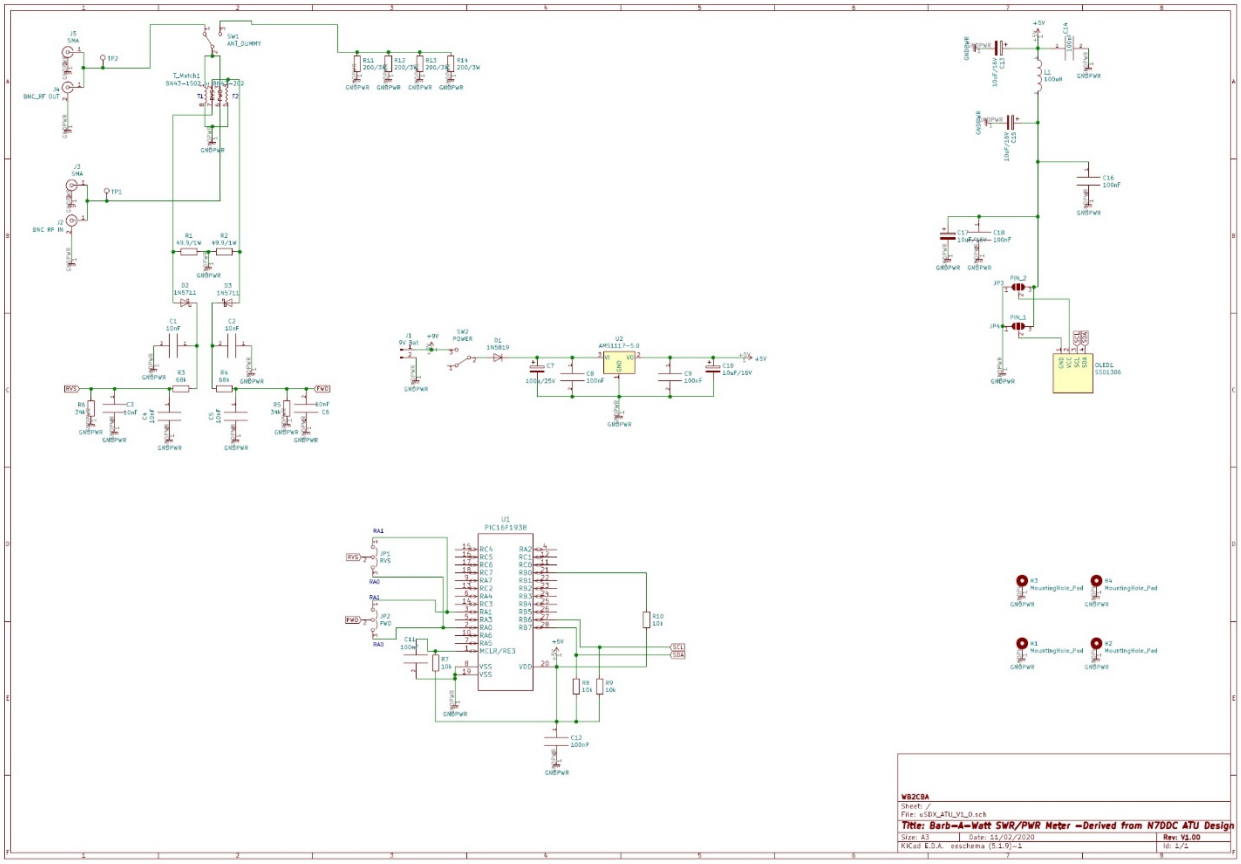
Barb-A-Watt – QRP RF POWER and SWR MONITOR

Barb-A-Watt is a QRP RF Power and SWR monitor to be used as a companion measuring device for measuring actual RF power output from QRP Transceiver, actual power to the antenna, SWR and power output efficiency at once during a QSO. It also has a built in dummy load that can be used up to 10 Watts to measure RF output power.

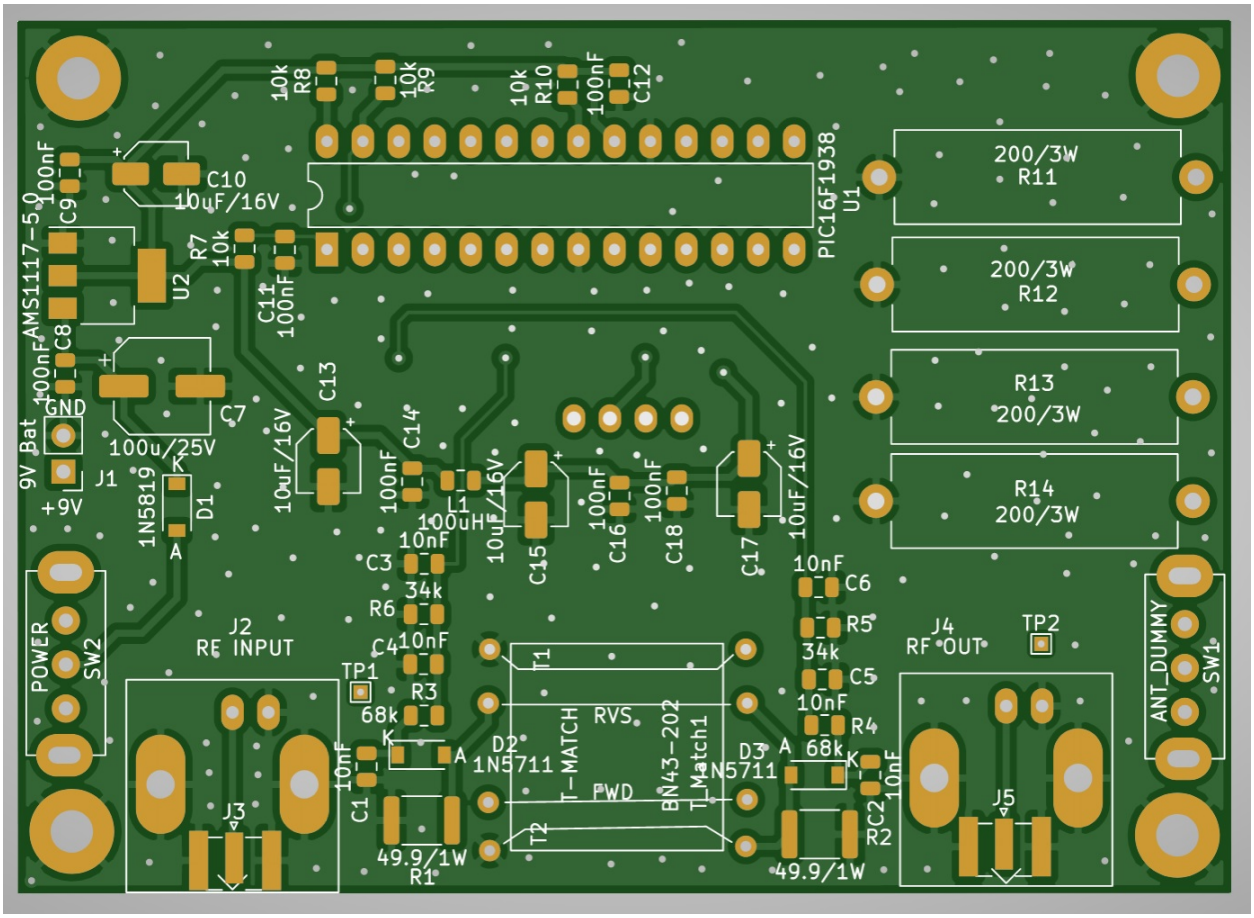
This is the Schematic of Barb-A-Watt:



