SCSI

Self-Paced Training Guide

Table of Contents

1 Printing History 4

2 About This Self-Paced Training Guide 5

3 Technology Overview 6

4 SCSI Technology 7

4.1 SCSI Architecture / Standards 7
4.2 SCSI Bus Width 10
4.3 SCSI Clock Speed / Data Rate 10
4.4 SCSI Signalling Technology / Transfer Modes 11

5 SCSI Termination 13

5.1 Passive Termination 13
5.2 Active Termination 13

6 SCSI IDs and Address Setting 14

6.1 SCSI IDs 14
5.2 Address Setting 14

7 SCSI Connectors 15

6.1 Common SCSI Bus Connectors 15
6.2 VHDCI 16
6.3 SCA (SCSI-3 Extension) 16

8 SCSI Protocol Compatibility 17

8.1 Here are some rules of thumb you should keep in mind. 17
8.2 How to determine Single-Ended and Differential Interface 18

9 SCSI Commands 19

10 SCSI Host Adapters 27

9.1 SCSI Host Adapters 27
9.2 HP SCSI Roadmap 27
9.3 How to determine if the SCSI adapter is compatible with the SCSI peripheral 27
9.4 Quick Diagnostic Guide 28

11 A5838A Ultra2 SCSI-100Base-T Adapter 29

10.1 Architecture Diagram 29
10.2 Introduction 30
10.3 Features 30
10.4 Description 32

12 Installation and Troubleshootig 35

13 Glossary 36

14 Referrences 43

Revision History

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1 Printing History

New editions of this guide will incorporate all material updated since the previous edition. Update packages may be issued between editions and contain replacement or additional pages to be merged into the guide by the user. Each update will be indicated by a revision date at the bottom of the page. A vertical bar in the margin indicates the changes on each page. Note that pages which are rearranged due to changes on a previous page are not considered revised.

The guide’s print date and part number indicate its current edition. The print date changes when a new edition is printed. Minor corrections and updates which are incorporated at reprint do not cause the date to change. The guide part number changes when extensive technical changes are incorporated.

Final Edition.....February 2000

2 About This Self-Paced Training Guide

2.1 Purpose

The purpose of this guide is to provide HP field support personnel with the skills and knowledge necessary to support the PCI SCSI Ultra2 products, particularly the **A5838A,** an adapter supporting a combination of dual port PCI Ultr2 and dual port 100base-T**.** This guide covers the SCSI technology in general, plus the description and the features of the **PCI SCSI Wide Ultra2 / 100Base-TX Host Adapter Card A5838A.** This guide does not cover 802.3/Ethernet or 802.3u/Fast Ethernet technologies or implementation for the dual port 100Base-TX of the card.

The purpose of this training is to offer you quick access to specific information regarding the SCSI technology, and its progress, and give you or point you to the tools you need to have and feel comfortable in order to support this card and this technology for the first time.

2.2 Prerequisites

Booting an HP-PA machine..... If unfamiliar, see self-paced training:
HP PA-RISC COMMON CHARACTERISTICS, CE42-PACOMMON v.C

A glossary has been provided at the back of this guide. Reference the glossary for new terms encountered.

3 TECHNOLOGY OVERVIEW

3.1 Introduction

SCSI - an abbreviation of ***Small Computer System Interface***. Pronounced "***skuzzy***", SCSI is a local bus type interface for connecting multiple devices (up to sixteen), designated as either initiators (drivers) or targets (receivers).

Hardware interfaces prior to SCSI were designed specifically for a device. They required particular hardware interfaces for each different type of device, such as a hard disk interface for a hard disk.

The original SCSI specification was adopted in 1986 and is now referred to as SCSI-1.

SCSI now is a specification for a high-performance peripheral bus and common command set. SCSI buses provide for fast data transmission rates (up to 80 MBytes per second with Wide Ultra2 SCSI). In addition, you can attach many devices (tape drives, hard drives, scanners, CD-ROMs, etc...) to a single SCSI port, that is why SCSI is really an I/O bus rather than simply an interface. SCSI is also a system-level bus, with intelligent controllers (which means it knows what type of devices are attached and how to deal with each) on each SCSI device working together to manage the flow of information on the channel. SCSI provides a standard means for computers to exchange data among hardware devices such as disk drives and CD-ROM drives.

SCSI also defines standards for the computer software and communications rules needed to connect SCSI devices.

Some systems ship with SCSI interfaces built onto the motherboard. In most cases, however, you have to install a SCSI host adapter card. When you boot with a fully installed SCSI card, you'll see a set of new boot-up messages indicating that the BIOS for the SCSI interface is starting. The SCSI BIOS is separate from your computer's BIOS and allows the newly installed SCSI bus to exchange data with the CPU and other SCSI devices.

4 SCSI Technology

SCSI Terminology can be divided into four common areas:

4.0.1 SCSI Architecture: defines the ANSI standard to which the adapter complies: SCSI-1, SCSI-2, and SCSI-3.,

4.0.2 SCSI Bus width (Wide and Narrow): defines how many data bits travel in parallel on the bus. There are two common bus widths: 16-bit bus (wide bus) and 8-bit bus (narrow bus).

4.0.3 SCSI Clock Speed: identifies the maximum speed negotiated between the host bus adapter and the SCSI peripheral: Regular (5 MHz), Fast (10MHz), Ultra (20 MHz), and Ultra2 (40 MHz).

4.0.4 SCSI Signalling Technology: identifies the type and voltage of the signalling scheme: Single-Ended, Low Voltage Differential, and High Voltage Differential.

4.1 SCSI Architecture / Standards

Although SCSI is an ANSI standard, there are many variations of it, so two SCSI interfaces may be incompatible. For example, SCSI supports different flavors running at different bit widths and speeds.

- **SCSI-1 -** The original SCSI standard was approved by ANSI in 1986 as standard X3.131-1986. It defines the basics of the first SCSI buses, including cable length, signaling characteristics, commands and transfer modes. This original SCSI standard is far more limited than its successor, SCSI-2. It defines only the most basic 8-bit narrow bus, and 5 MB/s transfer rate. It was replaced gradually by SCSI-2.
- **SCSI-2 -** defines the same 8-bit wide bus and speeds, adds a number of commands, and several cabling variations. This basic 8-bit version defines support for many of the more advanced SCSI features that are in wide use today., especially on workstations. SCSI-2 defines the following significant new features as enhancements to the original SCSI-1 specification:

  Fast SCSI-2: uses an 8-bit wide bus and a faster signal switching speed to reach a transfer rate of 10 MB/s This is available on some of the newer workstations.

  Wide SCSI-2: uses a 16-bit wide bus and a data rate of 10 MB/s but doubles the support for the connection up to 15 peripheral devices.

Fast Wide SCSI-2: uses a 16-bit bus and a faster signal switching speed up to 20 MB/s. Again, up to 15 devices may be connected to the bus simultaneously.

It is important to note that one of the major design criteria in the creation of SCSI-2 was backward compatibility with SCSI-1. SCSI-2 devices will in most cases work with other SCSI-1 devices on a bus, however this is not always done, because the older devices have no ability to support the SCSI-2 enhancements and faster transfer protocols.

- **SCSI-3** - The SCSI-3 specification (drafted in 1996) splits SCSI into a number of standards. These include a variety of serial and parallel copper options. SCSI-3 also eliminates the need for a second cable for Fast SCSI or Wide SCSI, adds support for fiber-optic cable, and adds new instructions to the command set.

  The following are features commonly referred to as being part of SCSI-3:

  - **Ultra SCSI:** A further doubling of system bus speed, defining transfer rates up to 20 MHz, meaning 20 MB/s with 8-bit SCSI, or more with Wide SCSI.

  - **Improved Cabling:** SCSI-3 again improves cabling over the improvements in SCSI-2, for the use of Wide SCSI.

  - **Serial SCSI (Firewire):** SCSI-3 contains as one of its different protocol standards the description for the new Serial SCSI, also called Firewire.

- **Ultra2 SCSI:** Uses an 8-bit bus and supports data rates of 40 MB/s. Ultra2 SCSI sends the signal over two wires with the data represented as the difference in voltage between the two wires. This allows support for longer cables. A Low Voltage Differential (LVD) reduces power requirements and manufacturing costs. The term LVD and Ultra2 SCSI are used interchangeably.

