EXP15, EXP200, EXP500 HMM   S10L-9839-01

IBM Netfinity Storage Expansion Unit
EXP15-Type 3520, EXP200-Type 3530,
EXP500-Type 3560

Hardware Maintenance Manual

April, 2000

We Want Your Comments!
(Please see page 134)

EXP15, EXP200, EXP500 HMM   S10L-9839-01

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EXP500-Type 3560

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IBM

About This Manual

> **Note**
>
> This manual should be used with the Hardware Maintenance Manual for the system you are servicing.

This manual contains Symptom-to-FRU Index, service information, and configuration information for following IBM Netfinity Storage Expansion Units:

EXP15 - Type 3520 (Model 2RU, 2RX)
EXP200 - Type 3530 (Model 1RU, 1RX)
EXP500 - Type 3560 (Model 1RU)

> **Important**
>
> This manual is intended for trained servicers who are familiar with IBM PC/Netfinity Server products.

Important Safety Information

Be sure to read all caution and danger statements in this book before performing any of the instructions.

Leia todas as instruções de cuidado e perigo antes de executar qualquer operação.

注意和危险声明（简体中文）

重要事项：

本书中的所有注意和危险声明之前都有编号。该编号用于英语的注意或危险声明与 *Safety Information* 一书中可以找到的翻译版本的注意或危险声明进行交叉引用。

例如，如果一个注意声明以编号 1 开始，那么对该注意声明的翻译出现在 *Safety Information* 一书中的声明 1 中。

在按说明执行任何操作前，请务必阅读所有注意和危险声明。

注意及危險聲明（中文）

重要資訊：

本書中所有「注意」及「危險」的聲明均以數字開始。此一數字是用來作為交互參考之用，英文「注意」或「危險」聲明可在「安全資訊」(Safety Information) 一書中找到相同內容的「注意」或「危險」聲明的譯文。

例如，有一「危險」聲明以數字 1 開始，則該「危險」聲明的譯文將出現在「安全資訊」(Safety Information) 一書的「聲明」1 中。

執行任何指示之前，請詳讀所有「注意」及「危險」的聲明。

Prenez connaissance de toutes les consignes de type Attention et
Danger avant de procéder aux opérations décrites par les instructions.

Lesen Sie alle Sicherheitshinweise, bevor Sie eine Anweisung ausführen.

Accertarsi di leggere tutti gli avvisi di attenzione e di pericolo prima di effettuare qualsiasi operazione.

주의 및 위험 경고문(한글)

중요:

이 책에 나오는 모든 주의 및 위험 경고문은 번호로 시작됩니다.
이 번호는 Safety Information 책에 나오는 영문판 주의 및 위험
경고문과 한글판 주의 및 위험 경고문을 상호 참조하는데 사용됩
니다.

예를 들어 주의 경고문이 번호 1로 시작되면 Safety Information
책에서 이 주의 경고문은 경고문 1번 아래에 나옵니다.

지시를 따라 수행하기 전에 먼저 모든 주의 및 위험 경고문을 읽
도록 하십시오.

Lea atentamente todas las declaraciones de precaución y peligro ante
de llevar a cabo cualquier operación.

Online Support

Use the World Wide Web (WWW) to download Diagnostic, BIOS Flash, and Device Driver files.

File download address is:

http://www.pc.ibm.com/us/files.html

IBM Online Addresses:

The IBM Support Page is:

http:///www.pc.ibm.com/support/

The IBM Personal computing solutions page is:

http://www.pc.ibm.com

Contents

Netfinity EXP15 Type 3520

Features

Modularized Components

High-capacity hard disk drives
Environmental Services Monitor (ESM) board
Power Supplies
Cooling Fans

Technology

Supports disk array technology
SCSI (LVD or SE) host interface
Redundant data storage, cooling system, and power system.
Hot-swap technology for hard disk drives, power supplies, and fans
Automatic recovery after power failure without user intervention

User Interface

Built-in power, Activity, and Fault indicators
Identification labeling on Customer Replaceable Units, (CRUs), rear indicator lights, switches and connectors

Hard Disk Drives

Supports up to ten hard disk drives
Supports 2 channels per expansion unit
Supports 5 hard disk drives per channel

ESM Board

ID numbers
–   Switch controlled for hard disk drive channel numbers: 1 and 2
–   Switch On – Hard Disk Drive SCSI IDs: 0, 1, 2, 3, and 4 for both Channel 1 and Channel 2.
–   Switch Off (default) – Hard Disk Drive SCSI IDs: 0, 1, 2, 3, 4, 8, 9, 10, 11, and 12 for Channel 1 or Channel 2.
Technology and Interfaces
–   Model: SCSI, LVD, or single-ended
–   SCSI bus interface: Two, 68-pin, VHDCI connectors for incoming and outgoing SCSI bus cables

Diagnostics and Test Information

```
┌─ Important ─────────────────────────────────┐
│                                             │
│ The service procedures are designed to help │
│ you isolate problems.  They are written     │
│ with the assumption that you have           │
│ model-specific training on all computers,   │
│ or that you are familiar with the           │
│ computers, functions, terminology, and      │
│ service-related information provided in      │
│ this manual and the appropriate IBM         │
│ PC/Netfinity Server Hardware Maintenance    │
│ Manual.                                     │
│                                             │
└─────────────────────────────────────────────┘
```

The following is a list of problems and references for diagnosing the IBM Netfinity EXP15 Storage Expansion Unit - Type 3520.

Problem	Reference
Hard Disk Drive Numbering	See "Drive Numbering" on page 13.
Error Codes/Error Messages	Refer to the Symptom-to-FRU Index for the server that the Storage Expansion Unit you are servicing is connected to.
Expansion Unit Options Switches	See "Expansion Unit Option Switches" on page 11.
Fan Controls and Indications	See "Fan Controls and Indicators" on page 15.
Front Controls and Indications	See "Front Controls and Indicators" on page 12.
Performing a Shutdown	See "Performing a Shutdown" on page 4.
Power Supply Controls and Indicators	See "Power Supply Controls and Indicators" on page 17.
Rear Controls and Indications	See "ESM Board Controls and Indicators" on page 10.
Turning the Power On	See "Turning the Power On" on page 4.

Additional Service Information

"Performing a Shutdown"
"Turning the Power On"

Performing a Shutdown

Note

If the Expansion Unit loses power unexpectedly, it might be due to a hardware failure in the power system or mid-plane (see "Symptom-to-FRU Index" on page 7).

To perform a shutdown:

1. Make sure that all I/O activity has stopped. If applicable, logically disconnect from the host controller.
2. Make sure that all amber Fault LEDs are off. If any Fault LEDs are lit (drives, power supplies, or fans), correct the problem before you turn off the power.
3. Turn off *both* power supply switches on the back of the expansion unit.

Turning the Power On

Use this procedure to power-on the Netfinity EXP15 Storage Expansion unit.

Initial start-up:
1. Verify that all communication and power cables are plugged into the back of the expansion unit.
   a. All hard disk drives are locked securely in place.
   b. The Option ID switch on the expansion unit is set correctly.
   c. The host controller and other SCSI bus devices are ready for the initial power-up.
   d. Power-on the expansion unit before powering on the server.
2. Turn on the power to each device, based on this power-up sequence.
3. Turn on *both* power supply switches on the back of the expansion unit.
4. Only the green LEDs on the front and back should be on. If one or more of the amber Fault LEDs are on, refer to "Symptom-to-FRU Index" on page 7.

Re-starting:

If you are re-starting after a normal shutdown, wait at least ten seconds before you attempt to turn on *either* power supply switch.

Specifications

Size

    With front panel:
- Depth: 57.9 cm (22.8 in.)
- Height: 13.2 cm (5.20 in.)
- Width: 48.2 mm (18.97 in.)

Weight

    Typical expansion unit as shipped: 39 kg (86 lb)

Electrical Input

    Sign-wave input (50 to 60 Hz)
- Low range:
  Minimum: 90 V ac
  Maximum: 127 V ac
- High range:
  Minimum: 198 V ac
  Maximum: 257 V ac

    Input Kilovolt-amperes (kVA) approximately:
- Minimum configuration:
  0.06 kVA
- Maximum configuration:
  0.39 kVA

Environment

    Air Flow: Air flow is from front to back

    Air temperature:
- expansion unit on:
  10° to 35° C
  (50° to 95° F)
  Altitude: 0 to 914 m (3000 ft.)
- expansion unit on:
  10° to 32° C
  (50° to 90° F)
  Altitude: 914 m (3000 ft.) to 2133 m (7000 ft.)

    Humidity:
- 10% to 80%

Heat Output

    Approximate heat output in British Thermal Units
(BTU) per hour:
- Minimum configuration: 205.2 BTU (60 watts)
- Maximum configuration: 1333.8 BTU (390 watts)

Acoustical Noise Emissions Values

For open bay (0 drives installed) and typical system
configurations (8 hard drives installed).

    Sound Power (idling):
- 6.2 bels (open bay)
- 6.4 bels (typical)

    Sound Power (operating):
- 6.2 bels (open bay)
- 6.5 bels (typical)

    Sound Pressure (idling):

- – 47 dBA (open bay)
- – 49 dBA (typical)
- Sound Pressure (operating):
  - – 47 dBA (open bay)
  - – 50 dBA (typical)

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.

Symptom-to-FRU Index

Use this chart to find solutions to problems that have definite symptoms.

Problem Indicator	FRU/Action
Amber LED On (Front Panel)	1. **Hard Disk Drive**
Amber and Green LED Flashing (Front Panel)	1. **Host issued a drive rebuild command**
Amber LED On	1. **Fan**
Amber LED On (ESM Board)	1. **ESM board** 2. Check for fan fault LED 3. Unit is overheating. Check temperature.
Amber LED On, Green LED Off	1. **Turn Power Switch On** 2. Power cord 3. Reseat Power Supply 4. Power Supply
Amber and Green LEDs On	1. **Power Supply**
Amber and Green LEDs Off	1. **Reseat hard disk drive** 2. Hard Disk Drive
All Green LEDs Off	1. **Check AC voltage cabinet AC voltage line inputs.** 2. Power Supplies 3. Mid-plane board
Intermittent power loss to expansion unit	1. **Check AC voltage line inputs, and cabinet power components.** 2. Power Supplies 3. Mid-plane board
One or more Green LEDs Off	1. **Turn Power Switch On** 2. Power cord 3. Reseat Power Supply 4. Power Supply
One or more Green LEDs Off	1. **No activity to the drive** 2. This can be normal activity
One or more Green LEDs Off (All Hard Disk Drives or those on one Bus)	1. **Use SCSI RAID Manager to check drive status** 2. SCSI Cables 3. ESM Board 4. Mid-plane board

| Problem Indicator	FRU/Action
Unable to access drives on one or both SCSI buses	1. **Check SCSI cables and connections** 2. Option switch 2 must be set to off. 3. ESM board
Intermittent Power Loss	1. **AC power or plug** 2. Power supply 3. Mid-plane
Random errors	1. **Mid-plane board** 2. Make sure option switches 1 and 2 are set to Off.

Note

If you cannot find the problem using this Symptom-to-FRU Index, test the entire system. See the server documentation for more detailed information on testing and diagnostic tools.

Locations

ESM Board Controls and Indicators

Option Switches
Active LED
Lever
SCSI Bus 1 Connector
ESM Board FRU

Tray Number Switch
Over Temp LED
Active LED
Lever
SCSI Bus 2 Connector

Term Power LED
LVD/SE LED
Power LED
Term Power LED
LVD/SE LED

> **Note**
>
> SCSI Bus Connectors are 68-pin VHDCI connectors used for attaching SCSI cables.

ESM Board LED Indications:

LED	Description
Term Power (green)	LED is On if Term Power is present, indicating that the other end of the cable is connected to a power-on controller.
LVD/SE (green)	LED is On if the host bus is in LVD mode (default is LVD mode.)
Power (green)	LED is On when there is power to the ESM board.
Over Temp (amber)	This LED is On if the expansion unit overheats.
Active (green)	This LED flashes when there is activity on the external SCSI bus.

Expansion Unit Option Switches
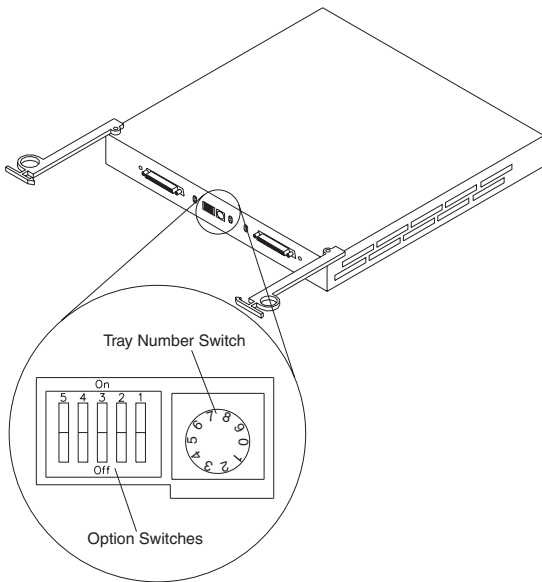
The expansion unit has three types of ID numbers:

Drive SCSI IDs   Identifies each drive in the expansion unit.

Tray ID   identifies each expansion unit

SAF-TE chip SCSI ID   System-management SCSI Accessed Fault Tolerant Enclosure processor

Switch settings are as follows:

    Option Switches
- Switch 1 off (default)
    - Bus 1 and 2 as Single Bus 1, accessing all ten drives, (IDs 0-4 and 8-12).
- Switch 1 on
    - Bus 1 and Bus 2 accessing 5 drives each.
      Bus 1 accessing IDs 0-4
      Bus 2 accessing IDs 0-4

Note

Option Switches 2-5 must be set to the Off (down) position. Errors might occur if these switches are set to the on position.
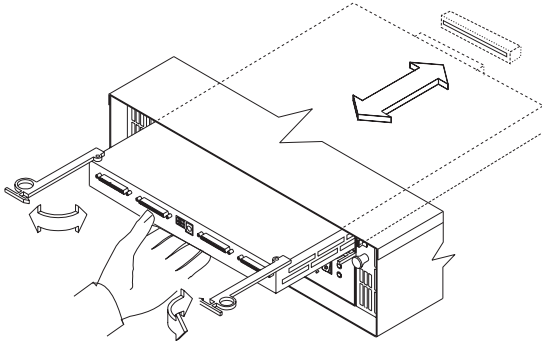
    Tray Number Switch
- Identifies each expansion unit 0-9.

    SAF-TE chip SCSI ID
- Internal SCSI ID numbers 14 and 15.

ESM Board Replacement

To remove the ESM board:

1. Shut down the expansion unit. For shutdown information, see "Performing a Shutdown" on page 4
2. Grasp each pull-ring and squeeze the latches to release.
3. Pull open both levers at the same time and remove ESM board.

Note

When inserting the ESM board:

1. Make sure both levers are straight out, as shown above.
2. Using your hand, gently push on the center of the ESM board to insert it into the controller.
3. When inserting the ESM board, make sure both levers swing inward at the same time.
4. Close and lock both levers at the same time.

Front Controls and Indicators

Note

Only the IBM ServRAID, ServRAID II, ServRAID-3H, and Fibre RAID controller provide support for the amber Fault LEDs.

Drive Numbering

There are *two SCSI channels* (1, 2) in the expansion unit. Each channel uses five SCSI ID numbers. Each disk drive within the expansion unit has a unique channel number and SCSI ID number, based on its physical location in the expansion unit.

When a drive is plugged into the midplane, its channel number and SCSI ID are set automatically. See the following illustration for bus and SCSI ID values when option switch 1 is set to the on (up) state. Use the option switch on the ESM board to change the ID settings.
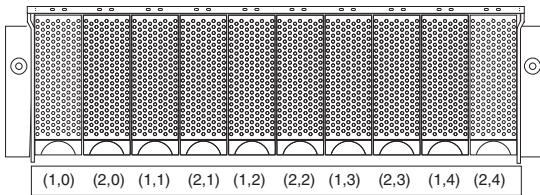
| (1,0) | (2,0) | (1,1) | (2,1) | (1,2) | (2,2) | (1,3) | (2,3) | (1,4) | (2,4) |

The first number represents the channel number and the second is the SCSI ID.

> **Notes**
>
> For IBM ServeRAID, the view configuration screens show bay numbers, not SCSI IDs. To calculate the bay number, add 1 to the SCSI ID.
>
> A blank label is provided in the drive tray behind the drive latch. Use this label to record the address location information for each drive before you remove it. If you install a drive in the wrong bay, data will be lost.
>
> If you are replacing a drive that is part of a RAID level 1 or RAID level 5 logical drive, ensure that you install the replacement drive in the correct bay. Failure to replace the drives in their correct bays can result in loss of data.

If the two channels are daisy chained using option switch 1 in the off position, then the SCSI IDs are as shown and the drives are all on the same channel.

| (1,0) | (1,8) | (1,1) | (1,9) | (1,2) | (1,10) | (1,3) | (1,11) | (1,4) | (1,12) |
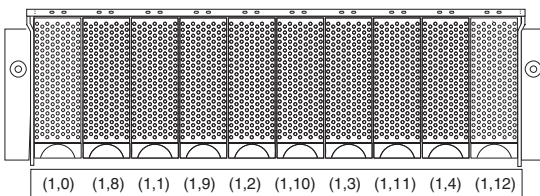
Replacing Drives (Hot-Swap)
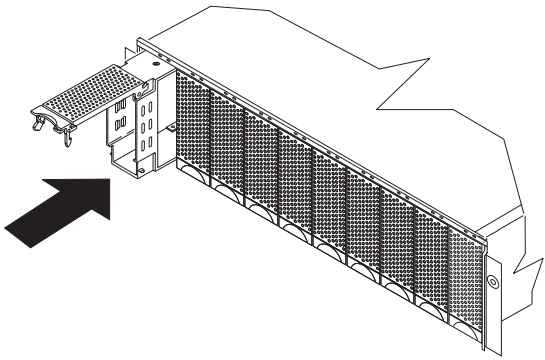
To remove the hot-swap drives:

1. Pull on the bottom of the tray lever to release the lever.
2. Lift the lever and slide the drive partially out of the slot.

> ┌─ **Note** ─────────────────────────────
>
> Wait at least 20 seconds before fully removing the drive from the expansion unit to allow for spin down. Allowing for spin down avoids possible damage to the drive.
>
> See "Drive Numbering" on page 13 when replacing drives.

3. Install the new drive, Making sure at least ten seconds have passed before you install the new drive tray. Unlatch and open the drive lever and insert the drive.
4. Lock the lever in place.
5. Check the LEDs.
   a. When drives are ready for use, the green Active LEDs should be off and the Power/Fault LEDS should be glowing green. (A flashing amber LED indicates a drive rebuild).
   b. If the Power/Fault light is solid amber, pull up on the drive latch and lift the drive lever to pull the drive partially out of the bay. Wait at least 20 seconds before fully removing the drive from the expansion unit to allow for spin down. If the SCSI adapter is the IBM ServeRAID; go to the ServeRAID User's Guide for additional information and procedures on changing the state of the drive from the current Default state to any other state (for example, HSP, RDY,

rebuild drive to ONL, and so on). The amber LED should go off within 10 seconds of the drive state change (to something other than DDD).

