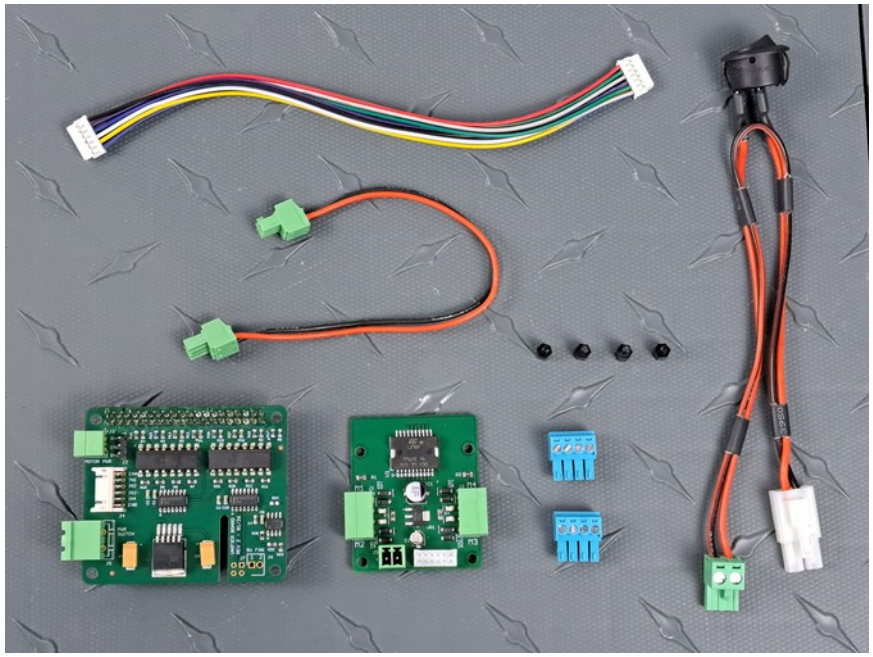
SolveBOTICS

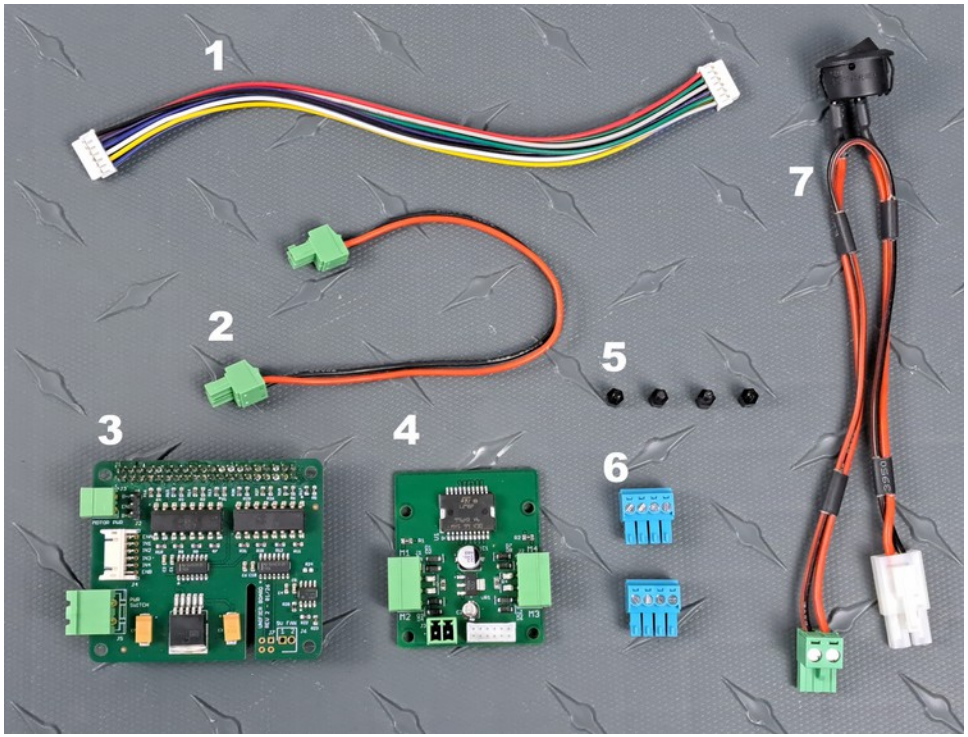


R22 Unifier GPIO Board and Cable Set

REV 1

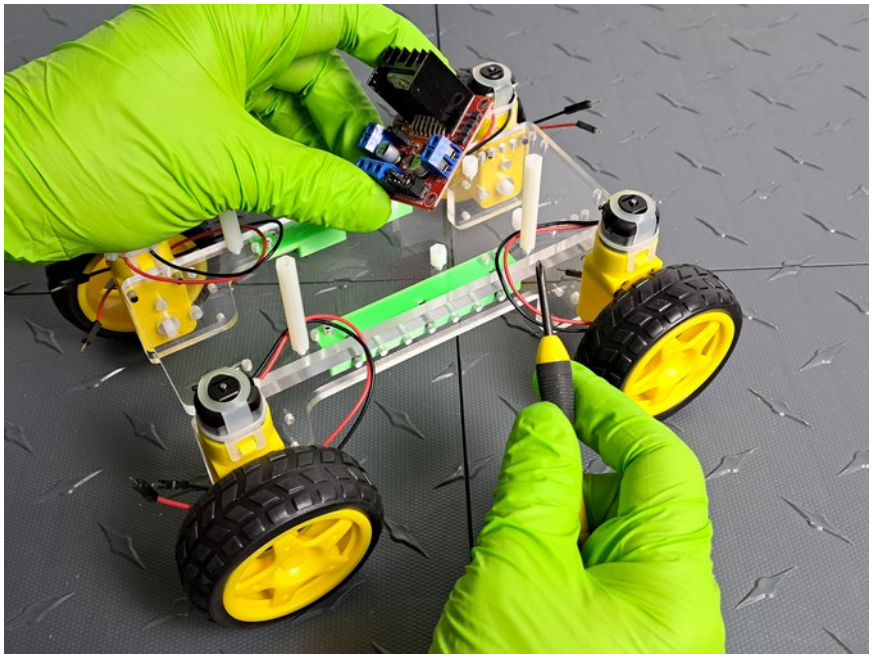
Tools Required

- Small precision flat-blade screwdriver (2.4 mm)
- Precision phillips screwdriver (#1)
- 2.5mm Hex Driver



Major Components:

1 – Signal Cable
2 – Motor-driver Voltage Cable
3 – Unifier GPIO Board
4 – Motor Driver PCB
5 – M2.5 x 6mm Hex Standoffs
6 – Motor terminal plugs
7 – Battery and power switch harness



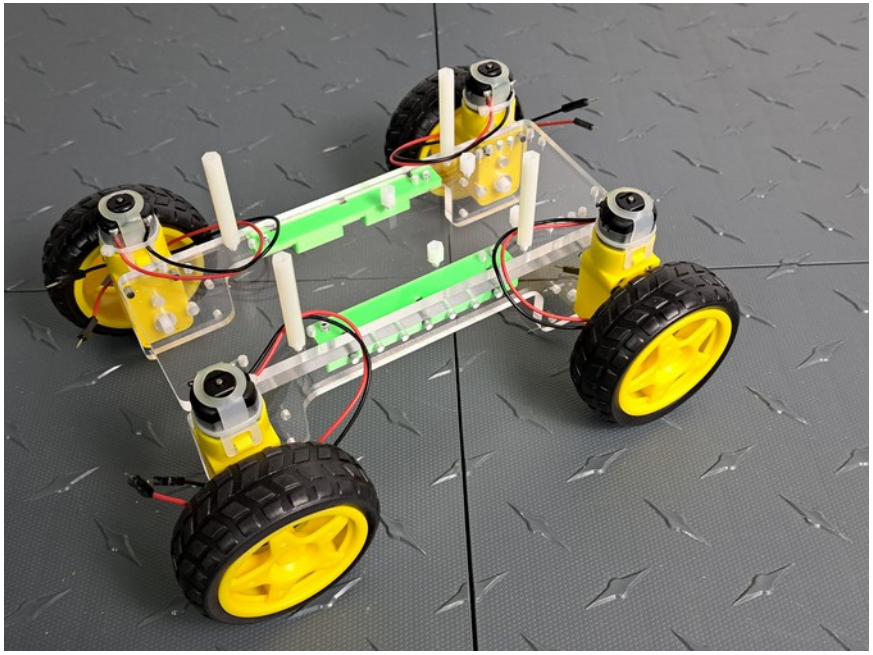


Figure 1 – Remove original Motor Driver PCB

1. If already installed, remove the original Motor Driver PCB.

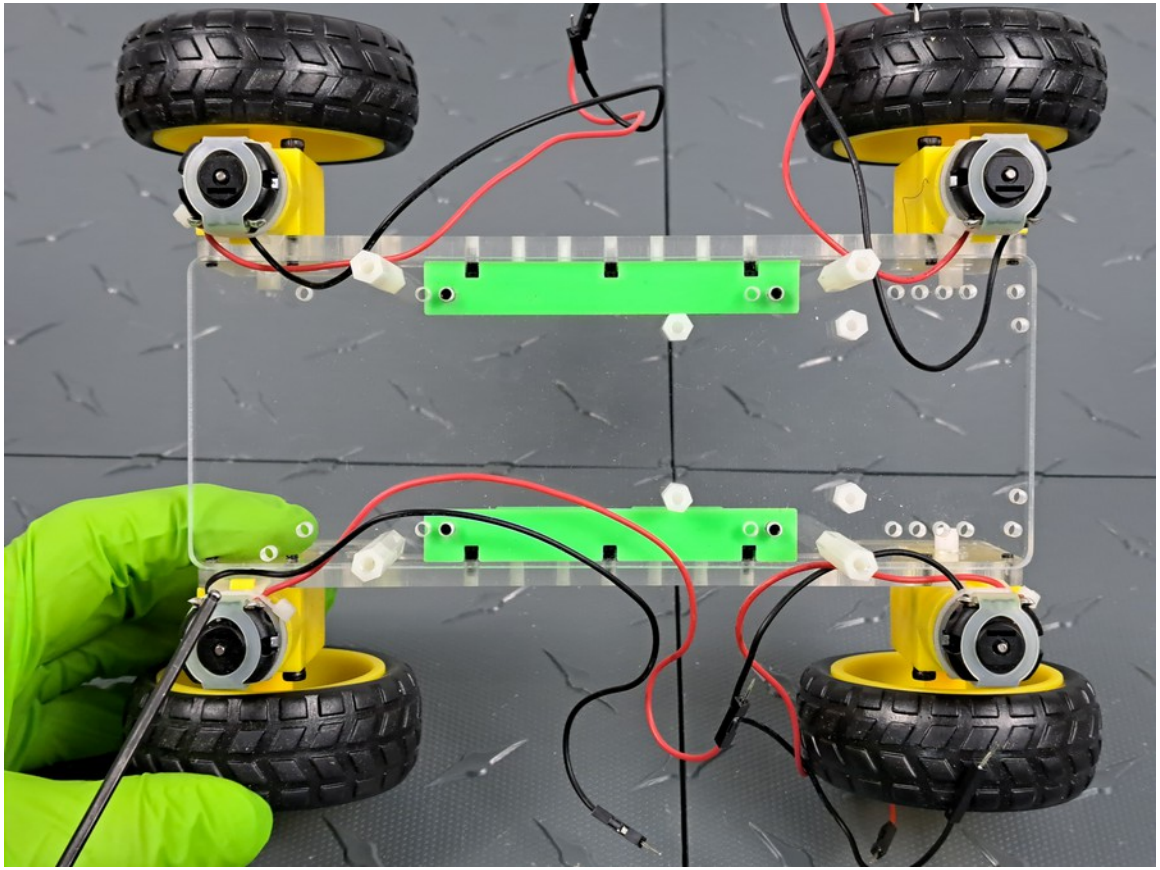


Figure 2 – Recommended arrangement of motors.

