Bleeble Tech Inc

Advanced Controller

Soldering Instructions

Revision 2

Last Updated: 2024-03-11

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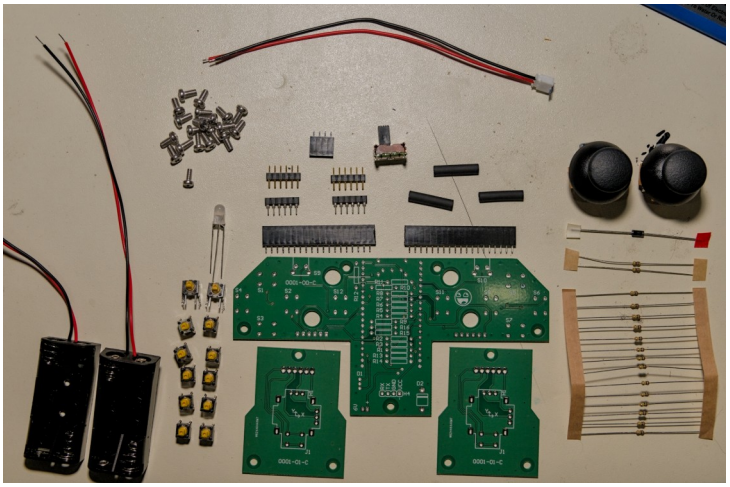
Before You Start

Make sure you have all your components and tools ready.

Parts include:

- 1x Advanced Controller Main-board PCB
- 2x Advanced Controller Joystick Module PCBs
- 14x 100kOhm Resistors (Brown-Black-Yellow)
- 2x 470 Ohm Resistors (Yellow-Purple-Brown)
- 10x 6mm Vertical Buttons
- 2x 6mm Right-Angle Shoulder buttons
- 2x Low-Profile 2.54mm Pitch Receptacles
- 2x Low-Profile 2.54mm Pitch Male Headers
- 2x 19-pin 2.54mm Pitch Receptacles
- 2x Joystick Modules
- 3x Heat-shrink Tubing Pieces
- 1x 4-pin 2.54mm Pitch Receptacle
- 1x JST connector with wire harness
- 1x Sliding Power Switch
- 1x Blue-Red Bi-Colour Common Cathode LED
- 1x SB140 Diode
- 2x AAA2 Wired Battery Holders
- Mounting Screws (Not needed for soldering, but its a good idea to not lose them!)



The minimum tools needed to assemble a controller are:

- Soldering Iron with Solder
    - A small tangent on solder types: I use 63/37 Leaded Rosin-Core Solder personally, but if you are concerned about lead, Lead-free solder alternatives work perfectly fine as well (and is what I use when assembling pre-soldered units)! **If you're solder does not include Rosin (Flux) in it, it is recommended to place some either from a Flux Pen, Flux paste, or other source onto each solder connection first, as Rosin/Flux helps the solder adhere by cleaning and preventing oxidation of the surfaces.**
- Flush Cutters (used to cut extra lead length off of each component, such as the resistors and diodes
- Needle-Nosed Pliers
- Duck (optional)

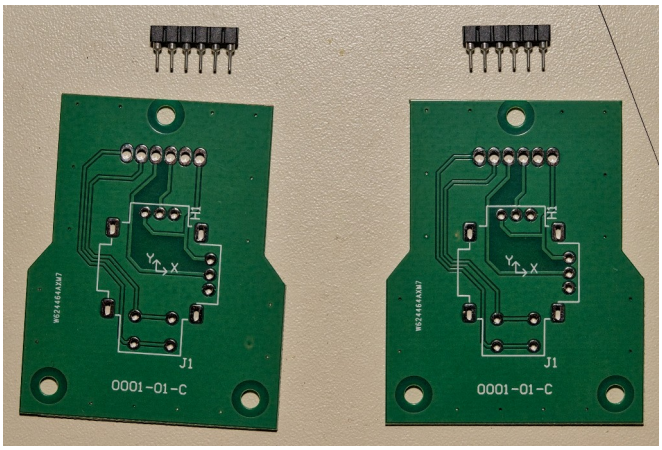
Using Helping Hands to hold the PCB and components makes assembly easier and is highly recommended for this kit, but they are not required (Source: Me, I don't have any but found some creative workarounds to hold things in place).

Tips for assembly are provided in *italics*. They do not need to be followed, but they can help make the assembly process easier.

