

Keysight Technologies

N4010A Wireless Connectivity Test Set and N4011A MIMO/Multi-port Adapter

Configuration Guide



Introduction

The Keysight Technologies, Inc. N4010A wireless connectivity test set is a measurement solution that helps you achieve low cost and efficient testing of products and components that incorporate *Bluetooth*, Wireless LAN (WLAN), ZigBee, and other emerging wireless connectivity technologies.

The Keysight N4011A MIMO/Multi-port adapter is a 1/4-rack width unit used in conjunction with an N4010A test set. The N4011A provides additional features that support production testing of multi-port MIMO-capable devices under test (DUTs). The MIMO adapter provides a switch matrix to connect the multi-ports of the DUT to the RF IN/OUT port of an N4010A.

This configuration guide is intended to assist with the ordering process for options, hardware, and software accessories for the N4010A wireless connectivity test set. Contact your local Keysight representative for additional information.

The standard N4010A product includes:

- Getting Started guide in hardcopy
- CD-ROM containing the documentation set and all necessary software components
- Country-specific power cord
- USB adapter cable (part number 8121-1354)
- Keysight Automation-Ready CD-ROM (part number E2094-60003)
- Carry handle kit
- Rackmount flange kit
- I/O connectivity (Option 110) to enable use of N4010A with signal creation or analysis software tools, such as 89601B and 89607A vector signal analyzer software, Signal Studio and N4017A *Bluetooth* graphical measurement application

At least one wireless standard option (Option 101, 102, or 103) must be ordered with the standard N4010A product.

The standard N4011A product includes:

- Installation Guide in hard copy
- Lock link kit
- Semi-rigid cable (connects the N4011A to the N4010A RF IN/OUT)
- 25-way D-sub cable (auxiliary in/out connection)

1. Choose the wireless technology standard(s) and additional hardware for your application

| Ordering number | Description | Purpose | Requires |
|-------------------------|--|---|---------------------------|
| N4010A-101 | <i>Bluetooth</i> | Built-in <i>Bluetooth</i> transmitter and receiver tests as defined in <i>Bluetooth</i> RF Test Specification 1.2 | |
| N4010A-107 | <i>Bluetooth</i> EDR link plus measurements | Provides enhanced data rate (EDR) normal and loopback test mode support. Six of the eight EDR transmit and receive test cases built-in | N4010A-101 |
| N4010A-113 ¹ | <i>Bluetooth</i> audio generation and analysis | Provides built-in audio source and analyzer to perform functional audio test over <i>Bluetooth</i> SCO link. A-law, μ -law, and CVSD 2 codecs A-law supported | N4010A-101 |
| N4010A-112 | <i>Bluetooth</i> headset profile | Provides headset profile for audio testing. May be required for audio testing depending on the requirements of the device being tested | N4010A-113 |
| N4010A-105 | <i>Bluetooth</i> EDR Tx/Rx | Provides EDR transmit and receive tests via remote interface using software driver provided. Does not support normal mode or test mode (loopback testing) | N4010A-101 |
| N4010A-106 | <i>Bluetooth</i> EDR Tx only | Provides EDR transmit-only tests via remote interface using software driver provided | N4010A-101 |
| N4010A-109 | <i>Bluetooth</i> low energy Tx/Rx | Provides <i>Bluetooth</i> low energy Tx/Rx measurement as defined in <i>Bluetooth</i> RF-PHY Test Specification 4.0 | N4010A-101 |
| N4010A-102 | 2.4 GHz WLAN Tx/Rx analysis | Instrument contains fully- calibrated vector signal generator and wideband analyzer. 802.11b and 802.11g RF test coverage via remote interface using software driver provided | N4010A-110 ³ |
| N4010A-103 | 2.4 GHz and 5 GHz WLAN Tx/Rx analysis | Instrument contains fully-calibrated vector signal generator and wideband analyzer. 802.11a, b, and g RF test coverage via remote interface using software driver provided | N4010A-110 ³ |
| N4010A-108 | 802.11n MIMO modulation analysis | Provides 802.11n and MIMO measurements | N4010A-103 |
| N4011A | MIMO/Multi-port adapter | Supports the testing of multi-port MIMO-capable DUTs. The N4011A and N4010A-108 combination provides full 802.11n test coverage | N4010A-102, or N4010A-103 |

