

Keysight Technologies

Solutions for Wireless Network Installation and Maintenance

Technical Overview

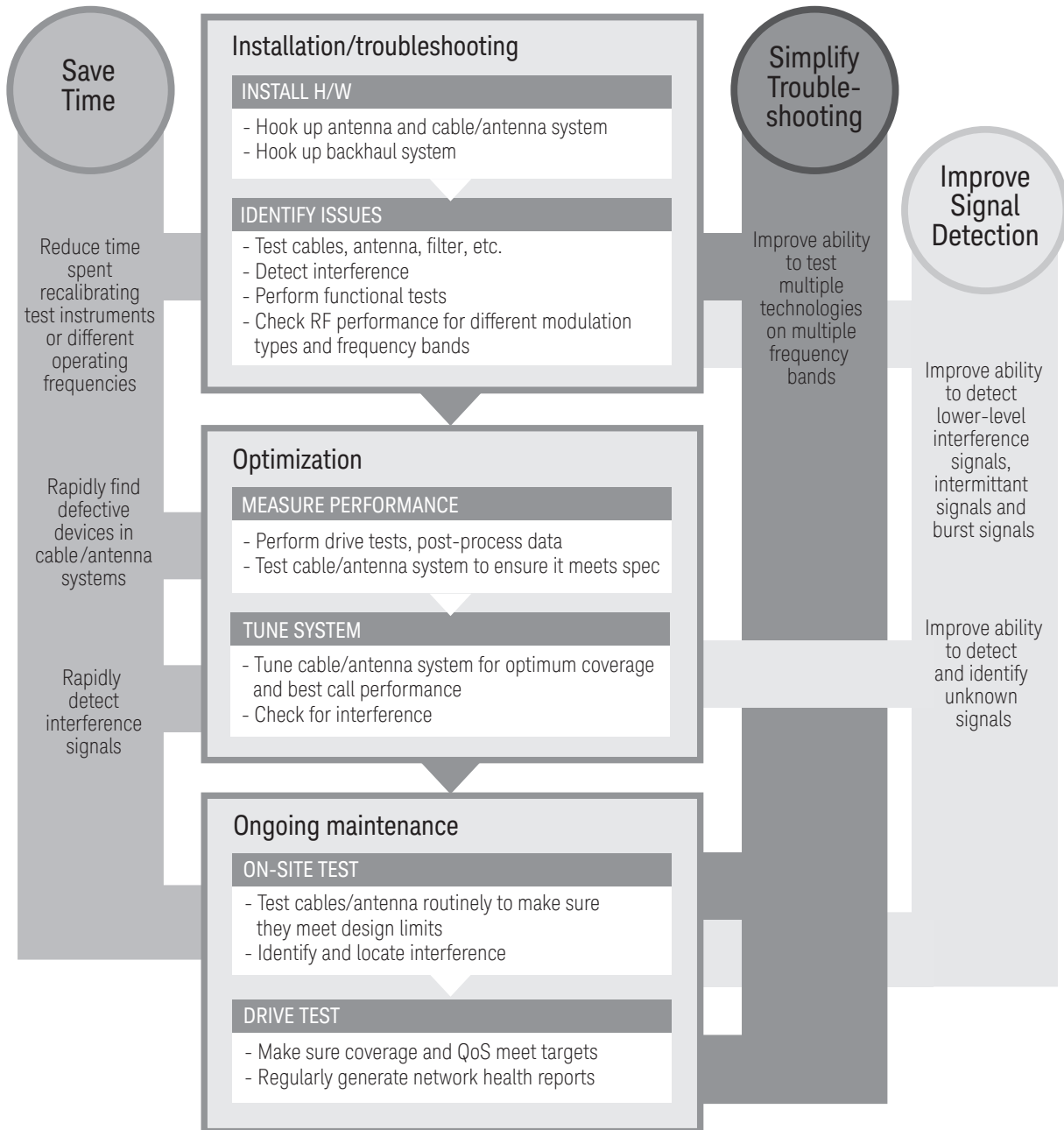


Test and monitor more
cell sites in less time

Your mission:
 Get new cell sites
 up and running
 quickly and keep
 them operating at
 peak efficiency

Common problems

- You need to install and maintain more cell sites with fewer people:
 You don't have enough hours in your day. You need to test more cell sites in the same amount of time, so you have to be able to rapidly detect and diagnose equipment problems.
- You need to troubleshoot interference issues faster:
 Customers care intensely about the quality of their service, so you need to be able to rapidly detect and identify unknown signals.
- You need a better way to make multiple tests on various technologies and frequencies:
 You work in a variety of environments on a variety of technologies. You need equipment that is flexible.



