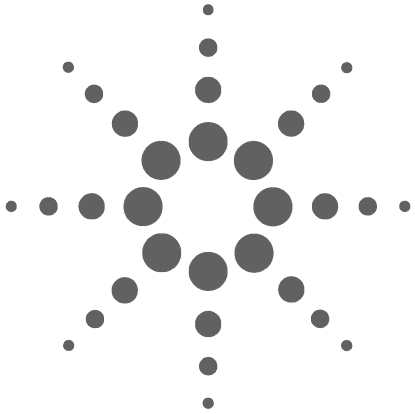

Agilent N8221A IF Digitizer Synthetic Instrument Module, 30 MS/s

User's Guide

First Edition, February 23, 2007

Agilent Technologies

Notices

Windows®

Adobe Acrobat Reader®

Manual Part Number

N8221-90003

Edition

First Edition, February 23, 2007

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Safety Notices

A **CAUTION** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a **CAUTION** notice until the indicated conditions are fully understood and met.

A WARNING notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

Introducing the N8221A IF Digitizer

The Agilent Technologies N8221A IF digitizer with 7.5 MHz IF input provides 80 dB dynamic range, 14 bits of resolution, and 10 MHz of modulation bandwidth.

The N8221A IF digitizer is based on industry leading Agilent PSA Series spectrum analyzers and is one of the many synthetic instrument (SI) modules offered by Agilent Technologies. An SI module itself may not perform complex measurements, but when combined with other SI modules, they form instruments that can execute all of the functions of a traditional ATE system. By working with the Test Program Set, which defines the type of measurements and the sequence of those measurements required for a particular military application, SI module software can be written to meet the needs of many different military electronic systems with a common SI test platform.

Agilent's SI modules use LAN eXtension for Instrumentation (LXI) modular format. LXI differs from other modular formats (such as VXI and PXI) by using an external computer and local area network (LAN), rather than embedded computers, for control.

The LXI standard supports the IEEE 1588 time synchronization and protocol standard, which allows synchronous triggering of different instruments, even with different-length LAN cables. The IEEE 1588 precision time protocol (PTP) enables a common sense of time over a distributed system.

SI modules offered by Agilent Technologies include the following:

- N8201A performance downconverter, 3 Hz to 26.5 GHz
- N8211A performance analog upconverter, 250 kHz to 20 / 40 GHz
- N8212A performance vector upconverter, 250 kHz to 20 GHz
- N8221A IF digitizer, 30 MS/s
- N8241A arbitrary waveform generator, 15-Bit, 1.25 GS/s or 625 MS/s
- N8242A arbitrary waveform generator, 10-Bit, 1.25 GS/s or 625 MS/s

For further information, refer to:

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

Contents

1
Software Installation

Before Installing Software and Instrument Drivers

Verify the PC Meets Minimum Requirements

- 1 GHz Intel Pentium processor
- Microsoft Windows XP Professional or Home Edition (Service Pack 1 or 2), Windows 2000 (Service Pack 2)
- 512 MB of RAM
- Up to 40 MB of available hard-disk space
- Microsoft Internet Explorer 6.0 (or higher)

The following software and instrument drivers are required to operate the N8221A IF digitizer.

CAUTION If the following software or instrument drivers are installed on the PC to be used, uninstall them and install the software and drivers shipped on the *Agilent N8221A IF Digitizer Synthetic Instrument Module, 30 MS/s Instrument Drivers and Documentation CD (N8221-90001)*.

The CD contains the following:

- Agilent I/O Libraries
- Agilent I/O Libraries Update (Patch)
- IVI Shared Components
- IVI-COM Drivers
- Synthetic Instrument's Graphical User Interface
- Agilent N8221A IF Digitizer User Interface
- Synthetic Instrument Finder

---

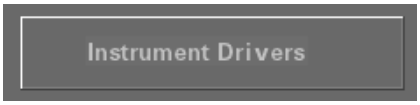
1 Place the *Agilent N8221A IF Digitizer Synthetic Instrument Module, 30 MS/s Instrument Drivers and Documentation CD* into the CD-ROM drive.

NOTE Prior to continuing this installation procedure, install Adobe Acrobat Reader 5.0 or later on your PC. The software is included on the *Agilent N8221A IF Digitizer Synthetic Instrument Module, 30 MS/s Instrument Drivers and Documentation CD*.

Click **Adobe Acrobat Reader 5.0** to install the software.

---

2 Click **Instrument Drivers**.



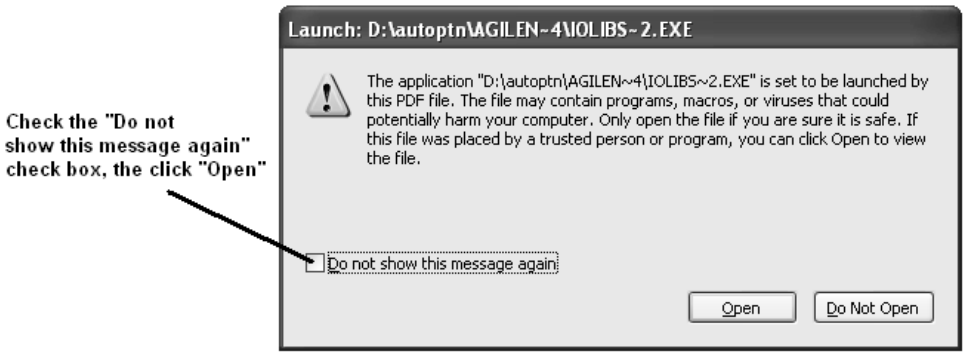
Installing Agilent I/O Libraries

3 Select **1. Agilent I/O Libraries** on the Software and Driver Installation page. It takes about 10 seconds for the application to run.

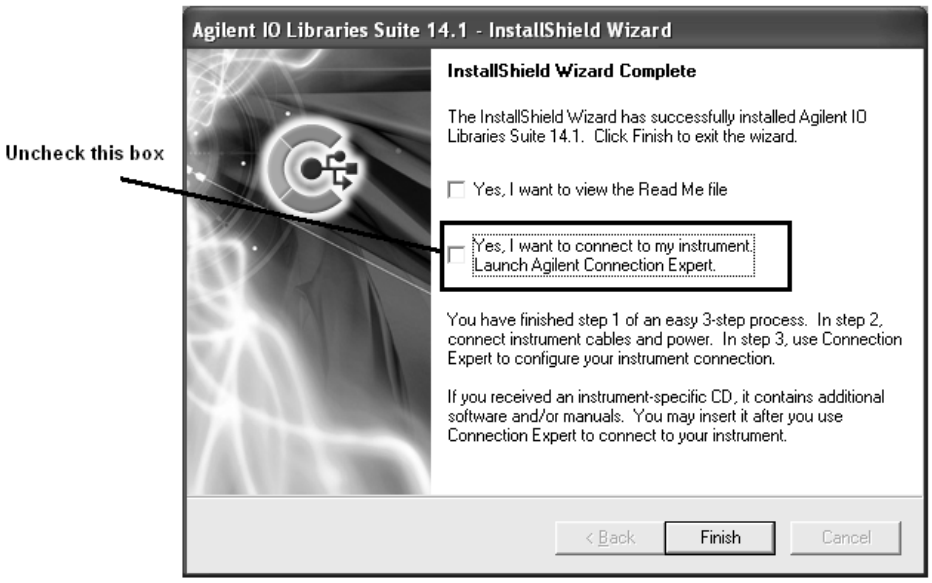
Agilent N8221A IF Digitizer Software and Driver Installation
Installation Order
1. Agilent I/O Libraries
2. Agilent I/O Libraries Update (Patch)
3. IVI Shared Components
4. IVI-COM Drivers
5. Synthetic Instrument's Graphical User Interface
6. Agilent N8221A IF Digitizer User Interface
7. Synthetic Instrument Finder

4 Click the check box, "**Do not show this message again"** so that the check box is selected.

5 Click **Open**.



6 Follow the Agilent I/O installation instructions, accepting the default settings until the Finish dialog box should appear.



7 Click the check box, "**Yes, I want to connect to my instrument. Launch Agilent Connection Expert."**, so that the check box is not selected.

8 Click **Finish**.

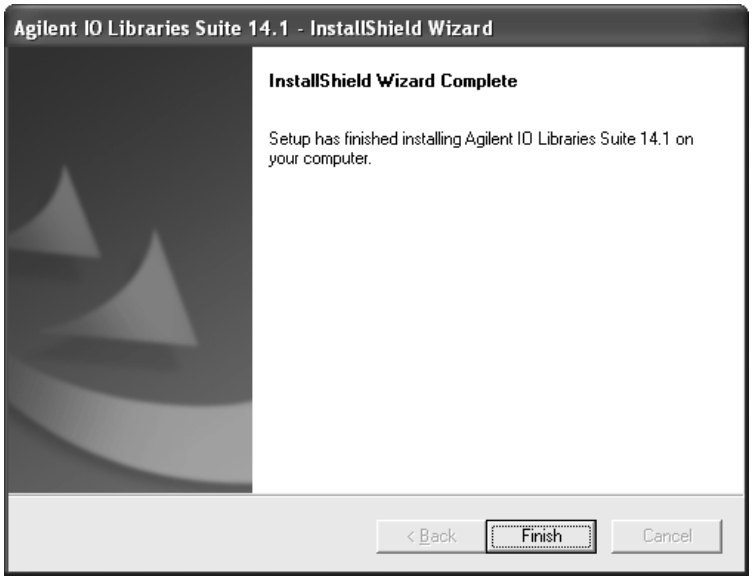
Installing Agilent I/O Libraries Update (Patch)

9 Select **2. Agilent I/O Libraries Update (Patch)** on the Software and Driver Installation page.

Agilent N8221A IF Digitizer Software and Driver Installation
Installation Order
1. Agilent I/O Libraries
2. Agilent I/O Libraries Update (Patch)
3. IVI Shared Components
4. IVI-COM Drivers
5. Synthetic Instrument's Graphical User Interface
6. Agilent N8221A IF Digitizer User Interface
7. Synthetic Instrument Finder

10 Follow the Agilent I/O Libraries Update (Patch) installation instructions, accepting the default settings.

11 Click **Finish**.



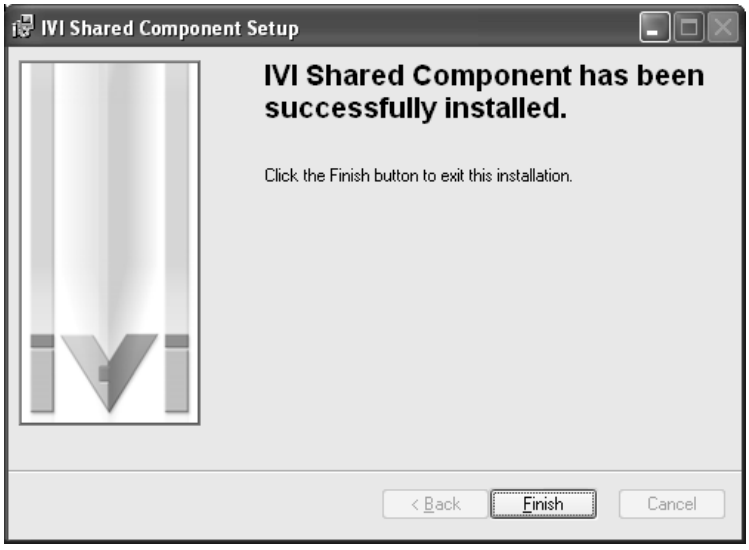
Installing IVI Shared Components

12 Select **3. IVI Shared Components** on the Software and Driver Installation page.

Agilent N8221A IF Digitizer Software and Driver Installation
Installation Order
1. Agilent I/O Libraries
2. Agilent I/O Libraries Update (Patch)
3. IVI Shared Components
4. IVI-COM Drivers
5. Synthetic Instrument's Graphical User Interface
6. Agilent N8221A IF Digitizer User Interface
7. Synthetic Instrument Finder

13 Follow the IVI Shared Components installation instructions, accepting the default settings.

14 Click **Finish**.



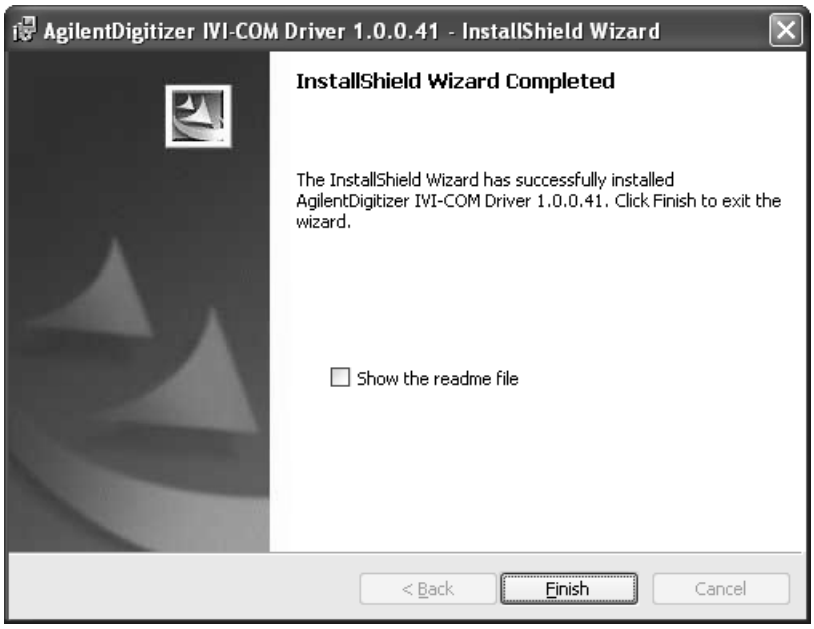
Installing IVI-COM Drivers

15 Select **4. IVI-COM Drivers** on the Software and Driver Installation page.

Agilent N8221A IF Digitizer Software and Driver Installation
Installation Order
1. Agilent I/O Libraries
2. Agilent I/O Libraries Update (Patch)
3. IVI Shared Components
4. IVI-COM Drivers
5. Synthetic Instrument's Graphical User Interface
6. Agilent N8221A IF Digitizer User Interface
7. Synthetic Instrument Finder