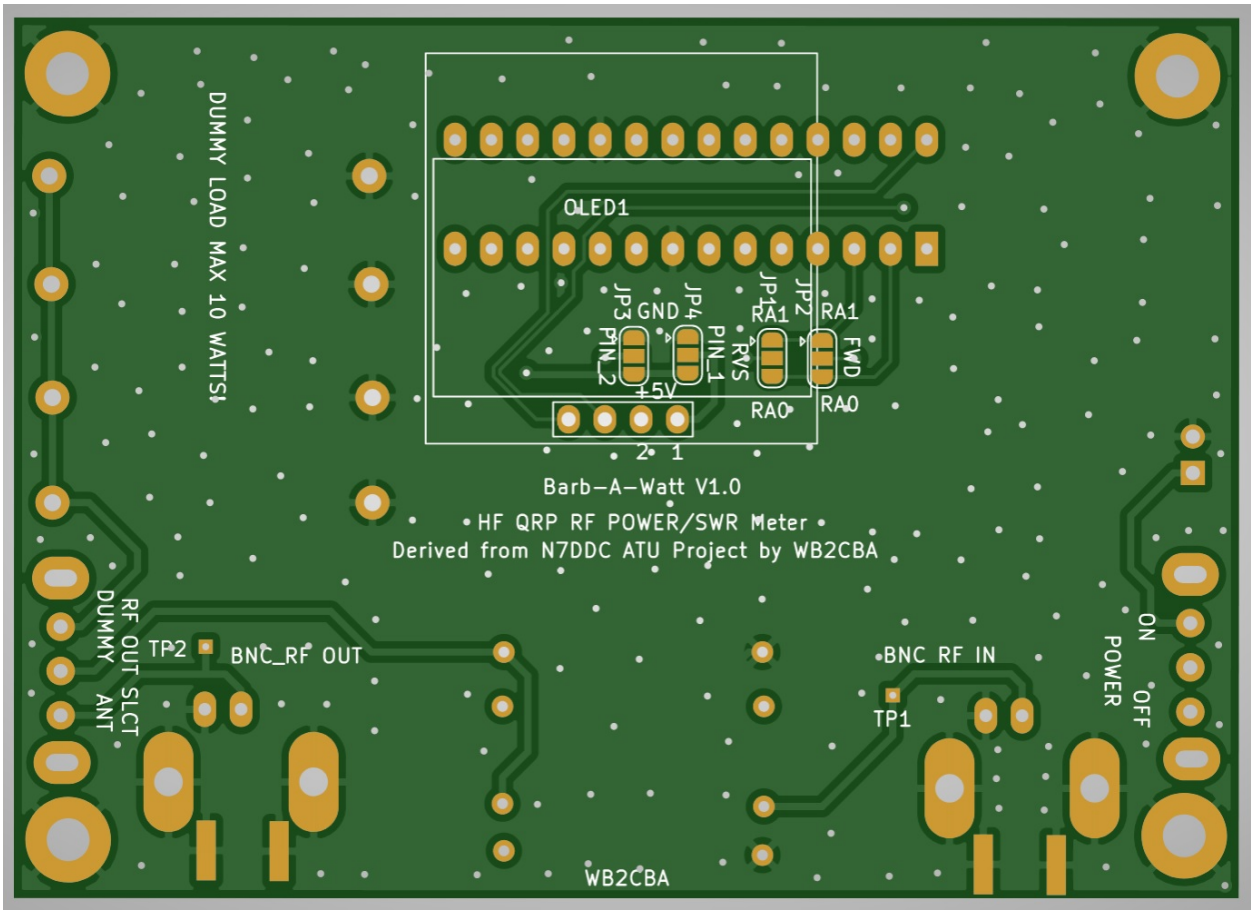
It is easy to build simple circuit. We have a tandem match consisting of two 5 turn coils in each side of BN43-1502 binocular core. A reverse and Forward line is passing rf signal to output and measures power and return loss as SWR. AWG 24 or 0.5 mm copper enamel wire is good enough for qrp power rating measurements. This power/swr meter is rated up to 20 watts connected to an antenna. Built in dummy load is rated at 10 WATTS. **CAUTION:DO NOT EXCEED 10 WATTS with the built in Dummy Load!**

For displaying results a 128x64 OLED display is used for easy readability.