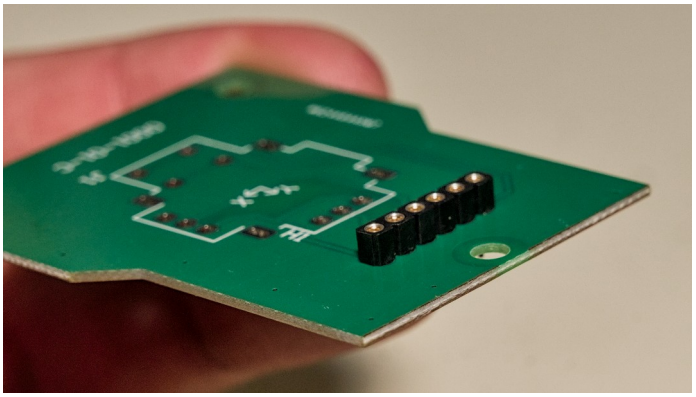
Important info is in **bold**. **These pieces of information should not be skipped over.**

Assembling the Controller

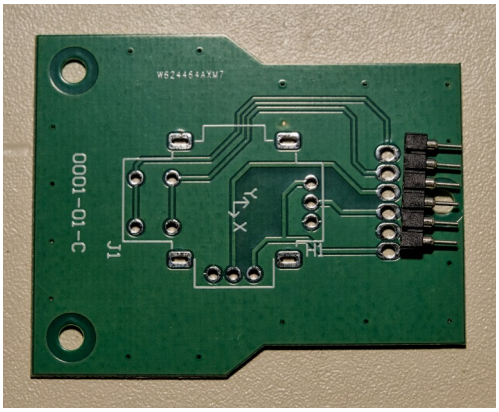
1. Solder the low-profile receptacles to the joystick module PCBs

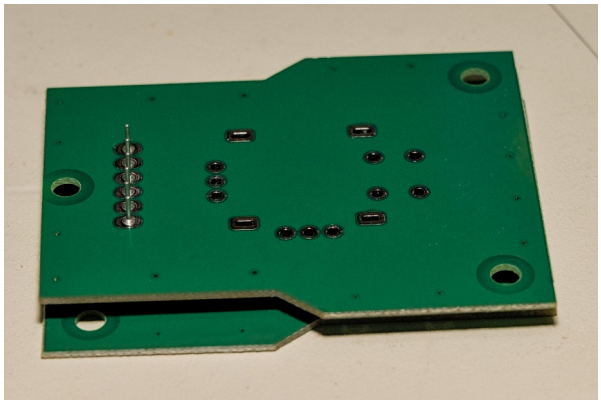


These are both H1 in the schematic, as both joystick module PCBs use the same page in the schematics. The holes for these headers is also larger than typical for these headers, this is to reduce the overall height of the controller slightly. The black plastic of the receptacle should sit flat on the PCB face like the image below.

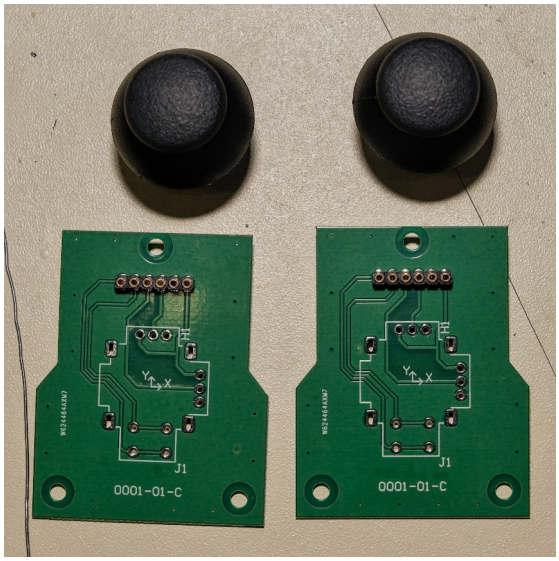


Tip: Using the other headers/receptacles on their sides placed on the opposite side of the board by the part number, you can keep the board level while soldering (the above was placed onto the below image for soldering, making a "receptacle sandwich")



