# FieldFox A-Series
# Handheld Analyzers
## 4/6.5/9/14/18/26.5/32/44/50 GHz

## Introduction

This configuration guide describes configurations, options, and accessories for the FieldFox A-Series 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 on Page 3 titled "FieldFox A-Series Family and Options" shows a comparison of the functions available in the FieldFox A-Series family of analyzers.

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

## Included accessories

The following accessories are included with every FieldFox

- AC/DC adapter
- Battery
- Soft carrying case
- Quick Reference Guide

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# Table of Contents

# FieldFox A-Series Family and Options

| Option | Description | Combination analyzers N991xA, N995xA | Vector network analyzers N992xA | Spectrum analyzers N993xA, N996xA |
|---|---|---|---|---|
| **CAT/vector network analysis** | | | | |
| 010 | VNA time domain | √ | √ | — |
| 112 | QuickCal | √ on N991xA (Not on N995xA) | √ | — |
| 210 | VNA transmission/reflection | √ (Not on N9912A) | Base model [1] | — |
| 211 | VNA full 2-port S-parameters | √ (Not on N9912A) | √ | — |
| 212 | 1-port mixed-mode S-parameters | √ (Not on N9912A) | √ | — |
| 215 | TDR cable measurements | √ (Not on N9912A) | √ | — |
| 303 | Network analysis capability | √ (N9912A only) | — | — |
| 305 | Cable and antenna analyzer | Base model [1] | √ | — [2] |
| 308 | Vector voltmeter | √ | √ | — |
| 320 | Reflection meas. (RL, VSWR and scalar meas.) | — [3] | — [3] | √ |
| V5K | VNA 5kHz start frequency | √ on N991xA (Not on N9912A nor N995xA) | — | — |
| **Spectrum analysis** | | | | |
| 209 | Extended range transmission analysis (ERTA) | √ (Not on N9912A) | — | √ |
| 220 | Tracking generator | — [4] | — | √ |
| 230 | Spectrum analyzer (4 GHz) | √ (N9912A only) | — | — |
| 231 | Spectrum analyzer (6 GHz) | √ (N9912A only) | — | — |
| 233 | Spectrum analyzer | √ (Not on N9912A) | — | Base model [1] |
| 235 | Pre-amplifier | √ | — | √ |
| 236 | Interference analyzer and spectrogram | √ | — | √ |
| 238 | Spectrum analyzer time gating | √ | — | √ |
| 312 | Channel scanner | √ | — | √ |
| 350 | Real-time spectrum analyzer (RTSA) | √ (Not on N9912A) | — | √ |
| 351 | I/Q Analyzer (IQA) | √ (Not on N9912A) | — | √ |
| 352 | Indoor and outdoor mapping | √ (Not on N9912A) | — | √ |
| 353 | IQ streaming | √ (Not on N9912A) | — | √ |
| 355 | Analog demodulation | √ | — | √ |
| 356 | Noise figure (NF) | √ (Not on N9912A) | — | √ |
| 357 | Pulse generator | √ (Not on N9912A) | — | √ |
| 358 | EMF measurements | √ (Not on N9912A) | — | √ |
| 360 | Phased array antenna support | √ (N995xA only) | — | √ (N996xA only) |
| 361 | EMI measurements | √ (Not on N9912A) | — | √ |
| 370 | Over-the-Air (OTA) LTE FDD | √ (Not on N9912A) | — | √ |
| 371 | Over-the-Air (OTA) LTE TDD | √ (Not on N9912A) | — | √ |
| 377 | Over-the-Air (OTA) 5GTF | √ (Not on N9912A) | — | √ |
| **Power measurements** | | | | |
| 208 | USB power sensor meas. versus frequency | √ | √ | √ |
| 302 | USB power sensor support | √ | √ | √ |
| 310 | Built-in power meter | √ (Not on N9912A) | √ | √ |
| 330 | Pulse meas. with USB peak power sensor | √ | √ | √ |
| **System features** | | | | |
| 030 | Remote control capability | √ | √ | √ |
| 307 | GPS receiver | √ (Not on N9912A) | √ | √ |
| 309 | DC bias variable-voltage source | √ (Not on N9912A) | √ | √ |
| — | Frequency extender support [5] | √ (Not on N9912A) | — | √ |
| **Windows-based software** | | | | |
| 89601B | PathWave VSA (89600 VSA) software | √ (Not on N9912A) | — | √ |
| N6820ES | Surveyor 4D software | √ (Not on N9912A) | — | √ |

1. 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.
2. 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.

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3.  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 Option 320 on these analyzers.
4.  On the N991xA or N995xA analyzers, order Options 233 and 210 to obtain a tracking generator with the spectrum analyzer. Option 220 is not available on the N991xA or N995xA analyzers. Option 233 provides the spectrum analyzer capability and Option 210 the "tracking" capability.
5.  Frequency extenders are not currently supported on models N9913A, N9914A, and N9915/35A since the starting LO frequency of these mixers is higher than 9 GHz and the LO is provided to the mixer from FieldFox Port 1.  For a list of supported OML frequency extenders, see Accessories page 22.

Note: Some of the functionalities listed above may have different option numbers on N9912A. Refer to N9912A Technical Overview for more information.

# FieldFox RF and Microwave (combination) Analyzers

## 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 |
|---|---|---|---|---|
| N9912A (Opt 104) | FieldFox RF analyzer | 2 MHz to 4 GHz | 100 kHz to 4 GHz (Opt 230) | Type-N (f) |
| N9912A (Opt 106) | FieldFox RF analyzer | 2 MHz to 6 GHz | 100 kHz to 6 GHz (Opt 231) | Type-N (f) |
| N9913A | 4 GHz FieldFox RF analyzer | 30 kHz to 4 GHz | 100 kHz to 4 GHz | Type-N (f) |
| N9913A (Opt V5K) | 4 GHz FieldFox RF analyzer | 5 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) |
| N9914A (Opt V5K) | 6.5 GHz FieldFox RF analyzer | 5 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) |
| N9915A (Opt V5K) | 9 GHz FieldFox microwave analyzer | 5 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) |
| N9916A (Opt V5K) | 14 GHz FieldFox microwave analyzer | 5 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) |
| N9917A (Opt V5K) | 18 GHz FieldFox microwave analyzer | 5 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) |
| N9918A (Opt V5K) | 26.5 GHz FieldFox microwave analyzer | 5 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) |

1.  Useable to 5 kHz.

## Analyzer options

### 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. Note: The option list below is specifically for N991xA/N995xA with N9912A excluded. For N9912A options, refer to N9912A Technical Overview for more information.

