

Keysight Technologies  
U3020AY04

User's and  
Service Guide

## Notices

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### 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.

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Notice: This document contains references to Agilent.  
Please note that Agilent's Test and Measurement business has become  
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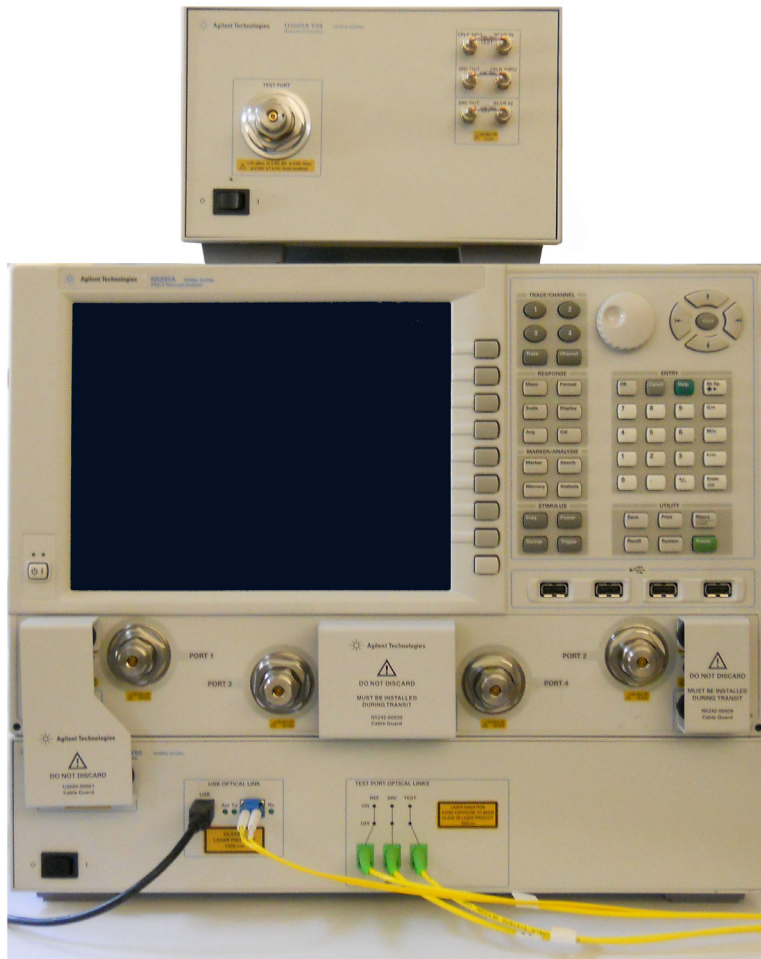
**U3020AY04**

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## Introduction

This document describes how to use the U3020AY04 Remote Converter with the Keysight N5242A for use in producing optical extension measurements. This document includes Options 026, 1TR and USB. Not all available options are listed within this document. Options will be documented when information becomes available.

**Figure 1** PNA-X with U3020AY03 and U3020AY04



## Description

The U3020AY04 Remote Converter Test Port is a microwave/RF Test Port module that provides electrical to optical (E/O) and optical to electrical (O/E) signal conditioning to the U3020AY03 Local Converter that connects to a PNA-X Network Analyzer. The U3020AY04 optical ports allow the user to extend remote measurement capability to 1,000 meters (3,280 ft) from the network analyzer.

The U3020AY04 requires no external control.

The N5242A or N5245A PNA-X Network Analyzer will be referred to throughout this document as the PNA-X. The U3020AY03 will be referred to as the Local Converter. The U3020AY04 will be referred to as either Remote Converter.

## Verifying the Shipment

To verify the contents shipped with your product, refer to the “Box Content List” included with the shipment.

Inspect the shipping container. If the container or packing material is damaged, it should be kept until the contents of the shipment have been checked mechanically and electrically. If there is physical damage refer to **“Contacting Keysight” on page 32** Keep the damaged shipping materials (if any) for inspection by the carrier and an Keysight Technologies representative.

## Network Analyzer Requirements

- N5242A is compatible with all options and firmware.

More PNA information is available on the following website:

- Documentation - <http://www.Keysight.com/find/pna>
- Network Analyzer Firmware - <http://na.Keysight.com/pna/firmware/firmware.htm>

## Available Remote Converter Options

The Remote Converter has several available options:

- U3020AY04-026 (10 MHz to 26.5 GHz)

All RF connectors are 3.5 mm compatible:

- U3020AY04-050 (10 MHz to 50 GHz)

All RF connectors are 2.4 mm compatible:

- U3020AY04-1TR (Full 1 Port)
- U3020AY04-1TX (Source Module)
- U3020AY04-1RX (Receiver Module)
- U3020AY04-1SR (Source Reference Module)
- U3020AY04-USB (Adds USB Optical Port)
- U3020AY04-UVP (USB to VGA Adapter)

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## General Specifications

Review this product and related documentation to familiarize yourself with safety markings and instructions before you operate the instrument.

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.

Specifications for the Remote Converter are nominal. System performance of the PNA-X and the Remote Converter are based on the customer's PNA-X, U3020AY03 Local Converter and measurement configuration. A functional certificate is offered for the Remote Converter only. No system specifications are provided.

When connected to a PNA-X and the U3020AY03, this Remote Converter will degrade the performance of the PNA-X. The internal O/E and E/O paths reduce source power and power to the receivers. This affects the PNA-X dynamic range, noise floor, and trace noise.

## Power Requirements

Verify that the required ac power is available before installing the Remote Converter to the Local Converter.

- 100/120/220/240 VAC (50/60Hz)
- The instrument can operate with mains supply voltage fluctuations up to  $\pm 10\%$  of the nominal voltage.
- Air conditioning equipment (or other motor-operated equipment) should not be placed on the same ac line that powers the Remote Converter and PNA-X.
- **Table 1** contains the maximum wattage for all instruments. This table can be use to determine the electrical and cooling requirements.

**Table 1**      **Power Requirements**

Standard Equipment	
Instrument	Maximum Wattage
N5242A	450
U3020AY03	350
U3020AY04	160

### **WARNING**

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



## Environmental Requirements

Refer to the PNA-X standard documentation for environmental requirements.

Install the instrument so that the detachable power cord is readily identifiable and is easily reached by the operator. The detachable power cord is the instrument disconnecting device. It disconnects the mains circuits from the mains supply before other parts of the instrument. The rear panel switch is only a standby switch and is not a LINE switch. Alternatively, 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.

## Environmental Tests

The Remote Converter complies with all applicable safety and regulatory requirements for the intended location of use.

- Temperature 0 to 50 °C
- Altitude 2000 meters (~6,561 feet)
- The instrument can safely operate in a relative humidity of 80% for temperatures to 31 °C, decreasing linearly to 50% relative humidity at 40 °C.

This product is designed for use in Installation Category II and Pollution Degree 2, per IEC 61010 Second Edition and 664 respectively.

## Equipment Heating and Cooling

If necessary, install air conditioning and heating to maintain the ambient temperature within the appropriate range.

**CAUTION** Ventilation Requirements: When installing the product in a cabinet, the convection into and out of the product must not be restricted. The ambient temperature (outside the cabinet) must be less than the maximum operating temperature of the product by 4 °C for every 100 watts dissipated in the cabinet. If the total power dissipated in the cabinet is greater than 800 watts, then forced convection must be used.

---

## Required Conditions for Accuracy Enhanced Measurement

Accuracy-enhanced (error-corrected) measurements require the ambient temperature of the PNA-X and Remote Converter to be maintained within  $\pm 1$  °C of the ambient temperature at calibration.

## Dimensions and Space Requirements

Standard installation of the Remote Converter and PNA-X includes configuration and installation on a customer provided lab bench or table top of adequate size and strength. For weight, dimensions and space requirements, refer to the network analyzer documentation that is used to configure the Remote Converter.

**Table 2 Instrument Dimensions**

Model	Weight	Height	Width	Depth
U3020AY04	5.1 kg (11.24 lb)	12. cm (5 in)	21.6 cm (8.5 in)	43.2 cm (17 in)

## Maximum Power Levels

**CAUTION** It is recommended that you do not operate components near damage levels. The power levels must be 3 dB below maximum level to ensure no damage, see [Table 3](#).

