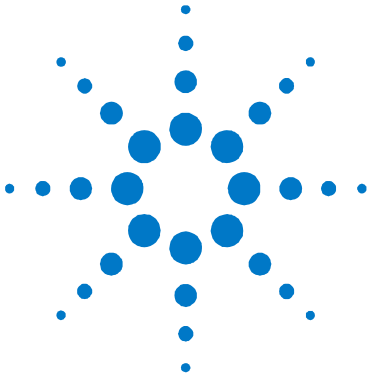

Agilent N4965A

Multi-Channel BERT 12.5 Gb/s

Getting Started Guide

Agilent Technologies

Notices

Manual Part Number

N4965-91011

Edition

Fifth edition, April 2014

Agilent Technologies, Deutschland GmbH

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For Assistance and Support

http://www.agilent.com/find/assist

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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.

NOTE

A **NOTE** provides important or special information.

Safety Summary

General Safety Precautions

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 elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument.

Agilent Technologies Inc. assumes no liability for the customer's failure to comply with these requirements.

Before operation, review the instrument and manual for safety markings and instructions. You must follow these to ensure safe operation and to maintain the instrument in safe condition.

Initial Inspection

Inspect the shipping container for damage. If there is damage to the container or cushioning, keep them until you have checked the contents of the shipment for completeness and verified the instrument both mechanically and electrically. The Performance Tests give procedures for checking the operation of the instrument. If the contents are incomplete, mechanical damage or defect is apparent, or if an instrument does not pass the operator's checks, notify the nearest Agilent Technologies Sales/Service Office.

WARNING To avoid hazardous electrical shock, do not perform electrical tests when there are signs of shipping damage to any portion of the outer enclosure (covers, panels, etc.).

General

This product is a Safety Class 1 product (provided with a protective earthing ground incorporated in the power cord). The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. Any interruption of the protective conductor, inside or outside of the instrument, will make the instrument dangerous. Intentional interruption is prohibited.

Environment Conditions

This instrument is intended for indoor use in an installation category II, pollution degree 2 environment per IEC 61010 Second Edition and 664 respectively. It is designed to operate within a temperature range of 10 to 40 °C at a maximum relative humidity of 80% for temperatures up to 31 °C, decreasing linearly to 50% relative humidity at 40 °C at an altitude of 2000 meters.

This module can be stored or shipped at temperatures between -40°C and +70°C. Protect the module from temperature extremes that may cause condensation within it.

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

Install the instrument so that the ON / OFF switch is readily identifiable and is easily reached by the operator. The ON / OFF switch is the instrument disconnecting device. It disconnects the mains circuits from the mains supply before other parts of the instrument. Or the detachable power cord can be removed from the electrical supply. Alternately, an externally installed switch or circuit breaker which is readily identifiable and is easily reached by the operator may be used as a disconnecting device.

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.

Symbols on Instruments

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.

C-Tick Conformity Mark of the Australian ACA for EMC compliance.

The CSA mark is a registered trademark of the CSA International. This instrument complies with Canada: CSA 22.2 No. 61010-1 -04.

Indicates that protective earthing ground is incorporated in the power cord.

This symbol indicates that internal circuits can be damaged by electrostatic discharge (ESD), therefore, avoid applying static discharges to the panel input connectors.

ICES/NMB-001

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.

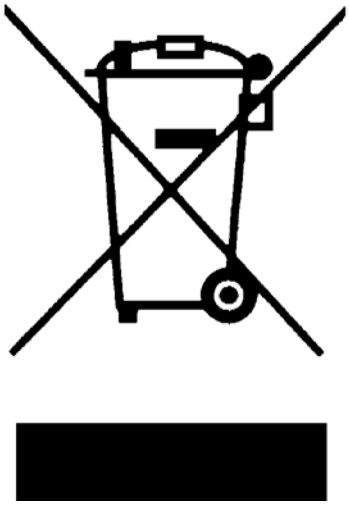
This symbol indicates that the instrument requires alternating current (AC) input.

This symbol indicates that the power line switch is in the ON position.

O

This symbol indicates that the power line switch is in the OFF position.

