



Battery Charging System Troubleshooting

General Troubleshooting

A fault in the battery charging system will usually cause the battery to become UNDERCHARGED. A defective VOLTAGE REGULATOR may also allow the system to OVERCHARGE the battery.

If a problem exists in the charging system, visually check the following:

1. Check for correct battery polarity [RED cable to (+) POSITIVE battery terminal].

NOTE: 40 AMP CHARGING SYSTEM voltage regulator/rectifier is protected internally against incorrectly installed battery cables.

2. Check for loose or corroded battery terminals.
3. Check condition of the battery.
4. Visually inspect all wiring between stator and battery for cuts, chafing and disconnected, loose or corroded connections.
5. Excessive electrical load (from too many accessories) will cause battery to run down, even if the system is operating correctly.

If the system is still OVERCHARGING the battery, the VOLTAGE REGULATOR is most likely defective and should be replaced.

If the battery is UNDERCHARGED, proceed with REGULATOR, STATOR, and RECTIFIER tests, following.

40 Ampere Alternator System

40 AMP STATOR TEST (ALTERNATOR COILS ONLY)

NOTE: Stator can be tested without removing from engine.

1. Disconnect 2 short YELLOW and 2 long YELLOW stator leads from bullet connectors at rear of engine above ignition coil plate.
2. Use an ohmmeter and perform the following test:

Test Leads To-	Resistance (Ohms)	Scale Reading
Connect test leads between 2 short YELLOW and 2 long YELLOW stator leads	.25-.45*	R x 1
RED test lead to 1 short YELLOW (or long YELLOW) stator lead, and BLACK test lead to engine ground if stator is mounted or to steel frame of stator (if off engine)	No Continuity	R x 1000

* Resistance of these windings generally is less than one ohm. A reading, that resembles a short, is acceptable. Copper wire is an excellent conductor but will have noticeable differences from cold to hot. Reasonable variation from specified reading is acceptable.

3. If meter readings are other than specified, replace stator assembly Refer to stator assembly replacement in Section 2A.

TROUBLESHOOTING 40 AMP ALTERNATOR SYSTEM

⚠ WARNING

Before connecting or disconnecting any electrical connection, battery cables **MUST BE REMOVED** from battery to prevent possible personal injury or damage to equipment.

IMPORTANT: The charging system may be connected to one or more batteries during these tests. However, these batteries **MUST BE** fully charged. These batteries **MUST NOT BE** connected to any other charging source.



IMPORTANT: Check that all connections are tight prior to starting tests. Ensure that the battery posts and terminals are clean and making good contact. Verify with test equipment that wiring harnesses are not at fault.

DETERMINING CAUSE OF PROBLEM

1. Connect outboard battery leads to battery(s) that are known to be in good condition and are fully charged.
2. Check voltage at battery(s) with an analog voltmeter. Digital voltmeters are not recommended as they may be inaccurate due to interference from outboard ignition system.
3. Start outboard and run at 1000 RPM. Voltage at battery should rise to and stabilize at approximately 14.5 volts if system is operating properly. If voltage does not increase from previously checked battery voltage values, refer to “**NO OUTPUT**,” following, for troubleshooting procedures. If voltage exceeds 16 volts and DOES NOT return down to and stabilize at 14.5 volts, refer to “**CONSTANT HIGH OUTPUT**,” following for troubleshooting procedures.

PROBLEM: CONSTANT HIGH OUTPUT

1. Remove flywheel and visually inspect stator. Discoloration of one or more poles, or burned windings will require replacement of stator.
2. If no visual defects of stator are found, reinstall flywheel. Temporarily install ammeter (of sufficient size to carry 50 amperes) in series with the RED output lead (MALE bullet lead) of the regulator and the starter solenoid.
3. Remove 1 short and 2 long YELLOW stator leads from their bullet connectors. Run engine at 1000-2000 RPM. If no output current is observed, disconnect 2 short YELLOW leads and 1 long YELLOW lead. Repeat the test with the second long YELLOW lead connected. Any output current indicates stator is shorted to ground. Replace stator.
4. If there is no output with either short or long YELLOW leads disconnected, the regulators are defective.

PROBLEM: NO OUTPUT

IMPORTANT: Regulators **MUST** have a good ground. Verify a clean contact surface exists between regulator case, powerhead and attaching hardware.

1. Check voltage on either RED wire to regulator(s) (bullet connectors). These leads must indicate battery voltage. If battery voltage is NOT present, wiring between the test point and battery terminals is defective. Refer to WIRING DIAGRAMS, SECTION 2D.
2. Connect an AC voltmeter to either the 2 short or 2 long YELLOW lead bullet connectors on the regulators. If the AC voltage at idle or above is greater than 16 VAC, the regulator is defective.

NOTE: The tachometer signal is provided by either regulator. It is possible to still have an accurate tachometer signal with a defective regulator.

REGULATION VOLTAGE CHECK

NOTE: Battery must be fully charged before testing regulation voltage. A low battery will not allow an accurate reading of regulation voltage.