If the SCSI adapter is the IBM ServeRAID II, in some cases, the drive will automatically reset to either a hotspare (HSP) or be rebuilt (ONL). See the ServeRAID II User's Guide for additional information. If the state change in the ServeRAID II configuration does not change automatically (amber LED does not go off), then refer to the ServeRAID II User's Guide for directions on how to perform a manual drive state change. The amber LED should go off within 10 seconds of a drive state change (to something other than DDD).

If the state change in the RAID configuration does not change automatically, refer to the *RAID Controller User's Guide* for directions on how to perform a drive state change.

LED drives status:

The following table shows the LED status on the drives:

LED	Description
Activity (green)	Indicates read/write or inquiry operation
Power/Fault (green)	Indicates drive present
Power/Fault (amber/green Flashing)	Indicates drive rebuild
Power/Fault (amber)	Indicates a drive failure
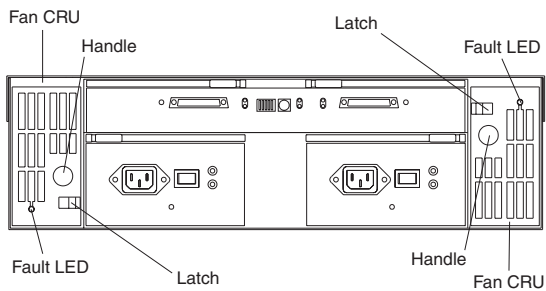
Fan Controls and Indicators

Fan LED Indications

LED	Description
Fault LEDs (amber)	LEDs are On when a fan fails.

Replacing Fans (Hot-Swap)
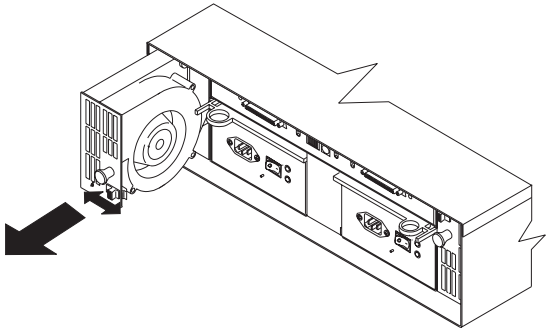
To Remove Cooling Fans:

1. Check the LEDs on the back of the expansion unit.
2. Slide the latch left or right to unlock the fan.
3. Use the handle (black knob) to pull the fan from the expansion unit.
4. Install the new fan by inserting it into the expansion slot and making sure it is seated into the mid plane connector. Slide the latch into the middle position.
5. Check the LEDs. If the fault LEDs do not turn off after a few seconds, refer to "Symptom-to-FRU Index" on page 7.

Note

The Fan units are hot swap redundant; however, when one fan fails, the failing fan unit needs to be replaced within 48 hours in order to maintain redundancy and optimum cooling. When replacing the failed fan unit, insure that this replacement is performed in less than 10 minutes to prevent any overheating. If it takes longer than 10 minutes to replace the fan unit, you must shut down the expansion unit to keep the unit from overheating.

For information on expansion unit shutdown, see "Performing a Shutdown" on page 4.

Power Supply Controls and Indicators

Power Supply LED Indications

LED	Description
Power (green)	LEDs are On when power switches are turned on.
Fault (amber)	If only the amber LED is on, then power supply is off.
Power (green) and Fault (amber)	Both the green and amber LEDs on indicates a power supply failure.

Replacing Power Supplies (Hot Swap)

To remove a power supply:

1. Turn the switch on the power supply to the Off position.
2. Unplug the supply power cord from the electrical outlet.
3. Disconnect the power cord from the power supply.
4. Grasp each pull-ring and squeeze the latches to release.

5. Pull open lever and remove power supply.

Note

When installing a new power supply, make sure that the latch is mounted to the side of the supply that is toward the middle of the machine. If not, remove the lever screw, flip the lever over and replace the screw. See the illustration above.

Removal From Rack

The expansion unit should only need to be removed from the rack for replacement of the midplane board/frame assembly. See "Parts Listing" on page 22 for more information.

Rear of Rack
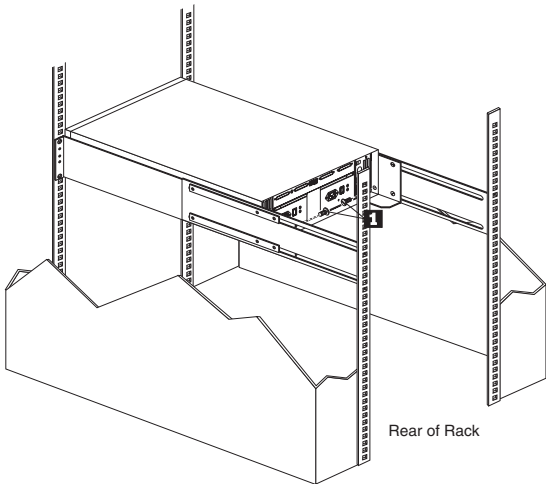
1. Remove screws 1 from assembly rails at rear.

Front of Rack
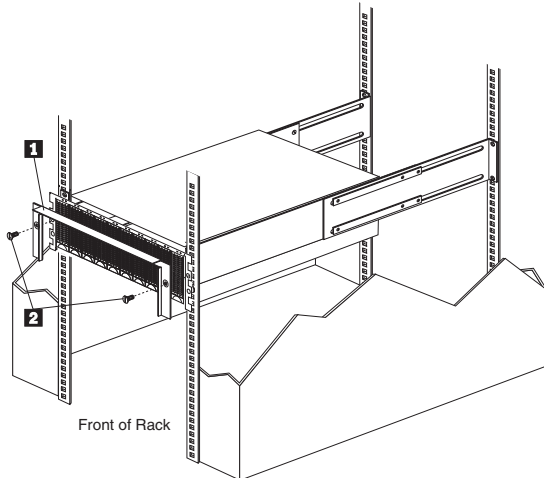
2. Remove screws 2 and remove bezel 1 .

Front of Rack
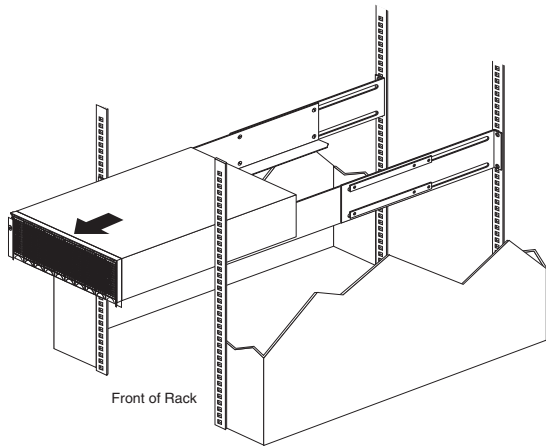
3. Slide expansion unit out of rack.

Note

Avoid touching the LED lights when removing the unit to avoid damage to the expansion unit.

Replacing Rails

1. Align the rail assembly (provided with the hardware kit) to the rear of the rack.

   a. Install two black hex head screws 1 in the top and bottom positions, starting with the top.

   b. Loosely tighten the screws.

Rear of Rack
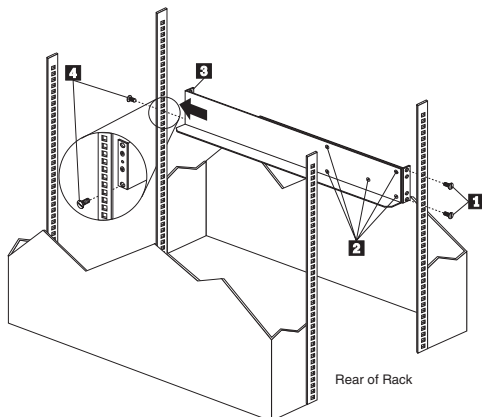
2. Loosen the five screws (four large screws and one small screw) 2 located on the interior of the rail

assembly; then slide the front rail assembly forward
3 until it makes contact with the front rack rail.

> **Note**
>
> Make sure the front rail position matches the rear
> rail position.

3. From the front of the rack, thread one (black) hex
   head screw 4 into the bottom position of the rail
   assembly and tighten firmly.

> **Note**
>
> Before tightening, make sure the pins are located
> correctly in the rail holes.

4. Firmly tighten the screws on the rear of the rack and
   the four interior screws on the rail assembly.
5. Repeat the rail assembly procedure on the opposite
   side of the rack.

Rear of Rack
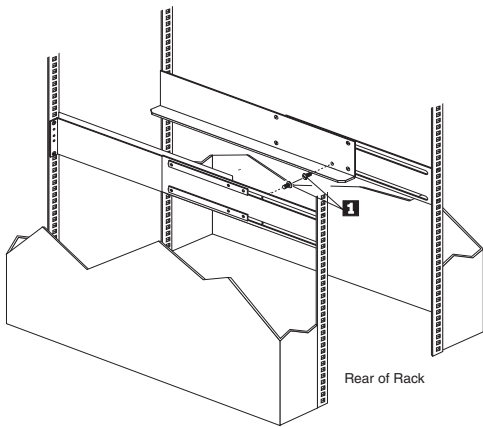
6. Remove the two small 6-32 screws 1 on the interior
   side of the rails. Save these screws to install the
   expansion unit

Parts Listing
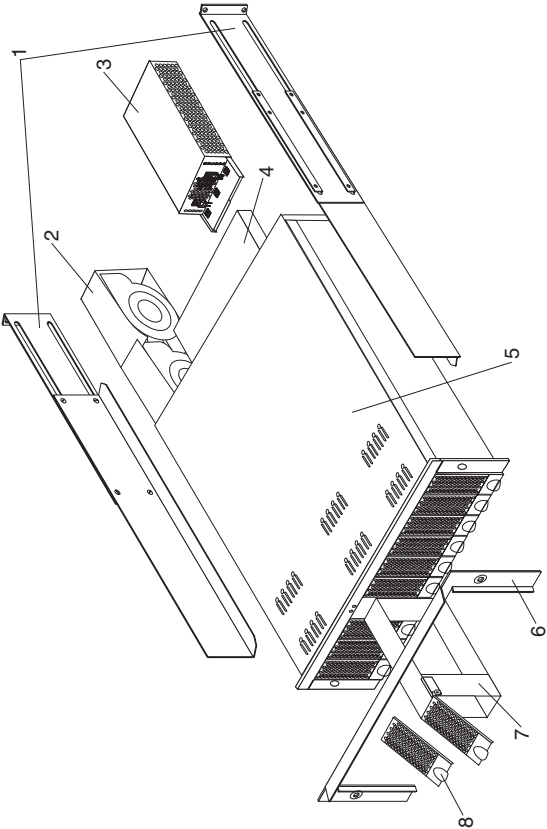
System

Index	System (IBM Netfinity EXP15, Type 3520) Model 2RU, 2RX	FRU No.
1	Rail Kit	01K6670
2	Blower Assembly	01K6706
3	350W Power Supply Assembly	01K6709
4	Electronic Module (ESM)	01K6708
5	Midplane/Frame	01K6707
	Note: The midplane board and frame are replaced as a unit. If either part is needed, order the above FRU.	
6	Bezel, Front	01K6705
7	Blank Tray, with bezel	01K6667
8	Bezel, HF Tray	01K6666
	Misc Hardware Kit	01K6671

ESM Lever Screws (2 each)
Power Supply Lever Screw
Power Cord Retainer
Power Cord Retainer Knurled Nut
EMC Clips (6 each)
Tray Spring
6-32 Tray Spring Screw and nut
6-32X1/4-Inch Drive Screws (2 each)
ESM Latch Left
ESM Latch Right
Power Supply Latch
Light Pipes (2 each)
6-32X1/2-Inch Screw
M6 Rail Screws (2 each)
M5X8L Screw (2 each)
M3X5L Screw (2 each)
Large Spacer (2 each)

Options	FRU No.
LVD SCSI Cable, 2 Meter external	03K9196
LVD SCSI Cable, 4 Meter external	03K9198
LVD SCSI Cable, 12 Meter external	03K9200
4.5 GB Hard Disk Drive with tray and bezel (7200 RPM)	01K6675
4.5 GB Hard Disk Drive with tray and bezel (10,000 RPM)	01K6682
9.1 GB Hard Disk Drive with tray and bezel (7,200 RPM)	01K6679
9.1 GB Hard Disk Drive with tray and bezel (10,000 RPM)	02K0459
18.2 GB Hard Disk Drive with tray and bezel (7,200 RPM)	01K6718
18.2 GB Hard Disk Drive with tray and bezel (10,000 RPM)	02K0462
HF tray with holes (restricted)	01K6677

Power Cords

Power Cords	FRU No.
Arabic	14F0033
Belgium	1339520
Bulgaria	1339520
Czech Republic	1339520
Denmark	13F9997
Finland	1339520
France	1339520
Germany	1339520
Hungary	1339520
Israel	14F0087
Italy	14F0069
Latvia	1339520
Netherlands	1339520
Norway	1339520
Poland	1339520
Portugal	1339520
Serbia	1339520
Slovakia	1339520
South Africa	14F0015
Spain	1339520
Switzerland	1339520
Switzerland (French/German)	14F0051
U.S. English	62X1045
U.K./Ireland	14F0033
Yugoslavia	1339520

Netfinity EXP200 Type 3530

Features

Modularized Components

    High-capacity hard disk drives
    Environmental Services Monitor (ESM) board
    Power Supplies
    Cooling Fans

Technology

    Supports disk array technology (Ultra2 disk drives only)
    SCSI (Ultra2 or Ultra) host interface
    Redundant data storage, cooling system, and power system.
    Hot-swap technology for hard disk drives, power supplies, and fans
    Automatic recovery after power failure without user intervention
    Supports clustering

User Interface

    Built-in power, Activity, and Fault indicators
    Identification labeling on Customer Replaceable Units, (CRUs), rear indicator lights, switches and connectors

Hard Disk Drives

    Supports up to ten hard disk drives
    Supports 2 channels per expansion unit
    Supports 5 hard disk drives per channel

ESM Board

    ID numbers
    – Switch controlled for hard disk drive channel numbers: 1 and 2
    – Switch On – Hard Disk Drive SCSI IDs: 0, 1, 2, 3, and 4 for both Channel 1 and Channel 2.
    – Switch Off (default) – Hard Disk Drive SCSI IDs: 0, 1, 2, 3, 4, 8, 9, 10, 11, and 12 for Channel 1 or Channel 2.
    Technology and Interfaces
    – Model: Ultra2 or Ultra
    – SCSI bus interface: Two, 68-pin, VHDCI connectors for incoming and outgoing SCSI bus cables

Diagnostics and Test Information

> **Important**
>
> The service procedures are designed to help you isolate problems. They are written with the assumption that you have model-specific training on all computers, or that you are familiar with the computers, functions, terminology, and service-related information provided in this manual and the appropriate IBM PC/Netfinity Server Hardware Maintenance Manual.

The following is a list of problems and references for diagnosing the IBM Netfinity EXP200 Storage Expansion Unit - Type 3530.

Problem	Reference
Hard Disk Drive Numbering	See "Drive Numbering" on page 37.
Error Codes/Error Messages	Refer to the Symptom-to-FRU Index for the server that the Storage Expansion Unit you are servicing is connected to.
Expansion Unit Options Switches	See "Expansion Unit Option Switches" on page 35.
Fan Controls and Indications	See "Fan Controls and Indicators" on page 43.
Front Controls and Indications	See "Front Controls and Indicators" on page 36.
Performing a Shutdown	See "Performing a Shutdown" on page 28.
Power Supply Controls and Indicators	See "Power Supply Controls and Indicators" on page 45.
Rear Controls and Indications	See "ESM Board Controls and Indicators" on page 34.
Turning the Power On	See "Turning the Power On" on page 28.

Additional Service Information

"Performing a Shutdown"
"Turning the Power On"

Performing a Shutdown

> **Note**
>
> If the Expansion Unit loses power unexpectedly, it might be due to a hardware failure in the power system or mid-plane (see "Symptom-to-FRU Index" on page 31).

To perform a shutdown:

1. Make sure that all I/O activity has stopped. If applicable, logically disconnect from the host controller.
2. Make sure that all amber Fault LEDs are off. If any Fault LEDs are lit (drives, power supplies, or fans), correct the problem before you turn off the power.
3. Turn off *both* power supply switches on the back of the expansion unit.

Turning the Power On

Use this procedure to power-on the Netfinity EXP200 Storage Expansion unit.

Initial start-up:

1. Verify that all communication and power cables are plugged into the back of the expansion unit.
   a. All hard disk drives are locked securely in place.
   b. Option switchs 1 through 5 and the tray number switch on the expansion unit are set correctly.
   c. The host controller and other SCSI bus devices are ready for the initial power-up.
   d. Power-on the expansion unit before powering on the server.
2. Turn on the power to each device, based on this power-up sequence.
3. Turn on *both* power supply switches on the back of the expansion unit.
4. Only the green LEDs on the front and back should be on. If one or more of the amber Fault LEDs are on, refer to "Symptom-to-FRU Index" on page 31.

Re-starting:

If you are re-starting after a normal shutdown, wait at least ten seconds before you attempt to turn on *either* power supply switch.

Specifications

Size

    With front panel:
- Depth: 56.3 cm (22.2 in.)
- Height: 12.8 cm (5 in.)
- Width: 44.7 mm (17.6 in.)

Weight

    Typical expansion unit as shipped: 22.5 kg (49.5 lb)

Electrical Input

    Sign-wave input (50 to 60 Hz)
- Low range:
  Minimum: 90 V ac
  Maximum: 127 V ac
- High range:
  Minimum: 198 V ac
  Maximum: 257 V ac

    Input Kilovolt-amperes (kVA) approximately:
- Minimum configuration:
  0.06 kVA
- Maximum configuration:
  0.36 kVA

Environment

    Air Flow: Air flow is from front to back

    Air temperature:
- expansion unit on:
  10° to 35° C
  (50° to 95° F)
  Altitude: 0 to 914 m (3000 ft.)
- expansion unit on:
  10° to 32° C
  (50° to 90° F)
  Altitude: 914 m (3000 ft.) to 2133 m (7000 ft.)

    Humidity:
- 10% to 80%

Acoustical Noise Emissions Values

For open bay (0 Hard Disk Drives installed) and typical system configurations (8 hard Hard Disk Drives installed).

    Sound Power (idling):
- 6.3 bels (open bay)
- 6.5 bels (typical)

    Sound Power (operating):
- 6.3 bels (open bay)
- 6.6 bels (typical)

    Sound Pressure (idling):
- 47 dBA (open bay)
- 49 dBA (typical)

    Sound Pressure (operating):
- 47 dBA (open bay)
- 50 dBA (typical)

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.

Symptom-to-FRU Index

Use this chart to find solutions to problems that have
definite symptoms.

