

# USER'S GUIDE

## LSI20860 PCI to Ultra SCSI Host Adapter

*Version 1.1*

**January 2001**

**LSI LOGIC®**



## 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:

- Reorient or relocate the receiving antenna.
- 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.

Shielded cables for SCSI connection external to the cabinet are used in the compliance testing of this Product. LSI Logic is not responsible for any radio or television interference caused by unauthorized modification of this equipment or the substitution or attachment of connecting cables and equipment other than those specified by LSI Logic. The correction of interferences caused by such unauthorized modification, substitution, or attachment will be the responsibility of the user.

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# Preface

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This book is the primary reference and user's guide for the LSI Logic LSI20860 PCI to Ultra SCSI Host Adapter. It contains a complete functional description for the LSI20860 and includes complete physical and electrical specifications for the LSI20860.

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## Audience

This document assumes that you have some familiarity with microprocessors and related support devices. The people who benefit from this book are:

- Engineers and managers who are evaluating or designing the host adapter board for possible use in a system
  - End users who are installing the host adapter board into their computer
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## Organization

This document has the following chapter and appendix:

- [Chapter 1, Using the LSI20860](#), describes the PCI and SCSI interfaces for this board along with the physical and electrical specifications. Quick installation instructions are also provided for inserting this host adapter into your computer.
- [Appendix A, Glossary of Terms and Abbreviations](#), describes various terminology that is referenced throughout this user's guide.

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## Related Publications

*LSI53C860 PCI to Ultra SCSI I/O Processor Data Manual,*  
Order Number T09962

*PCI Storage Device Management System SDMS 4.0 User's Guide,*  
Order Number S14007.A

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## Revision Record

Revision	Date	Remarks
1.0	11/99	Final version.
1.1	01/01	All product names changed from SYM to LSI.

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# Chapter 1

## Using the LSI20860

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This chapter contains instructions and illustrations to help you install a LSI20860 PCI to Ultra SCSI host adapter board into a PCI computer system. It includes these topics:

- [Section 1.1, "General Description," page 1-1](#)
  - [Section 1.2, "Installing the LSI20860," page 1-5](#)
  - [Section 1.3, "Connecting SCSI Devices," page 1-7](#)
  - [Section 1.4, "Troubleshooting," page 1-12](#)
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## 1.1 General Description

The LSI20860 provides a low-cost SCSI solution for attaching SCSI devices (disk drives, scanners, CD-ROM drivers, tape drives, removable media drives, etc.) to PCI computer systems with an ISA/EISA bracket type. The LSI20860 uses the LSI53C860 PCI to Ultra SCSI I/O Processor chip, an 80 MHz oscillator, and transfers SCSI data up to 20 Mbytes/s.

### 1.1.1 Features

This section provides a high level overview of the PCI Interface, the SCSI Interface, and Board Characteristics for the LSI20860.

#### 1.1.1.1 PCI Interface

- Full 32-bit DMA bus master
- Zero wait-state bus master data bursts
- Supports 5 V

### 1.1.1.2 SCSI Interface

- Supports 8-bit Single-Ended (SE) signaling only
- Automatically enables SE termination
- Supports SCSI termination power (TERMPWR) source
- External: 50-pin high density; Internal: 50-pin low density connectors
- Provides Ultra SCSI synchronous transfer capability up to 20 Mbytes/s

