

ARTISAN®
TECHNOLOGY GROUP

Your **definitive** source for quality pre-owned equipment.

Artisan Technology Group
(217) 352-9330 | sales@artisantg.com | artisantg.com

Full-service, independent repair center
with experienced engineers and technicians on staff.

We buy your excess, underutilized, and idle equipment
along with credit for buybacks and trade-ins.

Custom engineering
so your equipment works exactly as you specify.

- Critical and expedited services
- In stock / Ready-to-ship
- Leasing / Rentals / Demos
- ITAR-certified secure asset solutions

Expert team | Trust guarantee | 100% satisfaction

All trademarks, brand names, and brands appearing herein are the property of their respective owners.

Find the *Keysight / Agilent E8491B* at our website: ***Click HERE***

Contents

HP E8491A IEEE 1394 PC Link to VXI Configuration and User's Guide

Edition 1

Safety Symbols 6
WARNINGS 6
Declaration of Conformity 7
Reader Comment Sheet 9

Chapter 1
Introduction 11
Using the IEEE 1394 Serial Bus in VXI Systems 11
Component Overview 11
The HP E8491A PC Link to VXI Interconnect 11
The Adaptec® AHA-8940 1394-to-PCI Host Adapter 11
The HP I_O Libraries 11
Using this Manual 11
Chapter 2: Interface Installation and Configuration 11
Chapter 3: VXI Programming Using the IEEE 1394 Serial Bus 12
Chapter 4: IEEE 1394 Fundamentals and Interface Overview 12
Appendix A: Specifications 12
Appendix B: Editing the HP E8491A Resource Manager Configuration 12
Additional Information 12

Chapter 2
Interface Installation and Configuration 13
Using this Chapter 13
Step 1: Installing the IEEE 1394Host Adapter 13
Where to go Next 17
Step 2: Installing the HP E8491A Interconnect 17
Alternate Configurations 19
Where to go Next 20
Step 3: Installing VXI Instruments 20
Installing C-size Instruments 20
Installing A- and B-size Instruments 22
Step 4: Installing the HP I_O Libraries 24
Configuring the HP E8491A Interconnect 25
Editing the HP E8491A Configuration 27
Editing the HP E8491A Configuration on Windows 95 Platforms 28
Step 5: Installing the HP VXIplug&play Instrument Drivers 28
Step 6. Verifying the Installation 29
Using Instrument Soft Front Panels 29
Viewing the Resource Manager Output 30
Running the Resource Manager 33

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Chapter 3
VXI Programming Using the IEEE 1394 Serial Bus 35
Using this Chapter 35
Programming Register-Based and Message-Based VXI Instruments 35
Opening Instrument Sessions 35
Optimizing Programs 36
Block Data Transfers 36
Block Transfers using HP VXIplug&play Drivers 37
Block Transfers using HP VISA 40
HP E8491A Triggering 43
Using Triggers 43
Configuring the E8491A Trig In and Trig Out Ports 44
Triggering Example 45
Trigger Pull Up 47
Using HP E8491A Shared Memory 47
Locating E8491A Shared Memory 47
Example Programs 49
Storing Readings in Shared Memory - HP VISA Example 50
Storing Readings in Shared Memory - SICL Example 54

Chapter 4
IEEE 1394 Fundamentals and Interface Overview 57
Using this Chapter 57
IEEE 1394 Topology and Terminology 57
Features of the IEEE 1394 Bus 58
Optimizing the Configuration 59
IEEE 1394 Data Transfer Protocol 59
Asynchronous Data Transfers 60
Fair Arbitration Protocol 60
VXI Data Transfers 60
The Adaptec® AHA-8940 Host Adapter and Interface Cable 61
The HP E8491A PC to VXI Interconnect 62
Using the HP E8491A with the HP E1406 Command Module 64
The HP I_O Libraries 64

Appendix A
Specifications 65
Interface Characteristics 65
VXI Characteristics 65
General 65
CLK 10 66
External Trigger Input 66
External Trigger Output 66
Trigger Delays 67
Cooling 67
Power Supply Loading 67

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Appendix B
Editing the HP E8491A Resource Manager Configuration 69
Introduction 69
Configuration File Overview 69
The names.cf Configuration File 72
The oride.cf Configuration File 72
The vmedev.cf Configuration File 72
The cmdrsrvt.cf Configuration File 72
The dynamic.cf Configuration File 72
The irq.cf Configuration File 73
The ttltrig.cf Configuration File 73
The vximanuf.cf Configuration File 73
The vximodel.cf Configuration File 73
Utility Function Overview 73
Using ivxisc 73
Using iclear 75

Index 77

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

HEWLETT-PACKARD WARRANTY STATEMENT

HP PRODUCT: HP E8491A I E E E 1394 PC LINK to VXI **DURATION OF WARRANTY:** 3 years

1. HP warrants HP hardware, accessories and supplies against defects in materials and workmanship for the period specified above. If HP receives notice of such defects during the warranty period, HP will, at its option, either repair or replace products which prove to be defective. Replacement products may be either new or like-new.

2. HP warrants that HP software will not fail to execute its programming instructions, for the period specified above, due to defects in material and workmanship when properly installed and used. If HP receives notice of such defects during the warranty period, HP will replace software media which does not execute its programming instructions due to such defects.

3. HP does not warrant that the operation of HP products will be interrupted or error free. If HP is unable, within a reasonable time, to repair or replace any product to a condition as warranted, customer will be entitled to a refund of the purchase price upon prompt return of the product.

4. HP products may contain remanufactured parts equivalent to new in performance or may have been subject to incidental use.

5. The warranty period begins on the date of delivery or on the date of installation if installed by HP. If customer schedules or delays HP installation more than 30 days after delivery, warranty begins on the 31st day from delivery.

6. Warranty does not apply to defects resulting from (a) improper or inadequate maintenance or calibration, (b) software, interfacing, parts or supplies not supplied by HP, (c) unauthorized modification or misuse, (d) operation outside of the published environmental specifications for the product, or (e) improper site preparation or maintenance.

7. TO THE EXTENT ALLOWED BY LOCAL LAW, THE ABOVE WARRANTIES ARE EXCLUSIVE AND NO OTHER WARRANTY OR CONDITION, WHETHER WRITTEN OR ORAL, IS EXPRESSED OR IMPLIED AND HP SPECIFICALLY DISCLAIMS ANY IMPLIED WARRANTY OR CONDITIONS OF MERCHANTABILITY, SATISFACTORY QUALITY, AND FITNESS FOR A PARTICULAR PURPOSE.

8. HP will be liable for damage to tangible property per incident up to the greater of $300,000 or the actual amount paid for the product that is the subject of the claim, and for damages for bodily injury or death, to the extent that all such damages are determined by a court of competent jurisdiction to have been directly caused by a defective HP product.

9. TO THE EXTENT ALLOWED BY LOCAL LAW, THE REMEDIES IN THIS WARRANTY STATEMENT ARE CUSTOMER'S SOLE AND EXLUSIVE REMEDIES. EXCEPT AS INDICATED ABOVE, IN NO EVENT WILL HP OR ITS SUPPLIERS BE LIABLE FOR LOSS OF DATA OR FOR DIRECT, SPECIAL, INCIDENTAL, CONSEQUENTIAL (INCLUDING LOST PROFIT OR DATA), OR OTHER DAMAGE, WHETHER BASED IN CONTRACT, TORT, OR OTHERWISE.

FOR CONSUMER TRANSACTIONS IN AUSTRALIA AND NEW ZEALAND: THE WARRANTY TERMS CONTAINED IN THIS STATEMENT, EXCEPT TO THE EXTENT LAWFULLY PERMITTED, DO NOT EXCLUDE, RESTRICT OR MODIFY AND ARE IN ADDITION TO THE MANDATORY STATUTORY RIGHTS APPLICABLE TO THE SALE OF THIS PRODUCT TO YOU.

U.S. Government Restricted Rights

The Software and Documentation have been developed entirely at private expense. They are delivered and licensed as "commercial computer software" as defined in DFARS 252.227- 7013 (Oct 1988), DFARS 252.211-7015 (May 1991) or DFARS 252.227-7014 (Jun 1995), as a "commercial item" as defined in FAR 2.101(a), or as "Restricted computer software" as defined in FAR 52.227-19 (Jun 1987)(or any equivalent agency regulation or contract clause), whichever is applicable. You have only those rights provided for such Software and Documentation by the applicable FAR or DFARS clause or the HP standard software agreement for the product involved.



HP E8491A IEEE 1394 PC Link to VXI Configuration and User's Guide
Edition 1
Copyright © 1998 Hewlett-Packard Company. All Rights Reserved.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Documentation History

All Editions and Updates of this manual and their creation date are listed below. The first Edition of the manual is Edition 1. The Edition number increments by 1 whenever the manual is revised. Updates, which are issued between Editions, contain replacement pages to correct or add additional information to the current Edition of the manual. Whenever a new Edition is created, it will contain all of the Update information for the previous Edition. Each new Edition or Update also includes a revised copy of this documentation history page.

Edition 1 . . . . . .June 1998

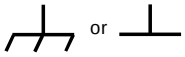
Safety Symbols



Instruction manual symbol affixed to product. Indicates that the user must refer to the manual for specific WARNING or CAUTION information to avoid personal injury or damage to the product.



Indicates the field wiring terminal that must be connected to earth ground before operating the equipment—protects against electrical shock in case of fault.



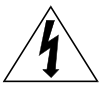
Frame or chassis ground terminal—typically connects to the equipment's metal frame.



Alternating current (AC)



Direct current (DC).



Indicates hazardous voltages.

WARNING Calls attention to a procedure, practice, or condition that could cause bodily injury or death.

CAUTION Calls attention to a procedure, practice, or condition that could possibly cause damage to equipment or permanent loss of data.

WARNINGS

The following general safety precautions must be observed during all phases of operation, service, and repair of this product. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the product. Hewlett-Packard Company assumes no liability for the customer's failure to comply with these requirements.

Ground the equipment: For Safety Class 1 equipment (equipment having a protective earth terminal), an uninterruptible safety earth ground must be provided from the mains power source to the product input wiring terminals or supplied power cable.

DO NOT operate the product in an explosive atmosphere or in the presence of flammable gases or fumes.

For continued protection against fire, replace the line fuse(s) only with fuse(s) of the same voltage and current rating and type. DO NOT use repaired fuses or short-circuited fuse holders.

Keep away from live circuits: Operating personnel must not remove equipment covers or shields. Procedures involving the removal of covers or shields are for use by service-trained personnel only. Under certain conditions, dangerous voltages may exist even with the equipment switched off. To avoid dangerous electrical shock, DO NOT perform procedures involving cover or shield removal unless you are qualified to do so.

DO NOT operate damaged equipment: Whenever it is possible that the safety protection features built into this product have been impaired, either through physical damage, excessive moisture, or any other reason, REMOVE POWER and do not use the product until safe operation can be verified by service-trained personnel. If necessary, return the product to a Hewlett-Packard Sales and Service Office for service and repair to ensure that safety features are maintained.

DO NOT service or adjust alone: Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.

DO NOT substitute parts or modify equipment: Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modification to the product. Return the product to a Hewlett-Packard Sales and Service Office for service and repair to ensure that safety features are maintained.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Declaration of Conformity

according to ISO/IEC Guide 22 and EN 45014

Manufacturer's Name:	Hewlett-Packard Company Loveland Manufacturing Center
Manufacturer's Address:	815 14th Street S.W. Loveland, Colorado 80537

declares, that the product:

Product Name:	IEEE 1394 PC Link to VXI
Model Number:	HP E8491A
Product Options:	All

conforms to the following Product Specifications:

Safety:	IEC 1010-1 (1990) Incl. Amend 1 (1992)/EN61010-1 (1993) CSA C22.2 #1010.1 (1992) UL 3111-1 (1994)
EMC:	CISPR 11:1990/EN55011 (1991): Group1 Class A IEC 801-2:1991/EN50082-1 (1992): 4kVCD, 8kVAD IEC 801-3:1984/EN50082-1 (1992): 3 V/m IEC 801-4:1988/EN50082-1 (1992): 1kV Power Line .5kV Signal Lines

Supplementary Information: The product herewith complies with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC (inclusive 93/68/EEC) and carries the "CE" mark accordingly.

Tested in a typical configuration in an HP C-Size VXI mainframe.

June, 1998

Jim White, QA Manager

European contact: Your local Hewlett-Packard Sales and Service Office or Hewlett-Packard GmbH, Department HQ-TRE, Herrenberger Straße 130, D-71034 Böblingen, Germany (FAX +49-7031-14-3143)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Notes:

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Please fold and tape for mailing

Reader Comment Sheet

HP E8491A IEEE 1394 PC Link to VXI Configuration and User's Guide
Edition 1

You can help us improve our manuals by sharing your comments and suggestions. **In appreciation of your time, we will enter you in a quarterly drawing for a Hewlett-Packard Palmtop Personal Computer** (U.S. government employees are not eligible for the drawing).

Your Name	City, State/Province
Company Name	Country
Job Title	Zip/Postal Code
Address	Telephone Number with Area Code

Please list the system controller, operating system, programming language, and plug-in modules you are using.

fold here

NO POSTAGE NECESSARY IF MAILED IN THE UNITED STATES

BUSINESS REPLY MAIL
FIRST CLASS PERMIT NO. 37 LOVELAND, CO

POSTAGE WILL BE PAID BY ADDRESSEE

HEWLETT-PACKARD COMPANY
Measurement Systems Division
Learning Products Department
P.O. Box 301
Loveland, CO 80539-9984

cut along this line

fold here

Please pencil-in one circle for each statement below:

	Disagree ←				→ Agree
• The documentation is well organized.	O	O	O	O	O
• Instructions are easy to understand.	O	O	O	O	O
• The documentation is clearly written.	O	O	O	O	O
• Examples are clear and useful.	O	O	O	O	O
• Illustrations are clear and helpful.	O	O	O	O	O
• The documentation meets my overall expectations.	O	O	O	O	O

Please write any comments or suggestions below–be specific.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Chapter 1
Introduction

Using the IEEE 1394 Serial Bus in VXI Systems

The IEEE 1394 Serial Bus (FireWire) is a high-speed bus that has been implemented as an I/O interface between external PCs and HP VXI systems. The bus links the PC backplane to the VXI mainframe backplane. This manual describes the implementation, configuration, and use of this interface.

Component Overview

Implementation of the IEEE 1394 serial bus as an I/O interface for HP VXI systems is provided through three components:

- HP E8491A PC Link to VXI Interconnect
- Adaptec® AHA-8940 1394-to-PCI Host Adapter
- HP I_O Libraries

The HP E8491A PC Link to VXI Interconnect

The HP E8491A is the VXI hardware that links the VXI mainframe backplane to the IEEE 1394 serial bus. The E8491A is a 1-slot, C-size, message-based device that is installed in mainframe slot 0.

The Adaptec® AHA-8940 1394-to-PCI Host Adapter

The Adaptec® AHA-8940 1394-to-PCI Host Adapter card is installed in the PC and links the computer's (PCI) backplane to the IEEE 1394 bus. The AHA-8940 has one internal and two external IEEE 1394 ports and can support up to 16 HP E8491As.

The HP I_O Libraries

The HP I_O Libraries provide the HP VISA and HP SICL drivers required to use the HP E8491A. Included with the libraries are the drivers for the Adaptec® AHA-8940 host adapter.

Using this Manual

This manual is organized to help you install, configure, and begin using the IEEE 1394 serial bus as quickly and efficiently as possible. The following information outlines the contents of the other chapters, and identifies the areas of programming a VXI system that are NOT covered in this manual.

Chapter 2: Interface Installation and Configuration

This chapter contains information on installing the HP E8491A hardware and its drivers (the HP I_O Libraries). Also included is information on installing VXI instruments, installing HP VXI*plug&play* drivers, and on verifying the system.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Chapter 3: VXI Programming Using the IEEE 1394 Serial Bus

This chapter contains the information necessary to begin communicating with VXI instruments through the HP E8491A and IEEE 1394 serial bus. The chapter contains information on optimizing system performance using block data transfers, and also covers triggering and using HP E8491A shared memory.

Chapter 4: IEEE 1394 Fundamentals and Interface Overview

This chapter describes the IEEE 1394 serial bus and how it is implemented in HP VXI systems. It defines the bus terminology and data transfer protocol.

Appendix A: Specifications

Appendix A contains the operating and performance specifications of the HP E8491A.

Appendix B: Editing the HP E8491A Resource Manager Configuration

Appendix B contains information on editing your VXI system configuration as set by the resource manager. It describes selected configuration files and utility functions used to view and modify your configuration.

Additional Information

Programming the HP E8491A is through HP VISA and HP SICL functions. Although this manual identifies the specific functions used, you will need to refer to the HP VISA and HP SICL manuals for detailed information.

Also, included with the HP I_O Libraries is the utility ‘I_O Config’. This utility is used to configure the HP E8491A and has a help file associated with it.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Chapter 2
Interface Installation and Configuration

Using this Chapter

This chapter contains information necessary to install and configure the IEEE 1394 host adapter (if required) and the HP E8491A interconnect. The installation sequence and other topics covered in this chapter are as follows:

- Step 1: Installing the IEEE 1394 Host Adapter 13
- Step 2: Installing the HP E8491A Interconnect 18
- Step 3: Installing VXI Instruments 22
- Step 4: Installing the HP I_O Libraries. 26
- Step 5: Installing HP VXI*plug&play* Instrument Drivers. . . 30
- Step6: Verifying the Installation 31
- Running the Resource Manager 35

Step 1: Installing the IEEE 1394 Host Adapter

The IEEE 1394 adapter shipped as Option 001 to the HP E8491A is the Adaptec® AHA-8940 1394-to-PCI Host Adapter. Included with the adapter is a cable for powering 1394 devices and a 4.5m interface cable.

Note

If your personal computer (PC) currently has an Adaptec® IEEE-1394 host adapter or built-in IEEE-1394 port, proceed to Step 2: Installing the HP E8491 Interconnect.

The layout of the Adaptec® host adapter is shown in Figure 2-1.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

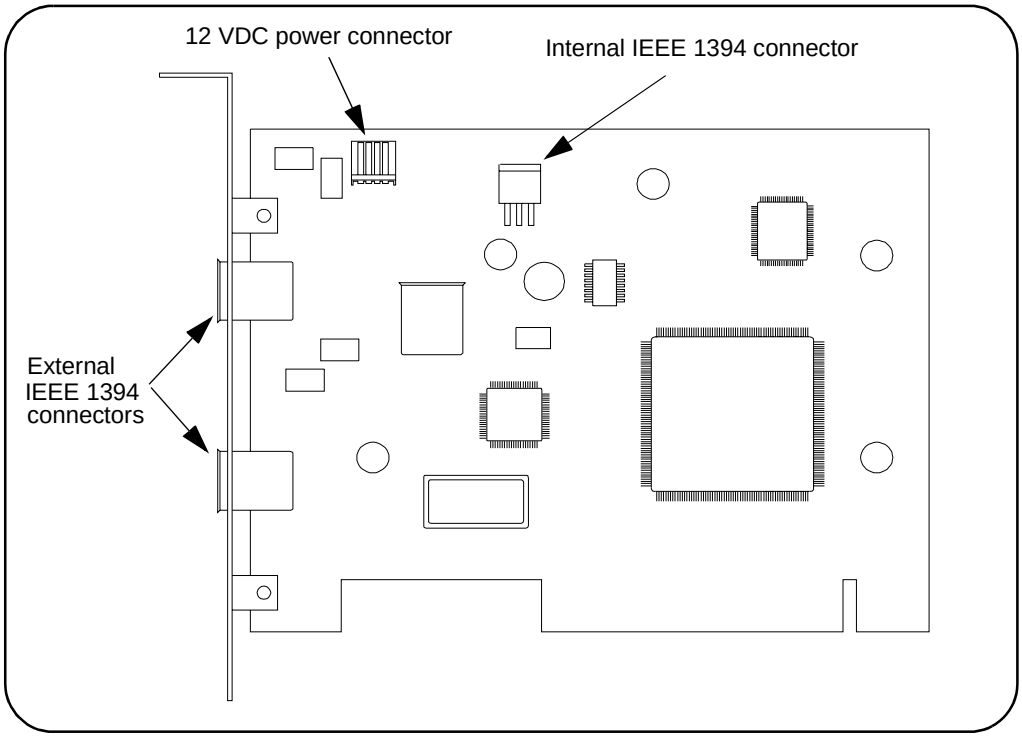


Figure 2-1. Layout of the Adaptec® AHA-8940 1394-to-PCI Host Adapter.

WARNING **Turn off and disconnect the power to your computer and to any peripheral devices before installing the host adapter.**

A. Remove the computer chassis cover to expose the expansion slots and external access covers.

B. Locate an unused, unobstructed PCI bus expansion slot (Figure 2-2) that supports bus mastering. (PCI bus slots are usually white or ivory.) See your computer documentation to determine if the PCI slot supports bus mastering.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

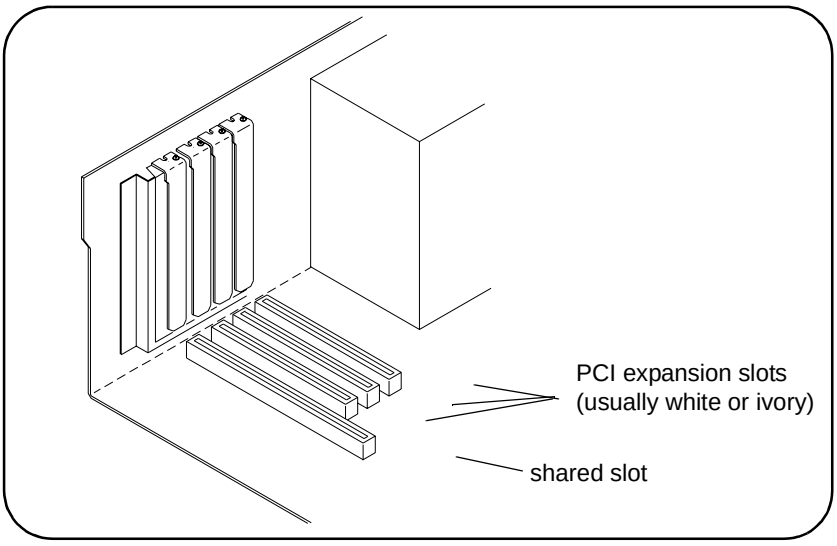


Figure 2-2. Locating a PCI bus Expansion Slot.

