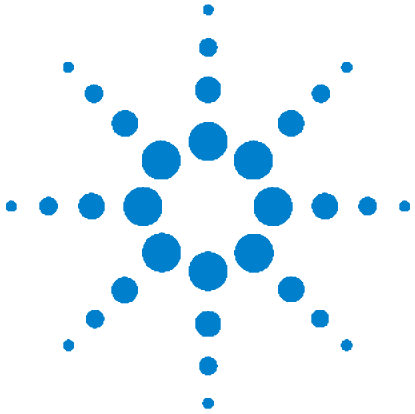

Agilent E5505A Phase Noise Measurement System

for E5500 Software rev A.03.01

Installation Guide

Third edition, November 2004

IMPORTANT

Create a Recovery DVD
Refer to Chapter 5, Recovery

Agilent Technologies

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WARNING

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Contents

4 Measurement Software

1 General Information

This chapter introduces you to the Agilent E5505A Phase Noise Measurement System. It contains an overview of the system, system specifications, and guidelines for unpacking a system. It also provides a reading road map for installation documentation.

Introduction

Use this guide to unpack, connect instruments (if needed), power on, configure, test, and power off your Agilent E5505A Phase Noise Measurement System. For all system models, start with the information in this chapter—especially the unpacking guidelines starting on page 10.

If you've ordered a *racked system*, it arrives as a turnkey solution—ready to power on with all hardware and software installed. If you've ordered a flat-panel display, procedures for mounting it are in Chapter 2. Follow the powering on procedures in Chapter 4 and you're ready to make your first measurement.

A *benchtop system* arrives with all hardware and software installed, but you must connect the instruments with the appropriate cables. You'll find instrument connection diagrams in Chapter 3. (Agilent ships the needed cables with the system.) Then proceed to Chapter 4 to power on your system and make your first measurement.

NOTE If you need to re-install the phase noise hardware and software in the E5505A system PC for any reason, refer to the *E5505A Phase Noise Measurement System User's Guide* for information and procedures.

Use Table 1 as a guide to the chapters to use for your model:

- Racked system
- Benchtop system

Table 1 E5505A installation reading road map

Rack	Benchtop
Chapter 1, "General Information"	Chapter 1, "General Information"
Chapter 2, "Flat-Panel Display" (if applicable)	Chapter 3, "System Interconnections"
Chapter 4, "Measurement Software"	Chapter 4, "Measurement Software"
Appendix A, "Service, Support, and Safety Information"	Appendix A, "Service, Support, and Safety Information"

Unpacking and Inspecting the System

This section presents procedures for unpacking a racked system and a benchtop model. *Do not* attempt to unpack your system without reviewing them.

To unpack a racked system

To unpack an E5505A racked system, you need the following tools:

- Safety glasses
- Klimp hammer or prybar to remove the klimps
- Socket wrench and sockets
- Pliers

NOTE Retain all packing material—crate, foam, curb gate, bolts, cleats, and klimps—for future use should you need to move the system to another location.

WARNING **Always wear safety glasses or goggles when removing steel clips (klimps) from the shipping crate. These clips are under tension and when pried free can spring back and cause injury to unprotected eyes.**

To remove the racked system from the packing crate, follow these steps:

1. Remove the klimps from the crate wall marked “Ramp Panel.”
2. Position the ramp panel to create a ramp. The non-hinged end rests on the crate base and the hinged flap meets the floor.
3. Secure the ramp panel to the base by placing the drop-in bolt (located in the packing foam) through the holes in the ramp and the base of the crate.
4. Remove the remaining crate walls and top, as well as the foam padding from the top of the cabinet and the anti-static bag covering the cabinet.
5. Remove the center restraining bolts and cleats holding the cabinet to the crate base using the socket wrench. These bolts are located on the ramp side of the crate and the side opposite.
6. Lift the side bolts from the curb gate on the ramp side of the crate base using pliers. Remove the curb gate.
7. With one person behind the system and two guiding the sides, gently roll the system down the ramp.

WARNING **Do not stand in the path of a system being moved down the incline of the cabinet ramp.**

To unpack a benchtop system

To unpack an E5505A benchtop system, you need the following tools:

- Safety glasses
- Sturdy scissors

NOTE Retain all packing material—crate, pallet, boxes, foam, etc.—for future use should you need to move the system to another location.

WARNING **Always wear safety glasses or goggles when cutting plastic straps from the shipping container. These straps are under tension and when cut can snap and cause injury to unprotected eyes.**

1. Cut and remove the plastic straps that secure the shipping container and lift the lid.
2. Remove and open the individual shipping boxes.
3. Carefully remove the contents from each box.

Inspecting the system

After unpacking a racked or benchtop system, the next step is to inspect the shipping container and its contents thoroughly to ensure that nothing was damaged during shipment.

NOTE If the container or packing material is damaged, the contents should be checked both mechanically and electrically. If the contents are damaged or defective, contact your customer engineer through your local Agilent Technologies Service Center. Keep the shipping materials for the transport company's inspection.

For instructions on removing an instrument from the system, see Chapter 6. See Appendix A for return procedures.

Verify that all parts and materials are included in your shipment:

- E5500 Phase Noise Measurement System software and documentation CD-ROM
- E5500 Software Keyword Licence Certificate
- Recovery media kit for Microsoft® Windows XP Pro®
- *E5505A Phase Noise Measurement System Installation Guide*
- Instrument manuals on CD-ROM
- Benchtop system cables

- Custom system connection diagram
- PC, display, keyboard, mouse, and Microsoft Certificate of Authenticity sticker.
- Instrument connectors and adapters specific to your system. (Table 2 shows all adapters.)

Table 2 E5505A connectors and adapters

Part Number	Description	N5500A Std.	N5500A Opt. 001	N5500A Opt. 201	N5501A N5502A	N5507A	N5508A	N5508A Opt. 2
0960-0053	Termination, coaxial SMA (male), 50 Ω					4	3	3
1250-0207	Termination, BNC, 50 Ω	1	1	1				
1250-0780	Adapter, Type N (male) to BNC (female)	3	2	3	1			
1250-0839	Termination, coaxial SMC (female), 50 Ω					1	1	1
1250-1200	Adapter, SMA (male) to BNC (female)		2					
1250-1250	Adapter, N (male) to SMA (female)		1		2	1		
1250-2015	Adapter, SMA (female) to BNC (male)				1			
1250-2076	Termination, coaxial SMB (female), 50 Ω					1	1	1
5061-5311	Adapter/Connector saver, 3.5 mm (female) to 3.5mm (female)		2	2		3	1	2
5813-0803	GPIB extension	1 with E5505A system						
E5505-60001	Digitizer adapter for PC	1 with E5505A system						

System Overview

The Agilent E5505A Phase Noise Measurement System provides flexible sets of measurements on one-port devices such as voltage controlled oscillators (VCOs), dielectric resonator oscillators (DROs), crystal oscillators, and synthesizers, and on two-port devices such as amplifiers and converters. The E5505A system measures absolute and residual phase noise, AM noise, and low-level spurious signals, as well as CW and pulsed signals. It operates in the frequency range of 50 KHz to 26.5 GHz.

The E5505A phase noise measurement system combines standard instruments, phase noise components, and PC software for maximum flexibility and re-use of assets. The system PC operates under Windows® XP Professional® and controls the system through the Agilent E5500 measurement software. The E5500 software enables many stand-alone instruments to work in the system. This standalone-instrument architecture easily configures for various measurement techniques, including the PLL/reference-source technique, and delay-line and FM-discriminator methods.

The E5505A system is available as a one-bay wide, System II rack and as a benchtop model. Due to the system's flexibility, the hardware in the system varies greatly with the options selected. You may be installing instruments you already own in the system as well. A typical system includes these components:

- Advantech custom PC with digitizer card assembly
- 15-inch display (flat-panel or standard), keyboard, and mouse
- Windows® XP Professional® operating system
- Agilent E5500 Phase Noise Measurement software
- Phase noise test set
- Downconverter
- RF source

Additional instruments may include a spectrum analyzer, oscilloscope, RF counter, power meter, and power splitter.

NOTE For detailed information on the instruments in your Agilent E5505A phase noise measurement system, refer to the individual instrument user guides (provided on CD-ROM).

Figure 1 shows a typical configuration of the E5505A system.

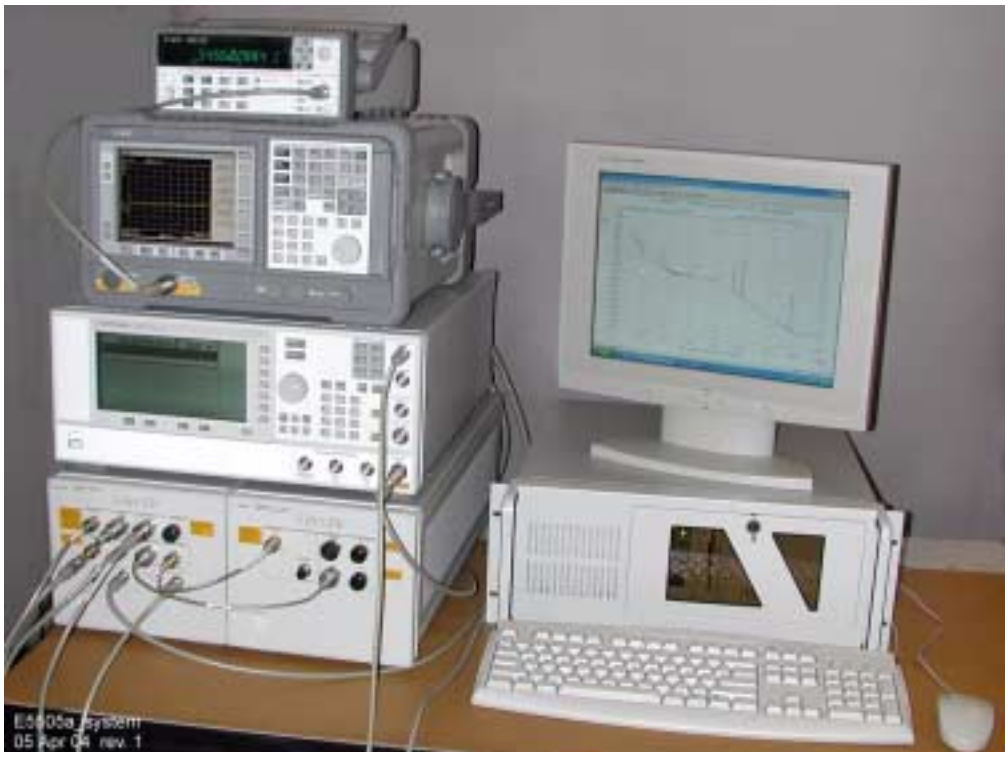


Figure 1 Agilent E5505A benchtop system, typical configuration

The E5505A replaces earlier Agilent E5500A/B series phase noise systems, which are based on MMS technology. The E5505A system uses GPIB communication and certain instruments have been redesigned with GPIB functionality. However, the E5505A system and E5500 software are backwards compatible with earlier systems and instruments, including the MMS mainframe. You may easily integrate existing assets into your E5505A system. Table 3 shows the E5505A and earlier-model equivalents.

Table 3 Equivalent system/instrument model numbers

System or Instrument	New Number	Old Number
Phase noise measurement system	E5505A	E5501A, E5501B, E5502B, E5503A, E5503B, E5504A, E5504B
Test set	E5500A	70420A
6.6 GHz downconverter	N5501A	70421A
18 GHz downconverter	N5502A	70422A
26.5 GHz downconverter	N5507A	70427A, 71707A
Microwave source	N5508A	70428A, 71708A

System Specifications

This section contains mechanical and environmental specifications, operating characteristics, power requirements, and PC requirements for the system.

Table 4 contains the mechanical and environmental specifications for a system. Table 5 shows the system's operating characteristics.

Table 4 Mechanical and environmental specifications

Specifications	Values		
Temperature:			
Operating	05 °C to 40 °C (41 °F to 104 °F)		
Nonoperating/storage	-40 °C to 70 °C (-40 °F to 158 °F)		
Altitude	Up to 2,000 m (6,500 ft)		
Maximum relative humidity	80% for temperatures up to 31 °C, decreasing linearly to 50% relative humidity at 40 °C		
Air flow space required	102 mm (4 in) on all sides		
System weight:	**Benchtop**	**1.6 Meter Rack**	**2 Meter Rack**
Approximate, typical	210 lbs (95.5 kg)	431 lbs (195.5 kg)	465 lbs (211 kg)
System dimensions:			
Height	711 to 915 mm (28 to 36 in)	1,620 mm (64 in)	2,020 mm (79.5 in)
Width	432 mm (17 in)	600 mm (23.6 in)	600 mm (23.6 in)
with rack-mounted flat-panel display	n/a	1438 mm (56.7 in)	1438 mm (56.7 in)
with benchtop PC and display	1,016 mm (40 in)	n/a	n/a
Depth	711 mm (28 in)	905 mm (35.7 in)	905 mm (35.7 in)

Table 5 Operating characteristics

Warm up time required	30 minutes
Carrier frequency ranges	50 KHz to 1.6 GHz 50 KHz to 6 GHz 50 KHz to 18 GHz 50 KHz to 26.5 GHz
Offset frequency ranges	0.01 Hz to 2 MHz 0.01 Hz to 100 MHz
System noise response	–180 dBc/Hz typically (>10 kHz offsets)
System spurious response	≤120 dBc typically
Phase detector input power	(<1.6 GHz carrier frequency) R input = 0 to +23 dBm L input = +15 to +23 dBm

Table 5 Operating characteristics (continued)

Downconverter input range	1 GHz to 6 GHz 1 GHz to 18 GHz 1.5 GHz to 26.5 GHz
External noise input port	0.01 Hz to 100 MHz
Measurement accuracy	±2 dB (<1.0 MHz offsets) ±4 dB (<100 MHz offsets)

Power requirements

The flexibility of the E5505A system configuration results in a significant range of power requirements, depending on the type and number of instruments in a system. Table 6 provides the maximum requirements for individual instruments so that you can determine the requirements of your specific system. It also provides the maximum current drawn by an E5505A system that contains one of each type of instrument listed in the table.

Table 6 E5505A maximum AC power requirements

Component	115 VAC	230 VAC
System maximum (one of each type of instrument below)	27 A	17 A
PC	9 A	4.5 A
Display (LCD)	1.2 A	1.2 A
N5500A test set (Opt. 001)	3 A	2 A
Downconverter	3 A	2 A
Source	~ 6 A	~ 4 A
Spectrum analyzer	~ 2.5 A	~ 1.5 A
Frequency counter	1.5 A	~ 1 A
Oscilloscope	~ 1 A	~ .7 A

The E5505A system is shipped with AC power cords appropriate for your location.