2. Shown in figure 2 above is the recommended arrangement of the motors. Take note of how motors are turned so the motor terminals are facing inward. This arrangement sets the motors up to have the correct movement direction when combined with the motor driver PCB connections and python code in later steps.

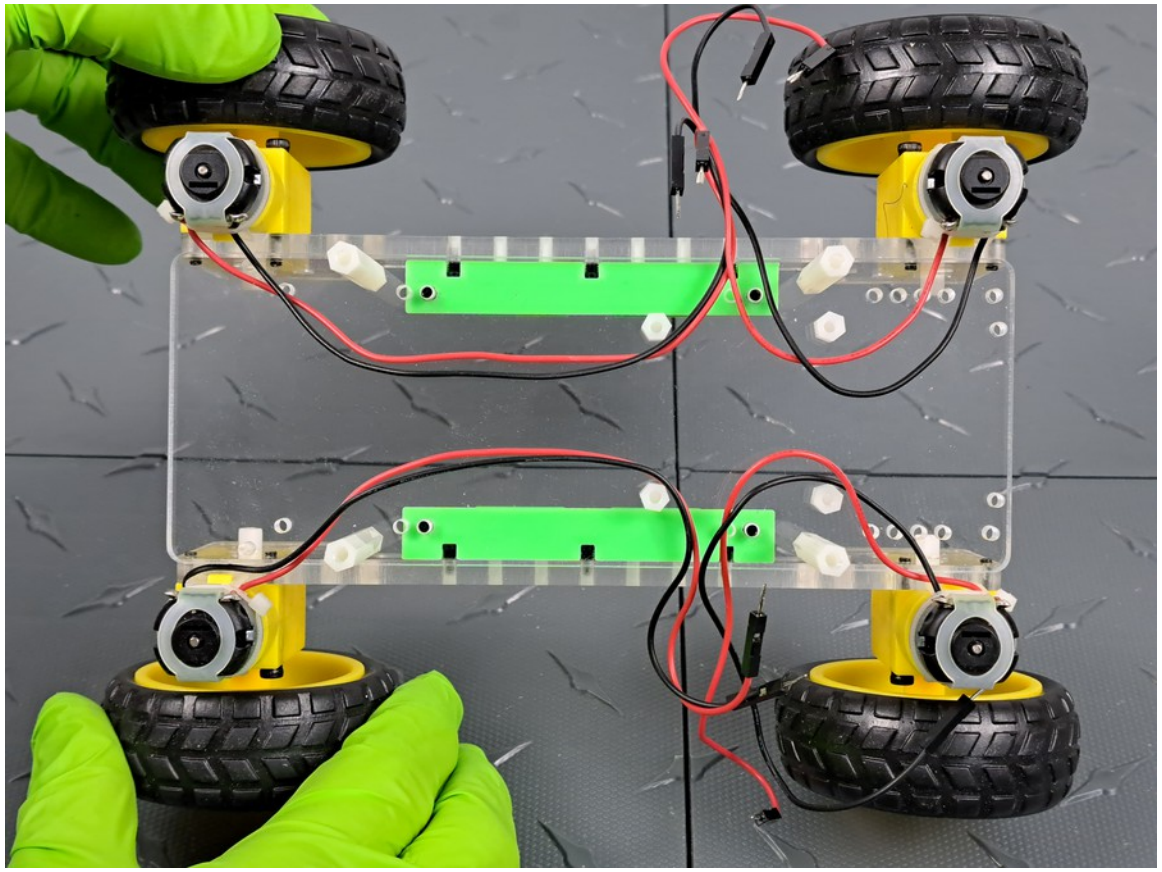
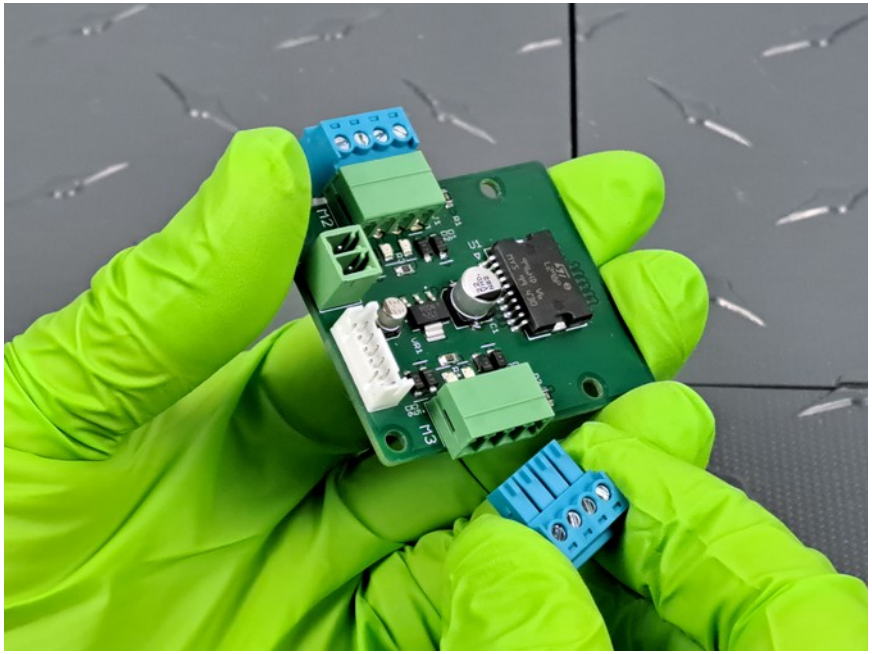


Figure 3 – Suggested routing of motor wires.

3. Before installing the new Motor Driver PCB, route the motor wires as shown in figure 3 above.



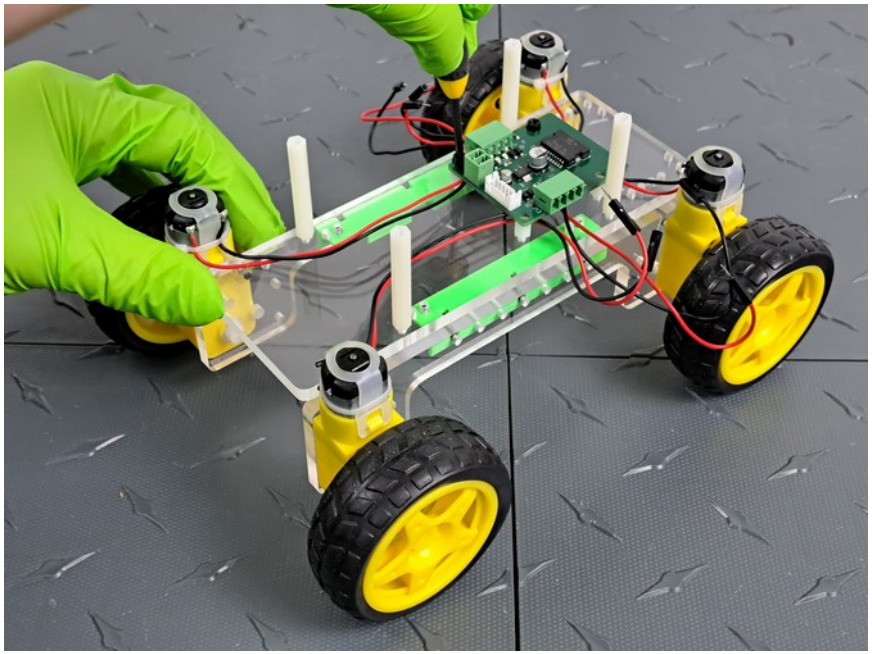


Figure 4 – Remove terminal plugs and install Motor Driver PCB

4. Locate the new Motor Driver PCB and gently remove the terminal plugs, then install the motor driver PCB using the original M3x6mm nylon screws.

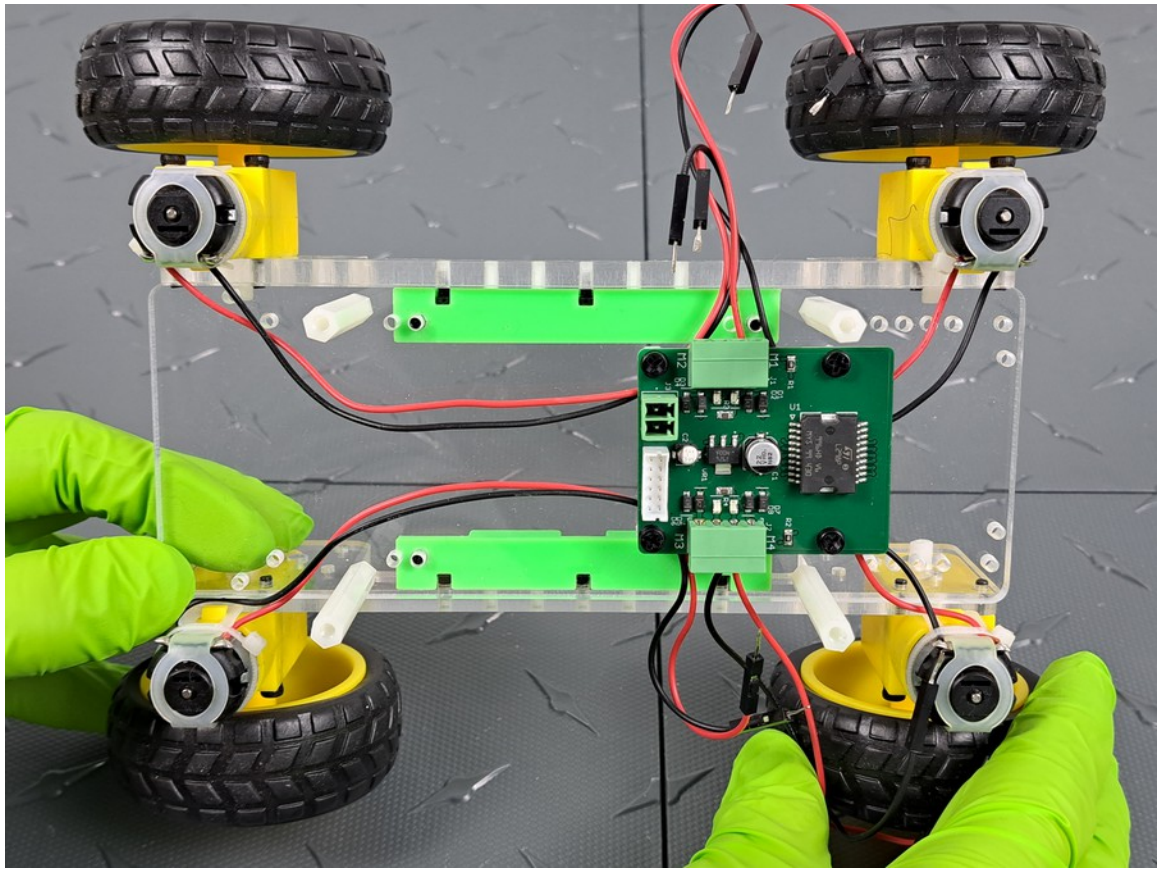


Figure 5 – Correct arrangement of Motor Driver PCB

5. At this point, the motors, PCB, and wiring should match figure 5 above. It's crucial that the Motor Driver PCB be oriented as shown in figure 5.