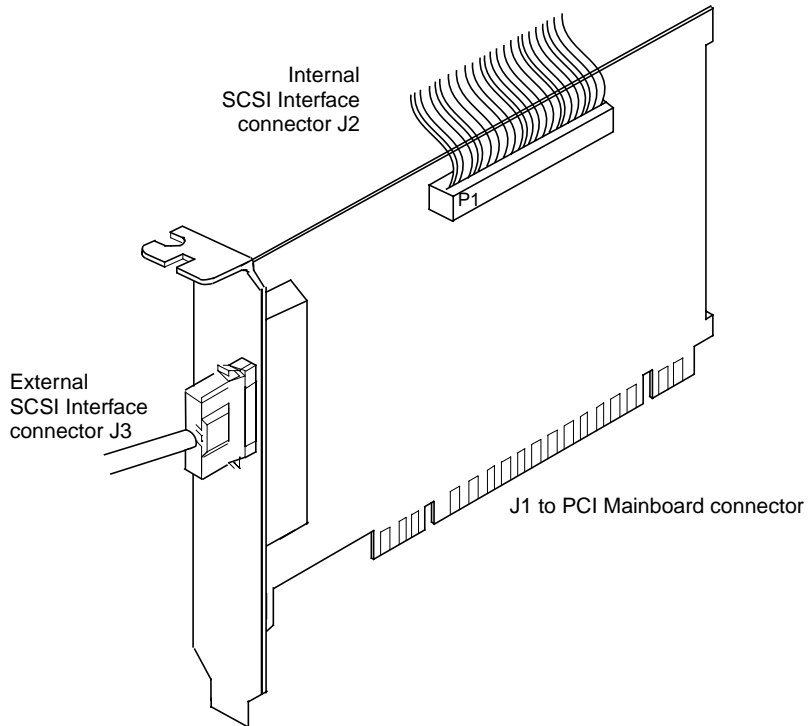
### 1.1.1.3 Board Requirements

- PCI board dimensions: 2.5 x 4.75 inches
- PCI 5 V signaling environment
- ISA/EISA bracket type

The Storage Device Management System (SDMS™) software includes drivers and utilities for operating this host adapter in computers. The *PCI Storage Device Management System SDMS 4.0 User's Guide* contains installation instructions for the appropriate drivers and utilities for various operating systems.

[Figure 1.1](#) shows the major components and connections of the LSI20860.

**Figure 1.1 LSI20860 Board Hardware**



## 1.1.2 Physical Environment

This section discusses the physical, electrical, thermal, and safety characteristics of the LSI20860. Additionally, this board is compliant with Class B electromagnetic standards set by the FCC.

### 1.1.2.1 Physical Characteristics

The dimensions of the LSI20860 are 2.5 x 4.75 inches. PCI connection is made through edge connector J1.

Internal SCSI connection is made through the 50-pin low density connector J2. External SCSI connection is made through the 50-pin high density connector J3. The J3 connector extends outside the cabinet through a bracket attached to the board and the face of the connector. The bracket is a standard ISA type with a cutout to accommodate connector J3.

The component height on the top and bottom of the board conforms to the PCI Specification.

### 1.1.2.2 Electrical Characteristics

The LSI20860 maximum power requirement, including SCSI TERMPWR, under normal operation is:

**Table 1.1 Maximum Power Requirements**

+ 5 V DC	± 5%	1.5 A	Over the operating range 5 °C to 55 °C
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Under abnormal conditions such as a short on SCSI TERMPWR, +5 V current may be higher. At temperatures of at least 25 °C a current of 4 A is sustained no longer than 30 seconds before the self-resetting TERMPWR short circuit protection device opens.

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

### 1.1.2.3 Thermal, Atmospheric Characteristics

The board is designed to operate in an environment defined by the following parameters:

- Temperature range: 5 °C to 55 °C (dry bulb)
- Relative humidity range: 5% to 90% noncondensing
- Maximum dew point temperature: 32 °C
- Storage Temperature: -40 °C to +85 °C with 0 to 95% RH noncondensing 10 °C

### 1.1.2.4 Electromagnetic Compliance

The board is designed and implemented to minimize electromagnetic emissions, susceptibility, and the effects of electromagnetic discharge. The board meets the requirements of FCC Class B and CISPR 22 limits and is marked with the FCC Class B Declaration of Conformity Symbol. It also carries the CE mark.

### 1.1.2.5 Safety Characteristics

The bare board meets or exceeds the requirements of UL flammability rating 94 V0. The bare board is also marked with the supplier's name or trademark, type, and UL flammability rating. Since this board is installed in a PCI bus slot, all voltages are below the SELV 42.4 V limit.

