PCI SCSI Option Board Owner's Guide

Document Number 007-3627-001

CONTRIBUTORS

Written by Carolyn Curtis
Illustrated by Dan Young and Carolyn Curtis
Edited by Christina Cary
Production by Julie Sheikman and Linda Rae Sande
Engineering contributions by Mike Ham and
Henry Ortiz

Attention

This product requires the use of external shielded cables in order to maintain compliance pursuant to Part 15 of the FCC Rules.

European Union Statement

This device complies with the European Directives listed on the "Declaration of Conformity" which is included with each product. The CE mark insignia displayed on the device is an indication of conformity to the aforementioned European requirements.

International Special Committee on Radio Interference (CISPR)

This equipment has been tested to and is in compliance with the Class A limits per CISPR publication 22, Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment; Germany's BZT Class A limits for Information Technology Equipment; and Japan's VCCI Class 1 limits.

Canadian Department of Communications Statement

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus as set out in the Radio Interference Regulations of the Canadian Department of Communications.

Attention

Le présent appareil numérique n'émet pas de perturbations radioélectriques dépassant les normes applicables aux appareils numériques de Classe A prescrites dans le Règlement sur le interferences radioélectriques établi par le Ministère des Communications du Canada.

VCCI Class A Statement for Japan

この装置は、情報処理装置等電波障害自主規制協議会（VCCI）の基準に基づくクラスＡ情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

Chinese Statement

警告使用者：

這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策．

PCI SCSI Option Board Owner's Guide
Document Number 007-3627-001

Contents

List of Figures

List of Tables

About This Guide

The Silicon Graphics® PCI (Peripheral Component Interconnect) SCSI option board provides one SCSI (small computer systems interface) port for qualified servers and graphics workstations in the Origin™ family, such as Origin200™ and OCTANE™ workstations. The board is available in two versions:

- single-ended (marketing code PCI-SCSI-Q-SE-1P, part number 9980983)
- differential (marketing code PCI-SCSIB-Q-DF-1P, part number 9980984)

In each case, the board's connector is standard Fast-20, affording connectivity to a wide range of SCSI peripheral devices.

Audience

This guide is written for owners and users of the PCI SCSI single-ended or differential option board. It presumes general knowledge of SCSI, knowledge of the host system in which the PCI SCSI option board is installed, and knowledge of the SCSI devices to which the PCI SCSI board port is to be cabled.

Structure of This Guide

This guide consists of the following chapters:

- Chapter 1, “Features of the PCI SCSI Option Board,” describes the SCSI connector on the PCI SCSI option boards, compatible media, and cabling. It also explains SCSI basics.
- Chapter 2, “PCI SCSI Board Connector Pinouts,” gives pinouts for the single-ended or differential connector on the two versions of the board.

In addition to this manual, have handy the owner’s guide for the server or workstation in which the PCI SCSI board is installed, and the owner’s guide for the peripheral device(s) with which the PCI SCSI board interfaces.

Chapter 1

Features of the PCI SCSI Option Board

The PCI SCSI option board is a half-length PCI board that provides expansion capability for qualified servers and graphics workstations of the Origin family, such as Origin200 and OCTANE workstations.

The board is available with either of two SCSI interfaces, differential or single-ended. Both interfaces support Ultra SCSI transfer rates and are compliant with ANSI Fast-20 standard X3T10/1071D and ANSI SCSI-2 standard X3.131-1994. Ultra SCSI (which adheres to the Fast-20 standard) is a 16-bit wide SCSI bus running at 20 MHz (40 MBps).

Figure 1-1 shows features of the differential PCI SCSI option board.

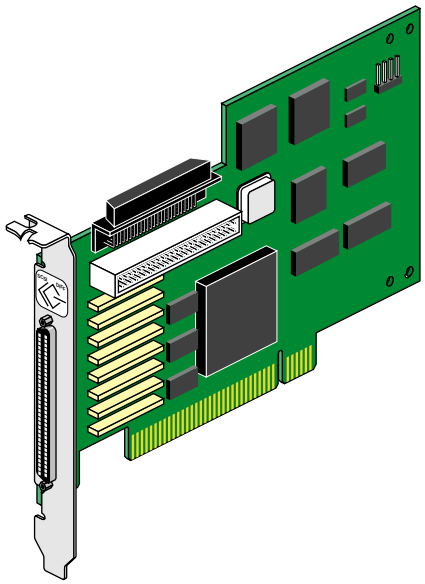

Figure 1-1 PCI SCSI Option Board: Differential

Figure 1-2 shows features of the single-ended PCI SCSI option board.

