DELCO-REMY WITH INTEGRAL REGULATOR

American Motors
Most Models
General Motors
All Models

DESCRIPTION

The Delcotron 10 SI alternator with integral regulator is used on all American Motors models except the Eagle equipped with heated rear window and fog lights. It is available with rated outputs of 42 and 55 amps. On General Motors vehicles, 10 SI, 15 SI, and 27 SI alternators are used. The 10 SI alternator is available with different idle outputs and maximum outputs of 37, 42, 55, 61, and 63 amps. See *Fig. 1*. The 15 SI alternator offers a maximum output of 70 amps., while the 27 SI alternators offer maximum outputs of 80 and 100 amps. See *Fig. 2*.

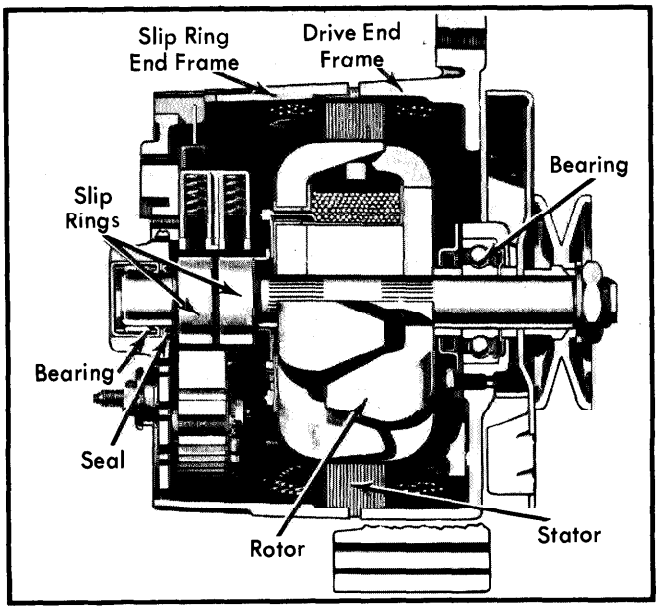


Fig. 1 Cutaway View Showing Internal Components of Delcotron 10 SI Alternator With Integral Regulator

All models feature a solid state regulator mounted inside the alternator, providing electrical system protection, eliminating needless wiring, saving space and preventing misconnection of terminals.

The construction and operation of all models is basically the same. Delcotrons consist primarily of 2 end assemblies, rotor, stator, brushes, slip rings and diodes. The rotor is supported in the drive end frame by ball bearings and in the slip ring end frame by roller bearings. Bearings contain enough lubricant to eliminate need for periodic lubrication.

OPERATION

Two brushes carry current through the slip rings to the field coil mounted on the rotor. The stator windings are assembled on the inside of a laminated core that forms part of the alternator frame. A rectifier bridge connected to the stator windings contains 6 diodes (three positive and three negative) molded into

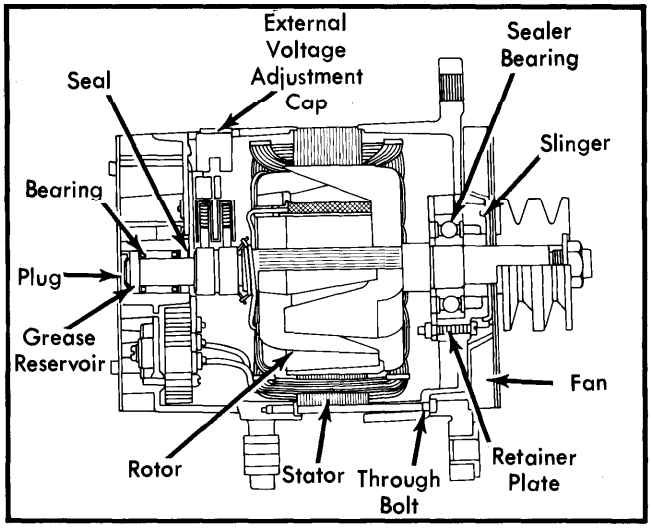


Fig. 2 Cutaway View Showing Internal Components of Delcotron 100 Amp. Heavy-Duty Alternator With Integral Regulator

an assembly. This rectifier bridge changes stator A.C. voltage into D.C. voltage, which appears at the output "BAT" terminal. Blocking action of the diodes prevents battery discharge back through the alternator. Because of this blocking action, need for a cutout relay is eliminated. Alternator field current is supplied through a diode trio, which is also connected to the stator windings. A capacitor is mounted in the end frame and protects the rectifier bridge and diodes from high voltage and suppresses radio noise.

ADJUSTMENTS

No periodic adjustment or maintenance is required on alternator assembly. Regulator voltage is preset and no adjustment is provided, except on 100 amp. heavy-duty alternators used by Cadillac.

NOTE – *Adjustment of 100 amp. alternators is accomplished by repositioning an external voltage adjustment cap in the slip ring end frame. For instructions, see UNDERCHARGED BATTERY (HEAVY-DUTY ALTERNATOR).*

CAUTION – *Do not attempt to polarize alternator. Do not short or ground any terminals except as instructed. Never operate alternator with battery out of circuit or output terminal open. Alternator and battery must share same ground polarity.*

TESTING

NOTE – *Before making electrical checks, visually inspect all terminals for clean and tight connections. Check alternator mounting bolts and drive belt tension. Do not ground No. 2 lead wire. Battery must be in good condition to test charging system.*

UNDERCHARGED BATTERY (REGULAR ALTERNATOR)

1) With ignition switch at "ON" position, connect a voltmeter from alternator "BAT" terminal to ground. See *Fig. 3*. Then

DELCO-REMY WITH INTEGRAL REGULATOR (Cont.)

connect voltmeter from No. 1 terminal to ground and then No. 2 terminal to ground. A zero reading indicates an open between connection and battery.

