

Keysight Technologies N9912A FieldFox RF Handheld Analyzer

4/6 GHz



Data Sheet

Documentation Warranty

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Definitions

All specifications and characteristics apply over a 25 ± 5 °C range (unless otherwise stated) and 90 minutes after the instrument has been turned on.

Specification (spec.)

Warranted performance. Specifications include guardbands to account for the expected statistical performance distribution, measurement uncertainties, and changes in performance due to environmental conditions. The following conditions must be met:

- FieldFox has been turned on at least 90 minutes
- FieldFox is within its calibration cycle
- Storage or operation at 25 ± 5 °C range (unless otherwise stated)

Typical (typ.)

Expected performance of an average unit over a 20 °C to 30 °C temperature range after being at ambient temperature for two hours, unless otherwise indicated; does not include guardbands. It is not covered by the product warranty. The FieldFox must be within its calibration cycle.

Nominal (nom.)

A general, descriptive term or design parameter. It is not tested, and not covered by the product warranty.

Calibration

The process of measuring known standards to characterize an instruments systematic (repeatable) errors.

Corrected (residual)

Indicates performance after error correction (calibration). It is determined by the quality of calibration standards and how well "known" they are, plus system repeatability, stability, and noise.

Uncorrected (raw)

Indicates instrument performance without error correction. The uncorrected performance affects the stability of a calibration.

Cable and Antenna Analyzer

| | Specification | Typical | | Supplemental Information |
|--|--|-------------------|-------------------|------------------------------|
| | | 10 minute warm up | 90 minute warm up | |
| Frequency Range | | | | |
| Option 104 | 2 MHz to 4 GHz | | | |
| Option 106 | 2 MHz to 6 GHz | | | |
| Frequency Reference (0 to 55 °C) | | | | |
| Accuracy | ±2 ppm | ±2 ppm | | |
| Aging Rate | ±1 ppm/yr | ±1 ppm/yr | | |
| Temperature Stability | ±1 ppm | ±1 ppm | | |
| Frequency Resolution | | | | |
| 2 MHz to 1.6 GHz | 2.5 kHz | | | |
| > 1.6 to 3.2 GHz | 5 kHz | | | |
| > 3.2 to 6 GHz | 10 kHz | | | |
| Resolution (Number of data points) | | | | |
| | 101, 201, 401, 601, 801, 1001, 1601, 4001, 10001 | | | |
| | Custom number of points can be set using SCPI | | | |
| Measurement Speed (Sweep time) | | | | |
| Return Loss ¹ , 1.75 to 3.85 GHz, 1001 points, Cal ON | | | | 0.4 ms/point (nominal) |
| DTF ² , 0 to 500 ft, 601 points, Cal ON | | | | 0.5 ms/point (nominal) |
| Output Power (RF Out Port) | | | | |
| High | | | | |
| 2 MHz to 4 GHz | | | | < +8 dBm, +6 dBm (nominal) |
| > 4 to 6 GHz | | | | < +7 dBm, +2 dBm (nominal) |
| Low (Typically 31 dB below high power) | | | | |
| 2 MHz to 4 GHz | | | | < -23 dBm, -25 dBm (nominal) |
| > 4 to 6 GHz | | | | < -24 dBm, -25 dBm (nominal) |
| Immunity to interference signals | | | | |
| | | | | +16 dBm (nominal) |

1. 1.5 ms/pt; applicable for N9912A with serial number prefix <MY5607/SG5607/US5607 and N9912A not upgraded with Option N9910HU-500
2. 2.4 ms/pt; applicable for N9912A with serial number prefix <MY5607/SG5607/US5607 and N9912A not upgraded with Option N9910HU-500

Cable and Antenna Analyzer (continued)

| | Specification | Typical | |
|--|---------------|-------------------|-------------------|
| | | 10 minute warm up | 90 minute warm up |
| Directivity | | | |
| Corrected with OSL calibration ¹ | > 42 dB | > 42 dB | |
| Corrected with QuickCal (Option 111) ² | | | ≥ 42 dB |
| Raw | | | |
| 2 MHz to 3.5 GHz | | | > 20 dB |
| > 3.5 to 6 GHz | | | > 14 dB |
| Source Match | | | |
| Corrected with OSL calibration ¹ | > 36 dB | > 36 dB | |
| Corrected with QuickCal (Option 111) ² | | | ≥ 35 dB |
| Raw | | | |
| 2 MHz to 3 GHz | | | > 25 dB |
| > 3 to 6 GHz | | | > 16 dB |
| Reflection Tracking | | | |
| Corrected with OSL calibration ¹ | ± 0.06 dB | ± 0.06 dB | |
| Corrected with QuickCal (Option 111) ² | | | ± 0.15 dB |
| Reflection Dynamic Range | | | |
| Reflection (RF Out port) (High power out) | | | |
| 2 MHz to 4 GHz | | 60 dB | |
| > 4 to 6 GHz | | 55 dB | |
| Maximum Measurable Cable Loss Using 1-Port CAT Measurement Model ³ | | | |
| | | Refl Dyn Range /2 | |

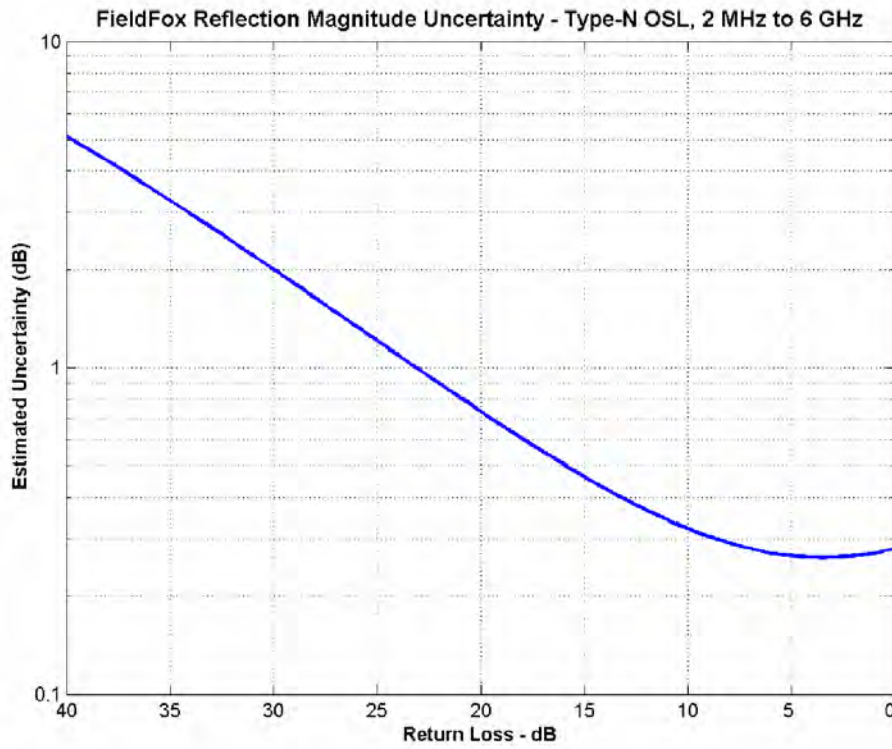
1. Using recommended calibration kits
2. QuickCal is performed with the connect LOAD step
3. Higher cable losses can be measured using transmission or S21 measurements. Cable losses measured in transmission mode limited by transmission dynamic range

