

# **Agilent Technologies U3042AE16**

## **User's and Service Guide**

**Use this manual with the following documents:  
PNA Series Network Analyzer On-line Help System**



**Agilent Technologies**

**Manufacturing Part Number: U3042-90012**

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## Safety Notes

The following safety notes are used throughout this document. Familiarize yourself with each of these notes and its meaning before performing any of the procedures in this document.

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**WARNING**      **Warning denotes a hazard. It calls attention to a procedure which, if not correctly performed or adhered to, could result in injury or loss of life. Do not proceed beyond a warning note until the indicated conditions are fully understood and met.**

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**CAUTION**      Caution denotes a hazard. It calls attention to a procedure that, if not correctly performed or adhered to, could result in damage to or destruction of the instrument. Do not proceed beyond a caution sign until the indicated conditions are fully understood and met.

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## Definitions

- *Specifications* describe the performance of parameters covered by the product warranty (temperature 0 to 40 °C, unless otherwise noted.)
- *Typical* describes additional product performance information that is not covered by the product warranty. It is performance beyond specification that 80% of the units exhibit with a 95% confidence level over the temperature range 20 to 30 °C. Typical performance does not include measurement uncertainty.
- *Nominal* values indicate expected performance or describe product performance that is useful in the application of the product, but is not covered by the product warranty.
- *Characteristic Performance* describes performance parameter that the product is expected to meet before it leaves the factory, but is not verified in the field and is not covered by the product warranty. A characteristic includes the same guard bands as a specification.



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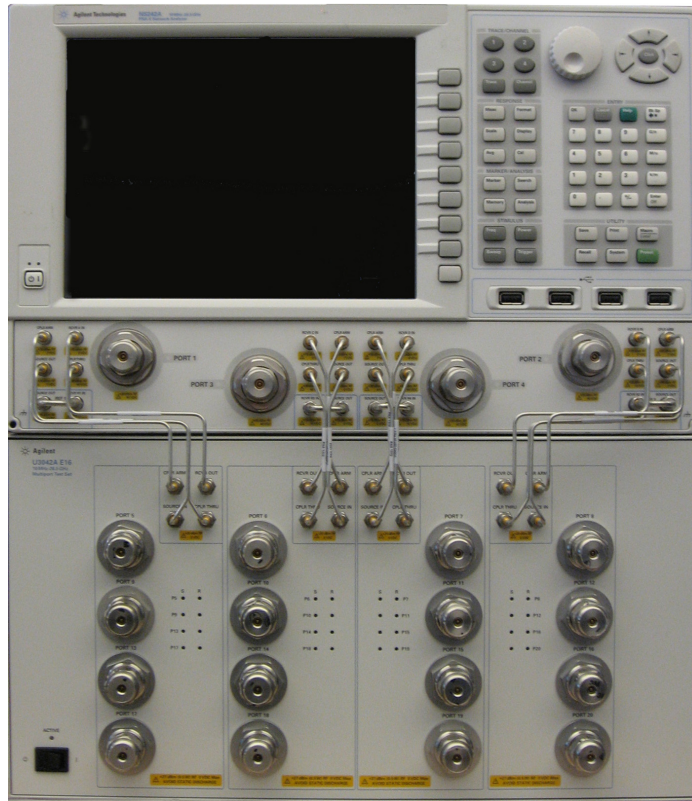
# **U3042AE16**

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## Introduction

This document describes how to use and service the U3042AE16 Multiport Extension Test Set with the Agilent 4-Port N5242A PNA-X for a 20-Port Network Analyzer solution.

**Figure 1 Front Panel N5242A with U3042AE16**





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## Description

The Agilent U3042AE16 is a 16-Port solid-state extension Test Set. The Test Set can be combined with a 4-Port N5242A (10 MHz to 26.5 GHz) PNA-X Network Analyzer through the front panel source outputs, receiver inputs and coupler access ports. With Option 551 in the PNA-X the analyzer provides a 20-Port calibration and full cross bar measurement capability.

The U3042AE16 is directly controlled by the network analyzer, no external personal computer or software is required.

The N5242A PNA-X Network Analyzer's will be referred to throughout this document as the PNA-X. The U3042AE16 will be referred to as the Test Set.

## Network Analyzer Requirements

- The network analyzer requires Option 551 (for N-Port error correction and multiport measurement capability).
- The N5242A PNA-X requires Option 400 to provide the test set interface connections and requires test set file u3042ae16\_pnax\_p4.tsx

The test set file must be installed into the PNA-X file directory:  
c:\Program Files\Agilent\Network Analyzer\testsets

- PNA-X Multiport Mode firmware revision:  
N5242A Option 551 ≥ A.09.22.07

More PNA information is available on the following websites:

- Documentation - <http://www.agilent.com/find/pna>
- Network Analyzer Firmware - <http://na.tm.agilent.com/pna/firmware/firmware.htm>
- U3042AE16 Test Set Files - <http://na.tm.agilent.com/multiport> (see test set files)

## Verifying the Shipment

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

Inspect the shipment. Keep the shipping container and packaging material until you have inspected the contents of the shipment for completeness and have verified the instrument mechanically and electrically. If there is physical damage refer to [“Contacting Agilent” on page 74](#). Keep the damaged shipping materials (if any) for inspection by the carrier and an Agilent Technologies representative.

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## Available Options

### Interface Option

The available Test Set cable options:

- U3021PX3 Option 442 (connects the 4-Port N5242A to the Test Set)

### Mounting Kits

Available Test Set cable options:

- U3021M Option 042 (Locking links for the Test Set to the N5242A, can be order separately).
- U3042AE16-1CP, Front Handle Kit (5063-9229)
- U3042AE16-1CM, Rack Mount Kit without Handles (5063-9216)
- U3042AE16-1CN, Rack Mount Kit with Handles (5063-9236)

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## General Specifications

Specifications for the Test Set (10 MHz to 26.5 GHz) are characteristic for the system performance of the PNA-X and the Test Set. Before using the PNA-X and Test Set a calibration is recommended for best measurement performance. Actual performance of the system is based on the customer's PNA-X and options that are used with the Test Set. A functional certificate is only offered for the Test Set.

When connected to a PNA-X, this Test Set will degrade the performance at the test ports. The internal switch paths reduce test port power and power to the receivers. This affects the test port power of the PNA-X and also reduces dynamic range. The reflection tracking values measured in the [“Operational Check” on page 40](#) can be subtracted from the analyzers dynamic range to determine the approximate performance of the system.

## Power Requirements

Verify that the required ac power is available before installing the Test Set to the PNA-X.

- 100/120/220/240 VAC (50/60Hz)
- The instruments 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 Test Set 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**

Instrument	Maximum Wattage
N5242A	450
U3042AE16	350

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**WARNING**      **This is a Safety Class I product (provided with a protective earthing 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.**

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## Environmental Requirements

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

### Environmental Tests

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

- Operating Environment (Indoor Use)
- Temperature (0 to 40 °C)
- Pressure Altitude (Operation)  
3,000 meters (~10,000 feet)
- The instrument can safely operate in a relative humidity of 80% for temperatures to 31 degrees C, decreasing linearly to 50% relative humidity at 40 degrees C.

### Equipment Heating and Cooling

If necessary, install air conditioning and heating to maintain the ambient temperature within the appropriate range. Air conditioning capacity must be consistent with the BTU ratings given in [Table 1](#).

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

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### Required Conditions for Accuracy Enhanced Measurement

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

### Dimensions and Space Requirements

Standard installation of the Test Set 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 Test Set.

**Table 2 Instrument Dimensions**

Model	Weight	Height	Width	Depth
U3042AE16	15 kg (30.8 lb)	23.2 cm (9.1 in)	42.9 cm (16.8 in)	52.4 cm (20.6 in)

## Maximum Power Levels

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**CAUTION** It is recommended that you do not operate components near damage levels (+27 dBm). The power levels must be 3 dB below maximum level to ensure no damage, see [Table 3](#).

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**Table 3 Power Levels**

<b>Maximum U3042AE16 Test Port RF Power Levels:</b>	
PORT 5-20	+27 dBm 0 Vdc
<b>Maximum U3042AE16 Access Ports:</b>	
SOURCE OUT	+20 dBm 0 Vdc
CPLR ARM	+20 dbm 0 Vdc
CPLR THRU	+20 dBm 0 Vdc
RCVR OUT	+20 dBm 0 Vdc
NOISE SOURCE IN/OUT	+20 dBm 0 Vdc

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**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.

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

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## Typical Reflection Tracking

Specifications for the Test Set are typical. System performance for the PNA-X and Test Set are only characteristic and are intended as non-warranted information.

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**NOTE** Typical specifications are based on 1 to 2 units performance. Refer to [Table 4](#) below, and [Table 9 on page 40](#).

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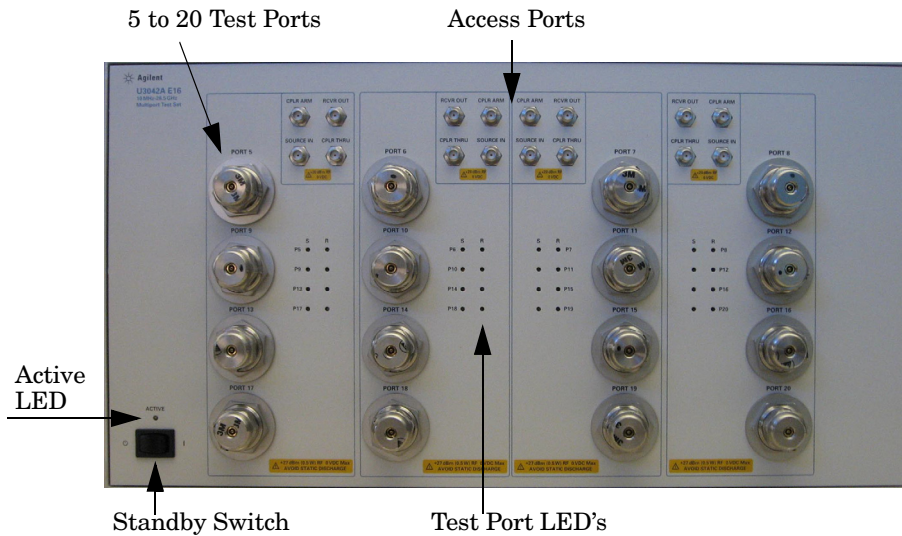
**Table 4** Typical Reflection Tracking

Frequency	Ports 1 - 4	Ports 5 - 20
10 MHz to 50 MHz <sup>1</sup>	-4	+21
50 MHz to 500 MHz <sup>1</sup>	-5	-5
500 MHz to 3.2 GHz	-7	-13
3.2 GHz to 10 GHz	-12	-18
10 GHz to 16 GHz	-15	-24
16 GHz to 20 GHz	-17	-28
20 GHz to 24 GHz	-21	-34
24 GHz to 26.5 GHz	-22	-40

1. Response from 10 MHz to 500 MHz is normal due to the PNA-X couplers in comparison to the Test Set bridges. The bridges have more gain in the coupled RF path.

## Front and Rear Panel Features

Figure 2 U3042AE16 Front Panel



### Test Ports – 3.5 mm Bulkhead (male)

- Port 5–20

### Access Ports – 3.5 mm (female)

- CPLR ARM
- SOURCE IN
- CPLR THRU
- RCVR OUT

### Test Port's LEDs

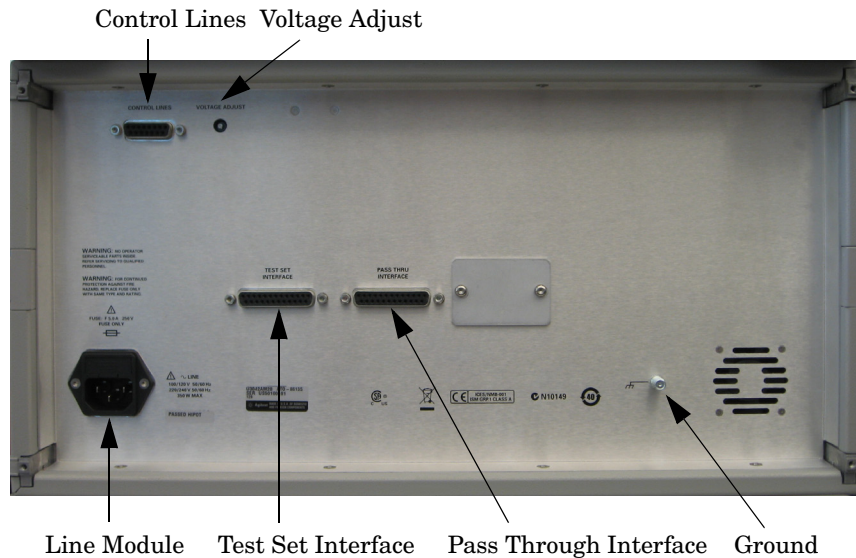
An illuminated LED indicates an active port in Source or Receiver mode. On the front panel “S” indicates Source test ports and “R” indicates Receiver test ports.

### Standby Switch

Note that this switch is Standby only, not a line switch. The main power cord can be used as the system disconnecting device. It disconnects the mains circuits from the mains supply.

### Active LED

When the Test Set is connected and addressed by a PNA-X, the LED is On (illuminated). The LED is Off (not illuminated) when the Test Set is in Standby, or not addressed by the PNA-X.

**Figure 3 U3042AE16 Rear Panel**

### Control Lines and Voltage Adjust

For further information pertaining to control lines and voltage adjustments see. Refer to [“DUT Control Lines” on page 32](#).

### Ground

Chassis ground is provided for ESD and safety connection.

### Pass Through Interface

The Pass Through Interface is used to connection to another test set.

### Test Set Interface

The Test Set Interface connector is used to send address and data to the Test Set from the PNA-X.

### Line Module

The line fuse, as well as a spare, reside within the line module. [Figure 4](#) illustrates where the fuses are located and how to access them.

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 front 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.



**Available Fuse**

- Fuse (F 5 A/250V, 2110-0709) UL listed and CSA certified.

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

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**Figure 4** Line Fuse



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

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## System Setup with N5242A

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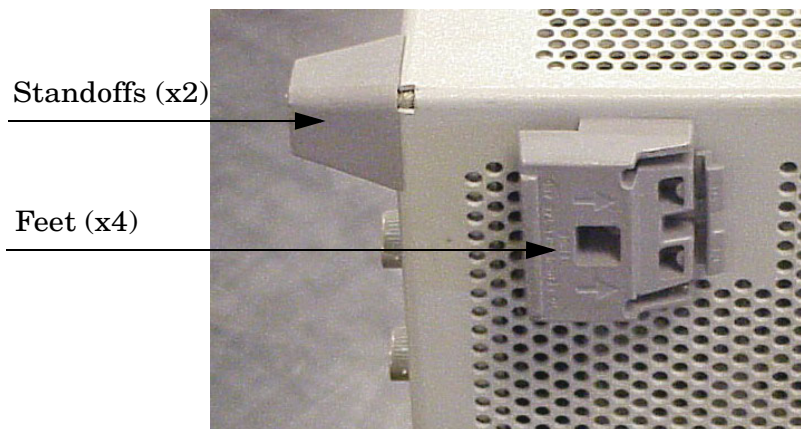
**WARNING** The opening of covers or removal of parts is likely to expose the user to dangerous voltages. Disconnect the instrument from all voltage sources while it is being opened.

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### Preparing the N5242A Network Analyzer

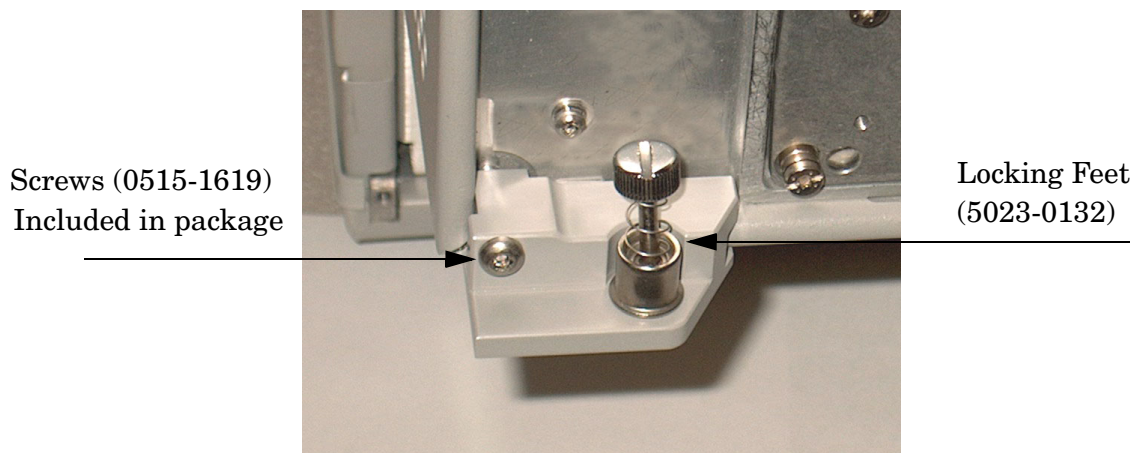
1. Remove the feet from the bottom of the PNA-X.
2. Remove the 2 lower standoffs and screws (0515-1619) from the rear panel on the PNA-X.

**Figure 5 Rear Bottom Feet**



3. Install the two rear locking feet (5023-0132) onto the PNA-X, using the included screws (0515-1619), where the standoffs were removed.

**Figure 6 Install Locking Feet on PNA-X**



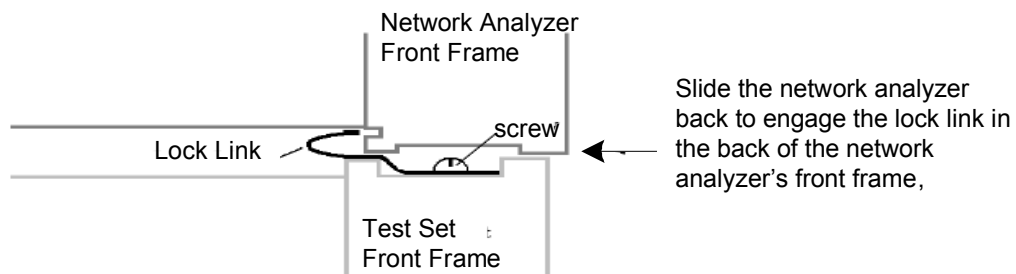
4. Remove the top two standoffs and screws (0515-1619) from the rear panel on the Test Set.
5. Install the two rear locking feet onto the Test Set. Looking at the front panel, the N5242-20206 is the right foot and the N5242-20207 is the left foot. Two screws (0515-2317) are included with this option.

