

# **USER'S GUIDE**

## **LSI40909G-S PCI to Fibre Channel Host Adapter for Sun Solaris**

*Version 1.0*

**February 2001**



## Electromagnetic Compatibility Notices

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

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- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
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# Preface

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This book is the primary reference and user's guide for the LSI Logic LSI40909G-S PCI to Fibre Channel Host Adapter for Sun Solaris board. It contains a complete functional description for the LSI40909G-S as well as complete physical and electrical specifications.

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## Audience

This document assumes that you have some familiarity with Fibre Channel protocol and related support devices and will benefit persons installing and using the LSI40909G-S.

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## Organization

This document has the following chapters and appendix:

- [Chapter 1, LSI40909G-S Description](#), defines the interfaces and characteristics of the LSI40909G-S.
- [Chapter 2, Installing the LSI40909G-S](#), provides both quick and detailed installation instructions.
- [Chapter 3, Software Installation](#), describes the installation procedures for the Fusion-MPT and Fibre Channel drivers.
- [Chapter 4, LSI40909G-S Technical Characteristics](#), describes the physical and operational environments of the LSI40909G-S.
- [Appendix A, Glossary of Terms and Abbreviations](#), provides definitions of various terminology that is referenced throughout this user's guide.

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**Related Publications**

*LSIFC909 Fibre Channel I/O Processor Technical Manual,*  
Order Number S14029.A

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**Revision Record**

<b>Revision</b>	<b>Date</b>	<b>Remarks</b>
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# Chapter 1

## LSI40909G-S

### Description

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This chapter describes the LSI40909G-S PCI to Fibre Channel (FC) Host Adapter board and includes these topics:

- [Section 1.1, “General Description,” page 1-1](#)
  - [Section 1.2, “Features,” page 1-1](#)
- 

## 1.1 General Description

The LSI Logic LSI40909G-S provides an FC interface to Sun Solaris PCI computer systems. This board is referred to as the LSI40909G-S throughout this guide. The LSI40909G-S uses the LSIFC909 FC I/O Processor chip.

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## 1.2 Features

This section provides an overview of the [PCI Interface](#), the [FC Interface](#), and [Board Characteristics](#) for the LSI40909G-S.

### 1.2.1 PCI Interface

PCI interfaces I/O components to the processor and memory subsystems in equipment ranging from PCs to servers. The PCI interface operates as a 64-bit DMA bus master capable of 64-bit addressing. The LSIFC909 contains the PCI functionality for the LSI40909G-S.

The PCI interface includes these features:

- Full 64-bit DMA bus master
- LSIFC909 functionality:
  - Zero wait-state bus master data bursts up to 1 Kbyte
  - Complies with PCI Local Bus Specification, Revision 2.2
  - 3.3 V interface (5.0 V tolerant)
- Serial EEPROM configuration storage
- Card edge keyed as a universal add-in card

## 1.2.2 FC Interface

The LSIFC909 contains the FC functionality for the LSI40909G-S. The LSIFC909 generates signal timing and link protocol in compliance with FC standards.

The FC interface includes these features:

- 1 Gigabit Giga-Bit Interface Converter (GBIC) connection
- LSIFC909 functionality:
  - Class 3, Arbitrated Loop (AL)
  - 2 Kbyte frame payloads
  - Multiframe buffering
- 1 Gigabit/s serial link
- Link fault LED

## 1.2.3 Board Characteristics

The LSI40909G-S board characteristics are:

- PCI board dimensions: 168 x 98 mm (6.625 x 3.875 inches)
- PCI Universal 64-bit card edge connector
- FC Link Activity LED

In [Chapter 4, "LSI40909G-S Technical Characteristics," Figure 4.1](#) illustrates the mechanical drawing for this host adapter board.

## 1.2.4 FC Link Activity/Link Fault LED

The LSI40909G-S provides a dual-purpose LED visible through the bracket which indicates activity on the FC link when the LED is green. This LED turns yellow when there has been a fault on the FC link.



# Chapter 2

## Installing the LSI40909G-S

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This chapter provides instructions on how to install the LSI40909G-S and includes these topics:

- [Section 2.1, “Quick Installation Procedure,” page 2-1](#)
  - [Section 2.2, “Detailed Installation Procedure,” page 2-2](#)
- 

### 2.1 Quick Installation Procedure

This section provides an overview of the installation procedure. If you are an experienced computer user with prior host adapter installation and FC setup experience, this section may sufficiently describe the procedure for you. If you prefer a more detailed guidance for installing the LSI40909G-S, proceed to [Section 2.2, “Detailed Installation Procedure.”](#)

For safe and proper installation, check the user’s manual supplied with your computer and perform the following steps.

- Step 1. *Ground yourself* before removing this host adapter board.
- Step 2. Remove the LSI40909G-S from the packing and check that it is not damaged.  
  
[Figure 2.1](#) illustrates an example of this host adapter board. Also refer to [Figure 4.1](#) on [page 4-2](#) to see a more detailed drawing of this board.
- Step 3. Open your PC cabinet and select an appropriate open PCI slot.
- Step 4. Insert the host adapter board.
- Step 5. Make any configuration changes.
- Step 6. Close your PC cabinet cover.
- Step 7. Connect the FC cable to the LSI40909G-S.

---

## 2.2 Detailed Installation Procedure

This section provides step-by-step instructions for installing the LSI40909G-S. If you are experienced in these tasks, you may prefer to use [Section 2.1, “Quick Installation Procedure.”](#)

### 2.2.1 Before You Start

Before starting, look through the following task list to get an overall idea of the steps you will be performing. If you are not confident you can perform the tasks as described here, LSI Logic recommends getting assistance.

Each FC host adapter that you install can act as host for up to 126 Arbitrated Loop FC devices, not including the adapter itself. Follow the detailed instructions in the next section to successfully install the host adapter board.

### 2.2.2 Inserting the Host Adapter

For safe and proper installation, use the user’s manual supplied with your computer. Perform the following steps to install the LSI40909G-S.

- Step 1. *Ground yourself* before removing this host adapter board.
- Step 2. Remove the LSI40909G-S from the packing and check that it is not damaged.  
[Figure 2.1](#) illustrates an example of this host adapter board. Also refer to [Figure 4.1](#) on [page 4-2](#) to see a more detailed drawing of this board.
- Step 3. Switch off the computer and unplug power cords for all components in your system.
- Step 4. Remove the cover from your computer per the instructions in the user’s manual for your system to access the PCI slots.

**Caution:** *Ground yourself* by touching a metal surface before removing the cabinet top. Static charges on your body can damage electronic components. Handle plug-in boards by

the edge; do not touch board components or gold connector contacts. The use of a static ground strap is recommended.

Step 5. Locate the slots for PCI plug-in board installation.

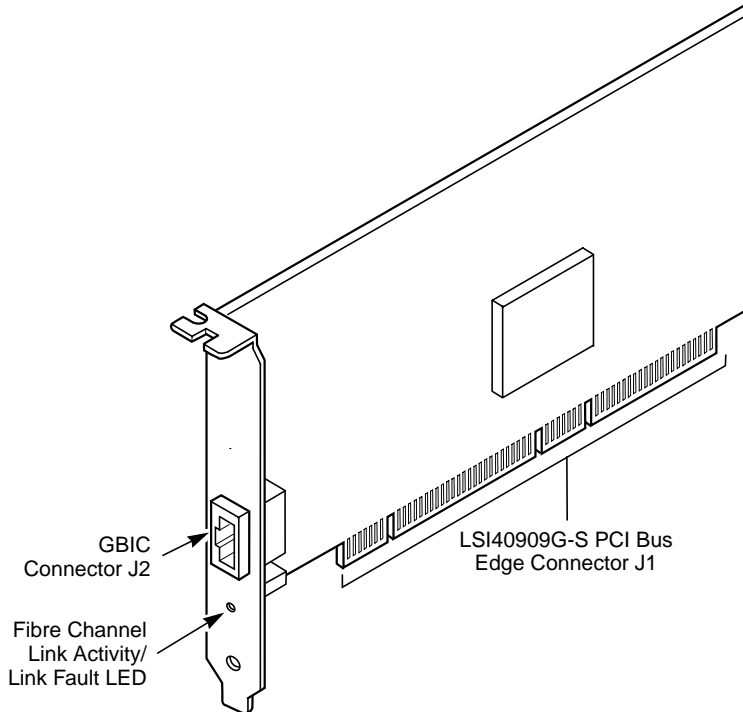
Refer to the computer's user's manual to confirm the location of the PCI slots.

The LSI40909G-S requires a 32-bit or 64-bit PCI slot that allows bus master operation. If a 32-bit PCI slot is used, the portion of the J1 connector opposite the bracket remains uninserted. See [Figure 2.2](#).

**Note:** For the LSI40909G-S to function as a 64-bit device, it must be inserted in a 64-bit PCI slot. If the LSI40909G-S is inserted in a 32-bit PCI slot, it will function as a 32-bit device.

Step 6. Remove the blank bracket panel on the back of the computer aligned with the PCI slot you intend to use. Save the bracket screw.

