Solar Charge Station Troubleshooting

Before starting: Safety

- These charge docks leads are live and dangerous for a lot of the troubleshooting steps used listed in this document.
- Never touch the contacts to either a robots dock bumpers or to the charge station fangs.
- Always wear insulated gloves when working through this troubleshooting guide.

Before starting: Potentially useful tools

- #2 Phillips Screwdriver
- 8mm wrench
- Digital Multimeter
- Medium flathead screwdriver
- Socket wrench
- ½" socket
- Socket extender

Before starting: Checks prior to diagnosing charge station

- Before trying to diagnose an issue on the charge station itself, make sure the following is done

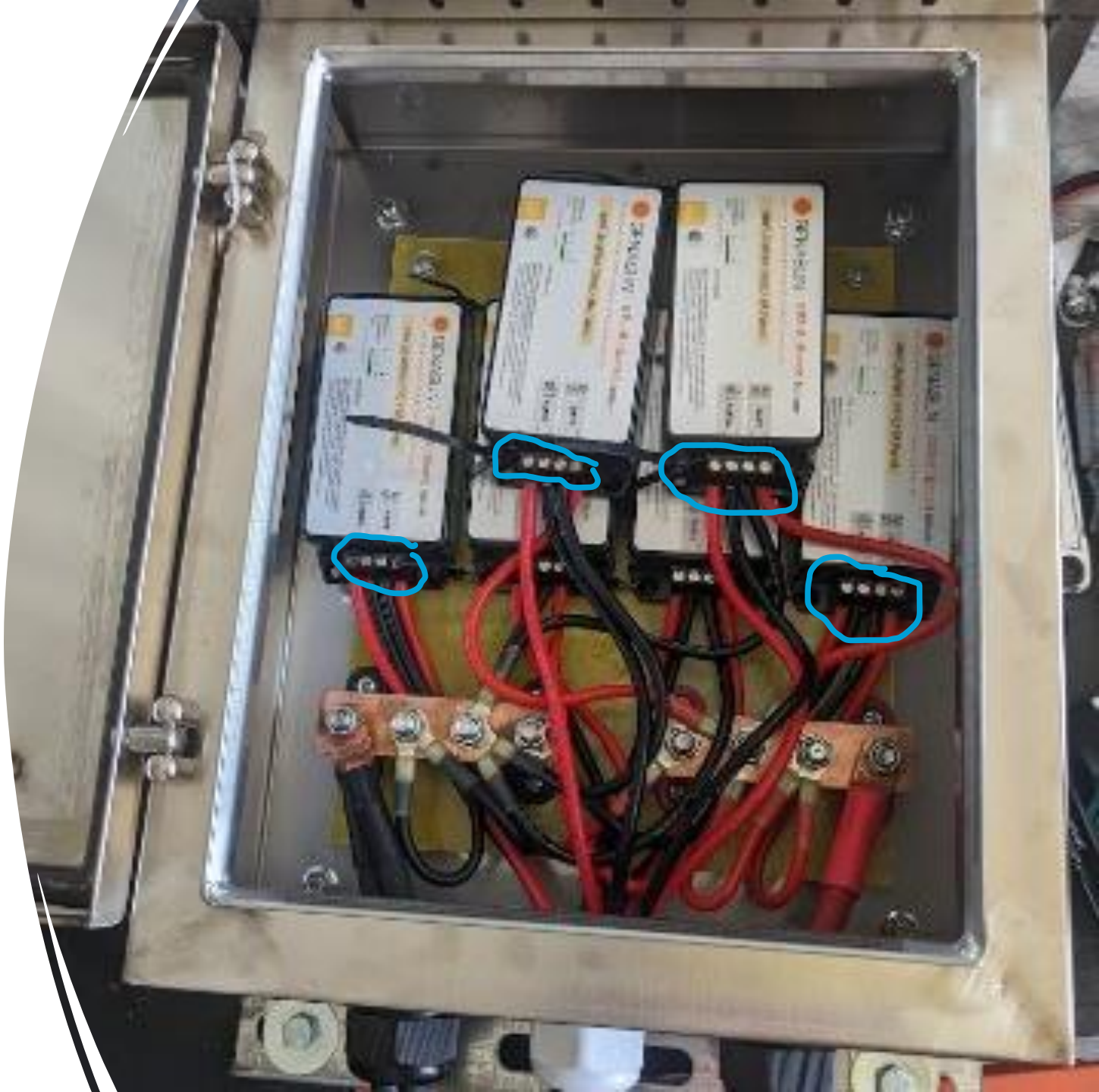
- Issue verified replicable with multiple robots, ideally more than 2
- Issue verified to show up regardless of time of day or quality of sunlight

Step 1: Verify all SCCs working properly

- Verify that, in each enclosure, all SCCs are blinking correctly, with a pattern that reflects a healthy charge pattern. Note that you do need a robot charging for this to be reflected properly.