Barb-A-Watt Component side layout:



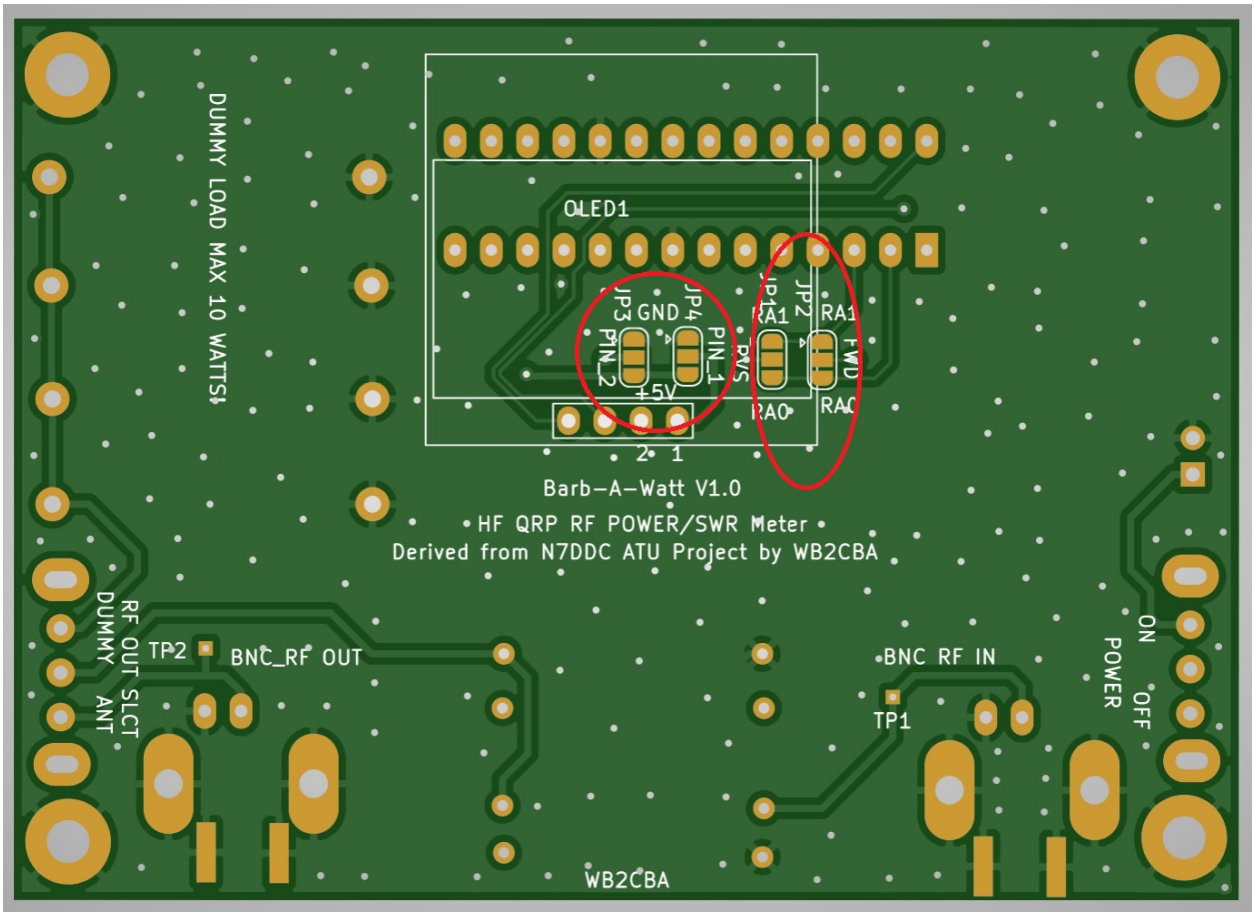
Barb-A-Watt Solder side layout:



The whole unit is powered with 9V PP3 battery. It draws 10mA current so a 9V battery is ideal for portable operation.

There are two slide switches. Looking from top left side slide switch is for powering the unit on and off. Right hand side slide switch is for selecting output either to connect to an antenna or internal 10W rated dummy load.

There are two jumpers on the solder side of the board named as FWD and RVS. These are added for test purposes:



The second set of jumpers are for OLED VCC and GND pins depending on OLED type the unit is shipped with and all these jumpers are pre-soldered before shipping.

Building Barb-A-Watt:

Barb-A-Watt comes with a smd pre populated PCB board. There are couple of Through hole parts that needs to be soldered by the user including one BN43-1502 Binocular ferrite inductor that has to be wound and installed by the user.

List of Parts included in the kit:

1 x Smd populated BARB-A-WATT pcb board.

