Keysight Technologies

N9912A FieldFox RF Handheld Analyzer

4/6 GHz

Data Sheet

KEYSIGHT TECHNOLOGIES

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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	

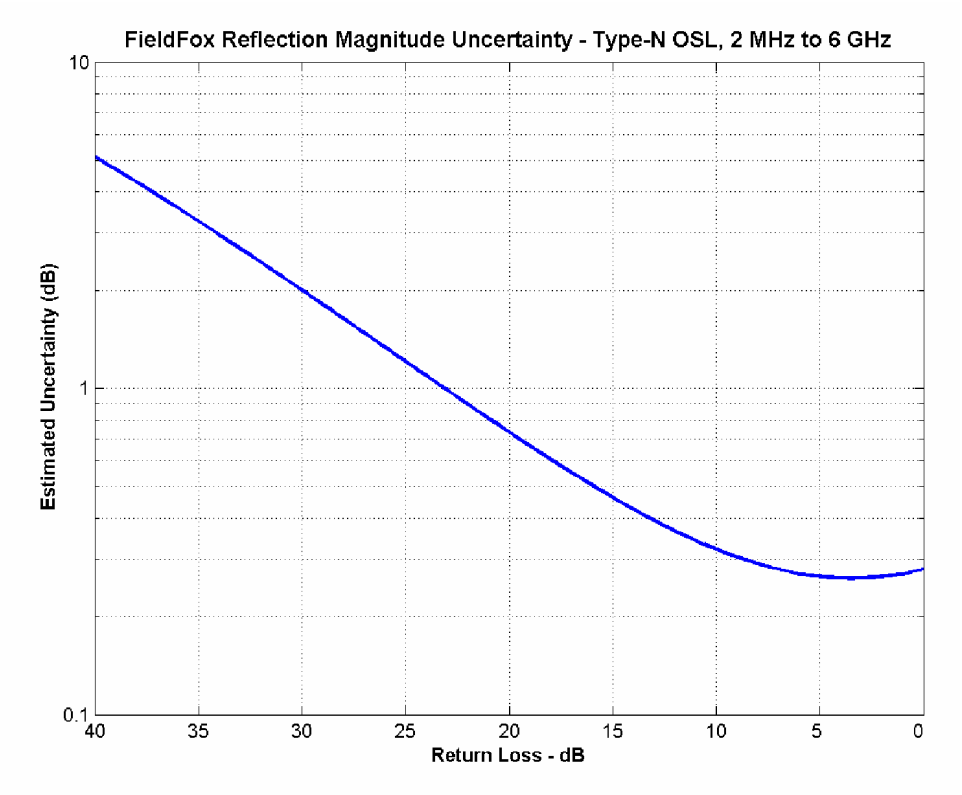
1. Using recommended calibration kits
2. QuickCal is performed with the connect LOAD step
3. Higher cable losses can be measured using transmission or S21 measurements. Cable losses measured in transmission mode limited by transmission dynamic range

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)