**Figure 7 Install Locking Feet on Test Set**



6. Place the PNA-X on top of the Test Set and ensure that the front frame of the PNA-X is positioned slightly forward of the locks that are attached to the Test Set. Slide the PNA-X back so the locks engage the front frame.

**Figure 8 Locking the Analyzer**



7. Secure the PNA-X's lower locking feet to the Test Set upper locking feet, using the spring-loaded screws on the locking feet. Refer to [Figure 9](#). If the PNA-X's lower locking feet are not aligned with the screw holes in the Test Set's upper locking feet, loosen the screws securing the feet to the instrument slightly to align and tighten.

**Figure 9** Locking Feet Screws



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**NOTE** There are two Lock-Foot kits available. Refer to [“Contacting Agilent” on page 74](#) for ordering information.

- PNA-X – 5023-0132 (Kit includes locking feet and screws)
  - Test Set – N5242-20206 (right foot) and N5242-20207 (left foot).
  - Screw – 0515-2317
-

## N5242A RF Interface Cable Connections

Figure 10 on page 16 illustrates the cable configuration of the Test Set to the PNA-X. The cables have been supplied with Option 442.

1. Remove the SOURCE OUT to CPLR THRU and RCVR IN to CPLR ARM jumpers (x8) on the PNA-X. The RCVR R1 - R4 to SOURCE OUT reference loop jumpers (x4) remain on the front panel.
2. Connect the RF interconnect cables from the PNA-X to the Test Set in the order listed. As you are connecting each cable, torque to 8 in-lb. Refer to Table 5 and Figure 10 on page 16.

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**CAUTION** Over torque will cause damage to the Test Set and may cause connectors to spin or become loose.

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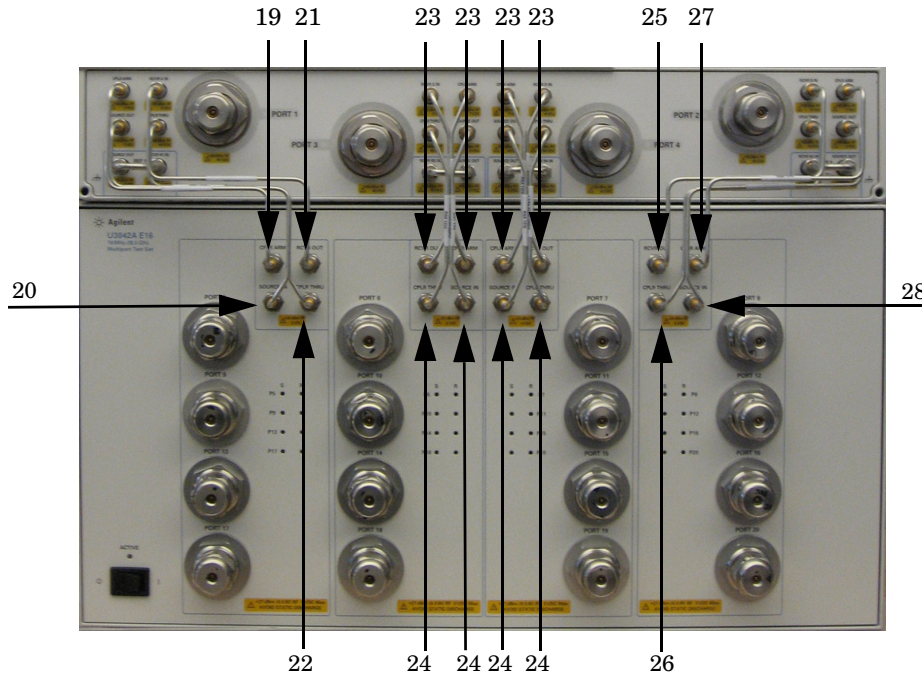
**Table 5 N5242A RF Interface Cable Connection (Option 442)**

Numeric Order	RF Cables	From PNA-X	To Test Set
1	U3042-20122	Port 1 CPLR THRU	Port 5 CPLR THRU
2	U3042-20120	Port 1 SOURCE OUT	Port 5 SOURCE IN
3	U3042-20119	Port 1 CPLR ARM	Port 5 CPLR ARM
4	U3042-20121	Port 1 RCVR A IN	Port 5 RCVR OUT
5	U3042-20123	Port 3 CPLR ARM	Port 6 CPLR ARM
6	U3042-20123	Port 3 RCVR C IN	Port 6 RCVR OUT
7	U3042-20124	Port 3 SOURCE OUT	Port 6 SOURCE IN
8	U3042-20124	Port 3 CPLR THRU	Port 6 CPLR THRU
9	U3042-20123	Port 4 RCVR D IN	Port 7 RCVR OUT
10	U3042-20123	Port 4 CPLR ARM	Port 7 CPLR ARM
11	U3042-20124	Port 4 SOURCE OUT	Port 7 SOURCE IN
12	U3042-20124	Port 4 CPLR THRU	Port 7 CPLR THRU
13	U3042-20126	Port 2 CPLR THRU	Port 8 CPLR THRU
14	U3042-20128	Port 2 SOURCE OUT	Port 8 SOURCE IN
15	U3042-20125	Port 2 RCVR B IN	Port 8 RCVR OUT
16	U3042-20127	Port 2 CPLR ARM	Port 8 CPLR ARM



Figure 10 illustrates the final two digits of the part number for each cable. The cables must be connected in the numeric order listed in Table 5 on page 15.

**Figure 10 PNA-X RF Interface Cable Connections**



3. Connect the PNA-X Test Set I/O cable (8120-6818) to the Test Set Interface connector on the rear panel.

**Figure 11 Rear Panel N5242A with U3042AE16**



## Controlling the U3042AE16 with N5242A

This section will describe how to operate the Test Set with the PNA-X.

The Test Set is considered a “slave” instrument. A PNA-X must be used to control the Test Set. There are three methods to control the Test Set. Multiport mode is recommended due to calibration and ease of use.

- PNA-X Multiport Mode
- PNA-X Interface Control
- PNA-X GPIB Command Processor

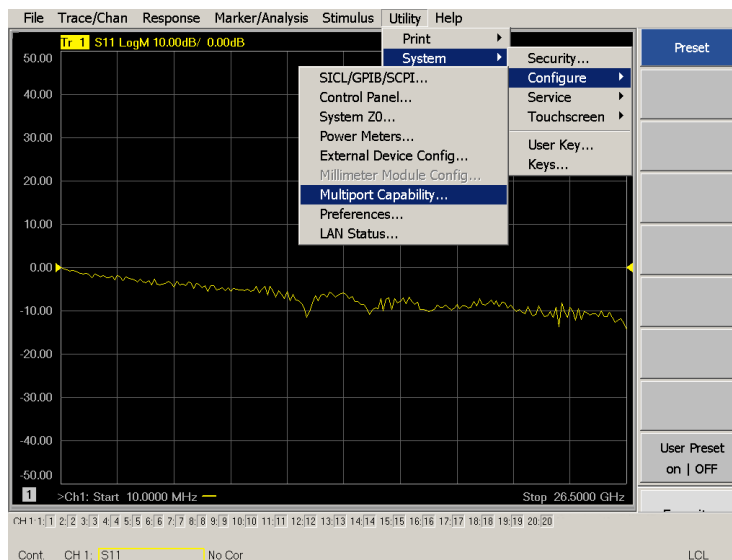
### N5242A Multiport Mode for Option 551

The PNA-X multiport mode selects the Test Set file that will enable the PNA-X to control the Test Set. The PNA-X multiport mode allows you to complete a N-Port calibration using the Cal Wizard application in the PNA-X. Refer to the Help menu for more information.

#### How to Access Multiport Mode

1. The Option 551 must be installed for multiport capability. To access the multiport application select **Utility > System > Configure > Multiport Capability**.

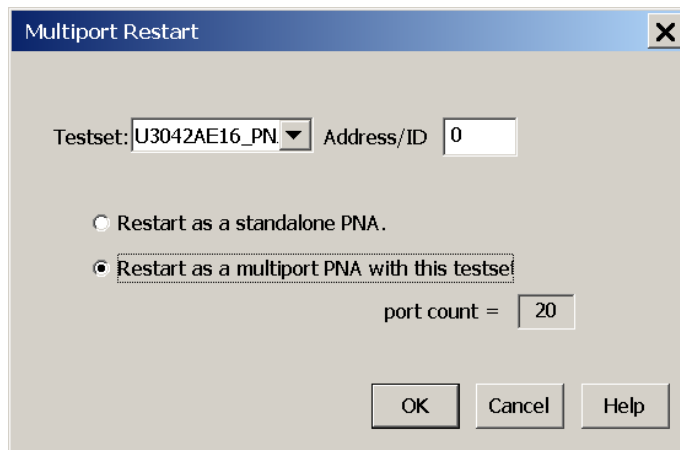
**Figure 12** Selecting Multiport Mode



2. Select **U3042AE16 (20-Port System)** from the drop-down menu and select **Restart as a multiport PNA with this testset > OK**. The PNA-X will restart the network application with the Test Set interface features.

If the Test Set is not available in the drop-down list, it will be necessary for you to copy the required Test Set file to the PNA-X hard drive. The current version of the Test Set files are available on the web at <http://na.tm.agilent.com/multiport>. Copy the appropriate file to `c:\program files\Agilent\Network Analyzer\testsets` directory.

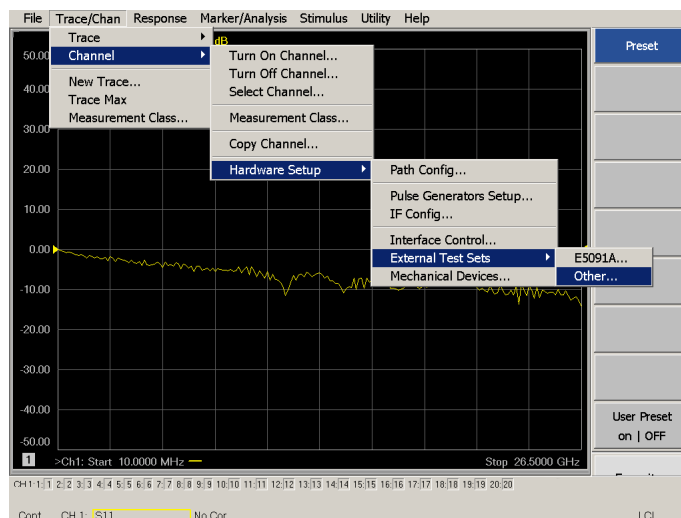
**Figure 13 Test Set Selection**



### External Test Set Control Feature

To verify that the network application has the Test Set interface features, select **Trace/Chan > Channel > Hardware Setup > External Test Set > Other**. The Test Set will be displayed as **External Test Set Control-U3042AE16**. Refer to [Figure 14](#) and [Figure 15](#).

**Figure 14 External Test Set Control**



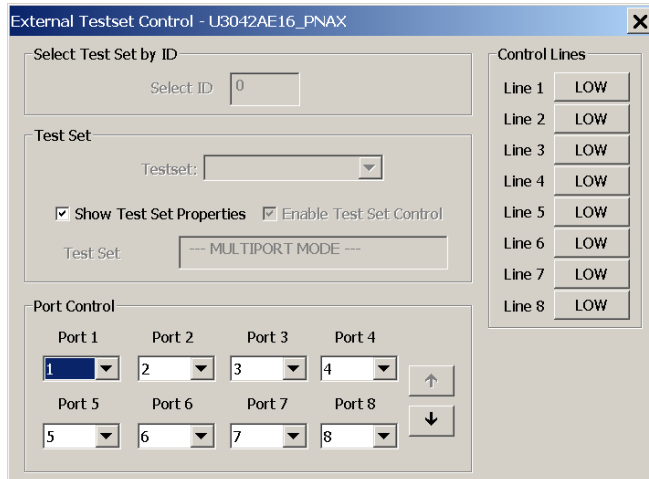


This menu will allow the physical Ports 1 thru 20 to be identified as any port for your convenience. For example; Port 5 can be named Port 2.

The **External Test Set Control-U3042AE16** also allows control of the DUT control lines, refer to **“DUT Control Lines” on page 32**. To change the state from LOW to HIGH, select the graphical user interface (GUI) for the specific control (LINE 1 thru 8) > **OK**. Each line can be controlled separately.

Select the Port Control down arrow for Ports 9 thru 16, see [Figure 15](#).

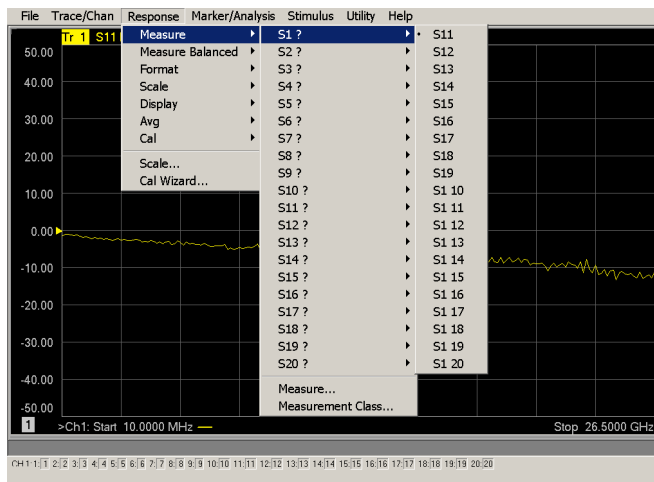
**Figure 15 External Test Set U3042AE16 (Port 1 - 20)**



**Trace Measure S-Parameter**

S-Parameter selection can be accomplished using **Response > Measure**. Use the drop-down menu to select 1 of 400 S-Parameters for the 20-Port system, see [Figure 16](#). The first number in the Sxx selection is the Receiver Port and the second number will be the Source Port. Any port can be selected to be the Receiver, Source or both, as in S11. The front panel R LED indicates the port is the Receiver and the S LED indicates the port is the Source.

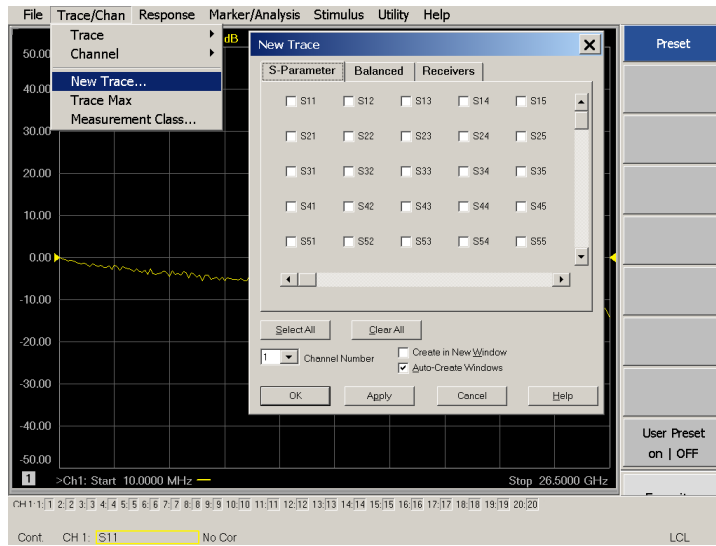
**Figure 16 Trace Measure**



### New Trace Measure S-Parameter

**S-Parameter Tab:** Multiple S-Parameters can be made from the New Trace menu. In the drop-down menu select **Trace/Chan > New Trace**. The dialog box allows the selection of any of the 400 S-Parameter's.

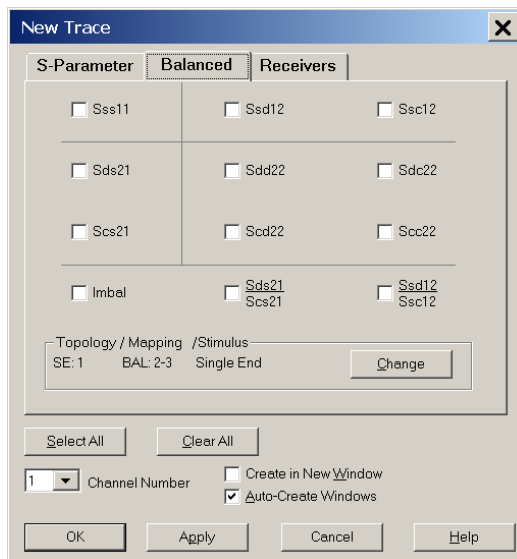
**Figure 17 New Trace Measure**



**Balanced Tab:** Balanced Measurements can be configured by selecting the Balance tab in the New Trace menu.

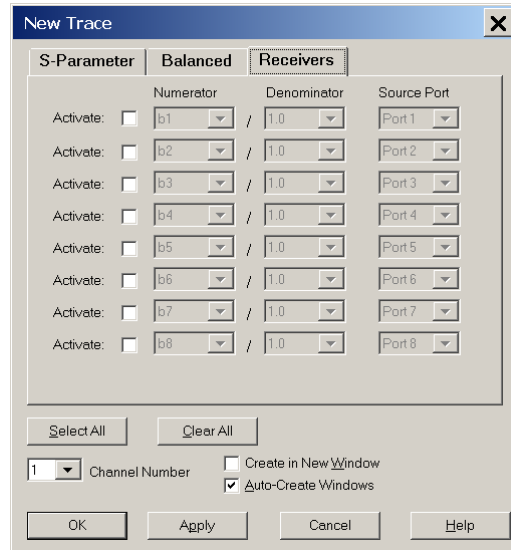
For more information on balanced (differential) component measurement, refer to the Application Note 1373-1 and 1373-2 (5988-5634EN and 5988-5635EN) at <http://www.home.agilent.com>. In the search menu type **“Multiport and Balanced.”**

**Figure 18 Selecting Balanced Measurements**



**Receivers Tab:** The S-Parameter measurements can be ratioed with selectable Denominators for each port and receiver. Refer to the standard PNA-X documentation for more information.

