




WCARC Club Test Equipment Pool

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- Our WCARC-owned test equipment may be borrowed for temporary use by WCARC members.
 - First a few words about our WCARC-owned test equipment and the caution required.
 - This presentation contains some information that may be new to some of you.
 - Hopefully that knowledge will prevent equipment and connector damage and/or excessive wear.
 - Of the dozens of coaxial connectors available, there are only a few popular connectors that connect directly to our WCARC test equipment.
 - These connectors are discussed briefly in this presentation.
 - You can provide any additional adapters you may need to mate with your cables or equipment.

MFJ-269 Antenna Analyzer

- HF/VHF 1.8 – 170 MHz; UHF 415-470 MHz.
- Analog and Digital displays. Multiple modes.
- Built-in frequency counter. BNC connector for external frequency counter.
- Test Signal: 3V pp (20 mW).
- An external wall-wart supply is provided.
- A Type N(m) to UHF(f) adapter is provided.
- ***Beware of large off-air signals from an antenna under test as they will mix with the test signal reflection and affect accuracy.***
- ***Do not select UHF range before unit is powered on. Deselect before powering off.***



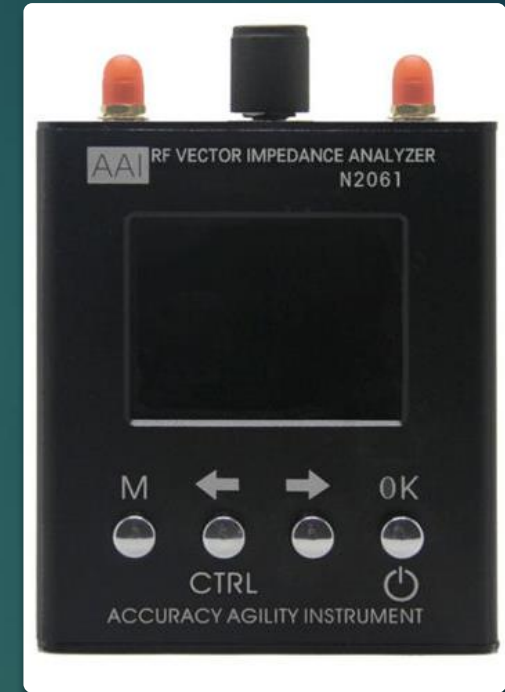
RF Explorer Model WSUB1G+ Spectrum Analyzer

- Frequency Range: 50 KHz – 960 MHz.
- Sweep Span: 100 kHz width to 960 MHz width.
- Dynamic Range: -125 dBm to +10 dBm
- Internal switchable 25 dB low-noise amplifier and/or 30 dB attenuator
- UHF 400-900 MHz Antenna shown. A telescopic antenna is also provided for lower frequencies.
- An SMA(m) to SMA(f) adapter is provided
- A USB Cable provided for battery recharge and external data processing/display and printing.
- **Absolute Max Input: 30 dBm (1 watt). Use extreme caution near high RF fields or if connecting directly to input via an SMA cable.**



AAI Model N2061SA RF Vector Impedance Analyzer

- Frequency Range: S11:1.1-1300 MHz; S21 1.1 - 600MHz
- Frequency Step: 1 KHz. Accuracy: <3 ppm.
- Source: -10 dBm (100 μ W). **Beware of off-air signal interaction causing measurement errors or damage.**
- Measures: Resistance, Reactance, SWR and S11.
- Directivity: ~35 dB (factory calibrated).
- Battery Cap: 2000 MAH, USB rechargeable.
- Test Ports: SMA(f). Cables included for N(f) and N(m).
- Both SMA(m) and (f) and N(m) and (F) Open-Short-Load calibration kits provided. (SMA(f) shown). This permits calibration beyond an SMA jumper cable for maximum accuracy testing a device that must use a cable to connect to the N2061SA.



AAI N2061 Complete Accessories Kit

- Photo shows the padded carrying case with the new expanded Instruction Manual
- The Vector Impedance Analyzer is in front, on its storage pouch
- Recharging power supply is shown with USB cable.
- Cables, N and SMA Cal Kits and adapters are on right, providing ability to measure match to 1300 MHz and insertion loss to 600 MHz.



