

GS Charging System Health

Hi all,

Most know I have posted a lot about the analysis of and the do's and don't's for fixing your GS charging systems over the last couple of years. This started when I first bought my 81 GS750EX and started a mission to solve what is a very common issue not just with GS's but with most any permanent magnet (non alternator) charging system.

While I have striven to keep the discussion as simple as I could, I still made the discussion technical enough so that I could collect other's opinions and observations to modify my analysis as might be required. There are years of collective experience with the members here and I wanted to elicit that knowledge as best I could.

Well I think we are now at a point to create a simple set of suggestions for modification of a GS charging system so that you can save your stator and R/R if they have not yet failed and hopefully prolong their life as well as your batteries and not leave you stranded on the side of the road somewhere.

I got a question from a member here if it was all necessary? This is a good question as we know many stock GS did coming from the factory working. But as most of us here at GSR know by now, many motorcycle charging systems have fallen into a defective state even with very few miles. So if you actively pursue and achieve a factory fresh condition of your charging system then you can keep it stock. But therein lies the problem;

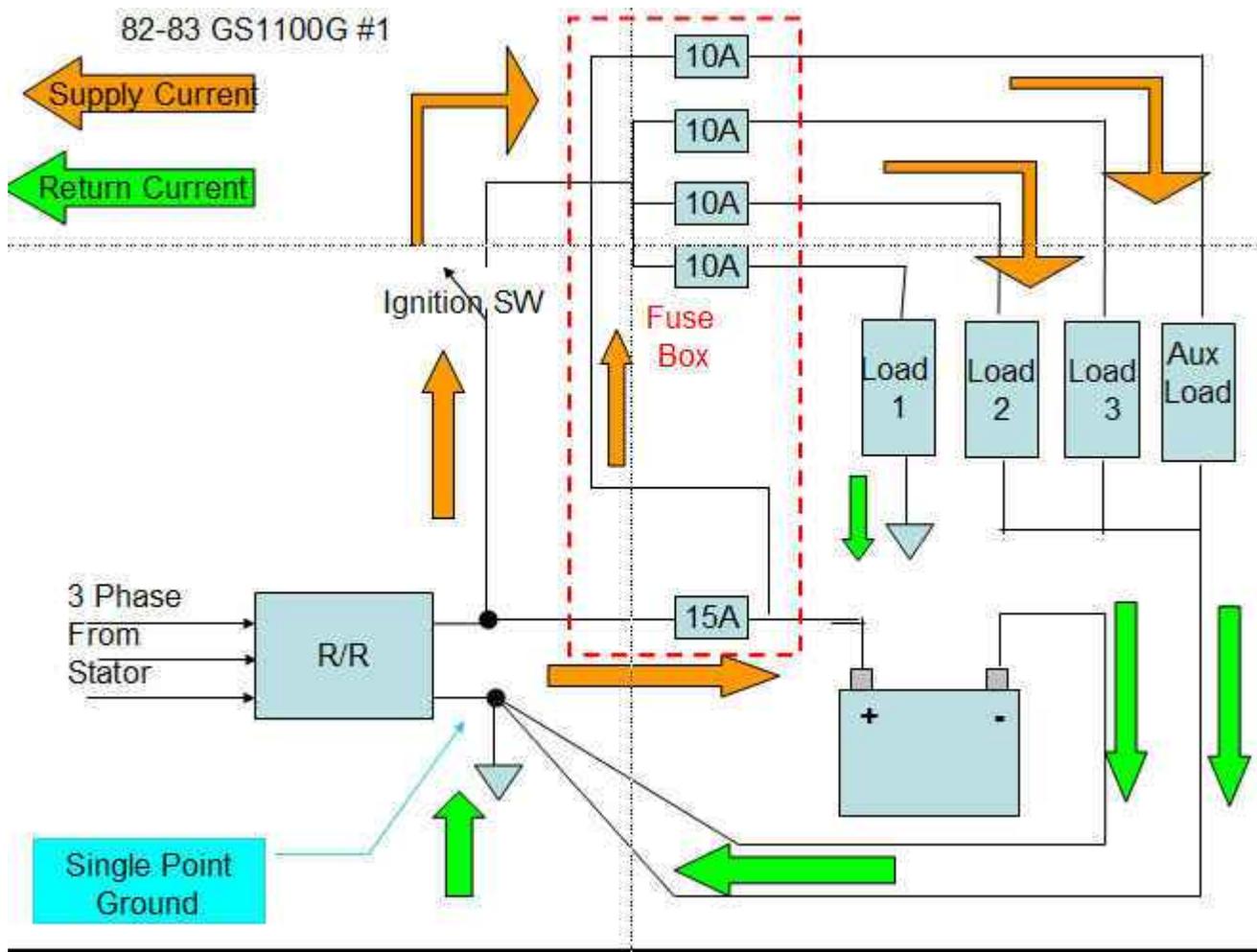
"How can you avoid the natural corrosion that occurs in the contacts connectors , crimps and other grounding surfaces?"