Note Many computer PCI systems have one pair of ISA and PCI slots close to each other. This saves space and allows you to install either an ISA card or a PCI card in the slot pair.

C. Remove the corresponding expansion slot cover from the computer chassis (Figure 2-3).

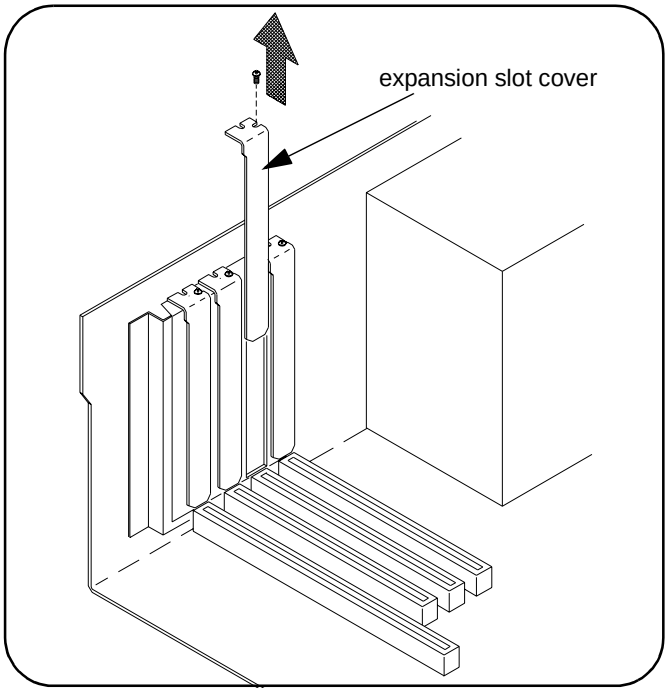


Figure 2-3. Removing the PC Expansion Slot Cover.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

D. Align the bus contacts on the bottom of the host adapter with the PCI bus slot. Carefully, but firmly, press the adapter into the slot.

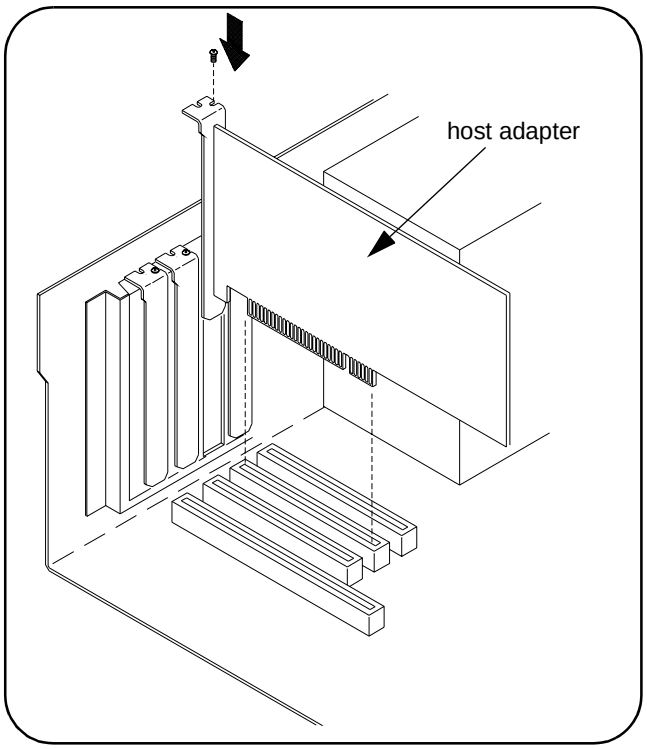


Figure 2-4. Installing the Host Adapter.

E. Secure the host adapter bracket to the computer chassis with the screw from the expansion slot cover removed in step C.

Connecting the Power Cable

F. Connect the power cable between the adapter and the PC as shown in Figure 2-5. This provides power from the adapter to devices along the interface via the interface cable. This allows you to cycle power on any VXI mainframe in multi-frame systems without affecting other frames. The power is also available to other IEEE 1394 devices that may be part of the interface network. The Adaptec® host adapter is capable of supplying 12V with a maximum current draw of 1.5 amps.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

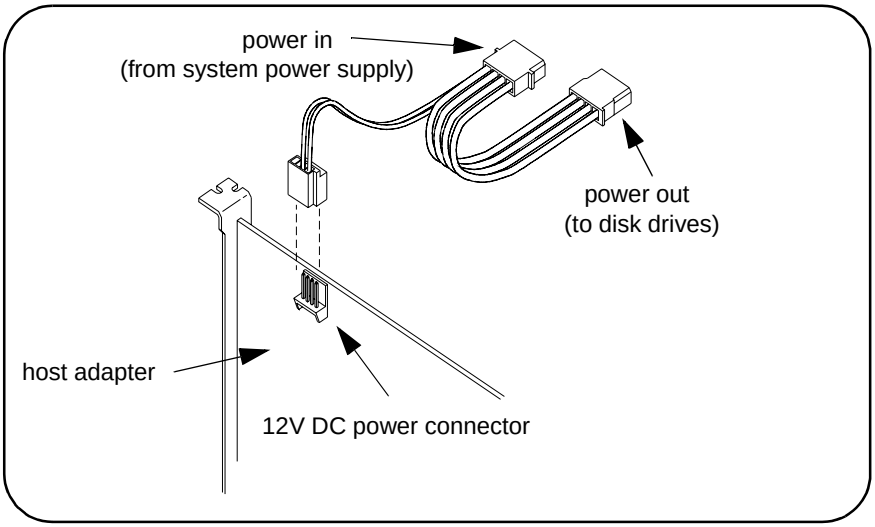


Figure 2-5. Connecting the Power Cable Between the PC and the Host Adapter.

G. Replace the computer cover. Connect one end of the interface cable to either of the adapter's external connectors. You can now turn on the PC.

Note When power is applied, Windows 95 operating systems may detect the Adaptec® card and indicate that it cannot locate an associated .inf file. Ignore this message as the .inf file is installed when the HP I_O Libraries are installed (Step 4).

Note Refer to Chapter 4: IEEE 1394 Fundamentals and Interface Overview for more information on the Adaptec® host adapter.

Where to go Next

If you are installing the IEEE 1394 interface for the first time, continue with "Step 2: Installing the HP E8491A Interconnect." If the E8491A and your VXI instruments are already installed, proceed to "Step 4: Installing the HP I_O Libraries." Notice that the HP I_O Libraries contain the Adaptec® host adapter drivers.

Step 2: Installing the HP E8491A Interconnect

The HP E8491A interconnect links the IEEE 1394 bus to the backplane of the VXI mainframe. The E8491A is a C-size device with VXI Resource Manager and Slot 0 capability.

There are no configuration switches on the E8491A. The device's logical address is 0 and it provides the system's resource manager functionality via software that is part of the HP I_O Libraries. Its VXI servant area is 255, therefore; it is the interface to all VXI devices with logical addresses between 1 and 255. The E8491A is normally, **but not required to be**, installed in mainframe slot 0.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Note Refer to “Alternate Configurations” for information on using the E8491A with the HP E1406 Command Module and using it in VXI-MXI systems.

A. If turned on, turn off the VXI mainframe and disconnect all power sources that may be applied to any instruments.

B. Insert the E8491A into mainframe slot 0 by aligning the module with the guides inside the mainframe (Figure 2-6). Slowly push the module into the slot until it seats in the backplane connectors. It may be necessary to pull out (not remove) the retaining screws in order to seat the device securely in the connectors.

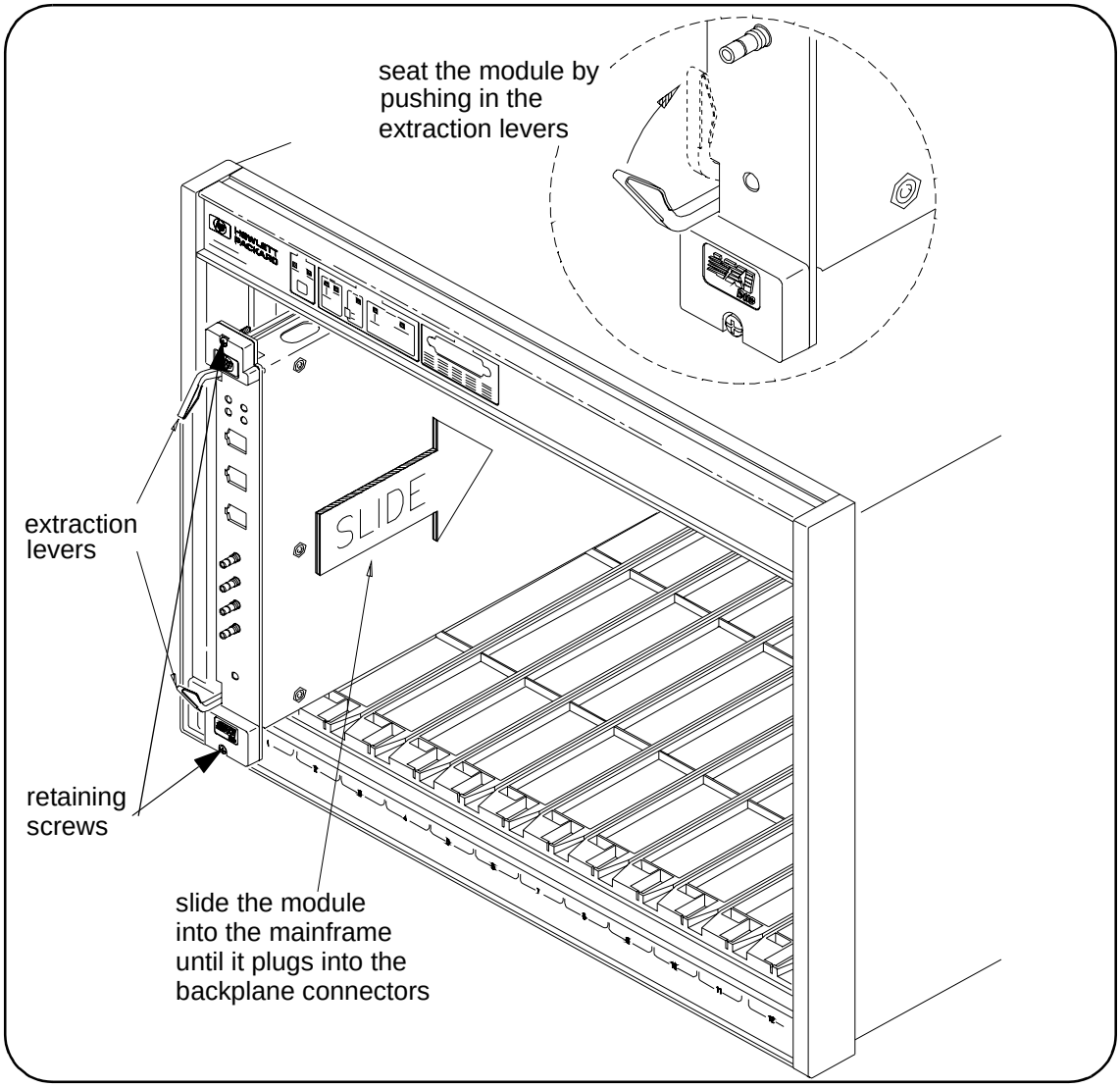


Figure 2-6. Installing the HP E8491A in the VXI Mainframe.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

C. Tighten the retaining screws on the top and bottom of the module.

Connecting the HP E8491A to the Host Adapter

D. Connect the interface cable from the host adapter to E8491A port A, B, or C. The ports are identical and unused ports are available to connect additional E8491As and other IEEE 1394 devices in a daisy-chain or tree configuration (Figure 2-7). Notice that there can be no closed loops.

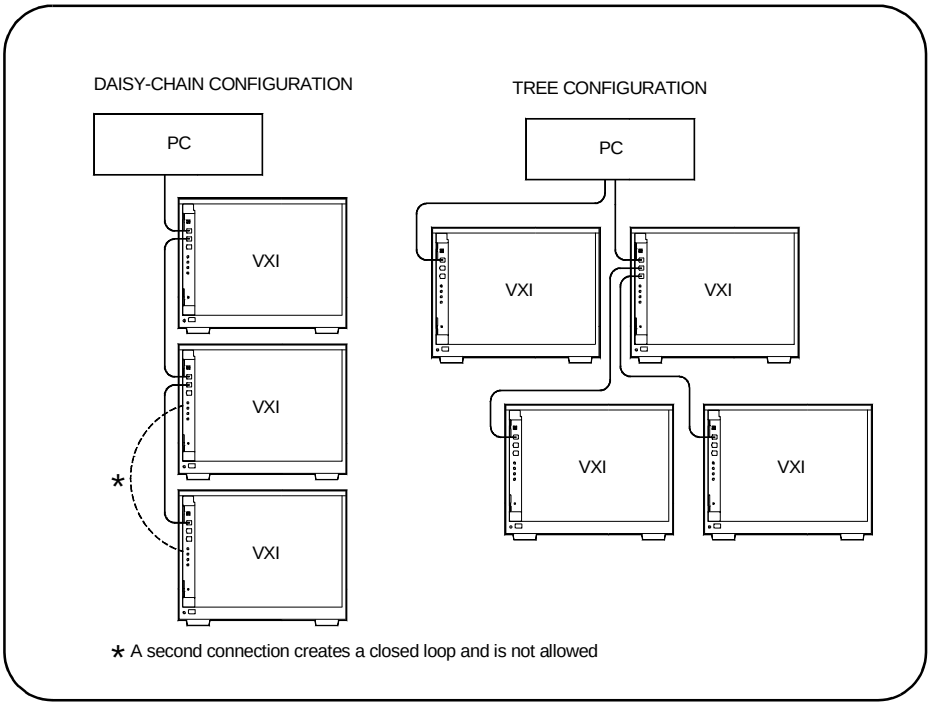


Figure 2-7. IEEE 1394 Interface Configurations.

I/O performance is impacted slightly by the hardware configuration.The VXI mainframe with the fewest number of hops (cable links) to the PC has the highest priority. However, each mainframe has equal access to the bus during each data transfer interval.

Note Refer to Chapter 4: IEEE 1394 Fundamentals and Interface Overview for information on the topology and terms associated with the IEEE 1394 bus.

Alternate Configurations

Certain applications may include the HP E1406A Command Module as an HP-IB interface to selected instruments. In this configuration, the E8491A must be the resource manager since its logical address is always 0. It is generally installed in mainframe slot 0 so that it also provides the system's slot 0 functionality.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

If you want the E1406 to provide slot 0 functionality in addition to providing an HP-IB interface, set its configuration as follows:

1. Set the E1406 logical address to a value other than 0.
2. Set the Slot 0 and System Controller switches to “Enable” (default).
3. Set the CLK 10 source to “Internal” (default).
4. Set the VME BTO Disable switch to 0 - Enable (default). Set VME Bus Timeout (BTO) on the E8491A to ‘Off’ (see “Editing the HP E8491A Configuration” later in this chapter).
5. Set the E1406 servant area to include the logical addresses of those instruments it is to control. Note:

   E1406 servant area = (E1406 logical address + 1) through (E1406 logical address + servant area switch setting)
6. Install the E1406 in slot 0.

If the E1406 is not the slot 0 device, its slot 0 functionality must be disabled. From step 2 above, set the E1406A Slot 0 and System Controller switches to “Disable”. From step 4, set its VME BTO Disable switch 1 and ensure that VME Bus Timeout (BTO) on the E8491A is set to ‘On’.

If you are using the E8491A in a configuration with multiple mainframes linked with MXI extender cards, the E8491A must be the resource manager; however, VME Bus Timeout (BTO) must be disabled (off - Step 4 above). Again, the E8491A is generally installed in mainframe slot 0 so that it also provides the system’s slot 0 functionality. Refer to the MXI documentation for configuration guidelines based on where the E8491A is installed.

Where to go Next

If you are installing the IEEE 1394 interface and your VXI system for the first time, continue with “Step 3: Installing VXI Instruments.” If your VXI instruments are already installed, proceed to “Step 4: Installing the HP I_O Libraries.”

Step 3: Installing VXI Instruments

Generally, any VXI instrument can be installed in any slot other than slot 0.

When installing instruments, notice that the E8491A and the IEEE 1394 bus do not extend the (VXI) backplane between frames in multi-frame VXI systems (MXI cards are required). This means that the multimeter and multiplexers in a VXI scanning multimeter for example, must be installed in the same mainframe (in adjacent slots). Devices sharing the VXI Local bus must also be installed in the same mainframe.

Installing C-size Instruments

Figure 2-8 shows the installation of C-size instruments.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

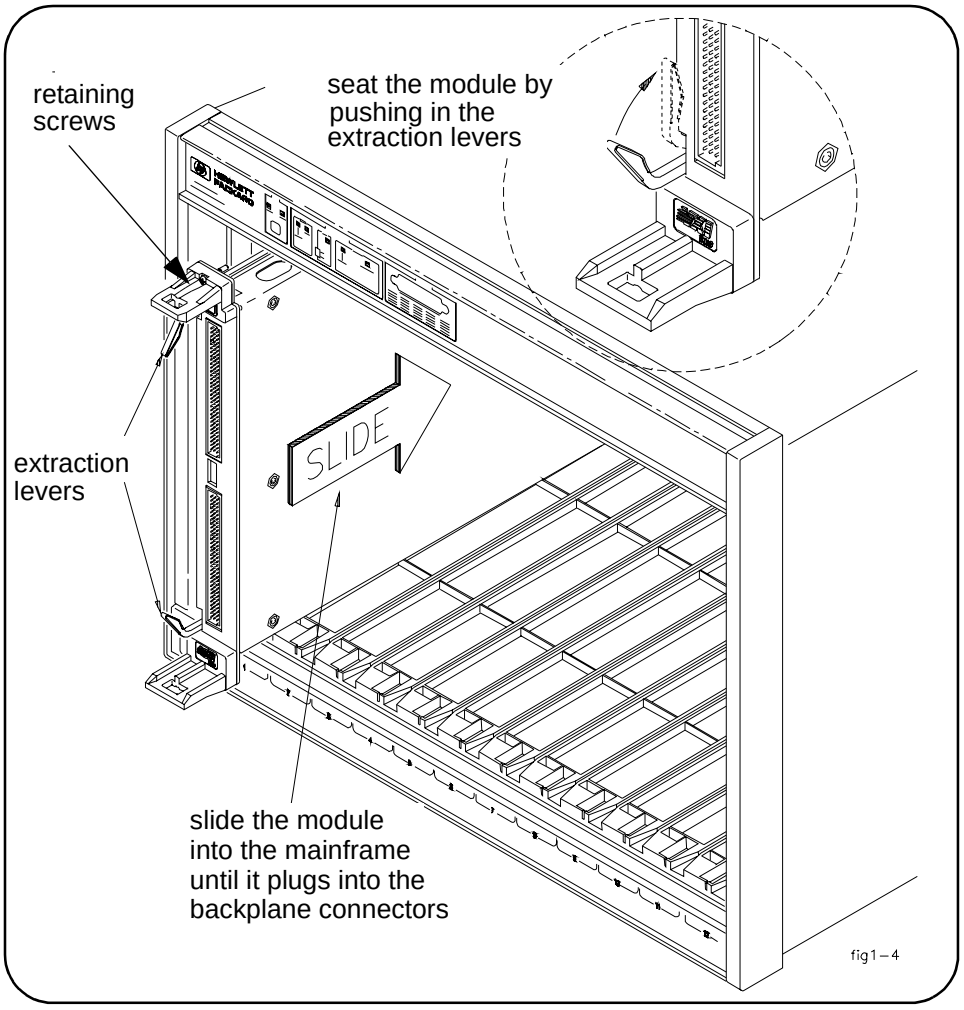


Figure 2-8. Installing C-size Instruments.

Caution **To prevent damage to the VXI instruments, install the instruments when the mainframe is turned off.**

A. Insert the instrument into the mainframe by aligning the instrument with the card guides inside the mainframe. Slowly push the instrument into the slot until it seats in the backplane connectors. The front panel of the instrument should be even with the front edges of the mainframe.

B. Tighten the retaining screws on the top and bottom of the module.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

WARNING **All instruments within the VXI mainframe are grounded through the mainframe chassis. During installation, tighten the instruments' retaining screws to secure the instrument to the mainframe and to make the ground connection.**

Installing A- and B-size Instruments

A- and B-size instruments can also be installed in the mainframe. These instruments are installed using a module carrier:

- **HP E1403C A/B-size Module Carrier** extends the P1 connector on the VXIbus backplane and mounts the (A/B-size) modules flush with C-size modules. This carrier is recommended for Hewlett-Packard B-size, slave-only devices which have the P1 connector.

- **HP E1407A A/B Module Carrier** extends the P1and P2 connectors on the VXIbus backplane. This carrier is recommended for B-size, slave-only devices which have the P1/P2 connectors.

