

Keysight N4960A Serial BERT 17 and 32 Gb/s

Notices

© Keysight Technologies, Inc. 2012-2019

No part of this manual may be reproduced in any form or by any means (including electronic storage and retrieval or translation into a foreign language) without prior agreement and written consent from Keysight Technologies, Inc. as governed by United States and international copyright laws.

Manual Part Number

N4960-91011

Edition

Edition 6.0, April 2019

Printed in Germany

Keysight Technologies, Inc.

Keysight Technologies R&D and Marketing-
GmbH & Co. KG

Herrenberger Str. 130

71034 Böblingen, Germany

Warranty

THE MATERIAL CONTAINED IN THIS DOCUMENT IS PROVIDED "AS IS," AND IS SUBJECT TO BEING CHANGED, WITHOUT NOTICE, IN FUTURE EDITIONS. FURTHER, TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW, KEYSIGHT DISCLAIMS ALL WARRANTIES, EITHER EXPRESS OR IMPLIED WITH REGARD TO THIS MANUAL AND ANY INFORMATION CONTAINED HEREIN, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. KEYSIGHT SHALL NOT BE LIABLE FOR ERRORS OR FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES IN CONNECTION WITH THE FURNISHING, USE, OR PERFORMANCE OF THIS DOCUMENT OR ANY INFORMATION CONTAINED HEREIN. SHOULD KEYSIGHT AND THE USER HAVE A SEPARATE WRITTEN AGREEMENT WITH WARRANTY TERMS COVERING THE MATERIAL IN THIS DOCUMENT THAT CONFLICT WITH THESE TERMS, THE WARRANTY TERMS IN THE SEPARATE AGREEMENT WILL CONTROL.

Technology Licenses

The hardware and/or software described in this document are furnished under a license and may be used or copied only in accordance with the terms of such license.

Restricted Rights Legend

If software is for use in the performance of a U.S. Government prime contract or subcontract, Software is delivered and licensed as "Commercial computer software" as defined in DFAR 252.227-7014 (June 1995), or as a "commercial item" as defined in FAR 2.101(a) or as "Restricted computer software" as defined in FAR 52.227-19 (June 1987) or any equivalent agency regulation or contract clause. Use, duplication or disclosure of

Software is subject to Keysight Technologies' standard commercial license terms, and non-DOD Departments and Agencies of the U.S. Government will receive no greater than Restricted Rights as defined in FAR 52.227-19(c)(1-2) (June 1987). U.S. Government users will receive no greater than Limited Rights as defined in FAR 52.227-14 (June 1987) or DFAR 252.227-7015 (b)(2) (November 1995), as applicable in any technical data.

Safety Notices

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 Summary

The following general safety precautions must be observed during all phases of operation of this instrument. Failure to comply with these precautions or with specific warnings or operating instructions in the product manuals violates safety standards of design, manufacture, and intended use of the instrument. Keysight Technologies assumes no liability for the customer's failure to comply with these requirements. Product manuals are provided with your instrument on CD-ROM and/or in printed form. Printed manuals are an option for many products. Manuals may also be available on the Web. Go to www.keysight.com and type in your product number in the Search field at the top of the page.

General This product is a Safety Class 1 instrument (provided with a protective earth terminal). The protective features of this product may be impaired if it is used in a manner not specified in the operation instructions.

All Light Emitting Diodes (LEDs) used in this product are Class 1 LEDs as per IEC 60825-1.

Environment Conditions This instrument is intended for indoor use in an installation category II, pollution degree 2 environment. It is designed to operate at a maximum relative humidity of 15 to 85% and at altitudes of up to 2000 meters.

Refer to the specifications tables for the ac mains voltage requirements and ambient operating temperature range.

Before Applying Power Verify that all safety precautions are taken. The power cable inlet of the instrument serves as a device to disconnect from the mains in case of hazard. The instrument must be positioned so that the operator can easily access the power cable inlet. When the instrument is rack mounted the rack must be provided with an easily accessible mains switch.

Ground the Instrument To minimize shock hazard, the instrument chassis and cover must be connected to an electrical protective earth ground. The instrument must be connected to the ac power mains through a grounded power cable, with the ground wire firmly connected to an electrical ground (safety ground) at the power outlet. Any interruption of the protective (grounding) conductor or disconnection of the protective earth terminal will cause a potential shock hazard that could result in personal injury.













Do Not Operate in an Explosive Atmosphere Do not operate the instrument in the presence of flammable gases or fumes.

Do Not Remove the Instrument Cover Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made only by qualified personnel.

Instruments that appear damaged or defective should be made inoperative and secured against unintended operation until they can be repaired by qualified service personnel.


