

IBM TotalStorage FAStT100 Storage Server



Installation, User's, and Maintenance Guide

IBM TotalStorage FAStT100 Storage Server



Installation, User's, and Maintenance Guide

Note:

Before using this information and the product it supports, be sure to read the general information in "Notices" on page 111.

First Edition (June 2004)

© Copyright International Business Machines Corporation 2004. All rights reserved.

US Government Users Restricted Rights – Use, duplication or disclosure restricted by GSA ADP Schedule Contract with IBM Corp.

Safety

The caution and danger statements that this document contains can be referenced in the multilingual *IBM Safety Information* document that is provided with your IBM TotalStorage FASTT100 storage server. Each caution and danger statement is numbered for easy reference to the corresponding statements in the translated document.

- **Danger:** These statements indicate situations that can be potentially lethal or extremely hazardous to you. A danger statement is placed just before the description of a potentially lethal or extremely hazardous procedure, step, or situation.
- **Caution:** These statements indicate situations that can be potentially hazardous to you. A caution statement is placed just before the description of a potentially hazardous procedure step or situation.
- **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.

Before installing this product, read the following danger and caution notices.

Statement 1:



DANGER

Electrical current from power, telephone, and communication cables is hazardous.

To avoid a shock hazard:

- **Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.**
- **Connect all power cords to a properly wired and grounded electrical outlet.**
- **Connect to properly wired outlets any equipment that will be attached to this product.**
- **When possible, use one hand only to connect or disconnect signal cables.**
- **Never turn on any equipment when there is evidence of fire, water, or structural damage.**
- **Disconnect the attached power cords, telecommunications systems, networks, and modems before you open the device covers, unless instructed otherwise in the installation and configuration procedures.**
- **Connect and disconnect cables as described in the following table when installing, moving, or opening covers on this product or attached devices.**

| To Connect: | To Disconnect: |
|--|---|
| <ol style="list-style-type: none">1. Turn everything OFF.2. First, attach all cables to devices.3. Attach signal cables to connectors.4. Attach power cords to outlet.5. Turn device ON. | <ol style="list-style-type: none">1. Turn everything OFF.2. First, remove power cords from outlet.3. Remove signal cables from connectors.4. Remove all cables from devices. |

Statement 3:



CAUTION:

When laser products (such as CD-ROMs, DVD drives, fiber optic devices, or transmitters) are installed, note the following:

- Do not remove the covers. Removing the covers of the laser product could result in exposure to hazardous laser radiation. There are no serviceable parts inside the device.
- Use of controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.



DANGER

Some laser products contain an embedded Class 3A or Class 3B laser diode. Note the following.

Laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam.




Class 1 Laser statement

Class 1 Laser Product
Laser Klasse 1
Laser Klasse 1
Luokan 1 Laserlaitte
Appareil À Laser de Classe 1

IEC 825-11993 CENELEC EN 60 825

Statement 4:



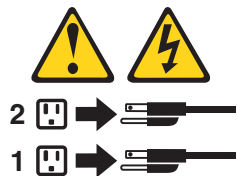
| | | |
|---|---|---|
|  |  |  |
| ≥ 18 kg (39.7 lb) | ≥ 32 kg (70.5 lb) | ≥ 55 kg (121.2 lb) |

CAUTION:
Use safe practices when lifting.

Statement 5:



CAUTION:
The power control button on the device and the power switch on the power supply do not turn off the electrical current supplied to the device. The device also might have more than one power cord. To remove all electrical current from the device, ensure that all power cords are disconnected from the power source.



Statement 8:



CAUTION:

Never remove the cover on a power supply or any part that has the following label attached.



Hazardous voltage, current, and energy levels are present inside any component that has this label attached. There are no serviceable parts inside these components. If you suspect a problem with one of these parts, contact a service technician.

Contents

| | |
|---|-------|
| Safety | iii |
| Figures | xiii |
| Tables | xv |
| About this document | xvii |
| Who should read this document | xvii |
| How this document is organized | xvii |
| FAST installation process overview | xvii |
| FAST Storage Server publications | xviii |
| FAST900 Fibre Channel Storage Server library | xviii |
| FAST700 Fibre Channel Storage Server library | xx |
| FAST600 Fibre Channel Storage Server library | xxi |
| FAST100 Storage Server library | xxi |
| FAST-related hardware publications | xxiii |
| FAST Storage Manager Version 8.4 publications | xxiii |
| Getting information, help, and service | xxiv |
| Before you call | xxv |
| Using the documentation | xxv |
| Web sites | xxv |
| Software service and support | xxvi |
| Hardware service and support | xxvi |
| Fire suppression systems | xxvi |
| How to send your comments | xxvi |
| Chapter 1. Introduction | 1 |
| Overview | 1 |
| Fibre channel defined | 2 |
| SATA defined | 2 |
| Product updates | 2 |
| Features at a glance | 3 |
| Clustering support | 3 |
| Inventory checklist | 4 |
| Best practices guidelines | 4 |
| Storage server components | 5 |
| Hot-swap drive bays | 5 |
| Front controls and indicators | 6 |
| Back view | 7 |
| Interface ports and switches | 8 |
| Storage server operating environment | 9 |
| FAST100 specifications | 10 |
| Heat output, airflow, and cooling | 11 |
| Chapter 2. Installing the storage server | 13 |
| Handling static-sensitive devices | 14 |
| Preparing for installation | 14 |
| Preparing the site | 15 |
| Preparing the rack | 15 |
| Installing the FAST100 | 16 |
| Rack mounting template | 16 |
| Installing the support rails | 18 |
| Removing the CRUs | 20 |

| | |
|---|-----------|
| Removing a RAID controller | 21 |
| Removing a power supply | 22 |
| Removing a fan | 23 |
| Removing a hard disk drive | 23 |
| Installing the FAStT100 into a rack | 24 |
| Replacing the FAStT100 CRUs | 25 |
| Replacing a RAID controller | 26 |
| Replacing a power supply | 26 |
| Replacing a fan. | 27 |
| Replacing a hard disk drive | 28 |
| Setting the interface options | 28 |
| Fibre-channel loop and ID settings. | 29 |
| Server ID (Enclosure ID) settings | 29 |
| Storage server speed settings | 31 |
| Configuring the storage subsystem | 31 |
| Storage subsystem management methods. | 31 |
| Fibre channel connections. | 33 |
| Fibre channel loop configurations | 33 |
| Redundant host and drive loops | 34 |
| Installing the storage subsystem configuration | 37 |
| Chapter 3. Cabling the storage server | 39 |
| Working with SFPs and fiber-optic cables | 39 |
| Handling fiber-optic cables | 39 |
| Installing SFP modules | 40 |
| Removing SFP modules | 42 |
| Installing fiber-optic cables | 42 |
| Using LC-LC fibre-channel cables | 43 |
| Connecting an LC-LC cable to an SFP module | 44 |
| Removing an LC-LC fibre-channel cable | 45 |
| Using LC-SC fibre-channel cable adapters. | 46 |
| Connecting an LC-SC cable adapter to a device | 47 |
| Removing an LC-LC cable from an LC-SC cable adapter | 48 |
| Connecting hosts to the RAID controllers | 49 |
| Connecting secondary interface cables | 50 |
| Power cabling | 50 |
| Installing the Storage Manager client | 52 |
| Connecting expansion units | 53 |
| FAStT EXP100 loop redundancy | 54 |
| Chapter 4. Operating the storage server. | 57 |
| Turning the storage server on and off | 57 |
| Turning on the storage server | 57 |
| Turning off the storage server | 59 |
| Restoring power after an unexpected shutdown | 60 |
| Performing an emergency shutdown | 61 |
| Restoring power after an emergency shutdown | 61 |
| Restoring power after an over-temperature shutdown. | 61 |
| Monitoring status through software | 62 |
| Checking the LEDs | 63 |
| Cache memory and RAID controller battery | 66 |
| Cache memory | 66 |
| RAID controller cache battery | 67 |
| Chapter 5. Installing and replacing components | 69 |
| Handling static-sensitive devices | 69 |

| | |
|--|------------|
| Working with hot-swap hard disk drives | 69 |
| Installing hot-swap hard disk drives | 70 |
| Replacing hot-swap hard disk drives | 72 |
| Upgrading drives | 73 |
| Adding larger-capacity drives. | 73 |
| Replacing all drives at the same time | 74 |
| Replacing the drives one at a time. | 76 |
| Working with hot-swap cooling fans | 77 |
| Working with hot-swap power supplies | 79 |
| Removing a hot-swap power supply | 80 |
| Installing a hot-swap power supply | 81 |
| Working with hot-swap RAID controllers. | 83 |
| Replacing a RAID controller | 83 |
| Replacing the battery in the RAID controller | 88 |
| Installing SFPs and fiber-optic cables | 91 |
| Adding a FAStT EXP100 to an existing FAStT100 configuration | 91 |
| | |
| Chapter 6. Hardware maintenance | 95 |
| General checkout | 95 |
| Using the diagnostic hardware | 95 |
| Solving problems | 95 |
| Parts listing | 99 |
| | |
| Appendix A. Records | 103 |
| Identification numbers | 103 |
| Installed device records | 103 |
| | |
| Appendix B. Rack mounting template | 105 |
| | |
| Appendix C. Power cords | 109 |
| | |
| Notices | 111 |
| Trademarks. | 111 |
| Important notes | 112 |
| Electronic emission notices | 112 |
| Federal Communications Commission (FCC) statement | 112 |
| Chinese class A compliance statement. | 113 |
| Industry Canada Class A emission compliance statement | 113 |
| Australia and New Zealand Class A statement | 113 |
| United Kingdom telecommunications safety requirement | 113 |
| European Union EMC Directive conformance statement | 113 |
| Taiwan Class A warning statement | 114 |
| Japanese Voluntary Control Council for Interference (VCCI) statement | 114 |
| | |
| Glossary | 115 |
| | |
| Index | 123 |

Figures

| | |
|--|-------|
| 1. Installation process flow by current publications | xviii |
| 2. FAST100 hot-swap drive bays | 6 |
| 3. Front controls and indicators | 6 |
| 4. Back view of FAST100 storage server | 7 |
| 5. Interface ports and switches | 8 |
| 6. Example of cold aisle/hot aisle rack configuration | 12 |
| 7. Front rack mounting template | 17 |
| 8. Rear rack mounting template | 18 |
| 9. Alignment pins with and without spacers | 19 |
| 10. Installing the support rails | 20 |
| 11. Removing a RAID controller. | 22 |
| 12. Removing a power supply | 22 |
| 13. Removing a fan | 23 |
| 14. Removing a drive CRU | 24 |
| 15. Installing the FAST100 | 25 |
| 16. Replacing a RAID controller. | 26 |
| 17. Replacing a power supply | 27 |
| 18. Replacing a fan | 27 |
| 19. Removing a drive CRU | 28 |
| 20. Enclosure ID switches | 29 |
| 21. Setting the Server ID | 30 |
| 22. Host-agent managed storage subsystems | 32 |
| 23. Direct-managed storage subsystems | 33 |
| 24. Redundant host and drive fibre channel loop configurations | 35 |
| 25. Single SAN fabric zone configuration | 36 |
| 26. Dual SAN fabric zone configuration | 36 |
| 27. Two clusters configuration | 37 |
| 28. Small Form-Factor Pluggable (SFP) Module | 41 |
| 29. Installing an SFP module into the host port | 41 |
| 30. Unlocking the SFP module latch - plastic variety | 42 |
| 31. Unlocking the SFP module latch - wire variety | 42 |
| 32. Removing caps from fiber-optic cables | 43 |
| 33. Connecting cables to the installed SFP. | 43 |
| 34. LC-LC fibre-channel cable | 44 |
| 35. Removing fiber-optic cable protective caps | 45 |
| 36. Inserting an LC-LC fibre-channel cable into an SFP module | 45 |
| 37. LC-LC fibre-channel cable lever and latches. | 46 |
| 38. Removing the LC-LC fibre-channel cable | 46 |
| 39. LC-SC fibre-channel cable adapter | 47 |
| 40. Removing the LC-SC cable adapter protective caps | 48 |
| 41. Connecting an LC-LC cable into the LC-SC cable adapter | 48 |
| 42. LC-LC fibre-channel cable lever and latches. | 49 |
| 43. Removing the LC-LC fibre-channel cable from an LC-SC fibre-channel cable adapter | 49 |
| 44. Location of host cables | 50 |
| 45. Ethernet and serial port locations | 50 |
| 46. Power cord locations | 51 |
| 47. Redundant AC power connections to controllers and drive expansion units | 52 |
| 48. Adding an expansion unit. | 54 |
| 49. FAST EXP100 redundant loop configuration | 55 |
| 50. Storage server LEDs (front) | 63 |
| 51. RAID controller LEDs | 64 |
| 52. Fan and power supply LEDs | 66 |
| 53. Cache active LED | 67 |

| | |
|---|-----|
| 54. Battery LED | 68 |
| 55. Hot-swap hard disk drive LEDs | 71 |
| 56. Drive CRU handle | 71 |
| 57. Fan locations | 78 |
| 58. Removing a fan | 78 |
| 59. Power supply controls | 79 |
| 60. Lever for power supply removal | 81 |
| 61. Installing a hot-swap power supply | 81 |
| 62. Connecting the power cord to the AC power connector | 82 |
| 63. RAID controller levers and labels | 83 |
| 64. Location of SFPs and fiber-optic cables | 84 |
| 65. Unlocking the SFP module latch - plastic variety | 85 |
| 66. Unlocking the SFP module latch - wire variety | 85 |
| 67. Pull-rings for removing a controller | 86 |
| 68. Controller battery-access panel screws | 86 |
| 69. Removing the controller battery | 87 |
| 70. Installing a new RAID controller | 91 |
| 71. Cabling the FAStT100 to a redundant loop | 92 |
| 72. FAStT100 parts list | 100 |
| 73. Front rack mounting template | 106 |
| 74. Rear rack mounting template | 107 |

Tables

| | |
|---|-------|
| 1. TotalStorage FAStT900 Fibre Channel Storage Server document titles by user tasks | xviii |
| 2. TotalStorage FAStT700 Fibre Channel Storage Server document titles by user tasks | xx |
| 3. TotalStorage FAStT600 Fibre Channel Storage Server document titles by user tasks | xxi |
| 4. TotalStorage FAStT100 Storage Server document titles by user tasks | xxi |
| 5. TotalStorage FAStT related document titles by user tasks | xxiii |
| 6. TotalStorage FAStT Storage Manager Version 8.4 titles by user tasks | xxiv |
| 7. Features at a glance | 3 |
| 8. IBM TotalStorage FAStT100 specifications | 10 |
| 9. Alignment pin requirements for different rack flange hole types | 19 |
| 10. Storage server LEDs (front) | 63 |
| 11. RAID controller LEDs | 64 |
| 12. Fan LED | 66 |
| 13. Power supply LEDs | 66 |
| 14. Drive LED activity | 70 |
| 15. Symptom-to-FRU index | 96 |
| 16. Parts listing (TotalStorage FAStT100 storage server) | 100 |
| 17. Hard disk drive record | 103 |

About this document

This document provides instructions for installing and customizing the configuration of your IBM® TotalStorage® FAStT100 storage server. It also provides hardware maintenance procedures and troubleshooting information.

Who should read this document

This document is intended for system operators and service technicians who have extensive knowledge of fibre channel and network technology.

How this document is organized

Chapter 1, "Introduction," on page 1 describes the IBM TotalStorage FAStT100 storage server. This chapter includes an inventory checklist and an overview of the storage server features, operating specifications, and components.

Chapter 2, "Installing the storage server," on page 13 contains instructions for installing the storage server in a standard rack cabinet and setting the interface options.

Chapter 3, "Cabling the storage server," on page 39 contains fibre channel and power cabling information for the storage server.

Chapter 4, "Operating the storage server," on page 57 contains instructions for power the storage server on or off during either normal or emergency situations.

Chapter 5, "Installing and replacing components," on page 69 contains step-by-step instructions for how to install or remove customer replaceable units (CRUs), such as hard disk drives, power supplies, RAID controllers, and fan units.

Chapter 6, "Hardware maintenance," on page 95 contains problems, symptoms, and error messages that are specific to your storage server.

Appendix A, "Records," on page 103 provides a table that you can use to record and update important information about your FAStT100, including serial number and device records. Whenever you add options to your FAStT100, be sure to update the information in this table.

Appendix B, "Rack mounting template," on page 105 provides the rack mounting templates for installation of the FAStT100. If you want to tear out the templates from the document for use during installation, use these copies of the templates.

Appendix C, "Power cords," on page 109 lists power cord information for the FAStT100.

FAStT installation process overview

The following flow chart gives an overview of the FAStT hardware and the FAStT Storage Manager software installation process. Lined arrows in the flow chart indicate consecutive steps in the hardware and software installation process. Labeled arrows indicate which current documents provide detailed information about those steps.

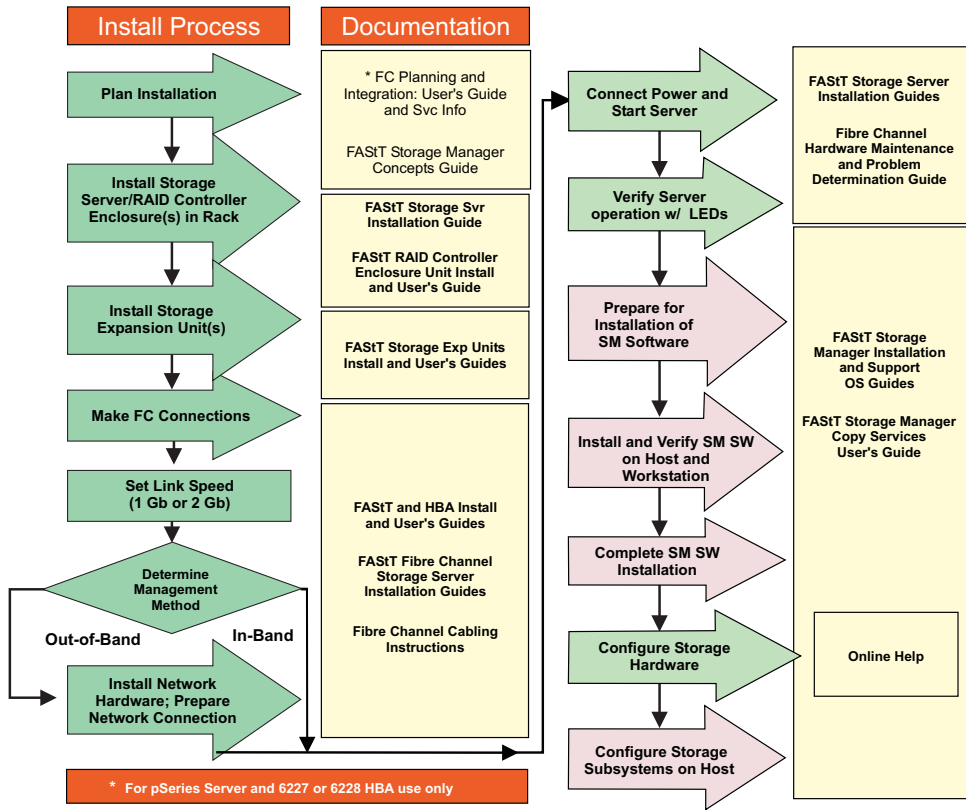


Figure 1. Installation process flow by current publications

FAST Storage Server publications

The following tables present an overview of the FAST900, FAST700, FAST600, and FAST100 Fibre Channel Storage Server product libraries, as well as other related documents. Each table lists documents that are included in the libraries and what common tasks they address. Click on active links in the tables to access those documents currently available on the Internet. You can access documentation for the other FAST products at the following Web site:

www-1.ibm.com/servers/storage/support/fastt/index.html

FAST900 Fibre Channel Storage Server library

Table 1 associates each document in the FAST900 Fibre Channel Storage Server library with its related common user tasks.

Table 1. TotalStorage FAST900 Fibre Channel Storage Server document titles by user tasks

| Title | User Tasks | | | | | |
|--|------------|-----------------------|-----------------------|---------------|------------------------------|---------------------------|
| | Planning | Hardware Installation | Software Installation | Configuration | Operation and Administration | Diagnosis and Maintenance |
| IBM TotalStorage FAST900 Installation and Support Guide, GC26-7530 | ✓ | ✓ | | ✓ | | |

Table 1. TotalStorage FAST900 Fibre Channel Storage Server document titles by user tasks (continued)

| Title | User Tasks | | | | | |
|---|------------|-----------------------|-----------------------|---------------|------------------------------|---------------------------|
| | Planning | Hardware Installation | Software Installation | Configuration | Operation and Administration | Diagnosis and Maintenance |
| IBM TotalStorage FAST900 Fibre Channel Cabling Instructions, 24P8135 | ✓ | ✓ | | | | |
| IBM TotalStorage FAST900 Storage Server User's Guide, GC26-7534 | | | | ✓ | ✓ | ✓ |
| IBM TotalStorage FAST FC2-133 Dual Port Host Bus Adapter Installation and User's Guide, GC26-7532 | | ✓ | | | ✓ | |
| IBM FAST FC2-133 Host Bus Adapter Installation and User's Guide, 48P9823 | | ✓ | | | ✓ | |
| IBM TotalStorage FAST900 Rack Mounting Instructions, 19K0900 | ✓ | ✓ | | | | |
| IBM Fibre Channel Planning and Integration: User's Guide and Service Information, SC23-4329 | ✓ | ✓ | | | ✓ | ✓ |
| IBM FAST Management Suite Java User's Guide, 32P0081 | | | | | ✓ | ✓ |
| IBM TotalStorage FAST Fibre Channel Hardware Maintenance Manual, GC26-7640 | | | | | | ✓ |
| IBM TotalStorage FAST Fibre Channel Problem Determination Guide, GC26-7642 | | | | | | ✓ |

FAST700 Fibre Channel Storage Server library

Table 2 associates each document in the FAST700 Fibre Channel Storage Server library with its related common user tasks.

Table 2. TotalStorage FAST700 Fibre Channel Storage Server document titles by user tasks

| Title | User Tasks | | | | | |
|---|------------|-----------------------|-----------------------|---------------|------------------------------|---------------------------|
| | Planning | Hardware Installation | Software Installation | Configuration | Operation and Administration | Diagnosis and Maintenance |
| IBM FAST700 Installation and Support Guide, 32P0171 | ✓ | ✓ | | ✓ | | |
| IBM FAST700 Fibre Channel Cabling Instructions, 32P0343 | ✓ | ✓ | | | | |
| IBM FAST700 Fibre Channel Storage Server User's Guide, 32P0341 | | | | ✓ | ✓ | ✓ |
| IBM FAST FC2-133 Dual Port Host Bus Adapter Installation and User's Guide, GC26-7532 | | ✓ | | | ✓ | |
| IBM TotalStorage FAST FC2-133 Host Bus Adapter Installation and User's Guide, 48P9823 | | ✓ | | | ✓ | |
| IBM FAST Management Suite Java User's Guide, 32P0081 | | | | | ✓ | ✓ |
| IBM TotalStorage FAST Fibre Channel Hardware Maintenance Manual, GC26-7640 | | | | | | ✓ |
| IBM TotalStorage FAST Fibre Channel Problem Determination Guide, GC26-7642 | | | | | | ✓ |

FAST600 Fibre Channel Storage Server library

Table 3 associates each document in the FAST600 Fibre Channel Storage Server library with its related common user tasks.

Table 3. TotalStorage FAST600 Fibre Channel Storage Server document titles by user tasks

| Title | User Tasks | | | | | |
|---|------------|-----------------------|-----------------------|---------------|------------------------------|---------------------------|
| | Planning | Hardware Installation | Software Installation | Configuration | Operation and Administration | Diagnosis and Maintenance |
| IBM TotalStorage FAST600 Fibre Channel Storage Server Installation and User's Guide, GC26-7531 | ✓ | ✓ | | ✓ | | |
| IBM TotalStorage FAST Fibre Channel Hardware Maintenance Manual, GC26-7640 | | | | | | ✓ |
| IBM TotalStorage FAST Fibre Channel Problem Determination Guide, GC26-7642 | | | | | | ✓ |
| IBM TotalStorage FAST FC2-133 Dual Port Host Bus Adapter Installation and User's Guide, GC26-7532 | | ✓ | | | ✓ | |
| IBM TotalStorage FAST600 Rack Mounting Instructions, 24P8125 | ✓ | ✓ | | | | |
| IBM TotalStorage FAST600 Cabling Instructions, 24P8126 | ✓ | ✓ | | | | |

FAST100 Storage Server library

Table 4 associates each document in the FAST100 Storage Server library with its related common user tasks.

Table 4. TotalStorage FAST100 Storage Server document titles by user tasks

| Title | User Tasks | | | | | |
|--|------------|-----------------------|-----------------------|---------------|------------------------------|---------------------------|
| | Planning | Hardware Installation | Software Installation | Configuration | Operation and Administration | Diagnosis and Maintenance |
| IBM TotalStorage FAST100 Storage Server Installation, User's, and Maintenance Guide, GC26-7641 | ✓ | ✓ | | ✓ | | ✓ |

Table 4. TotalStorage FAStT100 Storage Server document titles by user tasks (continued)

| Title | User Tasks | | | | | |
|--|------------|-----------------------|-----------------------|---------------|------------------------------|---------------------------|
| | Planning | Hardware Installation | Software Installation | Configuration | Operation and Administration | Diagnosis and Maintenance |
| IBM TotalStorage FAStT100 Fibre Channel Cabling Instructions, 24P8973 | ✓ | ✓ | | | | |
| IBM TotalStorage FAStT FC2-133 Dual Port Host Bus Adapter Installation and User's Guide, GC26-7532 | | ✓ | | | ✓ | |
| IBM FAStT FC2-133 Host Bus Adapter Installation and User's Guide, 48P9823 | | ✓ | | | ✓ | |
| IBM TotalStorage FAStT Fibre Channel Hardware Maintenance Manual, GC26-7640 | | | | | | ✓ |
| IBM TotalStorage FAStT Fibre Channel Problem Determination Guide, GC26-7642 | | | | | | ✓ |

FAST-related hardware publications

Table 5 associates each of the following documents related to FAST operations with its related common user tasks.

Table 5. TotalStorage FAST related document titles by user tasks

| Title | User Tasks | | | | | |
|---|------------|-----------------------|-----------------------|---------------|------------------------------|---------------------------|
| | Planning | Hardware Installation | Software Installation | Configuration | Operation and Administration | Diagnosis and Maintenance |
| IBM Safety Information, P48P9741 | | | | | ✓ | |
| IBM TotalStorage FAST EXP100 Storage Expansion Unit Release Notes, GC26-7619 | ✓ | ✓ | | | | |
| IBM TotalStorage FAST EXP100 Storage Expansion Unit Installation and Users Guide, GC26-7601 | ✓ | ✓ | | ✓ | ✓ | ✓ |
| Fibre Channel Solutions - IBM FAST EXP500 Installation and User's Guide, 59p5637 | ✓ | ✓ | | ✓ | ✓ | ✓ |
| IBM EXP700 Storage Expansion Unit Installation and User's Guide, 32P0178 | ✓ | ✓ | | ✓ | ✓ | ✓ |
| IBM Netfinity® Fibre Channel Cabling Instructions, 19K0906 | | ✓ | | | | |
| IBM Fibre Channel SAN Configuration Setup Guide, 25P2509 | ✓ | | ✓ | ✓ | ✓ | |

FAST Storage Manager Version 8.4 publications

Table 6 on page xxiv associates each document in the FAST Storage Manager library with its related common user tasks.

Table 6. TotalStorage FAST Storage Manager Version 8.4 titles by user tasks

| Title | User Tasks | | | | | |
|--|------------|-----------------------|-----------------------|---------------|------------------------------|---------------------------|
| | Planning | Hardware Installation | Software Installation | Configuration | Operation and Administration | Diagnosis and Maintenance |
| IBM TotalStorage FAST Storage Manager 8.4x Installation and Support Guide for Intel-based Operating System Environments, GC26-7621 | ✓ | | ✓ | ✓ | | |
| IBM TotalStorage FAST Storage Manager 8.4x Installation and Support Guide for AIX®, UNIX, and Solaris, GC26-7622 | ✓ | | ✓ | ✓ | | |
| IBM TotalStorage FAST Storage Manager Copy Services User's Guide, GC26-7561 | ✓ | | ✓ | ✓ | ✓ | |
| IBM FAST Storage Manager Script Commands (see product CD) | | | | ✓ | | |
| IBM TotalStorage FAST Fibre Channel Hard Drive and Storage Expansion Enclosure Installation and Migration Guide, GC26-7639 | ✓ | ✓ | | ✓ | | |
| IBM TotalStorage FAST Storage Manager Concepts Guide, GC26-7560 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

Getting information, help, and service

If you need help, service, or technical assistance or just want more information about IBM products, you will find a wide variety of sources available from IBM to assist you. This section contains information about where to go for additional information about IBM and IBM products, what to do if you experience a problem with your IBM @server xSeries™ or IntelliStation® system, and whom to call for service, if it is necessary.

Before you call

Before you call, make sure that you have taken these steps to try to solve the problem yourself:

- Check all cables to make sure that they are connected.
- Check the power switches to make sure that the system is turned on.
- Use the troubleshooting information in your system documentation and use the diagnostic tools that come with your system.
- Check for technical information, hints, tips, and new device drivers at the following Web site:
www.ibm.com/storage/techsup.htm
- Use an IBM discussion forum on the IBM Web site to ask questions.

You can solve many problems without outside assistance by following the troubleshooting procedures that IBM provides in the online help or in the documents that are provided with your system and software. The information that comes with your system also describes the diagnostic tests that you can perform. Most xSeries and IntelliStation systems, operating systems, and programs come with information that contains troubleshooting procedures and explanations of error messages and error codes. If you suspect a software problem, see the information for the operating system or program.

Using the documentation

Information about the xSeries or IntelliStation system and preinstalled software, if any, is available in the documents that come with your system. This includes printed documents, online documents, readme files, and help files. See the troubleshooting information in your system documentation for instructions on how to use the diagnostic programs. The troubleshooting information or the diagnostic programs might tell you that you need additional or updated device drivers or other software.

Web sites

IBM maintains pages on the World Wide Web where you can get the latest technical information and download device drivers and updates.

- For FAStT information, go to the following Web site:
www.ibm.com/storage/techsup.htm
The support page has many sources of information and ways for you to solve problems, including:
 - Diagnosing problems using the IBM Online Assistant
 - Downloading the latest device drivers and updates for your products
 - Viewing frequently asked questions (FAQ)
 - Viewing hints and tips to help you solve problems
 - Participating in IBM discussion forums
 - Setting up e-mail notification of technical updates about your products
- You can order publications through the IBM Publications Ordering System at the following web site:
www.elink.ibm.com/public/applications/publications/cgibin/pbi.cgi/
- For the latest information about IBM xSeries products, services, and support, go to the following Web site:
www.ibm.com/eserver/xseries/

- For the latest information about IBM pSeries products, services, and support, go to the following Web site:
www.ibm.com/eserver/pseries/
- For the latest information about the IBM IntelliStation information, go to the following Web site:
www.ibm.com/pc/intellistation/
- For the latest information about operating system and HBA support, clustering support, SAN fabric support, and Storage Manager feature support, see the TotalStorage FASTT Interoperability Matrix at the following Web site:
www.storage.ibm.com/disk/fastt/supserver.htm

Software service and support

Through IBM Support Line, for a fee you can get telephone assistance with usage, configuration, and software problems with xSeries servers, IntelliStation workstations, and appliances. For information about which products are supported by Support Line in your country or region, go to the following Web site:

www.ibm.com/services/sl/products/

For more information about the IBM Support Line and other IBM services, go to the following Web sites:

- www.ibm.com/services/
- www.ibm.com/planetwide/

Hardware service and support

You can receive hardware service through IBM Integrated Technology Services or through your IBM reseller, if your reseller is authorized by IBM to provide warranty service. Go to the following Web site for support telephone numbers:

www.ibm.com/planetwide/

In the U.S. and Canada, hardware service and support is available 24 hours a day, 7 days a week. In the U.K., these services are available Monday through Friday, from 9 a.m. to 6 p.m.

Fire suppression systems

A fire suppression system is the responsibility of the customer. The customer's own insurance underwriter, local fire marshal, or a local building inspector, or both, should be consulted in selecting a fire suppression system that provides the correct level of coverage and protection. IBM designs and manufactures equipment to internal and external standards that require certain environments for reliable operation. Because IBM does not test any equipment for compatibility with fire suppression systems, IBM does not make compatibility claims of any kind nor does IBM provide recommendations on fire suppression systems.

Table 8 on page 10 lists the environmental specifications for the FASTT100.

How to send your comments

Your feedback is important in helping us to provide the most accurate and high-quality information. If you have comments or suggestions for improving this publication, you can send us comments electronically by using these addresses:

- Internet: starpubs@us.ibm.com

- IBMLink from U.S.A.: STARPUBS at SJEVM5
- IBMLink from Canada: STARPUBS at TORIBM
- IBM Mail Exchange: USIB3WD at IBMMAIL

You can also mail your comments by using the Reader Comment Form in the back of this manual or direct your mail to

International Business Machines Corporation
Information Development
Dept. GZW
9000 South Rita Road
Tucson, AZ 85744-0001
U.S.A

Chapter 1. Introduction

This chapter describes the operating specifications, features, and components for the IBM TotalStorage Fibre Array Storage Technology (FAStT) FAStT100 storage server (hereafter referred to as FAStT100 or storage server). This chapter also includes a list of hardware that comes with the storage server.

Overview

IBM FAStT solutions support the large and growing data storage requirements of business-critical applications. These scalable IBM FAStT solutions offer you data access and protection to meet your existing enterprise storage requirements and prepare for the future.

The FAStT100 (Machine Type 1724, Model 100) is a rack-mountable storage server that comes with two RAID controllers, two power supplies, and two cooling units and provides dual, redundant controllers, redundant cooling, redundant power, and battery backup of the RAID controller cache. The FAStT100 is designed to provide maximum host and drive-side redundancy. Each RAID controller supports direct attachment of one host that contains one or two host adapters.

Designed for data archival, data reference, and near-line storage applications, the FAStT100 utilizes the latest Serial Advanced Technology Attachment (SATA) disk drive technology. The FAStT100 supports up to fourteen 1.5 Gbps 250 GB SATA disk drive modules, offering up to 3.5 terabytes (TB) of capacity per enclosure. You can configure RAID-protected storage solutions of up to 14 TB, providing economical and scalable storage for your rapidly growing application needs for limited access, data reference storage capacity. The FAStT100 is designed with redundant 2 Gbps fibre channel connections for expanding the FAStT100 storage capacity to SATA hard drives in external EXP100 drive expansion enclosures.

The FAStT100 supports redundant configurations with FAStT EXP100 expansion units. External cables and small form-factor pluggable (SFP) modules connect the storage server to the expansion unit. The FAStT100 can be used in storage area networks to satisfy the needs of various fixed content, data reference applications that require large amounts of storage capacity but do not have the high utilization and access characteristics satisfied by fibre channel disk drive storage. The storage server provides continuous, reliable service, using hot-swap technology for easy replacement without shutting down the system. Up to three FAStT EXP100 units can be connected together with the FAStT100 in a fibre-channel loop, providing connections to a maximum of 56 hard drives. Contact your IBM support representative for information about the availability of future support for connecting more than three FAStT EXP100 units.

Note: SATA hard drive CRUs cannot be interchanged with the fibre-channel hard drive CRUs that are supported in other FAStT storage products.

Attention

To ensure proper operation when connecting EXP100 expansion units to the FASTt100, you must verify that the EXP100 ESM firmware level is at level 9551 or later. If the ESM firmware level is lower than 9551, disconnect the EXP100 and contact IBM support, your IBM reseller, or your IBM representative for assistance. See the *IBM TotalStorage FASTt EXP100 Expansion Unit Installation and User's Guide* for details on how to determine ESM firmware versions.

Fibre channel defined

Fibre channel technology is outlined in the *SCSI-3 Fibre Channel Protocol* (SCSI-FCP) standard. Fibre channel is a high-speed data transport technology that is used for mass storage and networking.

Using a fibre-channel arbitrated loop (FC-AL), more than 100 fibre-channel devices¹ can be supported, compared to 15 small computer system interface (SCSI) devices. The connection from the FASTt100 to the FASTt EXP100 is a 2 Gb fibre-channel device that supports data transfer rates up to 200 MBps half-duplex and 400 MBps full-duplex on optical interfaces.

SATA defined

The Serial Advanced Technology Attachment (SATA) interface offers increased data rate performance over Parallel Advanced Technology Attachment (ATA), while maintaining the benefits of ATA. SATA is designed to overcome the performance barriers that have been forecasted for current parallel technologies while maintaining the cost-efficiency of Parallel ATA. SATA specifications allow for thinner, more flexible cables, and lower pin counts. It also enables easier, more flexible cable routing management and the use of smaller connectors than is possible with the existing Parallel ATA technology.

The Serial ATA Working Group introduced the first SATA specification, Serial ATA 1.0, in 2001 (<http://www.serialata.org>).

Product updates

You should download the latest version of the FASTt Storage Manager host software and the FASTt storage server controller firmware (and, if you are connecting EXP100 expansion units to the FASTt100 storage server, the EXP100 ESM firmware and the EXP100 disk drive firmware) at the time of the initial installation and when product updates become available.

To be notified of important product updates, you must first register at the IBM Support and Download Web site:

www.ibm.com/servers/storage/support/fastt

1. For the FASTt100, each drive is considered to be a device in a fibre-channel loop, even though the FASTt100 drive interface is SATA (not fibre channel). The EXP100 ESM and the FASTt100 controller and SATA hard drive interposer convert SATA interface protocol to fibre channel protocol.

