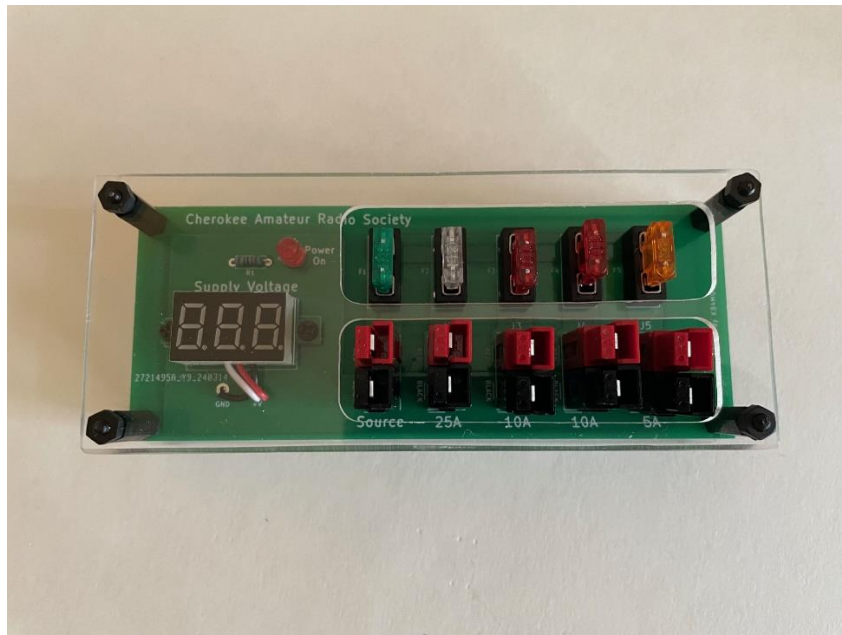


Assembly Manual

Four-output PowerPole™

Distribution Board

Board version 3.0



Instructors for the Workshop

Tom Perry KN4LSE

Martin Buehring KB4MG

Stan Ham WB9GFA

Assembly Manual

Introduction

This manual accompanies the 4-output PowerPole™ Distribution Board kit designed by the Cherokee Amateur Radio Society for its members. There may be instances where this module will be sold to others outside the club and offered as a kit. These instructions are for anyone who wants to assemble this board.

Motivation

The motivation for this project was to design and supply a kit for people to build a 4-output DC distribution board using the standardized Anderson PowerPole™ connectors. The number of outputs was chosen to be four because this was found to be sufficient in most applications and helped to keep the cost and size reasonable.

Implementation

The circuit board was designed by Martin Buehring (KB4MG) using an open-source printed circuit design program called KiCAD. This process starts with a schematic diagram (see Appendix for schematic). This tells KiCAD about the connectivity of the components so that errors in the physical layout can be minimized. The software makes sure that the board traces match the schematic diagram.

The other main consideration is the library of footprints that are needed for each component. Many of these can be found in standard libraries, but some need to be created by the designer. This board has a little of both.

Operational Caveats

Because the board must handle high DC currents, the traces and thickness of the copper must be sufficient to handle the current density. This board has 2-ounce copper traces. One word of caution is that this was done by using calculations of the copper area. If this was a commercial product it would be tested under many operating conditions including temperature, voltage, current, and humidity. The design is as robust as possible, but could have failures if the user exceeds a total of 30 amps, 13.3 volts DC. Additionally, the maximum voltage is designed to be 15 volts DC.

Legal Disclaimer

YOUR USE OF THIS FOUR-OUTPUT POWERPOLE DISTRIBUTION PRODUCT IS ENTIRELY AT YOUR OWN RISK. CHEROKEE AMATEUR RADIO SOCIETY MAKES NO REPRESENTATIONS OR WARRANTIES ABOUT THIS ITEM. IT IS PROVIDED "AS-IS". WE DISCLAIM ALL WARRANTIES, EXPRESSED, STATUTORY, OR IMPLIED, BUT NOT LIMITED TO: 1) MERCHANTABILITY, FITNESS, FOR A PARTICULAR PURPOSE, TITLE, QUIET ENJOYMENT, NO LIENS, OR EMCUMBARENCES; 2) WARRANTIES AGAINST INFRINGEMENT, MISAPPROPRIATION OR VIOLATION OF ANY INTELLECTUAL PROPERTY RIGHTS OF ANY PERSON; 3) ARISING THROUGH THE COURSE OF DEALING OR USAGE IN TRADE; AND 4) RELATING TO THE ACCURACY, RELIABILITY, CORRECTNESS, OR COMPLETENESS OF DATA OR CONTENT MADE AVAILABLE ABOUT THIS PRODUCT BY CHEROKEE AMATEUR RADIO SOCIETY.

