

IBM TotalStorage NAS 100, 200, and Gateway 300



Planning Guide

Note

Before using this information and the product it supports, be sure to read the general information in “Notices” on page 45.

First Edition (October 2002)

This guide applies to the IBM TotalStorage™ NAS 100 Model R12, NAS 200 Model 25T, NAS 200 Model EXP, and the NAS Gateway 300 Model G27.

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About this guide

This guide describes the requirements to consider when planning the installation of the following IBM TotalStorage appliances:

- NAS 100 Model R12
- NAS 200 Model 25T
- NAS 200 Model 25T with tower to rack conversion kit
- NAS 200 Storage Unit Model EXP
- NAS Gateway 300 Model G27.

Who should read this guide

This guide is intended for anyone responsible for planning the setup of the NAS 100, NAS 200, or NAS Gateway 300.

Notices used in this guide

The notice definitions are as follows:

Notes	These notices provide important tips, guidance, or advice.
Attention	These notices indicate possible damage to programs, devices, or data. An attention notice is placed just before the instruction or situation in which damage could occur.
Caution	These notices indicate situations that can be potentially hazardous to you. A caution notice is placed just before the description of a potentially hazardous procedure step or situation.
Danger	These notices indicate situations that can be potentially lethal or extremely hazardous to you. A danger notice is placed just before a description of a potentially lethal or extremely hazardous procedure step or situation.

Publications

This section provides a list of shipped publications, related publications, an accessibility statement, and a list of Web sites where additional information about storage products is found.

Hardcopy publications shipped with the appliances

The following publications are shipped in hardcopy with the NAS 100, and are also provided in softcopy form at www.ibm.com/storage/support/:

- *IBM TotalStorage NAS 100 Installation Guide*

This publication provides procedures for setting up, cabling, and replacing components of the NAS 100.

- *IBM TotalStorage NAS 100 Release Notes*

This publication provides last-minute updates to the documentation that are not included in the other publications.

The following publications are shipped in hardcopy with the NAS 200, and are also provided in softcopy form at www.ibm.com/support/:

- *IBM TotalStorage NAS 200 Model 25T Hardware Installation Guide*

This publication provides procedures for setting up, cabling, and replacing components of the NAS 200.

- *IBM TotalStorage NAS 200 Storage Unit Model EXP Installation and User's Guide*

This publication provides procedures for setting up, cabling, replacing components of, and solving problems for the NAS 200 Storage Unit Model EXP.

- *IBM TotalStorage NAS 200 Model 25T Release Notes*

This publication provides last-minute updates to the documentation that are not included in the other publications.

The following publications are shipped in hardcopy with the NAS Gateway 300, and are also provided in softcopy form at www.ibm.com/storage/support/:

- *IBM TotalStorage NAS Gateway 300 Model G27 Hardware Installation Guide*

This publication provides procedures for setting up, cabling, and replacing components of the NAS Gateway 300.

- *IBM TotalStorage NAS Gateway 300 Model G27 Release Notes*

This publication provides last-minute updates to the documentation that are not included in the other publications.

Related publications

The related publications are provided in softcopy form at www.ibm.com/storage/support/.

The following publications contain additional information about the NAS 200:

- *IBM TotalStorage NAS 200 Model 25T User's Reference*

This document provides information on configuring the software of the NAS 200.

- *IBM TotalStorage NAS 200 Model 25T Hardware Service Guide*

This guide provides procedures intended for service personnel to troubleshoot and repair the NAS 200.

- *IBM TotalStorage NAS 200 Storage Unit Model EXP Installation and User's Guide*

This publication provides procedures for setting up, cabling, replacing components of, and solving problems for the NAS 200 Storage Unit Model EXP.

The following publications contain additional information about the NAS Gateway 300:

- *IBM TotalStorage NAS Gateway 300 Model G27 User's Reference*

This document provides information on configuring the software of the NAS Gateway 300.

- *IBM TotalStorage NAS Gateway 300 Model G27 Hardware Service Guide*

This guide provides procedures intended for service personnel to troubleshoot and repair the NAS Gateway 300.

Accessibility

The softcopy version of this guide and the other related publications are accessibility-enabled for the IBM Home Page Reader.

Web sites

This section lists the Web sites where additional technical information is found.

Getting help online

Be sure to visit the support page that is specific to your hardware, complete with FAQs, parts information, technical hints and tips, technical publications, and downloadable files, if applicable. This page is at www.ibm.com/storage/support/.

Other helpful sites

www.ibm.com

www.ibm.com/storage

Main IBM home page

IBM Storage home page

Chapter 1. Planning overview

Planning for NAS appliances consists of these tasks:

1. Understand the features and functions of the NAS appliance you are installing. Refer to the information provided in Chapter 2, "Introduction" on page 3.
2. Plan for the physical environment where the machines operate. See Chapter 3, "Site planning" on page 15. This planning step includes planning for physical space, power, and understanding the allowable operating temperatures and humidity for which the NAS appliances are designed.
3. For NAS 200 and NAS Gateway 300, plan for optional adapters such as Ethernet and adapters for attaching tape devices. See Chapter 2, "Introduction" on page 3 and Chapter 5, "Optional Adapters" on page 31.
4. Plan for network attachments and network addresses. See Chapter 4, "Configuration" on page 21.
5. For a NAS Gateway 300 plan for clustering. See "Cluster setup requirements" on page 29.

Chapter 2. Introduction

This chapter describes the features and functions of NAS 100, NAS 200, and NAS Gateway 300 appliances.

NAS 100

The IBM TotalStorage NAS 100, 5190 Model R12 is a low profile, 1U high, table-top NAS solution designed for central management of data storage for mid-range and large enterprises that have multiple remote office and branch office locations. Optionally a kit is available to mount the NAS 100 in a rack.

NAS 200

The NAS 200 is a storage appliance that consists of one machine, along with associated optional features:

- The Model 25T is a tower-based appliance that provides hard-disk-drive storage. It requires only power and network connections for setup. A conversion kit is available to convert this model to a rack-mounted appliance.
- The Model 25T with the rack-mount conversion kit is a rack-mounted appliance that provides hard-disk-drive storage. It can be mounted in a 5U rack.
- Up to three 5194-EXP storage units can be attached to the NAS 200 if the appropriate RAID feature is installed in the engine.

The base NAS 200 is already configured; aside from the initial configuration that determines the IP address, you do not need to configure hardware or install features for the base model configurations.

NAS Gateway 300

The NAS Gateway 300 is a rack-mounted storage server that connects LAN servers and clients to a storage area network (SAN) and allocates storage on approved SAN appliances.

The Model G27 has **two** appliance engines, which are connected with a 10-ft. crossover cable to provide engine-to-engine communication for redundancy.

IBM TotalStorage Network Attached Storage family comparison guide

Use the following table to determine which IBM TotalStorage NAS family appliance is best suited for your needs.

Table 1. IBM TotalStorage NAS family comparison guide

NAS Product	Description
IBM TotalStorage NAS 100	The NAS 100 is designed to meet these requirements: <ul style="list-style-type: none">• Data storage requirements of up to 480 gigabytes of storage.• Windows® networking or Novell environments• Windows centered management environments• Workgroup, remote office and branch office environments• Users with minimal IT skills
IBM TotalStorage NAS 200	The NAS 200 is designed to meet these requirements: <ul style="list-style-type: none">• Data storage requirements of up to 3.5 terabytes (TB) of storage• Windows® networking or Novell environments• Windows centered management environments• Workgroup and departmental environments• Users with minimal IT skills
IBM TotalStorage NAS Gateway 300	The NAS 300 is designed to meet these requirements: <ul style="list-style-type: none">• Users requiring up to 6.5 TB of SAN-attached storage• Windows networking, NFS and Novell environments• Windows centered management environments• Clustered failover for mission-critical applications• Large departments and data center environments• Users with moderate IT skills• SAN-based storage for application servers

NAS 100 Features

The NAS 100 has the following features:

- Single 1.26 GHz Pentium III processor
- 512 MB 133 MHz, ECC, SDRAM memory
- four 120 Gigabyte, 7200 rpm, Ultra-ATA, hot swap, hard disk drives
- two integrated 10/100/1000 BASE-T Ethernet ports
- one 9-pin serial port. The serial port can be used to attach a local computer to manage the NAS 100.
- One PCI slot that accepts a SCSI adapter for attachment of a tape backup device. NAS 100 supports only the IBM PCI SCSI Adapter, part number 55P4040. See “IBM PCI SCSI Adapter (NAS 100 Only)” on page 11 for a description of the adapter.
- one 162 watt power supply.
- an optional kit for mounting in a rack.

NAS 200 features

Table 2 lists the standard features of the NAS 200 Model 25T.

Table 3 lists the optional features of the NAS 200 Model 25T.

Table 2. Standard features of the NAS 200 Model 25T

Hardware	Model 25T
System	<ul style="list-style-type: none"> • One 2.4-GHz processor • 512-KB Level-2 cache per processor • Integrated 10/100/1000 Ethernet • Advanced System Management support • Six PCI expansion slots
Memory	<ul style="list-style-type: none"> • 2 x 256 MB • Type: Double data rate (DDR) Synchronous DRAM (SDRAM) with RDIMM connectors • Upgradable to a maximum of 4.5 GB
Expansion bays	<ul style="list-style-type: none"> • Hot-swap: six SCSI hard-disk drive bays • Non-hot-swap: two 5.25-inch bays used for feature-specific options
Service processor	Imbedded system management processor
Power supplies	Two 560W (180 -256V)
SCSI port	External SCSI port that can be used for attaching additional storage when used with the ServeRAID-5i controller, or tape backup when using the integrated RAID controller on the system board

Table 3. Optional Features of a Model 25T

Feature Type	Feature	Model 25T
System	One 2.4-GHz processor upgrade	Option
Memory	Add or replace with these combinations: <ul style="list-style-type: none"> • 2 x 256 MB • 2 x 1 GB • 2 x 512 MB 	Option
Adapters	IBM Gigabit Ethernet SX Server Adapter	Option
	PRO/1000 XT Server Adapter by Intel	Option
	Alacritech 100x4 Quad-Port Server Accelerated Adapter	Option
	Alacritech 1000x1 Single-Port Server and Storage Accelerated Adapter	Option
	IBM PCI Ultra160 SCSI adapter (LVD/SE)	Option
	Qlogic 2340 1-port Fibre Channel adapter	Option

Table 3. Optional Features of a Model 25T (continued)

Feature Type	Feature	Model 25T
Storage	Model EXP 5194-EXP storage unit	Option to add up to three storage units with three to fourteen 36.4 GB or 73.4 GB hard-disk-drives
	IBM Netfinity 3-Pack Ultra320 Hot-Swap Expansion Kit	Option to add one IBM Netfinity 3-Pack Ultra320 Hot-Swap Expansion Kit with three 36.4 GB or 73.4 GB hard-disk-drives
	36.4 GB 10K Ultra160 SCSI Hot-Swap SL hard-disk-drives in the engine	Option to order the base engine with three 36.4 GB hard-disk-drives
	73.4 GB 10K Ultra160 SCSI Hot-Swap SL hard-disk-drives in the engine	Option to order the base engine with three 73.4 GB hard-disk-drives
	36.4 GB 10K Ultra160 SCSI Hot-Swap SL expansion hard-disk-drives	Option to add up to three additional hard-disk-drives (if three 36.4-GB HDDs are already installed)
	73.4 GB 10K Ultra160 SCSI Hot-Swap SL expansion hard-disk-drives	Option to add up to three additional HDDs (if three 73.4-GB HDDs are already installed)
	36.4 GB 10K Ultra160 SCSI Hot-Swap SL spare hard-disk-drive	Option
	73.4 GB 10K-4 Ultra160 SCSI Hot-Swap SL spare hard-disk-drive	Option
RAID controller	ServeRAID™-4H, ServeRAID-4Mx, ServeRAID-5i.	Option, but one must be selected.
Service processor	Remote Supervisor Adapter	Option
Conversion kit	Tower-to-Rack Kit	Option on the tower configuration

NAS 200 Storage Unit Model EXP

The NAS 200 EXP is a compact unit that provides high-capacity, small computer system interface (SCSI) disk storage. It supports a minimum of three to a maximum of fourteen 36.4-GB or 73.4-GB 10K rpm Ultra160 SCSI drives on each drive array. It delivers fast, high-volume data transfer, retrieval, and storage functions across multiple drives.

The NAS EXP will support any combination of 36.4-GB and 73.4-GB drives with the following restrictions:

- No drive array can contain drives of more than one size (for example, an array must contain only 36.4-GB drives or only 73.4-GB drives).
- Each array must contain at least three drives.
- The total number of arrays for the system (NAS 200 plus all attached NAS EXPs) cannot exceed eight.