Figure 2-9 shows the installation of A- and B-size instruments.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

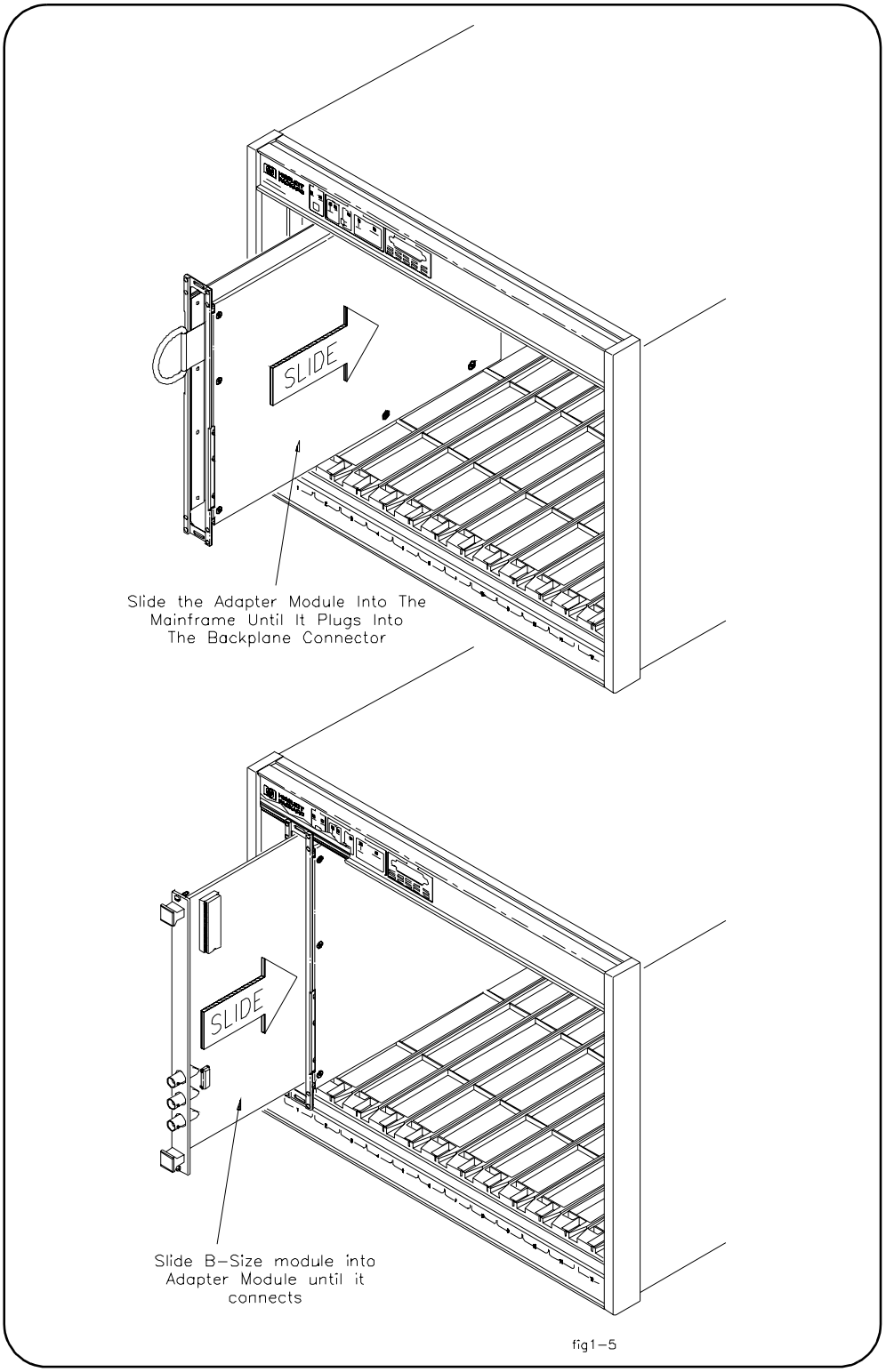


Figure 2-9. Installing A- and B-size VXI Instruments.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Caution **To prevent damage to the VXI instruments, install the instruments when the mainframe is turned off.**

A. Install the HP E1403 A/B-size Module Carrier or the HP E1407 A/B-size Module Carrier into the mainframe. This is done by aligning the top and bottom of the carrier with the card guides and slowly pushing the carrier into the mainframe. The front of the carrier should be even with the front edges of the mainframe.

B. Slide the A- or B-size instrument into the carrier until it connects.

C. Tighten the retaining screws on the top and bottom of the instrument.

WARNING **All instruments within the VXI mainframe are grounded through the mainframe chassis. During installation, tighten the instruments' retaining screws to secure the instrument to the mainframe and to make the ground connection.**

Step 4: Installing the HP I_O Libraries

The software required to use the IEEE 1394 interface in a VXI system, including the Adaptec® host adapter drivers, is contained on the HP I_O Libraries CD.

Note Refer to Chapter 4: IEEE 1394 Fundamentals and Interface Overview for more information on the HP I_O Libraries and related software.

A. Turn on the PC if you have not already done so. Close all open applications and insert the I_O libraries CD into your PC CD-ROM drive. Inserting the CD automatically activates the installer. If the installer is not activated, select Start / Run and type <drive>:SETUP.EXE. Do not turn on the VXI mainframe.

Note If your PC indicates that new hardware has been found, select "do not install a driver." The Adaptec® host adapter drivers are installed with the I_O libraries installer program.

B. Review the information and license agreements presented at the beginning of the installation process.

C. Continue through the installation process as directed by the installer. Be sure to indicate that you want HP I_O Libraries support for the E8491A interface installed by clicking on the box next to "Install HP E8491 VXI Components." **Do not configure the interface at this time**.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

D. After the installation is complete, re-start the computer.

Configuring the HP E8491A Interconnect

A. Connect the IEEE 1394 interface cable between the host adapter (PC) and the E8491A interconnect if you have not already done so. Turn on the VXI mainframe.

B. From the HP I_O Libraries program group created when the libraries were installed, click on ‘I_O Config’ (Figure 2-10).

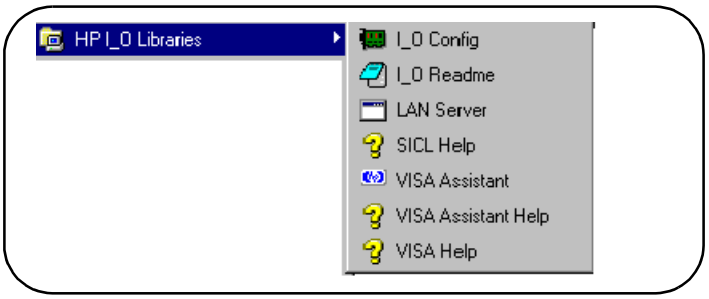


Figure 2-10. The HP I_O Libraries Program Group.

This brings up a configuration window similar to that shown in Figure 2-11.

C. Select `HP E8491A` in the “Available Interface Types” box and click on ‘Configure’

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

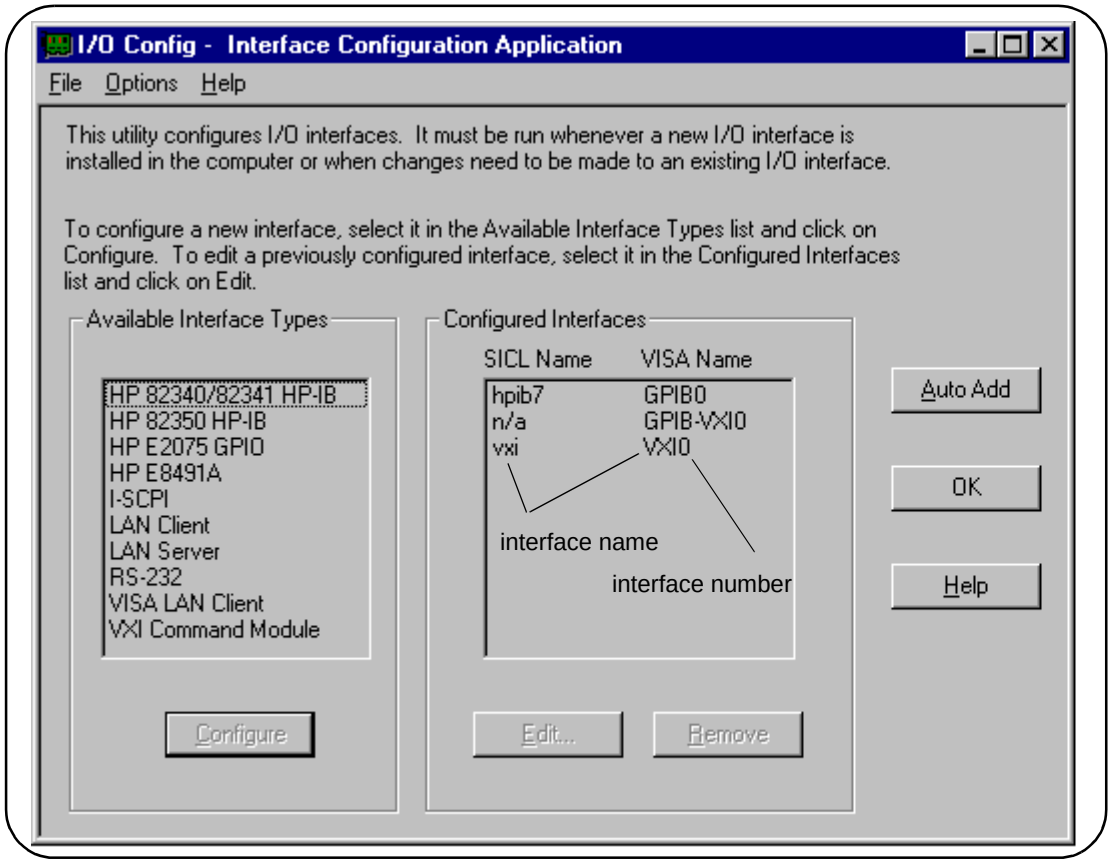


Figure 2-11. The HP I_O Libraries I_O Config Utility.

The HP E8491A uses the SICL interface name ‘vxi’ and the VISA interface name ‘VXI’ (Figure 2-12). The VISA interface number is assigned by ‘I_O Config’ and is unique to each E8491A. The interface name and number identify each mainframe in multi-frame VXI systems, and are also used in addressing each instrument in the mainframe. The unique interface number allows instruments with the same logical addresses to be installed in different mainframes, but in the same system.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

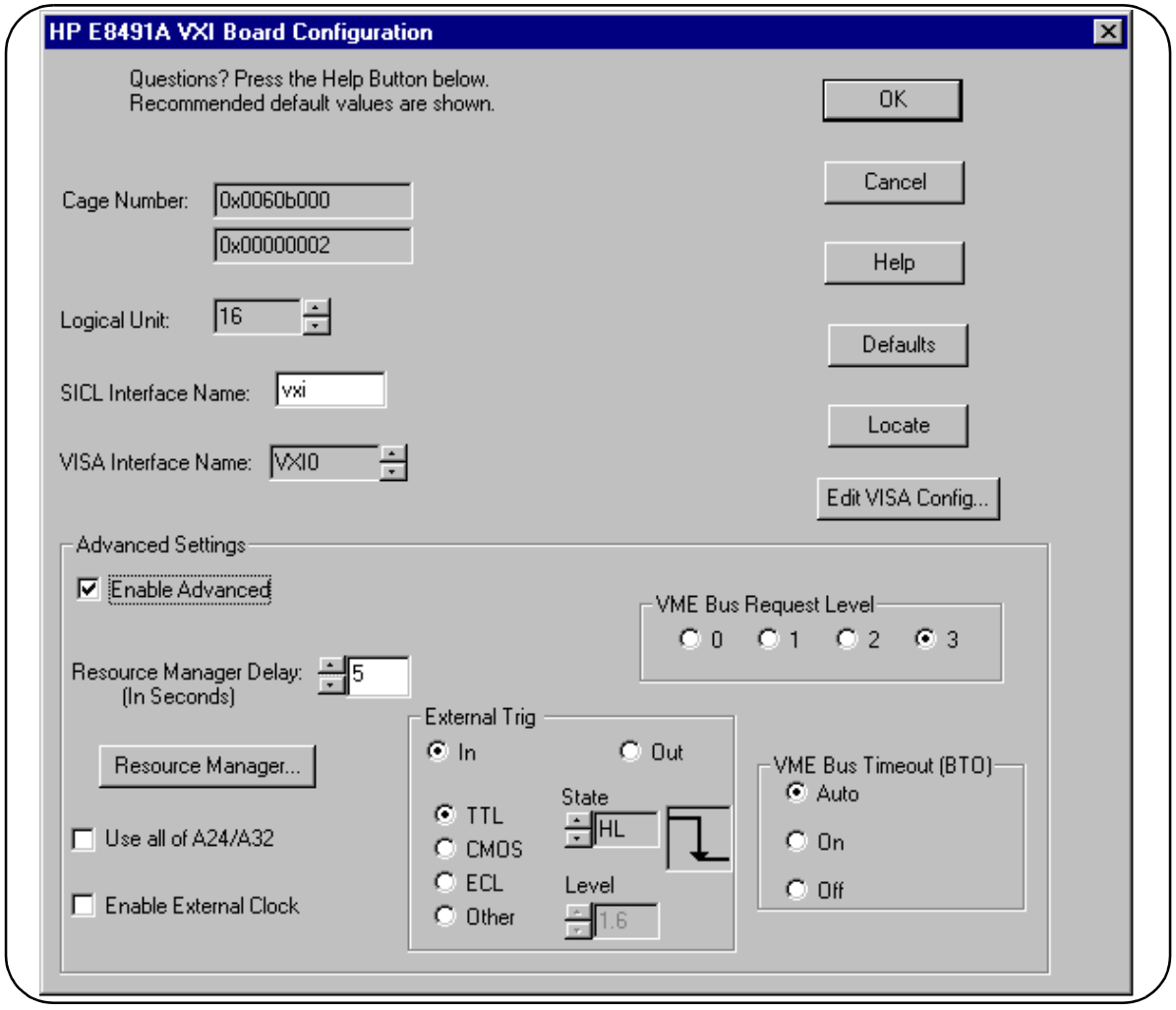


Figure 2-12. Editing the HP E8491A Configuration.

D. Click on OK to close the utility and complete the configuration.

Editing the HP E8491A Configuration

When it is necessary to edit your configuration, click 'I_O Config' in the HP I_O Libraries program group (Figure 2-10). To edit the HP E8491A, click (highlight) the configured interface (vxi VXI0) in the utility (Figure 2-11). This activates the 'Edit' button on the bottom of the window.

If you want to change the SICL interface name and number to something more descriptive, use the 'SICL Interface Name' field. You can change the VISA interface number using the up/down arrows next to the 'VISA Interface Name' field. The SICL and VISA interface names (and numbers) do not have to be the same.

Make a note of the interface name and number, as they are used in addressing instruments in the mainframe (see "Chapter 3: VXI Programming Using the IEEE 1394 Serial Bus" for more information).

The 'Help' button provides information on each item in the window.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Editing the HP E8491A Configuration on Windows 95 Platforms

After installing the HP I_O Libraries and configuring the HP E8491A on the Windows 95 platform, an ***hp*** icon is placed in the bottom right corner of your PC monitor (Figure 2-13).



Figure 2-13. Editing Your Configuration on Windows 95 Platforms.

Clicking on the icon using the right mouse button brings up the following menu items:

I_O Config: starts the HP I_O Libraries' 'I_O Config' utility.

Edit Resource Manager: goes directly to the Resource Manager section of the 'I_O Config' utility (see Figure 2-16). This section allows you to edit configuration files, run the resource manager **on a specific** mainframe, and view the resource manager output. You must re-run the resource manager each time changes are made.

Refresh Resource Manager: re-runs the resource manager on **all** VXI mainframes in your system to implement configuration changes made. You must "refresh" (re-run) the resource manager each time changes are made. If changes are made to only a single configuration (mainframe), see "Edit Resource Manager" above.

Close Application: stops the SICL *iproc* utility which enables the resource manager to run. To re-start *iproc*, select Start/Programs/StartUp/HP E8491 Resource Manager .

Step 5: Installing the HP VXI*plug&play* Instrument Drivers

There are no SCPI instrument drivers installed in, or downloaded to the HP E8491A. While this does not impact message-based instruments, register-based instruments in IEEE 1394 based systems are programmed using their VXI*plug&play* drivers.

The HP VXIplug&play drivers are located on the HP Universal Instrument Drivers CD which ships with the E8491A and with each VXI instrument.The installer program on the driver CD is similar to that on the I_O libraries CD.

Once the drivers have been installed, reboot the PC.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Note

If you are updating an existing VXI system to use the HP E8491A and IEEE 1394 serial bus, we highly recommend that you obtain the latest version of the HP VXI*plug&play* drivers. Information on the latest drivers available can be found on the World Wide Web at http://www.hp.com/go/inst_drivers .

Step 6. Verifying the Installation

Once you have installed the hardware, the I_O Libraries, the VXI*plug&play* drivers, and have re-booted the PC, you should now verify the installation. This ensures that you can communicate with instruments in the system over the IEEE 1394 interface. Two ways to check your system are to run an instrument's soft front panel, or to view the output of the system's resource manager.

Using Instrument Soft Front Panels

Soft front panels are part of the instruments' VXI*plug&play* drivers. A soft front panel is activated from the 'Vxipnp' program group as shown in Figure 2-14.

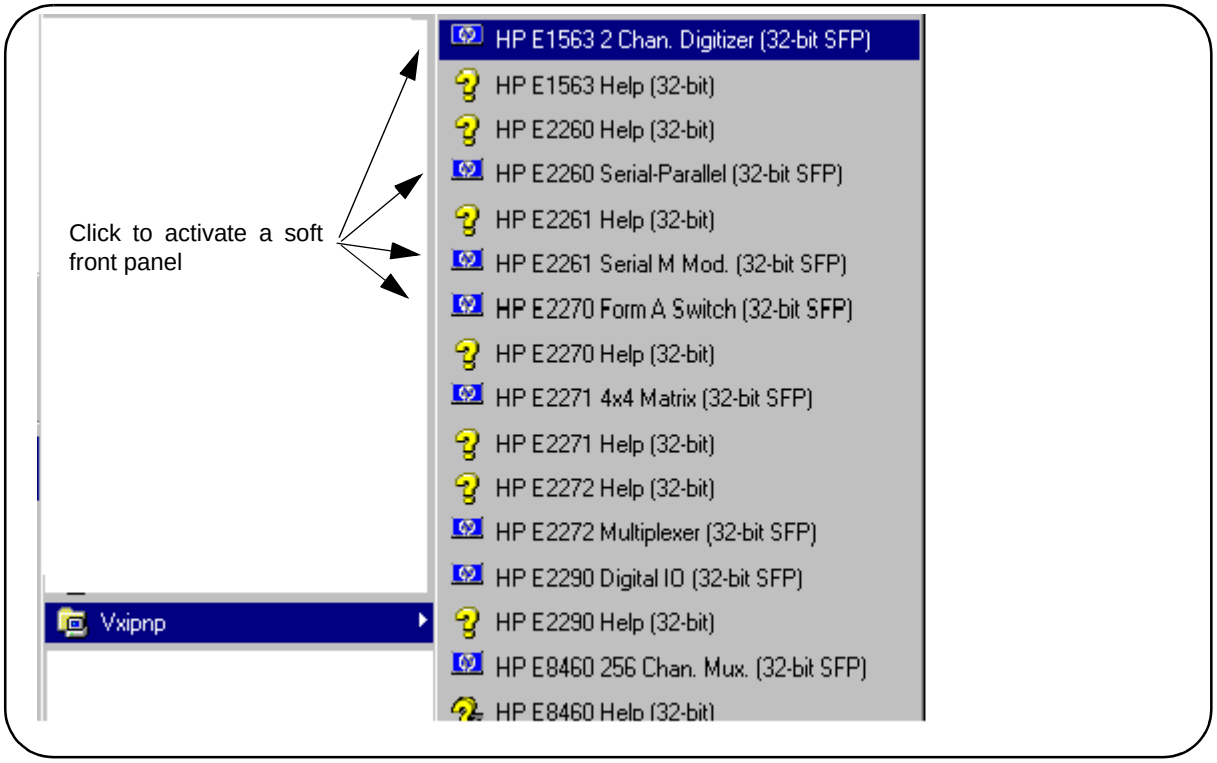


Figure 2-14. Selecting a VXIplug&play Soft Front Panel.

When the system hardware and software are properly installed and the PC is communicating with the mainframe, the soft front panel will be opened and a connection made to the instrument as shown in Figure 2-15.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

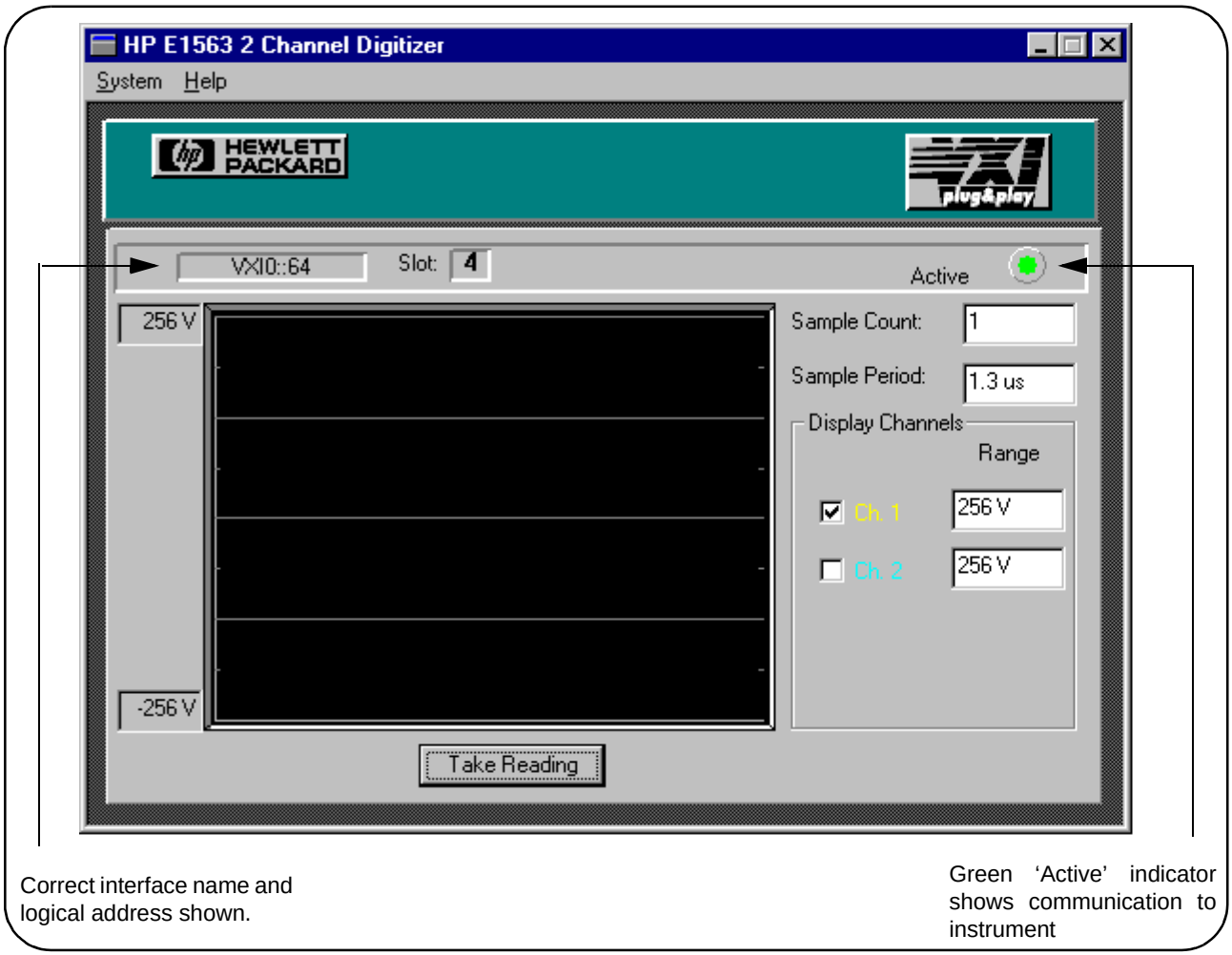


Figure 2-15. Soft Front Panel Indicating PC - Mainframe Communication.