**Figure 2.1 Hardware Connections for the LSI40909G-S**

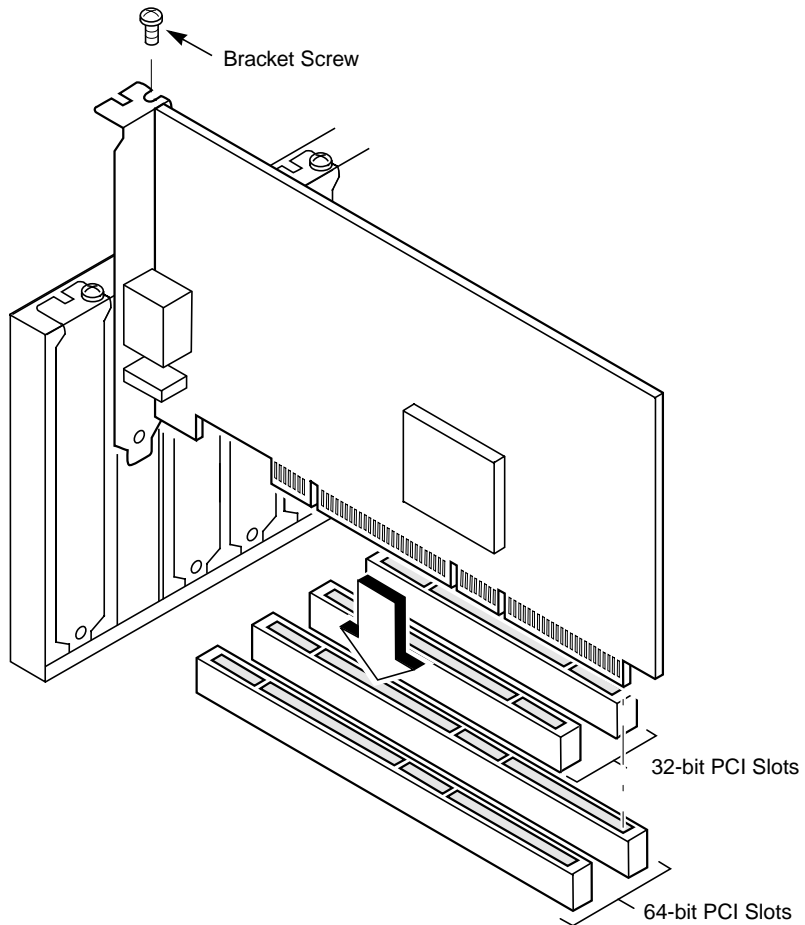


Step 7. Carefully insert edge connector J1 (see [Figure 2.1](#)) of the host adapter into the PCI slot.

Make sure the edge connector is properly aligned before pressing the board into place as shown in [Figure 2.2](#). The bracket around connector J2 should fit where you removed the blank panel.



**Figure 2.2 Inserting the Host Adapter**



Step 8. Secure the board with the bracket screw (see [Figure 2.2](#)) before making the external FC link connection.

Step 9. Connect the FC cable to the LSI40909G-S.



# Chapter 3

## Software Installation

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This chapter describes the features and use of the LSI Logic/IntraServer device drivers for the Solaris operating system 2.6, 2.7, and 2.8. This chapter includes these topics:

- Section 3.1, “Installing the Sun SPARC Solaris Fusion-MPT™ Drivers,” page 3-1
- Section 3.2, “Installing the itmpt Sun SPARC Solaris FC Driver,” page 3-7
- Section 3.3, “Troubleshooting,” page 3-15

For the most up-to-date information on drivers, please visit:  
<http://www.intraserver.com/support/drivers.html>

---

### 3.1 Installing the Sun SPARC Solaris Fusion-MPT™ Drivers

The LSI Logic LSI40909G-S offers the highest possible performance on Sun Solaris systems. The LSI Logic Fusion-MPT FC driver (itmpt) is optimized for low CPU overhead and high I/O throughput, making use of the LSI Logic Fusion-MPT architecture.

The LSI Logic FC adapters have built-in Fcode, designed to operate in the Sun OpenBoot environment, allowing FC devices to be available to the OpenBoot (ok) prompt.

The LSI Logic driver, itmpt, allows the Solaris operating system to interface with FC devices connected to the LSI40909G-S. This driver takes advantage of new hardware features in the LSI40909G-S to minimize CPU utilization, including interrupt coalescing, which can result in less than one interrupt per I/O.

### 3.1.1 Features

The following features of the LSI40909G-S minimize CPU utilization:

- Uses state of the art Fusion-MPT interface, providing support for FC, SCSI, and RAID devices with a single binary image.
- Provides highly efficient, low CPU usage architecture.
- Multiport functionality minimizes slot usage.
- 66 MHz/64-bit PCI interface provides maximum I/O bandwidth.
- Supports multiple host adapters.
- Supports scatter/gather.
- Supports multiprocessor environments.

### 3.1.2 System Requirements

Your SPARC Solaris system must have the available resources as listed in [Table 3.1](#) in order to install the LSI40909G-S.

**Table 3.1 Resource Requirements**

Resource	Requirement
Host Bus Slot	Sun Solaris system with available PCI slot
Operating system	Solaris 2.6 release or later
Network Boot Server	Sparc or Intel Solaris boot server <sup>1</sup>
Firmware	OpenBoot PROM Version 3.0 or greater

1. Only required if you will be using the LSI Logic module to support your System disk.

After installing the module in an appropriate PCI slot and making all the necessary internal and external connections to the module, power on the host system.

### 3.1.3 Verifying Correct Installation

Use this procedure to verify installation of your LSI Logic/IntraServer FC adapter before booting your system:

Step 1. Power on the system.

- Step 2. When the banner is displayed, press the Stop-A keys to interrupt the boot process and stop at the `ok` prompt.
- Step 3. Use the `show-devs` command to list the system devices. You should see an output similar to the following example, as shown in [Figure 3.1](#):

**Figure 3.1 System Devices Listing**

```
ok show-devs

/SUNW,UltraSPARC-IIi@0,0
/pci@1f,0
/virtual-memory
/memory@0,10000000
/aliases
/options
/openprom
/chosen
/packages
/pci@1f,0/pci@1
/pci@1f,0/pci@1,1
/pci@1f,0/pci@1/pci@2
/pci@1f,0/pci@1/IntraServer,Ultra2-scsi@1
/pci@1f,0/pci@1/pci@2/IntraServer,fc@4
/pci@1f,0/pci@1/pci@2/IntraServer,fc@4/disk
/pci@1f,0/pci@1/pci@2/IntraServer,fc@4/tape
/pci@1f,0/pci@1/IntraServer,Ultra2-scsi@1/tape
/pci@1f,0/pci@1/IntraServer,Ultra2-scsi@1/disk
/openprom/client-services
...
```

**Note:** `/pci@1f,0/pci@1/pci@2/IntraServer,fc@4` identifies the first FC interface on an LSI Logic/IntraServer 7000 Series adapter.

The above is an example. The output of `show-devs` may vary depending on your system and configuration. Use the corresponding entries on your system, not those given here.

If these devices are not listed, check that the adapter is correctly installed, and reseal the adapter if necessary.

### 3.1.4 Identifying the FC Disks

The `probe-scsi-all` command is used to identify the FC disk devices on your LSI Logic/IntraServer adapter, as shown in [Figure 3.2](#).

**Figure 3.2 FC Disk Devices Listing**

```
ok probe-scsi-all

/pci@1f,0/pci@1/IntraServer,Ultra2-scsi@1
Target 0
  Unit 0   Disk      IBM      DNES-309170W   SA30

/pci@1f,0/pci@1/pci@2/IntraServer,fc@7

MPT Firmware Version 1.00

Target 0
  Unit 0   Disk      SEAGATE ST39173FC   6615
  WWN 220000203710d063  ID 111d2

Target 1
  Unit 0   Disk      SEAGATE ST39173FC   6258
  WWN 220000203710c09b  ID 111d6

Target 2
  Unit 0   Disk      SEAGATE ST39173FC   6258
  WWN 220000203710b066  ID 111d5

Target 3
  Unit 0   Disk      SEAGATE ST39173FC   6258
  WWN 220000203710b063  ID 111d3

Target 4
  Unit 0   Disk      SEAGATE ST39173FC   6258
  WWN 220000203710b04f  ID 111d4

Target 5
  Unit 0   Disk      SEAGATE ST39173FC   6615
  WWN 2200002037104f73  ID 111d9

Target 6
  Unit 0   Disk      SEAGATE ST39173FC   6615
  WWN 2200002037102d0f  ID 111d1
```

If the FC disks on your LSI Logic/IntraServer adapter are not identified by your system, check the following:

1. Are all the FC cables correctly connected to the disk enclosure?
2. Is the disk enclosure powered up?
3. If the external disk enclosure required a loopback connector, is the loopback connector correctly installed?

### **3.1.5 Persistent Device Naming**

Under certain configurations, such as when the FC disk is the boot device of a system, it may be preferable to lock a target disk to a unit number. LSI Logic/IntraServer Fcode allows the system administrator to write a nonvolatile map of IDs to the FC controller. The following is an example of how to map devices in the persistent device table.

Select the controller you want to modify, as shown in [Figure 3.3](#):

### Figure 3.3 Persistent Device Mapping

```
ok show-disks

a) /pci@1f,0/pci@1/IntraServer,fc@2/disk
b) /pci@1f,0/pci@1/IntraServer,Ultra2-scsi@1/disk
c) /pci@1f,0/pci@1,1/ide@3/cdrom
d) /pci@1f,0/pci@1,1/ide@3/disk
e) /pci@1f,0/pci@1,1/ebus@1/fdthree@14,3203f0
q) NO SELECTION

Enter Selection, q to quit: a
/pci@1f,0/pci@1/IntraServer,fc@2/disk has been selected.

Type ^Y (Control-Y) to insert it in the command line.
e.g. ok nvalias mydev ^Y for creating devalias mydev for
/pci@1f,0/pci@1/IntraServer,fc@2/disk

ok select/pci@1f,0/pci@1/IntraServer,fc@2
ok show-children

MPT Firmware Version 1.00

Target 0
  Unit 0   Disk      SEAGATE ST39173FC      6615
          WWN 200000203710c4e8  PortID a3

ok set-persistent (Note: issue command with no parameters to
print this help)

usage is <current-target-id> <persistent-target-id>
set-persistent

ok 0 0 set-persistent
ok show-persistent

Entry 1  WWN 200000203710c4e8  Target 0

ok
```



To clear an entry in the persistent device map, use the `clear-persistent` command, as shown in [Figure 3.4](#):

**Figure 3.4 Clearing an Entry**

```
ok 1 clear-persistent
Entry 1 has been cleared
ok show-persistent
ok
```

Entry 1 has been deleted from the table, and the table is now empty.

