks, the gauge is defective. Replace the unit if the above checks prove it to be defective.
6. Disconnect all test connections and reconnect harness to instrument panel fuel gauge.

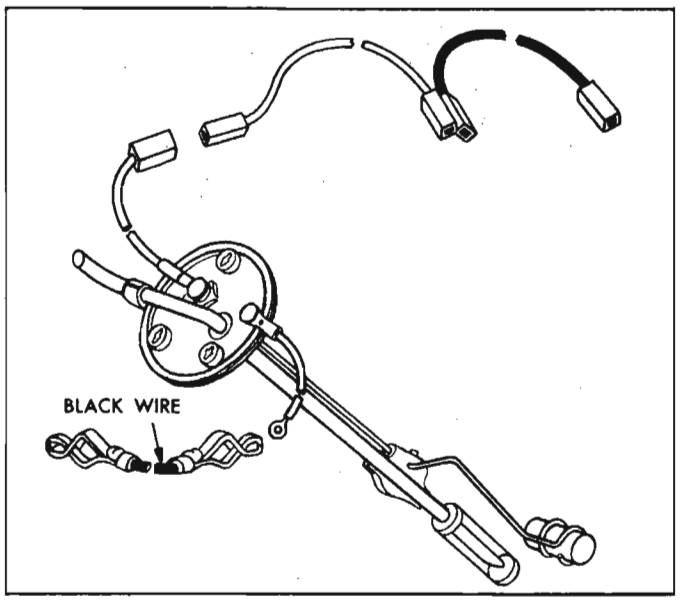


Fig. 8-119—Gasoline Gauge Tester Detail

Checking the Tank Unit

If the procedures above indicated that the tank unit is inoperative, proceed as follows:

1. Remove the tank unit and remove all dirt and corrosion which has collected on or around the electrical connections.
2. Replace the harness connector on the tank unit and connect the tank unit ground wire to good ground.
3. Move the tank unit float arm up and down. If the unit is now operative, the fuel gauge will give readings corresponding to the position of the float arm. In this case, the tank unit may be reinstalled in the tank.
4. If the tank unit is still inoperative, it is defective and should be replaced with a new unit.

Checking the Wiring Harness

If the above checks have indicated that the instrument panel fuel gauge and the tank unit are both operating properly, any trouble in the gasoline gauge circuit must, of necessity, be occurring in the wiring harness. If this is the case, check all wiring with an ohmmeter and replace as necessary.

Removal and Installation of Dash Unit

1. Remove the battery ground strap.
2. Unplug the electrical connector from the back of the gauge.
3. Remove the two screws attaching the gauge unit to the back of the instrument cluster and remove the unit from the cluster.
4. To install the gauge unit, reverse the removal procedure.

SPEEDOMETER SERVICE

The speedometer head requires comparatively little service and as special equipment is required to render this service, most automobile dealers send the speedometer to an authorized AC speedometer service station.

Cable Replacement or Lubrication

1. Disconnect the speedometer cable from the speedometer head and fitting at the transmission. Remove the old cable by pulling it out from speedometer end of conduit.

   NOTE: If old cable is broken it may be necessary to remove lower piece from transmission end of conduit.

2. Lubricate the lower ¾ of cable with AC speedometer cable lubricant and push the cable into the conduit. Connect lower end to fitting on transmission and upper end to speedometer head. Road test vehicle for speedometer operation. ***Do not over-lubricate. Apply only thin film of lubricant.***

Head Replacement

1. Remove instrument cluster as previously outlined.
2. Remove the two harness clips from back of cluster.
3. Remove the seven screws attaching the cluster back to the cluster.
4. Remove the two screws and grommets holding the speedometer head to the cluster back.
5. To replace, reverse the above procedure.
6. Road check vehicle to test speedometer operation.

HORN AND HORN RELAY

NOTE: A single horn is provided on "500" series. Dual horns are used on "700" series.

QUICK CHECKS FOR HORN TROUBLE

When analyzing faulty horn operation, any of the following four basic conditions may be found:

1. Horn will not operate.
2. Horn operates, but has poor tone.
3. Horn operates intermittently.
4. Horn operates continuously.

Horn Will Not Operate

If the battery checks GOOD, then this condition may be caused by:

1. Defective relay, horn button or wiring.
2. Defects within the horn.

To locate the trouble, connect a jumper lead to the "H" and "B" terminals of the relay (see Figure 8-120 for terminal location). If the horn blows the trouble is in the relay, horn button or wiring.

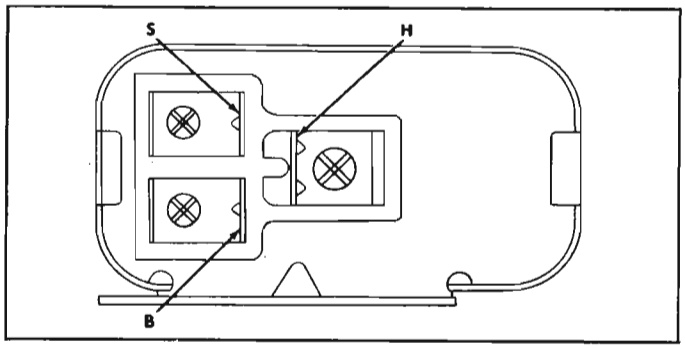


Fig. 8-120—Horn Relay Terminals

To determine whether the relay, horn button, or wiring is at fault, ground the "S" terminal of the relay (see Figure 8-120 for terminal location). If the horn blows, the horn button or wiring is at fault. If the horn does not blow and the relay is not defective, connect a voltmeter between horn terminal and the horn mounting nut. Again connect the jumper lead to the "H" and "B" terminals of the relay and note the voltmeter reading.

If no voltmeter reading is obtained, the wiring between the relay and horn is open or the horn is not grounded. If the voltmeter reading is less than 7.0 volts, the trouble is due to high resistance connections in the wiring or a faulty horn. If the reading is above 7.0 volts, the trouble is due to a faulty horn which should be adjusted or replaced.

Horn Operates But Has Poor Tone

This condition may result from:

1. Low available voltage at the horn.
2. Defects within the horn.

Although the horn should blow at any voltage above 7.0 volts, a weak or poor tone may occur at operating voltages below 11 volts. If the horn has a weak or poor tone at an operating voltage of 11 volts or higher (even after adjustment), replace the horn.

Horn Operates Intermittently

This condition may result from:

1. Loose or intermittent connections in the horn relay or horn circuit.

2. Defective horn switch.
3. Defective horn relay.
4. Horn in need of adjustment.
5. Defects within the horn.

Horn Operates Continuously

This condition may result from:

1. Relay sticking.
2. Horn button sticking.

HORN ADJUSTMENT

To check the current adjustment, connect an ammeter into the horn circuit at the horn terminal and measure the current draw at the horn while the horn is operating. Each horn should show a current draw of 7.0-11.0 amperes at 12.0 volts. If the current reading is not up to specifications, turn the current adjusting screw (fig. 8-121) to raise or lower the current draw as required. The adjustment of this screw is very sensitive and requires only a fraction of a turn at a time before operating the horn to recheck the current adjustment. The ammeter will indicate an excessive flow of current if the horn internal windings are shorted or grounded, in which case the horn must be replaced.

HORN REPLACEMENT

1. Remove horn shield from front fender panel (four attaching screws).

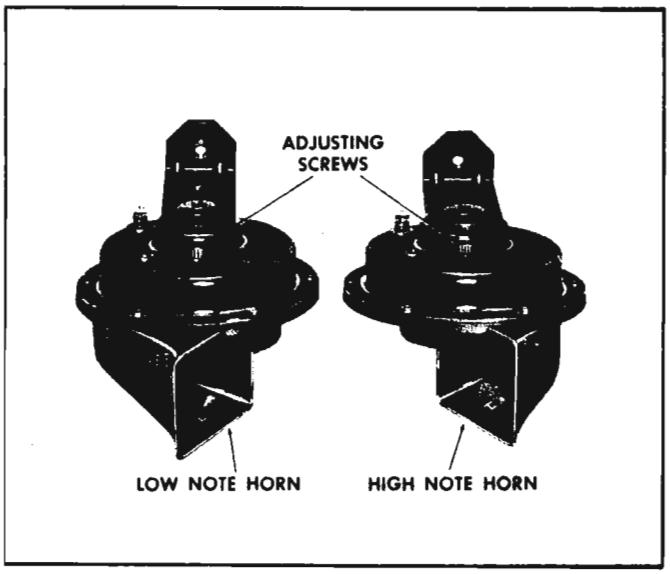


Fig. 8-121—Horn Adjustment

2. Unplug connector from horn and remove horn attaching bolt.
3. Plug horn connector into new horn, set in place and install attaching screw.
4. Secure horn shield to fender panel with the four attaching screws after coating screws with body putty.
5. Check operation of horn.

DIRECTION SIGNAL

TROUBLE DIAGNOSIS

Presented below are a few of the more common direction signal troubles and their probable causes:

- **Trouble:**

When signalling a turn, the indicator light comes on but does not flash.

Correction:

1. Check for a burned out parking or tail lamp on that side.
2. Check for the wrong flasher (3-bulb instead of 2-bulb flasher).

- **Trouble:**

When signalling a turn:

1. The turn indicators come on and stay on, on either a left or a right turn.
2. In either case no "clicking" is heard.

Correction:

Replace the flasher. Be sure to replace with the same type flasher removed (2-bulb series type flasher).

- **Trouble:**

When signalling a turn, a "clicking" is heard but the indicator light does not flash.

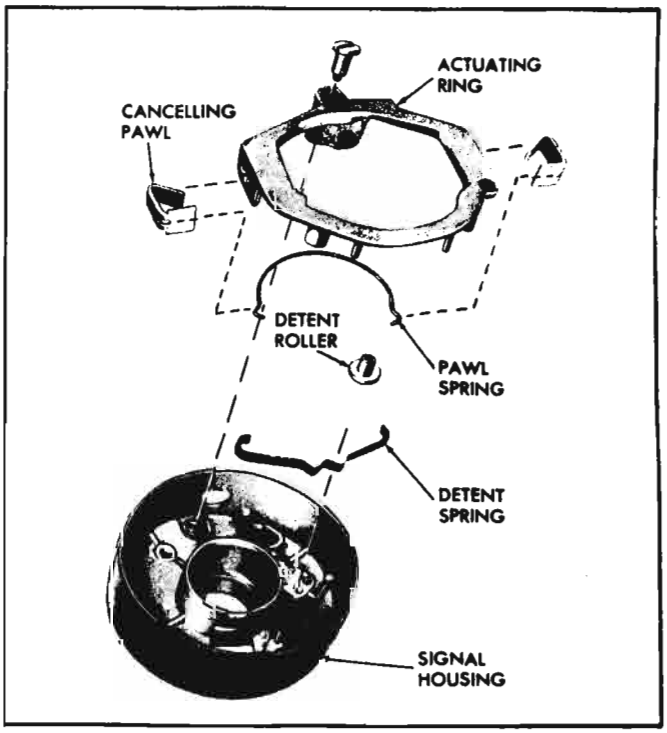


Fig. 8-122—Exploded View—Direction Signal Mechanism

Correction:

Replace the indicator bulb.

- **Trouble:**

Mechanism fails to cancel after completing turn.

Correction:

Check within the turn signal housing (fig. 8-122) for broken or worn parts. Replace with new parts.

Adjustments

The direction signal switch (fig. 8-123) requires no adjustments due to its simplicity of design.

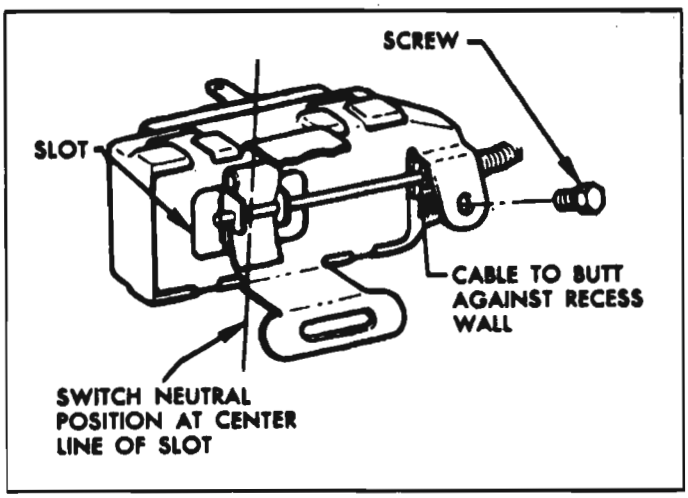


Fig. 8-123—Direction Signal Switch

WINDSHIELD WIPER AND WASHER ASSEMBLY

SINGLE SPEED

Description and Operation

The windshield wiper (fig. 8-124) on the 1961 Corvair is a single speed 12 volt unit which mounts in the luggage compartment. Compared to the wiper units used on the 1960 Corvair, the parking switch contacts have been relocated in the gear box so a mechanical type washer pump of similar design to that used on two speed wipers could be utilized. Like previous wipers, the motor is rectangular shaped and shunt wound. Transmission and connecting links for the wiper are located beneath the instrument panel in the passenger compartment.

Controls for the wiper (and washer option) are mounted in the instrument panel. The instrument panel switch has two positions ("off" and "on"). This controls wiper operation as follows:

When the wiper is turned "on" at the dash, current flows from the battery through the circuit breaker, motor field and armature to the dash switch and ground (fig. 8-125).

When the wiper is first turned "off," the wiper motor circuit to ground is opened at the dash switch. However, the parking switch contacts, which are closed to ground by a ring on the wiper gear, keep the motor circuits closed to ground until the wiper reaches the park position. As the wiper reaches the park position, a cut out section of the ring on the wiper gear is reached. This allows the parking switch contacts to open which, in turn, open the motor circuits to ground. Figures 8-126 and 8-127 show parking switch contacts during operation and when wiper is parked.

