ALTERNATOR CHARGING SYSTEM

DIAGNOSIS, ADJUSTMENT and OVERHAUL

REGISTERED TECHNICIAN

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COURSE 10001.2 10003.1

AUTOLITE ALTERNATOR IDENTIFICATION

Autolite alternators are used on all Ford Motor Company cars and on trucks up to 65-amp capacity.

The Autolite alternators can be identified by the ink stamped nameplate on the alternator rear housing adjacent to the adjusting ear location. The color of ink serves as a color code to the output capacity of the alternator, in amperes. Output capacity is also included in the nameplate information.

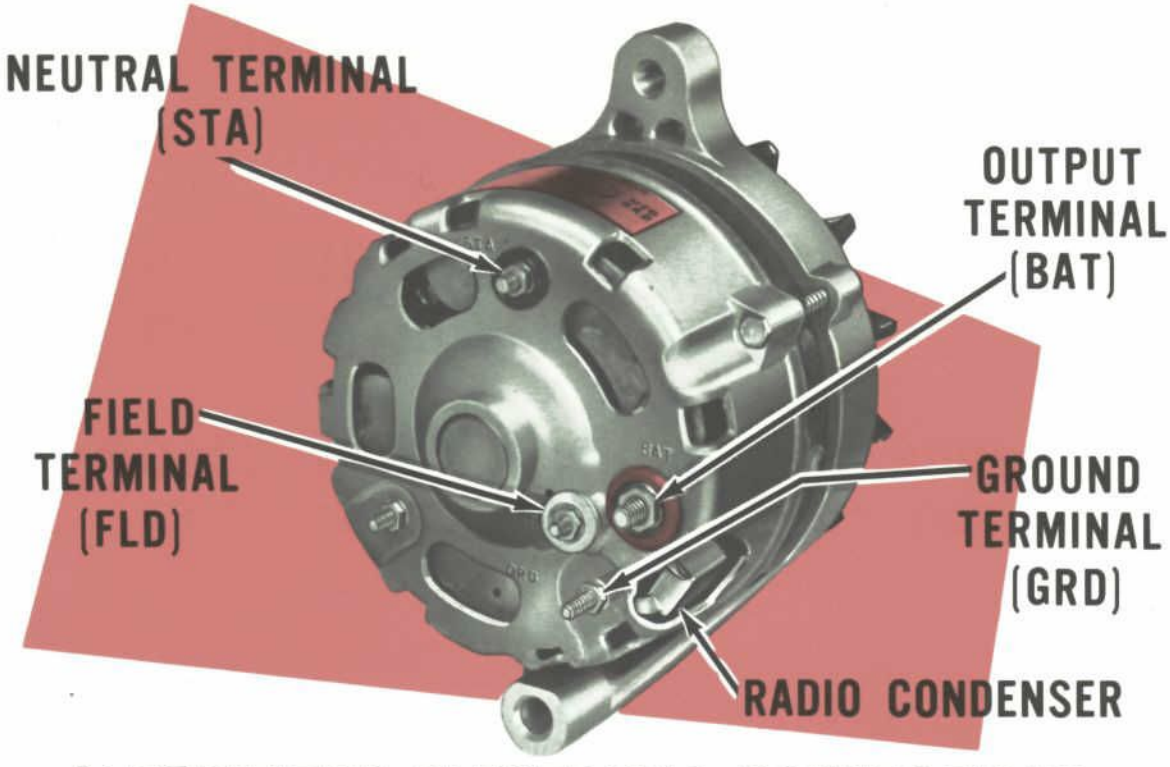
Autolite alternators (38-60 amps) are similar in appearance, with the exception of the width of the stator core. The core is wider as the current rating is increased. The same front and rear housings are used.

The Autolite 65-amp alternator is similar to the other units. It can be readily identified by the protruding brush housing on the rear of the alternator.

Regulators built for trucks are similar to passenger car regulators, except that the points are slightly heavier. The truck regulator is being supplied for service and can be used as a replacement unit on all passenger cars using the Autolite alternator system (except the 60 and 65-amp units). The electrical specifications of the two mechanical regulators are the same.

The transistorized regulator is used on the 60 and 65-amp Autolite alternators. A short wiring new harness connects the conventional wiring harness regulator disconnect to the transistorized regulator.

Leece-Neville alternators are also available in 53, 60 and 105 amp capacities.



ALTERNATOR ELECTRICAL CONNECTIONS

AMPERE CAPACITY	NAMEPLATE COLOR	OTHER EXTERNAL IDENTIFICATION
38	PURPLE	NONE
42	ORANGE	NONE
45	BLACK	NONE
55	RED	STATOR HAS MORE AND THINNER (0.032) LAMINATIONS
60	GREEN	
65	BLACK	PROTRUDING BRUSH HOUSING

AUTOLITE ALTERNATOR IDENTIFICATION

10001.2-1A

SUMMARY OF ALTERNATOR SERVICING PRECAUTIONS

Several servicing procedures can cause diode damage or complete failure if carried out improperly.

1. Observe polarity when installing the battery in a vehicle. Reversed battery cable connections or installation of a battery which has been charged backwards will burn out diodes. Use a voltmeter to determine battery terminal post polarity before connecting cables. The ground cable must be connected to the negative battery terminal post.

2. Observe polarity when a booster battery is used to start the engine. Connect negative to negative, and positive to positive.

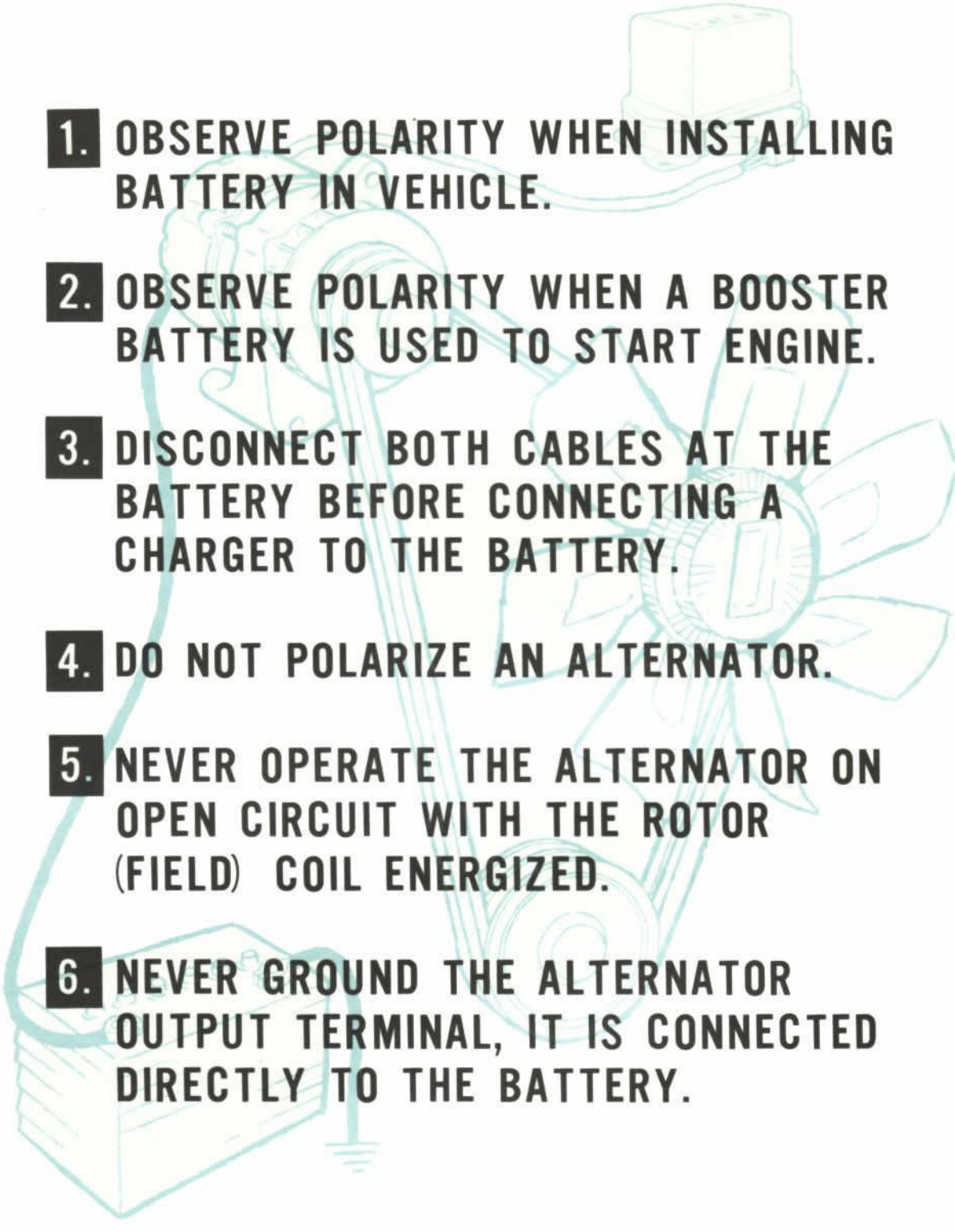
3. Disconnect both cables at the battery before connecting a charger to the battery.

4. It is not necessary to polarize an alternator. Regulator contacts can be destroyed by an attempt to do so.

5. Never operate the alternator on open circuit with the rotor (field) coil energized. Very high voltage will be developed which can burn the rotor coil or possibly damage the diodes.

6. Never ground the alternator output "BAT" terminal, it is connected directly to the battery.

Always disconnect the battery ground cable at the battery before removing the alternator or its connecting wires. Serious damage to the wiring harness and the alternator could result from accidentally grounding the output terminal.



1. OBSERVE POLARITY WHEN INSTALLING BATTERY IN VEHICLE.

2. OBSERVE POLARITY WHEN A BOOSTER BATTERY IS USED TO START ENGINE.

3. DISCONNECT BOTH CABLES AT THE BATTERY BEFORE CONNECTING A CHARGER TO THE BATTERY.

4. DO NOT POLARIZE AN ALTERNATOR.

5. NEVER OPERATE THE ALTERNATOR ON OPEN CIRCUIT WITH THE ROTOR (FIELD) COIL ENERGIZED.

6. NEVER GROUND THE ALTERNATOR OUTPUT TERMINAL, IT IS CONNECTED DIRECTLY TO THE BATTERY.

ALTERNATOR SYSTEM PRECAUTIONS

ALTERNATOR CHARGING SYSTEM

Energy needed to operate the starting system is stored in the storage battery, but the source of this energy is the charging system. When the engine is running, the ignition sysfem, lighting system, and motors used in accessories such as heaters, air conditioning systems, power seats, power windows and top operating mechanisms receive their power from the charging system, up to the point where electrical power demands exceed the charging system output. Should the demand exceed the charging system output, the additional energy would be supplied by the battery.

Charging system diagnosis and service are not difficult since relatively simple components and circuits are involved.

The most important factors in diagnosing trouble in the charging system are a clear understanding of how the system works and the ability to interpret the readings of a few test instruments.

The alternator charging system is composed of an alternator, a regulator, a battery, and a charge indicator light or an ammeter. These units are connected by means of cables, wires, and parts of the vehicle itself.

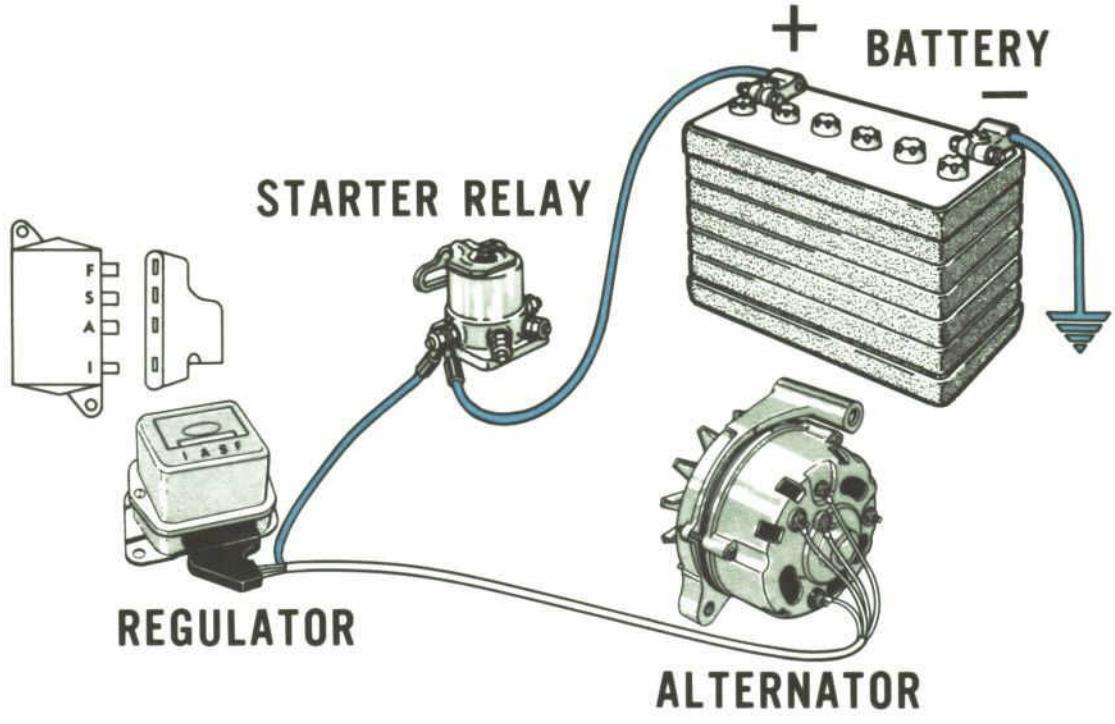
When a charge indicator light is used in the charging system, the regulator terminals are connected as shown, and a wire is connected between the regulator ground and the alternator ground. The field relay is activated as the regulator output reaches a specified output.

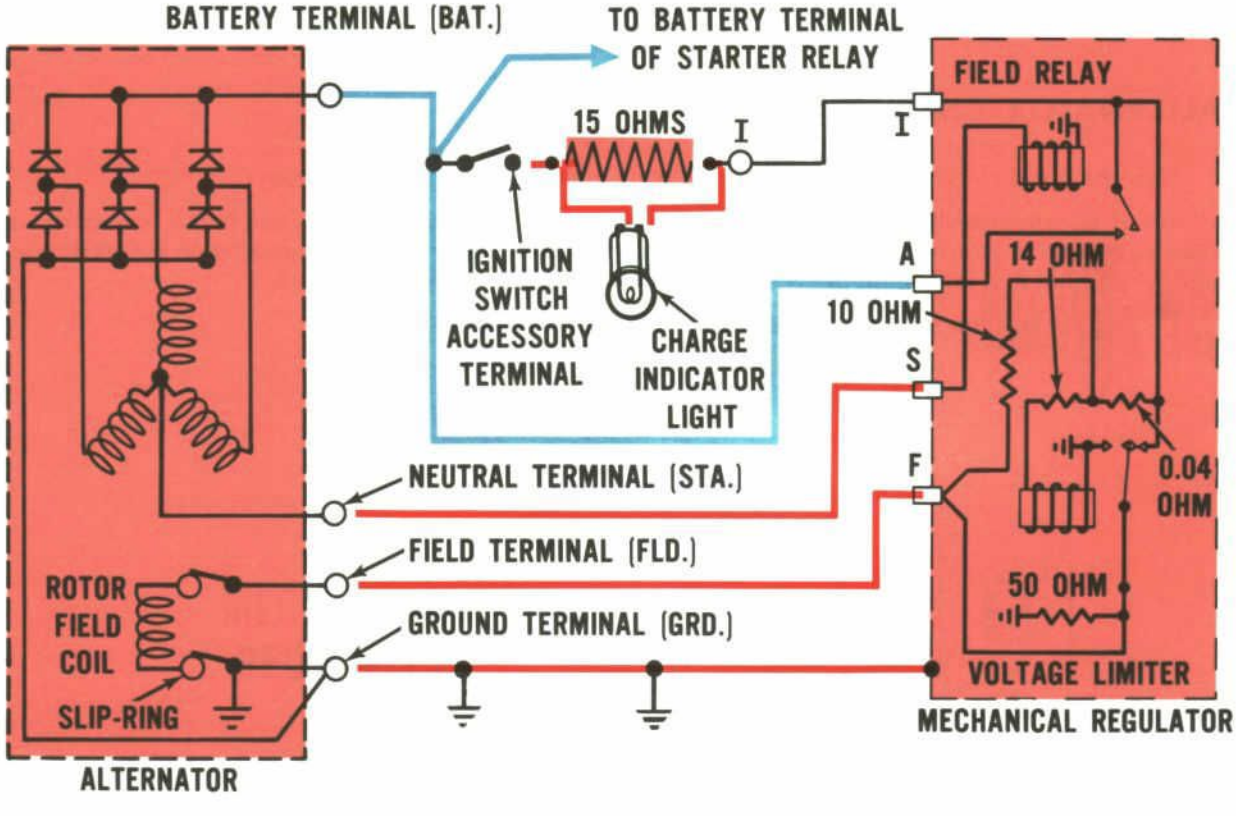
Alternator output is controlled by the regulator, so that adequate current is supplied without injury to the alternator, the battery, or any other electrical units served by the supply system.

