

WARS Powerpole Box Kit Assembly Instructions

IMPORTANT - PLEASE READ ALL PAGES BEFORE CONSTRUCTION

Updated: 7 Jan 2023



This is a kit of parts only. Correct and safe operation of what is constructed is dependent on your attention to proper construction of the kit, and following the assembly, test and operation instructions provided in these instructions.

It is assumed that you are an Australian Licenced Radio Amateur Operator and

have experience in kit construction and the requisite skills to construct the kit. The kit is not intended for assembly by inexperienced and unskilled persons.

The device after construction should be tested and externally fused. Good soldering technique is important and all soldered joints should be carefully inspected.

All supplied components should be inspected before construction commences.

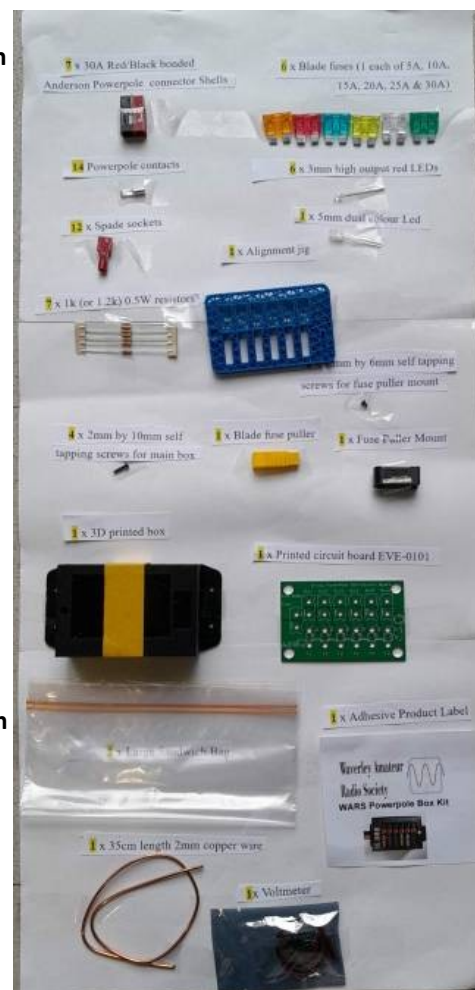
It is recommended to follow the instructions sequentially for best results.

Disclaimer.

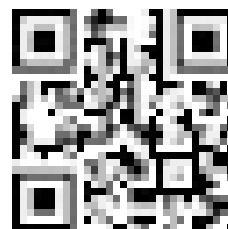
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Further, liability is not accepted for loss or damage caused by, or substantially contributed to by, factors beyond WARS control, including (but not limited to) defective construction, installation, maintenance, or repair; alterations or modifications of the kit or constructed device in a manner not recommended by WARS; or any neglect, misuse, excessive or commercial use of the constructed device.

If there is any conflict between any warranty herein contained and a statutory warranty, the terms of the statutory warranty will prevail.



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AssemblyInstructions

Materials and Tools

Your kit should contain the following parts:

- 1 x 3D printed box
- 4 x 2mm by 10mm self tapping screws for main box
- 1 x Printed circuit board EVE-0101
- 7 x 30A Red/Black bonded Anderson Powerpole connectors with contacts
- 6 x Blade fuses (1 each of 5A, 10A, 15A, 20A, 25A & 30A)
- 1 x Blade fuse puller
- 1 x Fuse Puller Mount
- 2 x 1 mm by 6mm self tapping screws for fuse puller mount
- 12 x Spade sockets
- 7 x 1k (or 1.2k) 0.5W resistors
- 6 x 3mm high output red LEDs
- 1 x 5mm dual colour Led
- 1 x 35cm length 2mm copper wire
- 1x Voltmeter
- 1 x Alignment jig

If there are any missing or faulty components, email treasurer@vk2bv.org

Recommended Tools

- Soldering iron medium tip - minimum 40 watts, 60 W recommended.
- Metric ruler
- Side cutters
- Vice
- 2mm Allen key
- A pair of long nose pliers
- Five minute Araldite glue - or equivalent
- Phillips (small) screwdriver
- Multimeter
- Crimper for Anderson Powerpole connectors – optional
- 12 volt DC power supply

Introduction

The PCB is designed with double the normal thickness of copper and is double sided with plated through holes so should have no problem carrying the required current.

The PCB is also designed to be RoHS compliant so may also be built using lead free solder. All the supplied components should be RoHS compliant.

Step 1: Initial Preparation – Powerpole connectors

Sometimes only enamelled rather than bare wire is supplied depending on availability. If you have the enamelled wire, prepare the wire by removing all the enamel from it. This can be achieved by scraping, sandpaper or even heating to burn it off.