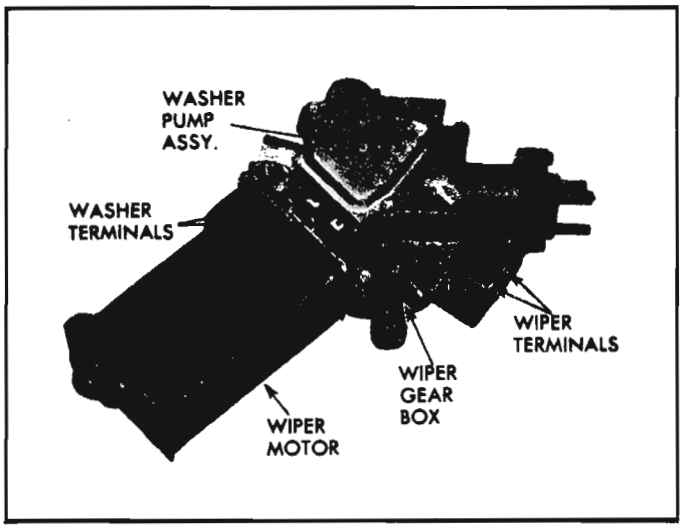


Fig. 8-124—Windshield Wiper and Washer Assembly

Removal and Installation

Removal and installation of the wiper assembly is covered in Section 10—Body.Wiper electrical circuit is shown in Section 8, Figure 8-86.

Disassembly

Gear Box (fig. 8-128)

1. Remove 7/16" crank arm retaining nut (13), crank arm (12), seal cap (11), retaining ring (10) and end play washers (9).
2. Remove gear box cover (2) or washer pump (not shown) and pull gear and shaft (3) out of gear box (8).
3. Remove terminal board assembly (7), and shield (6), then unsolder motor leads as required.

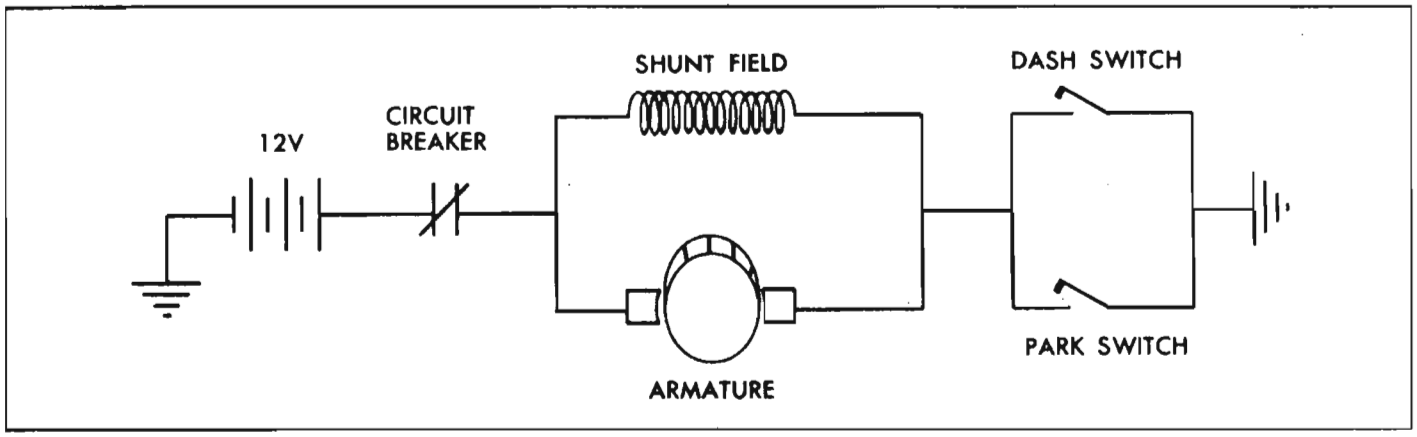


Fig. 8-125—Wiper Motor Circuit

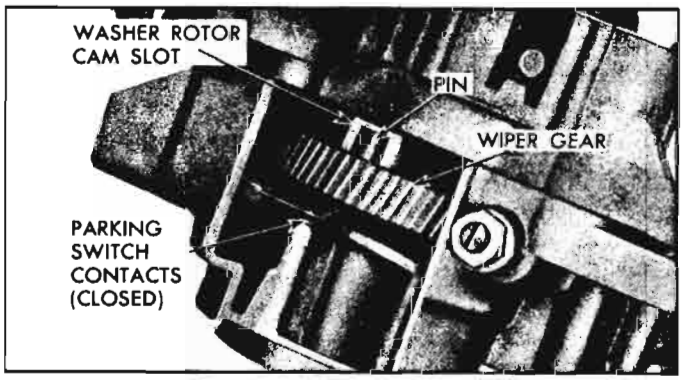


Fig. 8-126—Parking Switch Contacts in Operating Position

Motor (fig. 8-129)

1. Disassemble Gear Box. (See Gear Box Disassembly).
2. Remove motor tie bolts.
3. Tap gear box lightly with a mallet to free it from the frame.

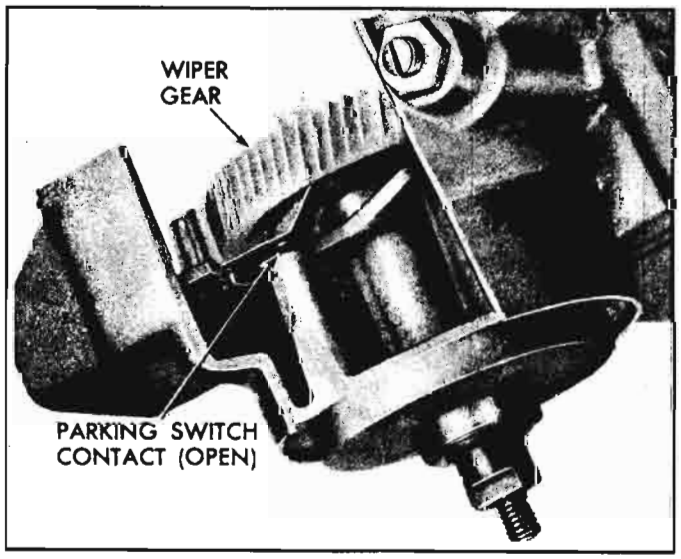


Fig. 8-127—Parking Switch Contacts in Park Position

4. Holding the wiper as shown in Figure 8-130, lift gear housing away from motor frame until it clears the armature worm.
5. Release brush spring pressure from brushes by lifting spring off end of brush and placing off to one side of brush holder, then move brushes away from armature commutator.
6. Remove end plate assembly (fig. 8-129) and pull armature out of motor frame.
7. Lift brush plate and circuit breaker assembly (fig. 8-130) away from frame and unsolder leads as required.

Inspection

Check all parts for condition and replace as required. All parts can be replaced individually except for the frame and field which are serviced only as an assembly.

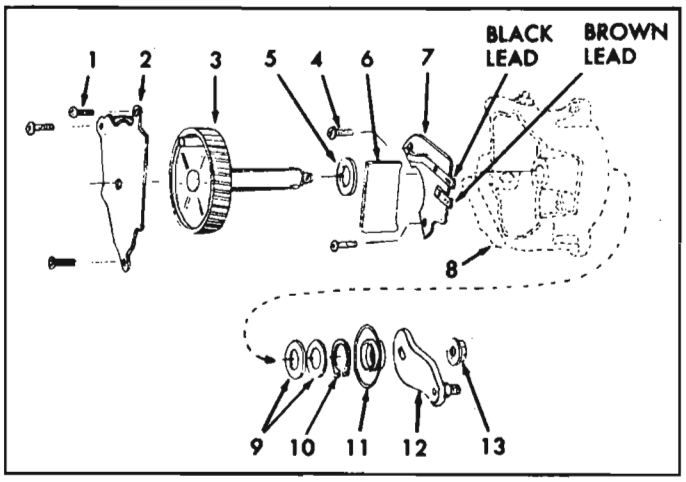


Fig. 8-128—Wiper Gear Box—Exploded View

1. Cover Plate Mounting Screw
2. Cover Plate
3. Gear and Shaft Assembly
4. Terminal Board Mounting Screw
5. Spacer Washer
6. Terminal Shield
7. Terminal Board Assembly
8. Gear Box Housing
9. End Play Washers
10. Retaining Ring
11. Seal Cap
12. Crank Arm
13. Crank Arm Retaining Nut

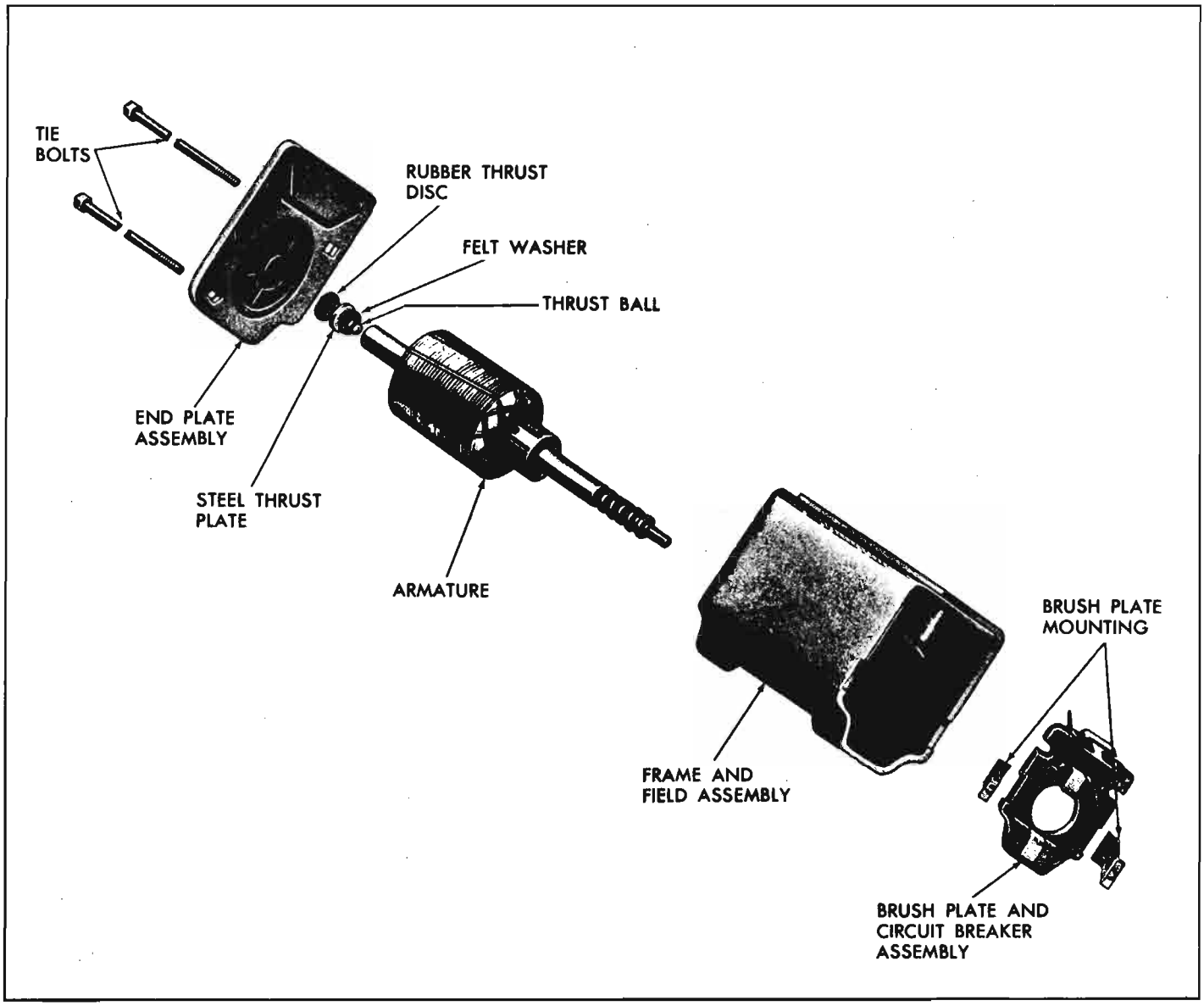


Fig. 8-129—Wiper Motor—Exploded View

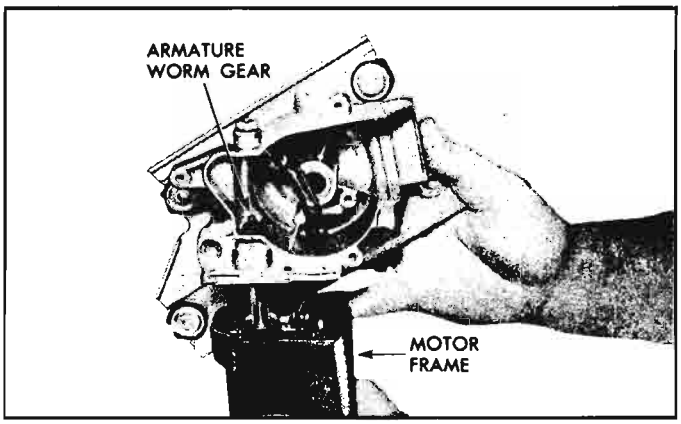


Fig. 8-130—Removing Gear Box

Assembly

Motor

Refer to Figure 8-129

1. If removed, install rubber thrust disc (fig. 8-129), steel thrust plate, felt washer, and thrust ball in end plate assembly.
2. Insert armature into frame and field assembly.
3. Position end plate assembly onto armature shaft, being sure to index thrust ball into armature shaft. Then place brush plate and circuit breaker assembly onto frame and field assembly and secure with two brush plate mountings. Reposition brush springs against brushes.
4. Position assembled unit to gear box housing and secure with two tie bolts.

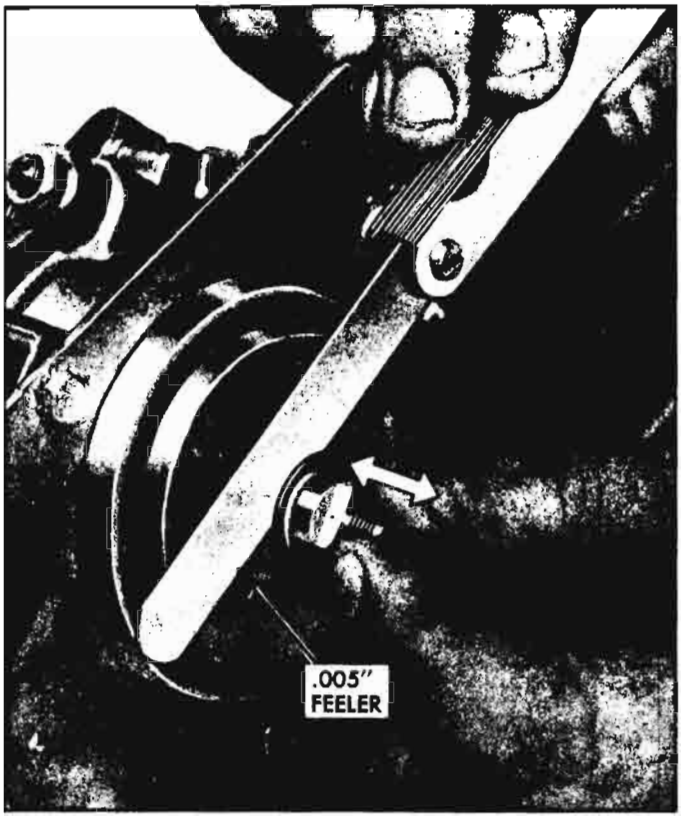


Fig. 8-131—Measuring Gear Shaft End Play

Gear Box

Refer to Figure 8-128

1. Resolder leads as required. Terminal board points of connection are called out on Figure 8-128.
2. Install terminal board (7) and shield (6) in housing.
3. Assemble spacer washer (5) on gear shaft (3) and install gear in housing.

