Bike Battery Charging Problems - Troubleshooting & Fixing

This procedure can help you find out why your bike battery does not charge correctly, and help you to fix that. This assumes that your bike has a permanent magnet 3 phase generator, a standard thyristor shunt type regulator rectifier (RR unit), and a 12Volt battery. You will need simple workshop tools including a multimeter with clips or an AVO, bits of wire and crimp terminals, a headlamp bulb and a soldering iron.

Start at the beginning of the chart and work through each step in turn until the problem is found and fixed. It is not so unusual to have more than one problem on a bike charging system, and your bike will work better if all the problems are fixed. Please use a GOOD battery. The battery must be fully charged up first, using a bench charger. If not available, maybe you can borrow a charged good battery from another bike.

Step 1 - Bike Leakage Current Test

Put the battery back on the bike, but connect only the +VE clamp to the battery, leaving the –VE stud not connected. The battery voltage should measure 12V7 to 13V1 across the stud terminals on top of the battery. Measure the LEAKAGE CURRENT of the bike, by setting the meter to DC AMPS, connect one meter probe to battery -VE terminal, connect the other meter probe to the bike harness -VE battery strap / clamp. The current should be no higher than about 50mA (Ignition OFF). Press the brake lever just to check everything is connected okay - the brake light should light, the meter should read about 1A750. Note: 50mA leakage will take a week to flatten a 9Ahour battery.

If the LEAKAGE CURRENT is less than 50mA, the bike leakage current is okay, please proceed to Step 2.	If LEAKAGE CURRENT exceeds 50mA, there is a fault on the bikes wiring harness, maybe in the alarm. Try pulling fuses to locate the problem.

Step 2 - Battery Charge-Holding Test

Connect the -VE strap / clamp to the -VE battery terminal, so the battery is fully connected to the bike. The battery voltage should measure 12V7 to 13V1 measured across the stud terminals on top of the battery (ignition switch OFF). Switch on the headlights (ignition ON, engine OFF). Battery stud voltage should drop slowly, maybe down to about 12v4 *over a period of 30 seconds*. Switch off the headlights and ignition soon.

If battery stud voltage remains above 12V4, then the battery is okay, please proceed to Step 3.	If battery stud voltage drops below 12V4, the battery is not good and should be replaced.

Step 3 - Functional Test of Whole Battery Charging System

Complete all connections between the Generator, Regulator Rectifier Unit, Battery - just as normal. Set the meter to show DC VOLTS and connect the meter clips only to the stud terminals *directly on top of the battery*. The battery voltage should measure between 12V7 to 13V1 with engine OFF.

Start up the engine and run at low idle speed. Meter should show battery charging voltage around 14V4 (limits are 13V6 to 14V9) at idle. Increasing engine speed should produce NO proportional increase in battery voltage, but often will produce some small and meaningless variations in voltage. Battery voltage should always remain between 13V6 and 14V9 while charging.

Switching the headlight on and off creates big changes in power draw on the generator and battery, which usually results in a slight reduction of battery charging voltage. On older bikes it may be necessary to increase engine speed slightly (maybe 2500RPM) so charging can keep up with the headlight current.

Charge voltage between 13V6 and 14V9? Everything is good, battery charges perfectly.	Charge voltage >15V? RR is defective, needs to be replaced. Charge voltage <13V5? Please go to step 4.

Step 4 - Simple Meter Test for RR (Regulator Rectifier Unit)

Disconnect the RR from the bike. Select DIODE test range on the meter. This causes the meter to push out typically 1mA of test current, the display shows the resulting voltage across the test piece. When no test piece is connected the meter output voltage goes higher than about 2 volts so the meter displays “over-range”.

Connect the RED meter clip to the BLACK RR wire, and use the BLACK meter probe to test in turn each of the YELLOW wires on the RR. The meter should read between 0V350 and 0V550 for each of the 3 measurements.

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- Any readings higher than 0V550 indicate an open circuit or bad joint within the RR.
- Any readings lower than 0V350 indicate a short circuited rectifier or thyristor within the RR.

Although this simple test can never prove an RR is good, it can often show that an RR is defective.

All readings >0V350 and <0V550 means no problem evident. Please proceed to Step 5.	Any readings <0V350 or >0V550 means RR is defective. RR must be replaced.