Go to the **Personalized Support** section of the web page and click **My Support**. On the next page, go to the **We use IBM Registration** section. To register to use this site, click **Register**.

Perform the following steps to receive product updates:

1. Once you have registered, type your user ID and password to log into the site. The Welcome page opens.
2. In the Select a Product Family pull-down menu, scroll down to the listing of hardware topics and select **Computer Storage**. Click **Go**. The Computer Storage page opens.
3. Scroll down to the Disk Storage Systems category and check the box for 1724 (and 1710 if you are connecting EXP100 expansion units to the FAST100). Check the boxes for any other FAST products for which you would like to receive information. Scroll to the bottom of the page and select **Save and Return**. The main page opens.
4. Select your mail preferences. Select **Flashes and Downloadable files** to receive important information about product updates. Click **Submit**. You should see a confirmation at the bottom of the page that indicates that your profile was successfully updated.

Features at a glance

Table 7 summarizes the features of the storage server. For a list of the operating specifications, such as weight, height, and heat output, see Table 8 on page 10.

Table 7. Features at a glance

| | | |
|---|---|--|
| <p>General</p> <ul style="list-style-type: none"> • Modular components: <ul style="list-style-type: none"> – High-capacity SATA disk drives – RAID controllers – Power supplies – Cooling fans • Technology: <ul style="list-style-type: none"> – Support for disk arrays – Support for clustering – Fibre channel host interface – Redundant data storage, cooling system, power system, and RAID controllers – Hot-swap technology for drives, power supplies, fans, and RAID controllers | <ul style="list-style-type: none"> • User interface: <ul style="list-style-type: none"> – Built-in power, activity, and fault Light Emitting Diodes (LEDs) – Identification labeling on customer replaceable units (CRUs), rear LEDs, switches, and connectors – Easy-to-replace drives, power supplies, RAID controllers, and fans <p>Disk drive storage</p> <p>1.5 Gbps SATA drive enclosure Maximum drives per storage server: 14</p> <p>Attached Expansion Units</p> <p>2 Gb connection only</p> | <p>RAID controllers</p> <ul style="list-style-type: none"> • Technology and interfaces: <ul style="list-style-type: none"> – Fibre channel: 40-pin FC disk drives – Fibre channel interface: six small form-factor pluggable (SFP) modules for incoming and outgoing FC cables (three SFPs on each RAID controller) – Two 1 Gbps/2 Gbps (auto-negotiated) fibre channel host side connections per controller |
|---|---|--|

Clustering support

Clustering is a means of sharing array groups among controllers to provide redundancy of controllers and servers. This redundancy is important if a hardware component fails. If a hardware component failure occurs in a cluster, another server takes ownership of the array group.

Clustering requires software specific to your operating system. For more information about clustering, go to the following Web site:

www.pc.ibm.com/us/compat/nos/cert.shtml

Inventory checklist

The FAStT100 ships with the following items:

- Two RAID controllers
- Two fan units
- Two power supplies
- Two line cord jumpers
- 14 filler panels
- One rack-mounting hardware kit, including:
 - Two rails (right and left assembly)
 - Eight M6 black hex-head slotted screws
- 14 blank trays (your storage server might come with up to 14 hard disk drives)
- Box ID labels (used to label the storage server IDs on the front of the FAStT100)

Attention:

The FAStT100 does not ship with region-specific power cords. You must obtain the IBM-approved power cords for your region. See Appendix C, “Power cords,” on page 109 for the IBM-approved power cords for your region.

A rack mounting template and instructions for installing the support rails and the storage server are provided in this book in Chapter 2, “Installing the storage server,” on page 13.

To connect your FAStT100 to other devices, use the following options:

- IBM SFP module
- IBM LC-LC fibre-channel cable
- IBM LC-SC fibre-channel cable (for host-side connections only)

Note: You must order these options separately.

Software and documentation

- IBM FAStT Storage Manager Version 8.42 CD including client software and firmware, and online help and publications in Adobe Acrobat Portable Document Format (PDF)

For a list of available IBM FAStT publications, see “FAStT Storage Server publications” on page xviii.

- Fibre channel cabling instructions

If an item is missing or damaged, contact your IBM reseller or your IBM marketing representative.

If you have not already done so, record your storage server serial number in the table in Appendix A, “Records,” on page 103. The serial number is located on a label at the rear of the FAStT100. The machine and model number are found on the product information label above the serial number.

Best practices guidelines

To ensure optimal operation of your system, always follow these best practices guidelines:

- Back up the data on your storage drives periodically.

- To maintain power redundancy, plug the storage server's right and the left power supplies into two independent external power circuits through ac distribution units inside a rack cabinet or directly into external receptacles. Similarly, the right and left power supplies of the FAStT drive enclosures attached to the FAStT100 should be plugged into the same two independent external power circuits as the FAStT100. This ensures that the FAStT100 and all its attached drive enclosures will have power if only one power circuit is available. In addition, having all the right or all the left power supplies plug into the same power circuit enables the components in the storage subsystem to power on simultaneously during an unattended restoration of power. See Figure 47 on page 52 for an example of redundant power connections.
- Before any planned system shutdown or after any system changes (additions, removals, or modifications), save controller subsystem profiles as explained in the storage manager guide for your operating system.
- Ensure that your system is in an optimal state before you shut it down. Never turn the power off if any fault light is lit; be sure to resolve any error conditions before you shut down the system.
- During any maintenance or attended power-up procedure, carefully follow the power-up sequence listed in "Turning on the storage server" on page 57. Check that each component of the subsystem is powered-on in the proper order during this entire power-up procedure to ensure the controller will be able to optimally access all of your storage subsystems.
- The storage subsystem supports simultaneous power-up to the system components; however, you should always follow the power-up sequence listed in "Turning on the storage server" on page 57 during any attended power-up procedure.
- A storage system in an optimal state should recover automatically from an unexpected shutdown and unattended simultaneous restoration of power to system components. After power is restored, call IBM support if any of the following conditions occur:
 - The storage subsystem logical drives and arrays are not displayed in the Storage Manager graphical user interface (GUI).
 - The storage subsystem logical drives and arrays do not come online.
 - The storage subsystem logical drives and arrays seem to be degraded.

Storage server components

The following sections show the components of the storage server.

The hot-swap features of the storage server enable you to remove and replace hard disk drives, power supplies, RAID controllers, and fans without turning off the storage server. Therefore, you can maintain the availability of your system while you remove, install, or replace a hot-swap device.

Hot-swap drive bays

The hot-swap drive bays that are accessible from the front of your storage server are shown in Figure 2 on page 6.

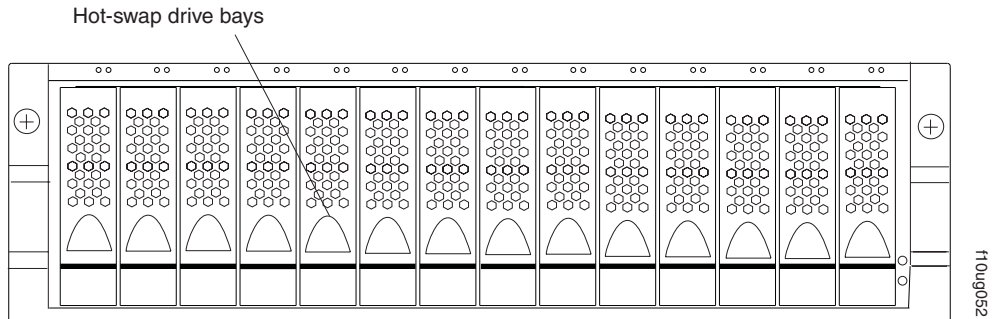


Figure 2. FAST100 hot-swap drive bays

The FAST100 supports up to 14 FAST 1.5 Gbps SATA hard disk drives. These drives are preinstalled in drive trays. The unit consisting of the drive and the drive carrier assembly is called a *drive CRU*. The SATA drive CRU includes the drive tray, the SATA drive, and the hard disk drive (HDD) interposer card. You install the drive CRUs in the 14 drive bays on the front of the storage server. There are no serviceable parts in a drive CRU. If it fails, it must be replaced in its entirety (drive, interposer, bezel, and tray).

Attention:

1. Never hot-swap a drive CRU when its associated green Activity LED is flashing. Hot-swap a drive CRU only when its associated amber Fault LED lights and is not flashing or when the drive is inactive and its associated green Activity LED lights and is not flashing.
2. The SATA drive and its HDD card are digitally signed together at the factory. Do not swap drives and interposers between drive CRUs. Do not replace one SATA drive with another SATA drive. These actions will result in a drive CRU that cannot be recognized by the storage server RAID controller.

Note: If the hard disk drive you want to remove is not in a failed or bypass state, always use the Storage Manager client program either to place the drive in a failed state or to place the array that is associated with the drive (or drives) in an offline state before you remove the drive from the enclosure.

Front controls and indicators

This section describes the primary controls on the front of the storage server. The locations of these primary controls are shown in Figure 3.

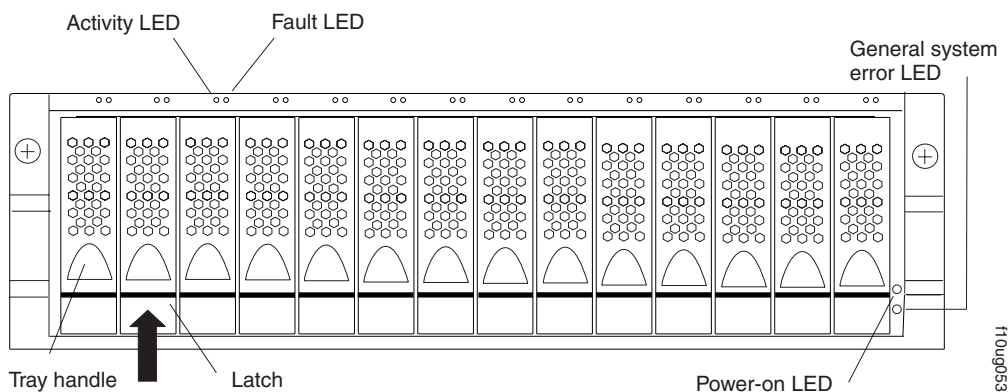


Figure 3. Front controls and indicators

The FAStT100 has blank trays in the unused drive bays. To begin installing new drives, you must first remove the blank trays and save them. Each of the 14 bays must always contain either a blank tray or a drive CRU. You can install up to 14 hot-swap drive CRUs in the storage server.

- **Activity LED:** Each drive CRU has an associated Activity LED on the FAStT100 chassis. A flashing green LED indicates drive activity. A solid green LED indicates that the drive is properly installed and powered on.
- **Fault LED:** Each drive CRU has an associated Fault LED on the FAStT100 chassis. A solid amber LED indicates a drive failure. A flashing amber LED indicates that a drive identify process is in progress.
- **General system error LED:** A solid amber LED indicates that the unit has a power supply, fan unit, or hard disk drive error.
- **Latch:** Use this multipurpose latch to release or lock the drive CRU in place.
- **Power-on LED:** A solid green LED indicates that the storage server has dc power.
- **Tray handle:** Use this multipurpose handle to insert and remove a drive CRU in the bay.

Back view

Figure 4 shows the components at the back of the storage server.

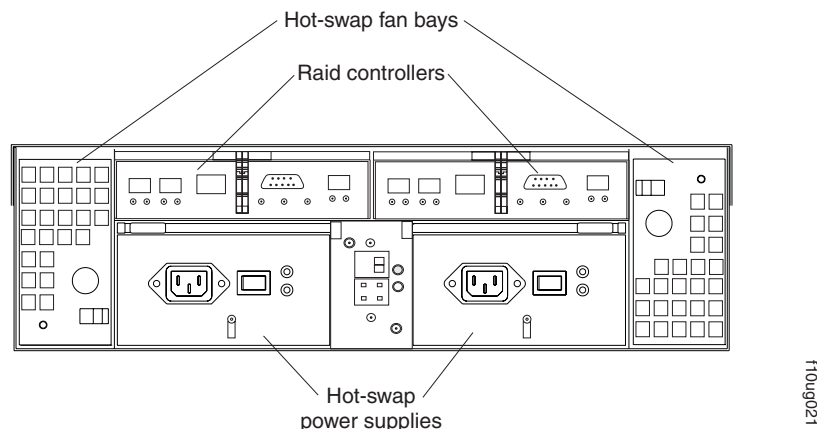


Figure 4. Back view of FAStT100 storage server

RAID controller

Each RAID controller contains three ports for Small Form-Factor Pluggable (SFP) modules that connect to the fibre channel cables. Two of the SFP ports (labelled *Host 1* and *Host 2*) are for host server attachment. The third SFP port (labeled *Expansion*) is used to connect additional expansion units to the storage server.

Each RAID controller also contains a battery to maintain cache data in the event of a power failure. For more information, see “Cache memory and RAID controller battery” on page 66.

Hot-swap fans

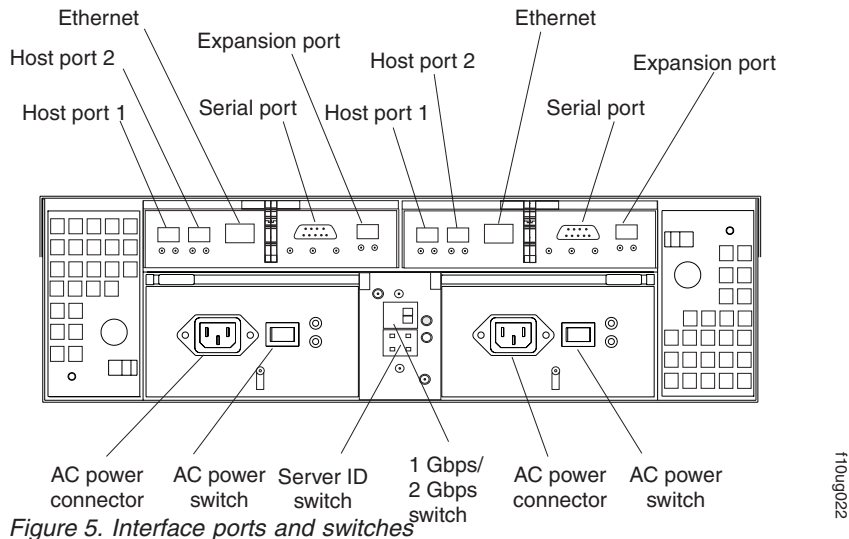
The storage server has two interchangeable hot-swap and redundant fan CRUs. Each fan CRU contains two fans. If one fan CRU fails, the second fan CRU continues to operate. You must install both fan CRUs to maintain proper cooling within the storage server, even if one fan CRU is not operational.

Hot-swap power supplies

The storage server comes with two hot-swap power supplies. You must install both power supplies to maintain proper cooling.

Interface ports and switches

Figure 5 shows the ports and switches on the back of the storage server.



RAID controller

Each RAID controller contains several connectors and LEDs. Each controller has two host ports and one expansion port for connecting the storage server to hosts or expansion units. You first insert SFPs into the ports and then connect the fibre channel cables.

Host ports

The host ports (labelled *Host 1* and *Host 2*) are used to connect a fibre channel cable from the host systems. You first insert an SFP into the port and then connect a fibre channel cable. The two host ports in each controller are independent. They are not connected in the controller module as they would be in a hub configuration. The host port connections can auto-negotiate between 1 Gbps and 2 Gbps.

Ethernet port

The Ethernet port is used for an RJ-45 10BASE-T or 100BASE-T Ethernet connection to each controller. Use the Ethernet connection to directly manage the FAStT100.

Expansion port

The expansion port (labelled *Expansion*) is used to connect additional expansion units to the RAID controllers. You first insert an SFP into the port and then connect a fibre channel cable.

Serialport

The serial port is used by service personnel to perform diagnostic operations on the RAID controllers. Incorrect use of the serial port can result in loss of data access and, in some cases, in loss of data.

Server ID switch (Enclosure ID switch)

The Server ID (also referred to *Enclosure ID*) switch settings range from 0 through 7. When connecting the FAStT100 to EXP100 drive enclosures, only the unique IDs ranging from 00 through 07 can be set.

Attention: When connecting the FAStT100 to EXP100 drive enclosures, DO NOT use the tens digit (x10) setting. Use only the ones digit (x1) setting to set unique server IDs or enclosure IDs. For more information, see “Server ID (Enclosure ID) settings” on page 29.

1 Gbps/2 Gbps switch

The default switch setting is 2 Gbps. This is the *only* speed setting that is allowed for the FAStT100.

Attention: Do not remove the metal plate that covers the storage server speed setting. Do not adjust the storage server speed setting.

Storage server operating environment

This section provides general operating information about the FAStT100. All components plug directly into the backplane.

FAStT100 specifications

Table 8 lists the specifications for the FAStT100.

Table 8. IBM TotalStorage FAStT100 specifications

| | |
|---|---|
| <p>Size</p> <ul style="list-style-type: none"> • Width: 48.1 cm (18.97 in.) • Height: 13.2 cm (5.21 in.) • Depth: 59.7 cm (23.52 in.) <p>Weight</p> <ul style="list-style-type: none"> • Drive-ready weight (without disk drive modules installed): 26.5 kg (58.3 lb) • Fully configured weight (with 14 disk drives installed): 40.8 kg (85.7 lb) <p>Electrical input</p> <ul style="list-style-type: none"> • Sine-wave input (50 - 60 Hz) is required • Input voltage low range: <ul style="list-style-type: none"> – Minimum: 90 V ac – Maximum: 127 V ac • Input voltage high range: <ul style="list-style-type: none"> – Minimum: 198 V ac – Maximum: 257 V ac • Input kilovolt-amperes (kVA), approximately: <ul style="list-style-type: none"> – Minimum configuration: 0.06 kVA – Maximum configuration: 0.39 kVA <p>Environment</p> <ul style="list-style-type: none"> • Air temperature <ul style="list-style-type: none"> – Operating: <ul style="list-style-type: none"> - Altitude: 0 - 914 m (3000 ft): 10° - 35° C (50° - 95° F) - Altitude: 914 m - 2133 m (3000 - 7000 ft): 10° - 32° C (50° - 90° F) <p style="margin-left: 20px;">Important: The recommended operating environment air temperature is 22° C (72° F) or lower.</p> <ul style="list-style-type: none"> – Storage: <ul style="list-style-type: none"> - Altitude: 0 - 914 m (3000 ft): 1° - 60° C (33° - 140° F) • Humidity <ul style="list-style-type: none"> – 8% - 80% – Noncondensing | <p>Heat dissipation</p> <ul style="list-style-type: none"> • Fully configured storage server (14 1.5 Gbps SATA hard disk drives) <ul style="list-style-type: none"> – 1088 BTU per hour <p>Acoustical noise emission values</p> <p>For open bay (0 drives installed) and typical system configurations (eight hard disk drives installed):</p> <ul style="list-style-type: none"> • Sound power (idling): <ul style="list-style-type: none"> – 5.9 bel (open bay) – 6.1 bel (typical) • Sound power (operating): <ul style="list-style-type: none"> – 5.9 bel (open bay) – 6.2 bel (typical) • Sound pressure (idling): <ul style="list-style-type: none"> – 44 dBA (open bay) – 46 dBA (typical) • Sound pressure (operating): <ul style="list-style-type: none"> – 44 dBA (open bay) – 47 dBA (typical) <p>These levels are measured in controlled acoustical environments according to ISO 7779 and are reported in accordance with ISO 9296. The declared sound power levels indicate an upper limit, below which a large portion of machines operate. Sound pressure levels in your location might exceed the average 1-meter values stated because of room reflections and other nearby noise.</p> |
|---|---|

Notes:

1. The nonoperating environment must not exceed the operating environment limits for longer than 60 days.
2. The storage environment must not exceed the operating environment limits for longer than 1 year.

3. Substantial deviations from the suggested operating range, in either direction, if sustained for extended periods of time, will expose the unit to greater risk of failure from external causes.

Heat output, airflow, and cooling

The maximum heat output of the FAStT100 is 390 watts (1088 BTU/hr). Each FAStT100 rack-mounted unit requires an airflow of 2.5 m³ (87 ft³) per minute. The input air temperature to all racks should be in the range 10° C - 35° C (50° F - 95° F). The recommended operating temperature is 22° C (72° F).

When racks that contain many FAStT100s are to be installed together, the following requirements must be met to ensure that the FAStT100s are adequately cooled:

- Air enters at the front of the rack and leaves at the back. To prevent the air that is leaving the rack from entering the intake of another piece of equipment, you must position the racks in alternate rows, back-to-back and front-to-front. This arrangement is known as “cold aisle/hot aisle” and is shown in Figure 6 on page 12.
- Where racks are in rows, each rack must touch the rack that is next to it to reduce the amount of hot air that can flow around from the back of the rack into the intakes of the storage servers that are in that rack. You should use Suite Attach Kits to completely seal any gaps that remain between the racks. For details about Suite Attach Kits, contact your marketing representative.
- Where racks are in rows front-to-front or back-to-back, a gap of at least 1220 mm (48 in.) must separate the rows across the cold aisle.
- To ensure correct airflow in each rack, the rack filler plates must be installed in unused positions. Also, all the gaps in the front of the racks must be sealed, including the gaps between the storage servers.

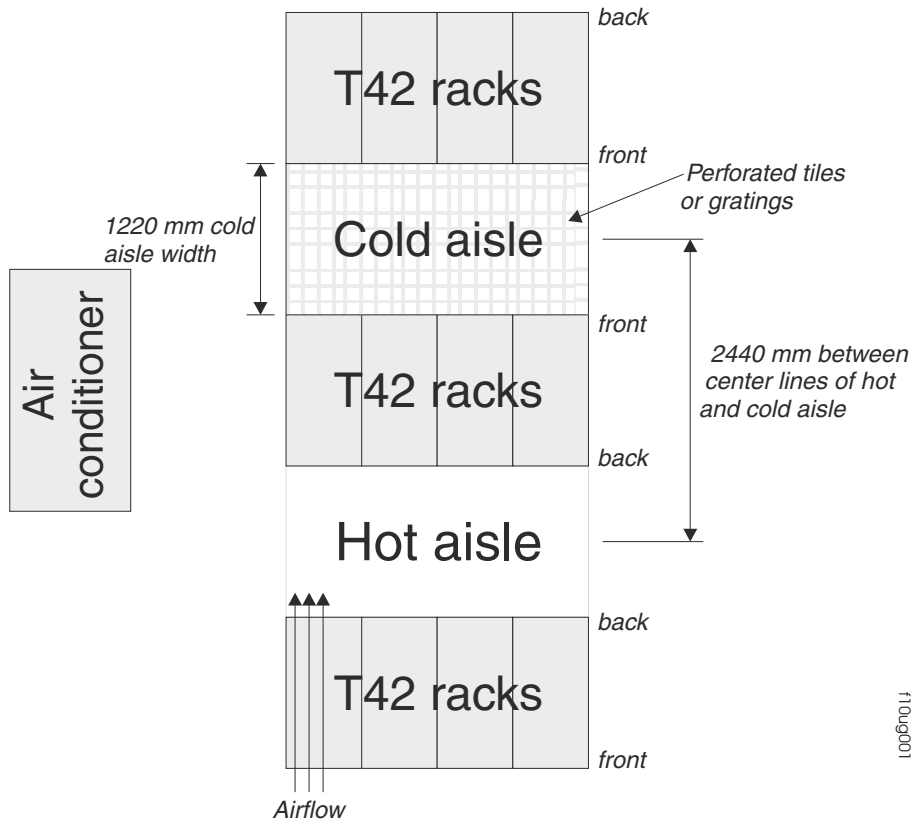


Figure 6. Example of cold aisle/hot aisle rack configuration

Chapter 2. Installing the storage server



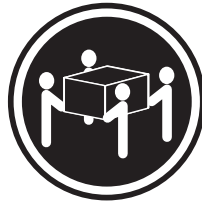
This chapter provides the information that you need to prepare the FAStT100 for installation into a rack cabinet. This chapter also contains information about cabling, setting interface options, and installing optional cables.

The following sequence summarizes the installation steps you will perform in this chapter.

1. Prepare the installation site and the rack cabinet. Unpack the FAStT100 and other hardware from the shipping box. See “Preparing for installation” on page 14.

Statement 4:



| | | |
|---|--|---|
|  |  |  |
| ≥ 18 kg (39.7 lb) | ≥ 32 kg (70.5 lb) | ≥ 55 kg (121.2 lb) |

CAUTION:

Use safe practices when lifting.

Attention: The fully configured FAStT100 weighs up to 40.8 kg (85.7 lbs). At least two other people should help you lift the FAStT100 from the shipping box. If desired, open the sides of the shipping box and remove the CRUs from the FAStT100 before you lift it from the shipping box in order to lighten the storage server. See “Removing the CRUs” on page 20.

2. Install the support rails in the rack. See “Installing the support rails” on page 18.
3. If necessary, remove the CRUs from the FAStT100. See “Removing the CRUs” on page 20.
4. Install the FAStT100. See “Installing the FAStT100 into a rack” on page 24. If necessary, replace the CRUs in the FAStT100. See “Replacing the FAStT100 CRUs” on page 25.
5. Set the FAStT100 interface options. See “Setting the interface options” on page 28.
6. If required, cable the FAStT100 to other FAStT EXP100s. See Chapter 3, “Cabling the storage server,” on page 39.
7. Install the FAStT Storage Manager 8.42 host software. Refer to the *IBM TotalStorage FAStT Storage Manager 8.4x Installation and Support Guide* for the appropriate operating system for instructions on how to install the FAStT Storage Manager 8.42 host software.
8. Turn on the FAStT100. See “Turning the storage server on and off” on page 57.
9. Use the FAStT Storage Manager 8.42 host software to verify the configuration.

Handling static-sensitive devices

Attention: Static electricity can damage electronic devices and your system. To avoid damage, keep static-sensitive devices in their static-protective packages until you are ready to install them.

To reduce the possibility of electrostatic discharge, observe the following precautions:

- Limit your movement. Movement can cause static electricity to build up around you.
- Handle the device carefully, holding it by its edges or its frame.
- Do not touch solder joints, pins, or exposed printed circuitry.
- Do not leave the device where others can handle and possibly damage the device.
- While the device is still in its static-protective package, touch it to an unpainted metal part of the system unit for at least two seconds. This drains static electricity from the package and from your body.
- Remove the device from its package and install it directly into your system unit without setting it down. If it is necessary to set the device down, place it in its static-protective package. Do not place the device on your system unit cover or on a metal table. Take additional care when handling devices during cold weather because heating reduces indoor humidity and increases static electricity.




Preparing for installation

Complete the following steps to prepare the FAStT100 for installation into a rack cabinet.

1. Prepare the site to meet all area, environmental, power, and site requirements. For more information, see “Storage server operating environment” on page 9.
2. Move the FAStT100 to the site.

Statement 4:



| | | |
|---|---|---|
|  |  |  |
| ≥ 18 kg (39.7 lb) | ≥ 32 kg (70.5 lb) | ≥ 55 kg (121.2 lb) |

CAUTION:
Use safe practices when lifting.

3. Remove the FAStT100 from its shipping container and check the contents (see “Inventory checklist” on page 4). If any items are missing, contact your IBM reseller before proceeding.
4. Assemble the tools and equipment that you will need for installation. These might include:

- The power cords that are shipped with the FAStT100
 - Number 2 Phillips and medium flat-blade screwdrivers
 - Antistatic protection (such as a grounding wrist strap)
 - Fibre channel (FC) and Ethernet interface cables and cable straps
 - SFP modules
 - The rack-mounting hardware that ships with the FAStT100
 - The IBM FAStT Storage Manager Version 8.42 CD, which includes the IBM FAStT Storage Manager 8.42 software and FAStT storage server controller firmware 05.42.xx.xx that ships with the FAStT100. You use this software to configure the storage subsystems.
5. Continue with “Preparing the site.”

Preparing the site

This section lists the floor space requirements and weight information for the FAStT100. For information on interface cables and connections, see Chapter 3, “Cabling the storage server,” on page 39.

Floor space: The floor area at the installation site must provide the following conditions:

- Enough stability to support the weight of the fully configured FAStT100 and associated systems
- Sufficient space to install the FAStT100

Weight: The FAStT100 total weight depends on the number of FAStT 1.5 Gbps SATA hard disk drives that are installed. A fully configured FAStT100 with two fans, two power supplies, two RAID controllers, and up to 14 SATA hard disk drives installed weighs 40.8 kg (85.7 lbs).

Continue with “Preparing the rack.”

Preparing the rack

Important: Before you install the FAStT100 in a rack, keep in mind the following considerations:

- Review the documentation that comes with your rack enclosure for safety and cabling considerations.
- Install the FAStT100 in a recommended 22° C (72° F) environment.
- To ensure proper airflow, do not block the air vents; 15 cm (6 in.) of air space is sufficient.
- To ensure rack stability, load the rack starting at the bottom.
- If you install multiple components in the rack, do not overload the power outlets.
- Always connect the storage server to a properly grounded outlet.
- Always connect the rack power distribution units (PDUs) to at least two different power circuits or sources.

Complete the following steps to prepare the rack before you install the FAStT100:

1. Move, unpack, and level the rack at the installation site (if needed).
2. Remove the external rack panels.
3. If necessary, stop all I/O activity to the devices in the rack.
4. If necessary, turn off all drive enclosure and rack power. Disconnect existing power, network, and other external cables.

5. Install any additional interface cables and power cables.

After you have completed these steps, continue with “Installing the FAStT100.”

Installing the FAStT100

This section provides instructions on how to install the FAStT100 in a rack.

Rack mounting template

Attention: Duplicate copies of the rack mounting templates are provided in Appendix B, “Rack mounting template,” on page 105. If you want to tear out the templates from this document for easier use, use the copies in Appendix B, “Rack mounting template,” on page 105 rather than the copies provided in this section.

Use the following templates (Figure 7 on page 17 and Figure 8 on page 18) to identify the proper locations for inserting M6 screws when mounting the support rails and FAStT100 to a rack. The locations for the M6 screws are highlighted in the templates.

The FAStT100 is 3 U high. Align the template with the rack at a U boundary. U boundaries are shown as horizontal dashed lines in the rack mounting templates.

Note: The mounting holes that are shown in the following templates are square. The holes in your rack might be round, square, or threaded.

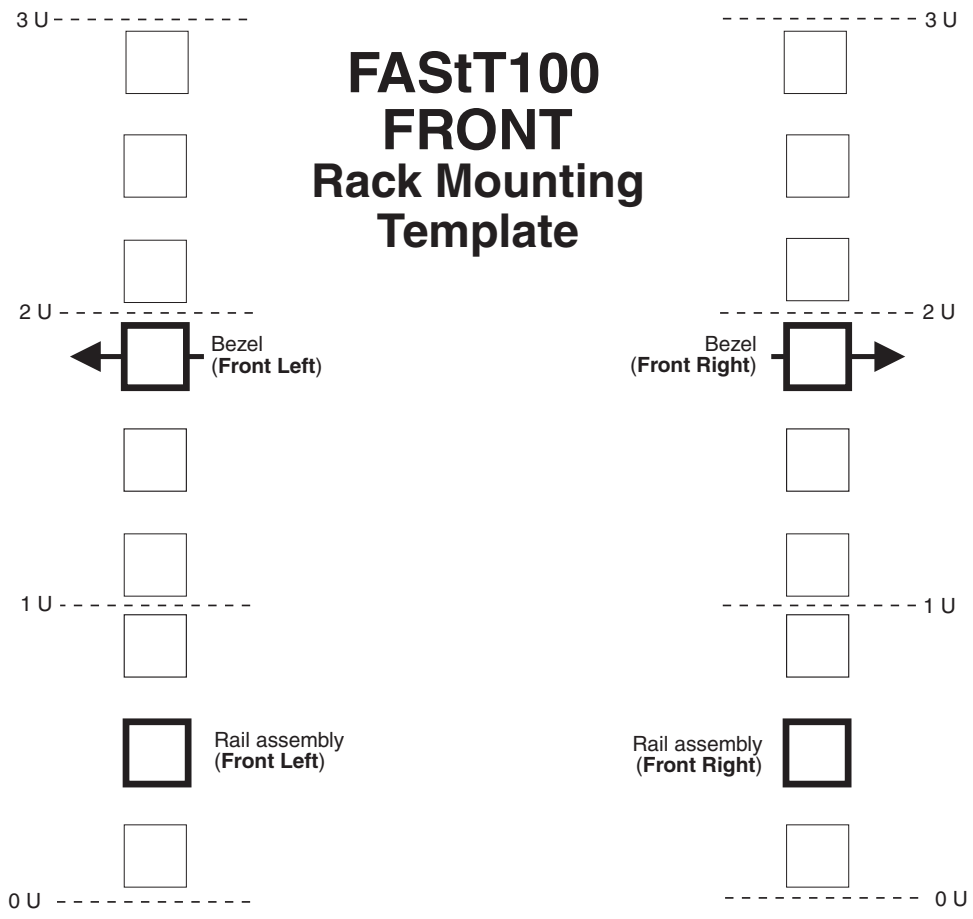


Figure 7. Front rack mounting template

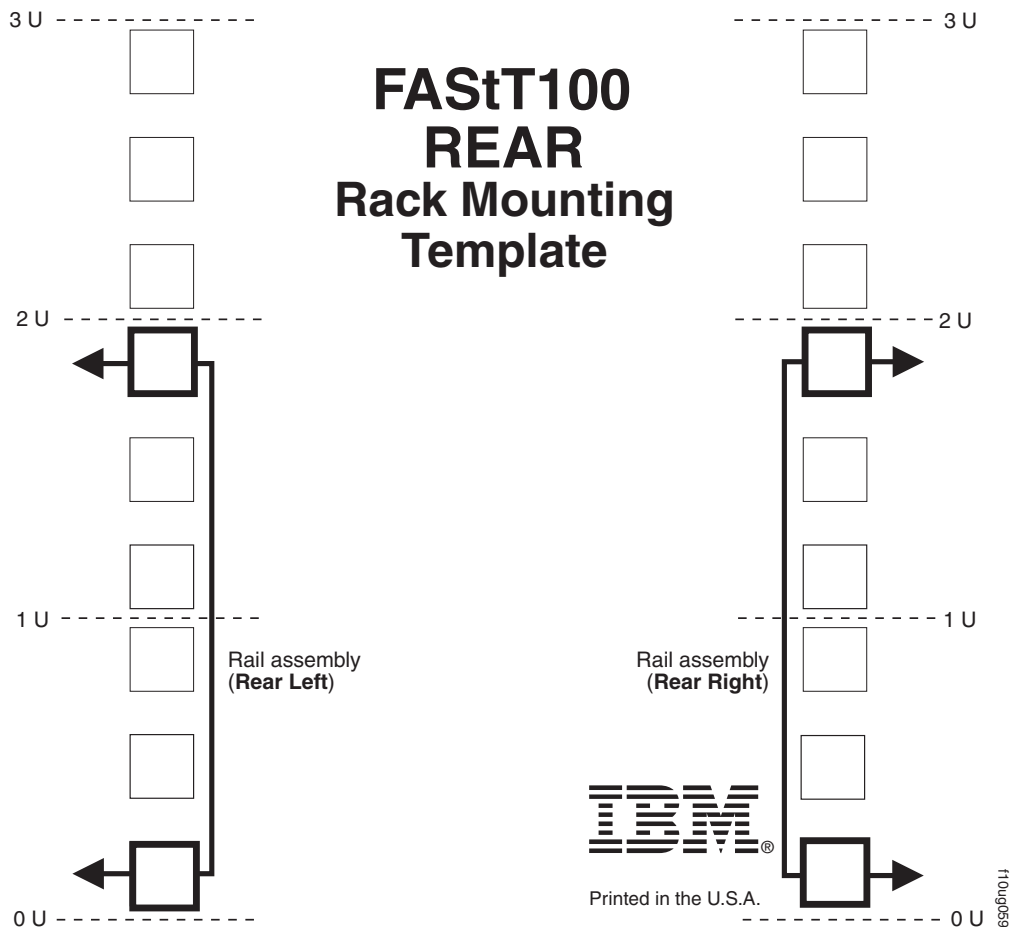


Figure 8. Rear rack mounting template

Installing the support rails

Before installing the FASTt100 in a rack, you must install the rails and rack-mounting hardware that come with your storage server. The FASTt100 requires an Electronic Industries Association (EIA) 310-D Type A 19-inch rack cabinet. The distance between EIA rails, from the front to the rear of the rack, is 60.96 cm (24 in.) minimum and 81.28 cm (32 in.) maximum. This rack conforms to the EIA standard. Where you place the support rails in the rack depends on where you intend to position the storage server.

Complete the following steps to install the support rails:

Note: Refer to Figure 10 on page 20 while performing these steps.

1. Ensure that the rack has already been installed.
2. Ensure that a stabilizer has been correctly attached to the bottom front of the rack to prevent the rack from tipping forward while the FASTt100 is being installed.

Refer to the installation and service guide, or equivalent, for the rack as required.

3. Locate the two support rails and six of the eight M6 screws that are supplied with the FASTt100.

Attention: Both support rails are shipped with three screws and spacers, called *alignment pins*, already installed at the front of each rail. They have been inserted in the front of each support rail as guides to indicate where *not* to use M6 screws when you attach the front of the support rail to the rack. See Figure 9.

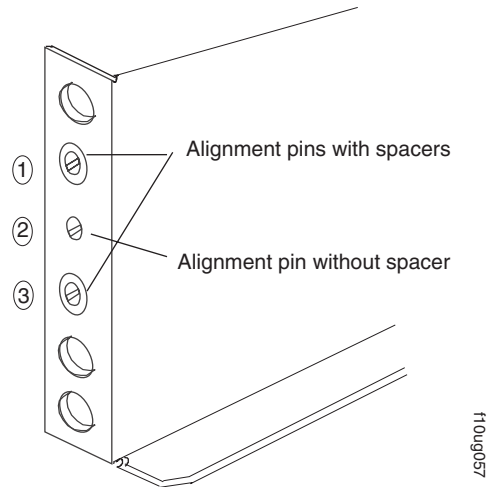


Figure 9. Alignment pins with and without spacers

Depending on which type of rack mounting flange is present on your rack, you might have to remove some or all of the spacers. For example, if the rack in which you are installing the support rails has round holes, you will need to remove the spacers from the top and bottom alignment pins so that the rail sits flush with the rack. See Table 9.