Here's what you can do with Keysight solutions for wireless network installation and maintenance

Do more in the field in less time

- Rapidly find defective devices in cable/antenna systems
- Reduce time spent recalibrating test instruments for different operating frequencies
- Make measurements faster

Increase your ability to eliminate interference signals

- Detect and identify unknown signals
- Detect lower-level interference signals, intermittent signals and burst signals
- Identify and demodulate modulated signals

Simplify troubleshooting of multitechnology, multifrequency equipment

- Easily test multiple technologies on multiple frequency bands



PROBLEM

1

You need to install and maintain more cell sites with fewer people

As operating frequencies have soared from sub-GHz levels up to 5.8 GHz, you have had to build more base stations or upgrade existing sites to maintain the same size coverage area. As a result, you need to deploy and maintain more cell sites and more complex and co-located networks than you previously did in the same amount of time. You need installation and maintenance tools that make you more productive.

SOLUTION: Diagnose problems faster...

...with Keysight handheld test tools

N9912A FieldFox RF analyzer, handheld cable/antenna analyzer, spectrum analyzer, and vector network analyzer

- Capture signals more efficiently with the most integrated handheld for wireless I&M – combines cable/antenna analysis, spectrum analysis, interference analysis, power meter measurements, vector network analysis (S11, S21), and a vector voltmeter into one lightweight package.
- Quickly capture intermittent signals with the fastest sweep time in the most commonly used 20-MHz span and 3 kHz RBW, 1.5 updates per second.
- Resolve problems faster with test times more than 50% faster than traditional handheld instruments.

N9923A FieldFox RF vector network analyzer (VNA)

- Measure and display all four S-parameters (S11, S21, S12, S22) simultaneously to save time and increase your measurement confidence with the world's most accurate handheld VNA.
- Integrated QuickCal calibrates in seconds without a calibration kit, providing a quick way to eliminate measurement errors.
- Industry's most stable handheld VNA over time and temperature with a specification of 0.01 dB/degrees Celsius, drift errors due to test equipment are greatly reduced.

N9330B handheld RF cable and antenna tester

- Make fast and reliable measurements with a handheld that offers the industry's best price/performance.
- Make fast sweeps (< 3.0 ms per data point) on SWR/return loss/cable loss/distance to fault/high-accuracy power.
- Get to work faster with quick start-up time.

E7495B wireless base station test set

- Analyze and decode signals faster with an all-in-one test set, which eliminates the need to use multiple tools to accomplish your tasks.
- Quickly analyze sweeps: Maximum 1024 data points for antenna/cable sweeps provides detailed resolution.
- Simplify report generation and post-signal analysis with post-processing software for antenna/cable tester data analysis.

For more information refer to pages 10 through 15.

To Learn More

Visit our **PRODUCT-specific web site:**

www.keysight.com/find/handheld

E7495A/B Measurement Optimization Guide:

http://www.home.keysight.com/upload/cmc_upload/All/E7495_meas_opt.pdf



Case study: Cell-site technician finds and fixes problems faster

A senior technician for a leading wireless service provider had close to 100 cell sites to manage, and they were stretched out over 600 miles. He needed to make sure all of his sites were properly maintained and all trouble tickets were cleared promptly. To keep up with the workload, he needed to find a faster way to identify feeder system problems and diagnose interference issues so he could reduce the time he spent troubleshooting each cell site.

Solving the problem

The technician's biggest challenges were finding a reliable and fast RF analyzer that reduced the time he spent at each cell site and that quickly identified feeder system problems and interference issues that caused dropped calls. FieldFox's built-in interference analyzer helped him capture and record events of interest, play back and review these events immediately at the site, and diagnose internal and external issues without an external PC.

Using the FieldFox RF analyzer, the technician was able to check feeder lines and antennas without calibrating the instrument.

The analyzer's return loss/distance-to-fault dual display also helped him find and fix problems twice as fast as he could with his old equipment.

