



Winter Storage of Batteries

Battery companies are not responsible for battery damage, either in winter storage or in dealer stock, if the following instructions are not observed:

1. Remove battery from its installation as soon as possible and remove all grease, sulfate and dirt from top surface by running water over top of battery. Be sure, however, that vent caps are tight beforehand, and blow off all excess water thoroughly with compressed air. Check water level, making sure that plates are covered.
2. When adding distilled water to battery, be extremely careful not to fill more than 3/16" (4.8mm) over plate inside battery. Battery solution or electrolyte expands from heat caused by charging. Overfilling battery will cause electrolyte to overflow (if filled beyond 3/16" (4.8 mm) over plate).
3. Grease terminal bolts well with Quicksilver 2-4-C Marine Lubricant, and store battery in COOL-DRY place. Remove battery from storage every 30-45 days, check water level (add water if necessary), and put on charge for 5 or 6 hours at 6 amperes. DO NOT FAST CHARGE.
4. If specific gravity drops below 1.240, check battery for reason, and then recharge. When gravity reaches 1.260, discontinue charging. To check specific gravity, use a hydrometer, which can be purchased locally.
5. Repeat preceding charging procedure every 30-45 days, as long as battery is in storage. When ready to place battery back in service, remove excess grease from terminals (a small amount is desirable on terminals at all times), recharge again as necessary and re-install battery.

WARNING

Hydrogen and oxygen gases are produced during normal battery operation or charging. Sparks or flame can cause this mixture to ignite and explode if they are brought near the battery. Sulfuric acid in battery can cause serious burns, if spilled on skin or in eyes. Flush or wash away immediately with clear water.

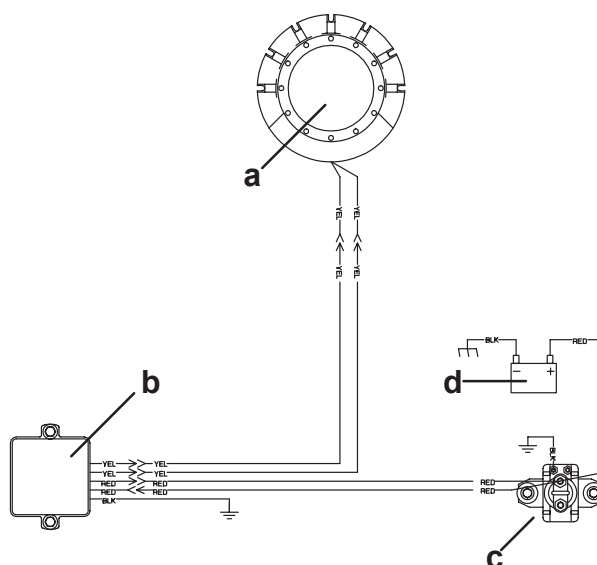
Battery Charging System Troubleshooting

Description

The battery charging system components are the stator, voltage regulator/rectifier and the battery. Alternating current is generated in the stator alternator coils and flows to the regulator/rectifier. The rectifier changes the alternating current to direct current for charging the battery and the regulator senses battery voltage and allows the correct amount of direct current to charge the battery.

The charging system may be damaged by:

- a. Reversed battery cables.
- b. Running the engine with battery cables disconnected and stator leads connected to regulator/rectifier.
- c. Open circuit, such as a broken wire or loose connection.



- a - Stator
b - Voltage Regulator/Rectifier
c - Start Solenoid
d - 12V Battery

A fault in the battery charging system usually will cause the battery to become undercharged. Check battery electrolyte level, and charge battery. See "Electrolyte Level", and "Charging a Discharged Battery".

If battery will not accept a satisfactory charge, replace battery.

If battery accepts a satisfactory charge, determine the cause of the charging system problem as follows.



1. Check for correct battery polarity [red cable to positive (+) battery terminal]. If polarity was incorrect, check for damaged rectifier. See “rectifier test”, later in this section.
2. Check for loose or corroded battery connections.
3. Visually inspect wiring between stator and battery for cuts, chafing, and disconnected, loose or corroded connection.
4. Excessive electrical load (from too many accessories) will cause battery to run down.

If visual inspection determines that battery connections and wiring are OK, perform the following stator and alternator systems tests.