Cable and Antenna Analyzer (continued)

| | Specification | Typical | |
|---|--|--|-------------------|
| | | 10 minute warm up | 90 minute warm up |
| Transmission Dynamic Range (Option 110), 300 Hz IF Bandwidth | | | |
| 2 MHz to 2 GHz | | 72 dB | |
| > 2 to 3 GHz | | 67 dB | |
| > 3 to 5 GHz | | 58 dB | |
| > 5 to 6 GHz | | 49 dB | |
| Return Loss | | | |
| Display Range | 0 to 100 dB | | |
| Resolution | 0.01 dB | | |
| VSWR | | | |
| Display Range | 1 to 500 | | |
| Resolution | 0.01 | | |
| Cable Loss | | | |
| Display Range | 0 to 100 dB | | |
| Resolution | 0.01 dB | | |
| Distance-to-Fault | | | |
| Horizontal Range | Range = [(number of points - 1) / frequency span * 2] * velocity factor * speed of light | Number of points auto coupled according to start and stop distance entered | |
| Horizontal Resolution | Resolution = Range / (number of points - 1) | Number of points settable by user | |
| Bandpass Mode Window Types | | Maximum, medium, and minimum windows | |

Cable and Antenna Analyzer (continued)

Figure 1: CAT Mode, Type-N Calibration Kit – Magnitude (Specification)



Cable and Antenna Analyzer (continued)

Figure 2: CAT Mode, QuickCal – Magnitude (Typical)

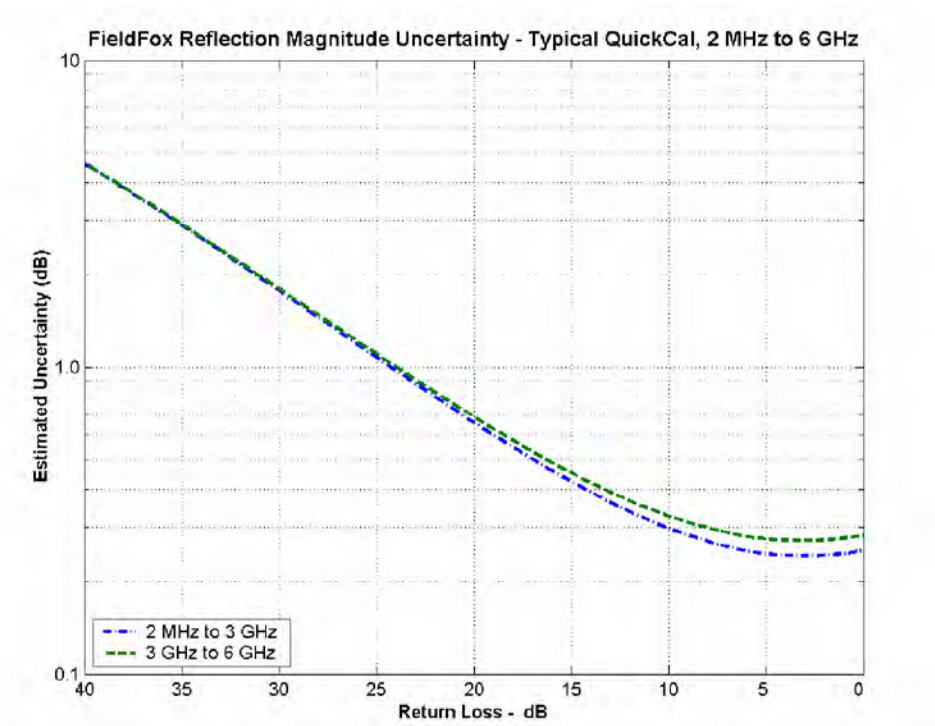
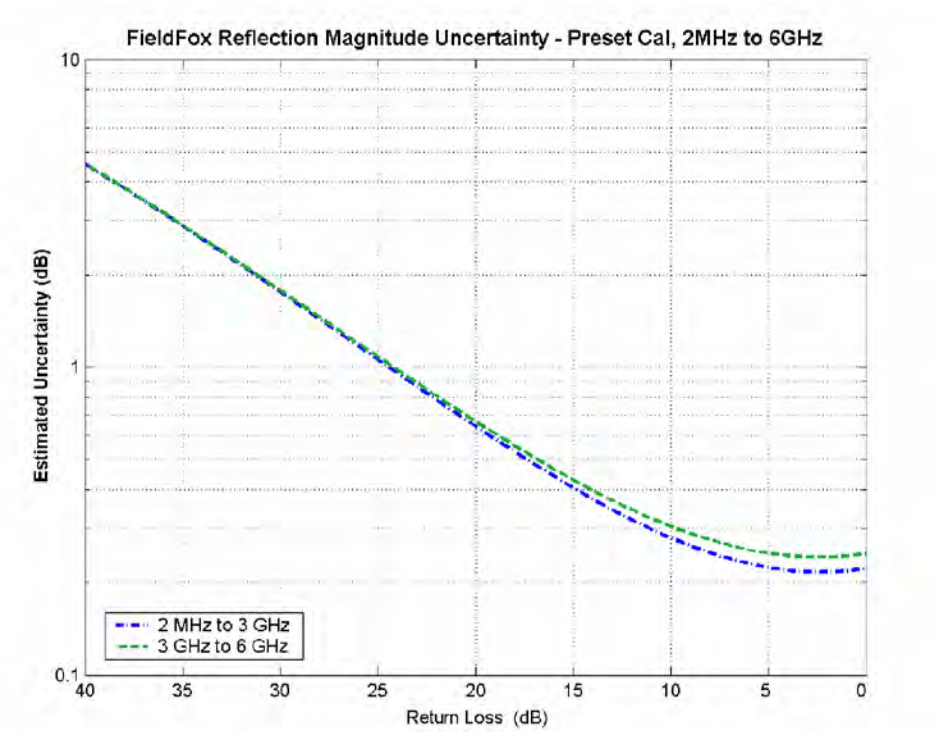


Figure 3: CAT Mode, Preset Cal – Magnitude (Typical)



Network Analyzer (Option 303)

The following CAT mode performance parameters apply to NA mode: frequency accuracy, frequency resolution, output power, directivity, source match, reflection tracking, and reflection and transmission dynamic range. NA mode performance that is in addition to CAT mode is listed in the table below.

| | Specification | Supplemental Information |
|--|-------------------------|--|
| Frequency Range | | |
| Option 104 | 2 MHz to 4 GHz | |
| Option 106 | 2 MHz to 6 GHz | |
| Measurement Option | | |
| S11 – Option 303 | | |
| S21 – Option 110 and 303 | | |
| Measurement Speed (Sweep time) | | |
| S11: 1.75 GHz – 3.85 GHz, 1001 Points, Cal ON ¹ | | 0.4 ms/point (nominal) |
| S21: 1.78 GHz – 2.06 GHz, 201 Points, Cal ON ² | | 1.8 ms/point (nominal) |
| S11 Phase Uncertainty³ | | |
| | See Figure 5 on page 12 | |
| Display Range | –180° to +180° | |
| System Impedance | | |
| | 50Ω (nominal) | 75Ω with appropriate adapter and Cal Kit |

1. 1.5 ms/pt; applicable for N9912A with serial number prefix <MY5607/SG5607/US5607 and N9912A not upgraded with Option N9910HU-500
2. 1.9 ms/pt; applicable for N9912A with serial number prefix <MY5607/SG5607/US5607 and N9912A not upgraded with Option N9910HU-500
3. Using recommended calibration kits

Network Analyzer (Option 303 continued)

| | Information |
|---------------------------------------|--|
| Measurements | S11 magnitude and phase S21 magnitude (Option 110 and 303) A receiver magnitude R receiver magnitude |
| Formats | Log magnitude, Linear magnitude Available ONLY for S11: VSWR, Phase, Smith Chart, Polar, Group delay, Unwrapped phase |
| Resolution (Number of data points) | 101, 201, 401, 601, 801, 1001, 1601, 4001, 10001 Custom number of points can be set using SCPI |
| Averaging | Sweep and point averaging; 2 to 999 points. |
| Number of traces | Four traces available. Tr1, Tr2, Tr3, Tr4 |
| Data markers | Each trace has six independent markers that can be displayed simultaneously. Delta markers are available for each marker. |
| Marker formats | Default marker format is the trace format. In Smith chart or polar format, [Real +Imag] or [Mag and Phase] formats are also available. |
| Marker functions | Peak, Next Peak, Peak Left, Peak Right, Mkr→ Center, Min Search, Peak Excursion, Peak Threshold, Target, Bandwidth, Tracking |
| Display formats | Single-trace Dual-trace overlay (both traces on one graticule) Dual-trace split (each trace on separate graticules) Three-trace overlay (all three traces on one graticule) Three-trace split (each trace on separate graticules) Quad-trace split (each trace on separate graticules) |
| Display data | Display data, memory, data and memory, or data math |
| Trace math | Vector division or subtraction of current linear measurement values and memory data. |
| Scale | Autoscale, scale, reference level, reference position Autoscale: Automatically selects scale resolution and reference value to center the trace. Autoscale all scales all visible traces. |
| Title | Add custom titles to the display. |
| Limit lines | Define test limit lines that appear on the display for go/no go testing. Lines may be any combination of horizontal, sloping lines, or discrete data points. Each trace can have its own limit line. Limit Lines can be Fixed, Relative to center frequency and reference level, and can be built from existing traces. |