### 3.1.6 itmpt Device Driver

The LSI Logic/IntraServer itmpt driver is designed to Sun Microsystems SCSI specifications for device drivers. This driver allows connection of FC devices to LSI Logic/IntraServer adapter cards on PCI-based machines.

The following sections describe the procedures to install the driver on Solaris.

---

## 3.2 Installing the itmpt Sun SPARC Solaris FC Driver

The LSI Logic LSI40909G-S uses the itmpt FC driver for Solaris. This driver is included with your adapter kit.

**Note:** If you plan to use an LSI Logic/IntraServer FC adapter for your *system disk*, you *must* use the installation procedure as described in [Section 3.2.2, “Network Installation Procedure,”](#) in order to load the device driver during installation.

### 3.2.1 Existing System Installation

These instructions provide details to install the LSI Logic/IntraServer itmpt driver to an existing Solaris operating system installation.

**Note:** You must be logged on as root to perform the installation.

### 3.2.1.1 Floppy Disk Install

If you received the drivers on a floppy diskette, follow these steps:

- Step 1. Place the diskette in the floppy drive and execute the `volcheck` command to ensure the system sees the floppy.
- Step 2. Change the directory to the root of the floppy (e.g. "`cd /floppy/floppy0`").
- Step 3. Execute the `pkgadd` procedure to add the `itnpt` driver to the operating system.

Example: `pkgadd(space)-d(space)`.

You will see the display on the screen as shown in [Figure 3.5](#) through [Figure 3.7](#).

### Figure 3.5 pkgadd Procedure

```
The following packages are available:

1 TImpt LSI Logic/IntraServer FusionMPT(tm)
  Fibrechannel/SCSI drivers

      (sparc) itmpt kit version 1.1

Select package(s) you wish to process (or 'all' to process
all packages). (default: all) [?,??,q]: 1

Processing package instance <ITImpt> from
</floppy/intraserver>

LSI Logic/IntraServer FusionMPT(tm) Fibrechannel/SCSI
drivers (sparc) itmpt kit version 1.1

IntraServer Technology, Inc / LSI Logic

Using </> as the package base directory.

## Processing package information.
## Processing system information.

2 package pathnames are already properly installed.

## Verifying disk space requirements.
## Checking for conflicts with packages already installed.
## Checking for setuid/setgid programs.
```

### Figure 3.6 Completing Floppy Disk Installation

```
This package contains scripts which will be executed with
superuser permission during the process of installing this
package.

Do you want to continue with the installation of <ITImpt>
[y,n,?] y

Installing LSI Logic/IntraServer FusionMPT(tm)
Fibrechannel/SCSI drivers as <ITImpt>

## Installing part 1 of 1.
/kernel/drv/itmpt
/kernel/drv/itmpt.conf

[ verifying class <none> ]

## Executing postinstall script.
installing /kernel/drv/sparcv9/itmpt

Updating /kernel/drv/ssd.conf with itmpt entries...

Entries added. For support of more than 15 targets or nonzero
LUNS it may be necessary to edit /kernel/drv/ssd.conf to add
additional entries.
```

See [Figure 3.8](#) for additional information.

### Figure 3.7 Completing Floppy Disk Installation (Continued)

```
Following installation, please reboot the system to properly
configure and load the drivers.

Installation of <ITImpt> was successful.
```

To support nonzero LUNs, which is default for most RAID controllers such as the LSI Logic MetaStor<sup>®</sup>, you *must* edit the file `/kernel/drv/ssd.conf` as shown in [Figure 3.8](#):

**Figure 3.8 /kernel/drv/ssd.conf**

Example:

With just the default entry for each target in /kernel/drv/ssd.conf, only devices at LUN 0 will be probed.

```
name="ssd" parent="itmpt" target=0;
```

To add nonzero LUN support, replace the above entry with an entry for each LUN to probe, such as:

```
name="ssd" parent="itmpt" target=0 lun=0;
name="ssd" parent="itmpt" target=0 lun=1;
name="ssd" parent="itmpt" target=0 lun=2;
name="ssd" parent="itmpt" target=0 lun=3;
```

This should be done for any targets that need to probe for multiple LUNs.

Step 4. The itmpt device driver is now installed. Reboot the machine to reconfigure the system and to recognize the new devices.

### 3.2.1.2 Distribution File Install

If you received the drivers in an itmpt\_install.tar.Z file, follow these steps:

Step 1. Uncompress and untar the itmpt\_install.tar.Z file by typing the following commands in order to create a directory named install:

```
uncompress itmpt_install.tar.Z
tar -xvf itmpt_install.tar
cd install
```

Step 2. Execute the `pkgadd` process as described in the previous section to add the itmpt driver to the operating system:

**Note:** If you change the disk drive configuration of your machine, it may be necessary to issue the command:

```
touch(space)/reconfigure
```

and then reboot the system in order for the system to detect and correctly install your new disks.

## 3.2.2 Network Installation Procedure

If you are using your LSI Logic/IntraServer adapter to support your Sparc Solaris system disk, you must install the Solaris operating system using a network install. This section describes a complete installation of Solaris to a client system using LSI Logic/IntraServer FC adapters for the system disk. The method described in this section allows you to install the LSI Logic/IntraServer itmpt driver onto a network boot kit, making it available during the Sparc installation process.

If you are simply installing an LSI Logic/IntraServer adapter as an additional storage adapter in an existing system, use the driver installation procedure described in [Section 3.2.1.2, “Distribution File Install.”](#)

### 3.2.2.1 Setting up a Boot/Install Server

Refer to the “Preparing to Install Solaris Software Over the Network,” section of the Solaris Advanced Installation Guide, available at <http://docs.sun.com>.

The basic steps to set up a boot and install server are as follows:

- Step 1. Insert your Solaris distribution CD in your boot/install server’s CD-ROM drive.
- Step 2. Change your directory to the Tools area on your distribution CD:  

```
cd /cdrom/cdrom0/Solaris_2.7/Tools
```
- Step 3. Use the `setup_install_server` script to copy the boot and installation files to your boot/install server:  

```
./setup_install_server /export/home/install
```

### 3.2.2.2 Installing the itmpt Driver on the Boot/Install Server

After you have set up your network boot and install server, follow these steps run the `install.sh` script with the `-n` parameter to copy the driver kit to the boot server’s boot files:

- Step 1. Place the diskette in the floppy drive and execute the `volcheck` command to ensure the system sees the floppy.
- Step 2. Change the directory to the root of the floppy:

```
cd /floppy/floppy0
```

Step 3. Execute the `install.sh` shell script to add the `itmpt` driver to the boot installation area:

```
./install.sh -n /export/home/install/Solaris_2.7
```

Notes:

- For Solaris 2.8 boot files, the directory would be `/export/home/install/Solaris_2.8`.
- The message “major number maximum based on server, not client” can safely be ignored.

Running the `install.sh` script this way copies and installs the LSI Logic/IntraServer drivers into the `Tools/Boot/` area of the boot files and allows LSI Logic/IntraServer adapters to be booted for installation using the bootserver.

### 3.2.2.3 Adding Clients to Your Boot/Install Server

For each machine that boots into the boot/install server, follow these steps to add a client entry on the boot/install server:

Step 1. Change the directory to the boot/install kit:

```
cd /export/home/install/Solaris_2.7/Tools
```

Step 2. Use the `add_install_client` script to add the client machine

```
./add_install_client -i ipaddr  
-e ethernetid client_name platform_group
```

Where:

<code>ipaddr</code>	is the tcp/ip address of the client
<code>ethernetid</code>	is the ethernet hardware (mac) address of the client
<code>client_name</code>	is the client's system name
<code>platform_group</code>	is the client's vendor defined hardware group

Example: `./add_install_client -i 192.168.103.124 -e 00:08:26:02:25:34 sunsys sun4u`

Note: You can obtain the `platform_group` from a machine of the same type as the target client using the `uname -m` command.

#### 3.2.2.4 Booting the Client Using the `itmpt` FC Driver

Now you can begin the installation of the Solaris operating system to the client target machine using the boot and install server. On the client machine, boot the network install kit you created in the preceding steps as follows:

```
ok boot net -v
```

Note: It is important to choose "Manual Reboot" rather than "Auto Reboot" during the installation of Solaris on the target machine. If you choose "Auto Reboot", you will not have the opportunity to complete the installation of the LSI Logic/IntraServer FC drivers and your system will fail to boot.

After the installation has completed and the system is waiting to be manually rebooted, proceed to a console window and run the following script:

```
/sbin/itmptinst
```

This copies and installs the drivers from the boot server to the newly created Solaris installation. After this script has been run, the LSI Logic/IntraServer device driver installation is complete and the system can be rebooted.



Notes: The message “major number maximum based on server, not client” can safely be ignored.

Your Sun machine will prompt you to allow power saving automatic shutdown. You must answer *no* to this question if you are using the LSI Logic/IntraServer adapter to support your boot disk.

