

# **Agilent IO Libraries Suite**

## **E2094N**

### **Getting Started**



**Agilent Technologies**

# Notices

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# 1

## Quick Start

This chapter gives you the information you will need, in most cases, to configure connections to your instruments and interfaces and start using the Agilent IO Libraries to communicate with your instruments. The Quick Start steps detailed in this chapter are:

- 1 Install IO Libraries Suite Software
- 2 Connect and Configure Interface and/or Instrument Hardware
- 3 Run Connection Expert to Verify I/O Configuration



## IO Libraries Suite Quick Start Steps

### 1. Install IO Libraries Suite Software

**a Perform pre-installation checks:**

- Make sure your PC meets the minimum system requirements. (See “System Requirements” on page 26.)

**b Install IO Libraries Suite:**

- Close all other applications on your PC, insert the *Automation-Ready CD with Agilent IO Libraries Suite* into your CD-ROM drive, and follow the instructions on your screen.
- If the IO Libraries Suite installation does not start automatically, select **Start > Run** (on the Windows **Start** menu) and type <drive>:\autorun\auto.exe, where *drive* is your CD-ROM drive.
- After IO Libraries Suite has been successfully installed, you will see the IO Control (**IO** icon) in the taskbar notification area on your PC screen as in [Figure 1](#). (The taskbar notification area is where the clock is usually displayed.)
- If you have difficulty with the installation, see Chapter 3, “Installing the IO Libraries Suite Software”.



**Figure 1** IO Control icon in taskbar notification area

## 2. Connect and Configure Interface and/or Instrument Hardware

*If you are not installing new hardware, skip this section and proceed directly to step 3.*

- a Install hardware:** If you received the Agilent IO Libraries Suite when you purchased an instrument or an interface product (such as an Agilent GPIB card or USB/GPIB interface converter), it is time to install the hardware now. Consult the documentation for your hardware product for installation instructions and specific hardware configuration (for example, setting Ethernet or GPIB addresses). General instructions for hardware installation appear in the *Agilent Connectivity Guide*, which you can display (in PDF format) by clicking the IO Control and choosing **Documentation > Connectivity Guide**. The **Documentation** menu also includes manuals for Agilent interface hardware products that you have installed.
- b Configure hardware; turn on the PC if necessary:** If you turned your PC off to install new hardware, turn it back on when the installation is complete, and wait for your PC to start up. Perform any necessary hardware configuration.

### NOTE

When you connect a USB device, Windows will display a **Found New Hardware Wizard**. If your USB device is an Agilent USBTMC instrument or an Agilent USB/GPIB Interface Converter, you do not need to insert a CD when prompted by the wizard, because all the drivers you need have already been installed with the IO Libraries Suite. Simply click Next until the wizard completes. If a second **Found New Hardware Wizard** appears, continue to click Next until that wizard completes as well. These wizards place the installed USB drivers in the appropriate locations for Windows to recognize your device.

## 3. Run Connection Expert to Verify I/O Configuration

- a Run Connection Expert:** If the Connection Expert utility does not run automatically at this time, click the

IO Control (**IO** icon in the Windows notification area) and then click **Agilent Connection Expert**.


**b Change the I/O configuration if necessary:** Connection Expert will automatically detect most interfaces and instruments, and will assign names and other default configuration settings. If you want to change these parameters, you can do so in the Connection Expert window.

- Select the instrument or interface in the explorer pane in the center of the Connection Expert window.
- The properties of the selected item appear in the properties pane on the right. When you right-click on an item in the explorer pane, you see a shortcut menu of actions that you may take on that item. These actions are also available from the menus at the top of the Connection Expert window. The most common actions are also listed in the Connection Expert's task guide (the left pane of the window).
- You may also add instruments or interfaces manually to your test system configuration if Connection Expert does not automatically detect the hardware (for example, if it is connected via ethernet or via serial port).
- See the *Agilent IO Libraries Suite Online Help* for more information on Connection Expert and on configuration changes.

**c Test instrument connections:**

- Connection Expert will automatically send an identification query (\*IDN?) to any instrument that has its auto-identify property set to **Yes**. (See the *Agilent IO Libraries Suite Online Help* if you want to turn this function off.)



- When you see a green check mark on the icon representing an instrument, this means that the instrument has responded as expected. (Note that some instruments do not support the \*IDN? query and will not respond appropriately.) The instrument's identification information is displayed in the properties pane on the right side of the Connection Expert window. 
- You can explicitly test the connections to your instruments, and exercise more of their functionality, by selecting **Send commands to this instrument** in the task guide or shortcut menu. This starts the Interactive IO utility, which allows you to send commands to your instruments and see their responses. Note that some commands (such as \*TST?, instrument self-test) may take longer than Interactive IO's default timeout; you can modify the timeout in the Interactive IO window by selecting **Interact > Options...**

#### 4. Optional: Install additional software

If you received the *Automation-Ready CD* with an Agilent instrument or interface product, you may also have received a second CD-ROM containing additional software and information related to your product. This CD may contain software such as instrument drivers, specialized applications, or sample programs. Consult the documentation that came with your hardware for complete software descriptions and installation information.





## 2 Welcome to Agilent IO Libraries Suite

This chapter includes:

- What is Agilent IO Libraries Suite?
- Where Can I Get More Information about Using Agilent IO Libraries Suite?



### What is Agilent IO Libraries Suite?

Agilent IO Libraries Suite is a collection of libraries that give you the ability to use your instruments from a test and measurement program, and utilities that help you quickly and easily connect your instruments to your PC.

Agilent IO Libraries Suite speeds your success with software utilities that let you quickly connect your instruments to your PC, configure and verify your connection, and get on with your job – whether that entails programming instruments or using pre-existing application software. For test and measurement programmers, Agilent IO Libraries Suite brings the power of the industry-standard VISA and VISA COM libraries to your programming experience.

Below you will find a list of the components (libraries and utilities) that make up the Agilent IO Libraries Suite product. You can find more information about each of these components in the *Agilent IO Libraries Suite Online Help*.

#### NOTE

To access the *Agilent IO Libraries Suite Online Help* from the Connection Expert window, click **Help > Help Topics** on the menu bar or press the **F1** key. To access the online Help without running Connection Expert, click the IO Control (**IO** icon in the taskbar notification area), click **Documentation** and then **IO Libraries Suite Help**.

---

#### NOTE

To find out where the Agilent IO Libraries Suite components listed below have been installed on your system, click the IO Control (**IO** icon in the Windows notification area), then click **Installation Information**.

---

## Agilent IO Libraries

There are three IO Libraries included in Agilent IO Libraries Suite; each of them allows you to programmatically control instruments, send commands to them, and receive responses and data. The *Agilent IO Libraries Suite Online Help* provides guidelines to help you choose among these libraries; in general, VISA and VISA COM are recommended for new development.

