

Agilent Technologies U3042AM12

User's and Service Guide

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



Agilent Technologies

Manufacturing Part Number: U3042-90006

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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.

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.**

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.

Definitions

- *Specifications* describe the performance of parameters covered by the product warranty (temperature –0 to 55 °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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Contents

U3042AM12

Introduction

This document describes how to use and service the U3042AM12 Multiport Test Set with the Agilent N5230A/C 4-Port PNA-L Network Analyzer and the N5242A PNA-X for a 16-Port network analyzer solution.

Figure 1 N5230A/C 4-Port PNA-L with U3042AM12



Figure 2 N5242A 4-Port PNA-X with U3042AM12



Description

The Agilent U3042AM12 is a 12-Port mechanical switch extension test set. The 12-Port extension test set can be connected to a 4-Port PNA-L or PNA-X Network Analyzer. This expands the 4-Port network analyzer to 16 test ports. Full cross bar. Option 551 in the Network Analyzer provides N port calibration capabilities.

Frequency Range: 300 kHz to 26.5 GHz. Operates up to 26.5 GHz with N5242A PNA-X or down to 300 kHz with N5230A/C PNA-L. Requires a four port PNA with a test set and configurable options such as N5242A-400 or N5230A-245. Mechanical switches provide low loss and best frequency range performance, but have slower switch speed and limited life compared to solid-state switches in U3042AE12.

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

The N5230A/C PNA-L and N5242A PNA-X Network Analyzer's will be referred to as the PNA-L and the PNA-X throughout this document. PNA refers to both PNA-L or PNA-X.

Network Analyzer Requirements

- For Multipoint Operations the Network Analyzer requires Option 551 (N-Port error correction and measurement capability).
- The N5230A/C PNA-L requires Option 245, 145, 246 or 146 to provide the test set interface connections and requires test set file u3042aM12_p4.tsx.
- The N5242A PNA-X requires Option 400 to provide the test set interface connections and requires test set file u3042aM12_pnax_p4.tsx.

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>
Refer to “Installing New Firmware” on page 18.
- U3042AM12 Test Set Files - <http://na.tm.agilent.com/multiport>. (see test set files link)

Available Options

Test Set Options

The U3042AM12 has two available test set options:
Refer to “[System Block Diagram](#)” beginning on [page 88](#).

- Standard - mechanical switches for low loss.

Accessory Options

Installation instructions are included in the option package.

- Option 1CM - Rackmount Kit (5063-9215).
- Option 1CN - Front Handle Kit (5063-9228).
- Option 1CP - Rackmount with front handle Kit (5063-9222).

Cable Options

The U3042AM12 has two available cable options:

- Option 030 provides the interface cable set and hardware to connect the test set to the PNA-L.
- Option 042 provides the interface cable set and hardware to connect the U3042AM12 to the PNA-X.

Verifying the Shipment

Inspect the shipping container. If the container or packing material is damaged, it should be kept until the contents of the shipment have been checked mechanically and electrically. If there is physical damage refer to “[Contacting Agilent](#)” on [page 106](#). Keep the damaged shipping materials (if any) for inspection by the carrier and an Agilent Technologies representative.

[Table 1 on page 5](#) contains the accessories shipped with your U3042AM12.

Table 1 Content List

Agilent Part Number	Description	Qty
Common to the following Options		
9320-6636	Functional Test Certificate	1
9320-0333	Envelope-Cal Certificate	1
5023-0132	Locking Feet	1
8120-6818	Test Set I/O Cable	1
U3042-90006	User's Guide	1
Option 030 (Cable-set for PNA-L)		
Z5623-20418	RF Cable Semi-rigid	8
Z5623-20419	RF Cable Semi-rigid	8
Option 042 (Cable-set for PNA-X)		
U3042-20031	RF Cable Semi-rigid	1
U3042-20032	RF Cable Semi-rigid	1
U3042-20029	RF Cable Semi-rigid	1
U3042-20030	RF Cable Semi-rigid	1
U3042-20035	RF Cable Semi-rigid	1
U3042-20033	RF Cable Semi-rigid	1
U3042-20034	RF Cable Semi-rigid	1
U3042-20036	RF Cable Semi-rigid	1
U3042-20037	RF Cable Semi-rigid	1
U3042-20038	RF Cable Semi-rigid	1
U3042-20039	RF Cable Semi-rigid	1
U3042-20040	RF Cable Semi-rigid	1
U3042-20041	RF Cable Semi-rigid	1
U3042-20043	RF Cable Semi-rigid	1
U3042-20044	RF Cable Semi-rigid	1
0515-2317	Screw	2
N5242-20138	Rear Lock Feet (right)	1
N5242-20139	Rear Lock Feet (left)	1

General Specifications

Specifications for the U3042AM12 Multiport Test Set (300 kHz to 26.5 GHz) are characteristic for the System performance of the PNA and Test Set. Actual performance of the system is based on the customers PNA that is used with the test set. A functional certificate is only offered for the U3042AM12.

When connected to a PNA, the test set will degrade the performance at the test ports. The internal switch paths reduce test port power to the receivers. This affects the test port power of the PNA and also reduces dynamic range. The reflection tracking values measured in the [“Operational Check” on page 69](#) can be subtracted from the analyzers dynamic range to determine the approximate performance of the system.

CAUTION The life expectancy of the following switches are 5 million cycles. When making measurements using more than one port, single sweeps are recommended to minimize switch cycles.

- 87104-60001 (switch, x8)

Power Requirements

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

- 100/120/220/240 V (50/60 Hz)
- Air conditioning equipment (or other motor-operated equipment) should not be placed on the same ac line that powers the Test Set and PNA.
- [Table 2](#) contains the maximum wattage for all instruments. This table can be use to determine the electrical and cooling requirements.

Table 2 Power Requirements

Standard Equipment	
Instrument	Maximum Wattage
N5242A	270
N5230A/C	350
U3042AM12	350

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.

Environmental Requirements

Refer to the N5230A/C PNA-L standard documentation for environmental specifications. The PNA-L provides front panel access to the source outputs, receiver inputs and couplers for use with the multiport test sets.

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.

Environmental Tests

The U3042AM12 complies with all applicable safety and regulatory requirements for the intended location of use.

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 2](#).

Required Conditions for Accuracy Enhanced Measurement

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

Dimensions and Space Requirements

Standard installation of the U3042AM12 and PNA includes configuration and installation on a customer provided lab bench, or table top of adequate size and strength.

CAUTION The network analyzer is heavy. It is recommended that two individuals, or a mechanical lift be used to lift or transport the instrument.

Table 3 System Dimensions

Item	Dimensions
Required Bench Top Dimension:	
Clearance above the bench	43 cm (17 in)
Width	127 cm (50 in)
Depth	102 cm (40 in)
Weight	55 kg (110 lb)

Table 4 Instrument Dimensions

Model	Weight	Height	Width	Depth
N5242A	See Table 5 .	26.7 cm (10.5 in)	42.5 cm (16.8 in)	55.8 cm (21.97 in)
N5230A/C	29.7 kg (65.5 lb, ±0.5 lb)	27.9 cm (11 in)	48.3 cm (19 in)	50 cm (19.7 in)
U3042AM12	11.4 kg (25 lb)	19.1 cm (7.5 in)	42.5 cm (16.7 in)	43.2 cm (17 in)

Table 5 Weights

Weight		
Model	2-Port Modules (Option 200, or 219 or 224)	4-Port Modules (Option 400, or 419 or 423)
N5242A PNA-X	27 Kg (60 lb) nominal	37 Kg (82 lb) nominal

Frequency Range and Maximum Power Levels

Table 6 Usable Frequency Range

Model	Standard
N5230A/C(PNA-L)	300 kHz to 20 GHz
N5242A(PNA-X)	10 MHz to 26.5 GHz

CAUTION It is recommend that you do not operate components near damage levels (+30 dBm). The power levels must be 3 dB below maximum level to ensure no damage. See [Table 7](#).

Table 7 Power Levels

Maximum U3042AM12 Test Port RF Power Levels:	
PORT 5-16	+27 dBm 0 Vdc
Maximum U3042AM12 Access Ports:	
SOURCE OUT	+20 dBm 0 Vdc
CPLR ARM	+20 dbm 0 Vdc
CPLR THRU	+20 dBm 0 Vdc
RCVR OUT	+20 dBm 0 Vdc

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

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

Typical Reflection Tracking

Specifications for the U3042AM12 Multiport Test Set are typical. System performance for the PNA and Test Set are only characteristic and intended as non warranted information. A functional certificate is provided for the U3042AM12 only.

NOTE Typical specifications are based on 1 to 2 units performance. Refer to [Table 8](#), [Table 31](#) and [Table 32 on page 70](#).

Table 8 N5230A/C Typical Reflection Tracking

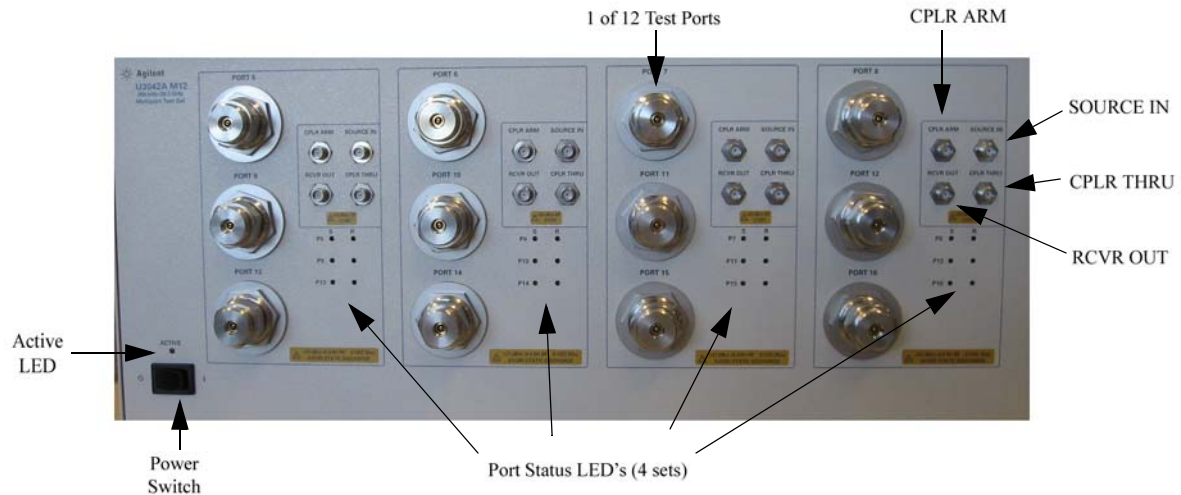
Frequency	Standard 700
300 kHz to 10 MHz	-0.2
10 MHz to 4 GHz	-3
4 GHz to 6 GHz	-4
6 GHz to 10.5 GHz	-5
10.5 GHz to 13.5 GHz	-6
13.5 GHz to 15 GHz	-7
15 GHz to 20 GHz	-10

Table 9 N5242A Typical Reflection Tracking

Frequency	Standard 700
10 MHz to 50 MHz	-0.5
50 MHz to 500 MHz	-2
500 MHz to 3.2 GHz	-3
3.2 GHz to 10 GHz	-5
10 GHz to 16 GHz	-7
16 GHz to 20 GHz	-10
20 GHz to 24 GHz	-11
24 GHz to 26.5 GHz	-12

Front and Rear Panel Features

Figure 3 Front Panel (Multiport Test Set)



Active LED

- When the test set power switch is On and is connected and addressed by a PNA, the LED is On (illuminated).
- The LED is Off (not illuminated) when the test set power switch is in Standby, or not addressed by a PNA.

Test Port 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.


Test Ports – 3.5 mm Bulkhead (male)

- Port 3–8

Access Ports – 3.5 mm (female)

- SOURCE OUT
- CPLR THRU
- CPLR ARM
- RCVR (A-D) OUT

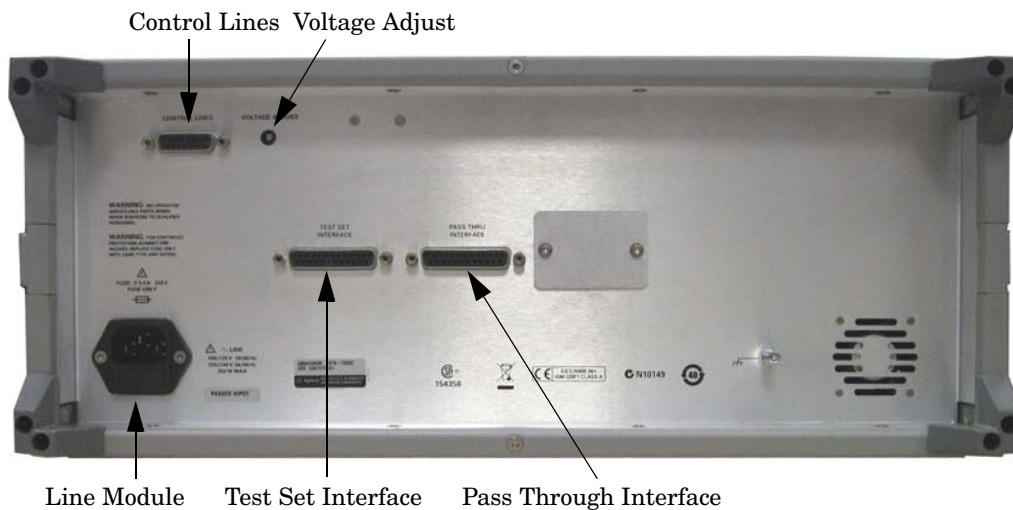
Line Switch

-  – Standby
- | – ON (Active LED On)

Control Lines and Voltage Adjust

For further information pertaining to control lines and voltage adjustments see “[DUT Control Lines](#)” on page 55.

Figure 4 Rear Panel (Multiport Test Set)



Test Set Interface

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

Pass Through Interface

Connection to another test set.

Line Module

The line fuse, as well as a spare, reside within the line module. [Figure 5](#) illustrates where the fuses are located and how to access them.

Available Fuses

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

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

Figure 5 Line Fuse



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

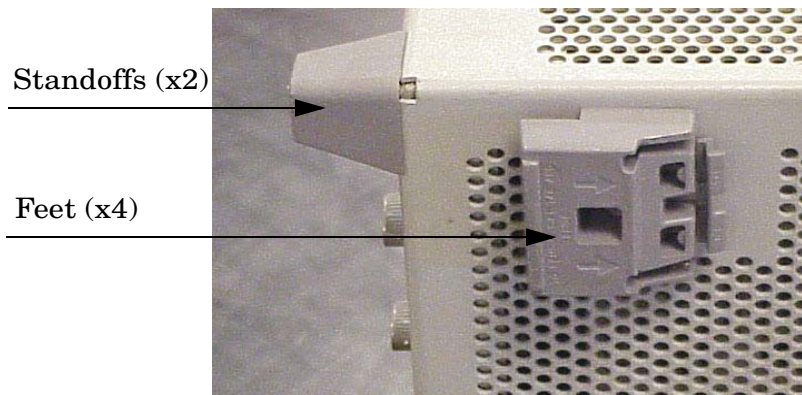
System Setup with N5230A/C

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

Preparing the N5230A/C Network Analyzer

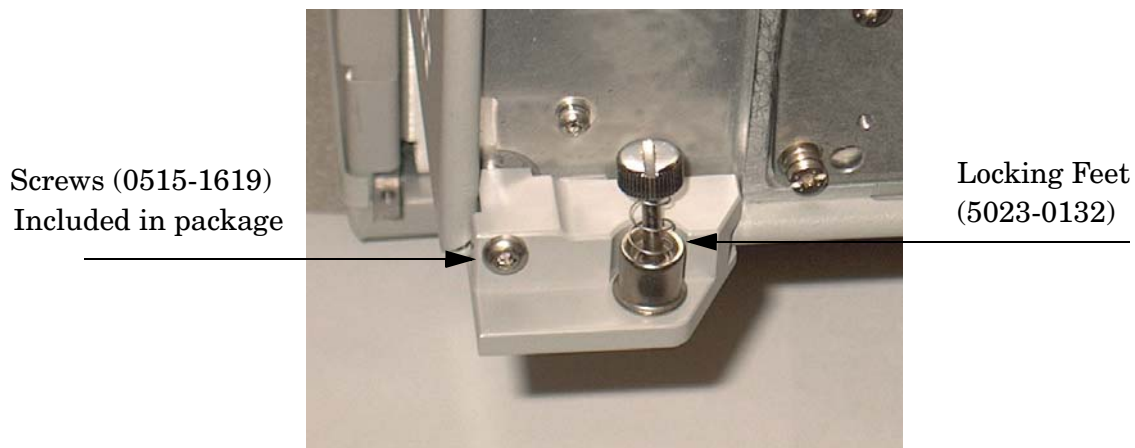
1. Remove the feet from the bottom of the network analyzer. Refer to [Figure 6](#).
2. Remove the 2 lower standoffs and screws (0515-1619) from the rear panel on the network analyzer.

Figure 6 Rear Bottom Feet



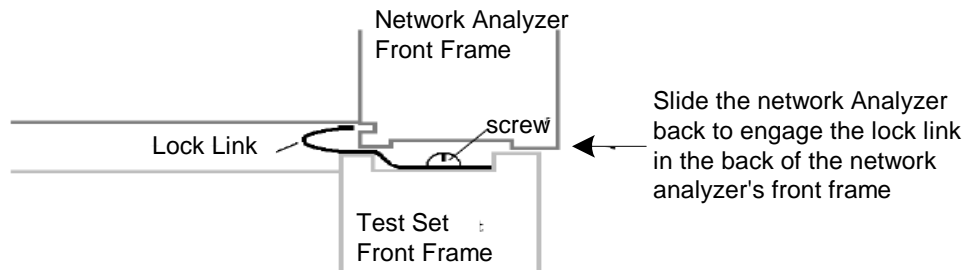
3. Install the two rear locking feet (5023-0132) onto the PNA-L, using the included screws (0515-1619), where the standoffs were removed. Refer to [Figure 7](#).

Figure 7 Install Locking Feet



- Place the network analyzer on top of the Test Set and ensure that the front frame of the network analyzer is positioned slightly forward of the locks that are attached to the Test Set. Slide the network analyzer back so the locks engage the front frame of the analyzer. Refer to [Figure 8](#).

Figure 8 Locking the Analyzer's



- Secure the network analyzer'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 network analyzer'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.

Figure 9 Locking Feet Screws



NOTE There are two Lock-Foot kits available. Refer to [“Contacting Agilent” on page 106](#) for ordering information.

- PNA – 5023-0132 (Kit includes locking feet and screws)
- Test Set – 5063-9253 (Kit includes lock links, locking feet and screws)

N5230A/C RF Interface Cable Connections

Figure 10 on page 16 illustrates the setup configuration of the U3042AM12 Multiport Test Set and how it should be configured to the PNA-L.

Each end of the interconnect RF cables have a different length from the bend. When connecting the RF Interconnect cables be sure that the longer end from the bend is connected to the PNA.

1. Connect the RF interconnect cables, supplied with this option, from the PNA-L to the Test Set. Torque each cable to 8 in-lb. Refer to Table 10 and Figure 10 on page 16. The Z5623-20418 are the short cables and the Z5623-20419 are the long cables.

CAUTION Over torque will cause damage to the test set and may cause connectors to spin or become loose.

Table 10 N5230A/C Interface Cable Connection (Option 030)

RF Cables	From PNA	To Test Set
Z5623-20418 (short)	SOURCE OUT	SOURCE OUT
Z5623-20418 (short)	CPLR ARM	CPLR ARM
Z5623-20419 (long)	CPLR THRU	CPLR THRU
Z5623-20419 (long)	RCVR IN	RCVR OUT

Figure 10 indicates the final two digits of the part number for each cable, and the quantity required.

Figure 10 N5230A/C RF Interface Connections



2. Connect the PNA Test Set I/O cable (8120-6818) to the U3042AM12 Test Set Interface on the rear panel. Refer to Figure 29 on page 38.

Controlling the Test Set with N5230A

This section will describe how to setup and operate the U3042AM12 Multiport Test Set with the N5230A 4-Port PNA-L Network Analyzer.

The U3042AM12 Multiport Test Set is considered a “slave” instrument. A PNA-L 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 Multiport Mode (firmware revision \geq (A.07.50.26) for the N5230A Option 551).
From the PNA drop-down menu and select **Help > About Network Analyzer**.

The following test set file must be installed into network analyzer file directory:
c:\Program Files\Agilent\Network Analyzer\testsets

4-Port PNA-L requires test set: u3042aM12_p4.tsx

- PNA Interface Control
- PNA GPIB Command Processor

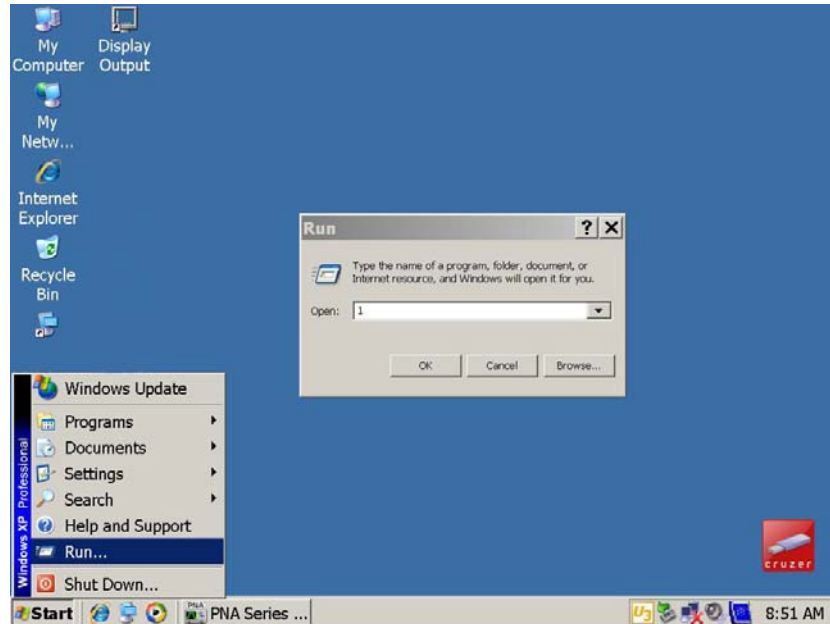
Visit our website for firmware revision and downloads.

