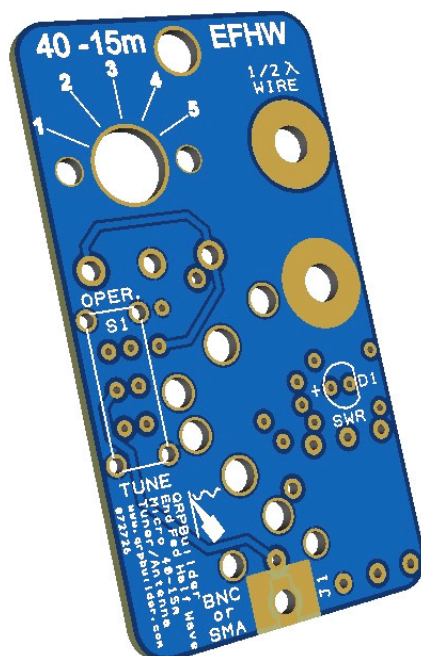




QRPBuilder Micro 40-15m EFHW Halfwave Tuner/Antenna

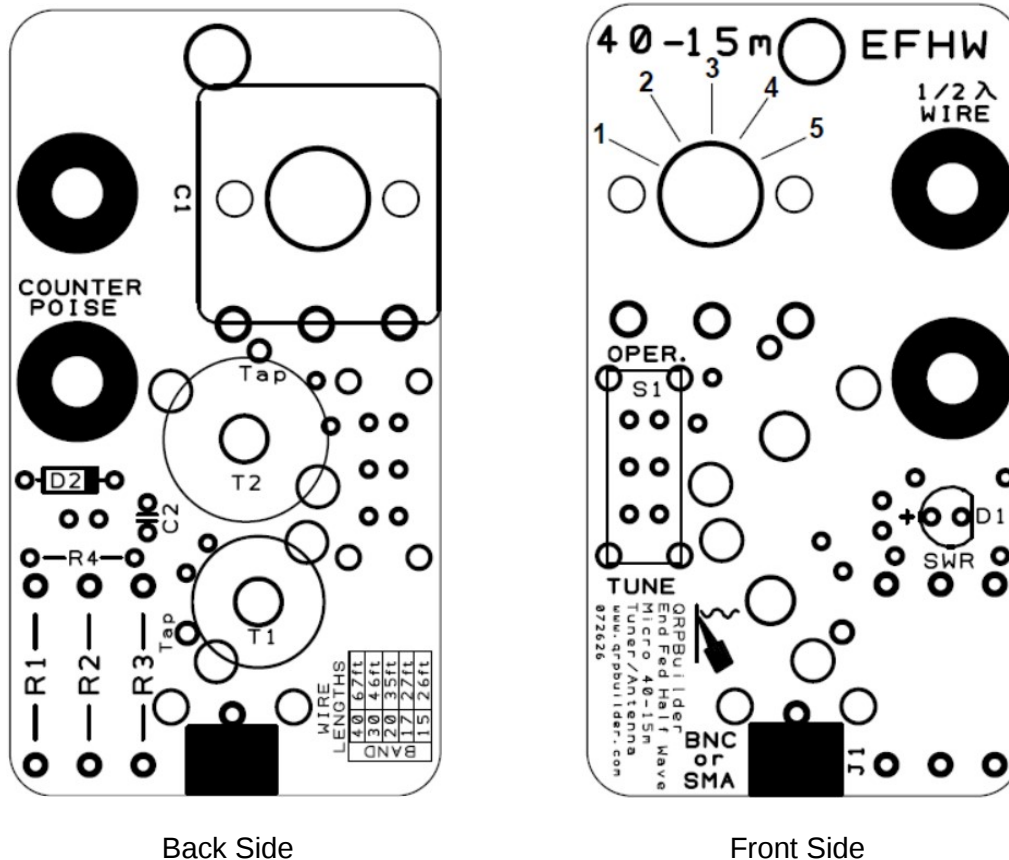


First, familiarize yourself with the parts and check for all the components. If a part is missing, please contact us and we will send one. You must use qrpbuilder@gmail.com to request a part.