2) Alternators have a built-in feature, that avoids overcharging or accessory damage by preventing alternator from turning on if there is an open in wiring harness connected to No. 2 alternator terminal. Opens in wiring harness connected between No. 2 terminal and battery may be between terminals, at crimp between harness wire and terminal, or in the wire.

NOTE – *If preceding test is satisfactory, continue to next step.*

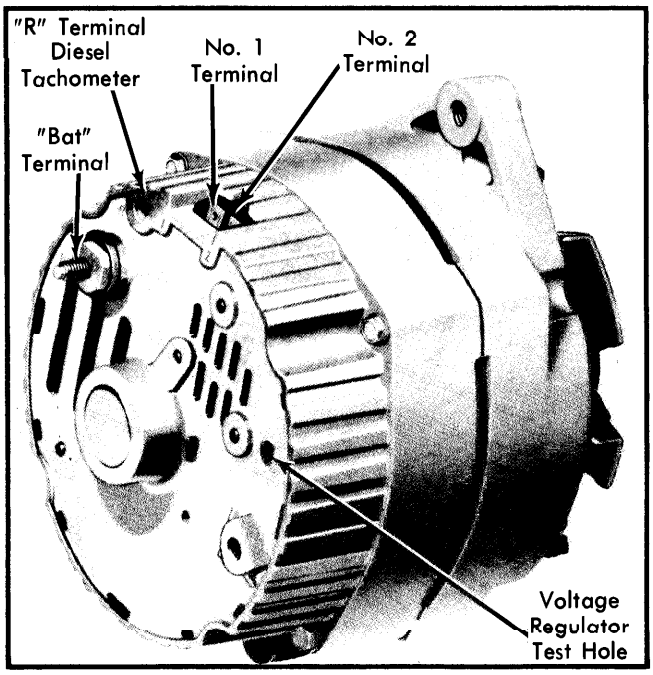


Fig. 3 Identification of Delcotron Terminal Locations (10 SI Alternator Shown)

3) Disconnect battery ground cable. Connect an ammeter in series at "BAT" terminal of alternator. See *Fig. 5*. Reconnect battery ground cable. Turn on all available accessories. Connect a carbon pile across battery. Operate engine at moderate speed and adjust carbon pile as necessary to obtain maximum current output.

4) If ampere output is within 10 amps. of rated output stamped on alternator case, alternator is good. If output is not within 10 amps. of rated output, ground field winding tab by inserting a screwdriver into end case test hole. See *Fig. 4*.

CAUTION – *Tab is within ¾" of casting surface. Do not force screwdriver deeper than 1" into end frame.*

5) Operate engine at moderate speed and again adjust carbon pile as required to obtain maximum current output. If output is within 10 amps. now, check field winding and test regulator with tester. If not within 10 amps. of rated output, check field winding, diode trio, rectifier bridge and stator.

NOTE – *If test hole is not accessible, disassemble alternator and test components.*

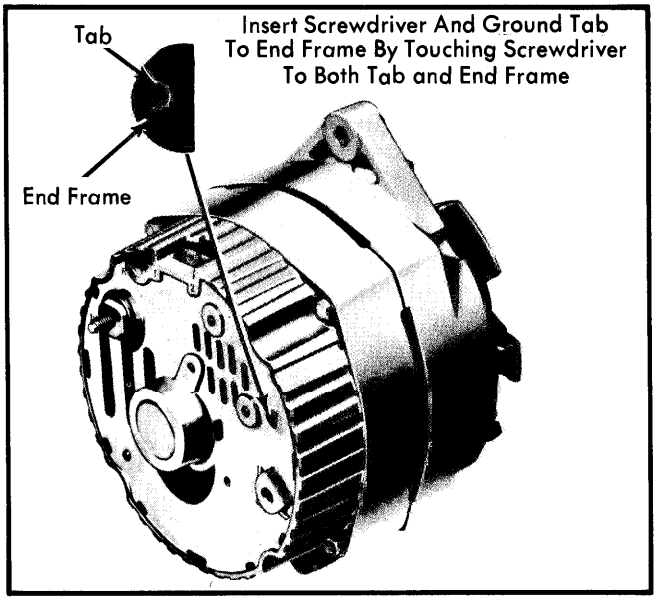


Fig. 4 View Showing Field Ground Tab Accessible Through Hole in End Frame

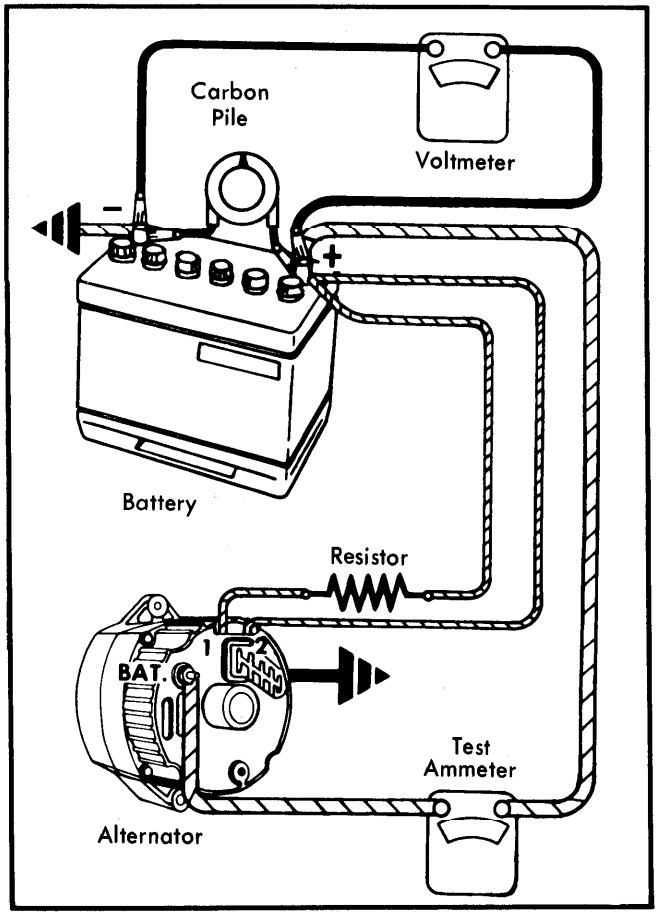


Fig. 5 Alternator Connections for Bench Testing and On-Car Check of Undercharged Battery

DELCO-REMY WITH INTEGRAL REGULATOR (Cont.)