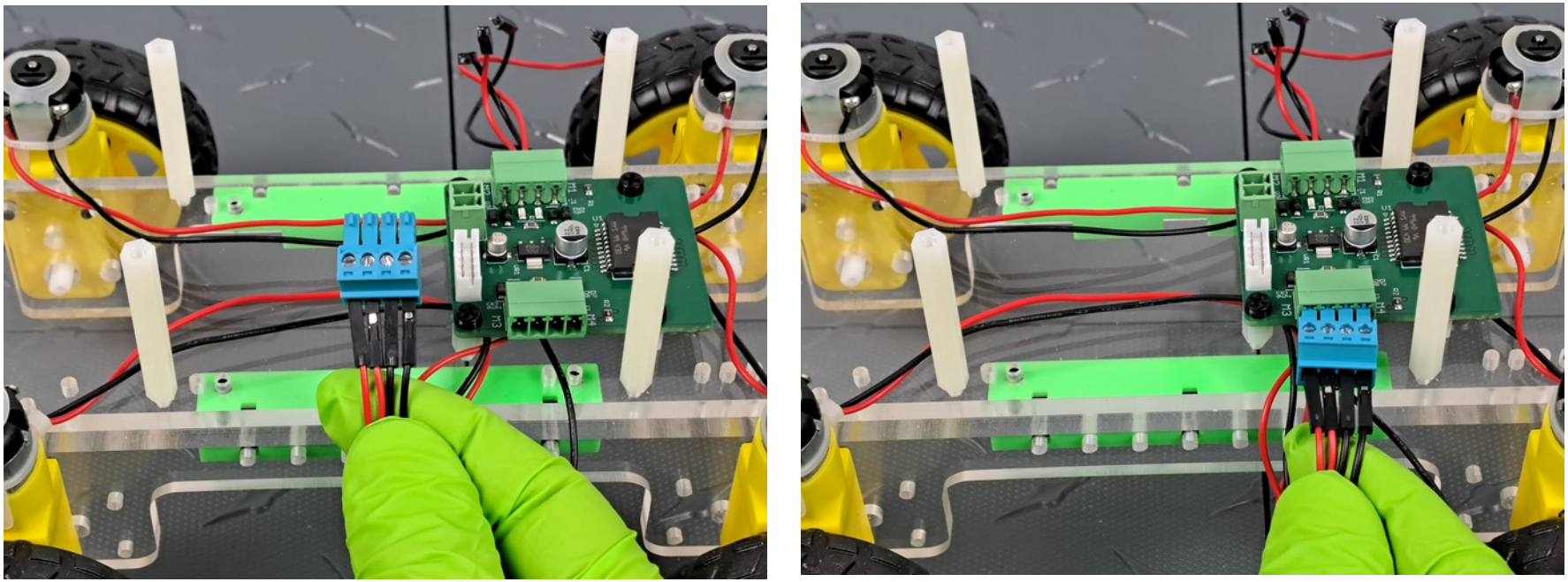


Figure 6 – Wire up the left motors

6 – Insert the left (driver side) motor wires into the terminal plug exactly as shown in figure 6 (RED RED BLACK BLACK), then use a small flat-blade screwdriver to secure the wires in the terminal plug. The R22 uses skid-steering, so both front and rear left side motors are connected in parallel. The wiring shown above will ensure these motors are driven correctly. After the terminal plug has been wired, insert it into the Motor Driver PCB header as shown in figure 6 above.

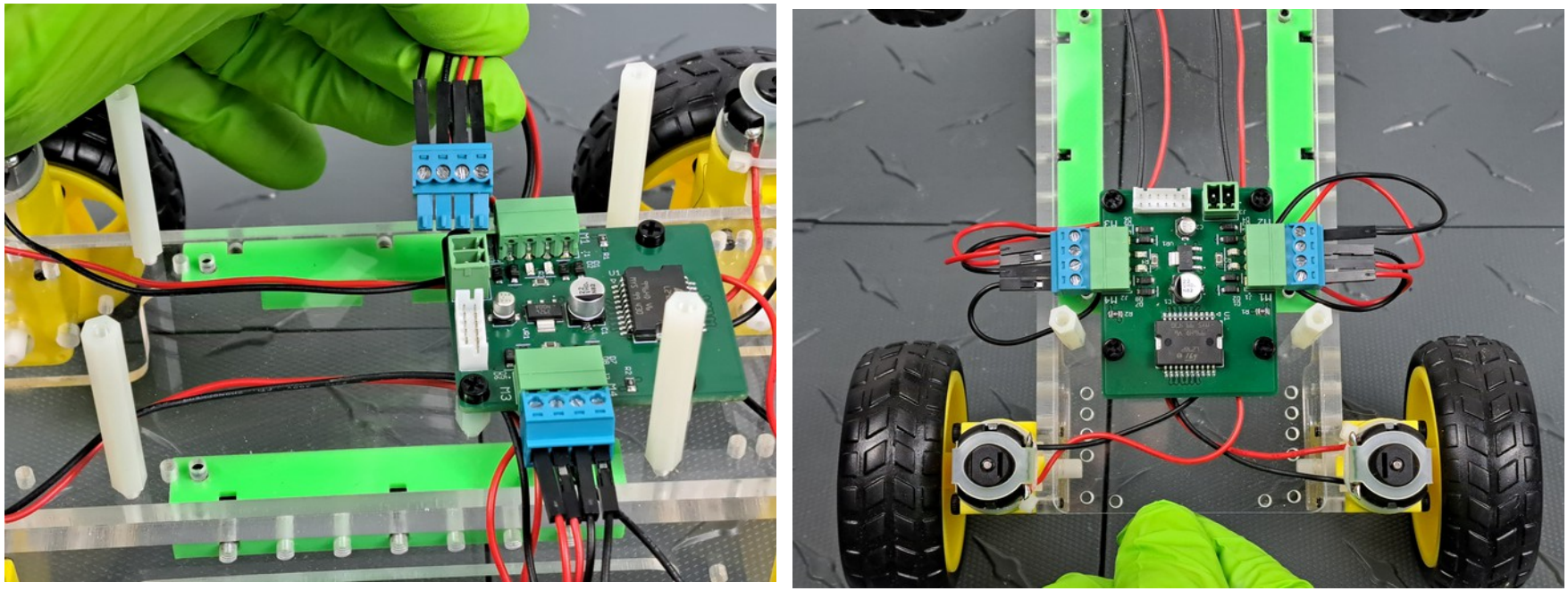


Figure 7 – Right side motors and completed motor wiring

7 – Wire the right (passenger side) motor wires into the terminal plug exactly as shown in figure 7. After the terminal plug has been wired, insert it into the right Motor Driver PCB header. The wiring should match the image to the left in figure 7 above.

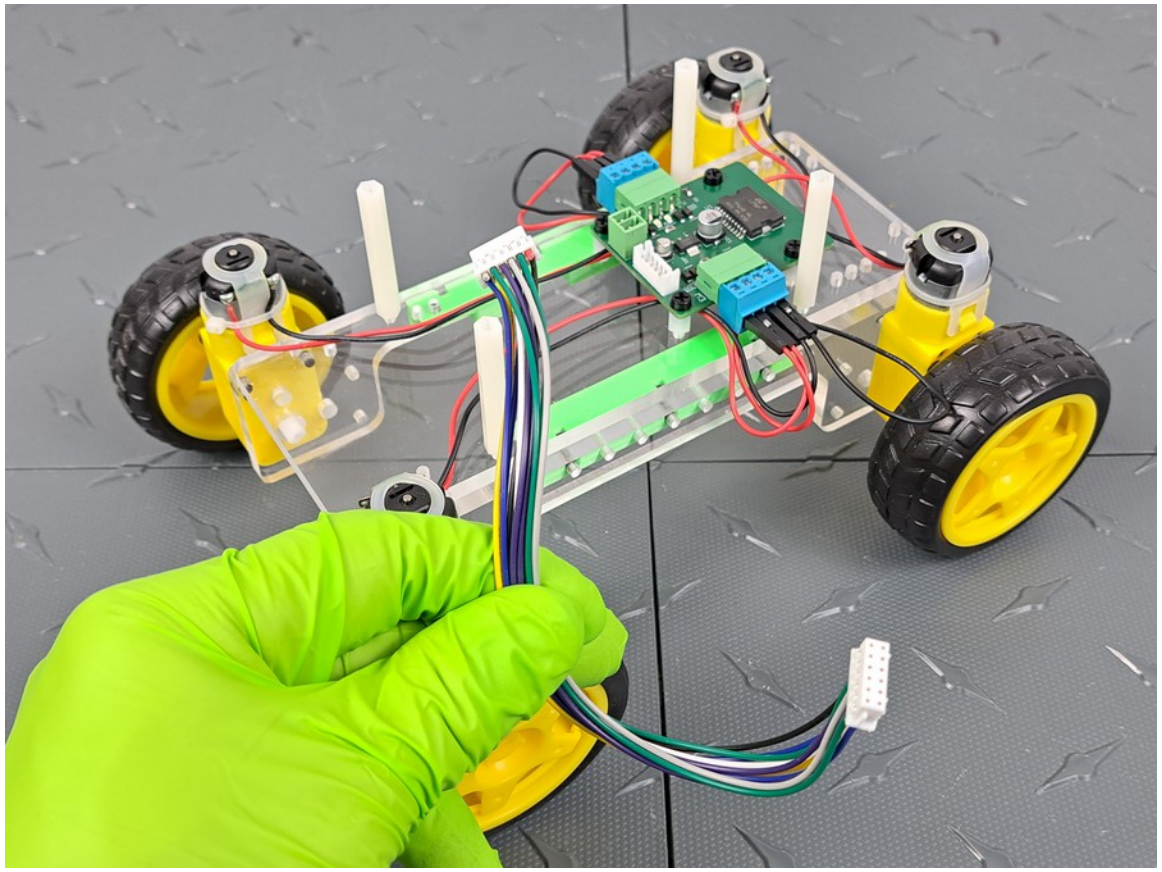


Figure 8 – Signal cable

8. Locate the Signal Cable as shown in figure 8.

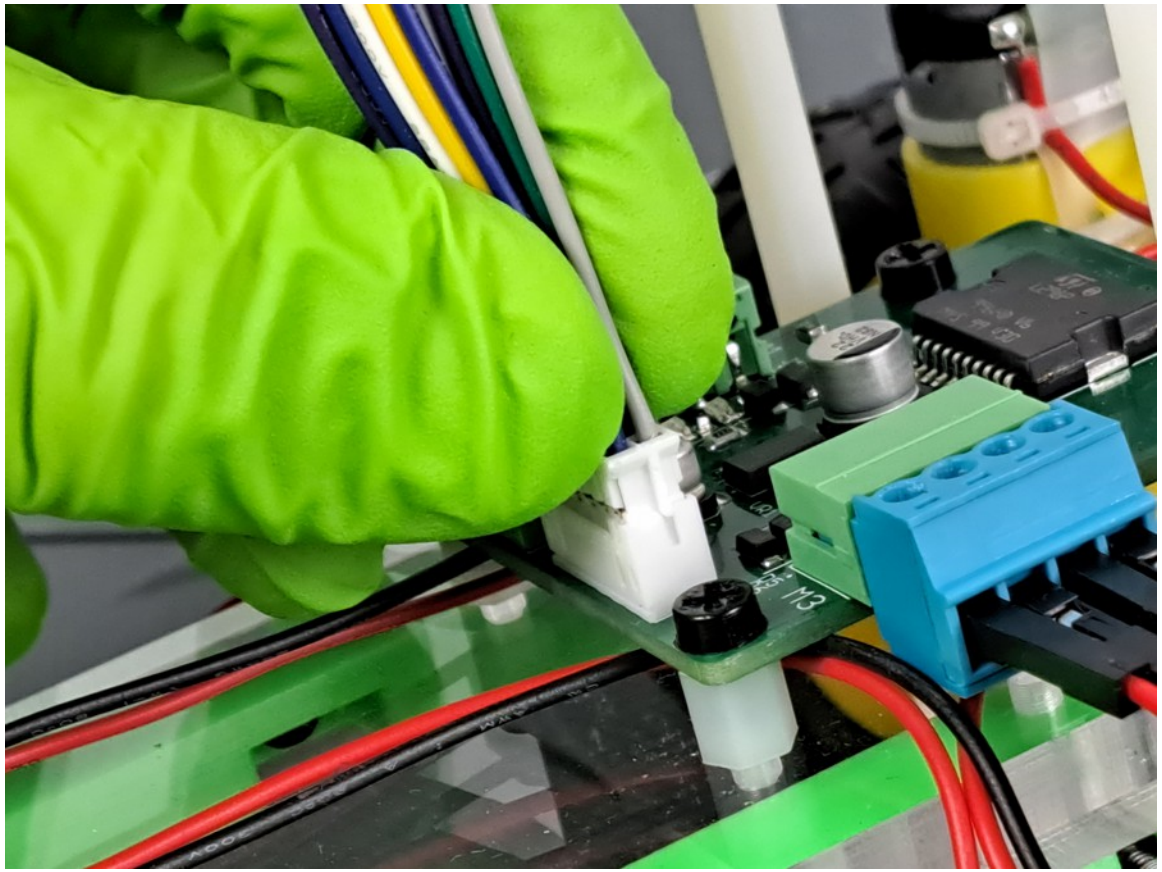


Figure 9 – Insert signal cable

9. Insert either end of the signal cable into the header of the Motor Driver PCB. The connector is keyed and can only be inserted in one direction.