**CAUTION** Power into SRC OUT should not exceed the optimum RF power level. The power levels above the optimum power level will cause measurement instability, see [Table 3](#). It is recommended that a user define a PNA-X User State to not exceed the optimum RF power levels.

**Table 3 Power Levels**

<b>Maximum Test Port RF Power Levels:</b>	
Test Port	+25 dBm
All Access Ports	+20 dBm
<b>Maximum Optical:</b>	
All Ports	+16 dBm
<b>Maximum Reverse Power:</b>	
SRC OUT	+17 dBm

**NOTE** Refer to your PNA-X specifications to determine the maximum input power levels for the access and test ports, or to optimize the power levels in the receivers.

**NOTE** Damage and maximum levels are not necessarily the optimum level.

## Remote Converter Performance

Specifications for the Remote Converter are nominal and are intended as non-warranted information. This information is provided as reference material only.

**NOTE** Nominal specifications are based on 1 to 2 unit's performance. Refer to [Table 4](#), [Table 5](#), [Table 6](#) and [Table 8](#) on page 13.

**Table 4 RF Performance 1TR**

Description	10 MHz to 26.5 GHz	26.5 GHz to 50 GHz
REF <> TEST RCVR ISOLATION S21 <sup>1</sup>	≤ 80 dB	≤ 60 dB
RF IN to REF RCVR SRC OUT S21 <sup>2</sup>	≥ -20 dB	≥ -20 dB
RF IN to TEST RCVR CPLR ARM S21 <sup>2</sup>	≥ -25 dB	≥ -25 dB
TEST PORT to CPLR THRU S21	≥ -3 dB	≥ -3 dB
J1 RF IN to SRC OUT S21	≥ -2 dB	≥ -3 dB
SRC OUT MATCH S11	≤ 10 dB	≤ 5 dB
REF RCVR IN MATCH S22	≤ 8 dB	≤ 5 dB
TEST RCVR IN MATCH S22	≤ 8 dB	≤ 5 dB

1. ≤ 50 dB @ 10 MHz to 2.5 GHz.

2. Frequencies below 500 MHz are not characterized due to the coupler roll off of the Test and Ref coupler.

**Table 5 RF Performance 1SR**

Description	10 MHz to 26.5 GHz	26.5 GHz to 50 GHz
J1 RF IN to Test Port	≤ -3 dB	TDB
J1 RF IN to Match	≤ 8 dB	TBD
J1 RF OUT to Match	≤ 8 dB	TBD

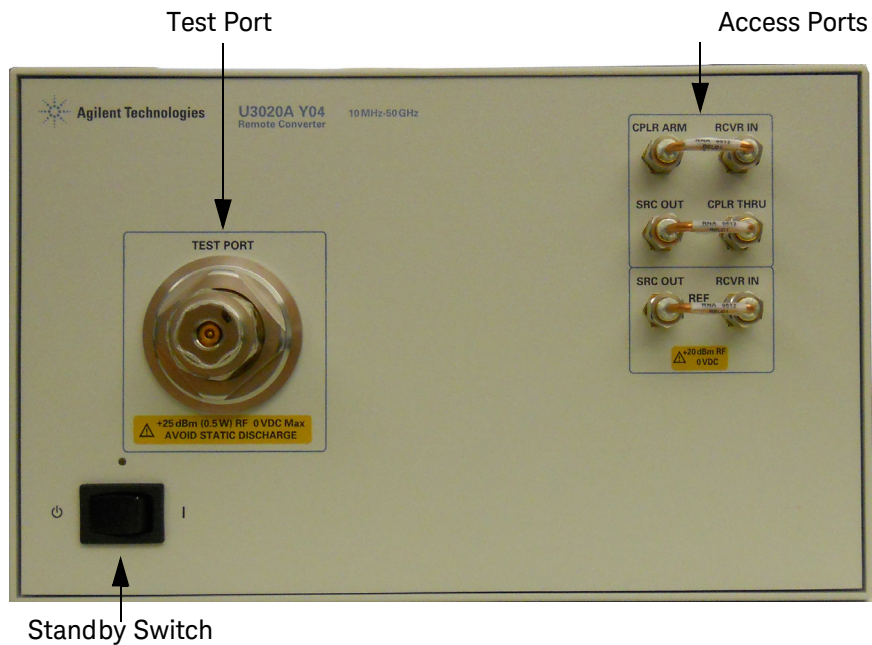
**Table 6 Optical Performance**

Description	Response
REF/TEST Optical Link Power	≥ 3.0 mW
SRC Optical Link Wavelength	1480 to 1620 nm (SMF)
REF Optical Link Wavelength	1550 nm (SMF)
TEST Optical Link Wavelength	1550 nm (SMF)
USB Optical Link Power	≥ 0.1 mW
USB Optical Link Power	1300 nm (SMF)

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## Front and Rear Panel Features

Figure 2 U3020AY04 Front Panel



### Test Port – (male)

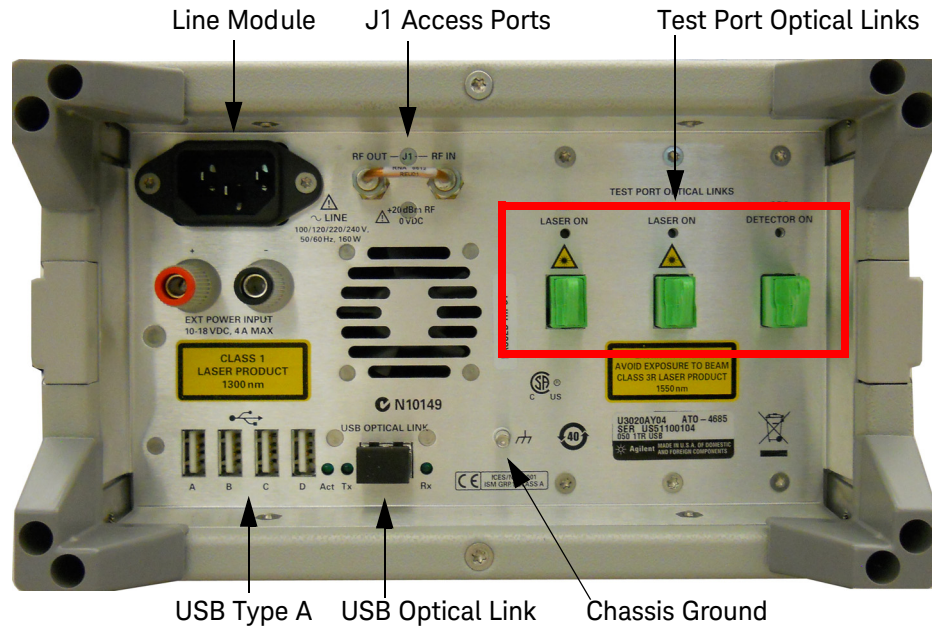
### Access Ports – (female)

- TEST CPLR ARM, delete from Option 1SR
- TEST RCVR IN, delete from Option 1SR
- TEST SRC OUT, delete from Option 1SR
- CPLR THRU, delete from Option 1SR
- REF RCVR IN
- REF SRC OUT

### Standby Switch

This switch is Standby only, not a line switch.

Figure 3 U3020AY04 Rear Panel



### Line Module

The line module is used for connection to the premise electrical system.

**WARNING** 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** Verify that the premise electrical voltage supply is within the range specified on the instrument.

### J1 Access Ports (female)

- RF OUT
- RF IN

### Test Port Optical Links - E2000/APC - Class 3R Laser

- REF (IN)
- SRC (OUT)
- TEST (OUT), delete from Option 1SR

### **Chassis Ground**

A threaded terminal post for connecting the Remote Converter to a conductive object, cabinet or structure to ensure a common potential and reduce leakage current in a system. Requires a metric M4 nut (0535-0023) with lock washer (2190-0646) or M4 nut with an integrated washer (0535-0082).

