IBM Netfinity EXP15 Storage Expansion Unit
Type 3520

Hardware Maintenance Manual

September, 1998

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

We Want Your Comments!
(Please see page 48)
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We Want Your Comments!
(Please see page 48)
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First Edition (September 1998)

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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.

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.

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Use the IBM Personal computing solutions (BBS) or the World Wide Web (WWW) to download Diagnostic, BIOS Flash, and Device Driver files.

File download address is:

The IBM BBS can be reached at (919) 517-0001.

IBM Online Addresses:

The HMM manuals online address is:

The IBM Support Page is:
http://www.pc.ibm.com/support/

The IBM Personal computing solutions page is:
http://www.pc.ibm.com
Related Publications
The following publications are available for IBM products. For more information, contact IBM or an IBM Authorized Dealer.

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<td>IBM Personal System/2 Hardware Maintenance Manual (S52G-9971)</td>
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<td>IBM Mobile Systems Hardware Maintenance Manual Volume 2 (S82G-1502)</td>
</tr>
<tr>
<td>ThinkPad Computers (ThinkPad 365, 560, 760, SelectaDock)</td>
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</tr>
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Features

Modularized Components
- High-capacity 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 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 drives per channel

ESM Board
- ID numbers
  - Switch controlled for drive channel numbers: 1 and 2
  - Switch On – Drive SCSI IDs: 0, 1, 2, 3, and 4 for both Channel 1 and Channel 2.
  - Switch Off (default) – Drive SCSI IDs: 0, 1, 2, 3, and 4 for Channel 1 and Drive SCSI IDs: 8, 9, 10, 11, and 12 for 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

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.

<table>
<thead>
<tr>
<th>Problem</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drive Numbering</td>
<td>See “Drive Numbering” on page 13.</td>
</tr>
<tr>
<td>Error Codes/Error Messages</td>
<td>Refer to the Symptom-to-FRU Index for the server that the Storage Expansion Unit you are servicing is connected to.</td>
</tr>
<tr>
<td>Expansion Unit Options Switches</td>
<td>See “Expansion Unit Option Switches” on page 11.</td>
</tr>
<tr>
<td>Fan Controls and Indications</td>
<td>See “Fan Controls and Indicators” on page 15.</td>
</tr>
<tr>
<td>Front Controls and Indications</td>
<td>See “Front Controls and Indicators” on page 12.</td>
</tr>
<tr>
<td>Performing a Shutdown</td>
<td>See “Performing a Shutdown” on page 4.</td>
</tr>
<tr>
<td>Power Supply Controls and Indicators</td>
<td>See “Power Supply Controls and Indicators” on page 17.</td>
</tr>
<tr>
<td>Rear Controls and Indications</td>
<td>See “ESM Board Controls and Indicators” on page 10.</td>
</tr>
<tr>
<td>Turning the Power On</td>
<td>See “Turning the Power On” on page 4.</td>
</tr>
</tbody>
</table>
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):
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.