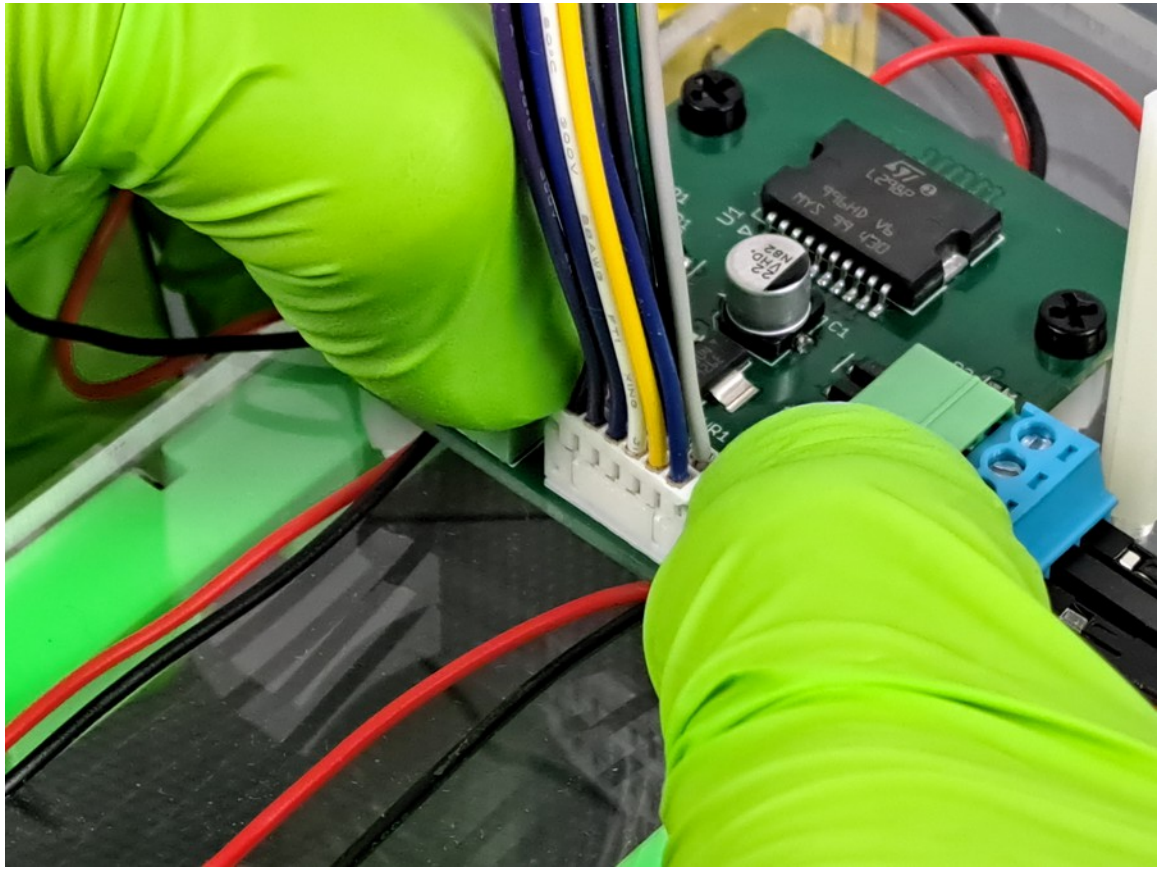


Figure 10 – Seating signal cable into header

10. Gently apply force to completely seat the signal cable into the header as shown in figure 10 above.

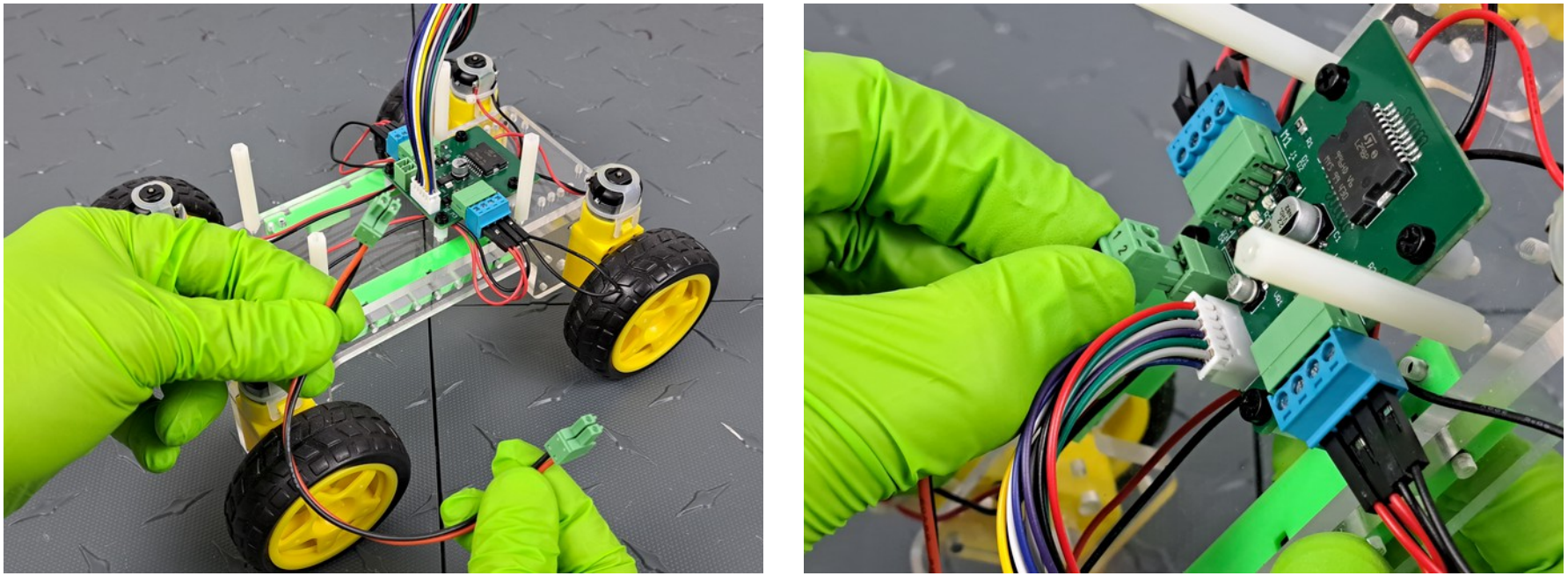


Figure 11 – Connect Motor Driver voltage cable

11. Locate the Motor Driver Voltage Cable and connect either end to the header of the Motor Driver PCB. This connector is also keyed and will only insert into the header in one direction.

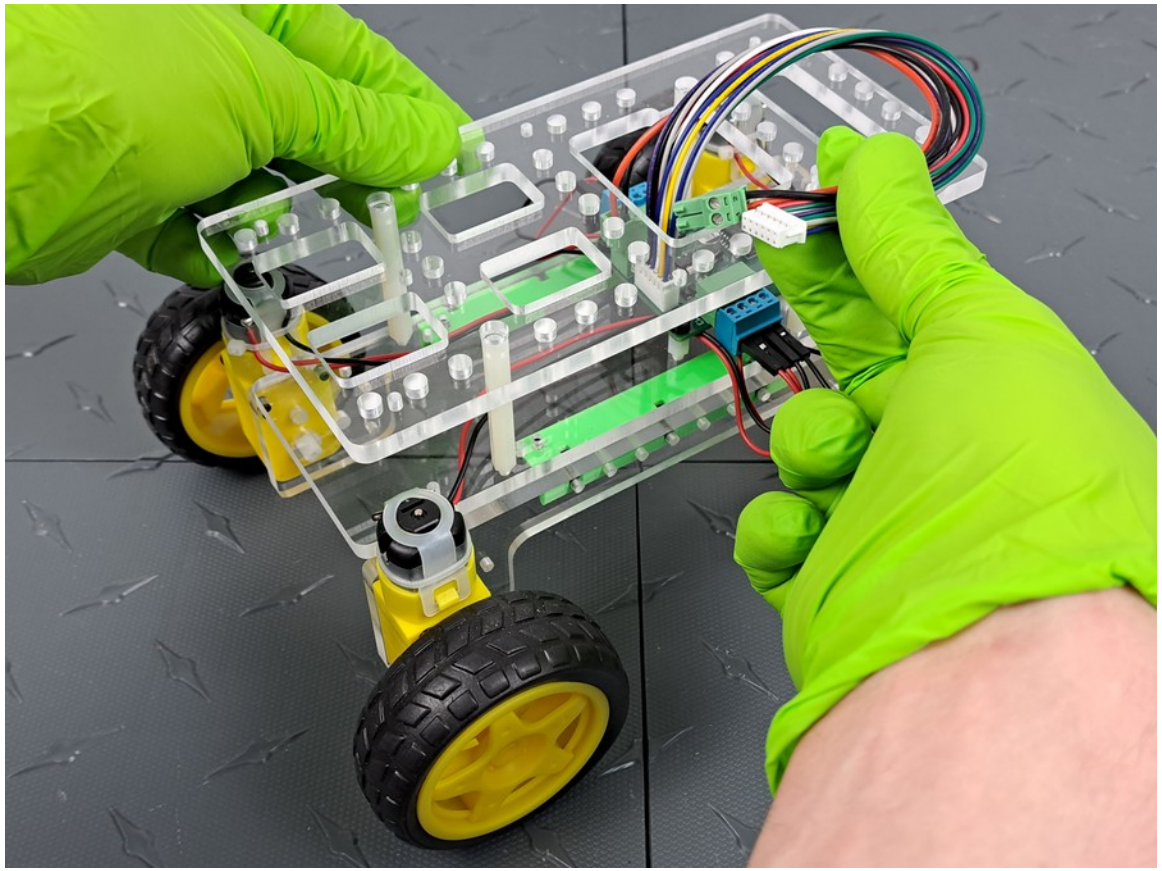


Figure 12 – Reinstall Upper Platform Plate

12. Reinstall the Upper Platform Plate, making sure to route the signal and voltage cables as shown in figure 12 above.

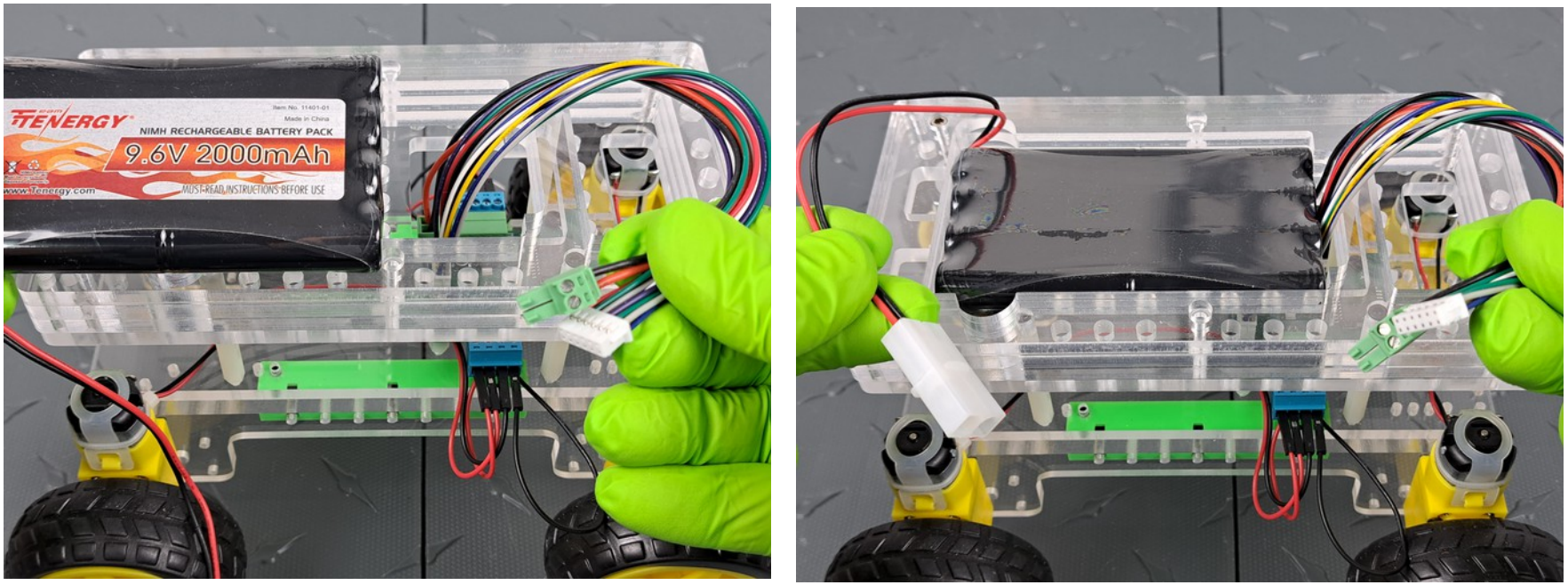


Figure 13 – NiMH Battery recommendation

13. The power switch and battery harness in this kit is wired to work with a NiMH 9.6V rechargeable battery with the standard Tamiya connector. This type of battery will provide the best performance and longest run time.