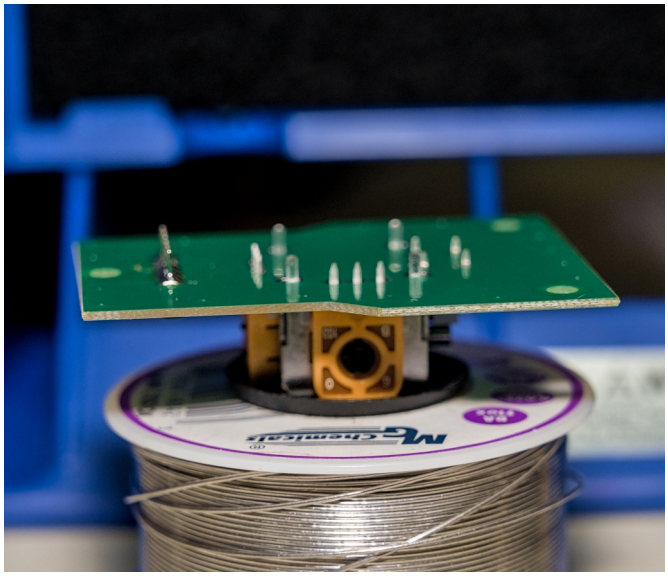


2. Solder the joystick modules to the joystick module PCBs

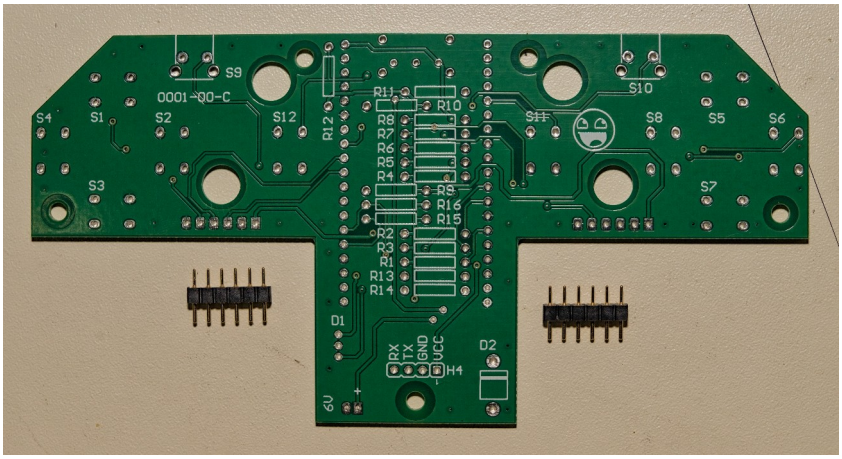


Like the low-profile receptacles, these are both J1 in the schematic. These may be a tight fit into the solder pads, be careful to not crush any of the leads.

Tip: if you're like me and don't have helping hands, using the hole of a solder spool can be an effective way to hold the PCB upside down while soldering the controller.

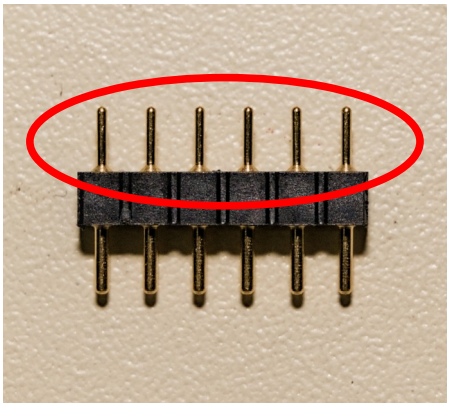


3. Solder the low-profile male headers to the advanced main-board PCB

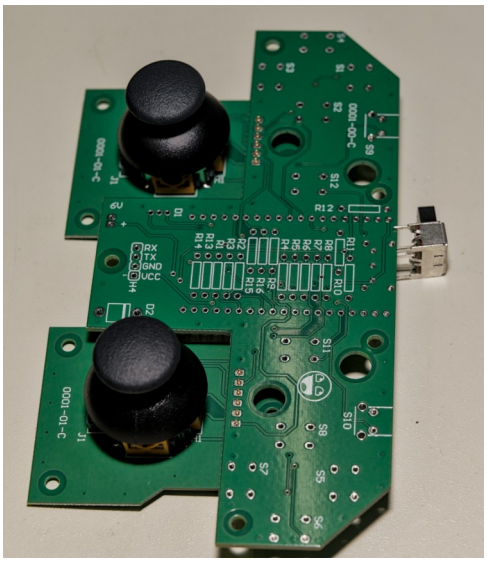


These headers are H2 and H3 in the schematic for the right and left joystick module respectively.

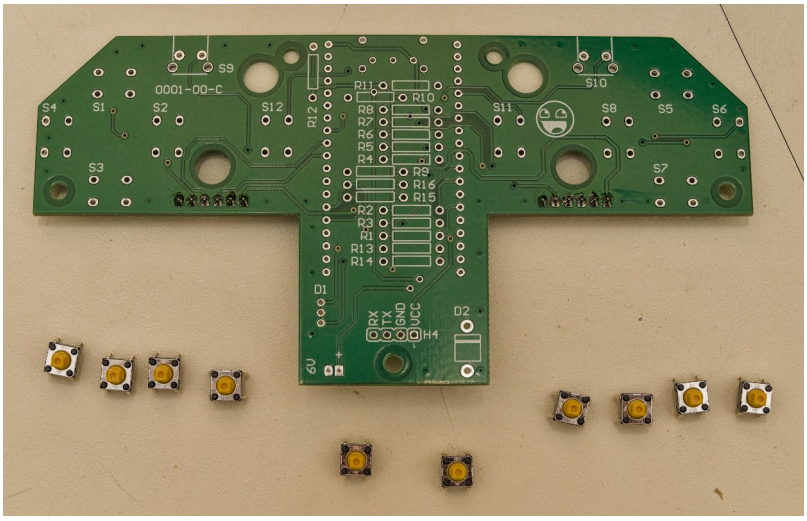
One side of these headers has a larger diameter than the other, the smaller diameter side is what should be inserted into the PCB (circled in red below).



Tip: attaching the joystick module PCBs to these headers and using the switch's pins to prop up the board can help keep it stable while soldering these headers.