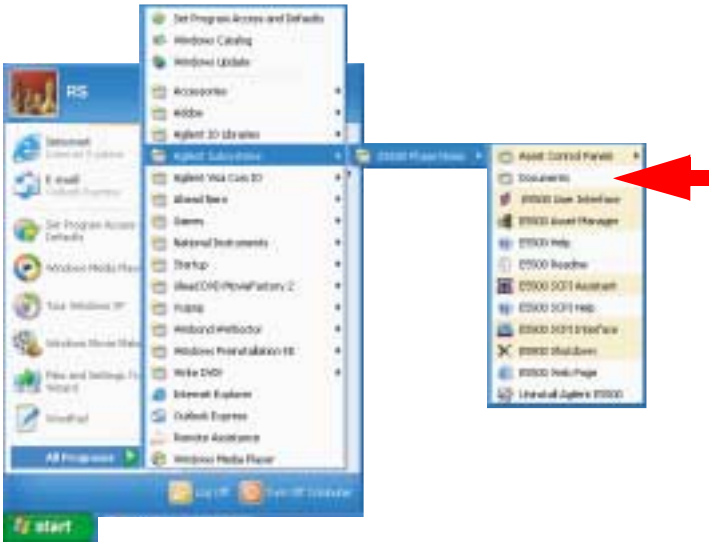
For information on an instrument's power line module, see the instrument's separate user's guide.

Documentation

You can access the complete set of PDF documents that support the E5505A system through the system GUI. (Adobe® Acrobat Reader® is supplied.) Navigate the menu as shown in Figure 2. The files are stored on the system PC hard drive and on the E5500A software CD. Be sure to explore the E5500 Help menu for additional information.

The E5505A system documentation includes:

- *Agilent E5505A Phase Noise Measurement System Installation Guide*
- *Agilent E5505A Phase Noise Measurement System User's Guide*
- *Agilent N5501A/N5502A Phase Noise Downconverter User's Guide*
- *Agilent N5507A/N5508A Phase Noise Downconverter and Microwave Source User's Guide*
- *Agilent N5500A Phase Noise Test Set User's Guide*
- *Agilent E5500 Series Phase Noise Measurement Systems SCPI Command Reference*
- *Agilent E5500 Phase Noise Measurement System Online Help*



E5500_start_menu
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Figure 2 Navigate to system documentation

2
Flat-Panel Display

Instructions for mounting a flat-panel display and peripheral on a *racked* system are in this chapter.

If you're setting up a *benchtop* system, skip to Chapter 3, "System Interconnections."

Connecting a Rack-Mounted Flat-Panel Display

If you're setting up racked system with a flat-panel display, installation includes mounting the display and peripherals on a swing arm assembly. Figure 3 on page 19 provides an overview. Table 7 lists the parts needed for connecting the display, keyboard, and mouse.

Table 7 Monitor, keyboard, and mouse parts listing

Description	Part Number	Quantity
Swing arm assembly	0960-1104	1
Bolt, locking lever, black	85127-80238	2
T-bolt	85127-80232	3
Cap	85127-80236	2
Monitor, LCD 15"	2090-0804	1
Bolts, M4 x 0.7, 14 mm	0515-0685	4
Keyboard, HP	C3757-60401	1
Mouse	85121-80287	1
Bolt, star knob	85127-80237	2

To attach the swing arm, display, keyboard, and mouse

Step	Notes
1 Loosely attach the two locking-lever bolts and three t-bolts to the swing arm assembly.	• Refer to items 1, 2, and 3 in Figure 3 on page 19.
2 Slide the swing arm assembly into the slide bar (from either the top or bottom), making sure the t-bolts are in the channel tracks.	• Refer to Note 1 in Figure 3 on page 19.
3 Tighten the lever bolts to secure the swing arm to the slide bar at the desired height.	
4 Install the star-knob safety stop at least 1 in from the bottom of the slide bar. Tighten securely.	• The star knob prevents the swing arm from falling from the slide bar should the locking-levers fail.
5 Install caps on the top and bottom of the slide bar.	
6 Use the four M4 x 0.7 bolts to attach the monitor to the bracket on the swing arm.	• Refer to Note 2 in Figure 3.
7 Place the keyboard on the left side of the swing arm tray. Press down on the back of the keyboard to secure the keyboard to the tray.	• The keyboard fits snugly on the tray.

To attach the swing arm, display, keyboard, and mouse (continued)

Step	Notes
8 Place the mouse on the right side of the tray.	
9 Feed the two monitor cables through the access hole on the side of the cabinet and connect them to the back of the display.	• The monitor has a DC power cable and video signal cable.
10 Feed the keyboard and mouse cables through the access hole in the side of the cabinet.	
11 Connect the keyboard, mouse, and SVGA cables to the proper extension cables hanging from the access hole.	
12 Dress the cables neatly.	• Make sure the cables have enough slack for vertical movement of the swing arm.

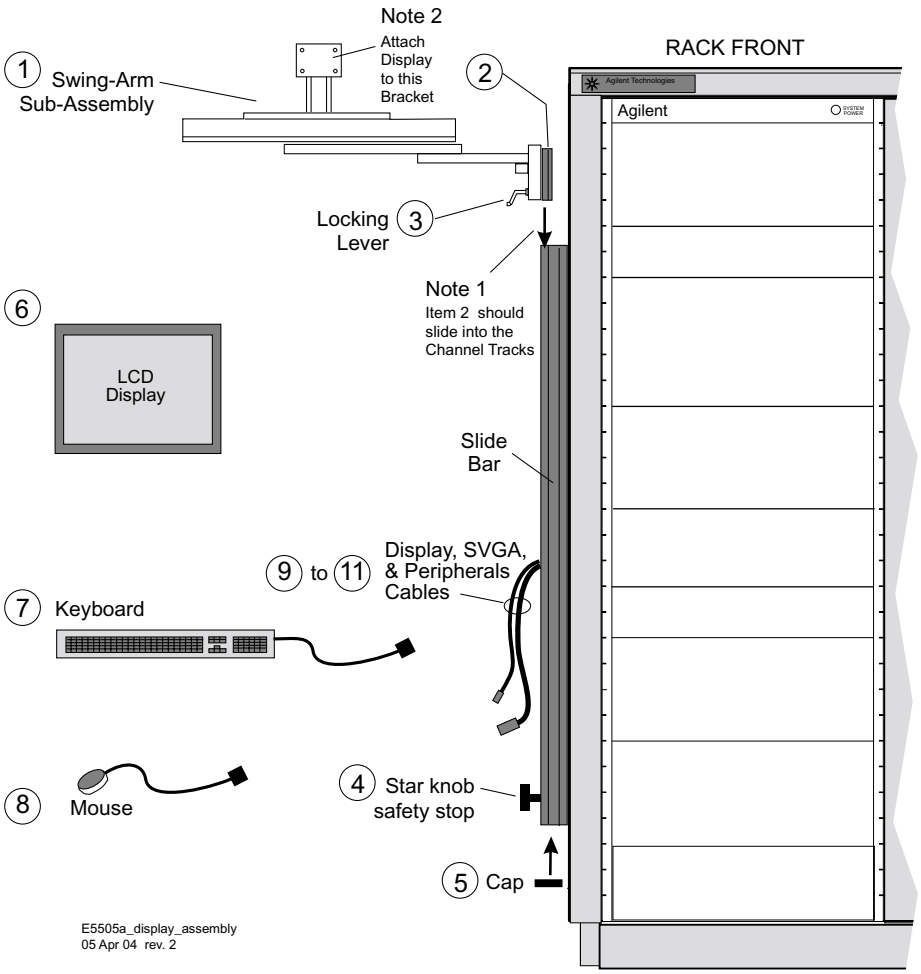


Figure 3 Display assembly installation

3 System Interconnections

If you're setting up a benchtop system, or adding assets to a racked system, use the diagrams in this chapter to connect the instruments. Otherwise, skip to Chapter 4, "Measurement Software." (The instruments in a racked system are already connected.)

CAUTION

Agilent Technologies, Inc. **has not provided internet security software** for this E5500 phase noise measurement system. Connecting the PC to a Local Area Network (LAN), without first installing internet security software (firewall, virus protection, etc) puts both your PC and data at risk. If you decide to connect the E5500 to a LAN, without first installing internet security software, you do so at your own risk.

Making Connections

Use the information in this section to connect your system hardware.

CAUTION Make all system hardware connections without AC power applied. Failure to do so may result in damage to the hardware. GPIB connections are an exception; they may be connected with power applied.

Make connections in a properly grounded environment. Agilent recommends wearing grounding wrist or foot straps. Failure to do so may result in damage to the hardware.

1 *Without* power applied, connect the digitizer adapter to the back of the PC digitizer card, as shown in Figure 4.

Figure 4 Connect adapter to back of PC digitizer card

2 Connect a GPIB extension to the GPIB connector on the PC to provide adequate clearance for the cable.

3 Connect cables to instruments with the appropriate connectors and adapters, using the tables and diagrams in this section. Install a GPIB extension on these system instruments before connecting the GPIB cable: N5500A/01A/02A/07A/08A.

4 You may connect other assets (in addition to those supplied with the system) either at this time or after running the confidence test.

5 Lastly, connect the power cord(s) to the AC power supply.

CAUTION *Do not* make a GPIB connection with an oscilloscope. Doing so causes the E5505A system to malfunction and may result in damage.

System Connectors

Table 8 contains the connectors and adapters for the main E5505A system instruments. It includes the type and quantity for each instrument and option. (You receive the devices specific to the instruments in your system with your shipment; you may not receive every device shown in the table.)

Table 8 E5505A connectors and adapters

Part Number	Description	N5500A Standard	N5500A Opt. 001	N5500A Opt. 201	N5501A N5502A	N5507A	N5508A	N5508A Opt. 002
0960-0053	Termination, coaxial SMA (male), 50 Ω					4	3	3
1250-0207	Termination, BNC, 50 Ω	1	1	1				
1250-0780	Adapter, Type N (male) to BNC (female)	3	2	3	1			
1250-0839	Termination, coaxial SMC (female), 50 Ω					1	1	1
1250-1200	Adapter, SMA (male) to BNC (female)		2					
1250-1250	Adapter, N (male) to SMA (female)		1		2	1		
1250-2015	Adapter, SMA (female) to BNC (male)				1			
1250-2076	Termination, coaxial SMB (female), 50 Ω					1	1	1
5061-5311	Adapter/Connector saver, 3.5 mm (female) to 3.5mm (female)		2	2		3	1	2
5813-0803	GPIB extension	1	1	1	1	1	1	1
E5505-60001	Digitizer adapter for PC	1 with E5505A system						

System Cables

Table 9 shows the E5505A system cables and their connections. Some cables are used only with specific system options; you may not receive all cables in the table. An additional GPIB cable is shipped with each optional instrument ordered.

Table 9 E5505A cables and connections

Part Number	Description	Qty	From	To
8120-2582	BNC (male) to BNC (male), coaxial, 4 feet	3	Varies with configuration and function	
8120-5370	BNC (male) to BNC (male), coaxial, 8 feet	2	Varies with configuration and function	
8120-3445	GPIB, 10834A, 1 meter	1	Test set rear panel GPIB	Downconverter rear panel GPIB
8120-3446	GPIB, 10834B, 2 meter	1	PC rear panel GPIB	Test set rear panel GPIB
E5505-80001	RF, SMA (male) to BNC (male), yellow	1	PC digitizer card adapter IN	Test set front panel ANALYZER <100 MHz OUT
E5505-80002	RF, SMA (male) to BNC (male), green	1	PC digitizer card adapter OUT	Test set rear panel CHIRP SOURCE IN
For Test Set, Opt 001				
E5501-20001	RF, semi-rigid, N-Type (male) to N-Type (male)	1	Test set front panel FROM DOWNCONVERTER	Downconverter front panel VOLTAGE CONTROL
E5501-20002	RF, semi-rigid, N-Type (male) to SMA (male)	1	Test set front panel TO DOWNCONVERTER	N5501A / 2A Downconverter front panel SIGNAL
E5501-20003	RF, semi-rigid, SMA (male) to SMA (male)	1	Test set front panel TO DOWNCONVERTER	N5507A Downconverter front panel SIGNAL

