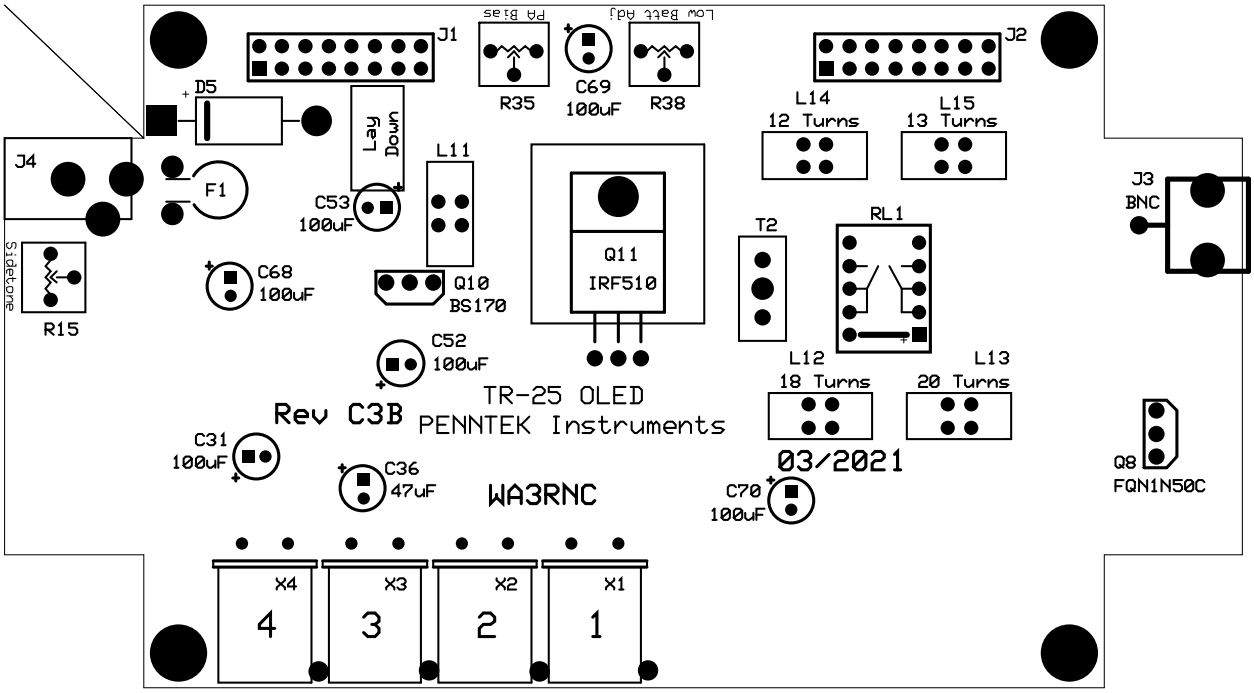
TR-25 Lower Board Assembly Instructions 5/13/2021

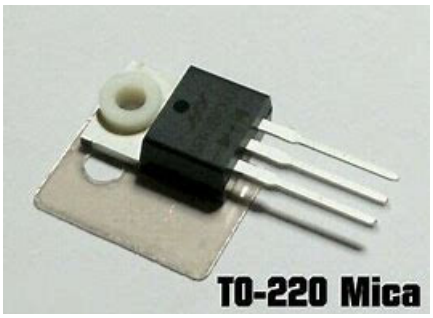


Refer to the above diagram while performing the following steps

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 to fit on the board. The banded end goes to the square pad. Position the diode fairly close to the board, about ¼". Solder and trim 2 leads.
3) Install and solder Polyfuse F1 to the board. 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 BNC connector J3. Note that this will require lots of heat due to its mass. A heavier iron will most likely be needed. Make sure the jack is mounted straight and is tight against the board. Solder only 1 ground pin on the bottom of the board, then check that the connector is

straight and level. Only when you are satisfied with the alignment of the connector should the other ground pin be soldered. It's nearly impossible to correct alignment of this connector after both ground pins have been soldered. Solder a total of 3 pins.

6) 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.
7) 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.
8) 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.
9) 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.
10) Install and solder 47uF electrolytic capacitor C36 tight against the board. The longer lead goes to the square pad. Solder and trim 2 leads.
11) 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 with clear fingernail polish.

