

TAMS L488 LAN GPIB Adapter



Installation and Configuration Guide

TAMS L488 LAN GPIB Adapter Installation & Operation Instructions

Test & Measurement Systems Inc.
750 14th Street SW
Loveland, CO 80537
USA

Telephone	(970) 669 6553
Fax	(970) 669 3090
Web Site	www.tamsinc.com
Email	info@tamsinc.com

How to Use This Guide

Use this guide to install and configure the TAMS L488 LAN GPIB Adapter for use with supported, network-equipped computer systems. You can also use this guide to administer the Adapter on your network and to troubleshoot any problems you might encounter while installing or configuring the Adapter. Network-equipped computer systems that are supported for use with the LAN GPIB Adapter 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 Adapter for GPIB 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 Adapter, please refer to the appropriate documentation for your software product(s). See Appendix B, “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 GPIB Adapter. 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 Adapter, you must also have superuser (root) privileges on those systems. If you will use a Windows workstation with the Adapter, you must also have system administrator privileges on those workstations.

TAMS L488 Table of Contents

1 - Overview	6
TAMS L488 Package Contents	6
Product Overview	6
2 - Installation	10
Prerequisites	10
Installing the Hardware	11
Installing the TAMS Adapter Software on Windows	12
Installing the TAMS Adapter Software on Linux	12
3 - Simple Network Configuration with DHCP	13
4 - Network Configuration without DHCP	15
Route Add	15
Verify the initial network configuration	17
Remote Configuration via the web server	18
Default Configuration Settings	18
List of Configuration Values	19
Remote Configuration via Telnet	21
TAMS Adapter Finder	22
Resetting the Adapter to factory defaults	23
Testing the final network configuration	24
5 - Usage with SICL/VISA Applications	26
Connecting your instrument to the L488 Adapter	26
Choosing a LAN protocol: use VXI-11	26
Configuration for SICL on Linux	26
Errors using Protocol AUTO	27
Running a SICL application	27
Configuration for VISA on Linux	28
Running a VISA application	28
Configuration on Windows	28
6 - Troubleshooting	30
HP SICL LAN Error Codes and Messages	31

Network Connection Problems	31
Client Connection Problems	32
Client Run-time Errors	34
Appendix A - Technical Reference	38
Specifications	38
GPIB Characteristics	38
Appendix B - Related Software Documentation	39
TAMS SICL and VISA for HP-UX 11i Documentation	39
TAMS SICL and VISA for RedHat Linux Documentation	39
HP SICL Documentation	40
HP VISA	40
HP VEE Documentation	40
HP BASIC/UX 700 Documentation	40
TAMS BASIC/LX Documentation	41
Appendix C - Software License Agreement	42
Glossary	43
Warranty	45
Safety	46
Declaration of Conformity	47

1 - Overview

This chapter provides a general overview of the TAMS L488 LAN GPIB Adapter, including:

- An explanation of the contents of your TAMS L488 product package.
- A brief overview of the TAMS L488 LAN GPIB Adapter's functionality.

TAMS L488 Package Contents

Your TAMS L488 product package contains the following items:

- TAMS L488 LAN GPIB Adapter
- CD containing this Manual and software for configuring the Adapter on your network

Product Overview

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

The Adapter connects the local area network (LAN) from the computer system to a local instrumentation buss, 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 GPIB Adapter, 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 Adapter is configurable via a web browser, with a default value of 21.

The Adapter is powered by Power over Ethernet, or PoE, IEEE standard 802.3af. The standard provides for power to be delivered over a Cat-5 cable through the 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 Adapter must be used with Power over Ethernet: the GPIB and LAN without PoE provide no power. The Power over Ethernet can be provided by a PoE Ethernet Switch, or a PoE injector. Two examples of PoE injectors are PhiHong PSA16U-480(POE) and Ault PW130RB.

Note: You must choose a Power over Ethernet injector that meets IEEE 802.3af, since some “PoE” injectors do not meet the standard. Consult the documentation from the Power over Ethernet injector. For example, PhiHong PSA16U-480 and the Ault PW130RA (Rev A) are **NOT** IEEE 802.3af compliant.

SICL and VISA instrument control libraries provide the ability to communicate with remote instruments in the same manner as if they were connected locally to a computer.

Software/Firmware Architecture

The TAMS L488 LAN GPIB Adapter 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
- TAMS SICL and VISA for RedHat Linux

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 GPIB Adapter 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: the proprietary SICL LAN Protocol and the newer standard VXI-11 Protocol (also known as the TCP/IP Instrument Protocol). The TAMS L488 Adapter 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 GPIB Adapter. See “Usage with SICL & VISA Applications”.