1 x Top face panel

1 x Bottom face panel

1 x PIC16F1938 PIC microcontroller

1x 28 pin DIP Socket

4 x 200 ohm / 3Watt resistor

2 x slide switch

1 x 128x64 OLED Display

1 x BN43-1502 (or BN43-202) Binocular inductor

2 x BNC Connector

1 x 9V clip head

12 inch - AWG 24(0.5 mm) enamel copper wire

4 x 6 mm stand off

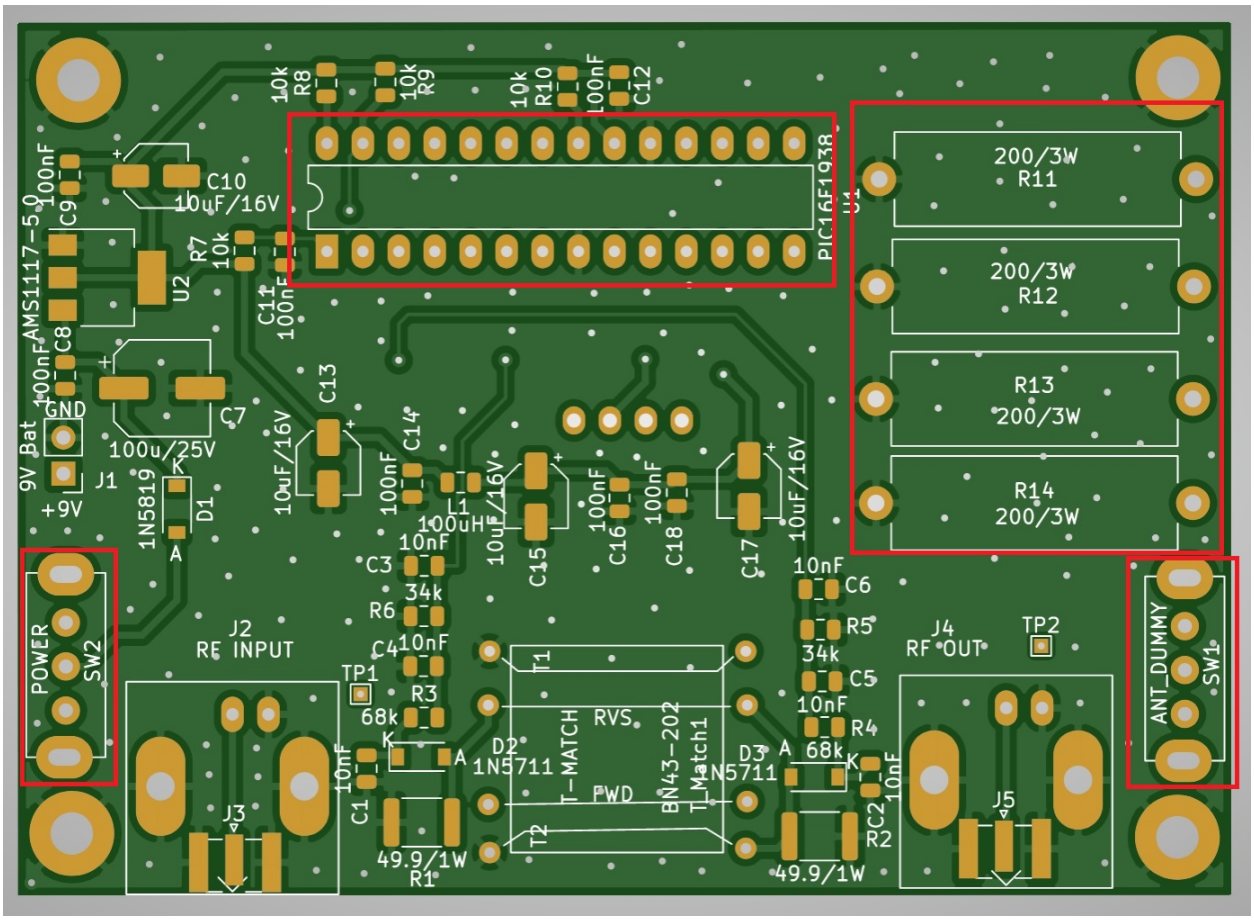
4 x 25 mm stand off

8 x M3 screw

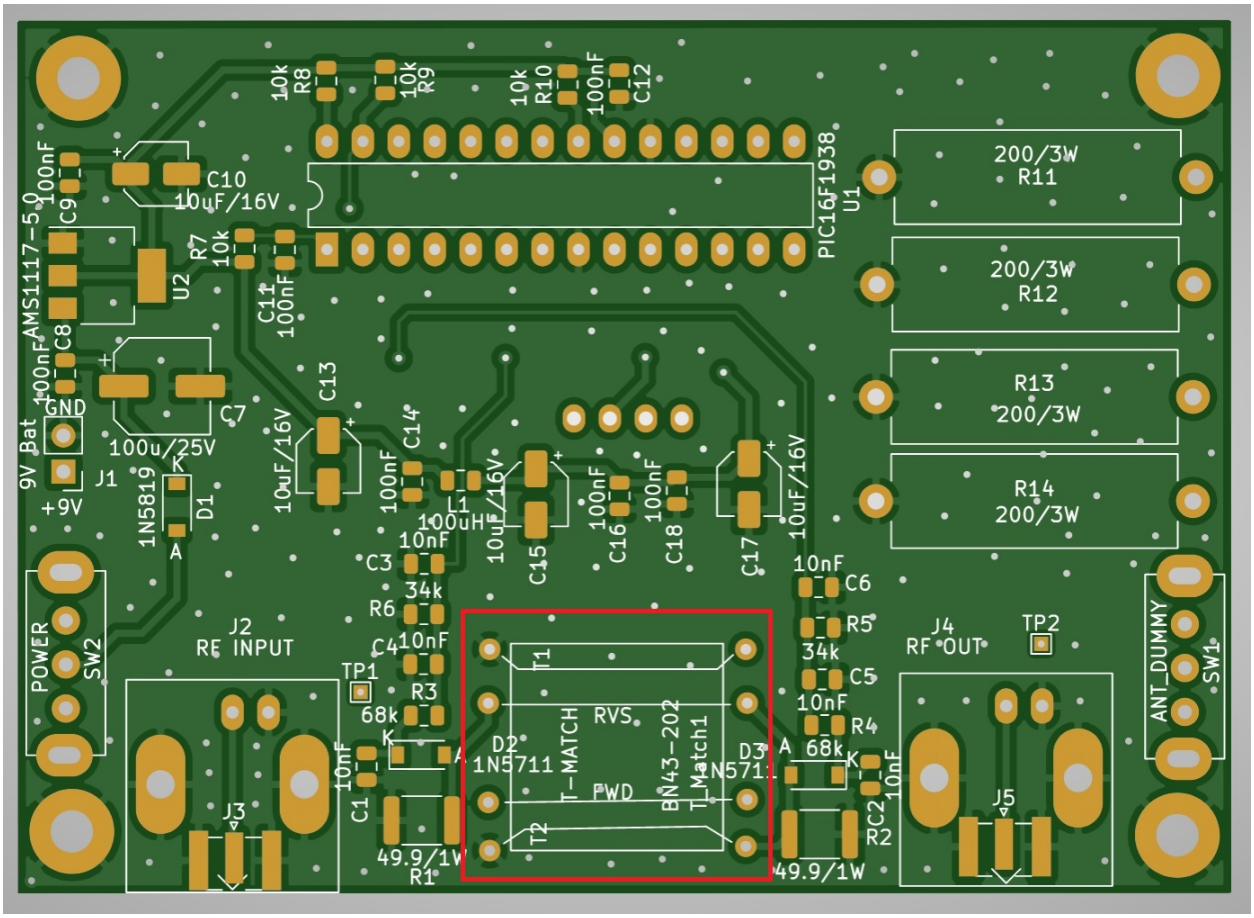
1 x Strip of double sided tape to fix Battery