Results

"I have been using the FieldFox unit for a couple months now and it has become my secret weapon in the field," said the technician. "My old BTS tester was large, had a short battery life, was hard to see in the daylight at my outdoor sites, and constantly needed recalibration. Now with this FieldFox unit I can sweep antennas and collect the sweeps quickly. For antenna sweeps and interference hunting, I have not found a better, smaller, better-lit or easier-to-use unit."



"We had a tough dropped call situation in one of our sites. We had tried to locate the issue for a couple of months with help from our other test equipment vendors, but we had no luck. Keysight brought in FieldFox and expertise in interference hunting, and we were able to find the problem within a day!"

Senior technician for a leading wireless service provider

"How will the N9912A RF Analyzer save me time?"

- Complete tests faster with the world's fastest sweep time
- Test times 50% faster than other handheld analyzers
- 1001-point resolution in cable/antenna test mode finds faults faster
- Easy-to-use, task-driven interface

Talk to an Expert

Get answers to your questions about wireless installation and maintenance: Call 1 800 829-4444.

Get a quote: www.keysight.com/find/quick



PROBLEM

2

You need to troubleshoot interference issues faster

Interference can cause big headaches because it has a direct impact on the quality of service. Interference can be internal or external, on an uplink or downlink. Before you can find the source and resolve the issue, you have to be able to quickly detect the interfering signals, including lower-level interference signals, intermittent signals, and burst signals.

SOLUTION: Improve your ability to detect interference signals...

...with Keysight I&M test tools

N9912A FieldFox RF analyzer, handheld cable/antenna analyzer and spectrum analyzer

- Quickly capture intermittent signals with the fastest sweep time in the commonly used 20-MHz span and 3 kHz RBW, 1.5 updates per second.
- Detect interference with the best dynamic range in spectrum analyzer mode (96 dB) with resolution bandwidths under 30 kHz.
- Detect low-level signals quickly with exceptional DANL (-148 dB).

N9340B handheld spectrum analyzer

- Diagnose interference issues quickly with powerful measurement features: spectrogram, power suite (channel power, ACPR, OBW), high-accuracy power measurement, spectrum emission mask (SEM), field strength, AM/FM/ASK/FSK demodulation analysis, and AM/FM IBOC.
- Capture intermittent signals more reliably with the fastest sweep available in a handheld analyzer (< 120 ms at 3-GHz full span).

E7495B wireless base station test set

- Identify possible interferers quickly with built-in signal identification capability.
- Observe and quickly test weak or large signals with a dynamic range of -150 dBm to +50 dBm.

For more information refer to pages 10 through 15.

To Learn More

Visit our product-specific web site:

www.keysight.com/find/handheld

Check out these related application notes:

The Application of Handheld Spectrum Analyzers in Interference Testing:

<http://literature.cdn.keysight.com/5989-8611EN.pdf>

Speed Up Low-Level Signal Search with the N9340B Handheld Spectrum Analyzer:

<http://literature.cdn.keysight.com/5989-9331EN.pdf>

AM/FM IBOC Measurements with the Keysight N9340B:

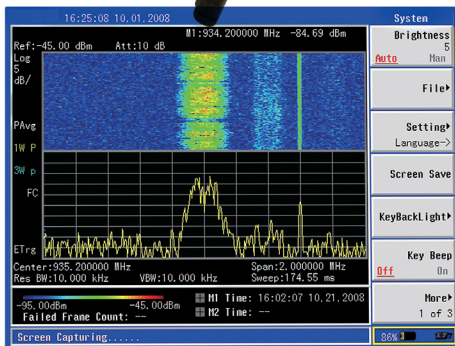
<http://literature.cdn.keysight.com/5989-9969EN.pdf>



CASE STUDY: Technicians discover CDMA base station interfering with GSM base station

A 900-MHz GSM base station in Qingdao, China, experienced an uplink interference problem in sector 3. The RF technicians were unable to locate the interference source with a competitor's handheld spectrum analyzer. They turned to Keysight for help, and Keysight application engineers responded with a N9340B handheld spectrum analyzer with Option INM (interference monitoring).

N9311X-504 directional antenna



Solving the problem

The technicians used the N9340B with a directional antenna (N9311X-504) from the N9311X RF accessory kit to scan the uplink frequency span of 890 MHz to 915 MHz on sector 3. They found the noise floor between 890 MHz and 900 MHz was much higher than the normal noise floor (see Figure 1).

