Keysight Technologies

N9912A 4/6 GHz RF Analyzer FieldFox

Technical Overview

KEYSIGHT TECHNOLOGIES

Boost Your Readiness

Every piece of gear in your kit had to prove its worth. Measuring up and earning a spot is the driving idea behind the Keysight Technology, Inc. FieldFox RF analyzers. It starts with adaptability: every operating mode is flexible enough to meet the needs of novices and experts alike. To accelerate your work, each mode has a task-driven interface that saves time in the field. Best of all, FieldFox is designed to withstand your toughest working conditions.

Step up to FieldFox – and achieve more in the field.

World's Most Integrated Handheld RF Analyzer

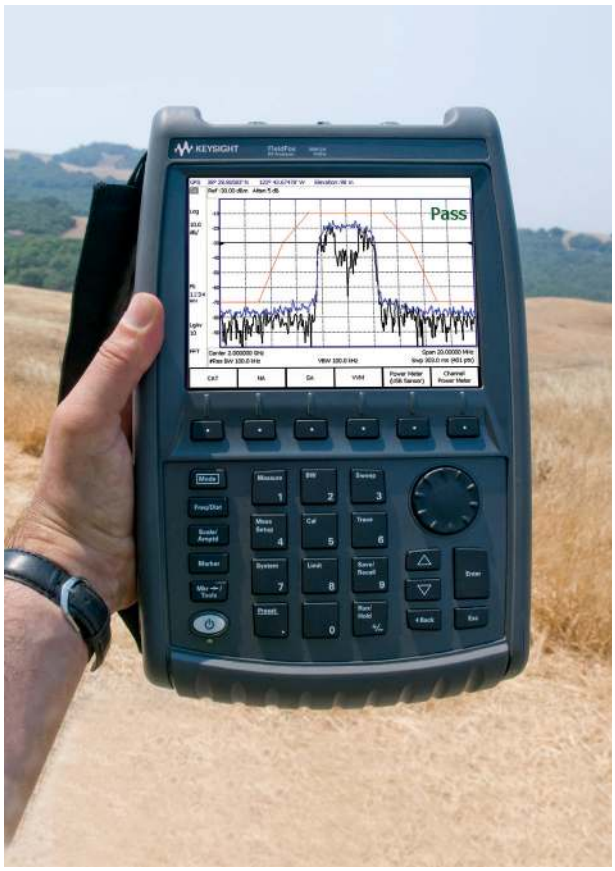
Key measurements

- Cable and antenna test, distance-to-fault, return loss, cable loss
- Vector network analysis with Smith chart display and time domain
- Vector voltmeter
- Spectrum analyzer, CHP, ACPR, OBW
- Interference analyzer, spectrogram, waterfall, record and playback
- Independent source, CW and tracking
- Power meter (USB), channel power meter (built-in), and pulse measurements

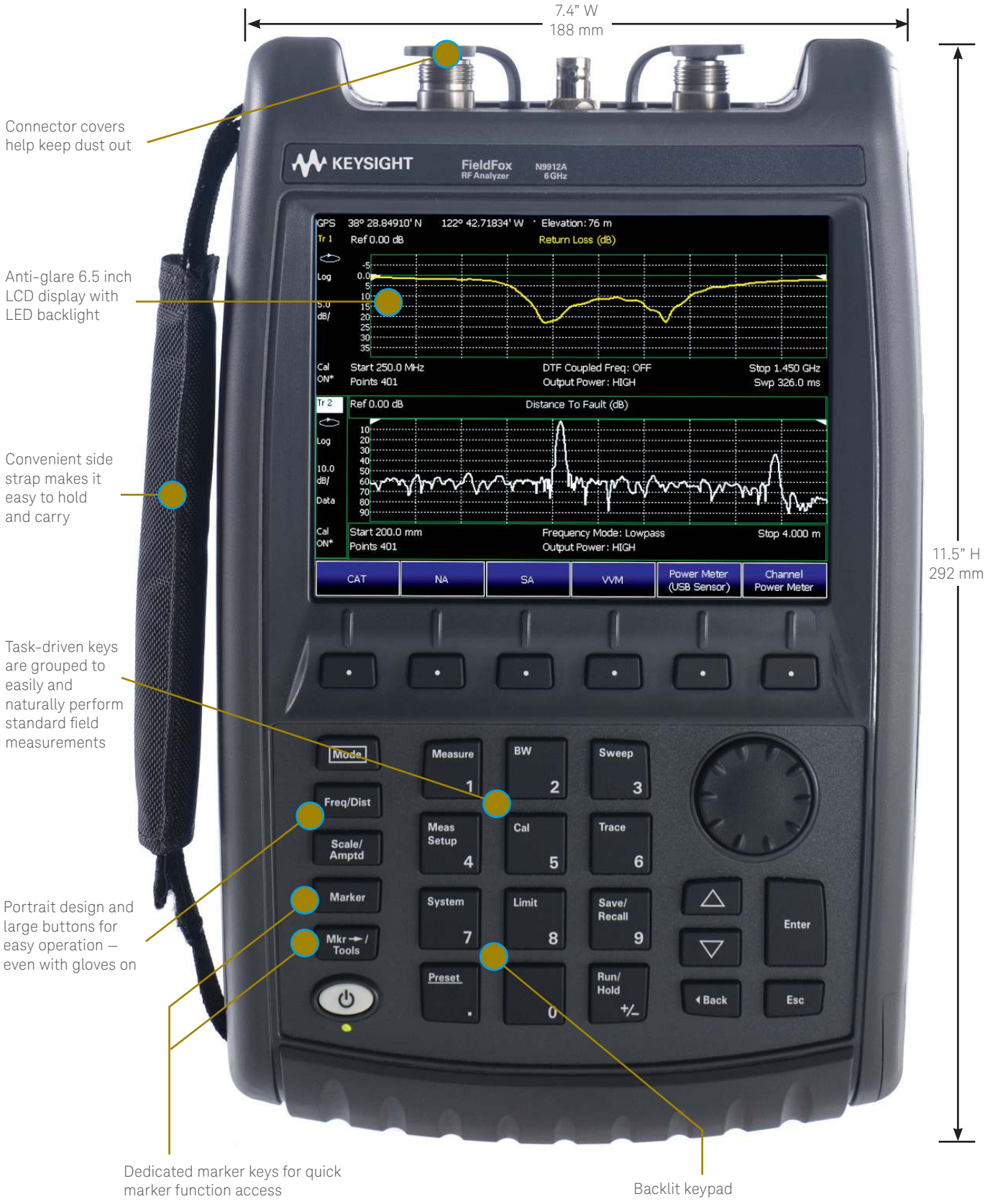
Key differentiators

- Integrated ***QuickCal*** calibrates without a calibration kit
- Immediate measurements with ***CalReady***
- 50 percent faster than traditional
- handheld instruments
- Superior dynamic range (96 dB) and sensitivity (-148 dBm) in the spectrum analysis mode