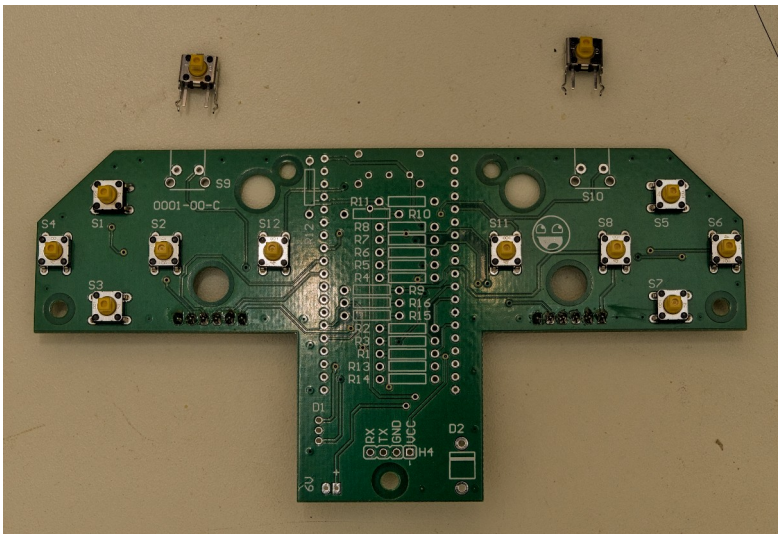
4. Solder the 6mm vertical buttons to the main-board PCB



These are labelled S1-S8, S11, and S12 in the schematic.

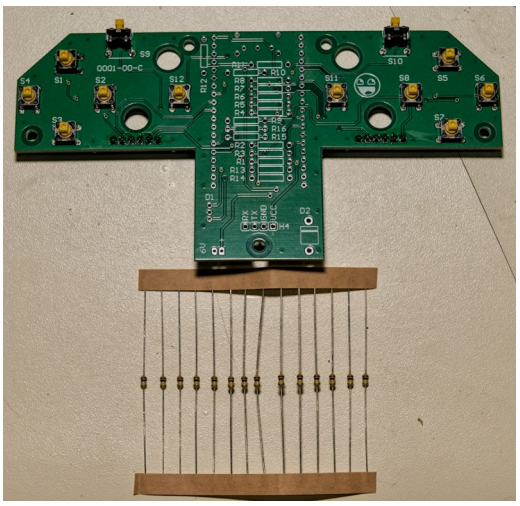
Tip: these buttons lock into their pads, so press on them until they click into place (should be a very audible click). There are also enough of them around the centre of mass of the board that nothing special needs to be done to prop the board up while soldering.

5. Solder the right angle 6mm shoulder buttons to the main-board PCB



These are S10 and S11 in the schematic. Due to the previous step, these should need no special support when soldering, and they also some slight locking like the vertical buttons.

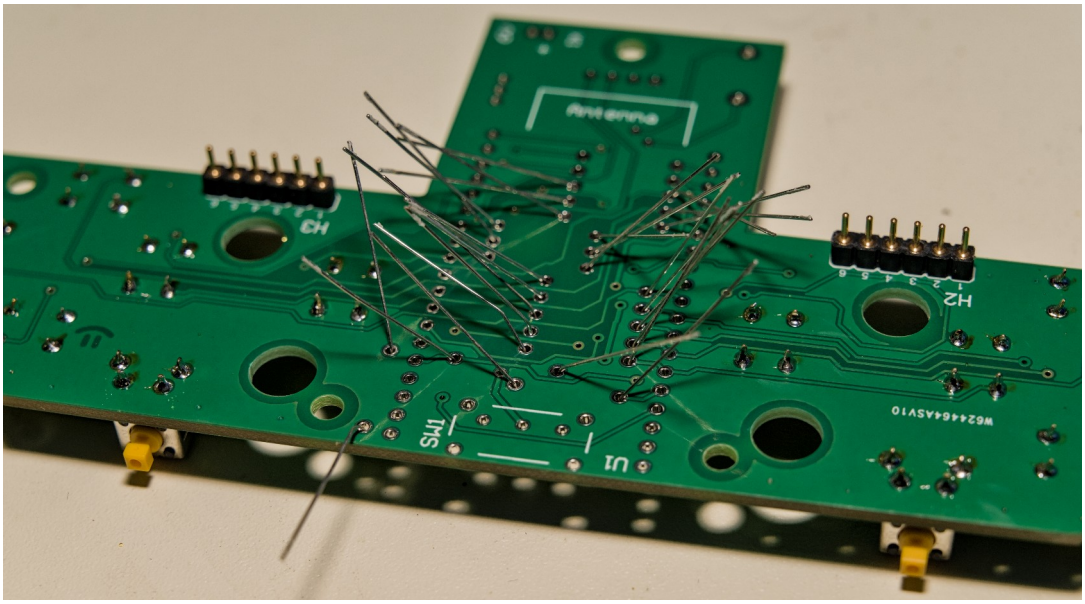
6. Solder the 100kOhm resistors to the main-board PCB