How I/O Application Software Works with the Adapter

This subsection briefly summarizes how the software on a client computer system works with the TAMS L488 LAN GPIB Adapter to complete I/O application operations on attached instruments. For more detailed information on how to use your software with the Adapter, please refer Chapter 5 “Usage” or to your software documentation as listed in Appendix B, “Related Software Documentation.”

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

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

Although several instruments can be connected to the Adapter’s GPIB, only one I/O operation can occur on the GPIB 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 Adapter'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 Adapter 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 6, "Troubleshooting."

Basic Networking Concepts

Client/Server Model

Throughout this manual, the terms Client and Server will be used. The Server is the TAMS L488 LAN GPIB Adapter, which receives requests from Clients (workstations or PC's running user applications) to perform various I/O operations on GPIB in the Adapter. The software to operate the Adapter is factory installed in the Adapter. The Adapter 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 Adapter 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 Adapter 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 GPIB Adapter. 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 GPIB Adapter 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. The proprietary SICL LAN protocol was developed originally by HP and transferred to Agilent. The standard VXI-11 is a newer protocol that is supported by a wider range of manufacturers, including Agilent and TAMS. The L488 Adapter 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 Adapter 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

Routing is 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 Windows or 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 Adapter can sometimes cause problems in communicating with the Adapter.

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 Adapter.

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 Adapter, *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 Adapter 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 GPIB Adapter on the LAN and GPIB 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 Adapter hardware by connecting it to the LAN (with Power over Ethernet) and GPIB.
3. Install the Adapter software on Windows or Linux.

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 GPIB Adapter.

Hardware Requirements

To install the Adapter, 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.
 - 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 GPIB Adapter can connect via the appropriate LAN cables.
- The LAN must provide Power over Ethernet (PoE) to the L488.
- The TAMS L488 LAN GPIB Adapter.
- GPIB instrument(s), including any GPIB cable(s) needed to connect the Adapter to the instrument(s).

Software Requirements

Each client computer system that will access the Adapter 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 Adapter.

- TAMS LAN Libraries for Linux
- Agilent SICL and VISA for HP-UX 10.20
- TAMS SICL and VISA for HP-UX 11i
- Agilent SICL and VISA for Microsoft Windows
- TAMS SICL and VISA for RedHat Linux
- NI VISA for Windows
- TAMS Adapter Finder utility for Microsoft Windows or for Redhat Linux on at least one client.

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

Installing the Hardware

This section explains how to install the LAN GPIB Adapter hardware by connecting it to the LAN and GPIB.

1. Make sure the GPIB instruments you will connect to the Adapter are working properly.
2. Connect the Adapter to the LAN with PoE. If your Ethernet switch or hub already provides PoE, then just use a Cat-5 cable to connect your switch or hub directly to the RJ-45 connector on the back of the Adapter. 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 Adapter. Use only Cat-5 or better cabling. Two examples of PoE injectors are PhiHong PSA16U-480(POE) and Ault PW130. If you are connecting the Adapter directly to a PC (through a PoE injector) then use a LAN “crossover” cable. If you are connecting the Adapter to a LAN switch or Hub then use a straight-through LAN cable.

Note: You must choose a Power over Ethernet injector that meets IEEE 802.3af, since some “PoE” injectors do not meet the standard.

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 100BaseT 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 Adapter GPIB connector directly onto the GPIB connector of an instrument, or onto a GPIB cable on the back of an instrument. The Adapter 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.

Installing the TAMS Adapter Software on Windows

Insert the CD that came with your L488 into your CD drive of your client machine. The L488 Adapter must be on the same subnet (or accessible 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.

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.

Installing the TAMS Adapter Software on Linux

Note: You must have root permission to install the software. In addition, you must have permission to create and write to the directories /opt/sicl, /opt/vxipnp, and /etc/opt.

1. Insert the installation media into the drive and wait for the busy light to remain off.
2. If your system does not automount the CD-ROM, mount the CD-ROM.

```
mount /dev/cdrom /mnt/cdrom
```

The device file (/dev/cdrom) and mount point (/mnt/cdrom) may be different on your system.

3. Install the software.

```
/mnt/cdrom/linux/INSTALL
```

The exact location will vary depending on where you mounted the CD-ROM in Step 2.

4. Once the installation is complete, unmount the CD.

```
cd /
```

```
umount /mnt/cdrom
```

Use the mount point (/mnt/cdrom) you used in 2.

