Agilent FieldFox Handheld Analyzers

4/6.5/9/14/18/26.5 GHz

Configuration Guide

N9913A

N9914A

N9915A

N9916A

N9917A

N9918A

N9925A

N9926A

N9927A

N9928A

N9935A

N9936A

N9937A

N9938A

This configuration guide describes configurations, options, and accessories for the FieldFox family of portable analyzers. This guide should be used in conjunction with the technical overviews and data sheets for a complete description of the analyzers.

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The FieldFox analyzer family

The table below shows a comparison of the functions available in the FieldFox family of analyzers.

Functionality	FieldFox RF and microwave analyzers (Combination or combo analyzers) N9913A, N9914A N9915A, N9916A N9917A, N9918A	FieldFox microwave vector network analyzers N9925A, N9926A N9927A, N9928A	FieldFox microwave spectrum analyzers N9935A, N9936A N9937A, N9938A
Cable and antenna analyzer (referred to as CAT)	Yes	Yes	No[1]
Vector network analyzer (VNA)	Yes	Yes	No
Spectrum analyzer (SA)	Yes	No	Yes
Built-in power meter	Yes	Yes	Yes
Vector voltmeter (VVM)	Yes	Yes	No

The table below shows a comparison of the functions available in the FieldFox family of analyzers.

Option	Description	N991x Combo	N992x VNA	N993x SA
233	Spectrum analyzer	Available	-	Base model
235	Preamplifier	Available	-	Available
220	Tracking generator	See 210	-	Available
236	Interference analyzer and spectrogram	Available	-	Available
305	Cable and antenna analyzer	Base model	Available	See 320
320	Reflection measurements (RL, VSWR)	Included in base	Included in base	Available
210	VNA transmission/reflection	Available	Base model	-
211	VNA full 2-port S-parameters	Available	Available	-
010	VNA time domain	Available	Available	-
112	QuickCal	Available	Available	-
308	Vector voltmeter	Available	Available	-
307	Built-in GPS receiver	Available	Available	Available
302	USB power sensor support	Available	Available	Available
309	DC bias variable-voltage source	Available	Available	Available
310	Built-in power meter	Available	Available	Available

[1] *Return loss and VSWR measurements available.*

FieldFox microwave combination analyzers

► **Step 1.** Select the model that provides the desired frequency range.

Model	Description	CAT and VNA frequency	SA frequency[1]	Test port connectors
N9913A	4 GHz FieldFox RF analyzer	30 kHz to 4 GHz	100 kHz to 4 GHz	Type-N (f)
N9914A	6.5 GHz FieldFox RF analyzer	30 kHz to 6.5 GHz	100 kHz to 6.5 GHz	Type-N (f)
N9915A	9 GHz FieldFox microwave analyzer	30 kHz to 9 GHz	100 kHz to 9 GHz	Type-N (f)
N9916A	14 GHz FieldFox microwave analyzer	30 kHz to 14 GHz	100 kHz to 14 GHz	Type-N (f)
N9917A	18 GHz FieldFox microwave analyzer	30 kHz to 18 GHz	100 kHz to 18 GHz	Type-N (f)
N9918A	26.5 GHz FieldFox microwave analyzer	30 kHz to 26.5 GHz	100 kHz to 26.5 GHz	3.5 mm (m)

All N991xA FieldFox combo analyzers include the cable and antenna analyzer as the base model. Additional functionality such as spectrum analysis or network analysis can be added using the options listed below.

► **Step 2.** Select optional measurement capabilities. Note that any of the options can easily be added as software upgrades in the future.

Option	Description	Pre-requisite options/notes
N991xA-233	Spectrum analyzer	-
N991xA-235	Preamplifier	Requires 233
N991xA-236	Interference analyzer and spectrogram	Requires 233
N991xA-210	Vector network analyzer transmission/reflection	Recommend ordering a cal kit
N991xA-211	Vector network analyzer full 2-port S-parameters	Requires 210, recommend ordering a cal kit
N991xA-010	Vector network analyzer time domain	Requires 210, recommend 211
N991xA-112	QuickCal	-
N991xA-308	Vector voltmeter	Recommend 210
N991xA-307	Built-in GPS receiver	Need to order GPS antenna
N991xA-302	External USB power sensor support	Need to order U2000x power sensor
N991xA-309	DC bias variable-voltage source	-
N991xA-310	Built-in power meter	No power sensor required

Note: See FAQ's for more information.

