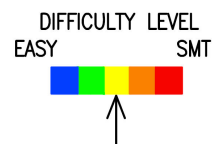




## QRPGuys UnUnTenna Plus Assembly Manual

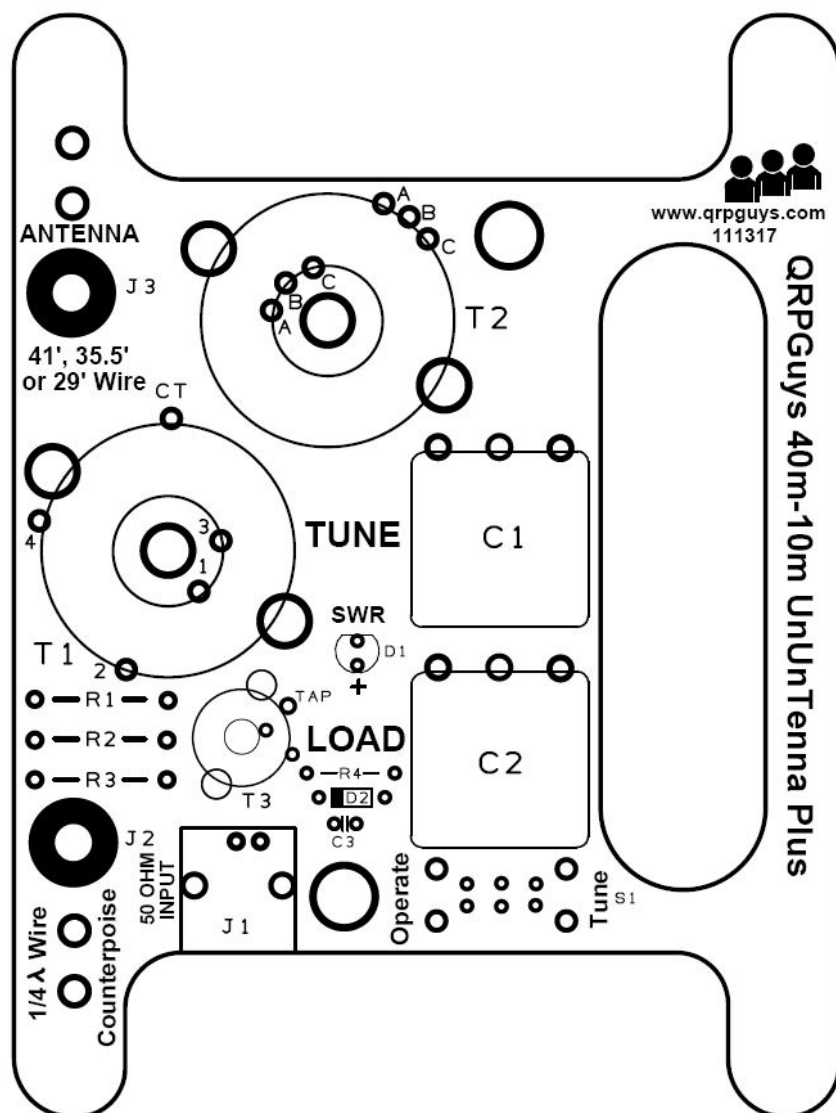


First, familiarize yourself with the parts and check for all the components. If a part is missing, please contact us and we will send one. To request a part, please use [qrpguys.parts@gmail.com](mailto:qrpguys.parts@gmail.com).

### Parts List

- 1 – QRPGuys UnUnTenna Plus and Poly Plate pcb
- 1 – S1, Slide switch – DPDT
- 2 – C1,C2 – Polyvaricon, w/shaft and mounting hardware, 1 long and 2 short metric screws for each
- 1 – C3 - .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, R2, R3 - 51 ohm 2W power resistor (green-brown-black-gold), value may be printed
- 1 – R4 - 470 ohm resistor (yellow-violet-brown-gold)
- 2 – T1,2 – T106-2 toroid core (red)
- 1 – T3 - FT37-43 toroid core (black)
- 1 – 24" of 26AWG magnet wire
- 1 – 10' of 20AWG magnet wire, 48" red, 48" green, 24" yellow
- 2 – #2 size control knob
- 1 - BNC PCB horizontal 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
- 6 – nylon zip tie

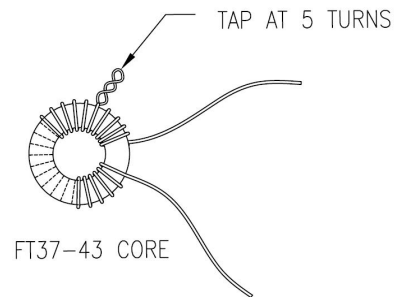
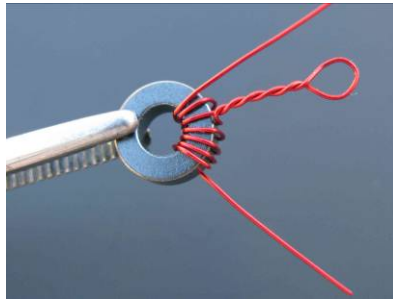
Refer to the figure below for location of the individual components.