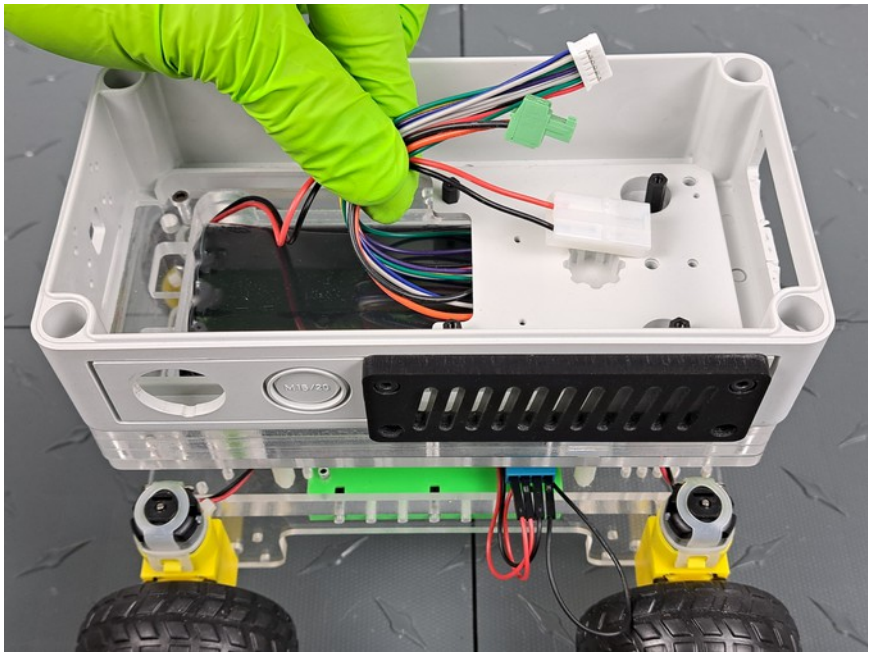
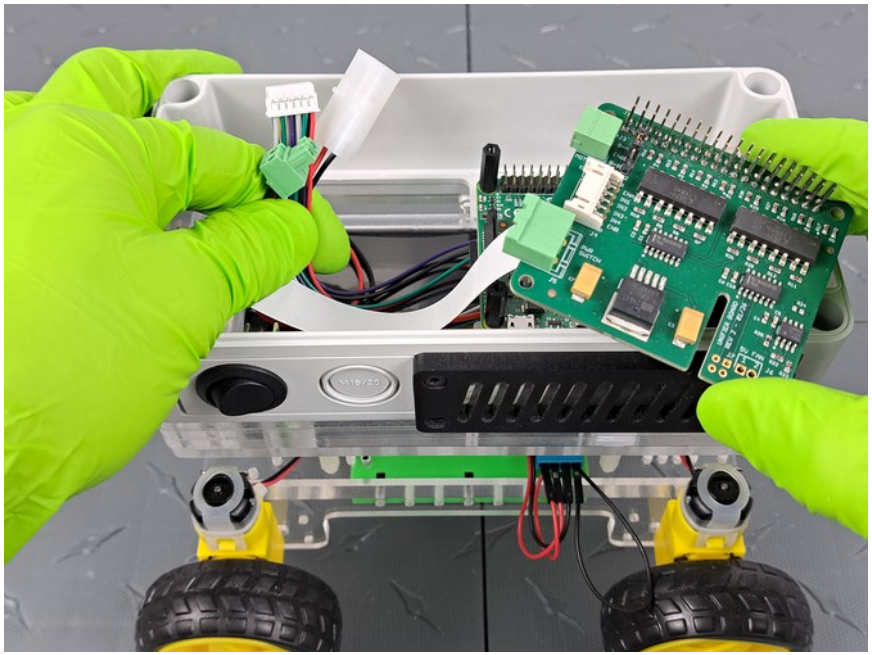
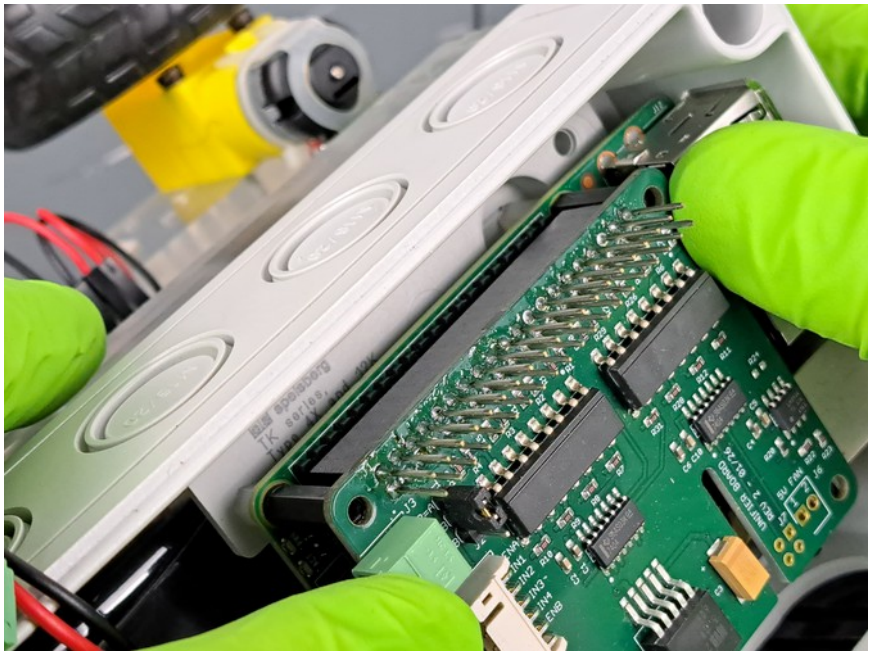



Figure 14 – Pull the battery, voltage, and signal cables into the enclosure and re-install the Pi

14. Follow the instructions in the original R22 user manual to install the enclosure, Raspberry Pi, and camera cable.



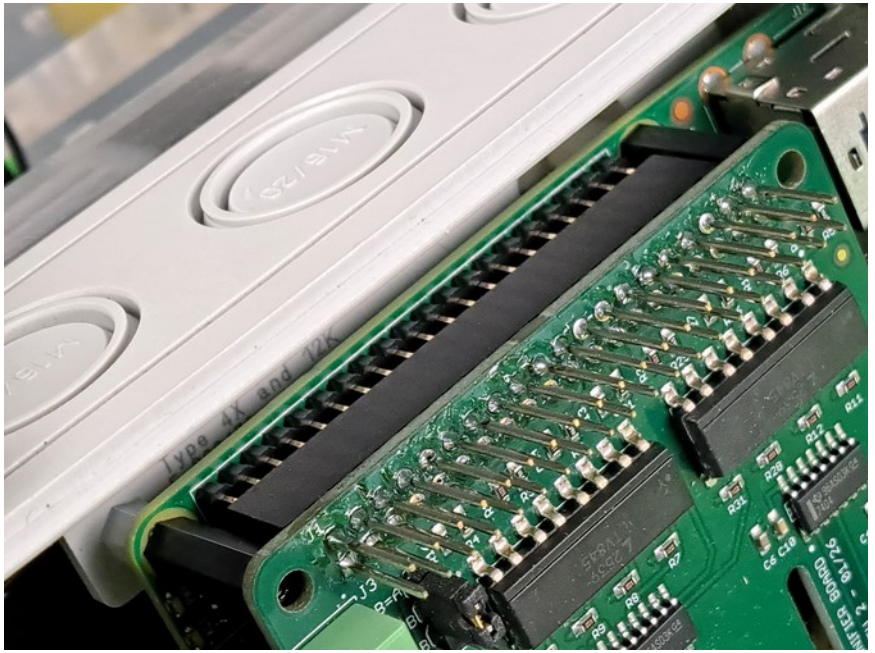


Figure 15 – Correct alignment of Unifier GPIO board

15. Position the Unifier GPIO board over the GPIO header of the Pi and connect it, ensuring the connectors are aligned correctly as shown in figure 15.

WARNING incorrect alignment of the Unifier GPIO board may damage the Pi!

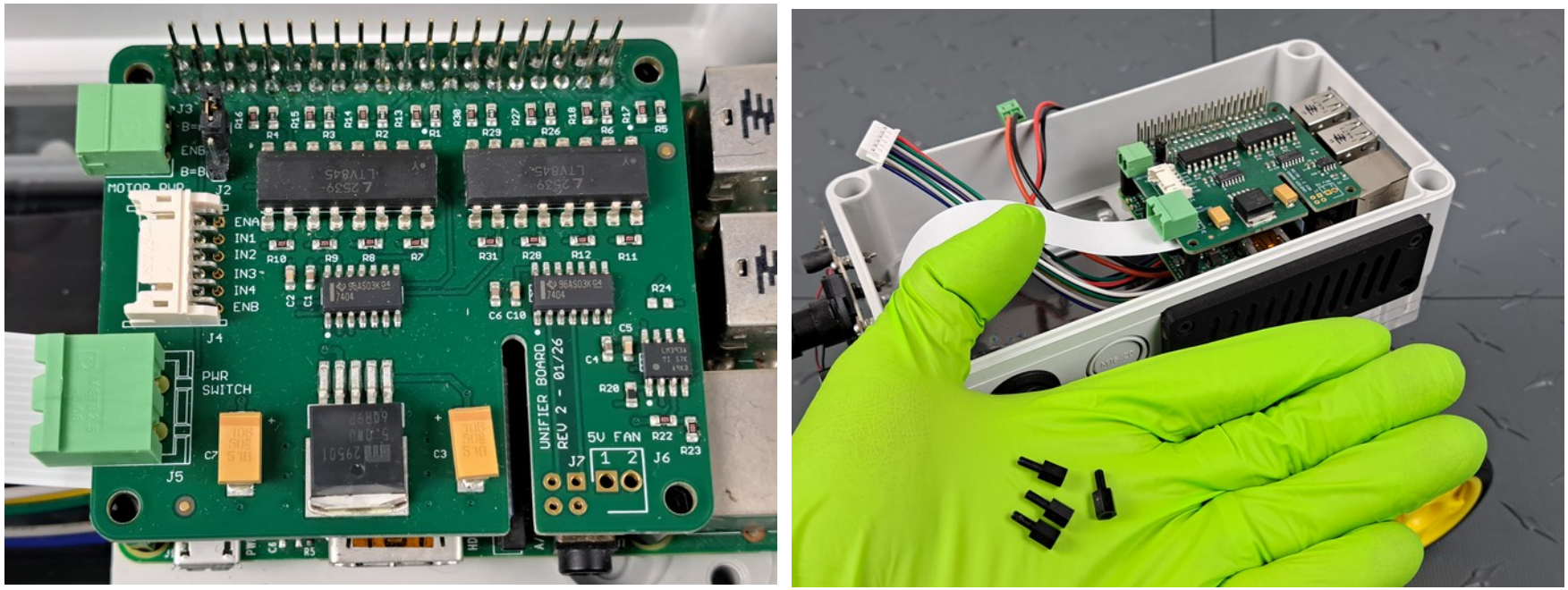


Figure 16 – Check alignment of Unifier GPIO board with Raspberry Pi.