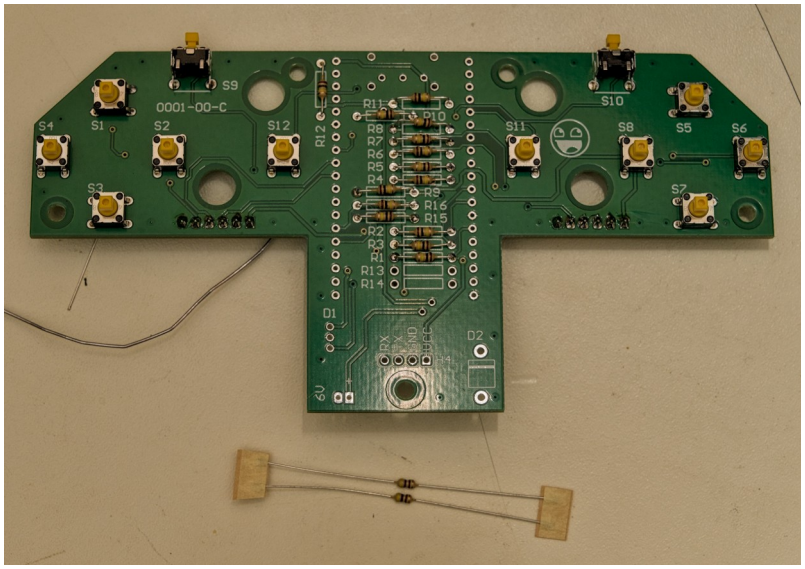
These resistors are R1-12, R15, and R16 on the schematic. These resistors are used as “pull-up” resistors, they ensure the buttons are always in a defined state as voltages can sway if a pin is not pulled to logic-low or logic-high and create unpredictable behaviour. In this case: when idle, the input pin on the ESP32 will have a logic-high (3.3V) signal on it due to these resistors, and when you press a button it will pull its respective pin to ground (0V). This is called Active-Low logic, the “Active” state is when the system is pulled to ground.

Tip: Bending the leads using the needle-nosed pliers is recommended to make placement into the PCB easier.

Tip Part 2: Doing these in smaller batches rather than all of them at the same time like I did can make reaching each pin way easier. Bending the leads outwards can also help hold the resistors in place while soldering. If you want a good challenge though, try to do all these resistors at the same time without having an air-gap between them and the board, I failed that challenge while soldering this unit for these photos as you’ll probably see in future images.



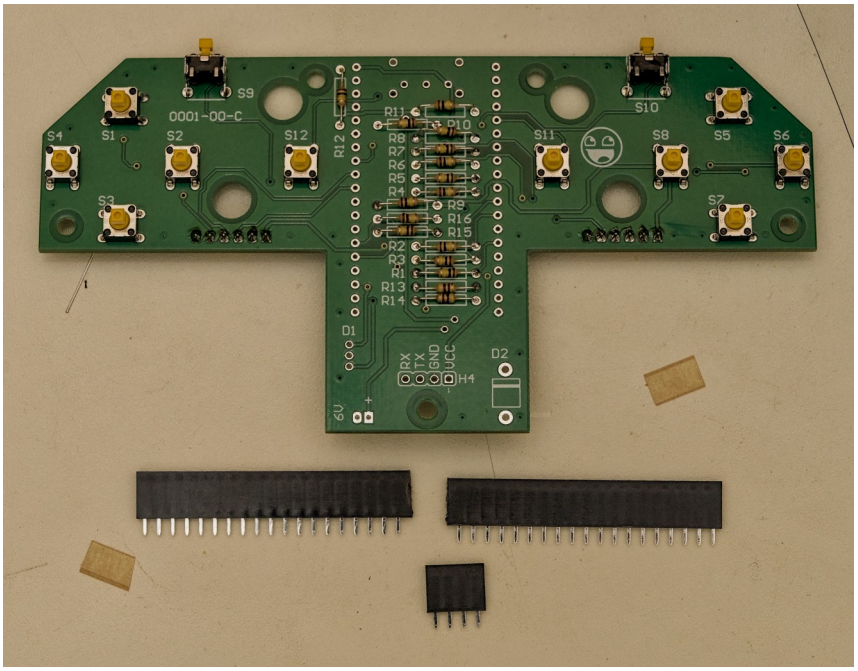
7. Solder the 470 ohm resistors to the main-board PCB



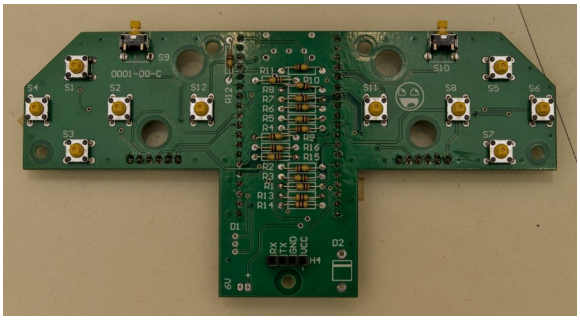
These are R13 and R14 in the schematic. These resistors limit the current to each colour of the Bi-colour LED, preventing the LED from drawing too much current and damaging itself.

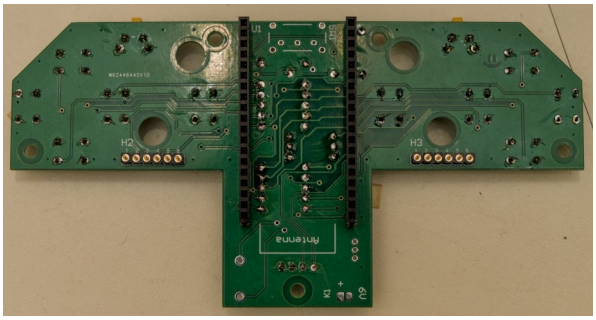
Tip: the same soldering tips from the 100kOhm resistors apply to these ones too.