Safety Symbols

Table 1. Safety Symbol

Symbol	Description
	Indicates warning or caution. If you see this symbol on a product, you must refer to the manuals for specific Warning or Caution information to avoid personal injury or damage to the product.
	Frame or chassis ground terminal. Typically connects to the equipment's metal frame.
	Indicates hazardous voltages and potential for electrical shock.
	Indicates that antistatic precautions should be taken.
	Indicates hot surface. Please do not touch.
	CSA is the Canadian certification mark to demonstrate compliance with the Safety requirements.
	CE compliance marking to the EU Safety and EMC Directives. ISM GRP-1A classification according to the international EMC standard. ICES/NMB-001 compliance marking to the Canadian EMC standard.
	The RCM mark indicates that this product meets EMS/Product Safety Requirements and may be imported to Australia and New Zealand.
	This mark indicates compliance with the Canadian EMC regulations.
ISM 1-A	This text denotes the instrument is an Industrial Scientific and Medical Group 1 Class A product.
	China RoHS regulations include requirements related to packaging, and require compliance to China standard GB18455-2001. This symbol indicates compliance with the China RoHS regulations for paper/fiberboard packaging.
	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.
	The South Korean Class A EMC declaration (KC) mark indicates that this product is Class A suitable for professional use and is for use in electromagnetic environments outside of the home. The KC mark includes the marking's identifier code that has up to 26 digits and follows this format: KCC-VWX-YYY-ZZZZZZZZZZZZ.

Compliance and Environmental Information

Table 2. Compliance and Environmental Information

Safety Symbol	Description
	<p>This product complies with WEEE Directive (2002/96/EC) marking requirements. The affixed label indicates that you must not discard this electrical/electronic product in domestic household waste.</p> <p>Product Category: With reference to the equipment types in WEEE Directive Annex I, this product is classed as a “Monitoring and Control instrumentation” product.</p> <p>Do not dispose in domestic household waste.</p> <p>To return unwanted products, contact your local Keysight office for more information.</p>

Contents

1	N4960A Getting Started Guide.....	9
1.1	Introduction.....	9
1.2	Support	10
1.3	General Specifications	10
1.4	Safety and Regulatory	12
1.5	Unpacking	13
1.6	Important Notes.....	13
1.7	Installation.....	13
1.8	Connector Care.....	15
1.9	Returning the N4960A to Keysight Technologies.....	16

1 N4960A Getting Started Guide

1.1 Introduction

Welcome to the Keysight Technologies N4960A serial BERT 17 and 32 Gb/s getting started guide. This guide will help you identify the contents of the shipping package, perform a quick functional check of the product, and guide you on where to find more information and support for the N4960A serial BERT 17 and 32 Gb/s.

The N4960A serial BERT controller 17 and 32 Gb/s is shipped in a protective box. Each shipping box contains:

- N4960A-CJ0 or N4960A-CJ1 serial BERT controller.
- AC power cord.
- CD-ROM, which includes:
 - N4960A Serial BERT 17 and 32 Gb/s user guide
 - N4960A Serial BERT 17 and 32 Gb/s getting started guide
 - N4960A Serial BERT 17 and 32 Gb/s datasheet



Figure 1. N4960A Serial BERT

The N4951A, N4951B, and N4952A are shipped with all the accessories required for operation. Each package contains:

- N4951A, N4951B, or N4952A with remote head controller cable.
- CD-ROM, which includes:
 - N4960A Serial BERT 17 and 32 Gb/s user guide
 - N4960A Serial BERT 17 and 32 Gb/s getting started guide
 - N4960A Serial BERT 17 and 32 Gb/s datasheet

1.2 Support

For more information on the operation and features of the N4960A Serial BERT 17 and 32 Gb/s, please refer to N4960A Serial BERT 17 and 32 Gb/s User Guide on the CD or the product webpage at <http://www.Keysight.com/find/N4960A>.

Technical Support information:
<http://www.Keysight.com/find/techsupport>

1.3 General Specifications

Before installing the N4960A serial BERT, review the specifications in [Table 3](#).