It is going to be a lot of work. So in the interest of reducing the sensitivity of the GS charging system to corrosion there are some standard suggestions.

Make no mistake about this point. Your stator converts the mechanical power of your GS motor into electrical power that is supposed to be regulated by your R/R as the engine RPM's change. The higher the RPM the more power it generates. Because of the delicate balance of charging system design (not much margin in any direction), If that power can't go to all intended loads (the lights, the ignition, and all other loads) the stator will just have to eat the power in the form of converting it back to heat. The stator will get hot and most likely the R/R as well. How does this happen ? primarily bad connections.

But first so we have a point of reference, here is a simplification of how the currents flow through your charging system. All charging currents come from the R/R (+). While the battery can also supply current, generally that is only when the engine is off or the RPM's are so low that the battery is discharging. In all other cases there should be positive current flow out of the R/R(+) to the system. That means all that current will only flow if it can return back to the R/R(-).

So we see that generally current splits after leaving the R/R(+) most goes to the ignition switch and feeds the different legs of the fuse box which by one ground return path (frame, harness, or battery terminal) gets back to the R/R (-). From this it is pretty easy to see that the split in the R/R (+) output is similar to the R/R(-) single point ground concept. We want to separate the currents going to the battery from all of the currents in the system. This is because we are trying to regulate the voltage to the system but more importantly to the battery. The less current that travels between the R/R and the battery the more accurately the voltages will track. So while Suzuki did not implement a single point grounding scheme, the positive side of the circuit does pretty good in immediately separating the positive currents. I will describe the details of a typical single point ground in STEP #2



OK So without much more explanation and motivation, here are the three steps to GS Charging health

STEP #1.) GOOD R/R CONNECTIONS On the typical non sense wire R/R there are 5 wires. Make sure these have very good connections to the rest of the system by either:

- (1) High quality contacts (like spades with dielectric grease)
- (2) Direct physically twist and solder with shrink tubing.

I prefer #2 as I seldom have to remove the connections and the solder keeps out corrosion.