Viewing the Resource Manager Output

Another way to determine if your system is properly configured is to view the output of the resource manager. The easiest way to view the output is using the I_O Libraries' 'I_O Config' utility. Select and start the utility as shown in Figures 2-10 through 2-12. The output is viewed as shown in Figure 2-16.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

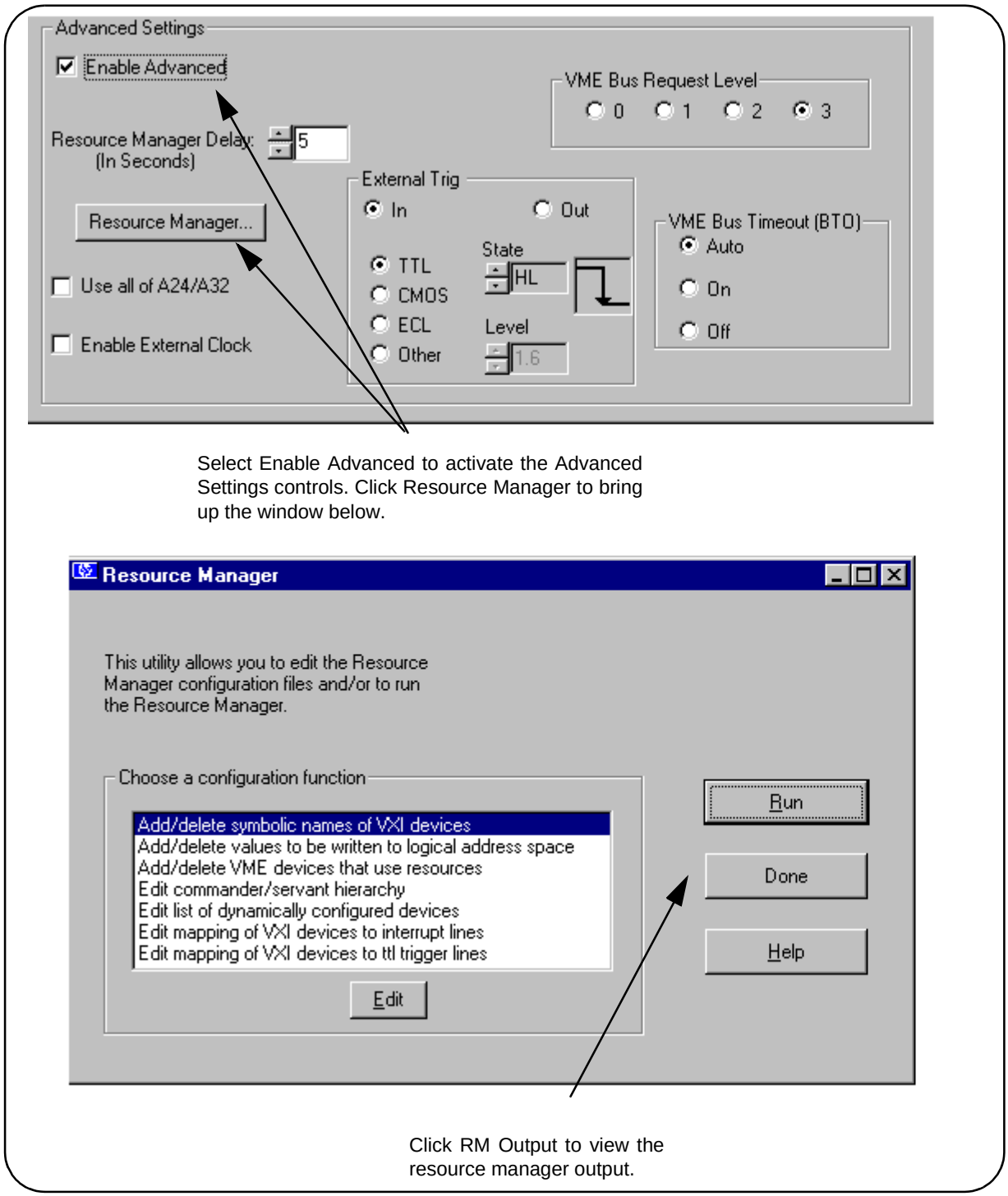


Figure 2-16. Viewing the Resource Manager Output using 'I_O Config'.

Figure 2-17 is a partial listing of a typical resource manager output.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

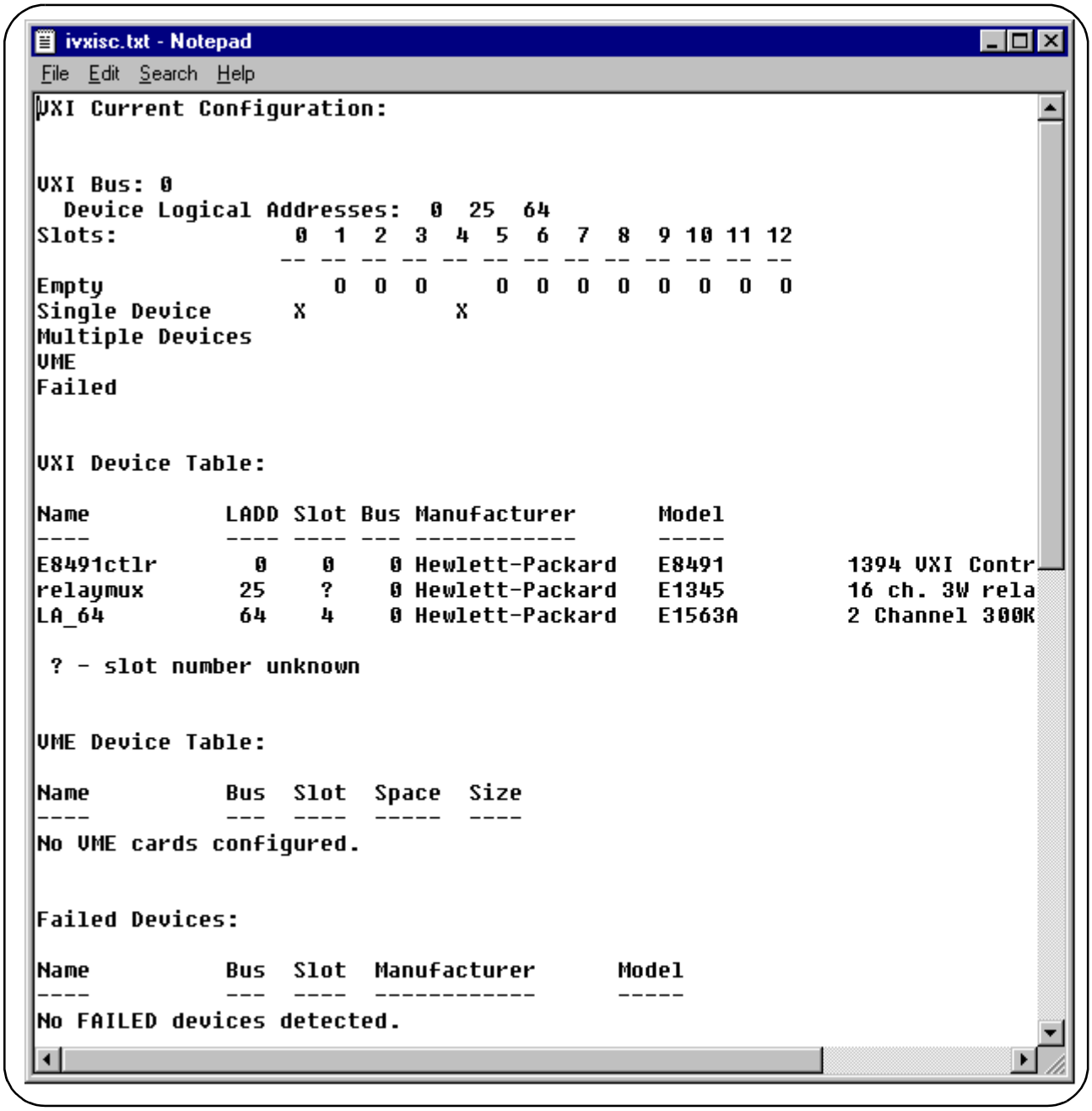


Figure 2-17. Typical Resource Manager Output.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Running the Resource Manager

When the VXI mainframe is turned on and the E8491A interface has been configured using ‘I_O Config’, the SICL *iproc* utility is started. This enables the resource manager to run when:

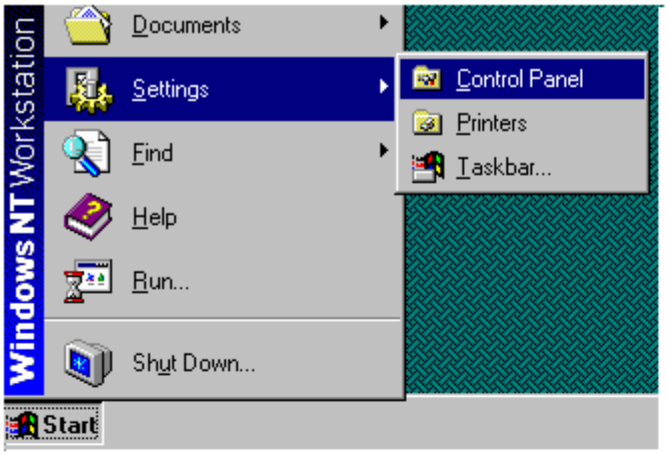
- mainframe power is cycled
- the E8491A faceplate Reset button is pressed
- activated from the ‘I_O Config’ utility

The resource manager initializes and prepares the VXI system for use.

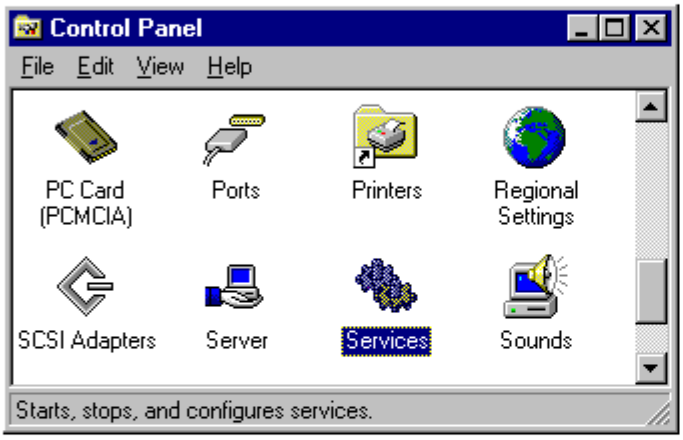
In VXI systems with multiple E8491As (mainframes), individual mainframes can be turned off without affecting other mainframes in the system. When a mainframe is turned on, the resource manager reconfigures the mainframe.

Notice that the resource manager will only run if the *iproc* utility is started. Again, configuring the E8491A interface using and then closing ‘I_O Config’ starts *iproc*. You can manually start, stop, or verify the state of the utility as shown in Figure 2-18.

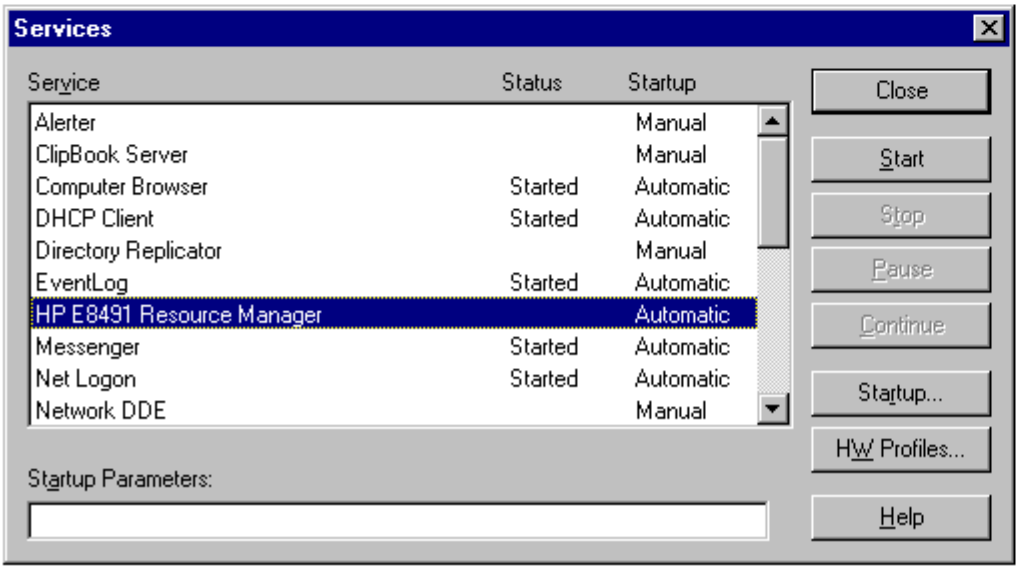
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



1. Click Start, select Settings, and click Control Panel.



2. Double-click Services.



3. Select HP E8491 Resource Manager and either Start, Stop, or Close after verifying.

Figure 2-18. Starting, Stopping, and Verifying iproc.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Chapter 3
VXI Programming Using the IEEE 1394 Serial Bus

Using this Chapter

This chapter contains examples and general information for programming VXI systems over the IEEE 1394 serial bus. The contents of the chapter include:

- Programming Register-Based and Message-Based Instruments 35
- Opening Instrument Sessions 35
- Optimizing Programs 36
- HP E8491A Triggering 43
- Using HP E8491A Shared Memory 47

Programming Register-Based and Message-Based VXI Instruments

There are no SCPI instrument drivers for register-based instruments installed in, or downloaded to the HP E8491A. Therefore, register-based instruments are programmed over the IEEE 1394 bus using either their VXI*plug&play* drivers, or through register-level peeks and pokes using HP VISA or SICL.

Message-based instruments are programmed using HP VXI*plug&play* drivers, or using SCPI commands embedded in HP VISA or SICL function calls.

VXI*plug&play* drivers for HP register-based and message-based instruments are contained on the HP Universal Instrument Drivers CD which ships with each HP VXI instrument.

Opening Instrument Sessions

Programs which run over the IEEE 1394 interface begin by opening a session between the VXI instrument and the driver or I_O library (VISA or SICL). An address that includes the interface name and number (described in Chapter 2) and the instrument's logical address is used in opening these sessions.

Following are three segments that open sessions to an instrument in HP VXI*plug&play*, HP VISA, and SICL programs.

HP VXIplug&play

```
ViSession vi;

// open device (VXIplug&play) session to the HP E1563
errStatus = hpe1563_init("VXI0::24::INSTR",VI_FALSE,
VI_FALSE, &vi);
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

HP VISA

```
ViSession defaultRM, id;

//open device (VISA) session to the HP E1563
viOpenDefaultRM (&defaultRM);

viOpen (defaultRM, "VXI0::24::INSTR",VI_NULL,VI_NULL,
&id);
```

SICL

```
INST id;

// open device (SICL) session to the HP E1563
id = iopen("vxi,24")
```

Or, to open an interface session to the HP E8491A:

```
INST id;

// open (SICL) session to the VXI interface
id = iopen("vxi")
```

The HP E8491A IEEE 1394 interconnect uses the interface name VXI (or vxi). The interface number is assigned using the 'I_O Config' utility (Chapter 2). In the examples above, the logical address of the HP E1563 digitizer is 24 and INSTR indicates a VISA instrument control resource.

Optimizing Programs

Programs that run over the IEEE 1394 serial bus are optimized by transferring data between the PC and the instrument in blocks. The following section identifies HP VISA and SICL functions that perform block transfers.

Note

Refer to "Chapter 4: IEEE 1394 Fundamentals and Interface Overview" for detailed information on data transfers using the IEEE 1394 data transfer protocol.

Block Data Transfers

VXI*plug&play* drivers for selected instruments contain functions that perform block transfers. You will need to consult the driver help file to determine if the driver for a particular instrument supports block transfers.

The following HP VISA functions perform block transfers over the IEEE 1394 serial bus:

viMoveIn8	viMoveOut8	viMove
viMoveIn16	viMoveOut16	viMoveAsync
viMoveIn32	viMoveOut32	

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The following extended SICL function is unique to the HP E8491A and is used for block transfers over the bus:

iblockmovex

Additionally, the extended SICL functions shown below must be used when porting SICL programs to the IEEE 1394 bus from other I/O interfaces:

imapx
iunmapx
ipeekx8, ipeekx16, ipeekx32
ipokex8, ipokex16, ipokex32

These functions are covered in detail in the SICL documentation.

The following examples demonstrate how to set up and perform block transfers using HP VXI*plug&play* and HP VISA functions.

Block Transfers using HP VXIplug&play Drivers

This program performs a block transfer of 2,000 readings using the HP E1563A digitizer and its VXI*plug&play* driver.

```
// 1563VPNP.CPP - This program transfers a block of 2,000 readings from the
// HP E1563 digitizer to the computer using the VXIplug&play driver's
// hpe1563_fetchAll_Q function. 2,000 readings is the maximum number of
// readings that can be transferred using the function.

#include "hpe1563.h"// include the driver header file
#include <stdio.h>
#include <stdlib.h>
#include <windows.h>

// project files: 1563vpnp.cpp, hpe1563.lib

// Specify the addressing path.
#define E1563 "VXI0::64::INSTR"         // VXI addressing

// prototypes
void check(ViSession vi, ViStatus error);


void main(void)
{
  ViSession vi;
  ViStatus errStatus;
  ViInt16 rdgs[2000];
  ViInt16 *dataPtr;// pointer to cast readings to 16-bit integers
  ViReal64 range;// range variable for reading conversions
  int i;
  long dataArrayLen=2000;// return 2,000 readings using
                         // hpe1563_fetchAll_Q
  ViInt32 numRdgs;
  ViChar err_message[256];

  dataPtr = rdgs;// set pointer to rdgs array
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

```
// open a VXIplug&play device session and reset the digitizer
errStatus = hpe1563_init(E1563,0,1,&vi);
if( VI_SUCCESS > errStatus)
{
  hpe1563_error_message( vi, errStatus, err_message);
  printf("Unable to open %s\n", E1563);
  printf("hpe1563_init() returned error message %s\n", err_message);
  return;
}

// enable digitizer error detection
hpe1563_errorQueryDetect(vi, 1);

  // set a 5s timeout period to allow functions to complete
errStatus = hpe1563_timeOut(vi, 5000);
check(vi, errStatus);

// configure the digitizer to take 2,000 post-trigger readings
// not to exceed 4V on channel 1
errStatus=hpe1563_configure(vi, 1, 4.0, 2000,1);
check(vi, errStatus);

  // set an immediate trigger
  errStatus = hpe1563_trigEvent(vi, 1, hpe1563_TRIG_IMM, 0.0);
  check(vi, errStatus);

  // set the minimum sample period
 errStatus = hpe1563_sampTim(vi, hpe1563_SAMP_TIM_MIN);
 check(vi, errStatus);

// disable digitizer error detection
hpe1563_errorQueryDetect(vi, 0);

 // initiate the digitizer
errStatus = hpe1563_initImm(vi);

// pause 3 ms (1.3e-6 * 2000) to allow readings to complete
Sleep (3);

// fetch readings from the digitizer's A24 space
errStatus = hpe1563_fetchAll_Q(vi, dataArrayLen, (ViInt32 *)rdgs,
&numRdgs );

// confirm readings transferred are valid by printing first 5 readings
dataPtr = (ViInt16 *)rdgs;

// query digitizer reading range
errStatus = hpe1563_range_Q(vi, 1, &range);
printf("Reading samples are:\n\n");

 for (i=0; i<10; i+=2)
{
  printf("%lf\n\n",dataPtr[i]*range/32768);
}
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

```
  // reset digitizer following the transfer
  errStatus = hpe1563_reset(vi);

  // close the device session
  hpe1563_close(vi);// HP VXIplug&play session
}

//*********************************************************************

// error checking routine

void check (ViSession vi, ViStatus errStatus)
{
  ViInt32 inst_err;
  ViChar err_message[256];

  if(VI_SUCCESS > errStatus)
  {
    if(hpe1563_INSTR_ERROR_DETECTED == errStatus)
    {
      /* query instrument error */
      hpe1563_dcl(vi);/* send a device clear */
      hpe1563_error_query(vi, &inst_err, err_message);
      /* display the error */
      printf("Instrument Error : %ld, %s\n", inst_err, err_message);
    }
    else
    {
      /* get driver error message */
      hpe1563_error_message(vi, errStatus, err_message);
      /* display the error */
      printf("HP E1563 Driver Error : %ld, %s\n", errStatus, err_message);
    }

    hpe1563_reset(vi);/* reset the digitizer */
    hpe1563_close(vi);/* close the digitizer handle */

    exit(1);
  }

  return;
}
```

Comments

1. The maximum block transfer size allowed by the HP E1563A **hpe1563_fetchAll_Q** function is 2,000 bytes.

2. This manual is included on the HP I_O Libraries CD. By viewing the manual from the CD, you can cut and paste this program into your development environment.

3. The section “Using HP E8491A Shared Memory” contains an example of block data transfers using HP SICL.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Block Transfers using HP VISA

This program performs a block transfer of 60,000 readings using the HP E1563A digitizer and the HP VISA function **viMoveIn32**.

```
// 1563visa.CPP - This program configures the HP E1563A digitizer using its
// VXIplug&play driver and then transfers a block of 60,000 readings from
// the digitizer's FIFO memory to the computer using the VISA viMoveIn32
// function.