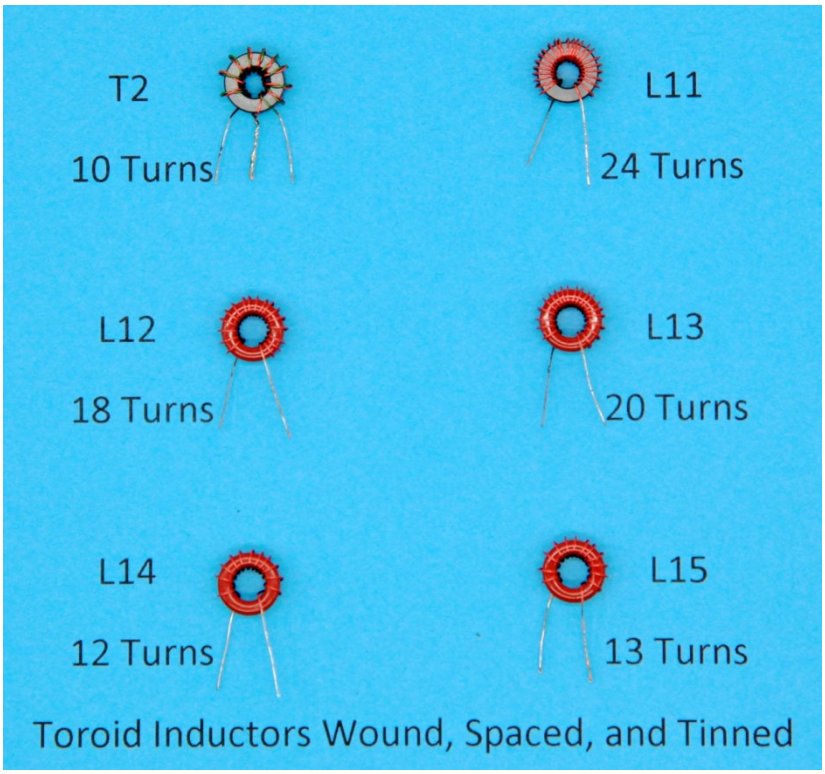


12) This step involves preparation of the 6 toroidal inductors. If you ordered your kit with the optional “Pre-wound and Prepared Toroidal Cores”, you may skip to step 12B.

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.

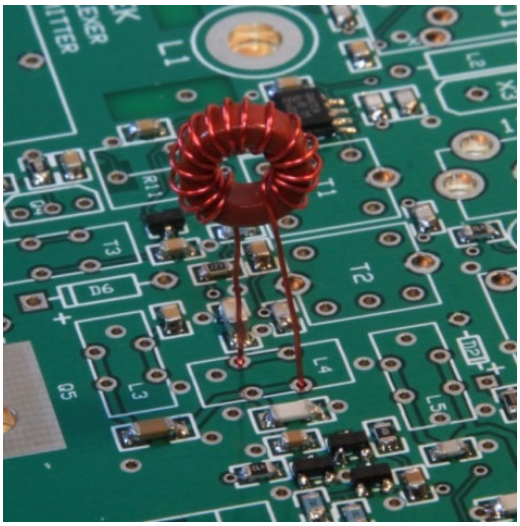
There are 2 different cores used, 4 powdered Iron T37-2 cores, and 2 ferrite FT37-43 cores. The T37-2 cores are red, and the FT37-43 cores are all black. It is very important that they don’t get mixed up, or there will be trouble ahead. All of the toroids are wound using #28 magnet wire. One of the cores 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, 24 turns requiring about 15” 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

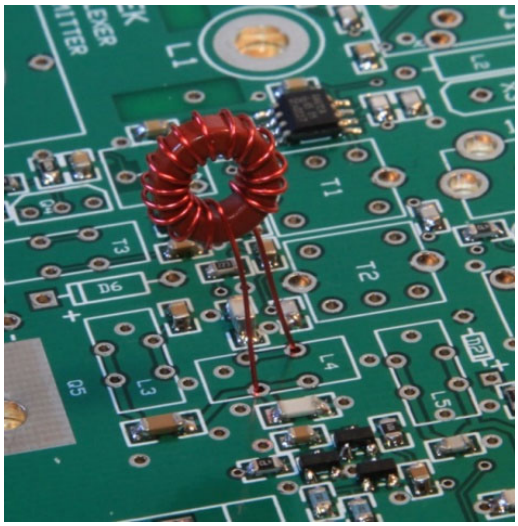
wires leaving two red and two green wires. The enamel coating must be removed from the exposed wire ends using the included piece of emery cloth. Be careful not to apply too much pressure, else the wire will break, requiring a rewind! After the enamel insulation is removed, tin the wires. Select one 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.