Network Analyzer (Option 303 continued)

Figure 4: NA Mode, Type-N Calibration Kit – Magnitude (Specification)

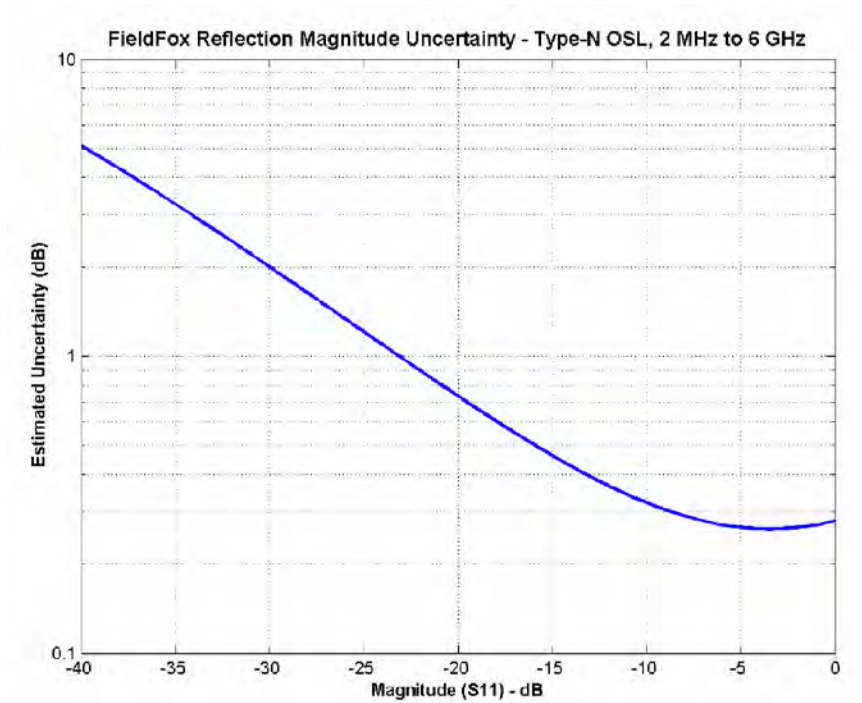
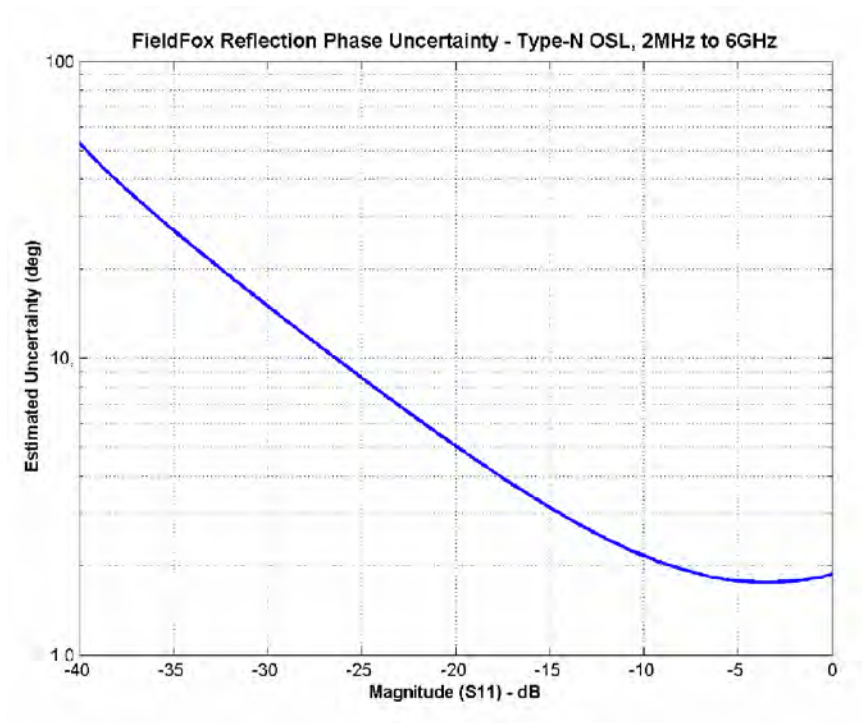


Figure 5: NA Mode, Type-N Calibration Kit – Phase (Specification)



Network Analyzer (Option 303 continued)

Figure 6: NA Mode, QuickCal – Magnitude (Typical)

