

TAMS L488 LAN I/O Gateway

Installation and Configuration Guide

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How to Use This Guide

Use this guide to install and configure the TAMS L488 LAN I/O Gateway for use with supported, network-equipped computer systems. You can also use this guide to administer the Gateway on your network and to troubleshoot any problems you might encounter while installing or configuring the Gateway. Network-equipped computer systems that are supported for use with the LAN I/O Gateway are:

- HP 9000 workstations running either HP-UX 10.20 or 11i.
- 32-bit personal computers (PC's) running Microsoft Windows 2000, XP Professional, or Vista.
- 32-bit personal computers (PC's) running RedHat Enterprise Linux

To use the Gateway for I/O applications, you must also have one or more of the following software products installed and configured on your network-equipped computer system(s):

- Agilent SICL and VISA for Microsoft Windows computers
- Agilent SICL and VISA for HP-UX 10.20 workstations
- TAMS SICL and VISA for HP-UX 11i workstations
- TAMS SICL for RedHat Enterprise Linux workstations
- HP Visual Engineering Environment (HP VEE)
- Agilent (HP) BASIC/UX for HP-UX 10.20 workstations
- TAMS BASIC for HP-UX 11i workstations
- TAMS BASIC for RedHat Enterprise Linux workstation

Note: Once you have used this guide to install and configure the Gateway, please refer to the appropriate documentation for your software product(s). See Appendix C, “Related Software Documentation,” for the software manuals you should use.

Who Should Use This Guide

This guide assumes that you are a Network Administrator who installs, configures, and maintains a local area network (LAN), including network related hardware like the TAMS L488 LAN I/O Gateway. If you are not a Network Administrator, that person must be readily available to provide assistance. If you use HP-UX or Linux workstations with the Gateway, you must also have superuser (root) privileges on those systems. If you will use a Windows workstation with the Gateway, you must also have system administrator privileges on those workstations.

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1. Overview

This chapter provides a general overview of the TAMS L488 LAN I/O Gateway, including:

- An explanation of the contents of your TAMS L488 product package.
- A brief overview of the TAMS L488 LAN I/O Gateway's functionality.

TAMS L488 Package Contents

Your TAMS L488 product package contains the following items:

- TAMS L488 LAN I/O Gateway
- CD containing this Manual and software for configuring the L488 on your network

Product Overview

The TAMS L488 LAN I/O Gateway combines hardware and firmware in a small box that provides a network gateway between network-equipped computer systems and instruments. The Gateway enables users of I/O applications to obtain measurement data either locally or remotely from GPIB instrumentation.

The Gateway connects the local area network (LAN) from the computer system to a local instrumentation bus, GPIB (also called HP-IB or IEEE-488). GPIB is a shared bus with up to fourteen external devices possible by daisy-chaining the bus. Each device, including the TAMS LAN I/O Gateway, must have a unique address on a GPIB bus. See the manuals that came with the GPIB devices for information on setting the bus address. The bus address of the Gateway is configurable with the Configuration Utility, with a default value of 21.

The Gateway is powered by Power over Ethernet, or PoE, IEEE standard 802.3af. The standard provides for power to be delivered over a standard Cat-5 twisted cable through the standard RJ-45 connector. The power is carried on the wires in the Cat-5 cable that are NOT used to carry the LAN signals. The Gateway must be used with Power over Ethernet: the GPIB bus and LAN without PoE provide no power. The Power over Ethernet can be provided by an Ethernet Switch that supports PoE, or a PoE injector. Two examples of PoE injectors are PhiHong PSA16U-480(POE) and Ault PW130.

SICL and VISA provide the ability to communicate with remote instruments in the same manner as if they were connected locally to a computer. Only the LAN address of the Gateway must be added to SICL or VISA commands in order to provide that functionality.

Software/Firmware Architecture

The TAMS L488 LAN I/O Gateway is supported with the following I/O application software products:

- Agilent SICL and VISA for HP-UX 10.20
- TAMS SICL and VISA for HP-UX 11i
- Agilent SICL and VISA for Microsoft Windows 2000 or XP Professional

- TAMS SICL and VISA for RedHat Linux
- TAMS L488 configuration utility for RedHat Linux
- TAMS L488 configuration utility for Windows 2000 or XP Professional

VISA software is also available from other vendors. *VXIplug&play* drivers are available for many instruments to minimize programming required by the user.

Note: The GPIB interface in the LAN I/O Gateway supports all I/O application operations provided by these software products except for parallel polling, SICL commander sessions and asynchronous aborting.

Note: There are two different LAN networking protocols used for communicating with instruments: SICL LAN Protocol and the newer VXI-11 Protocol (also known as the TCP/IP Instrument Protocol). The TAMS L488 Gateway product supports only the VXI-11 Protocol. VXI-11 Protocol must be configured on the client in order to communicate with the server, the TAMS L488 LAN I/O Gateway. See “Usage with SICL & VISA Applications”.

How I/O Application Software Works with the Gateway

This subsection briefly summarizes how the software on a client computer system works with the TAMS L488 LAN I/O Gateway to complete I/O application operations on attached instruments. For more detailed information on how to use your software with the Gateway, please refer Chapter 3 Usage or to your software documentation as listed in Appendix C, “Related Software Documentation.”

Before trying to perform an I/O application operation on a Gateway’s interface, the LAN client software in the client computer system establishes a network connection to the LAN server (the Gateway). Once the client establishes a connection, the client can begin to send I/O requests to the Gateway.

The Gateway can have one or two clients connected and being serviced at any given time.

Although several instruments can be connected to the Gateway’s GPIB bus, only one I/O operation can occur on the GPIB bus at any given time. Therefore, once a client’s request begins to execute on the GPIB, all other client requests for operations on the GPIB must wait until the current client request completes. Client requests are serviced in a first come, first served manner, unless they are prohibited by interface or device locks. If a client has a sequence of I/O application operations to perform that should not be preempted, the client should obtain a lock on the Gateway’s GPIB interface or device. Once the client’s sequence has completed, it should release its lock, allowing other clients access. When a client closes a connection, the Gateway frees up the resources allocated to that client, including any locks, pending I/O requests, memory usage, and so forth. Abnormal termination (for example, the network and/or client goes down) is discussed in Chapter 5, “Troubleshooting.”

Basic Networking Concepts

Client/Server Model

Throughout this manual, the terms Client and Server will be used. In this context, the Server is the TAMS L488 LAN I/O Gateway, which receives requests from Clients (workstations or PC’s running user applications) to perform various I/O operations on interfaces installed in the Gateway. The software to operate the Gateway is factory installed in the box. The Gateway can be remotely configured by using a web browser, or the **telnet** command available on any workstation that has networking software installed. The web browser is the easiest way to setup the L488. The telnet interface provides the same capabilities

as the web server, but is command line oriented instead of a web interface. The “TAMS Gateway Finder” utility can be used to “find” the L488 on your local network if you have forgotten the IP address of the L488.