### Agilent VISA

Agilent VISA (Virtual Instrument Software Architecture) can be used to develop I/O applications and instrument drivers that are interoperable with many other VISA applications from many vendors, and that comply with IVI Foundation standards (formerly *VXIplug&play* standards).

### Agilent VISA COM

Agilent VISA COM is a COM (Microsoft Common Object Model) implementation based on the Agilent VISA architecture. Like VISA, VISA COM conforms to IVI Foundation standards.

### Agilent SICL

Agilent SICL (Standard Instrument Control Library) is an I/O library developed by Agilent that is portable across many instrument I/O interfaces.

## Agilent Connection Expert

Connection Expert is a software utility that helps you quickly get your instruments connected to your PC and troubleshoot connectivity problems. You can use Connection Expert to:

- configure instrument I/O interfaces
- automatically discover instruments that are connected to your PC or to your local area network

## 2 Welcome to Agilent IO Libraries Suite

- browse the structure and connections of your test system (including your PC, instruments, and interfaces)
- detect and troubleshoot connectivity problems in your test system
- create programming aliases that you can use in place of addresses to improve portability and readability of your test program

Connection Expert includes a task guide (the left pane of the utility's window) that provides shortcuts to common tasks and information.

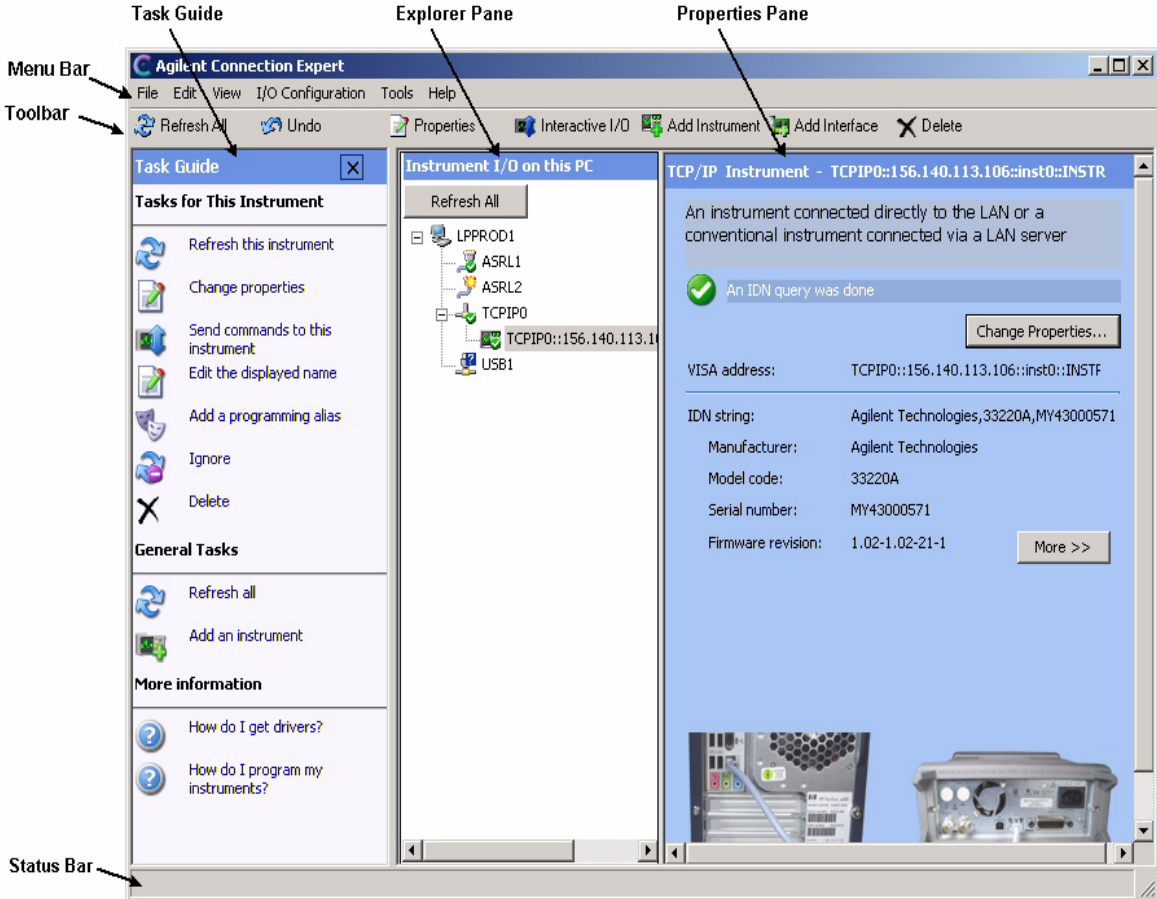


Figure 2 Agilent Connection Expert

To run Connection Expert, click the IO Control (IO icon in the Windows notification area), and click **Agilent Connection Expert**.

**NOTE**

You must have Administrator privileges to run Connection Expert.

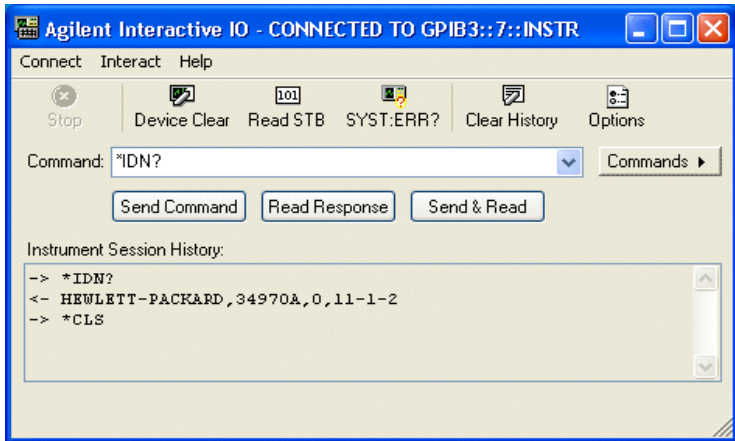
### Interactive IO

Agilent Interactive IO is a software utility that allows you to interact with an instrument by sending commands to the instrument and seeing the instrument's responses. You can use Interactive IO to:

- quickly verify connectivity to your instrument
- troubleshoot communication problems
- learn the instrument's command set
- rapidly prototype commands and check the instrument's responses before writing code

To start Interactive IO from within Connection Expert, click **Tools > Interactive IO** from the Connection Expert menu bar or click **Send commands to this instrument** on the task guide. You can also start Interactive IO from the IO Control by clicking the **IO** icon in the Windows notification area and then selecting **Interactive IO**.