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## 1.2 Installing the LSI20860

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

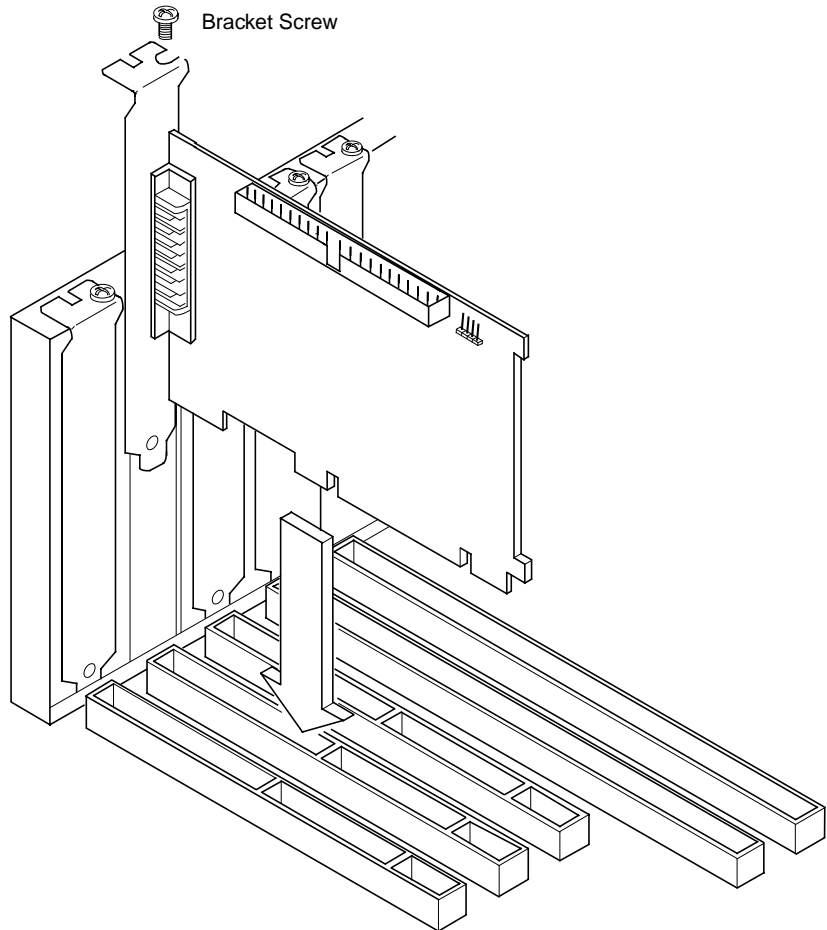
**Caution:** *Ground yourself* by touching a metal surface before handling boards. Static charges on your body can damage electronic components. Handle plug-in boards by the edge; do not touch board components or gold connector contacts. The use of a static group strap is recommended.

- Step 1. *Ground yourself* before removing this host adapter board. Remove the LSI20860 from the packing and check that it is not damaged. An example of this host adapter board is shown in [Figure 1.1](#).
- Step 2. Switch off and unplug the system.
- Step 3. Remove the cover on your computer to access the PCI slots. Refer to your computer documentation if necessary.
- Step 4. Locate the slots for PCI plug-in board installation. Refer to your computer documentation if necessary to locate the expansion slots. The LSI20860 requires a PCI slot that allows bus master operation. See [Figure 1.2](#).
- Step 5. Remove the blank bracket panel on the back of the computer aligned with the PCI slot you intend to use. Save the bracket screw.
- Step 6. Carefully insert edge connector J1 of the host adapter board into the PCI slot. Make sure the edge connector is properly aligned before pressing the board into place. Apply even pressure to both ends of the board while inserting it. See the example shown in [Figure 1.2](#).

Note: Notice that the components on a PCI host adapter face the opposite way from non-PCI adapter boards you have in your system. This is correct, and the board is keyed to go in only one way.

- Step 7. The bracket around the external connector J3 should fit where the blank panel was removed. Secure it with the bracket screw before making the internal and external SCSI bus connections. See [Figure 1.2](#).
- Step 8. To connect any internal SCSI device, plug a 50-pin connector on the end of the internal SCSI ribbon cable into the J2 connector.
- Step 9. Make sure the connection to the opposite end of the ribbon cable has been made to a SCSI device. See [Figure 1.3](#).
- Step 10. Replace the cabinet cover as described in the user's manual for your computer.
- Step 11. Make all external SCSI bus connections. Finally, refer to the *PCI Storage Device Management System SDMS 4.0 User's Guide* (or the guide for the software that you will use) to load the driver software for your particular operating system.

