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23.09.2024.

FAULT FINDING FLOW CHART FOR MOTORCYCLE CHARGING SYSTEMS

START

VERY IMPORTANT :
This fault-finding chart assumes that the user has knowledge of the basics of electricity (Voltage, current, resistance, etc.), and about electrical systems on motorcycles in general. If you do not have this knowledge/experience, find someone that has and let him/her check the charging-system on the bike. The use of this fault-finding chart is entirely at the risk of the user. The author cannot be held responsible for any damage that could arise from the use of this fault finding flow chart.

Fully charge the battery. If the battery is not fully charged you may get wrong results using this fault-finding chart.You could just replace it with a battery off another motorcycle that has a known good functioning charging system. Use an accurate digital multimeter! RR means Regulator/Rectifier. This whole fault finding flow chart only works if you have a bike with a combined regulator and rectifier (= regulator/rectifier) in a single case.

NOTE:
Suzuki used on the older GS models three different colors for the three output wires of the stator. They were the only manufacturer doing this. This has caused a lot of unnecessary confusion, because the output of all the three wires is the same. The colors on the wires from the stator are : YELLOW, WHITE/BLUE and WHITE/ GREEN. On the Suzuki RR these colors are : YELLOW, WHITE/BLUE and WHITE/RED.
JUST THINK OF THEM ALL BEING YELLOW !!!

Checking the charging voltage

#1 Switch the multimeter to DC Volts (DCV or Vdc). Switch the range to 20 or 50 V. Connect the multimeter leads to the battery terminals. Start and rev the engine up to **2500** rpm. Check the battery-voltage

Higher than 13.9 V

For AGM battery higher than 14.2V

#2 Rev the engine up to **5000** rpm. Check the reading on the meter.

Less than14.7V

Charging system perfectly OK. You could still disconnect most of the connections on the bike and spray them with contact cleaner or WD40. This could prevent problems in the future.

Less than 13.9V

For AGM battery less than 14.2V

Higher than 14.7V or less than 13.9V

Recognition of the type of RR

#3 Count the # of ***DIFFERENT*** wire ***COLORS*** coming from the RR. If there's a yellow wire on a Yamaha RR, don't count it (it is a special output-wire for switching the lights on and off)

MORE than 4 COLORS or if there is no RR on the bike at all or you have an alternator with excitation

Goto **D**

4 colors or less

Checking the voltage drop on the plus conductor - dU1

#4 You've got a **permanent magnet alternator system**. Let the engine idle, and connect the black multimeter-lead up to the battery(+). Connect the RED multimeter lead up to the RED (or WHITE/RED = Kawasaki) output wire of the RR. Leave the RR connected up to the bike. Check the reading on the meter. ***Leave the engine idling!***

Higher than 0.2V

Bad connection in the positive lead from RR to battery(+). Check this connection all the way through. (suspect the connectors as well as the fuse-box and fuses). Good connections are extremely important in this high current connection. Fix the problem and return to START

Less than 0.2V

Checking the voltage drop on the plus conductor - dU2

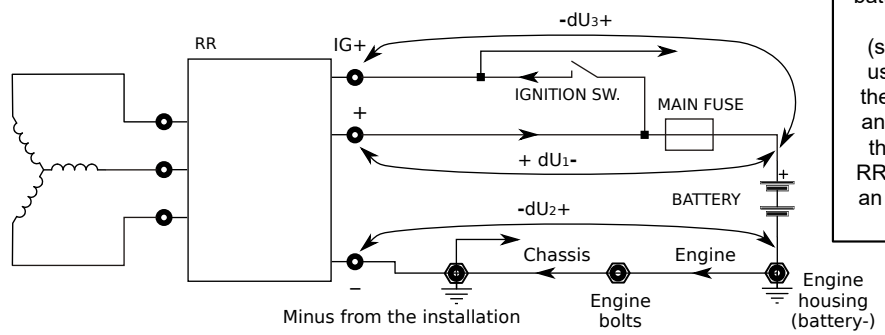
#5 Connect the RED multimeter lead up to the battery(-). Connect the BLACK multimeter lead up to the negative output of the RR (Honda : GREEN, Suzuki : BLACK/WHITE, Yamaha : BLACK, Kawasaki : BLACK, other brands normally use a black wire). If you can't find a negative output wire, then the casing of the RR is probably the negative lead to the frame. Check the reading on the meter. ***Leave the engine idling !***