<http://na.tm.agilent.com/pna/firmware/firmware.htm>

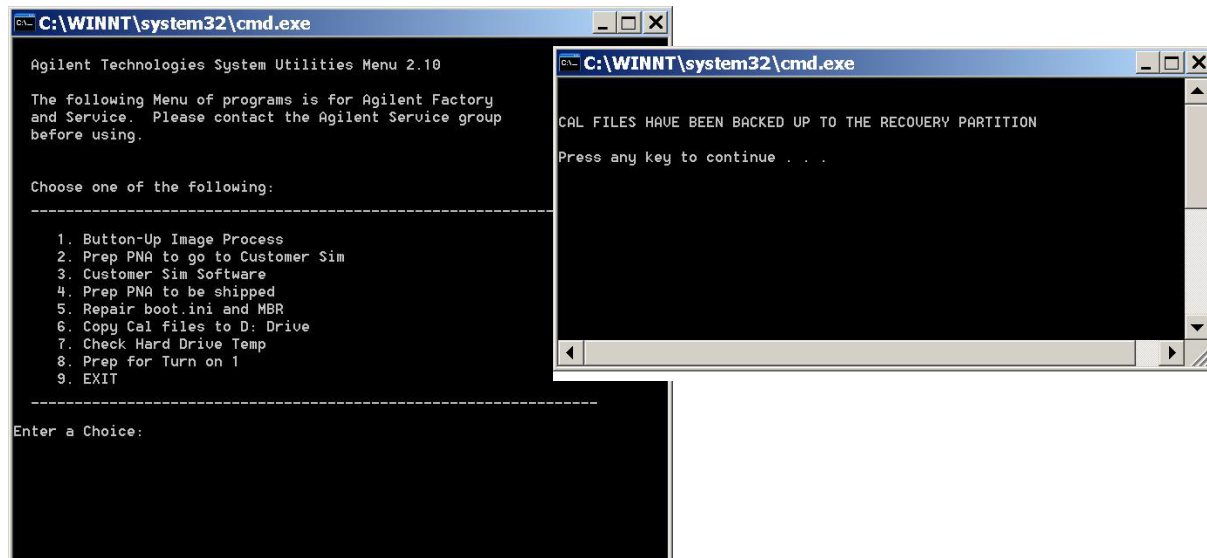
Installing New Firmware

Before installing new firmware into your PNA-L, you must store the mixer calibration files.

1. From the **Start** menu select **run** and enter **1 > OK**.

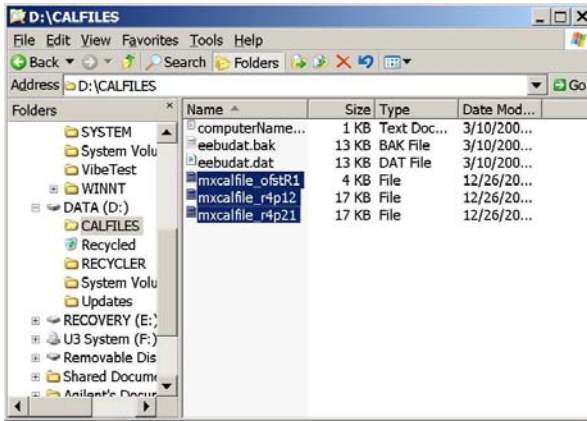


2. Command line “Enter a Choice:”, using the front panel keys enter **[6]**.
3. Command line “Press any key to continue...”, use any front panel key.

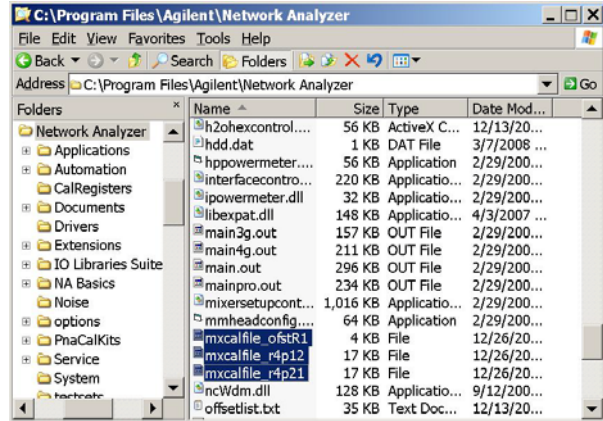


- Copy the following three mxcalfiles from D:\CALFILES to c:\Program Files\Agilent\Network Analyzer.

From



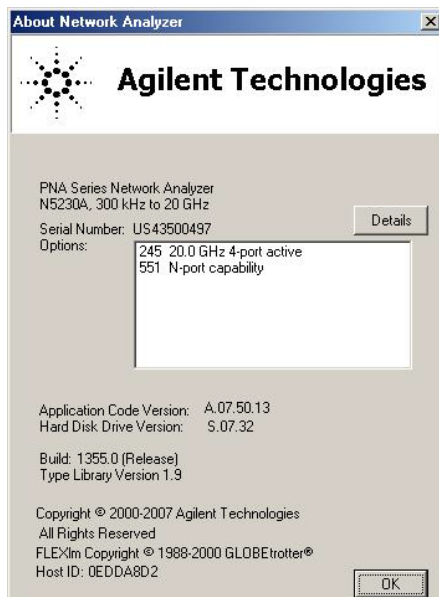
To



N5230A Multiport Mode Option 551

The PNA Multiport Mode selects the test set file that will enable the PNA to control the Test Set. The PNA Multiport Mode allows you to complete a N-Port calibration using the Cal Wizard application in the PNA. Refer to the PNA Help system for more information.

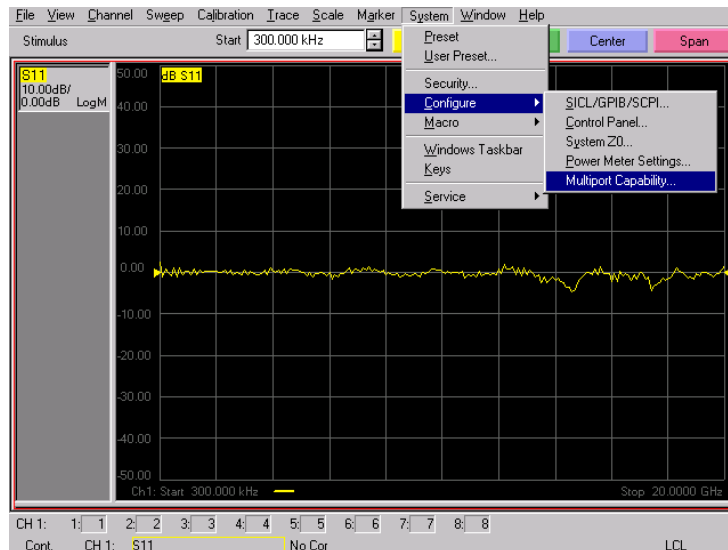
Figure 11 N5230A Options



How to Access Multiport Mode

The Option 551 must be installed for Multiport capability. To access the multiport application select **System > Configure > Multiport Capability**. See [Figure 12](#).

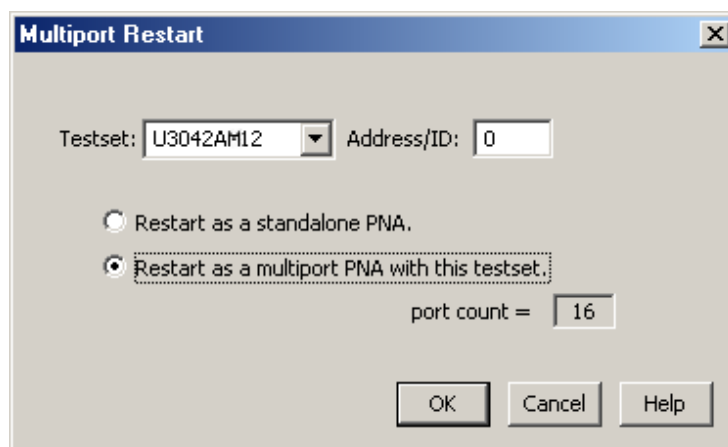
Figure 12 System Configuration



Select **U3042AM12** (16-Port System) from the test set drop-down menu and select **Restart as a Multiport PNA with this test set**. Press **OK**. The PNA will restart the network analyzer application with the U3042AM12 Multiport Test Set interface features. See [Figure 13](#).

If the U3042M12 is not available in the Testset list, it will be necessary for you to copy the required test set file to the PNA 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 U3042AM12 Selection



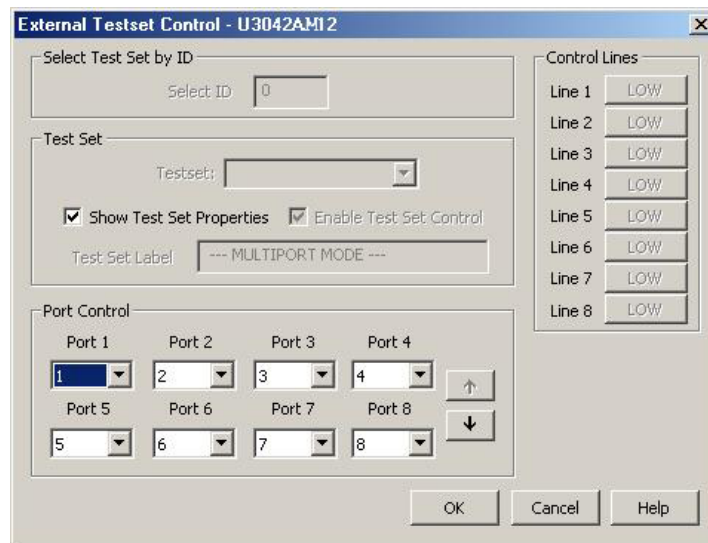
External Test Set Control Feature

To verify that the network application has the U3042AM12 interface features, select **Channel > External Test Set > Other**. The U3042AM12 will be displayed as **External Test Set Control-U3042AM12**. See [Figure 14](#).

This menu will allow the physical Ports 1 thru 16 to be identified as any port for your convenience. For example; Port 5 can be named Port 2.

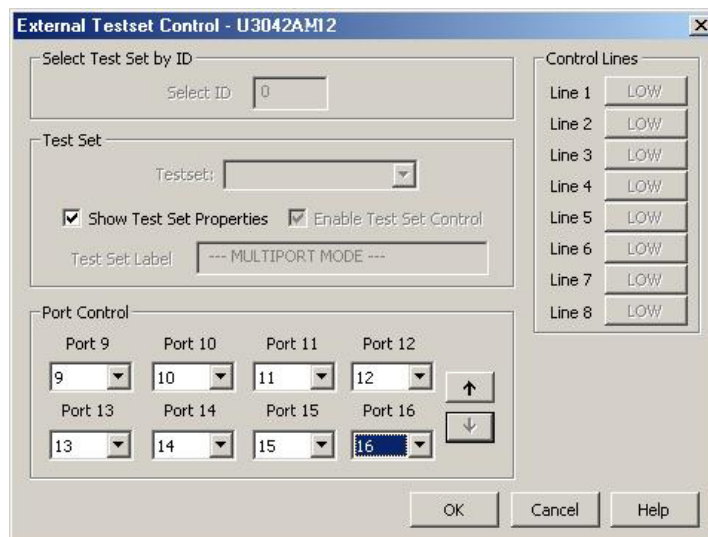
The **External Test Set Control-U3042AM12** also allows control of the DUT control lines, refer to [“DUT Control Lines” on page 55](#). To change the state from LOW to HIGH, select the graphical user interface (GUI) for the specific control (LINE 1 thru 8) and then press **OK**. Each line can be controlled separately, see [Figure 14](#).

Figure 14 External Test Set U3042AM12 (Port 1 - 8)



Select the **Port Control** down arrow for Ports 9 thru 12, see [Figure 15](#).

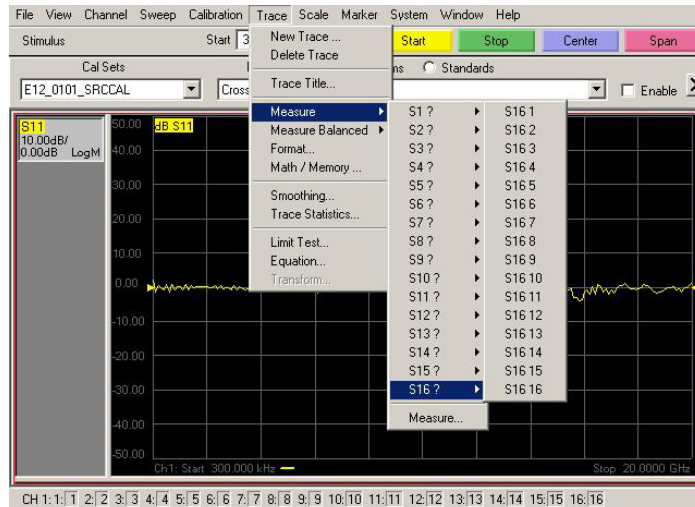
Figure 15 External Test Set U3042AM12 (Port 9 - 16)



Trace Measure S-Parameter

S-Parameter selection can be accomplished using **Trace Measure** menu. Select **Trace > Measure**. Use the drop-down menu to select 1 of 256 S-Parameters for the 16-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 N5230A 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 > New Trace**. The **New Trace** dialog box allows the selection of any of the 256 S-Parameter's. See [Figure 17](#) and [Figure 18](#).

Figure 17 16-Port New Trace Measure (S11 - S55)

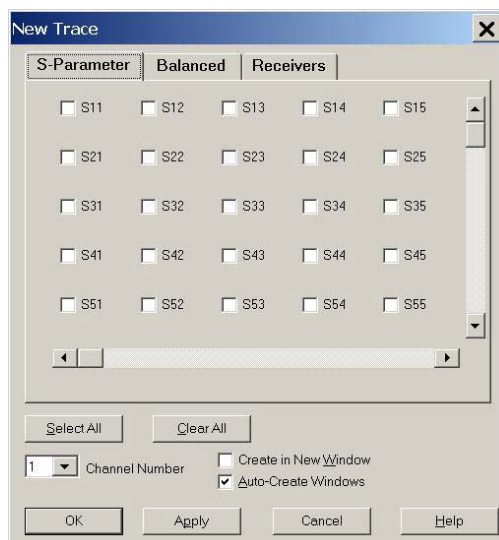
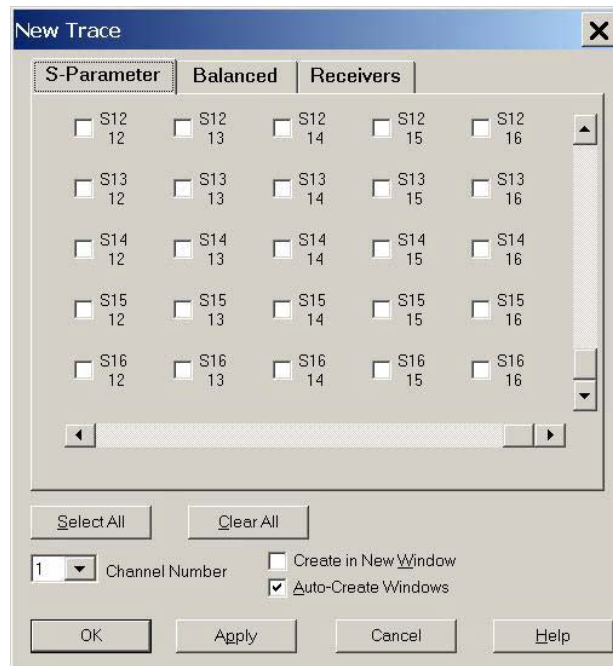


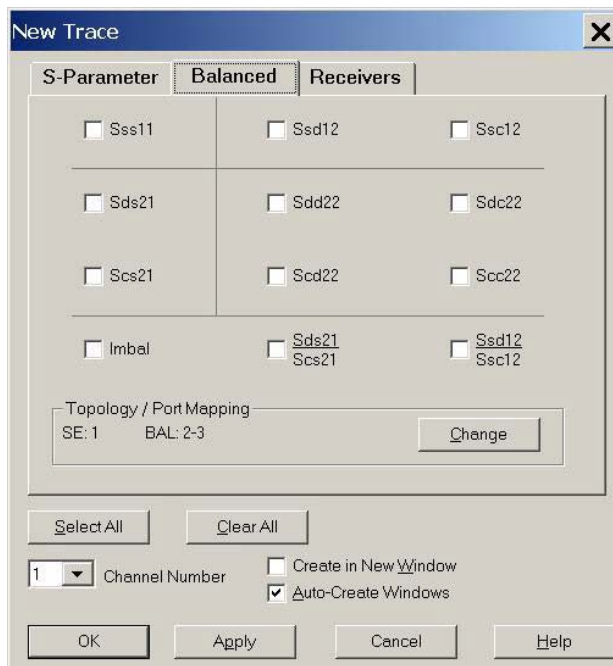
Figure 18 16-Port New Trace Measure (S1212 - S1616)



Balanced Tab: Balanced Measurements can be configured by selecting the Balance tab in the **New Trace** menu. Refer to [Figure 19](#).

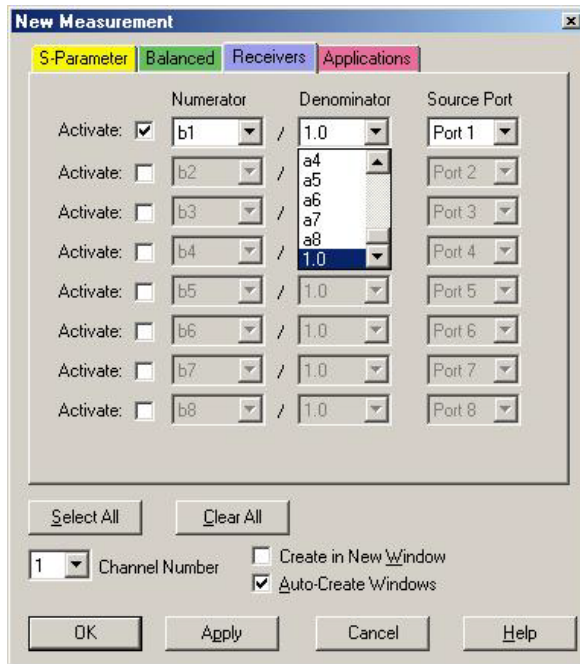
For more information on balanced (differential) component measurement, refer to the Application Note 1373-1 and 1373-2 (5988-5634EN and 5988-5635EN) at <http://www.home.agilent.com>. In the search menu enter **Multiport and Balanced**.

Figure 19 Balance



Receiver Tab: The S-Parameter measurements can be ratioed with selectable Denominators for each port and receiver. Refer to the standard N5230A PNA-L documentation for more information.

Figure 20 Receiver Ports



N-Port Calibration with N5230A

It is recommended that you perform an ECal characterization to minimize the connections required for multiple port calibration, refer to [Figure 21](#). The N4691B Option M0F is recommended with cable (85131F) if you are calibrating at the PNA and test set ports. Characterize the ECal module with adapters that will not be used in the measurement of the DUT.

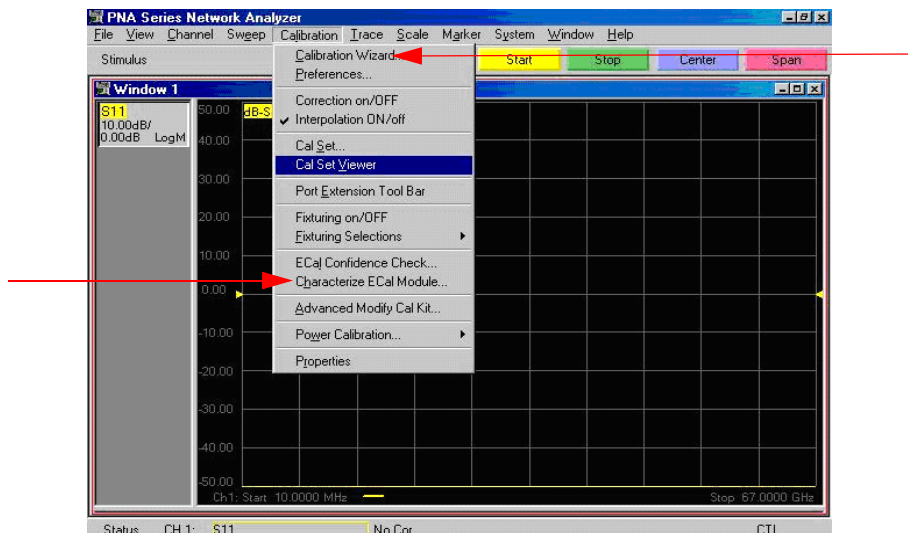
Calibrate at the end of the test port RF cables and any adapters that are used to connect the DUT. This removes the effect on the measurement of the DUT. Failure to do this will create ripple and other measurement errors. If measurement errors occur, ensure the newest version of firmware is installed on the PNA.

Consult with Agilent Service or the 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>

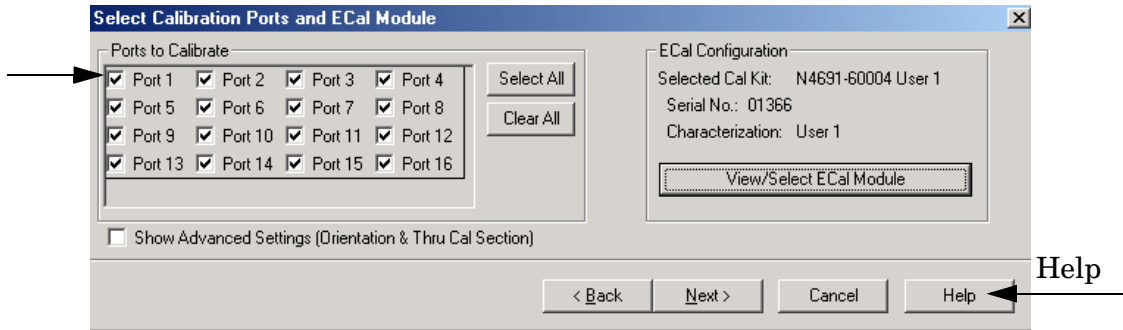
1. To perform an ECal characterization select **Calibration > Characterize ECal Module** and follow the prompts and save the ECal characterization file, see [Figure 21](#). Refer to the system help menu for ECal characterizing information.
2. To perform an N-Port Calibration on the network analyzer select **Calibration > Calibration Wizard**. Continue following the prompts, see [Figure 21](#).
 - a. If using a mechanical cal kit, select **SmartCal**.
 - b. If using an ECal module, select **ECal**.

Figure 21 ECal Characterization and Calibration Wizard



- On the “Select Calibration Ports and ECal Module” dialog box, press **Select All** or select the ports you are calibrating and press **Next**. If an ECal characterization has been done, select **View/Select ECal Module** and select the previously saved user file from [step 1](#).

Figure 22 16-Port Calibration



- Connect the ECal or the mechanical cal kit to the ports you are calibrating following the Cal Wizard prompts and press **Measure** after each connection.
- At the Calibration Completed prompt, select **Save As User Calset** and enter the name desired. Press **Save**.
- 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 is in standard (non-multiport) mode.

N5230A Interface Control

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

This section includes only the features required in the Interface Control for the U3042AM12 Multiport Test Set. Applications and feature information can be found in the PNA's Help System Menu, "Interface Control."

- Overview
- How to Access Interface Control Settings
- Interface Control Dialog Box

Other connectivity topics can be found in the PNA Series Network Analyzer's Help System Menu.