STATOR OHMS TEST (ALTERNATOR COILS ONLY)

NOTE: Stator can be tested without removing from engine.

1. Disconnect both yellow (stator leads) from voltage regulator/rectifier, or terminal block.
2. Use an ohmmeter and perform the following test.

IMPORTANT: If stator is mounted on engine, black stator lead (if provided) must be grounded to power-head when testing.

3. Replace stator if readings are outside ranges shown.

NOTE: Resistance varies greatly with temperature. Measurements should be taken with an ambient temperature range of 65° to 85° F.

9 Ampere Manual Stator

Test Leads	Resistance (Ohms)	Scale Reading
Between Yellow Stator Leads	0.16 - 0.19*	R x 1
Between Either Yellow Stator Lead and Engine Ground	No Continuity	R x 1000

* DC Resistance of these windings generally is less than 1.5 Ohms. If a reading resembling a short is obtained, this would be acceptable.

16 Ampere Stator

Test Leads	Resistance (Ohms)	Scale Reading
Between Yellow Stator Leads	0.16 - 0.19*	R x 1
Between Either Yellow Stator Lead and Engine Ground	No Continuity	R x 1000

* DC Resistance of these windings generally is less than 1.5 Ohms. If a reading resembling a short is obtained, this would be acceptable.



ALTERNATOR SYSTEMS TEST

9 Ampere Manual Stator

IMPORTANT: Rectifier (optional accessory) must be functioning properly for accurate test results to be obtained.

1. Remove RED lead from (+) terminal of rectifier.
2. Connect RED (+) ammeter lead to rectifier (+) terminal and BLACK (–) ammeter lead to RED rectifier lead.
3. With engine running at the indicated RPM, the ammeter should indicate the following approximate amperes:

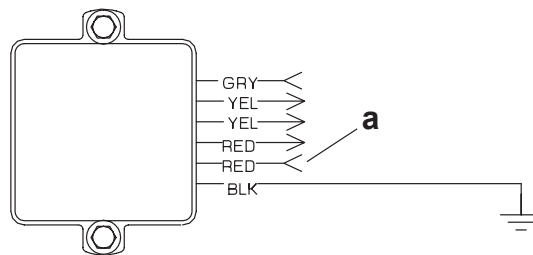
9 Ampere Manual Stator	RPM	AMPERES
	Idle	0
	1000	0.6
	2000	8.0
	3000	9.0

4. If proper ampere readings are not obtained, replace stator.

16 Ampere Stator

1. Check battery voltage at battery with engine running.
2. If battery voltage is above 14.5 volts, replace voltage regulator/rectifier. Check condition of battery as overcharging may damage battery.
3. If battery voltage is below 14.5 volts, charge battery; refer to “Charging a Discharged Battery”, preceding. If battery can not be satisfactorily charged, replace battery.
4. If battery accepts a satisfactory charge, check battery voltage while cranking engine; refer to “Charging a Discharged Battery”, preceding. If cranking voltage is not acceptable, replace battery.
5. If cranking voltage is acceptable, disconnect larger diameter RED harness wire from starter solenoid terminal.

6. Remove RED sense lead wire from starter solenoid terminal and connect to the positive (+) terminal of a 9 volt transistor battery. Ground the negative (–) terminal of the 9 volt battery to the engine.



a - Red Sense Lead (Female Connector)

7. Connect RED (+) ammeter lead to larger diameter RED harness wire, and BLACK (–) ammeter lead to POSITIVE terminal on starter solenoid.
8. Secure starter wires away from flywheel.
9. With engine running at the indicated RPM's, the ammeter should indicate the following approximate amperes:

16 Ampere Stator	RPM	AMPERES
	Idle	2.8
	1000	9.3
	2000	16

10. A reading of 16 amperes at 2000 RPM indicates the charging system is functioning properly. The battery is being discharged because of the excessive amperage draw on the system (the draw is greater than the amperage output of the engine charging system).
11. If ammeter reads less than required amperes @ 3000 RPM, test the stator; refer to “Stator Ohm Test (Alternator Coils Only)”. If stator tests OK, replace voltage regulator.



