

PLEASE READ ME FIRST

6/11/21

The TR-25 Upper and Lower PC boards are shipped inside the plastic enclosure. Remove the 4 black screws holding the enclosure together and remove the board set. Discard any anti-rattle bubble material. Place the case screws in a safe place, you will need them later. Remove the four 3mm screws holding the lower board to the metal spacers. You will need these screws later as well. Set the lower board aside for now. The metal spacers should remain on the upper board. The upper board will be assembled first, followed by the lower board. There are separate assembly instructions for the two boards. You should read through both sets of assembly procedures before you start. Try to resolve questions or anything that seems unclear ahead of time. There are separate parts carrier strips for the upper board, the lower board, and the case final assembly parts. The parts are arranged in the carriers in the order of the assembly instruction steps. You will work from the top of the carrier strip down as you complete steps. It is recommended that you remove only the parts needed for the particular building step as outlined in the assembly instructions. Some of the hardware is small and could easily be lost or misplaced. A clean working environment will help prevent lost or misplaced items. This might be a good time to clean up your workbench before you start assembly.

Upper Board Notes: All of the parts (except the crystal) need to be tight against the board, especially the capacitors. If they extend above the 12mm metal spacers, the case will not fit together. After the display is mounted, be sure to use nail polish on the screws and nuts under the board. The nuts could come loose and cause damage. This has happened on prototype units. Don't forget to remove the display protective covering before final case assembly.

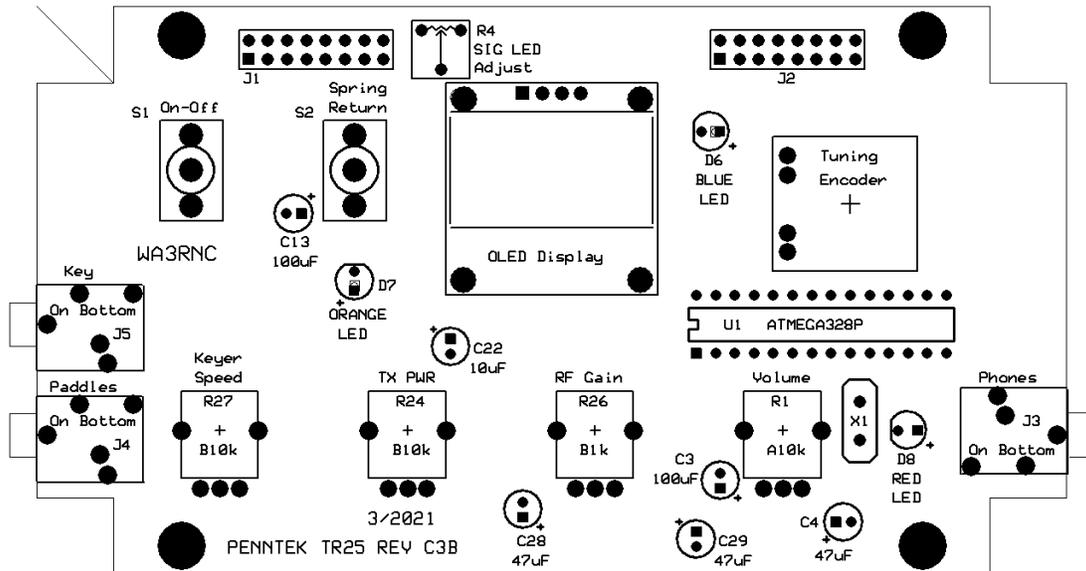
Lower Board Notes: Don't neglect to trim leads and pins under this board when instructed lest the case might not fit together. It's tight in there! Be sure you get the relay positioned correctly. It's not easy to remove if you get it wrong. The BNC antenna connector has been installed at the factory due to the high amount of

heat required for soldering due to its mass. Don't forget that capacitor C53 must be installed lying down on the board. Bend the leads before installing. The polyfuse will also need to be installed lying over. Do not molest the 4 trimmer capacitors. They affect receiver sensitivity and have been carefully adjusted as part of the total alignment procedure performed at the factory on a bed-of-nails fixture prior to shipment. Thermal heat sink compound was not used on the prototype units, but you may use a small amount if you wish. Also, the toroids were not glued to the board in the prototypes and there were no issues. If you routinely subject your radio to extreme shock and vibration, you could glue the toroids to the board with hot melt glue, or maybe epoxy. Do not use any silicon sealer that liberates acetic acid as it cures (smells like vinegar) as this would be very corrosive and could cause damage.

Final Assembly Notes: Remember to remove the OLED display protective covering. Follow the instructions for adjusting the PA bias control. Adjust the blue "SIG" quality LED sensitivity on the top board before installing the case top. Some users have commented that the unit looks better without the plastic display window installed. You may or may not install it, as you wish. Before installing the plastic protective window, you may need to remove the thin clear protective film from one or both sides of the window, and poke out any remaining plastic in the screw holes.