Overview of the Interface Control

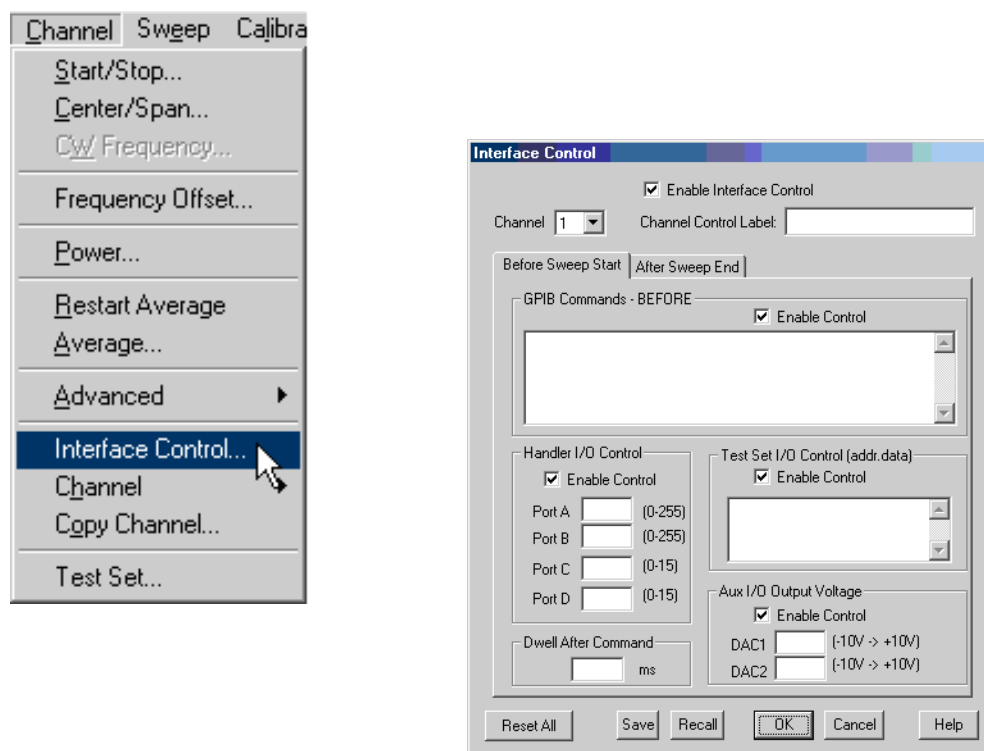
The Interface Control feature allows you to send data and remote commands to control external equipment using the GPIB, Material Handler I/O, Test Set I/O, and Auxiliary I/O without needing to create a remote program. Refer to PNA Series Network Analyzer's Help System Menu, "Rear Panel Tour."

- 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:
 1. GPIB Interface
 2. Material Handler Interface (not covered in this manual)
 3. Test Set Interface (not covered in this manual)
 4. Dwell Time (not covered in this manual)

How to Access Interface Control Settings with N5230A

This section will describe how to setup and operate the U3042AM12 Multiport Test Set with the N5230A 4-Port Series Network Analyzer. To access the Interface Control application select Channel > Interface Control in the drop-down menu.

NOTE The Agilent N5230A 4-Port PNA-L Series Network Analyzer comes with the Interface Control application. Please review this application before connecting the U3042AM12 Test Set to the PNA. Information regarding this application can be found in the PNA's **Help** System Menu, **InterfaceControl**. The application is shown below.



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

Test Set I/O Address and Data using Control Interface with N5230A

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 screen and the Channel Trigger State is set to Hold. You must fix the condition that caused the error, then change the Channel TriggeState 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.

Channel:

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 Label:

Specifies the label to be displayed on the PNA 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 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. The address also specifies outputs on specific ports. Refer to [“Test Set I/O Interface Commands” on page 60](#).

- 112 = DUT Control
- 0 = Ports 1, 5, 9, and 13
- 16 = Ports 2, 6, 10, and 14
- 32 = Ports 3, 7, 11 and 15
- 64 = Ports 4, 8, 12 and 16

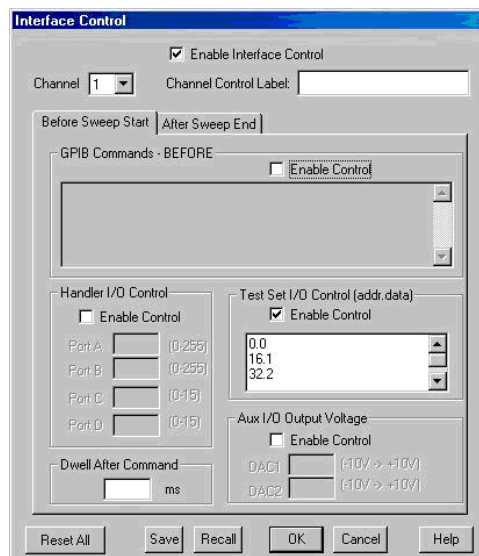
Data:

Positive integer is used to select switch position or state of DUT control interface line. Refer to [“Test Set I/O Interface Commands”](#) on page 60.

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

For example:

0.0
16.1
32.2



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 only by the available memory of the PNA. See [“Test Set I/O Interface Commands”](#) on page 60.

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 could indicate that more settling time is necessary.

Reset All:

Sets all fields on all channels to their default values.

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 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 U3042AM12 Test Set I/O Commands can be found in [“Test Set I/O Interface Commands” on page 60](#). The Address and Data commands can be entered into the Test Set I/O control.

N5230A GPIB Control

The GPIB Command Processor feature allows you to send remote commands and data to the PNA rear-panel GPIB connector and test set I/O connector. More information regarding the GPIB Command Processor can be found in the PNA Series Network Analyzer Help System Menu.

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

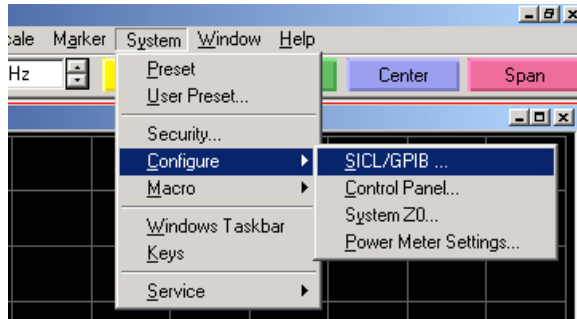
Overview of the GPIB Control

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 Series Network Analyzer Help System Menu.

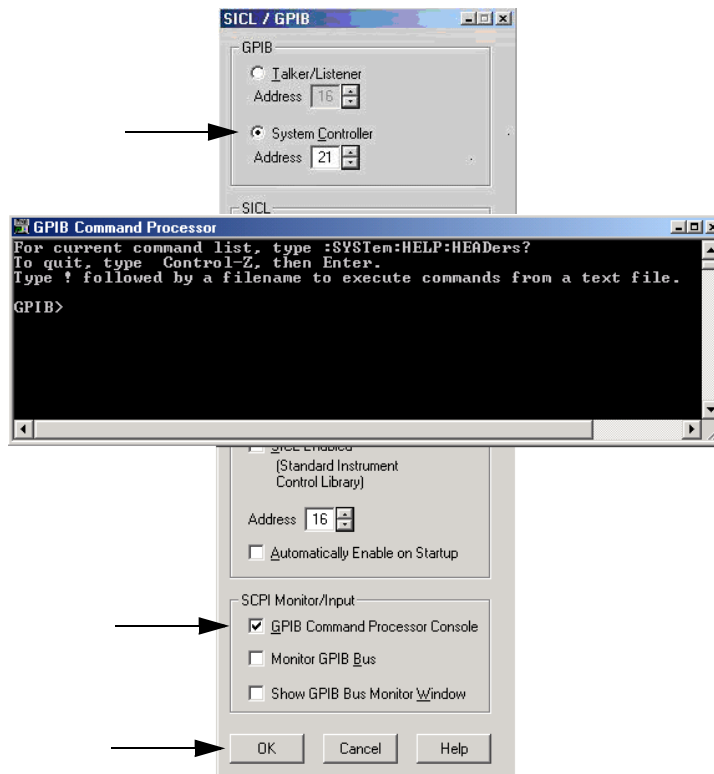
- GPIB Command Processor settings can not be saved or recalled.
- Address and data can be *written* to the GPIB Command Processor and *read* from the GPIB Command Processor.

How to Access GPIB Command Processor with N5230A

1. To access the GPIB Command Processor press **[Menu/Dialog]** then tab to **System**, select **Configure > SICL/GPIB**.



2. Select **System Controller** and **GPIB Command Processor Console** and select **OK**.



NOTE If the PNA is not in System Controller mode, an error message appears and the GPIB Command Processor is disabled. To correct this situation, place the PNA in System Controller mode and restart the GPIB Command Processor Console.

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

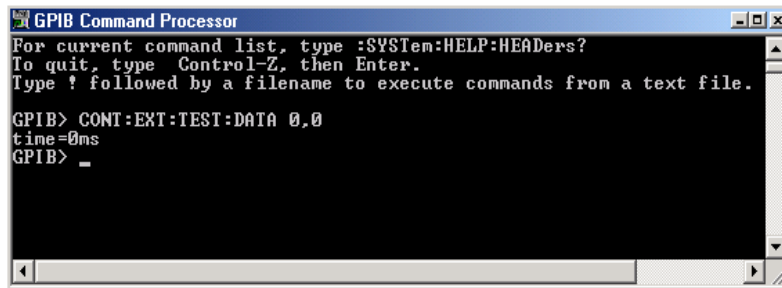
Address and data are separated by a comma. Commands should be separated by a new line, or carriage return.

For example:

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

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

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



```

GPIB Command Processor
For current command list, type :SYSTem:HELP:HEADers?
To quit, type Control-Z, then Enter.
Type ! followed by a filename to execute commands from a text file.

GPIB> CONT:EXT:TEST:DATA 0,0
time=0ms
GPIB> _
  
```

Read Commands

address: a integer number

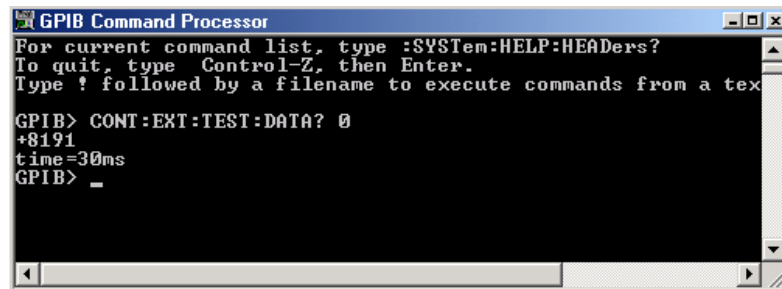
Address is entered, data value will be returned. Commands should be executed with a carriage return (enter).

For example:

```
CONT:EXT:TEST:DATA? <address>
```

```
CONT:EXT:TEST:DATA? 0
```

Example: CONT:EXT:TEST:DATA? 0



```

GPIB Command Processor
For current command list, type :SYSTem:HELP:HEADers?
To quit, type Control-Z, then Enter.
Type ! followed by a filename to execute commands from a text file.

GPIB> CONT:EXT:TEST:DATA? 0
+8191
time=30ms
GPIB> _
  
```

This command reads the decimal equivalent of the binary data from the specified address. The example shown above illustrates address is 0 and the returned data is 8191. Refer to [Table 17 on page 62](#).

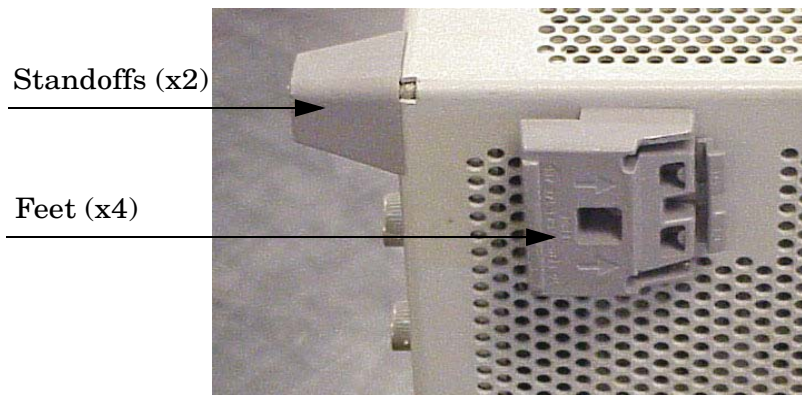
System Setup with N5242A

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

Preparing the N5242A Network Analyzer

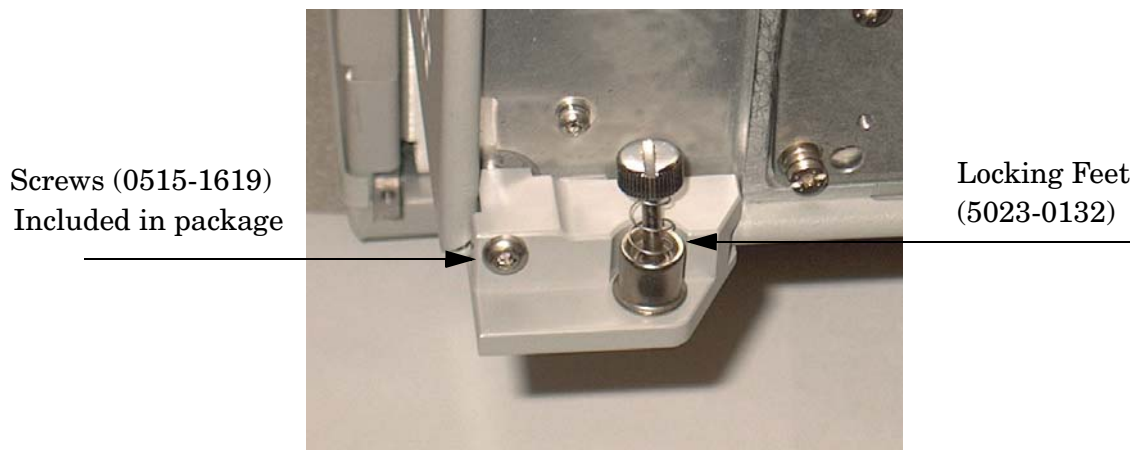
1. Remove the feet from the bottom of the network analyzer. Refer to [Figure 23](#).
2. Remove the 2 lower standoffs and screws (0515-1619) from the rear panel on the network analyzer. Refer to [Figure 23](#).

Figure 23 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. Refer to [Figure 24](#).

Figure 24 Install Locking Feet on N5242A



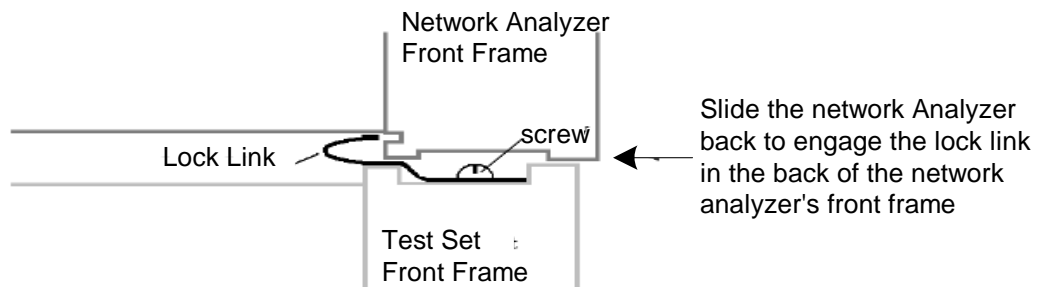
4. Install the two rear locking feet onto the U3042AM12. Looking at the front panel, the N5242-20138 is the right foot and the N5242-20139 is the left foot. Two screws (0515-2317) are included with this option. Refer to [Figure 25](#).

Figure 25 Install Locking Feet on U3042AM12



5. Place the network analyzer on top of the Test Set and ensure that the front frame of the network analyzer is positioned slightly forward of the locks that are attached to the Test Set. Slide the network analyzer back so the locks engage the front frame of the analyzer. Refer to [Figure 26](#).

Figure 26 Locking the Analyzer's



- Secure the network analyzer's lower locking feet to the Test Set upper locking feet, using the spring-loaded screws on the locking feet. Refer to [Figure 27](#). If the network analyzer'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.

Figure 27 Locking Feet Screws



NOTE There are two Lock-Foot kits available. Refer to [“Contacting Agilent” on page 106](#) for ordering information.

- PNA – 5023-0132 (Kit includes locking feet and screws)
 - Test Set – N5242-20138 is the right foot and the N5242-20139 is the left foot.
 - Screw – 0515-2317
-

N5242A RF Interface Cable Connections

Figure 28 on page 38 illustrates the setup configuration of the U3042AM12 Multiport Test Set and how it should be configured to the PNA-X. The cables have been supplied with Option 042.

1. 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. The longer, straight end of each cable is connected to the test set. Refer to Table 11 and Figure 28 on page 38.

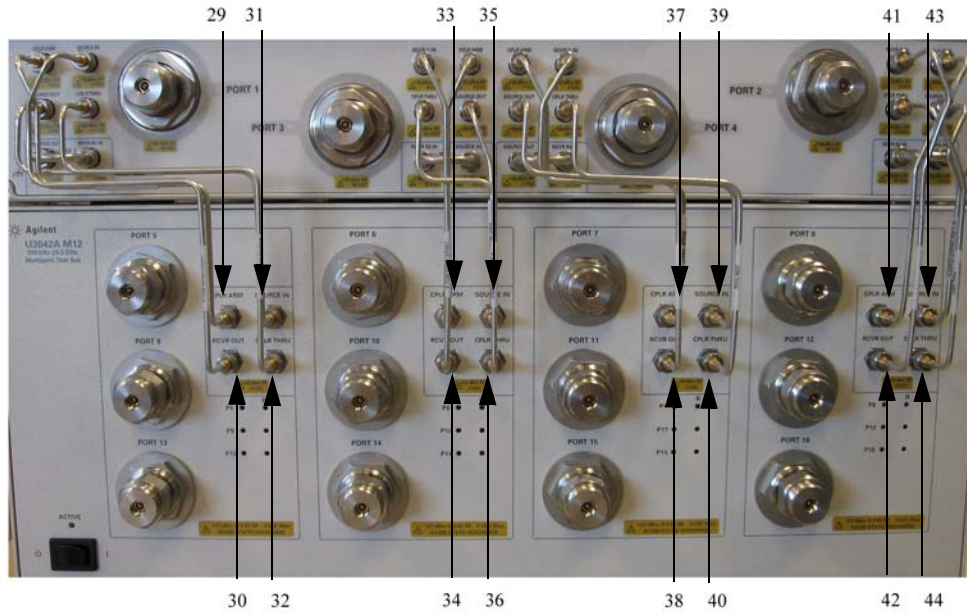
CAUTION Over torque will cause damage to the test set and may cause connectors to spin or become loose.

Table 11 N5242A RF Interface Cable Connection (Option 042)

Numeric Order	RF Cables	From PNA-X	To Test Set
1	U3042-20031	Port 1 SOURCE OUT	Port 5 SOURCE IN
2	U3042-20032	Port 1 CPLR THRU	Port 5 CPLR THRU
3	U3042-20029	Port 1 CPLR ARM	Port 5 CPLR ARM
4	U3042-20030	Port 1 RCVR A IN	Port 5 RCVR OUT
5	U3042-20035	Port 3 SOURCE OUT	Port 6 SOURCE IN
6	U3042-20033	Port 3 CPLR ARM	Port 6 CPLR ARM
7	U3042-20034	Port 3 RCVR C IN	Port 6 RCVR OUT
8	U3042-20036	Port 3 CPLR THRU	Port 6 CPLR THRU
9	U3042-20039	Port 4 SOURCE OUT	Port 7 SOURCE IN
10	U3042-20037	Port 4 CPLR ARM	Port 7 CPLR ARM
11	U3042-20038	Port 4 RCVR D IN	Port 7 RCVR OUT
12	U3042-20040	Port 4 CPLR THRU	Port 7 CPLR THRU
13	U3042-20041	Port 2 CPLR ARM	Port 8 CPLR ARM
14	U3042-20044	Port 2 CPLR THRU	Port 8 CPLR THRU
15	U3042-20043	Port 2 SOURCE OUT	Port 8 SOURCE IN
16	U3042-20042	Port 2 RCVR B IN	Port 8 RCVR OUT

Figure 28 indicates the final two digits of the part number for each cable.

Figure 28 N5242A RF Interface Cable Connections



2. Connect the PNA-X Test Set I/O cable (8120-6818) to the U3042AM12 Test Set Interface on the rear panel.

Figure 29 N5242A Test Set I/O Cable Connection



Controlling the Test Set with N5230C or N5242A

This section will describe how to setup and operate the U3042AM12 Multiport Test Set with the N5242A or N5230C.

The U3042AM12 Multiport Test Set is considered a “slave” instrument. A N5230C or N5242A 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 Multiport Mode firmware revision:
 - N5242A Option 551 \geq A.08.04.07
 - N5230C Option 551 \geq A.08.04.10

The following test set file must be installed into network analyzer file directory:

c:\Program Files\Agilent\Network Analyzer\testsets

4-Port PNA-L requires test set: u3042aM12_p4.tsx

4-Port PNA-X requires test set: u3042aM12_pna_p4.tsx

- PNA Interface Control
- PNA GPIB Command Processor

Visit our website for firmware revision and downloads.

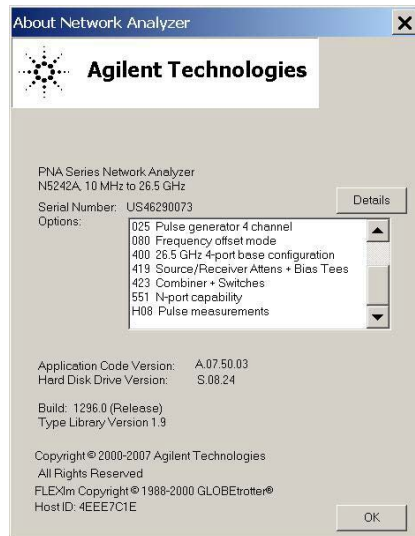
<http://na.tm.agilent.com/pna/firmware/firmware.htm>

You may also refer to [“Installing New Firmware” on page 18](#) in this manual.

N5230C and N5242A PNA Multiport Mode for Option 551

The PNA multiport mode selects the test set file that will enable the PNA to control the Test Set. The PNA multiport mode allows you to complete a N-Port calibration using the Cal Wizard application in the PNA. Refer to the PNA Help system for more information. Refer to [Figure 11 on page 19](#) for the N5230C Options.

Figure 30 N5242A Options



How to Access Multiport Mode

The Option 551 must be installed for Multiport capability. To access the multiport application select **Utility > System > Configure > Multiport Capability**. See [Figure 31](#).

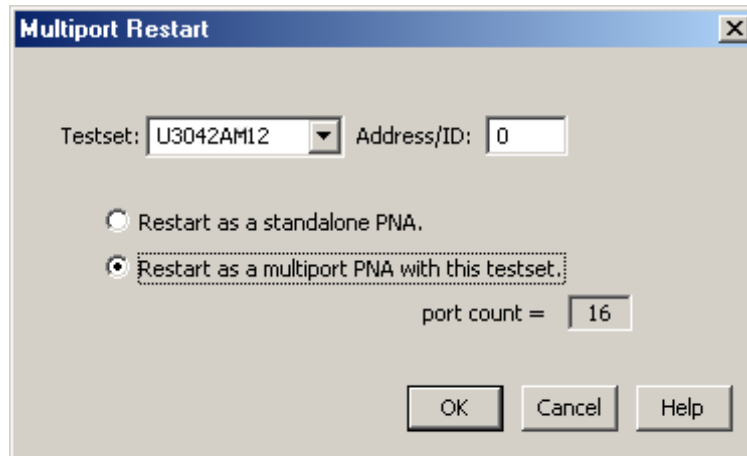
Figure 31 Selecting Multiport Mode



Select **U3042AM12** (16-Port System) from the test set drop-down menu and select **Restart as a Multiport PNA with this test set**. Press OK. The PNA will restart the network application with the U3042AM12 Multiport Test Set interface features. See [Figure 32](#).