The GSM base station was shut down for further analysis. Technicians used the N9340B's interference monitoring feature (spectrogram) to continuously monitor the 870-MHz to 915-MHz frequency and found strong CDMA-like signals between 870 MHz and 890 MHz. Also shown on the spectrogram was a wideband noise-like interference at 890 MHz to 900 MHz (see Figure 2).

To see if the signals were CDMA signals, technicians used the N9340B's occupied bandwidth (OBW) one-button measurement to evaluate the signals' bandwidth. The N9340B showed the measurement occupied bandwidth was 1.2 MHz, which is the bandwidth of a CDMA signal (see Figure 3).

Results

A nearby CDMA base station was found to generate the out-of-band emissions that interfered with the GSM base station. A report with measurement screenshots was submitted to the two service providers to resolve this interference issue.

“What new capabilities will I get with the N9340B?”

- Fastest sweep time and lowest DANL
- Dual spectrogram and spectrum trace displays help you detect intermittent signals
- Recording and playback capability lets you monitor signals for long time periods
- Remote monitoring lets you monitor multiple sites at the same time

Talk to an Expert

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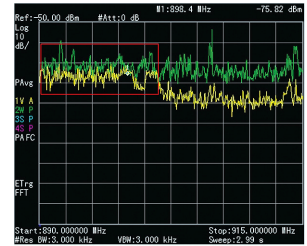


Figure 1. Noise floor for the 890 MHz to 915 MHz frequency span

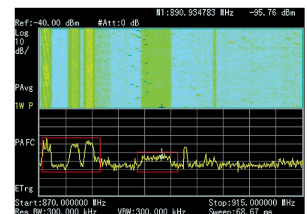


Figure 2. Interference signals on the spectrogram

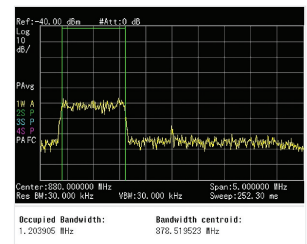


Figure 3. Occupied bandwidth reading on the N9340B



PROBLEM

3

You need a better way to make multiple tests on various technologies and frequencies

Carrying multiple test tools to remote sites can be a hassle. It can also be frustrating if you forget to bring an instrument or you simply don't have an instrument for a specific measurement, frequency, or technology. You also don't have extra time to maintain, calibrate, and learn how to use multiple instruments. You need a multi-function solution that can eliminate the need to use multiple tools with the ability to troubleshoot the latest frequencies and technologies.

SOLUTION: Simplify troubleshooting of multitechnology, multifrequency and multifunction equipment ...

...with Keysight I&M test tools

N9912A FieldFox RF analyzer, handheld cable/antenna analyzer and spectrum analyzer

- Eliminate the need to use multiple tools to make your measurements. Integrated handheld for wireless I&M combines cable/antenna analysis, spectrum analysis, interference analysis, power meter measurements, vector network analysis, and a vector voltmeter into one lightweight package.
- Troubleshoot the latest technologies such as LTE, WiMAX™ and TD-SCDMA with the first RF handheld spectrum analyzer for uplink and downlink testing of TDD signals.

N9923A FieldFox RF vector network analyzer

- Provides the power of a full 2-port, 4 or 6 GHz, VNA in the palm of your hand: S11, S21, S12, and S22 with magnitude and phase for all 4 S-parameters. To verify components for 2G, 3G, 4G and beyond.
- Eliminate the need to carry additional tools with its built-in cable and antenna analysis, power meter and vector voltmeter measurements.

N9330B handheld cable and antenna tester

- Make SWR/return loss/cable loss/distance to fault (DTF)/high-accuracy power measurements on all technologies and most cellular frequencies.
- Full range eliminates the need to recalibrate when you troubleshoot multitechnology and multifrequency equipment.

N9340B handheld spectrum analyzer

- Make multiple-technology measurements with powerful measurement features: spectrogram, power suite (channel power, ACPR, OBW), high-accuracy power measurement, spectrum emission mask, field strength, AM/FM/ASK/FSK demodulation analysis, and AM/FM IBOC measurement.
- Test all technologies with a fast sweep, < 120 ms at 3 GHz full span.

E7495B wireless base station test set

- Eliminate the need for multiple test sets: Modulation analyzer with over-the-air testing for CDMA, 1xEVDO, W-CDMA, GSM, HSDPA, and EDGE all in one solution.
- Allow other users to monitor or help troubleshoot a site using remote monitoring through a LAN connection.