| Option | Description | Prerequisite options/notes |
|---|---|---|
| CAT/vector network analysis | | |
| 010 | VNA time domain | Requires 210, recommend 211. See page 6, FAQ #7 |
| 112 | QuickCal | Not available for N995xA models. See page 6, FAQ #9 |
| 210 | VNA transmission/reflection | Recommend ordering a cal kit. See page 6, FAQ #4 and page 6, FAQ #6 |

| Option | Description | Prerequisite options/notes |
|---|---|---|
| 211 | VNA full 2-port S-parameters | Requires 210, recommend ordering a cal kit. See page 6, FAQ #5 |
| 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 6, FAQ #8 |
| V5K | VNA 5kHz start frequency | Not available for N9912A nor N995xA |
| **Spectrum analysis** | | |
| 209 | Extended range transmission analysis (ERTA) | Requires 233 and 210. Recommend 307. Requires two FieldFox units. See page 6, FAQ # 10. See page 8 for typical configuration. |
| 233 | Spectrum analyzer | — |
| 235 | Pre-amplifier | Requires 233 |
| 236 | Interference analyzer and spectrogram | Requires 233 |
| 238 | Spectrum analyzer time gating | Requires 233 |
| 312 | Channel scanner | Requires 233 |
| 350 | Real-time spectrum analyzer (RTSA) [1] | Requires 233, Recommend 235. See page 7, FAQ #12 |
| 351 | I/Q Analyzer (IQA) [1] | Requires 233 |
| 352 | Indoor and outdoor mapping | Requires 233, 307, and at least one of 312, 360, 370, 371 or 377. See page 8, FAQ #17 |
| 353 | IQ streaming [1] | Requires 233, 351 |
| 355 | Analog demodulation | Requires 233 |
| 356 | Noise Figure (NF) [1] | Requires 233, 235, 309 and accessory item N9910X-713 BNC to SMB cable. See page 7, FAQ #15 for external preamplifier and noise source requirements. |
| 357 | Pulse generator | Requires 233 |
| 358 | EMF measurements | Requires 233. Also requires triaxial antenna. See page 8, FAQ #18 |
| 360 | Phased array antenna support | Requires 233. Also requires phased arrayed antenna. See page 7, FAQ #16 |
| 361 | EMI measurements [1] | Requires 233 |
| 370 | Over-the-Air (OTA) LTE FDD [1] | Requires 233, 307. Recommend 235. |
| 371 | Over-the-Air (OTA) LTE TDD [1] | Requires 233, 307. Recommend 235. |
| 377 | Over-the-Air (OTA) 5GTF [1] | Requires 233, 307. Recommend 235. See page 9, FAQ #19 |
| **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 10, FAQ #1 |
| 330 | Pulse meas. with USB peak power sensor | Requires 302 and USB peak power sensor [2]. See page 11, FAQs #7 and #8 |
| **System features** | | |
| 030 | Remote control capability | Requires an iOS device or an Android device |
| 307 | GPS receiver | Need to order GPS antenna, N9910X-825. See page 11, FAQ #3 |
| 309 | DC bias variable-voltage source | Recommend N9910X-713 cable, see page 11, FAQ #4 |
| — | Frequency extender support | Requires 233. Optional 350, 351, 360, 370, 371, 377, PathWave VSA software. See Accessories, page 22 |
| **Windows-based software** | | |
| 89601B | PathWave VSA (89600 VSA) software | Requires 233 and CPU2 processor. See page 7, FAQ #13 |
| N6820ES | Surveyor 4D software [1] | Requires 233, 235 and 307, see page 8, FAQ #20 |

1. Requires CPU2 fast processor. See page 7, FAQ #13. All new FieldFox analyzers currently ship with CPU2.
2. List of compatible sensors available from www.keysight.com/find/fieldfoxsupport.

# FieldFox RF and Microwave (combination) Analyzer FAQs

| Question | Answer |
|---|---|
| 1. What is included with a base N991xA/N995xA analyzer? | 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 |
| | Note: 2-port insertion loss is NOT included with the base model, if 2-port insertion loss is needed, order Option 210 |
| | Note: Base analyzer does not have phase information, for S11 or S21 phase, order Option 210 |
| 2. What is included with N991xA/N995xA Option 233? | Basic spectrum analysis, four traces, different detector types, radio standard selection, limit lines |
| | Channel power, occupied bandwidth, adjacent channel power, spectrum emission mask |
| | AM/FM tune and listen, field strength measurements, antenna factors, frequency counter marker |
| | Tracking generator (TG)/Independent source:<br>• TG CW mode (source CW frequency can be set independent of SA frequency) - included<br>• **TG CW coupled mode (source CW frequency is auto coupled to SA's center frequency)** - included<br>• TG tracking mode (traditional TG operation, swept SA coupled to swept source) - (requires Option 210) |
| 3. What is included with N991xA/N995xA Option 236? | Interference analyzer and spectrogram |
| | Trace playback and recording |
| 4. What is included with N991xA/N995xA 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 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? | 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? | 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? | 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 |
| | Note: A/B and B/A measurements require an external source |
| 9. What is included with N991xA Option 112? | Option 112 (QuickCal), is not available for N995xA analyzers. It is available for N991xA analyzers. |
| | QuickCal is included with Option 112<br>• 1-port QuickCal with a base analyzer<br>• 1-port and enhanced response QuickCal with a T/R analyzer (one that has Option 210)<br>• 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. |
| 10. What are the requirements for Option 209? | Extended Range Transmission Analysis (ERTA) or Option 209 is a scalar measurement system based on the use of two (2) FieldFox units. One FieldFox acts as the source and reference receiver, while the second FieldFox acts as the measurement receiver. When different frequency models are used in an ERTA pair, the ERTA system frequency range is limited to the lowest of the pair. |
| | Required hardware |

| Question | Answer |
|---|---|
| | A. Two (2) FieldFox units. FieldFox units can be any of these models: <br> • FieldFox microwave combination analyzers: N9913A, N9914A, N9915A, N9916A, N9917A, N9918A, N9950A, N9951A, N9952A <br> • FieldFox microwave spectrum analyzers: N9935A, N9936A, N9937A, N9938A, N9960A, N9961A, N9962A <br> • ERTA cannot use N9912A, N9923A, N9925A, N9926A, N9927A or N9928A |
| | The two FieldFox units used in ERTA do not have to be the same model. |
| | ERTA requires the following options on Combo FieldFox models (N9913A, N9914A, N9915A, N9916A, N9917A, N9918A, N9950A, N9951A, N9952A): <br> • Option 210, VNA transmission/reflection <br> • Option 233, spectrum analyzer <br> ERTA requires the following options on SA FieldFox models (N9935A, N9936A, N9937A, N9938A, N9960A, N9961A, N9962A) <br> • Option 220, tracking generator |
| | Both FieldFox units (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 a SA analyzer. |
| | With either the Combo or SA FieldFox units, the following options are highly recommended: <br> • Option 235, preamplifier – this option increases the measurement dynamic range by increasing the received signal power <br> • Option 307, GPS receiver – this option increases the dynamic range by increasing the frequency accuracy and permitting the use of a narrower RBW |
| | 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. |
| | C. N9910X-712, Trigger/Reference-in cable, SMA (m) to BNC(f), 1 m, quantity two |
| | D. N9910X-713, Trigger/Reference-out cable, SMB (m) to BNC (m), 1 m, quantity two |
| | E. LAN connection – For ERTA, the two FieldFox units 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. |
| | Recommended accessory |
| | F. N9910X-825, GPS Antenna |
| 11. What is included with Option 355? | FieldFox analog demodulation has two parts: (1) Tune and listen, and (2) AM/FM metrics. Tune and listen is available with the purchase of the spectrum analyzer option 233. AM/FM metrics become available when Option 355 is purchased. AM/FM metrics provide the user with RF spectrum view, demodulated baseband signal waveform, carrier power, frequency deviation, SINAD and more. |
| 12. What is included with Option 350? | Real-time spectrum analyzer (RTSA) or Option 350 provides real-time measurements on a FieldFox. The FieldFox must be equipped with spectrum analysis capability. The preamplifier option is recommended, as elusive signals often have low power levels. The maximum real-time bandwidth for option 350 is 10 MHz. RTSA includes trace recording and playback capabilities. It does not include a frequency-mask trigger (FMT). |
| 13. How do I determine if my FieldFox has CPU2 fast processor? | All N995xA and N996xA analyzers include CPU2. On other FieldFox models, if the serial number starts with MY5607/SG5607/US5607, then it has CPU2. If the serial number prefix is different, then the analyzer firmware needs to be checked to see if the instrument has been upgraded with N9910HU-100/200/300/400/500 to have CPU2. |
| 14. Is Spectrum Analyzer Trace Recording and Playback standard or an option? | Spectrum Analyzer mode (Option 233) does not include Trace Recording and Playback by default. To obtain this capability in SA mode, Option 236 Interference Analyzer and Spectrogram needs to be purchased. |
| | RTSA mode (Option 350) does include Trace Recording and Playback by default in RTSA mode. |
| | Purchasing RTSA mode (Option 350) does not enable Trace Recording and Playback in SA mode (Option 233). |