**Figure 19 Receiver Measurements**

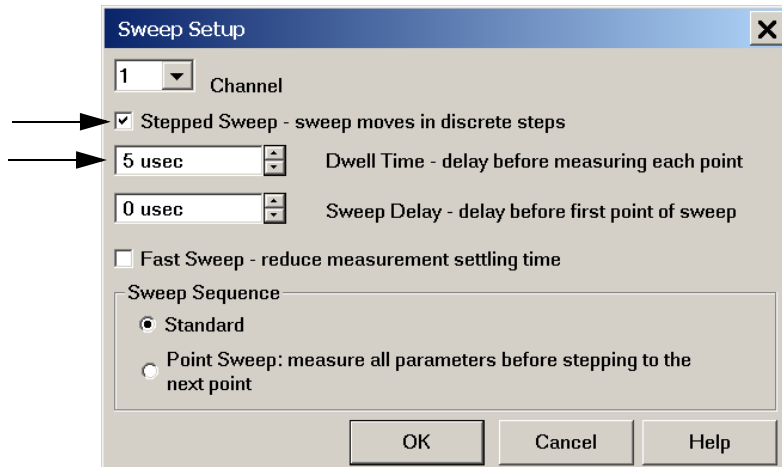


## Sweep Setup for Multiport and Standalone PNA-X Modes

When the test set is connected to the PNA-X, it is recommended that the analyzer's Sweep Setup be configured to Stepped Sweep before calibrating. This is slower than the Analog Sweep, but is more accurate due to the extra electrical length of the test set and test port cables. Only Stepped Sweep is available on all PNA models.

1. On the PNA-X select **STIMULAS > Sweep > Sweep Setup**.
2. Select the **Stepped Sweep-sweep moves in discrete steps** check box.
3. Set the **Dwell Time** to **5  $\mu$ s** > **OK**.

**Figure 20 Sweep Setup**



## N-Port Calibration with N5242A

It is recommended that you perform an ECal characterization to minimize the connections required for multiple port calibration. The N4691A/B Option M0F is recommended with cable (85131F) if you are calibrating at the PNA-X and Test Set ports.

Characterize the ECal module with adapters that will not be used in the measurement of the DUT.

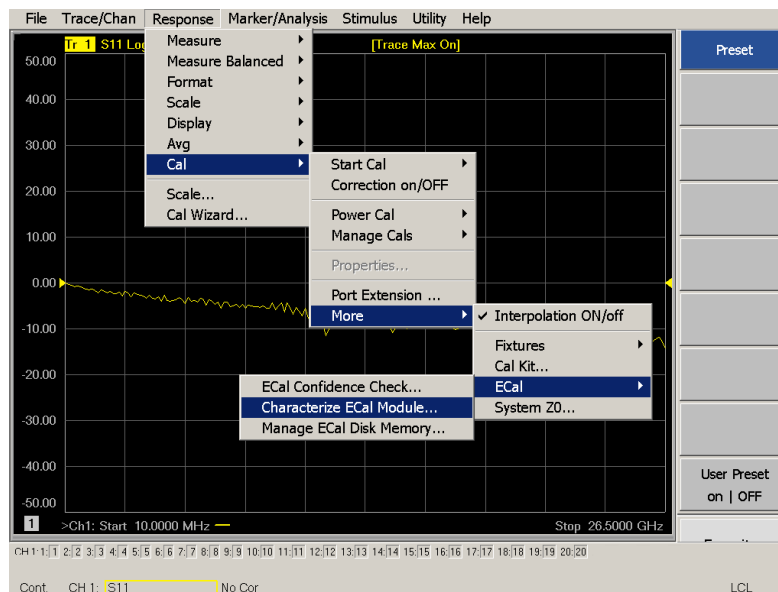
Calibrate at the end of the test port RF cables and any adapters that are used to connect the DUT. This removes the effect on the measurement of the DUT. Failure to do this will create ripple and other measurement errors. Refer to the PNA-X Help menu, Ecal > user-characterization.

---

**NOTE** If measurement errors occur, ensure the newest version of firmware is installed on the PNA. Measurement errors can be a result of firmware algorithms. Consult with Agilent Service or firmware web page for the latest PNA, PNA-L or PNA-X Option 551 firmware revisions and history.  
<http://na.tm.agilent.com/pna/firmware/firmware.htm>

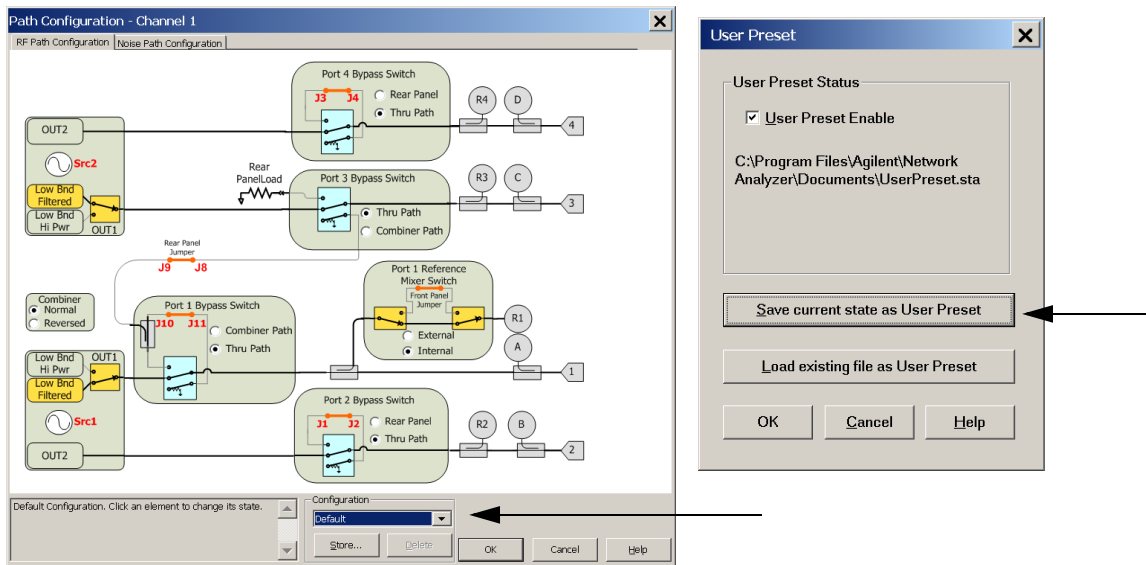
---

**Figure 21 ECal Characterization**



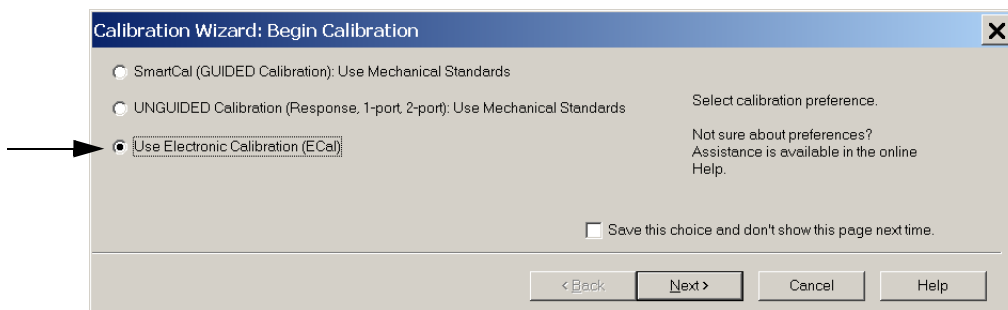
**NOTE** If the PNA-X has Option 029 (noise figure capability) verify that the path configuration is set to default. If the PNA-X is not in Default configuration, ports 5, 9, 13, and 17 will not operate correctly. Select **Trace/Chan > Hardware Setup > Path Cong...** and in the drop-down menu select **Default > OK**. Save this configuration as a User Preset by selecting **Save > User Preset > Save current state as User Preset**. Do not use the factory Preset (User Preset Off), the PNA-X will return to Option 029 path configuration.

**Figure 22 RF Path Configuration**



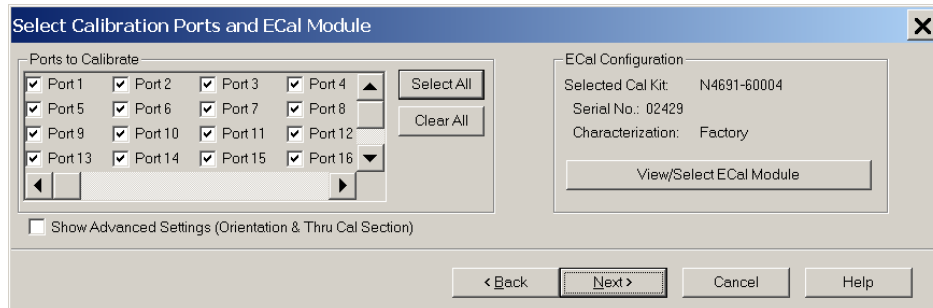
1. On the PNA-X select **Response > Cal Wizard**.
  - a. If using a mechanical cal kit, select **SmartCal (Guided Calibration) > Next**.
  - b. If using an ECal module, connect the ECal to an available PNA-X USB port and select **Use Electronic Calibration (ECal) > Next**.

**Figure 23 Begin Calibration**



- Continue following the Cal Wizard prompts. In the Select Calibration Ports and ECal Module dialog box select the **Select All** check box, or select the ports you are calibrating and click **Next**.

**Figure 24 20-Port Calibration**



- Connect the ECal or the mechanical cal kit to the ports you are calibrating following the Cal Wizard prompts and click **Measure** after each connection. The electrical delay value may be shown in the dialog box after the last measurement, click **OK**.
- At the Calibration Completed prompt click **Save As User Calset**, type the name and **Save**. See [Figure 35 on page 43](#).
- After calibrating Test Set ports, use a quality load and short to verify the calibration on each port or end of the test cable. Measure reflection and confirm the return loss is as expected. If the result is not as expected, repeat the calibration without the Test Set and ensure that the PNA-X is in standard (non-multiport) mode.

---

**NOTE** If measurement errors occur, ensure the newest version of firmware is installed on the PNA-X. Measurement errors can be a result of firmware algorithms. Consult with Agilent Service or firmware web page for the latest PNA-X Option 551 firmware revisions and history.  
<http://na.tm.agilent.com/pna/firmware/firmware.htm>

---

## N5242A Interface Control

---

**NOTE** The interface control will not function properly when using multiport mode. The multiport mode will reset the switch path commands of the interface control. It is recommended that the PNA-X be restarted in stand-alone mode if the interface control is being used.

---

This section includes the interface control information for the Test Set. Applications and connectivity information can be found in the PNA-X Help menu.

- Overview
- How to Access Interface Control Settings
- Interface Control dialog box

Other connectivity topics can be found in the PNA Help menu.

### Overview of the Interface Control

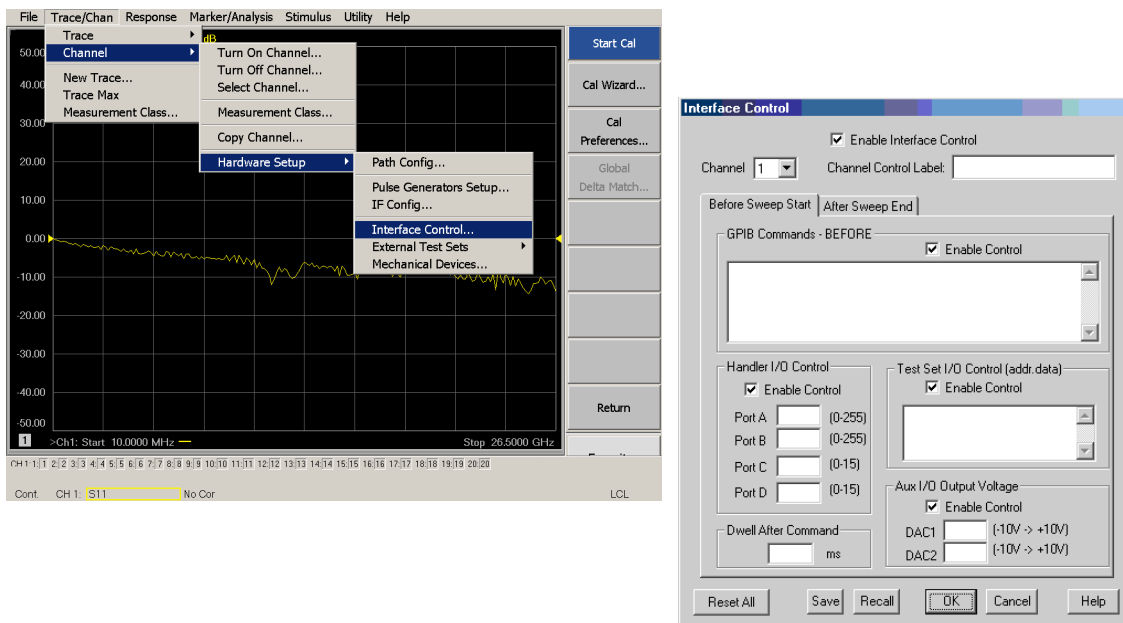
The Interface Control feature allows you to send data and remote commands to control external equipment using the GPIB, Material Handler I/O, Test Set I/O, and Auxiliary I/O without needing to create a remote program. Refer to PNA-X Help menu, “Rear Panel Tour.”

- A unique set of control data can be sent for each channel. In addition, a unique set of control data can be sent before the channel sweep starts and after the sweep ends.
- Interface Control settings can be saved and recalled from the Interface Control dialog box or with Instrument State Save and Recall.
- Interface Control settings can be copied to other channels using Copy Channels.
- Control data can only be WRITTEN to the interfaces, NOT READ from the interfaces.
- Control data is sent in the following order and this order cannot be changed: Refer to the PNA-X Help menu.
  1. GPIB Interface
  2. Material Handler Interface
  3. Test Set Interface
  4. Dwell Time

## How to Access Interface Control Settings

This section describes how to configure and operate the Test Set with the PNA-X. To access the Interface Control application select **Trace/Chan > Channel > Hardware Setup > Interface Control** in the drop-down menu, and select **Enable Interface Control**.

**NOTE** The PNA-X Series Network Analyzer comes with the Interface Control application. Please review this application before connecting the Test Set to the PNA-X. Information regarding this application can be found in the PNA-X Help menu, Interface Control. The application is shown below.



**NOTE** While using Interface Control, the PNA-X must be in GPIB System Controller mode. Once this is complete you must restart the PNA-X application to go back to Talker/Listener.



## Test Set I/O Address and Data using Control Interface with N5242A

An Instrument Preset will reset all of the fields to their default settings.

---

**NOTE** If an error is encountered when sending Interface Control data, an error message is displayed on the PNA-X screen and the Channel Trigger State is set to Hold. You must fix the condition that caused the error, then change the Channel Trigger State to its original setting.

---

### Enable Interface Control:

Enables and disables ALL Interface Control communication. When cleared (default setting) Interface Control is disabled and NO data is sent. To send data, the individual interfaces must also be enabled.

### Test Set I/O Control (address data):

Provides control of the Test Set I/O Interface on the rear panel of the PNA-X. Used to control your Test Set.

Positive integer is used to select switch position or state of DUT control interface line.

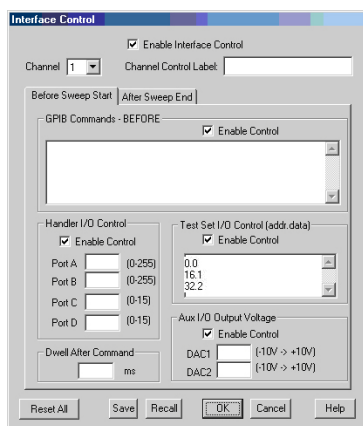
Address and data are separated by a period. Entries should be separated by a new line, or carriage return. The front panel Enter key inserts a new line into the field. The number of Test Set I/O entries that can be entered is limited by the available memory of the PNA-X. See [“Test Set I/O Interface Commands” on page 37](#).

For example:

**0.0**

**16.1**

**32.2**



### Channel 1:

Specifies the channel number for dialog settings. Each channel is configured individually. The list box illustrates the channels that currently have measurements. There must be at least one measurement present in order to make the settings.

### Channel Control Label:

Specifies the label to be displayed on the PNA-X screen during the channel sweep.

**Before Sweep Start – After Sweep End Tabs:**

Commands /data for all four interfaces can be sent Before Sweep Start and After Sweep End. However, they are configured and enabled on separate tabs of the Interface Control dialog box. For example; to send GPIB commands Before and After a PNA-X sweep, the Enable Control check box must be selected and commands entered on both the Before Sweep Start and After Sweep End tabs.

**Before Sweep Start:**

The data is sent before the first trace on the channel begins sweeping.

**After Sweep End:**

The data is sent after the last trace on the channel completes sweeping.

**Address:**

Positive integer is used to specify switch path to be controlled. Address also specifies output on specific ports. Refer to [“Test Set I/O Interface Commands” on page 37](#).

**Dwell After Command:**

Specifies a wait time in milliseconds, after all commands to all interfaces are sent. Any positive integer is allowed. This is used to allow all external devices to settle before beginning a measurement. An erratic trace may indicate that more settling time is needed.

**Reset All:**

Sets all fields on all channels to their default values.

**Handler I/O Control and Aux I/O Output Voltage:**

Provides I/O interface control through the rear panel of the PNA-X. Refer to the PNA-X Help menu for further information.

**Save and Recall:**

Saves and recalls the contents of the dialog box. If the Interface Control dialog box is populated with settings during an Instrument State Save, the settings are automatically recalled with the instrument state settings. Interface control uses an \*.xml file type. An example file is stored on the PNA-X hard drive. You can recall it into the dialog, or you can open and edit it with a word processor, such as Word Pad.

**OK:**

Applies the settings and closes the dialog box.

**Cancel:**

Does not apply changes that were made and closes the dialog box.

---

**NOTE** Test Set I/O Commands can be found in [“Test Set I/O Interface Commands” on page 37](#). The Address and Data commands can be entered into the Test Set I/O control.