- **Wide Ultra2 SCSI:** The latest SCSI standard uses a 40 MHz clock rate to get maximum data transfer rates up to 80 MB/s. It provides a longer possible cabling distance, up to 12 meters, by using Low Voltage Differential (LVD) signaling, and up to 6 meters, by using Single-Ended (SE) signaling.

  Earlier forms of SCSIs use a single wire that ends in a terminator with a ground.

Table 1: Currently existing SCSI standards

Technology Name	Bus Width, in *Bits*	Max Bus Speed *(MB/s)*	Max number of *devices*	Maximum Cable Length, in *meters*		
				SE	LVD	Differential
SCSI-1	8	5	8	6	12	25
Fast SCSI (3)	8	10	8	3	12	25
Fast Wide SCSI	16	20	16	3	12	25

Table 1: Currently existing SCSI standards

Ultra SCSI (3)	**8**	**20**	**8**	**1.5**	**12**	**25**
Ultra SCSI (3)	**8**	**20**	**4**	**3**	**12**	**25**
Wide Ultra SCSI	**16**	**40**	**16**	**-**	**12**	**25**
Wide Ultra SCSI	**16**	**40**	**8**	**1.5**	**-**	**-**
Wide Ultra SCSI	**16**	**40**	**4**	**3**	**-**	**-**
Ultra-2 SCSI (3)	**8**	**40**	**8**	**(2)**	**12**	**(2)**
Wide Ultra2 SCSI	**16**	**80**	**16**	**(2)**	**12**	**(2)**

1) Max. Bus Length in **Meters** may be exceeded in point-to-point and engineered applications
2) Single-ended and high-powered differential are not defined at Ultra2 speed unless the HBA chip has dual functionality.
3) Use of the word "**narrow**", preceding SCSI, Ultra SCSI, or Ultra2 SCSI is optional

- **Serial SCSI / FireWire:** All of the "conventional" types of SCSI that have been used since the interface was created, have been forms of what is called *parallel* SCSI. This term refers to the fact that the data is transmitted 8 or 16 bits at a time, in parallel. A new type of SCSI, called *Serial* SCSI, takes a different approach to the SCSI bus by transmitting just one bit at a time. The distinction between parallel and serial here is very similar to the difference between the serial and parallel ports at the back of your PC, which you probably use for your mouse and printer or other devices.

  On the surface, going from 8 or 16 bits of data being transmitted at a time to one, might seem like a bit step backwards. The bandwidth of a bus is directly proportional to its width; why reduce it by a factor of 16? The answer is the other factor that controls bus performance: **speed.**

  As technology improves, our appetite for bandwidth continues to increase, and the desire to increase bus speeds has led us from Regular to Fast to Ultra SCSI. The problem is that each time the bus is made faster, it gets more difficult to manage the complex signaling on the parallel SCSI bus, and to ensure that there is no data corruption on the cable due to interference or signal degradation. This is why the maximum cable length for single-ended SCSI decreases by half each time the speed doubles.

  The 20 MHz of Ultra SCSI is close to the top end of what is achievable using the old style bus. **Serial SCSI**, which also goes by the nickname ***FireWire***, trades in the width of the original SCSI bus in favor of dramatic increases in speed. Since only a single data line must be managed, it is possible to increase its speed from 20 MHz maximum of Ultra SCSI, to 400 MHz or even higher. Ultimately speeds of over 1 GHz will be possible; even if you divide this by 16 you get 64 MB/s, which is much higher than Ultra SCSI's 40 MB/s.

  Furthermore, the serial connection is much simpler than the large, cumbersome SCSI connection of old. Instead of a 68-wire cable, *FireWire* uses a 6-bit wire cable. The serious concerns about termination and signal delay are also addressed. Serial SCSI devices promise to have even more widespread support than older SCSI did. In addition to the PC platform, it will be

supported by Apple, and perhaps more interestingly, by non-computer hardware as well. In fact, one of the first types of FireWire devices were digital video cameras, using FireWire to connect to the PC.

FireWire has been formalized as IEEE standard 1394. A trade association has been formed to further the advancement of the standard.

4.2 SCSI Bus Width *(Narrow and Wide)*

There are two commonly used SCSI bus widths: narrow and wide. Narrow SCSI uses a data pathway that is 8-bits wide. Wide SCSI uses a data pathway 16-bits wide. Narrow SCSI is “conventional” and is what the original forms of SCSI used. Wide SCSI is newer and allows for doubling of bus bandwidth, at a higher cost. It also requires either additional or newer cabling. Wide SCSI also allows the use of 16-devices on the SCSI bus, as opposed to only 8 for regular “narrow” SCSI.

Regarding terminology, the narrow SCSI bus is considered the “regular” or default type, so it is not usually mentioned in the name of the protocol. Wide SCSI has the name “wide” inserted in the protocol name. For example, “Fast SCSI” implies a narrow bus, while “Fast Wide SCSI” of course is wide.

It is possible to mix narrow and wide SCSI on the same bus, but there are problems that must be overcome to do so. These typically resolve around cabling, which is different for narrow and wide SCSI, and also with termination. Adapters are generally required to convert between the narrow and wide cables.

4.3 SCSI Clock Speed / Data Rate

- **Regular:** The default speed for SCSI is 5 MHz. This is the bus defined in the original SCSI-1 specification. Buses running at regular speed have a transfer rate of 5 MB/s for narrow SCSI, or 10 MB/s for wide SCSI.
- **Fast:** Fast SCSI increases bus speed to 10 MHz. The doubling of this theoretical transfer rate was defined as part of SCSI-2. Buses running at this speed have a transfer rate of 10 MB/s for narrow SCSI, or 20 MB/s for wide SCSI.
- **Ultra (Fast-20):** The SCSI-3 specification defines timing that again doubles the interface transfer rate, to 20 MHz (which is why it is also sometimes called Fast-20). Ultra SCSI buses have a maximum transfer rate of 20 MB/s for narrow SCSI, or 40 MB/s for wide SCSI.
- **Ultra2:** The most recent standard defines timing that again doubles the transfer rate of Ultra2 to 40 MB/s and Wide Ultra2 to 80 MB/s.

4.4 SCSI Signalling Technology / Transfer Modes

SCSI is a high-speed bus capable of supporting multiple devices, including devices connected to the outside of the system. Due to the high speed, and the external cabling in particular, there is always concern about signaling integrity on the bus. The longer the cables are, the more problems there potentially can be with signal degradation or interference. The faster the bus runs, the more difficult it is to keep the signals clean.

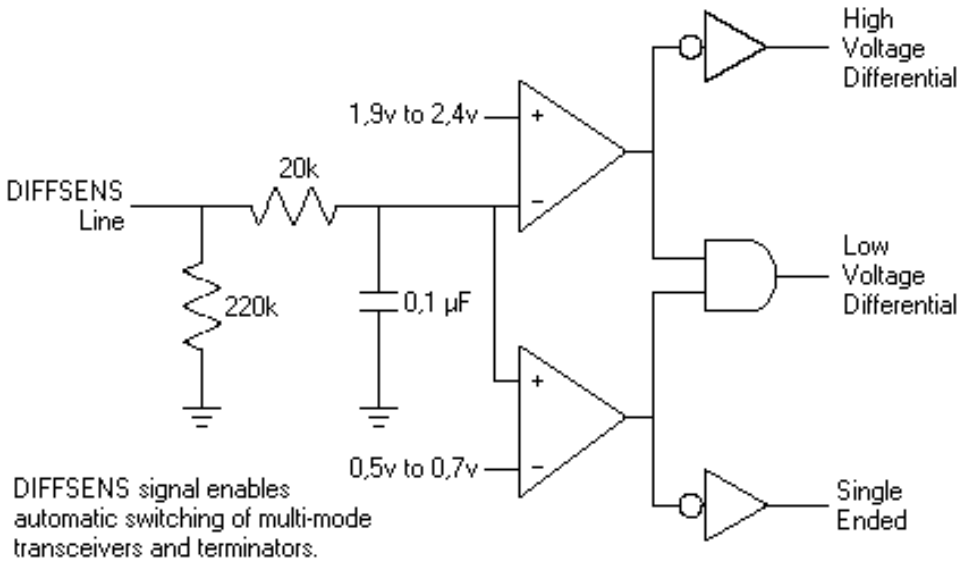
SCSI has therefore defined two different electrical signaling systems:

- **Single-Ended SCSI:** This is “regular” SCSI, and uses the type of conventional signaling that is used on other buses. Basically, a positive voltage is a “one”, and ground (zero voltage) is a “zero” and each signal is carried on one wire. It references each SCSI signal to a common ground, as opposed to Differential SCSI and Low Voltage Differential, which uses a separate return for each signal. This is by far the most common type of SCSI, and therefore offers the most flexibility and the most cost-effective solutions. However, the cable length of the bus is extremely limited. A single-ended device can be either 8-bit or 16-bit
- **Differential SCSI:** A bus with a voltage signal that ranges from a negative level to a positive level. This form of SCSI uses a form of differential signaling, where each signal is actually carried by two different wires, each the mirror image of the other. So here, a “one” is represented by a positive voltage on one wire, and an equal but opposite negative voltage on another wire; a “zero” is electrical ground or zero voltage on both wires. This use of two conductors per signal makes the signal much more resilient and less likely to be corrupted. This allows the use of much longer cabling than single-ended SCSI, but the cost is much higher. A differential device is almost always 16-bit.

