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

Hardware Maintenance Manual

October, 1999

**Use this manual with
the PC/Netfinity Servers
Hardware Maintenance Manual**

**We Want Your Comments!
(Please see page 84)**

IBM Netfinity EXP15, EXP200   S10L-9839-01

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IBM

Second Edition (October 1999

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About This Manual

This manual contains Symptom-to-FRU Index, service information, and configuration information for the IBM Netfinity EXP15 Storage Expansion Unit Type 3520, Model 2RU, 2RX and Netfinity EXP200 Storage Expansion Unit Type 3530, Model 1RU, 1RX.

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

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 HMM manuals online address is:

http://www.pc.ibm.com/us/cdt/hmm.html

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

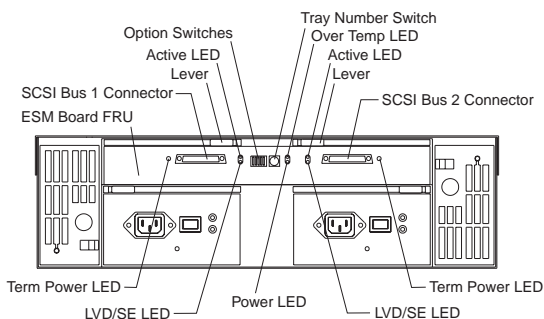| Problem Indicator	FRU/Action
Unable to access drives on one or both SCSI buses	1. **Check SCSI cables and connections** 2. Option switch 2 must be set to off. 3. ESM board
Intermittent Power Loss	1. **AC power or plug** 2. Power supply 3. Mid-plane
Random errors	1. **Mid-plane board** 2. Make sure 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
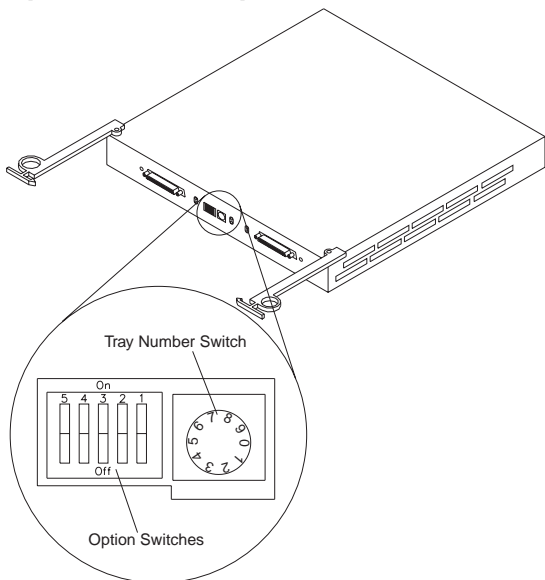
The expansion unit has three types of ID numbers:

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
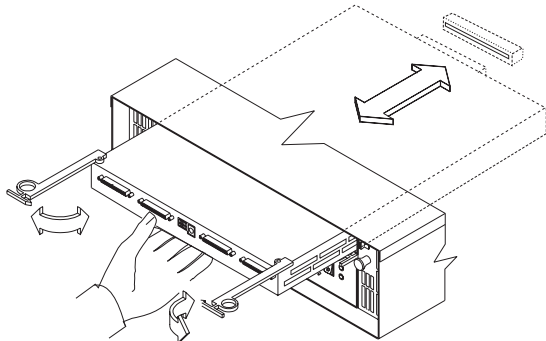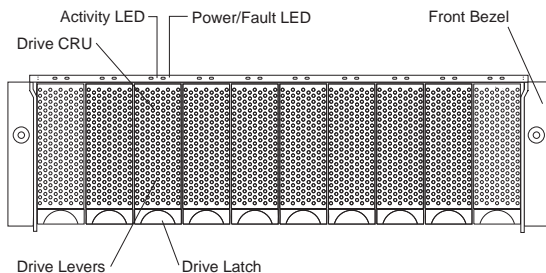

To remove the ESM board:

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.
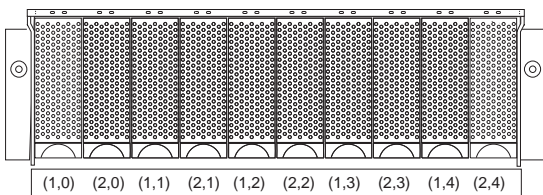

```
(1,0)  (2,0)  (1,1)  (2,1)  (1,2)  (2,2)  (1,3)  (2,3)  (1,4)  (2,4)
```