**Figure 1.2 Inserting the Host Adapter**



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## 1.3 Connecting SCSI Devices

The main connections to SCSI devices involve two types of connectors:

- Internal 50-pin SCSI connector
- External 50-pin SCSI connector

The next sections provide more detailed information.

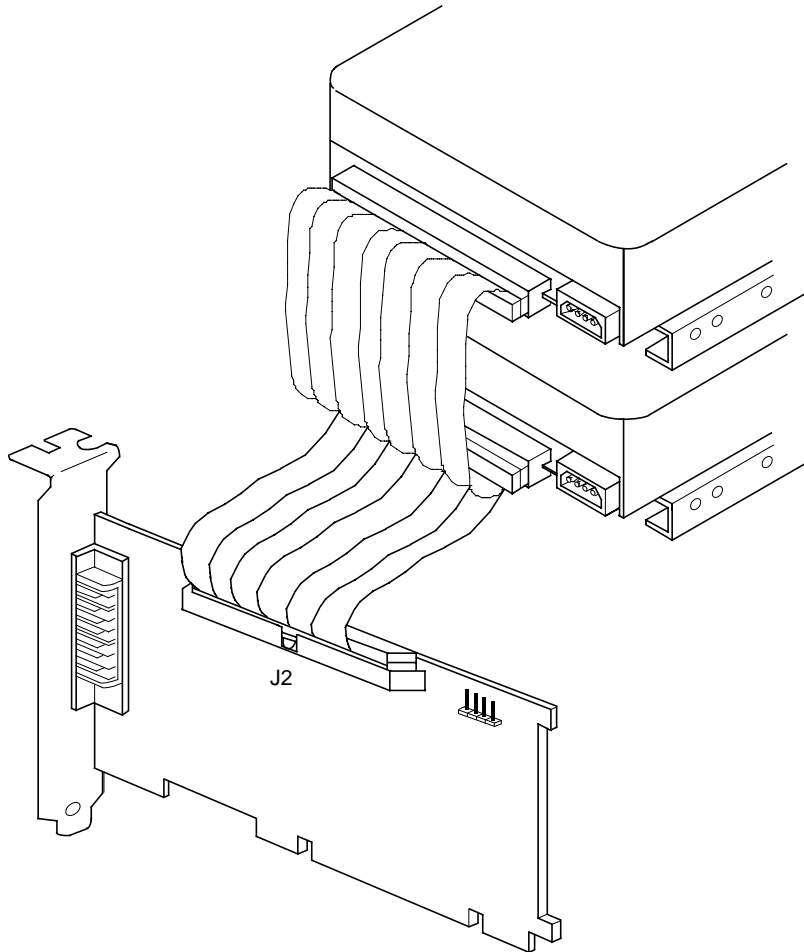
### 1.3.1 Internal SCSI Bus Connections

This section provides step-by-step instructions about making internal SCSI bus connections.

- Step 1. To connect an internal SCSI device, plug the 50-pin connector on one end of the SCSI ribbon cable into the connector J2 (see [Figure 1.3](#)). The ribbon cable included in your LSI20860 kit is keyed to ensure it is connected correctly.
- Step 2. Plug the 50-pin connector on the other end of the SCSI ribbon cable into the SCSI connector on your internal SCSI device.
- Step 3. To attach more than one internal device, use an internal SCSI ribbon cable with the required number of 50-pin connectors attached along its length. Plug the cable connectors into the internal SCSI device connectors, as illustrated in [Figure 1.3](#).
- Step 4. Terminate the SCSI bus as described in the [Section 1.3.3, "SCSI Bus Termination,"](#) page 1-10.
- Step 5. Make any required power connections to your internal SCSI device(s).