Note that some commands (such as \*TST?, instrument self-test) may take longer than Interactive IO's default timeout; you can modify the timeout in the Interactive IO window by selecting **Interact > Options...**



**Figure 3** Interactive IO



Command	Description
*IDN?	The Identification query returns manufacturer, model, serial number, and firmware level or equivalent.
*CLS	The Clear Status command clears status data structures, and forces the device to the Operation Complete query idle state.
*OPC?	The Operation Complete query places an ASCII character "1" into the device's Output Queue when all pending selected device operations have been finished.
*RCL	The Recall command restores the current settings of a device from a copy stored in local memory.
*RST	The Reset command performs a device reset, which sets the device-specific functions to a known state that is independent of the past-use history of the device.
*SAV	The Save command stores the current settings of the device in local memory.
*STB?	The Read Status Byte query returns the status byte and master Summary Status bit.
*TRG	The Trigger command signals the transition of the Device Trigger (DT) function to the Device Trigger Active State (DTAS).
*TST?	The Self-test query returns zero to indicate the test completed with no errors. A return value not equal to zero indicates the test is not completed or completed with errors.

**Table 1** Interactive IO Commands

## IO Control

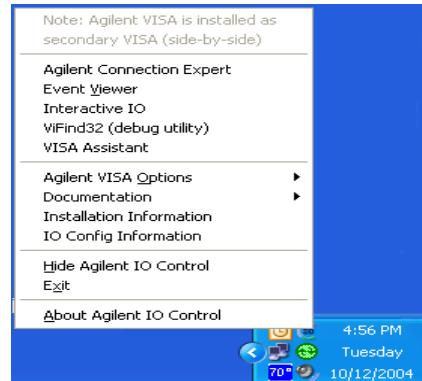
When you install Agilent IO Libraries Suite, the Agilent IO Control is displayed as a circled **IO** symbol in the Windows notification area. (To do this, Agilent IO Libraries Suite runs a program called `iprocsvr.exe`.) The IO Control provides easy access to the IO Libraries Suite utilities and documentation.

When you click the IO Control, you will see a menu that includes several types of commands:

- Commands to run each of the Agilent IO Libraries Suite utilities: Connection Expert, Interactive IO, VXI Resource Manager (if applicable to your system), ViFind32, and VISA Assistant

## 2 Welcome to Agilent IO Libraries Suite

- An **Event Viewer** command to invoke the Microsoft Event Viewer, which can be useful in debugging I/O programs
- A **Documentation** submenu with commands to display:
  - online Help files for IO Libraries Suite and for specific IO Libraries
  - manuals for IO Libraries Suite, specific IO Libraries, and Agilent interface products
  - the Agilent IO Libraries Suite Read Me file
  - installation and path information, which includes paths for Agilent IO Libraries Suite and for Agilent VISA, and Windows registry entries used by Agilent IO Libraries Suite
- An **Agilent VISA Options** submenu with commands to set the Logging and LockWait options for the Agilent VISA library.



**Figure 4** IO Control Menu

### NOTE

If the IO Control icon is not visible, you can display the icon by clicking **Start > Programs > Agilent IO Libraries Suite > Utilities > IO Control** or, in Connection Expert, **View > IO Control**.

## ViFind32

ViFind32 is a console application that uses the **viFindRsrc** and **viFindNext** VISA functions to enumerate all resources visible to VISA. This application is useful for verifying that all expected interfaces have been configured by Connection Expert, and that the expected devices have been attached.

To run ViFind32, you can do any one of the following:

- Click **Start > Programs > Agilent IO Libraries Suite > Utilities > ViFind32**
- Click the IO Control, and then click **ViFind32**
- In Connection Expert, click **Tools > ViFind32**

## VXI Resource Manager

The VXI Resource Manager is a software utility that initializes and prepares a VXI system for use. If your system includes an E8491 IEEE-1394 PC Link to VXI interface, you can use the VXI Resource Manager to determine whether your system is properly configured.

The VXI Resource Manager runs when any of the following conditions occurs:

- You start it from the Connection Expert's Tools menu (select **Tools > VXI Resource Manager > Edit Resources**, then click **Run** in the resulting Resource Manager dialog box)
- You start it from the Agilent IO Control
- You apply or cycle VXI mainframe power
- You press the E8491 Reset button
- You reboot your PC

In VXI systems with multiple E8491 interfaces, you can turn off individual VXI mainframes without affecting other mainframes in the system. When a mainframe is turned on, the VXI Resource Manager reconfigures that mainframe.

### **Remote IO Server**

The Remote IO Server software provides a way to connect via local area network (Ethernet) to instruments that are physically connected to another PC on the network. When the Remote IO Server is running on one PC (the server), you can use instruments connected to that server from other PCs (the clients) by using the Connection Expert to create remote interfaces on the client PCs. See the *Agilent IO Libraries Suite Online Help* for details.

### **VISA Assistant**

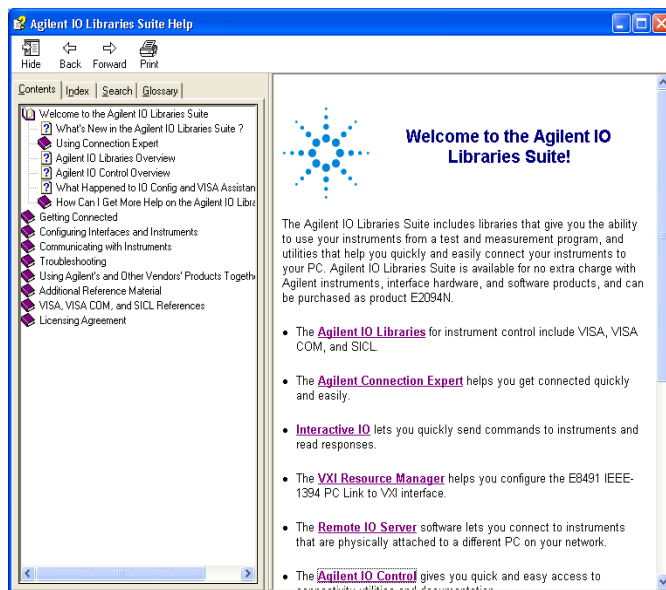
The VISA Assistant utility is provided for your convenience, though most of its capabilities have been replaced by Interactive IO and Connection Expert.

## Where Can I Get More Information about Using Agilent IO Libraries Suite?

### Agilent IO Libraries Suite Documentation

#### Online Help

Online Help is always easily available whenever you use the Connection Expert software. Just click **Help > Help Topics**. The online Help will appear on your screen in a new window.



**Figure 5** Agilent IO Libraries Suite Help

- Click any book icon to see the topics beneath it.



- When a book or chapter is open, it looks like this:



- Each topic is represented by a symbol like this:



- When Connection Expert is running, you can press F1 in any Connection Expert pane or dialog box to go directly to the most relevant help topic.
- When Connection Expert is not running, you can view the online Help by clicking the **IO** icon in the taskbar notification area (the IO Control) and then clicking **Documentation > IO Libraries Suite Help**.