3 - Simple Network Configuration with DHCP

If your Local Area Network supports DHCP (Dynamic Host Configuration Protocol), the Adapter setup will be much more straightforward. Once you plug the Adapter into the LAN, the DHCP server will automatically assign the network parameters to the Adapter. Most such assignments are NOT permanent, so you should use these network parameters as temporary “getting started” values and then hardcode fixed network parameters.

1. Plug the Adapter into the LAN with DHCP.
2. Once the “LAN Connect” LED on the upper left of the RJ-45 jack glows green, the DHCP server has assigned an address to the L488. To find that address, run the “TAMS Adapter Finder”:

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/sicl/bin/lanfind`

Launching this utility under Windows:

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

On your desktop double click on the **TAMS Adapter Finder** icon

OR

Click on **Start->All Programs->TAMS Adapter Finder**

An example output is shown:

```
192.168.0.78  nameUnknown  VXI11
```

This means that the DHCP server chose the IP address “192.168.0.78” for the Adapter. We’ll use that IP address in the next step.

If the IP address is 192.168.0.1, be aware that this is the default address of the L488 when there is no DHCP. This probably means that your LAN does not have DHCP, and therefore you should follow the instructions in the next chapter.

At this point, the Adapter is using address “192.168.0.78”, but that address was provided by the DHCP server. You don’t want to rely upon that server providing this same address every time, as many network configurations will have trouble always producing the same address. Therefore, work with your Network Administrator to select a permanent or static IP address on that same subnet.

If the Adapter Finder does not find any devices, then perhaps your LAN does not support DHCP. In that case, see Chapter 4 - Network Configuration without DHCP.

3. Start a web browser, and type the IP address produced by the “TAMS Adapter Finder” into the URL field. The web page for the Adapter will be displayed. On that web page, click to UNcheck the “DHCP Enable” button, and then type in the IP address, Gateway Address, and Subnet Mask that you chose in conjunction with your Network Administrator. Then press the “Submit Changes. (Adapter will reboot)” button.

The TAMS L488 Adapter will reboot with the new network configuration parameters. After the left LED on the RJ-45 jack glows green indicating a LAN connection, click on the new address displayed in the web browser to verify that the new network parameters are working.

If the web browser does not load and display the webpage for the Adapter, then perhaps you typed in the IP address, subnet mask, or gateway incorrectly. Disconnect the Adapter from the LAN and repeat the steps in this chapter.

If the red Activity LED on the Adapter flashes, then the IP address chosen for the Adapter is already in use on your LAN. In other words, some other computer or internet device is already using that IP address, and you will have to change the IP address in the L488. In order to do this, you will have to reset the L488 to its factory defaults (see “Resetting the Adapter to factory defaults”) and then repeat the steps in this chapter. Coordinate your IP address with your Network Administrator.

4 - Network Configuration without DHCP

This chapter explains how to configure the TAMS L488 LAN GPIB Adapter on a network which does not have DHCP (Dynamic Host Configuration Protocol). If your LAN has DHCP, see Chapter 3.

To configure the LAN GPIB Adapter on a network either of these methods may be used:

1. Use the built in webserver in the L488. For most users, this will be the easiest method. With this method all the configurable parameters provided by the L488 LAN GPIB Adapter can be changed. With this method the IP address of the L488 must be known; otherwise TAMS Adapter 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 GPIB Adapter can be changed. With this method the IP address of the L488 must be known; otherwise TAMS Adapter Finder should be used to find these values. If you are familiar with using 'telnet' on your client this method will be easy to do, otherwise you may find it easier to use the webserver.

Note: The Adapter will try and use DHCP to obtain an IP address, and will wait 30 seconds before giving up and using its default IP address. So during these initial configuration steps, you will have to wait 30 seconds before the Adapter will connect to the network. The connection will be visible via the left LED on the RJ-45 jack glowing solid green. After the Adapter is configured with a working static IP address, DHCP can be disabled and the device will connect without the 30 second delay.

Route Add

Before you can talk to the Adapter, in general you will have to add to the route table on your Windows, Linux, or HP-UX client. The Adapter ships with a default address of 192.168.0.1. If your LAN is setup to use this particular subnet, then you can skip ahead to "Verify the initial network configuration". For the more typical case where your LAN does not use addresses of the form 192.168.0.xxx, follow the directions in this section before continuing.

If your Adapter's IP address has changed, and you don't know what it is changed to, the TAMS Adapter Finder will find the L488 on your LAN and tell you its IP address, and optionally allow you to reset back to the factory default IP address. See the section "TAMS Adapter Finder" if you don't know the IP address of your Adapter. Then continue with the configuration.

The Adapter 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 Adapter.

Remote Configuration from a RedHat Linux Workstation

The Adapter 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 Adapter, until such time as the Adapter 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 Adapter 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 “Verify the Initial Network Configuration”.

