

Keysight

FieldFox Handheld Analyzers

4/6.5/9/14/18/26.5/32/44/50 GHz

Configuration Guide



Unlocking Measurement Insights

The FieldFox Analyzer Family

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 overview and data sheet for a complete description of the analyzers. The table below shows a comparison of the functions available in the FieldFox family of analyzers.

The following accessories are included with every FieldFox: AC/DC adapter, battery, soft carrying case, LAN cable and Quick Reference Guide.

Note: Combination analyzer (combo) = Cable and antenna tester (CAT) + Vector network analyzer (VNA) + Spectrum analyzer (SA)

FieldFox family and options

| Option | Description | RF and microwave (combination) analyzer | Microwave vector network analyzer (VNA) | Microwave spectrum analyzer (SA) |
|------------------------------------|--|--|--|-------------------------------------|
| | | N991xA N995xA | N992xA | N993xA N996xA |
| CAT/vector network analysis | | | | |
| 010 | VNA time domain | √ | √ | – |
| 112 | QuickCal | √ on N991xA – on N995xA | √ | – |
| 210 | VNA transmission/reflection | √ | Base model | – |
| 211 | VNA full 2-port S-parameters | √ | √ | – |
| 212 | 1-port mixed-mode S-parameters | √ | √ | – |
| 215 | TDR cable measurements | √ | √ | – |
| 305 | Cable and antenna analyzer | Base model | √ | Note 1 |
| 308 | Vector voltmeter | √ | √ | – |
| 320 | Reflection meas. (RL, VSWR and scalar meas.) | Note 2 | Note 2 | √ |
| Spectrum analysis | | | | |
| 209 | Extended range transmission analysis (ERTA) | √ | – | √ |
| 220 | Tracking generator | Note 3 | – | √ |
| 233 | Spectrum analyzer | √ | – | Base model |
| 235 | Pre-amplifier | √ | – | √ |
| 236 | Interference analyzer and spectrogram | √ | – | √ |
| 238 | Spectrum analyzer time gating | √ | – | √ |
| Power measurements | | | | |
| 208 | USB power sensor meas. versus frequency | √ | √ | √ |
| 302 | USB power sensor support | √ | √ | √ |
| 310 | Built-in power meter | √ | √ | √ |
| 330 | Pulse meas. with USB peak power sensor | √ | √ | √ |
| System features | | | | |
| 030 | Remote control capability | √ | √ | √ |
| 307 | GPS receiver | √ | √ | √ |
| 309 | DC bias variable-voltage source | √ | √ | √ |

Notes:

Base model means that the functionality listed is the primary function of that instrument. For example, on the N991xA or N995xA combo analyzers, cable and antenna analysis is the standard function included with every N991xA or N995xA.

- Option 305 is not available on the N993xA or N996xA. However, a subset of cable and antenna analyzer measurements, return loss and VSWR, is available as Option 320.
- Option 320 is not applicable to N991xA, N995xA, or N992xA. The reflection measurements of return loss and VSWR are included with every N991xA, N995xA, and N992xA. So there is no need for an Option 320 on these analyzers.
- On the N991xA or N995xA analyzers, order Options 233 and 210 to obtain a tracking generator with the spectrum analyzer. There is no Option 220 on the N991xA or N995xA analyzers. To obtain tracking generator capability, you need Options 233 and 210. Option 233 provides the spectrum analyzer capability and Option 210 the "tracking" capability.

FieldFox Microwave (Combination) Analyzers

FieldFox microwave (combination) analyzer models

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) |
| N9950A | 32 GHz FieldFox microwave analyzer | 300 kHz to 32 GHz | 9 kHz to 32 GHz | NMD 2.4 mm (m) |
| N9951A | 44 GHz FieldFox microwave analyzer | 300 kHz to 44 GHz | 9 kHz to 44 GHz | NMD 2.4 mm (m) |
| N9952A | 50 GHz FieldFox microwave analyzer | 300 kHz to 50 GHz | 9 kHz to 50 GHz | NMD 2.4 mm (m) |

Step 2. Select optional measurement capabilities.

Any of these options can easily be added as a software upgrade in the future.

Exception: Option 112 is only applicable to N991xA models. It is not applicable to N995xA models.

FieldFox microwave (combination) analyzer options

| Option | Description | Prerequisite options/notes |
|------------------------------------|---|---|
| CAT/vector network analysis | | |
| 010 | VNA time domain | Requires 210, recommend 211 |
| 112 | QuickCal | Not available for N995xA models. See page 4, FAQ #9 |
| 210 | VNA transmission/reflection | Recommend ordering a cal kit |
| 211 | VNA full 2-port S-parameters | Requires 210, recommend ordering a cal kit |
| 212 | 1-port mixed-mode S-parameters | Requires 210 and 211 |
| 215 | TDR cable measurements | - |
| 308 | Vector voltmeter | 210 and 211 required to obtain full VVM functionality. See page 4, FAQ #8 |
| Spectrum analysis | | |
| 209 | Extended range transmission analysis (ERTA) | Requires 233 and 210. Recommend 307. Requires two FieldFoxes. See page 5, FAQ # 10. |
| 233 | Spectrum analyzer | - |
| 235 | Pre-amplifier | Requires 233 |
| 236 | Interference analyzer and spectrogram | Requires 233 |
| 238 | Spectrum analyzer time gating | Requires 233 |
| Power measurements | | |
| 208 | USB power sensor meas. versus frequency | Requires 302 |
| 302 | USB power sensor support | Need to order USB power sensor ² |
| 310 | Built-in power meter | No power sensor required. See page 7, FAQ #1 |
| 330 | Pulse meas. with USB peak power sensor | Need to order USB peak power sensor. See page 8, FAQs #7 and #8 |
| System features | | |
| 030 | Remote control capability | Requires an iOS device |
| 307 | GPS receiver | Need to order GPS antenna, N9910X-825. See page 8, FAQ #3 |
| 309 | DC bias variable-voltage source | - |