---

## N5242A GPIB Control

The GPIB Command Processor feature allows you to send remote commands and data to the PNA-X rear-panel GPIB connector and Test Set I/O connector. More information regarding the GPIB Command Processor can be found in the PNA-X Help menu.

- Overview
- How to Access GPIB Command Processor
- GPIB Command Processor Console

### Overview of the GPIB Control

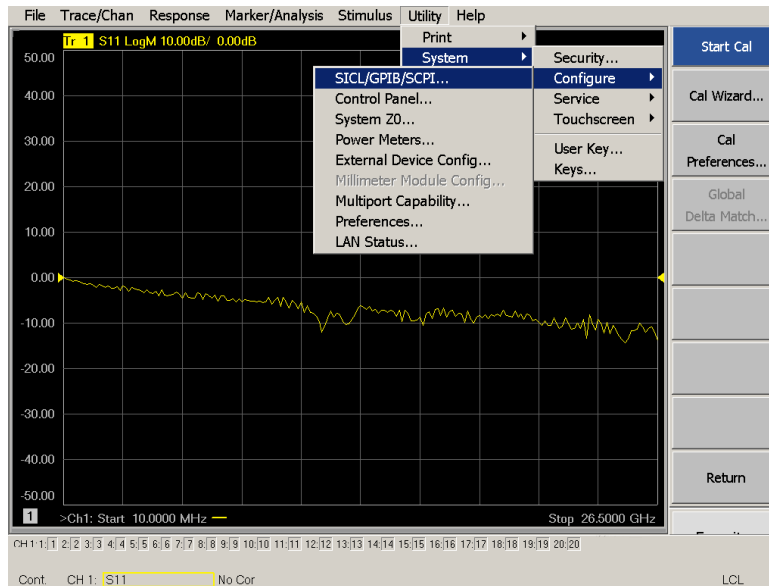
The GPIB Command Processor allows you to send address and data to control an external Test Set, without needing to create a remote program. The user is required to manually input address and data using the GPIB Command Processor Console in the PNA-X Help menu.

- GPIB Command Processor settings can not be saved or recalled.
- Address and data can be *written* from the GPIB Command Processor.

## How to Access GPIB Command Processor

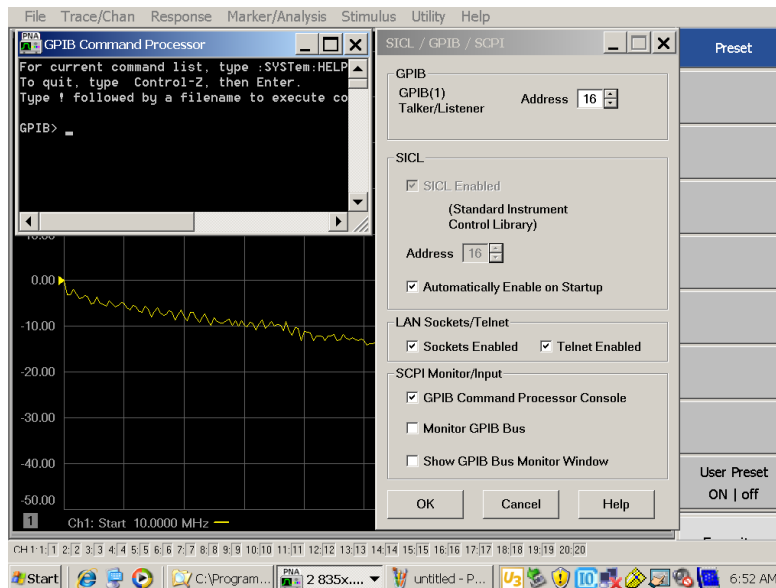
1. To access the GPIB Command Processor select **Utility > System > Configure > SICL/GPIB/SCPI**.

**Figure 25 Utility Configure**



2. Select **GPIB Command Processor Console > OK**.

**Figure 26 GPIB Command Processor**



## GPIB Command Processor Console

**Write Commands** Once the GPIB Command Processor Console is open, commands can remotely control the external Test Set I/O connector by sending the following:

**address:** a integer number

**data:** a integer number

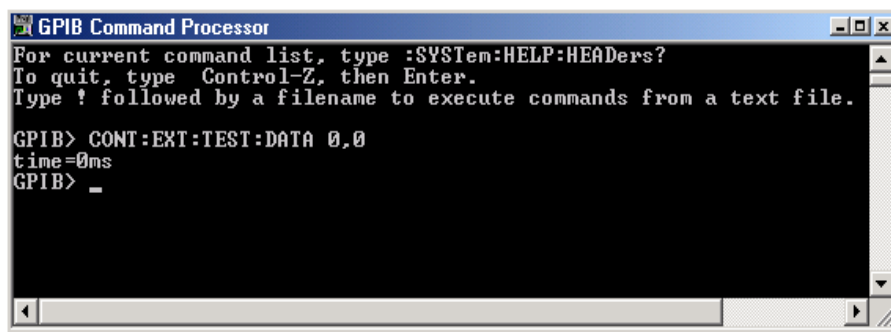
Address and data are separated by a comma. Commands should be separated by a new line, or carriage return.

For example:

```
CONT:EXT:TEST:DATA <address>,<data>
```

```
CONT:EXT:TEST:DATA 0,0
```

Example: CONT:EXT:TEST:DATA 0,0



Refer to [“Test Set I/O Interface Commands”](#) on page 37.

## DUT Control Lines

The 15 pin female D-Sub connector on the rear panel provides 8 latched data connections that can be used to control your DUT. An adjustable voltage source (+2 to +5 Vdc) is provided on the rear panel. A positive or negative external source can be used. Refer to [Table 8](#) and [Figure 30](#) on page 36.

### Setting the DUT Control Interface

This section describes how to control the DUT control lines. Refer to [“Controlling the U3042AE16 with N5242A”](#) on page 17. For more information regarding the control lines, see [Table 6](#) and [Table 7](#).

**Table 6 Test Set DUT Control Address and Data**

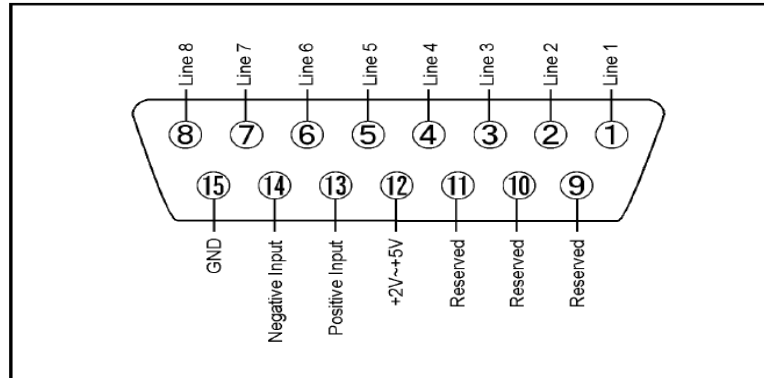
Address	Data	Data AD12-AD0	Description					Bit Data 0= +Voltage 1= -Voltage		
112	0	0000000000000	ALL DUT Control Lines set to 0 or + voltage							
112	255	0000001111111	ALL DUT Control Lines set to 0 or – voltage							
112	1	00000xxxxxxxB	DUT Control Line 1					0,1		
112	2	00000xxxxxxBx	DUT Control Line 2					0,1		
112	4	00000xxxxxBxx	DUT Control Line 3					0,1		
112	8	00000xxxxBxxx	DUT Control Line 4					0,1		
112	16	00000xxxBxxxx	DUT Control Line 5					0,1		
112	32	00000xxBxxxxx	DUT Control Line 6					0,1		
112	64	00000xBxxxxxx	DUT Control Line 7					0,1		
112	128	00000Bxxxxxxx	DUT Control Line 8					0,1		
Control Lines			Line 8	Line 7	Line 6	Line 5	Line 4	Line 3	Line 2	Line 1
Test Set I/O Bits			AD7	AD6	AD5	AD4	AD3	AD2	AD1	AD0
Bit Decimal Equivalent			128	64	32	16	8	4	2	1
Example 1 Data = 0			0	0	0	0	0	0	0	0
Example 2 Data = 21			0	0	0	1	0	1	0	1
X indicates unknown user bit state										
B indicates bit of interest										
To select a Test Set DUT control line configuration, all 8 DUT control lines must be set. To do this you must add AD7 to AD0 binary number and convert this to a decimal equivalent.										

---

**NOTE** All DUT control lines must be set with each command sent. Logic 0 = high

---

**Figure 27 DUT Control Line Pin Assignment**



**Table 7 DUT Control Line Pin Assignment**

Pin Number	Signal Name	Description
1	Line 1	Output port of line 1
2	Line 2	Output port of line 2
3	Line 3	Output port of line 3
4	Line 4	Output port of line 4
5	Line 5	Output port of line 5
6	Line 6	Output port of line 6
7	Line 7	Output port of line 7
8	Line 8	Output port of line 8
9		Not used
10		Not used
11		Not used
12	+2 V to +5 V	The voltage input to pin 13. (The voltage can be varied by rotating the voltage adjustment trimmer on the rear panel).
13	Positive Input	Input a signal that is outputted when each line is high from pin 12 or external dc power supply.
14	Negative Input	Input a signal that is outputted when each line is low from the external dc power supply. Able to output 0 V as low from the each line by connecting to pin 15.
15	Gnd	ground terminal

## Setting the Variable Source Voltage

The output voltage of pin 12 can be varied from +2 to +5 V. Perform the following procedure to set the voltage:

1. Turn On the Test Set.
2. Measure the voltage between pin 12 and 15 using a multimeter.
3. Rotate the voltage adjustment trimmer on the rear panel until the multimeter indicates the appropriate voltage.

## Connecting to the DUT Control Lines

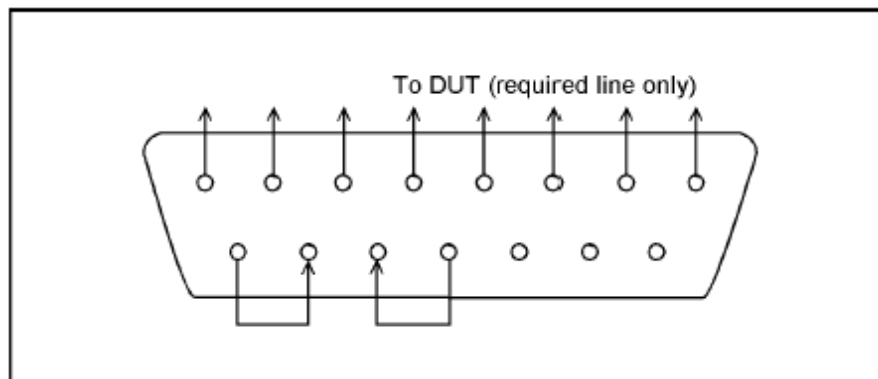
Figure 28 illustrates an example of the connection between the DUT and the Test Set *without* an external dc power supply. Connect pin 12 to pin 13 for +5 V, and pin 14 to pin 15 to provide the ground path. Connect each DUT control line to the external device under test.

---

**CAUTION** You may only connect pin 12–13, and pin 14–15. Damage may result if any other path is short-circuited.

---

**Figure 28** Control Line Connector





## Using an External Power Supply

Figure 29 illustrates an example of the connection between the DUT and the Test Set *with* an external dc power supply. Input the High and Low signals from the external power supply to the Positive Input and Negative Input respectively, and connect each line to the control terminal of the DUT.

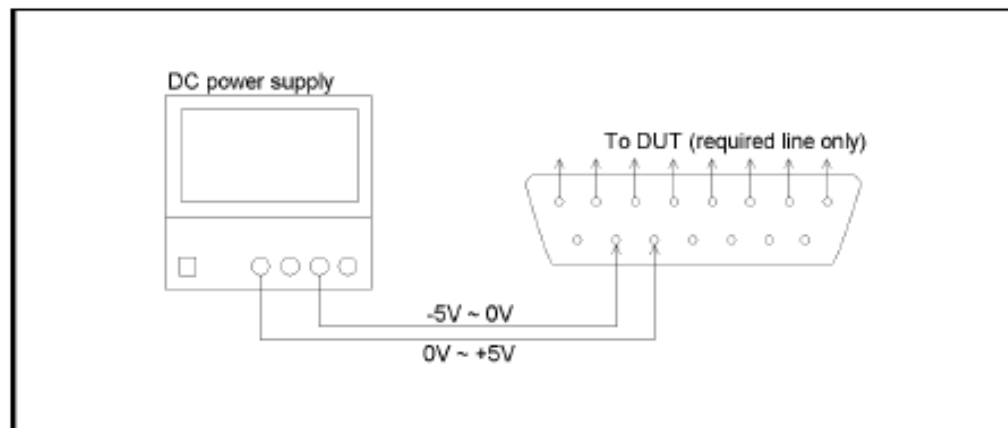
### Turning On the Test Set using an External Power Supply.

1. Turn On the Test Set.
2. Connect the DUT.
3. Turn On the external power supply.

### Turning Off the Test Set using an External Power Supply.

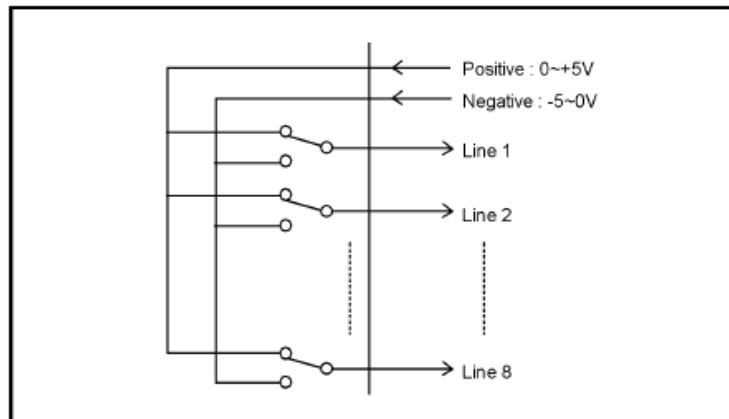
1. Turn Off the Power Supply.
2. Turn Off the Test Set.
3. Disconnect the DUT.

**Figure 29** Test Set to the DUT and External DC Power Supply



**Table 8 DUT Control Specifications**

Item	Specifications
Connector Shape	15-pin female D-Sub
Voltage Range:	
Positive Input	0 to +5 V
Negative Input	-5 to 0 V
Maximum Current	100 mA (in total of each line)
Impedance	< 10 $\Omega$
Range of Variable Voltage	+2 to +5 V

**Figure 30 Block Diagram of DUT Control**

## Test Set I/O Interface Commands

### Switch Address and Data

Refer to [Table 31 on page 37](#) and [Figure 33 on page 39](#) for information to set the internal switch paths of the Test Set. Additional information regarding the operation and descriptions for the internal switches can be found in [“Theory of Operation” on page 52](#).

A combination of the address and data value controls the source and receiver paths of the ports. To select a Test Set port configuration, both Source and Receiver switches must be set to complete the switch paths. Refer to the following examples.

Example 1: Refer to [Figure 32 on page 38](#).

If the ports have the same address, only one command is needed.

Ports 9 is the Receiver and Port 5 is the Source.

Source Port 5 = address 0, data 1, and Receiver Port 9 = address 0, data 32. Since the addresses are the same, add the data value of  $1 + 32 = 33$ . Send address 0 and data 33. Refer to [Figure 32 on page 38](#).

Example 2:

If the ports have different addresses, two separate address data commands must be used.

Port 5 is the Source and Port 6 is the Receiver.

Source Port 5 = address 0, data 1 and Receiver Port 6 = address 16, data 16.

Two separate commands must be sent, you may use the same dialog box. Send address 0 and data 1 in one command line, and address 16 and data 16 in the second line.

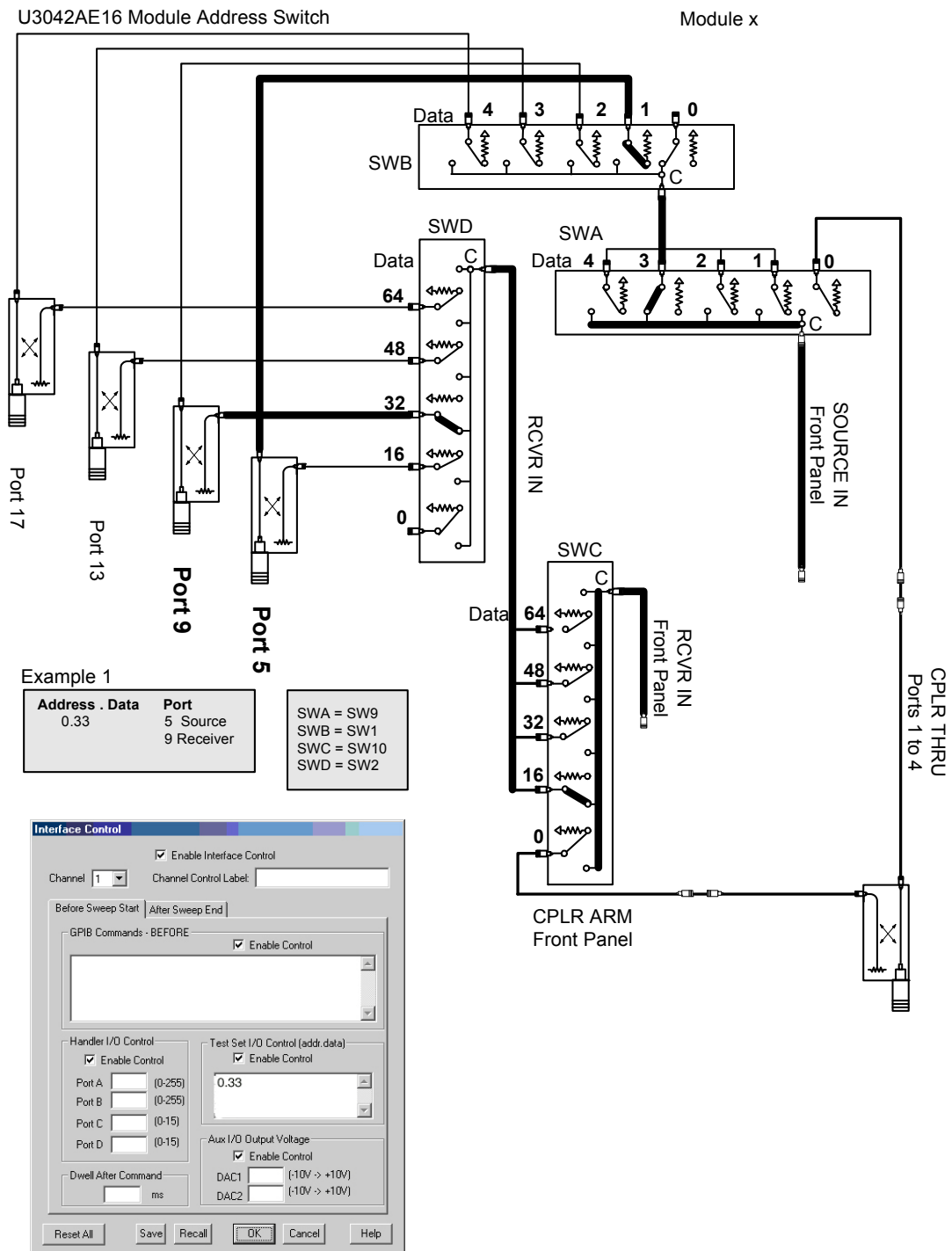
For further information refer to [“How to Access Interface Control Settings” on page 26](#) and [“How to Access GPIB Command Processor” on page 30](#).

