Keysight N1923/4A Wideband Power Sensor

KEYSIGHT TECHNOLOGIES

User's Guide

Notices

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CAUTION

A CAUTION notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a CAUTION notice until the indicated conditions are fully understood and met.

WARNING

A WARNING notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

Safety Considerations

Read the information below before using this instrument.

The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards for design, manufacture, and intended use of the instrument. Keysight Technologies assumes no liability for the customer's failure to comply with these requirements.

WARNING Before connecting the sensor to other instruments, ensure that all instruments are connected to the protective (earth) ground. Any interruption of the protective earth grounding will cause a potential shock hazard that could result in personal injury.

CAUTION Repair or service that is not covered in this manual should only be performed by qualified personnel.

Environmental Conditions

The N1923/4A is designed for indoor use and in an area with low condensation. The table below shows the general environmental requirements for this instrument.

Environmental conditions	Requirements
Temperature	Operating condition – 0 °C to 55 °C Storage condition – –30 °C to 70 °C
Humidity	Operating condition – Up to 95% RH at 40°C (non-condensing) Storage condition – Up to 90% RH at 65°C (non-condensing)
Altitude	Operating condition - Operating up to 3000 m (9840 ft) Storage condition - Non-operating up to 15420 m (50000 ft)

Regulatory Information

The N1923/4A complies with the following safety and Electromagnetic Compatibility (EMC) compliances:

- IEC 61326-1:2005/EN 61326-1:2006
- Canada: ICES/NMB-001:Issue 4, June 2006
- Australia/New Zealand: AS/NZS CISPR11:2004

Regulatory Markings

	The CE mark is a registered trademark of the European Community. This CE mark shows that the product complies with all the relevant European Legal Directives. ICES/NMB-001 indicates that this ISM device complies with the Canadian ICES-001. Cet appareil ISM est conforme a la norme NMB-001 du Canada. ISM GRP.1 Class A indicates that this is an Industrial Scientific and Medical Group 1 Class A product.		The RCM mark is a registered trademark of the Australian Communications and Media Authority.
	This symbol indicates the time period during which no hazardous or toxic substance elements are expected to leak or deteriorate during normal use. Forty years is the expected useful life of the product.		This instrument complies with the WEEE Directive (2002/96/EC) marking requirement. This affixed product label indicates that you must not discard this electrical or electronic product in domestic household waste.

Waste Electrical and Electronic Equipment (WEEE) Directive 2002/96/EC

This instrument complies with the WEEE Directive (2002/96/EC) marking requirement. This affixed product label indicates that you must not discard this electrical or electronic product in domestic household waste.

Product category:

With reference to the equipment types in the WEEE directive Annex 1, this instrument is classified as a “Monitoring and Control Instrument” product.

The affixed product label is as shown below.

Do not dispose in domestic household waste.

To return this unwanted instrument, contact your nearest Keysight Service Center, or visit http://about.keysight.com/en/companyinfo/environment/takeback.shtml for more information.

Sales and Technical Support

To contact Keysight for sales and technical support, refer to the support links on the following Keysight websites:

- www.keysight.com/find/powersensors
  (product-specific information and support, software and documentation updates)
- www.keysight.com/find/assist
  (worldwide contact information for repair and service)

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1 Introduction

This chapter gets you started with the N1923/4A wideband power sensor.

General Information

This guide contains information on the initial inspection, connection, operation, and specifications of the N1923/4A wideband power sensor.

Figure 1-1 N1923A and N1924A wideband power sensors

Initial inspection

1. Inspect the shipping container for damage. Signs of damage may include a dented or torn shipping container or cushioning material that shows signs of unusual stress or compacting.
2. Carefully remove the contents from the shipping container and verify that your order is complete.

NOTE

- **If the shipping container or packaging material is damaged, it should be kept until the contents have been checked mechanically and electrically. If there is mechanical damage, notify the nearest Keysight Sales and Service office. Keep the damaged shipping material (if any) for inspection by the carrier and a Keysight representative. If required, you can refer to "Sales and Technical Support" on page 7.**
- **Ensure that you have read and understood the preceding safety information before proceeding.**

If you have ordered any optional items, verify that the items are included with the shipment by checking the shipment packing list.

Original packaging

Containers and materials identical to those used in the factory packaging are available through **Keysight** Sales and Service offices. If the device is being returned to **Keysight** for servicing, attach a tag indicating the type of service required, return address, model number, and serial number. Also mark the container as FRAGILE to assure careful handling. In any correspondence, refer to the device by its model number and serial number.

Power meter and sensor cable requirements

The N1923/4A is ONLY compatible with the 8990B peak power analyzer.

The following table lists the length of cable options for the N1923/4A; these have no interconnecting cable requirements, as the cable is permanently connected (hard-wired) to the N1923/4A.

Table 1-1 Cable length options

Option	Description
N1923A-105 N1924A-105	1.5 m (5 ft) cable length
N1923A-106 N1924A-106	3.0 m (10 ft) cable length
N1923A-107 N1924A-107	10.0 m (31 ft) cable length

Interconnection

Connect the N1923/4A cable to the 8990B peak power analyzer RF channel input as shown in the following figure. Ensure that you align the red dots on the N1923/4A cable and the 8990B connector.

Figure 1-2 Connecting the N1923/4A cable to the 8990B peak power analyzer

Allow a few seconds for the 8990B to read the data contained in the N1923/4A EEPROM and perform automatic zeroing of the N1923/4A.