All the components mount on the top side of the board.

- [ ] Install C3, .1uF mono capacitor, marked 104.
- [ ] Install D2, 1N4148 signal diode, observe the black polarity band to match the board.
- [ ] Install R4, 470 ohm resistor (yellow-violet-brown-gold)
- [ ] Install D1, the clear lens LED on the top side. **The long lead is “+”.**
- [ ] Install R1 – R3, 51 ohm, 2W, power resistors (green-brown-black-gold), or value is printed on the component.
- [ ] For T3, use the FT37-43 (black) core and the 24” of the thinner supplied magnet wire. You are winding a total of **24** 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 24 turns will completely fill the toroid. Don’t wind it loose. Secure it to the pcb using two of the nylon tyrap.

**Note:** Now is a good time to mention a good way for counting the turns on small toroids. Many times on toroids with a lot of turns, you lose track going around. 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. Never cut until you verify the turn count. Too many turns is easy to fix, too few leaves only one option.



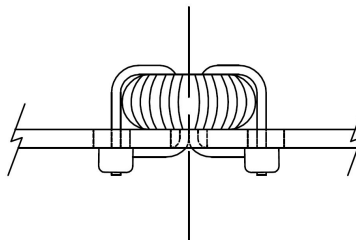
**Note:**

**Strip the enamel by whatever method you like. Burn it off with a lighter, an iron, or scrape, but tin the wire with solder before inserting into the pcb holes.**

- [ ] Bend the leads as down 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.



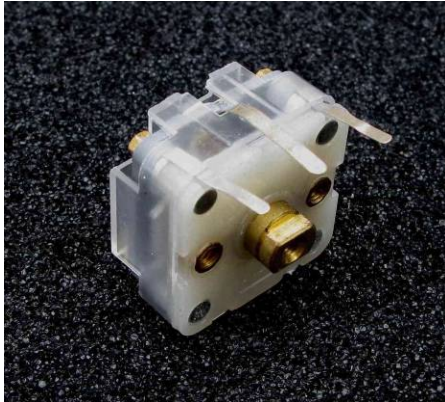
- [ ] Solder T3 where indicated on the PCB. You will notice the tap hole is indicated, and is slightly larger in diameter to accept the double twisted wire. Install the toroid flush with the backside of the board. **Do not elevate it off the board.**
- [ ] Secure T3 to the top of the board using two of the nylon zip ties, as shown below. Tighten enough to secure the toroid, but do not over tighten.



- [ ] Install the BNC connector flush with the top of the board, and solder the two locating pins and two electrical connections.
- [ ] Install the S1 slide switch at the place indicated, soldering all four corners and electrical pins.

## Polyvaricon installation for kits ordered before 01/28/18

- [ ] Prior to installing the poly-varicon variable capacitor the leads must be re-routed through the snap-on cover. The pictures below show the “as received” and “modified” condition. Carefully pry off the cover, bend the leads to the rear, feed them through the cover and snap it back on. There is a small tab on the cover, opposite the side with the leads, that matches the body of the poly-varicon for the cover to fit properly.