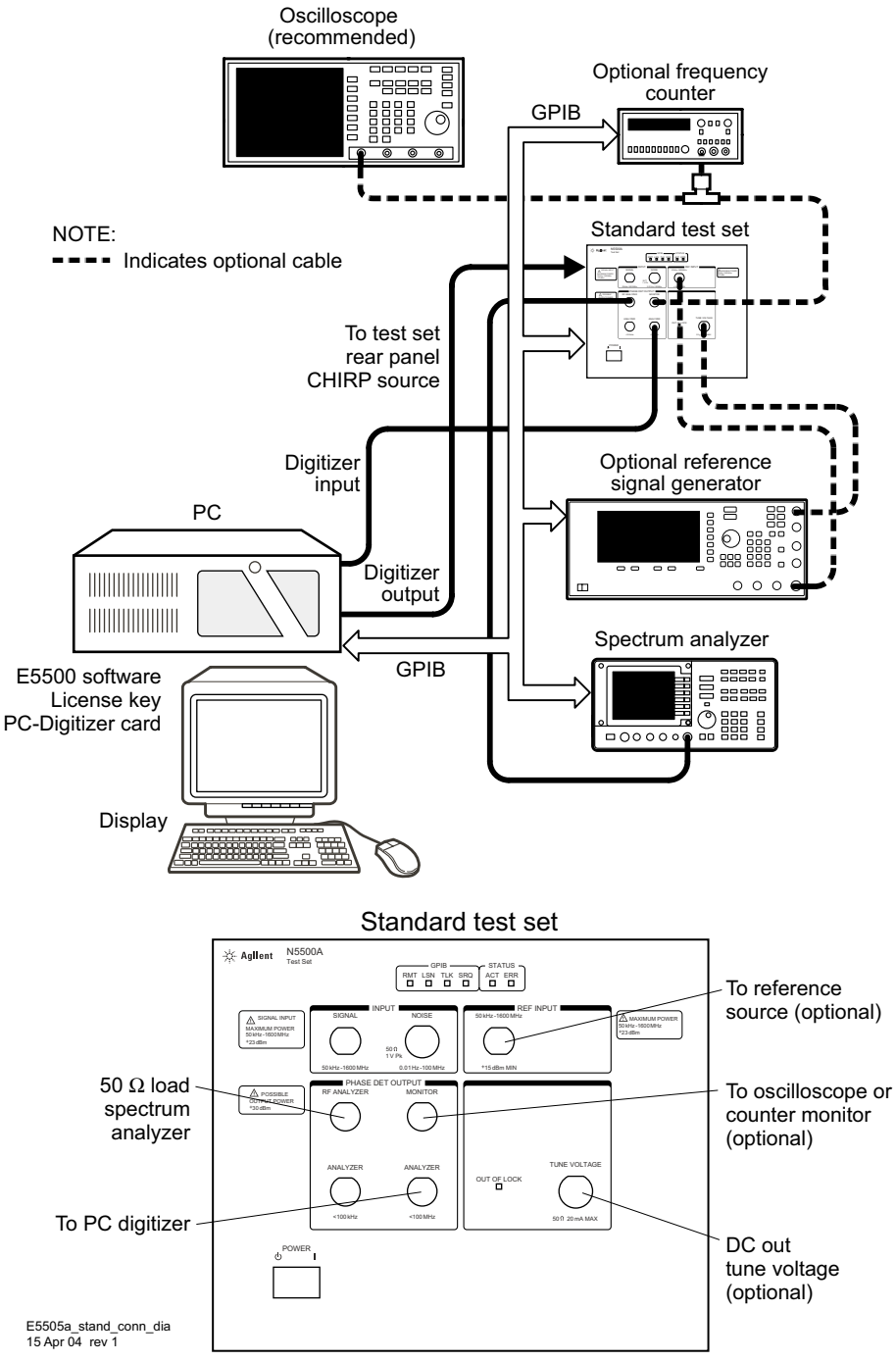


Figure 5 System connections with test set, standard model

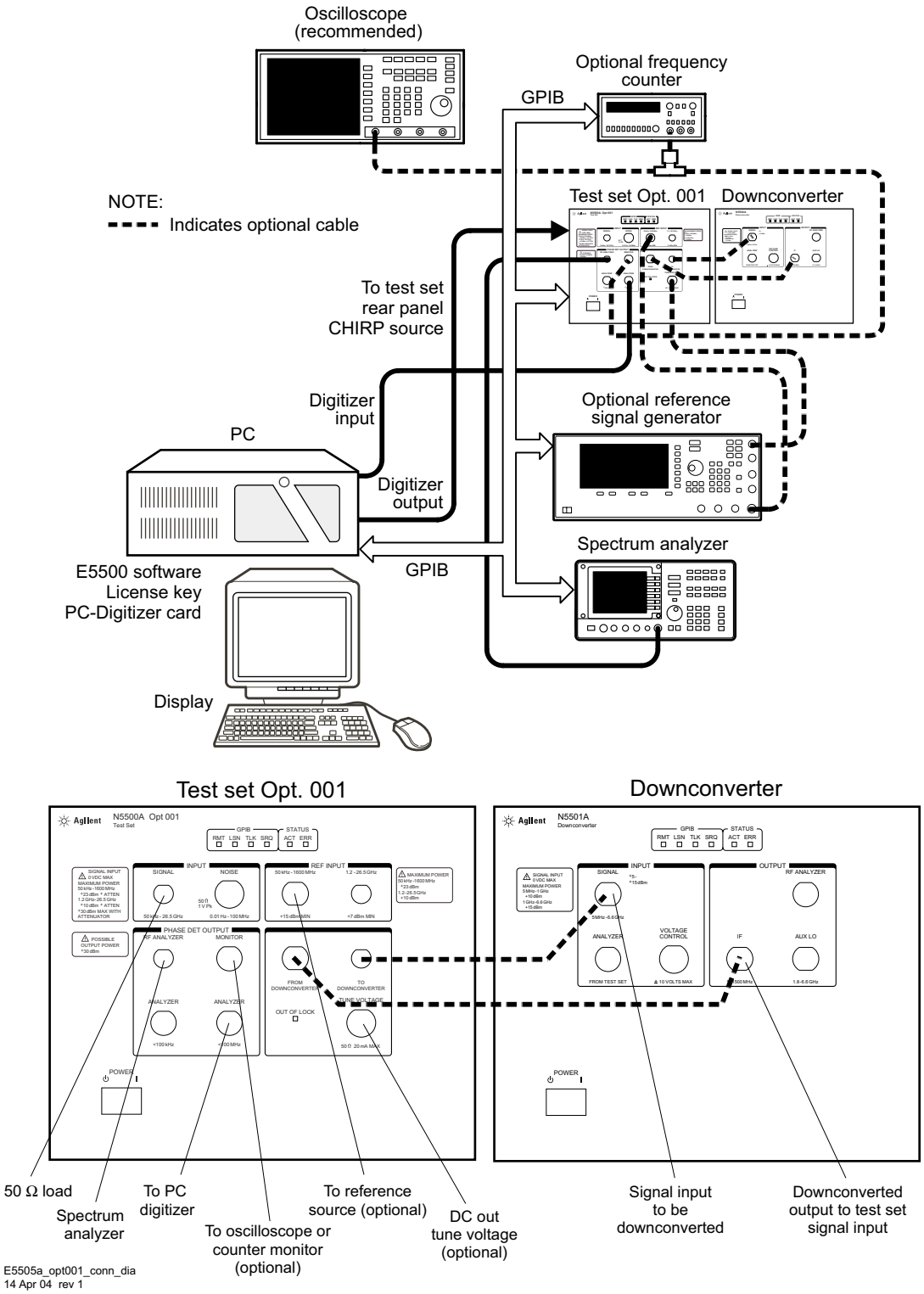


Figure 6 System connections with test set, option 001

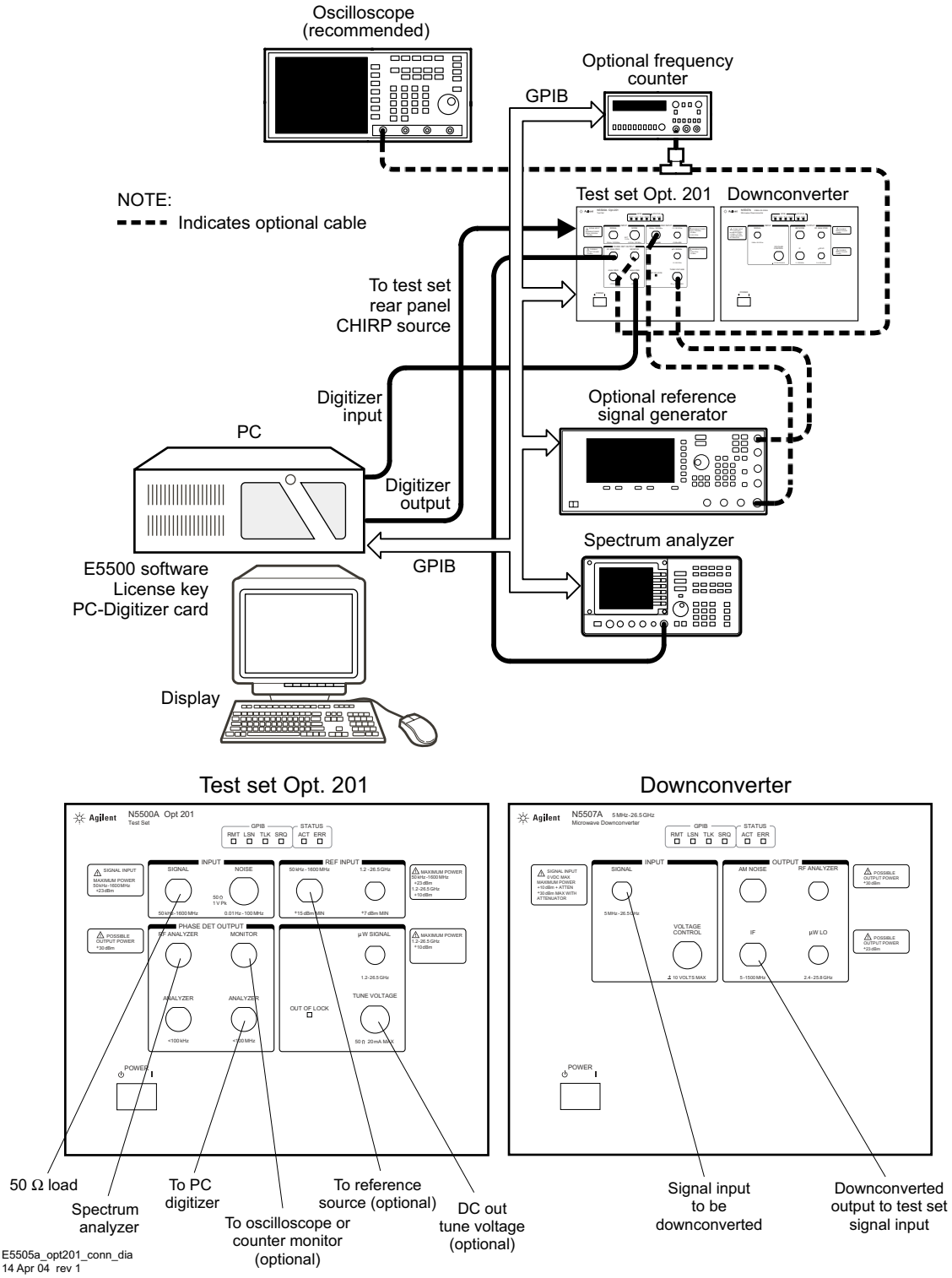


Figure 7 System connections with test set, option 201

4
Measurement Software

Chapter 4 contains procedures for powering the system on and off, configuring the E5500 software and instruments, and conducting a confidence test to verify that all system assets are communicating.

Powering the System On

This section provides procedures for powering on a racked or benchtop system. First connect your system to an appropriate AC power source, then follow the steps below.

WARNING Before applying power, make sure the AC power input and the location of the system meet the requirements given in Table 4 on page 14. Failure to do so may result in damage to the system or personal injury.

NOTE

Warm-up Time: The downconverter and RF source instruments contain ovenized oscillators which must warm up for 30 minutes to produce accurate measurements.

Standby Mode: The RF source uses a standby mode to keep the ovenized oscillator warm when the instrument is connected (plugged in) to AC power, *even when the power switch is in the off position*. To completely shut down the instrument, you must disconnect it from the AC power supply.

To power on a racked system

1. Press the system power switch (front, top right of the rack) to the on position.
2. Verify that all instrument power switches are on.
3. Allow the system to warm up for 30 minutes.

To power on a benchtop system

1. Press the power switch on each instrument to the on position.
2. If you have the system connected to a safety power strip, turn the strip's power switch to the on position.
3. Allow the system to warm up for 30 minutes.

Starting the Measurement Software

The first step in using the Agilent E5500 software is to copy the E5500 User Interface (UI) and E5500 Shutdown utility shortcuts from the E5500 folder to your PC desktop. You can double-click on these icons as an alternative to navigating menus. Easy desktop access to the E55000 Shutdown utility is extremely important for restoring functionality when system errors occur. (Shutdown utility instructions are on page 52.)

Copy the UI and Shutdown shortcuts to your PC desktop as shown in Figure 8.

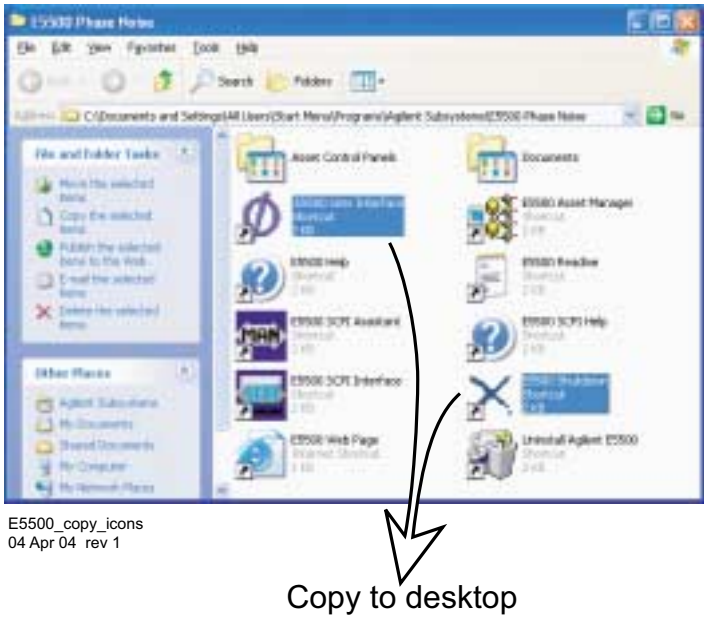
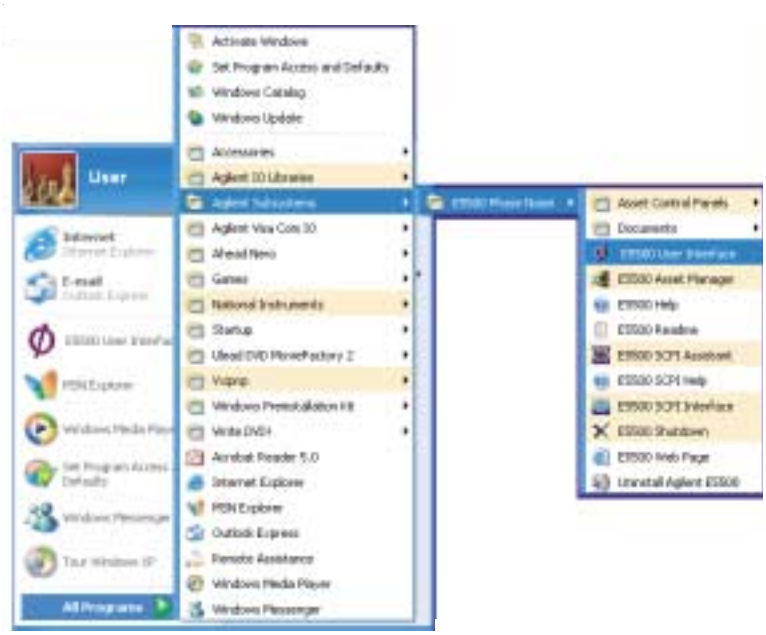


Figure 8 E5500 UI and Shutdown desktop shortcuts

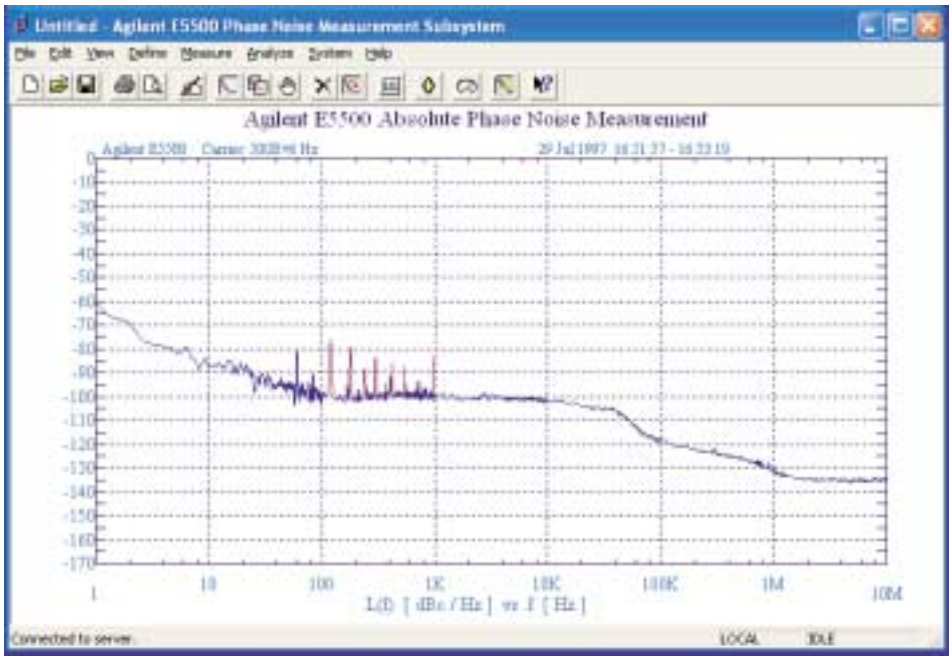
CAUTION Always power on the E5505A system before starting the E5500 software. Failure to do so produces errors in the stem and may result in inaccurate measurements or an inoperable system. In such cases, use the E5500 Shutdown icon to launch the Shutdown utility, which restores functionality to the system.

