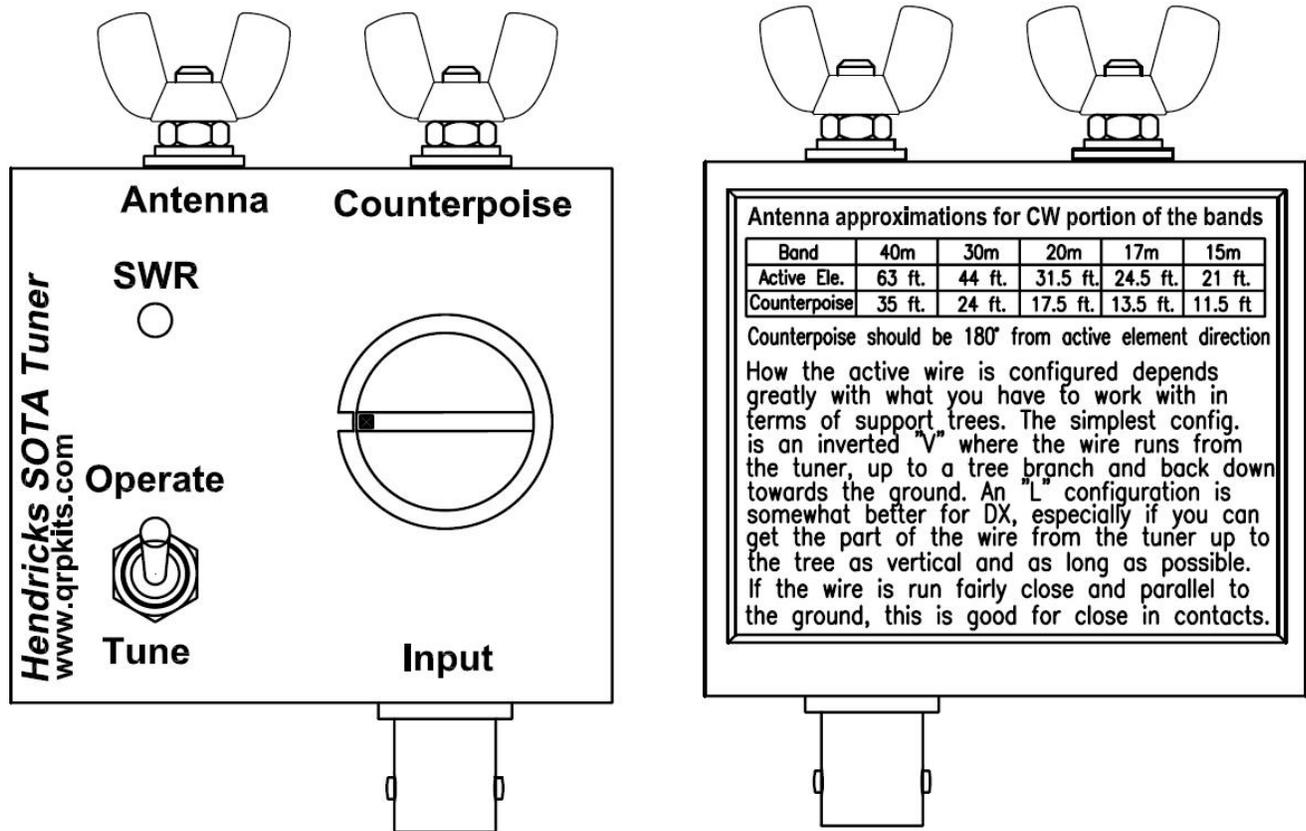


## Hendricks 40m – 15m SOTA Halfwave Tuner

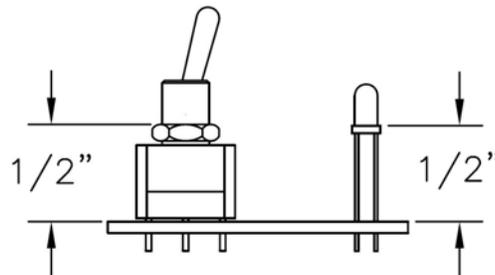


- First, familiarize yourself with the parts and check for all the components.

### Parts Inventory

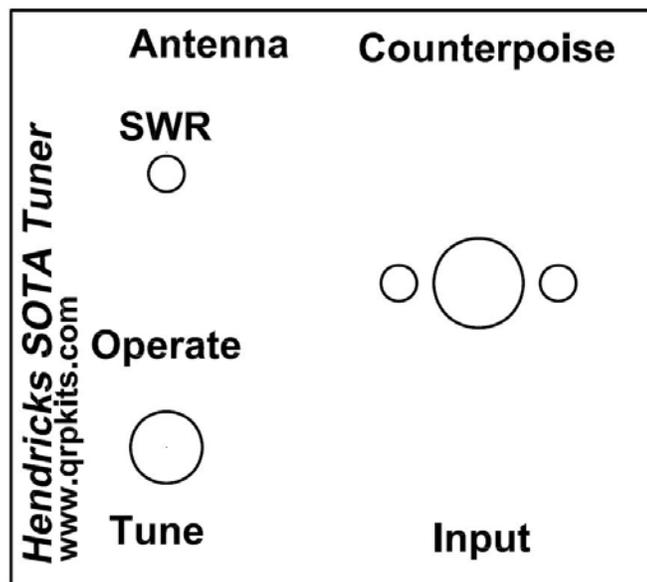
- 1 - Tayloe SWR Indicator kit
- 1 - T50-6 core (yellow)
- 1 - poly-varicon, w/shaft and mounting hardware
- 24" - magnet wire for the toroid
- 2 - 6-32 x 5/8" Philips pan head screw
- 2 - #6 s.s lock washer
- 2 - #6 s.s. flat washer
- 2 - 6-32 s.s. wingnut
- 2 - #6 nylon step washer
- 2 - #8 nylon flat washer
- 2 - #6 tinned solder lug
- 2 - 6-32 s.s. nut
- 2 - 4-40 x 1/4" undercut flat head screw
- 1 - bnc female, chassis mount
- 1 - 1/4" shaft knob
- 18" - 22 AWG hook-up wire
- 1 - chassis
- 1 - decal set

Begin by assembling the Tayloe SWR Indicator Kit. Dan's complete assembly instructions are located in the appendix of this document or on-line at <http://www.qrpkits.com/files/LED SWR 20v1.pdf> .



The last component to solder to the Tayloe SWR board is the LED. Use the above dimensions to locate the lip of the LED, and adjust the inside nut of the switch, for the correct fit to the chassis. Then, set the SWR indicator aside, for now.

The rest of the assembly is done inside the chassis. So, now you need to prepare the chassis with the decals.