Problem Indicator	FRU/Action
Amber LED On (Front Panel)	1. **General Machine Fault** Check for amber LED on expansion unit
Amber LED On	1. **Hard Disk Drive**
Amber LED On	1. **Fan**
Amber LED On	1. **ESM board** 2. Check for fan fault LED 3. Unit is overheating. Check temperature.
Amber LED On, Green LED Off	1. **Turn Power Switch On** 2. Power cord 3. Reseat Power Supply 4. Power Supply
Amber and Green LEDs On	1. **Power Supply**
All Green LEDs Off	1. **Check AC voltage cabinet AC voltage line inputs.** 2. Power Supplies 3. Mid-plane board
Intermittent power loss to expansion unit	1. **Check AC voltage line inputs, and cabinet power components.** 2. Power Supplies 3. Mid-plane board
One or more Green LEDs Off	1. **Turn Power Switch On** 2. Power cord 3. Reseat Power Supply 4. Power Supply
One or more Green LEDs Off	1. **No activity to the drive** 2. This can be normal activity
One or more Green LEDs Off (All Hard Disk Drives or those on one Bus)	1. **Use SCSI RAID Manager to check drive status** 2. SCSI Cables 3. ESM Board 4. Mid-plane board

Problem Indicator	FRU/Action
Unable to access drives on one or both SCSI buses	1. **Check SCSI cables and connections** 2. Check the drive SCSI ID setting. 3. ESM board 4. Ensure that option switches 1 and 5 are set to the appropriate position (only change switch position when the expansion unit is powered off).
Intermittent Power Loss	1. **AC power or plug** 2. Power supply 3. Mid-plane
Random errors	1. **Mid-plane board**

Note

If you cannot find the problem using this Symptom-to-FRU Index, test the entire system. See the server documentation for more detailed information on testing and diagnostic tools.

Locations

ESM Board Controls and Indicators

> **Note**
>
> SCSI Bus Connectors are 68-pin VHDCI connectors
> used for attaching SCSI cables.

ESM Board LED Indications:

LED	Description
Term Power (green)	LED is On if Term Power is present, indicating that the other end of the cable is connected to a power-on controller.
LVD/SE (green)	LED is On if the host bus is in LVD mode (default is SE mode.)
Power (green)	LED is On when there is power to the ESM board.
Over Temp (amber)	This LED is On if the expansion unit overheats.
Active (green)	This LED flashes when there is activity on the external SCSI bus.

Expansion Unit Option Switches
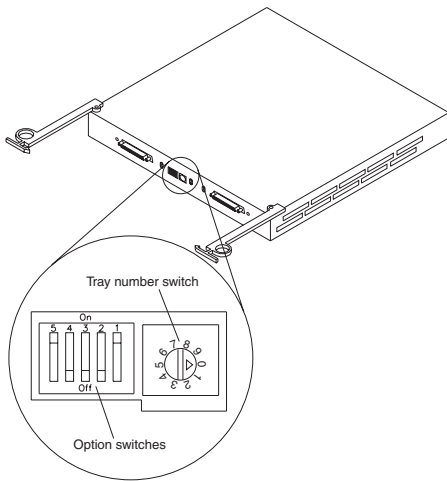
The expansion unit has two types of ID numbers:

Drive SCSI IDs   Identifies each drive in the expansion unit.

Tray ID   identifies each expansion unit

Switch settings are as follows:

Option Switches
  – Switch 1 off (default)
    - Bus 1 and 2 as Single Bus 1, accessing all ten drives, (IDs 0-4 and 8-12).
  – Switch 1 on
    - Bus 1 and Bus 2 accessing 5 drives each.
      Bus 1 accessing IDs 0-4
      Bus 2 accessing IDs 0-4
  – Switch 5 off (default)
    - Rack Mode
  – Switch 5 on
    - Tower Mode
      When Option Switch 5 is in the On position, two changes occur. First, the SCSI ID ordering is reversed, providing IDs in ascending order from top to bottom. Second, the general system error indicator on the front panel is swapped with the power-on LED, placing the green power-on LED above the general-system error indicator.
  – Switches 2 through 4 are reserved and must remain off.
Tray Number Switch
  – Identifies each expansion unit 0-9.

ESM Board Replacement

To remove the ESM board:

1. Shut down the expansion unit. For shutdown information, see "Performing a Shutdown" on page 28
2. Grasp each pull-ring and squeeze the latches to release.
3. Pull open both levers at the same time and remove ESM board.

> **Note**
>
> When inserting the ESM board:
>
> 1. Make sure both levers are straight out, as shown above.
> 2. Using your hand, gently push on the center of the ESM board to insert it into the controller.
> 3. When inserting the ESM board, make sure both levers swing inward at the same time.
> 4. Close and lock both levers at the same time.

Front Controls and Indicators

> **Note**
>
> Only the IBM ServRAID, ServRAID II, ServRAID-3H, and Fibre RAID controller provide support for the amber Fault LEDs.

Drive Numbering

There are *two SCSI channels* (1, 2) in the expansion unit. Each channel uses five SCSI ID numbers. Each disk drive within the expansion unit has a unique channel number and SCSI ID number, based on its physical location in the expansion unit.

When a drive is plugged into the midplane, its channel number and SCSI ID are set automatically. See the following illustration for bus and SCSI ID values when option switch 1 is set to the on state and switch 5 is off. Use the option switch on the ESM board to change the ID settings.

Expansion unit ID labels   Serial number label

The first number represents the channel number and the second is the SCSI ID. See the following illustration for bus and SCSI ID values when option switch 1 is set to the on state and switch 5 is on (for tower orientation). Use the option switch on the ESM board to change the ID settings.
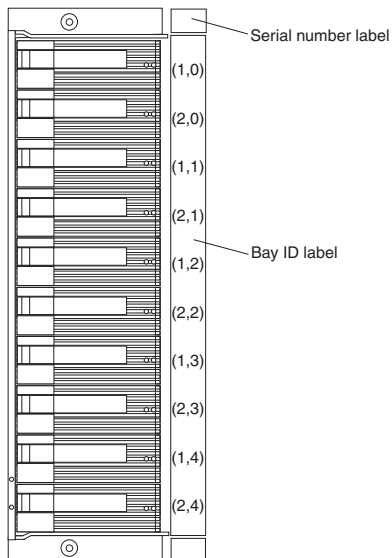
Serial number label

(1,0)
(2,0)
(1,1)
(2,1)
(1,2)   Bay ID label
(2,2)
(1,3)
(2,3)
(1,4)
(2,4)

The first number represents the channel number and the second is the SCSI ID.

Notes

For IBM ServeRAID, the view configuration screens show bay numbers, not SCSI IDs. To calculate the bay number, add 1 to the SCSI ID.

A label is provided on the front of the drive tray. Use this label to record the address location information for each drive before you remove it. If you install a drive in the wrong bay, data will be lost.

If you are replacing a drive that is part of a RAID level 1 or RAID level 5 logical drive, ensure that you install the replacement drive in the correct bay. Failure to replace the drives in their correct bays can result in loss of data.

If the two channels are daisy chained using option switch 1
in the off position and switch 5 is off, then the SCSI IDs
are as shown and the drives are all on the same channel.
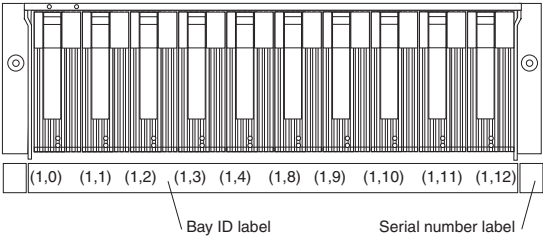
(1,0)　(1,1)　(1,2)　(1,3)　(1,4)　(1,8)　(1,9)　(1,10)　(1,11)　(1,12)

Bay ID label　　　　　　　Serial number label

If the two channels are daisy chained using option switch 1 in the off position and switch 5 is on (for tower orientation), then the SCSI IDs are as shown and the drives are all on the same channel.

Serial number label

(1,0)

(1,1)

(1,2)

(1,3)

Bay ID label

(1,4)

(1,8)

(1,9)

(1,10)

(1,11)

(1,12)
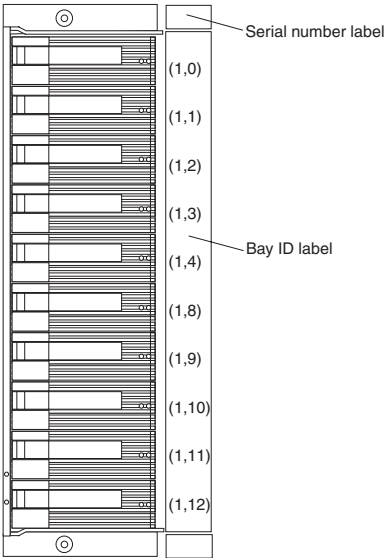
Replacing Drives (Hot-Swap)
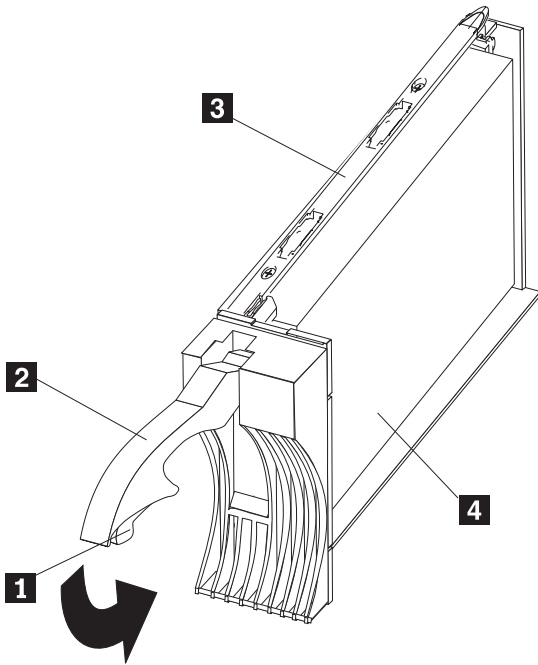
To remove the hot-swap drives:

1. Press on the inside of the bottom of the tray handle to release the blue latch 1 .
2. Pull the handle 2 on the tray 3 out into the open position.
3. Lift the drive CRU partially out of the bay.

> **Note**
>
> Wait at least 20 seconds before fully removing the drive from the expansion unit to allow for spin down. Allowing for spin down avoids possible damage to the drive.
>
> See "Drive Numbering" on page 37 when replacing drives.

4. If you are replacing a slim-high drive, ensure that the filler piece remains in place for use with the new drive.
5. Install the new drive, Making sure at least ten seconds have passed before you install the new drive tray. Gently push the drive into the empty bay until the tray handle 2 touches the expansion unit bezel.
6. Push the tray handle 2 down into the closed (latched) position.
7. Check the LEDs.
   a. When drives are ready for use, the green Activity LED and the amber Fault LED should be off.

b. If the Fault light is solid amber, pull up on the drive latch and lift the drive lever to pull the drive partially out of the bay. Wait at least 20 seconds before fully removing the drive from the expansion unit to allow for spin down. If the SCSI adapter is the IBM ServeRAID II; go to the ServeRAID User's Guide for additional information and procedures on changing the state of the drive from the current Default state to any other state (for example, HSP, RDY, rebuild drive to ONL, and so on). The amber LED should go off within 10 seconds of the drive state change (to something other than DDD).

If the SCSI adapter is the IBM ServeRAID II, in some cases, the drive will automatically reset to either a hotspare (HSP) or be rebuilt (ONL). See the ServeRAID II User's Guide for additional information. If the state change in the ServeRAID II configuration does not change automatically (amber LED does not go off), then refer to the ServeRAID II User's Guide for directions on how to perform a manual drive state change. The amber LED should go off within 10 seconds of a drive state change (to something other than DDD).

If the state change in the RAID configuration does not change automatically, refer to the *RAID Controller User's Guide* for directions on how to perform a drive state change.

LED drive status:

The following table shows the LED status on the drives:

LED	Description
Activity (green/flashing)	Indicates read/write or inquiry operation
Fault (amber/flashing)	Indicates drive rebuild or that drive has been identified by software
Fault (amber)	Indicates a drive failure
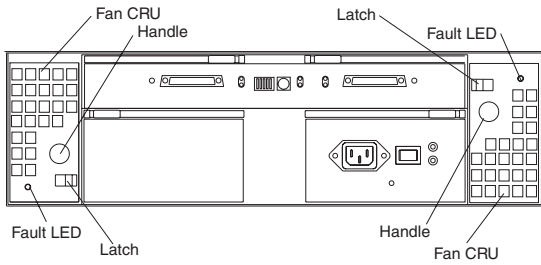
Fan Controls and Indicators

Fan LED Indications

LED	Description
Fault LEDs (amber)	LEDs are On when a fan fails.

Replacing Fans (Hot-Swap)
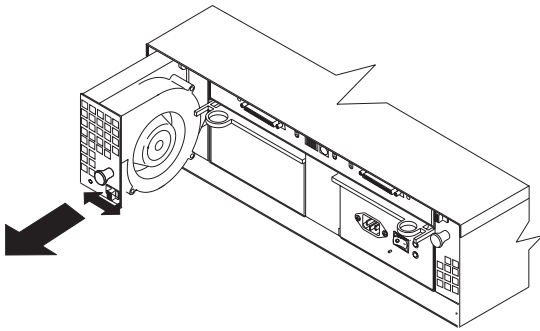
To Remove Cooling Fans:

1. Check the LEDs on the back of the expansion unit.
2. Slide the latch left or right to unlock the fan.
3. Use the handle (black knob) to pull the fan from the expansion unit.
4. Install the new fan by inserting it into the expansion slot and making sure it is seated into the mid plane connector, rotate the fan 180° if it does not go into the slot. Slide the latch into the middle position.
5. Check the LEDs. If the fault LEDs do not turn off after a few seconds, refer to "Symptom-to-FRU Index" on page 31.

> **Note**
>
> The Fan units are hot swap redundant; however, when one fan fails, the failing fan unit needs to be replaced within 48 hours in order to maintain redundancy and optimum cooling. When replacing the failed fan unit, insure that this replacement is performed in less than 10 minutes to prevent any overheating. If it takes longer than 10 minutes to replace the fan unit, you must shut down the expansion unit to keep the unit from overheating.
>
> For information on expansion unit shutdown, see "Performing a Shutdown" on page 28.

Power Supply Controls and Indicators

Power Supply LED Indications

LED	Description
Power (green)	LEDs are On when power switches are turned on.
Fault (amber)	If only the amber LED is on, then the power supply is turned off.
Power (green) and Fault (amber)	Both the green and amber LEDs on indicates a power supply failure.

Replacing Power Supplies (Hot Swap)
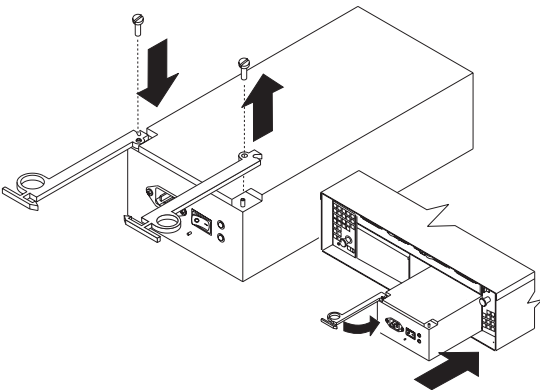
Attention:

The base unit with one power supply is *not* redundant. You must install the redundant power supply option to make your unit redundant. If you unplug the standard power supply from the basic configuration without having the redundant power option installed, you will lose power

to the expansion unit and you might lose data. **To remove a power supply:**

1. Turn the switch on the power supply to the Off position.
2. Unplug the supply power cord from the electrical outlet.
3. Disconnect the power cord from the power supply.
4. Grasp each pull-ring and squeeze the latches to release.
5. Pull open lever and remove power supply.

Note

When installing a new power supply, make sure that the latch is mounted to the side of the supply that is toward the middle of the machine. If not, remove the lever screw, flip the lever over and replace the screw. See the illustration above.

Preparing the expansion unit

This section explains how to prepare the expansion unit for installation by removing the CRUs (customer replaceable units) and by setting the interface options.

Removing CRUs

It is easier to lift the expansion unit and install it in a rack or tower enclosure if you remove all CRUs (drives, fans, and power supplies) first. A fully loaded expansion unit with 10 disk drives, two fan units, and the second power supply installed weighs 36.1 kg (79.5 lbs). The standard unit shipped with one power supply and two fan units weighs 22.5 kg (49.5 lbs). If you remove all the CRUs, you can reduce the overall weight.

Attention:
If you have data stored on the drives, label the drives before you remove them. Then when you replace the drives, install them in the exact drive bays from which you removed them.

Attention:
The expansion unit is shipped with the decorative bezel attached to the front of the unit with two white screws and nuts. This bezel protects the light pipes located above the drive trays. Leave the decorative bezel in place until you are instructed to remove it during the installation process.

Setting the interface options

There are five option switches and a tray number switch located on the back of the expansion unit. It is easier to set these switches before you install the expansion unit in a rack or tower enclosure.

Attention:
Option switch settings must always be done while the expansion unit and host server are powered off. Failure to do so will result in loss of data.

Option Switch 1 controls the SCSI bus and ID settings, and Option Switch 5 controls the rack and tower installation modes. Option Switches 2 through 4 are Reserved; leave these switches in the Off position.

The tray number switch has ten settings. You can use these settings (0–9) to identify the tray number for the expansion unit. System-management software, such as IBM Netfinity Manager, uses this tray number when it provides data and alerts for the expansion unit.
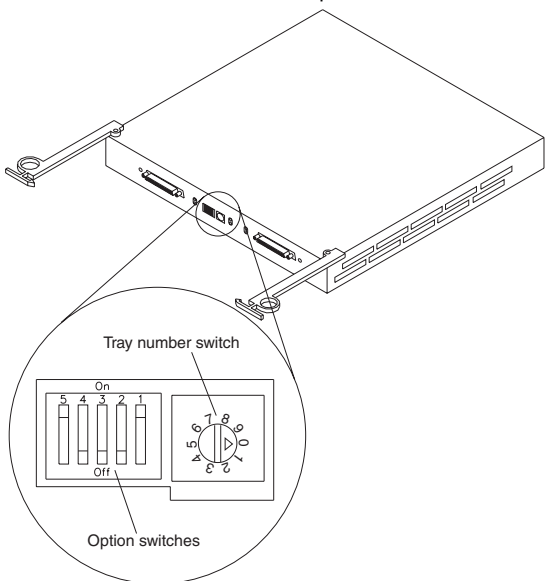
SCSI bus and ID settings: When you install a drive CRU in the expansion unit, the drive tray plugs into a printed circuit board called the *midplane*. The midplane sets the SCSI bus number and ID automatically, based on the setting of Option Switch 1 and the physical location (bay) of the drive CRU.

Your expansion unit supports up to two external SCSI buses and up to two internal SCSI buses. Each internal SCSI bus uses five SCSI IDs. When you install the expansion unit, you can set Option Switch 1 on the ESM board to create two separate five drive SCSI buses, or you can leave it set as one, daisy-chained ten drive SCSI bus.

Option Switch 1 set to Off:
With this default setting, all 10 disk drive bays are on a single SCSI bus. The midplane will assign the SCSI IDs for the drive bays in ascending order from left to right (rack mode) or from top to bottom (tower mode) as follows:

`, 1, 2, 3, 4, 8, 9, 1 , 11, 12.` The system-management SCSI accessed fault tolerant enclosure (SAF-TE) processor uses SCSI ID 15. When Option Switch 1 is set to the Off position, you can use either external cable connector.

Option Switch 1 set to On:
When Option Switch 1 is set to the On position, two independent internal five drive SCSI buses are created. External SCSI Bus 1 maps to internal SCSI Bus 1 and external SCSI Bus 2 maps to internal SCSI Bus 2. The midplane assigns the five internal Bus-1 bays SCSI IDs `, 1, 2, 3, and 4`; and the five internal Bus-2 bays SCSI IDs `, 1, 2, 3, and 4`. On each SCSI bus, the system-management processor uses SCSI ID 15.

┌─ **Important information:** ──────────────┐

If you are using a ServeRAID software version earlier than Version 3.50, the View Configuration screens might show SCSI IDs or bay numbers. If the data shown on the View Configuration screen begins with '0', it denotes SCSI IDs. If the data shown on the View Configuration screen begins with '1', it denotes bay numbers.