Whenever the alternator is not supplying current and the battery is discharging, a charge indicator light or ammeter shows this condition.

To test and diagnose the charging system intelligently, it is necessary to know how the system operates, where to make the tests, how to make the tests, and what the tests mean in relation to the performance of the system.

An examination of the charging circuit will reveal the circuit connecting points and locate the test areas.





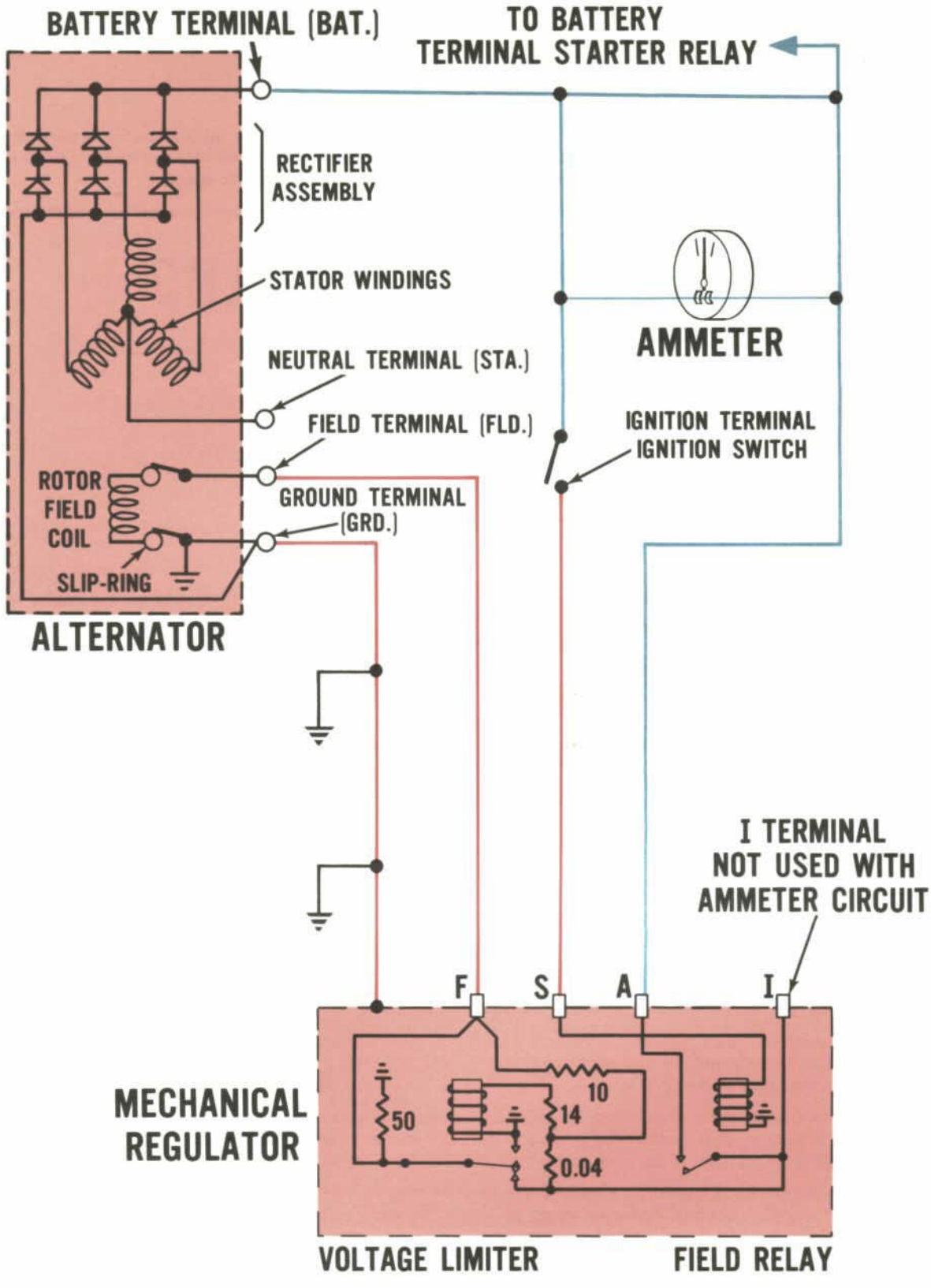
AUTOLITE ALTERNATOR SYSTEM— CHARGE INDICATOR LIGHT

ALTERNATOR CIRCUITS

This chart shows the schematic of the alternator system used with an ammeter.

When an ammeter is used in the charging system, the regulator "I" terminal is not connected. The alternator neutral terminal is not connected. The regulator "A" terminal is connected to the starter relay battery terminal and the regulator "S" terminal is connected to the ignition switch.

Closing the ignition switch activates the regulator field relay.



ALTERNATOR AND MECHANICAL REGULATOR CIRCUITS

TROUBLE DIAGNOSIS

Charging system troubles are about the same whether a generator or an alternator is used to supply the current for the system. Trouble will probably show up first in the area of poor battery performance, as evidenced by slow cranking, hard starting, and/or headlights dim at idle speeds.

The problem will be in one of the following areas: a defective battery, excessive resistance in the charging circuits, a defective alternator, or a defective regulator.

A good diagnosis of the charging system should include:

- Visual Inspection
- Battery Capacity Test
- Alternator Output Test
- Voltage Drop Test
  Alternator-to-Battery Positive Terminal
  Alternator-to-Battery Ground Terminal
- Regulator Voltage Limiter Test
- Field Relay Test

VISUAL INSPECTION

If the battery is not securely clamped, material can shake loose on the inside, or the cables may become worn and broken. Dirt on the battery can cause the battery to self-discharge. A cracked battery case will allow the electrolyte to leak out, and constant refilling with water will reduce the acid strength. Corroded terminals create resistance in the connections.

A loose belt causes the alternator to run at lowered speeds, thereby reducing the output. Glazed, frayed, or worn spots on the belt will result in a reduced output. A cracked belt must be replaced. A belt must be in good condition so that the proper tension can be maintained for proper performance of the alternator.

Connections must be clean and tight to maintain a good conductive path for the flow of electricity without excessive resistance. Broken wire strands or loose connections cause open circuits.

Damaged parts include such items as pinched wires. Wires are sometimes pinched under sheet metal edges or under screw heads. Worn insulation is common where the wire is loose and is rubbing against a rough metal surface or the threads of a screw. A cracked alternator housing may allow the rear bearing to move out of alignment and cause the rotor to rub on the stator core. A broken bracket may cause the alternator to become misaligned with the belt and cause a noisy condition or low output.

BATTERY CAPACITY TEST

The capacity of a battery is the battery's ability to furnish current and maintain a minimum necessary voltage. If a battery passes the capacity test, it is in satisfactory condition. However, it may need some additional charging to bring it to peak performance.

There is one caution that must be considered, however, and that is when cold, a battery has a lower discharge capacity. If a battery fails to pass the capacity test during cold weather, remove it from the vehicle and let it stand until it reaches room temperature then retest.

To complete the inspection, measure the specific gravity of the electrolyte in each cell after the battery has been charged. This will show the state-of-charge in each cell.

Hydrogen and oxygen gases are produced in the course of normal battery operation. This gas mixture can explode if flames or sparks are brought near the vent openings of the battery. The sulphuric acid in the battery electrolyte can cause a serious burn if spilled on the skin or spattered in the eyes. It should be flushed away immediately with large quantities of clean water.

The battery capacity test and specific gravity test procedures are covered in chart 10000.1.

If the charging system does not operate properly and the battery and drive belt have been eliminated as possible causes of the trouble, check the alternator output.

When a battery requires the frequent addition of water, the indication is that there is excessive voltage in the charging circuit. If the battery does not maintain a high state-of-charge, it may be due to low voltage in the charging circuit. Either condition is an indication that the regulator voltage limiter should be checked and adjusted.

CHARGING SYSTEM DIAGNOSIS

- VISUAL INSPECTION
- ALTERNATOR OUTPUT TEST
- CIRCUIT RESISTANCE TESTS
- REGULATOR TESTS

TROUBLE DIAGNOSIS – Continued

ALTERNATOR OUTPUT TEST

This test measures the current output at the specified speed and voltage. The test result is a measure of the ability of the generator to produce its rated output.

Connect the test instruments to the charging system as shown. Remove the ground cable and the positive cable, then install the battery post adapter switch. Open the switch and connect the ground cable. Connect the field leads to the regulator plug with a jump wire (male spade lugs or spade lugs with wire leads may be used to make these connections). Turn the field resistance OFF. Connect a tachometer to indicate the engine rpm.

Place the transmission in neutral or park and apply the parking brake.

Test Procedure

1. Close the battery post adapter switch and start the engine. Open the battery post adapter switch. All electrical accessories must be turned off, including door-operated interior lights.

2. Increase the engine speed to about 2000 rpm and observe the voltmeter and ammeter.

3. Turn the field resistance control knob clockwise until 15 volts are indicated on the voltmeter.

4. Observe the ammeter reading. To obtain the total alternator output, add two amperes to this reading for vehicles equipped with conventional ignition or six amperes with the transistor ignition system.

5. If the battery was fully charged, it might not be possible to obtain maximum current output. If specified current is not obtained, make the following test before condemning the alternator:

a. Turn the field rheostat control knob to the OFF position. Rotate the master control knob to the CURRENT REG. position. Maintain the engine speed at the rpm used in Step 2.

b. Turn the field rheostat control and the master control clockwise, maintaining a voltmeter reading of 15 volts maximum, until the field rheostat control is at its maximum-clockwise position.

c. Readjust the master control until the voltmeter reads exactly 15 volts. Observe the ammeter reading. Add two amperes to this reading for vehicles equipped with conventional ignition or six amperes with the transistor ignition system to obtain total-alternator output. If the rated output still cannot be obtained, increase the engine speed to 2900 rpm and repeat step 5.

6. Stop the engine and remove the test equipment.

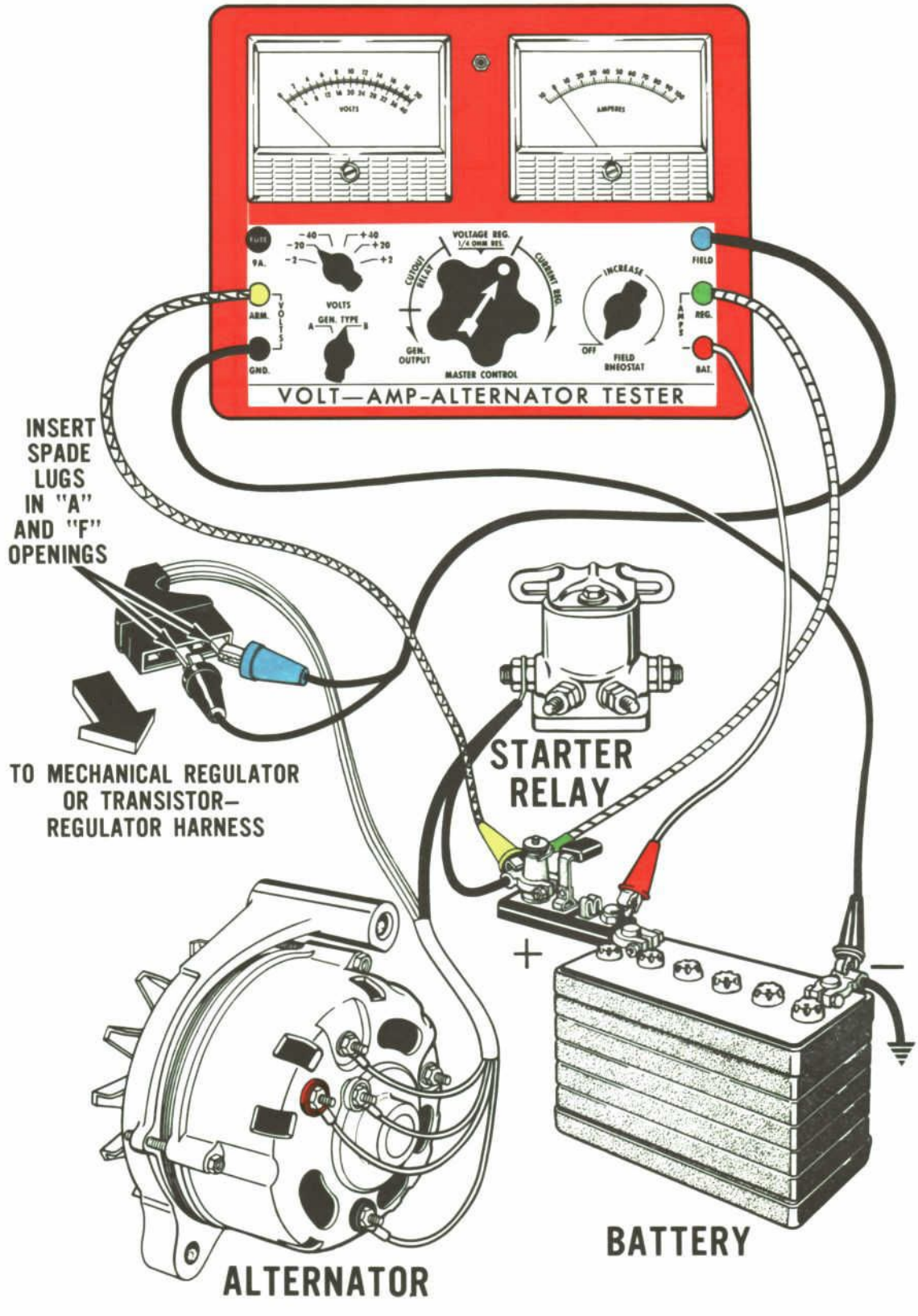
Conclusions

If the output is 2 to 8 amperes below the specified rating, it usually indicates an open diode rectifier. A slipping drive belt or excessive circuit resistance can also cause this indication. Recheck the belt and the circuit resistance.

An output of approximately 10 to 15 amperes less than the specified rating is usually an indication of a shorted diode. An alternator with a shorted diode often causes a noticeable whine at idle speeds.

A shorted positive diode often causes alternate flashing of the oil pressure warning light and the charge indicator light with the ignition switch off. Feedback from the charge indicator light circuit to the accessory terminal of the ignition switch causes this peculiar effect by activating the fuel and temperature gauge system. (When the contacts in the constant-voltage regulator on the instrument cluster close, the oil pressure light becomes dim and the charge indicator light becomes bright. When the constant voltage contacts open, the oil pressure light becomes bright and the charge indicator light becomes dim). A shorted positive diode also causes battery discharge through the field circuit due to the closed relay contacts.

