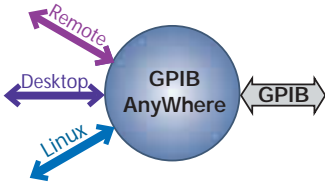




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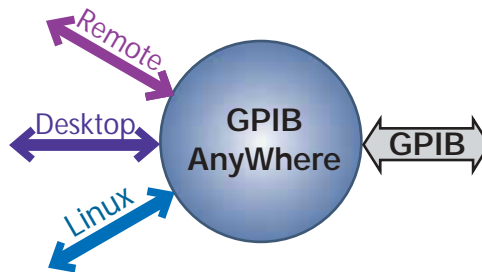
GPIB AnyWhere Instruction Manual



GPIB AnyWhere

GPIB AnyWhere™

Instruction Manual



**ICS
ELECTRONICS**

a division of Systems West Inc.

7034 Commerce Circle
Pleasanton, CA 94588
Phone: 925-416-1000, Fax: 925-416-0105
Web: <http://www.icselect.com>

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Within 12 months of delivery (14 months for OEM customers), ICS Electronics will repair or replace this product, at our option, if any part is found to be defective in materials or workmanship (labor is included). Return this product to ICS Electronics, or other designated repair station, freight prepaid, for prompt repair or replacement. Contact ICS for a return material authorization (RMA) number prior to returning the product for repair.

CERTIFICATION

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Getting Started

1.1 INTRODUCTION

This manual provides information and directions for using ICS Electronics' GPIB AnyWhere™ VXI-11 Service software.

This section covers shipment verification, compatibility with other products, software license, backing up your software, installation, and the use of ICS's interactive VXI-11 Keyboard Controller program..

1.2 COMPATIBILITY WITH OTHER PRODUCTS

ICS's GPIB AnyWhere software has been tested and works with GPIB-32.DLLs from National instruments, ICS Electronics,, Measurement Computing (formerly Computer Boards) and Ines. Test have been run on Intel PCs with Windows 2K and Windows XP operating systems.

GPIB AnyWhere is only intended for use on PCs with WIN32 operating systems. GPIB AnyWhere installs a VXI-11 service on the PC which runs in the background. This service must be manually stopped before removing it or when updating or switching GPIB-32.DLLs

1.3 SHIPMENT VERIFICATION

Take a moment to verify you have everything you need. If you ordered the GPIB AnyWhere program we should have sent you:

- (1) GPIB AnyWhere CD-ROM with Serial Number
- (1) GPIB AnyWhere User's Manual

The GPIB AnyWhere installation program is on the CD-ROM disk. If anything is missing or damaged, save the shipping carton and contact ICS immediately. ICS will arrange for a replacement shipment without waiting for the shipper to process any claim. You can also download a current installation program from ICS's website.

1.4 ICS SOFTWARE LICENSE AGREEMENT

Note - Please carefully read this License agreement prior to opening the media envelope or using the software. By opening the media envelope and/or using the software, the customer agrees to all provisions of this license. If you do not agree with the license, you may return this product for a full refund.

1.4.1 License

In exchange for payment of his invoice, ICS Electronics (ICS) grants the customer a license to the software subject to the following conditions.

Customer may use the software with any compatible GPIB Controller product and may not reverse engineer or reverse-compile the software. Customer agrees the software is copyrighted and may only make archival copies of it. Customer shall not sublicense or distribute copies of the software without the written permission of ICS. A transfer or sale of the software to a third party is permitted, if the third party agrees to this license and the original purchaser ceases use of the software.

Customer may use ICS's software to make executable programs and distribute them freely without permission of ICS.

Customer may install the GPIB AnyWhere software on as many as three machines with this single user license. The Customer is required to obtain a multiple machine license for installations on four or more machines.

ICS may terminate this license and seek damages if the customer fails to comply with the license after being notified in writing to cure the failure. Customer agrees that the software does not include updates and ICS is not responsible for any damage to the customer's computer or other equipment.

1.4.2 Warranty

ICS warrants, for a 90 day period, that the software will execute its instructions when properly installed on a computer as specified herein. ICS further warrants the media to be free of defects and workmanship for a like 90 day period. The customer's remedy for a failure in either case is to return the media to ICS for replacement.

