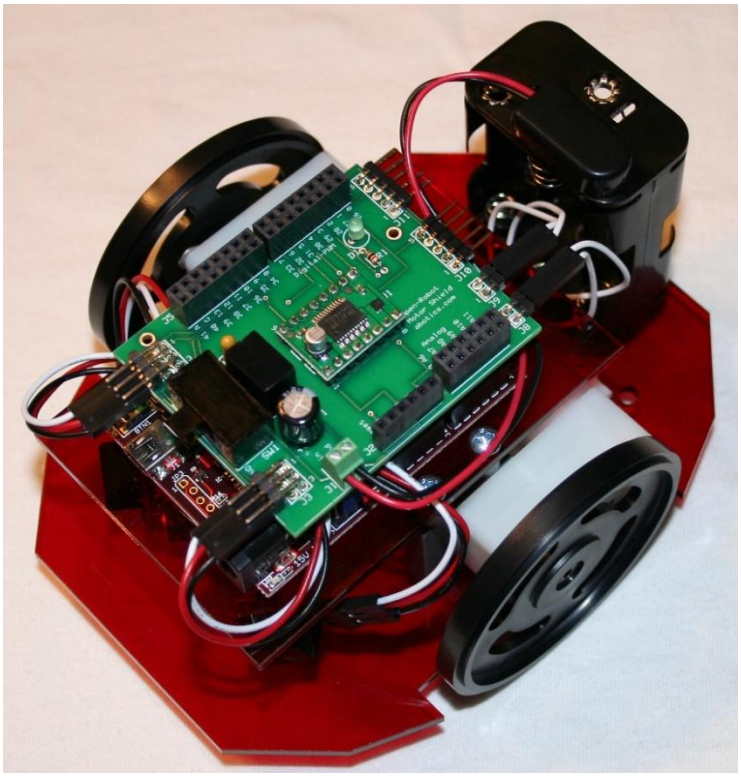
Assembly Manual for the PIC32™ Based Open-Robot



This manual will guide you through the assembly process for a 32-Bit Open-Robot Kit. You will need to have access to a soldering iron, solder, flat & Phillips screwdrivers, pliers and a basic multi-meter for diagnostic testing of the soldered boards. ***NOTE: Image above shows optional RECOM +3.3V high-efficiency voltage regulator (purchase separately). RECOM regulator will be needed when using add-on PCBs such WiFi, Vision & Memory, etc… RECOM regulator increases available current to 1.0 Amp.***

Table of Contents

FIG 1. Unassembled UNO32™ Based Open-Robot Kit.

Figure 1 above shows the unassembled PIC32™ based Open-Robot kit. Assembling this kit will require soldering, electrical wiring and mechanical assembly. If you are not up to the task, then please request a Return Authorization (RMA) for your unopened kit. We cannot accept a return for opened kits.

Step 1 - Solder Pololu TB6612FNG Motor Driver Carrier

In step 1 we will solder the Pololu TB6612FNG motor driver carrier board. You can refer to figure 2 below and Pololu's website for additional information. http://www.pololu.com/catalog/product/713/

FIG 2. Solder Pololu TB6612FNG Motor Driver Carrier.

Step 2 - Solder motor driver onto Motor PCB, U1

Refer to figure 3 below and solder the motor driver onto the Motor PCB in U1 location.

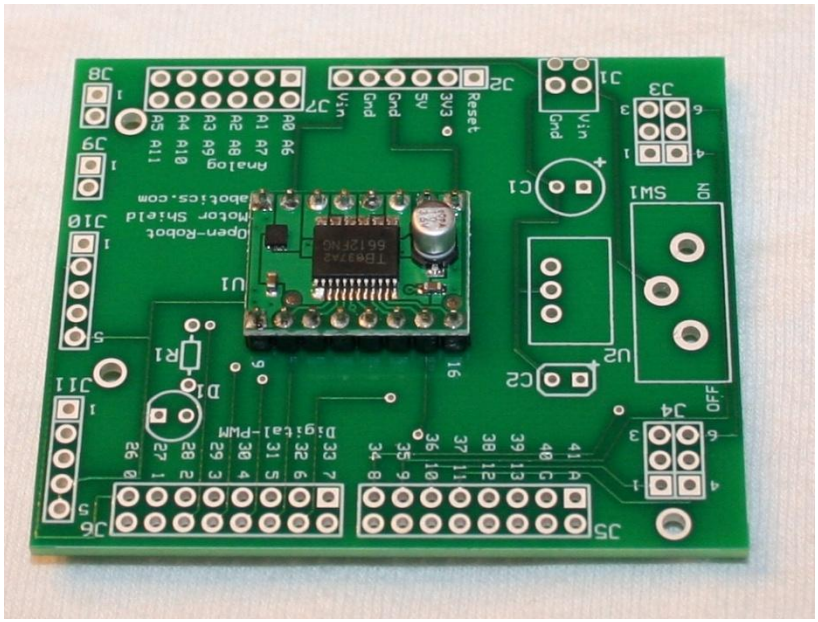


FIG 3. Solder Motor Driver onto Motor PCB.

Step 3 - Prepare & Solder On/Off Switch, SW1

Refer to figure 4 below for how to prepare the on/off switch. Notice that the protruding plastic tab must be removed from the back of the switch.

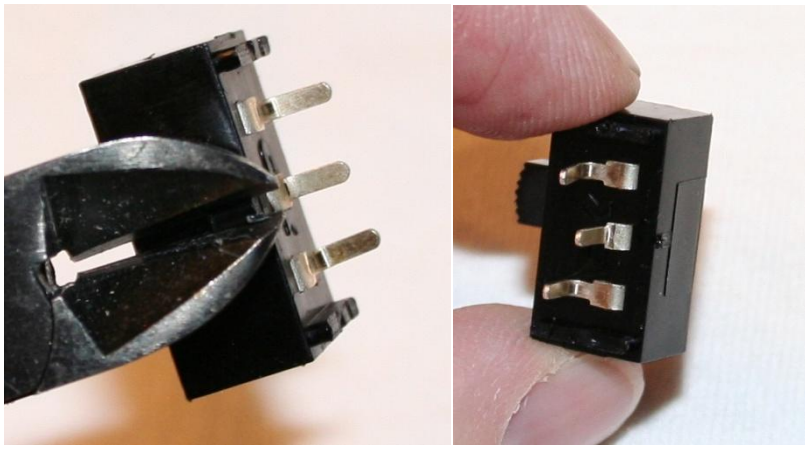


FIG 4. Prepare On/Off Switch by Removing Tab.

Refer to figure 5 for where to solder on/off switch onto Motor PCB.

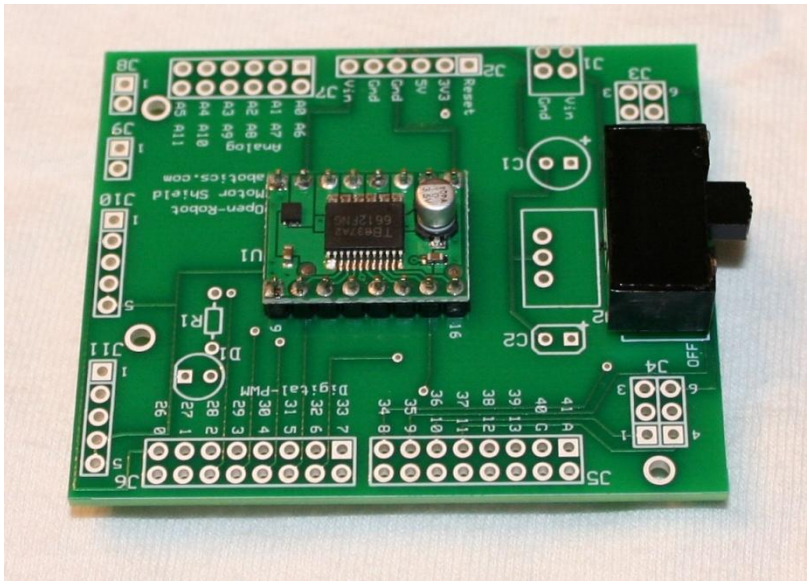


FIG 5. Solder On/Off Switch.

Step 4 - Solder 3.3 Volt Regulator, U2 (*Purchase Separately*)

Refer to figure 6 below for where to solder the high-efficiency 3.3 volt regulator in location U2.