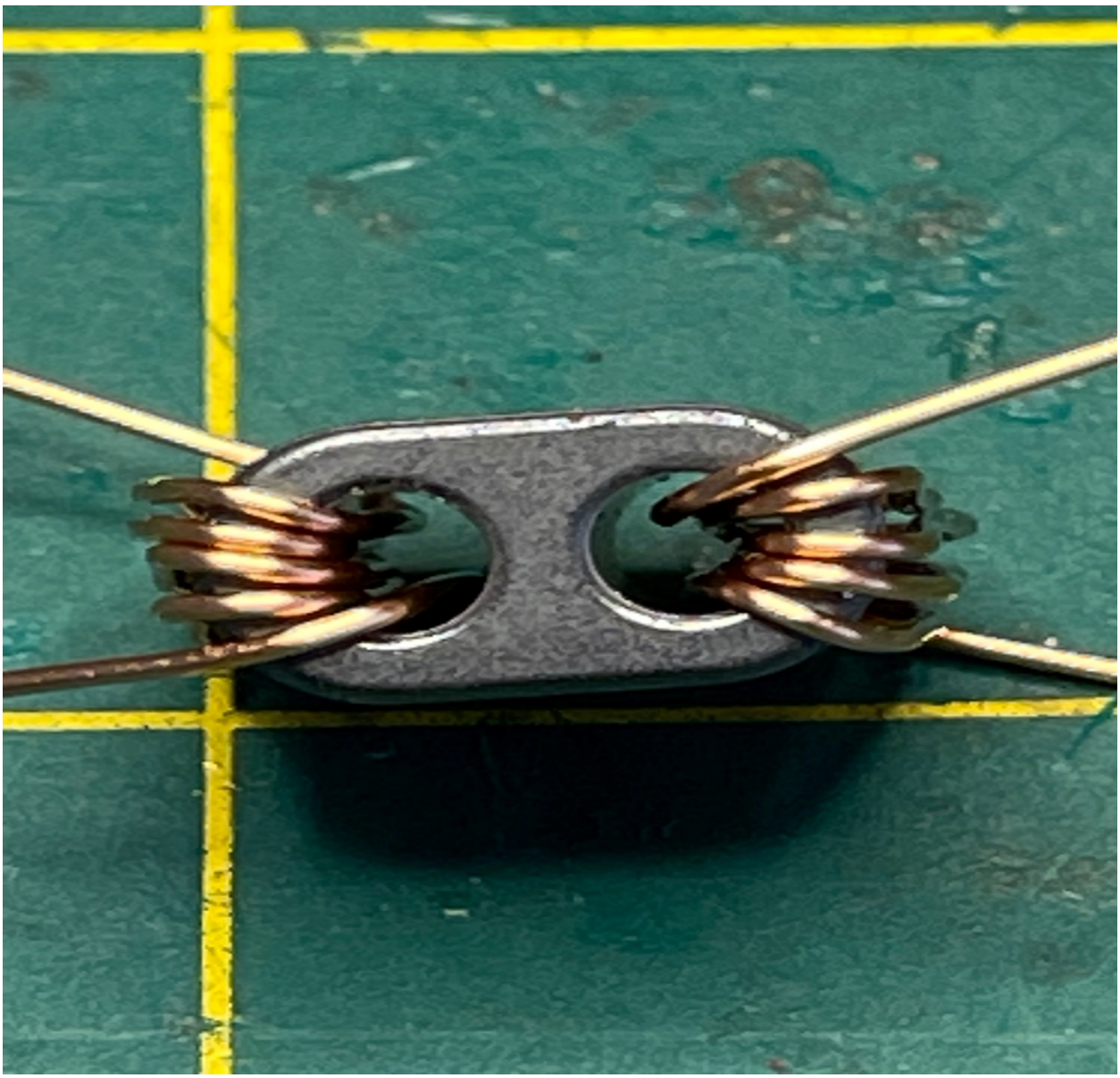
Here are suggested steps to build Barb-A-Watt:

Step 1 : Solder 28 pin DIP socket, two slide switches, 4x200/ 3W resistors for dummy load. Insert Barb-A-Watt PIC16F1938 preprogrammed PIC microcontroller in it's 28 pin DIP socket.



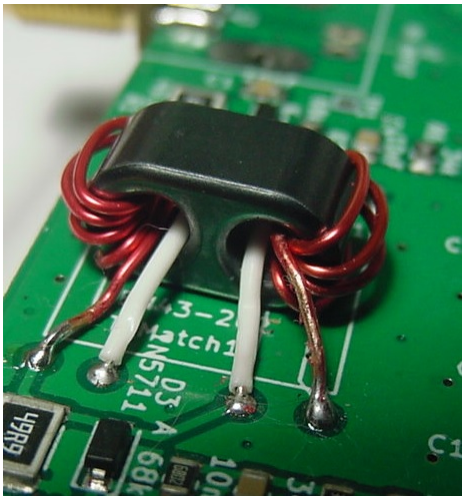
Step 2: Prepare BN43-1502 or BN43-202 Binocular Tandem match inductor.