None of these software programs (web browser, telnet, TAMS Gateway Finder) need to be run from the same machine as the intended client. Rather they just need to be run from a machine on the same subnet (or subnets linked by subnetting) as the TAMS L488 LAN Gateway . For example, suppose you want to use an HP-UX client but you also have available a Linux client on the subnet that the TAMS L488 LAN Gateway resides. Then you can use the Linux machine to run a web browser for the initial network configuration of the TAMS L488. Then you can move to the HP-UX client to run your SICL or VISA based user application.

SICL LAN vs. VXI-11

There are two different low-level protocols available to access devices remotely across LAN. SICL LAN was developed originally by HP and transferred to Agilent. VXI-11 is a newer protocol that is supported by a wider range of manufacturers, including Agilent and TAMS. The L488 Gateway works with VXI-11 protocol only.

Subnets

A subnet is a collection of Internet Protocol (IP) addresses. Devices contained in the same subnet generally communicate with each other without difficulty. If a client and the Gateway reside on different subnets, then the “subnet gateway” must be configured for both devices, which reside on their respective subnets. These “subnet gateways” have the ability to route information between subnets. The term “subnetting” refers to communication that crosses subnets.

Routing

The act of specifying how to route network packets from one machine to another. A client can set up routing to a limited number of devices, or a subnet gateway may be used to provide the routing to a large number of machines. Routing is not required when communicating between machines on the same subnet.

Firewalls

Some clients, such as Linux workstations, can be configured with firewalls. In many applications, the client will be shielded behind a larger firewall that provides adequate protection from the Internet. Firewalls configured on the client or between the client and the Gateway can sometimes cause problems in communicating with the Gateway.

With one LAN interface, a firewall at the client may need to be disabled to avoid problems. If this is not feasible due to security concerns, an additional LAN interface not shielded by the firewall may be added to the client to communicate with the Gateway.

SICL vs. VISA

SICL (Standard Instrument Control Library) was developed by HP and transferred to Agilent. It is a client-side programming library that allows applications to be written to allow remote access to instruments across LAN (as well as locally). It also includes command-line utilities that have that capability. SICL is supported today by Agilent for Windows clients, and by TAMS for HP-UX and RedHat Linux clients.

VISA (Virtual Instrument Software Architecture) is standardized by the *VXIplug&play* Systems Alliance to provide similar capabilities as SICL, but with wider industry support.

For instruments connected to the Gateway, *VXIplug&play* drivers are frequently available to minimize the programming required under VISA. Contact the maker of the instrument for information. These are more commonly available for Windows clients rather than Linux/HP-UX.

The TAMS L488 Gateway can handle application programs written in SICL and VISA simultaneously. Different instruments on a bus can use the two different libraries, but any one instrument must use the same library when being accessed. See the www.tamsinc.com website for further details on supported configurations.

2. Installation

This chapter explains how to install the TAMS L488 LAN I/O Gateway on the LAN and local busses for use with network-equipped computer systems. To complete the installation, you will do the following:

1. Ensure that you have the hardware and software required.
2. Install the Gateway hardware by connecting it to the LAN (with Power over Ethernet) and GPIB.

The following sections explain how to complete these installation steps.

Prerequisites

This section lists the hardware and software you need to install the TAMS L488 LAN I/O Gateway.

Hardware Requirements

To install the Gateway, you must have the following hardware. The selection of GPIB instruments and cables, of course, is installation-specific. At a minimum, one peripheral device is required.

- One or more of the following, network-equipped computer systems to act as the LAN client system(s) and/or the network configuration system:
 - HP workstation running HP-UX 10.20 or 11i.
 - 32-bit personal computer (PC) running RedHat Linux or Microsoft Windows
- A local area network (LAN) to which the client system(s) and the TAMS L488 LAN I/O Gateway can connect via the appropriate LAN cables.
- The LAN must provide Power over Ethernet (PoE).
- The TAMS L488 LAN I/O Gateway.
- GPIB instrument(s), including any GPIB cable(s) needed to connect the Gateway to the instrument(s).

Software Requirements

Each client computer system that will access the Gateway must be running one of the following operating systems.

- HP-UX version 10.20 or 11i for HP workstations
- RedHat Enterprise Linux (for 32 bit PC's)
- Microsoft Windows 98, 2000, XP Professional, or Vista

You must also have one or more of the following I/O application products configured on each client workstation that you wish to use with the Gateway.

- Agilent SICL and VISA for HP-UX 10.20
- TAMS SICL and VISA for HP-UX 11i
- Agilent SICL and VISA for Microsoft Windows 98, 2000 or XP Professional
- TAMS SICL and VISA for RedHat Linux
- TAMS Gateway Finder utility for Microsoft Windows or for Redhat Linux on at least one client; this is not required but may be useful if you cannot determine the IP address of your L488.

To learn how to install and configure these software products for use with the Gateway, please refer to Appendix C, “Related Software Documentation.”

Installing the Hardware

This section explains how to install the LAN I/O Gateway hardware by connecting it to the LAN and peripheral interface busses.

1. Make sure the GPIB instruments you will connect to the Gateway are working properly.
2. Connect the Gateway to the LAN with PoE. If your LAN already has PoE, then just connect your PoE LAN cable to the RJ-45 connector on the back of the Gateway. If your LAN does not have PoE, then you must use a PoE injector. In this case, connect your LAN (from your Ethernet Switch/Hub or PC) to the RJ-45 connector on the PoE injector labeled “LAN IN”. Connect another LAN cable from the PoE injector labeled “LAN OUT” to the RJ-45 connector on the Gateway. Use only Cat-5 or better cabling. The Power over Ethernet can be provided by an Ethernet Switch that supports PoE, or a PoE injector. Two examples of PoE injectors are PhiHong PSA16U-480(POE) and Ault PW130.
3. The “Power” LED will flash orange for a moment, then should glow solid green to indicate good power. Then the left LED on the RJ-45 connector will glow solid green once a LAN connection is established. On a 100BaseTX network, this should happen almost immediately. On a 10BaseT network, it may take a half minute to establish the connection. The right LED on the RJ-45 connector will flicker to indicate LAN traffic. The “Activity” LED on the far right will flicker to indicate GPIB activity.
4. Connect the Gateway GPIB connector directly onto the GPIB connector of an instrument, or onto a GPIB cable on the back of an instrument. The Gateway can drive up to 14 instruments, per IEEE-488 standards. Insure that each device, including the L488, has a unique bus address. Linear topologies are recommended.

3. Network Configuration

This chapter explains how to configure the TAMS L488 LAN I/O Gateway on your network. You can use this chapter if you are configuring the Gateway for the first time on your network, or if you need to change the Gateway's configuration in the future.

To configure the LAN I/O Gateway on a network either of these methods may be used:

1. Use the built in webserver in the L488. With this method all the configurable parameters provided by the L488 LAN Gateway can be changed. With this method the IP address of the L488 must be know; otherwise TAMS Gateway Finder should be used to find the IP address.
2. Use the standard operating system **telnet** facility from a remote client. With this method all the configurable parameters provided by the L488 LAN Gateway can be changed. With this method the IP address of the L488 must be know; otherwise TAMS Gateway Finder should be used to find these values. If you are familiar with using 'telnet' and setting up the routing table ('route' command) on your client this method will be easy to do, otherwise you may find it difficult.

