

T41-EP SDT v12 Enclosure Kit Assembly Manual

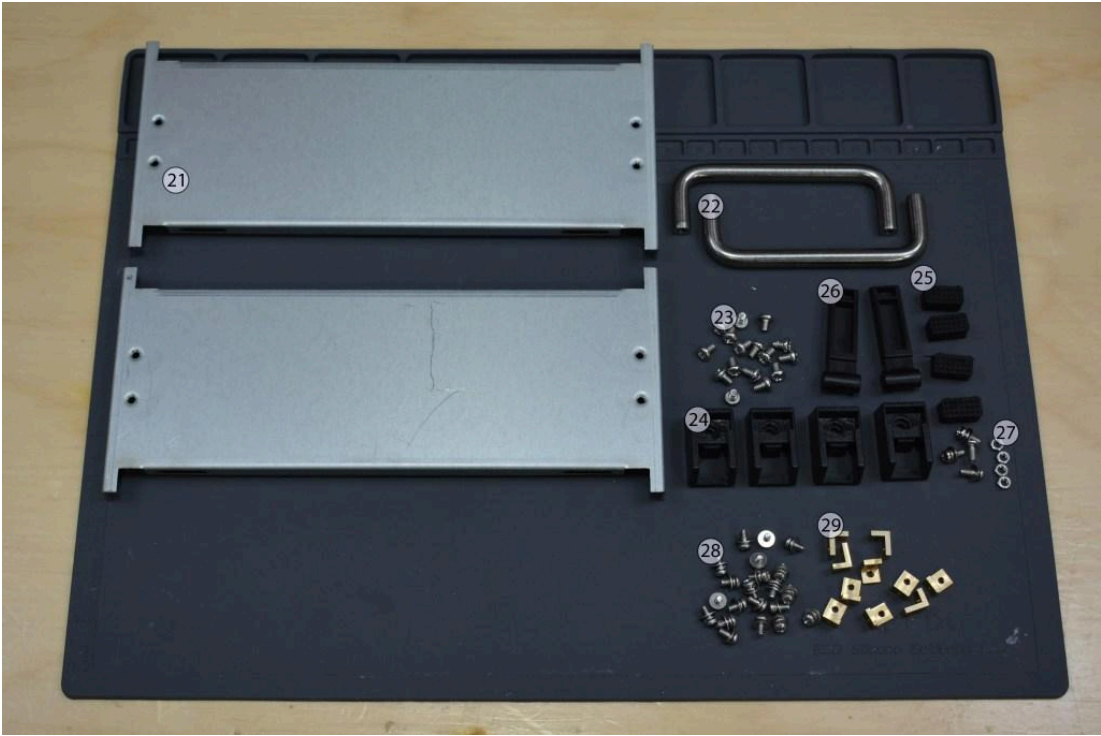


Figure 1 & 2. Parts included in Enclosure Kit

This document shows the second version of my enclosure kits, a black anodized aluminum body with steel side rails inside. There are a few minor differences, besides the color, between this kit and the first enclosure kits. The differences will be called out as they are encountered in the instructions.

The kit included with the enclosure provides the cabling, connectors, and hardware required to install a radio built from my kits into the enclosure. Radios not built from my kits should still be compatible but may require some extra hardware.

What's Included (Parts List)

1. (1) Fused Power Cable with Powerpole Connector & Mount (the first version of this cable is shown, in the second version the mount is black and the fuse is a glass tube rather than a blade)
2. (4) Panel Mount SMA Extension Cables (with washers and nuts)
3. (2) Right-Angle TRS Pigtails
4. (3) Male / Female DuPont Wires
5. (1) Panel Mount Micro-USB Extension Cable
6. (10) Right-Angle Board Mounting Brackets (with bolts)
7. (4) Panel Mount TRS Jacks (with nuts)