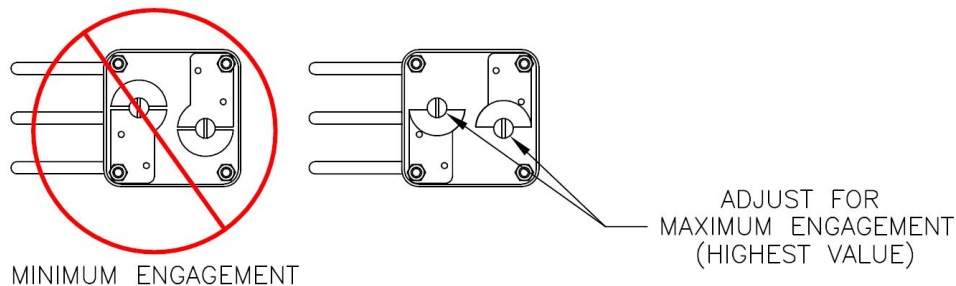


As received

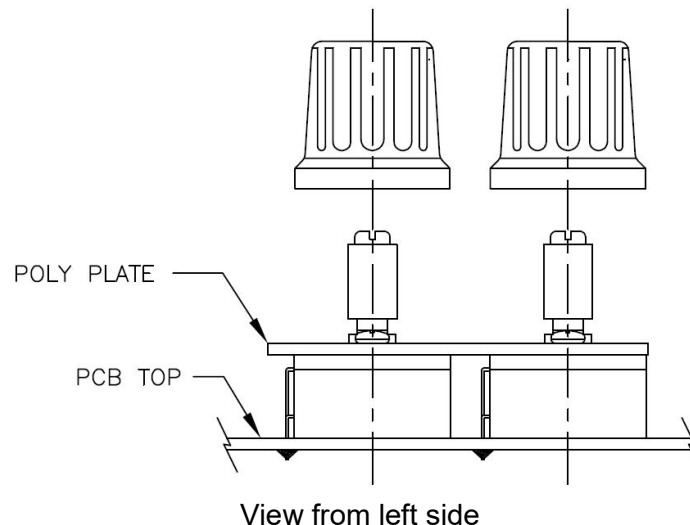


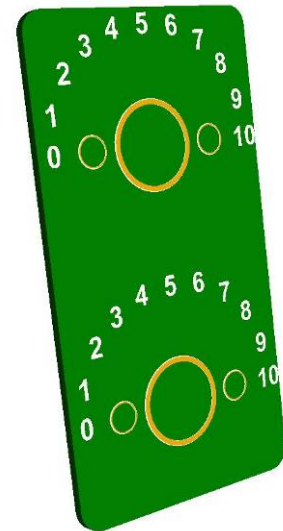
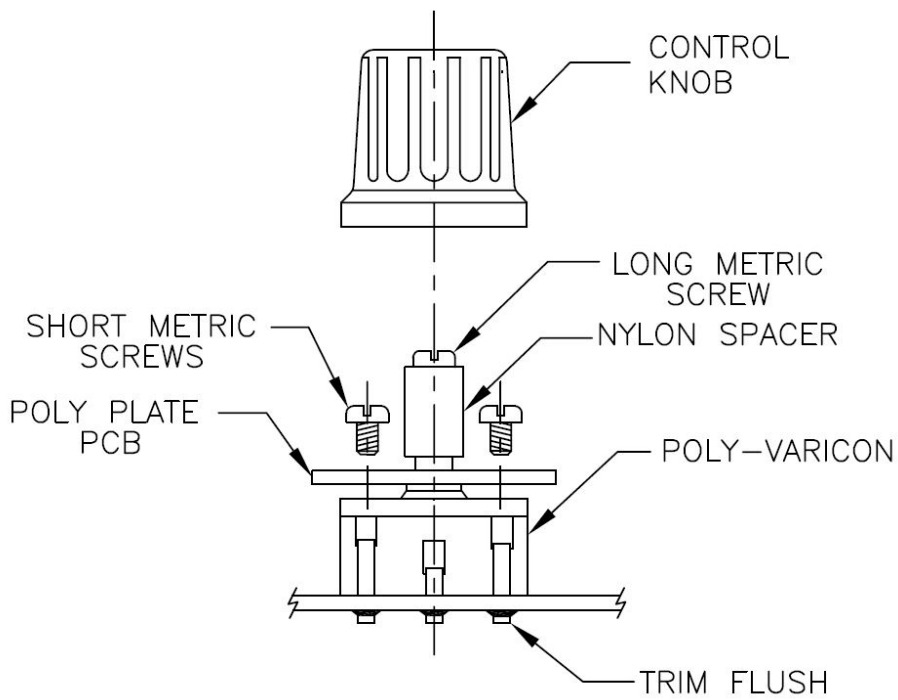
Modified

- [ ] Preset the two trimmers on the back of both polyvaricons to their “MAXIMUM” capacitance as shown in the graphic below.



- [ ] Install C1 & C2 by attaching the Poly Board pcb with the four small screws to the polyvaricons. Carefully feed the six leads through the board. Solder the six leads with the capacitors flush with the top of the board, and clip the leads flush on the bottom. Install the nylon spacers, long metric screws, and knob as shown in the figures below.