### The Task Guide

The Connection Expert task guide appears in the left-most pane of the Connection Expert window. The choices listed in the task guide are based on what you have selected in the explorer pane (the middle pane of the Connection Expert window). The purpose of the task guide is to point you to common tasks and useful information.

### Other Documentation

The table below lists documentation that may be helpful to you as you connect and control your instruments.

**Table 2** Agilent IO Libraries Suite and Related Documentation

Document or helpful information	Description
<i>Agilent IO Libraries Suite Getting Started</i>	This manual. Provides an introduction to IO Libraries Suite features and installation instructions.
<i>Agilent USB/LAN/GPIB Connectivity Guide</i>	Provides step-by-step instructions on connecting instruments to PCs via USB, LAN, or GPIB, with troubleshooting techniques and programming information.
<i>Agilent IO Libraries Suite Online Help</i>	Provides general Agilent IO Libraries Suite information and specific information on usage of the Connection Expert utility. Includes detailed troubleshooting techniques and high-level programming information. In Connection Expert, click <b>Help &gt; Help Topics</b> , or use the IO Control <b>Documentation</b> menu.

**Table 2** Agilent IO Libraries Suite and Related Documentation

<i>VISA Online Help</i> <i>VISA COM Online Help</i> <i>SICL Online Help</i>	Provides programming reference information in the form of Windows HTML Help. In Connection Expert, click <b>Help &gt; Help Topics</b> , or use the IO Control <b>Documentation</b> menu.
<i>VISA Users' Guide</i> <i>SICL Users' Guide</i>	Provides introduction to I/O programming concepts, library details, and step-by-step instructions to build sample programs. In Connection Expert, click <b>Help &gt; Documentation</b> , or use the IO Control <b>Documentation</b> menu.
<i>Agilent IO Libraries Suite Task Guide</i>	Appears in the left-most pane of the Connection Expert window. The task guide lists common tasks and helpful information; the choices are based on what you have selected in the explorer pane (middle pane).
Programming Samples	Agilent IO Libraries Suite provides sample programs online to help you develop VISA, VISA COM, and SICL applications. Access these samples from Connection Expert by clicking <b>Help &gt; Programming Samples</b> . Additional sample code is available on the Agilent Developer Network (see below).
Agilent Developer Network (ADN)	The ADN Web site provides code samples, software downloads including IO Libraries Suite updates and instrument drivers, technical notes, white papers, and other resources for software developers. The URL for ADN is <a href="http://www.agilent.com/find/adn">http://www.agilent.com/find/adn</a>

## Contacting Agilent

In the USA, you can reach Agilent Technologies at this telephone number:

USA: 1-800-829-4444

Outside the USA, contact your country's Agilent support organization. A list of contact information for other countries is available on the Agilent Web site:

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

## **2 Welcome to Agilent IO Libraries Suite**





## 3 Installing IO Libraries Suite

This chapter includes:

- System Requirements
- Installing the IO Libraries Suite Software
- Optional: Installing Additional Software For A New Instrument Or Interface
- Installation Troubleshooting
- Keeping Your Software Up To Date

### NOTE

This chapter assumes that you are installing Agilent IO Libraries Suite from the *Automation-Ready CD*. If you are installing from the Web, double-click the downloaded executable to extract files and launch the setup program; then proceed with the software installation as documented in this chapter.



## System Requirements

- **Processor:** 100 MHz Pentium II or higher required, 800 MHz recommended
- **Operating system:** Any one of the following Microsoft Windows versions:
  - Windows XP Professional or Home Edition, Service Pack 1 or later (Service Pack 1 required for USBTMC device support)
  - Windows 2000 Professional, Service Pack 4 or later (Service Pack 4 required for USBTMC device support)
  - Windows Millennium Edition (Me)
  - Windows 98 Second Edition
- **Browser:** Microsoft Internet Explorer 5.01 or greater
- **Available memory:** 64 MB (96 MB or greater recommended)
- **Available disk space:**
  - 215 MB required for installation:
    - 160 MB for Microsoft .NET Framework
    - 55 MB for Agilent IO Libraries Suite
  - 125 MB required for operation:
    - 70 MB for Microsoft .NET Framework
    - 55 MB for Agilent IO Libraries Suite
- **Video:** Super VGA (800x600) 256 colors or more

## Installing the IO Libraries Suite Software

**NOTE**

You must have Administrator privileges to install Agilent IO Libraries Suite and to run Connection Expert.

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**NOTE****Every IO Libraries Suite installation is a “Full installation”**

In past versions of IO Libraries, there was an option to install IO Libraries as either a Full version or a Runtime version. Beginning with IO Libraries Suite 14.0, the installation process provides a **Full installation** for all users (i.e. there is no longer a Runtime installation option). This means that every installation now includes the development components of the Agilent IO Libraries Suite software, which allows you to develop your own IO programs. If you wish to minimize the size of the installed software, select a **Custom** installation; when you get to the **Select Features** dialog, un-check the manuals and the sample programs.

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This section describes how to install Agilent IO Libraries Suite on your PC. The process is as follows:

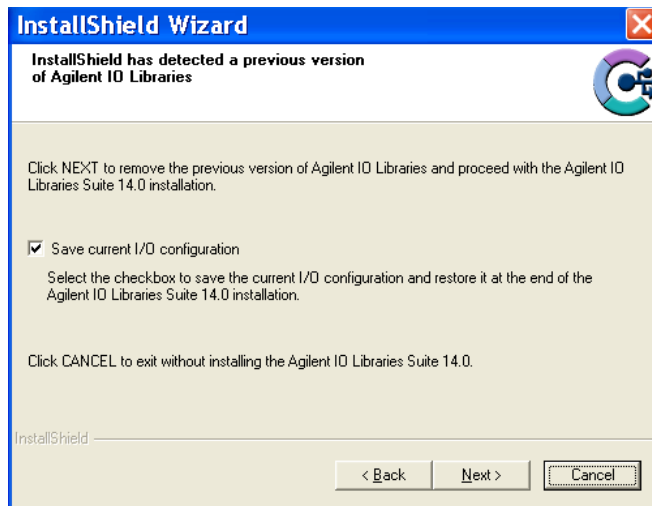
- 1 Verify that your PC meets the minimum system requirements. (See “System Requirements” on page 26.)
- 2 If you are upgrading to IO Libraries Suite from a previous version of IO Libraries, you must remove the instruments and interfaces listed below before you upgrade your software. This step is necessary in order for these devices to obtain the correct drivers to work with Agilent IO Libraries Suite.
  - a Disconnect any USB instruments from your PC.
  - b Disconnect any Agilent 82357 USB/GPIB interface converters from your PC.
  - c Disconnect any Agilent E8491 IEEE 1394 PC Link to VXI interfaces from your PC.
- 3 Close all other applications on your PC.