    - **Low Voltage Differential**: Low Voltage Differential (LVD) devices are defined under the Ultra2 subset of the SCSI-3 standard. Industry wide, the term LVD and Ultra2 SCSI are used interchangeably. LVD provides SCSI bus data rate of 80 Mbytes/sec. That’s double the fastest SCSI-2 standard (40 Mbytes/sec), and light years ahead of the SCSI-1 standard used prior to 1992 in which SCSI bus rates were as slow as 3 Mbytes/sec.

    - **High Voltage Differential or Differential**: Differential is a logic signal system used in some SCSI devices. It uses a paired plus and minus signal level to reduce the effects of noise on the SCSI bus. Any noise injected into the signal would be present in both a plus and minus state, thereby being cancelled. Due to changing definitions, Differential is now often referred to as High Voltage Differential (HVD). High Voltage Differential (HVD) is supported in legacy systems, when external transceivers are connected to the SCSI controller.This technology will be obsolete soon. It is not very popular because it draws too much current. Most boards are designed to auto-terminate when it senses an HVD device.

The following diagram shows the three bus operational states and the resulting LVD compatibility. HVD devices require a special controller and are not compatible with LVD or Single-Ended devices; therefore when DiffSens senses an HVD device, it disables the operation.


High
Voltage
Differential
1,9v to 2,4v
+
20k
DIFFSENS
Line
–
Low
Voltage
Differential
220k
0,1 µF
+
0,5v to 0,7v
–
DIFFSENS signal enables
automatic switching of multi-mode
transceivers and terminators.
Single
Ended

5 SCSI Termination

Termination is special electrical resistors (terminators) installed on SCSI devices. Every wire on the SCSI bus has an impedance (resistance) to passing electrical signals. The SCSI bus also has a specific impedance, but when the electrical signals reach the end of the cables that make up the SCSI bus they encounter the air which has a very high impedance and acts as a wall of infinite resistance. (That's why the electricity doesn't jump out of your wall outlet - the air keeps it in). The only problem with the high impedance at the end of the bus for electric signals is that any signal coming down the bus is reflected back in the other direction once it hits this barrier. That's where termination comes in. Termination is an electrical requirement that must be met in order to prevent the reflection of signals when they reach the ends of the bus. Terminators provide impedance that matches the cable's, thereby preventing the signal from bouncing back. Terminators use power and the power to operate them comes from the SCSI interface card by way of the termination power wire on the bus.

- The SCSI devices or controller cards at the end of the SCSI bus must be terminated.
- The SCSI devices in the middle of the chain are not terminated.
- There are several ways to change termination on SCSI devices:
  - physically remove terminating resistors from their sockets, or insert them in the sockets (for internal SCSI devices)
  - change a switch setting on the device's switch block
  - remove or install a terminator plug (for external and internal SCSI devices)
- Your SCSI controller and devices must be properly terminated or you could experience problems.

Multimode terminators are more useful because they provide both LVD and SE, depending on what mode of operation is detected by the DIFF_SENS pins. HVD requires a different termination configuration.

5.1 Passive Termination

Passive termination is usually done with resistors. Power is not supplied from the SCSI controller card to the passive termination resistors. Passive termination provides an impedance that is close to the impedance of the SCSI cable. Therefore it minimizes reflection at the end of the cable.

5.2 Active termination

Active termination works to control the impedance at the end of the SCSI bus. It uses a voltage regulator not just the power supplied by the interface card. Because it is active, regulating the power supplied by the interface card, it is more stable than passive termination.

6 SCSI IDs and Address Setting

6.1 SCSI IDs

Each SCSI on the SCSI bus must have a unique identification number called a SCSI ID. SCSI IDs are a way to identify each device on the SCSI bus like having a mailing or e-mail address. This way when a command is sent to the bus it can be sent to the correct device.

The Wide SCSI bus can support up to 16 SCSI IDs (whereas the narrow SCSI bus supports up to 8). The host bus adapter uses one ID therefore Wide SCSI generally supports up to 15 devices on one SCSI controller card, and up to 7 devices for Narrow SCSI.

6.1.1 Recommended SCSI Bus IDs

0: Boot Drive 1: 2nd Hard Drive 2: 3rd Hard Drive 3: CD-ROM Drive 4: CD-ROM Drive
5: Tape Drive, MO Drive 6: Tape Drive, MO Drive 7: Host Adapter

6.2 Address Setting

Set each SCSI port to a separate SCSI ID, 0 through 15. SCSI ID 7 is the preset adapter setting that gives it the highest priority on the SCSI bus. If you plan to boot your computer from a SCSI hard disk drive on the SCSI bus, that drive should have SCSI ID 0 or the lowest SCSI ID on the bus. For system performance, this value can be set to an ID other than 0. There are no SCSI address switches or jumpers for address setting. You must invoke the appropriate commands in the “SCSI” section of the **BCH (Boot Code Handler)** and change the address electronically to whatever is required for the HA configuration being used. There must be no duplication of IDs on the SCSI bus.

For example: to set the address of the SCSI device at path 0/2/0/0 to 7:

Service Menu: Enter command > **scsi init 0/2/0/0 7**

Path (dec)	Initiator ID	SCSI Rate	Auto Term
0/2/0/0	7	Unknown	Unknown

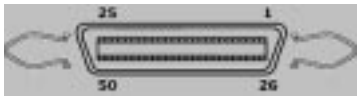
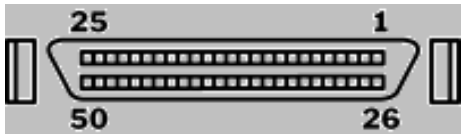
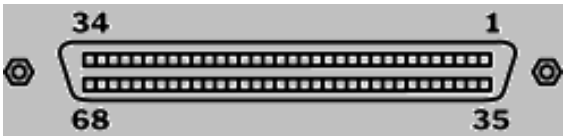
•*NOTE*• *Refer to Section 11 on “SCSI commands” for more details.*

7 SCSI Connectors

SCSI is a bus that supports both internal and external devices. Most adapters should have an internal connector for connecting to devices inside the system, and an external connector for devices on the outside. The type of connector used depends on the protocol that the card supports. External devices usually supply their own power and options are more limited. Internal devices, however, share a common power source and the number of options required can increase.

7.1 Common SCSI Bus Connectors

Table 2: Common SCSI Bus Connectors

Host or Host Adapter	Connector
Most SCSI SLOW (5 Mbyte/sec) computers and host adapters use the **Centronics-type 50-pin connector**. Also some 8-bit Fast computers and host adapters.	
Many 8-bit SCSI FAST (up to 10 Mbytes/sec) computers and host adapters use **this 50-pin High Density connector**.	
Apple/Mac and some **older Sun 8-bit** workstations use 25 pins and they are always single-ended.	
All FAST/WIDE (16-bit) SCSI-3 and Ultra2 SCSI) computers and host adapters plus old DEC single-ended SCSI use this **68-pin High Density connector**.	

7.2 VHDCI (Very High Density Connect Interface) Connectors

The VHDCI connector supports the Wide Ultra2 SCSI or SCSI-3 standards and was designed for external applications. The connector utilizes contacts in a high-density 68-pin (0.8 mm contact spacing) package with a planned option for a 40-pin (Micro SCSI).

7.3 SCA (SCSI-3 Extension)

The SCA (Single Connector Attachment) connector also support the SCSI-3 standard. Unlike the VHDCI, the SCA was developed specifically to provide one internal connector to replace the separate 68-pin data, 4-pin power, and 6-pin optional connector. Like the VHDCI, the SCA has leaf-style contacts and standardized gender for the cable and device side. Unlike the VHDCI (0.8mm contact spacing), the SCA continued the 1.27mm contact spacing of the original SCSI-3.