If the U3042M12 is not available in the Testset list, it will be necessary for you to copy the required test set file to the PNA 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.

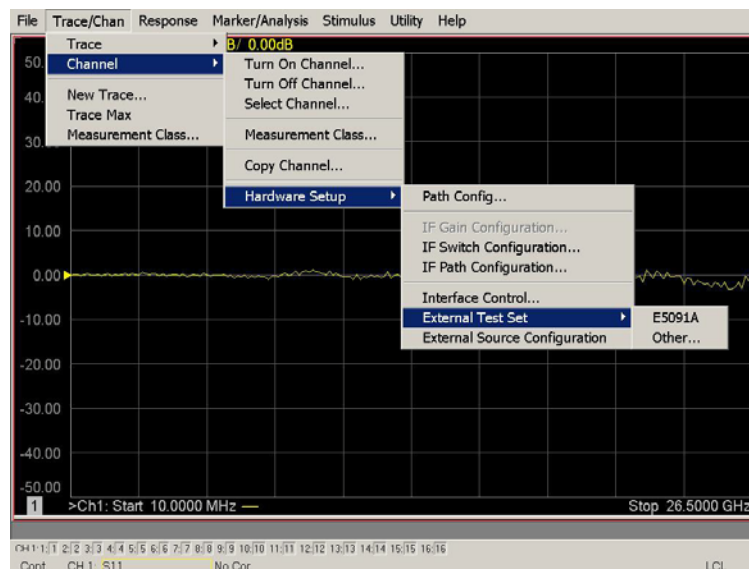
Figure 32 U3042AM12 Selection



External Test Set Control Feature

To verify that the network application has the U3042AM12 interface features, select **Trace/Chan > Channel > Hardware Setup > External Test Set > Other**. The U3042AM12 will be displayed as **External Test Set Control-U3042AM12**. See [Figure 33](#), [Figure 34](#) and [Figure 35](#).

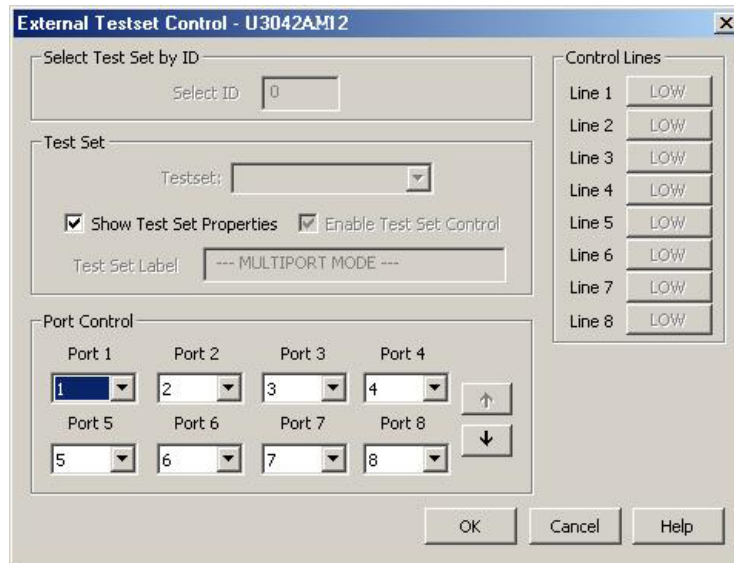
Figure 33 External Test Set Control



This menu will allow the physical Ports 1 thru 16 to be identified as any port for your convenience. For example; Port 5 can be named Port 2.

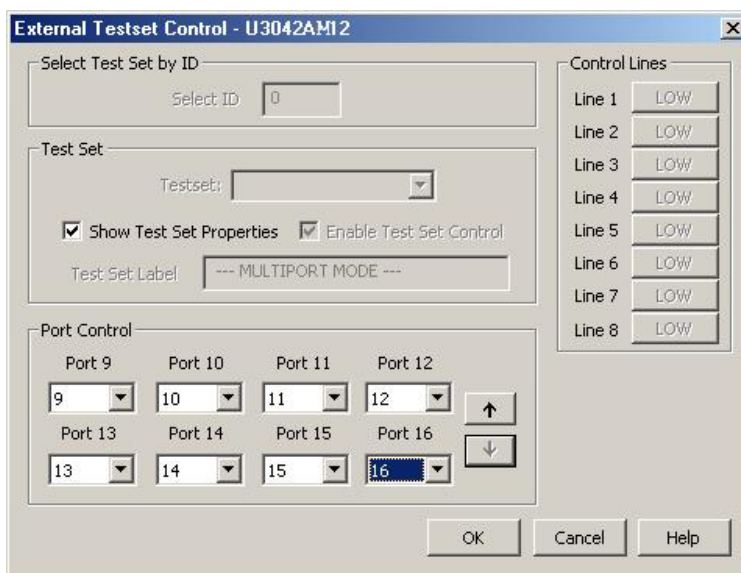
The **External Test Set Control-U3042AM12** also allows control of the DUT control lines, refer to [“DUT Control Lines” on page 55](#). To change the state from LOW to HIGH, select the graphical user interface (GUI) for the specific control (LINE 1 thru 8) and then press **OK**. Each line can be controlled separately, see [Figure 34](#).

Figure 34 External Test Set U3042AM12 (Port 1 - 8)



Select the **Port Control** down arrow for Ports 9 thru 12, see [Figure 35](#).

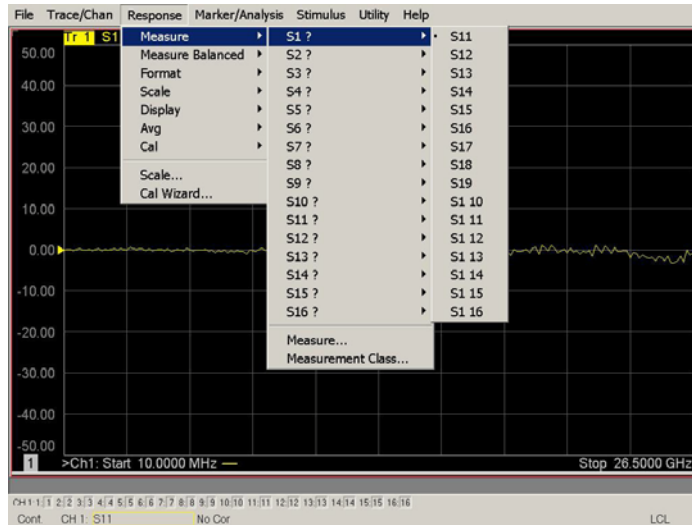
Figure 35 External Test Set U3042AM12 (Port 9 - 16)



Trace Measure S-Parameter

S-Parameter selection can be accomplished using **Response > Measure**. Use the drop-down menus to select 1 of 256 S-Parameters for the 16-Port system, see [Figure 36](#). 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 36 Trace Measure



New Trace Measure S-Parameter

Multiple S-Parameters can be made from the **New Trace** menu. In the drop-down menu select **Trace > New Trace**. The **New Measurement** dialog box allows the selection of any of the 256 S-Parameter's. Refer to [Figure 37](#) and [Figure 38](#).

Figure 37 New Trace Measure

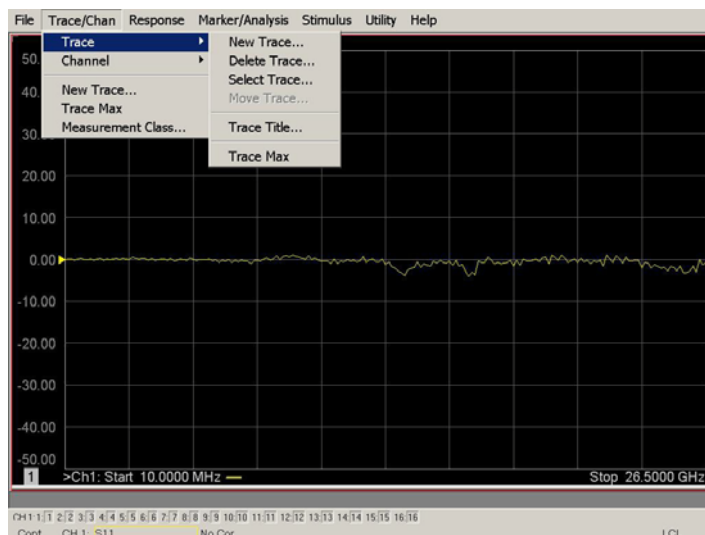


Figure 38 16-Port New Trace Measure (S11 - S55)

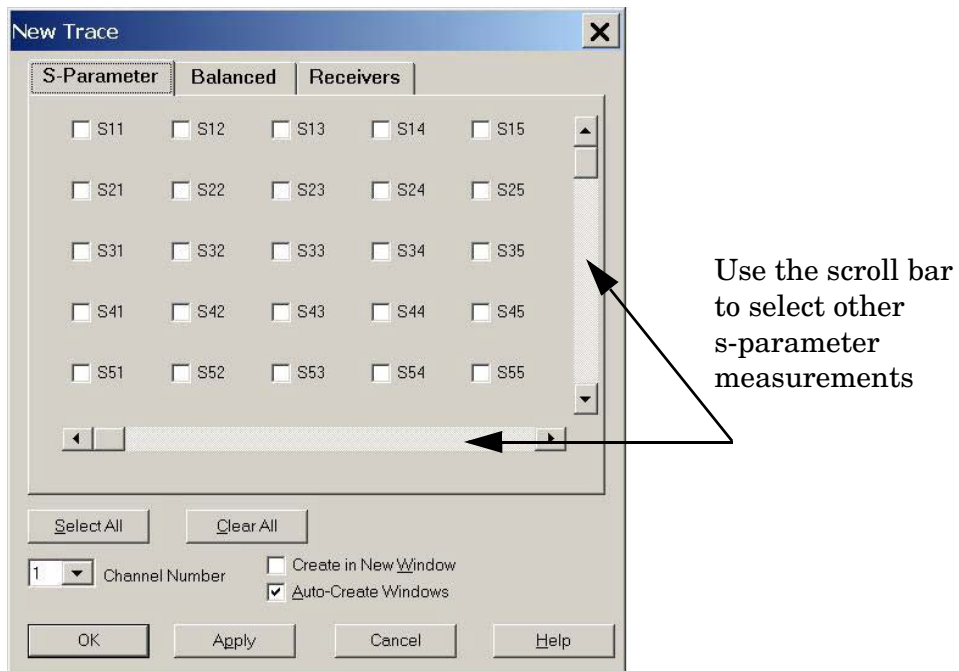
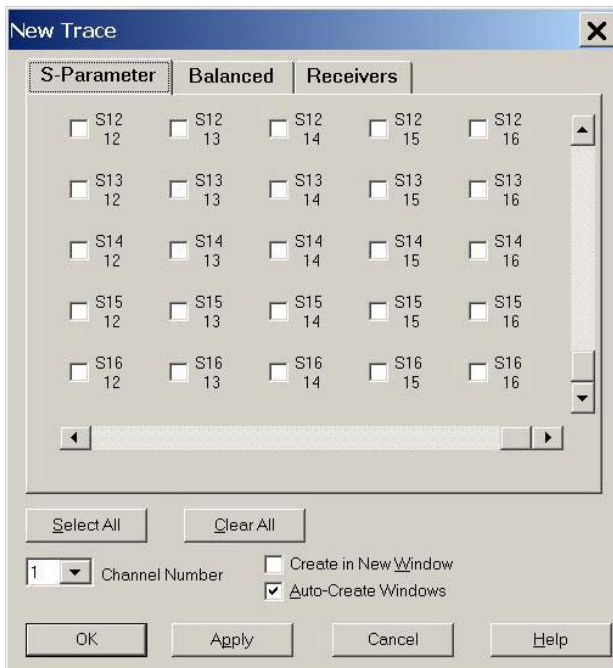


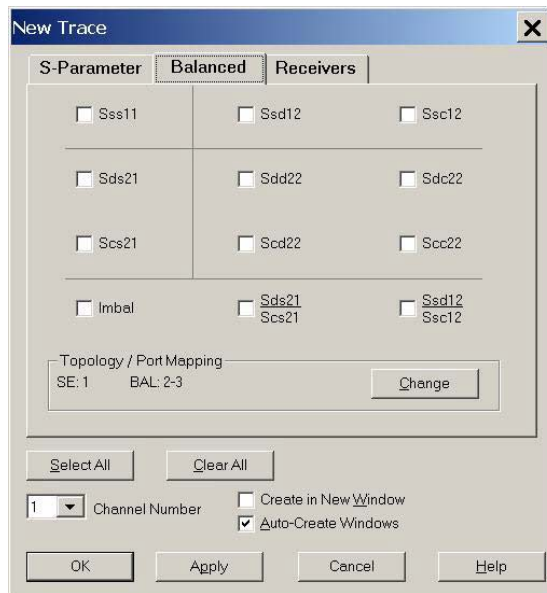
Figure 39 16-Port New Trace Measure (S1212 - S1616)



Balanced Tab: Balanced Measurements can be configured by selecting the Balance tab in the **New Trace** menu. Refer to [Figure 19](#).

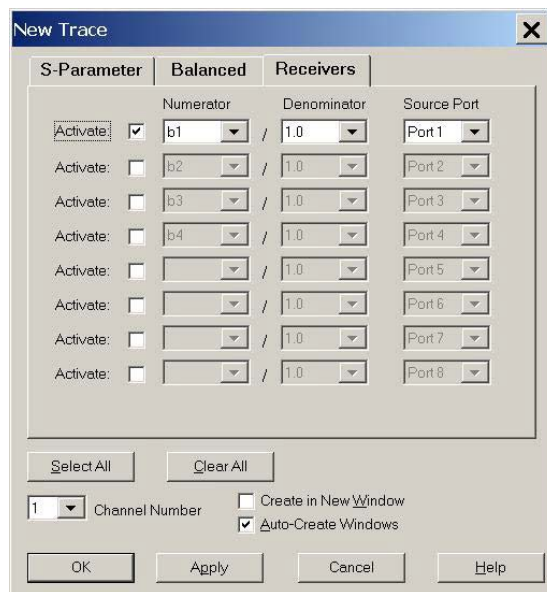
For more information on balanced (differential) component measurement, refer to the Application Note 1373-1 and 1373-2 (5988-5634EN and 5988-5635EN) at <http://www.home.agilent.com>. In the search menu enter **Multiport and Balanced**.

Figure 40 Selecting Balanced Measurements



Receiver 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 41 Receiver Measurements



N-Port Calibration with N5230C or N5242A

It is recommended that you perform an ECal characterization to minimize the connections required for multiple port calibration, refer to [Figure 42](#). The N4691B Option M0F is recommended with cable (85131F) if you are calibrating at the PNA and test set ports.

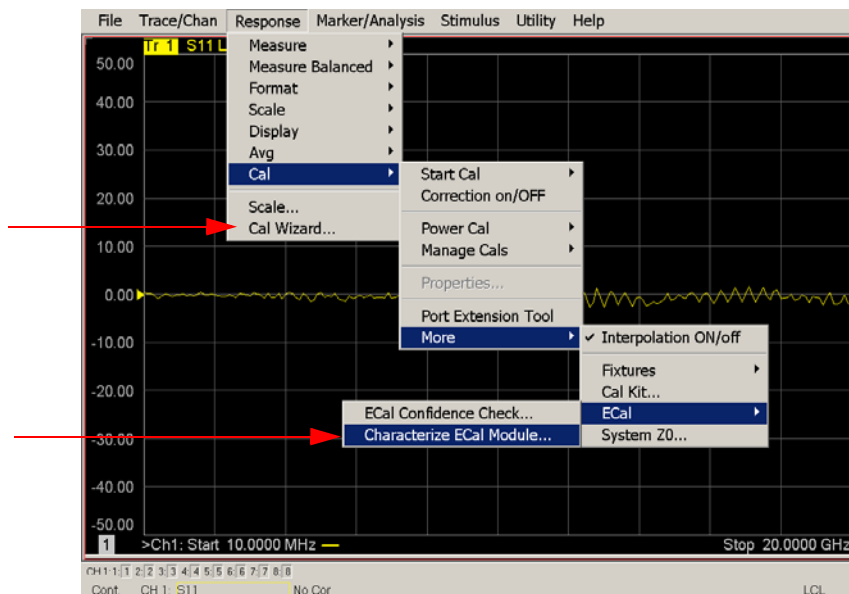
Characterize the ECal module with adapters that will not be used in the measurement of the DUT.

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.

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>

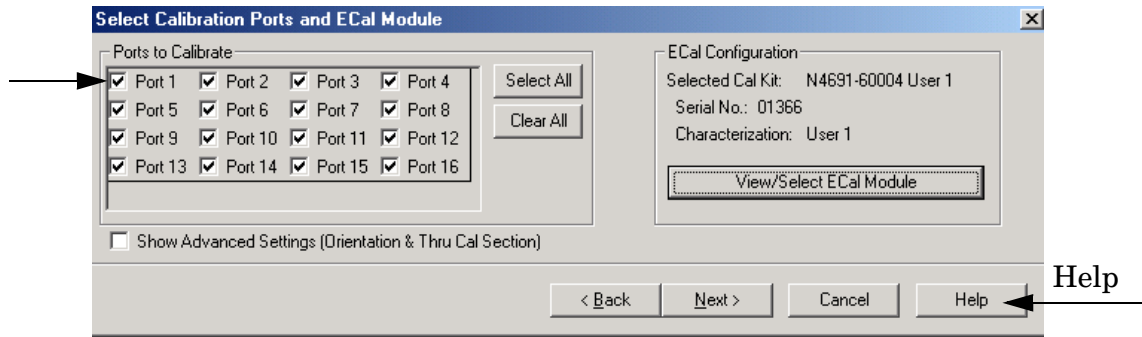
1. To perform an ECal characterization select **Response > Cal Wizard > Characterize ECal Module** to perform ECal characterization and follow the prompts and save the ECal characterization file, see [Figure 42](#). Refer to the help menu for further information on characterizing.
2. On the network analyzer select **Response > Cal Wizard**, see [Figure 42](#).
 - a. If using a mechanical cal kit, select **SmartCal**.
 - b. If using an ECal module, select **ECal**.

Figure 42 ECal Characterization and Calibration Wizard



- On the “Select Calibration Ports and ECal Module” dialog box, press **Select All** or select the ports you are calibrating and press **Next**. If an ECal characterization has been done, select **View/Select ECal Module** and select the previously saved user file from [step 1](#). Refer to [Figure 43](#).

Figure 43 16-Port Calibration



- Connect the ECal or the mechanical cal kit to the ports you are calibrating following the Cal Wizard prompts and press **Measure** after each connection.
- At the Calibration Completed prompt, select **Save As User Calset** and enter the name desired. Press **Save**.
- 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 is in standard (non-multiport) mode.

N5230C or N5242A Interface Control

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

This section includes only the features required in the Interface Control for the U3042AM12 Multiport Test Set. Applications and feature information can be found in the PNA's Help System Menu, "Interface Control."

- Overview
- How to Access Interface Control Settings
- Interface Control Dialog Box

Other connectivity topics can be found in the PNA Series Network Analyzer's Help System Menu.

Overview of the Interface Control

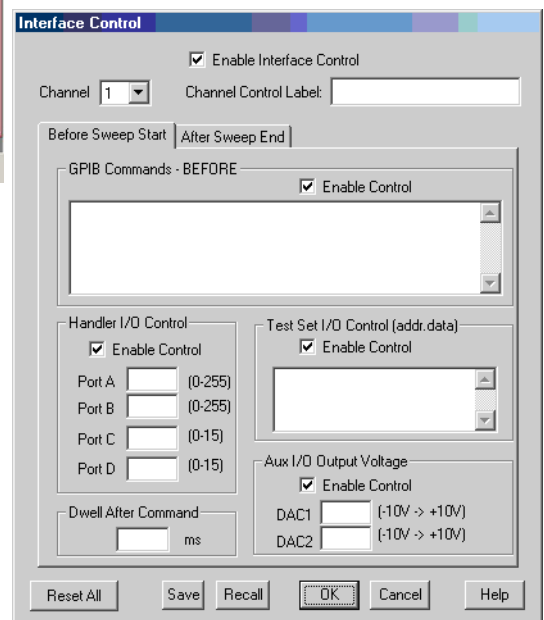
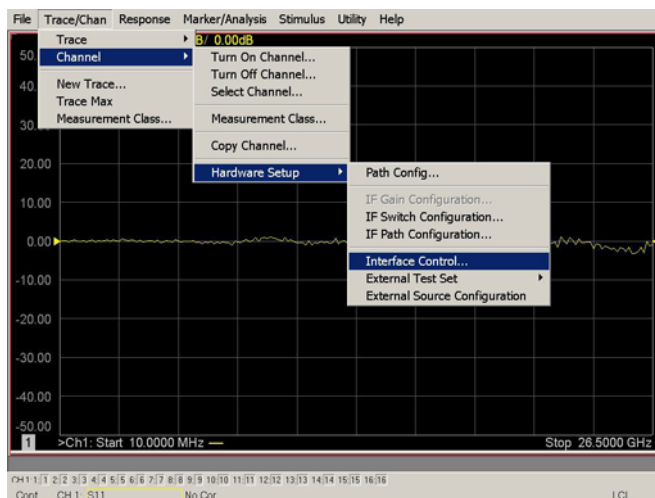
The Interface Control feature allows you to send data and remote commands to control external equipment using the GPIB, Material Handler I/O, Test Set I/O, and Auxiliary I/O without needing to create a remote program. Refer to PNA Series Network Analyzer's Help System Menu, "Rear Panel Tour."

- 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:
 1. GPIB Interface
 2. Material Handler Interface (not covered in this manual)
 3. Test Set Interface (not covered in this manual)
 4. Dwell Time (not covered in this manual)

How to Access Interface Control Settings

This section will describe how to setup and operate the U3042AM12 Multiport 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.

NOTE The PNA-X Series Network Analyzer comes with the Interface Control application. Please review this application before connecting the U3042AM12 Test Set to the PNA. Information regarding this application can be found in the PNA's **Help** System Menu, **InterfaceControl**. 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 application to go back to Talker/Listener.

Test Set I/O Address and Data using Control Interface with N5230C or 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 screen and the Channel Trigger State is set to Hold. You must fix the condition that caused the error, then change the Channel TriggeState 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.

Channel:

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 Label:

Specifies the label to be displayed on the PNA 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 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 60](#).