Poly Plate



## Polyvaricon installation to kits ordered after 01/28/18



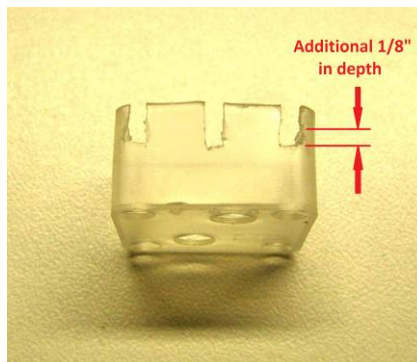
As received



Modified

The polyvaricons as received, need a modification to allow the leads to reach the bottom of the device so it can be soldered to the pcb. If bent without modifying the cover, all the leads will not reach. Shown above is the un-modified polyvaricon as received.

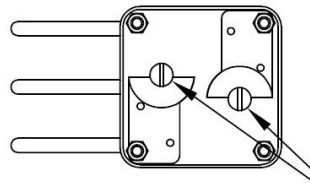
Carefully unsnap the protective cover. Deepen all three slots for the connection tabs by  $\sim 1/8$ " with an Exacto knife as shown on the right. Snap the cover back on, and run the leads on the outside of the cover.



Shown below the modified cover is snapped back on and the leads are bent to the bottom. It is now ready for installation. As you can see, one of the leads is shorter than the others and may need to be soldered on the top of the board. This is not a problem with plated through holes.

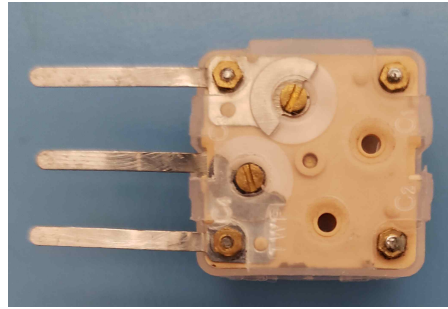


- [ ] Adjust the two trimmer caps on the back of each poly-varicon to their *maximum* value as shown below. Can be either style.

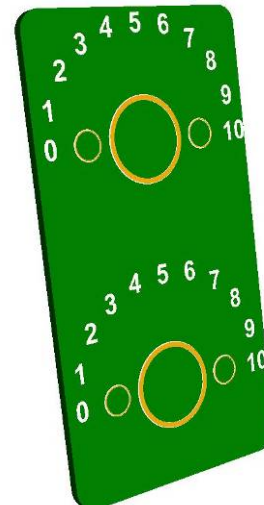
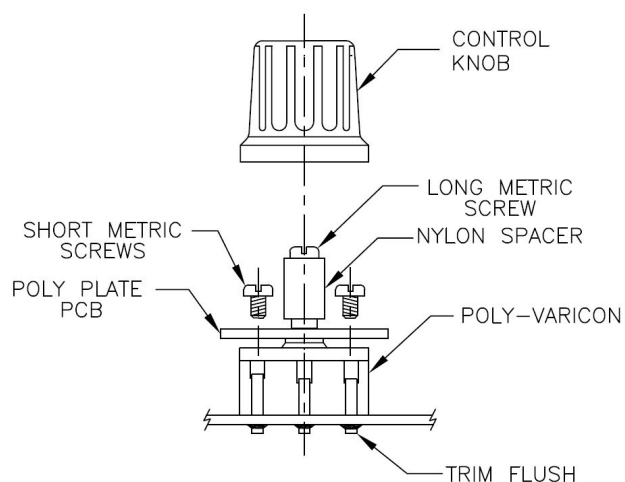
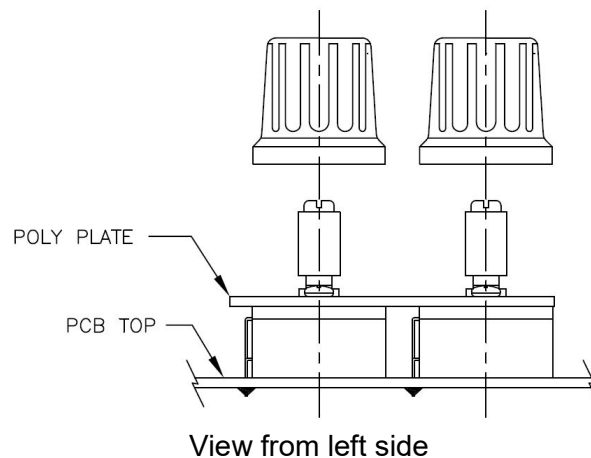


ADJUST FOR  
MAXIMUM ENGAGEMENT  
(HIGHEST VALUE)