- 4 Insert the *Automation-Ready CD with Agilent IO Libraries Suite* into the CD-ROM drive of your PC.
  - Wait a few seconds for the auto-run window to appear.
  - If the auto-run window does not appear automatically,
    - Click **Start > Run...**
    - Type `<drive>:autorun\auto.exe`, where `<drive>` is your CD drive letter.
- 5 When the auto-run window appears, click **Install Software** once, and wait for the InstallShield Wizard to appear.

Optional: If you want more information before you begin the installation, click **Connect in 3 Steps** and/or **Readme**.

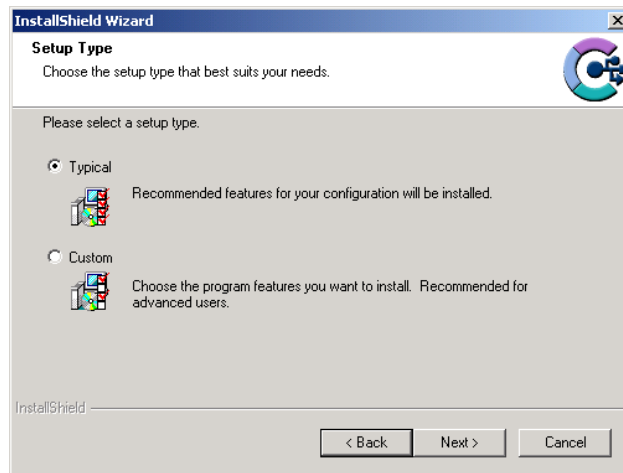
  - The *Three-Step Connection Procedure* explains how to connect an instrument to your PC quickly and easily, using the IO Libraries Suite.
  - The Read Me file includes last-minute information about the IO Libraries Suite software.
- 6 When the InstallShield Wizard appears, click **Next >** to begin the IO Libraries Suite software installation.
- 7 Read the License Agreement(s). If you accept the terms, click **Yes**.
- 8 If you are upgrading to IO Libraries Suite from a previous version of IO Libraries (version M or before), you may see a dialog box similar to [Figure 6](#). Notice that you *must* allow the previous version to be removed if you want to install the current version of IO Libraries Suite.
  - a Select the check box if you want to save your current I/O configuration.
    - If you select this option, interfaces and instruments that were either discovered by, or manually added to, the old IO Config utility will appear when you run Connection Expert.

- If you do not select this option, Connection Expert will display only the interfaces and instruments that it discovers automatically. Serial and LAN instruments will not appear; you will have to add them manually.
- b** Click **Next >** to proceed with the installation of IO Libraries Suite.



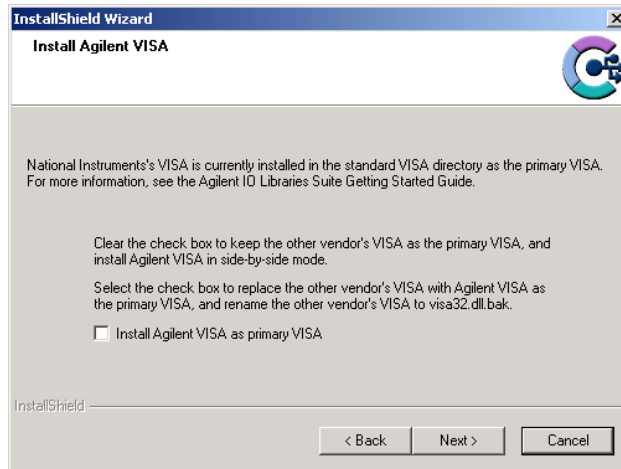
**Figure 6** Upgrading From Previous Version of IO Libraries

- 9** When the InstallShield Wizard **Setup Type** dialog box appears, as shown, select **Typical** or **Custom**, then click **OK**. The **Typical** setup installs the recommended features for your configuration in standard locations on your PC. In a **Typical** setup, if another vendor's VISA software is already installed on this PC, Agilent VISA is installed as secondary. If no other vendor's VISA software is found on this PC, Agilent VISA is installed as primary. (See "Using Agilent VISA In Side-by-Side Mode" on page 35.)



**Figure 7** Choosing Setup Type

**10** If you chose the **Custom** setup, then you will see the dialog box below, which asks whether you want to install Agilent VISA as the primary VISA.



**Figure 8** Agilent VISA as Primary VISA

For details on this topic, see “Using Agilent VISA In Side-by-Side Mode” on page 35.

- 11** If you chose a **Custom** setup, you will now see the **Choose Destination Location** dialog.

From this dialog, you may select specific destination folders for:

- The IO Libraries Suite software
- Agilent VISA (only if you have not previously installed *VXIPlug&Play* drivers or other VISA components)\*
- IVI shared components (only if you have not previously installed IVI shared components or IVI drivers.\*

\*The destination folders chosen here will affect where you must install related instrument drivers in the future.

- 12** If you chose a **Custom** setup, you will now see the **Select Features** dialog box.
- a** Click on any feature in the list to see the feature description and the space requirements for the selected set of features. It is recommended that you install the manuals and sample programs if you plan to program with the Agilent IO Libraries; however, you may omit them to save space.
  - b** Select the check box for each feature to be installed. Clear the check box for each feature to omit.
  - c** When you are done selecting features, click **Next >**.

- 13** The **Start Copying Files** dialog appears; click **Next >** to begin copying files.

- 14** If the Microsoft .NET Framework has not previously been installed on your PC, you will see the .NET Framework files being copied onto your computer. The Microsoft .NET Framework provides necessary infrastructure for Agilent IO Libraries Suite utilities, as well as for .NET programming tools and many other applications. You will only need to install the .NET Framework once, even if you remove and reinstall or upgrade your IO Libraries Suite.

- 15** If the IVI (Interchangeable Virtual Instrument) Shared Components have not previously been installed on your PC, you will now see them being copied onto your computer. The IVI Shared Components provides necessary infrastructure for Agilent IO Libraries Suite utilities, as well as for IVI-COM instrument drivers.
- 16** After the files have been copied, you may see a dialog asking you to restart your PC. This occurs only if you have certain I/O hardware configurations. If you choose not to reboot at this time, you should reboot before running Connection Expert.
- 17** When the **InstallShield Wizard Complete** dialog appears,
  - a** Select the check boxes for the actions that you want to do next.
    - Select the **Read Me** file check box if you want to view the Read Me file.
    - Select the **Launch Agilent Connection Expert** check box if you want to run Connection Expert now. Run Connection Expert if you are ready to connect, configure, and verify your instruments. If you need to install hardware, such as a GPIB card, then wait to run Connection Expert after you have done that installation.
  - b** Click **Finish**.
- 18** If you are installing Agilent IO Libraries Suite along with another instrument, interface, or software package, there may be another CD with additional software (drivers, sample programs, etc.) if you are installing Agilent IO Libraries Suite along with a new instrument, interface, or a software package such as Agilent VEE or Agilent T&M Toolkit.