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)
```
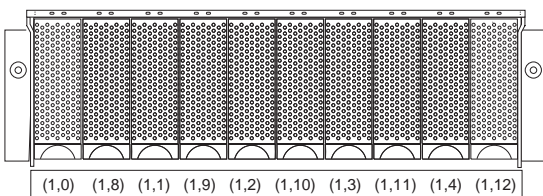
Replacing Drives (Hot-Swap)
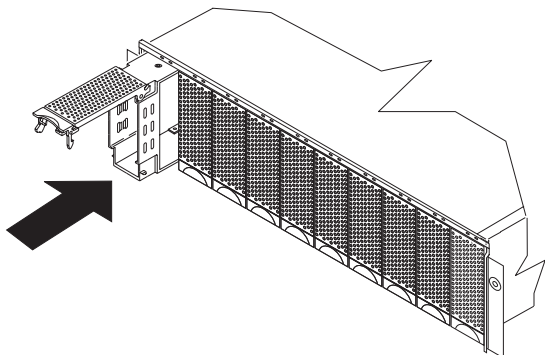
To remove the hot-swap drives:

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
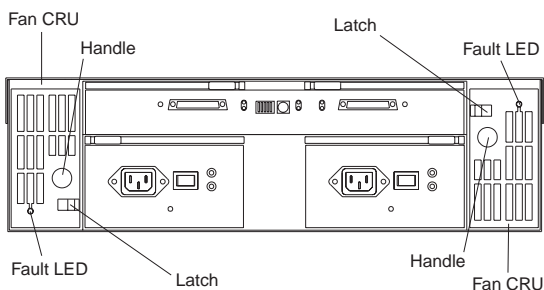
Fan Controls and Indicators

Fan LED Indications

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

Replacing Fans (Hot-Swap)

To Remove Cooling Fans:

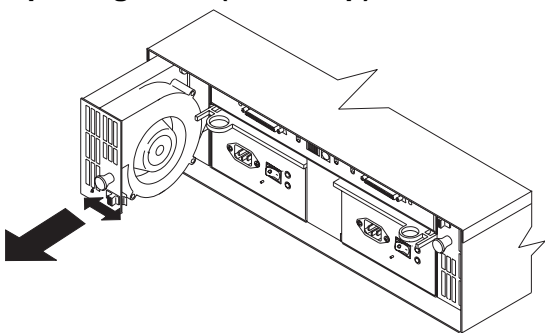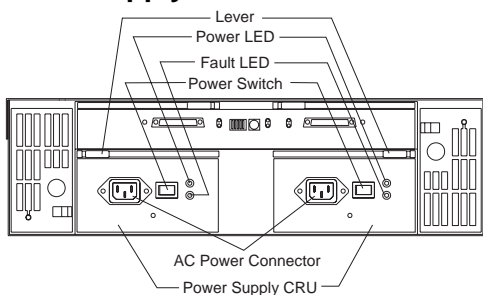1. Check the LEDs on the back of the expansion unit.
2. Slide the latch left or right to unlock the fan.
3. Use the handle (black knob) to pull the fan from the expansion unit.
4. Install the new fan by inserting it into the expansion slot and making sure it is seated into the mid plane connector. Slide 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
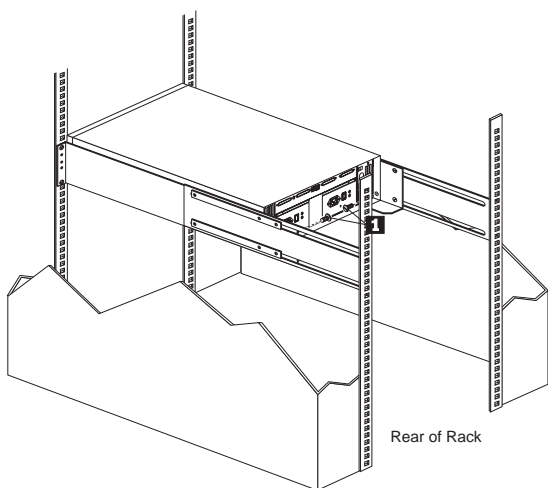
1. Remove screws **1** from assembly rails at rear.

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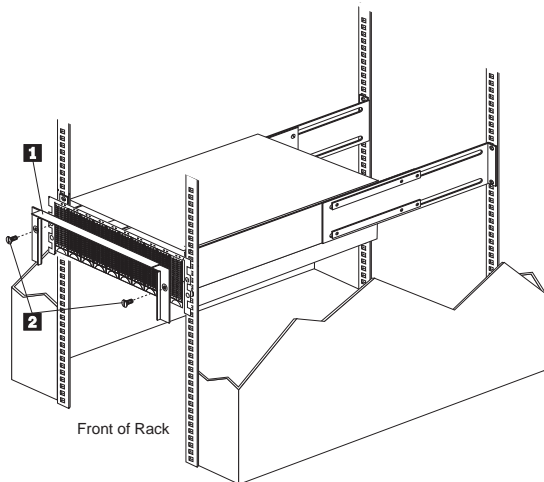
2. Remove screws **2** and remove bezel **1** .

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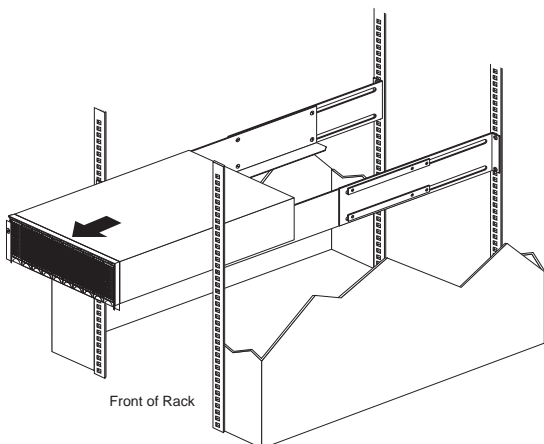
3. Slide expansion unit out of rack.

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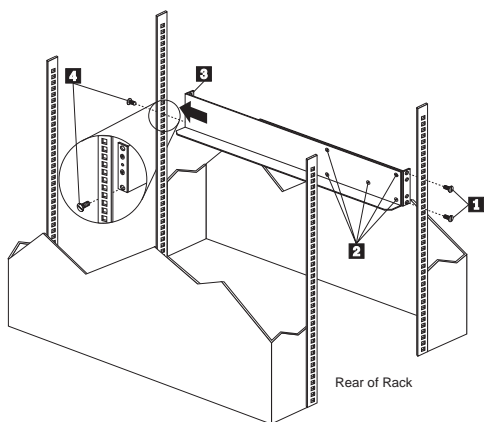
2. Loosen the five screws (four large screws and one
   small screw) **2** located on the interior of the rail

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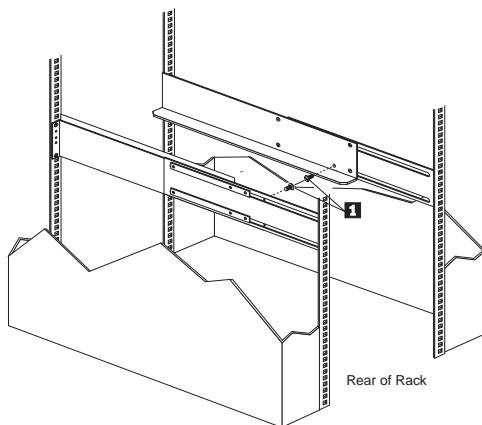
6. Remove the two small 6-32 screws **1** on the interior side of the rails. Save these screws to install the expansion unit