**Figure 31 N5242A Port Address and Data Select<sup>1</sup>**

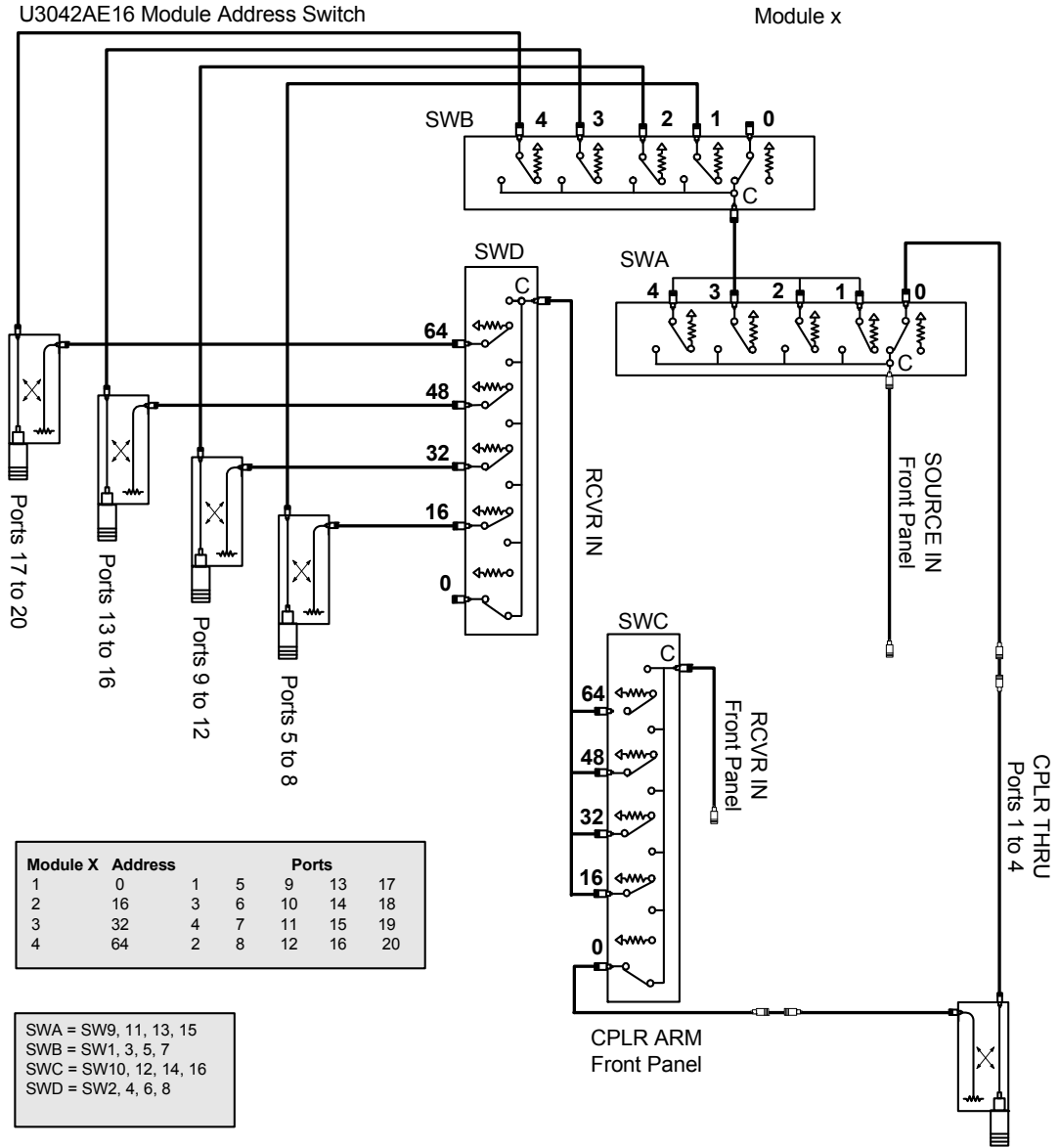
Address		Source Path					Receiver Path				
		0	1	2	3	4	0	16	32	48	64
	Data	0	1	2	3	4	0	16	32	48	64
0	Ports	1	5	9	13	17	1	5	9	11	13
16	Ports	3	6	10	14	18	3	6	10	14	18
32	Ports	4	7	11	15	19	4	7	11	15	19
64	Ports	2	8	12	16	20	2	8	12	16	20

1. Data 7 will terminate all Source Paths.  
Data 112 will terminate all Receiver Paths.  
Data 119 will terminate all Source and Receiver Paths.

**Figure 32 Example Port Selection with Test Set I/O Control**



**Figure 33 Source and Receiver Switch Path**



---

## Operational Check

This operational check is to confirm the Test Set and PNA-X operational performance. The operation verification limits provided ensure that your U3042AE16 and PNA-X are operating properly. Refer to [“Troubleshooting Operational Check Failures” on page 48](#) to ensure the RF interface cables are installed and working correctly before returning the Test Set for repairs.

### Verification Limits

Specifications for the Test Set are typical. System performance for the PNA-X and Test Set are only characteristic and intended as non-warranted information. Only a functional certificate is provided for the Test Set.

It is recommended that you return your instrument to Agilent Technologies for servicing or repair if the Test Set 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. An N-Port calibration should be performed before making a measurement.

**Table 9 N5242A Operation Verification Limit for Reflection Tracking<sup>1</sup>**

Frequency	Port 1-4	Port 5-20
10 MHz to 4 GHz	-10 dB	-20 dB
4 GHz to 10 GHz	-15 dB	-25 dB
10 GHz to 20 GHz	-22 dB	-35 dB
20 GHz to 26.5 GHz	-30 dB	-45 dB

1. Reflection Tracking takes into account Source Loss, Receiver Loss, Margin, and PNA-X Mixer Cal.

---

**NOTE** If you suspect that your 20-Port configuration is not operating properly, ensure that all front RF jumper interconnect cables are correctly attached.

---

## Equipment Required

The Agilent U3042AE16 requires that the user be familiar with the equipment and components listed in [Table 10](#).

This section provides an equipment list and configuration of the PNA-X and Test Set.

**Table 10**      **Equipment List**

<b>Description</b>	<b>Qty</b>
N4691A 3.5 mm ECal Module 10 MHz - 26.5 GHz (Option 00F or M0F) <i>or</i> N4691B 3.5 mm ECal Module 300 kHz - 26.5 GHz (Option 00F or M0F) <i>or</i> Mechanical cal kit 85052B or 85052D	1
N5242A Option 400 and 551	1
Set of interconnect cables (PNA-X and Test Set), see “ <a href="#">N5242A RF Interface Cable Connections</a> ” on page 15.	1

## Operational Check Procedure

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. Ensure that the Test Set is not connected to the PNA-X if you are performing a PNA-X Operator's Check. The PNA-X will indicate false failures if the Test Set is connected.

### Preparing the N5242A

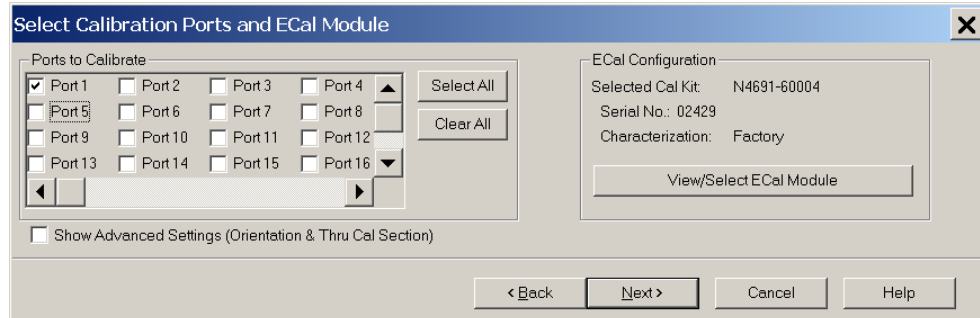
1. Connect the Test Set to the 4-Port PNA-X using the interconnect cables as shown in [Figure 10 on page 16](#) and [Table 5 on page 15](#).
2. Turn On the Test Set.
3. On the PNA-X, select **Response > Cal > Manage Cals > Cal Set**. Delete or Rename any Cal Sets titled "999.1" thru "999.20" (20-Port), although it is unlikely that you will find Cal Sets with these names.
4. Verify that the PNA-X is in 20-Port. See the bottom of the measurement window.
  - a. If only four S-Parameters are listed, select **Utility > System > Configure > Multiport Capability**. Select **Restart as multiport PNA with this testset** and select **U3042AE16 (20-Port)** from the drop-down menu > **OK**. Refer to [Figure 13](#).
5. Press **Preset**.
6. Verify that the **[Start Frequency]** is set to **[10 MHz]**.
7. Verify that the **[Stop Frequency]** is set to **[26.5 GHz]**.
8. Verify that the **[Power]** is to set to **[-5 dBm]**.
9. Select **Response > Avg > IF Bandwidth > 100 Hz > OK**.
10. Select **Stimulus > Sweep > Number of Points > 401**.
11. Connect the ECal module to an available PNA-X USB port on the front or rear panel. Refer to [Figure 10 on page 16](#). This procedure assumes you are using a ECal. If you are not, see "N5242A 1-Port Calibration and Verification Procedure" on page 43, step 2.
12. Allow the ECal module, Test Set and PNA-X to warm up for a minimum of 30 minutes.



## N5242A 1-Port Calibration and Verification Procedure

1. Connect the ECal or the mechanical cal kit to Port 1 or the port you are testing. Refer to [Figure 1 on page 2](#). Torque to 8 in-lb. For further information refer to the Help menu, see [Figure 34](#).
2. Perform a 1-Port Calibration on Port 1. On the PNA-X, select **Response > Cal > Start Cal > Calibration Wizard...**
  - a. If using a mechanical cal kit, select **SmartCal > Next**.
  - b. If using an ECal module, connect the ECal to a PNA-X USB port. Select **Use Electronic Calibration (ECal) > Next**.
3. Continue following the Cal Wizard prompts. In the Select Calibration Ports and ECal Module dialog box click **Clear All** and select **Port 1 > Next > Measure**.

**Figure 34 1-Port Calibration**



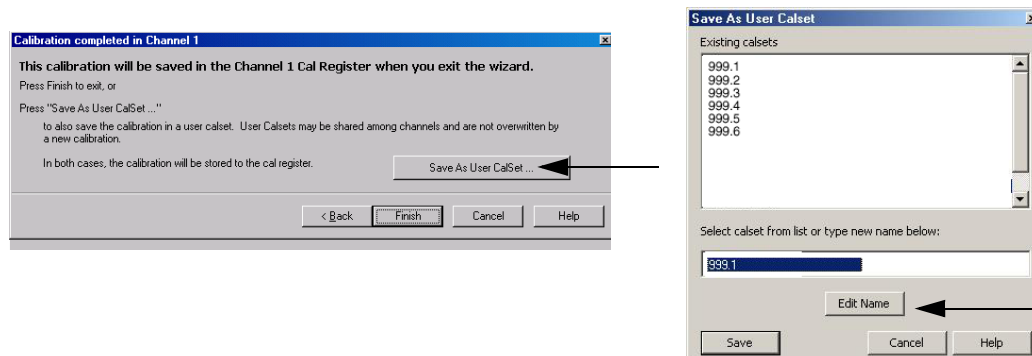
4. Continue to follow the prompts until the Calibration Completed dialog box appears.
5. At the Calibration Completed prompt, select **Save As User Calset** and type the name **999.1**. Overwrite the Calset if it already exists and **Save**.

---

**NOTE** If you do not have a key board, select **Save As User Calset > Edit Name** and save as **999.x**. X is the port number you are calibrating. Refer to [Figure 35](#). Use the numeric keypad on the PNA-X front panel to enter “999.1.”

---

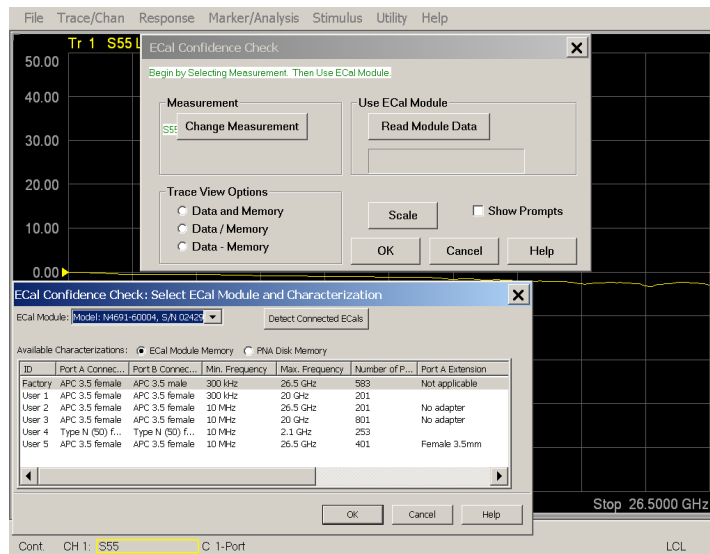
**Figure 35 Calibration Complete**



- Repeat [step 1](#) thru [step 5](#) for Ports 2 thru 20. When finished, there should be 20 Cal Sets saved with the titles “999.1” thru “999.20” (20-Port).

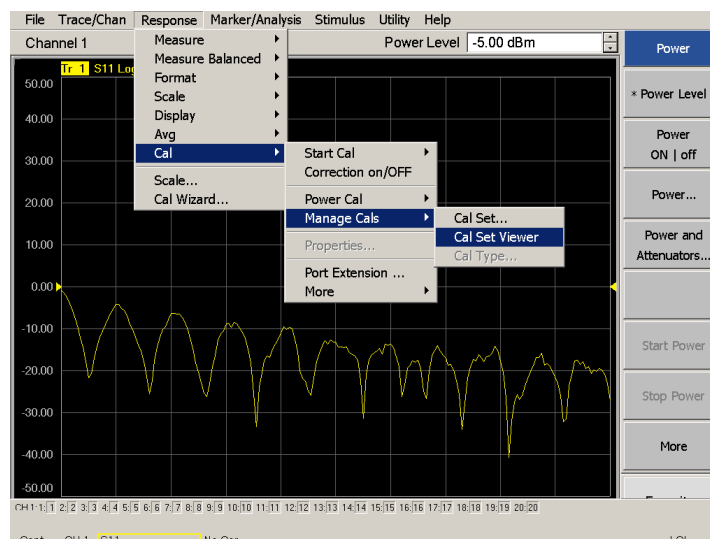
If you are using an ECal module you can verify the individual port calibration by selecting **Response > Cal > More > ECal > ECal Confidence Check**. Click **Change Measurement** and select the test port S-Parameter > **Apply > OK > Read Module Data**. For further information refer to the Help menu.

**Figure 36 ECal Confidence Check**



- Select **Trace/Chan > Trace > Delete Trace**. There should be no traces on the PNA-X display.
- To launch the Cal Set Viewer toolbar, select **Response > Cal > Manage Cals > Cal Set Viewer**.