#include "hpe1563.h"// include the driver header file
#include "visa.h"
#include <stdio.h>
#include <stdlib.h>
#include <windows.h>

// project files: 1563visa.cpp, hpe1563.lib, VISA.lib

// specify the addressing path
#define E1563 "VXI0::64::INSTR"         // VXI addressing

// prototypes
void check(ViSession vi, ViStatus error);
void err_handler(ViSession vi, ViStatus err);

void main(void)
{
  ViSession vi;
  ViStatus errStatus, err;
  ViInt32 rdgs[60000];
  ViReal64 range;// range variable for reading conversions
  ViInt16 *dataPtr;// pointer to cast readings to 16-bit integers
  int i;
  ViChar err_message[256];

  // open a VXIplug&play device session and reset the digitizer
  errStatus = hpe1563_init(E1563,0,1,&vi);
  if( VI_SUCCESS > errStatus)
  {
    hpe1563_error_message( vi, errStatus, err_message);
    printf("Unable to open %s\n", E1563);
    printf("hpe1563_init() returned error message %s\n", err_message);
    return;
  }

  // enable digitizer error detection
  hpe1563_errorQueryDetect(vi, 1);

  // set a 5s timeout period to allow functions to complete
  errStatus = hpe1563_timeOut(vi, 5000);
  check(vi, errStatus);

  // configure the digitizer to take 60,000 post-trigger readings
  // not to exceed 4V on channel 1
  errStatus=hpe1563_configure(vi, 1, 4.0, 60000, 1);
  check(vi, errStatus);
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

```
    // set an immediate trigger
    errStatus = hpe1563_trigEvent(vi, 1, hpe1563_TRIG_IMM, 0.0);
    check(vi, errStatus);

    // set the minimum sample period
    errStatus = hpe1563_sampTim(vi, hpe1563_SAMP_TIM_MIN);
    check(vi, errStatus);

  // disable digitizer error detection
  hpe1563_errorQueryDetect(vi, 0);

  // initiate the digitizer
  errStatus = hpe1563_initImm(vi);

  // pause 78 ms (1.3e-6 * 60000) to allow readings to complete
  Sleep (78);

  // transfer the (60,000) readings from the digitizer using the VISA
  // function viMoveIn32 - use the same session name (vi) opened for
  // VXIplug&play
  err = viMoveIn32(vi, VI_A16_SPACE, 0x08, 60000, (ViPUInt32)rdgs);
  if(err < VI_SUCCESS) err_handler(vi, err);

  // confirm readings transferred are valid
  dataPtr = (ViInt16 *)rdgs;

  // query digitizer reading range
  errStatus = hpe1563_range_Q(vi, 1, &range);
  printf("Reading samples are:\n\n");

   for (i=0; i<10; i+=2)
  {
    printf("%lf\n\n",dataPtr[i]*range/32768);
  }

  // reset digitizer following the transfer
  errStatus = hpe1563_reset(vi);

  // close the device session
  hpe1563_close(vi);// HP VXIplug&play session

}

//************************************************************
// error checking routine

void check (ViSession vi, ViStatus errStatus)
{
  ViInt32 inst_err;
  ViChar err_message[256];

  if(VI_SUCCESS > errStatus)
  {
    if(hpe1563_INSTR_ERROR_DETECTED == errStatus)
    {
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

```
      /* query instrument error */
      hpe1563_dcl(vi);/* send a device clear */
      hpe1563_error_query(vi, &inst_err, err_message);
      /* display the error */
      printf("Instrument Error : %ld, %s\n", inst_err, err_message);
    }
    else
    {
      /* get driver error message */
      hpe1563_error_message(vi, errStatus, err_message);
      /* display the error */
      printf("HP E1563 Driver Error : %ld, %s\n", errStatus, err_message);
    }

    hpe1563_reset(vi);/* reset the digitizer */
    hpe1563_close(vi);/* close the digitizer handle */

    exit(1);
  }

  return;
}

//*********************************************************************

// Error handling function

void err_handler (ViSession vi, ViStatus err)
  {
    char buf[1024]={0};
    viStatusDesc(vi,err,buf);
    printf("ERROR = %s\n", buf);
   return;
   }
```

Comments

1. A single instrument session opened with the hpe1563_init function can be used by both HP VXI*plug&play* driver function calls and by HP VISA function (i.e **viMoveIn32**) calls.

2. This manual is included on the HP I_O Libraries CD. By viewing the manual from the CD, you can cut and paste this program into your development environment.

3. The section “Using HP E8491A Shared Memory” contains an example of block data transfers using HP SICL.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

HP E8491A Triggering

The HP E8491A is capable of asserting, receiving, and routing trigger signals along the VXI (mainframe) backplane trigger lines. In addition to the VXI backplane's eight TTL level trigger lines and two ECL level trigger lines, the E8491A can receive and assert triggers on the faceplate 'Trig In' and 'Trig Out' connectors.

Table 3-1 summarizes the triggering parameters and capabilities of the HP E8491A.

Table 3-1. HP E8491A Triggering Parameters.

Trigger Lines	Trigger Levels	Trigger Routing
TTLTRG7 - TTLTRG0 (VXI backplane)	Trigger levels or pulses can be output on any number of TTLTRG trigger lines.	One TTLTRG trigger line can be routed to one ECLTRG trigger line.
ECLTRG1 - ECLTRG0 (VXI backplane)	Trigger levels or pulses can be output on any number of ECLTRG trigger lines.	One ECLTRG trigger line can be routed to one TTLTRG trigger line.
Trig In Port* (HP E8491A faceplate)	Input trigger levels are TTL, ECL, CMOS, or programmable up to +30V. Default assumes TTL low true signal.	Input triggers can be routed to any number of TTLTRG trigger lines and to any number of ECLTRG trigger lines.
Trig Out Port* (HP E8491A faceplate)	Output trigger level is +5V (low true - default) and can be pulled to +30V.	One TTLTRG or ECLTRG trigger line can be routed to the Trig Out port
* The E8491A Trig In and Trig Out ports are configured using the HP I_O Libraries 'I_O Config' utility.		

Using Triggers

The triggering functionality of the HP E8491A is accessed through the following HP VISA and SICL functions:

Asserting Triggers - HP VISA

viSetAttribute

VI_ATTR_TRIG_ID

VI_TRIG_TTL0 to VI_TRIG_TTL7
VI_TRIG_ECL0 to VI_TRIG_ECL1

viAssertTrigger

VI_TRIG_PROT_DEFAULT

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Asserting Triggers - HP SICL

ivxitrigoff
ivxitrigon
ixtrig
I_TRIG_ALL
I_TRIG_TTL0 to I_TRIG_TTL7
I_TRIG_ECL0 to I_TRIG_ECL1
I_TRIG_EXT0 (specifies faceplate ‘Trig Out’ port)

Routing Triggers- HP SICL

ivxigettrigroute
ivxitrigroute[1]
I_TRIG_ALL
I_TRIG_TTL0 to I_TRIG_TTL7
I_TRIG_ECL0 to I_TRIG_ECL1
I_TRIG_EXT0 (specifies faceplate ‘Trig Out’ and ‘Trig In’ ports)

Configuring the E8491A Trig In and Trig Out Ports

Configuration of the E8491A external ‘Trig In’ and ‘Trig Out’ ports is done through the HP I_O Libraries’ ‘I_O Config’ utility. This portion of the utility is shown in the following figure.

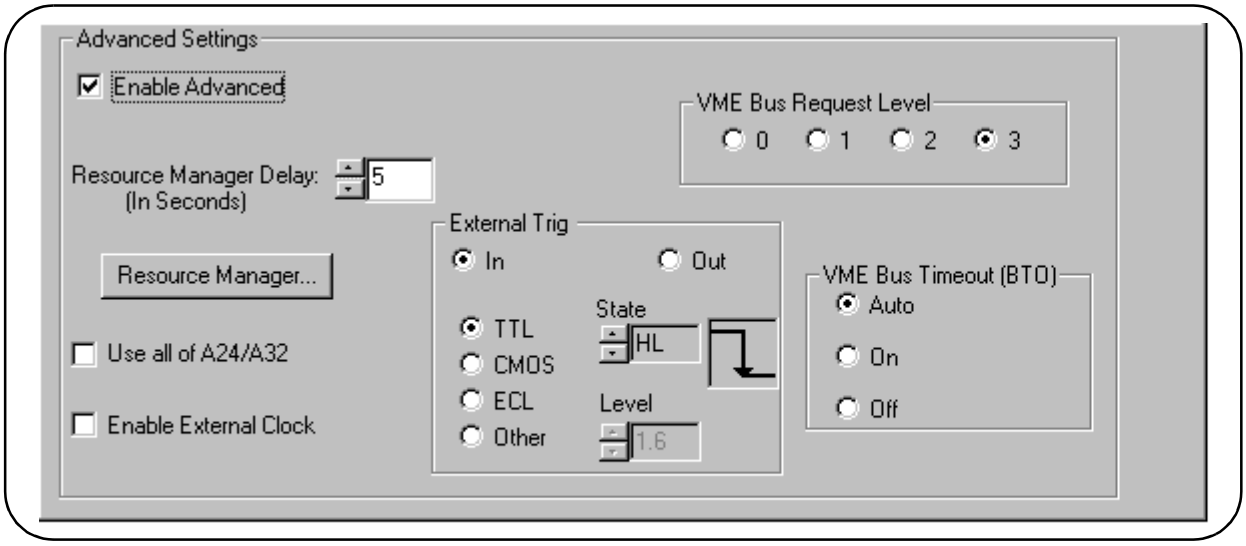


Figure 3-1. Configuring the HP E8491A External Trigger Ports.

When ‘External Trig In’ is selected, the faceplate ‘Trig In’ port is configured for the trigger level and state (normally high or normally low) selected. When ‘External Trig Out’ is selected, the faceplate ‘Trig Out’ port is configured for the state (normally high or normally low) selected.

1. Trigger routing is only available using the HP SICL ivxitrigroute function.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Note The 'I_O Config' help file associated with the HP E8491A interface contains additional information on configuring the faceplate trigger ports.

Triggering Example

The following program demonstrates how an external trigger received on the faceplate 'Trig In' port is routed to TTL trigger lines on the VXI backplane.

```
// TRIGSICL.CPP - This program demonstrates how trigger signals are
// generated and routed using the HP E8491A. The program uses SICL functions
// to generate and route a trigger signal from the face plate 'Trig Out'
// port to VXI backplane trigger line TTLTRG4. The signal triggers the
// E1412 multimeter which then takes a burst of 10 readings.

#include "sicl.h"
#include <stdio.h>
#include <stdlib.h>

// project files: trigsicl.cpp, sicl32.lib

void main(void)
{
  INST e8491;// E8491 SICL handle
  INST e1412;// E1412 SICL handle
  short i;
  double dcv_rdgs[10];

  // install SICL error handler
  ionerror(I_ERROR_EXIT);

  // open a (SICL) interface session to the E8491A
  // open a (SICL) device session to the E1412
  e8491 = iopen("vxi");
  e1412 = iopen("vxi,24");

  // set up trigger routing; rout a trigger from the faceplate 'Trig In'
  // port to VXI backplane TTL trigger line 4
  ivxitrigroute(e8491, I_TRIG_EXT0, I_TRIG_TTL4);

  // E1412 Multimeter configuration

  // set a 50s timeout period for external trigger to occur
  itimeout(e1412, 50000);

  // configure the multimeter for DCV measurements
  iprintf(e1412, "CONF:VOLT:DC 8.0\n");

    // set the fastest aperture time
    iprintf(e1412, "VOLT:DC:APER MIN\n");

   // turn off the autozero function
    iprintf(e1412, "ZERO:AUTO OFF\n");
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

```
    // set the trigger source
    iprintf(e1412, "TRIG:SOUR TTLT4\n");//trigger line 4

    // set the sample count
    iprintf(e1412, "SAMP:COUN 10\n");// 10 readings

  // initiate the multimeter
  iprintf(e1412, "INIT\n");

  printf("Press 'Enter' to trigger the voltmeter\n");
  getchar ();

  // output a trigger pulse on the E8491A 'Trig Out' connector, the
  // trigger is then input to the 'Trig In' connector via a jumper wire
  // and routed to TTL trigger line 4 which triggers the multimeter
  ixtrig(e8491, I_TRIG_EXT0);

  // fetch the readings once the trigger is received
  ipromptf(e1412, "FETC?\n", "%,10lf", dcv_rdgs);

  // display the readings
  for (i=0; i<10; i++)
  {
    printf("%lf\n", dcv_rdgs[i]);
  }

  // close the device sessions
  iclose(e8491);// close SICL interface session
  iclose(e1412);// close SICL device session

}
```

Comments

1. For demonstation purposes, the trigger signal output from the 'Trig Out' port (ixtrig function) is routed to the 'Trig In' port using a jumper wire. The signal is then routed to TTLTRG4 (ivxitrigroute function).

2. The external trigger routed to TTLTRG4 can also be routed to any or all of the VXI backplane trigger lines.

3. When using the faceplate 'Trig In' and 'Trig Out' ports, notice that both ports are specified using I_TRIG_EXT0.

In the program, `ivxitrigroute(e8491s, I_TRIG_EXT0, I_TRIG_TTL4)` routes the trigger received on the faceplate '**Trig In**' port to backplane TTL trigger line 4. `ixtrig(e8491s, I_TRIG_EXT0)` outputs a trigger pulse on the '**Trig Out**' port which is connected by a jumper wire to the 'Trig In' port.

4. This manual is included on the HP I_O Libraries CD. By viewing the manual from the CD, you can cut and paste this program into your development environment.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Trigger Pull Up

Trigger signals output from the E8491A 'Trig Out' port can be "pulled up" to +30V as shown in Figure 3-2.

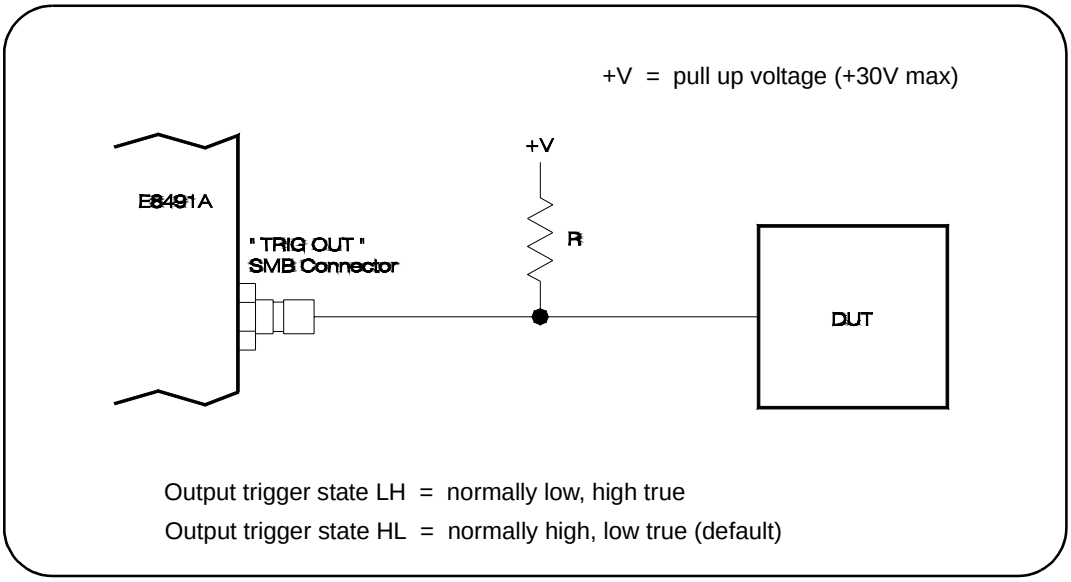


Figure 3-2. Using a Pull Up on the HP E8491A 'Trig Out' Port.

Using HP E8491A Shared Memory

The E8491A has 128 kBytes of shared (VME) memory. This memory is in the E8491A's A24 address space and is available to those VXI instruments capable of mapping and accessing A24 memory. Shared memory is often used as a temporary storage space for data transfers between the PC and VXI instruments.

HP instruments with the ability to store and receive data from shared memory generally implement the SCPI (Standard Commands for Programmable Instruments) MEMory:VME subsystem shown below:

MEMory:VME:SIZE
MEMory:VME:ADDRess
MEMory:VME:STATe

Corresponding HP VXIplug&play functions are:

hpexxxx_memVmeAddr
hpexxxx_memVmeSize
hpexxxx_memVmeStat

where xxxx is the instrument model number.

Locating E8491A Shared Memory

In order to use the E8491A shared memory, you must first locate the starting address of the memory as mapped by the resource manager (see "Running the Resource Manager" in Chapter 2). The address varies from system to system depending on the number of devices that use A24 memory. The address can be determined programatically using HP VISA or SICL, or by viewing the resource manager output. Each method is described in the following sections.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Locating Shared Memory Using HP VISA

For HP VISA programs, the E8491A shared memory starting address is obtained using the function:

viGetAttribute

and the VXI interface attribute:

VI_ATTR_MEM_BASE

The HP VISA version of the example “Storing Readings in Shared Memory” demonstrates the use of this function and attribute.

Locating Shared Memory Using SICL

For SICL programs, the E8491A shared memory starting address is found using the function:

ivxirminfo

This function fills the structure *struct vxiinfo*. The item within the structure containing the starting address is *memstart*. The SICL version of the example program showing the use of shared memory demonstrates the use of this function and structure.

Locating Shared Memory by Viewing the Resource Manager Output

The third method of determining the E8491A’s shared memory starting address is to view the resource manager output. “Viewing the Resource Manager Output” in Chapter 2 describes how this is done using the ‘I_O Config’ utility. Figure 3-3 shows the section of the output that indicates A24 address mapping.

Another way to view the output is using the SICL *ivxisc* utility contained in the <drive:>\siclnt\bin or sicl95\bin directory. This utility is an executable that is used with the SICL logical unit number (see “Editing the HP E8491A Configuration” in Chapter 2) to return the configuration output of the resource manager. Again, Figure 3-3 shows a partial listing of the output.

Note Refer to Appendix B for additional information on using *ivxisc* and for an example of the complete configuration output.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

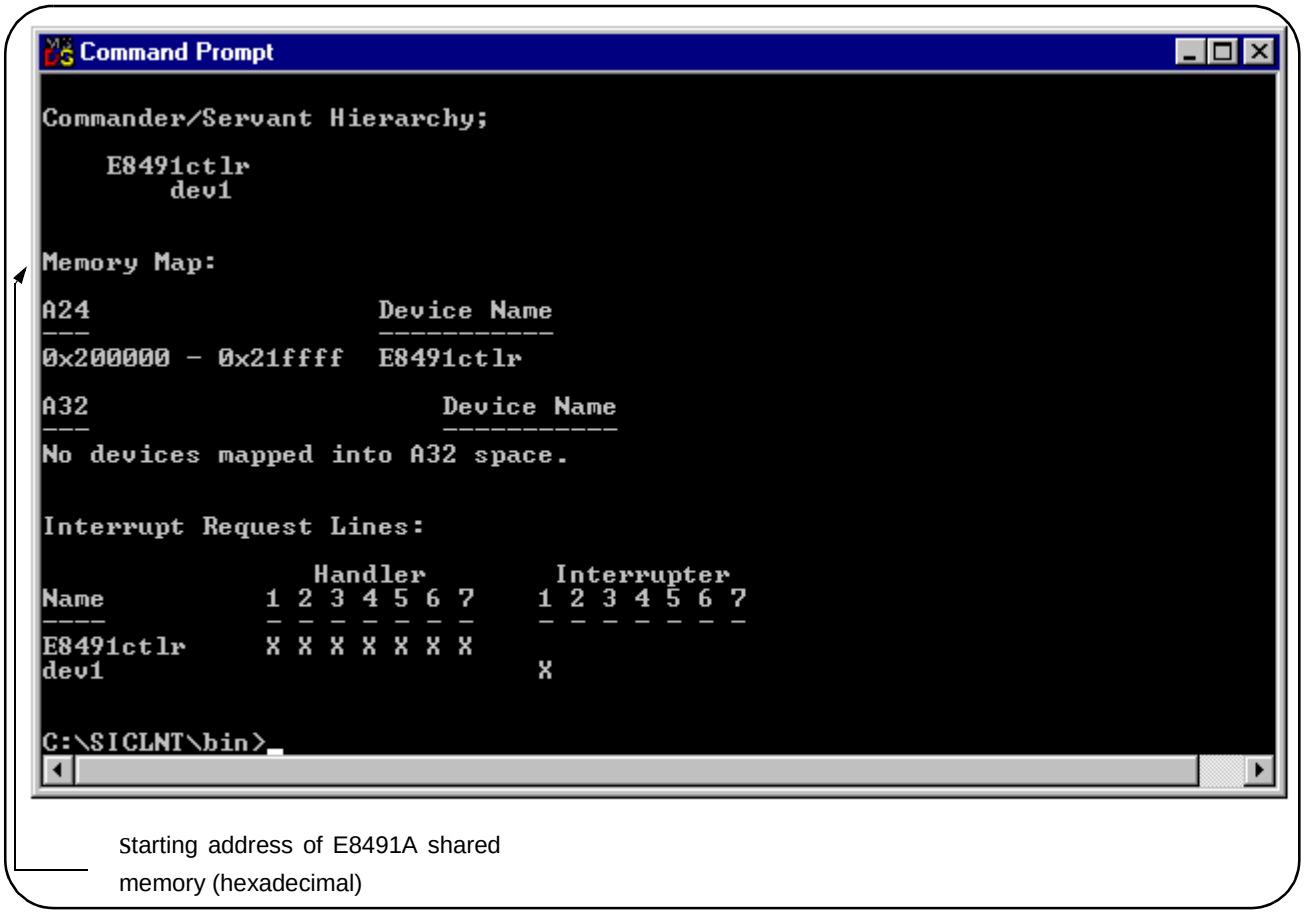


Figure 3-3. Partial Listing of Resource Manager Output Showing Shared Memory Mapping.

Example Programs

The following examples show an application using the E8491A's shared memory. In the program, 8,000 readings are taken with the HP E1410 multimeter. Because the E1410 has only enough memory to store 4,096 readings internally, all 8,000 readings are stored in shared memory and then transferred to the PC. Given the shared memory size of 128 kBytes and the E1410 storage format of eight bytes/reading, up to 16,000 readings can be stored.