8. (4) M3 16mm Bolts
9. (8) M3 10mm Bolts
10. (4) M3 6mm Bolts
11. (8) M3 Washers
12. (14) M3 Nuts
13. (1) M2 Nut
14. (1) M2 12mm Bolt
15. (4) M3 Plastic Bushings
16. (1) Thermal Paste Packet
(some kits shipped with a syringe instead)
17. (1) Front Panel (not pictured)
18. (1) Back Panel (not pictured)
19. (1) Top Panel (not pictured)
20. (1) Bottom Panel (not pictured)
21. (2) Side Rails
22. (2) Front Handles (the first kits included longer bolts for the handles)
23. (16) M4 5mm bolts (the first kits used self tapping sheet metal screws)
24. (4) Feet Bases
25. (4) Feet Contacts
26. (2) Tilt Feet
27. (4) M3 8mm Bolts w/lock washers and nuts
28. (20) M3 6mm Bolts w/lock washers and nuts
29. (10) Board Mounting Brackets (the first kits used a slightly different design)

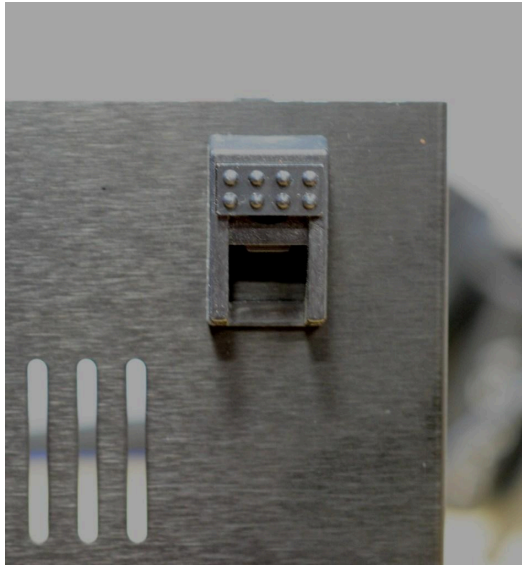
Missing a part? Send an email to justin@ai6ym.radio.

You Will Need

1. #1 Phillips Screwdriver (a long shaft is recommended)
2. Small Flathead Screwdriver
3. Locking Pliers
4. Metric Sockets & Ratchet (optional)
5. [Wire Strippers](#)
6. [Soldering Station](#)
7. [Solder](#) of your preference, 60/40 tin/lead is recommended

Initial Assembly of the Enclosure

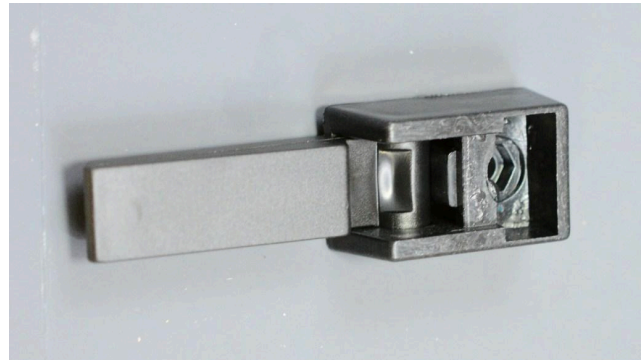
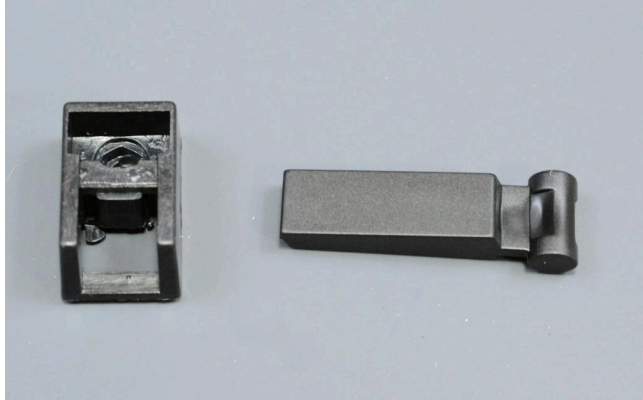
Identify the bottom panel. The bottom panel has two rows of holes in the middle for mounting the various T41 PCBs and extra holes at the corners for mounting the feet.



Install the feet first. The back feet are made of a base (part 24) and a contact (25) secured with a bolt and nut (27). In the current kits the contact is a soft rubber piece with bumps on one side. This part slides into the base after the base has been secured to the bottom panel. The first version of the kits had a contact piece which is hard plastic with grooves on one side, the contact did not cover up the bolt and nut.

Line up the base of each back foot with the holes in the bottom panel, secure with a bolt and nut, then insert the contact piece into the foot.