The NAS EXP supports IBM Ultra160 SCSI for the host and drive interfaces and is designed for easy installation and integration into a variety of system environments.

NAS Gateway 300 features

Table 4 shows the standard features of the NAS Gateway 300 Model G27. Table 5 shows the optional adapters and features.

Note: The same optional features must be applied to both engines in the cluster.

Table 4. Standard features of the NAS Gateway 300 Model G27

Hardware	Model G27
System	<ul style="list-style-type: none"> • Two 2.4-GHz processors • 512-KB Level-2 cache per processor • Integrated 10/100/1000 Ethernet • Advanced System Management support • Six PCI expansion slots
Memory	Each engine: <ul style="list-style-type: none"> • 512 KB • Type: 133-MHz, ECC, SDRAM, registered DIMMs • Upgradable to a maximum of 4.5 GB
Hard disk drives (HDDs)	Each engine: One Ultra160 10 000 rpm 36.4 GB hard disk drive
SCSI port	External SCSI port that can be used for tape backup
Power supplies	Two 560W (180 - 256V)

Table 5. Optional Features of a NAS Gateway 300 Model G27 per engine

Feature Type	Feature	NAS Gateway 300 Engine
Memory (In addition to the standard memory one of the following options must be installed)	2 x 512 KB 2 x 1 GB	Option
Network adapters (only one is required)	IBM Gigabit Ethernet SX Server Adapter	Option
	PRO/1000 XT Server Adapter by Intel	Option
	Alacritech 1000x1 Single-Port Server and Storage Accelerated Adapter	Option
	Alacritech 100x4 Quad-Port Server Accelerated Adapter	Option
Service Processor	Remote Supervisor Adapter	Option

PCI Adapters

This section describes the optional PCI adapters available for a NAS 200 or NAS Gateway 300.

The NAS 100 supports only the following adapter to provide attachment of a tape device. See “IBM PCI SCSI Adapter (NAS 100 Only)” on page 11.

Ethernet adapters

This section describes the integrated Ethernet controller and the optional Ethernet adapters that are available.

IBM integrated 10/100 Ethernet controller (NAS 100 only)

The NAS 100 provides an integrated Ethernet controller. This controller provides an interface for connecting to 10BASE-T Ethernet networks, or 100BASE-TX FAST Ethernet networks, and provides full-duplex capability, which enables simultaneous transmission and reception of data on the Ethernet LAN.

When you connect your engine to the network, the Ethernet controller automatically detects the data-transfer rate (10 Mbps, or 100 Mbps) on the network and then sets the controller to operate at the appropriate rate. That is, the Ethernet controller will adjust to the network data rate, whether the data rate is standard Ethernet (10BASE-T), Fast Ethernet (100BASE-TX). The controller supports half-duplex and full-duplex modes at all speeds.

The Ethernet controller is a PCI Plug and Play device. You do not need to set any jumpers or configure the controller for your operating system before you use the Ethernet controller.

Alacritech 1000x1 Single-Port Server and Storage Accelerated Adapter

The Alacritech 1000x1 Single-Port Server and Storage Accelerated Adapter is a PCI adapter that offers hardware acceleration over TCP/IP. Performance is enhanced by the session-layer interface card (SLIC) technology, which uses a custom, high-performance ASIC for protocol processing to free the CPU for other activities.

Key features:

- A 66 MHz 64-bit bus master PCI adapter that provides one 10BASE-T/100BASE-TX/1000BASE-T, full duplex port.
- Offloads TCP/IP processing from the host CPU to the adapter which accelerates network performance, and reduces server overhead and network latency.
- Interoperable with industry standard hubs, routers, and switches.
- Allows the teaming of multiple Alacritech adapters together using Port Aggregation software for advanced fault tolerance, increased network bandwidth, and greater server availability.

Requirements:

The Alacritech 1000x1 Single-Port Server and Storage Accelerated Adapter provides connectivity using TCP/IP. The network should have:

- 1000BASE-T Gigabit (1000 Mbps) or 100BASE-TX Fast Ethernet (100 Mbps) using Cat 5 UTP, or 10BASE-T (10 Mbps) using Cat 3, 4, or 5 UTP cable
- RJ-45 connector on the cable
- TCP/IP protocol

PRO/1000 XT Server Adapter by Intel

You can add up to two PRO/1000 XT Server Adapter by Intels to attach high-speed (1 Gb) networks. This adapter provides automatic speed configuration to 10, 100, or 1000 Mbps.

Key features:

- Uses the Intel PROSet utility for easy setup
- Shares a common driver set with the IBM Gigabit Ethernet SX Server Adapter
- Has LEDs for visual indication of network speed and link status
- Is totally software configurable, with no jumpers or switches
- Can operate in 10/100/1000 BASE-T modes
- Is compliant with 802.3z and 802.3ab

Requirements:

1000BASE-T Gigabit (1000 Mbps) or 100BASE-TX Fast Ethernet (100 Mbps) using Cat 5 UTP, or 10BASE-T (10 Mbps) using Cat 3, 4, or 5 UTP cable

Alacritech 100x4 Quad-Port Server Accelerated Adapter

The Alacritech 100x4 Quad-Port Server Accelerated Adapter is a PCI adapter that offers hardware acceleration over TCP/IP. Performance is enhanced by the session-layer interface card (SLIC) technology, which uses a custom ASIC for protocol processing to free the CPUs for other uses. This adapter supports UDP without acceleration.

Key features:

- Offers four 10BASE-T/100BASE-TX ports for maximum network performance and flexibility
- Offloads TCP/IP processing from host CPU to the adapter, which accelerates your network performance and reduces server overhead and network latency
- Interoperable with industry-standard hubs, routers, and switches
- Port aggregation software delivers fault tolerance and higher throughput

Requirements:

The Alacritech 100x4 Quad-Port Server Accelerated Adapter is designed to provide connectivity between the engines and your Ethernet or Fast Ethernet network using TCP/IP. The network should have the following features:

- 10BASE-T Ethernet (10 Mbps) using Category 3, 4, or 5 UTP or 100BASE-TX Fast Ethernet (100 Mbps) using Category 5 UTP with RJ-45 connectors
- TCP/IP

IBM Gigabit Ethernet SX Server Adapter

Optionally, you can add an IBM Gigabit Ethernet SX Server Adapter to connect to high-speed (1-Gb) networks. This adapter provides full-duplex capability, which enables simultaneous transmission and reception of data on the gigabit LAN.

Key features:

- 66-MHz, 64-bit PCI gigabit Ethernet adapter
- Can be paired with another IBM Gigabit Ethernet SX Server Adapter to achieve a high level of communication integrity
- Fully compliant with the IEEE 802.3z gigabit Ethernet standard
- Supports optional jumbo frames

The IBM Gigabit Ethernet SX Server Adapter must be installed in 64-bit PCI slots.

Requirements:

- Optical multimode cable with an SC-style duplex connector that meets 62.5/125-micron or 50/125-micron multimode specifications
- A gigabit switch that is compliant with IEEE 802.3z or 802.3ab, or a buffered repeater

Fibre Channel adapter (NAS 200)

For NAS 200, you can install a Qlogic 2340 1-port Fibre Channel adapter to connect to a backup tape drive.

Key features:

- 133-MHz, 64-bit, PCI-x host adapter
- High performance, allowing up to 400-MBps full duplex data transfers
- Compliant with third generation Fibre Channel Physical and Signaling Interface (PC-PH-3) standard
- Compliant with Fibre Channel Arbitrated Loop (FC-AL-2) standard
- Supports bus-master DMA
- Supports FC protocol - SCSI (FCP-SCSI) and internet protocol (IP) protocols
- Supports point-to-point fabric connection (F-PORT FABRIC LOGIN)
- Supports Fibre Channel Service (Classes 2 and 3)

Requirements:

- Use optical multimode cable with an LC-Style duplex connector that meets 62.5/125-micron or 50/125-micron multimode specifications.

Fibre Channel adapter (NAS Gateway 300)

Any one the following mix of Fibre Channel adapters can be installed in each engine in a NAS Gateway 300:

- A Qlogic 2340 1-port Fibre Channel adapter to connect to SAN
- A Qlogic 2340 1-port Fibre Channel adapter to connect to SAN and an additional Qlogic 2340 1-port Fibre Channel adapter to connect to a backup tape drive
- A Qlogic 2342 2-port Fibre Channel adapter for redundant SAN connections
- A Qlogic 2342 2-port Fibre Channel adapter for redundant SAN connections and a Qlogic 2340 1-port Fibre Channel adapter to connect to a backup tape drive.

Key features:

- 133-MHz, 64-bit, PCI-x host adapter
- High performance, allowing up to 400-MBps per channel full-duplex data transfers
- Compliant with Third generation Fibre Channel Physical and Signaling Interface (FC-PH-3) standard
- Compliant with Fibre Channel Arbitrated Loop (FC-AL-2) standard
- Supports bus-master DMA
- Supports FC protocol - SCSI (FCP-SCSI) and internet protocol (IP) protocols
- Supports point-to-point fabric connection (F-PORT FABRIC LOGIN)
- Supports Fibre Channel Service (Classes 2 and 3)

Requirements:

Use optical multimode cable with an LC-style duplex connector that meets 62.5/125-micron or 50/125-micron multimode specifications.

IBM PCI SCSI Adapter (NAS 100 Only)

Optionally, you can add an IBM PCI SCSI Adapter (IBM P/N:55P4040) to connect to a backup tape drive. The adapter provides SCSI LVD/SE connectivity and is compatible and fully compliant with SCSI, SCSI-2, and SCSI-3 protocols.

Key features:

- DMA allows the adapter to control the transfer of data from the peripherals to the system memory, relieving the system processor of this time consuming burden.
- 80-MBps sustained synchronous data transfer rate.
- 266-MBps host bus transfer rate using a 64-bit PCI bus.
- Ability to handle any combination of 8-bit and 16-bit drives.

Requirements:

The total length of cabling on the SCSI bus cannot exceed the maximum lengths listed in Table 6).

Table 6. Maximum cable lengths for the IBM PCI SCSI Adapter (IBM P/N:55P4040)

Data transfer rate	Maximum cable length
5 MBps (SCSI)	6 m
10 MBps (Fast)	3 m
20 MBps (Fast/Wide)	3 m
20 MBps (Ultra)	1.5 m
40 MBps (Wide Ultra)	1.5 m
40 MBps (Ultra2) (LVD)	12 m
80 MBps (Fast/Wide Ultra2) (LVD)	12 m

Remote Supervisor Adapter

You can optionally install a Remote Supervisor Adapter, which allows you to manage a NAS appliance at any time from virtually anywhere.

Key features:

- Continuous monitoring and control
- Advanced Predictive Failure Analysis® (PFA)
- Configurable notification and alerts
- Event logs that are timestamped and saved by battery backup, and can be attached to e-mail alerts
- LAN, serial and ISM interconnect remote access
- Independent power, which enables around-the-clock access even when engine power is off

Requirements:

The Remote Supervisor Adapter must be installed in PCI slot 1

IBM PCI Ultra160 SCSI adapter (LVD/SE)

Optionally, you can add an IBM PCI Ultra160 SCSI adapter (LVD/SE) to connect to a backup tape drive. The adapter provides SCSI LVD/SE connectivity and is compatible and fully compliant with SCSI, SCSI-2, and SCSI-3 protocols.

Key features:

- Direct Memory Access (DMA) — Allows the adapter to control the transfer of data from the peripherals to the system memory, relieving the system processor of this time consuming burden.
- SCSISelect configuration utility — The SCSISelect configuration utility resident in the adapter's BIOS allows simple, on-screen configuration of the adapter and eliminates the need to manipulate jumpers or terminators during the installation.
- 160-MBps sustained synchronous data transfer rate.
- 133-MBps host bus transfer rate using a 32-bit PCI bus.
- Ability to handle any combination of 8-bit and 16-bit drives.

Requirements:

The total length of cabling on the SCSI bus cannot exceed the maximum lengths listed in Table 7.

Table 7. Maximum cable lengths for the IBM PCI Ultra160 SCSI adapter (LVD/SE)

Data transfer rate	Maximum cable length
5 MBps (SCSI)	6 m
10 MBps (Fast)	3 m
20 MBps (Fast/Wide)	3 m
20 MBps (Ultra)	1.5 m
40 MBps (Wide Ultra)	1.5 m
40 MBps (Ultra2) (LVD)	12 m
80 MBps (Fast/Wide Ultra2) (LVD)	12 m

IBM ServeRAID-4Mx Ultra160 SCSI Controller (NAS 200 Model 25T only)

The IBM ServeRAID-4Mx Ultra160 SCSI Controller is an option available for the Model 25T. It can enable the attachment of a 5194-EXP storage unit or an IBM Netfinity 3-pack Ultra320 Hot-Swap Expansion Kit with either 36.4 or 73.4-GB hard-disk-drives.