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.

Index		FRU No.
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
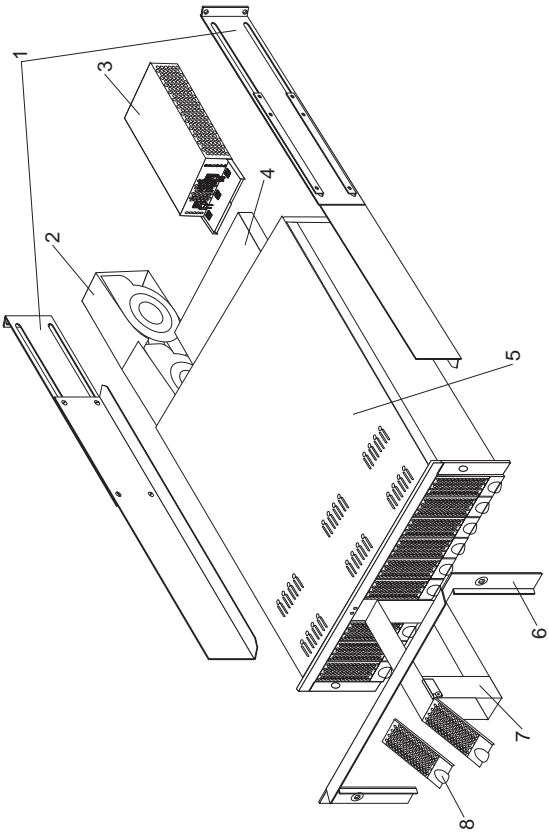- ESM Latch Right
- Power Supply Latch
- Light Pipes (2 each)
- 6-32X1/2-Inch Screw
- M6 Rail Screws (2 each)
- M5X8L Screw (2 each)
- M3X5L Screw (2 each)
- Large Spacer (2 each)

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
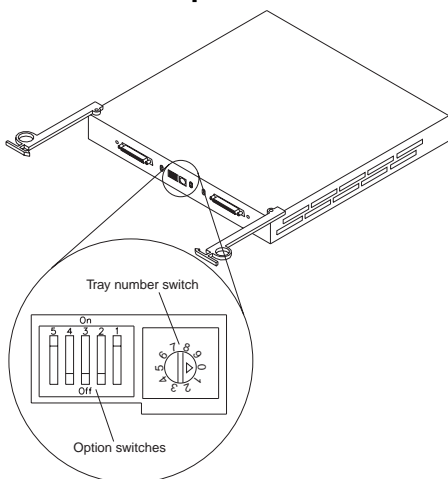
The expansion unit has two types of ID numbers:

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
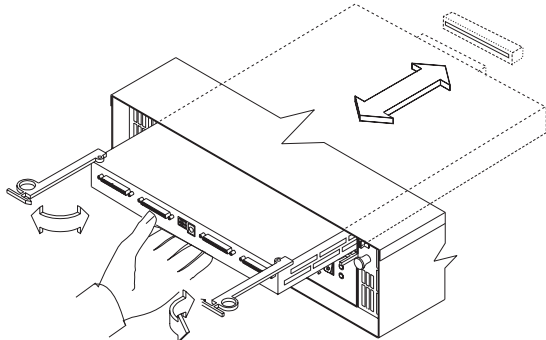
To remove the ESM board:

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.

(1,0) (2,0) (1,1) (2,1) (1,2) (2,2) (1,3) (2,3) (1,4) (2,4)

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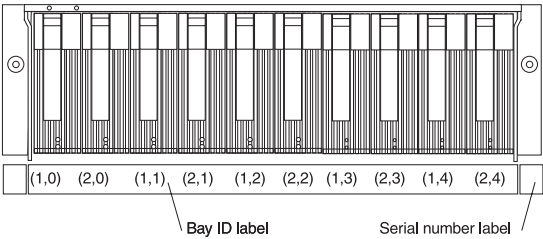
The first number represents the channel number and the
second is the SCSI ID. See the following illustration for
bus and SCSI ID values when option switch 1 is set to the
on state and switch 5 is on (for tower orientation). Use the
option switch on the ESM board to change the ID settings.
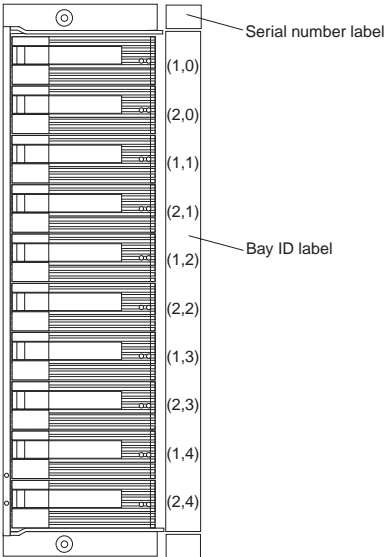
The first number represents the channel number and the
second is the SCSI ID.

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.
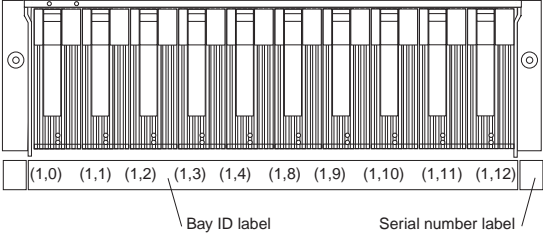
(1,0) (1,1) (1,2) (1,3) (1,4) (1,8) (1,9) (1,10) (1,11) (1,12)

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.
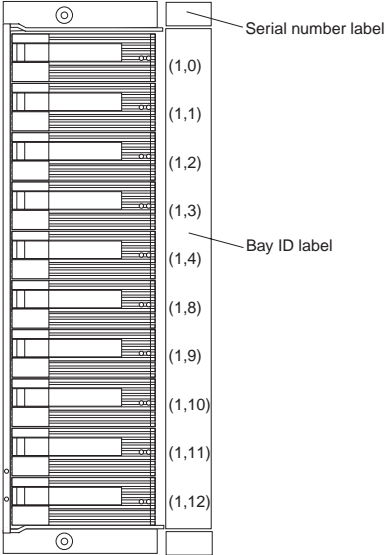
Replacing Drives (Hot-Swap)
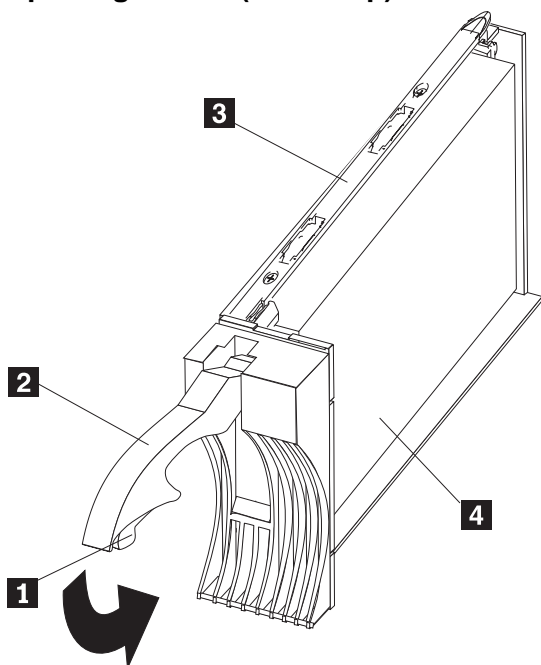
To remove the hot-swap drives:

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