Table 9. Alignment pin requirements for different rack flange hole types

| Rack flange type | Pins to remove |
|------------------|----------------|
| Square hole | None |
| Round hole | 1 and 3 |
| Threaded hole | All |

- The rack-mounted unit is three EIA units high. Decide accordingly where you are going to install the support rails.

Attention: Use the rack mounting template provided in Figure 7 on page 17 and Figure 8 on page 18 to locate the proper rack mounting holes for installing the support rails into the rack.

Note the following considerations before you choose where to install the rails:

- If you are installing the FAStT100 into an empty rack, install it into the lowest available position so that the rack does not become unstable.
- If you are installing more than one FAStT100 in the rack, start at the lowest available position, and work upward.
- If appropriate, allow for possible later installation of other units.
- If necessary, remove the rack power distribution unit before you install the support rails.
- For procedures and more information, refer to the installation and service guide, or equivalent, for the rack.

- Starting with the left rail, remove and save the 6/32 in. screw (**5**). Loosen the four rail adjustment screws (**2**).

Note: The support rails are not marked as Left or Right. However, each rail can be correctly mounted on only one side of the rack cabinet. The rails should be mounted with the alignment pins at the front of the rack. Figure 10 shows the installation of the left support rail.

- Hold the front of the rail against the inside of the right rack-mounting flange and loosely tighten the lower M6 screw (**4**). See Figure 7 on page 17 for the location for this screw.
- Extend the rear of the support rail until it makes contact with the rear rack rail.
- From the rear of the rack, thread and tighten two M6 screws (**1**) (see Figure 8 on page 18 for the location for these screws). From the front of the rack, finish tightening the front M6 screw (**4**).

When you are finished, the rail should be attached to the cabinet using one M6 screw in the front (inserted at the second-to-lowest hole) and two M6 screws at the back.

- Repeat step 5 through step 8 for the right rail.

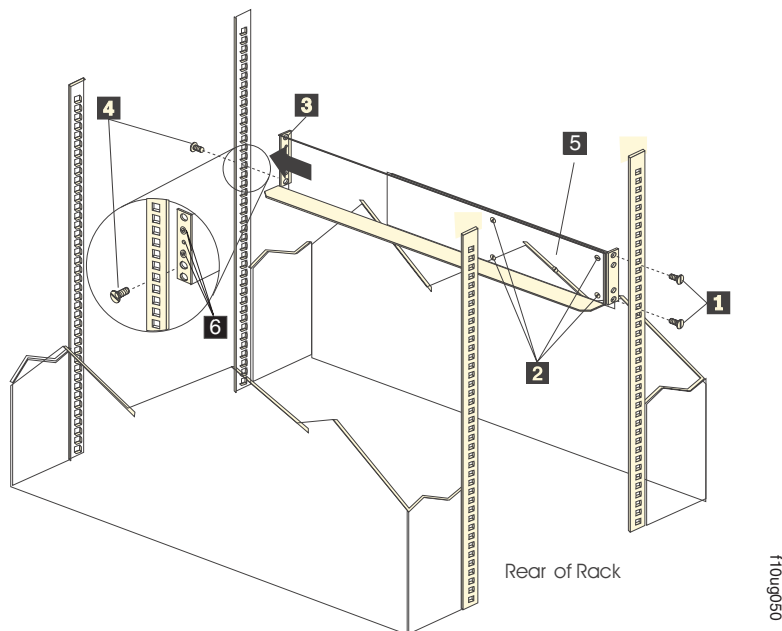


Figure 10. Installing the support rails

- Tighten the rail adjustment screws **2** on both rails.
- Continue with “Removing the CRUs.”

Removing the CRUs

Attention: This section describes how to remove the CRUs in order to minimize the weight of the FAST100 before you install it in the rack. However, if you have three or more people available to lift and install the FAST100 in a rack, you might not find it necessary to remove the CRUs before you install the FAST100. If this is the case, you can skip the CRU removal instructions provided in this section. Instead, continue with “Installing the FAST100 into a rack” on page 24, and then skip the CRU replacement instructions provided in “Replacing the FAST100 CRUs” on page 25.

Use the following procedures to remove the CRUs from the FAStT100 before installation. Use these instructions after you have completed all applicable site, rack, and FAStT100 preparations (as discussed in “Preparing for installation” on page 14) and installed the support rails (as discussed in “Installing the support rails” on page 18). Alternately, if necessary, you can use these instructions to lighten the FAStT100 before removing it from the shipping box. The shipping box opens to provide access to the storage server CRUs.




The FAStT100 comes with a rack-mounting hardware kit for installing it in a rack. It is easier to lift the FAStT100 and install it in a rack cabinet if you remove all the CRUs first. You will need an antistatic wrist strap and a cart or level surface (to hold the CRUs). Observe the precautions listed in “Handling static-sensitive devices” on page 14. In the following procedure, you will remove the following CRUs from the storage server before you install it in the rack:

- RAID controllers
- Power supplies
- Fans
- Hot-swap hard disk drives

You do not need to remove the blank trays.

Statement 4:



| | | |
|---|--|---|
|  |  |  |
| ≥ 18 kg (39.7 lb) | ≥ 32 kg (70.5 lb) | ≥ 55 kg (121.2 lb) |

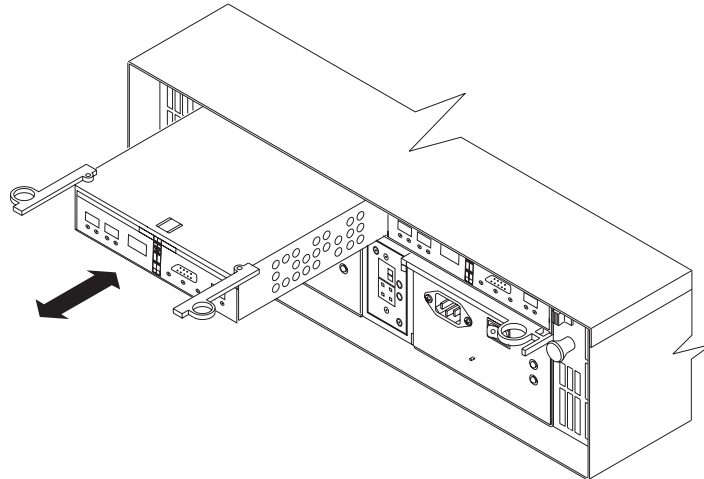
CAUTION:
Use safe practices when lifting.

Attention: The storage server comes with a bezel that is attached to the front of the unit. The bezel protects the light pipes that are located above the drive trays. Leave the protective bezel in place until you are instructed to remove it.

Removing a RAID controller

Complete the following steps to remove a RAID controller:

1. Push down on the latch (centered above the RAID controller). Pull both levers at the same time out of the locked position.



f10ug033

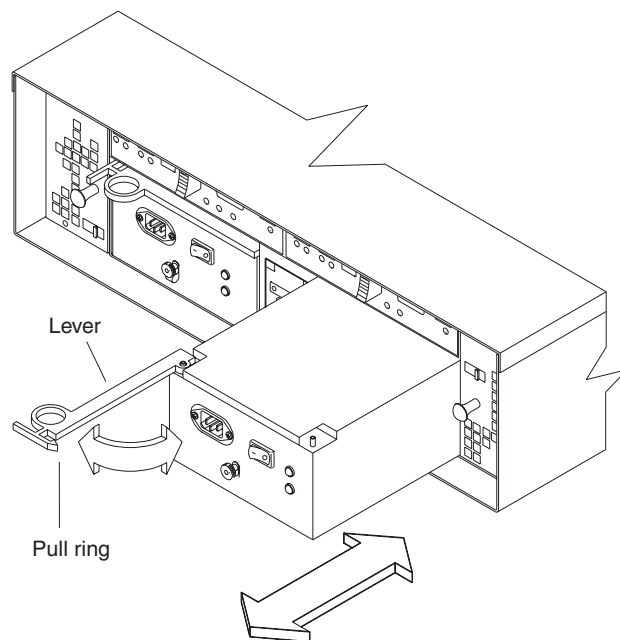
Figure 11. Removing a RAID controller

2. Grasp the pull-rings; then pull on the levers and remove the RAID controller.
3. Place the RAID controller on a level surface.
4. Repeat step 1 through step 3 for the second RAID controller.

Removing a power supply

Complete the following steps to remove a power supply:

1. Grasp the pull-ring on the power supply lever and squeeze the latch to release it.
2. Pull the lever open 90° and remove the power supply, as shown in Figure 12.



f10ug054

Figure 12. Removing a power supply

3. Place the power supply on a level surface.
4. Repeat step 1 through step 3 for the second power supply.

Removing a fan

Complete the following steps to remove a fan:

1. Unlock the latch by moving the latch in the same direction as the latch direction arrow shown on the back of the fan.
2. Grasp the handle and pull the fan unit out of the bay, as shown in Figure 13.

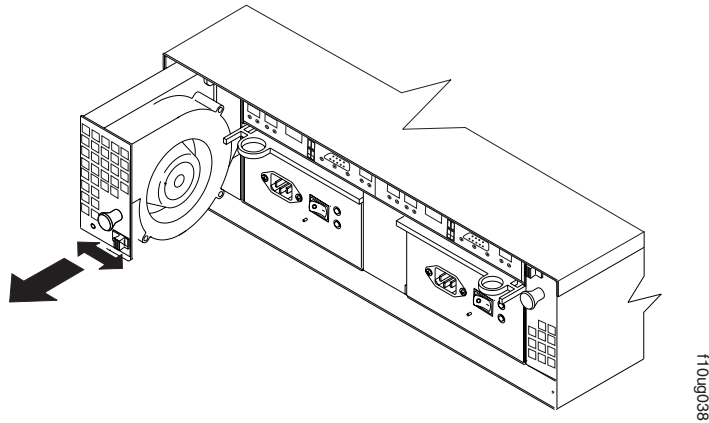


Figure 13. Removing a fan

3. Place the fan unit on a level surface.
4. Repeat step 1 through step 3 for the second fan unit.

Removing a hard disk drive

Complete the following steps to remove a hot-swap hard disk drive:

Note: The hard disk drive comes installed in a drive tray. Do not attempt to detach the drive from the tray.

1. Use Table 17 on page 103 to record the location and identify your FASTT SATA hard disk drives. You must record this information to be able to replace the hard disk drives in their original order before they were removed.
2. Release the latch on the drive CRU by pinching together the blue line on the tray latch and the finger hole on the tray handle.
3. Pull the tray handle out so that it is in the open position to release the drive CRU. Pull the drive out of the bay, as shown in Figure 14 on page 24.

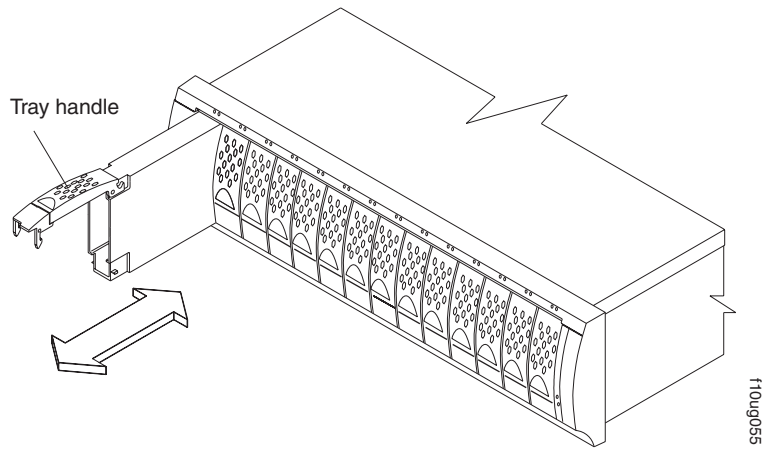


Figure 14. Removing a drive CRU

4. Place the drive CRU horizontally on a level surface, with the printed circuit boards facing down.
 - Attention:** Do not stack drive CRUs on top of one another. Protect the drive CRUs from vibrations or sudden shocks.
5. Repeat step 1 through step 4 for additional drive CRUs.

Continue with “Installing the FAST100 into a rack.”

Installing the FAST100 into a rack

Complete the following steps to install the FAST100 in the rack.

1. Place the FAST100 in the rack.
 - Note:** If you have removed the CRUs from the FAST100, you should be able to lift the unit into the cabinet with the help of one other person. If you have not removed the CRUs before the installation, you should have at least two other people available to help you lift the unit into the rack.
 - a. Move the FAST100 to the front of the rack-mount cabinet.
 - b. With help from another person, place the back of the storage server on the support rails. Slide the unit into the rack, as shown in Figure 15 on page 25.

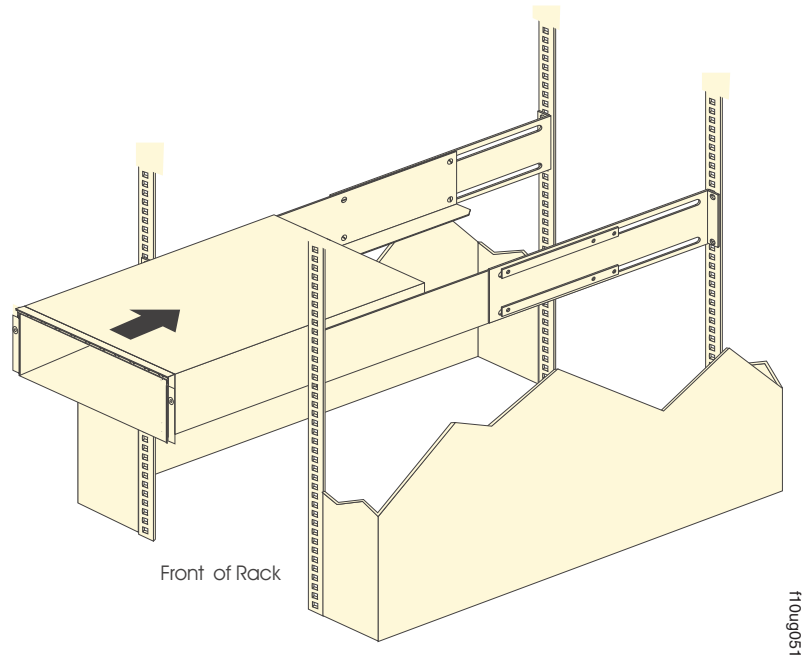


Figure 15. Installing the FAST100

2. The bezel is secured to the front of the FAST100 either by plastic wingnuts or by adhesive tape. Remove and discard the wingnuts or the adhesive tape. The bezel should remain attached to the FAST100 chassis.

Attention: The bottom cross member of the bezel has a tab that must fit beneath the FAST100 chassis and snap into place. The top cross member of the bezel has a recess that must be mated with a metal tab on the bottom of the FAST100 chassis.

3. Secure the FAST100 to the rack:
 - a. Align the front mounting holes on each side of the storage server with the mounting holes on the front of the support rails.
 - b. Install the bezel.
 - c. Insert an M6 screw into the upper mounting hole on both sides of the front of the unit (see Figure 7 on page 17). Gently tighten the screws to secure the bezel and the front of the FAST100 to both of the front cabinet rails.

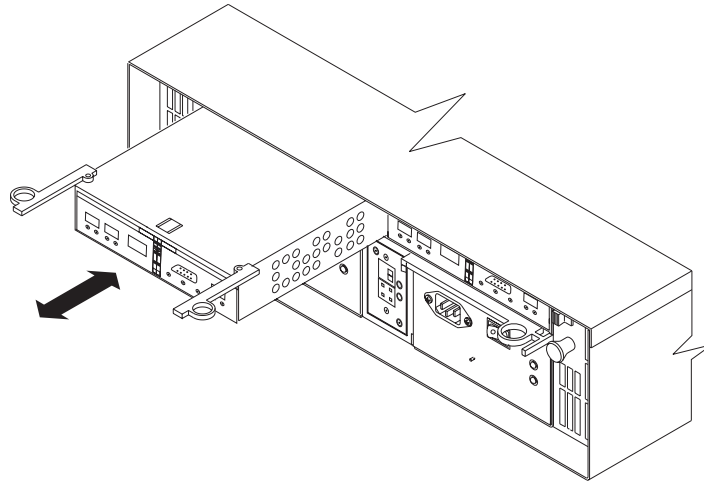
Attention: Do not overtighten. If you overtighten these screws, you could break the bezel.
 - d. From the back of the rack, insert the two 6/32 in. screws (**5** in Figure 10 on page 20), one on each side, in the holes on the side of the unit. Tighten the screws.
4. Continue with one of the following actions:
 - If you did remove the FAST100 CRUs before installation (as described in “Removing the CRUs” on page 20), continue with “Replacing the FAST100 CRUs.”
 - If you did not find it necessary to remove the FAST100 CRUs before installation, continue with “Setting the interface options” on page 28.

Replacing the FAST100 CRUs

Use the following procedures to replace the CRUs in the FAST100 after installation.

Replacing a RAID controller

Complete the following steps to replace the RAID controller that you removed before the installation:



110ug033

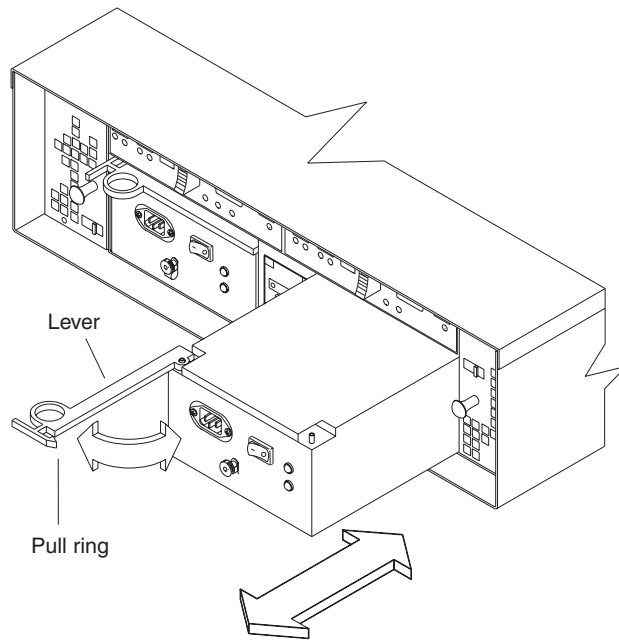
Figure 16. Replacing a RAID controller

1. Slide the RAID controller all the way into the empty slot.
2. Close both levers until the latch locks into place.
Attention: Make sure that the levers lock into place in the storage server chassis.
3. Repeat step 1 and step 2 to replace the second RAID controller.

Replacing a power supply

Complete the following steps to replace the power supplies that you removed before the installation:

1. Slide one power supply into the storage server. Be sure to replace the power supplies so that the lever on each power supply opens toward the interior of the storage server, as shown in Figure 17 on page 27.
Attention: Be sure that the lever is pulled straight out as you slide the power supply into the storage server, as shown in Figure 17 on page 27.



110ug054

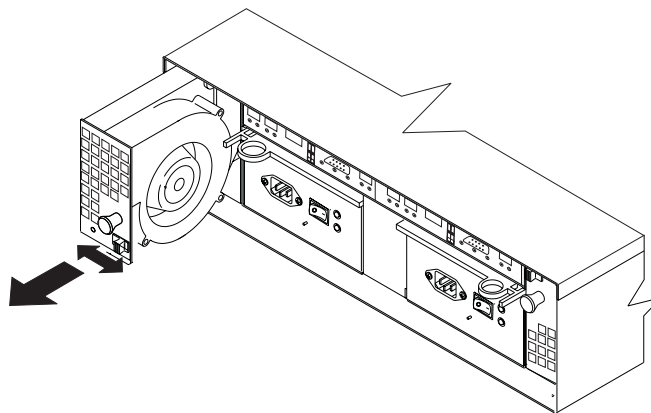
Figure 17. Replacing a power supply

2. Close the lever until the pull-ring latch locks in place. Make sure that the lever locks into place in the storage server chassis.
3. Then gently push the front of the power supply to ensure that it is fully seated.
4. Repeat step 1 and step 2 to replace the second power supply.

Replacing a fan

Complete the following steps to replace the fan units that you removed before the installation:

1. Place the fan in front of the fan bay.
2. Ensure that you move the fan latch in the same direction as the arrow before you slide the fan all the way into the bay. If the fan does not go into the bay, rotate it 180° (see Figure 18).



110ug038

Figure 18. Replacing a fan

3. If the latch does not automatically lock when you have successfully inserted the fan unit into the bay, pull back slightly on the fan and then push it in again until the latch snaps into place.
4. Repeat step 1 through step 3 to replace the second fan.

Replacing a hard disk drive

Complete the following steps to replace the hot-swap hard disk drives that you removed before the installation.

Note: Use Table 17 on page 103 to verify the proper replacement locations of your FAStT 1.5 Gbps SATA hard disk drives.

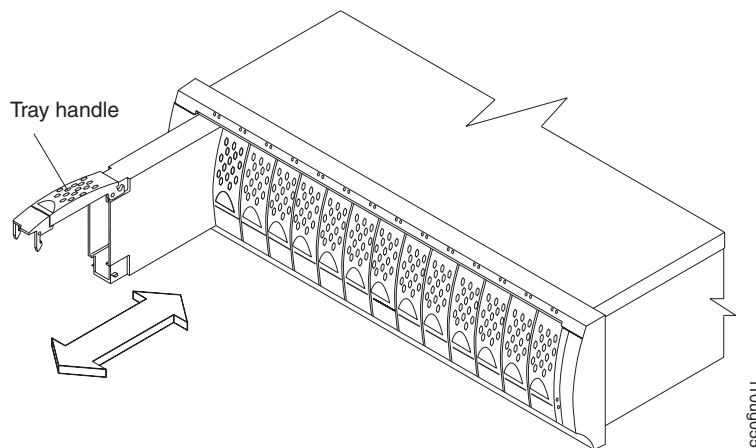


Figure 19. Removing a drive CRU

1. Lift up on the handle and gently push the drive CRU into the empty bay until the hinge of the tray handle latches beneath the storage server bezel.
2. Push the tray handle down until the latch clicks into place.
3. Repeat step 1 and step 2 to replace additional drives.

Setting the interface options

The FAStT100 has two server ID switches that identify the FAStT100 on a fibre-channel loop and that assign physical addresses to the drives. The server ID switches are located on the back of the storage server, as shown in Figure 20 on page 29.

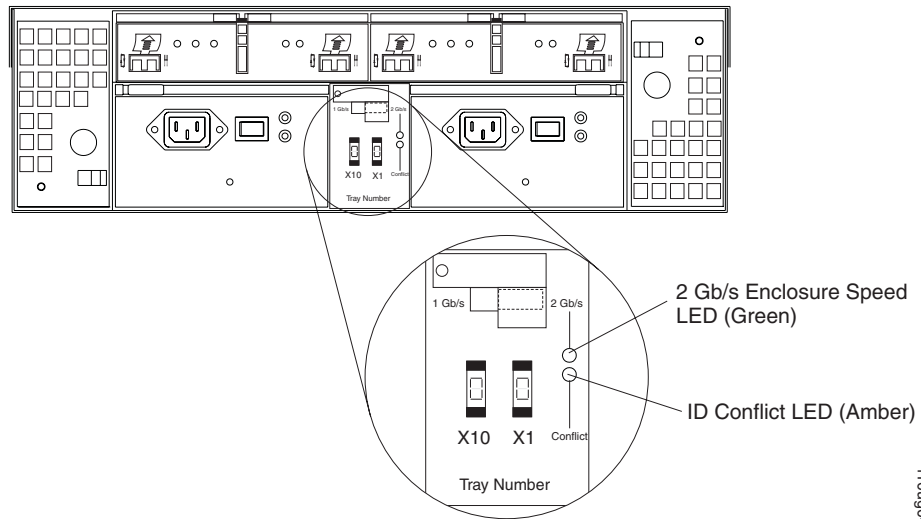


Figure 20. Enclosure ID switches

110ug046

Fibre-channel loop and ID settings

When you install a hard disk drive in the storage server, the drive tray plugs into a printed circuit board called the *midplane*. The midplane sets the fibre-channel loop ID automatically, based on the server ID switch setting and the physical location (bay) of the hard disk drive.

Server ID (Enclosure ID) settings

The FASTT100 comes with a server ID switch (also referred to as an *enclosure ID switch*) that is used to identify the FASTT100 on a fibre channel loop. The server ID switch is located on the back of the unit, as shown in Figure 21 on page 30.

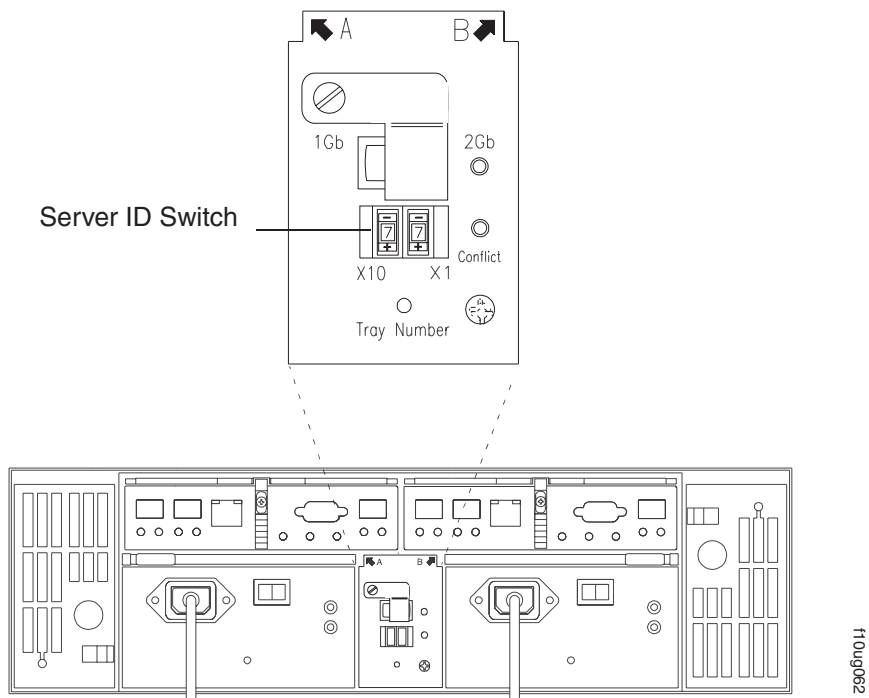


Figure 21. Setting the Server ID

Each drive enclosure in a FASTt storage subsystem drive loop must have a unique drive enclosure ID. FASTt controllers use a combination of the enclosure ID and the number of the physical slot that a fibre channel hard drive occupies to create a unique fibre channel loop address or arbitrated loop physical address (AL_PA) for each drive in a fibre channel drive loop. The enclosure ID consists of two digits, a tens digit (x10) and ones digit (x1).

Attention: When connecting the FASTt100 to EXP100 drive enclosures, DO NOT use the tens digit (x10) setting. Use only the ones digit (x1) setting to set unique server IDs or enclosure IDs.

Give each drive expansion enclosure in a redundant drive loop a unique ones digit (x1) ID. This setting will enforce hard AL_PAs (unchangeable between fibre channel Loop Initializations [LIPs]) for the drives and facilitate drive loop problem troubleshooting in the event of an error. If the ones digits are not unique, two or more devices will have the same hard AL_PA. In such a case, the controller will use soft AL_PAs for the devices that have identical hard AL_PAs.

The problem with soft addressing is that addresses may change between LIPs. This possibility increases the difficulty of troubleshooting drive loop problems, since one cannot easily ascertain whether the same device with a different address or different device may be causing a problem.

Note: The FASTt100 is shipped with 00 as the default server ID setting. If you connect the storage server to a FASTt EXP100, you must set the EXP100 enclosure ID setting to a value other than 00. Each server unit should have a unique ID if it is going to be connected to other drive expansion units through the drive loop ports. The Server ID setting is only valid for the drive

loop. The amber Conflict LED (located on the right-side of the switch) will be lit if another unit in the drive loop has the same ID setting as the server ID.

Storage server speed settings

The default switch setting is 2 Gbps. This is the *only* speed setting allowed for the FASiT100.

Attention: Do not remove the metal plate that covers the storage server speed setting. Do not adjust the storage server speed setting.

Configuring the storage subsystem

You must configure the storage subsystem configuration after you install the storage server in a rack. Use the information in the following sections to configure your storage subsystem configuration.

Storage subsystem management methods

Before you configure the storage subsystem, determine which method of storage subsystem management you want to use. You can manage the storage subsystems in either of two ways: host-agent management or direct-management.

Important: If the operating system of the host server that the storage subsystem logical drive(s) is mapped to is not Microsoft Windows NT, you have to make an out-of-band direct management connection to the storage subsystem to set the correct host type first. Then, the server will be able to recognize the storage subsystem correctly for in-band management.

Host-agent management method

This method requires host-agent software that you install on the host server. The host-agent software allows the FASiT storage manager client program to manage the FASiT storage subsystem using the same fibre channel connections between the host server and the storage subsystem. You must install at least one management station and a software agent host. The management station can be the host or a workstation on the Ethernet network. A management station will have the client software installed. Figure 22 on page 32 shows the host-agent management method.

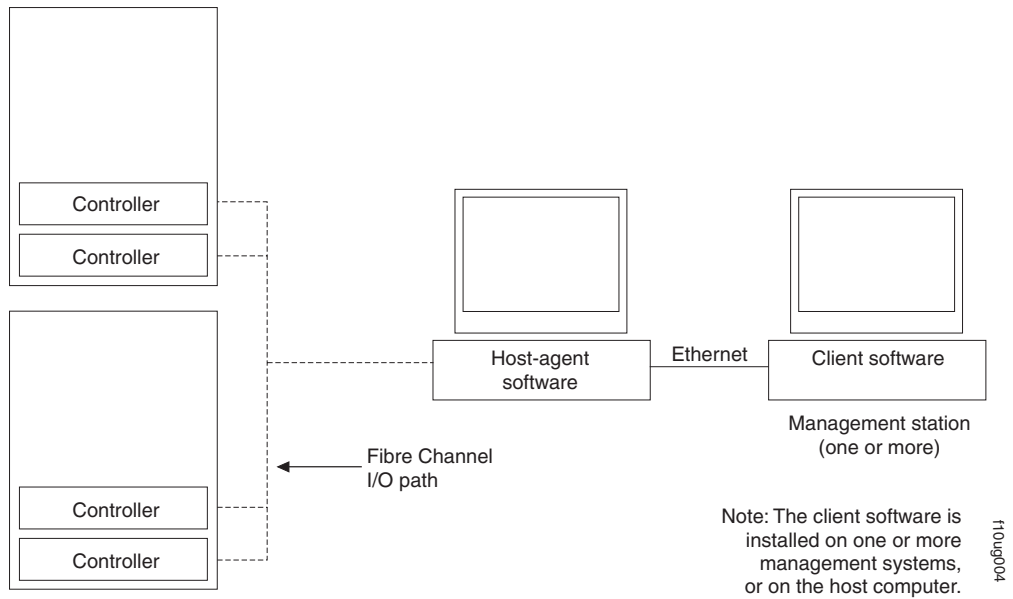


Figure 22. Host-agent managed storage subsystems

Direct-management method

This method uses Ethernet connections from a management station to each controller. You must install at least one management station. The management station can be the host or a workstation on the Ethernet network. A management station will have the client software installed. Attach Ethernet cables to each management station (one pair per storage server). You will connect the cables to each controller later when you install the storage server. Figure 23 on page 33

shows the direct management method.

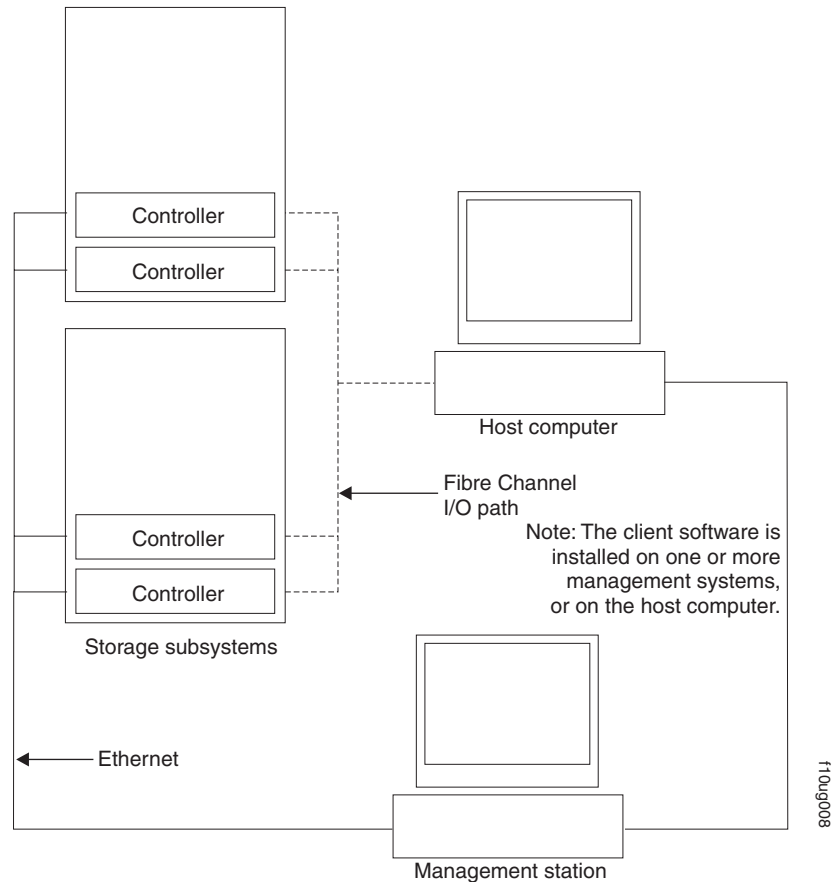


Figure 23. Direct-managed storage subsystems

Fibre channel connections

The storage server fibre channel consists of a host fibre channel loop and a drive fibre channel loop. The host fibre channel loop provides the fibre path for host attachment. It can consist of fibre channel cables, SFPs, host bus adapters, fibre channel switches, and RAID controllers. The drive fibre channel loop provides the fibre path to the hard disk drives (HDDs). The drive fibre channel loop consists of fibre channel HDDs and optional drive expansion units, fibre channel cables, and SFPs.

The FAStT100 supports redundant disk-drive-loop configurations. Each RAID controller has three SFP ports. These SFP ports are labeled *Host 1*, *Host 2*, and *Expansion*. You can build a redundant drive loop by connecting one or more expansion units to the redundant RAID controllers. Then, use dual fiber-optic cables to connect one expansion unit to another in a daisy-chain. For more information about adding expansion units, see “Connecting expansion units” on page 53.

Fibre channel loop configurations

You must determine how the host systems will connect to the storage server. You can connect up to two host systems directly to the storage server, or you can connect more than two hosts to the fibre channel storage server through switches. The illustrations in the following sections show common host system configurations.

Note: The default is one partition. Four-partition and eight-partition configurations are provided as option upgrades, as is the option of additional attachments to expansion units (EXPs). Contact your IBM resellers or marketing representatives for more information.

Redundant host and drive loops

This section provides the following examples of FAStT100 host fibre channel configurations:

- Redundant host and drive fibre channel loop configurations, as shown in Figure 24 on page 35
- Single SAN fabric zone configuration, as shown in Figure 25 on page 36
- Dual SAN fabric zone configuration, with an additional FAStT100 and an EXP100 attached, as shown in Figure 26 on page 36
- Two clusters, as shown in Figure 27 on page 37

Note: These configurations have host and drive path failover protection and are recommended for high availability.