More than 0.06V

Bad connection in negative lead from RR to battery (-). Check this connection to the battery (-). That circuit starts from the battery minus, the engine, the engine screws, the chassis, the screw at the connection of the chassis and the installation minus, minus the regulator. If the RR does not have an output cable, but uses the case as the ground connection, clean the area where the screw is and use new screws. Also check the connection between the battery (-) and ground. Also suspect the board the RR is mounted on (sometimes it is rubber mounted and use an extra cable from this board to the battery (-) or ground). Take it apart any suspicious connections and clean them. The best solution: connect the RR minus directly to the battery (-) with an extra wire. Correct the problem and return to START

Less than 0.06V

Goto **B**



B

Checking the voltage drop on the Ignition+ 12V wire - dU3

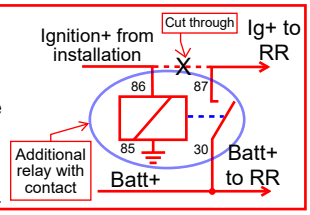
Bad connection from the battery(+) through the **ignition switch** to the switched +12V supply-input on the RR. Check the whole electrical circuit. This is one of the most difficult faults to find. Suspect the ignition-switch itself, the fuse-box and its connections. The **RR thinks the battery-voltage is too low** while the actual voltage is correct or too high. Disconnect all terminals and clean them with contact-cleaner. If you have fixed the problem, return to START

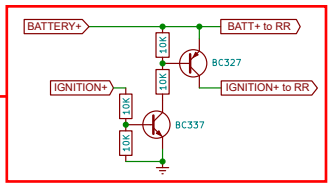
#6

If you have an RR with 4 different wire COLORS emerging from it find the switched +12V supply input. (Normally Honda: BLACK, Suzuki: ORANGE, Yamaha: BROWN, Kawasaki: BROWN otherwise check the wiring-diagram for the extra wire coming from the ignition-switch). Connect the red multimeter-lead to the battery(+) and the black multimeter-lead to the switched +12V input-wire (the one you just found). Leave the RR fully connected up to the bike and let the engine idle. Switch on the lights. Check the reading on the meter.

Higher than 0.2V

The solution to the problem can be to use the incoming (Ig+) Ignition+ wire only to activate an additional relay whose contacts then connect the Battery+ to the Ignition+ input RR. RR then receives voltage on the ignition+ wire through the contacts of the relay, which is activated by the incoming ignition+ wire, which has a higher voltage drop compared to the battery plus. The same is possible with transistor switches (below).

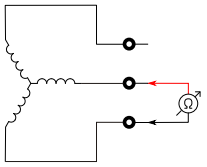




Reading is lower than 0.2V

You have less than 4 different wire COLORS

Checking the stator winding resistance



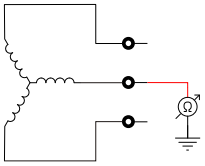
#7

Stop the engine. Disconnect the wires coming from the stator. These are usually three YELLOW (or WHITE = Yamaha) wires. Switch the multimeter to Ohms, the lowest range on the meter. Measure the resistance between all three wires coming from the stator, so you need to take three readings.

One of the readings is lower than 0.5 Ohms or higher than 2 Ohms

All readings are within 0.5 to 2.0 Ohms

Checking the stator winding insulation



Checking the winding insulation can also be done while the motor is running by measuring the fault current to ground. Clamp all the yellow wires with the clamps and check that there is no DC or AC current through all of them together. If there is current, the stator is faulty (short circuit to the housing).

#8B

#8

Connect one of the multimeter-leads up to one of the three YELLOW (or WHITE = Yamaha) wires. Connect the other multimeter lead up to the engine-case. Check the reading on the meter. Make sure the connection to the engine case is a good one !

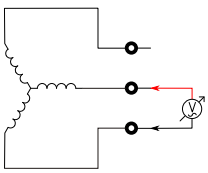
You have any reading ***lower than 100 Ohms***
Check the display, your meter might be showing kilo Ohms or Mega Ohms , (0.1k Ohms is 100 Ohms, 0.45M Ohms is 450 k Ohms is 450,000 Ohms.)

Stator is at fault. Replace the stator and return to START

You have no readings at all, or „OL" in the display

Checking the AC voltage from the generator

Be careful: the voltage changes with revolutions



#9

Switch the multimeter AC-Voltage (Range at least to 100 Vac). Make sure you DON'T switch it to DC-Voltage (=DCV or Vdc). Connect the multimeter leads between two of the three YELLOW (or WHITE = Yamaha) wires coming from the stator. Start the engine and rev it up to app. 5000rpm. Check the reading on the meter. Switch one of the multimeter leads to another YELLOW (or WHITE) wire and check the reading again. Switch the other multimeter-lead to another YELLOW (or WHITE) wire, and check the reading again.

