# LAN GPIB GATEWAY

## 9065

### Ethernet-to-GPIB Gateway

- Control GPIB instruments anywhere from any PC
  *Control GPIB and HP-IB Devices anywhere there is a network connection.*

- Runs from any VXI-11 compliant VISA library.
  *Use VEE, LabVIEW, C, and Visual Basic programs with VISA or SICL calls.*

- Adds GPIB Controller capability to MAC OS X, Unix, Linux, SunOS and similar operating systems.
  *RPC calls over TCP/IP eliminates all driver problems.*

- Control GPIB instruments with any web browser.
  *New interactive HTML page for controlling instruments*

- ICS's VXI-11 Keyboard Controller program provides interactive control of GPIB devices.
  *Lets you control instruments without writing a program.*

- Online programming support.
  *Numerous Application Notes for all programming methods.*

- Model 8065 replacement.
  *Faster plus an improved webserver and control page.*

☑ *RoHS Compliant*

CE *Approved*

## DESCRIPTION

ICS's 9065 is an Ethernet-to-GPIB Gateway that lets you easily control your GPIB instruments from any PC, over an in-house network or anywhere in the world over the internet. The 9065 connects to any TCP/IP network or to a network port on your computer.

The 9065 is a VXI-11 compliant network service which can be easily controlled by several programming techniques. Windows users can control the 9065 through VISA layers from Agilent, National Instruments, Kikusui and other vendors. Apple OS X, Unix, and Linux operating system users can control the 9065 with RPC (Remote Procedure Call) calls over a TCP/IP network. RPC provides an invisible communication medium allowing the developer to concentrate on his program and eliminates driver problems caused by kernel or OS variations.

The 9065's internal webserver includes an interactive html Control page so the user can control GPIB instruments directly from a web browser.

ICS also provides a VXI-11 Keyboard utility for Windows that lets users find and control GPIB instruments connected to the 9065.

## VXI-11

VXI-11 is a communication standard developed in conjunction with the VISA Specification for instruments and for GPIB Gateways (Controllers) like ICS's 9065. VXI-11 provides an error free, GPIB like experience for controlling instruments over an Ethernet network while maintaining the IEEE-488.2 Standard.

**9065 Ethernet-to-GPIB Gateway**

## Programming

If you program with Agilent VEE or other Agilent programs, you can use Agilent's VISA or its internal SICL library to control ICS's 9065. The Model 9065 is fully VXI-11 compliant and is interchangeable with Agilent's' E5810A and older E2050B if you are not using their RS-232 interfaces or their private commands. Agilent's VISA or its internal SICL library is recommended for C/C++/C# and Visual Basic programmers.

LabVIEW and National Instruments' VISA supports the 9065 with VXI-11.3 calls. NI's Measurement and Automation Explorer treats the 9065 as any other TCP/IP resource[1].

Apple's OS X, Linux or any variation of Unix like SunOS, IBM-AIX, or HP-UX, can communicate with the 9065's RPC Service either through RPC over TCP/IP or, in some cases, with VISA calls.

If you program with Java, then you can write a 9065 control program that can be easily moved to virtually any operating system. The Java jGpibEnet project on SourceForge was developed using an ICS 8065 Controller. ICS provides numerous Application Notes about programming the 8065 and 9065.

For Python users, PyVXI-11 is a new Python and C++11 extension that supports communications between a computer and instruments. PyVXI-11 relies heavily on the 9065 Gateway and is a modern pythonic alternative to LabView and Linux GPIB.
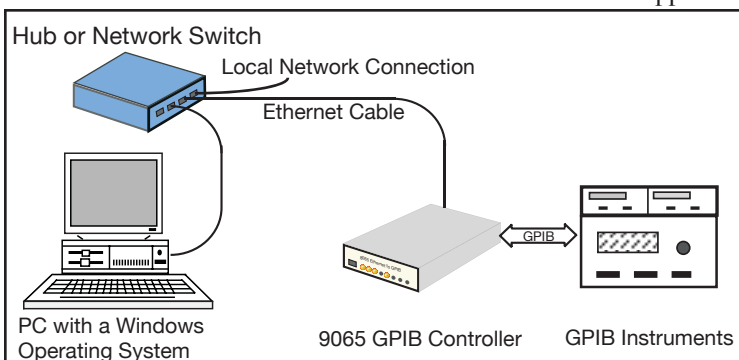


Hub or Network Switch
Local Network Connection
Ethernet Cable
GPIB
PC with a Windows Operating System
9065 GPIB Controller
GPIB Instruments

**Figure 1    9065 shown connected to Company Network**

## RPC Calls eliminate Drivers

Apple OS X, Unix and Linux systems do not need special drivers when using RPC calls to communicate with the 9065. These operating systems include an rpcgen utility that converts the VXI-11 Specification's RPCL header file into operating system specific library files that can be called from a C language program. Using the operating system's rpcgen utility eliminates driver bugs and driver obsolescence when the test computer is updated or when the test program gets ported to another system. ICS has several Application Notes that show how to write programs with RPC calls. RPC calls can be used on Windows PCs with a third party RPC utility.