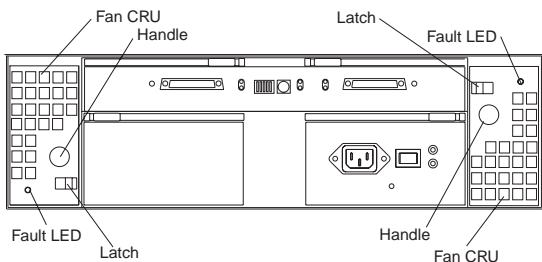
Fan Controls and Indicators

Fan LED Indications

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

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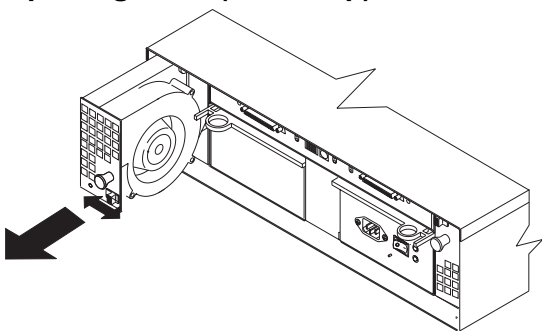
To Remove Cooling Fans:

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

- Levers
- Power LED
- Fault LED
- Power switch
- AC power connector
- Power supply CRU
- Optional power supply bay cover

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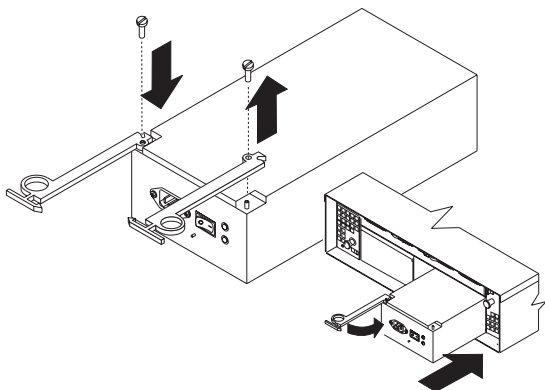
Attention:
The base unit with one power supply is *not* redundant. You must install the redundant power supply option to make your unit redundant. If you unplug the standard power supply from the basic configuration without having the redundant power option installed, you will lose power

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.

Tray number switch
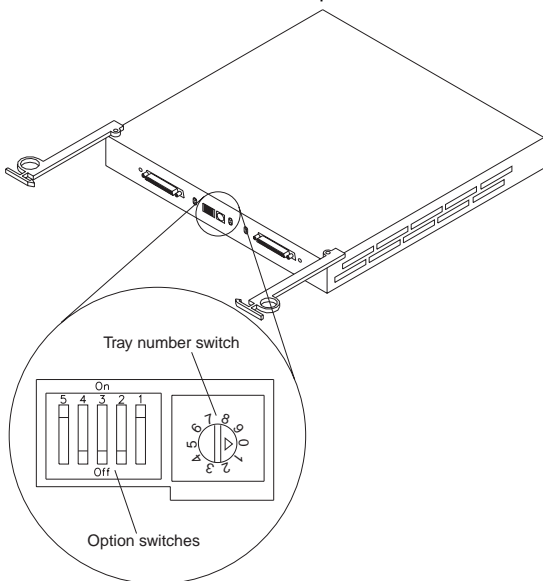
Option switches

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:
  0, 1, 2, 3, 4, 8, 9, 10, 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 0, 1, 2, 3, and 4; and the five internal Bus-2 bays SCSI IDs 0, 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**
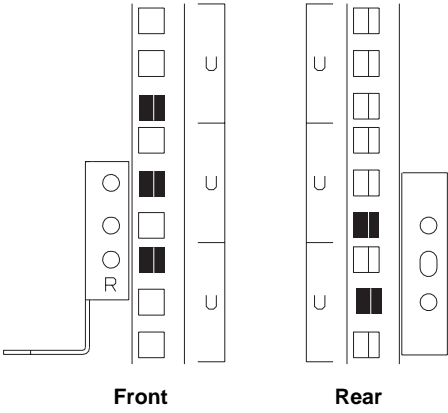
Note: Use clip nuts if your rack has round holes. If your rack has square holes, you can use the rack insertion tool or a flat-blade screwdriver to install cage nuts.

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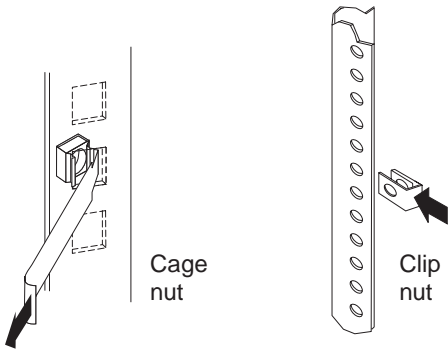
2. On the rail marked "L", remove and save the small screw **1**; then, loosen the four large screws **2**.