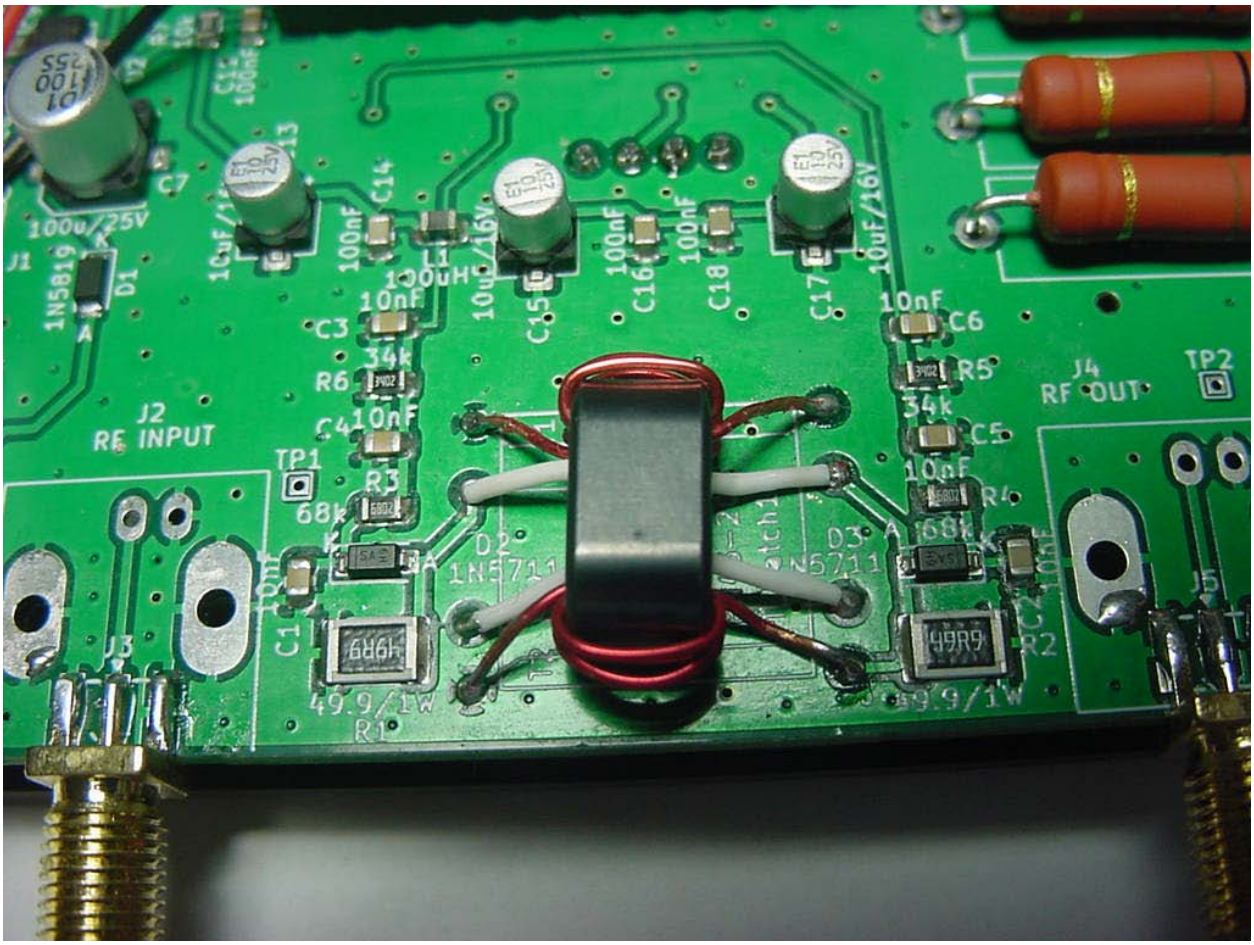




To wind the BN43-1502 inductor core start at one side of the core and feed the enamel copper wire 5 times through the hole. Every time the enamel copper wire goes through the hole counts as one turn. After completing 5 turns in first hole now start from the second hole on the opposite side of binocular core at the second hole. When you finish it should look like as in the photo above.

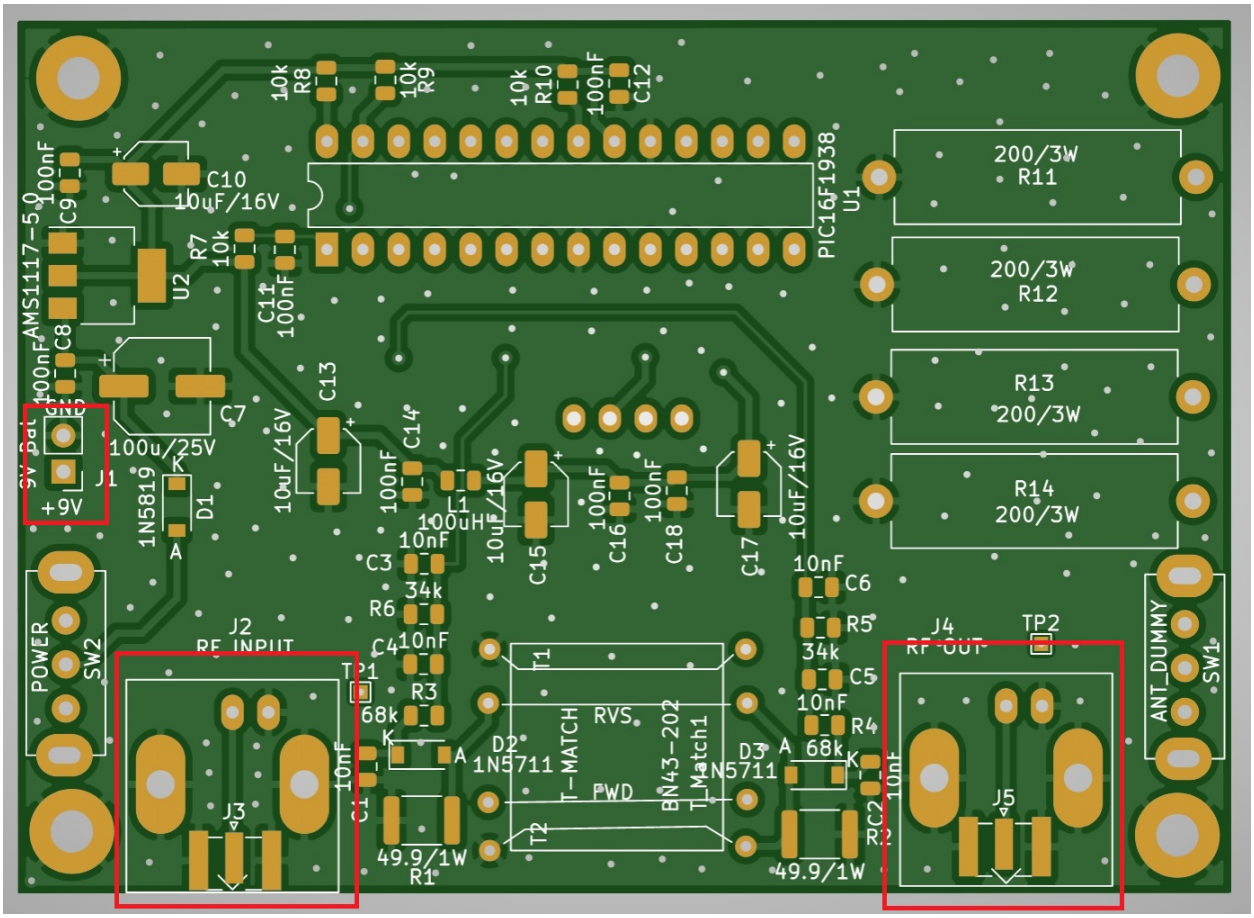
Now cut two 1 inch(25mm) insulated electrical wire. These two wires will be fed through the holes of binocular core.(white wires in the photo)





