A Beginner's Guide to Serial Attached SCSI (SAS)

This guide:

- Provides basic information about Serial Attached SCSI, cabling and device drivers

- Describes what you need to know about HP StorageWorks SAS tape drives in order to make the correct purchasing decisions for your make and model of server

hp

i n v e n t

Legal and notice information

A Beginner's Guide to Serial Attached SCSI (SAS)

Helpful web sites

For product information, see the following HP web sites:

- http://www.hp.com
- http://www.hp.com/go/connect/
- http://www.hp.com/go/tape/
- http://www.hp.com/go/obdr/
- http://www.hp.com/go/storage/
- http://www.hp.com/support/
- http://www.docs.hp.com/

Telephone numbers for worldwide technical support are listed on the HP support web site:

- http://www.hp.com/support/

Further background information on SAS may be obtained from the SCSI Trade Association web site:

- http://www.scsita.org/

A Beginner's Guide to Serial Attached SCSI (SAS)

Introduction

This guide introduces new users to Serial Attached SCSI, often abbreviated to SAS, as a technology for attaching HP StorageWorks tape drives to their servers.

What is SCSI?

The SCSI standard (pronounced "Scuzzy") stands for Small Computer Systems Interface. SCSI is an ANSI interface standard that defines both physical hardware and a command set suitable for connecting peripheral devices, such as tape and disk drives, to a server. Initially conceived as a system based on a parallel bus, it enables several devices to share the same host bus adapter (HBA). Serial Attached SCSI, or SAS, technology for connecting peripherals to servers was introduced in May 2002.

Why do I need Serial Attached SCSI (SAS)?

The parallel SCSI standard has reached the technical limits of its capability and can go no faster than the current parallel Ultra320 version. The SAS, point-to-point system eliminates these limits and allows faster speeds. SAS also enables the use of Small Form Factor, SFF, 2.5" disk drives with improved performance and less demand on power.

Hewlett-Packard servers use SAS to connect internal peripherals. SAS is a point-to-point technology unlike the bus system used in parallel SCSI. This means each device can take full advantage of the bandwidth available and has the ability to connect multiple initiators, allowing peripherals to be shared between several servers. SAS provides scalable input and output of data for peripherals; it moves data at speeds up to 3 Gigabits per second and provides a clear roadmap up to 12 Gigabits per second.

Server I/O bus technology is moving from PCI-X to PCI-Express (PCI-e). Parallel SCSI host bus adapters will not be widely available for the PCI-Express bus.

What type of cable and connector does SAS use?

SAS uses screened cable consisting of two pairs of conductors plus ground wires operating at speeds up to 3 GHz. The maximum cable length is 6 metres.

SAS uses several different types of cable and connector depending on the type of peripheral used. These are defined in the T10 draft SAS standards document which can be found on the SCSI Trade Association's web site (http://www.scsita.org).

- **Internal peripherals** use the SFF8482 drive plug connection, as shown in Figure 1. This connector sometimes has a standard, PC peripheral DC lead attached. This is used to connect the peripheral to the standard DC power connector. However, for peripherals that consume more DC power, such as LTO Ultrium tape drives, this connection is not used and the tape drive is equipped with its own standard DC power socket.

- **External peripherals** use the Mini SAS 4X type connector at the device end, as shown in Figure 2, and an Infiniband type of connector, as shown in Figure 3, to connect to the host bus adapter.
- Some servers come with SAS-based controllers already installed that connect to hot-swap disk bays. These controllers normally have eight SAS connections in blocks of four, pre-wired to the disk bays, as shown in Figure 4. On HP Proliant SAS-based servers, tape drives can be connected to these controllers using a special HP cable. When using this configuration, the total number of SAS peripherals connected (both disk and tape) must not be greater than eight.

Figure 1 Internal drive plug SAS connection with optional DC input connection (SFF8482)
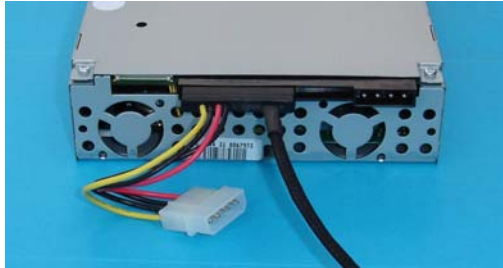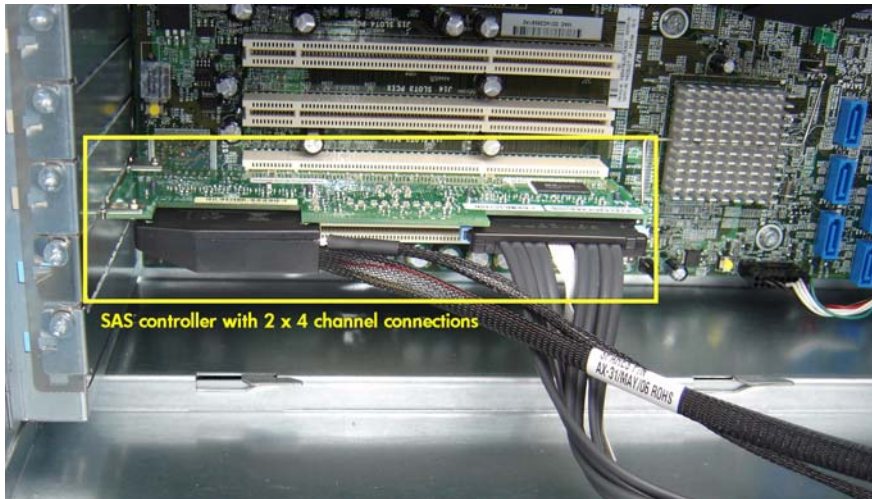