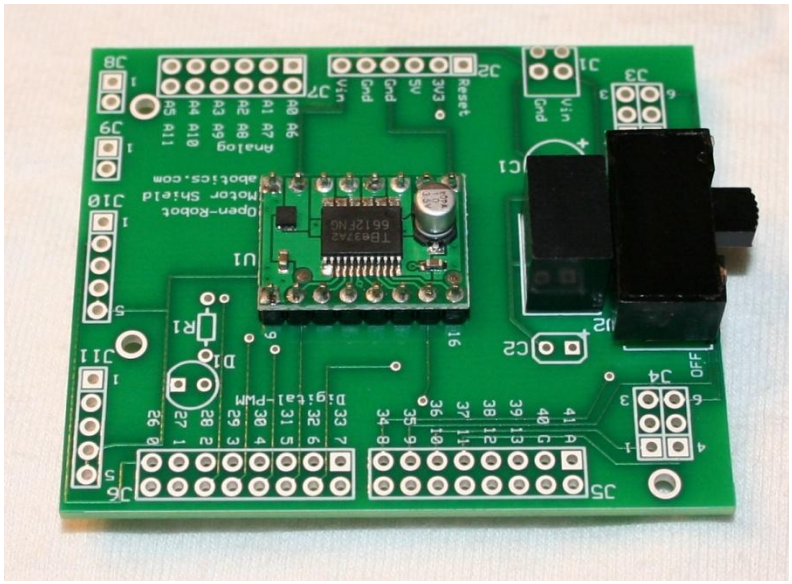


FIG 6. Solder Regulator.

Step 5 - Solder 2-Postion Terminal Connector, J1

Refer to figure 7 below for how to solder the 2-position terminal connector in the J1 location.

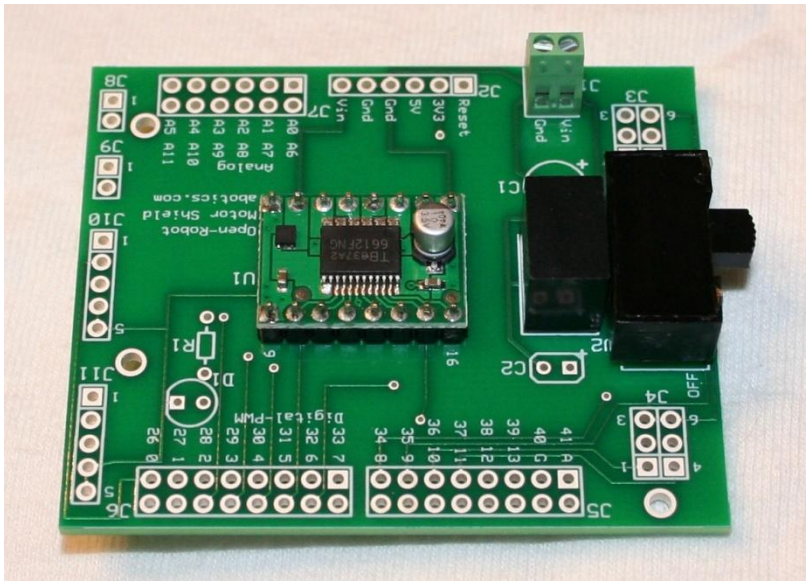


FIG 7. Solder 2-Position Terminal Connector.

Step 6 - Solder Capacitors, C1 & C2 (*Purchase Separately with RECOM Reg.*)

Refer to figure 8 below for where to solder capacitors, C1 & C2. C1 is 100 µF & C2 is 0.1 µF. These are polarized capacitors, so it is critical that you properly orient these on the PCB (note "**+**" sign).

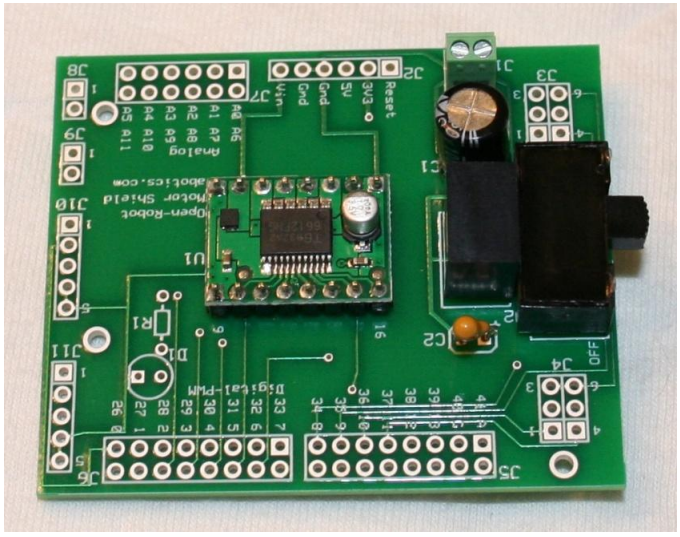


FIG 8. Solder Capacitors C1 & C2.

Step 7 - Solder 1k Ohm Resistor, R1

Refer to figure 9 below for where to solder 1k Ohm resistor, R1.

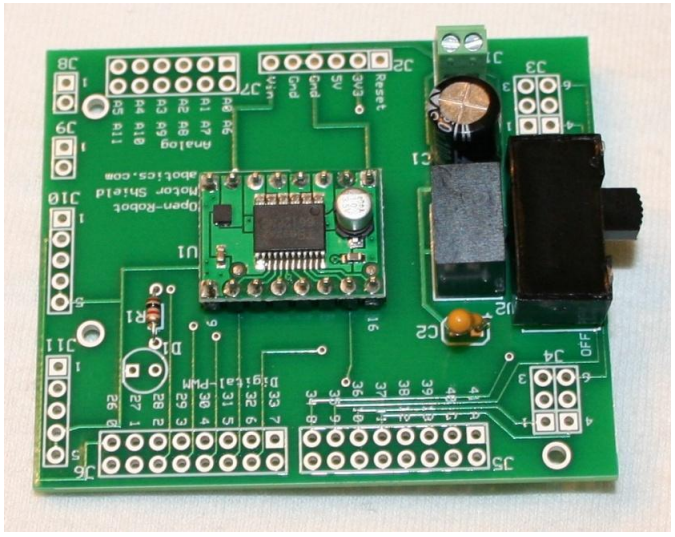


FIG 9. Solder 1k Ohm Resistor R1.

Step 8 - Solder Green LED, D1

Refer to figure 10 below for how and where to solder Green LED, D1.

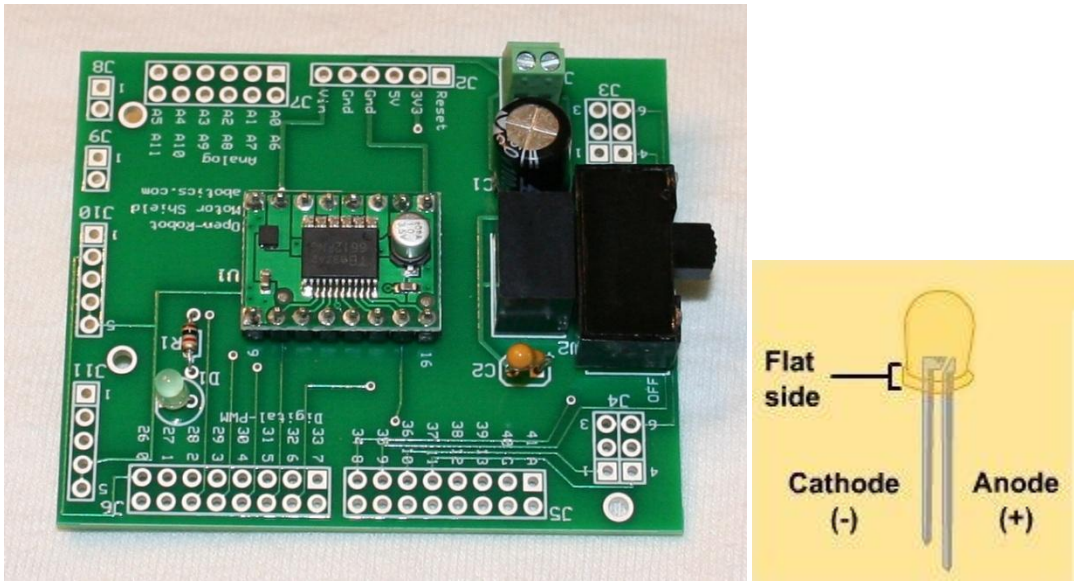


FIG 10. Solder Green LED, D1.

Step 9 - Solder 3x2 Right Angle Connectors, J3 & J4

Refer to figure 11 below for where to solder 3x2 Right Angle Connectors, J3 & J4.