1. To start the program, double-click on the E5500 User Interface desktop shortcut (shown in Figure 8), or using Figure 9, navigate to the E5500 User Interface through the Windows® start menu.
2. When the program starts, the main E5500 measurement window appears (see Figure 10 on page 32). It shows the phase noise graph.



E5500_user_interface
04 Apr 04 rev 1

Figure 9 Navigate to E5500 user interface from start menu



E5500_main_screen
23 Mar 04 rev 1

Figure 10 Main E5500 user interface window

Specifying Assets for the Confidence Test

The next task is to specify the system assets in order to run a confidence test. This measurement tests the Agilent N5500A Test Set's low-noise amplifier circuitry.

1 From the **System** menu, select **Server Hardware Connections**. See Figure 11.

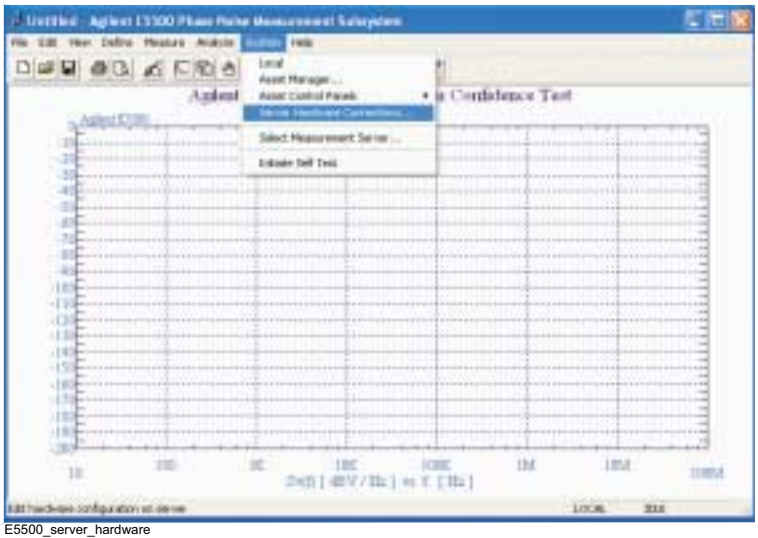
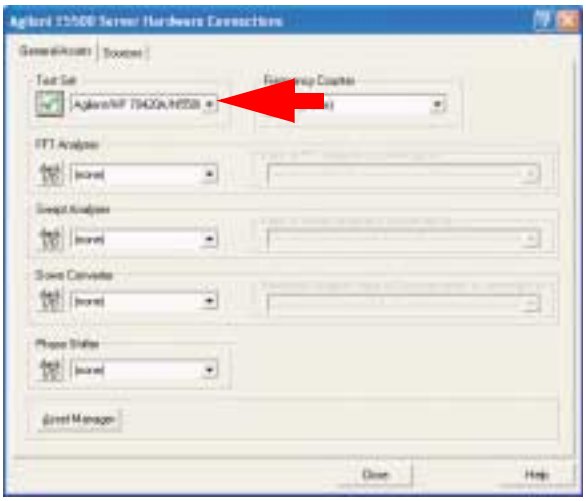


Figure 11 Navigate to server hardware connections

2 In the Server Hardware Connections dialog box, select the **General Assets** tab (see Figure 12 on page 34).

3 Select **N5500A/70420A f**rom the **Test Set** pull-down list. (It may already be selected.)

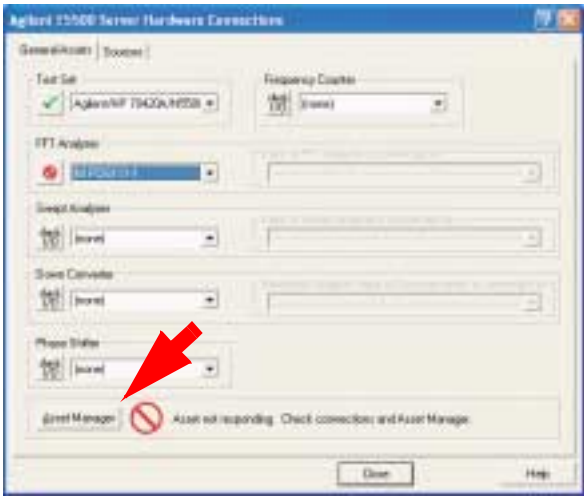
   a A green check-mark appears after an automatic I/O check has been successfully performed by the software (see Figure 12 on page 34). If nothing happens, click the **Check I/O** button to manually initiate the check.



E5500_server_hardware3
04 Apr 04 rev 1

Figure 12 Successful I/O check

b A red circle with a slash appears if an I/O check is unsuccessful.



E5500_server_hardware2
04 Apr 04 rev 1

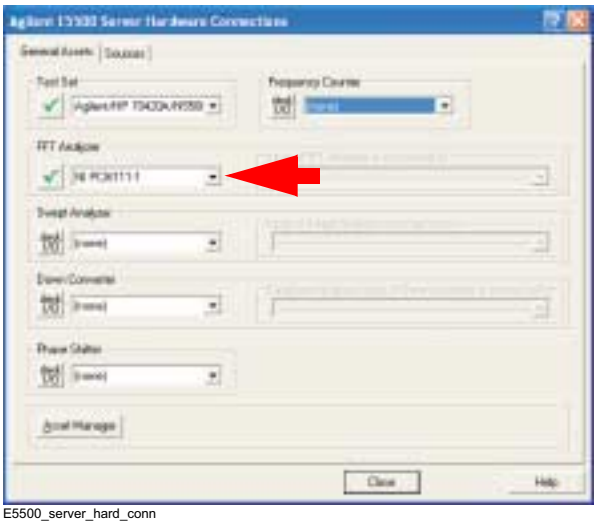
Figure 13 Failed I/O check

c If the I/O check fails, click the **Asset Manager** button to return to the Asset Manager (see Figure 13).

d In the Asset Manager, verify that the test set and PC Digitizer are configured correctly (check that the license key has been entered correctly). Also do the following:

- Check your system hardware connections.
- Click the green **check-mark** button on the Asset Manager's toolbar to verify connectivity.
- Return to **Server Hardware Connections** and click the **Check I/O** button to re-check it.

4 From the **FFT Analyzer** pull-down list, select **NI PCI6111-1** (see Figure 14). Click the **Check I/O** button. A green check-mark confirms a successful I/O check. If the I/O check is not successful, follow the same process as in step 3d to verify instrument configuration and connection.



E5500_server_hard_conn
05 Apr 04 rev 1

Figure 14 Select test set, FFT analyzer, and swept analyzer

5 From the **Swept Analyzer** pull down list select **E4411A**. Click the **Check I/O** button. A green check-mark confirms a successful I/O check. If the I/O check is not successful, follow the same process as in step 3d to verify instrument configuration and connection.

NOTE Selecting the three instruments ties those assets to the confidence test performed in the next step.

6 Close the **Server Hardware Connections** box.

Running the Software Confidence Test

This measurement tests the Agilent phase noise test set's low-noise amplifier circuitry. The phase detectors are not tested. This measurement also confirms that the PC and test set are communicating with each other.

1 From the **File menu**, choose **Open**.

2 Choose the drive or directory where the file you want is stored.

3 In the **File Name** box, open **Confidence.pnm**. See Figure 15.

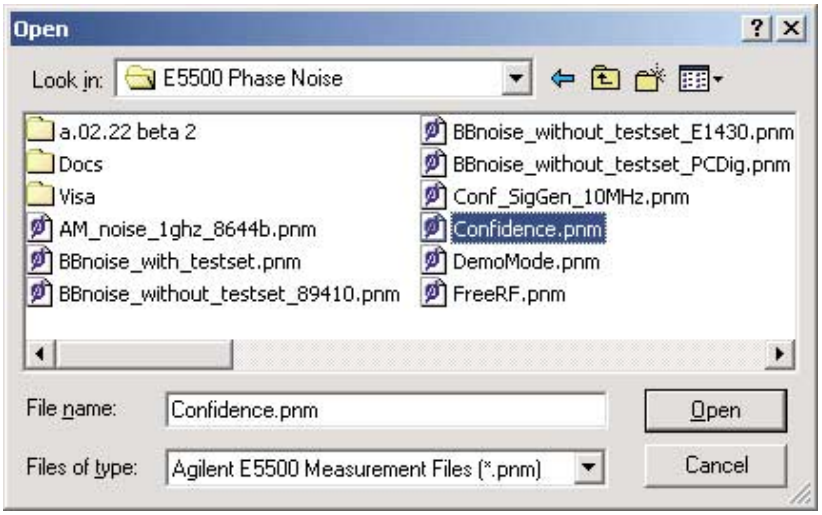


Figure 15 Opening the parameters definition file

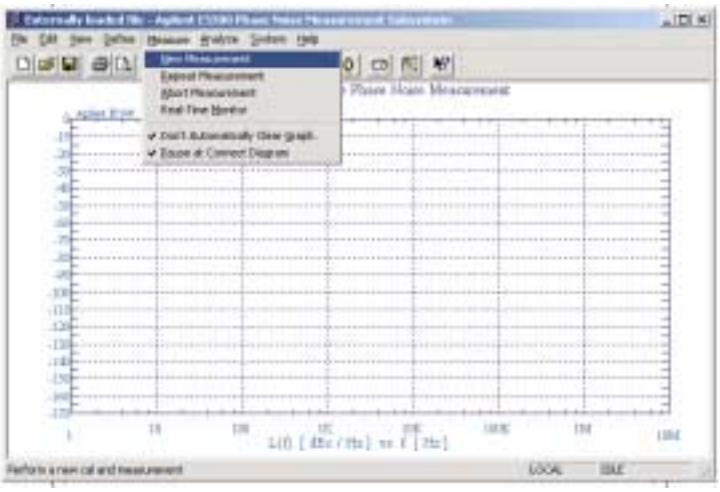
The appropriate measurement definition parameters for this example have been pre-stored in the Confidence.pnm file. Table 10 on page 37 lists the parameter data that has been entered for the phase noise test set Confidence Test example.

Table 10 Parameter Data for the Agilent N5500A Confidence Test Example

Step	Parameters	Data
1	**Type and Range Tab**	
	• Measurement Type	• Baseband noise (using a test set)
	• Start Frequency	• 10 Hz
	• Stop Frequency	• 100E + 6 Hz (determined by analyzer used)
	• Minimum Number of Averages	• 4
	FFT Quality	• Fast
	Swept Quality	• Fast
2	**Cal Tab**	
	Gain preceding noise input	• 0 dB
3	**Block Diagram Tab**	
	Noise Source	• Test set Noise input
4	**Test Set Tab**	
	Input Attenuation	• 0 dB
	LNA Low Pass Filter	• 20 MHz (auto checked)
	• LNA Gain	• Auto Gain (minimum auto gain –14 dB)
	• DC Block	• Not checked
	• PLL Integrator Attenuation	• 0 dBm
	• Ignore out-of-lock conditions	• Not checked
	• Pulsed Carrier	• Not checked
5	**Graph Tab**	
	• Title	• E5500 Confidence Test
	• Graph Type	• Base band noise (dBV/Hz)
	• X Scale Minimum	• 10 Hz
	• X Scale Maximum	• 100 E + 6 Hz
	• Y Scale Minimum	• 0 dBc/Hz
	• Y Scale Maximum	• –200 dBc/Hz
	• Normalize trace data to a:	• 1 Hz bandwidth
	• Scale trace data to a new carrier frequency of	• 1 times the current carrier frequency
	• Shift trace data by	• 0 dB
	• Trace Smoothing Amount	• 0
	• Power present at input of DUT	• 0 dBm

Beginning the Measurement

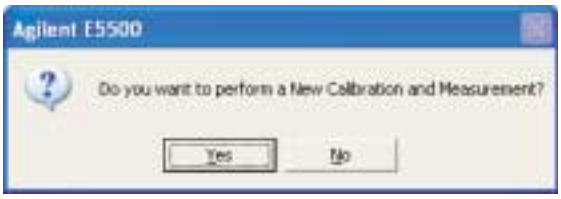
1 From the **Measure** menu, choose **New Measurement.** See Figure 16.



E5500_new_measurement
04 Apr 04 rev 1

Figure 16 Selecting a new measurement

2 When the **Do you want to perform a New Calibration and Measurement?** prompt appears, click **OK**.



E5500_new_cali_meas
04 Apr 04 rev 1

Figure 17 Selecting a new measurement

3 When the **Connect Diagram** dialog box appears, connect the 50 Ω termination provided with your system to the test set's CHIRP IN connector (as shown in Figure 18 on page 39).

NOTE This connect diagram (Figure 18) shows where to connect the 50 Ω termination to the test set. The specific setup in the diagram *does not* apply to running the confidence test.

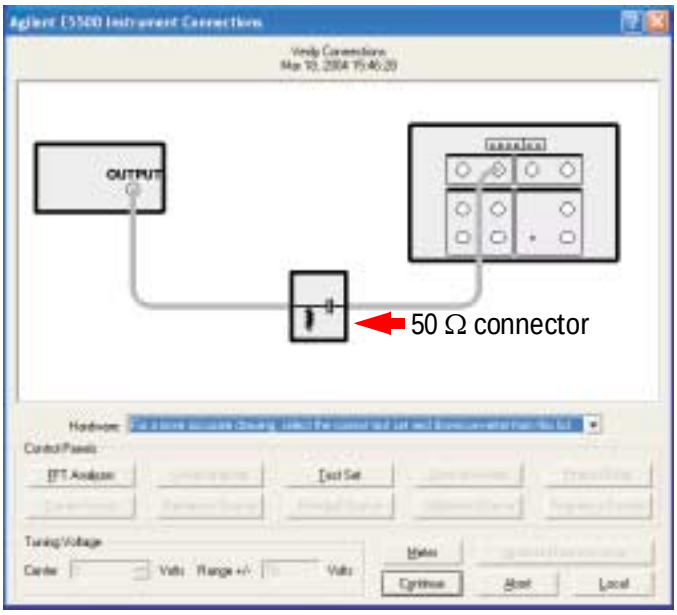


Figure 18 50 Ω connector location for measurement

Making the Measurement

1 Press the **Continue** key. Because you selected New Measurement to begin this measurement, the System starts by running the routines required to calibrate the current measurement setup.