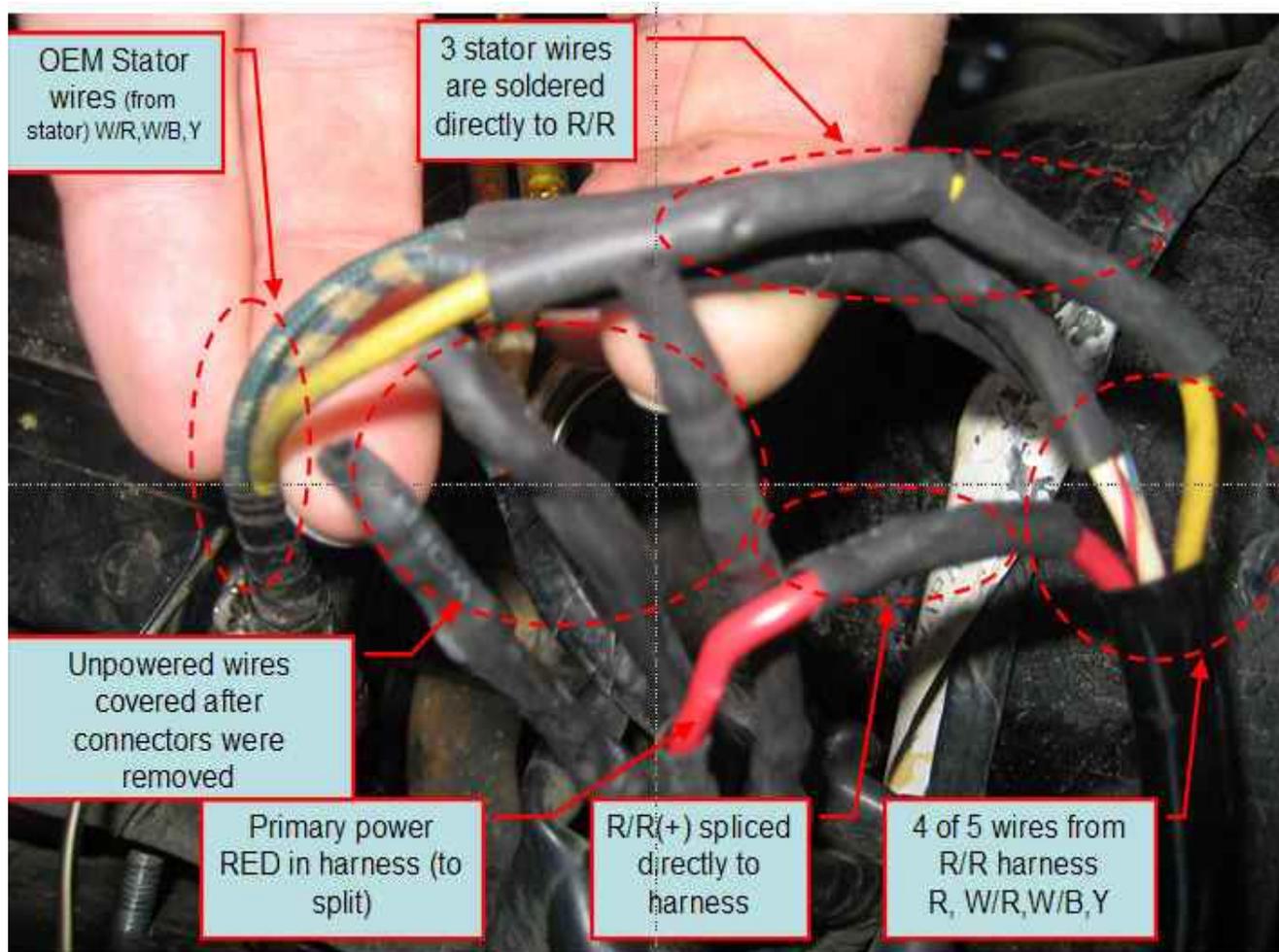
Just for reference, the 5 wires are:

R/R (+) - RED charging system output

R/R (-) - Black (typically with a ring lug) Charging system return

3 stator wires which are W/G, Y and W/B if OEM or typically all Yellow if say from an aftermarket stator

Here is a picture of an 83 GS1100ED with stock harness and an OEM R/R . First thing I did was cut off the burned and melted OEM connectors from the harness. The original ED OEM R/R was fired so it was thrown out. These connectons avoid the left hand switch and are best.



If you have a 6 wire the same applies, you are just going to have to find a low impedance switched power source. You can do a search, but a coil mod relay provides about the best option. Otherwise hook it right to the battery and make sure to not let the GS set for long periods of days

STEP #2.) GOOD R/R GROUNDS Make sure that the R/R(-) is properly grounded to: harness, battery, frame.