Remote Configuration from an HP-UX Workstation

The Adapter 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 Adapter, until such time as the Adapter 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 “Verify the Initial Network Configuration”.

Remote Configuration from a Windows Workstation

The Adapter 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 Adapter, until such a time as the Adapter IP address can be changed.

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

Verify the initial network configuration

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 Adapter at 192.168.0.1.

At this point, the required routing from the local workstation to the Adapter 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

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

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

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 Adapter. 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 Adapter, review the routing that should be in place, the physical LAN cabling, and make sure the Adapter is powered up. Consult with your local System Administrator for assistance in dealing with network problems.

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

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 page for the Adapter will be displayed. On that web page, click to UNcheck the “DHCP Enable” button, and then type in the IP address, Gateway Address, and Subnet Mask that you chose in conjunction with your Network Administrator. Then press the “Submit Changes. (Adapter will reboot)” button.

The TAMS L488 Adapter will reboot with the new network configuration parameters. After the left LED on the RJ-45 jack glows green indicating a LAN connection, click on the new address displayed in the web browser to verify that the new network parameters are working. The see “Testing the final network configuration”.

Default Configuration Settings

The TAMS L488 LAN GPIB Adapter 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 GPIB Adapter uses these default configuration values until you explicitly change any of these values and set any other configuration values. The Adapter also reloads these values when the procedure described in “Resetting the Adapter to factory defaults” is followed.

Parameter	Default Value	Configurable
DHCP enable	Yes	Yes
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	350 nanoseconds	Yes

Table 4-1 – Default Configuration Table

List of Configuration Values

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

DHCP Enable

This value determines whether or not the DHCP (Dynamic Host Configuration Protocol) is enabled. If enabled, then the Adapter will request an IP address from a DHCP server on the LAN. Most routers can be a DHCP server, and will supply the Adapter with a valid IP address, subnet mask, and gateway address for this subnet.

Hardware Address

This value is the unique address of the LAN interface in the TAMS L488 LAN GPIB Adapter. (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 GPIB Adapter. The IP address is a required value and is used for all IP and TCP/IP communications with the LAN GPIB Adapter. 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 L488 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. 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.

GPIO 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

Short T1 Time: the user must specify the IEEE-488.1 T1 delay value for write data transactions in nanoseconds. Reasonable values are an integer between 350 and 1100.

The Short T1 Time affects the rate at which your GPIB interface handshakes bytes onto the bus when it is writing. This does not alter the speed at which data handshakes into the card on a read.

If all of the devices on your bus are capable of high speed (1 MB/sec) transfers, then you can set the Short T1 Time to 350 nsec, which will yield the fastest data transfers. If any of the devices are not capable of high speed communication, then use a Short T1 Time of 500 nsec. IEEE 488.1-1987 section 5.2.3 provides details on requirements for high speed communications.

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 Adapter reside on the same subnet.

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

```
telnet 192.168.0.1
```

The response from the Adapter should be:

```
TAMS L488 Adapter Configuration version 1.0
Copyright 2008, Test & Measurement Systems Inc.
Portions Copyright Freescale Semiconductor
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 Adapter settings:

```
>config
hwaddress:      00:02:B6:15:36:49
DHCP enable:    yes
ip:             192.168.0.1
gateway: 0.0.0.0
subnetmask:     0.0.0.0
force LAN speed to 10Base-T: no
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.

If your LAN does not use DHCP, then we should disable DHCP, since that will cause the Adapter to boot without waiting 30 seconds for a DHCP server to respond.

```
>DHCP no
```

The IP address of the Adapter 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 Adapter 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 this usage, “gateway” refers to the “subnet gateway”, a machine that routes packets into and out of the local subnet when required.

If there is a computer or router designated as the gateway for the subnet on which the L488 Adapter 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.

If your network only supports 10Base-T, the Adapter will connect to the LAN faster if you force the Adapter to use 10Base-T. For these rare occasions, use the following command.

```
>force10 yes
```

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 Adapter is changed and further remote accesses to it via **ping**, **telnet**, or application programs must be done to the new address.

TAMS Adapter Finder

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

Running TAMS Adapter Finder Utility

The TAMS Adapter Finder will search your LAN to find any TAMS L488 Adapters present.

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/sicl/bin/lanfind`

Launching this utility under Windows:

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

- On your desktop double click on the **TAMS Adapter Finder** icon
OR
- Click on **Start->All Programs->TAMS Adapter Finder**

The utility takes about 10 seconds to run. It will print out all of the Adapters 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 Adapters 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 earlier in this chapter for more details on these two methods.