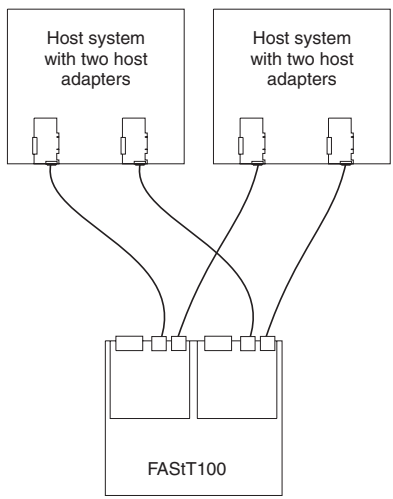
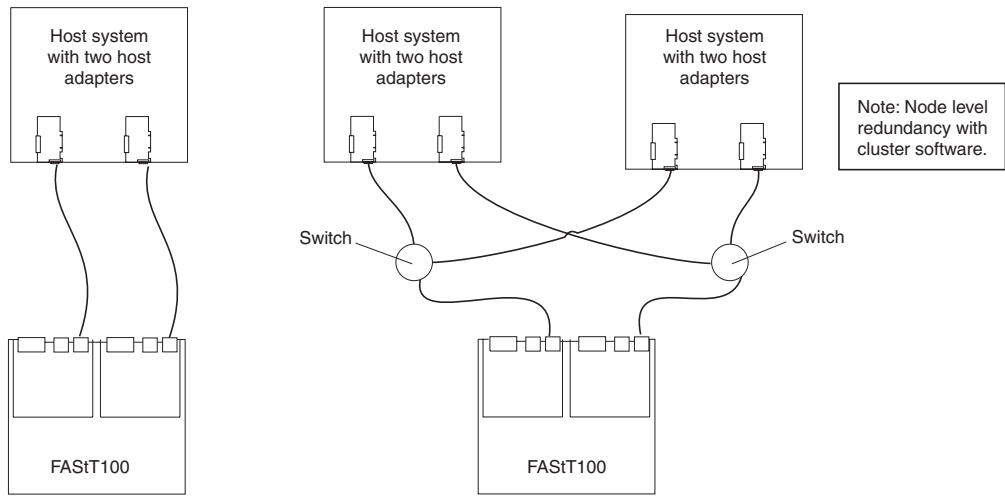
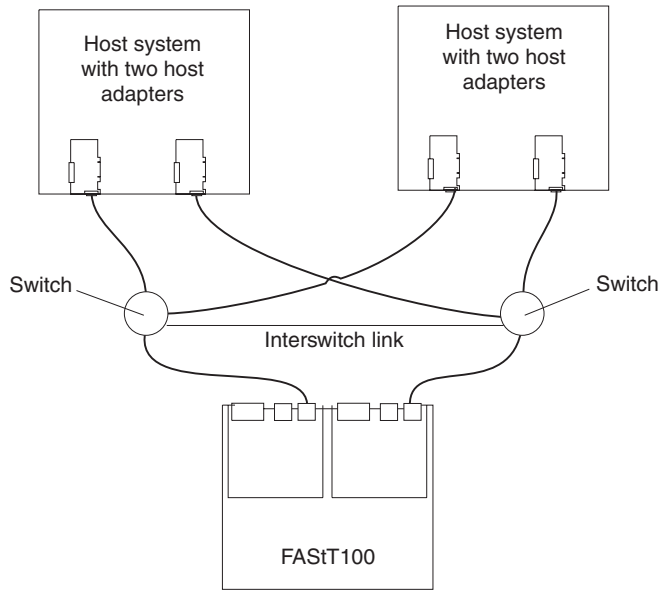


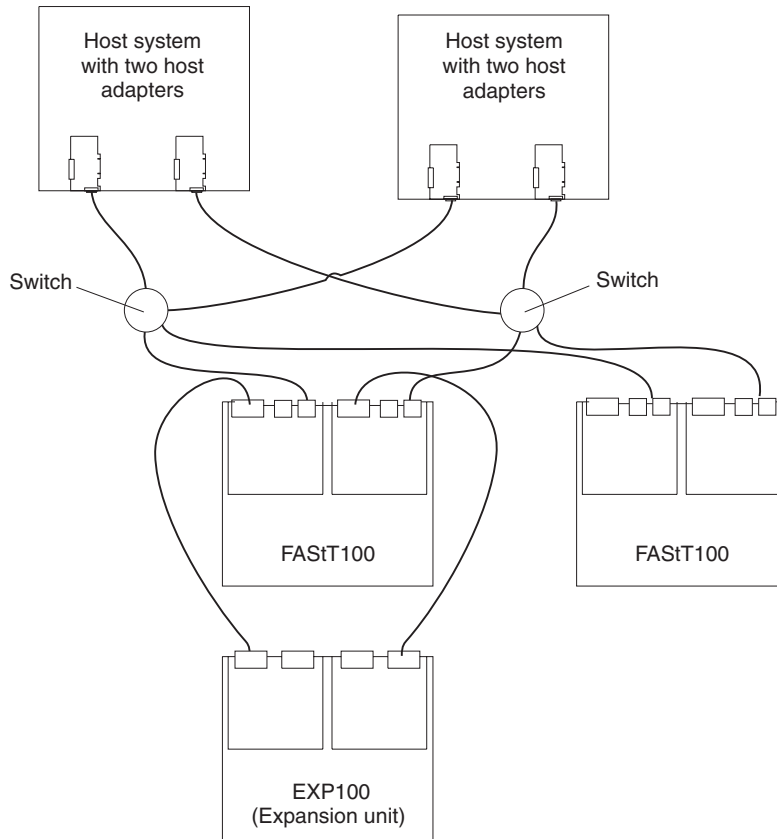
Figure 24. Redundant host and drive fibre channel loop configurations

11049028



f10ug043

Figure 25. Single SAN fabric zone configuration



f10ug042

Figure 26. Dual SAN fabric zone configuration

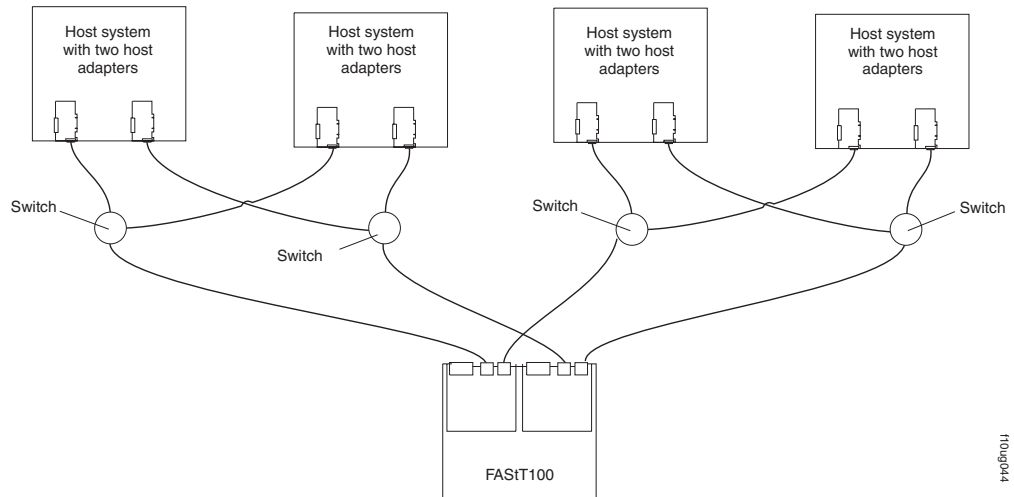


Figure 27. Two clusters configuration

Installing the storage subsystem configuration

Using the information gathered in the previous sections, install the host systems and host adapters.

Notes:

1. See the documentation provided with your host adapters for installation requirements and procedures.
2. Use the correct host adapter driver. For the latest supported host adapters and drivers, go to the following Web site:

www.ibm.com/support/

Attach fiber-optic interface cables to each host adapter. You will connect the other end of the cables to the controller later in the installation process. For more information about handling fiber-optic cables, see “Handling fiber-optic cables” on page 39.

Note: Do not install the Storage Manager client at this time, if it is not already installed. Install the storage server completely before you install the software because you cannot test the software installation until the hardware is connected.

Chapter 3. Cabling the storage server

This chapter provides fibre channel and power cabling information for the storage server.

After you attach the storage server power cables, use the instructions that are provided in “Turning the storage server on and off” on page 57 for the initial startup of the storage server.

Working with SFPs and fiber-optic cables

Each RAID controller has two host ports and one expansion port. You use a small-form factor pluggable transceiver (SFP) to connect each host port and expansion port to hosts and expansion units. The SFP is inserted into the port, and then a fiber-optic cable is inserted into the SFP. The other end of the fiber-optic cable connects to an external device. SFPs are laser products.

Statement 3



CAUTION:

When laser products (such as CD-ROMs, DVD drives, fiber optic devices, or transmitters) are installed, note the following:

- Do not remove the covers. Removing the covers of the laser product could result in exposure to hazardous laser radiation. There are no serviceable parts inside the device.
- Use of controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.



Danger

Some laser products contain an embedded Class 3A or Class 3B laser diode. Note the following.

Laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam.

Handling fiber-optic cables

Before you use fiber-optic cables, read the following precautions.

Attention: To avoid damage to the fiber-optic cables, follow these guidelines:

- Do not route the cable along a folding cable-management arm.
- When attaching to a device on slide rails, leave enough slack in the cable so that it does not bend to a radius of less than 38 mm (1.5 in.) when extended or become pinched when retracted.
- Route the cable away from places where it can be snagged by other devices in the rack.

- Do not overtighten the cable straps or bend the cables to a radius of less than 38 mm (1.5 in.).
- Do not put excess weight on the cable at the connection point. Be sure that the cable is well supported.

Installing SFP modules

The FAStT100 host ports require SFP modules. SFP modules are used to convert electrical signals to optical signals that are required for fibre channel transmission to and from RAID controllers. The FAStT100 supports two types of SFP modules: one with a plastic latch and one with a wire latch. After you install the SFP modules, you use fiber-optic cables to connect the FAStT100 to other fibre channel devices.

Before you install SFP modules and fiber-optic cables, read the following information:

- Do not mix long-wave SFPs and short-wave SFPs on a single storage server. Use either long-wave SFPs or short-wave SFPs. You can use the Storage Manager client to view the Storage Subsystem Profile in order to verify that you are not mixing long-wave and short-wave SFPs.
- The SFP module housing has an integral guide key designed to prevent you from inserting the SFP module improperly.
- Use minimal pressure when you insert the SFP module into a port. Forcing the SFP module into a port could cause damage to the SFP module or the port.
- You can insert or remove the SFP module while the port is powered on.
- The operational loop performance is not affected when you install or remove an SFP module.
- You must insert the SFP module into a port before you connect the fiber-optic cable.
- You must remove the fiber-optic cable from the SFP module before you remove the SFP module from the port. See “Removing SFP modules” on page 42 for more information.

To install an SFP module, complete the following steps.

Statement 3:



CAUTION:

When laser products (such as CD-ROMs, DVD drives, fiber-optic devices, or transmitters) are installed, note the following:

- **Do not remove the covers. Removing the covers of the laser product could result in exposure to hazardous laser radiation. There are no serviceable parts inside the device.**
- **Use of controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.**



DANGER

Some laser products contain an embedded Class 3A or Class 3B laser diode. Note the following.

Laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam.

Attention: When you handle static-sensitive devices, take precautions to avoid damage from static electricity. For details about handling static-sensitive devices, see “Handling static-sensitive devices” on page 14.

1. Remove the SFP module from its static-protective package.
2. Remove the protective cap from the SFP module, as shown in Figure 28. Save the protective cap for future use.

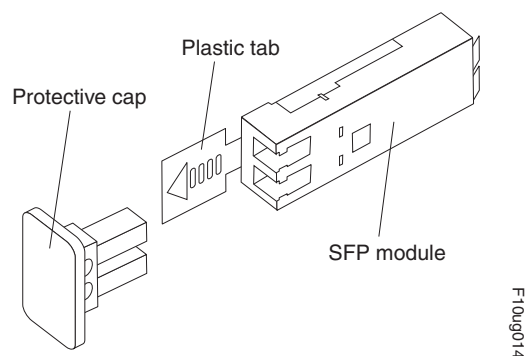


Figure 28. Small Form-Factor Pluggable (SFP) Module

3. Remove the protective cap from the host port. Save the protective cap for future use.
4. Insert the SFP module into the host port until it clicks into place. See Figure 29.

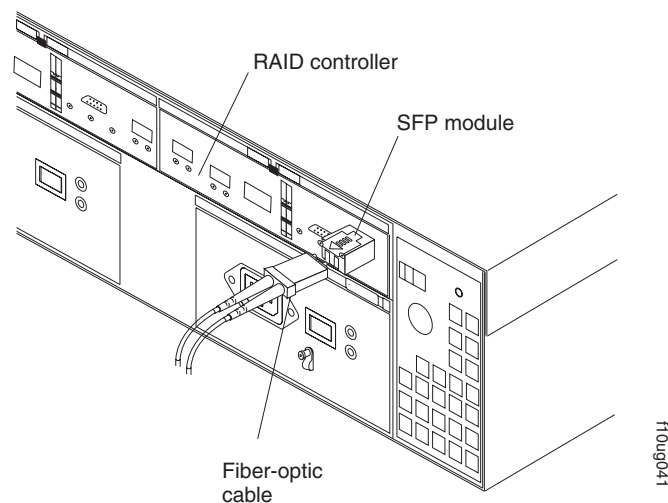


Figure 29. Installing an SFP module into the host port

5. Connect a fibre channel cable.

Removing SFP modules

To remove the SFP module from the host port, perform the following steps.

Attention: To avoid damage to the cable or to the SFP module, make sure you unplug the LC-LC fibre channel cable *before* you remove the SFP module.

1. Remove the LC-LC fibre channel cable from the SFP module. For more information, see “Handling fiber-optic cables” on page 39.
2. Unlock the SFP module latch:
 - For SFP modules that contain plastic tabs, unlock the SFP module latch by pulling the plastic tab outward 10°, as shown in Figure 30.

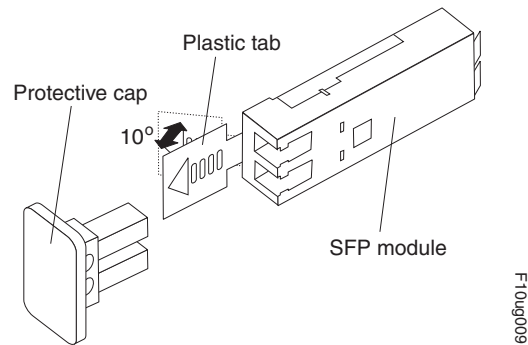


Figure 30. Unlocking the SFP module latch - plastic variety

- For SFP modules that contain wire tabs, unlock the SFP module latch by pulling the wire latch outward 90°, as shown in Figure 31.

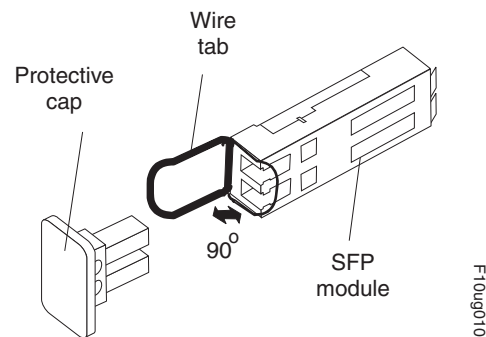


Figure 31. Unlocking the SFP module latch - wire variety

3. With the SFP latch in the unlocked position, extract the SFP module.
 - For SFP modules that contain plastic tabs, slide the SFP module out of the port.
 - For SFP modules that contain wire tabs, grasp the wire latch and pull the SFP module out of the minihub port.
4. Replace the protective cap on the SFP module.
5. Place the SFP module into a static-protective package.
6. Replace the protective cap on the port.

Installing fiber-optic cables

To connect the fiber-optic cables, perform the following steps.

1. Remove the protective cap from the fiber-optic cable. See Figure 32.

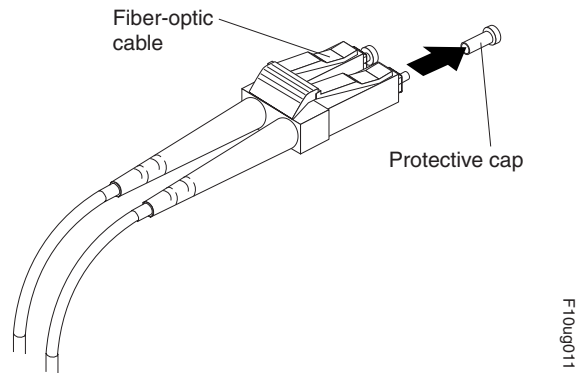


Figure 32. Removing caps from fiber-optic cables

2. Connect the fiber-optic cable to the installed SFP, as shown in Figure 33.

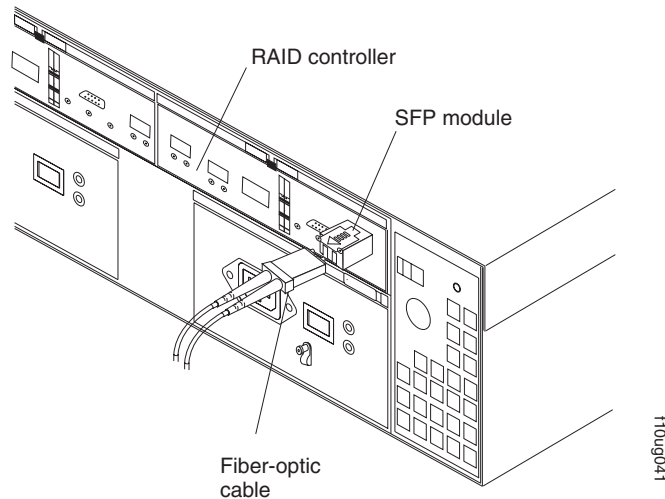


Figure 33. Connecting cables to the installed SFP

3. Check the LEDs on the RAID controller. When the RAID controller is operating properly, the amber Fault LED is off. For information about the status of the RAID controller LEDs, see Table 11 on page 64.
4. To remove the fiber-optic cables, gently pull the fiber-optic cable from the SFP; then replace the protective caps.

Using LC-LC fibre-channel cables

The LC-LC fibre-channel cable is a fiber-optic cable that you use to connect into one of the following devices:

- An SFP module installed in an IBM FASTt100
- An SFP module installed in an IBM FASTt EXP100 Expansion Unit

See Figure 34 on page 44 for an illustration of the LC-LC fibre-channel cable.

For more information about cabling these devices, see the documentation that comes with the LC-LC fibre-channel cable.

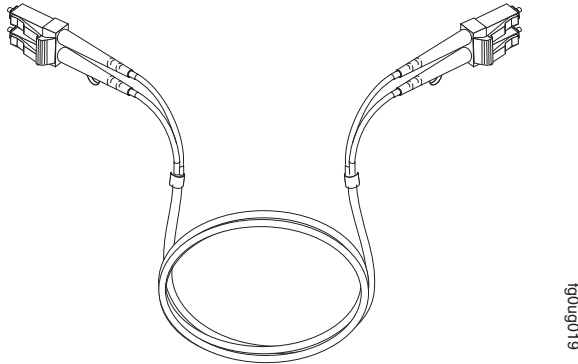


Figure 34. LC-LC fibre-channel cable

Note: If you are connecting the FAST100 to a 1 Gbps device (such as a 1 Gbps FC switch), you must also use an LC-SC fibre-channel cable adapter. For more information about using an LC-SC fibre-channel cable adapter, see “Using LC-SC fibre-channel cable adapters” on page 46.

Connecting an LC-LC cable to an SFP module

Complete the following steps to connect an LC-LC fibre-channel cable to an SFP module:

Statement 3:



CAUTION:

When laser products (such as CD-ROMs, DVD drives, fiber optic devices, or transmitters) are installed, note the following:

- Do not remove the covers. Removing the covers of the laser product could result in exposure to hazardous laser radiation. There are no serviceable parts inside the device.
- Use of controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.



DANGER

Some laser products contain an embedded Class 3A or Class 3B laser diode. Note the following.

Laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam.

1. Read the information in “Handling fiber-optic cables” on page 39.

2. If necessary, remove the protective cap from the SFP module, as shown in Figure 28 on page 41. Save the protective cap for future use.
3. Remove the two protective caps from one end of the LC-LC cable, as shown in Figure 35. Save the protective caps for future use.

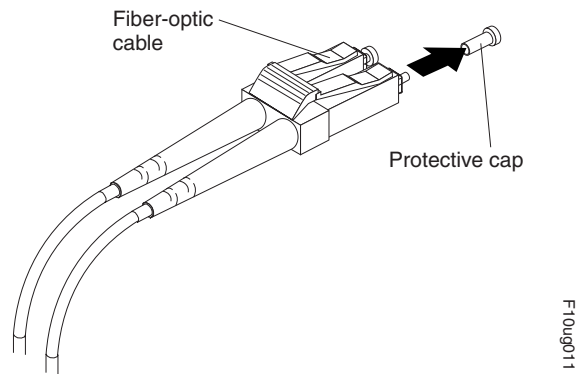


Figure 35. Removing fiber-optic cable protective caps

4. Carefully insert this end of the LC-LC cable into an SFP module that is installed in the FAStT100. The cable connector is keyed to ensure it is inserted into the SFP module correctly. Holding the connector, push in the cable until it clicks into place, as shown in Figure 36.

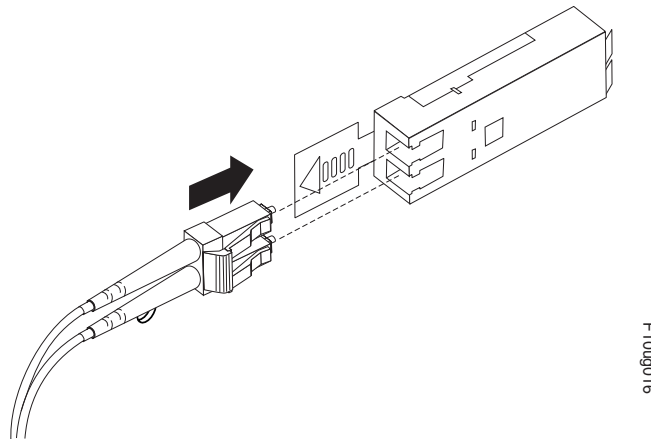


Figure 36. Inserting an LC-LC fibre-channel cable into an SFP module

5. Remove the two protective caps from the other end of the LC-LC cable. Save the protective caps for future use.
6. Connect this end of the LC-LC cable to the SFP module that is installed in a FAStT EXP100.

Removing an LC-LC fibre-channel cable

Complete the following steps to remove an LC-LC fibre-channel cable:

Attention: To avoid damaging the LC-LC cable or SFP module, make sure that you press and hold the lever to release the latches before you remove the cable from the SFP module. Ensure that the levers are in the released position when removing the cable. When removing the cable from the SFP module, make sure that you do not grasp the SFP module plastic tab.

1. On the end of the LC-LC cable that connects into the SFP module or host bus adapter, press down and hold the lever to release the latches, as shown in Figure 37.

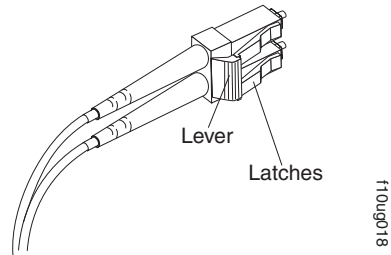


Figure 37. LC-LC fibre-channel cable lever and latches

2. Carefully pull on the connector to remove the cable from the SFP module, as shown in Figure 38.

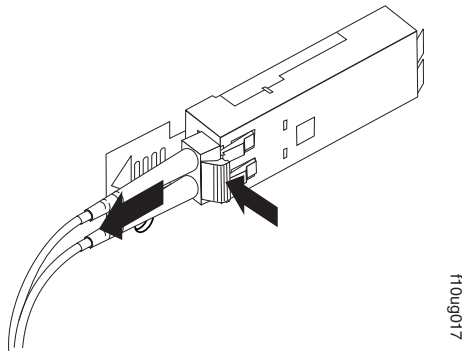


Figure 38. Removing the LC-LC fibre-channel cable

3. Replace the protective caps on the cable ends.
4. Replace the protective cap on the SFP module.

Using LC-SC fibre-channel cable adapters

The LC-SC fibre-channel cable adapter is a fiber-optic cable that is used to connect an LC connector into one of the following devices that require SC connectors:

- 1-Gbps FC switch
- FC Host Bus adapter

For more information about connecting to these devices, see the documentation that comes with the LC-SC fibre-channel cable adapter.

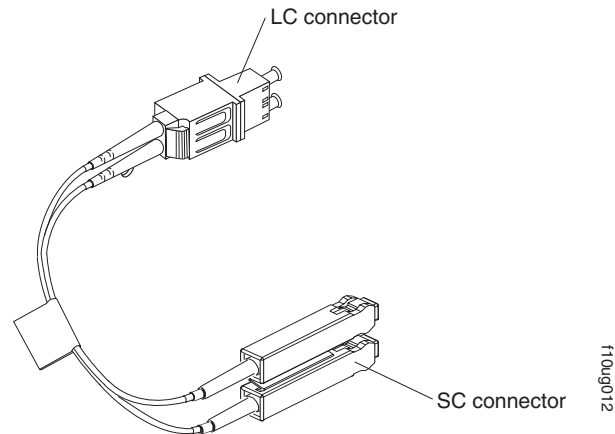


Figure 39. LC-SC fibre-channel cable adapter

The following sections provide the procedures for properly connecting and removing an LC-SC fibre-channel cable.

Connecting an LC-SC cable adapter to a device

Complete the following steps to connect an LC-SC fibre-channel cable adapter to a device:

Statement 3:



CAUTION:

When laser products (such as CD-ROMs, DVD drives, fiber optic devices, or transmitters) are installed, note the following:

- Do not remove the covers. Removing the covers of the laser product could result in exposure to hazardous laser radiation. There are no serviceable parts inside the device.
- Use of controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.



DANGER

Some laser products contain an embedded Class 3A or Class 3B laser diode. Note the following.

Laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam.

1. Read the information in “Handling fiber-optic cables” on page 39.
2. Connect one end of an LC-LC cable to an SFP module in the FASTT100. For instructions, see “Using LC-LC fibre-channel cables” on page 43.

3. Remove the two protective caps from the LC connector end of the LC-SC cable adapter as shown in Figure 40. Save the protective caps for future use.

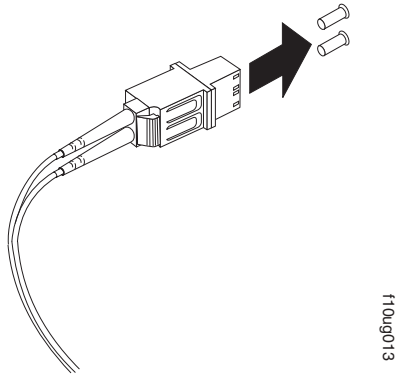


Figure 40. Removing the LC-SC cable adapter protective caps

4. Carefully insert the other end of the LC-LC cable into the LC connector end of the LC-SC cable adapter as shown in Figure 41. Push in the connector until it clicks into place.

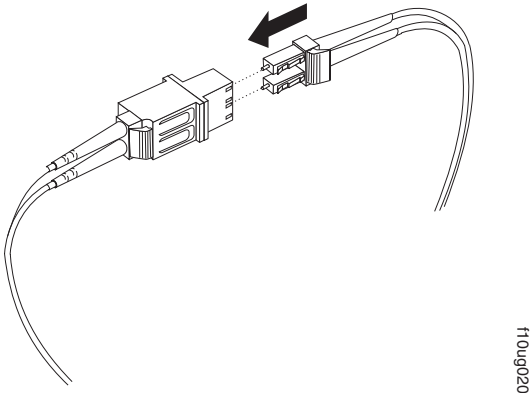


Figure 41. Connecting an LC-LC cable into the LC-SC cable adapter

5. If you are connecting the FAST100 to a 1-Gbps FC switch or FC Host Bus adapter, connect the SC connector end of the LC-SC cable adapter to a Gigabit Interface Converter (GBIC) that is installed in the 1-Gbps FC switch or FC Host Bus adapter. For more information about connecting to these devices, see the documentation that comes with the device.

Removing an LC-LC cable from an LC-SC cable adapter

Complete the following steps to remove an LC-LC cable from an LC-SC cable adapter:

Attention: To avoid damaging the LC-LC cable, make sure you press and hold the lever to release the latches before you remove the cable from an LC-SC cable adapter. Ensure that both levers are in the released position when removing the cable. When removing the cable from the SFP module, make sure you do not grasp the SFP module plastic tab.

1. On the end of the cable that connects into the LC connector end of the LC-SC cable adapter, press down and hold the lever to release the latches. Figure 42 on page 49

on page 49 shows the location of the lever and latches.

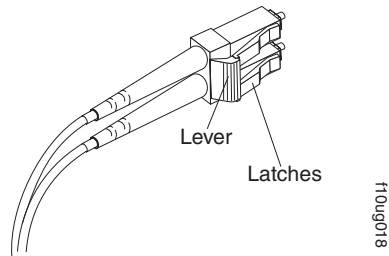


Figure 42. LC-LC fibre-channel cable lever and latches

2. Carefully pull on the connector to remove it. Make sure you grasp the connector and not the cable when removing the LC-LC cable from the LC-SC cable adapter as shown in Figure 43.

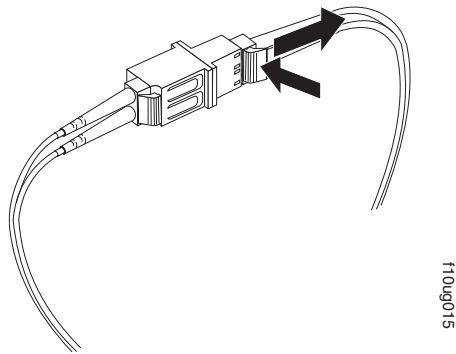


Figure 43. Removing the LC-LC fibre-channel cable from an LC-SC fibre-channel cable adapter

3. Replace the protective caps on the cable ends.

Connecting hosts to the RAID controllers

To connect a host adapter to the RAID controller, perform the following steps:

1. Install an SFP in a host port on the RAID controller.
2. Connect the host-system cables to the RAID controller or to switches. Figure 44 on page 50 shows the location on the RAID controllers where the host-system cables connect.

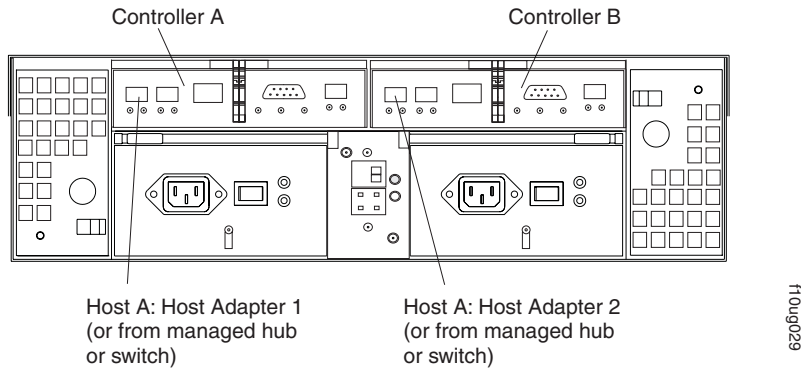


Figure 44. Location of host cables

For examples of redundant, partially-redundant, and non-redundant host and drive loop configurations, see “Fibre channel loop configurations” on page 33.

Connecting secondary interface cables

Use the Ethernet interface ports on the back of the storage server to connect the controllers for direct management of the storage subsystems (see 32). Connect a pair of Ethernet cables from the storage-management station to the Ethernet ports for Controller A (located on the left) and Controller B (located on the right) on the back of the storage server. Figure 45 shows the location of the ports.

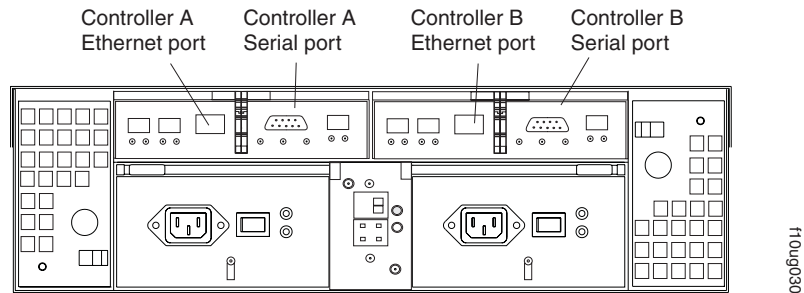


Figure 45. Ethernet and serial port locations

Note: The serial interface ports are intended to be used by service technicians to perform diagnostic operations on the storage server. Incorrect use of the serial port can result in loss of data access and, in some cases, in loss of data.

Power cabling

The storage server uses two standard power cords. You can connect the power cords to a primary power unit inside the rack, such as a properly grounded ac distribution unit, or to an external source, such as a properly grounded electrical outlet.

If you have not already done so, attach the power cords by using Figure 46 on page 51 for the location of the component parts.

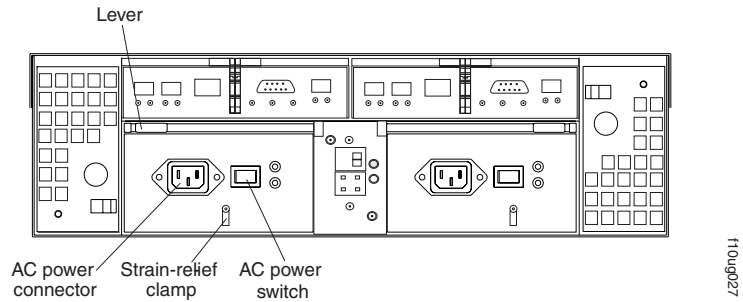


Figure 46. Power cord locations

Perform the following to cable the power cords:

1. Wrap the strain-relief clamp around the power cord approximately 20 cm (8 in.) from the power supply connection end.
2. Attach the power-supply nut, and tighten it securely.
3. Connect the power cord to the power supply.
4. Plug the power cord into a properly grounded electrical outlet.

Note: To maintain power redundancy, plug the storage server's right and the left power supplies into two independent external power circuits through ac distribution units inside a rack cabinet or directly into external receptacles. Similarly, the right and left power supplies of the FAST drive enclosures attached to the FAST100 should be plugged into the same two independent external power circuits as the FAST100. See Figure 47 on page 52 for an example of redundant power cabling.

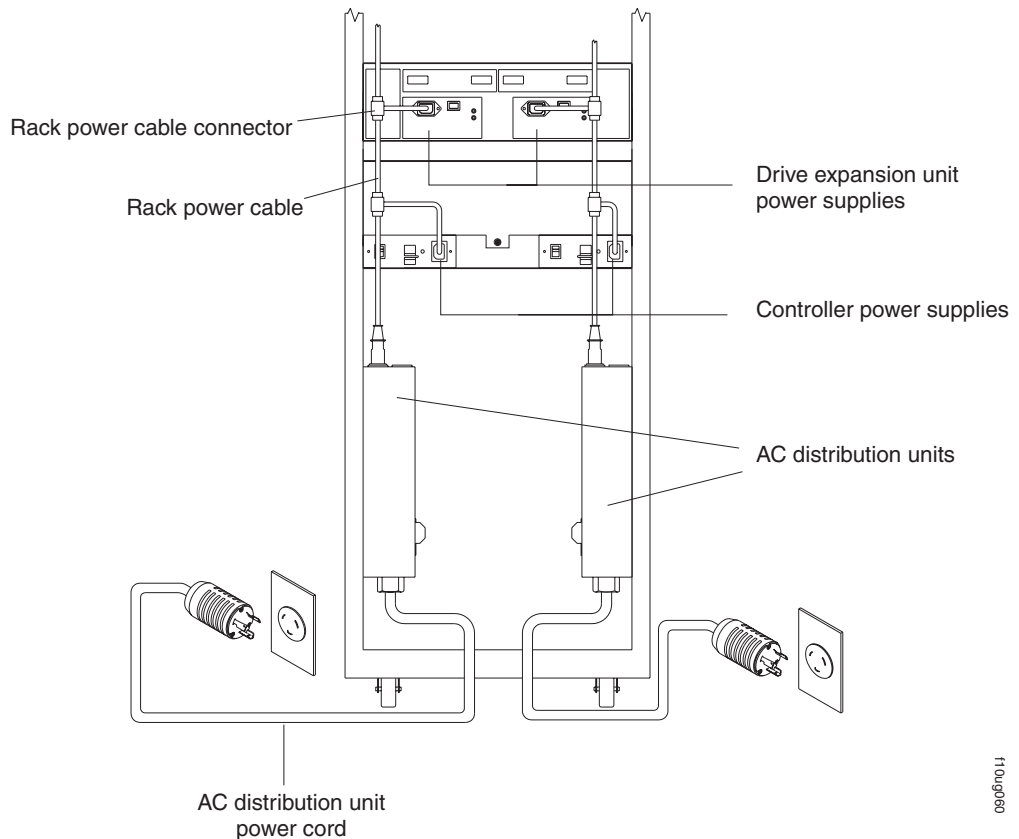


Figure 47. Redundant AC power connections to controllers and drive expansion units

For details about power requirements, see “FAST100 specifications” on page 10.

5. Go to “Turning the storage server on and off” on page 57 for the initial startup of the storage server.

Installing the Storage Manager client

Install the Storage Manager 8.42.xx.xx client by using the procedures in the software installation and support guide for your operating system. Use that document and the online help to configure the logical drives, partitions, and so on for the RAID controllers. Use your operating system documentation to make the new logical drives accessible to the operating system.

Important: Controller firmware version 5.42.xx.xx is required for the FAST100. However, this version of the controller firmware should be used only for the FAST100. Do not use controller firmware version 5.42.xx.xx for any FAST storage servers other than the FAST100.

Note: Make sure that you start the Storage Manager client to continuously monitor the status of the storage server. For information about the importance of this information, see “Monitoring status through software” on page 62.

Connecting expansion units

Attention: The minimum EXP100 ESM firmware level (9551 or later) is required before attaching an EXP100 to the FAStT100.

After you install the storage server, you can connect additional expansion units. You can do this at any time after you install the storage server, even while it is turned on and processing data. You can even install one expansion unit now and an additional expansion unit later.

Attention: You can add only *new* expansion units to the storage server. This means that there must be no existing configuration information on the expansion unit that you want to install. If the expansion unit that you want to install currently contains logical drives or configured hot spares, and you want them to be part of the FAStT100 storage server, you must contact IBM for information. Improper drive migration might cause loss of configuration and other storage server problems.

To connect a single additional expansion unit to the storage server, perform the following steps:

Note: The following procedures are for "cold-case" procedures (the FAStT100 is powered down when expansion units are connected, as in the case of a new installation). For "hot-case" procedures (the FAStT100 is powered on when expansion units are connected), see "Adding a FAStT EXP100 to an existing FAStT100 configuration" on page 91.

1. Follow the instructions in your expansion unit installation manual to set up and mount the new expansion unit.
2. Use the following procedure and Figure 48 on page 54 to connect a single expansion unit to the storage server:
 - a. Use a fiber-optic cable to connect to the FC-Expansion Units port on the left RAID controller in the storage server to the In port on the left ESM board of the expansion unit.
 - b. Use a second fiber-optic cable to connect the FC-Expansion Units port on the right RAID controller in the storage server to the Out port on the right ESM board of the expansion unit.
 - c. Ensure that the enclosure ID switch is set to a value different from one set for the FAStT100 server and other drive expansion enclosures in the loop. Also, ensure that the link speeds of the expansion units are set to 2 Gb.

