USER'S GUIDE

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

Version 1.0

February 2001

LSI LOGIC®

S14062

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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- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

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This document describes the LSI Logic LSI40909G-S PCI to Fibre Channel Host Adapter for Sun Solaris and will remain the official reference source for all revisions/releases of this product until rescinded by an update.

To receive product literature, visit us at http://www.lsilogic.com.

DB

Preface

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.

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.

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.

Related Publications

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

Revision Record

Revision	Date	Remarks
1.0	02/01	First printing.

Contents

Chapter 1
LSI40909G-S Description

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

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.

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

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

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.

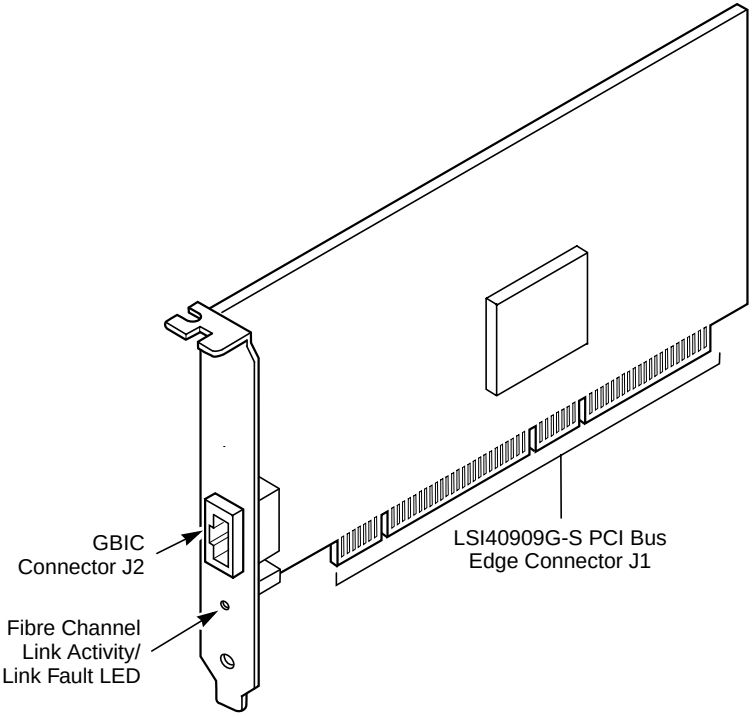
Refer to the computer's user's manual to confirm the location of the PCI slots.

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.

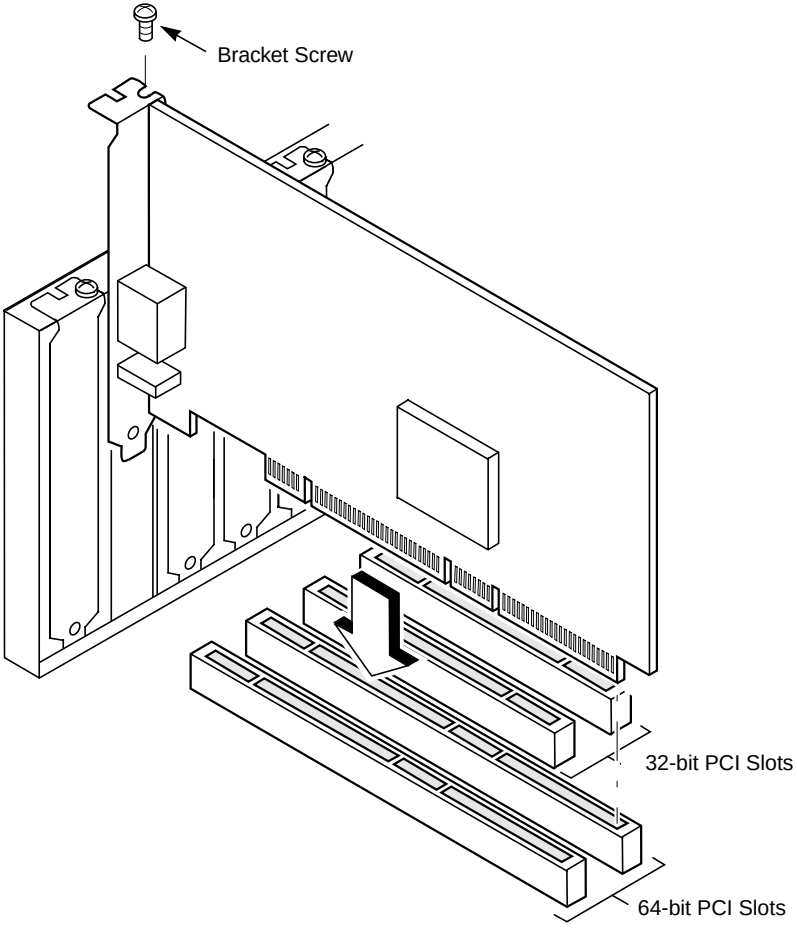
Figure 2.1 Hardware Connections for the LSI40909G-S