Key features:

- Allows connection of 5194-EXP storage unit to the Model 25T or an IBM Netfinity 3-pack Ultra320 Hot-Swap Expansion Kit
- Contains 64 MB of battery backed up cache
- Controls up to 30 hard-disk-drives
- Controls up to eight logical drives
- Supports RAID levels 0, 1, 5, Enhanced-1 (1E), and Enhanced-5 (E5), 00, 10, 1E0, 50
- Supports a sustained synchronous data transfer rate of 40-MBps
- Supports a maximum SCSI transfer speed of 160-MBps

IBM ServeRAID-4H Ultra160 SCSI Controller (NAS 200 Model 25T only)

The IBM ServeRAID-4H Ultra160 SCSI Controller is an option available for the NAS 200 Model 25T. It can enable the attachment of up to two storage units with 36.4 or 73.4-GB hard disk drives and an IBM Netfinity 3-Pack Ultra320 Hot-Swap Expansion Kit, or three storage units with no IBM Netfinity 3-Pack Ultra320 Hot-Swap Expansion Kit.

Key features:

- Allows connection of two storage units and an IBM Netfinity 3-Pack Ultra320 Hot-Swap Expansion Kit
- Contains 128 MB of battery backed up cache
- Controls up to 60 hard disk drives
- Controls up to eight logical drives
- Supports RAID levels 0, 1, 5, Enhanced-1 (1E), and Enhanced-5 (5E), 00, 10, 1E0, 50
- Supports a maximum SCSI transfer speed of 160-MBps

IBM ServeRAID-5i Ultra320 SCSI Controller (NAS 200 Model 25T only)

The IBM ServeRAID-5i Ultra320 SCSI Controller is an option available for the Model 25T. It can enable the attachment of a 5194-EXP storage unit or an IBM Netfinity 3-pack Ultra320 Hot-Swap Expansion Kit with either 36.4 or 73.4-GB hard disk drives.

Key features:

- Allows connection of 5194-EXP storage unit to the Model 25T or an IBM Netfinity 3-pack Ultra320 Hot-Swap Expansion Kit
- Contains 128 MB of battery backed up cache
- Controls up to 30 hard disk drives
- Controls up to eight logical drives
- Supports RAID levels 0, 1, 5, Enhanced-1 (1E), 00, 10, 1E0, 50

- Supports a maximum SCSI transfer speed of 320 MBps (currently, the 25T supports only 160 MBps)

NAS software

Each NAS appliance ships with preloaded software that is based on the Windows Powered OS operating system. The preloaded software includes these capabilities:

Microsoft® Windows 2000 for Network Attached Storage

Enables remote administration of the appliance using a Web-based graphical user interface (GUI).

Microsoft Windows Terminal Services

Enables remote administration of the appliance using its Windows desktop.

Microsoft Services for UNIX®

Provides file access to UNIX and UNIX based clients and servers using the Network File System (NFS) protocol.

IBM Director Agent and Universal Manageability Server Extensions

Provides system management support based on industry standards (in conjunction with the IBM Director console application as well as other management software).

IBM Advanced Appliance Configuration Utility agent

Supports management through the IBM Advanced Appliance Configuration Utility console application (supports aggregate Web-based management of all of your IBM appliances). This utility is not provided with the NAS 100.

ServeRAID Manager RAID Configuration and Monitoring

Provides configuration tools and RAID management of the ServeRAID-4x adapter.

Intel PROSet II

Provides diagnostics for the Intel Ethernet adapters.

Alacritech SLIC

Provides diagnostics for the Alacritech Quad-port Ethernet adapter.

Columbia Data Products Persistent Storage Manager (PSM)

Provides 250 persistent images of customer data and enables full online backup of system with Microsofts backup applications.

Tivoli® Storage Manager Client

Provides data backup and archive support (in conjunction with Tivoli Storage Manager Server).

Chapter 3. Site planning

This chapter contains information on site planning for the installation of the NAS 100, NAS 200 Model 25T and EXP, or NAS Gateway 300.

Whether you are installing preassembled racks or performing your own installation, you must keep in mind certain environmental factors. When you are planning your installation of the NAS 100, NAS 200, NAS EXP, or NAS Gateway 300, give careful consideration to the following environmental factors:

- Power requirements (See “Power requirements” for more information.)
- Uninterruptible power supply (UPS) (See “Uninterruptible power supply (UPS)” on page 16 for more information.)
- Weight (See “Weight” on page 17 for more information.)
- Site planning (See “Site planning” on page 17 for more information.)
- Floor planning (See “Floor planning” on page 18 for more information.)

Power requirements

This section describes these aspects of power for NAS appliances:

- Voltages
- Power plugs and power outlets
- Uninterruptible power supplies
- Thermal considerations

Table 8. Power required for setting up the appliance

	NAS 100	NAS 200	NAS Gateway 300 per engine	NAS 200 EXP
Voltage high range	200 - 240 V ac, 47 - 63 Hz	180 - 265 Vac, 57 - 63 Hz	280 - 265 V ac; 57 - 63 Hz	198 - 257 Vac, 50 - 60 Hz
Voltage low range	100 - 127V ac, 47 - 63 Hz	90 - 137 Vac, 47 - 53Hz	90 - 137 Vac, 47 - 53 Hz	90 - 127 Vac, 50 - 60 Hz
Power consumption	3 - 1.5 Amps	0.1 - 0.8 kVa	0.1 - 0.8 kVa	0.06 - 0.45 kVa

Important:

1. Before you install the appliance, you must make sure that its proposed location meets the power requirements. If necessary, consult an electrician to determine if your electrical infrastructure can support the NAS appliances that you are installing.
2. Consider security when planning your power requirements. (For example, your power mains should be kept in a secure area.) See “Security” on page 19 for more information.

Types of plugs

Figure 1 shows a NEMA L6-30P plug.

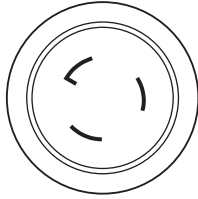


Figure 1. NEMA L6-30P plug

Figure 2 shows an IEC 309 2P+Gnd plug.

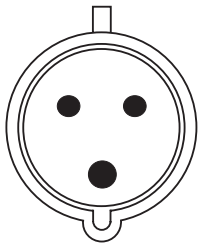


Figure 2. IEC 309 2P+Gnd 32A/220-240 V plug

Power outlets

This section describes the power outlets required for the NAS appliances. Table 9 outlines the number of outlets required for the NAS appliances.

Note: IBM recommends that any power cord used for redundant power (the second cord attached to an engine) be plugged in to an outlet on a different circuit and main. This increases the effectiveness of the redundancy because both plugs will not fail if the single circuit or main fails.

Table 9. Outlets required for setting up the appliance

Outlet type	NAS Gateway 300	NAS 200	NAS 200 EXP	NAS 100
High voltage	Four (2 different mains or circuits, if possible)	Two (2 different mains or circuits, if possible)	Two per storage unit (the storage units should be divided between two different mains or circuits, if possible)	One Main or circuit.

Uninterruptible power supply (UPS)

You might decide to purchase an uninterruptible power supply (UPS) for your appliance. A UPS will keep your appliance running for several minutes in case of a power outage. Use a 5000 VA (3750 Watt) UPS with a 208 V input and a 208 V output.

Thermal considerations

If you purchased a preassembled rack, the thermal concerns have already been addressed.

If you are assembling the appliance yourself, be aware of the following thermal considerations:

- If you are planning to install an Ethernet switch, the air flow must be from back to front or from side to side. If you are planning to install a component with a side-to-side airflow, the heat dissipation of that unit must not exceed 75 Watts.
- Be aware that installing a component so that it intakes warm air may cause it to overheat.
- Avoid installing a UPS inside the same rack. The heat generated could cause a controlled thermal shutdown of the engines. Place any UPS outside and away from the rack that contains the engines.

Weight

Table 10 specifies the weights of the NAS 100, NAS 200, and NAS Gateway 300. You must ensure that your facility meets the proper floor-load requirements when you are planning an installation. See “Floor-loading specifications” on page 18 for more information.

Table 10. Weight of the appliances

	NAS 100	NAS 200	NAS Gateway 300	NAS 200 EXP
Maximum configuration (approximate)	9.3 kg (20.5 lb)	45.8 kg (101 lb)	91.6 kg (202 lb)	36.1 kg (79.4 lb)
Minimum configuration (approximate)		33.5 kg (74 lb)	67 kg (148 lb)	27.5 kg (60.5 lb)

Site planning

You must ensure that the location in which you want to install equipment has correct clearances and adequate space available around the equipment to permit easy access to the equipment and for cooling purposes. Site planning involves planning the space requirements.

Before you order the NAS 100, NAS 200, NAS Gateway 300, or NAS 200 EXP be sure that you:

- Understand the appliance specifications and requirements
- Know the service and operating clearance specifications
- Prepare a layout for the appliance or group of appliances
- Prepare the floor plan (see “Floor planning” on page 18)

Note: See “Temperature” on page 19 for information on the ambient temperature of the room containing your NAS 100, NAS 200, NAS Gateway 300, or NAS 200 EXP.

Site planning includes determining these requirements:

- Security required
- Floor area required by the equipment
- Floor-loading capacity

- Space for future expansion
- Location of columns or other unmovable building structures
- Power and environmental requirements

Remember to provide space for storage cabinets, desks, communication facilities, daily storage of tapes, and other supplies.

The appliances require operational clearances to ensure correct ventilation and access to open the front and rear doors of the rack. An extended service clearance also provides easier access so that you can install and service optional devices.

Floor-loading specifications

It is important to ensure that the total weight of installed racks and equipment does not exceed the maximum amount of weight that the floor in your facilities will support. Consult with an engineer to determine your floor-loading specifications. See “Weight” on page 17 for information on appliance and component weights. See the *IBM TotalStorage Enterprise Storage Server Introduction and Planning Guide 2105 Models E10, E20, F10 and F20* for floor-loading specifications.

Floor planning

It is important to create a floor plan before installing a NAS 100, a NAS 200, a NAS Gateway 300, or NAS 200 EXP. This section discusses floor planning considerations and how to create a floor plan. It also discusses security measures to keep in mind when doing your floor planning.

Floor plan considerations

Before you create your floor plan, consider these variables:

- Flow of work and personnel within the area.
- If the placement will be on a raised floor, decide between these choices:
 - Position the appliance over a cutout in the floor
 - Leave the bottom of the appliance open to enhance cooling
- If the placement will not be on a raised floor, decide how to include cable guards or other items to protect equipment and personnel.
- Maximum cable lengths.
- Location of any planned safety equipment.
- Future expansion.

Creating a floor plan

Note: You might need to prepare and analyze several plans before choosing a final one. If you install more than one appliance in more than one installation stage, prepare a separate plan for each installation stage.

Begin with an accurate drawing of the installation area (blueprints and floor plans are appropriate). Include the following items in your floor plan:

- Service and operational clearances.
- If the appliance will be on a raised floor, consider any objects that might obstruct cable routing and the height of the raised floor.
- If the appliance will not be on a raised floor, consider these factors:
 - The placement of cables to minimize obstruction

- The amount of additional cable required if the cable is indirectly routed between appliances (for example, along the walls or suspended from the ceiling)
- Location of:
 - Power receptacles
 - Air conditioning equipment and controls
 - File cabinets, desks, and other office equipment
 - Room emergency power-off controls
 - All entrances, exits, windows, columns, and pillars
- LAN and telephone connections.

When you finish the floor plan, review it to make sure all cables to be connected to the appliances are long enough. Also ensure that the appliances have enough clearance.

Security

In forming your floor plan, you should consider ways to keep your appliance secure. For security purposes, use these precautions:

- Choose a trusted administrator.
- Place any equipment that may disrupt operations (for example, power supplies) in a secure location.
- Keep rack cabinet keys in a secure location.

Batteries

Each engine contains a 3-volt lithium manganese dioxide battery. It maintains power to the real-time clock circuitry and configuration memory when ac power is gone. You must dispose of the batteries properly.

ServeRAID adapters also contain a battery that must be disposed of properly.

Temperature

Table 11 shows the correct ambient temperature ranges for the NAS appliances.

Table 11. Temperature operating environment

Elevation	Ambient temperature
0 - 914 m (0 - 3000 ft)	<ul style="list-style-type: none"> • NAS 100, Power On: 16° to 32° C (60.8° to 89.6° F) • NAS 200, NAS Gateway 300 and NAS EXP, Power On: 10° to 35° C (50° to 95° F) • Power Off: 10° to 43° C (50° to 109.4° F)
914 - 2133 m (3000 - 7000 ft)	<ul style="list-style-type: none"> • NAS 100, Power On: 16° to 32° C (60.8° to 89.6° F) • NAS 200, NAS Gateway 300, and NAS EXP Power On: 10° to 32° C (50° to 89.6° F) • Power Off: 10° to 43° C (50° to 109.4° F)

Humidity

The NAS appliances must operate in 8% - 80% (noncondensing) relative humidity.