Remote Configuration via the web server

The web server is the simplest way to configure your L488. Simply open your web server (Internet Explorer, Mozilla Firefox, etc) and type the IP address of the L488 into the URL field at the top. So for example, since the default IP for the L488 is 192.168.0.1, you would type that into the URL field.

The web browser will show the current settings of the L488. Notice that you can change all of the settings: GPIB address, T1 delay, IP address, Subnet Mask, and Gateway. If you change the GPIB address or the T1 delay, click on "Submit Changes" and the changes will take effect immediately, and the new values will be stored in non-volatile memory, so they will be remembered even after power is lost.

If you change the LAN settings (IP address, Subnet Mask, Gateway), click on "Submit Changes (TAMS L488 will reboot!)". The changes will be stored to flash memory, and then the L488 will reboot. The reboot is necessary in order for the new LAN parameters to take effect. The browser will then present a link to the new IP address. Allow the L488 to reboot for a few seconds, then click on this link and verify the changes. If the speed of your LAN is only 10MPs, you may have to wait a half minute before the L488 can establish a link.

But what is the IP address of my L488?

The TAMS Gateway Finder utility will find LAN/GPIB gateways on your LAN. This utility will run on Microsoft Windows and Red Hat Linux.

Installing TAMS Gateway Finder Utility

Insert the CD that came with your L488 into your CD drive of your client machine (RedHat Linux or Windows).

The L488 Gateway must be on the same subnet (or accesible via subnetting) as this client machine. The client need not be the same machine as the intended client machine for running your SICL or VISA based applications.

RedHat Linux installation:

- Open a terminal window on your system; all commands below are typed into this window.
- Ensure you are the root user, if not:
`su – root`
Password:
- Find the mount point of your CD drive containing the TAMS disc. One way to do this is as follows
`cat /proc/mounts | grep iso9660`
look at the results to see the CD drive mount point, example results are as follows:
`/dev/hdc /media/cdrecorder iso9660 ro 0 0`
the mount point is the second field, in this case /media/cdrecorder
- `rpm –U /media/cdrecorder/linux/gatefind*.noarch.rpm`
This command will vary depending upon where your CD drive mount point is.

Windows installation:

An installation wizard should automatically start once you insert your CD into the CD drive and close the door. If not use the windows explorer to browse to your CD folder. Double click on windows/Setup.exe. Follow the instructions in the installation wizard.

Running Gateway Finder Utility

Note: The most important configuration value is the Internet Protocol (IP) address of the L488 LAN Gateway. Without a proper IP address, the Gateway may appear “dead” or operate unexpectedly.

IP addresses for network devices are assigned by a designated Network Administrator in your workplace. If you are not the Network Administrator, you will need to contact the designated Network (or System) Administrator who can assign the TAMS L488 Gateway’s IP address for you. The LAN Gateway product does not support DHCP addressing, so a fixed IP address must be assigned to it.

Please refer to the appropriate sections of “LAN Configuration Values”, which is later in this chapter, for detailed descriptions of IP address, hostname and other networking terms.

Launching this utility under RedHat Linux:

- Open a terminal window on your system.
- Change to the root user if you are not already:
`su – root`
Password:
- To execute in command line mode:
`/opt/L488/bin/gatefind`

Launching this utility under Windows:

For Windows machines, the installation created shortcuts to the program:

- On your desktop double click on the **TAMS Gateway Finder** icon;

OR

- Click on **Start->All Programs->TAMS Gateway Finder**,

OR

The utility takes about 6 seconds to run. It will print out all of the gateways that it finds. For example:

- 1) 192.168.0.1 192.168.0.1 VXI11
- 2) 206.143.62.5 goofy.mycompany.com HPLAN VX11

This example shows two LAN/GPIB gateways on your LAN. The first is at IP address 192.168.0.1, which is the default address of the L488. The IP address is repeated because there is no hostname associated with that IP address yet. The L488 understands the VXI11 protocol. So to configure the L488 via the webserver, you would launch a web browser and type “192.168.0.1” into the URL field. To configure the L488 via telnet, you would type “telnet 192.168.0.1” at the command prompt. See below for more details on these two methods.

The second gateway is at 206.143.62.5, and this hostname is “goofy.mycompany.com”. This gateway understands both the HPLAN and VXI11 protocol. It is probably a TAMS 3020 LAN/GPIB gateway.

Default Configuration Settings

The TAMS L488 LAN Gateway is shipped from the factory with default settings for the configuration values listed in Table 3-1. You can use the web server or telnet to change any of these settings. The TAMS L488 LAN Gateway uses these default configuration values until you explicitly change any of these values and set any other configuration values. The Gateway also reloads these values when the telnet “reset” command is done.

Parameter	Default Value	Configurable
IP address	192.168.0.1	Yes
Subnet Gateway Address	0.0.0.0	Yes
Subnet Mask	0.0.0.0	Yes
GPIB address	21	Yes
T1 delay	500 nanoseconds	Yes

Table 3-1 – Default Configuration Table

List of Configuration Values

This section provides a brief description of the configuration values that are used to configure the L488.

Hardware Address

This value is the unique address of the LAN interface in the TAMS L488 LAN I/O Gateway. (Note that this is also often called the link-level address, the Ethernet station address, the MAC Address or the LANIC ID.) This address is uniquely programmed during manufacture, and cannot be changed. It can be read through the web server or telnet, but is not normally used during configuration. Your Network Administrator may want to be informed of this address for troubleshooting or security purposes.

IP Address

This value is the Internet Protocol (IP) address of the LAN I/O Gateway. The IP address is a required value and is used for all IP and TCP/IP communications with the LAN I/O Gateway. The IP address is represented in dotted decimal notation (for example, **15.1.222.201**). This number is not assigned by TAMS; rather, it is assigned by your designated Network Administrator. The Gateway uses the default IP address of 192.168.0.1 as a temporary IP address until you configure a real IP address.

Gateway Address

This value is the IP address of the subnet gateway that allows the L488 to communicate with systems that are not on the local subnet. Thus, this is the gateway where packets are sent which are destined for a device not on the local subnet, as determined by the subnet mask setting. (See the explanation for the subnet mask configuration value.)

Only one subnet gateway can be configured. A value of **0.0.0.0** indicates that no subnetting is to be done, which is the equivalent of setting the subnet gateway address to the IP address of the LAN I/O Gateway. A device on the network does not need a gateway, if all communication with it will occur on its subnet.

If your L488 will be on the same subnet as your host PC, then leave the Gateway at 0.0.0.0. If your L488 will be on a different subnet than your host PC, then enter the IP address of the router or gateway which will forward the packets to the PC.

