

Homebrewing the HFI 2016 SWR Meter

SP Bhatnagar, VU2SPF

Bhavnagar, Gujarat

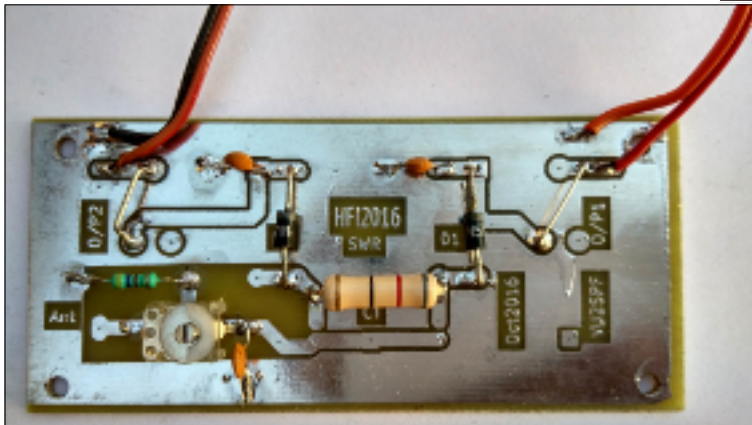
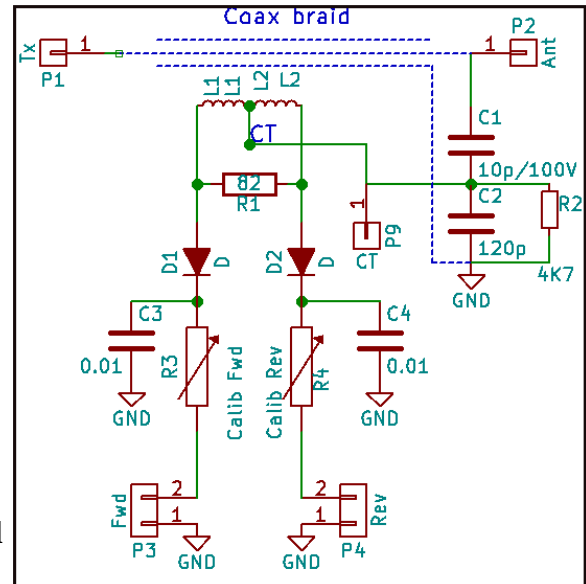
vu2spf@gmail.com

Homebrewing: Many hams enjoy building and using their own equipment. The Joy of making by ones own hand is to be felt and cannot be described. One only needs a few basic tools and components to jump into the game of Homebrewing. Help is abundantly available from many Hams and of course on the Internet. Homebrewing is both an Art and Science.

SWR Meter : An SWR meter provides information about how well matched is your antenna with the transmitter and how well power is being radiated.

We are going to show how a SWR meter can be made at home with very few resources. This can even be a beginner's project and can provide a lot of enjoyment and satisfaction of building and using a useful tool at very reasonable cost.

Looking at its circuit diagram, it needs only a few resistors, capacitor and diodes with a sensing coil. This is a standard design and nothing original is claimed here. It provides an indication of Forward and Reflected power and not absolute power measurements. With



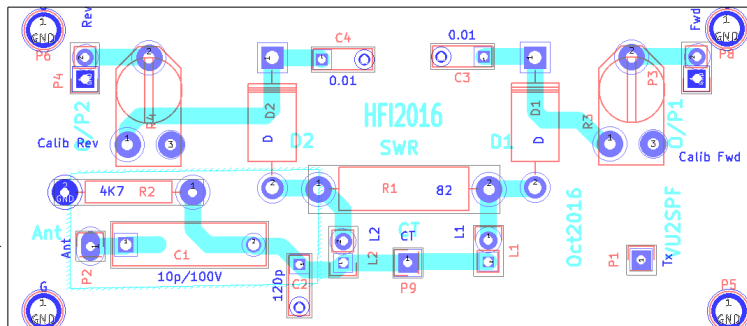
some additional simple circuitry it can be modified to indicate power too. A lot of information is on Internet.