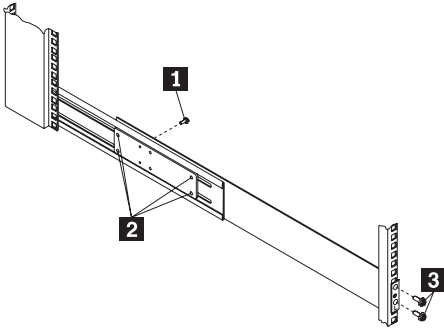
3. Hold the rail against the outside of the left rack mounting flange and loosely insert the front black hex screws **3**.

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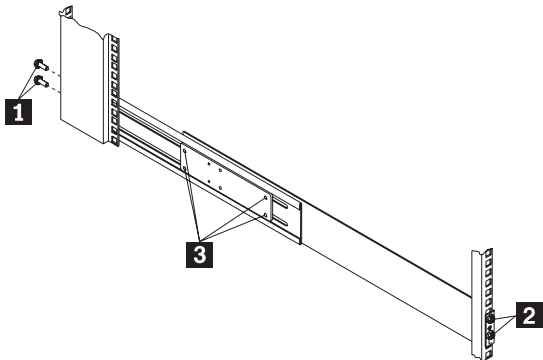
5. Tighten the two front screws **2** ; then, tighten the four large screws **3** .

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.
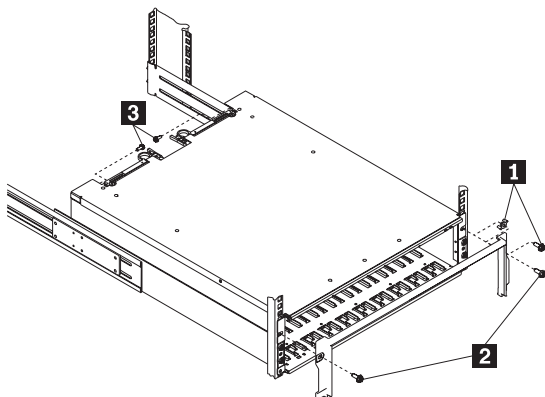
7. Align the bezel locator pins with the expansion unit; then, secure the bezel and EXP200 with two black hex screws **2** .

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:
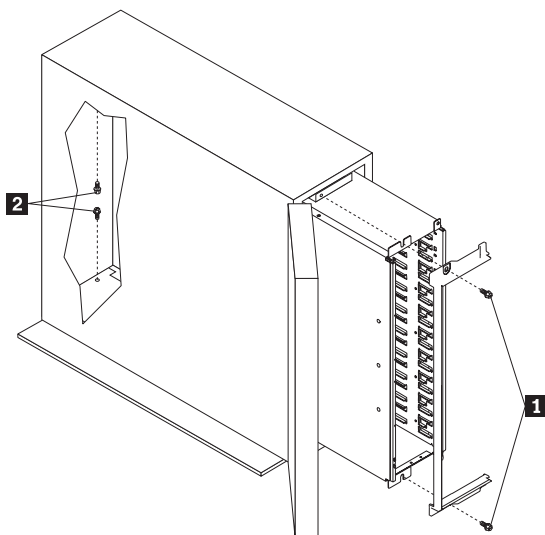
1. Unlock and open the enclosure door.

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).
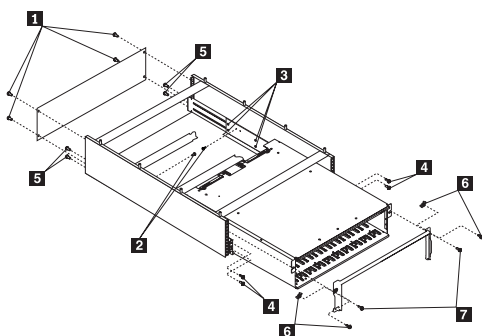
To install the expansion unit in the enclosure, use the following procedure:

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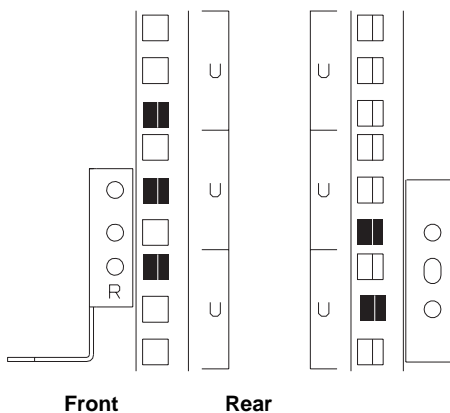
3. On the rail marked "L", remove and save the small screw **2**; then, loosen the four large screws **3**.

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
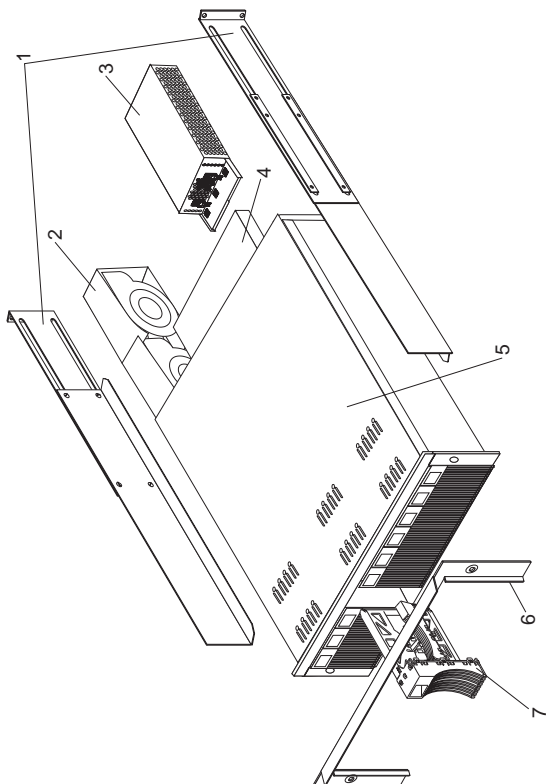
System

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

Related Service Information

Safety Information

The following section contains the safety information that you need to be familiar with before servicing the IBM Netfinity EXP15 or EXP200 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，或開啓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. 開啓裝置電源。	

・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.	
4. Branchez les cordons d'alimentation sur un socle de prise de courant.	3. Débranchez les câbles d'interface des prises.