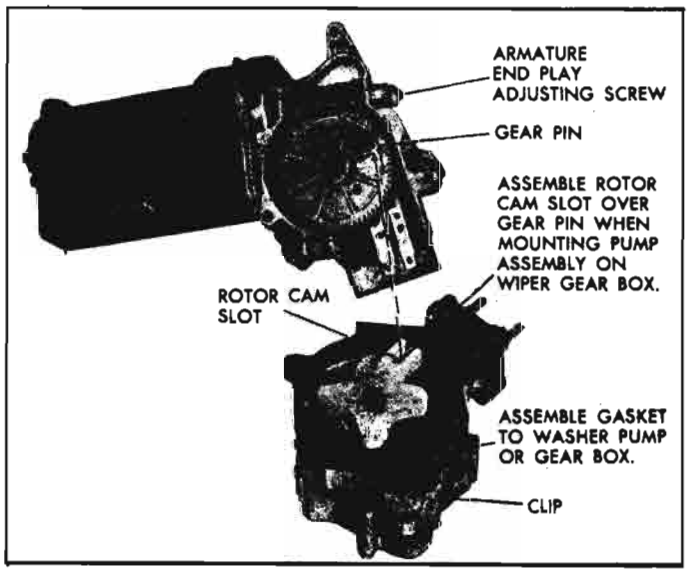


Fig. 8-132—Mounting Washer Pump to Gear Box

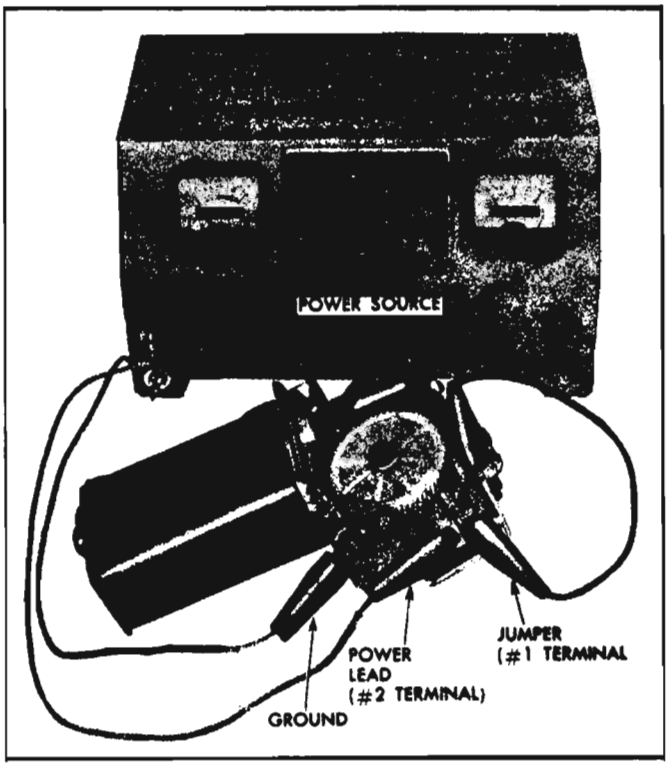


Fig. 8-133—Operating Wiper to Park Position

4. Assemble end play washers (9) and retaining ring (10) to gear shaft (3).
5. Check end play of gear shaft assembly by inserting feeler between gearbox and end play washers while moving shaft endwise (fig. 8-131). If end play exceeds .005", remove retainer ring and add end play washers as required, then install seal cap (11) after first packing it with a waterproof grease.
6. Reassemble washer pump on gear box cover. See Figure 8-132 for washer pump to gear box installation.
7. Operate wiper (fig. 8-133) and allow wiper to park by disconnecting the jumper wire. This operation is necessary to insure that wiper is in park while installing crank arm.
8. Install crank arm in position as shown (fig. 8-134).

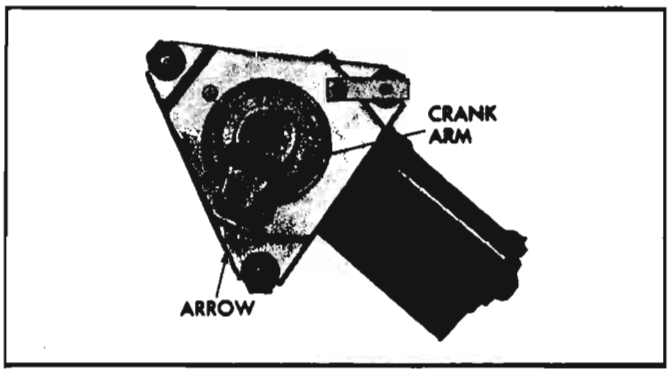


Fig. 8-134—Wiper Crank Arm in Park Position

9. Adjust armature end play by loosening end play adjusting screw lock-nut (fig. 8-132) and tighten the adjusting screw until finger tight. Back off ¼ turn and tighten lock-nut.

TROUBLE SHOOTING

Checking the wiper installed in car

1. Check that ground strap connection is tight at both the wiper and car body.
2. With ignition switch on check for 12 volts at feed wire terminal that connects to the No. 2 wiper terminal (fig. 8-133). If no voltage reading was obtained, check car wiring.
3. If correct voltage is obtained in step 2, connect 12 volts to No. 2 terminal (fig. 8-133) and connect a jumper wire from the No. 1 terminal to ground. If wiper operates, a defective dash switch or broken wire to dash switch is indicated.
4. If wiper fails to operate in step 3, disconnect transmission arms from wiper crank arm and recheck to see if wiper will operate. If wiper operates correctly, trouble is located in the transmission. If wiper fails to operate, remove wiper from car for bench check.

Checking wiper detached from car

There are four basic reasons for removing the wiper unit from the car for repairs:

- Wiper inoperative.
- Wiper blades fail to park (i.e., blades stop anywhere on glass when wiper is turned off).
- Wiper fails to shut off.
- Intermittent operation (wiper operates 3-4 minutes then shut off for approximately one minute and automatically starts up again).

1. *Wiper Inoperative:*

   Connect wiper to 12 volt supply as shown in Figure 8-133, except that an ammeter should be used in the "power lead" and note current draw.

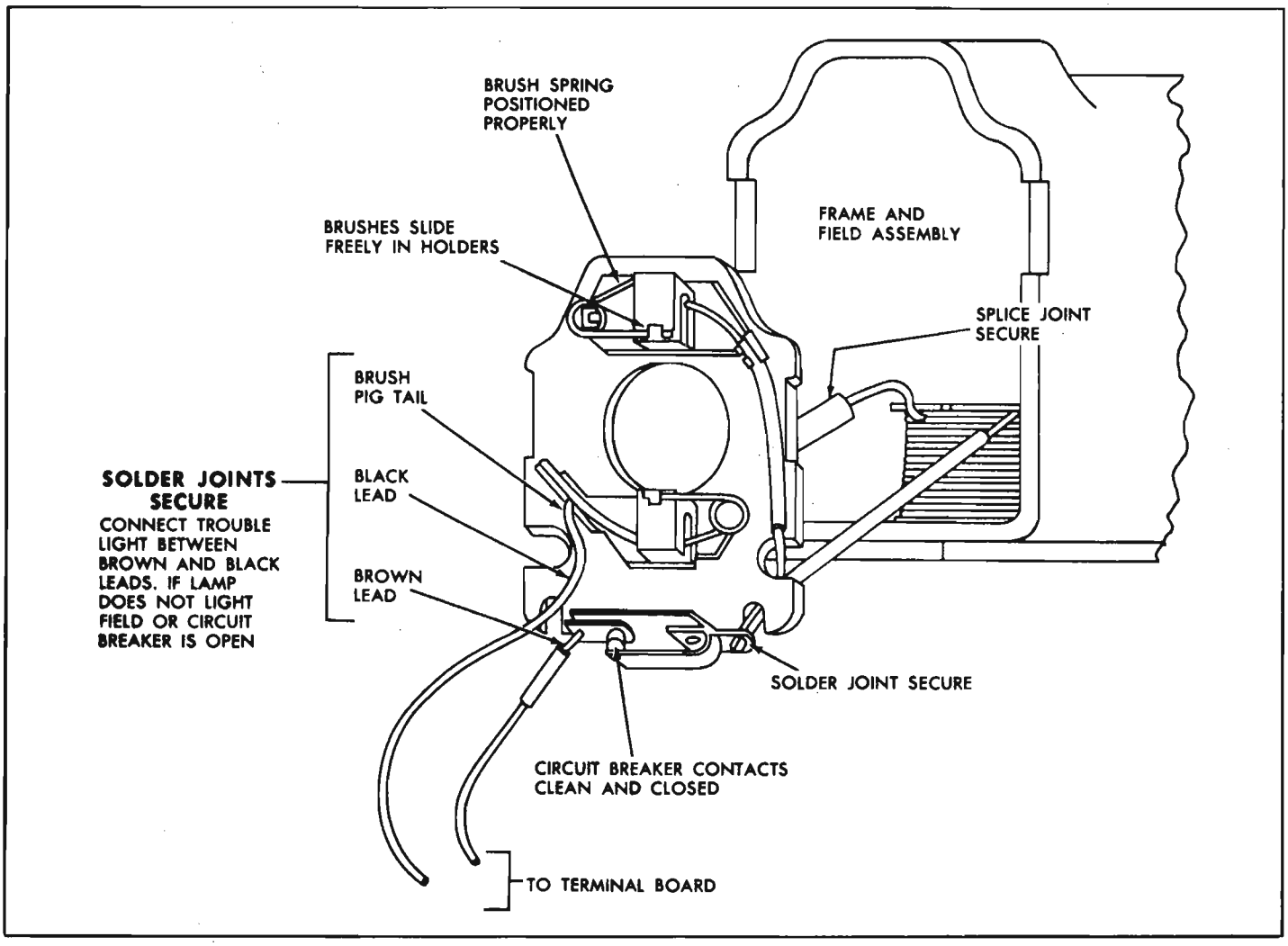


Fig. 8-135—Motor Trouble Diagnosis Diagram

The following ammeter readings will indicate the type of trouble to look for.

a. No reading indicates an open motor circuit.

b. If wiper operates slowly (less than 35-40 rpm at crank arm) or not at all and ammeter reading exceeds 4.5 amps, loosen armature end play adjusting screw slightly and recheck. If ammeter reading returns to approximately 4.5 amps, adjust armature and play and tighten lock nut. If ammeter reading remains high, an internal short or grounded condition is indicated.

c. Disassemble Gear Box and inspect gear for cracked or broken gear teeth.

d. Disassemble wiper motor (see *Disassembly*) and inspect or check items shown in Figure 8-135 as required until trouble is located. Also check armature on growler.

2. *Wiper Blades Fail to Park*

This condition is caused by parking switch contacts (fig. 8-127) being dirty or broken. To inspect and/or clean contacts, disassemble gear box. (See *Gear Box Disassembly* instructions.)

3. *Wiper Fails to Shut Off*

a. Check that wiper motor lead that connects to the No. 1 terminal (fig. 8-133) is not grounded.

b. Check that parking switch contacts (fig. 8-127) are not frozen, bent, or burnt together.

4. *Intermittent Operation*

Connect wiper as shown in Figure 8-133 and note current draw. If current draw does not exceed 4.5 amps, a weak circuit breaker is indicated and the brush plate and circuit breaker assembly should be replaced.

If current draw exceeds 4.5 amps, check the various items outlined in Figure 8-135.

Specifications

Crank Arm Rotation (looking at the crank arm)	Counter-Clockwise
Operating Voltage	12 VDC
Current Draw (Free Speed)	3.5-4.0 Amp.
(Dry Windshield)	4.5-6.0 Amp.
Stall Current	12 Amp.
Wiper Crank Arm Speed	35-45 RPM

WINDSHIELD WASHER (OPTIONAL)

Description and Operation

The windshield washer pump is equipped with a four lobe rotor cam and consists of a relay, pump assembly, valve assembly and related parts assembled in a casting which attaches directly to the wiper gear box.

When the washer pump assembly is mounted on the wiper correctly, a pin on the gear fits into the slot of washer rotor cam (See Figure 8-126). Thus when the wiper is operated, this rotor cam is always turning with the wiper gear.

Wiper On—Washer Off

As the rotor cam rotates, it actuates a spring loaded lever and pin assembly to which a ratchet arm is attached (fig. 8-136).

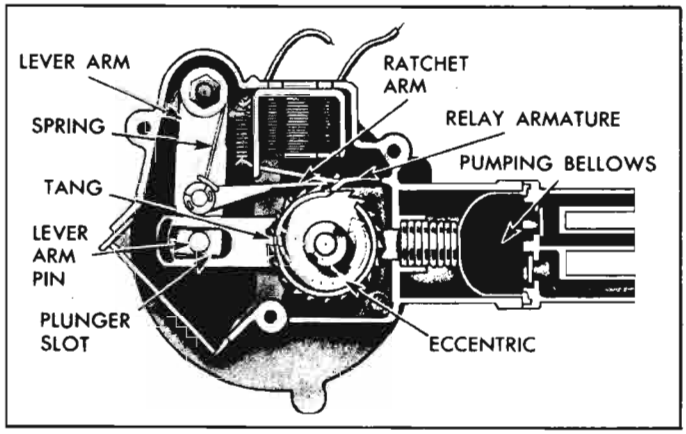


Fig. 8-136—Washer Pump Components

The lever arm pin extends into the slot of a spring loaded plunger arm. The spring loaded plunger arm, which is attached to the pumping bellows, is held in a retracted position (spring compressed) by an eccentric on the ratchet wheel when the pump is idling (fig. 8-136).

