IBM Netfinity EXP10 Storage Expansion Unit Type 3520

Hardware Maintenance Manual

October, 1997

Use this supplement with the PC Servers Hardware Maintenance Manual

We Want Your Comments! (Please see page 29)

IBM

Note

Before using this information and the product it supports, be sure to read the general information under “Notices” on page 33.

First (October 1997)

About This Supplement

This supplement contains Symptom-to-FRU Index, service information, and configuration information for the Netfinity EXP10 Storage Expansion Unit Type 3520.

This supplement should be used with information in the IBM *Personal System/2 Hardware Maintenance Manual* (part number 83G8990, form number S52G-9971) and *IBM PC Servers Hardware Maintenance Manual* (part number 70H0751, form number S30H-2501 to troubleshoot problems effectively.

Important

This manual is intended for trained servicers who are familiar with IBM PC Server products.

Before servicing an IBM product, be sure to review "Safety Information" on page 22.

Related Publications

The following publications are available for IBM products. For more information, contact IBM or an IBM Authorized Dealer.

For Information About	See Publication
PC Servers	IBM PC Servers Hardware Maintenance Manual (S30H-2501)
PS/2 Computers	IBM Personal System/2 Hardware Maintenance Manual (S52G-9971)
PS/ValuePoint Computers	IBM PS/ValuePoint Hardware Maintenance Service and Reference (S61G-1423)
Laptop, Notebook, Portable, and ThinkPad Computers (L40, CL57, N45, N51, P70/P75, ThinkPad 300, 350, 500, 510, 710T, Expansion Unit, Dock I, Dock II)	IBM Mobile Systems Hardware Maintenance Manual Volume 1 (S82G-1501)
ThinkPad Computers (ThinkPad 340, 355, 360, 370, 700, 701, 720, 750, 755)	IBM Mobile Systems Hardware Maintenance Manual Volume 2 (S82G-1502)
ThinkPad Computers (ThinkPad 365, 560, 760, SelectaDock)	IBM Mobile Systems Hardware Maintenance Manual Volume 3 (S82G-1503)
Monitors (Displays) (February 1993)	IBM PS/2 Display HMM Volume 1 (SA38-0053)
Monitors (December 1993)	IBM Color Monitor HMM Volume 2 (S71G-4197)
IBM Monitors (P/G Series) (July 1996)	IBM Monitor HMM Volume 3 (S52H-3679)
IBM 2248 Monitor (February 1996)	IBM Monitor HMM Volume 4 (S52H-3739)
Disk Array technology overview and using the IBM RAID Configuration Program	Configuring Your Disk Array booklet (S82G-1506)
Installation Planning for Personal System/2 computers	Personal System/2 Installation Planning and Beyond (G41G-2927)
Installation Planning for Advanced Personal System/2 Servers	Advanced PS/2 Servers Planning and Selection Guide (GG24-3927)

Contents

Netfinity EXP10 Type 3520

Features

Modularized Components

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

Technology

- Supports disk array technology
- Supports RAID levels 0, 1, and 5
- SCSI host interface
- Redundant data storage, cooling system, and power system.
- Hot-swap logic 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), 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
  - Drive channel numbers: 1 and 2
  - Drive SCSI IDs: 0, 1, 2, 3, and 4 (can be changed) — Channel 1 default
  - Drive SCSI IDs: 9, 10, 11, 12,and 13 (can be changed) — Channel 2 default
- Technology and Interfaces
  - Model: SCSI, single-ended
  - SCSI bus interface: Four, 68-pin, Ultra SCSI connectors for incoming and outgoing SCSI bus cables

Additonal Service Information

- "Performing a Shutdown"
- "Turning the Power On" on page 3

Performing a Shutdown

Note: If the Expansion Unit loses power unexpectedly, it might be be due to a hardware failure in the power system or mid-plane (see " Symptom-to-FRU Index" on page 6).

To perform a shutdown:

1. If possible, stop all activity and check the LEDs (front and back). Make note of any fault LEDs that may be lit so you can correct the problem when you turn on the power again.
2. Turn off *both* power supply switches; then, unplug both power cords from the Expansion Unit.

Turning the Power On

Use this procedure to power on the Netfinity EXP10 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 switches on the Expansion Unit are set correctly.
     c. The host controller and other SCSI bus devices are ready for the initial power-up.
     d. Check the system documentation for all the hardware devices you intend to power-up and determine the proper startup sequence.
  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 6.
- **Re-starting:**

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

Specifications

Size

- With front panel:
  - Depth: 57.15 cm (22.5 in.)
  - Height: 13.3 cm (5.19 in.)
  - Width: 48.2 mm (19.97 in.)