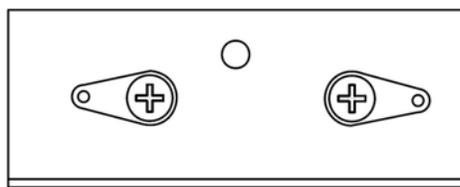
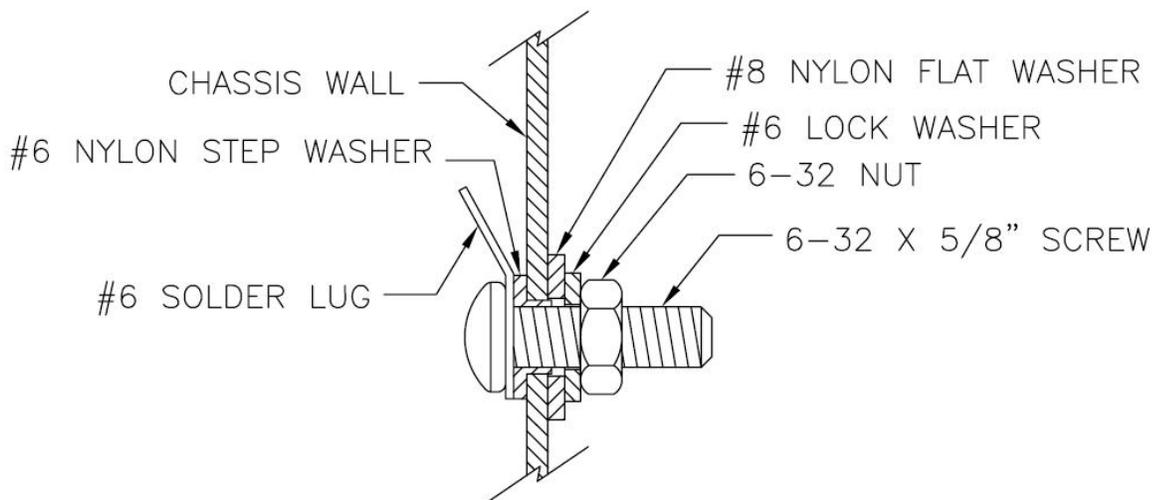


The decals are applied the same as model decals. Cut around each group of text or symbols you wish to apply. It doesn't have to be perfect as the background film is transparent. Apply the decals before you mount anything to the chassis. Use the above picture to get the correct spacing around the holes, as it is very easy to do a great decal installation and have a portion covered up with a knob.

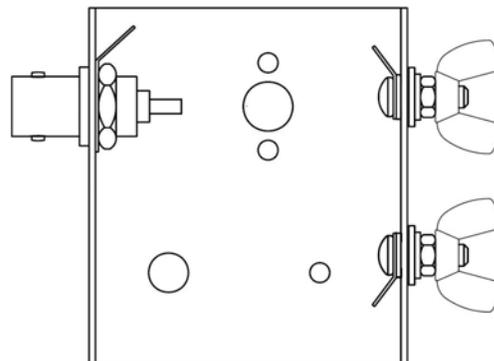
**Thoroughly clean the surface of the panel to remove any oils or contamination. If you do not paint your case, we have found that moving the decals into position on a bare aluminum chassis is more difficult, due to the brushed surface, so we advise pre-coating the chassis with the Krylon clear before applying the decals.**

Trim around the decal. After trimming, place the decal in a bowl of lukewarm water, with a small drop of dish soap to reduce the surface tension, for 10-15 seconds. Using tweezers, handle carefully to avoid tearing. Start to slide the decal off to the side of the backing paper, and place the unsupported edge of the decal close to the final location. Hold the edge of the decal against the panel, with your finger, and slide the paper out from under the decal. You can slide the decal around to the right position, as it will float slightly on the film of water. Use a knife point or something sharp to do this. When in position, hold the edge of the decal with your finger and gently squeegee excess water out from under the decal with a tissue or paper towel. Work from the center, to both sides. Remove any bubbles by blotting or wiping gently to the sides. Do this for each decal, and take your time. Allow to set overnight, or speed drying by placing near a fan for a few of hours. When dry, spray two **light** coats of matte finish, Krylon, clear to seal and protect the decals, and allow to dry in between coats. All decals come with two complete sets, in case you mess one up.

Allow plenty of time for the clear spray to harden up, and continue as follows:

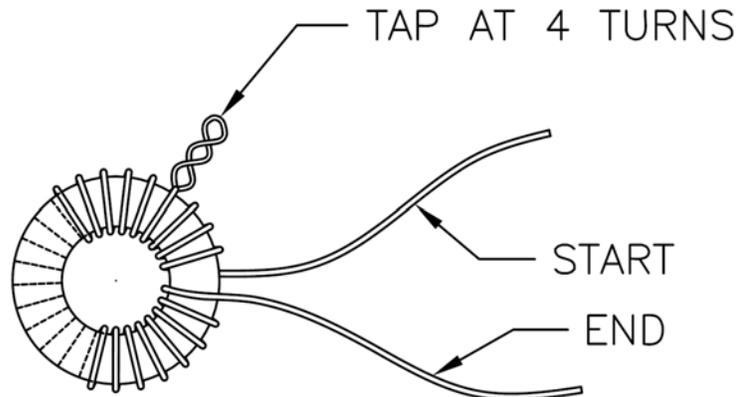


AS VIEWED FROM THE INSIDE

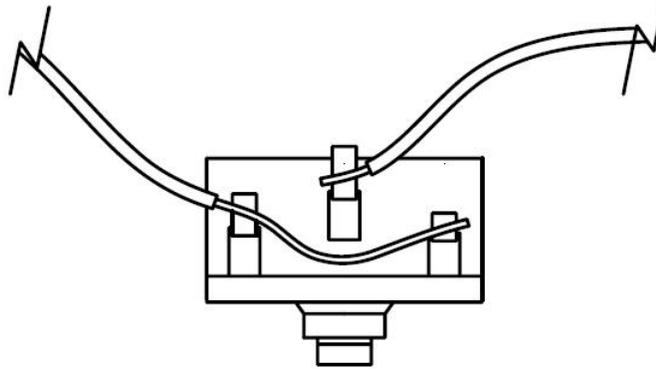


- Using the above details, assemble the two antenna connections and the bnc connector to the chassis cover. The nylon step washers keep the antenna connections insulated from the aluminum chassis. Position the solder tabs as shown, and angled down slightly, so that the antenna lug does not short against the PEM nut when the case is assembled.

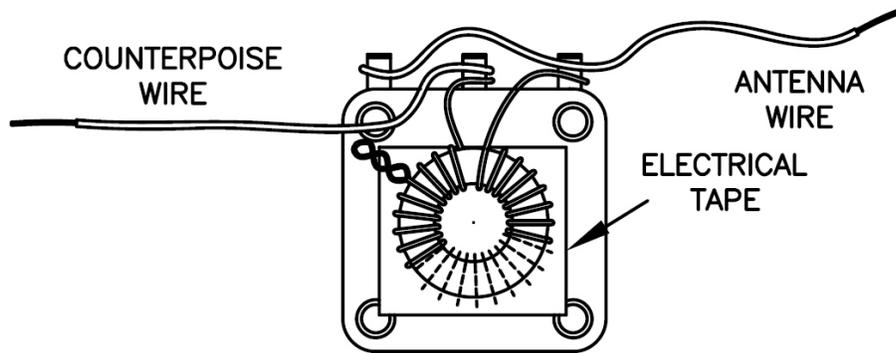
**Check to see that there is no continuity between the lugs and the case.**



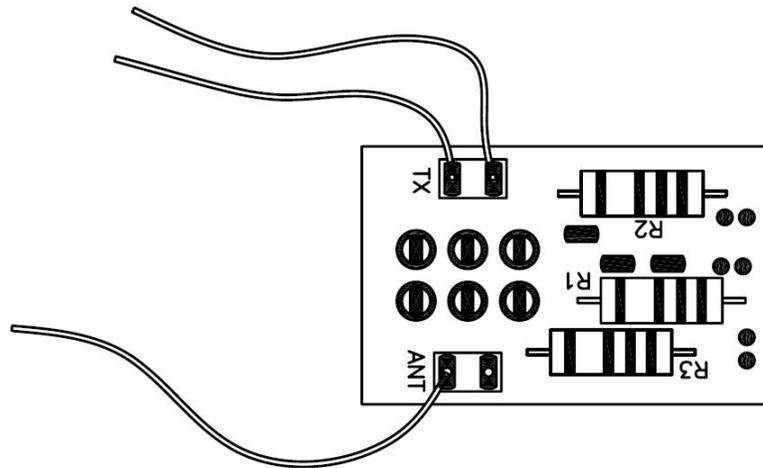
- Wind L1, using the T50-6 yellow toroid, and the enclosed magnet wire, with 28 turns total, and a tap at 4 turns from the "START" end. Remember, every time the wire passes through the center of the toroid, counts as one turn.