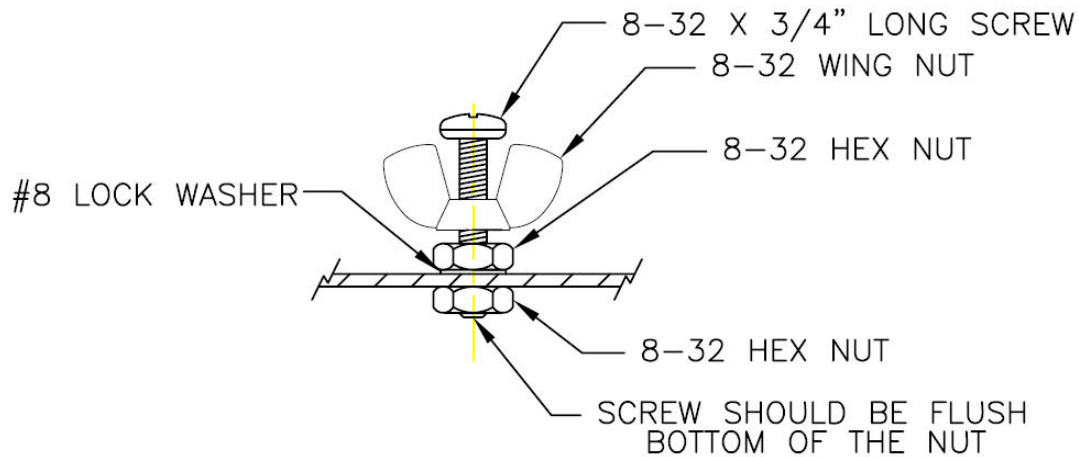
or



- [ ] **Install C2 first.** Feed the tabs down from the front of the board. One of the tabs may be a little short, and can be soldered to the top of the board if needed. The holes are plated through, so this is not a problem. Solder the three tabs with the polyvaricon flush with the top of the board.
- [ ] Install C1 next. Feed the tabs down from the front of the board. One of the tabs may be a little short, and can be soldered to the top of the board if needed. The holes are plated through, so this is not a problem. Solder the three tabs with the polyvaricon flush with the top of the board.
- [ ] Install the poly plate, nylon spacers, long metric screws, and knob as shown in the figures below.



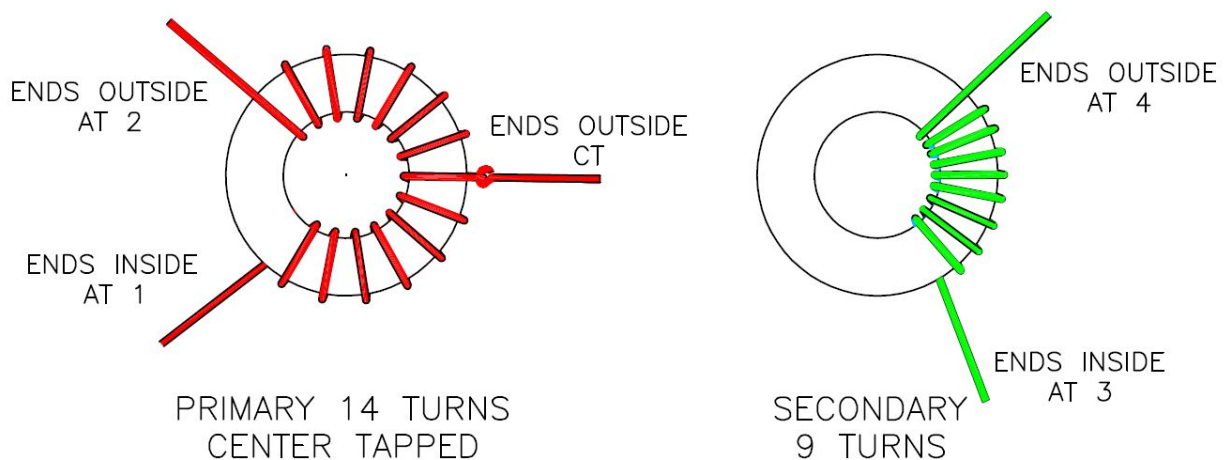
- [ ] Install the hardware posts for the antenna and counterpoise wires, as shown in the figure below. The post screw should be flush with the outside of the securing nut on the back side.



### T1 assembly

The next item to make and install is T1. This T106-2 toroid (red) has a 14 turn center tapped primary, and a 9 turn secondary. We have supplied a total of 10' of 20awg magnet wire for T1 and T2. Proper winding of the transformer will result in the two different windings ending up at the correct positions on the PCB. The secondary winding is on top of the primary winding. The graphic below shows the separate windings and how they are positioned on the T160-2 toroid. Please study the following figures and understand the process before you try winding the transformer.

