Agilent E7501A Arbitrary Analog Signal Development System

(...a component of *Signal Studio*™)

Getting Started

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Service and Support

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Review this product and related documentation to familiarize yourself with safety markings and instructions before you operate the instrument. This product has been designed and tested in accordance with international standards.

WARNING

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

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The **CAUTION** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like, which, 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.

Instrument Markings

	When you see this symbol on your instrument, you should refer to the instrument's instruction manual for important information.
	This symbol indicates hazardous voltages.
	The laser radiation symbol is marked on products that have a laser output.
	This symbol indicates that the instrument requires alternating current (ac) input.
	The CE mark is a registered trademark of the European Community. If it is accompanied by a year, it indicates the year the design was proven.
	The CSA mark is a registered trademark of the Canadian Standards Association.
1SM1-A	This text indicates that the instrument is an Industrial Scientific and Medical Group 1 Class A product (CISPR 11, Clause 4).
	This symbol indicates that the power line switch is ON.
	This symbol indicates that the power line switch is OFF or in STANDBY position.

⏚ Safety Earth Ground

This is a Safety Class I product (provided with a protective earthing terminal). An uninterruptible safety earth ground must be provided from the main power source to the product input wiring terminals, power cord, or supplied power cord set. Whenever it is likely that the protection has been impaired, the product must be made inoperative and secured against any unintended operation.

Before Applying Power

Verify that the product is configured to match the available main power source as described in the input power configuration instructions in this manual. If this product is to be powered by autotransformer, make sure the common terminal is connected to the neutral (grounded) side of the ac power supply.

Typeface Conventions

Italics

- Used to emphasize important information:
  Use this software *only* with the Agilent Technologies xxxxxX system.
- Used for the title of a publication:
  Refer to the *Agilent Technologies xxxxxX System-Level User's Guide*.
- Used to indicate a variable:
  Type `LOAD BIN` *filename.*

`Instrument Display`

- Used to show on-screen prompts and messages that you will see on the display of an instrument:
  The Agilent Technologies xxxxxX will display the message **`CAL1 SAVED`**.

[Keycap]

- Used for labeled keys on the front panel of an instrument or on a computer keyboard:
  Press **[Return]**.

{Softkey}

- Used for simulated keys that appear on an instrument display:
  Press ***{Prior Menu}***.

`User Entry`

- Used to indicate text that you will enter using the computer keyboard; text shown in this typeface must be typed *exactly* as printed:
  Type `LOAD PARMFILE`
- Used for examples of programming code:

```
#endif // ifndef NO_CLASS
```

`Path Name`

- Used for a subdirectory name or file path:
  Edit the file *`usr/local/bin/sample.txt`*

Computer Display

- Used to show messages, prompts, and window labels that appear on a computer monitor:
  The **Edit Parameters** window will appear on the screen.
- Used for menus, lists, dialog boxes, and button boxes on a computer monitor from which you make selections using the mouse or keyboard:
  Double-click **EXIT** to quit the program.

In This Book...

In this book, you will learn about:

- Installation of Hardware and Software
- Performing Manual Acceptance Tests
- Using SCPI Interfaces
- Specifications and Characteristics

This book prepares you for your first steps in using the Agilent E7501A arbitrary analog signal developer.

The standard Agilent E7501A arbitrary analog signal developer forms a frequency source and consists of a microwave synthesizer coupled with a three-channel arbitrary waveform generator (ARB) for generating AM, FM, and Pulse drive signals. The frequency source is implemented in a C-size, VXI mainframe that occupies four to six slots; the actual number of slots depends on the Slot 0 module being used.

Agilent E7501A arbitrary analog signal developer software is used to produce signals with AM, FM, and Pulse modulations and save all information about the signal in what is referred to as a Signal Plan. You can use the features of this software through its main GUI or through a remote-programming interface. The way that the main GUI is used is dependent on the view that you select. There are currently three views available: RF Source Control View, Stimulus Parameters View, or Signal Plan View. While all views give you access to information used in a Signal Plan, there is a difference in the way in which information is accessed and displayed. In addition, each view gives you access to different sets of parameters in a Signal Plan. When using the software through a remote-programming interface, you control the software by the use of SCPI commands that are sent through either the E7501A SCPI Interface, the E7501A SCPI Assistant, a LAN interface, or a GPIB interface.

How to proceed…

First, review the hardware and software requirements for using this product. After installing the Agilent E7501A arbitrary analog signal developer software, start the program and become familiar with the features available on the main GUI, various pull-down menus, dialog boxes, and the various views available.

This software is used to produce signals with AM, FM, and Pulse modulations and save all information about the signal in what is referred to as a Signal Plan. A Signal Plan is a detailed description of a signal which is used to generate physical signals in a hardware independent manner.

If you have your hardware assets available, you can learn about preparing the software to work with your hardware. Finally, you can learn about producing signals and developing a Signal Plan by working through the main GUI or a SCPI interface.

Contents

1 Installation and Configuration

Preconfigured System
A preconfigured system includes a computer shipped from Agilent Technologies with all required hardware and software pre installed.

This chapter helps guide you though the process of installing both the hardware (if you did not order a **preconfigured system**) and the Agilent E7501A arbitrary analog signal developer software. A set of acceptance tests are also included at the end of this installation process. The acceptance tests are intended as functionality checks and are not intended for testing against customer specifications.

If You Ordered

...Preconfigured System, perform the following steps:	...Option 1FF (delete computer), perform the following steps:
Skip "Hardware and Software Requirements" on page 1-2	Confirm that your system meets all "Hardware and Software Requirements" on page 1-2
"Step 1. Unpacking the Agilent E7501A System" on page 1-3	"Step 1. Unpacking the Agilent E7501A System" on page 1-3
Skip Steps 2 to 4	"Step 2. Installing the System Hardware" on page 1-4
	"Step 3. Installing the Agilent E7501A Software" on page 1-7
	"Step 4. Configuring Hardware/Software Assets" on page 1-10
"Step 5. Starting the Agilent E7501A Software" on page 1-20	"Step 5. Starting the Agilent E7501A Software" on page 1-20
"Performing Acceptance Test Procedures" on page 2-1	"Performing Acceptance Test Procedures" on page 2-1

Hardware and Software Requirements

- Pentium® microprocessor (400 MHz or higher recommended)
- Windows NT 4.0® with Service Pack 5 or higher
- Minimum of 128 MB of RAM or higher
- Minimum of 1 GB hard disk space or higher
- CD-ROM drive
- Agilent E8403A C-size VXI mainframe or equivalent with five or six empty slots (the number of slots is dependent on the Slot 0 module used)

- One of the following Slot 0 modules:

❑ Agilent E8491B IEEE-1394 PC Link to VXI - Using a PCI to IEEE-1394 Interface

  ○ Agilent I/O Libraries Version J.01.02 or higher (which contains Agilent Technologies VISA)

❑ Agilent 9850A VXI Embedded PC Controller or equivalent

  ○ Agilent I/O Libraries Version J.01.02 or higher (which contains Agilent Technologies VISA)

  ○ Agilent External CD-ROM drive and its interface cable

❑ NI VXI-MXI-2 - Using a PCI-MXI-2 Interface

  ○ National Instruments VISA I/O Library Version 2.0 or higher

NOTE

Agilent E7501A arbitrary analog signal developer is not compatible with National Instruments MXI-1 or GPIB interfaces, or an Agilent 82341A GPIB interface card or its equivalent.

Step 1. Unpacking the Agilent E7501A System

1. Unpack and inspect the shipping container and its contents thoroughly to ensure that nothing was damaged during shipment.

   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 nearest Agilent Technologies Sales and Service office. Keep the shipping materials for the carrier's inspection.

   Verify that all parts and materials were included in the shipping container:

   - **Getting Started** - this document
   - **Software CD** - contains all software components for installing the Agilent E7501A arbitrary analog signal development system
   - **Parallel Port License Key**- contains a hardware license key (dongle) that attaches to the parallel printer port on the rear of your PC and is used to validate a use license; if you order a VXI Embedded PC, the license key is connected to the parallel printer port through an interface adapter cable that is supplied with the PC.
   - **VXI Mainframe** - Agilent E8403A C-size mainframe
   - **RF Source** - Agilent E6432A microwave synthesizer
   - **Modulation Source** - Racal 3153 waveform generator
   - **Three Cables** - for connecting AM, FM, and Pulse input and output ports between the RF source and the modulation source
   - **External CD-ROM Drive** - this external CD-ROM drive and its interface cable is only supplied when your system uses a VXI Embedded PC controller as the Slot 0 module

Step 2. Installing the System Hardware

NOTE

If you ordered a preconfigured system, skip this step and proceed to "Step 5. Starting the Agilent E7501A Software" on page 1-20.

CAUTION

Do not turn power on to the C-size VXI mainframe until all VXI modules have been installed and you have made all peripheral connections to the Slot 0 module being used.

If you have problems or questions reqarding the following processes, refer to the manufacturers' documentation for the product in question.

1. Set up an Agilent Technologies E8403A C-size VXI mainframe or equivalent.
2. Turn power off to the C-size VXI mainframe and install the Slot 0 module being used.
3. Set the logical addresses of the Agilent Technologies E6432A microwave synthesizer and Racal 3153 waveform generator:
   - The units can be Auto Configured when set to address 255 (FF).
   - If you prefer to manually select the addresses, the factory suggests using address 210 (D2) for the Agilent Technologies E6432A microwave synthesizer and 3 for the Racal 3153 waveform generator.
4. Install the Agilent Technologies E6432A microwave synthesizer and Racal 3153 waveform generator into the C-size VXI mainframe.
5. Connect the front panel cables as follows:

Agilent Technologies E6432A	Racal 3153
Pulse	Output 1
FM	Output 2
AM	Output 3
10 MHz Out 0 dBm	10 MHz REF INPUT

6. Depending on the Slot 0 module being used, perform one of the following two procedures:

❑ "If using a VXI Embedded PC Controller as the Slot 0 module:" on page 1-5

❑ "If NOT using a VXI Embedded PC Controller as the Slot 0 module:" on page 1-6

If using a VXI Embedded PC Controller as the Slot 0 module:

a. Turn power ON to the C-size VXI mainframe.

b. Run the pre-installed Agilent I/O Config utility (which is part of Agilent I/O Libraries).

CAUTION

Use extreme caution when connecting peripheral cables to the embedded controller. The I/O base board of the embedded controller provides power for peripheral devices through different pins. Making incorrect connections can damage the board and may damage the peripheral device being connected.

i. Connect any desired peripherals (keyboard, mouse, serial ports, monitor, and SCSI devices) and turn power on to the C-size VXI mainframe. When the system is powered on, the embedded controller automatically runs the program SURM [Startup Resource Manager].

ii. Before the Windows NT software (including Agilent VISA) can be used, the I/O Config utility must be run. You can run the I/O Config utility that is located in the Agilent I/O Libraries program folder. The I/O Config utility is used by the Agilent I/O Libraries to configure instrument I/O interfaces. An interface must be configured before it can be used.

While running the I/O Config utility, check the box labeled, `"Configure interfaces automatically"`.

iii. Reboot the C-size VXI mainframe so that changes take effect.

iv. Run Resman [VXI Resource Manager] and verify that the Slot 0 module being used is found. Resman is available from the Windows NT Start task bar by selecting:

`Start/Programs/National Instruments VXI/Resman`

v. Proceed to "Step 3. Installing the Agilent E7501A Software" on page 1-7.

If NOT using a VXI Embedded PC Controller as the Slot 0 module:

a. Set up a Windows NT computer with Service Pack 5 or higher that has a CD-ROM drive and a minimum of 128 MB or RAM.

b. Turn power OFF to the Windows NT computer and install the PCI interface card being used.

PCI Interface Card Being Used	Slot 0 Module Being Used
PCI to IEEE-1394 Interface	Agilent Technologies E8491B IEEE-1394 PC Link to VXI
PCI-MXI-2 Interface	National Instruments VXI-MXI-2

c. Connect the interface cable between the PCI interface card and the Slot 0 module being used.

   When connecting between an Agilent E8491B Slot 0 module and the PCI to IEEE-1394 interface, any available IEEE-1394 port may be used.

d. Turn power ON to the Windows NT computer and the C-size VXI mainframe.

e. Proceed to “Step 3. Installing the Agilent E7501A Software” on page 1-7.

Step 3. Installing the Agilent E7501A Software

NOTE

If you ordered a preconfigured system, skip this step and proceed to "Step 5. Starting the Agilent E7501A Software" on page 1-20.

1. Insert the Agilent E7501A arbitrary analog signal developer CD-ROM.

   If the CD does not auto install, the `Setup.exe` file can be executed from the Windows NT Start task bar by selecting: `Start/Run and typing D:\Setup.exe` (where `D:\` is the path to the CD-ROM drive).

The following is performed during the installation process:

2. The version of the operating system is checked to assure Windows NT 4.0 is installed.

   If Windows NT 4.0 is not found, a message is displayed and the installation process is aborted.

3. The computer is checked to assure that a minimum of 128 MB of RAM is installed.

   If there is not 128 MB or more of RAM available, a message is displayed informing the user that the software will run slow, but the installation process can still continue.

4. The version of the Service Pack is checked to assure Service Pack 5 or greater is installed.

   If Service Pack 5 or greater is not installed, a dialog box is displayed allowing the Service Pack to be upgraded.

   - If you answer "no" to the dialog box, a message is displayed and the software installation process is aborted.

   - If you answer "yes" to the dialog box, the software installation process is aborted and a Service Pack installation is run. After the Service Pack upgrade is complete, the software installation process must be restarted from step 1 of this procedure.

     The user is prompted to select a Slot 0 module for I/O communication or to install the software to run in Demonstration Mode (Demo Mode).

Use Demo Mode or select a Slot 0 Module

- If Demonstration Mode is selected, no I/O libraries are required and the Agilent E7501A arbitrary analog signal developer software can be used without hardware.

If You Select a Slot 0 Module

- If Slot 0 is selected to be an Agilent E8491B IEEE-1394 PC Link to VXI, the Agilent I/O Libraries are installed.