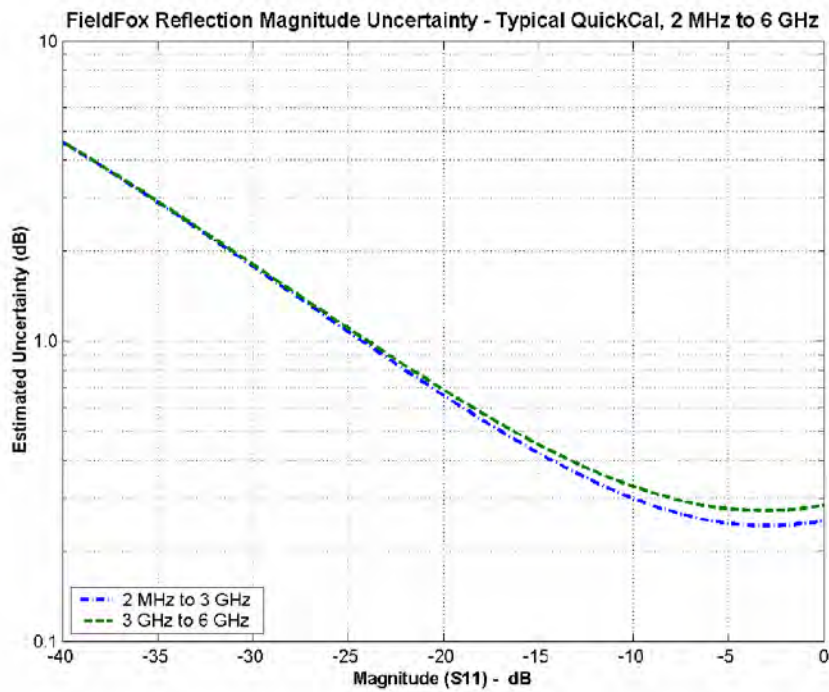
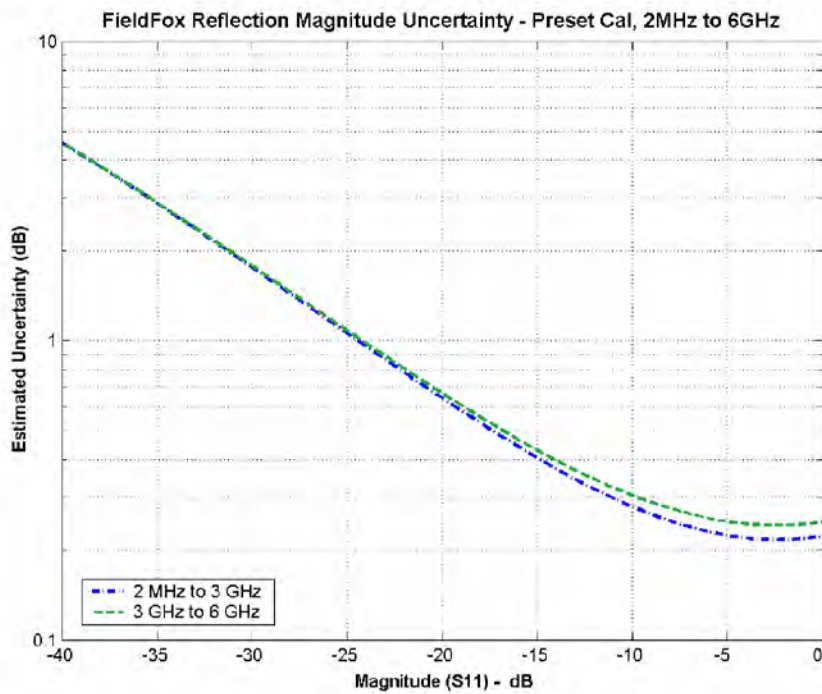
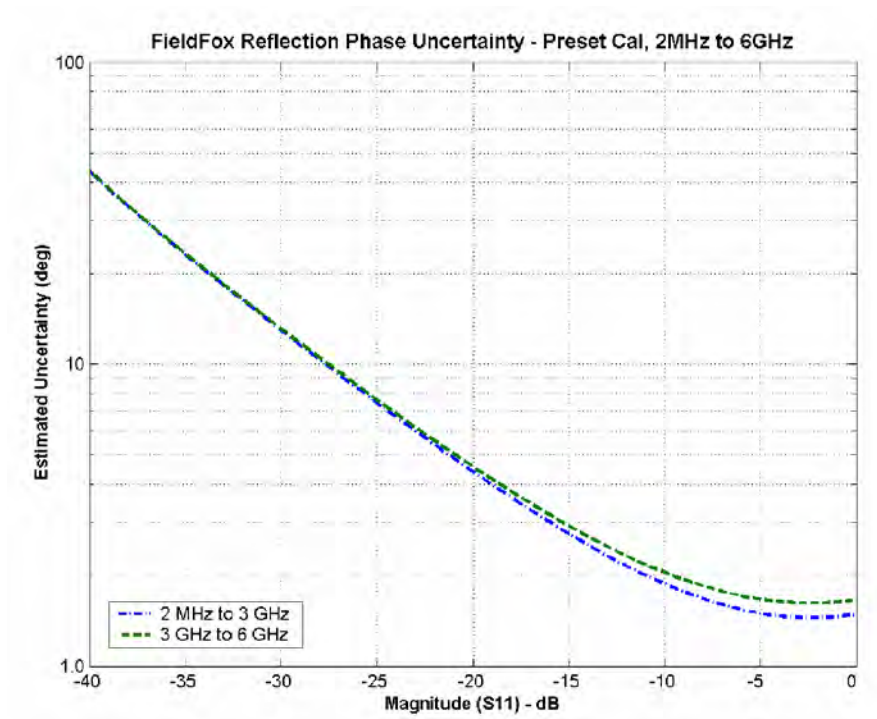


Figure 7: NA Mode, Preset Cal – Magnitude (Typical)



Network Analyzer (Option 303 continued)

Figure 8: NA Mode, Preset Cal – Phase (Typical)



Time Domain (Option 010)

Using time domain, data from transmission or reflection measurements in the frequency domain are converted to the time domain. The time-domain response shows the measured parameter value versus time.

Time stimulus modes

| | |
|------------------|--|
| Low-pass step | Similar to a traditional time domain reflectometer (TDR) stimulus waveform, Low-pass step is used to measure low-pass devices. The frequency-domain data should extend from DC (extrapolated value) to a higher value. |
| Low-pass impulse | Also used to measure low-pass devices |
| Bandpass impulse | Stimulates a pulsed RF signal and is used to measure the time-domain response of band-limited devices |

Windowing

The windowing function is used to filter the frequency-domain data and thereby reduce overshoot and ringing in the time-domain response.

Gating

The gating function is used to selectively remove reflection or transmission time-domain responses. When converted back to the frequency domain, the effects of the responses outside the gate are removed.

Spectrum Analyzer (Option 230 or 231)

| | Specification | Supplemental Information |
|---|--|--|
| Frequency Range | | |
| Option 230 | 100 kHz to 4 GHz | Usable to 5 kHz ¹ |
| Option 231 | 100 kHz to 6 GHz | Usable to 5 kHz ¹ (Tunable to 6.1 GHz) |
| Frequency Reference (-10 to 55 °C) | | |
| Accuracy | ±2 ppm | |
| Aging Rate | ± 1 ppm/yr | |
| Temperature Stability | ± 1 ppm | |
| Frequency Readout Accuracy (start, stop, center, marker) | | |
| | ± (readout frequency x frequency reference accuracy + RBW centering + 0.5 x horizontal resolution) | Horizontal resolution = span/(trace points - 1) RBW centering : 5% x RBW, FFT mode (nominal) 16% x RBW, Step mode (nominal) |
| Frequency Span | | |
| Range | 0 Hz (zero span), 10 Hz to max freq | |
| Accuracy | ±(2 x RBW centering + horizontal resolution) | ±(2 x RBW centering +2 x horizontal resolution) for detector = Normal |
| Resolution | 1 Hz | |
| Sweep Time, Span = 0 Hz | | |
| Range | | |
| Minimum | 1.0 us | |
| Maximum | | |
| RBW = 2 MHz | 2.18 ms | |
| RBW = 1 MHz | 3.28 ms | |
| RBW = 300 kHz | 5.46 ms | |
| RBW = 100 kHz | 16.38 ms | |
| RBW = 30 kHz | 54.60 ms | |
| RBW = 10 kHz | 163.84 ms | |
| RBW = 3 kHz | 546.00 ms | |
| RBW = 1 kHz | 1.64 s | |
| RBW = 300 Hz | 2.54 s | |
| Resolution | 100.0 ns | |
| Readout | Entered value representing trace horizontal scale range. | |

1. With signal at center frequency.

Spectrum Analyzer (Option 230 or 231 continued)

| Description | Specification | Supplemental Information |
|---|--|---|
| Sweep Acquisition, Span > 0 Hz | | |
| Range | 1 to 5000. Number of data acquisitions per trace point. Value is normalized to the minimum required to achieve amplitude accuracy with CW signals. | Auto coupled. For pulsed RF signals, manually increase the sweep acquisition value to maximize the pulse spectrum envelope. |
| Resolution | 1 | |
| Readout | Measured value representing time required to tune receiver, acquire data, and process trace. | |
| Trigger | | |
| Type | Free Run, Video, External | |
| Slope | Positive, Negative edge | |
| Delay | Range: 0 to 10 sec | |
| Range | Resolution: 100 nsec | |
| Auto Trigger | Forces a periodic acquisition in the absence of a trigger event Range: 0 sec (OFF) to 10 sec | |
| Time Gating | | |
| Gate Method | Triggered FFT | |
| Gate Delay Range | Same as Trigger Delay | |
| Trace Update | | |
| Span = 20 MHz, RBW = 3 kHz ¹ | 5.9 updates/s (nominal) | |
| Span = 100 MHz, RBW auto coupled ² | 16.7 updates/s (nominal) | |
| Span = 6 GHz, RBW auto coupled ³ | 1.7 update/s (nominal) | |
| Trace Points | | |
| 101, 201, 401, 601, 801, 1001 (Defaults to 401) | | |

1. 1.5 updates/s; applicable for N9912A with serial number prefix <MY5607/SG5607/US5607 and N9912A not upgraded with Option N9910HU-500.
2. 7 updates/s; applicable for N9912A with serial number prefix <MY5607/SG5607/US5607 and N9912A not upgraded with Option N9910HU-500.
3. 1 update/s; applicable for N9912A with serial number prefix <MY5607/SG5607/US5607 and N9912A not upgraded with Option N9910HU-500.