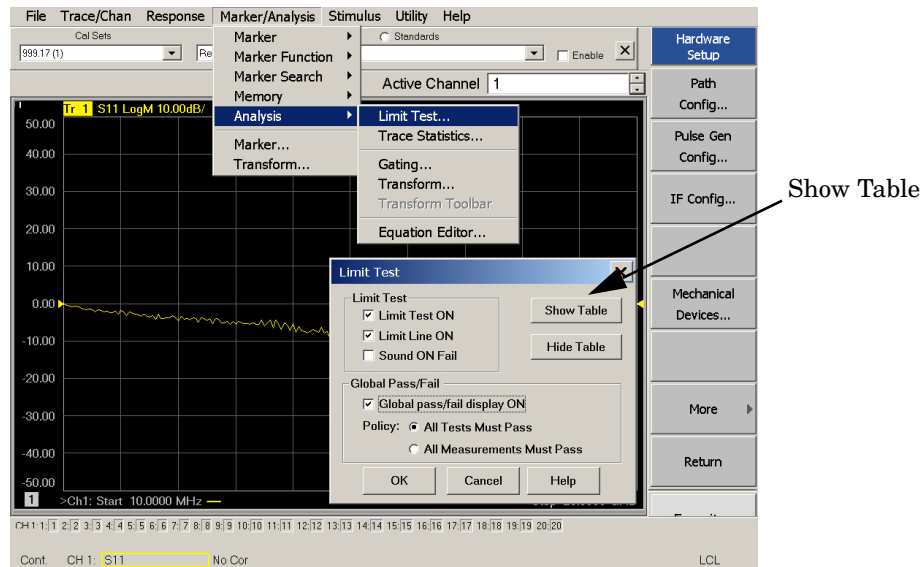
**Figure 37 Calibration, Cal Set Viewer**



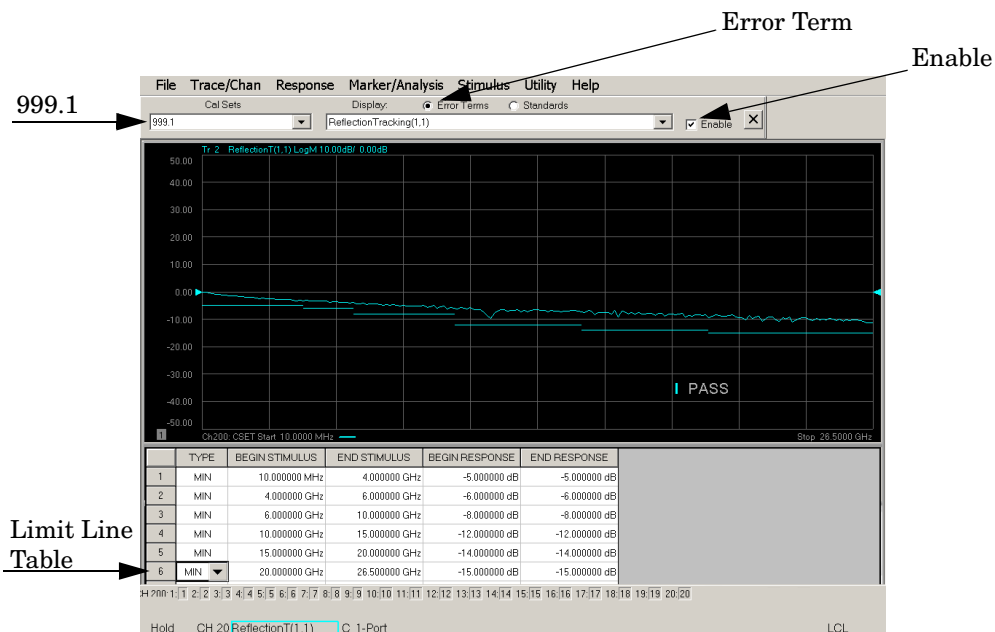
- From the Cal Sets drop-down menu, select **999.1** and select **Enable**. Select the **Reflection Tracking(x,x)**, where x,x is the port being tested, term in the center drop-down menu and ensure that the **Enable** and **Error Terms** are selected.

**NOTE** You may also create a table on the PNA-X and enter the limit line stimulus and response values. Select **Marker/Analysis > Analysis > Limit Test > Limit Test ON** and **Limit Line ON > Global pass/fail display ON > Show Table**. See [Figure 38](#) and [Figure 39](#).

**Figure 38 PNA-X Setting the Test Limits**



**Figure 39 Reflection Tracking Trace with Limit Line Table**



10. Compare the Reflection Tracking (1,1) trace to the appropriate limits in [Table 9 on page 40](#). This can be done using Limit Lines, select **Marker/Analysis > Analysis > Limit Test > Limit Test ON** and **Limit Line ON > Global pass/fail display ON**, and click **Show Table**. The trace should be above the limit. PASS will be displayed on the screen if the limit lines are used.

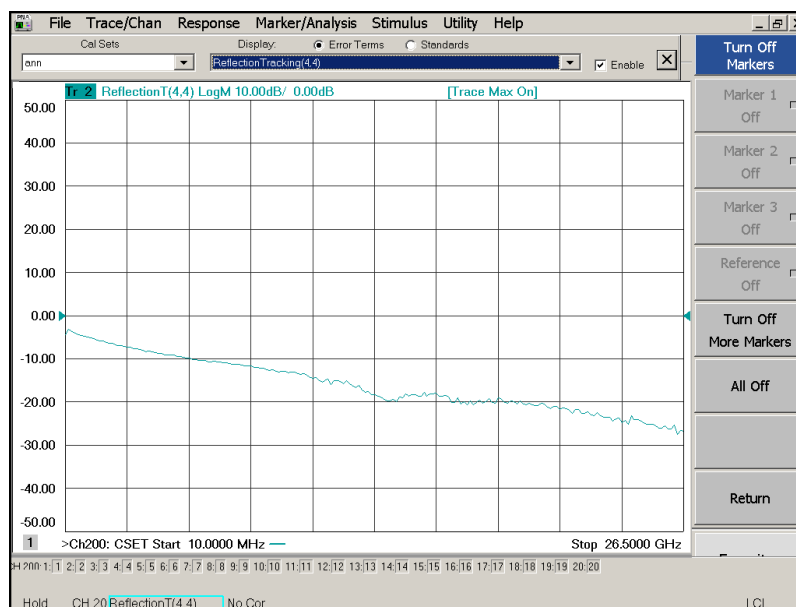
11. Repeat [step 9](#) and [step 10](#) for Cal Sets “999.1” thru “999.20” (20-Port).

---

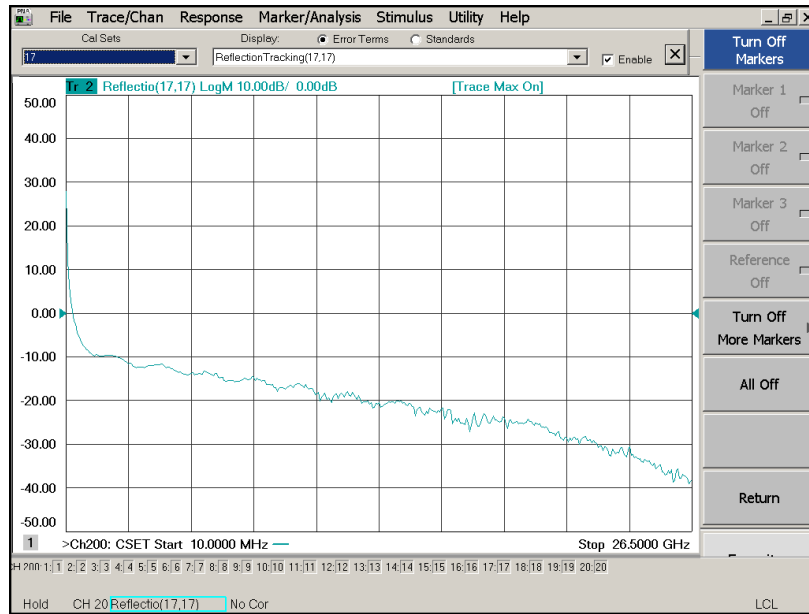
**NOTE** Response from 10 MHz to 500 MHz is normal due to the PNA-X couplers in comparison to the Test Set bridges. The bridges have more gain in the coupled RF path.

---

**Figure 40 Standard Reflection Tracking Trace (Port 1-4) with PNA-X**



**Figure 41 Standard Reflection Tracking Trace (Port 5-20) with PNA-X**




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**NOTE** Response from 10 MHz to 500 MHz is normal due to the PNA-X couplers in comparison to the Test Set bridges. The bridges have more gain in the coupled RF path.

---

---

## Troubleshooting Operational Check Failures

If your test results fail the Operational Check limits, verify following:

1. Insure that the Test Set is turned on and connected properly to the PNA-X.
2. Check all appropriate PNA-X and Test Set connectors for damage, cleanliness, and proper torque.
3. Repeat the relevant 1-Port calibrations.
4. Verify that the PNA-X is operating properly and meeting its published specifications. If the PNA-X is connected to the Test Set it will fail the Operational Check.

### Interconnect Cable Verification

1. Connect the Test Set to the PNA-X and select Multiport mode.
2. Verify the Source Interconnect RF cables (Source Out and CPLR THRU).
  - a. Remove the Receiver and CPLR ARM interconnect cables and install the standard PNA-X jumpers.
  - b. Connect two RF cables on the PNA-X, Port-1 to Port-2 and Port-3 to Port-4.
  - c. Set the PNA-X to measure Trace S12, S21, S34 and S43, and verify that there are no power holes. If S12, or S34 has a power hole check the Port-2, or Port-4 Source interconnect cables and Test Set connectors for damage. If S21, or S43 has a power hole check the Port-1, or Port-3 Source interconnect cables and Test Set connectors for damage.
3. Verify the Receiver Interconnect RF cables (Receiver A IN or B IN and CPLR ARM).
  - a. Re-install the Receiver and CPLR ARM interconnect cables.
  - b. Remove the Source Out and CPLR THRU interconnect cables and install the standard PNA-X jumpers.
  - c. Set the PNA-X to measure Trace S12, S21, S34 and S43. Verify that there are no power holes. If S12 or S34 has a power hole check Port-1, or Port-3 Receiver Interconnect cables and Test Set connectors for damage. If S21, or S43 has a power hole check Port-2, or Port-4 Receiver Interconnect cables and Test Set connectors for damage.
4. If the problem still exists, connect the standard jumpers to the PNA-X (Source and Receiver) and verify the Source Out to CPLR THRU and A/B IN to CPLR ARM switch paths.
  - a. Connect two RF cable, one to Port-1 and one to Port-2.
  - b. Set the PNA-X to measure trace S12 (all standard jumpers connected).
  - c. Connect the Port-1 cable to Source Out and Port-2 cable to CPLR THRU connectors on the Test Set. If a power hole still exists refer to [“Contacting Agilent” on page 74](#).
  - d. Connect Port-1 to Receiver A IN or B IN and Port-2 to CPLR ARM connectors on the Test Set. If a power hole still exists refer to [“Contacting Agilent” on page 74](#).

---

## Service Information

Refer to [“Contacting Agilent”](#) on page 74.

---

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

---



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**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.**

---

## Replaceable Parts

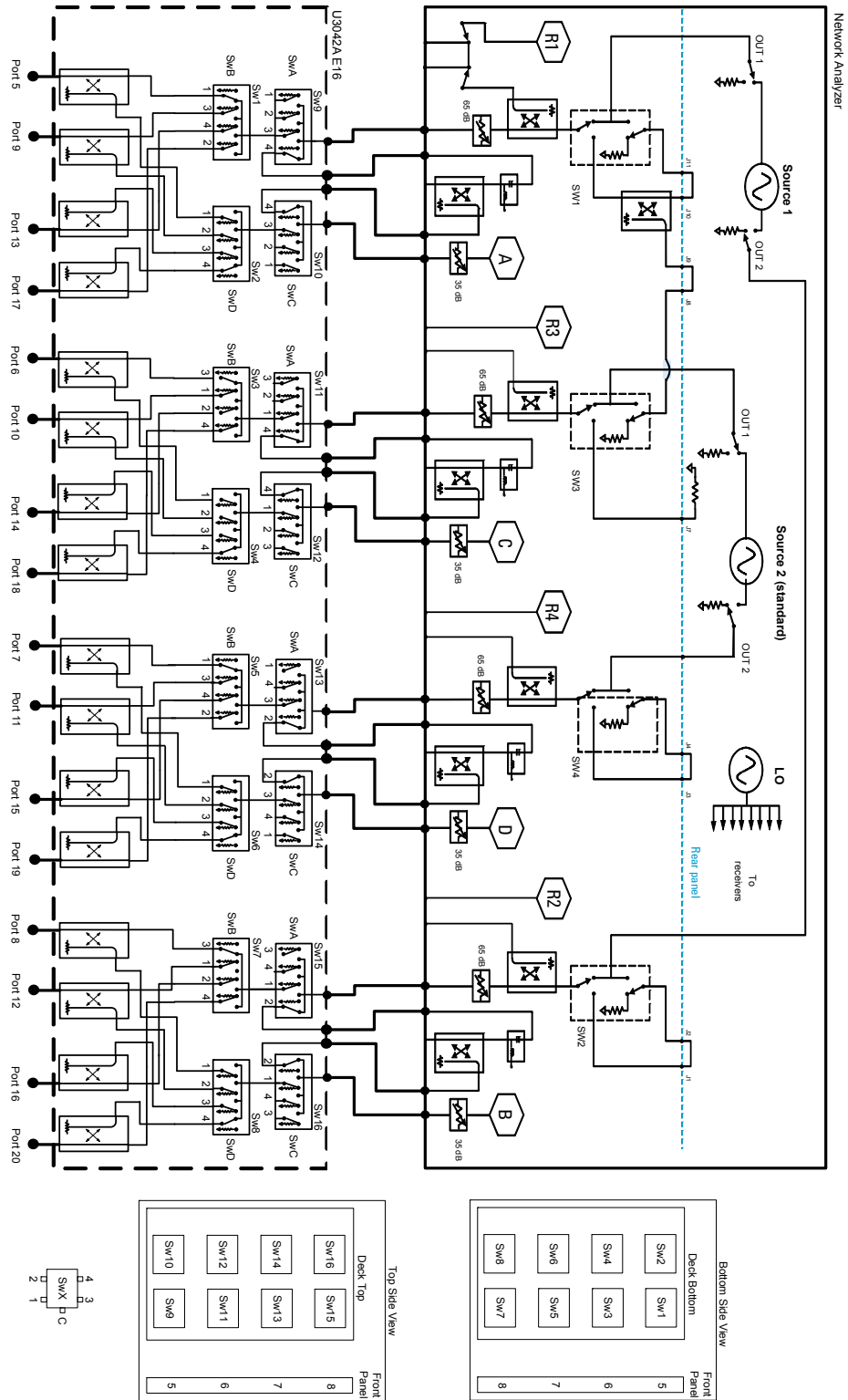
Special options are built to order, long lead times may be encountered when ordering replacement parts.

Description	Agilent Part Number
RF Cable, Semi-rigid	U3042-20120
RF Cable, Semi-rigid	U3042-20122
RF Cable, Semi-rigid	U3042-20119
RF Cable, Semi-rigid	U3042-20121
RF Cable, Semi-rigid	U3042-20124
RF Cable, Semi-rigid	U3042-20123
RF Cable, Semi-rigid	U3042-20123
RF Cable, Semi-rigid	U3042-20124
RF Cable, Semi-rigid	U3042-20123
RF Cable, Semi-rigid	U3042-20123
RF Cable, Semi-rigid	U3042-20124
RF Cable, Semi-rigid	U3042-20124
RF Cable, Semi-rigid	U3042-20127
RF Cable, Semi-rigid	U3042-20126
RF Cable, Semi-rigid	U3042-20128
RF Cable, Semi-rigid	U3042-20125
RF Cable, Semi-rigid	U3042-20076
SW Interface Board, programmed	U3042-63130
Dress Nut (coupler/bridge)	N5230-20081
PNA-X Test Set Rear Lock Feet (right)	N5242-20206

<b>Description</b>	<b>Agilent Part Number</b>
PNA-X Test Set Rear Lock Feet (left)	N5242-20207
10 LED Board (programmed)	N5261-60005
Test Set Control Board (programmed)	N5261-60006
Quad Switch, 26.5 GHz	5087-7306
Fan (rear panel)	87050-60027
DUT Control Board	E5091-66503
PNA-X Locking Feet	5023-0132
Rackmount kit without Handles	5063-9216
Rackmount kit with Handles	5063-9236
Front Handles	5063-9229
Coupler Bridge	5087-7716
Screw	0515-2317
PWR Supply (AC/DC SWG 650W 9- Output	0950-4729
Fuse (8 A 250 V non-time delay 0.0146 Ohm	2110-0342
Fuse (5 A 250 V non-time delay Socket	2110-0709
Test set I/O Cable	8120-6818
U3042A Option E16 User's and Service Guide	U3042-90012



**Figure 42 U3042AE16 with PNA-X Block Diagram**



---

## Theory of Operation

The following is a description of the operation of the Test Set. Reference the Test Set block diagrams shown in [Figure 42 on page 51](#). This section assumes the user has a general understanding of couplers, switches, and network analyzers.

There are four modules, a module is a group of four switches and couplers controlling the source and receiver paths of the PNA-X and Test Set. Refer to [Figure 33, “Source and Receiver Switch Path.”](#)

### RF Coupler/Bridges

The Test Set uses sixteen coupler/bridges (5087-7716) on the front panel for RF Test Ports 5 - 20. The coupler/bridges provide the signal separation of the source and receiver paths, using resistor networks. The Test Set ports can receive from or stimulate a signal to the DUT.

The RF Test Ports are 3.5 mm male connectors. The coupling factor is approximately -16 dB for the Coupled Arm (minimum -22 dB and max -12 dB at 26.5 GHz). The insertion loss through the CPLR THRU path is typically < 4 dB at 26.5 GHz for the coupler. Do not use excessive RF power or DC voltage, or damage may occur to the internal resistors.

### RF Switch Components

The Test Set uses sixteen solid-state switches that have internal 50 Ohm terminations for each path. The switches select the RF paths from the PNA-X source and receiver through interconnect cables to the Test Set. PNA-X Ports 1 to 4 and Test Set Port paths 5 to 20.

### Source and Receiver Switch Paths

#### SW1 and SW9 Source to Ports (1, 5, 9, 13 and 17)

Switch 9 provides control of the Source Output path to PNA-X Port 1 and with SW1 for Test Set Ports 5, 9, 13 and 17. In the state shown in the block diagram, switches 1 and 9 route the RF Source back to the PNA-X Port 1, and the Test Set Source path to Ports 5, 9, 13 and 17 are terminated.

#### SW3 and SW11 Source to Ports (3, 6, 10, 14 and 18)

Switch 11 provides control of the Source Output path to PNA-X Port 3 and with SW3 for Test Set Ports 6, 10, 14 and 18. In the state shown in the block diagram, switches 3 and 11 route the RF Source back to the PNA-X Port 3, and the Test Set Source path to Ports 6, 14 and 18 are terminated.

**SW5 and SW13 - Source to Ports (4, 7, 11, 15 and 19)**

Switch 13 provides control of the Source Output path to PNA-X Port 4 and with SW5 for Test Set Ports 7, 11, 15 and 19. In the state shown in the block diagram, switches 5 and 13 route the RF Source back to the PNA-X Port 4, and the Test Set Source path to Ports 7, 11, 15 and 19 are terminated.

**SW7 and SW15 - Source to Ports (2, 8, 12, 16 and 20)**

Switch 15 provides control of the Source Output path to PNA-X Port 2 and with SW7 for Test Set Ports 8, 12, 16 and 20. In the state shown in the block diagram, switches 7 and 15 route the RF Source back to the PNA-X Port 2, and the Test Set Source path to Ports 8, 12, 16 and 20 are terminated.

