

# *N7VE LED SWR Bridge*

## *Hendricks QRP Kits*

A simple, rugged and lightweight SWR bridge

by Dan Tayloe, N7VE

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## Kit Parts

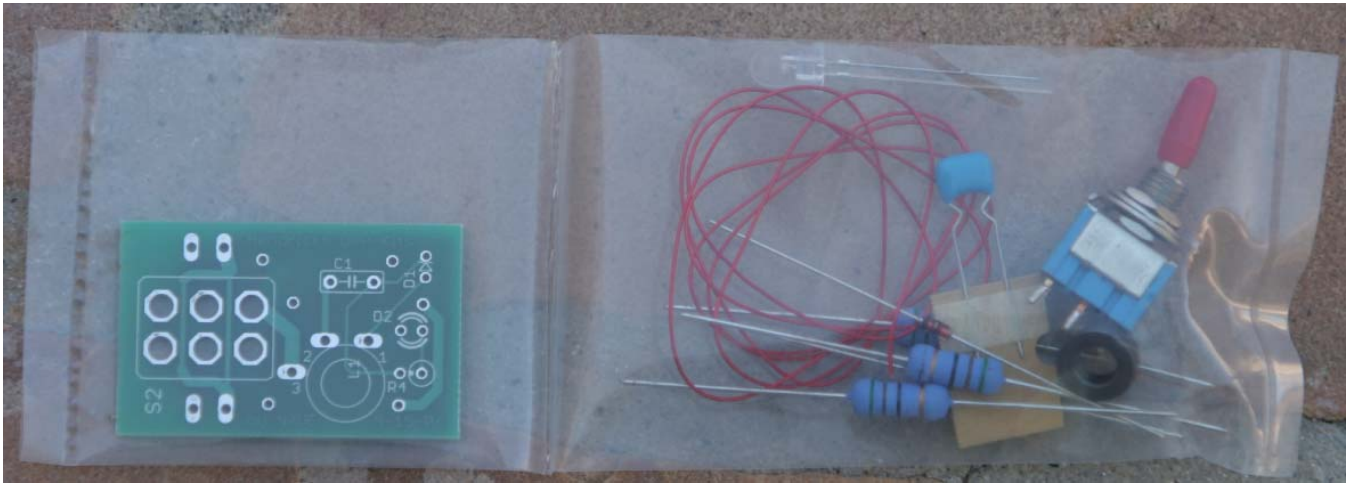


Figure 1. Kit bag of parts right out of the box