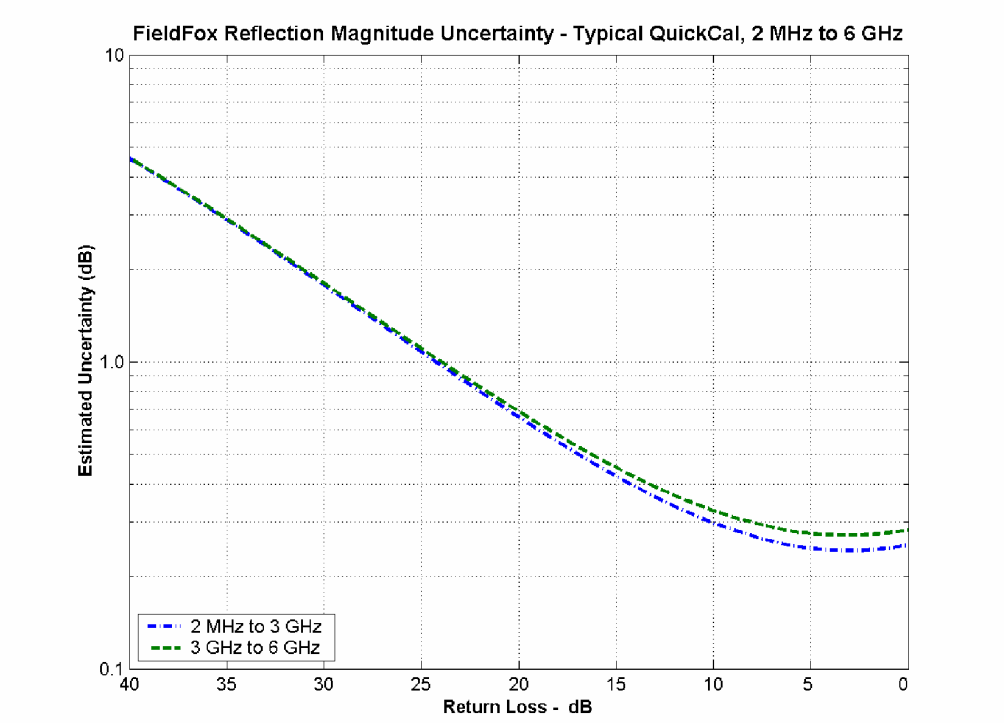
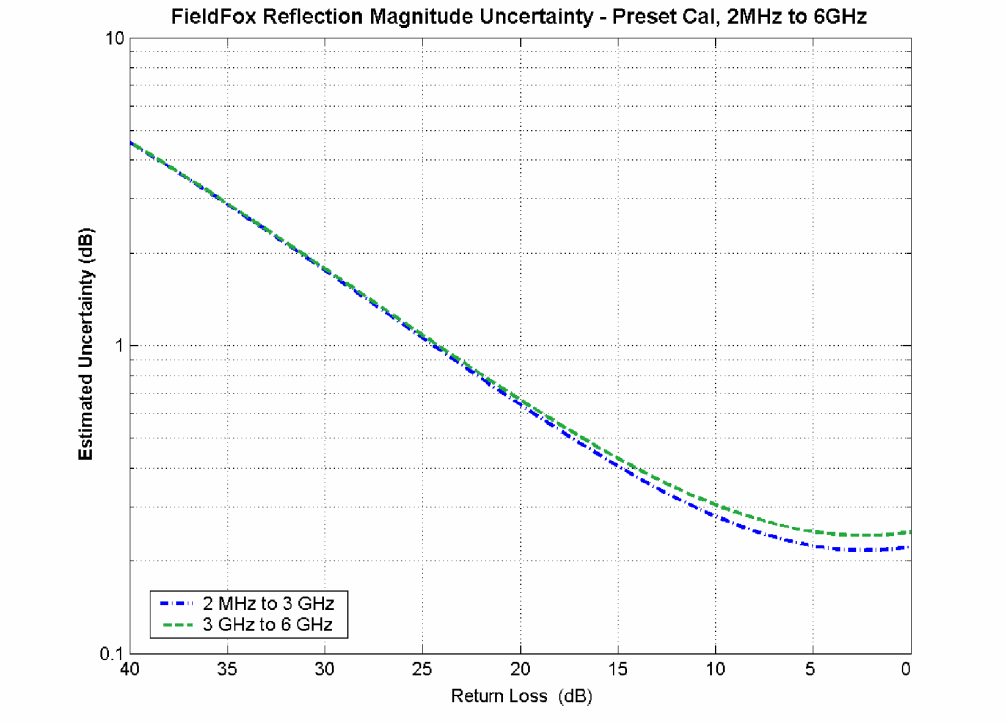


Figure 3: CAT Mode, Preset Cal – Magnitude (Typical)



Network Analyzer

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 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 Uncertainty [3]		
	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 (continued)

	Information
Measurements	S11 magnitude and phase S21 magnitude (Option 110) 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 (continued)