2. Choose signal creation options

| Ordering number | Description | Purpose | Requires |
|-----------------|--|--|--|
| N4010A-104 | Enables fully flexible arbitrary waveform generation | Allows user to download and encrypt waveform files to N4010A using such tools as MATLAB and N4010A Signal Studio ⁴ | N4010A-102 or N4010A-103 |
| N4010A-204 | N4010A Signal Studio license | The N4010A Signal Studio software is a PC-based application used to design 802.11a, b, and g signals. These signals can be downloaded to N4010A (if Option 104 is present) | N4010A-104 and N4010A Signal Studio software (free download ⁴) |

1. Supersedes Option 111 *Bluetooth* audio.
2. CVSD: Continuous variable slope delta modulation.
3. Once downloaded to the N4010A-104, the waveforms can subsequently be uploaded and are encrypted in a format suitable for downloading to any N4010A with Option 102 or 103 installed.
4. N4010A Signal Studio software may be downloaded via: www.keysight.com/find/N4010A "Library", "Software & Firmware Downloads".

3. Choose control and analysis software accessories

| Ordering number | Description | Purpose | Requires |
|--------------------------|--|--|---|
| N4017A | <i>Bluetooth</i> graphical measurement application | Provides the ability to fully configure the test set and display both numerical and graphical results for <i>Bluetooth</i> tests | N4010A-110 N4010A-101 N4010A-113 required for audio capability |
| N4017A-205 | <i>Bluetooth</i> EDR measurement | Adds <i>Bluetooth</i> EDR measurements to N4017A | N4017A N4010A-105, 106, or 107 |
| 89601A-200 89601A-300 | Vector signal analysis software with hardware connectivity | Fully-flexible vector signal analysis software | N4010A-110 |
| 89601A-AYA | Vector modulation analysis | | N4010A-110 89601B-200 89601B-300 |
| 89601A-B7R | Wireless LAN modulation analysis software | Specifically designed with preset states to demodulate WLAN signals to perform complex transmitter analysis | N4010A-110 89601B-200 89601B-300 |
| 89607A-100 | Wireless LAN test suite | Provides one-button WLAN transmitter tests; included in 89601B-B7R, wireless LAN option | N4010A-110 |

4. Choose calibration certification option

| Ordering number | Description |
|-----------------|--|
| N4010A-1A7 | ISO17025 compliant calibration performed prior to shipment |

5. Choose a repair plan

| Ordering number | Description |
|-----------------|--|
| R-51B-501 | Return-to-Keysight repair agreement |
| R-51D-501 | Return-to-Keysight repair – per incident |

6. Choose a calibration plan

For a calibration plan, specify a period of coverage for one of the appropriate plans below when ordering. For more information, please visit www.keysight.com/find/services_upfront_options

| Ordering number | Description |
|---|--|
| Select Keysight calibration plan | |
| R-50C-011-3 | 3-year calibration assurance plan (return-to-Keysight) |
| R-50C-011-5 | 5-year calibration assurance plan (return-to-Keysight) |

7. Choose productivity assistance and training

Keysight provides both product-specific and technology training, as well as specialized consulting services.

| Ordering number | Description |
|-----------------|---|
| PS-S10 | Remote scheduled productivity assistance |
| PS-S20 | Daily productivity assistance |
| PS-S20-1 | 1 day of start-up assistance (recommended) |
| PS-T10-N40XX | <i>Bluetooth</i> technology fundamentals; one day |