### **Test Port Optical Link LEDs**

- **REF** - Optical port Status, On or OFF, (8 second time delay)
- **SRC** - Optical port Status, On or OFF
- **TEST** - Optical port Status, On or OFF (8 second time delay), delete from Option 1SR.

### **USB Optical Links - DUAL LC/PC - Class 1 Laser**

### **USB Type A, Supports USB 2.0**

### **USB Optical Link LEDs**

- **Act** - USB optical port is active
- **Tx** - USB optical port is transmitting
- **Rx** - USB optical port is receiving

### **Power Cords**

A line power cord is supplied in one of several configurations, depending on the destination of the original shipment. Keysight can supply additional certified power cords to meet region electrical supply and receptacle configurations. Please contact Keysight at: [www.Keysight.com](http://www.Keysight.com) for assistance in power cord selection.

### **EXT Power Input - Banana Jack**

Note that this input can only be used when no main power cord is disconnected.

### Optical Interface Cable Connections

Figure 4 illustrates the fiber optic cable configuration between the Remote Converter to the Local Converter. The fiber optic cables have been supplied with the Remote Converter.

#### Option 1TR & 1SR

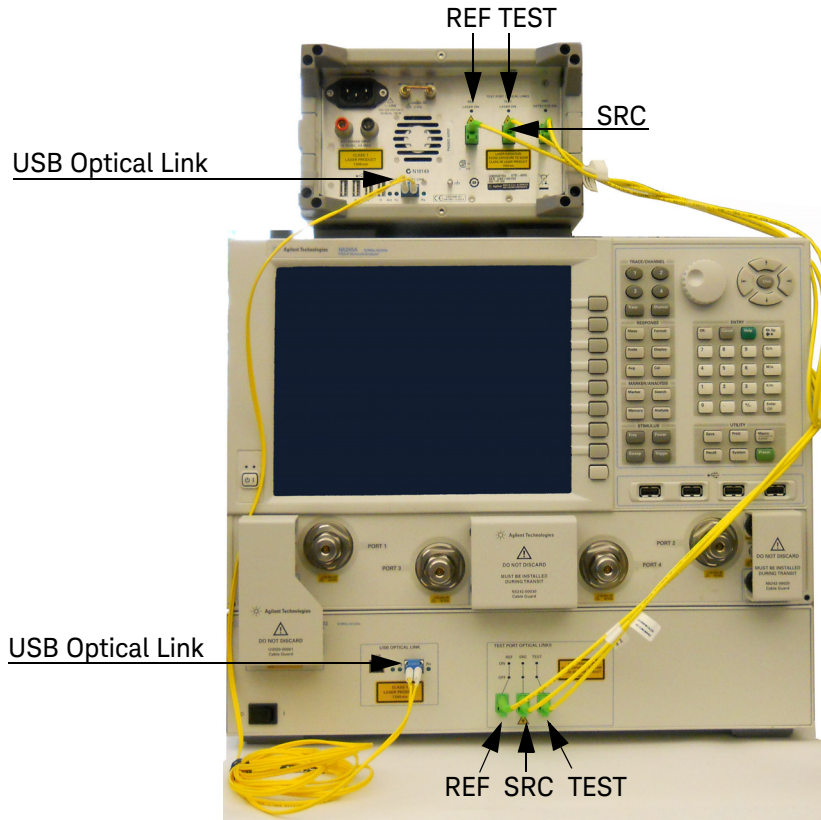
1. Connect the Optical interconnect cables from the Local Converter to the Remote Converter in the order listed. As you are connecting each cable, ensure the E2000 optical cables are locked to the converters.

**Table 7** Optical Interface Cable Connections (Option 1TR)

Numeric Order	Optic Cables	From: Option Y04	To: Option Y03
1	U3020-20149	SRC	SRC
2	U3020-20149	REF	REF
3 <sup>1</sup>	U3020-20149	TEST	TEST
4	U3020-20146	USB	USB

1. Option 1SR delete line 3 in the Numeric Order column.

**Figure 4** U3020AY04 to U3020AY03 Connections



## Using the U3020AY04 with a PNA-X and U3020AY03

This section will describe how to operate the Remote Converter with the PNA-X and Local Converter. Refer to your U3020AY03 Local Converter documentation (U3020-90008) for setup and configuration information.

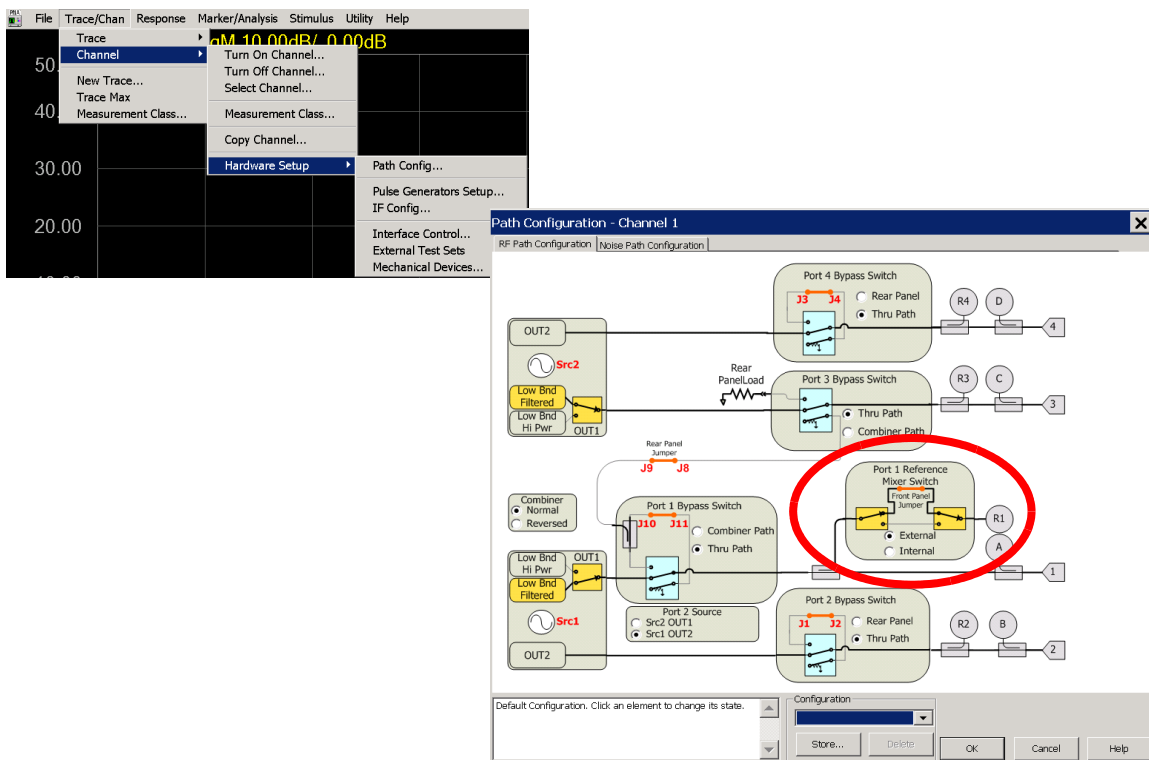
**CAUTION** Before switching on this instrument, make sure the supply voltage is in the specified range of the instrument.

**CAUTION** This instrument has auto-ranging line voltage input, be sure the supply voltage is within the specified range.

### Setup of Port 1 REF RCVR for Remote Mode

1. On the PNA-X select **Channel > Hardware Setup > Path Config...**
2. This configuration can be saved by selecting Store and naming the configuration.

Figure 5 Port 1 Reference Mixer Switch





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## Operational Check

This operational check is to confirm the Remote Converter and PNA-X performance. The operation verification limits provided ensure that your Remote Converter and PNA-X are operating properly. Refer “[Non-RF Failures](#)” on [page 26](#) to ensure the Remote Converter is working correctly before returning it for repairs.

### Verification Limits

Specifications for the Remote Converter are typical. System performance for the PNA-X and Remote Converter are only characteristic and intended as non-warranted information. A functional certificate is provided for the Remote Converter only.