Weight

- Typical expansion unit as shipped: 43.5 kg (96.0 lb)

Heat Output

- Approximate heat output in British Thermal Units (BTU) per hour:
  - Minimum configuration: 440 BTU (129 watts)
  - Maximum configuration: 1000 BTU (293 watts)

Electrical Input

- Single-Phase Line to Neutral
  - Low range (50Hz):
    Minimum: 90 V ac
    Maximum: 257 V ac
  - High range (60Hz):
    Minimum: 90 V ac
    Maximum: 127 V ac
- Single-Phase Line to Line
  - Low range (50Hz):
    Minimum: 180 V ac
    Maximum: 240 V ac
- High range (60Hz):
  Minimum: 180 V ac
  Maximum: 254 V ac

Environment

- Air Flow: Air flow is from front to back
- Altitude:
  - Operating/Storage Range:
    30.5m (100ft.)BSL - 3,000m (9,840ft.)ASL
  - Transit Range:
    30.5m (100ft.)BSL - 12000m (40,000ft.)ASL
  - Temperature:
    - Operating Range: 10° to 40° C (50° to 104° F)
    - Storage Range: -10° to 50° C (14° to 120° F
    - Transit Range: -40° to 60° C (-40° to 140° F)
  - Temperature Change (maximum allowed)
    - Operating Range: 10° C (18° F) per hour
    - Storage Range: 15° C (27° F) per hour
  - Relative Humidity: (no condensation)
    - Operating Range: 10% to 90%
    - Storage Range: 10% to 90%
    - Transit Range: 10% to 95%
    - Max Dew Point: 26° C (79° F)
    - Max Humidity Gradient: 10% per hour

Heat Output

- Approximate heat output in British Thermal Units (BTU) per hour:
  - Minimum configuration: 337.4 BTU (98.7 watts)
  - Maximum configuration: 929.1 BTU (271.7 watts)

Sound

- Sound Power: 6.0 bels
- Sound Pressure 60 dba

Symptom-to-FRU Index

Use the troubleshooting chart in this section to find solutions to problems that have definite symptoms.

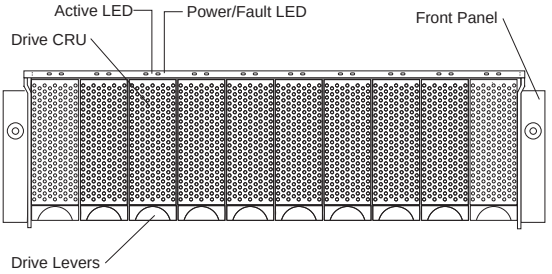
Problem Indicator	FRU/Action
Amber LED on	**Drive** Fan Check ambient air temperature ESM board Power to server but not expansion unit Power to expansion unit but not server Clustering problems Loose cable connections between expansion unit and server External SCSI cable length too long for application Adapter speed set too fast for external SCSI cable length **Note:** For more information on SCSI issues, see the SCSI Adapter User's Guide.
Amber LED on, green LED off	**Power Switch**
Amber and green LEDs on	**Power Supply**
Amber and green LEDs off	**Reseat drive CRU** Drive
All green LEDs off	**Check AC voltage cabinet AC voltage line inputs.** Power Supplies Mid-plane board
Intermittent power loss to Expansion Unit	**Check AC voltage line inputs, and cabinet power components.** Power Supplies Mid-plane board
One or more green LEDs off	**Reseat Power Supplies** Reseat drive CRU Power Supplies Drive CRUs Mid-plane board ESM board Check SCSI cables

Problem Indicator	FRU/Action
Unable to access drives on one or both SCSI buses	**Check SCSI cables and connections** Check the drive SCSI ID settings. If drives are daisy-chained to same SCSI bus, option switches 1 and 2 must be set to different SCSI ID settings ESM board
Random errors	**Mid-plane board**

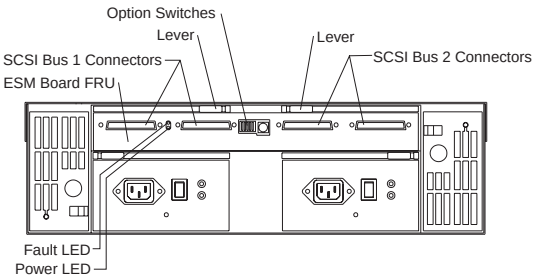
Note: If you cannot find the problem in the troubleshooting charts, test the entire system. See the server documentation for more detailed information on testing and diagnostic tools.