8. Solder the 2.54mm receptacles to the main-board PCB

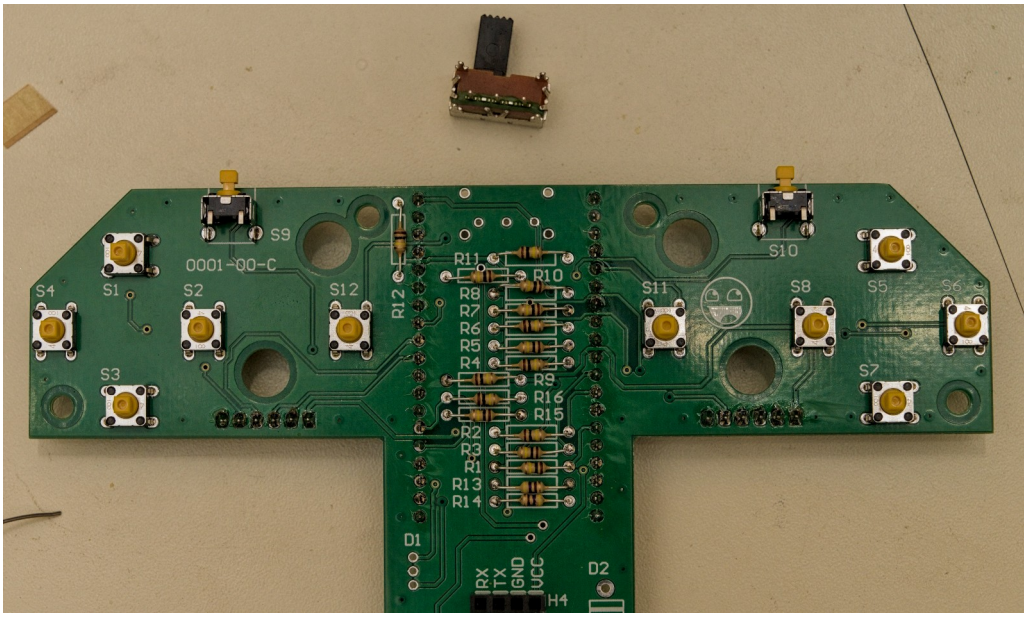


These are U1 and H4 in the schematic. U1 is actually the ESP32 module, but it is placed into these 19 pin headers rather than being soldered directly to the board. **The 4 pin receptacle goes on the top face of the board (the side with the buttons) and the 19 pin receptacles go on the bottom face of the board.**





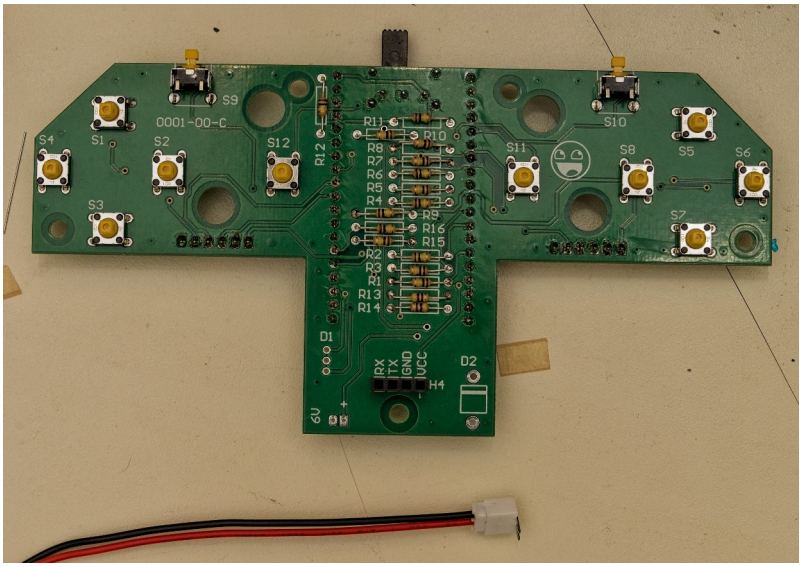
9. Solder the main power switch to the main-board PCB



This is SW1 in the schematic. **This switch goes on the bottom of the PCB.**

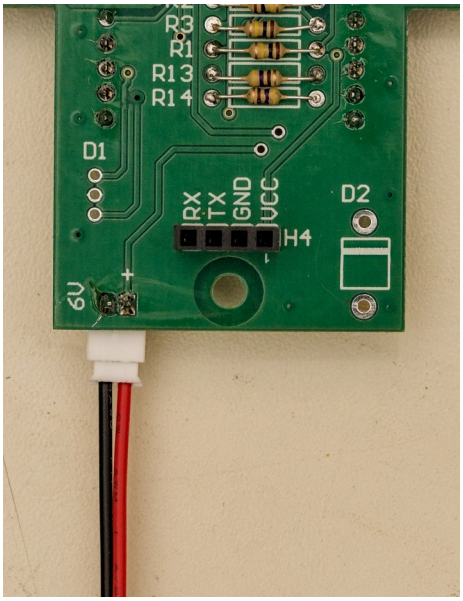
10. Solder the JST connector to the main-board PCB

Note: You may receive a board with the JST connector already soldered, in which case, skip this step.