For the front feet a tilt lever (part 26) is added. This part goes through the back of the foot base as shown in the pictures below.



With the feet installed next install the two side rails on the inside of the bottom panel. These stick up halfway out of the bottom panel (so the top panel can be installed later). The two rails are not the same. One side of each rail has threaded holes for mounting the back panel and the other side has unthreaded holes for mounting the front panel. The rails are mirror images and must be installed correctly for the panels to mount later.



Once you've figured out the correct orientation, secure each

rail to the bottom panel with two M4 bolts (sheet metal screws in the first kits).

Pause assembling the enclosure here so that you can easily install the radio.

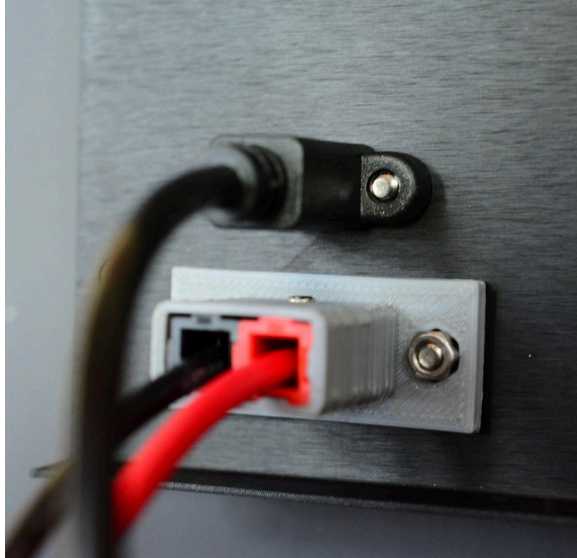
Assembly of the Back Panel

Assemble the Powerpole Mount & USB Connection

The power cable with Powerpole mount ships partially assembled. To complete assembly align connectors inside the mount so that the hole between the connectors aligns with the hole in the mount. Use the M2 bolt and nut to secure the connectors. Note the hex-nut shaped cutout in the mount which holds the nut for you.

Secure the powerpole mount to the back panel using two M3 6mm bolts and two M3 nuts. The mount sits fully inside the enclosure with the connectors accessible from the outside. Note the hex-nut shaped recesses in the back of the mount which hold the nuts for you while you tighten the bolts. No need to over tighten the bolts, a half-turn past finger-tight is sufficient.

Secure the USB connection with two more M3 6mm bolts. The connection has built in nuts.



Note: The power cable included in the kit contains a 5A fuse. This is sufficient for the T41 kits I sell but may need to be replaced with something larger if your build contains upgrades which require more power. Fuses can be cheaply acquired from most auto parts stores. The cable is rated for up to 15A.

Install the Fan



Install the 40mm fan (included with the main board kit) on the back panel. The back panel cutout allows for mounting an 80mm fan if desired, the 40mm fan mount is inside the larger cutout.

Orient the fan with the airflow facing in to the enclosure. Use the 4 M3 16mm bolts, 4 M3 nuts, and 4 M3 washers to secure the fan. The washers are placed inside the enclosure on the back of the fan.

Install the SMA Extension Cables

The SMA extension cables come with washers and nuts. Assemble these on the back panel with the lock washer inside the enclosure and the nut outside. Again there is no need to over tighten. The threading is somewhat delicate and may be broken by over tightening.



Install the 20W Amplifier & Heatsink

My 20W PA kit came with 6 M3 6mm bolts. These are insufficient for mounting in the enclosure. Replace the 4 bolts on the corners of the PA PCB with M3 10mm bolts included with the enclosure kit. The 6mm bolts on

the transistors are sufficient. Keep the 6mm bolts you are replacing here, you will use them to mount the front panel boards.

Place a thin layer of thermal paste on the back of both PA transistors. If removing the PA from another assembly, clean off the old thermal paste and replace it. If you previously installed mica sheets or other insulating materials between the transistor tabs and the heatsink remove those materials. Only a thin layer of fresh thermal paste should be on the transistor tabs.

Place the 20W PA PCB on the inside of the panel, ensure the plastic bushings (already in place from the PA kit) are still in place and no wires or component pins are contacting the back panel. These may cause a short now or in the future as they rub through the anodized layer on the panels. Pass the 10mm bolts through the PCB and the back panel on each corner and the 6mm bolts through the tabs of the transistors.