Parts List

- 1 – QRPGuys Micro Halfwave Tuner/Antenna PCB
- 1 – C2, .1uF mono capacitor, marked 104
- 1 – D1, Red LED w/clear lens
- 1 – D2, 1N4148 signal diode, sm. glass, w/black band on one end
- 3 – R1-3, 51 ohm 2W power resistor (green-brown-black-gold)
- 1 – R4, 470 ohm resistor (yellow-violet-brown-gold)
- 1 – FT37-43 toroid core (black)
- 1 – T50-6 toroid core (yellow)
- 1 – Poly varicon, w/mounting hardware and shaft spacer
- 1 – 20mm knob for poly varicon
- 1 – Slide switch – DPDT
- 1 – 48" of 26AWG magnet wire for the toroids
- 1 - BNC vertical pcb male connector
- 2 – 8-32 x 3/4"L SS Phillips pan head screw
- 4 – 8-32 SS nut
- 2 – #8 internal tooth SS lock washer
- 2 – 8-32 SS wing nut
- 4 – small plastic ties

We will assemble the smallest components first. **Not all components are on the same side of the board.**



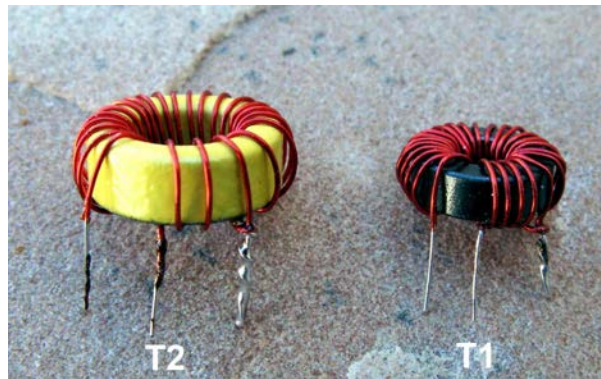
Start with the **back** of the board. Use the figure above to aid in the parts placement.

- [] Install C2, .1uF, marked 104
- [] Install D2, 1N4148 signal diode, matching the black polarity band (cathode) with the silkscreened outline.
- [] Install R4, 470 ohm, resistor, (yellow-violet-brown-gold)
- [] Install R1 – R3, 51 ohm, 2w, (green-brown-black-gold)

On the **front** of the board, install the following:

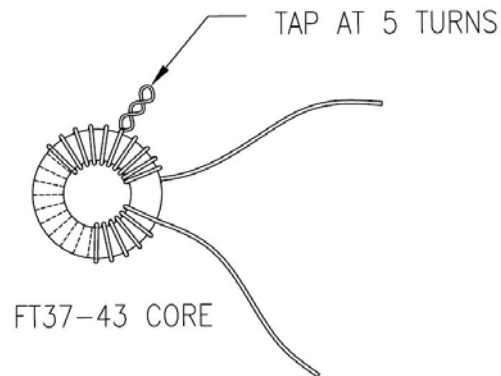
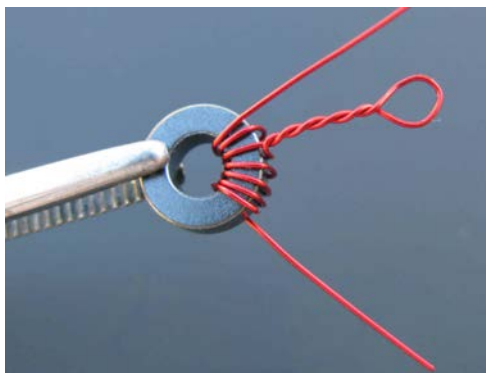
- [] Install D1, the red clear lens LED on the **front** side of the board. The polarity must be correct. The long lead is “**positive**” and goes towards silkscreened “+”. Seat the LED flush with the surface of the board.
- [] Install S1, slide switch, soldering all four corners and electrical pins.

Next assemble the two toroids on the **back** side of the board.

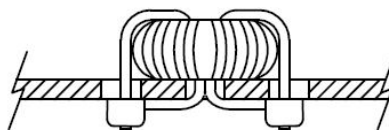


- [] For T1, use the FT37-43 (black) core and 24" of the supplied magnet wire. You are winding a total of **25** turns, with a tap at **5** turns from the beginning of winding. Remember, every time the wire goes through the center of the core, it counts as one turn. The picture, and figure below shows the beginning of winding and the twisted technique for the tap. The total of 25 turns will completely fill the toroid.

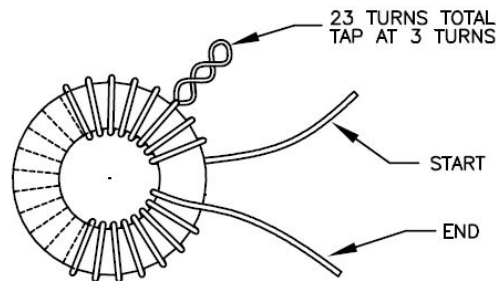
Note: Now is a good time to mention a good way for counting the turns on your toroids. Many times on toroids with a lot of turns, you lose track going around, as some are quite small. A good trick is to take a digital picture of it and blow it up on your computer screen. Counting is clearly a lot easier.