ICS makes no other warranty with respect to the software. In no event shall ICS be liable for any other incidental or consequential damages from the use of this software.

1.5 BE SURE YOU HAVE THE CORRECT COMPUTER

The GPIB AnyWhere program is only designed to run on a PC with a Windows 2K or XP operating system. Use on anything but a WIN32 operating system may result in faulty or no operation.

1.6 SOFTWARE ORGANIZATION

GPIB AnyWhere installs a VXI-11 Service in the WIN32 operating system as shown in Figure 1. It communicates directly with the existing GPIB-32.DLL to control the GPIB bus using the existing GPIB Controller hardware. Communication with an internal application (LabVIEW, VEE, C programs or Visual Basic programs) can be through an Agilent or NI VISA layer. Communication with an external computer is over a TCPIP network using RPC calls.

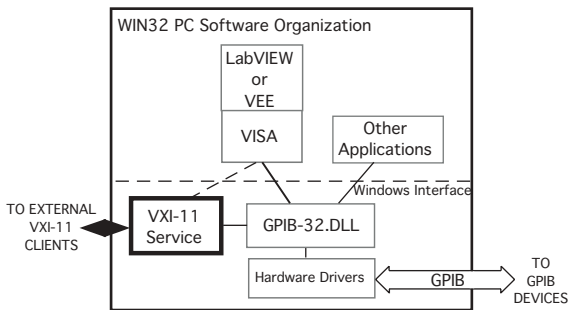


Figure 1-1 GPIB AnyWhere Software Communication Model

1.7 INSTALLATION

Perform the following steps to install ICS's GPIB AnyWhere™ program in a Intel type PC running Windows 2000 or XP.

1.7.1. Installing on the WIN32 computer with the GPIB Controller

1. Close all other applications before installing the software.
2. Verify that your operating system has all of the latest upgrades and Service Packs installed.
3. Verify that this computer has a GPIB-32.DLL installed on it and that the GPIB Controller is functional..
4. Insert the GPIB AnyWhere CD-ROM in the computer's CD ROM drive. The CD-ROM will autorun and bring up the selection screen.
5. Click on the "Install GPIB AnyWhere" button and follow the instructions on the following screens to complete the installation. Select both the VXI-11 Service and the VXI-11 keyboard when asked what to install.
6. Enter your serial number when requested. Save this number with your CD-ROM in case you need to reinstall the program in the future or want to move it to another computer. Note - The serial number is version sensitive so you will need to obtain a new serial number if you install an updated version of he program.
7. Connect one or more known good GPIB devices to the existing GPIB Controller
8. Run the VXI11_kybd program and communicate with the instrument to confirm the installation of GPIB AnyWhere.

1.7.2. Installing on a WIN32 computer without a GPIB Controller

1. Close all other applications before installing the software.
2. Verify that your operating system has all of the latest upgrades and Service Packs installed.
3. Verify that this computer has a National Instruments or Agilent VISA installed on it. If not, download and install the current LabVIEW runtime package from National Instruments website. URL : http://digital.ni.com/softlib.nsf/MainPage?ReadForm&node=132010_US
4. Insert the GPIB AnyWhere CD-ROM in the computer's CD ROM drive. The CD-ROM will autorun and bring up the selection screen.
5. Click on the "Install GPIB AnyWhere" button and follow the instructions on the following screens to complete the installation. Select **only** the VXI-11 keyboard when asked what to install.
6. Connect one or more know good GPIB devices to the existing GPIB Controller in the first computer. See step 8 above.
7. Run the VXI11_kybd program and communicate with the first computer and to control the instrument.

1.8 TROUBLESHOOTING

The following are the recommended troubleshooting steps to solve GPIB Any-Where installation problems and to confirm connectivity.

1.8.1 Host Computer

1. Use the utilities that came with your GPIB Controller to confirm that it is operational. Test it with a known good instrument.
2. If the VXI-11 complains that it cannot run because the GPIB-32.DLL is missing, verify that you have a working compatible GPIB Controller installed in the computer.
3. Use the VXI-11 Keyboard to verify that the VXI-11 Service is able to control your GPIB devices.