<table>
<thead>
<tr>
<th>Problem Indicator</th>
<th>FRU/Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amber LED On</td>
<td>1. Drive CRU</td>
</tr>
<tr>
<td>(Front Panel)</td>
<td></td>
</tr>
<tr>
<td>Amber and Green LED Flashing</td>
<td>1. Host issued a drive rebuild command</td>
</tr>
<tr>
<td>(Front Panel)</td>
<td></td>
</tr>
<tr>
<td>Amber LED On</td>
<td>1. Fan</td>
</tr>
<tr>
<td>(Fan CRU)</td>
<td></td>
</tr>
<tr>
<td>Amber LED On</td>
<td>1. ESM board&lt;br&gt;2. Check for fan fault LED&lt;br&gt;3. Unit is overheating. Check temperature.</td>
</tr>
<tr>
<td>(ESM Board)</td>
<td></td>
</tr>
<tr>
<td>(Power Supply CRU)</td>
<td></td>
</tr>
<tr>
<td>Amber and Green LEDs On</td>
<td>1. Power Supply CRU</td>
</tr>
<tr>
<td>(Power Supply CRU)</td>
<td></td>
</tr>
<tr>
<td>Amber and Green LEDs Off</td>
<td>1. Reseat drive CRU&lt;br&gt;2. Drive CRU</td>
</tr>
<tr>
<td>(Drive CRU)</td>
<td></td>
</tr>
<tr>
<td>All Green LEDs Off</td>
<td>1. Check AC voltage cabinet AC voltage line inputs.&lt;br&gt;2. Power Supplies&lt;br&gt;3. Mid-plane board</td>
</tr>
<tr>
<td>(All CRUs)</td>
<td></td>
</tr>
<tr>
<td>Intermittent power loss to Expansion Unit</td>
<td>1. Check AC voltage line inputs, and cabinet power components.&lt;br&gt;2. Power Supplies&lt;br&gt;3. Mid-plane board</td>
</tr>
<tr>
<td>One or more Green LEDs Off</td>
<td>1. Turn Power Switch On&lt;br&gt;2. Power cord&lt;br&gt;3. Reseat Power Supply&lt;br&gt;4. Power Supply CRU</td>
</tr>
<tr>
<td>(Power Supply CRU)</td>
<td></td>
</tr>
<tr>
<td>One or more Green LEDs Off</td>
<td>1. No activity to the drive&lt;br&gt;2. This can be normal activity</td>
</tr>
<tr>
<td>(One or Two Drive CRUs)</td>
<td></td>
</tr>
<tr>
<td>One or more Green LEDs Off</td>
<td>1. Use SCSI RAID Manager to check drive status&lt;br&gt;2. SCSI Cables&lt;br&gt;3. ESM Board&lt;br&gt;4. Mid-plane board</td>
</tr>
<tr>
<td>(All Drive CRUs or those on one Bus)</td>
<td></td>
</tr>
<tr>
<td>Problem Indicator</td>
<td>FRU/Action</td>
</tr>
<tr>
<td>--------------------------------------------------------</td>
<td>-------------------------------------------------</td>
</tr>
<tr>
<td>One or more Green LEDs Off (Several CRUs)</td>
<td>1. Affected CRU</td>
</tr>
<tr>
<td></td>
<td>2. ESM board</td>
</tr>
<tr>
<td></td>
<td>3. Mid-plane board Check</td>
</tr>
<tr>
<td></td>
<td>SCSI cables</td>
</tr>
<tr>
<td>Unable to access drives on one or both SCSI buses</td>
<td>1. Check SCSI cables and connections</td>
</tr>
<tr>
<td>(Drives and SCSI Bus)</td>
<td>2. Option switch 2 must be set to off.</td>
</tr>
<tr>
<td></td>
<td>3. ESM board</td>
</tr>
<tr>
<td>Intermittent Power Loss (Some or all CRUs)</td>
<td>1. AC power or plug</td>
</tr>
<tr>
<td></td>
<td>2. Power supply CRU</td>
</tr>
<tr>
<td></td>
<td>3. Mid-plane</td>
</tr>
<tr>
<td>Random errors</td>
<td>1. Mid-plane board</td>
</tr>
<tr>
<td></td>
<td>2. Make sure option switches 1 and 2 are set to Off.</td>
</tr>
</tbody>
</table>

**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” on page 10
- “Expansion Unit Option Switches” on page 11
- “ESM Board Replacement” on page 12
- “Front Controls and Indicators” on page 12
- “Drive Numbering” on page 13
- “Replacing Drives (Hot-Swap)” on page 14
- “Fan Controls and Indicators” on page 15
- “Replacing Fans (Hot-Swap)” on page 16
- “Power Supply Controls and Indicators” on page 17
- “Replacing Power Supplies (Hot Swap)” on page 17
- “Removal From Rack” on page 19
- “Replacing Rails” on page 20
Note

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

ESM Board LED Indications:

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

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.
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:

<table>
<thead>
<tr>
<th>LED</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity (green)</td>
<td>Indicates read/write or inquiry operation</td>
</tr>
<tr>
<td>Power/Fault (green)</td>
<td>Indicates drive present</td>
</tr>
<tr>
<td>Power/Fault (amber/green Flashing)</td>
<td>Indicates drive rebuild</td>
</tr>
<tr>
<td>Power/Fault (amber)</td>
<td>Indicates a drive failure</td>
</tr>
</tbody>
</table>

**Fan Controls and Indicators**

**Fan LED Indications**

<table>
<thead>
<tr>
<th>LED</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fault LEDs (amber)</td>
<td>LEDs are On when a fan fails.</td>
</tr>
</tbody>
</table>
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

![Diagram of power supply controls and indicators]

Power Supply LED Indications

<table>
<thead>
<tr>
<th>LED</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power (green)</td>
<td>LEDs are On when power switches are turned on.</td>
</tr>
<tr>
<td>Fault (amber)</td>
<td>If only the amber LED is on, then power supply is off.</td>
</tr>
<tr>
<td>Power (green) and Fault (amber)</td>
<td>Both the green and amber LEDs on indicates a power supply failure.</td>
</tr>
</tbody>
</table>

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.

