The Nano VNA: A Ham's Best Friend?

A Beginner's Guide
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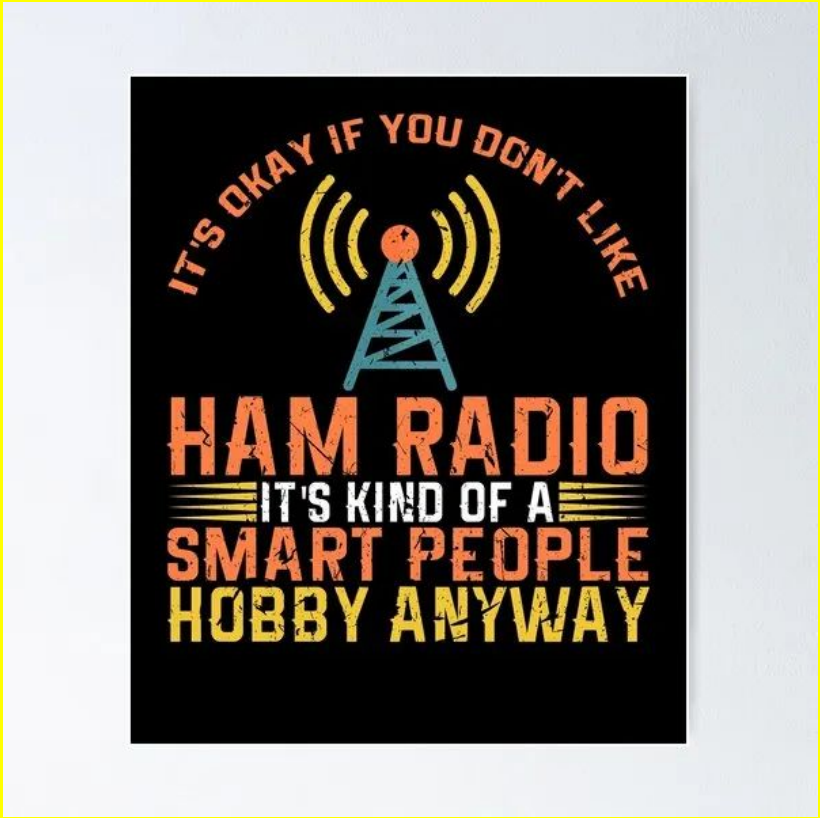

Nano VNA-Nan-O-Rama: Mastering the Nano VNA for Ham Radio

Workshop goal: Learn to use the Nano VNA for 7 key ham radio tasks

Unpacking: Parts of the Nano VNA

Nano VNA unit, calibration standards (Open, Short, Load), SMA cables, USB cable, optional SMA-to-SO-239/PL-259 adapters

Why “Nano Vector Network Analyzer?”

- ***Nano*: Small, portable, open-source software.**
- ***Vector*: Magnitude + direction (phase) for precise SWR/impedance.**
- ***Network*: Antenna systems (dipole + coax), feedlines, filters, tuners.**
- ***Analyzer*: Visuals like SWR curves, Smith Charts.**

Ports and Setup

CH0 (S11, Reflection): Measures SWR, impedance (upper left: SWR, impedance). The port is upper left.

CH0+CH1 (S21, Transmission): Measures feedline/filter loss (upper right: S21 LogMag, Phase). The port is lower left.

Setup: Power on, attach SMA-to-SO-239/PL-259 adapters, connect coax/antenna.

Diagram: CH0 → dipole (S11); CH0 (S11) → filter → CH1 (S21).

Step 1: Resetting

Why: Reset clears old settings and reboots from the existing firmware.

Steps:

- **Reset: Menu > Config > Expert Settings > More > Clear Configuration > Clear All and Reset**

Step 2: Calibration

Why: Calibration ensures accuracy.

Steps:

- **One-Port (S11, CH0): Open, Short, Load with adapters.**
- **Two-Port (S11+S21): Add Thru (CH0 to CH1).**

Diagram: Calibration standards connected to CH0 with SMA-to-SO-239 adapter.

Function 1: Measuring SWR

Why: Low SWR (<1.5:1) ensures efficient antenna performance.

How: CH0 (S11) measures reflection (upper left: SWR).

Steps: Calibrate CH0, set 7.0–7.3 MHz (40m), select SWR trace, connect antenna, read curve.

Image: SWR curve with dip at 7.1 MHz.

Function 2: Impedance Analysis

Why: Matching impedance (~50 ohms) maximizes signal efficiency.

How: CH0 (S11) measures R+X or |Z| (upper left).

Steps: Calibrate CH0, set 14.0–14.35 MHz (20m), select R+X trace, connect antenna, read values.

Image: Impedance display (e.g., 45+j10 ohms)

Break

Grab a coffee, stretch, and chat about your antennas!

Function 3a: Feedline Signal Testing

Why: Low-loss, fault-free coax ensures strong signals.

S21 (Loss): CH0 to CH1, S21 LogMag (upper right, dB loss).

S11 (TDR, Faults): CH0, Transform > Low Pass Impulse.

Steps (S21): Calibrate CH0+CH1, set 1–30 MHz, select S21 LogMag, connect coax, read loss.

Function 3b: Feedline Fault Testing

What is TDR?

- **"Time Domain Reflectometry (TDR) uses S11 on CH0 to measure reflections and find coax length or breaks!"**

Setup:

- **"Connect coax to CH0 (upper left port) with SMA adapter. Reset, calibrate (Open, Short, Load), then Menu > Display > Transform > Transform On."**

Options:

- **"Choose Low Pass Impulse/Step for breaks, set Velocity Factor (e.g., 78% for RG-8X)."**

Results:

- **"TDR plot on Trace 0 (upper left) shows distance: full length (e.g., 15 ft) or break (e.g., 7.5 ft) as peaks!"**

Function 4: Antenna Resonance and Bandwidth

Why: Resonance maximizes performance; bandwidth defines usable range.

How: CH0 (S11) measures SWR (upper left) for resonance.

Steps: Calibrate CH0, set 3.5–7.3 MHz, select SWR trace, find resonance, note bandwidth (SWR < 2:1)

Function 5: Filter Testing

Why: Filters reduce interference for clean signals.

How: CH0+CH1 (S21) measure LogMag (dB loss, upper right) and Phase (degrees, upper right)

Steps: Calibrate CH0+CH1, set 14.0–14.5 MHz, select S21 LogMag/Phase, connect filter, check passband/stopband

Function 6: Smith Chart Analysis

Why: Simplifies impedance matching.

How: CH0 (S11) plots vector data on Smith Chart (upper left).

Steps: Calibrate CH0, set frequency, select Smith Chart, connect antenna, read impedance.

Function 7: Field Use and Wrap-Up

Why: Portable testing for POTA/SOTA.

Steps: Battery power, calibrate CH0, set frequency, select SWR, connect portable antenna, adjust.

Wrap-Up: Recap 7 functions, resources (NanoVNA Saver, QRZ forums), Google Form feedback (30 responses)

Conclusion

Q and A Session