N2061SA VNA (cont'd)

- ▶ The inclusion of a second test port enables the N20161SA to test the loss (or gain) of devices connected between the two test ports.
- ▶ Losses of up to 60 dB may be directly measured and displayed.
- ▶ Because the N2061SA has a fixed -10 dBm power level test signal, it is not directly suitable for measuring devices with amplification.
- ▶ Use of an attenuator in series with an amplifier under test allows indirect measurement and display of gain subject to:
 - ▶ a. any added attenuation will limit the amount of gain displayed.
 - ▶ b. The power output of the amplifier under test must not exceed +10 dBm or damage to the N2061SA will result.
 - ▶ There must be no DC on the amplifier output signal or use a DC block.

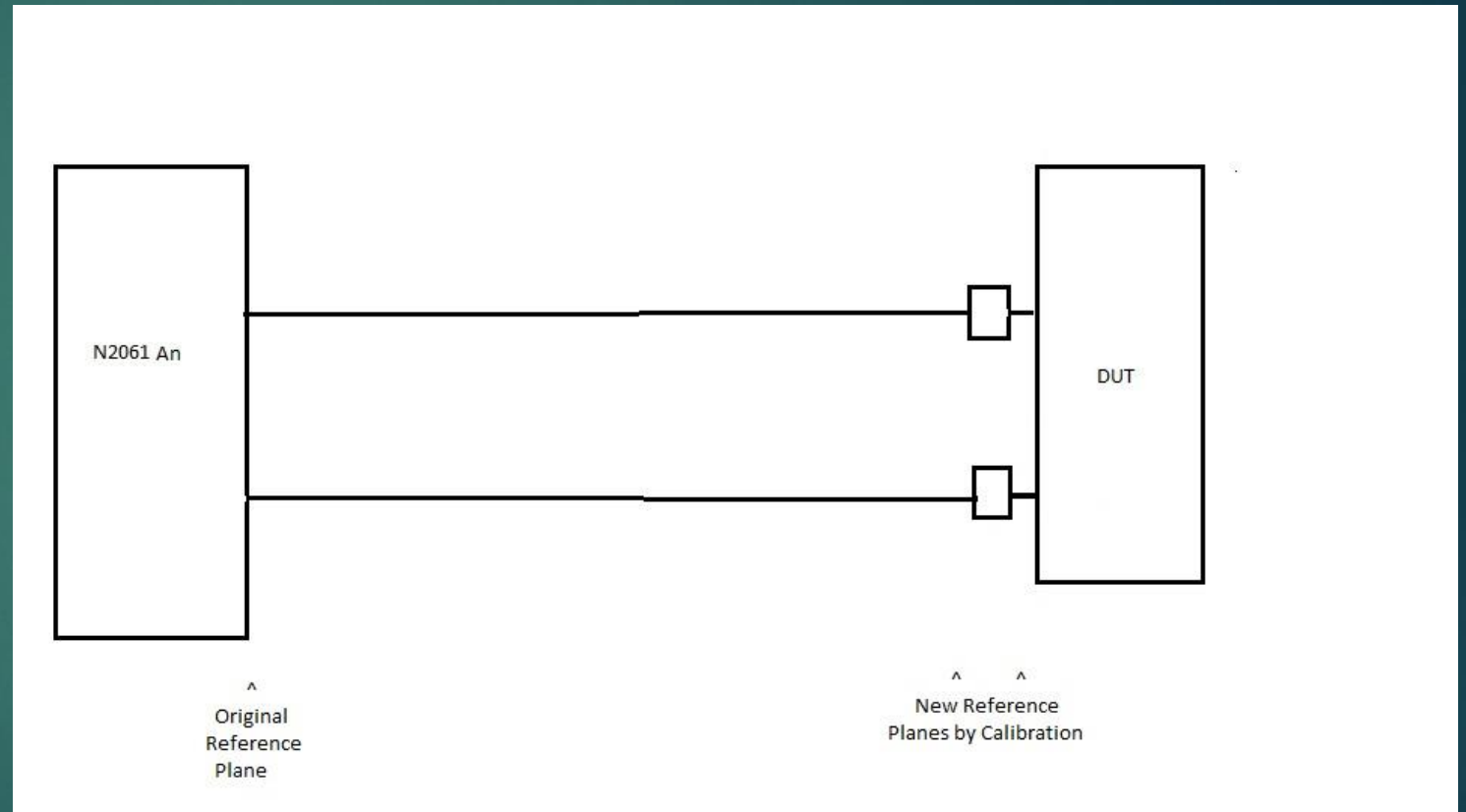
Testing Antennas

- ▶ The MFJ-269 is designed for testing antennas on all bands except 1.25M (232 MHz). The WCARC unit has both N and UHF female connectors so a short jumper cable (N or UHF) may be added to connect to the antenna under test.
- ▶ If you are testing a 1.25M antenna you can use the N2061SA Vector Impedance Analyzer.
- ▶ The N2061 has an SMA(f) connector on the test port so you will need to use a short jumper cable. If the antenna connection is N(f) use the SMA(F) to N(m) jumper cable provided and the N(f) Calkit to correct for the jumper cable.
- ▶ If the antenna has a UHF(f) connector, use a short SMA(m) to SMA(m) jumper cable. You can use the SMA(f) Calkit to correct for the cable, and add an SMA(f) to UHF(m) adapter. Consider the adapter as part of the antenna under test (AUT)

The Reference Plane Concept for Two-Port Loss Measurements

The N2061 has two SMA(f) test ports, between which you connect the DUT.

- The instrument has been calibrated at the AAI factory. This establishes the original reference plane at the two test ports.
- If you need to connect to a Device Under Test through jumper cables, you need to move the Reference Plane out to the end of the cables so that the cables do not add to the measurement errors.
- Ideally, if any more adapters are added to mate with the DUT, you would calibrate with Female to Female adapters of the same connector type as the DUT. This puts the reference plane at the DUT. Failing that, you can calibrate before the last adapters, and consider that the adapters are part of the DUT. At lower frequencies adapter errors are minimal.



Testing Attenuators and Filters

- ▶ This N2061 is designed to measure devices up to 600 MHz connected between the two test ports. Attenuators and filters up to 60 dB loss are easily measured.
- ▶ If the device is a filter with UHF(f) connectors, you would use two of the SMA(m) to SMA(m) jumper cables, and calibrate with the SMA(f) to SMA(f) adapter to correct for the cable. Use two SMA(f) to UHF(m) adapters to connect to the device. Consider the adapters to be part of the device under test (DUT).