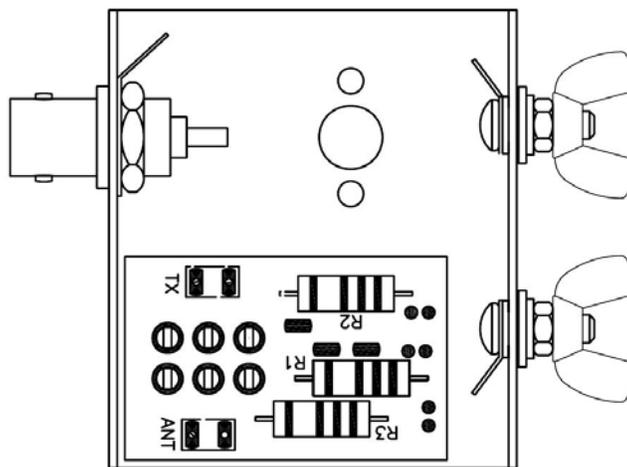
- Pre-wire the Poly-varicon as shown with 2" pieces of the hook-up wire. This puts the two sections of the poly-varicon in parallel. At this time, adjust the small trimmers on the back of the poly-varicon for half engagement.



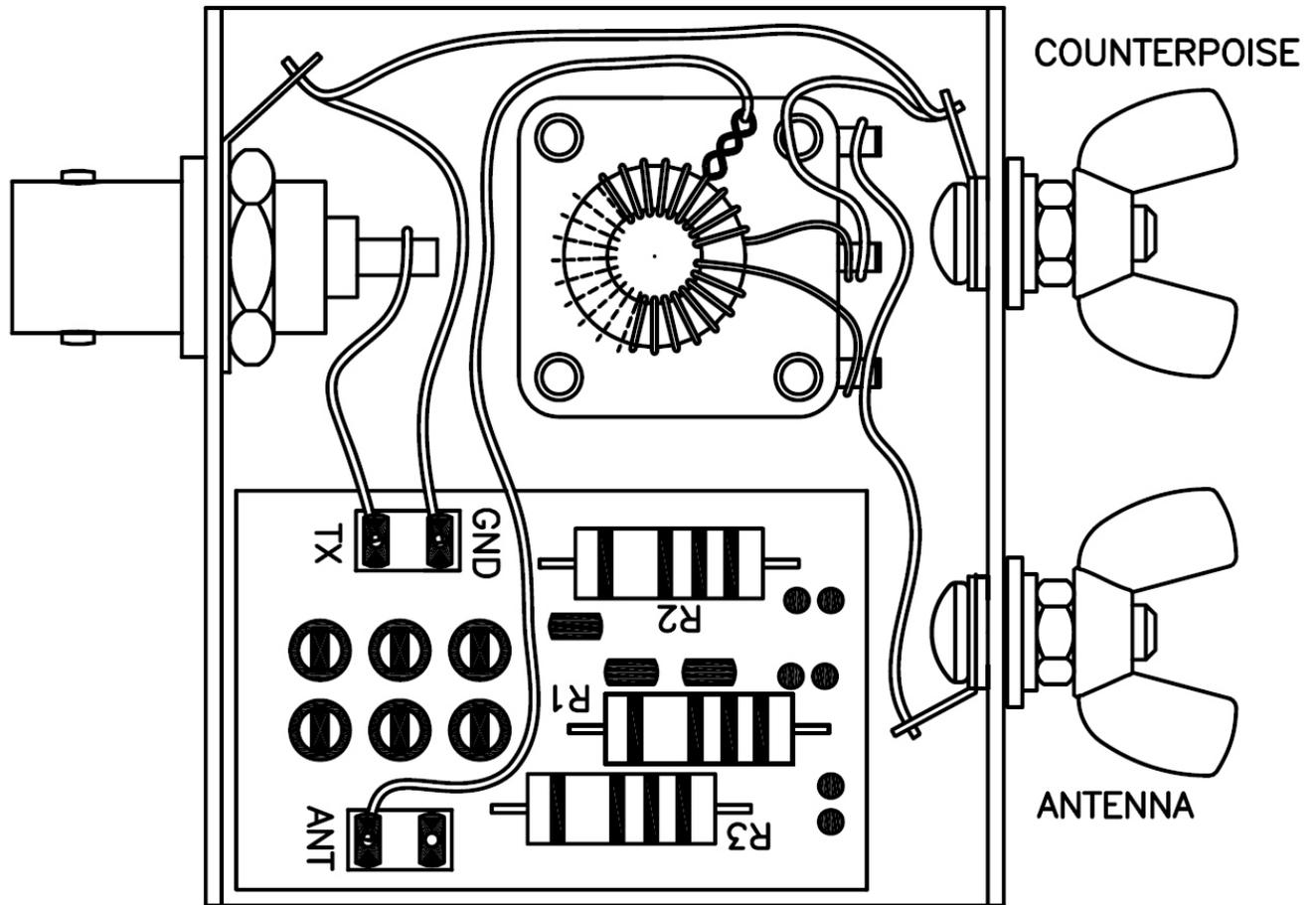
- Put a small piece of electrical tape on the back of the poly-varicon. This will act as a surface to secure the toroid. Wire the toroid to the poly-varicon as shown, and secure it with a couple of drops of hotmelt glue or suitable adhesive. Mount the shaft and center screw provided.



- Pre-wire the Taylor SWR indicator as shown with 3" long pieces of hook-up wire.



- Install the pre-wired Taylor SWR indicator as shown, and secure it to the chassis with the remaining toggle switch nut.



- Study the above picture carefully to complete the final interconnections.

1. Mount the poly-varicon/toroid assembly to the chassis cover, with the two 2.6mm screws.
2. Solder the wire from center connection of the poly-varicon to the counterpoise lug.
3. Solder the wire from the side connection of the poly-varicon to the antenna lug.
4. Solder the "ANT" wire from the swr indicator center connection of the BNC connector.
5. Solder the "TX" wire from the swr indicator center connection of the BNC connector.
6. Solder the "GND" wire from the swr indicator to the BNC ground lug.

**Before proceeding test with the toggle switch in the "OPERATE" position, there should be no continuity between the wingnuts and the case.**

7. Now, solder a wire from the BNC ground lug to the counterpoise ground lug.
8. Fit the bottom half of the case to the top and secure it with the two flat head 4-40 screws.
9. Install the knob on the poly-varicon shaft

Antenna approximations for CW portion of the bands					
Band	40m	30m	20m	17m	15m
Active Ele.	63 ft.	44 ft.	31.5 ft.	24.5 ft.	21 ft.
Counterpoise	35 ft.	24 ft.	17.5 ft.	13.5 ft.	11.5 ft.