└──┘

Rack and tower mode settings: Option Switch 5 on the ESM board is the rack and tower mode switch. Switch 5 must be in the Off position when the unit is placed in a rack and in the On position if the unit is placed in a tower. When shipped, Option Switch 5 is set to the rack (Off) position.

When Option Switch 5 is in the On position, two changes to your expansion unit will occur. First, the SCSI ID

ordering will be reversed. This SCSI ID reversal provides SCSI IDs in ascending order from top to bottom, when the expansion unit is installed in a tower. Second, the general system error indicator on the front panel will be swapped with the power-on LED, placing the green power-on LED above the general-system error indicator.

Tray number settings: Use the tray number switch on the ESM board to set a tray identification number for the expansion unit. You can set a number from 0–9. System-management software, such as IBM Netfinity Manager, uses this identification number when it provides data and alerts for the expansion unit.

Installing the expansion unit in a rack

The EXP200 expansion unit requires 3U of EIA rack mounting space. Before installing the expansion unit in your rack you must:

Plan device installation starting from the bottom of the rack

Refer to the rack documentation for safety and cabling considerations. Ensure that your planned installation is within the rack enclosure guidelines for heat generation, electrical requirements, air flow, and mechanical loading.

Note: Because of the limited space in some racks, it might be easier to connect and route cables before you install the mounting brackets and hardware devices.

Position the unit in the rack to allow for proper air circulation around and through the expansion unit

Turn off power to your rack

Refer to the rack documentation for instructions on removing its doors and side panels

Use the rack mounting template that comes with the expansion unit to locate the rack mounting holes and install the unit into a rack cabinet. If you misplace the template, you can use the following steps to install your expansion unit:

1. Use the following illustration of front and rear rack
   mounting flanges to determine the appropriate rack
   mounting holes for installing cage nuts or clip nuts to
   secure your EXP200 rails.
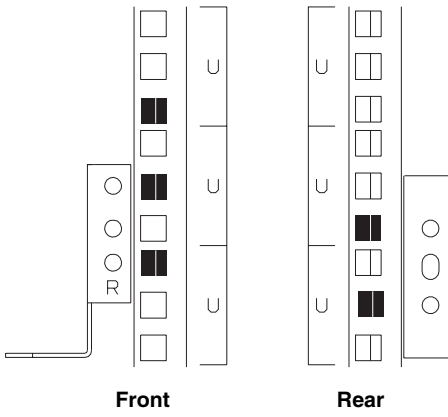
Front   **Rear**

Note: Use clip nuts if your rack has round holes. If your rack has square holes, you can use the rack insertion tool or a flat-blade screwdriver to install cage nuts.

Cage nut

Clip nut

2. On the rail marked "L", remove and save the small screw 1 ; then, loosen the four large screws 2 .
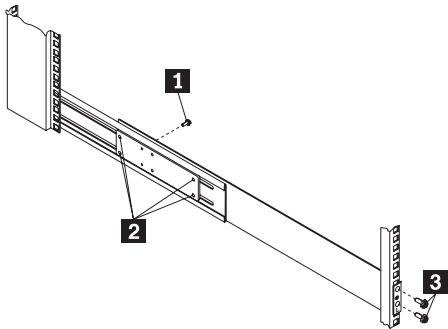
3. Hold the rail against the outside of the left rack mounting flange and loosely insert the front black hex screws 3 .

4. Extend the rail outside of the rear rack mounting flange; then, install and tighten both rear black hex screws 1 .
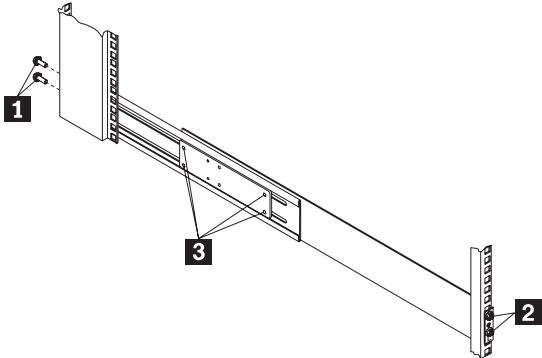
5. Tighten the two front screws 2 ; then, tighten the
four large screws 3 .

Repeat step 2 on page 52 through step 5 to install
the rail marked "R" on the right side of the rack.

6. Slide the expansion unit into the rack; then, remove
and discard both white screws and wingnuts 1   from
the bezel.
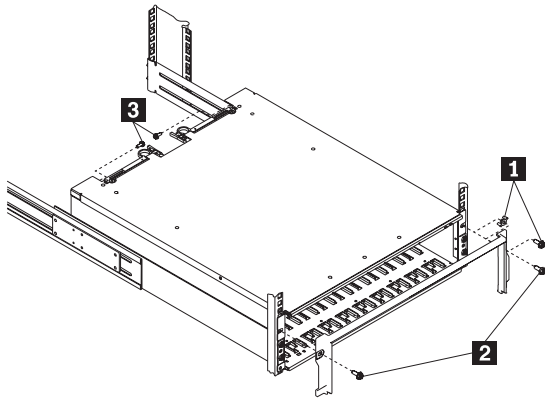
7. Align the bezel locator pins with the expansion unit;
then, secure the bezel and EXP200 with two black
hex screws 2 .

8. Use the two small screws 3   (removed in step 2 on
page 52) to secure the rear of the expansion unit.

9. Verify that Option Switch 5 is set to Off (see "Setting
the interface options" on page 48 for further device
settings).

10. Install hard drives, fans, and power supplies in the
EXP200 expansion unit

Installing the expansion unit in a tower conversion kit

The EXP200 Rack-to-Tower Conversion Kit provides an enclosure for a single EXP200 expansion unit. Use the mounting hardware that comes with the EXP200 expansion unit to install the unit in the enclosure as follows:
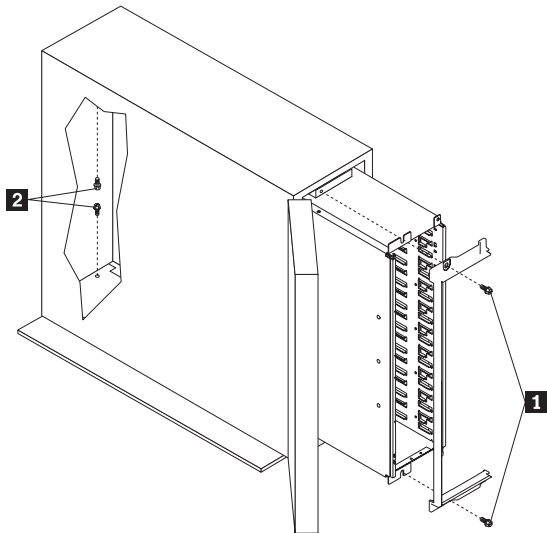
1. Unlock and open the enclosure door.

2. Turn the EXP200 expansion unit counter-clockwise onto its left side and slide it into the enclosure; then, remove the white screws and wingnuts from the EXP200 bezel.

3. Align the bezel locator pins with the expansion unit; then, secure the bezel and EXP200 with black hex screws 1 on the top and bottom.

4. Remove the two small screws from the rails that come with the EXP200 expansion unit; then, secure the rear of the expansion unit with the small screws 2 on the top and bottom.

5. Verify that Option Switch 5 is set to On (see "Setting the interface options" on page 48 for further device settings).

6. Install hard drives, fans, and power supplies in the EXP200 expansion unit.

Installing the expansion unit in a NetBAY enclosure

NetBAY enclosures are stackable and each can store a different device, such as the EXP200 expansion unit. You can also attach a server on top of the enclosure. Refer to the NetBAY documentation for details on installing other devices.

Note: Due to the depth of the NetBAY3E enclosure, it might be difficult to set the expansion unit option switches once installed. Verify that Option Switch 5 is set to Off and Option Switch 1 and the tray ID switch are set properly for your environment (see "Setting the interface options" on page 48 for further device setting s).
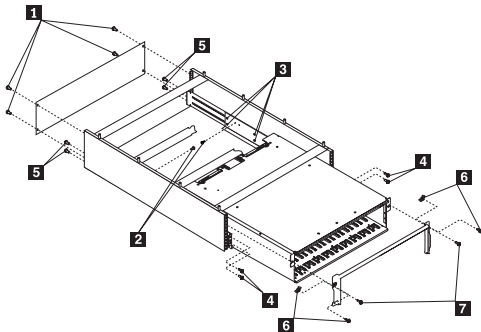
To install the expansion unit in the enclosure, use the following procedure:

1. Remove the rear of the enclosure   1 .

2. Use the following illustration to determine the appropriate enclosure mounting holes for installing cage nuts to secure your device and rails.

Front   Rear
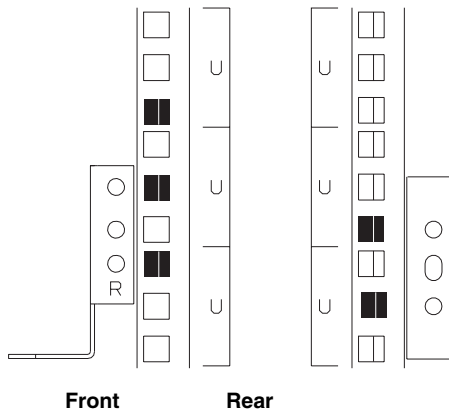
3. On the rail marked "L", remove and save the small screw   2 ; then, loosen the four large screws   3 .

4. Hold the rail against the outside of the left enclosure mounting flange and loosely insert the front black hex screws 4 .

5. Extend the rail outside of the rear enclosure mounting flange; then, install and tighten both rear black hex screws 5 .

6. Tighten the two front screws 4 ; then, tighten the four large screws 3 .

   Repeat step 3 on page 55 through step 6 to install the rail marked "R" on the right side of the enclosure.

7. Slide the expansion unit into the enclosure; then, remove and discard both white screws and wingnuts 6 from the bezel.

8. Align the bezel locator pins with the expansion unit; then, secure the bezel and EXP200 with two black hex screws 7 .

9. Use the two small screws 2 (removed in step 3 on page 55) to secure the rear of the expansion unit.

10. Install hard drives, fans, and power supplies in the EXP200 expansion unit.

Parts Listing
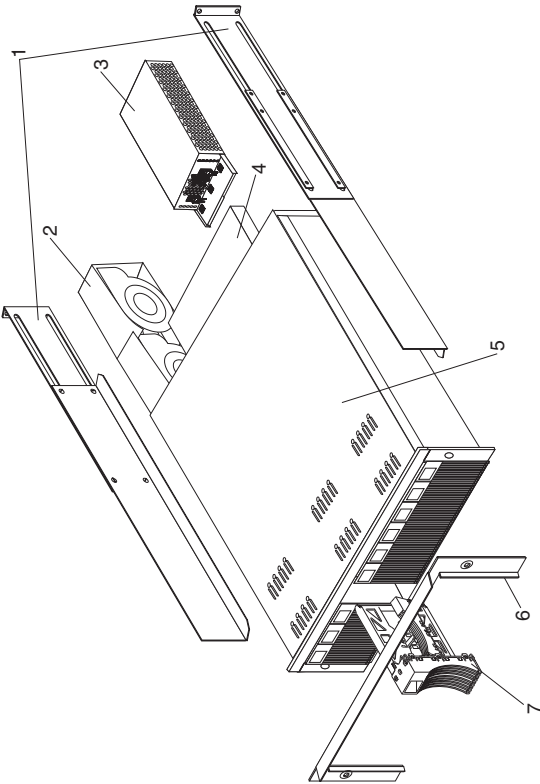
System

Index	System (IBM Netfinity EXP200, Type 3530) Model 1RU, 1RX	FRU No.
1	Rail Kit Left/Right	37L0067
2	Blower Assembly	37L0057
3	350W Power Supply Assembly	37L0059
	Power Supply Blank	09N7264
4	Electronic Module (ESM, LVD/LVD)	37L0063
5	Midplane/Frame	37L0061

> **Note:** The midplane board and frame are replaced as a unit. If either part is needed, order the above FRU.

Index		FRU No.
6	Decorative Bezel, EXP200	37L0065
7	Blank Tray Assembly	37L6708
	Tower Enclosure	37L0120
	Tower Lock/Pawl	37L0121
	Tower Feet	09N7266
	Misc Hardware Kit	37L0068

     ESM Lever Screws (2 each)
     Power Supply Lever Screw
     Power Cord Retainer
     Power Cord Retainer Knurled Nut
     EMC Clips (6 each)
     Label - Box ID
     Labels - Rack SCSI ID
     Labels - Tower SCSI ID
     ESM Latch Left
     ESM Latch Right
     Power Supply Latch
     Light Pipes (2 each)
     6-32X1/2-Inch Flat Head Screw
     M6 Rail Screws (2 each)
     ESM Cam Channel (2 each)
     M6 Nut Clips (2 each)
     M6 "C" Clips (2 each)
     M5X8L Flat Head Screw (2 each)

	FRU No.
LVD SCSI Cable, 2 Meter external	03K9196
LVD SCSI Cable, 4 Meter external	03K9198
LVD SCSI Cable, 12 Meter external	03K9200
LVD SCSI Cable, 20 Meter external	37L0053
Line Cord, 9 Foot	6952300
Line Cord Jumper, High Voltage	36L8886

Power Cords

Power Cords	FRU No.
Arabic	14F0033
Argentina	13F9940
Australia	13F9940
Belgium	13F9979
Bulgaria	13F9979
Canada	6952300
Czech Republic	13F9979
Denmark	13F9997
Finland	13F9979
France	13F9979
Germany	13F9979
Hungary	13F9979
Israel	14F0087
Italy	14F0069
Latvia	13F9979
Netherlands	13F9979
Norway	13F9979
Poland	13F9979
Portugal	13F9979
Serbia	13F9979
Slovakia	13F9979
South Africa	14F0015
Spain	13F9979
Switzerland	13F9979
Switzerland (French/German)	14F0051
Thailand	1838574
U.S. English	6952300
U.K./Ireland	14F0033
Yugoslavia	13F9979

Netfinity FAStT EXP500 - Type 3560

Features

The following table summarizes the features of the
EXP500 - Type 3560. For a list of the operating
specifications, such as weight, height, and heat output, see
"Specifications" on page 70.

General

> Modular components:
> – High-capacity disk drives
> – Environmental services monitor (ESM) boards
> – Power supplies
> – Cooling fans
>
> Technology:
> – Supports disk arrays
> – Supports clustering
> – Fibre Channel host interface
> – Redundant data storage, cooling system, power system,
>   and ESM boards
> – Hot-swap technology for drives, power supplies, fans,
>   and ESM boards
>
> User interface:
> – Built-in power, activity, and fault indicators
> – Identification labeling on customer replaceable units
>   (CRUs), rear indicator lights, switches, and connectors
> – Easy-to-replace drives, power supplies, ESM boards, and
>   fans

Disk drive storage

> Maximum drives per expansion unit: 10

ESM boards

> Technology and interfaces:
> – Fibre Channel: 40-pin FC disk drives
> – Fibre Channel interface: Four, GBICs connectors for
>   incoming and outgoing FC cables (two GBICs on each
>   ESM board)

Diagnostics and Test Information

Important

The service procedures are designed to help you isolate problems. They are written with the assumption that you have model-specific training on all computers, or that you are familiar with the computers, functions, terminology, and service-related information provided in this manual and the appropriate IBM PC/Netfinity Server Hardware Maintenance Manual.

The following is a list of problems and references for diagnosing the IBM Netfinity FAStT EXP500 - Type 3530.

Problem	Reference
Hard Disk Drive Numbering	See "Fibre Channel (FC) loop and ID settings" on page 76.
Error Codes/Error Messages	Refer to the Symptom-to-FRU Index for the server that the Storage Expansion Unit you are servicing is connected to.
Expansion Unit Options Switches	See "Setting the interface options" on page 76.
Front Controls and Indications	See "Front controls and indicators" on page 102.
Rear Controls and Indications	See "Rear controls, indicators, and connectors" on page 103.

Additional Service Information

"Turning the expansion unit on and off."
"Performing an emergency shutdown" on page 67.
"Restoring power after an emergency" on page 68.
"Clustering support" on page 69.
"Getting help on the World Wide Web" on page 69.
"Specifications" on page 70.

Turning the expansion unit on and off

This section contains instructions for turning the expansion unit on and off under normal and emergency circumstances.

If you are turning on the expansion unit after an emergency shutdown or power outage, refer to "Restoring power after an emergency" on page 68.

Turning on the expansion unit: Use this procedure to turn on the power for the initial startup of the expansion unit.

1. Verify that:
   a. All communication and power cables are plugged into the back of the expansion unit and an ac power outlet.
   b. All hard disk drives are locked securely in place.
   c. The tray number switches on the expansion unit are set correctly. (See "Setting the interface options" on page 76 for more information.)
2. Check the system documentation for all the hardware devices you intend to turn on and determine the proper startup sequence.

   > **Note**
   >
   > Be sure to turn on the IBM Netfinity EXP500 before or at the same time as the server.

3. Turn on the power to each device, based on the startup sequence.

   Attention:
   If you are restarting the system after a normal shutdown, wait at least 10 seconds before you turn on the power supply switches.

4. Turn on both power supply switches on the back of the unit.

   The expansion unit might take a few seconds to power up. During this time, you might see the amber and green LEDs on the expansion unit turn on and off intermittently. When the startup sequence is complete, only the green LEDs on the front and back and the amber Bypass LEDs for unconnected GBIC

ports should remain on. If other amber LEDs remain lit, refer to "Symptom-to-FRU Index" on page 71.

Turning off the expansion unit: Attention:

Except in an emergency, never turn off the power if any Fault LEDs are lit on the expansion unit. Correct the fault before you turn off the power, using the proper troubleshooting or servicing procedure. This will ensure that the expansion unit will power up correctly later. For guidance, refer to "Symptom-to-FRU Index" on page 71.

The expansion unit is designed to run continuously, 24 hours a day. Once you turn on the expansion unit, 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 67).

> **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.
>
>
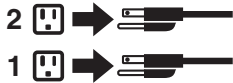
Use this procedure to turn off the power.

1. Check the system documentation for all hardware devices you intend to turn off and determine the proper power-down sequence.
2. Make sure that all I/O activity has stopped.
3. Make sure that all amber Fault LEDs are off. If any Fault LEDs are lit (drives, power supplies, or fans), correct the problem before you turn off the power. For guidance, refer to "Symptom-to-FRU Index" on page 71.
4. Turn off both power supply switches on the back on the expansion unit.

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 expansion unit loses power unexpectedly, it might be due to a hardware failure in the power system or midplane (see "Symptom-to-FRU Index" on page 71).

Use this procedure to shut down during an emergency.

1. If you have time, stop all activity and check the LEDs (front and back). Make note of any Fault LEDs that are lit so you can correct the problem when you turn on the power again.
2. Turn off all power supply switches; then, unplug the power cords from the expansion unit.

Restoring power after an emergency

Use this procedure to restart the expansion unit if you turned off the power supply switches during an emergency shut down, or if a power failure or a power outage occurred.

1. After the emergency situation is over or power is restored, check the expansion unit 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 switches are in the off position; then, plug in the expansion unit power cords.
3. Check the system documentation for the hardware devices you intend to power up and determine the proper startup sequence.

   > **Note**
   >
   > Be sure to turn on the IBM Netfinity EXP500 prior to or at the same time as the server.