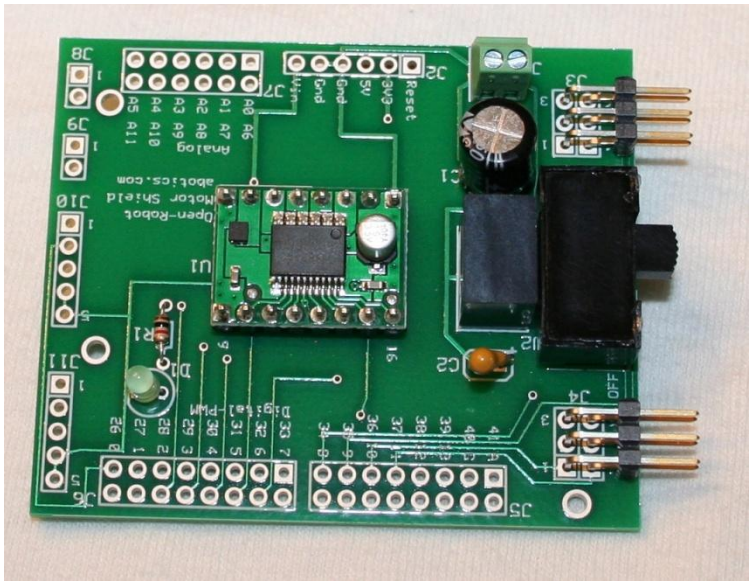


FIG 11. Solder 3x2 Right Angle Connectors, J3 & J4.

Step 10 - Prepare 2x1 Right Angle Connectors, J8 & J9

Refer to figure 12 below for how to prepare 2x1 Right Angle Connectors, J8 & J9. You must break off (2) 2x1 headers from the provided 6x1 right angle header.

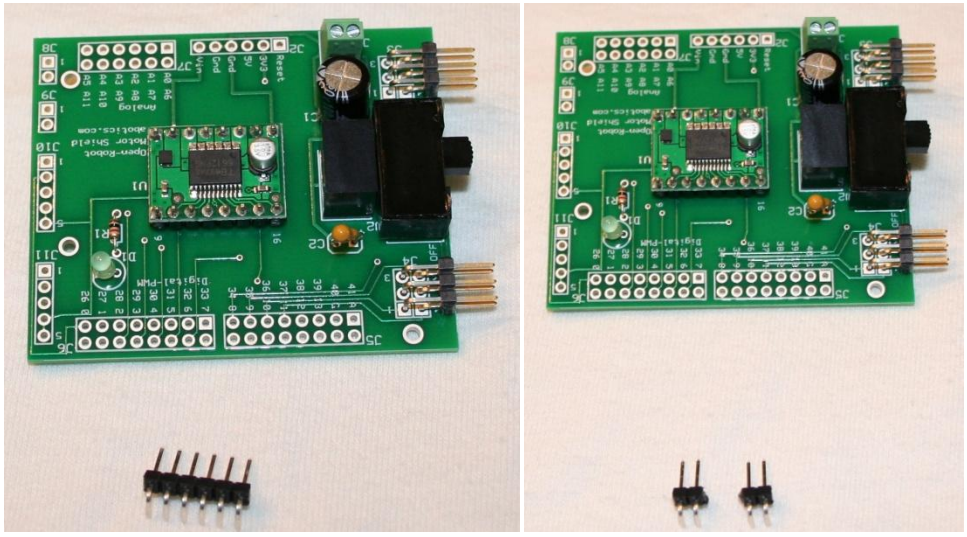


FIG 12. Prepare 2x1 Right Angle Connectors, J8 & J9.

Step 11 - Solder 2x1 Right Angle Connectors, J8 & J9

Refer to figure 13 below for where to solder 2x1 Right Angle Connectors, J8 & J9.

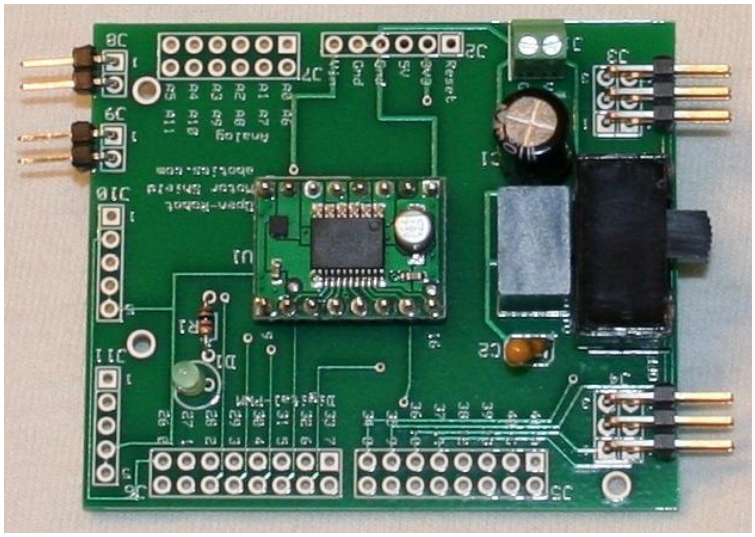


FIG 13. Solder 2x1 Right Angle Connectors, J8 & J9.

Step 12 - Solder Stackable Headers, J2, J5, J6 & J7

Refer to figure 14 below for where to solder stackable headers, J2, J5, J6 & J7. Typically I only solder (1) lead on each of the headers and then check alignment with the UNO32™ board prior to soldering the rest. I have even used the UNO32™ board as an alignment jig, so that I know that the pin alignment is correct. Place the Motor PCB upside down and then place the UNO32™ board on top & slightly engage the Motor PCB pins with the UNO32™ board headers. This will properly align the stackable headers on the Motor PCB.

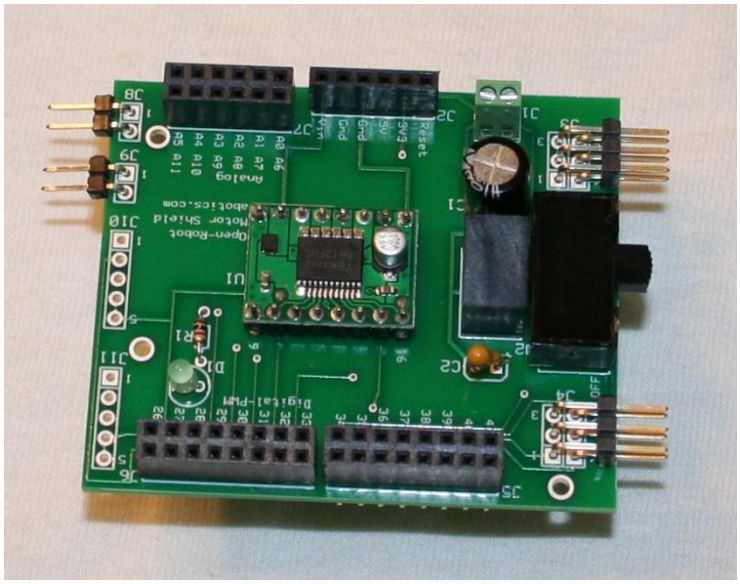


FIG 14. Solder Stackable Headers, J2, J5, J6 & J7.

Step 13 - Prepare & Solder 5x1 Right Angle Connectors, J10 & J11

Refer to figure 15 below for how to solder right angle connectors J10 & J11. Similar to step 10 you must create (2) 5x1 right angle headers from (2) 6x1 right angle headers by breaking off (1) pin on each header.

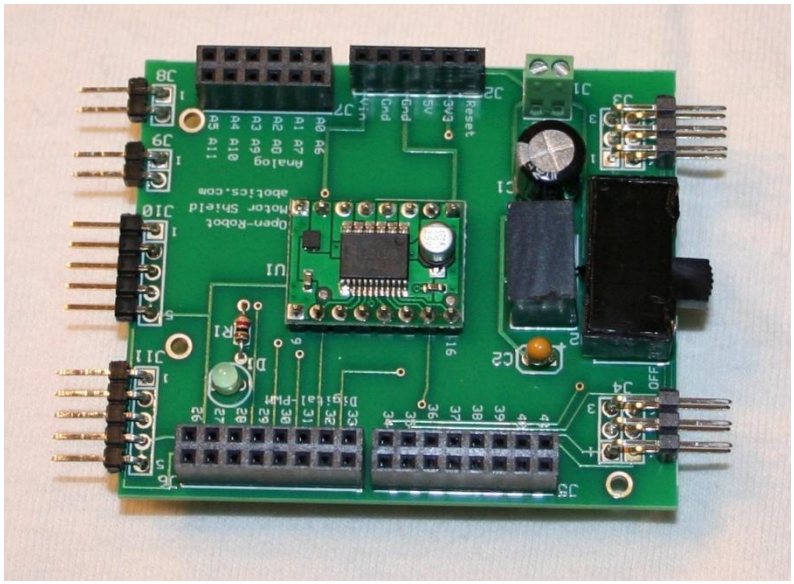


FIG 15. Solder 5x1 Right Angle Connectors, J10 & J11.

Step 14 - Cut Off 3V3 Pin from J2 Stackable Header (*Only if RECOM is installed*)

Refer to figure 16 below for how to cut off the 3V3 pin from the J2 Header. **Only perform this step if you have purchased and soldered the RECOM 3.3V regulator.** This step must be performed when the RECOM regulator is installed because the UNO32™ board already has a 3.3 volt power supply.