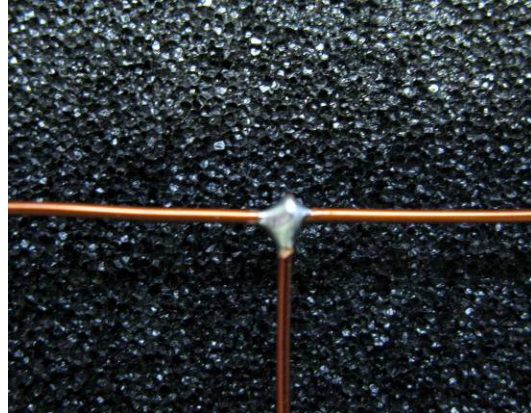
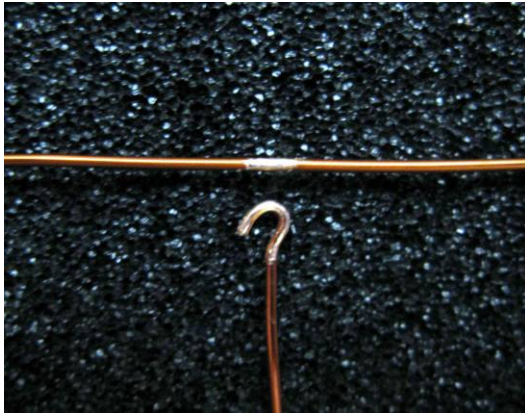
***If a winding does not end up as shown below or is not wound in the same direction as shown below, the tuner will not work properly. Note that the ends of the windings must be over or under the core as shown below.***



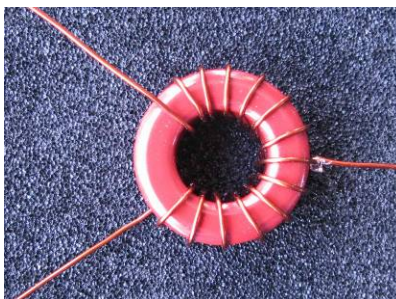
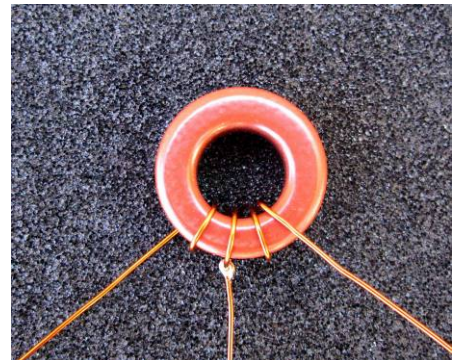
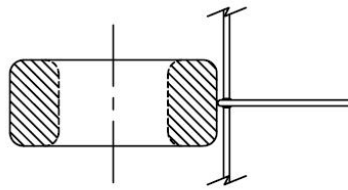
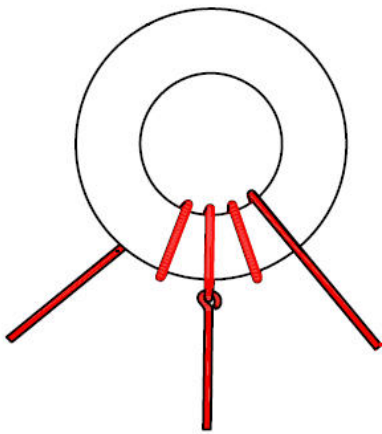
The five pad positions for T1



- [ ] Prepare the primary wire as shown in the figure below. Cut 30" of the supplied red 20awg wire and a 2" piece. Strip the insulation off of the 2" piece for 1/4" and make a small loop that will attach to the center of the 30" long section. On the 30" piece measure to the center (15") and strip off the enamel insulation for 1/8" inch and solder the loop to the center. See photos below.