Subnet Mask

This value is used to enable the L488 to determine if an IP address is on the same local subnet as the L488 itself. When an address is on a different subnet, all packets must be sent to a subnet gateway. The subnet mask is sometimes not needed with today's smart subnet gateways, which automatically know when to forward packets between subnets. A value of **0.0.0.0** indicates no subnetting is to be done. That is, no packets will be forwarded between subnets, and the L488 must be used with clients that reside on the same subnet.

GPIB Address

This is the address on the GPIB bus of the interface itself. Each device on a bus must have a unique address. Must be an integer between 0 and 30 inclusive. The default value is 21.

T1 Delay

This is the delay in nanoseconds from the data being available on the GPIB to the "Data Available" line being asserted. Must be an integer between 350 and 2000 inclusive. 500 is a "safe" and typical number to use. If you have all modern GPIB instruments on relatively short cables, 350 is also reasonable. Some very old GPIB instruments may require the full 2000. For details, see the IEEE488 specification.

Remote Configuration via Telnet

Remote Configuration can be from:

- From a RedHat Linux workstation
- From an HP-UX Unix workstation
- From a Windows workstation

The following examples of Remote Configuration assume that the workstation being used for configuration and the Gateway reside on the same subnet.

Remote Configuration

The Gateway box can be remotely configured from a RedHat Linux machine, an HP-UX Unix machine, or a Windows machine. Jump down to the appropriate section based on what workstation will be used to set the configuration of the Gateway.

Remote Configuration from a RedHat Linux Workstation

The Gateway is initially configured with an IP address of 192.168.0.1, and subnetting disabled. Since this address will most likely not be in your local subnet, routing from a RedHat workstation must be set up to allow initial communication with the Gateway, until such time as the Gateway IP address can be changed.

Log in as root user on the workstation. Determine what the device name of the Ethernet connection to be used to communicate with the Gateway is. This is frequently eth0.

Confirm that with a **route** command. The last column of output is labeled Iface, and shows what interfaces are being used for the various routes. Generally, "eth0" and "lo" will be the only two shown. The "eth0" interface is the physical interface to the LAN.

The command needed to add the routing with eth0 is:

```
route add -host 192.168.0.1 dev eth0
```

Consult the manual pages for 'route' and 'netstat', if trouble is encountered in adding the proper route. Now jump ahead to the section "Remote Configuration Continued".

Remote Configuration from an HP-UX Workstation

The Gateway is initially configured with an IP address of 192.168.0.1, and subnetting disabled. Since this address will most likely not be in your local subnet, routing from an HP-UX workstation must be set up to allow initial communication with the Gateway, until such time as the Gateway IP address can be changed.

Log in as root user on the workstation. Determine what the hostname of the HP-UX workstation is with the **uname -n** command.

The command needed to add the routing with eth0 is:

```
route add host 192.168.0.1 hostname
```

Consult the manual pages for 'route' and 'netstat', if trouble is encountered in adding the proper route. Now jump ahead to the section "Remote Configuration Continued".

Remote Configuration from a Windows Workstation

The Gateway is initially configured with an IP address of 192.168.0.1, and subnetting disabled. Since this address will most likely not be in your local subnet, routing from a Windows workstation must be set up to allow initial communication with the Gateway, until such a time as the Gateway IP address can be changed.

Log in as a user with administrative privileges. An example command to add the routing to the Gateway is:

```
route add 192.168.0.1 hostname
```

or

```
route -p add 192.168.0.1 hostname
```

The 'hostname' parameter is the name or IP address of the Windows workstation being used. The first command adds a route that does not survive a reboot, while the second command adds one that does survive.

Additional help can be obtained by doing **netstat /help** and **route /help** commands.

After successfully performing the **route add** command as above, a new entry should appear in **netstat -r** output, similar to:

```
=====
Active Routes:
Network Destination  Netmask          Gateway          Interface        Metric
192.168.0.1          255.255.255.255  aaa.bbb.ccc.ddd  aaa.bbb.ccc.ddd  1
=====
```

This will allow the local machine at address aaa.bbb.ccc.ddd to communicate with the Gateway box at 192.168.0.1. The **route -p add** command would add a similar line under "Persistent Routes".

Remote Configuration Continued

At this point, the required routing from the local workstation to the Gateway box should be in place. Confirm this with the **ping** command from the local workstation:

```
ping 192.168.0.1
```

Output similar to the following should be obtained:

```
Reply from 192.168.0.1: bytes=32 time<10ms TTL=255
```

Ping statistics for 192.168.0.1:
Packets: Sent = 4, Received = 4, Lost = 0(0% loss),
Approximate round trip time in milli-seconds:
Minimum = 0ms, Maximum = 0ms, Average = 0ms

This shows four replies from the Gateway box. On some platforms, it may be necessary to type <Ctrl-C> to terminate the **ping** command. If the **ping** command cannot communicate successfully with the Gateway, review the routing that should be in place, the physical LAN cabling, and make sure the Gateway is powered up. Consult with your local System Administrator for assistance in dealing with network problems.

Now, communications with the Gateway box have been successfully demonstrated, and we're ready to configure network parameters and interface card parameters to suit the local environment.

The utility used for communication with the Gateway is the common command **telnet**. From the command line:

```
telnet 192.168.0.1
```

The response from the Gateway should be:

```
TAMS L488 Gateway Configuration version 1.0  
Copyright 2008, Test & Measurement Systems Inc.
```

```
Type help to get a list of commands.  
>
```

The version number is subject to change. The ">" symbol is the prompt for the command-line interface.

Enter **help** in order to show the supported commands. If the commands are not being shown as they are typed, then enter '**echo yes**' in order to turn on the terminal echo.

The **config** command displays a summary of the network parameter settings, plus shows which interfaces are currently configured in the system:

```
>config  
hwaddress:    00:02:B6:15:36:49  
ip:           192.168.0.1  
gateway:      0.0.0.0  
subnetmask:   0.0.0.0  
maxconnections: 0  
GPIB Interface: gpib0  
GPIB address: 21  
Short T1 delay (nanoseconds): 500  
>
```

In this sample output, all parameters are set to factory-default values.

The IP address of the Gateway must be changed to an address assigned by a local System Administrator for its use. This should be an address within the local subnet in which the Gateway will be used.

To change the IP address from 192.168.0.1 to aaa.bbb.ccc.ddd, simply type:

```
>ip aaa.bbb.ccc.ddd
```

The line that says:

```
gateway:      0.0.0.0
```

must also be changed, if subnetting is to be enabled. In the usage, "gateway" refers to the "subnet gateway", a machine that routes packets into and out of the local subnet when required. This is a different use of the term than Gateway, which is used as shorthand for the TAMS L488 LAN I/O Gateway in this document.

If there is a computer or router designated as the gateway for the subnet on which the L488 Gateway box resides, then its IP address is appropriate here. Simply type in its address:

```
>gateway www.xxx.yyy.zzz
```

The default value of 0.0.0.0 is acceptable if no communication across subnets (i.e. subnetting) is to be done.