- ▶ If the device has BNC(f) connectors, follow the same procedure as above, calibrating with your own UHF(f) to UHF(f) adapter, and then using the SMA(f) to BNC(m) adapters to connect to the DUT. Consider the adapters as part of the DUT.
- ▶ If the device has N(f) connectors, use the SMA(f) to N(m) and SMA(f) to N(f) jumper cables. As the two cables mate, you can calibrate without an adapter. You will need an N(m) to N(m) adapter on one cable to connect to the DUT.
- ▶ Unless you are very experienced with amplifier measurements do not attempt as both the amplifier and N2061 are easily damaged.

Coaxial Connectors

Use and Abuse

- The top connector is a UHF male which is terminating a patch cable. Note that the male pin does not protrude beyond the plane of the shell.
- When the knurled shell is tightened finger-tight the male pin will not bottom on the female receptacle shown below. **Over-tightening risks damage.**
- **Insert the male pin straight into the female. Never rotate the female around the male pin as this will score both.**



Coaxial Connectors

Use and Abuse

- The connector shown is only one of the available UHF male family, but it is the most problematic.
- Why? The open-ended pin does not prevent the user from allowing the cable centre conductor to extend beyond the surface of the shell, risking damage to the female.
- ***The installer must trim and smooth the cable center conductor and any excess solder.***



Coaxial Connectors *Use and Abuse*

- The Type N Male (above) and female connectors are shown here.
- Notice that the male centre pin is flush with the inner barrel.
- ***ALWAYS check that any Type N male centre pin does not protrude beyond flush. This is a common problem with home-brew cables.***
- The Type N Male centre pin should be inserted straight into the female (not turned) and the knurled shell tightened only finger-tight.
- ***NEVER turn the female as this will score both pins***



Coaxial Connectors *Use and Abuse*

- The patch cable shown is terminated with the SMA connectors – male on the left and female on the right.
- **The same cautions about pin depth on the male and NEVER turning the female apply equally to the SMA connectors.**
- The SMA is fragile and is especially at risk when mated with a cable or a device balanced on an SMA.



Coaxial Connectors *Use and Abuse*

- This “adapter patch cord” is fitted with a BNC male on one end (left) and an SMA male on the other end. *I hope you checked the pin depth of each.*
- The BNC was designed by the same Amphenol connector designer as the Type N, and shares the same inner geometry.
- In a pinch it is possible to plug a BNC Male into a Type N Female and vice versa. ***If you use this trick you should be aware that both connectors are now susceptible to mechanical damage.***





Thank you.

Enjoy the new WCARC test equipment. Please return all accessories including plastic connector caps and manual.

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