Spectrum Analyzer (Option 230 or 231 continued)

| Description | Specification | Supplemental Information | |
|------------------------------------|---|---|--------------------------|
| Resolution Bandwidth (RBW) | | | |
| Range (-3 dB bandwidth) | | | |
| Zero Span | 300 Hz to 1 MHz in 1, 3, 10 sequence; 2 MHz | | |
| Non-Zero Span | 10 Hz to 300 kHz in 1/1.5/2/3/5/7.5/10 sequence; 1 MHz, 2 MHz | Step keys change RBW in 1, 3, 10 sequence | |
| Bandwidth Accuracy | | | |
| 1 kHz to 1 MHz | | ± 5% (nominal) | |
| 10 Hz to 100 kHz non-zero span | | ± 1% (nominal) | |
| 2 MHz | | ± 10% (nominal) | |
| 300 Hz zero span | | ± 10% (nominal) | |
| Selectivity (-60 dB/ -3 dB) | | 4:1 (nominal) | |
| Video Bandwidth (VBW) | | | |
| Range | 1 Hz to 2 MHz in 1/1.5/2/3/5/7/10 sequence | VBW ≥ RBW in zero span | |
| Stability | Specification | Typical | |
| Noise Sidebands, CF = 1 GHz | | 10 minute warm up | 90 minute warm up |
| 10 KHz offset | < - 85 dBc/Hz | - 88 dBc/Hz | - 88 dBc/Hz |
| 30 KHz offset | | - 89 dBc/Hz | - 89 dBc/Hz |
| 100 KHz offset | | - 95 dBc/Hz | - 95 dBc/Hz |
| 1 MHz offset | | - 115 dBc/Hz | - 115 dBc/Hz |
| Amplitude Range | | | |
| Measurement Range | Displayed average noise level (DANL) to + 20 dBm | | |
| Input Attenuator Range | 0 to 31 dB (1 dB steps) | | |
| Maximum Safe Input Level | | | |
| Average Continuous Power | +27 dBm (0.5 W) | | |
| DC | ±50 VDC | | |

Spectrum Analyzer (Option 230 or 231 continued)

| Displayed Average Noise Level (DANL) 10 Hz RBW, 10 Hz VBW, 50 ohm input termination, 0 dB attenuation, average detector | | | | |
|--|---|---------------------|--------------------|--------------------|
| | Specification | | Typical | |
| | | | 10 minute warm up | 90 minute warm up |
| Preamp off | 20 to 30 °C | -10 to 55 °C | 20 to 30 °C | 20 to 30 °C |
| 10 MHz to 2.4 GHz | - | - | - | -130 dBm |
| > 2.4 to 5.0 GHz | - | - | - | -125 dBm |
| > 5.0 to 6.0 GHz | - | - | - | -119 dBm |
| Preamp on (Option 235) | 20 to 30 °C | -10 to 55 °C | 20 to 30 °C | 20 to 30 °C |
| 10 MHz to 2.4 GHz | < -143 dBm | < -141 dBm | - | -148 dBm |
| > 2.4 to 5.0 GHz | < -140 dBm | < -138 dBm | - | -145 dBm |
| > 5.0 to 6.0 GHz | < -132 dBm | < -130 dBm | - | -138 dBm |
| Display Range | | | | |
| Log Scale | Ten divisions displayed; 0.1 to 1.0 dB/division in 0.1 dB steps and 1 to 20 dB/division in 1 dB steps | | | |
| Traces | | | | |
| Detectors | Normal, Positive Peak, Negative Peak, Sample, Average | | | |
| States | Clear/Write, Max Hold, Min Hold, Average, View, Blank | | | |
| | Number of averages: 1 to 10,000 | | | |
| Number of traces | 4 | | | |
| Reference Level | | | | |
| Range | -170 to +30 dBm | | | |
| Resolution | 0.1 dB | | | |
| Accuracy | 0 dB | | | |

Spectrum Analyzer (Option 230 or 231 continued)

| Absolute Amplitude Accuracy at 50 MHz | | | |
|--|---------------|-------------------|-------------------|
| Peak detector, 10 dB attenuation, preamplifier off, RBW < 2 MHz, input signal -5 dBm to -50 dBm, all settings auto-coupled | | | |
| | Specification | Typical | |
| | | 10 minute warm up | 90 minute warm up |
| 20 to 30 °C | ± 0.8 dB | ± 0.8 dB | ± 0.4 dB |
| -10 to 55 °C | ± 1.1 dB | - | ± 0.8 dB |
| Frequency Response | | | |
| Relative to 50 MHz, Peak detector, 10 dB attenuation, preamplifier off, RBW = 30 kHz, input signal 0 dBm to -50 dBm, all settings auto-coupled | | | |
| Preamp off | | | |
| 20 to 30 °C | | | |
| 2 to 10 MHz | ± 1.1 dB | ± 1.0 dB | ± 0.5 dB |
| > 10 MHz to 3 GHz | ± 0.9 dB | ± 0.6 dB | ± 0.3 dB |
| > 3 to 5 GHz | ± 1.3 dB | ± 1.1 dB | ± 0.5 dB |
| > 5 to 6 GHz | ± 1.5 dB | ± 1.5 dB | ± 0.5 dB |
| -10 to 55 °C | | | |
| 2 to 10 MHz | ± 2.0 dB | - | ± 1.0 dB |
| > 10 MHz to 3 GHz | ± 1.5 dB | - | ± 0.6 dB |
| > 3 to 5 GHz | ± 2.0 dB | - | ± 1.1 dB |
| > 5 to 6 GHz | ± 2.6 dB | - | ± 1.5 dB |
| Preamp on (Option 235) | | | |
| 20 to 30 °C | | | |
| 2 to 10 MHz | - | - | ± 0.7 dB |
| > 10 MHz to 3 GHz | - | - | ± 0.5 dB |
| > 3 to 5 GHz | - | - | ± 0.7 dB |
| > 5 to 6 GHz | - | - | ± 0.7 dB |
| -10 to 55 °C | | | |
| 2 to 10 MHz | - | - | ± 1.2 dB |
| > 10 MHz to 3 GHz | - | - | ± 0.8 dB |
| > 3 to 5 GHz | - | - | ± 1.3 dB |
| > 5 to 6 GHz | - | - | ± 1.7 dB |

Spectrum Analyzer (Option 230 or 231 continued)