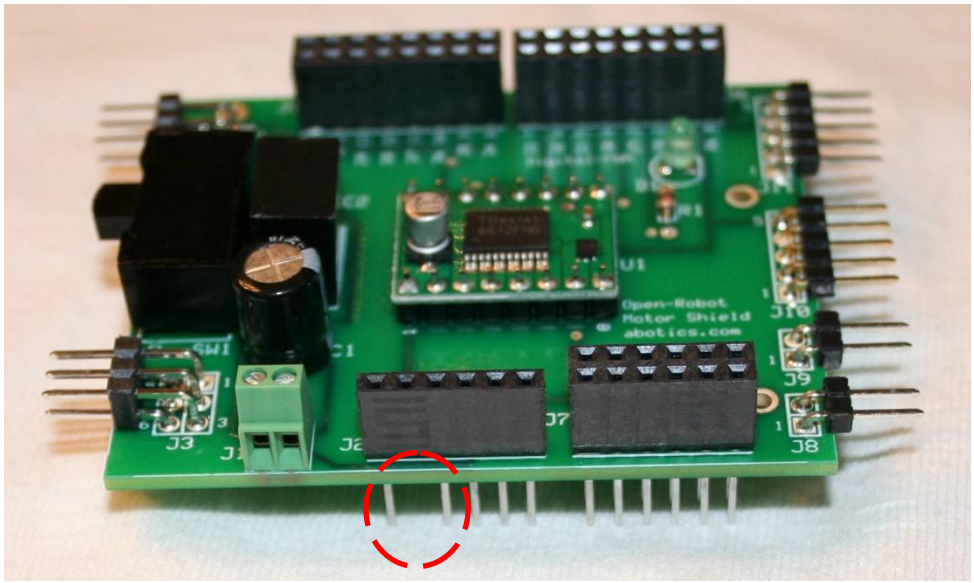


FIG 16. Cut Off 3V3 Pin from J2 Stackable Header. Only perform when RECOM regulator is installed.

Step 15 - Prepare to Apply Locking Tape to Base & Battery Holder

Refer to figure 17 below for how to prepare base and battery holder for locking tape.

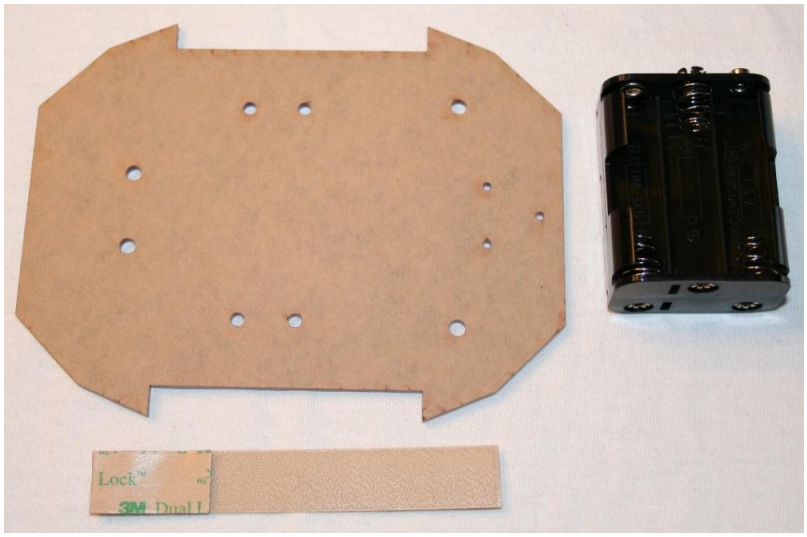


FIG 17. Prepare to Apply Locking Tape to Base and Battery Holder.

Step 16 - Cut & Apply Locking Tape to Base & Battery Holder

Refer to figure 18 below for how to cut & apply locking tape to the base and battery holder.

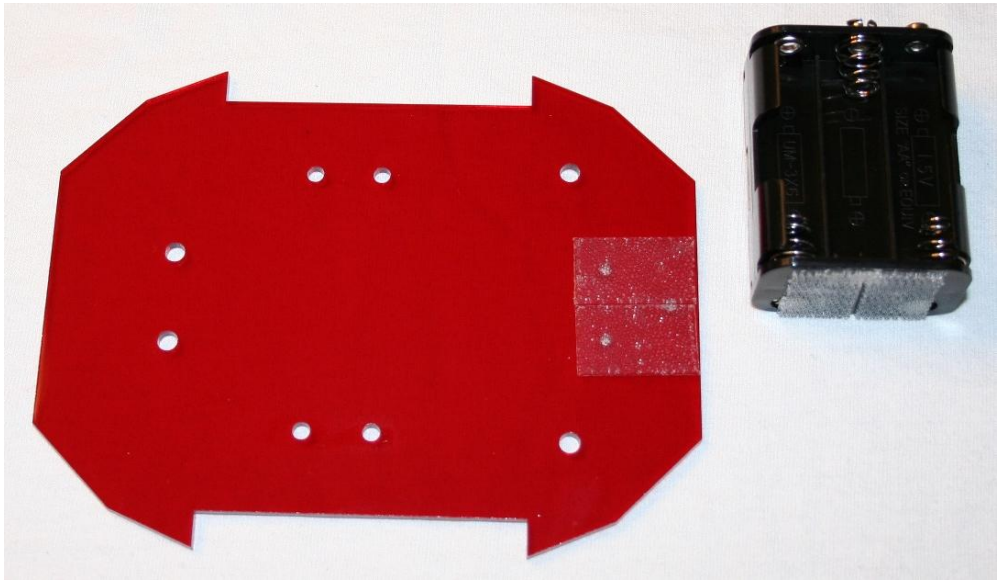


FIG 18. Apply Locking Tape to Base and Battery Holder.

Step 17 - Assemble Rear Caster Wheel

Refer to figure 19 below for how to assemble rear caster wheel.

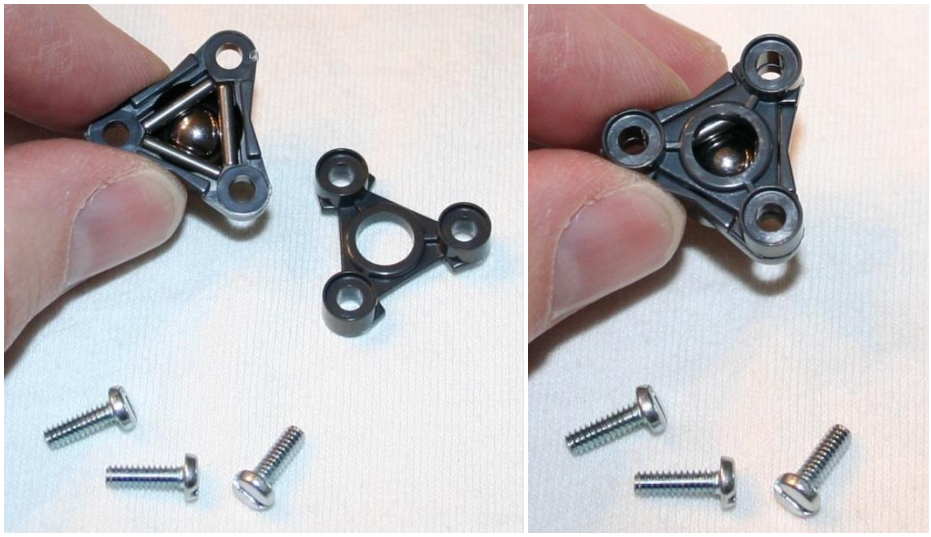


FIG 19. Assemble Rear Caster Wheel.

Step 18 - Attach Rear Caster Wheel to Base Plate

Refer to figure 20 below for how to attach the rear caster wheel to the base plate using (3) 4-40 x 3/8" machine screws. ***Do not*** over-tighten screws or you will crack the base plate plastic.

FIG 20. Assemble Rear Caster Wheel to Base Plate.

Step 19 - Prepare to Assemble Motor Mounts to Base Plate

Refer to figure 21 below for how to prepare to assemble motor mounts to base plate using (4) 6-32x1/2" machine screws and flat washers.

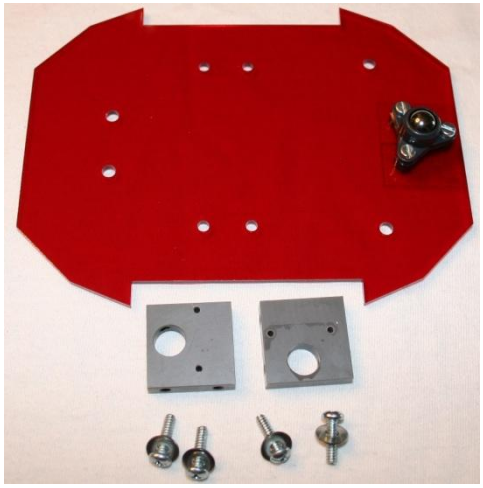


FIG 21. Prepare to Assemble Motor Mounts to Base Plate.