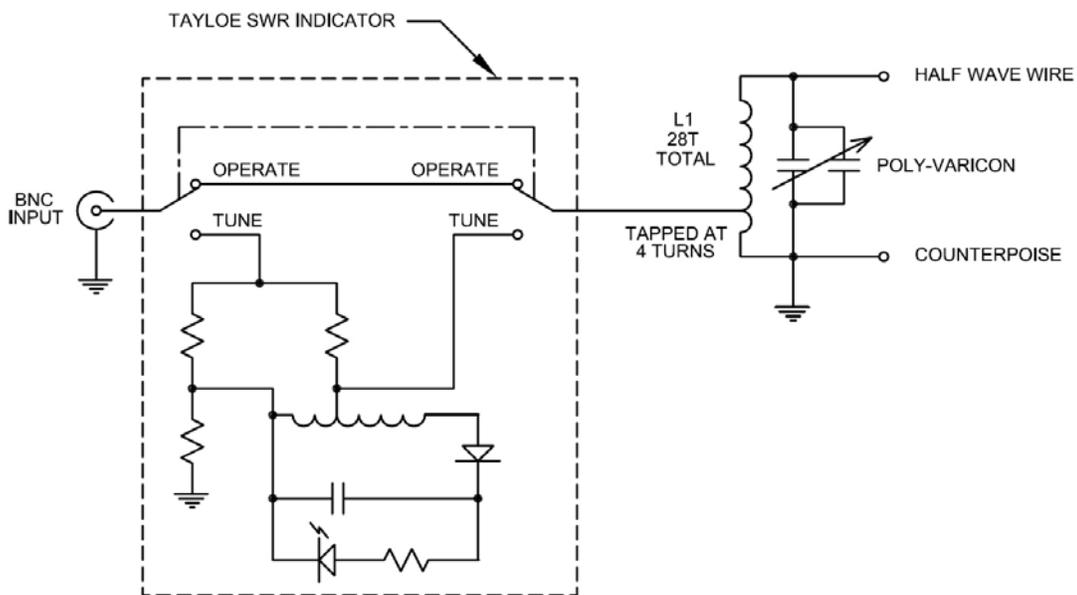
Counterpoise should be 180° from active element direction

How the active wire is configured depends greatly with what you have to work with in terms of support trees. The simplest config. is an inverted "V" where the wire runs from the tuner, up to a tree branch and back down towards the ground. An "L" configuration is somewhat better for DX, especially if you can get the part of the wire from the tuner up to the tree as vertical and as long as possible. If the wire is run fairly close and parallel to the ground, this is good for close in contacts.

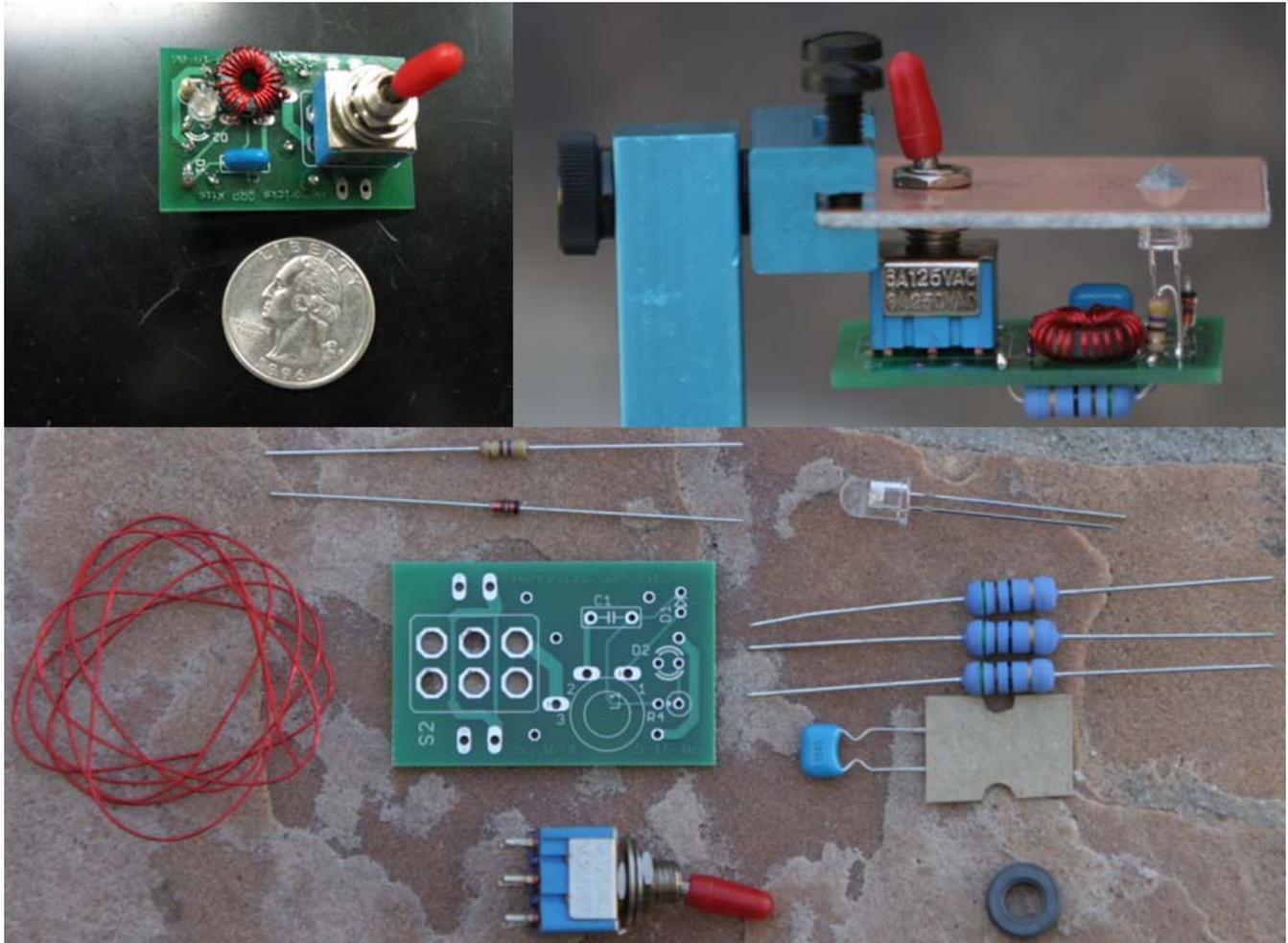
Print out the above label, and scale if necessary to fit the bottom of the chassis. Cover it with a piece of clear packaging tape, and attach it with two-sided tape.

### Using your Hendricks SOTA Halfwave Tuner

Use some light weight wire and start with the lengths suggested, for the band you wish to operate. How the wire is configured depends greatly what you have to work with in terms of support 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 for the active element is somewhat better for DX, especially if you can get the part of the wire from the tuner up to the tree as vertical as possible. If the wire is run fairly close to the ground, it favors close in contacts. Try to keep the counterpoise 180 degrees from the active element.