| Trace record/playback features | SA mode <br> SA and Interference Analyzer Options 233 and 236 | RTSA mode <br> RTSA <br> Option 350 |
|---|---|---|
| Record and playback spectrum traces | Yes | Yes |
| Save trace data with GPS time stamp over time | Yes | Yes |
| Record and playback spectrogram data | Yes | No [1] |

| Question | Answer |
|---|---|
| 15. What are the requirements for Noise figure (NF) Option 356? | Requires spectrum analyzer mode (Option 233 on combination models), internal preamplifier (Option 235) and DC bias variable voltage source (Option 309) as well as CPU2 processor. An external noise source is also required and FieldFox supports Keysight noise source models 346A/B/C/K40/K01. Also recommended to improve accuracy is an external preamplifier Keysight models U7227A/C/F or U7228A/C/F. Requires accessory item N9910X-713 BNC to SMB cable for DC bias variable voltage source to noise source connection. |
| 16. What is required for phased array antenna support (Option 360)? | Requires spectrum analyzer mode (Option 233 on combination models). Also requires phased array antenna, can be ordered as Keysight 85571A-028 or directly from Anokiwave as AWMF-0129. Recommend GPS receiver (Option 307) and internal preamplifier (Option 235). Supported only on N995xA and N996xA models, since phased array antenna operates at 28 GHz. |
| 17. What is included with indoor | **FieldFox's mapping function is available in the following modes: Channel Scanner (312), Phased-Array Antenna (360),** |

| Question | Answer |
|---|---|
| and outdoor mapping (Option 352)? | OTA LTE FDD/TDD (370/371), and OTA 5GTF (377). Mapping is currently not available in SA or RTSA modes. Outdoor mapping requires the availability of GPS (Option 307). Maps can be saved to the FieldFox internal memory, SD card or USB drive. Using a direct wired LAN connection, FieldFox will automatically access OSM once location coordinates (latitude and longitude) and zoom levels have been entered the Map Explorer menu. If using the l FieldFox Map Support Tool, OSM map files can be downloaded to a .zip file and imported to FieldFox internal memory. If the FieldFox GPS receiver is enabled and OSM maps have been previously saved to FieldFox with those GPS coordinates, FieldFox can automatically load the corresponding map to match the current GPS coordinates. |
| 18. What is required for EMF measurements (Option 358)? | Requires triaxial antenna. Supported antenna is AGOS advanced technologies Triaxial Isotropic Antenna model SDIA-6000 30 MHz to 6 GHz. It can also be ordered as Keysight 85572A-006. EMF measurements are supported with spectrum analyzer mode (Option 233 on combination models). |
| 19. What is required for 5GTF over-the-air (OTA) measurements (Option 377)? | Recommend 32, 44 or 50 GHz FieldFox model (N995xA and N996xA) to support 5GTF FR2 frequency of 28 GHz. Requires spectrum analyzer mode (Option 233 on combination models). Also recommend GPS receiver (Option 307) and internal preamplifier (Option 235). FieldFox models 26.5 GHz and below will require external mixer to down convert millimeter wave frequency to intermediate frequency (IF). The mixer is orderable as OML Inc. model M28H2ADC-K, please see website www.omlinc.com for more information or contact a Keysight representative. OML mixer RF input interface is 2.92 mm (f). |
| 20. What is required for N6820ES Surveyor 4D software? | Surveyor 4D software connected to FieldFox spectrum analyzer mode offers a versatile, truly portable spectrum monitoring system that covers VLF to 50 GHz, including 5G millimeter wave bands. The software runs on an external PC or tablet. FieldFox required options include spectrum analyzer mode (Option 233 on combination models), preamplifier (Option 235) and built-in GPS receiver (Option 307). Core Surveyor 4D software for Windows (Option N6820ES-114) is required to run the Surveyor 4D software. Other Surveyor 4D software optional licenses that are supported include basic modulation recognition application (N6820ES-MR1) and universal signal detection (N6820ES-USD). Requires Surveyor 4D software version 4.3 or later (May 2019). |

1.   RTSA trace recordings can be recalled and played back in SA mode Spectrogram. This has the added benefit that the measurements are shown 'slower', making it easier for the human eye to decipher the signal content.