Environmental Information



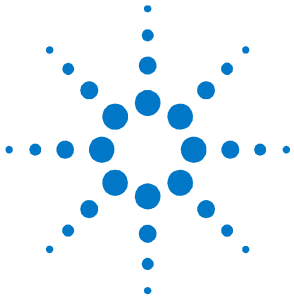
This product complies with the WEEE Directive (2002/96/EC) marketing requirements. The affixed label indicates that you must not discard this electrical/electronic product in domestic household waste.

Product category: With reference to the equipment types in the WEEE Directive Annexure I, this product is classed as a "Monitoring and Control instrumentation" product.

Do not dispose in domestic household waste.

To return unwanted products, contact your local Agilent office, or see **www.agilent.com/environment/product/** for more information.

Contents



1 N4965A Getting Started Guide

1.1 Introduction

Welcome to the Agilent Technologies N4965A multi-channel BERT 12.5 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 N4965A.

1.2 Support

For more information on the operation and features of the N4965A please refer to the N4965A Multi-Channel BERT 12.5 Gb/s User Guide on the CD or the following product webpage:
http://www.agilent.com/find/N4965A

Technical Support information:
http://www.agilent.com/find/assist

1.3 N4965A Multi-Channel BERT Controller Shipping Box Contents

The N4965A is shipped in a protective box with all the accessories required for operation. The shipping box contains:

- N4965A multi-channel BERT controller

Figure 1. N4965A multi-channel BERT controller

- AC power cord
- CD-ROM, which includes:
  - N4965A multi-channel BERT 12.5 Gb/s data sheet
  - N4965A multi-channel BERT 12.5 Gb/s getting started guide
  - N4965A multi-channel BERT 12.5 Gb/s user guide

1.4 N4955A-P12 / N4955A-D12 / N4956A-E12 Shipping Box Contents

The N4955A-P12 / N4955A-D12 / N4956A-E12 is shipped in a protective box with all the accessories required for operation. The shipping box contains:

- Accessory kit, which includes the following for each N4955A-P12 / N4955A-D12 / N4956A-E12:
  - (Qty 2) 2.92 mm male-male cables
  - (Qty 2) 2.92 mm male-female cables
  - (Qty 1) 50Ω 18 GHz 1W SMA male terminations

Refer to the N4960-90030 N495xA through N498xA Connector Care Reference Guide at www.agilent.com/find/N4955A.

1.5 N4956A-E12 Indicators Quick Reference

Figure 2. N4956A-E12 LED indicators

Three LED indicators are integrated into the N4956A-E12 front panel. These indicators are used to communicate the current status of the N4956A-E12 error detector. The combinations are shown below.