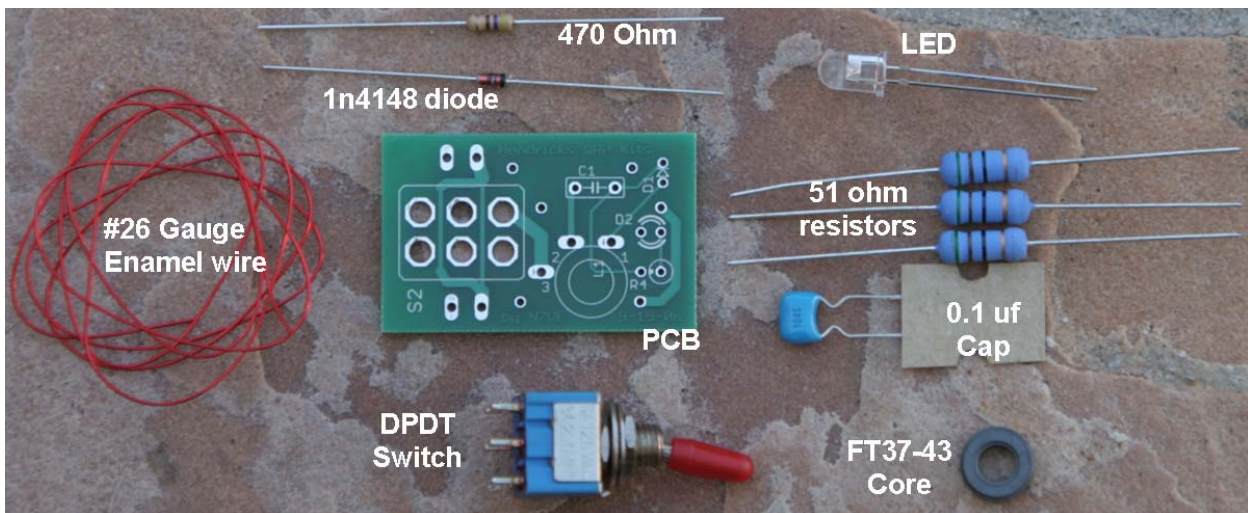


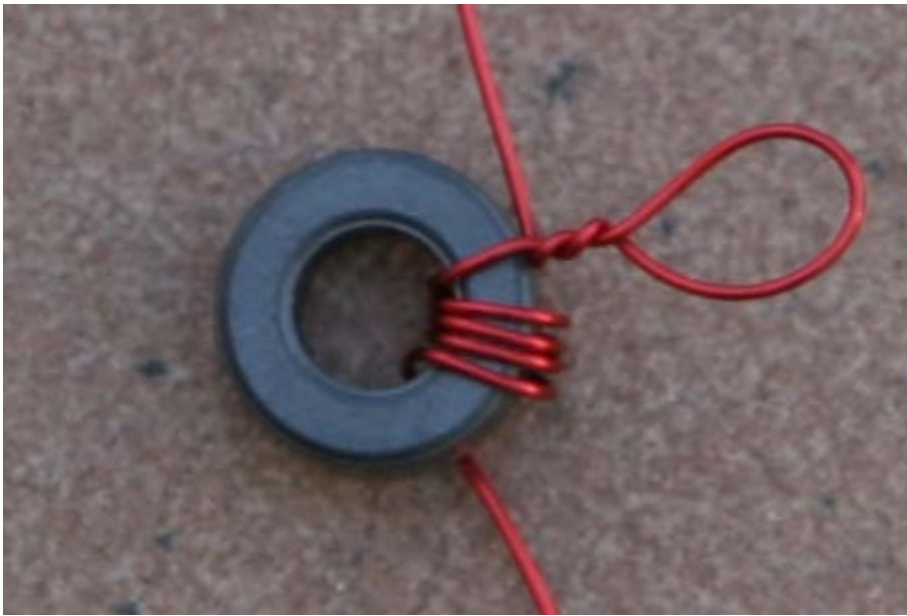
Figure 2. Contents of the bag identified

## Building the LED SWR bridge

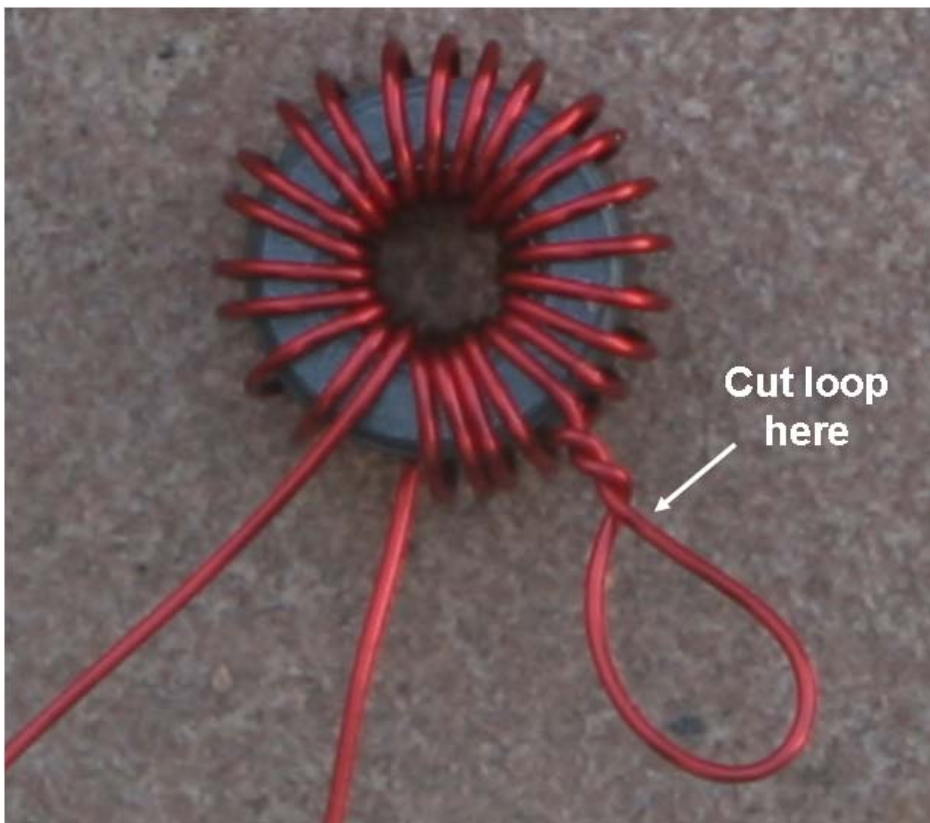
**Note: Order is important: LED last; Switch next to last, 51 ohm power resistors just before that.**

