Quick Reference Guide

FieldFox N9923A
RF Vector Network Analyzer

Contents

KEYSIGHT
TECHNOLOGIES

Do You Have Everything?

- ☐ **FieldFox** –To check for installed options, press **System** then **System Configuration** then **Options** then **Show Options**

- ☐ **Phase stable jumper cable or adapters** – Used to connect the FieldFox to devices with various connector types and gender.

- ☐ **Attenuators** – Reduces power and prevents damage to the FieldFox at the test ports.

- ☐ **Cal Kit** – T-Calibration Kits or other devices.

- ☐ **MicroSD card or USB flash drive** – Save files to these devices for quick download to a PC.

- ☐ **USB Power Sensor** – For making Power Meter measurements. (Opt 302)

- ☐ **Battery charger** or extra battery

The Power Button and LED

- ▪ To turn power **ON**, briefly press the power button. The LED is green. The boot-up takes about 60 seconds.

- ▪ To switch to **Stand by** power (low battery drain) briefly press the power button. The LED is amber and blinks slowly. To turn power ON, briefly press the power button. Power and settings are restored instantly.

- ▪ To turn Power **OFF** (very low battery drain) press and hold the power button until power is shut OFF - about 4 seconds. The LED is OFF.

Battery Usage

A fully charged battery should last about **four hours.**

Battery charge status is viewable:

- In the upper-right corner of the screen.
  84% ▮▮▮▮
- On the battery. To view the LCD gauge, open the FieldFox battery compartment door.
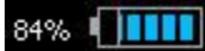
To conserve battery power:

- Use **Hold** mode to trigger a measurement only when needed. **Hold** is shown on the display.
- Press **System** then **Display** then **Brightness** then dim the FieldFox display as much as possible.
- Briefly press the power button to switch to Stand by mode when not being used. Press again to restore power. All current settings are preserved.

The FieldFox will shutdown automatically when battery power is very low to prevent it from being completely discharged.

Use ONLY a FieldFox charger to recharge a battery.

The battery can be fully charged while in the FieldFox in about 4 hours with the FieldFox either ON or OFF.

A fully discharged battery takes about 1.5 hours to recharge to 80%.

The battery can be fully charged in about 4 hours using the external battery charger (Opt 872).

Measure S-Parameters (NA Mode)

S-parameter syntax is described by the following:

S (out | in)

> **out** = FieldFox receiver port
> **in** = FieldFox source port

1. Press **Preset** then **Preset**

2. Press **Measure 1** then choose from the following:

   - **S11** 1-port reflection measurement.
   - **S21** 2-port transmission measurement.
   - **S12** Reverse 2-port transmission measurement. Requires Opt 122.
   - **S22** Reverse 1-port reflection measurement. Requires Opt 122.

   OR Press **Trace 6** then **Num of Traces** then select a Multi-trace configuration. Learn more on page 6.

3. Press **Freq/Dist** then either **Start** and **Stop** or **Center** and **Span** to enter a frequency range for the measurement.

4. Press **BW 2** then **IFBW** to select the IF Bandwidth for the measurement. Narrower bandwidths require more time to sweep.

5. Press **Sweep 3** then **Resolution** to select the number of data points for the measurement. More data points requires more time to sweep.

6. Press **Cal 5** to calibrate the measurement. See page 8 to learn more.

Measure S-Parameters (NA Mode)
...continued

The following NA Mode settings can be made **before** or **after** calibrating without affecting measurement accuracy.

- Press **Scale/Amptd** to change scale.
    - **Autoscale** Adjusts the Y-axis to comfortably fit the Min and Max amplitude of the active trace.
    - **Autoscale All** Autoscales all of the traces on the screen. Useful for multi-trace configurations.
    - **Scale** Manually enter a **scale per division** to view specific areas of the trace.
    - **Ref Level** Manually set the value of the reference line.
    - **Ref Position** Manually set the position of the reference line. Values must be between 0 (TOP line) and 10 (BOTTOM line)
- Press **Measure 1** then **Format** to change the format for the measurement.
- Press **BW 2** then **Average** then enter a value for the number of trace sweeps to average.
- Press **Marker** then enter a value to move the marker to the X-axis position of interest.
- Press **Limit 8** then **Edit** or **Recall Limits** to test measurement results against limit lines.

Multi-Trace Configurations (NA Mode)

You can display multiple traces on the FieldFox screen.
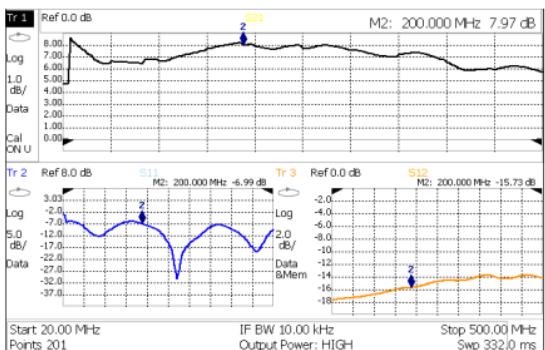
The above image shows a 3-trace configuration. **Tr1** is the **ACTIVE** trace as indicated by the highlighted **Tr1** annotation in the upper left corner.

The Frequency Range, IF BW, Resolution, and Output power is common to all traces. All trace settings, such as format, markers, and limit lines, are applied to the **ACTIVE** trace in the same manner as when a single trace is present.

To select a multi-trace configuration:

- Press **Trace 6** then **Num Traces**
- Then choose a multi-trace configuration.

To activate a trace in order to change a setting:

- Use the **▲|▼ arrows** to scroll through the traces - OR
- Press **Trace 6** then select **Trace 1**, **Trace 2**, **Trace 3**, or **Trace 4**. Only traces that are shown can be activated.