If you want to install this additional software,

- a** Insert the CD into the CD drive on your PC.
- b** Follow the instructions that came with the CD or the hardware.



- 19 Re-connect any USB instruments or E8491 IEEE-1394 FireWire to VXI interfaces that you may have disconnected in [step 2](#).
- 20 Run the Connection Expert utility to verify your I/O configuration:
  - a In the Windows taskbar notification area, click the **IO** icon (IO Control).
  - b Click **Run Connection Expert**.
  - c Locate your interfaces and instruments in the explorer pane. Click on them to see their properties (displayed in the right-hand pane). Observe their state, also displayed in the right-hand pane: if communication to the interface or instrument has been successfully established, it will be in the Verified state, denoted by a green check mark.
  - d Change the default I/O configuration (if necessary) by clicking **Change Properties...** in the property pane of the interface or instrument you wish to configure.
  - e If you would like to test your connections manually, select your instrument, right-click and choose **Send Commands To This Instrument**.

## Installation Troubleshooting

If you encounter problems while installing the IO Libraries Suite, the following steps may help.

- 1 Close or Cancel all InstallShield Wizards and other Agilent IO Libraries Suite windows. Exit any other applications on your system.
- 2 Browse to the autorun folder of your *Automation-Ready CD* and double-click to run `auto.exe`. This restarts the installation process.
- 3 If you see the standard InstallShield Wizard, step through the installation process as described in this chapter.
- 4 If you see **Modify**, **Repair**, and **Remove** options, select **Repair**. This will reinstall all installed features of IO Libraries Suite. If this does not solve the problem, restart

the installation again, select **Remove**, and then reinstall the product.

### “Error 1935” When Installing Microsoft .NET Framework

The Agilent IO Libraries Suite utilities require the Microsoft .NET Framework; if the .NET Framework is not already installed on your PC, the IO Libraries Suite installation process will attempt to install it. There is a known issue that can cause you to receive an “Error 1935” error message during this .NET installation.

For steps to resolve this error, go to <http://www.microsoft.com> and search on "Error 1935". Follow the instructions given by Microsoft to resolve the error.

## Changing Your Installation or Removing IO Libraries Suite

- 1 Click **Start > [Settings] > Control Panel > Add or Remove Programs**
- 2 Select **Agilent IO Libraries Suite**
- 3 Click **Change/Remove**
- 4 Select the action you want to take:
  - **Modify:** Adds, replaces, or removes selected features. You can change your installation from primary to side-by-side or from side-by-side to primary by using this option. You can also use this to install manuals or sample code if you did not initially install them.
  - **Repair:** Reinstalls all features.
  - **Remove:** Removes the product from your PC.

## Keeping Your Software Up To Date

**Web resource for the latest IO Libraries Suite software:**

[www.agilent.com/find/iolib](http://www.agilent.com/find/iolib)

When you update the IO Libraries Suite software, you may choose to preserve your test system configuration. This includes the instruments, instrument aliases, interfaces, and all related properties.

#### **Web resource for the latest instrument drivers:**

[www.agilent.com/find/drivers](http://www.agilent.com/find/drivers)

This Web site includes many types of instrument drivers, including IVI-COM and VXI*plug&play* drivers.

## **Using Agilent VISA In Side-by-Side Mode**

Agilent IO Libraries Suite includes an implementation of VISA (Virtual Instrument Software Architecture), one of three available application programming instruments for instrument control. The VISA standard requires that `visa32.dll`, the dynamic-link library that implements the VISA interface, be installed in a prescribed location; therefore, only one installed implementation (the **primary** implementation) can fully comply with the standard at any one time. Because of this, you must take special care if you want to use Agilent IO Libraries Suite alongside any other implementation of VISA, such as National Instruments' NI-VISA.

When you have both Agilent VISA and another vendor's VISA installed on the same system, you will need to decide whether to let your programs use the primary VISA or whether to explicitly direct them to use the Agilent VISA implementation.

### **NOTE**

In general, you do not need to install NI-VISA to use National Instruments GPIB cards and devices. You can install NI-488.2 as a driver for these devices, and avoid the complications of side-by-side operations.

Agilent IO Libraries Suite supports the option to install Agilent VISA in side-by-side mode, which allows Agilent VISA to be used simultaneously with another vendor's VISA

implementation. In side-by-side mode, Agilent VISA is installed only in a secondary location and therefore does not overwrite another vendor's VISA if it is present on the computer.

In general, non-Agilent VISA implementations do not support operation as the secondary VISA (in side-by-side mode). This means that you must operate Agilent VISA in side-by-side mode as the secondary VISA, and the other vendor's VISA as primary.

#### **About primary and secondary VISA**

- VISA programs normally use `visa32.dll`, which is installed in the Windows system directory. This is the primary VISA, as defined by the VISA standard.
- Agilent VISA is implemented in `agvisa32.dll`, which is also installed in the Windows system directory.
- If Agilent VISA is installed as primary, the Agilent version of `visa32.dll` is installed in the Windows system directory. It simply forwards all VISA calls to `agvisa32.dll`.
- If you install Agilent VISA as primary, all files needed to support side-by-side mode are also installed. This means that if you subsequently install another vendor's VISA as primary, you can still use Agilent VISA as secondary.

#### **If Agilent VISA is installed in side-by-side mode (as the secondary VISA)**

- `agvisa32.dll` is installed, but Agilent's `visa32.dll` is not. Thus, it will not overwrite another vendor's `visa32.dll` residing in the standard location.
- Agilent support files are not installed in the `bin`, `include`, and `lib` directories of the VISA path (e.g. `c:\program files\visa\winnt`), since they would overwrite the other vendor's support files. Copies of the Agilent versions of the VISA support files reside in the `agbin`, `include`, and `lib` subdirectories under `<VISA path>\agvisa`. (These files are installed even when Agilent VISA is primary.)

- The IO Control menu and the status bar at the bottom of the Connection Expert window will contain a message indicating whether Agilent VISA is installed as primary, installed as secondary, or installed as primary but overwritten by another vendor's VISA. In the latter case, Agilent VISA will operate identically to a secondary installation.

VISA programs that are linked to the standard VISA DLL (e.g. C:\WINDOWS\system32\visa32.dll) will use the primary VISA. However, if a VISA program is linked with `agvisa32.lib` or dynamically loads `agvisa32.dll`, it will always use Agilent VISA (regardless of whether Agilent VISA is primary or secondary). Addressing is identical regardless of whether you are using the primary or secondary VISA in your program.