NOTE Ensure that the N1923/4A cable is attached and removed in an indoor environment.

WARNING Before connecting the N1923/4A to other instruments, ensure that all instruments are connected to the protective (earth) ground. Any interruption of the protective earth grounding will cause a potential shock hazard that could result in personal injury.

Calibration

When calibrating the N1923/4A, there is no need to disconnect it from the RF power source.

The 8990B peak power analyzer performs internal zeroing and calibration routines on the N1923/4A. The process used for this internal zeroing and calibration is explained in "Overview of the N1923/4A" on page 21.

The 8990B *User's Guide* explains in more detail the methods used to perform zeroing and calibration of the N1923/4A.

Operating instructions

To operate the N1923/4A, refer to the operating instructions in the 8990B *User's Guide*.

Torque

The following table shows the connector types (for connection to devices-under-test) for the N1923/4A. A torque wrench must be used to tighten these connectors. Only use a wrench set to the correct torque value.

Table 1-2 Wrench sizes and torque values

Model	Connector	Wrench size	Torque value
N1923A	Type-N (male)	3/4-inch open-end	12 in-lb (135 Ncm)
N1924A	2.4 mm (male)	5/16-inch open-end	8 in-lb (90 Ncm)

Overview of the N1923/4A

The N1923/4A is a wideband power sensor used with the 8990B peak power analyzer to measure the dynamic or time-dependent aspects of RF and microwave power. The N1923/4A-8990B combination is able to measure the RF pulse rise/fall times up to 5 nsecs. In use, the N1923/4A is connected to an RF or microwave source or a device-under-test (DUT) and to the 8990B. All calibration data for the N1923/4A is stored in EEPROM and is downloaded to the 8990B when the N1923/4A is connected.

The N1923A has a frequency range of 50 MHz to 18 GHz, while the N1924A has a frequency range of 50 MHz to 40 GHz.

Internal zeroing and calibration

The N1923/4A internal zeroing and calibration process is used to combine the N1923/4A and the 8990B peak power analyzer to make accurate power measurements.

Referring to the following figure, the process for the internal zeroing and calibration explains how three objectives in this process are achieved.

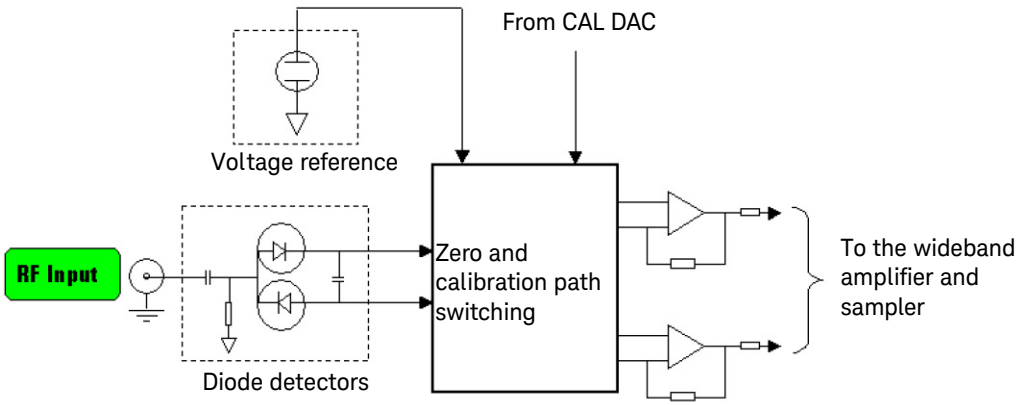

Figure 1-3 Simplified N1923/4A block diagram

1 To account for the environment that the system is working in — the temperature and the presence of electromagnetic signals.

   This is achieved during the internal zeroing process, where the diode detectors are isolated from the active amplifier circuitry. The process allows the zero measurement to be made, regardless of the RF input signal, thus allowing the N1923/4A to remain connected to the DUT. The isolation is achieved by a network of transistor switches in the zeroing and calibration path switching.

2 To account for the combining of the N1923/4A and the 8990B, as these may never have been used together as a system.

   This is achieved during the internal calibration; the amplifier circuitry is isolated from the diode detectors by a network of transistor switches, and the N1923/4A voltage reference is routed to the amplifier circuitry.

3 To verify traceability to National Standards, hence, verifying that your measurements are going to perform to specifications.

   To achieve traceable and accurate RF power measurements, each N1923/4A is individually characterized during its production procedure. To achieve optimal accuracy, a 3-dimensional correction is generated across power, frequency, and temperature. This uses advanced modeling techniques, and is superior in accuracy and speed of evaluation to the overlaying of linearity, temperature corrections, and calibration factors.

The calibration factors are stored in EEPROM during the manufacturing process. All the compensation data is downloaded to the 8990B at power-on or when the N1923/4A is connected.

NOTE Between 50 MHz and 500 MHz, the N1923/4A is sensitive to the RF signal propagating through onto the detector amplifier circuitry and resulting in distorted power measurements. To reduce this effect, additional filtering is switched into the measurement path, which results in a 23 MHz video bandwidth limitation for signals below 500 MHz.

2 Characteristics and Specifications

For the characteristics and specifications of the N1923/4A Wideband Power Sensor, refer to the datasheet at
https://literature.cdn.keysight.com/litweb/pdf/5990-8126EN.pdf

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