**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:

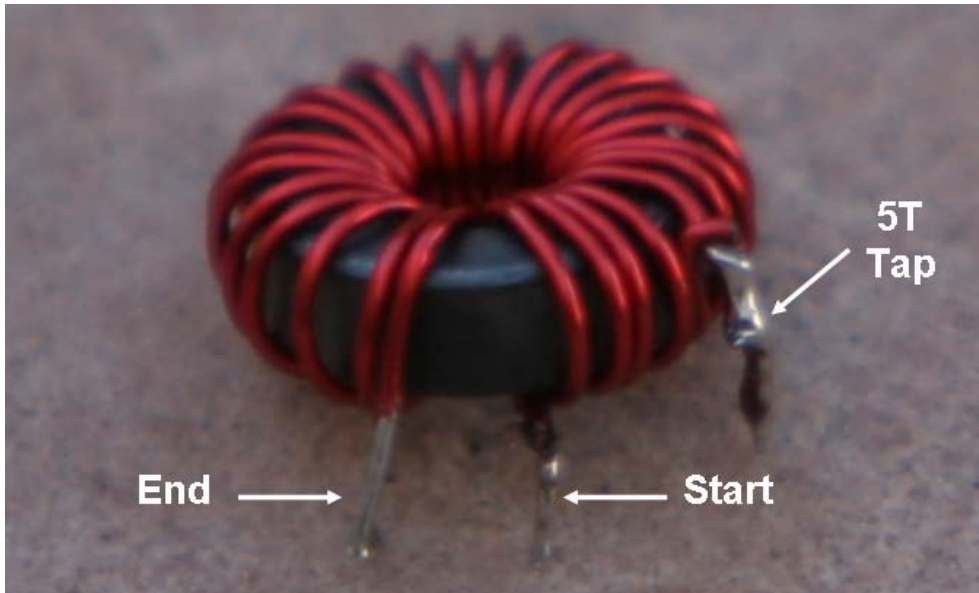


Figure 5. Close up view of the RF step up transformer with dressed leads

*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.