  During the installation of Agilent I/O Libraries (which contains Agilent VISA):

  a. Check the box labeled,
  `"Install Agilent E8491 VXI Components".`

  This installs code for the PCI to IEEE-1394 interface card.

  b. Check the box labeled
  `"Configure interfaces automatically".`

  (If this box is not checked, you must manually configure the PCI to IEEE-1394 interface card using the I/O Config utility before it can be used with the Agilent I/O Libraries. The I/O Config utility is used by the Agilent I/O Libraries to configure instrument I/O interfaces. An interface must be configured with the I/O Config utility before it can be used with the Agilent I/O Libraries. For further information on using the I/O Config utility, refer to the documentation that came with the PCI to IEEE-1394 interface card.)

- If Slot 0 is selected to be a National Instruments VXI-MXI-2, the National Instruments VISA Library is installed.

  The following steps must be performed after the installation of the National Instruments VISA Library:

  a. Run the program T&M Explorer [Test and Measurement Explorer].

  T&M Explorer is available from the Windows NT Start task bar by selecting:
  `Start/Programs/National Instruments VXI/T&M Explorer.`

  b. Select the PCI-MXI-2 interface.

  c. Right-mouse click and select `Hardware Configuration.`

  d. Select the **PCI tab** and select the checkbox labeled:
  `Enable low-level register access API support.`

  e. Select the down arrow on the `User window size` entry box, select **8 MB**, and select OK.

  f. Exit T&M Explorer.

g. Reboot the Windows NT computer and VXI mainframe so that changes take effect.

h. Run the program Resman [VXI Resource Manager] and verify that the Slot 0 module being used is found.

   Resman is available from the Windows NT Start task bar by selecting:
   `Start/Programs/National Instruments VXI/Resman.`

Step 4. Configuring Hardware/Software Assets

NOTE

If you ordered a preconfigured system, skip this step and proceed to "Step 5. Starting the Agilent E7501A Software" on page 1-20.

Understanding the Asset Manager

Before using the Agilent E7501A arbitrary analog signal developer, you must configure a Stimulus Server. Once configured and connected, the Stimulus Server controls the hardware/software (which is a minimum of one RF Source and zero or more Modulation Sources). It is used to generate user specified AM, FM, and Pulse modulated signals.

A **Stimulus Server** is the primary signal-generation element in the Agilent E7501A arbitrary analog signal development system.

A **Hardware Asset** is any piece of hardware (such as an Agilent Technologies E6432A microwave synthesizer) that is configured for system use.

An **Asset Role** is the general category of a hardware asset. (For example, some asset roles are: Stimulus Server, Power Meter, Modulation Analyzer, RF Source, Modulation Source, Source Synchronizer, Modulation Type, and Frequency List Calculator.)

The Stimulus Server operates as follows:

- ❑ Zero or more Stimulus Servers may be running on the same machine at the same time.
- ❑ More than one Stimulus Server may be pointing at the same set of hardware assets, but only one Stimulus Server may be actively controlling the hardware assets.
- ❑ More than one Stimulus Server may be pointing at the same set of hardware assets, but only one Stimulus Server may be actively controlling the hardware assets.

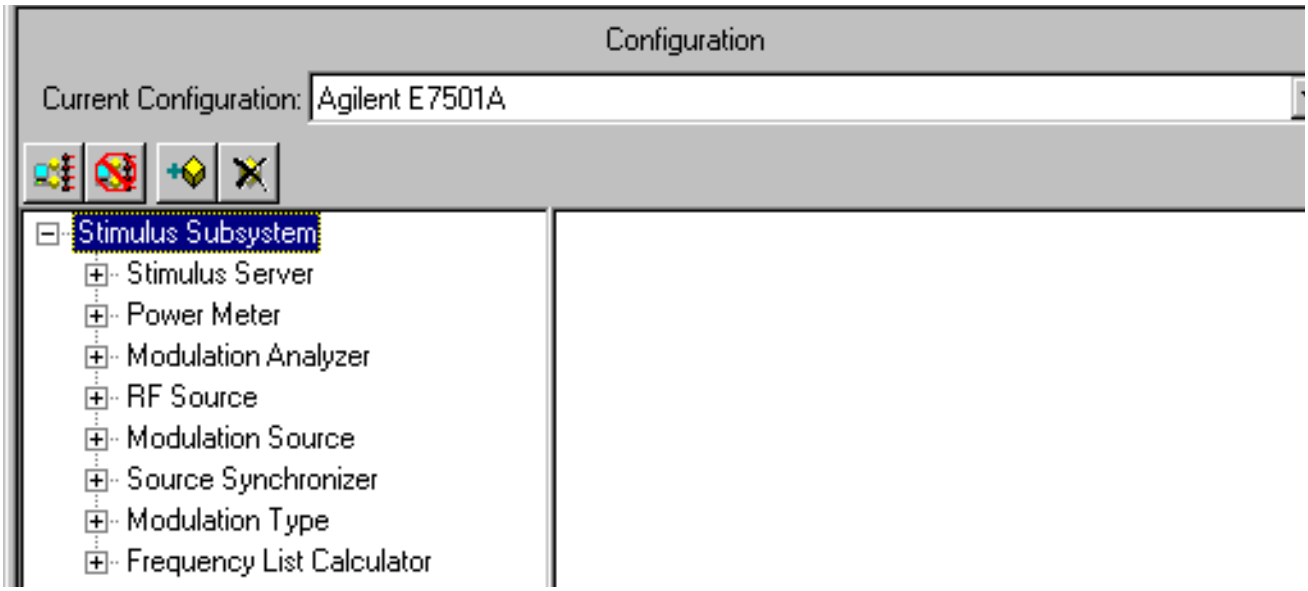
How to proceed:

1. "Starting the Asset Manager" on page 1-11.
2. "Selecting a Configuration" on page 1-12.
3. "Configuring an RF Source" on page 1-13.
4. "Configuring a Modulation Source" on page 1-15.
5. "(Optional) Configuring Other Available Assets" on page 1-16.
6. "(Optional) Adding a Hardware/Software Asset" on page 1-17
7. "(Optional) Removing a Hardware/Software Asset" on page 1-19
8. "Exiting Configuration" on page 1-19

The following procedures demonstrate how to use the Asset Manager to configure a Stimulus Server with one RF Source and three Modulation Sources that deliver AM, FM, and Pulse modulations. Following these procedures are some optional procedures that demonstrate how to configure other additional assets, and how to add or remove assets from a configuration.

Starting the Asset Manager

Click the **Start** menu,
point to **Programs**,
point to **Agilent Signal Studio**,
point to **E7501A Signal Development System**,
point to **E7501A Signal Developer**,
point to the pull down **View** menu and click **Configuration**.



Selecting a Configuration

Select either the Agilent E7501A or Demo configuration.

- If you select the Agilent E7501A as the `Current Configuration`, you must configure a Stimulus Server with a minimum of one RF Source and zero or more Modulation Sources.
- If you do not have any hardware assets connected to the computer that is running this software, you can set the `Current Configuration` to **Demo**.

  This selects a simulation asset for each role used by the Stimulus Server.
- If you have purchased other servers with your system, they will show on the available list and can be selected as the `Current Configuration`.

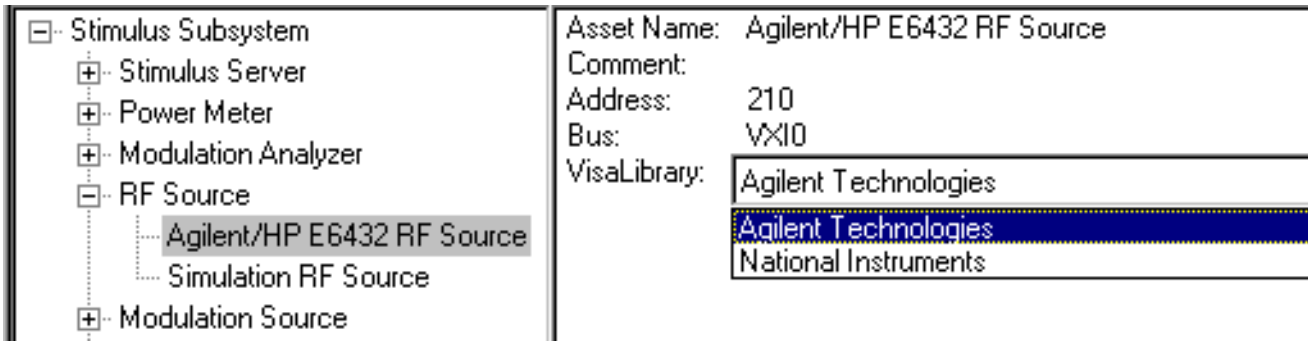
NOTE

Each time changes are made to an asset in the selected configuration, the software must be restarted before the changes take effect.

Configuring an RF Source

1. From the list of assets in the left-hand window pane, select **RF Source**.

   A dialog box similar to the following appears.



   The left-hand window pane is a tree view of assets that can be selected. The right-hand window pane shows information related to a selected asset.

2. Select an RF Source such as the **Agilent/HP E6432 RF Source**.
3. Select any of the fields in the right-hand window pane and an entry box or drop-down selection box will open and allow the field to be edited.

   For example, you could edit the asset name, comment, address, interface bus, or the VISA library being used by the RF Source.

To Edit the Asset Name Field

Select the **Asset Name** field and type **Agilent/HP E6432 RF Source** or any name that you would like for this asset.

To Edit the Comment Field

Select the **Comment** field and type a comment for this asset.

To Edit the Address Field

Select the **Address** field and type an address such as **210**. The address being used must match the actual address of the hardware.

To Edit the Bus Field

Select the **Bus** field and select a bus from the drop-down selection box that is to be used with this asset.

To Edit the VISA Library Field

Select the **VISA Library** field and select either Agilent Technologies or National Instruments from the drop-down selection box.

The selection that you make is dependent on the Slot 0 module being used with your system.

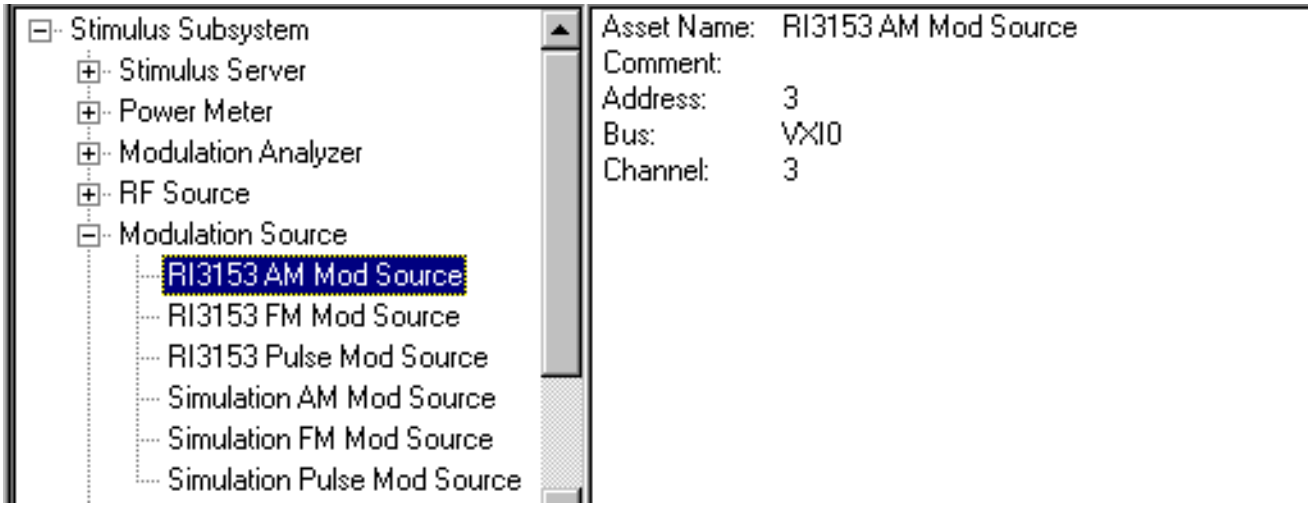
Slot 0 Module Being Used	VISA Library
Agilent Technologies E8491B IEEE-1394 PC Link to VXI	Agilent Technologies
Agilent Technologies 9850A VXI Embedded PC Controller or equivalent	Agilent Technologies
National Instruments VXI-MXI-2	National Instruments

This is important because a unique copy of the visa32.dll is used by both the Agilent Technologies and National Instruments VISA Library, and both of these libraries use a different version of this file. The most current installation of one of these VISA Libraries will have their version of the visa32.dll file installed. So, the VISA Library that is selected must correspond with the Slot 0 module being used.

Configuring a Modulation Source

1. From the list of assets in the left-hand window pane, select **Modulation Source**.

   A dialog box similar to the following appears.



   The left-hand window pane is a tree view of assets that can be selected. The right-hand window pane shows information related to a selected asset.

2. Select an AM modulation source such as the **RI3153 AM Mod Source**.

   An FM or Pulse modulation source can be configured using the same process that is used when configuring an AM modulation source.

3. Select any of the fields in the right-hand window pane and an entry box or drop-down selection box will open and allow the field to be edited.

   For example, you could edit the asset name, comment, address, interface bus, or the VISA library being used by the RI3153 AM Mod Source.

To Edit the Asset Name Field

Select the **Asset Name** field and type **RI3153 AM Mod Source** or any name that you would like for this asset.

To Edit the Comment Field

Select the **Comment** field and type a comment for this asset.

To Edit the Address Field

Select the **Address** field and type an address such as **3** for this asset. The address being used must match the actual address of the hardware.

To Edit the Bus Field

Select the **Bus** field and select a bus from the drop-down selection box that is to be used with this asset.

To Edit the Channel Field

Select the **Channel** field and select the channel from the drop-down selection box that is to be used with this asset.

CAUTION

The following table shows the default channel that is used with each output of a Racal 3153 waveform generator. When changes are made to the channel field, the corresponding cabling on the front panels must also be changed.

Agilent Technologies E6432A	Racal 3153	Default Channel
Pulse	Output 1	1
FM	Output 2	2
AM	Output 3	3

The default channel settings should not be changed unless you understand that changing these channels also changes the filters and frequency ranges used by each of these channels.

To Edit the Filter Field

Select the **Filter[1,2,3]** field and enter the directory path and file name to designate a particular correction file. This correction file is used to correct (offset) the response of a built-in filter. (For example, when using the Racal 3153 waveform generator as the modulation source, a correction file named `C:\Temp\Filter_AM_1.txt` could be created that contains values to offset the response of the built-in filter for Channel 3.)

Each correction file must contain correction-value pairs in a sequential list. The list is composed of a frequency point and an offset power value that is to be applied at each specific frequency point. Unspecified points, between correction points, are interpolated.