Heat output

Table 12 describes the heat output in British thermal units (Btu) per hour.

Table 12. Heat output

	NAS Gateway 300 per engine	NAS 200	NAS 100
Minimum configuration	minimum 341 Btu (100 W)	341 BTU (100 W)	552.13 Btu (162 W)
Maximum configuration	2600 Btu (760 W)	2600 BTU (760 W)	553.13 Btu (162 W)

Dimensions

Table 13 describes the physical dimensions of the appliances.

Table 13. Physical dimensions of the appliances

	NAS 100	NAS 200 Model 25T	NAS 200 Model 25T with tower to rack conversion kit	NAS Gateway 300 per engine	NAS 200 EXP
Width	425 mm (16.73 in.)	221 mm (8.7 in.)	440 mm (17.3 in.)	440 mm (17.3 in.)	447 mm (17.6 in.)
Depth	468 mm (18.42 in.)	700 mm (27.5 in.)	216 mm (8.5 in.)	674 mm (26.5 in.)	538 mm (21.2 in.)
Height	42 mm (1.65 in.)	440 mm (17.3 in.)	674 mm (27.5 in.)	216 mm (8.5 in.)	128 mm (5 in.)

Chapter 4. Configuration

This chapter describes the configuration that must be defined to enable network communication for a NAS 100, NAS 200, or a NAS Gateway 300.

NAS 100 Configuration

This section provides worksheets for recording configuration information for 5190 NAS 100 Model R12.

The following worksheet is provided to help plan for the NAS 100 network configuration.

Machine Name: _____
 Serial Number: 5190 Model R12- _____

- Record the number of disk drives and the total GB of storage.

Table 14. Model R12 disks

Number of disk drives (4)	Size 120 GB	Total GB

- Is the optional PCI adapter for tape backup installed? _____
- For each Ethernet port record the applicable IP address information.

Table 15. NAS 100 Ethernet network adapter worksheet

LAN	Adapter IP address	Gateway IP address	DNS IP address	WINS IP address
1				
2				

- Appliance Administrator account and password with administrator privileges in the domain. Administrator ID: _____ Password: _____
- Which of the following clients do you want to have share the data partition?
 - Windows 2000 - _____
 - Windows NT 4.0 - _____
 - AIX - _____
 - HP-UX - _____
 - Sun Solaris - _____
 - Other - _____

- Complete the data partition sharing table (sample below).

Table 16. NAS 100 Data partition sharing

Computer/client name	Share folder name	Folder size

Table 16. NAS 100 Data partition sharing (continued)

For Alert Standard Format support, record the following information:

ASF Enabled LAN port (1 or 2) _____
Enable all PETS (Yes or No) _____
TCP/IP Management Console IP Address _____
Gateway IP Address _____
Subnet Mask _____
Enable heartbeat (yes or no) _____
Heartbeat Frequency (in seconds) _____

NAS 200 Configuration

This section provides worksheets for recording configuration information for 5194 NAS 200 Model 25T.

5194 NAS 200 Model 25T

The following worksheet is provided to help plan for the NAS 200 network configuration.

Machine Name: _____
 Serial Number: 5194 Model 25T - _____
 Serial Number: 5194 Model EXP - _____
 Serial Number: 5194 Model EXP - _____
 Serial Number: 5194 Model EXP - _____

- Record the number of disk drives and the total GB of storage.

Table 17. Model 25T disks

Number of disk drives (3 to 6)	Size (36.4 GB or 73.4GB)	Total GB

Table 18. Netfinity 3-Pack Expansion Kit

Number of disk drives (3)	Size (36.4 GB or 73.4GB)	Total GB

Table 19. Model EXP disks

Number of disk drives (3 to 14)	Size (36.4 GB or 73.4GB)	Total GB

- Up to 6 optional adapters can be installed. How many optional adapters do you plan to install ? _____
- Depending on the number of optional adapters, refer to one of the tables in "NAS 200 adapter placement" on page 31 to determine the location of each network adapter:
- For each adapter, record the type of adapter and the applicable IP address information. For the Alacritech 100x4 Quad-Port Server Accelerated Adapter you will need to record information for each Ethernet subnet.

Table 20. Model 25T network adapter worksheet

Slot	Adapter IP address	Gateway IP address	DNS IP address	WINS IP address
1				
2				
3				
4				
5				
6				

- Appliance Administrator account and password with administrator privileges in the domain. Administrator ID: _____ Password: _____
- Which of the following clients do you want to have share the data partition?

Windows 2000 - _____
 Windows NT 4.0 - _____
 AIX - _____
 HP-UX - _____
 Sun Solaris - _____
 Other - _____

7. Complete the data partition sharing table (sample below).

Table 21. Model 25T Data partition sharing

Computer/client name	Share folder name	Folder size

NAS Gateway 300 Configuration

The following worksheet is provided to help plan for the NAS Gateway 300 configuration.

Machine Name Node 1: _____
 Machine Information Node 1: 5196 Model G27 - _____

Machine Name Node 2: _____
 Machine Information Node 2: 5196 Model G27 - _____

1. How many network adapters do you plan to install in each engine? _____
 These notes apply to the mix and number of optional adapters per engine that can be installed in a NAS Gateway 300:
 - a. Slot 1 is reserved for the Remote Supervisor Adapter.
 - b. The maximum number of the combination of Ethernet adapters cannot exceed four.
 - c. A minimum of one optional Fibre Channel adapter installed per engine for connection to the SAN is required, either a 1-port or 2-port adapter.
 - d. The maximum number of adapters per engine is six.
 - e. The maximum number of Fibre Channel adapters used for attachment of a tape backup device is one.
2. Be certain to follow the rules described in “NAS Gateway 300 PCI Adapter Placement” on page 38 to determine the location of each network adapter. If the adapter are not installed in the correct sequence, thermal cooling failures can occur.
3. For each adapter, record the type of adapter and the applicable IP address information. For the Alacritech 100x4 Quad-Port Server Accelerated Adapter you will need to record information for each Ethernet subnet.

Table 22. Network adapters for engine 1 (node 1)

	FC/PCI slot	Adapter type	IP Address	Gateway	DNS	WINS
1	PCI 1					
2	PCI 2					
3	PCI 3					
4	PCI 4					
5	FC (SAN)	FC	N/A	N/A	N/A	N/A
6	PCI 6					

Table 23. Network adapters for engine 2 (node 2)

	FC/PCI slot	Adapter type	IP Address	Gateway	DNS	WINS
1	PCI 1					
2	PCI 2					
3	PCI 3					
4	PCI 4					
5	FC (SAN)	FC	N/A	N/A	N/A	N/A
6	PCI 6					

4. NAS Gateway 300 Appliance Administrator account and password with administrator privileges in the domain.

Administrator ID: _____ Password: _____

5. Which of the following clients do you want to share the data partition (one Windows client or one UNIX client may be configured)?

Windows 2000 - _____
Windows NT 4.0 - _____
AIX - _____
HP-UX - _____
Sun Solaris - _____
Other - _____

6. Create and complete the data partition sharing table.

Table 24. NAS Gateway 300 data partition sharing

Computer name	Share folder name	Folder size

7. Create and complete the networking information worksheet. See “Cluster setup requirements” on page 29 for additional information.

Table 25. Networking information worksheet for the public connection

Cluster component	Information needed
Cluster	Cluster name: IP address: Subnet:

Table 25. Networking information worksheet for the public connection (continued)

Cluster component	Information needed
First node	<p>Computer name (example: IBM 5196–23H1234):</p> <p>IP address:</p> <p>Subnet:</p> <p>Gateway:</p> <p>Preferred DNS:</p> <p>WINS server (optional):</p>
Joining node	<p>Computer name:</p> <p>IP address:</p> <p>Subnet:</p> <p>Gateway:</p> <p>Preferred DNS:</p> <p>WINS server (optional):</p>
Domain to join	<p>Domain name:</p>
Fibre Channel hub, switch, or controller	<p>Model:</p> <p>Type:</p> <p>Point of attachment:</p>

List tape devices to be used for backup: _____

Is switch zoning in use? _____

- Hard or soft? _____
- What ports are a zone? _____

Is LUN masking used on SAN storage device? _____

- What partitions are available? _____

Is SANergy™ in use? _____

List information on the cluster group.

Table 26. Cluster group information

Cluster name	
Cluster IP address	
Quorum disk	
Preferred owner quorum disk	
Failover and failback options	

What backup tools are in use?

Cluster setup requirements

Before you configure NAS appliance nodes for clustering, ensure that the following requirements are met:

Network requirements

- A unique NetBIOS cluster name is defined.
- At least three unique, static IP addresses for the public network are defined: one for each node (engine) (for client access through the PCI NIC adapter) and one for the cluster itself (the administration IP address)
- Two static IP addresses for the cluster interconnect on a private network or crossover, through the integrated Ethernet adapter. The default IP addresses for the private network adapters are 10.1.1.1 for the first node in the cluster and 10.1.1.2 for the node that joins the cluster.

Notes:

1. One additional static IP address is required to create each clustered group.
2. Each node (engine) in a cluster must join the same domain and be able to access the primary domain controller (PDC) and DNS server, but it is not required that the nodes log into the domain.
3. Each node in the cluster must have at least two network adapters: one for the public network and the other for the private interconnect.

Shared disk requirements

- All shared disk arrays and devices, including the quorum disk, must be physically attached to a shared storage bus.
- All shared disks must be configured as basic (not dynamic) disks.
- All shared disks must have the same drive letter on each node.
- All partitions on these disks must be formatted with NTFS.
- All partitions on these disks must also be Primary Partitions.
- Compression must not be enabled.

Chapter 5. Optional Adapters

This chapter provides tables that show the locations of optional adapters that can be installed in a NAS 200, and NAS Gateway 300 appliance. The location of a particular adapter depends on these factors:

- The specific NAS model
- The type of adapter
- The number of adapters

The NAS 100 has one 64-bit, 33MHz, PCI slot for an optional adapter. The IBM SCSI Adapter (part number 55P4040) can be installed in this slot.

NAS 200 adapter placement

Note: You can install up to two of any type of network adapter up to a combined total of four network adapters.

Adapter placement rules

Adapter placement rules guide which adapter to install in a PCI slot. These rules consist of *priority* and *slot location*. Priority is the sequence in which you install the adapters. Determining the slot location requires eliminating already filled slots and placing the adapter into the first available slot according to its possible Slot locations. The priority and slot locations are shown in Table 27 on page 32. To determine the location of the slots:

1. Arrange the adapters in order, one having the highest priority, using the Priority column in Table 27 on page 32.
2. Place the highest priority adapter into the first available slot location listed in the slot location column of Table 27 on page 32.
3. Repeat step 2 until all adapters are installed.

Example 1: If you are installing a single IBM Gigabit Ethernet SX Server Adapter in a NAS 200, that adapter should be installed in slot 2.

Example 2: If you are installing five adapters—one IBM ServeRAID-4Mx Ultra160 SCSI Controller, two IBM Gigabit Ethernet SX Server Adapters, one IBM PCI Ultra160 SCSI adapter (LVD/SE), and one Alacritech 100x4 Quad-Port Server Accelerated Adapter— they should be installed in the following slots:

- Slot 1 — Empty
- Slot 2 — IBM Gigabit Ethernet SX Server Adapter
- Slot 3 — IBM Gigabit Ethernet SX Server Adapter
- Slot 4 — IBM ServeRAID-4Mx Ultra160 SCSI Controller
- Slot 5 — IBM PCI Ultra160 SCSI adapter (LVD/SE)
- Slot 6 — Alacritech 100x4 Quad-Port Server Accelerated Adapter

Table 27. Adapter installation rules for the NAS 200

Priority	Adapter	Slot location	Maximum quantity
1	IBM ServeRAID-5i Ultra320 SCSI Controller	4	1
2	IBM ServeRAID-4H Ultra160 SCSI Controller	4	1
3	IBM ServeRAID-4Mx Ultra160 SCSI Controller	4, 3	2
4	Remote Supervisor Adapter	1	1
5	Qlogic 2340 1-port Fibre Channel adapter	5	1
6	IBM PCI Ultra160 SCSI adapter (LVD/SE)	5	1
7	Alacritech 1000x1 Single-Port Server and Storage Accelerated Adapter	2, 3, 6, 5	2
8	IBM Gigabit Ethernet SX Server Adapter	2, 3, 6, 5	2
9	PRO/1000 XT Server Adapter by Intel	2, 3, 6, 5	2
10	Alacritech 100x4 Quad-Port Server Accelerated Adapter	2, 3, 6, 5	2

There is also a complete list of adapter combinations and placement locations in the following charts.