If subnetting is to be used, then the subnetmask should also be configured at this time. In most situations, 255.255.255.0 is appropriate, but check with your local System Administrator for confirmation. Set the chosen subnetmask as follows:

```
>subnetmask 255.255.255.0
```

The default value of 0.0.0.0 is acceptable if no communication across subnets (i.e. subnetting) is to be done.

None of these networking parameters have actually been changed yet in non-volatile memory. Do a **config** command to allow verification of the parameters and if they are satisfactory, then enter the **save** command. This is necessary to save the changed values in memory. A reboot is also needed to allow the networking to be restarted with the new values. This is done automatically by the **save** command when required. After the reboot, the IP address of the Gateway is changed and further remote accesses to it via **ping**, **telnet**, or application programs must be done to the new address.

If the network parameters were successfully modified, you may want to jump to the "Testing Network Configuration" section at the end of this chapter to verify proper operation. If trouble was experienced in setting network parameters, you may need to continue on with the "Default Configuration" section following. The default values for all parameters are listed in the "Default Values" section of the chapter to allow you to decide if any further parameter value changes are needed for your system.

Testing Network Configuration

At this point, the network parameters should have been customized and the Gateway box accessible on the network. Confirm this by executing a **ping** command from a remote workstation directed to the Gateway box. For example, if you changed the IP address to 192.168.0.100:

```
C:\>ping 192.168.0.100
```

```
Pinging new_host_name with 32 bytes of data:
```

```
Reply from 192.168.0.100: bytes=32 time<10ms TTL=225
```

```
Ping statistics for 192.168.0.100:
```

```
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
```

```
Approximate round trip times in milli-seconds:
```

```
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

If reliable communication cannot be established, review the appropriate section on network configuration. Try pinging to 192.168.0.1 to see if the IP address did not get changed as expected. As a last resort, use the "Default Configuration" method above.

4. Usage with SICL/VISA Applications

This chapter shows how to use the TAMS L488 LAN I/O Gateway to remotely access an instrument via the gateway. This chapter is only meant as an overview of the steps needed to get a SICL or VISA application to work remotely with the L488 Gateway rather than a local instrument. The examples assume the client is either Red Hat Linux or HP-UX. For complete details refer to the SICL and VISA documentation listed in Appendix B.

After you have finished network configuration of the Gateway as outlined in the previous chapter, the next step is to connect your instrument to the L488 Gateway GP-IP connector and then configure a virtual LAN device under your I/O library (SICL or VISA) on your client machine. Then you can run your SICL/VISA application using this virtual LAN device on your client machine.

Connecting your instrument to the L488 Gateway

Connect your L488 directly to the GPIB connector on the back of your instrument, or “piggybacked” onto the GPIB cable connector on the back of the instrument.

Choosing a LAN protocol

As previously mentioned the L488 supports the VXI-11 LAN protocol, not the HP/Agilent proprietary SICL LAN protocol. VXI-11 LAN was developed by the VXIbus Consortium and permits the interoperability of LAN software from different vendors.

Configuration for SICL on Linux

Use **iosetup** to add a virtual LAN device for VXI-11 LAN.

su – root

Password:

/opt/sicl/bin/iosetup

In the Available interfaces list box select “VXI-11 LAN client” or “Top Level LAN Client”

Click “Configure”

A dialog box will pop up. For our example change the symbolic name to “vxilan”.

The protocol may be either “Auto” or “VXI-11”, but it cannot be “SICL-LAN”.

Click “ok”.

Click “ok” in the main window.

Now we have a virtual LAN device configured on our client machine named “vxilan” which can be used to run SICL based applications on our client machine to a remote instrument connected to the L488 Gateway.

Running a SICL application

To run a SICL application the following information needs to be specified as the device address:
1) virtual LAN device symbolic name configured by **iosetup**, 2) IP address of L488 Gateway, 3) GPIB interface symbolic name and bus address.

This information is specified with syntax as follows:

```
<virtual LAN name>[<IP address >]:gpib0,<GPIB address>
```

An example would be:

```
vxilan[192.168.0.100]:gpib0,22
```

“vxilan” is the virtual VXI11 LAN name as specified to **iosetup** as the symbolic name
“192.168.0.100” is the IP address for the L488 (fully qualified domain names or IP addresses are also acceptable)

“gpib0” is the L488 interface symbolic name

“22” is the GPIB bus address of the instrument

Refer to your application documentation to see how a device address is specified to the application.

Configuration for VISA on Linux

Make sure to first do the steps under “Configuration with SICL” which generates a LAN virtual device named “vxilan”

Use **iosetup** to add a virtual LAN device

```
su – root
```

```
Password:
```

```
/opt/sicl/bin/iosetup
```

```
Click “configure VISA”
```

```
In the “Unconfigured interfaces list box” select “vxilan” or “Top Level LAN Client”
```

```
Click on “configure”
```

```
For the interface name use, for example, GPIB1
```

```
For Remote Hostname enter the TAMS L488 Gateway IP address
```

```
For Remote SICL interface name we must choose gpib0
```

```
Click on “Automatically identify all devices at runtime”
```

```
Click on “ok”
```

```
Click on “ok” in the VISA configuration window
```

Now we have a virtual LAN device configured on our client machine named “GPIB1” which can be used to run VISA based applications on our client machine to a remote instrument connected to the L488 Gateway.

Running a VISA application

There is no difference in running your VISA application to a L488 Gateway as to a local GPIB interface except the virtual device name is given (e.g. “GPIB1” using the above configuration)

rather than a local device name. So in the above example, if we wanted to talk to an instrument at GPIB address 5, we could code in C:

```
status = viOpen (RMsession, "GPIB1::5", VI_NULL, VI_NULL,  
                &session);
```

See the VISA documentation for details.

NEED INFORMATION ON HOW TO CONFIGURE FOR WINDOWS

5. Troubleshooting

This chapter explains how to troubleshoot problems you may encounter with the TAMS L488 LAN I/O Gateway. This chapter includes information for:

- HP SICL LAN Error Codes and Messages
- Network Connection Problems
- Configuration Problems
- Client Connection Problems
- Client Run-time Errors

Note: Throughout the troubleshooting information in this chapter, reference is often made to Configuration commands you can use to troubleshoot problems. The Configuration Utility commands for the TAMS L488 LAN I/O Gateway are fully explained in Chapter 5, “Administration.”

Also, reference is often made to various configuration values. See Chapter 3, “Configuration,” for descriptions of the configuration values used with the LAN I/O Gateway, as well as the methods used to configure the Gateway.

HP SICL LAN Error Codes and Messages

The following table lists the more common SICL LAN error codes and messages that a client application might encounter when using the TAMS L488 LAN I/O Gateway. The final column in the table (Troubleshooting Explanation) explains the error and suggests possible troubleshooting procedures to try.

Error Code	Error Message	Troubleshooting Explanation
I_ERR_BADADDR	Bad address	The device/interface address passed to iopen doesn't exist. Use TAMS Gateway Finder to verify the IP address, then use the web browser at that IP address to verify the L488 settings. Example typical addresses would look like: <code>vxilan[192.168.0.100]:gpib0,22</code> <code>lan[192.168.0.100]:gpib0,22</code>
I_ERR_NOCONN	No connection	The communication session with the Gateway was never established, or the connection to a remote Gateway was dropped. See I_ERR_BADADDR.
I_ERR_NORSRC	Out of resources	No more resources are available. Use the telnet status command to get more information. The L488 can only support two VXI-11 clients at one time.
I_ERR_SYMNAME	Invalid Symbolic Name	The symbolic name passed to iopen was not recognized. See I_ERR_BADADDR.
I_ERR_TIMEOUT	Timeout occurred	A timeout occurred while performing an operation. The device may be busy, in a bad state, or a longer timeout value may be needed for the operation of the device. Verify the correct address was used in iopen . You may have to increase the timeout values in your program to account for the increased latency of TCP/IP.

Table 5-1 Common SICL LAN Errors

Network Connection Problems

Before attempting to communicate with the TAMS L488 LAN I/O Gateway, you may want to verify that the network connection and cabling are correct. Do the following:

- Verify proper connections and network terminations visually. (Refer to the installation instructions in Chapter 2.)
- Power on the LAN I/O Gateway. The Power LED must glow solid green. Make sure that your LAN is providing Power over Ethernet to the L488.
- Make sure the L488 is fully booted by waiting 1/2 minute at 10BASE-T or 10MBPS. At 100MBPS (100BASE-T) the connection should be instantaneous. The L488 is connected when the left LED on the RJ45 connector glows green.
- Run the TAMS Gateway Finder. If possible, run it from the same machine as your test program will run on. Make sure you have selected the correct L488 host from the list if more than one appears.
- Verify that any firewalls are disabled on the system where tL488conf is being run.
- Verify that the Gateway is on the same local subnet as the client system from which you are running the TAMS Gateway Finder. If not, consult your Network Administrator to determine if the default IP address will work from a separate subnet, or to find a client system on the same local subnet that you can use.
- Verify that the IP address you are trying to change to is a valid IP address for the subnet the L488 resides on. Also make sure no other machine is using that IP address. Use **ping** to see if another machine responds to that IP address.
- Verify that the **route** command was performed properly. Use the following command to display the network routing tables:

```
>netstat -r
```

Client Connection Problems

Once the TAMS L488 LAN I/O Gateway has been successfully configured and the configuration has been verified, individual clients might still have problems getting a connection to the Gateway.

The first step is to verify that the client system has network access to the Gateway:

1. Use the **ping** command, as follows.

- On an HP-UX or Linux client system, enter:
 >**ping** *hostname* (or) *IP_address*

For example:

```
>ping new_host_name
PING new_host_name: 64 byte packets
64 bytes from 128.10.0.3: icmp_seq=0. time=8. ms
64 bytes from 128.10.0.3: icmp_seq=1. time=3. ms
64 bytes from 128.10.0.3: icmp_seq=2. time=3. ms
64 bytes from 128.10.0.3: icmp_seq=3. time=3. ms
```

Each line after the **PING** line is an example of a packet successfully reaching the Gateway. If after several seconds **ping** does not print any lines, use <Ctrl-C> to kill **ping**. The **ping** command will then report on what it found. For example:

```
----new_host_name PING Statistics ----
7 packets transmitted, 0 packets received, 100% packet loss
```

This indicates that the client was unable to contact the Gateway. It could be that the Gateway is on a different subnet than the client (see your Network Administrator), or the Gateway could have incorrect network configuration values (see the previous information on “Network Connection Problems”).

- On a Windows client system, enter:
 >**ping** *hostname* (or) *IP_address*

For example:

```
>ping new_host_name
Pinging new_host_name[128.10.0.3] with 32 bytes of data:
Reply from 128.10.0.3:bytes=32 time=10ms TTL=255
Reply from 128.10.0.3:bytes=32 time=10ms TTL=255
Reply from 128.10.0.3:bytes=32 time=10ms TTL=255
Reply from 128.10.0.3:bytes=32 time=10ms TTL=225
```

Each line after the “Pinging” line is an example of a packet successfully reaching the Gateway from the client system. However, if **ping** is unable to reach the host, you will see a message similar to the following:

```
Pinging new_host_name[128.10.0.3] with 32 bytes of data:
Request timed out.
Request timed out.
Request timed out.
```

This indicates that the client was unable to contact the Gateway. It could be that the Gateway is on a different subnet than the client and subnetting is not properly configured (see your Network Administrator), or the Gateway could have incorrect network configuration values (see the previous information on “Troubleshooting Network Configuration”).

2. Once **ping** works, you can try the following **rpinginfo** commands from an HP-UX or Linux client system, using the Gateway IP name or IP address to verify proper operation of the VXI-11 server inside the Gateway:

>rpcinfo -p *IP_address*

This command should give the following response:

program	vers	proto	port	
100000	2	tcp	111	portmapper
100000	2	udp	111	portmapper
395183	1	tcp	1024	

You can try the following command to verify operation of server inside the Gateway box:

>rpcinfo -t *IP_address* 395183

program 395183 version 1 ready and waiting

The command and response indicates the VXI-11 server in the Gateway box is operational. If the command fails to provide the indicated response, try rebooting the Gateway box to recover. If the problem persists, contact TAMS for support. The VXI-11 server should always be running to handle the VXI-11 protocol.

Note: If the **rpcinfo -p** command executes properly, but **rpcinfo -t** commands hang without completing, this is generally caused by a firewall on the client, or between the client and Gateway blocking access. If this is seen on a RedHat Linux machine, review the firewall configuration to see if it is active.

3. The **telnet** command can be used from any supported workstation to verify if a client has network access to the Gateway as well. If the **telnet** command returns the message:

connection refused

then connectivity on the network has been shown, but there may be an internal error in the Gateway.

If one client has the Configuration Utility open, and another client attempts to use the utility, then an error is generated for that other client. For Windows clients, other than XP Professional, the error is:

Connection to host lost

For Windows XP Professional clients, there generally will be no error message visible.

For a Linux or HP-UX client, the error is:

Connection closed by foreign host.

If a client opens the Configuration Utility and leaves it open due to a crash or network failure, it may be necessary to power-cycle the Gateway box to recover from that situation.

4. The **iclear** command can be used to verify connectivity from the client to the server:

iclear lan[192.168.0.100]:gpib0

An error message of “Bad address” or “Invalid address” returned generally indicates that **lan** is not set up properly on the client machine. Use the **iosetup** utility on the client to correct the problem.

Client Run-time Errors

When debugging problems involving application programs, it may be useful to use SICL commands from the command line in order to verify basic connectivity. See the "Command Line Examples" section at the end of this chapter, if help is needed in diagnosing some of the problems indicated by the following error messages.

The following are common run-time errors that may occur on a client that is using a TAMS L488 LAN I/O Gateway.

- **iopen** fails: Invalid address errors, “Error 3, lan_connect failed”, or “Bad Address”
Use the Configuration Utility commands to verify that the interface address, name, and/or logical unit configuration values are correct. Also, use **iosetup** on the client machine to verify that the LAN client is correctly configured.
- **iopen** fails: No connection, “Error 6, lan_core_createSync() failed”
The connection to the LAN I/O Gateway failed for one of these reasons:
 - A TCP/IP network timeout occurred because the network connection is down or the Gateway is down.
 - The Gateway has reached its maximum concurrent client connections and this new connection was refused. Use the Configuration Utility **status** command to determine the current Gateway client connection status. You may need to have a client close its connection, or you may need to use the **clear** command in the Configuration Utility.
- **iopen** fails: Timeout
The client has timed out. The Gateway has not responded within the appropriate timeout time because:
 - A Linux firewall on the client is blocking the operation.
 - The network connection is down or the Gateway is down.
 - The server is busy performing an operation for a different client. Use the Configuration Utility **status** command to verify the Gateway status. You may need to increase the Client Timeout Delta configuration value on the LAN client, using **iosetup**.
- **iopen** fails or I/O operation fails: Out of resources
The Gateway was unable to open another session or perform the operation because it is out of resources. Use the Configuration Utility **status** to determine the current Gateway status. You may need to have a client terminate its connection, or you may need to use the **clear** command to reclaim resources.

- **iopen** fails: “Error 2, bad hostname, gethostbyname() failed”
The **iopen** failed because the IP address of the hostname could not be determined. Likely causes would be the hostname of the L488 machine not being available via DNS or NIS due to improper configuration of those services at the client or at the name servers.
- I/O operation fails: No connection
The connection to the Gateway failed because:
 - The network connection is down or the Gateway is down and a TCP/IP network timeout occurred.
 - The Gateway was powered off and then powered on, or a Configuration Utility **reboot** or **clear** command was executed, either of which terminates any open client connections.
 - Sporadic failures may be caused by DNS or NIS lookup failures. Try putting the name and IP address of the Gateway box in /etc/hosts for Linux or HP-UX clients to avoid the need for DNS or NIS services across the network.
- I/O operation fails: Timeout
There are several possible causes:
 - The client may be attempting a transaction to a non-existent or powered-off device. Check the address used, as well as the status of the device.
 - The network connection or Gateway has gone down since the previous I/O operation.
 - The I/O timeout specified is not long enough for the transaction to complete. You may need to verify that the Gateway I/O timeout configuration value is long enough if the client specified a timeout value of infinity.
 - The Gateway is busy performing an I/O operation for another client, or another client has the device/interface locked. Use the Configuration Utility **status** command to determine if another client is currently executing an operation, or if the required device/interface is locked. See the following discussion, “Gateway appears to be hung,” for more information.
 - Gateway appears to be hung. There are several possible causes. Note that, for all of the following, use of client timeouts and/or Gateway timeouts (the I/O timeout and LAN timeout configuration values) can be used to ensure that the Gateway will not “hang” indefinitely.
 - The network connection has gone down or the Gateway has gone down.
 - The Gateway may be attempting a transaction to a non-existent or powered-off device. Check the address used, as well as the status of the device.
 - The Gateway is busy performing a very long transaction to a (slow) device, or it is waiting for input from a device.
 - A client may be waiting for access to a device/interface locked by another client. Use the Configuration Utility **status** command to determine which clients have which devices or

interface locked, and which clients are waiting for those locks to be freed before they can proceed. Check for possible deadlock situations and, if possible, make sure the clients owning locks and the connections to those clients are still up and functioning.

If you determine that the Gateway is truly hung, you may be able to free it by terminating a particular client connection at the client, thus freeing up the resources to allow the Gateway to proceed. Otherwise, you may have to use the Configuration Utility **clear** or **reboot** commands, or power-cycle the L488.

Caution Any client operations in progress and client connections will be terminated by the **clear** or **reboot** commands, or by power-cycling.

Command Line Examples

From a Windows workstation, read 34 characters from an GPIB clock at address 22 on interface 'hpib', with Gateway hostname of TL488:

```
>\Program Files\Agilent\IO Libraries\bin\iread -c 34 lan [TL488]:hpib,22
01:01:21:00:22
01:01:21:00:22
```

From a Linux workstation, write a string of characters without terminating characters to interface 'gpio', with Gateway hostname of TL488:

```
echo -n "helpme" | /opt/sicl/bin/iwrite lan[TL488]:gpio
```

Note that installing SICL on Windows workstation does not automatically set the execution path to include SICL commands, so using the full path is necessary for the **iread** command to be found, unless the path is manually added and the system rebooted. Also, the **echo** command works somewhat differently on Windows vs. Linux/HP-UX, so that example would operate differently on Windows.

Of course, for the first example to work, an instrument capable of outputting data without first receiving a command must exist at bus address 22. For the second example to work, some appropriate circuitry must be connected to the GPIO interface, and the polarity of the handshake lines configured appropriately. If no circuitry is attached, any reads or writes will simply hang until timeouts are reached.

Aborting Pending Transactions

If an I/O operation is failing to complete due to a configuration problem, the command usually can be aborted by a <Ctrl-C> from the keyboard. However, this does not clear the I/O operation being attempted at the Gateway box. For example, if an attempt is made to do an **iread** command from a non-existent hpib device, aborting the **iread** command leaves the interface in use until a timeout occurs, or a **clear** command is done from the Configuration Utility. Attempts to **iread** from an actual device will be blocked by the first I/O operation. This memory of uncompleted transactions can cause unexpected results if you are not aware of the issue. Liberal use of the **status** and **clear** commands may be needed until programs and scripts are debugged and hardware issues resolved.

Using the **clear** command in the Configuration Utility with operations pending can in some situations cause segmentation faults, application errors, or other serious errors to be reported by client-side software. For this reason, it is preferable to abort the operation at the client first, and then use the **clear** command to clean up pending operations in the Gateway box.

A Technical Reference

This appendix provides a technical reference of the following topics for the TAMS L488 LAN I/O Gateway:

- Specifications
- GPIB Characteristics
- Serial terminal communication specifications

Specifications

Power Supply:

- Maximum Output : 40Watts
- Output Voltage and Current Rating : +5V@3A, +12V@2A, -5V@0.3A, -12V@0.3A to 264VAC@0.3A
- Input Voltage : 90VAC to 264VAC
- Input Frequency : 47 to 63Hz
- Efficiency : 70% typical
- Safety Standards : Meets UL, CSA, VDE standards
- EMI Standards : Meets FCC standards

Environmental Specifications:

- Operating Temp. : 0 to 50 celsius degree
- Storage Temp. : -20 to 85 celsius degree
- Relative Humidity : 5% to 95% non-condensing
- Altitude : 0 to 10,000ft
- Vibration (operating) : Passed MIL-STD-810F basic transportation vibration test

Physical Specifications:

90(w) x 195(h) x 217(d) mm

GPIB Characteristics

The GPIB connection conforms to IEEE 488.1 - 1987 specifications. Per this specification, the following constraints exist:

Total Bus length: Less than 2 meters x number of devices, and no more than 20 meters total length. Linear bus topology recommended.

Length between devices: Less than 2 meters between each device or equivalent standard load.

Total number of devices: 15 devices or less (includes TAMS L488 LAN I/O Gateway).

Address restrictions: Address 31 is a reserved IEEE 488 address. The TAMS L488 LAN I/O Gateway normally uses address 21, unless changed in the configuration table.

Drivers: The TAMS L488 LAN I/O Gateway uses 48mA three-state drivers (E2).

RS-232 Serial Terminal

Refer to your serial terminal documentation and/or PC hardware/software documentation to setup a serial terminal to the L488 Gateway. The L488 Gateway is expecting the following communication parameters to be used in your serial terminal software configuration:

Baud rate	38400
Parity	Odd
Data bits	8
Stop Bits	1

A serial terminal is not needed for this product. It can be used to see the boot sequence and also once the L488 is fully booted the current configuration values are displayed.

B Related Software Documentation

This appendix explains what software manuals you should follow to use the TAMS L488 LAN I/O Gateway with these I/O application software products:

- TAMS SICL and VISA for HP-UX 11i
- TAMS SICL for RedHat Linux
- HP SICL
- HP VISA
- HP VEE
- HP BASIC/UX 700
- TAMS BASIC/LX

Note: The TAMS L488 LAN I/O Gateway supports all I/O application operations by these software products except for parallel polling, SICL commander sessions, and asynchronous aborting.

The HP SICL and VISA products were originally developed by HP, and then transferred to Agilent as part of the corporate restructuring. Contact Agilent Technologies for purchase and support of those products.

TAMS SICL and VISA for HP-UX 11i Documentation

To use the LAN I/O Gateway with TAMS SICL on a client computer, you must configure the software first. Documentation is provided as .pdf and .ps files on the software disk. See *Installation and Configuration Guide for HP-UX I/O Libraries* (installation.xx) for installation, then *Standard Instrument Control Libraries User's Guide* (siclug.xx) for information on using SICL.

TAMS SICL for RedHat Linux Documentation

To use the LAN I/O Gateway with TAMS SICL on a client computer, you must configure the software first. See *Installation and Configuration Guide for Linux I/O Libraries* (installation.xx) for the installation, then *Standard Instrument Control Libraries User's Guide* (siclug.xx) for information on using SICL.

HP SICL Documentation

To use the LAN I/O Gateway, you must configure the LAN client software provided with HP SICL. See the “Installing and Configuring the HP I/O Libraries” chapter of the *HP I/O Libraries Installation and Configuration Guide* for configuration procedures.

To develop and use HP SICL I/O applications for the Gateway, see the “Using HP SICL with LAN” chapter of the *HP SICL User’s Guide*. HP SICL functions, including those that are LAN-specific, are fully defined in the *HP SICL Reference Manual*.

HP VISA

To use the LAN I/O Gateway, you must configure the LAN client software provided with HP SICL and HP VISA. See the “Installing and Configuring the HP I/O Libraries” chapter of the *HP I/O Libraries Installation and Configuration Guide* for configuration procedures. To develop and use HP VISA I/O applications for the Gateway, see the “Programming over LAN” chapter of the *HP VISA User’s Guide*.

HP VEE Documentation

To use the LAN I/O Gateway, you must configure the HP SICL LAN client software provided with HP VEE. See the *Installing the HP I/O Libraries for HP VEE* manual for configuration procedures. To develop and use HP VEE I/O applications for the Gateway, see the “Using Instruments” chapter of the *HP VEE Advanced Programming Techniques* manual.

HP BASIC/UX 700 Documentation

Version 8.x

To use the LAN I/O Gateway, you must configure the HP SICL LAN client software provided with HP BASIC/UX 700 Version 8.x. See the “Installing and Configuring SICL for BASIC/UX 8.x” chapter of the *Installing and Using HP BASIC/UX 8.x* manual for configuration procedures.

To develop and use HP BASIC/UX 700 Version 8.x I/O applications for the Gateway, see “The HP SICL/LAN Interface” chapter of the *HP BASIC Interface Reference* manual.

Version 7.1

To use the LAN I/O Gateway, you must configure the HP SICL LAN client software provided with HP BASIC/UX 700 Version 7.1. See the “Configuring HP SICL for Series 700” chapter of the *Installing and Maintaining HP BASIC/UX* manual for configuration procedures. To develop and use HP BASIC/UX 700 Version 7.1 I/O applications for the Gateway, see the “HP SICL/LAN Interface” chapter of the *HP BASIC Interface Reference* manual.

TAMS BASIC/LX Documentation

In order to use the LAN I/O Gateway, you must configure the TAMS SICL LAN client software provided with TAMS BASIC/LX Version 11.0. See the “Basic for Linux Documentation”, TAMS PN 2047K, for configuration procedures. To develop and use TAMS BASIC/LX applications for the Gateway, see the siclug.pdf or siclug.ps file shipped in the iolibs directory of the installation disks.

C Client Software Matrix

	SICL	VISA
Windows 98, 2000, XP	E2094x	E2094x
RedHat Enterprise Linux	82091	82091
HP-UX 10.20	E2091x	E2091x
HP-UX 11i	72091	72091

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E Glossary

address

A string uniquely identifying a particular interface or a device on that interface which is interpreted at the TAMS L488 LAN I/O Gateway to identify the interface or device.

client

Part of the client/server model used in distributed computing. A client is a computer system that requests services from a server computer system, such as I/O application requests, networking requests, and so forth.

controller

A computer used to communicate with a remote device such as an instrument. In the communications between the controller and the device, the controller is in charge of and controls the flow of communication (that is, it does the addressing and/or other bus management).

device

A unit that receives commands from a controller. Typically a device is an instrument but could also be a computer acting in a non-controller role, or another peripheral such as a printer or plotter.

gateway

A device that permits a network connection between the LAN that your computer understands, and the instrument specific interface that your device understands.

instrument

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

interface

A connection and communication media between devices and controllers, including mechanical, electrical, and protocol connections.

LAN

Local Area Network.

lock

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

logical unit

A logical unit is a number associated with an interface. In SICL, a logical unit uniquely identifies an interface. Each interface on the controller must have a unique logical unit.

server

Part of the client/server model used in distributed computing. The server is a computer system designated to act as a main servicer of requests from other client computer systems, such as I/O application requests, networking requests, and so forth.

SICL

The Standard Instrument Control Library, which is client-side software used for I/O application programming.

SRQ

Service Request. An asynchronous request (an interrupt) from a remote device indicating that the device requires servicing.

symbolic name

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

VEE

The HP Visual Engineering Environment, which is software used for I/O application programming.

VISA

The Virtual Instrument Software Architecture library, which is client-side software used for I/O application programming. Available from multiple vendors.

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