UNDERCHARGED BATTERY (HEAVY-DUTY ALTERNATOR)

1) Connect a voltmeter from "BAT" terminal on integral charging system to ground. See *Fig. 6*. A zero reading indicates an open between voltmeter connection and battery. If fault is not due to an open, disconnect positive battery cable.

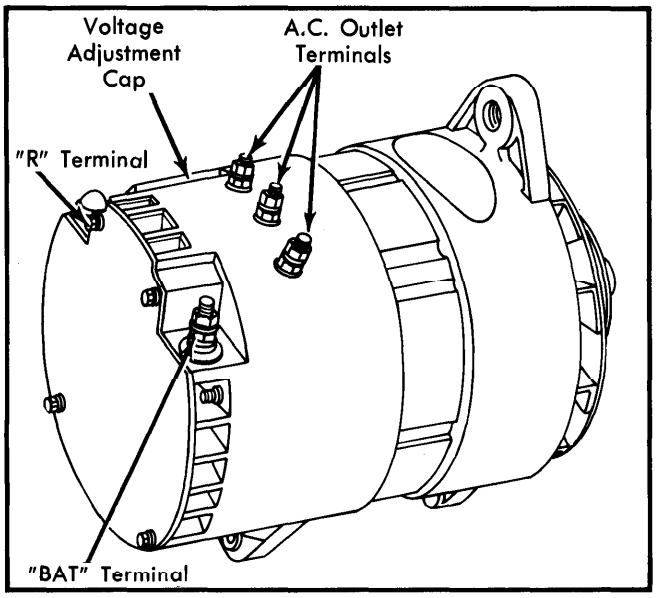


Fig. 6 Identification of Delcotron Terminal Locations (100 Amp. Heavy-Duty Alternator)

2) Install knife blade switch between battery positive post and battery cable terminal. Connect tester (AT-20) by setting ground polarity switch to negative position. Set load control to direct position. Connect "BAT" lead of ammeter to knife blade switch terminal stud and "REG" lead to positive battery cable on knife blade switch. Connect ammeter "GND" terminal to negative battery terminal.

3) On air conditioned vehicles, disconnect wire (18T) from blower motor. Close knife blade switch and start engine. Turn off all accessories and close vehicle doors.

NOTE – *Specifications are critical and given values must be adhered to.*

4) Open knife blade switch and raise engine speed to 750 RPM. Voltage should not be allowed to rise above 16 volts. Adjust load control for highest ammeter reading. Reading should be 95 amps. plus or minus 10 percent.

NOTE – *Do not let engine speed rise above 750 RPM, as alternator is capable of producing 145-150 amps. which would destroy the ammeter.*

5) If reading is 85-105 amps., generator is functioning normally. Adjusting voltage setting may correct undercharged condition. To adjust, remove voltage adjustment cap from slip ring end frame and turn it 90° and reinsert cap in connector body.

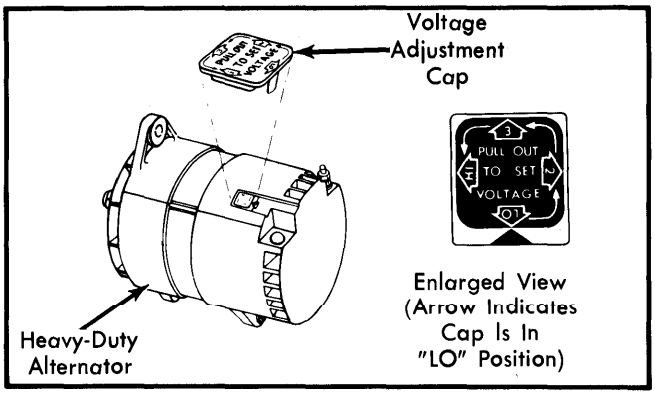


Fig. 7 Voltage Adjustment Cap for 100 Amp. Heavy-Duty Alternator

NOTE – *Cap is marked on 4 edges "LO", "2", "3" and "HI" positions. After adjusting cap position, check battery condition a week later to see if undercharged condition still exists. If so, reposition cap to next higher position and recheck in another week. See Fig. 7.*

OVERCHARGED BATTERY (REGULAR ALTERNATORS)

Connect a voltmeter from alternator No. 2 terminal to ground. If reading is zero, No. 2 lead circuit is open. If battery and No. 2 lead circuit check good, but overcharge exists, overhaul alternator, checking field windings for grounds and shorts. If defective, replace rotor and test regulator.

OVERCHARGED BATTERY (HEAVY-DUTY ALTERNATOR)

NOTE – *Remember, an overheated battery will be overcharged even though charging circuit defects are not present.*

1) Connect a voltmeter between integral charging system "BAT" terminal and ground. Turn off all accessories, increase engine speed as required to obtain maximum voltage reading. If voltage exceeds 15 volts, remove alternator and overhaul.