See the *Agilent IO Libraries Online Help* for more information about side-by-side VISA operation.

### **3 Installing IO Libraries Suite**



## Appendix A: Agilent IO Libraries Revision History

This appendix includes:

- Pointers to specific information on IO Libraries revisions
- New features of Agilent IO Libraries Suite 14.0
- What happened to IO Config?



## Where to Find Information on Past IO Libraries Revisions

A full matrix of information about past product revisions, including PC operating system support and physical interface support, is available in the *Agilent IO Libraries Suite Online Help* under **Additional Reference Material**. The most current information will always be provided on the Web at

`http://www.agilent.com/find/iolib\_osmatrix`

for operating system support information, and

`http://www.agilent.com/find/iolib\_revmatrix`

for general revision information.

If you need to download an older version of the IO Libraries or IO Libraries Suite, to support older operating systems or older interfaces, you can do so at

`http://www.agilent.com/find/iolib`



## New Features of Agilent IO Libraries Suite 14.0

Agilent IO Libraries Suite provides a new and improved set of tools for establishing, verifying, and troubleshooting instrument-to-PC connections. Some of the new features of the Agilent IO Libraries Suite 14.0 product are described here. You can get more information on all these features in the *Agilent IO Libraries Suite Online Help*.

- **Agilent Connection Expert** replaces the old IO Config utility with an integrated, task-oriented connectivity console. Connection Expert is designed for ease of use; it includes a task guide to help you quickly access important tasks and information, as well as an explorer view that lets you see and troubleshoot your connections and devices.
- **Interactive IO** is a software utility that lets you interactively send commands to instruments and see their responses. It is integrated into Connection Expert, and can also be run separately from the IO Control. It provides improved ease of use over the older VISA Assistant utility.
- **LAN local-subnet device discovery** is a new feature that allows Connection Expert to automatically discover devices that are connected directly, or via a LAN server or gateway, on the local subnet of your local area network. This means that you do not need to know the IP address or hostname of a local-subnet instrument in order to add it to your test system.
- IO Libraries Suite provides extended support of **VISA aliases**. VISA aliases were introduced for USB devices only in Agilent IO Libraries M.01.01. Now, using Agilent Connection Expert, you can define VISA aliases for any device or interface in your test system. VISA aliases can make your test program simpler and more portable.
- IO Libraries Suite includes **improved versions of the Agilent IO Libraries** – VISA, VISA COM, & SICL – with module files to facilitate test programming in Microsoft .NET languages, and with various defect fixes and performance enhancements.

## What Happened to IO Config?

The Agilent IO Libraries tool called IO Config has been replaced, in Agilent IO Libraries Suite, by Connection Expert. Connection Expert is an integrated utility that provides all the software you need to quickly establish and verify connections to your instruments.

Connection Expert provides an explorer view of your test system, as well as being the central console for instrument connectivity and interface configuration. All the functionality of IO Config is now available in Connection Expert.

The IO Config utility is provided in IO Libraries Suite for backward compatibility only. The supported configuration utility for IO Libraries Suite is Connection Expert. IO Libraries Suite installs the *unsupported* IO Config utility in the installation directory (by default, C:\Program Files\Agilent\IO Libraries Suite), as bin\iocfg32.exe.

VISA Assistant is still installed as part of Agilent IO Libraries Suite, but for most users, it has been replaced by the Interactive IO utility, which can be accessed from Connection Expert or from the IO Control. Interactive IO provides a simpler, more intuitive way to send commands to instruments and read the returned results. The discovery and tree view features of VISA Assistant are replaced and improved upon by Connection Expert.

Some capabilities of VISA Assistant are not yet available in the Interactive IO utility. These include:

- Memory I/O for VXI and GPIB-VXI interfaces
- Reading and writing of VISA attributes
- Association of *VXIplug&play* drivers to instruments

If you need these capabilities, you can start the VISA Assistant utility by clicking the IO Control and then **VISA Assistant**, or by clicking **Tools > VISA Assistant** on the Connection Expert menu.



## Glossary

### address

A string (or other language construct) that uniquely locates and identifies a resource. VISA defines an ASCII-based grammar that associates address strings with particular physical devices or interfaces and VISA resources.

### alias

See **VISA alias**.

### API

Application Programming Interface. The interface that a programmer sees when creating an application. For example, the VISA API consists of the sum of all of the operations, attributes, and events of each of the VISA ResourceClasses.

### attribute

In VISA and SICL, a value that indicates the operational state of a resource. Some attributes can be changed; others are read-only.

### bus error

An error that signals failure to access an address. Bus errors occur in conjunction with low-level accesses to memory, and usually involve hardware with bus mapping capabilities. Bus errors may be caused by non-existent memory, a non-existent register, an incorrect device access, etc.



### **bus error handler**

Software that runs when a bus error occurs.

### **commander**

In test-system architectures, a device that has the ability to control another device. In a specialized case, a commander may also be the device that has sole control over another device (as with the VXI Commander/Servant hierarchy).

### **commander session**

A session that communicates to the system controller.

### **communication channel**

A communication path between a software element and a resource. In VISA, “communication channel” is synonymous with “session.” Every communication channel in VISA is unique.

### **Connection Expert**

An Agilent software utility that helps you quickly establish connections between your instruments and your PC. It also helps you troubleshoot connectivity problems. Connection Expert is part of the Agilent IO Libraries Suite product.

### **controller**

A computer used to communicate with a device such as an instrument. The controller is in charge of communications and device operation; it controls the flow of communication and performs addressing and other bus management functions.

**device**

A unit that receives commands from a controller. A device is typically an instrument, but can also be a computer acting in a non-controller role or another peripheral such as a printer or plotter. In VISA, a device is logically represented by the association of several VISA resources.

**device driver**

Software code that communicates with a device: for example, a printer driver that communicates with a printer from a PC. A device driver may either communicate directly with a device by reading to and writing from registers, or it may communicate through an interface driver.

**device session**

A session that communicates as a controller with a single, specific device such as an instrument.

**direct I/O**

Programmatic communication with instruments not involving an instrument driver. Direct I/O may be accomplished by using an IO Library (VISA, VISA COM, or SICL) or by using direct I/O tools such as those provided by Agilent VEE and Agilent T&M Toolkit.

**driver**

See **instrument driver** and **device driver**.

**explorer view**

The tree view within the Connection Expert window that shows all devices connected to a test system.

**handler**

A software routine that responds to an asynchronous event such as an SRQ or an interrupt.

**instrument**

A device that accepts commands and performs a test and measurement function.

**instrument driver**

Software that runs on a computer to allow an application to control a particular instrument.

**Interactive IO**

An Agilent application that allows you to interactively send commands to instruments and read the results. Interactive IO is part of the Agilent IO Libraries Suite product.