If you change the disk drive configuration of your machine, it may be necessary to issue the command:

`touch /reconfigure`

and then reboot the system in order for the system to detect and correctly install your new disks.

---

### 3.3 Troubleshooting

Table 3.2 lists some potential error messages that may be preceded by a warning message displayed by the operating system. In the message descriptions below the `itmpt<n>` signifies that `<n>` can be replaced by some number assigned to it by the operating system. That value helps to identify the bus that is reporting the error.

**Table 3.2 Error Messages**

Error Messages	Explanation
<code>itmpt&lt;n&gt;</code> : This hardware not supported by this driver.	<code>itmpt</code> has been told to control an MPT device that is made by a manufacturer other than LSI Logic/IntraServer. This adapter requires a special driver provided by that manufacturer. Please contact the manufacturer for assistance.
<code>itmpt&lt;n&gt;</code> : Failed to map device registers.	<code>itmpt</code> was unable to access the hardware registers necessary for operation. The operating system did not properly configure the PCI device. Make sure your adapter has LSI Logic/IntraServer Fcode, and that the adapter is working correctly at the SUN OBP prompt.
<code>itmpt&lt;n&gt;</code> : Hardware not properly enabled by system, <code>cmd=xxxxh</code> .	The system has not properly enabled the configuration resources that <code>itmpt</code> needs in order to use this hardware. The <code>cmd=xxxxh</code> value needs to be reported to LSI Logic/IntraServer technical support.

**Table 3.2 Error Messages (Cont.)**

Error Messages	Explanation
itmpt<n>: Could not allocate memory to read configuration data.	The driver was unable to allocate memory required to process the configuration data. This means that the configuration was not properly determined. To fix this you may need to manually configure the driver using the itmpt.conf file.
itmpt<n>: Unable to make reset notification callbacks.	The itmpt was unable to notify the target device driver of a bus reset. The target driver may start to malfunction.
itmpt<n>: ddi_dma_unbind_handle: failed	The operating system failed to respond to the named routine in a known manner. This is a fatal error that is not recoverable. Please report this error to technical support.
itmpt<n>: ddi_dma_numwin() failed.	–
itmpt<n>: ddi_dma_getwin() failed.	–
itmpt<n>: ddi_dma_alloc_handle: xxh unknown/impossible.	–
itmpt<n>: ddi_dma_buf_bind_handle: DDI_DMA_INUSE impossible.	–
itmpt<n>: ddi_dma_buf_bind_handle: xxh unknown/impossible.	–
itmpt<n>: No KeyROM found. Hardware contains no valid license.	The adapter is not a valid LSI Logic/IntraServer adapter licensed for use with Solaris.
itmpt<n>: Hi-level interrupts not supported.	The adapter is in a slot that cannot be used with this driver. Please try moving the adapter to a different PCI slot.
itmpt<n>: Device in a slave-only slot and is unusable.	–
itmpt<n>: Failed to attach. This adapter will not be installed.	Because of one of the previous two errors, this adapter could not be "attached" to the I/O subsystem and will not be accessible. See the previous error message and solve that problem.
itmpt<n>: Unable to obtain soft state structure.	The driver was unable to initialize a required data structure and therefore did not load. Please call technical support.
itmpt<n>: Failed to attach interrupt handler.	The driver was unable to initialize the interrupt handler as required. Please call technical support.

**Table 3.2 Error Messages (Cont.)**

<b>Error Messages</b>	<b>Explanation</b>
itmpt<n>: The adapter is malfunctioning or is of an unknown type.	The driver is not able to communicate with the hardware. You may need to update your driver or your hardware.
itmpt<n>: The adapter is malfunctioning.	–
itmpt<n>: Failed to create minor node required for DMI interface.	The driver was unable to create an entry point for the DMI device driver. If you are not using the DMI device driver then you may safely ignore this message.
itmpt<n>: Could not attach to the SCSI subsystem.	The driver was unable to communicate with the SCSI/FC device driver that is part of the operating system. You may need to update your driver.
itmpt<n>: Failed to allocate memory.	The driver was unable to allocate the memory needed during initialization. You may have run out of available memory.
itmpt<n>: Unbind failed!	The driver had a problem when attempting to unload itself. This is a fatal error.



# Chapter 4

## LSI40909G-S Technical Characteristics

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This chapter provides specific details about the physical environment associated with the LSI40909G-S. This chapter includes these topics:

- [Section 4.1, “Physical Environment,” page 4-1](#)
  - [Section 4.2, “Operational Environment,” page 4-3](#)
  - [Section 4.3, “IEEE Unique Address,” page 4-4](#)
- 

### 4.1 Physical Environment

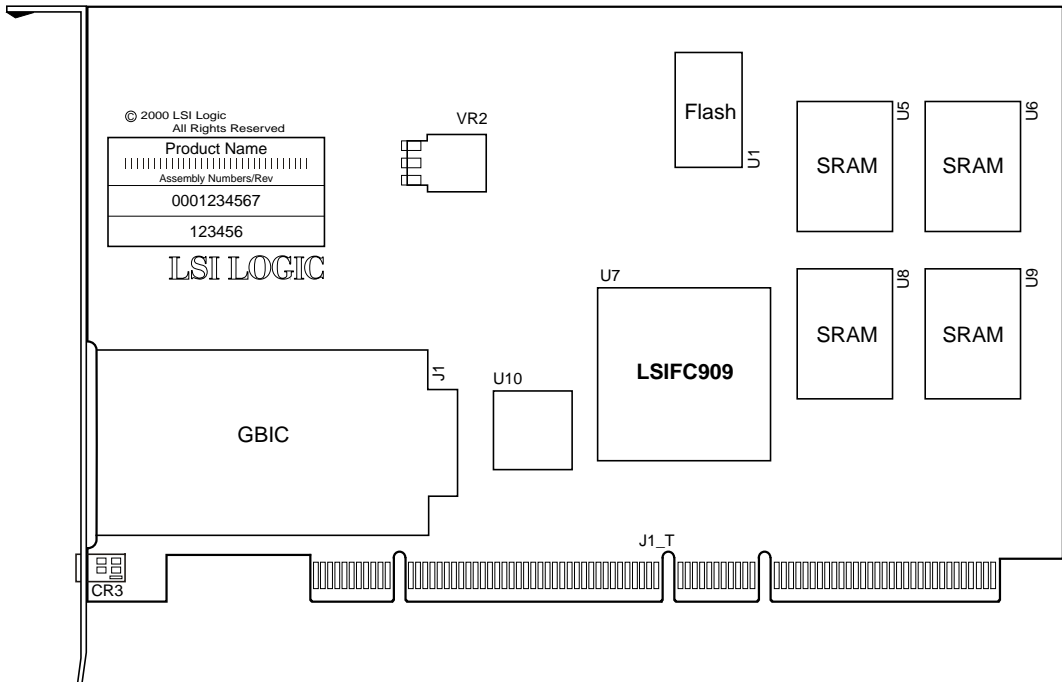
This section provides information about the physical, electrical, thermal, and safety characteristics of the LSI40909G-S. Additionally, these boards are compliant with electromagnetic standards set by the FCC.

#### 4.1.1 Physical Characteristics

The LSI40909G-S is a PCI short card; the dimensions are 168 x 98 mm (6.625 x 3.875 inches). J1 is the PCI edge connector. The external FC connection is made through a 1 Gigabit/s GBIC optical module.

The component height on the top and bottom of the board conforms to the PCI Local Bus Specification, Revision 2.2. [Figure 4.1](#) illustrates the components on the LSI40909G-S.

**Figure 4.1 LSI40909G-S Components**



### 4.1.2 Electrical Characteristics

Under normal conditions, the LSI40909G-S maximum power requirement is: + 5 V DC,  $\pm 5\%$ , 1.0 A, and over the operating range 0 °C to 55 °C. Under abnormal conditions + 5 V current may be higher.

The PCI PRSNT1/ and PRSNT2/ pins are set to indicate a 7.5 W maximum configuration.

### 4.1.3 Thermal, Atmospheric Characteristics

The thermal, atmospheric characteristics of the LSI40909G-S are:

- Temperature range: 0 °C to 55 °C (dry bulb)
- Relative humidity range: 5% to 90% noncondensing
- Maximum dew point temperature: 32 °C

The following parameters define the storage and transit environment for the LSI40909G-S:

- Storage Temperature: – 45 °C to + 85 °C (dry bulb)
- Relative Humidity Range: 5% to 95% noncondensing

#### 4.1.4 Electromagnetic Compliance

These boards minimize electromagnetic emissions, susceptibility, and the effects of electromagnetic discharge. The boards comply with Class B and carry markings for CE, VCCI, Canada, C-Tick, and FCC.

#### 4.1.5 Safety Characteristics

The bare boards meet or exceed the requirements of UL flammability rating 94 V0. The bare boards are also marked with the supplier's name or trademark, type, and UL flammability rating. Because these boards are installed in a PCI bus slot, all voltages are below the SELV 42.4 V limit.

---

## 4.2 Operational Environment

Use the LSI40909G-S in PCI computer systems with an ISA/EISA bracket type. The LSI Logic supplied FC BIOS and firmware operate the boards. An on-board flash memory device and a serial EEPROM are provided to allow BIOS code and open boot code support through PCI.

### 4.2.1 The PCI Interface

The PCI interface operates as a 64-bit DMA bus master. Edge connector J1 makes the PCI connection, which provides connections on both the front and back of the board. The signal definitions and pin numbers conform to the PCI Local Bus Specification, Revision 2.2. See that specification for more details regarding the signal assignments. The on-board regulators provide power to the board's 3.3 V devices.