Locations

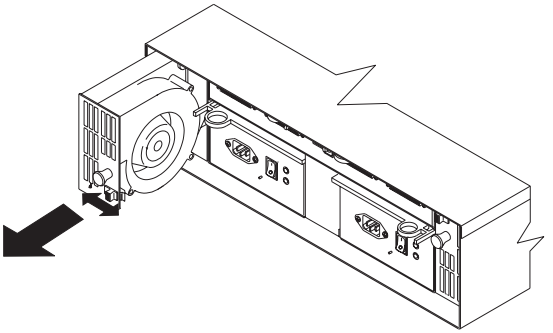
Front Controls and Indicators



Rear Controls and Indicators



Cooling Fans (Hot-Swap)



To Remove Cooling Fans:

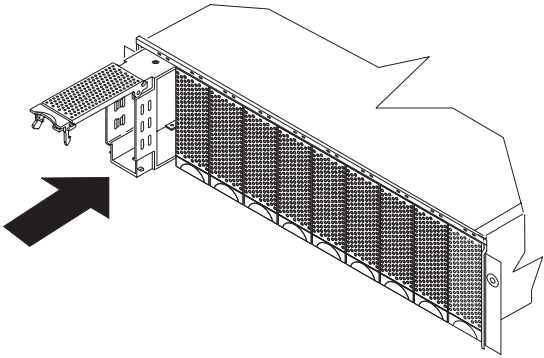
1. Check the LEDs on the back of the expansion unit.
2. Slide the latch left or right to unlock the fan.
3. Use the handle (black knob) to pull the fan from the expansion unit.
4. Install the new fan by inserting it into the expansion slot and making sure it is seated into the mid plane connector. Slide 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 6.

Caution

If it takes longer than 15 minutes to swap the fan, you must shut down the expansion unit to keep the unit from overheating. This time limit apples to the total time that the fan is out of the chassis and not running.

For information on expansion unit shutdown, see "Performing a Shutdown" on page 2.

Drives (Hot-Swap)



To remove the hot-swap drives:

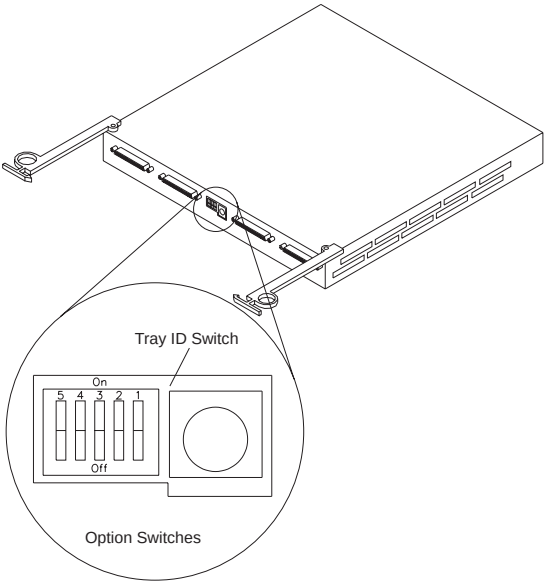
1. Pull on the bottom of the tray lever to release the lever.
2. Lift the lever and slide the drive out of the slot.
3. Install the new drive, Making sure at least ten seconds have passed before you install the new drive tray. Unlatch and open the drive lever and insert the drive.
4. Lock the lever in 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.
    b. If Power/Fault light is amber, remove the drive from the unit; wait 10 seconds, then reinstall the drive. If the SCSI adapter is the IBM ServeRaid, see 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 (such as HSP,RDY, and rebuild drive to ONL). 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, the drive may 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 instructions on how to perform a manual drive state change. The amber LED should go off within 10 seconds of a drive change to something other than DDD.

The following table shows the LED status on the drives:

Active LED	Green	Glows intermittently during read/write or inquiry operations to drive.
Power/Fault LED	Green	Glows when a drive is installed.
Power/Fault LED	Amber	Glows to indicate a drive failure or blinks to indicate a drive rebuild command to the drive.