Schematic



# *N7VE LED SWR Bridge*

## *Hendricks QRP Kits*

A simple, rugged and lightweight SWR bridge

by Dan Tayloe, N7VE

## ***Table of Contents***

Kit Parts .....	3
Building the LED SWR bridge.....	3
RF step up transformer.....	4
Other top mounted parts.....	6
Bottom mounted parts.....	7
DPDT Switch mounted.....	8
Mounting the board to a case.....	9
Attaching the switch to the case.....	9
Initial DC tests .....	10
Initial RF tests.....	10
Usage – <i>Caution! QRP power only! ~ 5w max!</i> .....	10

## ***List of Figures***

Figure 1. Kit bag of parts right out of the box .....	3
Figure 2. Contents of the bag identified.....	3
Figure 3. FT37-43 RF step up transformer with first 5 turns. Make loop for 5T tap. ....	4
Figure 4. 25 turns total totally fills the core.....	4
Figure 5. Close up view of the RF step up transformer with dressed leads.....	5
Figure 6. RF step up transformer mounted on the PCB.....	5
Figure 7. Double check after mounting that the inductor is mounted properly.....	6
Figure 8. Mounting D1, R4, and C1. Note the position and band orientation of the mounted D1 .....	6
Figure 9. Pre-form the leads of the three 51 ohm resistors as shown .....	7
Figure 10. Three 51 ohm power resistors mounted on the bottom side of the PC board .....	7
Figure 11. Switch shown mounted on the top side. ....	8
Figure 12. Switch mounted to simulated front panel. LED not soldered yet.....	9
Figure 13. LED mounted and soldered to PCB. ....	9

## Kit Parts

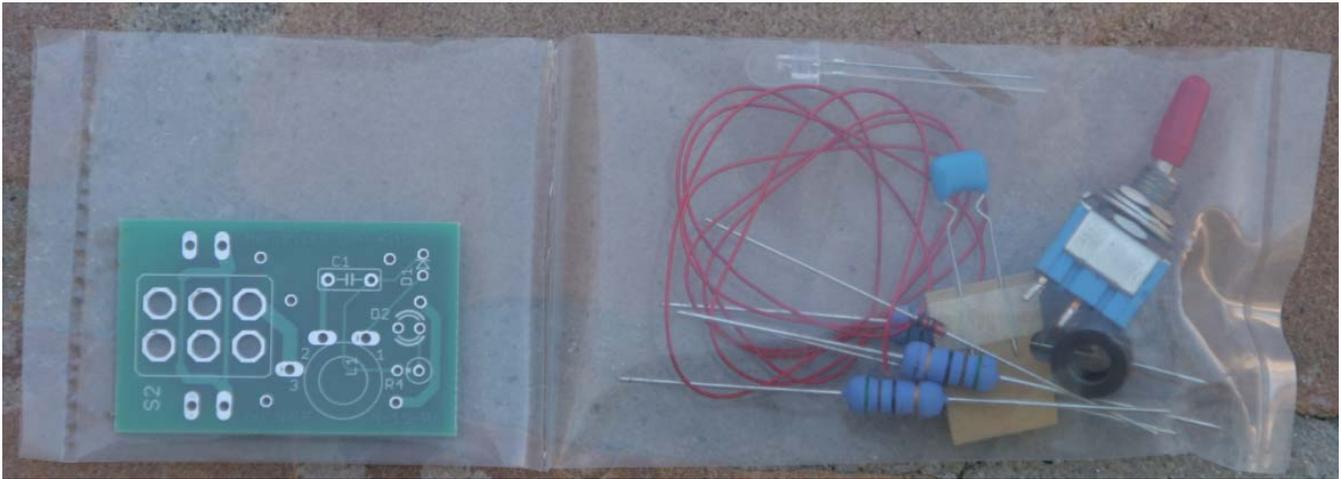


Figure 1. Kit bag of parts right out of the box

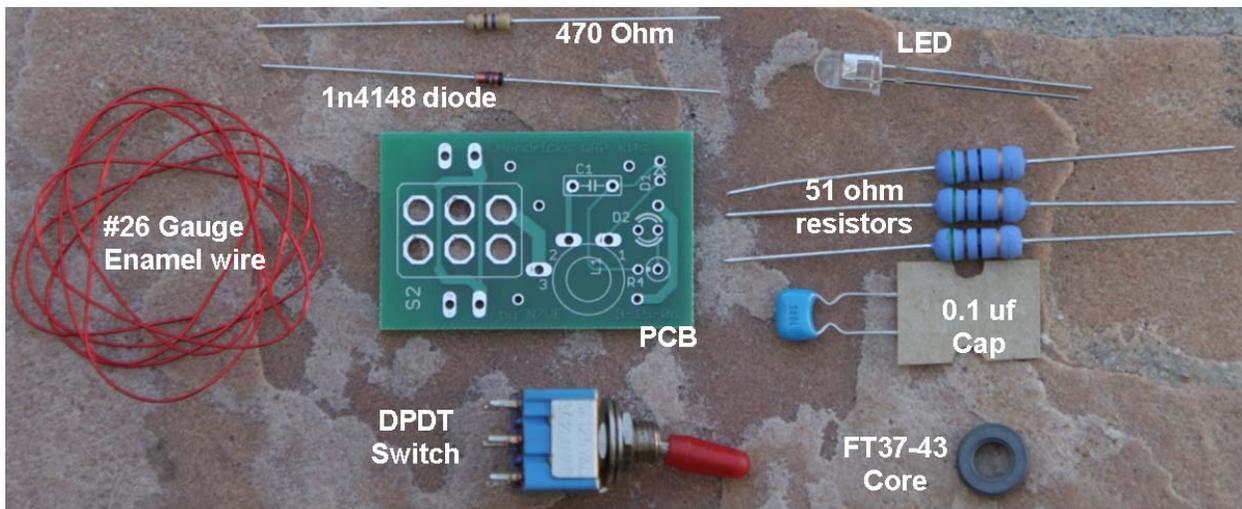


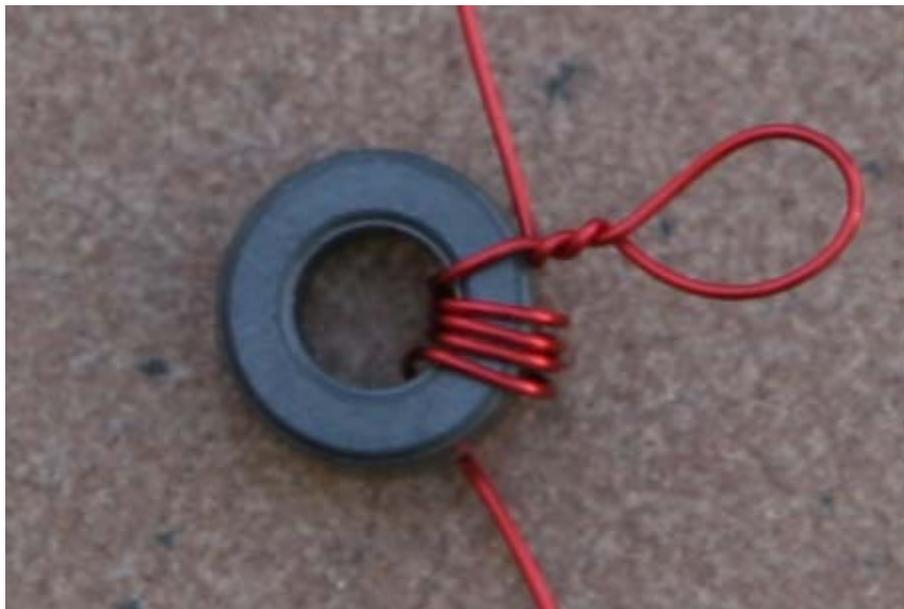
Figure 2. Contents of the bag identified