Cable and antenna analyzer Vector network analyzer	2 MHz to 4/6 GHz
Spectrum analyzer	100 kHz* to 4/6 GHz *Useable to 5 kHz
Signal source	2 MHz to 4/6 GHz



Pick up FieldFox for its ergonomics



...and depend on its durability and convenience

RF Out

External reference and external trigger

RF In

Connector bay protects RF connectors

Spacious connector design makes connections fast and simple

Quick-connect shoulder strap clips

Easily accessible battery compartment

LAN port for data transfer, SCPI programming and remote control from iPad

SD flash card slot for additional data storage

Simplify interference analysis with AM/FM tune and listen

USB ports for data transfer, GPS receiver, and USB power sensors

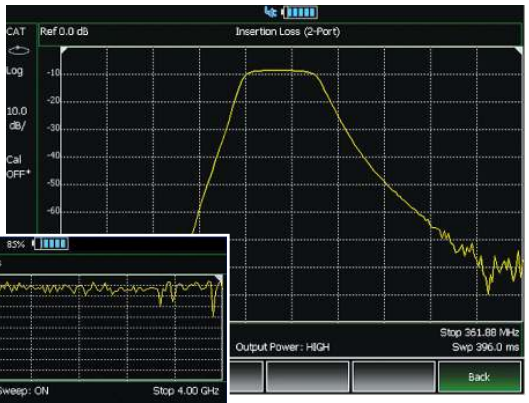
Gasketed doors protect ports from moisture

Key Measurements

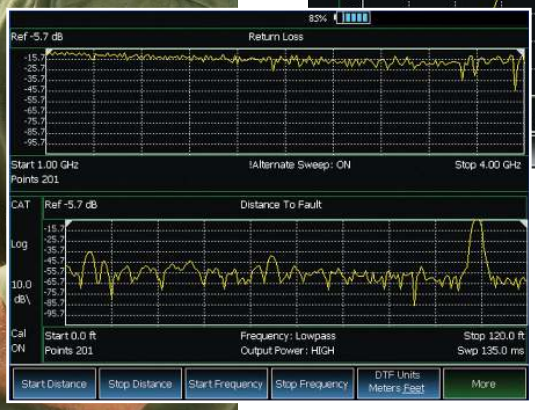
Cable and antenna analyzer

Fifty to sixty percent of cell site problems are caused by faulty cables, connectors, and antennas. Degraded feed lines cause poor coverage, unnecessary handovers, paging failures, and access failures on uplink. To avoid service quality problems, it is critical to keep cell sites' cable and antenna systems in good condition.

Use FieldFox to make return loss, VSWR, insertion loss/transmission, one-port cable loss, and distance-to-fault (DTF) measurements. You can test antennas, cables, filters, and amplifiers with a single instrument.



Insertion loss display



View and control the RL and DTF displays independently

Return loss and DTF measurements

FieldFox can make both return loss and distance-to-fault measurements at the same time. This helps you correlate overall system degradation with specific faults in the cable and antenna system.

The built-in cable editor allows you to edit existing cable types on-site, and save them as new cable types with user defined names.

Measurements in the field without the need to manually calibrate

Each instrument is ***CalReady*** at the RF Out port, immediately following power-on or preset. This means it's already calibrated and ready to make measurements such as one-port cable loss, VSWR, return loss, and DTF measurements at the test port.

Industry's first and only QuickCal

The industry's first and only built-in calibration system allows you to calibrate the cable/antenna tester without carrying a calibration kit into the field. As with any test instrument, when you add an additional device to the test port, such as a jumper cable or attenuator, you need to calibrate using a calibration kit (cal kit). ***QuickCal*** eliminates the hassle of carrying and using a cal kit, plus provides worry-free accuracy every time.

Broadband calibration

FieldFox allows you to make broadband calibrations, which means the instrument is calibrated over the maximum frequency span. After a broadband calibration, you can change the frequency range or number of points without recalibrating the instrument.

Calibration Wizard

Built-in spectrum analyzer

RF spectrum monitoring aided by spectrogram recording

Interference is a major source of cell site problems. Interference can be internal or external, and uplink or downlink. Downlink interference reduces coverage, while uplink interference causes access failure. Inter-ference has a direct impact on the quality of service of wireless communication services.

FieldFox has an optional built-in spectrum analyzer that covers frequency ranges from 5 kHz to 6 GHz. It provides a fast spectrum scan to detect interference and RF burst capture to measure intermittent signals. It displays four traces at the same time, and you can choose different detector modes.

Field strength measurements

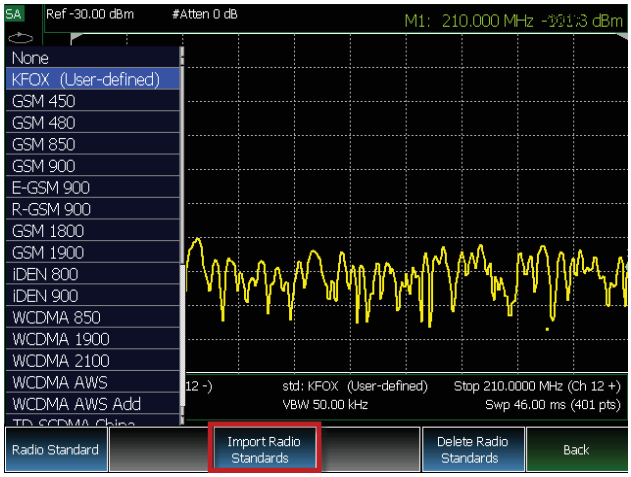
Field strength characterization is a common test performed by operators in the field. To make accurate measurements, the gain and loss of the antenna and cables need to be accounted for. With FieldFox, antenna factors and cable loss data can be loaded using either the front panel or the Data Link software.