Any test indicating alternator malfunction should be followed by circuit resistance tests to determine whether the circuit is faulty or if the alternator should be removed from the vehicle for bench testing and repair.



ALTERNATOR OUTPUT TEST

TROUBLE DIAGNOSIS – Continued

VOLTAGE DROP TEST – ALTERNATOR-TO-BATTERY GROUND TERMINAL

Test Connections

Install the battery post adapter switch and make the other test connections as shown. Set the voltmeter in the lowest volt position.

Place the transmission in neutral or park and apply the parking brake.

Test Procedure

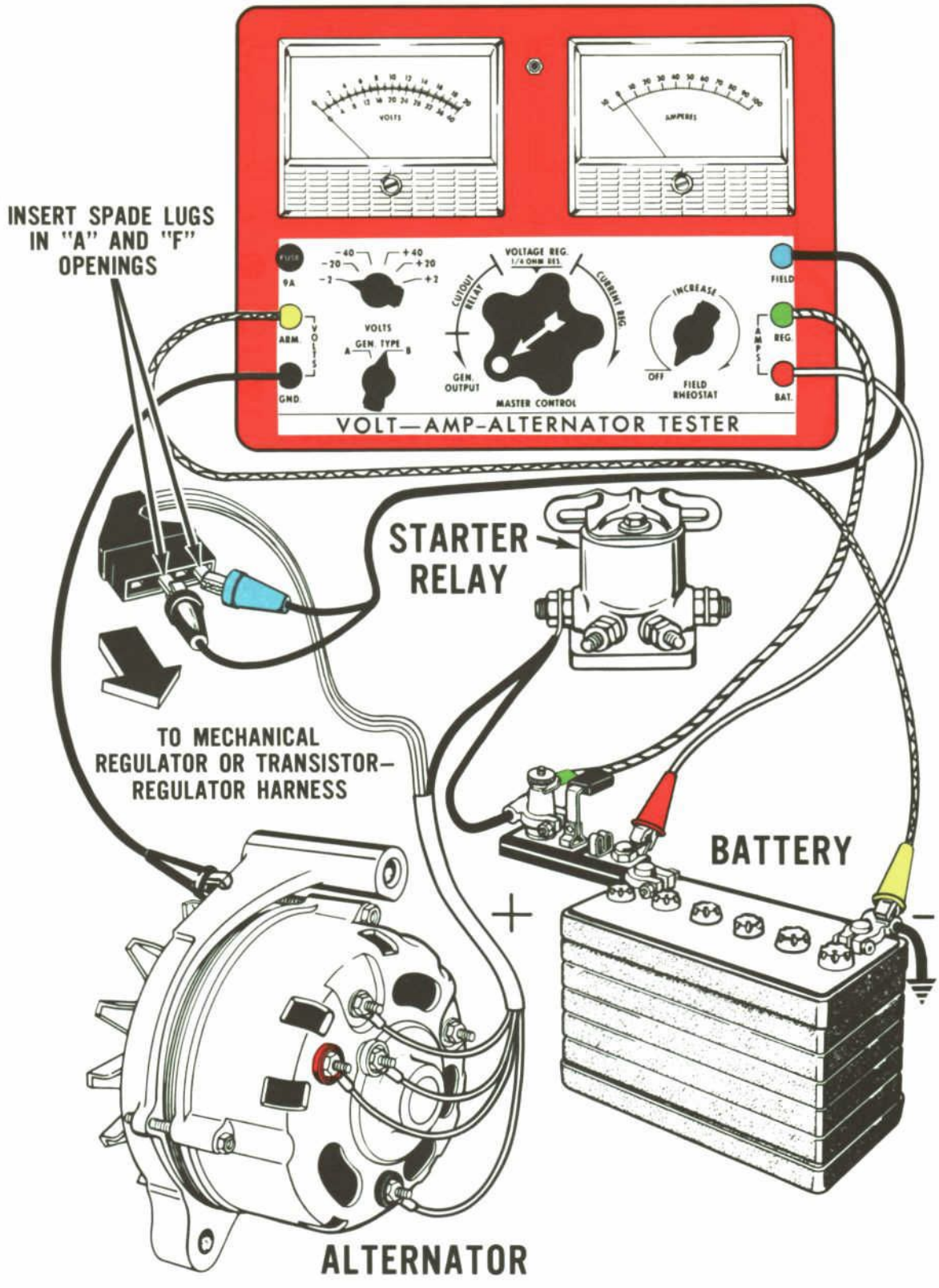
1. Close the battery post adapter switch and start the engine. Open the battery post adapter switch. All electrical accessories must be turned off, including the door-operated interior lights.

2. Increase the engine speed to about 2000 rpm and adjust the field rheostat until the ammeter indicates 20 amperes.

3. Observe the voltmeter. The voltage indicated on the voltmeter should be less than 0.1 volt. A faulty ground circuit is indicated when the voltmeter reading is more than 0.1 volt.

Conclusions

If the voltage reading is higher than specified, there is excessive resistance in the circuit. Inspect the battery ground cable for corrosion or loose connections. Repair or replace any defective parts.



VOLTAGE DROP TEST–ALTERNATOR-TO-BATTERY GROUND TERMINAL

TROUBLE DIAGNOSIS – Continued

VOLTAGE DROP TEST – ALTERNATOR-TO-BATTERY POSITIVE TERMINAL

Test Connections

Except for the voltmeter, the test connections are the same as for the "Alternator-To-Battery Ground Terminal Test." Connect the voltmeter as shown.

Place the transmission in neutral or park and apply the parking brake.

Test Procedure

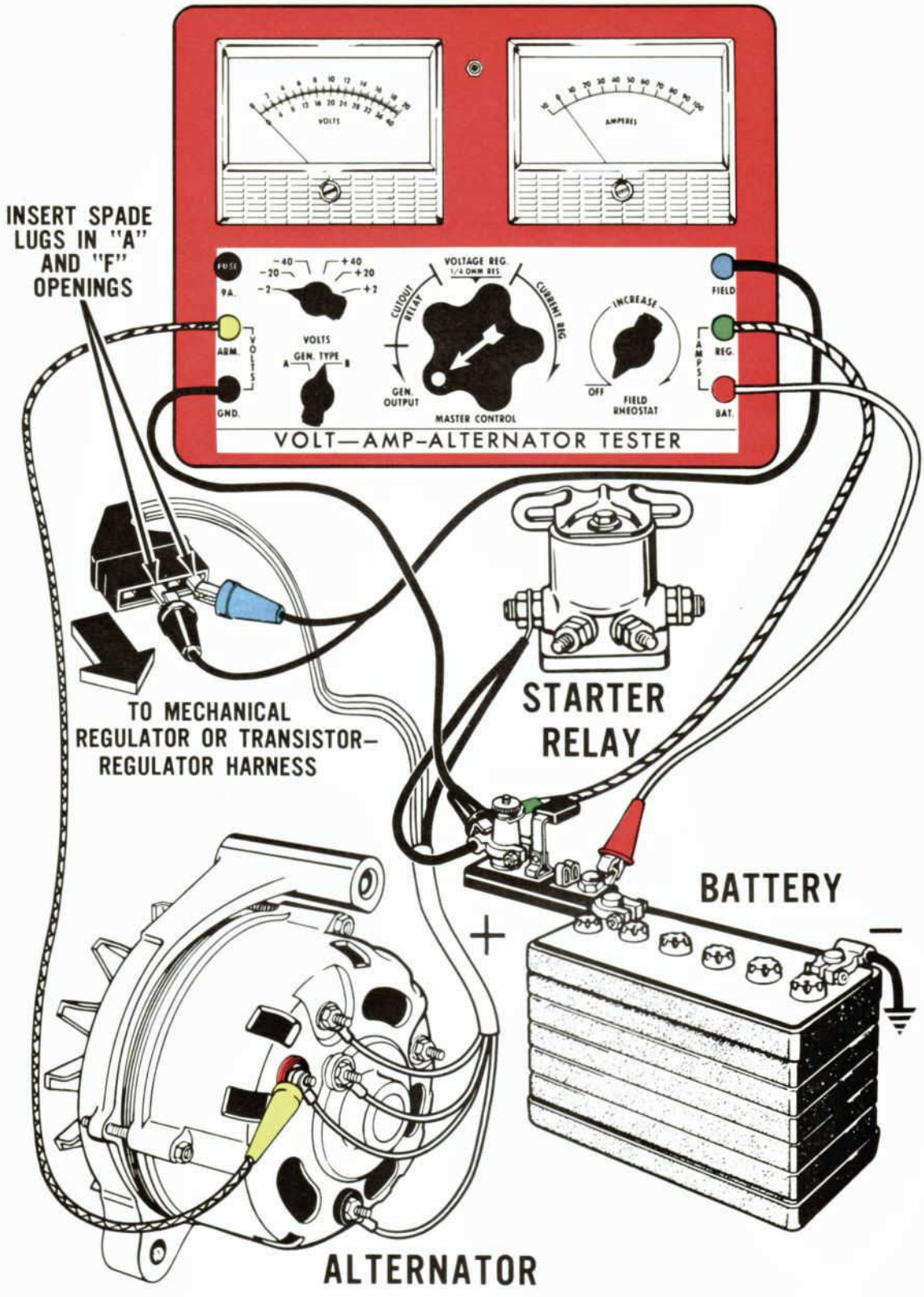
1. Close the battery post adapter switch and start the engine. Open the battery post adapter switch. All electrical accessories must be turned off, including the door-operated interior light.

2. Increase the engine speed to about 2000 rpm and adjust the field rheostat until the ammeter indicates 20 amperes.

3. Observe the voltmeter. A faulty charging circuit is indicated when the reading is more than 0.3 volt on vehicles with a charge indicator light, and 0.5 volt on ammeter systems.

Conclusions

If the voltage reading is higher than specified, there is excessive resistance in the circuit. Inspect the battery positive cable and the wiring harness from the starter relay positive terminal to the alternator for broken wires and loose or corroded connections. Repair or replace any defective parts.



VOLTAGE DROP TEST—ALTERNATOR-TO-BATTERY POSITIVE TERMINAL

TROUBLE DIAGNOSIS – Continued

STATOR NEUTRAL VOLTAGE TEST

The Autolite alternator STA terminal is connected to the stator coil neutral or center point. The voltage generated at this point is used to close the field relay in the charge indicator light system.

To test for the stator neutral voltage, connect the voltmeter positive lead to the STA terminal and connect the negative lead to ground. Start the engine and run it at 1000 rpm. Turn off all lights and accessories. The voltage indicated on the meter should be 6 volts or more.

VOLTAGE LIMITER TEST – MECHANICAL REGULATOR

Final voltage limiter calibration tests must be made with the regulator cover and gasket in place and the regulator temperature must be normalized before making the voltage limiter tests.

If the vehicle has not been driven far enough for the engine temperature to be normalized, turn off all electrical accessories and operate the engine at approximately 2000 rpm for 20 minutes with the hood down.

Only the lower stage (mechanical regulator lower contact) regulation need be tested as a check for proper calibration.

Test Procedure – Lower Stage

1. Disconnect both battery cables from the battery and install the battery switch. Connect the test ammeter as shown.

2. Connect the voltmeter positive lead to the battery positive cable clamp, and the voltmeter negative lead to the ground cable clamp. Set the voltmeter switch to the 20-volt position.

3. Install a thermometer to measure the temperature of the regulator. Connect the battery ground cable to the battery negative post.

4. Close the battery switch and start the engine. Be sure all electrical accessories, including the door-operated interior lights, are turned off. Open the battery switch.

5. Operate the engine at 2000 rpm for 5 minutes with the tester control in the output relay position. If the ammeter indicates more than 10 amperes, stop the engine. Disconnect the battery cables, and charge the battery. When the battery has been properly charged, repeat the temperature stabilizing procedure.

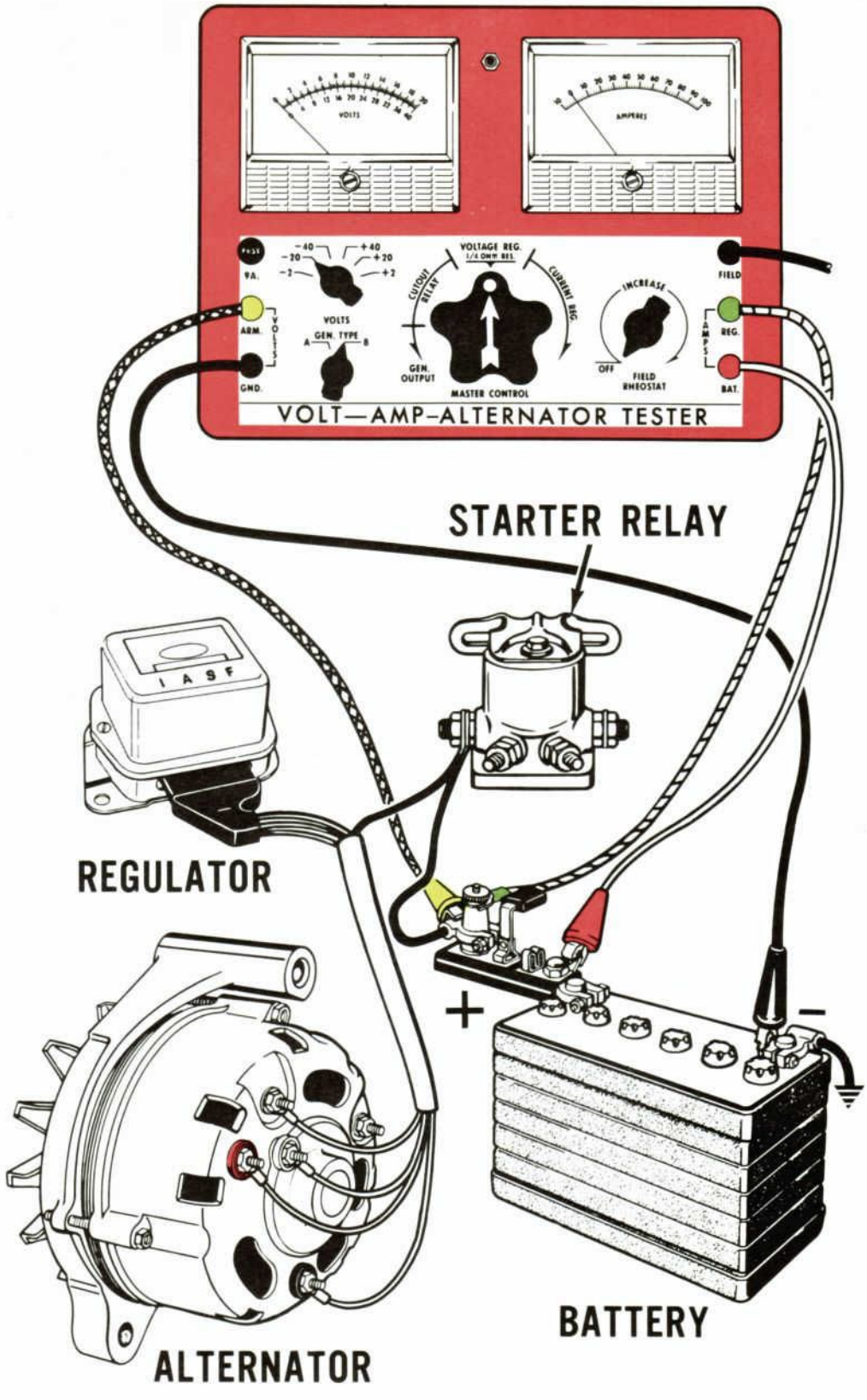
6. Move the tester control knob to the 1/4-ohm position. The ammeter should indicate less than 10 amperes.

7. Cycle the regulator as follows: Mechanical regulator only. Close the battery switch and stop the engine. Start the engine and increase the speed to 2000 rpm. Open the battery switch.

8. Allow the battery to normalize for a short time; then, read the voltmeter and the thermometer. Voltage readings should compare with indicated thermometer readings as shown in the applicable shop manual. If the regulated voltage is not within specifications, make the necessary voltage limiter adjustment. The mechanical regulator must be cycled after each adjustment before a new reading is obtained. All readings must be made with the regulator cover in place (mechanical regulator).