**Figure 1.3 Internal SCSI Devices Chained Together**



### 1.3.2 External SCSI Bus Connections

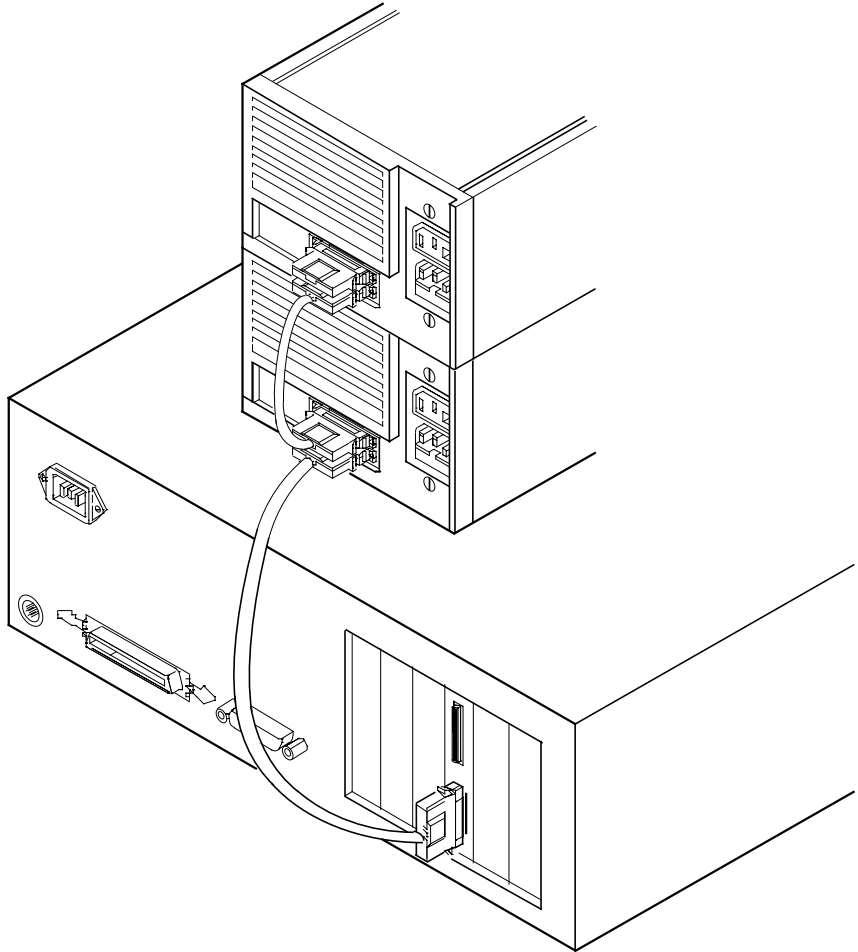
This section provides step-by-step instructions about making external SCSI bus connections.

Step 1. To connect external SCSI devices to the LSI20860, plug the 50-pin connector on one end of a shielded SCSI cable into the host adapter SCSI connector J3.

This connector is bracketed to the back panel of your computer. [Figure 1.4](#) shows how this connection is made.

- Step 2. Plug the 50-pin connector on the other end of the SCSI cable into the SCSI connector on the peripheral device. This connection is shown in [Figure 1.4](#).
- Step 3. To connect more than one device to the LSI20860, use shielded cables to chain them together as illustrated in [Figure 1.4](#).