1. Usable to 5 kHz

2. List of compatible sensors available from www.keysight.com/find/fieldfoxsupport

FieldFox Combo Analyzer FAQs

| Question | Answer |
|--|---|
| 1. What is included with a base N991xA/N995xA analyzer? | <ul style="list-style-type: none"> - The base model includes the cable and antenna analyzer - Measurements: DTF (dB, linear, VSWR), return loss and DTF, return loss (dB), and 1-port cable loss - Calibrations: CalReady, OSL, and response cal <p>Note: 2-port insertion loss is NOT included with the base model, if 2-port insertion loss is needed, order Option 210</p> <p>Note: There is no phase information with the base analyzer, to obtain S11 or S21 phase, order Option 210</p> |
| 2. What is included with N991xA/N995xA Option 233? | <ul style="list-style-type: none"> - 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 - Tracking generator (TG)/Independent source: <ul style="list-style-type: none"> - TG CW mode (source CW frequency can be set independent of SA frequency) - included - TG CW coupled mode (source CW frequency is autocoupled to SA's center frequency) - included - TG tracking mode (traditional TG operation, swept SA coupled to swept source) - (requires Option 210) |
| 3. What is included with N991xA/N995xA Option 236? | <ul style="list-style-type: none"> - Interference analyzer and spectrogram - Trace playback and recording |
| 4. What is included with N991xA/N995xA Option 210? | <ul style="list-style-type: none"> - 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 all four S-parameters, order Options 210 and 211 - If you need 2-port cal, order Options 210 and 211 - Adds tracking mode to the tracking generator/independent source included with Option 233, spectrum analyzer |
| 5. What is included with N991xA/N995xA Option 211? | <ul style="list-style-type: none"> - 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 |
| 6. Can I measure group delay on N991xA/N995xA 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. |
| 7. What is included with N991xA/N995xA Option 010? | <ul style="list-style-type: none"> - 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 |
| 8. What is included with N991xA/N995xA Option 308? | <ul style="list-style-type: none"> - With Option 308: 1-port cable trimming - With Options 308 and 210: 1-port cable trimming, 2-port transmission - With Options 308, 210, and 211: 1-port cable trimming, 2-port transmission, A/B and B/A <p>Note: A/B and B/A measurements require an external source</p> |
| 9. What is included with N991xA Option 112? | <ul style="list-style-type: none"> - Option 112 (QuickCal), is not available for N995xA analyzers. It is available for N991xA analyzers. - QuickCal is included with Option 112. <ul style="list-style-type: none"> - 1-port QuickCal with a base analyzer. - 1-port and enhanced response QuickCal with a T/R analyzer (one that has Option 210). - 1-port, enhanced response, and 2-port QuickCal with a full 2-port analyzer (one that has Option 211). - QuickCal is most accurate for DUTs with 7/16 and Type-N connectors and measurement uncertainties are provided for frequencies ≤ 18 GHz. Reduced accuracy for DUTs with 3.5 mm (m), SMA (m), or other male coaxial connectors; performance is unspecified. QuickCal is not recommended for DUTs with 3.5 mm (f), SMA (f), or other similar female connectors. QuickCal is not applicable to waveguide. |

FieldFox Combo Analyzer FAQs (continued)