1.8.2 Remote Computer

1. If it is a WIN32 computer, use the VXI-11 Keyboard to verify that the VXI-11 Service is able to communicate to and control your GPIB devices. Some times the network may be blocked by your network administrator.

1.9 VXI-11 KEYBOARD PROGRAM VXI11_kybd

1.9.1 VXI-11 Keyboard General

The VXI-11 Keyboard Program (VXI11_kybd) is a utility program that lets a user interactively control GPIB devices through GPIB AnyWhere's VXI-11 Service directly from the computer's keyboard. The GPIB Keyboard program is the recommended way to test the GPIB AnyWhere's VXI-11 service after its installation. The VXI-11 Keyboard Program is also very useful for testing GPIB (HP-IB or IEEE-488) devices without writing a program or for trying out device commands on a new instrument before incorporating them into a program. The VXI-11 Keyboard Program is installed in the installation directory with the other ICS files. Refer to paragraph 1.7.2 for installation instructions.

1.9.2 VXI-11 Keyboard Operation

To run the VXI-11 Keyboard Program, double click on the desktop VXI11_kybd icon or run from the Window's Start menu by pointing to Programs and then to ICS_Electronics. Select VXI11_kybd from the submenu.

When the VXI-11 Keyboard Program launches, only the Find Server button is enabled. See Figure 1-2 on the right. The initial steps are to discover and link to the VXI-11 Server and then to the desired GPIB instrument.

Press the Find Server button (located in the VXI-11 Server frame) to scan for servers. If you know the server host name or IP address, it can be manually entered in the VXI-11 Server window. The number of servers found is displayed in the Device Response window at the lower left. In the VXI-11 Server frame, use the pulldown arrow to display the found servers. Select one and press the Select and Create Link button. A message is displayed in the Device response window and the Find Instruments button is enabled with the link has been created.

Press the Find Instruments button (located in the Instrument Resource Address frame) to discover the instruments connected to the server. If you know that GPIB address of an instrument, it can be manually entered in the Instrument Resource Address window. The number of instruments found is displayed in the Device Response window. In the Instrument Resource Address frame, use the pulldown arrow to expose and select an instrument. Press the Select Inst. and Link button to link to the instrument. A message is displayed in the Device response window when the link has been created and the remaining VXI11_kybd buttons and controls are enabled.

At this point, you can communicate with the linked instrument just like any GPIB device. The VXI11_kybd default setup appends a linefeed terminator to all



Figure 1-2 VXI-11 Keyboard (VXI11-kybd) Panel

outgoing messages, looks for an EOI or linefeed terminator and automatically reads the response to a query (any string that includes a question mark).

To output a message, enter it in the Device Command window and press Send. If the message was a query, the VXI11_kybd program automatically reads and displays the device response. To read a response manually, press the Read device response button. If you uncheck the Auto Query button, you have to do a manual read after each query. If you do not read a response from a device and then send it another command or attempt to read when the device has nothing to output will generate a device query error in an IEEE-488.2 device. A read that does not get a response will produce a timeout error on the VXI11_kybd.

The Interface Command buttons on the right let you send commands to the GPIB Controller. These commands can send an IFC command to reset the devices' GPIB interfaces and can read the Bus Status. The Status response is displayed in the Device Response window.

The Instrument Command buttons on the right let you Lock and Unlock the instrument. Locking an instrument prevents other clients from changing its status or giving it new commands while you are using it to perform an operation. Always Unlock the instrument when done with it. When the Auto Lock check box is checked, the VXI11_kybd program automatically locks the instrument when sending it a command and unlocks it when done or when it has received a response to a query. A Red 'Locked' message is visible when the instrument is locked.

The Device Trigger and Device Clear buttons send the corresponding GPIB commands to the instrument. The Serial Poll button reads the instruments Status Register and displays the results in the Device Response window.

Use the Help button in the upper right hand corner to access the VXI11_kybd Help File.

General Information

2.1 INTRODUCTION

This section provides general information and specifications for ICS's GPIB AnyWhere Software.

2.2 SPECIFICATIONS

2.2.1 Supported Standards

VXI-11 Capabilities:

Provides VXI-11.2 Interface (GPIB Controller) and VXI-11.3 Instrument (GPIB Device) control functions.

Communication:

Uses RPC over TCP/IP for remote communication. The VXI-11 Standard includes the structure definitions necessary for rpcgen usage.