TR-25 Upper Board Assembly Procedure

5/13/2021



UPPER BOARD USER INSTALLED PARTS

Refer to the above placement diagram while performing the following steps

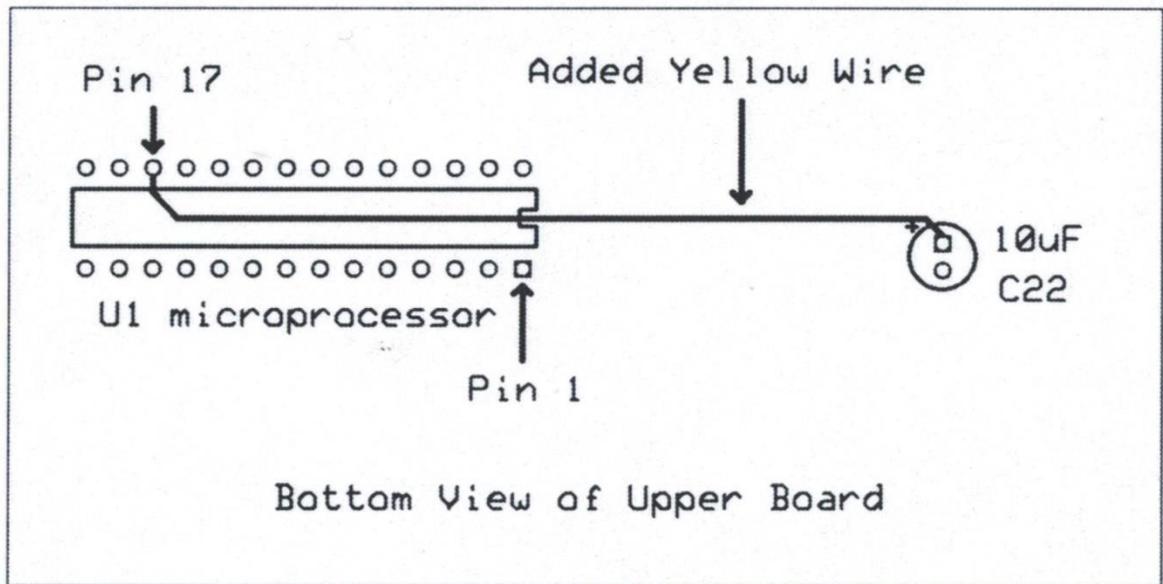
- 1) Install and solder X1, 16MHz crystal. Make certain that crystal is NOT down tight against the PC board. It should be about 1/32 to 1/16 inch above the board surface. Solder and trim 2 leads.
- 2) Install and solder U1, 28-pin socket tight against the board. The notch must be toward the center of the board. Verify that orientation is correct, and that all 28 pins are through the board before soldering. Solder 28 pins.
- 3) Install the OLED display using the provided white plastic spacers and 4 each miniature screws and nuts. The nuts go on the bottom of the board. Take your time with this, and be very careful not to lose your nuts (always good advice). Do not overtighten this hardware. Once the display is mounted, install 4 wires, cut from two included sacrificial resistors, from the display



connection points to the PC board. See the photo. Make certain that the wires do not short together. The resistors can be discarded. Solder and trim 8 connections, 4 on the display, and 4 on the PC board. **Important:** Place some clear fingernail polish on the screws and nuts on the bottom of the board so that they don't

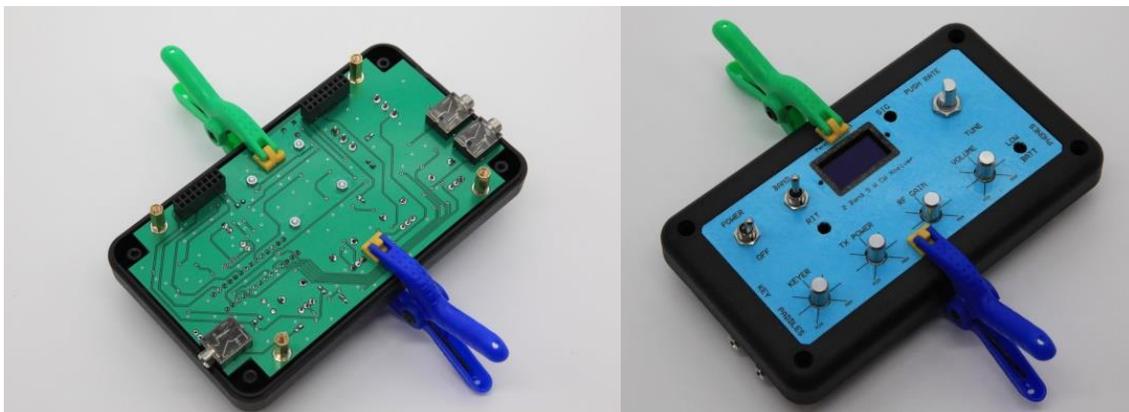
come loose and find trouble later. This has occurred several times on prototypes.

- 4) Install and solder R4, signal LED sensitivity control. Solder 3 leads.
- 5) Install and solder D6, the blue Signal Quality LED, mounted on a plastic spacer. Make sure the LED is tight against the spacer. The longer LED lead connects to the square hole. Make certain that the assembly is straight and tight against the PC board. Solder and trim 2 leads.
- 6) Install and solder D7, the orange RIT warning LED, using the same procedure as for D6. The longer LED lead goes to the square hole. Solder and trim 2 leads.
- 7) Install and solder D8, the red low battery warning LED, using the same procedure as for D6 and D7 above. The longer LED lead goes to the square hole. Solder and trim 2 leads.
- 8) Install and solder electrolytic capacitors C3 and C13, 100uF, tight against the board. The longer lead (+) goes to the square hole. Solder and trim 4 leads.
- 9) Install and solder electrolytic capacitor C4, C28, and C29, 47uF, tight against the board with the longer lead to the square hole. Solder and trim 6 leads.
- 10) Install and solder electrolytic capacitor C22, 10uF, tight against the board with the longer lead to the square hole. Solder and trim 2 leads.
- 11) Install a jumper wire from the microprocessor pin 17 to the positive terminal (square pad) of capacitor C22 on the underside of the board. See the figure. After soldering both ends, dress the wire as neatly as you can and secure it in the center with a small piece of tape. Use whatever wire color is supplied with your kit. Check carefully for solder shorts.