**Figure 1.4 Multiple External Devices Chained Together**



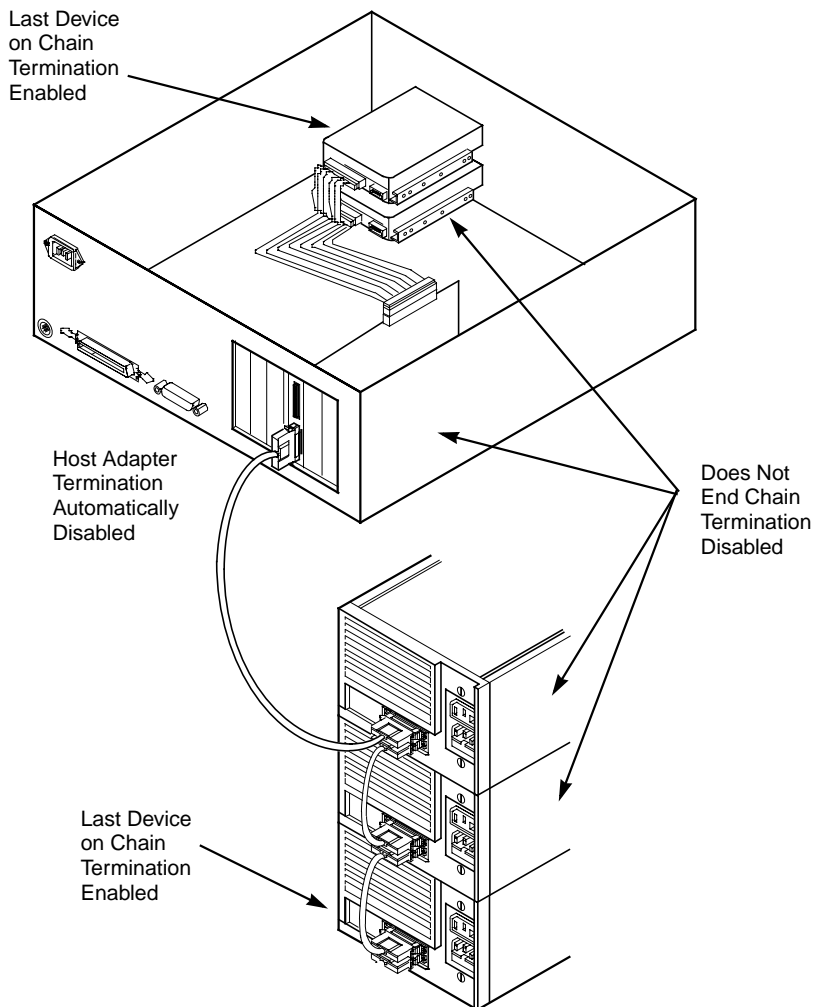
### 1.3.3 SCSI Bus Termination

All SCSI devices have a set of resistors called terminators to assure reliable operation of the SCSI bus. The devices making up the SCSI bus

are connected serially (chained together) with SCSI cables. The first and last physical devices connected on the ends of the SCSI bus must have these terminators enabled. All other SCSI devices on the bus must have their terminators removed or disabled.

Termination on the LSI20860 is automatically enabled when it is connected to the end of the bus. Refer to the SCSI device documentation for information on how to identify and change the terminator setting on each SCSI peripheral device.

**Figure 1.5 SCSI Bus Termination**



### 1.3.4 Setting SCSI IDs

Each device on the SCSI bus, including the host adapter, must have a unique SCSI ID from 0 through 7. SCSI ID 7 is the preset host adapter setting, giving it the highest priority on the SCSI bus. Refer to your peripheral device documentation for instructions on how to determine and change the ID of each peripheral device.

**Caution:** The LSI20860 supports only SE SCSI devices. Differential SCSI devices may be damaged if you connect them to this host adapter. Refer to your SCSI device documentation to make sure you are connecting an SE device.

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## 1.4 Troubleshooting

Some potential problems and their suggested solutions are:

### **During installation, no SCSI devices are found.**

1. Check the cable connections and the host bus adapter installation.
2. Ensure that all devices are powered on and terminated correctly.
3. Check that no devices have duplicate SCSI IDs.
4. Make sure INT A is assigned for the PCI slot(s) where your SCSI host adapter(s) are installed.
5. Make sure the SCSI device driver is installed properly.

### **The computer hangs or locks up when booting and the SCSI devices attached are not seen by the computer system.**

1. Make sure that all the SCSI devices are configured at different ID numbers (the boot drive should have the lowest ID).
2. Make sure both ends, but only the ends, of the SCSI bus are terminated.
3. Make sure the device driver for DOS and OS/2 are listed in the `CONFIG.SYS` file and loaded when booting.

**The device driver does not see one of the SCSI devices.**

1. Reboot the computer.
2. Make sure the SCSI devices have different ID numbers (the boot drive should have the lowest ID).
3. Make sure both ends, but only the ends, of the SCSI bus are terminated.
4. Check the cable and power connections.