## New HTML Control Page

The 9065's webserver includes an Instrument Control Page that lets a user control instruments connected to the 9065 with a web browser. The 9065 Control Page shown in Figure 2, lets a user write out commands and automatically reads back the instrument responses. The page operates with auto query enabled so it automatically detects most queries and serves up the instrument responses. This prevents the user from getting out of sync with the instrument

The Control Page also includes the common GPIB commands such as Device Trigger, Device Clear and Serial Poll. Its important to include these commands on the Control Page to control instruments that use them as escape characters, to clear buffers, to initiate an action and to read the device status register.

## Keyboard Controller Program

The 9065 includes ICS's VXI-11 Keyboard program for Windows which provides interactive control of GPIB devices from the computer keyboard without having to write a program. The VXI-11 Keyboard program uses ICS's VXI-11.dll for Windows PCs and is the ideal utility program for testing the 9065 Controller, for exercising GPIB devices or for trying out device commands before using them in a program.

With the VXI-11 Keyboard program you can find the 9065 on your network, link to your 9065s, read back Bus Status, generate IFCs, run the 488.2 FindLstn protocol to discover the GPIB devices connected to the 9065, and link to an instrument. Besides reading and writing data strings, the VXI-11 Keyboard has controls for Device Clear, Device Trigger, and Serial Poll. Instrument links can be locked manually or automatically to prevent another user from interfering with your use of the GPIB devices.

## Ease of Installation

ICS's 9065 is very easy to install. Plug the 9065 into a network access point (switch or hub) adjacent to your computer as shown in Figure 4 or use an Ethernet cable to connect the 9065 directly to a PC's network port. Then use your favorite web browser or run ICS's Configuration Utility to configure the unit for your network. Both let you set the 9065 to a static IP address or you can enable the 9065 to accept an DHCP address setting if your network has a server that can assign network addresses. Then set the remaining network and GPIB bus parameters. Save the setup and the 9065 is ready to go.
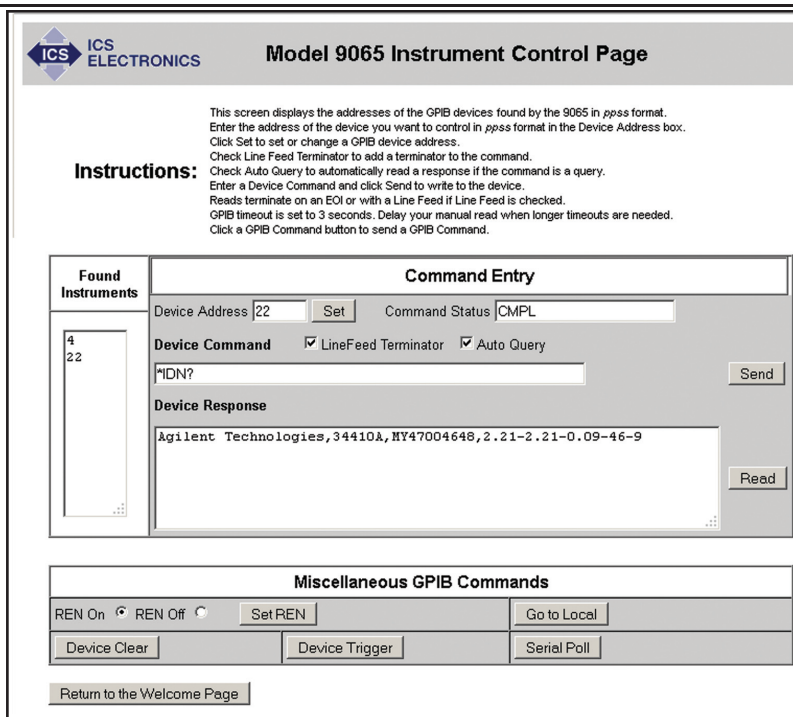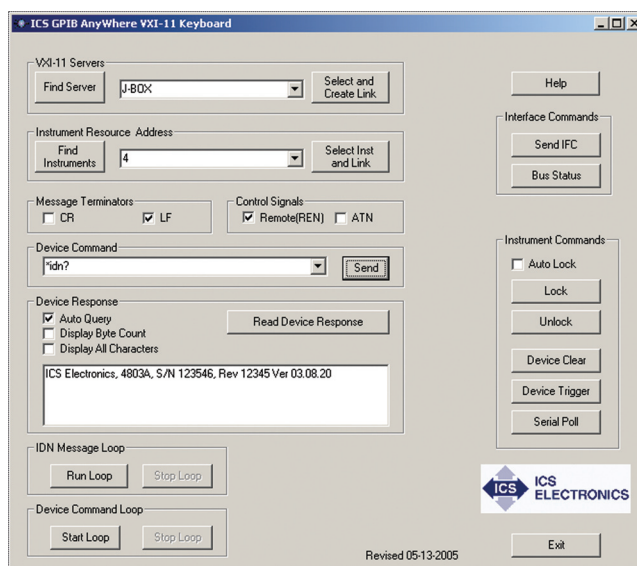