A special PCB to commemorate 25th HFI (2016), has been created for this SWR meter using Kicad (a free PCB creation program). The PCB with overlay is shown in the next diagram. Step by step instructions for assembling the SWR meter are given later. All components are

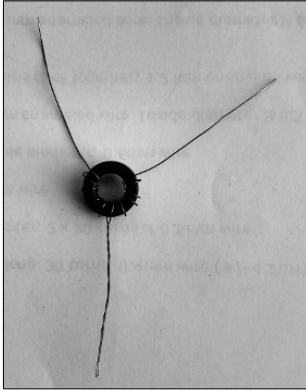
mounted on the track side on the PCB.

Picture of populated PCB on left and its overlay below show component positions on PCB. Take care during soldering. Inspect and verify again after finishing.

Construction: In the circuit diagram L1 and L2 are combined sensing coil which sample the RF current passing through the cable. Both of these are wound on FT50-



43 toroid. For winding the L1 and L2 take an insulated wire of about 30 cm. Start winding it from one end and after 5 turns create a tap of about 5 cm length. Continue winding the wire in the same direction for 5 more turns. Scrap off the insulation with a knife at both the ends and at the tap for soldering, tin these three ends. The two ends are identified as L1 and L2 while the tap is called CT (center tap) on the PCB. On PCB, the lower ends of L1 and L2 connectors are already connected with CT and so not used, only the upper part is connected to ends of the two coils.

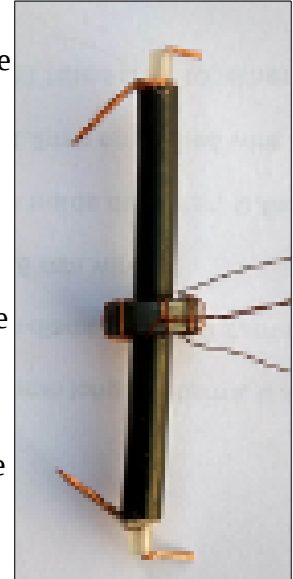


In place of C1 (10pf / 100V) fixed capacitor we can use a trimmer capacitor which can withstand 100V. The PCB tracks can accommodate most of the trimmer caps.

The diodes are used for RF rectification and along with the capacitors of 0.01 uF, they provide DC voltage proportional to RF voltage at their Anodes. Any Germanium diode (e.g. 1N60) or Schottky diode (e.g. 1N5711) are suitable. If working at higher

powers even Silicon diodes (e.g. 1N4148) work fine.

The R3 and R4 variable resistors are usually not needed and are kept only to be used if required. These should be shorted with small pieces of insulated wires or 100 ohm resistors.



Take a 10 cm long piece (choose length depending upon your enclosure) of RG58 or similar coaxial cable and strip the outer insulation of about 1 cm from both ends exposing the braid. Loosen the braid and slip out the inner conductor with its insulation. Wrap the braid into a tight bundle like a thick wire. Now strip about 5 mm of the inner insulation at both the ends. The exposed inner conductors will be soldered to SO239 / BNC connectors for antenna and Tx so tin these.

Box: Any general purpose metal box may be used. Or one can get a box made at the local fabricator / workshop from Aluminum Sheet or MS sheet. The box should have 2 holes for connectors (SO239 /BNC etc), a Meter, a Toggle switch and a Pot. An example is given here.

Once all the components are soldered in place we are ready to connect the meter, current limiting or Setting potentiometer and a Forward / Reverse selection switch as shown in next figure, on the front panel of the box.