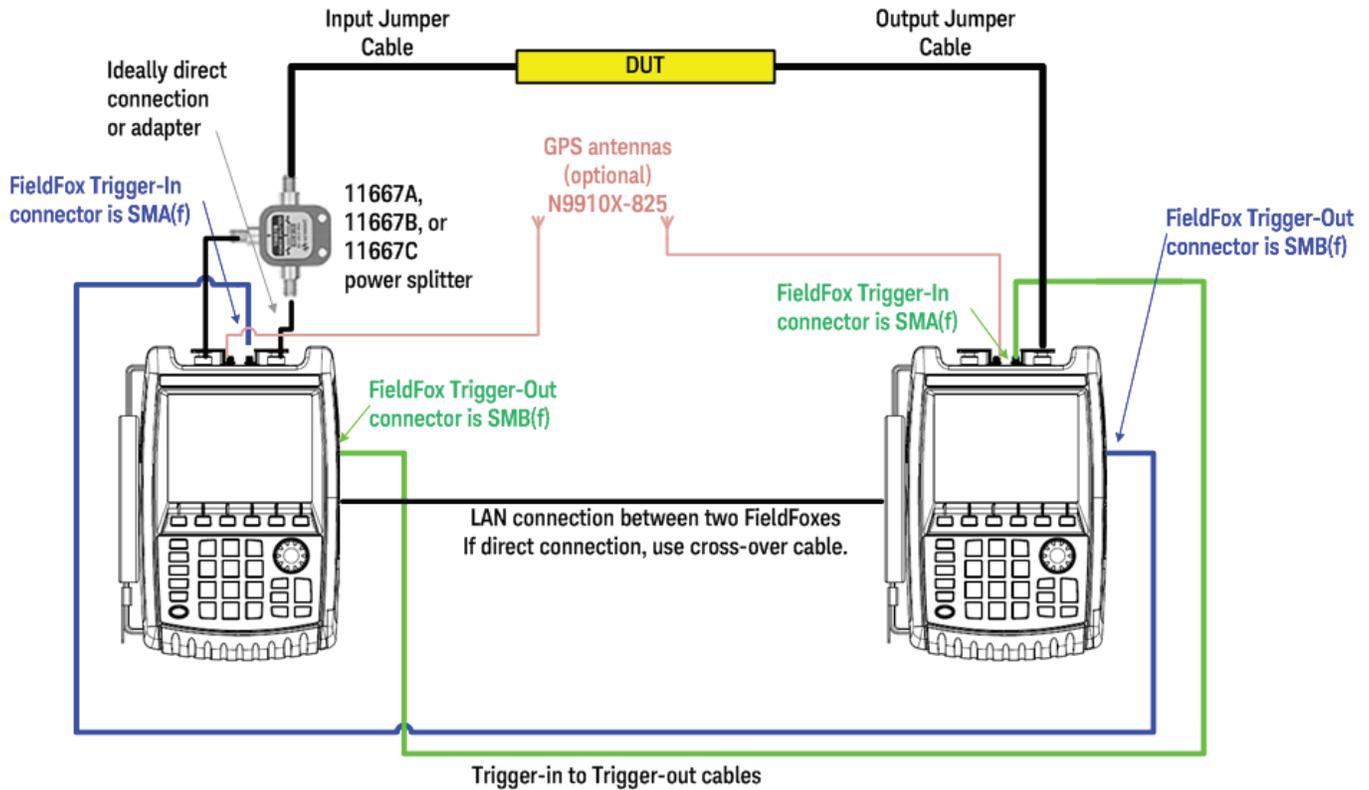
| Question | Answer |
|---|---|
| 10. What are the requirements for Option 209? | <p>Extended Range Transmission Analysis (ERTA) or Option 209 is a scalar measurement system based on the use of two FieldFoxes. One FieldFox acts as the source and reference receiver, while the second FieldFox acts as the <i>measurement</i> receiver.</p> <p>Required hardware</p> <p>A. Two FieldFoxes. FieldFoxes can be any of these models:</p> <ul style="list-style-type: none"> – FieldFox microwave combination analyzers: N9913A, N9914A, N9915A, N9916A, N9917A, N9918A, N9950A, N9951A, N9952A – FieldFox microwave spectrum analyzers: N9935A, N9936A, N9937A, N9938A, N9960A, N9961A, N9962A – ERTA cannot use N9912A, N9923A, N9925A, N9926A, N9927A or N9928A <p>The two FieldFoxes used in ERTA do not have to be the same model.</p> <p>ERTA requires the following options on Combo FieldFoxes. (N9913A, N9914A, N9915A, N9916A, N9917A, N9918A, N9950A, N9951A, N9952A)</p> <ul style="list-style-type: none"> – Option 210, VNA transmission/reflection – Option 233, spectrum analyzer <p>ERTA requires the following options on SA FieldFoxes. (N9935A, N9936A, N9937A, N9938A, N9960A, N9961A, N9962A)</p> <ul style="list-style-type: none"> – Option 220, tracking generator <p>Both FieldFoxes (the one used as the source, and the other used as the receiver) must have the options listed above. The ERTA option (209) cannot be installed unless 210 and 233 are present on a combo analyzer, or 220 is present on an SA analyzer.</p> <p>With either the Combo or SA FieldFoxes, the following options are highly recommended:</p> <ul style="list-style-type: none"> – Option 235, preamplifier – this option increases the measurement dynamic range by increasing the received signal power. – Option 307, GPS receiver – this option increases the dynamic range by increasing the frequency accuracy and permitting the use of a narrower RBW. <p>B. Power splitter, two-resistor model, Keysight 11667A, 11667B, or 11667C. Other power splitters can be used but the specifications listed are based on the match and tracking performance of 11667A, 11667B, or 11667C. Three-resistor power splitters are not recommended.</p> <p>C. N9910X-712, Trigger/Reference-in cable, SMA (m) to BNC(f), 1 m, quantity two</p> <p>D. N9910X-713, Trigger/Reference-out cable, SMB (m) to BNC (m), 1 m, quantity two</p> <p>E. LAN connection – For ERTA, the two FieldFoxes communicate via a LAN connection. For a direct connection, a cross-over LAN cable is required. Alternately, both analyzers can be on a local area network.</p> <p>Recommended accessory</p> <p>F. N9910X-825, GPS Antenna</p> |

FieldFox Combo Analyzer FAQs (continued)

ERTA System Typical Configuration

| Item | Description/Options | Quantity |
|--------------------------------|---|--------------------------------|
| FieldFox | Combo analyzer: required Option 210, 233. Recommended: 235, 307 SA analyzer: required: Option 220, recommended: 235, 307 | 2 |
| Power splitter | 11667A (Type-N) or 11667B (3.5 mm) or 11667C (2.4 mm) | 1 |
| Type-N(m) to Type-N(m) adapter | N9910X-850 (for use with 11667A or Type-N systems) | 1 |
| Trigger cables ¹ | N9910X-712, SMA(m) to BNC(f) N9910X-713, SMB(m) to BNC(m) | 2 of each Total of 4 cables |
| RF test cable | Connecting FieldFox source port 1 to power splitter input | 1 |
| RF test cable or adapter | Connecting power splitter output arm to FieldFox port 2 | 1 |
| RF jumper cable or adapter | Power splitter output arm to DUT input | 1 |
| RF jumper cable or adapter | DUT output to FieldFox receiver port 2 | 1 |
| LAN cable | LAN cable to connect FieldFoxes directly, or the analyzers must be on the LAN | 1 |
| N9910X-825 | GPS antenna, recommended. Necessary if Option 307 is ordered. | 2 |