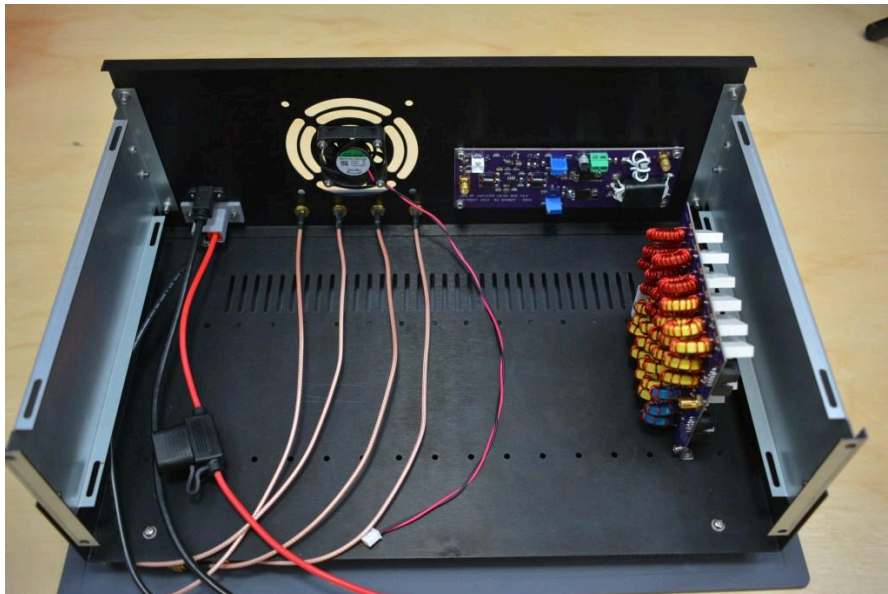


Place a thin layer of thermal paste on the back of the heatsink. Cover as much of the heatsink as possible. Secure the heatsink to the back panel by threading the bolts which are passing through from the PCB. Tighten all 6 bolts one quarter to one half turn past finger-tight. Do not over tighten.



Mount the Back Panel

The back panel is now complete and ready to install in the enclosure. Align the panel with the rails and bottom panel (the panel is fully inside the enclosure, make sure the bent edge of the panel isn't hooked on the outside of the bottom panel). Secure the panel to the rails with four sheet metal screws. Leave these a half turn loose too.



Note: This image shows the LPF board installed, we'll get to that in the next step.

Install the Radio Inside the Enclosure

Each of the modules of the radio, except the PA and front panel, are mounted inside to the bottom panel of the enclosure. The exact layout of these boards is not critical. I have drilled extra holes in the bottom panel to give you some flexibility (and to leave room for future upgrades).

