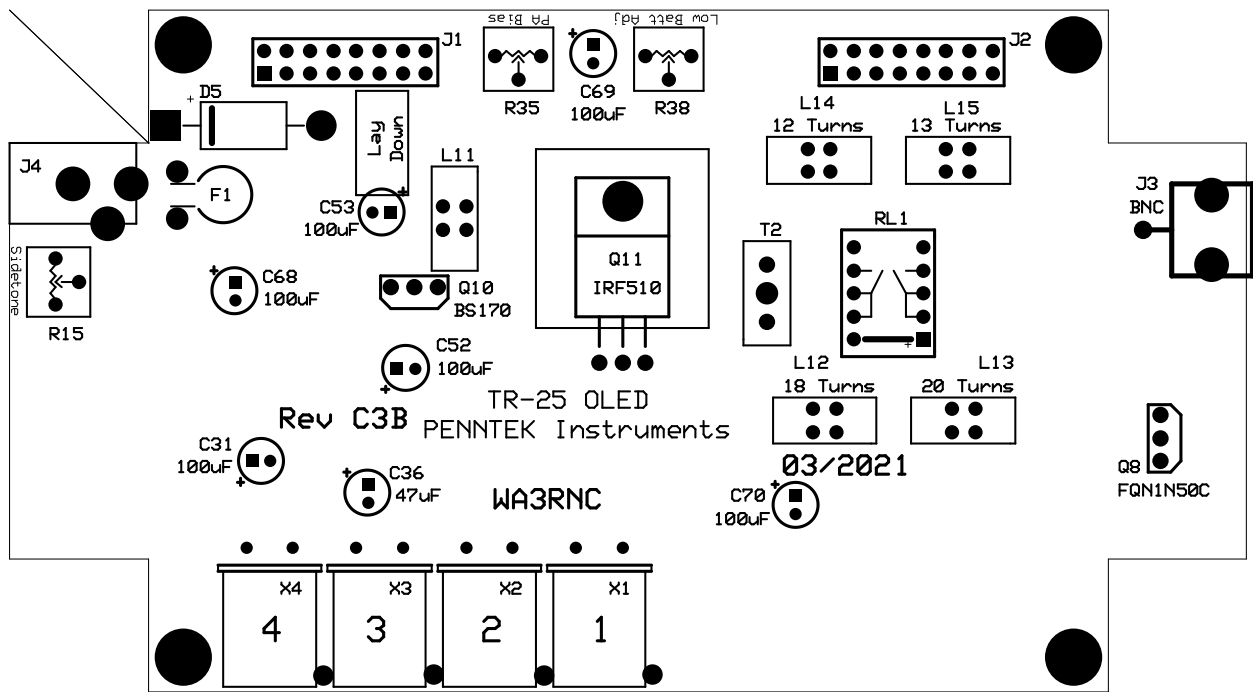


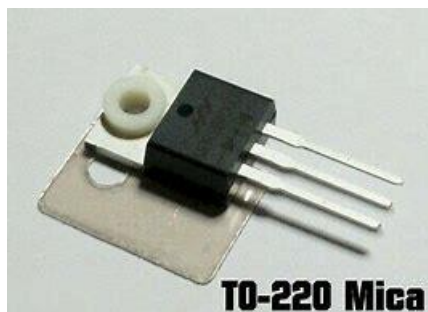
# TR-25 Lower Board Assembly Instructions 8/13/2021



Refer to the above diagram while performing the following steps

- 1) Install and solder relay RL1 to the board with the polarity bar toward the board center. See the photo. Solder 10 pins.
- 2) Carefully form the leads of diode D5, if necessary, to fit on the board. The banded end goes to the square pad. Position the diode fairly close to the board, about 1/4". Solder and trim 2 leads.
- 3) Install and solder Polyfuse F1 to the board. Bend this part over as shown on the overlay before soldering. Solder and trim 2 leads.
- 4) Install and solder the DC power jack J4. Make certain this jack is tight against the board and is straight. Solder and trim 3 pins. These pins must be trimmed after soldering to allow for proper fit into the case.
- 5) Install and solder the side-tone level pot R15, low battery warning adjustment pot R38, and PA bias pot R35. Solder and trim 6 pins.