**interface**

A connection and medium of communication between devices and controllers. Interfaces include mechanical, electrical, and protocol connections.

**interface driver**

Software that communicates with an interface. The interface driver also handles commands used to perform communications on an interface.

**interface session**

A session that communicates and controls parameters affecting an entire interface.

**interrupt**

An asynchronous event that requires attention and actions that are out of the normal flow of control of a program.

**IO Control**

The icon in the Windows notification area (usually the lower right corner of your screen). The IO Control gives you access to Agilent I/O utilities such as Connection Expert, Agilent I/O documentation, and VISA options.

**IO Libraries**

Application programming interfaces (APIs) for direct I/O communication between applications and devices. There are three Agilent IO Libraries in the Agilent IO Libraries Suite: VISA, VISA COM, and SICL.

**lock**

A state that prohibits other users from accessing a resource such as a device or interface.

**logical unit**

A number associated with an interface. A logical unit, in SICL and Agilent VEE, uniquely identifies an interface. Each interface on the controller must have a unique logical unit.

**mapping**

An operation that returns a reference to a specified section of an address space and makes the specified range of addresses accessible to the requester. This function is independent of memory allocation.

**non-controller role**

A computer is in a non-controller role when it acts as a device communicating with a computer that is in a controller role.

### **notification area**

The area on the Windows taskbar where notifications are posted, typically in the lower right corner of the screen. Also called “taskbar notification area” or “Windows notification area”.

### **operation**

A defined action that can be performed on a resource.

### **primary VISA**

The VISA installation that controls the visa32.dll file. The primary VISA will be used by default in VISA applications. See also “secondary VISA”.

### **process**

An operating system component that shares a system's resources. A single-process computer system allows only a single program to execute at any given time. A multi-process computer system allows multiple programs to execute simultaneously, each in a separate process environment.

### **refresh**

In Connection Expert, the action that invokes the discovery mechanism for detecting interfaces and instruments connected to your computer. The explorer view is then refreshed to show the current, discovered state of your test system.

### **register**

An address location that contains a value that represents the state of hardware, or that can be written into to cause hardware to perform a specified action or to enter a specified state.



**resource (or resource instance)**

In VISA, an implementation of a resource class (in object-oriented terms, an instance of a resource class). For example, an instrument is represented by a resource instance.

**resource class**

The definition of a particular resource type (a class in object-oriented terms). For example, the VISA Instrument Control resource classes define how to create a resource to control a particular capability of a device.

**resource descriptor**

A string, such as a VISA resource descriptor, that specifies the I/O address of a device.

**SCPI**

Standard Commands for Programmable Instrumentation: a standard set of commands, defined by the SCPI Consortium, to control programmable test and measurement devices in instrumentation systems.

**secondary VISA**

A VISA installation that does not install visa32.dll in the standard VISA location. A secondary VISA installation names its VISA DLL with a different name (such as agvisa32.dll) so that it can be accessed programmatically. The primary VISA will be used by default in VISA applications. See also “primary VISA”.

**session**

VISA term for a communication channel. An instance of a communications path between a software element and a resource. Every communication channel in VISA is unique.

### **SICL**

Standard Instrument Control Library. SICL is an Agilent-defined API for instrument I/O. Agilent SICL is one of the IO Libraries installed with Agilent IO Libraries Suite.

### **side-by-side**

A side-by-side installation allows two vendors' implementations of VISA to be used on the same computer. See also “primary VISA” and “secondary VISA”.

### **SRQ**

An IEEE-488 Service Request. This is an asynchronous request (an interrupt) from a remote device that requires service. In GPIB, an SRQ is implemented by asserting the SRQ line on the GPIB. In VXI, an SRQ is implemented by sending the Request for Service True event (REQT).

### **status byte**

A byte of information returned from a remote device that shows the current state and status of the device. If the device follows IEEE-488 conventions, bit 6 of the status byte indicates whether the device is currently requesting service.

### **symbolic name**

A name corresponding to a single interface. This name uniquely identifies the interface on this controller. When there is more than one interface on the controller, each interface must have a unique symbolic name.

### **system tray**

See “notification area”.

**task guide**

The information and logic represented in the left pane of the Connection Expert window. The task guide provides links to actions and information that help guide you through the most common I/O configuration tasks.

**taskbar notification area**

See **notification area**.

**test system**

An entire test setup including a controller (often a PC), instruments, interfaces, software, and any remote controllers, instruments, and interfaces that are configured to be used as part of the system.

**thread**

An operating system object that consists of a flow of control within a process. A single process may have multiple threads, each having access to the same data space within the process. Each thread has its own stack, and all threads may execute concurrently (either on multiple processors, or by time-sharing a single processor).

**ViFind32**

A console application that uses the viFindRsrc and viFindNext VISA functions to enumerate all resources visible to VISA. This application is useful for verifying that all expected interfaces have been configured by Connection Expert, and that the expected devices have been attached. ViFind32 is part of the Agilent IO Libraries Suite.

**virtual instrument**

A name given to the grouping of software modules (such as VISA resources with any associated or required hardware) to give them the functionality of a traditional

stand-alone instrument. Within VISA, a virtual instrument is the logical grouping of any of the VISA resources. The VISA Instrument Control Resources Organizer serves as a means to group any number of any type of VISA Instrument Control Resources within a VISA system.

### **VISA**

Virtual Instrument Software Architecture. VISA is a standard I/O library that allows software from different vendors to run together on the same platform. Agilent VISA is part of the Agilent IO Libraries Suite.

### **VISA address**

A resource descriptor that can be used to open a VISA session.

### **VISA alias**

A string that can be used instead of a resource descriptor in VISA programs. Using VISA aliases rather than hard-coded resource descriptors makes your programs more portable. You can define VISA aliases for your instruments in Connection Expert.

### **VISA COM**

The VXIplug&play specification for a COM-compliant VISA I/O library and its implementation. Agilent VISA COM is part of the Agilent IO Libraries Suite.

### **VISA Instrument Control Resources**

The VISA definition of device-specific resource classes. VISA Instrument Control Resources include all VISA-defined device and interface capabilities for direct, low-level instrument control.

### **VISA name**

The prefix of a VISA address. The VISA name specifies the interface.

**VISA resource manager**

The part of VISA that manages resources. This management includes support for opening, closing, and finding resources, setting attributes, retrieving attributes, and generating events on resources.

**VISA resource template**

The part of VISA that defines the basic constraints and interface definition for the creation and use of a VISA resource. Each VISA resource must derive its interface from the VISA resource template.

**VXI Resource Manager**

A software utility that initializes and prepares a VXI system for use. The VXI Resource Manager is part of the Agilent IO Libraries Suite.

**Windows notification area**

See **notification area**.

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