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

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:

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[1]
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 reseat 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 SCSA 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 itmpt 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®, 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:

ipaddr	is the tcp/ip address of the client
ethernetid	is the ethernet hardware (mac) address of the client
client_name	is the client’s system name
platform_group	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
itmpt<n>: This hardware not supported by this driver.	itmpt 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.
itmpt<n>: Failed to map device registers.	itmpt 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.
itmpt<n>: Hardware not properly enabled by system, cmd=xxxxh.	The system has not properly enabled the configuration resources that itmpt needs in order to use this hardware. The cmd=xxxxh 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.)

Error Messages	Explanation
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

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

4.1 Physical Environment

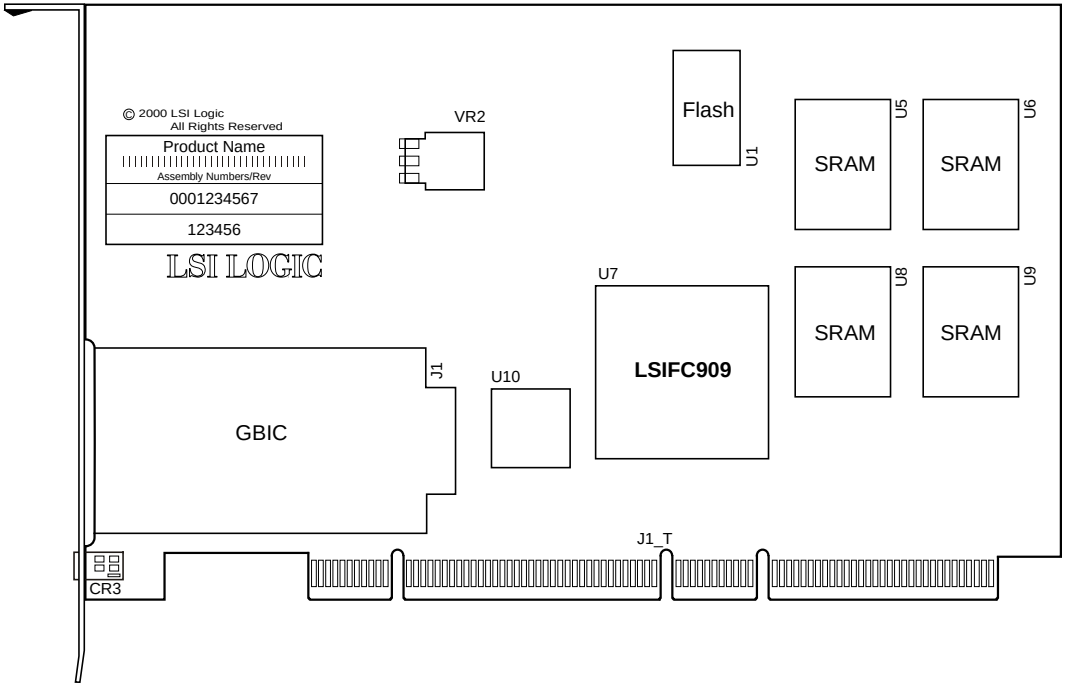
This section provides information about the physical, electrical, thermal, and safety characteristics of the LSI40909G-S. Additionally, these boards are compliant with electromagnetic standards set by the FCC.

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, ± 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

8B/10B	A data encoding scheme developed by IBM, translating byte wide data to an encoded 10-bit format.
ANSI	American National Standards Institute. The coordinating organization for voluntary standards in the United States.
Arbitrated Loop Topology (FC-AL)	A FC Topology that provides a low cost solution to attach multiple ports in a loop without hubs and switches.
BER	Bit Error Rate.
Bit	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.
Broadcast	Sending a transmission to all N_Ports on a fabric.
Bus	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.
Bus Mastering	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.
Byte	A unit of information consisting of eight bits.
Channel	A point-to-point link, the main task of which is to transport data from one point to another.