Thus, while the pumping mechanism is idling, the lever arm pin can move freely back and forth in the plunger arm slot and no pumping action occurs. The ratchet arm, which extends through an opening in the relay armature, is prevented from rotating the ratchet wheel by the relay armature (fig. 8-136).

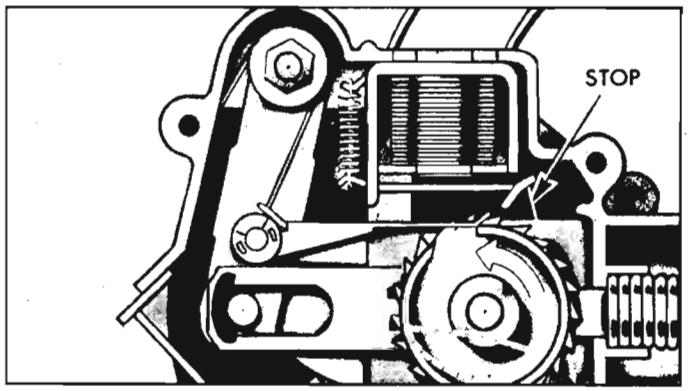


Fig. 8-137—Washer Pump Relay Energized

Wiper On—Washer On

When the washer button on the dash is pushed in to start the washer, the circuit to the washer pump relay coil is closed to ground. The relay is held in the energized position by a wire stop (fig. 8-137).

The ratchet arm, which previously was moving freely back and forth through the armature opening, now drops out of the opening and starts to rotate the ratchet wheel (fig. 8-138).

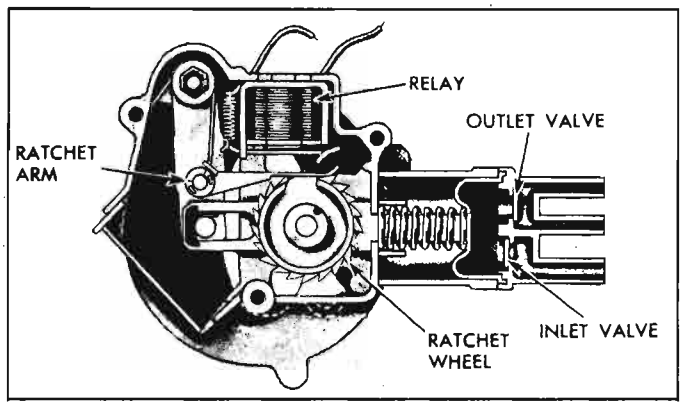


Fig. 8-138—Washer Pump Discharge Stroke

As the rotor cam rotates, it actuates a spring loaded away from the plunger arm tang releasing the plunger arm for pumping action (fig. 8-136).

The plunger arm, being spring loaded, now moves in a direction toward the bellows and collapses the bellows forcing the water in the bellows through the outlet valves to the nozzles (fig. 8-138). At the same time, the edge of the plunger arm slot moves up tight against the lever pin arm. As the rotor cam is turned each of the four lobes actuates the lever arm which, in turn, pulls the plunger arm back compressing the spring. While the plunger arm is being pulled back (suction stroke), water is drawn in through the inlet valve (fig. 8-139). As the high point of each lobe is passed, the plunger arm spring pulls the plunger arm toward the bellows repeating the exhaust stroke previously described.

Thus, for each revolution of the wiper gear and/or rotor cam there are four pumping strokes. For each

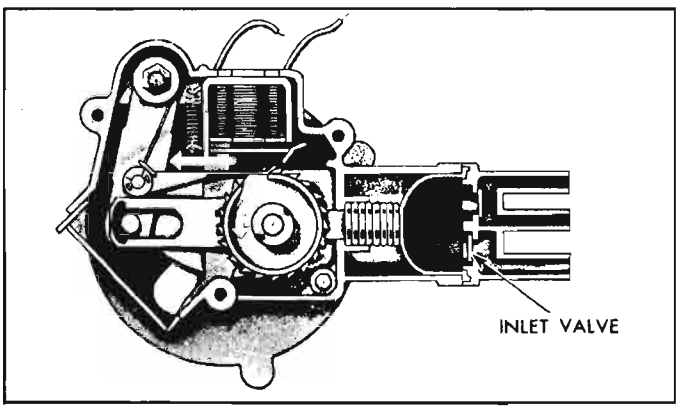


Fig. 8-139—Washer Pump Inlet Stroke

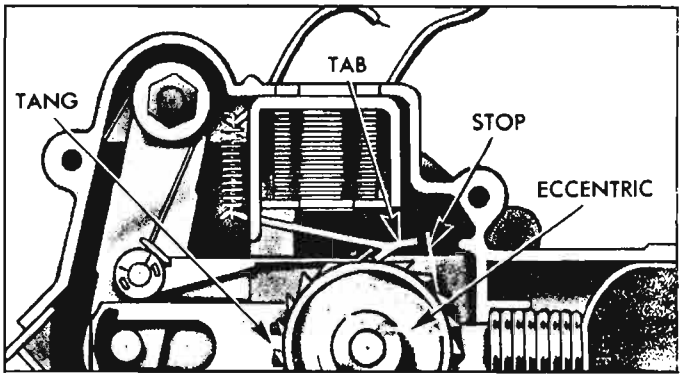


Fig. 8-140—Washer Pump Approaching Idle

pumping stroke, the ratchet wheel is actuated or turned one tooth by the ratchet arm.

As the ratchet wheel turns, the eccentric (fig. 8-140) pushes the wire stop out of the way of the relay armature. This allows the armature to partially drop so that the armature tab rests against the edge of the ratchet wheel.

After the ratchet wheel has been rotated about 12 teeth, the ratchet wheel eccentric starts to interfere with the plunger arm tang (fig. 8-140). This results in shorter pumping strokes and thus smaller "squirts" out of the nozzles.

When the ratchet wheel has been turned through 360° or 21 teeth, two simultaneous functions occur as

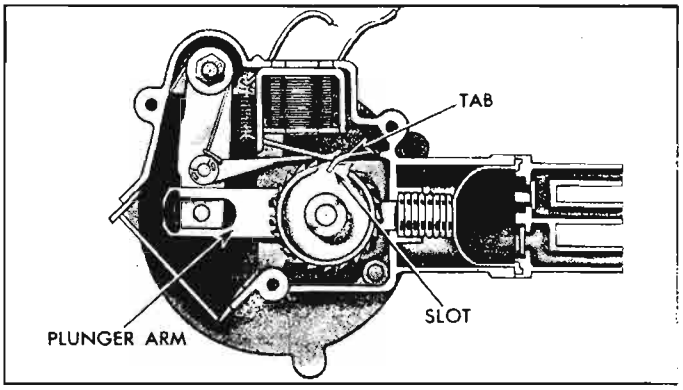


Fig. 8-141—Washer Pump Idling

the wash cycle is completed. First, the relay armature tab drops into the ratchet wheel slot allowing the ratchet arm to enter the armature opening, thus preventing further ratchet wheel rotation (fig. 141). Then ratchet wheel eccentric is moved into a position which holds the plunger arm in a retracted position, preventing further pumping action (fig. 141). The pump is now idling.

Overhaul Procedures

(Refer to Figure 8-142)

Relay Terminal Board Replacement

1. Remove relay terminal board cover.
2. Slide spring clip off relay mounting stud.

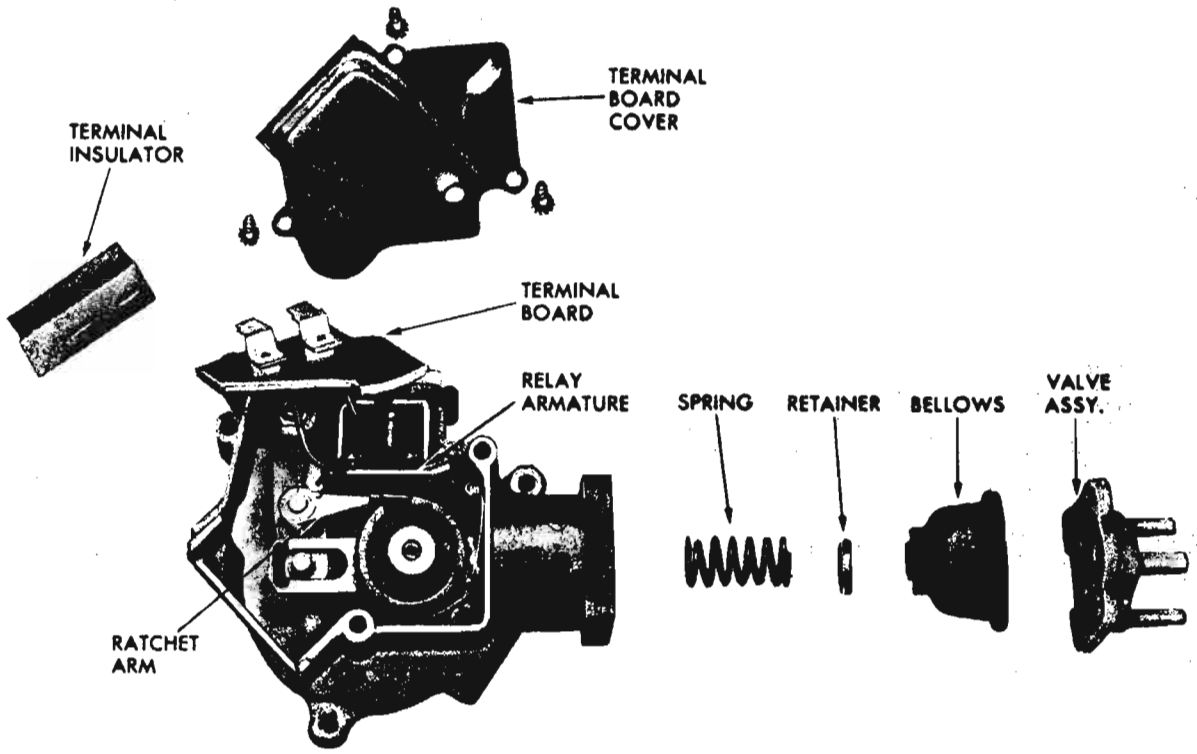


Fig. 8-142—Washer Pump Components

3. Rotate nylon rotor cam to free ratchet arm from relay armature and lift out relay-terminal board assembly.
4. Save terminal insulator for reassembly.
5. To re-install relay assembly hold relay armature against the coil pole and position the coil mounting stud in the casting slot.
6. Re-install spring clip on mounting stud.
7. Assemble insulator over terminal and position terminal board.
8. Manually rotate washer pump cam through a cycle (ratchet rotated 21 teeth) to check if pump is operating correctly as explained under pump operation.

Valve Assembly

Remove the four screws that secure the valve assembly to the housing and gently pry the assembly bellows lip out of the valve.

Bellows Replacement

1. Remove valve assembly.
2. If pump is in idling position release it as follows: Push relay armature toward relay coil so that wire stop spring engages relay armature, then manually rotate nylon rotor cam until pumping action can be felt. The bellows should now extend partially out of the housing.
3. Place an obstruction (small block of wood) between plunger and housing.
4. Push in against bottom of bellows and turn bellows approximately 90°. This should release bellows unit from pumping arm.
5. To reassemble reverse steps 1 through 4.

Trouble Shooting

Checking the Washer Pump on the Car

Washer Pump Inoperative

1. Inspect all washer hoses and hose connections;

check that screen at end of jar cover tube is not plugged and an adequate supply of washer solution is in jar.

2. If items in step 1 check out, start wiper motor first, then push washer button and listen for "click" as washer relay pulls in. If no "click" is heard, check power supply (12 V) at washer pump wiring connector. No voltage indicates defective car wiring.
3. If correct voltage reading was obtained in step 2, start wiper first, then connect 12 volt supply to one of wiper terminals and ground the other. If washer relay "click" is heard, a defective dash switch is indicated.
4. If washer relay click is not heard in step 3, a defective washer pump relay coil is indicated.
5. If relay click is heard in step 3 and pump still does not pump water, a defective valve assembly is indicated.

NOTE: Listen for soft clicking as washer pump ratchet wheel is rotated through a cycle.

Washer Pumps Continuously When Wiper is "ON"

1. Disconnect wiring from washer pump. If pump shuts off, trouble is located in the wiring or switch.
2. If pump fails to shut off in step 1, remove pump assembly from car for further checking (See *Checking Procedure* for detached washer pump below.)