5. Mettez les unités sous tension.	4. Débranchez tous les câbles des unités.

- 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.	3. Rimuovere i cavi di segnale dalle prese.
4. Collegare il(i) cavo(i) di alimentazione alla presa elettrica.	4. Rimuovere tutti i cavi dalle unità.
5. ACCENDERE le unità.	

- Avviso 5

≥**32 kg**   ≥**55 kg**

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

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 배선 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.	

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

1. Apague todos los componentes (OFF).

2. En primer lugar, conecte todos los cables a los dispositivos.

3. Conecte los cables de señal a los receptáculos.

4. Conecte los cables de alimentación a las tomas.

5. Encienda el dispositivo (ON).

Instrucciones de desconexión

1. Encienda todos los componentes (ON).

2. En primer lugar, retire los cables de alimentación de las tomas.

3. Retire los cables de señal de los receptáculos.

4. Retire todos los cables de los dispositivos.

- 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 _____

Phone Number _____

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.

Phone Numbers, U.S. and Canada

> **Note**
>
> EMEA customers should contact their Dealer or IBM Service organization.

Before you place a call to the Support Center, refer to "Problem Determination Tips" on page 85.

Authorized Dealers or Servicers

Number	Information
800-528-7705	Bulletin Board Service - TSS Only
800-937-3737	IBM Business Partner Education
800-426-2472	IBM Customer Engineer Technical Support