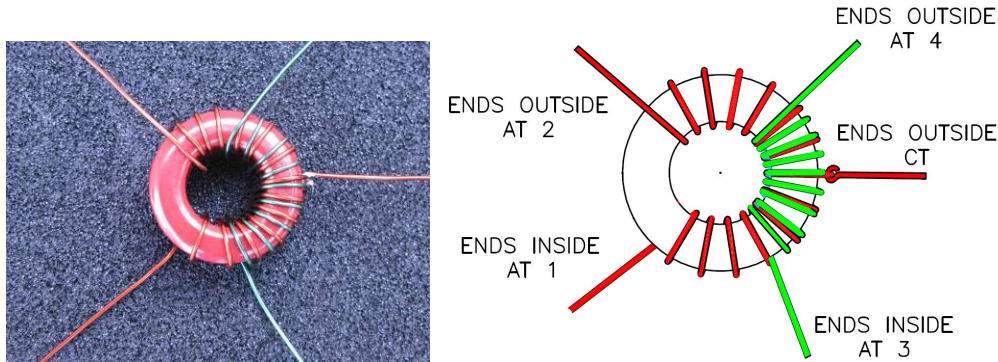


- [ ] Start winding by positioning the tap halfway up the outside of the core and pass the right side winding **up** thru the center of the core and the left side winding **down** thru the center of the core. Wind a couple of turns in each direction and compare it to the graphic and picture below. All three windings will be done with this method. If it doesn't look like this, stop and correct it. Wind a total of 14 turns, seven in each direction. Every time the wire passes through the core, counts as one turn



Completed primary winding, 14 turns

- [ ] Cut another piece of the green 20awg wire 18" long, mark the center at 9" with a marker and Start with the center of the wire along one side of the tap, on the outside, and wind in each direction for a total of 9 turns. Wind the right side **up** thru the center and the left side **down** thru the center of the core. Space the winding so that it ends up about 120° apart, centered on the primary tap as shown below. With 9 turns, one side will have 4, the other 5 turns.



Completed with the 9 turn secondary

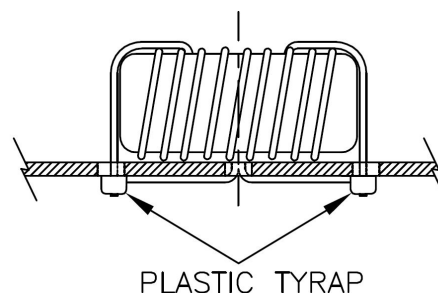
In the picture above, the leads (2,4) above the center tap should exit the core over the top of the toroid and the leads (1,3) below the center tap should exit under the toroid. When all these leads are bent down, they will line up with the lettered pads on the PCB.

- [ ] When you are satisfied you have followed these instructions you may bend the leads down, strip the enamel, and tin the leads. **1** and **3** pass through the PCB on the inner diameter of the toroid. **2,4** and **CT** pass through the PCB on the outer diameter of the toroid. Install on the top side of the board

**Note:**

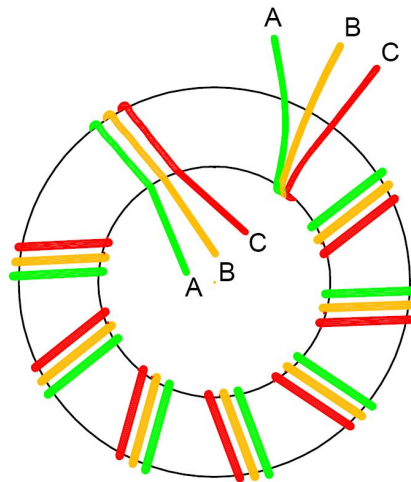
**Strip the enamel by whatever method you like. Burn it off with a lighter, an iron, or scrape, but tin the wire with solder before inserting into the pcb holes. If you lose absolute confidence in the name of the leads, verify their identity with an ohmmeter before proceeding.**

- [ ] Solder the five leads on the backside and trim flush.
- [ ] Secure the T1 toroid to the main board with two of the nylon zip ties.



## T2 assembly

Next to install is T2 that must be wound as shown below.

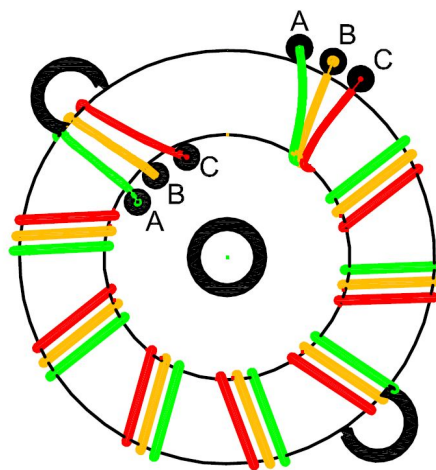


*If a winding does not end up as shown below or is not wound in the same direction as shown below, T2 will not align up with the pads on the pcb. Note that the ends of the windings must be over or under the core as shown.*

Use 18" of each color, and wind a total of "nine" turns for each color. Remember every time a wire goes thru the center is one turn. You can wind the "B" winding then wind the other color on each side.

Bend the wires down and pre-tin the wire in preparation to soldering them to the board. Solder the toroid flush with the top of the board.