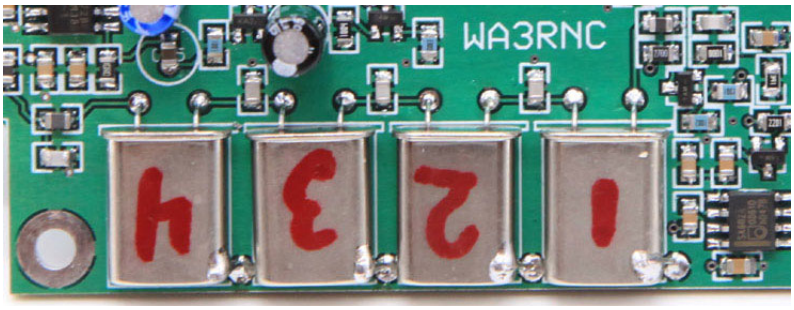
12B) The 6 toroidal coils will now be installed. Start with T2, the coil wound with 10 turns of red and green wire. Place the twisted pair of wires in the center hole, and the other two wires to either side. It doesn't matter which of these single red and green wires go where, so long as the center connection includes one of each. Keep all of the coils upright and close to the board. Solder and trim three connections. Next is L11, 24 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.





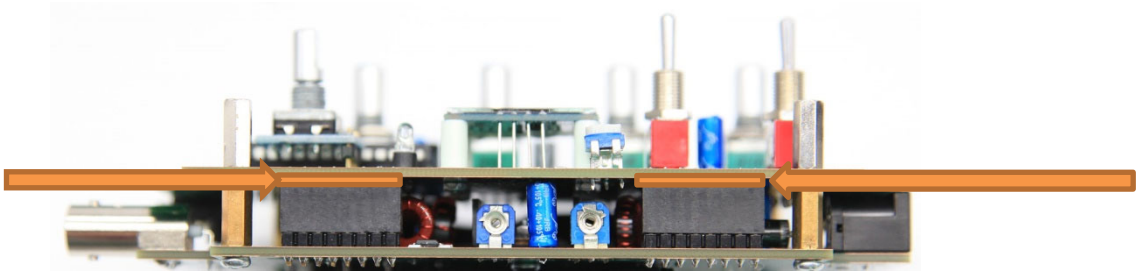
13) Install the IF filter crystals X1 through X4. The crystals have been measured and sorted, so they must be installed properly for maximum IF filter effectiveness. The crystals are numbered according to the reference designator where they will be installed. The crystal marked “1” will be mounted at 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.

14) 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

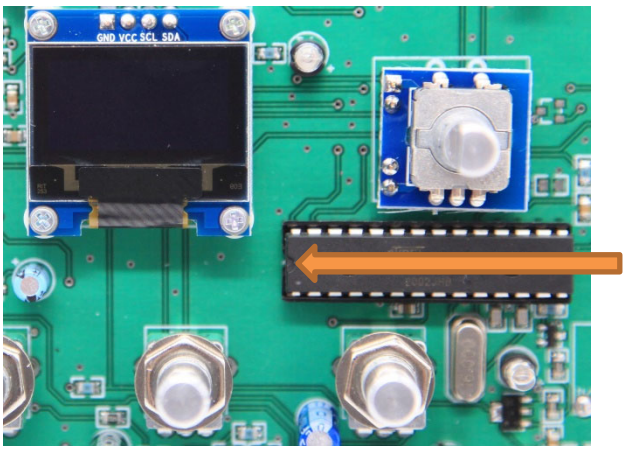
right, or if the board mounting holes do not line up. With the boards tight together, locate the four 3mm x 6mm screws and use them to secure the boards together. Turn the board set assembly right side up with the display and controls facing up. Now, the object is to fully engage the female connectors 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.

15) Locate the 28 pin microcontroller IC U1. Observing antistatic measures, install U1 into the 28 pin socket. Be sure to place the pin 1 end toward the center of the board.