Step 20 - Assemble Motor Mounts to Base Plate

Refer to figure 22 below for how to assemble motor mounts to base plate using (4) 6-32x1/2" machine screws and flat washers. ***Do not*** over-tighten screws or you will crack the base plate plastic.

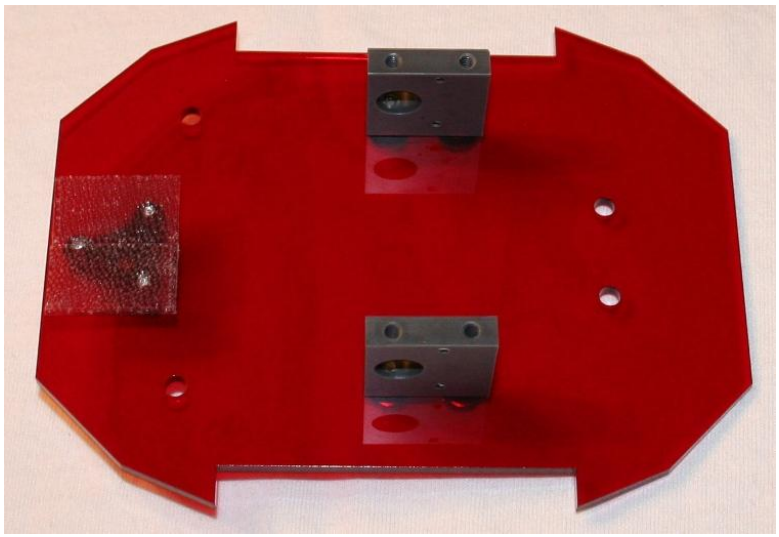


FIG 22. Assemble Motor Mounts to Base Plate.

Step 21 - Prepare & Solder Motor Wires

Refer to figure 23 below for how to prepare & solder motor wires. Cut (2) of the 6” long white wires in half and then solder to the motor tabs. Insert crimp ends into 2-position plastic connector.

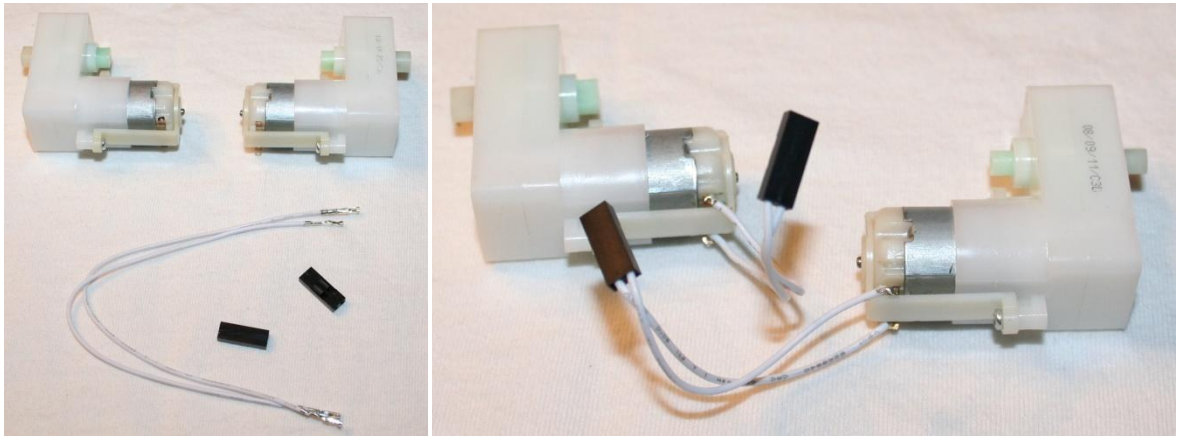


FIG 23. Prepare & Solder Motor Wires.

Step 22 - Mount Motors into Motor Mounts

Refer to figure 24 below for how to mount motors into motor mounts using 2-56x1” machine screws.

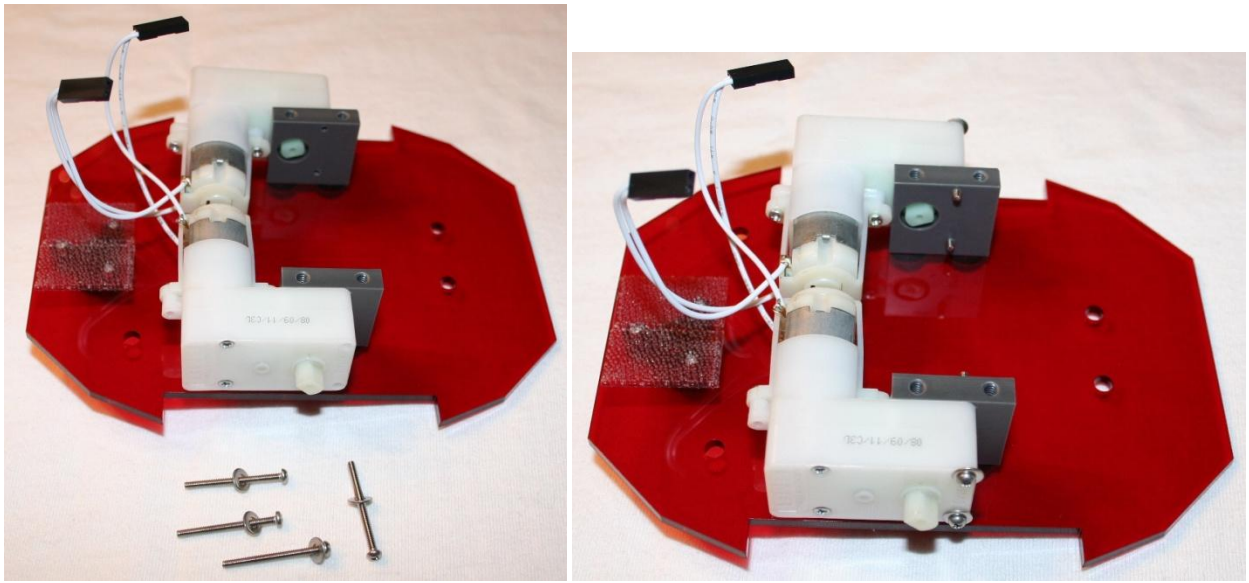


FIG 24. Mount Motors into Motor Mounts.

Step 23 - Prepare to Mount UNO32™ Board to Plastic Deck

Refer to figure 25 below for how to prepare to mount UNO32™ using 2-56x1/2" machine screws & nuts.

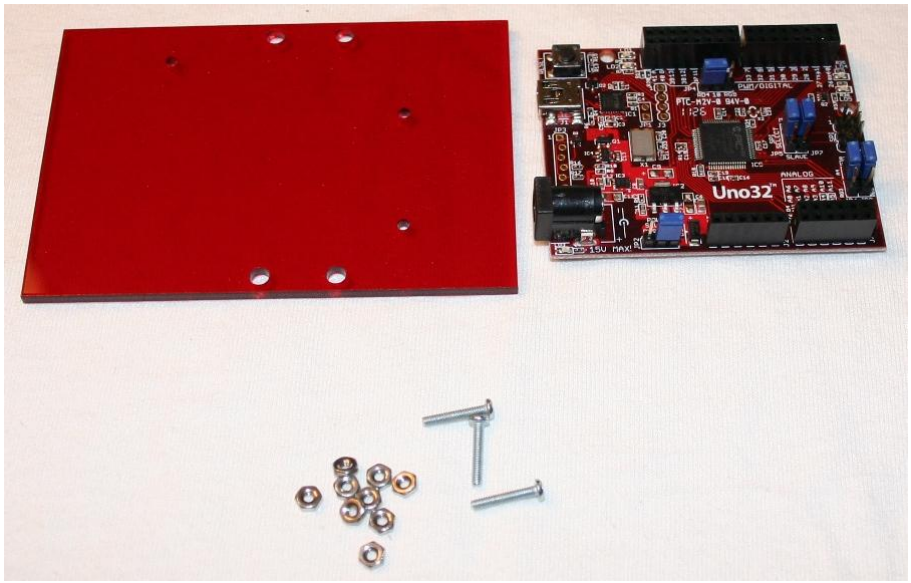


FIG 25. Prepare to Mount UNO32™ to Plastic Deck.

Step 24 - Install Screws into UNO32™ Board & Plastic Deck

Refer to figure 26 below for how to install 2-56 machine screws & nuts.