(Optional) Configuring Other Available Assets

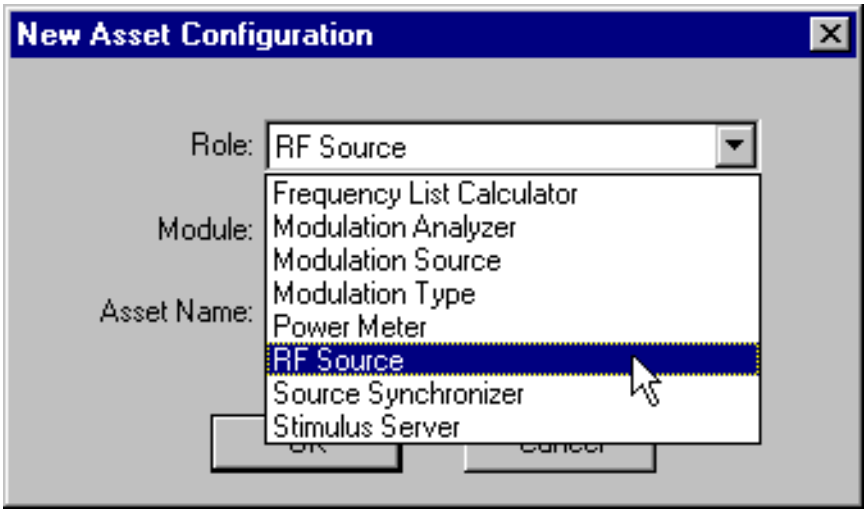
The process for configuring other available assets follows a similar process to configuring an RF source and a modulation source.

(Optional) Adding a Hardware/Software Asset

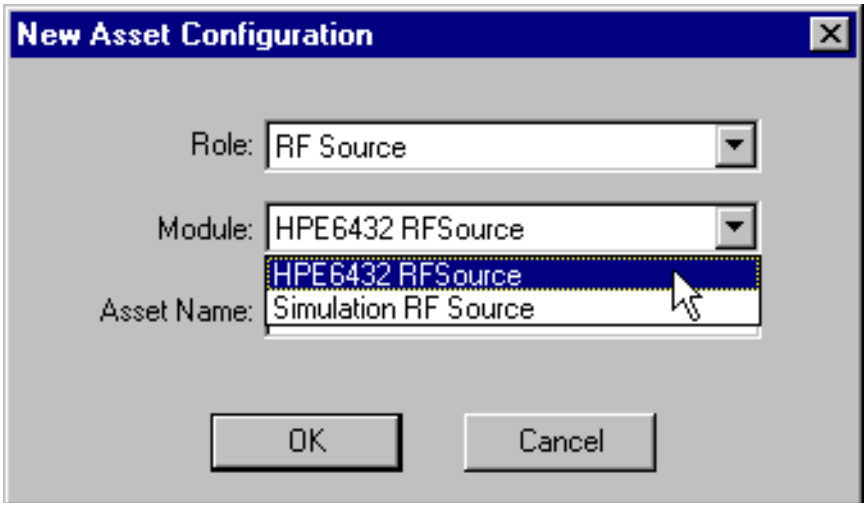
1. Click the **Add Asset** icon ( ).
2. Click the down arrow to expose all asset roles (different categories of hardware/software assets) that are available in the currently selected configuration.

As an example, we could add an **RF Source** as follows:

1. Click the **Add Asset** icon.
2. Click the down arrow to expose all asset roles that are available in the currently selected configuration, and select **RF Source**.

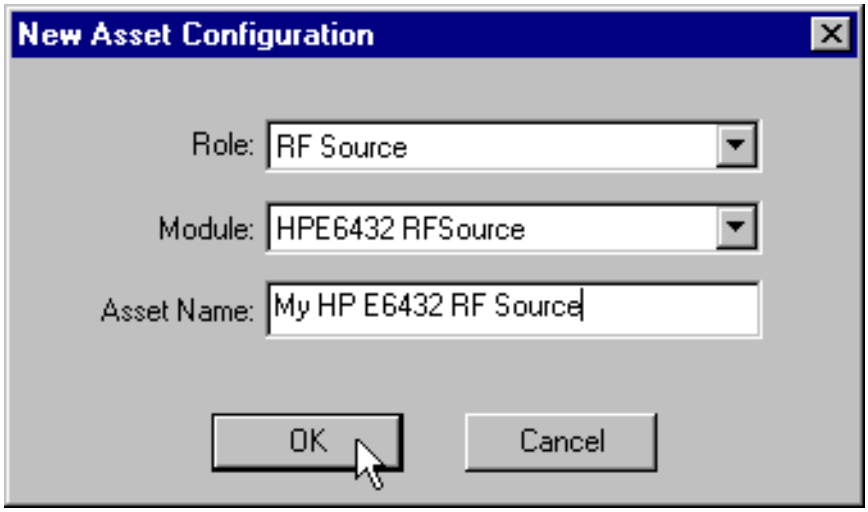


3. Click the down arrow to expose all modules that fill the selected role and select **HP E6432 RF Source**.



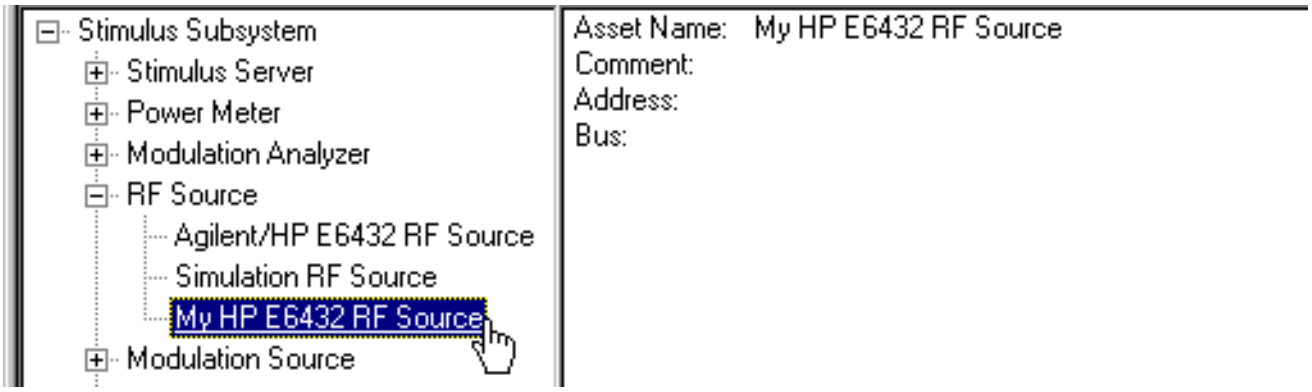
4. Edit the name that you would like assigned to the newly added asset by typing in the Asset Name field.

   When finished editing the name, click OK.



5. The left-hand window pane should now show the newly added asset as an RF Source that can be selected and used by the current configuration.

   The right-hand window pane shows information related to the selected RF Source. (For information related to changing the fields in the right-hand window pane, refer to the section titled, “Configuring an RF Source” on page 1-13.)



(Optional) Removing a Hardware/Software Asset

When the Configuration view is selected, the left-hand window pane is a tree view of available assets. The right-hand window pane shows information related to a selected asset.

1. Select the general category (asset role) that an asset is to be removed from by clicking the plus sign.
2. Select an asset to remove from the list that is exposed.
3. Click the **Delete Asset** icon ().

NOTE

There is no Undo for this action. To get a deleted asset back into a configuration, refer to the section titled, "(Optional) Adding a Hardware/Software Asset" on page 1-17.

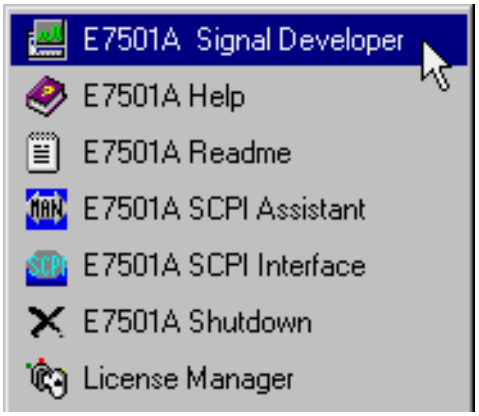
If you delete a configuration (such as Agilent E7501A or Demo), the fastest way to restore them is to re-install the Agilent E7501A arbitrary analog signal development system software. (For details on installation, refer to "Step 3. Installing the Agilent E7501A Software" on page 1-7.)

Exiting Configuration

To exit Configuration, select a different view.

Step 5. Starting the Agilent E7501A Software

1. Click the **Start** menu,
   point to **Programs**,
   point to **Agilent Signal Studio**,
   point to **E7501A Signal Development System**,
   point to and click **E7501A Signal Developer**.



2. The Agilent E7501A arbitrary analog signal developer software should open and be ready for use.

   At this point, an Acceptance Test Procedure (ATP) may be performed. The ATP is a set of manual tests and is documented in the section of “Performing Acceptance Test Procedures” on page 2-1. The ATP is intended as a functionality check and is not intended for testing against customer specifications.

2 Performing Acceptance Test Procedures

In this chapter, you will learn about:

- Performing Acceptance Test Procedures

After satisfying the requirements and steps detailed in Chapter 1, “Installation and Configuration””, the following manual Acceptance Test Procedure (ATP) may be performed.

Performing an ATP is not required and is provided and intended as a functionality check only; it is not intended for testing against customer specifications. This ATP consists of a set of tests that can be performed in under two hours with a minimum of test equipment.

Acceptance Tests

Required Test Equipment or Equivalent

- Agilent E7501A arbitrary analog signal developer
- Agilent 8563E spectrum analyzer

Test 1. CW Frequency and Power

Description

During this test, the system is set to two different frequencies at two different power levels, and the output signal is measured with a spectrum analyzer.

Equipment Required

- Agilent E7501A arbitrary analog signal developer
- Agilent 8563E spectrum analyzer

Equipment Setup

NOTE

All test equipment requires a 30 minute warm-up period to ensure warranted performance. Both the Agilent E7501A arbitrary analog signal developer and the Agilent 8563E spectrum analyzer need to be connected to a common 10 MHz reference.

When using the Agilent E7501A arbitrary analog signal developer, ensure that **Reference** is set to **External**; the Reference can be selected from the RF Source Control view.

Step 1. Use a high frequency 3.5 mm cable to connect the Agilent E7501A arbitrary analog signal developer output to the input of the Agilent 8563E spectrum analyzer.

Step 2.

Agilent E7501A Summary	Agilent E7501A Details
Reset	1. From the pull down View menu, select **Reset View Settings and Windows**.
Reference = External	2. From the RF Source Control view, select **Reference** and set it to **External**.
Frequency = 1 GHz	3. From the RF Source Control view, select Frequency Units and set it to **GHz**.
	4. From the RF Source Control view, highlight the **Frequency** field and enter **1** using the keyboard.
Power = +10 dBm	5. From the RF Source Control view, highlight the **Power** field and enter **10** using the keyboard.
RF On = Enabled	6. From the RF Source Control view, select the **RF Output Enable** check box.

Agilent 8563E Summary	Agilent 8563E Details
Preset	1. Press the green **Preset** front panel key.
Frequency = 1 GHz	2. Press the **Frequency** front panel key and enter **1 GHz**.
Span = 1 MHz	3. Press the **Span** front panel key and enter **1 MHz**.
Reference Level = +20 dBm	4. Press the **Amplitude** front panel key and enter **+20 dBm**; this sets a reference level.
Marker, Peak Search	5. Press the **Mkr** and **Peak Search** front panel keys.
Record Marker value for 1 GHz and 10 dBm.	6. Enter the marker value in Table 2-1 for 1 GHz and 10 dBm.

Step 3.

Agilent E7501A Summary	Agilent E7501A Details
Auto Atten = Disabled	1. From the RF Source Control view, unselect the **Auto Atten** check box so that the attenuator can be manually controlled.
Attenuation = 50 dB	2. From the RF Source Control view, highlight the **Attenuation** field and enter **50** using the keyboard.

Agilent 8563E Summary	Agilent 8563E Details
Marker, Peak Search	1. Press the **Mkr** and **Peak Search** front panel keys.
Record Marker value for 1 GHz and -40 dBm.	2. Enter the marker value in Table 2-1 for 1 GHz and -40 dBm.

Step 4.

Agilent E7501A Summary	Agilent E7501A Details
Frequency = 10 GHz	1. From the RF Source Control view, highlight the **Frequency** field and enter **10** using the keyboard.

Agilent 8563E Summary	Agilent 8563E Details
Frequency = 10 GHz	1. Press the **Frequency** front panel key and enter 10 GHz.
Marker, Peak Search	2. Press the **Mkr** and **Peak Search** front panel keys.
Record Marker value for 10 GHz and -40 dBm.	3. Enter the marker value in Table 2-1 for 10 GHz and -40 dBm.

Step 5.

Agilent E7501A Summary	Agilent E7501A Details
Attenuation = 0 dB	1. From the RF Source Control view, highlight the **Attenuation** field and enter **0** using the keyboard.

Agilent 8563E Summary	Agilent 8563E Details
Marker, Peak Search	1. Press the **Mkr** and **Peak Search** front panel keys.
Record Marker value for 10 GHz and 10 dBm.	2. Enter the marker value in Table 2-1 for 10 GHz and 10 dBm.

Table 2-1 Maximum Power Table

Test Frequency	Selected Power	Measured Power	Test Limits
1 GHz	10 dBm		dBm
10 GHz	-40 dBm		dBm
1 GHz	10 dBm		dBm
10 GHz	-40 dBm		dBm

Test 2. AM Accuracy

Description

This test is used to verify that AM modulation is working correctly.

The Agilent E6432A microwave synthesizer is configured for linear AM and a spectrum analyzer is used to measure sidebands. The AM output of the Racal 3153 arbitrary waveform generator drives the Agilent E6432A microwave synthesizer AM input. The test is performed at carrier frequencies of 10 MHz and 20 GHz, with AM depth of 100%, and an AM rate of 10 kHz.

Equipment Required

- Agilent E7501A arbitrary analog signal developer
- Agilent 8563E spectrum analyzer

Equipment Setup

NOTE

All test equipment requires a 30 minute warm-up period to ensure warranted performance. Both the Agilent E7501A arbitrary analog signal developer and the Agilent 8563E spectrum analyzer need to be connected to a common 10 MHz reference.