- 12) Install and solder jacks J3, J4, and J5 TIGHT AGAINST THE BOTTOM of the PC board. Straighten any bent pins before installing. Solder 15 pins. Set the board aside for later.
- 13) On each of the toggle switches S1 and S2 install a single nut (used as a spacer) onto the bushing. Tighten the nuts for a snug fit. Save the remaining 2 nuts for later. Set the switches aside for now.
- 14) The 4 potentiometers (R1, R24, R26, and R27), are fitted with a washer and a nut (used as spacers) on the bushings. Tighten the nuts for a snug fit. Set the potentiometers aside with the switches previously prepared with nuts.
- 15) In this step the tuning encoder, switches, and potentiometers will be soldered to the PC board using the front case half as an alignment fixture. Take your time with this effort. It is important for a good fit within the housing. Do not solder any of these components until instructed to do so. To start, position the PC board with the display side up and with the jacks closest to you. Place the on-off toggle switch S1 onto the board with the slot in the bushing toward the board center. Place the 3 position spring return Band/RIT switch S2 into the board next to the display with the slot in the bushing toward the board center. Place the potentiometers carefully into the board making certain the correct part goes to the proper place (do

not solder yet). Pot R1 (Volume Control) must read “A5K” or “A10K” on the rear side of the part (either one will work fine). R26 (RF Gain Control) must read “B1K”, R24 (TX Power Control) and R27 (Keyer Speed Control) must read “B10K”. Please check this carefully as these parts are extremely difficult to remove if you make a mistake! The standard tuning encoder is supplied with 2 nuts and a washer. Make sure the first nut is tight on the bushing. This nut is used as a spacer. The washer and second nut will attach the encoder to the panel. Place the 4 pins of the tuning encoder sub-board into the board to the right of the display (do not solder yet). If you ordered your kit with the optional precision optical encoder, it is supplied with a plastic washer and a 3/8 inch nut. Place the encoder carefully into the 6 holes to the right of the display, and place the spacer onto the encoder bushing, taped side down (don’t solder yet). Now carefully fit the top case half down over the control shafts. You might need to gently nudge some of the controls, tuning encoder and switch bushings to allow the top inside of the case half to make contact with the 12mm spacers and/or the switch and potentiometer nuts. Once contact is made, clamp the board to the top case half with small plastic clamps as shown in the photos. The clamps in the photo came from Harbor Freight (6 pieces for 2 bucks). Anything similar should work. You might be able to improvise by using rubber bands and an additional object to keep pressure on the back side of the PC board. The idea is to maintain pressure of the board components against the inside of the top case half while soldering the switches and controls.