It is recommended that you return your instrument to Keysight Technologies for servicing or repair if the Remote Converter and PNA-X performance exceed the operational verification limits. A periodic calibration is not required. The Operators Check should be performed after System Setup, or if performance is in question.

**Table 8**      **Operational Verification Limits**

Description	10 MHz to 26.5 GHz	26.5 GHz to 50 GHz
TEST REF RF IN to RF OUT S21 <sup>1</sup>	≥ -30 dB	≥ -35 dB

1. Frequencies below 500 MHz are not characterized due to the coupler roll off of the Test and Ref coupler.

## Equipment Required

The Keysight U3020AY04 requires that the user be familiar with the equipment listed and how to perform a full 2-Port calibration with the PNA-X.

**Table 9**      **Equipment List**

Description	Qty
<b>Option 026:</b>	
N5242A or E8362C Network Analyzer (26.5 GHz)	1
N4691B 3.5 mm Ecal Module female to female)	1
RF Cables (3.5 mm male connectors)	2
3.5 mm Short (female)	1
<b>Option 050:</b>	
N5242A or E8364C Network Analyzer (50 GHz)	1
N4693A 2.4 mm Ecal Module (female to female)	1
RF Cables (2.4 mm male connectors)	2
2.4 mm Short (female)	1
<b>All Options:</b>	
E2000/APC to E2000/APC Optical Cable	1
N1914A EMP Power Meter	1
E4413A E Series Power Sensor	1

## Operational Check Procedure

Install the instrument so that the detachable power cord is readily identifiable and is easily reached by the operator.

The sequence of this procedure is very important and must be followed or the performance accuracy and results may vary from the reference plots provided. The Operator's Check verifies that the Remote Converter is operational is used for a confidence test only.

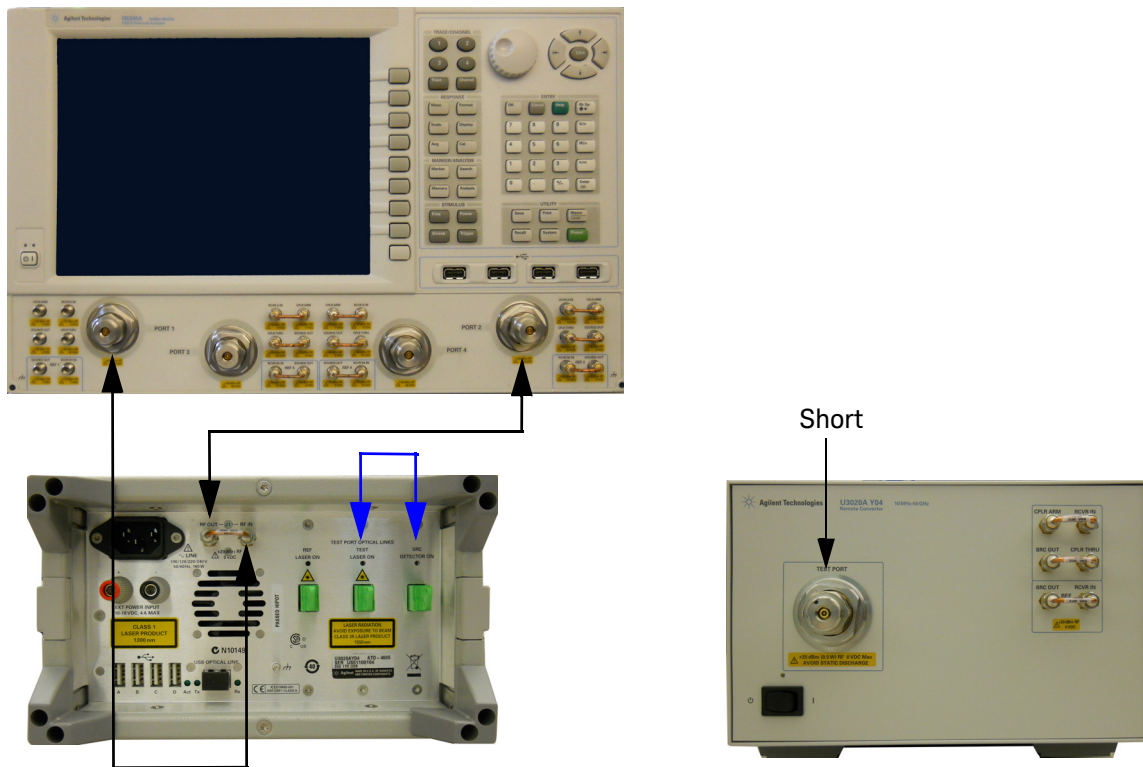
### Preparing the N5242/44/45A

1. Turn on the Remote Converter.
2. Select [**Preset**].
3. Select **Response** > **Avg** > **IF Band width** > **1 kHz** > **OK**.
4. Select **Stimulus** > **Power** > **Power**, enter **-5 dBm**.
5. Select **Stimulus** > **Sweep** > **Number of Points**, **401**.
6. Connect the ECal module to an available PNA-X USB port on the front or rear panel.
7. Allow the Remote Converter and PNA-X to warm up for a minimum of 30 minutes.
8. Perform a power calibration at the end of the reference cable on Port 1 of the PNA-X. Select **Cal** > **Power Cal** > **Source Cal**.
9. Perform a full 2-Port calibration.

### Procedure 1TR & 1SR

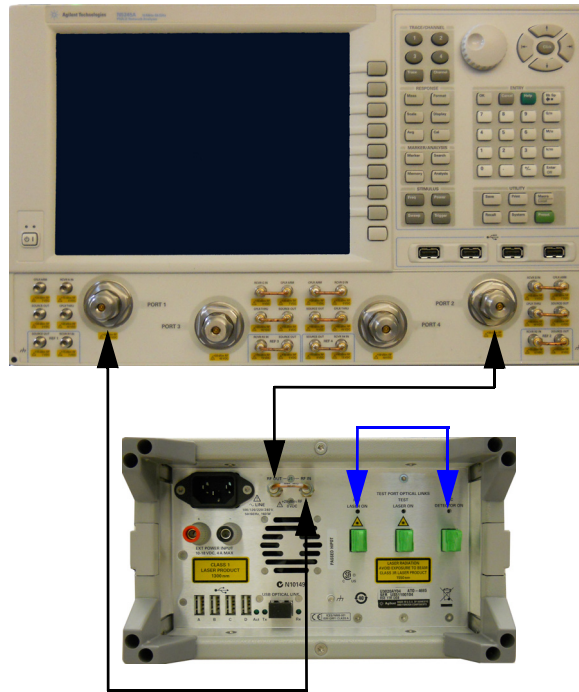
1. Connect the PNA-X Port 1 to the Remote Converter's RF IN and PNA-X Port 2 to the Remote Converter's RF OUT. For Option 1SR proceed to **step 5**.
2. Connect the E2000 fiber optic cable from the SRC and TEST optical ports on the rear panel of the Remote Converter.
3. Connect a Short to the TEST PORT.
4. Measure the S21 S-Parameter for TEST path RF IN to RF OUT. Refer to **Table 8 on page 13** and **Figure 8 on page 17**.

**Figure 6** Operational Check Test



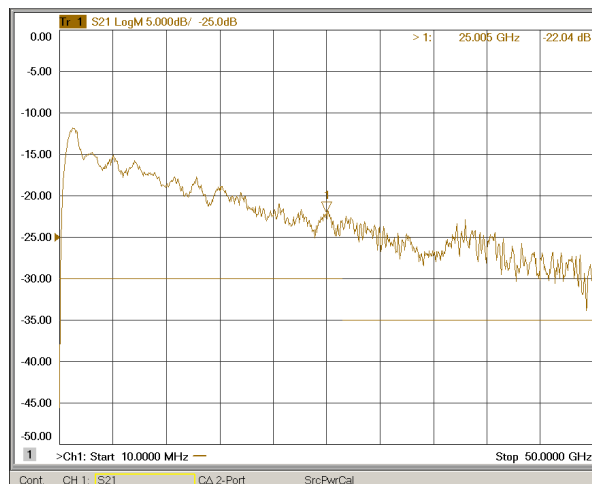
5. Connect the E2000 fiber optic cable from SRC to REF optical ports on the rear panel of the Remote Converter as shown in **Figure 7**.
6. Measure the S21 S-Parameter for the REF path RF IN to RF OUT. Refer to **Table 8 on page 13** and **Figure 8**.