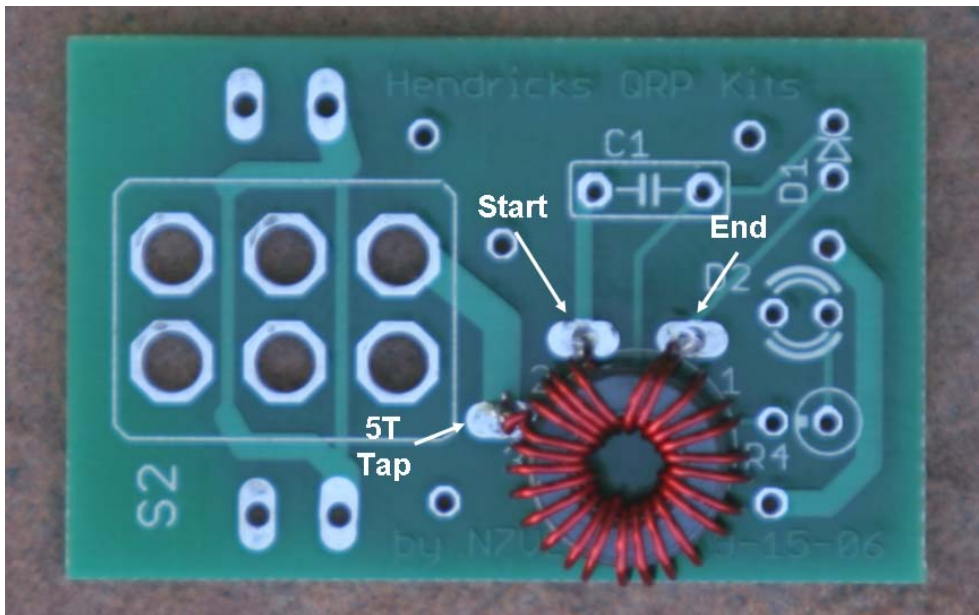


Figure 6. RF step up transformer mounted on the PCB

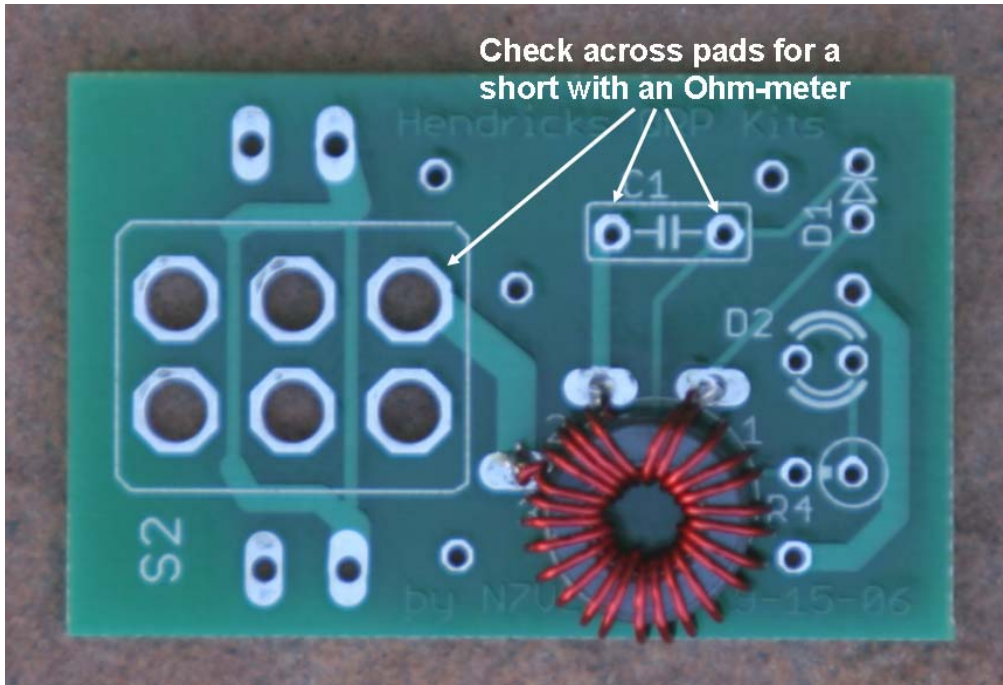


Figure 7. Double check after mounting that the inductor is mounted properly. These pads must be shorted!