Adapter placement charts

These sections explain where to install the PCI adapters according to your configuration.

The following abbreviations for adapter names are used in the tables:

Tape	Either an IBM PCI Ultra160 SCSI adapter (LVD/SE) or a Qlogic 2340 1-port Fibre Channel adapter used for tape backup.
RSA	Remote Supervisor Adapter
EN4	Alacritech 100x4 Quad-Port Server Accelerated Adapter
S5i	IBM ServeRAID-5i Ultra320 SCSI Controller
S4H	IBM ServeRAID-4H Ultra160 SCSI Controller
S4M	IBM ServeRAID-4Mx Ultra160 SCSI Controller
SR1	Either a ServeRAID-4H, a ServeRAID-4Mx, or a ServeRAID-5i. SR2 denotes either a ServeRAID-4Mx or a ServeRAID-5i, but not a ServeRAID-4H controller. See 2.
SR2	Either a ServeRAID-4Mx or a ServeRAID-5i, but not a ServeRAID-4H controller. See 2.
GB	IBM Gigabit Ethernet SX Server Adapter
CEN	PRO/1000 XT Server Adapter by Intel
CENA	Alacritech 1000x1 Single-Port Server and Storage Accelerated Adapter

Notes:

1. The IBM ServeRAID-5i Ultra320 SCSI Controller is only available when it is ordered and installed in the engine from the factory.
2. An engine can be ordered with a single ServeRAID adapter (5i, 4Mx, or 4H) or two ServeRAID adapters (in which case, one must be a 4Mx and the other either a second 4Mx or a 5i). If a IBM ServeRAID-4H Ultra160 SCSI Controller adapter is installed, it must be the only ServeRAID adapter installed. In the placement charts, SR2 denotes either a 4Mx or a 5i, but not a 4H adapter. Similarly, SR1 denotes either a 4H, a 4Mx or a 5i.
3. The Remote Supervisor Adapter is the only adapter that is supported in slot 1. For this reason, the Remote Supervisor Adapter can be added to any of the combinations in the placement charts that do not already list a Remote Supervisor Adapter .
4. An engine can be ordered with a maximum of one adapter for tape backup (either a Qlogic 2340 1-port Fibre Channel adapter or a IBM PCI Ultra160 SCSI adapter (LVD/SE)). In the placement charts, *Tape* refers to the tape backup adapter. If there is a tape backup adapter, it is always installed in slot 5.
5. The maximum number of Ethernet adapters in each engine is four.
6. Each engine must be ordered with at least one of the following ServeRAID controllers:
 - IBM ServeRAID-5i Ultra320 SCSI Controller
 - IBM ServeRAID-4Mx Ultra160 SCSI Controller
 - IBM ServeRAID-4H Ultra160 SCSI Controller

Each engine can also support two ServeRAID controllers in these combinations:

- 1 IBM ServeRAID-5i Ultra320 SCSI Controller and 1 IBM ServeRAID-4Mx Ultra160 SCSI Controller

- 2 IBM ServeRAID-4Mx Ultra160 SCSI Controller

No options

Table 28 shows the placement of a single ServeRAID adapter with no additional options. Table 29 shows the placement of dual ServeRAID adapters with no additional options.

Table 28. Single ServeRAID adapter Options (SR1) — No options

Configuration	PCI Slot-1 (32-bit)	PCI Slot-2 (64-bit)	PCI Slot-3 (64-bit)	PCI Slot-4 (64-bit)	PCI Slot-5 (64-bit)	PCI Slot-6 (64-bit)
				S5i		
				S4H		
				S4M		

Table 29. Dual ServeRAID adapter Options (SR2) — No options

Configuration	PCI Slot-1 (32-bit)	PCI Slot-2 (64-bit)	PCI Slot-3 (64-bit)	PCI Slot-4 (64-bit)	PCI Slot-5 (64-bit)	PCI Slot-6 (64-bit)
			S4M	S5i		
			S4M	S4M		

RSA only options

Table 30 shows the adapter placement of a SAN connection with only an RSA option.

Table 30. NAS 200 with SAN: RSA only options

Configuration	PCI Slot-1 (32-bit)	PCI Slot-2 (64-bit)	PCI Slot-3 (64-bit)	PCI Slot-4 (64-bit)	PCI Slot-5 (64-bit)	PCI Slot-6 (64-bit)
RSA	RSA			SR1		
RSA	RSA		S4M	SR2		

Tape only options

Table 31 shows the adapter placement of a SAN connection with only a tape backup option.

Table 31. NAS 200 with SAN: Tape only options

Configuration	PCI Slot-1 (32-bit)	PCI Slot-2 (64-bit)	PCI Slot-3 (64-bit)	PCI Slot-4 (64-bit)	PCI Slot-5 (64-bit)	PCI Slot-6 (64-bit)
LVD	RSA			SR1	LVD	
LVD	RSA		S4M	SR2	LVD	
FC	RSA			SR1	FC	
FC	RSA		S4M	SR2	FC	

Network only options

These tables show the adapter placement of a SAN connection with only network connection options.

- Table 32 on page 35 shows placement of single ServeRAID adapters with network options
- Table 33 on page 36 shows placement of dual ServeRAID adapters with network options

Table 32. Single ServeRAID adapters with network options

Configuration	PCI Slot-1 (32-bit)	PCI Slot-2 (64-bit)	PCI Slot-3 (64-bit)	PCI Slot-4 (64-bit)	PCI Slot-5 (64-bit)	PCI Slot-6 (64-bit)
CENA	RSA	CENA		SR1		
GB	RSA	GB		SR1		
CEN	RSA	CEN		SR1		
EN4	RSA	EN4		SR1		
CENA, CENA	RSA	CENA	CENA	SR1		
CENA, GB	RSA	CENA	GB	SR1		
GB, GB	RSA	GB	GB	SR1		
CEN, CEN	RSA	CEN	CEN	SR1		
CEN, CENA	RSA	CENA	CEN	SR1		
CEN, GB	RSA	GB	CEN	SR1		
EN4, EN4	RSA	EN4	EN4	SR1		
EN4, CEN	RSA	CEN	EN4	SR1		
EN4, CENA	RSA	CENA	EN4	SR1		
EN4, GB	RSA	GB	EN4	SR1		
EN4, EN4, CEN	RSA	CEN	EN4	SR1		EN4
EN4, EN4, CENA	RSA	CENA	EN4	SR1		EN4
EN4, EN4, GB	RSA	GB	EN4	SR1		EN4
EN4, CEN, CEN	RSA	CEN	CEN	SR1		EN4
EN4, CEN, CENA	RSA	CENA	CEN	SR1		EN4
EN4, CEN, GB	RSA	GB	CEN	SR1		EN4
EN4, CENA, CENA	RSA	CENA	CENA	SR1		EN4
EN4, CENA, GB	RSA	CENA	GB	SR1		EN4
EN4, GB, GB	RSA	GB	GB	SR1		EN4
CEN, CEN, CENA	RSA	CENA	CEN	SR1		CEN
CEN, CEN, GB	RSA	GB	CEN	SR1		CEN
CEN, CENA, CENA	RSA	CENA	CENA	SR1		CEN
CEN, CENA, GB	RSA	CENA	GB	SR1		CEN
CEN, GB, GB	RSA	GB	GB	SR1		CEN
CENA, CENA, GB	RSA	CENA	CENA	SR1		GB
CENA, GB, GB	RSA	CENA	GB	SR1		GB
EN4, EN4, CEN, CENA	RSA	CENA	CEN	SR1	EN4	EN4
EN4, EN4, CEN, GB	RSA	GB	CEN	SR1	EN4	EN4
EN4, EN4, CEN, CEN	RSA	CEN	CEN	SR1	EN4	EN4
EN4, EN4, CENA, CENA	RSA	CENA	CENA	SR1	EN4	EN4
EN4, EN4, CENA, GB	RSA	CENA	GB	SR1	EN4	EN4
EN4, EN4, GB, GB	RSA	GB	GB	SR1	EN4	EN4
EN4, CEN, CEN, CENA	RSA	CENA	CEN	SR1	EN4	CEN
EN4, CEN, CEN, GB	RSA	GB	CEN	SR1	EN4	CEN
EN4, CEN, CENA, CENA	RSA	CENA	CENA	SR1	EN4	CEN

Table 32. Single ServeRAID adapters with network options (continued)

Configuration	PCI Slot-1 (32-bit)	PCI Slot-2 (64-bit)	PCI Slot-3 (64-bit)	PCI Slot-4 (64-bit)	PCI Slot-5 (64-bit)	PCI Slot-6 (64-bit)
EN4, CEN, CENA, GB	RSA	CENA	GB	SR1	EN4	CEN
EN4, CEN, GB, GB	RSA	GB	GB	SR1	EN4	CEN
EN4, CENA, CENA, GB	RSA	CENA	CENA	SR1	EN4	GB
EN4, CENA, GB, GB	RSA	CENA	GB	SR1	EN4	GB
CEN, CEN, CENA, CENA	RSA	CENA	CENA	SR1	CEN	CEN
CEN, CEN, CENA, GB	RSA	CENA	GB	SR1	CEN	CEN
CEN, CEN, GB, GB	RSA	GB	GB	SR1	CEN	CEN
CEN, CENA, CENA, GB	RSA	CENA	CENA	SR1	CEN	GB
CEN, CENA, GB, GB	RSA	CENA	GB	SR1	CEN	GB
CENA, CENA, GB, GB	RSA	CENA	CENA	SR1	GB	GB

Table 33. Dual ServeRAID adapters with network options

Configuration	PCI Slot-1 (32-bit)	PCI Slot-2 (64-bit)	PCI Slot-3 (64-bit)	PCI Slot-4 (64-bit)	PCI Slot-5 (64-bit)	PCI Slot-6 (64-bit)
CENA	RSA	CENA	S4M	SR2		
GB	RSA	GB	S4M	SR2		
CEN	RSA	CEN	S4M	SR2		
EN4	RSA	EN4	S4M	SR2		
CENA, CENA	RSA	CENA	S4M	SR2		CENA
CENA, GB	RSA	CENA	S4M	SR2		GB
GB, GB	RSA	GB	S4M	SR2		GB
CEN, CEN	RSA	CEN	S4M	SR2		CEN
CEN, CENA	RSA	CENA	S4M	SR2		CEN
CEN, GB	RSA	GB	S4M	SR2		CEN
EN4, EN4	RSA	EN4	S4M	SR2		EN4
EN4, CEN	RSA	CEN	S4M	SR2		EN4
EN4, CENA	RSA	CENA	S4M	SR2		EN4
EN4, GB	RSA	GB	S4M	SR2		EN4
EN4, EN4, CEN	RSA	CEN	S4M	SR2	EN4	EN4
EN4, EN4, CENA	RSA	CENA	S4M	SR2	EN4	EN4
EN4, EN4, GB	RSA	GB	S4M	SR2	EN4	EN4
EN4, CEN, CEN	RSA	CEN	S4M	SR2	EN4	CEN
EN4, CEN, CENA	RSA	CENA	S4M	SR2	EN4	CEN
EN4, CEN, GB	RSA	GB	S4M	SR2	EN4	CEN
EN4, CENA, CENA	RSA	CENA	S4M	SR2	EN4	CENA
EN4, CENA, GB	RSA	CENA	S4M	SR2	EN4	GB
EN4, GB, GB	RSA	GB	S4M	SR2	EN4	GB
CEN, CEN, CENA	RSA	CENA	S4M	SR2	CEN	CEN
CEN, CEN, GB	RSA	GB	S4M	SR2	CEN	CEN
CEN, CENA, CENA	RSA	CENA	S4M	SR2	CEN	CENA

Table 33. Dual ServeRAID adapters with network options (continued)

Configuration	PCI Slot-1 (32-bit)	PCI Slot-2 (64-bit)	PCI Slot-3 (64-bit)	PCI Slot-4 (64-bit)	PCI Slot-5 (64-bit)	PCI Slot-6 (64-bit)
CEN, CENA, GB	RSA	CENA	S4M	SR2	CEN	GB
CEN, GB, GB	RSA	GB	S4M	SR2	CEN	GB
CENA, CENA, GB	RSA	CENA	S4M	SR2	GB	CENA
CENA, GB, GB	RSA	CENA	S4M	SR2	GB	GB

Tape and network options

These tables show the adapter placement of a SAN connection with tape and network connection options.