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

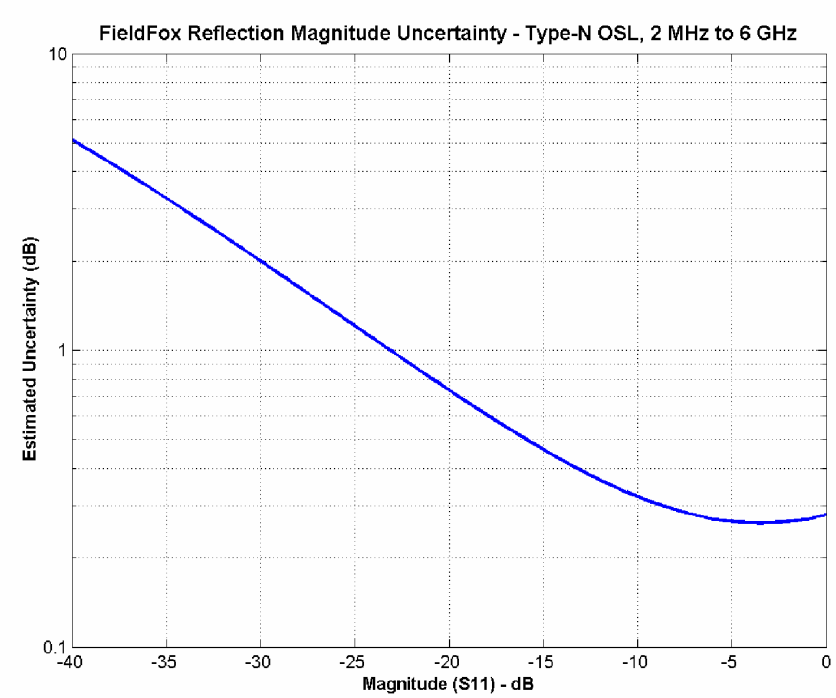
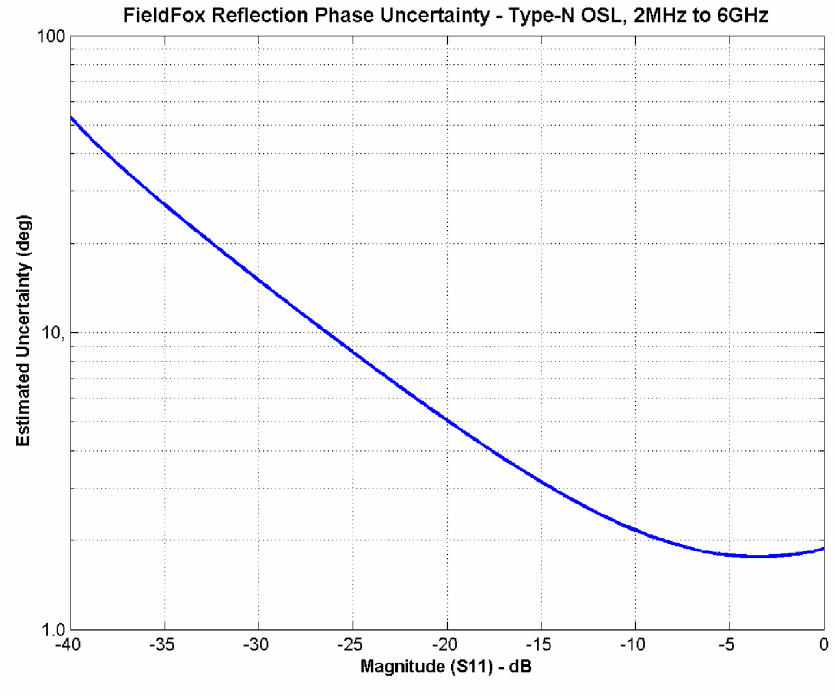


Figure 5: NA Mode, Type–N Calibration Kit – Phase (Specification)



Network Analyzer (continued)