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

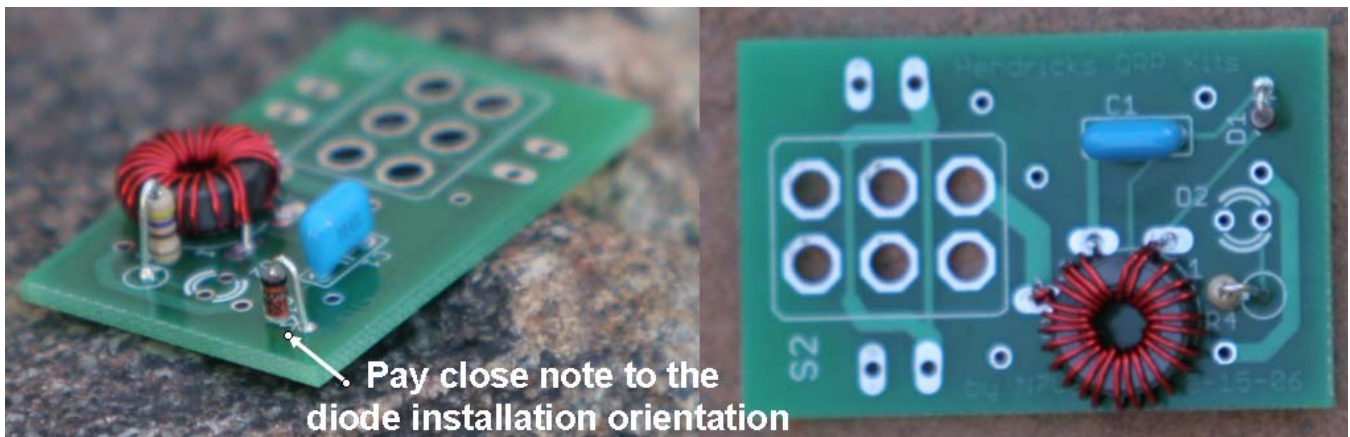


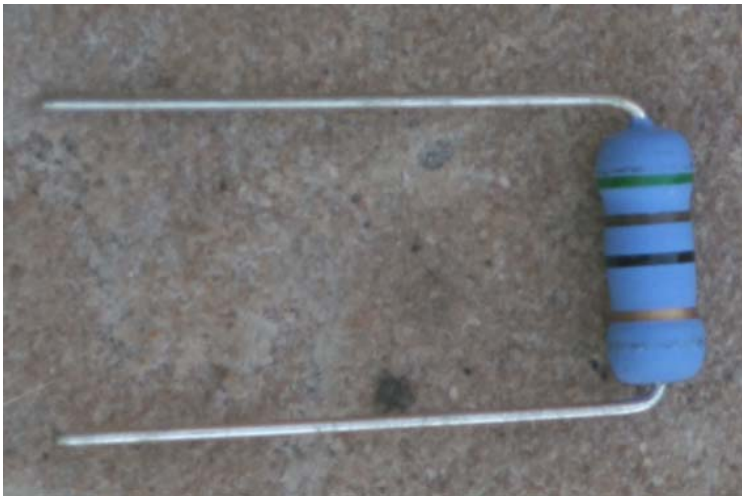
Figure 8. Mounting D1, R4, and C1. Note the position and band orientation of the mounted D1

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

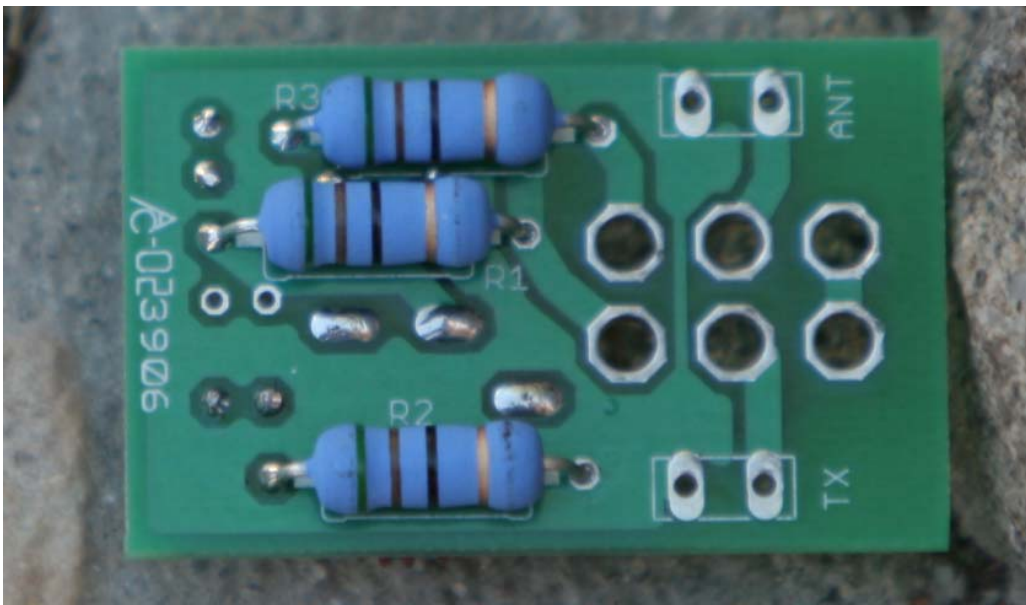
***Make very, very sure diode D1 is mounted as shown above.*** D1 is mounted on end, with the band oriented up as shown.