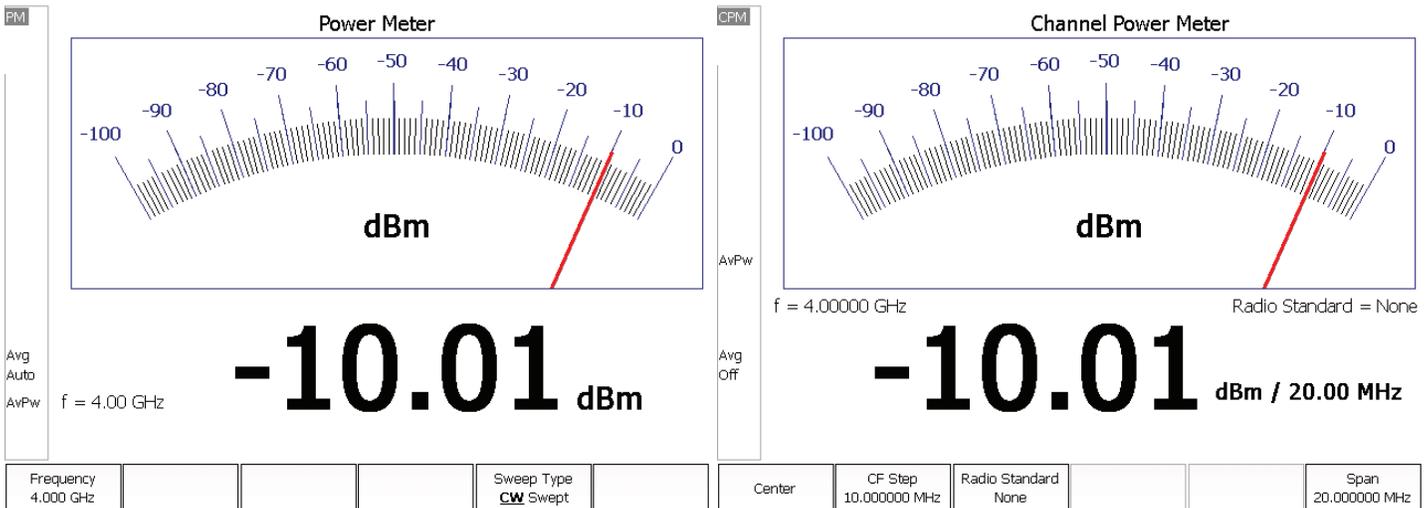
1. The trigger cables and LAN cables must be at least as long as the separation distance between the two ends of the DUT.



ERTA system diagram

FAQs – Applicable To All FieldFox Microwave Analyzers

| Question | | |
|--|--|---|
| 1. What is the difference between USB power sensor (Option 302) and built-in power meter (Option 310)? | | |
| | Option 302 USB power sensor | Option 310 Built-in power meter (or channel power meter) |
| Description | Option 302 allows users to connect a USB power sensor to FieldFox's USB port and make broadband power measurements. | Option 310 is a channelized power measurement capability built into FieldFox analyzers. Maximum bandwidth is 100 MHz. |
| External hardware | USB power sensor required | None. Uses internal receiver. |
| Power measurement | Broadband diode detector, measures all frequencies | Tuned receiver, so measures frequencies within defined channel bandwidth |
| Frequency range | Depends on USB sensor | Frequency range of the analyzer |
| Settings | Set CW frequency | Set CW frequency, Set channel width/span |
| Power range | Depends on USB sensor | Depends on channel width and attenuator setting. |
| Warm-up time | 30 minutes to meet accuracy specifications | No warm-up time required |
| Accuracy | Depends on USB sensor | InstAlign accuracy: ± 0.5 dB typical for a CW signal. Since the measurement is within a certain frequency channel or bandwidth, to make an accurate measurement, the user needs to know the exact center frequency and the signal's bandwidth and set those accurately. |
| Programmable | Yes, via SCPI | Yes, via SCPI |
| Physical connection | The power sensor can easily be moved to the measurement point, with a USB cable connecting the detector to FieldFox. | The measurement point needs to be connected to FieldFox's RF input port. If a RF jumper cable is used, the user needs to account for the loss of the cable with an offset value (can be entered into the analyzer). |
| FieldFox source control | Yes, on/off, and nominal power level control | No access to FieldFox's source from the built-in power meter mode |



FAQs – Applicable To All FieldFox Microwave Analyzers (continued)

| Question | Answer |
|--|---|
| 3. What do I need to get GPS information? | <p>(1) The recommended GPS solution is to order:</p> <ul style="list-style-type: none"> – 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) <p>(2) Alternatively, you can purchase a USB-based GPS receiver. 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.</p> |
| 4. What is the connector for Option 309, DC output? | The DC output has a SMB (m) connector. Recommend ordering N9910X Option 713 bias-tee power cable SMB (f) to BNC (m). |
| 5. What are the connectors for the Reference/Trigger In and Reference/Trigger Out? | <p>The connector for the Ref/Trig In is SMA (f). Recommend ordering N9910X Option 712 Trig/Ref in SMA (m) to BNC (f) cable.</p> <p>The connector for the Ref/Trig Out is SMB (m). Recommend ordering N9910X Option 713 bias-tee power cable SMB (f) to BNC (m).</p> |
| 6. What is Option 030 Remote control capability? | <p>(1) Option 030 provides a license for FieldFox to allow remote control via an iOS device.</p> <p>(2) Not supplied by user, but necessary for operation of Option 030 are:</p> <ul style="list-style-type: none"> – iOS device: iPad, iPhone, or iPod Touch with iOS 6.1 or higher with free FieldFox app – A WiFi or 3G/4G network connection between FieldFox and iOS device |
| 7. What USB sensor is required for Option 330? | Option 330 or pulse measurements requires a Keysight USB peak power sensor. Visit www.keysight.com/find/usbsensorsforfieldfox for a list of supported peak power sensors. Average power sensors cannot be used with Option 330, only peak power sensors. The peak power sensor needs to be purchased separately. |
| 8. What measurement capabilities are included with Option 330? | <p>Average power, peak power, and peak to average ratio</p> <p>Analog gauge display and digital display, dBm and watts</p> <p>Relative/absolute measurements, dB or %, minimum and maximum limits</p> <p>Trace graph for pulse profiling with gating</p> <p>Rise time, fall time, pulse width, pulse period, pulse repetition frequency</p> |
| 9. What is included with Option 208? | Option 302, USB power sensor measurements, includes CW power measurements (one frequency at a time). With Option 208 added, you can make swept-frequency power measurements. You can plot source power, gain, and receive power versus frequency. Additionally, the source frequency can be offset from the receiver frequency. The power sensor needs to be purchased separately. |