Recommended Configurations

For Bluetooth testing

| Development | QA/Integration | Manufacturing |
|--|----------------|---------------|
| N4010A-101 | N4010A-101 | N4010A-101 |
| N4010A-110 | N4010A-110 | N4010A-107 |
| N4010A-107 ¹ | N4010A-107 | N4010A-109 |
| N4010A-109 | N4010A-109 | N4010A-1A7 |
| N4017A | N4017A | |
| N4017A-205 | N4017A-205 | |
| For audio testing (for Bluetooth headset test), also order | | |
| N4010A-113 | N4010A-113 | N4010A-113 |
| N4010A-112 | N4010A-112 | N4010A-112 |

For WLAN testing (IEEE 802.11a, b, g, and n)

| Development | QA/Integration | Manufacturing |
|-------------------------|-------------------------|-------------------------|
| N4010A-110 | N4010A-110 | N4010A-110 |
| N4010A-103 | N4010A-103 | N4010A-103 |
| N4010A-108 ² | N4010A-108 ² | N4010A-108 ² |
| N4010A-104 | N4010A-104 ³ | N4010A-1A7 |
| N4010A-204 | N4010A-204 | |
| 89601A-200, 300, B7R | 89607A-100 | |

For 802.11n MIMO testing

| Manufacturing |
|-------------------------|
| N4010A-110 |
| N4010A-103 |
| N4010A-108 ² |
| N4010A-1A7 |
| N4011A |

For ZigBee (IEEE 802.15.4-2003) testing

| Development | QA/Integration | Manufacturing |
|----------------------|-------------------------|----------------------|
| N4010A-110 | N4010A-110 | N4010A-110 |
| N4010A-102 | N4010A-102 | N4010A-102 |
| N4010A-104 | N4010A-104 ³ | N4010A-1A7 |
| 89601B-200, 300, AYA | 89601B-200, 300, AYA | 89601B-200, 300, AYA |

For testing multiple wireless technologies (e.g. Bluetooth, WLAN, and ZigBee)

| Part number |
|-------------------------|
| N4010A-101 |
| N4010A-113 |
| N4010A-112 |
| N4010A-107 |
| N4010A-103 |
| N4010A-109 |
| N4010A-108 ² |

1. If Bluetooth EDR transmitter-only analysis is required, order Option 106 instead of Option 107.
2. Option N4010A-108 is required only if you want to perform 802.11n measurements.
3. Option 104 is required for customers who want to create and then encrypt their own waveform files for use with N4010A. At least one N4010A-104 instrument is required to generate encrypted waveform files. Once down loaded to the N4010A-104, the waveforms can subsequently be uploaded and encrypted in a format suitable for downloading to any N4010A with Option 102 or 103 installed.

For testing multiple wireless technologies (e.g. *Bluetooth*, *WLAN*, and *ZigBee*) (continued)

| Part number |
|---------------------------|
| N4010A-110 |
| N4010A-104 |
| N4010A-204 |
| N4017A-205 |
| 89601B-200, 300, AYA, B7R |

Upgrade Options

The following upgrade kits are available for the N4010A wireless connectivity test set. Upgrade kits denoted with “K” are customer or field/Keysight service center-installable.

Platform upgrades

| Ordering number | Upgrade description | Notes |
|-----------------|--|--|
| N4010AK-110 | I/O connectivity upgrade | |
| N4010AK-104 | Fully flexible arb upgrade | If N4010A-102 or -103 is already installed |
| N4010AK-204 | N4010A Signal Studio license upgrade | |
| N4010AK-040 | 40-MHz receiver bandwidth hardware upgrade | For units with serial number GB45460100 or lower |