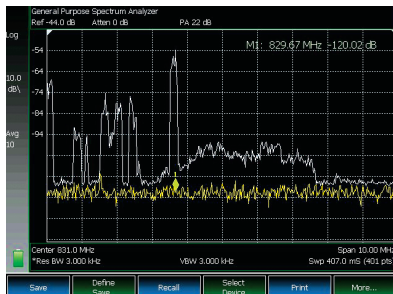
For more information refer to pages 10 through 15.

3

CASE STUDY: Consulting firm restores network service in one day after 2-month downtime

A consulting firm received a contract from one of the largest service providers to troubleshoot their network. Interference between their 2G and 3G cell sites had caused a shut down that lasted nearly two months resulting in a substantial loss of revenue.

The consulting company's President brought in a FieldFox unit to perform interference hunting measurements. They were able to quickly identify the uplink interference and get the network back up and running.



Solving the problem

Using FieldFox's built-in spectrum analyzer the consultant was easily able to perform a spectrum scan that detected interference in the site's uplink. The interference analyzer's fast sweep quickly identified intermittent interference generated by GSM signals. With the help of the spectrogram and waterfall displays, the consultant was able to monitor the system over a long period of time to find the intermittent signals. FieldFox's cable and antenna analyzer helped identify faults along the feedline. This enabled the consultant to uncover a damaged filter that was causing poor system return loss which was contributing to the network's coverage issues. FieldFox enabled the consultant to uncover and resolve multiple network problems quickly and easily in a single visit.

Results

After replacing the filter and re-tuning the network, the consultant was able to get the base station back up and running within a day. He also used FieldFox to monitor the site for an additional two weeks to ensure the site was running smoothly and providing uninterrupted service.

"FieldFox is now my RF tool of choice. I would recommend FieldFox to anyone doing field work."

Senior consultant of consulting firm

"How will the N9912A quickly find interference issues in the field?"

- You can scan up to 6 GHz with the built-in spectrum analyzer to detect internal and external interference
- With the spectrogram and waterfall displays you can quickly and easily detect and monitor intermittent interference signals
- You can record signal traces into its internal memory or external flash device to play back for offline processing



To Learn More

Visit our product-specific web site:

www.keysight.com/find/handheld

Check out these related application notes:

Identifying and Solving GSM 850 Interferences with Public Safety Communications:

<http://literature.cdn.keysight.com/5990-5343EN.pdf>

RF Handheld Testers Guarantee Traffic Stability Under Olympic-Sized Stress Conditions:

<http://literature.cdn.keysight.com/5989-9680EN.pdf>

AM/FM Signals Measurement and Operation Using the Keysight N9340B Option AMA:

<http://literature.cdn.keysight.com/5989-9332EN.pdf>

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Get a quote:

www.keysight.com/find/quick

Test and monitor more cell sites in less time with Keysight installation and maintenance tools

Selection Guide

Product	Frequency range	Measurements	Cable and antenna test (CAT)/network analyzer (NA) specifications	Spectrum analyzer specifications	Weight	Price range
N9912A FieldFox RF analyzer, handheld cable and antenna analyzer and handheld spectrum analyzer		CAT and NA: 2 MHz to 6 GHz SA: 100 kHz to 6 GHz PM: Depends on USB sensor	Cable and antenna test Spectrum analyzer Interference analyzer Network analyzer (S11, S21) Power meter Vector voltmeter	CalReady, QuickCal, OSL CAT mode: 1.5 ms/point 1,001 point DTF resolution	-148 dBm DANL with preamp 2.8 kg 6.2 lbs	\$\$
N9923A FieldFox RF vector network analyzer		CAT and NA: 2 MHz to 4/6 GHz PM: Depends on USB sensor	Network analyzer (S11, S21, S12, S22) Cable and antenna test Power meter Vector voltmeter	CalReady QuickCal, OSL, Enhanced Response, full 2-port cal CAT mode: 1.5 ms/point 1,001 point DTF resolution	Not applicable 2.8 kg 6.2 lbs	\$\$
N9330B Handheld cable and antenna tester		CAT: 25 MHz to 4 GHz PM: Depends on USB sensor	Cable and antenna test (SWR, return loss, cable loss, DTF) Power meter	Automatic Cal with electronic calibrator CAT mode: 3 ms/point 521/261/131 data point	Not applicable 2.6 kg 5.7 lbs	\$
N9340B Handheld RF spectrum analyzer		SA: 100 kHz to 3 GHz (tunable to 9 kHz) PM: Depends on USB sensor	Spectrum analyzer Interference analysis Spectrum emission mask (SEM) AM/FM IBOC AM/FM/ASK/FSK demod xDSL interference measurement	Not applicable -144 dBm DANL -87 dBc SSB at 30 kHz 30 Hz narrowest RBW 10 ms fastest sweep	3 kg 6.6 lbs	\$\$
E7495B wireless base station test set		CAT and NA: 375 MHz to 2.5 GHz SA: 10 MHz to 2.7 GHz	Cable and antenna test (RL, DTF, insertion loss) Spectrum analyzer with digital demodulation Power meter	OSL calibration 1,024 point DTF resolution	-150 dBm DANL (no preamp available) 9 kg+ 20 lbs+	\$\$\$\$