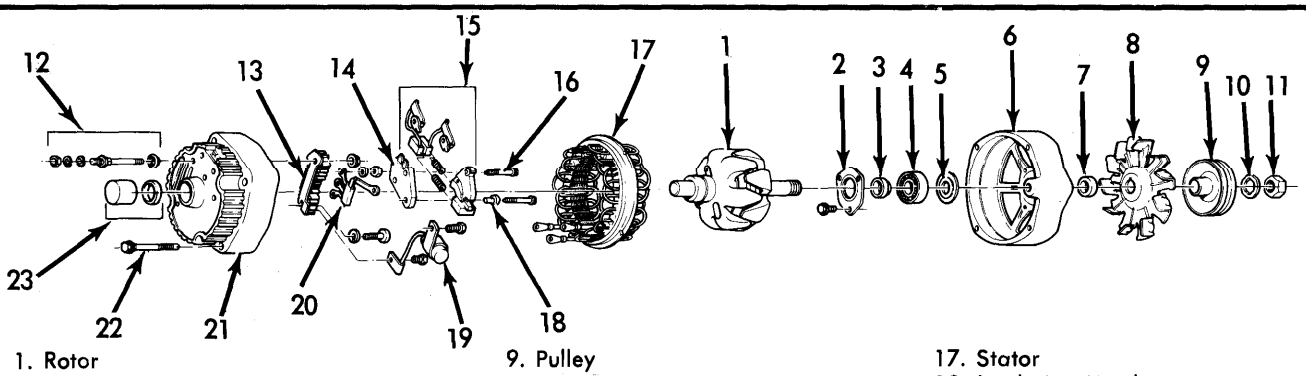
2) If voltage does not exceed 15 volts, adjust voltage to a lower value, by removing adjusting cap and rotating it to next lowest value. Reinsert cap into end frame. Check battery in a week and reset adjusting cap to next lower value, if still overcharged. See *Fig. 7*.

OVERHAUL

REGULAR ALTERNATORS

Disassembly – 1) Scribe an alignment mark on both end frames for reassembly reference. Remove 4 through bolts and separate drive end frame and rotor from slip ring end frame and stator. See *Fig. 8*. Remove and clean brushes to prevent grease from soaking into brushes.

DELCO-REMY WITH INTEGRAL REGULATOR (Cont.)



1. Rotor
2. Front Bearing Retainer
3. Inner Collar
4. Bearing
5. Washer
6. Front Housing
7. Outer Collar
8. Fan
9. Pulley
10. Lock Washer
11. Pulley Nut
12. Terminal Assembly
13. Rectifier Bridge
14. Regulator
15. Brush Assembly
16. Screw
17. Stator
18. Insulating Washer
19. Capacitor
20. Diode Trio
21. Rear Housing
22. Through Bolt
23. Bearing and Seal Assembly

Fig. 8 Exploded View of 10 SI Alternator

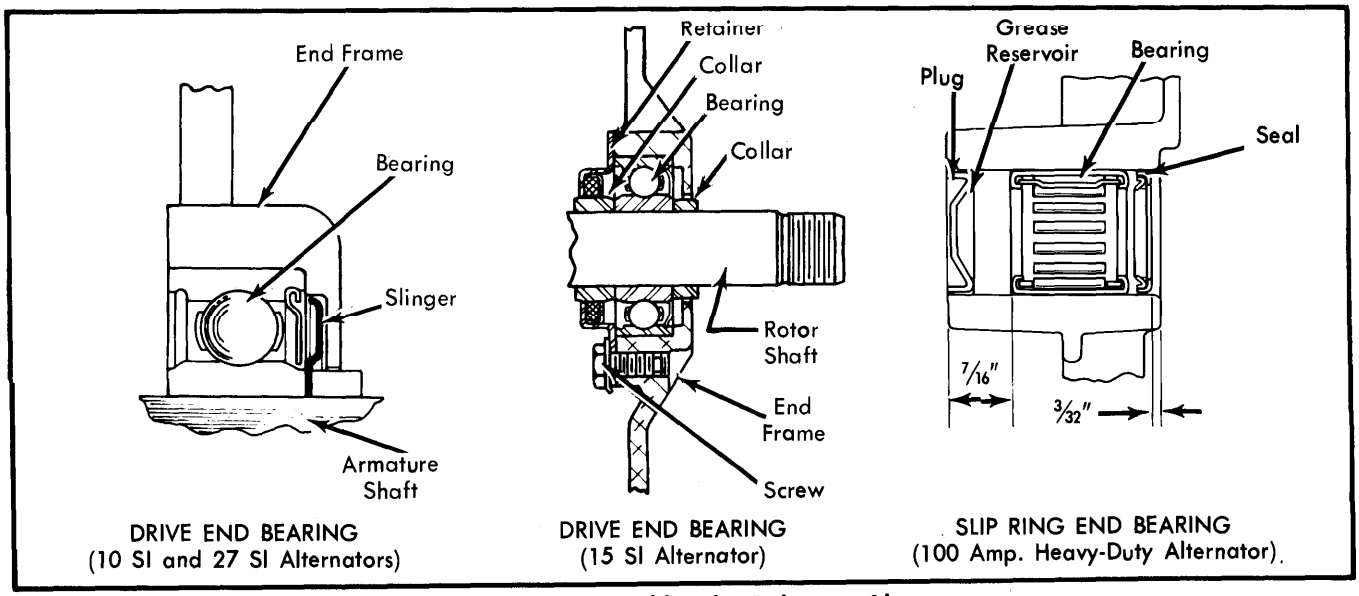
2) Remove brush springs and place pressure sensitive tape (not friction tape) over slip ring end bearing and bearing shaft on rotor. See *Fig.* 9. Remove 3 nuts holding stator leads to rectifier bridge and remove stator.

3) Remove 1 screw with plastic insulator, holding diode trio to brush holder. Remove diode trio. Remove screws securing regulator and brush holder. Remove indicator lamp resistor, brush holder and regulator.

4) Remove rectifier bridge by removing screw with washer, screw at capacitor lead, and nut and washer from "BAT" terminal stud. Remove insulator and "BAT" terminal stud. Remove screw securing capacitor to end frame. To remove rotor from drive end frame, install rotor in vise only tight enough to remove shaft nut, washer, pulley and fan. Separate end frame from rotor.