Checking Detached Washer Pump

1. Connect 12 volt supply to one of washer terminals and ground the other. Manually rotate the rotor cam and observe if relay armature pulls in (fig. 8-143). Failure of relay to pull in indicates an open relay coil or poor solder connections.
2. If relay pulled in in step 1, manually rotate the rotor cam (counterclockwise looking at rotor) through a complete cycle, ratchet wheel rotated through 360° or 21 teeth. Carefully observe if performance matches that as explained under

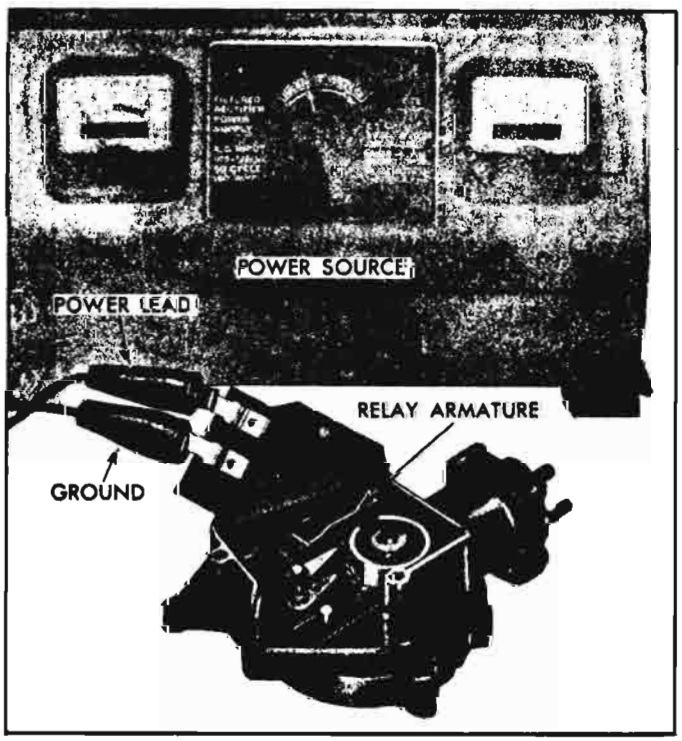


Fig. 8-143—Checking Detached Washer Pump

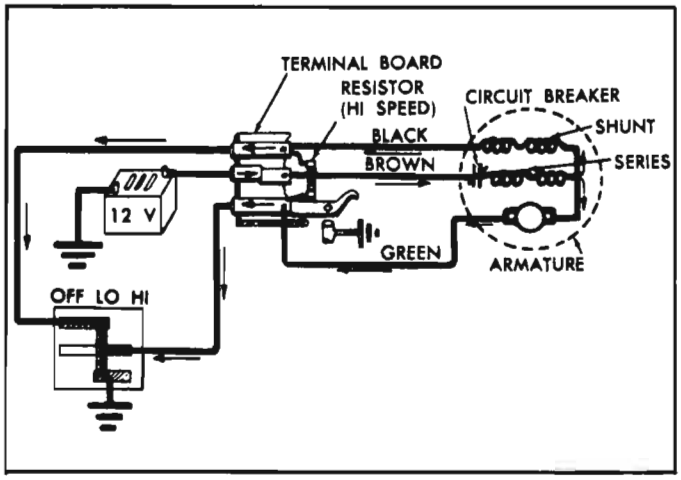


Fig. 8-144—"Lo" Speed Circuit

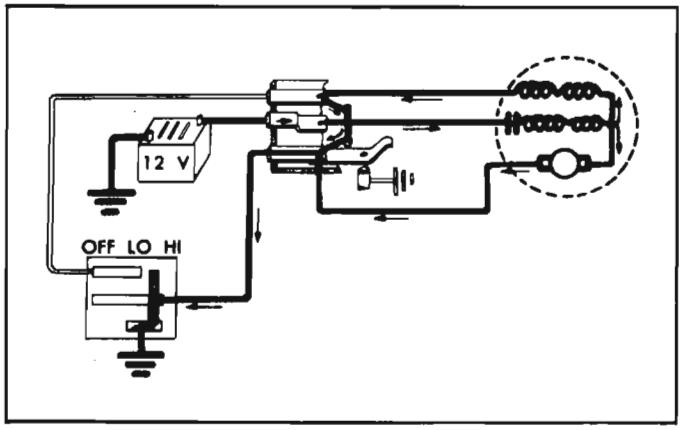


Fig. 8-145—"HI" Speed Circuit

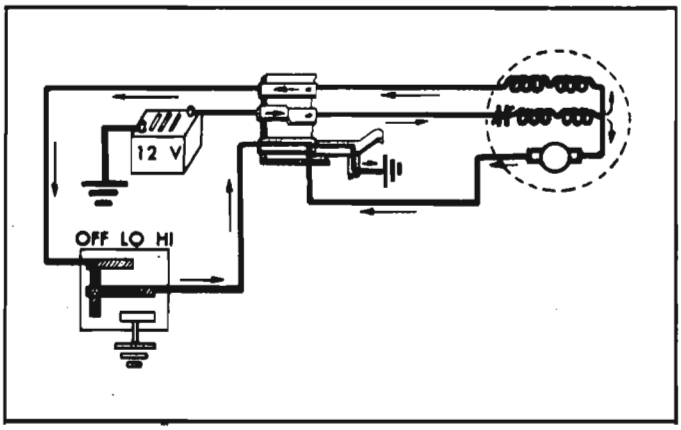


Fig. 8-146—Parking Circuit

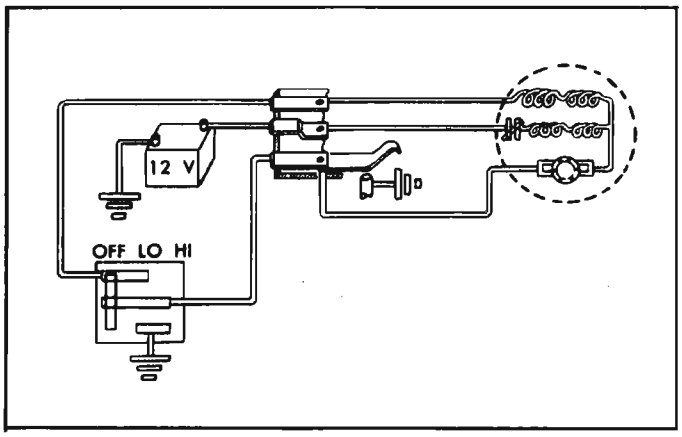


Fig. 8-147—Wiper Off—Blades Parked

washer operation. Binds or any other type of malfunction can usually be located in this manner.

TWO SPEED WINDSHIELD WIPER

The optional two-speed wiper consists of a round compound wound motor attached to a gear box similar to that used with the single speed rectangular wipers. It uses the same type washer (mechanism) as that used on single speed wipers.

Operation

Except for the fact that this wiper has two speeds, the basic principle of operation is very similar to that of the single speed rectangular type. Two switches, a dash switch and a parking switch control the starting and stopping of the wiper. The parking switch, located in the gear box and controlled through a ring on the gear, functions the same as the parking switch in the single speed wipers, (acting as a holding switch to maintain motor circuits until blades reach their park position).

The wiper circuits for "Lo," "Hi," "Parking" and "Off" are shown in Figures 8-144, 8-145, 8-146 and 8-147.

Removal and Installation

Removal and installation is accomplished in the same manner as for the single speed wiper motor which is covered in Section 10—Body, of this book.

Disassembly

Gear Box

Refer to Figure 8-148—exploded view of gear box. The gear box may be disassembled independently of

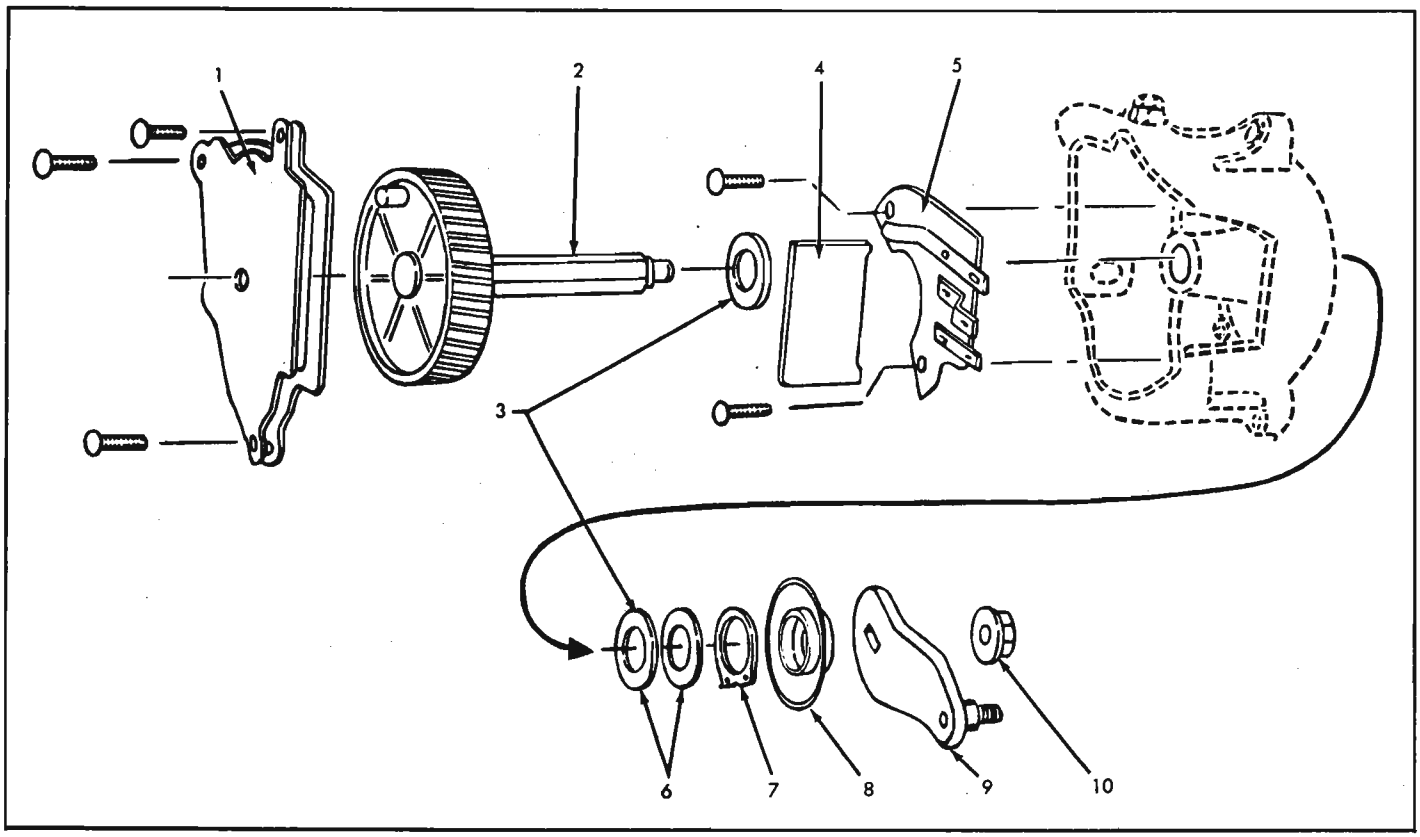


Fig. 8-148—Gear Box—Exploded View

1. Cover
2. Gear and Shaft Assembly
3. Spacer Washer
4. Shield
5. Terminal Board
6. End Play Washer (as required to obtain .005 max. end play)
7. Retaining Ring
8. Seal Cap (Rubber)
9. Crank Arm
10. Crank Arm Retaining Nut

the motor section as follows:

1. Clamp crank arm in a vise and remove crank arm retaining nut.
2. Remove crank arm and rubber seal cap.

   IMPORTANT: During reassembly pack inside of seal cap with a waterproof type grease.

3. Remove gear shaft retaining ring, end play washers and spacer washer.

   NOTE: Use end play washers as required to obtain .005" maximum gear shaft end play.

4. Remove gear box cover or washer pump and gasket (when used).
5. Remove terminal shield and slide gear and shaft assembly out of housing.
6. Remove terminal board assembly and unsolder leads as required.

Motor

See Figure 8-150 for an exploded view of the motor assembly.

1. Remove motor tie bolts.
2. Tap case assembly lightly with a suitable mallet to partially loosen it from the field and gear housing.
3. Slide the case assembly away from the gear housing and turn the wiper crank arm counter-clockwise (looking at the crank arm). This will maintain the armature commutator between the brushes until ready to remove the armature from the case assembly.
4. Hold the brushes and brush springs in position as shown in Figure 8-149.

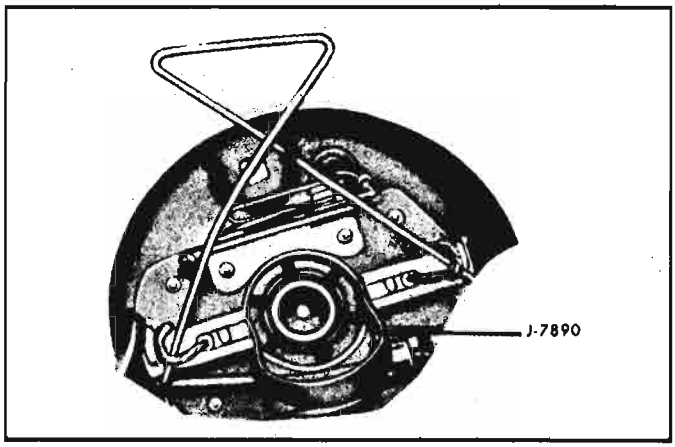


Fig. 8-149—Retaining Armature Brushes

5. Pull armature out of case and install brush retainer clip, part number 5096576, or tool J-7890.
6. Remove felt washer, steel thrust plate and rubber thrust disc from case assembly bearing as required.
7. To separate case and brush assembly from field and housing cut the leads approximately 4" back from where they are connected in the case assembly.

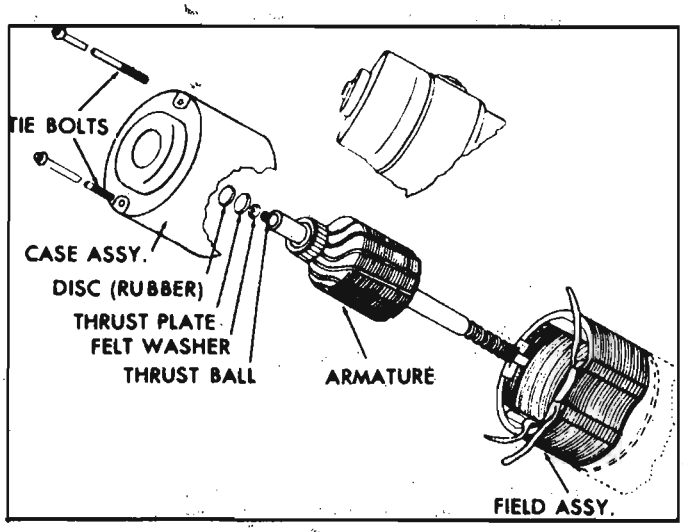


Fig. 8-150—Wiper Motor—Exploded View

CAUTION: Before cutting the leads code the two black field leads as follows: (1) Circuit breaker (2) Brush holder for reassembly purposes.

8. Removing the Field Assembly:
   a. Disassemble gear box section and unsolder the black lead from terminal No. 3, Figure 8-151.
   b. Scribe a reference line along side of the housing and field lamina for reassembly purposes.