# Appendix A

## Glossary of Terms and Abbreviations

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<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 or connectors 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>Chain</b>	In computers, the linking together of two or more SCSI devices so that they are dependent upon one another for operation.
<b>Daisy Chain</b>	A set of SCSI devices connected in a series. When devices are daisy-chained to a microcomputer, the first device is connected to the computer, the second device is connected to the first, and so on down the line.
<b>Device Driver</b>	A program that allows a microprocessor (through the operating system) to direct the operation of a peripheral device.
<b>External SCSI Device</b>	A SCSI device installed outside the computer cabinet. These devices are connected in a continuous chain using specific types of shielded cables.
<b>FCC</b>	Federal Communications Commission.
<b>File</b>	A named collection of information stored on a disk.
<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>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>Internal SCSI Device</b>	A SCSI device installed inside the computer cabinet. These devices are connected in a continuous chain using an unshielded ribbon cable.
<b>IRQ</b>	Interrupt Request Channel. A path through which a device can get the immediate attention of the computer's CPU. The PCI bus assigns an IRQ path for each SCSI host adapter.
<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>Mainboard</b>	A large circuit board that holds RAM, ROM, the microprocessor, custom integrated circuits, and other components that make a computer work. It also has expansion slots for host adapters and other expansion boards.
<b>Main Memory</b>	The part of a computer's memory which is directly accessible by the CPU (usually synonymous with RAM).
<b>Motherboard</b>	See Mainboard. In some countries, the term Motherboard is not appropriate.
<b>Operating System (OS)</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>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>Peripheral Devices</b>	A piece of hardware (such as a video monitor, disk drive, printer, or CD-ROM) used with a computer and under the computer's control. SCSI peripherals are controlled through a SCSI host adapter.
<b>Pin-1 Orientation</b>	The alignment of pin 1 on a SCSI cable connector and the pin-1 position on the SCSI connector into which it is inserted. External SCSI cables are always keyed to ensure proper alignment. Internal SCSI ribbon cables are sometimes not keyed, although they may have a colored strip indicating pin 1.
<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>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>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 Bus</b>	A host adapter and one or more SCSI peripherals connected by cables in a linear chain configuration. The host adapter may exist anywhere on the chain, allowing connection of both internal and external SCSI devices. A system may have more than one SCSI bus by using multiple host adapters.
<b>SCSI Device</b>	Any device that conforms to the SCSI standard and is attached to the SCSI bus by a SCSI cable. This includes SCSI host adapters and SCSI peripherals.
<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>SDMS</b>	Storage Device Management System. An LSI Logic software product that manages SCSI system I/O.
<b>STA</b>	SCSI Trade Association. A group of companies that cooperate to promote SCSI parallel interface technology as a viable mainstream I/O interconnect for commercial computing. Refer to their web site at <a href="http://www.scsita.org">www.scsita.org</a> for more detailed information.

<b>Single-Ended SCSI</b>	A hardware specification for connecting SCSI devices. It references each SCSI signal to a common ground. This is the most common method (as opposed to differential SCSI which uses a separate ground for each signal).
<b>Termination</b>	The electrical connection required at each end of the SCSI bus, composed of a set of resistors. It improves the integrity of bus signals.
<b>Ultra SCSI</b>	A standard for SCSI data transfers. It allows a data transfer rate of up to 20 Mbytes/s over an 8-bit SCSI bus and up to 40 Mbytes/s over a 16-bit SCSI bus. The SCSI Trade Association (STA) supports using the term "Ultra SCSI" over the term "Fast-20".

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Tel: 800.638.5988  
B. M. Tel: 302.328.8968  
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B. M. Tel: 407.682.1199  
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I. E. Tel: 727.524.8850  
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A. E. Tel: 407.657.3300  
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W. E. Tel: 800.395.9953  
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B. M. Tel: 770.980.4922  
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## Idaho

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A. E. Tel: 847.797.7300  
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B. M. Tel: 847.413.8530  
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Schaumburg  
I. E. Tel: 847.885.9700

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A. E. Tel: 512.219.3700  
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B. M. Tel: 713.917.0663  
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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.