**SW2 and SW10 - Receiver to Ports (1, 5, 9, 13 and 17)**

Switch 10 provides control of the Receiver Input path to PNA-X Port 1 and with SW2 for Test Set Port 5, 9, 13 and 17. In the state shown in the block diagram, switches 2 and 10 route the Port 1 Coupler Arm to the Receiver, and Test Set Ports 5, 9, 13 and 17 Coupler Arm path is terminated.

**SW4 and SW12 - Receiver to Ports (3, 6, 10, 14 and 18)**

Switch 12 provides control of the Receiver Input path to PNA-X Port 3 and with SW4 for Test Set Ports 6, 10, 14 and 18. In the state shown in the block diagram, switches 4 and 12 route the Port 3 Coupler Arm to the Receiver, and Test Set Ports 6, 10, 14 and 18 Coupler Arm path is terminated.

**SW6 and SW14 - Receiver to Ports (4, 7, 11, 15 and 19)**

Switch 14 provides control of the Receiver Input path to PNA-X Port 4 and with SW6 for Test Set Ports 7, 11, 15 and 19. In the state shown in the block diagram, switches 6 and 14 route the Port 4 Coupler Arm to the Receiver, and Test Set Ports 7, 11, 15 and 19 Coupler Arm path is terminated.

**SW 8 and SW16 - Receiver to Ports (2, 8, 12, 16 and 20)**

Switch 16 provides control of the Receiver Input path to PNA-X Port 2 and with SW8 for Test Set Port 8, 12, 16 and 20. In the state shown in the block diagram, switches 8 and 16 route the Port 2 Coupler Arm to the Receiver, and Test Set Ports 8, 12, 16 and 20 Coupler Arm path is terminated.

---

## Troubleshooting the Test Set

If the U3042AE16 is not operating properly, use the following procedures to isolate and repair the type of failure encountered. It is recommended that a qualified service technician perform the following procedures.

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

To request service, please contact your local service center. In the US, call 1-800-829-4444. For a listing of service centers worldwide, please visit us at [www.agilent.com/find/service](http://www.agilent.com/find/service).

When sending the Test Set in for repair, also send your PNA-X and cables. This will allow us to verify proper operation of the complete system, and speed your repair turn-around time. Refer to [“Shipping Your Product to Agilent for Service or Repair” on page 74](#).

Refer to the following procedures for troubleshooting. 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.**

---

### Fan is not Operating

Suspect a power supply problem or failed fan, and perform the following troubleshooting.

---

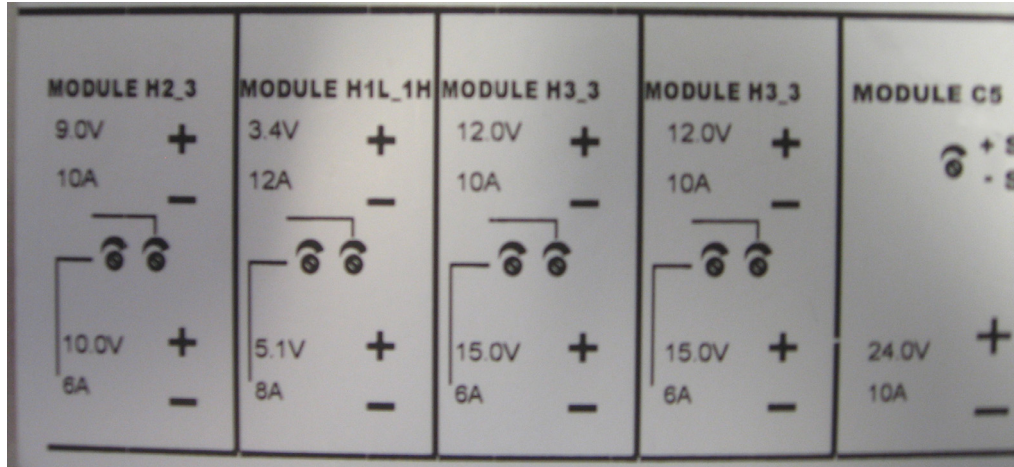
**WARNING**    **The opening of covers or removal of parts is likely to expose the user to dangerous voltages. Disconnect the instrument from all voltage sources before being opened.**

---

1. Verify the front panel power switch (3101-4058) is operational.
2. Verify that the AC line voltage is correct (100 to 240 V @ 50/60 Hz) and that the power cord is not damaged.
  - a. If the power cord is damaged, replace it.
  - b. If the AC line voltage is incorrect, use another receptacle.
3. Verify that the fuse (2110-0709) in line module is not blown. There is a spare fuse in the line module. Refer to [Figure 4 on page 11](#). If the fuse is working, continue to step 4.
4. Remove the top cover. Verify that the supply LED indicators on the Test Set control board (N5261-60006) are illuminated. If the LED's are illuminated, replace the fan (87050-60027). Refer to [Figure 44 on page 66](#).
5. If the LED's are off, verify the voltages (+24, +5, +3, -15, -12, +15, +12, +9 and +10 Volts) on the Test Set Controller board. If the voltages are not correct, verify that J10 - J14 cables are connected correctly on both the power supply and controller board. Refer to [Figure 44 on page 66](#).

6. If the J10 - J14 cables are connected properly, measure the voltages on the power supply screw terminals. See the power supply voltages in [Figure 43 on page 55](#).

**Figure 43 Power Supply**



7. If power supply voltages are not present, verify and/or replace the two 8 amp fuses (2110-0342) in the line fuse assembly. Refer to [Figure 44 on page 66](#).
- If the fuses are correct, replace power supply (0950-4729).

## Front Panel LEDs (R, S or Active) are not Illuminated

If the U3042AE16 fan and power supplies are operating the following procedures can be used to verify the failure. Suspect the Test Set Controller Board (N5261-60006) or Front Panel LED Assembly (N5261-60005).

1. Verify the Test Set I/O cable (8120-6818) is installed correctly. See [Figure 11 on page 16](#).
2. Using multiport mode (Option 551), verify the PNA-X firmware is correct, and the test set file is loaded into the PNA-X, refer to [“Network Analyzer Requirements” on page 3](#).
3. Using the I/O command values, confirm the correct address and data values are used. Refer to [“Test Set I/O Interface Commands” on page 37](#).
4. Remove the top cover. Verify that the supply LED indicators, on the test set control board (N5261-60006), are illuminated.
5. If the LED's are off, verify the voltages (+24, +5, +3, -15, -12, +15, +12, +9 and +10 Volts) on the Test Set Controller board. If the voltages are not correct, verify that J10 - J14 cables are connected correctly on both the power supply and controller board. Refer to [“Fan is not Operating” on page 54](#).
6. Verify at least one of the status LEDs is on. If not, replace the controller board (N5261-60006).
7. If the controller board status LEDs are on, and the Active LED is on, suspect the front panel LED boards (N5261-60005) or the ribbon cables (N5261-60001). If only one set of front panel LEDs are not working, connect the ribbon cable from one of the working front panel LED boards to the front panel LED board assembly that is not working. Replace if necessary.

## Test Ports are not Switching

If the test ports are not switching, the following procedures can be used to verify the failure. The procedures assume power supplies, controller board and front panel LEDs are working. Suspect the switch interface board (U3042-63130), ribbon cable connection or switch (5087-7306).

1. Inspect the ribbon cable connections from the test port switches to the Switch Interface board (U3042-63130). Refer to [Table 12 on page 65](#)
2. Send a Test Set I/O command to verify the path for each port. See [“Source and Receiver Path Test” on page 57](#).
3. Substitute a known good switch, or connect a known good ribbon cable to a suspect switch and retest. Replace if necessary.

---

## Source and Receiver Path Test

This section provides information for testing the RF paths.

### Equipment Required

- N5242A PNA-X
- Two Flex Cable with SMA connectors (5062-6696 or equivalent)
- Three SMA Adapters (female to female)
- Test Set I/O Cable (8120-6818)

### Equipment Setup

1. Connect the Test Set I/O cable (8120-6818) from the PNA-X to Test Set. Refer to [Figure 11 on page 16](#). Set the PNA-X to “Standalone mode” (test can not be performed in Multiport mode).
2. Connect the flexible cables (5062-6696 or equivalent) with the SMA adapters to PNA-X Ports 1 and 2. Connect the cables together using a SMA adapter.
3. Set the frequency range to 10 MHz to 26.5 GHz, or the frequency range of the PNA-X you are using.
4. Select measure S21 trace, and perform a Response Cal.
5. Select Ref Level 0 dB > Scale 10 dB (or Autoscale).

## Source Path Trace

The S21 trace should slope down approximately  $-0.5$  to  $-10$  dB for all CPLR THRU (SMA) to SOURCE IN paths. Refer to the individual port path to be tested. The S21 trace should slope down approximately  $-3$  to  $-20$  dB for test Ports 5 thru 20 to SOURCE IN (SMA) paths.

When measuring CPLR THRU or SOURCE IN SMA connectors, the connections are to the four SMA connectors to the right of the associated test ports being measured. See [Figure 2 on page 9](#) for the connector locations. Start with sending command 0.0.

### Port 1 Source

- Set Test I/O addr.data 0.0
- Connect PNA Port 1 flex cable to Test Set Port 5 CPLR THRU.
- Connect PNA Port 2 flex cable to Test Set Port 5 SOURCE IN.

### Port 3 Source

- Set Test I/O addr.data 16.0
- Connect PNA Port 1 flex cable to Test Set Port 6 CPLR THRU.
- Connect PNA Port 2 flex cable to Test Set Port 6 SOURCE IN.

### Port 4 Source

- Set Test I/O addr.data 32.0
- Connect PNA Port 1 flex cable to Test Set Port 7 CPLR THRU.
- Connect PNA Port 2 flex cable to Test Set Port 7 SOURCE IN.

### Port 2 Source

- Set Test I/O addr.data 64.0
- Connect PNA Port 1 flex cable to Test Set Port 8 CPLR THRU.
- Connect PNA Port 2 flex cable to Test Set Port 8 SOURCE IN.

### Port 5 Source

- Set Test I/O addr.data 0.1
- Connect PNA Port 1 flex cable to Test Set Port 5.
- Connect PNA Port 2 flex cable to Test Set SOURCE IN.

### Port 6 Source

- Set Test I/O addr.data 16.1
- Connect PNA Port 1 flex cable to Test Set Port 6.
- Connect PNA Port 2 flex cable to Test Set SOURCE IN.

### Port 7 Source

- Set Test I/O addr.data 32.1
- Connect PNA Port 1 flex cable to Test Set Port 7.
- Connect PNA Port 2 flex cable to Test Set SOURCE IN.



**Port 8 Source**

- Set Test I/O addr.data 64.1
- Connect PNA Port 1 flex cable to Test Set Port 8
- Connect PNA Port 2 flex cable to Test Set SOURCE IN.

**Port 9 Source**

- Set Test I/O addr.data 0.2
- Connect PNA Port 1 flex cable to Test Set Port 9.
- Connect PNA Port 2 flex cable to Test Set SOURCE IN.

**Port 10 Source**

- Set Test I/O addr.data 16.2
- Connect PNA Port 1 flex cable to Test Set Port 10.
- Connect PNA Port 2 flex cable to Test Set SOURCE IN.

**Port 11 Source**

- Set Test I/O addr.data 32.2
- Connect PNA Port 1 flex cable to Test Set Port 11
- Connect PNA Port 2 flex cable to Test Set SOURCE IN.

**Port 12 Source**

- Set Test I/O addr.data 64.2
- Connect PNA Port 1 flex cable to Test Set Port 12
- Connect PNA Port 2 flex cable to Test Set SOURCE IN.

**Port 13 Source**

- Set Test I/O addr.data 0.3
- Connect PNA Port 1 flex cable to Test Set Port 13
- Connect PNA Port 2 flex cable to Test Set SOURCE IN.

**Port 14 Source**

- Set Test I/O addr.data 16.3
- Connect PNA Port 1 flex cable to Test Set Port 14
- Connect PNA Port 2 flex cable to Test Set SOURCE IN.

**Port 15 Source**

- Set Test I/O addr.data 32.3
- Connect PNA Port 1 flex cable to Test Set Port 15
- Connect PNA Port 2 flex cable to Test Set SOURCE IN.

**Port 16 Source**

- Set Test I/O addr.data 64.3
- Connect PNA Port 1 flex cable to Test Set Port 16
- Connect PNA Port 2 flex cable to Test Set SOURCE IN.

**Port 17 Source**

- Set Test I/O addr.data 0.4
- Connect PNA Port 1 flex cable to Test Set Port 17
- Connect PNA Port 2 flex cable to Test Set SOURCE IN.

**Port 18 Source**

- Set Test I/O addr.data 16.4
- Connect PNA Port 1 flex cable to Test Set Port 18
- Connect PNA Port 2 flex cable to Test Set SOURCE IN.

**Port 19 Source**

- Set Test I/O addr.data 32.4
- Connect PNA Port 1 flex cable to Test Set Port 19
- Connect PNA Port 2 flex cable to Test Set SOURCE IN.

**Port 20 Source**

- Set Test I/O addr.data 64.4
- Connect PNA Port 1 flex cable to Test Set Port 20
- Connect PNA Port 2 flex cable to Test Set SOURCE IN.

## Receiver Path Trace

The S21 trace should slope down approximately  $-0.5$  to  $-10$  dB for all RCVR OUT (SMA) to CPLR ARM paths. Refer to the individual port path to be tested. The S21 trace should slope down approximately  $-18$  to  $-35$  dB for test Ports 5 thru 20 to RCVR OUT (SMA) paths.

When measuring CPLR ARM or RCVR OUT SMA connectors, the connections are to the four SMA connectors to the right of the associated test ports being measured. See [Figure 2 on page 9](#) for the connector locations.

### Port 1 RCVR

- Set Test I/O addr.data 0.0
- Connect PNA Port 1 flex cable to Test Set Port 5 CPLR ARM.
- Connect PNA Port 2 flex cable to Test Set Port 5 RCVR OUT.

### Port 3 RCVR

- Set Test I/O addr.data 16.0
- Connect PNA Port 1 flex cable to Test Set Port 6 CPLR ARM.
- Connect PNA Port 2 flex cable to Test Set Port 6 RCVR OUT.

### Port 4 RCVR

- Set Test I/O addr.data 32.0
- Connect PNA Port 1 flex cable to Test Set Port 7 CPLR ARM.
- Connect PNA Port 2 flex cable to Test Set Port 7 RCVR OUT.

### Port 2 RCVR

- Set Test I/O addr.data 64.0
- Connect PNA Port 1 flex cable to Test Set Port 8 CPLR ARM.
- Connect PNA Port 2 flex cable to Test Set Port 8 RCVR OUT.

### Port 5 RCVR

- Set Test I/O addr.data 0.16
- Connect PNA Port 1 flex cable to Test Set Port 5.
- Connect PNA Port 2 flex cable to Test Set Port 5 RCVR OUT.

### Port 6 RCVR

- Set Test I/O addr.data 16.16
- Connect PNA Port 1 flex cable to Test Set Port 6.
- Connect PNA Port 2 flex cable to Test Set Port 6 RCVR OUT.

### Port 7 RCVR

- Set Test I/O addr.data 32.16
- Connect PNA Port 1 flex cable to Test Set Port 7.
- Connect PNA Port 2 flex cable to Test Set Port 7 RCVR OUT.

**Port 8 RCVR**

- Set Test I/O addr.data 64.16
- Connect PNA Port 1 flex cable to Test Set Port 8.
- Connect PNA Port 2 flex cable to Test Set Port 8 RCVR OUT.

**Port 9 RCVR**

- Set Test I/O addr.data 0.32
- Connect PNA Port 1 flex cable to Test Set Port 9.
- Connect PNA Port 2 flex cable to Test Set Port 9 RCVR OUT.

**Port 10 RCVR**

- Set Test I/O addr.data 16.32
- Connect PNA Port 1 flex cable to Test Set Port 10.
- Connect PNA Port 2 flex cable to Test Set Port 10 RCVR OUT.

**Port 11 RCVR**

- Set Test I/O addr.data 32.32
- Connect PNA Port1 flex cable to Test Set Port 11.
- Connect PNA Port 2 flex cable to Test Set Port 11 RCVR OUT.

**Port 12 RCVR**

- Set Test I/O addr.data 64.32
- Connect PNA Port 1 flex cable to Test Set Port 12.
- Connect PNA Port 2 flex cable to Test Set Port 12 RCVR OUT.

**Port 13 RCVR**

- Set Test I/O addr.data 0.48
- Connect PNA Port 1 flex cable to Test Set Port 13
- Connect PNA Port 2 flex cable to Test Set RCVR OUT.

**Port 14 RCVR**

- Set Test I/O addr.data 16.48
- Connect PNA Port 1 flex cable to Test Set Port 14
- Connect PNA Port 2 flex cable to Test Set RCVR OUT.

**Port 15 RCVR**

- Set Test I/O addr.data 32.48
- Connect PNA Port 1 flex cable to Test Set Port 15
- Connect PNA Port 2 flex cable to Test Set RCVR OUT.

**Port 16 RCVR**

- Set Test I/O addr.data 64.48
- Connect PNA Port 1 flex cable to Test Set Port 16
- Connect PNA Port 2 flex cable to Test Set RCVR OUT.

**Port 17 RCVR**

- Set Test I/O addr.data 0.64
- Connect PNA Port 1 flex cable to Test Set Port 17
- Connect PNA Port 2 flex cable to Test Set RCVR OUT.

**Port 18 RCVR**

- Set Test I/O addr.data 16.64
- Connect PNA Port 1 flex cable to Test Set Port 18
- Connect PNA Port 2 flex cable to Test Set RCVR OUT.

**Port 19 RCVR**

- Set Test I/O addr.data 32.64
- Connect PNA Port 1 flex cable to Test Set Port 19
- Connect PNA Port 2 flex cable to Test Set RCVR OUT.

**Port 20 RCVR**

- Set Test I/O addr.data 64.64
- Connect PNA Port 1 flex cable to Test Set Port 20
- Connect PNA Port 2 flex cable to Test Set RCVR OUT.