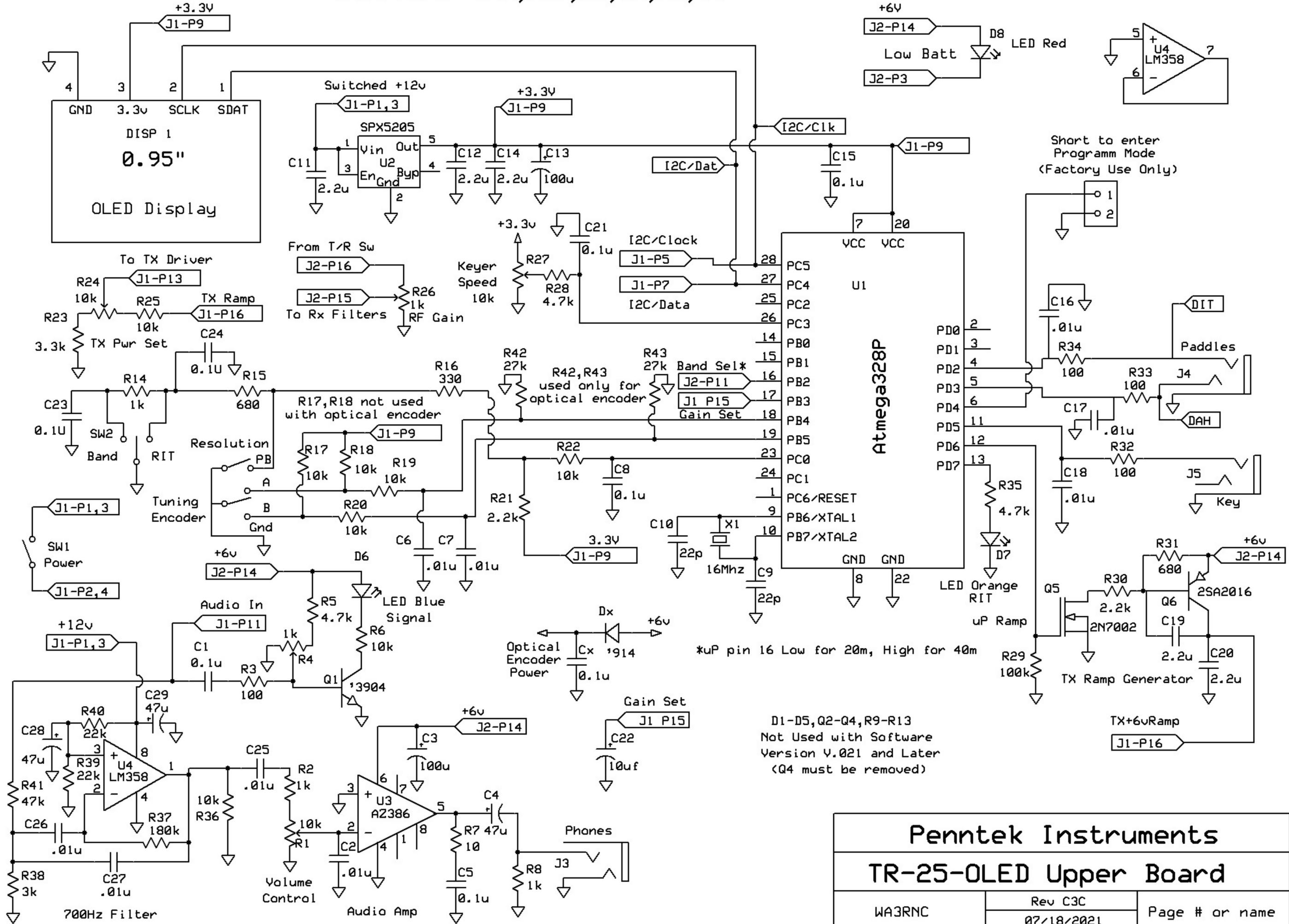




Do this if you don't have clamps.

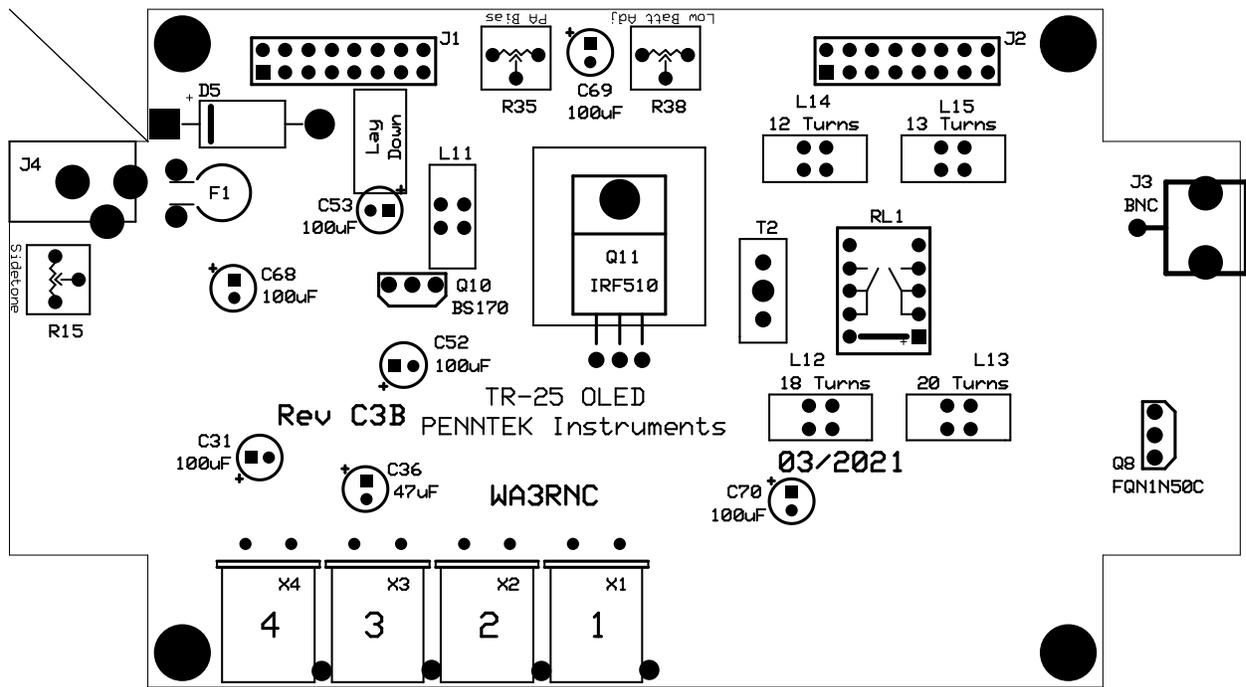
Attach the switches temporarily to the panel with their 2 remaining nuts, and snug them up. Be careful not to scratch the front panel. Attach the tuning encoder to the panel with the second nut and a washer on its bushing as well (the optical encoder does not use a washer under the attachment nut). The nut must pull the encoder tight against the inside of the front panel, but be careful not to overtighten it. Carefully turn the assembly over and verify that the PC board is level with and centered in the case half. If one end of the board seems higher than the other, or if the board seems crooked, investigate and find the cause. Once you are satisfied with the alignment, the switches, potentiometers, and tuning encoder can be soldered. There will be a total of 30 soldered connections (32 with the optional optical encoder) in this step. After soldering, remove the clamps and the 3 nuts holding the board to the panel. Don't lose the nuts, you will need them later. Separate the board from the case top. Set both aside for later. Note that the female connectors J1 and J2 will be installed as part of the lower board assembly procedure. This completes assembly of the upper board. Proceed to the lower board assembly procedure.