SCA is a type of disk drive connector that includes connection pins for the power cables as well as the data wires. The current version of SCA, called SCA-2, uses 80 pins and is frequently used for high-end SCSI devices.

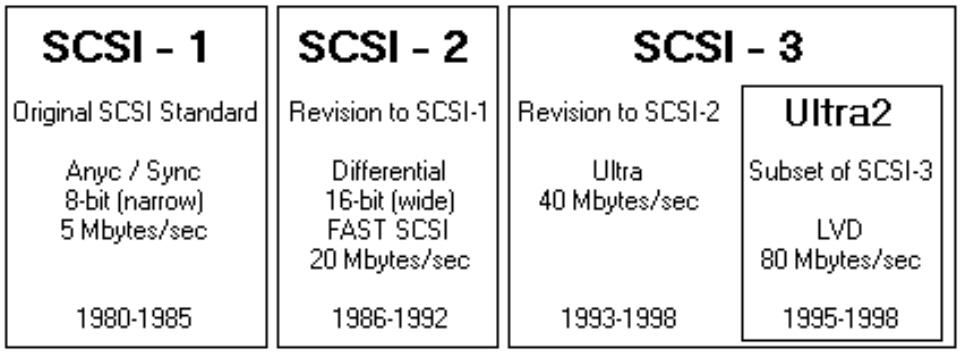
8 SCSI Protocol Compatibility

SCSI has been designed to be backward compatible. SCSI-2 host adapters are supposed to be able to work with older SCSI-1 hard disks, and SCSI-2 hard disks are supposed to work on SCSI-1 host adapters, for example. Of course, it isn't always this simple. The sheer number of different flavors of SCSI makes it impossible to guarantee that any particular combination of devices will work.

8.1 Here are some rules of thumb you should keep in mind

- In general, most SCSI devices should work on most SCSI buses, but nothing is guaranteed (unless you are buying a complete system from a vendor, with host adapter, drivers and cabling, in which case it should be guaranteed to work).
- The greater the difference in age between the devices, the more likely that there will be compatibility problems.
- The greater the discrepancy in the types of SCSI being used, the more difficult it will be to make the bus behave properly. It is possible to mix narrow and wide devices on the same bus, but this is more difficult to arrange than just using all narrow or all wide.

Compatibility is an important feature, but when using SCSI devices of different vintage on the same SCSI bus, all peripherals on that bus will respond to the earliest version SCSI specification. If an Ultra device is installed on an LVD bus, all devices on the bus will respond at Ultra mode.



Warning: Single-Ended and Differential SCSI are incompatible at the electrical level. You should not mix single-ended and differential SCSI devices on the same bus or actual physical damage could result. To compound the matter, the cables used for single-ended and differential SCSI look the same. Make sure you know what you have before putting together your SCSI bus. Converters between single-ended and differential SCSI are available.

8.2 How to Determine Single-ended or Differential Interface

When facing with the questions: What type of SCSI port does the host have? Is it 8-bit (narrow) or 16-bit (wide) and is it single-ended or differential?

Here are a couple of ways to do to determine this information:

Action 1: To determine if it is an 8-bit or 16-bit system, simply look to see if the SCSI connector has 50-pins or 68-pins. The 50-pin connector is an 8-bit system and the 16-bit connector is, of course, a 16-bit system. For convenience, check the “SCSI BUS CONNECTORS” table on the previous page.

Action 2: To determine if the SCSI host is single-ended or differential requires the use of an ohmmeter. Make sure the power to the computer is turned off. Pull the cable connector off the host’s SCSI port and measure the resistance between pins 2 and 24 on high density or Centronics-type 50-pin connector or pins 2 and 33 on a 68-pin connector. If you ever run into a DB-50 type SCSI connector, measure between pins 3 and 49. If the resistance is a few tenths of an ohm or less, it is single-ended SCSI port. If it is more than a few tenths of an ohm (probably something over 1 ohm), it is a differential SCSI port. This technique can also be used to determine if the port on a SCSI peripheral is single-ended or differential.

8.2.1 SCSI Devices that do not work together

The two SCSI devices that you connect with a cable should be compatible, or of the same type in terms of each of the following features:

1. Single-Ended or Differential
2. Termination Power supplied by the cable or not
3. Parity implemented or not
4. ”Hard reset” or “Soft reset”
5. Reservation queuing implemented or not

9 SCSI Commands

9.1 Examples Of General SCSI commands

To access the SCSI commands, you have to bring down your system by entering the command:

#**shutdown -r 0**

When you see the Processor Dependent Code (PDC) HP Copyright message, hit **any key** to interrupt the reboot. This will bring you to the Main menu.

•*NOTE*• *Please note that not all machines have all of the PDC commands listed.*

```
Main Menu: Enter command >CO
------Configuration Menu-----------------------------------------
Command                        Description
--------                       ----------
AUto [BOot|SEArch] [ON|OFF]    Display or set specified auto flag
BootINfo                       Display boot-related information
BootTimer [0 - 200]            Display or set boot delay time
DEfault                        Set the system to predefined values
FastBoot [ON|OFF]              Display or set boot tests execution
PAth [PRI|ALT|CON][<path>]     Display or modify a path
SCSI [INIT|RATE] [<path>] [<val>]Display or set SCSI controller
values
SEArch [DIsplay|IPL] [<path>] Search for boot devices
TIme [c:y:m:d:h:m: [s]]        Read or set real time clock in GMT
BOot [PRI|ALT| <path>]         Boot from specified path
DIsplay                        Redisplay the current menu
HElp [<menu> | <command>]      Display help for menu or command
RESET                          Restart the system
MAin                           Return to Main menu
```

```
Configuration Menu: Enter command >MAin
     Command                          Description
     -------                          -----------
BOot [PRI|ALT|<path>]         Boot from specified path
PAth [PRI|ALT] [<path>]       Display or modify a path
SEArch [DIsplay|IPL] [<path>] Search for boot devices
COnfiguration menu            Displays or sets boot values
INformation menu              Displays hardware information
SERvice menu                  Displays service commands
DIsplay                       Redisplay the current menu
HElp [<menu>|<command>]       Display help for menu or command
RESET                         Restart the system
----

Main Menu: Enter command or menu > ser
---- Service Menu -----------------------------------------------
     Command                          Description
     -------                          -----------
CLEARPIM                       Clear (zero) the contents of PIM
SCSI [option] [<path>] [<val>] Display or set SCSI controller val-
ues
MemRead <address> [<len>]      Read memory and I/O locations
PDT [CLEAR]                    Display PIM information
ProductNum <O|C> [<number>]    Display or set Product Number
SELftests [ON|OFF]             Enable/disable self-test execution
BOot [PRI|ALT|<path>]          Boot from specified path
DIsplay                        Redisplay the current menu
HElp [<command>]               Display help for specified command
RESET                          Restart the system
MAin                           Return to Main Menu
----

Service Menu: Enter command > help scsi
------- SCSI Help ------------------------------------------------
SCSI displays the SCSI controller parameters. SCSI is also
used to set parameters for a SCSI controller at a specified path.
These parameters are used by the operating system SCSI driver.

If a parameter is set to Unknown or a path is not in the table,
```

a firmware suggested SCSI controller parameter is used by the SCSI driver. The firmware suggested value for the initiator id is 7.The firmware suggested value for the scsi rate is FAST.