16 Follow the IVI-COM installation instructions, accepting the default settings.

17 Click **Finish**.



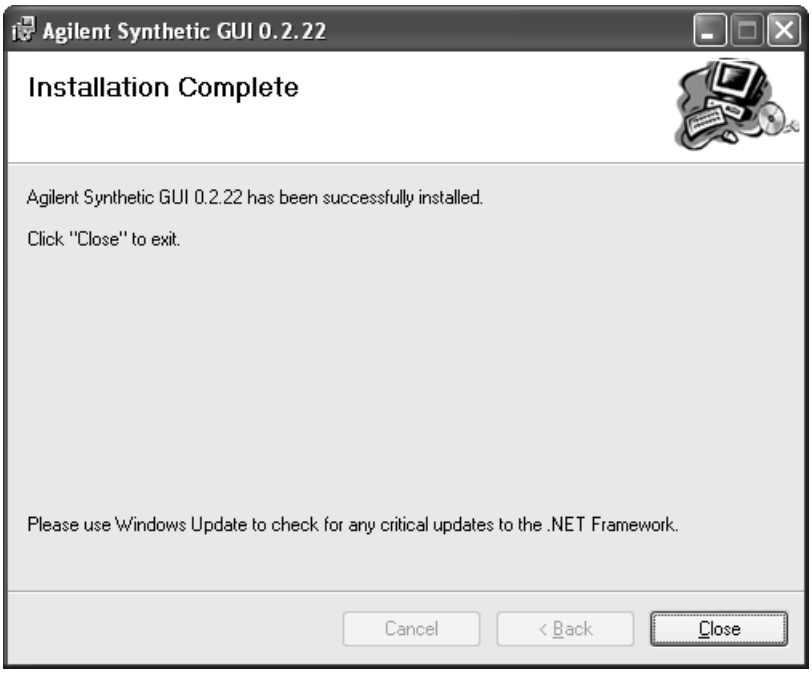
Installing the Synthetic Instrument Graphical User Interface

18 Select **5. Synthetic Instrument's Graphical User Interface** on the Software and Driver Installation page.

Agilent N8221A IF Digitizer Software and Driver Installation
Installation Order
1. Agilent I/O Libraries
2. Agilent I/O Libraries Update (Patch)
3. IVI Shared Components
4. IVI-COM Drivers
5. Synthetic Instrument's Graphical User Interface
6. Agilent N8221A IF Digitizer User Interface
7. Synthetic Instrument Finder

19 Follow the Synthetic Instrument's Graphical User Interface installation instructions, accepting the default settings.

20 Click **Close**.



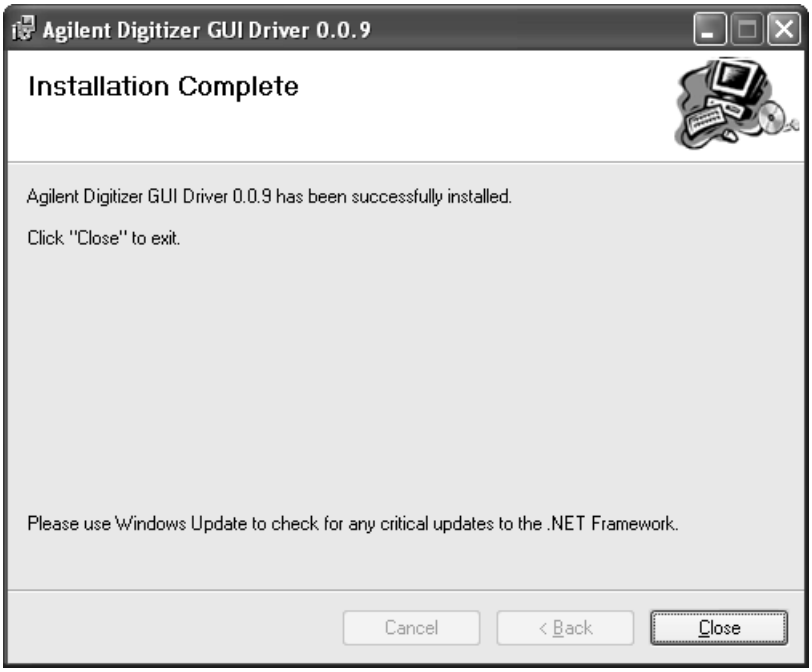
Installing the Agilent N8221A IF Digitizer User Interface

21 Select **6. Agilent N8221A IF Digitizer User Interface** on the Software and Driver Installation page.

Agilent N8221A IF Digitizer Software and Driver Installation
Installation Order
1. Agilent I/O Libraries
2. Agilent I/O Libraries Update (Patch)
3. IVI Shared Components
4. IVI-COM Drivers
5. Synthetic Instrument's Graphical User Interface
6. Agilent N8221A IF Digitizer User Interface
7. Synthetic Instrument Finder

22 Follow the **N8221A IF Digitizer User Interface** installation instructions, accepting the default settings.

23 Click **Close**.



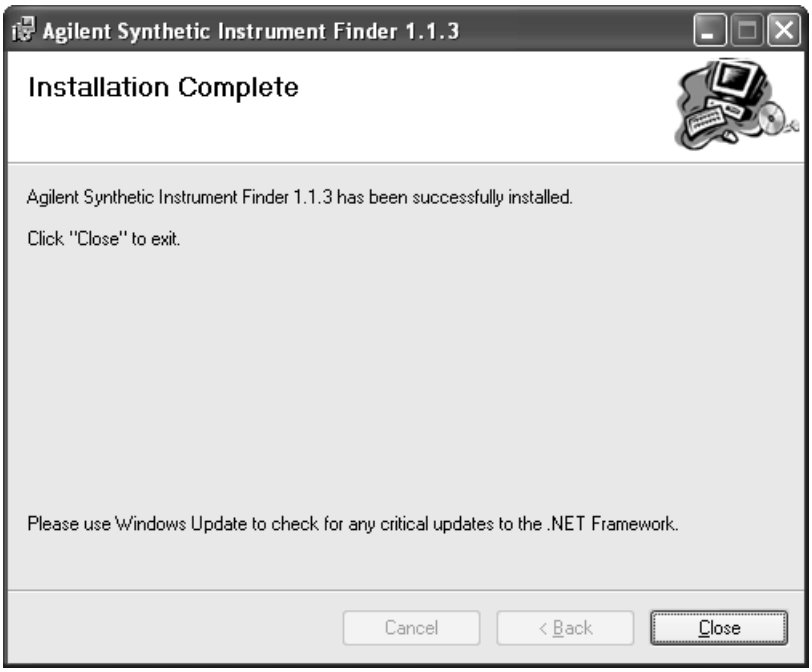
Installing the Synthetic Instrument Finder

24 Select **7. Synthetic Instrument Finder** on the Software and Driver Installation page.

Agilent N8221A IF Digitizer Software and Driver Installation
Installation Order
1. Agilent I/O Libraries
2. Agilent I/O Libraries Update (Patch)
3. IVI Shared Components
4. IVI-COM Drivers
5. Synthetic Instrument's Graphical User Interface
6. Agilent N8221A IF Digitizer User Interface
7. Synthetic Instrument Finder

25 Follow the **Synthetic Instrument Finder** installation instructions, accepting the default settings.

26 Click **Close** and exit the CD-ROM. The installation is complete!



2
Hardware Setup and Configuration

"Troubleshooting"

Step 1. Unpacking the N8221A IF Digitizer

WARNING The unique shape of the N8221A IF digitizer was intended to allow multiple instruments to reside in a compact system that is both modular and transportable. With instruments adjacent to each other, handles could not be installed on the respective instruments. Exercise caution when lifting and carrying the instrument to avoid personal injury. At nearly 20 pounds (9 kilograms), it is recommended that two people be utilized for instrument lifting and transport.

NOTE Verify that any options ordered are included with the shipment by checking the packing literature included with the shipment.

The serial number label on the N8221A IF digitizer only verifies hardware/firmware options. The packing literature verifies all items shipped.

Verify the Shipment

1 Inspect the shipping container for damage.

Signs of damage may include a dented or torn shipping container or cushioning material that shows signs of unusual stress or compacting.

2 Carefully remove the contents from the shipping container and verify that the order is complete.

The following items are shipped standard with each N8221A IF digitizer:

- instrument drivers, synthetic graphical user interface, and documentation CD-ROM (p/n N8221-90001)
- three-prong AC power cord specific to geographic location

(Optional) Prepare the Instrument for Rack Mounting

CAUTION If the N8221A IF digitizer is to be placed in a system rack, the feet currently attached can be replaced with the rack mount feet (part number W1312-40032) supplied with the accessories. Failure to do so can result in a safety issue.

Step 2. Connecting to a LAN

Before Connecting to a LAN

Before connecting to a LAN, verify your local policy by contacting the system administrator in your Information Technology (IT) department and inquire about connecting instruments to the LAN.

- If the network uses DHCP [Dynamic Host Configuration Protocol], an address is assigned to the device automatically. If you need to know what the IP address is, it can be determined using the Synthetic Instrument Finder. (Refer to "How to Use the Synthetic Instrument Finder" on page 28.)

  If no DHCP is present, but the instrument is set to use DHCP (the default), the instrument waits two minutes for its DHCP request to time out. When the N8221A IF digitizer is used in this situation, there is a time delay of approximately three minutes between the time of when the N8221A IF digitizer's power is turned on and when it is available for use.

  If the network does not use DHCP, you can use Auto IP or configure your LAN settings manually. Although you can also manually configure LAN settings in a network with DHCP, it is recommended that you do so with the assistance of your system administrator.

- If the network uses Auto IP (does not use DHCP), the N8221A IF digitizer acquires a 169.254.X.X address.

Select one of the following two configurations:

- Connect a LAN cable from the LAN connector on your PC to an empty connector on your internal local area network or LAN hub. Connect a LAN cable from the LAN connector on the rear panel of the N8221A IF digitizer to an empty connector on your internal local area network or LAN hub.

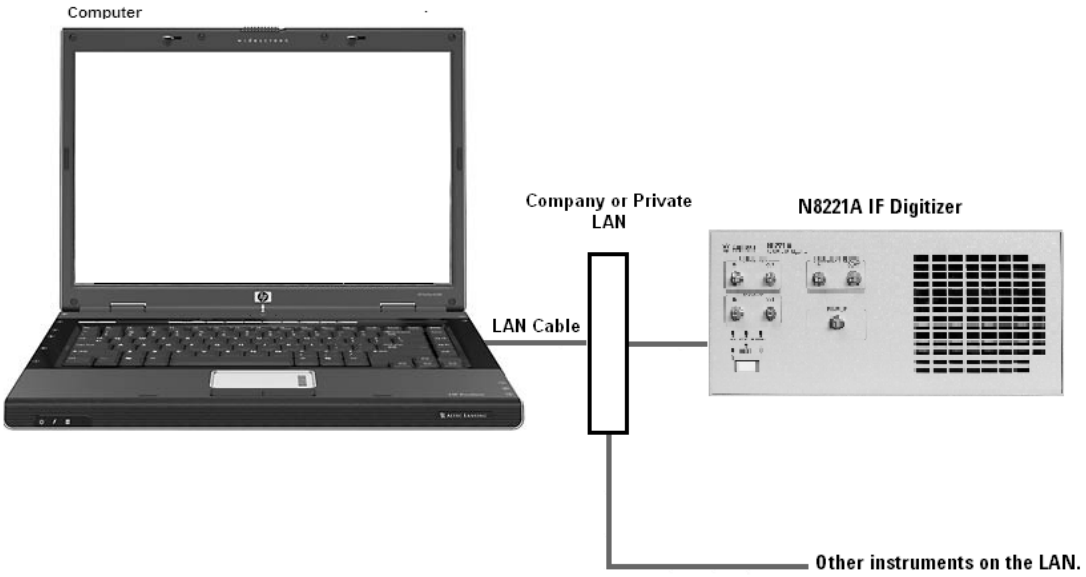


Figure 1 Connecting the PC LAN cable to a company/private LAN to the instrument LAN

- Connect a cross-over cable from the LAN connector on your PC to the LAN connector on the rear panel of the N8221A IF digitizer.

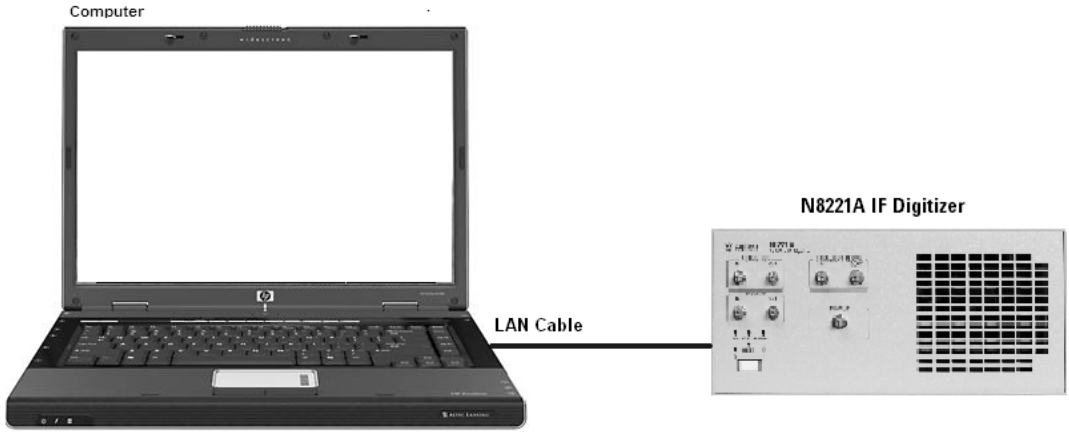


Figure 2 Connecting the PC LAN cable to the instrument LAN (cross-over cable)

Step 3. Turning on Power

1. Turn on power to the N8221A IF digitizer and wait until the LAN LED turns solid green; this takes about 60 seconds. This can take up to four minutes depending on whether the instrument is using DHCP or Auto IP.
2. Turn on power to the PC.

Step 4. Verifying Connectivity to the PC

To verify the connectivity between the N8221A IF digitizer and the PC:

1 Verify that the LAN LED on the N8221A IF digitizer's rear panel is green or blinking green. This indicates a good connection.

If the LED is off, there is a problem with your LAN connection.

2 Verify that the LAN LED on the N8221A IF digitizer's front panel (next to the LAN port) is solid green.

If the LED turns red, this indicates a problem with your LAN connection. This takes approximately 60 seconds.

3 (Optional) Ping the N8221A IF digitizer from the PC.

a From the Windows Desktop, select **Start** > **Run**.

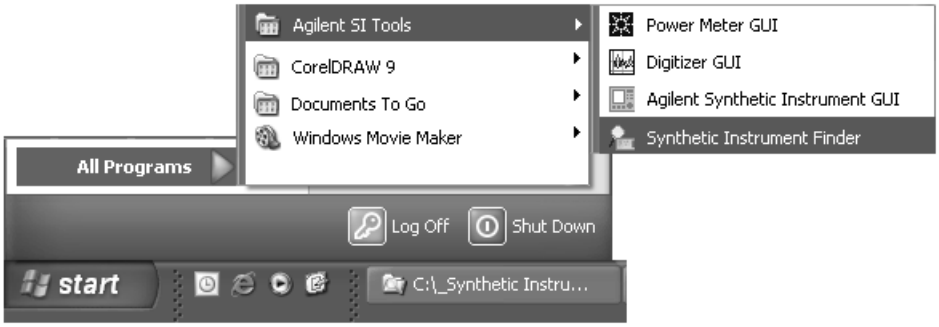
b At the Open prompt, type **CMD** and press **Enter** to open a DOS window.

c At the command prompt, type `Ping` and the instrument's IP address (for example, `Ping 141.121.84.108`.) or type `Ping` and the instruments *hostname* (for example, `Ping a-n8221a-80179`**)**.