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

Resetting the Adapter to factory defaults

If necessary, the Adapter can be reset to its factory defaults, as shown in Table 3-1. There are two ways to accomplish this. If you know the IP address of the Adapter, start a telnet session to that IP address, and then enter the “reset” and then the “save” commands.

If you don't know the IP address of the Adapter, or if the Adapter IP address conflicts with another P addressed computer or device on your LAN, the defaults can be restored by running the TAMS Adapter Finder with a special command line option. Therefore, first ensure that the Adapter Finder utility is installed, as described in the installation chapter.

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:
- Execute this command:
/opt/sicl/bin/lanfind -r

Launching this utility under Windows:

- Ensure that you are logged in with Administrator privileges
- Open a command window on your system
- Execute this command:
C:\Program Files\TAMS\TAMS Adapter Finder\lanfind -r

The utility will scan the LAN and find your L488 Adapter. It will print out the MAC address so that you can confirm that this is the correct unit. Then the utility will ask you to verify that you want to reset the L488 to factory defaults. Once confirmed, the unit will be returned to factory defaults, and will then reboot with those factory defaults.

Testing the final network configuration

At this point, the network parameters should have been customized and the Adapter accessible on the network. Confirm this by executing a **ping** command from a remote workstation directed to the Adapter. 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
Reply from 192.168.0.100: bytes=32 time<10ms TTL=225
Reply from 192.168.0.100: bytes=32 time<10ms TTL=225
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. The TAMS Adapter Finder may be used to locate the unit's IP address, if needed.

5 - Usage with SICL/VISA Applications

This chapter shows how to use the TAMS L488 LAN GPIB Adapter to remotely access an instrument. 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 Adapter rather than a local instrument. For complete details refer to the SICL and VISA documentation listed in Appendix B.

After you have finished network configuration of the Adapter as outlined in the previous chapter, the next step is to connect your instrument to the L488 Adapter GPIB 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 Adapter

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: use VXI-11

As previously mentioned the L488 supports the standard 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 VXI-11 LAN interface.

su – root

Password:

/opt/sicl/bin/iosetup

In the Available interfaces list box select “LAN Client”

Click “Configure”

A dialog box will pop up. For our example enter the symbolic name “lan”.

The protocol should be “VXI-11”, and it cannot be “SICL-LAN”. If you use “AUTO”, beware that you may get error messages. See below.

Click “OK”.

Click “OK” in the main window.

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

Errors using Protocol AUTO

If you set the protocol to AUTO, you may get error messages of the form

```
ilan<> Error 6, core connect failed: RPC: Program not registered
ilan<> Error 6, lan_core_createSync() failed
ilan<> Error 6, unable to setup connections to server
```

This message is caused by AUTO attempting to use the SICL-LAN protocol, and not being successful. Next, the VXI-11 protocol is used, and that will be successful, but the message misleads the user to conclude that the entire operation failed. There are two solutions: specify VXI-11 instead of AUTO, or turn logging OFF. Turning logging OFF may prevent helpful diagnostic messages from being seen.

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 Adapter, 3) GPIB interface symbolic name and bus address.

This information is specified with syntax as follows:

<LAN interface>[<IP address >]:gpib0,<GPIB address>

An example would be:

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

“lan” is the LAN interface 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” to configure a LAN interface named “lan”

Use **iosetup** to add a LAN interface

su – root

Password:

/opt/sicl/bin/iosetup

Click “Configure VISA”

In the “Unconfigured interfaces” list box select “lan” or “LAN Client”

Click on “configure”

For the interface name use, for example, GPIB1

For Remote Hostname enter the TAMS L488 Adapter 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 LAN interface 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 Adapter.

Running a VISA application

There is no difference in running your VISA application to a L488 Adapter 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.

Configuration on Windows

To configure SICL or VISA on Windows using Agilent IO Libraries, run the IO Config utility. This may not appear on your desktop or menu, so run one of the following:

```
Start, Run, "C:\Program Files\Agilent\IO Libraries\bin\iocfg32"
Start, Run, "C:\Program Files\Agilent\IO Libraries
Suite\bin\iocfg32"
```

Type in the double quotes, because these filenames have spaces. Once the utility starts, click on the “Configured Interfaces / TCPIP0 lan” entry. (If there is no such entry in Configured Interfaces, select “TCPIP Lan Client” in the “Available Interface Types”,

then click “Configure”). Once “TCPIP0 lan” entry is highlighted in “Configured Interfaces”, click on “Edit ...”. This brings up a dialog box. Set the SICL Interface name to “lan”, Default Protocol to “VXI-11”, and uncheck “Use TCP for Portmap Requests”. Click on both “OK” buttons to exit the utility and save changes.