Inspection – Wash all metal parts except bearings, stator and rotor. Inspect rotor slip rings, and clean with 400 grain or finer polishing cloth. Slip rings may be lathe turned to a .002" indicator reading. Slip rings are not replaceable. Excessive damage will require rotor replacement. Inspect brushes for wear. Clean with acetone if necessary, and replace if worn halfway.

Reassembly – **1)** Position "BAT" terminal stud in end frame with molded plastic insulator outside and fiber insulator inside. Place rectifier bridge in end frame and secure with nut and washer at one end and screw and washer at other. Install capacitor to end frame and heat sink.



DRIVE END BEARING (10 SI and 27 SI Alternators)

DRIVE END BEARING (15 SI Alternator)

SLIP RING END BEARING (100 Amp. Heavy-Duty Alternator)

Fig. 9 Bearing Assemblies for Delcotron Alternators

DELCO-REMY WITH INTEGRAL REGULATOR (Cont.)

2) Position regulator in slip ring end frame. Install indicator lamp resistor and brush holder over regulator and install screws securing regulator. Place diode trio on rectifier bridge and attach to regulator with insulated screw.

3) Place stator on end frame, with leads over rectifier bridge studs. Secure with nuts. Install brush springs and brushes in holder. Insert straight wire or pin through hole in end frame and holes in bottom of brush holder.

NOTE — *This will hold brushes in place until rotor is assembled into frame.*

4) Install rotor in vise with drive end up. Do not overtighten vise. Install end frame, fan, pulley and washer over rotor shaft and secure with nut. Install rotor to slip ring end frame, aligning scribe marks. Remove wire holding brush. Install 4 through bolts through end frames and tighten.

HEAVY-DUTY ALTERNATOR

Disassembly — **1)** Remove cover plate from slip ring end frame. Hold rotor shaft with Allen wrench and remove shaft nut. Remove washer, pulley, fan and slinger. Remove 4 through bolts and separate slip ring end frame and stator from drive end frame and rotor.

2) Separate stator from slip ring end frame, removing 3 stator leads from studs. Remove and clean brushes in acetone if necessary. Place tape over bearing and shaft to protect from dirt. See *Fig.* 9. Do not use friction tape.

3) Remove 2 remaining nuts and washers from each rectifier bridge. Remove nut, lock washer, flat washer, insulating washer, and insulating collar from A.C. terminal studs.

4) Remove screw with flat washer and insulator from diode trio brush holder and remove diode trio, A.C. leads and inner insulator. Remove connector strap from each rectifier bridge.

5) Remove 2 nuts with internal tooth lock washers and flat washers, attaching bottom rectifier bridge. Remove 2 terminal studs. Remove screw with lock and flat washers, attaching rectifier bridge to end frame. Remove bridge.

6) Remove rectifier bridge nearest voltage adjuster, by removing 2 screws with lock and flat washers. To remove remaining bridge, loosen nut at "BAT" terminal. Remove screw with external tooth lock washer, securing "BAT" terminal lead to bridge. Remove additional screw securing bridge to end frame and remove bridge.

7) Remove 2 remaining screws holding brush holder. Make note of cap position, and remove voltage adjustment cap. Remove screw securing voltage regulator bracket to end frame and remove bracket and regulator.

8) Remove capacitor and "R" terminal lead. Remove rotor from drive end frame, by removing 4 screws from drive end bearing. Tap rotor out of housing with soft-faced hammer. Remove bearings.

Inspection — Wash all metal parts except bearings, stator and rotor. Inspect rotor slip rings, and clean with 400 grain or finer polishing cloth. Slip rings may be lathe turned to a .002" indicator reading. Slip rings are not replaceable. Excessive damage will require rotor replacement. Inspect brushes for wear. If worn halfway, replace.

Reassembly — **1)** Install capacitor and "R" terminal lead if removed. Position voltage regulator and adjuster to end frame. Place bracket over adjuster and secure with screw and external tooth lock washer.

2) Install voltage adjustment cap in same position as removed. One of the 3 rectifier bridges has an insulating sleeve at one end; other 2 are identical. Install one of identical bridges under "BAT" lead, securing to end frame with screw, lock and flat washers. Attach "BAT" lead to bridge with screw and external tooth lock washer.

3) Tighten "BAT" terminal nut. Install bridge with insulator at opposite side of end frame. Secure, using 2 screws with lock and flat washers. Place remaining bridge in end frame. Install 2 terminal bolts with internal tooth lock washers. Use flat washer at end with insulated bridge and capacitor lead at opposite end. Install, but do not tighten nuts.

4) Install screw with lock and flat washers, securing bridge to end frame and tighten screw. Tighten 2 nuts just installed. Install connector strap to each bridge. Install insulator at inside of end frame for A.C. terminal studs, and position diode trio and A.C. terminal leads. See *Fig. 10.*

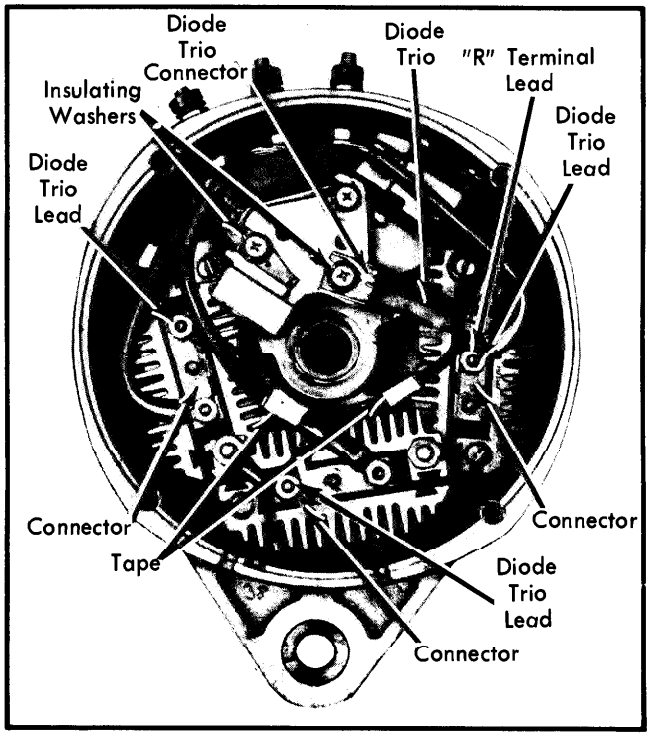


Fig. 10 Components of Slip Ring End Frame (100 Amp. Heavy-Duty Alternator)