**VXI-11 Keyboard
Controller Program**

Runs on the local WIN32 computer and on a remote WIN32 computer to interactively send user inputs from the PC Keyboard to bus device, to read back device responses and to execute other commands. Includes controls for executing VXI-11 interface and instrument commands. VXI-11 keyboard uses RPC to communicate with the VXI-11 Service so it does not require VISA or any other support programs on the computer.

2.2.2 System Requirements

Local Computer	An Intel type PC with a GPIB Controller and a GPIB-32.DLL installed. WIN32 Operating System (Win 2K or XP) 3 Mbytes of free Hard Disk space.
Remote Computer	Virtually any computer with an operating system that can make RPC protocol calls or has a VXI-11 compatible VISA installed.

2.2.3 Compatible Software

GPIB AnyWhere's VXI-11 Service is compatible with the following applications:

NI LabVIEW (4.0 thru 7.1)
Agilent VEE
MathWorks MATLAB
Argonne Labs EPICS

2.2.4 Compatible VISAs

GPIB AnyWhere's VXI-11 Service is compatible with any VISA that supports TCP/IP VISA resources.

VXI-11.2 and VXI-11.3 capable VISAs:	Linux VISA (non-National Instruments) Unix VISA
VXI-11.3 capable VISAs	Agilent VISA National Instruments VISA

2.2.5 Compatible GPIB-32.DLLs

GPIB AnyWhere's VXI-11 Service is compatible with GPIB-32.DLLs from the following companies:

Agilent
ICS Electronics
Ines
Measurement Computing (formerly ComputerBoards)
National Instruments

2.2.6 Included Accessories

Instruction Manual

Theory of Operation

3.1 INTRODUCTION

This section describes ICS's GPIB AnyWhere's operation and how it interacts with other software.

3.2 GPIB AnyWhere Components

ICS's GPIB AnyWhere installs a VXI-11 Service in the host computer. The host computer must be an Intel PC running a WIN32 operating system such as Windows 2K or Windows XP. The host computer must also have a GPIB Controller and a GPIB-32.DLL installed in the computer.

The VXI-11 Service runs in the background and communicates directly with the GPIB-32.DLL. The GPIB-32.DLL is installed as part of the GPIB Controller installation

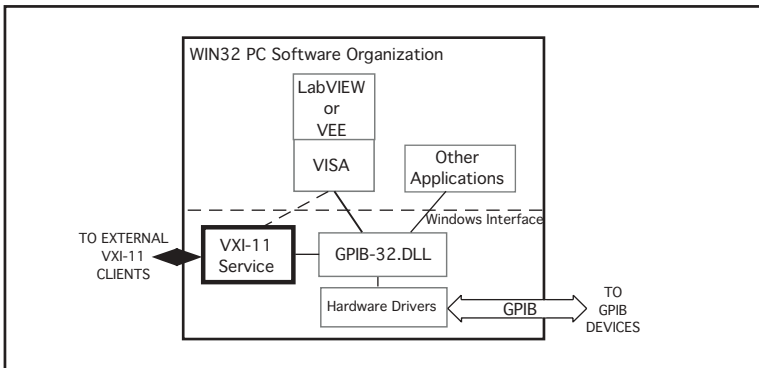


Figure 3-1 GPIB AnyWhere Software Interface

Internally, communication to the VXI-11 Service is normally done through a VISA layer. VISA layers were created and defined in 1990 as an offshoot of the VXI Consortium to provide a standard interface between application programs and manufacturer specific GPIB Controller hardware. With VISA, the application programs are independent of the type of GPIB Controller installed in the computer. LabVIEW, VEE, C programs and Visual Basic programs can all make VISA calls.

Figure 3-1 shows an NI VISA layer with a direct path to the GPIB-32.DLL and an indirect path to the VXI-11 Service. The choice of paths is determined by the definition of the VISA Resource. If GPIB0 is elected, VISA calls the GPIB-32.DLL directly. If TCPIP is selected, VISA calls the VXI-11 Service which makes the GPIB-32.DLL calls. Tests have shown that the time difference between the two paths is negligible.