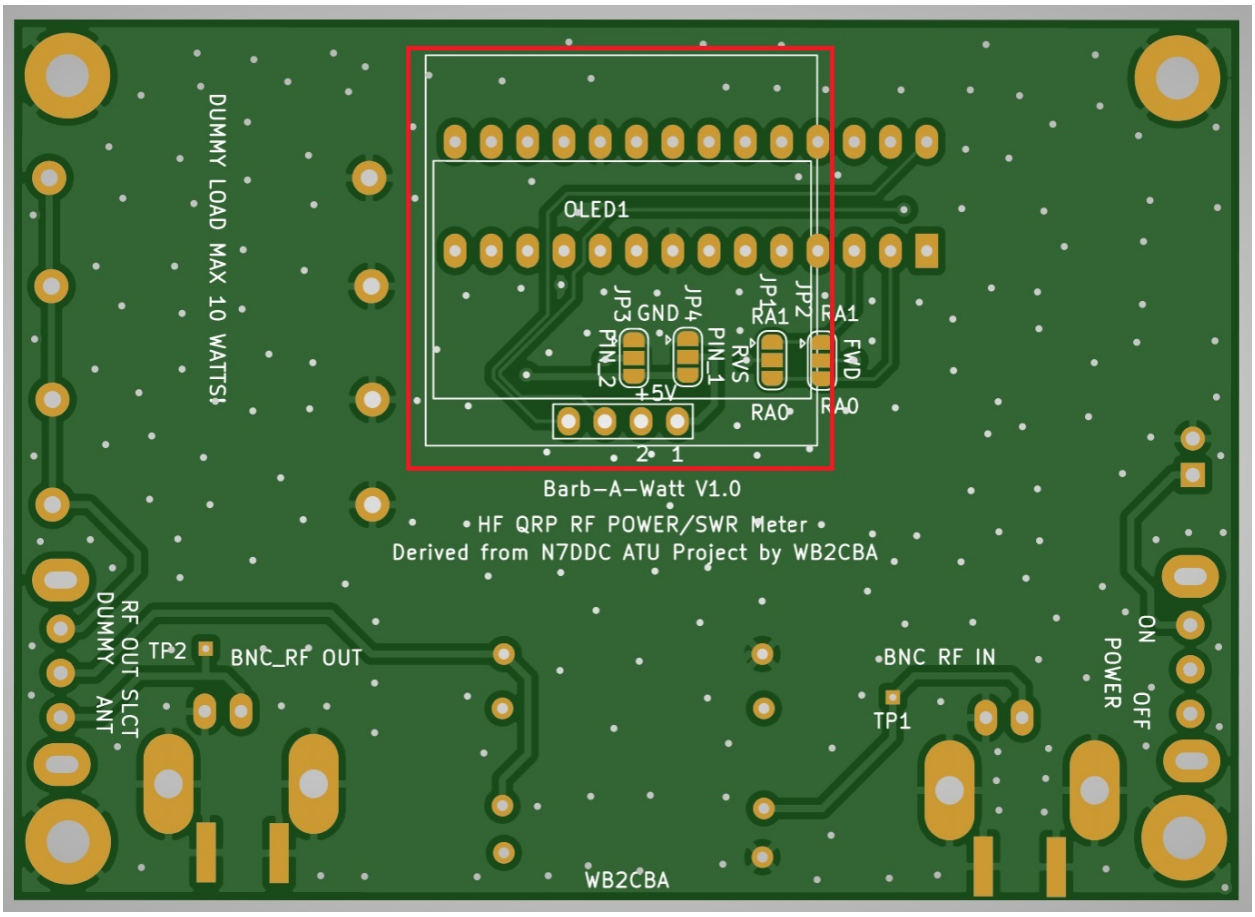
Adjust the length of these insulated thru wires as needed and solder the binocular tandem match inductor as in the photo above in it’s place.

Step 3: Solder two BNC connectors and 9V battery clip head.

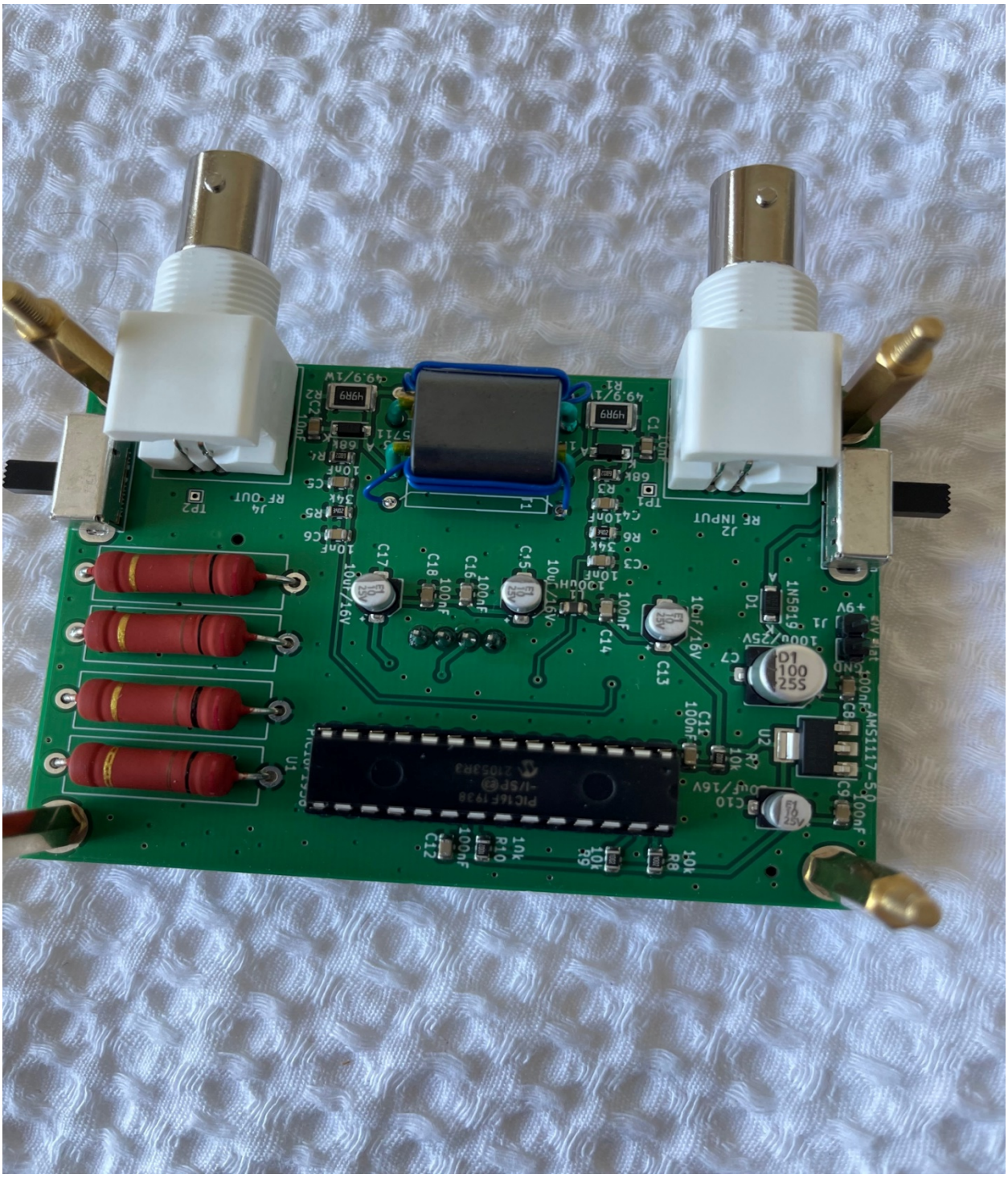


Step 4:

Now it is time to solder OLED display. OLED Display will be soldered on solder side of the pcb. It is good practice to use a tiny strip of double sided tape stick to OLED display's component side for two purposes, it makes sure OLED is aligned and fixed properly in it's location and as an electrical isolator to prevent any short circuit with the pcb and jumpers below the oled.