**Note:** The PCI + 3.3 V pins are tied together and decoupled with high frequency bypass capacitors to ground. No current from these + 3.3 V pins is used on the board. The board derives power from the + 5 V pins, directly and through a

3.3 V voltage regulator. The PCI + 3 V/+ 5 V pins are used to differentiate between a 5 V or a 3.3 V PCI signaling environment.

## **4.2.2 The FC Interface**

The LSI40909G-S Fibre Channel interface provides an optical connection to the FC link. The GBIC board uses an SCA connector and rail set which accepts a GBIC module.

## **4.2.3 The FC Link Activity/Link Fault LED**

The LSI40909G-S provides a dual-purpose LED visible through the bracket which indicates activity on the FC link when the LED is green. This LED turns yellow when there has been a fault on the FC link.

---

## **4.3 IEEE Unique Address**

Each LSI40909G-S is provided with a unique IEEE address. The last six hexadecimal characters of this address appear on a label on the board. This address is stored in the serial EEPROM on the board, and is also used for the worldwide name.



# Appendix A

## Glossary of Terms and Abbreviations

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<b>8B/10B</b>	A data encoding scheme developed by IBM, translating byte wide data to an encoded 10-bit format.
<b>ANSI</b>	American National Standards Institute. The coordinating organization for voluntary standards in the United States.
<b>Arbitrated Loop Topology (FC-AL)</b>	A FC Topology that provides a low cost solution to attach multiple ports in a loop without hubs and switches.
<b>BER</b>	Bit Error Rate.
<b>Bit</b>	A binary digit. The smallest unit of information a computer uses. The value of a bit (0 or 1) represents a two-way choice, such as on or off, true or false, and so on.
<b>Broadcast</b>	Sending a transmission to all N_Ports on a fabric.
<b>Bus</b>	A collection of unbroken signal lines across which information is transmitted from one part of a computer system to another. Connections to the bus are made using taps on the lines.
<b>Bus Mastering</b>	A high-performance way to transfer data. The host adapter controls the transfer of data directly to and from system memory without bothering the computer's microprocessor. This is the fastest way for multitasking operating systems to transfer data.
<b>Byte</b>	A unit of information consisting of eight bits.
<b>Channel</b>	A point-to-point link, the main task of which is to transport data from one point to another.

<b>Configuration</b>	Refers to the way a computer is setup; the combined hardware components (computer, monitor, keyboard, and peripheral devices) that make up a computer system; or the software settings that allow the hardware components to communicate with each other.
<b>CPU</b>	Central Processing Unit. The “brain” of the computer that performs the actual computations. The term Microprocessor Unit (MPU) is also used.
<b>Crosspoint-Switched Topology (FC-XS)</b>	Highest performance FC fabric, providing a choice of multiple path routings between pairs of F_Ports.
<b>DMA</b>	Direct Memory Access. A method of moving data from a storage device directly to RAM, without using the CPU’s resources.
<b>DMA Bus Master</b>	A feature that allows a peripheral to control the flow of data to and from system memory by blocks, as opposed to PIO (Programmed I/O) where the processor is in control and the flow is by byte.
<b>Device Driver</b>	A program that allows a microprocessor (through the operating system) to direct the operation of a peripheral device.
<b>EEPROM</b>	Electrically Erasable Programmable Read Only Memory. A memory chip typically used to store configuration information.
<b>EISA</b>	Extended Industry Standard Architecture. An extension of the 16-bit ISA bus standard. It allows devices to perform 32-bit data transfers.
<b>Exchange</b>	A term that refers to one of the FC “building blocks”, composed of one or more nonconcurrent sequences for a single operation.
<b>Fabric</b>	FC defined interconnection methodology that handles routing in FC networks.
<b>FC-EP</b>	The future FC Enhanced Physical standard, which will build on and is compatible with FC-PH.
<b>FC-PH</b>	FC Physical standard, consisting of the three lower levels; FC-0, FC-1, and FC-2.
<b>FC-0</b>	Lowest level of the FC Physical standard, covering the physical characteristics of the interface and media.

<b>FC-1</b>	Middle level of the FC-PH standard, defining the 8B/10B encoding/decoding and transmission protocol.
<b>FC-2</b>	Highest level of FC-PH, defining the rules for signaling protocol and describing transfer of the frame, sequence, and exchanges.
<b>FC-3</b>	The hierarchical level in the FC standard that provides common services, such as striping definition.
<b>FC-4</b>	The hierarchical level in the FC standard that specifies the mapping of Upper Layer Protocols (ULPs) to levels below.
<b>FCC</b>	Federal Communications Commission.
<b>FCP</b>	Fibre Channel Protocol.
<b>FDDI</b>	Fiber Distributed Data Interface. ANSI option for a Metropolitan Area Network (MAN); a network based on the use of optical fiber cable to transmit data at 100 Mbits/s.
<b>Fibre Channel Service Protocol (FSP)</b>	The common FC-4 level protocol for all services, transparent to the fabric type or topology.
<b>File</b>	A named collection of information stored on a disk.
<b>Firmware</b>	Software that is permanently stored in ROM. Therefore, it can be accessed during boot time.
<b>F_Port</b>	“Fabric” port, the access point of the fabric for physically connecting the user’s N_Port.
<b>FL_Port</b>	An F_Port that contains arbitrated loop functions.
<b>Frame</b>	A linear set of transmitted bits that define a basic transport element.
<b>Hard Disk</b>	A disk made of metal and permanently sealed into a drive cartridge. A hard disk can store very large amounts of information.
<b>HAL</b>	Hardware Abstraction Layer.
<b>HIPPI</b>	High Performance Parallel Interface. An 800 Mbits/s interface to supercomputer networks (formerly known as high speed channel) developed by ANSI.

<b>Host</b>	The computer system in which a SCSI host adapter is installed. It uses the SCSI host adapter to transfer information to and from devices attached to the SCSI bus.
<b>Host Adapter</b>	A circuit board or integrated circuit that provides a SCSI bus connection to the computer system.
<b>IP</b>	Internet Protocol.
<b>IPI</b>	Intelligent Peripheral Interface.
<b>ISA</b>	Industry Standard Architecture. A type of computer bus used in most PCs. It allows devices to send and receive data up to 16 bits at a time.
<b>Kbyte</b>	Kilobyte. A measure of computer storage equal to 1024 bytes.
<b>LCT</b>	Logical Configuration Table.
<b>LLC</b>	Logical Link Control.
<b>Local Bus</b>	A way to connect peripherals directly to computer memory. It bypasses the slower ISA and EISA buses. PCI is a local bus standard.
<b>L_Port</b>	An FC port which supports the arbitrated loop topology.
<b>Link_Control_Facility</b>	A termination card that handles the logical and physical control of the FC link for each mode of use.
<b>Login Server</b>	Entity within the FC fabric that receives and responds to login requests.
<b>LUN</b>	Logical Unit Number. An identifier, zero to seven, for a logical unit.
<b>Mbyte</b>	Megabyte. A measure of computer storage equal to 1024 kilobytes.
<b>MFA</b>	Message Frame Address.
<b>Multicast</b>	Refers to delivering a single transmission to multiple destination N_Ports.
<b>NIC</b>	Network Interface Card.
<b>N_Port</b>	"Node" port, an FC defined hardware entity at the node end of a link.
<b>NL_Port</b>	An N_Port that contains arbitrated loop functions.

<b>Operating System</b>	A program that organizes the internal activities of the computer and its peripheral devices. An operating system performs basic tasks such as moving data to and from devices, and managing information in memory. It also provides the user interface.
<b>Operation</b>	A term, defined in FC-2, that refers to one of the FC “building blocks” composed of one or more, possibly concurrent, exchanges.
<b>Ordered Set</b>	An FC term referring to four 10-bit characters (a combination of data and special characters) that provide low level link functions, such as frame demarcation and signaling between two ends of a link. It provides for initialization of the link after power-on and for some basic recovery actions.
<b>Originator</b>	An FC term referring to the initiating device.
<b>Parity Checking</b>	A way to verify the accuracy of data transmitted over the SCSI bus. One bit in the transfer is used to make the sum of all the 1 bits either odd or even (for odd or even parity). If the sum is not correct, an error message appears.
<b>PCI</b>	Peripheral Component Interconnect. A local bus specification that allows connection of peripherals directly to computer memory. It bypasses the slower ISA and EISA buses.
<b>PDB</b>	Packet Descriptor Block.
<b>PIO</b>	Programmed Input/Output. A way the CPU can transfer data to and from memory using the computer’s I/O ports. PIO is usually faster than DMA, but requires CPU time.
<b>Port</b>	The hardware entity within a node that performs data communications over the FC link.
<b>Port Address</b>	Also Port Number. The address through which commands are sent to a host adapter board. This address is assigned by the PCI bus.
<b>Port Number</b>	See Port Address.
<b>RAM</b>	Random Access Memory. The computer’s primary working memory in which program instructions and data are stored and are accessible to the CPU. Information can be written to and read from RAM. The contents of RAM are lost when the computer is turned off.