RPC is the other connection path. Programs in the host computer and in the remote computer can communicate with the VXI-11 Service with RPC over the TCPIP network. GPIB AnyWhere's VXI-11 Keyboard program is an example of a program that uses RPC to communicate directly with the VXI-11 Service.

Programming

4.1 INTRODUCTION

This section describes how to write programs using the GPIB AnyWhere's VXI-11 Service to control GPIB devices.

4.2 GENERAL CONCEPTS

The ICS GPIB AnyWhere acts as a network service, hosted on a WIN32 system. It provides network access to a GPIB interface for any networked computer, including the computer hosting the service itself.

Access to the ICS GPIB AnyWhere service is possible either through RPC or as a VISA resource. For RPC communication, refer to the VXI-11 Specification. For communication through VISA, refer to the VISA documentation specific to your system.

When using VISA to access a GPIB instrument through the ICS GPIB AnyWhere service, you must define the instrument as a VISA resource. Typically, this is through a fully qualified VISA resource name such as the following.

TCPIP::127.0.0.1::gpib0,4::INSTR

In the above example, a VISA resource has been defined with the following qualifications.

1. The VISA resource is to be communicated with via TCP/IP (VXI-11).
2. The VISA resource is located on the local computer (127.0.0.1).
3. The VISA resource is named “gpib0,4”.
4. The VISA resource is an instrument, not an interface.

The VISA resource may have either a network hostname, or a numeric IP. Normally the hostname is used, since the numeric IP may occasionally change.

The naming of the VISA resource defines the GPIB interface (GPIB0) and the GPIB bus address of the instrument. If secondary GPIB addresses were used, then the name would have a second comma and the secondary address specified (i.e. “gpib0,4,10”).

Most VISA libraries only communicate with GPIB instruments (VXI-11.3) and not GPIB interfaces (VXI-11.2). It should be noted that the ICS GPIB AnyWhere service does provide support for both instruments and interfaces. As such, it is possible to perform interface level VXI-11.2 functions if your communication method allows. The ICS VXI Keyboard utility provides an example of this when it scans the selected service for instruments.

If desired, direct communication can be established with the ICS GPIB AnyWhere service through RPC. The use of rpcgen makes such communication relatively simple. This does give the added benefit of interface level control, as well as instrument control. Further information on VXI-11 over RPC can be obtained from the VXI-11 specifications found at the following URL. GPIB AnyWhere provides full support for the VXI-11.2 and VXI-11.3 specifications. Note that VXI-11.1 refers to VXIbus communication, rather than GPIB bus communication.

<http://www.vxibus.org/freepdfdownloads/>

Many GPIB applications utilize VISA GPIB specific resources rather than allowing the usage of VISA general resources. Such applications can usually be converted to VISA general resources by simply changing the VISA resource names. In the following example a GPIB specific name is shown, followed by the TCP/IP name.

```
GPIB::4::INSTR  
TCPIP::127.0.0.1::gpib0,4::INSTR
```

An even better method is to give the user of the VISA application a pulldown menu of VISA resources. Then the correct VISA resource can be used by the VISA application with no code changes. This is true even if the communication protocol, instrument address, or any other defining instrument characteristic changes. This coding style can be observed in the National Instruments VISA Interactive Control. The VISA Interactive Control displays all discovered VISA resources, allowing the operator to choose which VISA resource to use for communication.

The VISA resource may be predefined through a configuration tool (such as National Instruments MAX). If this method is used, it is normally possible to also

give an alias to the VISA resource. This is the preferable method since the application can then refer to the VISA resource through a simple name with no direct knowledge of the resource address information. Otherwise, the application must be aware of the protocol and all addressing information.

Usage of RPC communication is a low level protocol, which causes the application to become aware of protocol and all addressing information. Note that the RPC application must specify the VXI-11 hostname and all addressing information. The ICS VXI-11 Keyboard utility shows that it is possible to write sophisticated RPC based tools without pre-knowing addressing information. However, such sophistication does place an added overhead on the application author. If possible, usage of high-level I/O libraries should be considered. The use of a VISA library or some other high level library (such as EPICS) will simplify the communication and thus reduce the chance of error.