FieldFox Microwave Vector Network Analyzers

FieldFox microwave vector network analyzer models

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.

Any of these options can easily be added as a software upgrade in the future.

FieldFox microwave vector network analyzer options

| Option | Description | Prerequisite options/notes |
|--------------------------------------|---|--|
| Vector network analysis / CAT | | |
| 010 | VNA time domain | Recommend 211 |
| 112 | QuickCal | See page 10, FAQ #7 |
| 211 | VNA full 2-port S-parameters | |
| 212 | 1-port mixed-mode S-parameters | Requires 211 |
| 215 | TDR cable measurements | Requires 305 |
| 305 | Cable and antenna analyzer | |
| 308 | Vector voltmeter | 211 required to obtain full VVM functionality. See page 10, FAQ #5 |
| Power measurements | | |
| 208 | USB power sensor meas. versus frequency | Requires 302 |
| 302 | USB power sensor support | Need to order USB power sensor ¹ |
| 310 | Built-in power meter | No power sensor required. See page 7, FAQ #1 |
| 330 | Pulse meas. with USB peak power sensor | Need to order USB peak power sensor. See page 8, FAQs #7 and #8 |
| System features | | |
| 030 | Remote control capability | Requires an iOS device |
| 307 | GPS receiver | Need to order GPS antenna, N9910X-825. See page 8, FAQ #3 |
| 309 | DC bias variable-voltage source | - |

1. List of compatible sensors available from www.keysight.com/find/fieldfoxsupport

FieldFox Microwave Vector Network Analyzer FAQs

| Question | Answer |
|--|---|
| 1. What is included with a base N992xA analyzer? | <ul style="list-style-type: none"> – Measurements: Transmission/reflection or S21 and S11, magnitude and phase – Calibrations: CalReady, OSL, response, and enhanced response cal |
| 2. What is included with N992xA Option 211? | <ul style="list-style-type: none"> – 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 |
| 3. What is included with N992xA Option 010? | <ul style="list-style-type: none"> – S11/S21 in time domain. 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 |
| 4. What is included with N992xA Option 305? | <ul style="list-style-type: none"> – Measurements: DTF (dB, linear, VSWR), return loss and DTF, return loss (dB), and 1-port cable loss, 2-port insertion loss, TDR (linear, ohm) – Calibrations: CalReady, OSL, and response cal |
| 5. What is included with N992xA Option 308? | <ul style="list-style-type: none"> – 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 |
| 6. If I have the full 2-port VNA with time domain, why would I order Option 305? What additional functionality is available? | <p>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:</p> <ul style="list-style-type: none"> – 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 |
| 7. What is included with N992xA Option 112? | <ul style="list-style-type: none"> – QuickCal is included with Option 112. <ul style="list-style-type: none"> – 1-port and enhanced response QuickCal with a base analyzer – 1-port, enhanced response, and 2-port QuickCal with a full 2-port analyzer (one that has Option 211). – QuickCal is most accurate for DUTs with 7/16 and Type-N connectors and measurement uncertainties are provided for frequencies 18 GHz. Reduced accuracy for DUTs with 3.5 mm (m), SMA (m), or other male coaxial connectors; performance is unspecified. QuickCal is not recommended for DUTs with 3.5 mm (f), SMA (f), or other similar female connectors. QuickCal is not applicable to waveguide. |
| Additional FAQs on pages 7 and 8. | FAQs on pages 7 and 8 apply to all microwave FieldFox models. |

FieldFox Microwave Spectrum Analyzers

FieldFox microwave spectrum analyzer models

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 |
| N9960A | 32 GHz FieldFox microwave spectrum analyzer | 9 kHz to 32 GHz | NMD 2.4 mm (m) |
| N9961A | 44 GHz FieldFox microwave spectrum analyzer | 9 kHz to 44 GHz | NMD 2.4 mm (m) |
| N9962A | 50 GHz FieldFox microwave spectrum analyzer | 9 kHz to 50 GHz | NMD 2.4 mm (m) |

Step 2. Select optional measurement capabilities.

Any of these options can easily be added as a software upgrade in the future.