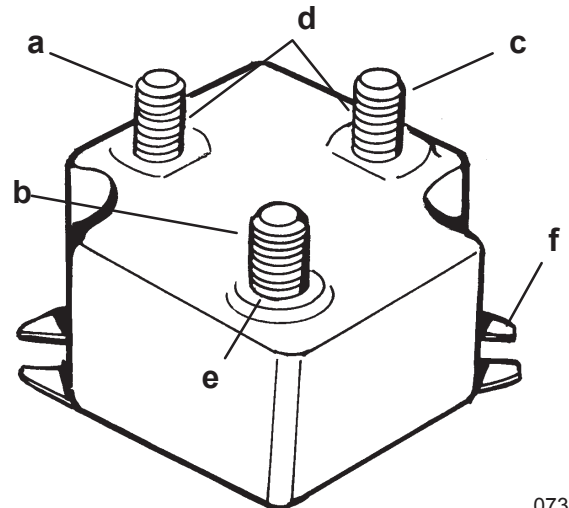
RECTIFIER TEST (OPTIONAL ACCESSORY FOR 9 AMP STATOR)

! WARNING

Disconnect battery leads from battery before testing rectifier.

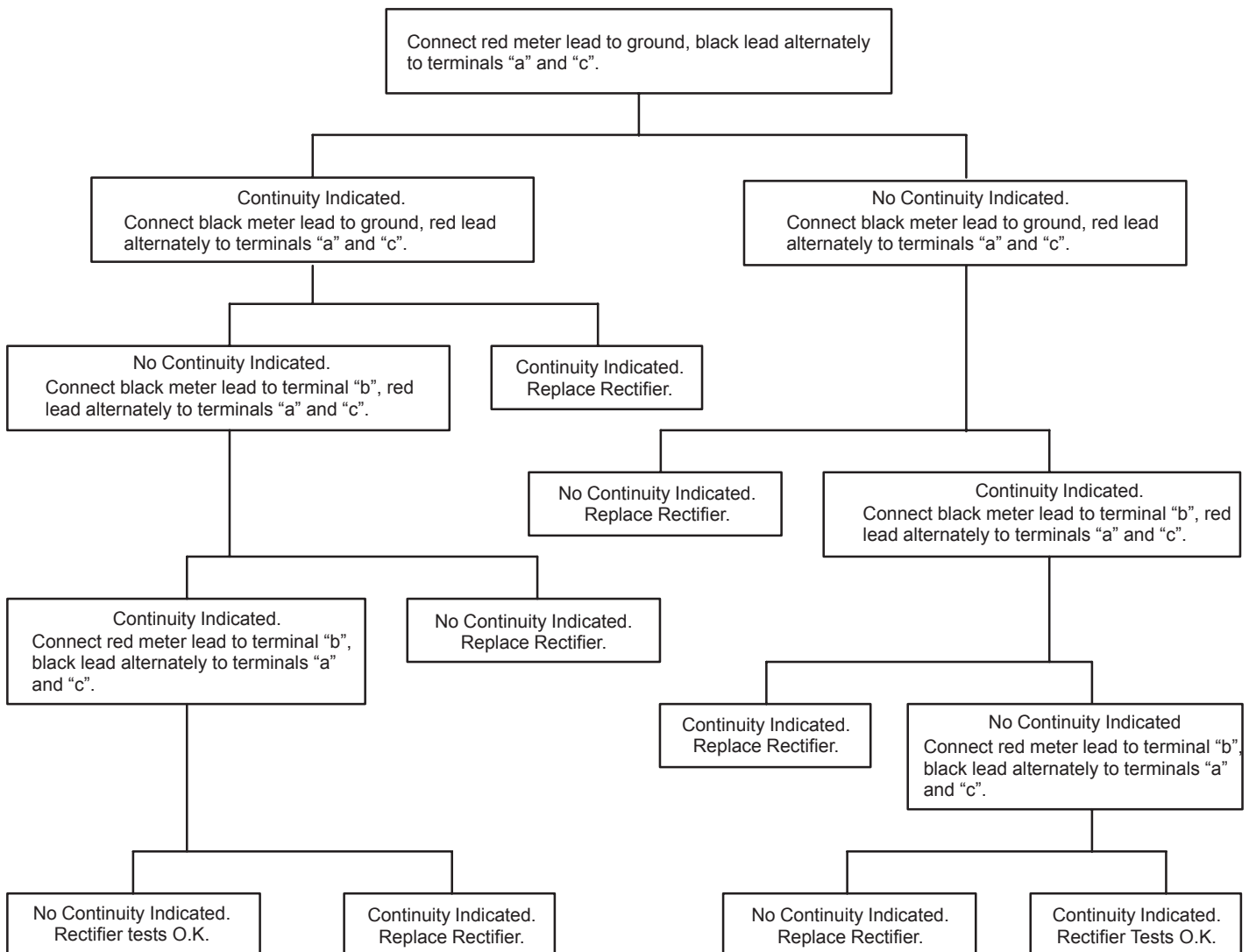
NOTE: Rectifier can be tested without removing from engine.