Some older GPIB based applications access the GPIB-32.DLL library instead of the VISA library. Using the ICS GPIB AnyWhere service does not preclude continued usage of such applications, but conversion to VISA library access should be considered for these applications and especially any new applications. Not only is such conversion relatively easy, but it also gives many new abilities. One example is the ability to run the application on any networked computer through the use the ICS GPIB AnyWhere service. Another example is the ability to use multiple applications on a single GPIB bus – at the same time (the reader is referred to “device locking” VXI-11 capabilities).

4.2 HOST WIN32 COMPUTER

The host WIN32 computer is the computer that hosts the GPIB Controller, has a compatible GPIB-32.DLL installed and has the VXI-11 Service installed. Applications that use the VISA Resource calls can run on either the host or on a remote computer. In either case, the client application communicates to the GPIB instruments with GPIB AnyWhere.

LabVIEW VIs should use VISA general resources and not make direct GPIB calls. You can also run VEE programs using Agilent's VISA. C language and Visual Basic programs can be written to make VISA calls and access the GPIB AnyWhere's VXI-11 Service.

4.2.1 National Instruments VISA

If you have installed LabVIEW, you installed National Instruments' VISA layer. Write your LabVIEW program using general VISA resources. Use the Measurement and Automation Explorer (MAX) to define the TCP/IP devices. After this is done, any LabVIEW VI may reference the defined TCP/IP devices. Refer to MAX's on line help for more information on defining TCP/IP devices.

4.2.2 Agilent VISA

If you are running VEE, then Agilent's VISA is your VISA layer. If you are running both Agilent programs and have LabVIEW on the computer, install Agilent's VISA as the second VISA.

Use Agilent's IO Configure utility to configure VISA for the interfaces. In the host computer, define TCPIB0. Select 'TCPIB Lan Client for Lan Instruments'. Do not select 'TCPIB VISA Lan Clients'.

Edit the VISA Configuration and Select Add Device. Enter the Host Name and the Device name. An example is 'JBOX' and 'GPIB0,4'.

Run Agilent's VISA Assistant to test the configuration. VISA Assistant is Agilent's Interactive Control Panel for VISA. When The VISA Assistant opens, it shows all found resources in the left hand window. If it doesn't display TCPIB0 then you need to go back and correct the configuration. Use VISA Assistant to query the instrument to verify communication with the device.

4.2.3 C Language Programs

Compatible C Language programs are written so they make VISA calls. Application Note AB48-38 on ICS Electronics website contains a brief example of a C Language program and some guidelines for writing our own program. Download AB48-38 from:

http://www.icselect.com/ab_note.html

If you do not have a VISA layer installed on your computer, you can download a LabVIEW runtime package from National Instruments website. The package will install the NI VISA layer on your computer. National Instruments will ask you to register to download application notes, programs and other information from their site.

4.3 REMOTE WIN32 COMPUTERS

The client applications are setup the same way on the remote (client) computer as described above for the host computer. Do not install the VXI-11 Service on the remote computer. Use the VXI11_kybd program to check the communication path from the client to the host before running your application. Sometimes routers and switches may be set to block the communication path and you will have to enter the host DSN number to make the connection.

4.4 OTHER REMOTE COMPUTERS

Non-windows computers running Unix/Linux/Apple OS X/Sun OS etc. can communicate with the host computer using the VXI-11 protocol. If you have LabView installed on the remote computer, you can use its VISA to communicate with the host computer. There are also some free VISAs available for Unix like operating systems. Another method is to write your program with RPC calls.

The VXI-11 Specification defines all VXI-11 functions, any of which may be used by the RPC application. The GPIB AnyWhere™ service fully supports all VXI-11 functions as defined by the VXI-11 specification. The following URL is the first section of the VXI-11 Specification. The last 3 pages of the Specification contain the RPCL for VXI-11. After copy/pasting the RPCL definitions into a C source file, use rpcgen to create the stubs for your RPC application.

<http://www.vxibus.org/freepdfdownloads/vxi-11.pdf>

Note that most VISA libraries only support device level (VXI-11.3) functions. For interface level (VXI-11.2) functions, normally you must use RPC application coding. The ICS VXI Keyboard utility is an example of an RPC based application using both interface and device level VXI-11 functions. Write your program in a similar fashion to the VXI11_kybd program. First create a link to the GPIB Interface on the host computer and then create a link to the desired GPIB instrument.

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