If the voltage reading is within specification, but the battery is either over-or under-charged, adjust the regulator to bring the voltage reading within the specifications given in the shop manual. Cycle the mechanical regulator before each reading. Do not change the setting more than 0.5 volt from the original setting until a test period involving actual vehicle usage has indicated that a greater correction is required. See "Regulator Adjustments" Charts 10001.2-12 and 13 for proper adjustment procedures.

As an example, if battery water usage seems excessive and a hydrometer check shows all cells to be fully charged, the voltage limiter setting is assumed to be too high. Testing shows the limiter to be operating within specification at a temperature of 125°F. and 14.5 volts. Adjust the regulator to decrease the voltage limit to 14.0 volts. Actual use indicates that the voltage is still slightly high. To correct the complaint, the voltage can be reduced again as long as the regulator is within specifications.



VOLTAGE LIMITER TEST

TROUBLE DIAGNOSIS – Continued

FIELD RELAY TEST – WITH MECHANICAL REGULATOR

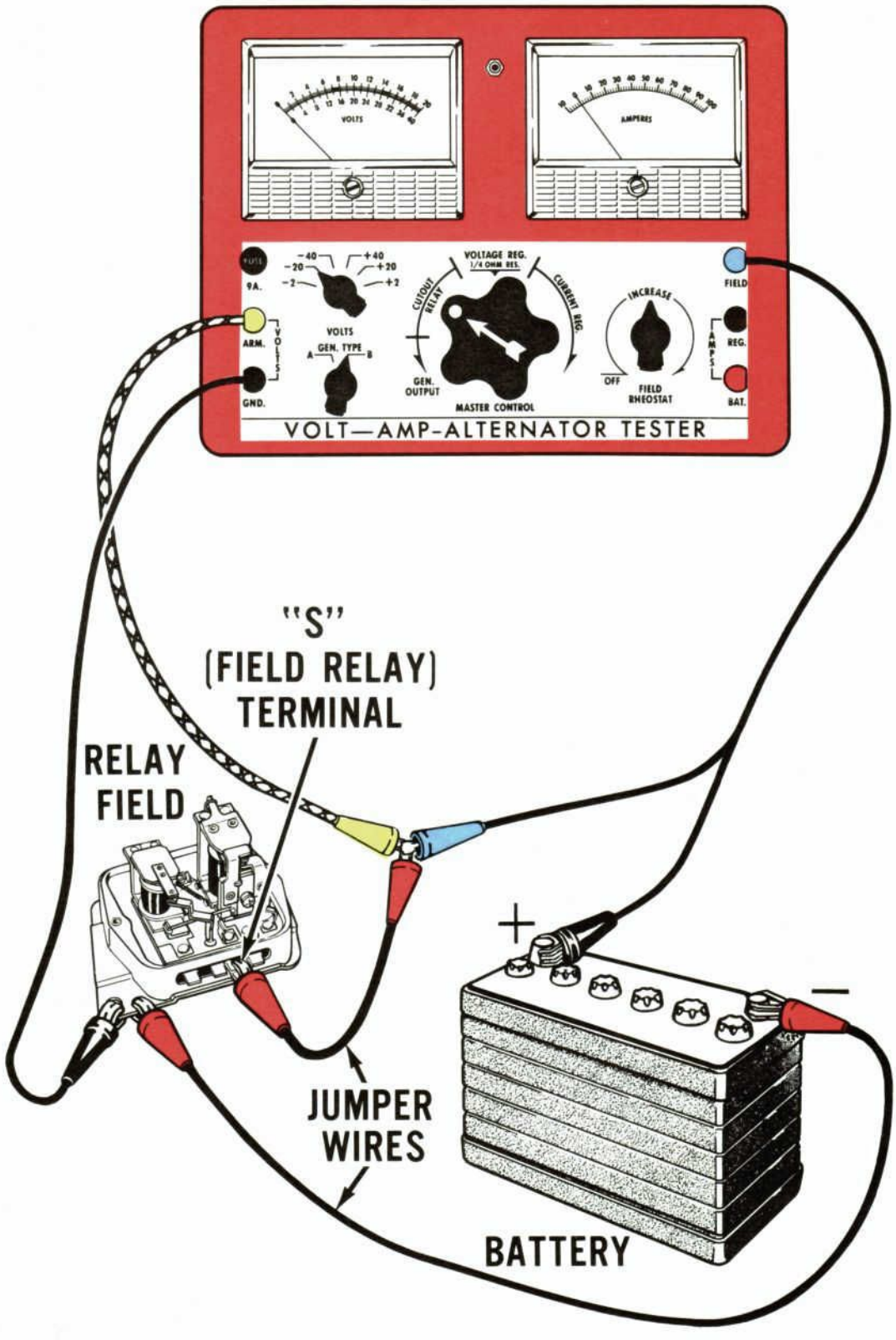
Connect the Tester as shown. Two jumper wires are needed to complete the hook-up. Make the battery positive post connection last to prevent a possible flash if the field resistance is not turned off.

1. Place the field rheostat in the full counterclockwise (maximum resistance) position. Depress the Sensitivity Control located between the meters and slowly rotate the Field Rheostat Control clockwise from the maximum resistance position until the field relay **contacts** close.

2. Observe the voltmeter reading at the moment the relay contacts closes. Repeat the test several times to verify the readings.

Test Conclusion

The relay contact closing voltage should be between 2.5 and 4 volts. If the relay closing voltage is outside the specified limits, make the proper adjustments. See "Mechanical Regulator Adjustments" Chart 10001.2-12 for proper adjustment procedures.

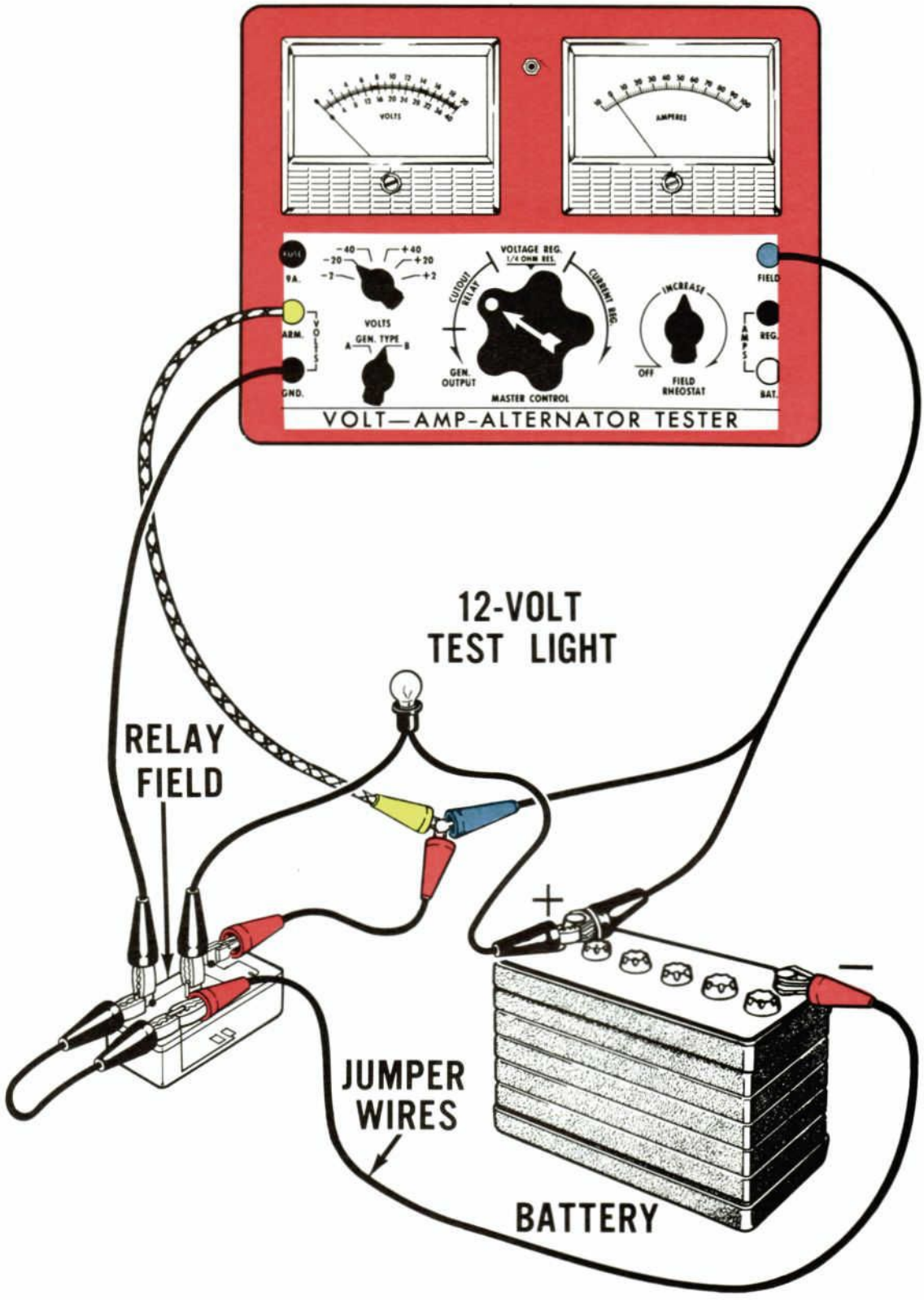


FIELD RELAY TEST— MECHANICAL REGULATOR

FIELD RELAY TEST – TRANSISTOR REGULATOR

Disconnect the relay connector plug. Make the connections as shown. Slowly rotate the Field Rheostat Control clockwise from the maximum counterclockwise position until the test light comes on. Observe the voltmeter reading at the moment that the light comes on. This is the relay closing voltage. If the relay closes immediately, even with the field rheostat close to the maximum counterclockwise position, push the red button between the two meters, and repeat the test. If the closing voltage is not to specification, replace the relay.

If the field leads are reversed, the red button (sensitivity control) will not work.



FIELD RELAY TEST— TRANSISTOR REGULATOR

ADJUSTMENTS AND LIGHT REPAIR

ADJUSTMENTS

Charging system efficiency is often reduced because attention is not given to the drive belt adjustment. Proper belt tension must be maintained to prevent slippage.

Check the belt tension with a belt tension gauge. If the tension is below 70 lbs, adjustment is required. The following specifications apply to both new and used V-belts regardless of use or size. It must be emphasized that these specifications mean only the pounds tension that a belt must be set to at the time of installation or retensioning.

New Belt Tension. A new belt installed in service should be adjusted to 140 lbs.

Used Belt Tension. A V-belt is considered used after 10 minutes of operation and it should be adjusted to 110 lbs.

The regulator is factory-adjusted for proper performance. If the performance of the charging system indicates that an adjustment is required, the proper procedures for making the adjustments are covered under Regulator Adjustments.

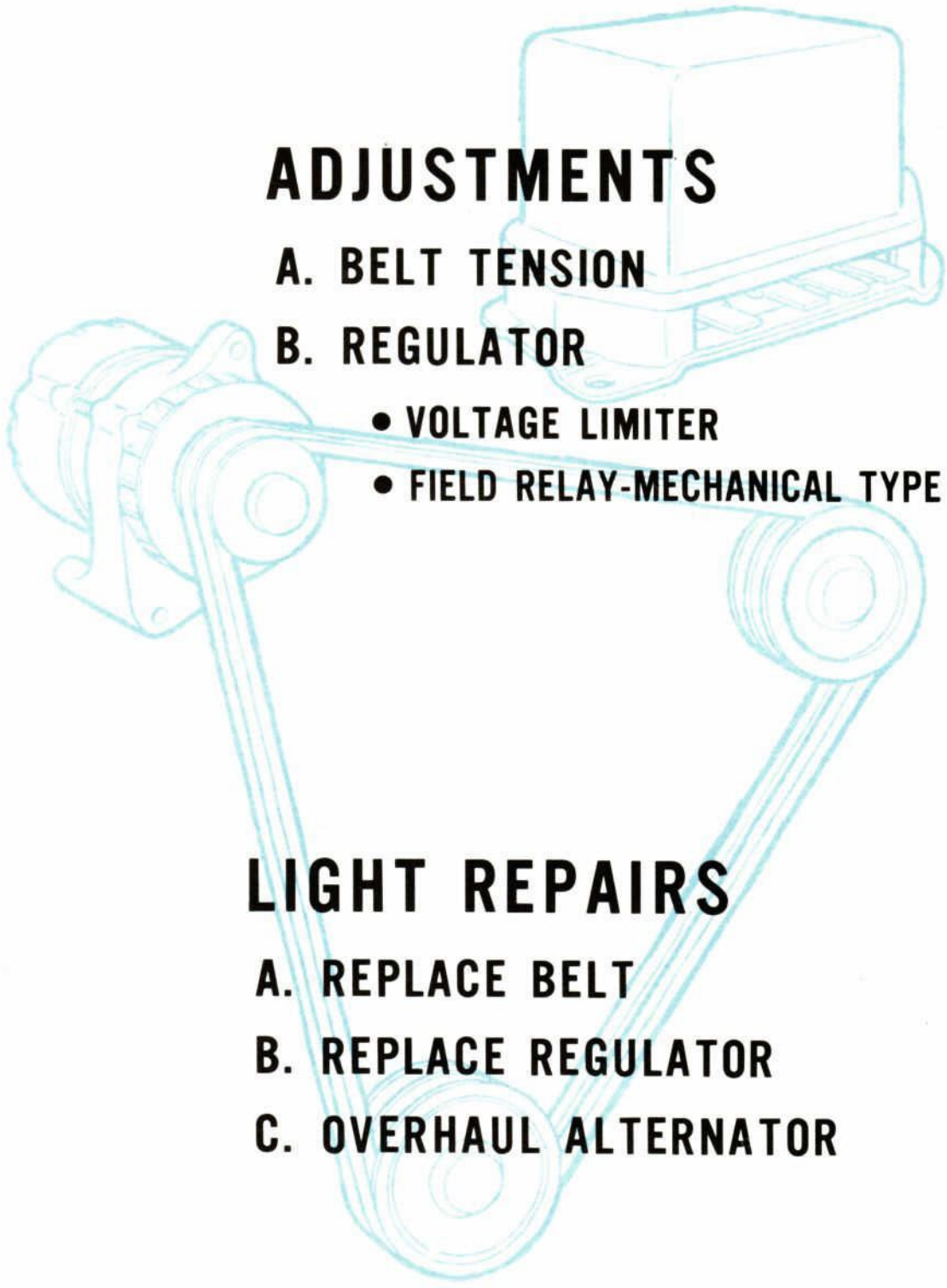
It should be noted that it is normal for an ammeter pointer to waver at certain critical engine speeds and electrical loads. Do not replace a regulator for this reason.

The ammeter used on cars is the shunt type and non-adjustable. The recommended test procedure for this ammeter consists of turning on the headlights and checking for ammeter needle movement. If no needle movement takes place, check system for possible loose connections. If no loose connections are found, replace the ammeter as an assembly.

LIGHT REPAIR

Light repair includes some items which may need attention to keep the charging system operating efficiently. Belt replacement is probably the most frequent repair. No provisions are made for replacing regulator parts. The points cannot be cleaned so replace the regulator.

Any type of alternator repair is most conveniently made with the unit off the vehicle.



ADJUSTMENTS

A. BELT TENSION

B. REGULATOR

- VOLTAGE LIMITER
- FIELD RELAY-MECHANICAL TYPE

LIGHT REPAIRS

A. REPLACE BELT

B. REPLACE REGULATOR

C. OVERHAUL ALTERNATOR

VOLTAGE LIMITER ADJUSTMENTS – MECHANICAL REGULATOR

The regulator voltage limiter adjustments should be made on an alternator regulator test stand.

The voltage limiter is adjusted by bending the voltage limiter spring arm. To increase the voltage setting, bend the adjusting arm downward. To decrease the voltage setting, bend the adjusting arm upward.