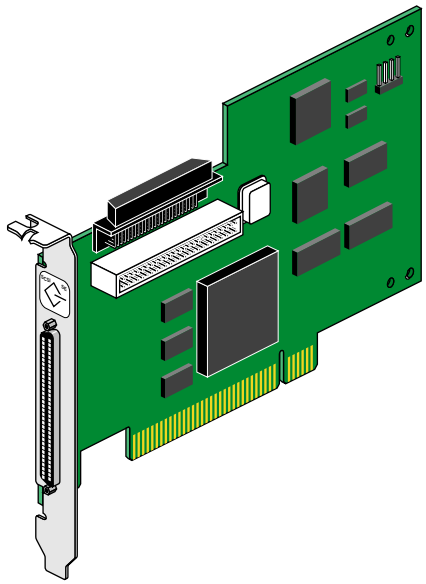

Figure 1-2 PCI SCSI Option Board: Single-Ended

To determine if the board is single-ended or differential, see the icon near the connector, as shown in Figure 1-3.

Figure 1-3 PCI SCSI Option Board Icons

The connector is terminated on the board.

This chapter describes

Cables

No cables are included with the PCI SCSI option board. (Cables are typically included with Silicon Graphics SCSI storage options.) Table 1-1 summarizes some Silicon Graphics SCSI cables that you can use with the board.

Table 1-1 SCSI Cables for the PCI SCSI Option Board

Marketing Code	Part Number	Length	SE/DF
X-S-1M	018-0546-301	1 m	SE/DF
X-S-DF-10M	018-0546-501	10 m	DF

For pinouts for each type of connector for the PCI SCSI option board, see Chapter 2, "PCI SCSI Board Connector Pinouts."

Installation Information

Board installation depends on the type of Silicon Graphics workstation or server you have.

- O2000 and Onyx2 workstations and servers: contact your factory-authorized field service personnel.
- All other applicable Silicon Graphics workstations and servers: see the owner's guide or installation guide. If you don't have these guides handy, the information is also online in the following locations:
  - IRIS InSight Library: from the Toolchest, choose Help > Online Books > SGI EndUser or SGI Admin, and select the applicable owner's or hardware guide.
  - Technical Publications Library: if you have access to the Internet, enter the following URL in your Web browser location window: http://www.sgi.com/Technology/TechPubs/

    Once you are in the library, choose Catalogs > Hardware Catalog > and look under the Owner's Guides for the applicable owner's guide.

Compatible Media

External SCSI devices can be

- slow, Fast-10, or Fast-20
- wide or narrow
- single-ended or differential

Removable media SCSI devices are typically single-ended; Table 1-2 summarizes some of these important peripherals.

Table 1-2 Supported Removable Media SCSI Devices

Device	Internal	External
CD-ROM drive	x	x
Digital linear tape drive	x	x
8-mm tape drive		x
4-mm digital audio tape drive	x	x
QIC (1/4-inch tape) drive		x
Scanner		x
Color laser printer		x

Note: Make sure that the SCSI peripheral you wish to use is compatible with the PCI SCSI option board you have selected (single-ended or differential).

SCSI Basics

This section explains

Note: For information on setting up disks and filesystems, see the latest version of *IRIX Admin: Disks and Filesystems*.

SCSI Channels and Devices

The PCI SCSI board supports one single-ended or differential channel that can connect to a single-ended or differential storage option, respectively. Such options include the Origin Vault expansion option, with its single-ended or differential storage capability. Each Origin Vault can contain up to six 3.5-inch disk drives (each 4.5 GB or 9.1 GB) as well as one or two 5.25-inch SCSI-2 peripherals. The 5.25-inch peripherals are single-ended; the 3.5-inch disk drives can be single-ended or differential, depending on whether the Origin Vault format has the differential converter board.

SCSI devices continue to evolve with higher bus bandwidths, faster data transfer rates, and channels with longer cables and more devices. A *protocol* establishes a SCSI bus's bandwidth, type, and data transfer rate. These factors are interdependent. For example, a 16-bit SCSI peripheral typically transfers more data at a faster rate than an 8-bit SCSI peripheral.