1. Turn on all electrical accessories and crank engine for 20 seconds with the ignition lanyard switch turned off. This will discharge battery slightly.
2. Start engine and observe battery voltage. Voltage should slowly rise to approximately 14 to 15 volts. If voltage does not rise, repeat previous tests for stator and regulator.

NOTE: If a digital voltmeter is used for this reading, measure voltage at the battery and keep meter as far away from engine as possible. This will reduce the possibility of erroneous readings from ignition noise.



VOLTAGE REGULATOR TEST

IMPORTANT: Make sure meter is “zeroed” by shorting meter leads together after changing selector knob to appropriate setting. The meter reading must read “0” Ohms.

IMPORTANT: The following regulator tests should be performed as soon as possible after suspected regulator failure. A “cold” regulator may test “GOOD” when in fact it is defective when “warm”.

Disconnect all voltage regulator wires.

Voltage Regulator Test Using Analog Meter Test Leads To-	Resistance (Ohms)	Scale
Diode Check: Connect NEGATIVE (–) ohm lead to either YELLOW lead. Connect POSITIVE (+) test lead to thick RED lead.	100-400	R x 10
Diode Check: Connect NEGATIVE (–) ohm lead to thick RED lead. Connect POSITIVE (+) ohm lead to either YELLOW lead.	20000 to ∞	R x 1K
SCR Checks: Connect NEGATIVE (–) ohm lead to either YELLOW lead. Connect POSITIVE (+) ohm lead to case ground.	8000 – 15000	R x 1K
Tachometer Circuit Check: Connect NEGATIVE (–) ohm lead to case ground. Connect POSITIVE (+) ohm lead to GRAY lead.	10000 – 50000	R x 1K

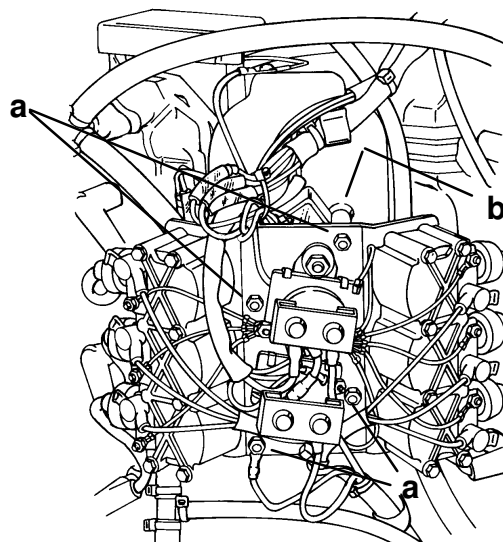
NOTE: Meters ground could be reversed for diode test.

Voltage Regulator Test Using Digital Meter Test Leads To-	Resistance (Ohms)	Scale
Diode Check: Connect NEGATIVE (–) meter lead to RED regulator lead in connector. Connect POSITIVE (+) test lead to either YELLOW regulator lead.	0.4 – 0.8 volts	→
Diode Check: Connect NEGATIVE (–) meter lead to either YELLOW regulator lead. Connect POSITIVE (+) ohm lead to RED regulator lead in connector.	∞ or OUCH or OL	→
SCR Checks: Connect NEGATIVE (–) meter lead to regulator case. Connect POSITIVE (+) meter lead to either YELLOW regulator lead.	1.5 volt – ∞ or OUCH or OL	→
Tachometer Circuit Check: Not measurable with digital meter		

REMOVAL OF VOLTAGE REGULATORS

1. Remove 4 locknuts and spacers from coil mounting plate. Lay coil mounting plate off to one side.

Production Models –

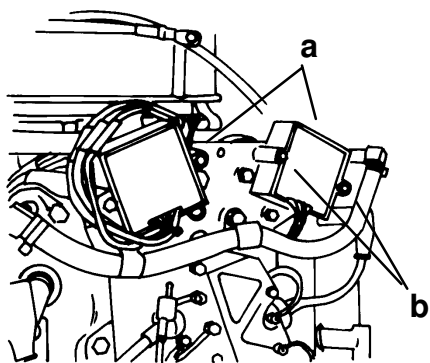


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- a - 4 Locknuts
b - 4 Spacers (HIDDEN)



Pro Max/Super Magnum Models –



a - Regulators
b - Screws

2. Disconnect 2 YELLOW leads, 2 RED leads and GRAY tach lead (if connected) from respective bullet connectors.
3. Remove voltage regulator/rectifier from powerhead.

INSTALLATION OF VOLTAGE REGULATOR/RECTIFIER

1. Position regulators over attaching studs (production models).
2. Connect YELLOW, RED and GRAY (as required) leads to their respective bullet connectors.
3. Position spacers over attaching studs (production models).

NOTE: *Pro Max/Super Magnum regulators are secured to powerhead with bolts and lock nuts.*

4. Position coil/solenoid plate over attaching studs. Place trim ground lead (BLACK) onto bottom stud.
5. Secure plate, regulators and trim ground lead to powerhead with locknuts. Torque nuts to 80 lb. in. (9.0 N·m).