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

### **Bottom mounted parts**

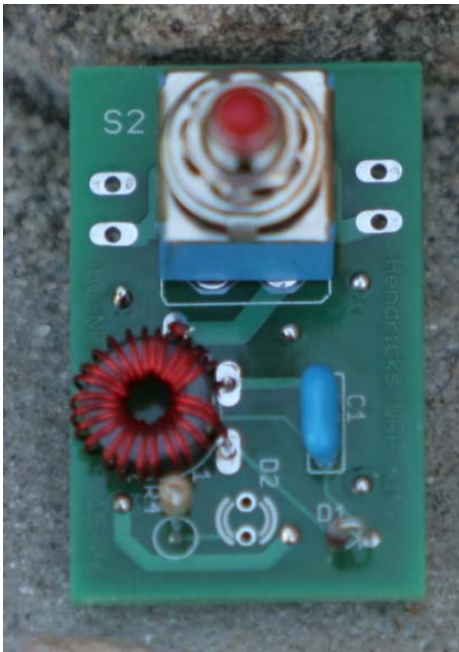


**Figure 9.** Pre-form the leads of the three 51 ohm resistors as shown



**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

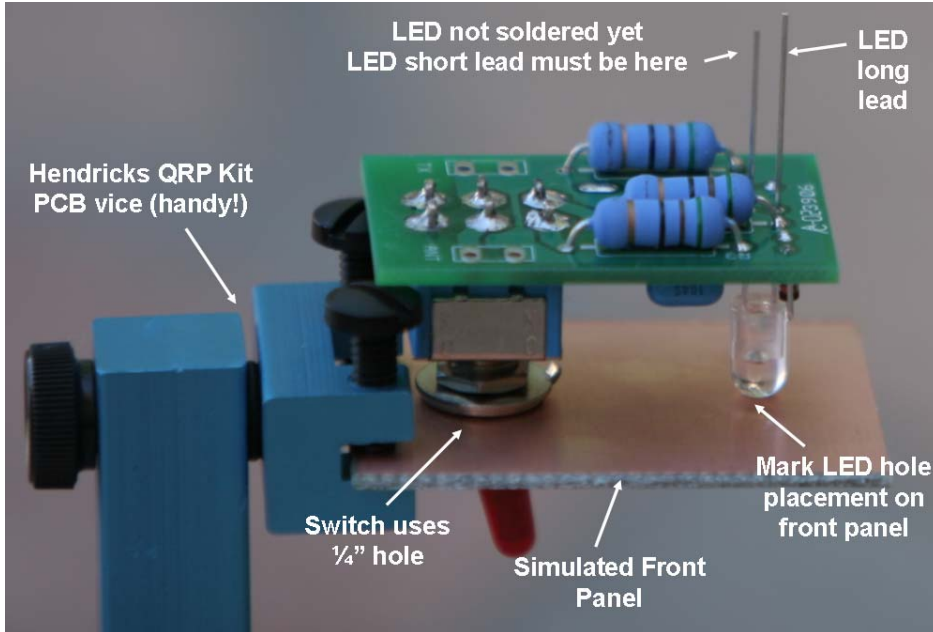


Figure 12. Switch mounted to simulated front panel. LED not soldered yet.

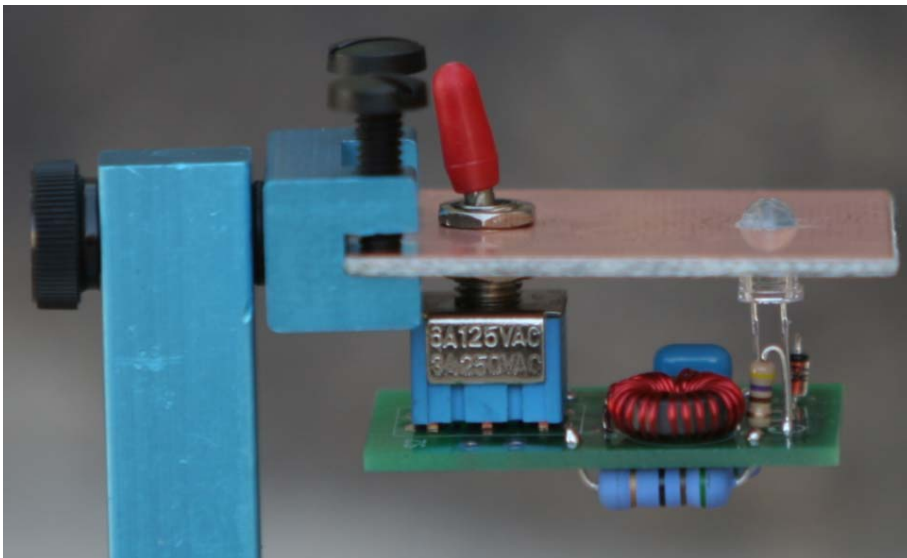


Figure 13. LED mounted and soldered to PCB.

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.