Before setting the voltage and before making a final voltage test, the alternator speed must be reduced to zero and the regulator circuits deenergized to cycle the regulator.

Erratic operation of the regulator, indicated by erratic movement of the voltmeter pointer during a voltage limiter test, may be caused by dirty or pitted regulator contact points. Do not attempt to clean the regulator contact points. Replace the regulator.

The voltage limiter contact gap and core gap should not be adjusted.

MANUAL TEST – UPPER STAGE

An open connection at the voltage limiter coil, a broken or faulty armature spring, or dirt upper contacts will reduce the alternator output. Therefore, upper stage operation must be tested whenever the system output is low, and the alternator and field relay are known to be functioning properly.

Upper stage regulation can be checked manually to determine whether limiting and transfer functions are operative. The battery must be in good state-of-charge.

Connect a voltmeter across the battery. Remove the regulator cover. Turn the low-beam headlights on and operate the engine speed high enough to cause the armature to vibrate (usually about 1500 rpm). Use a finger to lightly lift the voltage limiter armature toward the upper contact.

The voltmeter reading should rise when the armature is lifted, and decrease to the original limited voltage reading when pressure is removed.

If the voltage does not rise, turn the headlights off and the parking lights on and repeat the test. Do not attempt to compare the voltage reading to the specification because the regulator cover must be in place for calibrated voltage readings.

FIELD RELAY ADJUSTMENT – MECHANICAL REGULATOR

Testing and adjusting the field relay is not a part of the normal service procedure. This information is presented so that an approved procedure is available if required.

CORE GAP

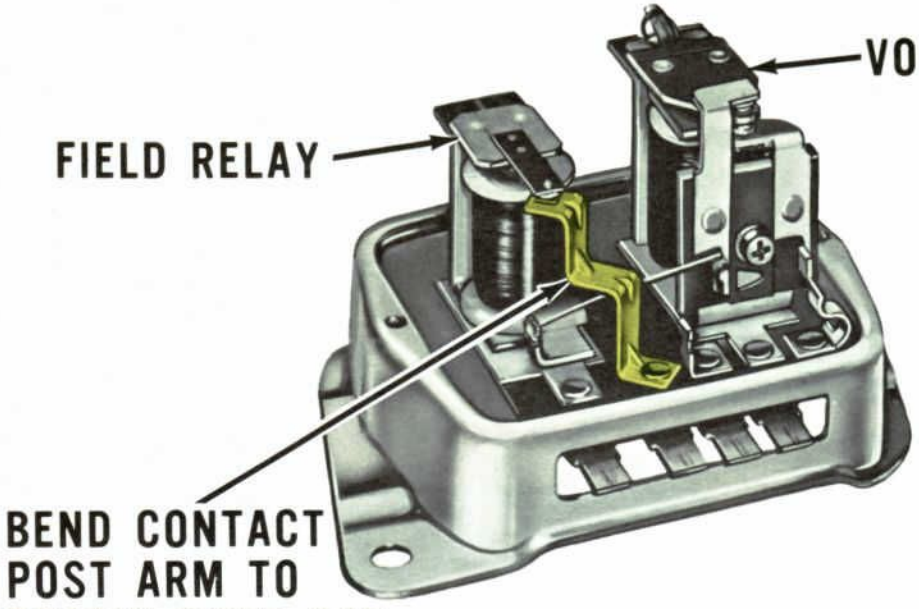
1. Apply light pressure to the armature when adjusting the core gap. Do not push down on the contact spring arm.

2. Place a feeler gauge on top of the coil core and adjust the gap to 0.010-0.018-inch when the contacts just touch.

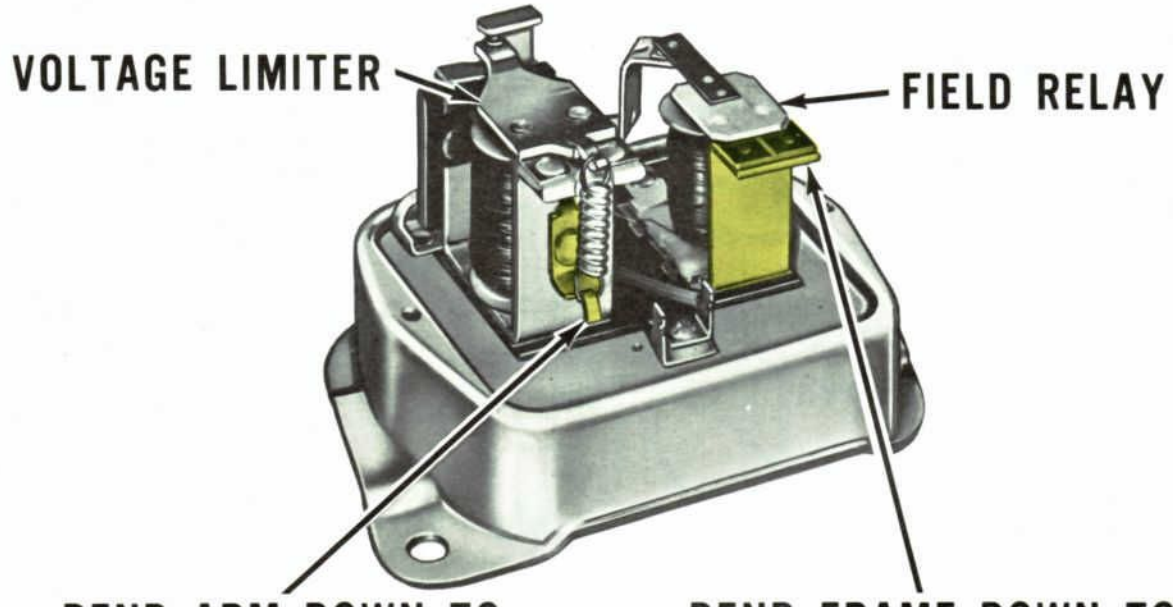
3. Bend the contact post to obtain the correct gap.

CONTACT GAP

Not adjustable, but varies with the closing voltage setting.



GAP ADJUSTMENTS



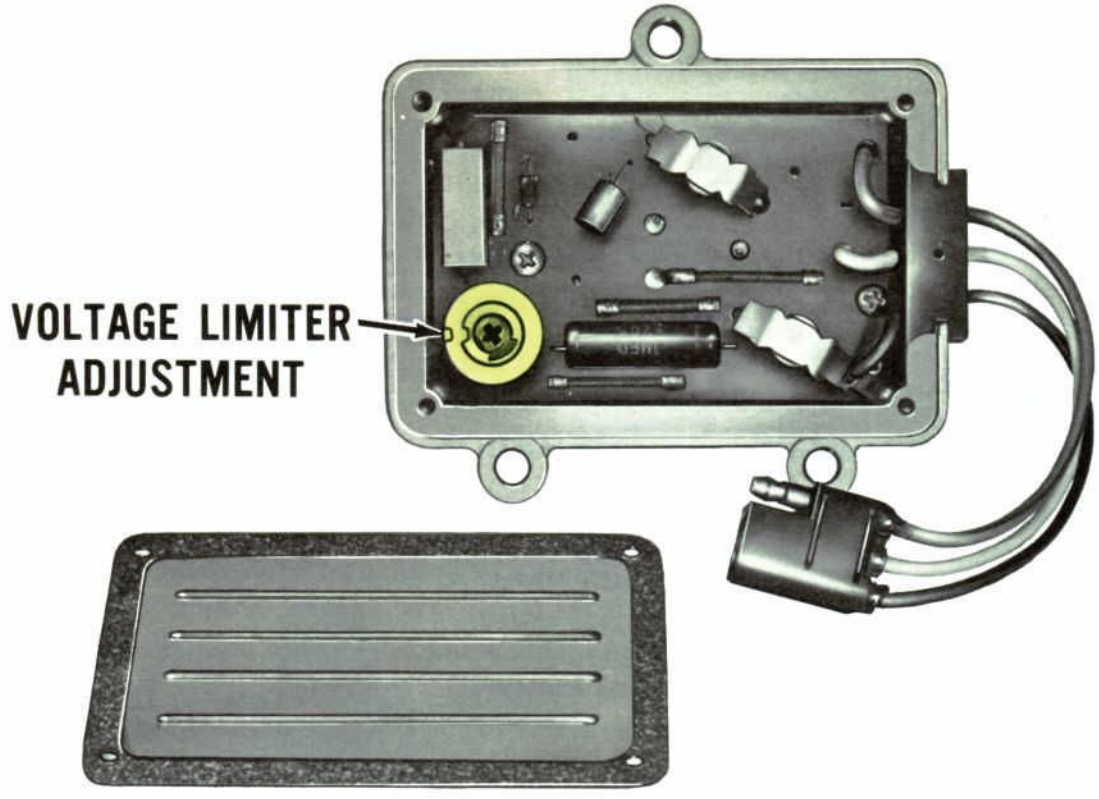
VOLTAGE ADJUSTMENTS

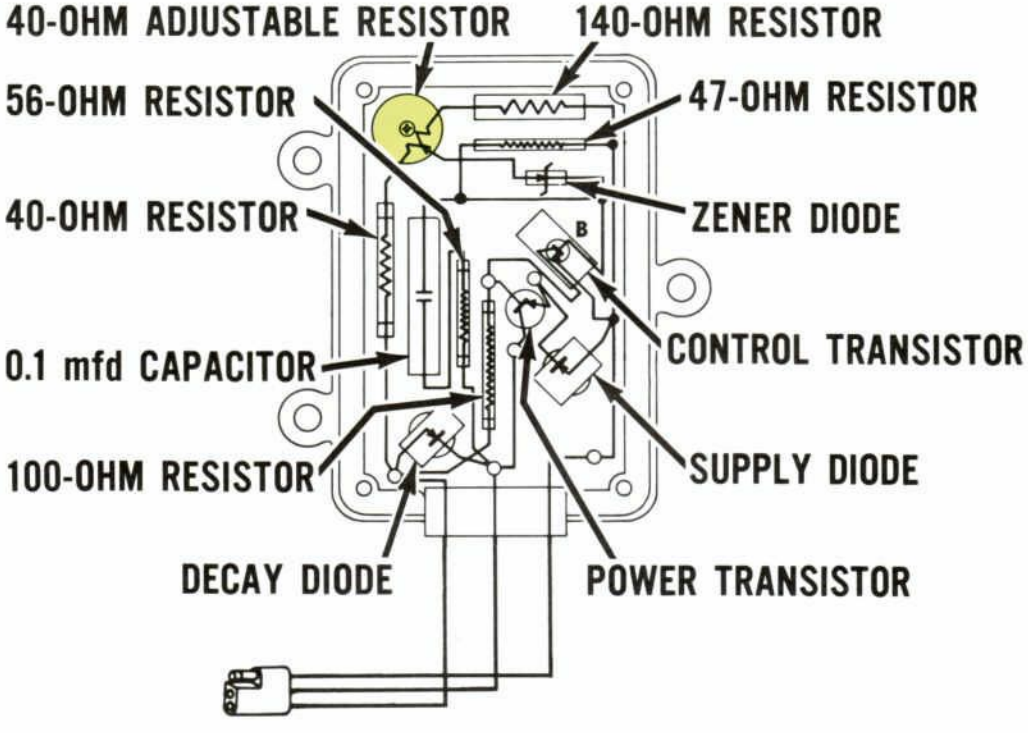
MECHANICAL REGULATOR

TRANSISTORIZED REGULATOR ADJUSTMENT

The only adjustment on the alternator transistorized regulator is the voltage limiter adjustment. The regulator voltage limitation is adjusted by varying the 40-ohm resistor. This performs the same function as adjusting the voltage limiter armature spring tension on a mechanical regulator.

Adjustment of the transistorized regulator must be made with the regulator at normal operating temperature. Remove the regulator mounting screws and remove the bottom cover. The voltage limitation can be adjusted up-or-down by turning the screw. There is an approximate 280° adjustment from stop-to-stop.





TRANSISTORIZED REGULATOR ADJUSTMENT

ALTERNATOR REMOVAL AND INSTALLATION

A circuit breaker (cutout relay) is not used; therefore, the BAT terminal of the alternator is hot at all times. Grounding the BAT terminal or the lead wire will result in a wire harness burn-out or damage to the alternator. **The battery ground cable must always be disconnected before removing the alternator.**

1. Disconnect the battery ground cable.
2. Loosen the alternator mounting bolt and remove the adjusting arm to alternator bolt. Disconnect the alternator wiring harness retaining clip, if required.
3. Disengage the alternator belt. Remove the alternator mounting bolt and spacer. Lift the alternator to the fender apron area and disconnect the wires from the alternator.
4. To install the Autolite alternator, connect the wires to the alternator as follows:

   GRD. terminal — Black-Red wire.

   STA. terminal — White-Black wire.

   FLD. terminal — White wire.

   BAT. terminal — Black-Yellow wire or a Black wire.

5. Position the alternator on the engine, and install the spacer and alternator mounting bolt finger-tight.
6. Install the adjusting arm to the alternator bolt.
7. Adjust the belt tension, using tool T63L-8620-A. **Apply pressure on the alternator front housing only, when tightening the belt.** Tighten the adjusting arm bolts and the mounting bolt.
8. Position the wiring harness retaining clip, if required, and connect the battery ground cable.

OBSERVE THE FOLLOWING PRECAUTIONS:

- Never connect the battery ground cable until all wiring harness connections to the alternator have been made and are properly tightened.
- When adjusting the drive belt tension (using tool T36L-8620-A), always place the pry bar against the rear of the front housing. Never pry against the stator (steel center) section of the alternator.
- Never attempt to polarize the alternator. The alternator is polarized every time the ignition switch is turned to the ON position. Attempting to polarize the alternator will damage the voltage regulator and wiring harness.
- Do not ground the field circuit at the alternator or regulator as the regulator will be damaged.

ALTERNATOR
IN VEHICLE

ALTERNATOR
FRONT VIEW

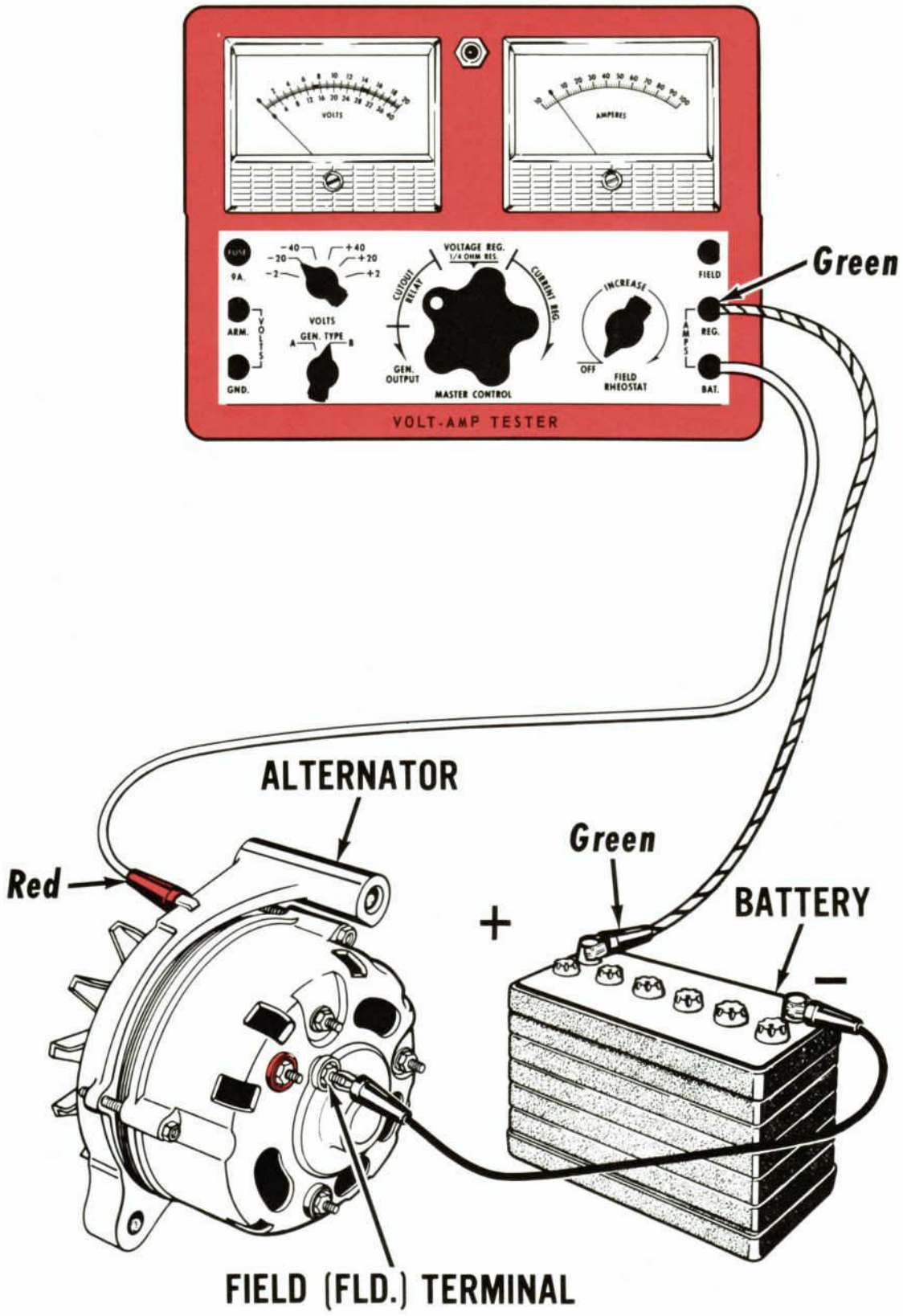
ALTERNATOR
REAR VIEW

FIELD OPEN OR SHORT CIRCUIT TEST

Before disassembling the alternator, perform a field open or short circuit test. This simple test will provide the additional information needed to properly locate a defective component. Make the connections as shown. The current draw, as indicated by the ammeter should be to specifications.