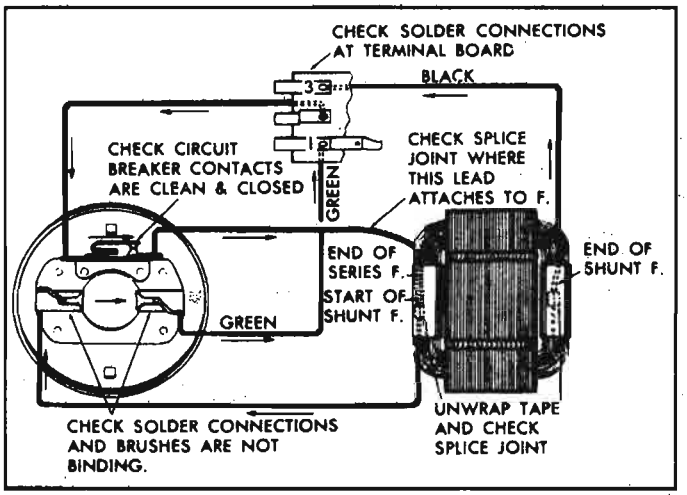


Fig. 8-151—Shunt Field Circuit

   c. Install field puller tool J-7844 as shown in Figure 8-152 and remove field.
   d. Code the two field leads that connect to the case assembly (See Step 7 above) and cut them off in a location convenient for splicing.

Inspection

Check all parts for condition and replace as required. All parts can be replaced individually.

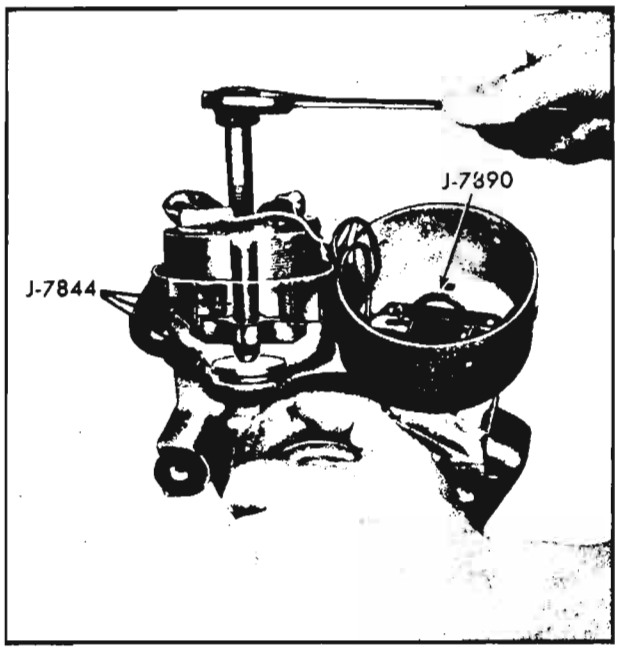


Fig. 8-152—Removing Field Coil with Tool J-7844

Assembly

Gear Box

1. Reverse steps 2 through 6 in the disassembly procedure.
2. Operate wiper to park position (fig. 8-153).
3. Install crank arm in park position.

CAUTION: Clamp crank arm in vise when tightening up crank arm retaining nut.

Motor

1. Install replacement field as follows:
   a. Scribe reference line on new field in approximately the same location as the one scribed on the original field.
   b. Install tie bolts in housing and position field assembly over housing and tie bolts so that the reference lines match and the tie bolts line up with the two grooves in the field lamina.
   c. Push field into housing until it bottoms on the machined ridge.
   d. Connect up leads as required (fig. 8-151).
2. Reassemble rubber disc, steel thrust plate and felt washer in case assembly bearing in the order indicated.
3. When replacing the armature **BE SURE** to remove thrust ball from original armature and reuse it in the new armature. Always check armature end-play after replacing the armature.
4. Install armature in case assembly and remove brush retainer clip installed in step 5 under disassembly.
5. Maintaining the armature in its assembled position in the case, start the armature worm through the gear housing bearing.
6. Align case assembly tie bolt holes with those in the housing and start folding the excess lead lengths in the open areas between the field and housing.
7. Push the case assembly and armature on the field lamina until the case butts against the housing.

CAUTION: It may be necessary to turn the gear or armature slightly in order to get the

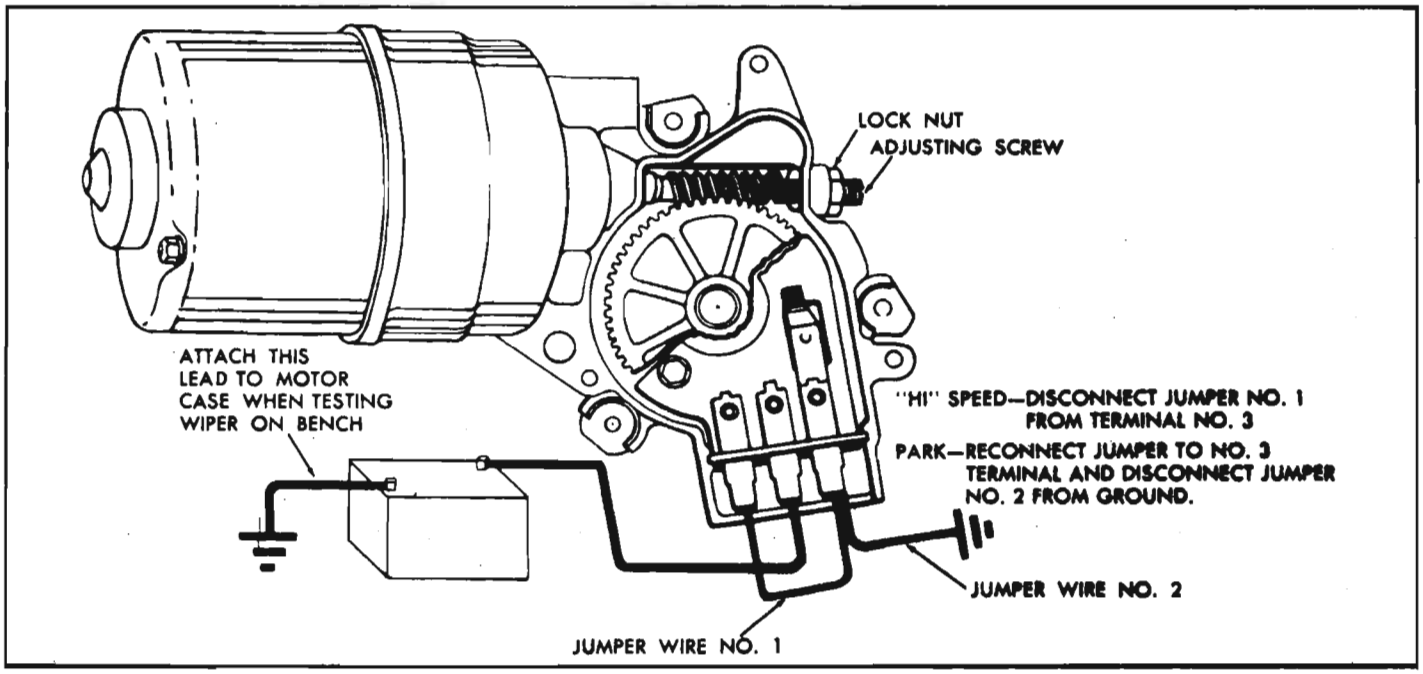


Fig. 8-153—Trouble Shooting Procedures

armature worm to mesh properly with gear teeth.

8. Install tie bolts.
9. Operate wiper motor and tap the case assembly lightly with a mallet to realign the bearings.
10. Reassemble gear box as required.

Adjustments

Armature End Play—Loosen end play adjusting screw lock-nut, Figure 8-153, and tighten the adjusting screw until finger tight. Then back off ¼ turn and tighten lock-nut.

Gear Shaft End Play—Remove crank arm, seal cap and retaining ring, Figure 8-148. Add or remove end play washers as required to obtain .005" maximum end play.

TROUBLE SHOOTING

Wiper Installed in Car:

Types of Troubles

A—Wiper Inoperative
B—Wiper Will Not Shut Off
C—Wiper Has One Speed Fast
D—Wiper Has One Speed Slow
E—Wiper Will Not Park Blades Correctly
F—Wiper Speed Normal in "Lo" Too Fast in "Hi"
G—Intermittent Operation

A—Wiper Inoperative:

1. With ignition switch "On" check power source (12 V.) to center or #2 terminal of wiper terminal board (fig. 8-153).
2. To determine if dash switch or car wiring is the source of trouble try to operate the wiper as shown in Figure 8-153.

   If wiper still fails to operate remove body parts as required to gain access to wiper transmissions. Disconnect transmissions from wiper crank arm and recheck to see if wiper will operate.

   If wiper still fails to operate, remove it from car and check it according to the procedures outlined in "Trouble Shooting—Wiper Detached."

B—Wiper Will Not Shut Off:

1. Check if wiper has both "Lo" and "Hi" speeds.
   —If wiper has only "Lo" speed, see Item D.
   —If wiper has only "Hi" speed, see Item C.
   —If wiper has both speeds, proceed to Step 2.
2. By-pass car wiring and dash switch and operate as shown in Figure 8-153.
3. Disconnect jumper wire #2. Wiper should shut off when blades reach park position.
   —*Wiper still fails to shut off*—Park switch contacts probably not opening. Remove wiper from car and repair or replace parking switch contacts.
   —*Wiper shuts off correctly*—Check for a grounded condition in car wiring lead that connects to wiper terminal No. 1.

C—Wiper Has One Speed "Fast":

1. By-pass car wiring and dash switch and connect up wiper as shown in Figure 8-153. This should operate in "Lo" speed (approximately 35-45 wipes per minute.
   —*Wiper operates correctly*—Check that leads from terminal #3 to dash switch is not open. If lead is not open, switch is at fault.
   —*Wiper still has one speed "Fast"*—Remove wiper from car and follow procedures outlined under "Trouble Shooting—Wiper Detached."

D—Wiper Has One Speed "Slow":

1. By-pass car wiring and dash switch and connect up wiper as shown in Figure 8-153. This should operate wiper in "Lo" speed. Next, disconnect jumper wire #1. This should operate wiper in "Hi."
   —*Wiper operated correctly—Has both speeds*—Look for a grounded condition in the wire between wiper terminal #3 and dash switch.
   —*Wiper still has one speed "Slow"*—Remove wiper from car and check for a ground in the wiper motor black wire that connects to #3 terminal.

E—Wiper Will Not Park Blades Correctly:

(i.e., when dash switch is turned to "Off" position blade movement stops immediately regardless of blade position on windshield.)

1. Remove wiper from car and check that parking switch contacts are not bent, dirty or broken.

F—Wiper Speed Normal in "Lo" But Too Fast in "Hi":

1. Remove wiper from car and check for an open terminal board resistor.

G—Intermittent Operation:

(Wiper cycles on and off automatically.)

1. Remove wiper from car and follow intermittent Operation checking procedures outlined under "Trouble Shooting—Wiper Detached."

Wiper Detached from Car:

Check wiper operation as follows:

"Lo" Speed—Using an ammeter in the feed wire circuit from battery connect up wiper as shown in Figure 8-153.

"Hi" Speed—Disconnect jumper lead No. 1 from No. 3 terminal.

To Park Wiper—Leave jumper lead No. 1 connected and disconnect jumper lead No. 2 from ground.

A—Wiper Inoperative:

The following ammeter readings will provide a hint as to where trouble might be located.

Ammeter Reading	Check the Following
Approx. 2 amps.	Open armature, hung brushes, solder connections, broken green lead, etc. (See Figure 8-151.)
0	Dirty or defective circuit breaker contacts, solder connections at circuit breaker terminals. (See Figure 8-151.)
Approx. 13 amps.	Broken gear or some similar condition that would stall the wiper.

B—Wiper Will Not Shut Off:

1. Check that wiper has "Lo" speed. If wiper has only one speed (fast), look for an open shunt field circuit. (See Figure 8-151.)
2. Check that parking switch contacts are opening as follows:
   a. Remove wiper gear from housing (See Disassembly Procedure) and check that parking switch contacts are not stuck or bent together.
   b. To double check operation of park switch, slide gear and shaft out of housing far enough to disengage gear teeth from worm shaft. Turn gear so that gap in ring can be positioned over the raised part of the parking switch and slide gear back in housing.

   Connect a test light as shown in Figure 8-154. Test lamp should not light.
3. If the checks in step 1 fail to locate the trouble, look for a grounded condition in the green lead.

C—Wiper Has One Speed (Fast):

1. Check for an open shunt field circuit (fig. 8-151).

D—Wiper Has One Speed (Slow):

1. Look for a grounded condition in the shunt field circuit (fig. 8-151).

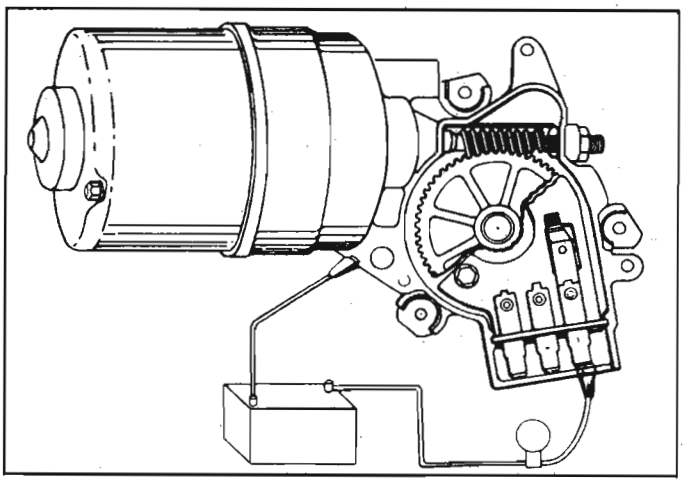


Fig. 8-154—Test Lamp Connections

E—Wiper Crank Arm Stops Rotating Immediately When Jumper No. 2 Is Disconnected From Ground:

(i.e., stops in any position)

1. Check that parking switch contacts are not dirty, bent or broken.

F—Wiper Speed Normal In "L" But Too Fast In "Hi":

1. Check for an open resistor on wiper terminal board.

G—Intermittent Operation:

(Wiper cycles on and off automatically)

1. Operate wiper in **"Lo" speed** and observe current draw. If current draw exceeds that shown in specification table, check the following items:
   a. Armature end play too tight.
   b. Armature shorted or grounded.
   c. Field Assembly shorted.
   d. Gear Assembly end play tight.

If current draw is normal, a defective circuit breaker is indicated and it should be replaced.