16. Make sure the mounting holes of the Unifier GPIO board line up with the standoffs, then secure the Unifier GPIO board with 4 M3x6mm standoffs as shown.

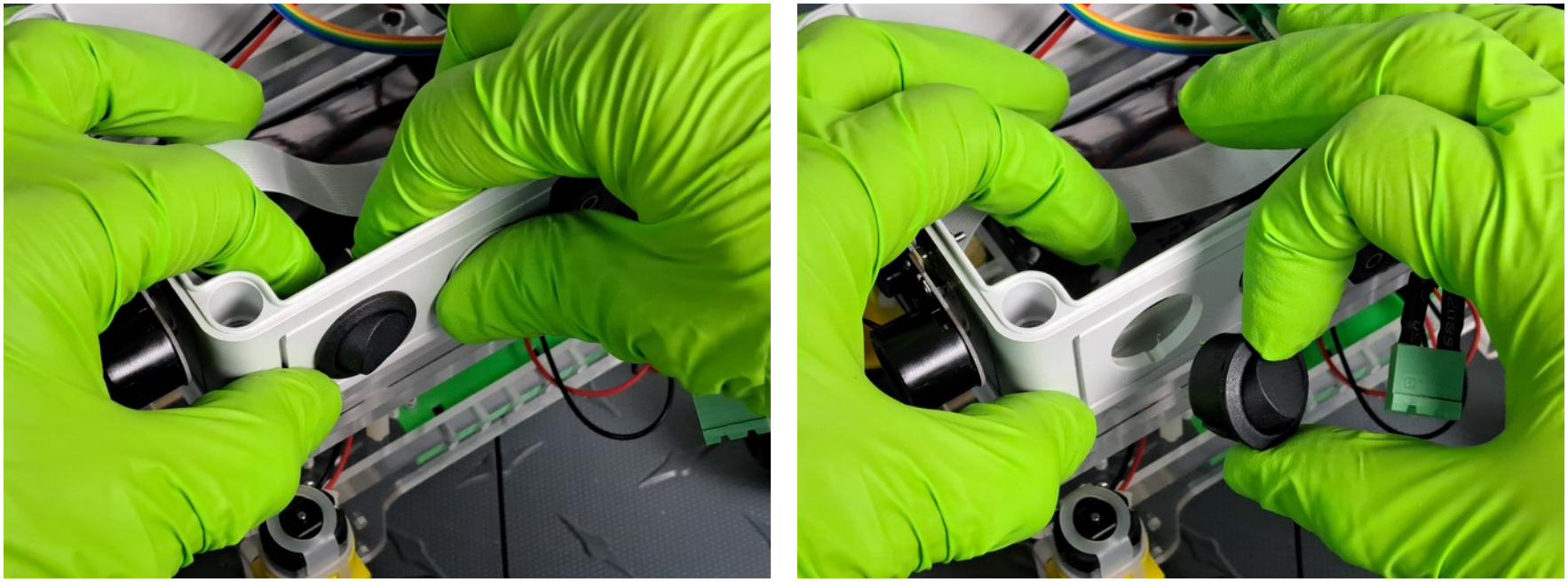


Figure 17 – Remove original power switch

17. Remove the original power switch by gently, but firmly pushing it out.

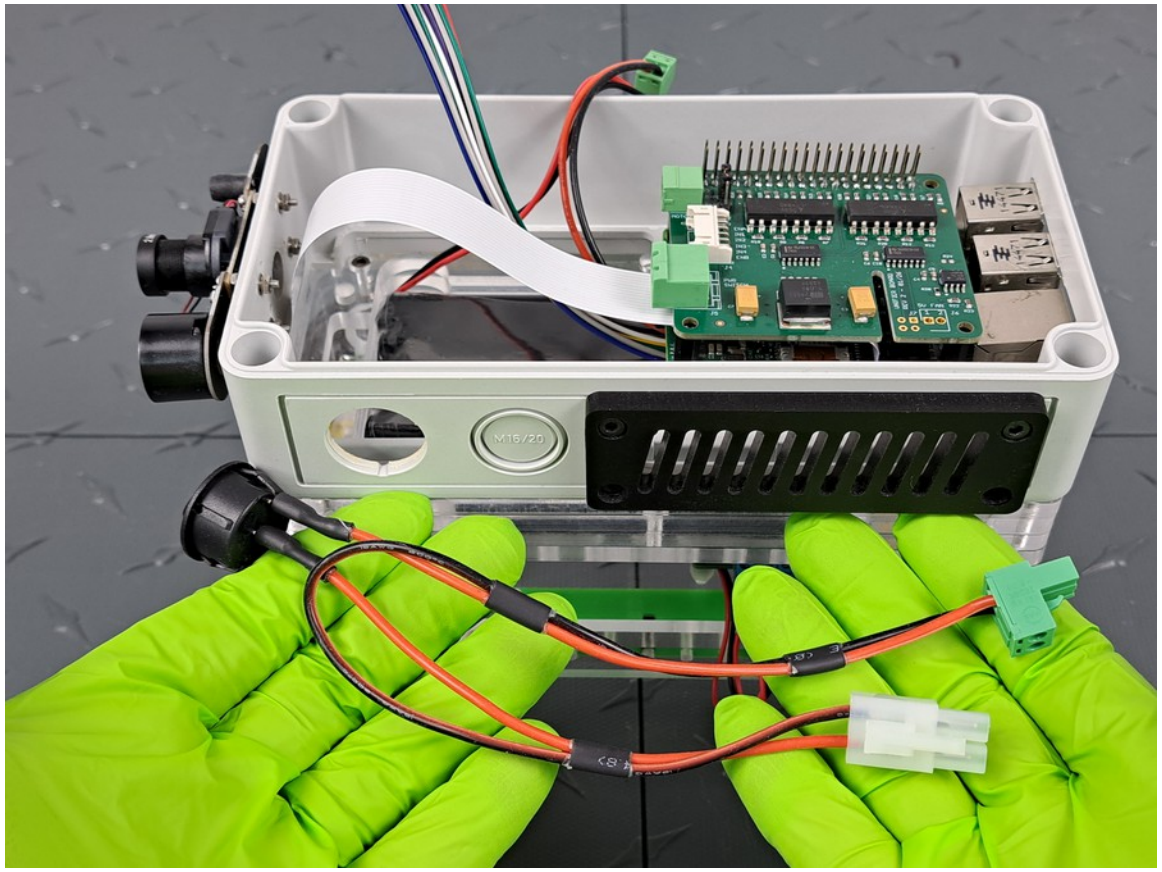


Figure 18 – Locate power switch and battery harness

18. Locate the new power switch and battery harness.

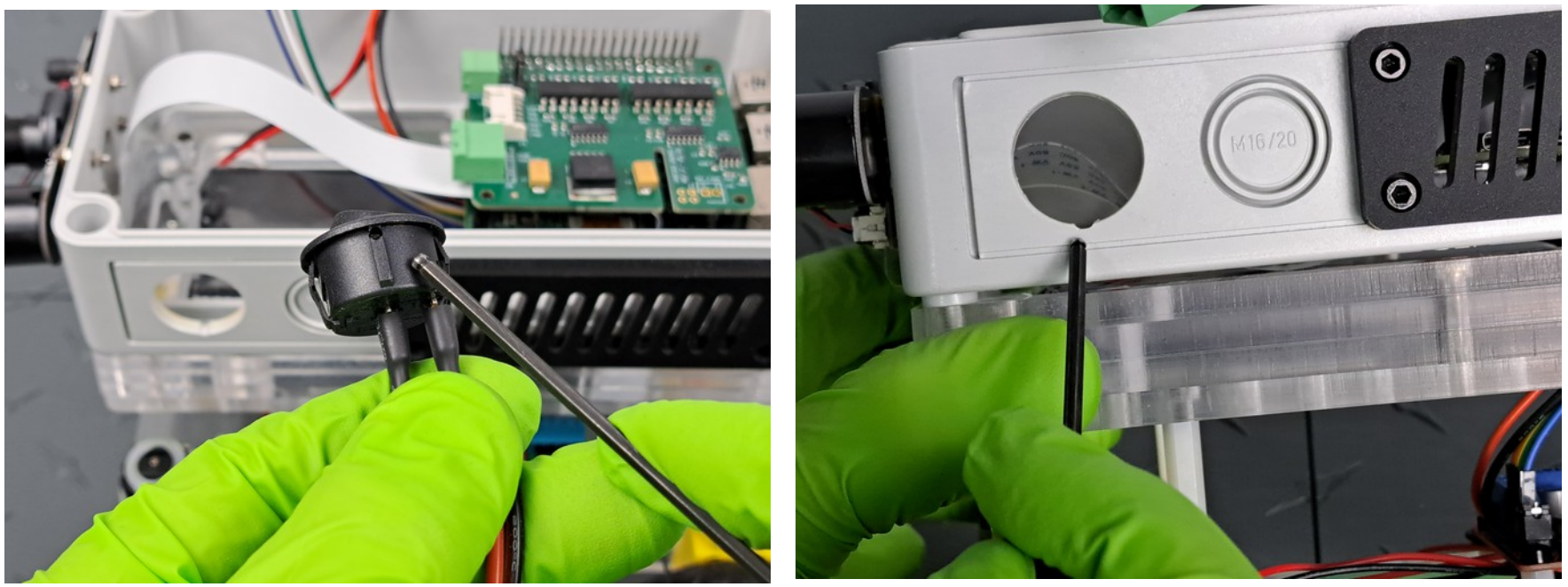


Figure 19 – Align lug on power switch with notch in enclosure.

19. The power switch has a lug on the bottom, which fits into a notch on the enclosure. When installing the power switch and battery harness in the next step, make sure to line up the lug with the notch.