## Building the LED SWR bridge

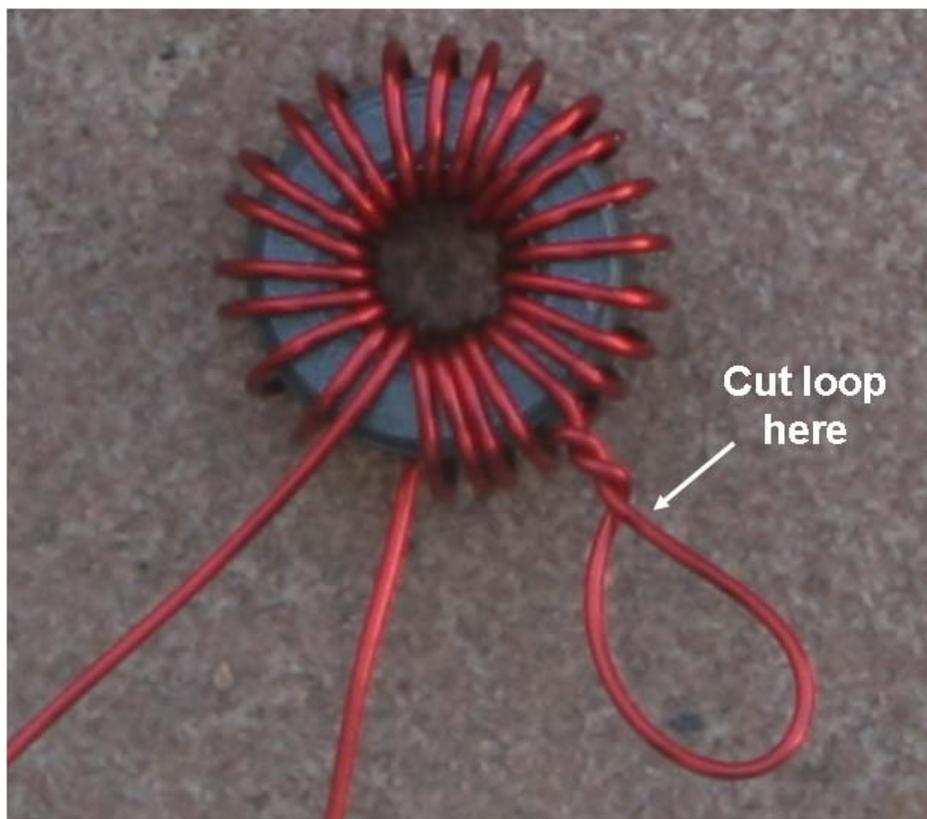
***Note: Order is important: LED last; Switch next to last, 51 ohm power resistors just before that.***

***Note: This bridge is for QRP only! 5w average power (10w PEP) max!***

## ***RF step up transformer***



**Figure 3. FT37-43 RF step up transformer with first 5 turns. Make loop for 5T tap.**



**Figure 4. 25 turns total totally fills the core.**

After winding the RF step up transformer as above, clip one side of the 5T tap loop. Next trim the leads as shown below:

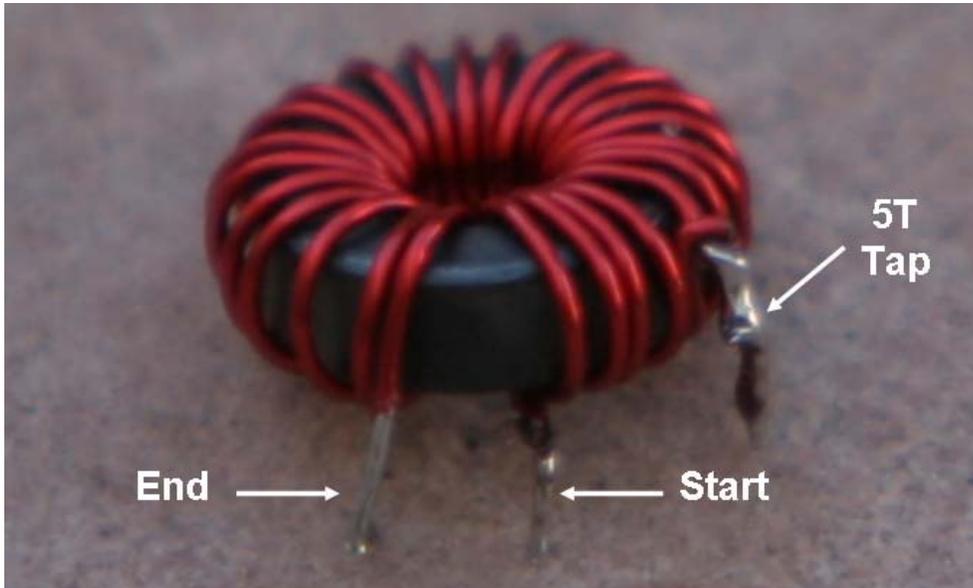


Figure 5. Close up view of the RF step up transformer with dressed leads

*After dressing the leads as above, take an ohm-meter, place it across the “start” and “end” leads above, and make sure that the ohm-meter shows a short (0 ohms).* If this is not the case, the twisted leads at the 5T tap have not been properly soldered together.