TROUBLES AND REMEDIES

Symptom and Probable Cause	Probable Remedy
HEADLAMP AND CIRCUIT	
Headlights Dim (engine idling or shut off)	
Partly discharged battery	Charge battery
Defective cells in battery	Replace battery
High resistance in light circuit	Check headlight circuit including ground connection. Make necessary repairs
Faulty sealed beam units	Replace sealed beam units
Headlights Dim (engine running above idle)	
High resistance in lighting circuit	Check lighting circuit including ground connection. Make necessary repairs
Faulty sealed beam units	Replace sealed beam units
Faulty voltage control unit	Test voltage control and generator Make necessary repairs
Lights Flicker	
Loose connections or damaged wires in lighting circuit	Tighten connections and check for damaged wiring
Light wiring insulation damaged producing momentary short	Check light wiring and replace or tape damaged wires
Lights Burn Out Frequently	
High voltage regulator setting	Adjust voltage regulator
Loose connections in lighting circuit	Check circuit for loose connections
Lights Will Not Light	
Discharged battery	Recharge battery and correct cause
Loose connections in lighting circuit	Tighten connections
Burned out bulbs	Replace bulbs or sealed beam unit
Open or corroded contacts in lighting switch	Replace lighting switch
Open or corroded contacts in dimmer switch	Replace dimmer switch
Thermal Circuit Breaker Causing Current Interruption	
Short in headlamp wiring	Check wiring of circuits in use for short circuits and make necessary repairs
Short within some light or instrument in use	Check lights or instruments for short. Headlamps are on separate circuit breaker from remainder of lighting units. Instruments are fused
GASOLINE GAUGE	
Gauge Shows Empty at All Times	
Tank unit shorted	Replace unit
Wire from dash unit to tank unit shorted	Replace wire or repair short
Float stuck in empty position	Replace tank unit
Dash unit improperly grounded on instrument panel	Properly ground dash unit
Gauge Shows Full at All Times	
Tank unit burned out	Replace tank unit
Wire between units disconnected or broken	Connect or replace wire
High resistance in wire between units	Clean connections and terminals
Float stuck in full position	Replace tank unit
Gauge Does Not Register Accurately (within normal limits)	
Bent hand on dash unit	Replace unit or straighten hand
High resistance in circuit	Check and correct circuit
Partial short in circuit	Correct cause of short
Loose electrical connection	Tighten connections at dash unit and tank unit

Symptom and Probable Cause	Probable Remedy

STOPLIGHT AND CIRCUIT

Will Not Light	
Switch faulty	Replace switch
Wires broken, disconnected or loose	Make necessary repairs
Bulb burned out	Replace bulb
Loose connection or poorly grounded lamp body	Tighten loose connections or properly ground lamp body
Burned out fuse	Check for shorts and replace fuse

HORNS

Will Not Blow	
Loose connections or broken wire	Tighten loose connections or replace broken wire
Horn button not making contact	Adjust horn button contact
Faulty horn	Replace horn
Defective horn relay	Replace horn relay
Horn Tone Poor	
Faulty horn	Replace horn
Horn Operates Intermittently	
Loose connections or intermittent connections in horn relay or horn circuit	Check connections and repair as required
Horn switch out of adjustment	Adjust horn button contact
Defective horn relay	Replace horn relay
Defects within the horn	Replace horn
Horn Operates Continuously	
Relay sticking	Replace relay
Horn button sticking	Adjust horn button contact

GENERATOR TELLTALE LIGHT

Ignition on, Engine Not Running, Telltale Off	
Indicator bulb burned out	Replace bulb
Open circuit or loose connection in telltale circuit	Locate open circuit or loose connection and correct
Telltale Light Stays On After Engine is Started	
If on idle only, improper idle speed	Adjust idle speed and check for loose blower belt
Low generator output	Check generator output

OIL PRESSURE AND CYLINDER HEAD TEMPERATURE INDICATOR

Telltale Light On, Engine Running	
Circuit grounded between telltale light and switches	Locate and correct grounded condition
Oil or cylinder head switches not functioning properly	Replace switch(es)
Oil pressure low	Correct as necessary
Engine overheating	Correct as necessary
Ignition On, Engine Not Running, Telltale Off	
Telltale light burned out	Replace bulb
Open circuit between light and ignition switch or light and either switch	Find and correct open circuit
Pressure switch stuck	Replace switch
Either switch not grounded	Check threads of switch for foreign material

WINDSHIELD WIPER

See *Windshield Wiper Assembly* in this section for complete wiper diagnosis information.

ENGINE ELECTRICAL

CORVAIR 95 and GREENBRIER—1200 SERIES

Corvair 95 vehicles make use of the same engine and electrical components as the regular Corvair sedan models covered previously in this section. Since the information is the same for each vehicle it will not be repeated here.

WIRING DIAGRAMS

CORVAIR 95 and GREENBRIER—1200 SERIES

Most of the wiring diagrams included in the Corvair portion of this shop manual apply as well to the Corvair 95. The body connectors in the two styles differ only as to shape. Those illustrated are rectangular while those used in the Corvair 95 are round, similar to the 1960 Corvair. Another minor difference is that the Corvair 95 has no "Front Harness" such as is found in the Corvair passenger car, and therefore has no connector attaching the Front Harness to the "Instrument Panel Harness."

Only the Ignition wiring diagram (fig. 8-155) and the Tail Lamp wiring diagram (fig. 8-156) will be repeated here as being different enough to cause some confusion.

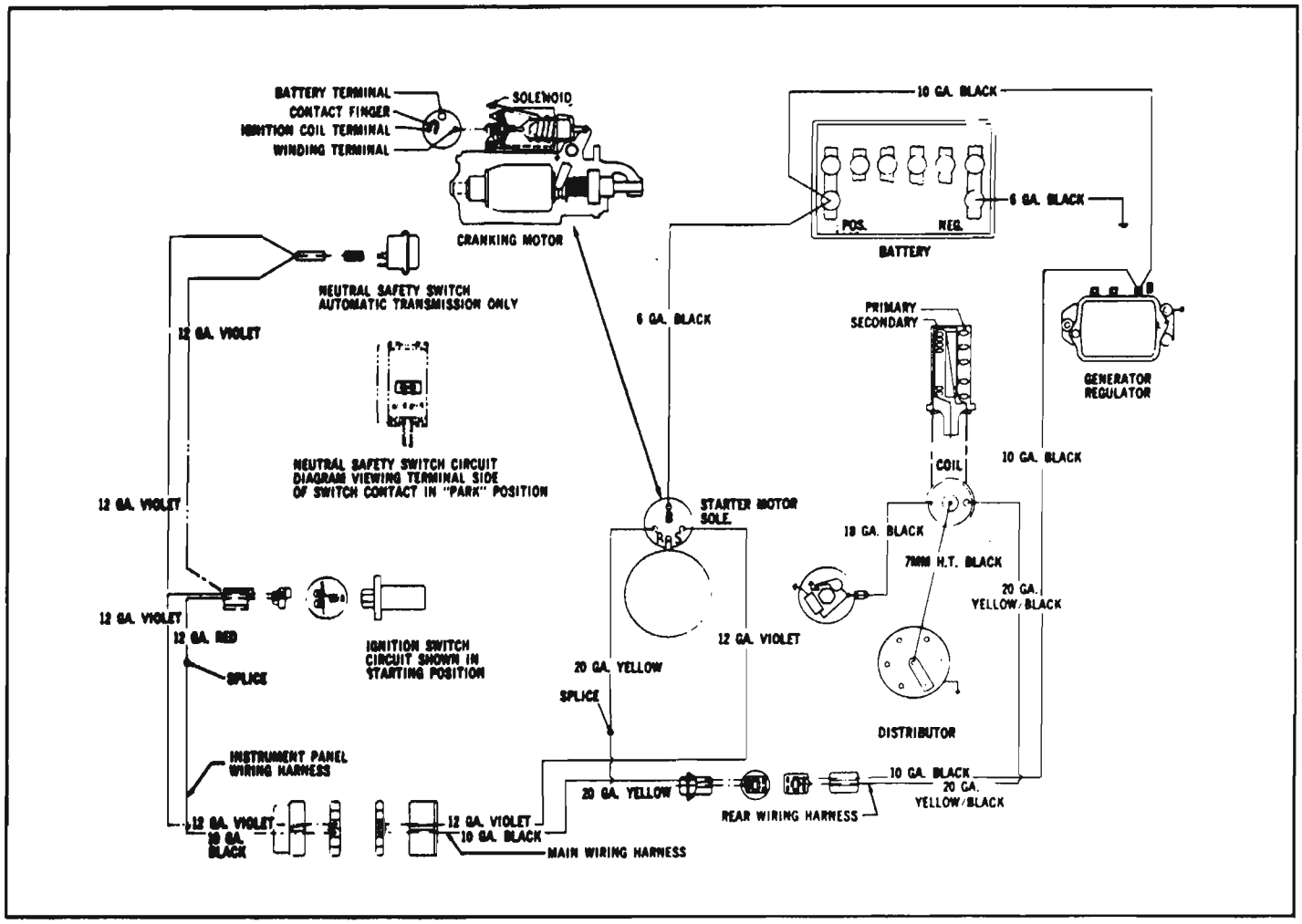


Fig. 8-155—Ignition Starting Energized

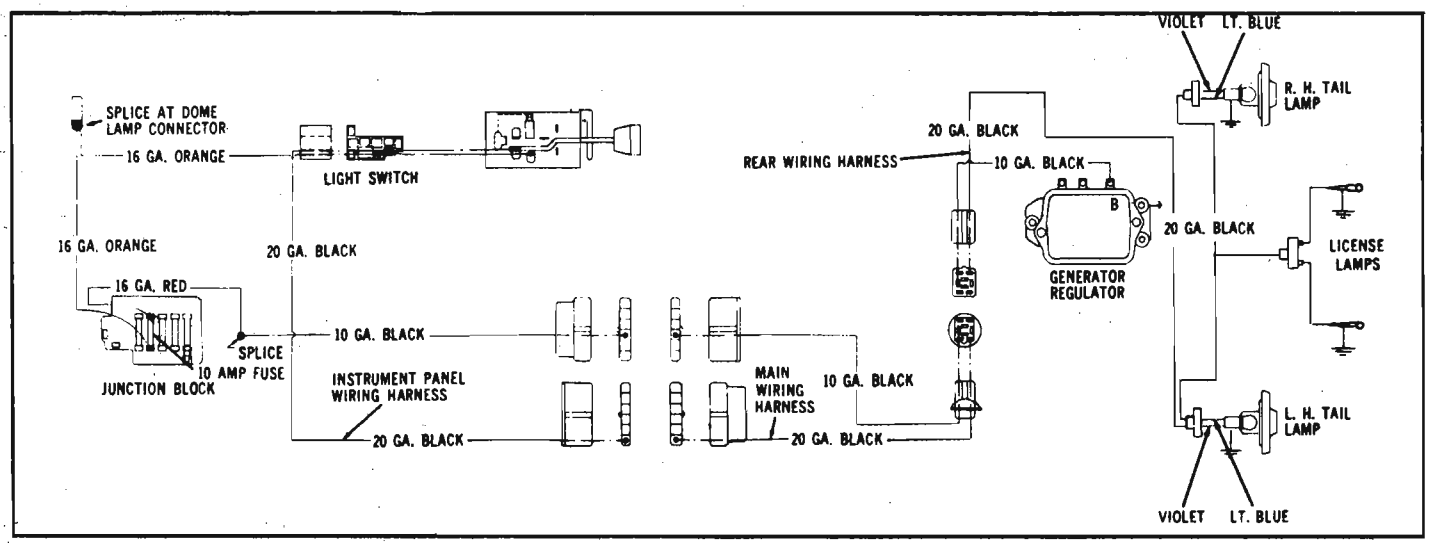


Fig. 8-156—Tail Lamp Circuit

CHASSIS ELECTRICAL

CORVAIR 95 and GREENBRIER—1200 SERIES

INDEX

LIGHTING SYSTEM

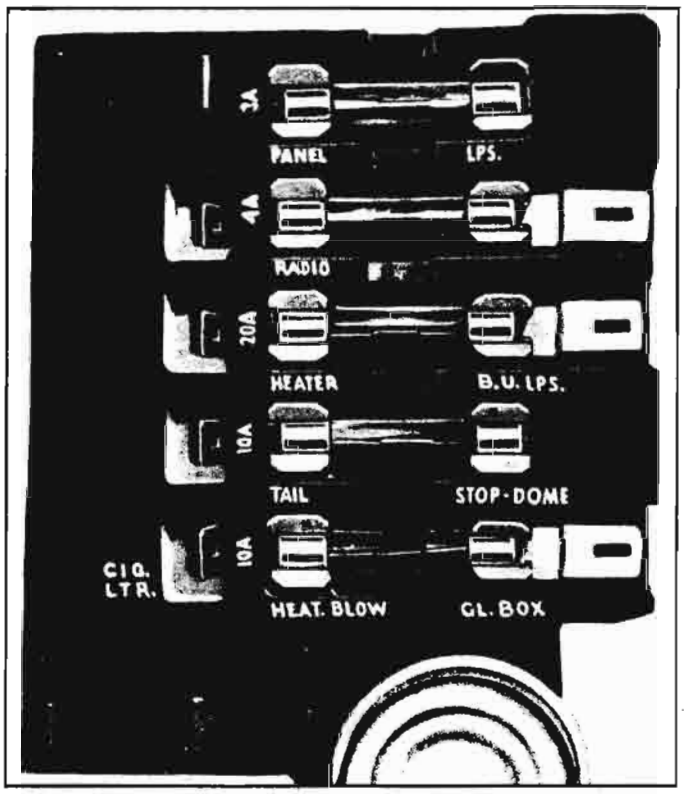


Fig. 8-157—Junction Block

STOPLIGHT SWITCH REPLACEMENT

Junction Block

The junction block differs somewhat from the regular Corvair Sedan model junction block. Figure 8-157 shows the Corvair 95 and Greenbrier junction block.