THERE IS NO WARRANTY THAT THIS PRODUCT WILL MEET YOUR NEEDS OR REQUIREMENTS OR FOR ANY OTHER PERSON OR THE NEEDS SET FORTH IN THIS DOCUMENT.

Assemble Considerations

There is a sequence of assemble steps, if followed, will make it easy to complete. You are advised to follow these steps so that it will make the soldering steps easy to complete.

All parts are in the provided plastic bag. The only additional items you need are the suggested tools.

If you are assembling this as part of a workshop exercise, please wait for the instructor to tell you what steps to follow.

DO NOT just dump all the parts on the table as there are small parts that can easily roll off the table and be hard to find. There may be special verbal instructions as well.

Assembly Steps

Step 1: Inventory the parts



Carefully remove the parts from the bag and do a quick inventory. (The Appendix has the parts list) If you are missing any parts, let us know.

The voltmeter bag has the screws and nuts (M2.5mm) to mount it on the board.

Step 2: Pair up the PowerPole™ Connector Housings

This picture shows the correct orientation of the PowerPole housings.

Caution! This must be correct or the polarity of your power strip could be wrong and damage your equipment.

Note the location of the metal clips inside as well as the letter 'A' on the housing. This will help with orienting them.

This orientation matches the amateur radio conventions for connection of PowerPole™ connectors.¹

This will match other commercial equipment that has these connectors.

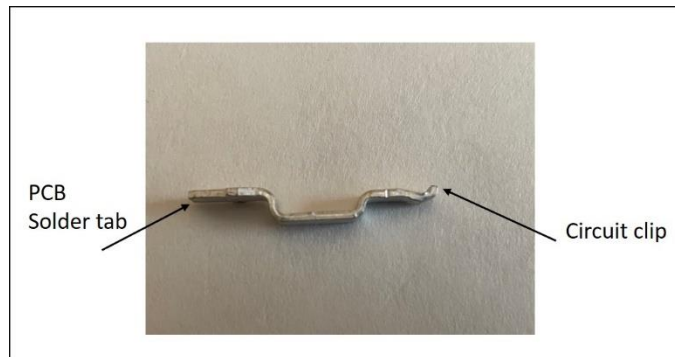


¹ <https://www.arrl.org/files/file/Public%20Service/TrainingModules/Technical/Anderson%20powerpole.pdf>

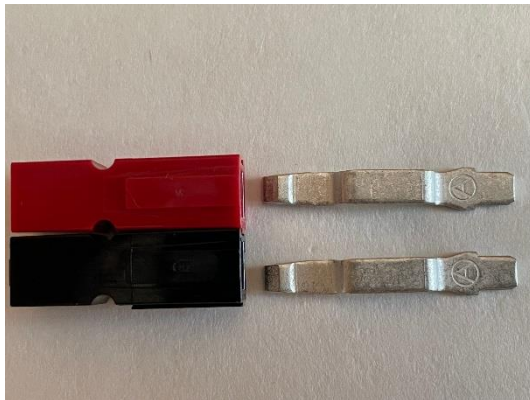
Assembly Manual

Step 3: Insert the pins into the PowerPole Connectors

Identify the correct end of the pin that needs to be inserted into the PowerPole™ housing. The diagram shows which ends are what reason.



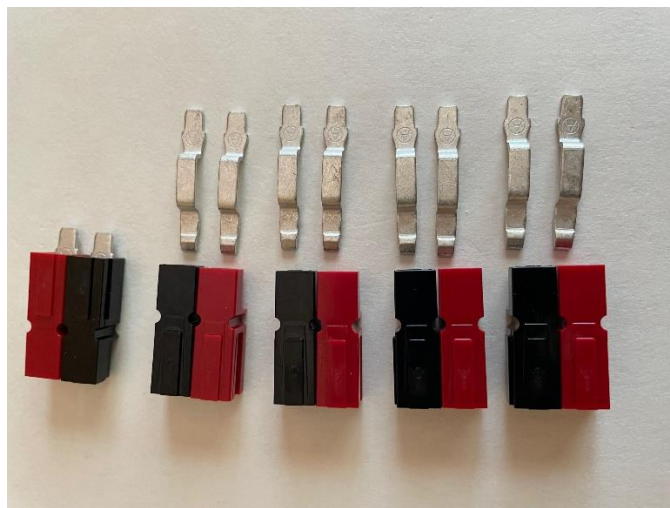
Align the pins as shown.