FieldFox microwave spectrum analyzer options

| Option | Description | Prerequisite options/notes |
|---------------------------|---|--|
| Spectrum analyzer | | |
| 100 | 3.5 mm (m) connectors | Only available on N9938A. Option 100 is only available at time of purchase. It is not available as an upgrade. |
| 209 | Extended range transmission analysis (ERTA) | Requires 220. Recommend 307. Requires two FieldFoxes. See page 5, FAQ # 10. |
| 220 | Full-band tracking generator | CW, CW coupled, and tracking |
| 235 | Pre-amplifier | - |
| 236 | Interference analyzer and spectrogram | - |
| 238 | Spectrum analyzer time gating | - |
| 320 | Reflection measurements | 320 requires 220 on all models. On N9938A specifically, 320 also requires 100. |
| Power measurements | | |
| 208 | USB power sensor meas. vs. frequency | Requires 302 |
| 302 | USB power sensor support | Need to order USB power sensor ³ |
| 310 | Built-in power meter | No power sensor required. See page 7, FAQ #1 |
| 330 | Pulse meas. with USB peak power sensor | Need to order USB peak power sensor. See page 8, FAQs #7 and #8 |
| System features | | |
| 030 | Remote control capability | Requires an iOS device |
| 307 | GPS receiver | Need to order GPS antenna, N9910X-825. See page 8, FAQ #3 |
| 309 | DC bias variable-voltage source | - |

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). Option 100 is a prerequisite for Option 320 for N9938A.
3. List of compatible power sensors available from www.keysight.com/find/fieldfoxsupport

FieldFox Spectrum Analyzer FAQs

| Question | Answer |
|--|---|
| 1. What is included with the basic spectrum analyzer? | <ul style="list-style-type: none"> – 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 |
| 2. What is included with Option 236? | <ul style="list-style-type: none"> – Interference analyzer and spectrogram – Trace playback and recording |
| 3. What is included with Option 320? | <ul style="list-style-type: none"> – Return loss and VSWR – Normalization using data/memory |
| 4. What is the difference between Option 320 and the CAT mode on the combo base model? | Option 320 on the N993xA/N996xA SA offers RL and VSWR. CAT mode on the N991xA/N995xA combo analyzers offers RL and VSWR, DTF, insertion loss, and also various calibration capabilities such as QuickCal and OSL. |
| Additional FAQs on pages 7 and 8. | FAQs on pages 7 and 8 apply to all microwave FieldFox models. |

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.keysight.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.keysight.com/find/fieldfoxsupport

FieldFox microwave (combination) upgrades

N9913AU, N9914AU, N9915AU, N9916AU, N9917AU, N9918AU, N9950AU, N9951AU, N9952AU

| Option | Description | Upgrade contents | Additional requirements |
|--------|--|------------------|----------------------------------|
| 010 | VNA time domain analysis | License key | 210 |
| 030 | Remote control capability | License key | None |
| 112 | Enable QuickCal | License key | None (Does not apply to N995xAU) |
| 208 | USB power sensor measurements versus frequency | License key | 302 |
| 209 | Extended range transmission analysis (ERTA) | License key | 233 and 210 ¹ |
| 210 | VNA transmission and reflection | License key | None |
| 211 | VNA full 2-port S-parameters | License key | 210 |
| 212 | Mixed-mode S-parameters | License key | 210 and 211 |
| 215 | TDR cable measurements | License key | None |
| 233 | Spectrum analyzer | License key | None |
| 235 | Preamplifier | License key | 233 |
| 236 | Interference analyzer and spectrogram | License key | 233 |
| 238 | Spectrum analyzer time gating | License key | 233 |
| 302 | External USB power sensor support | License key | None |
| 307 | GPS receiver | License key | None |
| 308 | Vector voltmeter | License key | None |
| 309 | DC bias variable-voltage source | License key | None |
| 310 | Built-in power meter | License key | None |
| 330 | Pulse measurements | License key | None |

1. 209 is a system based on two FieldFoxes. See page 6, FAQ # 10, for a detailed description of the system requirements.

FieldFox VNA upgrades

N9925AU, N9926AU, N9927AU, N9928AU

| Option | Description | Upgrade contents | Additional requirements |
|--------|--|------------------|-------------------------|
| 010 | VNA time domain analysis | License key | None |
| 030 | Remote control capability | License key | None |
| 112 | Enable QuickCal | License key | None |
| 208 | USB power sensor measurements versus frequency | License key | 302 |
| 211 | VNA full 2-port S-parameters | License key | None |
| 212 | Mixed-mode S-parameters | License key | 211 |
| 215 | TDR cable measurements | License key | 305 |
| 302 | External USB power sensor support | License key | None |
| 305 | Cable and antenna analyzer | License key | None |
| 307 | GPS receiver | License key | None |
| 308 | Vector voltmeter | License key | None |
| 309 | DC bias variable-voltage source | License key | None |
| 310 | Built-in power meter | License key | None |
| 330 | Pulse measurements | License key | None |

Upgrades (continued)

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

FieldFox SA upgrades

N9935AU, N9936AU, N9937AU, N9938AU,
N9960AU, N9961AU, N9962AU

| Option | Description | Upgrade contents | Additional requirements |
|--------|--|--------------------------|--|
| 030 | Remote control capability | License key | None |
| 100 | 3.5 mm connectors | Not applicable | Not applicable |
| 208 | USB power sensor measurements versus frequency | License key | 302 |
| 209 | Extended range transmission analysis (ERTA) | License key | 220 ¹ |
| 220 | Full-band tracking generator | License key | None |
| 235 | Preamplifier function | License key | None |
| 236 | Interference analyzer and spectrogram | License key | None |
| 238 | Spectrum analyzer time gating | License key | None |
| 302 | External USB power sensor support | License key | None |
| 307 | GPS receiver | License key | None |
| 309 | DC bias variable-voltage | License key | None |
| 310 | Built-in power meter | License key | None |
| 320 | Reflection measurements | License key ² | <ul style="list-style-type: none"> – Option 220 for all models – Option 100 and 220 for N9938A |
| 330 | Pulse measurements | License key | None |

1. 209 is a system based on two FieldFoxes. See page 6, FAQ # 10, for a detailed description of the system requirements.
2. On N9938A, Option 320 is only available as a software upgrade if the spectrum analyzer is already equipped with Option 100, which is 3.5 mm connectors on the test port. Option 100 must have been ordered at the time of original purchase. It cannot be upgraded later.