Last Used: R43,C29,Q6,D8,X1,U4



Penntek Instruments		
TR-25-OLED Upper Board		
WA3RNC	Rev C3C 07/18/2021	Page # or name

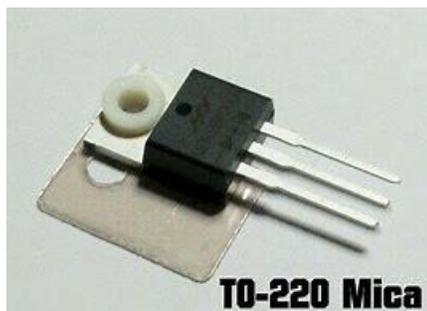
TR-25 Lower Board Assembly Instructions 8/13/2021



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 ¼". 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.

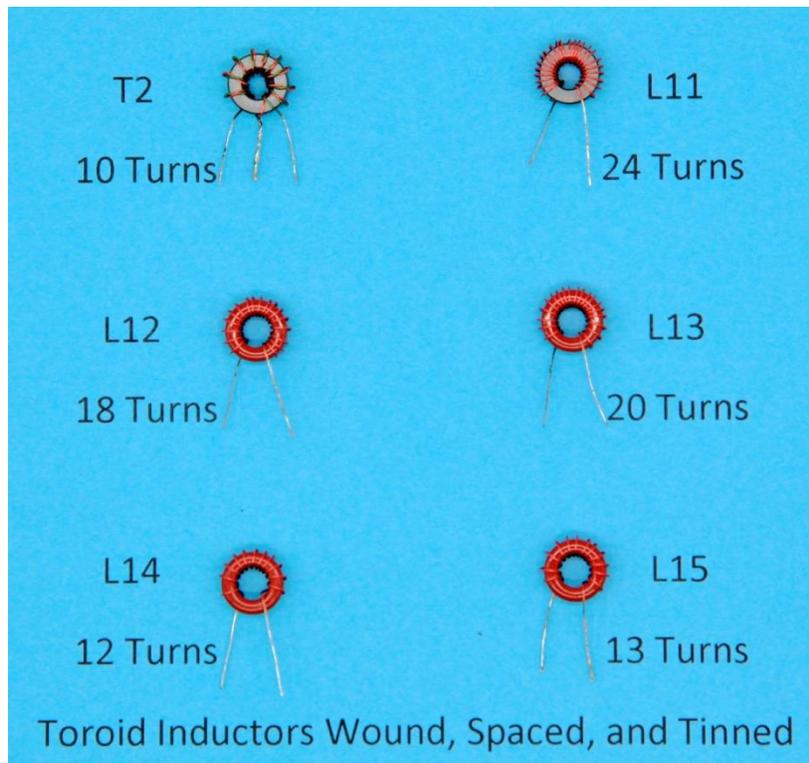


11) This step involves preparation of the 6 toroidal inductors. If you ordered your kit with the optional “Pre-wound and Prepared Toroidal Cores”, you may skip to step 11B.

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.

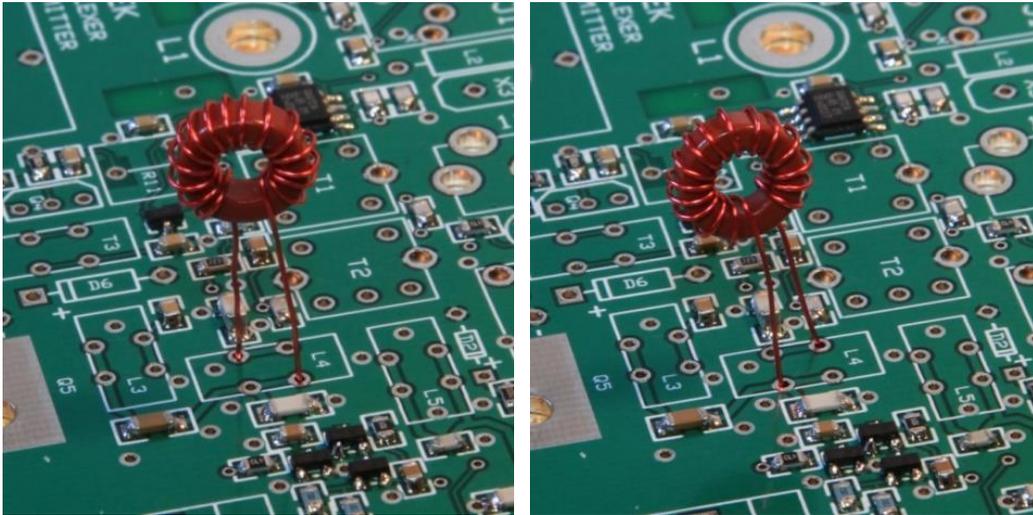
There are 2 different cores used, 4 powdered Iron T37-2 cores, and 2 ferrite FT37-43 cores. The T37-2 cores are red, and the FT37-43 cores are all black. It is very important that they don't get mixed up, or there will be trouble ahead. All of the toroids are wound using #28 magnet wire. One of the cores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