Keysight tools for installation and maintenance...

Keysight N9912A FieldFox RF analyzer

Key Measurements

- Cable and antenna test (distance to fault, return loss, etc.)
- Cable loss measurement
- Insertion loss and transmission measurements
- Spectrum analyzer
- Interference analyzer
- Power meter with USB power sensor
- Vector network analysis with Smith chart display
- Vector voltmeter

Key Advantages

- Integrated QuickCal calibrates without a calibration kit
- Immediate calibration with CalReady
- 50 percent faster than traditional handheld instruments
- Superior dynamic range (96 dB) and sensitivity (-148 dBm) in the spectrum analysis mode
- Easy-to-use, task-driven user interface



Key Specifications

Function	Description
Cable and antenna analyzer	
Frequency	2 MHz to 6 GHz
Speed	Less than 1.5 ms per point, up to 1001 points
Directivity	> 42 dB
Dynamic range	72 dB
Spectrum analyzer	
Frequency	100 kHz to 6 GHz
Speed	750 ms (span: 20 MHz) RBW: 3 kHz, VBW: 3 kHz, 1 second full span (6 GHz)
DANL	-148 dBm
Phase noise	-88 dBc at 10 kHz
TOI	-96 dBc, +18 dBm
Internal storage	Minimum 16 MB, up to 1000 traces
External storage	1 x mini SD slot and 2 x USB 2.0
Connectivity	2 x USB 2.0; 1 x mini USB; 1 x LAN
Display	Bright 6.5" color anti-glare LCD
Environmental	Meets MIL-PRF-28800F Class 2 specification
Temperature	Operating: -10 °C to +55 °C, Non-operating: -51 °C to +71 °C
Internal battery	Lithium Ion, 4 hours operating time. Replace easily in the field without tools.
Dimensions	11.5" X 7.4" X 2.8" (292 X 188 X 72 mm)
Weight	Lightweight 6.2 lbs/2.8 kg including battery

Keysight tools for installation and maintenance...

Keysight N9923A FieldFox vector network analyzer (VNA)

Key Measurements

- Full 2-port error corrected S-parameters, S11, S21, S12, S22, with both magnitude and phase
- Cable and antenna test (distance to fault, return loss, etc.)
- Cable loss measurement (1-port)
- Insertion loss and transmission measurement (2-port)
- Smith chart and polar display
- Vector voltmeter (1- and 2-channel)
- Power meter with external USB power sensor

Key Advantages

- Built-in QuickCal technology enables calibration without a calibration kit
- Best measurement stability over temperature and time
- Industry's only handheld network analyzer with full MIL Class 2 compliance with no exceptions
- Superior system dynamic range: 100 dB
- Easy-to-use, task-driven user interface
- Weather resistant, compact, field-friendly design, and no fans or vents



Key Specifications

Function	Description
Frequency	2 MHz to 4 GHz/6 GHz
Directivity	> 42 dB
System dynamic range	100 dB typical
Trace noise	0.01 dB rms
Source power	+5 to -40 dBm
Internal storage	Minimum 16 MB, up to 1000 traces
External storage	1 x microSD card and 2 x USB 2.0
Connectivity	2 x USB 2.0, 1 x mini-USB, 1x LAN
Display	Bright 6.5" color anti-glare LCD
Environment	Meets MIL-PRF-28800F Class 2 specification
Temperature	Operating -10 °C to +55 °C, non-operating: -51 °C to 71 °C
Battery	Lithium Ion, 3.5 hours operating time, field replaceable
Dimension	11.5" x 7.4" x 2.8" (292 x 188 x 72 mm)
Weight	Lightweight 6.0 lbs/2.7 kg including battery

Keysight tools for installation and maintenance...