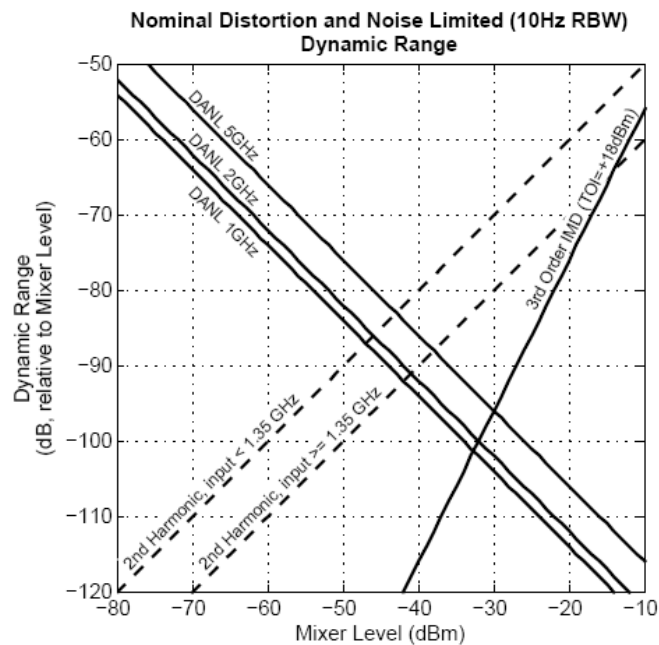
| Specification | Typical | | Supplemental Information |
|---|-------------------|-------------------|--|
| | 10 minute warm up | 90 minute warm up | |
| Resolution Bandwidth Switching Uncertainty | | | |
| RBW < 2 MHz | | | 0.0 dB 0.7 dB peak-to-peak ¹ |
| Total Absolute Amplitude Accuracy ² | | | |
| Peak detector, 10 dB attenuation, preamplifier off, RBW < 2 MHz, input signal 0 dBm to -50 dBm, all settings auto coupled | | | |
| Absolute Amplitude at 50 MHz + Frequency Response ³ | | | |
| 20 to 30 °C: | | | |
| 2 to 10 MHz | ± 1.8 dB | ± 1.28 dB | ± 0.60 dB |
| > 10 MHz to 3 GHz | ± 1.5 dB | ± 1.0 dB | ± 0.50 dB |
| > 3 to 5 GHz | ± 1.9 dB | ± 1.36 dB | ± 0.60 dB |
| > 5 to 6 GHz | ± 2.1 dB | ± 1.7 dB | ± 0.60 dB |
| RF Input VSWR | | | |
| At all attenuation settings | | | 1.5:1 (nominal) |
| Second harmonic distortion (SHI) | | | |
| -30 dBm signal at input mixer ⁴ | | | |
| 2 MHz to 1.35 GHz | | | < -70 dBc, +40 dBm (nominal) |
| 1.35 to 3 GHz | | | < -80 dBc, +50 dBm (nominal) |
| Third order intermodulation distortion (TOI) | | | |
| Two -30 dBm tones at input mixer | | | < -96 dBc, +18 dBm (nominal) |

1. For signals not at center frequency
2. With signal at center frequency
3. The specification for Total Absolute Amplitude Accuracy is less than the sum of the Absolute Amplitude Accuracy and Frequency Response specifications because redundant uncertainty is removed
4. Mixer level = RF input level - input attenuation

Spectrum Analyzer (Option 230 or 231 continued)

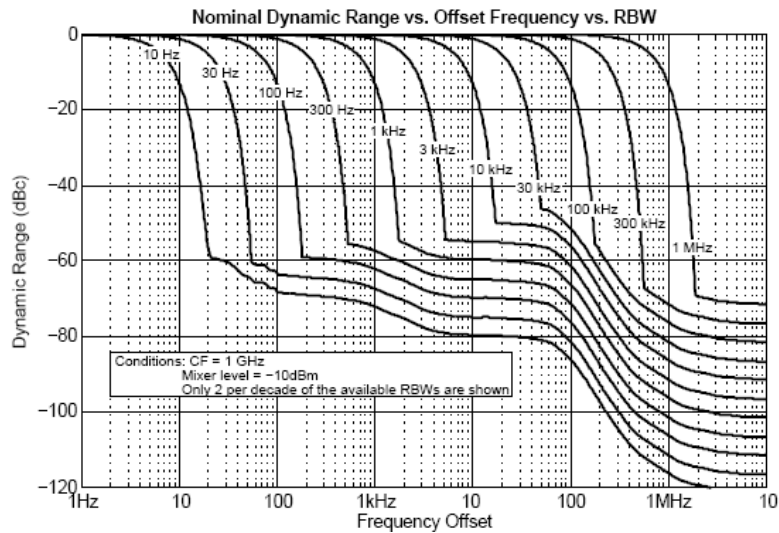
| Residual Responses | |
|--|---|
| Input terminated, 0 dB attenuation, preamplifier off, RBW \leq 1 kHz, VBW auto coupled | |
| 20 MHz to 3 GHz | -90 dBm (nominal) |
| > 3 to 6 GHz | -85 dBm (nominal) |
| Spurious Responses | |
| Input Mixer level -30 dBm | |
| Rf _{sig} = Rftune + 417 MHz | -70 dBc (nominal) |
| Rf _{sig} = Rftune + 1.716 GHz | -80 dBc (nominal) |
| Input Mixer level -10 dBm; First IF Image Response | |
| Rf _{sig} = Rftune - 2 x 0.8346 GHz (for Rftune 5.7 to 6 GHz) | -50 dBc (nominal) |
| Sidebands | -80 dBc (nominal) |
| | -60 dBc (nominal) when battery charging, 260 kHz offset |

Figure 10



Spectrum Analyzer (Option 230 or 231 continued)

Figure 11



Tracking Generator or Independent Signal Source

The independent source or tracking generator is included with either spectrum analyzer option. The source can be used in continuous wave (CW) or stimulus/response (S/R) mode. In CW mode, the source frequency is independent of the receiver frequency. The source can be tuned to a frequency that is different from the receiver. In stimulus/response mode, the source operates the same as a traditional tracking generator - the receiver tracks the source.

| Frequency range | |
|--|---|
| 2 MHz to 4 GHz (Option 230) or 2 MHz to 6 GHz (Option 231) | |
| Amplitude | |
| High power | 2 MHz to 4 GHz < +8 dBm, +6 dBm (nominal) >4 GHz to 6 GHz < +7 dBm, +2 dBm (nominal) |
| Low power | 2 MHz to 4 GHz < -23 dBm, -25 dBm (nominal) >4 GHz to 6 GHz < -24 dBm, -29 dBm (nominal) |
| Attenuation | 0 to 31 dB |
| Functions | Continuous wave, stimulus/response |

AM/FM Tune and Listen

| Description | |
|--|------------------------|
| Audio demodulation types | AM, FM Narrow, FM Wide |
| Audio Bandwidth | 16 kHz |
| Receiver IF Bandwidth | |
| AM | 35 kHz |
| FM Narrow | 12 kHz |
| FM Wide | 150 kHz |
| Listen Time Range | 0 to 100 seconds |
| Audio Signal Strength Indicator | |
| Audio Signal Strength Indicator helps locate signals. The tone and frequency of the beep varies with signal strength. | |
| Radio Standards | |
| With a Radio Standard applied, pre-defined frequency bands, channel numbers or Uplink / Downlink selections can be used instead of manual frequency entry. The pre-defined FieldFox Radio Standards include bands such as W-CDMA, LTE, and GSM. Custom Radio Standards can also be defined, imported, and applied to the FieldFox. | |
| FieldFox Power Suite Measurement types | |
| Channel Power, Occupied Bandwidth, and Adjacent Channel Power Ratio | |

Preamplifier (Option 235)

| Specification | Typical |
|-----------------|--------------------|
| | 10 minute warm up |
| Frequency Range | 100 kHz to 4/6 GHz |
| Gain | 22 dB |

Interference Analyzer (Option 236)

| Description | |
|------------------------------|---|
| Spectrogram display | Overlay, full screen, top, or bottom with active trace |
| Waterfall angle | Moderate, steep, gradual, wide angle |
| Markers | Time, delta time |
| Trace playback and recording | Record all spectrum analyzer measurements |
| | Store data internally/USB/SD card |
| | Playback recorded data using FieldFox |
| | Frequency mask trigger allows recording to occur upon trigger |

Channel Scanner (Option 312)

| | Description |
|------------------------------|--|
| Scan Mode | Range or custom list |
| Display Type | Bar chart vertical, bar chart horizontal, channel power, strip chart, chart overlay, scan & listen |
| Data logging mode | Time with geo tagging |
| Trace playback and recording | Record channel power measurement |
| | Store data internally or USB or SD card in .csv or .kml format |
| | Playback recorded data using FieldFox |
| | Data in .kml format can be exported to Google Earth |

Channel Power Meter (Option 311)

Channel power meter is a built-in power measurement that application does not require an external power sensor. Set the center frequency and channel bandwidth. The results are shown on a large analog display.

| | Specification | Typical |
|-----------------------|--------------------|----------|
| Frequency range | 100 kHz to 4/6 GHz | |
| Power accuracy | | |
| 2 to 10 MHz | ± 1.8 dB | ± 0.6 dB |
| > 10 MHz to 3 GHz | ± 1.5 dB | ± 0.5 dB |
| > 3 to 5 GHz | ± 1.9 dB | ± 0.6 dB |
| > 5 to 6 GHz | ± 2.1 dB | ± 0.6 dB |

External USB Power Sensor Support (Option 302)

The external USB power sensor option supports various Keysight USB Power Sensors. Supported power sensors: www.keysight.com/find/fieldfoxsupport

Power Sensor Measurements vs. Frequency (Option 208 and 302)

This feature allows the FieldFox source frequency to be set independently from the power sensor (receiver) frequency. With frequency-offset using power sensor (FOPS), the frequency of both the source and receiver are swept, and the two track each other. The offset frequency can be negative, zero, or positive.