# ERTA System Typical Configuration

| Item | Description/options | Quantity |
|---|---|---|
| FieldFox | Combo analyzer: Required Options 210, 233. Recommended: 235, 307<br>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) | 2 of each |
| | N9910X-713, SMB(f) to BNC(m) | 2 of each |
| 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 two FieldFox units 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.
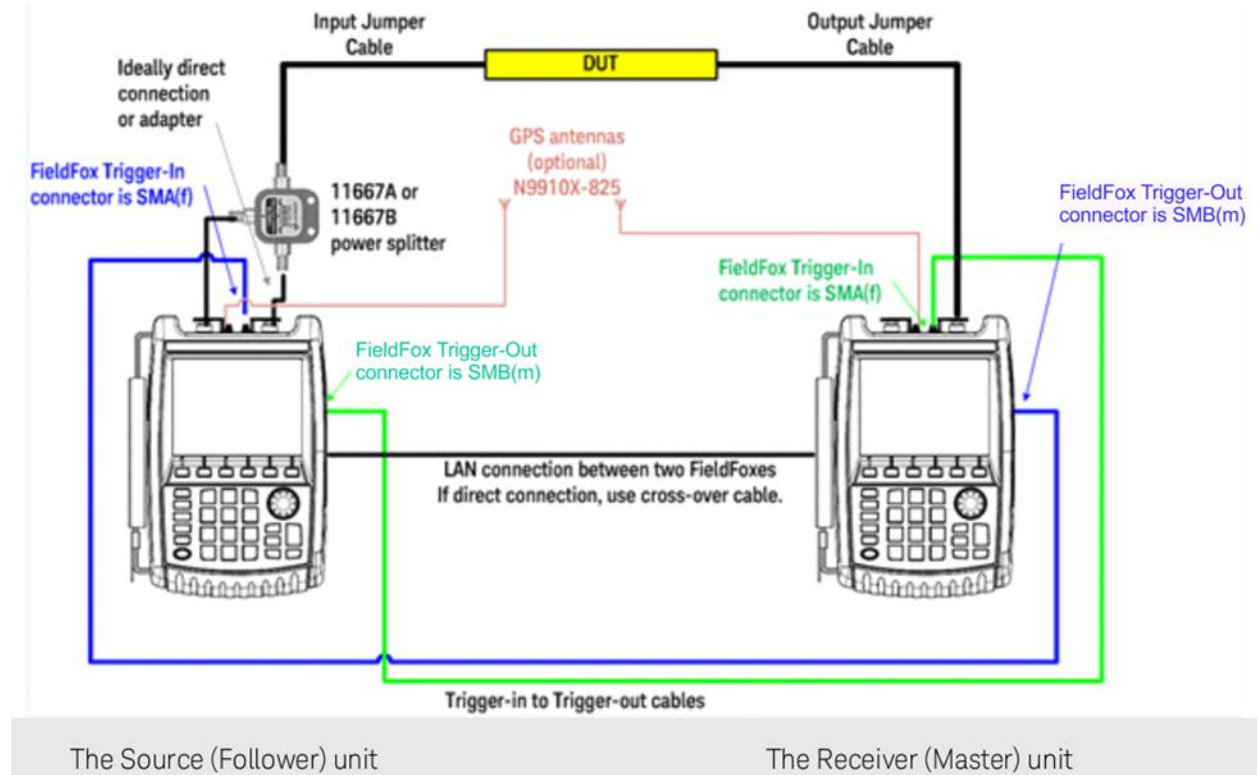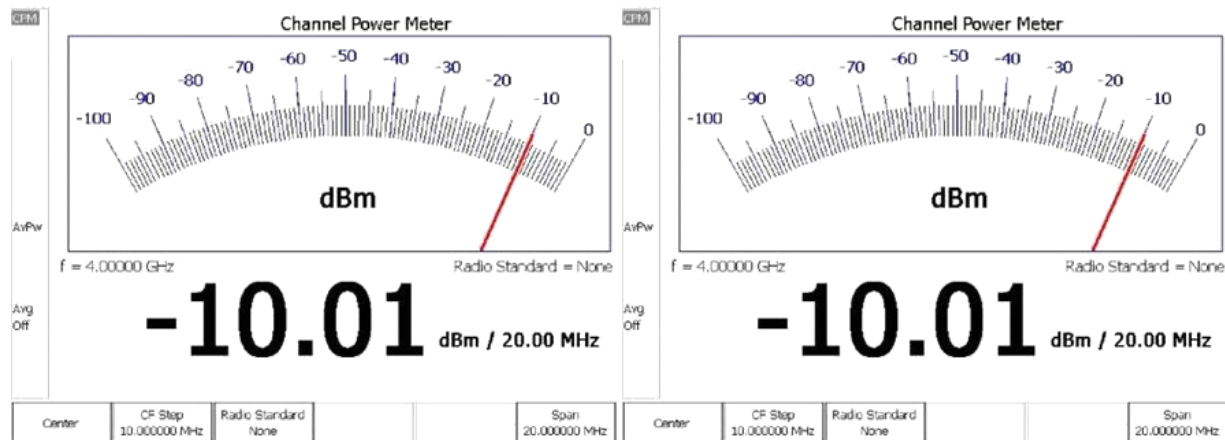


**Figure 1.** ERTA system diagram

# FAQs – Applicable to All FieldFox RF and Microwave Analyzers

| Question | Answer |
|---|---|
| 1. What USB power sensors work with Option 302? | All Keysight U2000x Series USB power sensors are supported with FieldFox.<br>Visit: www.keysight.com/find/fieldfoxsupport for an up-to-date listing. |

| | Option 302<br>USB power sensor | Option 310<br>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 an 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 |

The question column for the table above reads: "2. What is the difference between USB power sensor (Option 302) and built-in power meter (Option 310)?"

| 3. What do I need to get GPS information? | 1. The recommended GPS solution is to order:<br>• Option 307 - built-in GPS receiver<br>• A GPS antenna such as N9910X-825<br>• Other GPS antennas can also be used<br>• The GPS connector on the instrument is SMA (f)<br>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. |
|---|---|
| 4. What is the connector for Option 309, DC output? | The DC output has an 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? | 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). |
| 6. What is Option 030 remote control capability? | 1. Option 030 provides a license for FieldFox to allow remote control via an iOS or Android device.<br>2. Not supplied by user, but necessary for operation of Option 030 are:<br>• iOS device: iPad, iPhone, or iPod Touch with iOS 6.1 or higher, or Android device with Android OS 9.0 or higher, with free FieldFox app<br>• A WiFi or 3G/4G network connection between FieldFox and iOS device or Android 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. Option 330 or pulse measurement requires Option 302 and Keysight USB power sensor |
| 8. What measurement capabilities are included with Option 330? | Average power, peak power, and peak to average ratio |
| | Analog gauge display and digital display, dBm and watts |
| | Relative/absolute measurements, dB or %, minimum and maximum limits |
| | Trace graph for pulse profiling with gating |
| | Rise time, fall time, pulse width, pulse period, pulse repetition frequency |
| 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

## 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 (x=5, 6, 7, 8) 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.

Note: For N9923A information, refer to N9923A Technical Overview for more information.

## Analyzer options

### Step 2. Select optional measurement capabilities. Any of these options can easily be added as a software upgrade in the future.

| Option | Description | Prerequisite options/notes |
|---|---|---|
| Vector network analysis/CAT | | |
| 010 | VNA time domain | Recommend 211. See page 13, FAQ #3 |
| 112 | QuickCal | See page 13, 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 13, 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 10, FAQ #2 |
| 330 | Pulse meas. with USB peak power sensor | Need to order USB peak power sensor. See page 11, FAQs #7 and #8 |
| System features | | |
| 030 | Remote control capability | Requires an iOS device or an Android device |
| 307 | GPS receiver | Need to order GPS antenna, N9910X-825. See page 11, FAQ #3 |
| 309 | DC bias variable-voltage source | Recommend N9910X-713 cable, see page 11, FAQ #4 |

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? | 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? | 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? | 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? | Measurements: DTF (dB, Linear, VSWR), return loss and DTF, return Loss (dB), and 1-port cable loss, 2-port insertion loss |
| | TDR (linear, ohm). TDR measurements require Option 215, in addition to Option 305. |
| | Calibrations: CalReady, OSL, and response cal |
| 5. What is included with N992xA Option 308? | 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? | 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 |
| 7. What is included with N992xA Option 112? | QuickCal is included with Option 112. 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. |

# FieldFox Microwave Spectrum Analyzers

## 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) |

1. Useable 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. Option 100 is not available as an upgrade.

# Analyzer options

## Step 2. Select optional measurement capabilities. Any of these options can easily be added as a software upgrade in the future.