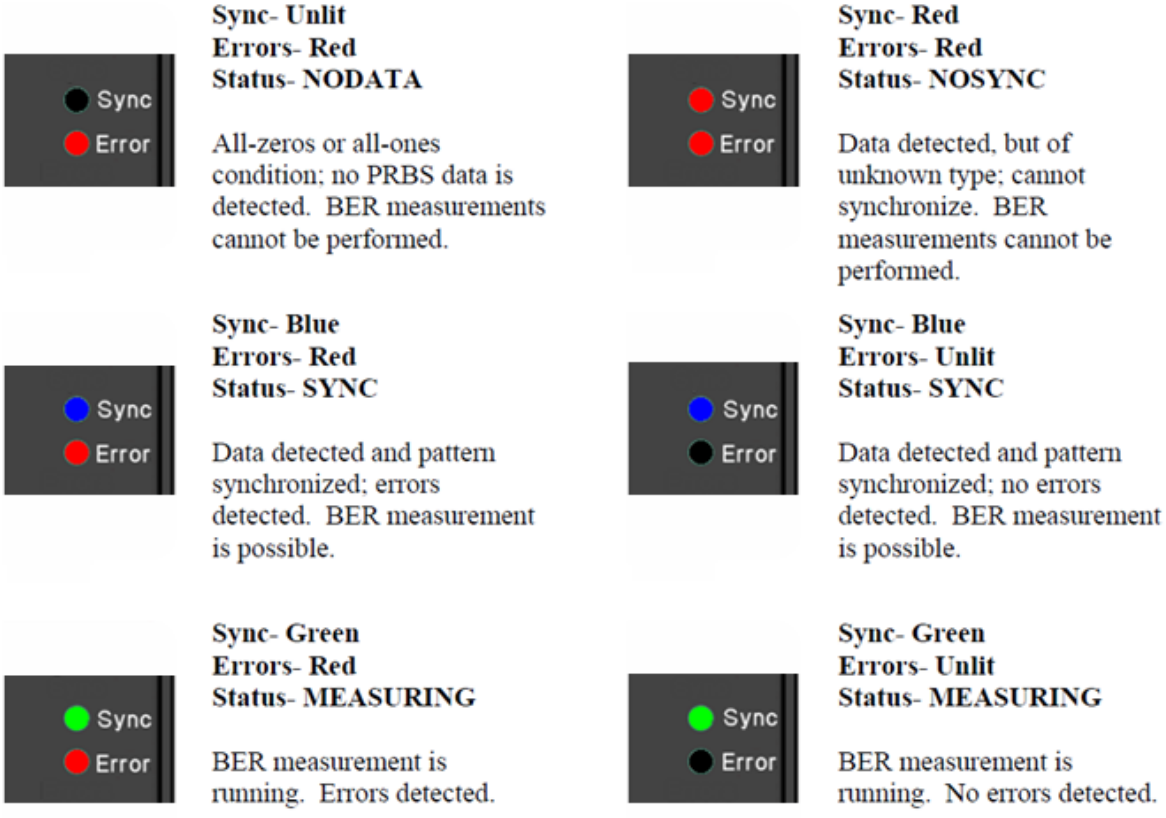


Figure 3. Combination of LED indicators

1.6 Unpacking

Carefully remove the instrument from the case in an ESD-safe environment.

1.7 Important Notes

- Use ESD protection at all times when using the instrument.
- 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.

1.8 Measurement Best Practices

- When using differential-mode connections, ensure the cables are phase balanced for best performance.
- Differential connectors may be used single-ended if unused outputs are terminated in 50 Ω.
- Use high quality cables and connector savers (or adaptors).
- Keep cable lengths short and minimize the number of cable bends.
- Use a 8 lb-in (90 N-cm) torque wrench when attaching connectors.

1.9 General Specifications

Before installing the system, review the specifications in Table 1.

Table 1. Specification considerations before installation

Parameter	Specification
Operating temperature	+10 °C to +40 °C
Storage temperature	–40 °C to +70 °C
Remote control interface	USB2.0 and IEEE-488 (GPIB)
Voltage	100 to 240 VAC auto ranging
Frequency	50/60 Hz nominal
Power consumption	170 Watts maximum
Current	1.8 A RMS maximum
Fuse	250 V 2 A (p/n 12260-002) Always replace instrument fuse with one of the same type and rating.
EMC	• CISPR Pub 11 Group 1, class A • AS/NZS CISPR 11 • ICES/NMB-001 This ISM device complies with Canadian ICES-001. Cet appareil ISM est conforme a la norme NMB-001 du Canada.

Parameter	Specification
Safety	• 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 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
Dimensions (Height, Width, and Depth)	
N4965A	100 mm (3.9 in) x 214 mm (8.4 in) x 425 mm (16.7 in)
N4955A-P12	33 mm (1.3 in) x 72 mm (2.8 in) x 130 mm (5.1 in)
N4955A-D12	33 mm (1.3 in) x 72 mm (2.8 in) x 130 mm (5.1 in)
N4956A-E12	33 mm (1.3 in) x 72 mm (2.8 in) x 130 mm (5.1 in)
Weight	
N4965A	3.3 kg (7.1 lbs)
N4955A-P12	0.38 kg (13.4 oz)
N4955A-D12	0.38 kg (13.4 oz)
N4956A-E12	0.38 kg (13.4 oz)

1.10 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 Agilent 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.