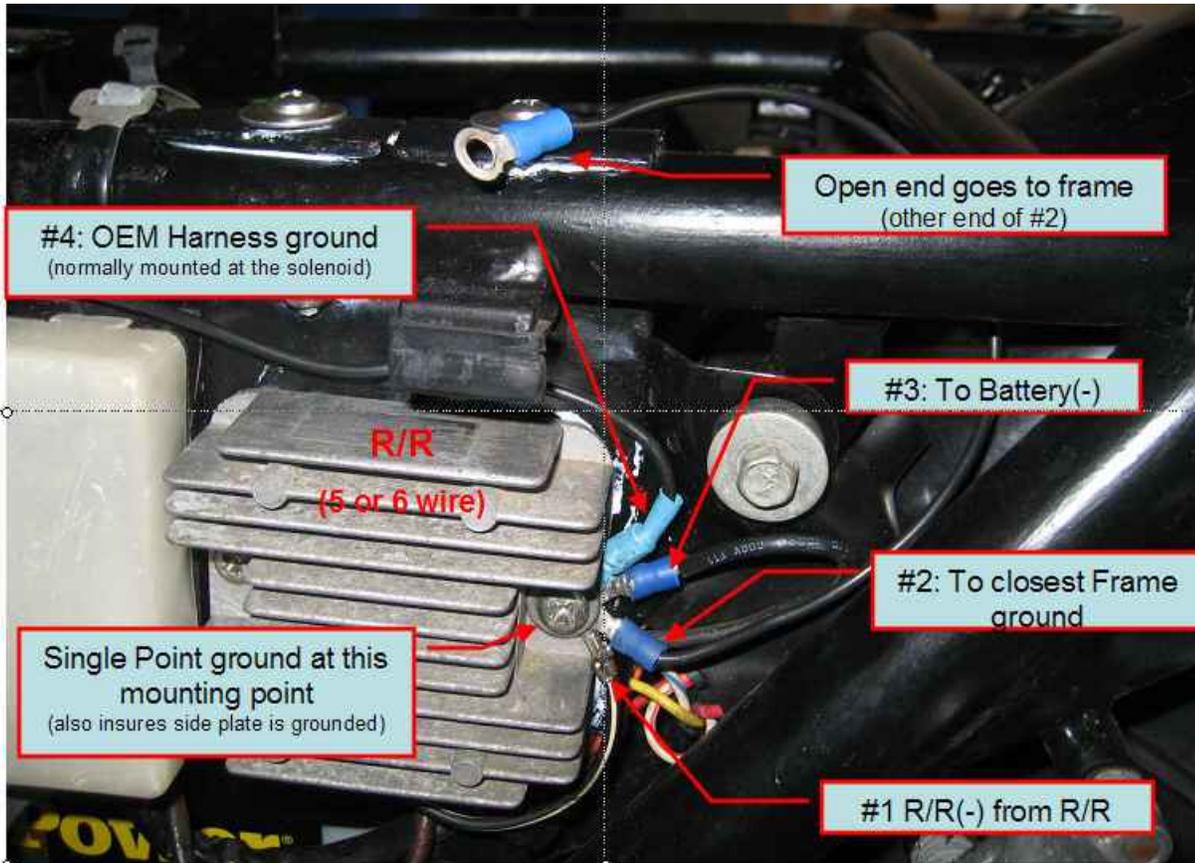
I have described a single point grounding approach that minimizes the amount of current that flows between the battery (-) and the R/R (-) connections. By doing that there is less susceptibility to resistance due to bad connections and corrosion and the R/R should charge the battery more accurately.

While there a different way to connect the R/R the grounding scheme, the way Suzuki originally implemented the GS electrical charging systems is confused, inconsistent and not ideal in any sense of the word. If you follow the approach below you will be doing just about as good as you can do and you DO NOT you can certainly do much worse.