| Option | Description | Prerequisite options/notes |
|---|---|---|
| **Spectrum analyzer** | | |
| 100 [1] | 3.5 mm (m) connectors | Only available on N9938A. Not available as an upgrade. |
| 209 | Extended range transmission analysis (ERTA) | Requires 220. Recommend 307. Requires two (2) FieldFox units. See page 6, FAQ # 10. See page 10 for typical configuration. |
| 220 | Full-band tracking generator | CW, CW coupled, and tracking |
| 235 | Pre-amplifier | — |
| 236 | Interference analyzer and spectrogram | — |
| 238 | Spectrum analyzer time gating | — |
| 312 | Channel scanner | — |
| 320 | Reflection measurements | 320 requires 220 on all models. On N9938A specifically, 320 also requires 100. |
| 350 | Real-time spectrum analyzer (RTSA) [2] | Recommend 235. See page 7, FAQ # 12 |
| 351 | I/Q Analyzer (IQA) [2] | — |
| 352 | Indoor and outdoor mapping | Requires 307, and at least one of 312, 360, 370, 371, or 377. See page 8, FAQ #17 |
| 353 | IQ streaming [2] | Requires 351 |
| 355 | Analog demodulation | — |
| 356 | Noise figure (NF) [2] | Requires 235, 309, and accessory item N9910X-713 BNC to SMB cable. See page 7, FAQ #15 for external preamplifier and noise source requirements. |
| 357 | Pulse generator | — |
| 358 | EMF measurements | Requires triaxial antenna. See page 8, FAQ #18 |
| 360 | Phased array antenna support | Requires phased array antenna. See page 8, FAQ #16 |
| 361 | EMI measurements [2] | — |
| 370 | Over-the-Air (OTA) LTE FDD [2] | Requires 307, Recommend 235. |
| 371 | Over-the-Air (OTA) LTE TDD [2] | Requires 307, Recommend 235. |
| 377 | Over-the-Air (OTA) 5GTF [2] | Requires 307, Recommend 235. See page 8, FAQ #19 |
| **Power measurements** | | |
| 208 | USB power sensor meas. vs. frequency | Requires 302 |
| 302 | USB power sensor support | Need to order USB power sensor 3. See page 10, FAQ #1 |
| 310 | Built-in power meter | No power sensor required. See page 10, FAQ #2 |
| 330 | Pulse meas. with USB peak power sensor | Need to order USB peak power sensor. See page 11, FAQs #7 and #8 |
| **System features** | | |
| 030 | Remote control capability | Requires an iOS device or an Android device |
| 307 | GPS receiver | Need to order GPS antenna, N9910X-825. See page 11, FAQ #3 |
| 309 | DC bias variable-voltage source | Recommend N9910X-713 cable, see page 11, FAQ #4 |
| — | Frequency extender support | Optional 350, 351, 360, 370, 371, 377, PathWave VSA software. See Accessories, page 22 |
| **Windows based software** | | |
| 89601B | PathWave VSA (89600 VSA) software | Requires CPU2 processor. See page 7, FAQ #13 |
| N6820ES | Surveyor 4D software 2 | Requires 235 and 307, see page 8, FAQ #20 |

1. 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. Option 100 is not available as an upgrade.
2. Requires CPU2 fast processor. See page 7, FAQ #13.
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? | Basic spectrum analysis, four traces, different detector types, radio standard selection, limit lines |
| | Channel power, occupied bandwidth, adjacent channel power, spectrum emission mask |
| | AM/FM tune and listen, field strength measurements, antenna factors, frequency counter marker |
| 2. What is included with Option 236? | Interference analyzer and spectrogram |
| | Trace playback and recording |
| 3. What is included with Option 320? | 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 offer RL and VSWR, DTF, insertion loss, and also various calibration capabilities such as QuickCal and OSL. |
| 5. What is included with Option 355? | FieldFox analog demodulation has two parts: (1) Tune and listen, and (2) AM/FM metrics. Tune and listen are available as a standard feature on all N993xA and N996xA FieldFox spectrum analyzers. AM/FM metrics becomes available when Option 355 is purchased. AM/FM metrics provides the user with RF spectrum view, demodulated baseband signal waveform, carrier power, frequency deviation, SINAD and more. |
| Additional FAQs | FAQs on pages 6 through 11 apply to all microwave FieldFox models. |

# Upgrades

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

## FieldFox microwave (combination) analyzer upgrades

### N9912AU

| Option | Description | Upgrade contents | Additional requirements |
|---|---|---|---|
| 010 | Network analysis time domain | License key | 303 |
| 030 | Remote control capability | License key | Requires an iOS device or an Android device |
| 110 | Transmission measurement | License key | None |
| 111 | Enable QuickCal | License key | None |
| 230 | 4 GHz Spectrum analyzer | License key | 104, for 4 GHz unit only |
| 231 | 6 GHz Spectrum analyzer | License key | 106, for 6 GHz unit only |
| 235 | Preamplifier | License key | 230 or 231 |
| 236 | Interference analyzer | License key | 230 or 231 |
| 302 | USB power sensor support | License key | None |
| 303 | Network analysis capability | License key | None. For second port, add 110 |
| 308 | Vector voltmeter | License key | None |
| 311 | Channel power meter | License key | None |
| 312 | Channel scanner | License key | None |
| 330 | Pulse measurements | License key | Requires USB peak power sensor |

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

| Option | Description | Upgrade contents | Additional requirements |
|---|---|---|---|
| 010 | VNA time domain analysis | License key | 210, recommend 211 |
| 030 | Remote control capability | License key | Requires an iOS device or an Android device |
| 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) [1] | License key | 233 and 210 [1], recommend 307 |
| 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 | 210 and 211 for full VVM functionality |
| 309 | DC bias variable-voltage source | License key | Recommend N9910X-713 cable |
| 310 | Built-in power meter | License key | None |
| 312 | Channel scanner | License key | 233 |
| 330 | Pulse measurements | License key | Need to order USB peak power sensor |
| 350 | Real-time spectrum analyzer (RTSA) | License key [2] | 233, recommend 235 |
| 351 | I/Q Analyzer (IQA) | License key [2] | 233 |
| 352 | Indoor and outdoor mapping | License key [2] | 233, 307, and at least one of 312, 360, 370, 371, or 377 |
| 353 | IQ streaming | License key [2] | 233, 351 |
| 355 | Analog demodulation | License key | 233 |
| 356 | Noise figure (NF) | License key [2,3] | 233, 235, 309 and accessory cable N9910X-713 |
| 357 | Pulse generator | License key [2] | 233 |
| 358 | EMF measurements | License key [2] | 233. Also requires triaxial antenna. See page 9, FAQ #18 |
| 360 | Phased array antenna support | License key [2] | 233. Also requires phased array antenna. See page 9, FAQ#16 |
| 361 | EMI measurements | License key [2] | 233 |
| 370 | Over-the-Air (OTA) LTE FDD | License key [2] | 233 and 307, recommend 235 |
| 371 | Over-the-Air (OTA) LTE TDD | License key [2] | 233 and 307, recommend 235 |
| 377 | Over-the-Air (OTA) 5GTF | License key [2] | 233 and 307, recommend 235 |

1. 209 is a system based on two FieldFox units. See page 6, FAQ #10, for a detailed description of the system requirements.
2. Requires CPU2 fast processor. See page 7, FAQ #13.
3. See page 7, FAQ #15 for external preamplifier and noise source requirements.