Table 3. Specification considerations before installation

Parameter	Specification
Connector Type	
Controller	
All signals except 10 MHz In/Out	SMA
10 MHz In/Out	BNC
N4951A and N4952A	2.92 mm female
N4951B	2.4 mm female (data connectors), SMA female (auxiliary connectors)
Remote Control Interface	USB2.0 and IEEE-488 (GPIB)
Operating Temperature	+10 °C to +40 °C
Storage Temperature	–40 °C to +70 °C

Parameter	Specification
Line Power	
Voltage	100 to 240 VAC 10% autoranging
Frequency	50/60 Hz
Power	170 Watts MAX
Fuse	250 V 2 A 5x20 mm (p/n 12260-002) Always replace instrument fuse with one of the same type and rating.
Dimensions (Height, Width, and Depth)	
N4960-CJ0	100 mm (3.9 in) x 214 mm (16.7 in) x 425 mm (16.7 in)
N4951A/N4952A	50 mm (1.9 in) x 109 mm (4.3 in) x 222 mm (8.7 in)
N4951B	50 mm (1.9 in) x 109 mm (4.3 in) x 273 mm (10.75 in)
N4951A/N4951B/N4952A remote head controller cable length	1.0 m (39.7 in)
Weight	
N4960-CJ0	3.2 kg (7.0 lbs)
N4951A/N4952A (with cable)	0.86 kg (30.3 oz)
N4951B (with cable)	1.0 kg (35.3 oz)
EMC	<ul style="list-style-type: none"> • Complies with European EMC Directive 2004/108/EC • IEC/EN 61326-1 • CISPR Pub 11 Group 1, class A • AS/NZS CISPR 11 • ICES/NMB-001 <p>This ISM device complies with Canadian ICES-001. Cet appareil ISM est conforme a la norme NMB-001 du Canada.</p>
Safety	<ul style="list-style-type: none"> • Complies with European Low Voltage Directive 2006/95/EC • IEC/EN 61010-1, 2nd Edition • Canada: CSA C22.2 No. 61010-1 • USA: UL std no. 61010-1, 2nd Edition <p>Acoustic noise emission Geraeuschemission LpA <70 dB LpA <70 dB Operator position Am Arbeitsplatz Normal position Normaler Betrieb Per ISO 7779 Nach DIN 45635 t.19</p>

1.4 Safety and Regulatory

This product has been designed and tested in accordance with accepted industry standards, and has been supplied in a safe condition. The documentation contains information and warnings that must be followed by the user to ensure safe operation and to maintain the product in a safe condition.

WARNING

Do not remove instrument covers. There are no user serviceable parts within. Operation of the instrument in a manner not specified by Keysight Technologies may result in personal injury or loss of life.

WARNING

For continued protection against fire hazard, replace fuses, and or circuit breakers only with same type and ratings. The use of other fuses, circuit breakers or materials is prohibited.

WARNING

To prevent electrical shock, disconnect instrument from mains before cleaning. Use a dry cloth or one slightly dampened with water to clean the external case parts. Do not attempt to clean internally.

CAUTION

The Mains wiring and connectors shall be compatible with the connector used in the premise electrical system. Failure, to ensure adequate earth grounding by not using the correct components may cause product damage, and serious injury.

CAUTION

Before switching on this instrument, make sure the supply voltage is in the specified range.

1.5 Unpacking

Carefully remove the N4960A Serial BERT 17 and 32 Gb/s components from the case in an ESD-safe environment.

1.6 Important Notes

- Use ESD protection at all times when using the instrument.
- Before connecting any cable to the instrument, discharge the cable by shorting the center and outer connectors of the cable together to ground momentarily.
- Install the instrument on a flat surface away from heat sources.
- Do not block the fans, or the exhaust vents on the rear and side panels (3" min. clearance).
- Use a 8 lbf-in (90 N-cm) torque wrench when attaching connectors.

1.7 Installation

1. Plug the AC power cord into the N4960A-CJ0 or N4960A-CJ1 serial BERT controller rear panel power socket.
2. Plug the other end of the AC power cord into a suitable wall socket. (100-240 VAC, 50/60 Hz).

WARNING

If this product is not used as specified, the protection provided by the equipment could be impaired. This product must be used in a normal condition (in which all means for protection are intact) only.