When using the Agilent E7501A arbitrary analog signal developer, ensure that **Reference** is set to **External**; the Reference can be selected from the RF Source Control view.

Step 1. Use a high frequency 3.5 mm cable to connect the Agilent E7501A arbitrary analog signal developer output to the input of the Agilent 8563E spectrum analyzer.

Step 2.

Agilent E7501A Summary	Agilent E7501A Details
Reset	1. From the pull down View menu, select **Reset View Settings and Windows**.
Reference = External	2. From the RF Source Control view, select **Reference** and set it to **External**.
Frequency = 10 MHz	3. From the RF Source Control view, select Frequency Units and set it to **MHz**.
	4. From the RF Source Control view, highlight the **Frequency** field and enter **10** using the keyboard.
Power = 0 dBm	5. From the RF Source Control view, highlight the **Power** field and enter **0** using the keyboard.
AM = Enabled	6. From the Stimulus Parameters view, select the AM tab.
	7. On the AM tab, select the **Value** field for AM Rate and enter **10000** (10 kHz).
	8. From the RF Source Control view, select the **AM** check box.
RF On = Enabled	9. From the RF Source Control view, select the **RF Output Enable** check box.

Agilent 8563E Summary	Agilent 8563E Details
Preset	1. Press the green **Preset** front panel key.
Frequency = 10 MHz	2. Press the **Frequency** front panel key and enter **10 MHz**.
Span = 100 kHz	3. Press the **Span** front panel key and enter **100 kHz**.
Reference Level = +10 dBm	4. Press the **Amplitude** front panel key and enter **+10 dBm**; this sets a reference level.
Marker, Peak Search	5. Press the **Mkr** and **Peak Search** front panel keys.
Marker Delta, Next Peak	6. Press the **Marker Delta** and **Next Peak** front panel keys.
Record Marker value for 10 MHz and 10 kHz Rate.	7. Enter the marker value in Table 2-2 for 10 MHz test frequency and 10 kHz Rate

Step 3.

Agilent E7501A Summary	Agilent E7501A Details
Frequency = 20 GHz	1. From the RF Source Control view, highlight the **Frequency** field and enter **20** using the keyboard.

Agilent 8563E Summary	Agilent 8563E Details
Frequency = 20 GHz	1. Press the **Frequency** front panel key and enter 20 GHz.
Marker, Peak Search	2. Press the **Mkr** and **Peak Search** front panel keys.
Marker Delta, Next Peak	3. Press the **Marker Delta** and **Next Peak** front panel keys.
Record Marker value for 20 GHz and 10 kHz Rate.	4. Enter the marker value in Table 2-2 for 20 GHz test frequency and 10 kHz Rate.

Table 2-2 AM Accuracy Table

Test Frequency	AM Rate	AM Depth	Measured Power	Test Limits
10 MHz	10 kHz	100%		dBm
20 GHz	10 kHz	100%		dBm

AM Accuracy Test Limit = ±12% and is calculated as follows:

$$Esb\ (dB) - Ec\ (dB) = 20 \log m/2$$

where: Esb = the amplitude of the AM sideband
Ec = the amplitude of the carrier
m = modulation percent expressed as a fraction

Test 3. FM Accuracy

Description

This test is used to verify that FM modulation is working correctly.

The Agilent E6432A microwave synthesizer and the Racal 3153 arbitrary waveform generator are configured for a modulation index of 2.404 which is approximately a null of the Bessel function J_o. The amplitude of the function generator is varied until the carrier being monitored on the spectrum analyzer is a minimum. The function generator amplitude is then recorded and compared to the theoretical value to calculate the FM accuracy error.

The test is performed at carrier frequencies of 10 MHz and 20 GHz, with an FM Rate of 200 kHz.

Equipment Required

- Agilent E7501A arbitrary analog signal developer
- Agilent 8563E spectrum analyzer

Equipment Setup

NOTE

All test equipment requires a 30 minute warm-up period to ensure warranted performance. Both the Agilent E7501A arbitrary analog signal developer and the Agilent 8563E spectrum analyzer need to be connected to a common 10 MHz reference.

When using the Agilent E7501A arbitrary analog signal developer, ensure that **Reference** is set to **External**; the Reference can be selected from the RF Source Control view.

Step 1. Use a high frequency 3.5 mm cable to connect the Agilent E7501A arbitrary analog signal developer output to the input of the Agilent 8563E spectrum analyzer.

Step 2.

Agilent E7501A Summary	Agilent E7501A Details
Reset	1. From the pull down View menu, select **Reset View Settings and Windows**.
Reference = External	2. From the RF Source Control view, select **Reference** and set it to **External**.
Frequency = 10 MHz	3. From the RF Source Control view, select Frequency Units and set it to **MHz**.
	4. From the RF Source Control view, highlight the **Frequency** field and enter **10** using the keyboard.
Power = 0 dBm	5. From the RF Source Control view, highlight the **Power** field and enter **0** using the keyboard.
FM = Enabled	6. From the Stimulus Parameters view, select the FM tab.
	7. On the FM tab, select the **Value** field for FM Rate and enter **200000** (200 kHz).
	8. From the RF Source Control view, select the **FM** check box.
RF On = Enabled	9. From the RF Source Control view, select the **RF Output Enable** check box.

Agilent 8563E Summary	Agilent 8563E Details
Preset	1. Press the green **Preset** front panel key.
Frequency = 10 MHz	2. Press the **Frequency** front panel key and enter **10 MHz**.
Span = 100 kHz	3. Press the **Span** front panel key and enter **100 kHz**.
Reference Level = +10 dBm	4. Press the **Amplitude** front panel key and enter **+10 dBm**; this sets a reference level.
Marker, Peak Search	5. Press the **Mkr** and **Peak Search** front panel keys.
Marker Delta, Next Peak	6. Press the **Marker Delta** and **Next Peak** front panel keys.
Record Marker value for 10 MHz and 200 kHz FM Rate.	7. Enter the marker value in Table 2-3 for 10 MHz and 200 kHz FM Rate.

Step 3.

Agilent E7501A Summary	Agilent E7501A Details
Frequency = 20 GHz	1. From the RF Source Control view, select Frequency Units and set it to **GHz**. 2. From the RF Source Control view, highlight the **Frequency** field and enter **20** using the keyboard.

Agilent 8563E Summary	Agilent 8563E Details
Frequency = 20 GHz	1. Press the **Frequency** front panel key and enter 20 GHz.
Marker, Peak Search	2. Press the **Mkr** and **Peak Search** front panel keys.
Marker Delta, Next Peak	3. Press the **Marker Delta** and **Next Peak** front panel keys.
Record Marker value for 20 GHz and 200 kHz FM Rate.	4. Enter the marker value in Table 2-2 for 20 GHz test frequency and 200 kHz FM Rate.

$$\text{FM Accuracy Error \%} = \left(\frac{\text{Calc Fgen Amp Vpp} - \text{Act Fgen Amp Vpp}}{\text{Calc Fgen Amp Vpp}}\right) \times 100$$

Test Limit = +40%

Table 2-3 FM Accuracy Table

Test Frequency	FM Rate	Calc Fgen Amp Vpp	Act Fgen Amp Vpp	FM Accuracy Error%
10 MHz	200 kHz	1.92 Vpp		
20 GHz	200 kHz	1.92 Vpp		

Test 4. Pulse Modulation Level Accuracy

Description

The Agilent E6432A microwave synthesizer and the Agilent E7501A arbitrary analog signal developer is configured for pulse modulation. A spectrum analyzer is used in zero span to measure the amplitude of the pulse envelope. This measured value is compared to the CW amplitude with pulse modulation turned off. Depending on the model of spectrum analyzer used, the Pulse Repetition Frequency (PRF) may need to be decreased to measure the pulse.

Equipment Required

- Agilent E7501A arbitrary analog signal developer
- Agilent 8563E spectrum analyzer

Equipment Setup

NOTE

All test equipment requires a 30 minute warm-up period to ensure warranted performance. Both the Agilent E7501A arbitrary analog signal developer and the Agilent 8563E spectrum analyzer need to be connected to a common 10 MHz reference.

When using the Agilent E7501A arbitrary analog signal developer, ensure that **Reference** is set to **External**; the Reference can be selected from the RF Source Control view.

Step 1. Use a high frequency 3.5 mm cable to connect the Agilent E7501A arbitrary analog signal developer output to the input of the Agilent 8563E spectrum analyzer.

Step 2.

Agilent E7501A Summary	Agilent E7501A Details
Reset	1. From the pull down View menu, select **Reset View Settings and Windows**.
Reference = External	2. From the RF Source Control view, select **Reference** and set it to **External**.
Frequency = 1 GHz	3. From the RF Source Control view, select Frequency Units and set it to **GHz**.
	4. From the RF Source Control view, highlight the **Frequency** field and enter **1** using the keyboard.
Power = 0 dBm	5. From the RF Source Control view, highlight the **Power** field and enter **0** using the keyboard.
Pulse = Enabled	6. From the RF Source Control view, select the **Pulse** check box.
RF On = Enabled	7. From the RF Source Control view, select the **RF Output Enable** check box.

Agilent 8563E Summary	Agilent 8563E Details
Preset	1. Press the green **Preset** front panel key.
Frequency = 1 GHz	2. Press the **Frequency** front panel key and enter **1 GHz**.
Span = 100 kHz	3. Press the **Span** front panel key and enter **100 kHz**.
Reference Level = +10 dBm	4. Press the **Amplitude** front panel key and enter **+10 dBm**; this sets a reference level.
Marker, Peak Search	5. Press the **Mkr** and **Peak Search** front panel keys.
Marker Delta, Next Peak	6. Press the **Marker Delta** and **Next Peak** front panel keys.
Record Marker value for 1 GHz and 30 kHz PRF.	7. Enter the marker value in Table 2-4 for 1 GHz and 30 kHz PRF.

Step 3.

Agilent E7501A Summary	Agilent E7501A Details
Frequency = 20 GHz	1. From the RF Source Control view, select Frequency Units and set it to **GHz**. 2. From the RF Source Control view, highlight the **Frequency** field and enter **20** using the keyboard.

Agilent 8563E Summary	Agilent 8563E Details
Frequency = 20 GHz	1. Press the **Frequency** front panel key and enter 20 GHz.
Marker, Peak Search	2. Press the **Mkr** and **Peak Search** front panel keys.
Marker Delta, Next Peak	3. Press the **Marker Delta** and **Next Peak** front panel keys.
Record Marker value for 20 GHz and 30 kHz PRF.	4. Enter the marker value in Table 2-4 for 20 GHz test frequency and 30 kHz PRF.

$$\text{Accuracy} = -(\text{Carrier Amplitude} - \text{Pulse Amplitude})$$

Table 2-4 Pulse Leveled Accuracy Table

Test Frequency	PRF	Pulse Amplitude	Carrier Amplitude	Accuracy	Test Limit
1 GHz	30 kHz				±2 dB
20 GHz	30 kHz				±2 dB

Test 5. Verify Hopping with Two Pulse Modulated Signals

Description

This test uses a “canned waveform” that hops slowly between two pulse modulated signals. The canned waveform is supplied in the form of a Signal Plan that is loaded, compiled, and played.

The Signal Plan creates a pulse list with four pulses and a hop list with two frequency values. The hop list is stepped when the Pulse Mod Source outputs a marker on VXI TTLTRG4.

Equipment Required

- Agilent E7501A arbitrary analog signal developer
- Agilent 8563E spectrum analyzer

Equipment Setup

NOTE

All test equipment requires a 30 minute warm-up period to ensure warranted performance. Both the Agilent E7501A arbitrary analog signal developer and the Agilent 8563E spectrum analyzer need to be connected to a common 10 MHz reference.

When using the Agilent E7501A arbitrary analog signal developer, ensure that **Reference** is set to **External**; the Reference can be selected from the RF Source Control view.

Step 1. Use a high frequency 3.5 mm cable to connect the Agilent E7501A arbitrary analog signal developer output to the input of the Agilent 8563E spectrum analyzer.

Step 2.

Agilent E7501A Summary	Agilent E7501A Details
Reset	1. From the pull down View menu, select **Reset View Settings and Windows**.
Open a Signal Plan	2. From the pull down File menu, select **Open**.
	3. In the browser window that opens, navigate to the folder **C:\Program Files\Agilent\Measurement and Stimulus Subsystems\FreqHopAndPulse.ssp.** If you installed your software in a different path, you may need to use the program: **Start/Find/Files or Folders** and enter **FreqHopAndPulse.ssp** in the browser window that appears.
Compile the Signal Plan	4. From the pull down Signal Plan menu, select **Compile All**.
Play the Signal Plan	5. From the pull down Signal Plan menu, select **Play**.

To view the signal that is created, set up a spectrum analyzer at a center frequency of 1 GHz with a 50 MHz span. Shown below are the two signals that should be visible. Note that the two signals may be reversed; this is dependent on when the Racal 3153 waveform generator triggers the hop list.

Test 6. Verify Synchronization of the Racal 3153

Description

This test is used to verify synchronization between all three channels of the Racal 3153 arbitrary waveform generator.

Equipment Required

- Agilent E7501A arbitrary analog signal developer
- Agilent 8563E spectrum analyzer

NOTE

A different negative detector may be used depending upon the frequency range of the external leveling loop configuration.

Step 1. Use a high frequency 3.5 mm cable to connect the Agilent E7501A arbitrary analog signal developer output to the input of the Agilent 8563E spectrum analyzer.

Step 2.

Agilent E7501A Summary	Agilent E7501A Details
Reset	1. From the pull down View menu, select **Reset View Settings and Windows**.
Open a Signal Plan	2. From the pull down File menu, select **Open**.
	3. In the browser window that opens, navigate to the folder **C:\Program Files\Agilent\Measurement and Stimulus Subsystems\Synchronization.ssp.** If you installed your software in a different path, you may need to use the program: **Start/Find/Files or Folders** and enter **Synchronization.ssp** in the browser window that appears.
Compile the Signal Plan	4. From the pull down Signal Plan menu, select **Compile All**.
Play the Signal Plan	5. From the pull down Signal Plan menu, select **Play**.

3 Using SCPI Interfaces

In this chapter, you will learn about:

How to proceed…

First, after you have decided to use SCPI commands to control your hardware, select either the E7501A SCPI assistant, the E7501A SCPI interface, or both.