Note that top of the housing is where you see the protrusions for connecting housing together. This should help identify the correct way of inserting the pin.

Push the pin into the housing until you here a click.

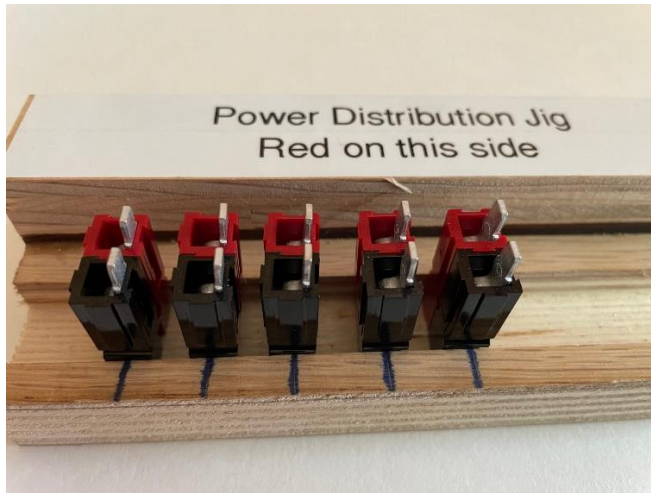
You may find it easier if you “stage” all your connectors on the bench so that everything is in the proper alignment for assembly.



Step 4: Solder PowerPole connectors to the board

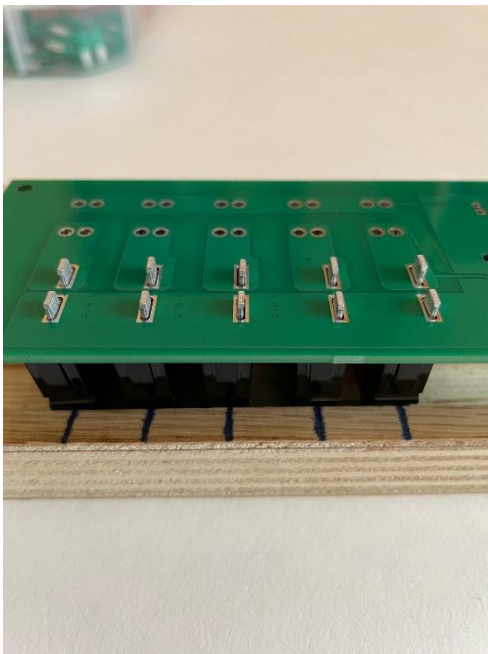
The insertion and soldering of the PowerPole™ connectors can be challenging. Follow any verbal instructions given.

Use the supplied wooden jig to hold the connectors in the right orientation for soldering. Note the orientation of each one as well the position of the RED connectors. The black line indicates the connector spacing. Caution! You don't want to get these in backward as they are almost impossible to remove and re-solder. Take your time.



With no jig, it is possible to solder one pair at a time by holding the board flat to the bench surface upside down and being certain that the connector is standing up straight (ie perpendicular) to the board.

However, if you have the jig, this is the easiest way to accomplish this step.



Place the board upside down onto the connector pins as shown. BE CERTAIN you have the bottom the board facing up.

Tack one connection and verify that the connector is still straight before soldering the other tab.

Because the pads and copper are heavy-duty, these do require a fair amount of heat. The solder should completely fill the hole to make a low-resistance connection.

Inspect your connections to be sure they are filled with solder.

If you need to add more solder, put a dab of soldering flux on the connection and heat it till it dissolves. Add solder to fill the voids.

Assembly Manual

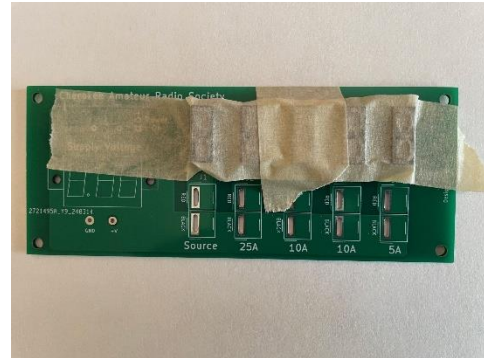
Step 5: Install and Solder fuse holders

The circuit board hole size for the fuse holders is slightly oversized, which makes them want to fall out of the board before being soldered. As an aid, you can use masking tape to secure them to the board as shown. However, when soldering them, make sure they are seated flat on the board.

Placing the board back in the jig from the prior step will keep them flat while soldering.