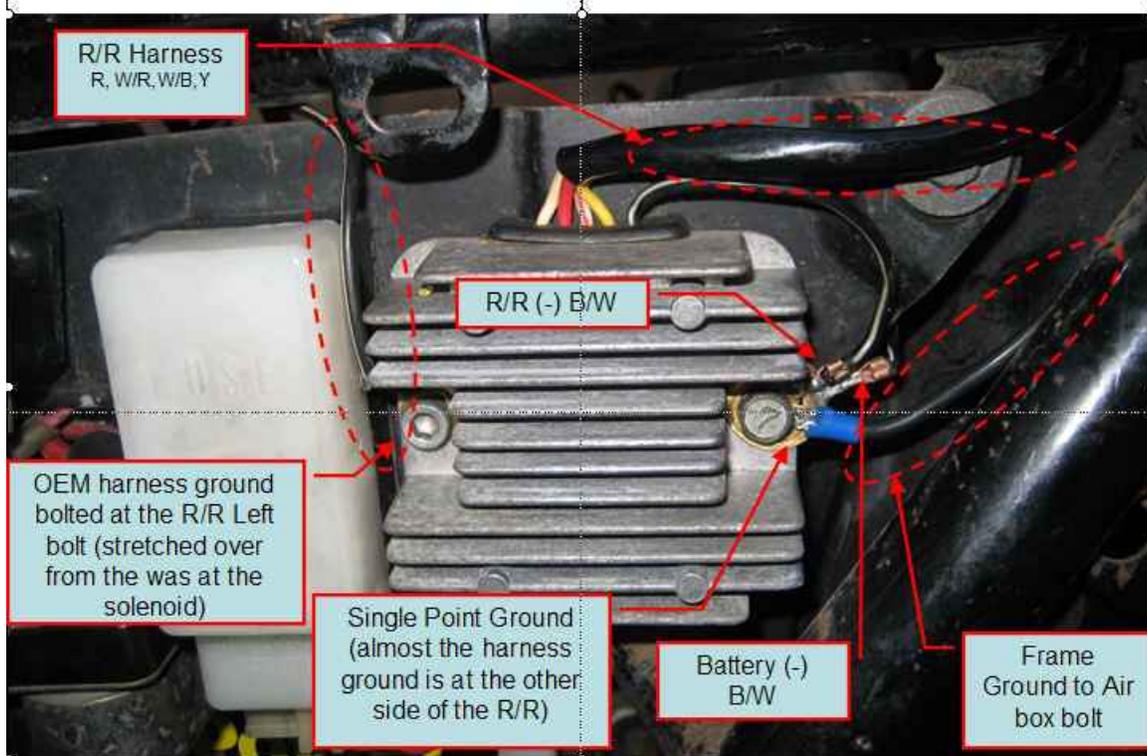
By picking one of the R/R mounting bolts as the single point ground point, the R/R(-) wire can be very short, the mounting plate is automatically grounded and all of the return current wires can be tied securely together at a single point. Here are the connections

- #1: Ground R/R(-) to case and side plate
- #2: The shortest wire to a frame bolt
- #3: The shortest wire to the Battery (-)
- #4: Connects to the (B/W) harness negative ring lugs (typically the one attached at the solenoid mounting bolt). You can leave the other harness ground ring lug (B/W) where it normally is picking up the battery box ground.

Here is a matching picture on a GS750EX, it will work well for most all E's at least. The layout may be a little different on the G's and L's but the ideas will be the same.



Here is a GS1100ED done similarly; Here the harness ground lead would not stretch all the way so I just bolted it to the other side of the R/R. R/R should probably be turned the other side around but all wires would fit the same way.



The reason for all these connections is basically the fact that all currents from the charging system (leaving the R/R (+) red wire have to return to the R/R(-) black wire. Some of these currents come back from the harness B/W, some from the engine, some from frame return loads. By connecting all of these as close as possible to the R/R (-) you have created a "single point ground" at this point. In this way the current that runs from the Battery (-) to the R/R(-) is only carrying the battery charging current and nothing else. That is the real reason for having a single point ground. There is no current return sharing of the various loads.

Finally **STEP #3.) Perform Stator Paper Checks.** The stator pages checks are not perfect, but they are designed to help you through a process of elimination in determining what is wrong with your charging system. The good news about doing steps #1 and #2 above first, is that when the stator pages say to check your connections you know you already have done it. Here is the update.

[Revised PHASE 1 of Stator Pages](#)

[ORIGINAL STATOR PAGES](#)

The most important thing will be to make sure every thing checks out at 5000 RPM which is typical cruising speed. You might find that you will need to clean your fuse box to get the positive side voltage drops below 0.2V at 5000 RPM. In steps #1 above you should of gotten most of the connections between the R/R(+) to battery (+) in good shape except the fuse box.

There are two types I'm aware of:

- old crimp type where the wiring harness runs right into the fuse box and is crimped into the connections
- Copper strip type where there is a connector to the fuse box and all internal connections are solid copper strips (GS1100EZ/ED's have these type) between the connector and the fuses.

I would clean either type with some navel jelly to remove corrosion. On the crimp style I would then solder all the crimps to keep out the corrosion. Replace the fuses using dielectric grease. Replace the whole thing if this they are too far gone.

Some links to prior posts:

[High Performance Power and Grounding](#)

[GS Stators : Helpful additions](#)

[Ground Loops](#)

Posplayr (Kinky Jim) 