# Log VSWR Bridge

Kjell has designed a high power VSWR bridge which could be connected to an Arduino to implement a VSWR meter with electronic display. This could be an Arduino Nano Every with Nextion display.

# Hardware

Two analogue inputs for forward and reverse power. Suggest A0=forward, A1=rev. There is nothing more needed – a simple prototype board is all that’s needed.

The analogue inputs need a CR filter with ~5ms time constant.

## VSWR Bridge

The VSWR bridge apparently has 50dB loss to the log amp inputs. Each input is routed to an AD8310 log amp. The output voltage is given in the Analog Devices data sheet. ~24mV/dB. It does tail off at very low powers so it will read a non zero power output for 0W in.

There is a simple voltage follower (U1a, U1d) followed by a variable gain and offset op amp. For the processor version, fixed gain and offset would be better with the values chosen to scale to 0-5V or most of that range. A fixed gain of 1.66 with no offset would be OK. Kjell suggests R26/R28=15K and R25/R27=10K to give a scaling of

# Displays

The idea is to have several displays, with a button to step between the displays. The unit will power on to the last display used.

|  |  |
| --- | --- |
| The simplest display will be a bargraph of linear power and VSWR | Forward power (W)  VSWR  Display |
| May want a display with log power (dBm) and linear VSWR | Forward power (dBm)  VSWR  Display |
| A crossed needle display would be harder. The difficulty is in drawing the display background. But they do look good! |  |
| An analogue meter with forward power, and bargraph VSWR would be possible |  |
| An engineering display with forward and reverse power and input voltages would also be possible | Forward power (dBm)  33.2  Reverse power (dBm)  14.9  Forward voltage  1.25  Reverse voltage  0.06  Display |

We need a choice of immediate or peak reading; or can both be displayed at the same time? And several power scales needed. Suggest for linear power, have scales of 2W/20W/200W/2KW.

For each display: have a bitmap background with Nextion drawn bars. That seems to work OK.

# Sketch Code

16ms timer tick

Faster analogue read process, finding peak readings. Say every ms read one new input. So I will need a CR filter to hold peaks with a time constant of ~5ms. Within a 16ms period

h/w driver reads voltages and every 16ms calculates parameters, then updates display

## Analogue I/O Code

Long term I should read from the ADC much faster, using the ADC interrupt.

10 bit ADC; reads 0-4.99v

ADC input voltage = 5\*reading/1024

Logamp output voltage = (5\*reading/1024)/1.666

Logamp output voltage rises by 23.4mV/dBm and intercept ~-96dBm (from graph)

Therefore input power = -96 + 42.75\*logamp output voltage

input power = -96 + 42.75\*(5\*reading/1024)/1.666

**input power = -96 + 0.1253 \* reading**

Using the same value lookup from ADC voltage to line voltage. From that I can calculate power and VSWR rapidly.

## Display Code

Be aware that the Nextion display takes time to draw bars!