The three readings are not equal, or one of them is below 50 Volts (AC)

Three equal readings, all higher than 50 Volts (AC)

Goto C

#9B

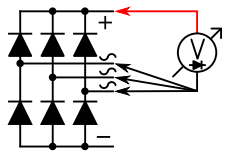
If you have the possibility to measure the short-circuit currents between the generator wires, make the same connections as when measuring the voltage with a minimum 50A AC ammeter. When the windings are OK, then the short-circuit currents will be equal. You can measure short-circuit currents with an AC current clamp.
There were cases where the voltage measurements were OK, and the current measurements deviated significantly. If this is the case, the stator should be replaced.

AC/DC 4 or 80A current clamp VOLTCRAFT VC-539

C

#10 Disconnect the RR from the bike. Switch the multimeter to the ***DIODE-TEST*** function. (The reading on the display will be in ***VOLTS*** now, not in Ohms!) Connect the RED multimeter-lead to the RED (or WHITE/RED = Kawasaki) output wire of the RR. Connect the BLACK multimeter-lead to one YELLOW (or WHITE = Yamaha) wire. Check the reading. Repeat this procedure for the two other YELLOW wires

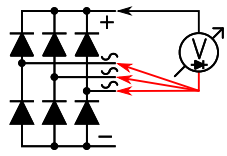
Checking the rectifying battery+ diodes in the non-conductive direction



The meter shows ***1.00 V or lower*** on one of the three tests.

The multimeter display ***"OL"*** or ***above 1.5V*** in all three tests

Checking the rectifying battery+ diodes in the conductive direction



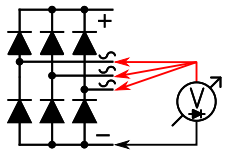
#11 Povežite CRNU pipalicu multimetra s crvenom (ili bijelo/crvenom = Kawasaki) izlaznom žicom RR. Spojite CRVENU pipalicu multimetra s jednom žutom (ili bijelom = Yamaha) žicom. Provjerite očitanje. Ponovite ovaj postupak za druge dvije žute žice.

The meter shows lower than ***0.2 V or higher than 1.0 V*** on one of the three tests

The multimeter shows about ***0.5V*** in all three tests

If it is a serial RR skip this test as the RR has passed the test if the reading exceeds 1.0V or shows "OL" for all three tests

Checking the rectifying Batt- in the non-conductive direction

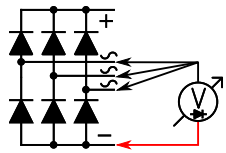


#12 Connect the BLACK multimeter-lead to the negative output wire of the RR (Kawasaki : BLACK, Yamaha : BLACK, Honda : GREEN, Suzuki : BLACK/WHITE). If there is no output wire, connect the black multimeter-lead to the RR case Connect the RED multimeter lead to one YELLOW (or WHITE = Yamaha) wire. Check the reading. Repeat this procedure for the two other YELLOW wires.

The meter shows ***1.00 V or lower*** on one of the three tests.

The multimeter display ***"OL"*** or ***above 1.5V*** in all three tests

Checking the rectifying Batt- in the conductive direction

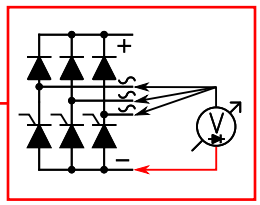


#13 Connect the RED multimeter-lead to the negative output wire of the RR (Kawasaki: BLACK, Yamaha : BLACK, Honda : GREEN, Suzuki : BLACK/WHITE). If there is no output wire, connect the BLACK multimeter-lead to the RR-case Connect the BLACK multimeter-lead to one YELLOW (or WHITE = Yamaha) wire. Check the reading. Repeat this procedure for the two other YELLOW wires.

The meter shows lower than 0.2 V or higher than 1.0 V on one of the three tests (**paralell type RR**)

The multimeter displays ***0.5V*** on all three tests

If it is a serial RR skip this test as the RR has passed the test if the reading exceeds 1.0V or shows "OL" for all three tests



This is easily determined by measuring the DC charging current of the battery and measuring the AC currents from the generator (DC and AC current clamps).

RR is at fault, replace it with a new one and return to START

#14 Since this is the last test, the only thing that can be at fault is the battery itself. Replace it with a known, fully charged battery and return to START.

Pay attention to the comment on the right so that you don't have to buy a new battery unnecessarily.

#14B It is possible that a broken **battery takes a lot of current**, but that the voltage on it does not rise!