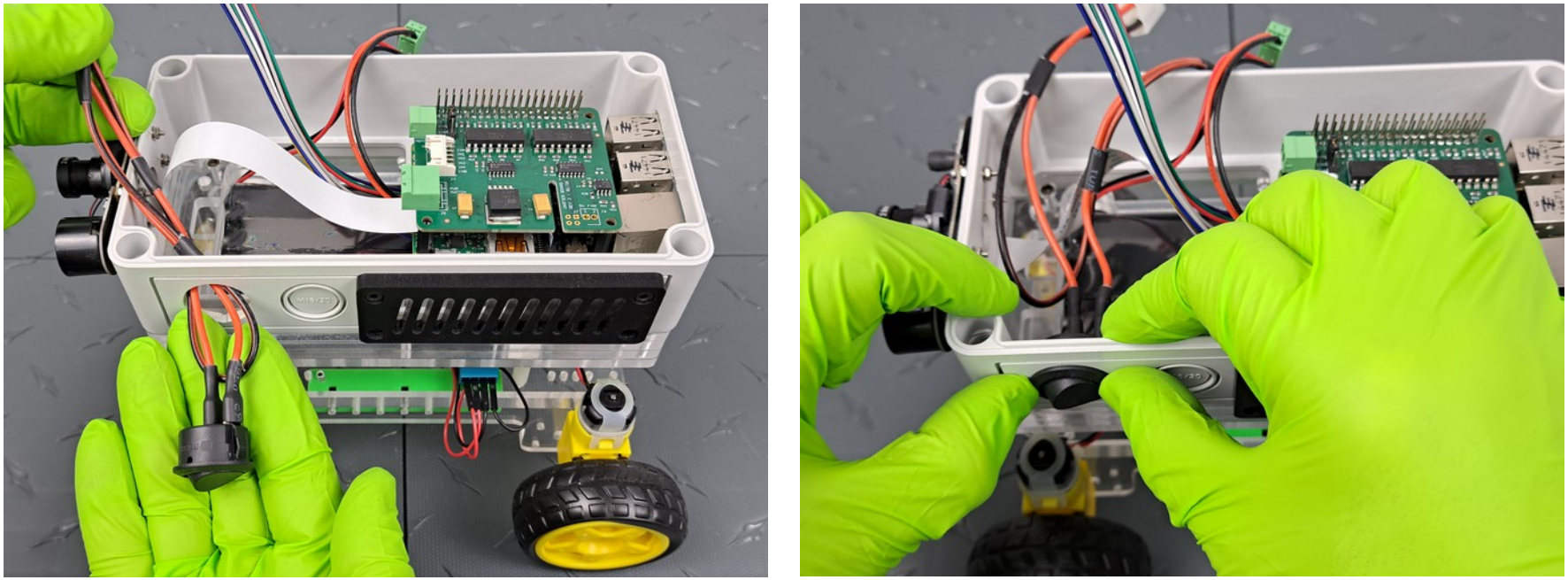


Figure 20 – Feed wiring harness into enclosure

20. Feed the wiring harness into the enclosure as shown, then gently but firmly snap the power switch into place.

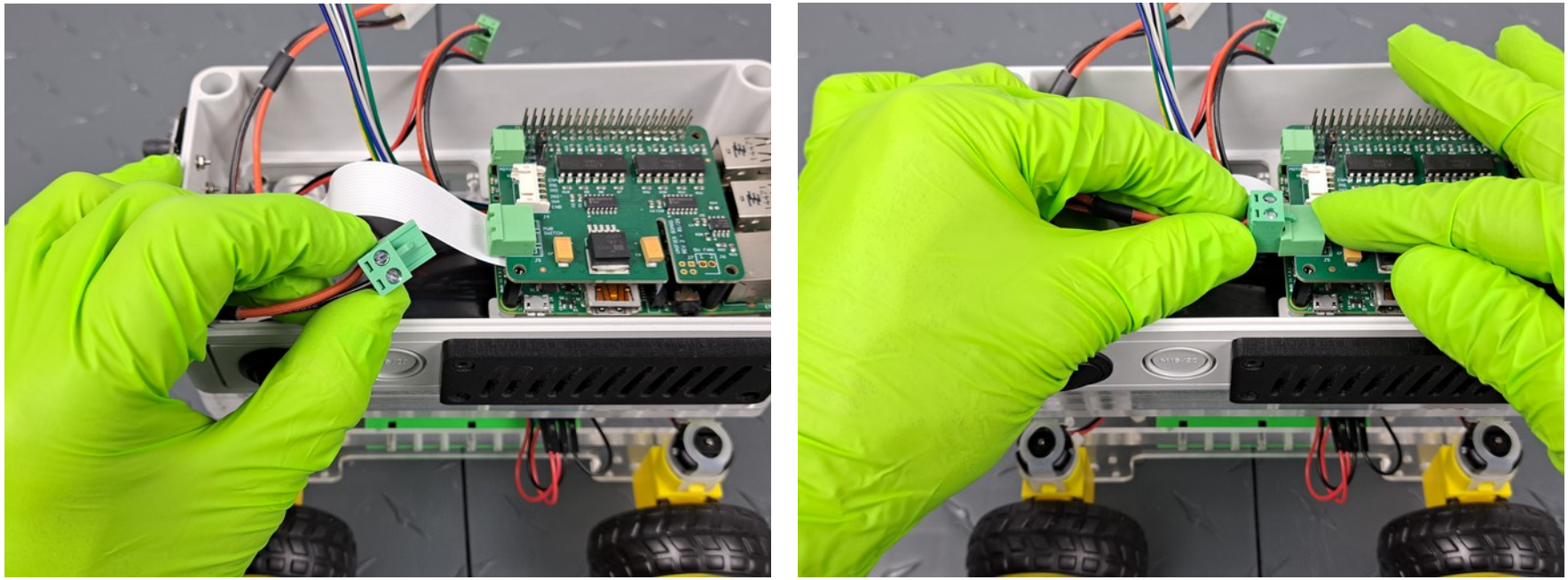


Figure 21 – Connect the power cable to Unifier GPIO board.

21. Locate the large green plug of the wiring harness and connect it to the Unifier GPIO board.

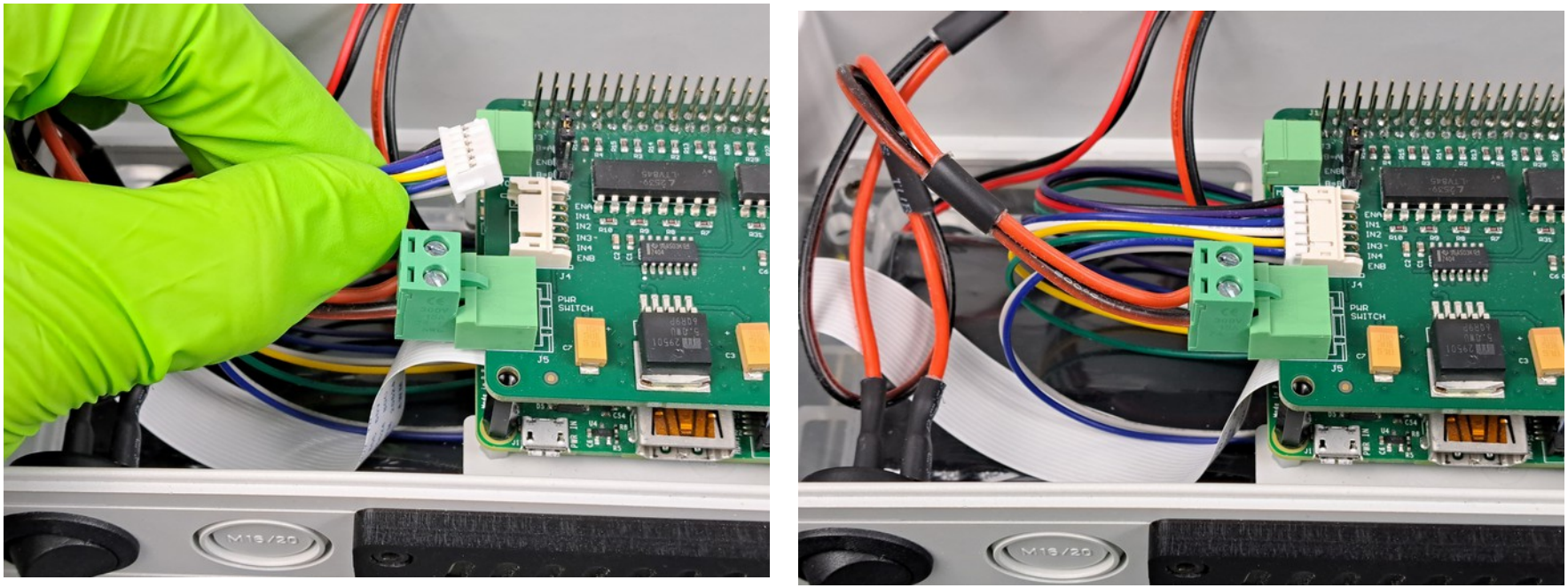


Figure 22 – Connect signal cable to Unifier GPIO board

22. Locate the signal cable and connect it to the Unifier GPIO board, This connector is also keyed, so it will connect in only one direction.