Figure 3-4 illustrates the reading transfers performed with the following programs.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

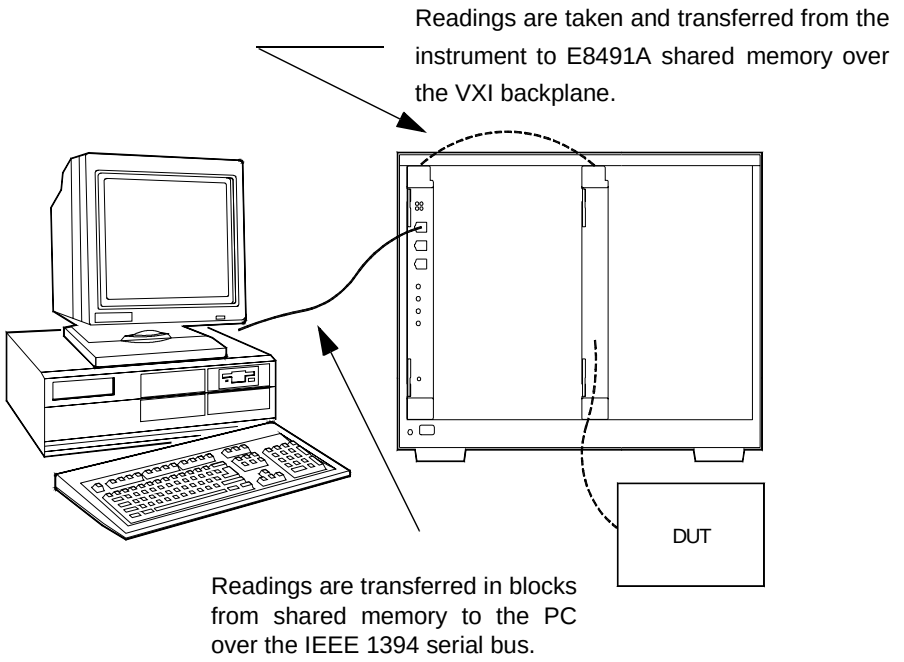


Figure 3-4. Storing Readings in Shared Memory.

Storing Readings in Shared Memory - HP VISA Example

This example uses the HP E1410 VXI*plug&play* driver to configure the multimeter, take the readings, and store them in E8491A shared memory. HP VISA functions are used to transfer the readings from shared memory to the PC.

```
// SHAR_VISA.CPP - This program demonstrates how to access the
// HP E8491A's shared memory. The program stores readings taken
// by the HP E1410 multimeter in HP E8491A shared memory, and then
// transfers those readings from shared memory to the computer.

#include "hpe1410.h"// include the driver header file
#include "visa.h"
#include <stdio.h>
#include <stdlib.h>
#include <windows.h>

// project files: SHAR_VISA.cpp, hpe1410.lib, VISA32.lib

// specify the addressing path to the multimeter
#define E1410 "VXI0::24::INSTR"      // E1410 path
#define E8491 "VXI0::0::INSTR"       // E8491 path

// check for instrument errors
#define INSTR_ERROR 0xBFFC0D07
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

```
// set up byte swap function for readings transferred from
// E8491A shared memory to the PC
#define SWAP_FLOAT64(rdgs)      \
{ unsigned char src[8];                                          \
  *((double *)src) = *((double *)rdgs);                          \
  ((unsigned char *) (rdgs))[0] = ((unsigned char*) (src))[7]; \
  ((unsigned char *) (rdgs))[1] = ((unsigned char*) (src))[6]; \
  ((unsigned char *) (rdgs))[2] = ((unsigned char*) (src))[5]; \
  ((unsigned char *) (rdgs))[3] = ((unsigned char*) (src))[4]; \
  ((unsigned char *) (rdgs))[4] = ((unsigned char*) (src))[3]; \
  ((unsigned char *) (rdgs))[5] = ((unsigned char*) (src))[2]; \
  ((unsigned char *) (rdgs))[6] = ((unsigned char*) (src))[1]; \
  ((unsigned char *) (rdgs))[7] = ((unsigned char*) (src))[0]; \
}

// prototypes
void check(ViSession vi, ViStatus error);
void err_handler(ViSession vi, ViStatus err);

void main(void)
{
  ViSession vi, defaultRM, fw;
  ViStatus errStatus, err;
  unsigned long start_addr;// starting address of shared memory
  ViReal64 rdgs[8000];// array for readings from shared memory
  int i;
  ViChar err_message[256];

  // open a VXIplug&play device session and reset the multimeter
  errStatus = hpe1410_init(E1410,0,1,&vi);
  if( VI_SUCCESS > errStatus)
  {
    hpe1410_error_message( vi, errStatus, err_message);
    printf("Unable to open %s\n", E1410);
    printf("hpe1410_init() returned error message %s\n", err_message);
    return;
  }

  // open a VISA session to the E8491A
  viOpenDefaultRM(&defaultRM);
  viOpen(defaultRM,E8491, VI_NULL, VI_NULL, &fw);

  // get E8491A shared memory base address
  viGetAttribute(fw, VI_ATTR_MEM_BASE, &start_addr);

  // enable multimeter error detection
  hpe1410_errorQueryDetect(vi, 1);

  // set a 5s timeout period to allow functions to complete
  errStatus = hpe1410_timeOut(vi, 5000);
  check(vi, errStatus);

  // configure the multimeter for DCV measurements
  errStatus = hpe1410_confVoltDc(vi);
  check(vi, errStatus);
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

```
  // turn off autorange, set a 30V DCV range
   errStatus = hpe1410_voltDcRang(vi, 0, 30);
  check(vi, errStatus);

   // set a 10 us aperture time
   errStatus = hpe1410_voltDcAper(vi, 10.0e-6);
   check(vi, errStatus);

  // set 8000 readings
  errStatus = hpe1410_sampCoun(vi, 8000);
  check(vi, errStatus);

   // store the readings in HP E8491A shared memory

   // specify the E8491A shared memory base address
   errStatus = hpe1410_memVmeAddr(vi, start_addr);
   check(vi, errStatus);

   // specify the amount of memory required
  // (8000 readings * 8 bytes/reading)
   errStatus = hpe1410_memVmeSize(vi, 64000);
   check(vi, errStatus);

   // enable the readings to be stored
   errStatus = hpe1410_memVmeStat(vi, 1);

// disable multimeter error detection
hpe1410_errorQueryDetect(vi, 0);

// initiate the multimeter to take the readings
errStatus = hpe1410_initImm(vi);

// pause 30s to allow readings to complete
Sleep (30000);

// transfer the 8,000 readings (64,000 bytes) from the multimeter using
// the VISA function viMoveIn8
err = viMoveIn8(fw, VI_A24_SPACE, 0, 64000, (ViPUInt8)rdgs);
if(err < VI_SUCCESS) err_handler(fw, err);

// swap the bytes once they are transferred from shared memory
for (i=0;i<7999;i++)
{
  SWAP_FLOAT64(&rdgs[i]);
}

// print some readings to verify the transfer was successful
for (i=0; i<10; i++)
{
  printf("%lf\n", rdgs[i]);
}

// close the device sessions
hpe1410_close(vi);   // close E1410 session
viClose(fw);         // close E8491 session
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

```
}

//*********************************************************
// error checking routine

void check (ViSession vi, ViStatus errStatus)
{
  ViInt32 inst_err;
  ViChar err_message[256];

  if(VI_SUCCESS > errStatus)
  {
    if(INSTR_ERROR == errStatus)
    {
      // query instrument error
      hpe1410_dcl(vi);// send a device clear
      hpe1410_error_query(vi, &inst_err, err_message);

      // display the error
      printf("Instrument Error : %ld, %s\n", inst_err, err_message);
    }
    else
    {
      // get driver error message
      hpe1410_error_message(vi, errStatus, err_message);

      // display the error
      printf("HP E1410 Driver Error : %ld, %s\n", errStatus, err_message);
    }

    hpe1410_reset(vi);// reset the multimeter
    hpe1410_close(vi);// close the multimeter handle

    exit(1);
  }

  return;

}

//*********************************************************
// Error handling function

  void err_handler (ViSession vi, ViStatus err)
  {
   char buf[1024]={0};
   viStatusDesc(vi,err,buf);
   printf("ERROR = %s\n", buf);
   return;

  }
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Comments

1. Because of the E1410 multimeter data storage format (eight bytes / reading), the readings are transferred from shared memory to the PC in bytes. Therefore, it is necessary to swap each byte in order to re-construct the reading. Depending on the storage formats of your particular instruments, swapping may not be necessary.

2. This manual is included on the HP I_O Libraries CD. By viewing the manual from the CD, you can cut and paste this program into your development environment.

Storing Readings in Shared Memory - SICL Example

This example uses the HP E1410 VXI*plug&play* driver to configure the multimeter, take the readings, and store them in E8491A shared memory. SICL functions are used to transfer the readings from shared memory to the PC.

```
// SHAR_SICL.CPP - This program demonstrates how to access the
// HP E8491A's shared memory. The program stores readings taken by
// the HP E1410 multimeter in HP E8491A shared memory, and then
// transfers those readings from shared memory to the computer.

#include "sicl.h"
#include <stdio.h>
#include <stdlib.h>
#include <windows.h>

// project files: SHAR_SICL.cpp, SICL32.lib

// set up byte swap function for readings transferred from
// E8491A shared memory to the PC

#define SWAP_FLOAT64(rdgs) \
{ unsigned char src[8];                                          \
  *((double *)src) = *((double *)rdgs);                  \
  ((unsigned char *) (rdgs))[0] = ((unsigned char*) (src))[7]; \
  ((unsigned char *) (rdgs))[1] = ((unsigned char*) (src))[6]; \
  ((unsigned char *) (rdgs))[2] = ((unsigned char*) (src))[5]; \
  ((unsigned char *) (rdgs))[3] = ((unsigned char*) (src))[4]; \
  ((unsigned char *) (rdgs))[4] = ((unsigned char*) (src))[3]; \
  ((unsigned char *) (rdgs))[5] = ((unsigned char*) (src))[2]; \
  ((unsigned char *) (rdgs))[6] = ((unsigned char*) (src))[1]; \
  ((unsigned char *) (rdgs))[7] = ((unsigned char*) (src))[0]; \
}

void main(void)
{
  INST e8491;             // handle for SICL session to E8491
  INST e1410;             // handle for SICL session to E1410
  struct vxiinfo info;    // structure for data returned by ivxirminfo
  unsigned long start_addr;   // starting address of shared memory
  double rdgs[8000];          // array for readings from shared memory
  short i;
  unsigned long map;          // memory map space
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

```
// install SICL error handler
ionerror(I_ERROR_EXIT);

// open a (SICL) interface session to the E8491A
// open a (SICL) device session to the E1410
e8491 = iopen("vxi");
e1410 = iopen("vxi,24");

// read the VXI resource manager information in order to determine
// the E8491A shared memory starting address
ivxirminfo(e8491, 0, &info);
start_addr = info.memstart;

// convert address from pages to an address
start_addr = (start_addr*256);

// map E8491A memory space for transfer of readings from
// E8491A shared memory to the computer
map = imapx(e8491, I_MAP_SHARED, 0, 1);

// set a 5s timeout period to allow functions to complete
itimeout(e8491, 5000);
itimeout(e1410, 5000);

// configure the multimeter for DCV measurements
iprintf(e1410, "CONF:VOLT:DC 30.0\n");

  // set a 10 us aperture time
  iprintf(e1410, "VOLT:APER 10.0e-6\n");

  // set 8000 readings
  iprintf(e1410, "SAMP:COUN 8000\n");

 // store the readings in HP E8491A shared memory

  // specify the E8491A shared memory base address
  iprintf(e1410, "MEM:VME:ADDR %d\n", start_addr);

  // specify the amount of memory required
  // (8000 readings * 8 bytes/reading)
  iprintf(e1410, "MEM:VME:SIZE 64000\n");

  // enable the reading to be stored
  iprintf(e1410, "MEM:VME:STAT 1\n");

// initiate the multimeter to take the readings
iprintf(e1410, "INIT\n");

// pause 30s to allow readings to complete and to transfer
// to shared memory
Sleep (30000);
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

```
  // transfer the (8000) readings from the multimeter using the SICL
  // function iblockmovex - the parameters are id, source handle, source
  // offset, source width, source increment, destination handle, destination
  // offset, destination width, destination increment, count, and swap

  iblockmovex(e8491, map, 0, 8, 1, 0, (unsigned long) rdgs, 8, 1, 64000, 0);

  // swap the bytes once they are transferred from shared memory
  for (i=0;i<7999;i++)
  {
     SWAP_FLOAT64(&rdgs[i]);
  }

  // print some readings to verify the transfer was successful
  for (i=0; i<10; i++)
    {
    printf("%lf\n", rdgs[i]);
    }

  // unmap memory
  iunmapx(e8491, map, I_MAP_SHARED, 0, 1);

  // close the device sessions
  iclose(e8491);// close SICL interface session
  iclose(e1410);// close SICL device session

}
```

Comments

1. Because of the E1410 multimeter data storage format (eight bytes / reading), the readings are transferred from shared memory to the PC in bytes. Therefore, it is necessary to swap each byte in order to re-construct the reading. Depending on the storage formats of your particular instruments, swapping may not be necessary.

2. This manual is included on the HP I_O Libraries CD. By viewing the manual from the CD, you can cut and paste this program into your development environment.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Chapter 4
IEEE 1394 Fundamentals and Interface Overview

Using this Chapter

This chapter contains reference information on the IEEE 1394 Serial Bus, the data transfer protocol, and on the related hardware. The contents of the chapter include:

- IEEE 1394 Topology and Terminology 57
- IEEE 1394 Data Transfer Protocol 59
- The Adaptec® AHA-8940 Host Adapter and Interface Cable 61
- The HP E8491A PC to VXI Interconnect 62
- The HP I_O Libraries 64

IEEE 1394 Topology and Terminology

Optimizing the IEEE 1394 bus must include an understanding of the topology and terms associated with its use. Figure 4-1 shows a VXI system consisting of a PC and three VXI mainframes - interconnected with the IEEE 1394 bus.

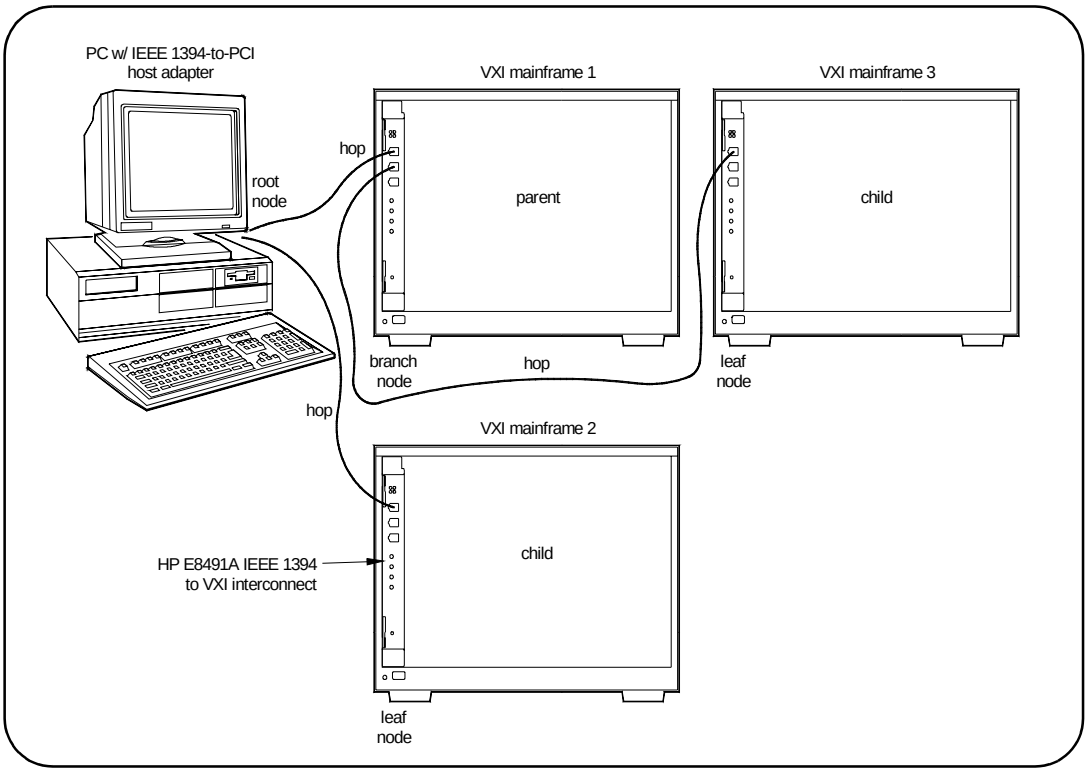


Figure 4-1. IEEE 1394 Topology and Terms.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The terms shown in Figure 4-1 are defined in the following table.

Table 4-1. Definition of Terms.

Host Adapter	Links the computer's PCI bus to the IEEE 1394 interface. To use a host adapter, computers must be PCI Rev. 2.0 compliant.
HP E8491A 1394-to-VXI Interconnect	Links the IEEE 1394 interface to the VXI backplane. Provides the backplane's clock and trigger resources.
Root Node	Each device (HP E8491A) on the bus is a "node." In VXI systems, the PC is always the root node having cycle master and bus master capabilities.
Branch Node	A branch node has IEEE 1394 cables connected to two or more ports. In Figure 1, VXI mainframe 1 is a branch node because of the 1394 cables connecting it to the PC (root node) and to VXI mainframe 3 on its right.
Leaf Node	A leaf node has a single IEEE 1394 cable connected to it.VXI mainframes 2 and 3 are leaf nodes.
Parent	A node (HP E8491A) is a parent if it is physically connected closer to the root than an adjacent node. In Figure 1, VXI mainframe 1 is a parent node because it is closer to the root than VXI mainframe 3.
Child	A node (HP E8491A) is a child if it is farther from the root than an adjacent node. In Figure 1, VXI mainframe 3 is a child node because it is farther from the root than VXI mainframe 1. A node with a single IEEE 1394 cable connected to it (leaf node) is always a child (VXI mainframe 2).
Hop	A hop is a IEEE 1394 cable link between nodes. There can be no more than 16 hops between any two nodes. In the diagram above, there is a maximum of three hops between nodes. The distance between any two nodes cannot exceed 72m.

Features of the IEEE 1394 Bus

The following features of the IEEE 1394 bus apply to all bus applications including VXI systems.

* Daisy-chain or branching configurations are allowed. There can be no closed loops (i.e. more than one connection between any two devices).

* Up to 63 devices (including 16 HP E8491As) are allowed per bus segment. One host adapter represents one bus segment.

* There is a maximum of 16 hops between any two devices. The bus cable length cannot exceed 72 meters between any two devices.

* Live/hot connections. A VXI mainframe anywhere in the configuration can be turned on/off without affecting the other mainframes. The IEEE 1394 bus automatically reconfigures itself any time a VXI mainframe (or other device) is added or removed. It is best to do this however, if there are no data transactions taking place elsewhere in the system.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Optimizing the Configuration

I/O performance is impacted slightly by the hardware configuration.The VXI mainframe closest to the PC (root node) has the highest priority. For example, if instruments in VXI mainframes 1 and 3 (Figure 4-1) contend for the bus at the same time, the root node will grant mainframe 1 access to the bus first. However, the bus's fair arbitration protocol (covered in the next section) ensures that each device has equal access to the bus and that devices closer to the root are not continually granted the bus.

IEEE 1394 Data Transfer Protocol

Data transfer over the IEEE 1394 bus can be either asynchronous or isochronous[1]. Hewlett-Packard's IEEE 1394 based VXI systems use asynchronous data transfers and a "fair arbitration" protocol to ensure each VXI mainframe has equal access to the bus. Figure 4-2 illustrates the concepts of asynchronous data transfers and fair arbitration.

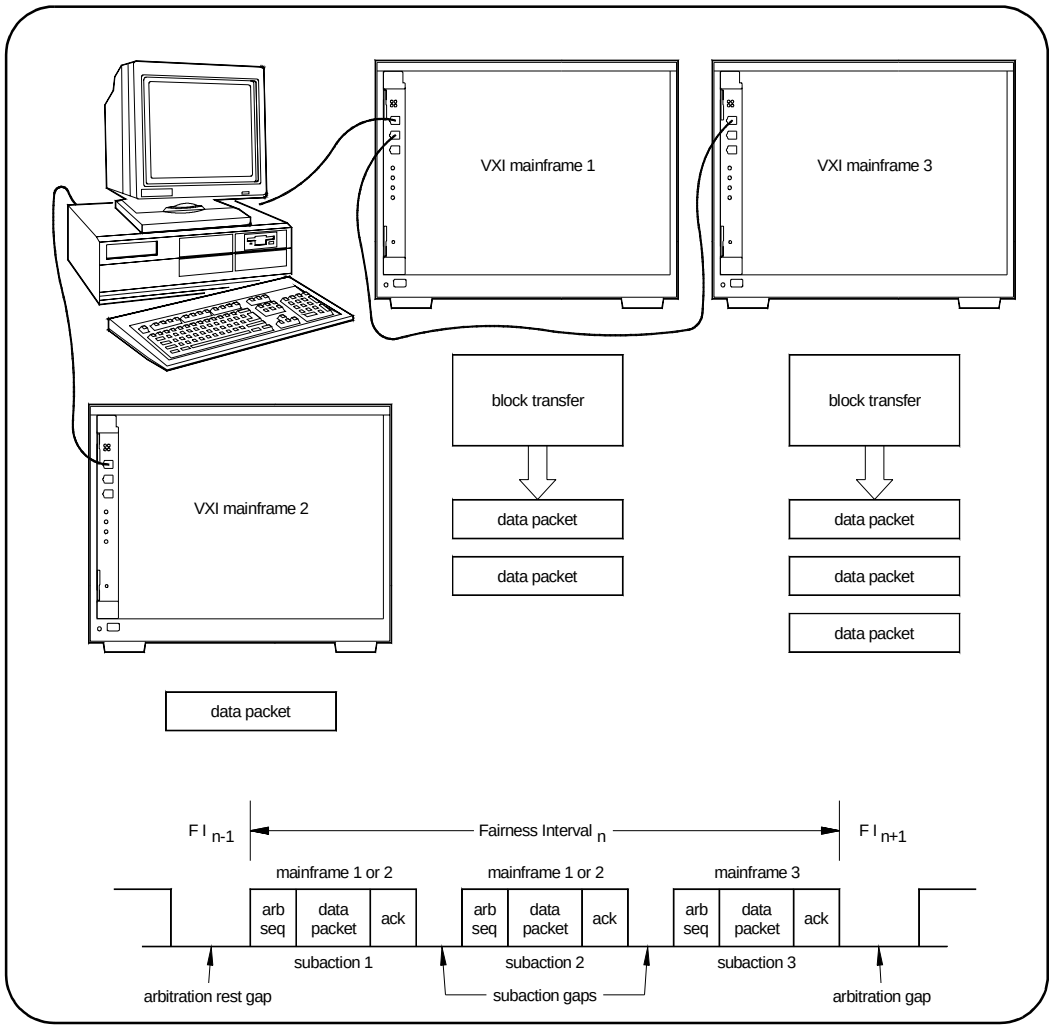


Figure 4-2. IEEE 1394 Data Transfer Protocol.