You could now code in your C SICL program:

```
session = iopen ("lan[192.168.0.100]:gpib0,22");
```

which would open the device at GPIB address 22 on the given L488 Adapter.

To use VISA with Agilent IO, go back to the IO Config utility and take note of the VISA Name in “Configured Interfaces”. It is probably TCPIP0. In that case, you could code in your C VISA program:

```
status = viOpen (RMsession,  
"TCPIP0::192.168.0.100::gpib0,22::INSTR",  
                VI_NULL, VI_NULL, &session);
```

which would open the device at GPIB address 22 on the given L488 Adapter.

6 - Troubleshooting

This chapter explains how to troubleshoot problems you may encounter with the TAMS L488 LAN GPIB Adapter. This chapter includes information for:

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

Also, reference is often made to various configuration values. See Chapter 3 - Simple Network Configuration for DHCP for descriptions of the configuration values used with the LAN GPIB Adapter, as well as the methods used to configure the Adapter.

Error Code	Error Message	Troubleshooting Explanation
I_ERR_BADADDR	Bad address	The device/interface address passed to iopen doesn't exist. Use TAMS Adapter Finder to verify the IP address, then use the web browser at that IP address to verify the L488 settings. An example typical addresses would look like: <code>lan[192.168.0.100]:gpi0.22</code>
I_ERR_NOCONN	No connection	The communication session with the Adapter was never established, or the connection to a remote Adapter 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 accountfor the increased latency of TCP/IP.

Table 6-1 Common SICL LAN Errors

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 GPIB Adapter. The final column in the table (Troubleshooting Explanation) explains the error and suggests possible troubleshooting procedures to try.

Network Connection Problems

Before attempting to communicate with the TAMS L488 LAN GPIB Adapter, 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 GPIB Adapter. 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. At 100BASE-T the connection should be instantaneous. The L488 is connected when the left LED on the RJ45 connector glows green.
- Run the TAMS Adapter 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 the TAMS Adapter Finder is being run.
- Verify that the Adapter is on the same local subnet as the client system from which you are running the TAMS Adapter 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

- If the red Activity LED on the Adapter flashes, then the IP address chosen for the Adapter is already in use on your LAN. In other words, some other computer or internet device is already using that IP address, and you will have to change the IP address in the L488. In order to do this, you will have to reset the L488 to its factory defaults (see “Resetting the Adapter to factory defaults”) and then repeat the steps in Chapters 3 or 4. Coordinate your IP address with your Network Administrator.

Client Connection Problems

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

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

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_IP
PING new_IP: 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 Adapter. 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 Adapter. It could be that the Adapter is on a different subnet than the client (see your Network Administrator), or the Adapter 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_IP
Pinging new_IP[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 Adapter 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 Adapter. It could be that the Adapter is on a different subnet than the client and subnetting is not properly configured (see your Network Administrator), or the Adapter could have incorrect network configuration values (see the previous information on “Troubleshooting Network Configuration”).

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

>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 Adapter:

>rpcinfo -t IP_address 395183

program 395183 version 1 ready and waiting

The command and response indicates the VXI-11 server in the Adapter is operational. If the command fails to provide the indicated response, try rebooting the Adapter 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 Adapter blocking access. 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 Adapter 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 Adapter, or the Adapter may be out of memory.

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 Adapter 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 GPIB Adapter.

- **iopen** fails: Invalid address errors, “Error 3, lan_connect failed”, or “Bad Address”
Use the web server to verify that the interface address, name, and/or logical unit configuration values are correct. Also, use **iosetup** / IO Config on the client machine to verify that the LAN client is correctly configured as described in Chapter 5.
- **iopen** fails: No connection, “Error 6, lan_core_createSync() failed”
The connection to the LAN GPIB Adapter failed for one of these reasons:
 - A TCP/IP network timeout occurred because the network connection is down or the Adapter is down.
 - The Adapter has reached its maximum concurrent client connections and this new connection was refused. Use the telnet **status** command to

determine the current Adapter client connection status. You may need to have a client close its connection.

- The connection protocol is configured as AUTO or SICL-LAN. Change the configuration to VXI-11 as described in Chapter 5.

- **iopen** fails: Timeout

The client has timed out. The Adapter 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 Adapter is down.
- The server is busy performing an operation for a different client. Use the telnet **status** command to verify the Adapter status.