1.11 N4965A Multi-Channel BERT Controller Installation

1. Plug the AC power cord into the N4965A controller, rear panel power socket.
2. Plug the other end of the AC power cord into a suitable wall socket. (100-240 V AC, 50/60 Hz).

1.12 N4955A-P12 / N4955A-D12 Installation

1. Connect the N4965A controller to a clock source and high speed sampling scope as shown in Figure 4.

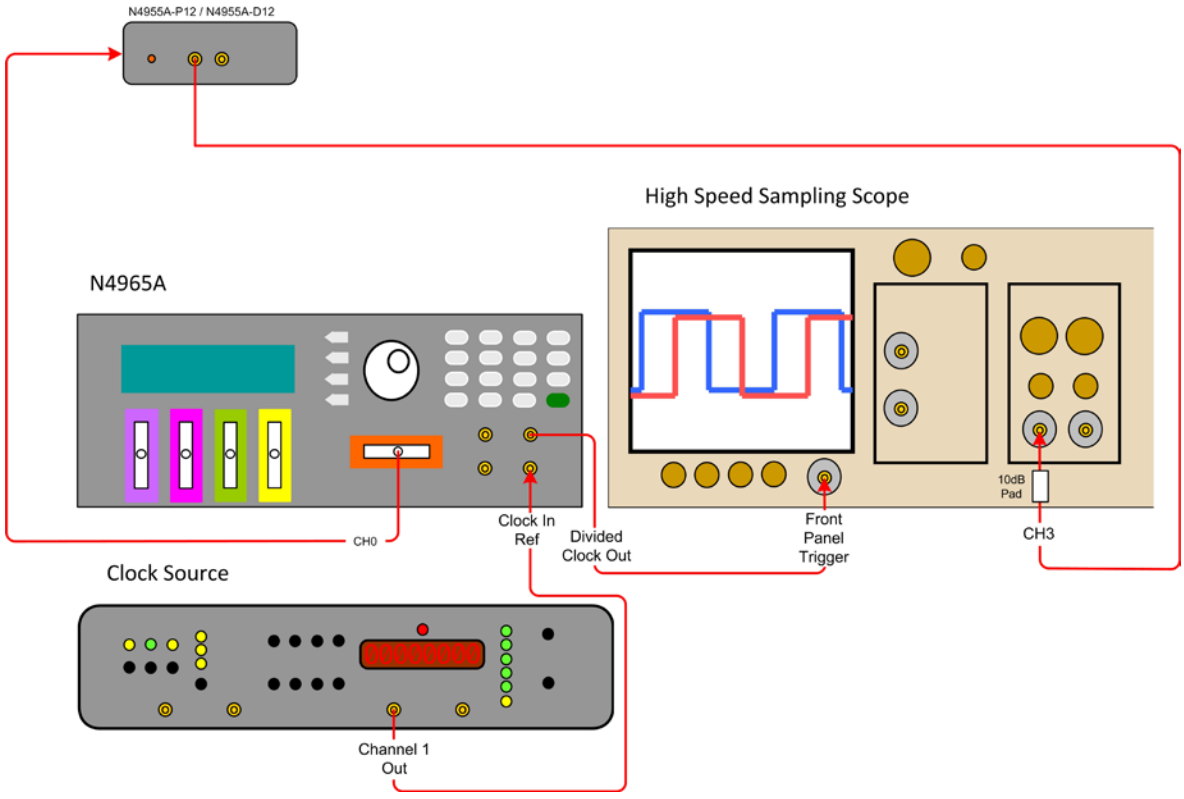


Figure 4. N4955A-P12 / N4955A-D12 installation setup

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.**

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

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

---

2. Connect the N4955A-P12 / N4955A-D12 to the reference channel (Ch. 0).
3. Turn the N4965A controller power on.
4. Set up the clock source as follows: Frequency 10 GHz, Output Level +3 dBm, output on.

5. Set up the high speed sampling scope as follows: (Note: Agilent 86100C Infiniium DCA used in this example, other high speed scope setup option names may differ.)