One trick is to tack two corners first and test for flatness on the board. Press it flat while applying heat to one of the pins.

Also note, that there are 4 pins on these sockets, even if they are electrically connected they all must be soldered.



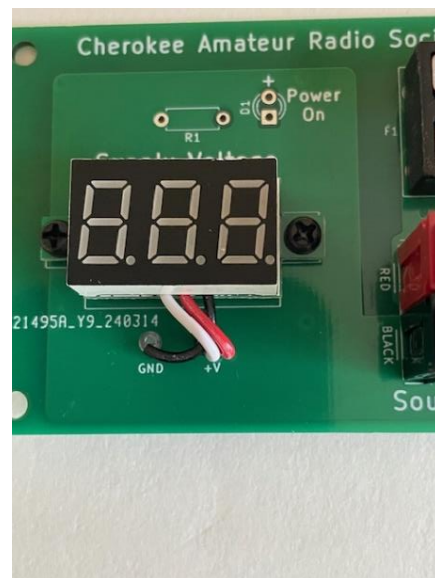
Step 6: Attach voltmeter and solder wires

The voltmeter may have 2 or three wires, depending on the maker. The black wire is the negative (-) and the red and/or white is the positive (+). If you have three wires, the red and white get inserted in the + pad, and the black in the - pad.

Note: The wires may be twisted as shown in the figure. Different brands of voltmeters have wire in different orders.

The voltmeter is attached using M2.5mm screws and nuts. These should be in the bag with the voltmeter.

Be sure you have the correct screws. Screw head is on the top and the nut on the bottom of the board. DO NOT over tighten. The slight flex of the mounting tabs on the voltmeter will keep the screw tight.



Step 7: Install and solder Red LED and 1.2K resistor

This step is very easy. Insert the 1.2K resistor in the location (R1) provided on the board.

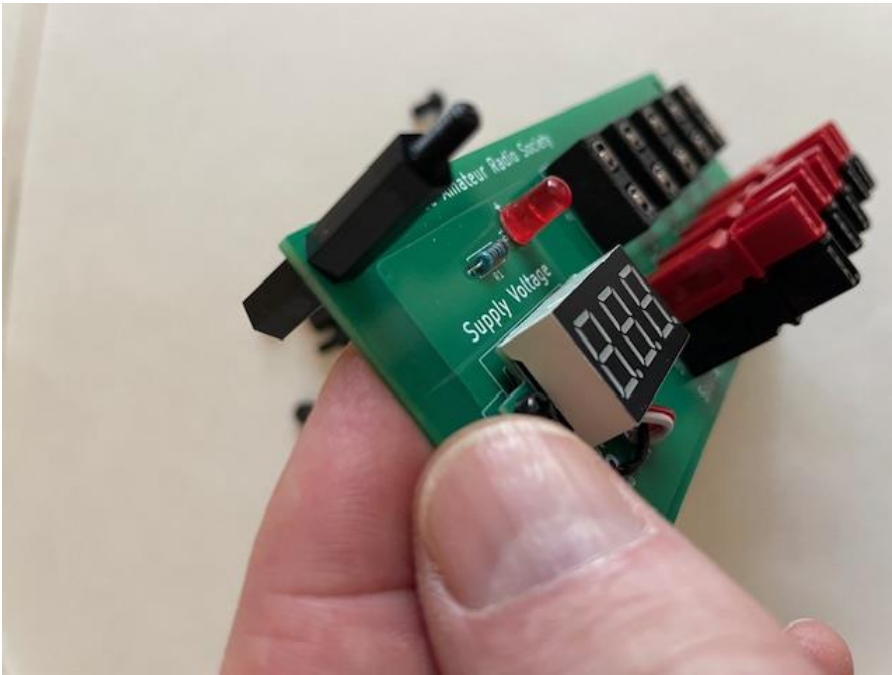
Insert the red LED. The longer pin is the anode (+) and goes in the hole marked +

Solder these and clip the leads.

Step 8: Attach Stand-offs

For protection of the circuits, a top and bottom cover are included in the kit. Eight nylon stand-offs will be used for mounting the covers.

The smaller standoff is on the bottom and the larger on the top to allow for mechanical clearance for the voltmeter and LED. These will use the M3mm screws and nuts that are loose in the bag.