- 112 = DUT Control
- 0 = Ports 1, 5, 9 and 13
- 16 = Ports 6, 10, 14, and PNA-L Port 2, or PNA-X Port 3
- 32 = Ports 7, 11, 15 and PNA-L Port 3, or PNA-X Port 4
- 64 = Ports 8, 12, 16 and PNA-L Port 4, or PNA-X Port 2

Data:

Positive integer is used to select switch position or state of DUT control interface line. Refer to [“Test Set I/O Interface Commands”](#) on page 60.

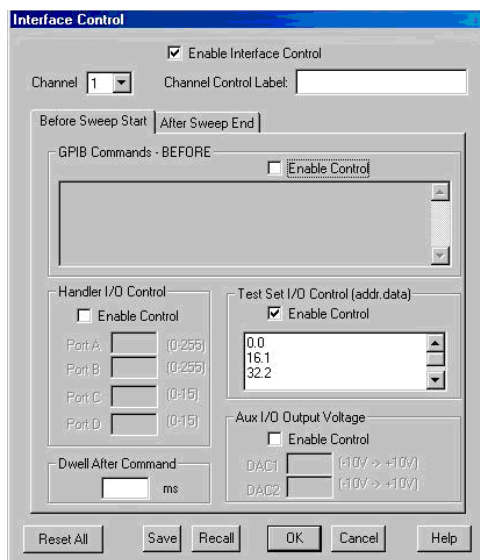
Address and data are separated by a period. Entries should be separated by a new line, or carriage return.

For example:

0.0

16.1

32.2



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 only by the available memory of the PNA. See [“Test Set I/O Interface Commands”](#) on page 60.

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 could indicate that more settling time is necessary.

Reset All:

Sets all fields on all channels to their default values.

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 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 U3042AM12 Test Set I/O Commands can be found in [“Test Set I/O Interface Commands” on page 60](#). The Address and Data commands can be entered into the Test Set I/O control.

N5230C or N5242A GPIB Control

The GPIB Command Processor feature allows you to send remote commands and data to the PNA rear-panel GPIB connector and test set I/O connector. More information regarding the GPIB Command Processor can be found in the PNA Series Network Analyzer Help System Menu.

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

Overview of the GPIB Control

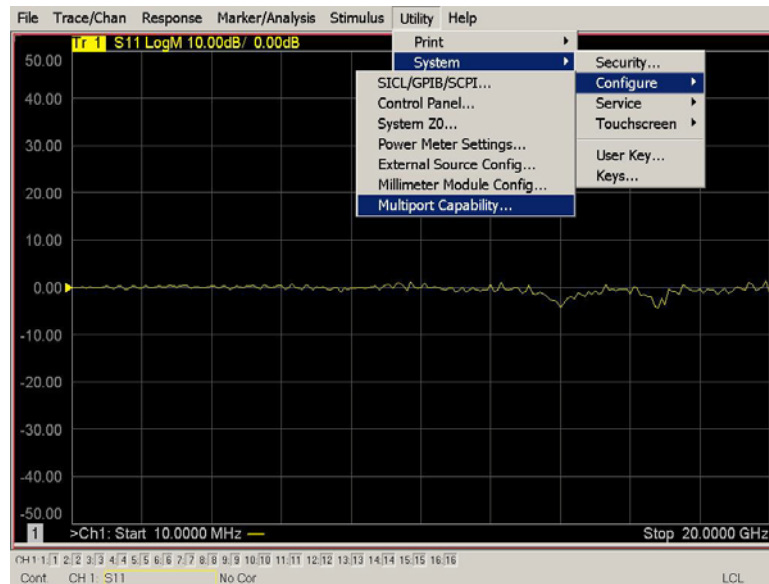
The GPIB Command Processor allows you to send address and data to control an external test set, without needing to create a remote program. The user is required to manually input address and data using the GPIB Command Processor Console in the PNA Series Network Analyzer Help System Menu.

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

How to Access GPIB Command Processor

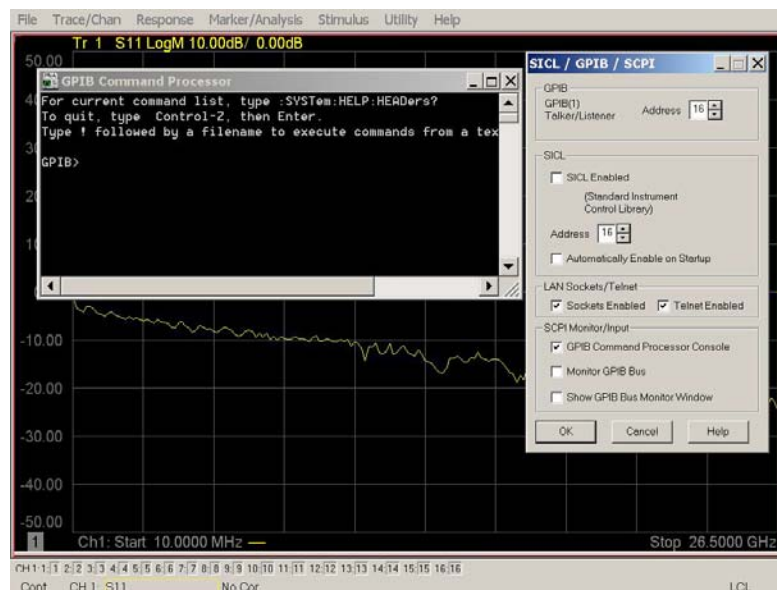
1. To access the GPIB Command Processor press: **Utility > System > Configure > SICL/GPIB/SCPI.**

Figure 44 Utility Configure



2. Check System Controller and GPIB Command Processor Console and select **OK.**

Figure 45 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

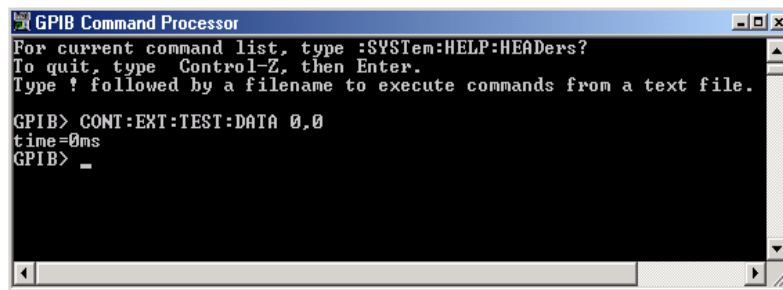
Address and data are separated by a comma. Commands should be separated by a new line, or carriage return.

For example:

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

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

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



```

GPIB Command Processor
For current command list, type :SYSTem:HELP:HEADers?
To quit, type Control-Z, then Enter.
Type ! followed by a filename to execute commands from a text file.

GPIB> CONT:EXT:TEST:DATA 0,0
time=0ms
GPIB> _
  
```

Read Commands

address: a integer number

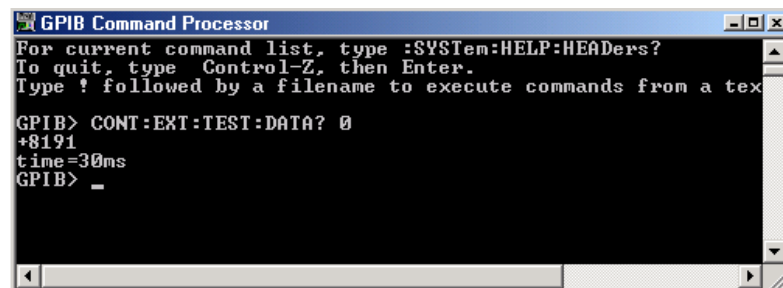
Address is entered, data value will be returned. Commands should be executed with a carriage return (enter).

For example:

```
CONT:EXT:TEST:DATA? <address>
```

```
CONT:EXT:TEST:DATA? 0
```

Example: CONT:EXT:TEST:DATA? 0



```

GPIB Command Processor
For current command list, type :SYSTem:HELP:HEADers?
To quit, type Control-Z, then Enter.
Type ! followed by a filename to execute commands from a text file.

GPIB> CONT:EXT:TEST:DATA? 0
+8191
time=30ms
GPIB> _
  
```

This command reads the decimal equivalent of the binary data from the specified address. The example shown above illustrates address is 0 and the returned data is 8191. Refer to [“Test Set I/O Interface Commands” on page 60](#).

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 front panel. A positive or negative external source can be used. Refer to [Table 14](#) and [Figure 49 on page 59](#).

Setting the DUT Control Interface

This section describes how to control the DUT control lines. Refer to “[Controlling the Test Set with N5230C or N5242A](#)” on [page 39](#) or “[Controlling the Test Set with N5230A](#)” on [page 17](#). For more information regarding the control lines, see [Table 12 on page 55](#) and [Table 13 on page 56](#).

Table 12 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 46 DUT Control Line Pin Assignment

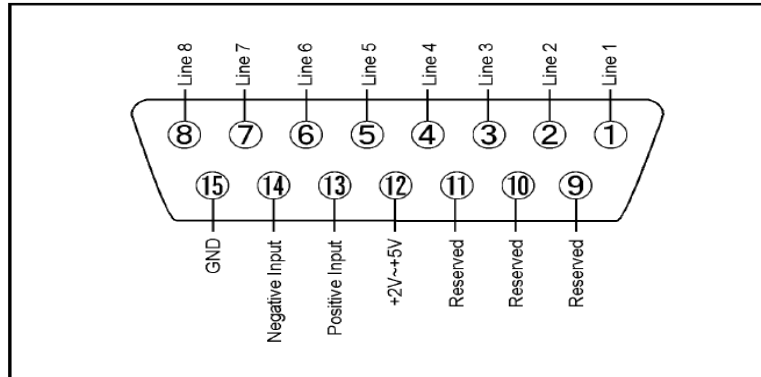


Table 13 DUT Control Line Pin Assignment

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 front 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:

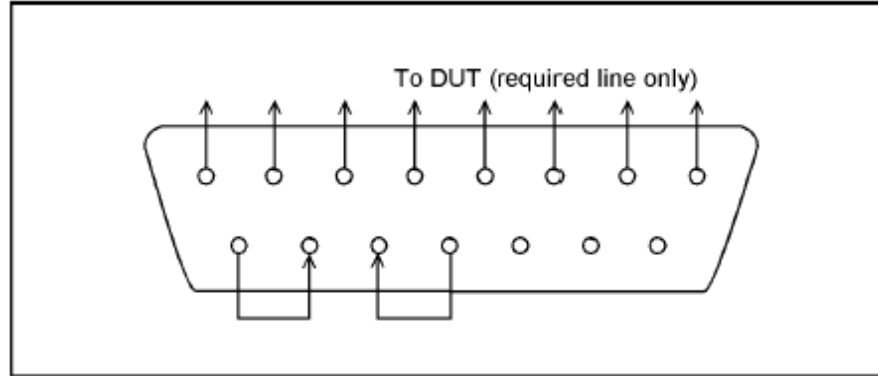
1. Turn On U3042AM12.
2. Measure the voltage between pin 12 and 15 using a multimeter.
3. Rotate the voltage adjustment trimmer on the front panel until the multimeter indicates the appropriate voltage.

Connecting to the DUT Control Lines

Figure 47 illustrates an example of the connection between the DUT and the U3042AM12 *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 47 Control Line Connector



Using an External Power Supply

Figure 47 illustrates an example of the connection between the DUT and the U3042AM12 *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 U3042AM12 using an External Power Supply.

1. Turning On the U3042AM12.
2. Connect the DUT.
3. Turn On the external power supply.

Turning Off the U3042AM12 using an External Power Supply.

1. Turning Off the Power Supply.
2. Turning Off the U3042AM12.
3. Disconnect the DUT.

Figure 48 U3042AM12 to the DUT and External DC Power Supply

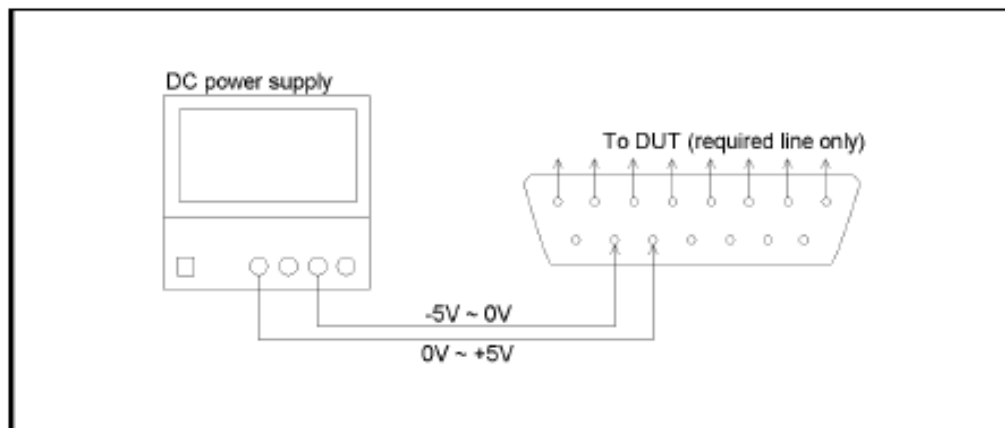
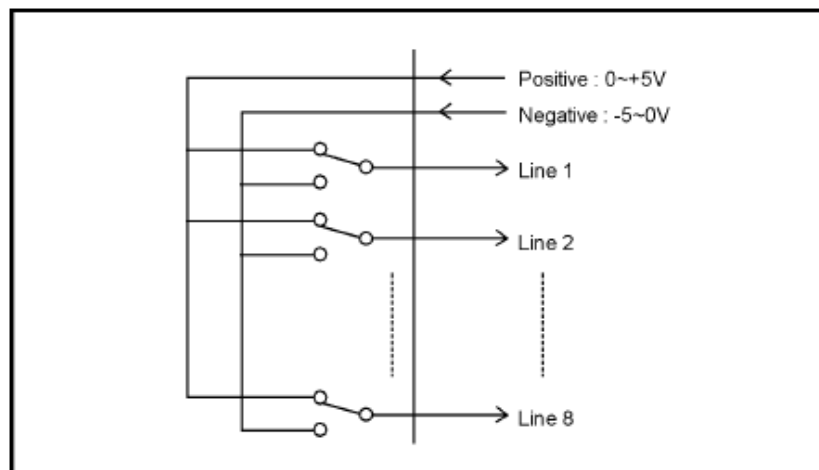


Table 14 DUT Control Specifications

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 Ω
Range of Variable Voltage	+2 to +5 V

Figure 49 Block Diagram of DUT Control

Test Set I/O Interface Commands

Switch Address and Data

Table 15 through Table 30 contain the information to set the internal switch paths of the U3042AM12 Test Set. Additional information regarding the operation and descriptions for the internal switches can be found in [“Theory of Operation” on page 85](#).

If you are using the interface control, the address and data are separated by a period. Entries should be separated by a new line (Enter key). Refer to the [“N5230A Interface Control” on page 27](#) or [“N5230C or N5242A Interface Control” on page 48](#).

If you are using the GPIB command processor, the address and data are separated by a comma. Entries should be separated by a new line (Enter key). Refer to [“N5230A GPIB Control” on page 31](#) or [“N5230C or N5242A GPIB Control” on page 52](#).

The address is the first value in the Test Set I/O control or GPIB data command. The second value controls the source and receiver paths of the ports. To select a test set port configuration both switches must be set to complete the source and receiver paths. To do this you must add the data values together to determine the data command value for each port, which is the second number in the test set I/O or GPIB command.

Refer [Table 15](#) and [Table 16 on page 61](#).

[Table 17](#) and [Table 18 on page 62](#) illustrates Port 1, 5, 9 and 13 as the configured source and receiver paths. Refer to [Table 15](#) to calculate other path combinations.

Example:

If Port 5 is to be the Source and the Receiver. then;

Source Port 5 = address 0, data 1 and Receiver Port 5 = address 0, data 16. The data values are added together, the entry will be 0.17. See [Table 15 on page 61](#). Refer to [“How to Access Interface Control Settings with N5230A” on page 28](#) and in [“How to Access GPIB Command Processor with N5230A” on page 32](#).

Example:

If Port 5 is to be the Source and Port 6 is to be the Receiver. then;

Source Port 5 = address 0, data 1 and Receiver Port 6 = address 16, data 16. Since the addresses are different, both 0.1 and 16.16 will be entered as separate lines.

See [Table 15 on page 61](#). Refer to [“How to Access Interface Control Settings with N5230A” on page 28](#) and in [“How to Access GPIB Command Processor with N5230A” on page 32](#).

Table 15 N5230A Port Value Select

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

1. All Source switches are 10, 20, 30 and 40.
2. All Receiver switches are 11, 21, 31 and 41.

Table 16 N5242A Port Value Select

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

1. All Source switches are 10, 20, 30 and 40.
2. All Receiver switches are 11, 21, 31 and 41.

Table 17 N5230A/C and N5242A Port 1 and Test Set Ports 1, 5, 9 and 13

Address	Data	Description							
0	D0 - D3	Controls SW10; Source to PNA Port 1 or Test Set Port 5, 9 and 13.							
0	D4 - D7	Controls SW11; Receiver to PNA Port 1 or Test Set Port 5, 9 and 13.							
Test Set I/O Data Bit		D0	D1	D2	D3	D4	D5	D6	D7
Data Bit Decimal Equivalent		1	2	4	8	16	32	64	128

Table 18 N5230A/C and N5242A Address and Data for Port 1, 5, 9 and 13

Address	Data	Description	Port LED's
0	0	Selects Port 1 as the Source and Receiver port. Ports 5 and 9 terminated with a 50 Ω switch load.	All Off
0	1	Selects the PNA Port 1 as the Receiver and Port 5 as the Source. Port 9 is terminated with a 50 Ω switch load.	Port 5 S ON
0	16	Selects Port 1 as the Source Port. Port 5 as the Receiver. Port 9 is terminated with a 50 Ω switch load.	Port 5 R ON
0	17	Selects Port 5 as the Source and Receiver port. Port 1 and 9 are terminated with a 50 Ω switch load.	Port 5 R ON Port 5 S ON
0	32	Selects Port 1 as the Source and Port 9 as the Receiver Port. Port 5 is terminated with a 50 Ω switch load.	Port 9 R ON
0	2	Selects Port 1 as the Receiver and Port 9 as the Source. Port 5 is terminated with a 50 Ω switch load.	Port 9 S ON
0	34	Selects Port 9 as the Receiver and Source. Port 1 and 5 are terminated with a 50 Ω switch load.	Port 9 R ON Port 9 S ON
0	48	Select Port 1 as the Source and Port 13 as Receiver. Port 5 and 9 are terminated with a 50 Ω switch load.	Port 13 R ON
0	3	Select Port 1 as the Receiver and Port 13 as Source. Port 5 and 9 are terminated with a 50 Ω switch load.	Port 13 S ON
0	51	Select Port 13 as the Receiver and Source. Port 1, 5 and 9 are terminated with a 50 Ω switch load.	Port 13 R ON Port 13 S ON

Table 19 N5230A/C Port 1 and Test Set Ports 2, 6, 10 and 14

Address	Data	Description							
16	D0 - D3	Controls SW20; Source to PNA Port 2 or Test Set Port 6, 10 and 14.							
16	D4 - D7	Controls SW21; Receiver to PNA Port 2 or Test Set Port 6, 10 and 14.							
Test Set I/O Data Bit		D0	D1	D2	D3	D4	D5	D6	D7
Data Bit Decimal Equivalent		1	2	4	8	16	32	64	128

Table 20 N5230A/C Address and Data for Port 2, 6, 10 and 14

Address	Data	Description	Port LED's
16	0	Selects Port 2 as the Source and Receiver port. Ports 6 and 10 are terminated with a 50 Ω switch load.	All Off
16	1	Selects the PNA Port 2 as the Receiver and Port 6 as the Source. Port 10 is terminated with a 50 Ω switch load.	Port 6 S ON
16	16	Selects Port 2 as the Source Port. Port 6 as the Receiver. Port 10 is terminated with a 50 Ω switch load.	Port 6 R ON
16	17	Selects Port 6 as the Source and Receiver port. Ports 2 and 10 are terminated with a 50 Ω switch load.	Port 6 R ON Port 6 S ON
16	32	Selects Port 2 as the Source and Port 10 as the Receiver Port. Port 6 is terminated with a 50 Ω switch load.	Port 10 R ON
16	2	Selects Port 2 as the Receiver and Port 10 as the Source. Port 6 is terminated with a 50 Ω switch load.	Port 10 S ON
16	34	Port 10 as the Receiver and Source. Ports 2 and 6 are terminated with a 50 Ω switch load.	Port 10 R ON Port 10 S ON
16	48	Selects Port 2 as the Source and Port 14 as the Receiver. Ports 6 and 10 are terminated with a 50 Ω switch load.	Port 14 R ON
16	3	Selects Port 2 as the Receiver and Port 14 as the Source Port. Ports 6 and 10 are terminated with a 50 Ω switch load.	Port 14 S ON
16	51	Selects Port 14 as the Source and Receiver. Ports 2, 6 and 10 are terminated with a 50 Ω switch load.	Port 14 R ON Port 14 S ON

Table 21 N5242A Port 1 and Test Set Ports 3, 6, 10 and 14

Address	Data	Description							
16	D0 - D3	Controls SW20; Source to PNA Port 3 or Test Set Port 6, 10 and 14							
16	D4 - D7	Controls SW21; Receiver to PNA Port 3 or Test Set Port 6, 10 and 14.							
Test Set I/O Data Bit		D0	D1	D2	D3	D4	D5	D6	D7
Data Bit Decimal Equivalent		1	2	4	8	16	32	64	128

Table 22 N5242A Address and Data for Port 3, 6, 10 and 14

Address	Data	Description	Port LED's
16	0	Selects Port 3 as the Source and Receiver port. Ports 6 and 10 are terminated with a 50 Ω switch load.	All Off
16	1	Selects the PNA Port 3 as the Receiver and Port 6 as the Source. Port 10 is terminated with a 50 Ω switch load.	Port 6 S ON
16	16	Selects Port 3 as the Source Port and Port 6 as the Receiver. Port 10 is terminated with a 50 Ω switch load.	Port 6 R ON
16	17	Selects Port 6 as the Source and Receiver port. Ports 3 and 10 are terminated with a 50 Ω switch load.	Port 6 R ON Port 6 S ON
16	32	Selects Port 3 as the Source and Port 10 as the Receiver. Port 6 is terminated with a 50 Ω switch load.	Port 10 R ON
16	2	Selects Port 3 as the Receiver and Port 10 as the Source. Port 6 is terminated with a 50 Ω switch load.	Port 10 S ON
16	34	Port 10 as the Receiver and Source port. Ports 3 and 6 are terminated with a 50 Ω switch load.	Port 10 R ON Port 10 S ON
16	48	Selects Port 3 as the Source and Port 14 as the Receiver. Ports 6 and 10 are terminated with a 50 Ω switch load.	Port 14 R ON
16	3	Selects Port 3 as the Receiver and Port 14 as the Source. Ports 6 and 10 are terminated with a 50 Ω switch load.	Port 14 S ON
16	51	Port 14 as the Receiver and Source port. Ports 3, 6 and 10 are terminated with a 50 Ω switch load.	Port 14 R ON Port 14 S ON