Note: When connecting the FAStT100 to EXP100 drive enclosures, do not use the tens digit (x10) setting. Use only the ones digit (x1) setting to set unique server IDs or enclosure IDs. For more information, see "Server ID (Enclosure ID) settings" on page 29.

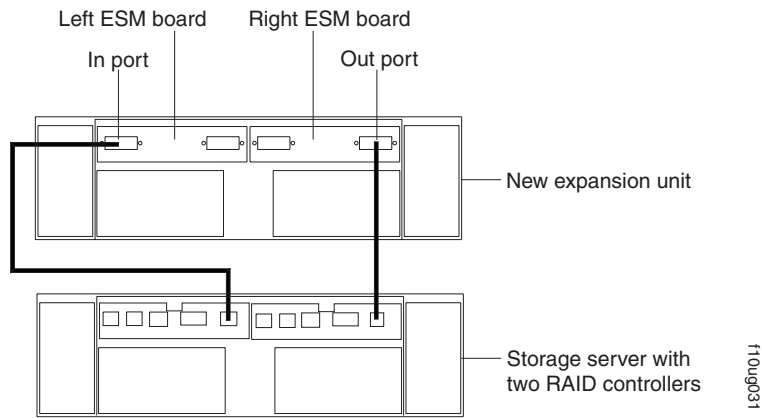


Figure 48. Adding an expansion unit

3. Remove the blank filler trays and insert drive trays. Connect power to the drive expansion unit first, then connect power to the FAStT100. After the storage server is powered-on, the storage server locates the new drives.
4. Use the Storage Manager client to check the status of the new drives, correct any errors found, and configure the new drives.

For more detailed information about how to cable the storage server and expansion units, see the *FAStT100 Fibre Channel Cabling Instructions* that come with the storage server.

FAStT EXP100 loop redundancy

The FAStT EXP100 provides redundant loop support when the second ESM is configured, and when both loops (called A and B) are connected to a FAStT storage server that supports redundant loops. If a cable or SFP module fails on drive loop A, drive loop B provides redundancy, which is an alternate path to your disk drives.

Figure 49 on page 55 shows a redundant loop that you might create with a FAStT100 and three FAStT EXP100s. The numbers provided in Figure 49 on page 55 show the order in which cables should be attached.

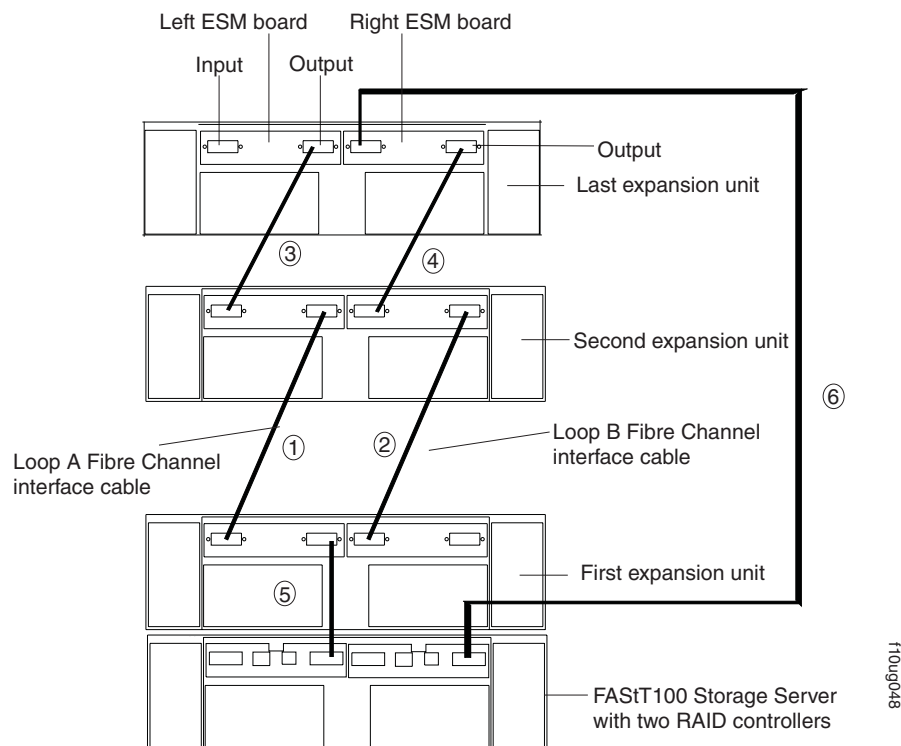


Figure 49. FAST EXP100 redundant loop configuration

To create the redundant loop shown in Figure 49, you would perform the following steps:

1. Make two fibre-channel connections from the *First expansion unit* to the *Second expansion unit* (connections 1 and 2).
2. Make two fibre-channel connections from the *Second expansion unit* to the *Last expansion unit* (connections 3 and 4). Currently, you can connect up to three FAST EXP100s together in a redundant drive loop. Contact your IBM support representative for information about the availability of future support for connecting more than three FAST EXP100 units.
3. Make a fibre-channel connection from the storage server drive port to the **OUT** port in the left ESM of the *First expansion unit* in the redundant drive loop (connection 5).
4. Make a fibre-channel connection from the storage server drive port to the **IN** port in the right ESM of the *Last expansion unit* in the redundant drive loop (connection 6).

IBM SATA disk drives are dual-ported, providing individual access from two fibre-channel loops to the same disk drive. When configuring the ESMs, configure the second ESM the same way that you configured the first ESM. Refer to the *Fibre Channel Cabling Instructions* that come with your storage server for more information about dual-loop support and implementation.

Each ESM on the EXP100 has an SFP module input port and an SFP module output port. As you cable FAST EXP100s together, connecting input ports to output ports can improve diagnostic capability. Refer to the *FAST100 Storage Server Fibre Channel Cabling Instructions* for cabling connections between input and output ports.

Chapter 4. Operating the storage server

To ensure optimal operation of your system, always follow these best practices guidelines:

- Back up the data on your storage drives periodically.
- To maintain power redundancy, plug the storage server's right and the left power supplies into two independent external power circuits through ac distribution units inside a rack cabinet or directly into external receptacles. Similarly, the right and left power supplies of the FAStT drive enclosures attached to the FAStT100 should be plugged into the same two independent external power circuits as the FAStT100. This ensures that the FAStT100 and all its attached drive enclosures will have power if only one power circuit is available. In addition, having all the right or all the left power supplies plug into the same power circuit will enable the components in the storage subsystem to power on simultaneously during an unattended restoration of power. See Figure 47 on page 52 for an example of redundant power connections.
- Before any planned system shutdown or after any system changes (additions, removals, or modifications), save controller subsystem profiles as explained in the Storage Manager guide for your operating system.
- Ensure that your system is in an optimal state before you shut it down. Never turn the power off if any fault light is lit; be sure to resolve any error conditions before you shut down the system.
- During any maintenance or attended power-up procedure, carefully follow the power-up sequence listed in "Turning on the storage server." You should check that each component of the subsystem is powered-on in the proper order during this entire power-up procedure to ensure that the controller will optimally access all of your storage subsystems.
- The storage subsystem supports simultaneous power-up to the system components; however, you should always follow the power-up sequence listed in "Turning on the storage server" during any attended power-up procedure.
- A storage system in an optimal state should recover automatically from an unexpected shutdown and unattended simultaneous restoration of power to system components. After power is restored, call IBM support if any of the following conditions occur:
 - The storage subsystem logical drives and arrays are not displayed in the Storage Manager graphical user interface (GUI).
 - The storage subsystem logical drives and arrays do not come online.
 - The storage subsystem logical drives and arrays seem to be degraded.

Turning the storage server on and off

This section contains instructions for turning the storage server on and off under normal and emergency situations.

If you are turning on the storage server after an emergency shutdown or power outage, see "Restoring power after an emergency shutdown" on page 61.

Turning on the storage server

Important: You must turn on the drive enclosures and verify that the drive enclosures' FC connections are optimal by checking the indicator lights *before* you turn on the FAStT100. The controllers might not recognize

the correct configuration if the hard disk drives are powered up after the FAStT100. For instructions on how to power up the drive enclosures, refer to the drive enclosure documentation.

Note: Always wait at least 30 seconds between the time you turn off a power switch and the time you turn on the power again.

Perform the following steps to turn on the power for the initial startup of the storage server:

1. Verify that:
 - a. All communication and power cables are plugged into the back of the storage server and a properly grounded ac electrical outlet.
 - b. All hard disk drives are locked securely in place. For more information, see “Installing hot-swap hard disk drives” on page 70.

Note: At least one drive must be present before you start the FAStT100.

Attention: If you are restarting the system after a normal shutdown, wait at least 10 seconds before you turn on the power by using the power-on sequence in step 2.

2. Check the system documentation for the hardware devices that you intend to power up, and then determine the proper startup sequence. Use the following power-on sequence, where applicable:
 - a. Turn on the power to the supporting devices (for example, Ethernet switches and management stations) before the storage server.

Attention: If you will be directly managing the storage array, you must set up the Dynamic Host Configuration Protocol (DHCP) or BOOT-P server before you turn on the power. Setting up the server allows the controllers to obtain the corresponding IP address when you turn on the power to the array module. For more information, see the software installation guide for your operating system.

- b. You must turn on the expansion units before the storage server. The controllers might not recognize the correct configuration if the drives are powered up after the storage server. For instructions on how to power up the expansion units, see the expansion-unit documentation.
 - c. Turn on the power to the storage server; then restart or turn on the power to the host.

Note: Depending on your operating system, you might not have to restart the host. For more information, see the software installation guide for your operating system.

3. Turn on the power to each device, based on the power-on sequence in step 2. To turn on power to the storage server, turn on the power-supply switches on the back of the storage server. You must turn on both power-supply switches to take advantage of the redundant power supplies.
4. Use the Storage Manager client and the Fault LEDs to check the overall status of the storage server and its components. All LEDs should be green on the front of the storage server. If they are not, use the Storage Manager client to diagnose the problem (see “Monitoring status through software” on page 62).

Note: The green drive active LED and amber drive fault LED below the drive CRUs might flash intermittently as the drives spin-up. Wait until the storage server is finished powering up before checking the LEDs on the front of the storage server. For more information, see “Checking the LEDs” on page 63.

Turning off the storage server

Attention: Except in an emergency, never turn off the power if any storage server Fault LEDs are on. Correct the fault before you turn off the power. Use the Storage Manager client and the Fault LEDs to check the overall status of the storage server and its components. All LEDs should be green on the front of the storage server. If they are not, use the Storage Manager client to diagnose the problem (see “Monitoring status through software” on page 62). This ensures that the storage server will power up correctly later. For more information, see Chapter 6, “Hardware maintenance,” on page 95.

The storage server is designed to run continuously, 24 hours a day. After you turn on the storage server, do not turn it off. Turn off the power only when:

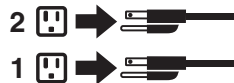
- Instructions in a hardware or software procedure require you to turn off the power.
- A service technician tells you to turn off the power.
- A power outage or emergency situation occurs (see “Performing an emergency shutdown” on page 61).

Statement 5:



CAUTION:

The power control button on the device and the power supply do not turn off the electrical current supplied to the device. The device also might have more than one power cord. To remove all electrical current from the device, ensure that all power cords are disconnected from the power source.



Perform the following steps to turn off the power:

1. Before proceeding, use the Storage Manager client to determine the status of the system components and special instructions. The operating system software might require you to perform other procedures before you turn off the power.
2. Use the Storage Manager client to check the status of the storage server. Correct problems that are reported before you turn off the power.
3. Stop all I/O activity to the storage server and attached expansion units. Make sure that:
 - All of the green Drive active LEDs on the front of the storage server (and on all attached expansion units) are not flashing.
 - The green Cache active LEDs on the back of the storage server are off.

Attention: To turn off all power to the storage server, you must turn off both power-supply switches and disconnect both power cords. Use the procedure in step 5 on page 60 for the proper shutdown sequence.

4. If applicable, use the operating system software to disconnect the storage server logical drives from the host before the storage server is powered off.

5. Turn off the power to each device based on the following shutdown sequence:
 - a. Turn off power to the host before the storage server. If the host must stay powered on to support an existing network, see the operating system documentation for information about disconnecting the storage server logical drives from the host before the storage server is powered off.
 - b. Turn off power to the storage server before you turn off power to the expansion units. Turn off both power supply switches on the back of the storage server.
 - c. Turn off power to other supporting devices (for example, management stations, fibre-channel switches, or Ethernet switches).

Note: You do not need to perform this step if you are servicing only the storage server.

6. After you perform the necessary maintenance procedures, turn on the power using the procedure in “Turning on the storage server” on page 57.

Restoring power after an unexpected shutdown

The storage server might shut down unexpectedly under any of the following conditions:

Attention: There might be data loss in each of the following cases:

- The internal temperature of the storage server exceeds the maximum operating temperature (an over-temperature condition).

If both fan CRUs fail or are unable to maintain an internal temperature below 70°C (158°F), one or both of the power supplies in the storage server will shut down. If both power supplies shut down, the unit is inoperable.

The Storage Manager client warns you if the temperature of the unit is rising before it has risen sufficiently to shut down the power supplies. The first warning comes when the storage server internal temperature exceeds 45°C (113°F). The storage server shuts down if the temperature rises to 70°C (158°F).

- There is a general power failure or a loss of power to the unit.
- You are forced to shut down the storage server without performing the normal shutdown procedures (listed in “Turning off the storage server” on page 59) because of an emergency situation.

Attention: To avoid damage to the hardware, take special care when you restart the system after an unexpected shutdown.

If the storage server shuts down unexpectedly, go to “Restoring power after an over-temperature shutdown” on page 61. Otherwise, go to “Restoring power after an emergency shutdown” on page 61.

Note: Unattended restoration of power is supported; however, if power restoration is attended, you should follow the best practices guidelines and the power restoration sequence in “Turning on the storage server” on page 57.

Performing an emergency shutdown

Attention: Emergency situations might include fire, flood, extreme weather conditions, or other hazardous circumstances. If a power outage or emergency situation occurs, always turn off all power switches on all computing equipment. This will help safeguard your equipment from potential damage due to electrical surges when power is restored. If the storage server loses power unexpectedly, it might be due to a hardware failure in the power system or midplane (see Chapter 6, “Hardware maintenance,” on page 95).

Use this procedure to shut down the storage server during an emergency:

1. If you have time, stop all I/O activity to the storage server by shutting down the host or disconnecting the storage server logical drives through the host.
2. Check the LEDs (front and back). Make note of any Fault LEDs that are on so you can correct the problem when you turn on the power again.
3. Turn off all power-supply switches; then unplug the power cords from the storage server.

Restoring power after an emergency shutdown

Use this procedure to restart the storage server if you turned off the power-supply switches during an emergency shutdown, or if a power failure or a power outage occurred:

1. After the emergency situation is over or power is restored, check the storage server for damage. If there is no visible damage, continue with step 2; otherwise, have your system serviced.
2. After you have checked for damage, ensure that the power-supply switches are off; then plug in the storage-server power cords.
3. Complete step 2 on page 58 to determine the proper power-on sequence for your system.
4. Complete steps 3 and 4 on page 58 to turn on power to the devices in your system and to check the status of the storage server.

Restoring power after an over-temperature shutdown

Use this procedure to restart the storage server after an unexpected shutdown due to an over-temperature condition:

1. Make sure that the power-supply switches on the back of the storage server are turned off.
2. Do whatever is necessary to cool the unit (replace the fans, use external fans to cool the room, and so on).
3. Check all components and cables for visible damage. *Do not start the storage server if you find evidence of damage.*
4. Complete step 2 on page 58 to determine the proper power-on sequence for your system.
5. When the internal temperature of the storage server is below 35°C (95°F), complete steps 3 and 4 on page 58 to turn on power to the devices in your system and to check the status of the storage server.

Monitoring status through software

Attention

To ensure proper operation when connecting EXP100 expansion units to the FAStT100, you must verify that the EXP100 ESM firmware level is at level 9551 or later. If the ESM firmware level is lower than 9551, disconnect the EXP100 and contact IBM support, your IBM reseller, or your IBM representative for assistance. See the *IBM TotalStorage FAStT EXP100 Expansion Unit Installation and User's Guide* for details on how to determine ESM firmware versions.

Use the Storage Manager client to monitor the status of the storage server. Run the software constantly, and check it frequently.

Important: Refer to the *IBM TotalStorage FAStT Storage Manager 8.42 Installation and Support Guide* for the appropriate operating system for instructions on how to install the FAStT Storage Manager 8.42.xx.xx host software.

In addition, to download the latest version of the FAStT Storage Manager 8.42.xx.xx host software, the FAStT storage server controller firmware and NVSRAM 5.42.xx.xx, and the latest FAStT EXP100 R2 ESM firmware (version 955x or higher), go to the following Web site:

www.ibm.com/storage/support/fastt

The Storage Manager client provides the best way to diagnose and repair storage-server failures. The software can help you:

- Determine the nature of the failure
- Locate the failed component
- Determine the recovery procedures to repair the failure

Although the storage server has fault LEDs, these lights do not necessarily indicate which component has failed or needs to be replaced, or which type of recovery procedure you must perform. In some cases (such as loss of redundancy in various components), the fault LED does not turn on. Only the Storage Manager client can detect the failure.

For example, the recovery procedure for a Predictive Failure Analysis[®] (PFA) flag (impending drive failure) on a drive varies depending on the drive status (hot spare, unassigned, RAID level, current logical drive status, and so on). Depending on the circumstances, a PFA flag on a drive can indicate a high risk of data loss (if the drive is in a RAID 0 volume) or a minimal risk (if the drive is unassigned). Only the Storage Manager client can identify the risk level and provide the necessary recovery procedures.

Note: For PFA flags, the General-system-error LED and Drive fault LEDs do not turn on, so checking the LEDs will not notify you of the failure, even if the risk of data loss is high.

Recovering from a storage-server failure might require you to perform procedures other than replacing the component (such as backing up the logical drive or failing a drive before removing it). The Storage Manager client gives these procedures.

Attention: Not following the software-recovery procedures can result in data loss.

Checking the LEDs

The LEDs display the status of the storage server and components. Green LEDs indicate a normal operating status; amber LEDs indicate a possible failure.

It is important to check all the LEDs on the front and back of the storage server when you turn on the power. In addition to checking for faults, you can use the LEDs on the front of the storage server to determine if the drives are responding to I/O transmissions from the host.

For information about the LEDs on the front of the storage server, see:

- Figure 50
- Table 10

For information about the LEDs on the back of the storage server, see:

- Figure 52 on page 66
- Table 11 on page 64
- Table 12 on page 66

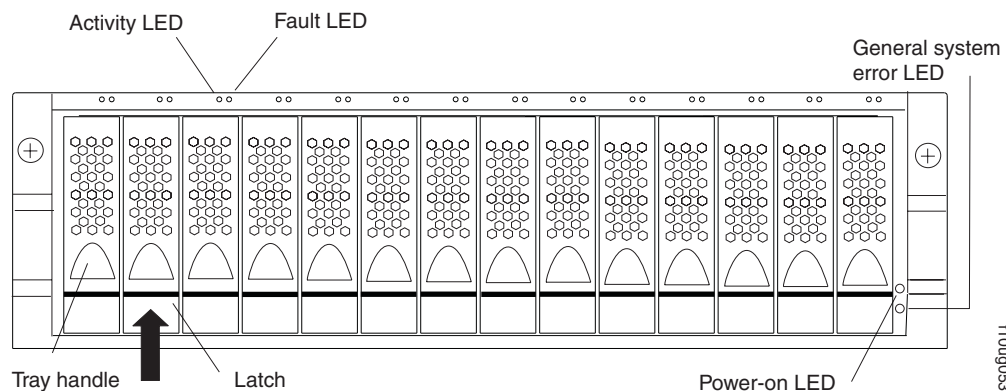


Figure 50. Storage server LEDs (front)

Table 10. Storage server LEDs (front)

| LED | Color | Operating states ¹ |
|--------------|-------|---|
| Drive active | Green | <ul style="list-style-type: none"> • On - Normal operation. • Flashing - The drive is reading or writing data. • Flashing every 5 seconds - The drive has not spun up or the drive is bad. • Off - One of the following situations has occurred: <ul style="list-style-type: none"> – The storage server has no power. – The drive is not properly seated in the storage server. |
| Drive fault | Amber | <ul style="list-style-type: none"> • Off - Normal operation. • Flashing - The Storage Manager client is locating a drive, logical drive, or storage subsystem. • On - The drive has failed, or a user failed the drive. |

Table 10. Storage server LEDs (front) (continued)

| LED | Color | Operating states ¹ |
|----------------------|-------|--|
| Power | Green | <ul style="list-style-type: none"> • On - Normal operation. • Off - One of the following situations has occurred: <ul style="list-style-type: none"> – The storage server has no power. – Both power supplies have failed. – There is an over-temperature condition. |
| General system error | Amber | <ul style="list-style-type: none"> • Off - Normal operation. • On - A storage server component has failed². |

¹ Always use the Storage Manager client to identify the failure.

² Not all component failures turn on this LED. For more information, see “Monitoring status through software” on page 62.

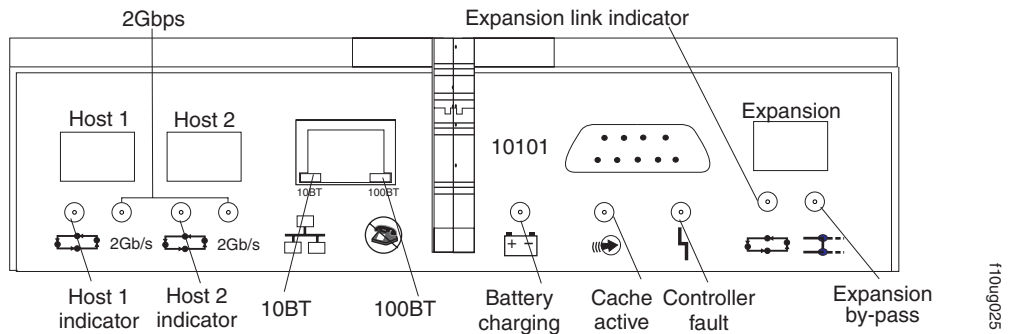






Figure 51. RAID controller LEDs

Table 11. RAID controller LEDs

| Icon | LED | Color | Operating states ¹ |
|------|-----------|-------|---|
| | Fault | Amber | <ul style="list-style-type: none"> • Off - Normal operation. • On - One of the following situations has occurred: <ul style="list-style-type: none"> – The RAID controller has failed. – The RAID controller was placed offline. – The controller battery had failed (in conjunction with the battery LED in off state). |
| | Host loop | Green | <ul style="list-style-type: none"> • On - Normal operation. • Off - One of the following situations has occurred: <ul style="list-style-type: none"> – The host loop is down, not turned on, or not connected. – A SFP has failed, or the host port is not occupied. – The RAID controller circuitry has failed, or the RAID controller has no power. |

Table 11. RAID controller LEDs (continued)

| Icon | LED | Color | Operating states ¹ |
|---|--------------------------|-------|---|
|  | Cache active | Green | <ul style="list-style-type: none"> • On - There is data in the RAID controller cache. • Off - One of the following situations has occurred: <ul style="list-style-type: none"> – There is no data in cache. – There are no cache options selected for this array. – The cache memory has failed, or the battery has failed. |
|  | Battery | Green | <ul style="list-style-type: none"> • On - Normal operation. • Flashing - The battery is recharging or performing a self-test. • Off - The battery or battery charger has failed. |
|  | Expansion port bypass | Amber | <ul style="list-style-type: none"> • Off - Normal operation. • On - One of the following situations has occurred: <ul style="list-style-type: none"> – An SFP module is inserted in the drive loop port and the fibre-channel cable is not attached to it. – The fibre-channel cable is not attached to an expansion unit. – The attached expansion unit is not turned on. – An SFP has failed, a fibre-channel cable has failed, or an SFP has failed on the attached expansion unit. |
|  | Expansion loop | Green | <ul style="list-style-type: none"> • On - Normal operation. • Off - The RAID controller circuitry has failed, or the RAID controller has no power. |
| 2Gbps | Fibre channel port speed | Green | <ul style="list-style-type: none"> • On - Normal operation (host connection is at 2Gbps). • Off - Host connection is at 1Gbps |
| 10BT | 10BT | Green | <ul style="list-style-type: none"> • If the Ethernet connection is 10BASE-T: The 10BT LED is on, 100BT LED flashes faintly. • If the Ethernet connection is 100BASE-T: 10BT LED is off, 100BT LED is on. • If there is no Ethernet connection - Both LEDs are off. |
| 100BT | 100BT | | |
| <p>¹ Always use the Storage Manager client to identify the failure.</p> | | | |

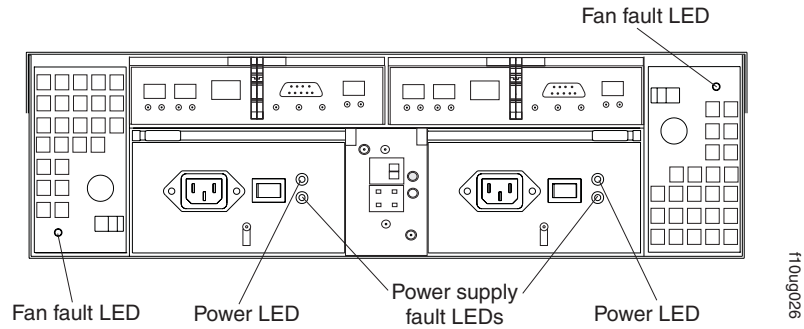


Figure 52. Fan and power supply LEDs

Table 12. Fan LED

| LED | Color | Operating states ¹ |
|---|-------|---|
| Fault | Amber | <ul style="list-style-type: none"> • Off - Normal operation. • On - The fan CRU has failed. |
| ¹ Always use the Storage Manager client to identify the failure. | | |

Table 13. Power supply LEDs

| LED | Color | Operating states ¹ |
|---|-------|--|
| Fault | Amber | <ul style="list-style-type: none"> • Off - Normal operation. • On - One of the following situations has occurred: <ul style="list-style-type: none"> – The power supply has failed. – An over-temperature condition has occurred. |
| Power | Green | <ul style="list-style-type: none"> • On - Normal operation. • Off - One of the following situations has occurred: <ul style="list-style-type: none"> – The power supply is disconnected. – The power supply is seated incorrectly. – The storage server has no power. – The power supply is turned off. |
| ¹ Always use the Storage Manager client to identify the failure. | | |

Cache memory and RAID controller battery

Each RAID controller in the FASi100 contains 128 MB of cache data. Each controller also contains a rechargeable battery that maintains data in the cache in the event of a power failure. The following sections describe these features and their associated LEDs.

Cache memory

Cache memory is memory on the RAID controller that is used for intermediate storage of read and write data. Using cache memory can increase system performance. The data for a read operation from the host might be in the cache memory from a previous operation (thus eliminating the need to access the drive itself), and a write operation is completed when it is written to the cache, rather than to the drives.

See the Storage Manager client documentation for information on setting cache memory options.

The RAID controller has a Cache active LED that displays the current status of the cache. The LED is on if there is data in the cache, and it is off if there is no data in the cache.

If caching is enabled and the Cache active LED never comes on during I/O activity, it indicates that the cache memory has failed or the battery has failed (the green Battery LED will be off).

Note: Always use the Storage Manager client to check your cache memory settings before assuming a hardware failure.

Figure 53 shows the location of the Cache active LED on the front of the RAID controller.

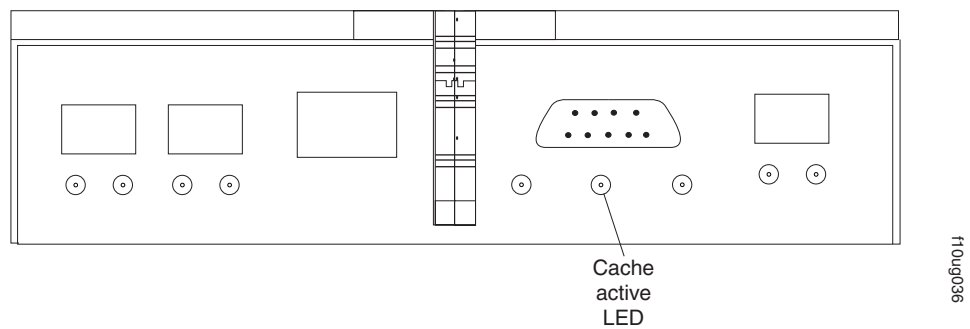


Figure 53. Cache active LED

RAID controller cache battery

Each RAID controller contains a sealed, rechargeable 4-volt lead-acid battery. This battery provides cache backup for up to three days in the event of a power loss.

The service life of the battery is three years, after which time the battery must be replaced. See the Storage Manager client for information on how to view and set the battery expiration date.

Each RAID controller has a green Battery LED on the back that indicates the battery status, as follows:

- The LED is on and remains steady when the battery is fully charged.
- The LED flashes when the battery is charging or performing a self-test.
- The LED is off if the battery or the battery charger has failed.

The battery performs a self-test at startup and every 25 hours thereafter (during which time the Battery LED flashes). If necessary, the battery begins recharging at that time. If the battery fails the self-test, the Battery LED turns off, indicating a battery fault.

Data caching starts after the battery completes the startup tests.

Figure 54 shows the location of the Battery LED on the front of the RAID controller.

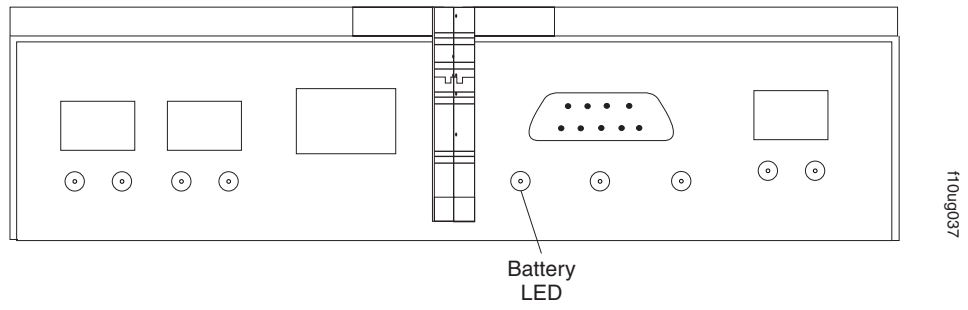


Figure 54. Battery LED

Chapter 5. Installing and replacing components

This chapter provides instructions to help you install or remove customer replaceable units (CRUs), such as hot-swap drives, fans, RAID controllers, and power supplies. This chapter also provides instructions to help you add new EXP100 expansion units to existing FAStT100 configuration.

For more field-replaceable unit (FRU) and Option part number information, see the following Web site:

www.ibm.com/storage/techsup.htm

Handling static-sensitive devices

Attention: Static electricity can damage electronic devices and your system. To avoid damage, keep static-sensitive devices in their static-protective packages until you are ready to install them.

To reduce the possibility of electrostatic discharge, observe the following precautions:

- Limit your movement. Movement can cause static electricity to build up around you.
- Handle the device carefully, holding it by its edges or its frame.
- Do not touch solder joints, pins, or exposed printed circuitry.
- Do not leave the device where others can handle and possibly damage the device.
- While the device is still in its static-protective package, touch it to an unpainted metal part of the storage server for at least two seconds. This drains static electricity from the package and from your body.
- Remove the device from its package and install it directly into your storage server without setting it down. If it is necessary to set the device down, place it in its static-protective package. Do not place the device on your storage server cover or any metal surface.
- Take additional care when handling devices during cold weather because heating reduces indoor humidity and increases static electricity.

Working with hot-swap hard disk drives

Drives are devices that the system uses to store and retrieve data. This section explains how you can increase the storage-server capacity by adding more drives or replacing existing drives with ones containing a larger capacity.

Before you begin, complete the following tasks:

- Read the safety and handling guidelines in “Safety” on page iii and in “Handling static-sensitive devices” on page 14.
- Ensure that your current system configuration is working properly.
- Back up all important data before you make changes to data storage devices.

Attention: Never hot-swap a drive CRU when its green Activity LED is flashing. Hot-swap a drive CRU only when its amber Fault LED is completely on and not flashing or when the drive is inactive with the green Activity LED on and not flashing.

Before you install or remove drive CRUs, review the following information:

- **Blank trays:** A storage server without a full set of drives (14) contains blank trays in the unused drive bays. Before installing new drives, you must remove these empty trays. Save the empty trays for future use. Each of the 14 bays must always contain either a blank tray or a hot-swap hard disk drive.

Note: For proper cooling and EMC protection, do not leave a drive slot open without either a drive blank or a drive CRU inserted.

- **Drive CRUs:** The FAStT100 supports up to fourteen IBM 1.5 Gbps SATA hard disk drives.

Note: Do not use fibre-channel hard disk drive CRUs in the FAStT100. These drives come preinstalled in drive trays. This drive-and-tray assembly is called a *drive CRU*. You can install the drive CRUs in the 14 drive bays on the front of the storage server.

- **Drive CRU labels:** A label is provided on the front of each hard disk drive. Use this label to record the location information for each drive before you remove it. Ensure that you keep track of the drives and their corresponding bays. Also, record the location information in Table 17 on page 103. If you install a drive in the wrong bay, you might lose data.
- **Drive LEDs:** Each drive tray has two associated LEDs, a green Activity LED and an amber Fault LED, on the chassis of the FAStT100. These LEDs indicate the status for that drive. See Table 14 for the drive LED states and descriptions.

Table 14. Drive LED activity

| LED | LED state | Descriptions |
|-------------------------|----------------|---|
| Activity LED | Flashing green | The green LED flashes to indicate fibre-channel activity to the drive. |
| Activity LED | Steady green | The green LED lights to indicate that the drive is properly installed and is spun up by the FAStT controller. |
| Fault LED | Flashing amber | The amber LED flashes to indicate that a drive has been identified by the software. |
| Fault LED | Steady amber | The amber LED lights to indicate a drive failure. |
| Activity and Fault LEDs | All unlit | The storage server is powered off. |

- **Fibre-channel loop IDs:** When you install a drive CRU in the storage server, the drive CRU connects into a printed circuit board called the *midplane*. The midplane automatically sets the fibre-channel loop ID to the default value 00.
- **Hot-swap hardware:** The storage server contains hardware that you can use to replace a failed hard disk drive without turning off the storage server. Therefore, you can continue operating the system while a hard disk drive is removed or installed. These drives are known as *hot-swap* drives.

Installing hot-swap hard disk drives

You can install hard disk drives while the storage server is turned on and running. Complete the following steps to install hot-swap hard disk drives in the storage server:

1. Read the documentation that comes with the hard disk drive.
2. Check for Fault LEDs shown in Figure 55. If any amber LEDs are lit, see Chapter 6, "Hardware maintenance," on page 95.

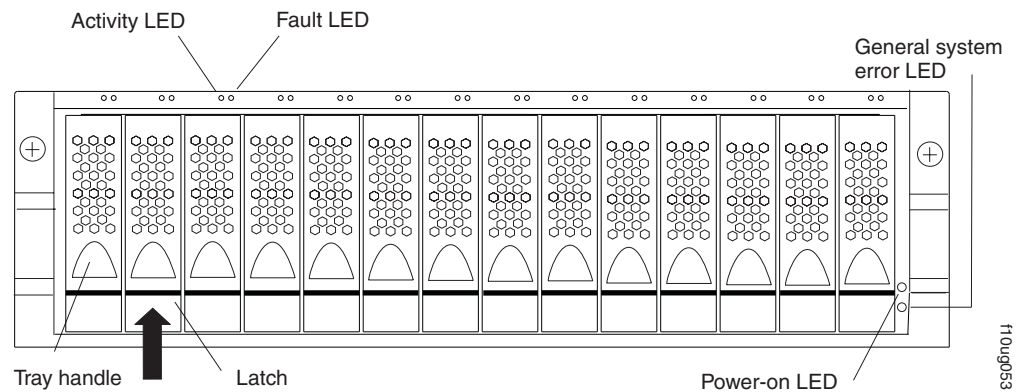


Figure 55. Hot-swap hard disk drive LEDs

3. Determine the bay into which you want to install the drive.
4. Remove the blank tray:
 - a. Release the latch on the drive CRU by pinching together the blue line on the tray latch and the finger hole on the tray handle, as shown by the arrow in Figure 55.
 - b. Pull the handle on the tray out so that it is in the open position to release the drive CRU, and then pull the blank tray out of the bay.
 - c. Save the blank tray for later use.
5. Install the hard disk drive:

Note: The hard disk drive comes installed in a drive tray. Do not attempt to detach the drive from the tray.

- a. Release the latch on the drive CRU by pinching together the blue line on the tray latch and the finger hole on the tray handle.
- b. Pull the handle on the tray out so that it is in the open position, as shown in Figure 56.

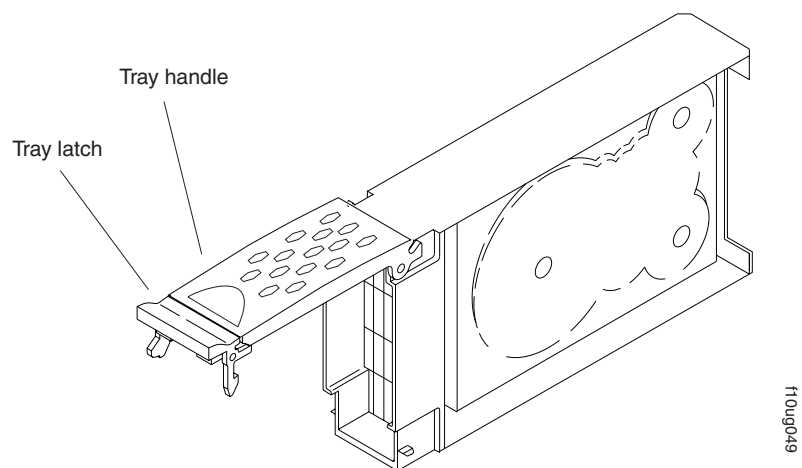


Figure 56. Drive CRU handle

- c. Slide the drive CRU into the empty bay until the hinge of the tray handle latches beneath the storage server bezel.
- d. Push the tray handle down until it latches into place.