Figure 19 shows a typical baseband phase noise plot for an Agilent test set.

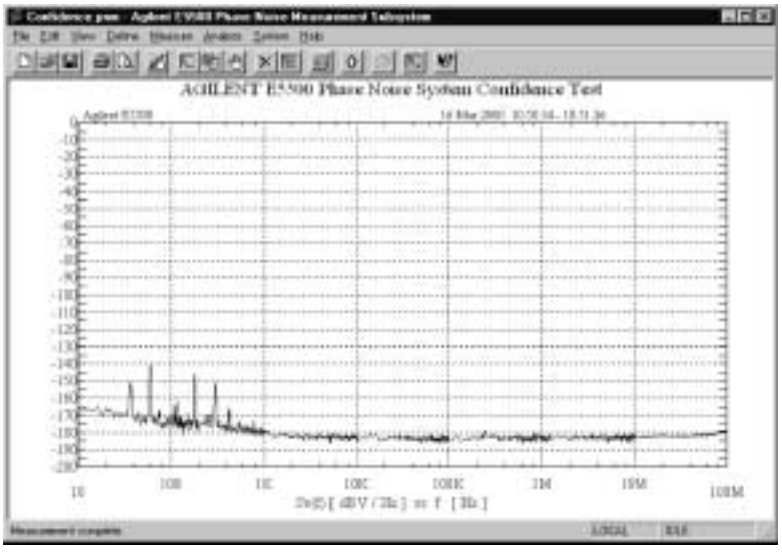


Figure 19 Typical phase noise curve for a system confidence test

Congratulations

You have completed a phase noise measurement. This measurement of the Agilent phase noise test set's low noise amplifier circuitry provides a convenient way to verify that the system hardware and software are properly configured for making noise measurements.

Additional Assets

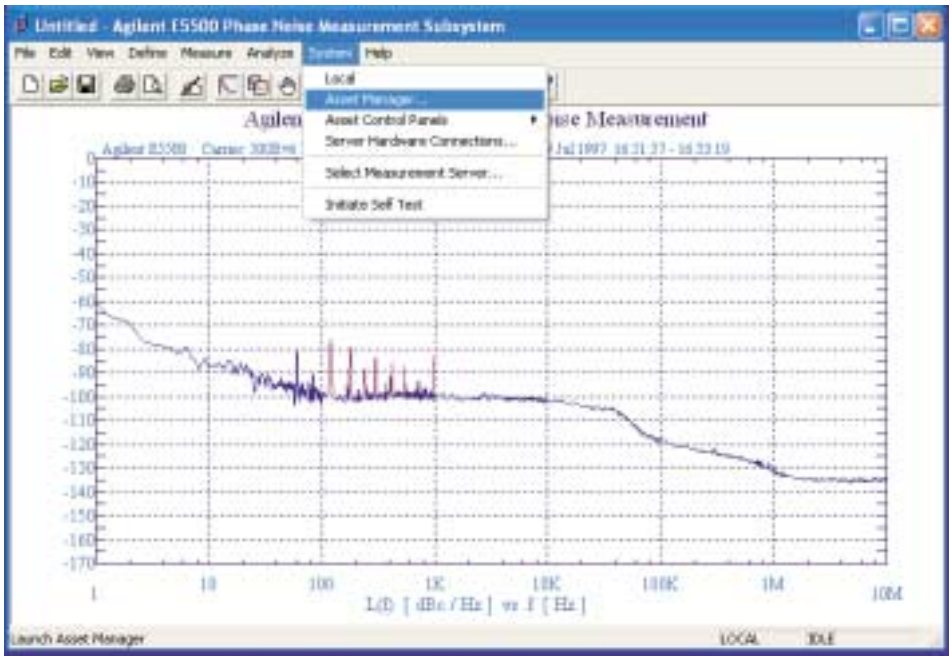
Use the Asset Manager to add other assets to your system. The procedure is essentially the same for any asset. We use a source as an example. Adding an asset involves two steps, once the hardware connections have been made:

- Configuring the asset
- Verifying the server hardware connections.

NOTE If you have not already connected the assets to the system, do so now. Be sure to power off the system before making all hardware connections other than GPIB. (For more information on connecting assets, see Chapter 3, “System Interconnections.”)

Configuring an Asset

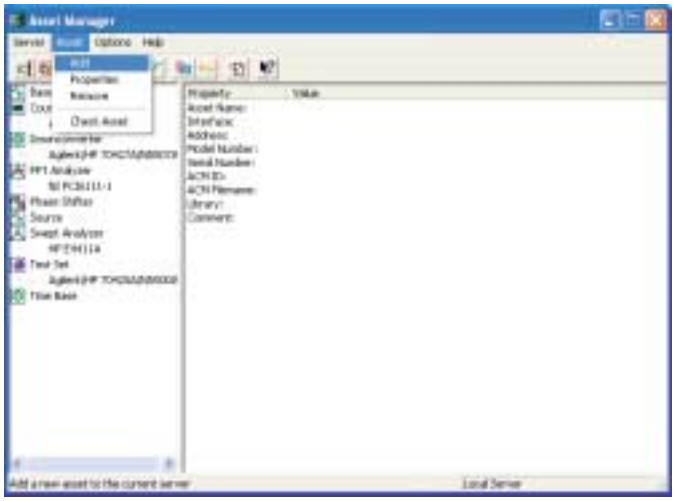
1 Using Figure 20 as a guide, navigate to **Asset Manager**. For this example we invoke the Asset Manager Wizard from the E5500 main screen. This is the most common way to add assets.



E5500_asset_manager
23 Mar 04 rev 1

Figure 20 Navigate to Asset Manager

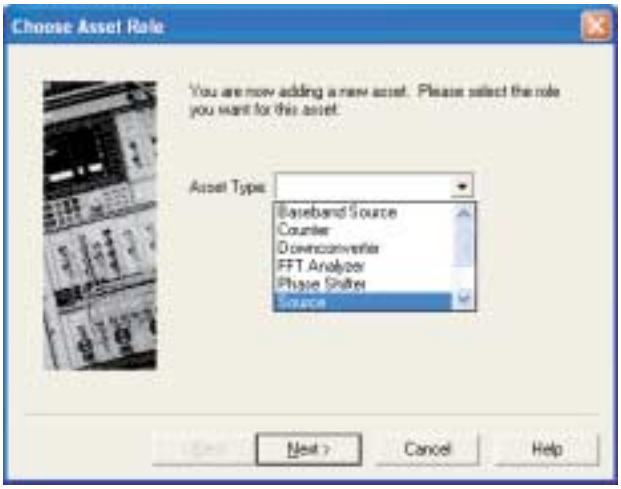
2 Select **Add** in the Asset Manager window.



E5500_add_source2
16 Apr 04 rev 1

Figure 21 Navigate to Add in Asset Manager

3 From the **Asset Type** pull-down list in **Choose Asset Role** dialog box, select **Source,** then click **Next**.



E5500_add_source3
16 Apr 04 rev 1

Figure 22 Select source as asset type

4 Click on the source to be added, then click the **Next** button (see Figure 23).

E5500_add_source4
16 Apr 04 rev 1

Figure 23 Choose source

5 From the **Interface** pull-down list, select **GPIB0**. (Refer to Figure 24).

6 In the **Address** box, type **19.**

NOTE

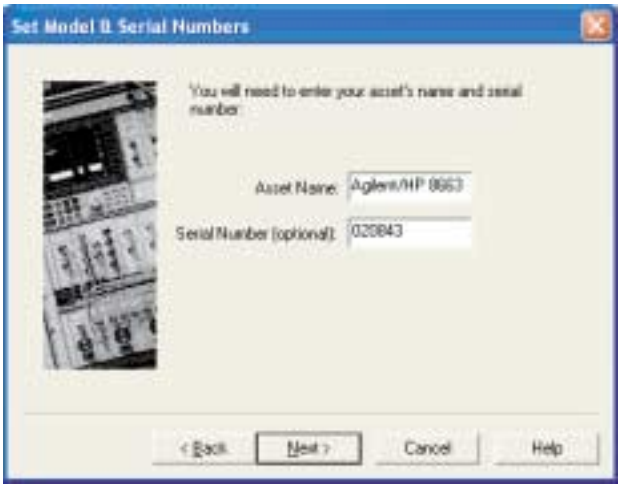
19 is the default address for the Agilent 8663A sources, including Agilent 8662A, 8663A, and 8644B. Table 11 on page 49 shows the default GPIB address for all system instruments.

7 In the **Library** pull-down list, select the **Agilent Technologies VISA**. Click the **Next** button.

E5500_add_source5
16 Apr 04 rev 1

Figure 24 Select I/O library

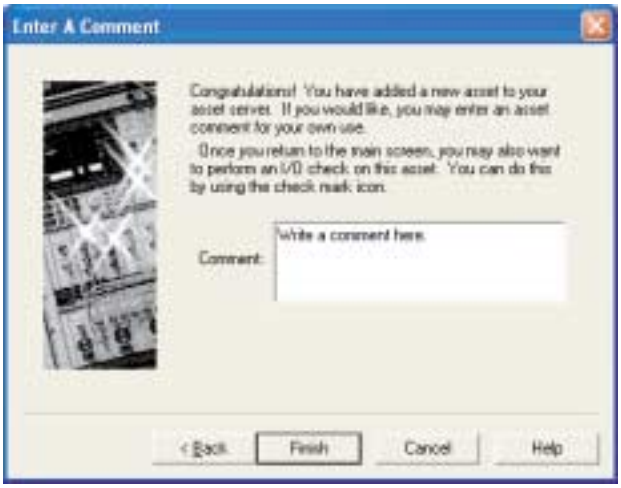
8 In the **Set Model & Serial Numbers** dialog box, type in your source name and its corresponding serial number. Click the **Next** button.



E5500_add_source6
16 Apr 04 rev 1

Figure 25 Enter asset and serial number

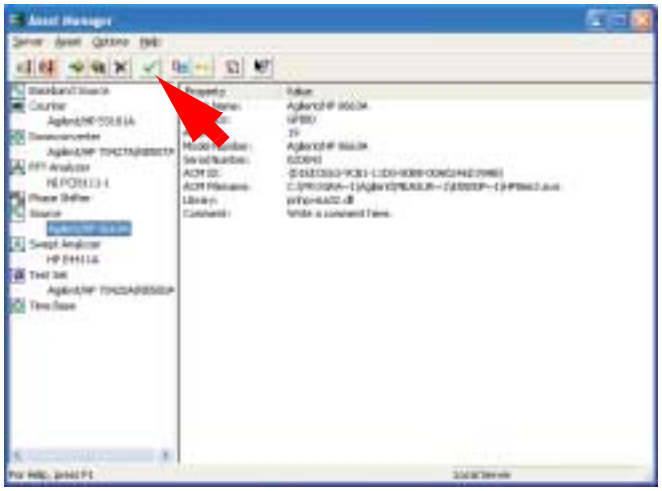
9 In the **Enter A Comment** dialog box, you may type a comment that associates itself with the asset you have just configured. Click **Finish**.



E5500_add_source7
16 Apr 04 rev 1

Figure 26 Enter comment

10 In the Asset Manager window, select the source in the left window pane. Click the **check-mark** button on the toolbar to verify connectivity.



E5500_add_source8
16 Apr 04 rev 1

Figure 27 Click Check button

- The Asset Manager displays a message verifying the connection to your asset. This indicates that you have successfully used the Asset Manager to configure a source.

E5500_add_source9
16 Apr 04 rev 1

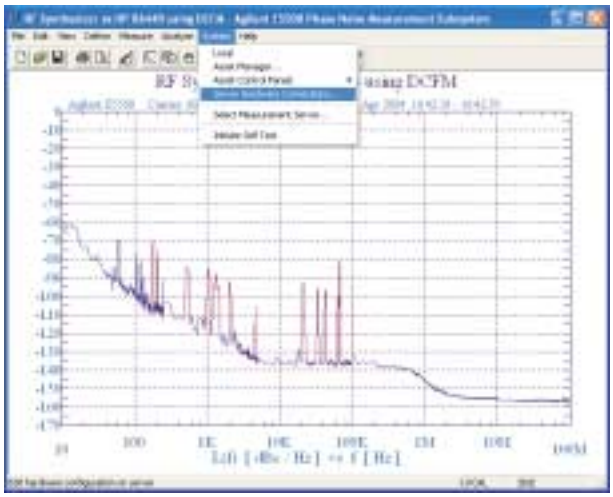
Figure 28 Confirmation message

11 To exit the Asset Manager, on the menu select **Server/Exit**.

12 Perform the procedure "Verifying Server Hardware Connections" on page 46.

Verifying Server Hardware Connections

1 From the **System** menu, choose **Server Hardware Connections.**



E5500_add_source10
16 Apr 04 rev 1

Figure 29 Navigate to server hardware connections

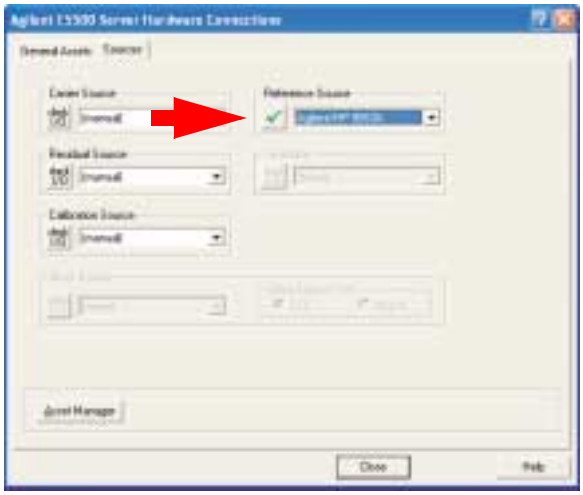
2 Select the **Sources** tab.