# FieldFox signal analyzer upgrades

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

| Option | Description | Upgrade contents | Additional requirements |
|---|---|---|---|
| 030 | Remote control capability | License key | Requires an iOS device or an Android device |
| 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], recommend 307 |
| 220 | Full-band tracking generator | License key | None |
| 235 | Preamplifier | 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 | Recommend N9910X-713 cable |
| 310 | Built-in power meter | License key | None |
| 312 | Channel scanner | License key | None |
| 320 | Reflection measurements | License key [2] | Option 220 for all models |
|  |  |  | Option 100 and 220 for N9938A |
| 330 | Pulse measurements | License key | Need to order USB peak power sensor |
| 350 | Real-time spectrum analyzer (RTSA) | License key [3] | Recommend 235 |
| 351 | I/Q Analyzer (IQA) | License key [3] | None |
| 352 | Indoor and outdoor mapping | License key [3] | 307, and at least one of 312, 360, 370, 371, or 377 |
| 353 | IQ streaming | License key [3] | 351 |
| 355 | Analog demodulation | License key | None |
| 356 | Noise figure (NF) | License key [3, 4] | 235, 309 and accessory cable N9910X-713 |
| 357 | Pulse generator | License key [3] | None |
| 358 | EMF measurements | License key [3] | Requires triaxial antenna. See page 9, FAQ #18 |
| 360 | Phased array antenna support | License key [3] | Requires phased array antenna. See page 9, FAQ#16. |
| 361 | EMI measurements | License key [3] | None |
| 370 | Over-the-Air (OTA) LTE FDD | License key [3] | 307, recommend 235 |
| 371 | Over-the-Air (OTA) LTE TDD | License key [3] | 307, recommend 235 |
| 377 | Over-the-Air (OTA) 5GTF | License key [3] | 307, recommend 235 |
|  |  |  |  |

1. 209 is a system based on two FieldFox units. 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.
3. Requires CPU2 fast processor. See page 7, FAQ #13.
4. See page 7, FAQ #15 for external preamplifier and noise source 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 | 211 required to obtain full VVM functionality |
| 309 | DC bias variable-voltage source | License key | None |
| 310 | Built-in power meter | License key | None |
| 330 | Pulse measurements | License key | Need to order USB peak power sensor |

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

# FieldFox RF and microwave analyzers hardware upgrades

| Model number/option [1,2] | Description | Upgrade contents | Additional requirements |
|---|---|---|---|
| N9910HU-100 | N9913/14/15/16/17A processor upgrade | Improved performance for N9915/16/17A models | Return to service center only |
| N9910HU-200 | N9925/26/27A processor upgrade | Improved performance for N9925/26/27A models | Return to service center only |
| N9910HU-300 | N9935/36/37A processor upgrade | Improved performance for N9935/36/37A models | Return to service center only |
| N9910HU-400 | N9918/28/38A processor upgrade | Improved performance for N9918/28/38A models | Return to service center only |
| N9910HU-500 | N9912A/N9923A processor upgrade | Improved performance for N9912A/23A models | Return to service center only |

1. Upgrades are not available for FieldFox analyzers with serial number prefix starting MY5607/SG5607/US5607, as these analyzers already have the improved hardware.
2. Please contact your local Keysight Service Center for instructions on how and where to send the instrument and how to order the factory upgrades.

# Documentation

By default, a printed copy of the User's Guide is not included in FieldFox orders. If you wish to receive the printed User's Guide, please order N99xxA Option ABA.

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

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.

# Calibration Kits

FieldFox analyzers support most standard HP/Agilent/Keysight mechanical calibration kits and all Keysight USB ECal modules. Component list shows calibration components, some calibration kits also include adaptors. Custom calibration kits can be created and uploaded to FieldFox using Data Link software.

| Model | Description | Connector | Frequency range | Components |
|---|---|---|---|---|
| **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 [1] | 3-in-1 OSL cal kit | Type-N (m) | DC to 6 GHz | Open, short, load (all male) |
| N9910X-801 [1] | 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 |
| N4690D | ECal, 2-ports | Type-N | 300 kHz to 18 GHz or DC to 18 GHz | Connectors configurable |
| N7550A | ECal economy, 2-ports | Type-N | DC to 4 GHz | Connectors configurable |
| N7551A | ECal economy, 2-ports | Type-N | DC to 6.5 GHz | Connectors configurable |
| N7552A | ECal economy, 2-ports | Type-N | DC to 9 GHz | Connectors configurable |
| N7553A | ECal economy, 2-ports | Type-N | DC to 14 GHz | Connectors configurable |
| N7554A | ECal economy, 2-ports | Type-N | DC to 18 GHz | Connectors configurable |
| **Type-N, 75 Ω** [2] | | | | |
| 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 |

| Model | Description | Connector | Frequency range | Components |
|---|---|---|---|---|
| 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 | 3.5 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 |
| N4691D | ECal, 2-ports | 3.5 mm | 300 kHz to 26.5 GHz or DC to 26.5 GHz | Connectors configurable |
| N7550A | ECal economy, 2-ports | 3.5 mm | DC to 4 GHz | Connectors configurable |
| N7551A | ECal economy, 2-ports | 3.5 mm | DC to 6.5 GHz | Connectors configurable |
| N7552A | ECal economy, 2-ports | 3.5 mm | DC to 9 GHz | Connectors configurable |
| N7553A | ECal economy, 2-ports | 3.5 mm | DC to 14 GHz | Connectors configurable |
| N7554A | ECal economy, 2-ports | 3.5 mm | DC to 18 GHz | Connectors configurable |
| N7555A | ECal economy, 2-ports | 3.5 mm | DC to 26.5 GHz | Connectors configurable |
| **2.92 mm (same as K connector)** | | | | |
| 85561A | 4-in-1 OSLT cal kit | 2.92 mm (f) | DC to 40 GHz | Open, short, fixed load, thru (all female) |
| 85562A | 4-in-1 OSLT cal kit | 2.92 mm (m) | DC to 40 GHz | Open, short, fixed load, thru (all male) |
| 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 |
| **2.4 mm** | | | | |
| 85563A | 3-in-1 OSL cal kit | 2.4 mm (f) | DC to 50 GHz | Open, short, fixed load (all female) |
| 85564A | 3-in-1 OSL cal kit | 2.4 mm (m) | DC to 50 GHz | Open, short, fixed load (all male) |
| 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 |

1. This calibration kit is not eligible for annual re-calibration. There are also no data report calibrations (UK6, 1A7 and A6J).
   If annual calibration is required, please order 85514A or 85515A.
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.