If there is little or no current flow, the field or brushes have a high resistance or are open. A current flow considerably higher than that specified indicates shorted or grounded turns or brush leads touching. If the test shows that the field is shorted or open and the field brush assembly or slip rings are not at fault, the entire rotor must be replaced.

If the alternator has output at low rpm and no output at high rpm, centrifugal force may be causing the rotor windings to short to ground. Put the alternator on a test stand and repeat the preceding test. Run the alternator at high speed during the test.



FIELD OPEN OR SHORT CIRCUIT TEST

OVERHAUL

DISASSEMBLY

1. Mark both end housings and the stator so that they can be assembled in the same position. On the 65-amp alternator, remove the brush holder and cover from the rear housing.

2. Remove the three housing through bolts.

3. Separate the front end housing and rotor from the stator and rear end housing.

4. Remove all the nuts and washers from the rear end housing and remove the rear end housing from the stator and diode plate assembly. The slip-ring brush springs may bound out of their openings.

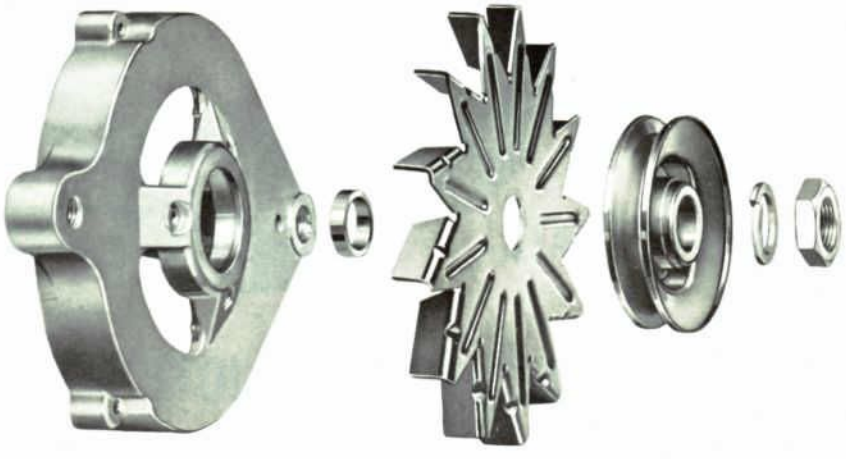
5. Remove the alternator drive pulley nut, using tool T65P-10300-B. Then slide the pulley, fan, fan spacer, rotor and bearing spacer from the front end housing.

REAR HOUSING DETACHED FROM FRONT HOUSING

Tool—T65P-10300-B

PULLEY REMOVAL

HOUSING, FAN AND PULLEY



OVERHAUL – Continued

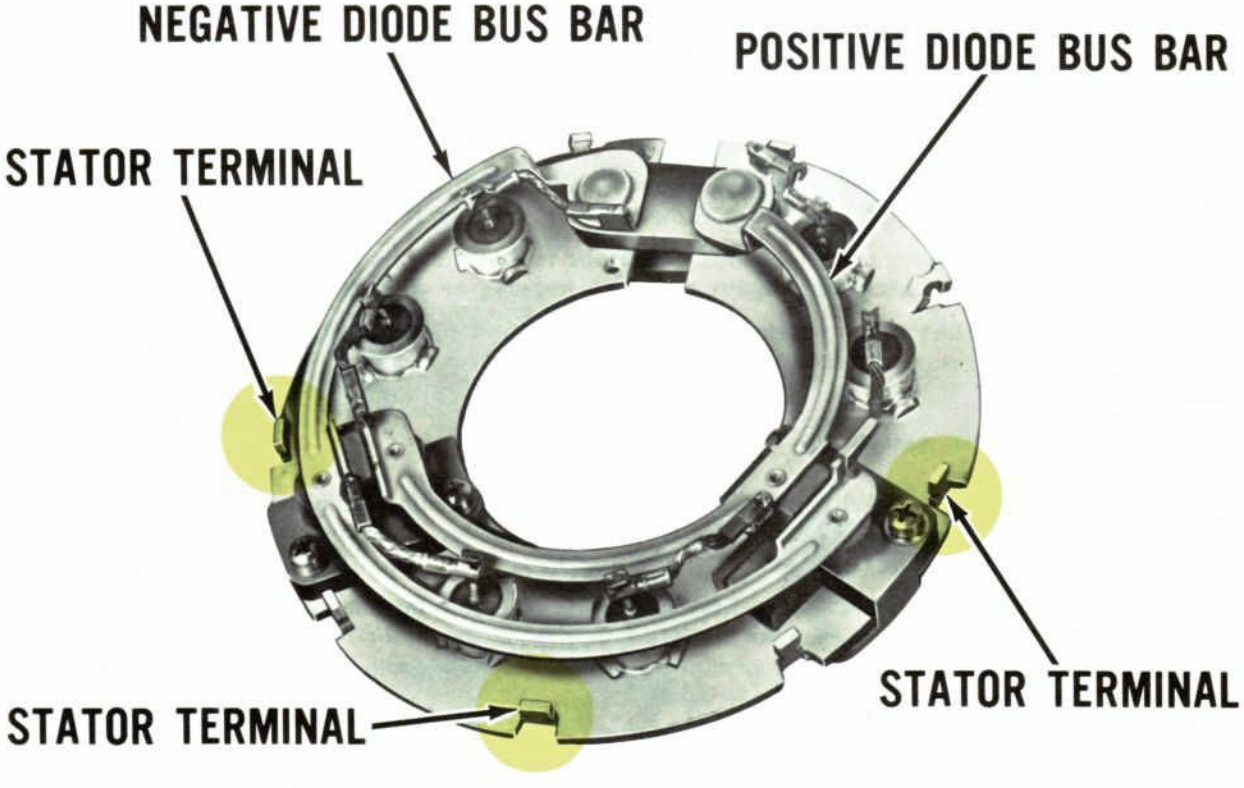
RECTIFIER ASSEMBLY REPLACEMENT

1. If rectifier assembly is being replaced, carefully unsolder the stator leads from the rectifier terminals, disconnect the stator neutral lead terminal lug and screw, if so equipped and separate the stator from the rectifier assembly. Use a 100-watt soldering iron except on the 65-amp unit which requires a 200-watt soldering iron. Leave the soldering iron in contact with the terminals only long enough to remove the wires. Excess heat can damage the printed-circuit board and/or diodes.

2. On all except the 65-amp alternator, press the insulated STA terminal bolt from the assembly, if so equipped, the terminal lug and stator wires can be left attached to the bolt. Attach the STA insulated terminal bolt to the new rectifier assembly.

3. Solder the three stator winding leads to the rectifier terminals. Use a 100-watt soldering iron and rosin-core solder (200-watt soldering iron for the 65-amp alternator).

STATOR AND DIODE ASSEMBLY (EXCEPT 65-AMP AUTOLITE)



65-AMP AUTOLITE RECTIFIER

RECTIFIER ASSEMBLY

OVERHAUL – Continued

DIODE TESTS – WITH ROTUNDA OHMMETER

This test is made with the rectifier assembly removed from the alternator and disconnected from the stator. Each individual diode is tested with this method. The connection and circuits through the stator need not be considered.

AUTOLITE RECTIFIER – EXCEPT 65-AMP UNIT

1. Set the ohmmeter on the Multiply by 10 Scale, touch the two probes together and adjust the meter pointed to the Set Line.

2. Connect one of the ohmmeter test probes to the diode mounting plate of the rectifier. With the other test probe, touch each of the three stator lead terminals of the printed-circuit board. Note the ohms registered. Gently push and wiggle the test probe to be sure of a good electrical connection.

3. Reverse the test probe positions in Step 2 and repeat the test.

4. A good diode has a high resistance in one direction and a low resistance in the opposite direction.

A shorted diode has low resistance in both directions. An open diode has high resistance in both directions.

5. Connect one of the ohmmeter test probes to the other diode mounting plate of the rectifier and continue the test at each of the three stator lead terminals.

AUTOLITE RECTIFIER – 65-AMP UNIT

1. To test the positive diodes contact one probe to the inner bus bar and contact each of the three stator terminals with the other probe. Reverse the probes and repeat the test.

2. To test the negative diodes contact one probe to the outer bus bar and contact each of the three stator terminals with the other probe. Again, repeat the test after reversing the probes.

3. A good diode has a high resistance in one direction and a low resistance in the opposite direction. A shorted diode has a low resistance in both directions. An open diode has high resistance in both directions.

DIODE TESTS – WITH AMMETER

Several diode testers are available which permit diode testing without disconnecting stator lead wires. The following procedure is based on the use of a tester of this type. Specific instructions provided by the tester manufacturer should be followed.

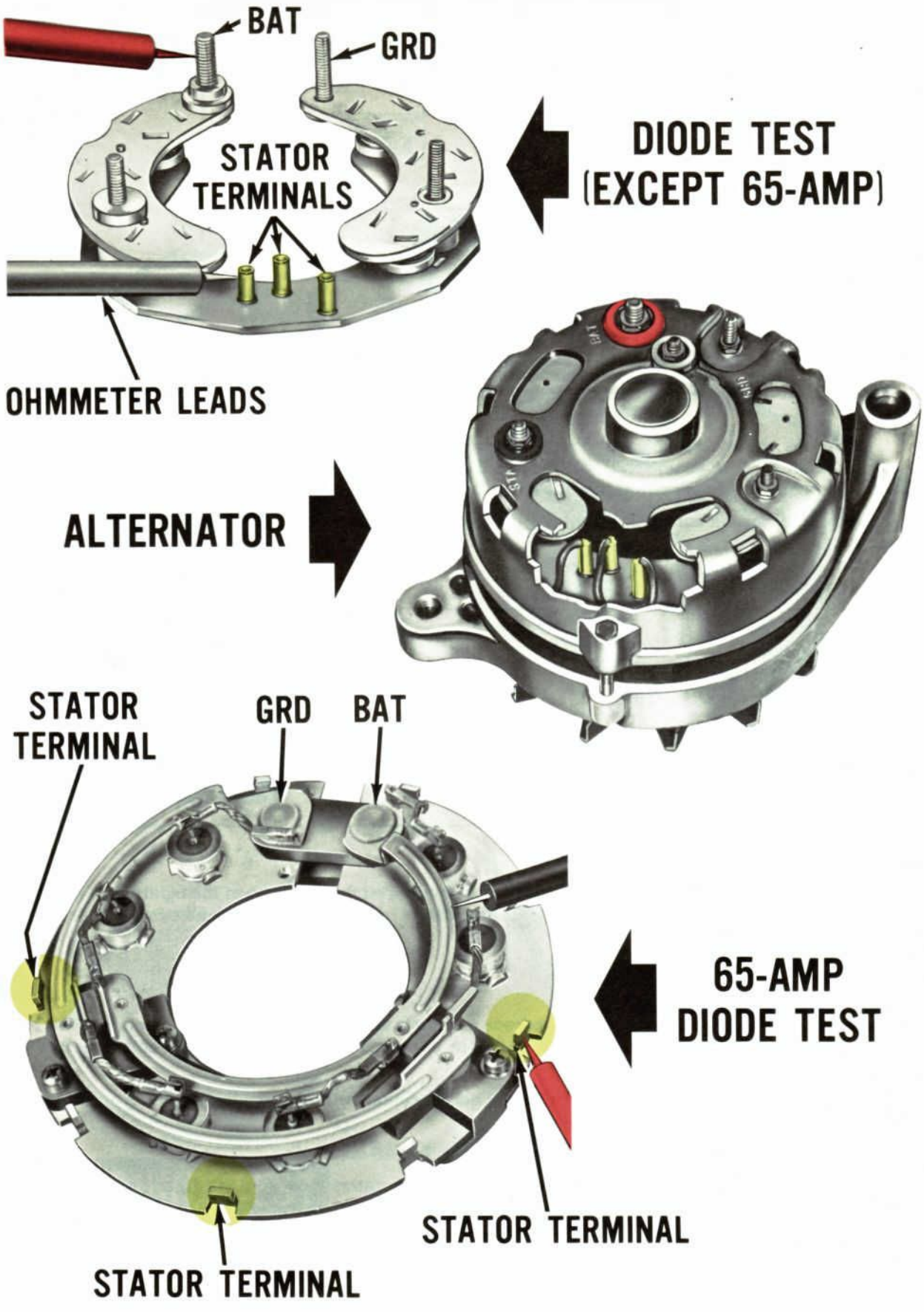
To make a test of the positive diodes, first attach the clip lead to the alternator output terminal (BAT). With the sharp end of the probe, make contact with each of the stator terminals on the printed-circuit board. Each terminal contacts a pair of diodes; one positive diode and one negative diode. Be sure that the probe makes good contact with each terminal.

Compare all three readings taken at the printed-circuit board stator terminals. If the meter reads two amperes or more, the diodes are good. They should also read within two scale points of each other.

A low reading willl usually indicate a faulty soldered connection at one of the diode terminals.

If the readings are not satisfactory, the printed-circuit board or rectifier assembly must be replaced. Check each new rectifier diode before installing the assembly to the stator assembly. The good diode should read two amperes or more.

To check the negative diode assembly, attach the tester clip lead to the ground terminal (GRD) on the housing. With the probe, follow the same procedures as for the positive diodes.


BAT
GRD
STATOR TERMINALS
DIODE TEST (EXCEPT 65-AMP)
OHMMETER LEADS
ALTERNATOR
STATOR TERMINAL
GRD
BAT
65-AMP DIODE TEST
STATOR TERMINAL
STATOR TERMINAL

OVERHAUL – Continued

STATOR TESTS

Stator Coil Test

The purpose of this test is to locate shorted coils and faulty neutral junction splices.

Replace a stator having discolored or burned coils. Insulation enamel will flake off badly burned coils.

1. With the stator assembly disconnected from the rectifier assembly, connect the tester as shown to a 12-volt battery. The ammeter BAT (red) lead and the field rheostat control lead are not used in this test. This hookup places the carbon pile in series with the ammeter.