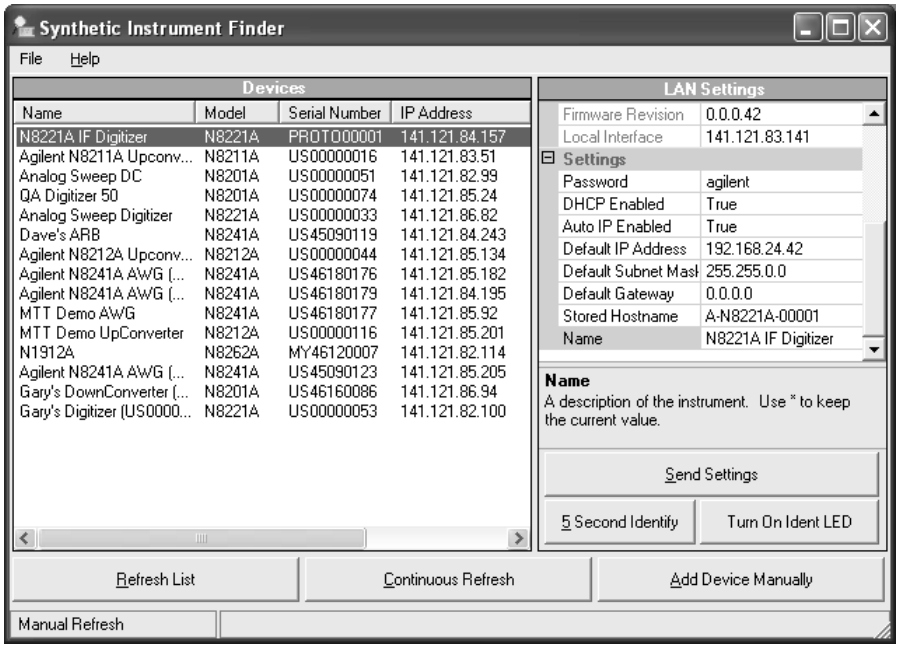
(Optional) Verifying Connectivity with the Synthetic Instrument Finder

Agilent supplies a program named the **Synthetic Instrument Finder** that enables connection between a PC and instruments that are connected on a LAN [Local Area Network]. (For further details, refer to “Troubleshooting" on page 28.)

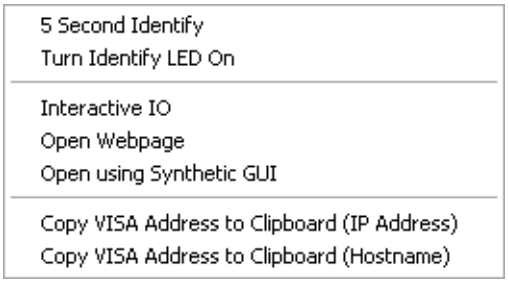
1 From the Windows Desktop, click **Start** > **All Programs** > **Agilent SI Tools** > **Synthetic Instrument Finder**.



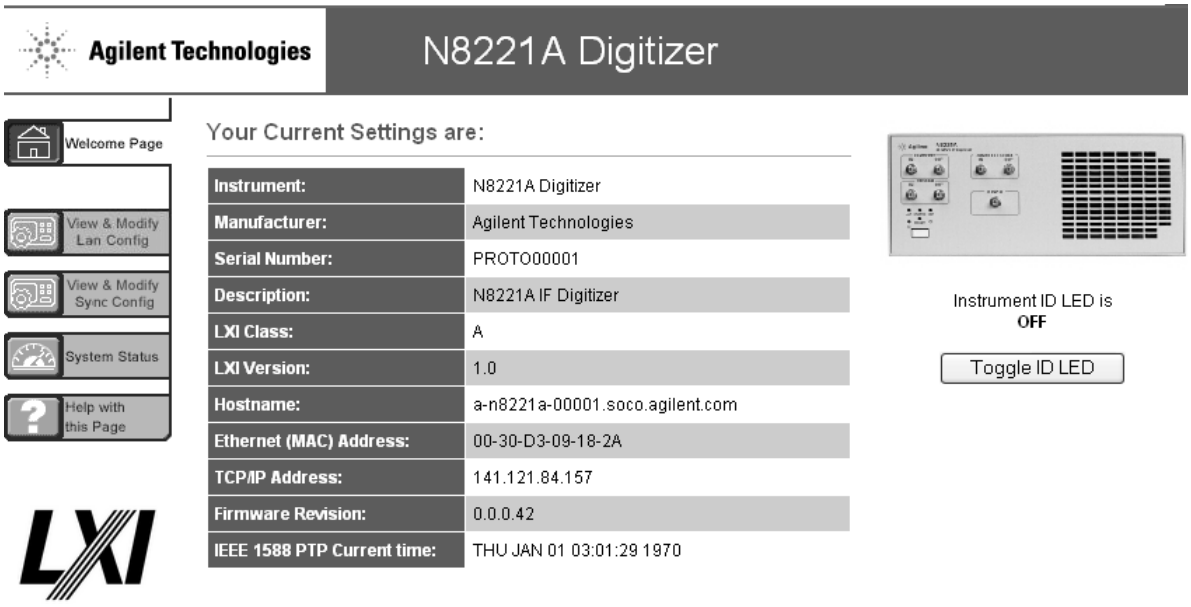
The Synthetic Instrument Finder should appear and look similar to the following.



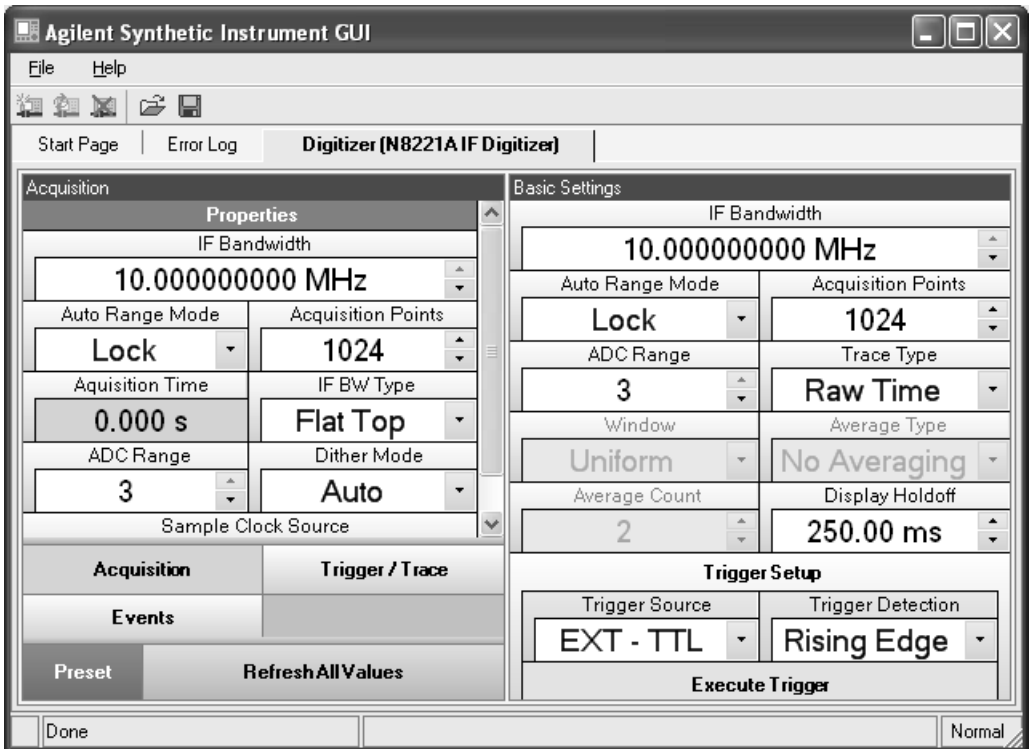
2 In the left-hand pane of the Synthetic Instrument Finder, right-click the N8221A IF digitizer and the following menu should appear.



3 Select **Open Webpage** and a Web browser should appear that allows viewing and modifying settings for instruments on the network. If this Web page opens, you have verified connectivity.



4 (Optional) Select **Open with Synthetic GUI** and the Synthetic Instrument GUI should appear; this GUI allows you to control the settings on the selected instrument. If the Agilent Synthetic Instrument GUI opens, you have verified connectivity.



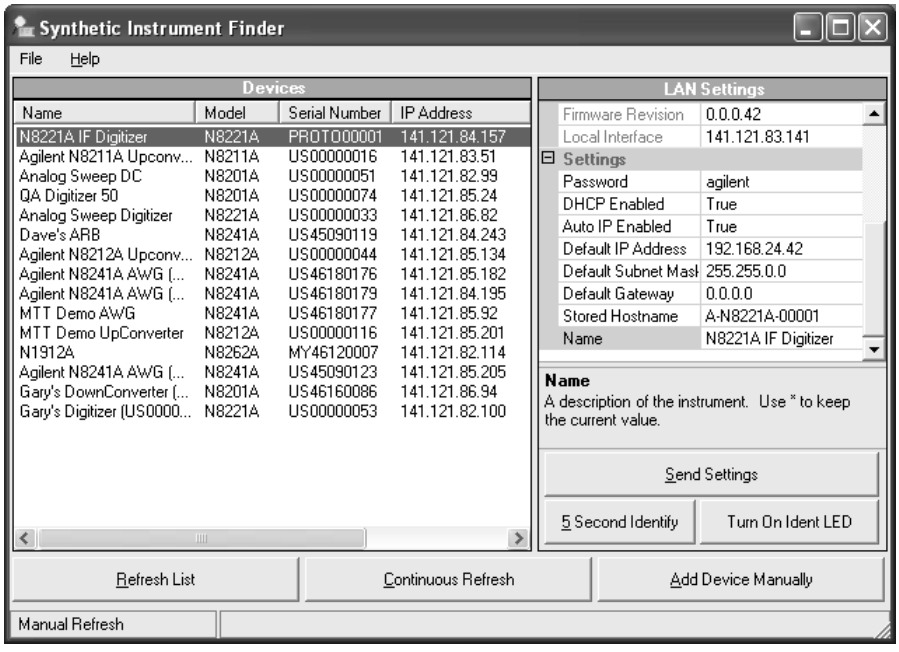
Troubleshooting

How to Use the Synthetic Instrument Finder

Agilent supplies a program named the **Synthetic Instrument Finder** that enables connection between a PC and instruments that are connected on a LAN [Local Area Network].

1 Click **Start** > **All Programs** > **Agilent SI Tools** > **Synthetic Instrument Finder** to open the Synthetic Instrument Finder program.

2 In the left-hand pane of the Synthetic Instrument Finder, right-click the N8221A IF digitizer and the following menu should appear.



The Synthetic Instrument Finder window is divided into two main sections:

- right pane contains information specific to the instrument highlighted in the left pane.
- left pane contains a list of equipment available on your LAN for connection.

Right-Pane Functions

Send Settings Sends the current instrument settings to the N8221A IF digitizer. Use this function if you modified the settings in Instrument Finder.

5 Second Identify Flashes the LAN LED for five seconds.

Turn On Ident LED When On, the LAN LED continuously flashes on and off. Once the Turn On Ident LED button is pressed, the button name changes to Turn Off Ident LED.

Refresh List Updates the device's list.

Continuous Refresh Updates the device's list every one minute.

Add Device Manually Allows you to add a device for connection. Use this feature only if your instrument does not appear in the Devices list.

a. Click **Add Device Manually**. The Devices area will display a new listing titled "Unknown".

b. In the Manual settings area, enter in the MAC address, serial number, and model number of the device.

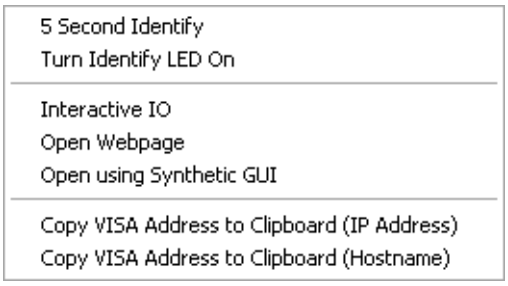
c. In the LAN settings area, enter in the information for the new device. (Make sure that you scroll down the list to get to the editable settings area.)

d. Click **Send Settings** to enter this information in the Devices area.

e. Double-click the new listing to open the webpage, or right-click and select Open using Synthetic GUI to use the virtual interface.

Left-Pane Functions

In the left pane, right-click on the N8221A IF digitizer and the following menu should appear.

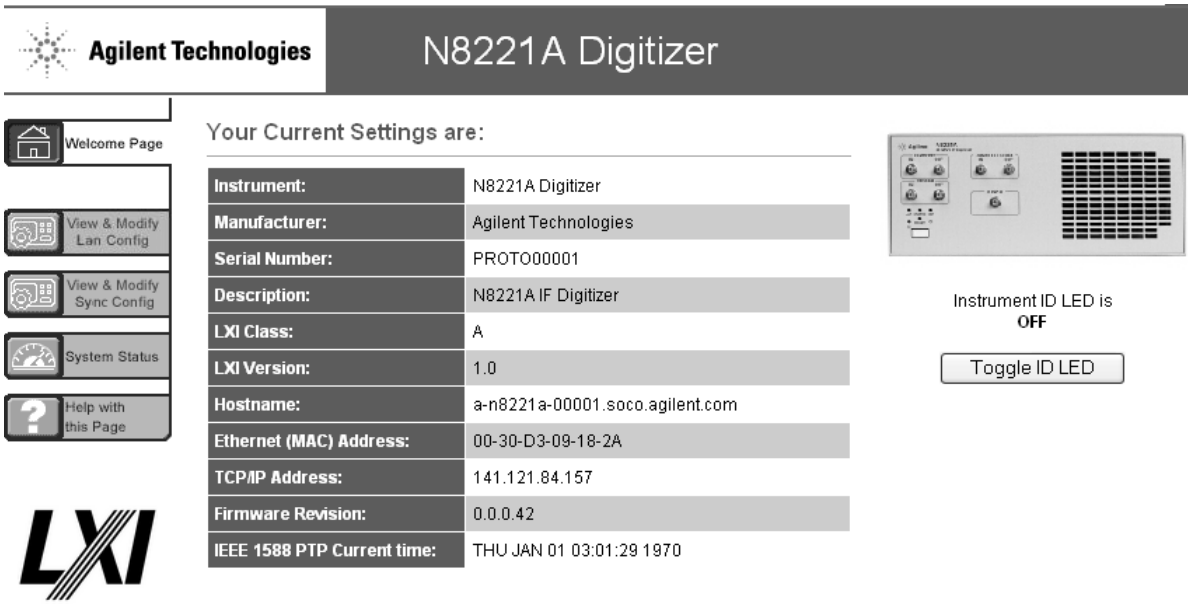


Interactive IO Opens the Agilent Interactive IO application which allows SCPI commands to be sent to the instrument. (The Interactive IO option is only available if the Agilent Connection Expert has been installed on the PC.)