Table 23 N5230A/C Port 1 and Test Set Ports 3, 7, 11 and 15

Address	Data	Description							
32	D0 - D3	Controls SW30; Source to PNA Port 3 or Test Set Port 7, 11 and 15.							
32	D4 - D7	Controls SW31; Receiver to PNA Port 3 or Test Set Port 7, 11 and 15.							
Test Set I/O Data Bits		D0	D1	D2	D3	D4	D5	D6	D7
Data Bit Decimal Equivalent		1	2	4	8	16	32	64	128

Table 24 N5230A/C Address and Data for Port 3, 7, 11 and 15

Address	Data	Description	Port LED's
32	0	Selects Port 3 as the Source and Receiver port. Ports 7 and 11 are terminated with a 50 Ω switch load.	All Off
32	1	Selects the PNA Port 3 as the Receiver and Port 7 as the Source. Port 11 is terminated with a 50 Ω switch load.	Port 7 S ON
32	16	Selects Port 3 as the Source Port. Port 7 as the Receiver. Port 11 is terminated with a 50 Ω switch load.	Port 7 R ON
32	17	Selects Port 7 as the Source and Receiver port. Ports 3 and 11 are terminated with a 50 Ω switch load.	Port 7 R ON Port 7 S ON
32	32	Selects Port 3 as the Source and Port 11 as the Receiver Port. Port 7 is terminated with a 50 Ω switch load.	Port 11 R ON
32	2	Selects Port 3 as the Receiver and Port 11 as the Source. Port 7 is terminated with a 50 Ω switch load.	Port 11 S ON
32	34	Selects Port 11 as the Receiver and Source. Ports 3 and 7 are terminated with a 50 Ω switch load.	Port 11 R ON Port 11 S ON
32	48	Selects Port 3 as the Source and Port 15 as Receiver. Ports 7 and 11 are terminated with a 50 Ω switch load.	Port 15 R ON
32	3	Selects Port 3 as the Receiver and Port 15 as the Source. Ports 7 and 11 are terminated with a 50 Ω switch load.	Port 15 S ON
32	51	Selects Port 15 as the Receiver and Source. Ports 3, 7 and 11 are terminated with a 50 Ω switch load.	Port 15 R ON Port 15 S ON

Table 25 N5242A Port 1 and Test Set Ports 4, 7, 11 and 15

Address	Data	Description							
32	D0 - D3	Controls SW30; Source to PNA Port 4 or Test Set Port 7, 11 and 15.							
32	D4 - D7	Controls SW31; Receiver to PNA Port 4 or Test Set Port 7, 11 and 15.							
Test Set I/O Data Bits		D0	D1	D2	D3	D4	D5	D6	D7
Data Bit Decimal Equivalent		1	2	4	8	16	32	64	128

Table 26 N5242A Address and Data for Port 4, 7, 11 and 15

Address	Data	Description	Port LED's
32	0	Selects Port 4 as the Source and Receiver port. Ports 7 and 11 are terminated with a 50 Ω switch load.	All Off
32	1	Selects the PNA Port 4 as the Receiver and Port 7 as the Source. Port 11 is terminated with a 50 Ω switch load.	Port 7 S ON
32	16	Selects Port 4 as the Source Port. Port 7 as the Receiver. Port 11 is terminated with a 50 Ω switch load.	Port 7 R ON
32	17	Selects Port 7 as the Source and Receiver port. Ports 4 and 11 are terminated with a 50 Ω switch load.	Port 7 R ON Port 7 S ON
32	32	Selects Port 4 as the Source and Port 11 as the Receiver Port. Port 7 is terminated with a 50 Ω switch load.	Port 11 R ON
32	2	Selects Port 4 as the Receiver and Port 11 as the Source. Port 7 is terminated with a 50 Ω switch load.	Port 11 S ON
32	34	Selects Port 11 as the Receiver and Source. Ports 4 and 7 are terminated with a 50 Ω switch load.	Port 11 R ON Port 11 S ON
32	48	Selects Port 4 as the Source and Port 15 as the Receiver Port. Ports 7 and 11 are terminated with a 50 Ω switch load.	Port 15 R ON
32	3	Selects Port 4 as the Receiver and Port 15 as the Source. Ports 7 and 11 are terminated with a 50 Ω switch load.	Port 15 S ON
32	51	Selects Port 15 as the Receiver and Source. Ports 4, 7 and 11 are terminated with a 50 Ω switch load.	Port 15 R ON Port 15 S ON

Table 27 N5230AC Port 1 and Test Set Ports 4, 8, 12 and 16

Address	Data	Description							
32	D0 - D3	Controls SW40; Source to PNA Port 4 or Test Set Port 8, 12 and 16.							
32	D4 - D7	Controls SW41; Receiver to PNA Port 4 or Test Set Port 8, 12 and 16.							
Test Set I/O Data Bits		D0	D1	D2	D3	D4	D5	D6	D7
Data Bit Decimal Equivalent		1	2	4	8	16	32	64	128

Table 28 N5230A/C Address and Data for 4, 8, 12 and 16

Address	Data	Description	Port LED's
64	0	Selects Port 4 as the Source and Receiver port. Ports 8 and 12 are terminated with a 50 Ω switch load.	All Off
64	1	Selects the PNA Port 4 as the Receiver and Port 8 as the Source. Port 12 is terminated with a 50 Ω switch load.	Port 8 S ON
64	16	Selects Port 4 as the Source Port. Port 8 as the Receiver. Port 12 is terminated with a 50 Ω switch load.	Port 8 R ON
64	17	Selects Port 9 as the Source and Receiver port. Ports 4 and 12 are terminated with a 50 Ω switch load.	Port 8 R ON Port 8 S ON
64	32	Selects Port 4 as the Source and Port 12 as the Receiver Port. Port 8 is terminated with a 50 Ω switch load.	Port 12 R ON
64	2	Selects Port 4 as the Receiver and Port 12 as the Source. Port 8 is terminated with a 50 Ω switch load.	Port 12 S ON
64	34	Selects Port 12 as the Receiver and Source. Ports 4 and 8 are terminated with a 50 Ω switch load.	Port 12 R ON Port 12 S ON
64	48	Selects Port 4 as the Source and Port 16 as the Receiver. Ports 8 and 12 are terminated with a 50 Ω switch load.	Port 16 R ON
64	3	Selects Port 4 as the Source and Port 16 as the Receiver. Ports 8 and 12 are terminated with a 50 Ω switch load.	Port 16 S ON
64	51	Selects Port 16 as the Receiver and Source. Ports 4, 8 and 12 are terminated with a 50 Ω switch load.	Port 16 R ON Port 16 S ON

Table 29 N5242A Port 1 and Test Set Ports 2, 8, 12 and 16

Address	Data	Description							
32	D0 - D3	Controls SW40; Source to PNA Port 2 or Test Set Port 8, 12 and 16.							
32	D4 - D7	Controls SW41; Receiver to PNA Port 2 or Test Set Port 8, 12 and 16.							
Test Set I/O Data Bits		D0	D1	D2	D3	D4	D5	D6	D7
Data Bit Decimal Equivalent		1	2	4	8	16	32	64	128

Table 30 N5242A Address and Data for Ports 2, 8, 12 and 16

Address	Data	Description	Port LED's
64	0	Selects Port 2 as the Source and Receiver port. Ports 8 and 12 are terminated with a 50 Ω switch load.	All Off
64	1	Selects the PNA Port 2 as the Receiver and Port 8 as the Source. Port 12 is terminated with a 50 Ω switch load.	Port 8 S ON
64	16	Selects Port 2 as the Source Port. Port 8 as the Receiver. Port 12 is terminated with a 50 Ω switch load.	Port 8 R ON
64	17	Selects Port 8 as the Source and Receiver port. Ports 2 and 12 are terminated with a 50 Ω switch load.	Port 8 R ON Port 8 S ON
64	32	Selects Port 2 as the Source and Port 12 as the Receiver Port. Port 8 is terminated with a 50 Ω switch load.	Port 12 R ON
64	2	Selects Port 2 as the Receiver and Port 12 as the Source. Port 8 is terminated with a 50 Ω switch load.	Port 12 S ON
64	34	Selects Port 12 as the Receiver and Source. Ports 2 and 8 are terminated with a 50 Ω switch load.	Port 12 R ON Port 12 S ON
64	48	Selects Port 2 as the Source and Port 16 as the Receiver Port. Ports 8 and 12 are terminated with a 50 Ω switch load.	Port 16 R ON
64	3	Selects Port 2 as the Receiver and Port 16 as the Source. Ports 8 and 12 are terminated with a 50 Ω switch load.	Port 16 S ON
64	51	Selects Port 16 as the Receiver and Source. Ports 2, 8 and 12 are terminated with a 50 Ω switch load.	Port 16 R ON Port 16 S ON

Operational Check

This section provides operational check to confirm the U3042AM12 and PNA operational performance. The operation verification limits provided ensure that your U3042AM12 and PNA are operating properly. Multiport mode is required to perform the 1-Port calibration. If the PNA does not have Option 551, refer to [“Source and Receiver Path Test” on page 92](#).

Verification Limits

Specifications for the U3042AM12 Multiport Test Set are typical. System performance for the PNA and Test Set are only characteristic and intended as non warranted information. Only a functional certificate is provided for the U3042AM12.

It is recommended that you return your instrument to Agilent Technologies for servicing or repair if the Test Set and PNA performance exceed the operational verification limits.

NOTE Typical specifications are based on 1 to 2 units performance. Refer to [Table 31](#) and [Table 32 on page 70](#).

Table 31 N5230A/C Operation Verification Limit for Reflection Tracking¹

Frequency	Port 1-12
10 MHz to 4 GHz	-5 dB
4 GHz to 6 GHz	-6 dB
6 GHz to 10 GHz	-8 dB
10 GHz to 15 GHz	-12 dB
15 GHz to 20 GHz	-14 dB

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

Table 32 N5242A Operation Verification Limit for Reflection Tracking¹

Frequency	Port 1-16
10 MHz to 4 GHz	-5 dB
4 GHz to 6 GHz	-6 dB
6 GHz to 10 GHz	-8 dB
10 GHz to 15 GHz	-12 dB
15 GHz to 20 GHz	-14 dB
20 GHz to 26.5 GHz	-15 dB

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

NOTE If you suspect that your 16-Port configuration is not operating properly, ensure that all front RF jumper interconnect cables are correctly attached.

Equipment Required

The Agilent U3042AM12 requires that the user be familiar with the equipment and components listed in [Table 33](#).

This section provides an equipment list and setup of the PNA and Test Set.

Table 33 Equipment List

Description	Qty
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
N5230A/C 4-Port Network Analyzer (Option 245 and 551) <i>or</i> N5242A Option 400 and 551	1
Set of interconnect cables (PNA and Test Set), see “N5230A/C RF Interface Cable Connections” on page 16.	1

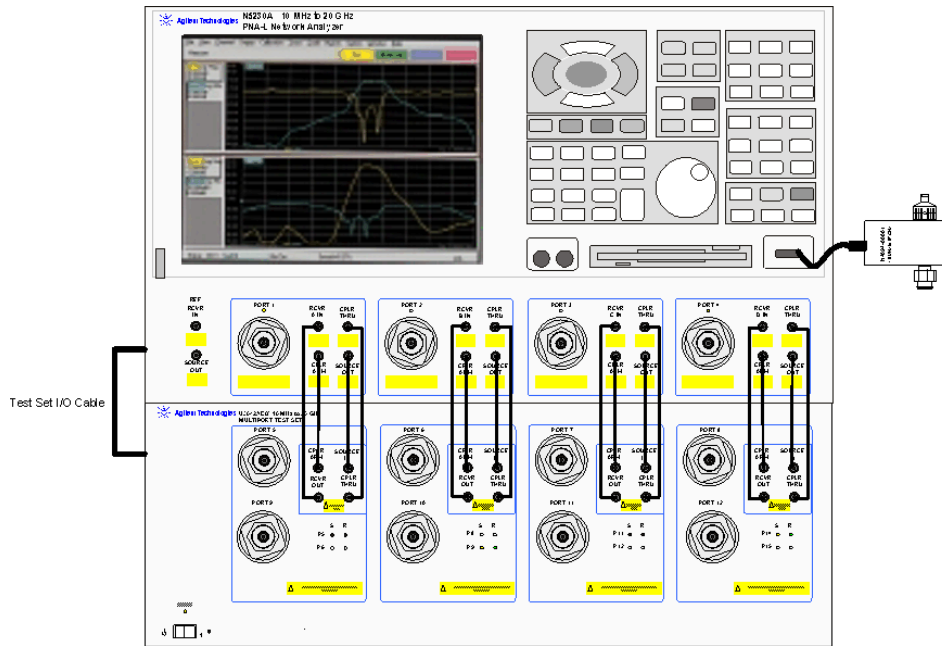
Operational Check Procedure

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 if you are performing a PNA Operator's Check. The PNA will indicate false failures if the test set is connected.

Preparing the N5230A

1. Connect the Test Set to the N5230A 4-Port PNA using the interconnect cables as shown in [Figure 50 on page 72](#) and [Table 10 on page 16](#).
2. Turn On the Test Set.
3. On the PNA, press **Calibration > Cal Sets**. Delete or Rename any Cal Sets titled "999.1" thru "999.16" (16-Port), although it is unlikely that you will find Cal Sets with these names.
4. Verify that the PNA is in 16-Port mode. Refer to the bottom of [Figure 55 on page 75](#), or select **Trace > New Trace**.
 - a. If only four S-Parameters are listed, press **System > Configure > Multiport Capability**. On the Multiport Restart dialog, select **Restart as multiport PNA with this test set**. Select **U3042AM12** (16-Port).
5. Press **System > Preset**.
6. Verify that the **[Stop Frequency]** is set to the maximum of the PNA and test set.
7. Verify that the **[Start Frequency]** is set to **[300 kHz]**. If not, press **Channel > Start/Stop** and enter **[300 kHz]**.
8. Verify that the **[Power]** is set to **[-8 dBm]**. If not, press **[Power] > Power Level** and enter **[-8 dBm]**.
9. Select **Sweep > IF Bandwidth > 100 Hz**.
10. Select **Sweep > Number of Points > 401**.
11. Connect the ECal module to the PNA-L USB port on the front or rear panel, refer to [Figure 50 on page 72](#). This procedure assumes you are using a ECal. If you are not, see "N5230A 1-Port Calibration and Verification Procedure", [step 2 on page 73](#).

Figure 50 Test Set to N5230A Connections

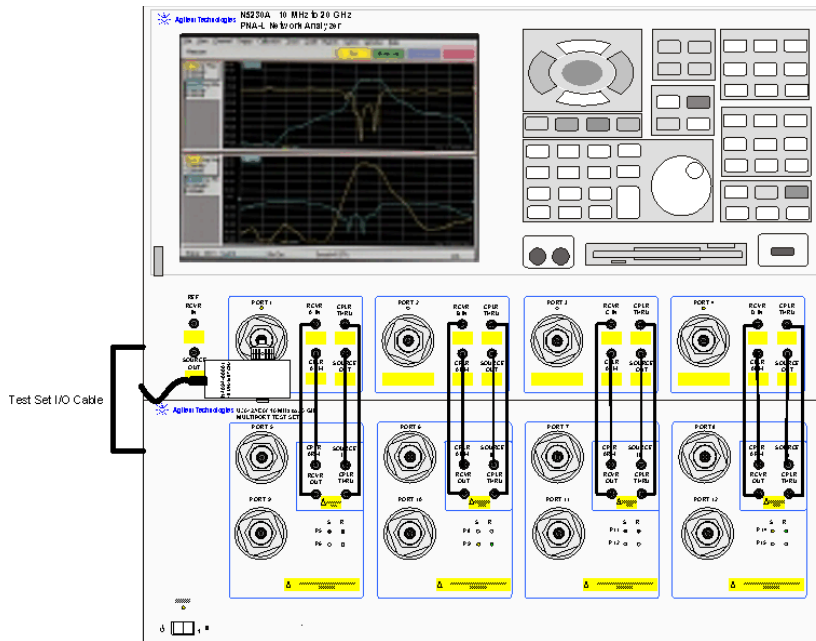


12. Allow the ECal module, Test Set and PNA to warm up for a minimum of 30 minutes.

N5230A 1-Port Calibration and Verification Procedure

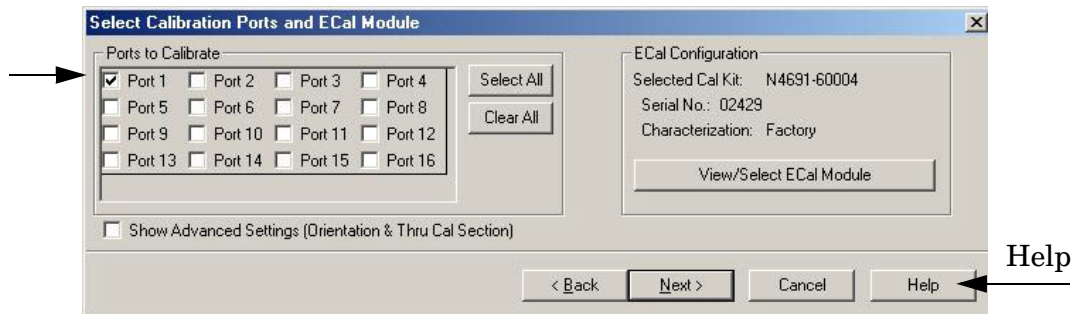
1. Connect the ECal or the mechanical cal kit to Port 1 or the port you are testing. Torque to 8 in-lb. For more information press the **Help** button, see [Figure 51](#).

Figure 51 ECal at N5230A Port 1



2. Perform a 1-Port Calibration on Port 1. On the PNA, press **Calibration > Calibration Wizard**.
 - a. If using a mechanical cal kit, select **SmartCal**.
 - b. If using an ECal module, select **ECal**.
3. Continue following the Cal Wizard prompts. In the “Select Calibration Ports and ECal Module” dialog box, press **Clear All** and select **Port 1 > Next**. See [Figure 52](#).

Figure 52 1-Port Calibration

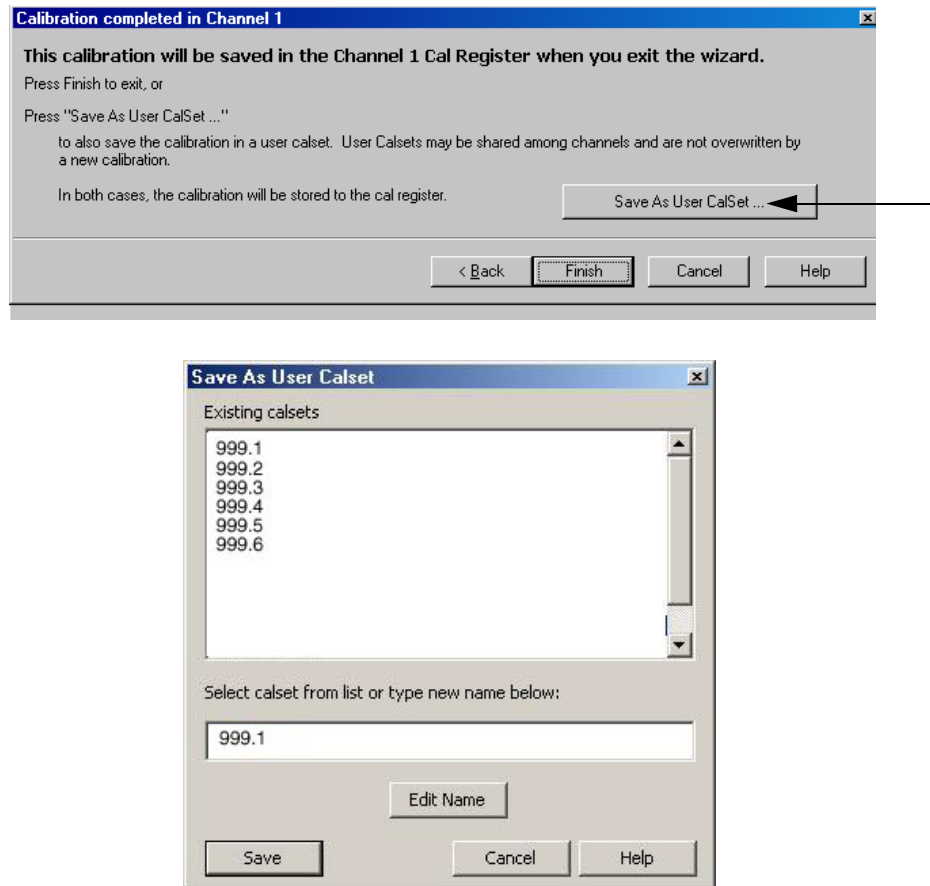


4. Continue to follow the prompts until “Calibration Completed” is displayed.

- At the Calibration Completed prompt, select **Save As User Calset** and enter the name **999.1**. Overwrite the Calset if it already exists. Press **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. See [Figure 53](#). Use the numeric keypad on the PNA front panel to enter **999.1**.

Figure 53 Calibration Complete



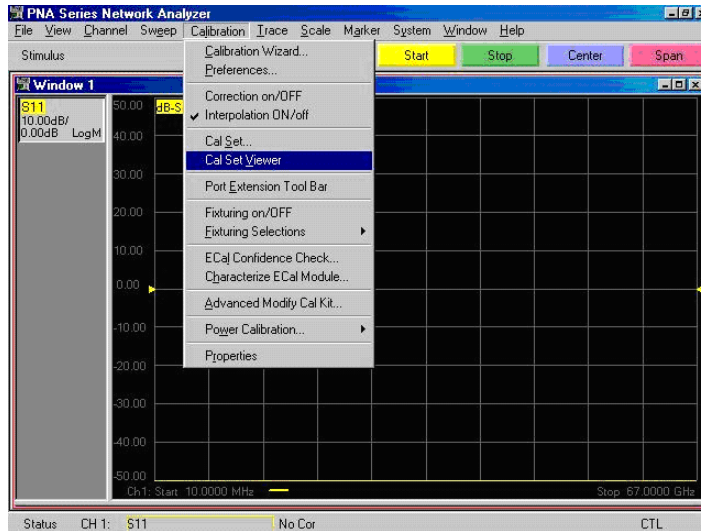
- Repeat [step 1](#) thru [step 5](#) (1-Port Calibration Procedure) for Ports 2 thru 16. When finished, there should be twelve Cal Sets saved with the titles “999.1” thru “999.16” (16-Port).

If you are using an ECal module you can verify the individual port calibration by selecting **Calibration > ECal Confidence Check**. For further information refer to the system **Help** menu.

- Press **Trace > Delete Trace**. There should be no traces on the PNA screen.