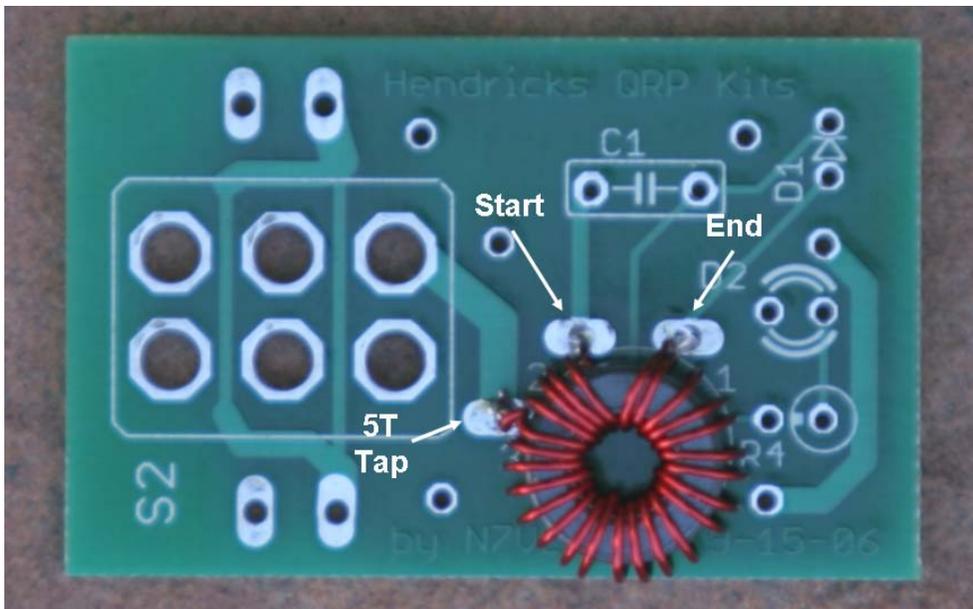


Figure 6. RF step up transformer mounted on the PCB

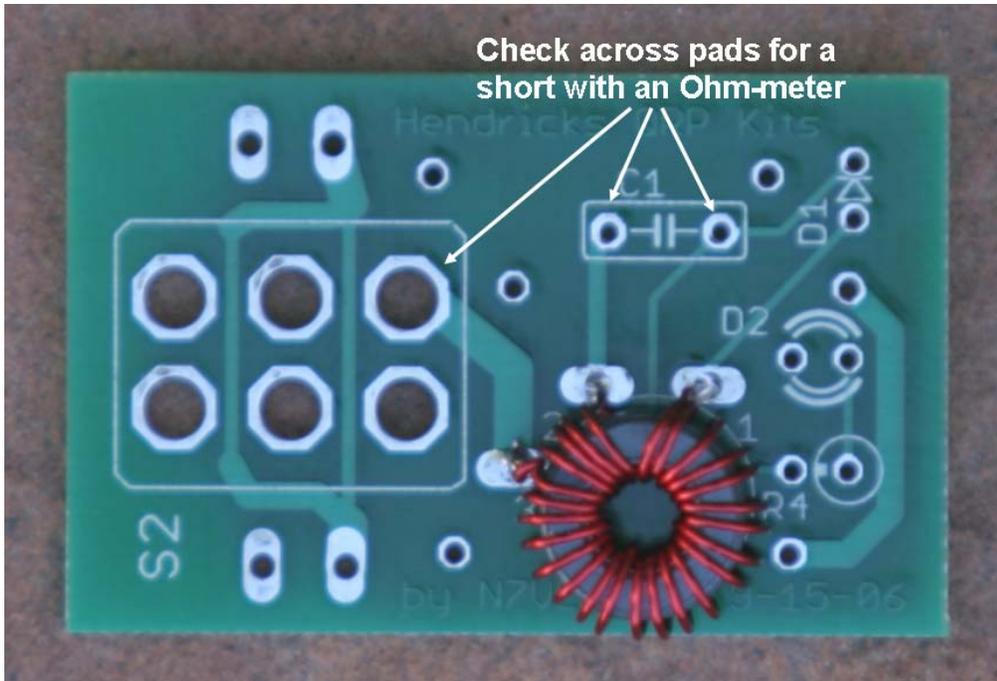


Figure 7. Double check after mounting that the inductor is mounted properly. These pads must be shorted!

Using a ohm-meter check the three pads above to make sure that all of these pads show a short to each other. This makes sure that the RF step up transformer has been constructed and mounted properly.

### ***Other top mounted parts***

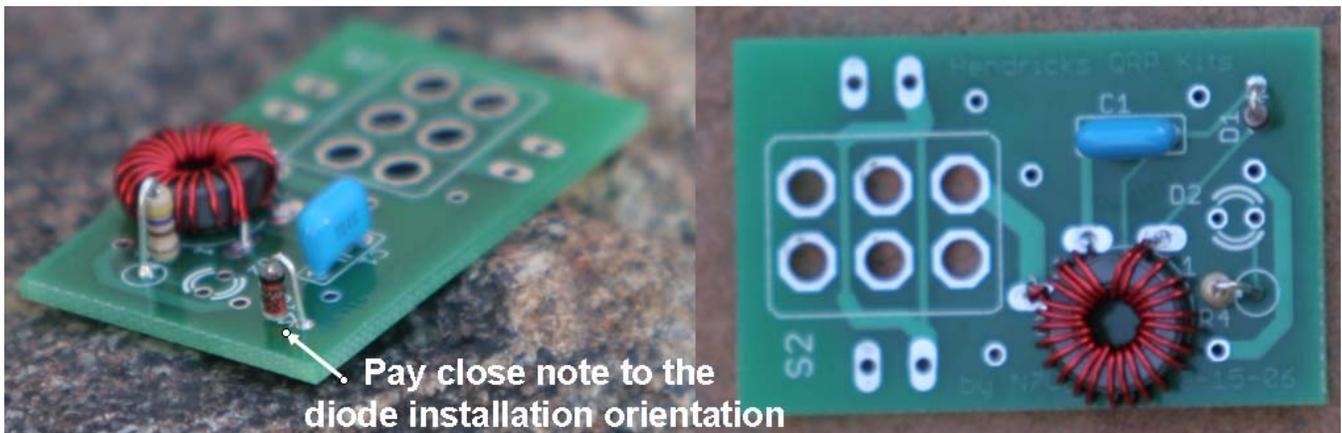


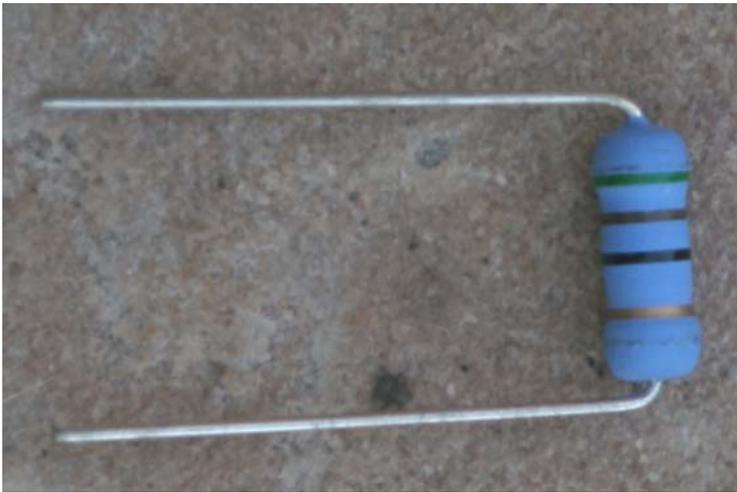
Figure 8. Mounting D1, R4, and C1. Note the position and band orientation of the mounted D1

C1 has some crimps that I straightened out in order to mount it more flush to the top of the board as shown. R4 gets mounted now also

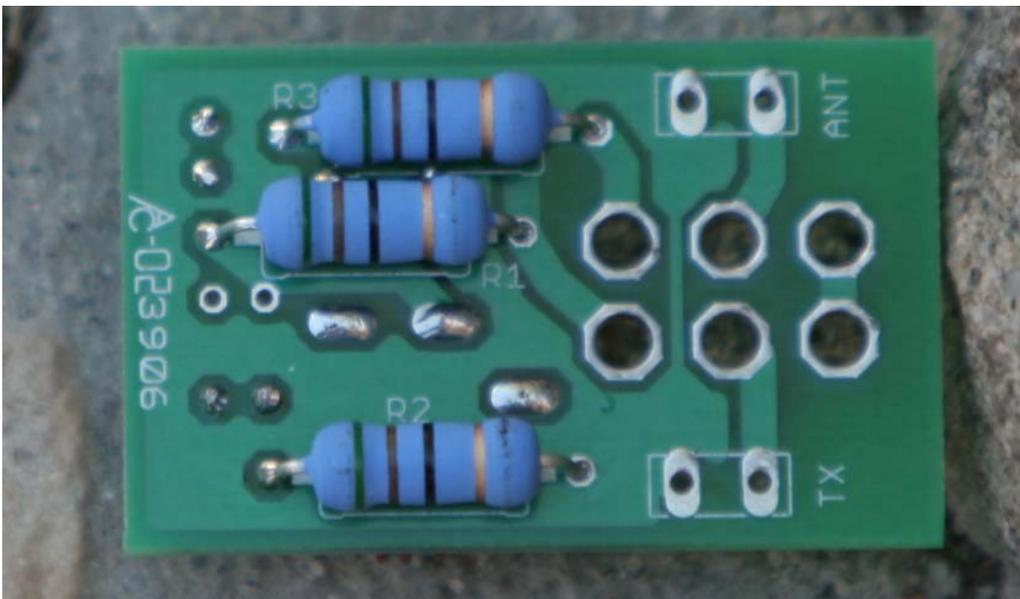
***Make very, very sure diode D1 is mounted as shown above.*** D1 is mounted on end, with the band oriented up as shown.