Open Webpage Opens the Web page associated with the currently selected instrument. From this Web page, settings for the instrument can be viewed and modified.

Tip: There are two other ways to access the device's Web page:

- By double-clicking on the Device listing in the Synthetic Instrument Finder.
- By typing in the device's hostname or IP address in your Internet browser.



Open using Synthetic GUI Opens the Synthetic Instrument GUI.

Copy VISA Address to Clipboard (IP Address) Copies the VISA IP address to the clipboard for use in other applications.

Copy VISA Address to Clipboard (Hostname) Copies the VISA hostname to the clipboard for use in other applications. It is recommended that you use this address on networks with DHCP and DNS network capability.

How to Reset the LAN Configuration

On the instrument front panel, near the power switch, is a recessed button labeled “RESET”. This button enables you to place the LAN configuration of the instrument into a known state.

When this button is pressed (a straightened paper clip will do the job) the following settings are made and the system reboots.

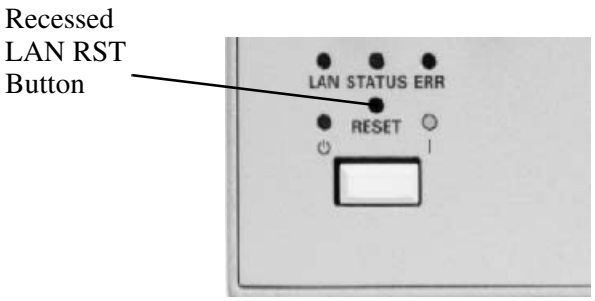
- IP address is set to 192.168.EE.FF, where EE and FF are the last two parts of the MAC address (AA.BB.CC.DD.EE.FF). This is designed to prevent multiple instruments from using the same default IP address (refer to the instrument label).
- Subnet Mask is set to 255.255.0.0
- DHCP is set to on
- Auto IP is set to on

NOTE If you had manually configured LAN settings before, you may have to reconfigure your instrument to reset DHCP and Auto IP to OFF. Refer to “How to Set a Static IP Address" on page 33.

- The instrument hostname is set to A-N82XXA-NNNNN, where N82XXA is the instrument model number (such as N8221A) and NNNNN represents the last five digits of the instrument serial number.

If the instrument is in an environment with a DHCP server, it is assigned an IP address through DHCP. The IP address can be found by using the instrument hostname as the URL in a web browser.

Without DHCP, the instrument will use Auto IP and acquire a 169.254.X.X address. If no DHCP is present, but the instrument is set to use DHCP (the default), the instrument will wait two minutes for its DHCP request to time out. In this case, there is a time delay of approximately three minutes between when the instrument is powered on and when it is usable.



How to Set a Static IP Address

The DHCP server automates the process of setting up the IP addresses on your network by default. When the N8221A IF digitizer is turned on, it searches for a DHCP server on the network and selects a “dynamic IP address”. Each time the N8221A IF digitizer is rebooted, the N8221A IF digitizer may get a different IP address. To set the N8221A IF digitizer to a static IP address, rather than allowing the DHCP server to select an auto IP address:

1 Assign a N8221A IF digitizer instrument IP address that will work with your computer.

NOTE

For a company wide network, your system administrator will have to assign an IP address that is compatible with your PC. If you have a private LAN network or a direct connection from your PC to the instrument, you can assign the IP address. Refer to “Step 1. Unpacking the N8221A IF Digitizer" on page 20.

2 Connect the N8221A IF digitizer in one of the following two configurations:

- Connect a LAN cable from the LAN connector on your PC to an empty connector on your internal local area network or LAN hub. Connect a LAN cable from the LAN connector on the rear panel of the N8221A IF digitizer to an empty connector on your internal local area network or LAN hub.

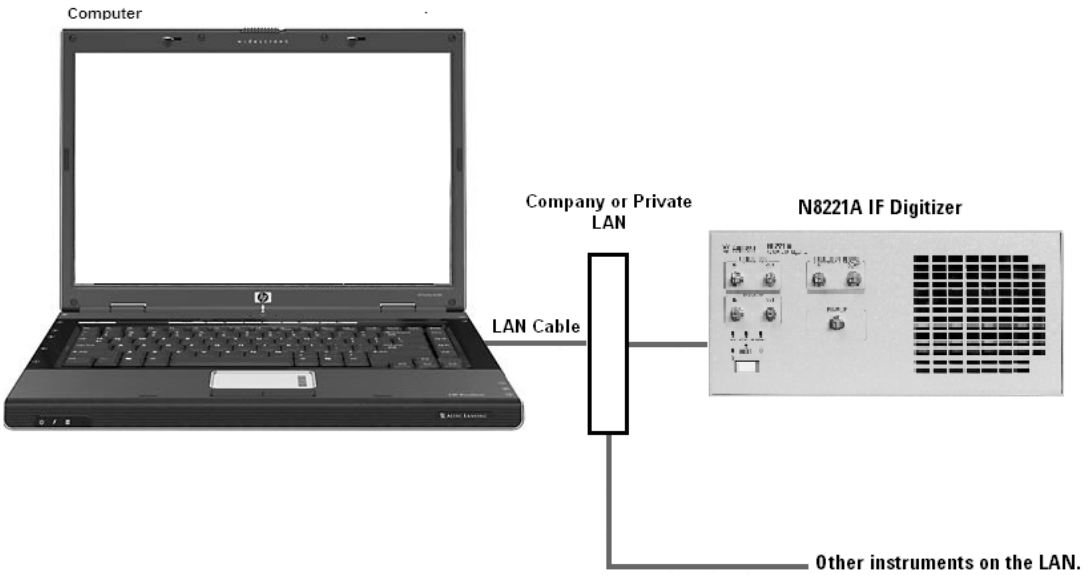


Figure 3 Connecting the PC LAN cable to a company/private LAN to the instrument LAN

- Connect a cross-over cable from the LAN connector on your PC to the LAN connector on the rear panel of the N8221A IF digitizer.

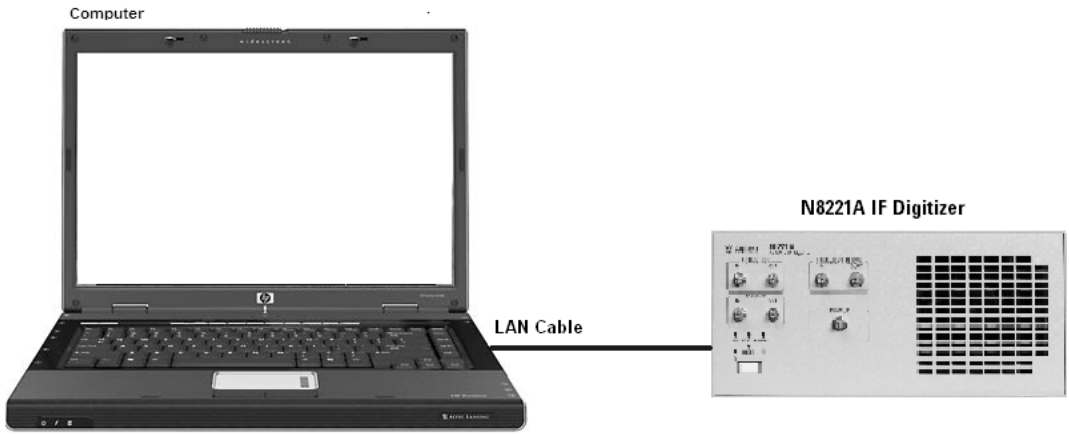
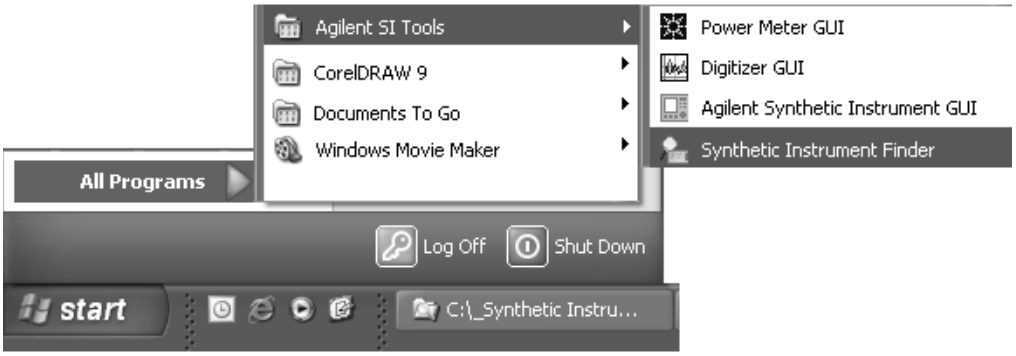


Figure 4 Connecting the PC LAN cable to the instrument LAN (cross-over cable)

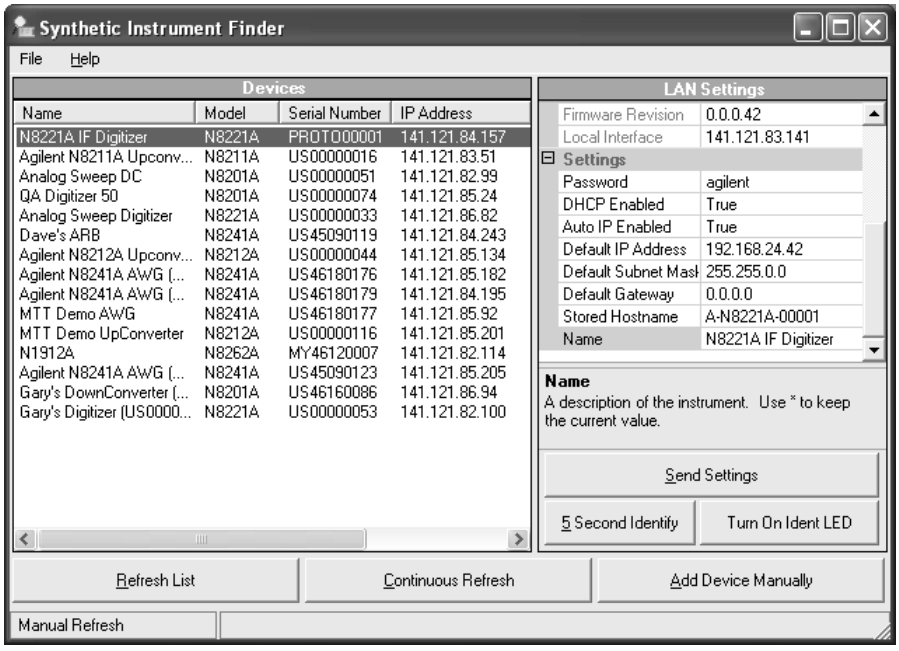
3 Turn on power to the PC.

4 Turn on power to the N8221A IF digitizer and wait until the LAN LED turns solid green; this takes about 60 seconds.

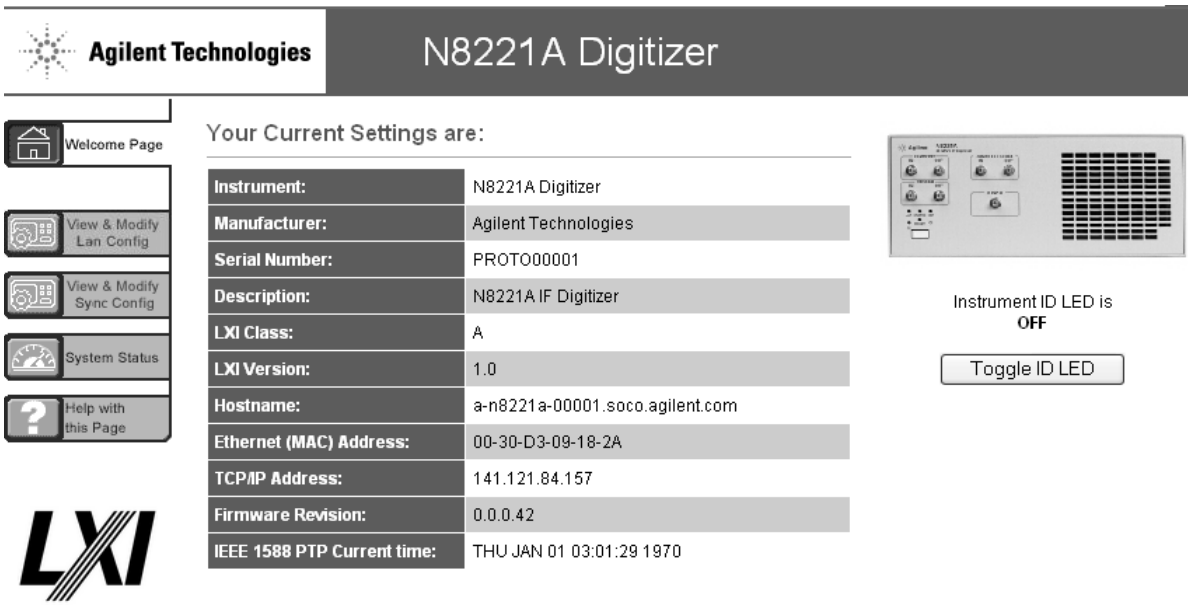
5 From the Windows Desktop, click **Start** > **All Programs** > **Agilent SI Tools** > **Synthetic Instrument Finder**.



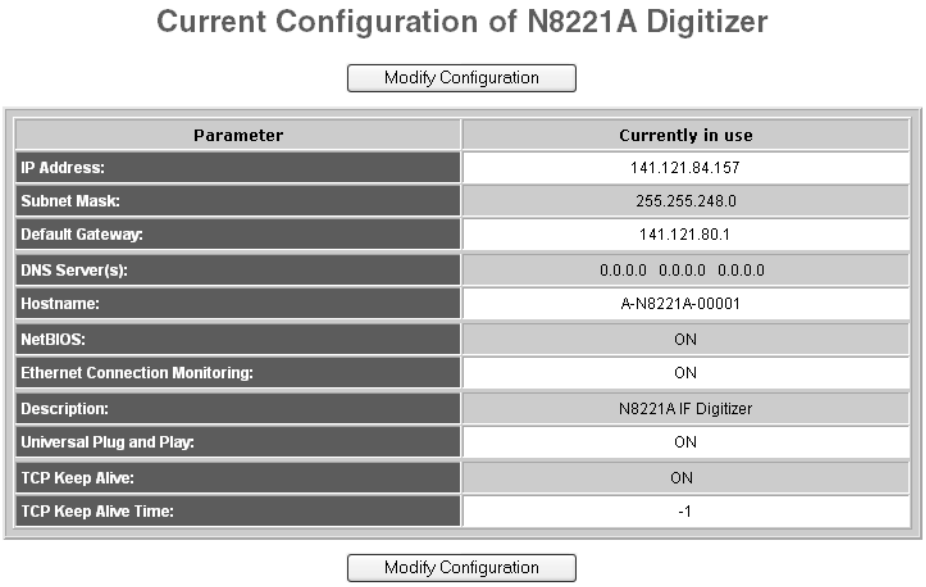
The following Synthetic Instrument Finder dialog box should appear.