Figure 2 Mini-SAS 4X connection to external tape SAS peripheral (SFF8088)

Figure 3 Infiniband type of connector used to connect to a SAS HBA external port (SFF8470)

Figure 4 SAS controller installed in a server with two 4-channel cables connected (SFF8484)

SAS controller with 2 x 4 channel connections

How about the device address?

Traditional parallel SCSI devices and host bus adapters are assigned a numeric device address of between 0 and 15 (wide SCSI) or 0 to 7 (narrow SCSI). This is typically set by switches or jumpers on the device and HBA.

SAS devices have a permanent SCSI address. The concept is similar to the MAC address assigned to network hosts or the World Wide Name in fibre channel. This address is programmed at manufacture and cannot be changed by the user.

Are terminators required for SAS?

No. Terminators are not required for SAS.

Software drivers

A Microsoft Windows Server 2003 driver for SAS tape drives is available from the www.hp.com website. This driver offers additional functionality to the standard Microsoft driver. SAS peripherals are listed in the Device Manager screen in the same manner as parallel SCSI devices. SAS host bus adapters and array controllers require the correct software, which is available from the appropriate manufacturer's web site.

I want to connect an HP StorageWorks SAS tape drive to my server. What do I need to know to make the correct purchasing decisions?

Table 1 Purchasing decisions with HP StorageWorks tape drives

Decision point	Description
Does your server have an internal 5.25" peripheral bay?	The HP StorageWorks internal SAS tape drive occupies one half-height, 5.25" peripheral bay. If your server does not have an internal 5.25" peripheral bay, you need an external tape drive.
Are you installing onto an HP server?	For non-HP servers, it is necessary to purchase an additional SAS HBA (host bus adapter). For recommended products, please refer to www.hp.com/go/connect.
Does your HP ProLiant server have a SAS controller?	You may be able to use one of the connections on this controller for a SAS tape drive. If your server has a SATA controller, it will be necessary to purchase a SAS HBA (host bus adapter). For recommended products, please refer to www.hp.com/go/connect.
Does your HP ProLiant server have a built-in, SAS-based array controller (RAID)?	A cost-effective way of connecting an internal SAS tape drive is to use one of the SAS connections on the array controller. HP Proliant SAS array controllers have connections for up to eight devices, which may be disk or tape. This means that if one connection is used for a SAS tape drive, then only seven disks can be connected to the array controller. If all eight disks are required, an additional SAS HBA must be purchased. The special, split cable required to implement this configuration is supplied with HP internal SAS tape drives
Are you connecting an external HP SAS tape drive?	External HP SAS tape drives may also be connected to the internal SAS array controller, using the special HP cable supplied with the tape drive. This enables users of servers that do not have internal drive bays to use SAS tape drives without purchasing an additional host bus adapter.

How do I find out more on www.hp.com/go/connect?

For the most up-to-date information about recommended SAS HBAs and supported cabling configurations, always refer to www.hp.com/go/connect and be sure to check the details of the specific tape drive and server combination that you require.

To use go/connect:

1. Select **tape backup** and navigate down to the Hardware Compatibility table for your make of server. The server/tape drive matrix shows top-level compatibility.
2. Click on the box for your combination of server and tape drive to display a further page with detailed connectivity information. This is the page that provides detailed information about cabling and any impact this may have on disk bay configuration.

How can I check that my HP StorageWorks tape drive will work with my backup software solution and operating system?

HP StorageWorks SAS tape drives have been fully tested with the popular backup applications. Please check the compatibility web site at www.hp.com/go/connect for full details.

What about detailed installation and user guides?

The following documents are available for each tape drive product:

- A *Start here poster* for an overview of the installation information (available in English, French, German and Japanese)
- The *User Guide* on the HP StorageWorks Tape CD-ROM, supplied with the tape drive, for step-by-step instructions on installing and operating your tape drive (available in 13 languages)

These and other HP documents can be found on the HP documents web site: http://www.docs.hp.com.