# 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-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-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-716 | Type-N (m) | Type-N (m) | 18 GHz | 2 ft | 0.61 m |
| N9910X-718 | 2.4 mm (f) | K / 2.92 mm (m) | 40 GHz | 3 ft | 0.914 m |
| N9910X-810 | Type-N (m) | Type-N (m) | 8 GHz | 5 ft | 1.5 m |
| N9910X-811 | Type-N (m) | Type-N (f) | 8 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 |

Preamplifiers

| U7227A | USB preamplifier, 10 MHz to 4 GHz | www.keysight.com/find/U7227A |
|---|---|---|
| U7227C | USB preamplifier, 100 MHz to 26.5 GHz | www.keysight.com/find/U7227C |
| U7227F | USB preamplifier, 2 to 50 GHz | www.keysight.com/find/U7227F |
| U7228A | USB preamplifier, 10 MHz to 4 GHz | www.keysight.com/find/U7228A |
| U7228C | USB preamplifier, 100 MHz to 26.5 GHz | www.keysight.com/find/U7228C |
| U7228F | USB preamplifier, 2 to 50 GHz | www.keysight.com/find/U7228F |

Noise sources

| 346A/B/C/K01/K40 | Noise source family<br>www.keysight.com/find/346noisesources |
|---|---|

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) |
| N9910XA-823 [1] | Antenna, cellular narrowband, 824 to 869 MHz, Type-N (f) |
| N9910XA-824 [1] | Antenna, cellular narrowband, PCS 1850 to 1990 MHz, Type-N (f) |
| N9910X-825 | Antenna, GPS, active, SMA (m) |
| 85571A-028 [1] | 5G Phased Array Antenna 28 GHz |

1. Currently not RoHS compliant.

OML frequency extender module adapter kits

OML frequency extenders may be purchased directly through OML, Inc. Contact OML, Inc. directly (www.omlinc.com) for pricing, ordering and datasheet information or contact a Keysight representative for assistance.

When ordering the OML frequency extender adapter kits separately, you may order the adapter kits as the Keysight part numbers shown below as needed.

| Part number | Description |
|---|---|
| 1250-1636 | Coaxial straight Male-N to Male-SMA, order Qty 2, connects mixer directly to FieldFox with Type-N ports |
| 1250-3968 | Coaxial straight Female-SMA to Female-N, order Qty 2, spacer for FieldFox units with 3.5 mm ports and used with (part number 1250-1636 adapter kit shown above) when GPS antenna is mounted vertically. |
| 1250-3851 | Coaxial straight Male-SMA to Female-SMA, order Qty 2, connects mixer directly to FieldFox with 3.5 mm ports |
| N0000-33203 | Female-SMA to Male-SMA, Right Angle, Qty 1, for connecting GPS antenna at right angle and used for GPS antenna attachment with (part number 1250-1636 or 1250-3851 adapter kits shown above). |
| 0950-6352 | Antenna and mounting fixture, 0.75-inch square flange plastic, Qty 1 included, to be used with 0955-3591 below. |
| 0955-3591 | Waveguide horn antenna, pyramidal Ka-band 26.5 to 40 GHz WR-28, Qty 1 included, also order 0950-6352 above for mounting fixture. |
| 85032-60020 | Type-N Male-Female adapter. Acts as a spacer to offset the mixer from the FieldFox to allow access to the Trig/Ref input connector. |

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-601 | Coaxial adapter, NMD 2.4 mm (f) to Type-N (f), 50-ohm, 18 GHz |
| N9910X-602 | Coaxial adapter, NMD 2.4 mm (f) to 2.92 mm/K (f), 40 GHz |
| N9910X-603 | Coaxial adapter, NMD 2.4 mm (f) to 3.5 mm (f), 26.5 GHz |
| N9910X-604 | 3.5 mm NMD (f) to 3.5 mm (f) adapter, 26.5 GHz |
| N9910X-605 | 3.5 mm NMD (f) to Type-N (f) adapter, 18 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, 10 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 |
| N9910X-856 | Coaxial adapter, 2.4 mm (f) to 2.4 mm (f), 50 GHz |
| N9910X-857 | Coaxial adapter, 2.4 mm (f) to 2.92 mm/K (f), 40 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 [1] | External bias-tee, 2.5 MHz to 6 GHz, 1 W, 0.5 A |
| N9910X-886 | Torque wrench, 17 mm, 90 N-cm (8 in-lb) |
| 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 |

1. Also recommend ordering N9910X-713 Bias-Tee Power Cable, SMB(f) to BNC(m), 3.28 ft., to connect to the FieldFox DC bias variable voltage source port.

Other FieldFox accessories

| | |
|---|---|
| N9910X-876 | Extra high-capacity 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 (8 in-lb), recommended for N995xA and N996xA analyzers |

Keysight power sensors supported with FieldFox (options 208, 302, or 330)