Interference analyzer

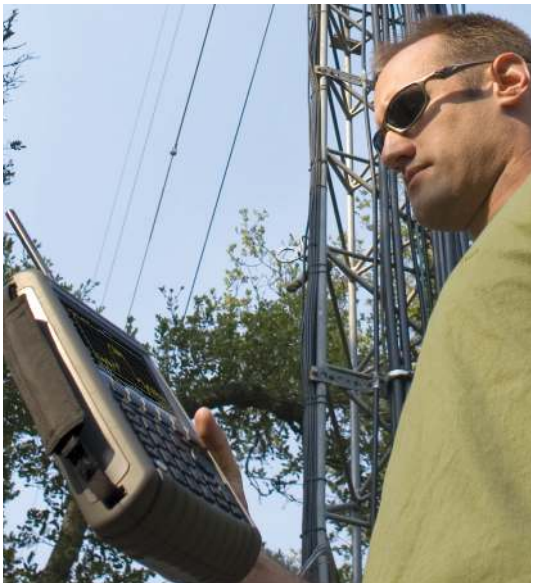
FieldFox interference analyzer is designed for identifying interference signals quickly in the field. It has the best dynamic range on the market (96 dB) with very fast sweep times under narrow resolution bandwidths (RBWs).

FieldFox provides a spectrogram and waterfall display to detect intermittent interference signals or monitor signals of interest for longer periods of time. Signal traces can be recorded into internal memory or external flash memory devices, the saved traces can be played back for offline processing.

FieldFox also allows you to listen to demodulated AM/FM signals to identify signal types.



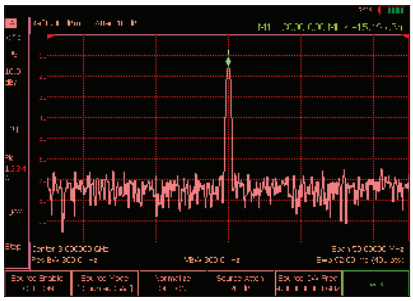
Select one of the pre-loaded radio frequency standards, or create your own custom standard



Use the spectrum analyzer's audio signal strength indicator to locate signals when walking around

Independent signal source and tracking generator

FieldFox has a built-in independent signal source, with a frequency range of 2 MHz to 4/6 GHz. The signal source and spectrum analyzer can be on at the same time. The signal source can be tuned to any frequency, independent of the spectrum analyzer frequency.



FieldFox's independent CW signal source, coupled, viewed in "Night Vision" display mode

The signal source can be used to create a test signal to measure coverage, antenna isolation, antenna direction alignment, frequency offset device verification, and long cable loss measurement.

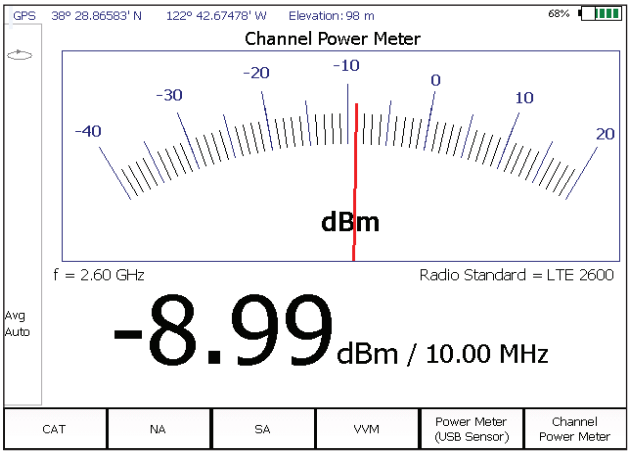
FieldFox's source can generate both a CW signal and a swept frequency signal, similar to a traditional tracking generator. This feature is standard on FieldFox RF analyzers with spectrum analyzer Options 230 or 231.

Channel power meter

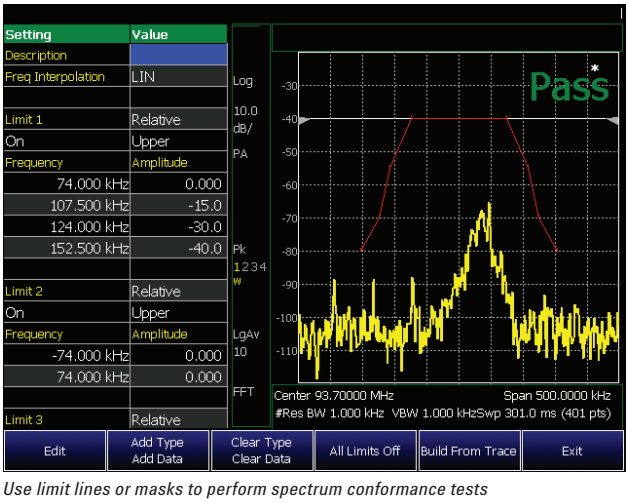
With Option 311, FieldFox is able to make channel power measurements (CPMs) easily, without the need for an external USB power sensor. Users can set the center frequency directly or select from a list of pre-defined radio standards such as GSM or LTE. Additionally, with CPM, the channel bandwidth can be controlled, thereby reducing errors caused by out-of-band signals.

Limit lines simplify testing

Limit lines or masks can be used for quick pass/fail testing of devices or frequency spectrums. FieldFox allows you to define fixed and relative limit lines, for both the RF spectrum traces and S-parameters. Additionally, with a single key press, you can build a limit line table from a current trace, and add offsets or margins to simplify your testing process.



Channel power measurements are easily displayed on a large analog display, viewed in "Outdoor Sun" display mode



Use limit lines or masks to perform spectrum conformance tests

Network analyzer time domain

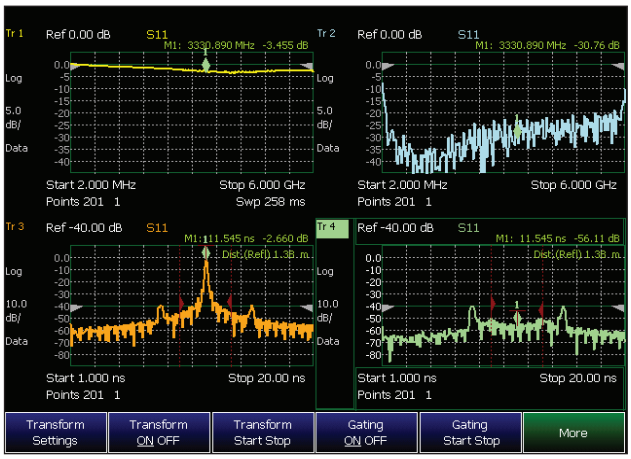
With the time domain Option, FieldFox computes the inverse Fourier transform of the frequency-domain data to display reflection or transmission coefficients versus time. Time domain gating can be used to remove unwanted responses such as connector mismatch or cable discontinuities, and the results can be displayed in either time or frequency domain. FieldFox's time domain function supports both low pass mode and band pass mode, enabling users to measure both broadband and frequency-selective devices.