**Figure 7** Operational Check Reference



7. Normalize the S21 response.
8. Reconnect the E2000 fiber optic cable from the Remote Converter's SRC and TEST optical ports.

**Figure 8** TEST-REF RF IN to RF OUT S21



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## Laser Safety Information

### Class 1

- Wavelength: 1300 nm
- Power: < 1.0 mW Max

The Class 1 Laser produces invisible radiation in the 1300 nm range. The power level and classification are in compliance to IEC 60825-1:2007.

**NOTE**

The Class 1 Laser is safe to operate under reasonably foreseeable conditions. The user of this instrument is expected to have experience in safely operating products containing lasers.

---

**Figure 9** Class 1 Laser Label



### Class 3R

The U3020AY04 contains two Class 3R Lasers. The operation of the Class 3R laser takes place after an 8 second time delay when the rear panel Standby switch is placed from Standby to ON. After 8 seconds, the REF and TEST LEDs on the TEST PORT OPTICAL LINKS will switch from OFF (amber) to ON (green), the SRC LED is ON (green). Should the indicating light fail to either energize ON or OFF the instruments should be removed from service and returned to Keysight for repairs. The indicating lights are used to advise the operator that power has been applied to the lasers and they are now operable.

- Wavelength: 1550 nm
- Power: < 25 mW Max

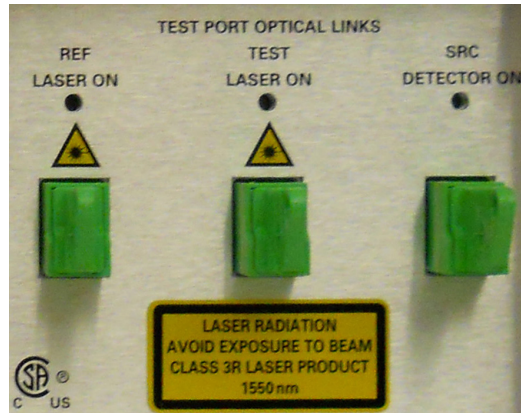
The Class 3R Laser produces invisible radiation in the 1550 nm range. The power level and classification are in compliance to IEC 60825-1:2007.

**Figure 10** Class 3R Laser Label



The Class 3R Laser utilizes spring loaded attenuator, or shutter stops to effectively terminate laser radiation when the optical interface cables are inserted and removed. When the interface cables are removed the attenuators stop are designed to snap into the closed position, effectively terminating the laser radiation. Should a spring fail the shutter is designed to gravity close. In the event the attenuator, or shutter stop fails to snap into the closed position, the instrument should be removed from service and immediately returned to Keysight for service.

**Figure 11 Shutter Stop**

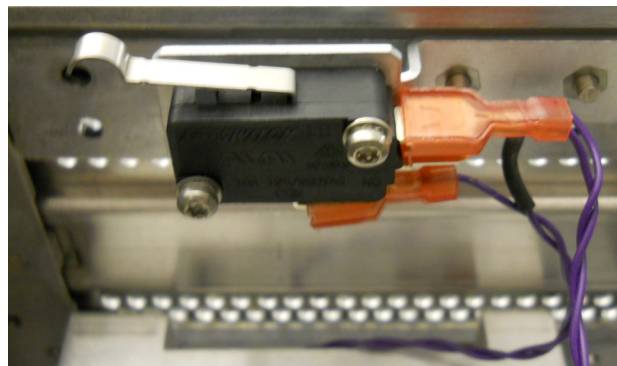


The installation of the lasers resulted in interlocks attached to the top and bottom covers on the instrument to protect the user in the event the fiber cable were to become severed from the rear panel connector, or attenuator stop. Removal of the top or bottom cover will de-energize the instrument to Standby and remove power from both Class 3R Lasers.

**Figure 12 Class 3R Interlock Label**



**Figure 13 Interlock - Top and Bottom Covers**



## Service Information

The U3020AY04 Remote Converter contains a safety interlock to prevent removal of an instrument panel or cover, and allow the Class 3R Lasers to remain in operation should a fiber connection fail internal to the instrument. The interlock is arranged internal to the instrument chassis and in positive contact with the instrument's top cover. Should the top cover be removed while the instrument's front panel switch is in the ON position the lasers will be de-energized. If the front panel switch is in the Standby position the Class 3R Lasers will remain OFF. The interlock switch is a positive engagement switch. In the event the spring loading is lost, the switch will remain in the "failed" position and the Class 3R Lasers de-energized. The instruments should be removed from service and returned to Keysight for repairs. Refer to ["Regulatory Information" on page 29](#).

The U3020AY04 contains two Class 3R Lasers that require that the top and bottom covers be equipped with the required interlock switch. The bottom cover interlock provides the same function as the top cover. Defeating the interlock and placing the front panel switch from Standby to ON will result in the Class 3R Lasers becoming energized.

The U3020AY03 contains a single Class 3R Laser that requires that the top cover be equipped with the required interlock switch. Defeating the interlock and placing the front panel switch from Standby to ON will result in the Class 3R Laser becoming energized.

Refer to ["Contacting Keysight" on page 32](#).

---

**WARNING** No user serviceable parts. The opening of covers or removal of parts is likely to expose the user to hazardous voltages. Refer all servicing to qualified personnel.

---

**WARNING** These servicing instructions are for use by qualified personnel only. To avoid electrical shock, do not perform any servicing unless you are qualified to do so.

---

## Electrostatic Discharge Protection

Electrostatic discharge (ESD) can damage or destroy electronic components. The product is shipped in materials that prevent damage from static, and should only be removed from the packaging in an anti-static area ensuring that the correct anti-static precautions are taken.

Two types of ESD protection are listed below. Purchase acceptable ESD accessories from your local supplier.

- Conductive table-mat and wrist-strap combination
- Conductive floor-mat and heel-strap combination

Both types, when used together, provide a significant level of ESD protection. To ensure user safety, static-safe accessories must provide at least 1 M $\Omega$  of isolation from ground.

---

**WARNING** These techniques for a static-safe work station should not be used when working on circuitry with a voltage potential greater than 500 volts.

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## Theory of Operation

The following is a description of the operation of the Remote Converter. Reference the Remote Converter block diagrams beginning on [page 21](#). This section assumes the user has a general understanding of RF/microwave components.

### Electrical to Optical (E/O) Path

The Remote Converter has two optical modulators that connect to two CW 1550 nm lasers that provide the optical carrier signals for REF and TEST transmission. The Remote Converter's REF and TEST microwave/RF signals are modulated onto the optical carrier on separate optical fibers.

### Optical to Electrical (O/E) Path

The Remote Converter also receives an optical signal through the SRC port. This optical signal is routed to the optical detector that demodulates the optical signal back to microwave/RF. This signal is amplified to provide the reference coupler and Test Port RF Source.

### REF Coupler (Option 1TR & 1SR)

The reference coupler (5086-7518) provides an external reference from the remote converter module.

### Test Port Coupler (Option 1TR)

The test port coupler (5086-7658) provides signal stimulation to the DUT and internal test receiver.

### Optical Modulator

The optical modulator (U3020-80017) modulates a microwave/RF signal onto an optical carrier.

### Optical Detector

The optical detector (U3020-80018) demodulates the microwave/RF signal from the optical carrier.

### Laser

The laser (U3020-80015) provides the optical carrier.

### Power Supply

The power supply (0950-5376) converts the AC line voltages to DC. The AC line voltage (100 to 240 V @ 50/60 Hz) is provided from the line module on the rear panel. The power supply  $\pm 12$  Vdc will be used to bias the two amplifiers used in the Remote Converter.

## Interface Board

The Interface board (U3020-63139) provides the biasing for the amplifiers, optical modulators, lasers, optical detectors, and modulator, laser, and LED PCAs.