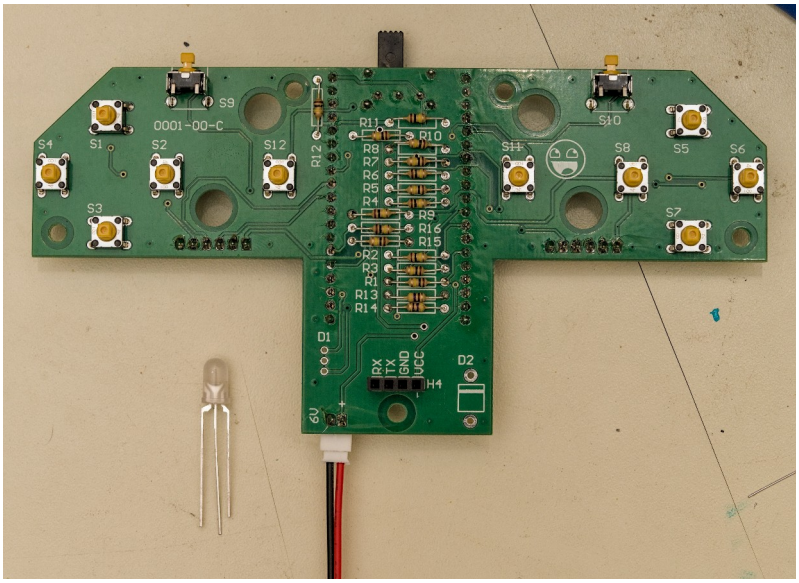
This is K1 in the schematic. This connector is keyed so you cannot plug it in backwards, helping to prevent reverse-polarity voltage events which could damage the controller.

This part goes on the bottom of the board, and from a top-down birds eye view the red wire should be on the right side. The connector is purposefully placed to go slightly off the board. (Shown below)



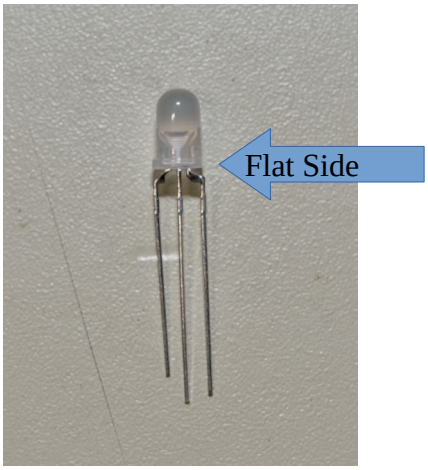
Tip: by bending the wire harness that is plugged into this connector can help hold it stable while soldering. After soldering the connector, you can disconnect the wire harness if it is in the way.

11. Solder the Bi-Colour LED to the main-board PCB



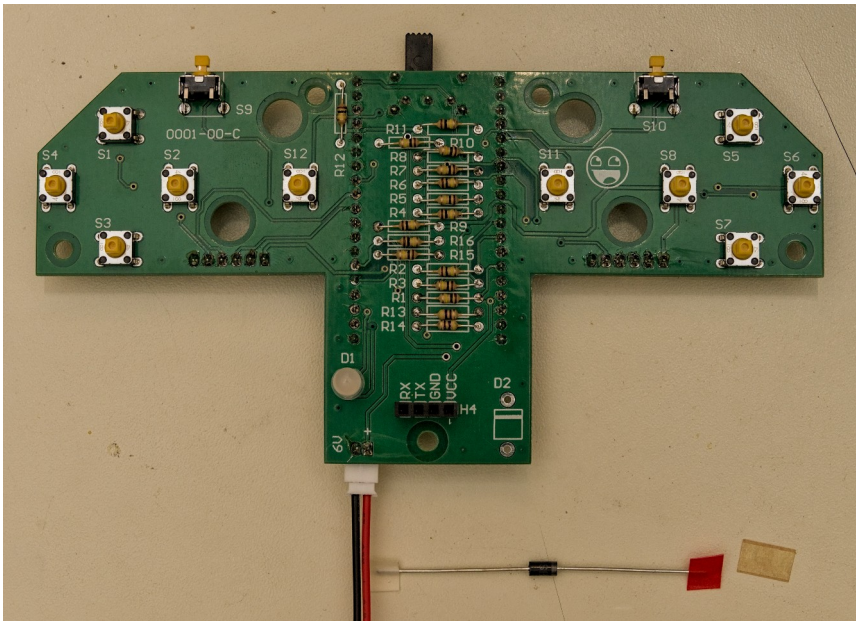
This is D1 in the schematic. This LED has 2 colors (Red and Blue) with a common cathode (ground) lead.

One side of the LED's housing is flatter than the other, this side should be facing down AWAY from the soldered feet of the 19-pin header it is beside. (Note: future images show this LED soldered in with the flat side facing up instead of down, which opposite to the above important note, please ignore that...)