Bluetooth upgrades

| Ordering number | Upgrade description | Notes |
|-----------------|--|--|
| N4010AK-101 | Bluetooth firmware upgrade | |
| N4010AK-BT2 | Bluetooth 2.0 upgrade kit | If N4010A-101 is already installed, contains hardware and firmware required for EDR loopback (Option 107) operation ¹ |
| N4010AK-107 | Bluetooth EDR link plus measurements firmware upgrade | If N4010A-101 is already installed ² |
| N4010AK-105 | Bluetooth Tx/Rx EDR; firmware upgrade | If N4010A-101 plus either N4010A-102 or -103 are already installed. Note: Does not provide EDR loopback capability |
| NN4010AK-505 | Bluetooth EDR (transmit and receive) hardware and software upgrade kit | If N4010A-101 is already installed, and N4010A-102 or -103 are not installed |
| N4010AK-106 | Bluetooth Tx EDR; firmware upgrade | If N4010A-101 is already installed |
| N4010AK-109 | Bluetooth low energy Tx/Rx software upgrade | If N4010A-101 plus either N4010A-102, -103, or -105 are already installed |
| N4010AK-509 | Bluetooth low energy Tx/Rx hardware and software upgrade | If N4010A-101 is already installed and N4010A-102 or -103 or -105 are not installed |
| N4010AK-113 | Bluetooth audio generation and analysis firmware upgrade | If N4010A-101 is already installed |
| N4010AK-112 | Bluetooth headset profiles; firmware upgrade | If N4010A-111 or N4010A-113 are already installed |
| N4017AK-205 | N4017A Bluetooth EDR graphical measurement application | If N4017A is already owned |

1. The N4010AK-BT2 kit cannot be used on units whose serial prefix is lower than GB4444. The N4010A-BT2 kit is only required for EDR loop-back test mode support if the LSS N4010-60010 is present. Press System > Service > Hardware Info to find out the revision of hardware in the N4010A. Units with a prefix of GB4444 (or higher) that do not use LSS N4010-60010 can use N4010AK-107 for EDR loopback test mode support.

2. Suitable for units whose serial prefix is GB4444 or higher, or for units that do not use LSS N4010-60010. Press System > Service > Hardware Info to find out the revision of hardware in the N4010A. If LSS N4010-60010 is present, order N4010AK-BT2.

WLAN upgrades

| Ordering number | Upgrade description | Notes |
|-----------------|--|--|
| N4010AK-102 | N4010A 2.4 GHz WLAN Tx/Rx analysis; firmware upgrade | This license-only upgrade path to Option 102 requires that Option 105 is already installed |
| N4010AK-103 | N4010A 2.4 GHz and 5 GHz WLAN Tx/Rx analysis; firmware upgrade | This license-only upgrade path to Option 103 requires that Option 105 is already installed. It can also be installed on a unit that has Option 102, although in this instance the Option 102 license must be deleted before Option 103 can be installed (the instrument must also be re-calibrated following an upgrade from Option 102 to Option 103) |
| N4010AK-108 | 802.11n MIMO modulation analysis license upgrade kit | This license-only upgrade path to Option 108 requires that the N4010A is fitted with RF assembly N4010-61043, motherboard N4010-60025, and LSS assembly N4010-60012. This upgrade path also requires Option 103 be already installed. If this option is not present, then an upgrade to Option 103 must be ordered at the same time as N4010AK-108 |
| N4010AK-502 | N4010A 2.4 GHz WLAN Tx/Rx analysis hardware and software upgrade kit | This hardware upgrade path to Option 102 is not required if Option 103 or Option 105 is already installed. A software license is also supplied for 2.4 GHz WLAN Tx and Rx analysis |
| N4010AK-503 | N4010A 2.4 and 5 GHz WLAN Tx/Rx analysis hardware and software upgrade kit | This hardware upgrade path to Option 103 is not required if Option 102 or Option 105 is already installed. A software license is also supplied for 2.4 and 5 GHz WLAN Tx and Rx analysis |
| N4010AK-508 | 802.11n MIMO hardware (motherboard) and license upgrade kit | This upgrade path to Option 108 requires that the N4010A is fitted with RF assembly N4010-61043 and LSS assembly N4010-60012, and that N4010-60025 motherboard is not present. The Option 108 license is included in this kit |
| N4010AK-518 | 802.11n MIMO hardware (motherboard, RF assembly) and license upgrade kit | This upgrade path to Option 108 requires that the N4010A is fitted with LSS assembly N4010-60012, and that the N4010-60025 motherboard and N4010-61043 RF assembly are not present. The Option 108 license is included in this kit |
| N4010AK-528 | 802.11n MIMO hardware (motherboard, LSS assembly) and license upgrade kit | This upgrade path to Option 108 requires that the N4010A is fitted with RF assembly N4010-61043, and that the N4010-60025 motherboard and N4010-60012 LSS assembly are not present. The Option 108 license is included in this kit |
| N4010AK-538 | 802.11n MIMO hardware (motherboard, RF assembly, LSS assembly) and license upgrade kit | This upgrade path to Option 108 applies to the N4010A which is not fitted with RF assembly N4010-61043, motherboard N4010-60025, and LSS assembly N4010-60012. The Option 108 license is included in this kit |