1. Remove screws 1 from assembly rails at rear.

2. Remove screws 2 and remove bezel 1.
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 in the top and bottom positions, starting with the top.
   b. Loosely tighten the screws.

2. Loosen the five screws (four large screws and one small screw) 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.

6. Remove the two small 6-32 screws \[1\] on the interior side of the rails. Save these screws to install the Expansion Unit.
### System

<table>
<thead>
<tr>
<th>Index</th>
<th>System (IBM Netfinity EXP15, Type 3520) Model 2RU, 2RX</th>
<th>FRU No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Rail Kit</td>
<td>01K6670</td>
</tr>
<tr>
<td>2</td>
<td>Blower Assembly</td>
<td>01K6705</td>
</tr>
<tr>
<td>3</td>
<td>350W Power Supply Assembly</td>
<td>01K6709</td>
</tr>
<tr>
<td>4</td>
<td>Electronic Module (ESM)</td>
<td>01K6708</td>
</tr>
<tr>
<td>5</td>
<td>Midplane/Frame</td>
<td>01K6707</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Index</th>
<th>Bezel, Front</th>
<th>01K6705</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Blank Tray, with bezel</td>
<td>01K6667</td>
</tr>
<tr>
<td>8</td>
<td>Bezel, HF Tray</td>
<td>01K6666</td>
</tr>
</tbody>
</table>

**Misc Hardware Kit**

- 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

<table>
<thead>
<tr>
<th>FRU No.</th>
<th>LVD SCSI Cable, 2 Meter external</th>
</tr>
</thead>
<tbody>
<tr>
<td>03K9196</td>
<td>LVD SCSI Cable, 4 Meter external</td>
</tr>
<tr>
<td>03K9198</td>
<td>LVD SCSI Cable, 12 Meter external</td>
</tr>
<tr>
<td>03K9200</td>
<td>4.5 GB Hard Disk Drive with tray and bezel (7200 RPM)</td>
</tr>
<tr>
<td>01K6675</td>
<td>4.5 GB Hard Disk Drive with tray and bezel (10,000 RPM)</td>
</tr>
<tr>
<td>01K6682</td>
<td>9.1 GB Hard Disk Drive with tray and bezel (7,200 RPM)</td>
</tr>
<tr>
<td>01K6679</td>
<td>9.1 GB Hard Disk Drive with tray and bezel (10,000 RPM)</td>
</tr>
<tr>
<td>02K0459</td>
<td>18.2 GB Hard Disk Drive with tray and bezel (7,200 RPM)</td>
</tr>
<tr>
<td>01K6718</td>
<td>18.2 GB Hard Disk Drive with tray and bezel (10,000 RPM)</td>
</tr>
<tr>
<td>02K0462</td>
<td>HF tray with holes (restricted)</td>
</tr>
<tr>
<td>01K6677</td>
<td></td>
</tr>
</tbody>
</table>
## Power Cords

<table>
<thead>
<tr>
<th>Country</th>
<th>FRU No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arabic</td>
<td>14F0033</td>
</tr>
<tr>
<td>Belgium</td>
<td>1339520</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>1339520</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>1339520</td>
</tr>
<tr>
<td>Denmark</td>
<td>13F9997</td>
</tr>
<tr>
<td>Finland</td>
<td>1339520</td>
</tr>
<tr>
<td>France</td>
<td>1339520</td>
</tr>
<tr>
<td>Germany</td>
<td>1339520</td>
</tr>
<tr>
<td>Hungary</td>
<td>1339520</td>
</tr>
<tr>
<td>Israel</td>
<td>14F0087</td>
</tr>
<tr>
<td>Italy</td>
<td>14F0089</td>
</tr>
<tr>
<td>Latvia</td>
<td>1339520</td>
</tr>
<tr>
<td>Netherlands</td>
<td>1339520</td>
</tr>
<tr>
<td>Norway</td>
<td>1339520</td>
</tr>
<tr>
<td>Poland</td>
<td>1339520</td>
</tr>
<tr>
<td>Portugal</td>
<td>1339520</td>
</tr>
<tr>
<td>Serbia</td>
<td>1339520</td>
</tr>
<tr>
<td>Slovakia</td>
<td>1339520</td>
</tr>
<tr>
<td>South Africa</td>
<td>14F0015</td>
</tr>
<tr>
<td>Spain</td>
<td>1339520</td>
</tr>
<tr>
<td>Switzerland</td>
<td>1339520</td>
</tr>
<tr>
<td>Switzerland (French/German)</td>
<td>14F0051</td>
</tr>
<tr>
<td>U.S. English</td>
<td>62X1045</td>
</tr>
<tr>
<td>U.K./Ireland</td>
<td>14F0033</td>
</tr>
<tr>
<td>Yugoslavia</td>
<td>1339520</td>
</tr>
</tbody>
</table>
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).