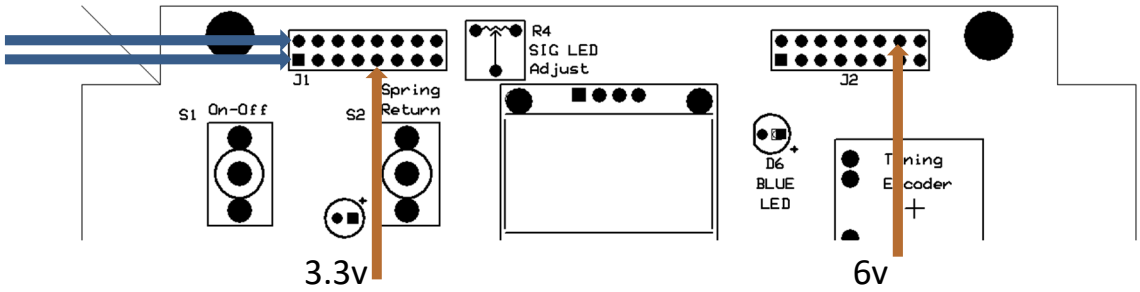
Note the orientation notch above that the arrow indicates.

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

Preliminary Checks and Tests

Before commencing with testing, you will need to understand the operating instructions for your TR-25 transceiver. The rotary controls and switches are pretty much self-explanatory. There are no hidden back menus, but the band switch does have a second function. While a quick upward flip and release of this switch changes operation from one band to the other, if the switch is flipped up and held for a few seconds, the current frequency will be stored in a semi-permanent memory. There is a separate memory for each band. Recall of this memory requires two quick successive upward clicks. The other part of this switch controls the RIT function. To engage the RIT function, a quick downward push and release of the toggle is needed. The orange RIT warning LED will come on, and the display will read out the RIT offset. Another quick downward toggle will dis-engage the RIT function. The knob to the right of the display is the tuning encoder. The frequency will change in 10 Hz, 100 HZ or 1kHz steps. The tuning step resolution is selected by a momentary switch attached to the tuning control. Short pushes on the tuning knob will alternate between 10 and 100 Hz steps. A long press will enable 1 kHz tuning steps. The frequency readout on the display will show the tuning resolution with an underline bar under the digit selected. That’s pretty much it.

There are a few ohmmeter checks that should be made. The 3.3 volt and the 6 volt power supplies as well as the 12 volt rail should be checked for shorts. Measurement points for these supplies are available on the top side of the upper board. See the diagram. The resistance to ground on any of these points should be more than 1000 ohms.



Note: The blue arrows points to the 12V pins and the orange arrows point to the 3.3V and 6V pins.

If all is well, the receiver will be tested first. Connect a speaker or headphone to the Phone jack, and a suitable antenna to BNC antenna connector. Do not connect a key or paddles yet. Turn the TX Power pot fully counterclockwise. Set the RF gain pot fully clockwise, and the volume control to about ¼ up. Connect a 10 to 12 volt power source able to supply up to 1.2 amps to the DC power input connector. Turn on the power switch, and observe the OLED display. It should come on right away, and after a few seconds the screen will show either 40 or 20 meter frequencies. The frequency should change as the tuning encoder is rotated, and you should hear signals or at least some band noise. Verify that the band switch allows both 40 and 20 meter operation. Verify that the RIT function is operational. Check the RF Gain and Volume controls. Once satisfied that the receiver is in working order, disconnect the antenna and connect a 10 watt 50 ohm dummy load and a wattmeter to the antenna BNC connector. The Blue LED Signal LED adjustment control, R4 on the upper board, should be adjusted for a faint glow with no signal present. Before attempting to transmit, you must first adjust the Final RF amplifier FET bias control R35 on the lower board. This will require that you can measure the DC current from the power supply with a resolution of a few milliamps. A Digital Multi-meter connected as an ammeter in series with the power supply is perfect. First, rotate the panel RF Power control fully counterclockwise. Also adjust the bias control R35 all the way counter-clockwise as viewed from the rear of the transceiver. Select the 40 meter band. Observe the current drain in receive mode. It should be less than 110ma, typically about 95ma. Connect

a key to the Key jack. With a dummy load connected to the BNC jack, close the key and observe the power supply current. It should increase from about 95ma to about 105 ma or so. The power meter should show no power at this point, and you may or may not hear the transmitter sidetone. With the key closed, slowly advance the bias pot R35 with a small screwdriver while observing the power supply current. The object is to adjust the bias control until the supply current just starts to increase. Set the control for an additional current of 4 or 5 milliamps, or to about 110 ma total. Do not set it higher as this does not appreciably increase the power output. If set too high, it does have a negative effect on the efficiency and heat stability of the final amplifier FET. With the bias pot set, disconnect the in-line current meter. You may now slowly increase the panel RF Power adjust control and observe the power output on the wattmeter, and the sidetone should be audible. You should see about 5 to 7 watts or more with the RF Power pot all the way up, depending on the supply voltage. RF power output on 20 meters will typically be a little less than on 40 meters.