SCSI Buses

This section explains

SCSI Bus Bandwidth

A bus on a PCI SCSI board is 16 bits wide. The host system negotiates with the target SCSI peripheral as to how many bits of data to send in each clock: 8 (narrow SCSI) or 16 (wide SCSI). Regardless of how the bus is utilized, it remains 16 bits wide.

SCSI IDs

Since the default SCSI bus controller is 0, 8-bit buses use seven SCSI IDs for devices, and 16-bit buses use 15 SCSI IDs. For a differential PCI SCSI board attached to an Origin Vault, the Origin Vault's 3.5-inch disks are numbered 1 through 6 or 9 through 14.

In narrow mode, there may be eight target SCSI IDs, minus the number of IDs for hosts on the bus. The target IDs must not conflict with the host ID; if there is more than one host, their IDs also must not conflict with each other. Similarly, in wide mode, there are 16 target SCSI IDs minus the number of hosts. (The default SCSI bus controller ID can be reconfigured for dual-hosted SCSI operation.)

SCSI Bus Type

A SCSI bus type is either single-ended or differential. A single-ended SCSI peripheral uses inexpensive, open-collector wired OR busing configurations that use a signal comparison to ground. This design limits the distance the signal can be driven because of noise and speed considerations.

Differential SCSI peripherals use differential drivers and receivers with built-in hysteresis to provide improved signal noise immunity so that the bus can be driven greater lengths. Table 1-3 summarizes maximum cable lengths for the various SCSI options.

Table 1-3 Maximum Cable Lengths for SCSI Bus Options

SCSI Flavor	Maximum Total Cable Length for Entire Bus
Differential Fast-20	25 m
Differential Fast-10 wide	25 m
Single-ended (SCSI-1)	6 m
Single-ended Fast-10 (SCSI-2 or SCSI-2 Fast)	3 m
Single-ended Fast-20 (Ultra SCSI or Ultra SCSI-3)	1.5 m

Single-ended Fast-20 can support a maximum of eight devices, which must be evenly spaced along a 1.5-meter cable; a 3-meter cable can support a maximum of only four devices, evenly spaced. For PCI SCSI boards in the Origin family of systems, single-ended Fast-20 is used exclusively inside the host system; differential Fast-20 is used for external SCSI buses.

Caution: Single-ended and differential SCSI peripherals use incompatible integrated circuitry and cannot be mixed on the same bus. Converters can be used to isolate the bus segments.

SCSI Data Transfer Rate

Data transfer rates are either slow or fast, measured in megabytes per second. An operation is either 8- or 16-bit in size; thus, data transfer rates are dependent on bus bandwidth. Figure 1-4 compares data transfer rates.

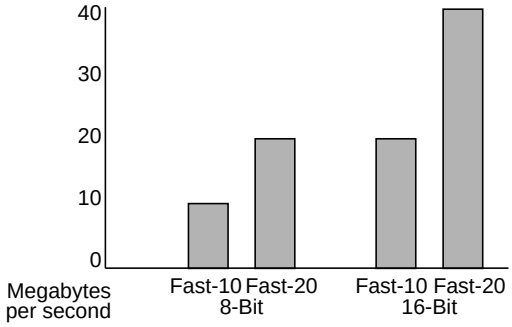

Figure 1-4 Maximum Burst Data Transfer Rates

Data transfer rate is also affected by the media speed of the SCSI peripheral.

Fast-20 SCSI is not merely "fast SCSI." The "-20" in the term signifies the maximum number of megatransfers (number of million operations per bus cycle, based on a bus's burst data rate) that can occur during an I/O operation, doubling the data rate. For example, an existing narrow 8-bit SCSI bus operating in fast mode can burst data at rates of 10 MBps; the same bus running Fast-20 SCSI can burst data at 20 MBps. An existing wide 16-bit SCSI bus in fast mode can burst data at 20 MBps, but the corresponding bus operating Fast-20 SCSI can burst data at 40 MBps.

SCSI Configuration Guidelines

These guidelines reflect the dependencies among SCSI bus bandwidths, types, and data transfer rates. Follow these guidelines to minimize inconsistent or inoperable SCSI buses:

- Install single-ended and differential devices on separate buses.
- In calculating SCSI bus length, include all cable length inside devices, components, and chassis.
- For maximum performance, install wide and narrow SCSI devices on different buses.