FOPS can be used to characterize the scalar transmission response of devices such as mixers and converters. This frequency-offset capability is necessary for conversion loss/gain measurements on frequency-translating devices, since by definition, the input and output frequencies of the DUT are different. The FieldFox source stimulates the DUT and the power sensor is used as the measurement receiver.

Since power sensors are inherently broadband devices (not frequency-selective), the user should ensure that only the signal of interest is present at the power sensor input and that all others signals are filtered appropriately.

| Setup parameter | |
|--|---|
| Source frequency | Center/span or start/stop. Range determined by FieldFox |
| Receiver frequency | Range determined by power sensor range |
| Frequency offset | 0, > 0, < 0 |
| Frequency step size | 30 kHz minimum |
| Number of points | 2 to 1601 |
| Combination of number of points and frequency step size limited by span. | |
| Dwell time/point: | 0 to 1.0 sec |

Source frequency span must be equal to receiver frequency span.

Receiver sweep direction: forward (default setting) or reverse.

For some DUTs, the output frequency may sweep in a reverse direction, as compared to the source frequency. The basic relationships between the source, receiver and offset frequencies are shown in the table below. The FieldFox analyzer includes an offset calculator that ensures a fast measurement setup.

| Src sweep direction | Rx sweep direction | Frequency calculations |
|-------------------------------------|-----------------------------------|---|
| Forward $f_{2_{rc}} > f_{1_{src}}$ | Forward $f_{2_{rx}} > f_{1_{rx}}$ | Receiver frequency = Source frequency \pm Offset |
| Forward $f_{2_{src}} > f_{1_{src}}$ | Reverse $f_{2_{rx}} < f_{1_{rx}}$ | Receiver frequency = Offset - Source frequency Offset > Source frequency |

| | Description |
|---------------|--|
| Measurements | Source power, gain/loss and receiver (Rx) power Gain = Rx power / source power (memory). Source power (memory) is measured during setup. |
| Output power | Refer to the test port output power typical data on page 5 |
| Dynamic range | The dynamic range with FOPS is dependent on FieldFox's output power and the power sensor's dynamic range. Supported USB power sensors: www.keysight.com/find/fieldfoxsupport |

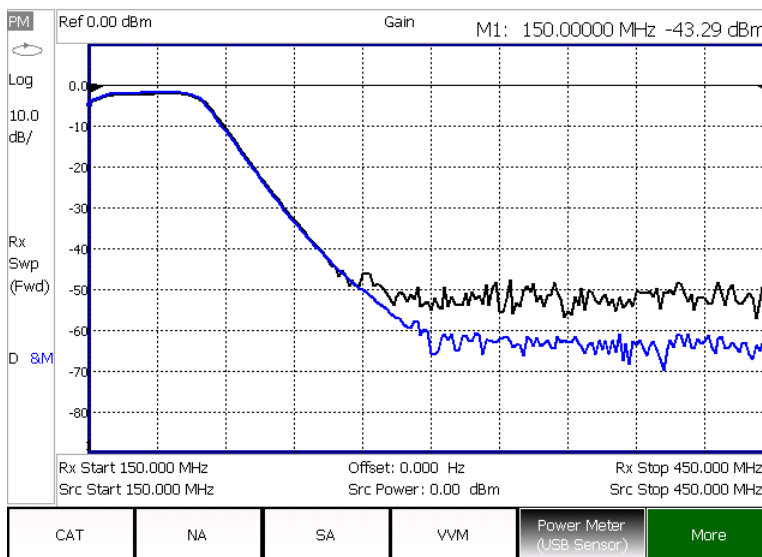
Power Sensor Measurements vs. Frequency (Option 208 and 302)

| | Description |
|---------------|--|
| Measurements | Source power, gain/loss and receiver (Rx) power Gain = Rx power / source power (memory). Source power (memory) is measured during setup. |
| Output power | Refer to the test port output power typical data on page xx |
| Dynamic range | The dynamic range with FOPS is dependent on FieldFox's output power and the power sensor's dynamic range. Supported USB power sensors: www.keysight.com/find/fieldfoxsupport |

The graph below shows a filter measurement using two different power sensors, the U2002A (-60 to +20 dBm) and the U2021XA (-45 to +20 dBm).

While a filter is not commonly measured using FOPS, it is a useful device for demonstrating dynamic range.

For both measurements, the FieldFox source power was set to 0 dBm, the maximum available in the selected frequency range of 150 to 450 MHz.



Pulse Measurements (Option 330)

The FieldFox pulse measurement option can be used to characterize RF pulses such as those used in radar and electronic warfare systems. Measurements are made using FieldFox and Keysight's UBS peak power sensors.

Performance specifications such as frequency, dynamic range and minimum pulse width depend on the peak power sensor. Supported peak power sensors: www.keysight.com/find/fieldfoxsupport

| | Description |
|------------------|--|
| Setup parameters | Frequency, time (center), time/division, gating, triggering, video bandwidth, resolution averaging |
| Functions | Average power, peak power, and peak to average ratio, standard and gated Analog gauge display and digital display, dBm and watts Relative/absolute measurements, dB or %, minimum and maximum limits Trace graph for pulse profiling with gating Rise time, fall time, pulse width, pulse period, pulse repetition frequency |

Remote Control Capability (Option 030)

Option 030 adds remote control capability to FieldFox analyzers, so that FieldFox can be controlled via an iOS device. The FieldFox app, running on the iOS device, combined with Option 030 on the FieldFox analyzer provides full control of the instrument from a remote location. The app emulates the front panel of FieldFox, so users can press the FieldFox hardkeys or softkeys using their iPhone or iPad, and make measurements remotely.

- iOS device requirements
- iPhone, iPad, or iPod Touch
- iOS of 6.1 or higher
- A WiFi or 3G/4G connection

The FieldFox app communicates with FieldFox via a network connection, so both the iOS device and FieldFox need to be on a network where both devices can reach the other. For example, a company intranet or a site installation using a wireless router. FieldFox can directly be connected to a LAN cable, or if wired LAN is not available, a user supplied wireless router can be configured to work with FieldFox.

FieldFox app without Option 030

The FieldFox app can be installed on an iOS device independent of the presence of Option 030 on the analyzer. Without Option 030, users can view the live display screen of their FieldFox remotely, but cannot control the instrument. With 030 purchased and installed on their FieldFox, users can both view and control their FieldFox.

Option 030 and the FieldFox app are not applicable to Android, BlackBerry, or Windows phone/tablet devices.

General Information

| | Specification | Typical | Supplemental Information |
|-----------------------------|---|--------------|--------------------------|
| Calibration Cycle | 1 Year | | |
| Weight | 2.8 kg or 6.2 lb. including battery | | |
| Dimension H x W x D | 292 x 188 x 72 mm (11.5" x 7.4" x 2.8") | | |
| Environmental | | | |
| MIL-PRF-28800F class 2 | Operating temperature | | |
| | Storage temperature | | |
| | Operating humidity | | |
| | Random vibration | | |
| | Functional shock | | |
| | Bench drop | | |
| Altitude – Operating | 9,144 m (30,000 ft) using battery | | |
| Altitude – Non-Operating | 15,240 m (50,000 ft) | | |
| Altitude – AC to Dc adapter | 3, 000 m (9, 840 ft) | | |
| IP Class | 30 | | |
| Temperature Range | | | |
| Operating, AC power | -10 to 55 °C | | |
| Operating, battery | -10 to 50 °C | -10 to 55 °C | |
| Storage ¹ | -51 to 71 °C | | |

1. With the battery pack removed. The battery packs should be stored in an environment with low humidity. Extended exposure to temperature above 45 °C could degrade battery performance and life

General Information (continued)

EMC: Complies with the essential requirements of the European EMC Directive as well as current editions of the following standards (dates and editions are cited in the Declaration of Conformity).