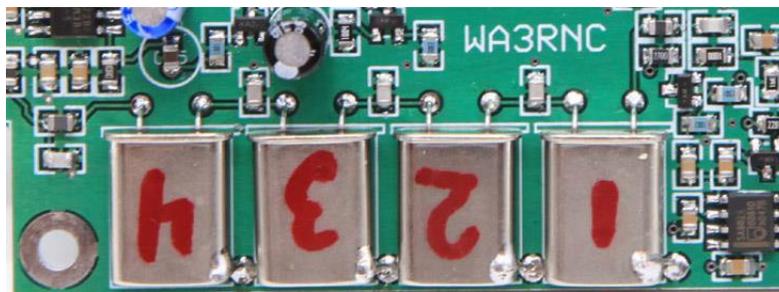


11B) The 6 toroidal coils will now be installed. Start with T2, the coil wound with 10 turns of red and green wire. Place the twisted pair of wires in the center hole, and the other two wires to either side. It doesn't matter which of these single red and green wires go where, so long as the center connection 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.



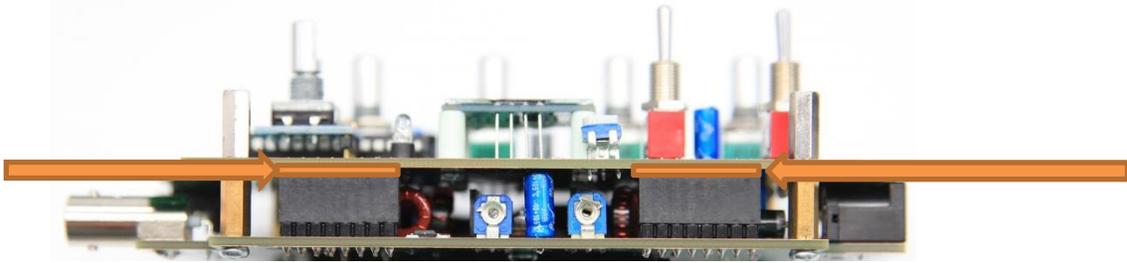
12) Install the IF filter crystals X1 through X4. The crystals have been measured and sorted, so they must be installed properly for maximum IF filter effectiveness. The crystals are numbered according to the reference designator where they will be installed. The crystal marked "1" will be mounted at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

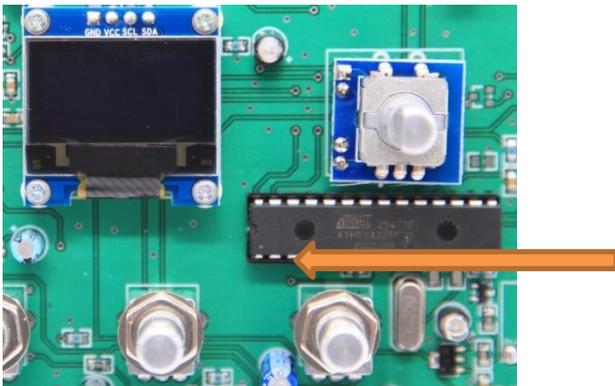
upper board surface and the female connector. See the picture.



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

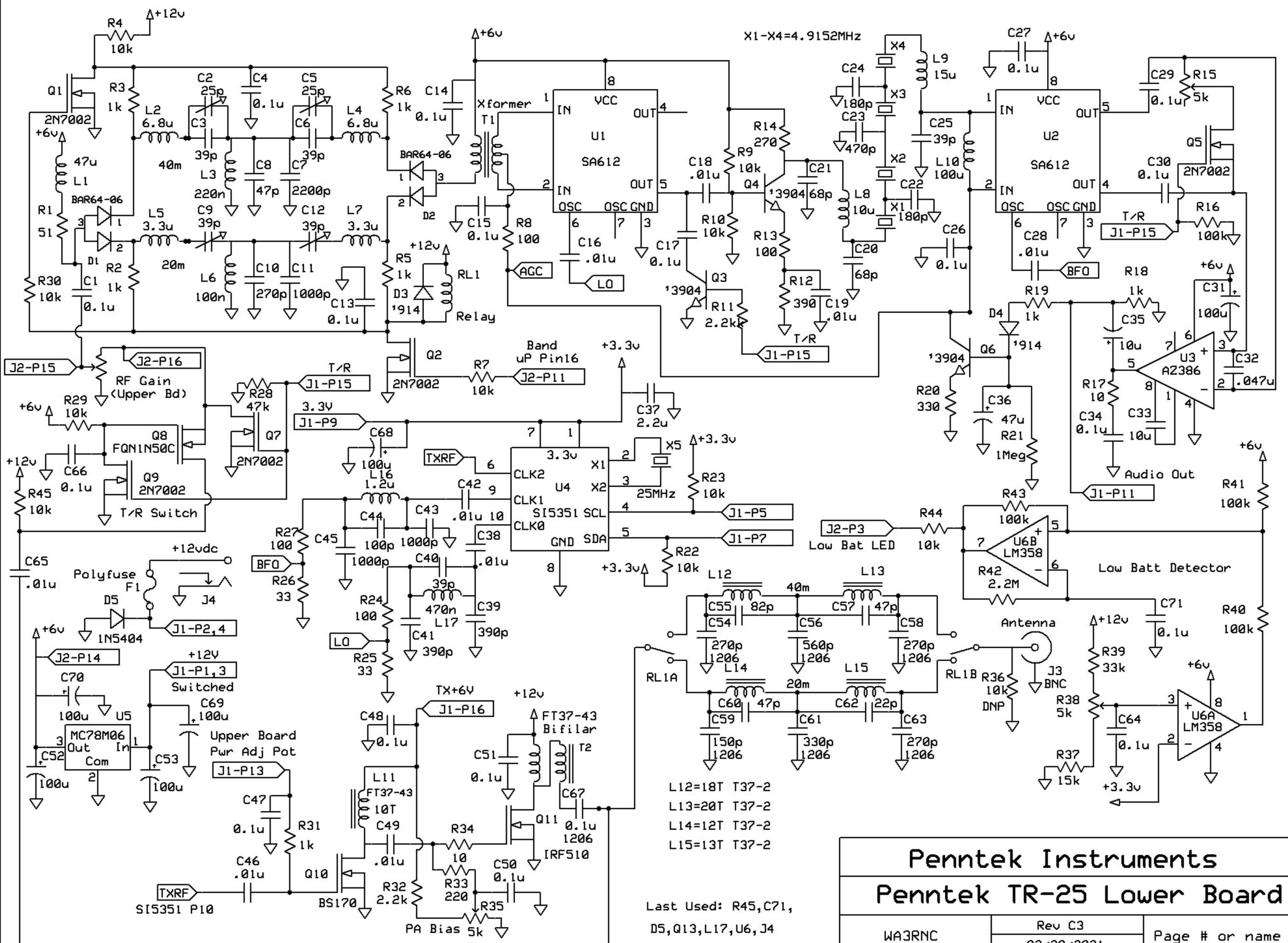
Now the upper board female connectors should be soldered. Solder 32 pins.

