A Homebrew UHF SWR Bridge

By G8MNY (Updated May 09)
(8 Bit ASCII graphics use code page 437 or 850, Terminal Font)

For work over 300MHz the standard SWR bridge pickup are too large. The clue to going higher in frequency is mainly that of size.

Here is a homemade design I use inside kit at 23cms 1st published 5/93 in UK's BATC CQTV mag No 162 page 25. Although this one was only used @ 24cms the small size enables it to be used at higher frequencies.

INTERNAL SWR BRIDGE FOR 23cms

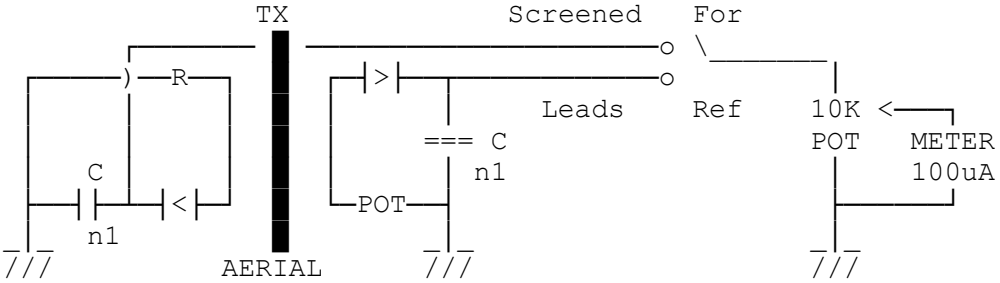
External SWR bridges and power meters are ways; fiddly to connect up, lossy, & expensive pieces of test gear, that you always need connected when they're not. This bridge design has been used inside "Brick PAs" & "1 Watt exciters".

SMALL

The only difference in a 23cm SWR bridge to a VHF one, is the reduced scale. So if the miniature bridge pickups are small enough, they can be placed over, only a few millimetres of 50 ohm track, which can be found on most PA layouts. As both length of pickup line & frequency determines sensitivity, the small size is not a problem for picking off enough power to drive the meter OK as RF just leaks of the PCB!

COMPONENTS

All the components are mounted with minimum lead lengths. There are better diodes than 1N4148, but these do give surprisingly good performance at these frequencies.
The forward signal terminating resistor is not critical, but a very small one should be used in an attempt to get the "100Û" required at 1296MHz.
The reflected terminating resistor is too critical to guess at, so a very small preset trim pot was used. This was a high value plastic 1k, but worked OK. The RF pickup wires should be about 6mm-10mm long.



EDGE VIEW OF PCB

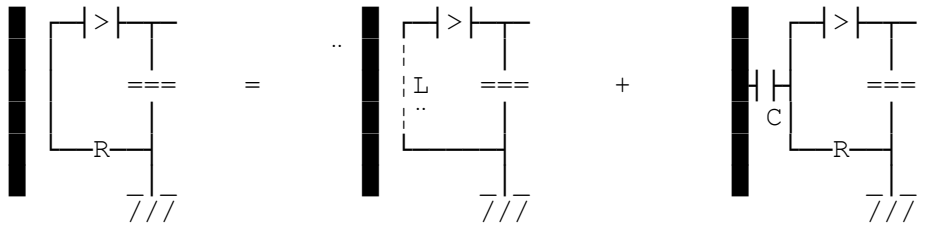
```
   For  Ref
     .  . Pot  Upper
    /    \▒    Ground
 ~~~~-~~-~~~~~~Plain
 ____50Û_______
    P.C.B.     Lower
```

CALIBRATION
1/ Adjust the calibration pot to give no meter reading on a GOOD LOAD.
2/ With reduced output (PA run on 10V) & NO load connected, adjust pickup distances so that forward & reflected give the same reading.
3/ As 2 but with a FULL SHORT connected, adjust distances for best compromise in forward & reflected readings.
4/ Recheck 2.
5/ With full power set the sensitivity pot for FSD.

Meter scale								
Deflection %	100	80	72	50	33	20	8	0
SWR 1:	Inf	9	6	3	2	1.5	1.2	1
Loss dB	Inf	4.4	3	1.3	0.5	0.2	.035	0

HOW IT WORKS
The principle to these pick up loop SWR bridges is really the same as the HF type with RF transfomers etc. except the sensitivity is proportional to frequency. e.g. 2x frequency = 2x deflection or 4x power! (Bird meters of this type use lossy dielectric inbetween to flatten the frequency response a bit)

If we look at how a pickup loops sees both the voltage & current components.



BOTH CURRENT ONLY VOLTAGE ONLY

If we don't have an R the voltage across the loop L is proportional to current & drives the detector & is current (power) direction sensitive.

If we have just stray capacitance C & no parallel pick up loop, some of the feeder voltage appears across the R & the detector sees that & as it is just voltage it is not power direction sensitive.

Now as the L was not terminated the voltage will be leading by about 90° & the same is true for the C feeding the R & it leads by approx 90°. When the 2 RF signals are added in series they either add up to double for power going up or cancel for power going down on transmission line.

Cancelling (SWR 1:1) only occurs if the R value has the same voltage & phase as the pick up loop for an ideal load. The R can be switched on some SWR bridges for the values needed for 75Û systems.

Note that its is not a "true power meter", as "Voltage + Current" is not the same as "Voltage x Current", & that can lead to calibration errors on anything other than "perfect loads".

See also my Tech bul on "Meter Damping & Speed Up".

Why don't U send an interesting bul?

73 De John, G8MNY @ GB7CIP