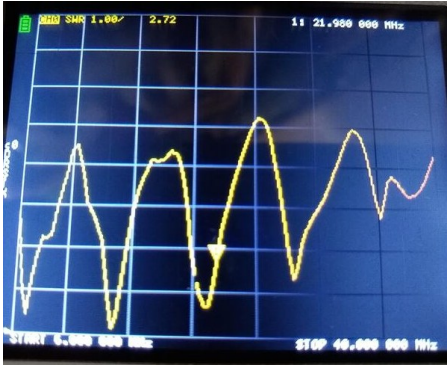


# THE HITCHHIKER'S GUIDE TO THE NANOVNA

have a sweep of SWR vs frequency:

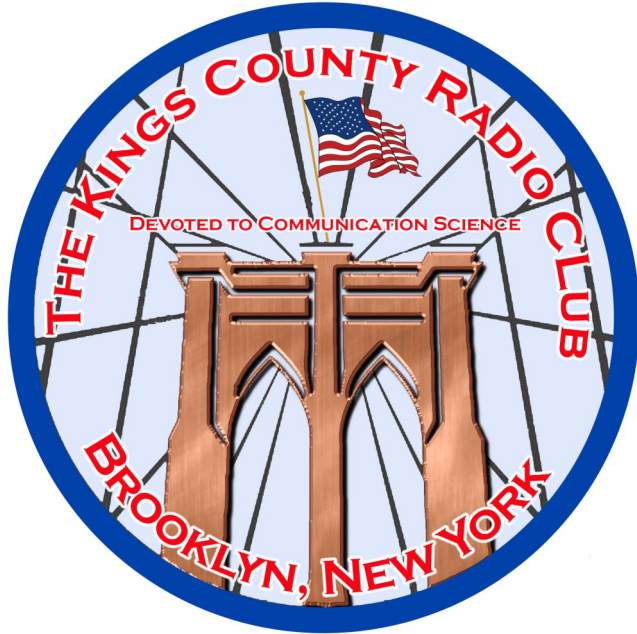


Do you see all those “dips” on the screen? Those are relatively resonant frequencies for this multiband antenna that is being swept.

If you go to Menu->Marker->Select Marker you will be able to move a marker around and read data from your selected point (Frequency, SWR, etc.) You can select maximum points, or minimum points, you can jump to the next minimum point to the right or to the left!

Do you want to select another way to represent a plot of your antenna sweep. Go to format and select something else, like a Smith Chart, or Reactance vs frequency, well just go to the Format menu and set it to whatever format fit your fancy!

That's VNAs for now—HAVE FUN!



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KC2RC Repeater 146.73MHz PL 88.5



# The NanoVNA

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Vector Network Analyzers (VNA) are incredible devices. They measure the frequency response of a component, or a network made up of components, across a given range of radio frequencies.

A VNA can measure complex impedances—the load's resistance, reactance as well as its phase shift.

For Amateur Radio Operators its most important feature is sweeping our antenna systems to tell us if our antenna is resonant at the frequency we want to use them for. If the resonant point is off frequency, something is obviously wrong.

In the old days the only thing that we Hams had available was a relatively crude device called a “grid dip meter” - it could make a crude determination of the resonant frequency of your antenna, but VNAs are a much more accurate, sophisticated method.

Originally when VNAs were first manufactured you might have to pay tens of thousands of dollars for industrial VNAs. Ten years ago you could get a decent VNA for \$500, but then China flooded the market with variations of the NanoVNA for as little as one hundred dollars. They come in at least two generations V1 and V2, different frequency ranges, different screen sizes as well as different types of connectors. Most use SMA connectors, used in HTs, but the sturdier ones use N connectors.

Here's a quick run thru of the main menu

categories:

**DISPLAY**—Set up what you want to see on the screen

**MARKER**—to set up markers which will display the plot's value at those points

**STIMULUS**—set up the frequencies to scan

**CALIBRATE**—calibrate known loads for accuracy

**RECALL**—restore stored settings on your VNA

**CONFIG**—set up various configurations

**PAUSE/SWEEP**—Self explanatory

The one thing you **MUST** keep in mind is that these devices require repeated calibration using an accurate open, shorted, and 50 ohm load. An uncalibrated VNA is worthless!

There is a lot of information available on the Internet regarding the use of a NanoVNA. One reference is “The Missing Manual For The NanoVNA V2 PLUS4 v2.4”, which can be found at: [https://nanorfe.com/images/V2Plus4\\_Manual\\_NC4BR.pdf](https://nanorfe.com/images/V2Plus4_Manual_NC4BR.pdf)

Keep in mind that the above Missing Manual is very good, but it is not complete, and it is 45 pages long, so this piece of paper you are reading now will just be a simple overview.

First, unless you are very nimble, a resistive touch screen pen will be very helpful.

You should calibrate the touch screen. Simply enable the menu by touching the screen

then:

Menu->Config->Touch Cal

And press down on the corners indicated.

Now, this part is very important. You really need to calibrate this model VNA with a short, open and 50 ohm load. This will improve the accuracy of your results. Get into the habit of doing this every time you power on the NanoVNA. You can save the calibration settings as well.

The NanoVNA is capable of displaying four traces simultaneously (LOG MAG, PHASE, DELAY, SMITH, SWR, Polar, LINEAR, REAL, RESISTANCE, REACTANCE, or QFACTOR by going thru the Menu->Display->Format). This can get a bit “busy”, so it is best to turn most of the traces off by going to Menu->Display->Trace.

Now that you've calibrated your load you can do some work with your VNA.

VNAs can do many things, but we will focus on sweeping your antenna for its resonance.

Select SWR as explained above, disable all but Trace A as described above, and you are “off to the races”!

Select the band range frequency that you would like to sweep your antenna.

Select Menu->Stimulus->Start. Press the numerical keys for the starting frequencies and end with either the kHz, MHz, or GHz key, then enter the Stop menu to enter the end of the frequency sweep and you should