- 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.



- L12=18T T37-2
- L13=20T T37-2
- L14=12T T37-2
- L15=13T T37-2

Last Used: R45, C71,
D5, Q13, L17, U6, J4

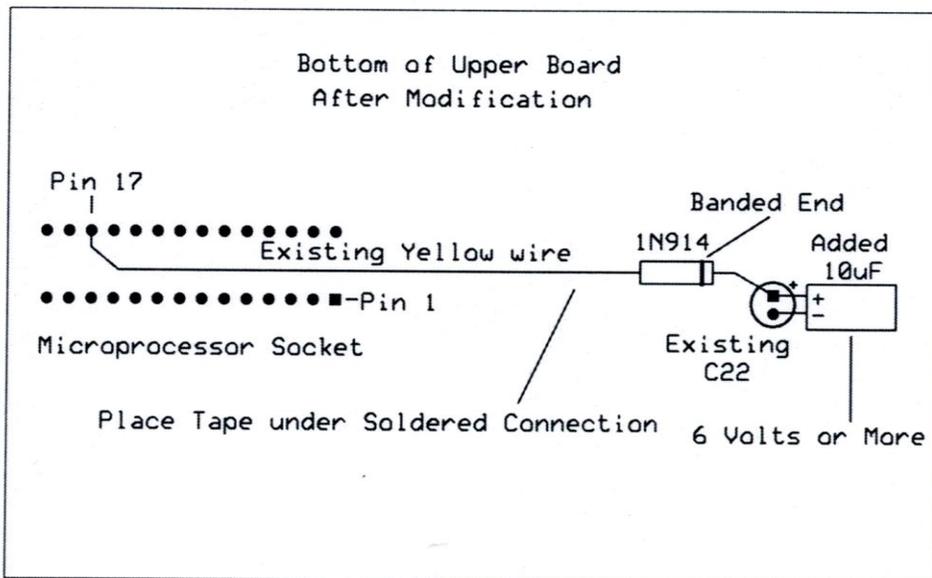
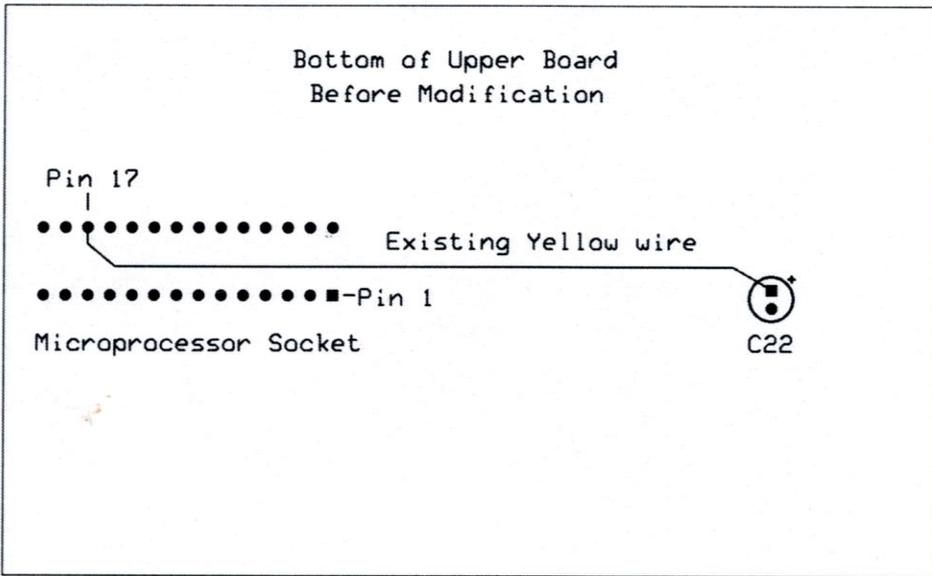
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TR-25 Version V.0.20 Sidetone Hardware Mod Note

This modification note only applies to TR-25 transceivers that show V.0.20 on the OLED display upon turn-on.