800-IBM-DEAL	IBM Dealer Support Center
800-342-6672	IBM Direct Desktop Software Sales
303-924-4015	IBM Part Number ID and Look Up
800-426-7763	IBM PC HelpCenter
800-237-5511	IBM Software Defect Support (CSDs)
800-327-5711	IBM Software Ordering (Publications)
800-426-1484	IBM Supplies Technical Hotline
800-388-7080	IBM Warranty Parts Claims Center

U.S. Customers and Helpware Subscribers

Number	Information
800-426-8322	Customer Education Business Unit
800-999-0052	Customized Operational Services
800-237-4824	EduQuest (Educational Computers)
800-964-8523	End User HelpDesk Support
800-742-2493	IBM Anti-Virus Services
800-447-4700	IBM Authorized Dealer Referrals
800-426-2468	IBM Dealer Referral
800-426-3333	IBM Information Referral Service
800-IBM-SERV	IBM Service
800-772-2227	IBM PC HelpCenter and HelpDesk
800-426-7282	IBM Technical Manuals
800-426-9402 (Ext. 150)	Multimedia Information Center
800-241-1620	Multimedia HelpCenter
800-342-6672	OS/2 Information Line
800-237-5511	OS/2 Support Services
800-284-5933	Prodigy
914-962-0310	Prodigy User Questions
800-547-1283	Technical Coordinator Program SystemXtra for Personal Systems LAN Automated Distribution/2 OS/2 Bulletin Board OS/2 Application Assistance Center
800-551-2832	Technical Solutions Magazine

IBM Canada Customer and Servicer Support

Number	Information
800-661-PSMT	Business Partner Marketing Support
905-316-5556	Business Partner Marketing Support - Toronto
514-938-6048	Business Partner Marketing Support - French
800-465-4YOU	Customer Relations
800-IBM-SERV	Customer Service Dispatch
800-263-2769	Customer Service Parts
800-465-2222	Customer Support Center (ISC)