4. Turn on the power to each device, based on the startup sequence.
5. Turn on both power supply switches on the back of the IBM Netfinity EXP500.
6. Only the green LEDs on the front and back and the amber Bypass LEDs for unconnected GBIC ports should remain on. If other amber Fault LEDs are on, refer to "Symptom-to-FRU Index" on page 71 for instructions.
7. Use your installed software application as appropriate to check the status of the expansion unit.

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 after clustering has been set up, another server will take ownership of the array group.

Clustering requires additional hardware and specialized software. For more information about clustering, visit the following IBM Web site:

```
http://www.ibm.com/pc/us/netfinity/clustering
```

Getting help on the World Wide Web

You can obtain up-to-date information about your IBM Netfinity EXP500, a complete listing of the options that are supported on your model, and information about other IBM server products by accessing the IBM Web page at the following address:

```
http://www.ibm.com/pc/us/netfinity
```

Specifications

The following table summarizes the operating specifications of the EXP500.

Size (with front panel and without mounting rails)

>   Depth: 56.3 cm (22.2 in)
>   Height: 12.8 cm (5 in)
>   Width: 44.7 cm (17.6 in)

Weight

>   Standard expansion unit as shipped: 25 kg (54.5 lbs)
>   Typical expansion unit fully loaded: 35.5 kg (78 lbs)

Electrical input

>   Sine-wave input (50 to 60 Hz) is required
>   Input Voltage:
>   – Low range:
>   - Minimum: 90 V ac
>   - Maximum: 127 V ac
>   – High range:
>   - Minimum: 198 V ac
>   - Maximum: 257 V ac
>   – Input kilovolt-amperes (kVA) approximately:
>   - Minimum configuration: 0.06 kVA
>   - Maximum configuration: 0.36 kVA

Environment

>   Air temperature:
>   – expansion unit on:
>   10° to 35° C
>   (50° to 95° F)
>   Altitude: 0 to 914 m (3000 ft.)
>   – expansion unit on:
>   10° to 32° C
>   (50° to 90° F)
>   Altitude: 914 m (3000 ft.) to 2133 m (7000 ft.)
>   Humidity:
>   – 8% to 80%
>
>   **Acoustical noise emissions values**
>   For open bay (0 drives installed) and typical system configurations (8 hard drives installed).
>   – Sound Power (idling):
>   - 6.3 bels (open bay)
>   - 6.5 bels (typical)
>   – Sound Power (operating):
>   - 6.3 bels (open bay)
>   - 6.6 bels (typical)
>   – Sound Pressure (idling):
>   - 47 dBA (open bay)
>   - 49 dBA (typical)
>   – Sound Pressure (operating):
>   - 47 dBA (open bay)
>   - 50 dBA (typical)
>   These levels are measured in controlled acoustical environments according 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.

Symptom-to-FRU Index

Use this chart to find solutions to problems that have definite symptoms.

Problem Indicator	FRU/Action
Amber LED On (Front Panel)	1. **General Machine Fault** Check for amber LED on expansion unit. Use the RAID manager software to check the status.
Amber LED On (Hard Disk Drive)	1. **Hard Disk Drive**
Amber LED On (Fan)	1. **Fan**
Amber LED On	1. **ESM board**
Amber LED On, Green LED Off (Power Supply)	1. **Turn Power Switch On** 2. Power cord 3. Reseat Power Supply 4. Power Supply
Amber and Green LEDs On (Power Supply)	1. **Power Supply**
All Green LEDs Off	1. **Check AC voltage cabinet AC voltage line inputs.** 2. Power Supplies 3. Mid-plane board
Intermittent power loss to expansion unit	1. **Check AC voltage line inputs, and cabinet power components.** 2. Power Supplies 3. Mid-plane board
One or more Green LEDs Off (Power Supply)	1. **Turn Power Switch On** 2. Power cord 3. Reseat Power Supply 4. Power Supply
One or more Green LEDs On (Drives)	1. **No activity to the drive** 2. This can be normal activity
Intermittent Power Loss	1. **AC power or plug** 2. Power supply 3. Mid-plane
Random errors	1. **Mid-plane board**
One or more Green LEDs blinking slowly. (All hard disk drives.)	1. **Chech cabling scheme** 2. FC Cable 3. GBIC

Problem Indicator	FRU/Action
Hard disk drive not visible in RAID management software.	1. **Hard Disk Drive** 2. Midplane Board
Amber temperatire LED onble in RAID management software. (ESM Board)	1. **Check for fan fault LED** 2. Unit is overheating. check temperature. 3. ESM Board
Amber conflict LED on. (ESM Board)	1. **Tray numbers of ESM boards within a single Netfinity FAStT EXP500 do not match.**

GBIC bypass LED.
 	
Note: It is normal for the LED to be on when no GBIC or cable is installed.
	1. **Check ESM fault LED.**
	2. GBIC does not detect an incoming signal.
	  a. FC Cable
	  b. GBIC or other end on the FC cable.
	  c. GBIC adjacent to amber LEDC cable.

Note

If you cannot find the problem using this Symptom-to-FRU Index, test the entire system. See the server documentation for more detailed information on testing and diagnostic tools.

Locations

The following information supports the EXP500.

Installing the expansion unit

Use the followign information to install the expansion unit in an EIA standard rack cabinet.

Getting started: Before you begin, review the following tasks and assumptions:

> If you are installing the expansion unit in a rack, you have already installed the other components in the rack and moved the rack to its permanent operating location.
> You have already installed the controllers and appropriate host adapters.
> There are optical Fibre Channel (FC) cables attached to the controllers or other previously installed Netfinity Fibre Array Storage Technology (FAStT) EXP500 expansion units, ready for final connection to the expansion unit.
> The installation site meets all area, environmental, power, and site requirements for the expansion unit. Refer to the expansion unit requirements listed under "Specifications" on page 70.

Preparing the expansion unit: The following information explains how to prepare the expansion unit for installation by removing the CRUs (customer replaceable units) and by setting the interface options.

Removing CRUs: It is easier to lift the expansion unit and install it in a rack if you remove all CRUs (drives, fans, power supplies, and ESM cards) first. A fully loaded expansion unit with 10 disk drives, two fan units, two ESM boards, and the two power supplies installed weighs 35.5 kg (78 lbs). If you remove all the CRUs, you can reduce the overall weight.

```
┌─ Attention ──────────────────────────────┐
│                                          │
│  If you have data stored on the drives,  │
│  label the drives before you remove      │
│  them. Then when you replace the         │
│  drives, install them in the same drive  │
│  bays from which you removed them.       │
│  Otherwise, you you might lose data.     │
│                                          │
└──────────────────────────────────────────┘
```

See "Installing and replacing devices" on page 83 for the information needed to remove the CRUs.

36.1 kg (79.5 lbs)

```
┌─ Caution ────────────────────────────────┐
│  Use safe practices when lifting.        │
└──────────────────────────────────────────┘
```

```
┌─ Attention ──────────────────────────────┐
│  The expansion unit is shipped with the  │
│  decorative bezel attached to the front  │
│  of the unit with two white screws and   │
│  nuts. This bezel protects the light     │
│  pipes located above the drive trays.    │
│  Leave the decorative bezel in place     │
│  until you are instructed to remove it   │
│  during the installation process.        │
└──────────────────────────────────────────┘
```

Setting the interface options: There are two rotary
tray number switches on each ESM board located on the
back of the expansion unit. It is easier to set these
switches before you install the expansion unit in a rack.

The switch on the left of the ESM board is for the
extended ID, which is the tens position (x10). The switch
on the right is for the base ID, which is the ones position
(x1). The tray number switches have 10 settings. Use
these settings (0–9) to identify the ID of the expansion unit.

Tray number switches

x10   x1
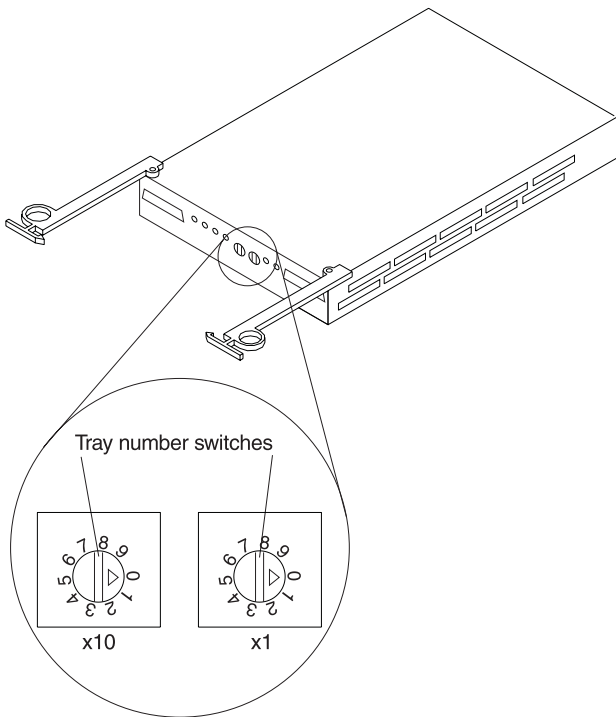
Fibre Channel (FC) loop and ID settings: When
you install a drive CRU in the expansion unit, the drive tray
plugs into a printed circuit board called the *midplane*. The
midplane sets the fibre channel loop ID automatically,
based on the setting of the tray number switch and the
physical location (bay) of the drive CRU.

Tray number settings: Each ESM board has two tray
number switches. These rotary switches (values 0–9) set
various addresses and IDs. The base ID switch (x1) is for
the ones position and the extended ID switch (x10) is for
the tens position. The settings of the two switches, when
used together, provide a two-digit ID of the expansion unit.
The system management software uses this ID to provide
correlation between the system management graphics and

the physical expansion unit; the ID identifies which physical unit corresponds to the system management status.

You can set the expansion unit ID to any value from 00–99. Each expansion unit attached to a Fibre Channel controller must have a unique ID.

The base ID switch (x1) also sets the physical IDs of the drives within the expansion unit. Some controllers might require all drives on the FC loop to have a unique, hard-assigned address. Refer to your controller documentation to determine if unique, hard-assigned addresses are required.

For each expansion unit ID, set the tray number for both ESM boards to the same value. Set the tray number for each pair of ESM boards to a unique value. The value must be different from all other pairs of ESM boards attached to the controller.

Attention

Each expansion unit tray number on both ESM boards must match exactly. Otherwise, the expansion unit might not function properly in the event of an ESM board failure.

Installing the expansion unit in a rack: The EXP200 expansion unit requires 3U of EIA rack mounting space. Before installing the expansion unit in a rack, it is important that you do the following:

Review the rack documentation for safety and cabling considerations. Ensure that your planned installation is within the rack-enclosure guidelines for heat generation, electrical requirements, air flow, and mechanical loading.

Note

Because of the limited space in some racks, it might be easier to connect and route cables before you install the mounting brackets and hardware devices.

Install the expansion unit in a maximum 35 degree C environment.

To ensure proper air flow, position the unit in the rack so that the air vents are not blocked. Usually 15 cm (6 inches) of air space is sufficient.

To ensure the rack stability, load the rack starting from the bottom.

If you install multiple components in the rack, do not overload the power outlets.

Connect the expansion unit to a properly grounded outlet.

Before installing the expansion unit in your rack, you must:

Plan device installation starting from the bottom of the rack.

Refer to the rack documentation for safety and cabling considerations. Ensure that your planned installation is within the rack-enclosure guidelines for heat generation, electrical requirements, air flow, and mechanical loading.

> **Note**
>
> Because of the limited space in some racks, it might be easier to connect and route cables before you install the mounting brackets and hardware devices.

Position the unit in the rack to allow for proper air circulation around and through the expansion unit.

Turn off power to your rack.

Refer to the rack documentation for instructions on removing its doors and side panels.

Use the rack-mounting template that comes with the expansion unit to locate the rack mounting holes and install the unit into a rack cabinet. If you misplace the template, you can use the following steps to install your expansion unit:

1. Use the following illustration of front and rear rack mounting flanges to determine the appropriate rack mounting holes for installing cage nuts or clip nuts to secure your Netfinity FAStT EXP500 rails.
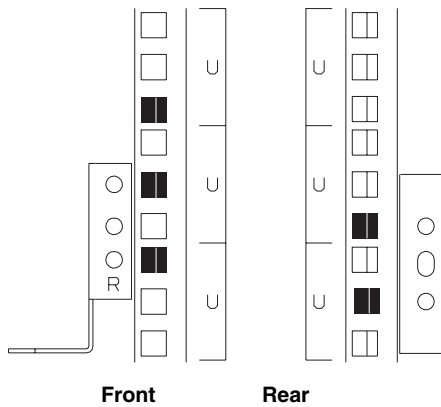
Front   Rear

Note

Use clip nuts if your rack has round holes. If your rack has square holes, you can use the rack insertion tool or a flat-blade screwdriver to install cage nuts.

Cage nut   Clip nut

2. On the rail marked L, remove and save the small screw 1 ; then, loosen the four large screws 2 .
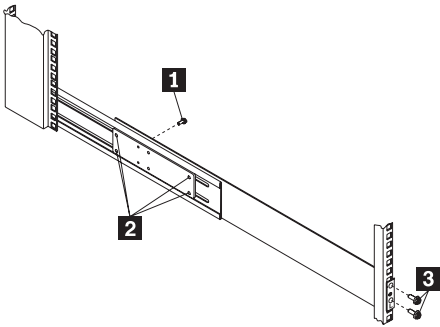
3. Hold the rail against the outside of the left rack mounting flange and loosely insert the front black hex screws 3 .

4. Extend the rail outside of the rear rack mounting
   flange; then, install and tighten both rear black hex
   screws 1 .
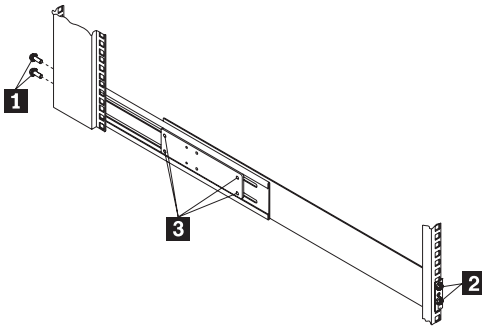
5. Tighten the two front screws 2 ; then, tighten the
   four large screws 3 .

   Repeat step 2 on page 79 through step 5 to install
   the rail marked R on the right side of the rack.

   rules=nonewidth=col align='c c c' valign='t t t'.

36.1 kg (79.5 lbs)

   ┌─ **Caution** ──────────────────────┐
   │ Use safe practices when lifting.   │
   └─────────────────────────────────────┘

6. Lift and then slide the expansion unit into the rack;
   then, remove and discard both white screws and wing
   nuts 1 from the bezel.

7. Align the bezel locator pins with the expansion unit;
   then, secure the bezel and Netfinity FAStT EXP500
   with two black hex screws 2 .

8. Use the two small screws 3 (removed in step 2 on
   page 79) to secure the rear of the expansion unit.

9. Install hard disk drives, fans, ESM boards, and power
   supplies in the EXP200 expansion unit according to
   "Installing and replacing devices" on page 83; then,
   return here to complete the installation.

10. Continue with "Completing the installation."

Completing the installation: This section
provides the information needed to complete the
installation. Instructions for installing the identification
labels and cabling the expansion unit are included.

Installing identification labels: Your expansion unit comes with two expansion unit ID labels.

Expansion unit ID labels   Serial number label

1. Install the expansion unit ID labels.
    a. Verify the setting of the tray number switches (0–9).
    b. Apply the expansion unit ID labels that match the setting for the tray number switches.
2. Continue with "Cabling the expansion unit."

Cabling the expansion unit: This section provides the FC expansion unit power cabling information. After you attach your expansion unit power cables, use the instruction provided in "Turning the expansion unit on and off" on page 65 for the initial startup of the expansion unit.

The Netfinity FAStT EXP500 provides redundant loop support. A redundant Netfinity FAStT EXP500 loop consists of one or more expansion units connected to a host (controller) using two sets of FC cables. If one FC fails, the host will use the other Netfinity FAStT EXP500 loop to maintain I/O to the Netfinity FAStT EXP500 array group.

Fibre Channel loop: A Fibre Channel (FC) loop consists of FC disk drives connected to each other and to one or more controllers. A loop can support multiple controllers, a large number of disk drives, and other addressable entities such as system management logic chips. Refer to your controller documentation for information on controller-dependent hardware configuration details. Some controllers might have restrictions on the maximum number of disk drives supported on a loop, cabling restrictions, and other requirements.

GBICs: Your Netfinity FAStT EXP500 expansion unit supports large, complex and redundant, disk drive loop configurations. Each ESM board has two GBIC ports. These GBIC ports are labeled with an   (input) and a   (output). You build a loop by connecting one or more Netfinity FAStT EXP500 expansion units to one or more controllers. You then use dual fibre optical cables to connect one Netfinity FAStT EXP500 expansion unit to another in a daisy-chain. It takes only one GBIC on the ESM board to connect a single Netfinity FAStT EXP500 expansion unit to a controller.

Optical Fibre Channel cable restrictions:

Controllers that are FC compliant can use any external cable length offered by IBM in any clustered or nonclustered application.

Power cabling: The expansion unit 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 uninterruptible power supply (UPS), or to an external source, such as a properly grounded electrical outlet.

If you have not already done so, attach the power supply cord as follows:

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 supply power cord into a properly grounded electrical outlet.
5. Go to "Turning the expansion unit on and off" on page 65 for the initial startup of the expansion unit.

Installing and replacing devices

Use the following information to help you install or remove customer replaceable units (CRUs), such as hot-swap drives, fans, ESM boards, and power supplies.

Working with hot-swap drives

> **Before you begin**
>
> Read the safety and handling guidelines provided in "Safety Information" on page 112.
> Ensure that your current system configuration is working properly.
> Back up all important data before you make changes to storage devices, such as hard disk drives.

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

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

Blank trays:
Expansion units without a full set of drives (10) contain blank trays in the unused drive bays. Before installing new drives, you must remove the empty trays. Save the empty trays for future use. Each of the 10 bays must always contain either a blank tray or a drive CRU. Each blank tray contains a filler piece for use with a half-high or slim-line drive.

Drive CRUs:
Your expansion unit supports IBM Fibre Channel (FC) hard disk drives. These IBM drives come preinstalled in a drive tray, ready for installation. (Do not detach the drive from the tray.) This drive and tray assembly is called a *drive CRU* (customer replaceable unit). You can install the drive CRUs directly into the 10 drive bays on the front of the expansion unit.

Drive CRU labels:
A label is provided on the front of the drive CRU tray. 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. (If you reinstall a drive in the wrong bay, you might lose data.)

Drive LEDs:
Each drive tray has two LEDs, which indicate the status for that particular drive. The drive LED states and descriptions are as follows.

LED	LED State	Definitions
Activity LED	Green flashing	The green light flashes to indicate FC activity to the drive.
Activity LED	Green on	The green light is on to indicate the drive is properly installed.
Fault LED	Amber flashing	The amber light flashes to indicate a drive rebuild is under way, or that a drive has been identified by software.
Fault LED	Amber on	The amber light is on to indicate a drive failure.

Fibre Channel loop IDs:

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

Hot-swap hardware:

Your expansion unit contains hardware that enables you to replace a failed hard disk drive without turning off the expansion unit. Therefore, you have the advantage of continuing to operate your system while a hard disk drive is removed or installed. These drives are known as *hot-swap* drives.