The termination command is used to control the auto termination of SCSI controllers. This only works on some SCSI controllers.

```
SCSI                    Display all SCSI controller parms
SCSI INITiator          Display SCSI controller initiator ids
SCSI INIT <path>        Display initiator id for specified path
SCSI INIT <path> <id>   Set initiator id for specified path
SCSI INIT <path> <id> Set initiator id for specified path
SCSI RATE               Display SCSI controller transfer rates
SCSI RATE <path>        Display transfer rate for specified path
SCSI RATE <path> <rate> Set transfer rate for specified path
SCSI DELETE <path>      Delete the specified path from the table
SCSI TERMination        Display SCSI controller auto termination
SCSI TERM <path>        Display auto termination for specific path
SCSI TERM <path> ON     Enable auto termination for specific path
SCSI TERM <path> OFF    Disable auto termination for specific path

<rate> is FAST, ULTRA, or NOLIMIT
<path> is in I/O notation, such as 1/2/3/4 (SBA/LBA/DEV./FUNC.)
-------
Service Menu: Enter command > scsi
Path (dec)Initiator ID SCSI Rate        Auto Term
--------- ------------ ------------     ---------
0/0/2/0   7            Ultra            Unknown
0/0/2/1   7            Ultra            Unknown
0/0/1/0   7            Fast             Unknown
0/2/0/0   7         Ultra        ON
0/2/0/1   6         Ultra        ON

Service Menu: Enter command > SCSI INIT 0/2/0/0 5
 Path (dec)     Initiator ID     SCSI Rate     Auto Term
 ------------   --------------   ----------    ---------------
 0/2/0/0        5                Ultra         ON
```

```
Service Menu: Enter command > scsi
 Path (dec)     Initiator ID     SCSI Rate     Auto Term
 ------------   --------------   ----------    ---------------
 0/0/2/0        7                Ultra         Unknown
 0/0/2/1        7                Ultra         Unknown
 0/0/1/0        7                Fast          Unknown
 0/2/0/0        5                Ultra         ON
 0/2/0/1        6                Ultra         ON
 Service Menu: Enter command > scsi rate 0/2/0/0 ultra
```

•NOTE• *Please set rate limit to NOLIMIT. This will set the rate to Fast, Ultra, or Ultra2, depending on your hardware limitation. If not set to NOLIMIT, the rate will default to just Fast.*

```
Path (dec)     Initiator ID     SCSI Rate     Auto Term
 --------  --------- -------- ---------------
 0/2/0/0        5                Ultra         ON

 Service Menu: Enter command > scsi
 Path (dec)     Initiator ID     SCSI Rate     Auto Term
 ------------   --------------   ----------    ---------------
 0/0/2/0        7                Ultra         Unknown
 0/0/2/1        7                Ultra         Unknown
 0/0/1/0        7                Fast          Unknown
 0/2/0/0        5                Ultra         ON
 0/2/0/1        6                Ultra         ON
 Service Menu: Enter command > scsi term 0/2/0/0 OFF
 Path (dec)     Initiator ID     SCSI Rate     Auto Term
 ------------   --------------   ----------    ---------------
 0/2/0/0        5                Ultra         OFF

 Service Menu: Enter command > scsi
 Path (dec)     Initiator ID     SCSI Rate     Auto Term
 ------------   --------------   ----------    ---------------
 0/0/2/0        7                Ultra         Unknown
 0/0/2/1        7                Ultra         Unknown
 0/0/1/0        7                Fast          Unknown
 0/2/0/0        5                Ultra         OFF
 0/2/0/1        6                Ultra         ON
```

```
 Service Menu: Enter command > scsi delete 0/2/0/0
 Service Menu: Enter command > scsi
 Path (dec)     Initiator ID     SCSI Rate     Auto Term
 ------------   --------------   ----------    ---------------
 0/0/2/0        7                Ultra         Unknown
 0/0/2/1        7                Ultra         Unknown
 0/0/1/0        7                Fast          Unknown
 0/2/0/1        6                Ultra         ON

Service Menu: Enter command > scsi init 0/2/0/0
 Path (dec)     Initiator ID
 ------------   --------------
 No matching entry for the specified path.

 Service Menu: Enter command > scsi init 0/2/0/0 7
 Path (dec)    Initiator ID     SCSI Rate     Auto Term
 ------------  ------------     ----------    ---------------
 0/2/0/0        7               Unknown       Unknown

 Service Menu: Enter command > scsi
 Path (dec)     Initiator ID     SCSI Rate     Auto Term
 ----------     ------------    --------     --------
 0/0/2/0        7                Ultra        Unknown
 0/0/2/1        7                Ultra        Unknown
 0/0/1/0        7                Fast         Unknown
 0/2/0/0        7                Unknown      Unknown
 0/2/0/1        6                Ultra        ON

 Service Menu: Enter command > scsi rate 0/2/0/0 ultra
 Path (dec)     Initiator ID     SCSI Rate     Auto Term
 -------- --------- --------- --------
 0/2/0/0        7                Ultra         Unknown

 Service Menu: Enter command > scsi term 0/2/0/00 OFF
 Path (dec)     Initiator ID     SCSI Rate     Auto Term
 --------       ------------    ---------     --------
 0/2/0/0        7                Ultra         OFF
```

Service Menu: Enter command > **scsi**

```
 Path (dec)     Initiator ID     SCSI Rate     Auto Term
 --------       -----------      ---------     ---------
 0/0/2/0        7                Ultra         Unknown
 0/0/2/1        7                Ultra         Unknown
 0/0/1/0        7                Fast          Unknown
 0/2/0/0        7                Ultra         OFF
 0/2/0/1        6                Ultra         ON

 Service Menu: Enter command > main
 ---- Main Menu -------------------------------------------------
      Command                  Description
      -------                  -----------
BOot [PRI|ALT|<path>]         Boot from specified path
PAth [PRI|ALT] [<path>]       Display or modify a path
SEArch [DIsplay|IPL] [<path>] Search for boot devices
COnfiguration menu            Displays or sets boot values
INformation menu              Displays hardware information
SERvice menu                  Displays service commands
DIsplay                       Redisplay the current menu
HElp [<menu>|<command>]       Display help for menu or command
RESET                         Restart the system
----
Main Menu: Enter command or menu > IN
---- Information Menu -----------------------------------------
      Command                          Description
      -------                          -----------
ALL                Display all system information
BootINfo           Display boot-related information
CAche              Display cache information
ChipRevisions      Display revisions of major VLSI
COprocessor        Display coprocessor information
FRU                Display FRU information
FwrVersion         Display firmware version
IO                 Display I/O interface information
LanAddress         Display Core LAN station address
MEmory             Display memory information
PRocessor          Display processor information
WArnings           Display selftest warning messages
```

```
BOot [PRI|ALT|<path>]Boot from specified path
DIsplay             Redisplay the current menu
HElp [<command>]    Display help for specified command
RESET               Restart the system
MAin                Return to Main Menu
----
Information Menu: Enter command > io
I/O MODULE INFORMATION

                     Path      Slot                          IODC
 Type               (dec)      Number   HVERSION  SVERSION  Vers
-----               ------     -------  ---------  ---------  ------
System bus adapter     0      0x8030    0xc10     0x0        0x0
Local bus adapter       0/0    Built_In 0x7820    0xa00      0x0
Local bus adapter       0/    Built_In  0x7820    0xa00      0x0
Local bus adapter       0/2    6        0x7820    0xa00      0x0
Local bus adapter       0/4    2        0x7820    0xa00      0x0
Local bus adapter       0/5    1        0x7820    0xa00      0x0
Local bus adapter       0/8    4        0x7820    0xa00      0x0
Local bus adapter       0/10   5        0x7820    0xa00      0x0
Local bus adapter       0/12   3        x7820     0xa00      0x0
 System bus adapter      1               0x8030    0xc10      0x0
 Local bus adapter       1/0    12       0x7820    0xa00      0x0
 Local bus adapter       1/2    10       0x7820    0xa00      0x0
 Local bus adapter       1/4    9        0x7820    0xa00      0x0
 Local bus adapter       1/8    11       0x7820    0xa00      0x0
 Local bus adapter       1/10   8        0x7820    0xa00      0x0
 Local bus adapter       1/12   7        0x7820    0xa00      0x0

PCI DEVICE INFORMATION
                    Path Vendor         Device    Bus   Slot
Description         (dec) Id            Id        #     #
-----------         ----- ----          ----      ---   ---
Ethernet Cntrl      0/0/0/0 0x1011      0x19       0    BuiltIn
SCSI bus Cntrl      0/0/1/0 0x1000      0xc        0    BuiltIn
SCSI bus Cntrl      0/0/2/0 0x1000      0xf        0    BuiltIn
SCSI bus Cntrl      0/0/2/1 0x1000      0xf        0    BuiltIn
Comp. ser Cntrl     0/0/4/0 0x103c      0x1048     0    BuiltIn
Comp. ser Cntrl     0/0/5/0 0x103c      0x1048     0    BuiltIn
```

```
Fibre channel       0/1/0/0 0x103c      0x1028     8    BuiltI
SCSI bus Cntrl      0/2/0/0 0x1000      0xb       16        6
SCSI bus Cntrl      0/2/0/1 0x1000      0xb       16        6
SCSI bus Cntrl      0/5/0/0 0x1000      0xf       40        1
SCSI bus Cntrl 0/10/0/0/4/0 0x1000      0xb       81        5
SCSI bus Cntrl 0/10/0/0/4/1 0x1000      0xb       81        5
Ethernet Cntrl 0/10/0/0/6/0 0x1011      0x19      81        5
Ethernet Cntrl 0/10/0/0/7/0 0x1011      0x19      81        5
PCI-to-PCI bridge 0/10/0/0  0x1011      0x26      80        5
Ethernet Cntrl 1/0/0/0/4/0  0x1011      0x9       129       12
Ethernet Cntrl 1/0/0/0/5/0  0x1011      0x9       129       12
Ethernet Cntrl 1/0/0/0/6/0  0x1011      0x9       129       12
Ethernet Cntrl 1/0/0/0/7/0  0x1011      0x9       129       12
PCI-to-PCI bridge 1/0/0/0   0x1011      0x24      128       12
Ethernet Cntrl 1/2/0/0      0x1011      0x19      144       10
Ethernet Cntrl 1/8/0/0      0x1011      0x19      192       11

Information Menu: Enter command >
```