Expansion Unit Option Switches



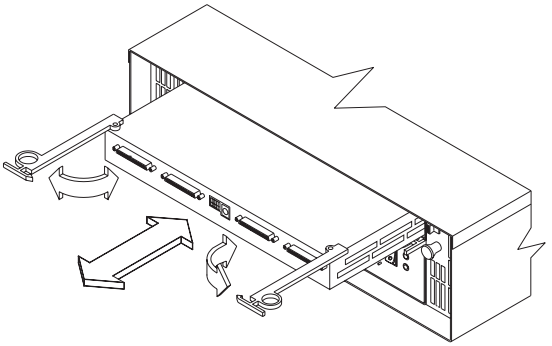
The expansion unit has three types of ID numbers:

Drive SCSI IDs	Identify each drive in the expansion unit.
SAF-TE chip SCSI ID	Identifies the chip on the ESM board.

The default settings are as follows:

- SCSI Channel 1
  - SCSI IDs = 0 through 4
  - SAF-TE SCSI ID = 0xE
- SCSI Channel 2
  - SCSI IDs = 8 through 12
  - SAF-TE SCSI ID2 = 0xF

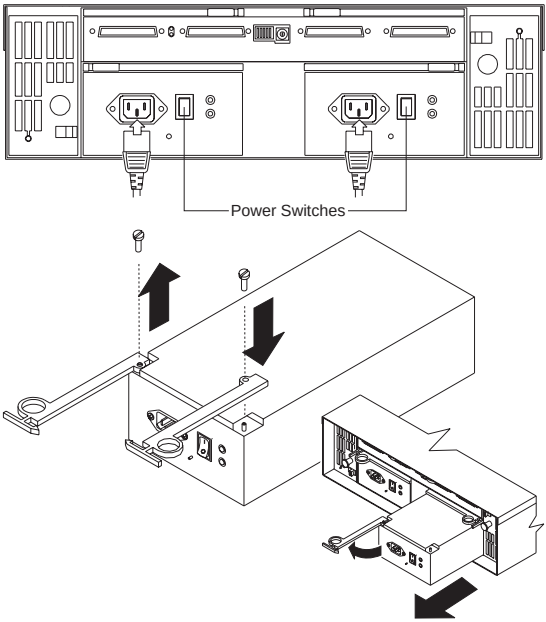
ESM Board



To the remove the ESM board:

1. Shut down the expansion unit. For shutdown information, see “Performing a Shutdown” on page 2
2. Grasp each ring and squeeze to unlatch.
3. Pull open levers and remove ESM board.

Power Supplies (Hot Swap)



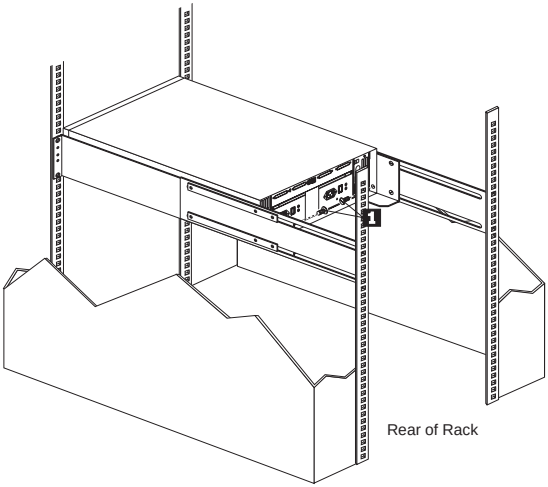
To remove a power supply:

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 ring and squeeze to unlatch.
5. Pull open lever and remove power supply.

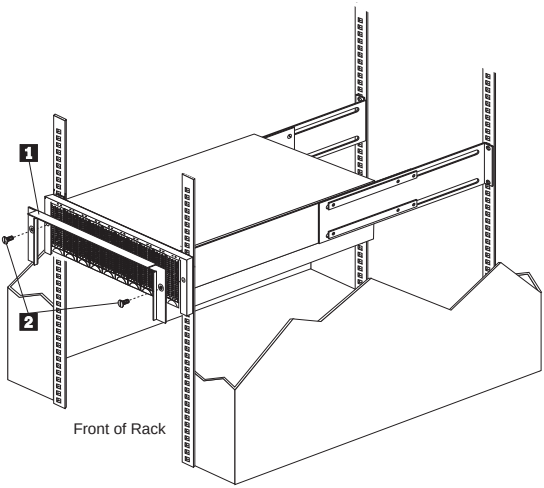
Note: When installing a new power supply, make sure that the latch is mounted to the side of the supply that is toward the middle of the machine. If not, remove the lever screw, flip the lever over and replace the screw. See the illustration above.