Slim-line drives:

You can install slim-line, hot-swap drive CRUs, which are slightly smaller in size than the standard disk drive. These drive CRUs do not fill the entire drive bay. To maintain proper air flow and cooling when you install a slim-line drive, you must also install one of the fillers provided in the blank trays.

Installing hot-swap drives: Use the following procedure to install drives in the expansion unit. You can install additional drives while the expansion unit is powered up and running.

Note

If you are replacing a drive, see "Replacing hot-swap drives" on page 88.

---

1. Read the instructions that come with the drive CRU.

2. Check for Fault LEDs. If any amber LEDs are lit, refer to "Symptom-to-FRU Index" on page 71.

Power on LED

General system error LED

Drive CRU

Blank tray filler

Tray handle   Latch   Activity LED

Fault LED
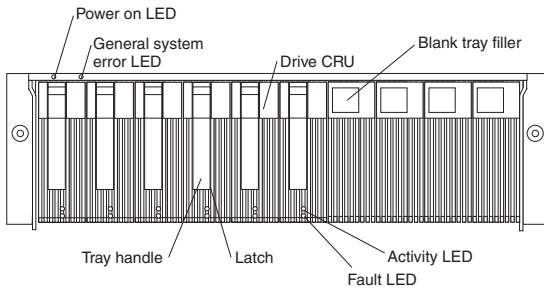
3. Determine the bay into which you want to install the drive.
4. Remove the blank tray.
   a. Insert a finger into the square hole at the top of the blank tray to grip and pull the tray out of the drive bay.
   b. Save the blank tray for later use.
5. Install the drive CRU:

> **Note**
>
> The hard disk drive comes with a tray already attached. Do not attempt to detach the drive 4 from the tray 3 .

3

2

4

1
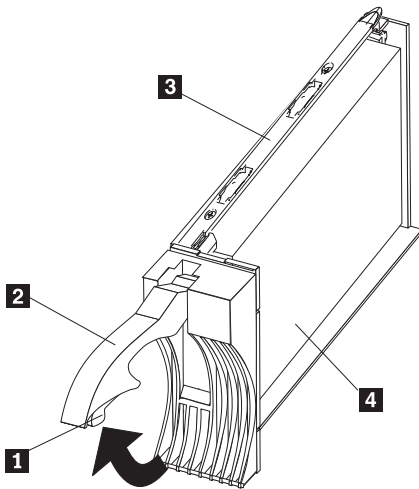
a. Release the blue latch 1 on the drive CRU by pressing on the inside of the bottom of the tray handle.
b. Pull the handle 2 on the tray out into the open position.

c. Slide the drive CRU into the empty bay until the tray handle ⌐2¬ touches the expansion unit bezel.

d. Push the tray handle ⌐2¬ down into the closed (latched) position.

6. If you are installing a slim-line drive, continue with
   step 6a. Otherwise, go to step 7.
   a. Locate the filler piece on the inside of the blank
      tray.
   b. Pull up on the small latch   1   inside the blank
      tray to release the filler piece.
   c. Tilt the filler piece up from the blank tray   2   ;
      then, remove it from the tray as shown in the
      following illustration.
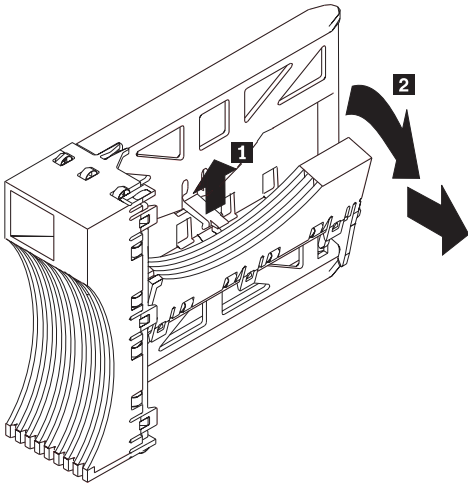
   d. Insert the filler piece into the empty space left in
      the drive bay, as shown in the following
      illustration.
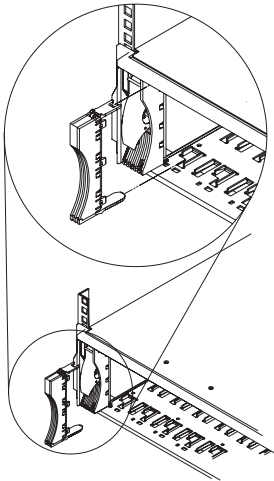
7. Check the drive LEDs.
   a. When a drive is ready for use, the green Activity
      LED is on and the amber Fault LED is off.

b. If the amber Fault LED is completely on and not flashing, remove the drive from the unit and wait 10 seconds; then, reinstall the drive.

8. Configure the drive using the appropriate software.

Replacing hot-swap 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 expansion unit. This includes transmission problems between the host controllers, the ESM boards, and the drives. This section explains how to replace a failed drive.

Attention

Failure to replace the drives in their correct bays might result in loss of data. If you are replacing a drive that is part of a RAID level 1 or RAID level 5 logical drive, ensure that you install the replacement drive in the correct bay.

Check the hardware and software documentation provided with your system to see if there are restrictions regarding hard disk drive configurations. Some system Fibre Channel (FC) configurations might not allow mixing different drive capacities or types within an array.

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 completely on and not flashing or when the drive is inactive with the green Activity LED completely on and not flashing.

---

2. Remove the drive CRU.
   a. Press on the inside of the bottom of the tray handle to release the blue latch 1 .
   b. Pull the handle 2 on the tray 3 out into the open position.
   c. Lift the drive CRU partially out of the bay.
   d. To avoid possible damage to the drive 4 , wait at least 20 seconds before fully removing the drive CRU from the expansion unit to allow for the drive to spin down.

.
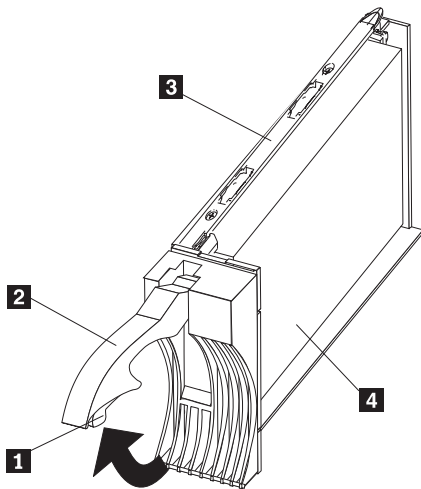
    e. Verify that there is proper identification (such as a label) on the drive CRU, then slide it completely out of the expansion unit.

    f. If you are replacing a slim-line drive, ensure that the filler piece remains in place for use with the new drive.

3. Install the new drive CRU.

    a. Gently push the drive CRU into the empty bay until the tray handle 2 touches the expansion unit bezel.

    b. Push the tray handle 2 down into the closed (latched) position.

4. Check the drive LEDs.

    a. When a drive is ready for use, the green Activity LED is on and the amber Fault LED is off.

    b. If the amber Fault LED is completely on and not flashing, remove the drive from the unit and wait 10 seconds; then, reinstall the drive.

5. Return to normal operation.

Working with hot-swap power supplies: The power supplies are customer replaceable units (CRUs) and do not require preventive maintenance.

The power supplies must always be in their proper places to maintain proper expansion-unit cooling. Use only the supported power supplies for your specific expansion unit.

Removing a hot-swap power supply:

⚠️

> **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.

To remove a hot-swap power supply:

1. Turn the power supply switch to the Off position.

Levers
Power LEDs
Fault LEDs
Power switches

AC power connectors
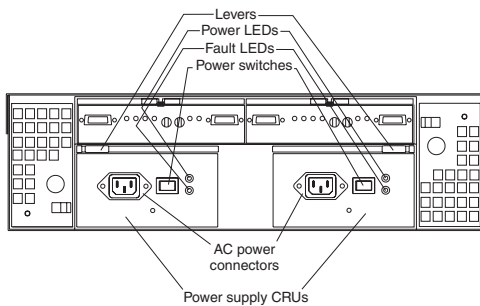
Power supply CRUs

2. Unplug the power supply cord from the electrical outlet.
3. Disconnect the power cord from the power supply.
4. Remove the nut and clamp from the rear of the power supply.
5. Remove the power supply from the expansion unit.
   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 replacing a power supply due to a failure, ensure that the power supply latch is mounted on the side of the power supply that faces the middle of the expansion unit. If not, remove the lever screw, flip the lever over and tighten the screw on the opposite side.
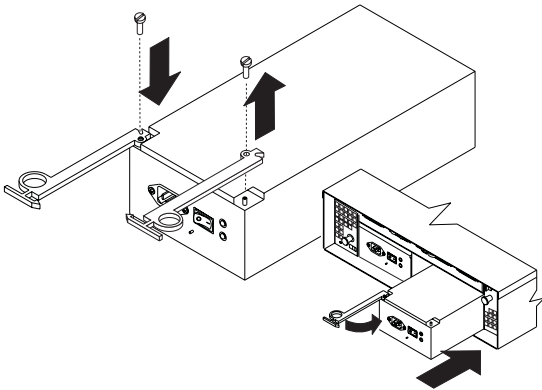
To install a hot-swap power supply:

> **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.

1. Ensure that the ac power switch on the power supply
   you are installing is in the Off position.
2. Install the power supply in the expansion unit.
   a. Slide the power supply into the expansion unit.
      Be sure the lever is pulled straight out as you
      slide the power supply into the expansion unit.
   b. Close the lever until the pull-ring latch locks in
      place. Make sure the lever locks into place in
      the expansion-unit chassis.
3. Wrap the 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 power supply.

AC power connectors

Strain relief clamps   AC power switches
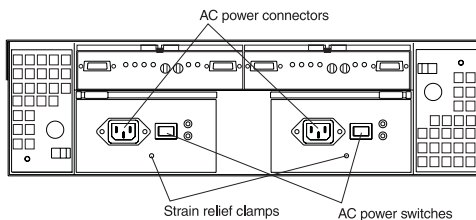
6. Plug the supply power cord into a properly grounded electrical outlet.
7. Turn the power supply switch to the On position.

Working with hot-swap ESM boards: When
replacing an ESM board, remember to do the following:

1. Check the software documentation provided with your
   system for instructions on ESM board failure-recovery
   procedures. Follow the steps provided in the
   software documentation before continuing to step 2.
2. Label each cable to ensure that all cables are
   properly reconnected to the new ESM board.
3. Label the GBICs when you remove them. You must
   install the GBICs in the same positions on the new
   ESM board.
4. Remove the GBICs and FC cables from the failed
   ESM board.

> **Note**
>
> Be careful not to bend the FC cables at a sharp
> angle or pinch them with objects. This can
> decrease the performance or cause data loss.
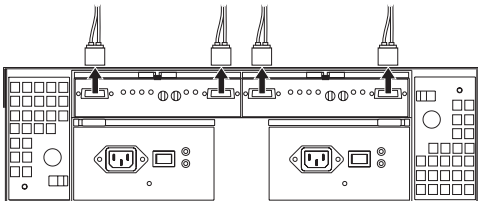
5. To remove the failed ESM board (the Fault indicator
   light is lit), push down on the latch. The levers will
   pop out of the locked position.
6. Grasp the pull-rings and pull out on the levers, then
   remove the ESM board.
7. Set the tray numbers on the new ESM board to
   match the tray numbers on the failed ESM board.
8. Install the new ESM board by sliding it into the empty
   slot. Be sure the levers are pulled straight out as you
   slide the ESM board into the expansion unit.
9. Close the levers until the pull-ring latch locks in place.
   Make sure the levers lock into place in the
   expansion-unit chassis.
10. Reattach the GBICs and FC cables to their original
    locations.
11. Check the Bypass LEDs at both ends of the
    reattached cables. If the Bypass LEDs are on,
    reattach the cables and GBICs.
12. Check the Power and Fault indicator lights on the
    new ESM board:
    > If the Power indicator is off, the ESM board
    > might not be inserted correctly.
    > If the Fault indicator is lit, the Power indicator
    > does not light, or any other Fault indicator is lit,
    > refer to "Symptom-to-FRU Index" on page 71.
13. Refer to your storage management software for
    instructions on enabling the ESM board.

Working with GBICs: The expansion unit has four gigabit interface card (GBIC) ports (two on each ESM board). Use the GBIC ports to attach FC cables to the expansion unit.

Installing GBICs: This section provides information on installing GBICs and adding additional Netfinity Fibre Array Storage Technology (FAStT) EXP500 expansion units to a loop. The GBICs are laser products.

⚠

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.

To install a GBIC, do the following:

   Remove the protective cap from the GBIC.
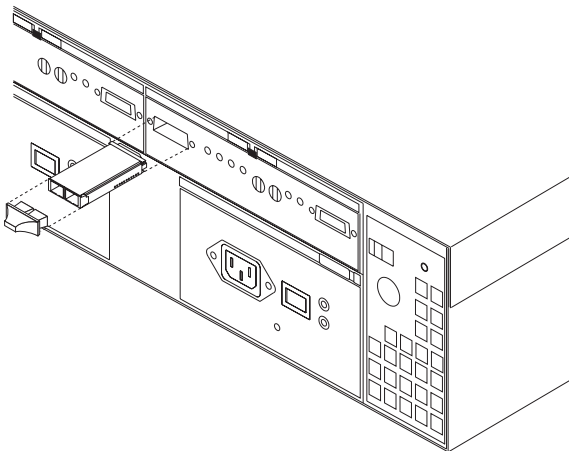
   Move the GBIC latch to the unlocked (center) position.

   Insert the GBIC into the GBIC port on the ESM board.

   Move the GBIC latch back to the locked position (flush with the rear of the GBIC).

Remove the protective caps from the fibre-optic cable.
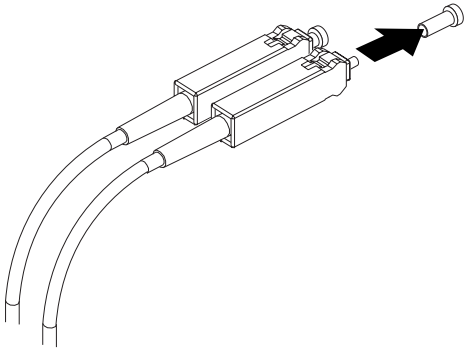
Connect the fiber-optic cable to the installed GBIC.

Adding Netfinity FAStT EXP500 expansion units to a loop: If you want to add an additional Netfinity FAStT EXP500 expansion unit to a loop, cable the GBIC input port on the existing ESM board (shown as First EXP500 in the figure below) to a GBIC output port on the new Netfinity FAStT EXP500 expansion unit. You can daisy-chain additional Netfinity FAStT EXP500 expansion units until the loop reaches the maximum defined by the controller. The controller might also have cabling configuration information or restrictions that you must follow.
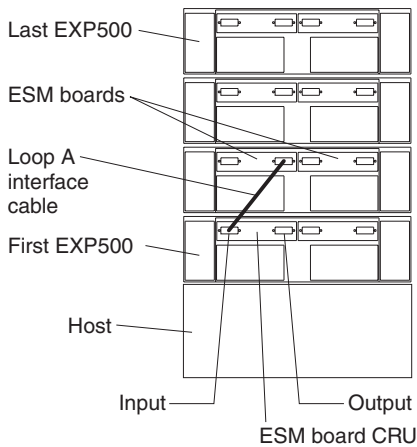
Netfinity FAStT EXP500 loop redundancy: The Netfinity FAStT EXP500 expansion unit provides redundant loop support. This redundant loop support is available when the second ESM board is configured (as shown in the figure below). If an ESM board, cable, or GBIC fails on a loop, the second loop provides an additional measure of redundancy (that is, an alternative path to your disk drives).

Some FC controllers might not support loop redundancy. IBM Fibre Channel (FC) disk drives are dual-ported, providing individual access from two FC loops to the same disk drive. When configuring the ESM boards, configure the second ESM board the same way you configured the first ESM board. Refer to your controller documentation for more information on dual-loop support and implementation.

Loop B interface cable

Input — Output
ESM board CRU
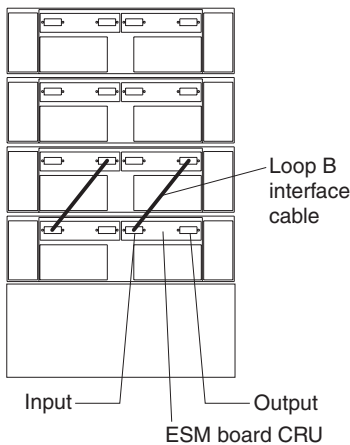
The GBIC ports are labeled with an   (input) and an   (output). Some controllers might provide additional reliability features if an   (input) port is connected to an   (output) port. As you daisy-chain Netfinity FAStT EXP500 expansion units together, connecting   (input) ports to   (output) ports can facilitate reliability. In many cases, a loop will still function properly without attaching the   (input) ports to   (output) ports. Refer to your controller documentation for requirements on connections between input and output ports.

A lit Bypass indicator next to a GBIC can be caused by a number of things. It does not necessarily mean that the GBIC has failed. Refer to "Symptom-to-FRU Index" on page 71 for other possible causes. If you do determine that a GBIC has failed, follow the procedures below to replace the failed GBIC.

1. Check the software documentation provided with your system for instructions on GBIC failure recovery

procedures. Follow the steps provided in the software documentation before continuing to step 2.

2. Remove the FC cables from the GBIC.
3. Remove the failed GBIC from the GBIC port on the back of the ESM board.

.
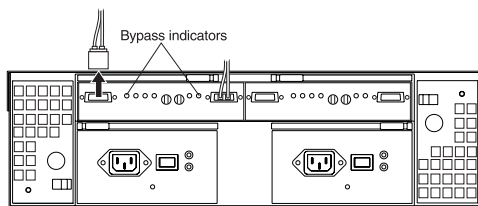
4. Unpack the new GBIC.

> **Note**
>
> Place the new GBIC on a dry, level surface near the expansion unit and away from magnetic fields. Save all packing materials in case you need to return the GBIC.

5. Read the documentation that came with the new GBIC for replacement procedures and other information.
6. Insert the new GBIC into the GBIC port on the ESM board.
7. Insert the FC cables into the new GBIC.
8. Check the Bypass indicator next to the failed GBIC:
      If the Bypass indicator is lit, the GBIC might not be inserted correctly.
      If the Bypass indicator remains lit, or a Fault indicator on the ESM board comes on, refer to "Symptom-to-FRU Index" on page 71.
9. Replace or close the back access panel, if necessary.

Working with hot-swap cooling fans

> **Attention**
>
> Do not run the expansion unit without adequate ventilation and cooling, because it might cause damage to the internal components and circuitry.

The fans are interchangeable and customer replaceable and do not require preventive maintenance. The fans help maintain proper air circulation across the components inside the expansion unit. Air flows through the expansion unit from the front to the back.

You can hot-swap the fans (replace them while the expansion unit is turned on and running), as long as you complete the exchange within 10 minutes. This time limit applies only to the total time that a fan is out of the expansion unit, beginning when you remove the failed unit and ending when you reseat the new one. This does not include the time it takes you to perform this entire procedure (checking LEDs, unpacking the new fan, and so on).