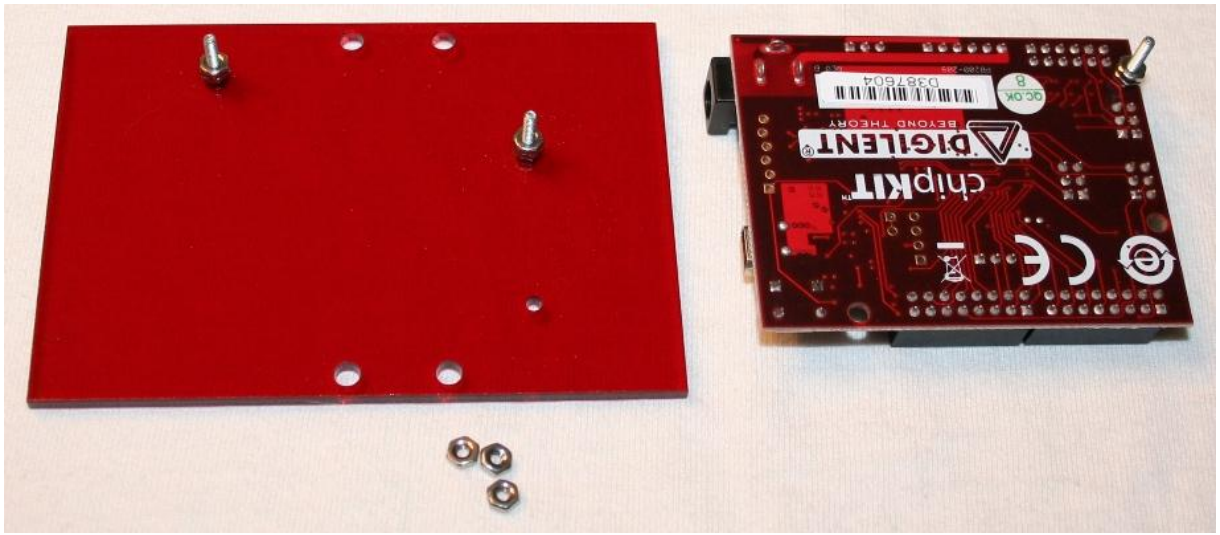


FIG 26. Install 2-56 Machine Screws & Nuts.

Step 25 - Install UNO32™ Board onto Plastic Deck

Refer to figure 27 below for how to install UNO32™ board onto plastic deck. Be extremely careful when threading and tightening the nuts because otherwise you might damage one of the surface mount components on the UNO32™.

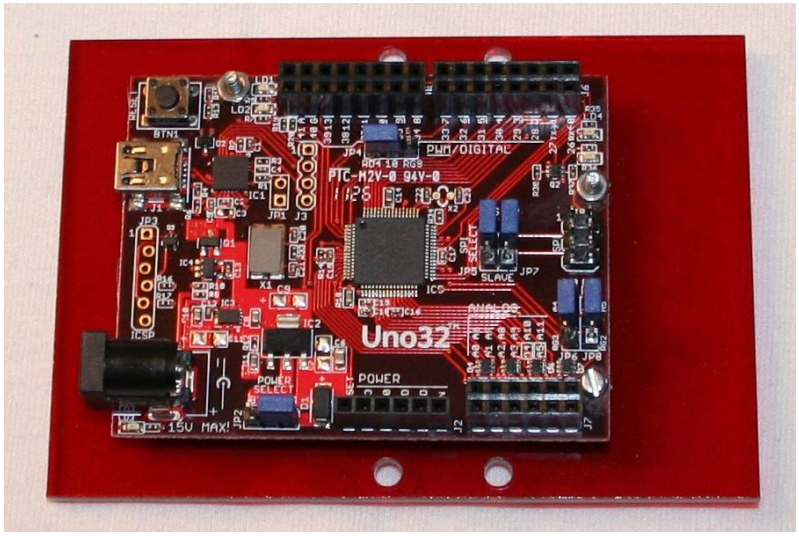


FIG 27. Install UNO32™ Board onto Plastic Deck.

Step 26 - Prepare to Install UNO32™ Board & Plastic Deck onto Robot

Refer to figure 28 below for how to prepare to install UNO32™ board & plastic deck onto robot. Place the (4) white plastic standoffs on top of the motor mounts. You can insert the (4) 6-32x1/2" screws into the plastic deck and then lower it onto the white standoffs in step#27.

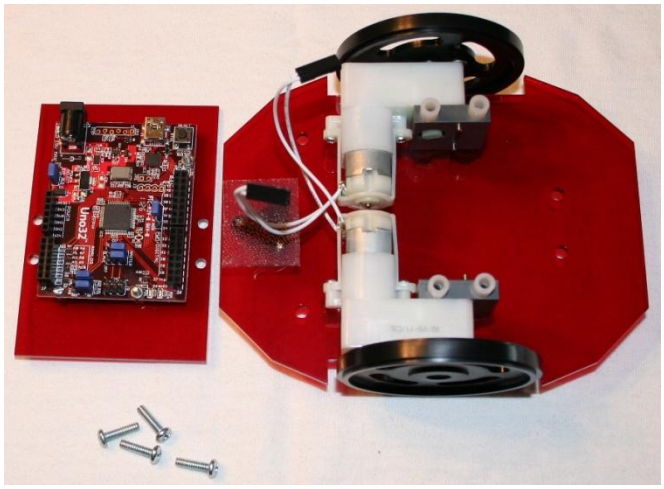


FIG 28. Prepare to Install UNO32™ Board & Plastic Deck onto Robot.

Step 27 - Install UNO32™ Board & Plastic Deck onto Robot

Refer to figure 29 below for how to install UNO32™ board onto robot. Secure with (4) 6-32x1/2" machine screws.

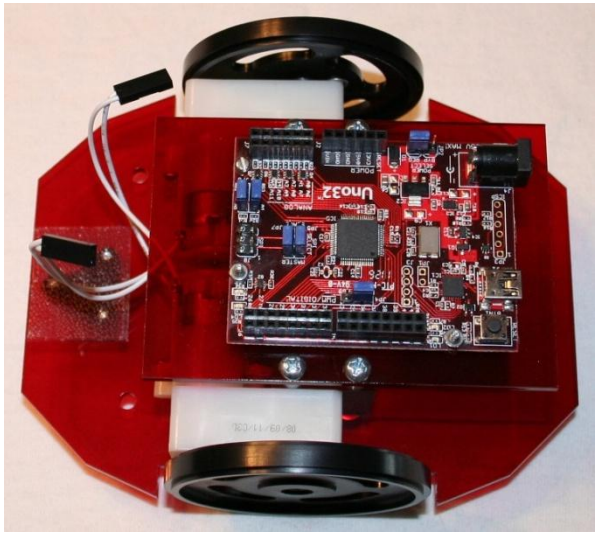


FIG 29. Install UNO32™ Board & Plastic Deck onto Robot.

Step 28 - Install Motor PCB onto UNO32™ Board

Refer to figure 30 below for how to install Motor PCB onto UNO32™ board. Be sure to properly align the Motor PCB stackable header pins with the UNO32™ headers. ***Be careful*** when inserting the Motor PCB

pins into the UNO32™ board headers because you can easily crack and damage the UNO32™ board. Note: you will not be able to insert the entire length of the Motor PCB pins into the UNO32™ headers. You only need to ensure that each pin has some amount of engagement with the mating header.

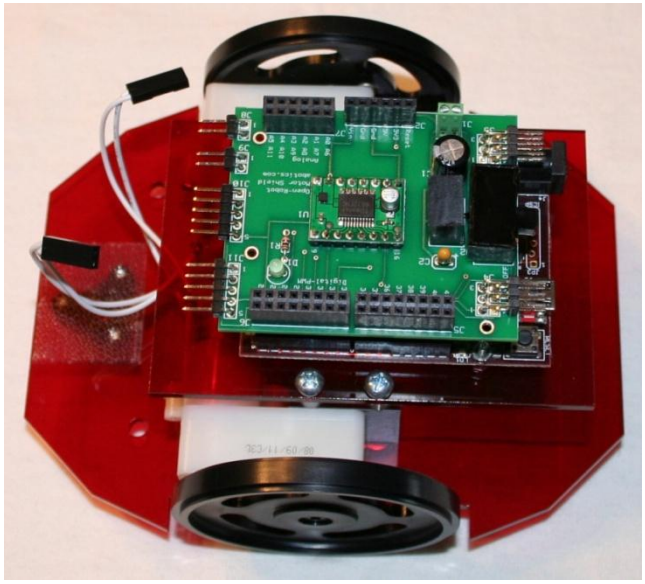


FIG 30. Install Motor PCB onto UNO32™ Board.

Step 29 - Connect Motor Wires to Motor PCB

Refer to figure 31 below for how to connect motor wires to Motor PCB headers, J8 & J9. The right motor connects to J8 and the left motor to J9.