10 SCSI Host Adapters

10.1 SCSI Host Adapters

There are many different types of SCSI host adapters on the market. They vary in cost and capabilities dramatically. Many lower-end devices are designed specifically to keep costs down to allow easy inexpensive access to SCSI devices like Zip drives, while higher-end devices provide more capabilities and performance for users who require a full-featured implementation.

Most newer host adapters that run on the PCI local bus, support the use of **bus mastering**. Bus mastering refers to a feature supported by some bus architectures that enables a controller connected to the bus to communicate directly with other devices on the bus without going through the CPU. Most modern bus architectures, including PCI, support bus mastering because it improves performance. This can be a very important feature, as it allows for more efficient transfer of data from the host adapter to the system memory.

10.2 HP SCSI Roadmap

Already released are the following SCSI products:

- A5159A - PCI, Dual Port, FWD SCSI
- A5150A - PCI, Dual Port, Ultra2 SCSI
- A5149A - PCI, Single Port, Ultra2 SCSI
- A4800A - PCI, FWD, SCSI-2
- A4107A - FWD, SCSI-2
- A2969A - 20 MB, FWD, SCSI-2
- A2679A - EISA, Fast, SE SCSI-2
- 28696A - HP-PB, FWD, SCSI-2
- 28655A - HP-PB, SE, SCSI-2

- PCI 2-Port 100BT / 2-Port Ultra2 SCSI (A5838A) scheduled to be released December 99
- PCI 4- Channel Ultra2 SCSI RAID Adapter (A????A), Feb - April 2000

10.3 How to determine if the SCSI adapter is compatible with the SCSI peripheral

- Signaling technologies must be compatible: only adapters and peripherals with matching sig-

naling technology can be connected together: LVD adapters to LVD adapters, SE to SE.

- Bus width must match (unless a converter is used): the two bus widths for SCSi are: 16-bit (wide) and 8-bit (narrow).
- SCSI architecture must be compatible: the SCSI architectures are commonly called: SCSI-1, SCSI-2, SCSI-3.
- Data rate is negotiated by both ends: the SCSI adapter and SCSI peripheral negotiate the highest possible data rate. As an example, a Wide Ultra2 SCSI adapter (max data rate of 80 MB/s) and a Fast Wide SCSI peripheral (max data rate of 20 MB/s) will negotiate to yield the highest data rate of 20 MB/s.

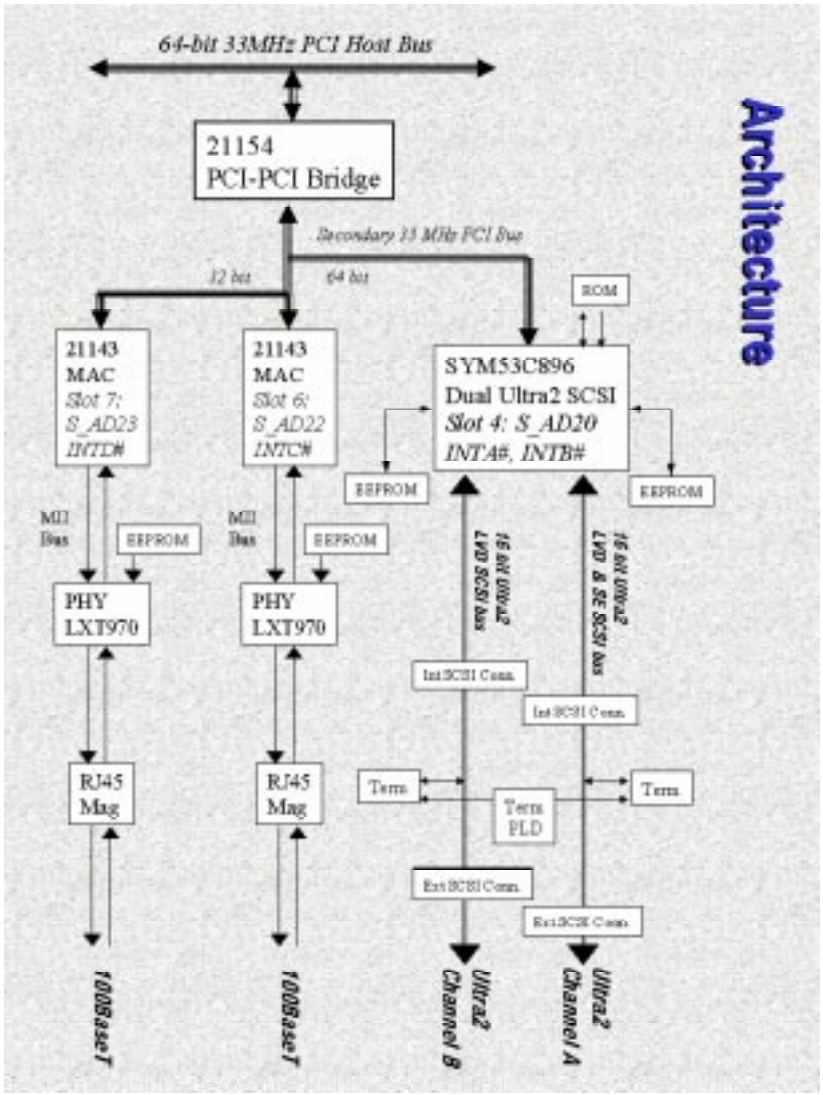
10.4 Quick Diagnostic Guide

- Maximum cable length. Refer to Table 1 for max cable length. Do not exceed what is allowed by the SCSI standards.
- Narrow Out. Don’t interleave 25-pin connectors and 50-pin connectors because the wider connections use data throughput that the 25-pin links can’t handle. It can severely degrade the performance of the 50-pin devices.
- No power supply to the SCSI port? Some devices, mainly scanners, take power exclusively from the SCSI bus and don’t have a separate power connector. Most SCSI adapters have BIOS options to turn bus power on or off for specific devices, so if a given device isn’t getting power, this is a good place to double-check. Also, take the time to shut off bus power for devices that don’t need it. Many SCSI adapters have hardware jumpers that tell the drive controller where the power is coming from, and can be set to take power from either the SCSI bus or the main power connector. Unless there’s a serious lack of power connectors, stick with the main power connector.

11 A5838A (100Base-T and Wide Ultra2)

11.1 Architecture Diagram for the A5838A

Figure 1: A5838A Architecture Diagram



11.2 Introduction

The A5838A, a new superior performance PCI 100Base-TX and Wide Ultra2 Adapter, supporting a combination of dual port 100Base-TX and dual port Wide Ultra2 SCSI, for the HP 9000 PCI servers, with the exception of V-Class, which will be supported in a later OS release.

The A5838A offers a combination of higher performance and integration of dual port 100Base-TX and dual port Wide Ultra2 SCSI. As a result, data accessibility and the subsequent performance of the I/O and networking subsystems are paramount. The Wide Ultra2 features of this card are fully compatible and uses the same environment as its predecessor. This card is ideal host connections to RAID controllers and other demanding I/O applications in the high performance servers.