If you select to use a E7501A SCPI interface, you must select a connection type and follow the directions for setting it up. When ready, become familiar with the SCPI interface panels and each of its various sections. To learn more about all available SCPI commands, refer to the Online Help system that is available from the main GUI of the Agilent E7501A arbitrary analog signal developer software.

Overview of SCPI Interfaces

In addition to the Agilent E7501A arbitrary analog signal developer user interface, your hardware can be controlled through either or both of the following SCPI interfaces.

E7501A SCPI Assistant

The E7501A SCPI assistant, through its own GUI, takes input from a person. It's primarily a development aid that provides an interface for both testing and demonstration of SCPI commands.

It allows you to enter one or more SCPI commands at a time (where each valid command is separated by a semicolon) or view the response from queries of SCPI commands that are sent; it even allows you to log your sessions in a log file.

E7501A SCPI Interface

The E7501A SCPI interface, through its own GUI, takes input from a program or programming environment. It provides a connectivity interface to the Agilent E7501A arbitrary analog signal development system.

When using the E7501A SCPI interface, there are four connection types that can be used. (For details about each connection type, refer to "Using the E7501A SCPI Interface" on page 3-27.)

- Telnet
- Sockets
- RS-232
- VXI-11

Programmable Interface
A programmable interface allows you to control the Agilent E7501A arbitrary analog signal development system from a programming environment such as VEE or C++; the programming environment may be running on the same machine or from a remote machine.

The main difference between the E7501A SCPI assistant and the E7501A SCPI interface is as follows:

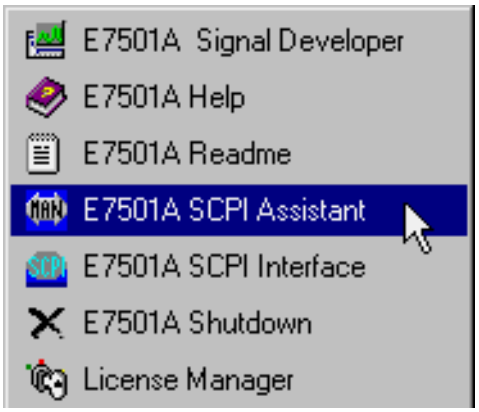
The E7501A SCPI assistant runs on the same machine that is running the Agilent E7501A arbitrary analog signal developer user interface, but is not a ***programmable interface***.

The E7501A SCPI interface is a ***programmable interface*** and it can be run from a remote machine or through a remote communication port on the same machine that is running the Agilent E7501A arbitrary analog signal developer user interface.

Using the E7501A SCPI Assistant

To Start the E7501A SCPI Assistant

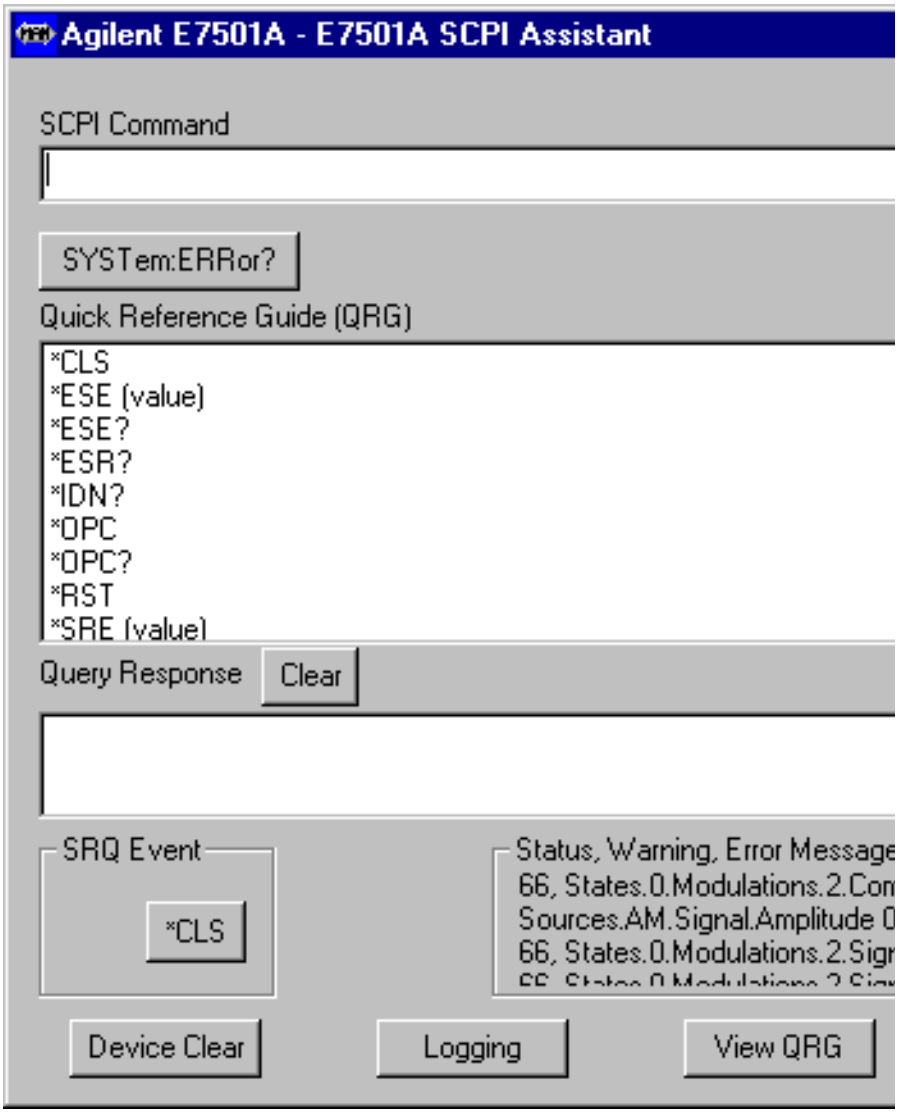
1. Click the **Start** menu,
   point to **Programs**,
   point to **Agilent Signal Studio**,
   point to **E7501A Signal Development System**,
   point to and click **E7501A SCPI Assistant**.



E7501A SCPI Assistant GUI

The E7501A SCPI assistant consists of the following main sections:

- SCPI Command Entry Box
- Quick Reference Guide Selection Box
- Query Response Box
- Indicators and Related Functions



SCPI Assistant SCPI Command Entry Box

The SCPI Command Entry Box allows you to enter one or more SCPI commands with their parameters, and send them to the Agilent E7501A arbitrary analog signal development system. Multiple SCPI commands can be sent by separating commands with semicolons.

To send SCPI commands from the SCPI Command Entry Box

Type any of the SCPI commands with their parameters in the SCPI Command Entry Box and click the **Send** button (

); you can also use the **Enter** key on your computer's keyboard. Multiple SCPI commands can be sent by separating commands with semicolons.

SCPI Assistant Quick Reference Guide Selection Box

The Quick Reference Guide Selection Box consists of a list of all available SCPI commands for the Agilent E7501A arbitrary analog signal developer.

To send a SCPI command from the Quick Reference Guide Selection Box

1. Double-click on a command in the Quick Reference Guide Selection Box and it is placed in the SCPI Command Entry Box.
   - If the command does not have any required parameters, it is executed immediately.
   - If the command requires parameters, a value must be entered for each required parameter before the command is executed.

To view a complete list of available SCPI commands

1. Click the **View QRG** button (

) available from the bottom of the E7501A SCPI assistant.

To print a complete list of available SCPI commands

1. Click the **View QRG** button (

) available from the bottom of the E7501A SCPI assistant.
2. Use standard Windows' printing capabilities once the list is displayed.

   As an example, if the SCPI commands are displayed by Microsoft Notepad, select **Print** from the pull down **File** menu.

SCPI Assistant Query Response Box

The Query Response Box displays all returned responses that are generated from SCPI commands being sent.

To clear the Query Response Box

1. Click the **Clear** button (Clear) available above the Query Response Box.

   This clears the Query Response buffer and the Query Response Box.

SCPI Assistant Indicators and Related Functions

The following Indicators and Related Functions are available:

- SYSTem:ERRor? Function
- SRQ Event Indicator
- Status, Error, Warning Messages
- Device Clear Function
- Logging Function
- View QRG [Quick Reference Guide] Function

SYSTem:ERRor? Function

The SYSTem:ERRor? button is a shortcut button that allows the SYSTem:ERRor? command to be executed without having to type it in the SCPI Command Entry Box or locate it in the Quick Reference Guide Selection Box.

SRQ Event Indicator

The SRQ [Service Request] Event light indicates that an SRQ interrupt has taken place. This event can be cleared with the *CLS button. Before the SRQ Event indicator will operate, SRQs must be enabled using SCPI status commands. (Refer to Online Help for information on using each of the SCPI status commands.)

The *CLS button is a shortcut button that allows the clear command to be executed without having to type it in the SCPI Command Entry Box or locate it in the Quick Reference Guide Selection Box.

Status, Error, Warning Messages

This section displays server status, error, and warning messages that occur due to the SCPI commands that are sent using either the SCPI Command Entry Box or the Quick Reference Guide Selection Box.

Device Clear Function

Device Clear is used to clear any commands from the SCPI Command Entry Box.

Logging Function

The Logging function is available in both the E7501A SCPI assistant and the E7501A SCPI interface; the procedure for using the Logging function is the same from both interfaces.

Enabling logging allows you to log Commands Sent, Query Responses, or both. All log entries can be saved in a text file (*.log) using the name and directory of your choice.

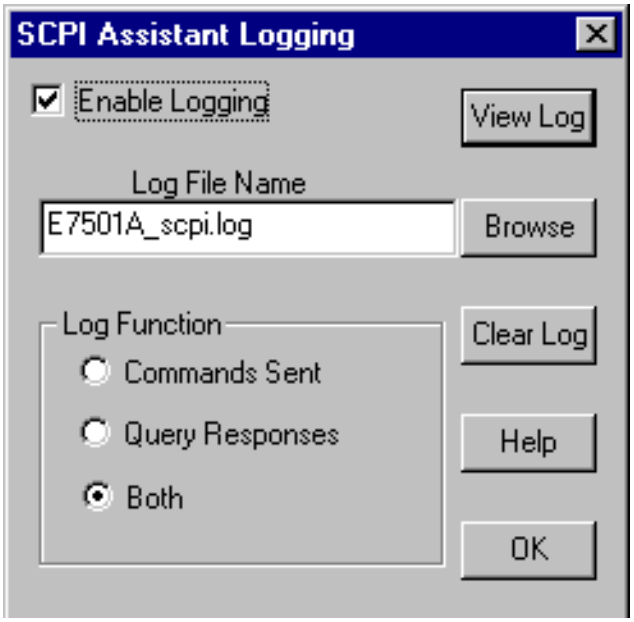
To start the Logging function

1. Click the **Logging** button (Logging) available from the bottom of the E7501A SCPI assistant.

   The SCPI Assistant Logging dialog box should appear.

2. Click the **Enable Logging** checkbox and select the **OK** button.

   Logging is disabled by default.



To specify a log file that is different from the default filename

1. Use the **Browse** button to open a browser and select a directory path.
2. Enter the name of the log file you wish to use in the **Log File Name** entry box. By default, the log file is stored in the same directory where the Agilent E7501A arbitrary analog signal developer software is installed.

To display the contents of the log file

1. Select the **View Log** button and the log file is displayed in Microsoft Notepad.

To clear the contents of the log file

1. Select the **Clear Log** button and all entries in the log file are cleared.

Using the E7501A SCPI Interface

Understanding the E7501A SCPI Interface

The E7501A SCPI interface, through its own GUI, takes input from a program or programming environment. It provides a connectivity interface to the Agilent E7501A arbitrary analog signal development system.

The E7501A SCPI interface GUI can be used with four connection types:

- Telnet
- Sockets
- RS-232
- VXI-11

Telnet, Sockets, and RS-232 come with all Microsoft Windows' operating systems. VXI-11 requires an Internal Instrument interface to be configured with the I/O Config utility before it can be enabled; the I/O Config utility is available only with Agilent I/O Libraries.

If you are using a National Instrument MXI-VXI Slot 0 module, a VXI-11 connection can not be enabled; it requires an Internal Instrument interface to be configured, and this functionality is not available with National Instruments MXI-VXI Slot 0 modules.

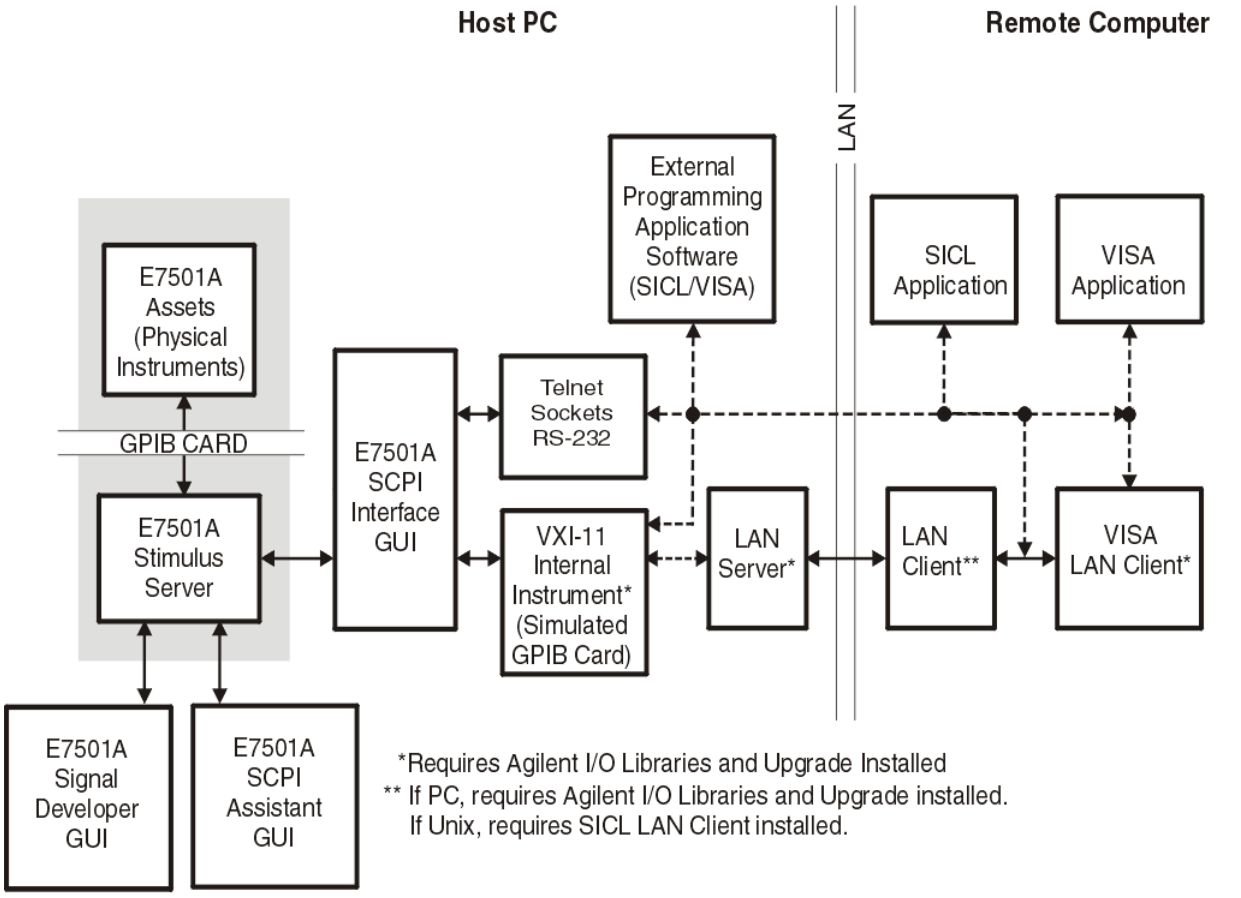
Telnet, Sockets, and VXI-11 each use different communication protocol (communication rules), listen on different ports, and communicate over a LAN [Local Area Network]; one or more sessions of communication can be configured and used simultaneously.