<b>Responder</b>	An FC term referring to the answering device.
<b>RISC Core</b>	LSIFC909 chips contain a RISC (Reduced Instruction Set Computer) processor, programmed through microcode scripts.
<b>ROM</b>	Read Only Memory. Memory from which information can be read but not changed. The contents of ROM are not erased when the computer is turned off.
<b>SAN</b>	Storage Area Network.
<b>SCAM</b>	SCSI Configured AutoMatically. A method to automatically allocate SCSI IDs using software when SCAM compliant SCSI devices are attached.
<b>Scatter/Gather</b>	A device driver feature that lets the host adapter modify a transfer data pointer so that a single host adapter transfer can access many segments of memory. This minimizes interrupts and transfer overhead.
<b>SCB</b>	SCSI Command Block.
<b>SCSI</b>	Small Computer System Interface. A specification for a high-performance peripheral bus and command set. The original standard is referred to as SCSI-1.
<b>SCSI-2</b>	The current SCSI specification which adds features to the original SCSI-1 standard.
<b>SCSI ID</b>	A way to uniquely identify each SCSI device on the SCSI bus. Each SCSI bus has eight available SCSI IDs numbered 0 through 7 (or 0 through 15 for Wide SCSI). The host adapter usually gets ID 7 giving it priority to control the bus.
<b>Sequence</b>	A term referring to one of the FC “building blocks”, composed of one or more related frames for a single operation.
<b>SGL</b>	Scatter Gather List.
<b>SNAP</b>	SubNetwork Access Protocol.
<b>Synchronous Data Transfer</b>	One of the ways data is transferred over the SCSI bus. Transfers are clocked with fixed frequency pulses. This is faster than asynchronous data transfer. Synchronous data transfers are negotiated between the SCSI host adapter and each SCSI device.

<b>System BIOS</b>	Controls the low level POST (Power-On Self-Test), and basic operation of the CPU and computer system.
<b>TID</b>	Target ID.
<b>Topology</b>	The logical and/or physical arrangement of stations on a network.
<b>ULP</b>	Upper Layer Protocol.
<b>VCCI</b>	Voluntary Control Council for Interference.
<b>Virtual Memory</b>	Space on a hard disk that can be used as if it were RAM.
<b>VPD</b>	Vendor Product Data.
<b>Word</b>	A two byte (or 16 bit) unit of information.
<b>X3T9</b>	A technical committee of the Accredited Standards Committee X3, titled X3T9 I/O Interfaces. It is tasked with developing standards for moving data in and out of central computers.





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Company Name \_\_\_\_\_

Street \_\_\_\_\_

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# U.S. Distributors by State

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A. E. Avnet Electronics  
<http://www.hh.avnet.com>  
B. M. Bell Microproducts,  
Inc. (for HAB's)  
<http://www.bellmicro.com>  
I. E. Insight Electronics  
<http://www.insight-electronics.com>  
W. E. Wyle Electronics  
<http://www.wyle.com>

## Alabama

Daphne  
I. E. Tel: 334.626.6190  
Huntsville  
A. E. Tel: 256.837.8700  
B. M. Tel: 256.705.3559  
I. E. Tel: 256.830.1222  
W. E. Tel: 800.964.9953

## Alaska

A. E. Tel: 800.332.8638

## Arizona

Phoenix  
A. E. Tel: 480.736.7000  
B. M. Tel: 602.267.9551  
W. E. Tel: 800.528.4040  
Tempe  
I. E. Tel: 480.829.1800  
Tucson  
A. E. Tel: 520.742.0515

## Arkansas

W. E. Tel: 972.235.9953

## California

Agoura Hills  
B. M. Tel: 818.865.0266  
Granite Bay  
B. M. Tel: 916.523.7047  
Irvine  
A. E. Tel: 949.789.4100  
B. M. Tel: 949.470.2900  
I. E. Tel: 949.727.3291  
W. E. Tel: 800.626.9953  
Los Angeles  
A. E. Tel: 818.594.0404  
W. E. Tel: 800.288.9953  
Sacramento  
A. E. Tel: 916.632.4500  
W. E. Tel: 800.627.9953  
San Diego  
A. E. Tel: 858.385.7500  
B. M. Tel: 858.597.3010  
I. E. Tel: 800.677.6011  
W. E. Tel: 800.829.9953  
San Jose  
A. E. Tel: 408.435.3500  
B. M. Tel: 408.436.0881  
I. E. Tel: 408.952.7000  
Santa Clara  
W. E. Tel: 800.866.9953  
Woodland Hills  
A. E. Tel: 818.594.0404  
Westlake Village  
I. E. Tel: 818.707.2101

## Colorado

Denver  
A. E. Tel: 303.790.1662  
B. M. Tel: 303.846.3065  
W. E. Tel: 800.933.9953  
Englewood  
I. E. Tel: 303.649.1800  
Idaho Springs  
B. M. Tel: 303.567.0703

## Connecticut

Cheshire  
A. E. Tel: 203.271.5700  
I. E. Tel: 203.272.5843  
Wallingford  
W. E. Tel: 800.605.9953

## Delaware

North/South  
A. E. Tel: 800.526.4812  
Tel: 800.638.5988  
B. M. Tel: 302.328.8968  
W. E. Tel: 856.439.9110

## Florida

Altamonte Springs  
B. M. Tel: 407.682.1199  
I. E. Tel: 407.834.6310  
Boca Raton  
I. E. Tel: 561.997.2540  
Bonita Springs  
B. M. Tel: 941.498.6011  
Clearwater  
I. E. Tel: 727.524.8850  
Fort Lauderdale  
A. E. Tel: 954.484.5482  
W. E. Tel: 800.568.9953  
Miami  
B. M. Tel: 305.477.6406  
Orlando  
A. E. Tel: 407.657.3300  
W. E. Tel: 407.740.7450  
Tampa  
W. E. Tel: 800.395.9953  
St. Petersburg  
A. E. Tel: 727.507.5000

## Georgia

Atlanta  
A. E. Tel: 770.623.4400  
B. M. Tel: 770.980.4922  
W. E. Tel: 800.876.9953  
Duluth  
I. E. Tel: 678.584.0812

## Hawaii

A. E. Tel: 800.851.2282

## Idaho

A. E. Tel: 801.365.3800  
W. E. Tel: 801.974.9953

## Illinois

North/South  
A. E. Tel: 847.797.7300  
Tel: 314.291.5350  
Chicago  
B. M. Tel: 847.413.8530  
W. E. Tel: 800.853.9953  
Schaumburg  
I. E. Tel: 847.885.9700

## Indiana

Fort Wayne  
I. E. Tel: 219.436.4250  
W. E. Tel: 888.358.9953  
Indianapolis  
A. E. Tel: 317.575.3500

## Iowa

W. E. Tel: 612.853.2280  
Cedar Rapids  
A. E. Tel: 319.393.0033

## Kansas

W. E. Tel: 303.457.9953  
Kansas City  
A. E. Tel: 913.663.7900  
Lenexa  
I. E. Tel: 913.492.0408

## Kentucky

W. E. Tel: 937.436.9953  
Central/Northern/ Western  
A. E. Tel: 800.984.9503  
Tel: 800.767.0329  
Tel: 800.829.0146

## Louisiana

W. E. Tel: 713.854.9953  
North/South  
A. E. Tel: 800.231.0253  
Tel: 800.231.5775

## Maine

A. E. Tel: 800.272.9255  
W. E. Tel: 781.271.9953

## Maryland

Baltimore  
A. E. Tel: 410.720.3400  
W. E. Tel: 800.863.9953  
Columbia  
B. M. Tel: 800.673.7461  
I. E. Tel: 410.381.3131

## Massachusetts

Boston  
A. E. Tel: 978.532.9808  
W. E. Tel: 800.444.9953  
Burlington  
I. E. Tel: 781.270.9400  
Marlborough  
B. M. Tel: 800.673.7459  
Woburn  
B. M. Tel: 800.552.4305

## Michigan

Brighton  
I. E. Tel: 810.229.7710  
Detroit  
A. E. Tel: 734.416.5800  
W. E. Tel: 888.318.9953  
Clarkston  
B. M. Tel: 877.922.9363

## Minnesota

Champlin  
B. M. Tel: 800.557.2566  
Eden Prairie  
B. M. Tel: 800.255.1469  
Minneapolis  
A. E. Tel: 612.346.3000  
W. E. Tel: 800.860.9953  
St. Louis Park  
I. E. Tel: 612.525.9999

## Mississippi

A. E. Tel: 800.633.2918  
W. E. Tel: 256.830.1119

## Missouri

W. E. Tel: 630.620.0969  
St. Louis  
A. E. Tel: 314.291.5350  
I. E. Tel: 314.872.2182

**U.S. Distributors  
by State  
(Continued)**

---

**Montana**

A. E. Tel: 800.526.1741  
W. E. Tel: 801.974.9953

**Nebraska**

A. E. Tel: 800.332.4375  
W. E. Tel: 303.457.9953

**Nevada**

Las Vegas  
A. E. Tel: 800.528.8471  
W. E. Tel: 702.765.7117

**New Hampshire**

A. E. Tel: 800.272.9255  
W. E. Tel: 781.271.9953

**New Jersey**

North/South  
A. E. Tel: 201.515.1641  
Tel: 609.222.6400

Mt. Laurel  
I. E. Tel: 856.222.9566  
Pine Brook  
B. M. Tel: 973.244.9668  
W. E. Tel: 800.862.9953  
Parsippany  
I. E. Tel: 973.299.4425  
Wayne  
W. E. Tel: 973.237.9010

**New Mexico**

W. E. Tel: 480.804.7000  
Albuquerque  
A. E. Tel: 505.293.5119

**New York**

Hauppauge  
I. E. Tel: 516.761.0960  
Long Island  
A. E. Tel: 516.434.7400  
W. E. Tel: 800.861.9953  
Rochester  
A. E. Tel: 716.475.9130  
I. E. Tel: 716.242.7790  
W. E. Tel: 800.319.9953  
Smithtown  
B. M. Tel: 800.543.2008  
Syracuse  
A. E. Tel: 315.449.4927