You Can Upgrade!

Options can be added after your initial purchase.



Most FieldFox options are license-key upgradeable.

Calibration Kits

FieldFox analyzers support most standard HP/Agilent/Keysight mechanical calibration kits and all Keysight USB ECal modules. Custom calibration kits can be created and uploaded to FieldFox using Data Link software.

| Model | Description | Connector | Frequency range | Components ¹ |
|---|---------------------|-----------------------|---------------------|--|
| 7-16 | | | | |
| N9910X-802 | 3-in-1 OSL cal kit | 7/16 (m) | DC to 4 GHz | open, short, load (all male) |
| N9910X-803 | 3-in-1 OSL cal kit | 7/16 (f) | DC to 4 GHz | open, short, load (all female) |
| 85038A | Standard cal kit | 7/16 | DC to 7.5 GHz | open, short, load (both female and male) |
| Type-N, 50 Ω | | | | |
| N9910X-800 | 3-in-1 OSL cal kit | Type-N (m) | DC to 6 GHz | open, short, load (all male) |
| N9910X-801 | 3-in-1 OSL cal kit | Type-N (f) | DC to 6 GHz | open, short, load (all female) |
| 85032E | Economy cal kit | Type-N (m) | DC to 6 GHz | open, short, load (all male) |
| 85514A | 4-in-1 OSLT cal kit | Type-N (m) | DC to 9 GHz | open, short, load, thru (all male) |
| 85515A | 4-in-1 OSLT cal kit | Type-N (f) | DC to 9 GHz | open, short, load, thru (all female) |
| 85032F | Standard cal kit | Type-N | DC to 9 GHz | open, short, load (both female and male) |
| 85518A | 4-in-1 OSLT cal kit | Type-N (m) | DC to 18 GHz | open, short, load, thru (all male) |
| 85519A | 4-in-1 OSLT cal kit | Type-N (f) | DC to 18 GHz | open, short, load, thru (all female) |
| 85054D | Economy cal kit | Type-N | DC to 18 GHz | open, short, load, thru (both female and male) |
| 85054B | Standard cal kit | Type-N | DC to 18 GHz | open, short, fixed load, sliding load (both female and male) |
| 85092C | ECal, 2-ports | Type-N | 300 kHz to 9 GHz | connectors configurable |
| N4690B/C | ECal, 2-ports | Type-N | 300 kHz to 18 GHz | connectors configurable |
| Type-N, 75 Ω² | | | | |
| 85036B | Standard cal kit | Type-N 75 Ω | DC to 3 GHz | open, short, load (both female and male) |
| 85036E | Economy cal kit | Type-N(m) 75 Ω | DC to 3 GHz | open, short, load, all male |
| 85096C | ECal, 2-ports | Type-N(m) 75 Ω | 300 kHz to 3 GHz | connectors configurable |
| 3.5 mm | | | | |
| 85520A | 4-in-1 OSLT | 3.5 mm (m) | DC to 26.5 GHz | open, short, load, thru (all male) |
| 85521A | 4-in-1 OSLT | 3.4 mm (f) | DC to 26.5 GHz | open, short, load, thru (all female) |
| 85033D/E | Economy cal kit | 3.5 mm | DC to 6/9 GHz | open, short, fixed load (both female and male) |
| 85052D | Economy cal kit | 3.5 mm | DC to 26.5 GHz | open, short, fixed load (both female and male) |
| 85052B | Standard cal kit | 3.5 mm | DC to 26.5 GHz | open, short, fixed load, sliding load (both female and male) |
| 85052C | Precision TRL kit | 3.5 mm | DC to 26.5 GHz | open, short, fixed load (both female and male), two line lengths |
| 85093C | ECal, 2-ports | 3.5 mm | 300 kHz to 9 GHz | connectors configurable |
| N4691B | ECal, 2-ports | 3.5 mm | 300 kHz to 26.5 GHz | connectors configurable |
| 2.92 mm (same as K connector) | | | | |
| 85056KE01 ³ | Standard cal kit | 2.92 mm | DC to 40 GHz | open, short, fixed load, sliding load (both female and male) |
| 85056KE02 ⁴ | Economy cal kit | 2.92 mm | DC to 40 GHz | open, short, fixed load (both female and male) |
| N4692A | ECal | 2.92 mm | 10 MHz to 40 GHz | connectors configurable |

1. Component list shows calibration components. Some cal kits also include adapters.
2. Recommend ordering quantity 2 of N9910X Option 846, 50 to 75 Ω adapter.
3. Same as Maury's 8770C47
4. Same as Maury's 8770D47

Calibration Kits (continued)

FieldFox analyzers support most standard HP/Agilent/Keysight mechanical calibration kits and all Keysight USB ECal modules. Custom calibration kits can be created and uploaded to FieldFox using Data Link software.