2. Adjust the master control (current reg.) to produce a 20 amperes of current flow and read the voltmeter.

AUTOLITE ALTERNATOR SIZE	TEST CURRENT (AMPS)	MAXIMUM VOLTAGE DIFFERENCE BETWEEN COILS
55, 60 and 65	20	0.5
42 and 45	20	0.6
38	20	0.7

3. If the voltage is too high, check the splice and repair. Test the stator when the repairs are complete. If voltage is still too high, replace the stator. If the voltage is too low, a section of the coil is shorted and the stator must be replaced.

Ground Test

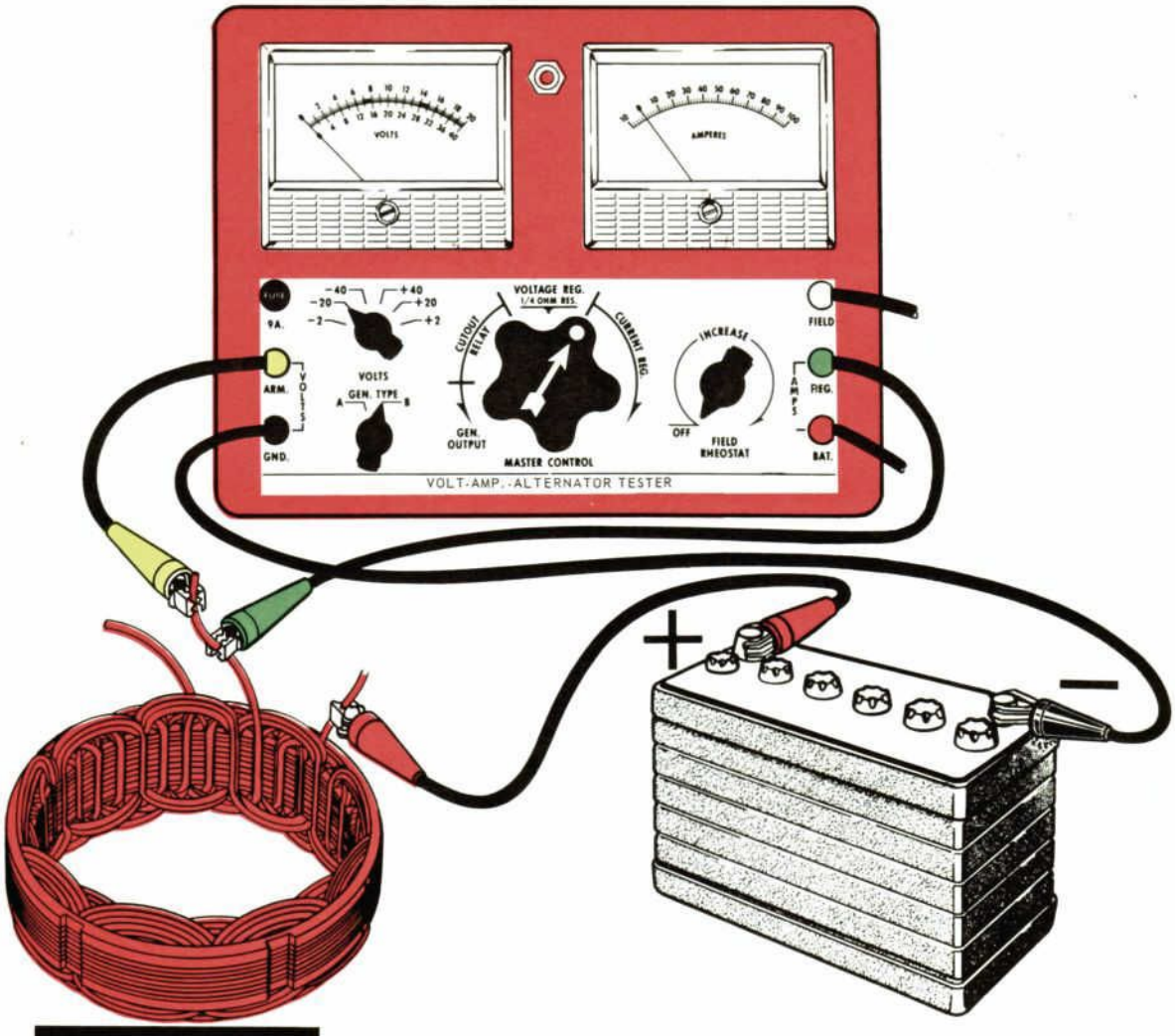
The stator must be disconnected from the diode and plate assemblies when this test is made. (The 120-volt power supply will burn out the diodes). Faulty or damaged insulation between the coil wires and the stator core can cause grounded stator coils.

Always use care to avoid electrical shock from bodily contact with the test probes during use. Remove the tester plug from the outlet when not in use.

1. Insert the plug into a 115-volt A.C. outlet. Use a 7 to 15-watt bulb.

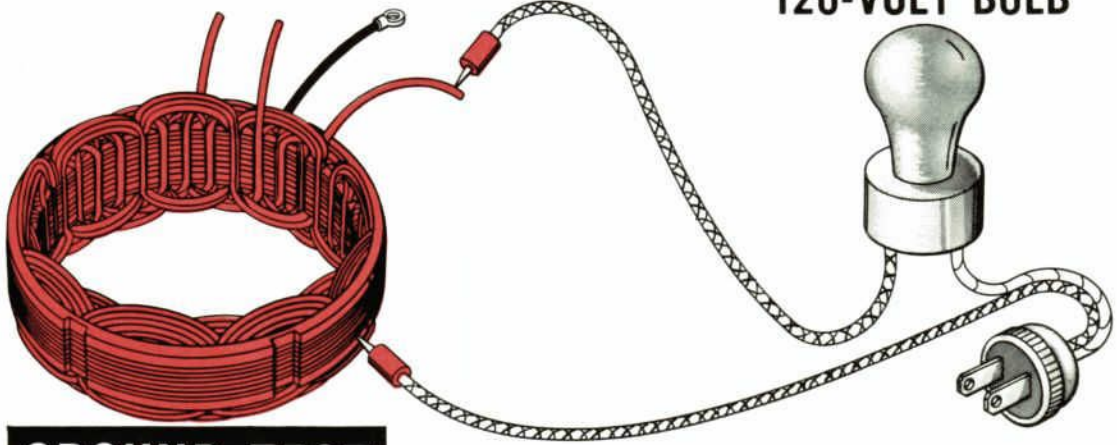
2. Touch one test probe to a bare metal surface of the stator core, and the other probe to a bare stator lead wire. The test lamp should not light.

3. Replace the stator assembly if even the slightest glow is seen in the test lamp.



COIL TEST

USE 7 TO 15-WATT, 120-VOLT BULB



GROUND TEST

STATOR TESTS

OVERHAUL — Continued

ROTOR TESTS

Nicks and scratches may be removed from the rotor slip-rings by turning down the slip-rings. Do not go beyond the minimum diameter limit of 1.22 inches. If the slip-rings are badly damaged, the entire rotor must be replaced as it is serviced as an assembly.

Rotor Coil Test

Insulation will flake off a badly burned rotor coil. Replace a rotor having a discolored or burned coil.

Do not attempt to measure coil resistance through the brushes of an assembled alternator. The brushes add resistance to the circuit causing erroneous readings.

1. Use either an ohmmeter or an ammeter to check rotor coil resistance. A fully charged 12-volt battery must be used. Ammeter readings could vary from the values given in the chart if the battery voltage is not precisely 12 volts.
2. Inspect the soldered connection at the slip-ring terminals. Repair, if necessary, and check the coil.
3. Replace the rotor assembly if the coil fails the prescribed test.

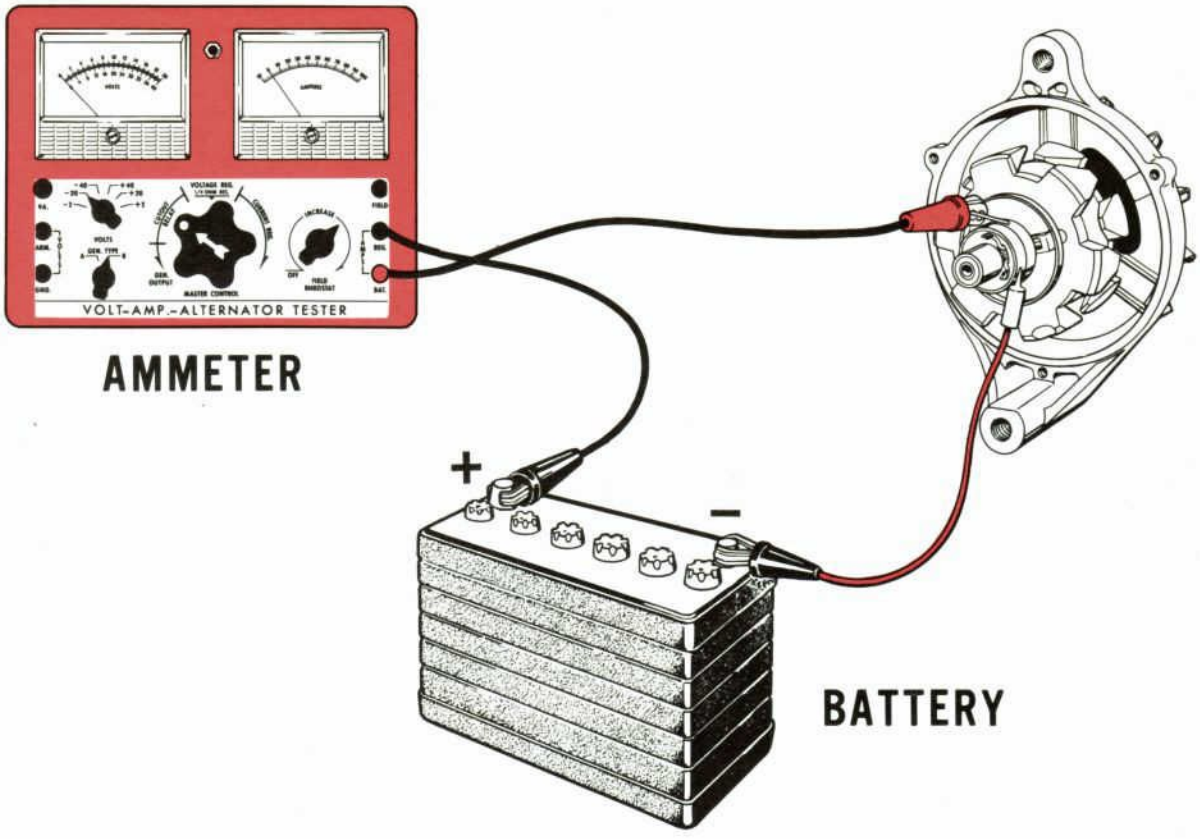
Rotor Ground Test

Grounded rotor coils are caused by defective coil or lead wire insulation which allows wire contact to some metal part of the rotor. Damaged regulator voltage limiter contacts usually result from the increased field current flow.

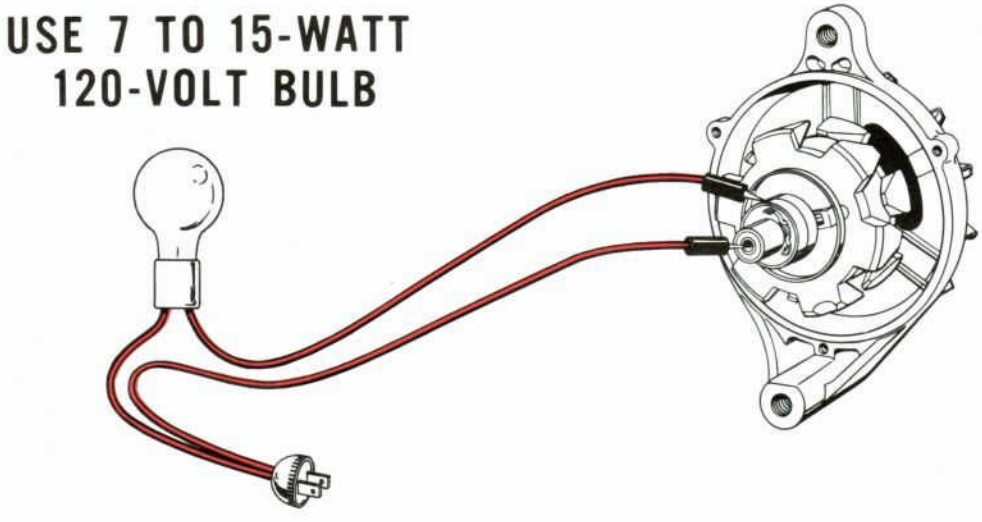
A relatively high voltage is used in this test to detect slight leakage before actual failure occurs. Use care to avoid electrical shock from bodily contact with the test prods during use. Remove the plug from the outlet when the tester is not in use.

1. Insert plug into a 115-volt A.C. outlet. Use a 7 to 15-watt bulb.
2. Touch one test prod to a bare metal surface of the rotor shaft, and the other to the slip-rings. The test lamp should not light.
3. Replace the rotor assembly if even the slightest glow is seen in the test lamp.

ALTERNATOR SIZE — AMPERES	ROTOR	
	CURRENT — AMPERES	RESISTANCE — OHMS
38	2.5	4.9
42, 45, 55, 65	2.9	4.2
60	4.6	2.6



ROTOR COIL TEST



ROTOR COIL-TO-GROUND TEST

ROTOR TESTS

OVERHAUL – Continued

BRUSH RETAINER (EXCEPT 65-AMP ALTERNATOR)

1. Remove the two brush retainer mounting screws and remove the retainer brushes, brush springs, insulator and FLD terminal.

2. If replacement of the rear bearing is necessary, replace the bearing before installing the brush retainer assembly.

3. Check the brushes for chipped edges, frayed or stiff pig-tail lead wires and proper retention in the brush holder arm. Check brush holder arms for freedom of movement and for spring tension. Examine spring for damage or distortion.

4. Place the brush springs, brushes, brush terminal and terminal insulator in the brush holder and hold the brushes in position by inserting a piece of stiff wire in the brush holder.

5. Position the brush holder assembly in the rear end housing. The stiff wire should go through the hole provided in the housing. Install the mounting screws. The inside brush lead terminal should be placed under the left mounting screw. Position the brush leads in the brush holder opening.

BRUSH RETAINER – 65-AMP ALTERNATOR

Brush Replacement

1. Remove the three screws retaining the FLD cover which contains the brush assembly. Slide the assembly out from the rear housing.

2. Unsolder the brush lead and pull the brush from the retainer.

3. Insert the replacement brush into the retainer with the pointed leading edge toward the end of the brush retainer. Solder the brush lead in place.