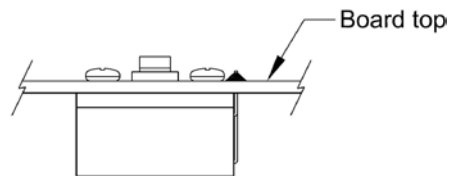
- [] Bend the leads as shown below, trim to 1/4" long, and tin the leads prior to soldering them to the backside of the board. The magnet wire supplied is Thermaleze® brand and will tin easily with a soldering iron. Always tin the leads before trying to solder them in place and you will greatly eliminate any continuity problems
- [] Install T1 on the **back** of the board where indicated on the PCB, and centered on the silkscreened circle. You will notice the tap hole is indicated, and is slightly larger in diameter to accept the double Twisted wire. Install the toroid flush with the backside of the board. **Do not elevate it off the board.** Do not pull the wires through the holes past where they are tinned. You will be securing it with two of the small plastic ties as shown below. Do not over tighten, you can break the core.



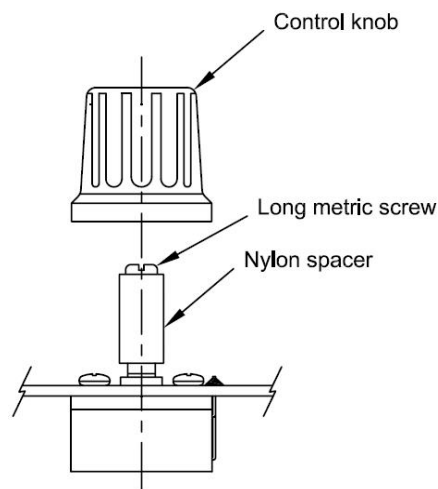
- [] Wind T2, using the T50-6 yellow toroid, and 24" of the supplied magnet wire, with **23** turns total, with a tap at **3** turns from the "START" end. Remember, every time the wire passes through the center of the toroid, counts as one turn. Tin the leads as described above.



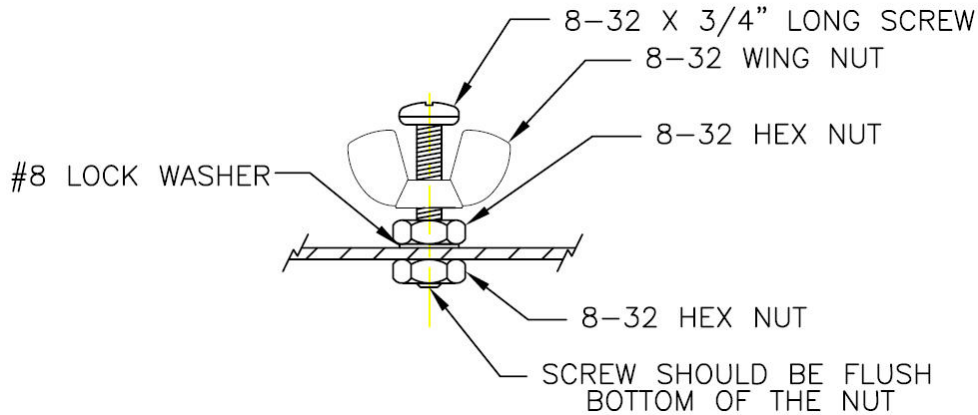
- [] Install T2 on the **back** of the board where indicated on the PCB, and centered on the silkscreened circle. You will notice the tap hole is indicated, and is slightly larger in diameter to accept the double Twisted wire. Install the toroid flush with the backside of the board. **Do not elevate it off the board.** Do not pull the wires through the holes past where they are tinned. You will be securing it with two of the small plastic ties as shown above. Do not over tighten, you can break the core.
- [] Install the male BNC connector flush with the **front** side of the board. Turn your soldering iron temperature up to solder the BNC connector. The three ground connections on the outside are part of the metal shell and require a little more heat than ordinary leaded components.
- [] Install the poly varicon capacitor on the **back** side of the board by carefully bending the three leads towards the shaft end of the capacitor. Feed the three leads through the board and secure it with the two short metric Phillips screws from the top. Solder and clip the three leads flush.



- [] Install the nylon spacer shaft, retaining screw, and control knob onto the poly varicon as shown.