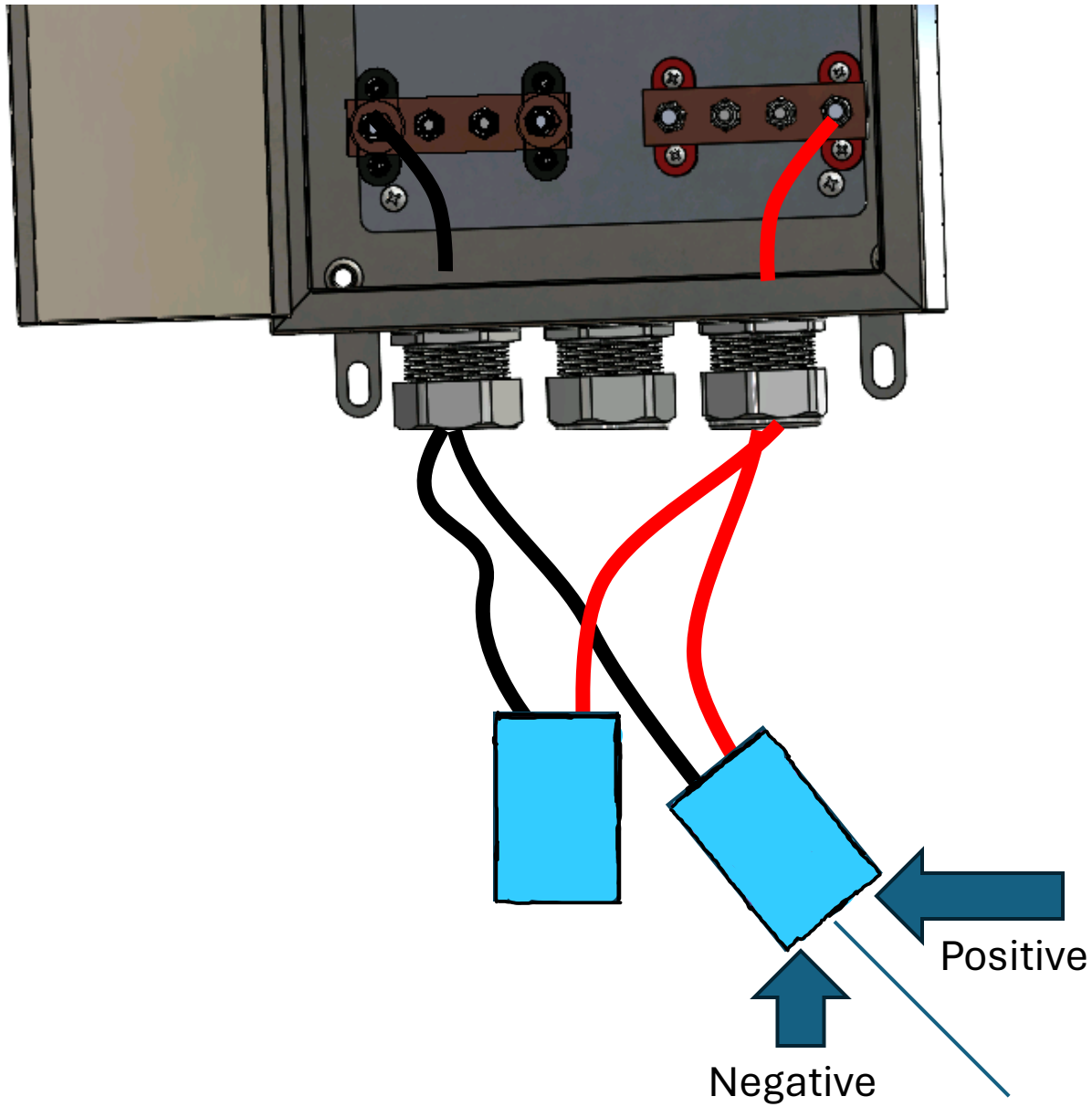
Step 2: Verify cable tightness into SCC screw terminals

- Make sure there are no loose cables connected to the screw terminals of the SCCs in the enclosures



Step 3: Check enclosure charge rates

- Using a Digital Multimeter set to read DC Volts, check the output of each SCC enclosure separately by putting the red lead on the red, positive bus bar, and the black lead on the black, negative bus bar. This will be the battery voltage, which should read 52V-57V depending on the battery charge state.
- Verify that the output matches what is expected for that time of day, knowing each panel is expected to output ~200W at peak hours with good sunlight.



