



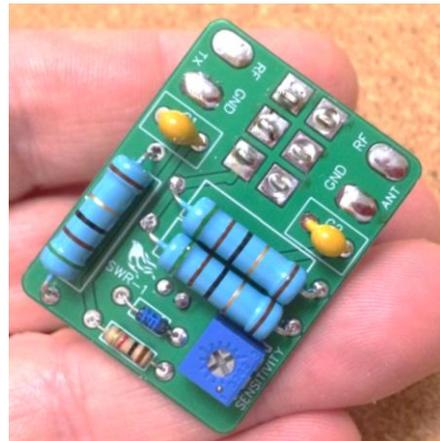
QRP SWR Resistive Bridge/Indicator



Many DIY and low cost ATU's do not have a built in SWR indicator and so it's an extra bit of kit to carry with you if out portable (or in the shack). Also it is easy to damage the output stage of your nice new QRP radio if you spend a long time setting up the tuner.

A tried and tested method to do this is to use a resistive SWR bridge. If you're not

sure what one of these is let me briefly explain. Now the purists will say this isn't right but even they would have to agree that in practice the results are the same.



Normally our radios are designed to work into a 50 ohm load, we use 50 ohm cable too. When we use an ATU we are trying to match the antenna impedance to that expected by the radio (50 ohm). The ATU (or AMU) acts like an impedance matching network.

There are many factors that should be considered when measuring SWR as it's not just a resistive load, but in practice this type of circuit does the job fine and 1000's of people use this type of bridge with good success.

The bridge is based around the Wheatstone Bridge circuit with the antenna being the 4 element in the bridge, when the antenna is matched to 50 ohms the bridge is balanced and our LED will go out, when the antenna is not matched the LED will illuminate, the brighter the LED the worse the mismatch so we tune the ATU for minimum brightness of the LED which will mean we have a good match.

The bridge will absorb most of the power so an IN/OUT of circuit switch is fitted, when tuning the switch is in the on position the highest SWR your radio should see will be 3:1 and that's with a short circuit or open circuit load. This gives a good amount of protection to the PA Transistors.

Once minimum SWR (minimum LED brightness) is found you can flick the switch and full power is applied to the antenna.

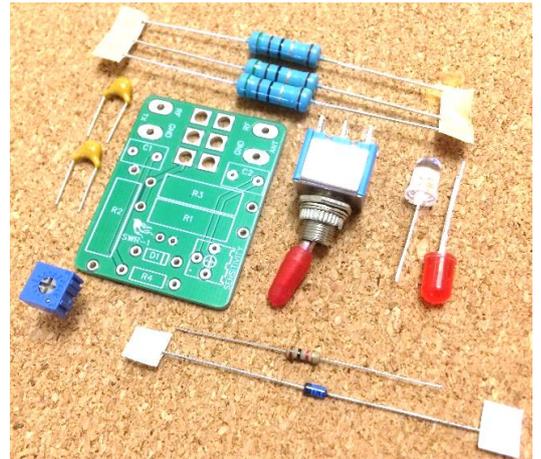


In an emergency you *COULD* leave the bridge turned on and just connect anything you can find to the antenna terminal, only about 1/8 of the power will find its way to the make shift antenna and the RX sensitivity will be reduced by about the same factor but sometimes ANY signal is better than no signal!

This bridge is intended for QRP radios so please don't connect your 100Watt radio to it!

OK so before building check you have all the parts:-

- 1 x PCB
- 1 x Change over switch
- 3 x 51 ohm 2 Watt resistors
- 1 x 10K trimmer
- 1 x 1N5711 diode
- 1 x 1K resistor
- 2 x 0.01uF capacitors
- 1 x Red LED
- 1 x Red High Brightness LED * see instructions



If any parts are missing contact me right away. parts@phoenixkitsonline.co.uk

Construction of the SWR-1

Please take care when cutting wires and soldering, wear eye protection if you can.

Look at the PCB, parts are fitted on both sides.

Find the three 2 watt resistors, bend the legs at 90 degrees and push them through the board as shown on the silk screen layout. Do not solder them just now. I like to stand the resistors off the board by a couple of mm. I do this by sliding a small metal ruler under the resistors body as a spacer while soldering. You don't have to do that but it can help with cooling of the resistor when you transmit, after all they are working like a dummy load when the circuit is active. Once you have them a mm or two off the board solder them in place.

Now fit the small 10K trimmer on the same side as the resistors. This part will allow you to adjust the sensitivity of the LED later.

Now fit the two 0.01uF yellow capacitors as indicated on the PCB, again the same side as the resistors.



Next the 1N5711 diode, this is a low volt drop diode to help keep the sensitivity of the bridge as high as we can. It must be fitted the correct way. The other parts so far can be fitted either way round but you should fit this diode as shown on the boards layout silk screen, the black band on the diode should be near the trimmer.

Now the last part on this side of the board, the 1K resistor. This can be fitted either way round.

We have completed this side so take a minute to double check the soldering is all ok and no shorts between pads.

Now we need to fit the switch. The switch is pushed through from the back of the board (See pictures above) , take care that you fit it nice and square on the board when you solder it, just solder one pin to start with and check its square. Then when sure solder the remaining pins.

Now the hardest part. The LED, I have supplied two different LED's one a standard red LED and the other looks like a clear bodied LED. The clear LED is a high brightness unit that should be more sensitive. To be honest I use the red LED on mine and find it works fine, but I have supplied both so its up to you. I find the red one is a more diffused light and is viewable from a greater angle.

Having decided which LED to use we need to fit it, it fits the same side as the switch. The idea is that this module should be fixed to a ATU, (or the rig) with the switch at the top and directly below it the LED (Could be mounted the other way round if you prefer) so the LED hight should be set so that it protrudes through the front panel. I don't solder this part till after I mount the board then I can then push the LED forward to get the distance right before soldering.

Connecting the Bridge

The bridge as large pads for connecting to the rigs output and to the antenna.



The board is marked TX (RF/GND) and ANT (RF /GND)

Make sure you connect them the right way round.



Using the SWR-1

Using the bridge is very easy, when tuning the antenna flick the switch down towards the LED, that puts the bridge into circuit. Now transmit and adjust the ATU to get **minimum** LED brightness, if you can, connect a known good dummy load in place of the ATU. That should have a low SWR. With the bridge active adjust the sensitivity trimmer so the LED is just goes out, it's possible that with such a good match you may not be able to get the LED to light at all, with a good 50 ohm match very little voltage will be available to light the LED. You can always connect a SWR meter between the bridge and radio for the first time you use it and adjust the ATU to give a SWR that you are happy to accept as your maximum working level and adjust the sensitivity trimmer so the LED just goes out at this. Once set that's it you ready to go. From now on just adjust the ATU so the LED goes out and you know your SWR is below the pre-set level. Then flick the bridge back out of circuit for normal use.

I hope you find the SWR-1 useful and a worthwhile addition to your shack.

Any problems contact me at paul@phoenixkitsonline.co.uk