[1] *Usable to 5 kHz.*

FAQ

Question	Answer
What is included with a base N991xA analyzer?	• The base model includes the cable and antenna analyzer • Measurements: DTF (dB, linear, VSWR), return loss & DTF, return loss (dB), and 1-port cable loss • Calibrations: CalReady, OSL, and response cal • Note: 2-port insertion loss is NOT included with the base model, if 2-port insertion loss is needed, order Option 210 • Note: There is no phase information with the base analyzer, to obtain S11 or S21 phase, order Option 210
What is included with N991xA Option 233?	• Basic spectrum analysis, four traces, different detector types, radio standard selection, limit lines • Channel power, occupied bandwidth, adjacent channel power • AM/FM tune and listen, field strength measurements, antenna factors, frequency counter marker • Independent source: CW (source can be set to a CW frequency independent of the spectrum analyzer frequency), CW coupled (source's CW frequency is autocoupled to the spectrum analyzer's center frequency setting). Order Option 210 to obtain tracking capability (source and spectrum analyzer set to sweep a frequency range, in sync).
What is included with N991xA Option 236?	• Interference analyzer and spectrogram • Trace playback and recording
What is included with N991xA Option 210?	• Option 210 adds a VNA with transmission/reflection (T/R) capability • Measurements: S21, S11, magnitude and phase • Additionally, in the CAT mode, you can measure 2-port insertion loss • Calibrations: CalReady, OSL, response, and enhanced response cal • If you need 2-port cal, order Option 211 • Adds CW coupled and tracking capabilities to the independent source included with Option 233, spectrum analyzer.
What is included with N991xA Option 211?	• Option 211 adds full 2-port S-parameter capability to the VNA mode • Measurements: All four S-parameters (S11, S21, S22, S12), magnitude and phase • Calibrations: CalReady, OSL, response, enhanced response, and full 2-port cal
Can I measure group delay on N991xA analyzers?	• If you have phase measurement capability, then you can measure group delay. Option 210 is required for any phase measurement capability. So if you do not have Option 210, you cannot measure group delay.
What is included with N991xA Option 010?	• S11/S21 in time domain, if Option 210 is ordered. To get time domain data for all four S-parameters and full 2-port cal, order Option 211. • View both time and frequency domain data at the same time • Low-pass, impulse, and band-pass modes • Minimum, medium, and maximum window • Gating
What is included with N991xA Option 308?	• N991xA with Option 308: 1-port cable trimming • N991xA with Options 308 and 210: 1-port cable trimming, 2-port transmission • N991xA with Options 308, 210, and 211: 1-port cable trimming, 2-port transmission, A/B and B/A • Note: A/B and B/A measurements require an external source

FieldFox microwave vector network analyzers

► **Step 1.** Select the model that provides the desired frequency range.

Model	Description	Frequency	Test port connectors
N9925A	9 GHz FieldFox microwave VNA	30 kHz to 9 GHz	Type-N (f)
N9926A	14 GHz FieldFox microwave VNA	30 kHz to 14 GHz	Type-N (f)
N9927A	18 GHz FieldFox microwave VNA	30 kHz to 18 GHz	Type-N (f)
N9928A	26.5 GHz FieldFox microwave VNA	30 kHz to 26.5 GHz	3.5 mm (m)

A standard N992xA FieldFox microwave VNA includes transmission/reflection measurement capability. Additional functionality such as full 2-port S-parameters can be added using the options listed below.

► **Step 2.** Select optional measurement capabilities. Note that any of the options can easily be added as software upgrades in the future.