Replacing hot-swap hard disk drives

Drive problems include any malfunctions that delay, interrupt, or prevent successful I/O activity between the hosts and the hard disk drives in the storage server. This includes transmission problems between the host controllers, the RAID controllers, and the drives. This section explains how to replace a failed hard disk drive.

Note: If you want to remove a hard disk drive that is not in a failed or bypass state, always use the Storage Manager client program either to place the drive in a failed state or to place the array that is associated with the drive (or drives) in an offline state before you remove the drive from the enclosure.

Attention: Failure to replace the hard disk drives in their correct bays might result in loss of data. If you are replacing a hard disk drive that is part of a configured array and logical drive, ensure that you install the replacement hard disk drive in the correct bay. Check the hardware and software documentation that is provided with your FASiT storage server to see if there are restrictions regarding hard disk drive configurations.

Complete the following steps to replace a hot-swap hard disk drive:

1. Determine the location of the drive that you want to remove.

Attention: Never hot-swap a drive CRU when its green Activity LED is flashing. Hot-swap a drive CRU only when its amber Fault LED is on and not flashing or when the drive is inactive with the green Activity LED on and not flashing.

If the drive is not in a failed state (as indicated by its lit amber LED), manually fail the drive using the Storage Management client before attempting to remove it from the drive slot.

2. Remove the drive CRU:
 - a. Release the latch on the drive CRU by pinching together the blue line on the tray latch and the finger hole on the tray handle, as shown by the arrow in Figure 56 on page 71.
 - b. Pull the tray handle out into the open position.
 - c. Lift the drive CRU partially out of the bay.
 - d. To avoid possible damage to the drive, wait at least 20 seconds before fully removing the drive CRU from the storage server to allow the drive to stop (spin down).
 - e. Verify that there is proper identification (such as a label) on the drive CRU, and then slide it completely out of the storage server.
3. Install the new drive CRU:
 - a. Gently push the drive CRU into the empty bay until the hinge of the tray handle latches beneath the storage server bezel.
 - b. Push the tray handle down into the closed (latched) position.
4. Check the drive LEDs:
 - When a drive is ready for use, the green Activity LED is either on continuously or rapidly flashing, and the amber Fault LED is off.
 - If the amber Fault LED lights and is not flashing, remove the drive from the unit and wait 10 seconds; then, install the drive again.

5. If the drive is part of a defined RAID array, the array reconstruction (without hot-spare) or copy-back (with hot-spare) operation automatically starts.
6. Use the Storage Manager software GUI to verify that the drive is shown in the Storage Subsystem Management window.

Upgrading drives

You can upgrade drives in the following two ways:

- By adding drives to empty slots in the storage server (see “Installing hot-swap hard disk drives” on page 70)
- By replacing existing drives with larger capacity drives

Adding larger-capacity drives

This section provides guidelines for upgrading the drives in the storage server. Read the software documentation and this entire section to determine if you should use this procedure, use a modified version of this procedure, or use a different procedure that is provided by your operating system. *Instructions that are provided with your software should supersede anything stated in this document.*

There are two methods for upgrading drives:

- **Replacing all the drives at the same time**

This method requires that you back up the data on the affected drives and then turn off the storage server. After replacing all the drives, you must reconfigure the new drives and restore data from backup. See the procedure in “Replacing all drives at the same time” on page 74.

This is the safest way to exchange drives without losing data. However, this method might take a long time to complete because of the backup, reconfiguration, and restoration processes. In addition, other users are not able to use the storage server (or any expansion units attached to the storage server) until you finish the procedure. You must use this method on RAID 0 logical drives.

- **Replacing the drives one at a time**

In this method, you manually fail each drive, replace it, and wait for the system to restore data to the new drive before installing the next drive. After you install the new drives, you can configure them to make the additional drive space available. See the procedure in “Replacing the drives one at a time” on page 76.

Using this method, you can replace the drives while the storage server is running, eliminating the down time that is required if you replace all the drives at once. However, this method is more risky because you can lose data if the drive restoration or storage subsystem reconfiguration process fails. In addition, the reconstruction process might take a long time. This method works only on redundant logical drives (RAID 1, 3, or 5). You cannot use this method with any drives containing RAID 0 logical drives.

Consider backing up your data if you use this method. This safeguards your data if the restoration and reconfiguration process fails or the new drive malfunctions.

The method you use depends on the following considerations:

- Which method most closely matches the recommended drive upgrade procedure that is provided in the operating system or the Storage Manager client documentation
- Which RAID level is used on the affected drives (RAID 0 requires you to replace all the drives at the same time)

- How much downtime is acceptable as you swap the drives
- The number of drives in an array. Replacing drives one at a time is better suited for arrays consisting of 3 to 5 drives. If you have more than 20 drives, consider replacing all drives at the same time.

Replacing all drives at the same time

Use this procedure to replace all drives at the same time. You must use this method if you are upgrading drives containing RAID 0 logical drives. All the data currently on the drives is lost when you replace the drives; therefore, you must back up all data that is currently on the drives. This procedure also requires you to turn off the storage server, which makes the storage server (and any attached expansion units) inaccessible to other users.

To replace all the drives at the same time, perform the following steps:

1. Read the following information:
 - The information in “Adding larger-capacity drives” on page 73, particularly the paragraphs that discuss the differences between the two possible upgrade procedures
 - The information in your software documentation regarding drive upgrades and installation
 - The documentation that comes with the new drives

Read all precautionary notes, kit instructions, and other information. Kit instructions often contain the most current information regarding the drives and their installation, plus upgrade or servicing procedures. Compare the kit instructions with this procedure to determine if you need to modify this procedure.
2. Use the Storage Manager client to check the status of the storage server. Correct any problems that are reported.
3. Perform a complete backup of the drives that you are replacing.
You need the backup to restore data on the drives later in this procedure.

Attention: When you handle static-sensitive devices, take precautions to avoid damage from static electricity. For details about handling static-sensitive devices, see “Handling static-sensitive devices” on page 69.
4. Unpack the new drives.
Set the drives on a dry, level surface away from magnetic fields. Save the packing material and documentation in case you need to return the drives.
5. Perform the following steps:
 - a. Stop all I/O activity to the storage server and attached expansion units. Make sure that:
 - 1) All of the green Drive activity LEDs on the front of the storage server (and on all attached expansion units) are not flashing.
 - 2) The green Cache active LEDs are off on the front of the RAID controllers.
 - b. If applicable, use the operating system software to disconnect the storage server logical drives from the host before you power off the storage server.

Attention: To turn off all power to the storage server, you must turn off both power-supply switches and disconnect both power cords. Use the procedure in step 6 for the proper shutdown sequence.

6. Turn off the power to each device based on the following shutdown sequence:

- a. Turn off power to the host before you turn off power to the storage server. If the host must stay powered on to support an existing network, see the operating system documentation for information about disconnecting the storage server logical drives from the host before the storage server is powered off.
- b. Turn off power to the storage server before you turn off power to the expansion units. Turn off both power supply switches on the back of the storage server.
- c. Turn off power to other supporting devices (for example, management stations, fibre-channel switches, or Ethernet switches).

Notes:

- 1) You do not need to perform this step if you are servicing only the storage server.
 - 2) Depending on your operating system, you might not have to restart the host. For more information, see the software installation guide for your operating system.
7. Use the procedures in 5 on page 20 to remove the drives that you want to replace. Use the procedures in “Installing hot-swap hard disk drives” on page 70 to install the new drives into the storage server.
 8. After you install all the new drives, check the system documentation for the hardware devices that you intend to power up, and then determine the proper startup sequence. Use the following power-on sequence, where applicable:
 - a. Turn on the power to the supporting devices (for example, Ethernet switches and management stations) before you turn off power to the storage server.
 - b. You must turn on the expansion units before the storage server. The controllers might not recognize the correct configuration if the drives are powered up after the storage server. For instructions on powering up the expansion units, see the expansion-unit documentation.
 - c. Turn on the power to the storage server; then restart or turn on the power to the host.
 9. Turn on the power to each device, based on the power-on sequence in step 8. To turn on power to the storage server, turn on the power-supply switches on the back of the storage server. You must turn on both power-supply switches to take advantage of the redundant power supplies.
 10. Check the green Drive activity LED and the amber Drive fault LED below the new drive CRUs.

Make sure that the Drive activity LEDs are on and the Drive fault LEDs are off.

Note: The Drive fault LEDs might flash intermittently while the drives spin up.

- If the Drive activity LED is off, the drive CRU might not be installed correctly. Remove the drive CRU, wait 30 seconds, and then reinstall it.
 - If the Drive fault LED stays on or the Drive activity LED stays off, the new drive might be faulty. See the Storage Manager client online Help for problem determination.
11. Use the Storage Manager client to configure the new drives. See the Storage Manager client online Help for detailed instructions.
 12. Restore the data from backup to all the drives.

Replacing the drives one at a time

Use this procedure to replace all the drives one at a time. You cannot use this procedure on RAID 0 logical drives (use the procedure in “Replacing all drives at the same time” on page 74).

Note: If your storage subsystem has hot spares assigned, you might want to unassign the hot spares while you perform this procedure. If you do not, reconstruction might start on the hot spare before you insert the new drive. The data on the new drive is still rebuilt, but the process takes longer for each drive. Remember to reassign the hot spares when you are finished with this procedure.

To replace the drives one at a time, perform the following steps:

1. Read the following information:
 - “Adding larger-capacity drives” on page 73, particularly the paragraphs that discuss the differences between the two possible upgrade procedures
 - Your software documentation regarding drive upgrades and installation
 - The documentation that comes with the new drives

Read all precautionary notes, kit instructions, and other information. Kit instructions often contain the most current information regarding the drives and their installation, plus upgrade or servicing procedures. Compare the kit instructions with this procedure to determine if you need to modify this procedure.
2. Use the Storage Manager client to check the status of the unit. Correct any problems that are reported.
3. Back up the data on the drives that you are replacing.

Attention: When you handle static-sensitive devices, take precautions to avoid damage from static electricity. For details about handling static-sensitive devices, see “Handling static-sensitive devices” on page 69.
4. Unpack the new drives.

Set the drives on a dry, level surface away from magnetic fields. Save the packing material and documentation in case you need to return the drives.
5. Use the storage management software to ensure that the array that was defined using these drives is in optimal (not degraded) state before manually failing the first drive you want to replace. If the array is in degraded state, use the recovery procedures to bring the array into the optimal state.

Make sure that:

- You fail only one drive
- The software status display shows a failed status for the appropriate drive
- The amber Drive fault LED (on the front bezel below the drive) is on

Attention: Removing the wrong drive can cause data loss. Make sure that you remove only the failed drive CRU. The Drive fault LED below the failed drive CRU should be on.

If you remove an active drive accidentally, wait at least 30 seconds and then reinstall it. Because you failed two drives in a RAID array, the array might be marked failed by the controller. This array will not be available to the host for I/O. See the Storage Manager client for further recovery instructions. Do not attempt to replace any drives until the array is brought back to optimal state.

6. Use the procedures in 5 on page 20 to remove the failed drive. Use the procedures in “Installing hot-swap hard disk drives” on page 70 to install the new drives into the storage server.

The new drive automatically reconstructs the data after you install it in the drive slot.

During data reconstruction, the amber Drive fault LED might come on for a few minutes, then turn off when the green Drive activity LED begins flashing. A flashing Drive activity LED indicates that data reconstruction is in progress.

Note: If your storage subsystem has active hot spares, data might not start copying to the new drive until the data is reconstructed on the hot spare. This increases the time that is required to complete the procedure.

7. Check the green Drive activity LED and the amber Drive fault LED below the new drive CRUs.

Make sure that the Drive activity LEDs are on and the Drive fault LEDs are off.

Note: The Drive fault LEDs might flash intermittently while the drives spin up.

- If the Drive activity LED is off, the drive CRU might not be installed correctly. Remove the drive CRU, wait 30 seconds, and then reinstall it.
- If the Drive fault LED stays on or the Drive activity LED stays off, the new drive might be faulty. See the Storage Manager client for problem determination.

8. Use the Storage Manager client to monitor the status of the new drive and the progress of the data reconstruction. Wait for data reconstruction to finish (the Drive activity LED stops flashing).

Note: The Drive activity LED will continue to flash after reconstruction is finished if there is I/O activity to that drive. In that case, use the host software to determine if the data reconstruction is finished.

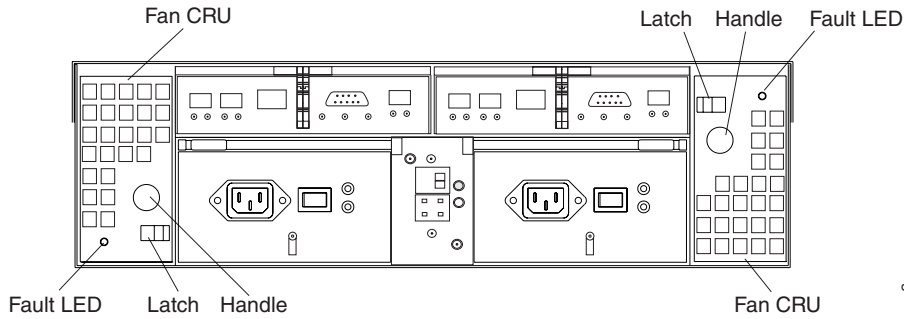
9. When reconstruction is finished on the new drive, repeat step 5 on page 76 through step 8 for each additional drive that you want to install.
10. Use the Storage Manager client to configure the additional space on the new drives.

Working with hot-swap cooling fans

The storage server cooling system consists of two fan CRUs, each containing two fans. The fan CRUs circulate air inside the unit by pulling in air through the vents on the front of the drive CRUs and pushing out air through the vents in the back of each fan CRU. See Figure 57 on page 78.

If two fans fail, or the fans cannot maintain an internal temperature below 70°C (158°F), the power supplies in the unit will automatically shut down (an over-temperature condition). If this occurs, you must cool the unit and restart it. See “Restoring power after an over-temperature shutdown” on page 61.

Attention: The fans in the storage server draw in fresh air and force out hot air. These fans are hot-swappable and redundant; however, when one fan fails, you must replace the fan CRU within 48 hours to maintain redundancy and optimum cooling. When you replace the failed fan CRU, be sure to install the second fan CRU within 10 minutes to prevent any overheating due to the lack of the additional fan CRU.



110ug024

Figure 57. Fan locations

Fan CRUs

The two fan CRUs are hot-swappable and redundant.

Fault LEDs

These amber LEDs light when a fan failure occurs.

Latches and handles

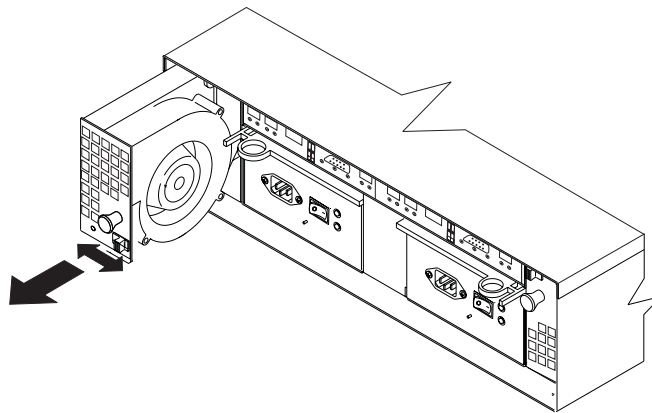
Use the latches and handles to remove or install the fan CRUs.

Attention: Do not run the storage server without adequate ventilation and cooling, because it might cause damage to the internal components and circuitry.

Both fan units must always be in place, even if one is not functioning properly, to maintain proper cooling.

Use the following procedure to replace a hot-swap fan:

1. Check the LEDs on the back of the storage server.
2. If the amber Fault LED is on, remove the fan CRU that has failed.
 - a. Slide the latch to unlock the fan CRU.
 - b. Use the handle (black knob) to pull the fan from the storage server. See Figure 58.



110ug038

Figure 58. Removing a fan

3. Install the new fan unit.
 - a. Place the fan CRU in front of the fan slot.

- b. Hold the latch open, and slide the fan all the way into the slot. If the fan does not go into the bay, rotate it 180°. Ensure that the latch is on the side closest to the center of the storage server.
 - c. Release the latch. If the lever remains open, pull back on the fan slightly, and then push it in again until the latch snaps into place.
4. Check the LEDs.

The Fault LEDs turn off after a few seconds. If they remain on, see Chapter 6, “Hardware maintenance,” on page 95.

Working with hot-swap power supplies

The storage server power system consists of two power supply CRUs. The power supply CRUs provide power to the internal components by converting incoming ac voltage to dc voltage. One power supply CRU can maintain electrical power to the unit if the other power supply is turned off or malfunctions. The power supply CRUs are interchangeable (by reversing the locking levers).

Each power supply CRU has a built-in sensor that detects the following conditions:

- Over-voltage
- Over-current
- Overheated power supply

If any of these conditions occurs, one or both power supplies will shut down. All power remains off until you cycle the power switches (turn the power switches off, wait at least 30 seconds, then turn the power switches on). For more information, see “Restoring power after an unexpected shutdown” on page 60 and “Restoring power after an over-temperature shutdown” on page 61.

The power supplies are customer replaceable units (CRUs) and do not require preventive maintenance.

- Always keep the power supplies in their proper places to maintain proper controller-unit cooling.
- Use only the supported power supplies for your specific storage server.

The power-supply controls on the rear of the storage server are shown in Figure 59.

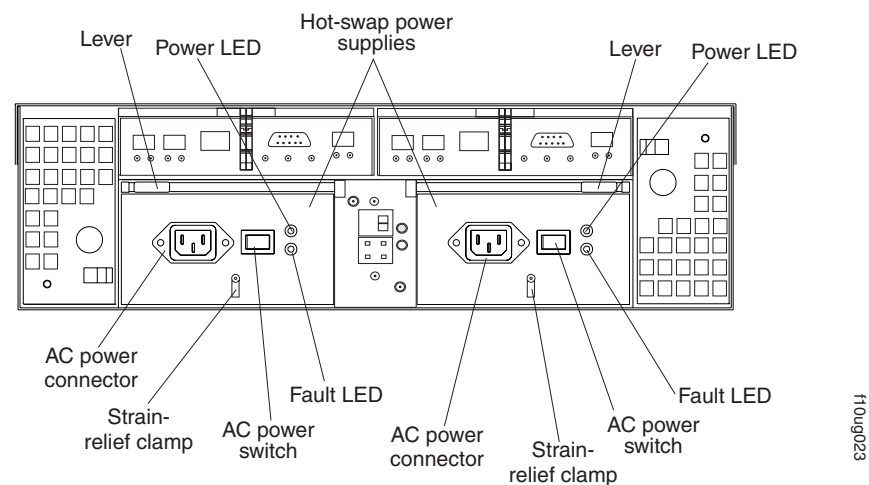


Figure 59. Power supply controls

Levers

Use these locking handles to remove or install a power supply.

Power LED

These green LEDs light when the storage server is turned on and receiving ac power.

Fault LEDs

These amber LEDs light if a power supply failure occurs or if the power supply is turned off.

AC power switches

Use these switches to turn the power supplies on and off. You must turn on both switches to take advantage of the redundant power supplies.

AC power connectors

This connection is for the ac power cord.

Strain-relief clamp

Use this clamp to provide strain relief on the power cord.

Removing a hot-swap power supply

Statement 8:**CAUTION:**

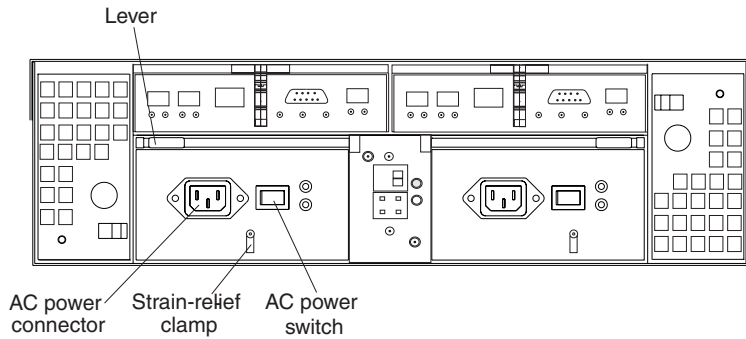
Never remove the cover on a power supply or any part that has the following label attached.



Hazardous voltage, current, and energy levels are present inside any component that has this label attached. There are no serviceable parts inside these components. If you suspect a problem with one of these parts, contact a service technician.

To remove a hot-swap power supply, perform the following steps:

1. Turn off the ac power switch. See Figure 60 on page 81.



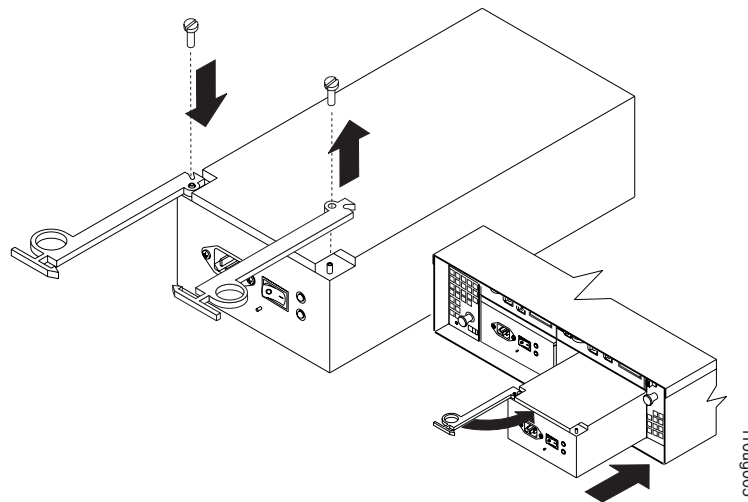
110ug027

Figure 60. Lever for power supply removal

2. Unplug the power cord from the electrical outlet.
3. Disconnect the power cord from the ac power connector on the power supply.
4. Remove the nut and strain-relief clamp from the rear of the power supply.
5. Remove the power supply from the storage server, as follows:
 - a. Grasp the pull-ring on the power-supply lever and squeeze the latch to release it.
 - b. Pull the lever open and remove the power supply.

Installing a hot-swap power supply

Note: When you replace a power supply that has failed, ensure that the power supply latch is mounted on the side of the power supply that faces the middle of the storage server. If it is not, remove the lever screw, flip the lever over, and tighten the screw on the opposite side.



110ug005

Figure 61. Installing a hot-swap power supply

To install a hot-swap power supply, perform the following steps:

Statement 8:



CAUTION:

Never remove the cover on a power supply or any part that has the following label attached.



Hazardous voltage, current, and energy levels are present inside any component that has this label attached. There are no serviceable parts inside these components. If you suspect a problem with one of these parts, contact a service technician.

1. Ensure that the ac power switch is off on the power supply that you are installing.
2. Install the power supply in the storage server, as follows:
 - a. Slide the power supply into the storage server. Make sure that the lever is pulled straight out as you slide the power supply into the storage server.
 - b. Close the lever until the pull-ring latch locks in place. Make sure that the lever locks into place in the storage-server chassis.
3. Wrap the strain-relief clamp around the power cord approximately 20 cm (8 in.) from the power-supply connection end.
4. Attach the power-supply nut and tighten it securely.
5. Connect the power cord to the AC power connector. See Figure 62.

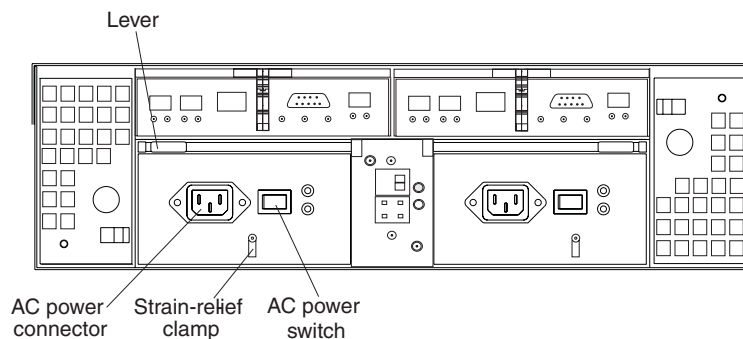


Figure 62. Connecting the power cord to the AC power connector

6. Plug the power cord into a properly grounded electrical outlet.
7. Turn on the power-supply switch.
8. Make sure that the green Power LED on the new power-supply CRU is on and the amber Fault LED is off.
 - If the Power LED is off, the power-supply CRU might not be installed correctly. Remove it and then reinstall it.

- If the Fault LED is on or the Power LED stays off, see the Storage Manager client for problem determination.

For more information about the LEDs, see “Checking the LEDs” on page 63.

Working with hot-swap RAID controllers

Each RAID controller fits into the back of the storage server and has the following components:

- Battery
- Cache memory
- Two host ports and one expansion port
- One Ethernet port
- One serial port

Each RAID controller has a unique hardware Ethernet address, which is printed on a label on the front. There is also a label giving the cache battery manufacturing and installation dates on the top of the controller unit. Figure 63 shows the location of these items.

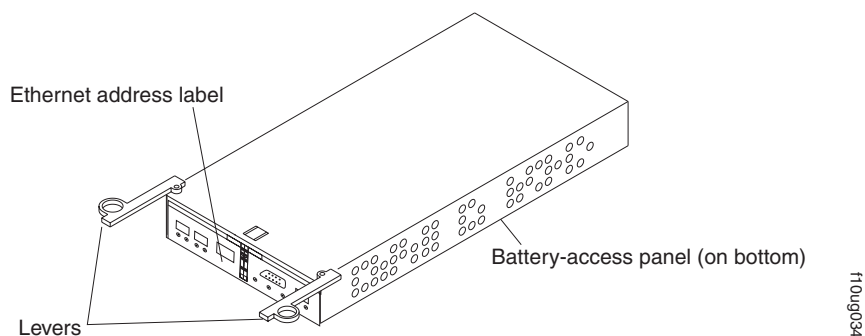


Figure 63. RAID controller levers and labels

For information about the RAID controller cache memory and rechargeable battery, see “Cache memory and RAID controller battery” on page 66.

Replacing a RAID controller

When instructed to do so by the Storage Manager client, replace a RAID controller that has failed.

Important

The replacement RAID controller CRU does not come with a RAID controller cache battery installed, nor does it come with the mounting hardware that holds the battery in place inside the RAID controller. You must remove the cache battery that is inside the existing RAID controller that you are replacing, and install that battery inside the replacement RAID controller CRU, using the battery unit mounting hardware taken from the existing controller. The steps to remove and replace the battery are included in the following procedure.

Note: Avoid operating the FAStT100 with controllers of different cache sizes. Operating the storage server with controllers of different cache size will disable caching and might adversely affect performance.

To replace a RAID controller, perform the following steps:

1. Check the Storage Manager client for instructions on RAID controller failure-recovery procedures. Follow the steps provided in the software documentation before continuing with step 2.
2. Label each cable that connects to the RAID controller that has failed. This ensures that all cables will be properly reconnected to the new RAID controller.

Attention: Handle and install fiber-optic cables properly to avoid degraded performance or loss of communications with devices. When working with fiber-optic cables, do not pinch them, step on them, or locate them in aisles or walkways. Do not overtighten the cable straps or bend the cables to a radius smaller than 38 mm (1.5 in.).

3. From the RAID controller that has failed, remove the fibre-channel cables from the SFPs. The location of these components is shown in Figure 64.

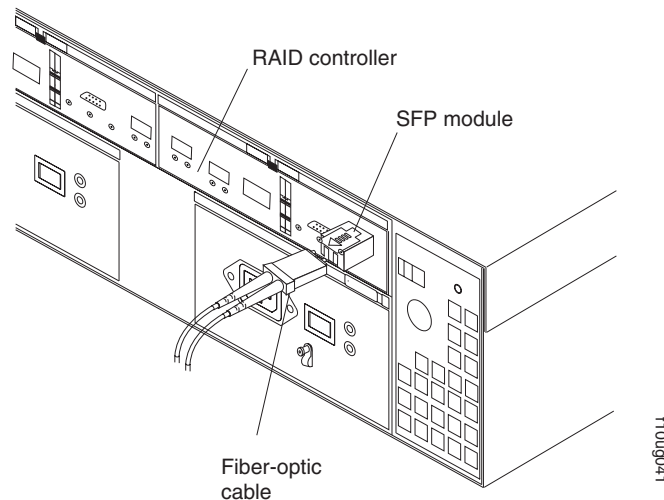


Figure 64. Location of SFPs and fiber-optic cables

After removing the fibre-channel cables, insert the protective caps.

4. Use the following procedure to remove the SFPs from the RAID controller that has failed.
 - a. Remove the LC-LC fibre-channel cable from the SFP module. For more information, see “Handling fiber-optic cables” on page 39.
 - b. Unlock the SFP module latch:
 - For SFP modules that contain plastic tabs, unlock the SFP module latch by pulling the plastic tab outward 10°, as shown in Figure 65 on page 85.

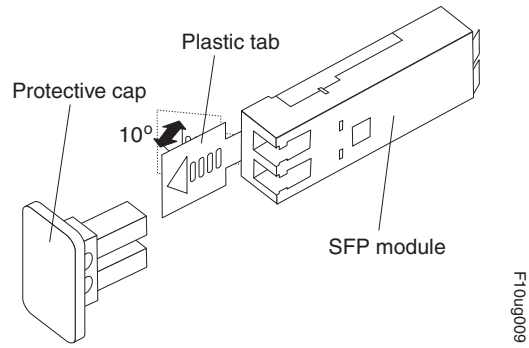


Figure 65. Unlocking the SFP module latch - plastic variety

- For SFP modules that contain wire tabs, unlock the SFP module latch by pulling the wire latch outward 90°, as shown in Figure 66.

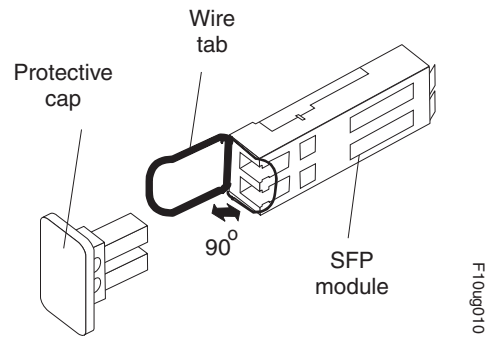
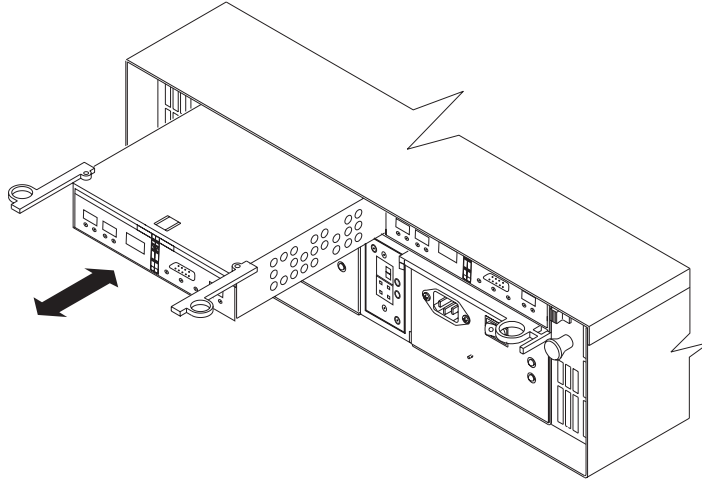


Figure 66. Unlocking the SFP module latch - wire variety

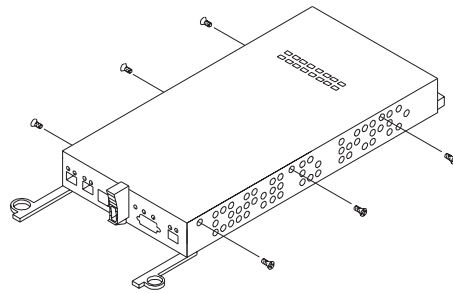
- c. With the SFP latch in the unlocked position, extract the SFP module.
 - For SFP modules that contain plastic tabs, slide the SFP module out of the port.
 - For SFP modules that contain wire tabs, grasp the wire latch and pull the SFP module out of the minihub port.
 - d. Replace the protective cap on the SFP module.
 - e. Place the SFP module into a static-protective package.
 - f. Replace the protective cap on the port.
5. Remove the failed RAID controller (the Fault LED is on), as follows:
 - a. Push down on the latch (centered above the RAID controller). Pull both levers at the same time out of the locked position.



t10ug033

Figure 67. Pull-rings for removing a controller

- b. Grasp the pull-rings; then pull on the levers and remove the RAID controller.
6. To remove the cache battery, place the RAID controller CRU bottom up on a flat surface. Using a #2 Phillips head screwdriver, remove the six screws (three on each side of the RAID controller) that hold the RAID controller bottom panel to the sides of the RAID controller, as shown in Figure 68.



t10ug035

Figure 68. Controller battery-access panel screws

7. Slide the RAID controller bottom panel away from the front side of the RAID controller (away from the SFP slots and black center latch) to unlatch it from the side panels.
 8. Carefully flip over the RAID controller bottom panel. Disconnect the battery harness on the battery from the two-pin connector on the controller board, as shown in Figure 69 on page 87.

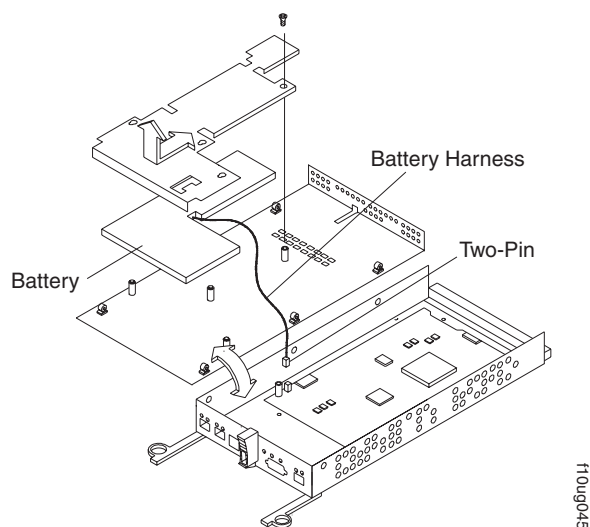


Figure 69. Removing the controller battery

9. Remove the screw that holds the battery access panel. Carefully slide the access panel toward the front to unlatch it from the three pins mounted on the RAID controller bottom panel.
10. Remove the battery unit and place it on a dry, level surface. If this is a battery replacement, then replace the old battery with the new one and go to step 18 on page 88.
11. Unpack the new RAID controller.
Set the RAID controller on a dry, level surface away from magnetic fields. Save the packing material and documentation in case you need to return the RAID controller.
12. Place the replacement RAID controller CRU bottom up on a flat surface. Using a #2 Phillips head screwdriver, remove the six screws (three on each side of the RAID controller) that hold the RAID controller bottom panel to the sides of the RAID controller, as shown in Figure 68 on page 86.
13. Slide the RAID controller bottom panel away from the front side of the RAID controller (away from the SFP slots and black center latch) to unlatch it from the side panels.
14. Carefully flip over the RAID controller bottom panel.
15. Remove the screw that holds the battery access panel. Carefully slide the access panel toward the front to unlatch it from the three pins mounted on the RAID controller bottom panel.
16. If DHCP/BootP was used to automatically set the IP address of the controller, record the MAC address of the upgrade controller and modify the existing DHCP/BootP record of the RAID controller to be upgraded with the new MAC address. Failure to modify the DHCP/BootP record will result in problems trying to manage the storage server using the existing IP address. This step must be performed before you insert the upgrade controller into the FASiT storage server.
17. Write the battery replacement information on the label on the battery pack.
 - Installed date – Write today's date
 - Replacement Date – Write the date three years from today's date

Note: The preferred method of checking for the battery operating age is through the storage server management software.

18. Position the battery inside the replacement RAID controller.
19. Reassemble the battery access panel to the RAID controller bottom panel by aligning it with the three pins on the RAID controller bottom panel. Slide the battery access panel toward the back until you can reinsert the screw that holds the battery access panel to the RAID controller bottom panel. Do not overtighten.
20. You must reconnect the battery harness to the two-pin connector on the controller board.

Note: The connector is keyed so that there is only one way to attach the harness to the connector. Do not force fit.

21. Flip the RAID controller bottom panel over and carefully place it on the controller sides. Push the RAID controller bottom panel toward the front to latch it to the side panels. If the controller bottom panel is placed correctly, you should be able to access the mounting holes for the six screws that you removed from step 6 on page 86. Reinsert the six screws. Do not overtighten.
22. Install the new RAID controller, as follows:
 - a. Slide the RAID controller all the way into the empty slot.
 - b. Close both levers until the latch locks into place.

Attention: When you replace the failed RAID controller, the Storage Manager client automatically synchronizes the firmware between the existing controller and the new controller. After you replace a controller, always use the Storage Manager client to verify the firmware levels and NVSRAM files.

23. Insert the SFPs according to the instructions in “Installing SFP modules” on page 40.
24. Connect the fibre-channel cables to their original locations, according to the instructions in “Installing fiber-optic cables” on page 42.
25. Wait approximately one minute, and then check the green Host Loop LED, green Expansion Loop LED, and amber Fault LED on the new RAID controller.
 - If the Host Loop LED or the Expansion Loop LED is off, the RAID controller might not be inserted correctly. Remove the CRU and reinsert it.
 - If the Fault LED is on, the Host Loop LED and the Expansion Loop LED stay off, or any other Fault LED is on, see the Storage Manager client for problem determination.
26. See the Storage Manager client online help for instructions on bringing the controller online.