5) Install insulating sleeve, insulating washer, flat and lock washers and nut to each A.C. terminal. Position diode trio and A.C. leads at each bridge, securing with nut and flat washer. Install brush holder over voltage regulator and fasten with 3 screws. Two screws nearest bearing have insulating and flat washers; other screw, a flat washer only.

DELCO-REMY WITH INTEGRAL REGULATOR (Cont.)

6) Install brush springs and brushes. Hold brushes in position with wire through holder and end frame. Position stator leads to bridges at remaining open terminals. Secure with nuts and flat washers.

7) Install drive end frame, if removed. Align weld nut plate and secure with 4 screws. Remove tape from slip ring bearing and rotor shaft. Clean shaft. Install rotor and drive end frame to stator and slip ring end frame, aligning mounting lugs and through bolt holes. Install through bolts.

8) Remove wire holding brush and install cover plate to slip ring end frame. Secure with 4 screws. Assemble slinger, fan, pulley, washer and nut on rotor shaft. Hold shaft with Allen wrench and tighten nut to 75 ft. lbs.

BENCH TESTING

ROTOR FIELD WINDING

1) Check rotor for grounds or an open circuit, using either a 110 volt test lamp or an ohmmeter set at the x 1000 scale. See *Fig. 11*. To test for grounds, touch leads to rotor shaft and, in turn, to each slip ring. No continuity should exist with either slip ring or test lamp should not light. If lamp lights or continuity is shown, check soldered connections at slip rings. Replace rotor if wiring connections are all right.

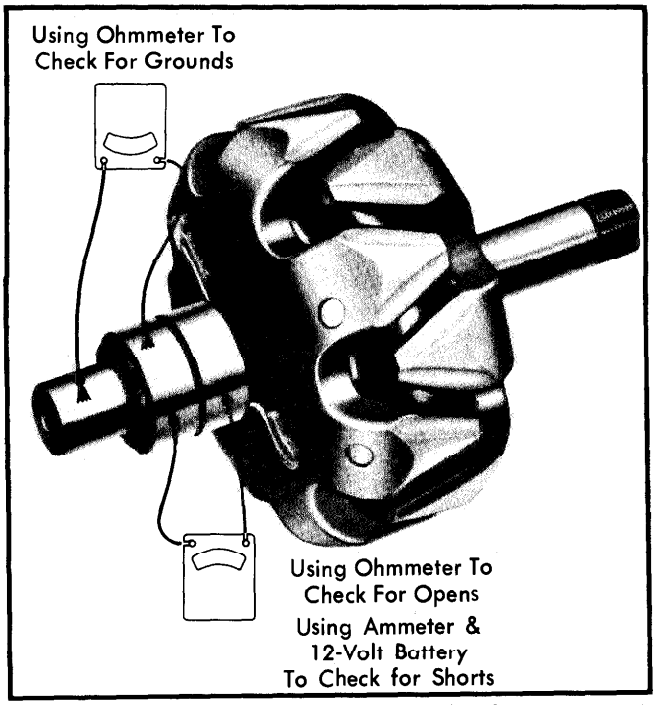


Fig. 11 Bench Testing Rotor for Opens, Shorts and Grounds

2) Test for an open field by connecting an ohmmeter set to the x 1 scale, touching leads to each slip ring. Continuity should exist.

3) To test for shorts, connect a 12 volt battery and ammeter in series with both slip rings (or an ohmmeter may be used). See *Fig. 11*. Current draw should be 3.5-5.0 amps (4.0-4.5 amps. for heavy-duty alternator). Ohmmeter resistance should be 2.5-3.0 ohms (2.75-3.0 ohms for heavy-duty alternator). Excessive amperage draw or low resistance readings indicate shorted windings. Replace rotor. If rotor tests okay, but alternator output is low, continue with other tests.

STATOR GROUNDS

Connect a 110 volt test lamp or an ohmmeter set to the x 1000 scale. Touch leads to stator frame and any stator lead. See *Fig. 12*. If test lamp lights or resistance is not infinity, stator is grounded and must be replaced.

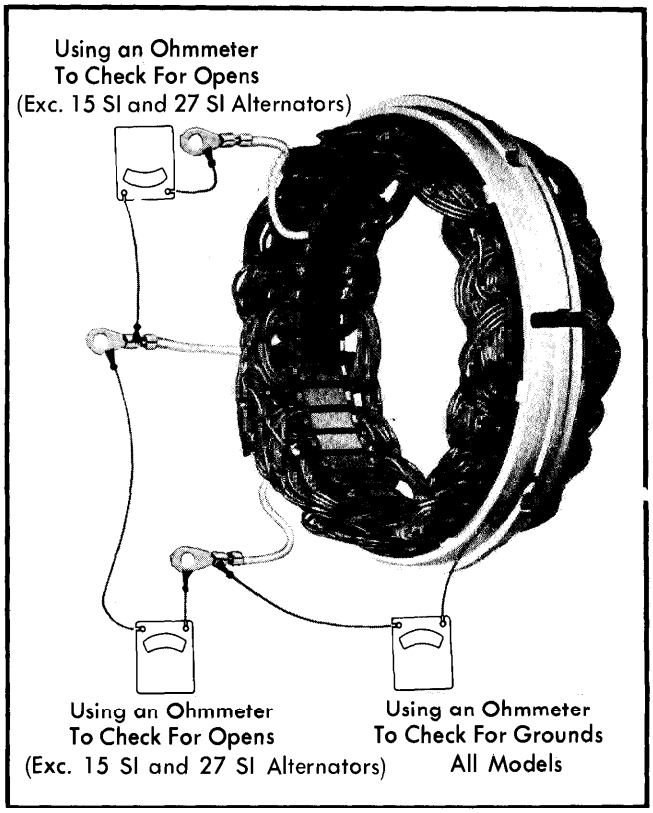


Fig. 12 Bench Testing Stator for Grounds (Also Opens on 10 SI Alternators)