- 6) Install Q10 BS170 TO-92 FET with the flat side as shown on the parts overlay. Position the part with about ¼" lead length above the board. Solder and trim 3 leads.
- 7) Install Q8 TO-92 FET FQN1N50C with the flat side as shown on the parts overlay. Position the part with about ¼" lead length above the board. Solder and trim 3 leads.
- 8) Install and solder 100uF electrolytic capacitors C31, C52, C53, C68, C69, and C70. The longer positive leads goes to the square pad. All of the capacitors except C53 must be installed tight against the board. Note that C53 must be installed lying down on the board. Bend the leads BEFORE soldering. Solder and trim 12 leads.
- 9) Install and solder 47uF electrolytic capacitor C36 tight against the board. The longer lead goes to the square pad. Solder and trim 2 leads.
- 10) Form the leads of the final RF amplifier FET IRF510 so that the 3 leads mate with the mounting holes while the tab hole mates with the FET mounting hole through the heatsink. See the photo. Place the heatsink against the board, with the clear mica washer between the heatsink and the FET. Fit the FET leads into the mounting holes, and then insert the mounting screw from the bottom through the board, heatsink, mica washer, FET tab, and plastic insulator. Place the nut on top of the plastic insulator. Make sure the plastic insulator fits inside the FET mounting hole. Align the FET and heatsink with the mica washer between them. Tighten the screw fairly tightly, being certain not to deform or damage the plastic insulator. Use an ohmmeter to check for shorts from the FET tab to ground. Solder and trim 3 pins. Secure the nut to the screw with clear fingernail polish.

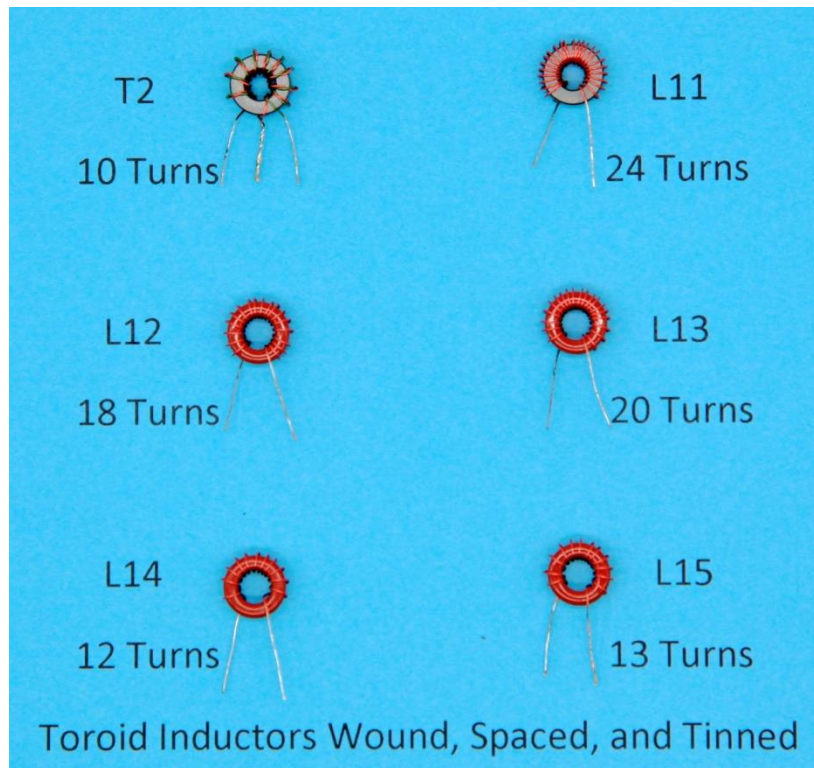


11) This step involves preparation of the 6 toroidal inductors. If you ordered your kit with the optional “Pre-wound and Prepared Toroidal Cores”, you may skip to step 11B.

Understand that this paragraph cannot be the final word on winding toroids. It is not hard to do, but can be daunting to the “toroid neophyte”. I recommend watching some U-tube videos on winding toroids. There are several good ones.