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

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

Host	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.
Host Adapter	A circuit board or integrated circuit that provides a SCSI bus connection to the computer system.
IP	Internet Protocol.
IPI	Intelligent Peripheral Interface.
ISA	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.
Kbyte	Kilobyte. A measure of computer storage equal to 1024 bytes.
LCT	Logical Configuration Table.
LLC	Logical Link Control.
Local Bus	A way to connect peripherals directly to computer memory. It bypasses the slower ISA and EISA buses. PCI is a local bus standard.
L_Port	An FC port which supports the arbitrated loop topology.
Link_Control_ Facility	A termination card that handles the logical and physical control of the FC link for each mode of use.
Login Server	Entity within the FC fabric that receives and responds to login requests.
LUN	Logical Unit Number. An identifier, zero to seven, for a logical unit.
Mbyte	Megabyte. A measure of computer storage equal to 1024 kilobytes.
MFA	Message Frame Address.
Multicast	Refers to delivering a single transmission to multiple destination N_Ports.
NIC	Network Interface Card.
N_Port	“Node” port, an FC defined hardware entity at the node end of a link.
NL_Port	An N_Port that contains arbitrated loop functions.

Operating System — 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.

Operation — A term, defined in FC-2, that refers to one of the FC “building blocks” composed of one or more, possibly concurrent, exchanges.

Ordered Set — 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.

Originator — An FC term referring to the initiating device.

Parity Checking — 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.

PCI — Peripheral Component Interconnect. A local bus specification that allows connection of peripherals directly to computer memory. It bypasses the slower ISA and EISA buses.

PDB — Packet Descriptor Block.

PIO — 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.

Port — The hardware entity within a node that performs data communications over the FC link.

Port Address — Also Port Number. The address through which commands are sent to a host adapter board. This address is assigned by the PCI bus.

Port Number — See Port Address.

RAM — 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.

Responder An FC term referring to the answering device.

RISC Core LSIFC909 chips contain a RISC (Reduced Instruction Set Computer) processor, programmed through microcode scripts.

ROM 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.

SAN Storage Area Network.

SCAM SCSI Configured AutoMatically. A method to automatically allocate SCSI IDs using software when SCAM compliant SCSI devices are attached.

Scatter/Gather 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.

SCB SCSI Command Block.

SCSI Small Computer System Interface. A specification for a high-performance peripheral bus and command set. The original standard is referred to as SCSI-1.

SCSI-2 The current SCSI specification which adds features to the original SCSI-1 standard.

SCSI ID 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.

Sequence A term referring to one of the FC “building blocks”, composed of one or more related frames for a single operation.

SGL Scatter Gather List.

SNAP SubNetwork Access Protocol.

Synchronous Data Transfer 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.

System BIOS Controls the low level POST (Power-On Self-Test), and basic operation of the CPU and computer system.

TID Target ID.

Topology The logical and/or physical arrangement of stations on a network.

ULP Upper Layer Protocol.

VCCI Voluntary Control Council for Interference.

Virtual Memory Space on a hard disk that can be used as if it were RAM.

VPD Vendor Product Data.

Word A two byte (or 16 bit) unit of information.

X3T9 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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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

Wyoming
A. E. Tel: 800.332.9326
W. E. Tel: 801.974.9953

Direct Sales Representatives by State (Components and Boards)

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

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Milpitas, CA 95035
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Design Center
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Tel: 408.433.8000
Fax: 408.433.7695

Wireless Design Center
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San Diego, CA 92130
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4940 Pearl East Circle
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Colorado Springs, CO 80907
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Boca Raton
2255 Glades Road
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Waltham, MA 02451
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215 Longstone Drive
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Prospect Technology Corporation, Ltd
4Fl., No. 34, Chu Luen Street
Taipei, Taiwan, R.O.C.
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7F., No. 34, Sec. 3, Pateh Road
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Milton Keynes
Ingram Micro (UK) Ltd
Garamonde Drive
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Milton Keynes
Buckinghamshire MK8 8DF
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Swindon
EBV Elektronik
12 Interface Business Park
Bincknoll Lane
Wootton Bassett,
Swindon, Wiltshire SN4 8SY
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