***The LED does not get mounted until the very last step! Do not mount the switch yet!***

### **Bottom mounted parts**

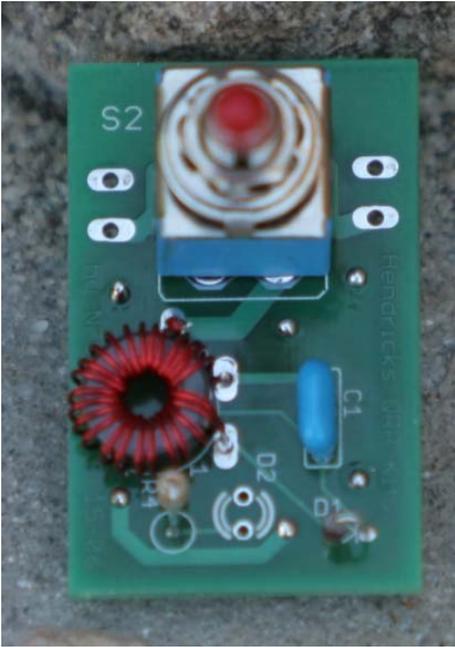


**Figure 9.** Pre-form the leads of the three 51 ohm resistors as shown



**Figure 10.** Three 51 ohm power resistors mounted on the bottom side of the PC board

## ***DPDT Switch mounted***



**Figure 11. Switch shown mounted on the top side.**

It is a bit hard to keep the switch flat while soldering it down. I suggest soldering down one corner, making sure the switch is flat, then soldering the opposite corner, and double checking the switch is indeed flat and level before finally soldering it down.

Do not despair if you don't get the switch completely level. It affects nothing but aesthetics as the board mounts using the switch hardware.

***Note the LED is not mounted yet.***

## Mounting the board to a case

### Attaching the switch to the case

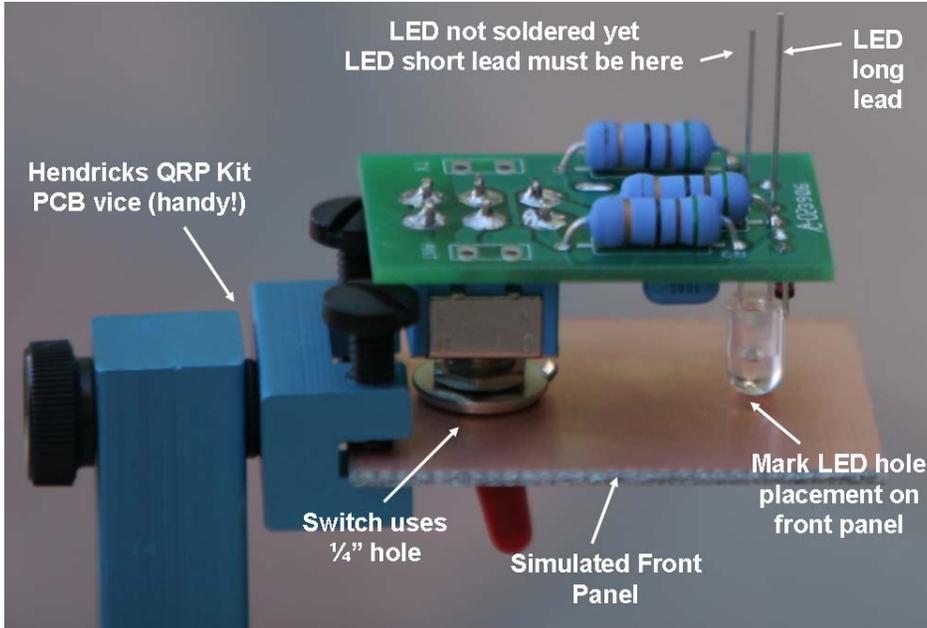


Figure 12. Switch mounted to simulated front panel. LED not soldered yet.

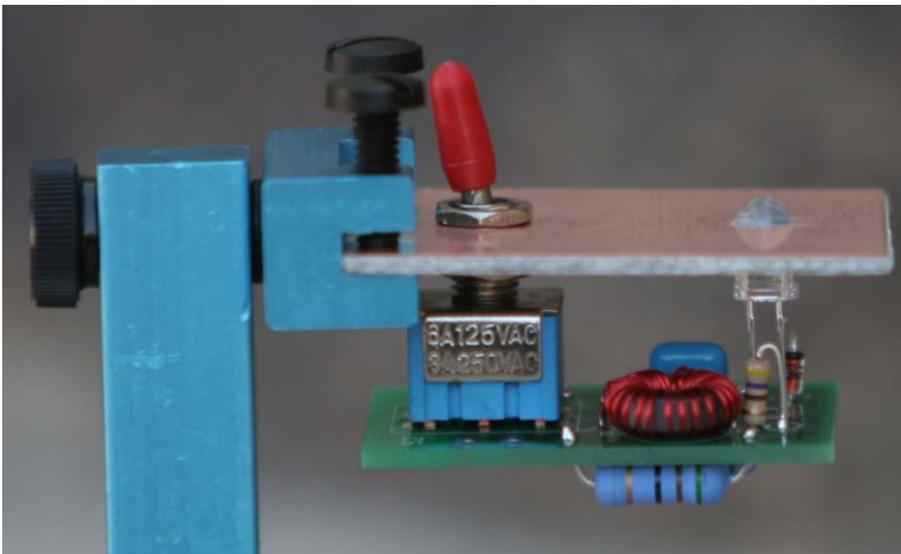


Figure 13. LED mounted and soldered to PCB.

The LED shown here is larger than that actually supplied. I personally like the smaller one better. I drilled the hole slightly smaller than the LED, then gradually enlarged the LED hole by spinning a tapered file in it until I got a snug press fit of the LED in its hole. Alternative epoxy could be used.

## Initial DC tests

Place an ohm-meter across the terminals marked “TX”. With the toggle handle *away* from the LED (as shown in the figure above), the ohm-meter should show 75 ohms. In this position, the SWR bridge is *in* the circuit, allowing SWR readings to be taken.

Place an ohm-meter across the terminals marked “TX”. With the toggle handle *towards* from the LED (as shown in the figure above), the ohm-meter should show an open circuit. In this position, the SWR bridge is *out* the circuit. This is the “operate” position that is used after the antenna has been tuned for best SWR.

Place an ohm-meter across the terminals marked “ANT”. With the toggle handle *away* from the LED (as shown in the figure above), the ohm-meter should show 51 ohms.

Place an ohm-meter across the terminals marked “ANT”. With the toggle handle *towards* from the LED (as shown in the figure above), the ohm-meter should show an open circuit.

## Initial RF tests

This test makes sure that both the diode D1 and the LED have been installed with the same polarity. If one of these were to be installed backwards, the LED will never light.

Connect a **QRP** transmitter (*5w max!*) to the TX terminal. Leave the antenna connection open. Make sure the switch is positioned away from the LED (SWR bridge is in the circuit). Send a single “dit” on the QRP transmitter and make sure the LED lights up. No antenna is a worst case SWR situation.

Optionally, a 50 ohm load can be connected to the antenna side, and another single ‘dit’ and make sure the LED is either out or very dim.

## Usage – **Caution! QRP power only! ~ 5w max!**

An LED SWR bridge is almost always used with an antenna tuner. When tuning up an antenna using an antenna tuner, first listen to the band background noise on the receiver, and try to peak the band noise using the tuner controls. This should get the tuner in the ballpark.

Next place the LED SWR bridge into the circuit by placing the switch *away from* the LED. I suggest tuning up by sending a series of dots. A series of dots will keep your transmitter PA finals from overheating, as well as pulsing the LED on. Now adjust the tuner to get the minimum LED brightness. Even a dim LED is a very good SWR level. The normal situation is to adjust the tuner until the LED goes out. This indicates a very good match.

After the antenna is tuned up, switch the bridge out of the circuit by flipping the switch handle *towards* the LED. Keeping the bridge in the circuit 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.