| Model | Description | Connector | Frequency range | Components |
|------------------|-------------------------|-----------|------------------|--|
| 2.4 mm | | | | |
| 85056D | Economy cal kit | 2.4 mm | DC to 50 GHz | open, short, fixed load (both female and male) |
| 85056A | Standard cal kit | 2.4 mm | DC to 50 GHz | open, short, load, fixed load, sliding load (both female and male) |
| N4693A | ECal | 2.4 mm | 10 MHz to 50 GHz | connectors configurable |
| Waveguide | | | | |
| N9911X-11x | Econ. waveguide cal kit | WR-137 | 5.38 to 8.18 GHz | short, termination, offset length |
| N9911X-21x | Econ. waveguide cal kit | WR-90 | 8.2 to 12.5 GHz | short, termination, offset length |
| N9911X-31x | Econ. waveguide cal kit | WR-62 | 11.9 to 18 GHz | short, termination, offset length |
| N9911X-41x | Econ. waveguide cal kit | WR-42 | 17.6 to 26.7 GHz | short, termination, offset length |
| X11644A | Waveguide cal kit | WR-90 | 8.2 to 12.4 GHz | short, shim, termination, standard section |
| P11644A | Waveguide cal kit | WR-62 | 12.4 to 18 GHz | short, shim, termination, standard section |
| K11644A | Waveguide cal kit | WR-42 | 18 to 26.5 GHz | short, shim, termination, standard section |
| R11644A | Waveguide cal kit | WR-28 | 26.5 to 40 GHz | short, shim, termination two straight sections |
| Q11644A | Waveguide cal kit | WR-22 | 33 to 50 GHz | short, shim, termination, two straight sections |
| U11644A | Waveguide cal kit | WR-19 | 40 to 60 GHz | short, shim, termination, two straight sections |

Accessories

| 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-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-714 | 2.4 mm (f) | 2.4 mm (m) | 50 GHz | 3.28 ft | 1 m |
| N9910X-715 | 2.4 mm (f) | 2.4 mm (f) | 50 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) | 8 GHz | 12 ft | 3.6 m |
| N9910X-813 | Type-N (m) | Type-N (f) | 8 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 | 3.28 ft | 1 m |
| N9910X-817 | Type-N (m) | Type-N (m) | 6 GHz | 3.28 ft | 1 m |
| Antennas | | | | | |
| N9910X-820 | Antenna, directional, multiband, 800 to 2500 MHz, 10 dBi, Type-N (f) | | | | |
| N9910X-821 | Antenna, telescopic whip, 70 MHz to 1 GHz, BNC (m) | | | | |
| N9910X-822 | Antenna, directional, log periodic, 600 MHz to 9 GHz, Type-N(f) | | | | |
| N9910X-823 | Antenna, cellular narrowband, 824 to 869 MHz, Type-N (f) | | | | |
| N9910X-824 | Antenna, cellular narrowband, PCS 1850 to 1990 MHz, Type-N (f) | | | | |
| N9910X-825 | Antenna, GPS, active, SMA (m) | | | | |
| 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, 11 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 | | | | |
| N9910X-886 | Torque wrench, 17 mm, 90 N-cm (8in-lb), recommended for N995x and N996x analyzers | | | | |

Accessories (continued)

Below are images for a subset of FieldFox accessories. Complete list of accessories are on pages 15 to 17 of this document.

| Description | Accessory |
|---|---|
| N9910X-701 Type-N (m) to Type-N (f) cable, 3.28 ft |  |
| N9910X-708 3.5 mm (m) to 3.5 mm (f) cable, 3.28 ft |  |
| N9910X-820 Antenna, directional |  |
| N9910X-823 Antenna, cellular narrowband |  |
| N9910X-822 Antenna, directional |  |
| N9910X-825 Antenna, GPS, active |  |
| N9910X-870 Extra battery |  |
| N9910X-872 External battery charger |  |
| N9910X-881 Hard transit case |  |

| Description | Accessory |
|--|---|
| N9910X-811 Type-N (m) to Type-N (f) cable, 5 ft |  |
| N9910X-812 Type-N (m) to Type-N (m) cable, 12 ft |  |
| N9910X-816 Type-N (m) to Type-N (f) cable, 3.28 ft |  |
| N9910X-824 Antenna, cellular narrowband |  |
| N9910X-848 Coaxial adapter, Type-N(f) to 3.5 mm (f) |  |
| N9910X-875 DC car charger and adapter |  |
| N9910X-873 AD/DC adapter |  |
| N9910X-874 External bias-tee |  |

Accessories (continued)

Below are images for a subset of FieldFox accessories. Complete list of accessories are on pages 15 to 17 of this document.

| Description | Accessory | Description | Accessory |
|---|---|---|---|
| N4690B 2-port ECal, Type-N, 18 GHz |  | N4691B 2-port ECal, 3.5 mm, 26.5 GHz |  |
| N9910X-800 3-in-1 OSL cal kit, Type-N (m), 6 GHz |  | 85520A 4-in-1 OSLT cal kit, 3.5 mm (m), 26.5 GHz |  |
| N991X0-801 3-in-1 OSL cal kit, Type-N (f), 6 GHz |  | 85521A 4-in-1 OSLT cal kit, 3.5 mm (f), 26.5 GHz |  |
| 85514A 4-in-1 OSLT cal kit, Type-N (m) 9 GHz |  | 85033D/E 3.5 mm cal kit, 9 GHz |  |
| 85515A 4-in-1 OSLT cal kit, Type-N (f), 9 GHz |  | 85052D 3.5 mm cal kit, 26.5 GHz |  |
| 85518A 4-in-1 OSLT cal kit, Type-N (m), 18 GHz |  | N4692A 2.92 mm, 2-port ECal, 40 GHz |  |
| 85519A 4-in-1 OSLT cal kit, Type-N (f), 18 GHz |  | N4693A 2.4 mm 2-port ECal, 50 GHz |  |
| 85054D Economy cal kit, Type-N, 18 GHz |  | 85056D 2.4 mm cal kit, 50 GHz |  |
| N9911X-211/212/213/214 WR-90 economical cal kit |  | X11644A WR-90 standard cal kit |  |

Carry Precision With You

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