E5500_add_source11
16 Apr 04 rev 1

Figure 30 Select Sources tab

3 From the **Reference Source** pull-down list, select Agilent 8663A.

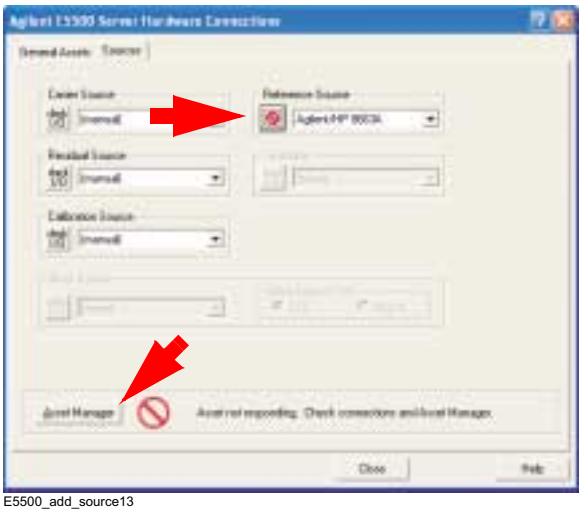
a A green check-mark appears after an automatic I/O check has been successfully performed by the software. If nothing happens, click the **Check I/O** button to manually initiate the check.



E5500_add_source12
16 Apr 04 rev 1

Figure 31 Successful I/O check

b A red circle with a slash appears if the I/O check is unsuccessful.



E5500_add_source13
16 Apr 04 rev 1

Figure 32 Failed I/O check

c If the I/O check fails, click the **Asset Manager** button to return to the Asset Manager (see Figure 32).

d In the Asset Manager, verify that the Agilent 8663A is configured correctly. Do the following:

- Check your system hardware connections.
- Click the green **check-mark** button on the Asset Manager's toolbar to verify connectivity.
- Return to **Server Hardware Connections** and click the **Check I/O** button to re-check it.

NOTE Use the same process to add additional assets to your E5505A system.

Setting GPIB Addresses

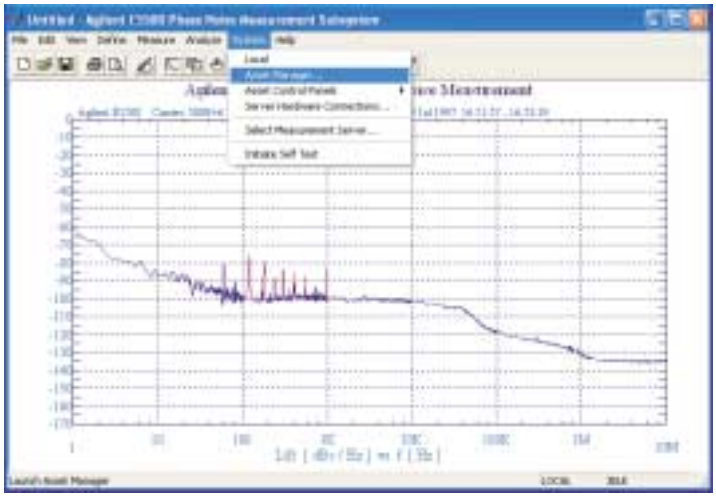
Table 11 shows the default GPIB addresses for the E5505A system instruments. If you need to change a GPIB address to prevent a conflict between assets, use the Asset Manager as shown in the easy procedure starting on page 50.

Table 11 Default GPIB addresses

Instrument	Address
Test set	20
Downconverter	28
Microwave downconverter	28
RF analyzer	17
FFT analyzer (PC digitizer card)	1
FFT analyzer (89410A)	18
Source # 1	19
Source # 2	23
Counter	3
Agilent E1430 VXI digitizer	129
Agilent E1437 VXI digitizer	192
Agilent E1420B VXI counter	48
Agilent E1441 VXI ARB	80

To change the GPIB address:

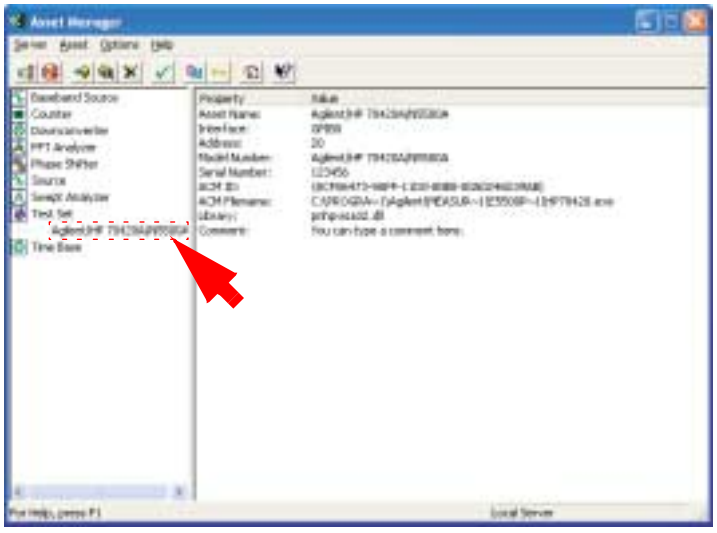
1 On the E5500 main menu, select **System/Asset Manager**.



E5500_asset_manager
23 Mar 04 rev 1

Figure 33 Asset Manager on System menu

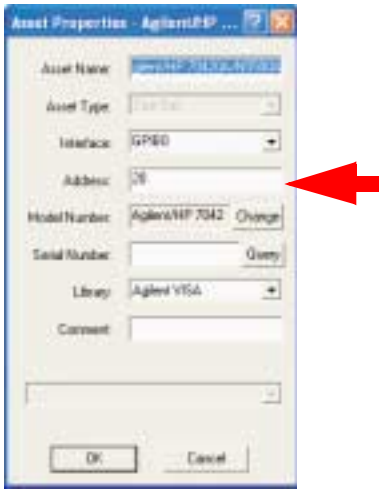
2 Double-Click on the desired instrument in the Asset Manager list (left pane).



E5500_asset_mgr_screen
23 Mar 04 rev 1

Figure 34 Asset Manager window

Type the desired address in the dialog box.



E5500_edit_asset_info
04 Apr 04 rev 1

Figure 35 GPIB address dialog box

3 Click **OK**.

4 To exit the Asset Manager, on the menu select **Server/Exit**.

Powering the System Off

To power off a racked system

1 On the E5500 software menu, select **File\Exit**. Always shut down the E5500 software before powering off the E5505A system.

2 Press the system power switch (front, top right of the rack) to the off position.

CAUTION Always shut down the E5500 software before powering off the E5505A system.

Failure to do so may produce errors in the stem, and result in an inoperable system or inaccurate measurements. If you do receive errors during shutdown, startup, or operation, use the E5500 Shutdown utility to restore functionality to the system. (See page 52 for instructions.)

To power off a benchtop system

1 On the E5500 software menu, select **File\Exit**.

2 Press the power switch on each instrument to the off position.

Using the E5500 Shutdown Utility

If you receive error messages during the power on or off procedures, or during operation, use the E5500 Shutdown utility to shut down the system. This utility automatically fixes most errors and restores functionality to the system. If you still receive errors after running the E5500 Shutdown utility, call your local Agilent Technologies Service Center.

To run the E5500 Shutdown utility

1 Double-Click on the E5500 Shutdown utility shortcut on the PC desktop and follow the onscreen instructions. (You can also navigate to it using the menu path Start/Agilent Subsystems/E5500 Phase Noise/Shutdown.)

Figure 36 Shutdown utility icon

2 When the shutdown utility has finished, use the Start menu to shut down the PC. Then power the system off.

5 Recovery

Chapter 5 contains procedures for creating an image on the a recovery DVD and, if necessary, reinstalling the image on to a hard drive.

NOTE

It is Important to create a backup recovery DVD. The recovery DVD is the only way to reinstall the original Windows XP® operating system after replacing the hard drive. For information about creating the recovery DVD, refer to "Create an Image on the Recovery DVD" on page 54.

Create an Image on the Recovery DVD

Agilent Technologies strongly recommends that you create a recovery DVD, so that in the case of a system or hard drive crash, you will be able to recover system operation quickly and dependably.

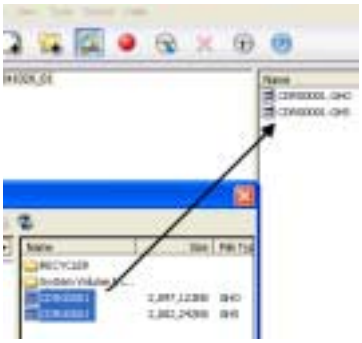
Recovery from the recovery partition is faster than recovery from the recovery DVD. However, only the DVD allows recovery after a serious hard drive crash that results in replacement of the hard drive.

In this procedure you will create an image of the secondary hard drive partition.

Create a recovery DVD

Step	Notes
1 Turn the computer ON.	• Follow the on-screen instruction to accept the Windows® licensing agreement.
2 Insert the provided DVD-R into the DVD burner drive.	A message appears “Blank CD/DVD inserted”. A dialog box appears “Formatting?”
3 Click “NO” for formatting.	
4 Launch Windows Explorer®.	
5 Expand Explorer to view “Recovery” (D).	• This is the recovery partition. You see a folder named ‘System Volume Information’. In addition you see two large files, CDR00001.GHO and CDR00001.GHS. These two files must be copied to the DVD-R. If these files do not exist, refer to “Create an Image on the New Recovery Partition" on page 60.
6 From the Windows® desktop, launch ‘ULead DVD MovieFactor 3 Suite’®.	The Digital Media Center banner screen is displayed.
7 Select “Create Data/Music disk”.	
8 Select “the Create Disc” icon in the left pane.	

Create a recovery DVD

Step	Notes
9 Select “Data disc” and “DVD” in the right pane.	
10 Click the OK button.	
11 In the “ULead Burn.Now - Data Disc” window, select the “Drag and Drop” icon (4th from left). Single-click the icon. A small window opens.	
12 Drag files CDR00001.GHO and CDR00001.GHS to the right pane of the Burn.Now window. Use the control key (Ctrl) to select both files.	 These two files total about 4 GBytes of content.
13 Close the Explorer window by selecting the [X] in the upper-right corner of the window.	
14 In the “ULead Burn.Now - Data Disc” window, select the “Burn” icon (5th from left). Single-click the icon. A small “Burn Disc” window appears.	

Create a recovery DVD

Step	Notes
15 Select the following in the “Burn Disc” window: • Volume Name: type “Recovery DVD” • Leave all other selections in their default positions.	
16 Click ‘Burn’.	• The burn and verification takes approximately 20 minutes.
17 Select “Exit”, then Click ‘OK’.	• “Operation successfully completed. • The written DVD is ejected. **Keep this DVD in a safe place**. The DVD will be required if you replace the hard drive on your PC.
18 Click ‘Next’.	•
19 Select the ”Disc” menu, then select “Exit”.	
20 Click “OK”.	•
21 Close the “Digital Media Center” window by selecting the [X] in the upper-right corner of the window.	•

Recover From a System Crash Using the Recovery Partition

A minor system crash (where the hard drive is still functional) can be readily recovered from using the image on the recovery partition.

Recover from a system crash using the recovery partition

Step	Notes
1 Insert the supplied bootable CD into the appropriate drive.	• The bootable CD part number is E5500-10010 and the content is Revision A.00.01.
2 Exit from Windows® **a** START **b** SHUTDOWN **c** select RESTART on Windows® shutdown.	• The system restarts with the bootable CD installed. Upon boot up A DOS® screen appears, entitled “Backup Menu”. •
3 Select (B) “Press B to recover from Recovery Partition”.	•
4 Press (C) to continue.	• Symantec Ghost takes over. This process takes about 2.5 minutes.
5 Remove the bootable CD and then press the red RESET button to boot up in Windows®.	•

Re-image a New Hard Drive Using the Recovery DVD

In the event of a hard drive crash in which the hard drive is replaced, the image must be copied from the recovery DVD that you created earlier to create an image on the new hard drive.

After completing the following procedure, Agilent strongly recommends that you continue through the next two procedures to create a recovery partition on the new hard drive and finally to create an image on the recovery partition.

This will enable faster recovery in the event of a minor system crash, where the hard drive is still functional.

NOTE Prior to re-imaging a new hard drive using the Recovery DVD, verify the system boot order. Refer to "System Boot Order Check" on page 61.

Reimage a new hard drive using the recovery DVD

Step	Notes
1 Have the bootable CD in-hand.	• The bootable CD part number is E5500-10010 and the content is Revision A.00.01.
2 Turn the computer ON.	•
3 Quickly put the bootable CD into the drive and press the red RESET button.	• The system boots up and the "Backup Menu" appears.
4 Press (C) to "Recover from DVD"	• The backup screen prompts you to "Please replace Bootable CD with Recovery DVD".
5 Replace the bootable CD with the recovery DVD.	• A DOS® prompt appears,"Press any key"
6 Press any key.	• The "Backup Menu" appears.
7 Press (C) to continue.	• Symantec Ghost® takes over to complete the imaging of the new drive from the recovery DVD. This process takes about 17 minutes. When finished, the "Backup Menu" displays "Remove CD/DVD media and then press RESET to launch Windows®.
8 Remove the recovery DVD and press the red RESET button to boot up in Windows®.	

Partition a New Hard Drive Using Windows Disk Manager®

Partition a new hard drive using Windows Disk Manager®

Step	Notes
1 From the Windows® Desktop, make the following selections: **a** 'Start' **b** 'Programs' **c** 'Administrative Tools' **d** 'Computer Management'	• The 'Computer Management' window appears.
2 Choose 'Disk Management'.	• Disk 0 is the entire hard drive. There are two sections. One section is approximately 20% of the total. This was set by the bootable CD as unallocated space.
3 Right-click on 'Unallocated'.	•
4 Select "New Partition".	• The 'Welcome to the New Partition Wizard' screen appears.
5 Click 'Next'.	• "Select partition type" appears.
6 Highlight 'Primary Partition'.	• This is the default.
7 Click 'Next'.	• The 'Specify Partition Size' screen appears.
8 To 'Specify partition size' use the default 'Set partition size @ maximum disk space in Mbytes'	• This is the default.
9 Click 'Next'.	•
10 Select 'Assign the following drive letter' Use the default "D".	•
11 Click 'Next".	• The 'Format Partition' screen appears.
12 Accept the defaults.	• File system 'NTFS' • Allocation unit size 'default'
13 Type "Recovery" into the Volume Label field.	•
14 Select "Perform a quick format"	•
15 Click 'Next'.	• The message 'Completing the New Partition Wizard' appears. This process takes about 15 seconds
16 Click 'Finish'.	• See 'Recovery (D)' • approximately 7.45 GB NTFS • Healthy
17 Close the Computer Management window.	•

Create an Image on the New Recovery Partition

After replacing a damaged/defective hard drive and recovering the image from the recovery DVD, you should create an image on the recovery partition.