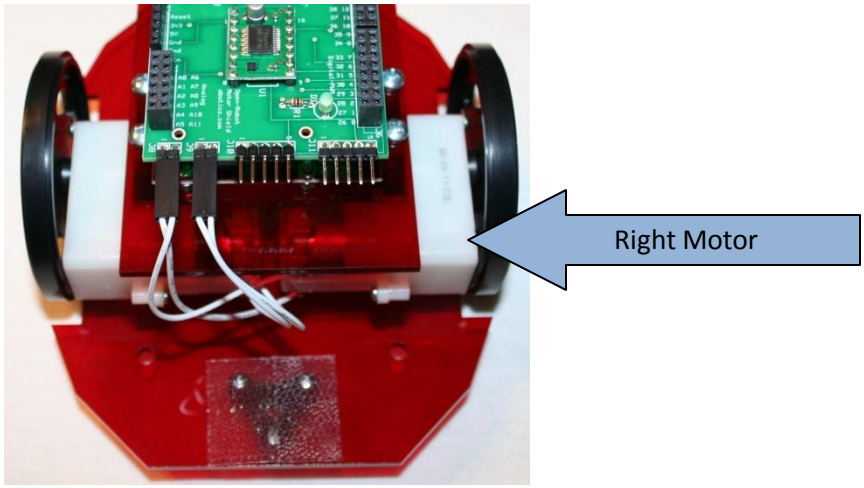


FIG 31. Connect Motor Wires to Motor PCB.

Step 30 - Solder GP2Y0D810Z0F Sensors

Refer to figure 32 below for how to solder 3x1 right angle headers onto GP2Y0D810Z0F sensors. You can also refer to Pololu's website for additional info: http://www.pololu.com/catalog/product/1134/

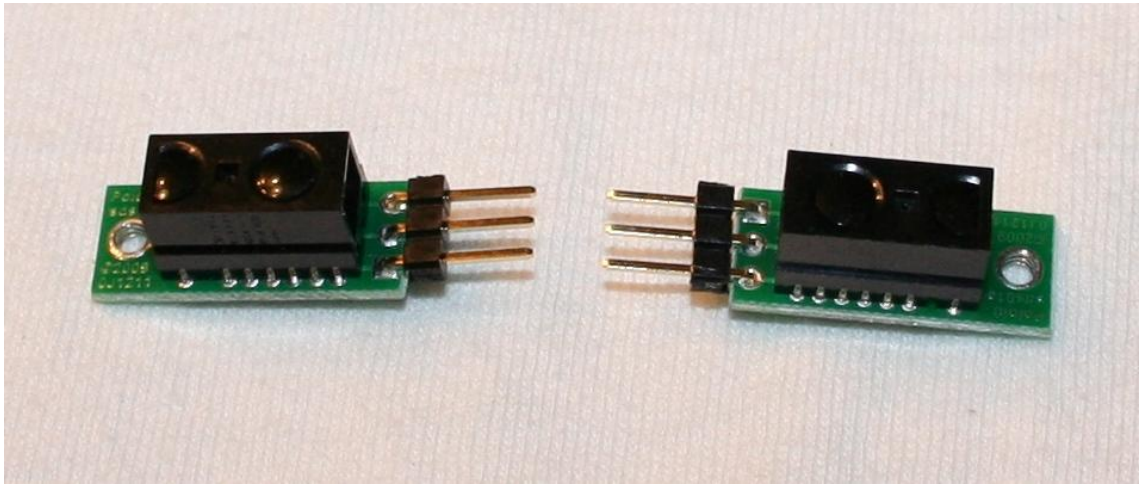


FIG 32. Solder 3x1 Right Angle Headers onto GP2Y0D810Z0F Sensors.

Step 31 - Prepare to Build Cables for GP2Y0D810Z0F Sensors

Refer to figure 33 below for how to prepare to build cables for the GP2Y0D810Z0F sensors. You will need (2) each of the 6" red, white & black wires and (4) 3-position plastic connectors.

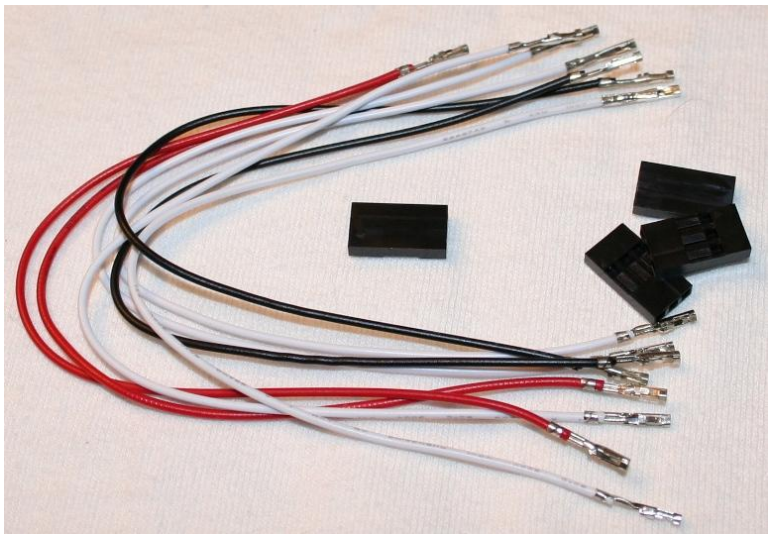


FIG 33. Prepare to Build Cables for GP2Y0D810Z0F Sensors.

Step 32 - Build Cables for GP2Y0D810Z0F Sensors

Refer to figure 34 below for how to build cables for the GP2Y0D810Z0F sensors. The red wire must be in the middle otherwise you can damage the GP2Y0D810Z0F Sensors once power is applied.

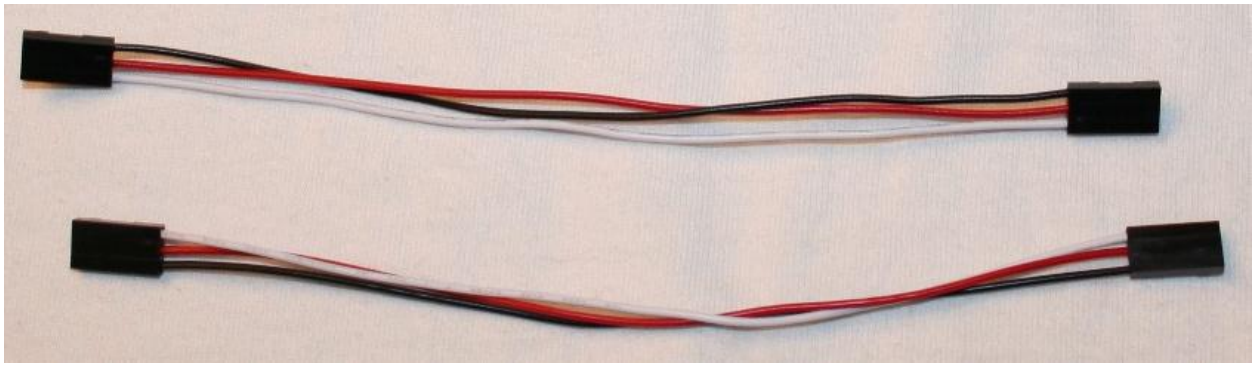


FIG 34. Build Cables for GP2Y0D810Z0F Sensors.

Step 33 - Connect Cables to GP2Y0D810Z0F Sensors

Refer to figure 35 below for how to connect cables to the GP2Y0D810Z0F sensors.

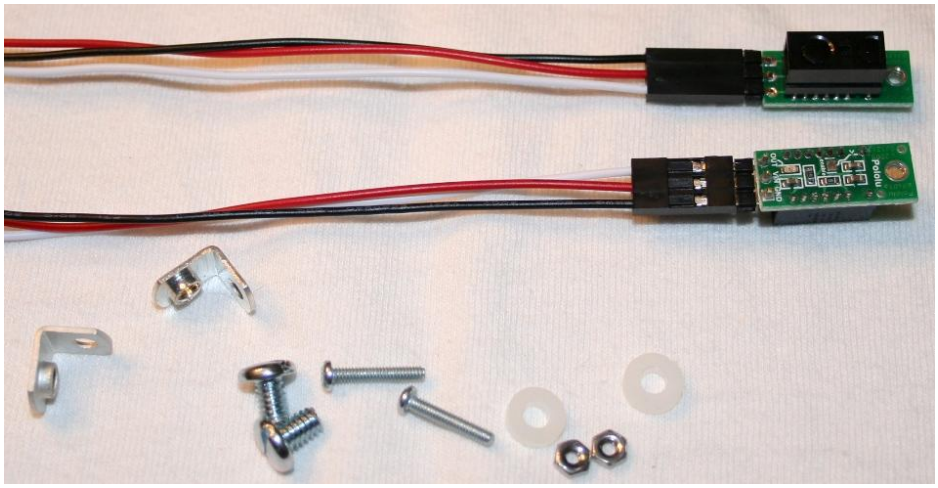


FIG 35. Connect Cables to GP2Y0D810Z0F Sensors.

Step 34 - Mount GP2Y0D810Z0F Sensors

Refer to figure 36 below for how to mount the GP2Y0D810Z0F sensors to the right angle brackets using 2-56x1/2” machine screws, a nylon washers and nuts.