Network analysis

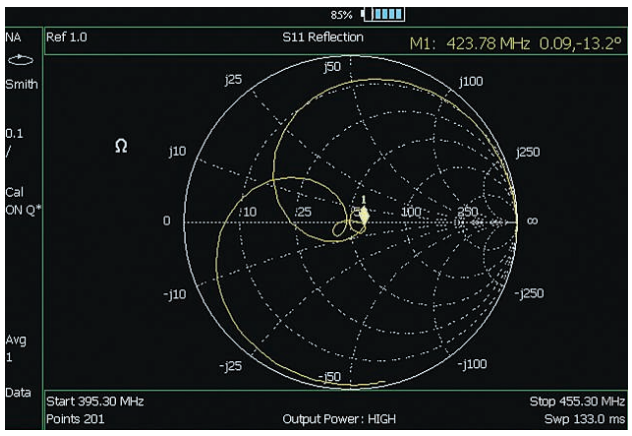
S11, S11 phase, Smith chart and polar display are available with Option 303 (Network analysis capability). To obtain S21or insertion loss/gain, users need to order Option 110 (transmission measurement), in addition to Option 303.

For in-fixture measurements, use FieldFox's port extension or electrical delay capability to easily extend the reference plane to the device interface to provide accurate measurements. You can use the electrical delay capability to measure *deviation from linear phase* by removing the linear portion of the phase delay.

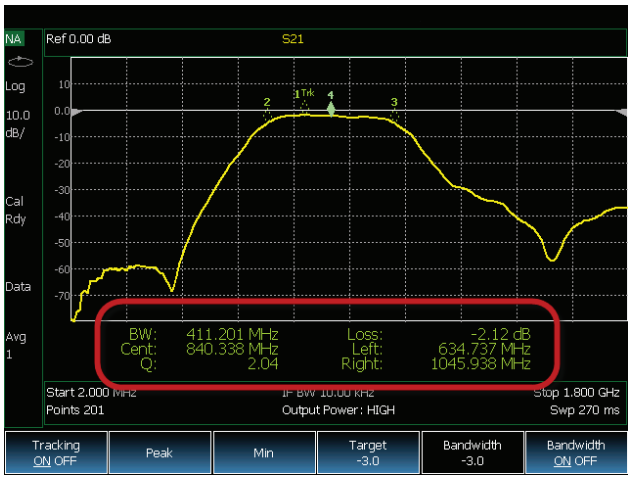
If you need to measure the magnitude and phase of all four S-parameters, consider the N9923A FieldFox RF VNA. Please refer to Keysight FieldFox RF Vector Network Analyzer, literature part number 5990-5087EN.



Use time domain gating to remove unwanted responses. Before gating: Traces 1 and 3, After gating: Traces 2 and 4.



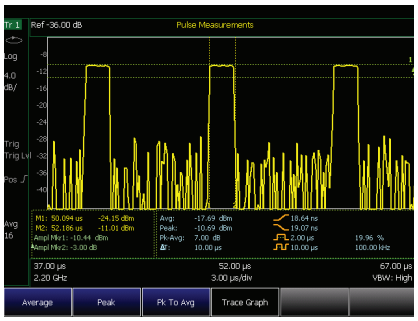
Device input impedance displayed on a Smith chart



The marker bandwidth/Q factor function simplifies filter testing and tuning.

Power meter with USB power sensor

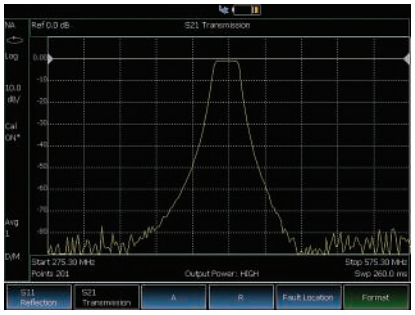
FieldFox can connect with the Keysight USB power sensors to make average power measurements up to 40 GHz. Using USB peak power sensors, users can measure both the average and the peak power of a modulated signal.



Pulse measurement

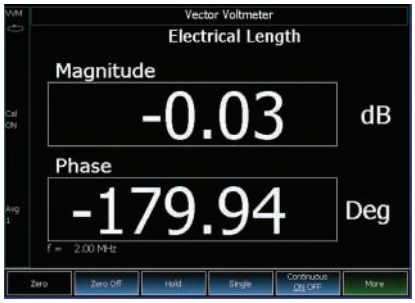
Pulse measurements

FieldFox's pulse measurement option allows users to efficiently characterize pulsed-RF signals such as those used in radar and electronic warfare systems, leveraging Keysight's USB peak power sensors (available in 18 and 40 GHz models). Measurements include peak power, peak to average ratio, and pulse profiling.



Transmission measurement

FieldFox provides a 2-port transmission measurement that measures insertion loss, amplifier gain, filter passband, and loss. It also makes a S21 scalar measurement if Option 303 is enabled.



VVM applications:

- *Cable trimming of phase matched cables*
- *Verifying the isolation of 2-port components*
- *Radio navigation – VHF omnidirectional radio range (VOR) and instrumentation landing system (ILS)*

Vector voltmeter

Using FieldFox's vector voltmeter (VVM), the phase shift and electrical length of a device can be measured.

By utilizing the "Zero" function, the phase and electrical length of one device can be measured relative to a "golden device". View results on the large display which can be seen as far as ten feet away.

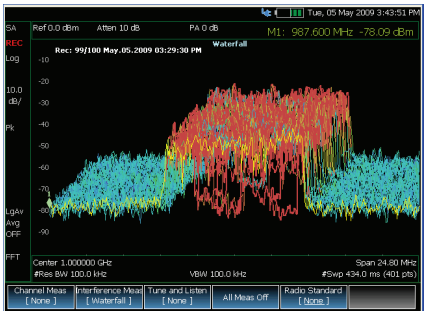
FieldFox offers much of the VVM functionality of the popular Keysight 8508A, in a handheld portable form factor, and without the need for the source/bridge/accessories required with the 8508A.