1. Disconnect the two connectors from the switch which is located under the toe pan adjacent to the brake lever arm.

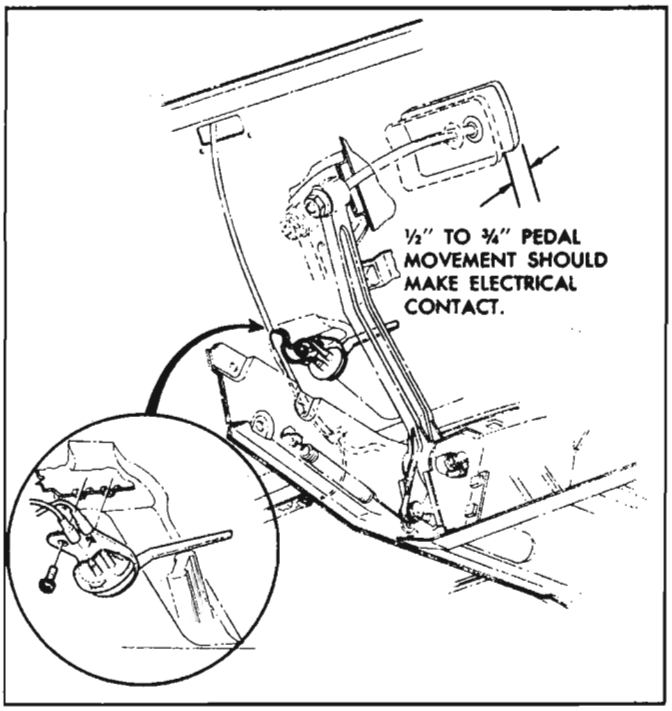


Fig. 8-158—Stoplight Switch Adjustment

2. Remove the two bolts attaching the switch to the underside of the toe pan and remove switch.
3. Install new switch with the switch lever arm between the brake lever arm and the toe pan. Tighten attaching screws.
4. Switch adjustment should be such that ½" to ¾" pedal will make electrical contact (see Figure 8-158). If necessary, adjust the switch by bending the switch bracket until proper operation is obtained.

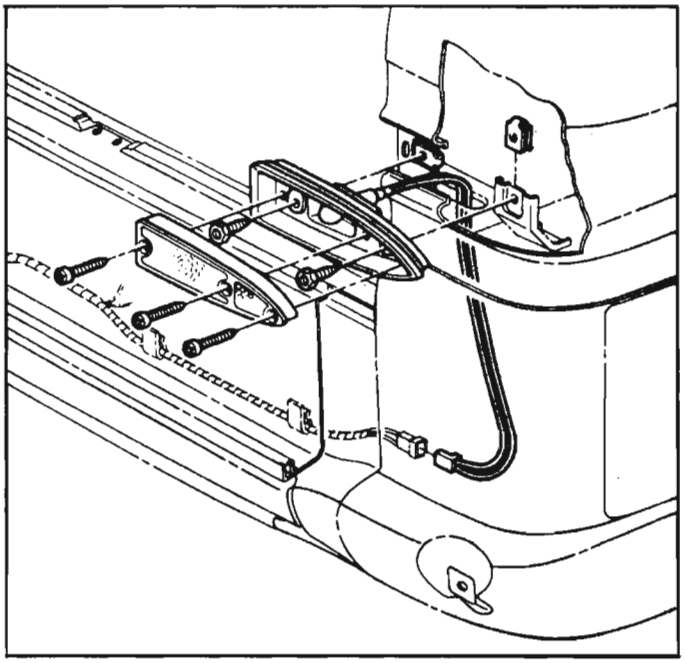


Fig. 8-159—Tail Lamp Assembly

BULB AND LAMP BODY SERVICE

Parking Lamp

Remove and install the parking lamp, bulb and/or housing assembly in the same manner as on the Corvair Sedan models covered previously in this section.

TAIL, STOP AND BACK-UP LAMP

1. To replace bulb:
   a. Remove the three phillips head screws securing the lens to the housing. Remove housing (see Figure 8-159).
   b. Remove bulb and install new bulb.
   c. Reinstall lens to housing with the three retaining screws.
2. To remove the lamp housing assembly:
   a. Remove the three lens attaching screws.
   b. Remove the two hex head screws which secure the housing.
   c. Pull housing straight out and disconnect the electrical connector.
   d. Reverse the procedure to reinstall the housing.

INSTRUMENTS AND GAUGES

INSTRUMENT CLUSTER

Although the Instrument Cluster wiring is basically the same as Corvair Sedan models, the routing differs enough that it is thought that less confusion will result if Figure 8-160 is printed here.

Removal

1. Disconnect the ground cable from the battery.

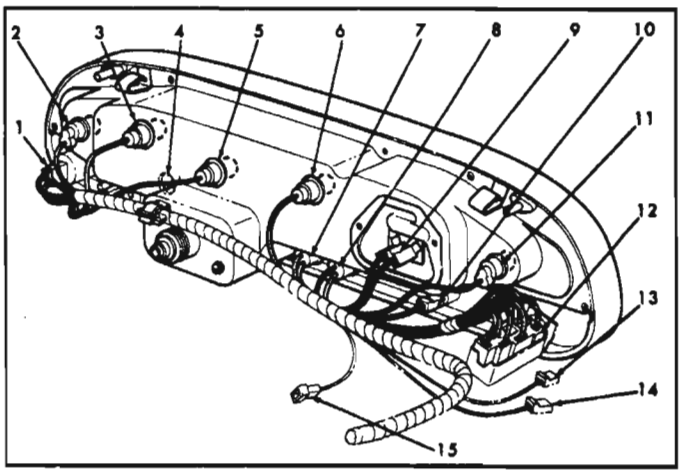


Fig. 8-160—Instrument Cluster Wiring

1. Ignition Switch Connector
2. Right Turn Signal Lamp (Dark Blue)
3. Instrument Lamp (Gray)
4. Cigarette Lighter
5. Hi-Beam Indicator (Light Green)
6. Instrument Lamp (Gray)
7. Generator Indicator Lamp (Brown-Tan)
8. Oil Pressure and Temperature Indicator Lamp (Dark Blue-Tan)
9. Gas Gauge Connector (Tan-Brown)
10. Windshield Wiper Switch (Red)
11. Left Turn Signal Lamp (Light Blue)
12. Light Switch
13. Dome Lamp Connector (White)
14. Dome Lamp Connector (Orange)
15. Horn Wire Connector (Tan)

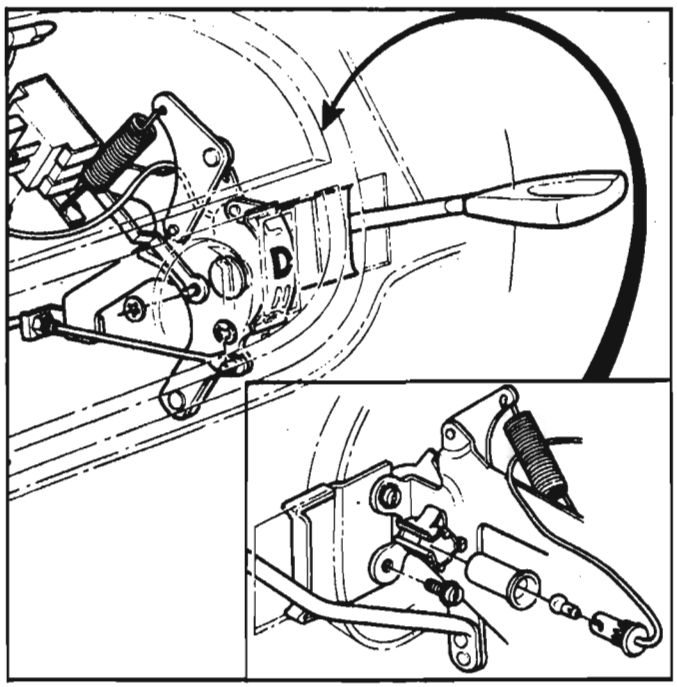


Fig. 8-161—Automatic Transmission Control Installation

2. Automatic Transmission models only (See Figure 8-161): Remove the "C" clip attaching the transmission cable assembly to the transmission control assembly. Remove the nut attaching the cable assembly to the control support arm. Move the selector lever to LOW position.
3. Remove speedometer cable and the two cluster

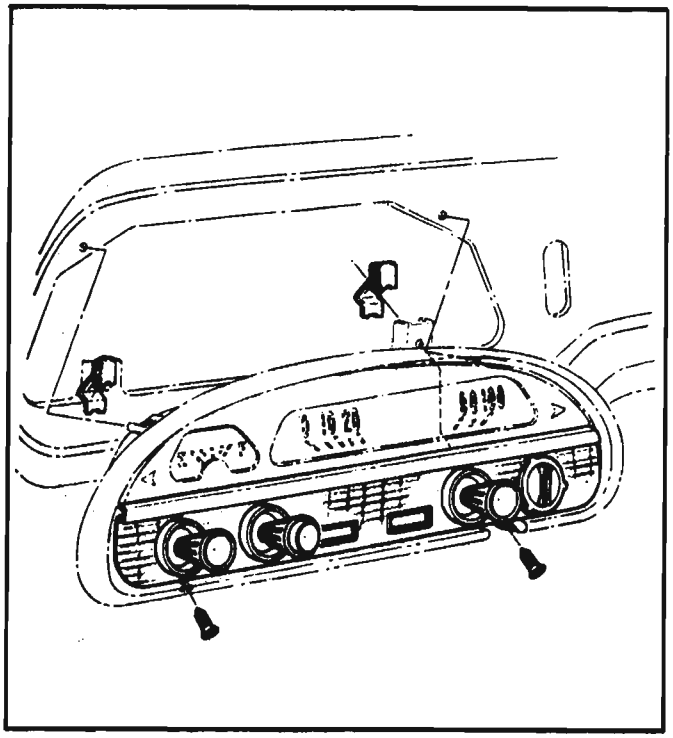


Fig. 8-162—Instrument Panel Removal

attaching screws shown in Figure 8-162 and pull the cluster from the instrument panel.

4. Disconnect the wiring connectors and remove the cluster from the vehicle.

Installation

1. Make sure all instruments and, in Automatic Transmission models, the control assembly are in place.

   NOTE: Move the selector lever to its full DOWN position.

2. Install all wiring connectors. Carefully insert the cluster into the opening in the instrument panel, guiding the two locating pins at the top of the cluster into their holes on the panel and being sure that the clips are behind the instrument panel.
3. Install the two cluster retaining screws.
4. Install the speedometer cable. On Automatic Transmission models, install the control cable in the control support assembly and attach the end of the cable to the control assembly with the "C" clip provided.
5. Reconnect the battery ground cable and test operation of all electrical units.

HORN AND HORN RELAY

All Troubles and Remedies covered on the previous pages for Corvair Sedan models also apply to all Corvair 95 and Greenbrier models.

The horn (or horns) are installed to the frame side rails with a single bolt, nut and lockwasher.

SPECIFICATIONS

Refer to Section 12 for Engine and Chassis Electrical specifications.

SPECIAL TOOLS

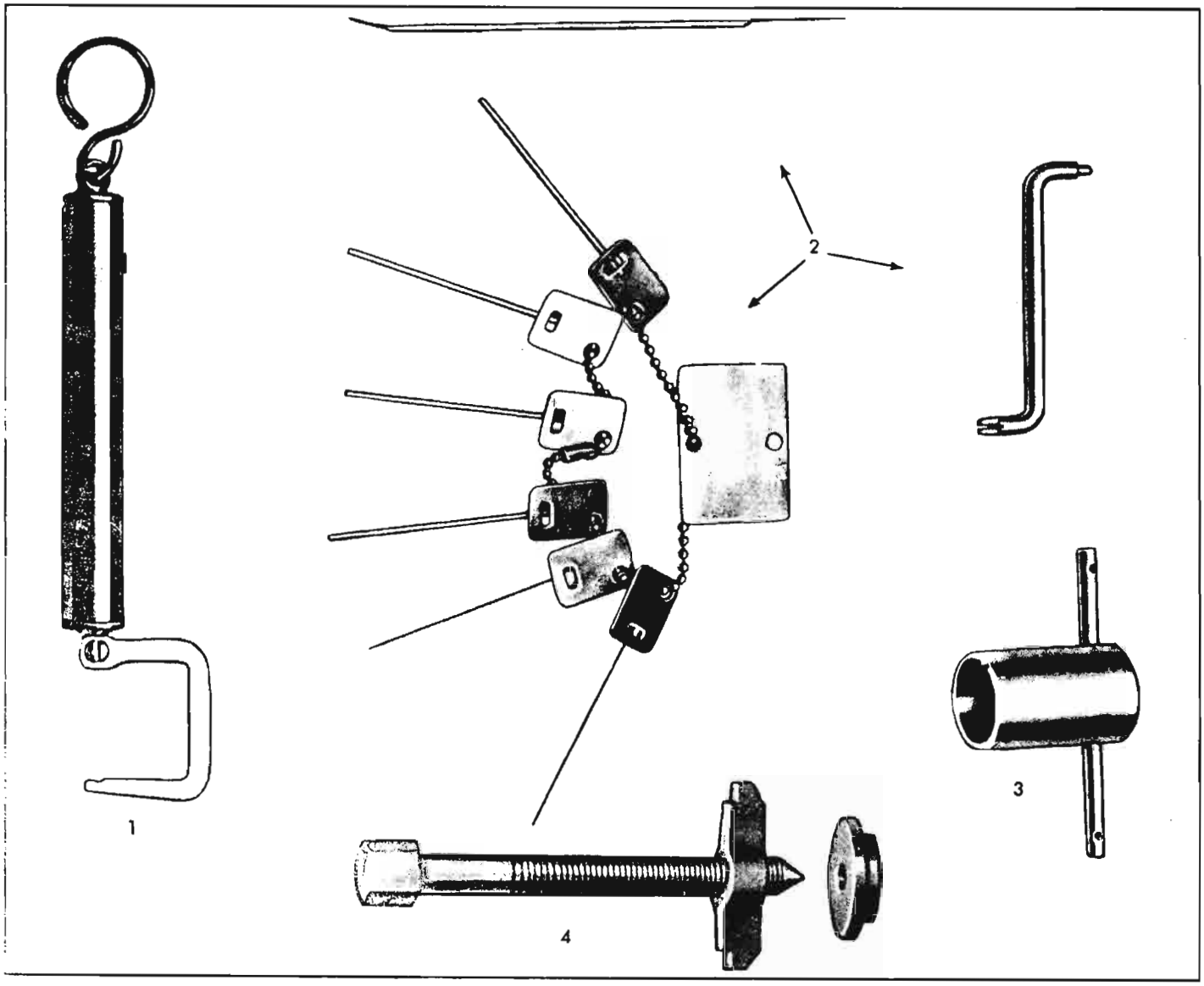


Fig. 8-163—Engine Electrical Special Tools

1. J-5184 Checking Scale
2. J-7590 Generator Regulator Set
3. J-7607 or J-5893 Ignition Switch Nut Remover and Installer
4. J-7844 Two Speed Wiper Field Coil Puller