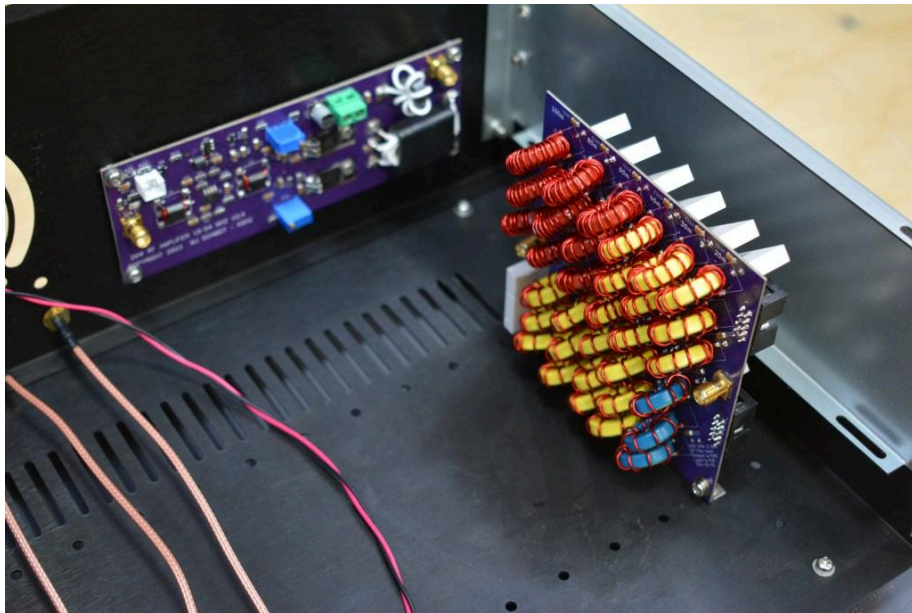
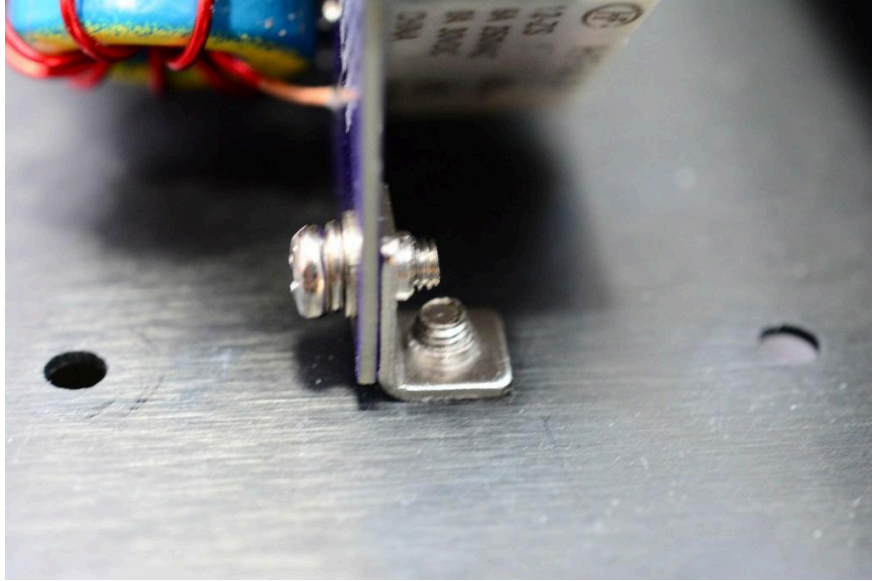
The only critical layout requirements are this:

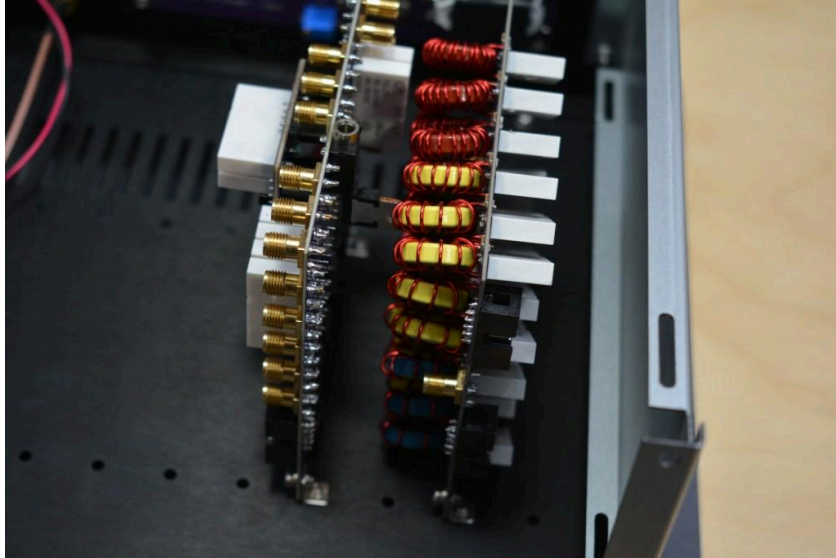
1. The main board must be positioned very close to connection on the display so that the display cable can be very short.
2. The Teensy, main board heatsinks, and RF board heatsink must be in the airflow coming from the fan.

In my build I placed my boards (from left to right, looking from the front) in this order: RF, main, BPF, LPF control, and LPF. This meets the requirements above and allows the cables that I provide with the kits to connect everything (with same SMA connectors reversed on the LPF control board). The gap between the RF board and main board is largest, giving plenty of room for airflow and moving the main board closer to the display connector.