Step 4: Verify output voltage of enclosure bus bars

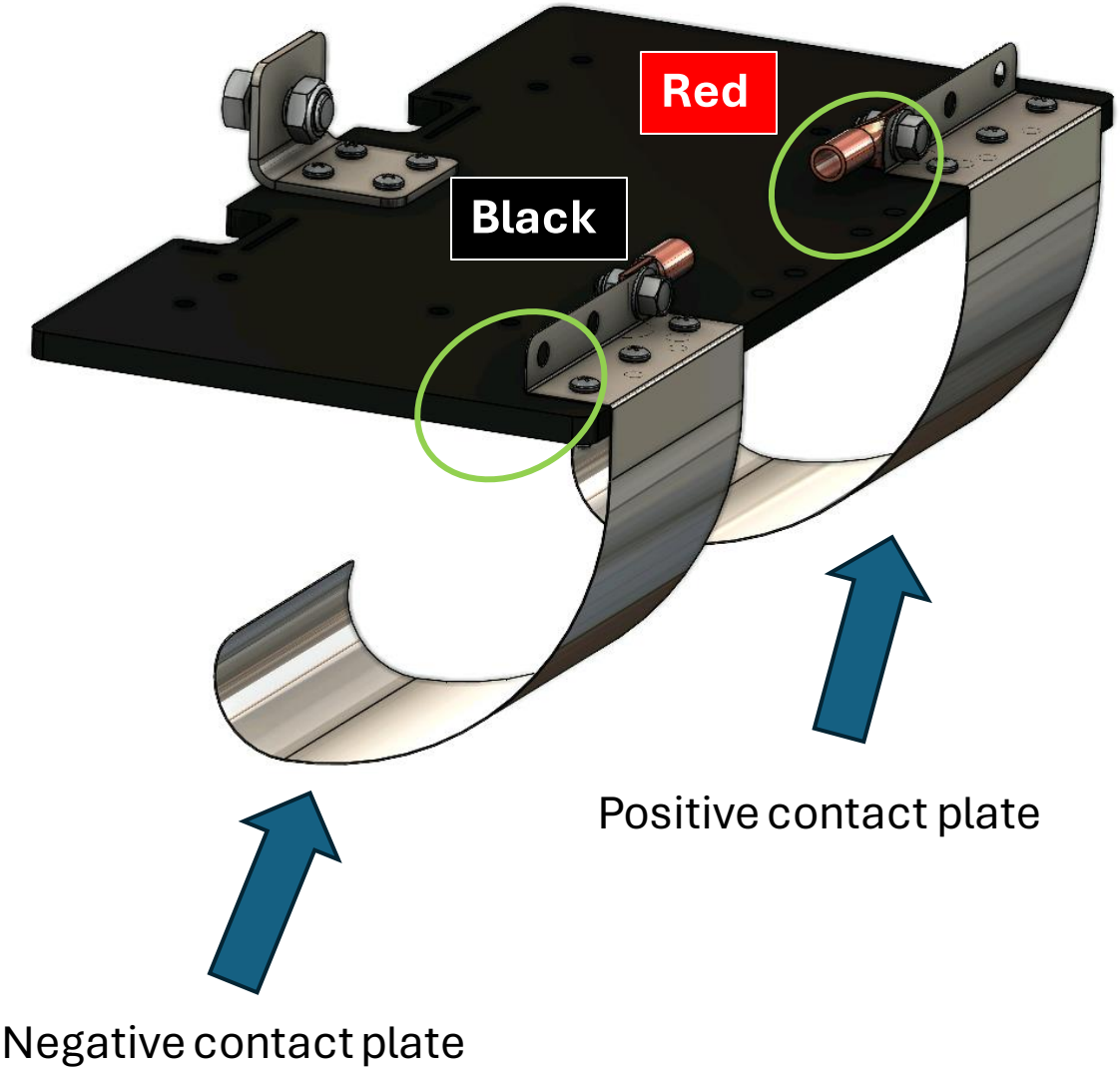
- Using a Digital Multimeter, again set to DC volts, verify that the output voltage of each of the enclosure busbars matches the expected battery voltages (52V +)
- The red, positive lead of the multimeter goes in the terminal of the blue 175A Anderson connector that corresponds to the red, positive wire exiting the other end, directly across from where the red wire enters the connector
- The black, negative lead similarly goes in the corresponding Anderson connector terminal to the black, negative wire, directly across from where the black wire enters the connector

Step 5: Verify continuity of Andersons

- A) Use a Digital Multimeter to verify the continuity (set to measure ohms) between the positive (+) 175A blue Anderson lead and the positive (+) bus bar in the enclosure
- B) Repeat continuity check between the negative (-) blue Anderson lead and the negative (-) bus bar

Step 6: Verify continuity on dock contact plate attachment

- On the attachment points to the dock contact plate, verify the continuity (set the multimeter to measure ohms) of both the red positive (+) end of the contact plate and the blue 175A Anderson connectors, then repeat with the black negative (-) end of the attachment points to the contact plate and the Anderson connectors.



Step 7: Inspect dock fangs for corrosion

- Inspect the actual dock fangs for corrosion and clean if necessary
- Remember to handle the fangs with care, and not to touch live connections, so always disconnect the fangs before cleaning
- If separate, unused fangs are available, it is smart to test multiple sets of fangs as another way to verify the fangs are or are not the cause of the issue

Step 8: Inspect all wire connections for dirt or corrosion

- If all previous steps produce nominal results and the issue persists, there may be dirt or corrosion missed on any wire connections made in the charge dock assembly.
- You may be thinking this was corrected by previous steps. If this point is reached, it is always worth double checking for dirt/corrosion.

Step 9: Inspect robot bumpers for corrosion

- If every step above produces nominal results, check all affected robots for corrosion. This is very unlikely as it requires all robots tested to be similarly corroded.
- If all steps to this point fail to resolve the issue, contact ops team as we will need to debug the issue further and update the found cause to this PowerPoint to prevent further difficulties finding said issue.