The fully soldered unit should look like this:



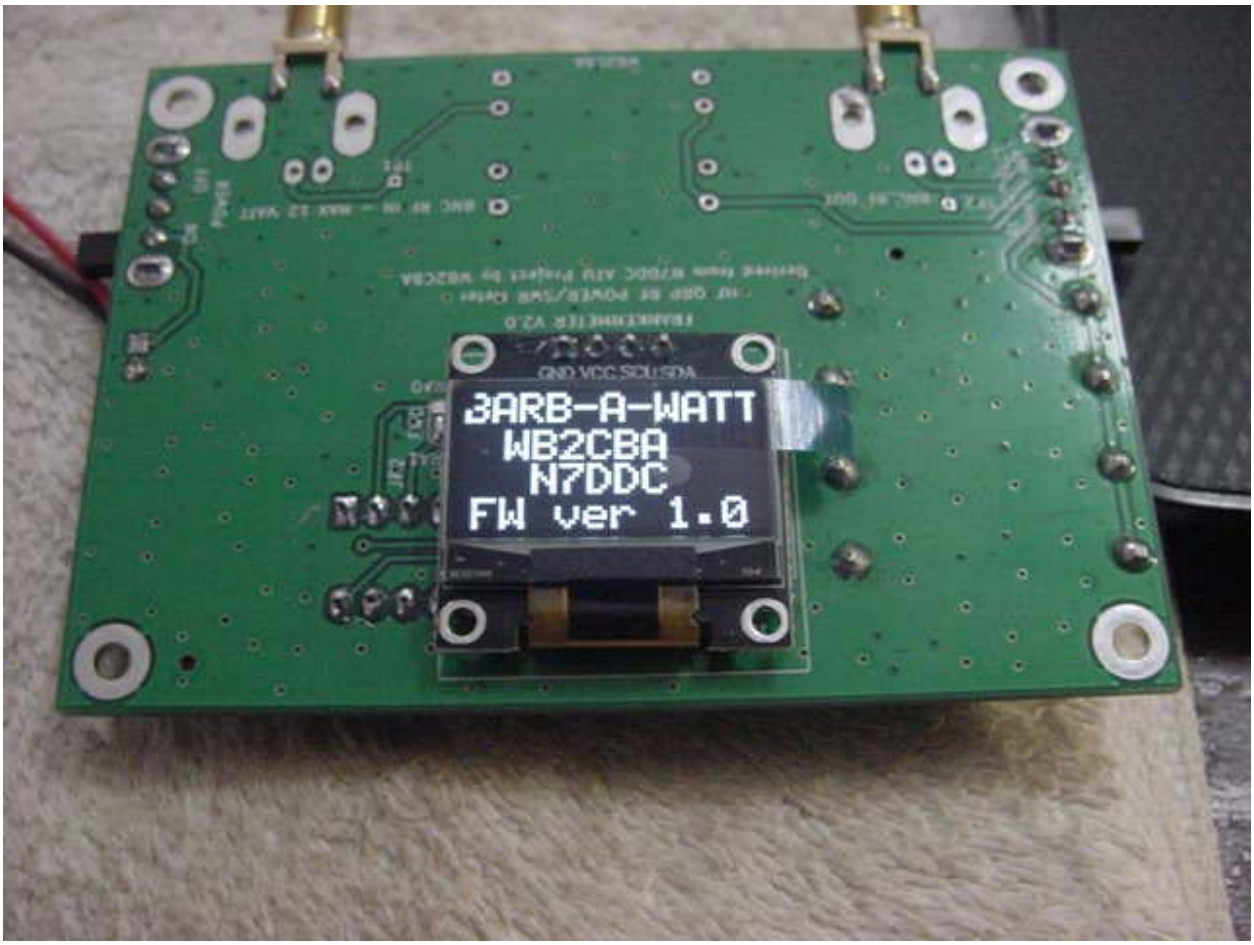
Step5:

Attach stand offs and bolt on top and bottom face plates. Short stand offs hold the top face panel and longer ones are for bottom face panel. Before bolting on bottom face panel, 9V battery can be fixed to the inner side of bottom face panel with a double sided tape. Power consumption is minimal and 9V battery will last quite some time.

Finished unit should look like this:

Using Barb-A-Watt:

Using Barb-A-Watt is as easy as using any other Power/SWR meter. RF input is connected to Transceiver antenna output and RF output is connected to antenna or internal dummy load in case of RF power measurement of a transceiver. When power up splash screen greets as in the below photo:


3ARB-A-WATT
WB2CBA
N7DDC
FW ver 1.0

Measurement screen shows four measured values:

- RF Power input from TRX
- actual RF power output to antenna
- SWR
- Actual RF output Efficiency in %.

Barb-A-Watt can be used in two different scenarios:

1- As a classic RF power meter using internal dummy load by sliding right slide switch to D.LOAD position. **CAUITON: DO NOT EXCEED 10 WATTS RF POWER WITH INTERNAL DUMMY LOAD!**

2- As a RF POWER and SWR meter connecting to an antenna and getting real time RF power and SWR readings. To do so right slide switch should be in ANT position which connects antenna as output load. In this mode Barb-A-Watt is a good companion for real time QSO antenna and rf power monitor in SOTA TX conditions.

Acknowledgement:
A special thank you to David Fainitski, N7DDC for his contribution and help on Barb-A-Watt firmware.

Barb-A-Watt is based on N7DDC David Fainitski's ATU-100 project. David was kind enough to modify atu-100 firmware specifically for Barb-A-Watt to create an accurate RF power and SWR measuring equipment.

09/2021
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