**North Carolina**

Raleigh  
A. E. Tel: 919.859.9159  
I. E. Tel: 919.873.9922  
W. E. Tel: 800.560.9953

**North Dakota**

A. E. Tel: 800.829.0116  
W. E. Tel: 612.853.2280

**Ohio**

Cleveland  
A. E. Tel: 216.498.1100  
W. E. Tel: 800.763.9953  
Dayton  
A. E. Tel: 614.888.3313  
I. E. Tel: 937.253.7501  
W. E. Tel: 800.575.9953  
Strongsville  
B. M. Tel: 440.238.0404  
Valley View  
I. E. Tel: 216.520.4333

**Oklahoma**

W. E. Tel: 972.235.9953  
Tulsa  
A. E. Tel: 918.459.6000  
I. E. Tel: 918.665.4664

**Oregon**

Beaverton  
B. M. Tel: 503.524.1075  
I. E. Tel: 503.644.3300  
Portland  
A. E. Tel: 503.526.6200  
W. E. Tel: 800.879.9953

**Pennsylvania**

Mercer  
I. E. Tel: 412.662.2707  
Philadelphia  
A. E. Tel: 800.526.4812  
B. M. Tel: 877.351.2355  
W. E. Tel: 800.871.9953  
Pittsburgh  
A. E. Tel: 412.281.4150  
W. E. Tel: 440.248.9996

**Rhode Island**

A. E. 800.272.9255  
W. E. Tel: 781.271.9953

**South Carolina**

A. E. Tel: 919.872.0712  
W. E. Tel: 919.469.1502

**South Dakota**

A. E. Tel: 800.829.0116  
W. E. Tel: 612.853.2280

**Tennessee**

W. E. Tel: 256.830.1119  
East/West  
A. E. Tel: 800.241.8182  
Tel: 800.633.2918

**Texas**

Arlington  
B. M. Tel: 817.417.5993  
Austin  
A. E. Tel: 512.219.3700  
B. M. Tel: 512.258.0725  
I. E. Tel: 512.719.3090  
W. E. Tel: 800.365.9953  
Dallas  
A. E. Tel: 214.553.4300  
B. M. Tel: 972.783.4191  
W. E. Tel: 800.955.9953  
El Paso  
A. E. Tel: 800.526.9238  
Houston  
A. E. Tel: 713.781.6100  
B. M. Tel: 713.917.0663  
W. E. Tel: 800.888.9953  
Richardson  
I. E. Tel: 972.783.0800  
Rio Grande Valley  
A. E. Tel: 210.412.2047  
Stafford  
I. E. Tel: 281.277.8200

**Utah**

Centerville  
B. M. Tel: 801.295.3900  
Murray  
I. E. Tel: 801.288.9001  
Salt Lake City  
A. E. Tel: 801.365.3800  
W. E. Tel: 800.477.9953

**Vermont**

A. E. Tel: 800.272.9255  
W. E. Tel: 716.334.5970

**Virginia**

A. E. Tel: 800.638.5988  
W. E. Tel: 301.604.8488  
Haymarket  
B. M. Tel: 703.754.3399  
Springfield  
B. M. Tel: 703.644.9045

**Washington**

Kirkland  
I. E. Tel: 425.820.8100  
Maple Valley  
B. M. Tel: 206.223.0080  
Seattle  
A. E. Tel: 425.882.7000  
W. E. Tel: 800.248.9953

**West Virginia**

A. E. Tel: 800.638.5988

**Wisconsin**

Milwaukee  
A. E. Tel: 414.513.1500  
W. E. Tel: 800.867.9953  
Wauwatosa  
I. E. Tel: 414.258.5338

# Direct Sales Representatives by State (Components and Boards)

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E. A. Earle Associates  
E. L. Electrodyne - UT  
GRP Group 2000  
I. S. Infinity Sales, Inc.  
ION ION Associates, Inc.  
R. A. Rathsburg Associates, Inc.  
SGY Synergy Associates, Inc.

## Arizona

Tempe  
E. A. Tel: 480.921.3305

## California

Calabasas  
I. S. Tel: 818.880.6480  
Irvine  
I. S. Tel: 714.833.0300  
San Diego  
E. A. Tel: 619.278.5441

## Illinois

Elmhurst  
R. A. Tel: 630.516.8400

## Indiana

Cicero  
R. A. Tel: 317.984.8608  
Ligonier  
R. A. Tel: 219.894.3184  
Plainfield  
R. A. Tel: 317.838.0360

## Massachusetts

Burlington  
SGY Tel: 781.238.0870

## Michigan

Byron Center  
R. A. Tel: 616.554.1460  
Good Rich  
R. A. Tel: 810.636.6060  
Novi  
R. A. Tel: 810.615.4000

## North Carolina

Cary  
GRP Tel: 919.481.1530

## Ohio

Columbus  
R. A. Tel: 614.457.2242  
Dayton  
R. A. Tel: 513.291.4001  
Independence  
R. A. Tel: 216.447.8825

## Pennsylvania

Somerset  
R. A. Tel: 814.445.6976

## Texas

Austin  
ION Tel: 512.794.9006  
Arlington  
ION Tel: 817.695.8000  
Houston  
ION Tel: 281.376.2000

## Utah

Salt Lake City  
E. L. Tel: 801.264.8050

## Wisconsin

Muskego  
R. A. Tel: 414.679.8250  
Saukville  
R. A. Tel: 414.268.1152

# Sales Offices and Design Resource Centers

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**LSI Logic Corporation  
Corporate Headquarters**  
1551 McCarthy Blvd  
Milpitas CA 95035  
Tel: 408.433.8000  
Fax: 408.433.8989

## NORTH AMERICA

### California

Irvine  
18301 Von Karman Ave  
Suite 900  
Irvine, CA 92612  
◆ Tel: 949.809.4600  
Fax: 949.809.4444

Pleasanton Design Center  
5050 Hopyard Road, 3rd Floor  
Suite 300  
Pleasanton, CA 94588  
Tel: 925.730.8800  
Fax: 925.730.8700

### San Diego

7585 Ronson Road  
Suite 100  
San Diego, CA 92111  
Tel: 858.467.6981  
Fax: 858.496.0548

### Silicon Valley

1551 McCarthy Blvd  
Sales Office  
M/S C-500  
◆ Milpitas, CA 95035  
Tel: 408.433.8000  
Fax: 408.954.3353  
Design Center  
M/S C-410  
Tel: 408.433.8000  
Fax: 408.433.7695

### Wireless Design Center

11452 El Camino Real  
Suite 210  
San Diego, CA 92130  
Tel: 858.350.5560  
Fax: 858.350.0171

### Colorado

Boulder  
4940 Pearl East Circle  
Suite 201  
◆ Boulder, CO 80301  
Tel: 303.447.3800  
Fax: 303.541.0641

### Colorado Springs

4420 Arrowswest Drive  
Colorado Springs, CO 80907  
Tel: 719.533.7000  
Fax: 719.533.7020

### Fort Collins

2001 Danfield Court  
Fort Collins, CO 80525  
Tel: 970.223.5100  
Fax: 970.206.5549

### Florida

Boca Raton  
2255 Glades Road  
Suite 324A  
Boca Raton, FL 33431  
Tel: 561.989.3236  
Fax: 561.989.3237

### Georgia

Alpharetta  
2475 North Winds Parkway  
Suite 200  
Alpharetta, GA 30004  
Tel: 770.753.6146  
Fax: 770.753.6147

### Illinois

Oakbrook Terrace  
Two Mid American Plaza  
Suite 800  
Oakbrook Terrace, IL 60181  
Tel: 630.954.2234  
Fax: 630.954.2235

### Kentucky

Bowling Green  
1262 Chestnut Street  
Bowling Green, KY 42101  
Tel: 270.793.0010  
Fax: 270.793.0040

### Maryland

Bethesda  
6903 Rockledge Drive  
Suite 230  
Bethesda, MD 20817  
Tel: 301.897.5800  
Fax: 301.897.8389

### Massachusetts

Waltham  
200 West Street  
Waltham, MA 02451  
◆ Tel: 781.890.0180  
Fax: 781.890.6158

### Burlington - Mint Technology

77 South Bedford Street  
Burlington, MA 01803  
Tel: 781.685.3800  
Fax: 781.685.3801

### Minnesota

Minneapolis  
8300 Norman Center Drive  
Suite 730  
◆ Minneapolis, MN 55437  
Tel: 612.921.8300  
Fax: 612.921.8399

### New Jersey

Red Bank  
125 Half Mile Road  
Suite 200  
Red Bank, NJ 07701  
Tel: 732.933.2656  
Fax: 732.933.2643

### Cherry Hill - Mint Technology

215 Longstone Drive  
Cherry Hill, NJ 08003  
Tel: 856.489.5530  
Fax: 856.489.5531

### New York

Fairport  
550 Willowbrook Office Park  
Fairport, NY 14450  
Tel: 716.218.0020  
Fax: 716.218.9010

### North Carolina

Raleigh  
Phase II  
4601 Six Forks Road  
Suite 528  
Raleigh, NC 27609  
Tel: 919.785.4520  
Fax: 919.783.8909

### Oregon

Beaverton  
15455 NW Greenbrier Parkway  
Suite 235  
Beaverton, OR 97006  
Tel: 503.645.0589  
Fax: 503.645.6612

### Texas

Austin  
9020 Capital of TX Highway North  
Building 1  
Suite 150  
Austin, TX 78759  
Tel: 512.388.7294  
Fax: 512.388.4171