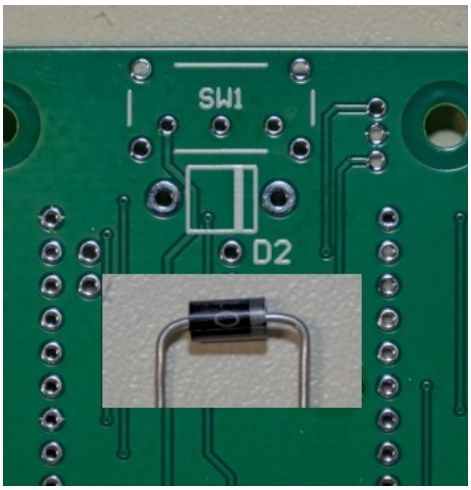
12. Solder the reverse-voltage protection diode to the main-board PCB

Note: You may receive a board with this diode already soldered, in which case, skip this step.



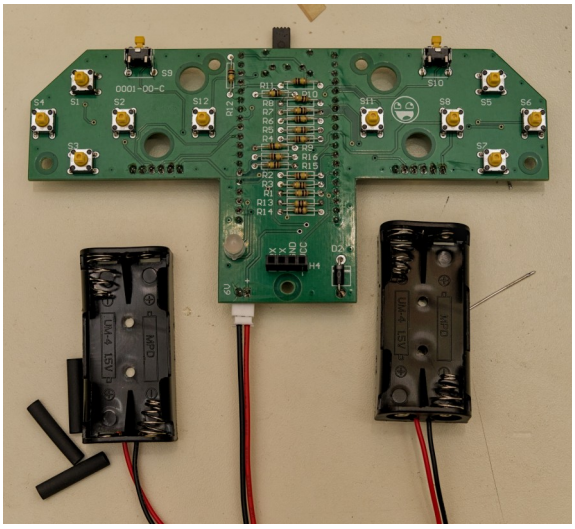
This is D2 in the schematic. Like the keyed power connector, this diode helps prevent reverse-voltage events, though it takes a more active approach: acting like a one-way valve which won't allow power to flow if it is connected backwards.

Because this diode (and most diodes actually) acts as a one-way valve, soldering it in the correct direction is important! The diode has a silver band on it which should line up with the silkscreen visuals on the board itself. (This image is from the Basic Controller, but it is the same part and silkscreen visuals as what is used on the Advanced Controller)



Tip: Like the resistors, you can bend the leads of the diode once it's placed on the PCB to help hold it in place while soldering.

13. Solder the battery holders in series and to the power connector’s wire harness

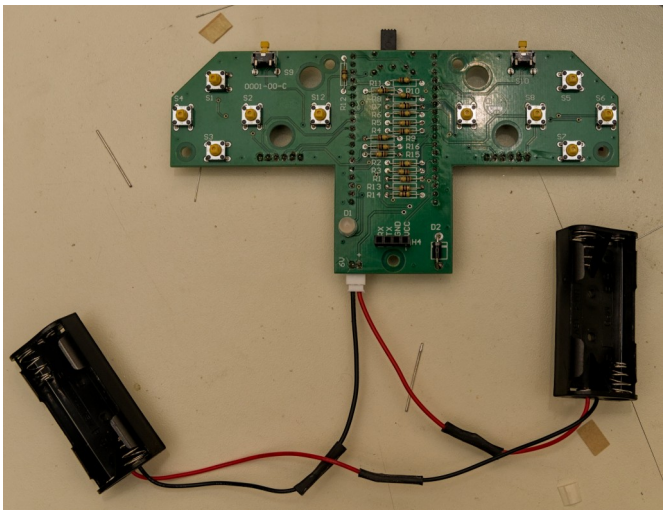


These holders do not have a schematic symbol, as they connect via the keyed JST power connector instead. The 3 pieces of heatshrink tubing are also used in this step to cover some wire-to-wire solder connections.

These battery holders need to be put into series to generate the 6 volt power needed. To do this, take the red wire from one battery holder and solder it to the black wire of the other. **Before doing this, place a piece of heatshrink tubing onto one of the wires so you can insulate that solder connection afterwards.** Afterwards the other 2 pieces of heatshrink can go onto the remaining wires, then you connect the remaining red wire from the battery holders to the power connector harness’ red wire and the remaining black wire from the battery holder’s to the harness’ black wire.

Tip: While it isn’t required, you can cut down the length of the harness and battery holder wires to be more form fitting to whatever housing (either our own design or your own) you intend to place the PCB into.

Once done, it should look similar to the below image:



Congratulations, you have now assembled the PCBs of the Advanced Controller! At this point, if they aren’t already connected, you can connect each joystick module to the main-board, then install everything into your controller housing using the supplied M3 mounting screws. After that, its just a matter of inserting 4 AAA batteries and programming the ESP32.

If you made it this far, here is a duck!

Document Revisions

Revision	Date	Change
1	2024-03-05	Initial document release.
2	2024-03-11	Corrected orientation note for Bi-Colour LED. Added notice about possibly having a pre-soldered diode on some boards. Added notice about possible having a pre-soldered JST power connector on some boards.