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 expansion unit.
2. If the amber Fault LED is on, remove the failed fan.
   a. Slide the latch to unlock the fan CRU.
   b. Use the handle (black knob) to pull the fan from the expansion unit.
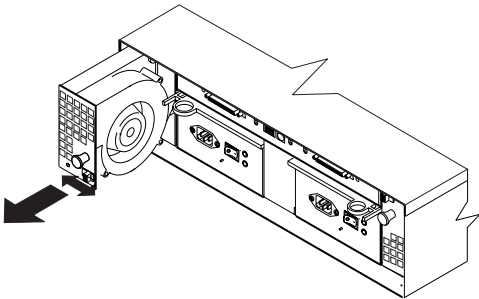
3. Install the new fan unit.
   a. Place the fan CRU in front of the fan slot.
   b. Hold the latch open and slide the fan all the way into the slot. If the fan does not go into the bay, rotate it 180°. Ensure that the latch is on the side closest to the center of the expansion unit.
   c. Release the latch. If the lever remains open, pull back on the fan slightly, 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, refer to "Symptom-to-FRU Index" on
page 71.

Netfinity FAStT EXP500 bays

The following sections show the hot-swap CRUs on the Netfinity FAStT EXP500 expansion unit.

The hot-swap features of the Netfinity FAStT EXP500 expansion unit enable you to remove and replace hard disk drives, power supplies, ESM boards, and fans without turning off the expansion unit. Therefore, you can maintain the availability of your system while a hot-swap device is removed, installed, or replaced.

Hot-swap drive bays: The following illustration shows the location of the hot-swap drive bays accessible from the front of your expansion unit. The Netfinity FAStT EXP500 supports up to 10 (half-high or slim-line) 40-pin FC hard disk drives. These drives come preinstalled in drive trays. This drive-and-tray assembly is called a *drive CRU* (customer replaceable unit). You can install the drive CRUs in the 10 drive bays on the front of the expansion unit.

In this example illustration, six of the 10 bays contain drive CRUs and four bays contain blank tray fillers. To maintain proper cooling within your expansion unit, always keep a blank tray filler in each drive bay that does not contain a drive CRU. For information on installing and replacing drive CRUs, refer to "Installing and replacing devices" on page 83.
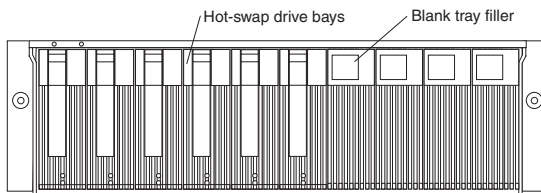
Attention

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 completely on and not flashing.

Fan, ESM, and power supply bays

The following illustration shows the location of the hot-swap fan bays, the hot-swap environmental services monitor (ESM) bays, and the hot-swap power supply bays.
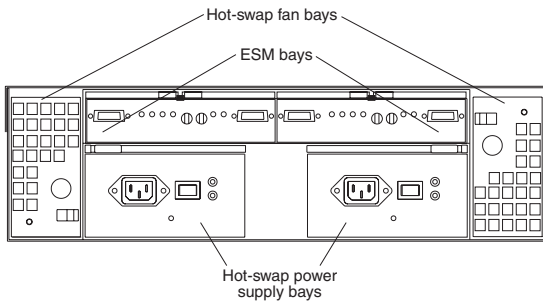
ESM bays: Your expansion unit comes with two hot-swappable ESM boards. The environmental services monitor (ESM) boards provide a 1 gigabit FC interface to the drives and monitors the overall status of the expansion unit. Each ESM board has two GBIC connector ports for connecting your expansion unit to the controller or connecting two or more Netfinity FAStT EXP500 expansion units together. The ESM boards provide redundancy when both boards are configured into redundant FC loops. Refer to your FC controller documentation to determine if the controller supports this redundancy function.

Hot-swap fan bays: Your expansion unit has two interchangeable hot-swap and redundant fan units. Each unit contains two fans. If one fan unit fails, the second fan unit continues to operate. Both fan units must be installed to maintain proper cooling within your expansion unit, even if one fan unit is not operational.

Hot-swap power supply bays: Your expansion unit comes with two hot-swap and redundant power supplies. Both power supplies must be installed to maintain proper cooling within your expansion unit, even if one power supply is not operational.

Front controls and indicators

The primary controls on the front of the expansion unit are shown in the following illustration.
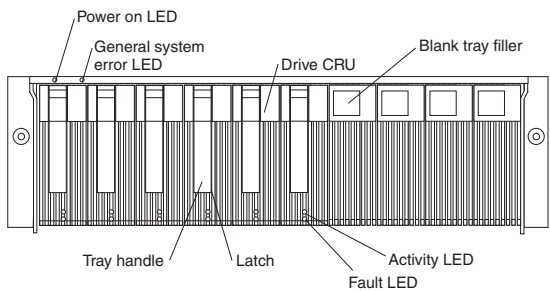
Activity LED: Each drive CRU has an Activity LED. When flashing, this green LED indicates drive activity. When completely on, this green LED indicates the drive is properly installed.

Blank tray filler: Expansion units shipped without a full set of drives (10) contain blank trays in the unused drive bays. Before installing new drives, you must remove the blank trays and save them. Each of the 10 bays must always contain either a blank tray or a drive CRU. Each blank tray contains a filler piece for use with a slim-line drive.

Drive CRU: You can install up to 10 hot-swap drive CRUs (customer replaceable units) in the expansion unit. Each drive CRU consists of a hard disk drive and tray.

Fault LED: Each drive CRU has a Fault LED. When lit, this amber LED indicates a drive failure. When flashing, this amber LED indicates that a drive Identify or Rebuild process is in progress.

General system error LED: When lit, this amber LED indicates that the unit has a fault, such as in a power supply, fan unit, or hard disk drive.

Latch: This multipurpose blue latch releases or locks the drive CRU in place.

Power-on LED: When lit, this green light indicates that the unit has good dc power.

Tray handle: You can use this multipurpose handle to insert and remove a drive CRU in the bay.

Rear controls, indicators, and connectors

Two hot-swap power supply CRUs, two hot-swap fan CRUs, and two environmental services monitor (ESM) boards are accessible from the back of the expansion unit. These components contain several controls, indicators, and connectors.

Power supply controls, indicators, and connectors:
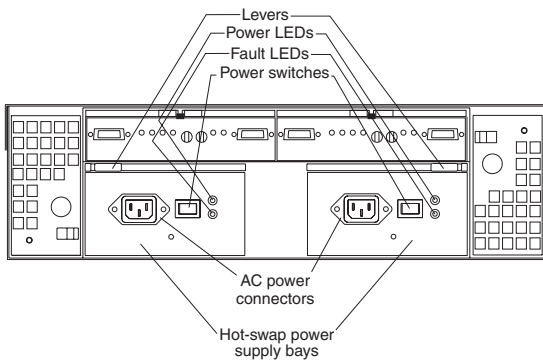
AC power connectors:	The power cords for the power supplies connect here.
Fault LEDs:	These amber Fault LEDs light if a power supply failure occurs or if the power supply is turned off.
Levers:	Use these locking handles to remove or install a power supply.
Power LEDs:	These green LEDs light when the expansion unit is turned on and receiving ac power.
Power supply CRUs:	The two hot-swap power supplies are located here. Both power supply CRUs must be installed, even if one power supply is not operational.
Power switches:	Use these switches to turn the power supplies on and off. You must turn both switches on to take advantage of the redundant power supplies.

Fan controls and indicators: The fans in your
Netfinity FAStT EXP500 are hot-swappable and redundant.
This means that your Netfinity FAStT EXP500 will continue
to operate if a fan fails. It also means that you can
remove and replace the fan while the Netfinity FAStT
EXP500 is on and accessing drives.

Attention

The fans in your expansion unit draw in fresh air and
force out hot air. These fans are hot-swappable and
redundant; however, when one fan fails, the fan unit
must be replaced within 48 hours in order to maintain
redundancy and optimum cooling. When you replace
the failed unit, be sure to install the second fan within
10 minutes to prevent any overheating due to the lack
of the additional fan unit.
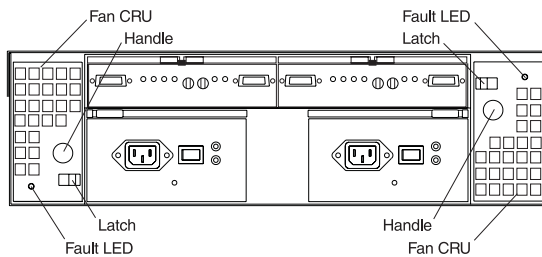
Fan CRUs:	The two fan CRUs are located here. These fans are hot-swappable and redundant.
Fault LEDs:	These amber LEDs light when a fan failure occurs.
Latches and handles:	Use the latches and handles to remove or install the fan CRUs.

ESM boards user controls

GBIC output port
Lever
Output bypass LED
ID conflict LED
Tray number
switch tens place (x10)
Tray number
switch ones place (x1)
Over-temperature LED
Fault LED
Power LED
Input bypass LED
GBIC input port
Lever

GBIC input port
Lever
Input bypass LED
Power LED
Fault LED
Over-temperature LED
Tray number
switch tens place (x10)
Tray number
switch ones place (x1)
ID conflict LED
Out put bypass LED
GBIC output port
Lever

ESM boards

ESM boards:	The environmental services monitor (ESM) boards contain the expansion unit controls, switches, and LEDs. Each ESM board has two GBIC ports for connecting the expansion unit to the controller.
Fault LEDs:	These amber LEDs light when an ESM board failure occurs.
GBIC input ports:	The two GBIC input ports are for attaching the optional GBICs to the expansion unit.
GBIC output ports:	The two GBIC output ports are for attaching the optional GBICs to the expansion unit. The optional GBICs (input and output) are for attaching your optical cables to the expansion unit, then to the controller or additional expansion units. Insert the GBICs in the expansion unit GBIC ports and attach your FC cables to the GBICs, then connect the FC cables to the controller or additional expansion units.
ID conflict LEDs:	These amber LEDs light if the expansion unit tray ID settings for the ESM boards do not match. In this case, the expansion unit uses the tray number of the left ESM board.

Input/ Output bypass LEDs:	These amber LEDs light when no valid input signal is detected and when no data is passed through the port. When no cable is connected to the port, the LEDs also light. Both ports on the ESM board are bypassed and the LEDs are lit in the event of an ESM board fault. In this case, the ESM Fault LED is also lit.
Levers:	Use these levers when removing and inserting the ESM boards.
Power LEDs:	These green LEDs are lit when there is power to the ESM board.
Over temperature LEDs:	These amber LEDs light if the expansion unit overheats.
Tray number switches:	These switches assign the physical addresses of the disk drives and the system management processors that are participating in the loop, and they identify the Netfinity FAStT EXP500 expansion unit. The base switch (x1) sets the IDs of the disk drives on the loop. The settings of both the base ID switch (x1) and the extended ID switch (x10) together is the expansion unit ID. The switches set the expansion unit ID using values of 00–99. The base ID switch (x1) is for the ones position and the extended ID switch (x10) is for the tens position.

System-management software support

The Netfinity FAStT EXP500 expansion unit meets the SES (SCSI-3 Enclosure Service) industry standards for external enclosures. The level of system management support is dependent upon the software and services provided by the FC controller. Refer to your controller documentation for additional information on the level of system management support provided.

Parts Listing
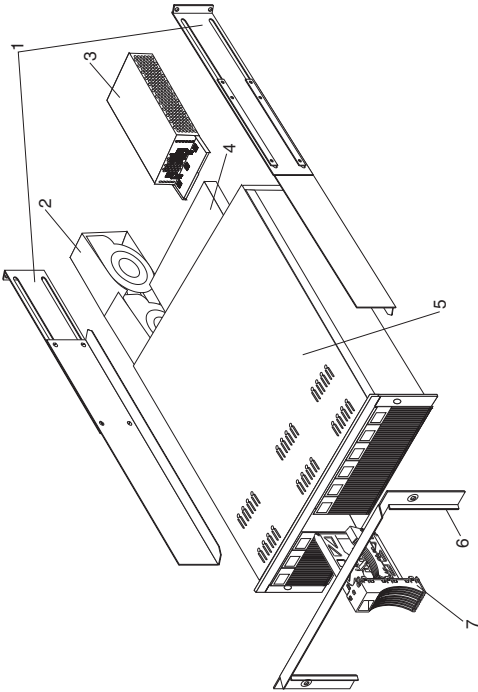
System

Index	System (IBM Netfinity FAStT EXP500 - Type 3560, Model 1RU)	FRU No.
1	Rail Kit Left/Right (Model 1RU)	37L0067
2	Blower Assembly (Model 1RU)	09N7285
3	350W Power Supply Assembly (Model 1RU)	37L0059
4	Electronic Module (ESM, LVD/LVD) (Model 1RU)	37L0103
5	Midplane/Frame (Model 1RU)	37L0104

> **Note:** The midplane board and frame are replaced as a unit. If either part is needed, order the above FRU.

Index	System (IBM Netfinity FAStT EXP500 - Type 3560, Model 1RU)	FRU No.
6	Decorative Bezel (Model 1RU)	37L0074
7	Blank Tray Assembly (Model 1RU)	37L6708
	Tower Enclosure (Model 1RU)	37L0120
	Tower Lock/Pawl (Model 1RU)	37L0121
	Tower Feet (Model 1RU)	09N7266
	Misc Hardware Kit (Model 1RU)	09N7288
	LVD SCSI Cable, 20 Meter external (Model 1RU)	37L0083
	Line Cord, 9 Foot (Model 1RU)	6952300
	Line Cord Jumper, High Voltage (Model 1RU)	36L8886

Power Cords

Power Cords	FRU No.
Arabic	14F0033
Argentina	13F9940
Australia	13F9940
Belgium	13F9979
Bulgaria	13F9979
Canada	6952300
Czech Republic	13F9979
Denmark	13F9997
Finland	13F9979
France	13F9979
Germany	13F9979
Hungary	13F9979
Israel	14F0087
Italy	14F0069
Latvia	13F9979
Netherlands	13F9979
Norway	13F9979
Poland	13F9979
Portugal	13F9979
Serbia	13F9979
Slovakia	13F9979
South Africa	14F0015
Spain	13F9979
Switzerland	13F9979
Switzerland (French/German)	14F0051
Thailand	1838574
U.S. English	6952300
U.K./Ireland	14F0033
Yugoslavia	13F9979

Related Service Information

> **Important**
>
> The service procedures are designed to help you isolate problems. They are written with the assumption that you have model-specific training on all computers, or that are familiar with the computers, functions, terminology, and service information provided in this supplement and the PS/2 Hardware Maintenance Manual (part number 83G8990, form number S52G-9971-02).

Safety Information

The following section contains the safety information that you need to be familiar with before servicing the IBM Netfinity EXP15, EXP200, or EXP500 Storage Expansion Unit.

Statement 1

DANGER

> **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.**
>
> **To avoid shock hazard:**
>
> – **The power cord must be connected to a properly wired and earthed receptacle.**
>
> – **Any equipment to which this product will be attached must also be connected to properly wired receptacles.**
>
> **When possible, use one hand to connect or disconnect signal cables to prevent a possible shock from touching two surfaces with different electrical potentials.**
>
> **Electrical current from power, telephone, and communications cables is hazardous. To avoid shock hazard, connect and disconnect cables as described following when installing, moving, or opening covers of this product or attached devices.**

To Connect	To Disconnect
1. Turn Everything OFF.	1. Turn Everything OFF.
2. First, attach all cables to devices.	2. First, remove power cord(s) from outlet.
3. Attach signal cables to receptacles.	3. Remove signal cables from receptacles.
4. Attach power cord(s) to outlet.	4. Remove all cables from devices.
5. Turn device ON.	

NOTE: In the UK, by law, the telephone cable must be connected after the power cord.	NOTE: In the UK, the power cord must be disconnected after the telephone cable.

Statement 5

32 kg (70.5 lbs)   **55 kg (121.2 lbs)**

CAUTION:
Use safe lifting practices when lifting your machine.

Instrução 1

PERIGO

> **Para evitar choques elétricos, não conecte ou desconecte nenhum cabo, nem efetue instalação, manutenção ou reconfiguração deste produto durante uma tempestade com raios.**
>
> **Para evitar choques elétricos:**
>
> – **O cabo de alimentação deve ser conectado a um receptáculo corretamente instalado e aterrado.**
> – **Todos os equipamentos aos quais este produto será conectado devem também ser conectados a receptáculos corretamente instalados.**
>
> **Quando possível, utilize uma das mãos para conectar ou desconectar cabos de sinal, para evitar um possível choque ao tocar duas superfícies com potenciais elétricos diferentes.**
>
> **A corrente elétrica proveniente de cabos de alimentação, de telefone e de comunicação é perigosa. Para evitar choques elétricos, conecte e desconecte os cabos conforme descrito a seguir, ao instalar, movimentar ou abrir tampas deste produto ou de dispositivos conectados.**

Para Conectar	Para Desconectar
1. DESLIGUE tudo.	1. DESLIGUE tudo.
2. Conecte primeiro todos os cabos nos dispositivos.	2. Remova primeiro o(s) cabo(s) de alimentação das tomadas.
3. Conecte os cabos de sinal nos receptáculos.	3. Remova os cabos de sinal dos receptáculos.
4. Conecte o(s) cabo(s) de alimentação nas tomadas.	4. Remova todos os cabos dos dispositivos.
5. LIGUE o dispositivo.	

Instrução 5

32 kg (70,5 lbs)   **55 kg (121,2 lbs)**

cuidado:
Utilize práticas seguras para levantamento de peso ao levantar sua máquina.

声明 1

危险！

为避免电击危险，请不要在暴风雨期间连接或断开任何电缆，
或是进行此产品的安装、维护或重新配置操作。

为避免电击危险：

– 电源线必须连接到适当的电线及接地插座。

– 此产品将要连接的所有设备也必须连接到正确接线的插座上。

如果可能，请使用一只手连接或断开连接信号电缆，以避免在
接触两个具有不同电势的表面时遭到电击。

电源线、电话线以及通信电缆中的电流非常危险。为避免电击，
请在安装、移动或打开本产品或连接设备的外盖时，按照下述
步骤连接或断开电缆。

要连接电缆	要断开电缆
1. 关闭所有设备。	1. 关闭所有设备。
2. 首先将所有电缆与设备连接。	2. 首先从电源插座拔下电源线。
3. 将信号线连接到插座。	3. 从插座拔下信号电缆。
4. 将电源线连接到电源插座。	4. 从设备上拔下所有电缆。
5. 打开设备。	

声明 5

32 kg (70.5 磅)   **55 kg (121.2 磅)**

注意！
搬运机器时，请进行安全搬运操作。

· 聲明 1

危險

為了避免雷擊，在閃電期間，請勿連接或拔掉本裝置上的任
何電纜線，或請勿安裝、維修或重新架構本產品。

為了避免雷擊：

- 電源線必須連接到接線及接地正確的插座。
- 本產品所連接的設備也必須連接到接線正確的插座。

儘可能使用單手來連接或拔掉信號電纜，以避免因接觸兩不
同電位的平面，而受到電擊。

電源、電話及通信電纜上均有電流流通。為了避免電擊，在
安裝、移動本產品，或開啟本產品的蓋子或與本產品連接之
裝置的蓋子時，請依照下列「連接」及「拔掉」電纜線的步
驟操作。

連接	拔掉
1. 關掉所有開關。	1. 關掉所有開關。
2. 首先，將所有電纜線連接到裝置。	2. 首先，自電源插座拔掉電源線。
3. 將信號電纜連接到信號插座。	3. 拔掉信號插座上的所有信號電纜。
4. 將電源線連接到電源插座。	4. 拔掉裝置上的所有電纜線。
5. 開啟裝置電源。	

· 聲明 5

>= 32 公斤(70.5 磅)   >= 55 公斤(121.2 磅)

注意：
提昇機器時，請使用安全提昇措施。

Notice n¢ 1

PERIGO

> **Pour éviter tout risque de choc électrique, ne manipulez aucun câble et n'effectuez aucune opération d'installation, d'entretien ou de reconfiguration de ce produit au cours d'un orage.**
>
> **Pour éviter tout risque de choc électrique :**
>
> – **Les cordons d'alimentation du présent produit et de tous les appareils qui lui sont connectés doivent être branchés sur des socles de prise de courant correctement câblés et mis à la terre.**
>
> **Afin d'éviter tout risque de choc électrique provenant d'une différence de potentiel de terre, n'utilisez qu'une main, lorsque cela est possible, pour connecter ou déconnecter les cordons d'interface.**
>
> **Le courant électrique passant dans les câbles de communication, ou les cordons téléphoniques et d'alimentation peut être dangereux. Pour éviter tout risque de choc électrique, lorsque vous installez ou que vous déplacez le présent produit ou des périphériques qui lui sont raccordés, reportez-vous aux instructions ci-dessous pour connecter et déconnecter les différents cordons.**

Connexion	Déconnexion
1. Mettez les unités hors tension.	1. Mettez les unités hors tension.
2. Commencez par brancher tous les cordons sur les unités.	2. Commencez pas débrancher les cordons alimentation des socles de prise de courant.
3. Branchez les câbles d'interface sur les prises.	3. Débranchez les câbles d'interface des prises.
4. Branchez les cordons d'alimentation sur un socle de prise de courant.	4. Débranchez tous les câbles des unités.
5. Mettez les unités sous tension.	