Step 5 - Generator Leakage Current Test

Disconnect the wire harness from the generator stator to the RR (Regulator Rectifier unit). Set the meter to measure OHMS, and probe into the open end of the block connector. Measure the resistance from any of the generator stator wires to the frame ground (battery -VE). A reading of less than about 10kOhms indicates damaged insulation in the stator winding, which often is indicative of a shorted turn fault at engine running temperatures. A reading of greater than 10kOhms does not actually prove the generator is good, but a lower reading always indicates an insulation problem.

Leakage resistance >10k, no problem evident. Please proceed to Step 6

Leakage resistance <10k, generator stator is probably defective and should be replaced.

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Step 6 - Generator Low Power Load Test

You shall need to make a special tool for this: Solder about 30cm of wire to the terminals of a spare 55W headlight bulb. Fit suitable crimp tags on the flying ends of these wires to insert into the connector block on the generator stator. Attach the meter clips onto the soldered joints on the end of the headlight bulb. This “bulbtool” allows voltages to be measured while pulling a handy 4 or 5 Amp test current through the headlight bulb.

Leave the RR disconnected from the generator. Set the meter to read AC RMS VOLTS. Start up the engine. Connect the bulbtool across any 2 of 3 phase wires from the generator. Measure the AC RMS VOLTS, at low IDLE speed. The voltage should be between 12VACRMS and 15VACRMS. Do NOT blip the throttle or rev up the engine, the bulb can burst with too much voltage applied.

Repeat this measurement for each combination of 2 probes on 3 wires, and write down the readings.

The readings should all be similar, say 13V21, 13V00, 13V31. If they are different or have any low values, say 13V21, 10V77, 10V82, then this indicates that the generator stator has an internal turn-to-turn short circuit and the generator stator must be replaced.

The generator connections have to carry very high currents, typically 20Amps or more per phase, and all the time. If replacing terminals or crimps in the shop, these MUST be soldered after crimping.

All readings closely similar and within range of 12VACRMS to 15VACRMS shows generator is good. Please proceed to Step 7.

Low readings or diverse readings shows generator stator is defective. Generator must be replaced.

Step 7 - Load Check of Wiring Between RR and Battery

Set the meter to measure DCVolts. Connect one meter probe to the Battery -VE stud. Stick the other probe into the back of the connector block on the RR to contact onto the -VE battery charge crimp (normally on the BLACK wire). Start up the engine and rev up to about 4000 RPM. The meter shows the voltage drop “along the wire” in the -VE charging circuit, it should ideally show zero volts. Any reading above about 200mV indicates a defective -VE charging circuit.
Switch off engine and reconnect the meter to measure the voltage along the +VE charging circuit. One meter clip on the +VE battery stud, the other meter probe in the back of the connector block on the RR to contact onto the +ve battery charge crimp (normally the RED wire). Start up the engine and rev up to about 4000 RPM. Again, the meter shows the voltage “along the wire” in the +VE charging circuit. Any reading above about 200mV indicates a defective +ve charging circuit.

Both readings <200mV indicates good charge circuits. Please go back to Step 3.

>200mV indicates bad conduction somewhere between RR and Battery. Please proceed to Step 8.

Step 8 - Bypass the Charging Circuit Completely

Step 7 is actually pretty difficult to execute, and it is not always conclusive. This Step 8 is a stronger technique, a bit trickier, but absolutely effective in overcoming the same set of problems.
Please build and install a special “charging circuit bypass wires”. The Bypass Wires shall bypass the entire bike wire harness between the RR and the battery. The Bypass Wires must have appropriate crimp tags inserted into the connector block of the bikes harness which connects to the connector block of the RR; and M6 ring tags at the other end for connection directly to the battery studs. The wires must be THICK, minimum 2.5 square millimeters (30Amp wire). All crimped tags must also be soldered, there are very heavy currents in these wires. Twisting & taping will absolutely NOT work.
It is necessary (*for safety*) to temporarily disconnect the battery +VE clamp in order to eject both the RED wire terminal and the BLACK wire terminal from the connector block housing on the bike wire harness, where the bike wire harness connects to the RR unit. Tape up the loose tags to ensure they cannot short to each other nor the bike frame before reconnecting the battery +VE clamp.
Quick test - start up the engine and monitor the charging voltage directly across the battery stud terminals.

Everything looks good? Please go back to step 7 to test fully. If everything works, and the Bypass Wires are all nice and tidy maybe you can leave it just like this.

Still not charging correctly? RR is defective, and must be replaced.