N9330B low-cost handheld cable and antenna tester

Key Measurements

- SWR/return loss/cable loss
- Distance to fault (DTF)
- High-accuracy power measurement

Key Advantages

- Low-cost: industry's best price/performance handheld cable and antenna tester
- Quick start-up time
- Automatic calibration with electronic calibrator
- Fast sweep time, < 3.0 ms/per data point
- Ultrabright TFT LCD screen with automatic brightness control
- Keypad backlight for night use
- USB flash drive support and USB PC connectivity
- Rugged design for field use



Key Specifications

Function	Description
Test functions	Return loss, SWR, cable loss and distance-to-fault (DTF)
Frequency range	25 MHz to 4.0 GHz
Frequency resolution	100 kHz
Measurement speed	3.0 ms/ data point (typically)
Number of data points	521 (maximum) (selectable: 521, 261, 131)
User storage	200 traces, 15 setups, 10 screens
Connectivity	USB interface for USB memory stick and PC software post analysis
Language	Multi-language user interface
Display	6.5" 640 x 480 color LCD
Internal battery	Rechargeable lithium-ion battery, 4 hours operating time
Dimensions	317 mm wide x 207 mm high x 69 mm deep (12.5" x 8.1" x 2.7")
Weight	2.6 kg (5.73 lbs), 2.9 kg (6.39 lbs) with battery

Keysight tools for installation and maintenance...

N9340B handheld spectrum analyzer

Key Measurements

- Interference analysis with spectrogram and N9311X-504 directional antenna
- One-button power measurement (channel power, ACPR, OBW)
- High-accuracy power measurement with Keysight U2000 Series USB power sensor
- Spectrum emission mask (SEM) for W-CDMA/cdma2000® technologies
- Field strength
- AM/FM tune and listen via audio jack or built-in speaker
- AM/FM/ASK/FSK demodulation analysis
- AM/FM IBOC spectrum measurement with auto-tune
- xDSL interference measurement



Key Advantages

- High-performance 3-GHz handheld spectrum analyzer with industry's richest measurement features
- Fastest sweep available in a handheld analyzer: minimum 10 ms
- Flexible remote control and monitoring capability via LAN and USB
- Ultrabright TFT LCD screen with automatic brightness control
- Rugged design for field use

Key Specifications

Function	Description
Frequency Range	100 kHz to 3 GHz (tunable to 9 kHz)
Sensitivity	DANL -144 dBm
SSB phase noise	-87 dBc/Hz at 30 kHz offset
RBW	30 Hz to 1 MHz in the sequence of 1-3-10
Connectivity	USB flash drive for saving/loading
Back-lit keys	For use at night
Internal battery	Field-replaceable lithium battery with operating time
Multi-language user interface	11 languages available
Dimensions	318 x 207 x 69 mm (12.5 x 8.1 x 2.7 in)
Weight	3 kg (6.6 lb)

Keysight tools for installation and maintenance.....

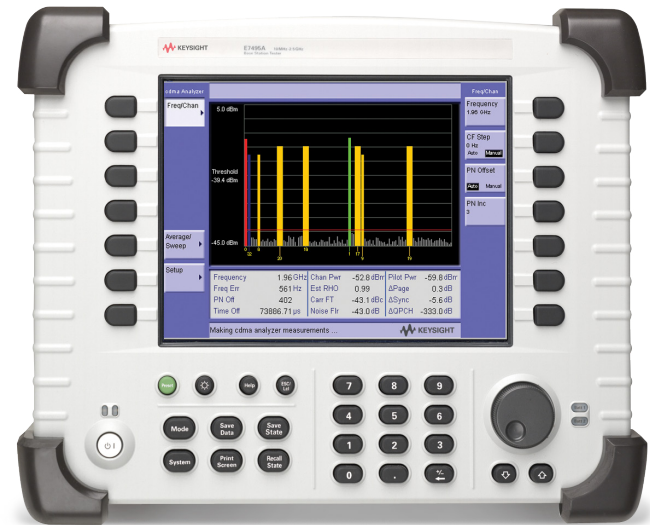
E7495B wireless base station test set

Key Measurements

- Modulation analysis and over-the-air testing for CDMA, 1xEVDO, W-CDMA, GSM, HSDPA and EDGE
- Full-feature spectrum analyzer
- Antenna/cable sweep capabilities
- SEM masks for CDMA and W-CDMA
- Interference analyzer and spectrogram
- Internal GPS
- CW and complex signal generator

