



Calibration of the HP 8720C Network Analyzer And Importing Data into Matlab

Overview: This document tells you how to calibrate the HP 8720C Network Analyzer. This should be done before each use.

Equipment Needed: Calibration standards kit, Network Analyzer cables, grounding strap.

For more information: go to www.agilent.com and search for 8720C

Safety Considerations (to protect the Network Analyzer!)

1. **Put on a grounding strap** (everybody ALL the time!)
2. **Put calibration standards back in the box** (they are TOO EXPENSIVE to replace, ouch!)
3. **Keep the area CLEAN. Absolutely no food/drink.**

The most important safety measure in working with the NA's is to avoid electrostatic discharge (ESD) while working at the bench. As we walk, we accumulate charge and when we touch something conductive, this charge drains off as an ESD. We usually do not even feel it until it gets to thousands of volts, but we must always assume that it is possible. Therefore, **NEVER TOUCH THE NETWORK ANALYZER CABLES AND ATTACHMENTS UNLESS YOU WEAR A GROUNDING STRAP!** An ESD into the coaxial input ports can damage the very sensitive microwave receivers in the system. They are very expensive to repair. Other than this, you probably will not hurt anything by pushing buttons and learning what the NA can do. (But, avoid "delete" and "modify" keys.)

Start the Network Analyzer:

4. Turn on the power.
5. Attach connectors and extra cables to the network analyzer as needed. Be careful with the network analyzer cables. Do not overbend them. They are also ridiculously expensive.

Calibrate the network analyzer

1. Preparation

- a. Choose a calibration kit for the type of connector you are using.
- b. Set your frequency range. On the STIMULUS control, press start and type the frequency you want to start (**300 MHz**, for this example). Do the same for the stop frequency (**500 MHz**).
- c. On the MENUS control, press CAL.
- d. Select a calibration type. Generally this is CAL1-7mm because that is the type of cable connected to the network analyzer. (For this example, make sure that verify that Cal Kit is 3.5mmD)

2. 1-port Calibration for Reflection Measurements

- a. Press the soft key "Calibrate Menu"
- b. For one-port, choose S11-1 port or S22 1-port (depending on which cable you will connect your circuit to). (Use S11-1 port for this example.)
- c. You will be prompted to put calibration standards on the end of your cable(s). The calibration standards are in a wooden box. You will need a short, open, and lowband load.
- d. Start with the short (it is labeled). Connect the short, press the softkey SHORT, and when it is done measuring (quickly) it will underline the SHORT. Take it off, put the plastic cover back on the standard, and find the open.
- e. Open. It is the same length as the short, but with a smaller radius and a hole in the end. Press OPEN, wait until open is underlined, remove the open and replace the plastic cover.
- f. Find the load standard. Connect it, and press LOADS. Then LOWBAND. Press BROADBAND (We are using the Lowband load for the broadband because we are not concerned with the higher frequencies). Then DONE LOADS. Replace the plastic cover, and put all the standards back in the box. (PLEASE! These standards are little and expensive, and if they get lost, we don't have any others.)
- g. Press DONE CAL

3. Save and Test Calibration

- a. Press SAVE/RECALL. Press the option SAVE STATE.
- b. Test your calibration. The worst is usually the open, so put the open standard on again. On the FORMAT menu, press SMITH CHART. You should see a small dot on the right side of the smith chart, but you will probably see a short line. Test the short and load the same way. For the short, you should see a dot (short line) on the left side of the smith chart. For the load, the dot should be in the center. IF these are not "clean", redo the calibration. Factors that can affect your calibration: tightness of cables and connectors, between elements and to the network analyzer.

4. Attach the antenna board to the network analyzer

- a. Attach PCB to network analyzer cable.
- b. On the MENUS control, press CAL.
- c. Select the MORE option.
- d. Select Port Extensions
- e. Make sure that Port Extensions are set ON.
- f. Select Extension Input A. Set the value to 1.8 ns, and adjust the time until the line is the smallest possible and centered on the right side of the smith chart.