Once cleaned, put about 1cm wire into a vice and stretch slightly to straighten. Cut 12 x 2cm long pieces and 2 x 3 cm long pieces. You should have about 5 cm left over.



Crimp (or solder) a Powerpole contact onto one end of each of the cut pieces of wire. Tin the rest of each piece. The solder may be flowed into the contact as well but be careful not to get too much in as it might flow onto the contact surface which is not desirable at all as it will increase the contact resistance of the contact.

Install the contacts into their housings with the two long ones in one housing and the pairs of short ones in the rest. The long wire contacts will be used for the input terminal. Alternatively, you may replace the input Powerpole with cable directly rather than using an input connector. When inserting the contacts into the housings ensure that the hooked “lip” of the contact is facing toward the metallic locking strip inside the housing. If it is upside down it won’t fit.



Check that the Powerpole connector contacts are properly inserted, by inspection and joining pairs together. They should make good connections and make positive clicks.



Set the Powerpoles aside for now.

Step 2: Initial Preparation – Spade Sockets and Fuses

Now take the 12 insulated spade sockets. The contact portion needs to be removed from the insulation.

The recommended procedure is to use a 2mm Allen key held in a vice with about 10 mm protruding. Hold the insulation with a pair of long nose pliers and push it down over the Allen key in where the wire normally goes. Tap the pliers down with a small hammer which will push the contact out of the insulation.



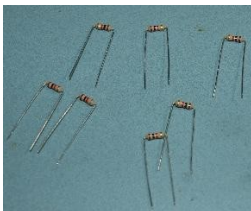
Push a contact onto each blade of each of the fuses. This will be used for the installation onto the board later. Make certain that they are both in the same direction on the fuse as otherwise the fuses will end up at an angle.



Board Assembly

STEP 3: Installation of resistors and LEDs

Next, take the PCB and the 7×1k0 (or 1k2) 0.5W resistors. Bend the resistor leads 90 degrees down at each end right next to the resistor body. Place these into the board in the positions R1 to R7 and right down onto the board. There is no polarity orientation. Solder them in place and trim the wire ends close to the board.



Next take the 6 small LEDs. Place them into the board in the LED1 to LED6

positions. Note that the longer lead is the positive and must go into the hole marked +. Depending on the batch of LEDs, the flat may, or may not, align with the flat marked on the board. Push the LEDs flush to the board, turn over and solder them in place. Trim the leads back to the board.

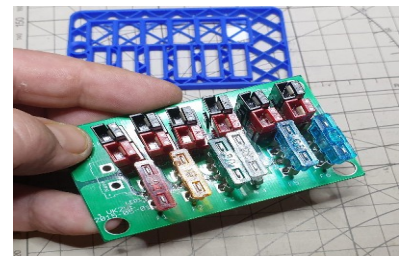


Now you will install the Powerpole connectors and the Fuses. Note that soldering the Powerpole connectors and fuses will require a very hot soldering iron as there is quite a bit of copper around them.

There are two techniques available; (1) using the supplied alignment jig or (2) using manual alignment.

STEP 4 Method 1 - Powerpole Connectors and Fuse installation using the supplied Alignment Jig

Place fuses in spade sockets into the board, and Powerpole connectors in their positions as shown. Orient the fuses such that the flat side of the contacts is towards the input end of the board.

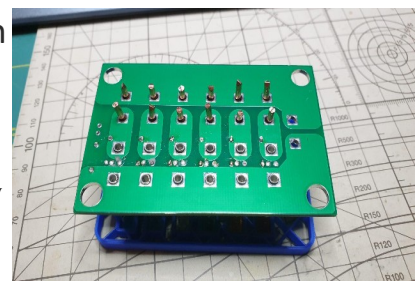


Position jig over parts so that they are aligned properly (several minutes of fiddling)!



Flip over and push fuse connectors down. They should be almost flush with the main board.

With the jig holding fuse and power pole components in place, tack solder each fuse contact closest to the



centre of the middle of the main board, i.e. those on the small copper islands, as they will soak away far less heat. Do not solder the Powerpole connectors.

Check and correct the alignment of all the fuse holders and then solder all the unsoldered fuse connections. Then come back to re-solder the inner fuse connections. Note that, with the jig, the initial tack soldering only provides an electrical connection to the fuse holder but does not provide enough mechanical support for the fuse holder. You need to solder the sides of the legs and the top to achieve a durable mechanical connection.

Flip board over and remove all the Powerpole connectors (because it will be much easier for access) and properly solder both sides of fuse sockets onto the board. Then reassemble the jig with Powerpole connectors making sure that the red sides of the Powerpoles go into the + holes. Solder the Powerpoles in place ensuring that they are pressed firmly flush on the board. Then continue to the input connector installation.