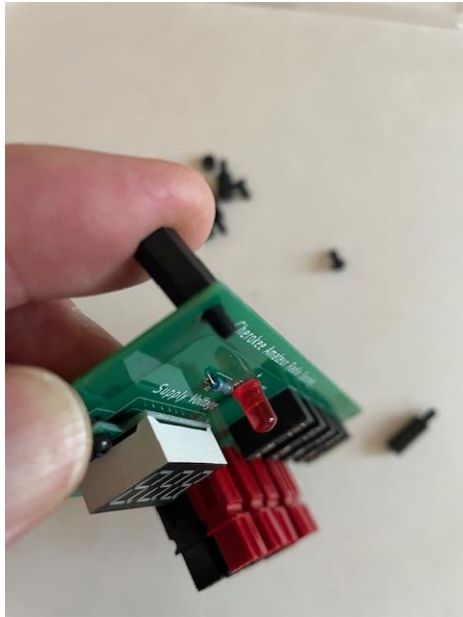
Fuses

Insert the fuses at this stage. It is easiest to do this before the top and bottom panels are installed. Place the board flat down on the workbench. Choose the correct amperage fuse for each socket based on the text on the board top. The main (Source) fuse is 30 Amps (Green).

- 30 Amp is Green
- 25 Amp is clear/white
- 10 Amp is Red
- 5 Amp is Orange

Assembly Manual

Step 9: Attach top and bottom acrylic panels

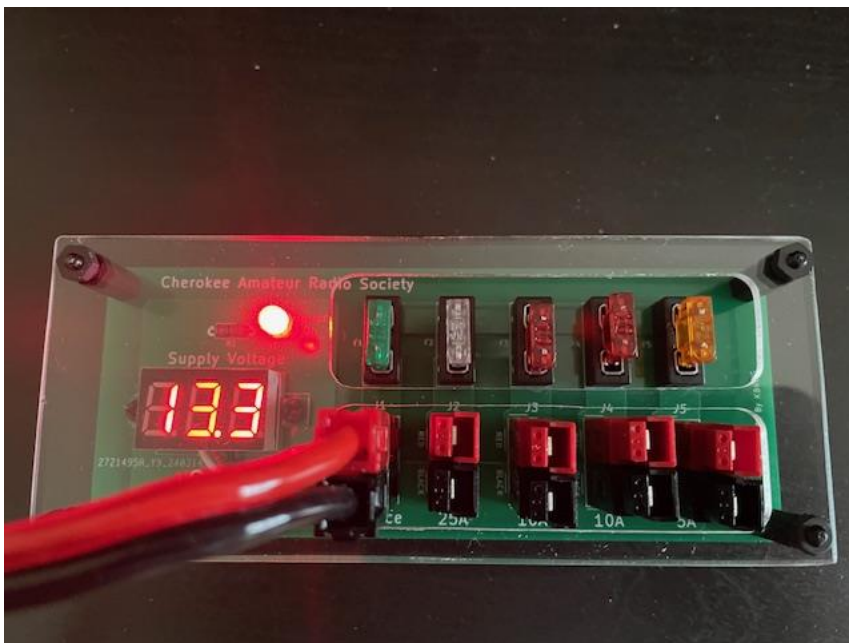


In a perfectly machined product, the top and bottom covers would not have an orientation, but these do. Note the black dot on the protective film that will mark the top surface of the cover and the matching bottom. Attach the top M3.0mm nuts. Attach the bottom with M3.0mm screws.

You can visually line these up as well by aligning the top and bottom panel and making sure the screw holes line up.

Step 10: Test Operation

The final step is to test the board. Attach the test power cable to the Source connector. The voltmeter should read the source voltage and the LED will light.



This completes the project. We hope you will use it and enjoy it for years to come.

Appendix

Parts List

Check	Item	Description	Qty Needed
	1	PCB Assembly	1
	2	PCB Mount P45 Power Pole pins	10
	3	RED P45 Power Pole Housing	5
	4	BLACK P45 Power Pole Housing	5
	5	Blade style fuse holders, PCB mount	5
	6	LED Volt Meter	1
	7	30 A blade fuse	1
	8	25A blade fuse	1
	9	10A blade fuse	2
	10	5A blade fuse	1
	11	Red LED	1
	12	1K 1/8w resistor	1
	13	Acrylic Bottom panel	1
	14	Soldering materials	1
	15	M2.5 6mm nylon screws	2
	16	M2.5 nylon nuts	2
	17	M3 Standoff - 6mm -nylon	4
	18	M3 Standoff - 15mm - nylon	4
	19	M3 nylon nuts	4
	20	M3 nyloscrews	4
	21	Top acrylic panel	1
	22	Bottom acrylic panel	1
	23	Plastic Bags	
		TOTALS	58

Schematic