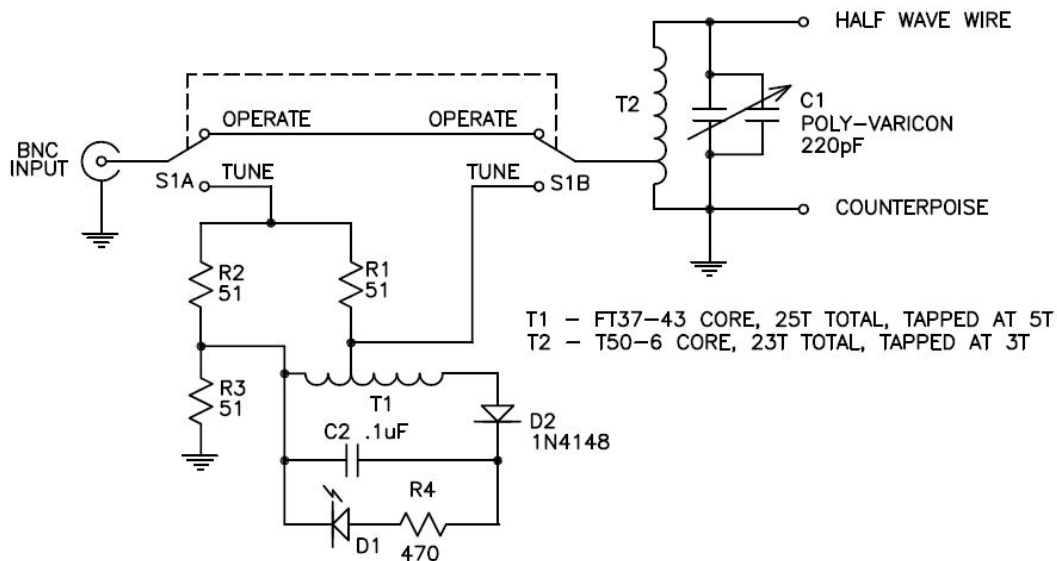


- [] Install the hardware posts for the antenna wire on the **front** side of the board and counterpoise on the **rear** of the board, as shown in the figure below. This prevents loss of the wing nut. The end of the post screw should be flush with the outside of the securing nut.



This completes the electrical and mechanical assembly.

Schematic:



Troubleshooting

By far the main issues have been traced to not tinning the wires before soldering or pulling the wires past where they are tinned when installing. Pay close attention to this.

SWR/LED Tuning Indicator usage

The LED indicates the relative SWR of your antenna. The tuner is rated at 10 watts PEP max., and incorporates a LED absorption bridge circuit for sensing SWR. In the TUNE position, you cannot damage your transmitter caused by a high SWR. The worst your transmitter is looking at is a maximum of 2:1 SWR in the TUNE position. The LED is only showing reflected power. At full brilliance your SWR is 4:1 or greater, at half brilliance your SWR is approximately 2:1, and the LED will completely extinguish at 1:1. *Tip from Dan... If your led does not completely go out at 1:1 there may be a little too much gain on T1, the indicator transformer. Just reduce the turns on the high side of the tap, one or two turns. This is due to differences in LED brilliance specifications.*