6 Select the N8221A IF digitizer listed in the Agilent Synthetic Instrument Finder dialog box to access the N8221A IF digitizer Web page.



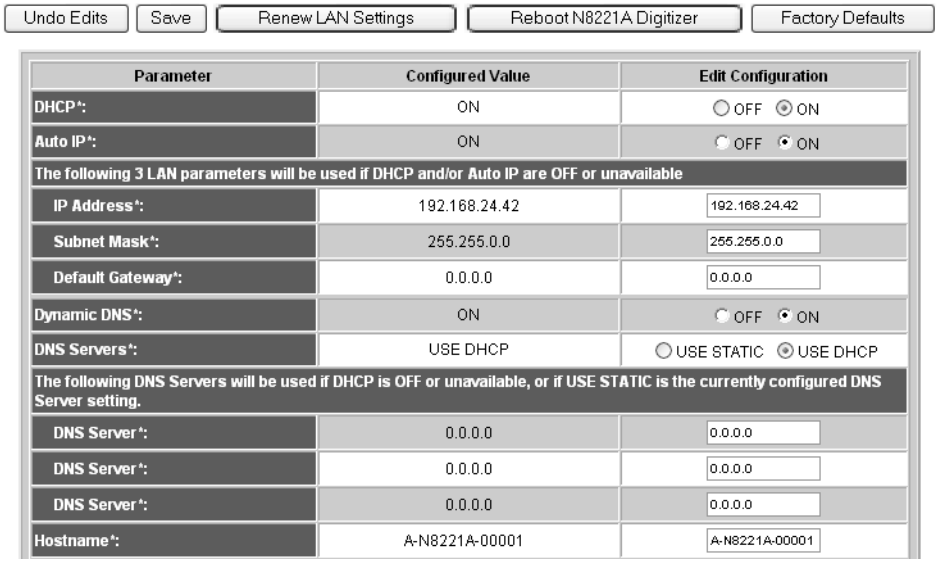
7 Click **View & Modify LAN Config** in the left-pane of the Web page. The following dialog box should appear.



8 Click **Modify Configuration** to access the Password dialog.

9 Click **Submit** (accept the default password) and the following dialog box should appear. The default password is set to "**agilent**".

Tip: You can change the password from the View & Modify LAN Connections. (Scroll down the Parameter column until you locate the Change Password parameter.)



10 Change the **DHCP** and **Auto IP** radio-buttons to **Off**. Change the IP address, Subnet Mask, and Default Gateway values to meet your network requirements.

11 Click **Save** to save the new settings. Parameters marked with an asterisk (*) also require that you click "Renew LAN settings" before changes take effect.

NOTE For the new settings to become effective, you may first cycle the power of the instrument and then cycle the power of the PC.

How to Troubleshoot Connectivity Problems on the Network

The Synthetic Instrument Finder program is used to find instruments on a network when the N8221A IF digitizer is connected through a router or cross-over cable. There are three possible configurations:

- connecting the PC through a company wide site LAN connection to the N8221A IF digitizer
- connecting the PC to the same private LAN network as the instrument
- connecting the PC directly to the instrument using a cross-over cable - this would typically be used for troubleshooting and is not normally used to control an instrument directly

The N8221A IF digitizer is shipped with a default IP address. This default IP address is **192.168.EE.FF**, where EE and FF are the last two parts of the Media Access Control (MAC) address (AA.BB.CC.DD.EE.FF).

How to Determine a PCs Configuration Settings

From a DOS Window

1. From the Windows Desktop, click **Start** > **Run**.
2. At the **`Open:`** prompt, type **`CMD`** and press **Enter** to open a DOS window.
3. At the command prompt, type **`ipconfig/all`** to display the PCs network connection details.

Or,

From the PCs Control Panel

1. From the Windows® Desktop, click **Start** > **Settings** > **Control Panel** > **Network and Internet Connections**.
2. From the Network and Internet Connections window, double-click the **Local Area Connection**.
3. In the Local Area Connection Status dialog, click the **Support** tab and click **Details** to display the PCs Network Connection Details.

   The Network Connection Details include:

   - Physical Address
   - DHCP status, enabled or disabled (displayed when using the DOS window ipconfig command only)
   - Auto configuration enabled or disabled (displayed when using the DOS window ipconfig command only)
   - IP Address
   - Subnet Mask
   - Default Gateway
   - DHCP Server Address
   - Lease Obtained
   - Lease Expired
   - Primary WINS Servers
   - Secondary WINS Servers

If the instrument was unable to join the LAN

or

If the LAN LED is red

Possible Causes	Possible Solutions
The instrument is not connected to a LAN.	If connecting the instrument to a switch or hub, verify that the instrument is connected with a standard LAN cable.
An incorrect LAN cable is being used.	• If connecting the instrument directly to a PC, verify that the instrument is connected with a cross-over cable. • If connecting the instrument to a switch or hub, verify that the instrument is connected with a standard LAN cable.
The device's LAN port is not active.	Connect the instrument to a known working LAN port.
The device is configured to use DHCP, but no DHCP server is available.	• Disable DHCP. Refer to "How to Set a Static IP Address" on page 33. • Connect the device to a LAN that uses a DHCP server.
The instrument is configured to use a duplicate static IP address.	• Make sure that no other device is using the same IP address as your instrument. • Configure your instrument to use a different IP address. Refer to "How to Set a Static IP Address" on page 33.

If the instrument's IP address or hostname cannot be found with Ping

Possible Causes	Possible Solutions
The instrument was unable to join the LAN.	See "If the instrument was unable to join the LAN" on page 40.
The instrument's LAN settings are incorrect.	Verify that the instrument's settings are appropriate for your LAN.
A firewall is preventing communication between your PC and your instrument.	Make sure that your firewall settings allow communication between your PC and other devices.
The instrument is using Auto-IP (That is, the instrument assigned itself a 169.254.x.x IP address) and your PC is not using Auto IP (That is, PC does not have a 169.254.x.x IP address.)	• Disable Auto-IP on the instrument. • Configure your PC to use Auto-IP.

If the instrument is not found by the Synthetic Instrument Finder

Possible Causes	Possible Solutions
The instrument was unable to join the LAN.	See "If the instrument was unable to join the LAN" on page 40.
The instrument and PC are on different switches/hubs and different subnets.	• Put the instrument on the same switch or hub as your PC. • If the instrument is using DHCP, make sure that the instrument and the PC are put on the same subnet. • If the instrument is using a static IP address, make sure that the instrument IP address and subnet mask put the instrument on the same subnet as your PC.

If the PC cannot communicate with the instrument using the hostname

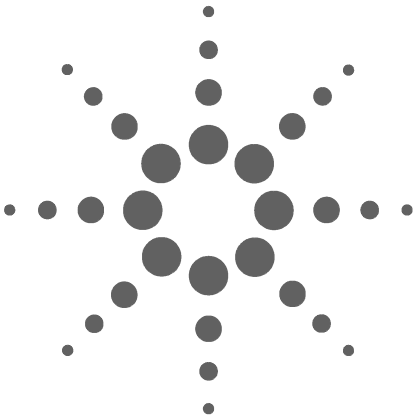
Possible Causes	Possible Solutions
No DNS server is available.	Communicate with the instrument using the instrument's IP address.
The DNS server has not been updated.	Wait several minutes.
Your PC cannot communicate with the device over your LAN.	See "If the instrument's IP address or hostname cannot be found with Ping" on page 41.

If the instrument Web page is not visible

Possible Causes	Possible Solutions
• The instrument has not yet joined the LAN. • The instrument is unable to join the LAN.	See "If the LAN LED is red" on page 40.
Your PC cannot communicate with the device over your LAN.	See "If the instrument was unable to join the LAN" on page 40.
You are attempting to use the device's hostname and the hostname is not working.	See "If the PC cannot communicate with the instrument using the hostname" on page 41.
Your browser is configured to use a proxy, and the proxy does not allow communication with instruments on the LAN.	Disable or reconfigure the proxy settings. Open Internet Explorer and select Tools > Internet Options > Connections > LAN Settings...

If the software driver will not open the connection

Possible Causes	Possible Solutions
Your PC cannot communicate with the device over your LAN.	See "If the instrument's IP address or hostname cannot be found with Ping" on page 41.
Someone else is currently connected to the instrument.	Make sure that no one else is connected to the instrument.



3
Using the Synthetic Instrument GUI

Starting the Agilent Synthetic Instrument GUI

This section describes how to access and use the Agilent Synthetic Instrument GUI.

1 From the Windows Desktop, click **Start > All Programs > Agilent SI Tools > Agilent Synthetic Instrument GUI** to access the Agilent Synthetic Instrument GUI.

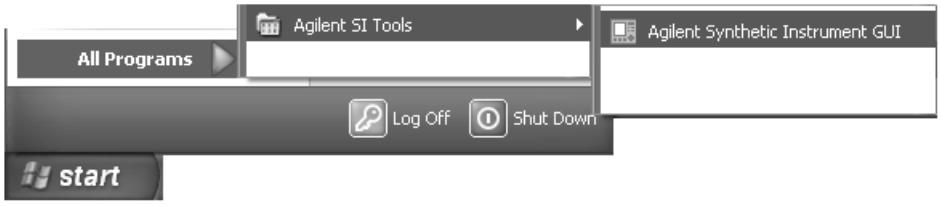


Figure 5 Agilent Synthetic Instrument GUI Menu Access Path

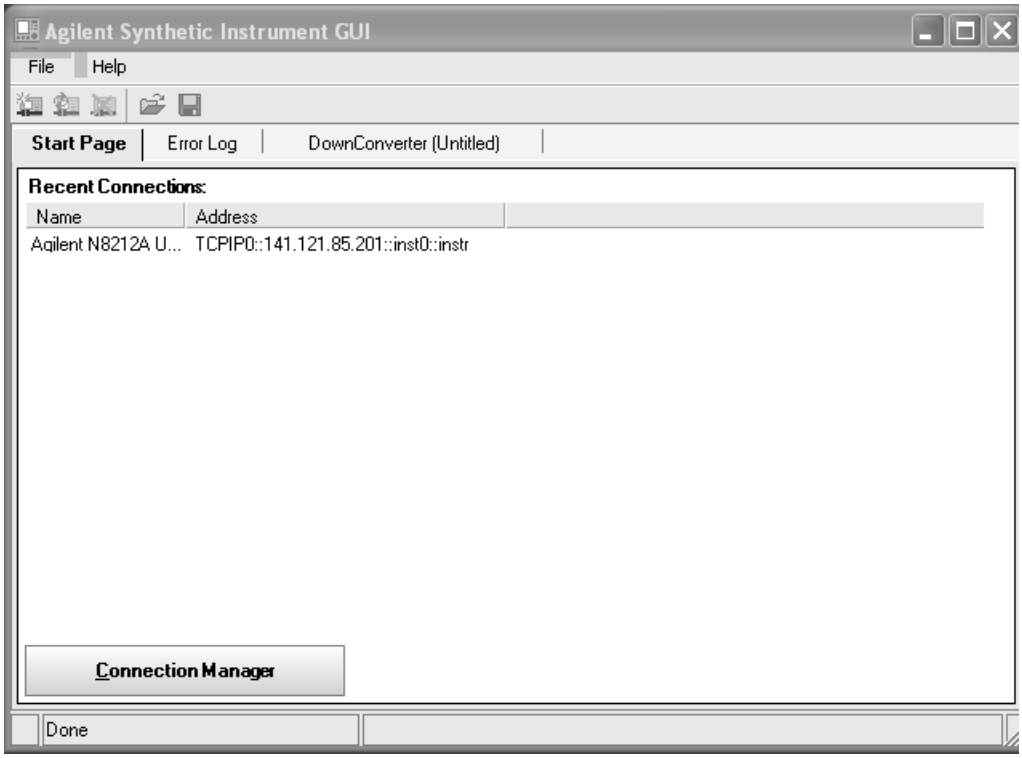


Figure 6 Agilent Synthetic Instrument GUI Start Page

2 Click the applicable N8221A IF digitizer from the Recent Connections are of the Agilent Synthetic Instrument GUI.

If this is the first time you are accessing the Agilent Synthetic Instrument GUI, (in the lower-left corner of the dialog box) click **Connection Manager** and from the Connect to Instruments dialog box, click **Find Instruments.** This should display a list of all available instruments on the LAN hub. From this list, select the N8221A IF digitizer.

3 A window similar to the following should appear.

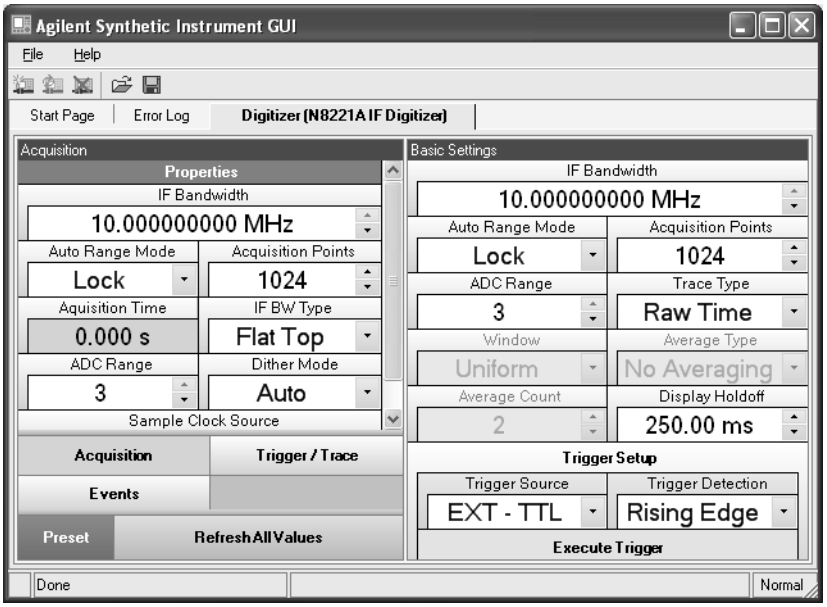


Figure 7 Agilent Synthetic Instrument GUI, N8221A IF Digitizer Settings Page

For descriptions on the Synthetic Instrument GUI settings refer to, Using the Synthetic Instrument GUI" on page 53.