Replacing the battery in the RAID controller

Each RAID controller contains a rechargeable battery that maintains the data in the cache memory for three days without power to the unit.

Use the following procedure if the Storage Manager client instructs you to replace the battery because the current battery has failed or is nearing its expiration date. You can also use the Storage Manager client to check the status of the battery.

1. Check the Storage Manager client online help for instructions on battery replacement procedures. If you are using write-cache mirroring, this might involve clearing cache memory on the RAID controller that contains the battery that needs to be replaced. This is done by either placing the controller offline

before removing it from the FAStT100 server or turning off caching in the FAStT100 server, using the Storage Manager client. Follow the steps given in the software procedure before you continue with this procedure.

Attention: When you handle static-sensitive devices, take precautions to avoid damage from static electricity. For details about handling static-sensitive devices, see “Handling static-sensitive devices” on page 69.

2. Unpack the new battery.

Set the new battery on a dry, level surface. Save all packing materials in case you need to return the battery.

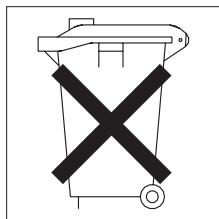
Note: The battery comes with a new battery label. You will need this label later in the procedure.

3. Review all documentation that comes with the new battery for updated replacement procedures and other information.
4. Use the Storage Manager client to locate the RAID controller that contains the failed battery (the RAID controller Fault LED might be on).
5. Label each cable that connects to the RAID controller that contains the battery that has failed. This ensures that all cables will be properly reconnected to the RAID controller after you replace the battery.
6. Use the storage management software to take offline the RAID controller that contains the battery that has failed.

Attention: To prevent data loss, you must shutdown the system before you can replace the RAID controller battery. For the proper shutdown sequence, see “Turning off the storage server” on page 59.

7. Remove the fibre-channel cables and the SFPs from the RAID controller that contains the battery that has failed or is nearing its expiration date. For more information, see “Working with SFPs and fiber-optic cables” on page 39.
8. Remove the RAID controller as described in “Replacing a RAID controller” on page 83.
9. To remove the cache battery, place the RAID controller CRU bottom up on a flat surface. Using a #2 Phillips head screwdriver, remove the six screws (three on each side of the RAID controller) that hold the RAID controller bottom panel to the sides of the RAID controller, as shown in Figure 68 on page 86.
10. Slide the RAID controller bottom panel away from the front side of the RAID controller (away from the SFP slots and black center latch) to unlatch it from the side panels.
11. Carefully flip over the RAID controller bottom panel. Disconnect the battery harness on the battery from the two-pin connector on the controller board as shown in Figure 69 on page 87.
12. Remove the screw that holds the battery access panel. Carefully slide the access panel toward the front to unlatch it from the three pins mounted on the RAID controller bottom panel.
13. Remove the battery unit and place it on a dry, level surface. If this battery is a replacement battery, then replace the old battery with the new one.
14. Write the battery replacement information on the label on the battery pack.
 - Installed date – Write today’s date
 - Replacement Date – Write the date three years from today’s date

Note: The preferred method of checking for the battery operating age is through the storage server management software.



CONTAINS
SEALED LEAD
BATTERY.
BATTERY
MUST BE
RECYCLED.

Pb

CAUTION:

This product contains a sealed lead acid battery. The battery must be recycled or disposed of properly. In the United States, IBM has established a collection process for reuse, recycling, or proper disposal of used IBM sealed lead acid batteries. For information on proper disposal of these batteries, please contact IBM at 1-800-426-4333 your IBM representative. For information on disposal of sealed lead acid batteries outside the United States, go to <http://www.ibm.com/ibm/environment/products/batteryrecycle.shtml> or contact your local waste disposal facility. If the battery CRU is physically damaged or leaking electrolyte gel, *do not* ship it to a recycling center. The battery contains sealed lead-acid batteries that might be considered hazardous material. You must handle this unit in accordance with all applicable local and federal regulations.

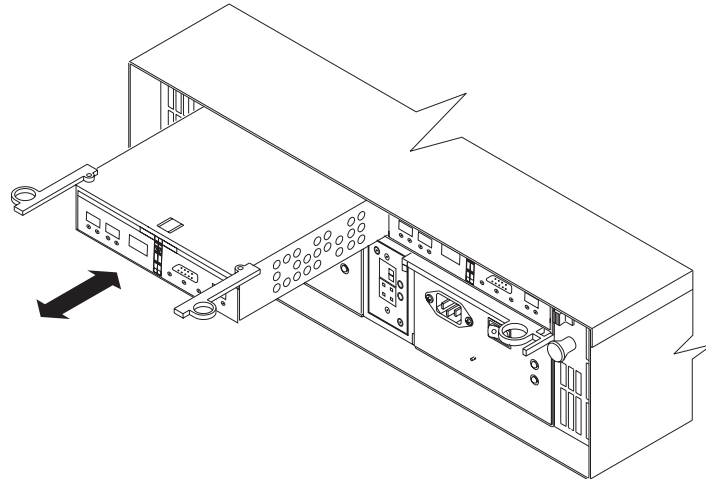
15. Position the replacement battery inside the RAID controller.
16. Reassemble the battery access panel to the RAID controller bottom panel by aligning it with the three pins on the RAID controller bottom panel. Slide the battery access panel toward the back until you can reinsert the screw that holds the battery access panel to the RAID controller bottom panel. Do not overtighten
17. You must reconnect the battery harness to the two-pin connector on the controller board.

Note: The connector is keyed so that there is only one way to attach the harness to the connector. Do not force fit.

18. Flip the RAID controller bottom panel over and carefully place it on the controller sides. Push the RAID controller bottom panel toward the front to latch it to the side panels. If the controller bottom panel is placed correctly, you should be able to access the mounting holes for the six screws that you removed in step 6 on page 86. Reinsert the six screws. Do not overtighten.
19. Dispose of the used battery CRU according to local and federal regulations, which might include hazardous material handling procedures.

This product contains a sealed lead acid battery. The battery must be recycled or disposed of properly. In the United States, IBM has established a collection process for reuse, recycling, or proper disposal of used IBM sealed lead acid batteries. For information on proper disposal of these batteries, please contact IBM at 1-800-426-4333 your IBM representative. For information on disposal of sealed lead acid batteries outside the United States, go to <http://www.ibm.com/ibm/environment/products/batteryrecycle.shtml> or contact your local waste disposal facility.

20. Install the RAID controller, as shown in Figure 70 on page 91.



110ug033

Figure 70. Installing a new RAID controller

- a. Slide the RAID controller all the way into the empty slot.
 - b. Close both levers until the latch locks into place.
21. Install the SFPs and then connect the fibre-channel cables to their original locations.
 22. Turn on power to the storage server and attached devices. For the proper power-on sequence, see “Turning on the storage server” on page 57.
 23. Wait approximately one minute and then use the Storage Manager client to place the controller in online state (it was placed offline in step 6 on page 89). If the operation fails, repeat the command. If the operation fails again, reseal the controller and repeat this step.

Note: It might take 15 minutes to a few hours for a new battery to become fully charged. The Storage Manager client will show the battery as failed until it is fully charged. Controller caching is automatically disabled until the new battery becomes fully charged.

24. Use the Storage Manager client to monitor the status of the storage server and to reset the battery age.

Note: There are two cache batteries in the unit (one for each controller). Make sure that you reset the age for the correct battery.

Installing SFPs and fiber-optic cables

Each RAID controller unit has two host ports and one expansion unit port. SFPs are inserted into the ports, and then fibre-channel cables are connected to the SFPs. For information on installing SFPs and fiber-optic cables, see “Working with SFPs and fiber-optic cables” on page 39.

Adding a FAStT EXP100 to an existing FAStT100 configuration

You can add up to three FAStT EXP100 drive enclosures to a FAStT100 storage server. However, you do not need to configure the FAStT100 with the maximum number of EXP100s at the time of initial installation. You can add additional EXP100s to an existing FAStT100 configuration (up to the maximum number of EXP100s supported in a drive loop) as you need more capacity.

Important

There might be a requirement for new firmware to support the maximum number of EXP100s in a drive loop. Always add new EXP100s when the FAST100 is powered on and in optimal state. Do not add new EXP100s when the FAST100 is powered down.

Before you cable FAST EXP100s to a loop, refer to the *FAST100 Storage Server Fibre Channel Cabling Instructions* that come with your storage server for specific instructions.

Figure 71 shows the process of adding an additional EXP100 to an existing FAST100 storage server configuration. Drive loops A and B form one redundant fibre-channel loop.

Note: Always add a new FAST EXP100 to the *end* of a drive loop.

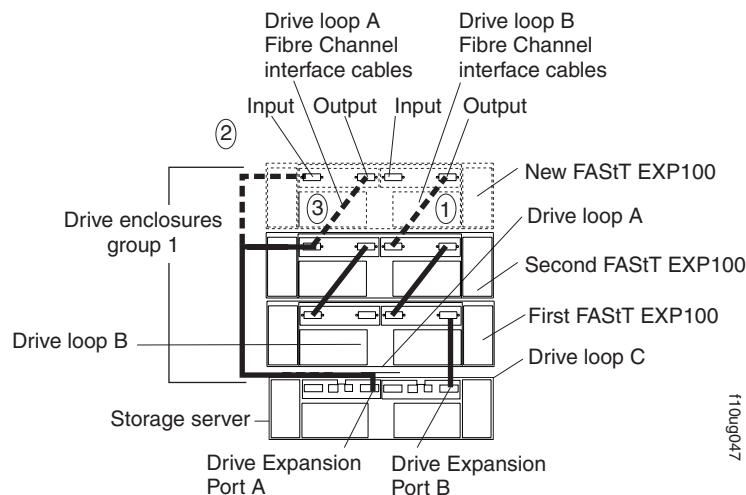


Figure 71. Cabling the FAST100 to a redundant loop

In Figure 71, the existing FAST100 configuration already includes two EXP100s. The dashed lines show you how to add a third EXP100 to the configuration. To add the new EXP100 shown in Figure 71, you would perform the following steps:

1. Verify that the existing configuration is powered on and is in optimal state. Use the Storage Manager client to correct any problems before proceeding.
2. Unpack the new EXP100 and mount it in the proper position on the rack.
3. Make the fibre-channel connection marked 1 in Figure 71 (drive loop B). Then power on the new FAST EXP100 and verify that it is recognized by the Storage Manager software GUI.
4. Make the fibre-channel connection marked 2 in Figure 71.
5. Make the fibre-channel connection marked 3 in Figure 71 (drive loop A).
6. Use the Storage Manager client to verify the ESM firmware version of the new EXP100.

- If the ESM firmware version of the new EXP100 is version 953x or lower, disconnect the new EXP100 and contact IBM support, your IBM reseller, or your IBM representative for assistance.
- If the ESM firmware version of the new EXP100 is version 955x or higher, but does not match exactly the ESM firmware version of the EXP100s that were already installed in the FAStT100 configuration, then refer to the procedures for resolving ESM firmware mismatches in the *IBM TotalStorage FAStT EXP100 Expansion Unit Installation and User's Guide*.

Chapter 6. Hardware maintenance

This chapter contains information to help you solve some of the simpler problems that you might have with your storage server. It contains the problem indicators and error messages along with suggested actions to take to resolve the problem.

For instructions on how to obtain service and technical assistance for your storage server and other IBM products, see “Getting information, help, and service” on page xxiv.

Note: See the *IBM TotalStorage FAStT Problem Determination Guide* for additional troubleshooting and debugging procedures.

General checkout

Use the status LEDs, Symptom-to-FRU index, and the storage management software to diagnose problems. See “Checking the LEDs” on page 63.

To diagnose a cluster system, use the cluster problem determination procedure in the *IBM TotalStorage FAStT Problem Determination Guide*.

Note: If power was just applied to the controller unit, the green and amber LEDs might turn on and off intermittently. Wait until the controller unit finishes powering up before you begin to check for faults.

Using the diagnostic hardware

The FAStT100 comes with an LC wrap-plug adapter and LC-LC coupler. The wrap-plug adapter and LC-LC coupler are used to perform the loopback test and to identify fibre path problems. See the *IBM TotalStorage FAStT Problem Determination Guide* for more information.

The loopback test and the sendEcho test are described in the *IBM TotalStorage FAStT Problem Determination Guide*. In the IBM TotalStorage SAN Integration Server configuration, a loopback adapter (p/n 17P6918) is included to identify path problems on the drive loop when using FC 1.2 m copper cable (p/n 18P5237).

Solving problems

Always use the Storage Manager client to diagnose storage server problems and component failures. Also use the symptom-to-FRU index (Table 15 on page 96) to find solutions to problems that have definite symptoms.

See the problem determination maps in the *IBM TotalStorage FAStT Problem Determination Guide* for more detailed procedures for problem isolation.

Table 15. Symptom-to-FRU index

| Problem indicator | Component | Possible cause | Possible solutions |
|------------------------------------|-----------------------------------|---|--|
| Amber LED on | Drive CRU | Drive failure | Replace the drive that has failed. |
| | Fan CRU | Fan failure | Replace the fan that has failed. |
| | RAID controller Fault LED | RAID controller failure | If the RAID controller Fault LED is on, replace the RAID controller. If the RAID controller has been placed offline by the user, use storage management software to place it online. If the controller failed, replace the RAID controller. |
| | Expansion or host port bypass LED | SFP port empty | No corrective action is needed if this is a stand-alone storage server with no expansion units attached, and if the system is properly configured. Otherwise, check to make sure that the drive expansion unit is powered on and the FC cables are attached properly. |
| | | Fibre-channel cable is not attached to the expansion unit | Connect the fibre-channel cable to the enclosure port; check other connections. |
| | No incoming signal detected | Reattach the SFPs and fibre-channel cables. Replace input and output SFPs or cables as necessary. | |
| | Front panel | General system error | Indicates that a Fault LED somewhere on the storage server has turned on. (Check for amber LEDs on CRUs.). Use Storage Manager software to diagnose server problems. |
| Amber LED is off and green LED off | Power-supply CRU | Power switch is turned off or ac power failure | Turn on all power-supply power switches. |
| Amber and green LEDs on | Power-supply CRU | Power supply failure | Replace the failed power-supply CRU. |

Table 15. Symptom-to-FRU index (continued)

| Problem indicator | Component | Possible cause | Possible solutions |
|----------------------------|-------------------|---|---|
| All green LEDs off | All CRUs | Subsystem power is off | Check that all storage-server power cords are plugged in and the power switches are on. If applicable, check that the main circuit breakers for the rack are turned on. |
| | | AC power failure | Check the main circuit breaker and ac outlet. |
| | | Power supply failure | Replace the power supply. |
| | | Midplane failure | Have the midplane replaced (service technician only). |
| Amber LED flashing | Drive CRUs | Drive identify is in process | No corrective action is needed. |
| One or more green LEDs off | Power supply CRUs | Power cord unplugged or switches turned off | Make sure that the power cord is plugged in and the power-supply switches are turned on. |
| | All drive CRUs | Midplane failure | Have the midplane replaced (service technician only). |
| | Front panel | Power supply problem | Make sure that the cords are plugged in and power supplies are turned on. |
| | | Hardware failure | If any other LEDs are on, replace the midplane (service technician only). |
| | Battery | Battery failure | Replace the battery. |
| | Cache active | The cache is disabled | Use the Storage Manager client to enable the logical drive read and write cache settings. |
| | | The cache memory has failed | Replace the RAID controller. |
| | | The cache battery has failed | Use the Storage Manager client to check and replace the battery. |
| | Host loop | Host or switch is off or has failed | Check if host or switch is on. Replace attached devices that have failed. |
| | | Fibre-channel cable has failed | Ensure that the fibre-channel cables are undamaged and properly connected. |
| | | SFP has failed | Ensure SFP is seated properly; replace SFP. |
| | | RAID controller has no power or has failed | Ensure that the unit is powered on. Replace RAID controller. |

Table 15. Symptom-to-FRU index (continued)

| Problem indicator | Component | Possible cause | Possible solutions |
|---|---------------------------|--|--|
| One or more green LEDs off (continued) | Expansion loop | Drives are improperly installed or not installed | Ensure that the drives are properly installed. |
| | | RAID controller has no power or has failed | Ensure that the unit is powered on. Replace the RAID controller. |
| | | Impending drive failure | A bad drive or drives can issue LIPs that cause the drive expansion loop to go down momentarily. Use the RLS function in the Storage Manager client to determine which drives are bad. Replace the bad drives. |
| | | Externally attached expansion port device has failed | Replace the expansion unit SFP or fibre-channel cable. |
| Intermittent or sporadic power loss to the storage server | Some or all CRUs | Defective ac power source or partially plugged-in power cord | Check the ac power source; verify that the ac circuit that the storage server connects to is not being overloaded. Reseat all installed power cables and power supplies. If applicable, check the power components. Replace defective power cords. |
| | | Power supply has failed | Check for a Fault LED on the power supply, and replace the failed CRU. |
| | | Midplane has failed | Have the midplane replaced (service technician only). |
| Unable to access drives | Drives and expansion loop | Fibre-channel cabling has failed. | Ensure that the fibre-channel cables are undamaged and properly connected. |
| | | RAID controller has failed | Replace the RAID controller. |
| | | SFP has failed | Ensure SFP is seated properly; replace SFP. |
| Random errors | Subsystem | Midplane has failed | Have the midplane replaced (service technician only). |

Table 15. Symptom-to-FRU index (continued)

| Problem indicator | Component | Possible cause | Possible solutions |
|--|------------|---|---|
| The Storage Manager client Enterprise Management window sees each storage server controller as an independent storage subsystem or a partially managed device. | Controller | No drives are present in the storage server. | Ensure that at least one drive is present in the storage server so that it can be configured properly. |
| | | One controller was replaced incorrectly. The controller firmware versions probably failed to synchronize correctly. | To recover, perform the following steps: <ol style="list-style-type: none"> 1. Remove and reinsert the controller blade. 2. Wait 5 minutes. 3. Delete the controller entry with the incorrect firmware version from the FASTT Storage Manager Enterprise Management window. 4. Add the controller back to the FASTT Storage Manager Enterprise Management window using the Add Device menu option in the Enterprise Management window. 5. If the Storage Manager client Enterprise Management window still shows each storage server controller as an independent storage subsystem or a partially managed device, repeat this procedure. If the problem still persists, contact IBM support. |

Note: If you cannot find the problem in the Symptom-to-FRU index, test the entire system.

Parts listing

Figure 72 on page 100 and the following table provide a parts listing for the FASTT100 (P/N 24P8966).

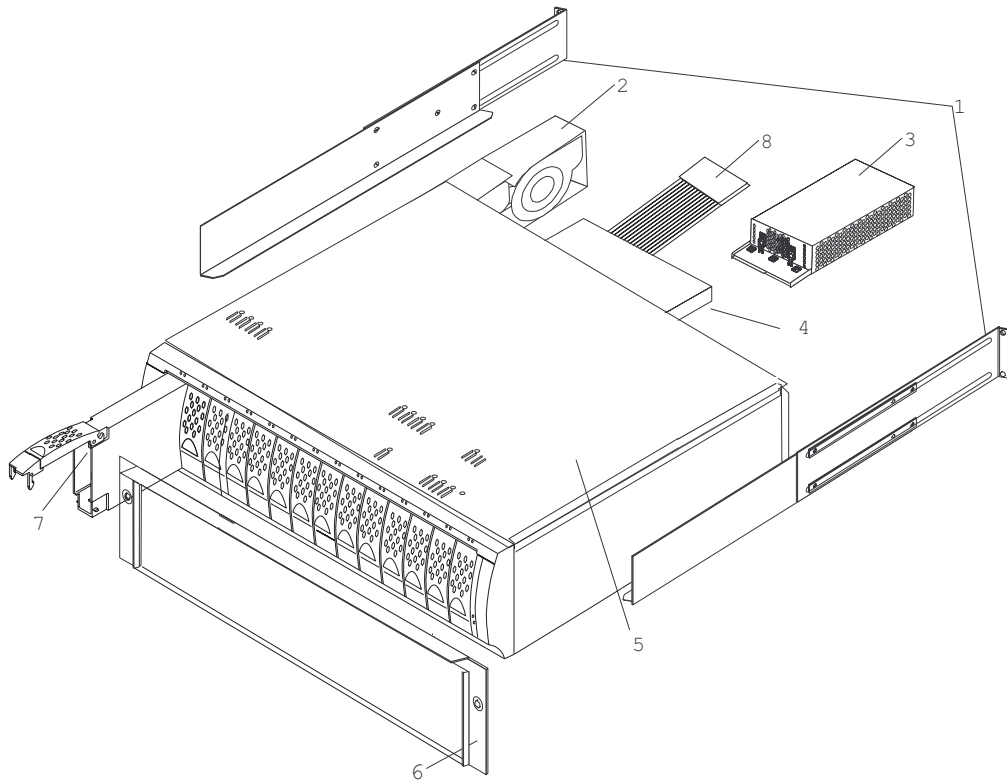


Figure 72. FAST100 parts list

Table 16. Parts listing (TotalStorage FAST100 storage server)

| Index | FAST100 storage server (Type 1724, Model 100) | FRU P/N |
|-------|---|---------|
| 1 | Rail kit | 01K6670 |
| 2 | Blower ASM FRU | 19K1293 |
| 3 | Power supply FRU, 400W | 19K1289 |
| 4 | FAST100 SATA controller | 25R0099 |
| 5 | SATA frame, midplane | 25R0101 |
| 6 | FAST100 bezel ASM | 25R0098 |
| | SATA tray, blank | 90P1348 |
| 7 | SATA 250 GB drive CRU | 90P1349 |
| 8 | Switch, harness | 19K1297 |
| | Miscellaneous hardware kit | 24P8813 |
| | Cable, FRU-1M | 19K1265 |
| | Cable, FRU-5M | 19K1266 |
| | Cable, FRU-25M | 19K1267 |
| | Short wave SFP | 19K1280 |

Table 16. Parts listing (TotalStorage FASt100 storage server) (continued)

| Index | FASt100 storage server (Type 1724, Model 100) | FRU P/N |
|-------|---|---------|
| | Long wave SFP | 19K1281 |
| | Power cord, 2.8M | 6952300 |
| | Power cord, jumper | 36L8886 |
| | Battery | 24P8062 |
| | Wrap plug (loopback adapter) | 17P6918 |
| | LC-SC fibre channel cable adapter | 19K1268 |

Appendix B. Rack mounting template

This appendix provides duplicate copies of the rack mounting templates. If you want to tear out the templates from this document for easier use, use these copies rather than those provided in “Rack mounting template” on page 16.

Use the following templates (Figure 73 on page 106 and Figure 74 on page 107) to identify the proper locations for inserting M6 screws when mounting the support rails and FASSt100 to a rack. The locations for the M6 screws are highlighted in the templates.

The FASSt100 is 3 U high. Align the template with the rack at a U boundary. U boundaries are shown as horizontal dashed lines in the rack mounting templates.

Note: The mounting holes that are shown in the following templates are square. The holes in your rack might be round or square.

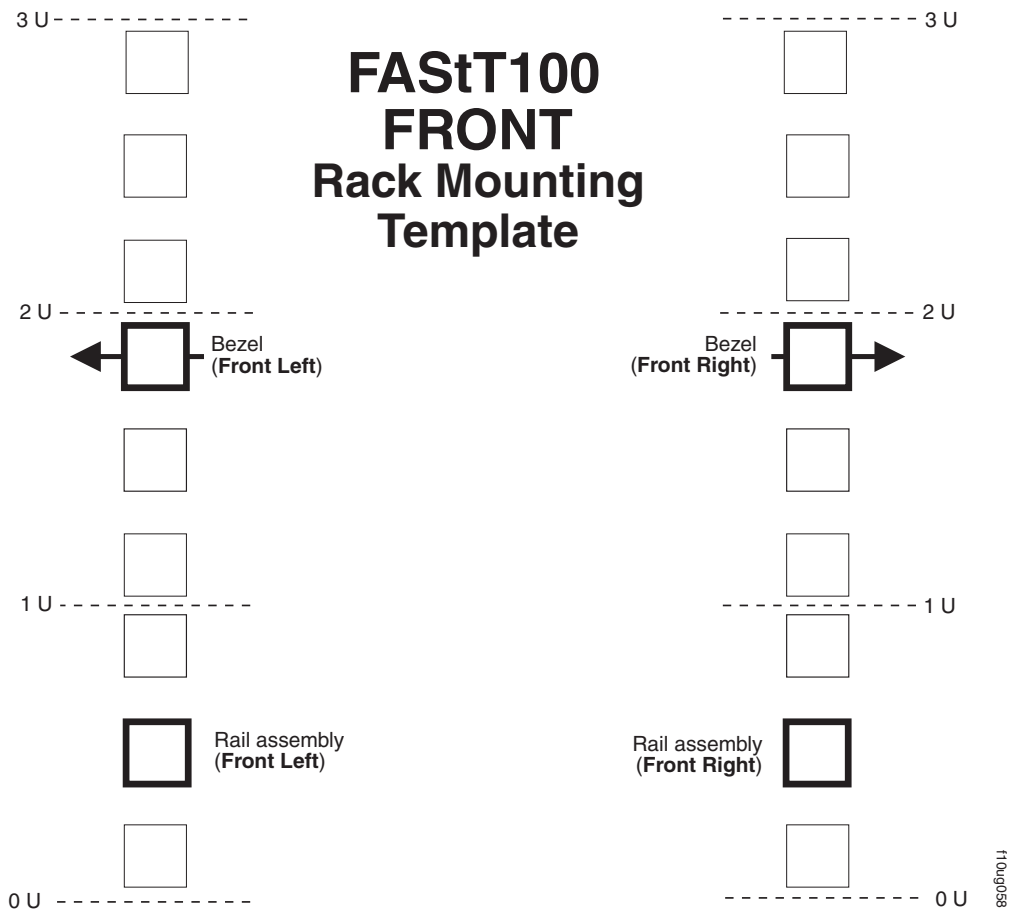
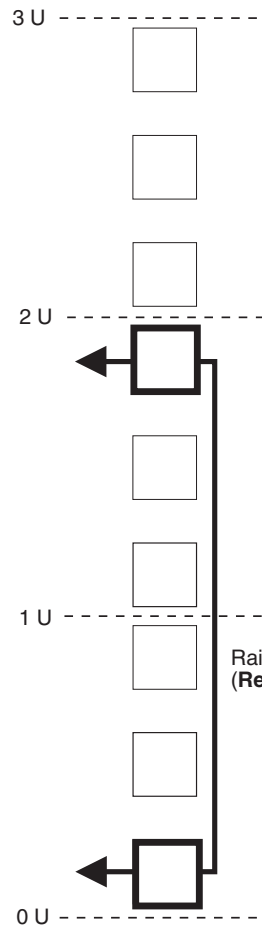


Figure 73. Front rack mounting template



FASTt100 REAR Rack Mounting Template

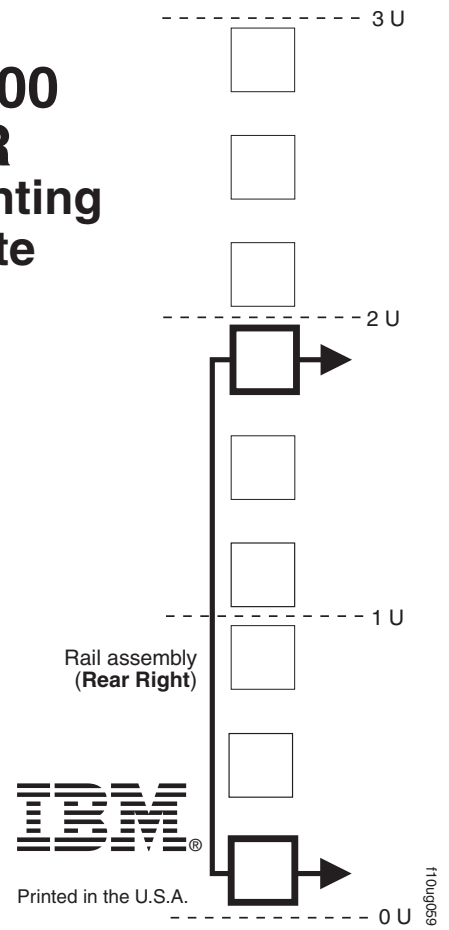


Figure 74. Rear rack mounting template

Appendix C. Power cords

For your safety, IBM® provides a power cord with a grounded attachment plug to use with this IBM product. To avoid electrical shock, always use the power cord and plug with a properly grounded outlet.

IBM power cords used in the United States and Canada are listed by Underwriter's Laboratories (UL) and certified by the Canadian Standards Association (CSA).

For units intended to be operated at 115 volts: Use a UL-listed and CSA-certified cord set consisting of a minimum 18 AWG, Type SVT or SJT, three-conductor cord, a maximum of 15 feet in length and a parallel blade, grounding-type attachment plug rated 15 amperes, 125 volts.

For units intended to be operated at 230 volts (U.S. use): Use a UL-listed and CSA-certified cord set consisting of a minimum 18 AWG, Type SVT or SJT, three-conductor cord, a maximum of 15 feet in length and a tandem blade, grounding-type attachment plug rated 15 amperes, 250 volts.

For units intended to be operated at 230 volts (outside the U.S.): Use a cord set with a grounding-type attachment plug. The cord set should have the appropriate safety approvals for the country in which the equipment will be installed.

IBM power cords for a specific country or region are usually available only in that country or region.

| IBM power cord part number | Cord specifics | Used in these countries or regions |
|-----------------------------------|-----------------------|--|
| 13F9940 | 250V/10A 2.8M | Australia, Fiji, Kiribati, Nauru, New Zealand, Papua New Guinea |
| 13F9979 | 250V/10A 2.8M | Afghanistan, Albania, Algeria, Andorra, Angola, Armenia, Austria, Azerbaijan, Belarus, Belgium, Benin, Bosnia and Herzegovina, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo (Democratic Republic of), Congo (Republic of), Cote D'Ivoire (Ivory Coast), Croatia (Republic of), Czech Rep, Dahomey, Djibouti, Egypt, Equatorial Guinea, Eritrea, Estonia, Ethiopia, Finland, France, French Guyana, French Polynesia, Gabon, Georgia, Germany, Greece, Guadeloupe, Guinea, Guinea Bissau, Hungary, Iceland, Indonesia, Iran, Kazakhstan, Kyrgyzstan, Laos (Peoples Democratic Republic of), Latvia, Lebanon, Lithuania, Luxembourg, Macedonia (former Yugoslav Republic of), Madagascar, Mali, Martinique, Mauritania, Mauritius, Mayotte, Moldova (Republic of), Monaco, Mongolia, Morocco, Mozambique, Netherlands, New Caledonia, Niger, Norway, Poland, Portugal, Reunion, Romania, Russian Federation Rwanda, Sao Tome and Principe, Saudi Arabia, Senegal, Serbia, Slovakia, Slovenia (Republic of), Somalia, Spain, Suriname, Sweden, SSyrian Arab Replublic, Tajikistan, Tahiti, Togo, Tunisia, Turkey, Turkmenistan, Ukraine, Upper Volta, Uzbekistan, Vanuatu, Vietnam, Wallis and Futuna, Yugoslavia (Federal Republic of), Zaire |
| 13F9997 | 250V/10A 2.8M | Denmark |

| IBM power cord part number | Cord specifics | Used in these countries or regions |
|-----------------------------------|-----------------------|---|
| 14F0015 | 250V/10A 2.8M | Bangladesh, Lesotho, Maceo, Maldives, Namibia, Nepal, Pakistan, Samoa, South Africa, Sri Lanka, Swaziland, Uganda |
| 14F0033 | 250V/10A 2.8M | Abu Dhabi, Bahrain, Botswana, Brunei Darussalam, Channel Islands, Cyprus, Dominica, Gambia, Ghana, Grenada, Guyana, Hong Kong S.A.R. of China, Iraq, Ireland, Jordan, Kenya, Kuwait, Liberia, Malawi, Malaysia, Malta, Myanmar (Burma), Nigeria, Oman, Qatar, Saint Kitts & Nevis, Saint Lucia, Saint Vincent and the Grenadines, Seychelles, Sierra Leone, Singapore, Sudan, Tanzania (United Republic of), Trinidad & Tobago, United Arab Emirates (Dubai), United Kingdom, Yemen, Zambia, Zimbabwe |
| 14F0051 | 250V/10A 2.8M | Liechtenstein, Switzerland |
| 14F0069 | 250V/10A 2.8M | Chile, Italy, Libyan Arab Jamahiriya |
| 14F0087 | 250V/10A 2.8M | Israel |
| 1838574 | 250V/10A 2.8M | Antigua and Barbuda, Aruba, Bahamas, Barbados, Belize, Bermuda, Bolivia, Brazil, Caicos Islands, Canada, Cayman Islands, Costa Rica, Columbia, Cuba, Dominican Republic, Ecuador, El Salvador, Guam, Guatemala, Haiti, Honduras, Jamaica, Japan, Mexico, Micronesia (Federal States of), Netherlands Antilles, Nicaragua, Panama, Peru, Philippines, Taiwan, United States, Venezuela |
| 36L8880 | 250V/10A 2.8M | Argentina, Paraguay, Uruguay |
| 02K0546 | 250V/6A 2.8M | PRC (China) |
| 6952300 | 125V/10A 2.8M | Antigua and Barbuda, Aruba, Bahamas, Barbados, Belize, Bermuda, Bolivia, Cayman Islands, Costa Rica, Columbia, Cuba, Dominican Republic, Ecuador, El Salvador, Guam, Guatemala, Haiti, Honduras, Jamaica, Mexico, Micronesia (Federal States of), Netherlands Antilles, Nicaragua, Panama, Peru, Philippines, Saudi Arabia, Taiwan, Thailand, Turks and Caicos Islands, United States, Venezuela |
| 6952301 | 125V/10A 1.8M | (Federal States of), Netherlands Antilles, Nicaragua, Panama, Peru, Philippines, Saudi Arabia, Taiwan, Thailand, Turks and Caicos Islands, United States, Venezuela |

Notices

This publication was developed for products and services offered in the U.S.A.

IBM may not offer the products, services, or features discussed in this document in other countries. Consult your local IBM representative for information on the products and services currently available in your area. Any reference to an IBM product, program, or service is not intended to state or imply that only that IBM product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any IBM intellectual property right may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any non-IBM product, program, or service.

IBM may have patents or pending patent applications covering subject matter described in this document. The furnishing of this document does not give you any license to these patents. You can send license inquiries, in writing, to:

*IBM Director of Licensing
IBM Corporation
North Castle Drive
Armonk, NY 10504-1785
U.S.A.*

INTERNATIONAL BUSINESS MACHINES CORPORATION PROVIDES THIS PUBLICATION "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Some jurisdictions do not allow disclaimer of express or implied warranties in certain transactions, therefore, this statement may not apply to you.

This information could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of the publication. IBM may make improvements and/or changes in the product(s) and/or the program(s) described in this publication at any time without notice.

Any references in this publication to non-IBM Web sites are provided for convenience only and do not in any manner serve as an endorsement of those Web sites. The materials at those Web sites are not part of the materials for this IBM product, and use of those Web sites is at your own risk.

IBM may use or distribute any of the information you supply in any way it believes appropriate without incurring any obligation to you.

Trademarks

The following terms are trademarks of International Business Machines Corporation in the United States, other countries, or both:

| | |
|----------------|--------------|
| IBM | ServerProven |
| eServer logo | TotalStorage |
| IntelliStation | xSeries |
| Netfinity | |

Intel is a trademark of Intel Corporation in the United States, other countries, or both.

Java and all Java-based trademarks and logos are trademarks or registered trademarks of Sun Microsystems, Inc. in the United States, other countries, or both.

Other company, product, or service names may be trademarks or service marks of others.

Important notes

Processor speeds indicate the internal clock speed of the microprocessor; other factors also affect application performance.

CD-ROM drive speeds list the variable read rate. Actual speeds vary and are often less than the maximum possible.

When referring to processor storage, real and virtual storage, or channel volume, KB stands for approximately 1000 bytes, MB stands for approximately 1 000 000 bytes, and GB stands for approximately 1 000 000 000 bytes.

When referring to hard disk drive capacity or communications volume, MB stands for 1 000 000 bytes, and GB stands for 1 000 000 000 bytes. Total user-accessible capacity may vary depending on operating environments.

Maximum internal hard disk drive capacities assume the replacement of any standard hard disk drives and population of all hard disk drive bays with the largest currently supported drives available from IBM.

Maximum memory may require replacement of the standard memory with an optional memory module.

IBM makes no representation or warranties regarding non-IBM products and services that are ServerProven[®], including but not limited to the implied warranties of merchantability and fitness for a particular purpose. These products are offered and warranted solely by third parties.

IBM makes no representations or warranties with respect to non-IBM products. Support (if any) for the non-IBM products is provided by the third party, not IBM.

Some software may differ from its retail version (if available), and may not include user manuals or all program functionality.

Electronic emission notices

This section gives the electronic emission notices or statements for the United States and other countries or regions.

Federal Communications Commission (FCC) statement

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio

communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. IBM is not responsible for any radio or television interference caused by using other than recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Chinese class A compliance statement

Attention: This is a class A statement. In a domestic environment, this product might cause radio interference in which case the user might be required to take adequate measures.

中华人民共和国“A类”警告声明

声明

此为A级产品，在生活环境中，该产品可能会造成无线电干扰。在这种情况下，可能需要用户对其干扰采取切实可行的措施。

Industry Canada Class A emission compliance statement

This Class A digital apparatus complies with Canadian ICES-003.