1. Isochronous data transfers broadcast variable amounts of data at regular intervals with no acknowledgement. Isochronous and Asynchronous data transfers can occur on the same bus.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Asynchronous Data Transfers

During an asynchronous data transfer, a variable amount of data is transferred to an explicit address in real time, and an acknowledgement is returned. Data is transferred across the IEEE 1394 bus in packets called "subactions." An asynchronous subaction is made up of three parts:

* arbitration sequence - the period when a device requests control of the bus in order to transmit a data packet.

* data packet - the data packet consists of a data prefix that contains information about the transaction, the data itself (e.g. VXI instrument commands), and a data end signal. The maximum packet size is 1 kByte for 200 Mbit host adapters and 2 kBytes for 400 Mbit adapters.

* acknowledgement - a code returned by the (addressed) data destination indicating the action taken by the receiver.

The periods between subactions are called subaction gaps. The subaction gap allows devices that have not had control of the bus during the current "fairness interval" to arbitrate for control.

Fair Arbitration Protocol

The fair arbitration protocol is based on the fairness interval shown in Figure 2. A fairness interval consists of one or more subactions in which data packets are transferred over the bus. A fairness interval is as follows:

1. The interval begins when devices (HP E8491A's) arbitrate for control of the bus.

2. When a device is granted control, it transfers its data packet and is then disabled from arbitrating until the next fairness interval.

3. A subaction gap occurs after the previous data packet is transferred. During this period, remaining devices arbitrate for the bus. The next device granted the bus transfers its data packet and is then disabled from arbitrating until the next fairness interval.

4. The fairness interval ends after each device has had an opportunity to access to the bus and the arbitration reset gap, which is longer than the subaction gap, occurs. The arbitration reset gap re-enables each device for arbitration during the next fairness interval.

VXI Data Transfers

To take advantage of the IEEE 1394 data transfer protocol, large amounts of data should be transferred between VXI instruments and the PC using block transfers. During a block transfer, data is divided into the packets described previously; the number of packets depends on the amount of data and whether a 200 Mbit or 400 Mbit host adapter is used. Compared to protocols that transfer data one byte or one word at a time, transfer speed between the instrument and the PC is increased because the IEEE 1394 protocol overhead is associated with the fairness interval and with each packet, rather than with each byte or word transferred. Thus, transfer speeds (bits/second) over the IEEE 1394 bus increase as the amount of data transferred (block size) increases.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The Adaptec® AHA-8940 Host Adapter and Interface Cable

The Adaptec® AHA-8940 1394-to-PCI host adapter is a PC plug-in card[1] capable of transferring data at up to 400 MBits/second. The adapter has one internal and two external 1394 ports. Each AHA-8940 represents one bus segment capable of supporting up to 63 nodes. If required, the AHA-8940 can supply 12V at up to 1.5A for IEEE 1394 devices that require power.The layout of the adapter is shown below.

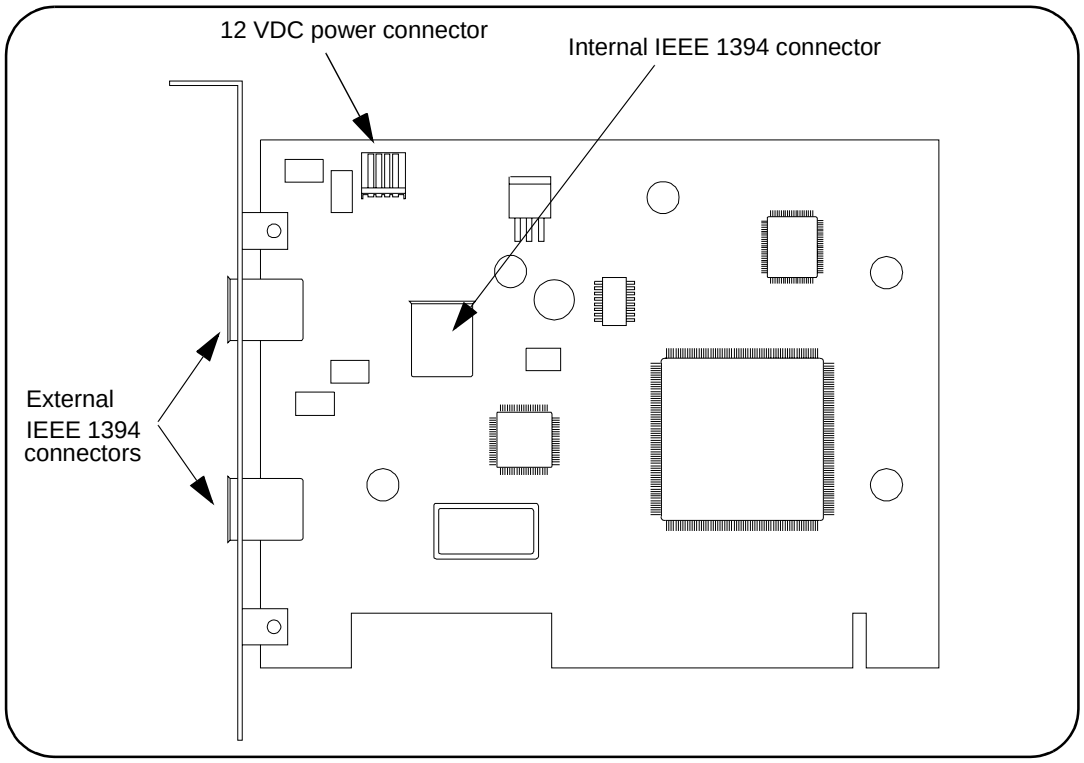
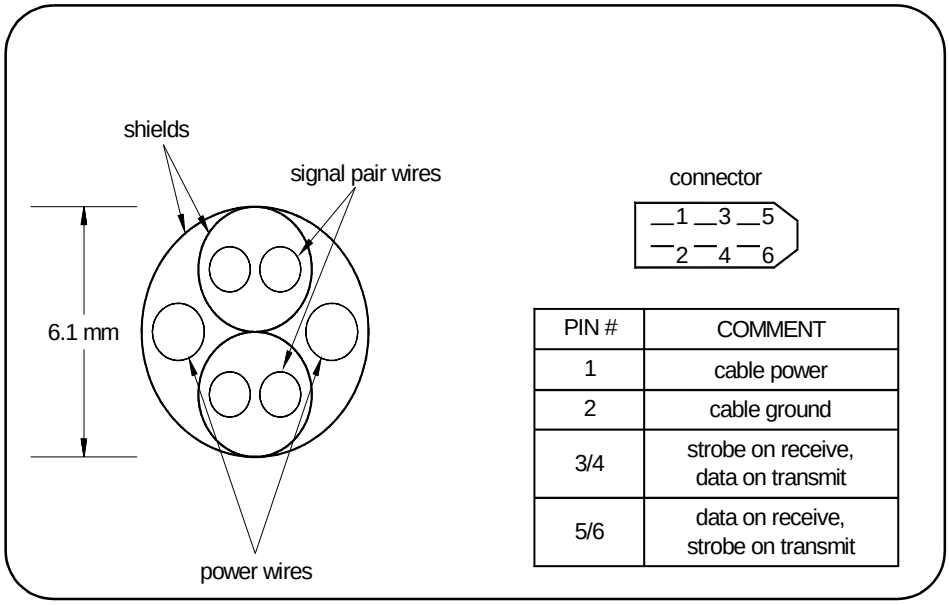


Figure 4-3. Layout of the Adaptec® AHA-8940 1394-to-PCI Host Adapter.

The interface cable supplied with the host adapter has two power wires and two signal twisted-pairs. A cross-section of the cable and the cable connector are shown in Figure 4-4.

1. In the future, IEEE 1394 will be a standard port on selected PCs.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



PIN #	COMMENT
1	cable power
2	cable ground
3/4	strobe on receive, data on transmit
5/6	data on receive, strobe on transmit

Figure 4-4. Cross-section of the IEEE 1394 Cable.

The power wires route power from the host adapter to devices (nodes) on the bus, whether the devices are turned on or off. Since each device in the system acts as a repeater, the power supplied to a device that is turned off enables signals to be transferred across that device. This maintains signal continuity throughout the system.

The HP E8491A PC to VXI Interconnect

The E8491A is a VXI C-size device (Figure 4-5) normally installed in mainframe slot 0. With a logical address of 0, the E8491A functions as the mainframe's resource manager via software included with the I_O libraries. The E8491A has 128 kBytes of shared RAM and contains many of the clock and triggering features found on the HP E1406A Command Module - a VXI resource manager/slot 0 device common in many GPIB-based systems. A VXI mainframe with the HP E8491A in slot 0 can also be powered on/off at any time without affecting other mainframes in the system.

The HP E8491A IEEE 1394 interconnect links the VXI backplane to the IEEE 1394 bus. However, the E8491A and the IEEE 1394 bus do not extend the (VXI) backplane between frames in multi-frame VXI systems. This means that the multimeter and multiplexers in a VXI scanning multimeter for example, must be installed in the same mainframe. Devices sharing the VXI Local bus must also be installed in the same mainframe.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Annunciators

Failed - a hardware failure was detected in the HP E8491A, or the E8491A is performing a self-test.

IEEE-1394 - indicates data traffic over the IEEE 1394 bus

SYSFAIL - asserted during a VXI instrument self-test.

VXI - indicates data traffic across the mainframe's VXI backplane.

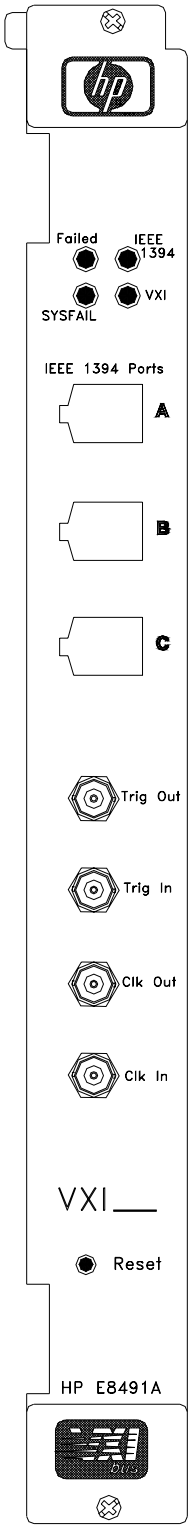
Trigger Ports

The E8491A is capable of sourcing TTL level triggers and receiving TTL, CMOS, ECL, or user specified levels up to +30V.

Trigger signals can be generated internally and distributed over the VXI backplane and to external devices, or the triggers can be distributed from an external source.

Configuration Label

Used to identify the interconnect address in multi-frame VXI systems.



IEEE 1394 Ports

Three ports allow tree topologies which minimize the number of hops. Each port is identical and any port or combination of ports can be used.

System Clock Ports

The E8491A is capable of sourcing and receiving the VXI system's 10 MHz clock.

The system clock (CLK10) is one of the VXI resources provided by the mainframe's slot 0 device. This TTL level clock is internally generated or can be received from an external source. The signal is distributed to every slot in the mainfame and can also be routed to external devices.

Reset Button

Resets the E8491A and all instruments in the mainframe. Re-runs the resource manager.

Figure 4-5. The HP E8491A IEEE 1394 to VXI Interconnect.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Using the HP E8491A with the HP E1406 Command Module

Though not a common configuration, the HP E1406 command module can be used in the same mainframe as the HP E8491 to provide HP-IB access to instruments. In this configuration, however, the E8491A must be the mainframe's resource manager.

The HP I_O Libraries

The software required to use the IEEE 1394 interface in a VXI system is contained in the HP I_O Libraries and HP VXI*plug&play* Drivers. The software supports the Windows 95 and Windows NT platforms.

The software "stack" shown below shows the relationship of the VXI*plug&play* drivers to HP VISA/ SICL, to the host adapter drivers, and to the VXI instruments. Notice that Hewlett-Packard's implementation of the IEEE 1394 interface requires HP VISA and will not work with the VISA supplied by other vendors.

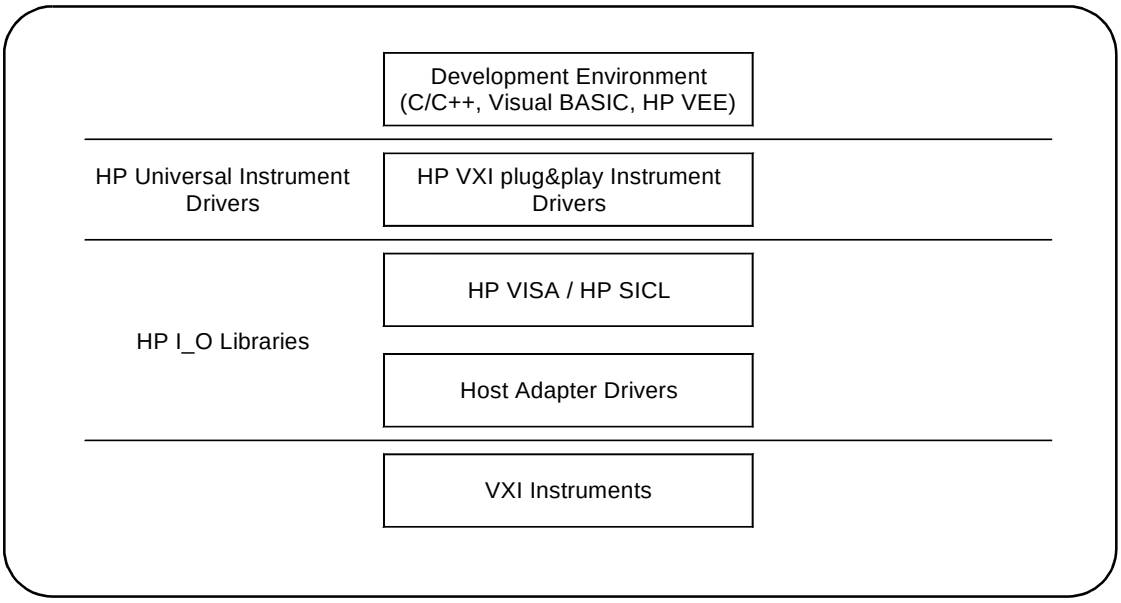


Figure 4-6. System Software and Drivers.

Most application programs are written using the instruments' VXI*plug&play* drivers. The plug&play driver functions make subsequent calls to the VISA functions and so on. Message-based instruments can be programmed at the HP VISA / SICL level by embedding SCPI commands in the HP VISA / SICL functions.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Appendix A
Specifications

The following specifications define the operating and performance characteristics of the HP E8491A.

Interface Characteristics

Operating System	Windows 95 Windows NT
Controllers	PC based
I/O Library	SICL / VISA
Backplane	PCI
Interface	IEEE 1394
Maximum I/O Speed* * 200 MHz Pentium PC / 400 MHz Adaptec Host	16-bit: 1.76 MBytes/s to PC 2.50 MBytes/s to HP E8491A 32 bit: 1.0 MByte/s to PC 1.0 MByte/s to HP E8491A
Languages	C/C++, Visual Basic, HP VEE, LabView

VXI Characteristics

General

VXI Device Type	Message-based commander
Data transfer bus	n/a
Slot 0 functionality	Yes
Resource Manager Functionality	Yes
MXIbus Resource Manager	Yes
Size	C
Slots	1
Connectors	P1 / P2
Shared Memory	128 kBytes
VXI busses	TTL trigger bus, ECL trigger bus
C-size compatibility	n/a

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CLK 10

Clk In	
Input	TTL
Frequency Stability	100 ppm
Duty Cycle	50% ± 5%
Clk Out	
Output	TTL
Frequency Stability	100 ppm
Duty Cycle	50% ± 5%

External Trigger Input

Connector	SMB (on faceplate)
Levels	TTL, CMOS, ECL, 0 to +33V
Programmable Threshold Range	0 to +30V
Programmable Threshold Accuracy	± 0.4V
Threshold Sensitivity (hysteresis)	0.5 Vpp maximum 0.1 Vpp minimum
Input Load	50 pf, 55 kohms
Maximum Rate	2 MHz
Minimum Pulse Width	200 ns

External Trigger Output

Connector	SMB (on faceplate)
Levels	nominal pull up to + 5V
Maximum External Pull Up	+ 30V
Sink Current	10 mA @ $V_{ol} \leq 0.4V$ or 150 mA @ $V_{ol} \leq 1.0V$

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Trigger Delays

Maximum delay from TTLTRG to ECLTRG	60 ns
Maximum delay from ECLTRG to TTLTRG	60 ns
Maximum delay from Trig In port to ECLTRG or TTLTRG	300ns
Maximum delay from TTLTRG or ECLTRG to Trig Out port	100 ns

Cooling

Watts / slot	20W
Δ P mm H_20	0.10
Air flow liters / s	2.0

Power Supply Loading

	I_{PM} (amps)	I_{DM} (amps)
+5V	2.5	0.001
+12V	0.35	0.050
-12V	0.015	0.001
+24V	0.0	0.0
-24V	0.0	0.0
-5.2V	0.180	0.001
-2V	0.360	0.001

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Appendix B
Editing the HP E8491A Resource Manager Configuration

Introduction

The resource manager functionality provided through the HP E8491A configures your VXI system based on rules specified by the VXI standard. The configuration can be viewed or modified through the configuration files and utility functions outlined in this appendix.

Configuration File Overview

Configuration files (.cf extension) are placed in the <drive:>\siclnt\defaults or \sicl95\defaults directory when the HP I_O Libraries are installed. Except where noted, the following files can be edited from the HP I_O Libraries' 'I_O Config' utility (Figure B-1) as shown on the following pages. When editing a file, note the following:

1. Add your entry(ies) below the commented (lines).

2. The first column must contain an entry. Any number of spaces can separate remaining entries on the line.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

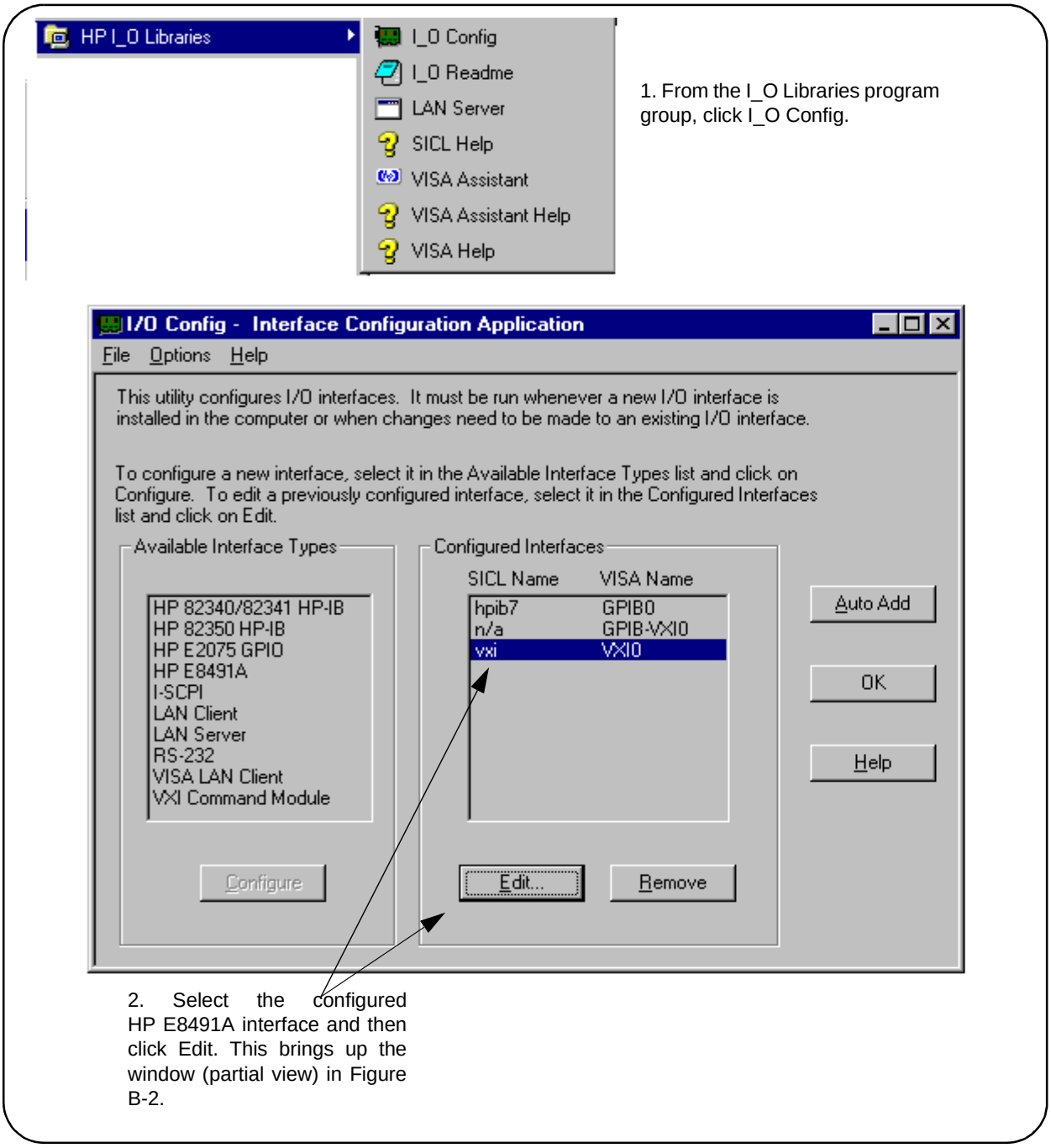


Figure B-1. Editing Configuration Files from the 'I_O Config' Utility.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