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

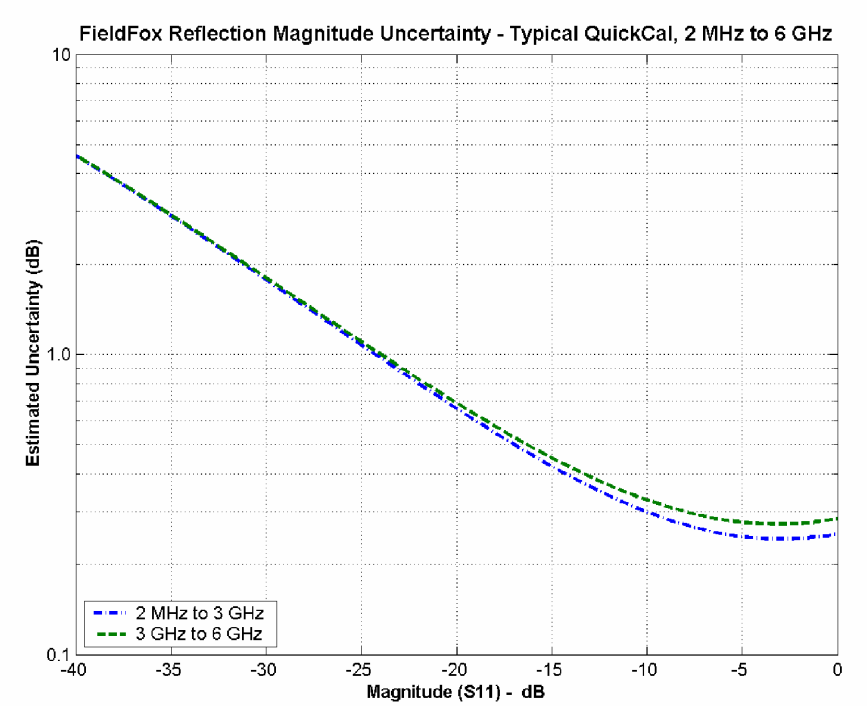
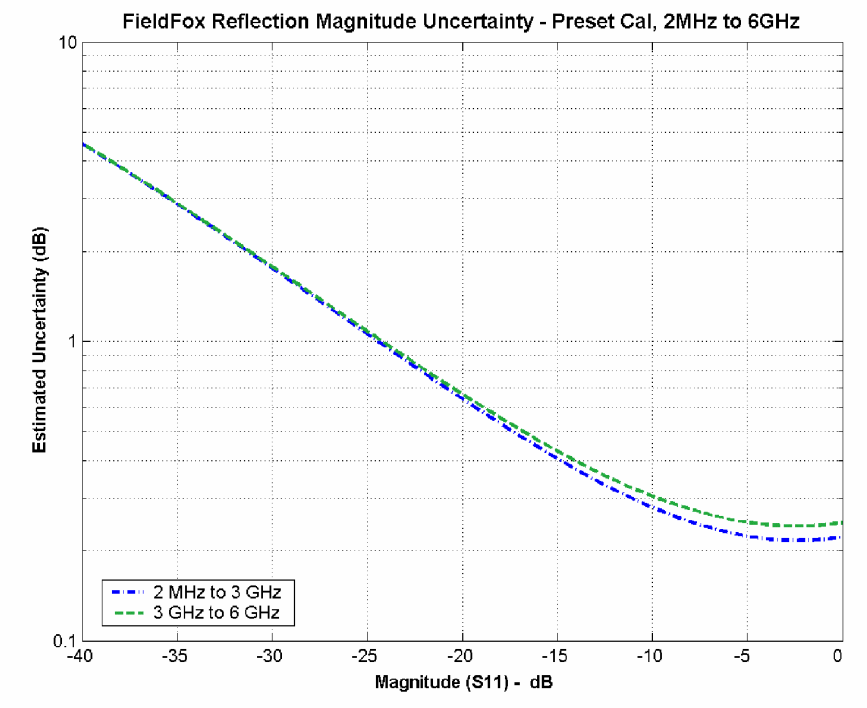
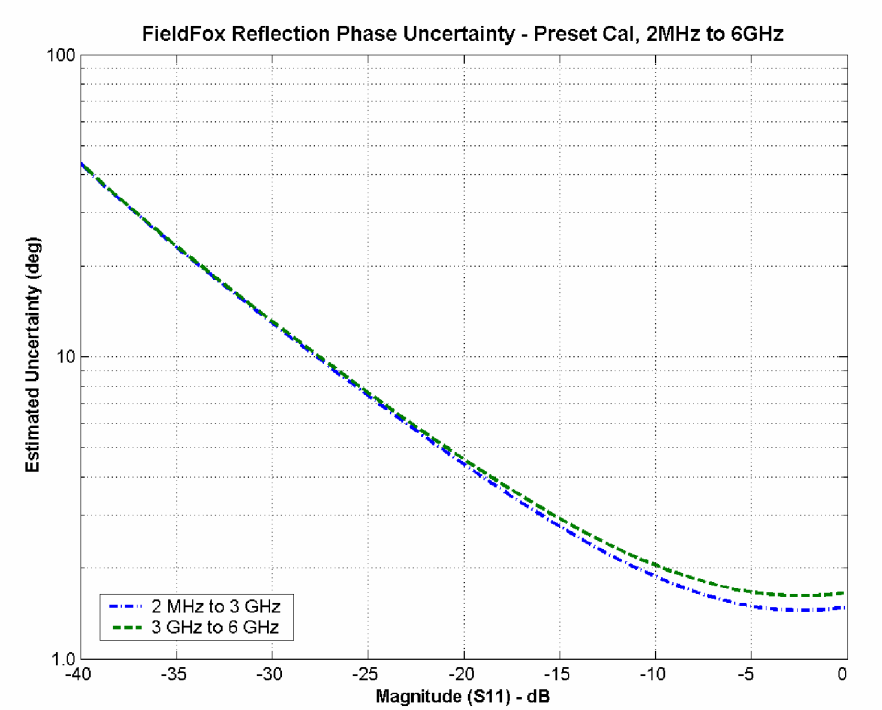