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E. A. Tel: 480.921.3305

## California

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

## Illinois

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R. A. Tel: 630.516.8400

## Indiana

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

## Massachusetts

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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

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GRP Tel: 919.481.1530

## Ohio

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

## Pennsylvania

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## Texas

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ION Tel: 512.794.9006  
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ION Tel: 817.695.8000  
Houston  
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## Utah

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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

**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

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Fort Collins, CO 80525  
Tel: 970.223.5100  
Fax: 970.206.5549

**Florida**  
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Suite 324A  
Boca Raton, FL 33431  
Tel: 561.989.3236  
Fax: 561.989.3237

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

**Illinois**  
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Two Mid American Plaza  
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Tel: 630.954.2234  
Fax: 630.954.2235

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Bowling Green, KY 42101  
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Suite 230  
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**Massachusetts**  
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Waltham, MA 02451  
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Fax: 781.890.6158

**Burlington - Mint Technology**  
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Fax: 781.685.3801

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**New Jersey**  
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Red Bank, NJ 07701  
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Fax: 732.933.2643

**Cherry Hill - Mint Technology**  
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Cherry Hill, NJ 08003  
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550 Willowbrook Office Park  
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Fax: 716.218.9010

**North Carolina**  
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Raleigh, NC 27609  
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Fax: 919.783.8909

**Oregon**  
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15455 NW Greenbrier Parkway  
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Beaverton, OR 97006  
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Fax: 503.645.6612

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

**Plano**  
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Fax: 972.244.5001

**Houston**  
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Tel: 281.379.7800  
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53 bis Avenue de l'Europe  
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78148 Velizy-Villacoublay  
Cedex, Paris  
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Orleansstrasse 4  
81669 Munich  
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Fax: 49.89.4.58.33.108

**Stuttgart**  
Mittlerer Pfad 4  
D-70499 Stuttgart  
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Fax: 49.711.86.61.428

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Milan  
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Centro Direzionale Colleoni Palazzo  
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Fax: 39.039.6057867

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**LSI Logic K.K.**  
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Minato-ku, Tokyo 108-0075  
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Fax: 81.3.5463.7820

**Osaka**  
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Fax: 31.40.296.2109

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Singapore

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Fax: 65.334.4749

## **Sweden**

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164 74 Kista  
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Taipei

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

#### **Taiwan Branch**

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Fax: 886.2.2718.8869

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### **LSI Logic Europe Ltd**

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Neutral Bay, NSW 2089  
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Fax: 612.9953.9683

## Belgium

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

## China

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**LSI Logic International Services Inc.**  
**Beijing Representative Office**  
Room 708  
Canway Building  
66 Nan Li Shi Lu  
Xicheng District  
Beijing 100045, China  
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**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  
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D-33181 Wuennenberg-Haaren  
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Hong Kong  
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Cheung Sha Wan Plaza  
833 Cheung Sha Wan Road  
Kowloon, Hong Kong  
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Fax: 852.2401.2105

## Serial System (HK) Ltd

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Kowloon, Hong Kong  
Tel: 852.2995.7538  
Fax: 852.2950.0386

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J P Nagar II Phase,  
Bangalore, India 560078  
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Fax: 91.80.664.9748

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Tel Aviv 61392  
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Fax: 972.3.6458666

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

## Global Electronics Corporation

Nichibei Time24 Bldg. 35 Tansu-cho  
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## Marubeni Solutions

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## Shinki Electronics

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Fax: 81.3.3760.3101

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Kohoku-ku  
Yokohama-City, 222-8580  
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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

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

## Switzerland

Brugg  
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Mattenstrasse 6a  
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Fax: 41.32.3743233

## Taiwan

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**Avnet-Mercuries Corporation, Ltd**  
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Sec. 2, Chien Kuo N. Road  
Taipei, Taiwan, R.O.C.  
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Fax: 886.2.2505.7391

## Lumax International Corporation, Ltd

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Fax: 886.2.2788.3568

## Prospect Technology Corporation, Ltd

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Taipei, Taiwan, R.O.C.  
Tel: 886.2.2721.9533  
Fax: 886.2.2773.3756

## Wintech Microelectronics Co., Ltd

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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,  
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