STEP 4: Method 2 – Powerpole and Fuse installation Using Manual Alignment

To use manual alignment the best way is to work from the OUT6 end and put in the Powerpole and then Fuse6, then do Powerpole 5 and Fuse5 etc.



Place the Powerpole leads through the board making sure that the red side of the Powerpole goes into the positive (+) hole and they are pushed right down onto the board. If they are not right down flush on the board, the fuse socket contacts will not go onto the board correctly. Turn over the board and solder. Trim the leads back close to the board.

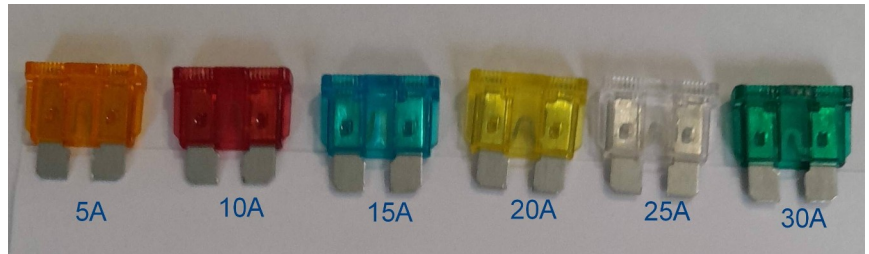
Next take the 30A fuse and put the spade contacts through the fuse holes. Place it such that the flat side of the contacts is towards the input end of the board.

Holding it approximately in place, tack solder one side. Now turn the board over and adjust the other contact so that it is flush with the bottom of the board and solder it. You can now reflow the tacked one and adjust it so that it is also flush with the bottom of the board and finish soldering it.

Repeat for the other 5 Powerpoles and fuses.

Note regarding Fuses

The kit comes with one each of 5A, 10A, 15A, 20A, 25A & 30A fuses.



You can replace one or all of them

with whatever rating fuses you need but remember that the Powerpole input connector has a rating of 30A so that maximum current should not be continuously exceeded as a total.

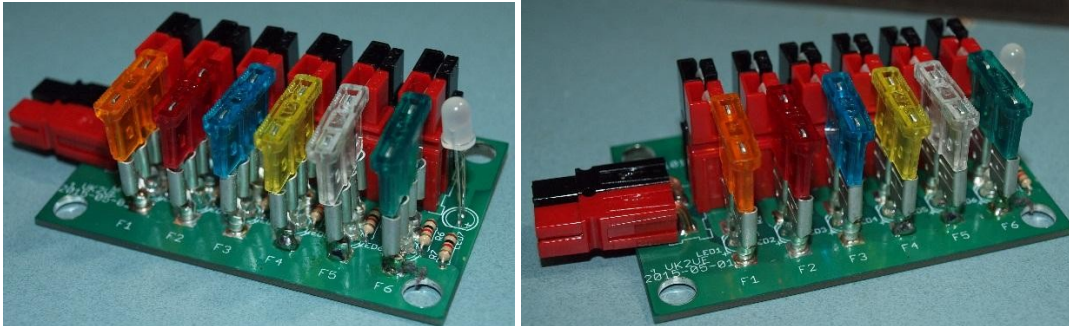
*In operation, as the continuous current approaches each fuse's current rating (whilst the fuse is connected to a device drawing current), that fuse will get warm and then hot. When that fuse's current rating is exceeded, the fuse will blow, (i.e. break the circuit) and the **red led** below it will illuminate. This is normal and by design to protect the connected device and alert you to a fault.*

You should investigate why the connected device caused the fuse to blow and repair the device before replacing the fuse and trying to power the device up again.

Use the supplied fuse puller to grip and replace the blown fuse with a new fuse of the appropriate current rating.

STEP 5: Input Connector Installation

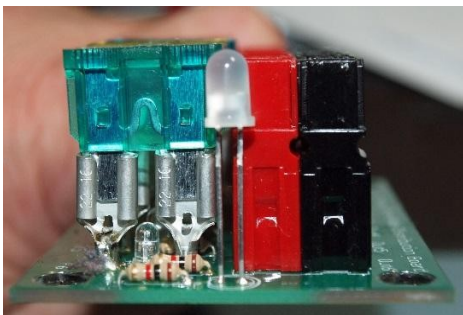
Once the 6 output connectors and fuses are installed it is time to proceed to the input connector.



Take the remaining Powerpole with the long leads. Bend the leads at 90 degrees so that the Powerpole will sit down onto the board with the leads going through the board and the red (+) side towards the fuses. Turn over, solder and trim.