## Laser Board

The Modulator Bias board (U3020-80016) provides the bias to the Laser (U3020-80015).

## Modulator Bias Board

The Modulator Bias board (U3020-80017) provides the bias to the optical modulator (U3020-80014).

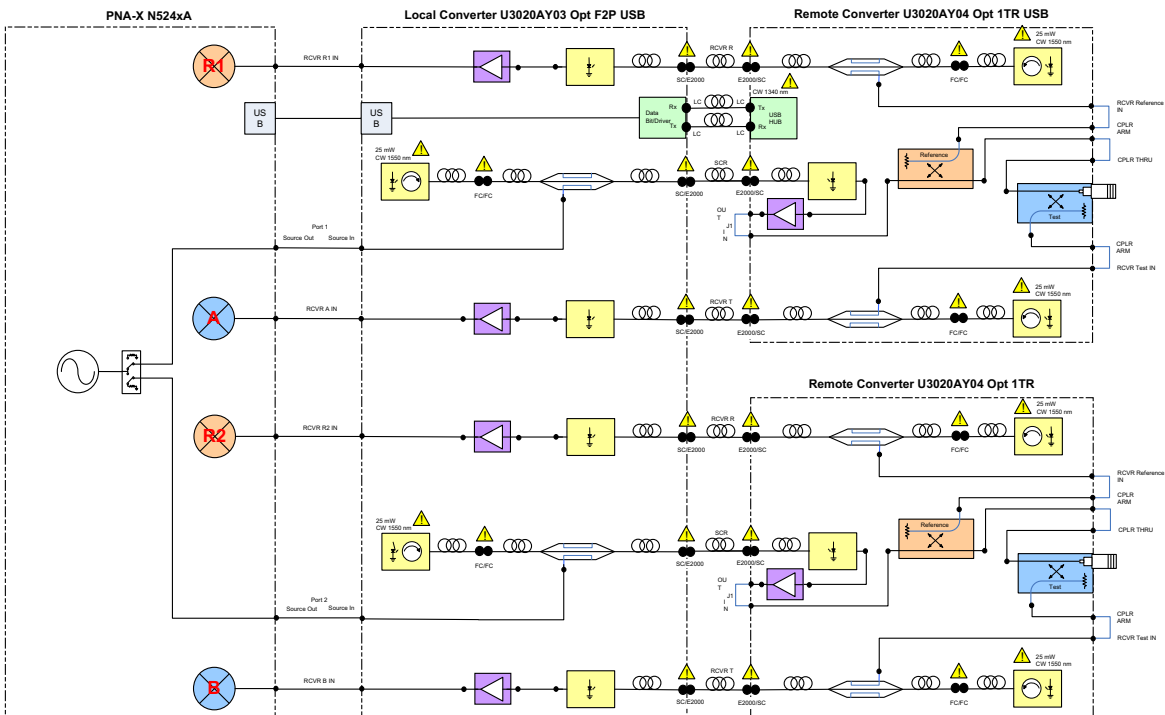
## LED Board

The LED board provides the indicator status of the Optical Ports.

## Option USB

The USB option provides a USB HUB to connect USB peripherals from a remote USB fiber bit driver.

Figure 14 Options Y04 & Y03 with N5242A F2P System Block Diagram



U3020AY04  
Theory of Operation

Figure 15 Options Y04 & Y03 with N5242A F1P System Block Diagram

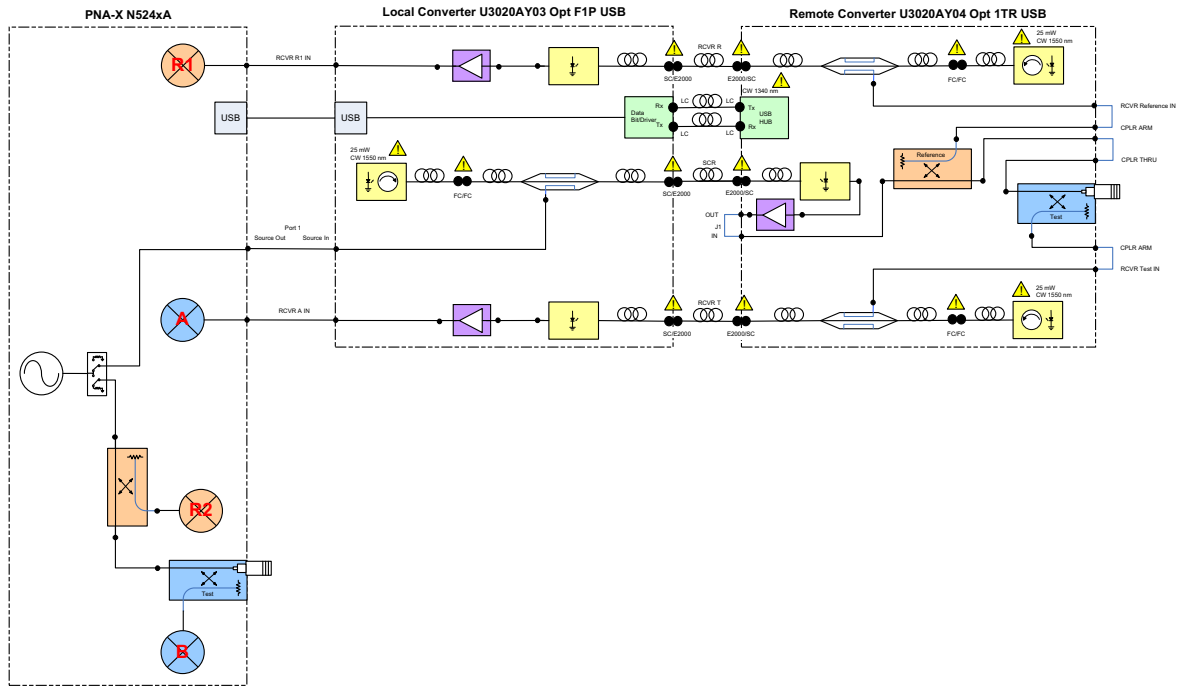
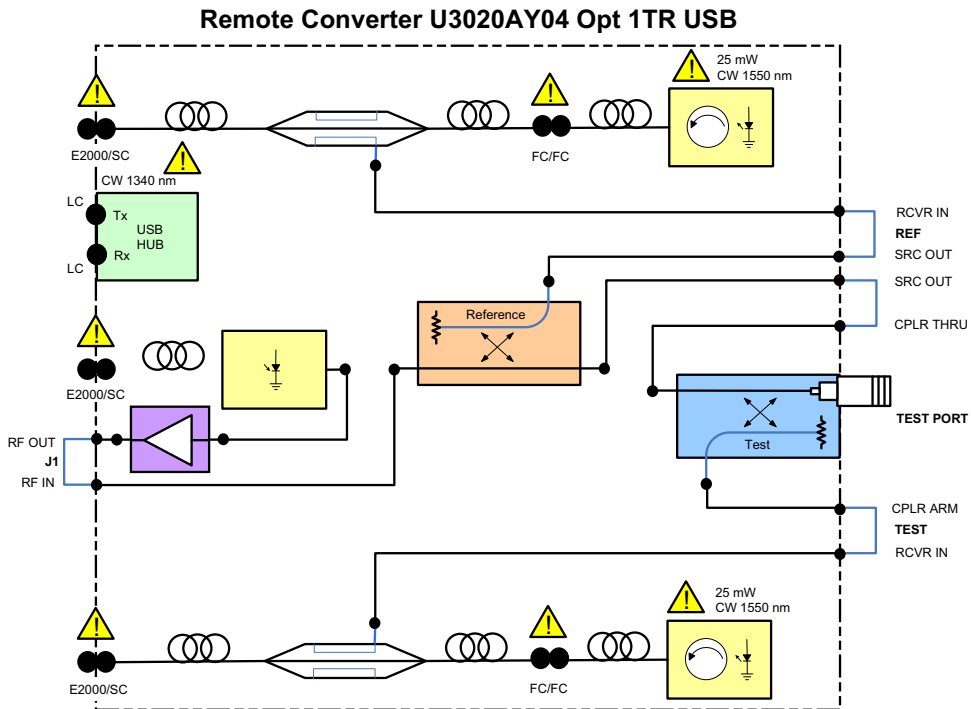