RS-232 is a serial COM port interface that uses a direct cable (a null-modem cable) between the computer running the Agilent E7501A arbitrary analog signal development system and the computer running the user's programming environment.

Making a Connection

Before sending any SCPI commands from an external programming environment, decide which connection type you plan to use and follow the steps to make one or more connections using:
Telnet, Sockets, RS-232, or VXI-11.

The following drawing shows the relationship between the host PC elements and those elements that are part of the remote computer.



Depending on which connection type you plan to use, refer to one of the following processes:

- "Configuring a VXI-11 Connection" on page 3-29
- "Configuring a Telnet, Sockets, or RS-232 Connection" on page 3-40

Configuring a VXI-11 Connection

Overview of Steps:

- Configure an Internal Instrument interface (initial setup only).
- Activate the LAN Server.
- Start the E7501A SCPI Interface.
- Select a configuration (Agilent E7501A or Demo).
- Select the VXI-11 Enable checkbox.
- Start the external programming application software.
- Send SCPI commands.

Configuring a VXI-11 connection may require the following:

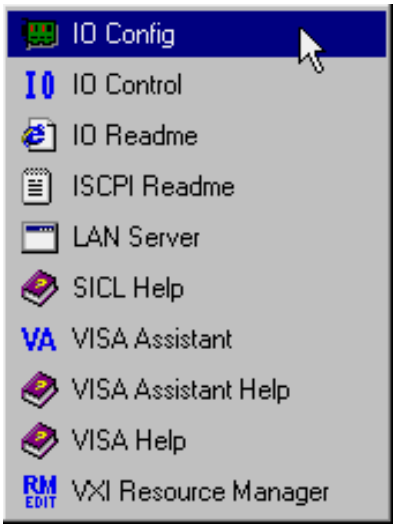
NOTE

If you wish to communicate with the Agilent E7501A arbitrary analog signal development system from a remote computer using SCPI through a VXI-11 connection, you must configure an Internal Instrument interface with the I/O Config utility before it can be enabled; the I/O Config utility is available only with Agilent I/O Libraries.

If you wish to communicate using SCPI through Telnet, Sockets, or RS-232, a VXI-11 connection does not need to be configured.

1. You may skip to step 5 of this procedure if an Internal Instrument interface has been previously configured.

   Click the **Start** menu,
   point to **Programs**,
   point to **Agilent IO Libraries**,
   point to and click **IO Config**.



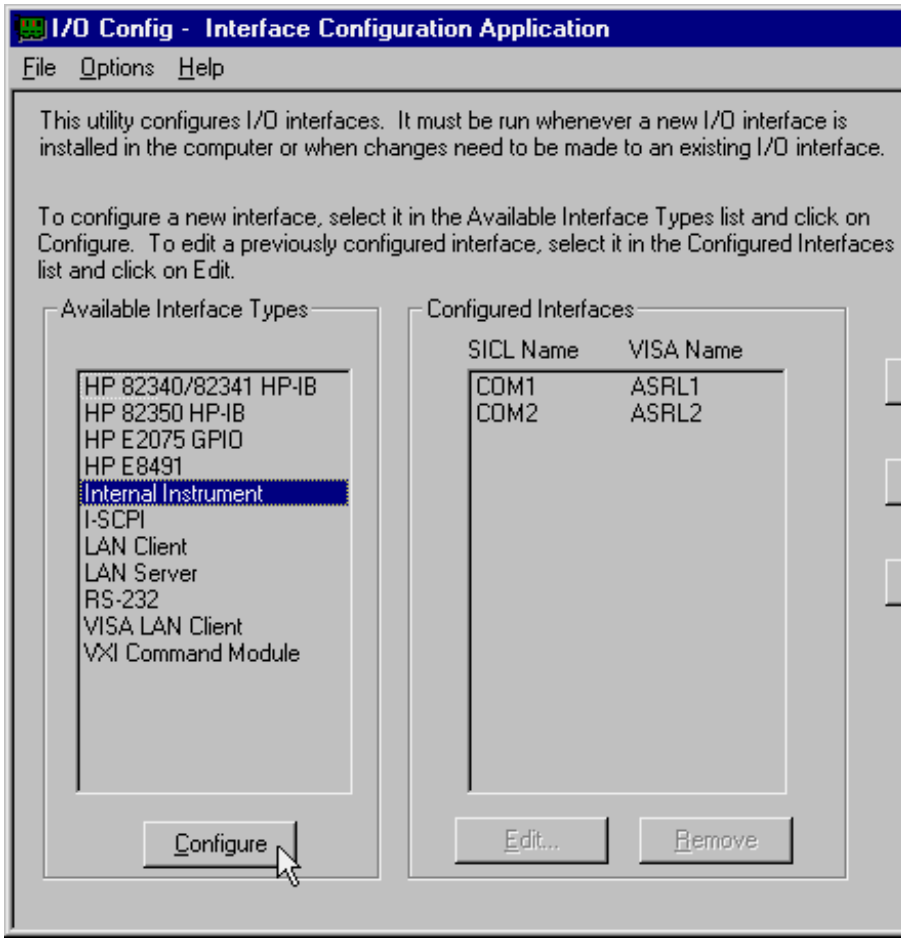
2. Select **Internal Instrument** in the left pane and click the **Configure** button.

   If the Internal Instrument is not available as a choice in the left pane, repeat the installation process using your setup CD.

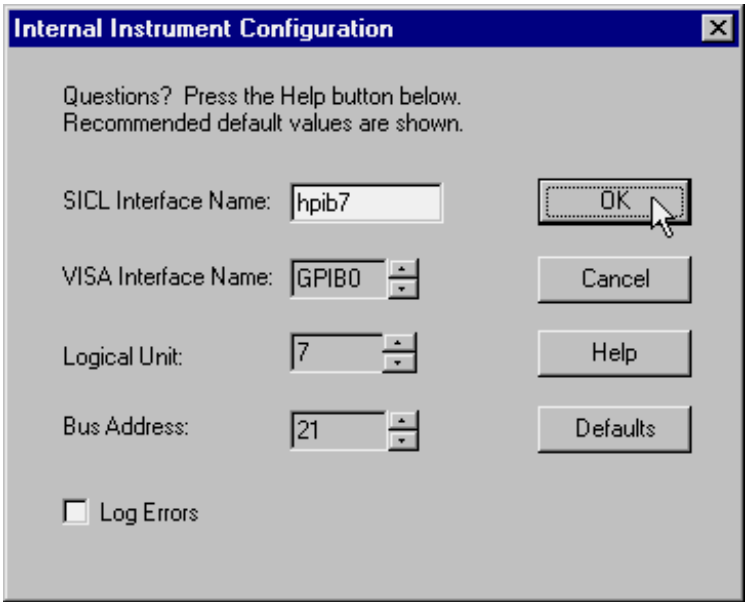
   In order for the Internal Instrument to be available, you must install Agilent I/O Libraries. During the installation process, your computer is checked for the installation of Agilent I/O Libraries and if it is found, an Agilent I/O Library Upgrade is automatically performed; this upgrade is what makes the Internal Instrument available.

NOTE

If you are using a National Instrument MXI-VXI Slot 0 module, a VXI-11 connection can not be enabled; it requires an Internal Instrument interface to be configured, and this functionality is not available with National Instruments MXI-VXI Slot 0 modules. Agilent I/O Libraries cannot be used to control National Instruments MXI-VXI Slot 0 modules.



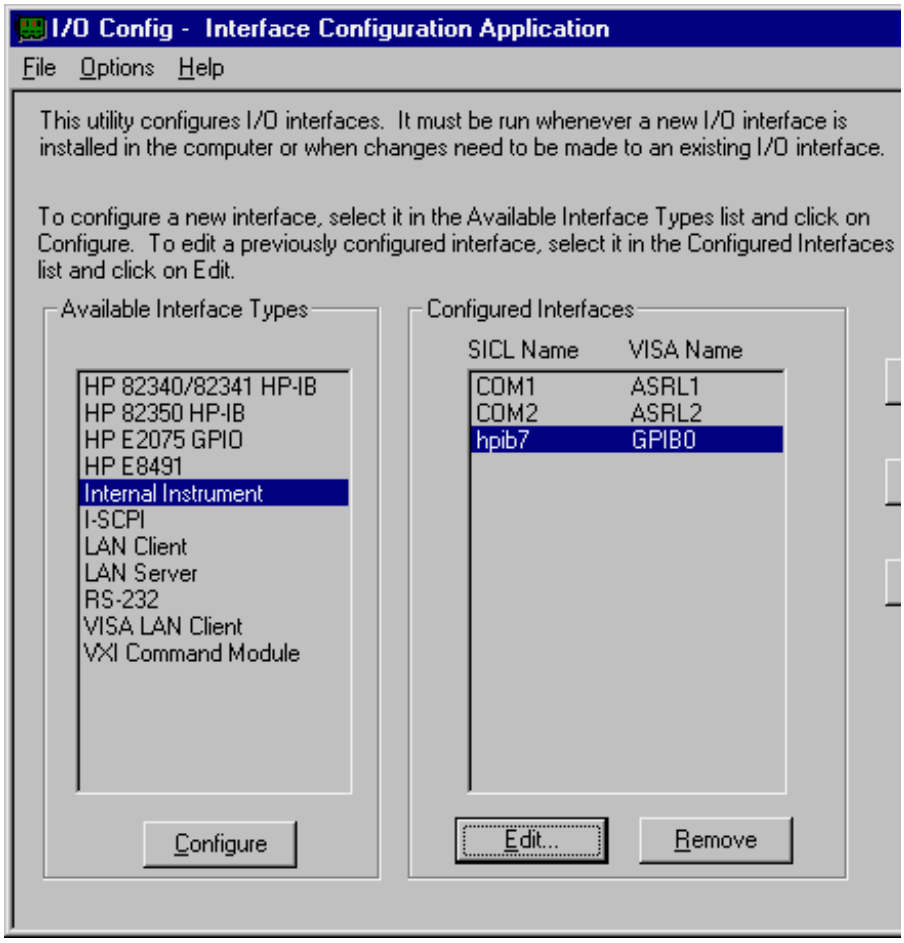
3. When the following dialog box appears, accept the default settings by clicking the **OK** button. The software automatically selects the next available “hpib(x)” number.



4. When the following dialog box appears, verify that the Internal Instrument appears in the right-pane list (`Configured Interfaces`) and click the **OK** button.

   In the following example, the Internal Instrument is configured as:

SICL Name	VISA Name
hpib7	GPIB0



NOTE

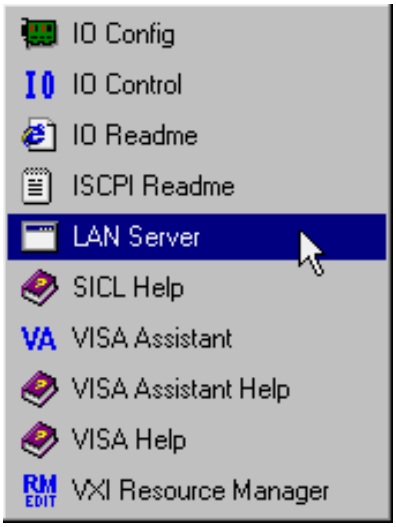
You must activate the LAN Server if you wish to communicate with the Agilent E7501A arbitrary analog signal development system from a remote computer using SCPI through a VXI-11 connection.

If not using a remote computer, the LAN Server does not need to be activated.

If you wish to communicate using SCPI through Telnet, Sockets, or RS-232, the LAN Server does not need to be configured.

5. Activate the LAN Server.

   Click the **Start** menu,
   point to **Programs**,
   point to **Agilent IO Libraries**,
   point to and click **LAN Server**.



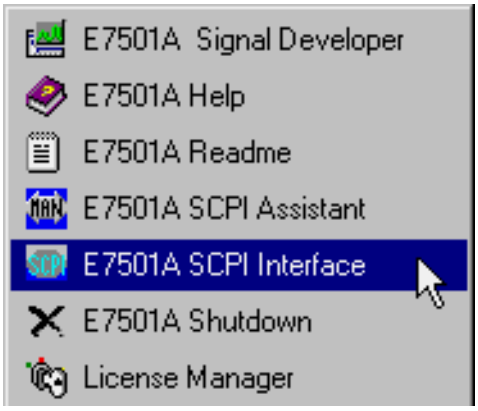
The LAN Server dialog box should appear and be ready to communicate with a remote PC or Unix workstation. This dialog box does not display any information, but it needs to be active for the LAN Server to function. The window can be minimized. (To minimize the window, select the minimize button in the upper-right corner of the dialog box.)