3. Interconnect the equipment as shown in [Figure 2](#).

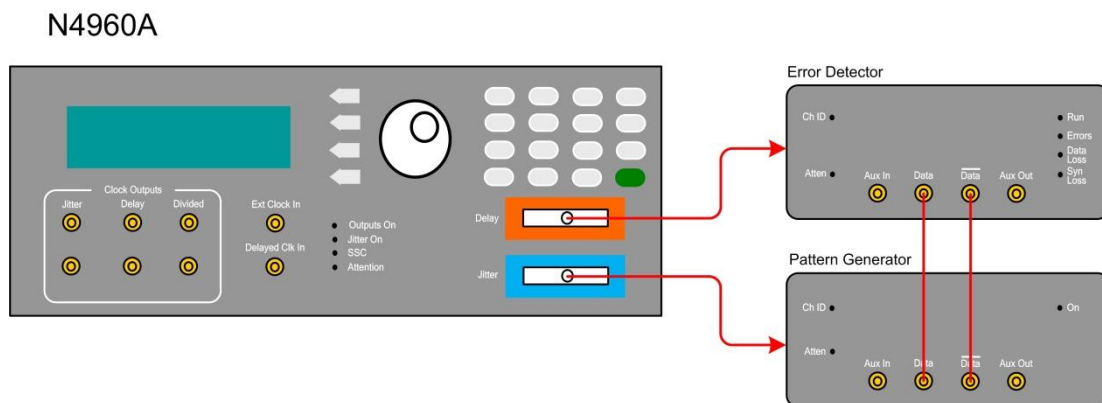


Figure 2. Test Setup

CAUTION

This instrument has autoranging line voltage input. Be sure the supply voltage is within the specified range.

4. In the **MAIN** menu position the arrow next to the **Pat Gen-Jit Menu** label then press the softkey corresponding to the **SEL** label.
5. In the **Pat Gen-Jit Menu** position the arrow next to the **Data Output Menu** label then press the softkey corresponding to the **SEL** label.
6. In the **Data Output Menu** position the arrow next to the **Enable** label then press the softkey corresponding to the **EDIT** label.
7. Use the rotary knob to set **Enable** to **ON**.
8. Press the softkey corresponding to the **SEL** label to accept the entry and return to the **Data Output Menu**.
9. Press the softkey corresponding to the **BACK** label until the **MAIN** menu is displayed.
10. In the **MAIN** menu position the arrow next to the **Err Det Menu** label then press the softkey corresponding to the **SEL** label.
11. In the **Err Det Menu** position the arrow next to the **AutoAlign Menu** label then press the softkey corresponding to the **SEL** label.
12. Position the arrow next to the Perform AutoAlign label then press the softkey corresponding to the **EXEC** label. A small clock appears in the display. When the clock disappears, ensure that the Errors, Data Loss, and Sync Loss LEDs on the front panel of the error detector are off.
13. Press the softkey corresponding to the **BACK** label to return to the Err Det Menu.
14. In the Err Det Menu position the arrow next to the Accumulation Menu label then press the softkey corresponding to the **SEL** label.
15. Position the arrow next to the Start Accum label then press the softkey corresponding to the **START** label. The Run LED on the front panel of the error detector should be lit.
16. After 15 to 30 seconds, press the softkey corresponding to the **STOP** label.
17. Position the arrow next to the Results label then press the softkey corresponding to the **SEL** label.
18. Ensure that Errs reads 0.000e0.

1.8 Connector Care

The N4960A serial BERT controller features high-quality SMA connectors for the front and rear panel input and output connections while the N4951A pattern generator and N4952A error detector use 2.92 mm. The N4951B pattern generators use type 2.4 mm connectors for data output and 2.92 mm for auxiliary input/output connectors. Connector damage will degrade signal fidelity.

Use high quality connectors/adapters on ports. Always leave dust jackets on unused ports.

Refer to the N4960-90030 N495xA through N498xA Connector Care Reference Guide at www.Keysight.com/find/N4951A.

CAUTION

Excessive mating of low quality SMA components to 2.92 mm female receptacles may degrade the 2.92 mm female receptacle.

Inspect the connectors for the following:

- Worn or damaged threads
- Scratches to mating surface
- Burrs and loose metal particles
- Ensure that female contacts are straight and aligned

Clean the connectors as described in the following procedure. Cleaning connectors with alcohol shall only be done with the instruments power cord removed, and in a well-ventilated area. Allow all residual alcohol moisture to evaporate, and the fumes to dissipate prior to energizing the instrument.

1. Remove any loose particles using a low-pressure air source.
2. Moisten a lint-free swab with isopropyl alcohol. Do not saturate the swab.
3. Minimize the wicking of the alcohol into the connector structure.
4. Clean the mating plane surfaces and threads.
5. Allow alcohol to evaporate, and then use a low-pressure air source to blow surfaces clean.
6. Make sure no particles or residue remains.
7. Inspect connector for damage.

1.9 Returning the N4960A to Keysight Technologies

If the N4960A fails system verification and you cannot correct the problem, return the N4960A to Keysight Technologies for repair following the steps shown below.

1. Record all symptoms.
2. Contact Keysight Technologies at <http://www.Keysight.com/find/assist>.
3. Use the original packing material or similar packing material to ship the instrument to Keysight Technologies.



This information is subject to change without notice.
© Copyright Keysight Technologies 2012-2019
Edition 6.0, April 2019



N4960-91011

www.keysight.com