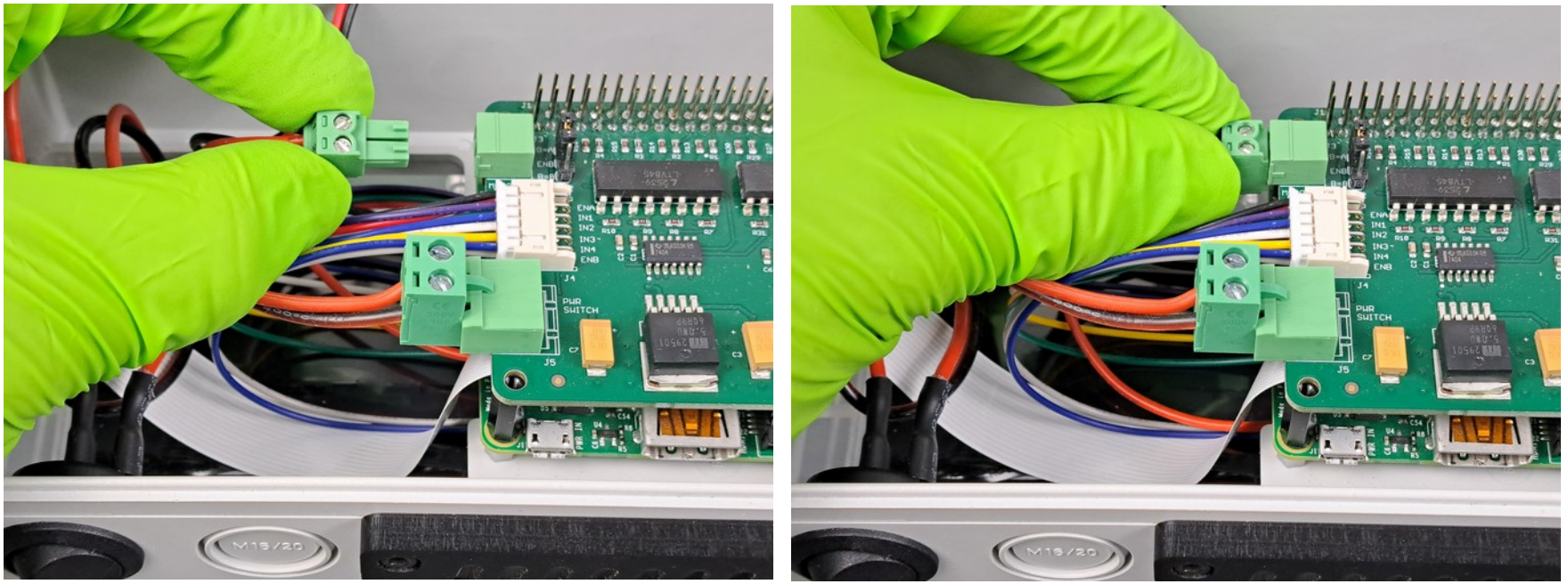


Figure 23 – Connect motor driver voltage cable

23. Connect the Motor Driver Voltage cable as shown in figure 23.

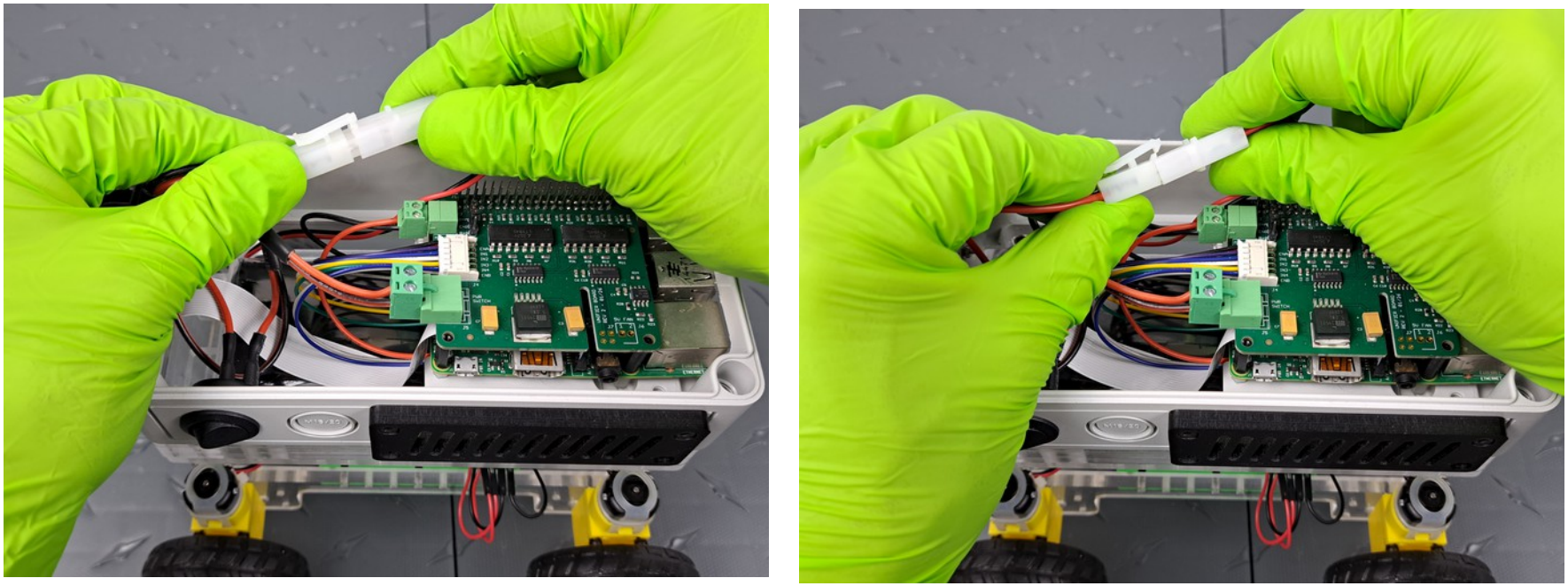


Figure 24 – With power switch off, connect battery cable

24. Make sure the power switch is in the OFF position as shown, then make the final connection to the battery.

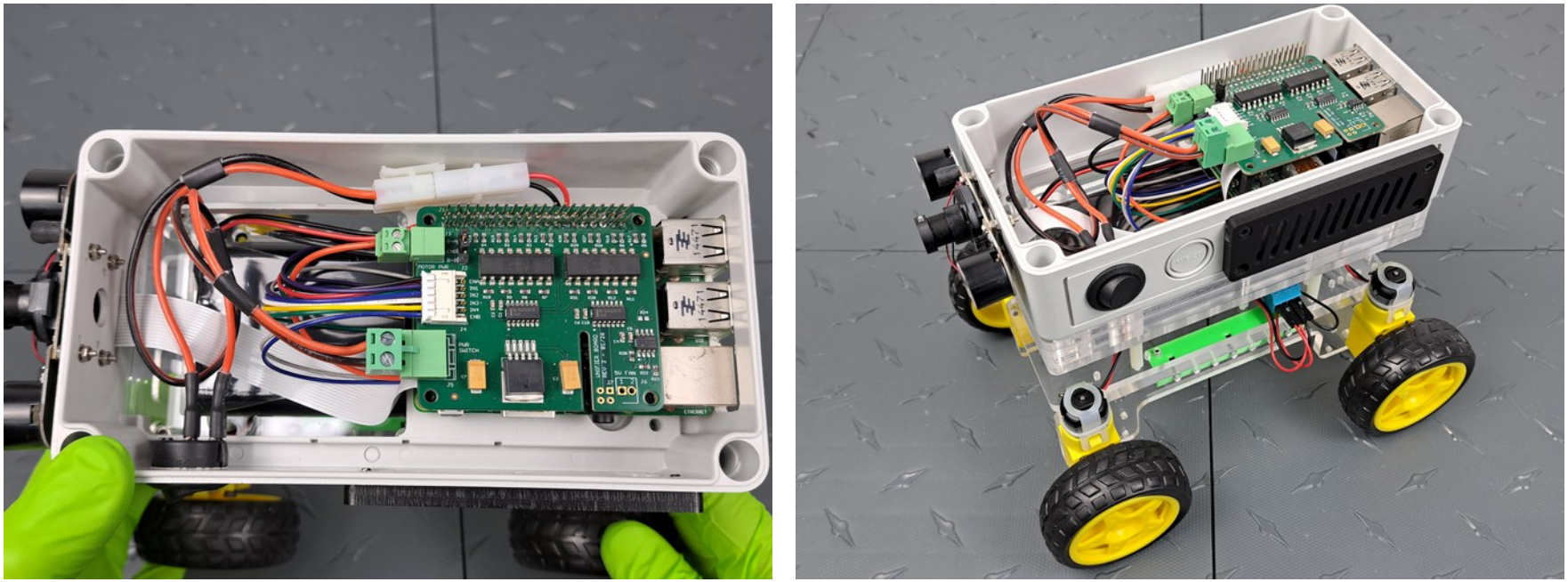


Figure 25 – Final steps

25. Neatly tuck the wires into the enclosure as shown, then re-install the lid.

Figure 26 – Connect keyboard, mouser, and monitor

26. Connect a keyboard, mouse, and monitor to the R22 robot as shown and power on the R22 robot.

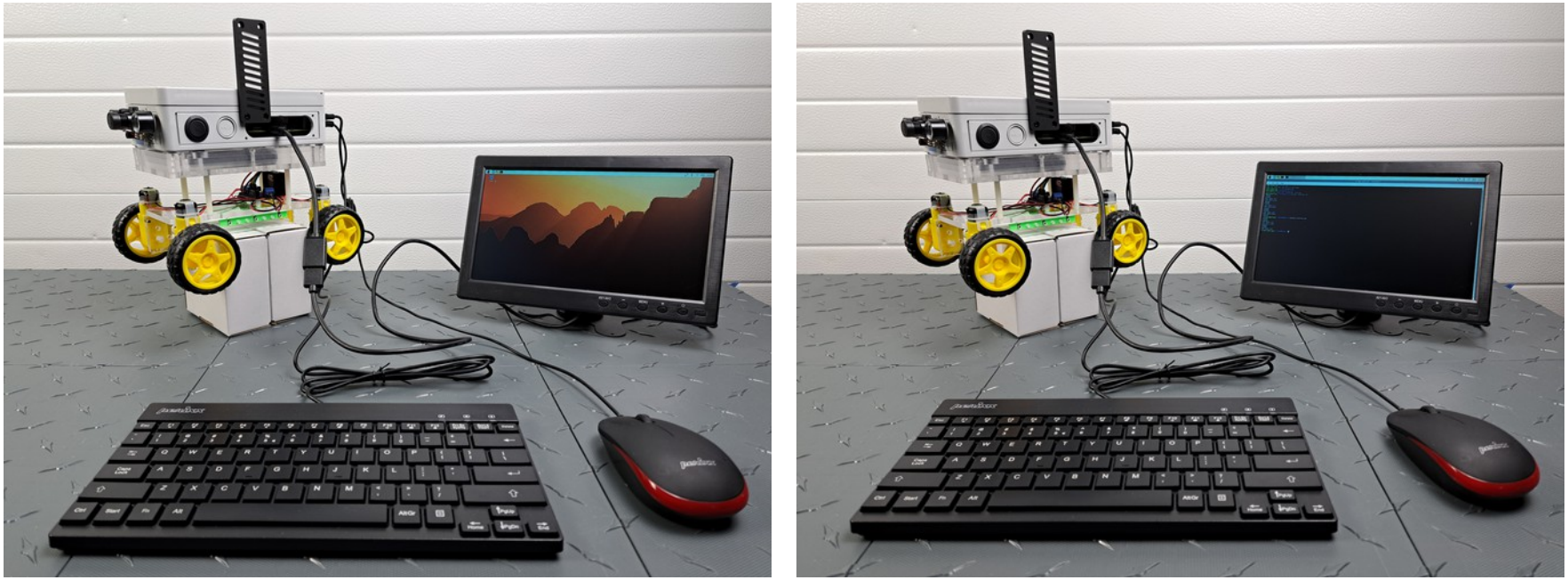


Figure 27 – Suspend R22 robot to prevent movement while testing motor control and direction

27. For this test, place the R22 robot onto an object so its wheels are not touching the ground or other surface. Copy the motortest.py file over to the Pi and run it with the command: python3 motortest.py.

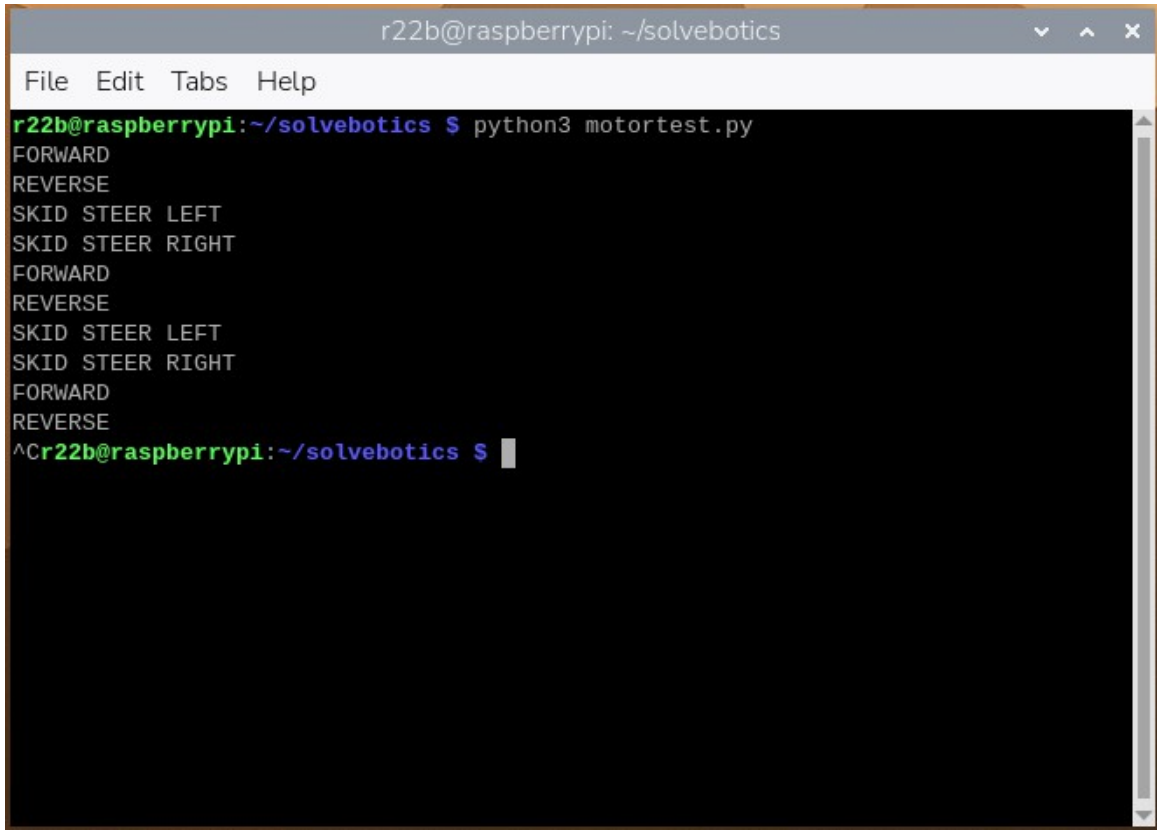


Figure 28 – Test motors and direction commands by running motortest.py (python3 motortest.py)

28. The motortest.py Python script will run the motors forward, backward, left, right, then repeat for 2 seconds at a time. Use it to observe if the motors are rotating in the correct direction. When finished, press -C on the keyboard to stop the script. The motortest.py python script can be downloaded from the Code Examples section at:

https://www.solvebotics.com/resources-manuals

Questions or Comments:

The Unifier GPIO board, Motor-driver PCB, and Power Switch Battery harness were designed to enable you to easily assemble the R22 robot without needing to solder any components. At SolveBOTICS, we strive to produce high-performance products for the high-performance student, hobbyist, and professional. We welcome feedback and will use it to make our products even better!

If you have questions or comments, please contact us at: info@solvebotics.com