Figure 7: NA Mode, Preset Cal – Magnitude (Typical)



Network Analyzer (continued)

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



Time Domain

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

	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 (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 (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**
	< – 85 dBc/Hz	– 88 dBc/Hz	– 88 dBc/Hz
		– 89 dBc/Hz	– 89 dBc/Hz
		– 95 dBc/Hz	– 95 dBc/Hz
		– 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 (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	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 (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			
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 (continued)

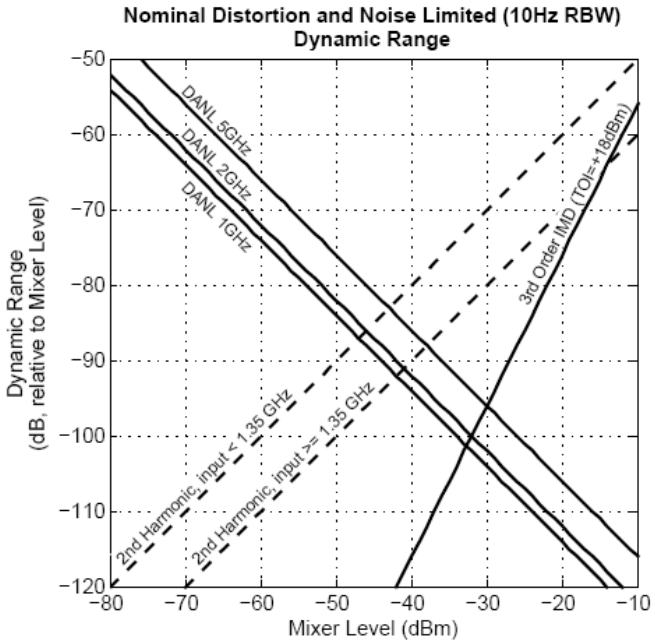
	Specification	Typical		Supplemental Information
		10 minute warm up	90 minute warm up	
Resolution Bandwidth Switching Uncertainty				
RBW < 2 MHz				0.0 dB 0.7 dB peak–to–peak [1]
Total Absolute Amplitude Accuracy [2] Peak detector, 10 dB attenuation, preamplifier off, RBW < 2 MHz, input signal 0 dBm 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 (continued)