## RF Performance Fails

If the U3042AE16 operates correctly, but RF performance fails the operational test. The following procedures can be used to isolate the failed component. Suspect the switches (5087-7306), RF cables, or coupler bridge (5087-7716).

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**NOTE** The RF performance of the U3042AE16 depends on the performance of the PNA-X. Ensure the PNA is meeting specification before continuing.

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1. Verify that the test set and PNA-X SOURCE, RCVR, CPLR THRU, and CPLR ARM connectors are clean and that the center pins are not damaged.
2. Verify the interface and internal RF cables are cleaned and not damaged. [“Troubleshooting Operational Check Failures” on page 48.](#)
3. Review the [“Operational Check” on page 40](#) and verify the results for the port that is failing.
4. Reflection tracking trace shows a power hole, or is below the test limit line, perform the switch path test for the port that is failing. Refer to [“Source and Receiver Path Test” on page 57.](#)
5. Directivity trace fails (above  $-10\text{dB}$ ), replace the coupler/bridge (5087-7716).
6. Source or load match fails (above  $-10\text{ dB}$ ), replace the switch (5087-7306).
7. Isolation is poor between ports, inspect the RF connections. If it continues to fail replace the switch (5087-7306). The RF cables require proper torque (10 in-lb) and can be damaged by over tightening.

## Control Lines are not Working

If the U3042AE16 operates correctly but the control lines are not functioning, the following procedures can be used to verify the component failure. Suspect the DUT CONTROL BD (E5091-66503).

1. Verify that the control voltage pins on the DUT control are connected correctly. Refer to [“DUT Control Lines” on page 32.](#)
2. Verify that the control pot is centered (5V). Refer to [Figure 3 on page 10.](#)
3. Verify the ribbon cable connection.
4. Replace the DUT control board (E5091-66503).
5. Replace the test set control board (N5261-60006).

## Troubleshooting Diagrams and Tables

**Table 11 Controller Board Connections**

Controller Board Connection	Connection
<b>LED Ribbon Cables From the LED Board</b>	
J5	Ports 5, 9, 13 and 17
J6	Ports 6, 10, 14 and 18
J7	Ports 7, 11, 15 and 19
J8	Ports 8, 12, 16 and 20
<b>Wire harness Active LED</b>	
J16	Active LED
<b>DUT Control Ribbon Cable</b>	
J9	DUT Controller Board
<b>Power Supply Wire Harness</b>	
J10- 14	Power Supply

**Table 12 Interface Board Connections**

Source and Receiver Switches	Switch Interface Board		Switches	
	Top Switches	Bottom Switches	Top Switches	Bottom Switches
Ports 5, 9, 13 and 17 (Source)	J13	J12	SW9	SW1
Ports 5, 9, 13 and 17 (Receiver)	J7	J10	SW10	SW2
Ports 6, 10, 14 and 18 (Source)	J21	J20	SW11	SW3
Ports 6, 10, 14 and 18 (Receiver)	J19	J18	SW12	SW4
Ports 7, 11, 15 and 19 (Source)	J29	J28	SW13	SW5
Ports 7, 11, 15 and 19 (Receiver)	J27	J26	SW14	SW6
Ports 8, 12, 16 and 20 (Source)	J37	J36	SW15	SW7
Ports 8, 12, 16 and 20 (Receiver)	J35	J34	SW16	SW8

**Figure 44 Top View**

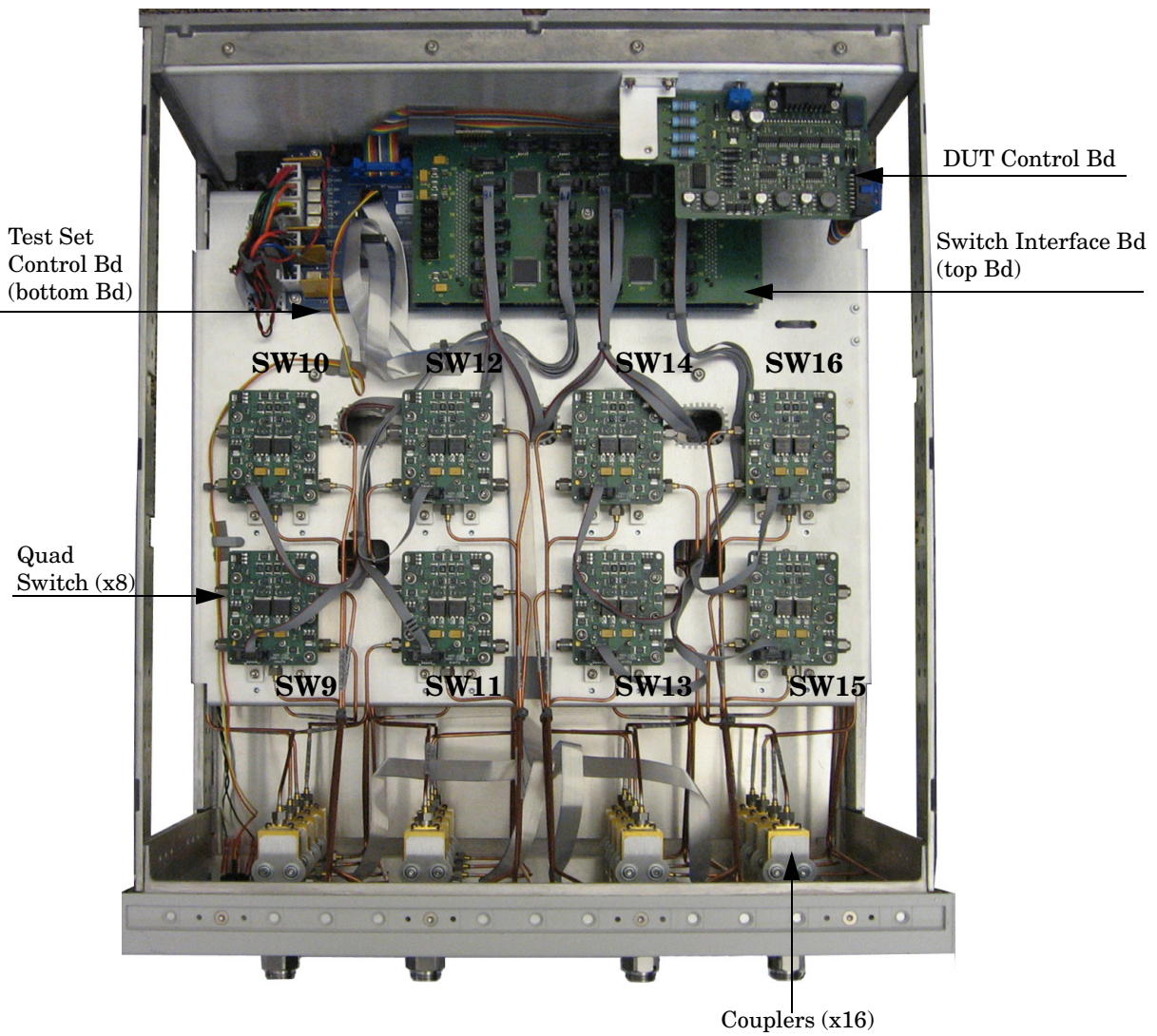
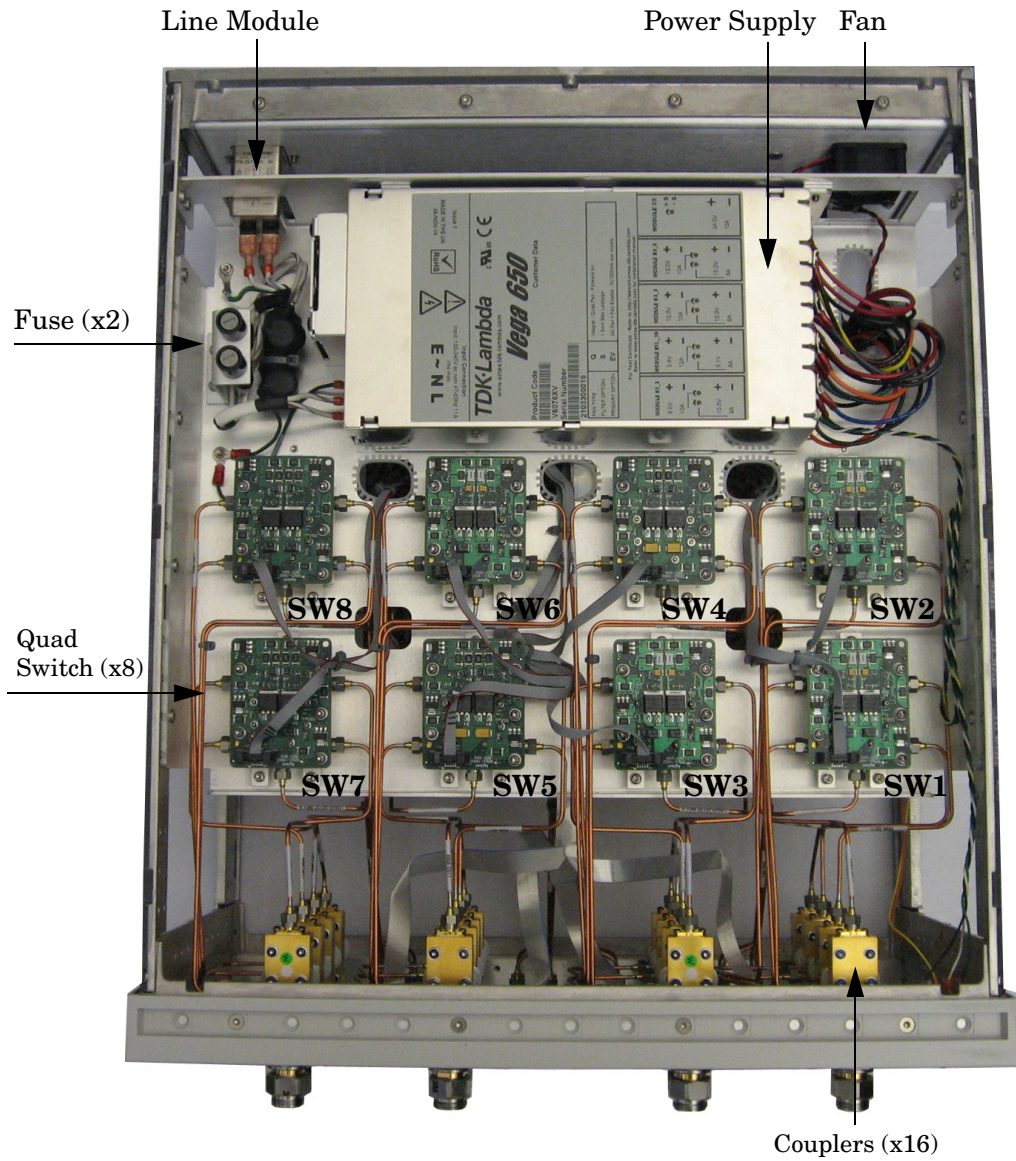




Figure 45 Bottom View



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## Safety and Regulatory Information

### Introduction

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

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**WARNING** This is a Safety Class I product (provided with a protective earthing 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.

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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.

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### Declaration of Conformity

A copy of the Declaration of Conformity is available upon request, or a copy is available on the Agilent Technologies web site at <http://regulations.corporate.agilent.com/DoC/search.htm>

### Statement of Compliance

This instrument has been designed and tested in accordance with CAN/CSA 22.2 No. 61010-1-04, UL Std. 61010-1 (2nd Edition), and IEC 61010-1 (Second Edition).

## Before Applying Power

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

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<b>WARNING</b>	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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<b>CAUTION</b>	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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<b>CAUTION</b>	This product is designed for use in Installation Category II and Pollution Degree 2.
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<b>CAUTION</b>	Before switching on this instrument, make sure the supply voltage is in the specified range.
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<b>CAUTION</b>	Verify that the premise electrical voltage supply is within the range specified on the instrument.
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<b>CAUTION</b>	<b>Ventilation Requirements:</b> When installing the instrument in a cabinet, the convection into and out of the instrument must not be restricted. The ambient temperature (outside the cabinet) must be less than the maximum operating temperature of the instrument by 4 °C for every 100 watts dissipated in the cabinet. If the total power dissipated in the cabinet is greater than 800 watts, forced convection must be used.
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<b>CAUTION</b>	This instrument has auto-ranging line voltage input, be sure the supply voltage is within the specified range.
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## Servicing

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**WARNING**     **Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended. Discard used batteries according to manufacturer's instructions.**

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**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.**

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

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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 front panel switch is only a standby switch and is not a LINE switch (disconnecting device).**

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**WARNING**     **The power cord is connected to internal capacitors that may remain live for 5 seconds after disconnecting the plug from its power supply.**

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### 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.

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**WARNING**     **To prevent electrical shock, disconnect the [Agilent Technologies U3042AE16](#) 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.**

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**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.**

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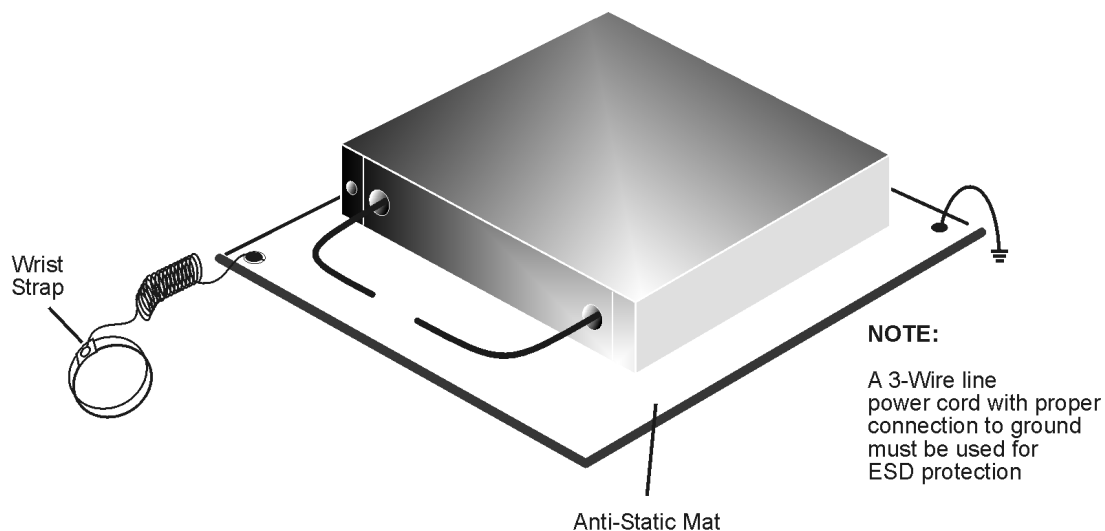
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## Electrostatic Discharge Protection

Protection against electrostatic discharge (ESD) is essential while removing assemblies from or connecting cables to the instrument. Static electricity can build up on your body and can easily damage sensitive internal circuit elements when discharged. Static discharges too small to be felt can cause permanent damage. To prevent damage to the instrument:

- *always* have a grounded, conductive table mat in front of your test equipment.
- *always* wear a grounded wrist strap with grounding cord, connected to a grounded conductive table mat, having a 1 M $\Omega$  resistor in series with it, when handling components and assemblies or when making connections.
- *always* wear a heel strap (9300-1126) when working in an area with a conductive floor. If you are uncertain about the conductivity of your floor, wear a heel strap.
- *always* ground yourself before you clean, inspect, or make a connection to a static-sensitive device or test port. You can, for example, grasp the grounded outer shell of the test port or cable connector briefly.
- *always* ground the center conductor of a test cable before making a connection to the analyzer test port or other static-sensitive device. This can be done as follows:
  1. Connect a short to one end of the cable to short the center conductor to the outer conductor.
  2. While wearing a grounded wrist strap, grasp the outer shell of the cable connector.
  3. Connect the other end of the cable to the test port and remove the short from the cable.

**Figure 46** ESD Protection Setup



ku310b

## Regulatory Information

### Instrument Markings

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



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 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 instrument requires alternating current (ac) input.



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.



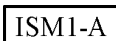
This symbol is used to identify a terminal which is internally connected to the product frame or chassis.



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.

**IP 2 0**

The instrument has been designed to meet the requirements of IP 2 0 for ingress and operational environment.



This is a required mark signifying compliance with an EMC requirement. The C-Tick mark is a registered trademark of the Australian Spectrum Management Agency.



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 on all primary and secondary packaging indicates compliance to China standard GB 18455-2001.

### Battery Collection

Do not throw batteries away but collect as small chemical waste, or in accordance with your country's requirements. You may return the battery to Agilent Technologies for disposal. Refer to [“Contacting Agilent” on page 74](#) for assistance.

### Compliance with German Noise Requirements

This is to declare that this instrument is in conformance with the German Regulation on Noise Declaration for Machines (Laermangabe nach der Maschinenlaermverordnung-3. GSGV Deutschland).

Acoustic Noise Emission/Geraeuschemission	
LpA<70 dB	Lpa<70 dB
Operator Position	am Arbeitsplatz
Normal Operation	normaler Betrieb
per ISO 7779	nach DIN 45635 t .19

### EMC Information

Complies with European EMC Directive 2004/108/EC

- IEC/EN 61326-1
- CISPR Pub 11 Group 1, class A
- AS/NZS CISPR 11
- This ISM device complies with Canadian ICES-001.  
Cet appareil ISM est conforme a la norme NMB du Canada.



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## Agilent Support, Services, and Assistance

### Service and Support Options

The standard product warranty is a *one-year return to Agilent Technologies* service warranty.

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

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### Contacting Agilent

Assistance with test and measurements needs and information or finding a local Agilent office are available on the Web at:

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

If you do not have access to the Internet, contact your field engineer.

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

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### Shipping Your Product to Agilent for Service or Repair

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**IMPORTANT** Agilent 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 Agilent for repair.

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

- To improve turn-around time, send your PNA-X and cables to Agilent to verify operation of the complete system.
- Include a complete description of the service requested or of the failure and a description of any failed test and any error message.
- Remove and retain the front handles and all rack mount hardware. The analyzer should be sent to Agilent in the same configuration as it was originally shipped.
- Ship the analyzer using the original or comparable antistatic packaging materials.
- Contact Agilent for instructions on where to ship your analyzer.