Avis de conformité à la réglementation d'Industrie Canada

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

Australia and New Zealand Class A statement

Attention: This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

United Kingdom telecommunications safety requirement

Notice to Customers

This apparatus is approved under approval number NS/G/1234/J/100003 for indirect connection to public telecommunication systems in the United Kingdom.

European Union EMC Directive conformance statement

This product is in conformity with the protection requirements of EU Council Directive 89/336/EEC on the approximation of the laws of the Member States relating to electromagnetic compatibility. IBM cannot accept responsibility for any failure to satisfy the protection requirements resulting from a nonrecommended modification of the product, including the fitting of non-IBM option cards.

This product has been tested and found to comply with the limits for Class A Information Technology Equipment according to CISPR 22/European Standard EN 55022. The limits for Class A equipment were derived for commercial and industrial environments to provide reasonable protection against interference with licensed communication equipment.

Attention: This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Taiwan Class A warning statement

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

Japanese Voluntary Control Council for Interference (VCCI) statement

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

Glossary

This glossary provides definitions for the terminology used for the IBM TotalStorage FAStT. This glossary also provides definitions for the terminology used for the IBM TotalStorage FAStT Storage Manager.

This glossary defines technical terms and abbreviations used in this document. If you do not find the term you are looking for, see the *IBM Glossary of Computing Terms* located at www.ibm.com/networking/nsg/nsgmain.htm

This glossary also includes terms and definitions from:

- *Information Technology Vocabulary* by Subcommittee 1, Joint Technical Committee 1, of the International Organization for Standardization and the International Electrotechnical Commission (ISO/IEC JTC1/SC1). Definitions are identified by the symbol (I) after the definition; definitions taken from draft international standards, committee drafts, and working papers by ISO/IEC JTC1/SC1 are identified by the symbol (T) after the definition, indicating that final agreement has not yet been reached among the participating National Bodies of SC1.
- *IBM Glossary of Computing Terms*. New York: McGraw-Hill, 1994.

The following cross-reference conventions are used in this glossary:

See Refers you to (a) a term that is the expanded form of an abbreviation or acronym, or (b) a synonym or more preferred term.

See also

Refers you to a related term.

Abstract Windowing Toolkit (AWT). A Java graphical user interface (GUI).

accelerated graphics port (AGP). A bus specification that gives low-cost 3D graphics cards faster access to main memory on personal computers than the usual peripheral component interconnect (PCI) bus. AGP reduces the overall cost of creating high-end graphics subsystems by using existing system memory.

access volume. A special logical drive that allows the host-agent to communicate with the controllers in the storage subsystem.

adapter. A printed circuit assembly that transmits user data input/output (I/O) between the internal bus of the host system and the external fibre-channel (FC) link and vice versa. Also called an I/O adapter, host adapter, or FC adapter.

advanced technology (AT) bus architecture. A bus standard for IBM compatibles. It extends the XT bus architecture to 16 bits and also allows for bus mastering, although only the first 16 MB of main memory are available for direct access.

agent. A server program that receives virtual connections from the network manager (the client program) in a Simple Network Management Protocol-Transmission Control Protocol/Internet Protocol (SNMP-TCP/IP) network-managing environment.

AGP. See *accelerated graphics port*.

AL_PA. See *arbitrated loop physical address*.

arbitrated loop. One of three existing fibre-channel topologies, in which 2 - 126 ports are interconnected serially in a single loop circuit. Access to the Fibre Channel-Arbitrated Loop (FC-AL) is controlled by an arbitration scheme. The FC-AL topology supports all classes of service and guarantees in-order delivery of FC frames when the originator and responder are on the same FC-AL. The default topology for the disk array is arbitrated loop. An arbitrated loop is sometimes referred to as a Stealth Mode.

arbitrated loop physical address (AL_PA). An 8-bit value that is used to uniquely identify an individual port within a loop. A loop can have one or more AL_PAs.

array. A set of fibre-channel hard drives that are logically grouped together to form a redundant array of independent disks (RAID) set.

AT. See *advanced technology (AT) bus architecture*.

ATA. See *AT-attached*.

AT-attached. Peripheral devices that are compatible with the original IBM AT computer standard in which signals on a 40-pin AT-attached (ATA) ribbon cable followed the timings and constraints of the Industry Standard Architecture (ISA) system bus on the IBM PC AT computer. Equivalent to integrated drive electronics (IDE).

auto-volume transfer/auto-disk transfer (AVT/ADT). A function that provides automatic failover in case of controller failure on a storage subsystem.

AVT/ADT. See *auto-volume transfer/auto-disk transfer*.

AWT. See *Abstract Windowing Toolkit*.

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*.

BOOTP. See *bootstrap protocol*.

bootstrap protocol (BOOTP). In Transmission Control Protocol/Internet Protocol (TCP/IP) networking, an alternative protocol by which a diskless machine can obtain its Internet Protocol (IP) address and such configuration information as IP addresses of various servers from a BOOTP server.

bridge. A storage area network (SAN) device that provides physical and transport conversion, such as fibre channel to small computer system interface (SCSI) bridge.

bridge group. A bridge and the collection of devices connected to it.

broadcast. The simultaneous transmission of data to more than one destination.

cathode ray tube (CRT). A display device in which controlled electron beams are used to display alphanumeric or graphical data on an electroluminescent screen.

client. A computer system or process that requests a service of another computer system or process that is typically referred to as a server. Multiple clients can share access to a common server.

command. A statement used to initiate an action or start a service. A command consists of the command name abbreviation, and its parameters and flags if applicable. A command can be issued by typing it on a command line or selecting it from a menu.

community string. The name of a community contained in each Simple Network Management Protocol (SNMP) message.

CRC. See *cyclic redundancy check*.

CRT. See *cathode ray tube*.

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 (FRU)*.

cyclic redundancy check (CRC). (1) A redundancy check in which the check key is generated by a cyclic algorithm. (2) An error detection technique performed at both the sending and receiving stations.

dac. See *disk array controller*.

dar. See *disk array router*.

DASD. See *direct access storage device*.

default host group. A logical collection of discovered host ports, defined host computers, and defined host groups in the storage-partition topology that fulfill the following requirements:

- Are not involved in specific logical drive-to-LUN mappings
- Share access to logical drives with default logical drive-to-LUN mappings

device type. Identifier used to place devices in the physical map, such as the switch, hub, or storage.

DHCP. See *Dynamic Host Configuration Protocol*.

direct access storage device (DASD). A device in which access time is effectively independent of the location of the data. Information is entered and retrieved without reference to previously accessed data. (For example, a disk drive is a DASD, in contrast with a tape drive, which stores data as a linear sequence.) DASDs include both fixed and removable storage devices.

direct memory access (DMA). The transfer of data between memory and an input/output (I/O) device without processor intervention.

disk array controller (dac). A disk array controller device that represents the two controllers of an array. See also *disk array router*.

disk array router (dar). A disk array router that represents an entire array, including current and deferred paths to all logical unit numbers (LUNs) (hdisks on AIX). See also *disk array controller*.

DMA. See *direct memory access*.

domain. The most significant byte in the node port (N_port) identifier for the fibre-channel (FC) device. It is not used in the fibre channel-small computer system interface (FC-SCSI) hardware path ID. It is required to be the same for all SCSI targets logically connected to an FC adapter.

DRAM. See *dynamic random access memory*.

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

dynamic random access memory (DRAM). A storage in which the cells require repetitive application of control signals to retain stored data.

ECC. See *error correction coding*.

EEPROM. See *electrically erasable programmable read-only memory*.

EISA. See *Extended Industry Standard Architecture*.

electrically erasable programmable read-only memory (EEPROM). A type of memory chip which can retain its contents without consistent electrical power. Unlike the PROM which can be programmed only once, the EEPROM can be erased electrically. Because it can only be reprogrammed a limited number of times before it wears out, it is appropriate for storing small amounts of data that are changed infrequently.

electrostatic discharge (ESD). The flow of current that results when objects that have a static charge come into close enough proximity to discharge.

environmental services monitor (ESM) canister. A component in a drive enclosure that monitors the environmental condition of the components in that enclosure. Not all storage subsystems have ESM canisters.

E_port. See *expansion port*.

error correction coding (ECC). A method for encoding data so that transmission errors can be detected and corrected by examining the data on the receiving end. Most ECCs are characterized by the maximum number of errors they can detect and correct.

ESD. See *electrostatic discharge*.

ESM canister. See *environmental services monitor canister*.

EXP. See *expansion unit*.

expansion port (E_port). A port that connects the switches for two fabrics.

expansion unit (EXP). A feature that can be connected to a system unit to provide additional storage and processing capacity.

Extended Industry Standard Architecture (EISA). A bus standard for IBM compatibles that extends the Industry Standard Architecture (ISA) bus architecture to 32 bits and allows more than one central processing unit (CPU) to share the bus. See also *Industry Standard Architecture*.

fabric. A Fibre Channel entity which interconnects and facilitates logins of N_ports attached to it. The fabric is responsible for routing frames between source and destination N_ports using address information in the frame header. A fabric can be as simple as a point-to-point channel between two N-ports, or as complex as a frame-routing switch that provides multiple and redundant internal pathways within the fabric between F_ports.

fabric port (F_port). In a fabric, an access point for connecting a user's N_port. An F_port facilitates N_port

logins to the fabric from nodes connected to the fabric. An F_port is addressable by the N_port connected to it. See also *fabric*.

FAStT MSJ. See *FAStT Management Suite Java*.

FAStT Management Suite Java (FAStT MSJ). A diagnostic and configuration utility that can be used on Linux, Microsoft Windows, and Novell NetWare host systems. In Linux, it is also used with the QLRemote agent to define preferred and non-preferred paths for logical drives.

FC. See *fibre channel*.

FC-AL. See *arbitrated loop*.

feature enable identifier. A unique identifier for the storage subsystem, which is used in the process of generating a premium feature key. See also *premium feature key*.

fibre channel (FC). A set of standards for a serial input/output (I/O) bus capable of transferring data between two ports at up to 100 Mbps, with standards proposals to go to higher speeds. FC supports point-to-point, arbitrated loop, and switched topologies.

Fibre Channel-Arbitrated Loop (FC-AL). See *arbitrated loop*.

Fibre Channel Protocol (FCP) for small computer system interface (SCSI). A high-level fibre-channel mapping layer (FC-4) that uses lower-level fibre-channel (FC-PH) services to transmit SCSI commands, data, and status information between a SCSI initiator and a SCSI target across the FC link by using FC frame and sequence formats.

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

FlashCopy. A premium feature for FAStT that can make an instantaneous copy of the data in a volume.

F_port. See *fabric port*.

FRU. See *field replaceable unit*.

GBIC. See *gigabit interface converter*

gigabit interface converter (GBIC). A transceiver that performs serial, optical-to-electrical, and electrical-to-optical signal conversions for high-speed networking. A GBIC can be hot swapped. See also *small form-factor pluggable*.

graphical user interface (GUI). A type of computer interface that presents a visual metaphor of a real-world scene, often of a desktop, by combining high-resolution

graphics, pointing devices, menu bars and other menus, overlapping windows, icons, and the object-action relationship.

GUI. See *graphical user interface*.

HBA. See *host bus adapter*.

hdisk. An AIX term representing a logical unit number (LUN) on an array.

host. A system that is directly attached to the storage subsystem through a fibre-channel input/output (I/O) path. This system is used to serve data (typically in the form of files) from the storage subsystem. A system can be both a storage management station and a host simultaneously.

host bus adapter (HBA). An interface between the fibre-channel network and a workstation or server.

host computer. See *host*.

host group. An entity in the storage partition topology that defines a logical collection of host computers that require shared access to one or more logical drives.

host port. Ports that physically reside on the host adapters and are automatically discovered by the FASTt Storage Manager software. To give a host computer access to a partition, its associated host ports must be defined.

hot swap. To replace a hardware component without turning off the system.

hub. In a network, a point at which circuits are either connected or switched. For example, in a star network, the hub is the central node; in a star/ring network, it is the location of wiring concentrators.

IBMSAN driver. The device driver that is used in a Novell NetWare environment to provide multipath input/output (I/O) support to the storage controller.

IC. See *integrated circuit*.

IDE. See *integrated drive electronics*.

in-band. Transmission of management protocol over the fibre-channel transport.

Industry Standard Architecture (ISA). Unofficial name for the bus architecture of the IBM PC/XT personal computer. This bus design included expansion slots for plugging in various adapter boards. Early versions had an 8-bit data path, later expanded to 16 bits. The "Extended Industry Standard Architecture" (EISA) further expanded the data path to 32 bits. See also *Extended Industry Standard Architecture*.

initial program load (IPL). The initialization procedure that causes an operating system to commence operation. Also referred to as a system restart, system startup, and boot.

integrated circuit (IC). A microelectronic semiconductor device that consists of many interconnected transistors and other components. ICs are constructed on a small rectangle cut from a silicon crystal or other semiconductor material. The small size of these circuits allows high speed, low power dissipation, and reduced manufacturing cost compared with board-level integration. Also known as a *chip*.

integrated drive electronics (IDE). A disk drive interface based on the 16-bit IBM personal computer Industry Standard Architecture (ISA) in which the controller electronics reside on the drive itself, eliminating the need for a separate adapter card. Also known as an Advanced Technology Attachment Interface (ATA).

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.

Internet Protocol (IP) address. The unique 32-bit address that specifies the location of each device or workstation on the Internet. For example, 9.67.97.103 is an IP address.

interrupt request (IRQ). A type of input found on many processors that causes the processor to suspend normal processing temporarily and start running an interrupt handler routine. Some processors have several interrupt request inputs that allow different priority interrupts.

IP. See *Internet Protocol*.

IPL. See *initial program load*.

IRQ. See *interrupt request*.

ISA. See *Industry Standard Architecture*.

isolated group. A collection of isolated devices not connected to the storage area network (SAN) but discovered by the SANavigator tool. The isolated group displays with a gray background near the bottom of the Physical and Data Path maps.

Java Runtime Environment (JRE). A subset of the Java Development Kit (JDK) for end users and developers who want to redistribute the Java Runtime Environment (JRE). The JRE consists of the Java virtual machine, the Java Core Classes, and supporting files.

JRE. See *Java Runtime Environment*.

label. A discovered or user entered property value that is displayed underneath each device in the Physical and Data Path maps.

LAN. See *local area network*.

LBA. See *logical block address*.

local area network (LAN). A computer network located on a user's premises within a limited geographic area.

logical block address (LBA). The address of a logical block. Logical block addresses are typically used in hosts' I/O commands. The SCSI disk command protocol, for example, uses logical block addresses.

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

loop address. The unique ID of a node in fibre-channel loop topology sometimes referred to as a loop ID.

loop group. A collection of storage area network (SAN) devices that are interconnected serially in a single loop circuit. Loop groups are discovered by the SANavigator tool and displayed with a gray background on the Physical and Data Path maps.

loop port. A node port (N_port) or fabric port (F_port) that supports arbitrated loop functions associated with an arbitrated loop topology.

LUN. See *logical unit number*.

MAC. See *medium access control*.

management information base (MIB). The information that is on an agent. It is an abstraction of configuration and status information.

man pages. In UNIX-based operating systems, online documentation for operating system commands, subroutines, system calls, file formats, special files, stand-alone utilities, and miscellaneous facilities. Invoked by the **man** command.

MCA. See *micro channel architecture*.

medium access control (MAC). In local area networks (LANs), the sublayer of the data link control layer that supports medium-dependent functions and uses the services of the physical layer to provide services to the logical link control sublayer. The MAC sublayer includes the method of determining when a device has access to the transmission medium.

MIB. See *management information base*.

micro channel architecture (MCA). Hardware that is used for PS/2 Model 50 computers and above to

provide better growth potential and performance characteristics when compared with the original personal computer design.

Microsoft Cluster Server (MSCS). MSCS, a feature of Windows NT Server (Enterprise Edition), supports the connection of two servers into a cluster for higher availability and easier manageability. MSCS can automatically detect and recover from server or application failures. It can also be used to balance server workload and provide for planned maintenance.

model. The model identification that is assigned to a device by its manufacturer.

MSCS. See *Microsoft Cluster Server*.

network management station (NMS). In the Simple Network Management Protocol (SNMP), a station that runs management application programs that monitor and control network elements.

NMI. See *non-maskable interrupt*.

NMS. See *network management station*.

non-maskable interrupt (NMI). A hardware interrupt that another service request cannot overrule (mask). An NMI bypasses and takes priority over interrupt requests generated by software, the keyboard, and other such devices and is issued to the microprocessor only in disastrous circumstances, such as severe memory errors or impending power failures.

node. A physical device that allows for the transmission of data within a network.

node port (N_port). A fibre-channel defined hardware entity that performs data communications over the fibre-channel link. It is identifiable by a unique worldwide name. It can act as an originator or a responder.

nonvolatile storage (NVS). A storage device whose contents are not lost when power is cut off.

N_port. See *node port*.

NVS. See *nonvolatile storage*.

NVSRAM. Nonvolatile storage random access memory. See *nonvolatile storage*.

Object Data Manager (ODM). An AIX proprietary storage mechanism for ASCII stanza files that are edited as part of configuring a drive into the kernel.

ODM. See *Object Data Manager*.

out-of-band. Transmission of management protocols outside of the fibre-channel network, typically over Ethernet.

PCI local bus. See *peripheral component interconnect local bus*.

PDF. See *portable document format*.

performance events. Events related to thresholds set on storage area network (SAN) performance.

peripheral component interconnect local bus (PCI local bus). 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 IA or EISA slot, while high-speed PCI controllers plug into a PCI slot. See also *Industry Standard Architecture*, *Extended Industry Standard Architecture*.

polling delay. The time in seconds between successive discovery processes during which discovery is inactive.

port. A part of the system unit or remote controller to which cables for external devices (such as display stations, terminals, printers, switches, or external storage units) are attached. The port is an access point for data entry or exit. A device can contain one or more ports.

portable document format (PDF). A standard specified by Adobe Systems, Incorporated, for the electronic distribution of documents. PDF files are compact; can be distributed globally by e-mail, the Web, intranets, or CD-ROM; and can be viewed with the Acrobat Reader, which is software from Adobe Systems that can be downloaded at no cost from the Adobe Systems home page.

premium feature key. A file that the storage subsystem controller uses to enable an authorized premium feature. The file contains the feature enable identifier of the storage subsystem for which the premium feature is authorized, and data about the premium feature. See also *feature enable identifier*.

private loop. A freestanding arbitrated loop with no fabric attachment. See also *arbitrated loop*.

program temporary fix (PTF). A temporary solution or bypass of a problem diagnosed by IBM in a current unaltered release of the program.

PTF. See *program temporary fix*.

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 *DASD*.

RDAC. See *redundant disk array controller*.

read-only memory (ROM). Memory in which stored data cannot be changed by the user except under special conditions.

recoverable virtual shared disk (RVSD). A virtual shared disk on a server node configured to provide continuous access to data and file systems in a cluster.

redundant array of independent disks (RAID). A collection of disk drives that appears as a single volume to the server and are fault tolerant through mirroring or parity checking.

redundant disk array controller (RDAC). (1) In hardware, a redundant set of controllers (either active/passive or active/active). (2) In software, a layer that manages the input/output (I/O) through the active controller during normal operation and transparently reroutes I/Os to the other controller in the redundant set if a controller or I/O path fails.

ROM. See *read-only memory*.

router. A computer that determines the path of network traffic flow. The path selection is made from several paths based on information obtained from specific protocols, algorithms that attempt to identify the shortest or best path, and other criteria such as metrics or protocol-specific destination addresses.

RVSD. See *recoverable virtual shared disk*.

SAI. See *Storage Array Identifier*.

SA Identifier. See *Storage Array Identifier*.

SAN. See *storage area network*.

SATA. See *serial ATA*.

scope. Defines a group of controllers by their Internet Protocol (IP) addresses. A scope must be created and defined so that dynamic IP addresses can be assigned to controllers on the network.

SCSI. See *small computer system interface*.

segmented loop port (SL_port). A port that allows division of a fibre-channel private loop into multiple segments. Each segment can pass frames around as an independent loop and can connect through the fabric to other segments of the same loop.

sense data. (1) Data sent with a negative response, indicating the reason for the response. (2) Data describing an I/O error. Sense data is presented to a host system in response to a sense request command.

serial ATA. The standard for a high-speed alternative to small computer system interface (SCSI) hard drives. The SATA-1 standard is equivalent in performance to a 10 000 RPM SCSI drive.

serial storage architecture (SSA). An interface specification from IBM in which devices are arranged in a ring topology. SSA, which is compatible with small computer system interface (SCSI) devices, allows full-duplex packet multiplexed serial data transfers at rates of 20 Mbps in each direction.

server. A functional hardware and software unit that delivers shared resources to workstation client units on a computer network.

server/device events. Events that occur on the server or a designated device that meet criteria that the user sets.

SFP. See *small form-factor pluggable*.

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).

SL_port. See *segmented loop port*.

SMagent. The FAStT Storage Manager optional Java-based host-agent software, which can be used on Microsoft Windows, Novell NetWare, HP-UX, and Solaris host systems to manage storage subsystems through the host fibre-channel connection.

SMclient. The FAStT Storage Manager client software, which is a Java-based graphical user interface (GUI) that is used to configure, manage, and troubleshoot storage servers and expansion units in a FAStT storage subsystem. SMclient can be used on a host system or on a storage management station.

SMruntime. A Java compiler for the SMclient.

SMutil. The FAStT Storage Manager utility software that is used on Microsoft Windows, HP-UX, and Solaris host systems to register and map new logical drives to the operating system. In Microsoft Windows, it also contains a utility to flush the cached data of the operating system for a particular drive before creating a FlashCopy.

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

small form-factor pluggable (SFP). An optical transceiver that is used to convert signals between optical fiber cables and switches. An SFP is smaller than a gigabit interface converter (GBIC). See also *gigabit interface converter*.

SNMP. See *Simple Network Management Protocol* and *SNMPv1*.

SNMP time-out. The maximum amount of time the SANavigator tool will wait for a device to respond to a request. The specified time applies to one retry only.

SNMP trap event. (1) (2) An event notification sent by the SNMP agent that identifies conditions, such as thresholds, that exceed a predetermined value. See also *Simple Network Management Protocol*.

SNMPv1. The original standard for SNMP is now referred to as SNMPv1, as opposed to SNMPv2, a revision of SNMP. See also *Simple Network Management Protocol*.

SRAM. See *static random access memory*.

SSA. See *serial storage architecture*.

static random access memory (SRAM). Random access memory based on the logic circuit known as flip-flop. It is called static because it retains a value as long as power is supplied, unlike dynamic random access memory (DRAM), which must be regularly refreshed. It is however, still volatile, meaning that it can lose its contents when the power is turned off.

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

Storage Array Identifier (SAI or SA Identifier). The Storage Array Identifier is the identification value used by the FAStT Storage Manager host software (SMClient) to uniquely identify each managed storage server. The FAStT Storage Manager SMClient program maintains Storage Array Identifier records of previously-discovered storage servers in the host resident file, which allows it to retain discovery information in a persistent fashion.

storage management station. A system that is used to manage the storage subsystem. A storage management station does not need to be attached to the storage subsystem through the fibre-channel input/output (I/O) path.

storage partition. Storage subsystem logical drives that are visible to a host computer or are shared among host computers that are part of a host group.

storage partition topology. In the FAStT Storage Manager client, the Topology view of the Mappings window displays the default host group, the defined host group, the host computer, and host-port nodes. The host port, host computer, and host group topological elements must be defined to grant access to host computers and host groups using logical drive-to-LUN mappings.

subnet. An interconnected but independent segment of a network that is identified by its Internet Protocol (IP) address.

sweep method. A method of sending Simple Network Management Protocol (SNMP) requests for information to all the devices on a subnet by sending the request to every device in the network.

switch. A fibre-channel device that provides full bandwidth per port and high-speed routing of data by using link-level addressing.

switch group. A switch and the collection of devices connected to it that are not in other groups. Switch groups are discovered by the SANavigator tool and displayed with a gray background on the Physical and Data Path maps.

system name. Device name assigned by the vendor's third-party software.

TCP. See *Transmission Control Protocol*.

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

terminate and stay resident program (TSR program). A program that installs part of itself as an extension of DOS when it is executed.

topology. The physical or logical arrangement of devices on a network. The three fibre-channel topologies are fabric, arbitrated loop, and point-to-point. The default topology for the disk array is arbitrated loop.

TL_port. See *translated loop port*.

transceiver. A device that is used to transmit and receive data. Transceiver is an abbreviation of transmitter-receiver.

translated loop port (TL_port). A port that connects to a private loop and allows connectivity between the private loop devices and off loop devices (devices not connected to that particular TL_port).

Transmission Control Protocol (TCP). A communication protocol used in the Internet and in any network that follows the Internet Engineering Task Force (IETF) standards for internetwork protocol. TCP provides a reliable host-to-host protocol between hosts in packed-switched communication networks and in interconnected systems of such networks. It uses the Internet Protocol (IP) as the underlying protocol.

Transmission Control Protocol/Internet Protocol (TCP/IP). A set of communication protocols that provide peer-to-peer connectivity functions for both local and wide-area networks.

trap. In the Simple Network Management Protocol (SNMP), a message sent by a managed node (agent function) to a management station to report an exception condition.

trap recipient. Receiver of a forwarded Simple Network Management Protocol (SNMP) trap.

Specifically, a trap receiver is defined by an Internet Protocol (IP) address and port to which traps are sent. Presumably, the actual recipient is a software application running at the IP address and listening to the port.

TSR program. See *terminate and stay resident program*.

uninterruptible power supply. A source of power from a battery that is installed between a computer system and its power source. The uninterruptible power supply keeps the system running if a commercial power failure occurs, until an orderly shutdown of the system can be performed.

user action events. Actions that the user takes, such as changes in the storage area network (SAN), changed settings, and so on.

vendor. Property value that the SANavigator tool uses to launch third-party software. Vendor property might be discovered, but will always remain editable.

worldwide name (WWN). A unique identifier for a switch on local and global networks.

WORM. See *write-once read-many*.

write-once read many (WORM). Any type of storage medium to which data can be written only a single time, but can be read from any number of times. After the data is recorded, it cannot be altered.

WWN. See *worldwide name*.

zoning. A function that allows segmentation of nodes by address, name, or physical port and is provided by fabric switches or hubs.

Index

A

about this document xvii
acoustical noise emission values 10
Activity LED 7
address label, hardware Ethernet 83
airflow 11

B

battery
 LED 67
 life of 67
 recycling properly 90
 replacing 67, 88
 voltage of 67
bays
 hot-swap drive 5
best practices 4
blank tray 7

C

cabling
 an IBM FASTt EXP100 43
 an IBM FASTt100 43
 drive loop 92
cabling instructions xvii
cabling the storage server
 connecting expansion unit 53
 connecting host to RAID controller 49
 connecting power cables 50
 connecting secondary interface cables 50
 maintaining redundancy 50
cache battery
 See battery 67
cache memory
 cache active LED 67
 size of 66
Class A electronic emission notice 112
cluster server support 3
comments, how to send xxvi
complete SM SW installation xvii
components, storage server
 back view 7
 hard disk drives 69
 hot-swap fans 77
 power supply 79
 RAID controller 83
concepts guide xvii
Concepts Guide xxiii
configuration, installing the storage subsystem 37
configure storage hardware xvii
configure storage subsystems on host xvii
connect power xvii
controls, front 6
cooling 11
copper cables 95

Copy Services Guide xxiii
customer replaceable units (CRUs)
 removing a fan unit 21, 23
 removing a hard disk drive 23
 removing a power supply 21, 22
 removing a RAID controller 21
 removing hard disk drives 21

D

determine management method xvii
diagnostic hardware
 wrap-plug 95
diagnostic interface port 8, 50
direct-management method 32
documentation
 FASTt Storage Manager Version 8.4 xxiii
 related xxiii
documentation checklist 4
drive
 amber Fault LED 6
 blank tray 7
 FASTt 1.5 Gbps SATA 6
 green Activity LED 6
 trays 6
drive, hard disk
 adding larger-capacity 73
 LEDs 63
 overview 69
 replacing all at same time 73, 74
 replacing one at a time 73, 76

E

EIA 310-D Type A 19-inch rack cabinet 18
electrical input 10
electronic emission Class A notice 112
Electronic emission notices
 Australia and New Zealand Class A statement 113
 European Union EMC Directive conformance statement 113
 Federal Communications Commission (FCC) statement 112
 Industry Canada Class A emission compliance statement 113
 Japanese Voluntary Control Council for Interference (VCCI) statement 114
 Taiwanese Class A warning statement 114
 United Kingdom telecommunications safety requirement 113
emergency shutdown
 performing 61
 restoring power 61
enclosure ID settings 29
enclosure ID switch 8
environment 10

Ethernet
 address label on RAID controller 83
 connecting to RAID controller 50
 ports 8
expansion unit
 connecting to storage server 53
 turning on before storage server 58, 75

F

fan
 LEDs 66
 overview 77
 replacing 78
FASTt Storage Manager
 related documents xxiii
 Version 8.4 Library xxiii
FASTt Storage Manager 8.4
 user tasks xxiii
FASTt100 Storage Server library xxi
FASTt600 Fibre Channel Storage Server library xxi
FASTt700 Storage Server library xx
FASTt900 Fibre Channel Storage Server library xviii
Fault LED, hard disk drive 7
FC cabling instructions xvii
FC HW maintenance and problem determination
 guide xvii
FC planning and integration user's guide and service
 information xvii
FC storage server installation guide xvii
FCC Class A notice 112
features of the storage server 3
fiber-optic cable
 handling 39
 installing 42
 removing 43
 working with 39
fibre channel
 connections 33
 loop configurations 33
Fibre channel defined 2
fibre-channel cable adapter
 LC-SC using the 46
fibre-channel loop
 adding the FASTt EXP100 91
fibre-channel loop ID
 midplane 29
 setting 29
fibre-channel loop IDs 70
fire suppression xxvi
front indicators
 Activity LED 7
 Fault LED 7
 general system error LED 7
 power on LED 7

G

GBIC
 removing 43

H

handling static-sensitive devices 14
hard disk drive
 adding larger-capacity 73
 LEDs 63
 overview 69
 replacing all at same time 73, 74
 replacing one at a time 73, 76
hardware Ethernet address label 83
hardware installation process xvii
hardware maintenance and problem determination xvii
hardware service and support xxvi
HBA installation and user's guide xvii
heat dissipation 10
heat output 11
host adapter, connecting to RAID controller 49
host bus adapter installation and user's guide xvii
host-agent management method 31
hot swap
 drive Activity LED 6
 drive bays 5
 drive CRU 7
 drive LED activity described 70
 hardware 70
hub
 See managed hub 49

I

IBM TotalStorage FASTt100
 Activity LED 7
 drive latches 7
 Fault LED 7
 front controls 6
 general system error LED 7
 hot-swap drive CRU 7
 installing into a rack cabinet 13
 introduction 1
 inventory checklist 4
 mounting in a rack 16
 operating specifications 9
 power on LED 7
 preparing for installation 14, 21
 removing CRUs 21
 site preparation 15
 size of 10
 speed settings, setting the 31
 tray handle 7
 unpacking the 14
 weight 10
indicators 6
install and verify SM SW on host and workstation xvii
install network hardware xvii
install storage expansion unit xvii
install storage server/RAID enclosures in rack xvii
installation
 into a rack cabinet 13
 installation and support OS guides xvii
 installation guide, storage server xvii
 installation planning xvii

- installation process xvii
- installing
 - hot-swap hard disk drives 70
- installing and replacing devices
 - blank trays 70
- installing components
 - fan 78
 - fiber-optic cable 42
 - power supply 81
 - RAID controller 83
- interface ports and switches 8
- inventory checklist 4

L

- latch, hard disk drive 7
- LC-LC fibre-channel cable 43, 44
 - latches and lever 48
 - removing 45
 - using the 43
- LC-SC fibre-channel cable adapter
 - connecting to a device 47
 - connecting to an LC-LC fibre-channel cable 48
 - described 46
 - protective caps 48
 - removing an LC-LC fibre-channel cable 48
 - using the 46
- LED
 - amber drive fault 7
 - general system error 7
 - green drive activity 7
 - green power-on 7
- LEDs
 - cache battery 67
 - fan 66
 - hard disk drive 63
 - power supply 66
 - RAID controller 64
 - storage server 63
- lever on power supply, changing location 81
- loop configurations
 - overview 33
 - redundant 34
- loop redundancy, described 54

M

- make FC connections xvii
- managed hub
 - in fibre channel loop configurations 33, 34
 - using to connect host to RAID controller 49
- memory, cache
 - cache active LED 67
 - size of 66

N

- notes, important 112
- notices
 - electronic emission 112
 - FCC, Class A 112

- notices (*continued*)
 - static-sensitive precautions 69
 - trademarks 111
 - used in this book iii

O

- online help xvii
- over-temperature condition, shutdown 61

P

- parts list 99
- power cords 109
 - connecting 50
- power on sequence, storage server 57
- power supply
 - changing lever location 81
 - installing 81
 - LEDs 66
 - overview 79
 - removing 80
 - strain-relief clamp 80
- prepare for SM SW installation xvii
- prepare network connection xvii

R

- rack cabinet
 - EIA 310-D Type A 19 inch 18
 - preparatory procedures 15
 - rail installation 18
 - site preparation 14
- rack mounting template for FAStT100 16, 105
- RAID controller
 - cache battery 67
 - connecting Ethernet cable to 50
 - connecting host to 49
 - connecting RS-232 (serial) cable 50
 - LEDs 64
 - overview 83
 - replacing 83
- RAID controller enclosure unit installation guide xvii
- recycling the cache battery 90
- redundant host and drive loops 34
- removing components
 - fiber-optic cable 43
 - GBIC 43
 - power supply 80
- replacing
 - a hot-swap hard disk drive 72
- replacing components
 - cache battery 88
 - fan 78
 - RAID controller 83
- replacing CRUs
 - fan unit 27
 - hot-swap hard disk drives 28
 - power supply 26
 - RAID controller 26

- restoring power
 - after emergency shutdown 61
 - after unexpected shutdown 60
- RS-232 (serial) port 8, 50

S

- safety information iii
- SATA defined 2
- Script Commands xxiii
- serial number 103
- serial port 8
- server ID settings 29
- server ID switch 8
- set link speed xvii
- setting interface options 28
- SFP modules
 - important information about 40
 - installing 40
 - removing 42
 - working with 39
- shutdown sequence, storage server 59
- SM concepts guide xvii
- SM installation and support guide for Linux xvii
- SM installation and support guide for Novell NetWare xvii
- SM installation and support guide for Windows 2000 xvii
- SM installation and support guide for Windows NT xvii
- small form-factor pluggable module (SFP)
 - connecting to an LC-LC fibre-channel cable 44
 - removing an LC-LC cable 45
- software checklist 4
- software installation process xvii
- software service and support xxvi
- specifications 10
- speed settings 9
- start server xvii
- static-sensitive devices, handling 69
- static-sensitive precautions 69
- storage expansion unit installation guide xvii
- Storage Manager client
 - installing 52
 - using to monitor storage server status 62
- storage server
 - components
 - back view 7
 - hard disk drives 69
 - installing power supply 81
 - power supply 79
 - replacing RAID controller 83
 - emergency shutdown 61
 - enclosure ID settings 29
 - features 3
 - fibre channel connections 33
 - identification numbers 103
 - installing SFP modules 40
 - interface ports and switches 8
 - LEDs 63, 64, 66
 - over-temperature shutdown 61
 - records 103

- storage server (*continued*)
 - restoring power after emergency shutdown 61
 - restoring power after over-temperature shutdown 61
 - restoring power after unexpected shutdown 60
 - server ID settings 29
 - turning off 59
 - turning on 57
- storage server installation guide xvii
- storage subsystem
 - configuring 31
- storage subsystem configuration, installing 37
- strain-relief clamp on power supply 80
- symptom-to-FRU index 95

T

- trademarks 111
- tray handle, hard disk drive 7
- turning off the storage server 59
- turning on the storage server 57

U

- United States electronic emission Class A notice 112
- United States FCC Class A notice 112
- user tasks
 - FAST Storage Manager xxiii
 - FAST100 Storage Server xxi
 - FAST600 Fibre Channel Storage Server xxi
 - FAST700 Fibre Channel Storage Server xx
 - FAST900 Fibre Channel Storage Server xviii
 - related documents xxiii

V

- verify server operation w/ LEDs xvii

W

- web sites, related xxv
- wrap-plug 95

Readers' Comments — We'd Like to Hear from You

IBM TotalStorage FAStT100 Storage Server
Installation, User's, and Maintenance Guide

Publication No. GC26-7641-00

Overall, how satisfied are you with the information in this book?

| | Very Satisfied | Satisfied | Neutral | Dissatisfied | Very Dissatisfied |
|----------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Overall satisfaction | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

How satisfied are you that the information in this book is:

| | Very Satisfied | Satisfied | Neutral | Dissatisfied | Very Dissatisfied |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Accurate | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Complete | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Easy to find | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Easy to understand | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Well organized | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Applicable to your tasks | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Please tell us how we can improve this book:

Thank you for your responses. May we contact you? Yes No

When you send comments to IBM, you grant IBM a nonexclusive right to use or distribute your comments in any way it believes appropriate without incurring any obligation to you.

Name

Address

Company or Organization

Phone No.



Fold and Tape

Please do not staple

Fold and Tape



NO POSTAGE
NECESSARY
IF MAILED IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST-CLASS MAIL PERMIT NO. 40 ARMONK, NEW YORK

POSTAGE WILL BE PAID BY ADDRESSEE

International Business Machines Corporation
Information Development
Dept. GZW
9000 South Rita Road
Tuscon, AZ
U.S.A. 85744-0001



Fold and Tape

Please do not staple

Fold and Tape



Part Number: 24P8970

Printed in USA

GC26-7641-00



(1P) P/N: 24P8970