11.3 Features

- Standard PCI Form Factor
- Operating System supported: HP-UX 11.0 and later versions
- MC/ServiceGuard support
- HP Auto-Port Aggregation support
- Dual port Wide Ultra2 SCSI delivering >60MB/s for each port
- Dual port 100Base-TX delivering >80 Mbits/sec for each port
- 2 independent Wide Ultra2 SCSI ports
- 2 independent sets of configuration space

11.3.1 SCSI Features

- 40 MHz SCSI clock
- 64-bit 33 MHz single load PCI interface
- 2 shielded external 68-pin VHDCI connectors
- Allows up to 15 devices in a daisy chain fashion
- Cable length max is 12 meters using LVD signalling and 6 meters using SE signalling
- Supports both Wide Ultra2 LVD and SE
- Automatically switch between SE and LVD
- Sustains >60 MB/s per port
- Activity and Status LED displays
- Mirror Disk/UX support (SCSI Mirroring)

11.3.2 100Base-TX Features

- Level One LXT970A supports IEEE 802.3 physical layer applications
- Manual speed and duplex configuration support
- Supports IEEE 802.3 (10Base-T) and IEEE 802.3u (100Base-TX) standards
- Dual RJ45 ports
- Sustains >80 Mbits/sec per port
- SAM configurable
- HP MAC address
- LED displays
- Auto-negotiation
- Full or Half Duplex
- Can be managed by SNMP
- Unshielded Twisted Pair (UTP) using 2 pairs, Category V
- Tools compatible with those of Lan/9000
- Connects existing wiring to a new network module using 10/100Base-TX switch/hub
- Supports TCP/IP, NFS, Internal Services, NetTL, DLPI Interface
- STM - Support Tools Manager (Exerciser and Verifier)
- Point-to-Point connections supported using crossover cables
- Platforms and maximum cards supported:

i) A-Class: 2 max cards

ii) N-Class: 12 max cards

iii) L-Class: only the top 6 slots are supported. No shared slots are supported.

iv) A500: 4 max cards

11.3.3 Operating System and Versions supported

HP-UX 11.11ACE or later versions

11.3.4 Functionality not supported

- 100Base-FX and 100VG
- HVD (High Density Differential)
- Non-PCI platforms
- Narrow SE, Fast Wide Differential, Ultra Wide Differential
- Internal connectors
- No V-Class supported

11.3.5 Future A5838A Features

- Boot over SCSI
- OLARD (Online Add, Replacement, Delete) with later HP-UX operating system versions

11.3.6 Product Structure

Product Name	Option	Description
A5838A		Ultra2 SCSI-100Base-T Combo Host Base Adapter
	0D1	Instant Ignition
	AVN	Release Note and Quick Install Card

11.4 Description

11.4.1 PCI Interface

PCI is a high speed standard local bus for interfacing a number of I/O components to a processor and memory subsystem. The PCI functionality for the A5838A is contained within the I/O Processor Chip. The adapter connects directly to the PCI bus and generates timing protocol in compliance with the PCI application.

The PCI interface operates as a 32-bit or 64-bit DMA bus master. The signal definitions and pin numbers conform to the PCI Local Bus Specification Revision 2.1 standard. The A5838A conforms to the PCI universal signalling environment for a 5 volt or 3.3 volt PCI bus.

11.4.2 SCSI Interface

The SCSI functionality for the A5838Ais contained within the PCI-SCSI I/O Processor Chip. The adapter connects directly to the two SCSI buses for 16-bit SE or LVD SCSI applications and generates timing and protocol in compliance with the SCSI standard. Each SCSI interface operates at a burst transfer rate of up to 40 MBytes per second for wide single-ended transfers, and up to 80 MBytes per second for wide LVD SCSI transfers.

The SCSI interfaces on the host bus adapter card operate as two 16-bit, synchronous or asynchronous, single-ended or LVD, and support Wide Ultra2 SCSI protocols and 16-bit arbitration. Con-

nectors are 68-pin VHDCI.

A 40 MHz oscillator is installed on the A5838A card to provide the clock frequency necessary to support Wide Ultra2 SCSI transfers of up to 80 MBytes per second.

11.4.3 LEDs

The adapter supplies SCSI bus TERMPWR (termination power) through a blocking diode and self-resetting fuse protection device. An onboard LED lights green when TERMPWR is shorted and turns off. The Activity LED lights yellow when there is data transmitted and/or received between the peripheral and the interface card.

11.4.4 Wide Ultra2 SCSI

The adapter card has full support for Wide Ultra2 SCSI. This interface is an extension of the SCSI-3 family of standards that expands the bandwidth of the SCSI bus to allow faster synchronous data transfers, up to 80 MBytes per second. Wide Ultra2 SCSI provides a doubling of the data rate over the Ultra2 SCSI interface, while it increases cable lengths and allows a larger number of devices on the cable than Ultra2 SCSI interfaces.

Special SCSI cables are specified for operation with Wide Ultra2 SCSI devices. You must consider the total number of devices and the length of your SCSI bus when setting up your system.

Table 3: A5838A Main Features

Technology Name	**Bus Width, in *Bits***	**Max Bus Speed *(MB/s)***	**Max number of *devices***	**Maximum Cable Length, in *meters***		
				SE	**LVD**	**Differential**
Wide Ultra2 SCSI	**16**	**80**	**16**	**6(*)**	**12**	**N/A**

Table 4: A5838A Cables

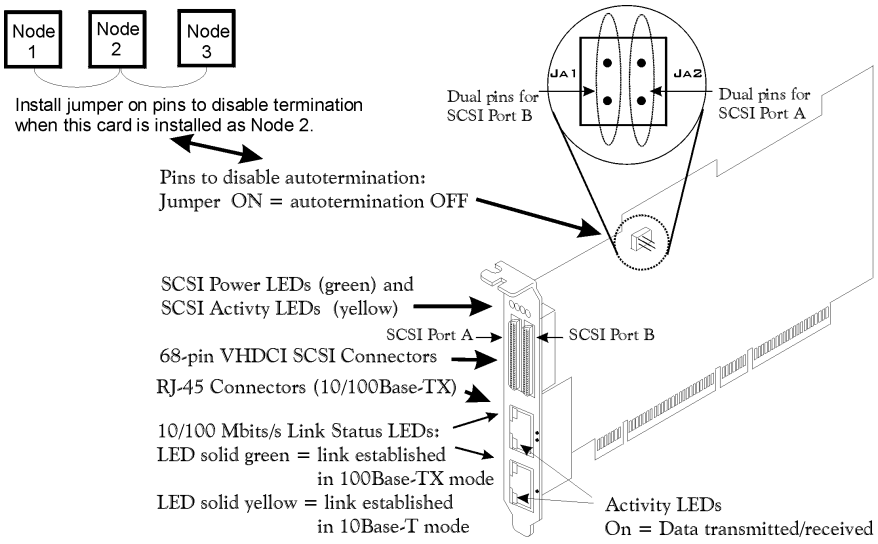
Recommended SCSI cables to plug into Wide SE peripherals	**Product Number**
1.0 M VHDCI to 68 pin HD SCSI Cable	C2361B
2.5 M VHDCI to 68 pin HD SCSI Cable	C2362B
5.0 M VHDCI to 68 pin HD SCSI Cable	C2365A
Recommended SCSI cables to plug into LVD peripherals	
10.0M VHDCI to 68 pin HD SCSI Cable	C2363B
VHDCI LVD/SE Terminator VHDCI/LVD/SCSI Product only	5021-1121

***** - This adapter has dual functionality and therefore single-ended (SE) is supported along with LVD.

11.4.5 Auto-termination of A5838A Adapter

Terminations have an automatic enable feature so that terminations become enabled ON the adapter as soon as a cable is detached. The dual pin set, if shorted with a jumper will, however, override the auto termination feature. That is, if the dual pin set is shorted, the port's termination power is disabled, even though the port is open (no cables attached). The termination pins and the jumpers are only used to terminate the termination power. The pin set labelled JA2 is for Port A connector (which is on the left side of Port B) and the pin set labelled JA1 is for Port B. (Refer to the following diagram for specific locations for Ports and termination pins).

Figure 2: A5838A Physical Diagram



12 Installation and Troubleshooting

Refer to the Quick Config Guide and Quick Troubleshooting Guide for installation and troubleshooting for this card.

13 Glossary

Address

A specific location in memory, designated either numerically or by a symbolic name.

Asynchronous Data Transfer

One of the ways data is transferred over the SCSI bus. It is slower than synchronous data transfer.

BIOS (Basic Input/Out System)

Software that provides basic read/write capability. Usually kept as firmware (ROM) -based). The system BIOS on the main board of a computer is used to boot and control the system. The SCSI BIOS on the host adapter acts as an extension of the system BIOS.

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.