Transmission measurement

Feature and Benefit Summary

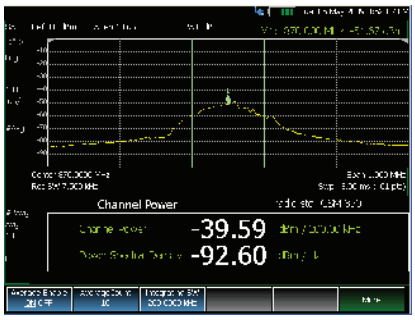
Perform and view return loss and distance-to-fault measurements at the same time

Locate interference signals



Waterfall display

Comprehensive measurement capabilities	
Cable and antenna test – Return loss, VSWR – Distance-to-fault	Return loss/VSWR measurements allow you to evaluate the impedance matching performance of the feed line across the frequency range of interest. Distance-to-fault measurements help you identify the faults along a feed line. Use these measurements to precisely pinpoint the location of damaged or degraded antennas, connectors, amplifiers, filters, and duplexers, etc. FieldFox provides up to 1001 data-point resolution to help accurately locate faults and extend measurement distance.
Transmission test – Cable loss – Insertion loss – Amplifier gain	Transmission test is used to accurately measure cable loss, insertion loss (filters), and amplifier gain (tower mounted amplifier). FieldFox offers two-port transmission magnitude measurements with up to 72 dB dynamic range.
One-port cable loss	For already-installed cables, FieldFox accurately measures cable loss via the RF Out port. The instrument measures actual cable loss, without the need for additional computation.
CalReady at test port	Each instrument is calibrated at the RF Out port. When you power up the instrument, it is ready to make measurements such as one-port cable loss, VSWR, return loss, and DTF at the test port.
QuickCal	The industry's-first and only built-in calibration system allows you to calibrate the cable and antenna tester without carrying a calibration kit with you all the time. It provides worry-free accuracy and excellent repeatability.
Mechanical calibration	Open-short-load (OSL) is standard in FieldFox. There are four calibration kits defined in the instrument.
Spectrum analysis	The built-in spectrum analyzer allows you to scan up to 6 GHz and detect internal and external interference. FieldFox can detect signals as low as -148 dBm up to 6 GHz, with phase noise of -88 dBc at 10 kHz, and a third order intercept (TOI) better than +18 dBm.
Limit lines	Use limit lines or masks for pass/fail testing. You can set up both fixed and relative limit lines, or build a limit line table from a current trace.
Interference analyzer	Spectrogram and waterfall displays allow you to detect and monitor intermittent interference signals. The interested signals can be recorded and played back.
Field strength measurements	Antenna factors and cable loss data can be loaded using either the front panel or the Data Link software. Field strength can be displayed in dBuV/m, dBuA/m, dBG or dBpT.
GPS	Enables operators to find exact locations and time/location stamp their measurement reports. The GPS information can be displayed on the screen and saved as part of the image, data or recorded signal.



Channel power measurement

Make accurate true average power measurements without bringing along a power meter

Keysight's FieldFox pulse measurements simplify radar field testing.

Comprehensive measurement capabilities continued	
Independent signal source	Provides a test signal to measure coverage, antenna isolation, long cable loss, frequency offset, and align antenna direction.
Power suite measurements	Built-in spectrum analyzer provides one-button power suite measurements such as; channel power, ACPR and OBW for LTE, WiMAX, WCDMA, TD-SCDMA, cdma2000 and GSM measurements.
Custom radio standards	Use one of the pre-loaded radio standards such as GSM 1900 or WCDMA 850, or create your own custom radio standard using a csv file.
AM/FM tune and listen	The built-in spectrum analyzer can demodulate AM/FM modulated signals and play the audio via speaker or headset. This feature is very useful to identify types of signals.
Channel power meter	Channel power meter measurements provide absolute power measurements over a defined frequency bandwidth, without the need for an external power sensor.
Power meter	Makes accurate true average power measurements without bringing a power meter along. The state-of-the-art Keysight USB power sensors provide measurements up to 24 GHz.
Pulse characterization	Using USB peak sensors and FieldFox, you can measure peak power, peak to average ratio, and pulse profile parameters such as rise time, fall time and pulse repetition frequency.
Smith chart	Smith charts can be used to display impedance matching characteristics in cable and antenna systems.
Vector voltmeter	The large vector voltmeter display makes it easy to match two or more device's electric length and ensure signals that travel on different devices have the same delay.
Electrical delay	Using the electrical delay function, you can remove the linear portion of the phase shift and view the deviation from linear phase.
Port extension	Allows you to extend the reference plan after calibration. This feature is useful for measurements such as in-fixture test, where calibrating at the DUT or reference plane is cumbersome.
Network analyzer time domain	Using the time domain feature, you can display reflection or transmission coefficients versus time. Time domain gating can be used to remove unwanted responses such as connector mismatch or cable discontinuities.

Transflective display makes it easy to read measurements in direct sunlight

Water resistant chassis withstands wide temperature ranges and humid environments

Field-proof usability	
Transflective display and backlit keys	The display is designed for easy viewing in indoor and outdoor settings and in direct sunlight and darkness. Access different display modes via softkeys.
Task-driven key design	Front-panel keys are grouped to easily and naturally perform standard field measurements.
Speaker and headphone jack	Used for demodulated audio signal capability.
One-button measurement	Provides task-driven user interface to simplify the measurements.

Rugged design	
Water-resistant chassis, keypad and case design	The case is made from polycarbonates that withstand wide temperature ranges and salty, humid environments.
RF connector protection	A specially designed connector bay protects the RF connectors from damage during drops or other external impacts.
Dust-free design	With no vents or fans in the case, FieldFox resists dust for better equipment reliability.
Meets tough environmental standard	Meets MIL-PRF-28800F Class 2 specification.
Gasketed doors	Protects instrument interface from moisture.

Modern connectivity	
USB 2.0 ports	Two USB 2.0 ports; can be used for data transfer, GPS receiver and USB power sensor support.
LAN port	Used for SCPI programming, Data Link connection, and remote control via iOS device.
SD flash card slot	Use as a data storage device.
FieldFox Data Link software	Transfer data remotely from the instrument to a PC for back-office applications such as baseline analysis and report generation.
Remote control capability	Remotely monitor and control FieldFox using an iOS device such as iPad or iPhone, via a LAN network connection.

Specifications

A condensed version of the specifications is provided here. See the User's Guide for the complete version; http://cp.literature.cdn.keysight.com/litweb/pdf/N9912-90001.pdf

Specification (spec.):
Warranted performance. Specifications include guard-bands 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 10 minutes (unless otherwise stated)
- FieldFox is within its calibration cycle
- Storage or operation at 25 °C ±5 °C range (unless otherwise stated)

Typical (typ.):
Expected performance of an average unit over a 20 °C to 30 °C temperature range, 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.