Option	Description	Pre-requisite options/notes
N992xA-211	Full 2-port S-parameters	-
N992xA-010	Time domain	Recommend 211
N992xA-305	Cable and antenna analyzer	-
N992xA-112	QuickCal	-
N992xA-308	Vector voltmeter	-
N992xA-307	Built-in GPS receiver	Need to order antenna
N992xA-302	External USB power sensor support	Need to order U2000x power sensor
N992xA-309	DC bias variable-voltage source	-
N992xA-310	Built-in power meter	No power sensor required

Note: See FAQ's for more information

FAQ

<table>
<tr><th>Question</th><th>Answer</th></tr>
<tr><td>What is included with a base N992xA analyzer?</td><td>• Measurements: Transmission/reflection or S21 and S11, magnitude and phase
• Calibrations: CalReady, OSL, response, and enhanced response cal</td></tr>
<tr><td>What is included with N992xA Option 211?</td><td>• Option 211 adds full 2-port S-parameter capability
• Measurements: All four S-parameters (S11, S21, S22, S12), magnitude and phase
• Calibrations: CalReady, OSL, response, enhanced response, and full 2-port cal</td></tr>
<tr><td>What is included with N992xA Option 010?</td><td>• S11/S21 in time domain, if Option 210 is ordered. To get time domain data for all four S-parameters and full 2-port cal, order Option 211.
• View both time and frequency domain data at the same time
• Low-pass, impulse, and band-pass modes
• Minimum, normal, and maximum window
• Gating</td></tr>
<tr><td>What is the difference between cable and antenna analyzer and time domain, in either the combo or the VNA analyzers?</td><td>DTF and time domain use the same iFT to transform frequency domain data to time domain. The DTF user interface is designed so users can find the location of cable faults easily, with an x-axis of distance. In time domain, they can have an x-axis of both time and distance, and also use gating to remove unwanted responses.
<table>
<tr><th></th><th>CAT mode</th><th>Time domain</th></tr>
<tr><td>X-axis</td><td>Distance</td><td>Distance, time</td></tr>
<tr><td>Parameters</td><td>DTF (or S11)</td><td>S11, S21, S22, S12</td></tr>
<tr><td>Number of traces</td><td>1, DTF</td><td>Up to 4</td></tr>
<tr><td>Viewing of time & frequency domain</td><td>No (except DTF and RL, limited setting)</td><td>Yes, full flexibility for four traces</td></tr>
<tr><td>Velocity factor</td><td>Yes</td><td>Yes</td></tr>
<tr><td>Transform modes</td><td>Band-pass, low-pass impulse</td><td>Band-pass, low-pass impulse, low-pass step</td></tr>
<tr><td>Windowing</td><td>Minimum, medium, maximum</td><td>Full control, window %, Kaiser Beta, impulse width</td></tr>
<tr><td>Gating</td><td>No</td><td>Yes</td></tr>
</table></td></tr>
<tr><td>What is included with N992xA Option 305?</td><td>• Measurements: DTF (dB, linear, VSWR), return loss & DTF, return loss (dB), and 1-port cable loss, 2-port insertion loss
• Calibrations: CalReady, OSL, and response cal</td></tr>
<tr><td>What is included with N992xA Option 308?</td><td>• N992xA with Option 308: 1-port cable trimming, 2-port transmission
• N992xA with Options 308 and 211: 1-port cable trimming, 2-port transmission, A/B and B/A
• Note: A/B and B/A measurements require an external source</td></tr>
<tr><td>If I have the full 2-port VNA with time domain, why would I order Option 305? What additional functionality is available?</td><td>CAT mode's basic measurements are similar to VNA measurements. The features listed below are often used for distance-to-fault cable testing and are only available in CAT mode:
• 3-peak marker tracking for finding faults for DTF measurements
• 1-port cable loss
• Cable type selection and editing, includes the cable's velocity factor and loss</td></tr>
</table>

FieldFox microwave spectrum analyzers

► **Step 1.** Select the model that provides the desired frequency range.