Shown below is how it should look when soldered into the board.

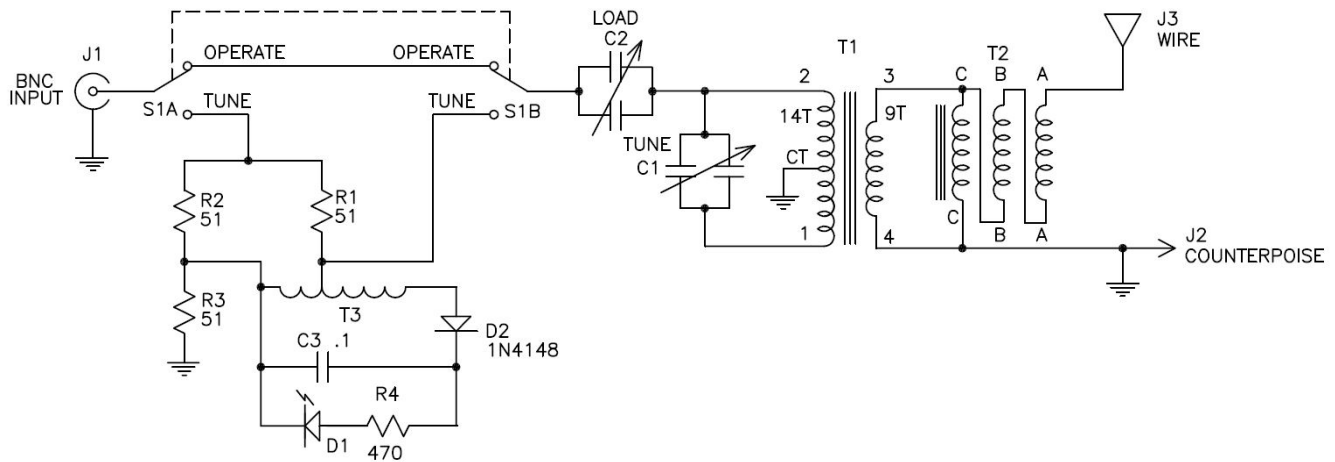


T2

[ ] Retain T2 with two nylon zip ties.

This completes the assembly.

## Schematic:



## Using the antenna:

**Use all the normal cautions throwing wires up in the air near power lines.**

The QRPGuys UnUnTenna Plus covers 40m – 10m. The UnUnTenna Plus is rated at 5W CW, 10 watts PEP max., and incorporates the N7VE 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 T3, the indicator transformer. Just reduce the turns on the side with the most turns from the tap, one or two turns.*

The builder supplies the wire for the driven element and counterpoise. You can use 20awg to 26awg depending what you have available for both wires. There is a BNC female connector for the input from your rig. Use a 29', 35.5', or 41' long non-resonate length of antenna wire for the driven element for all bands. Position the wire as high as practical, either vertical or on an angle. *Be sure to use a counterpoise.* The counterpoise can just be laid on the ground in a straight line. Theoretically the counterpoise can be 1/4 wavelength, but we have found the length of 35 feet works well on the ground for all the bands used. If you have a difficulty on 40m to obtain an optimum SWR, re-arrange the counterpoise or try with none at all. There are 1/4" diameter holes top and bottom to secure the pcb to whatever is handy. The antenna has optimum efficiency at 20m and will be an S unit less in performance at the 40m and 10m ends.

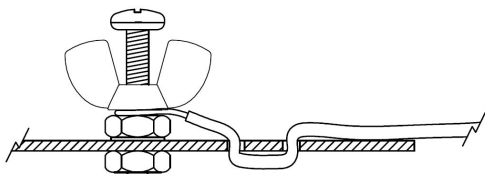
To start, put your rig in *receive* mode, move the slide switch to the "Operate" position and rotate both the "Tune" and "Load" capacitors to hear maximum noise. This will get you in the ballpark. Switch to the "Tune" position and *transmit*. Now you must alternate between the "Tune" and "Load" controls to obtain the *dimmiest* illumination of the led. Switch back to the "Operate" position and you are good to go. *Record the readings of the graduated tuning controls to permit presetting for future deployments.*



Additionally, after the antenna is tuned up, keeping the bridge in the circuit ("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.

You can keep the wires attached at all times using the built-in strain reliefs and winding the two element wires around the pcb for compact storage. *Hint: Use two different color wires and wind the main element and counterpoise separately.* This makes it easier to deploy next time.

Shown below is the strain relief routing for the antenna and counterpoise wires.



Notes:

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