8. Select **Calibration > Cal Set Viewer** to launch the Cal Set Viewer toolbar. See [Figure 54](#).

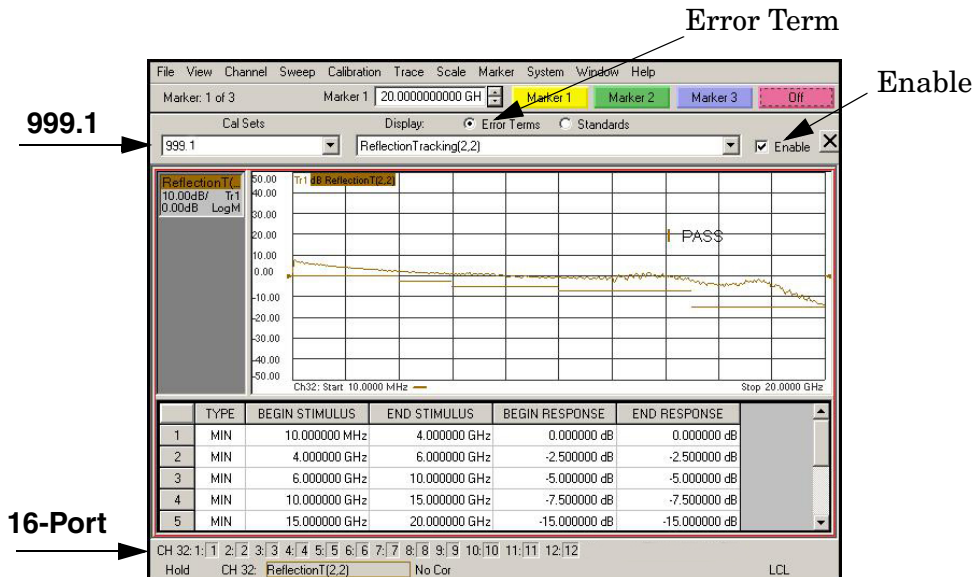
Figure 54 Calibration, Cal Set Viewer



9. From the Cal Sets drop-down menu, select **999.1** and check **Enable**. Select the **Reflection Tracking(1,1)** term in the center drop-down menu and ensure that the **Enable** and **Error Terms** are selected as shown in [Figure 55](#).

NOTE You may also create a table on the PNA and enter the limit line stimulus and response values. Select **Limit Test ON** and **Limit Line ON**, and press **Show Table**. See [Figure 55 on page 75](#).

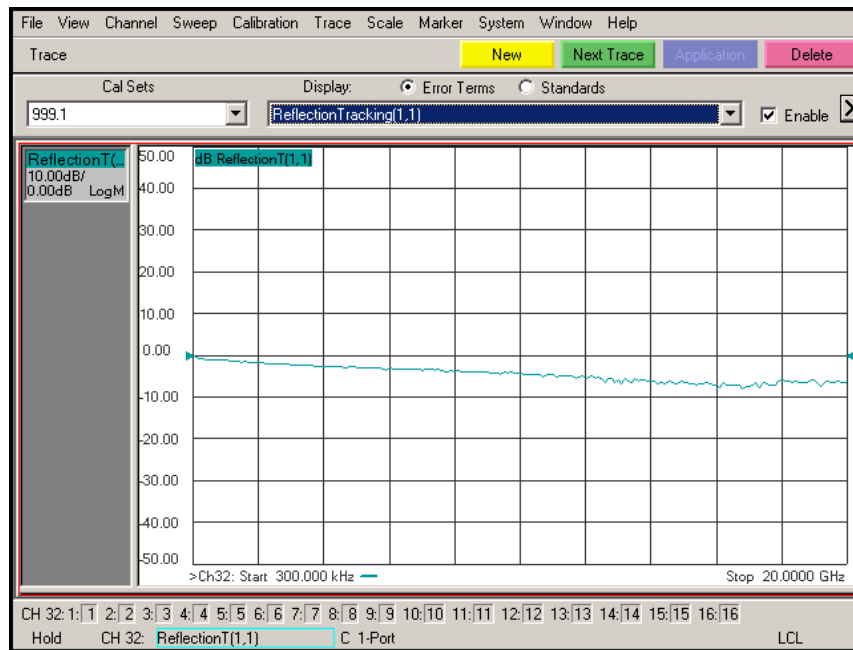
Figure 55 Reflection Tracking Trace (Port 1-16) with N5230A/C



10. Compare the Reflection Tracking (1,1) trace to the appropriate limits in [Table 31 on page 69](#). This can be done using Limit Lines (press **Trace** > **Limit Test**) or **Marker**. 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 “999.16” (16-Port).

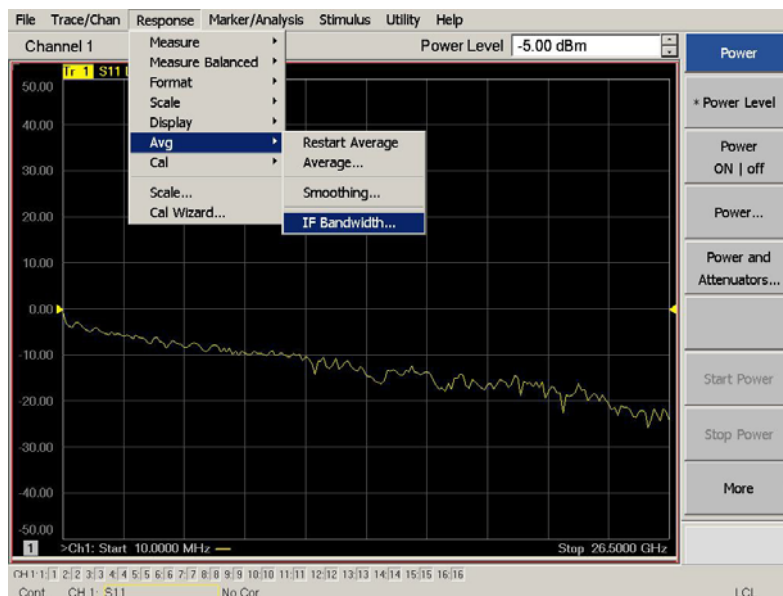
Figure 56 Reflection Tracking Trace (Port 1-16) with N5230A/C



Preparing the N5230C or N5242A

1. Connect the Test Set to the N5242A 4-Port PNA-X using the interconnect cables as shown in [Figure 28 on page 38](#) and [Table 11 on page 37](#). If you are using a N5230C, refer to [Figure 10 on page 16](#) and [Table 16 on page 61](#).
2. Turn On the Test Set.
3. On the PNA, press **Response > CAL > Manage CALS > CAL Set**. Delete or Rename any Cal Sets titled “999.1” thru “999.16” (16-Port), although it is unlikely that you will find Cal Sets with these names.
4. Verify that the PNA is in 16-Port. See the bottom of the measurement window.
 - a. If only four S-Parameters are listed, press **Utility > System > Configure > Multiport Capability**. On the Multiport Restart dialog, select **Restart as multiport PNA with this test set**. Select **U3042AM12 (16-Port)**.
5. Press **Preset**.
6. Verify that the **[Stop Frequency]** is set to **[26.5 GHz]** or **[20 GHz]** for the N5230C.
7. Verify that the **[Start Frequency]** is set to **[10 MHz]** or **[300 kHz]** for the N5230C.
8. Verify that the **[Power]** is set to **[-5 dBm]**.
9. Select **Response > Avg > IF Bandwidth > 100 Hz**. See [Figure 57](#).
10. Select **Stimulus > Sweep > Number of Points > 401**.
11. Connect the ECal module to the PNA USB port on the front or rear panel, refer to [Figure 50 on page 72](#). This procedure assumes you are using a ECal. If you are not, see “[N5230C or N5242A 1-Port Calibration and Verification Procedure](#)” step 2.
12. Allow the ECal module, Test Set and PNA to warm up for a minimum of 30 minutes.

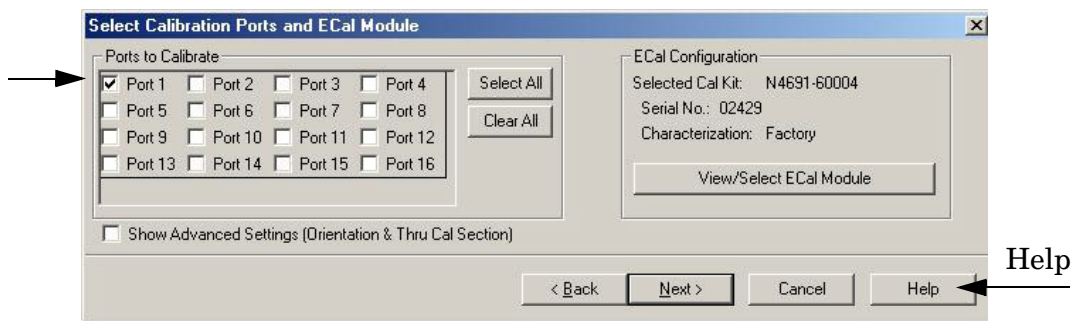
Figure 57 Setting the IF Bandwidth



N5230C or N5242A 1-Port Calibration and Verification Procedure

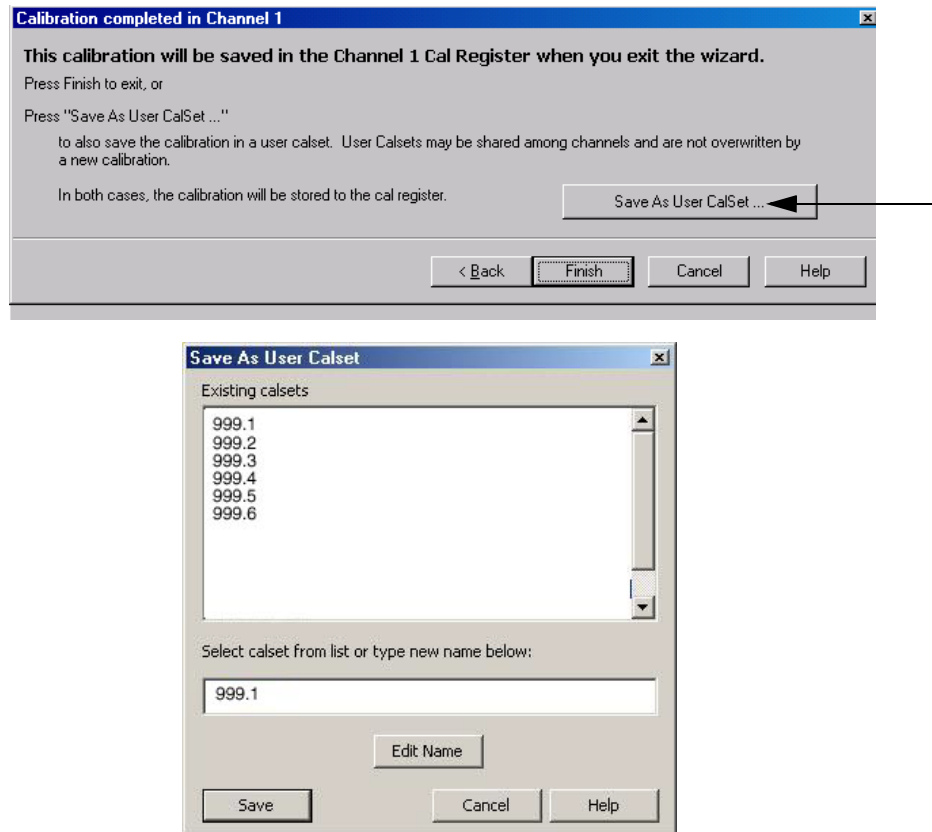
1. Connect the ECal or the mechanical cal kit to Port 1 or the port you are testing. Refer to [Figure 2 on page 2](#). Torque to 8 in-lb. For more information press the **Help** button, see [Figure 58](#).
2. Perform a 1-Port Calibration on Port 1. On the PNA, press **Response > CAL > Start Cal > Calibration Wizard**.
 - a. If using a mechanical cal kit, select **SmartCal**.
 - b. If using an ECal module, select **ECal**.
3. Continue following the Cal Wizard prompts. In the “Select Calibration Ports and ECal Module” dialog box, press **Clear All** and select **Port 1 > Next**.

Figure 58 1-Port Calibration



4. Continue to follow the prompts until “Calibration Completed” is displayed.
5. At the Calibration Completed prompt, select **Save As User Calset** and enter the name **999.1**. Overwrite the Calset if it already exists. Press **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. See [Figure 53](#). Use the numeric keypad on the PNA front panel to enter **999.1**.

Figure 59 Calibration Complete

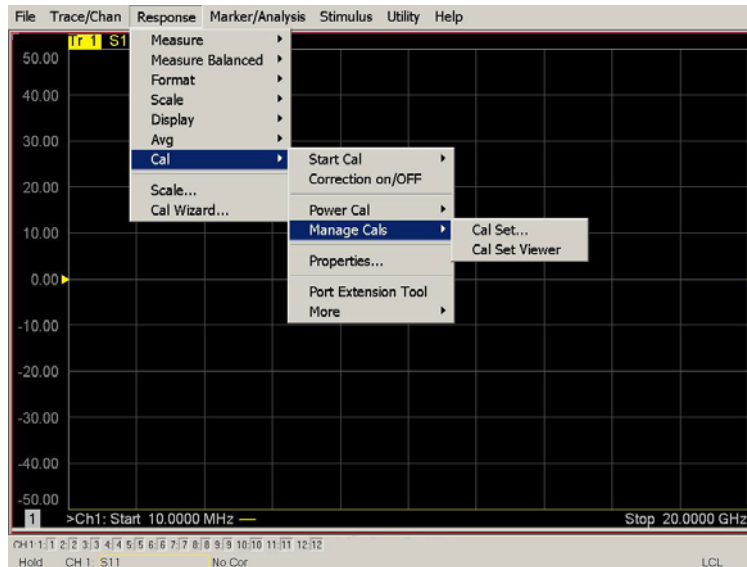
6. Repeat [step 1](#) thru [step 5](#) (1-Port Calibration Procedure) for Ports 2 thru 16. When finished, there should be sixteen Cal Sets saved with the titles “999.1” thru “999.16” (16-Port).

If you are using an ECal module you can verify the individual port calibration by selecting **Response > CAL > More > ECAL > ECAL Confidence Check**. For further information refer to the system **Help** menu.

7. Press **Trace/Chan > Trace > Delete Trace**. There should be no traces on the PNA screen.

- To launch the Cal Set Viewer toolbar. Select **Response > CAL > Manage CALS > CAL Set Viewer**.

Figure 60 Calibration, Cal Set Viewer



- From the Cal Sets drop-down menu, select **999.1** and check **Enable**. Select the **Reflection Tracking(1,1)** 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 and enter the limit line stimulus and response values. Select Limit Test ON and Limit Line ON, and press Show Table. See [Figure 61](#).

Figure 61 Setting the Test Limits

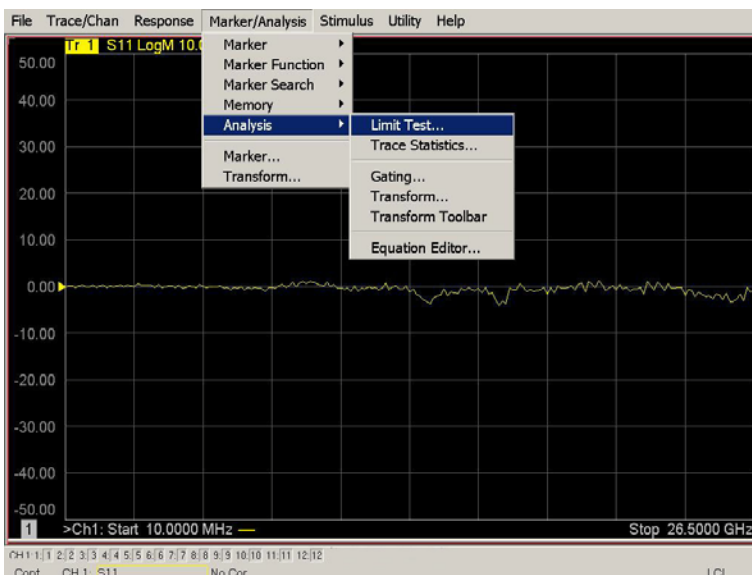
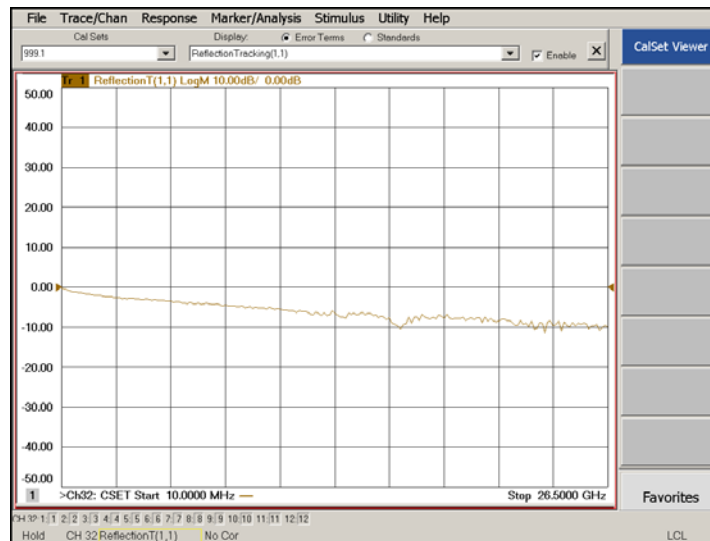
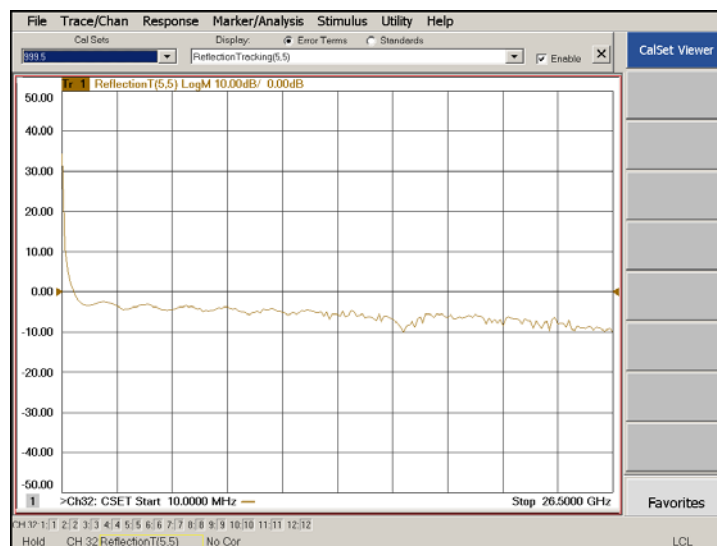


Figure 62 Reflection Tracking Trace (Port 1-4) with N5242A

10. Compare the Reflection Tracking (1,1) trace to the appropriate limits in [Table 31 on page 69](#). This can be done using Limit Lines (press **Marker/Analysis > Analysis > Limit Test**). 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 “999.16” (16-Port).

Figure 63 Reflection Tracking Trace (Port 5-16) with N5242A

NOTE Response from 10 MHz to 500 MHz is normal due to the PNA-X Couplers in comparison to the U3042AM12 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.
2. Check all appropriate network analyzer and test set connectors for damage, cleanliness, and proper torque.
3. Repeat the relevant 1-Port calibrations.
4. Verify that the stand-alone network analyzer is operating properly and meeting its published specifications.

Interconnect Cable Verification

1. Connect the Test Set to the PNA 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 jumpers.
 - b. Connect two RF cables on the PNA, Port-1 to Port-2 and Port-3 to Port-4.
 - c. Set the PNA to measure Trace S12, S21, S34 and S43, and verify that there are no power holes. If S12 or S34 has a power hole inspect Port-2, or Port-4 Source interconnect cables and test set connectors for damage. If S21 or S43 has a power hole inspect Port-1 or Port-3 Source interconnect cables and 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 jumpers.
 - c. Set the PNA 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 (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 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 106](#).
 - 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 106](#).

Service Information

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.

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

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, so long lead times may be encountered when ordering replacement parts. For parts that are not listed in the following table refer to [“Contacting Agilent” on page 106](#).

Description	Agilent Part Number
RF Cable, Semi-rigid	Z5623-20418
RF Cable, Semi-rigid	Z5623-20419
Port 1 SOURCE OUT	U3042-20031
Port 1 CPLR THRU	U3042-20032
Port 1 CPLR ARM	U3042-20029
Port 1 RCVR A IN	U3042-20030
Port 3 SOURCE OUT	U3042-20035
Port 3 CPLR ARM	U3042-20033
Port 3 RCVR C IN	U3042-20034
Port 3 CPLR THRU	U3042-20036
Port 4 CPLR ARM	U3042-20037
Port 4 RCVR D IN	U3042-20038
Port 4 SOURCE OUT	U3042-20039
Port 4 CPLR THRU	U3042-20040
Port 2 CPLR ARM	U3042-20041
Port 2 SOURCE OUT	U3042-20043
Port 2 RCVR B IN	U3042-20042
Port 2 CPLR THRU	U3042-20044

Description	Agilent Part Number
SW Interface Board, programmed	U3025-60062
User's Guide (Option M12)	U3042-90006
Dress Nut (coupler/bridge)	N5230-20081
PNA-X Test Set Rear Lock Feet (right)	N5242-20138
PNA-X Test Set Rear Lock Feet (left)	N5242-20139
10 LED Board (programmed)	N5261-60005
Test Set Control Board (programmed)	N5261-60006
Switch, Multiport, SP4T, DC-26.5 GHz	87104-60001
Fan (rear panel)	87050-60027
DUT Control Board	E5091-66503
PNA-L or PNA-X Locking Feet	5023-0132
PNA-L Test Set Locking Feet	5063-9253
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 0.0146OHM	2110-0342
Fuse (5 A 250 V non-time delay Socket	2110-0709
Test set I/O Cable	8120-6818

Theory of Operation

The following is a description of the operation of the U3042AM12. Reference the U3042AM12 block diagrams shown in [Figure 64 on page 88](#) or [Figure 66 on page 99](#). This section assumes the user has a general understanding of couplers, switches, and network analyzers.

RF Coupler/Bridges

U3042AM12 uses twelve coupler/bridges (5087-7716) on the front panel for RF Test Ports 5 - 16. 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 Port connectors are male 3.5 mm. The internal CPLR THRU and CPLR ARM ports are female 3.5 mm 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. Do not use excessive RF power or DC voltage, or damage may occur to the internal resistors.

RF Switches

Eight RF Switches (87104-60001) provide switching for RF Test Ports to the PNA access ports for SOURCE OUT, CPLR THRU, RCVR OUT and RCVR IN. Refer to the block diagram, [Figure 64 on page 88](#), for RF path information. Both mechanical switches typically have < 1 dB insertion loss at 26.5 GHz (not including RF cables connections) and are specified up to 5,000,000 cycles. The internal 50 Ohm loads, within the switch, can be damaged by excessive RF power or DC voltage. The switch expectancy of the switch is approximately 5,000,000 cycles.

S10 - Source to Ports (1, 5, 9 and 13)

Switch 10 provides control of the PNA Source path to Port 1, 5, 9 and 13. In the state shown in the block diagram, switch 10 routes the RF Source to Port 1 and the Test Set Source paths to ports 5, 9 and 13 are terminated.

S20 - Source to Ports (2 or 3, 6, 10 and 14)

Switch 20 provides control of the PNA Source path to PNA-L Port 2 or PNA-X Port 3 and the test set Ports 6, 10 and 14. In the state shown in the block diagram, switch 20 routes the RF Source back to the PNA Port and unused Test Set ports (6, 10 and 14) are terminated.