IEC/EN 61326-1

CISPR Pub 11 Group 1, class A

AS/NZS CISPR 11

ICES/NMB-001

This ISM device complies with Canadian ICES-001. Cet appareil ISM est conforme a la norme NMB-001 du Canada.

When subjected to continuously present radiated electromagnetic phenomena, some degradation of performance may occur.

Safety: Complies with the essential requirements of the European EMC Directive as well as current editions of the following standards (dates and editions are cited in the Declaration of Conformity).

IEC/EN 61010-1

Canada: CSA C22.2 No. 61010-1

USA: UL std no. 61010-1

Power Supply

External DC Input 15 to 19 VDC (40 W maximum when battery charging)

External AC Power Adapter Efficiency Level IV, 115 VAC

Input 100 to 250 VAC, 50 to 60 Hz, 1.25 – 0.56 A

Output 15 VDC, 4 A

Power Consumption 12 W (On)

Battery

Lithium ion 10.8 V, 4.6 A-h

Operating time 4 hours (typical)

Charge time A full discharged battery takes about 1.5 hours to recharge to 80%. 4 hours to 100%

Discharge temperature limits ¹ -10 to 60 °C, ≤ 85% RH

Charge temperature limits ¹ 0 to 45 °C, ≤ 85% RH

Storage temperature limits ¹ -20 to 50 °C, ≤ 85% RH

The battery packs should be stored in an environment with low humidity. Extended exposure to temperature above 45 °C could degrade battery performance and life

1. Charge and discharge temperatures are internal temperatures of the battery as measured by a sensor embedded in the battery. The Battery screen displays temperature information. To access the screen, select **System**, **Service**, **Diagnostics**, and **Battery**

General Information (continued)

| Test port connectors | |
|---|--|
| RF out port | Type-N, female, 50 Ω (nominal) Damage level: > + 23 dBm, > \pm 50 VDC |
| RF In port | Type-N, female, 50 Ω (nominal) Damage level: > + 27 dBm, > \pm 50 VDC |
| LO emission (0 dB atten, preamp off) | - 65 dBm (nominal) |
| Display | |
| | 6.5" transfective color VGA LED-backlit (640 x 480 with anti-glare coating) |
| Headphone jack connector | |
| | 3.5mm (1/8 inch) miniature audio jack |
| USB | |
| USB-A (2 ports) | Hi-speed USB 2.0 |
| Mini USB (1 port) ¹ | Hi-speed USB 2.0 used for SCPI programming; USBTMC (USB IEEE488) |
| Keyboard | USB keyboard are supported (user supply own keyboard) |
| LAN | |
| Connector | RJ-45 (100 base-T only) 10 base-T not supported |
| Programming | |
| | SCPI, using built-in LAN and mini USB interface |
| Languages | |
| | English, Spanish, German, Italian, French, Russian, Japanese, Chinese, Turkish, Korean, Portuguese |
| Preset | |
| | User preset for both mode preset and complete system preset |
| Data storage | |
| Internal | Minimum 4 GB (Up to 1000 instrument states and trace) |
| External | Supports USB 2.0 compatible memory devices and SD/SDHC memory cards |
| Data types | Trace, trace+state, picture(png), data (csv), S2P |

1. SCPI over USB is only available for N9912A with serial number prefix starting with MY5607/SG5607/US5607 or N9912A analyzer upgraded with N9910HU-500

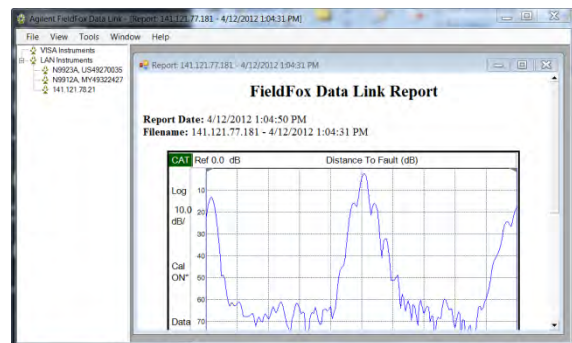
General Information (continued)

| External reference/trigger in | |
|-------------------------------|--|
| Connector | BNC (f) |
| Input frequency | 10 MHz |
| Input amplitude range | -5 dBm to +10 dBm, 50 Ω (nominal) |
| Lock range | ± 10 ppm of external reference frequency (nominal) |
| Trigger input | |
| Impedance | 10 k Ω (nominal) |
| Level Range | Rising edge: 1.7 V (nominal) |
| | Falling edge: 1 V (nominal) |

FieldFox Data Link Software

FieldFox Data Link software, installed on a PC, provides the following capabilities:

- Capture of current trace and settings
- Opening of data files (s1p, s2p, csv, sta, and png) residing on the instrument
- Editing cal kit and cable files on the instrument, or creating new cal kits and cables
- Transferring files to/from the instrument
- Annotating plots for documentation purposes
- Marker, limit line, and format changes on the PC
- Report generation
- Printing function



FieldFox Data Link software is available from the following website:

<http://www.keysight.com/find/fieldfoxsupport>

Supported Cal Kits

The following list of calibration kits are loaded in the FieldFox. You can add additional calibration kits to the FieldFox using FieldFox Data Link Software.

The basic 50-ohm QuickCal does not require cal standards. However, for higher accuracy, perform QuickCal with a load. 75-ohm QuickCal does require a 75-ohm load.

| Model number | Description |
|--------------|--|
| N9910X-800 | 3-in-1 OSL calibration kit, DC to 6 GHz, Type-N (m) 50 ohm |
| N9910X-801 | 3-in-1 OSL calibration kit, DC to 6 GHz, Type-N (f) 50 ohm |
| N9910X-802 | 3-in-1 OSL calibration kit, DC to 6 GHz, 7/16 DIN (m) |
| N9910X-803 | 3-in-1 OSL calibration kit, DC to 6 GHz, 7/16 DIN (f) |
| 85031B | Economy calibration kit, DC to 6 GHz, 7 mm |
| 85032E | Economy calibration kit, DC to 6 GHz, Type-N, 50-ohm |
| 85032F | Standard calibration kit, DC to 9 GHz, Type-N, 50-ohm |
| 85033E | Standard calibration kit, DC to 9 GHz, 3.5 mm |
| 85036B | Standard calibration kit, DC to 3 GHz, Type-N 75-ohm |
| 85036E | Economy calibration kit, DC to 3 GHz, Type-N 75-ohm |
| 85038A | Standard calibration kit, DC to 7.5 GHz, 7-16 |
| 85039B | Economy calibration kit, DC to 3 GHz, Type-F, 75-ohm |
| 85052D | Economy calibration kit, DC to 26.5 GHz, 3.5 mm |
| 85054B | Standard calibration kit, DC to 18 GHz, Type-N, 50-ohm |
| 85054D | Economy calibration kit, DC to 18 GHz, Type-N, 50-ohm |
| 85514A | Calibration kit, 4-in-1, open, short, load and through, DC to 9 GHz, Type-N(m), 50 |
| 85515A | Calibration kit, 4-in-1, open, short, load and through, DC to 9 GHz, Type-N(f), 50 |
| 85516A | Calibration kit, 4-in-1, open, short, load and through, DC to 3 GHz, Type-N(m), 75 ohm |
| 85517A | Calibration kit, 4-in-1, open, short, load and through, DC to 3 GHz, Type-N(f), 75 ohm |



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