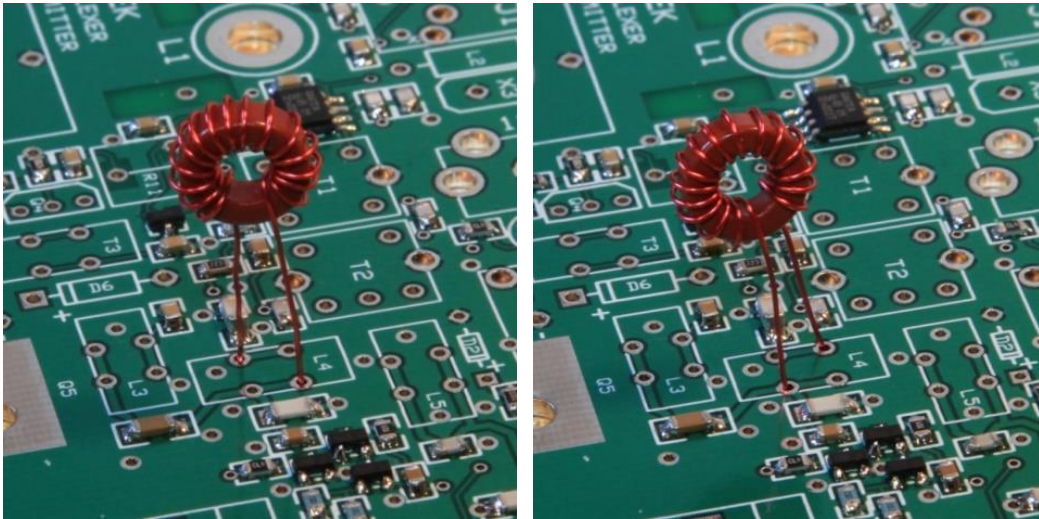
There are 2 different cores used, 4 powdered Iron T37-2 cores, and 2 ferrite FT37-43 cores. The T37-2 cores are red, and the FT37-43 cores are all black. It is very important that they don't get mixed up, or there will be trouble ahead. All of the toroids are wound using #28 magnet wire. One of the cores is wound with twisted red and green wire (bifilar wound). Start with L14, 12 turns on a T37-2 (red) core. Cut a piece of red magnet wire about 9" in length or so. Each time the wire passes through the center of the core, it counts as 1 turn. Wind these coils carefully to avoid kinks and crossovers. When you have 12 turns counted from the inside of the core, adjust the coils so that they evenly cover most of the core, and trim the ends to about a half-inch or so. Next wind coil L15 with 13 turns using about 9" of wire, then L12 with 18 turns needing 13" of wire, and L13 with 20 turns also needing 13" of wire. All of these coils should be wound on the red cores. The final 2 coils are wound on all black cores. Start with L11, 10 turns requiring about 9" of magnet wire. The final coil is the bifilar wound T2 requiring 10 turns of the red and green twisted pair. Cut a 9" piece of the twisted pair red and green wire, and wind 10 turns on a black core. This coil requires some special attention after winding. After adjusting the spacing to resemble the photo, trim the ends to about an inch, and untwist the wires leaving two red and two green wires. The enamel coating must be removed from the exposed wire ends using the included piece of emery cloth. Be careful not to apply too much pressure, else the wire will break, requiring a rewind! After the enamel insulation is removed, tin the wires. Select one red and one green wire to be twisted together. This junction will be the center connection of the coil with one red and one green wire to either side. These outside red and green wires are not polarity sensitive.

Prepare all of the other coils by removing the enamel insulation with the emery cloth, and tinning each of the leads. A hotter iron will help burn away the enamel while tinning. (**L11 is shown in the photo as 24 turns, but should be wound with only 10 turns.**)

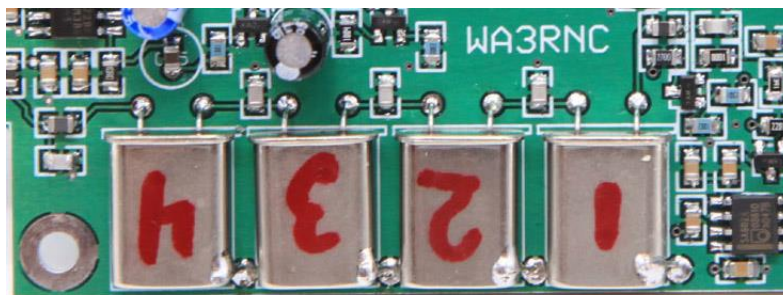


11B) The 6 toroidal coils will now be installed. Start with T2, the coil wound with 10 turns of red and green wire. Place the twisted pair of wires in the center hole, and the other two wires to either side. It doesn't matter which of these single red and green wires go where, so long as the center connection includes one of each. Keep all of the coils upright and close to the board. Solder and trim three connections. Next is L11, 10 turns on a black core. Solder and trim two connections. Follow with L12, L13, L14, and L15, all on red cores. It would be wise to examine each of these coils for the correct number of turns (counting inside the core) before installing, as performance will suffer if they are not installed at the proper place or have the wrong turn count. Use a magnifying glass or take a picture with your phone camera for a better view. Note that there are two sets of holes for L11 through L15. Depending on how the coils were wound, left hand or

right hand, one pair of holes will make for a better fit. Use either diagonal pair of holes, but be sure not to connect both coil leads to pads that are connected together! See the Photo for examples of left and right hand wound toroids. Neither is wrong, and either will work fine.