### Plano

500 North Central Expressway  
Suite 440  
◆ Plano, TX 75074  
Tel: 972.244.5000  
Fax: 972.244.5001

### Houston

20405 State Highway 249  
Suite 450  
Houston, TX 77070  
Tel: 281.379.7800  
Fax: 281.379.7818

### Canada

#### Ontario

Ottawa  
260 Hearst Way  
Suite 400  
Kanata, ON K2L 3H1  
◆ Tel: 613.592.1263  
Fax: 613.592.3253

## INTERNATIONAL

### France

Paris  
**LSI Logic S.A.**  
**Immeuble Europa**  
53 bis Avenue de l'Europe  
B.P. 139  
78148 Velizy-Villacoublay  
Cedex, Paris  
◆ Tel: 33.1.34.63.13.13  
Fax: 33.1.34.63.13.19

### Germany

Munich  
**LSI Logic GmbH**  
Orleansstrasse 4  
81669 Munich  
◆ Tel: 49.89.4.58.33.0  
Fax: 49.89.4.58.33.108

### Stuttgart

Mittlerer Pfad 4  
D-70499 Stuttgart  
◆ Tel: 49.711.13.96.90  
Fax: 49.711.86.61.428

### Italy

Milan  
**LSI Logic S.P.A.**  
Centro Direzionale Colleoni Palazzo  
Orione Ingresso 1  
20041 Agrate Brianza, Milano  
◆ Tel: 39.039.687371  
Fax: 39.039.6057867

### Japan

Tokyo  
**LSI Logic K.K.**  
Rivage-Shinagawa Bldg. 14F  
4-1-8 Kounan  
Minato-ku, Tokyo 108-0075  
◆ Tel: 81.3.5463.7821  
Fax: 81.3.5463.7820

### Osaka

Crystal Tower 14F  
1-2-27 Shiromi  
Chuo-ku, Osaka 540-6014  
◆ Tel: 81.6.947.5281  
Fax: 81.6.947.5287

# Sales Offices and Design Resource Centers (Continued)

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## **Korea**

Seoul

### **LSI Logic Corporation of Korea Ltd**

10th Fl., Haesung 1 Bldg.  
942, Daechi-dong,  
Kangnam-ku, Seoul, 135-283  
Tel: 82.2.528.3400  
Fax: 82.2.528.2250

## **The Netherlands**

Eindhoven

### **LSI Logic Europe Ltd**

World Trade Center Eindhoven  
Building 'Rijder'  
Bogert 26  
5612 LZ Eindhoven  
Tel: 31.40.265.3580  
Fax: 31.40.296.2109

## **Singapore**

Singapore

### **LSI Logic Pte Ltd**

7 Temasek Boulevard  
#28-02 Suntec Tower One  
Singapore 038987  
Tel: 65.334.9061  
Fax: 65.334.4749

## **Sweden**

Stockholm

### **LSI Logic AB**

Finlandsgatan 14  
164 74 Kista  
◆ Tel: 46.8.444.15.00  
Fax: 46.8.750.66.47

## **Taiwan**

Taipei

### **LSI Logic Asia, Inc.**

#### **Taiwan Branch**

10/F 156 Min Sheng E. Road  
Section 3  
Taipei, Taiwan R.O.C.  
Tel: 886.2.2718.7828  
Fax: 886.2.2718.8869

## **United Kingdom**

Bracknell

### **LSI Logic Europe Ltd**

Greenwood House  
London Road  
Bracknell, Berkshire RG12 2UB  
◆ Tel: 44.1344.426544  
Fax: 44.1344.481039

◆ Sales Offices with  
Design Resource Centers

# International Distributors

## Australia

New South Wales  
**Reptechnic Pty Ltd**  
3/36 Bydown Street  
Neutral Bay, NSW 2089  
◆ Tel: 612.9953.9844  
Fax: 612.9953.9683

## Belgium

**Acal nv/sa**  
Lozenberg 4  
1932 Zaventem  
Tel: 32.2.7205983  
Fax: 32.2.7251014

## China

Beijing  
**LSI Logic International Services Inc.**  
**Beijing Representative Office**  
Room 708  
Canway Building  
66 Nan Li Shi Lu  
Xicheng District  
Beijing 100045, China  
Tel: 86.10.6804.2534 to 38  
Fax: 86.10.6804.2521

## France

Rungis Cedex  
**Azzurri Technology France**  
22 Rue Saarinen  
Sillic 274  
94578 Rungis Cedex  
Tel: 33.1.41806310  
Fax: 33.1.41730340

## Germany

Haar  
**EBV Elektronik**  
Hans-Pinsel Str. 4  
D-85540 Haar  
Tel: 49.89.4600980  
Fax: 49.89.46009840

## Munich

**Avnet Emg GmbH**  
Stahlgruberring 12  
81829 Munich  
Tel: 49.89.45110102  
Fax: 49.89.42.27.75

## Wuennenberg-Haaren

**Peacock AG**  
Graf-Zepplin-Str 14  
D-33181 Wuennenberg-Haaren  
Tel: 49.2957.79.1692  
Fax: 49.2957.79.9341

## Hong Kong

Hong Kong  
**AVT Industrial Ltd**  
Unit 608 Tower 1  
Cheung Sha Wan Plaza  
833 Cheung Sha Wan Road  
Kowloon, Hong Kong  
Tel: 852.2428.0008  
Fax: 852.2401.2105

## Serial System (HK) Ltd

2301 Nanyang Plaza  
57 Hung To Road, Kwun Tong  
Kowloon, Hong Kong  
Tel: 852.2995.7538  
Fax: 852.2950.0386

## India

Bangalore  
**Spike Technologies India Private Ltd**  
951, Vijayalakshmi Complex,  
2nd Floor, 24th Main,  
J P Nagar II Phase,  
Bangalore, India 560078  
◆ Tel: 91.80.664.5530  
Fax: 91.80.664.9748

## Israel

Tel Aviv  
**Eastronics Ltd**  
11 Rozanis Street  
P.O. Box 39300  
Tel Aviv 61392  
Tel: 972.3.6458777  
Fax: 972.3.6458666

## Japan

Tokyo  
**Daito Electron**  
Sogo Kojimachi No.3 Bldg  
1-6 Kojimachi  
Chiyoda-ku, Tokyo 102-8730  
Tel: 81.3.3264.0326  
Fax: 81.3.3261.3984

## Global Electronics Corporation

Nichibei Time24 Bldg. 35 Tansu-cho  
Shinjuku-ku, Tokyo 162-0833  
Tel: 81.3.3260.1411  
Fax: 81.3.3260.7100  
Technical Center  
Tel: 81.471.43.8200

## Marubeni Solutions

1-26-20 Higashi  
Shibuya-ku, Tokyo 150-0001  
Tel: 81.3.5778.8662  
Fax: 81.3.5778.8669

## Shinki Electronics

Myuru Daikanyama 3F  
3-7-3 Ebisu Minami  
Shibuya-ku, Tokyo 150-0022  
Tel: 81.3.3760.3110  
Fax: 81.3.3760.3101

## Yokohama-City

**Innotech**  
2-15-10 Shin Yokohama  
Kohoku-ku  
Yokohama-City, 222-8580  
Tel: 81.45.474.9037  
Fax: 81.45.474.9065

## Macnica Corporation

Hakusan High-Tech Park  
1-22-2 Hadusan, Midori-Ku,  
Yokohama-City, 226-8505  
Tel: 81.45.939.6140  
Fax: 81.45.939.6141

## The Netherlands

Eindhoven  
**Acal Nederland b.v.**  
Beatrix de Rijkweg 8  
5657 EG Eindhoven  
Tel: 31.40.2.502602  
Fax: 31.40.2.510255

## Switzerland

Brugg  
**LSI Logic Sulzer AG**  
Mattenstrasse 6a  
CH 2555 Brugg  
Tel: 41.32.3743232  
Fax: 41.32.3743233

## Taiwan

Taipei  
**Avnet-Mercuries Corporation, Ltd**  
14F, No. 145,  
Sec. 2, Chien Kuo N. Road  
Taipei, Taiwan, R.O.C.  
Tel: 886.2.2516.7303  
Fax: 886.2.2505.7391

## Lumax International Corporation, Ltd

7th Fl., 52, Sec. 3  
Nan-Kang Road  
Taipei, Taiwan, R.O.C.  
Tel: 886.2.2788.3656  
Fax: 886.2.2788.3568

## Prospect Technology Corporation, Ltd

4Fl., No. 34, Chu Luen Street  
Taipei, Taiwan, R.O.C.  
Tel: 886.2.2721.9533  
Fax: 886.2.2773.3756

## Wintech Microelectronics Co., Ltd

7F, No. 34, Sec. 3, Pateh Road  
Taipei, Taiwan, R.O.C.  
Tel: 886.2.2579.5858  
Fax: 886.2.2570.3123

## United Kingdom

Maidenhead  
**Azzurri Technology Ltd**  
16 Grove Park Business Estate  
Waltham Road  
White Waltham  
Maidenhead, Berkshire SL6 3LW  
Tel: 44.1628.826826  
Fax: 44.1628.829730

## Milton Keynes

**Ingram Micro (UK) Ltd**  
Garamonde Drive  
Wymbush  
Milton Keynes  
Buckinghamshire MK8 8DF  
Tel: 44.1908.260422

## Swindon

**EBV Elektronik**  
12 Interface Business Park  
Bincknoll Lane  
Wootton Bassett,  
Swindon, Wiltshire SN4 8SY  
Tel: 44.1793.849933  
Fax: 44.1793.859555

◆ Sales Offices with  
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