Cable and antenna analyzer (Option 104 or 106)

Frequency

Frequency range		
Option 104	2 MHz[1] to 4 GHz	
Option 106	2 MHz[2] to 6 GHz	
Frequency reference		
Accuracy		±2 ppm
Aging rate	±1 ppm/yr	
Temperature stability ±1 ppm over -10 to 55 °C		
Frequency resolution		
2 MHz to 1.6 GHz	2.5 kHz	
> 1.6 GHz to 3.2 GHz	5 kHz	
> 3.2 GHz to 6 GHz	10 kHz	
Measurement speed		
Return loss	1.5 ms/point (nominal)	1.75 GHz to 3.85 GHz, 1001 points, Cal ON
Distance-to-fault	2.4 ms/point (nominal)	0 to 500 ft, 601 points, Cal ON
Data points		
	101, 201, 401, 601, 801, 1001 (up to 10,001 using SCPI)	
Directivity		
Corrected	> 42 dB	
QuickCal (Option 111)	> 42 dB (typical)[3]	
Source match		
Corrected	> 36 dB	
QuickCal (Option 111)	≥ 35 dB (typical) [3]	
Reflection tracking		
Corrected	±0.06 dB	
QuickCal (Option 111)	±0.15 dB (typical) [3]	

1. Spectrum analyzer (Option 230) start frequency is 100 kHz, usable to 5 kHz.
2. Spectrum analyzer (Option 231) start frequency is 100 kHz, usable to 5 kHz.
3. Requires 90 minute warm up

Dynamic range

Reflection (RF Out port)	
2 MHz to 4 GHz	60 dB (typical)
> 4 GHz to 6 GHz	55 dB (typical)
Transmission measurement (Option 110)	
2 MHz to 2 GHz	72 dB (typical)
> 2 GHz to 3 GHz	67 dB (typical)
> 3 GHz to 5 GHz	58 dB (typical)
> 5 GHz to 6 GHz	49 dB (typical)
Output power range	
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)
Immunity to interference	
+16 dBm (nominal)	
Maximum input level (RF Out port)	
+23 dBm	
Maximum input DC voltage (RF Out port)	
±50 VDC	

Cable and antenna measurements

Return loss	
Display range	0 to 100 dB
Resolution	0.01 dB
VSWR	
Display range	0 to 100
Resolution	0.01
Distance to fault (DTF)	
	Range = (number of points - 1)/ (span*2) x Vf (velocity factor in cable) x c (light speed)
	Resolution = range/(number of points - 1)
	Number of points: 101, 201, 401, 601, 801, 1601, 4001, 10,001 (custom number of points can be set using SCPI)
	Distance-to-fault display: return loss, VSWR, reflection coefficient
Cable loss (1-port)	
Terminated cable under test with short	
Insertion loss (2-ports)	
Requires Option 110	
Transmission measurement (Option 110)	
Frequency range	
Option 104	2 MHz to 4 GHz
Option 106	2 MHz to 6 GHz
Dynamic range	
2 MHz to 2 GHz	72 dB (typical)
2 GHz to 3 GHz	67 dB (typical)
> 3 GHz to 5 GHz	58 dB (typical)
> 5 GHz to 6 GHz	49 dB (typical)

Network analysis (Option 303)

S11	Vector measurement, S11 magnitude and S11 phase. Specification is listed under Cable and antenna analyzer section (S11/Return loss).
S21	Scalar measurement, S21 magnitude. Specification is listed under transmission measurement. S21 requires Option 110 transmission measurement.
A	Reflected power
R	Source power
Display	Log, linear, phase, VSWR, Smith chart, polar, group delay, unwrapped phase
Calibration types	
Mechanical cal	
QuickCal	
Normalization	
IF bandwidth selections	
300 Hz, 1 kHz, 3 kHz, 10 kHz and 30 kHz	
Data points	
101, 201, 401, 601, 801, 1001, 1601, 4001, 10,001 (custom number of points can be set using SCPI)	

Vector network analyzer 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	This stimulus, similar to a traditional time domain reflectometer (TDR) stimulus waveform, is used to measure low-pass devices. The frequency-domain data should extend from DC (extrapolated value) to a higher value.
Low-pass impulse	This stimulus is also used to measure low-pass devices.
Bandpass impulse	The bandpass impulse stimulates a pulsed RF signal and is used to measure the time-domain response of band-limited devices.
Windows	
The windowing function can be used to filter the frequency-domain data and thereby reduce overshoot and ringing in the time-domain response.	
Gating	
The gating function can be used to selectively remove reflection or transmission time-domain responses. In converting back to the frequency domain the effects of the responses outside the gate are removed.	

Spectrum analyzer (Option 230 or 231)

Frequency

Frequency range	
Option 104	100 kHz to 4 GHz, usable to 5 kHz
Option 106	100 kHz to 6 GHz, usable to 5 kHz, tunable to 6.1 GHz
Frequency reference	
Accuracy	±2 ppm
Frequency aging	±1 ppm/yr
Frequency reference	
Temperature stability	±1 ppm over -10 to 55 °C
Frequency readout accuracy	
± (readout frequency x frequency reference accuracy + RBW centering + 0.5 x horizontal resolution)	
Frequency span	
Range	0 Hz (zero span), 10 Hz to maximum frequency
Span accuracy	±(2 x RBW centering + horizontal resolution)
Span resolution	1 Hz
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
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 1/1.5/2/3/5/7.5/10 sequence
Stability	
Noise sidebands, CF = 1 GHz	10 kHz offset: -88 dBc/Hz (typical)
	30 kHz offset: -89 dBc/Hz, (typical)
	100 kHz offset:
	1 MHz offset: -115 dBc/Hz, (typical)
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
Resolution	1
Readout	Measured value representing time required to tune
Trace updates	
Span = 20 MHz, RBW = 3 kHz: **1.5 updates/second** Span = 100 MHz, RBW auto coupled: **7 updates/second** Span = 6 GHz, RBW auto coupled: **1 update/second**	
Trace points	
101, 201, 401, 601, 801, 1001 points, default is 401	