   Eye Mask Mode

Trigger Level	0 V
Slope	Rising edge
Trigger Bandwidth	Standard (DC-2.5 GHz)
Timbase Scale	16.3 ps/div
Reference	center
Channel 3 Setup	
Attenuation	10 dB (10 dB attenuator placed at the input)
Bandwidth	maximum
Display	On
Scale	243 mV/Div
Offset	0 V

6. On the keypad, press the number **0** to view the STAT (Status) menu settings for channel 0.

7. Position the arrow next to the **Pat Out** label on the N4965A controller then press the softkey corresponding to the **EDIT** label.
8. Rotate the knob until the highlighted text shows **ON** then press the softkey corresponding to the **EXIT** label to accept the change. This will turn on the data output. The channel ID LED of the N4955A-P12 should come on.
9. Position the arrow next to the **Clk Output** label on the N4965A controller then press the softkey corresponding to the **EDIT** label.
10. Rotate the knob until the highlighted text shows **ON** then press the softkey corresponding to the **EXIT** label to accept the change. This will turn on the clock output.
11. Verify that the waveform is similar to the one shown in Figure 5.

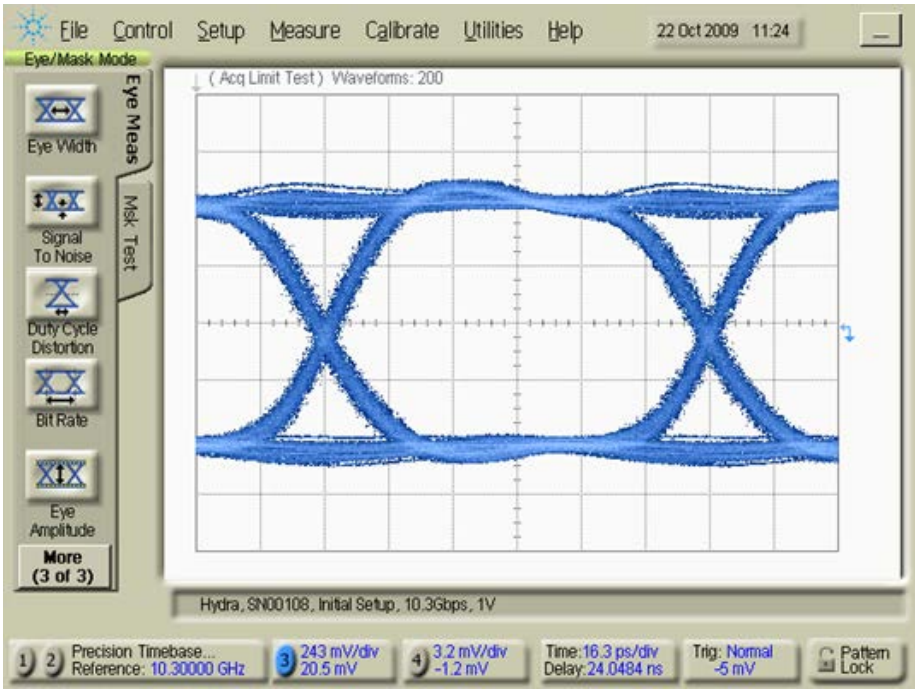


Figure 5. Installation setup waveform

1.13 N4956A-E12 Installation

1. Connect the N4965A controller to a clock source as shown in Figure 6.

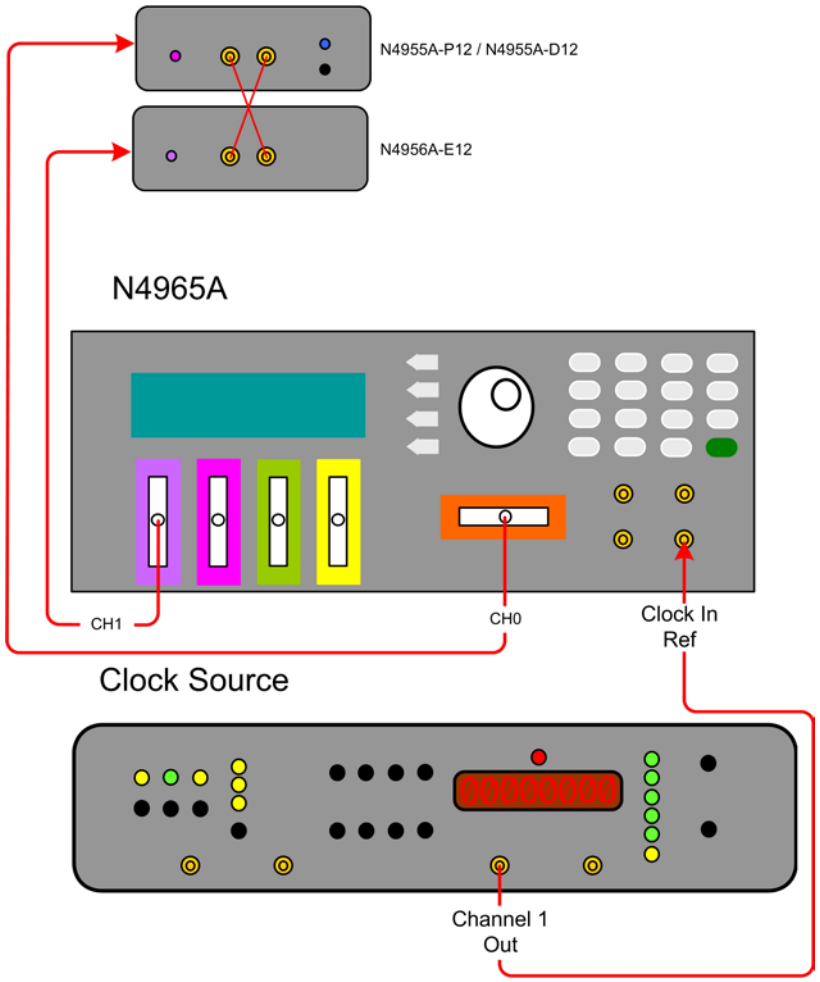


Figure 6. N4956A-E12 installation setup

2. You will need a N4955A-P12 / N4955A-D12 for this installation test. Connect the N4955A-P12 / N4955A-D12 to the reference channel (Ch. 0).
3. Connect the N4956A-E12 to channel 1.
4. Turn the N4965A controller power on.
5. On the keypad, press the number **0** to view the **STAT** (Status) menu settings for channel 0.

6. Position the arrow next to the **Pat Out** label on the N4965A controller then press the softkey corresponding to the **EDIT** label.