**Figure 2    9065 Control Page**
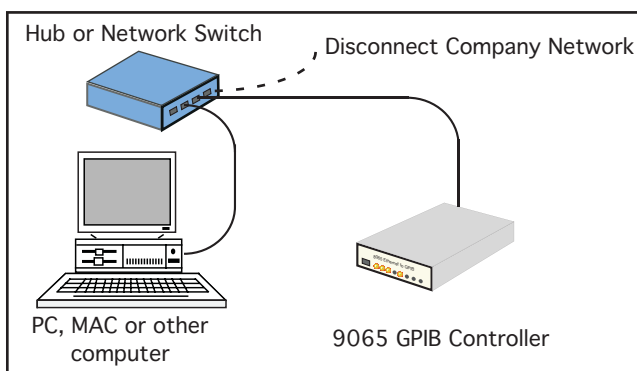


**Figure 3    VXI-11 Keyboard Utility**



**Figure 4    9065 Installation Setup Connection**

Note: 1. Problems with NI-VISA version 5.2 and later prevent it and MAX from recognizing ICS and Agilent Ethernet Gateways. Recommend using version 5.1 or earlier versions until the problem is resolved.

# 9065 APPLICATIONS

## Multiuser Capabilities

ICS's 9065 Ethernet to GPIB Controller lets multiple users share equipment from anywhere in the world at anytime.

Figure 5 on the right shows a 9065 being used to control a rack of test instruments on a factory test floor. The test technician's computer and the 9065 are both connected to a local network hub or switch. The test program is normally run in the test technician's computer.

When the Test Engineer has to upgrade or modify the test program he can run the new program from his computer and make any necessary changes without having to have a duplicate set of the production test equipment in his lab. This is a significant cost savings.

The Field Engineer can use the company's Virtual Private Network (VPN) to gain access to the company's network over the Internet. He too can become a 9065 client with out impacting the test setup. In companies with multiple test locations, VPN connections can allow the Test Engineer to access and update test programs anywhere in the world from his home office.

In a test environment, the Engineering and Field Engineer would normally not access the Test Equipment at the same time that it was being used by the Test Technician. However, in other applications with remote data collection equipment, such as in a weather station, the instruments could be accessed by several clients at the same time. Here one client may be looking at a data logger while another client could be reading current conditions. The 9065 supports multiple clients using different instruments at the same time and includes locking to prevent accidental access while an instrument is in use.

## 9065 Advantages

ICS's 9065 is a newer, faster Gateway that replaces the Model 8065 with a faster processor and Ethernet interface. The 9065 is a 100 percent VXI-11.2 and VXI-11.3 compatible and provides complete GPIB control capability and the ability to implement the IEEE-488.2 Controller Protocols like FindLstn. Other competitive units only have VXI-11.3 capability.