- Table 34 shows placement of single ServeRAID adapters with tape and network options
- Table 35 on page 38 shows placement of dual ServeRAID adapters with tape and network options

Table 34. Single ServeRAID adapters with tape and network options

Configuration	PCI Slot-1 (32-bit)	PCI Slot-2 (64-bit)	PCI Slot-3 (64-bit)	PCI Slot-4 (64-bit)	PCI Slot-5 (64-bit)	PCI Slot-6 (64-bit)
Tape, CENA	RSA	CENA		SR1	Tape	
Tape, GB	RSA			SR1	Tape	
Tape, CEN	RSA	CEN		SR1	Tape	
Tape, EN4	RSA	EN4		SR1	Tape	
Tape, CENA, CENA	RSA	CENA	CENA	SR1	Tape	
Tape, CENA, GB	RSA	CENA	GB	SR1	Tape	
Tape, GB, GB	RSA	GB	GB	SR1	Tape	
Tape, CEN, CEN	RSA	CEN	CEN	SR1	Tape	
Tape, CEN, CENA	RSA	CENA	CEN	SR1	Tape	
Tape, CEN, GB	RSA	GB	CEN	SR1	Tape	
Tape, EN4, EN4	RSA	EN4	EN4	SR1	Tape	
Tape, EN4, CEN	RSA	CEN	EN4	SR1	Tape	
Tape, EN4, CENA	RSA	CENA	EN4	SR1	Tape	
Tape, EN4, GB	RSA	GB	EN4	SR1	Tape	
Tape, EN4, EN4, CEN	RSA	CEN	EN4	SR1	Tape	EN4
Tape, EN4, EN4, CENA	RSA	CENA	EN4	SR1	Tape	EN4
Tape, EN4, EN4, GB	RSA	GB	EN4	SR1	Tape	EN4
Tape, EN4, CEN, CEN	RSA	CEN	CEN	SR1	Tape	EN4
Tape, EN4, CEN, CENA	RSA	CENA	CEN	SR1	Tape	EN4
Tape, EN4, CEN, GB	RSA	GB	CEN	SR1	Tape	EN4
Tape, EN4, CENA, CENA	RSA	CENA	CENA	SR1	Tape	EN4
Tape, EN4, CENA, GB	RSA	CENA	GB	SR1	Tape	EN4
Tape, EN4, GB, GB	RSA	GB	GB	SR1	Tape	EN4
Tape, CEN, CEN, CENA	RSA	CENA	CEN	SR1	Tape	CEN
Tape, CEN, CEN, GB	RSA	GB	CEN	SR1	Tape	CEN

Table 34. Single ServeRAID adapters with tape and network options (continued)

Configuration	PCI Slot-1 (32-bit)	PCI Slot-2 (64-bit)	PCI Slot-3 (64-bit)	PCI Slot-4 (64-bit)	PCI Slot-5 (64-bit)	PCI Slot-6 (64-bit)
Tape, CEN, CENA, CENA	RSA	CENA	CENA	SR1	Tape	CEN
Tape, CEN, CENA, GB	RSA	CENA	GB	SR1	Tape	CEN
Tape, CEN, GB, GB	RSA	GB	GB	SR1	Tape	CEN
Tape, CENA, CENA, GB	RSA	CENA	CENA	SR1	Tape	GB
Tape, CENA, GB, GB	RSA	CENA	GB	SR1	Tape	GB

Table 35. Dual ServeRAID adapters with tape and network options

Configuration	PCI Slot-1 (32-bit)	PCI Slot-2 (64-bit)	PCI Slot-3 (64-bit)	PCI Slot-4 (64-bit)	PCI Slot-5 (64-bit)	PCI Slot-6 (64-bit)
Tape, CENA	RSA	CENA	S4M	SR2	Tape	
Tape, GB	RSA	GB	S4M	SR2	Tape	
Tape, CEN	RSA	CEN	S4M	SR2	Tape	
Tape, EN4	RSA	EN4	S4M	SR2	Tape	
Tape, CENA, CENA	RSA	CENA	S4M	SR2	Tape	CENA
Tape, CENA, GB	RSA	CENA	S4M	SR2	Tape	GB
Tape, GB, GB	RSA	GB	S4M	SR2	Tape	GB
Tape, CEN, CEN	RSA	CEN	S4M	SR2	Tape	CEN
Tape, CEN, CENA	RSA	CENA	S4M	SR2	Tape	CEN
Tape, CEN, GB	RSA	GB	S4M	SR2	Tape	CEN
Tape, EN4, EN4	RSA	EN4	S4M	SR2	Tape	EN4
Tape, EN4, CEN	RSA	CEN	S4M	SR2	Tape	EN4
Tape, EN4, CENA	RSA	CENA	S4M	SR2	Tape	EN4
Tape, EN4, GB	RSA	GB	S4M	SR2	Tape	EN4

NAS Gateway 300 PCI Adapter Placement

These sections explain how to determine the correct positions for PCI adapters.

Adapter placement rules

Adapter placement rules guide which adapter to install in a PCI slot. These rules consist of *priority* and *slot location*. Priority is the sequence in which you install the adapters. Determining the slot location requires eliminating already filled slots and placing the adapter into the first available slot according to its possible slot locations. The priority and slot locations are shown in Table 36 on page 40. To determine the location of the slots:

1. Arrange the adapters in order, one having the highest priority, using the Priority column in Table 36 on page 40.
2. Place the highest priority adapter into the first available slot location listed in the slot location column of Table 36 on page 40.
3. Repeat step 2 on page 31 until all adapters are installed.

Example 1: If you are installing a single IBM Gigabit Ethernet SX Server Adapter, that adapter should be installed in slot 2.

Example 2: If you are installing five adapters—one Qlogic 2340 1-port Fibre Channel adapter, two IBM Gigabit Ethernet SX Server Adapters, one IBM PCI Ultra160 SCSI adapter (LVD/SE), and one Alacritech 100x4 Quad-Port Server Accelerated Adapter— they should be installed in the following slots:

- Slot 1 — Empty
- Slot 2 — IBM Gigabit Ethernet SX Server Adapter
- Slot 3 — IBM Gigabit Ethernet SX Server Adapter
- Slot 4 — Alacritech 100x4 Quad-Port Server Accelerated Adapter
- Slot 5 — IBM PCI Ultra160 SCSI adapter (LVD/SE)
- Slot 6 — Qlogic 2340 1-port Fibre Channel adapter

Table 36. Adapter installation rules

Priority	Adapter	Slot location	Maximum quantity
1	Qlogic 2342 2-port Fibre Channel adapter	6	1
2	Qlogic 2340 1-port Fibre Channel adapter	6, 5	2
3	Remote Supervisor Adapter	1	1
4	IBM PCI Ultra160 SCSI adapter (LVD/SE)	5	1
5	Alacritech 1000x1 Single-Port Server and Storage Accelerated Adapter	2, 3, 4 5	2
6	IBM Gigabit Ethernet SX Server Adapter	2, 3, 4, 5	2
7	PRO/1000 XT Server Adapter by Intel	2, 3, 4, 5	2
8	Alacritech 100x4 Quad-Port Server Accelerated Adapter	2, 3, 4, 5	2

The following tables show you where to install the PCI adapters.

Notes:

1. In the following charts, FC in slot 6 denotes a the SAN adapter, which must be either Qlogic 2342 2-port Fibre Channel adapter or Qlogic 2340 1-port Fibre Channel adapter. The SAN adapter is always in slot 6.
2. The Remote Supervisor Adapter is the only adapter that is supported in slot 1. For this reason, the Remote Supervisor Adapter can be added to any of the combinations in these charts that do not already list a Remote Supervisor Adapter .
3. An engine can be ordered with a maximum of one adapter for tape backup (either a Qlogic 2340 1-port Fibre Channel adapter or a IBM PCI Ultra160 SCSI adapter (LVD/SE)). In these charts, *Tape* refers to the tape backup adapter. If there is a tape backup adapter, it is always installed in slot 5.
4. The minimum number of Ethernet adapters in each engine is one, while the maximum number of Ethernet adapters in each engine is four.
5. The on-board Ethernet controllers on each engine of the NAS Gateway 300 are used to connect the engines. For this reason, there must be an Ethernet adapter installed in one of the engines of the NAS Gateway 300 for network connectivity. The configurations that meet this requirement and are valid for the NAS Gateway 300 appear in boldface type in the tables.

Adapter abbreviations

- FC** Qlogic 2340 1-port Fibre Channel adapter or Qlogic 2342 2-port Fibre Channel adapter
- GB** IBM Gigabit Ethernet SX Server Adapter

CEN	PRO/1000 XT Server Adapter by Intel
EN4	Alacritech 100x4 Quad-Port Server Accelerated Adapter
CENA	Alacritech 1000x1 Single-Port Server and Storage Accelerated Adapter
RSA	Remote Supervisor Adapter
Tape	Tape includes one and only one of the following: <ul style="list-style-type: none"> • IBM PCI Ultra160 SCSI adapter (LVD/SE) • Qlogic 2340 1-port Fibre Channel adapter

No options

Table 37 shows the adapter placement with no options.

Table 37. No options

Configuration	PCI Slot-1 (32-bit)	PCI Slot-2 (64-bit)	PCI Slot-3 (64-bit)	PCI Slot-4 (64-bit)	PCI Slot-5 (64-bit)	PCI Slot-6 (64-bit)
						FC

RSA only options

Table 30 on page 34 shows the adapter placement with only an RSA option.

Table 38. RSA only options

Configuration	PCI Slot-1 (32-bit)	PCI Slot-2 (64-bit)	PCI Slot-3 (64-bit)	PCI Slot-4 (64-bit)	PCI Slot-5 (64-bit)	PCI Slot-6 (64-bit)
RSA	RSA					FC

Tape only options

Table 39 shows the adapter placement with only a tape backup option.

Table 39. Tape only options

Configuration	PCI Slot-1 (32-bit)	PCI Slot-2 (64-bit)	PCI Slot-3 (64-bit)	PCI Slot-4 (64-bit)	PCI Slot-5 (64-bit)	PCI Slot-6 (64-bit)
LVD	RSA				LVD	FC
FC1	RSA				FC1	FC

Network only options

Table 40 shows Ethernet network options without tape backup.

Table 40. Ethernet network options

Configuration	PCI Slot-1 (32-bit)	PCI Slot-2 (64-bit)	PCI Slot-3 (64-bit)	PCI Slot-4 (64-bit)	PCI Slot-5 (64-bit)	PCI Slot-6 (64-bit)
CENA	RSA	CENA				FC
GB	RSA	GB				FC
CEN	RSA	CEN				FC
EN4	RSA	EN4				FC
CENA, CENA	RSA	CENA	CENA			FC
CENA, GB	RSA	CENA	GB			FC

Table 40. Ethernet network options (continued)

Configuration	PCI Slot-1 (32-bit)	PCI Slot-2 (64-bit)	PCI Slot-3 (64-bit)	PCI Slot-4 (64-bit)	PCI Slot-5 (64-bit)	PCI Slot-6 (64-bit)
GB, GB	RSA	GB	GB			FC
CEN, CEN	RSA	CEN	CEN			FC
CEN, CENA	RSA	CENA	CEN			FC
CEN, GB	RSA	GB	CEN			FC
EN4, EN4	RSA	EN4	EN4			FC
EN4, CEN	RSA	CEN	EN4			FC
EN4, CENA	RSA	CENA	EN4			FC
EN4, GB	RSA	GB	EN4			FC
EN4, EN4, CEN	RSA	CEN	EN4	EN4		FC
EN4, EN4, CENA	RSA	CENA	EN4	EN4		FC
EN4, EN4, GB	RSA	GB	EN4	EN4		FC
EN4, CEN, CEN	RSA	CEN	CEN	EN4		FC
EN4, CEN, CENA	RSA	CENA	CEN	EN4		FC
EN4, CEN, GB	RSA	GB	CEN	EN4		FC
EN4, CENA, CENA	RSA	CENA	CENA	EN4		FC
EN4, CENA, GB	RSA	CENA	GB	EN4		FC
EN4, GB, GB	RSA	GB	GB	EN4		FC
CEN, CEN, CENA	RSA	CENA	CEN	CEN		FC
CEN, CEN, GB	RSA	GB	CEN	CEN		FC
CEN, CENA, CENA	RSA	CEN	CENA	CEN		FC
CEN, CENA, GB	RSA	CENA	GB	CEN		FC
CEN, GB, GB	RSA	GB	GB	CEN		FC
CENA, CENA, GB	RSA	CENA	CENA	GB		FC
CENA, GB, GB	RSA	CENA	GB	GB		FC
EN4, EN4, CEN, CENA	RSA	CENA	CEN	EN4	EN4	FC
EN4, EN4, CEN, GB	RSA	GB	CEN	EN4	EN4	FC
EN4, EN4, CEN, CEN	RSA	CEN	CEN	EN4	EN4	FC
EN4, EN4, CENA, CENA	RSA	CENA	CENA	EN4	EN4	FC
EN4, EN4, CENA, GB	RSA	CENA	GB	EN4	EN4	FC
EN4, EN4, GB, GB	RSA	GB	GB	EN4	EN4	FC
EN4, CEN, CEN, CENA	RSA	CENA	CEN	CEN	EN4	FC
EN4, CEN, CEN, GB	RSA	GB	CEN	CEN	EN4	FC
EN4, CEN, CENA, CENA	RSA	CENA	CENA	CEN	EN4	FC
EN4, CEN, CENA, GB	RSA	CENA	GB	CEN	EN4	FC
EN4, CEN, GB, GB	RSA	GB	GB	CEN	EN4	FC
EN4, CENA, CENA, GB	RSA	CENA	CENA	GB	EN4	FC
EN4, CENA, GB, GB	RSA	CENA	GB	GB	EN4	FC
CEN, CEN, CENA, CENA	RSA	CENA	CENA	CEN	CEN	FC
CEN, CEN, CENA, GB	RSA	CENA	GB	CEN	CEN	FC

Table 40. Ethernet network options (continued)

Configuration	PCI Slot-1 (32-bit)	PCI Slot-2 (64-bit)	PCI Slot-3 (64-bit)	PCI Slot-4 (64-bit)	PCI Slot-5 (64-bit)	PCI Slot-6 (64-bit)
CEN, CEN, GB, GB	RSA	GB	GB	CEN	CEN	FC
CEN, CENA, CENA, GB	RSA	CENA	CENA	GB	CEN	FC
CEN, CENA, GB, GB	RSA	CENA	GB	GB	CEN	FC
CENA, CENA, GB, GB	RSA	CENA	CENA	GB	GB	FC

Tape and network options

Table 41 shows Ethernet network options with tape backup.