Create an image on the new recovery partition

Step	Notes
1 Insert the supplied bootable CD into the appropriate drive.	• The bootable CD part number is E5500-10010 and the content is Revision A.00.01 or higher.
2 Exit from Windows® **a** START **b** SHUTDOWN **c** select RESTART on Windows® shutdown.	• The system restarts with the bootable CD installed. Upon boot up A DOS® screen appears, entitled “Backup Menu”. •
3 Press (A) “Press A to create an image on Recovery Partition”.	•
4 Press (C) to continue.	• Symantec Ghost® now takes over to create an image on the recovery partition from the primary partition. This image includes hidden files. This process takes about 4-5 minutes.
5 Remove the bootable CD.	•
6 Restart the computer by pressing the red RESET button on the front panel.	• Windows® launches
7 Open Windows Explorer® to verify that the recovery partition exists. See Recovery (D).	• Two large files are visible, CDR00001.GHO and CDR00001.GHS. The total of these two files is about 4 GBytes.

System Boot Order Check

After replacing a damaged/defective hard drive and prior to recovering the image from the recovery DVD verify that the DOS boot order is as follows:

- CDROM
- Floppy drive
- Hard drive

Checking the PC BIOS

Step	Notes
1 Turn on or restart your PC. At the first DOS® screen, press the Delete [DEL] key to enter the CMOS setup utility screen.	"CMOS Setup Utility" appears
2 Use the down arrow button to highlight "Advanced BIOS Features"	"Advanced BIOS Features" appears
3 Press the "Enter" button.	
4 Use the down arrow button to highlight "First Boot Device"	
5 Press the "Enter" button.	
6 Use the down arrow button to select "CDROM"	Selects the CDROM as the
7 Press the "Enter" button.	
8 Use the down arrow button to highlight "Second Boot Device"	
9 Press the "Enter" button.	
10 Use the down arrow button to select "FLOPPY"	
11 Press the "Enter" button.	
12 Verify that the "Third Boot Device" is the hard drive (HDD-0)	
13 Press the Escape (Esc) button	
14 Use the down arrow button to highlight "Power Management Setup". Press the Press the "Enter" button.	Verify that the "Power Supply Type" is ATX.
15 Press the Escape (Esc) button	
16 Press the "F10" button to save the changes.	
17 Press the "Enter" button to "Save to CMOS and Exit"	

5 Recovery

6
Preventive Maintenance

Using, Inspecting, and Cleaning RF Connectors

Taking proper care of cables and connectors will protect your system's ability to make accurate measurements. One of the main sources of measurement inaccuracy can be caused by improperly made connections or by dirty or damaged connectors.

The condition of system connectors affects measurement accuracy and repeatability. Worn, out-of-tolerance, or dirty connectors degrade these measurement performance characteristics.

Repeatability

If you make two identical measurements with your system, the differences should be so small that they will not affect the value of the measurement. Repeatability (the amount of similarity from one measurement to another of the same type) can be affected by:

- Dirty or damaged connectors
- Connections that have been made without using proper torque techniques (this applies primarily when connectors in the system have been disconnected, then reconnected).

CAUTION

Static-Sensitive Devices

This system contains instruments and devices that are static-sensitive. Always take proper electrostatic precautions before touching the center conductor of any connector, or the center conductor of any cable that is connected to any system instrument. Handle instruments and devices only when wearing a grounded wrist or foot strap. When handling devices on a work bench, make sure you are working on an anti-static worksurface.

RF Cable and Connector Care

Connectors are the most critical link in a precision measurement system. These devices are manufactured to extremely precise tolerances and must be used and maintained with care to protect the measurement accuracy and repeatability of your system.

To extend the life of your cables or connectors:

- Avoid repeated bending of cables–a single sharp bend can ruin a cable instantly.
- Avoid repeated connection and disconnection of cable connectors.

- Inspect the connectors before connection; look for dirt, nicks, and other signs of damage or wear. A bad connector can ruin the good connector instantly.
- Clean dirty connectors. Dirt and foreign matter can cause poor electrical connections and may damage the connector.
- Minimize the number of times you bend cables.
- Never bend a cable at a sharp angle.
- Do not bend cables near the connectors.
- If any of the cables will be flexed repeatedly, buy a back-up cable. This will allow immediate replacement and will minimize system down time.

Before connecting the cables to any device:

- Check all connectors for wear or dirt.
- When making the connection, torque the connector to the proper value.

Proper Connector Torque

- Provides more accurate measurements
- Keeps moisture out of the connectors
- Eliminates radio frequency interference (RFI) from affecting your measurements

The torque required depends on the type of connector. Refer to Table 12. Do not overtighten the connector.

Never exceed the recommended torque when attaching cables.

Table 12 Proper Connector Torque

Connector	Torque cm-kg	Torque N-cm	Torque in-lbs	Wrench P/N
Type-N	52	508	45	hand tighten
3.5 mm	9.2	90	8	8720-1765
SMA	5.7	56	5	8710-1582

Connector Wear and Damage

Look for metal particles from the connector threads and other signs of wear (such as discoloration or roughness). Visible wear can affect measurement accuracy and repeatability. Discard or repair any device with a damaged connector. A bad connector can ruin a good connector on the first mating. A magnifying glass or jeweler's loupe is useful during inspection.

SMA Connector Precautions

Use caution when mating SMA connectors to any precision 3.5 mm RF connector. SMA connectors are not precision devices and are often out of mechanical tolerances, even when new. *An out-of-tolerance SMA connector can ruin a 3.5 mm connector on the first mating*. If in doubt, gauge the SMA connector before connecting it. The SMA center conductor must *never* extend beyond the mating plane.

Cleaning Procedure

1. Blow particulate matter from connectors using an environmentally-safe aerosol such as Aero-Duster. (This product is recommended by the United States Environmental Protection Agency and contains tetrafluoroethane. You can order this aerosol from Agilent (see Table 13).)
2. Use alcohol and a lint-free cloth to wipe connector surfaces. Wet a small swab with a small quantity of alcohol and clean the connector with the swab.
3. Allow the alcohol to evaporate off of the connector before making connections.

CAUTION *Do not allow excessive alcohol to run into the connector*. Excessive alcohol entering the connector collects in pockets in the connector's internal parts. The liquid will cause random changes in the connector's electrical performance. If excessive alcohol gets into a connector, lay it aside to allow the alcohol to evaporate. This may take up to three days. If you attach that connector to another device it can take much longer for trapped alcohol to evaporate.

Table 13 Cleaning Supplies Available from Agilent

Product	Part Number
Aero-Duster	8500-6460
Isopropyl alcohol	8500-5344
Lint-Free cloths	9310-0039
Small polyurethane swabs	9301-1243

WARNING **Cleaning connectors with alcohol should only be performed with the instruments' mains power cord disconnected, in a well ventilated area. Connector cleaning should be accomplished with the minimum amount of alcohol. Prior to connector reuse, be sure that all alcohol used has dried, and that the area is free of fumes.**

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

General Procedures and Techniques

This section introduces you to the various cable and connector types used in the system. Read this section before attempting to remove or install an instrument! Each connector type may have unique considerations.

Always use care when working with system cables and instruments.

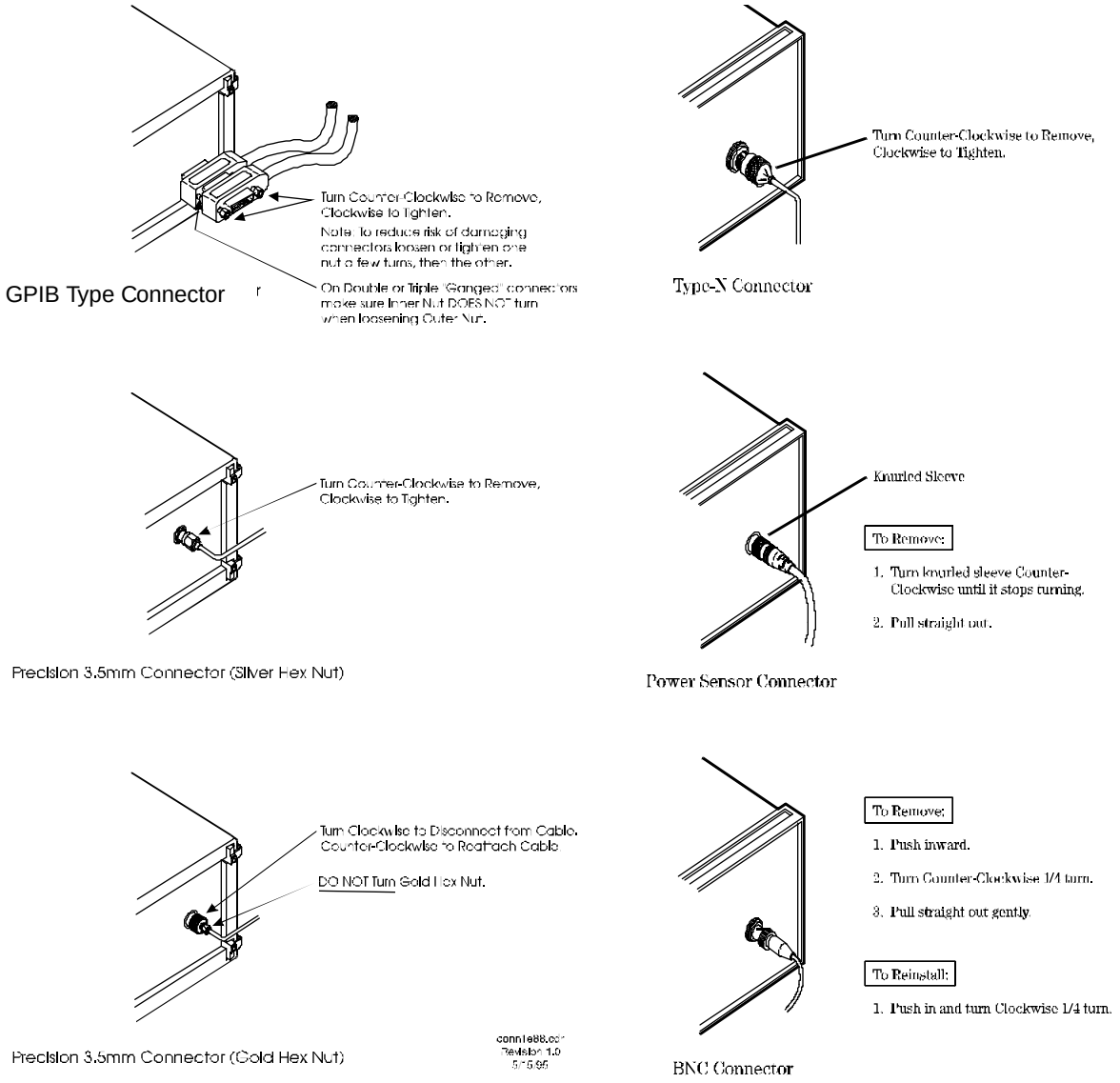


Figure 37 GPIB, 3.5 mm, Type-N, power sensor, and BNC connectors

Connector Removal

GPIB Connectors

These are removed by two captured screw, one on each end of the connector; these usually can be turned by hand. Use a flathead screwdriver if necessary.

GPIB connectors often are stacked two or three deep. When you are removing multiple GPIB connectors, disconnect each connector one at a time. It is a good practice to connect them back together even if you have not yet replaced the instrument; this avoids confusion, especially if more than one instrument has been removed.

When putting GPIB connectors back on, you must again detach them from one another and put them on one at a time.

Precision 3.5 mm Connectors

These are precision connectors. Always use care when connecting or disconnecting this type of connector. When reconnecting, make sure you align the male connector properly. Carefully join the connectors, being careful not to cross-thread them.

Loosen precision 3.5 mm connectors on flexible cables by turning the connector nut counter-clockwise with a 5/16 inch wrench. Always reconnect using an 8 inch-lb torque wrench (Agilent part number 8720-1765). Semirigid cables are metal tubes, custom-formed for this system from semirigid coax cable stock.

3.5 mm Connectors with a gold hex nut

The semirigid cables that go to the RF outputs of some devices have a gold connector nut. These do not turn. Instead, the RF connector on the instrument has a cylindrical connector body that turns. To disconnect this type of connector, turn the connector body on the instrument clockwise. This action pushes the cable's connector out of the instrument connector.

To reconnect, align the cable with the connector on the instrument. Turn the connector body counterclockwise. You may have to move the cable slightly until alignment is correct for the connectors to mate. When the two connectors are properly aligned, turning the instrument's connector body will pull in the semirigid cable's connector. Tighten firmly by hand.

3.5 mm connectors with a silver hex nut

All other semirigid cable connectors use a silver-colored nut that *can* be turned. To remove this type of connector, turn the silver nut counter-clockwise with a 5/16 inch wrench.

When reconnecting this type of cable:

- Carefully insert the male connector center pin into the female connector. (Make sure the cable is aligned with the instrument connector properly before joining them.)
- Turn the silver nut clockwise by hand until it is snug, then tighten with an 8 inch-lb torque wrench (part number 8720-1765).

Bent Semirigid Cables

Semirigid cables are not intended to be bent outside of the factory. An accidental bend that is slight or gradual may be straightened carefully by hand. Semirigid cables that are crimped will affect system performance and must be replaced. Do not attempt to straighten a crimped semirigid cable.

Instrument Removal

To remove an instrument from the system, use one of the following procedures.

Required tools

- #2 Phillips screwdriver
- #2 POZIDRIV screwdriver

Standard instrument

To remove an instrument from a rack

	Step	Notes
1	Turn off system power, but leave the system computer turned on.	• If you do plan to turn computer power off for any reason, have the computer system administrator: • Shut down all running software. • Shut down the computer.
2	Read “General Procedures and Techniques”, then disconnect all cables on the front and on the rear panel.	• Most cables are fairly easy to remove and reconnect, and have no special considerations (besides making sure you put the cables back in the right place). • Semirigid cables require more care, especially when reconnecting them. *Make sure all semirigid cables, on the front and back of an instrument are fully disconnected before removing the unit.*
3	When *all* cables are disconnected (including the power cord), remove the screws in the instrument’s rack “ears” that hold it in the rack.	
4	Slide the instrument out.	• If you feel any resistance when attempting to pull the instrument out, STOP! Look inside the cabinet and carefully examine all surrounding cables. Make sure all cables are fully disconnected.

Half-Rack-Width Instrument

To remove a half-width instrument from a system rack

1	Power off the system.	• For details see the system installation guide.
2	Remove the selected instrument's power cord from the power strip in the rack.	
3	The instrument is attached to the half-rack width instrument beside it; remove that instrument's power cord from the power strip also.	• The instruments are secured together by lock links at the front and rear. The lock links at the rear attach with screws. The lock links at the front hook together.
4	Remove the power cord and other cables from the front and rear of both instruments.	• Note the location of cables for re-installation.
5	Remove the four corner screws on the front of the rack panel that secures the instruments in place.	• The screws are located near the corners of the face of the instrument. • Use a #2 Phillips screwdriver.
6	Slide both instruments, as a single unit, out from the front of the rack and set them on a secure, flat surface.	
7	Detach the lock links that secure the rear of the instruments together by removing their screws.	• Use a #2 POZIDRIV screwdriver. • See Figure 38 on page 73.
8	Carefully and at the same time, push one instrument forward and pull the other back to unhook the lock links that secure the front of the instruments to each other.	
9	Store the "partner" instrument and lock links while the selected instrument is out of the rack.	• Only install the instruments as a pair; individual installation is not secure.