Model	Description	Frequency range[1]	Test port connectors
N9935A	9 GHz FieldFox microwave spectrum analyzer	100 kHz to 9 GHz	Type-N (f)
N9936A	14 GHz FieldFox microwave spectrum analyzer	100 kHz to 14 GHz	Type-N (f)
N9937A	18 GHz FieldFox microwave spectrum analyzer	100 kHz to 18 GHz	Type-N (f)
N9938A	26.5 GHz FieldFox microwave spectrum analyzer	100 kHz to 26.5 GHz	Type-N (f)[2]

► **Step 2.** Select optional measurement capabilities. With the exception of Option 100, all other options can easily be added as software upgrades in the future.

Option	Description	Pre-requisite options/notes
N9938A-100	3.5 mm (m) connectors	3.5 mm (m) - only available on N9938A
N993xA-220	Full-band tracking generator	CW, CW coupled, and tracking
N993xA-235	Preamplifier	-
N993xA-236	Interference analyzer and spectrogram	-
N993xA-320	Reflection measurements	Requires 220. On N9938A, Option 320 requires Option 100.
N993xA-307	Built-in GPS receiver	Need to order antenna
N993xA-302	External USB power sensor support	Need to order U2000x power sensor
N993xA-309	DC bias variable-voltage source	-
N993xA-310	Built-in power meter	No power sensor required

FAQ

Question	Answer
What is included with the basic spectrum analyzer?	• Basic spectrum analysis, four traces, different detector types, radio standard selection, limit lines • Channel power, occupied bandwidth, adjacent channel power • AM/FM tune and listen, field strength measurements, antenna factors, frequency counter marker
What is included with N993xA Option 236?	• Interference analyzer and spectrogram • Trace playback and recording
What is included with Option 320?	• Return loss and VSWR • Normalization using data/memory
What is the difference between Option 320 and the CAT mode on the N991xA combo base model?	Option 320 on the N993x SA offers RL and VSWR. CAT mode on the N991x combo analyzers offers RL and VSWR, DTF, insertion loss, and also various calibration capabilities such as QuickCal and OSL.

[1] *The spectrum analyzer can be tuned to 5 kHz.*

[2] *Order Option 100 for 3.5 mm (m) test port connectors. With N9938A-100, the spectrum analyzer is built with 3.5 mm test port connectors instead of the standard Type-N (f).*

FAQ – Applicable to all FieldFox microwave analyzers

<table>
<tr><th>Question</th><th>Answer</th></tr>
<tr><td>What USB power sensors work with Option 302?</td><td>All Agilent U2000x Series USB power sensors are supported with FieldFox. Visit: www.agilent.com/find/u2000 for an up-to-date listing.</td></tr>
<tr><td>What is the difference between USB power sensor (Option 302) and built-in power meter (Option 310)?</td><td>
<table>
<tr><th>Option 302 USB powers sensor</th><th>Option 310 built-in power meter</th></tr>
<tr><td>External power sensor required</td><td>Uses internal receivers</td></tr>
<tr><td>Set CW frequency</td><td>Set CW frequency
Set channel width/span
Radio standard selection for frequency, and channel control</td></tr>
<tr><td>Accuracy depends on sensor</td><td>InstAlign accuracy</td></tr>
<tr><td>Large analog display</td><td>Large analog display</td></tr>
</table>
</td></tr>
<tr><td>What do I need to get GPS information?</td><td>(1) The recommended GPS solution is to order:
Option 307 - built-in GPS receiver
A GPS antenna such as N9910X-825
Other GPS antennas can also be used
The GPS connector on the instrument is SMA (f)
(2) Alternatively, you can purchase a USB-based GPS receiver, such as Microsoft's Streets & Trips (need the u-blox chip set). You do not need to purchase any FieldFox options for the USB-based GPS to work. However, the USB-based GPS only provides time and location data, and time synchronization capability. It cannot be used to increase the frequency accuracy of the instrument.</td></tr>
<tr><td>What is the connector for Option 309, DC output?</td><td>The DC output has a SMB (m) connector. Recommend ordering N9910X Option 713 bias-tee power cable SMB (f) to BNC (m).</td></tr>
<tr><td>What are the connectors for the Reference/Trigger In and Reference/Trigger Out?</td><td>The connector for the Ref/Trig In is SMA (f). Recommend ordering N9910X Option 712 Trig/Ref in SMA (m) to BNC (f) cable.
The connector for the Ref/Trig Out is SMB (m). Recommend ordering N9910X Option 713 bias-tee power cable SMB (f) to BNC (m).</td></tr>
</table>

Warranty and service

All FieldFox analyzers come standard with a 3 year warranty.