Some users prefer to have a very low sidetone level. When attempting to set the level near the low end of the sidetone level adjustment pot range, you may start to hear transmit-receive switching transients that sound like clicking noises. These are not transmitter clicks, and they only affect the receiver when the sidetone level is low. The fix for these clicks is to slightly extend the falling edge of the microprocessor-generated receiver gain reduction pulse. This mod is something that you can do yourself if you need a low-level sidetone, and if you feel comfortable with a soldering iron. You should observe standard anti-static precautions such as using a static grounding strap, and perhaps working inside a large metal cookie sheet. Or, you may return your unit to me to have this mod installed at no charge. If you use a more moderate sidetone level and are not hearing the clicks, you do not need to be concerned with the mod. No one will be quizzed if they try this mod themselves and something goes wrong. Just return the unit to me for a no-charge fix with no questions asked.

The modification requires that a diode and a 22uF capacitor be added to the upper PC board. The diode (1N914 or similar) is added in series with the yellow wire on the bottom of the upper board that connects the microprocessor pin 17 to the 10uF capacitor C22. An additional 10uF capacitor is then bridged across the existing 10uF capacitor C22. This added capacitor may be any working voltage above 6 volts. The diode may be a 1N914, 1N4148, or just about any Schottky diode such as a 1N5817. Even the lowly 1N4000 series rectifier diodes will work so long as they don't have too much forward voltage drop. Several 1N4002 and 1N4003 diodes were tried, and all worked fine. If the diode has too much forward voltage drop, and if any of the FETs that receive this pulse have a gate threshold voltage that is at or above the upper specified limit, they may not turn on properly. I think this is more of an abstract possibility than a real issue. I tried about 8 different diodes on three different TR-25 units and all seemed to work just fine. See the drawings for before and after the modification.



7/15/2021

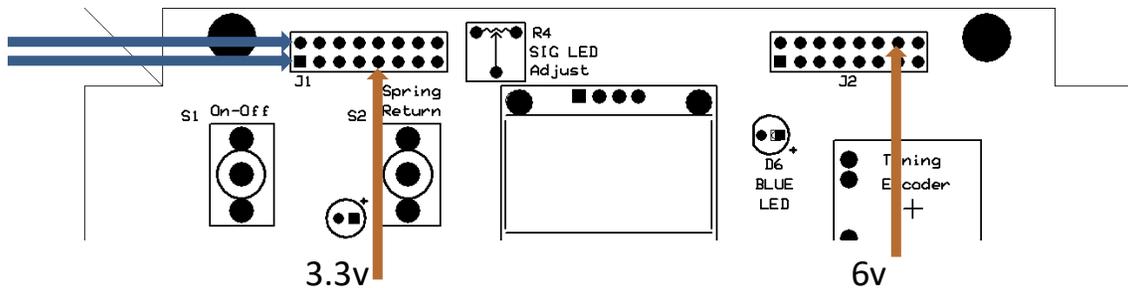
TR-25 Final Assembly

There are four adjustments that can be made before the final case assembly. The blue LED Signal level adjustment pot R4 must be adjusted before the top case half is installed. The other three adjustments can be made so long as the lower case half is not installed. R35 PA bias adjustment should have been made as part of the preliminary checks and tests. Make this adjustment before you transmit. The side-tone level control R15 should be adjusted to set the level to your liking. To set the battery warning level pot R38 will require a power source with an adjustable voltage level. Set the power supply voltage to the point where you wish the red warning LED to blink, and then adjust the pot until the LED just starts to blink. This level can be set from 9 volts to about 11 volts. Turning the pot all the way clockwise as viewed from the rear of the TR-25 will set the level to its lowest. Once the adjustments are made, the case can be assembled. Be sure that the lower board is attached to the board spacers with four 3mm screws. Start by placing the board set into the lower case half. Slip the BNC connector through the large hole in the right side of the case bottom half. The board set should fit flat with a minimal amount of persuasion. Now place the upper case half down over the panel shafts. If it seems that the fit must be forced, investigate the reason. With the top properly fitted to the bottom, install the four original black case screws. Place the two nuts on the switches, and place the nut on the encoder shaft. Slip the red vinyl cap onto the power switch toggle, and the white cap onto the Band/RIT switch. Be careful when installing the panel LED lenses. It requires some care to prevent damage to the lenses while installing them into the outside of the panel. Place the red lens for the Low Batt warning, the orange for the RIT warning, and the blue for the SIG indicator. When installing the knobs, make sure that they do not rub and mark up the pretty panel. Remember that the tuning knob must be installed far enough above the panel so as to allow for a slight downward movement with a push on the knob for setting the tuning resolution.

TR-25 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 1 kHz 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 110 ma, typically about 95 ma. If you

have the optional optical encoder installed, note that the current draw will be about 5 or 6 ma more than with the standard encoder. 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 profound 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.