- **iopen** fails or I/O operation fails: Out of resources

The Adapter was unable to open another session or perform the operation because it is out of resources. Use the telnet **status** to determine the current Adapter 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 Adapter failed because:

- The network connection is down or the Adapter is down and a TCP/IP network timeout occurred.
- The Adapter was powered off and then powered on, or a telnet **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 Adapter 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 Adapter 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 increase the timeout values in your program to allow for TCP / IP latency.
- The Adapter is busy performing an I/O operation for another client, or another client has the device/interface locked. Use the telnet **status** command to determine if another client is currently executing an operation, or if the required device/interface is locked. See the following discussion, “Adapter appears to be hung,” for more information.
- Adapter appears to be hung. There are several possible causes. Note that, for all of the following, use of client timeouts and/or Adapter timeouts (the I/O timeout and LAN timeout configuration values) can be used to ensure that the Adapter will not “hang” indefinitely.
- The network connection has gone down or the Adapter has gone down.
- The Adapter 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 Adapter 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 telnet **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 Adapter 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 Adapter to proceed. Otherwise, you may have to use the telnet **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, query the identity of an IEEE 488.2 instrument at GPIB address 22:

```
>echo *IDN? | "\Program Files\Agilent\IO Libraries
Suite\bin\iwrite" -e 1 lan[192.168.0.1]:gpib0,22
```

```
>"\Program Files\Agilent\IO Libraries Suite\bin\iread"  
lan[192.168.0.1]:gpib0,22
```

Older version of the Agilent IO Libraries were in directory "IO Libraries", newer in "IO Libraries Suite".

From a Linux workstation,

```
>echo "*IDN?" | /opt/sicl/bin/iwrite -e 1  
lan[192.168.0.1]:gpib0,22  
  
>/opt/sicl/bin/iread lan[192.168.0.1]:gpib0,22
```

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 Adapter. For example, if an attempt is made to do an **iread** command from a non-existent GPIB device, aborting the **iread** command leaves the interface in use until a timeout occurs, or a **reboot** command is done from telnet. 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 **reboot** commands may be needed until programs and scripts are debugged and hardware issues resolved.

Using the **reboot** command in telnet 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 **reboot** command to clean up pending operations in the Adapter.

Appendix A - Technical Reference

Specifications

Power Supply:

- IEEE 802.3af Power over Ethernet
- Input Voltage: 48VDC
- Input Power: 2 watts max

Environmental Specifications:

- Operating Temp. : 0 to 40 degrees celsius
- Storage Temp. : -20 to 85 degrees celsius
- Relative Humidity : 5% to 80% non-condensing
- Altitude : 0 to 3000 meters

Physical Specifications:

2.5(w) x 1.1(h) x 3.75(d) inch

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 GPIB Adapter).

Address restrictions: Address 31 is a reserved IEEE 488 address. The TAMS L488 LAN GPIB Adapter normally uses address 21, unless changed from the factory default.

Drivers: The TAMS L488 LAN GPIB Adapter uses 48mA three-state drivers (E2).

Appendix B - Related Software Documentation

This appendix explains what software manuals you should follow to use the TAMS L488 LAN GPIB Adapter 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 GPIB Adapter 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 GPIB Adapter 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 and VISA for RedHat Linux Documentation

To use the LAN GPIB Adapter 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 GPIB Adapter, 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 Adapter, 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 GPIB Adapter, 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 Adapter, see the “Programming over LAN” chapter of the *HP VISA User’s Guide*.

HP VEE Documentation

To use the LAN GPIB Adapter, 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 Adapter, 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 GPIB Adapter, 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 Adapter, see “The HP SICL/LAN Interface” chapter of the *HP BASIC Interface Reference* manual.

Version 7.1

To use the LAN GPIB Adapter, 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 Adapter, see the “HP SICL/LAN Interface” chapter of the *HP BASIC Interface Reference* manual.

TAMS BASIC/LX Documentation

In order to use the LAN GPIB Adapter, 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 Adapter, see the siclug.pdf or siclug.ps file shipped in the iolibs directory of the installation disks.

Appendix C - Software License Agreement

Please carefully read this License Agreement before installing the software. Rights in the software are offered only on the condition that the Customer agrees to all terms and conditions of the License Agreement. If you do not agree to the terms of the License Agreement, you may return the unopened software package and the hardware for a full refund.

Portions of this software are Copyright 2006 by Freescale Semiconductor Inc.

In return for the payment of fee TAMS grants the Customer a license to use the software, until terminated subject to the following

Customer may use the software on any one computer.

Customer may not translate, reverse engineer, disassemble, or decompile the software.

Customer may make copies for archival purposes.

Customer has no other rights to copy.

All copies of the software must bear the copyright notice(s) contained on the original.