STEP 6: Polarity LED

The next component to be installed is the polarity LED. This one needs to be installed so that the long lead is in the negative hole. In this case, the flat on the led should match the flat marked on the board. The height of the LED should be approximately even with the tops of the fuses. It has been found that the easiest way is to turn the board over and rest it on the bench with the LED also resting on the bench. Making sure it is approximately straight, solder in place and trim the leads. Alternatively, insert the board with the led unsoldered into the box and align the led to the appropriate height and solder.



Your board is now complete and you can test it by connecting 12Volts DC power to the input connector. The polarity LED should come on Green. If the polarity of the input is reversed it should light up Red. If this is wrong you may need to remove the LED and turn it around.

In operation, the polarity LED indicates whether the correct polarity of the input

power source is attached. **Green** indicates correct polarity, **Red** means incorrect (reverse) polarity.

You may also check the fuse fail LEDs by removing the fuses and shorting each output socket in turn with an input supply connected. The corresponding **red** LED under the fuse holder should light up

STEP 7: Installing the Voltmeter to the Kit.

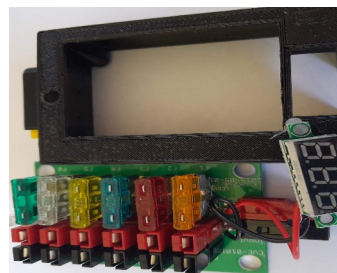
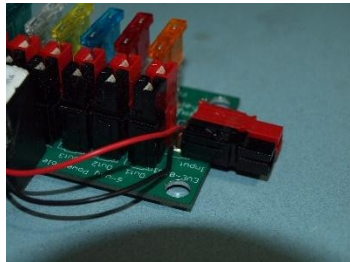
If you are adding the 3-USB upgrade to this kit now, refer to the 3-USB Upgrade instructions.

A voltmeter is included as standard in all kits and the box has a cut-out at the top for it.

The wires come off the bottom edge of the voltmeter PCB (the dots should be along the bottom when viewed from the display side).

It has been found that the connection wires on the voltmeter have a bit too much bare wire where they connect to the voltmeter PCB. It is therefore recommended to either desolder them, trim them to about 2 mm and then resolder them, or **alternatively** insulate them in some way. This will reduce the likelihood of them shorting if they become twisted.

Insert the meter into the hole provided and either use some 5 minute Araldite, or similar, to glue it or use small screws (not supplied) to fasten it into place on the posts of the 3D printed box. If the cutout hole is too tight, file the cutout a bit to suit.



STEP 8: Final Box Assembly

Once the glue has set, trim the red and black (and yellow if 3 wire meter) wires to about 75mm from the meter, strip and tin them about 3-5mm and connect the wires, black to negative (-) and red or red and yellow to positive (+) across the input connector where it connects to the PCB.

Test to make certain that the voltmeter indicates the (correct) voltage when power is applied. Reverse polarity will not harm the voltmeter module. There is a tiny pot (variable resistor) near the centre of the PCB which can be used to trim the voltage with a small screwdriver to the correct value, using a multimeter as a reference if the displayed voltage is too far off from true.

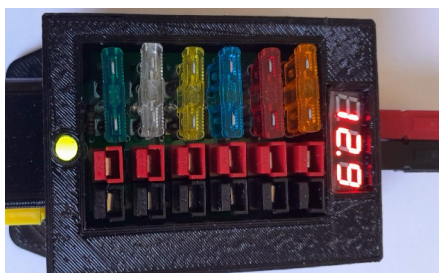
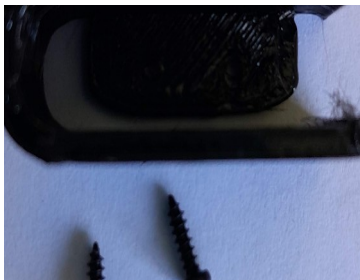
Test the orientation of the placement prior to gluing or screwing the voltmeter in to choose which way you would like the display orientated for easy reading.

Once you have tested the voltmeter module, assemble the main board back into the box, attach the bottom of the box to the lid and secure the bottom with the four 2mm x 10mm supplied screws.

STEP 9: Fuse Puller Mount

A blade fuse puller is included with the kit to assist in removing and replacing fuses.

To keep the fuse puller with your distribution box, included is a small plastic mount which holds the fuse puller by the springiness of the plastic plus the corrugations of the fuse puller. It is recommended to mount it on the opposite side to the input connectors using either the supplied M1 screws or some glue. Don't glue the free arm of the mount.



Congratulations, your WARS Powerpole DC power distribution box is complete.

Other optional supplies

1) Should you need Anderson Powerpole Connectors we usually have these in stock in packets of 10 connectors.

2) We have an upgrade to this kit which adds three 5 volt 3 Amp USB 'A' sockets with a voltage down convertor and fast charging chips in a redesigned box. The upgrade kit re-uses the standard kit's parts.



Check our website for details: www.vk2bv.org.