Overview of the Agilent Synthetic Instrument GUI

The Agilent Synthetic Instrument GUI is divided into two main areas: the left pane and right pane.

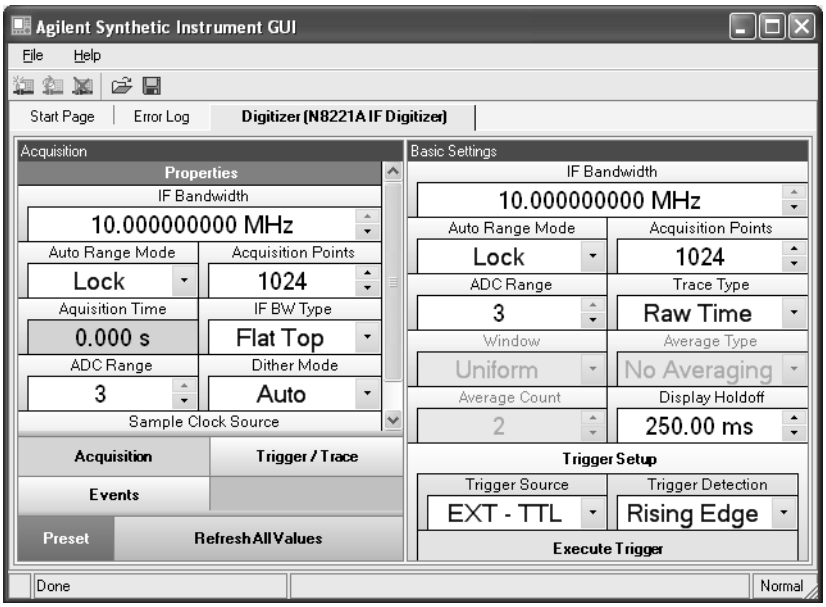


Figure 8 N8221A IF Digitizer GUI

Left Pane

The lower portion of the left pane displays the settings available for adjustment on the N8221A IF digitizer. Click a function button to activate that function and the related functions are displayed in the Properties area. For example, in Figure 8, **IF Bandwidth** is the active function. All settings associated with IF Bandwidth are available for modification. (That is: Auto Range Mode, Acquisition Points, Acquisition Time, IF BW Type, ADC Range, and Dither Mode.) Here, you can make adjustments to any of these settings.

Right Pane

The upper portion of the right pane always displays the functions that are most commonly used for a measurement. These functions are also accessible from the left pane. Changing one of these parameters changes the setting in the left pane as well.

The lower portion of the right pane has three tabs: Dynamic Help, Instrument Information, and the Event Log. For more information on theses areas, refer to “Dynamic Help" on page 50, “Instrument Information" on page 52, and “Event Log" on page 52.

Main Menu of the Agilent Synthetic Instrument GUI

File Menu

The File menu accesses options for instrument connection, save and recall settings, and exiting the application. Theses tasks are also available by clicking the icons on the tool bar.

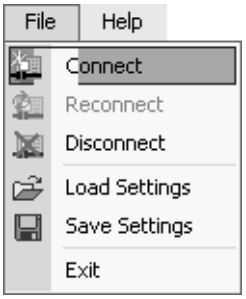


Figure 9 File sub menu

Connect

Accesses the Connect to Instrument dialog box which is used to connect to an instrument on the LAN hub.

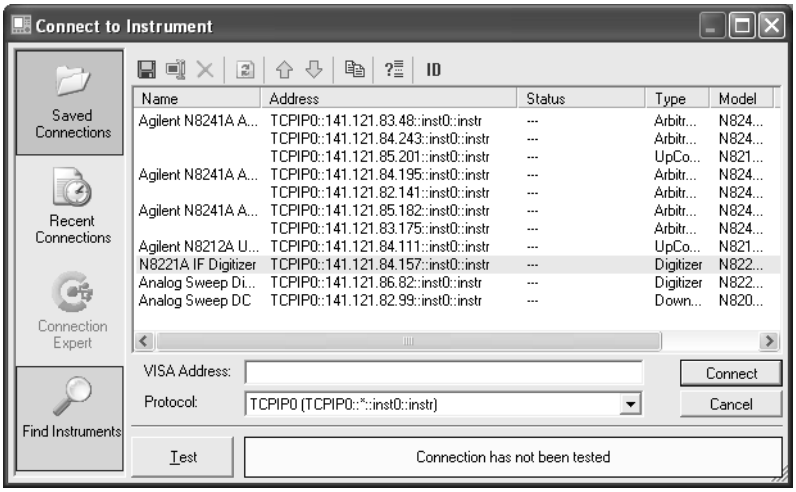


Figure 10 Connect to Instrument window

Reconnect

Re-establishes the connection to the instrument if the instrument has been disconnected.

Disconnect

Terminates the connection to the active instrument that is using the Synthetic Instrument GUI.

Load Settings

Accesses the Load Instrument Properties dialog box where you can recall user-definable instrument settings.

Save Settings

Accesses the Save Instrument Properties dialog box where you can save instrument settings for use at a later time.

Exit

Closes the Agilent Synthetic Instrument GUI application.

Help

The Help menu displays the current versions of the GUI and drivers.

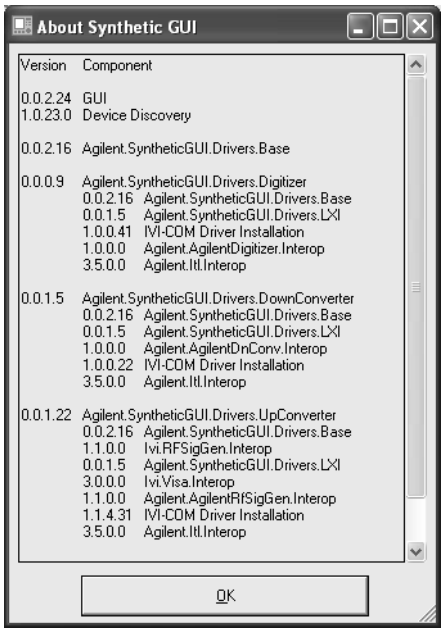


Figure 11 Help About Synthetic GUI

Tabbed Pages, Left Pane

Start Page

The Start Page lists the instruments previously connected to the Agilent Synthetic Instrument GUI.

Connection Manager Accesses the Connect to Instrument dialog box.

Saved Connections Accesses user defined connections.

Recent Connections Displays a list of instruments that have recently been controlled by the Agilent Synthetic Instrument GUI.

Connection Expert Accesses Agilent Connections Expert.

Find Instruments Lists the instruments found in Instrument Finder.

Test Tests the connection between the PC and the highlighted instrument.

Error Log

Displays a history of all instrument and GUI related errors and messages.

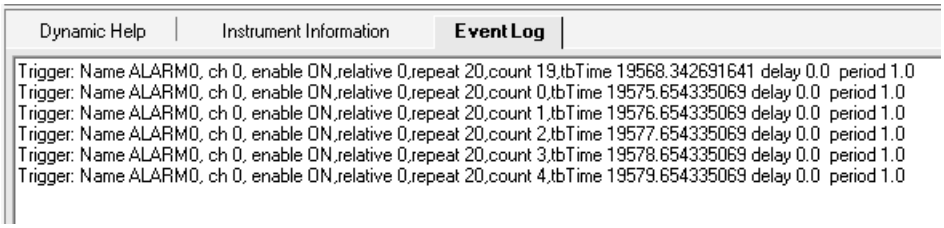


Figure 12 Error Log

N8221A IF Digitizer GUI

Accesses the settings available for modification for the active instrument.

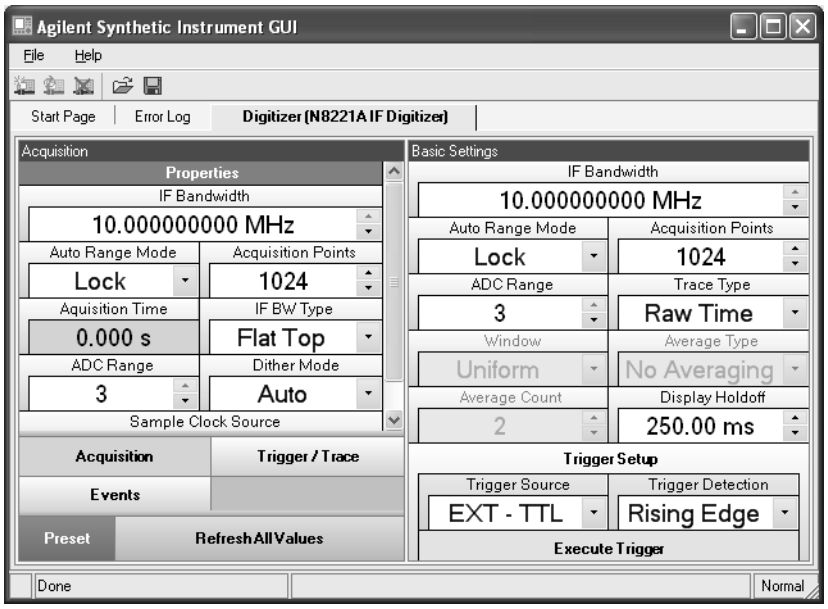


Figure 13 Upconverter properties

Tabbed Pages, Right Pane

The upper portion of the right pane always displays the functions that are most commonly used for a measurement. These functions are also accessible from the left pane. Changing one of these parameters changes the setting in the left pane as well.

The lower portion of the right pane has the following tabs: Dynamic Help, Instrument Information, and Event Log.

Dynamic Help

Provides information about the function currently selected in the left pane. In Figure 13, IF Bandwidth is the active function.

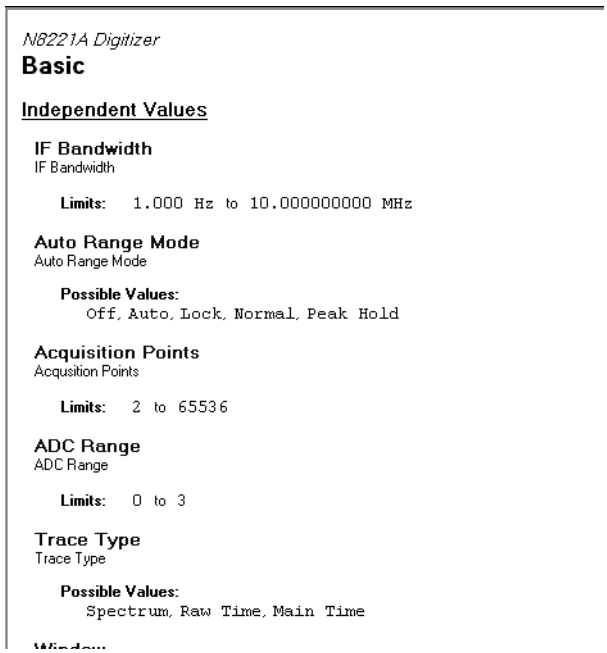


Figure 14 Dynamic Help

Instrument Information

Provides information about your N8221A IF digitizer such as the serial number, IP address, software revision used, and so on.

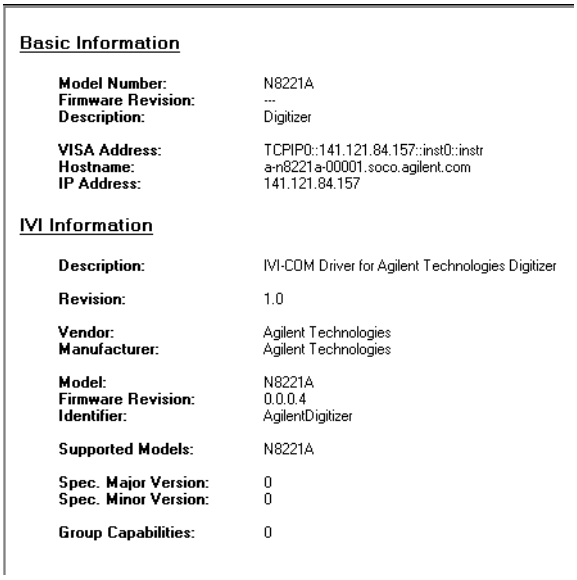


Figure 15 Instrument Information page

Event Log

When enabled in the Events parameters area, displays the event log history.

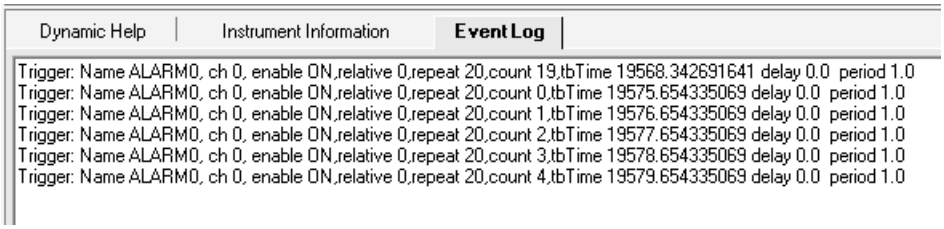


Figure 16 Event Log page

N8221A IF Digitizer Property Settings

IF Bandwidth

Sets the device IF Bandwidth.

Limits: 1.000 Hz to 10.000000000 MHz

Auto Range Mode

Sets the Auto Range Mode.

Possible Values: Off, Auto, Lock, Normal, Peak Hold

Acquisition Points

Sets the number of Acquisition Points.

Limits: 2 to 65536

ADC Range

Sets the ADC Range.

Limits: 0 to 3

Trace Type

Sets the Trace Type.

Possible Values: Spectrum, Raw Time, Main Time

Window

Sets the FFT Window.

Enabled**:** Can be set if **Trace Type** equals Spectrum.

Possible Values: Hanning, Uniform, Gaussian, Flat Top

Average Type

Sets the Average Type that is used for averaging.

Enabled**:** Can be set if **Trace Type** equals Main Time or if **Trace Type** equals Spectrum.

Possible Values:

- No Averaging
- Maximum (Available if **Trace Type** equals Spectrum)
- Minimum (Available if **Trace Type** equals Spectrum)
- RMS (Available if **Trace Type** equals Spectrum)
- Time (Available if **Trace Type** equals Main Time)

Average Count

Sets the Average Count.

Enabled**:** Can be set if **Average Type** does not equal No Averaging.

Limits: 2 to 1000

Display Holdoff

Sets the Display Holdoff value.

Limits: 50.00 ms to 60.00 s

Trigger Setup (Grouped Values)

Sets up the acquisition trigger.

Trigger Source

Sets the source of triggers. When the specified trigger occurs, the instrument will move to the next frequency in its frequency list.

Possible Values:

Free Run, EXT - TTL, LXI0, LXI1, LXI2, LXI3, LXI4, LXI5, LXI6, LXI7, LAN0, LAN1, LAN2, LAN3, LAN4, LAN5, LAN6, LAN7, ALARM0

Trigger Detection

Sets the trigger polarity. It is Positive to trigger on a rising edge and Negative to trigger on a falling edge.