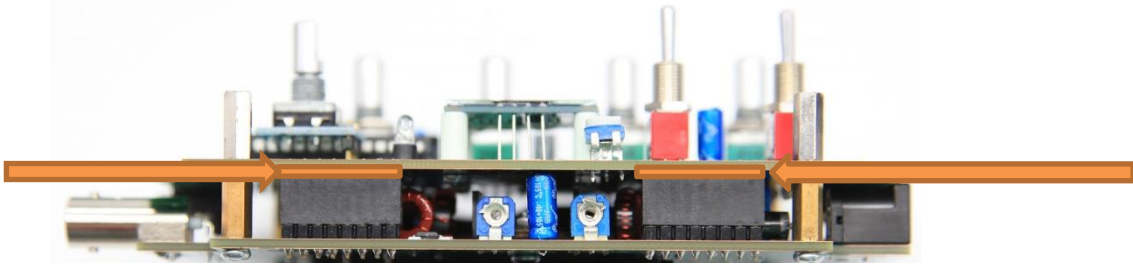
12) Install the IF filter crystals X1 through X4. The crystals have been measured and sorted, so they must be installed properly for maximum IF filter effectiveness. The crystals are numbered according to the reference designator where they will be installed. The crystal marked “1” will be mounted at X1, and so on. The crystal leads need to be formed by carefully bending them 90 degrees. See the photo.



Mount the crystals down tight against the board. Solder and trim 8 leads. Ground the crystal cans with wires cut from the included sacrificial resistors. Do not overheat the crystal cans! Be quick when soldering to the cans. Trim the grounding wires. The resistors may be discarded.

13) The 16 pin connectors J1 and J2 will be installed together on both the upper and lower boards. This step requires some attention. The male connectors (.025" square pins) will be installed on the lower board (the one with the heatsink), and the female connectors on the upper board (the one with the OLED display). In order to allow for maximum pin engagement for these connectors, the female connectors will not be assembled tight against the upper board. There will be a small gap between the female connector body and the bottom of the upper board. Start this step by installing the male header pins into the top side of the board with the heat sink (lower board). Make certain that these connectors are tight against the board, and are straight. Solder 1 pin on each connector and examine them before soldering the rest of the pins. Once all 32 pins are soldered, locate the assembled top board with the 12mm spacers attached, and place the board upside down in front of you with the spots for the upper board J1 and J2 closest to you. Place the female 16 pin connectors into the bottom of the upper board. Do not solder these connectors. Now carefully place the lower board upside down over the upper board, carefully aligning the 4 connectors. The lower board mounting holes should line up with the spacers mounted on the upper board. Once everything is lined up, carefully press the boards together. Stop and investigate if something doesn't seem right, or if the board mounting holes do not line up. With the boards tight together, locate the four 3mm x 6mm screws and use them to secure the boards together. Turn the board set assembly right side up with the display and controls facing up. Now, the object is to fully engage the female connectors onto the lower board pins by pushing the female connectors down onto the male pins as far as they will go. This may require the use a flat surfaced object to gently push on the female connector pins to fully seat them onto the pins. Note that this will let a small gap between the

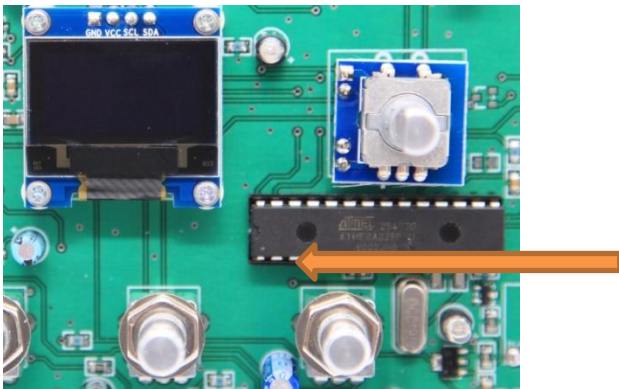
upper board surface and the female connector. See the picture.



***Note the gaps between the female connectors and the upper pc board***

Now the upper board female connectors should be soldered. Solder 32 pins.

- 14) Locate the 28 pin microcontroller IC U1. Observing antistatic measures, carefully install U1 into the 28 pin socket. Be sure to place the pin 1 end toward the center of the board. Be certain not to bend any pins!



***Note the orientation notch above that the arrow indicates.***

This completes assembly of the upper and lower pc boards. Proceed to the “Preliminary Checks and Tests” document.