Removal From Rack

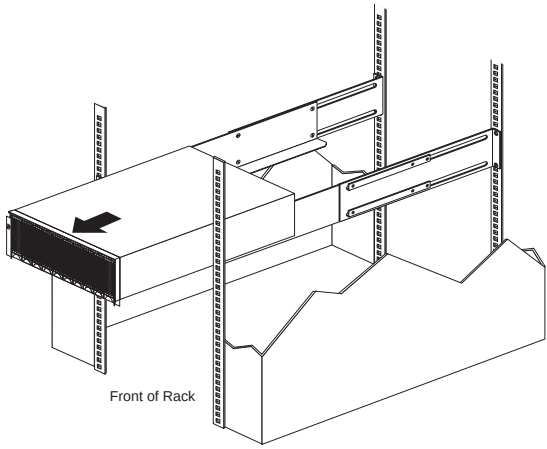
The expansion unit should only need to be removed from the rack for replacement of the midplane board/frame assembly. See “Parts Listing” on page 18 for more information.



1. Remove screws from assembly rails at rear.



2. Remove screws from bezel and remove bezel



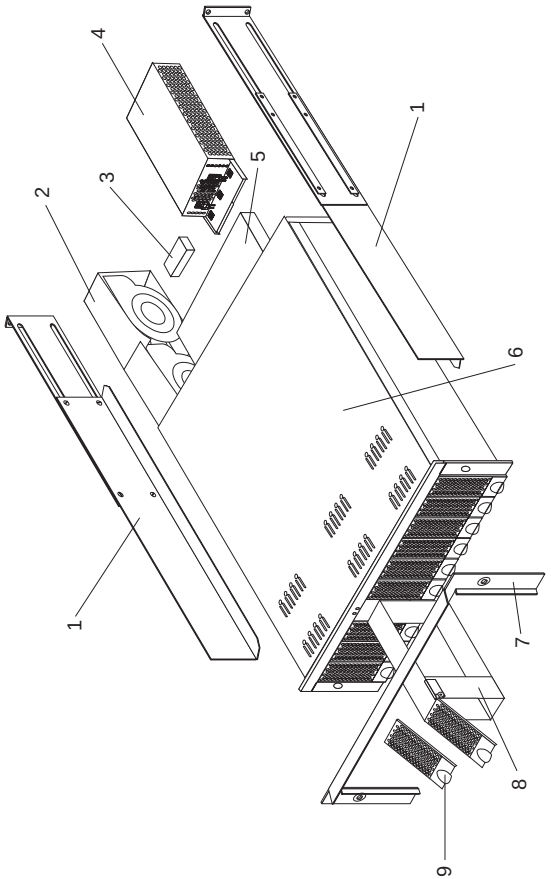
3. Slide expansion unit out of rack.

Caution

Due to the weight of the expansion unit, do not attempt to lift the expansion unit by yourself. To avoid injury, get two additional people to help you.

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

Parts Listing



System

Index	System (IBM Netfinity EXP10 3520) Model 1RU, 1RX	FRU No.
1	Rail Kit	01K6670
2	Blower Assembly	01K6672
3	SCSI Terminator	92F0432
4	250W Power Supply Assembly	01K6676
5	Electronic Module (ESM)	01K6674
6	Midplane/Frame	01K6673
	Note: The midplane board and frame are replaced as a unit. If either part is needed, order the above FRU.	
7	Bezel, Front	01K6668
8	Blank Tray, with bezel	01K6667
9	Bezel, HF Tray	01K6666
	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 • 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 • M3X5L Screw • Large Spacer (2 each)	01K6671
	SCSI Cable, .4M external	01K6669
	4GB Hard Disk Drive with tray and bezel (7,200 RPM)	01K6675
	9GB Hard Disk Drive with tray and bezel (7,200 RPM)	01K6679
	4GB Hard Disk Drive with tray and bezel (10,000 RPM)	01K6682

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

Related Service Information

Important

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

Safety Information

The following section contains the safety information that you need to be familiar with before servicing an IBM mobile computer.

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 84H8035). 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 30.

Authorized Dealers or Servicers

Number	Information
919-517-0001	Bulletin Board Service - PC Company
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
919-517-0001	Bulletin Board Service - PC Company
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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