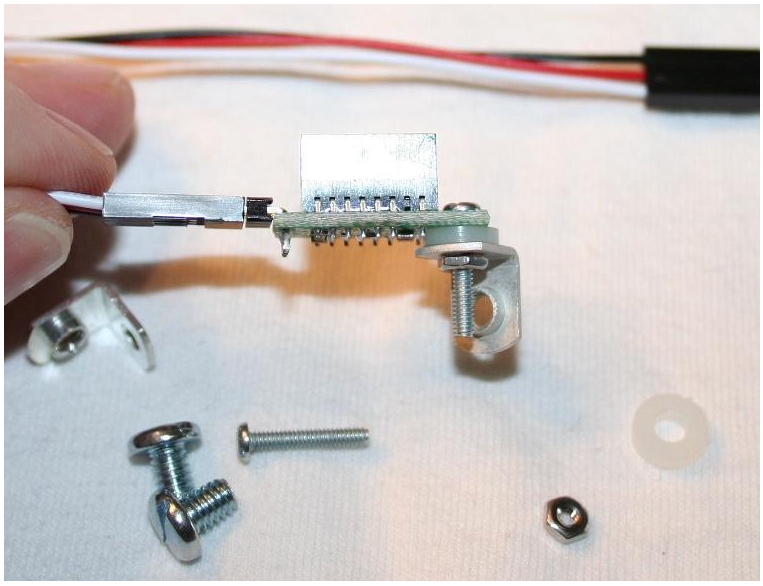


FIG 36. Mount GP2Y0D810Z0F Sensors to Right Angle Brackets.

Step 35 - Mount GP2Y0D810Z0F Sensors to Base Plate

Refer to figure 37 below for how to mount the GP2Y0D810Z0F sensors to the base plate using 8-32x1/4" pan-head screws. You can adjust the sensors to suit your sensing needs.

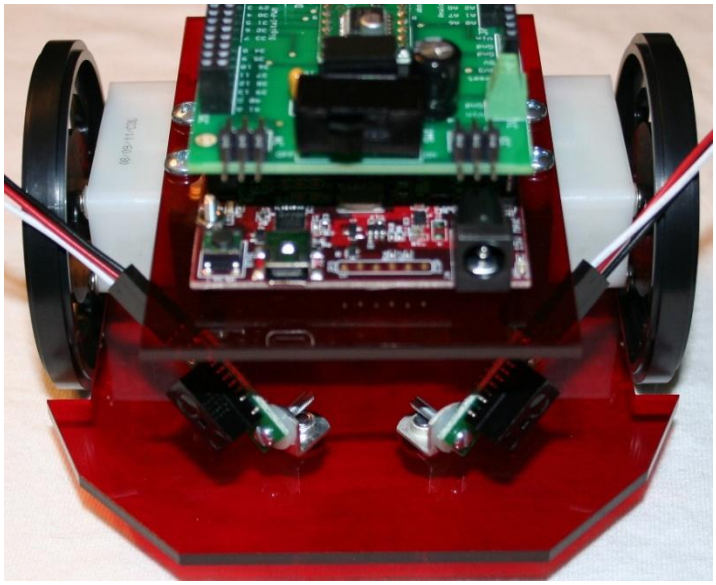


FIG 37. Mount GP2Y0D810Z0F Sensors to Base Plate.

Step 36 - Connect GP2Y0D810Z0F Cables to Motor PCB Headers, J3 & J4

Refer to figure 38 below for how to connect the GP2Y0D810Z0F cables to the Motor PCB headers, J3 & J4. The Right sensor cable connects to J4 & the left cable to J3. The white wire must connect to pin#4 on the J3 & J4 header, the red wire to pin#5 and the black wire to pin#6. Improper connection can ***permanently damage*** the GP2Y0D810Z0F sensor.

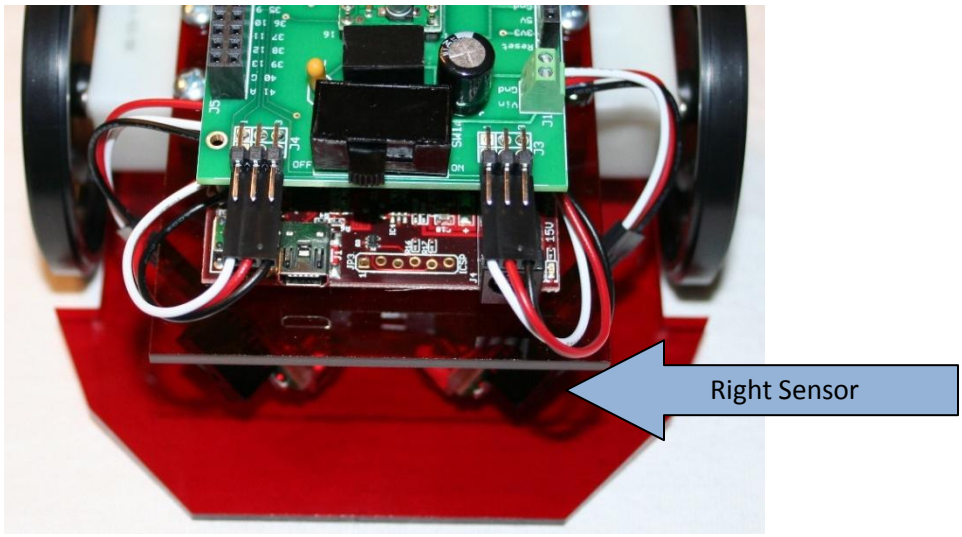


FIG 38. Connect GP2Y0D810Z0F Cables to Motor PCB Headers, J3 & J4.

Step 37 - Install Battery Pack & 9-Volt Style Connector

Refer to figure 39 below for how to install battery pack and 9-volt style connector to terminal J2. The red wire on the 9-volt style connector must be connected to the terminal labeled Vin on J1 and the black wire to the terminal labeled Gnd. Improper connection can ***permanently damage*** components on the Motor PCB and potentially the UNO32™ board.

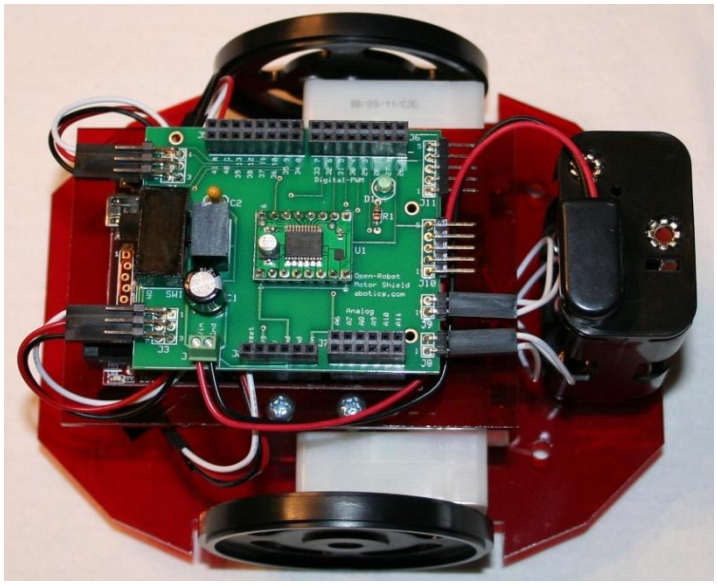


FIG 39. Install Battery Pack & 9-Volt Style Connector to Terminal J2.

Step 38 - Your 32-Bit Open-Robot is now Complete!

You have just successfully completed your 32-bit Open-Robot. Please refer to the 32-Bit Open-Robot Manual for how to get started. http://www.abotics.com/docs/PIC32-Based-OpenRobot-Manual.pdf

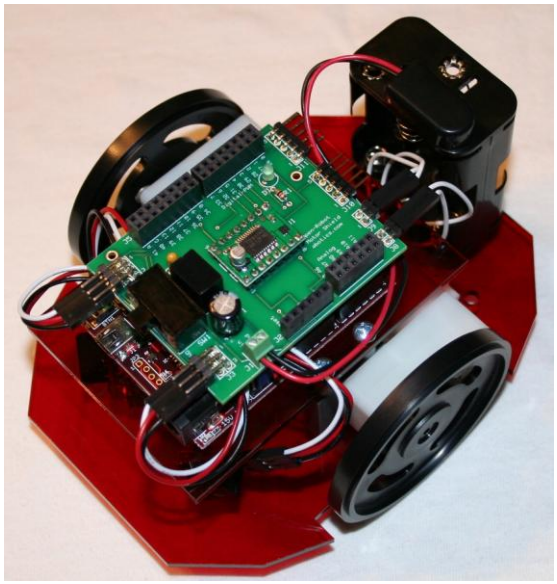


FIG 40. Completed 32-Bit Open-Robot.