STATOR OPENS

NOTE – *Delta windings of 15 SI and 27 SI series alternators cannot be checked for open circuits. However, if all other electrical checks are normal and generator fails to supply rated output (but will supply at least 10 amps.), windings are probably shorted.*

Check 10 SI stator for open condition with 110 volt test lamp or ohmmeter set to x 15 scale. See *Fig. 12*. Attach leads to any two stator leads, checking each pair of stator leads in succession. If lamp fails to light or meter reading is high, windings are open.

STATOR SHORTS

NOTE – *Delta windings of 15 SI and 27 SI series alternators cannot be checked for shorts.*

To test 10 SI alternator stator windings for shorts, check each of the 3 winding phases, using an ohmmeter reading in tenths

DELCO-REMY WITH INTEGRAL REGULATOR (Cont.)

of an ohm (0.1 ohm). See *Fig. 13*. Ohmmeter readings for 3 phases should show equal resistance. If not, a short exists and stator must be replaced.

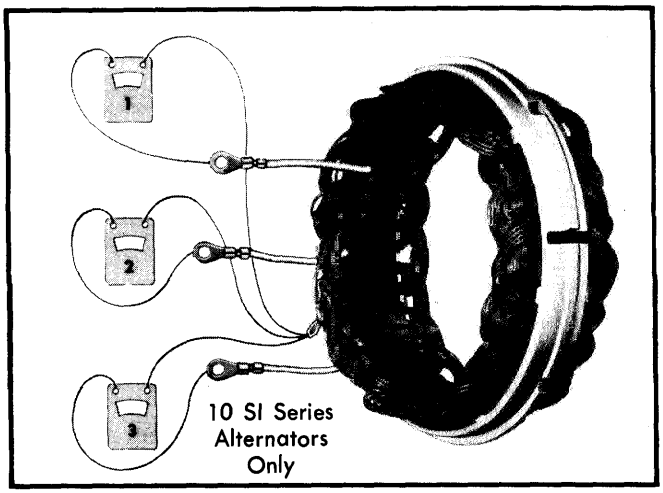


Fig. 13 Bench Testing Stator for Shorts Using an Ohmmeter (10 SI Alternators Only)

VOLTAGE REGULATOR WITH DIODE TRIO INSTALLED

1) Connect an ohmmeter (lowest range) from brush lead clip to end frame. See *Fig. 14*. Then reverse leads. If both readings are zero, either the brush clip is grounded or the regulator is defective.

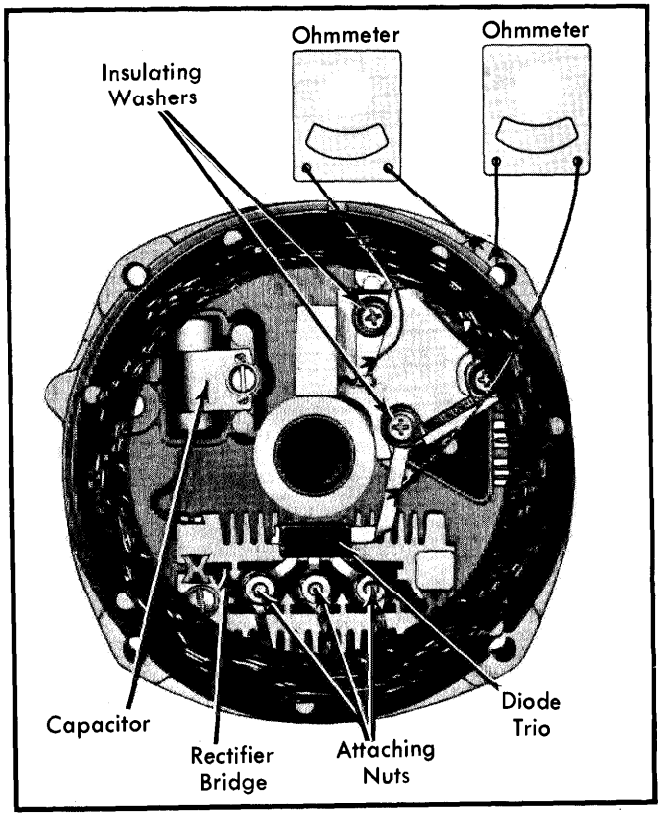


Fig. 14 Bench Testing Voltage Regulator Brush Lead Clips Using an Ohmmeter

2) A grounded brush lead clip can result from omitting the insulating washer or insulating sleeve on a mounting screw or from a damaged insulating sleeve. Remove screw and inspect insulating sleeve. If it is satisfactory, replace regulator unit.

DIODE TRIO

1) Remove diode trio from end frame assembly. Connect an ohmmeter to single brush connector and to any of 3 stator lead connectors. See *Fig. 15*. A good diode will give one high and one low reading. If both readings are the same, replace diode trio.