| Model number | USB or LAN | Sensor type | Frequency and power range |
|---|---|---|---|
| U2000A | USB | Average | 10 MHz to 18 GHz, -60 dBm to +20 dBm |
| U2000B | USB | Average | 10 MHz to 18 GHz, -30 dBm to +44 dBm |
| U2000H | USB | Average | 10 MHz to 18 GHz, -50 dBm to +30 dBm |
| U2001A | USB | Average | 10 MHz to 6 GHz, -60 dBm to +25 dBm |
| U2001B | USB | Average | 10 MHz to 6 GHz, -30 dBm to +44 dBm |
| U2001H | USB | Average | 10 MHz to 6 GHz, -50 dBm to +30 dBm |
| U2002A | USB | Average | 50 MHz to 24 GHz, -60 dBm to +20 dBm |
| U2002H | USB | Average | 50 MHz to 24 GHz, -50 dBm to +30 dBm |
| U2004A | USB | Average | 9 kHz to 6 GHz, -60 dBm to +20 dBm |
| U2021XA | USB | Average and peak | 50 MHz to 18 GHz, -30 dBm to +20 dBm |
| U2022XA | USB | Average and peak | 50 MHz to 40 GHz, -30 dBm to +20 dBm |
| U2041XA | USB | Average | 10 MHz to 6 GHz, -70 dBm to +26 dBm |
| U2042XA | USB | Average and peak | 10 MHz to 6 GHz, -70 dBm to +26 dBm |
| U2043XA | USB | Average | 10 MHz to 18 GHz, -70 dBm to +26 dBm |
| U2044XA | USB | Average and peak | 10 MHz to 18 GHz, -70 dBm to +26 dBm |
| U2051XA | USB | Average | 10 MHz to 6 GHz, -70 dBm to +26 dBm |
| U2052XA | USB | Average | 10 MHz to 18 GHz, -70 dBm to +26 dBm |
| U2053XA | USB | Average | 10 MHz to 33 GHz, -70 dBm to +26 dBm |
| U2054XA | USB | Average | 10 MHz to 40 GHz, -70 dBm to +20 dBm |
| U2055XA | USB | Average | 10 MHz to 50/53 GHz, -70 dBm to +20 dBm |
| U2056XA | USB | Average | 10 MHz to 54 GHz, -70 dBm to +20 dBm (≤ 50 GHz), to +15 dBm (≤ 54 GHz) |
| U2057XA | USB | Average | 10 MHz to 67 GHz, -70 dBm to +20 dBm (≤ 50 GHz), to +15 dBm (≤ 54 GHz), to +10 dBm (≤ 67 GHz) |
| U2061XA | USB | Average and peak | 10 MHz to 6 GHz, -70 dBm to +26 dBm |
| U2062XA | USB | Average and peak | 10 MHz to 18 GHz, -70 dBm to +26 dBm |
| U2063XA | USB | Average and peak | 10 MHz to 33 GHz, -70 dBm to +26 dBm |
| U2064XA | USB | Average and peak | 10 MHz to 40 GHz, -70 dBm to +20 dBm |
| U2065XA | USB | Average and peak | 10 MHz to 50/53 GHz, -70 dBm to +20 dBm |
| U2066XA | USB | Average and peak | 10 MHz to 54 GHz, -70 dBm to +20 dBm (≤ 50 GHz), to +15 dBm (≤ 54 GHz) |
| U2067XA | USB | Average and peak | 10 MHz to 67 GHz, -70 dBm to +20 dBm (≤ 50 GHz), to +15 dBm (≤ 54 GHz), to +10 dBm (≤ 67 GHz) |
| U8481A | USB | Average | 10 MHz to 18 GHz, -35 dBm to +20 dBm |
| U8485A | USB | Average | 10 MHz to 33 GHz, -35 dBm to +20 dBm |
| U8487A | USB | Average | 10 MHz to 50 GHz, -35 dBm to +20 dBm |
| U8488A | USB | Average | 10 MHz to 67 GHz, -35 dBm to +20 dBm |
| U8489A | USB | Average | DC to 120 GHz, -35 dBm to +20 dBm |
| L2051XA | LAN | Average | 10 MHz to 6 GHz, -70 dBm to +26 dBm |
| L2052XA | LAN | Average | 10 MHz to 18 GHz, -70 dBm to +26 dBm |
| L2053XA | LAN | Average | 10 MHz to 33 GHz, -70 dBm to +26 dBm |
| L2054XA | LAN | Average | 10 MHz to 40 GHz, -70 dBm to +20 dBm |
| L2055XA | LAN | Average | 10 MHz to 50/53 GHz, -70 dBm to +20 dBm |
| L2056XA | LAN | Average | 10 MHz to 54 GHz, -70 dBm to +20 dBm (≤ 50 GHz), to +15 dBm (≤ 54 GHz) |
| L2057XA | LAN | Average | 10 MHz to 67 GHz, -70 dBm to +20 dBm (≤ 50 GHz), to +15 dBm (≤ 54 GHz), to +10 dBm (≤ 67 GHz) |
| L2061XA | LAN | Average and peak | 10 MHz to 6 GHz, -70 dBm to +26 dBm |
| L2062XA | LAN | Average and peak | 10 MHz to 18 GHz, -70 dBm to +26 dBm |
| L2063XA | LAN | Average and peak | 10 MHz to 33 GHz, -70 dBm to +26 dBm |
| L2064XA | LAN | Average and peak | 10 MHz to 40 GHz, -70 dBm to +20 dBm |
| L2065XA | LAN | Average and peak | 10 MHz to 50/53 GHz, -70 dBm to +20 dBm |
| L2066XA | LAN | Average and peak | 10 MHz to 54 GHz, -70 dBm to +20 dBm (≤ 50 GHz), to +15 dBm (≤ 54 GHz) |
| L2067XA | LAN | Average and peak | 10 MHz to 67 GHz, -70 dBm to +20 dBm (≤ 50 GHz), to +15 dBm (≤ 54 GHz), to +10 dBm (≤ 67 GHz) |
| L2065XT | LAN | Average and peak | 10 MHz to 53 GHz, -70 dBm to +20 dBm |
| L2066XT | LAN | Average and peak | 10 MHz to 54 GHz, -70 dBm to +20 dBm (≤ 50 GHz), to +15 dBm (≤ 54 GHz) |
| L2067XT | LAN | Average and peak | 10 MHz to 67 GHz, -70 dBm to +20 dBm (≤ 50 GHz), to +15 dBm (≤ 54 GHz), to +10 dBm (≤ 67 GHz) |
| U2049XA | LAN | Average and peak | 10 MHz to 33 GHz, -70 dBm to +20 dBm |

| Description | Accessory | Description | Accessory |
| --- | --- | --- | --- |
| N9910X-701<br>Type-N (m) to Type-N (m) cable, 3.28 ft |  | N9910X-881<br>Hard transit case |  |
| N9910X-708<br>3.5 mm (m) to 3.5 mm (f) cable, 3.28 ft |  | N9910X-812<br>Type-N (m) to Type-N (m) cable, 12 ft |  |
| N9910X-820<br>Antenna, directional |  | N9910X-816<br>Type-N (m) to Type-N (f) cable, 3.28 ft |  |
| N9910XA-823<br>Antenna, cellular narrowband |  | N9910X-821<br>Antenna, telescopic whip™ |  |
| N9910X-822<br>Antenna, directional |  | N9910X-848<br>Coaxial adapter, Type-N (f) to 3.5 mm (f) |  |
| N9910X-825<br>Antenna, GPS, active |  | N9910X-875<br>DC car charger and adapter |  |
| N9910X-876<br>Extra high-capacity battery |  | N9910X-873<br>AD/DC adapter |  |
| N9910X-872<br>External battery charger |  | N9910X-874<br>External bias-tee |  |
| N9910X-895<br>Magnetic mount base for antenna |  | 85054D<br>Economy cal kit, Type-N, 18 GHz |  |

| Description | Accessory | Description | Accessory |
| --- | --- | --- | --- |
| N9910X-800<br>3-in-1 OSL cal kit, Type-N (m), 6 GHz | | N9910X-801<br>3-in-1 OSL cal kit, Type-N (f), 6 GHz | |
| N9910X-811<br>Type-N (m) to Type-N (f) cable, 5 ft | | 85520A<br>4-in-1 OSLT cal kit, 3.5 mm (m), 26.5 GHz | |
| 85514A<br>4-in-1 OSLT cal kit, Type-N (m), 9 GHz | | 85521A<br>4-in-1 OSLT cal kit, 3.5 mm (f), 26.5 GHz | |
| 85515A<br>4-in-1 OSLT cal kit, Type-N (f), 9 GHz | | 85518A<br>4-in-1 OSLT cal kit, Type-N (m), 18 GHz | |
| 85519A<br>4-in-1 OSLT cal kit, Type-N (f), 18 GHz | | N9911X-211/212/213/214<br>WR-90 economical cal kit | |
| N4691B [1]<br>2-port ECal, 3.5 mm, 26.5 GHz | | N4692A [1]<br>2.92 mm, 2-port ECal, 40 GHz | |
| N4693A [1]<br>2.4 mm 2-port ECal, 50 GHz | | N4690B [1]<br>2-port ECal, Type-N, 18 GHz | |

1. Discontinued

| Description | Accessory | Description | Accessory |
|---|---|---|---|
| N4691D<br>3.5 mm, 2-port ECal, 26.5 GHz | | N4692D<br>2.92 mm, 2-port ECal, 40 GHz | |
| N4693D<br>2.4 mm, 2-port ECal, 50 GHz | | X11644A<br>WR-90 standard cal kit | |
| 85033D/E<br>3.5 mm cal kit, 9 GHz | | 85052D<br>3.5 mm cal kit, 26.5 GHz | |
| 85056D<br>2.4 mm cal kit, 50 GHz | | | |

1.    Discontinued

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