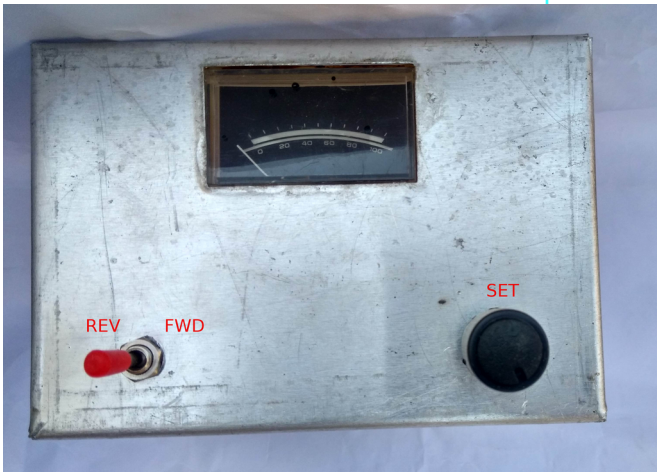
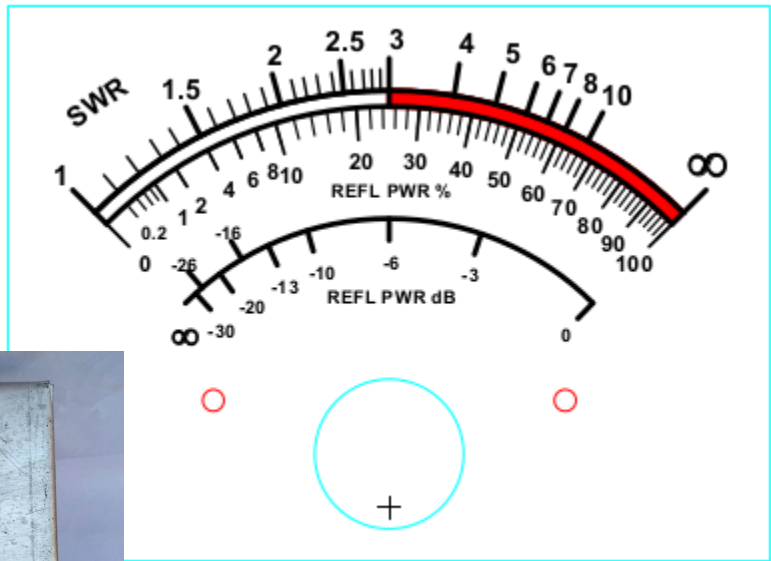
Slip on the sensing coil on the piece of coaxial cable and solder between the SO239/BNC connectors mounted in the box.

METER : Any 100 uA meter can be used with this. The scale can be redrawn based on the method given below. Keep in mind that the small VU meters are good as indicators but may not be linear. Since SWR is a ratio we can mark on meter face the SWR by load resistor only.

Testing: Connect the Tx input of SWR meter to Tx output and Ant to known 50 ohm load.

Bring down the power of Tx to 10 W. Apply stable continuous signal (like CW or input from an oscillator). Put Fwd/Rev Switch on FWD position and using Set control bring the meter needle on Max (infinity). Now switch to Rev position, the meter should read 1 (almost zero deflection) , indicating 1:1 SWR on matched 50 ohm load. If another 100 ohm load is connected to Ant terminal the SWR should be 1:2. Mark the positions of 1 and 2 SWR on meter panel.

Meter Scale can be drawn by hand or by using some program like Galva, available on the net. Another good method may be to scan the existing scale and modify it by any paint program. Print on good paper and stick on the original scale. Take great care in removing the scale of the meter or while refitting it back, as the pointer is very very very delicate. You may copy and resize the meter scale shown along side.



How to Use: Connect the output of Tx to Tx input on SWR meter and Antenna to Antenna Output of SWR meter. Lower down the power level to 10W or less. Switch to FWD side and key the Tx or apply a constant tone. Use SET knob to take

pointer to Infinity on right most marker on the meter. Now switch to REV side and read the SWR directly.

A copy of the original better quality photos and this document is on vu2spf.blogspot.com.

List of Materials: (Except box with SO239/BNC)

Sr	Description	Qty	Sr	Description	Qty	Sr	Description	Qty
1	Ft 43-50 Toroid	1	5	82 Ohm 2 W Res	1	9	Switch	1
2	Trimmer Cap 20pf	1	6	0.01uf cap	2	10	10K Pot	1
3	220pf cap	1	7	Diode	2	11	Meter	1
4	4k7 resistor	1	8	Coax Cable	1	12	Insulated Wire	1