Whatever you choose the boards are each installed using two of the right angle brackets and four of the bolts included with those brackets. Note the brackets have a long side and a short side. The long side fits perfectly against the boards with the short side on the bottom panel. For each PCB:

1. Install two brackets with the long side against the board. Brackets may be installed on either side of the board but both must be on the same side. The bolt goes through the PCB to screw into the threads on the bracket.
2. Before tightening the brackets on the PCB press the assembled PCB and brackets against a flat surface to make sure the brackets are aligned. Misaligned brackets will make the next step much more difficult.
3. Mount the PCB to the bottom panel wherever you have chosen it to be by passing bolts through the bottom panel into the brackets. Be sure that the PCB is aligned (i.e. the PCB isn't slanted inside the enclosure).





Once again do not over tighten. The included bolts include a spring washer to keep the bolts from loosening.

Note: The brackets shown in the pictures are from the first version of my kits. The design is slightly different in the second version of my kits but they function in the same way.

Repeat the process for each T41 PCB. I recommend connecting cables to each board as you install it into the enclosure. As the enclosure fills up, reaching each connector can become a bit challenging.

Assembly of the Front Panel

Install the Power Button and TRS Jacks

Install the power button (included with the main board kit) on the front panel. Simply pass the button through the panel from the front, place the included washer and nut on the back side, and gently tighten.

Install the four TRS jacks in the same way - pass them through the panel from the front and secure each one with the included nut on the back side. The threads are plastic and so quite sensitive to over tightening.

Wire these jacks before continuing.

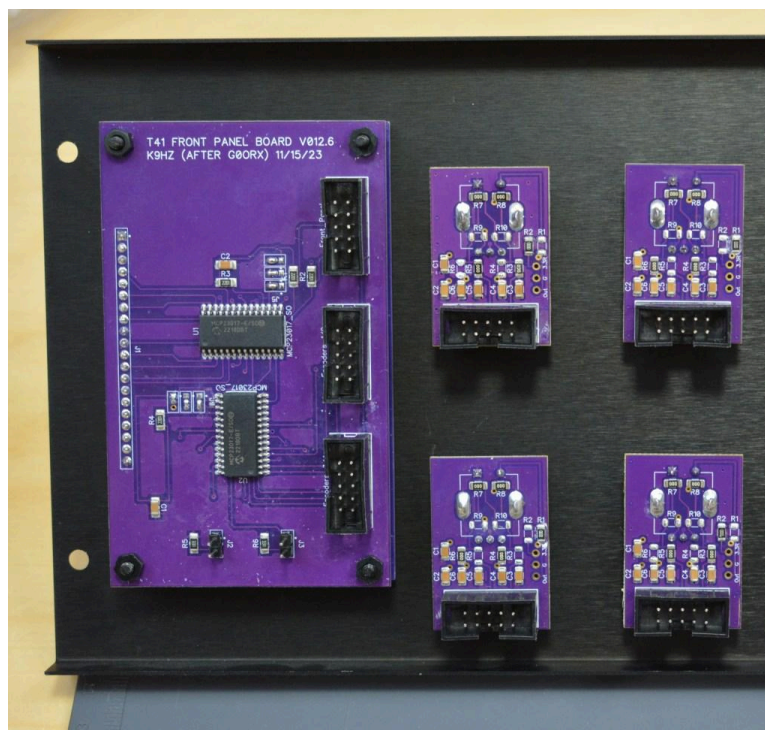
- The phones jack is the simplest. Solder a TRS pigtail to tabs on the back of the jack. The black wire from the pigtail is soldered to the ground / sleeve terminal on the jack. This terminal is the longer tab which is perpendicular to the other two. The red wire on the pigtail is the tip connection, marked 1 on the jack (it is on the left side when viewing the jack with the ground tab at the bottom). The white wire is the ring connection, marked 2 on the jack. In this case, reversing the tip and ring is irrelevant.
- The mic and PTT jacks share a single TRS pigtail. Solder the ground wire from the pigtail to the ground terminal on both jacks. This can be done simply by stripping a long length of insulation from the ground wire and running the uninsulated wire to both jacks. Solder the red (tip) wire to both the tip and ring terminals of the mic jack. This effectively creates a TS (mono) jack from the TRS (stereo) jack. Solder the white (ring) wire to both the tip and ring terminals of the PTT jack. The reason for this shared wiring is that the mic jack on the main board accepts a microphone on the tip connection and a PTT signal on the ring connection (with ground being shared on the sleeve). I'm not sure the purpose of this but it can cause a lot of problems connecting headsets, microphones, and PC soundcards which were not built for that setup.
- For the Key jack cut the male connectors off the included DuPont terminated ribbon wires. The colors on these will vary, solder one now unterminated wire to each of the terminals on the jack. Connect the female ends of the ribbon to the pins of *J9* (Keys / PTT) on the main board. Viewing from the front with the key on the *J9* header upward the tip and ring pins are the left and middle pin on the bottom row (respectively) and the ground pin is the right-most pin on the top row. Reversing tip and ring doesn't matter much (this reverses the connection for paddles but can be corrected in software) just make sure to get the ground connection right.