7. Rotate the knob until the highlighted text shows **ON** then press the softkey corresponding to the **EXIT** label to accept the change. This will turn on the data output. The channel ID LED of the N4955A-P12 / N4955A-D12 should come on.
8. Set up the clock source as follows: Frequency 10 GHz, Output Level 0 dBm.
9. On the keypad, press the number **1** to view the **STAT** (Status) menu settings for channel 1.

10. Position the arrow next to the **Sync** label on the N4965A controller then press the softkey corresponding to the **Align** label. This will turn on the auto alignment.
11. Position the arrow next to the **BER** label on the N4965A controller then press the softkey corresponding to the **RUN** label. **MEAS 000 000** should appear above **BER** and start counting. The **BER** and **Errs** should read **0.000e0**.

1.14 Connector Care

The system features high-quality SMA and 2.92 mm connectors for the front and rear panel input and output connections. Connector damage will degrade signal fidelity.

Use 2.92 mm adapters on 2.92 mm clock and data ports and high quality SMA-connectors on the SMA ports. Always leave dust jackets on unused ports.

Refer to the N4960-90030 N495xA through N498xA Connector Care Reference Guide at www.agilent.com/find/N4955A.

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.

1.15 Returning the N4965A to Agilent Technologies

If the N4965A fails system verification and you cannot correct the problem, return the N4965A to Agilent Technologies for repair following the steps shown below.

1. Record all symptoms.
2. Contact Agilent Technologies using the "Request an RMA" form at http://www.agilent.com/find/assist.
3. Use the original packing material or similar packing material to ship the instrument to Agilent Technologies.

Fifth edition, April 2014
Printed in Germany

N4965-91011

Agilent Technologies