Amplitude

Measurement range		
Displayed average noise level (DANL) to +20 dBm		
Input attenuator range		
0 to 31 dB, 1 dB steps		
Maximum DC voltage at RF In port		
±50 VDC		
Maximum input power at RF In port		
+27 dBm (0.5 W)		
Displayed average noise level (DANL)		
10 Hz RBW, 10 Hz VBW, 50 ohm termination input, 0 dB attenuation, average detector		
Preamplifier OFF		
20 to 30 °C		
10 MHz to 2.4 GHz	-130 dBm (typical)	
> 2.4 GHz to 5.0 GHz	-125 dBm (typical)	
> 5.0 GHz to 6.0 GHz	-119 dBm (typical)	
Preamplifier ON (Option 235)		
20 to 30 °C		
10 MHz to 2.4 GHz	-148 dBm (typical)	
> 2.4 GHz to 5.0 GHz	-145 dBm (typical)	
> 5.0 GHz to 6.0 GHz	-138 dBm (typical)	
-10 to 55 °C		
10 MHz to 2.4 GHz	< -141 dBm	
> 2.4 GHz to 5 GHz	< -138 dBm	
> 5 GHz to 6 GHz	< -130 dBm	
Total absolute amplitude accuracy[1]		
Peak detector, 10 dB attenuation, preamplifier off, RBW < 2 MHz, input signal 0 dBm to -50 dBm, all settings auto-coupled		
20 to 30 °C		
2 MHz to 10 MHz	±1.8 dB	±0.60 dB (typical)
> 10 MHz to 3.0 GHz	±1.5 dB	±0.50 dB (typical)
> 3.0 GHz to 5.0 GHz	±1.9 dB	±0.60 dB (typical)
> 5.0 GHz to 6.0 GHz	±2.1 dB	±0.60 dB (typical)
Second harmonic distortion (SHI)		
-30 dBm signal at input mixer		
2 MHz to 1.35 GHz	< -70 dBc, +40 dBm SHI (nominal)	
1.35 GHz to 3.0 GHz	< -80 dBc, +50 dBm SHI (nominal)	

1. Requires 90 minute warm up

Third order intermodulation distortion (TOI)	
Two -30 dBm tones at input mixer, > 100 kHz tone separation	
< -96 dBc, +18 dBm TOI (nominal)	
Residual responses	
Input terminated, 0 dB attenuation, preamplifier off, RBW ≤ 1 kHz, VBW auto-coupled	
20 MHz to 3 GHz	-90 dBm (nominal)
> 3 GHz 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 6.0 GHz	-50 dBc (nominal)
Sidebands	-80 dBc (nominal)
	-60 dBc (nominal) when battery charging, 260 kHz offset
Preamplifier (Option 235 requires Option 230 or 231)	
Option 230	100 kHz to 4 GHz
Option 231	100 kHz to 6 GHz
Gain	22 dB (nominal)
Reference level	
Range	-170 dBm to +30 dBm
Resolution	0.1 dB
Accuracy	0 dB (no error)
Traces	
4 traces, data/max/average/min	
Detectors	
Normal, positive peak, negative peak, sample, average	
Markers	
Marker types	Normal, noise marker, band/interval marker, frequency counter marker
Number of markers or delta markers	6
Marker functions	Peak, next peak, peak left, peak right, marker to center, minimum search
RF In VSWR	
1.5:1 (50 ohm)	
Trigger	

Independent signal source or tracking generator

The independent source or tracking generator is included with either spectrum analyzer option 230 or 231. 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
	External, video trigger, FFT gating with video (IF envelope) trigger

Channel power meter (Option 311)

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

Frequency range		
100 kHz to 4/6 GHz		
Power accuracy[1]		
Frequency range	**Spec**	*Typical*
2 MHz to 10 MHz	±1.8 dB	*±0.60 dB*
> 10 MHz to 3.0 GHz	±1.5 dB	*±0.50 dB*
> 3.0 GHz to 5.0 GHz	±1.9 dB	*±0.60 dB*
> 5.0 GHz to 6.0 GHz	±2.1 dB	*±0.60 dB*

Power meter measurement with USB sensor (Option 302)

Support for Keysight USB average and peak power sensors. Frequency and power range dependent on sensor.
List of supported sensors: www.keysight.com/find/usbsensorsforfieldfox.

Pulse measurements with USB peak power sensor (Option 330)

FieldFox's 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/usbsensorsforfieldfox.

Remote control capability with iPad or iPhone (Option 030)

Users can now remotely monitor and control their FieldFox using their iOS device such as an iPad, iPhone, or iPod Touch. FieldFox's Remote Viewer iOS app emulates the front panel of the unit, so users can simply press any FieldFox key right from their iOS device, including the hardkeys or softkeys.

With this technology, FieldFox can now be placed in areas where users do not wish to stay long due to extremely harsh or unsafe conditions. Additionally, if one technician or engineer has trouble making a measurement or determining the source of a problem, another can step in to remotely troubleshoot and solve the problem, which helps minimize rework and multiple trips.

1. Specification requires 90 minute warm-up

When the application is launched, users can access the FieldFox demo videos and technical literature such as user guides, application notes, and datasheets. Accessing this information via the FieldFox app helps engineers and technicians in the field quickly find the data they need to resolve issues as they arise. Such capabilities also make the app ideal for training and educational purposes.

The iOS device and FieldFox communicate via a WLAN or broadband data connection. Without Option 030, users can remotely view the live display screen of their FieldFox, but cannot control the instrument.

General specifications

Connector type	
Type-N (female)	
Input impedance	
50 ohm	
External reference	
Input type	BNC female
Reference frequency	10 MHz
Required level	-5 dBm to 10 dBm
Display	
6.5” transflective, color VGA LED backlit 640 x 480 with anti-glare coating	
Speaker	
Built-in speaker	
Headphone jack	
Built-in headphone jack	
Connectivity	
2 x USB 2.0; 1 x mini USB; 1 x LAN	
GPS	
Latitude, longitude, elevation and accurate time are provided. The GPS information can be displayed on the screen, and saved as part of the image, data, or recording file. The GPS capability is standard with all N9912A FieldFox RF analyzers. An external USB GPS receiver is required. Keysight recommends the Microsoft Streets & Trips, or Microsoft AutoRoute with GPS locator.	
Internal storage	
Minimum 16 MB, up to 1000 traces	
External storage	
1 x micro SD slot and 2 x USB 2.0	
EMC	
Complies with European EMC Directive 2004/108/EC	
– IEC/EN 61326-2-1)	
– CISPR Pub 11 Group 1, Class A	
– AS/NZS CISPR 11	
– ICES/NMB-001	
ESD	
– IEC/EN 61000-4-2, functional up to 20 kV test	
Safety	
Complies with European Low Voltage Directive 2006/95/EC	
· IEC/EN 61010-1 2nd Edition	
· Canada: CSA C22.2 No. 61010-1-04	
· USA: UL 61010-1 2nd Edition	

General specifications continued

Environmental	
Meets MIL-PRF-28800F Class 2 specification	
Humidity	95% at 40 °C
Temperature	
Operating	-10 °C to +55 °C
Non-operating	-51 °C to 71 °C
Weight	
6.2 lbs / 2.8 kg including battery	
Dimensions (H x W x D)	
11.5" x 7.4" x 2.8" (292 x 188 x 72 mm)	
Power	
Power supply	External DC input: 15 to 19 VDC
External AC power adapter	
Input	100 to 250 VAC, 50 to 60 Hz; 1.25 to 0.56 A
Output	15 VDC, 4 A
Power consumption	12 W
Battery	6 cell Lithium Ion, 10.8 V, 4.6 A-h
Battery operating time	4 hours
Languages	
English, Chinese, French, Spanish, Japanese, Russian, German, Italian, and Turkish	