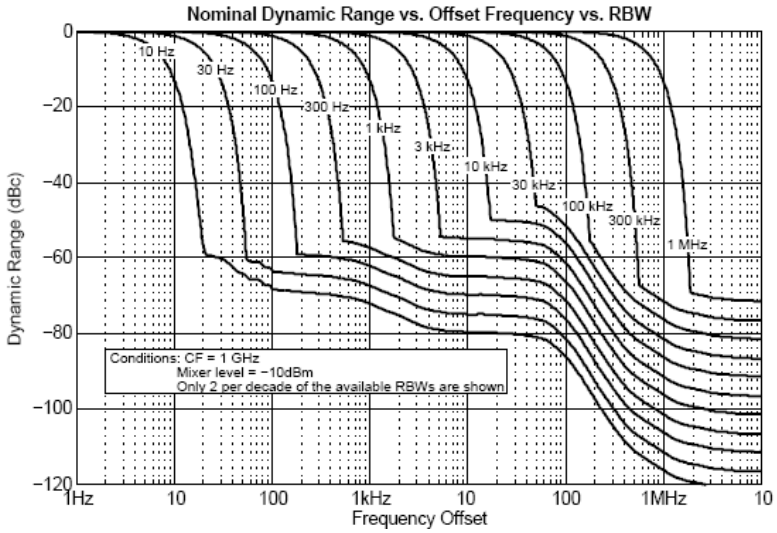
Residual Responses	
Input terminated, 0 dB attenuation, preamplifier off, RBW ≤ 1 kHz, VBW auto coupled	
20 MHz to 3 GHz	–90 dBm (nominal)
> 3 to 6 GHz	–85 dBm (nominal)
Spurious Responses	
Input Mixer level –30 dBm	
RFsig = RFtune + 417 MHz	–70 dBc (nominal)
RFsig = RFtune + 1.716 GHz	–80 dBc (nominal)
Input Mixer level –10 dBm; First IF Image Response	
Rfsig = 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 (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

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

Interference Analyzer

	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

	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

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

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

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 $f2_{rc} > f1_{src}$	Forward $f2_{rx} > f1_{rx}$	Receiver frequency = Source frequency ± Offset
Forward $f2_{src} > f1_{src}$	Reverse $f2_{rx} < f1_{rx}$	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

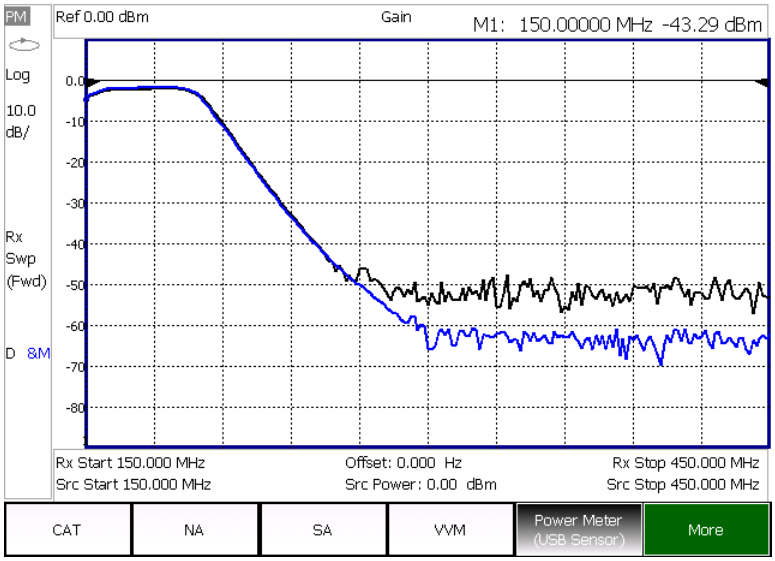
Power Sensor Measurements vs. Frequency (continued)

	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

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 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, > ± 50 VDC
RF In port	Type-N, female, 50 Ω (nominal)
	Damage level: > + 27 dBm, > ± 50 VDC
LO emission (0 dB atten, preamp off)	- 65 dBm (nominal)
Display	
	6.5" transflective 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

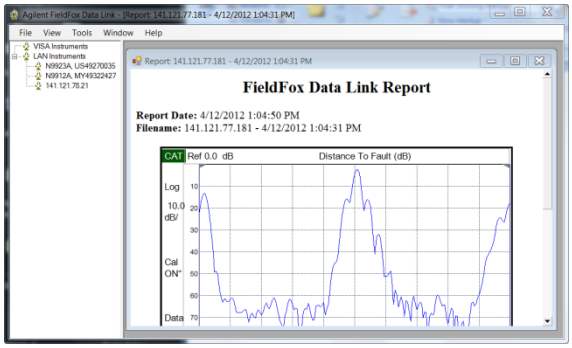
General Information (continued)

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 kΩ (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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