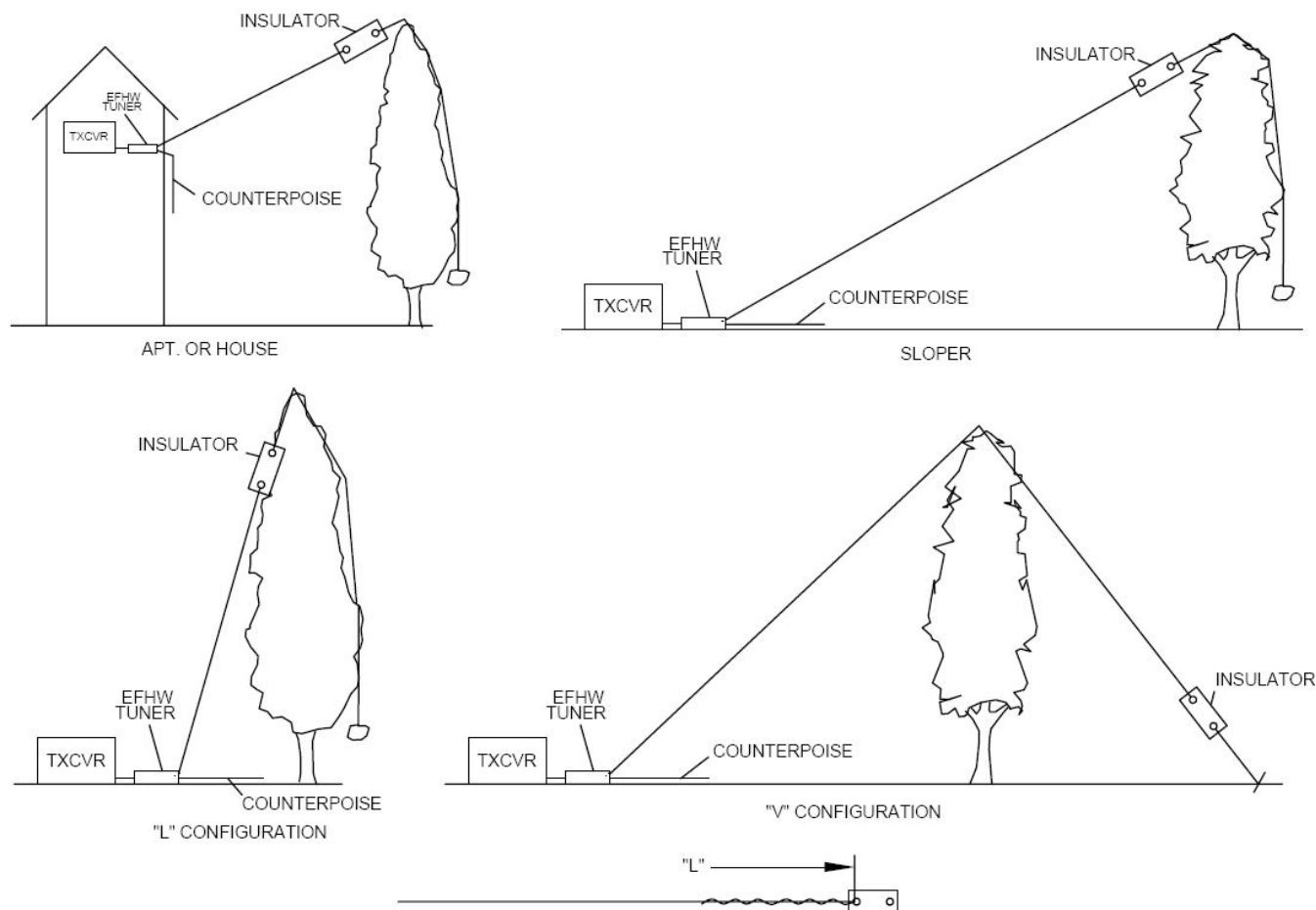
Additionally, after the antenna is tuned up, keeping the bridge in the circuit, in the ("Tune" position), will reduce the power by a factor of four to a matched antenna. This can occasionally be useful when trying to bring a 3w QRP transmitter to under the 1w level for certain sub-one watt contest multipliers.

The tuner/antenna is designed to attach to the transceiver bnc connector directly. If you do not wish to use it that way, simply run a piece of coax from the transceiver to the tuner/antenna.

Setting up the antenna

Use all the normal cautions throwing wires up in the air near power lines, and start with the lengths suggested on the board for the band you wish to operate. The lengths listed on the board are a little longer so it allows you fold back the ends, when securing. Adjust the lengths through experimentation as needed. Start with the suggested length and fold back in 2-3 inch increments until you achieve the best resonance. How the wire is configured depends greatly what you have to work with in terms of support, terrain, trees, and structures. The simplest configuration is an inverted "V", where the active element runs from the antenna connection of the tuner, up to a tree branch, and back down towards the ground. An "L" configuration may work well if you can get the part of the wire from the tuner up to the tree as vertical as possible.

Use a counterpoise wire and lay it out in a straight line, 180° from the antenna wire when possible. The wire element and counterpoise lengths suggested may vary, depending on the terrain and soil conditions. Experimentation with the counterpoise length can also be useful.



The board is also designed to optionally accept an edge mounted SMA female connector. Center the connector, solder the ground connections on both sides of the board, and use one of the clipped resistor leads soldered from the center connector pin to the input pad of the antenna as shown below.

Even with low power, feedline radiation can cause false and erratic swr readings. To eliminate feedline radiation, use a choke or 1:1 balun. *Feedline radiation refers to the phenomenon where the transmission line connected to an antenna radiates energy, which can cause interference and affect the performance of the antenna system. This radiation can occur when the feed line becomes part of the radiating system. It is important to minimize feed line radiation to ensure efficient transmission and reception. Techniques such as using a 1:1 balun or feed line choke can help minimize this effect.*



This is an example of a simple feedline choke using a few turns of RG174 coax through a clamp-on ferrite