Install the Front Panel Boards

The encoder boards from the front panel kit are installed simply by passing the encoder shafts through from the back of the panel, and securing them with the washers and nuts included with the front panel kit. Knobs, of course, can only be installed after securing the encoders to the panel.

To mount the button matrix and front panel electronics boards first remove and discard the M3 nylon bolts which were included with the front panel kit. Place the four M3 6mm bolts saved from installing the PA through the mounting holes in the front panel. Add an M3 plastic bushing to each bolt on the inside of the panel. These act as spacers ensuring the switch pins do not short to the panel. Place the button matrix board on the back of the panel with the switch buttons passing through the panel and secure the bolts. Do not over tighten.

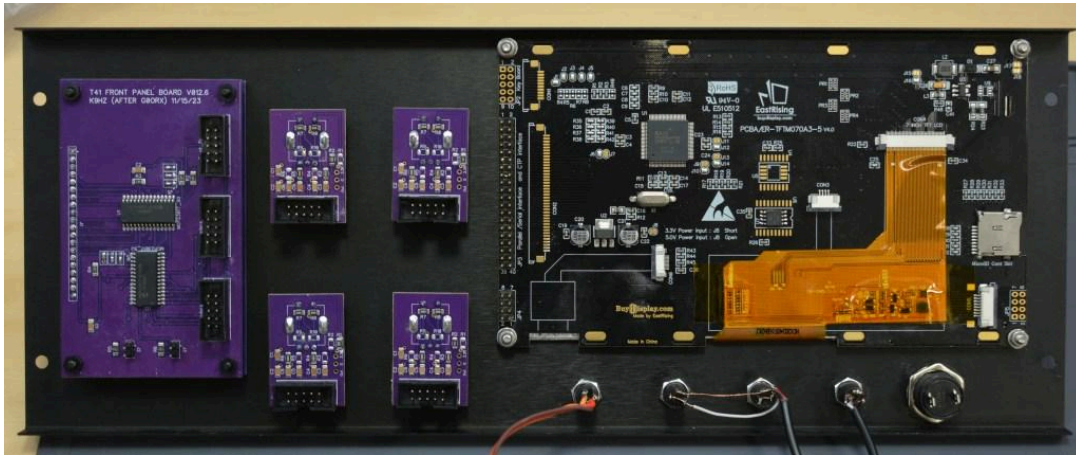


Install the Display

Place an M3 10mm bolt in each of the four display mounting holes on the front panel. Secure each bolt with an M3 nut. The nut acts as a spacer preventing the display PCB

pins from contacting the panel. Leave these nuts about one quarter turn loose to give yourself a bit of play on the bolts.

Place the display on the four bolts, add four M3 washers, and secure the display with M3 nuts. Do not over tighten.



Mount the Front Panel

The front panel is now complete and ready to be mounted to the enclosure. Pass the included bolts from the inside of the enclosure, through the holes in the rails, through the holes in the front panel, and into the front panel handles. Reaching the bolt heads on the bottom of the panel can be a bit tricky, a long screwdriver works with a bit of patience.

Align the panel and the handles before tightening the bolts.

Finishing Up

I recommend testing your radio before finishing the enclosure assembly. A cable could be installed incorrectly, something could be shorted or even damaged during assembly. Connect a current limited supply and test your rig.

Once satisfied that your radio is functioning, install the top panel onto the side rails with the four remaining sheet metal screws. There is a small amount of play in the panels to allow you to align all the top and bottom panels neatly before tightening the screws. Align the back panel neatly and tighten the screws there as well to complete your assembly.