OWNERSHIP: Customer agrees that they do not have any title or ownership of the software, other than ownership of the physical media. Customer acknowledges and agrees that the software is copyrighted and protected under the copyright laws. Customer Acknowledges and agrees that the software may have been developed by a third party software supplier named in the copyright notice(s) included with the software, who shall be authorized to hold Customer responsible for any copyright infringement or violation of this License Agreement.

TRANSFER OF RIGHTS IN SOFTWARE: Customer may transfer rights in the software to a third party only as part of the transfer of all their rights and only if Customer obtains the prior agreement of the third party to be bound by the terms of this License Agreement.

Upon such transfer, Customer agrees that their rights in the software are terminated and that they will either destroy their copies and adaptations or they will deliver them to the third party.

Transfer to a US government department or agency or to a prime or lower tier contractor in connection with a US government contract shall be made only upon their prior written agreement to terms required by TAMS.

SUBLICENSING AND DISTRIBUTION: Customer may not sublicense the software or distribute copies or adaptations of the software to the public in physical media or by telecommunications without the prior written consent of TAMS.

TERMINATION: TAMS May terminate this software license for failure to comply with any of these terms provided TAMS has requested Customer to cure the failure and Customer has failed to do so within thirty (30) days of such notice.

UPDATES AND UPGRADES: Customer agrees that the software does not include updates and upgrades, which may be available from TAMS under a separate support agreement.

EXPORT CLAUSE: Customer agrees not to export or re-export the software or any copy or adaptation in violation of the US Export Administration regulations or other applicable regulations.

Glossary

address

A string uniquely identifying a particular interface or a device on that interface which is interpreted at the TAMS L488 LAN GPIB Adapter 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.

Adapter

The TAMS L488.

device

A unit that receives commands from a Adapter. Typically a device is an instrument but could also be a computer acting in a non-Adapter 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 Adapters, 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 Adapter 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.

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.

Warranty

ONE YEAR LIMITED WARRANTY

Test & Measurement Systems, Inc. warrants to the purchaser that the product will be free of all defects in material and/or workmanship for one year from the date of shipment to the customer.

In the event of malfunction or failure attributable directly to faulty material and/or workmanship, TAMS will at its option, repair or replace the defective product or components, to whatever extent it shall deem necessary to restore the product or component, to proper operating condition. TAMS may at its option repair or replace, a defective unit with a new or refurbished unit.

The customer shall be solely responsible for the failure of any TAMS product, resulting from accident abuse, or misapplication of the product, and neither TAMS nor its suppliers assumes liability as a consequence of such events under the terms of this warranty.

While TAMS has made every effort to provide clear and accurate technical information about the application of this product, neither TAMS nor its suppliers assumes liability for any events arising out of the use of this technical information.

This Warranty gives you specific legal rights and you may also have other rights which vary from state to state, and from country to country.

This Warranty is in Lieu of all other express warranties which now or hereafter might otherwise arise with respect to this product. ANY AND ALL IMPLIED WARRANTIES OF MERCHANT ABILITY AND FITNESS FOR PARTICULAR USE, SHALL HAVE NO GREATER DURATION THAN THE PERIOD FOR THE EXPRESS WRITTEN WARRANTY APPLICABLE TO THIS PRODUCT AS SHOWN ABOVE, AND SHALL TERMINATE AUTOMATICALLY AT THE EXPIRATION OF SUCH PERIOD.

(Some states and countries do not allow limitations on how long an implied warranty lasts, so this limitation may not apply to you) No action shall be brought for breach of any implied or express warranty after one year subsequent to the expiration of the period of the express written warranty.

Incidental and consequential damages caused by malfunction, defect, or otherwise and with respect to breach of any express or implied warranty, are not the responsibility of TAMS or its suppliers, and to the extent permitted by law, are hereby excluded both for property and to the extent not unconscionable, for personal injury damage. (Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.)

Safety



This symbol indicates a caution. See the manual for a complete explanation, and only continue when all conditions are fully understood and met.



This symbol indicates that the product complies with the requirements of the EMC Directive, and carries the CE Mark accordingly.

Ordinary protection: This unit is for indoor use only. It is not protected against a harmful ingress of moisture.

This product uses components that may be damaged by electrostatic discharge. Although all such components are protected, take precautions to avoid electrostatic discharge into the connectors.

Do not use this product in a manner not specified by TAMS.

Only qualified, TAMS-trained personnel may service this product.

Declaration of Conformity

The Declaration of Conformity is on file at Test & Measurement Systems, Inc.

Test & Measurement Systems, Inc.

750 14th Street SW

Loveland, CO 80537

USA

970 669 6553

TAMS L488 GPIB LAN Adapter

Printed in the USA E7.17.2008

Part # L488-90000