Configuration Information

N9912A FieldFox RF analyzer	
FieldFox RF Analyzer base functions:	One port cable and antenna analyzer (4 GHz), broadband calibration, CalReady, standard mechanical cal kit support. Measurements include: return loss, distance-to-fault (DTF), one port cable loss and VSWR.
Standard accessories included N9912A:	AC/DC adapter; battery; soft carrying case comes with backpack and shoulder straps; Quick Reference Guide; User's Guide
N9912A FieldFox Options	
Option 104	4 GHz cable and antenna analyzer
Option 106	6 GHz cable and antenna analyzer
Qption 110	Transmission measurement
Option 111	QuickCal
Option 230	4 GHz spectrum analyzer (requires Option 104)
Option 231	6 GHz spectrum analyzer (requires Option 106)
Option 235	Preamplifier for spectrum analyzer (requires Option 230 or 231)
Option 236	Interference analyzer
Option 302	External USB power sensor support
Option 303	Network analysis capability
Option 308	Vector voltmeter
Option 010	Network analyzer time domain
Option 311	Channel power meter
Option 030	Remote control capability (from iOS device)
Option 330	Pulse measurements (requires USB peak power sensor)

N9912A upgrades

The following upgrades are available for the N9912A FieldFox RF Analyzer. More information regarding upgrades is available at: www.keysight.com/find/fieldfoxsupport

Product number before upgrade	Description	Required Options before upgrade
N9912AU-110	Add transmission measurement capability	None
	Allows use of second port in NA and CAT modes.	
N9912AU-111	Add QuickCal	None
N9912AU-230	Add 4 GHz spectrum analyzer	4 GHz unit only, Option 104
May only be installed on 4 GHz instrument.		
N9912AU-231	Add 6 GHz spectrum analyzer	6 GHz unit only, Option 106
	May only be installed on 6 GHz instrument.	
N9912AU-235	Add preamplifier to spectrum analyzer	Spectrum analyzer Option, 230 or 231
N9912AU-236	Add interference analyzer	Spectrum analyzer Option, 230 or 231
N9912AU-302	Add external USB power sensor support	None
N9912AU-303	Add network analyzer capability; one port only	None
	For second port, add Option 110.	
N9912AU-308	Vector voltmeter	None
N9912AU-010	Add network analyzer time domain	Network analyzer Option 303
N9912AU-311	Add channel power meter	None
N9912AU-030	Add remote control capability	None
N9912AU-330	Add pulse measurements (requires USB peak power sensor)	None

Configuration Information continued

N9910X RF/MW handheld analyzer accessories	
N9910X-800	T-calibration kit, DC to 6 GHz, Type-N (m)
N9910X-801	T-calibration kit, DC to 6 GHz, Type-N (f)
N9910X-802	T-calibration kit, DC to 6 GHz, 7/16 DIN (m)
N9910X-803	T-calibration kit, DC to 6 GHz, 7/16 DIN (f)
85514A	4-in-1 OSLT mechanical calibration kit, DC to 9 GHz, Type-N (m), 50 ohm
85515A	4-in-1 OSLT mechanical calibration kit, DC to 9 GHz, Type-N (f), 50 ohm
N9910X-810	Rugged phase-stable cable, Type-N (m) to Type-N (m), 5 ft
N9910X-811	Rugged phase-stable cable, Type-N (m) to Type-N (f), 5 ft
N9910X-812	Rugged phase-stable cable, Type-N (m) to Type-N (m), 12 ft
N9910X-813	Rugged phase-stable cable, Type-N (m) to Type-N (f), 12 ft
N9910X-814	Rugged phase-stable cable, Type-N (m) to 7/16 (m), 5 ft
N9910X-815	Rugged phase-stable cable, Type-N (m) to 7/16 (m), 12 ft
N9910X-816	Rugged phase-stable cable, Type-N (m) to Type-N (f), 3.28 ft
N9910X-817	Rugged phase-stable cable, Type-N (m) to Type-N (m), 3.28 ft
N9910X-820	Antenna, directional, multiband, 800 to 2500 MHz, 10 dBi
N9910X-821	Antenna, telescopic whip, 70 MHz to 1 GHz
N9910X-843	Coaxial adapter, Type-N (m) to 7/16 DIN (f)
N9910X-845	Adapter kit: Type-N (f) to 7/16 DIN (f), Type-N (f) to 7/16 DIN (m), Type-N (f) to Type-N (f)
N9910X-846	Coaxial adapter, Type-N (m) 50 ohm to Type-N (f) 75 ohm (Recommend quantity 2 for 75 ohm measurements)
N9910X-860	Fixed attenuator, 40 dB, 100 W, DC to 3 GHz, Type-N (m) to Type-N (f)
N9910X-861	Fixed attenuator, 40 dB, 50 W, DC to 8.5 GHz, Type-N (m) to Type-N (f)
N9910X-870	Extra battery
N9910X-872	External battery charger
N9910X-873	AC/DC adapter
N9910X-874	External bias-tee, 2.5 MHz to 6 GHz, 1 W, 0.5 A
N9910X-875	DC car charger and adapter
N9910X-880	Extra soft carrying case with backpack and shoulder strap
N9910X-881	Hard transit case

For more information go to: www.keysight.com/find/fieldfox

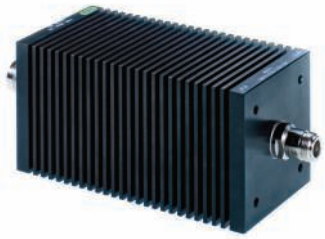
Configuration Information continued

Directional antenna, N9910X-820

Bias-tees, N9910X-874

Antenna, N9910X-821

Phase stable cable, N9910X-810



100 Watt attenuator, N9910X-860

85514A

85515A

Adapter kit, N9910X-845

DC car charger and adapter, N9910X-875

T-Cal kits

N9910X-800 N9910X-801 N9910X-802 N9910X-803

Soft carrying case with backpack and shoulder straps included with a standard N9912A. For an extra soft carrying case order N9910X-880

Hard transit case, N9910X-881

AC/DC adapter, N9910X-873

FieldFox fits inside hard transit case

External battery charger, N9910X-872

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