Bus

The bus is the path or channel that carries data between the computer and other devices. It is a set of shared wires or electrical connections that allow you to add peripherals to your computer thus expanding the system's basic capabilities. EISA, PCI, and SCSI are examples of buses.

Bus Slot Bus slots are connectors on the computer's motherboard used for connecting add-on cards. For example, video, sound and SCSI controllers.

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 multi-tasking operating systems to transfer data.

Byte

A unit of information consisting of eight bits.

Chain

A topology in which every device is connected to two others, except for two-end devices that are connected to only one other.

Configuration

Refers to the way a computer is set up; the combined hardware components (computer, monitor, key board, and peripheral devices) that make up a computer system; or the software settings that allow the hardware components to communicate with

each other.

Controller Card

Controller cards plug into the bus slots on the motherboard. They allow the computer to communicate with and control devices. For example, the SCSI controller card controls and communicates with a SCSI tape drive.

CPU (central processing unit)

The “brain” of the computer that performs the actual computations. The term Micro Processor Unit (MPU) is also used.

Data Transfer Rate

Data transfer rate is the measure of how fast information passes between the computer and another device or between devices.

Device

A device is hardware that connects to the computer via a controller card or port.

Some examples of SCSI devices are printers, scanners, tape drives, hard drives, etc.

Device Driver

A program that allows a microprocessor (through the operating system) to direct the operation of a peripheral devicce.Differential.

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 flow is byte by byte.

Differential

A hardware configuration for connecting SCSI devices. It uses a pair of lines for each signal transfer (as opposed to single-ended SCSI which references each SCSI signal to a common ground).

EEPROM (electronically erasable programmable read-only memory)

A memory chip typically used to store configuration information. See NVRAM.

EISA (Extended Industry Standard Architecture)

It is an extension of the 16-bit ISA bus standard. It allows devices to perform 32-bit data transfer.

EIDE

EIDE stands for “Enhanced Integrated Drive Electronics”. EIDE is an updated version of IDE that improves upon speed and includes support for CD-ROM drives in addition to larger hard drives. External SCSI Device

A SCSI device installed outside the computer cabinet. External SCSI devices are connected in a chain using shielded cables.

Fast SCSI

A standard for SCSI data transfers. It allows a transfer rate of up to 10 MBytes/sec over an 8-bit SCSI bus, and up to 20 MBytes/sec over a 16-bit SCSI bus.

FCC

Federal Communications Commission.

File

A named collection of information, usually stored on a disk.

Firmware

Software that is permanently stored in ROM. In the case of BIOS, it can be accessed during boot time without the aid of an operating or file system.

Hard Disk

A rigid disk permanently sealed into a driver cartridge. A hard disk can store very large amounts of information.

Hardware Interface

The hardware interface is the electronics required to communicate with and control devices. When you put these electronics on a card you have an interface card, also known as a controller card.

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 and/or integrated circuit device that provides a SCSI bus connection to the computer system.

IDE

IDE stands for “Integrated Drive Electronics”. IDE is a common standard for hard disk drives. All the control electronics for IDE is on the hard disk, not the interface card, therefore the name “Integrated Drive Electronics”.

Internal SCSI DEvice

A SCSI device installed inside the computer cabinet. These devices are connected in a chain using an unshielded ribbon cable.

IRQ (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.

ISA (Industry Standard Architecture)

A type of computer bus used in most PCs. I t allow3s devices to send and receive data 16 bits at a time.

KByte (Kilobyte)

A measure of computer storage equal to 1024 bytes.

Local Bus

A way to connect peripherals directly to the computer processor’s data path. It by-passes the slower ISA and EISA buses. PCI is a local bus standard.

Logical Unit

A subdivision, either logical or physical, of a SCSI device. Most devices have only one logical unit, but up to sixteen are allowed for a 16-bit SCSI bus and eight for an 8-bit SCSI bus.

LUN (logical unit number)

An encoded three-bit number for the logical unit.

LVD (low-voltage differential)

A robust design methodology that improves power consumption, data integrity, cable lengths, and support for multiple devices while providing a migration path for increased I/O performance.

MByte (megabyte)

A measure of computer storage equal to 1024 kilobytes.

Mainboard

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 plug-in boards.

Main Memory

The part of a computer's memory that is directly accessible by the CPU (usually synonymous with RAM).

Motherboard

See mainboard. In some countries, the term motherboard is not appropriate.

Multi-tasking

The initiation and control of more than one sequence of operation simultaneously. This allows program to operate in parallel. Examples of multitasking operating systems are Windows 95, Windows NT, and Unix. When your software, devices, and controller cards are multitasking, they don't have to wait for one program to finish before they can do their work.

Multi-threading

The simultaneous accessing of data by more than one SCSI device. This increases the aggregate data throughput.

NVRAM (Non-Volatile Random Access Memory)

An EEPROM (Electronically Erasable Read Only Memory Chip) used to store configuration information.

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.

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. SCSI uses odd parity.

Passive Termination

Passive termination is usually done with resistors. Power is not supplied from the

SCSI controller card to the passive termination resistors. Passive termination provides an impedance that is close to the impedance of the SCSI cable. Therefore it minimizes reflection at the end of the cable.

PCI (Peripheral component interconnect)

A local bus specification that allows connection of integrated peripheral controller components, peripheral add-in boards, and processor/memory systems. It bypasses the slower ISA and EISA buses.

Peripheral Devices

A hardware device (such as 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.

Pin-1 Orientation

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 keyed to ensure proper alignment, but internal SCSI ribbon cables may not be.

PIO (programmed input/output)

A way the CPU can transfer data to and from memory via the computer's I/O ports. PIO can be faster than DMA, but requires CPU time.

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.

Queue Tags

A way to keep track of multiple commands while allowing increased throughput on the SCSI bus.

RAM (Random Access Memory)

Generally, 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.

RISC Core

Symbios SCSI chips contains 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.

SCAM (SCSI Configured AutoMatically)

A method to automatically allocate SCSI IDs via software when SCAM compliant SCSI devices are attached.

SCSI (Small computer system interface)

A specification for a high-performance peripheral bus and command set. The original standard i s now referred to as SCSI-1.

SCSI-2

The SCSI specification that adds features to the original SCSI-1 standard.

SCSI-3

The next SCSI specification, that adds features to the SCSI-2 standard.

SCSI Bus

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.

SCSI Device

Any device conforming to the SCSI standard that attaches to the SCSI bus by means of a SCSI cable. This includes SCSI host adapters and SCSI peripherals.

SCSI ID

A unique identification for each SCSI device on the SCSI bus. Each SCSI bus has fifteen available SCSI IDs numbered 0 through 15 for Wide SCSI or 0-7 for 8-bit SCSI. The host adapter is assigned ID 7, which gives it priority to control the bus.

SDMS (SCSI Device Management System)

A Symbios software product that manages SCSI system I/O.

Single-Ended SCSI

A hardware specification for connecting SCSI devices. It references each SCSI signal to a common ground, as opposed to differential SCSI and low voltage differential SCSI, which use a separate return for each signal.

Synchronous Data Transfer

One of the ways data is transferred over the SCSI bus. Transfers are clocked with fixed frequency pulses.

System BIOS

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

Termination

The electrical connection required at each end of the SCSI bus, composed of a set of resistors.

Ultra SCSI

A standard for SCSI data transfers. It allows a transfer rate of up to 20 MBytes/sec over an 8-bit SCSI bus, and up to 40 MBytes/sec over a 16-bit SCSI bus SCSI Trade

Ultra SCSI

A standard for SCSI data transfer. It allows a transfer rate of up to 20 MBytes/sec over an 8-bit SCSI bus, and up to 40 MBytes/sec over a 16-bit SCSI bus. SCSI Trade Association (STA) supports using the term “**Ultra2 SCSI**” over the older term “Fast-40”.

VCCI

Voluntary Control Council for Interference.

VHDCI

Very High Density Cable Interconnect.

Wide SCSI

A SCSI-2 feature allowing 16 or 32-bit transfers on the SCSI bus. This dramatically increases the transfer rate over the standard 8-bit SCSI bus.

Wide Ultra2 SCSI

The SCSI Trade Association term for SCSI bus width 16 bits, SCSI bus speed maximum data rate 80 MBytes/sec.

14 References

1.The PC Guide: SCSI Protocols and Transfer Modes, Version Date: April 25, 1999
2.http://eccc.neth.hp.com/TheProducts/ISG/training/dls/E_BegSCSI/SCSI.html