Visibility: Visible if **Trigger Source** does not equal Free Run.

Possible Values: Rising Edge, Falling Edge

Alarm Mode

Sets the way that **Alarm Time** will be interpreted. In **absolute** mode, the alarm will begin firing at the time of day specified in **Absolute Alarm Time**. In **relative** mode, the alarm will begin firing at a time relative to when the alarm is set up.

Visibility: Visible if **Trigger Source** equals ALARM0

Possible Values: Relative, Absolute

Relative Alarm Time

Sets the number of seconds after pressing **Execute Trigger** that the first alarm will occur.

Visibility: Visible if **Trigger Source** equals ALARM0 and if **Alarm Mode** equals Relative.

Limits: 0.000000 s to 3600.000000000 s

Absolute Alarm Time

Sets the time that the first alarm will occur.

Visibility: Visible if **Trigger Source** equals ALARM0 and if **Alarm Mode** equals Absolute.

Limits: 1/1/1970 12:00:00 AM to 1/1/2200 12:00:00 AM

Alarm Period

Sets the time between successive alarms.

Visibility: Visible if **Trigger Source** equals ALARM0.

Limits: 0.000000 s to 3600.000000000 s

Alarm Repeat

Sets the number of times the alarm will be repeated. A value of 1 means that the alarm will occur once and will not be repeated. A value of 2 means that the alarm will occur twice. A value of 0 means that the alarm will be repeated until the alarm is disabled.

Visibility: Visible if **Trigger Source** equals ALARM0.

Limits: 0 to 1000000000

Execute Trigger

Sends the new trigger settings to the instrument.

Actions

Single Sweep

Specifies Single Sweep mode so that the instrument will stop after completing one sweep.

Toggle Continuous Sweep

Starts or stops a Continuous Sweep.

Abort Sweep

Aborts the current sweep.

4
Front and Rear Panel Connectors

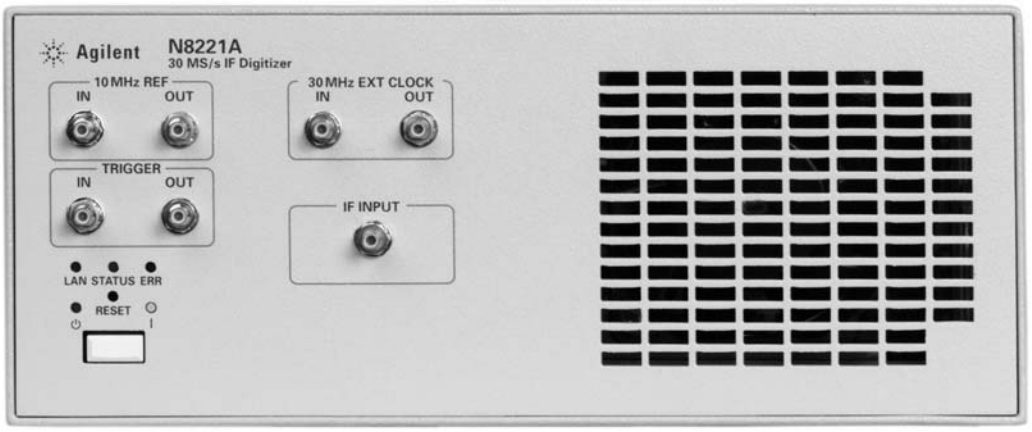


Figure 17 N8221A IF digitizer front panel

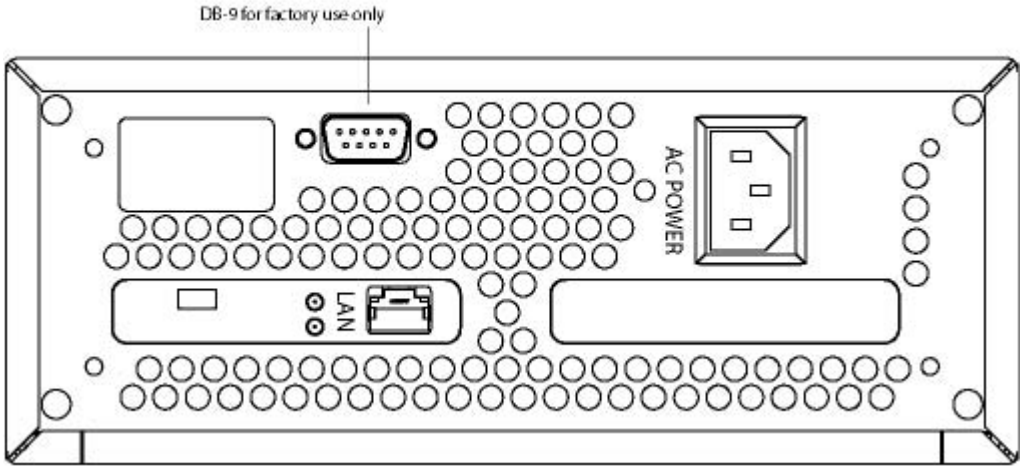


Figure 18 N8221A IF digitizer rear panel

N8221A IF Digitizer Front and Rear Panel Features

Front Panel Features

10 MHz REF IN

This SMB (male) connector accepts a 10 MHz reference signal for clock synchronization. This input accepts TTL compatible signal levels. The input is DC-coupled with 50 Ω input impedance.

10 MHz REF OUT

This SMB (male) connector outputs a 10 MHz reference signal, based on the units internal clock. The output signal is TTL compatible, DC-coupled, and 50 Ω output impedance. Nominal output power is +8 dBm.

TRIGGER IN

This SMB (male) connector accepts input triggers to the N8221A IF digitizer at TTL signal levels. This input is DC-coupled with 1 KΩ input impedance.

TRIGGER OUT

This SMB (male) connector outputs a trigger from the N8221A IF digitizer. The output signal is TTL compatible, DC-coupled and 50 Ω output impedance.

30 MHz EXT CLOCK IN

This SMB (male) connector accepts a 30 MHz external clock reference input. It uses a AC comparator with 1 KΩ input impedance. This connector accepts TTL, ECL, or >-6 dBm sine waves.

30 MHz EXT CLOCK OUT

This SMB (male) connector outputs the 30 MHz internal clock reference signal. The output signal is TTL compatible, DC-coupled and 1 KΩ output impedance.

IF INPUT

This SMB (male) connector accepts a 7.5 MHz IF input signal. The nominal input impedance is 50 Ω.

Power Switch

This switch offers a switching function between a power standby state and the power on state.

Rear Panel Features

AC Power Receptacle

The AC voltage is connected here. The power cord receptacle accepts a three-pronged power cable that is shipped with the N8221A IF Digitizer. The voltage range is 100/120/220/240 volts with a frequency range of 50 to 60 Hz and is automatically selected by the power supply.

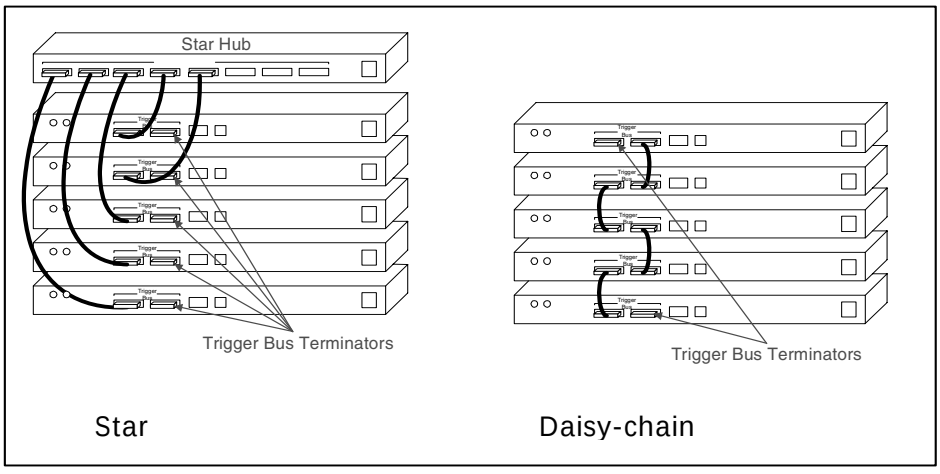
LXI Trigger Bus

The LXI (LAN eXtensions for Instrumentation) Trigger Bus is a hardware bus providing eight trigger channels using M-LVDS (low-voltage differential signaling). Cables connect various instruments together in a daisy chain or star configuration. Any instrument in a cluster can send or receive triggers on any of the channels.

NOTE

For more information about the LXI Trigger Bus and LAN triggering, refer to the following "LXI Consortium" white papers on the "Agilent N8221A IF Digitizer Documentation CD":

- White_Paper_1_The_Appliaction_of_IEEE_1588_to_Test_and_Measurement_System
- White_Paper_2_LXI_Triggering
- White_Paper_3_Wired_Trigger_Bus_Physical_Aspects



LAN - This LAN interface allows ethernet local area network communication through a 100BaseT LAN cable.

CAUTION Electrostatic discharge (ESD) can damage the highly sensitive components in your instrument. ESD damage is most likely to occur as the instrument is being installed or when cables are connected and disconnected. Protect the circuits from ESD damage by wearing a grounding strap that provides a high resistance path to ground. Alternately, ground yourself to discharge any static charge built-up by touching the outer shell of any grounded instrument chassis before touching the port connectors.

USB

This is not a functional connector.

DB-9

This connector is for factory testing only.

Interconnect Cabling

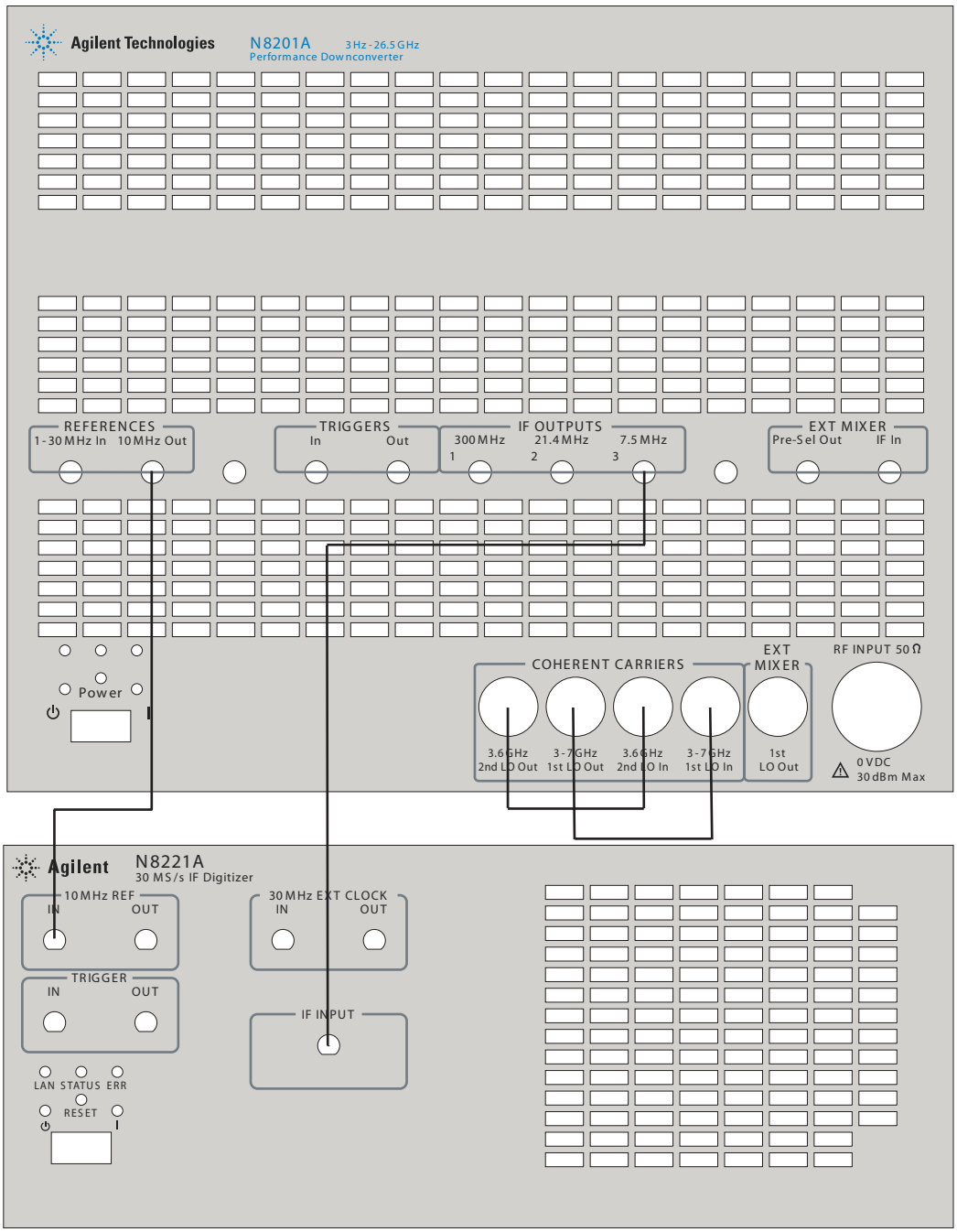


Figure 19 Interconnect cabling for the N8201A performance downconverter/N8221A IF digitizer

Operational Considerations

This section includes instructions for configuring a LAN interface to the Agilent Technologies N8201A performance downconverter and the N8221A IF digitizer. The instructions assume that the computer being used has a LAN card installed and is configured for TCP/IP protocol.

Agilent 89601A Vector Signal Analysis Software

The Agilent Technologies 89601A vector signal analysis (VSA) software is the virtual instrument interface for the N8201A performance downconverter/N8221A IF digitizer and offers a wide range of troubleshooting tools for analyzing signals.

Configuring the Local Area Network (LAN) Interface

You must ensure that the IP addresses for your computer and N8201A performance downconverter/N8221A IF digitizer are compatible, then configure the LAN interface. The IP address consists of four groups of numbers separated by periods (for example 192.168.1.5).

CAUTION The factory default IP address for the N8201A/N8221A is: 192.168.1.5. Changing the default IP address may cause the instruments to not communicate across the LAN.

To Change the IP Address on the N8221A IF Digitizer:

To configure the IP address on the N8221A IF digitizer

Step	Notes
1 Open Windows® Explorer	•
2 Enter the current IP address of the digitizer into the address entry box.	•
3 Click "GO"	• The N8221A IF digitizer's Welcome Page is displayed. **NOTE:** After loading the Welcome Page, the browser attempts to reload the Welcome Page using the hostname assigned to the digitizer. If the page cannot be located using the hostname, use Notepad to add the digitizer's IP address and hostname to:C:\ WINNT\system32\drivers\etc\lmhosts file using Notepad. An example line in the 1mhosts file: 100.100.100.99 digi99 Save the file and reload the Welcome Page using the IP address as done previously.