The 9065 supports SRQ handling, serial polling and SRQ notify. The 9065 also supports multiple clients as part of its standard firmware making it easy to share equipment from remote locations.
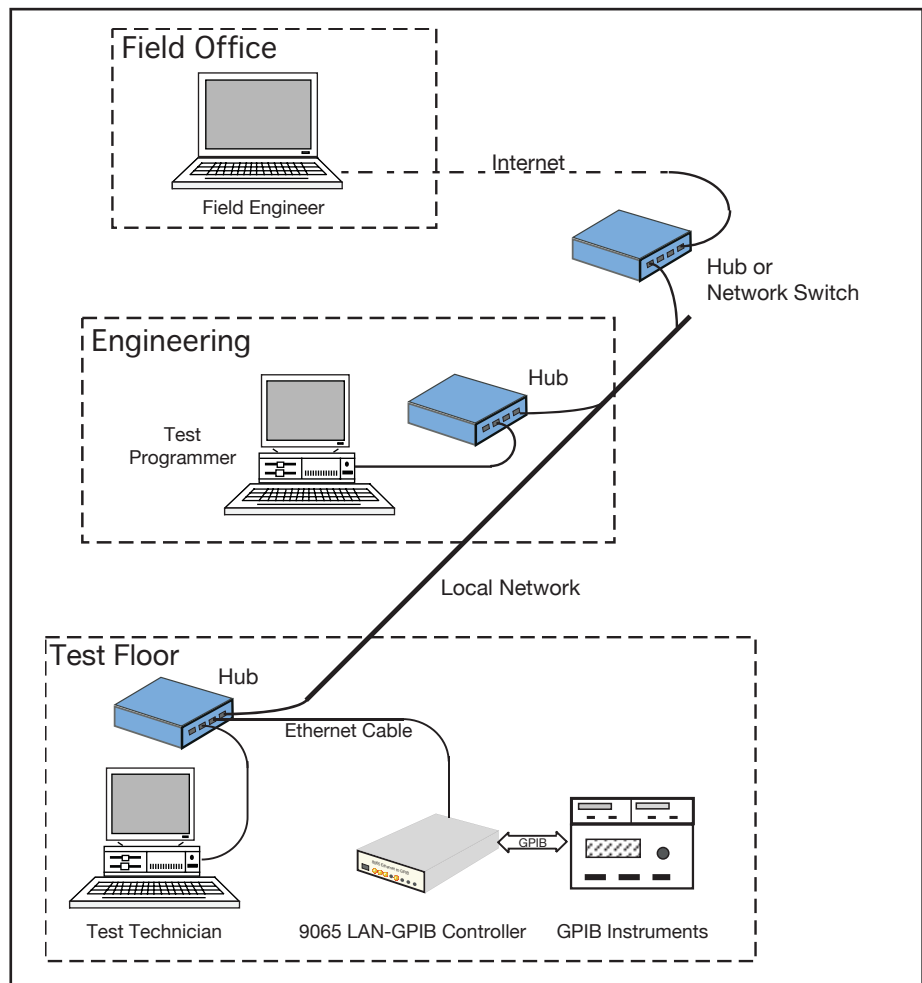


**Figure 5     9065 Multi-user Application**

The 9065 is a universal controller since it is not limited by the availability of a driver for a specific operating system. Moreover, the resulting test programs are more robust since they are free of any driver bugs. Finally the 9065 is RoHS compliant and meets most countries' environmental specifications.

## Hardware

ICS's 9065 Controller is packaged in ICS's small metal Minibox™ case that provides proven EMI/RFI protection and rack mount capability. Rear panel RJ-45 and GPIB connectors provide access to the network and to the GPIB bus. Front panel LEDs provide visual indication of the network and GPIB bus status and diagnostic help for troubleshooting system problems.

One or two 9065s can be rack mounted in a 1 U high space. Chose a single rack kit that holds one unit or a dual rack kit that holds two units.

## Network Communication

The client application uses the VXI-11 or RPC protocol to communicate with the 9065 and to control and transfer data to and from GPIB instruments. Both protocols operate over a TCP/IP network and guarantee error free communication with the 9065. The 9065 has communication timeout and keepalive capability to maintain the communication link with the client application. When the 9065 discovers that the channel is no longer active, or when a channel is closed, it closes that channel and releases all resources that were used by the client. This unlocks any instruments links, destroys the links and returns all resources to the pool for the next user.

An auto-disconnect feature is included in the 9065 for compatibility with programs designed for the Agilent (HP) E5810A and E2050B LAN to GPIB Controllers. If the user enables auto-disconnect, the channel is aborted automatically whenever the link count goes to zero.

# 9065 SPECIFICATIONS

## Supported Standards

**IEEE 488.1 Capabilities:**
The 9065 meets IEEE-STD-488.1 with the following capabilities:
    AH1, SH1, C1, C2, C3, C4, and C9
    E2 Drivers incorporate power up/down protection and drive 14 devices.