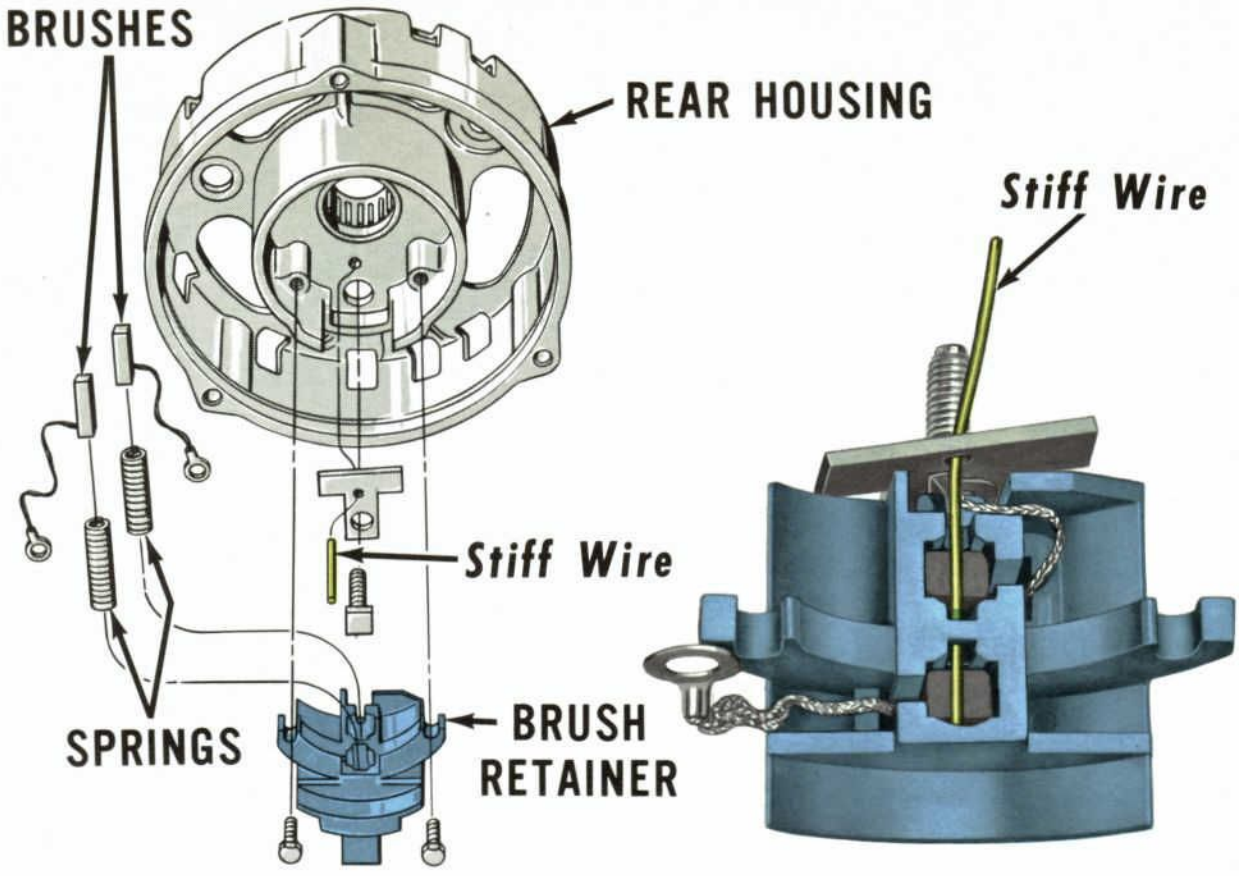
4. Place the brush assembly into the housing and install the mounting screws.

Brush, Brush Retainer and Spring Replacement

1. Remove the brush assembly and unsolder the brush leads from the FLD terminal and the bottom plate. Pry open the two tabs on the bottom plate and slide the bottom plate, brushes, brush retainers, springs and brush pivot shaft from the brush mounting plate.

2. Position the brush pivot shaft and spring into the slot in the brush mounting plate. Be sure the spring hooks are toward the bottom. Slide the bottom plate into position so that the springs hook onto the bottom plate lugs. Bend the two tabs on the bottom plate over the brush mounting plate. Insert the ground brush lead under the tab on the bottom plate and solder it in place. Solder the field brush lead to the FLD terminal.

3. Install the brush assembly.



AUTOLITE BRUSH ASSEMBLY–EXCEPT 65-AMP

AUTOLITE 65-AMP BRUSH ASSEMBLY

OVERHAUL – Continued

BEARING REPLACEMENT

The bearings will be damaged when removed; therefore, remove only the bearings you intend to replace. Bearings should be inspected for damaged seals, rough spots when turned, or excessive play.

Front Bearing Replacement

1. Remove the three screws that hold the front bearing retainer.

2. Support the front housing bearing inner boss with a 2-inch I.D. pipe (2-3/4" for the 65-amp model) and press inward on the bearing with 1-inch bar stock. (1-1/2" for the 65-amp model)

3. Inspect the front housing for cracks, particularly near the threaded mounting ear, at the ribs which support the mounting boss, and at the struts which support the bearing pocket.

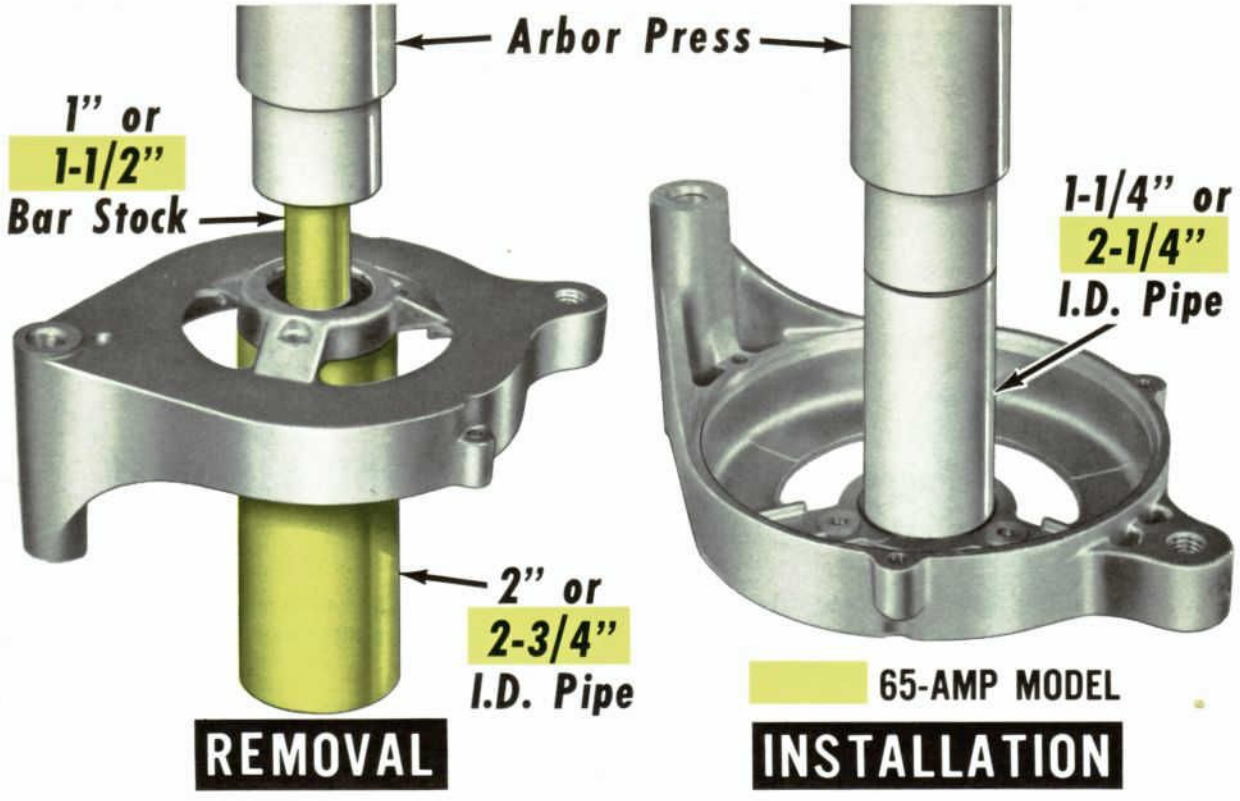
4. Press the front bearing on the outer race with a 1-1/4-inch I.D. pipe (2-1/4" for the 65-amp model) and install the bearing retainer and screws.

Rear Bearing Replacement

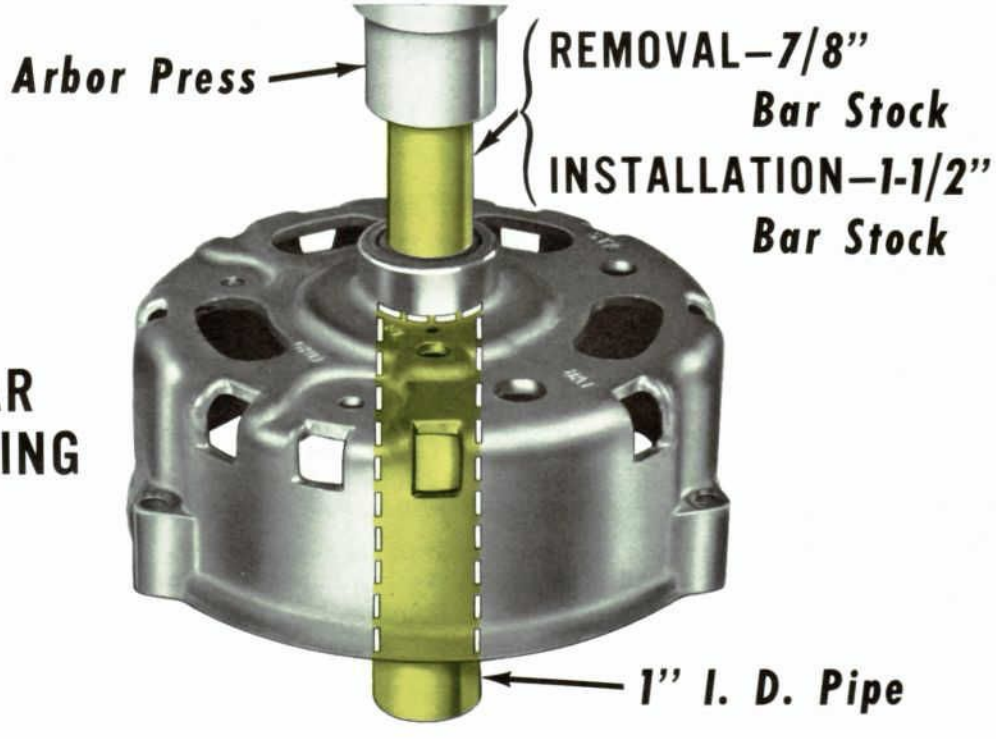
1. Press the rear bearing from the housing using 7/8-inch bar stock supporting the housing inner boss with 1-inch I.D. pipe.

2. Inspect the rear bearing for contamination of the grease by abrasive substances. Do not add grease to the bearing; replace the bearing when grease is lost or contaminated. Examine the rear bearing surface of the rotor shaft for roughness.

3. Support the housing on the inner boss with 1-inch I.D. pipe and press the bearing into the housing with 1-1/2-inch bar stock until the bearing is flush with the outer end surface.



FRONT BEARING



REAR BEARING

BEARING REPLACEMENT

OVERHAUL – Continued

ASSEMBLY (EXCEPT 65-AMP AUTOLITE)

1. If the stop-ring on the rotor drive shaft was damaged, install a new stop-ring. Push the new ring on the shaft and into the groove. **Do not open the ring with snap ring pliers as permanent damage will result.**

2. Position the front end bearing spacer on the drive shaft with the recessed side against the stop-ring.

3. Position the drive end housing, fan spacer, fan, pulley and lock washer on the rotor drive shaft and install the retaining nut to 60-100 ft-lbs torque.

4. Install the STA and BAT terminal insulators. Position the stator and diode plate assembly in the rear end housing. Position the STA (black), BAT (red), and FLD (white) insulators, on the terminal bolts, and install five retaining nuts.

5. Wipe the rear end bearing surface of the rotor shaft with a clean lint-free rag.

6. Position the rear end housing and stator assembly over the rotor and align the scribe marks made during disassembly. Seat the machined portion of the stator core into the step in both end housings. Install the housing through bolts. Remove the brush retracting rod, and put a daub of waterproof cement over the hole to seal it.

SUMMARY OF ALTERNATOR SERVICING PRECAUTIONS

Several servicing procedures can cause diode damage or complete failure if carried out improperly.

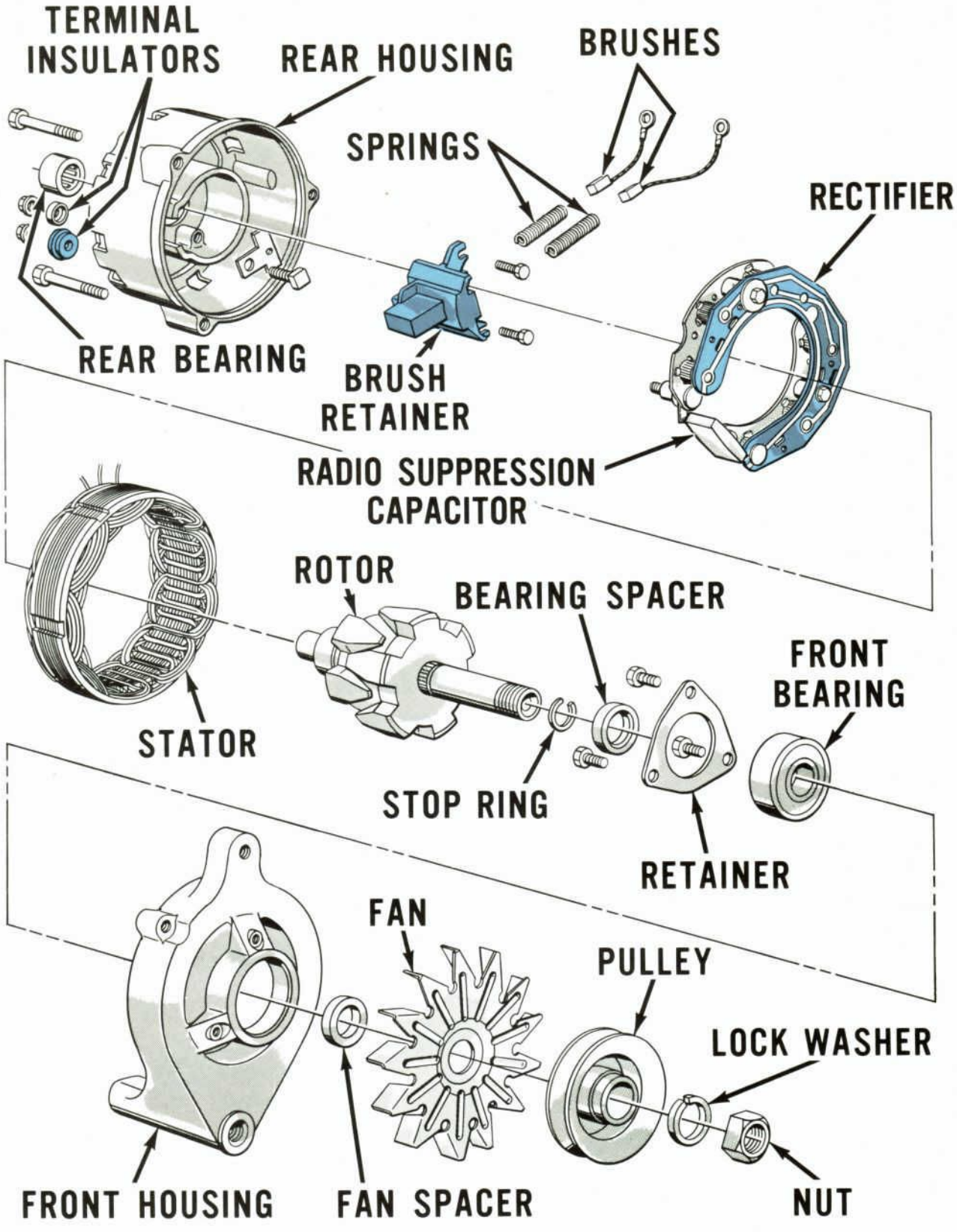
1. Observe polarity when installing a battery in the vehicle. Reversed battery cable connections or installation of a battery which has been charged backwards will burn out diodes. Use a voltmeter to determine battery terminal post polarity before connecting the cables. The ground cable must be connected to the negative battery terminal post.

2. Observe polarity when a booster battery is used to start the engine. Connect negative to negative and positive to positive.

3. Disconnect the ground cable at the battery before connecting a charger to the battery.

4. Never operate the alternator on open circuit with the rotor (field) coil energized. Very high voltage will be developed which can burn the rotor coil or possibly damage the diodes.

5. Do not use a 115-volt test lamp to check diodes. The diodes are not rated to withstand such high voltage.



AUTOLITE ALTERNATOR
EXCEPT 65-AMP MODEL


QUALITY
CAR CARE