To configure the IP address on the N8221A IF digitizer

Step	Notes
4 Click **View and Modify Configuration** at the left of the displayed page.	• The Current Configuration page will be displayed.
5 Click **Modify Configuration**. If the password is still set to the default (“agilent”) click submit, otherwise, enter the password and click “Submit”.	• The Configuration Setup page will be displayed.
6 Find the IP address text box and enter the new IP address.	•
7 Click **Save**.	•
8 When the save is complete, click **Renew LAN Settings**.	• When the command completes, the IP address will have changed.
9 Enter the new IP address in the browser’s address entry box and click “Go”.	• You may also want to edit your lmhosts file to reflect the change. See step 3.

5
Preventive Maintenance

This chapter provides preventative maintenance information, which should be reviewed prior to working with the Agilent system. This information applies to all Agilent-supplied instruments in the system and the system as a whole.

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 1.
Never exceed the recommended torque when attaching cables.

Table 1 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 2).)
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 2 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.

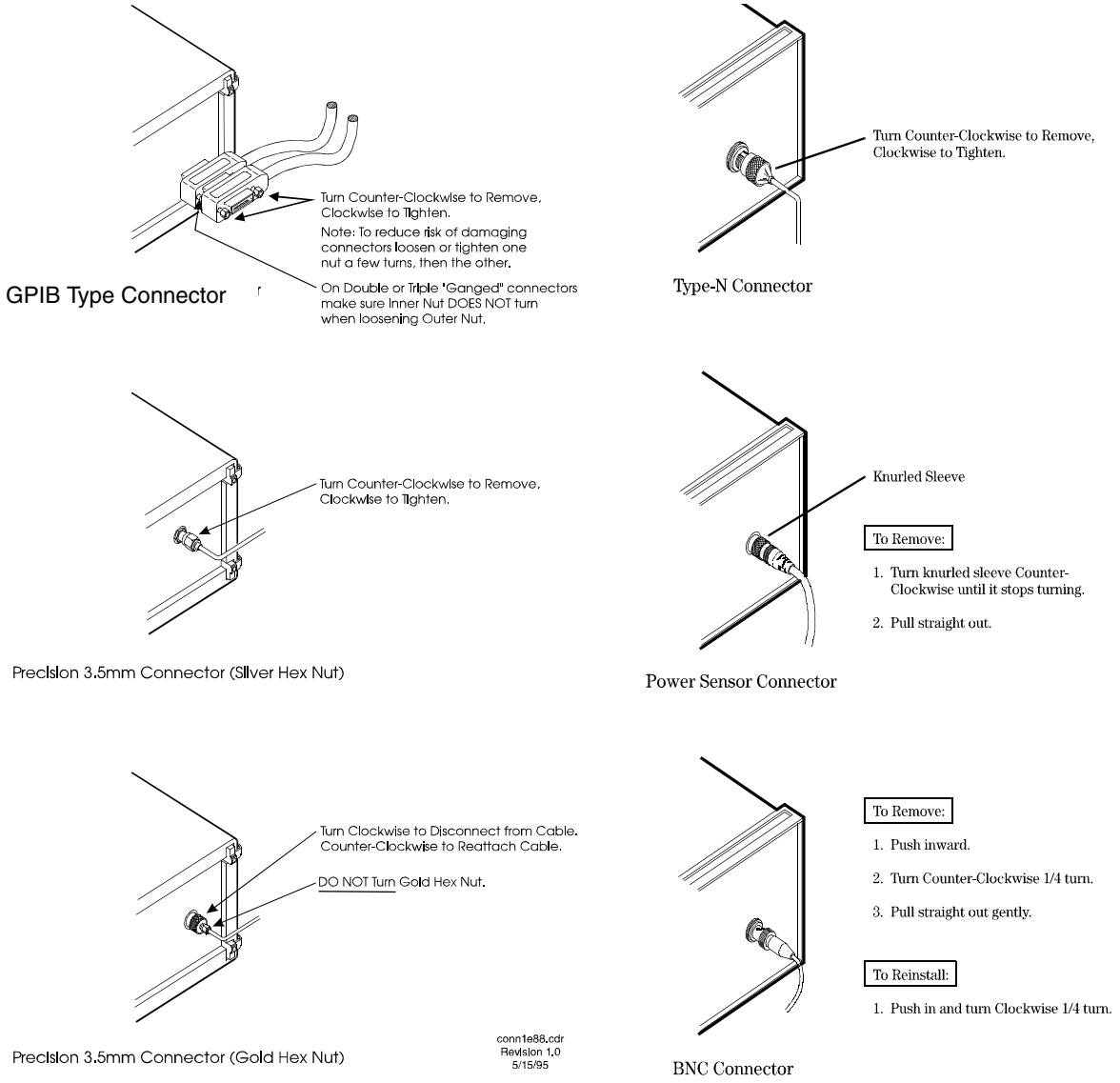


Figure 20 GPIB, 3.5 mm, Type-N, power sensor, and BNC connectors

Connector Removal

GPIB connectors

These are removed by two captured screws, 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.	

Benchtop Instrument

To remove an instrument from a bench top system

1	Power off each instrument in the system.	
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 reinstall 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.	
2 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.
3 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.
4 Confirm that the instrument is turned off.	
5 Connect the appropriate cables to the instruments (front and rear), including the power cords.	
6 Power on the system.	.

Bench top instrument

To install an instrument in a bench top system

1 Make sure the system is powered off.	
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.	
5 Set the instrument GPIB address, if necessary.	

6
Service, Support, and Safety Information

This chapter provides safety and regulatory information that should be reviewed prior to working with the Agilent system. The information contained in this chapter 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 reinstalling it.

Safety and Regulatory Information

EMC

Complies with European EMC Directive 89/336/EEC, amended by 93/68/EEC

- IEC/EN 61326
- CISPR Pub 11 Group 1, Class A
- AS/NZS CISPR 11:2002
- ICES/NMB-001

Complies with Canadian EMC Requirements

This ISM device complies with Canadian ICES-001

Cet appareil ISM est conforme a la norme NMB du Canada.

Safety

Complies with European Low Voltage Directive 73/23/EEC, amended by 93/68/EEC

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

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. Contact your Agilent sales representative to obtain a copy of the Declaration of Conformity. Alternately, contact Agilent via: www.Agilent.com.

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 position	normaler Betrieb
per ISO 7779	nach DIN 45635 t.19

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 **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 **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 second edition and 664 respectively. This instrument or system is designed to operate at altitudes up to 4600 meters, and at temperatures between 0°C and 55 °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 3, "Safety symbols and instrument markings," on page 84.

Position the instrument so that it is not difficult to operate the disconnecting device.

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

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.**

Magnetic Susceptibility

CAUTION Degradation of some product specifications can occur in the presence of ambient power frequency magnetic fields of 30 A/m or greater. The product self-recovers and operates as specified when removed or shielded from the ambient magnetic fields.

Vibration

CAUTION Degradation of some product specifications can occur if this instrument is operated while subjected to continuous vibrations of less than or equal to 0.21 grms in the 5 Hz to 500 Hz frequency range.

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 3 defines the symbols and markings you may find in a manual or on an instrument.

Table 3 Safety symbols and instrument markings

Safety symbols	Definition
	Warning: risk of electric shock.
	Warning: hot surface.
	Caution: refer to instrument documentation.
	The CE mark is a registered trademark of the European Community.
	The CSA mark is a registered trademark of the CSA-International. This instrument is in compliance with CSA 1010 Edition2.
 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.

Table 3 Safety symbols and instrument markings (continued)

Safety symbols	Definition
	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, 200/96/EC).
ISM1-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).
	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.
	Terminal is at earth potential. Used for measurement and control circuits designed to be operated with one terminal at earth potential.
	Terminal for neutral conductor on permanently installed equipment.
	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.
	OFF (supply); a switch with this symbol opens the instrument's power supply circuit, disconnecting it with the mains supply.
	ON (supply); a switch with this symbol closes the instrument's power supply circuit, connecting it with the mains supply.

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.**

CAUTION Any operator-replaceable parts or supplies are required to be examined or supplied by Agilent Technologies.

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 (N8201A, 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.

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 upconverter 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.

7 Glossary

Auto-IP Auto-IP is a method used by a device to self select an IP address. When a device is using Auto-IP, it randomly selects an address of the form `169.254.x.x`. If another device is already using that address, it selects another random address, and continues to select new addresses until it finds one that is not being used by any other instrument.

Cross-Over Cable A cross-over cable can be used to connect two devices directly to each other, without a **network switch** or any other hardware in-between. It is common to use **static IP addresses** when devices are connected using a cross-over cable, because there is no **DNS**, and there are no other devices on the connection that could cause an **IP address conflict**.

Default Gateway The default gateway is used by a device to communicate with devices that have IP addresses that are on different subnets. This would usually be the IP address of the router that connects the device's subnet to the rest of the network.

DHCP [Dynamic Host Configuration Protocol] In order to avoid **IP address conflicts**, and to simplify the process of connecting devices to a network, larger networks will sometimes use DHCP to assign IP addresses to devices.

When a device is configured to use DHCP, it attempts to communicate with the **DHCP server** when it is powered on. If it is able to communicate with the server, it asks the server for the correct network settings (including **IP Address, Subnet Mask, Gateway**, and so on) to communicate on the network. If the device is unable to communicate with the DHCP server, it will either go into a failure mode, or (if configured to do so) it will attempt to assign itself an IP address. (See **Auto-IP**)

Because the IP address assigned to an instrument can be different every time it is powered on, you cannot remember the IP address and expect to always be able to use that address to communicate with the instrument. However, networks using DHCP will often also use **DNS**, which can allow you to communicate with a device using a **hostname** that will stay the same, even if the device's IP address has changed.

DHCP Server The DHCP server responds to devices' requests for network settings. It is responsible for ensuring that no two devices attempt to use the same IP address.

DNS [Domain Name Server] A domain name server allows someone to communicate with a device using the device's hostname. When a device joins a network, it tells the domain name server its hostname and its IP address. When a hostname is used, the domain name server is asked which IP address the name corresponds to, and that address is then used to communicate with the instrument.

If the IP address of the device changes, it can request that its entry in the domain name server be updated. Any following requests that use the same hostname as before, will be sent to the new address.

Hostname A hostname is a unique name that can be used to communicate with a device on a network. Hostnames are commonly used in situations where devices have their addresses assigned to them using **DHCP**.

Hostnames can only be used if there is some way that the network can keep track of which hostname corresponds to an instrument. This is usually done using **DNS**.

Networks without DNS have no way to associate a hostname with a device. This is often true of small private LAN networks (for example, a network consisting of two devices connected using a **cross-over cable**, or through a simple router). In these cases, it is probably easiest to use **static IP addresses**.

IP Address [Internet Protocol Address] An IP address is a unique number assigned to a device which is used to send or receive data to and from other devices.

The most common IP addresses are IP Version 4. These addresses are usually written as four numbers (from 1 to 255) separated by periods. For example, `192.168.1.1` and `169.254.12.34` and `141.121.84.241` are all IP addresses.

A device's IP address can be assigned to it manually (See **Static IP Address**), assigned to it by another computer (See **DHCP**) or can be self-determined (See **Auto-IP**).

IP Address Conflict An IP address conflict occurs when two devices attempt to join the same network with the same **IP address**. When this happens, it may become impossible to communicate with either instrument over the LAN. Using dynamically assigned addresses can help avoid this problem. (See **DHCP** or **Auto-IP.**)

LAN [Local Area Network] A LAN is a network of devices connected to each other using LAN cables and **network switches**.

Network Switch A network switch is used to connect several devices together to form a LAN. It has several LAN ports that LAN cables can be connected to.

If it is necessary to create a network with more devices than can connect to a single network switch, one (or more) switches can be attached to the first switch.

Private LAN A private LAN network is defined as a local area network in which LAN-enabled instruments and Windows PCs are not connected to a site LAN (workgroup LAN, Intranet, or enterprise LAN). When using a private LAN, the designer of the LAN is responsible for defining all private LAN parameters.

Private Network All of the devices on a private network use IP addresses that have been reserved for private use. The most common private network IP addresses are of the form `192.168.x.x` and `169.254.x.x`. Devices which have been assigned a private network IP address cannot generally communicate with other devices outside of their private network. Many devices can use the same IP address (for example, `192.168.1.1`) as long as they each belong to different private networks.

Router A router can be used to transfer messages between two (or more) networks. Routers are often used to connect a private network to a larger network (for example, a company network, or the Internet). The router can also be used to isolate a local network from a larger coporate or public network.

Site LAN A site LAN is a local area network in which LAN-enabled instruments and Windows PCs are connected to a site LAN (workgroup LAN, Intranet, or enterprise LAN) through (optional) routers, hubs, and/or switches.

Static IP Address A device uses a static IP address when it always attempts to use the same IP address every time that it is turned on. Using a static IP address can be useful if you always want to communicate with an instrument using the same address every time it is turned on. However, using a static IP address can lead to **IP address conflicts** if two instruments are given the same static IP address.

Subnet (Subnetwork) A subnet is a group of devices which is a subset of a larger group of devices. Breaking a large network down into many smaller subnets can make the network easier to manage, and can decrease the amount of traffic that gets sent between devices.

One thing a device on a network can do is send a message to all of the other devices on its subnet. If a network consists of only a single subnet, that message would have to be sent to every device on the network. However, if the network has been broken down into subnets, the message would only be sent to other devices on the same subnet as the device sending the message.

Subnet Mask A subnet mask is used to specify how a network is broken down into **subnets**. Subnet masks look like IP addresses; they are of the form `x.x.x.x`. Common subnet masks include `255.0.0.0`, `255.255.0.0` (use this for private networks), and `255.255.255.0`.

When written in binary, subnet masks usually become several `1`s followed by several `0`s.

For example:

`255.255.0.0`

would become

`11111111.11111111.00000000.00000000.`

The subnet mask can be used with a device's IP address to determine the address of the subnet that the device is on. To do this, you perform a logical AND of the subnet mask and the IP address. (A logical AND combines two binary numbers into a single number. The new number contains 1s in positions where both numbers had 1s, and 0s everywhere else.)

For example, if a device has an IP address of 192.168.12.34 and the subnet mask 255.255.255.0 then:

192.168.12.34 =	11000000.	10101000.	00001100.	00100010
255.255.255.0 =	11111111.	11111111.	11111111.	00000000
Subnet Address =	11000000.	10101000.	00001100.	00000000
	192	168	12	0

The device is on the subnet with the 192.168.12.0 address.

A device with the IP address 192.168.12.100 is on the same subnet as the device with the IP address 192.168.12.34 (the 192.168.12.0 subnet), but a device with an IP address of 192.168.100.34 is on a different subnet (the 192.168.100.0 subnet).