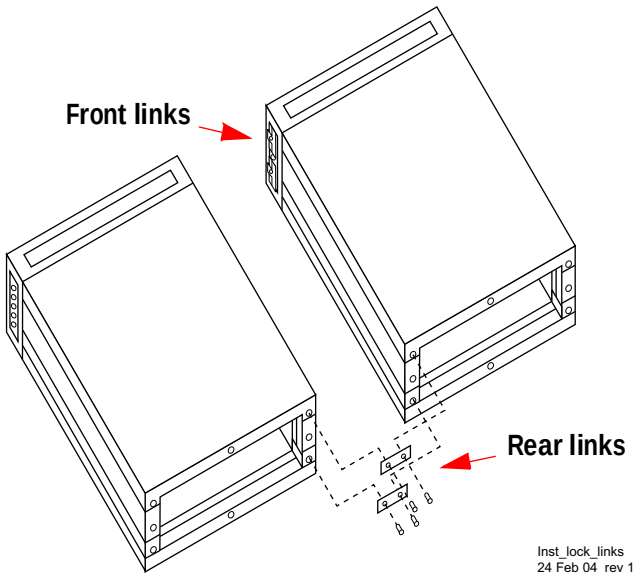


Figure 38 Instrument lock links, front and rear

Benchtop Instrument

To remove an instrument from a benchtop system

1 Power off each instrument in the system.	• For details, see "Powering the System Off" on page 52.
2 Unplug the selected instrument's power cord from the AC power supply.	
3 Remove the power cord and other cables from the front and rear of the instrument.	• Note the location of cables for re-installation.

Instrument Installation

To install or re-install an instrument in a system, use one of the following procedures.

Required tools

- #2 Phillips screwdriver
- #2 POZIDRIV screwdriver
- system installation guide

Standard rack instrument

To install an instrument

	Step	Notes
1	Slide the instrument gently into the rack.	
2	Insert the screws in the rack ears.	• Most cables are fairly easy to remove and reconnect and have no special considerations (besides making sure you put the cables back in the right place). • Semirigid cables require more care, especially when reconnecting them. *Make sure all semirigid cables, on the front and back of an instrument are fully disconnected before removing the unit.*
3	To reconnect the semirigid cables, carefully align them before you insert the male connector.	• Do not insert the male pin in at an angle or you will damage the female connector. RF connector center pins are very delicate, and if damaged must be replaced. System performance may be greatly impaired if there is a bad RF connector.
4	Turn on system power and restart the system computer if necessary.	

Half-Rack-Width instrument

To install the instrument in a rack

Step	Note
1 Make sure the system is powered off.	• For details, see "Powering the System Off" on page 52.
2 Re-attach the lock link that secures the front of the returned instrument to it's partner half-rack-width instrument.	• Use a #2 POZIDRIV screwdriver. • See Figure 38 on page 73.
3 Re-attach the lock link that secures the rear of the instruments together.	• Use a #2 POZIDRIV screwdriver.
4 Insert the attached instruments in the same slot from which you removed them, sliding them along the support rails until they meet the rack-mount ears.	• The rack-mount ears stop the instruments at the correct depth.
5 Replace the rack panel in front of the instruments and secure the four corner screws.	• The screws are located near the corners of the face of the instrument. • Use a #2 Phillips screwdriver.
6 Confirm that the instrument is turned off.	
7 Connect the appropriate cables to the instruments (front and rear), including the power cords.	
8 Power on the system.	• For details, see "Powering the System On" on page 30.

Benchtop instrument

To install an instrument in a benchtop system

1 Make sure the system is powered off.	• For details, see "Powering the System Off" on page 52.
2 Connect all cables to the instrument (front and rear), including the power cord.	
3 Connect the power cord to the AC power source.	
4 Power on the system.	• For details, see "Powering the System On" on page 30.
5 Set the instrument GPIB address, if necessary.	

6 Preventive Maintenance

A
Service, Support, and Safety Information

This appendix provides safety and regulatory information, which you should review prior to working with your Agilent system. The information contained in it applies to all Agilent-supplied instruments in the system, and the system as a whole.

It also contains information on servicing and obtaining support for an Agilent system or instrument, including procedures for removing an instrument from a system, returning it to Agilent, and re-installing it.

Safety and Regulatory Information

Safety summary

The following general safety precautions must be observed during all phases of operation of this instrument or system. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of this instrument or system. Agilent Technologies, Inc. assumes no liability for the customer's failure to comply with these requirements.

General

This product has been designed and tested in accordance with the standards listed on the Manufacturer's Declaration of Conformity, and has been supplied in a safe condition. The documentation contains information and warnings that must be followed by the user to ensure safe operation and to maintain the product in a safe condition.

All light-emitting diodes (LEDs) used in this product are Class 1 LEDs per IEC 60825-1.

Equipment Installation

Install the instrument or system so that the detachable power cord is readily identifiable and is easily reached by the operator. The detachable power cord is the disconnecting device. It disconnects the mains circuits from the mains supply before other parts of the instrument or system. The instrument front panel switch is only a standby switch and is not a LINE switch. Alternatively, an externally installed switch or circuit breaker (which is readily identifiable and is easily reached by the operator) may be used as a disconnecting device.

WARNING **This is a Safety Class 1 Product (provided with a protective earthing ground incorporated in the power cord). The mains plug shall be inserted only in a socket outlet provided with a protective earth contact. Any interruption of the protective conductor inside or outside of the products is likely to make the product dangerous. Intentional interruption is prohibited (IEC 348 clauses 17.3.3 c and 17.3.4).**

WARNING **DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE.**
Do not operate the instrument or system in the presence of flammable gases or flames.

WARNING **DO NOT REMOVE AN INSTRUMENT COVER.**

Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made only by qualified service personnel.

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

Environmental conditions

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

CAUTION Unless otherwise noted in the specifications, this instrument or system is intended for indoor use in an installation category II, pollution degree 2 environment per IEC 61010-1 and 664 respectively. It is designed to operate at a maximum relative humidity of 20% to 80% at 31 °C or less (non-condensing). This instrument or system is designed to operate at altitudes up to 2000 meters, and at temperatures between 0 °C and 40 °C.

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

Before applying power

CAUTION Verify that the product is set to match the available line voltage, the correct-rating service breaker is installed, the correct fuse is installed, and all safety precautions are taken. Note the instrument external markings described in Table 14, “Safety symbols and instrument markings,” on page 81.

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

Ground the instrument or system

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

WARNING **This is a Safety Class 1 Product (provided with a protective earthing ground incorporated in the power cord). The mains plug shall be inserted only in a socket outlet provided with a protective earth contact. Any interruption of the protective conductor inside or outside of the products is likely to make the product dangerous. Intentional interruption is prohibited (IEC 348 clauses 17.3.3 c and 17.3.4).**

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.

CAUTION The detachable power cord is the disconnecting device. It disconnects the mains circuit from the mains supply before other parts of the instrument or system. The instrument front panel switch is only a standby switch and is *not* a line switch.

Fuses and Circuit Breakers

Refer to individual instrument manuals for detailed information on operator accessible fuses.

WARNING **Use only fuses with the required rated current, voltage, and specified type (normal blow, time delay). Do not use repaired fuses or short-circuited fuse holders. To do so could cause a shock or fire hazard.**

WARNING **For continued protection against fire hazard, replace fuses and circuit breakers only with the same type and ratings. The use of other fuses or circuit breakers or materials is prohibited (IEC 348 clause 17.3.5.d).**

WARNING **The premise wiring should have a system-dedicated circuit breaker in the mains wiring for installation of the system.**

Agilent system cabinet power strips are equipped with a thermal circuit breaker for each power phase. If one phase shorts or overloads, one or both of the circuit breakers in the power strip trip. Unplug the power strip before trying to locate and correct the electrical problem, then reset both circuit breakers on the power strip to restore power to the cabinet.

Maintenance

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

Safety symbols and instrument markings

Symbols and markings in manuals and on instruments alert you to potential risks, provide information about conditions, and comply with international regulations. Table 14 defines the symbols and markings you may find in a manual or on an instrument.

Table 14 Safety symbols and instrument markings

Safety symbols	Definition
	Warning: risk of electric shock.
	Warning: hot surface.
	Caution: refer to instrument documentation.
	Laser radiation symbol: marked on products that have a laser output.
	Alternating current.
	Both direct and alternating current.
	Three-phase alternating current.
	Earth (ground) terminal.
	Protective earth (ground) terminal.
	Frame or chassis terminal.

Table 14 Safety symbols and instrument markings (continued)

Safety symbols	Definition
⊥	Terminal is at earth potential. Used for measurement and control circuits designed to be operated with one terminal at earth potential.
N	Terminal for neutral conductor on permanently installed equipment.
L	Terminal for line conductor on permanently installed equipment.
⏻	Standby (supply); units with this symbol are not completely disconnected from AC mains when this switch is in the standby position. To completely disconnect the unit from AC mains, either disconnect the power cord, or have a qualified/licensed electrician install an external switch.
O	OFF (supply); a switch with this symbol opens the instrument's power supply circuit, disconnecting it with the mains supply.
I	ON (supply); a switch with this symbol closes the instrument's power supply circuit, connecting it with the mains supply.
Instrument markings	**Definition**
CE	The CE mark is a registered trademark of the European Community.
CSA	The CSA mark is a registered trademark of the CSA-International.
✓N10149	The C-tick mark is a registered trademark of the Spectrum Management Agency of Australia. This signifies compliance with the Australian EMC Framework regulations under the terms of the Radio Communications Act of 1992.
1SM1-A	This text indicates that the instrument is an Industrial Scientific and Medical Group 1 Class A product (CISPER 11, Clause 4).
ICES/NMB-001	This text indicates product compliance with the Canadian Interference-Causing Equipment Standard (ICES-001).

Declaration of Conformity

This product complies with CSA 1010. You may obtain a copy of the Declaration of Conformity through your local Agilent Technologies Service Center. For contact information visit http://www.agilent.com.

Compliance with German noise requirements

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

Table 15 German noise requirements summary

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

Compliance with Canadian EMC requirements

This ISM device complies with Canadian ICES-001.
Cet appareil ISM est conforme a la norme NMB du Canada.

Service and Support

Any adjustment, maintenance, or repair of this product must be performed by qualified personnel. Contact your Agilent Technologies Service Center for assistance.

WARNING **There are no user serviceable parts inside the system. Any 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 dangerous voltages. Disconnect the product from all voltage sources while it is being opened.**

Agilent on the Web

You can find information about technical and professional services, product support, and equipment repair and service on the Web:

http://www.agilent.com

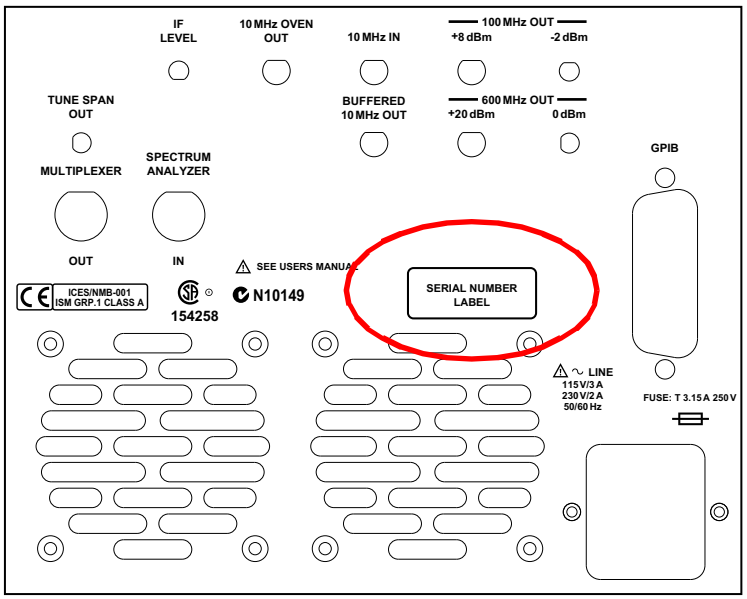
Click on the **Test & Measurement** link then click on **Select a Country**. Click on the **Contact Us** link for contact information.

Return Procedure

In any correspondence or telephone conversations with Agilent Technologies, please refer to the instrument by its model number (N5501A, for example) and serial number. With this information, the customer engineer can determine whether your instrument is still within its warranty period and provide accurate shipping information.

Determining your instrument's serial number

When Agilent Technologies manufactures an instrument, it is given a unique serial number. This serial number appears on a label on the rear panel of the instrument (see Figure 39). The serial number has two parts. The first part makes up the prefix and consists of four digits and a letter. The second part makes up the suffix and consists of the last five digits on the label. The serial number prefix is the same for all identical instruments; it changes only if the electrical or physical functionality differs between instruments. However, the serial number suffix changes sequentially from instrument to instrument to uniquely identify every one.



n5501_2_rear_pnl
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Figure 39 Serial number location

Shipping the instrument

Use the following procedure to package and ship your instrument for service. For instructions on removing an instrument from the system and re-installing it, refer to the system user's guide.

To package the instrument for shipping

Step	Notes
1 Place the instrument in its original packaging materials.	• If the original packaging materials are not available, use a professional packaging service. Contact your Agilent Service Center for more information.
2 Surround the instrument with at least 3 to 4 inches of its original packing material or bubble-pack to prevent the instrument from moving in its shipping container.	
3 After wrapping it with packing material, place the instrument in its original shipping container or a strong shipping container that is made of double-walled corrugated cardboard with 159 kg (350 lb) bursting strength.	• The shipping container must be large and strong enough to accommodate your instrument and allow at least 3 to 4 inches on all sides for packing material.
4 Seal the shipping container securely with strong nylon adhesive tape.	
5 Mark the shipping container "FRAGILE, HANDLE WITH CARE" to help ensure careful handling.	
6 Use the address obtained from your Agilent customer engineer.	
7 Retain copies of all shipping papers.	

CAUTION Damage can result if the original packaging materials are not used. Packaging materials should be anti-static and cushion the downconverter on all sides. NEVER USE STYRENE PELLETS IN ANY SHAPE AS PACKAGING MATERIALS. They do not adequately cushion the instrument or prevent it from moving in the shipping container. Styrene pellets can also cause equipment damage by generating static electricity or by lodging in fan motors.