

Procedures for Various Measurements with the NanoVNA

The steps that follow for various common procedures probably won't make much sense if you don't have a NanoVNA. However, they should be very helpful if you do. These instructions are based on YouTube videos by Alan Wolke, W2AEW.

SWR

- 1 - Power on
- 2 - calibrate, calibrate
- 3 - short, open, load
- 4 - done
- 5 - back, back
- 6 - display, trace, 1, 2, 3 off
- 7 - back, back
- 8 - display
- 9 - format
- 10 - SWR
- 11 - back, back
- 12 - stimulus
- 13 - start
- 14 - 7
- 15 - M (MHz)
- 16 - stop
- 17 - 7.3
- 18 - M (MHz)
- 19 - back
- 20 - connect load
- 21 - move cursor to dip, read frequency
- 22 - read SWR @ upper right

MEASURE IMPEDANCE OF COAX

- 1 - calibrate (same as in SWR)
- 2 - Smith chart only, display, trace 0, 1, 3 off
- 3 - stimulus start =50 kHz, stop=300 MHz
- 4 - reduce stop until curve crosses x-axis only once
- 5 - use rocker switch (or stylus) to go around curve until it's at x-axis, then fine adjust until it goes back & forth between XC and XL (above x-axis is inductive, below is capacitive)
- 6 - read resistive component at top: "CH 0 Smith **NNN** ohms X μ Hy or X pF"
- 7 - compute Z of coax using $Z = \text{SQR}(\text{NNN} \times 50 \text{ ohms})$

MEASURE PHASE vs FREQUENCY

- 1 - calibrate (same as in SWR)
- 2 - connect network between CH 0 and CH 1
- 3 - display
- 4 - trace, turn off 1, 2, 3
- 5 - back
- 6 - format
- 7 - phase
- 8 - move cursor to mid declining slope on two successive waves (A & B), note frequencies of each
- 9 - back, back
- 10 - stimulus
- 11 - start A
- 12 - stop B
- 13 - move cursor to find phase shifts and frequencies at $\pm 180^\circ$

MEASURE LENGTH OF COAX - VELOCITY FACTOR KNOWN

- 1 - calibrate (same as in SWR)
- 2 - display
- 3 - trace, 1, 2, 3 off
- 4 - back, back
- 5 - display
- 6 - format
- 7 - more
- 8 - linear
- 9 - back, back
- 10 - transform
- 11 - low pass impulse
- 12 - transform on
- 13 - velocity factor (e.g., RG-58A/U is 0.66)
- 14 - enter 66×1 (no decimal point)
- 15 - attach cable to CH 0 (far end is open)
- 16 - move cursor to peak: M1: XXX.X ms (N.NNN)....value inside () is length in meters; e.g., physical measurement is 11' 0", calculated is 3.435 meters or 11' 4"; error = 3%

MEASURE VELOCITY FACTOR - LENGTH (X_p) IS KNOWN

- 1 - calibrate (same as in SWR)
- 2 - display, trace, 0, 1, 2 off
- 3 - back, back
- 4 - connect cable to CH 0 and CH 1
- 5 - stimulus, start 50 kHz, stop 200 MHz
- 6 - keep changing stop frequency higher or lower so you see 2 complete cycles
- 7 - use cursor to find the frequencies of 2 adjacent points — either peak ($+180^\circ$) or valley (-180°)
- 8 - use rocker switch to find the exact frequency at each point
- 9 - Freq 1 - Freq 2 = delta F
- 10 - X_e is the electrical length = $300/\text{delta F}$
- 11 - X_p is the physical length in meters
- 12 - Velocity Factor = X_p / X_e e.g. delta F is 57.34 MHz, length is 3.435 meters; therefore: velocity factor is $3.435 / 5.232 = 0.656$

MEASURE FILTER RESPONSE (LOW PASS, HIGH PASS, BAND PASS)

Calibrate as follows (*Note: it is different from the others*)

- 1 - calibrate, calibrate
- 2 - short, open, load
- 3 - connect load to channel 1
- 4 - isolation
- 5 - connect channel 0 to channel 1 using a short cable
- 6 - thru
- 7 - done
- 8 - display, traces 0, 2, 3 off
- 9 - back, back, adjust stimulus for desired frequency range