Figure 16 U3020AY04 1TR Block Diagram



U3020AY04  
Theory of Operation

Figure 17 Options Y04 & Y03 with N5242A F2P 1TX/1RX System Block Diagram

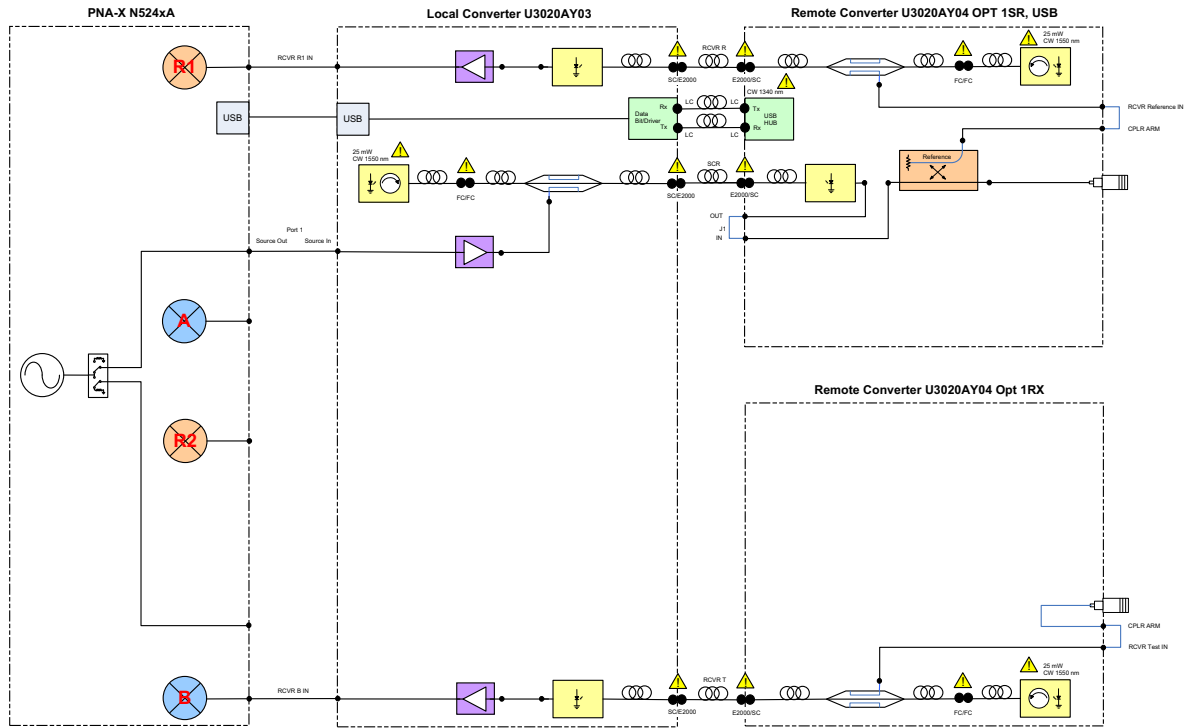


Figure 18 U3020AY04 1TX Block Diagram

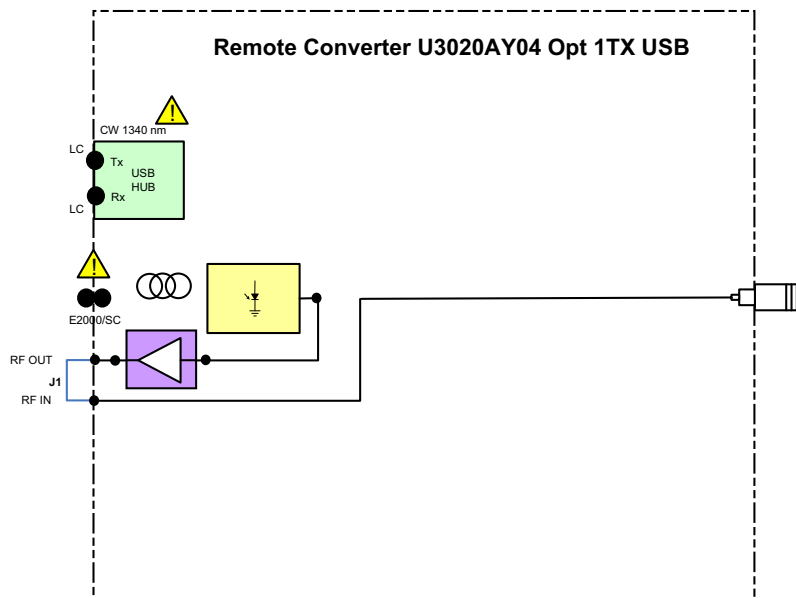


Figure 19 U3020AY04 1RX Block Diagram

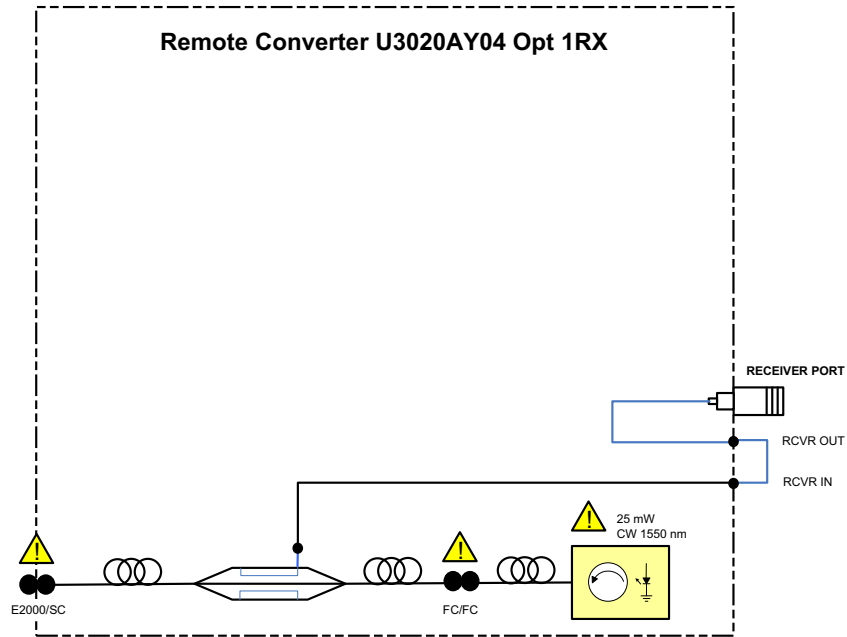
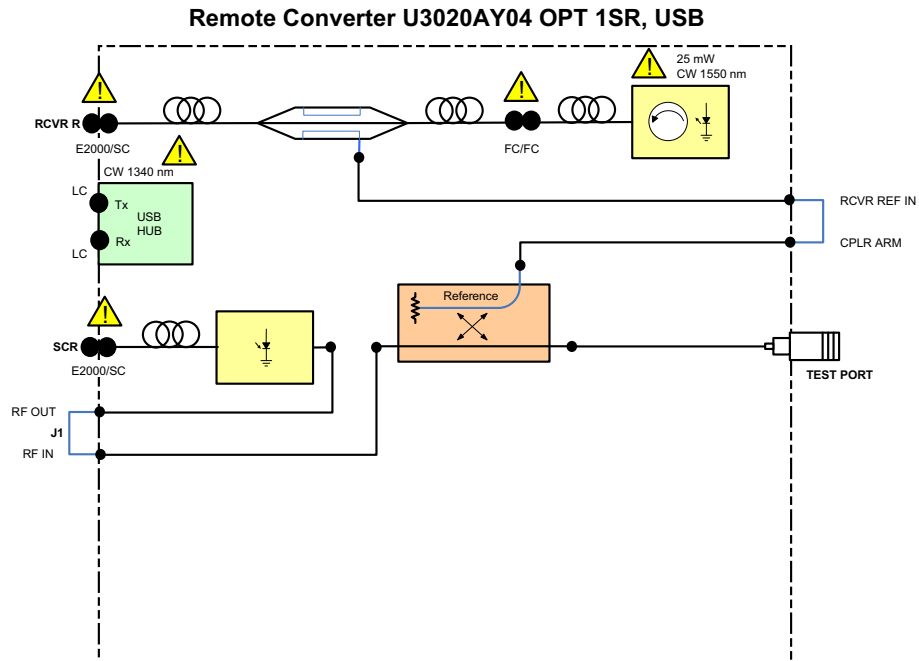


Figure 20 U3020AY04 1SR Block Diagram



## Troubleshooting

If the U3020AY04 is not operating properly, use the following procedures to isolate and repair the failure.