Notice n¢ 5

32 kg **55 kg**

cuidado:
Ce produit pèse un poids considérable.
Faites-vous aider pour le soulever.

Hinweis 1

VORSICHT

Aus Sicherheitsgründen bei Gewitter an diesem Gerät keine Kabel anschließen oder lösen. Ferner keine Installations-, Wartungs- oder Rekonfigurationsarbeiten durchführen.

Aus Sicherheitsgründen:

– **Gerät nur an eine Schutzkontaktsteckdose mit ordnungsgemäß geerdetem Schutzkontakt anschließen.**

– **Alle angeschlossenen Geräte ebenfalls an Schutzkontaktsteckdosen mit ordnungsgemäß geerdetem Schutzkontakt anschließen.**

Signalkabel möglichst einhändig anschließen oder lösen, um einen Stromschlag durch Berühren von Oberflächen mit unterschiedlichem elektrischem Potential zu vermeiden.

Elektrische Spannungen von Netz-, Telefon- und Datenübertragungsleitungen sind gefährlich. Um einen Stromschlag zu vermeiden, nur nach den Anweisungen arbeiten, die für Installation, Transport oder Öffnen von Gehäusen dieses Produkts oder angeschlossenen Einheiten gelten.

Kabel anschließen	Kabel lösen
1. Alle Geräte ausschalten und Netzstecker ziehen.	1. Alle Geräte ausschalten.
2. Zuerst alle Kabel an Einheiten anschließen.	2. Zuerst Netzstecker von Steckdose lösen.
3. Signalkabel an Anschlußbuchsen anschließen.	3. Signalkabel von Anschlußbuchsen lösen.
4. Netzstecker an Steckdose anschließen.	4. Alle Kabel von Einheiten lösen.
5. Gerät einschalten.	

Hinweis 5

32 kg   **55 kg**

achtung:
Beim Anheben der Maschine die vorgeschriebenen Sicherheitsbestimmungen beachten.

Avviso 1

PERICOLO

**Per evitare il pericolo di scosse
elettriche durante i temporali, non
collegare o scollegare cavi, non
effettuare l'installazione, la
manutenzione o la riconfigurazione di
questo prodotto.**

**Per evitare il pericolo di scosse
elettriche:**

 – **collegare il cavo di alimentazione ad
   una presa elettrica correttamente
   cablata e munita di terra di
   sicurezza;**
 – **collegare qualsiasi apparecchiatura
   collegata a questo prodotto ad una
   presa elettrica correttamente cablata
   e munita di terra di sicurezza.**

**Quando possibile, collegare o scollegare
i cavi di segnale con una sola mano per
evitare il rischio di scosse derivanti dal
contatto con due superfici a diverso
potenziale elettrico.**

**La corrente elettrica circolante nei cavi
di alimentazione, del telefono e di
segnale è pericolosa. Per evitare scosse
elettriche, collegare e scollegare i cavi
come descritto quando si effettuano
l'installazione, la rimozione o l'apertura
dei coperchi di questo prodotto o
durante il collegamento delle unità.**

Per collegare	Per scollegare
1. SPEGNERE tutti i dispositivi.	1. SPEGNERE tutti i dispositivi.
2. Collegare prima tutti i cavi alle unità.	2. Rimuovere prima il(i) cavo(i) di alimentazione dalla presa elettrica.
3. Collegare i cavi di segnale alle prese.	
4. Collegare il(i) cavo(i) di alimentazione alla presa elettrica.	3. Rimuovere i cavi di segnale dalle prese.
5. ACCENDERE le unità.	4. Rimuovere tutti i cavi dalle unità.

Avviso 5

32 kg   **55 kg**

ATTENZIONE:
Durante il sollevamento della macchina seguire delle norme di di sicurezza.

경고문 1

위험

전기 충격을 피하려면 날씨가 나쁠 때(예: 눈 또는 비가 오거나 천둥 번개가 칠
때)는 케이블을 연결하거나 끊지 않도록 하고 이 제품의 설치, 유지보수 또는 재구
성 등의 작업을 수행하지 않도록 하십시오.

전기 충격을 피하려면 다음과 같아야 합니다.

− 고압선은 적절한 배선 및 접지 상태의 콘센트로 연결되어야 합니다.

− 이 제품이 접속될 모든 장비도 적절한 배서 상태의 콘센트로 연결되어야 합니다.

다른 전위를 가진 두 표면을 만졌을 때 발생할 수 있는 전기 충격을 피하려면 한 손
으로 신호선을 연결하거나 끊으십시오.

전원, 전화 및 통신 케이블로부터 흘러 나오는 전류는 위험합니다. 전기 충격을 피
하려면 이 제품이나 접속 장치를 설치, 이동 및 덮개를 열 때 다음 설명에 따라 케
이블을 연결하고 끊도록 하십시오.

연결하려면	연결해제하려면
1. 모든 스위치를 켠다.	1. 모든 스위치를 끈다.
2. 먼저 모든 케이블을 장치에 연결한다.	2. 먼저 모든 케이블을 장치에 제거한다.
3. 신호선을 콘센트에 연결한다.	3. 신호선을 콘센트에서 제거한다.
4. 전원을 콘센트에 연결한다.	4. 장치에서 모든 케이블을 제거한다.
5. 장치 스위치를 켠다.	

경고문 5

32kg(70.5 파운드)   55kg(121.2 파운드)

주의:
기계를 들 때는 안전하게 들어 올리십시오.

Declaración 1

PELIGRO

> **Para evitar una posible descarga eléctrica, no conecte ni desconecte los cables ni lleve a cabo ninguna operación de instalación, de mantenimiento o de reconfiguración de este producto durante una tormenta eléctrica.**
>
> **Para evitar una posible descarga:**
>
> – **El cable de alimentación debe conectarse a un receptáculo con una instalación eléctrica correcta y con toma de tierra.**
>
> – **Los aparatos a los que se conecte este producto también deben estar conectados a receptáculos con la debida instalación eléctrica.**
>
> **Cuando sea posible, utilice una sola mano para conectar o desconectar los cables de señal a fin de evitar una posible descarga al tocar dos superficies con distinto potencial eléctrico.**
>
> **La corriente eléctrica de los cables de comunicaciones, teléfono y alimentación puede resultar peligrosa. Para evitar una posible descarga, siga las indicaciones de conexión y desconexión de los cables siempre que tenga que instalar, mover o abrir las cubiertas de este producto o de los dispositivos acoplados.**

Instrucciones de conexión	Instrucciones de desconexión
1. Apague todos los componentes (OFF).	1. Encienda todos los componentes (ON).
2. En primer lugar, conecte todos los cables a los dispositivos.	2. En primer lugar, retire los cables de alimentación de las tomas.
3. Conecte los cables de señal a los receptáculos.	3. Retire los cables de señal de los receptáculos.
4. Conecte los cables de alimentación a las tomas.	4. Retire todos los cables de los dispositivos.
5. Encienda el dispositivo (ON).	

Declaración 5

32 kg **55 kg**

percaución:
Alce la máquina con cuidado; el sobrepeso podría causar alguna lesión.

General Safety

Follow these rules to ensure general safety:

Observe good housekeeping in the area of the machines during and after maintenance.

When lifting any heavy object:

1. Ensure you can stand safely without slipping.
2. Distribute the weight of the object equally between your feet.
3. Use a slow lifting force. Never move suddenly or twist when you attempt to lift.
4. Lift by standing or by pushing up with your leg muscles; this action removes the strain from the muscles in your back. *Do not attempt to lift any objects that weigh more than 16 kg (35 lb) or objects that you think are too heavy for you.*

Do not perform any action that causes hazards to the customer, or that makes the equipment unsafe.

Before you start the machine, ensure that other service representatives and the customer's personnel are not in a hazardous position.

Place removed covers and other parts in a safe place, away from all personnel, while you are servicing the machine.

Keep your tool case away from walk areas so that other people will not trip over it.

Do not wear loose clothing that can be trapped in the moving parts of a machine. Ensure that your sleeves are fastened or rolled up above your elbows. If your hair is long, fasten it.

Insert the ends of your necktie or scarf inside clothing or fasten it with a nonconductive clip, approximately 8 centimeters (3 inches) from the end.

Do not wear jewelry, chains, metal-frame eyeglasses, or metal fasteners for your clothing.

Remember: Metal objects are good electrical conductors.

Wear safety glasses when you are: hammering, drilling soldering, cutting wire, attaching springs, using solvents, or working in any other conditions that might be hazardous to your eyes.

After service, reinstall all safety shields, guards, labels, and ground wires. Replace any safety device that is worn or defective.

Reinstall all covers correctly before returning the machine to the customer.

Electrical Safety

Observe the following rules when working on electrical equipment.

Important

Use only approved tools and test equipment. Some hand tools have handles covered with a soft material that does not insulate you when working with live electrical currents.

Many customers have, near their equipment, rubber floor mats that contain small conductive fibers to decrease electrostatic discharges. Do not use this type of mat to protect yourself from electrical shock.

Find the room emergency power-off (EPO) switch, disconnecting switch, or electrical outlet. If an electrical accident occurs, you can then operate the switch or unplug the power cord quickly.

Do not work alone under hazardous conditions or near equipment that has hazardous voltages.

Disconnect all power before:

– Performing a mechanical inspection
– Working near power supplies
– Removing or installing main units

Before you start to work on the machine, unplug the power cord. If you cannot unplug it, ask the customer to power-off the wall box that supplies power to the machine and to lock the wall box in the off position.

If you need to work on a machine that has *exposed* electrical circuits, observe the following precautions:

– Ensure that another person, familiar with the power-off controls, is near you.

   Remember: Another person must be there to switch off the power, if necessary.

– Use only one hand when working with powered-on electrical equipment; keep the other hand in your pocket or behind your back.

   Remember: There must be a complete circuit to cause electrical shock. By observing the above rule, you may prevent a current from passing through your body.

– When using testers, set the controls correctly and use the approved probe leads and accessories for that tester.

– Stand on suitable rubber mats (obtained locally, if necessary) to insulate you from grounds such as metal floor strips and machine frames.

Observe the special safety precautions when you work with very high voltages; these instructions are in the safety sections of maintenance information. Use extreme care when measuring high voltages.

Regularly inspect and maintain your electrical hand tools for safe operational condition.

Do not use worn or broken tools and testers.

Never assume that power has been disconnected
from a circuit. First, *check* that it has been
powered-off.
Always look carefully for possible hazards in your
work area. Examples of these hazards are moist
floors, nongrounded power extension cables, power
surges, and missing safety grounds.
Do not touch live electrical circuits with the reflective
surface of a plastic dental mirror. The surface is
conductive; such touching can cause personal injury
and machine damage.
Do not service the following parts *with the power on*
when they are removed from their normal operating
places in a machine:

  – Power supply units
  – Pumps
  – Blowers and fans
  – Motor generators

and similar units. (This practice ensures correct
grounding of the units.)
If an electrical accident occurs:

  – **Use caution; do not become a victim
    yourself.**
  – **Switch off power.**
  – **Send another person to get medical aid.**

Safety Inspection Guide

The intent of this inspection guide is to assist you in
identifying potentially unsafe conditions on these products.
Each machine, as it was designed and built, had required
safety items installed to protect users and service
personnel from injury. This guide addresses only those
items. However, good judgment should be used to identify
potential safety hazards due to attachment of non-IBM
features or options not covered by this inspection guide.

If any unsafe conditions are present, you must determine
how serious the apparent hazard could be and whether
you can continue without first correcting the problem.

Consider these conditions and the safety hazards they
present:

   Electrical hazards, especially primary power (primary
   voltage on the frame can cause serious or fatal
   electrical shock).
   Explosive hazards, such as a damaged CRT face or
   bulging capacitor
   Mechanical hazards, such as loose or missing
   hardware

The guide consists of a series of steps presented in a
checklist. Begin the checks with the power off, and the
power cord disconnected.

Checklist:

1. Check exterior covers for damage (loose, broken, or sharp edges).
2. Power-off the computer. Disconnect the power cord.
3. Check the power cord for:
   a. A third-wire ground connector in good condition. Use a meter to measure third-wire ground continuity for 0.1 ohm or less between the external ground pin and frame ground.
   b. The power cord should be the appropriate type as specified in the parts listings.
   c. Insulation must not be frayed or worn.
4. Remove the cover.
5. Check for any obvious non-IBM alterations. Use good judgment as to the safety of any non-IBM alterations.
6. Check inside the unit for any obvious unsafe conditions, such as metal filings, contamination, water or other liquids, or signs of fire or smoke damage.
7. Check for worn, frayed, or pinched cables.
8. Check that the power-supply cover fasteners (screws or rivets) have not been removed or tampered with.

Handling Electrostatic Discharge-Sensitive Devices

Any computer part containing transistors or integrated circuits (ICs) should be considered sensitive to electrostatic discharge (ESD). ESD damage can occur when there is a difference in charge between objects. Protect against ESD damage by equalizing the charge so that the machine, the part, the work mat, and the person handling the part are all at the same charge.

Notes:

1. Use product-specific ESD procedures when they exceed the requirements noted here.

2. Make sure that the ESD protective devices you use have been certified (ISO 9000) as fully effective.

When handling ESD-sensitive parts:

 Keep the parts in protective packages until they are inserted into the product.
 Avoid contact with other people.
 Wear a grounded wrist strap against your skin to eliminate static on your body.
 Prevent the part from touching your clothing. Most clothing is insulative and retains a charge even when you are wearing a wrist strap.
 Use the black side of a grounded work mat to provide a static-free work surface. The mat is especially useful when handling ESD-sensitive devices.
 Select a grounding system, such as those listed below, to provide protection that meets the specific service requirement.

Note: The use of a grounding system is desirable but not required to protect against ESD damage.

 – Attach the ESD ground clip to any frame ground, ground braid, or green-wire ground.
 – Use an ESD common ground or reference point when working on a double-insulated or battery-operated system. You can use coax or connector-outside shells on these systems.
 – Use the round ground-prong of the AC plug on AC-operated computers.

Grounding Requirements

Electrical grounding of the computer is required for operator safety and correct system function. Proper grounding of the electrical outlet can be verified by a certified electrician.

Software/Hardware Mismatch Problems

If a failure appears to be the result of a defective FRU, but you don't find a problem, there might be a software and hardware mismatch. These problems might be intermittent, and they are usually difficult to diagnose.

If you are experiencing this type of problem, and the operating system is of the "direct driver" variety, which bypasses the BIOS interface, such as:

> AIX
> Netware
> SCO UNIX
> Some "windowing" interfaces
> Other Unix-based software

the most-likely cause of the problem is a mismatch between the software and the hardware.

The following information is provided to help you resolve these problems:

Software Can Be Sensitive to the Hardware

Direct-driver software is sensitive to variations in hardware design. The resulting incompatibilities are usually addressed with a revision (sometimes referred to as a patch), to the direct-driver software. Make certain the software is current and that all known revisions are installed. The IBM on-line bulletin board (sometimes referred to as PCPROD), and other software tools sources, such as Novell Netware, should be referenced by the software support personnel for any revisions provided by the appropriate software vendor.

The most-likely cause of these types of problems, when direct-driver software is involved, is the failure to obtain the latest revisions from the software vendor.

Software Installation

It is very important to follow the vendor's installation procedures. The software should not be migrated from another system, unless the installation instructions indicate that migration is supported (especially from a different model in the product line).

Important

Migrating adapters from slower systems to faster systems might cause problems. This is due to device-specific, system-specific, or time-dependent software code, that controls these devices.

Adapter and Software Compatibility

Hardware adapters for some operating systems must be approved by the software vendor to be compatible with that software. The approval is specific to the system, adapter E.C. level, and the software version. Contact the software vendor to confirm that system and adapter configuration is supported by their software level. The compatibility support is especially important for, (but not limited to), all LAN adapters and RIPL applications.

Software Failures After a Hardware Change

After the initial installation, any changes in the hardware configuration (addition or changes of adapters or features), might result in computer failures and require the reinstallation of the operating system or the software revisions.

Specific hardware configuration changes (such as memory address, interrupt level, or programmable option select), might result in a computer failure if the software has unique operating requirements.

Send Us Your Comments!

We want to know your opinion about this manual (part number 09N1393) Your input will help us to improve our publications.

Please photocopy this survey, complete it, and then fax it to **IBM HMM Survey** at **919-543-8167 (USA)**.

Name _____

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1. Do you like this manual?

   Yes   No

   _____

   _____

2. What would you like to see added, changed, or deleted in this manual?

   _____

   _____

3. What is your service experience level?

   Less than five years

   More than five years

   _____

   _____

4. Which Servers do you service most?

   _____

   _____

   _____

   _____

Thanks in advance for your response!

Problem Determination Tips

Due to the variety of hardware and software combinations that can be encountered, use the following information to assist you in problem determination. If possible, have this information available when requesting assistance from Service Support and Engineering functions.

Machine type and model
Processor or hard disk upgrades
Failure symptom
– Do diagnostics fail?
– What, when, where, single, or multiple systems?
– Is the failure repeatable?
– Has this configuration ever worked?
– If it has been working, what changes were made prior to it failing?
– Is this the original reported failure?
Reference/Diagnostics Diskette Version
– Type and version level
Hardware configuration
– Print (print screen) configuration currently in use
– BIOS level
Operating system software
– Type and version level

> **Important**
>
> To eliminate confusion, identical systems are considered *identical* only if they:
>
> 1. Are the exact machine type and models
> 2. Have the same BIOS level
> 3. Have the same adapters/attachments in the same locations
> 4. Have the same address jumpers/terminators/cabling
> 5. Have the same software versions and levels
> 6. Have the same Reference/Diagnostics Diskette (version)
> 7. Have the same configuration options set in the system
> 8. Have the same setup for the operation system control files
>
> Comparing the configuration and software set-up between "working and non-working" systems will often lead to problem resolution.

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