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  Electrical Safety . . . . . . . . . . . . . . . . . 41
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Safety Information

The following section contains the safety information that you need to be familiar with before servicing the IBM Netfinity EXP15 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.
CAUTION: Use safe lifting practices when lifting your machine.

<table>
<thead>
<tr>
<th>To Connect</th>
<th>To Disconnect</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Turn Everything OFF.</td>
<td>1. Turn Everything OFF.</td>
</tr>
<tr>
<td>2. First, attach all cables</td>
<td>2. First, remove power</td>
</tr>
<tr>
<td>to devices.</td>
<td>cord(s) from outlet.</td>
</tr>
<tr>
<td>3. Attach signal cables to</td>
<td>3. Remove signal cables</td>
</tr>
<tr>
<td>receptacles.</td>
<td>from receptacles.</td>
</tr>
<tr>
<td>4. Attach power cord(s) to</td>
<td>4. Remove all cables</td>
</tr>
<tr>
<td>outlet.</td>
<td>from devices.</td>
</tr>
</tbody>
</table>

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.
Instrução 5

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

<table>
<thead>
<tr>
<th>Para Conectar</th>
<th>Para Desconectar</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. DESLIGUE tudo.</td>
<td>1. DESLIGUE tudo.</td>
</tr>
<tr>
<td>2. Conecte primeiro todos os cabos nos dispositivos.</td>
<td>2. Remova primeiro o(s) cabo(s) de alimentação das tomadas.</td>
</tr>
<tr>
<td>3. Conecte os cabos de sinal nos receptáculos.</td>
<td>3. Remova os cabos de sinal dos receptáculos.</td>
</tr>
<tr>
<td>4. Conecte o(s) cabo(s) de alimentação nas tomadas.</td>
<td>4. Remova todos os cabos dos dispositivos.</td>
</tr>
<tr>
<td>5. LIGUE o dispositivo.</td>
<td></td>
</tr>
</tbody>
</table>

- Instrução 5

≥32 kg (70,5 lbs)   ≥55 kg (121,2 lbs)
声明 1

危险！

为避免电击危险，请不要在湿气环境下连接或断开任何电缆，或是在进行该产品的安装、维护或重新配置操作时。

为避免电击危险：
- 电缆线必须连接到适当的电缆及接地端子。
- 该产品应连接到所有设备也必须连接到正确接地的端子上。

如需可能，请使用一只手连接或断开连接到信号电缆，以避免在接触两个具有不同电位的部件时遭到电击。

电流线、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壳时，按照下述步骤连接或断开电缆。

需连接电缆
1. 关闭所有设备。
2. 将信号线接到插座。
3. 将电缆线接到电源插座。
4. 打开设备。
5. 将电缆线接到电源插座。

需断开电缆
1. 关闭所有设备。
2. 将电源线从插座拔下电源线。
3. 从插座拔下信号电缆。
4. 从设备上拔下所有电缆。

声明 5

注意！

搬运设备时，请进行安全搬运操作。
危險

為了避免電擊，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、維修或重新安裝本產品。

為了避免電擊：
- 電源線必須連接到接線及接頭正確的插座。
- 本產品的電源線必須連接到接線正確的插座。

切勿使用管子、鈎子或任何工具來連接或拔掉信號電纜，以免造成觸碰異電位的接頭，而受到電擊。

電源、電話及信號電纜上有電流流通。為了避免電擊，在安裝、移動本產品，或開啓本產品的蓋子及與本產品連接之位置的蓋子時，請依照下列「連接」及「拔掉」電纜線的步驟操作。

連接
1. 開啓所有鎖頭。
2. 去除信號電纜連接至裝置。
3. 將信號電纜連接到信號源端。
4. 將電源線插入直流電源插座。
5. 開啓電源開關。

拔掉
1. 開啓所有鎖頭。
2. 去除信號電纜從信號源端。
3. 除掉信號電纜上的所有信號電纜。
4. 將電源線拔掉直流電源插座。

注意：

提昇機器時，請使用安全提昇措施。

Notice nc 1
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
1. Mettez les unités hors tension.
2. Commencez par brancher tous les cordons sur les unités.
4. Branchez les cordons d'alimentation sur un socle de prise de courant.
5. Mettez les unités sous tension.