Also, it is possible that the voltage on the battery does not rise because the broken **regulator has stopped filtering the voltage it measures and regulates to the peak values** of the voltage, interrupts charging and destroys the voltage on the battery. It is also **possible that the maximum current from the generator is less than the motorcycle** consumption. The cause may be a weakened generator (**magnet** or coil failure - **interruption of one phase**) or excessive consumption (e.g. stronger bulbs, additional consumers, broken electric fuel pump, etc.)

D

Generator with excitation

#15

Is there an RR on the bike ? (somewhere on the frame under the bodywork)

No

You have an integrated generator (car-type, with built in regulator and rectifier). Most of the problems with this kind of generator are bad connections, from generator to battery (battery doesn't charge), or a burned out regulator (battery-voltage too high) Sometimes the generator itself is at fault. You could check the resistance of the fieldwinding (around 5 Ohms) and the state the brushes are in. Otherwise leave it to an expert. After solving the problem, return to START

Yes

Voltage check

#16

Switch the multimeter to DC-Voltage (DCV or Vdc) Range 20 or 50V. Connect the multimeter-leads to the battery-terminals. Start the engine and rev it up to app.5000rpm. Check the voltage reading.

Higher than 14.7 V

RR at fault. Voltage is not regulated properly. Check voltage on the BROWN (Yamaha, Kawasaki), BLACK (Honda) wires. If it is lower than battery voltage, you have a bad connection between battery and RR through the ignition switch. Fix this bad connection, and/or replace the RR and return to START

Lower than 14.7 V

Checking the resistance of the excitation winding

#17

Stop the engine. Disconnect the blockconnector to the generator closest to the engine. This connector must have at least three YELLOW (or WHITE = Yamaha) wires in it and one or two extra ones. Switch the multimeter to the lowest Ohms-range. measure the resistance between the two other wires, or between the single extra one (apart from the YELLOW ones) and the engine-casing.

You have a reading lower than 3 Ohms or higher than 10 Ohms

#18

The fieldwinding in the generator or the brushes to the rotor are at fault. If there are any brushes inside the generator, disconnect them and measure the resistance between the two copper slip-rings on the rotor. These are the rings on which the brushes run.

If there are no brushes inside the generator, replace the fieldwinding or if that's not possible separately, replace the whole stator and return to START)

Resistance lower than 3.6 Ohms or higher than 6 Ohms

Rotor at fault. Replace it with a new one, and return to START

#17B

If you have leads on both ends of the excitation, check that the excitation winding is not connected to the housing. The resistance to the housing must be over 1000 Ohms.

Resistance between 4 Ohm and 6 Ohm

Resistance between 4 Ohm and 6 Ohm

Checking the resistance of the excitation winding on the sliding wheels

Checking the AC voltage from the stator at maximum excitation

#19

Connect one spare wire to the battery(+) terminal and connect it up to one of the extra wires that are in the blockconnector, apart from the YELLOW (or WHITE = Yamaha) wires. Connect a second spare wire between the battery(-) and the other extra wire in the connectorblock. If you have only one extra wire, only connect the battery(+) wire to this one. Make sure the battery(-) is still connected to the frame. Switch the multimeter to AC-Volts, range at least 100 V (ACV or Vac). Start the engine and rev it up to app. 5000 rpm. Connect the multimeter-leads up between two of the YELLOW (or WHITE = Yamaha) wires. Check reading on multimeter. Switch one of the multimeter-leads to another YELLOW wire and check the reading again. Then switch the other multimeter-lead and check the reading again.

Wiring to the brushes or the brushes themselves at fault. Replace the brushes, check the wiring to the brushes and return to START

The three readings are not equal, or they are below 50 Volts (AC)

Stator at fault. Replace stator and return to START

Three equal readings, all greater than 50V (AC)

#19B

If you change the RR and have a two-wire excitation, the polarity of the voltage with the RR can be connected in two ways. Check how the generator works in both ways!

Checking the excitation voltage provided by RR

#20

Stop the engine. Switch the multimeter to DC-Voltage (DCV or Vdc). With the block-connector disconnected as above, connect the multimeter-leads up to the two extra wires in this connector (apart from the three YELLOW wires), this in the connector-block emerging from the wiring-loom, not the other side going to the generator. If there's only one extra wire, connect it to one multimeter-lead and connect the other multimeter-lead to the engine-casing. When you switch on the ignition, Check the reading on the display.

No reading or a reading lower than 10 V (DC)

RR at fault. Replace it with a new one and return to START

Readings 10 V (DC) or higher

Goto C

Translated and amended based on the text: "Electrical fault finding ELECTREX USA LTD"