Table 41. Tape backup with Ethernet network option

Configuration	PCI Slot-1 (32-bit)	PCI Slot-2 (64-bit)	PCI Slot-3 (64-bit)	PCI Slot-4 (64-bit)	PCI Slot-5 (64-bit)	PCI Slot-6 (64-bit)
TAPE, CENA	RSA	CENA			Tape	FC
TAPE, GB	RSA	GB			Tape	FC
TAPE, CEN	RSA	CEN			Tape	FC
TAPE, EN4	RSA	EN4			Tape	FC
TAPE, CENA, CENA	RSA	CENA	CENA		Tape	FC
TAPE, CENA, GB	RSA	CENA	GB		Tape	FC
TAPE, CEN, CEN	RSA	CEN	CEN		Tape	FC
TAPE, CEN, CENA	RSA	CENA	CEN		Tape	FC
TAPE, CEN, GB	RSA	GB	CEN		Tape	FC
TAPE, GB, GB	RSA	GB	GB		Tape	FC
TAPE, EN4, EN4	RSA	EN4	EN4		Tape	FC
TAPE, EN4, CEN	RSA	CEN	EN4		Tape	FC
TAPE, EN4, CENA	RSA	CENA	EN4		Tape	FC
TAPE, EN4, GB	RSA	GB	EN4		Tape	FC
TAPE, EN4, EN4, CEN	RSA	CEN	EN4	EN4	Tape	FC
TAPE, EN4, EN4, CENA	RSA	CENA	EN4	EN4	Tape	FC
TAPE, EN4, EN4, GB	RSA	GB	EN4	EN4	Tape	FC
TAPE, EN4, CEN, CEN	RSA	CEN	CEN	EN4	Tape	FC
TAPE, EN4, CEN, CENA	RSA	CENA	CEN	EN4	Tape	FC
TAPE, EN4, CEN, GB	RSA	GN	CEN	EN4	Tape	FC
TAPE, EN4, CENA, CENA	RSA	CENA	CENA	EN4	Tape	FC
TAPE, EN4, CENA, GB	RSA	CENA	GB	EN4	Tape	FC
TAPE, EN4, GB, GB	RSA	GB	GB	EN4	Tape	FC
TAPE, CEN, CEN, CENA	RSA	CENA	CEN	CEN	Tape	FC
TAPE, CEN, CEN, GB	RSA	GB	CEN	CEN	Tape	FC
TAPE, CEN, CENA, CENA	RSA	CENA	CENA	CEN	Tape	FC
TAPE, CEN, CENA, GB	RSA	CENA	GB	CEN	Tape	FC
TAPE, CEN, GB, GB	RSA	GB	GB	CEN	Tape	FC
TAPE, CENA, CENA, GB	RSA	CENA	CENA	GB	Tape	FC

Table 41. Tape backup with Ethernet network option (continued)

Configuration	PCI Slot-1 (32-bit)	PCI Slot-2 (64-bit)	PCI Slot-3 (64-bit)	PCI Slot-4 (64-bit)	PCI Slot-5 (64-bit)	PCI Slot-6 (64-bit)
TAPE, CENA, GB, GB	RSA	CENA	GB	GB	Tape	FC

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Numerics

10BASE-T. The IEEE 802.3 Ethernet standard that supports a transmission rate of 10 Mbps using two twisted-pair wires (Category 3 telephone wiring).

100BASE-T. The IEEE 802.3 Ethernet standard that supports a transmission rate of 100 Mbps using two twisted-pair wires (Category 5 telephone wiring).

A

access control. In computer security, the process of ensuring that the resources of a computer system can be accessed only by authorized users in authorized ways.

accessory. An IBM designation for a separately orderable part that has no type number, is for purchase only, and does not receive normal IBM maintenance.

adapter load balancing. The ability of several adapters in a team to be active simultaneously, with the outbound-traffic load balanced across all the adapters in the team; spreading tasks among adapters improves performance by preventing uneven distribution of workload. If one adapter in the team fails, the outbound traffic is redistributed across the remaining active adapters in the team. See also *teaming*.

asynchronous. A class of data-transmission service whereby all requests for service contend for a pool of dynamically allocated ring bandwidth and response time.

attach. To make a device a part of a network logically. Contrast with *connect*.

attachment. A port or a pair of ports, optionally including an associated optical bypass, that are managed as a functional unit. A dual attachment includes two ports: a port A and a port B. A single attachment consists of one port: port S.

attention (ATTN). An occurrence external to an operation that could cause an interruption of the operation.

ATTN. See *attention*.

B

bandwidth. The capacity of a communication line or processor, normally expressed in bits per second (bps).

baseband LAN. A local area network in which data is encoded and transmitted without modulation of a carrier (T).

Basic Input/Output System (BIOS). The personal computer code that controls basic hardware operations, such as interactions with diskette drives, hard disk drives, and the keyboard.

BIOS. See *Basic Input/Output System*.

bits per second (bps). The rate at which bits are transmitted per second. Contrast with *baud*.

bps. See *bits per second*.

buffer. See *buffer storage*.

buffer storage. (1) A special-purpose storage or storage area allowing, through temporary storage, the data transfer between two functional units having different transfer characteristics. A buffer storage is used between non-synchronized devices, a serial and a parallel device, or between devices having different transfer rates. (2) In word processing, a temporary storage in which text is held for processing or communication (T).

bus. See *data bus*.

C

cache. A high-speed buffer storage that contains frequently accessed instructions and data to reduce access time.

carrier sense multiple access with collision detection (CSMA/CD). A class of medium access procedures that allows multiple stations to access the medium at will, without explicit prior coordination, and avoids contention by way of carrier sense and deference. Contention is resolved by way of collision detection and transmission.

CIFS. See *Common Internet File System*.

client. A computer system or process that requests access to the data, services, or resources of a server (another computer system or process). Multiple clients may share access to a common server.

client-server model. A common way to describe network services and the model user processes (programs) of those services.

cluster. (1) A station that consists of a control unit (a *cluster controller*) and the terminals attached to it. (2) A group of APPN nodes that have the same network ID and the same topology database. A cluster is a subset of a network identifier (NETID) subnetwork. See also *high-availability cluster multiprocessing (HACMP)* and *network identifier (NETID)*.

collision avoidance. In carrier sense multiple access with collision avoidance (CSMA/CA), the process of sending a jam signal and waiting for a variable time before transmitting data. The process is designed to avoid two or more simultaneous transmissions.

Common Internet File System (CIFS). A protocol that enables collaboration on the Internet by defining a remote file-access protocol that is compatible with the way applications already share data on local disks and network file servers.

connect. In a LAN, to physically join a cable from a station to an access unit or network connection point. Contrast with *attach*.

CRU. See *customer-replaceable unit*.

customer-replaceable unit (CRU). An assembly or part that a customer can replace in its entirety when any of its components fail. Contrast with *field-replaceable unit*.

D

DASD. See *direct access storage device*.

data bus. A bus used to communicate data internally and externally to and from a processing unit, storage, and peripheral devices (A).

device identifier (ID). An 8-bit identifier that uniquely identifies a physical I/O device.

device parity protection. A function that protects data stored on a disk-unit subsystem from being lost because of the failure of a single disk unit in the disk-unit subsystem. When a disk-unit subsystem has device parity protection and one of the disk units in the subsystem fails, the subsystem continues to run. The disk-unit subsystem reconstructs the data after the disk unit in the subsystem is repaired or replaced. See also *RAID*.

DHCP. See *Dynamic Host Configuration Protocol*.

DIMM. See *dual inline memory module*.

direct access storage device (DASD). A mass-storage medium on which a computer stores data. Contrast with *random access memory (RAM)*.

Direct Memory Access (DMA). A technique in which an adapter bypasses a computer's CPU, and performs the transfer of data between itself and the system's memory directly.

DMA. See *Direct Memory Access*.

DNS. See *Domain Name System*.

Domain Name System (DNS). In the Internet suite of protocols, the distributed database system used to map domain names to IP addresses.

drive bay. A receptacle in an appliance into which you insert a hard-disk-drive module. The bays are in storage units that can be located in a different rack from the appliance.

dual inline memory module (DIMM). A small circuit board with memory-integrated circuits containing signal and power pins on both sides of the board.

Dynamic Host Configuration Protocol (DHCP). A protocol defined by the Internet Engineering Task Force (IETF) that is used for dynamically assigning IP addresses to computers in a network.

E

EIA. See *Electronic Industries Association*.

EISA. See *Extended Industry Standard Architecture*.

electromagnetic compatibility (EMC). The design and test of products to meet legal and corporate specifications dealing with the emissions and susceptibility to frequencies in the radio spectrum. Electromagnetic compatibility is the ability of various electronic equipment to operate correctly in the intended electromagnetic environment.

Electronic Industries Association (EIA). An organization of electronics manufacturers that advances the technological growth of the industry, represents the views of its members, and develops industry standards.

electrostatic discharge (ESD). An undesirable discharge of static electricity that can damage equipment and degrade electrical circuitry.

EMC. See *electromagnetic compatibility*.

engine. The unit that contains the processors that respond to requests for data from clients. The operating software for the IBM TotalStorage appliance resides in the engine.

equivalent paths. A collection of paths to the storage device. The paths have no switchover time penalty when changing from one path group to another while accessing the storage device.

error. A discrepancy between a computed, observed, or measured value or condition and the true, specified, or theoretically correct value or condition (A) (I). Contrast with *failure*.

ESD. See *electrostatic discharge*.

ESM. See *environmental service monitor*.

Ethernet. A standard protocol for a 10-Mbps baseband local area network (LAN) that allows multiple access and manages contention by using carrier sense multiple access with collision detection (CSMA/CD) as the access method.

Ethernet network. A baseband LAN with a bus topology in which messages are broadcast on a coaxial cable using a carrier sense multiple access/collision detection (CSMA/CD) transmission method.

expansion slot. In personal-computer systems, one of several receptacles in the rear panel of the system unit into which a user can install an adapter.

Extended Industry Standard Architecture (EISA). The PC bus standard that extends the AT bus (ISA bus) to 32 bits and provides support for bus master. It was announced in 1988 as a 32-bit alternative to the Micro Channel that would preserve investment in existing boards. PC and AT cards (ISA cards) can plug into an EISA bus.

F

fabric. A complex network using hubs, switches and gateways. For example, Fibre Channel uses a fabric to connect devices. A fabric can be as simple as a single cable connecting two devices.

failback. The restoration of an appliance to its initial configuration after detection and repair of a failed network or component.

failover. (1) The automatic recovery of resources in the event of a network outage, or failure of the hardware or software. (2) A cluster event in which the primary database server or application server switches to a backup system due to the failure of the primary server.

failure. (1) The termination of the ability of a functional unit to perform its required function. (2) An uncorrected hardware error. Failures are either recoverable or not recoverable by the software or the operator. The operator is always notified when failures occur. Contrast with *error*.