S30 - Source to Ports (3 or 4, 7, 11 and 15)

Switch 30 provides control of the PNA Source path to PNA-L Port 3 or PNA-X Port 4 and test set Ports 7, 11 and 15. In the state shown in the block diagram, switch 30 routes the RF Source back to the PNA Port and unused test set ports (7, 11 and 15) are terminated.

S40 - Source to Ports (4 or 2, 8, 12 and 16)

Switch 40 provides control of the PNA Source path to PNA-L Port 4 or PNA-X Port 2 and the test set Ports 8, 12 and 16. In the state shown in the block diagram, switch 40 routes the RF Source back to the PNA Port and unused test set ports (8, 12 and 16) are terminated.

S11 - Receiver to Ports (1, 5, 9 and 13)

Switch 11 provides control of the Receiver path to Port 1, 5, 9 and 13. In the state shown in the block diagram, switch 11 routes the Coupler Arm from the PNA Port 1 to the A Receiver and all unused test set ports (5, 9 and 13) Coupler Arm paths are terminated.

S21 - Receiver to Ports (2 or 3, 6, 10 and 14)

Switch 21 provides control of the Receiver path to PNA-L Port 2 or PNA-X Port 3 and test set Ports 6, 10 and 14. In the state shown in the block diagram, switch 21 routes the Coupler Arm from the PNA Port 2 to the A Receiver and all unused Test Set ports (2, 6, 10 and 14) Coupler Arm paths are terminated.

S31 - Receiver to Ports (3 or 4, 7, 11 and 15)

Switch 31 provides control of the Receiver path to PNA-L Port 3 or PNA-X Port 4 and test set Ports 7, 11 and 15. In the state shown in the block diagram, switch 31 routes the Coupler Arm from the PNA Port 3 to the A Receiver and all unused Test Set ports (3, 7, 11 and 15) Coupler Arm paths are terminated.

S41 - Receiver to Ports (4 or 2, to 8, 12 and 16)

Switch 41 provides control of the Receiver path to PNA-L Port 4 or PNA-X Port 2 and test set Ports 8, 12 and 16. In the state shown in the block diagram, switch 41 routes the Coupler Arm from the PNA Port 4 to the B Receiver and all unused Test Set ports (2, 8, 12 and 16) Coupler Arm paths are terminated.

Test Set Control Board

The Test Set Control Board (N5261-60006) is a surface mount, printed circuit assembly (PCA). It provides a connection to the power supply, and the PNA Test Set I/O for control of the RF switch paths (through the Switch Interface board (U3025-60062)). The front panel “Active” and port LEDs are on only when the PNA has addressed the U3042AM12 test set. The rear panel fan is on when the controller board supplies are operational.

Switch Interface Board

The Switch Interface board (U3025-60062) is installed on top of the Test Set Controller Board and provides connections to the RF switches. This board regulates the DC voltage supply (24 volts), and routes logic signals to the switches through ribbon cables connected to plugs P10, P11, P20, P21, P30, P31, P40 and P41.

Front Panel LED Boards

Four LED board assemblies (N5261-60005) are mounted to the front panel. The LED's indicate the Source Path (amber/yellow color), or Receiver Path (green colored) shown as "S" and "R" on the front panel. The LED board assemblies are connected to the test set controller board by ribbon cables to J5, J6, J7 and J8.

DUT Control Board

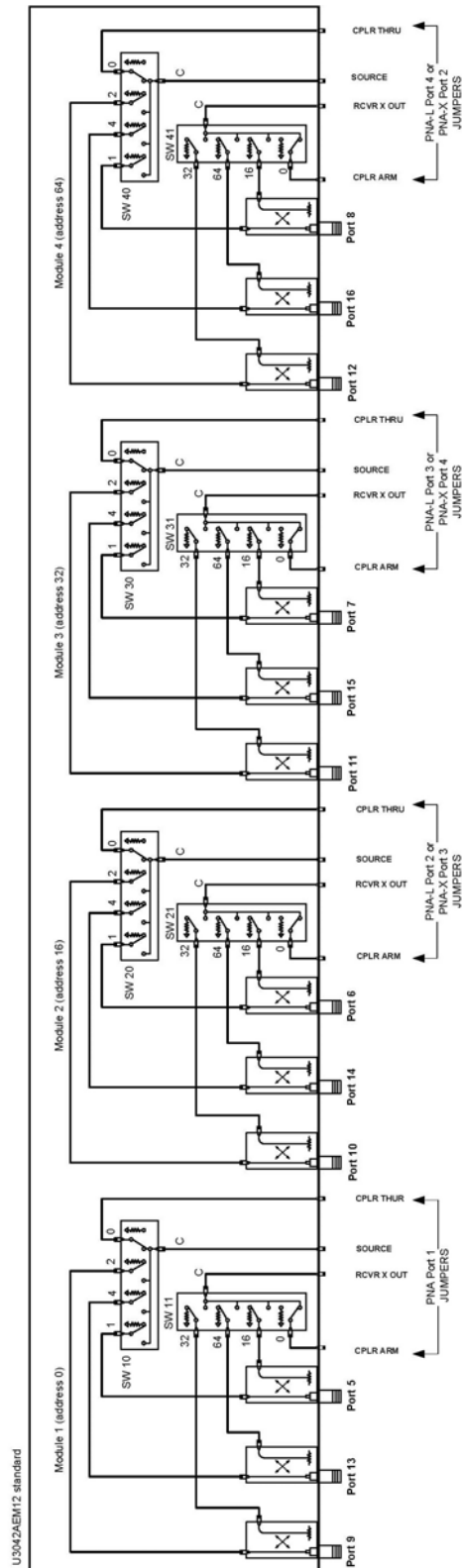
The DUT Control Board (E5091-66503) provides eight control lines for controlling an external device. The DUT Control Board installed on the rear panel and is connected to the Test Set Control Board through a ribbon cable to J9.

Power Supply

The power supply (0950-4729) converts the AC line voltages to DC. This is an automatic line voltage selecting power supply. The DC supplies are connected to the test set control board through four wire harness to J11, J12, J13 and J14. The AC line voltage (100 to 240 V @ 50/60 Hz) is provided from the line module on the rear panel.

System Block Diagram

Figure 64 U3042AM12 Standard Configuration



Troubleshooting

If the U3042AM12 is not operating properly, use the following procedures to isolate and repair the failure.

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 800-829-4444. For a listing of service centers worldwide, please visit us at www.agilent.com/find/service.

When sending the U3042A test set in for repair, please also send your PNA and cables. This will speed your repair turn around time, and verify proper operation of the complete system. Refer to “[Shipping Your Analyzer to Agilent for Service or Repair](#)” on page 107.

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

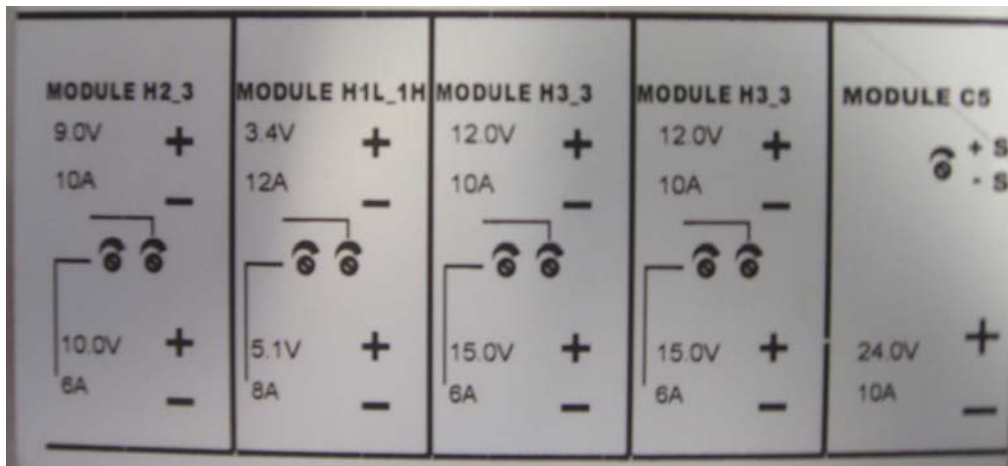
WARNING **No operator serviceable parts inside. Refer servicing to qualified personnel. To prevent electrical shock do not remove covers.**

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 while it is 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 5 on page 13](#). 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. The +9 and +10 V supplies will not be on. If the LED's are illuminated, replace the fan (87050-60027). Refer to [Figure 66 on page 99](#).
5. If the LED's are off, verify the voltages (+24, +5, +3, -15, -12, +15 and +12 Volt) on the Test Set Controller board. If the voltages are not correct, verify that J11 - J14 cables are connected correctly on both the power supply and controller board. Refer to [Figure 66 on page 99](#).
6. If the J11 - J14 cables are connected properly, measure the voltages on the power supply screw terminals. See the power supply voltages in [Figure 65](#).

Figure 65 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 67 on page 99](#).
 - a. If the fuses are correct, replace power supply (0950-4729).

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

If the U3042AM12 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 29 on page 38](#).
2. Using multiport mode (Option 551), verify the PNA firmware is correct, and the test set file is loaded into the PNA, 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 60](#).
4. Remove the top cover. Verify that the supply LED indicators, on the test set control board (N5261-60006), are illuminated. The +9 and +10 V supplies will not be on.
5. If the LED's are off, verify the voltages (+24, +5, +3, -15, -12, +15 and +12 Volt) on the Test Set Controller board. If the voltages are not correct, verify that J11 - J14 cables are connected correctly on both the power supply and controller board. Refer to [“Fan is not Operating” on page 89](#).
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 (U3025-60062), ribbon cable connection or coax switch (87104-60001) or (N1811T).

1. Inspect the ribbon cable connections from the test port switches to the Switch Interface board (U3025-60062).
2. Send a test set I/O command and verify that the mechanical switches are make a clicking sound. If there is no sound, replace the Switch Interface board (U3025-60062) or the suspected switch (87104-60001).
3. If the switches are operating, send a test set I/O command to verify the path for each port. See [“Source and Receiver Path Test” on page 92](#).
4. 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, N5230A/C PNA-L, or E8362B/C PNA
- 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 to Test Set. Refer to [Figure 29 on page 38](#). Set PNA 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 Ports 1 and 2. Connect the cables together using a SMA adapter.
3. Set the frequency range form 300 kHz to 26.5 GHz, or the frequency range of the PNA you are using.
4. Select measure S21 trace, and perform a Response Cal.
5. Select Ref Level 0 dB > Scale 2 dB (or Autoscale).

Source Path Trace

The S21 trace should slope down approximately -0 to -3.5 dB (± 1 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 -1.5 to -7 dB (± 1 dB) for test Ports 5 thru 12 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 3 on page 11](#) for the connector locations.

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 2 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 3 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 4 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.

Receiver Path Trace

The S21 trace should slope down approximately -0 to -3.5 dB (± 1 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 -15 to -20 dB (± 1 dB) for test Ports 5 thru 12 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 3 on page 11](#) 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 2 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 3 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 4 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 Port 13 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 Port 14 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 Port 15 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 Port 16 RCVR OUT.

RF Performance Fails

If the U3042AM12 operates correctly, but RF performance fails the operational test. The following procedures can be used to isolate the failed component. Suspect the coax switch (87104-60001), RF cables, or coupler bridge (5087-7716).

NOTE The RF performance of the U3042AM12 depends on the performance of the PNA. Ensure the PNA is meeting specification before continuing.

1. Verify that the test set and PNA 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 82.](#)
3. Review the [“Operational Check Procedure” on page 71](#) 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 92.](#)
5. Directivity trace fails (above -10 dB), replace the coupler/bridge (5087-7716).
6. Source or load match fails (above -10 dB), replace the coax switch (87104-60001).
7. Isolation is poor between ports, inspect the RF connections. If it continues to fail replace the coax switch (87104-60001). The RF cables require proper torque (10 in-lb) and can be damaged by over tightening.

Control Lines are not Working

If the U3042AM12 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 55.](#)
2. Verify that the control pot is centered (5 V). Refer to [Figure 4 on page 12.](#)
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 34 Controller Board Connections

Controller Board Connection	Connection
LED Ribbon Cables From the LED Board:	
J5	Ports 5, 9 and 13
J6	Ports 6, 10 and 14
J7	Ports 7, 11 and 15
J8	Ports 8, 12 and 16
Wire harness Active LED:	
P1	Active LED
DUT Control Ribbon Cable:	
J9	DUT Controller Board
Power Supply Wire Harness:	
J11- 14	Power Supply

Table 35 Switch Interface Board

Switch Interface Board	Connection
Switch Interface Board Connection:	
P10	Ports 5, 9 and 13 (Source)
P11	Ports 5, 9 and 13 (Receiver)
P20	Ports 6, 10 and 14 (Source)
P21	Ports 6, 10 and 14 (Receiver)
P30	Ports 7, 11 and 15 (Source)
P31	Ports 7, 11 and 15 (Receiver)
P40	Ports 8, 12 and 16 (Source)
P41	Ports 8, 12 and 16 (Receiver)

Figure 66 Top View

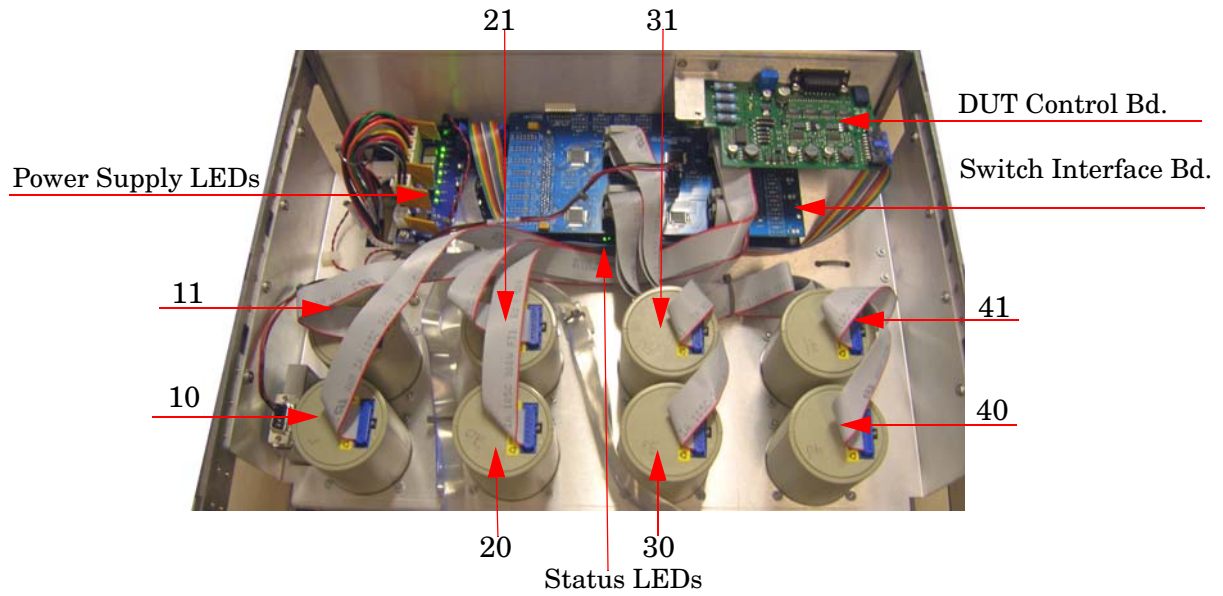
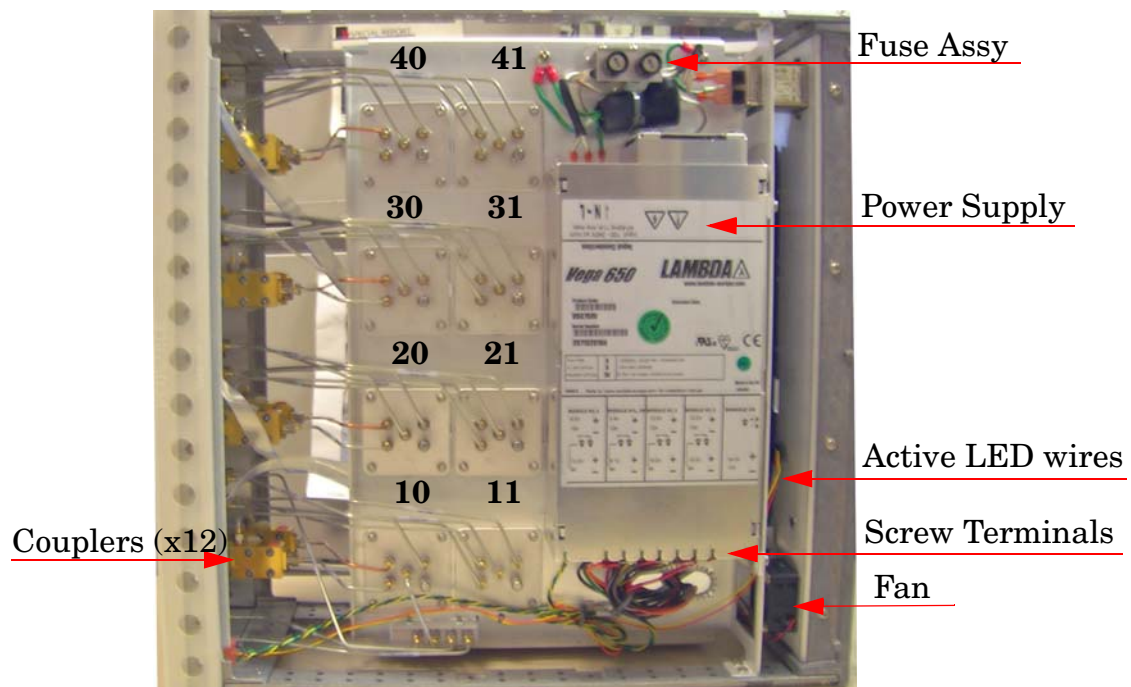


Figure 67 Bottom View



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.

Before Applying Power

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

WARNING To prevent electrical shock, disconnect the **Agilent Technologies U3042AM12** 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.

Connector Care and Cleaning

If alcohol is used to clean the connectors, the power cord to the instrument must be removed. All cleaning should take place in a well ventilated area. Allow adequate time for the fumes to disperse and moist alcohol to evaporate prior to energizing the instrument.

WARNING Keep isopropyl alcohol away from heat, sparks, and flame. Store in a tightly closed container. It is extremely flammable. In case of fire, use alcohol foam, dry chemical, or carbon dioxide; water may be ineffective.

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 No. 61010-1 (Second Edition), and IEC 61010-1 (Second Edition).

General Safety Considerations

Cautions

Cautions applicable to this instrument.

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

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

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

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

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.

Servicing

Warnings applicable to this instrument.

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.**

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.**

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

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

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.**

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

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

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

Regulatory Information

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

Instrument Markings



The instruction documentation symbol. The product is marked with this symbol when it is necessary for the user to refer to the instructions in the documentation.



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



This symbol indicates separate collection for electrical and electronic equipment, mandated under EU law as of August 13, 2005. All electric and electronic equipment are required to be separated from normal waste for disposal (Reference WEEE Directive, 2002/96/EC).



This symbol indicates that the power line switch is ON.



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



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



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



The CE mark is a registered trademark of the European Community. (If accompanied by a year, it is when the design was proven.)



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



This is a symbol of an Industrial Scientific and Medical Group 1 Class A product.



This is a marking to indicate product compliance with the Canadian Interference-Causing Equipment Standard (ICES-001).



Direct Current.



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.



China RoHS regulations include requirements related to packaging, and require compliance to China standard GB18455-2001.



This symbol indicates compliance with the China RoHS regulations for paper/fiberboard packaging.

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 106](#) 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 Maschinenlaermrerordnung-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

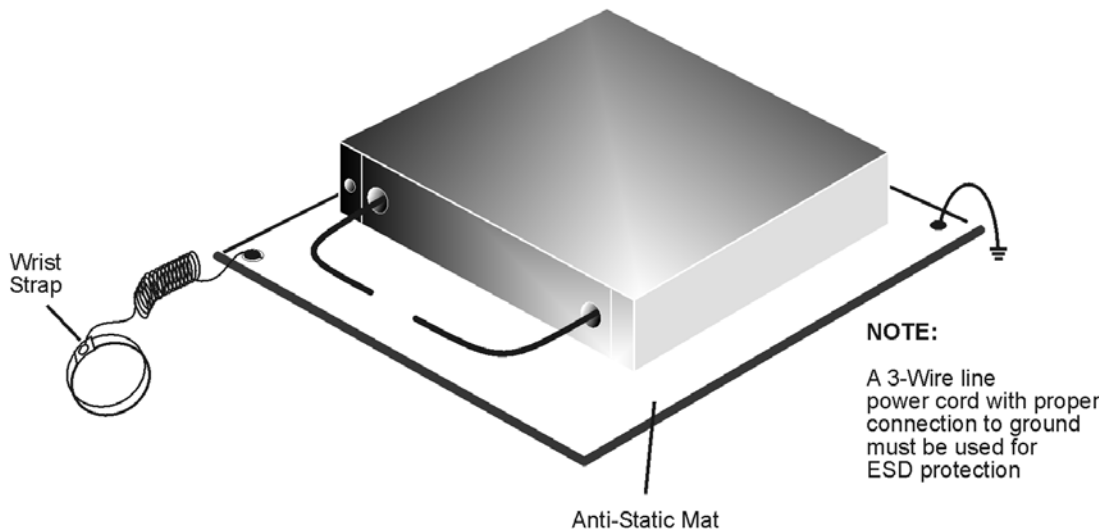
- IEC/EN 61326-1
- CISPR Pub 11 Group 1, class A
- AS/NZS CISPR 11
- This ISM device complies with Canadian ICES-001.
Cet appareil ISM est conforme a la norme NMB du Canada.

Electrostatic Discharge Protection

Protection against electrostatic discharge (ESD) is essential while removing assemblies from or connecting cables to the network analyzer. 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 (9300-0797) in front of your test equipment.
- *always* wear a grounded wrist strap (9300-1367) with grounding cord (9300-0980), connected to a grounded conductive table mat, having a 1 M Ω 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 (from your calibration kit) 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 36 ESD Protection Setup



ku310b

Agilent Support, Services, and Assistance

Service and Support Options

The analyzer's standard warranty is a one-year return to Agilent Technologies service warranty.

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.

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>

You can also purchase accessories or documentation items on the Internet at:

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

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

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.

Shipping Your Analyzer to Agilent for Service or Repair

You must always call the Agilent Technologies Instrument Support Center to initiate service before retuning your instrument to a service office. See [“Contacting Agilent” on page 106](#). Always transport or ship the instrument using the original packaging if possible. If not, comparable packaging must be used. Attach a complete description of the failure symptoms.

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.

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

- When sending the U3042A test set in for repair, please send your PNA and cables. This will speed your repair turn around time, and verify proper 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.
- Ship the analyzer using the original or comparable antistatic packaging materials.
- Contact Agilent for instructions on where to ship your analyzer.