### Déconnexion
1. Mettez les unités hors tension.
2. Commencez pas débrancher les cordons alimentation des socles de prise de courant.
3. Débranchez les câbles d'interface des prises.
4. Débranchez tous les câbles des unités.

*Notice n° 5*

⚠️

#### cuidado:
*Ce produit pèse un poids considérable.*
*Faites-vous aider pour le soulever.*
• Hinweis 1

VORSICHT


Aus Sicherheitsgründen:
– Gerät nur an eine Schutzkontaktteckdose mit ordnungsgemäß geerdetem Schutzkontakt anschließen.
– Alle angeschlossenen Geräte ebenfalls an Schutzkontaktteckdosen mit ordnungsgemäß geerdetem Schutzkontakt anschließen.

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

**Kabel anschließen**

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

**Kabel lösen**

1. Alle Geräte ausschalten.

- Hinweis 5

![Warnungssymbol](32 kg)  

![Warnungssymbol](55 kg)

**achtung:**
Beim Anheben der Maschine die vorgeschriebenen Sicherheitsbestimmungen beachten.
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.
**ATTENZIONE:**
Durante il sollevamento della macchina seguire delle norme di sicurezza.

<table>
<thead>
<tr>
<th>Per collegare</th>
<th>Per scollegare</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. <strong>SPEGNERE</strong> tutti i dispositivi.</td>
<td>1. <strong>SPEGNERE</strong> tutti i dispositivi.</td>
</tr>
<tr>
<td>2. Collegare prima tutti i cavi alle unità.</td>
<td>2. Rimuovere prima il(i) cavo(i) di alimentazione dalla presa elettrica.</td>
</tr>
<tr>
<td>3. Collegare i cavi di segnale alle prese.</td>
<td>3. Rimuovere i cavi di segnale dalle prese.</td>
</tr>
<tr>
<td>4. Collegare il(i) cavo(i) di alimentazione alla presa elettrica.</td>
<td>4. Rimuovere tutti i cavi dalle unità.</td>
</tr>
<tr>
<td>5. <strong>ACCENDERE</strong> le unità.</td>
<td></td>
</tr>
</tbody>
</table>
위험

전기 촉격을 방지하기 위해 다음과 같이 합니다.

→ 고압선은 접촉한 곳이 잘 지나는 콘센트로 연결되어야 합니다.

→ 이 제품이 접속할 모든 장비도 접속한 후 콘센트의 콘센트로 연결되어야 합니다.

다른 전원을 가진 두 표면을 연결할 때 발생할 수 있는 전기 촉격을 방지하기 위한 순서로 전원선을 연결하거나 꺼내십시오.

주의: 전원 및 통신 케이블로부터 물이 나오는 장치는 화재의 위험이 있습니다. 전기 촉격을 피하려면 이 제품이나 접촉 장치를 쌓지, 이동 및 열기를 방해할 수 있는 장소에 장려 케이블을 연결하고 꺼내십시오.

전원배선 순서

1. 모든 스위치를 끄,
2. 연체 또는 케이블을 장치에 연결한다.
3. 신호선을 콘센트에 연결한다.
4. 전원을 콘센트에 연결한다.
5. 장치 스위치를 끄.

연결해제 순서

1. 모든 스위치를 끄,
2. 연체 또는 케이블을 장치에 제거한다.
3. 신호선을 콘센트에서 제거한다.
4. 전원을 콘센트에서 제거한다.
5. 장치 스위치를 끄.

주의:
기계를 끄는 안전하게 물이 끓이지 않으십시오.

32kg(70.5파운드)
55kg(121.2파운드)
• 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.
Declaración 5

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

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

• Declaración 5

≥32 kg  
≥55 kg
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 10L9839). 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 49.

Authorized Dealers or Servicers

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<td>800-937-3737</td>
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<td>800-426-1464</td>
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<td>800-772-2227</td>
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