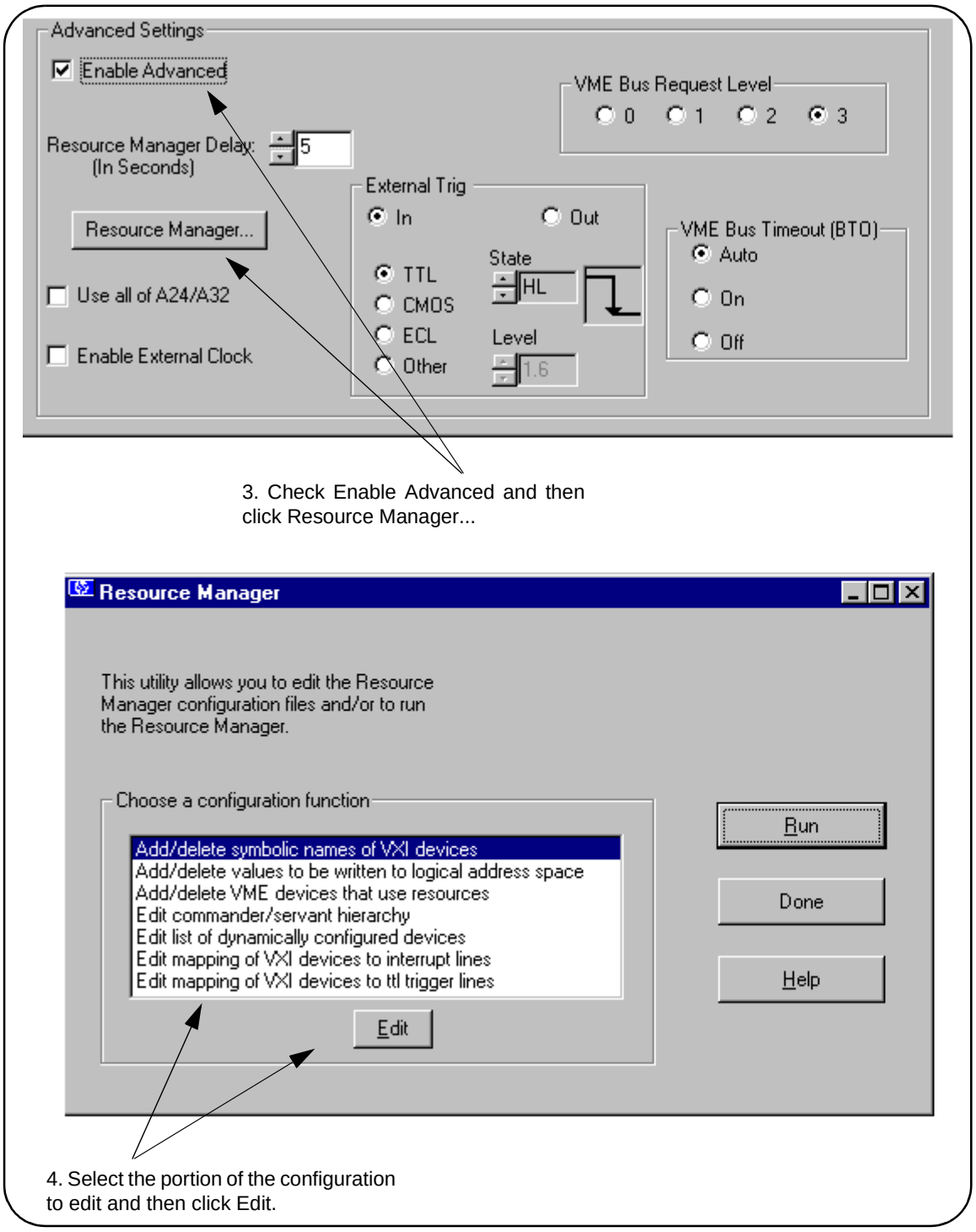


Figure B-2. Editing Configuration Files from the 'I_O Config' Utility (cont'd).

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The names.cf Configuration File

The *names.cf* file is a database that contains a list of symbolic names to assign VXI devices that have been configured. The *ivxirm* utility reads the model id number from the VXI device and the *ivxisc* utility uses that information and this file to print out the VXI device symbolic name. If you add a new VXI device to your system that is not currently in the database, you may want to add an entry to this file.

This file is edited by selecting "Add/delete symbolic names of VXI devices" in the Resource Manager window (Figure B-2).

The oride.cf Configuration File

The *oride.cf* file contains values to be written to logical address space for register-based instruments. This data is written to A16 address space after the resource manager runs, but before the system's resources are released. This can be used for custom configuration of register-based instruments every time the resource manager runs.

This file is edited by selecting "Add/delete values to be written to logical address space" in the Resource Manager window (Figure B-2).

The vmedev.cf Configuration File

The *vmedev.cf* file contains a list of VME devices that use resources in the VXI cardcage. Since the resource manager is unable to detect VME devices, the resource manager uses this information to determine such things as the slot number where the VME device is located, what type (A16, A24, or A32) and how much memory it uses, and what interrupt lines it uses. Additionally, the resource manager verifies that multiple resources aren't allocated. This file is also used by the *ivxisc* utility to print out information about the devices.

This file is edited by selecting "Add/delete VME devices that use resources" in the Resource Manager window (Figure B-2).

The cmdrsrvt.cf Configuration File

The *cmdrsrvt.cf* file contains a commander/servant hierarchy other than the default for the VXI system. The resource manager will set up the commander/servant hierarchy according to the commander's logical addresses and the servant area switch. However, you can use this file to override the default based on the commander's servant area. This file should only contain changes from the default.

This file is edited by selecting "Edit commander/servant hierarchy" in the Resource Manager window (Figure B-2).

The dynamic.cf Configuration File

The *dynamic.cf* file contains a list of VXI devices to be dynamically configured. You only need to add entries to this file if you want to override the default dynamic configuration assignment by the resource manager. Normally, if you have a dynamically configurable device and the logical address is set at 255, the resource manager will assign the first available address. However, if a dynamically configurable device has an entry in this file, the resource manager will assign the address listed in the file.

This file is edited by selecting "Edit list of dynamically configured devices" in the Resource Manager window (Figure B-2).

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The irq.cf Configuration File

The *irq.cf* file is a database that maps specific interrupt lines to VXI interrupt handlers. If you have non-programmable interrupters and you want the interrupters to be recognized by a VXI interrupt handler, you must make an entry in this file. Additionally, if you have progammable interrupters and you want them to be recognized by a device other than what's assigned by the resource manager (the commander of that device), you can make an entry in this file to override the default. Keep in mind that not all VXI devices need to use interrupt lines and not all interrupt lines need to be assigned. Note that any interrupt lines assigned in this file cannot also be assigned in the *vmedev.cf* configurtion file.

This file is edited by selecting "Edit mapping of VXI devices to interrupt lines" in the Resource Manager window (Figure B-2).

The ttltrig.cf Configuration File

The *ttltrig.cf* file contains the mapping of VXI devices to TTL trigger lines in extended VXI systems. If you have a MXI-extended (multiple-mainframe) system and you are sending / receiving triggers between mainframes, you must map the TTL trigger line to the logical address of the device asserting the trigger. This file is only used for extended VXI systems.

This file is edited by selecting "Edit mapping of VXI devices to ttl trigger lines" in the Resource Manager window (Figure B-2).

The vximanuf.cf Configuration File

The *vximanuf.cf* file contains a database that cross references the VXI manufacturer id numbers and the name of the manufacturer. The *ivxirm* utility reads the manufacturer id number from the VXI device. The *ivxisc* utility then uses that number and this file to print out the name of the manufacturer. If you add a new VXI device from a vendor that is not currently in the file, you may want to add an entry to the file.

This file can not be edited using 'I_O Config'.

The vximodel.cf Configuration File

The *vximodel.cf* file contains a database that lists a cross reference of manufacturer id, model id, and VXI device names. The *ivxirm* utility reads the model id number from the VXI device and the *ivxisc* utility uses that information and this file to print out the VXI device model. If you add a new VXI device to your system that is not currently in this database, you may want to add an entry to this file.

This file can not be edited using 'I_O Config'.

Utility Function Overview

Within the <drive:>\siclnt\bin or \sicl95\bin directory are utility functions that view the resource manager output (*ivxisc*) and which clear the HP E8491A interface (*iclear*) and run the resource manager (if the *iproc* utility is running).

Using ivxisc

The *ivxisc* function is used to view the resource manager output. *ivxisc* is executed from the Windows command (DOS) prompt (..\siclnt\bin or \sicl95\bin directory) as:

```
ivxisc vxi<logical unit>
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

where `<logical unit>` is the value from the '**Logical Unit**' window in the HP I_O Libraries 'I_O Config' utility. An example of the output produced by *ivxisc* is shown in Figures B-3 and B-4.

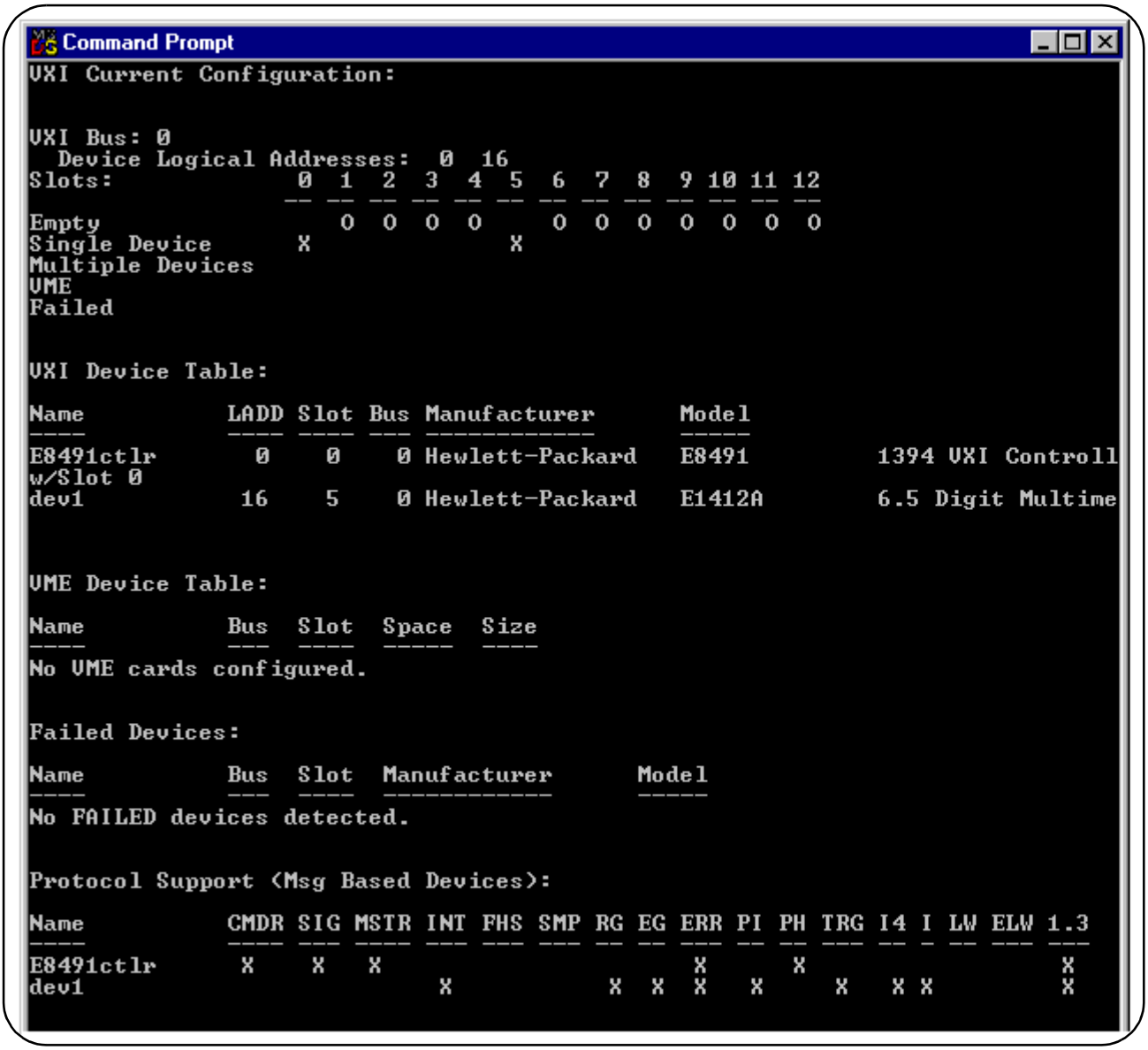


Figure B-3. Output of ivxisc.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

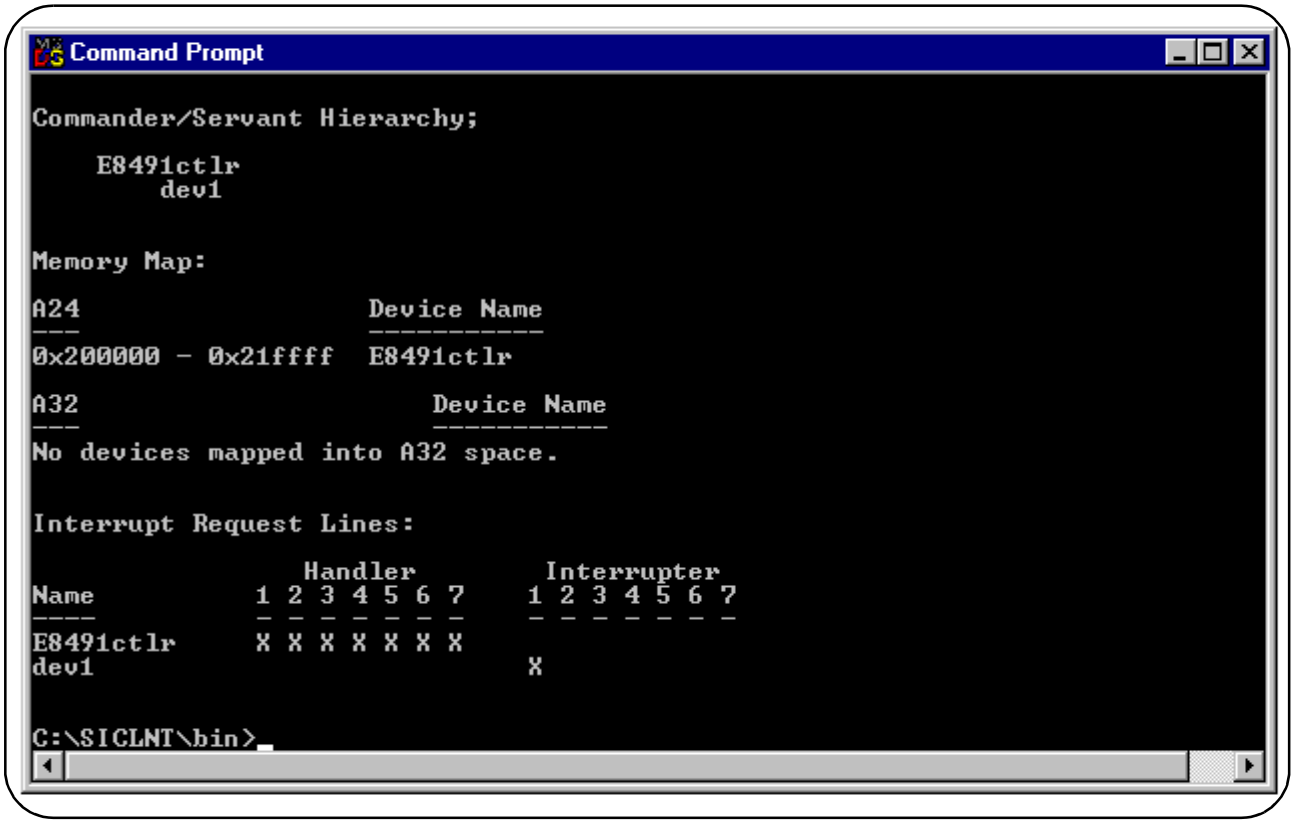


Figure B-4. Output of ivxisc (cont'd).

Using iclear

The *iclear* function is used to clear the interface (HP E8491A) or individual message-based instruments in the VXI mainframe. *iclear* is executed from the DOS command prompt (..\siclnt\bin or \sicl95\bin directory) as:

```
iclear <SICL interface name, [logical address]>
```

`SICL interface name` is the name (vxi) and number listed in the 'I_O Config' SICL Interface Name window. `logical address` is the address of the message-based VXI instrument to be cleared.

If a logical address is not specified, the (E8491A) interface is cleared and the resource manager is started.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Index

HP E8491A IEEE 1394 PC Link to VXI Configuration and User's Guide

A

alternate configurations, **19**
applying power, **33**
asynchronous data transfers, **60**

B

Block, **36**–**37**, **40**
block data transfers, **36**
  using HP VISA, **40**
  using HP VXIplug&play drivers, **37**

C

CLK 10
  specifications, **66**
cmdrsrvt.cf, **72**
configuration file overview, **69**
configuration files
  cmdrsrvt.cf, **72**
  dynamic.cf, **72**
  irq.cf, **73**
  names.cf, **72**
  oride.cf, **72**
  ttltrg.cf, **73**
  vmedev.cf, **72**
  vximanuf.cf, **73**
  vximodel.cf, **73**
configuring the E8491A interconnect, **25**
configuring the Trig In and Trig Out ports, **44**
connecting the HP E8491A to the host adapter, **19**
cooling, **67**

D

data transfer protocol, **59**
  asynchronous transfers, **60**
  fair arbitration, **60**
data transfers
  over VXI, **60**
dynamic.cf, **72**

E

E1406
  using the E8491A with, **19**
E8491A
  configuring, **25**
editing the configuration, **27**
  Windows 95 platforms, **28**
examples
  HP VISA block data transfers, **40**
  HP VXIplug&play block data transfers, **37**
  storing readings in shared memory - HP VISA, **50**
  storing readings in shared memory - SICL, **54**
  triggering, **45**
external trigger input
  specifications, **66**
external trigger output
  specifications, **66**

F

fair arbitration, **60**
first time configuration, **25**

H

host adapter and interface cable
  overview, **61**
HP E1406
  using the command module with the HP E8491A, **64**
HP E8491A
  connecting the host adapter, **19**
  installation, **17**
  overview, **62**
  triggering, **43**
HP I/O Libraries
  installation, **24**
  overview, **64**
HP VXIplug&play drivers
  installation, **28**

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

I

I/O Libraries
  installation, 24
iclear, 75
IEEE 1394
  bus features, 58
  data transfer protocol, 59
  topology and terminology, 57
IEEE 1394 host adapter
  installation, 13
installation
  A/B-size instruments, 22
  C-size instruments, 20
  host adapter, 13
  HP E8491A, 17
  HP I/O Libraries, 24
  HP VXIplug&play drivers, 28
  verifying, 29
  VXI instruments, 20
Installing, 20, 22
instrument sessions
  opening, 35
interface cable and host adapter
  overview, 61
interface characteristics
  specifications, 65
iproc, 33
irq.cf, 73
ivxisc, 73

L

loading
  power supply, 67
locating E8491A shared memory, 47
locating shared memory
  using HP SICL, 48
  using HP VISA, 48

M

message-based instruments
  programming, 35
MXI
  using the E8491A with MXI systems, 19

N

names.cf, 72

O

opening instrument sessions, 35
  HP VISA, 36
  HP VXIplug&play, 35
  SICL, 36
optimizing programs, 36
oride.cf, 72

P

plug&play drivers
  installation, 28
porting SICL programs, 36
power supply loading, 67
programming register-based and message-based VXI instruments, 35
pull up
  Trig Out port, 47

R

register-based instruments
  programming, 35
resource manager, 33
  viewing the output, 30
resource manager configuration
  editing, 27
running the resource manager, 33

S

shared memory, 47
  locating using HP VISA, 48
  locating using SICL, 48
shared memory examples, 49
SICL programs
  porting for use with the E8491A, 36
soft front panels
  for installation verification, 29
specifications
  CLK 10, 66
  cooling, 67
  external trigger input, 66
  external trigger output, 66
  general, 65
  interface characteristics, 65
  power supply loading, 67
  trigger delays, 67
storing readings in shared memory
  HP VISA example, 50
  SICL example, 54

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

T

Trig In
specifications, 66
Trig In port
configuring, 44
Trig Out port
configuring, 44
specifications, 66
trigger delay
specifications, 67
triggering, 43
example, 45
pull up, 47
ttltrg.cf, 73
turning on the mainframe, 33

U

using HP E8491A shared memory, 47
using instrument soft front panels, 29
using the HP E8491A with the HP E1406 Command Module, 64
utility functions, 73
iclear, 75
ivxisc, 73

V

verifying the installation, 29
viewing the resource manager output, 30
vmedev.cf, 72
VXI characteristics
specifications, 65
VXI data transfers, 60
VXI instruments
installation, 20
installing A/B-size, 22
installing C-size, 20
vximanu.cf, 73
vximodel.cf, 73
VXI-MXI systems
using the E8491A with, 19
VXIplug&play drivers
installation, 28

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group is an independent supplier of quality pre-owned equipment

Gold-standard solutions

Extend the life of your critical industrial, commercial, and military systems with our superior service and support.

We buy equipment

Planning to upgrade your current equipment? Have surplus equipment taking up shelf space? We'll give it a new home.

Learn more!

Visit us at **artisantg.com** for more info on price quotes, drivers, technical specifications, manuals, and documentation.

Artisan Scientific Corporation dba Artisan Technology Group is not an affiliate, representative, or authorized distributor for any manufacturer listed herein.

We're here to make your life easier. How can we help you today?

(217) 352-9330 | sales@artisantg.com | artisantg.com

ARTISAN® TECHNOLOGY GROUP