NOTE

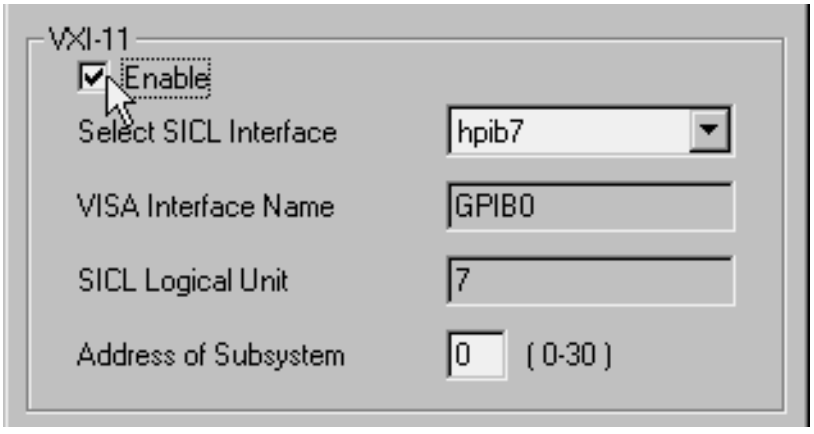
You must open an E7501A SCPI Interface before running any application software (such as VEE or C++).

6. Start the E7501A SCPI Interface.

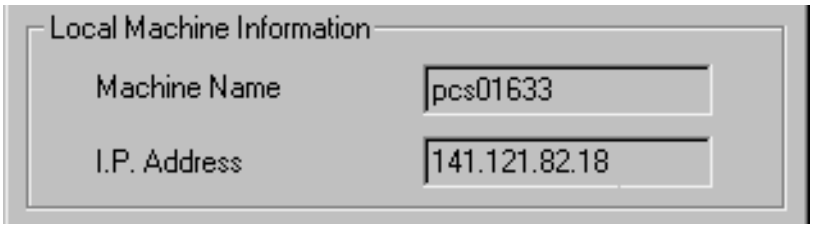
   Click the **Start** menu,
   point to **Programs**,
   point to **Agilent Signal Studio**,
   point to **E7501A Signal Development System**,
   point to and click **E7501A SCPI Interface**.



7. Select the configuration that you would like to use:
   Agilent E7501A or Demo. The Agilent E7501A configuration requires system hardware while the Demo configuration is used for operating without system hardware.
8. Select the VXI-11 **Enable** checkbox.
9. Select the **OK** button.



10. The E7501A SCPI Interface Monitor opens and displays information about the local machine you are using as well as the VXI-11 connection that has been enabled.

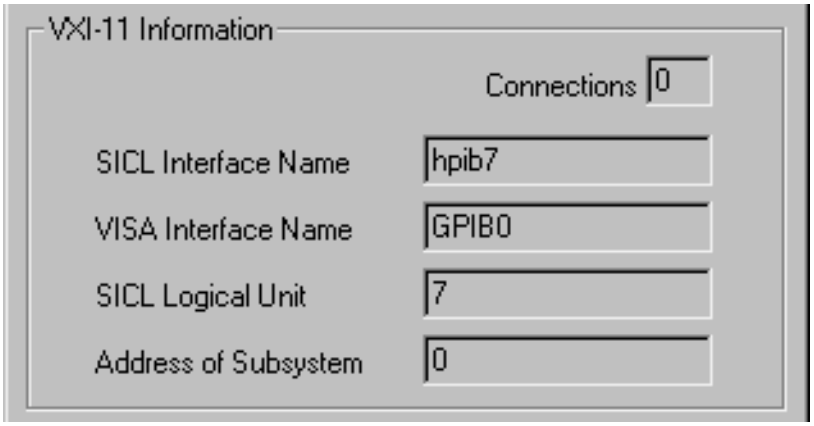


Machine Name

The machine name identifies your computer on your network, such as the network in your company. (For more information about your machine name, contact your network administrator.)

IP Address

The IP address is used to identify a node on a network and to specify routing information. Each node on a network must be assigned a unique IP address. This address is made up of the network ID, plus a unique host ID assigned by the network administrator. This address is typically represented in dotted-decimal notation, with the decimal value of each octet separated by a period (for example, 138.57.7.27). (For more information about IP addressing, contact your network administrator.)



Connections

The Connections box displays the number of VXI-11 sessions currently connected to E7501A SCPI interface. A total of 5 simultaneous VXI-11 connections are allowed.

SICL Interface Name

The SICL Interface Name is a symbolic name that SICL uses to uniquely identify an instrument interface. If your application software uses SICL I/O libraries, use this name and the Logical Unit number to address the instrument interface properly.

SICL Interface names are set using the I/O Config utility of Agilent I/O Libraries.

VISA Interface Name

The VISA Interface Name is a symbolic name that VISA uses to uniquely identify an instrument interface. If your application software uses VISA I/O Libraries, use this name to address the instrument interface properly.

VISA Interface names are set using the I/O Config utility of Agilent I/O Libraries.

SICL Logical Unit

SICL Logical Unit is a number that SICL uses to uniquely identify this Instrument interface. If your application software uses SICL I/O Libraries, use this number and the SICL Interface name in order to address this Instrument interface properly.

SICL Logical Unit numbers are set using the I/O Config utility of Agilent I/O Libraries.

Address of Subsystem

Address of Subsystem is the address of the Agilent subsystem on the VXI-11 interface emulated GPIB bus. Application software should address the subsystem using this device address.

The Address of Subsystem is set in the Interface Selection dialog.

NOTE

Note that the default address of the subsystem is 0 when the VXI-11 interface is used.

Logging Function

The Logging function is available in both the E7501A SCPI assistant and the E7501A SCPI interface; the procedure for using the Logging function is the same from both interfaces.

Enabling logging allows you to log Commands Sent, Query Responses, or both. All log entries can be saved in a text file (*.log) using the name and directory of your choice.

(For further information on the Logging function, refer to page 3-25.)

11. Start the external programming application software being used (such as VEE or C++). For further information, refer to “Examples Using HPBW and VXI-11” on page 3-39.
12. Send/Type the desired E7501A SCPI commands between the external programming application software, through the enabled connection, to the Agilent E7501A arbitrary analog signal development system.

    (For a complete list of available SCPI commands, refer to E7501A SCPI Commands in the Online Help.)

Examples Using HPBW and VXI-11

These examples are language specific to HP BASIC for Windows (HPBW). The HPBW program can be running on either the same local PC or a remote PC that is also running the E7501A SCPI interface with a VXI-11 connection enabled.

The HPBW autost file uses the HPIBS driver to open the interface as follows:

1. Using the Same PC, type:

   ```
   LOAD BIN “HPIBS; DEV hpib7 ISC 7”
   ```

   where, `hpib7` is the SICL interface name configured with the I/O Config utility and opened with the E7501A SCPI interface.

   or

   Using a Remote PC, type:

   ```
   LOAD BIN “HPIBS; DEV lan[<IP address>]:hpib7 ISC 7”
   ```

2. Your program would then address the Agilent E7501A arbitrary analog signal development system as follows:

   ```
   OUTPUT 700; “*IDN?”
   ENTER 700; Id$
   ```

   where, `<IP address>` is the IP address of the PC that is running the Agilent E7501A arbitrary analog signal development system, and `hpib7` is the SICL interface name configured with the I/O Config utility and opened with the E7501A SCPI interface.

Configuring a Telnet, Sockets, or RS-232 Connection

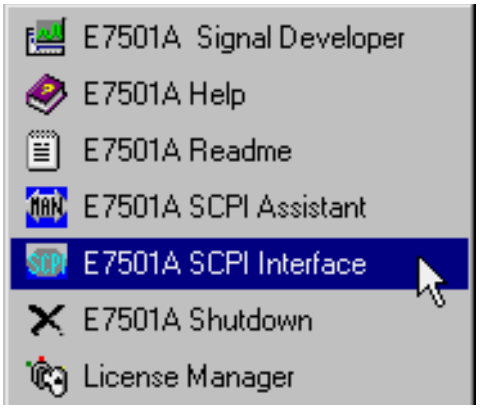
Overview of Steps:

- Start the E7501A SCPI Interface.
- Select a configuration (Agilent E7501A or Demo).
- Select the Enable check box for the type of connection being made.
- Start the external programming application software.
- Send SCPI commands.

Configuring a Telnet, Sockets, or RS-232 connection may require the following procedures:

1. Start the E7501A SCPI Interface.

   Click the **Start** menu,
   point to **Programs**,
   point to **Agilent Signal Studio**,
   point to **E7501A Signal Development System**,
   point to and click **E7501A SCPI Interface**.



2. Select the configuration that you would like to use:
   Agilent E7501A or Demo. The Agilent E7501A configuration requires system hardware while the Demo configuration is used for operating without system hardware.

3. Select the Enable check box for the type of connection being made.

   You may select one, two, three, or four of the Enable check-boxes. Checking all four Enable check-boxes gives access to the settings used for each connection. (When selecting the VXI-11 enable checkbox, refer to, “Configuring a VXI-11 Connection” on page 3-29.)

   Refer to the following procedures when enabling a connection:

   - “Enabling a Telnet Connection” on page 3-42
   - “Enabling a Sockets Connection” on page 3-46
   - “Enabling an RS-232 Connection” on page 3-48

4. Click the **OK** button when finished editing the connection settings.

   The selected connections are opened to the Agilent E7501A arbitrary analog signal development system.

5. Start the external programming application software being used (such as VEE or C++). For further information, refer to “Examples Using a Telnet Connection” on page 3-44

6. Send/Type the desired E7501A SCPI commands between the external programming application software, through the enabled connection, to the Agilent E7501A arbitrary analog signal development system.

   (For a complete list of available SCPI commands, refer to E7501A SCPI Commands in the Online Help.)

Enabling a Telnet Connection

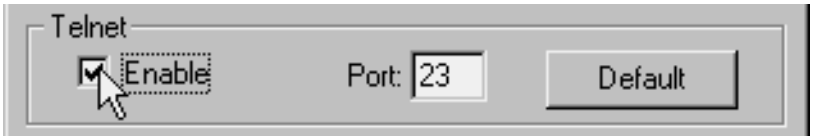
Telnet uses a LAN interface along with TCP/IP protocol to communicate between the Agilent E7501A arbitrary analog signal development system and the user's programming environment; each Telnet connection listens on a unique port address and requires installed and configured networking software. Telnet requires the IP address of the computer being communicated with along with the address of the port being listened on by the E7501A SCPI interface.

To enable a Telnet connection

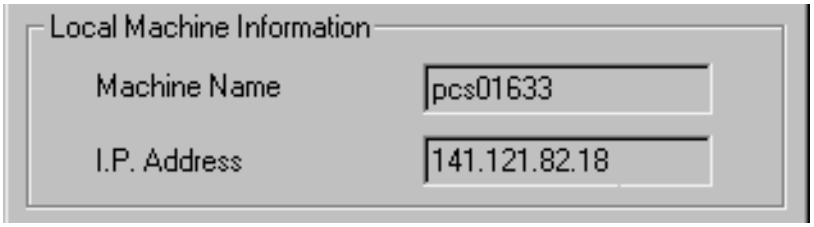
1. After starting the E7501A SCPI interface and selecting either the Agilent E7501A or Demo configuration, select the Telnet **Enable** checkbox.

   (For details on starting the E7501A SCPI Interface and selecting either the Agilent E7501A or Demo configuration, refer to "Making a Connection" on page 3-28.)

2. Enter a port number or leave the port set to **23**; this is the default value.
3. Select the **OK** button.



4. The E7501A SCPI Interface Monitor opens and displays information about the local machine you are using as well as the Telnet connection that has been enabled.

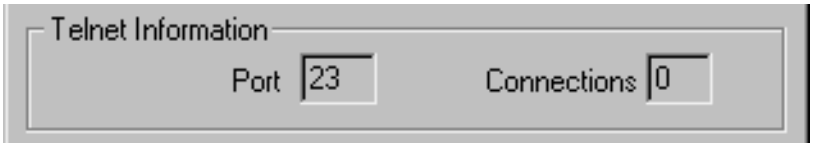


Machine Name

The machine name identifies your computer on your network, such as the network in your company. (For more information about your machine name, contact your network administrator.)

IP Address

The IP address is used to identify a node on a network and to specify routing information. Each node on a network must be assigned a unique IP address. This address is made up of the network ID, plus a unique host ID assigned by the network administrator. This address is typically represented in dotted-decimal notation, with the decimal value of each octet separated by a period (for example, 138.57.7.27). (For more information about IP addressing, contact your network administrator.)



Port

The Port box displays the number of the currently selected port being used by the enabled Telnet connection. (For more information about ports, contact your network administrator.)

Connections

The Connections box displays the number of Telnet sessions currently connected to E7501A SCPI interface. A total of 5 simultaneous Telnet or Sockets connections are allowed.

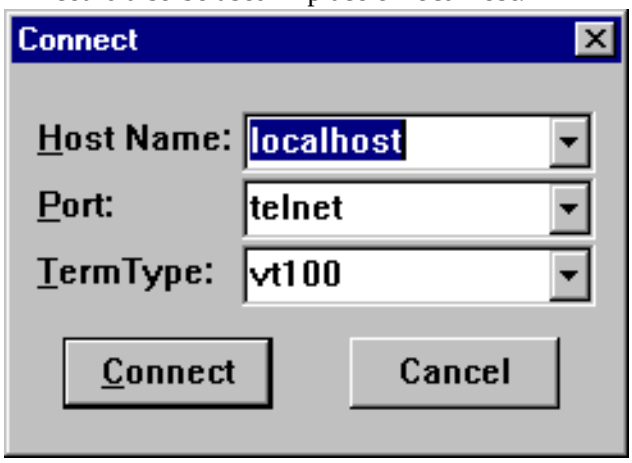
Examples Using a Telnet Connection

The Telnet program can be running on either the same local PC or a remote PC that is also running the E7501A SCPI interface with a Telnet connection enabled.