Documentation

A printed copy of the User's Guide is included with all FieldFox orders. If you do not wish to receive the printed User's Guide, order N99xxA Option 0B0.

Option	Description	Notes
N99xxA-0B0	Do not include User's Guide	
N99xxA-ABA	Printed User's Guide in English	Default option

The latest FieldFox User's Guide (manual) is available online from: www.agilent.com/find/fieldfoxsupport

The Service Guide, SCPI Programming Guide, Quick Reference Guide, and Data Link software help file can also be found via the website above.

Upgrades

Information on upgrades is available from: www.agilent.com/find/fieldfoxsupport

Accessories

Calibration kits[1]	
Type-N, 50 ohm	
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
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
85518A	4-in-1 OSLT mechanical calibration kit, DC to 18 GHz, Type-N (m) 50 ohm
85519A	4-in-1 OSLT mechanical calibration kit, DC to 18 GHz, Type-N (f) 50 ohm
85054D	Economy calibration kit, DC to 18 GHz, Type-N (male and female) 50 ohm
Type-N, 75 ohm[2]	
85036E	Economy calibration kit, DC to 3 GHz, Type-N (m) 75 ohm
3.5 mm	
85520A	4-in-1 OSLT mechanical calibration kit, DC to 26.5 GHz, 3.5 mm (m)
85521A	4-in-1 OSLT mechanical calibration kit, DC to 26.5 GHz, 3.5 mm (f)
85033E	Mechanical calibration kit, DC to 9 GHz, 3.5 mm (male and female)
85052D	Economy calibration kit, DC to 26.5 GHz, 3.5 mm (male and female)
7-16	
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)
Waveguide	
X11644A	WR-90 Waveguide calibration kit, 8.2 to 12.4 GHz
P11644A	WR-62 Waveguide calibration kit, 12.4 to 18 GHz
K11644A	WR-42 Waveguide calibration kit, 18 to 26.5 GHz

Cables

All cables listed below are rugged phase-stable cables.

Model	Cable connector	Other cable connector	Max frequency	Length (ft)	Length (m)
N9910X-700	Type-N (m)	Type-N (f)	18 GHz	3.28 ft	1 m
N9910X-701	Type-N (m)	Type-N (m)	18 GHz	3.28 ft	1 m
N9910X-704	Type-N (m)	TNC (f)	13 GHz	5 ft	1.5 m
N9910X-705	Type-N (m)	TNC (m)	13 GHz	5 ft	1.5 m
N9910X-708	3.5 mm (m)	3.5 mm (f)	26.5 GHz	3.28 ft	1 m
N9910X-709	3.5 mm (f)	3.5 mm (f)	26.5 GHz	3.28 ft	1 m
N9910X-810	Type-N (m)	Type-N (m)	6 GHz	5 ft	1.5 m
N9910X-811	Type-N (m)	Type-N (f)	6 GHz	5 ft	1.5 m
N9910X-812	Type-N (m)	Type-N (m)	6 GHz	12 ft	3.6 m
N9910X-813	Type-N (m)	Type-N (f)	6 GHz	12 ft	3.6 m
N9910X-814	Type-N (m)	7/16 (m)	6 GHz	5 ft	1.5 m
N9910X-815	Type-N (m)	7/16 (m)	6 GHz	12 ft	3.6 m
N9910X-816	Type-N (m)	Type-N (f)	6 GHz	12 ft	3.6 m
N9910X-817	Type-N (m)	Type-N (m)	6 GHz	3.28 ft	1 m

[1] FieldFox analyzers support most standard HP/Agilent mechanical calibration kits.
[2] Recommend ordering quantity 2 of N9910X Option 846, 50 to 75 ohm adapter.