416-443-5701	Customer Service Repair Centre
800-505-1855	Dealer Support Group (DSG)
800-465-7999	HelpClub Registration / IBM Direct
800-465-3299	HelpFax
905-316-3299	HelpFax - Toronto
800-565-3344	HelpPC
905-513-3355	IBM Certification Administrator Mail to: 50 Acadia Drive Markham, Ontario L3R 0B3
800-661-2131	IBM Education (A+ Course)
800-268-3100	IBM Information Network Support
800-387-8343	IBM PC Service Partners
800-487-7426	International Warranty Registration
800-663-7662	Lexmark Product Information
800-IBM-9990	PartnerLine
800-263-2769	Parts Orders, Exchange or Emergency
416-443-5808 (Fax)	Parts Regular Orders, Exchange
416-443-5755	Parts Orders, Inquiries
514-938-3022	PC Co Bulletin Board - Montreal
905-316-4255	PC Co Bulletin Board - Markham
604-664-6464	PC Co Bulletin Board - Vancouver
204-934-2735	PC Co Bulletin Board - Winnepeg
800-661-7768	PS Marketing Support (PSMT)
800-565-3344	PS/1 Warranty Customer Helpline
800-387-8483	PS/1 Warranty Service (DOAs)
800-465-1234	Publications Ordering
905-316-4148	Service Management Support
905-316-4100 (Fax)	Service Management Support
905-316-4150	Service (Warranty) Manager
905-316-4100 (Fax)	Service (Warranty) Manager
905-316-4872	Service Quality Programs
905-316-4100 (Fax)	Service Quality Programs
800-661-2131	Skill Dynamics (Education)
800-565-3344	ThinkPad EasyServe
416-443-5835 (Fax)	Warranty Claim Fulfillment
905-316-2445	Warranty Claim Reimbursement
905-316-3515 (Fax)	Warranty Claim Reimbursement
416-443-5778	Warranty Claim Parts Inquiry
800-505-1855	Warranty Provider Support Hotline
800-267-7472	Warranty Service, ThinkPad

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