Configuring a SCSI Channel

To configure a SCSI channel, you must verify the type of SCSI protocol required (single-ended or differential, data transfer rate), identify each component in the SCSI channel, and obtain any missing components.

Because the system controller negotiates independently with the devices on a bus to establish the acceptable transfer rate of each device, you can mix fast and slow devices on the same bus. However, mixing narrow Fast-20 and wide Fast-20 devices on the same single-ended SCSI bus is not recommended.

Chapter 2

PCI SCSI Board Connector Pinouts

This appendix lists pinouts for each type of PCI SCSI board P connector:

- Table 2-1 lists pinouts for the 68-pin standard single-ended SCSI connector.
- Table 2-2 lists pinouts for the 68-pin standard differential (wide bus) SCSI connector.

Table 2-1 PCI SCSI Connector Pinouts: Single-Ended

Signal Name	Pin Number	Pin Number	Signal Name
Ground	1	35	-DB(12)
Ground	2	36	-DB(13)
Ground	3	37	-DB(14)
Ground	4	38	-DB(15)
Ground	5	39	-DPARH
Ground	6	40	-D0
Ground	7	41	-D1
Ground	8	42	-D2
Ground	9	43	-D3
Ground	10	44	-D4
Ground	11	45	-D5
Ground	12	46	-D6
Ground	13	47	-D7
Ground	14	48	-DPAR
Ground	15	49	Ground
Ground	16	50	Ground
TERMPWR	17	51	TERMPWR
TERMPWR	18	52	TERMPWR
Reserved	19	53	Reserved
Ground	20	54	Ground
Ground	21	55	-ATN
Ground	22	56	Ground
Ground	23	57	-BSY
Ground	24	58	-ACK
Ground	25	59	-RST
Ground	26	60	-MSG
Ground	27	61	-SEL
Ground	28	62	-C/D
Ground	29	63	-REQ
Ground	30	64	-I/O
Ground	31	65	-DB(8)
Ground	32	66	-DB(9)
Ground	33	67	-DB(10)
Ground	34	68	-DB(11)

Table 2-2 PCI SCSI Connector Pinouts: Differential

Signal Name	Pin Number	Pin Number	Signal Name
+DB(12)	1	35	-DB(12)
+DB(13)	2	36	-DB(13)
+DB(14)	3	37	-DB(14)
+DB(15)	4	38	-DB(15)
+DPARH	5	39	-DPARH
+Ground	6	40	-Ground
+D0	7	41	-D0
+D1	8	42	-D1
+D2	9	43	-D2
+D3	10	44	-D3
+D4	11	45	-D4
+D5	12	46	-D5
+D6	13	47	-D6
+D7	14	48	-D7
+DPAR	15	49	-DPAR
DIFFSENS	16	50	Ground
TERMPWR	17	51	TERMPWR
TERMPWR	18	52	TERMPWR
Reserved	19	53	Reserved
+ATN	20	54	-ATN
Ground	21	55	Ground
+BSY	22	56	-BSY
+ACK	23	57	-ACK
+RST	24	58	-RST
+MSG	25	59	-MSG
+SEL	26	60	-SEL
+C/D	27	61	-C/D
+REQ	28	62	-REQ
+I/O	29	63	-I/O
Ground	30	64	Ground
+DB(8)	31	65	-DB(8)
+DB(9)	32	66	-DB(9)
+DB(10)	33	67	-DB(10)
+DB(11)	34	68	-DB(11)

Tell Us About This Manual

As a user of Silicon Graphics products, you can help us to better understand your needs and to improve the quality of our documentation.

Any information that you provide will be useful. Here is a list of suggested topics:

- General impression of the document
- Omission of material that you expected to find
- Technical errors
- Relevance of the material to the job you had to do
- Quality of the printing and binding

Please send the title and part number of the document with your comments. The part number for this document is 007-3627-001.

Thank you!

Three Ways to Reach Us

- To send your comments by **electronic mail**, use either of these addresses:
  - On the Internet: techpubs@sgi.com
  - For UUCP mail (through any backbone site): *[your_site]*!sgi!techpubs

- To **fax** your comments (or annotated copies of manual pages), use this fax number: 650-965-0964
- To send your comments by **traditional mail**, use this address:

  Technical Publications
  Silicon Graphics, Inc.
  2011 North Shoreline Boulevard,
  M/S 535
  Mountain View, California
  94043-1389