Accessories continued

Antennas	
N9910X-820	Antenna, directional, multiband, 800 to 2500 MHz, 10 dBi
N9910X-821	Antenna, telescopic whip, 70 MHz to 1 GHz
N9910X-823	Antenna, cellular narrowband, 824 to 869 MHz
N9910X-824	Antenna, cellular narrowband, PCS 1850 to 1990 MHz
N9910X-825	Antenna, GPS, active

RF and microwave adapters	
83059A	Coaxial adapter, 3.5 mm (m) to 3.5 mm (m), 26.5 GHz
83059B	Coaxial adapter, 3.5 mm (f) to 3.5 mm (f), 26.5 GHz
83059C	Coaxial adapter, 3.5 mm (m) to 3.5 mm (f), 26.5 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
N9910X-847	Adapter kit: Type-N (f) to TNC (m) adapter, Type-N (f) to TNC (f) adapter, 13 GHz
N9910X-848	Coaxial adapter, Type-N (f) to 3.5 mm (f), 18 GHz
N9910X-849	Coaxial adapter, Type-N (f) to 3.5 mm (m), 18 GHz
N9910X-850	Coaxial adapter, Type-N (m) to Type-N (m), 18 GHz
N9910X-851	Coaxial adapter, Type-N (f) to Type-N (f), 18 GHz
N9910X-852	Coaxial adapter, Type-N (m) to Type-N (f), 18 GHz

Other RF and microwave accessories	
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-874	External bias-tee, 2.5 MHz to 6 GHz, 1 W, 0.5 A
N9910X-712	Trig/Ref in Cable SMA (m) to BNC (f), 1 m or 3.28 ft
N9910X-713	Bias-tee power cable SMB (f) to BNC (m), 1 m or 3.28 ft

Other FieldFox accessories	
N9910X-870	Extra battery
N9910X-872	External battery charger
N9910X-873	AC/DC adapter
N9910X-875	DC car charger and adapter
N9910X-880	Extra soft carrying case with backpack and shoulder strap
N9910X-881	Hard transit case

Reference Web Links	
FieldFox family page	www.agilent.com/find/fieldfox
All FieldFox user's guides and manuals	www.agilent.com/find/fieldfox_manuals
FieldFox firmware	www.agilent.com/find/fieldfoxsupport
FieldFox upgrades	www.agilent.com/find/fieldfoxsupport
FieldFox RF and microwave accessories, N9910X	www.agilent.com/find/n9910x
USB power sensors	www.agilent.com/find/u2000

Precision. Readiness. FieldFox

Every piece of gear in your field kit had to prove its worth. Measuring up and earning a spot is the driving idea behind Agilent's FieldFox analyzers. Carry the precision of our microwave models: they deliver Agilent-quality measurements wherever you need to go. Boost your readiness with an RF unit: every operating mode is flexible enough to meet the needs of novices and experts alike. And count on the durability of handheld analyzers designed to withstand your toughest working conditions. Add FieldFox to your kit—and see how it measures up.

Literature	Number
FieldFox Handheld Analyzers, Brochure	5990-9779EN
FieldFox Combination Analyzers, Technical Overview	5990-9780EN
FieldFox Spectrum Analyzers, Technical Overview	5990-9782EN
FieldFox Vector Network Analyzers, Technical Overview	5990-9781EN
FieldFox Handheld Analyzers, Data Sheet	5990-9783EN
FieldFox Handheld Analyzers, Configuration Guide	5990-9836EN
FieldFox RF Analyzer, Technical Overview	5989-8618EN
FieldFox RF Analyzer, Data Sheet	N9912-90006
FieldFox RF Vector Network Analyzer, Technical Overview	5990-5087EN
FieldFox RF Vector Network Analyzer, Data Sheet	5990-5363EN

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