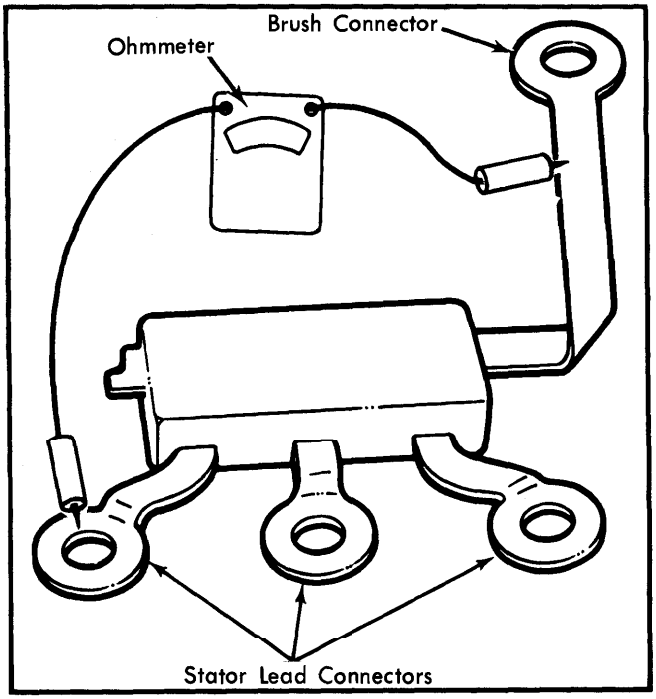


Fig. 15 Bench Testing Typical Diode Trio Using an Ohmmeter

2) Repeat tests, touching leads in turn from single brush connector to each of 3 stator lead connectors.

NOTE — *Before replacing diode trio, also check rectifier bridge. Do not use high voltage (110 volt) test lamp to check diode trio.*

RECTIFIER BRIDGE

1) Connect an ohmmeter to grounded heat sink, with second lead held firmly against flat metal connector (not threaded stud). See *Fig. 16*. Then reverse leads to same heat sink and connection. If both readings are the same, replace rectifier bridge.

2) A good rectifier bridge will give one high and one low reading. Repeat this test between grounded heat sink and other 2 flat metal connectors, making a total of 6 checks with 2 readings for each. Check other 2 rectifier bridges in same manner.

DELCO-REMY WITH INTEGRAL REGULATOR (Cont.)

NOTE — *Do not replace rectifier bridge or diode trio unless at least one pair of readings is the same. Also, never use 110 volt test lamp for this test.*

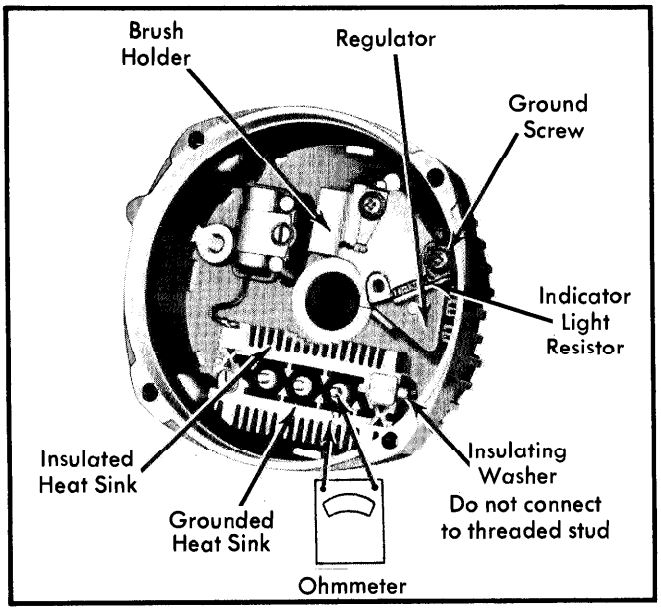


Fig. 16 Bench Testing Rectifier Bridge and Identification of End Frame Components

REGULATOR CHECK (HEAVY-DUTY ALTERNATOR)

NOTE — *As regulator is fully enclosed, there is no practical test of this unit.*

1) If none of the previous tests shows any defects and an overcharged condition was present, remove voltage adjustment cap (connector body) from slip ring end frame. Using an ohmmeter with middle range scale, attach leads to each pair of adjacent terminals (4 checks in all). *See Fig. 17.*

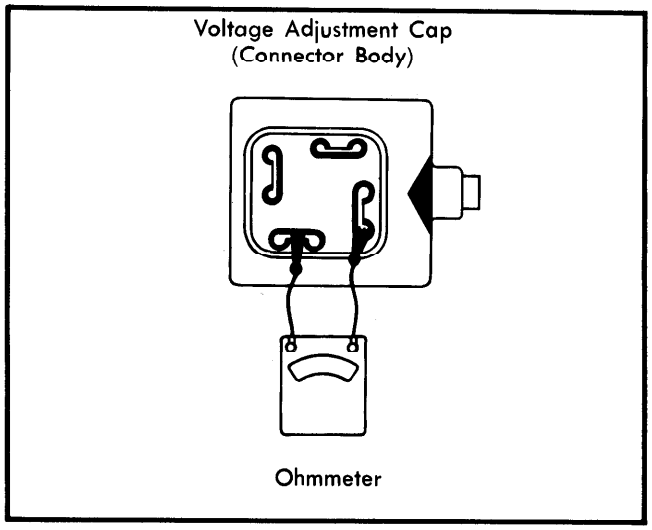


Fig. 17 Bench Testing Voltage Adjustment Cap (100 Amp. Heavy-Duty Alternator)

2) If any check is infinite, replace adjustment cap. There is no need to make this test for an undercharged condition.

DELCO-REMY DELCOTRON SPECIFICATIONS

Stamped Rated Amp. Output	Test Specifications (At 14.0 Volts)				Field Current (Amps.) 12 Volts @ 80°F
	Amps.	RPM	Amps.	RPM	
37	22	2000	33	5000	4.0-4.5
42	25	2000	38	5000	4.0-4.5
55	30	2000	51	5000	4.0-4.5
61	30	2000	57	5000	4.0-4.5
63	32	2000	60	5000	4.0-4.5
80	55	2000	76	5000	4.0-4.9
100	.....	.....	.....	.....	4.5-4.9