Related Products

N4018C *Bluetooth* and WLAN Wireless Test Manager, run-time license and software
 N4019C *Bluetooth* and WLAN Wireless Test Manager, Development license and software

Related Keysight Literature

Test Multiple Wireless Connectivity Technologies with One Test Platform, brochure
literature number 5989-2771EN

N4010A Wireless Connectivity Test Set, data sheet
literature number 5989-4035EN

Innovative Solutions for Testing Bluetooth Enhanced Data Rate Products, technical overview
literature number 5989-3055EN

Keysight N4010A Wireless Connectivity Test Set Performance Guide Using the 89601B Vector Signal Analysis Software and the 89607B WLAN Test Suite Software
literature number 5989-0637EN

Keysight N4017A Bluetooth Graphical Measurement Application, technical overview
literature number 5989-2771EN

Keysight N4018C and N4019C, brochure
literature number 5989-5809EN

Bluetooth Enhanced Data Rate (EDR): The Wireless Evolution, application note
literature number 5989-4204EN

Bluetooth Measurement Fundamentals, application note
literature number 5988-3760EN

Bluetooth Manufacturing: A Guide to Getting Started, application note
literature number 5988-1482EN

Next Generation of WLAN Manufacturing Test Solutions, application note
literature number 5989-1194EN

Keysight Wireless Connectivity Testing, brochure
literature number 5988-4438EN

Keysight 89600 Series Vector Signal Analysis Software 89601B/89601BN/89601N12, data sheet
literature number 5989-1786EN

Web Resources

For additional product information, visit www.keysight.com/find/n4010a or www.keysight.com/find/n4011a

For information on Keysight's complete WLAN offerings, visit www.keysight.com/find/wlan

For information on Keysight's complete *Bluetooth* offerings, visit www.keysight.com/find/bluetooth

For information on Keysight's complete ZigBee offerings, visit www.keysight.com/find/zigbee

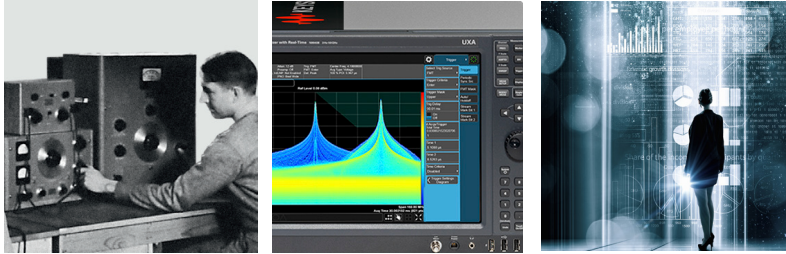
For more information on Keysight's complete MIMO offerings, visit www.keysight.com/find/mimo

For more information on the new adaptable Wireless Test Manager, visit the product pages at www.keysight.com/find/wtm

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For more information on Keysight Technologies' products, applications or services, please contact your local Keysight office. The complete list is available at: www.keysight.com/find/contactus

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|---------------|------------------|
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| Mexico | 001 800 254 2440 |
| United States | (800) 829 4444 |

Asia Pacific

| | |
|--------------------|----------------|
| Australia | 1 800 629 485 |
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| India | 1 800 11 2626 |
| Japan | 0120 (421) 345 |
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| Switzerland | 0800 805353 |
| | Opt. 1 (DE) |
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| | Opt. 3 (IT) |
| United Kingdom | 0800 0260637 |

For other unlisted countries: www.keysight.com/find/contactus (BP-9-7-17)

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