**IEEE 488.2 Compatible**
Runs all required 488.2 controller protocols and includes bus signal line monitoring.

**488 Bus Performance**
Long term GPIB transfer rates are limited by the LAN data transfer rate, the Client-computer performance and the GPIB device. Short term 9065 data rates are:

| | |
|---|---|
| GPIB to 9065 | > 125 kbytes/s |
| 9065 to GPIB | > 180 kbytes/s |
| | |
| GPIB Drivers | 14 loads or devices |
| Device Address | 64 addresses-any combination of primary or primary and secondary addresses. |
| 9065 address | 0 to 30 [0] |

**VXI-11 Capabilities**
Fully VXI-11.2 and VXI-11.3 compliant

| | |
|---|---|
| VXI-11.2 | Interface Control |
| VXI-11.3 | Device Control |
| Clients | 1 to 15 |
| Channel types | Data, Abort and Interrupt |
| Instrument links | 64 max |

**RPC Protocol**
Conforms to ONC RPC Version 2

**Ethernet Interface**

| | |
|---|---|
| Type | IEEE 802.3 compliant |
| Speeds | 10BaseT (10 Mb/s) |
| | 100BaseT (100 Mb/s) |
| IP Address | Static or DHCP w/AutoIP |
| Factory setting | 192.168.0.254 static |
| Interface name | any [gpib0] |

**Internal WebServer**
The internal WebServer provides HTML web pages for configuring the 9065 and for controlling GPIB instruments.

## System Requirements

Computer with an IEEE 802.3 LAN interface. Requires RPC support or a VXI-11 compliant VISA layer installed.

## Supported Software

The 9065 supports the following application and program languages:

NI LabVIEW (5.1 thru 8.6)
Agilent VEE - IO Libraries 14.2 and later
MathWorks MathLab
Visual Basic 6.0*
Visual Basic .NET (2005)*
Visual C, C++ and C#*
Java*

 * with VISA or RPC calls

## Controls and Indicators

**CONTROLS**

| | |
|---|---|
| Power | Front-panel switch |
| LAN Reset | Rear-panel push-button |

**LEDs**

| | |
|---|---|
| PWR | Power on |
| LNK | Unit connected to an active LAN |
| ACT | Transferring messages to/ from the network |
| RDY | Unit has passed self test |
| TALK | Unit is addressed to talk |
| LSTN | Unit is addressed to listen |
| SRQ | SRQ asserted on GPIB bus |
| ERR | Unit has detected a soft error |

## Physical

| | |
|---|---|
| Size | 7.45" L x 5.57" W x 1.52" H (18.92 cm L x 14.15 cm W x 3.86 cm H) |
| Weight | 1.6 lbs. (0.73 kg.) plus power adapter |
| Construction | RoHS Compliant |
| Temperature | |
| Operating | -10 °C to +65 °C |
| Storage | -40 °C to + 70 °C |
| Humidity | 0-90% RH non-condensing |
| Shock/Vibration | Normal handling |
| Connectors | |
| GPIB | GPIB 24 pin ribbon with metric studs. |
| Ethernet | RJ-45 |
| Power | 9 to 32 Vdc @ 4 VA |
| RFI/EMI | CE Certified |
| EEC Standards | EN 61000-6-4:2001, EN 61000-6-2:2001, EN 55024:1998, and EN 55022:1998. |

## Included Accessories

Instruction Manual

CD-ROM with VXI-11 Keyboard Controller program and Configuration Utility.

LAN Crossover Cable.

UL/CSA/VDE approved AC power Adapters provided for:
  US - 115±10% Vac, 60 Hz (std.)
 -U Europe/UK/Australia/China/Japan plugs, 100 to 240 Vac, 50/60 Hz

NOTE
For more information and programming examples refer to the
AB80 series Applications Notes at www.icselect.com

LabView is a trademark of National Instruments, Austin, TX.
VEE, IntuiLink and Benchlink are trademarks of Agilent Technologies, Palo Alto, CA.
The VXI-11 Specification is available from the VXI Consortium at http://www.vxibus.org/specs.html or from ICS's website at http://www.icselect.com/vxi_spec.html

## ORDERING INFORMATION                                                                    Part Number

| | |
|---|---|
| Ethernet - GPIB Controller with 115 VAC adapter, Manual and CD-ROM | 9065 |
| Ethernet - GPIB Controller with 100-240 VAC adapter with UK, Europe and Australia/China plugs, Manual and CD-ROM | 9065-U |
| GPIB Accessary Cables | See separate data sheet |
| Rack Mounting Kits (holds one or two 9065s). See separate data sheet | Single - 114210, Dual - 114211 |