Key Advantages

- Simple interface, simple procedures and built-in measurement help minimizes the need for training
- Increases each technician's productivity, decreasing time spent per cell-site visit
- Provides technicians with true spectrum analyzer performance for troubleshooting
- Stands up to rough field use and all weather conditions



Key Specifications

Function	Description
Spectrum analyzer	500 kHz to 2.7 GHz, DANL -150 dBm, ± 1 dB
Adjacent channel power accuracy	± 0.75 dBc
Antenna/cable tester	375 MHz to 2.5 GHz, 1024 data points
Frequency accuracy	± 1 ppm, with GPS lock ± 0.01 ppm
Power meter accuracy	± 0.24 dB or 5% with power sensor
CW source	375 MHz to 2.5 GHz, -5 to -90 dBm, ± 1 dB
Complex source	375 MHz to 2.5 GHz, -28 to -95 dBm, ± 1 dB
CDMA/1xEVDO Rho accuracy	± 0.005
W-CDMA/HSDPA code domain power accuracy	± 0.5 dB
GSM/EDGE accuracy	Phase error < 1 degree, EVM error < 1.4%
RF channel scanner	10 MHz to 2.7 GHz, +20 dBm to -125 dBm
Battery life	~ 1.5 hours per battery, 2-battery port, hot swappable to increase time

Keysight tools for installation and maintenance....

Wireless installation and maintenance solutions poster

Order your free I&M reference poster

Get a free I&M reference poster for your bench or classroom with useful conversion tables such as Watts vs. dBm, return loss vs. VSWR and more.

www.keysight.com/find/rftools



Do more in the field in less time with Keysight handheld solutions for wireless installation and maintenance.

Keysight discussion forums: I/M installation and maintenance tools

Discuss your RF challenges online with Keysight experts

Join Keysight's I&M discussion forum and get answers to RF issues, product questions, and more.

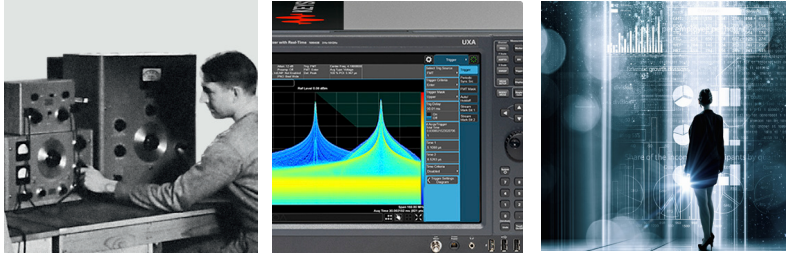
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TOPIC	REPLIES	VIEW	LAST POST
How to read information using vna at N9340B	2	25	Mon Mar 01, 2009 4:38 am
N9340B Display	5	345	Wed Feb 24, 2009 4:48 am
N9330B Frequency Range	2	54	Wed Jan 25, 2009 3:31 pm
N9912A options configuration	1	82	Mon Jan 26, 2009 12:04 pm
Why do I measure gain on my cables	1	75	Wed Dec 02, 2009 3:15 am
RECALL problems after a 4.03 firmware	1	646	Wed Dec 02, 2009 3:15 am
Marker Peak Operation N9340B	1	33	Tue Nov 17, 2009 7:56 pm
N9340B LAN connectivity	1	33	The Nov 12, 2009 11:47 am
Handhelds Frequency range	1	33	Wed Nov 26, 2008 6:24 pm
Support Strategy for Handhelds	1	33	Wed Nov 26, 2008 6:24 pm
Handhelds Frequency range	1	33	Wed Nov 26, 2008 6:24 pm
Support Strategy for Handhelds	1	33	Wed Nov 26, 2008 6:24 pm

Circular inset: Sample topics of current conversation, March 2010

Evolving Since 1939

Our unique combination of hardware, software, services, and people can help you reach your next breakthrough. We are unlocking the future of technology.
 From Hewlett-Packard to Agilent to Keysight.



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Singapore	1 800 375 8100
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