Using the Same Local PC

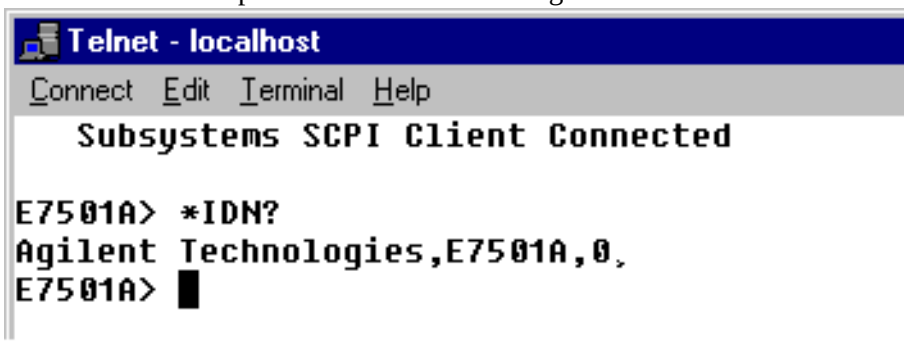
1. Select **Start/Run** and type **telnet**.

   The **telnet** program must be installed and available on your local PC. If it is available, a dialog box similar to the following might appear that allows you to enter SCPI commands. The IP address of your local PC could also be used in place of **localhost**.



2. Enter the SCPI command, `*IDN?`

   If everything is working correctly with the Telnet connection, you should see a response such as the following:

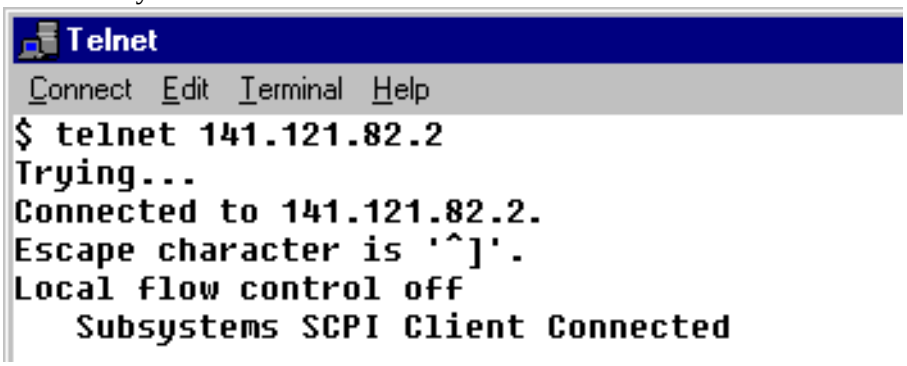


Using a Remote PC such as Unix

1. From a Unix prompt, type: `telnet <IP address>`,

   where, <IP address> is the IP address of the PC that is running the opened E7501A SCPI interface. (In the previous section, “Enabling a Telnet Connection” on page 3-42, the IP address was 141.121.82.18, but the PC being connected to in your situation would be different.)

   The **telnet** program must be installed and available on your Unix station. If it is available, a dialog box similar to the following might appear that allows you to enter SCPI commands.



2. Enter the SCPI command, `*IDN?`

   If everything is working correctly with the Telnet connection, you should see a response such as the following:

```
E7501A> *IDN?
Agilent Technologies,E7501A,
E7501A>
```

Enabling a Sockets Connection

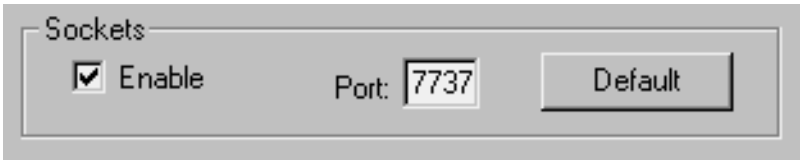
Sockets use a LAN interface along with TCP/IP protocol to communicate between the Agilent E7501A arbitrary analog signal development system and the user's programming environment; each Sockets connection listens on a unique port address and requires installed and configured networking software. Sockets require the IP address of the computer being communicated with along with the address of the port being listened on by the E7501A SCPI interface.

To enable a Sockets connection

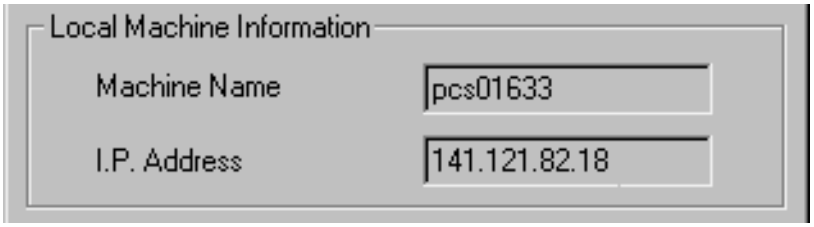
1. After starting the E7501A SCPI interface and selecting either the Agilent E7501A or Demo configuration, select the Sockets **Enable** checkbox.

   (For details on starting the E7501A SCPI Interface and selecting either the Agilent E7501A or Demo configuration, refer to "Making a Connection" on page 3-28.)

2. Enter a port number or leave the port set to **7737**; this is the default value.
3. Select the **OK** button.



4. The E7501A SCPI Interface Monitor opens and displays information about the local machine you are using as well as the Sockets connection that has been enabled.

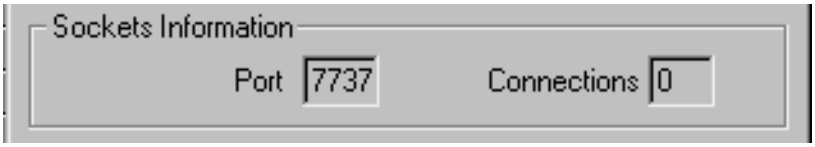


Machine Name

The machine name identifies your computer on your network, such as the network in your company. (For more information about your machine name, contact your network administrator.)

IP Address

The IP address is used to identify a node on a network and to specify routing information. Each node on a network must be assigned a unique IP address. This address is made up of the network ID, plus a unique host ID assigned by the network administrator. This address is typically represented in dotted-decimal notation, with the decimal value of each octet separated by a period (for example, 138.57.7.27). (For more information about IP addressing, contact your network administrator.)



Port

The Port box displays the number of the currently selected port being used by the enabled Sockets connection. (For more information about ports, contact your network administrator.)

Connections

The Connections box displays the number of Telnet sessions currently connected to E7501A SCPI interface. A total of 5 simultaneous Telnet or Sockets connections are allowed.

Enabling an RS-232 Connection

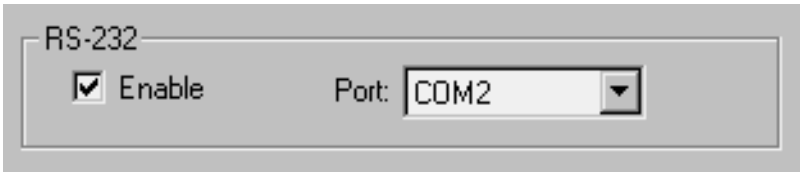
RS-232 is a serial COM port interface that uses a direct cable (a null-modem cable) between the computer running the Agilent E7501A arbitrary analog signal development system and the user's programming environment.

To enable an RS-232 connection

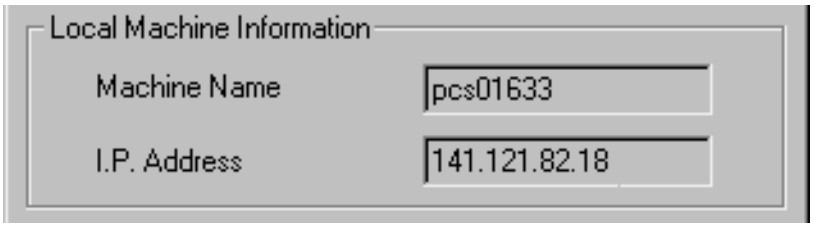
1. After starting the E7501A SCPI interface and selecting either the Agilent E7501A or Demo configuration, select the RS-232 **Enable** checkbox.

   (For details on starting the E7501A SCPI Interface and selecting either the Agilent E7501A or Demo configuration, refer to "Making a Connection" on page 3-28.)

2. Select a port number from the list of available ports (such as COM1 or COM2); the first available port is used by default. The port settings can be changed using the Windows Control Panel configuration utility.
3. Select the **OK** button.



4. The E7501A SCPI Interface Monitor opens and displays information about the local machine you are using as well as the RS-232 connection that has been enabled.



Machine Name

The machine name identifies your computer on your network, such as the network in your company. (For more information about your machine name, contact your network administrator.)

IP Address

The IP address is used to identify a node on a network and to specify routing information. Each node on a network must be assigned a unique IP address. This address is made up of the network ID, plus a unique host ID assigned by the network administrator. This address is typically represented in dotted-decimal notation, with the decimal value of each octet separated by a period (for example, 138.57.7.27). (For more information about IP addressing, contact your network administrator.)

Port

The Port box displays the name of the currently selected port being used by the enabled RS-232 connection.

Starting the E7501A SCPI Interface Programmatically

The E7501A SCPI interface can be started programmatically from a DOS command prompt, a Windows NT shortcut, or from a program using the following syntax:

```
<path>\ScpiClient.exe /driver ("<VXI-11_SICL_Name>" | telnet |
sockets | serial) [/server "<Configuration_Name>"]
```

The `/server` parameter is optional and defaults to the last one used and `<Configuration_Name> = "Agilent E7501A" | "Demo" | "<user_defined_name>"`

DOS Command Prompt Example:

- Telnet
  - `C:\Program Files\Agilent Signal Studio \E7501A Signal Development System\ScpiClient.exe /driver telnet`
- Sockets
  - `C:\Program Files\Agilent Signal Studio \E7501A Signal Development System\ScpiClient.exe /driver sockets`
- Serial (RS-232)
  - `C:\Program Files\Agilent Signal Studio \E7501A Signal Development System\ScpiClient.exe /driver serial`
- VXI-11
  - `C:\Program Files\Agilent Signal Studio \E7501A Signal Development System\ScpiClient.exe /driver "hpib8"`

Windows NT Shortcut Example:

For a Windows NT shortcut you must use quotes due to spaces in the path:

- Telnet
  - `"C:\Program Files\Agilent Signal Studio \E7501A Signal Development System\ScpiClient.exe" /driver telnet`
- Sockets
  - `"C:\Program Files\Agilent Signal Studio \E7501A Signal Development System\ScpiClient.exe" /driver sockets`
- Serial (RS-232)
  - `"C:\Program Files\Agilent Signal Studio \E7501A Signal Development System\ScpiClient.exe" /driver serial`
- VXI-11
  - `"C:\Program Files\Agilent Signal Studio \E7501A Signal Development System\ScpiClient.exe" /driver "hpib8"`

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Specifications and Characteristics

In this chapter, you will learn about:

- System Specifications for the Agilent E7501A arbitrary analog signal developer

System Specifications refer to the combination of specifications for the Agilent E6432A microwave synthesizer and Racal 3153 arbitrary waveform generator being used. These system specifications describe warranted product performance and apply over the 0 to +55 degrees Celsius temperature range, except as noted otherwise.

The system specifications rely on each of the modules being calibrated independently. Refer to the documentation of each module for a listing of their warranted specifications.

Items noted as *Typical* describe non-warranted typical performance and items noted as *Characteristic* describe non-warranted functional and performance information of a product. This non-warranted information is derived during the design phase of a product and is not verified on a continuing basis.

Warm-Up Time Required

Warm-up time is required before the system can meet specifications. Operation to specifications requires 30 minutes to warm-up from a cold start at 0 to +55 degrees Celsius.

Correctable Values only apply at ±3 degrees Celsius of the ambient temperature of where a correction is performed.

	Agilent E6432A Microwave Synthesizer	Racal 3153 ArbitraryWaveform Generator	Agilent E7501A Arbitrary Analog Signal Developer	Correctable Values of the Agilent E7501A Arbitrary Analog Signal Developer
AM Rate	dc to 100 kHz	0.01 Hz to 25 MHz	0.01 Hz to 100 kHz	0.01 Hz to 250 kHz
AM Accuracy	6%@1 kHz 30% depth	1%@1 kHz	6%@1 kHz 30% depth	1% 20 Hz to 100 kHz
AM Distortion	None	0.3% Max Res & Sampling	< 1% *Typical*	No Change
FM Rate (E6432A Standard Model)	100 kHz to 1 MHz	0.01 Hz to 25 MHz	100 kHz to 1 MHz	50 kHz to 1 MHz
FM Rate (E6432A Option 002)	1 kHz to 1 MHz	0.01 Hz to 25 MHz	1 kHz to 1 MHz	**???** kHz to 1 MHz
FM Accuracy	30%@ 1 vpp, 1 MHz FM Rate	1% @ 1 kHz	30%@ 1 vpp, 1 MHz FM Rate	1% < 100 kHz
FM Distortion	None	0.3%	< 1% *Typical*	No Change
Pulse Width	15 ns 2 GHz to 20 GHz	20 ns Minimun **???**	20 ns Minimun 2 GHz to 20 GHz	No Change

DECLARATION OF CONFORMITY

According to ISO/IEC Guide 22 and CEN/CENELEC EN 45014

Manufacturer's Name: Agilent Technologies, Inc.

Manufacturer's Address: 1400 Fountaingrove Parkway
Santa Rosa, CA 95403-1799
USA

Declares that the products

Product Name: Arbitrary Analog Signal Generation System

Model Number: E7501A

Product Options: This declaration covers all options of the above products.

Conform to the following product specifications:

EMC: IEC 61326-1:1997+A1:1998 / EN 61326-1:1997+A1:1998

Standard	Limit
CISPR 11:1990 / EN 55011-1991	Group 1, Class A
IEC 61000-4-2:1995+A1998 / EN 61000-4-2:1995	4 kV CD, 8 kV AD
IEC 61000-4-3:1995 / EN 61000-4-3:1995	3 V/m, 80 - 1000 MHz
IEC 61000-4-4:1995 / EN 61000-4-4:1995	0.5 kV sig., 1 kV power
IEC 61000-4-5:1995 / EN 61000-4-5:1996	0.5 kV L-L, 1 kV L-G
IEC 61000-4-6:1996 / EN 61000-4-6:1998	3 V, 0.15 – 80 MHz
IEC 61000-4-11:1994 / EN 61000-4-11:1998	1 cycle, 100%

Safety: IEC 61010-1:1990 + A1:1992 + A2:1995 / EN 61010-1:1993 +A2:1995
CAN/CSA-C22.2 No. 1010.1-92

Supplementary Information:
The products herewith comply with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC and carry the CE-marking accordingly.

Santa Rosa, CA, USA 1 September, 2000

Greg Pfeiffer/Quality Engineering Manager

For further information, please contact your local Agilent Technologies sales office, agent or distributor.

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