Refer to the Keysight PNA Series: Service & Support Home Page at: <http://na.keysight.com/pna> for further information.

To request service, please contact your local service center. In the US, call 800-829-4444. For a listing of service centers world wide, please visit us at [www.keysight.com/find/service](http://www.keysight.com/find/service). Refer to “Shipping Your Instrument to Keysight for Service or Repair” on page 32.

Refer to the following procedures for type of problem encountered. It is recommended that a qualified service technician perform the following procedures.

### **WARNING**

**No operator serviceable parts inside. Refer servicing to qualified personnel. To prevent electrical shock do not remove covers.**

---

## Non-RF Failures

1. Verify that the front panel Power Switch is operational.
2. AC line voltage checks (remove AC power from the instrument).
  - a. Ensure the proper AC line voltage is present at the instrument line cord.
  - b. Remove the AC power cord from the instrument. Confirm the instrument AC line module fuse is operational. See [Figure 3 on page 9](#).
  - c. Set the front panel switch to the Standby position. The fans (power supply and instrument) are Off.
  - d. Set the Standby Switch to the On position. The fans (power supply and instrument) are operational.

## Safety and Regulatory Information

### Introduction

Review this product and related documentation to familiarize yourself with safety markings and instructions before you operate the instrument.

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.

### Safety Earth Ground

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

---

**CAUTION** Always use the three prong AC power cord supplied with this product. Failure to ensure adequate earth grounding by not using this cord may cause product damage and the risk of electrical shock.

---

### Statement of Compliance

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.

### Connector Care and Cleaning Precautions

Remove the power cord to the instrument. To clean the connectors use alcohol in a well ventilated area. Allow all residual alcohol moisture to evaporate, and fumes to dissipate prior to energizing the instrument.

**WARNING** To prevent electrical shock, disconnect the **U3020AY04** from mains electrical supply before cleaning. Use a dry cloth or one slightly dampened with water to clean the external case parts. Do not attempt to clean internally.

---

**WARNING** If flammable cleaning materials are used, the material shall not be stored, or left open in the area of the equipment. Adequate ventilation shall be assured to prevent the combustion of fumes, or vapors.

---

## Before Applying Power

Verify that the premises electrical supply is within the range of the instrument. The instrument has an autoranging power supply.

**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.

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**CAUTION** Always use the three prong AC power cord supplied with this product. Failure to ensure adequate earth grounding by not using this cord may cause product damage and the risk of electrical shock.

---

**CAUTION** This product is designed for use in Installation Category II and Pollution Degree 2.

---

**CAUTION** Verify that the premise electrical voltage supply is within the range specified on the instrument.

---

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

---

**WARNING** These servicing instructions are for use by qualified personnel only. To avoid electrical shock, do not perform any servicing unless you are qualified to do so.

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**WARNING** The opening of covers or removal of parts is likely to expose the user to dangerous voltages. Disconnect the instrument from all voltage sources before opening.

---

**WARNING** This product is designed for use in Installation Category II and Pollution Degree 2.

---

**WARNING** No operator serviceable parts inside. Refer servicing to qualified personnel.

---

**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.

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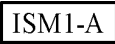







**WARNING** The detachable power cord is the instrument disconnecting device. It disconnects the mains circuits from the mains supply before other parts of the instrument. The rear panel switch is only a standby switch and is not a LINE switch (disconnecting device).

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## Regulatory Information

This section contains information that is required by various government regulatory agencies.

Symbol	Description
	The instruction documentation symbol. The product is marked with this symbol when it is necessary for the user to refer to the instructions in the documentation.
	This symbol indicates that the instrument requires alternating current (ac) input.
	This symbol indicates separate collection for electrical and electronic equipment, mandated under EU law as of August 13, 2005. All electric and electronic equipment are required to be separated from normal waste for disposal (Reference WEEE Directive, 2002/96/EC).
	This symbol indicates that the power line switch is ON.
	This symbol indicates that the power line switch is in the STANDBY position.
	This symbol indicates that the power line switch is in the OFF position.
	This symbol is used to identify a terminal which is internally connected to the product frame or chassis.
	The CE mark is a registered trademark of the European Community. (If accompanied by a year, it is when the design was proven.)
	The CSA mark is a registered trademark of the CSA International. This instrument complies with Canada: CSA 22.2 No. 61010-1-04.
	This is a symbol of an Industrial Scientific and Medical Group 1 Class A product.
	This is a marking to indicate product compliance with the Canadian Interference-Causing Equipment Standard (ICES-001).
	Direct Current.
	Laser Class 1 label denoting the wavelength.
	Class 3R Laser warning label. Denoting invisible laser radiation and wavelength.
	Laser Class 3R warning interlock label. Do not defeat interlock.
	Laser Radiation
	The instrument has been designed to meet the requirements of IP 2 0 for egress and operational environment.

U3020AY04  
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Symbol	Description
	The RCM mark is a registered trademark of the Australian Communications and Media Authority
	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.
	South Korean Certification (KC) mark; includes the marking's identifier code which follows the format: MSIP-REM-YYY-ZZZZZZZZZZZZZZ.

**EMC:** Complies with the essential requirements of the European EMC Directive as well as current editions of the following standards (dates editions are cited in the Declaration of Conformity):

- IEC/EN 61326-1
- 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.

**South Korean Class A EMC Declaration:** This equipment is Class A suitable for professional use and is for use in electromagnetic environments outside of the home.

A 급 기기 ( 업무용 방송통신기자재 ) 이 기기는 업무용 ( A 급 ) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며 , 가정외의 지역에서 사용하는 것을 목적으로 합니다 .

**SAFETY:** Complies with the essential requirements of the European Low Voltage Directive as well as current editions of the following standards (dates and editions are cited in the Declaration of Conformity):

- IEC/EN 61010-1
- Canada: CSA C22.2 No. 61010-1
- USA: UL std no. 61010-1

**Acoustic Statement:** (European Machinery Directive):

- Accoustical noise emission  
LpA<70 dB  
Operator position  
Normal operation mode Per ISO 7779

**Declarations of Conformity:** To find a current Declaration of Conformity for specific Keysight product, go to: <http://regulations.about.keysight.com/DoC/search.htm>

## Keysight Support and Services

There are many other repair and calibration options available from the Keysight Technologies support organization. These options cover a range of service agreements with varying response times. Contact Keysight for additional information on available service agreements for this product.

### Contacting Keysight

To contact Keysight for sales and technical support, refer to support links on the following Keysight websites: <http://www.keysight.com/find> (product specific information and support, software and documentation updates) <http://www.keysight.com/find/assist> (world wide contact information for repair and service).

In any correspondence or telephone conversation, refer to the Keysight product by its model number and full serial number. With this information, the Keysight representative can determine the warranty status of your unit.

### Shipping Your Instrument to Keysight for Service or Repair

**IMPORTANT** Keysight Technologies reserves the right to reformat or replace the internal hard disk drive in your analyzer as part of its repair. This will erase all user information stored on the hard disk. It is imperative, therefore, that you make a backup copy of your critical test data located on the analyzer's hard disk before shipping it to Keysight for repair.

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If you wish to send your instrument to Keysight Technologies for service or repair:

- Include a complete description of the service requested or of the failure and a description of any failed test and any error message.
- Ship the analyzer using the original or comparable antistatic packaging materials.
- Contact Keysight for instructions on where to ship your analyzer.





This information is subject to change without notice.

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[www.keysight.com](http://www.keysight.com)