By default with Multi-trace configurations, Markers that are applied to one trace are applied to ALL traces.

Measure DTF (CAT Mode-Opt 305)

Required Equipment:

- LOAD with correct connector type and gender to terminate the end of the DUT.
- Known length and cable type or Cable Loss (dB/Meter) and velocity factor of the DUT.
- Optional phase stable jumper cable or adapter to connect the beginning of the DUT to the FieldFox.

1. Connect any necessary jumper cable or adapter to the FieldFox Port 1 connector.

2. Press **Preset** then **Preset**

3. Then **Mode** then **CAT**

4. Then **Distance to Fault**

5. Press **Freq/Dist** then **Stop Distance** and enter the length of the DUT.

6. If a diplexer or other filter is in the measurement path, press **Freq/Dist** and manually type the **Min Start** and **Max Stop** frequencies. Otherwise, press **Meas Setup** then select **Frequency Mode [Lowpass]**

7. Press **Cal 5** and follow the Cal prompts.

8. Disconnect any components or antenna that should NOT be measured and connect a LOAD at the end of the DUT.

9. Press **Meas Setup 4** then **DTF Cable Specifications**.

10. Either press **Recall Coax Cable** or enter the **Velocity Factor** and **Cable Loss** of the DUT.

11. Connect the start end of the DUT to the FieldFox Port 1. The DTF measurement is displayed.

Measure Cable Loss (1-Port) CAT Mode- Opt 305

Required Equipment:

- LOAD with correct connector type and gender to terminate the end of the DUT.
- Optional phase stable jumper cable or adapter to connect the beginning of the DUT to the FieldFox.

1. Press **Preset** then **Preset**
2. Then **Mode** then **CAT**
3. Then **More** then **Cable Loss (1-Port)**
4. Connect the DUT.
5. Press **Freq/Dist** and enter **Start** and **Stop** frequency values of the measurement.
6. Press **Sweep 3** then **Min Swp Time**. Increase the sweep time until a stable trace is visible.
7. Press **Cal 5** then follow the calibration prompts.
8. Connect the DUT (cable to be tested) to the FieldFox and connect a LOAD at the end of the DUT.

Depending on the DUT, the following three steps may improve the amount of ripple that is visible on the screen.

9. Press **Trace 6** then **Data->Mem**.
10. Remove the LOAD and leave the end of the DUT open.
11. Press **Data Math** then **Data – Mem**. Use Averaging for high-loss measurements. Press **BW 2** then **Averaging**
12. Read Avg Cable Loss on the FieldFox screen.

Calibration

Calibration is performed in NA, CAT, and VVM Modes.

A CalReady calibration is automatically applied to measurements when the FieldFox is powered ON and when Preset. This calibration sets the reference plane at the test port connectors.

Calibration should be performed when any of the following occur:

- The temperature changes significantly.
- The Frequency Range, Resolution, Min Swp Time, or Power Level is changed.
- When using a phase stable jumper cable or adapter to connect the DUT to the FieldFox. These should be high-quality components.

After making measurement settings:

- Press **Cal 5** then follow the prompts.
- For highest accuracy with minimum connections for your setup, perform the Calibration Type that is recommended by the FieldFox.
- During a QuickCal, press **Skip Load** when NOT using a jumper cable or adapter.

Cal Rdy is shown on the screen when CalReady is correcting the measurement.

Cal ON Q is shown on the screen when a QuickCal is correcting the measurement.

CAL ON U is shown on the screen when a Response Cal or Mechanical Cal is correcting the measurement.

When a calibration is being interpolated, an asterisk is added to the screen annotation as follows:
Cal ON Q* or **CAL ON U***

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Power Meter Mode – Option 302

Power Meter measurements are made using a **Keysight USB Power Sensor.**

For a complete list of supported Keysight USB Power Sensors, visit: www.keysight.com/find/usbsensorsforfieldfox

Damage levels are:

- +25 dBm (320 mW) average
- +33 dBm peak (2 W) <10μs
- +5V

Use an Attenuator between the DUT and the power sensor when measuring power levels that are higher than +20 dBm. The attenuator value can be subtracted from the measurement using Offset as follows:

Select Offset

- Press **Scale / Amptd** then **Offset On Off**
- Then **Offset Val** Enter a value by which the power meter display is offset. A positive value compensates for a component with loss, such as an attenuator.

Zeroing

The Keysight USB Power Sensors perform internal zeroing automatically. Internal zeroing does NOT require that the power source be turned OFF.

Perform external zeroing when measuring power levels below -30 dBm. During external zeroing, the power source MUST either be turned OFF or the power sensor be disconnected from the DUT.

- Press **Cal 5**
- Then **External Zero**

Save and Recall Files

Save current settings and calibration, trace data (CSV) and .SNP), or a picture of the FieldFox screen.

Press **Save/Recall 9**

1. Then **Select Device** to set the **LOCATION** where the file is to be saved. Choose from the following:

   - **Internal** Saves/Recalls files to or from the FieldFox internal memory.
   - **SD Card** Saves/Recalls files to or from the mini SD card.
   - **USB** Saves/Recalls files to or from a USB Flash drive.

2. Then **File Type**

   - **State** Saves ALL FieldFox instrument settings and calibration for ALL Modes to an *.sta file.
   - **Trace + State** Saves the current trace (all traces in SA mode) and instrument settings to an *.sta file.
   - **Picture** Saves the FieldFox screen to a *.png file.
   - **Data (S1P)** Saves CAT and NA Mode trace data to an *.S1P file. (**Data (S2P)** for NA mode only.)
   - **Data (CSV)** Saves trace data from the current mode to a *.csv file.

3. Then press **Save** to save the specified **file type** to the specified **device location**.

4. Press **Recall** to read an *.sta file into the FieldFox.

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