Fast Etherchannel (FEC). A proprietary technology developed by Cisco that creates a team of two to four 10/100 Ethernet adapters or ports to increase transmission and reception throughput. Adapter fault tolerance is also supported by this technology.

Fast Ethernet. An Ethernet standard that provides a data rate of 100 Mbps.

feature code. A code used by IBM to process hardware and software orders.

FEC. See *Fast Etherchannel*.

Federal Communications Commission (FCC). A board of commissioners appointed by the President under the Communications Act of 1934, having the power to regulate all interstate and foreign communications by wire and radio originating in the United States.

fiber optic cable. See *optical cable*.

field-replaceable unit (FRU). An assembly that is replaced in its entirety when any one of its components fails. In some cases, a FRU may contain other FRUs. Contrast with *customer-replaceable unit*.

File Transfer Protocol (FTP). In the Internet suite of protocols, an application layer protocol that uses TCP/IP and Telnet services to transfer bulk-data files between machines or hosts.

flash memory. A type of non-volatile storage device that must be erased in fixed blocks rather than single bytes.

FRU. See *field-replaceable unit*.

FTP. See *File Transfer Protocol*.

G

gateway. A device that acts as a router to transfer packets between networks, but occurs at the transport layer. See also *router*.

GEC. See *Gigabit Etherchannel*.

Gigabit Etherchannel (GEC). A proprietary technology developed by Cisco that creates a team of two Gigabit Ethernet adapters to increase transmission and reception throughput. Adapter fault tolerance is also supported by this technology.

H

hertz (Hz). A unit of frequency equal to one cycle per second.

Note: In the United States, line frequency is 60 Hz or a change in voltage polarity 120 times per second; in Europe, line frequency is 50 Hz or a change in voltage polarity 100 times per second.

host. (1) In TCP/IP, any system that has at least one Internet address associated with it. A host with multiple network interfaces may have multiple internet addresses associated with it. The host can be a client, a server, or both. (2) In Fibre Channel technology, any system that has at least one worldwide name associated with it. A host with multiple network interfaces may have multiple worldwide names associated with it.

I

IETF. See *Internet Engineering Task Force*.

iLUN. See *iSCSI client logical-unit number*.

interference. (1) The prevention of clear reception of broadcast signals. (2) The distorted portion of a received signal. (3) In optics, the interaction of two or more beams of coherent or partially coherent light.

Internet Engineering Task Force (IETF). The task force of the Internet Architecture Board (IAB) that is responsible for solving the short-term engineering needs of the Internet. The IETF consists of numerous working groups, each focused on a particular problem. Internet standards are typically developed or reviewed by individual working groups before they can become standards.

Internet Protocol (IP). A protocol that routes data through a network or interconnected networks. IP acts as an intermediary between the higher protocol layers and the physical network.

interrupt request (IRQ). An input found on a processor that causes it to suspend normal instruction execution temporarily and to start executing an interrupt handler routine.

IP. See *Internet Protocol*.

IRQ. See *interrupt request*.

iSCSI client logical-unit number (iLUN). A unique number that is assigned to each virtual logical unit number (VLUN). The iLUN for a single client starts at zero and increments sequentially.

J

jumper. A connector between two pins on a network adapter that enables or disables an adapter option, feature, or parameter value.

jumper cable. See *patch cable*.

L

LAN. See *local area network*.

local area network (LAN). A network in which a set of devices is connected to one another for communication and that can be connected to a larger network.

logical drive. A unit of virtual storage that is made available to the network through virtual logical unit numbers (VLUNs) and iSCSI client logical-unit number (iLUNs). It consists of one or more physical disks that are combined using RAID 0, 1, 1E, 5, or 5E technology.

logical unit. A type of network-accessible unit that enables users to gain access to network resources and communicate with each other.

logical unit number (LUN). An identifier used on a SCSI bus to distinguish among up to eight devices (logical units) with the same SCSI ID.

loop. A closed unidirectional signal path connecting input/output devices to a system.

LUN. See *logical unit number*.

M

management information base (MIB). Simple Network Management Protocol (SNMP) units of managed information that specifically describe an aspect of a system, such as the system name, hardware number, or communications configuration. A collection of related MIB objects is defined as a MIB.

megahertz (MHz). A unit of measure of frequency. One megahertz equals 1 000 000 hertz.

MES. See *miscellaneous equipment specification*.

MHz. See *megahertz*.

MIB. See *management information base*.

miscellaneous equipment specification (MES). Any equipment that is added after the time of the initial order.

modulation. (1) The process by which a characteristic of a carrier is varied in accordance with a characteristic of an information-bearing signal (T). (2) The process by which a message signal is impressed upon a carrier signal so that the carrier is altered to represent the message signal.

multicast address. A type of IP address, which identifies a group of interfaces and permits all of the systems that are in that group to receive the same packet of information.

multimode optical fiber. (1) A graded-index or step-index optical fiber that allows more than one bound mode to propagate (E). Contrast with *single-mode optical fiber*. (2) In FDDI, an optical-fiber waveguide usually characterized by a core diameter of 50 - 100 microns that will allow a large number of modes to propagate.

N

N. See *newton*.

NAS. See *network-attached storage*.

NetBIOS. A standard interface to networks, IBM personal computers (PCs), and other compatible PCs. It is used on LANs to provide message, print-server, and file-server functions. Application programs that use NetBIOS need not manage the details of LAN data-link-control protocols.

network-attached storage (NAS). A task-optimized storage device directly attached to a network that operates independently of the general-purpose file servers.

Network File System (NFS). A protocol, developed by Sun Microsystems, Incorporated, that allows any host in a network to mount another host's file directories. After a file directory is mounted, it appears to reside on the local host.

network information services (NIS). A set of UNIX network services (for example, a distributed service for retrieving information about the users, groups, network addresses, and gateways in a network) that resolve naming and addressing differences among computers in a network.

newton (N). The unit of force required to impart an acceleration of one meter per second per second to a mass of one kilogram (1 m/s²).

NFS. See *Network File System*.

NIS. See *network information services*.

O

optical cable. A fiber, multiple fibers, or a fiber bundle in a structure built to meet optical, mechanical, and environmental specifications (E).

P

patch cable. A length of cable with data connectors at both ends; it is normally used to interconnect two sections of building cable at a distribution panel or to connect a product to the building cable.

path. In a network, a route between two nodes.

path group. A collection of equivalent paths. Storage devices may have one - *n* path groups.

PCI. See *Peripheral Component Interconnect*.

Peripheral Component Interconnect (PCI). A local bus for PCs from Intel that provides a high-speed data path between the CPU and up to 10 peripherals (video, disk, network, and so on). The PCI bus coexists in the PC with the industry standard architecture (ISA) or extended industry standard architecture (EISA) bus. ISA and EISA boards plug into an ISA or EISA slot, while high-speed PCI controllers plug into a PCI slot.

Persistent Storage Manager (PSM). Columbia Data Products software that creates multiple, point-in-time, persistent, TruImage data views of any or all system and data volumes residing on network-attached storage. All persistent images survive system power loss, or a planned or unplanned reboot. Each instance of PSM seamlessly handles 250 concurrent images of up to 255 independent volumes for a total of 63 750 independent data images.

port. See *socket*.

protocol. The meaning of, and the sequencing rules for, requests and responses used for managing a network, transferring data, and synchronizing the states of network components.

PSM. See *Persistent Storage Manager*.

R

RAID. See *redundant array of independent disks*.

RAM. See *random access memory*.

random access memory (RAM). A temporary storage location in which the central processing unit (CPU) stores and executes its processes. Contrast with *direct access storage device (DASD)*.

redundant array of independent disks (RAID). A method of protecting data loss due to disk failure based on the Redundant Array of Independent Disks specification published by the University of California in 1987. See also *device parity protection*.

router. An attaching device that connects two LAN segments at the reference-model network layer. The LAN segments may use similar or different architectures.

S

SAN. See *storage area network*.

SCSI. See *small computer system interface*.

SDLC. See *synchronous data link control*.

server. In a network, a node that provides facilities to other stations; examples of servers are a file server, a printer server, and a mail server.

shielded twisted pair (STP). A cable medium consisting of a telephone wire wrapped in a metal sheath to eliminate external interference.

Simple Network Management Protocol (SNMP). In the Internet suite of protocols, a network management protocol that is used to monitor routers and attached networks. SNMP is an application-layer protocol. Information on devices managed is defined and stored in the application's Management Information Base (MIB).

single-mode optical fiber. An optical fiber in which only the lowest-order bound mode (which can consist of a pair of orthogonally polarized fields) can propagate at the wavelength of interest. Contrast with *multimode optical fiber*.

small computer system interface (SCSI). A standard hardware interface that enables a variety of peripheral devices to communicate with one another.

SNMP. See *Simple Network Management Protocol*.

storage area network (SAN). A dedicated storage network tailored to a specific environment, combining servers, storage products, networking products, software, and services.

storage client network. A classic, interconnected, Fibre Channel fabric with a single, Fibre Channel, fabric name.

storage controller. A device (such as a RAID controller) that creates and manages other storage devices.

storage device. A logical unit number (LUN) that terminates a collection of ports on the storage network.

storage network. An arrangement that provides shared access to a set of logical unit numbers (LUNs) across one - n storage client networks.

storage port. An engine's connection point to a storage client network. A storage port is a member of a single fabric. See also *engine*.

storage unit. Hardware that contains one or more drive bays, power supplies, and a network interface. Some storage units contain RAID controllers; their storage unit is accessed by the appliance.

STP. See *shielded twisted pair*.

synchronous data link control (SDLC). A discipline for managing synchronous, code-transparent, serial-by-bit information transfer over a link connection. Transmission exchanges may be duplex or half-duplex over switched or nonswitched links. The configuration of the link connection may be point-to-point, multipoint, or loop.

synchronous data transfer. A physical transfer of data to or from a device that has a predictable time relationship with the execution of an I/O request.

T

tape device. A collection of tape units that share a model type and serial number (such as all the logical unit numbers (LUNs) of a tape library). See also *tape unit*.

tape unit. A tape device or a robotics controller that is visible over a storage network. A tape unit is a member of a single storage network (of 1 - n fabrics), but can have 1 - n equivalent paths.

target. A collection of logical units that are directly addressable on the network. The target corresponds to the server in a client-server model.

TCP. See *Transmission Control Protocol*.

TCP/IP. See *Transmission Control Protocol/Internet Protocol*.

teaming. The grouping of two to four ports or adapters to increase transmission and reception throughput. Teaming creates a single, high-speed, fault-tolerant link that provides load balancing for both outbound and inbound traffic.

Telnet. In the Internet suite of protocols, a protocol that provides remote-terminal connection service. It allows users of one host to log on to a remote host and interact as directly attached terminal users of that host.

timeout. A time interval that is allotted for certain operations to occur, such as a response to polling or addressing before system operation is interrupted and must be restarted.

Tivoli Storage Manager (TSM). A client/server product that provides storage management and data access services in a heterogeneous environment.

Transmission Control Protocol (TCP). In TCP/IP, a host-to-host protocol that provides transmission in an internet environment. TCP assumes Internet Protocol (IP) is the underlying protocol.

Transmission Control Protocol/Internet Protocol (TCP/IP). The Transmission Control Protocol and the Internet Protocol, which together provide reliable end-to-end connections between applications over interconnected networks of different types.

True Image data view. A data view that allows the file to be restored in the event of accidental deletion. It consists of point-in-time images that provide a near-instant virtual copy of an entire storage volume.

TSM. See *Tivoli Storage Manager*.

U

universal serial bus (USB). A serial-interface standard for telephony and multimedia connections to personal computers.

unshielded twisted pair (UTP). A cable medium with one or more pairs of twisted insulated copper conductors bound in a single plastic sheath.

USB. See *universal serial bus*.

V

virtual local area network (VLAN). A logical association of switch ports based upon a set of rules or criteria such as MAC addresses, protocols, network address, or multicast address. This concept permits resegmentation of the LAN without requiring physical rearrangement.

virtual logical unit number (VLUN). A subset of a logical drive.

VLAN. See *virtual local area network*.

VLUN. See *virtual logical unit number*.

volume. (1) A unit of storage on disk, tape, or other data-recording media. (2) A logical disk visible to an appliance over a storage network. A volume is a member of a single storage network of 1 - *n* fabrics. It can have 1 - *n* path groups of 1 - *n* equivalent paths.

W

Windows Internet Naming Service (WINS). A Microsoft program that provides a distributed database for registering and querying dynamic NetBIOS names to IP address mapping in a routed network environment.

WINS. See *Windows Internet Naming Service*.

Windows networking. A networking file-system protocol for the Windows operating system.

X

Xmodem. A public-domain asynchronous data link control (DLC) protocol that provides packet numbering and checksum error control for the transfer of binary files.

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