1. Disconnect all wires from terminals on rectifier.
2. Use an ohmmeter (R x 1000 scale) and perform the following test. Refer to drawing for rectifier terminal identification.



a - Terminal
b - Terminal
c - Terminal
d - Stator Terminals
e - Positive Terminal
f - Ground

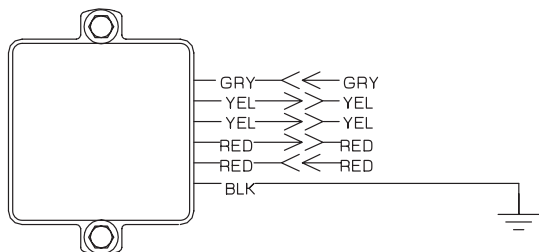
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VOLTAGE REGULATOR/RECTIFIER TEST

NOTE: Voltage regulator/rectifier specifications are given for informational purposes only, use the appropriate troubleshooting techniques previously mentioned to find the faulty component in the charging system.



DIODE TEST:

1. Set Ohm meter to R X 10 scale.
2. Connect Red (+) meter lead to RED regulator lead.
3. Connect Black (–) meter lead to YELLOW regulator lead.

TEST RESULTS:

100 - 400 OHMS

DIODE TEST:

1. Set Ohm meter to R X 1k scale.
2. Connect Black (–) meter lead to RED regulator lead.
3. Connect Red (+) meter lead to YELLOW regulator lead. Test. Then change Red (+) meter lead to the other YELLOW regulator lead for 2ND test reading.

TEST RESULTS (1ST READING):

40,000 to ∞ OHMS

TEST RESULTS (2ND READING):

∞ OHMS (No needle movement)

SCR TEST:

1. Set Ohm meter to R X 1k scale.
2. Connect Red (+) meter lead to regulator case.
3. Connect Black (–) meter lead to one YELLOW regulator lead. Test. Connect Black (–) meter lead to the other YELLOW lead.

TEST RESULTS (BOTH TESTS):

15,000 - ∞ OHMS (15k - ∞)

TACHOMETER CIRCUIT TEST:

1. Set Ohm meter to R X 1k scale.
2. Connect Red (+) meter lead to GREY regulator lead.
3. Connect Black (–) meter lead to regulator case.

TEST RESULTS:

10,000 - 50,000 OHMS (10k - 50k)



Starting System

Starting System Components

The starting system consists of the following components.

1. Battery
2. Starter Solenoid
3. Neutral Start Switch
4. Starter Motor
5. Ignition Switch

Description

The function of the starting system is to crank the engine. The battery supplies electrical energy to crank the starter motor. When the ignition switch is turned to "START" position, the starter solenoid is activated and completes the starting circuit between the battery and starter.

The neutral start switch opens the start circuit when the shift control lever is not in neutral. This prevents accidental starting when engine is in gear.

CAUTION

The starter motor may be damaged if operated continuously. DO NOT operate continuously for more than 30 seconds. Allow a 2 minute cooling period between starting attempts.

Troubleshooting the Starting Circuit

Before beginning the starting circuit troubleshooting flow chart, following, check first for the following conditions:

1. Make sure that battery is fully charged.
2. Check that control lever is in "NEUTRAL" position.
3. Check bullet connectors for corrosion and loose connections.
4. Check cables and wiring for frayed and worn insulation.
5. Check in-line fuse in RED wire; see diagram.